

Memorandum

To: City of Monticello

From: Jim Stremel, PE and WSB Design Team

Date: September 21, 2021

Re: Chelsea Commons Small Area Study
Preliminary Engineering Analysis
Traffic, Grading, Earthwork & Stormwater Resource Management Analysis
WSB Project No. 017991-000

Introduction and Purpose

The City of Monticello is considering the implementation of a mixed-use development concept proposed for what is currently being called the “Chelsea Commons” area, which is located south of Chelsea Road, north of School Boulevard between Cedar Street and Edmonson Avenue. The area is guided or zoned for commercial uses and for mid to high density residential.

The Chelsea Commons area is viewed as an ideal opportunity to create a centrally located complete neighborhood which blends commercial, residential, public spaces, and public amenities. One of the primary public amenities being considered is a large waterbody as the centerpiece of the development. The proposed pond or “lake” is approximately twelve acres in size and will serve as both an recreation amenity and as stormwater management feature.

The engineering analysis performed by WSB includes three primary elements,

1. A traffic impact study to review the closure of Dundas Road;
2. A stormwater resource management analysis to determine how the “lake” amenity can function with the surrounding development;
3. A preliminary grading plan and related earthwork analysis for the “lake” amenity and surrounding development areas.

The result of this work will provide the background information and data needed to advise the adjacent site development, Chelsea Commons area public improvement project development, and cost estimates for the proposed infrastructure and stormwater management improvements.

The following sections of this memorandum represent summaries of the engineering work completed for the project. For many of these sections the full/detailed report is included within the appendices where noted.

Traffic Impact Study

In conjunction with the proposed Chelsea Commons area concept development, a Traffic Impact Study was initiated to determine what potential traffic impacts the surrounding development will have on the adjacent roadway system, including the potential closure of Dundas Road. With this study, current traffic counts were obtained in the field (April 2021) to perform the traffic distribution analysis, traffic volume forecasts, and traffic operations/impact analysis.

The traffic impacts of the existing roadway system and proposed development area were evaluated at the following locations.

- TH 25 at Chelsea Road
- Cedar Street at Chelsea Road
- Edmonson Avenue at Chelsea Road
- TH 25 at Dundas Road
- Cedar Street at Dundas Road
- Edmonson Ave at Dundas Road
- TH 25 at School Boulevard
- Cedar Street at School Boulevard
- Edmonson Ave at School Boulevard

As part of the proposed Chelsea Commons Site development plan, it is proposed to close Dundas Road from east of Cedar Street (after Storage Links existing entrance) to Edmonson Avenue. An analysis of the closure was completed documenting the anticipated traffic volumes on Dundas Road for the existing and No-Build conditions; a comparison of the trips generated by the Chelsea Commons Site development with existing commercial zoning; and the increase travel time as a result of the closure. The analysis found that vehicles would require an additional 50 seconds to divert to Chelsea Road or 90 seconds to divert to School Boulevard. The results indicate that there would be little impact to the adjacent roadway system with the closing of Dundas Road.

The full detailed Traffic Impact study was drafted under separate cover (see **Appendix A**); based on the study conclusions the following improvements are recommended:

1. Based on Mitigation Scenario 1 and/or Mitigation Scenario 2 and preliminary estimated construction costs for each Mitigation Scenario discussed in this project memo, the recommended improvements at the intersections include:
 - a. Chelsea Road at Cedar Street – Single-lane roundabout
 - b. Chelsea Road at Edmonson Avenue – Single-lane roundabout
 - c. School Boulevard at Cedar Street – Single-lane roundabout
 - d. School Boulevard at Edmonson Avenue – Signal-lane roundabout

The final determination of traffic control will be based on discussion with City staff, input from the public and approval from City Council.

2. With the closure of Dundas Road, maintain the existing Side Street Stop control on Dundas Road at Cedar Street, Site Access and Dundas Road at Edmonson Avenue. As traffic continues to grow on Cedar Street and Edmonson Avenue review the need for improved traffic control (all-way stop) at these intersections.
3. Maintain the existing center left turn lane on Cedar Street from Chelsea Road to School Boulevard.
4. Construct a center left turn lane on Edmonson Avenue from Chelsea Road to School Boulevard to accommodate turns into future site access driveways as they are proposed.
5. As development proposals for the Chelsea Commons Site development area are considered, each site access should be evaluated to determine if right turn lanes on the City Street is required and what the driveway approach lane configuration should include (i.e. left and/or right turn lanes).

Stormwater Resource Management Analysis

The stormwater resource feasibility analysis was undertaken to provide information to the City on design criteria and improvements needed to facilitate construction of the proposed Chelsea Commons pond (see Location Map, **Figure 1**).

As part of this effort, WSB performed hydraulic, hydrologic, water quality, and water quantity analyses for the watershed tributary to the proposed pond under existing and proposed conditions, evaluated improvement options available to facilitate construction of the proposed Chelsea pond, and developed recommendations for improvements.

1. **Hydraulic/Hydrologic Modeling:** A computer model was created using HydroCAD to determine how much stormwater runoff the surrounding area generates during the 2, 10, and 100 year rainfall events and how this is routed to and through the proposed ponding area and outlet piping system. Through multiple iterations with both the modeling and proposed grading of the site, a recommended Normal Water Level (NWL) was determined at an elevation of 952.5. This elevation will allow the 100-year High Water Level (HWL, aka “flood elevation” or “bounce”) to be reduced over previously anticipated HWL elevations and allow for lower adjacent building floor and underground parking entrance elevations. The anticipated increase in pond elevation (bounce) occurring during the 100-year event is approximately 4 feet.

If a NWL greater than 952.5 is desired by the City, the storm sewer within School Boulevard must be rerouted to avoid storm sewer surcharge. If the stormwater from School Boulevard is rerouted elsewhere, this would reduce the reuse potential, reduce the availability of stormwater supply to the new pond, and add additional work/cost to the project even in consideration of the benefits of reducing the excavation depths of the pond.

The primary outlet for the pond will convey stormwater west to the existing storm sewer system along Cedar Street. A new/larger 24” pipe will need to be constructed for this outlet. An existing 18” pipe currently exists within the Deephaven development to the north of the proposed ponding area that could be used as a secondary/emergency overflow pipe.

2. **Water Quantity Analysis:** Based on the findings of the soil borings and geotechnical analysis, the prevailing underlying in-situ consists of coarse sand. An impervious liner will be required with the construction of the pond in order to keep stormwater from infiltrating into the ground; the liner will aid in maintaining the desired level of the pond.

The City of Monticello’s volume control requirement says that the proposed discharge volume shall not exceed the existing discharge volume from the site. To meet this requirement for the new net impervious surface for the surrounding development and public spaces (does not include existing commercial sites or the Deephaven Site), it is recommended that a stormwater reuse system be constructed to irrigate 40 acres of pervious surface within the Chelsea Commons area annually.

Due to evaporation and water reuse, there will likely be a need to augment the pond with additional water to maintain desired levels in the pond. The three primary ways to provide augmentation are pump water from the landlocked basin across TH 25, connect to the City water system, or install a well. Based on the finding of our analysis and discussions with City staff, the recommended method is to install a well onsite.

3. **Water Quality Management:** Based on the modelling results with the pond constructed, there will be no net increase in total suspended solids and total phosphorus in runoff generated from the full buildout conditions versus current/existing conditions. In order to maintain the water quality to a level needed for recreation (boating, swimming, and fishing), additional water quality treatment options will need to be implemented to meet the City's goal of exceeding water quality standards. The primary ways to achieve this include in-lake treatments, a stormwater treatment facility, or aeration. At minimum, the City will need to implement at least the in-lake treatments and an aeration system, but to provide the greatest long term benefit and the greatest control of water quality the City may want to consider a treatment facility.

Assuming a water reuse system is implemented to irrigate approximately 40 acres of pervious surface, adjacent development will not need to meet separate volume, rate, or water quality requirements. However, adjacent developments will need to provide pretreatment meeting the MN Stormwater Manual requirements. If the City is not inclined to provide a regional water reuse system that includes adjacent development, each site will need to provide individual irrigation reuse and/or construct a permanent stormwater treatment/infiltration pond; individual onsite treatment alternatives would eliminate runoff that could otherwise be utilized to maintain water levels within the Chelsea Commons pond.

Provided in **Appendix B** is a detailed description of the procedures and methods that were followed as part of completing the analysis, and our full findings and recommendations for improvements needed to facilitate construction of Chelsea Commons pond as well as development in the surrounding area.

Preliminary Grading Design

WSB's in-house land-development design team created a viable grading concept plan for the lake amenity and immediately adjacent development areas. The grading concept plan represents land uses that align with the City's preferred General Development Plan and the concept sketches prepared by NAC, as accepted by City Council.

The preliminary mass grading plan incorporated unique site constraints as analyzed with the WSB team including the various geologic, natural resources, environmental, and transportation constraints (e.g. wetlands, floodways, storm water management areas, habitat preservation area, preferred access locations to the existing roadway system, etc.).

An evaluation of the earthwork generated from the excavation of the lake amenity was also prepared. With the construction of the lake, up to 460,000 cubic yards of material could be generated; the best use for the material includes the proposed public open spaces and/or adjacent development parcels and could account for up to 100,000 cubic yards of the excavated materials. Any remaining material will require haul off or disposal from the site. As the project progresses into a more detailed design phase, the City may want to begin marketing the underlying sandy material to contractors, builders, developers, or others in the construction industry; a partnership with one or more of these entities could reduce cost for the materials excavation and haul-off.

Soil borings and a geotechnical analysis were also completed to determine what the underlying soil material is comprised of and what it could be used for. The full geotechnical evaluation and soil borings are included in **Appendix C**.

The process to develop the grading plan and earthwork estimates was as culmination of multiple iterations, utilizing the results of the stormwater management analysis and incorporating specific elevations for the Normal Water Level (NWL), High Water Level (HWL), minimum Lowest Floor Elevation (LFE) allowed at proposed building pads to meet the City's freeboard requirements, and to designate Emergency Overflow (EOF) path for the improvement area. The final grading concept plan can be utilized by the City to share with potential developers as guidance for the desired development parameters for the overall property developments. The final recommended grading plan can be found in **Appendix C** as **Figure 4**.

Project Cost Estimates

The City of Monticello provided a framework from which to organize the estimated project costs for the construction of the lake, trails, park, gateways, and surrounding roadway/intersection improvements. The breakdown correlated into three primary groups:

1. **Baseline:** This group is intended to include the bare minimum to construct the entire lake, remove Dundas Road, relocate the utilities under Dundas Road, construct the perimeter trail around the lake, basic landscaping, construction of two Major Gateways, and one of the parking lots within the park area. The total project cost of this group was estimated to be \$11,872,500.
2. **Good:** This group is a step up from the baseline costs and includes additional landscaping features, improvements to the major gateway features, the Northwest Plaza, docks/landings, construction of two Major Gateways, and the pavilion building. The total project cost of this group was estimated to be \$4,569,500.
- 3.
4. **Great:** This group includes further enhancements to the project area that the City would like to consider at a later date or if additional funding is obtained. These elements include the construction of the secondary gateways, the reconstruction of Edmonson Avenue to an urban section, Edmonson boulevard/parkway improvements, additional landscaping elements within the commons area, pathway surface upgrades, the installation of a playground, and the improvements to four adjacent intersections. The total project cost of this group was estimated to be \$7,534,000.

Within **Appendix D** is both a summary of the Baseline, Good, and Great project cost estimates as well as detailed line item quantity/cost estimates. Each opinion of probable cost incorporates estimated 2021 construction costs and includes a 15% construction contingency factor. Indirect costs are projected at 25% of the construction cost and include engineering, legal, financing, and administrative costs. It is recommended that the City's financial consultant analyze the most appropriate ways to fund the project.

Environmental Review

The Chelsea Commons project area has been reviewed for the need for an Environmental Assessment Worksheet (EAW). Based on the information provided by the City, we have concluded that an EAW is not required. A summary of this review is included below.

The mandatory EAW thresholds for Monticello are:

- Commercial/Industrial development: 200,000 sf or more.
- Residential development if in conformance with Comprehensive Plan:
 - o 250 unattached or 375 attached units.

- Residential development if not in conformance with Comprehensive Plan:
 - o 100 unattached or 150 attached.
- Extraction of sand, gravel, etc. that will excavate 40 or more acres of land to a mean depth of 10 feet or more.

When determining if the Chelsea Commons project area requires an EAW, we also considered what defines a “project” within the environmental review rules. To determine what defines a project, three factors are considered.

- Connected actions – One project induces the other.
- Phase actions – two or more projects by same proposer in same geographic area undertaken sequentially over time.
- Three-year lookback rule – This factor deals with expansion of existing project such as adding on to an existing commercial building or phases of the same residential development by the same developer.

Based on this review, we concluded the Chelsea Commons project area does not trigger a mandatory EAW based on the following reasons:

- The area is not considered a connected action as development projects in this area are independent of each other.
- This is not considered a phased action as there are different project proposers and the individual projects do not trigger an EAW.
- Each developer’s project has been reviewed for the three-year look back rule and at this time, this rule is not triggered.
- The excavation of the storm pond will not be over 40 acres to a mean depth of 10 or more feet.

Attachments

Appendix A – Traffic Impact Study

- *Traffic Impact Study & Figures*

Appendix B – Stormwater Resource Management Analysis

- *Stormwater Resource Management Feasibility Analysis*
- *Figure 1 – Location Map*
- *Figure 2 – Existing Drainage Area Map*
- *Figure 3 – Proposed Recommendations Map*
- *Existing Conditions HydroCAD Report*
- *Proposed Conditions HydroCAD Report*
- *Water Quantity Model Results*
- *Volume Control Calculations*
- *Water Quality Model Results and Calculations*

Appendix C – Grading & Geotechnical Evaluation

- *Figure 4 - Preliminary Grading Plan*
- *Soil Boring & Geotechnical Evaluation*

Appendix D – Project Cost Estimates

- *Project Cost Summary*
- *Itemized Project Cost Estimates*

Appendix A

Traffic Impact Study & Figures



TRAFFIC IMPACT STUDY

CHELSEA COMMONS

City of Monticello, Wright County, Minnesota

July 23, 2021

Prepared for:
City of Monticello

WSB PROJECT NO. R-017991-000



CERTIFICATION

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of Minnesota.

A handwritten signature in cursive script, reading "Charles T. Rickart", positioned above a horizontal line.

Charles T. Rickart, P.E.

Date: July 23, 2021

Reg. No. 26082

Table of Contents

Background / Introduction	2
Existing Conditions	5
A. Land Use	5
B. Roadway Characteristics	5
C. Traffic Volumes	7
Traffic Projections	7
A. Background (Non-Site) Traffic Growth	7
B. Traffic Generation	7
C. Traffic Distribution	11
D. Projected Traffic Volumes	11
Traffic Impact Analysis	17
A. Methodology	17
B. Existing Conditions Analysis	18
C. Forecasted Conditions Analysis	20
Dundas Road Closure Analysis	26
A. Dundas Road Traffic Volumes	26
B. Traffic Diversion	26
Conclusions	26
Recommendations	28

List of Figures

Figure 1 - Location Map	3
Figure 2 – Area Plan	4
Figure 3a/3b - 2021 Existing Conditions	8/9
Figure 4a/4b – 2040 No-Build Volumes	13/14
Figure 5a/5b – 2040 Build Volumes	15/16
Figure 6 – Level of Service Ranges	18

List of Tables

Table 1 – Site Traffic Generation – Chelsea Commons Development Area	10
Table 2 – Site Traffic Generation – Current Zoning	11
Table 3 – Average Daily Traffic Summary	12
Table 3 – 2021 Existing Conditions Summary	19
Table 4 – 2040 No-Build Conditions Summary	21
Table 5 – 2040 Build Conditions Summary – Existing Geometrics	22
Table 6 – 2040 Build Conditions Summary – with Signal / All-way Stop Mitigation	24
Table 7 – 2040 Build Conditions Summary – with Roundabout Mitigation	25

Background / Introduction

The City of Monticello is considering the implementation of a mixed-use development concept proposed for the “Chelsea Commons” area located south of Chelsea Road, north of School Boulevard between Cedar Street and Edmonson Avenue. The project location is shown on **Figure 1**.

The area is guided or zoned for commercial uses to mid- to high-density residential. The Chelsea Commons area is viewed as an ideal opportunity to create a centrally located complete neighborhood which blends commercial, residential, and public spaces. The proposed current concept area plan is shown in **Figure 2**.

In conjunction with the proposed Chelsea Commons area concept development, the impacts of traffic on the transportation system including the possible closure of Dundas Road will require review and analysis. The purpose of this study is to determine the potential traffic impacts the development will have on the adjacent roadway system.

The traffic impacts of the existing roadway system and proposed development area were evaluated at the following locations.

- TH 25 at Chelsea Road
- Cedar Street at Chelsea Road
- Edmonson Avenue at Chelsea Road
- TH 25 at Dundas Road
- Cedar Street at Dundas Road
- Edmonson Ave at Dundas Road
- TH 25 at School Boulevard
- Cedar Street at School Boulevard
- Edmonson Ave at School Boulevard

The following sections of this report outline the findings of this study including:

- Documentation of existing and no-build traffic conditions for the Chelsea Commons development area.
- Projecting future traffic on the area roadways for the proposed Chelsea Commons development plan.
- Determining future roadway improvement alternatives based on the future traffic conditions.
- Analyzing both existing conditions and future traffic conditions with and without alternative improvements.
- Analyze the impacts the proposed closing of Dundas Road will have on the area roadway system.
- Determining lane configuration needs at the primary intersections on the area roadways.
- Developing conclusions and recommendations with respect to the existing and future roadway configurations on the area roadways.



CHELSEA COMMONS
of Monticello, Minnesota

**Gateways/Focus Areas
Vignette Drawings**



Chelsea Commons
Traffic Impact Study
City of Monticello

Figure 2
Draft
Development
Concept Plan

Existing Conditions

A. Land Use

The existing land use in the study area consists of commercial / industrial and retail uses within the development area.

B. Roadway Characteristics

TH 25: TH 25 is a north/south 4-lane Principal Arterial in the City's 2040 Comprehensive Plan. It has a 4-lane urban cross section with left and right turn lanes at all intersections. TH 25 south of Oakwood Drive to south of School Boulevard has a posted 45mph speed limit. The existing 2021 ADT on TH 25 is 30,000vpd between Oakwood Drive and School Boulevard.

Chelsea Road: Chelsea Road is an east/west Major Collector in the City's 2040 Comprehensive Plan. It has a 2-lane cross section with turn lanes at the primary intersections and paved shoulders. Chelsea Road east of TH 25 has a posted 40 mph speed limit. The existing 2021 ADT on Chelsea Road east of Edmondson Avenue is 6,200vpd, 6,450vpd between Edmondson Avenue and Cedar Street and 6,750vpd between Cedar Street and TH 25.

Dundas Road: Dundas Road is an east/west Local street in the City's 2040 Comprehensive Plan. It has a 2-lane cross section with paved shoulders. Dundas Road east of TH 25 has a posted 30 mph speed limit. The existing 2021 ADT on Dundas Road east of Edmondson Avenue is 950vpd, 1,425vpd between Edmondson Avenue and Cedar Street and 1,500vpd between Cedar Street and TH 25.

School Boulevard: School Boulevard is an east/west City of Monticello 2-lane Minor Arterial roadway in the City's 2040 Comprehensive Plan. Left and/or right turn lanes are provided at most intersections. The posted speed limit east of TH 25 is 40 mph. The existing 2021 ADT on School Boulevard east of Edmondson Avenue is 6,250vpd, 6,600vpd between Edmondson Avenue and Cedar Street and 8,450vpd between Cedar Street and TH 25.

Cedar Street: Cedar Street is a north/south Local street in the City's 2040 Comprehensive Plan. It has an urban 2-lane cross section with a raised center median north of School Boulevard and a continuous center left turn lane from north of School Boulevard to Oakwood Drive. Cedar Street has a posted 30 mph speed limit. The existing 2021 ADT on Cedar Street between School Boulevard and Dundas Road is 3,700vpd and 2,000vpd between Dundas Road and Chelsea Road.

Edmondson Avenue: Edmondson Avenue is a north/south Minor Collector roadway in the City's 2040 Comprehensive Plan. It currently has a 2-lane cross section with no shoulders. The posted speed limit on Edmondson Avenue is 35mph between Chelsea Road and Dundas Road and 55mph south of Dundas Road. The existing 2021 ADT on Edmondson Avenue between School Boulevard and Dundas Road is 2,100vpd and 1,600vpd between Dundas Road and Chelsea Road.

The lane configurations at each of the primary intersections is outlined below.

TH 25 at Chelsea Road – Traffic Signal Control
SB TH 25 – one left, two thru, one right
WB Chelsea Rd – one left, one thru, one thru/right
NB TH 25 – one left, two thru, one right
EB Chelsea Rd – one left, one thru, one thru/right

Cedar Street at Chelsea Road - Side Street Stop Control
SB Cedar St – one left, one thru, one right
WB Chelsea Rd – one left, one thru, one thru/right
NB Cedar St - one left, one thru/right
EB Chelsea Rd – one left, one thru, one thru/right

Edmonson Avenue at Chelsea Road - Side Street Stop Control
SB Edmonson Ave – one left/thru/right
WB Chelsea Rd – one left/thru/right
NB Edmonson Ave - one left/thru/right
EB Chelsea Rd – one left/thru/right

TH 25 at Dundas Road – Side Street Stop Control
SB TH 25 – one left, two thru
WB Dundas Rd – one right
NB TH 25 – two thru, one right

Cedar Street at Dundas Road - Side Street Stop Control
SB Cedar St – one left, one thru/right
WB Dundas Rd – one left/thru/right
NB Cedar St - one left, one thru/right
EB Dundas Rd – one left/thru/right

Edmonson Avenue at Dundas Road - Side Street Stop Control
SB Edmonson Ave – one left/thru/right
WB Dundas Rd – one left/thru/right
NB Edmonson Ave - one left/thru/right
EB Dundas Rd – one left/thru/right

TH 25 at School Boulevard – Traffic Signal Control
SB TH 25 – one left, two thru, one right
WB School Blvd – one left, one thru, one right
NB TH 25 – one left, two thru, one right
EB School Blvd – one left, one thru/right

Cedar Street at School Boulevard – All-Way Stop Control
SB Cedar St – one left, one thru, one right
WB School Blvd – one left, one thru, one right
NB Cedar St - one left, one thru/right
EB School Blvd – one left, one thru, one right

Edmonson Avenue at School Boulevard - Side Street Stop Control
SB Edmonson Ave – one left/thru/right
WB School Blvd – one left, one thru/right
NB Edmonson Ave - one left/thru/right
EB School Blvd – one left, one thru/right

The existing roadway geometrics including the intersection traffic control, is shown on **Figure 3a / 3b**.

C. Traffic Volumes

AM and PM peak hour turning movement and daily counts were conducted during the week of April 19th, 2021. In order to determine if these counts should be adjusted to account for “COVID-19” impacts, the data was compared to previous counts in the area. Based on this review it was determined that the traffic volumes should be adjusted and increased by 10%. These counts were used as the existing baseline conditions for the area.

Figure 3a and **Figure 3b** shows the existing intersections that were analyzed as part of this study, with the existing 2021 AM and PM peak hour and traffic volumes.

Traffic Projections

In order to analyze the lane configuration and traffic control needs projected traffic volumes were determined for the area. Projected 2040 traffic volumes were determined based on proposed anticipated future development land use in the area and the City’s current Transportation Plan. The following sections outline the projected background traffic growth, traffic generation from the study area, as well as the traffic distribution and projected traffic volumes.

A. Background (Non-Site) Traffic Growth

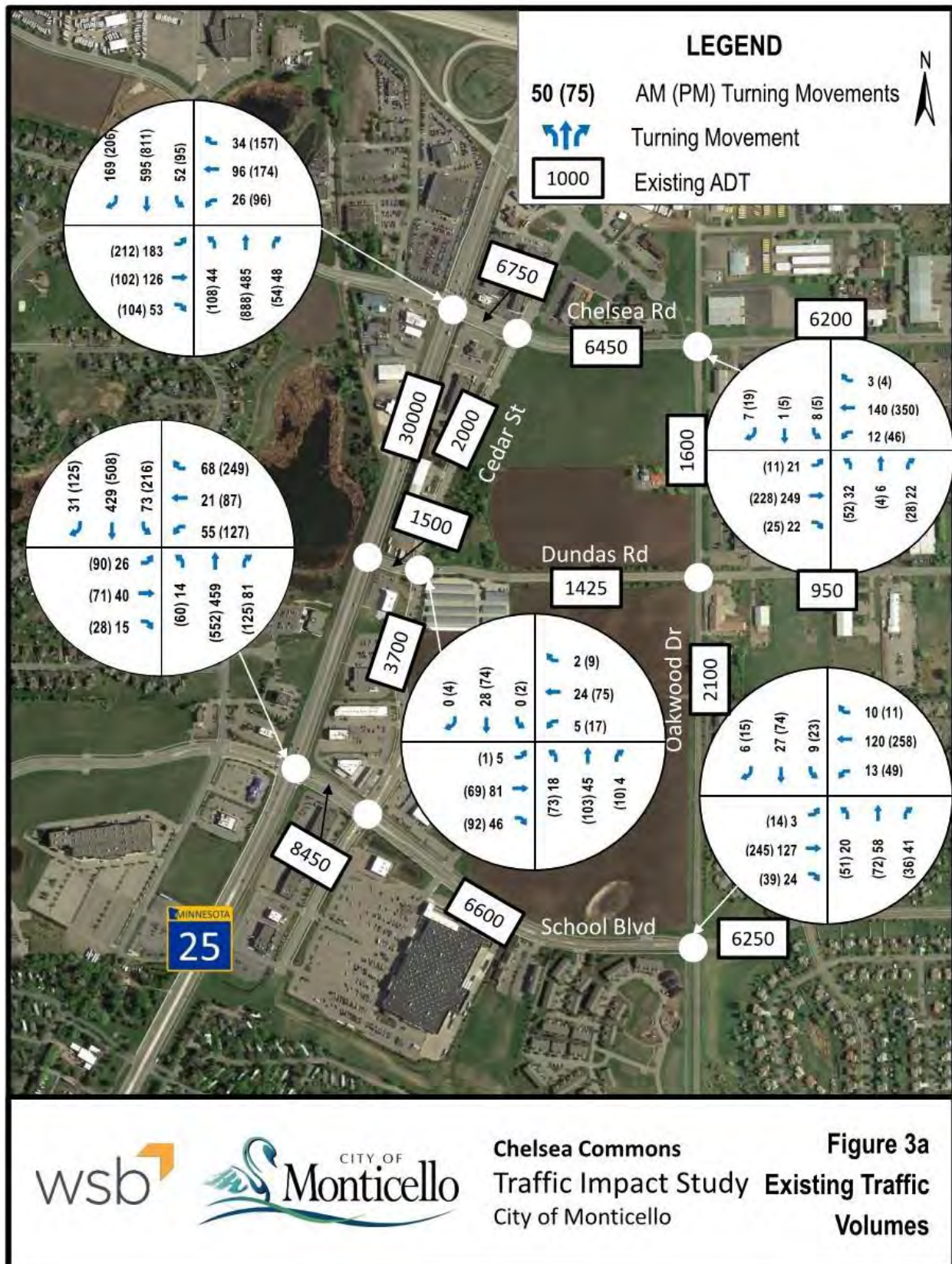
Traffic growth in the vicinity of a proposed site will occur between existing conditions (2021) and any given future year due to other development within the region. This background growth must be accounted for and included in future year traffic forecasts. Reviewing the historical traffic counts in the area, traffic has stayed somewhat constant or dropped in the past few years.

In order to account for some background traffic growth several factors were considered including the current City Transportation Plan future traffic projections compared to the existing traffic volumes, the historic traffic volumes, and the Wright County State Aid traffic growth projection factor. Based on this review a factor of 1.20 (1.0%/year) over a 20-year period was used to project traffic from 2021 to the 2040 analysis year.

B. Traffic Generation

The estimated trip generation from the proposed Chelsea Commons site development is shown below in **Table 1**. The trip generation used to estimate the proposed site traffic is based on rates for other similar land uses as documented in the Institute of Transportation Engineers *Trip Generation Manual*, 10th Edition.

The table shows the Daily, AM peak and PM peak hour trip generation for the proposed residential and commercial uses in the study area. The traffic generation was determined for three site development areas. The north section (north of Dundas Road), Central section (south of Dundas Road) and south section (north of School Boulevard).



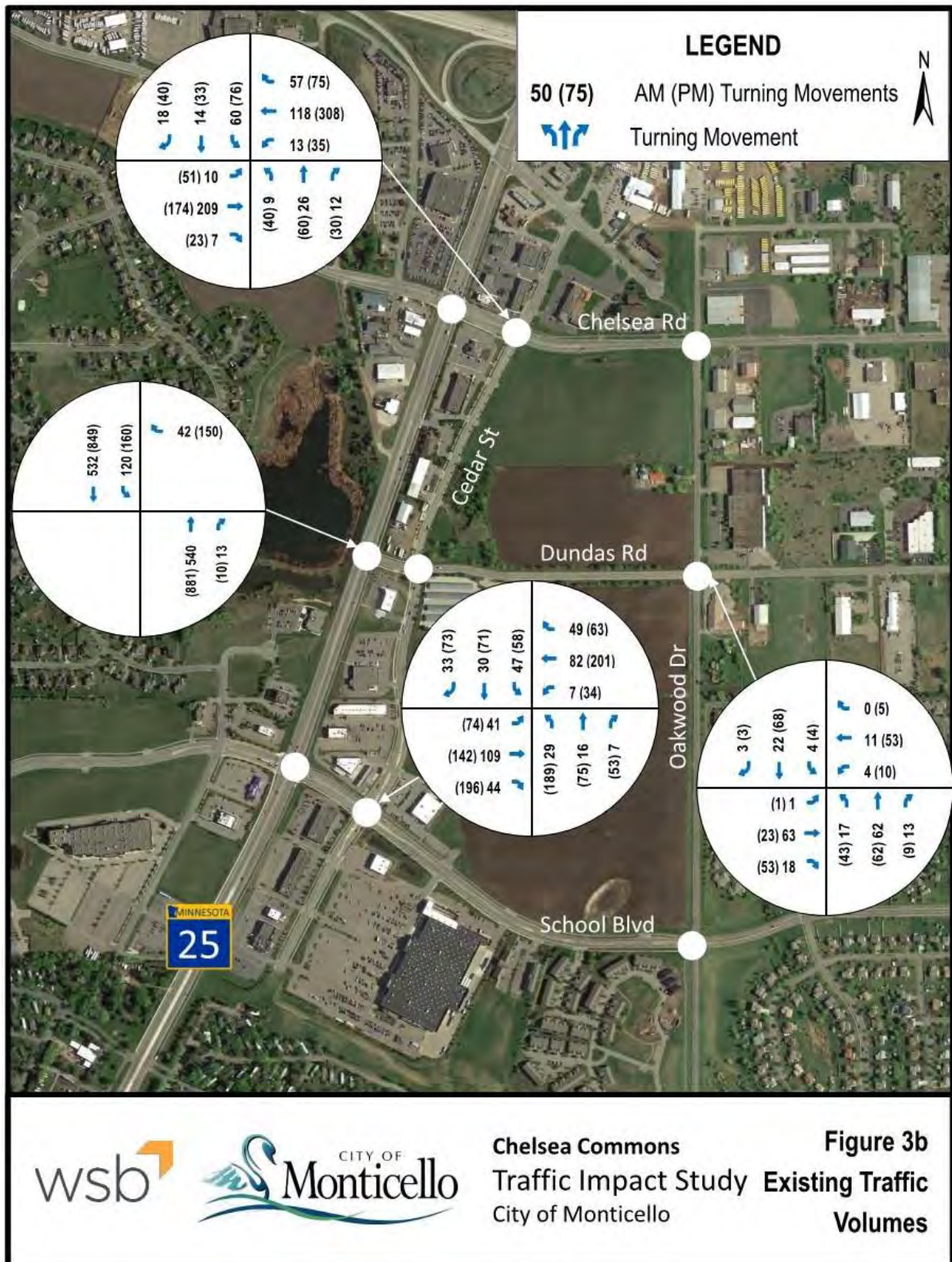


Table 1 - Estimated Site Trip Generation – Proposed Chelsea Commons Area

Planned Use	Size	ADT			AM Peak			PM Peak		
		Total	In	Out	Total	In	Out	Total	In	Out
North Section										
Residential	315 DU	2,306	1,153	1,153	145	33	112	176	111	65
Public Space	14.9 acre	12	6	6	1	1	0	2	1	1
Commercial (Office/Retail/ Hotel/Restaurant)	120,000 sf	1,168	584	584	139	120	19	138	22	116
Total		3,486	1,743	1,743	285	154	131	316	134	182
Central Section										
Residential	200 DU	1,464	732	732	92	21	71	112	71	41
Public Space	6.9 acre	6	3	3	1	1	0	2	1	1
Commercial (Retail/Restaurant)	65,000 sf	634	317	317	76	65	11	75	12	63
Total		2,104	1,052	1,052	169	87	82	189	84	105
South Section										
Residential	350 DU	2,562	1,281	1,281	161	37	124	196	123	73
Public Space	13.7 acre	10	5	5	1	1	0	2	1	1
Commercial (Retail/Office/ Restaurant)	185,000 sf	1,802	901	901	215	185	30	213	34	179
Total		4,374	2,187	2,187	377	223	154	411	158	253
Total		9,964	4,982	4,982	831	464	367	916	376	540

Source: Institute of Transportation Engineers Trip Generation Manual, 10th Edition

The study area is currently zoned for commercial uses. There are approximately 84 available undeveloped acres in the study area. Assuming a 30% FAR, and assuming no public space approximately, 257 acres (1,097,000sf) of building area could be developed.

Table 2 shows the estimated trip generation that could occur in the study area based existing zoning. Comparing this to the Chelsea Commons development plan the proposed development would generate approximately 7% fewer trips on a daily basis 34% fewer trips in the AM peak hour and 27% fewer trips in the PM peak hour.

Table 2 - Estimated Site Trip Generation – Current Zoning

Planned Use	Size	ADT			AM Peak			PM Peak		
		Total	In	Out	Total	In	Out	Total	In	Out
Commercial (Office/Retail)	1,097,000 sf	10,684	5,342	5,342	1,273	1,094	178	1,262	202	1,060

Source: Institute of Transportation Engineers Trip Generation Manual, 10th Edition

C. Traffic Distribution

Site generated trips were distributed to the adjacent roadway system based on several factors including:

- Previous traffic and transportation studies in the area, including City's current Transportation Plan.
- Anticipated origins and destinations for land use.
- Existing travel patterns and future roadway connections.

Based on these parameters the following general traffic distribution was used to distribute the projected traffic volumes to the Chelsea Commons study area:

- 40% to / from the north on TH 25
- 25% to / from the south on TH 25
- 16% to / from the east on Chelsea Road
- 2% to / from the east on Dundas Road
- 12% to / from the east on School Boulevard
- 5% to / from the south on Edmondson Avenue

D. Projected Traffic Volumes

Traffic forecasts were prepared for the twenty -year design, long term (year 2040) condition, which would represent the full development of the area.

The traffic forecasts were prepared by adding the projected annual background traffic growth to the existing 2021 traffic counts to determine the "2040 No-Build" traffic conditions. The anticipated site traffic generation was then added to the no-build traffic conditions to determine the 2040 Build traffic conditions.

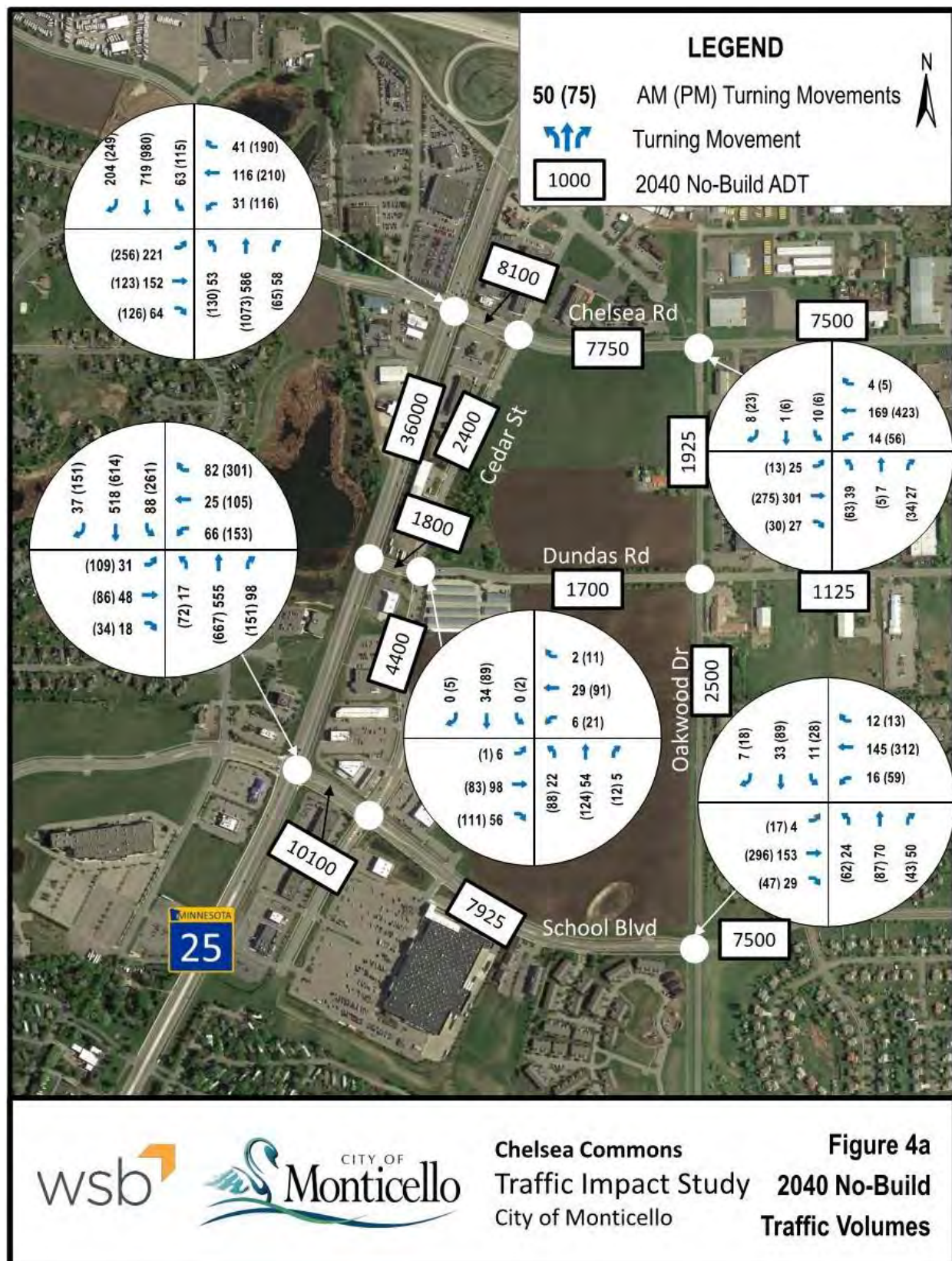
Figure 4a / 4b and **Figure 5a / 5b** shows the projected 2040 No-Build and Build ADT, AM peak hour and PM peak hour traffic volumes.

Table 3 shows a summary of the existing and projected average daily traffic (ADT) volumes.

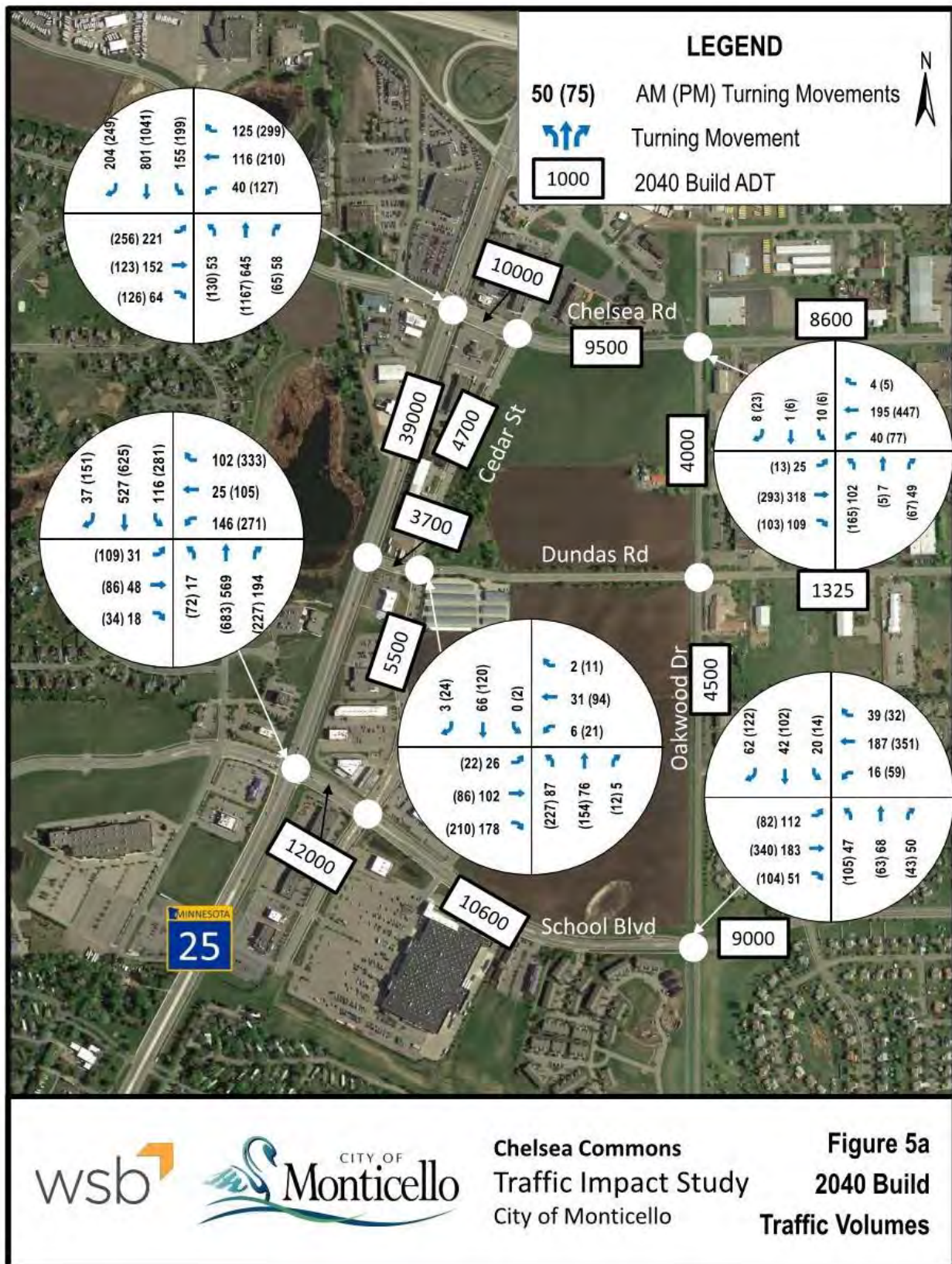
Table 3 – Average Daily Traffic Summary

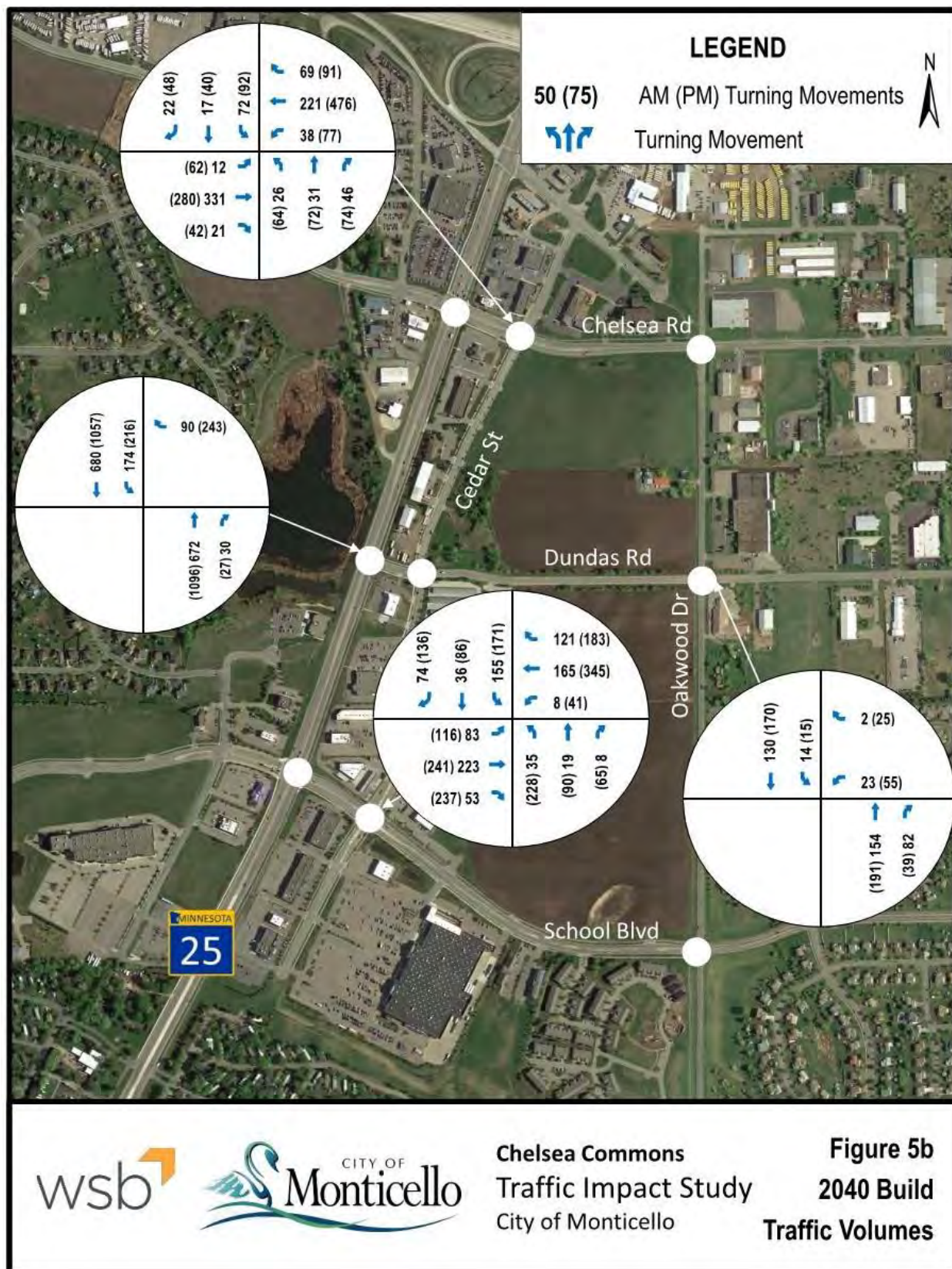
Roadway Segment	Existing 2021	Projected 2040 No-Build	Projected 2040 Build with Chelsea Commons Development	Projected 2040 Build with Commercial Land Use⁽¹⁾
Chelsea Rd – TH 25 to Cedar St	6,750	8,100	10,000	10,800
Chelsea Rd – Cedar St to Edmonson Ave	6,450	7,750	9,500	10,200
Chelsea Rd – East of Edmonson Ave	6,200	7,500	8,600	9,200
Dundas Rd – TH 25 to Cedar St	1,500	1,800	3,700	4,000
Dundas Rd – Cedar St to Edmonson Ave	1,425	1,700	0	2,500
Dundas Rd – East of Edmonson Ave	950	1,125	1,325	1,400
School Blvd – TH 25 to Cedar St	8,450	10,100	12,000	12,800
School Blvd – Cedar St to Edmonson Ave	6,600	7,925	10,600	11,300
School Blvd – East of Edmonson Ave	6,250	7,500	9,000	9,600
TH 25 – Chelsea Rd to School Blvd	30,000	36,000	39,000	41,000
Cedar St – Chelsea Rd to Dundas Rd	2,000	2,400	4,700	5,000
Cedar St – Dundas Rd to Edmonson Ave	3,700	4,400	5,500	5,800
Edmonson Ave – Chelsea Rd to Dundas Rd	1,600	1,925	4,000	4,200
Edmonson Ave – Dundas Rd to School Blvd	2,100	2,500	4,500	4,800

(1) Assumes Dundas Road open to traffic









Traffic Impact Analysis

Existing and/or forecasted traffic operations were evaluated for the intersections and access in the Chelsea Commons Site development study area. The analysis was conducted for the following scenarios.

1. Existing 2021
2. Projected 2040 No-Build
3. Projected 2040 Build
4. Projected 2040 Build with mitigation

This section describes the methodology used to assess the operations and provides a summary of traffic operations for each scenario.

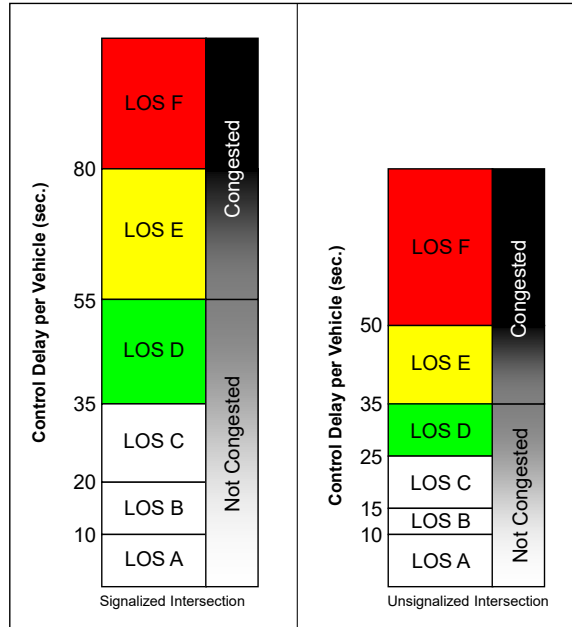
A. Methodology

The intersections in the study area were evaluated during the AM and PM peak hours using Synchro/SimTraffic micro simulation software. The results are derived from established methodologies documented in the Highway Capacity Manual (HCM) 2010. The software was used to evaluate the characteristics of the roadway network including lane geometrics, turning movement volumes, traffic control, and signal timing. In addition, the signal timing parameters for future year conditions were optimized using Synchro. This information was then transferred to SimTraffic, the traffic simulation model, to estimate average peak hour vehicle delays and queues.

One of the primary measures of effectiveness used to evaluate intersection traffic operations, as defined in the HCM, is Level of Service (LOS) – a qualitative letter grade, A – F, based on seconds of vehicle delay due to a traffic control device at an intersection. By definition, LOS A conditions represent high quality operations (i.e., motorists experience very little delay or interference) and LOS F conditions represent very poor operations (i.e., extreme delay or severe congestion).

Figure 6 depicts a graphical interpretation of delay times that define level of service. The delay thresholds are lower for un-signalized intersections than signalized intersections due to the public's perception of acceptable delays for different traffic controls as indicated in the HCM. In accordance with the Minnesota Department of Transportation (MnDOT) guidelines, this analysis used the LOS D/E boundary as an indicator of acceptable traffic operations.

Figure 6: Level of Service Ranges for Signalized and Un-signalized Intersections



SOURCE: Level of Service thresholds from the Highway Capacity Manual, 2000.

B. Existing Conditions Analysis

Existing Traffic Operations

Table 4 - 2021 Existing Conditions shown below, summarizes the existing LOS at the primary intersections in the study area based on the current lane geometry, traffic control and 2021 adjusted traffic volumes.

The analysis results show that all intersections are operating at overall LOS B or better during both the weekday AM and PM peak hours. All movements during the AM peak hour are operating at a LOS C or better, however there are some movements during the PM peak hour that are operating at LOS D including:

- Southbound left turn from TH 25 to Chelsea Road

Table 4: 2021 Existing Conditions Summary

Control	Intersection	AM Peak Hour		PM Peak Hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signal	TH 25 at Chelsea Rd	B (C)	12 (28)	C (D)	20 (46)
All-Way Stop	Cedar St at Chelsea Rd	A (B)	7 (10)	A (B)	8 (10)
Thru-Stop	Edmonson Ave at Chelsea Rd	A (A)	2 (9)	A (B)	2 (12)
Thru-Stop	TH 25 at Dundas Rd	A (A)	3 (7)	A (B)	5 (12)
Thru-Stop	Cedar St at Dundas Rd	A (A)	2 (6)	A (A)	4 (8)
All-Way Stop	Edmonson Ave at Dundas Rd	A (B)	7 (11)	A (B)	7 (11)
Signal	TH 25 at School Blvd	A (C)	8 (21)	B (C)	16 (30)
All-Way Stop	Cedar St at School Blvd	A (B)	6 (10)	A (B)	8 (13)
All-Way Stop	Edmonson Ave at School Blvd	A (A)	7 (9)	A (B)	9 (11)

X (X) – Overall LOS or Delay (Worst Movement LOS or Delay)

C. Forecasted Conditions Analysis

A capacity and LOS analysis was completed for the AM and PM peak hours at the study area intersections for the and long term (2040) conditions. The analysis was completed for the no-build, build and build with mitigation. The results of the analysis are discussed below and shown in the following sections:

2040 No-Build Traffic Operations

Table 5 – 2040 No Build Conditions Summary, shows that all intersections will continue to operate at overall LOS C or better in 2040 during both the weekday AM and PM peak hours with the current roadway configuration and only the background traffic growth. Based on the analysis the overall delays movement delays will increase from existing conditions. However, similar to the existing conditions some movements during the PM peak hour will be operating at LOS D or LOS E including:

- Southbound left turn from TH 25 to Chelsea Road = LOS E
- Northbound left turn from TH 25 to Chelsea Road = LOS D
- Southbound left turn from TH 25 to School Boulevard = LOS D

2040 Build Traffic Operations with Existing Roadway Geometrics

Table 6 – 2040 Build Conditions Summary with Existing Geometrics shows that assuming: the proposed Chelsea Commons Site development traffic generation; closing of Dundas Road from Cedar Street to Edmonson Avenue, and; existing roadway geometrics and traffic control, all intersections would operate at overall LOS C or better in the AM peak hour and LOS D or better in the PM peak hour. However, several movements would operate at LOS E or D including:

AM Peak Hour

- Eastbound left turn from Chelsea Road to Cedar Street = LOS D
- Southbound left turn from Cedar Street to School Boulevard = LOS D
- Eastbound left turn from School Boulevard to Edmonson Avenue = LOS D

PM Peak Hour

- Southbound left turn from TH 25 to Chelsea Road = LOS E
- Northbound left turn from TH 25 to Chelsea Road = LOS D
- Eastbound left turn from Chelsea Road to TH 25 = LOS D
- Northbound left turn from Cedar Street to Chelsea Road = LOS D
- Northbound left turn from Edmonson Avenue to Chelsea Road = LOS D
- Southbound left turn from TH 25 to School Boulevard = LOS D
- Northbound left turn from TH 25 to School Boulevard = LOS D
- Westbound right turn from School Boulevard to Cedar Street = LOS E
- Southbound left turn from Cedar Street to School Boulevard = LOS D
- Northbound left turn from Edmonson Avenue to School Boulevard = LOS D

Table 5: 2040 No Build Condition Summary

Control	Intersection	AM Peak Hour		PM Peak Hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signal	TH 25 at Chelsea Rd	B (C)	14 (28)	C (E)	26 (55)
All-Way Stop	Cedar St at Chelsea Rd	A (B)	8 (10)	A (B)	9 (12)
Thru-Stop	Edmonson Ave at Chelsea Rd	A (A)	2 (9)	A (B)	3 (13)
Thru-Stop	TH 25 at Dundas Rd	A (A)	4 (9)	A (C)	6 (17)
Thru-Stop	Cedar St at Dundas Rd	A (A)	3 (7)	A (A)	5 (8)
All-Way Stop	Edmonson Ave at Dundas Rd	A (B)	7 (11)	A (B)	8 (12)
Signal	TH 25 at School Blvd	A (C)	9 (22)	C (D)	20 (35)
All-Way Stop	Cedar St at School Blvd	A (B)	6 (10)	B (C)	12 (18)
All-Way Stop	Edmonson Ave at School Blvd	A (B)	7 (10)	B (B)	11 (13)

X (X) – Overall LOS or Delay (Worst Movement LOS or Delay)

Table 6: 2040 Build Conditions Summary – Existing Geometrics

Control	Intersection	AM Peak Hour		PM Peak Hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signal	TH 25 at Chelsea Rd	B (C)	17 (32)	C (E)	31 (59)
All-Way Stop	Cedar St at Chelsea Rd	C (D)	15 (25)	C (D)	17 (27)
Thru-Stop	Edmonson Ave at Chelsea Rd	B (C)	12 (20)	C (D)	15 (25)
Thru-Stop	TH 25 at Dundas Rd	B (C)	10 (17)	B (C)	12 (23)
Thru-Stop	Cedar St at Dundas Rd	B (C)	10 (16)	B (C)	12 (16)
All-Way Stop	Edmonson Ave at Dundas Rd	B (C)	12 (18)	B (C)	14 (20)
Signal	TH 25 at School Blvd	B (C)	14 (30)	C (D)	26 (39)
All-Way Stop	Cedar St at School Blvd	C (D)	17 (25)	D (E)	28 (39)
All-Way Stop	Edmonson Ave at School Blvd	C (D)	15 (26)	C (D)	20 (32)
Thru-Stop	Edmonson Ave at Farmstead Dr / Site Entrance	A (C)	9 (15)	B (C)	12 (21)

X (X) – Overall LOS or Delay (Worst Movement LOS or Delay)

2040 Build Traffic Operations – with Mitigation

In order to improve the operations at the impacted intersections adjacent to the proposed Chelsea Commons Site development two mitigation scenarios were evaluated.

Mitigation Scenario 1 (Signal / All-Way Stops) includes the following improvements:

- Cedar Street at Chelsea Road – Traffic Signal Control with left and right turn lanes on each approach
- Edmonson Avenue at Chelsea Road – All-way Stop Control with left turn lanes on each approach and right turn lanes on the Chelsea Road approaches and northbound Edmonson Avenue approach
- Cedar Street at School Boulevard – Traffic Signal Control with left and right turn lanes on each approach
- Edmonson Avenue at School Boulevard – Traffic Signal Control with left and right turn lanes on each approach
- Cedar Street – Center Left turn lane
- Edmondson Avenue – Center Left turn lane

Mitigation Scenario 2 (Roundabouts) includes the following improvements:

- Cedar Street at Chelsea Road – Single lane Roundabout
- Edmonson Avenue at Chelsea Road – Single lane Roundabout
- Cedar Street at School Boulevard – Single lane Roundabout
- Edmonson Avenue at School Boulevard – Single lane Roundabout
- Cedar Street – Center Left turn lane
- Edmondson Avenue – Center Left turn lane

Table 7 – 2040 Build Conditions Summary with Signal and All-way Stop Mitigation

shows that assuming: the proposed Chelsea Commons Site development traffic generation; closing of Dundas Road from Cedar Street to Edmonson Avenue, and; the proposed Mitigation Scenario 1 improvements, all intersections would improve to an overall LOS B or better in the AM peak hour and LOS C or better in the PM peak hour. All movements at the intersections adjacent to the site would be operating at LOS C or better. However, several movements at the TH 25 intersections during the PM peak hour would operate at LOS E or D including:

- Southbound left turn from TH 25 to Chelsea Road = LOS E
- Northbound left turn from TH 25 to Chelsea Road = LOS D
- Southbound left turn from TH 25 to School Boulevard = LOS D
- Northbound left turn from TH 25 to School Boulevard = LOS D

Table 8 – 2040 Build Conditions Summary with Roundabout Mitigation shows that assuming: the proposed Chelsea Commons Site development traffic generation; closing of Dundas Road from Cedar Street to Edmonson Avenue, and; the proposed Mitigation Scenario 2 improvements, all intersections would improve to an overall LOS B or better in the AM peak hour and LOS C or better in the PM peak hour. All movements at the intersections adjacent to the site would be operating at LOS C or better having slightly better operation than Mitigation Scenario 1. However, several movements at the TH 25 intersections during the PM peak hour would operate at LOS E or D including:

- Southbound left turn from TH 25 to Chelsea Road = LOS E
- Northbound left turn from TH 25 to Chelsea Road = LOS D
- Southbound left turn from TH 25 to School Boulevard = LOS D
- Northbound left turn from TH 25 to School Boulevard = LOS D

Table 7: 2040 Build Conditions Summary – with Signal / All-Way Stop Mitigation

Control	Intersection	AM Peak Hour		PM Peak Hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signal	TH 25 at Chelsea Rd	B (C)	17 (32)	C (E)	31 (59)
Signal	Cedar St at Chelsea Rd	B (B)	12 (15)	B (C)	13 (21)
All-Way Stop	Edmonson Ave at Chelsea Rd	B (C)	10 (17)	B (C)	12 (19)
Thru-Stop	TH 25 at Dundas Rd	B (C)	10 (17)	B (C)	12 (23)
Thru-Stop	Cedar St at Dundas Rd	B (C)	10 (16)	B (C)	12 (16)
All-Way Stop	Edmonson Ave at Dundas Rd	B (C)	12 (18)	B (C)	14 (20)
Signal	TH 25 at School Blvd	B (C)	14 (30)	C (D)	26 (39)
Signal	Cedar St at School Blvd	B (C)	11 (20)	B (C)	17 (24)
Signal	Edmonson Ave at School Blvd	B (C)	12 (21)	C (C)	20 (26)
Thru-Stop	Edmonson Ave at Farmstead Dr / Site Entrance	A (C)	9 (15)	B (C)	12 (21)

Table 8: 2040 Build Conditions Summary – with Roundabout Mitigation

Control	Intersection	AM Peak Hour		PM Peak Hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signal	TH 25 at Chelsea Rd	B (C)	17 (32)	C (E)	31 (59)
Round-about	Cedar St at Chelsea Rd	B (B)	10 (14)	B (C)	11 (17)
Round-about	Edmonson Ave at Chelsea Rd	A (C)	9 (15)	B (C)	10 (18)
Thru-Stop	TH 25 at Dundas Rd	B (C)	10 (17)	B (C)	12 (23)
Thru-Stop	Cedar St at Dundas Rd	B (C)	10 (16)	B (C)	12 (16)
All-Way Stop	Edmonson Ave at Dundas Rd	B (C)	12 (18)	B (C)	14 (20)
Signal	TH 25 at School Blvd	B (C)	14 (30)	C (D)	26 (39)
Round-about	Cedar St at School Blvd	A (C)	9 (16)	B (C)	15 (22)
Round-about	Edmonson Ave at School Blvd	B (C)	10 (15)	C (C)	17 (23)
Thru-Stop	Edmonson Ave at Farmstead Dr / Site Entrance	A (C)	9 (15)	B (C)	12 (21)

Dundas Road Closure Analysis

As part of the proposed Chelsea Commons Site development plan, it is proposed to close Dundas Road from east of Cedar Street (after Storage Links existing entrance) to Edmonson Avenue. Concern has been raised as to the impact of the Dundas Road closure. The purpose of this analysis is to document these impacts.

A. Dundas Road Traffic Volumes

Based on the traffic counts conducted in April of 2021 and traffic projections documented earlier in this report the following daily traffic volumes are/would be on Dundas Road between Cedar Street and Edmonson Avenue.

Existing 2021 = 1,425vpd

Projected 2040 No-Build = 1,700vpd

Projected 2040 Build with Chelsea Commons Development = 0

Projected 2040 Build with Commercial Land Use = 2,500vpd

Comparing the existing zoning traffic generation to the Chelsea Commons development plan traffic generation, the area would generate fewer daily trips, fewer trips in the AM peak hour and fewer trips in the PM peak hour.

Based on this comparison and as documented in the “Build Conditions Traffic Analysis” all the intersections, assuming the Dundas Road removal, would operate at acceptable levels of service.

B. Traffic Diversion

An analysis was completed for the traffic on Dundas Road that would be diverted to either School Boulevard or Chelsea Road. Based on the existing traffic patterns approximately 30% of the traffic would be diverted to Chelsea Road and 70% would be diverted to School Boulevard.

Assuming the additional distance traveled including the additional intersection stops, vehicles would require an additional 50secs to divert to Chelsea Road or 90sec to divert to School Boulevard.

Conclusions

Based on the analysis documented in this report, WSB has concluded the following:

- The City of Monticello is considering the implementation of a mixed-use development concept proposed for the “Chelsea Commons” area located south of Chelsea Road, north of School Boulevard between Cedar Street and Edmonson Avenue. It is anticipated that the site will include approximately 370,000sf of commercial uses and 860 residential units.

- The development area is anticipated to generate 9,964 daily, 831 AM peak hour and 916 PM peak hour additional trips at full build of the Chelsea Commons site.
- The access to the development site will be through driveways on Chelsea Road, Cedar Street, School Boulevard and Edmonson Avenue. The proposed site concept plan includes the removal of Dundas Road from Cedar Street to Edmonson Avenue.
- The results of the existing (2021) traffic analysis shows that all intersections are operating at overall LOS B or better during both the weekday AM and PM peak hours. All movements during the AM peak hour are operating at a LOS C or better, however there are some movements during the PM peak hour that are operating at LOS D.
- The traffic operations analysis for the No-Build condition shows that all intersections will continue to operate at overall LOS C or better in 2040 during both the weekday AM and PM peak hours with the current roadway configuration and only the background traffic growth. Based on the analysis the overall delays movement delays will increase from existing conditions, however, similar to the existing conditions some movements during the PM peak hour will be operating at LOS D or LOS E.
- The traffic operation analysis for the 2040 Build condition shows that assuming: the proposed Chelsea Commons Site development traffic generation; closing of Dundas Road, and; existing roadway geometrics and traffic control, all intersections would operate at overall LOS C or better in the AM peak hour and LOS D or better in the PM peak hour. However, several movements would operate at LOS D or LOS E.
- In order to improve the operations at the impacted intersections adjacent to the proposed Chelsea Commons Site development two mitigation scenarios were evaluated.
 - **Mitigation Scenario 1** – including: Traffic Signal Control and turn lane improvements at Cedar Street and Chelsea Road, Cedar Street and School Boulevard and Edmonson Avenue at School Boulevard; All-way Stop Control with turn lanes at Edmonson Avenue and Chelsea Road; and, center left turn lanes on Cedar Street and Edmonson Avenue.
 - **Mitigation Scenario 2** – including: Roundabout control at Cedar Street and Chelsea Road, Cedar Street at School Boulevard, Edmonson Avenue at Chelsea Road and Edmonson Avenue at School Boulevard; and, center left turn lanes on Cedar Street and Edmonson Avenue.
- The results of the traffic operations analysis for the 2040 Build condition with the Mitigation Scenario's show that assuming: the proposed Chelsea Commons Site development traffic generation; closing of Dundas Road from east of Cedar Street (after Storage Links existing entrance) to Edmonson Avenue; and, either of the proposed Mitigation Scenario improvements, all intersections would improve to an overall LOS B or better in the AM peak hour and LOS C or better in the PM peak hour. All movements at the intersections adjacent to the site would be operating at LOS C or better. However, some movements at the TH 25 intersections during the PM peak hour would operate at LOS D or LOS E.

- Both Mitigation Scenario's would have similar improvement to the operations of the adjacent intersection, although the Mitigation Scenario 2 assuming roundabouts has slightly better delays.
- As part of the proposed Chelsea Commons Site development plan, it is proposed to close Dundas Road from east of Cedar Street (after Storage Links existing entrance) to Edmonson Avenue. An analysis of the closure was completed documenting the anticipated traffic volumes on Dundas Road for the existing and No-Build conditions; a comparison of the trips generated by the Chelsea Commons Site development and the with existing commercial zoning; and the increase travel time as a result of the closure. The analysis found that vehicles would require an additional 50secs to divert to Chelsea Road or 90sec to divert to School Boulevard. The results indicate that there would be little impact to the adjacent roadway system with the closing of Dundas Road.

Recommendations

Based on the study conclusions the following improvements are recommended:

1. Based on Mitigation Scenario 1 and/or Mitigation Scenario 2 and preliminary estimated construction costs for each Mitigation Scenario discussed in the "Chelsea Commons Area Improvements Stormwater Management Evaluation & Preliminary Grading Design" project memo, the recommended improvements at the intersections include:
 - a. Chelsea Road at Cedar Street – Single-lane roundabout
 - b. Chelsea Road at Edmonson Avenue – Single-lane roundabout
 - c. School Boulevard at Cedar Street – Single-lane roundabout
 - d. School Boulevard at Edmonson Avenue – Signal-lane roundabout

The final determination of traffic control will be based on discussion with City staff, input from the public and approval from City Council.
2. Maintain the existing Side Street Stop control on Dundas Road at Cedar Street/Site Access and Dundas Road at Edmonson Avenue. As traffic continues to grow on Cedar Street and Edmonson Avenue review the need for improved traffic control (all-way stop) at these intersections.
3. Maintain the existing center left turn lane on Cedar Street from Chelsea Road to School Boulevard.
4. Construct a center left turn lane on Edmonson Avenue from Chelsea Road to School Boulevard to accommodate turns into future site access driveways as they are proposed.
5. As development proposals for the Chelsea Commons Site development area are considered, each site access should be evaluated to determine if right turn lanes on the City Street is required and what the driveway approach lane configuration should include (i.e. left and/or right turn lanes).

Memorandum

To: City of Monticello

From: Pete Willenbring, PE
Laura Kivisto, EIT
Laura Cummings, EIT

Date: August 12, 2021 - Updated September 21, 2021

Re: Chelsea Commons Water Resource Management Feasibility Analysis
WSB Project No. 017991-000

INTRODUCTION AND PURPOSE

This water resource feasibility analysis was undertaken to provide information to the City of Monticello on design criteria and improvements needed to facilitate construction of the proposed Chelsea Commons pond (see Location Map, **Figure 1**).

As part of this effort, WSB performed hydraulic, hydrologic, water quality, and water quantity analyses for the watershed tributary to the proposed pond under existing and proposed conditions, evaluated improvement options available to facilitate construction of the proposed Chelsea Commons pond, and developed recommendations for improvements.

Outlined below is a brief description of the procedures and methods that were followed as part of completing the analysis, and our findings and recommendations for improvements needed to facilitate construction of Chelsea Commons pond as well as development in the surrounding area.

PROCEDURES AND METHODS FOLLOWED

Data Collection

Existing stormwater infrastructure information was obtained via survey and Datalink as-builts.

Soil borings, included in an attached Appendix, provided information based on the Unified Soil Classification system.

Existing land conditions were determined from aerial imagery. Proposed land use conditions were predicted based on the Chelsea Commons area site rendering provided by the City of Monticello.

Existing drainage areas were determined via LiDAR surveys and record drawing information. Proposed drainage areas were determined based on LiDAR survey data and parcel lines along with proposed site information provided by the City of Monticello. See **Figure 2** and **Figure 3** for the existing and proposed drainage areas.

Pond storage was determined from LiDAR surveys for the in place existing basins. The Deephaven development site plan and Chelsea Commons site rendering were used to determine the storage for the proposed development basins.

The net new impervious acreage for the Chelsea Commons area that will contribute to the proposed pond and require rate, volume, and water quality control was approximated as 35 acres from aerial imagery and the proposed site rendering on a land use basis (excludes the Deephaven development). The acreages of land uses were entered into HydroCAD. The pervious and impervious areas were obtained from the weighted average determined within HydroCAD.

Hydraulic and Hydrologic Modeling

To assist in the completion of the hydraulic/hydrologic analyses, a computer assisted model (HydroCAD) was used. The model uses SCS TR-20 runoff method and Atlas 14 rainfall depths, specific for the City of Monticello, as provided in **Table 1**. The existing and proposed conditions model reports are included in the Appendix.

Table 1. Atlas 14 Rainfall Depths for Monticello, MN and Wright County, MN

Storm Event	Rainfall Depth, in
1-year 24-hour	2.42
1-inch	1.00
2-year 24-hour	2.84
2-inch	2.00
3-inch	3.00
10-year 24-hour	4.22
10-day Snowmelt	6.87
25-year 24-hour	5.18
50-year 24-hour	6.02
100-year 24-hour	6.87

Water Quantity Modeling

To evaluate the volume of water generated in the watershed in a typical year as well as the need for water level augmentation, HydroCAD modeling as well as daily rainfall data from 1961 to 2007 was utilized within a water balance spreadsheet calculator. The water balance takes into consideration rainfall, stormwater runoff, stormwater discharge, evaporation, and seepage calculations to determine the annual runoff and daily water level fluctuations (bounce) of the pond.

Estimates for water usage needed to irrigate the surrounding adjacent developments were based on irrigation volumes of one inch per week over pervious surfaces.

Water Quality Modeling

To assist in estimating the total suspended solids and total phosphorus concentrations in the runoff that will be directed to Chelsea Commons pond under existing, proposed untreated, and proposed treated conditions, a P8 water quality model was utilized.

The pollutant removal values used in the equations for wet ponding were determined from the Minnesota Stormwater Manual as 50% TP removal and 85% TSS removal. The irrigation rate was assumed at 1 inch per week operating for 26 weeks per year. The following equations were used to determine the pollutant reduction from stormwater reuse excluding the removal already obtained from ponding (P8).

Estimated TP Removed from Stormwater Reuse

$$\begin{aligned} &= \text{Area Irrigated ac} * 1 \frac{\text{in}}{\text{week}} * 26 \frac{\text{weeks}}{\text{year}} * 0.3 \frac{\text{mgTP}}{\text{L}} \\ &\quad * 50\% \text{ Particulate TP Removed from Ponding} * 0.288 \frac{\text{lbs}}{\text{yr}} \text{ conversion factor} \end{aligned}$$

Estimated TSS Removed from Stormwater Reuse

$$\begin{aligned} &= \text{Area Irrigated ac} * 1 \frac{\text{in}}{\text{week}} * 26 \frac{\text{weeks}}{\text{year}} * 54.5 \frac{\text{mgTSS}}{\text{L}} \\ &\quad * 15\% \text{ TSS Removed from Ponding} * 0.288 \frac{\text{lbs}}{\text{yr}} \text{ conversion factor} \end{aligned}$$

Cost Estimates

Cost estimates for the recommended stormwater management improvements needed to facilitate the project were based on historical pricing of projects similar in scope.

FINDINGS AND RECOMMENDATIONS

Based on the information developed as part of the data collection and analysis efforts that were completed, we have developed the following findings and recommendations related to water resource improvements needed for the Chelsea Commons pond project. A listing of these findings and recommendations is provided below. A proposed improvements figure is attached as **Figure 3**.

Hydraulic and Hydrologic Modeling

Normal Water Level

- Recommendation:
 - o Set the Chelsea Commons pond normal water level (runout elevation) at 952.5.
- Justification:
 - o A NWL at 952.5 is low enough to continue to allow a storm sewer pipe from School Boulevard to drain to Chelsea Commons pond without adverse hydraulic impacts.
 - o A 952.5 NWL will allow the 100-year flood elevations to be reduced over previously anticipated HWL elevations and allow for lower adjacent building floor elevations.
 - o If a NWL greater than 952.5 is desired, the School Boulevard storm sewer must be rerouted to the west to avoid storm sewer surcharge. If the stormwater from School Boulevard is diverted, water reuse potential will decrease and the likelihood for water augmentation within the pond will increase.

Storage Below Normal Water Level

- Recommendation:
 - o To adequately maintain a fishery within Chelsea Commons pond, both depth and volume below the normal water level are important. A 12-foot minimum depth over 50 percent of the pond surface area must be maintained to support a population of warm water fish species. The channels connecting the three pond cells must be a minimum of 8-feet deep.

Pond Outlet

- Recommendation:
 - o A 24-inch primary outlet pipe should be constructed to connect into existing storm sewer along Cedar Street. The existing 15-inch pipe stub shall be removed under Cedar Street and replaced with a 24-inch pipe to allow for increased capacity. The proposed pond outlet structure should consist of a 60-inch manhole with a 10-inch orifice (952.5) constructed in a plate in the manhole that will also serve as an overflow weir (956.0).

High Water Level

- Recommendation:
 - o Based on the proposed outlet control structure and associated hydrologic modeling which takes into consideration a clogging factor, we recommend the 100-year flood elevation be set at elevation 956.0.
- Justification:
 - o The 100-year high water level elevation (956.0) represents a condition that will occur in a 100-year return frequency rainfall event that assumes some blockage of the outlet by debris during the event and limits the peak downstream discharge rates to 5 cfs. Modeling shows that the outlet size and resulting discharge rate from Chelsea Commons pond will not increase flood elevations in downstream water bodies.

Secondary Outlet/Emergency Pond Overflow

- Recommendation:
 - o Install a secondary outlet/emergency overflow pipe (18" RCP) set at elevation 956.0 that will connect to a storm sewer pipe in the Deephaven development north of the Chelsea Commons pond. Utilize this pipe conveyance system for a lower emergency overflow than could be facilitated with an overland emergency overflow route. Coordination for connecting the secondary outlet into the Deephaven development storm sewer will need to be facilitated with the developer.
- Justification:
 - o The site survey indicates that an overland EOF will not be available until an elevation of approximately 961. The pipe overflow should serve as the EOF unless there is no concern with establishing low openings of proposed buildings at elevations greater than approximately 963.
 - o An overland overflow used in emergencies could be established at 961 or greater with additional grading.

Anticipated Pond Water Level Fluctuations

- Finding:
 - o Typical high water levels (HWL) and bounce associated with typical storm events are provided in table **Table 2**. These elevations are based on a normal water level set at 952.5.

Table 2. High Water Levels and Bounce

Storm Event	HWL	Bounce (ft)
1-year 24-hour	953.4	0.9
1-inch	952.8	0.3
2-year 24-hour	953.6	1.1
2-inch	953.2	0.7
3-inch	953.7	1.2

10-year 24-hour	954.4	1.9
10-day snowmelt	954.4	1.9
25-year 24-hour	955.0	2.5
50-year 24-hour	955.5	3.0
100-year 24-hour	956.0	3.5
No Discharge 100-year	956.3	3.8

Impact of Project on Downstream Waterbodies

- Finding:
 - o Analysis results show that no increase in the bounce of the downstream pond will occur due to the Chelsea Commons pond and area improvements. The finding assumes that a downstream lift station is in-place and functioning with a capacity of up to 10 cfs.
- Recommendation:
 - o It is recommended that the City of Monticello update the feasibility and cost of the downstream landlocked basin's proposed lift station due to the age of the study (with or without utilizing the area for water augmentation of the proposed Chelsea Commons pond).

Rate Control Requirement

- Finding:
 - o The proposed project will meet City of Monticello rate control requirements. Refer to **Table 3** for the results of the hydraulic and hydrologic analysis. The discharge points are shown on **Figure 2** and **Figure 3**.

Table 3. Rate Control

Discharge Point	Existing			Proposed		
	2-year	10-year	100-year	2-year	10-year	100-year
	cfs	cfs	cfs	cfs	cfs	cfs
To TH-01 Existing Landlocked Basin	12.4	22.8	42.1	2.2	3.2	4.7
West	9.4	15.7	29.7	2.6	6.8	12.5
Southeast	0.0	0.0	13.1	0.0	0.0	0.0
TOTAL	21.8	38.5	84.9	4.8	10.0	17.2

Water Quantity Modeling

Volume Control Requirement

- Finding:
 - o To meet the City of Monticello's volume control requirement, the proposed discharge volume may not exceed the existing discharge volume from the site. To calculate the volume control requirement for the site, the Deephaven development was excluded because volume control for that site will be provided via the development's pond. With approximately 35 acres of net new impervious area on the site (excludes existing commercial areas, proposed water surface, existing roads within the watershed, and the Deephaven development), 3.2 acre-feet of water must be abstracted to meet volume control requirements on an event basis. On an annual basis, 65 acre-feet must be abstracted (calculations are included in the Appendix).

- o With a stormwater reuse system installed to irrigate the pervious surface within the watershed (40 acres) and an irrigation rate of 0.75 inches per week functioning for 26 weeks per year, approximately 65 acre-feet of runoff will be abstracted from the system per year. The stormwater reuse system will abstract the amount of water necessary to meet the City of Monticello's volume control requirement.
- o Evaporation will also provide approximately 36.2 acre-feet per year of additional abstraction, further demonstrating compliance with volume control requirements.
- o In general, individual on-site infiltration basins and rain gardens are discouraged as a volume control method as this would remove runoff that could otherwise be utilized to sustain water levels within the Chelsea Commons pond.
- Recommendation:
 - o Install a stormwater reuse system to provide irrigation for 40 acres of pervious surfaces within the proposed Chelsea Commons developable area. The irrigation system will include a pumping station and service lines to all developments within the Chelsea Commons area. Stormwater reuse is recommended to meet volume control requirements because it reduces the need for City well water to irrigate and reuses stormwater that would otherwise be discharged downstream.
 - o If operation and maintenance of a regional stormwater reuse system to irrigate 40 acres is undesirable, each development could be required to install a stormwater reuse system utilizing water from the regional basin to irrigate site pervious area at a rate of 0.75 inches per week.
 - o If stormwater reuse is not implemented on adjacent development sites, individual infiltration basins and/or rain gardens are likely alternatives to meet the City's volume control requirements. These alternatives would eliminate runoff that could otherwise be utilized to sustain water levels within the Chelsea Commons pond.

Water Balance

- Finding:

Table 4. Water Quantity Modeling Results

Based on typical water abstractions from the pond based on evaporation, irrigation, and limited infiltration, water balance modeling results show that the proposed Chelsea Commons pond will draw down more than 0.5 feet below the NWL for up to 20 days per year during periods of average rainfall. For this reason, it is recommended a water volume augmentation system in installed to maintain water levels during periods significantly less than average rainfall.	Days Water Level is > 0.5 feet below the NWL
Average Rainfall	20
No Rainfall Every Year in the Month of July	44
No Rainfall Every Year in the Months of July and August	71

- Recommendation:
 - o Install a water augmentation system to maintain the pond NWL during low rainfall periods, replenishing water use for irrigation at selected times, as well as allow for initial filling of the pond immediately following construction. Additional discussion and recommendations are included in the *Augmentation System* section of this report.

Augmentation System

- Finding: Three different augmentation options were identified.
 1. Install a Well
 - a. Drill a well and pump water into the pond during periods of low water levels.
 2. Use City Water

- a. The City of Monticello has watermain adjacent to the proposed development. By connecting to the existing watermain, City water could be utilized as an augmentation option.
- 3. Pump Water from Landlocked Basin
 - a. A lift station and forcemain can be installed along the existing Dundas Road corridor to pump water from the landlocked basin to Chelsea Commons pond in periods of low water elevations.
- Recommendation:
 - o Install a well with a pump to augment water levels. The augmentation system is in addition to the stormwater reuse system.
- Justification:
 - o Although well installation is initially costly, it does not include a high annual cost as the use of treated City water would entail.

Pond Liner

- Recommendation:
 - o To prevent seepage, a liner should be installed. The liner shall be a minimum of 2-feet thick, in accordance with Minnesota Stormwater Manual recommendations.
- Justification:
 - o Soil borings for the area indicate HSG B soils corresponding to an infiltration rate ranging from 0.3 to 0.8 inches per hour. For this reason, a liner is needed to maintain water levels.

Water Quality Management

- Finding:
 - o Modeling results show there will be no net increase in total suspended solids and total phosphorus in runoff generated from the site compared to existing conditions, meeting the City of Monticello requirements. Results are shown in **Table 5**. Modeling outputs and associated calculations are in the Appendix.

Table 5. Pollutant Removal Results

Pollutant Type	Existing Load Downstream (lbs/yr)	Proposed Load Downstream with No Treatment (lbs/yr)	Proposed Load Removed via Ponding (lbs/yr)	Proposed Load Removed via Reuse (lbs/yr)	Proposed Load Downstream with Treatment (lbs/yr)	Reduction from Existing (%)
TSS	14539	85352	80293	2449	2610	82
TP	131	296	202	45	49	63

- o A variety of additional water quality treatment options to meet the City of Monticello's goal of exceeding water quality standards include:
 - In-Lake Treatments
 - Undertake periodic in-lake treatments using alum and/or algaecide/herbicide via boat.
 - Stormwater Treatment Facility
 - A permanent treatment facility could be installed, operated, and maintained that would take water from one end of the pond,

provide soluble total phosphorus removal, and return it to the other end of the pond.

- Aeration
 - The addition of an aeration system is desirable to maintain a fishery and improve water quality. An aeration system within the pond will help prevent fish die off during the winter months.
- Recommendation:
 - o Use periodic in-lake treatments and install an aeration system to meet City goals and requirements. Aerators must be present in each of the primary pond cells.
 - o The use of bubblers is the most cost-effective and feasible way to provide aeration. A combination of fountains and bubblers may also be used.
- Justification:
 - o Because the City of Monticello desires the pond to have recreational water quality and be suitable for public use, an advanced treatment method is required.

Stormwater Management Criteria for New Developments in Chelsea Commons Area

Freeboard

- Recommendation:
 - o Establish the low building floor and low opening elevations for new development in the area at elevations not less than 958.0 and 959.0 respectively.
- Justification:
 - o The City of Monticello design standards (Plan Requirements and Design Guidelines 2018) state that freeboard will be two-feet from the 100-year HWL to the low floor elevation and two-feet from the EOF to the low opening elevation. Because an overland overflow cannot be provided for the pond and a pipe EOF will be used instead, the low opening elevation of adjacent developments shall be set three-feet above the EOF.
 - o According to survey and LiDAR information, existing buildings in the area appear to have low floor elevations no lower than 960.0, allowing the pond design to meet freeboard requirements.

Site Development Stormwater Management

- Finding:
 - o To comply with City of Monticello design standards, land disturbing activities that result in one acre or greater of impervious surfaces (all Chelsea Commons area developments are subject) shall meet volume control, rate control, and water quality requirements. **Table 6** summarizes the requirements Chelsea Commons developments must meet.

Table 6. Chelsea Commons Development Stormwater Management Requirements

Stormwater Management Item	Development Requirement
Volume Control	None needed if the City chooses to operate and maintain a stormwater reuse system from Chelsea Commons pond to irrigate 40 pervious acres with a 0.75 inch per week irrigation rate. If a City-owned stormwater reuse system is not desired, developers shall install stormwater reuse systems from Chelsea Commons pond with a 0.75 inch per week irrigation rate to the development's pervious

	area. The sum of each developer's volume abstraction via irrigation shall satisfy the volume control requirement for the Chelsea Commons site.
Rate Control	None needed; provided via the regional Chelsea Commons pond.
Water Quality	None needed; provided by regional Chelsea Commons pond via batch treatments and stormwater reuse.
Pretreatment	Adhere to the Minnesota Stormwater Manual and Construction Stormwater general permit pretreatment requirements (typically requires a pretreatment device such as a vegetated filter strip or grit chamber prior to discharging to a waterbody).

- Recommendation:
 - o Connect all developments to the stormwater reuse system to maximize the irrigable pervious area.
 - o Require pretreatment that adheres to the Minnesota Stormwater Manual requirements.

Cost Estimates

Water Resource Improvements and Associated Costs

- Finding:
 - o Rough project cost estimates for the water resource improvements anticipated with the Chelsea Commons project are summarized in **Table 7**. Reference the Appendix for more detailed line-item quantities and full project cost estimates.
 - o The cost of stocking fish in the Chelsea Commons pond has not been determined in this feasibility analysis.

Table 7. Cost Estimates

Type	System	Capital Cost	Annual Maintenance Cost
Chelsea Commons Pond	Outlet	\$230,000	N/A
	Emergency Overflow	\$90,000	N/A
	School Boulevard Storm Sewer Diversion ¹	\$275,000	N/A
Water Level Augmentation System	Use City Water	\$102,000	\$59,000
	Pump from Landlocked Basin	\$430,000	\$60,000
	Well Installation	\$290,000	\$60,000
Stormwater Reuse	Irrigation	\$443,000	\$25,000
Water Quality Treatment	In-Lake Treatment	\$15,000	\$40,000
	Treatment Facility	\$600,000	\$40,000
	Aeration	\$176,000	\$15,000

¹Storm sewer diversion only needed if the NWL of Chelsea Commons pond exceeds 952.5.

Permits

- Recommendation:
 - o The Minnesota Pollution Control Agency's General Construction Permit will be required for the construction of the Chelsea Commons pond. An associated erosion control plan and SWPPP will be required.
 - o The MNDNR water appropriation permit will be required for the construction of the wet well for Chelsea Commons Pond. A preliminary assessment is required before drilling a well that will be used to withdraw more than 10,000 gallons of water per day or 1 million gallons per year. A wet well for Chelsea Commons pond during a drought year will require a permit.

ATTACHMENTS

- Figure 1 – Location Map
- Figure 2 – Existing Drainage Area Map
- Figure 3 – Proposed Recommendations Map
- Existing Conditions HydroCAD Report
- Proposed Conditions HydroCAD Report
- Water Quantity Model Results
- Volume Control Calculations
- Water Quality Model Results and Calculations
- Soil Borings
- Itemized Cost Estimates

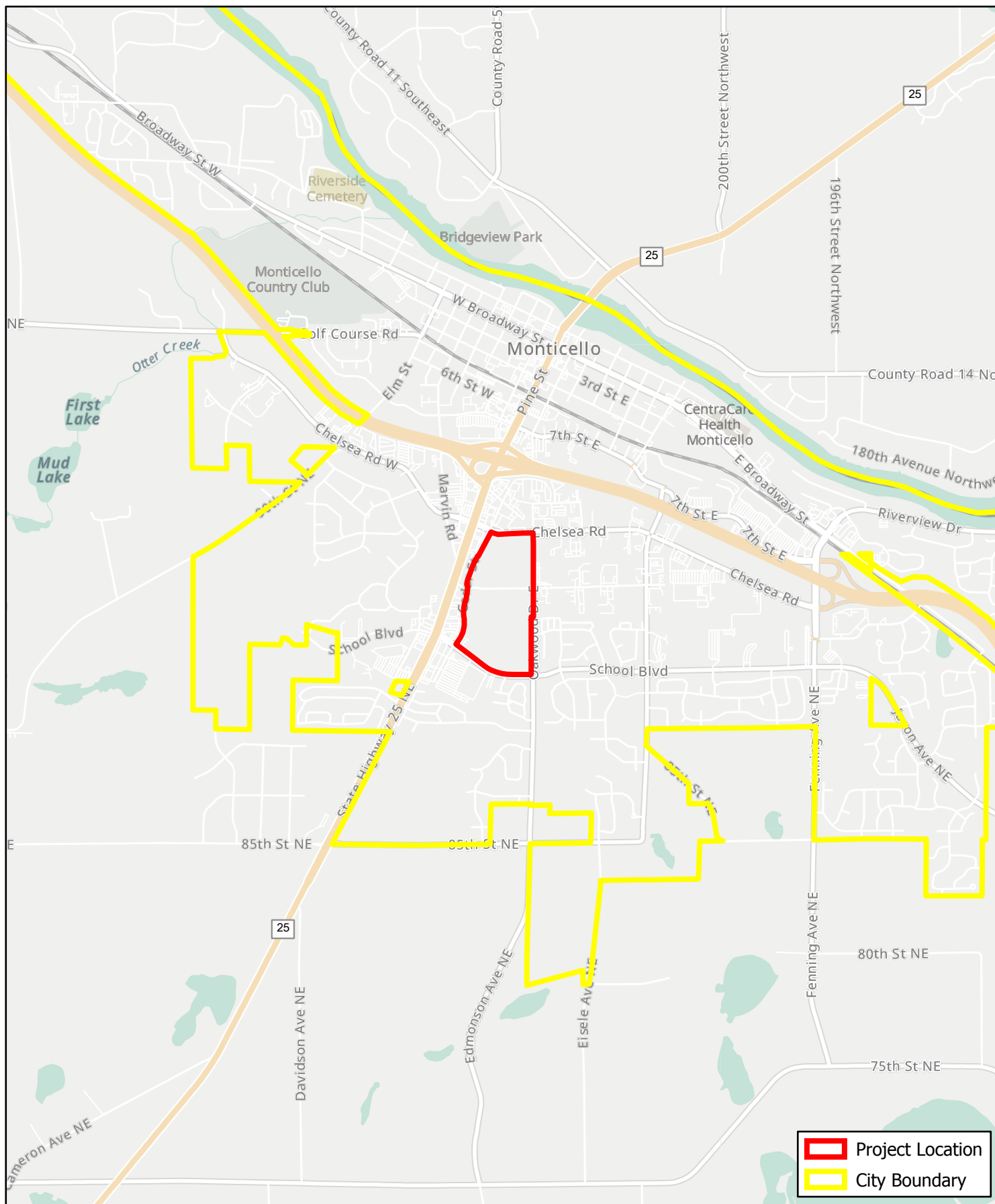


Figure 1 - Location Map

Chelsea Commons
City of Monticello, MN



0 3,000
Feet
1 inch = 3,000 feet



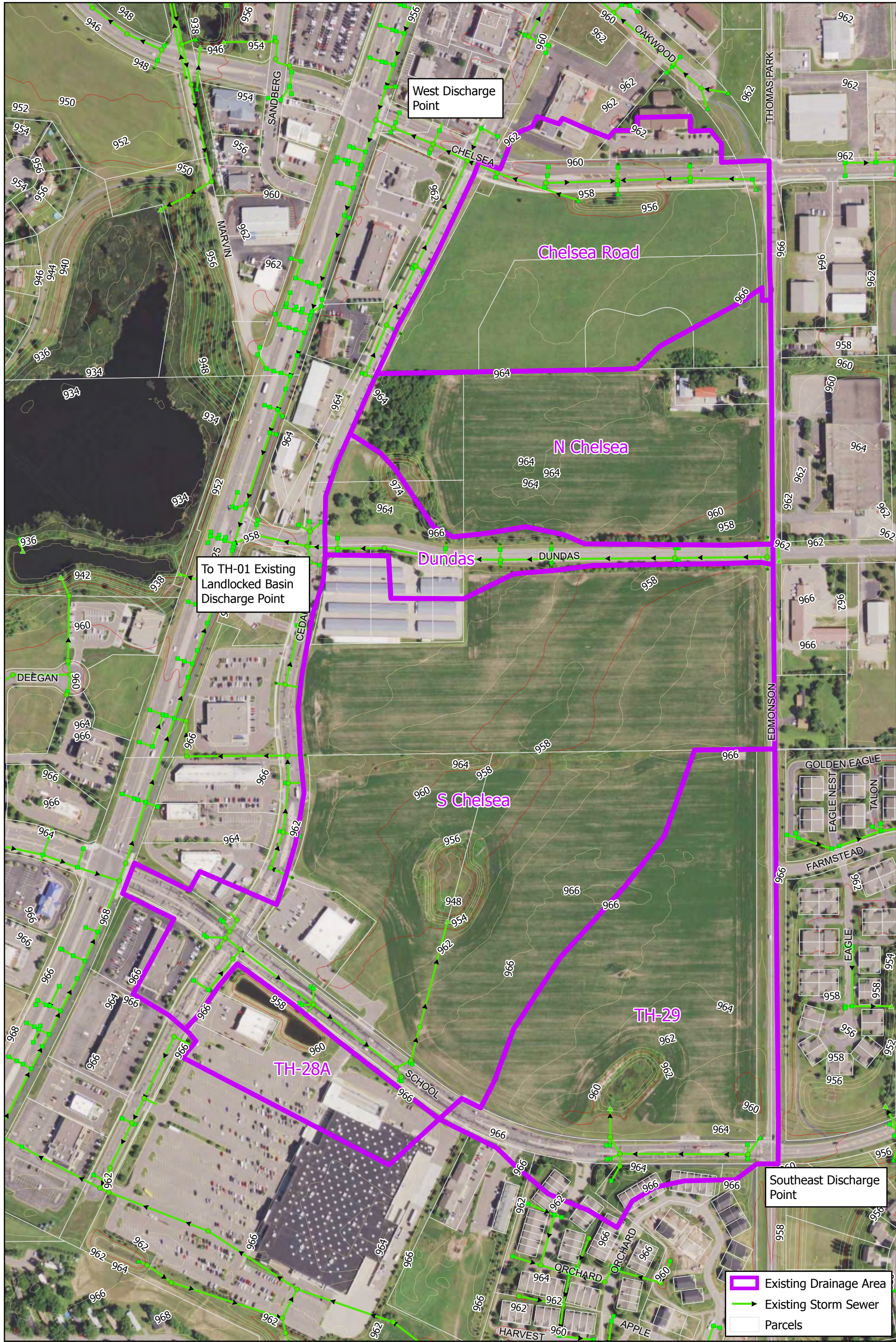


Figure 2 - Existing Drainage Area Map

Chelsea Commons
City of Monticello, MN



0 300
Feet
1 inch = 300 feet



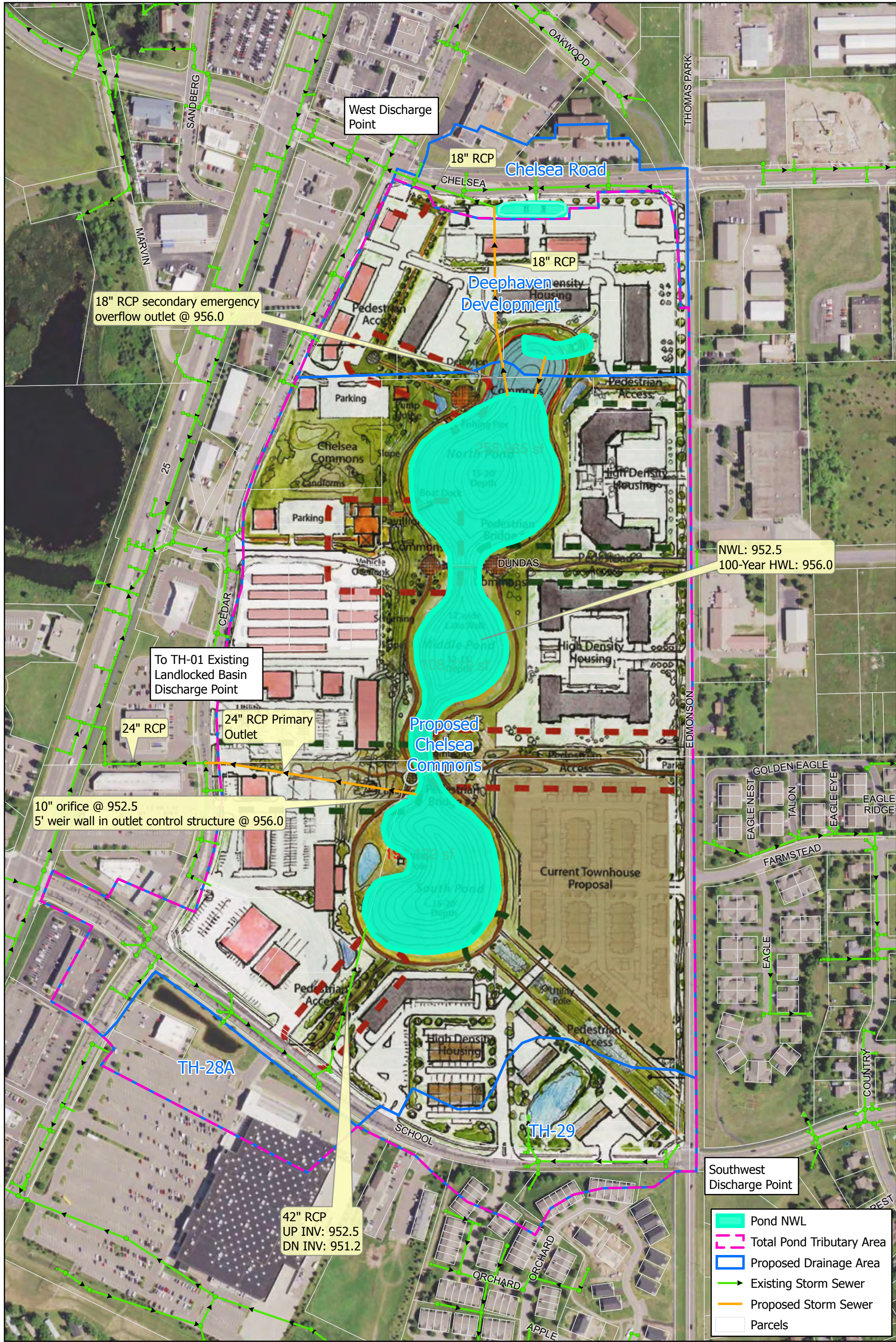


Figure 3 - Proposed Recommendations Map

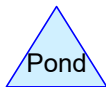
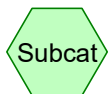
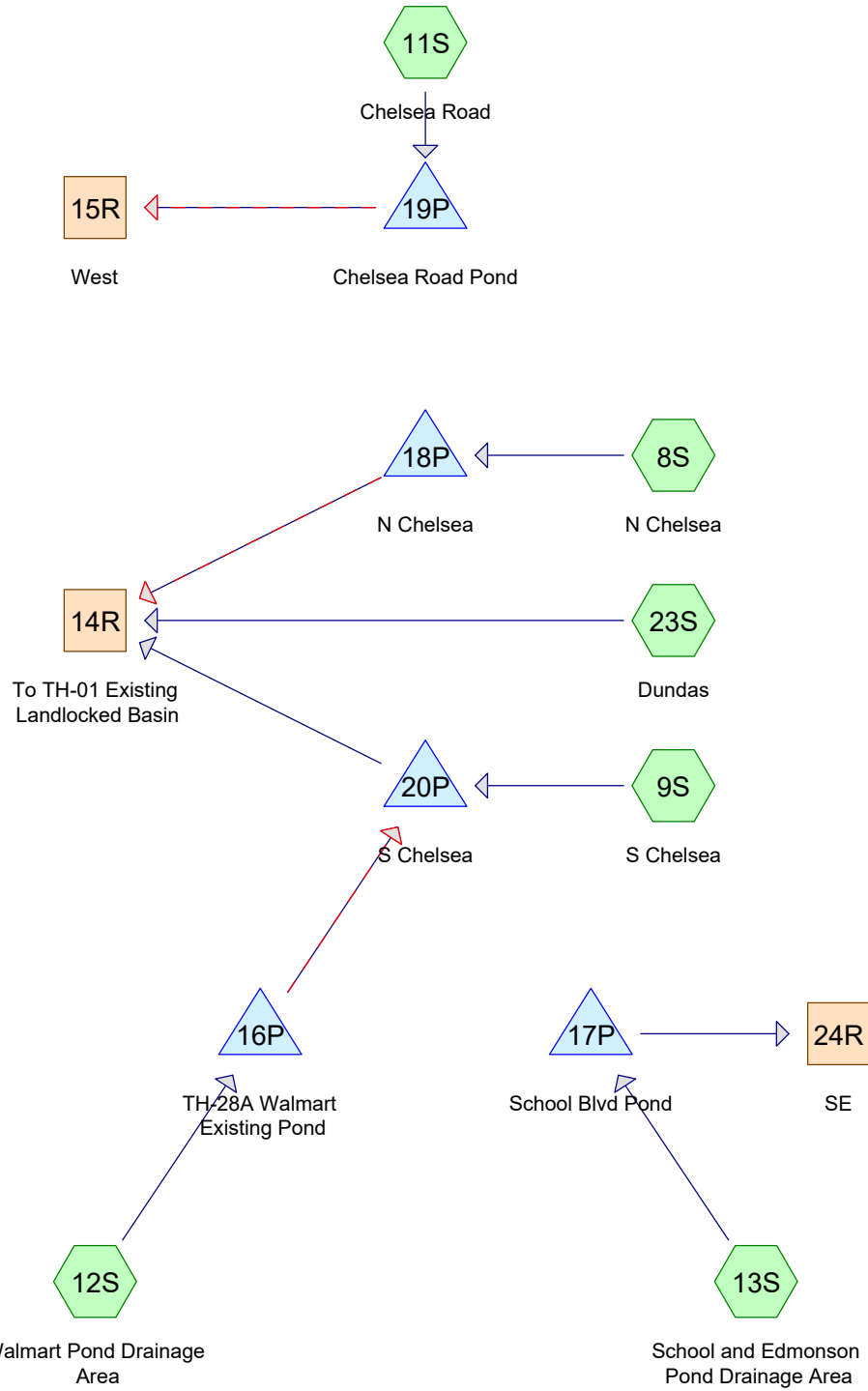
Chelsea Commons
City of Monticello, MN



0 300
Feet
1 inch = 300 feet



Existing



Routing Diagram for 017991-000 Chelsea Commons Scenario 1

Prepared by WSB, Printed 6/8/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 6/8/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.023	92	Offsite: Urban commercial, 85% imp, HSG B (13S)
11.965	89	Paved roads w/open ditches, 50% imp, HSG B (8S, 9S, 11S, 13S, 23S)
1.880	85	R4: 1/8 acre lots, 65% imp, HSG B (13S)
101.056	78	Row crops, straight row, Good, HSG B (8S, 9S, 11S, 13S, 23S)
10.538	92	Urban commercial, 85% imp, HSG B (9S, 12S, 23S)
1.974	88	Urban industrial, 72% imp, HSG B (11S)
1.221	98	Water Surface (11S, 12S, 13S)
128.657	81	TOTAL AREA

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 6/8/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 3

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
127.436	HSG B	8S, 9S, 11S, 12S, 13S, 23S
0.000	HSG C	
0.000	HSG D	
1.221	Other	11S, 12S, 13S
128.657		TOTAL AREA

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 6/8/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 4

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.023	0.000	0.000	0.000	0.023	Offsite: Urban commercial, 85% imp	
0.000	11.965	0.000	0.000	0.000	11.965	Paved roads w/open ditches, 50% imp	
0.000	1.880	0.000	0.000	0.000	1.880	R4: 1/8 acre lots, 65% imp	
0.000	101.056	0.000	0.000	0.000	101.056	Row crops, straight row, Good	
0.000	10.538	0.000	0.000	0.000	10.538	Urban commercial, 85% imp	
0.000	1.974	0.000	0.000	0.000	1.974	Urban industrial, 72% imp	
0.000	0.000	0.000	0.000	1.221	1.221	Water Surface	
0.000	127.436	0.000	0.000	1.221	128.657	TOTAL AREA	

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 6/8/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 5

Pipe Listing (selected 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	16P	958.00	956.00	23.0	0.0870	0.012	24.0	0.0	0.0
2	18P	957.66	957.42	12.0	0.0200	0.013	18.0	0.0	0.0
3	19P	953.13	953.00	20.0	0.0065	0.013	18.0	0.0	0.0

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 6

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea	Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=0.06" Tc=30.0 min CN=78/98 Runoff=0.47 cfs 0.102 af
Subcatchment9S: S Chelsea	Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=0.14" Tc=40.0 min CN=78/98 Runoff=3.87 cfs 0.609 af
Subcatchment11S: Chelsea Road	Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=0.15" Tc=30.0 min CN=78/98 Runoff=1.93 cfs 0.250 af
Subcatchment12S: Walmart Pond	Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=0.68" Tc=15.0 min CN=58/98 Runoff=4.91 cfs 0.332 af
Subcatchment13S: School and	Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=0.16" Tc=18.0 min CN=78/98 Runoff=3.35 cfs 0.334 af
Subcatchment23S: Dundas	Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=0.29" Tc=20.0 min CN=78/98 Runoff=1.62 cfs 0.143 af
Reach 14R: To TH-01 Existing Landlocked Basin	Inflow=1.66 cfs 0.245 af Outflow=1.66 cfs 0.245 af
Reach 15R: West	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Reach 24R: SE	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Pond 16P: TH-28A Walmart Existing Pond	Peak Elev=958.40' Storage=0.176 af Inflow=4.91 cfs 0.332 af Primary=1.21 cfs 0.331 af Secondary=0.00 cfs 0.000 af Outflow=1.21 cfs 0.331 af
Pond 17P: School Blvd Pond	Peak Elev=954.65' Storage=0.199 af Inflow=3.35 cfs 0.334 af Discarded=0.15 cfs 0.334 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.334 af
Pond 18P: N Chelsea	Peak Elev=957.91' Storage=0.014 af Inflow=0.47 cfs 0.102 af Primary=0.32 cfs 0.102 af Secondary=0.00 cfs 0.000 af Outflow=0.32 cfs 0.102 af
Pond 19P: Chelsea Road Pond	Peak Elev=952.76' Storage=0.183 af Inflow=1.93 cfs 0.250 af Discarded=0.07 cfs 0.251 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.251 af
Pond 20P: S Chelsea	Peak Elev=953.74' Storage=3.191 af Inflow=5.08 cfs 0.941 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 1.771 af Average Runoff Depth = 0.17"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 7

Summary for Subcatchment 8S: N Chelsea

Runoff = 0.47 cfs @ 12.66 hrs, Volume= 0.102 af, Depth= 0.06"

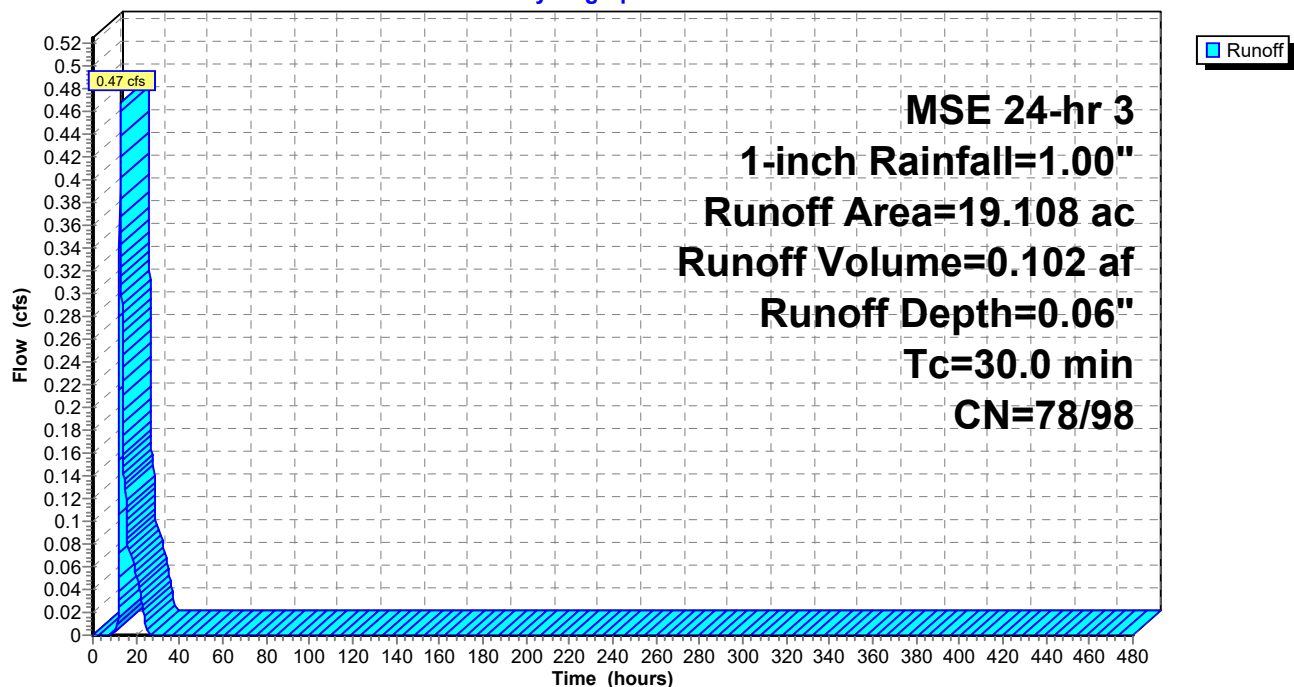
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 8

Summary for Subcatchment 9S: S Chelsea

Runoff = 3.87 cfs @ 12.60 hrs, Volume= 0.609 af, Depth= 0.14"

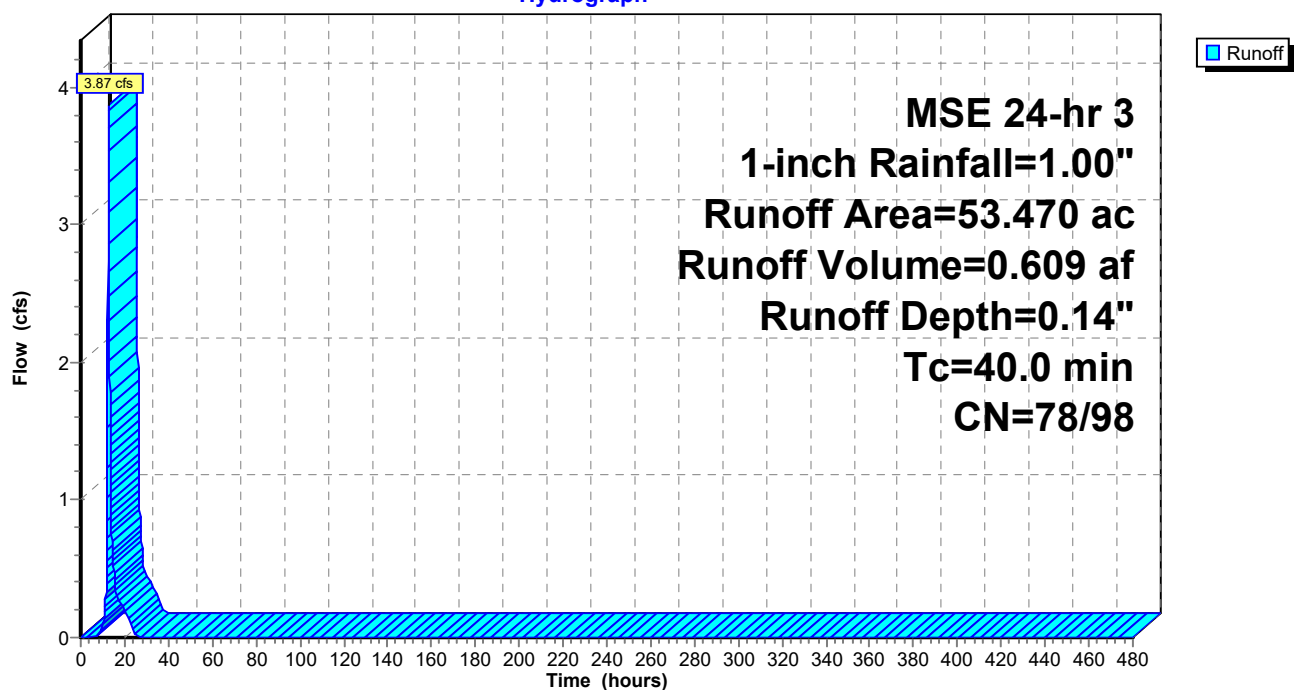
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 9

Summary for Subcatchment 11S: Chelsea Road

Runoff = 1.93 cfs @ 12.45 hrs, Volume= 0.250 af, Depth= 0.15"

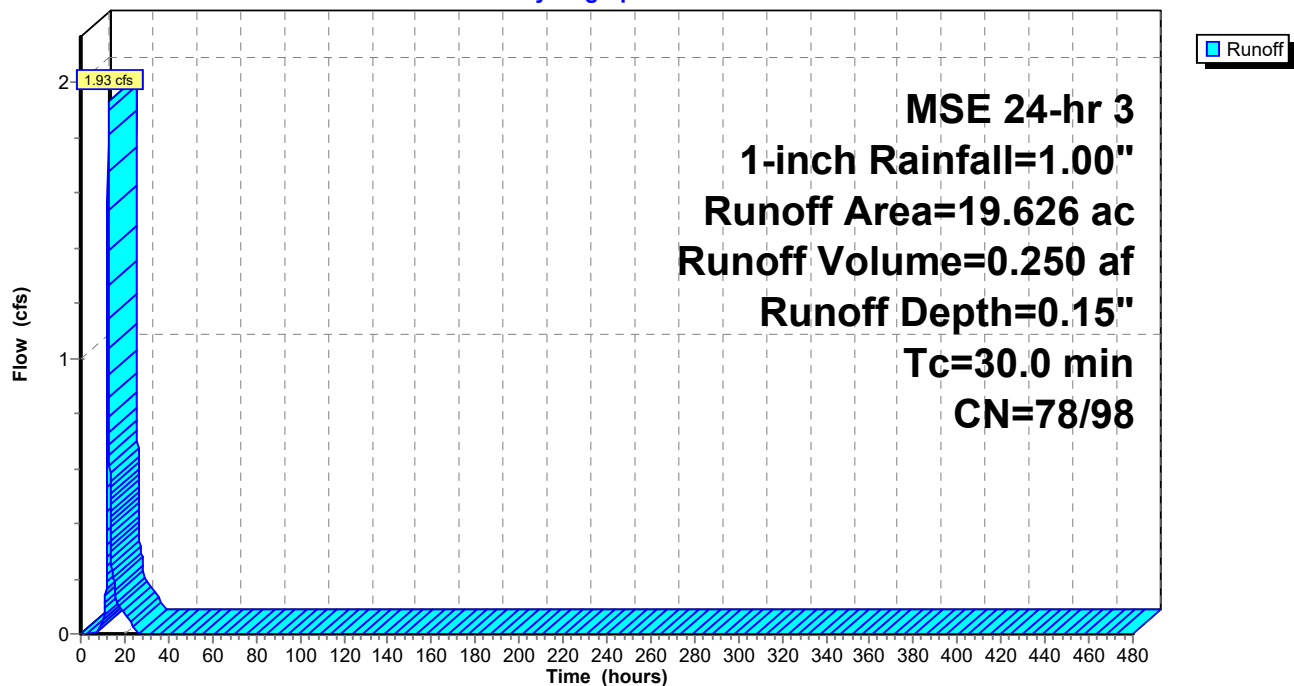
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 10

Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 4.91 cfs @ 12.23 hrs, Volume= 0.332 af, Depth= 0.68"

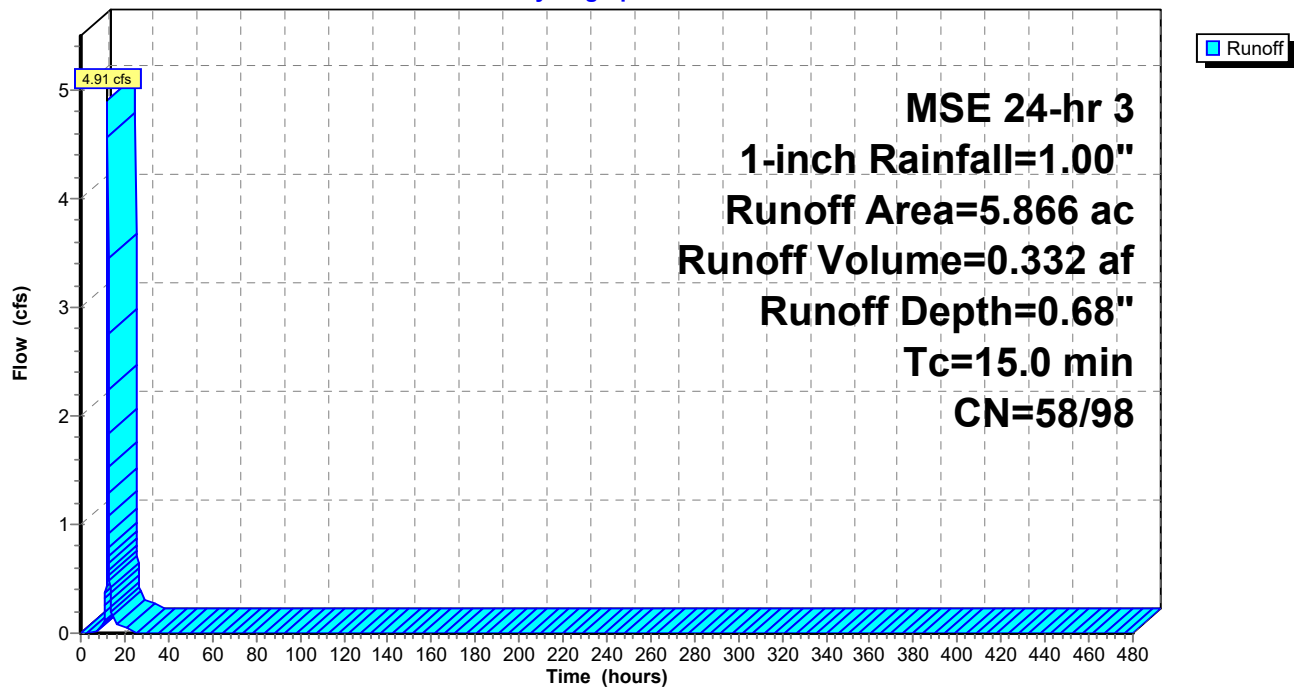
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 11

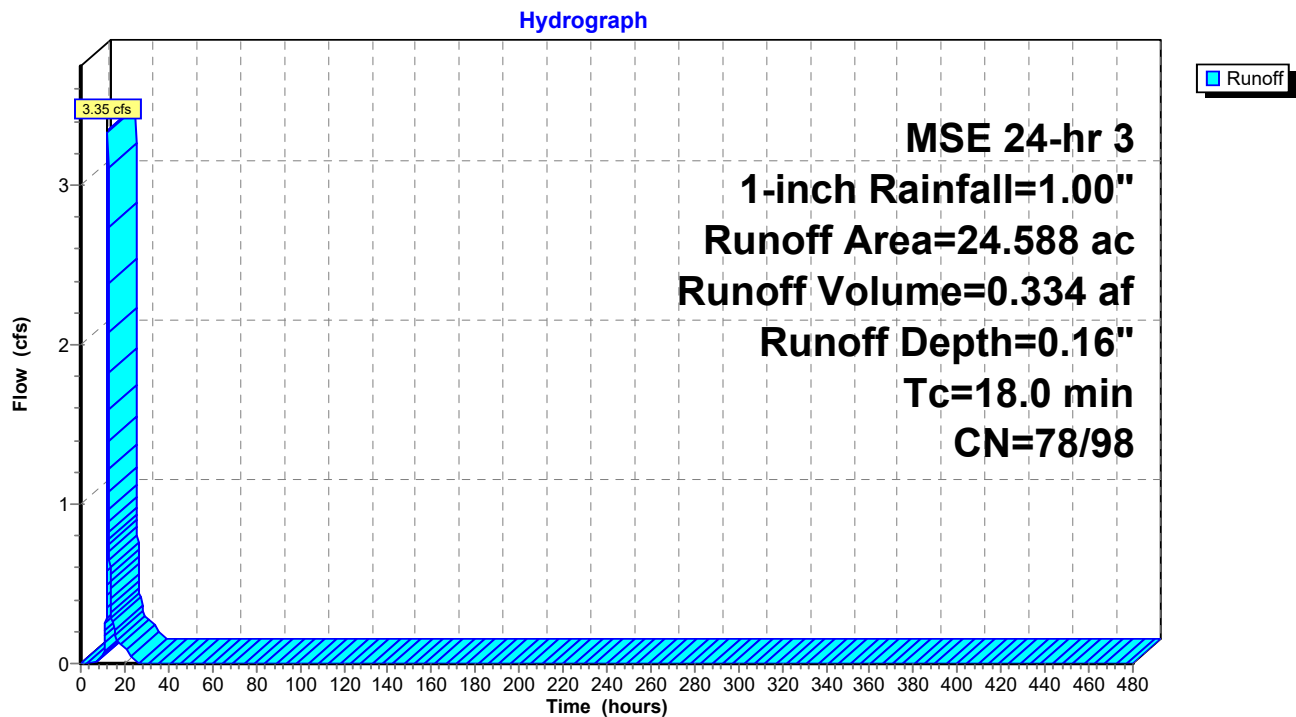
Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 3.35 cfs @ 12.28 hrs, Volume= 0.334 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 12

Summary for Subcatchment 23S: Dundas

Runoff = 1.62 cfs @ 12.30 hrs, Volume= 0.143 af, Depth= 0.29"

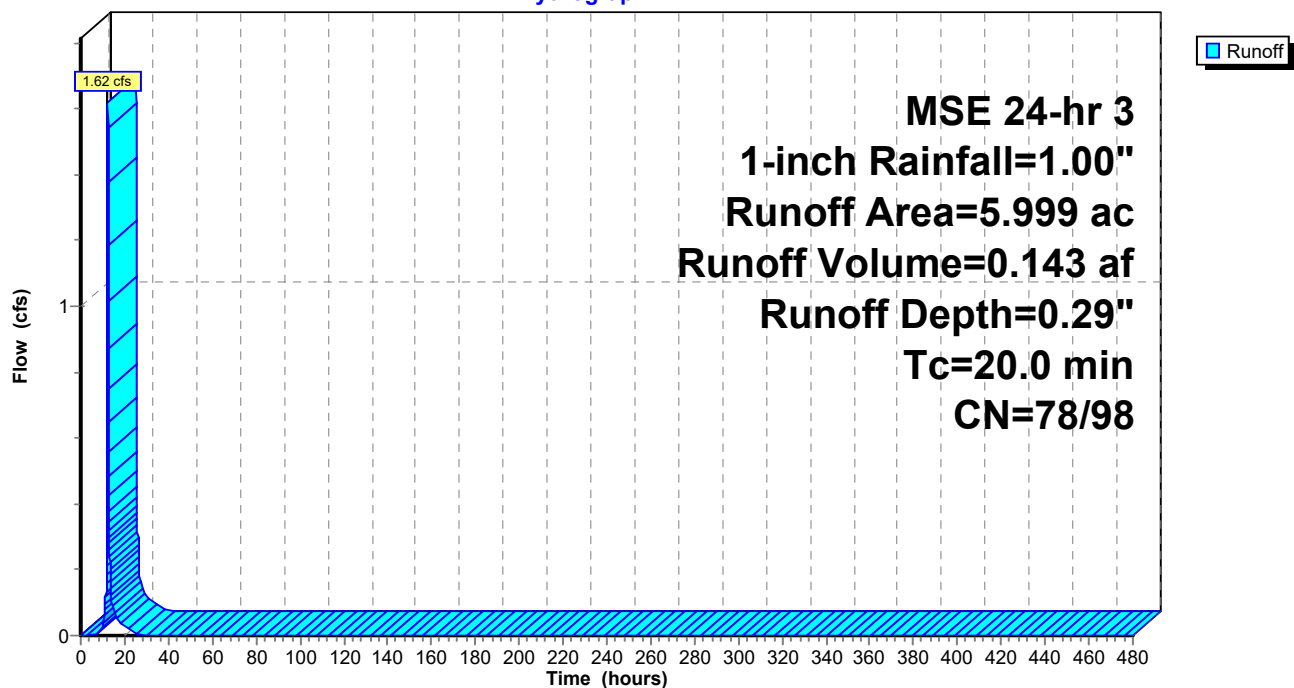
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

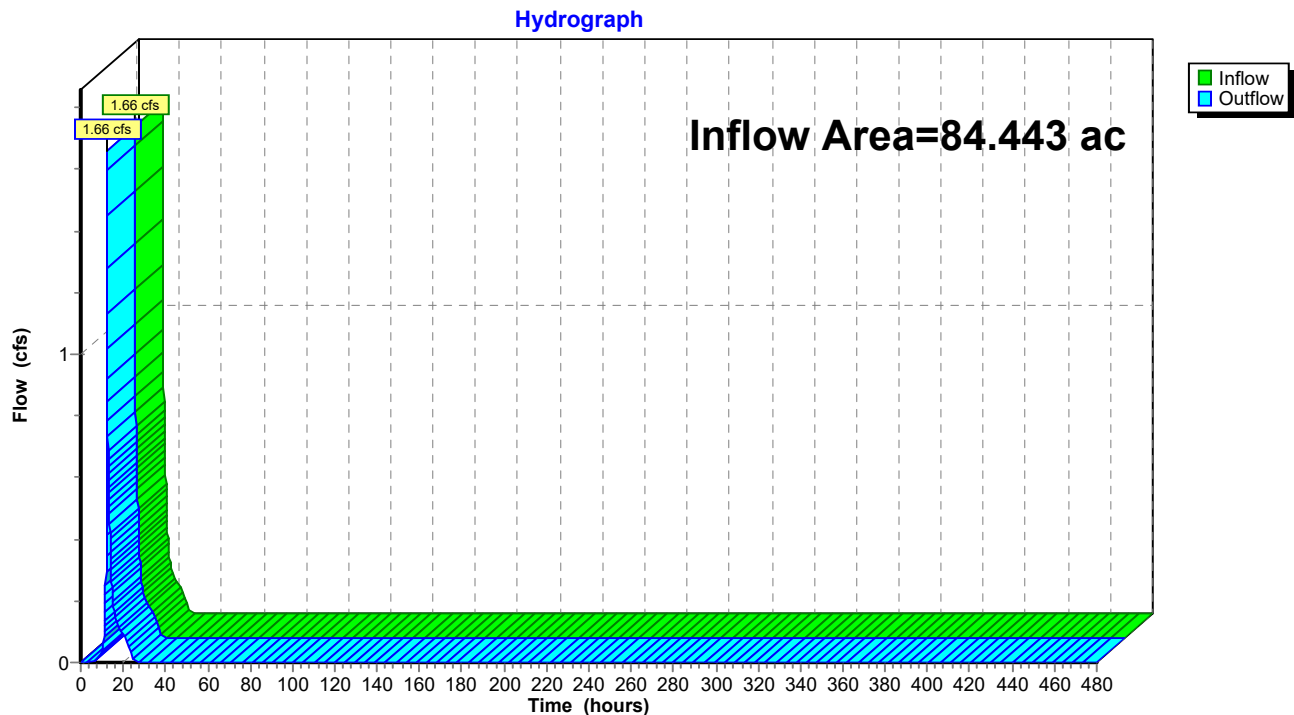
Page 13

Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.03" for 1-inch event
Inflow = 1.66 cfs @ 12.30 hrs, Volume= 0.245 af
Outflow = 1.66 cfs @ 12.30 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 14

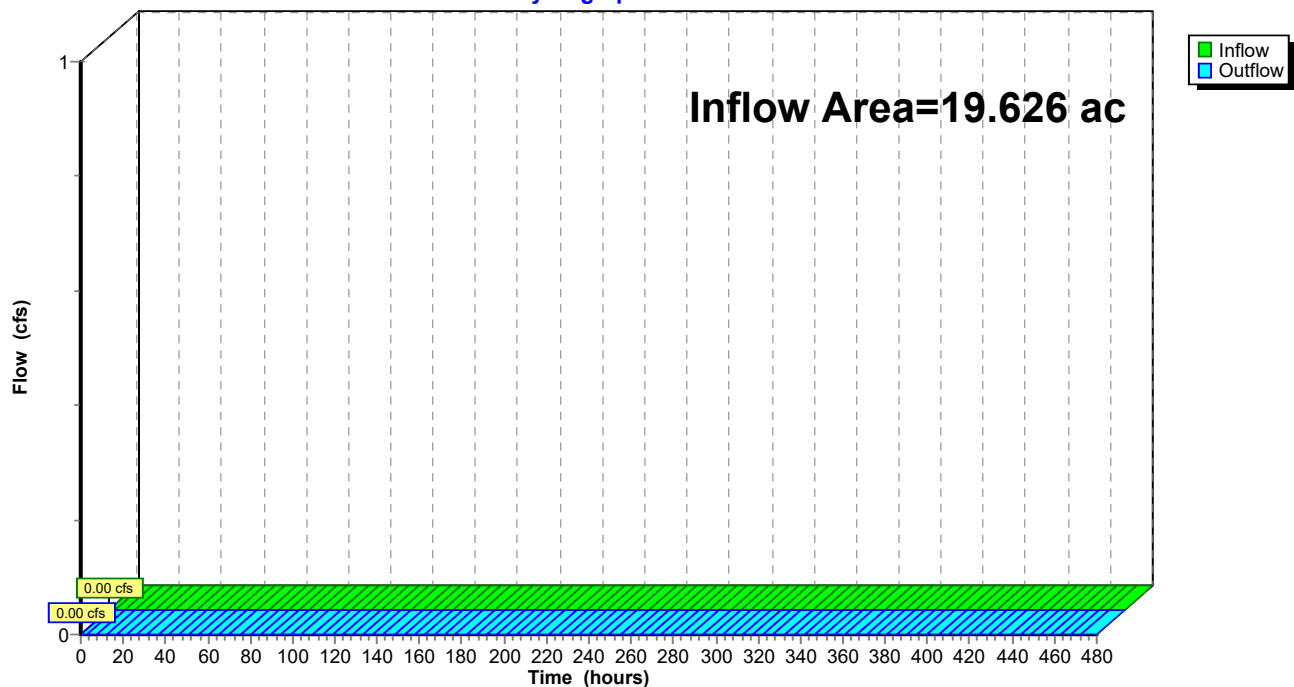
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 0.00" for 1-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

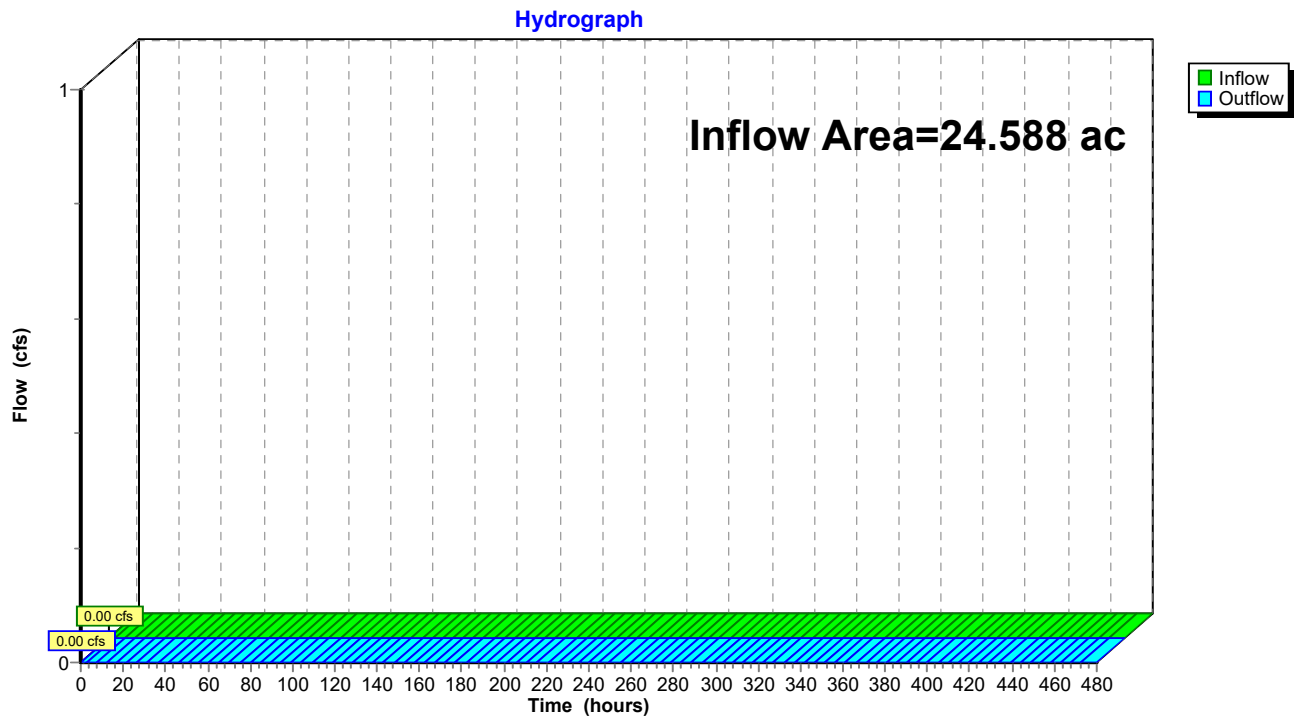
Page 15

Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 1-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 16

Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 0.68" for 1-inch event
 Inflow = 4.91 cfs @ 12.23 hrs, Volume= 0.332 af
 Outflow = 1.21 cfs @ 12.62 hrs, Volume= 0.331 af, Atten= 75%, Lag= 23.5 min
 Primary = 1.21 cfs @ 12.62 hrs, Volume= 0.331 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 958.40' @ 12.62 hrs Surf.Area= 0.456 ac Storage= 0.176 af

Plug-Flow detention time= 326.2 min calculated for 0.331 af (100% of inflow)

Center-of-Mass det. time= 325.1 min (1,108.9 - 783.8)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.21 cfs @ 12.62 hrs HW=958.40' TW=952.80' (Dynamic Tailwater)↑**1=RCP_Round 24"** (Inlet Controls 1.21 cfs @ 2.69 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)↑**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

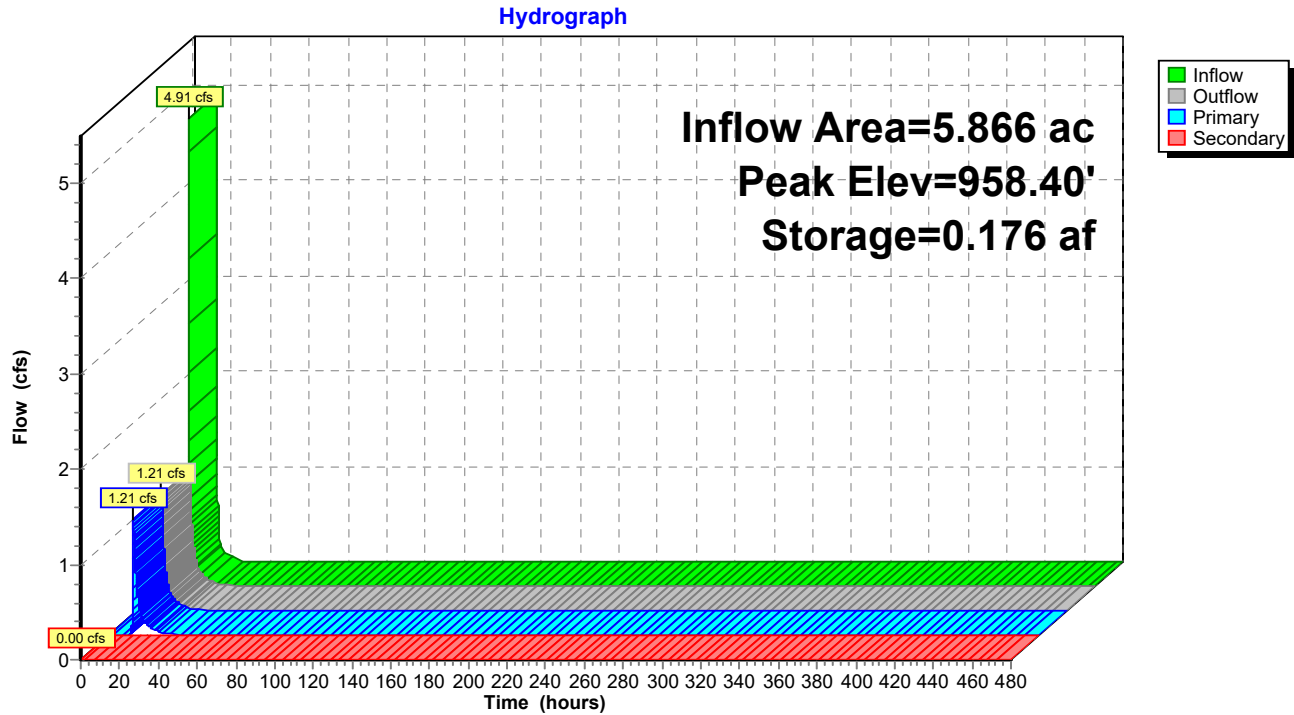
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 17

Pond 16P: TH-28A Walmart Existing Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 18

Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.16" for 1-inch event
 Inflow = 3.35 cfs @ 12.28 hrs, Volume= 0.334 af
 Outflow = 0.15 cfs @ 15.71 hrs, Volume= 0.334 af, Atten= 95%, Lag= 205.7 min
 Discarded = 0.15 cfs @ 15.71 hrs, Volume= 0.334 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 954.65' @ 15.71 hrs Surf.Area= 0.335 ac Storage= 0.199 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 586.3 min (1,417.2 - 830.9)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.15 cfs @ 15.71 hrs HW=954.65' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.15 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)↑**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

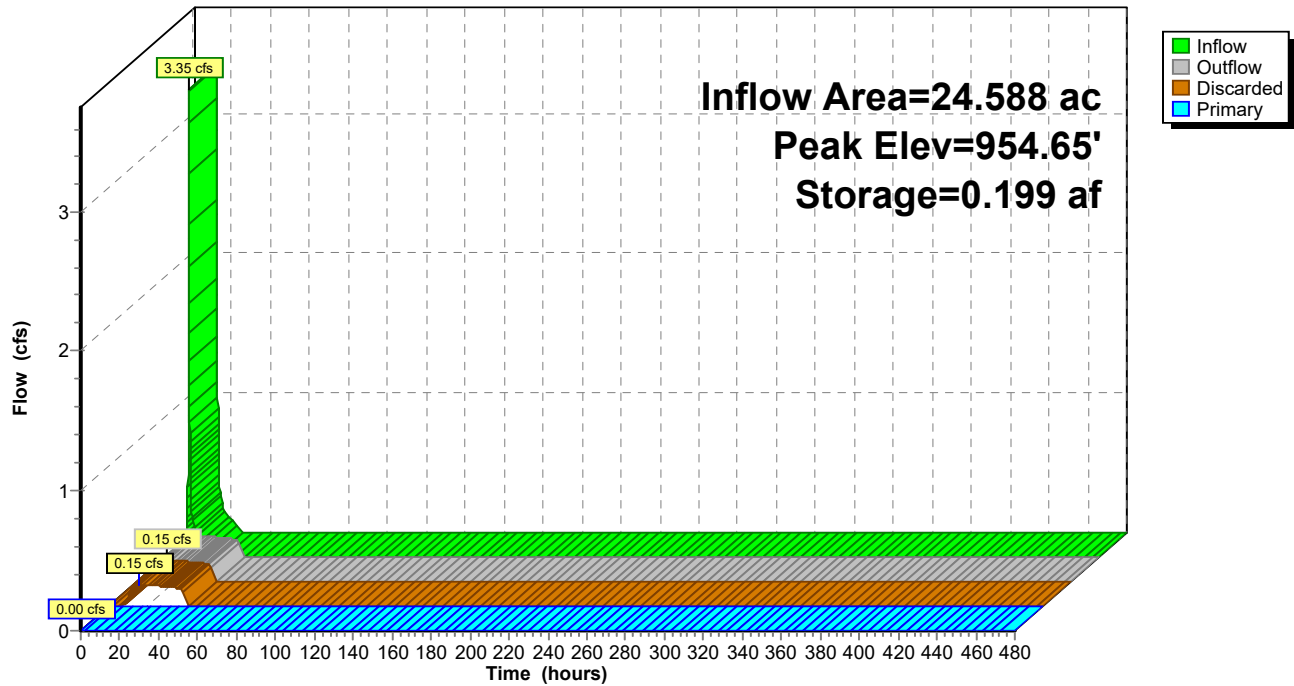
Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 19

Pond 17P: School Blvd Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 20

Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 0.06" for 1-inch event
 Inflow = 0.47 cfs @ 12.66 hrs, Volume= 0.102 af
 Outflow = 0.32 cfs @ 13.22 hrs, Volume= 0.102 af, Atten= 32%, Lag= 33.4 min
 Primary = 0.32 cfs @ 13.22 hrs, Volume= 0.102 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 957.91' @ 13.22 hrs Surf.Area= 0.104 ac Storage= 0.014 af

Plug-Flow detention time= 37.6 min calculated for 0.102 af (100% of inflow)

Center-of-Mass det. time= 36.7 min (964.8 - 928.1)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.32 cfs @ 13.22 hrs HW=957.91' TW=0.00' (Dynamic Tailwater)↑ **1=RCP_Round 18"** (Inlet Controls 0.32 cfs @ 1.69 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

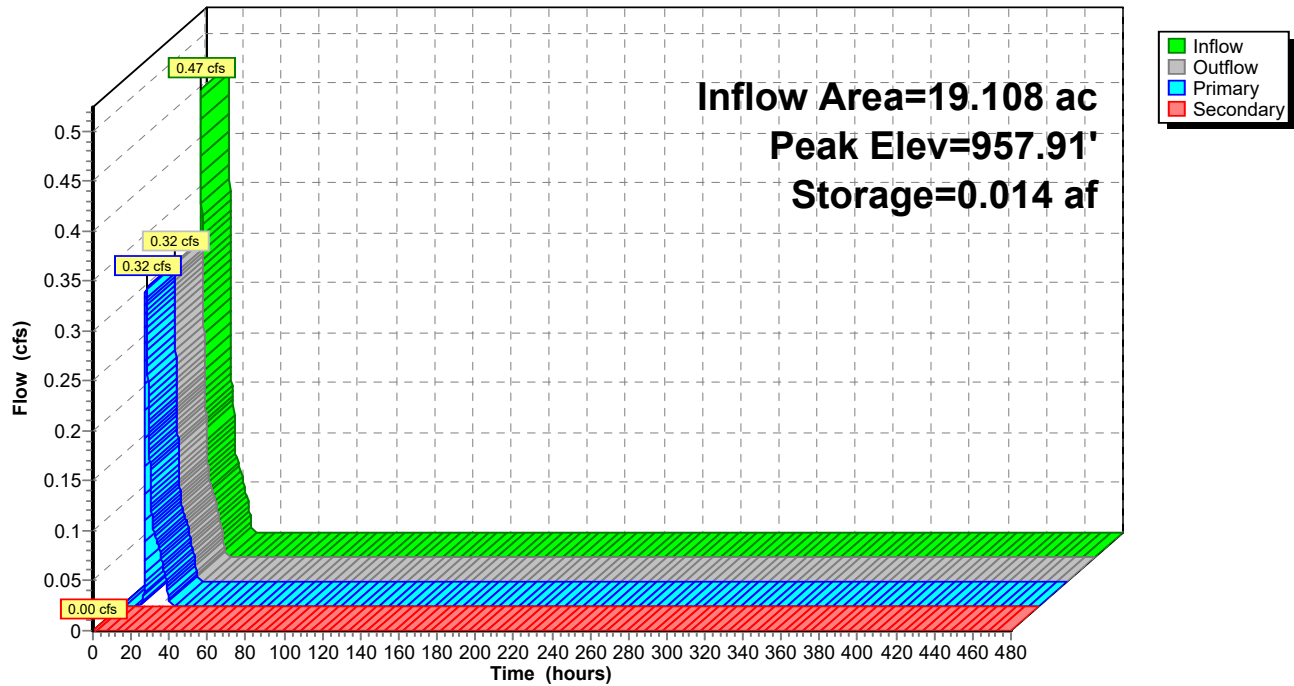
Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 21

Pond 18P: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 22

Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 0.15" for 1-inch event
 Inflow = 1.93 cfs @ 12.45 hrs, Volume= 0.250 af
 Outflow = 0.07 cfs @ 20.60 hrs, Volume= 0.251 af, Atten= 97%, Lag= 488.8 min
 Discarded = 0.07 cfs @ 20.60 hrs, Volume= 0.251 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 952.76' @ 20.60 hrs Surf.Area= 0.148 ac Storage= 0.183 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,319.6 min (2,165.2 - 845.6)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.07 cfs @ 20.60 hrs HW=952.76' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

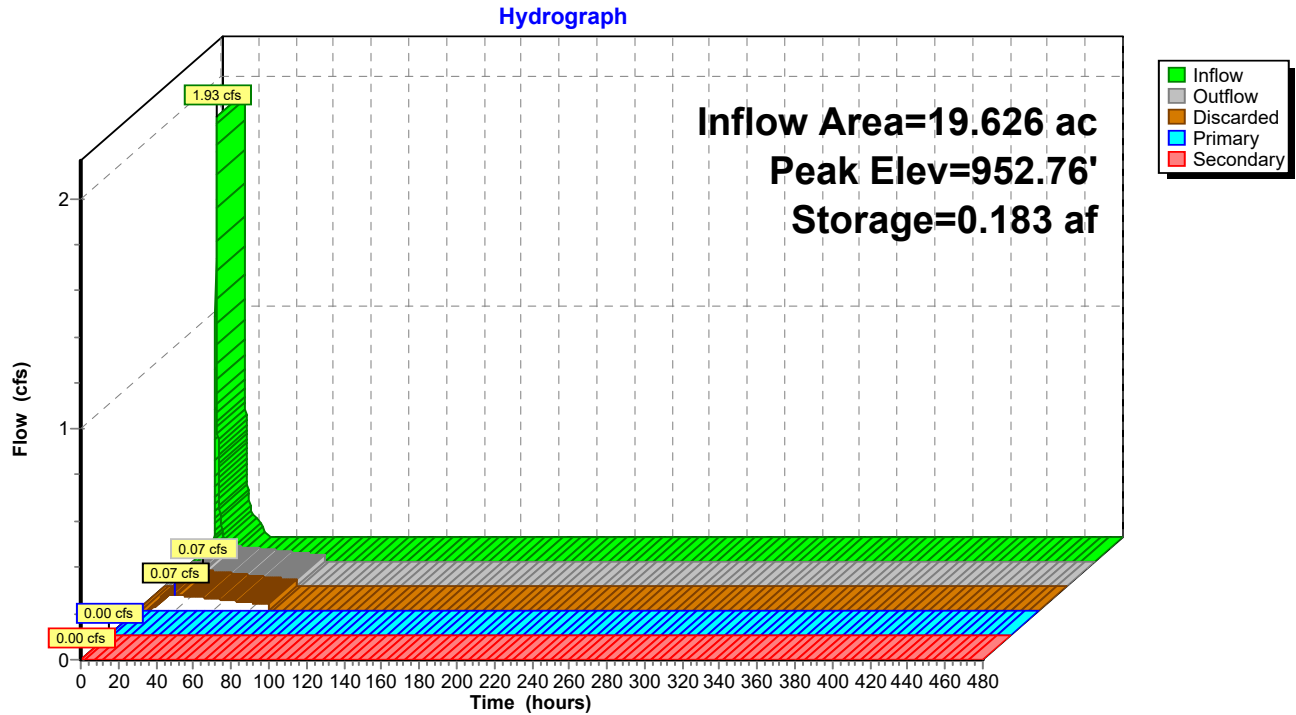
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 23

Pond 19P: Chelsea Road Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 24

Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 0.19" for 1-inch event
 Inflow = 5.08 cfs @ 12.60 hrs, Volume= 0.941 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 953.74' @ 480.00 hrs Surf.Area= 0.811 ac Storage= 3.191 af (0.941 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

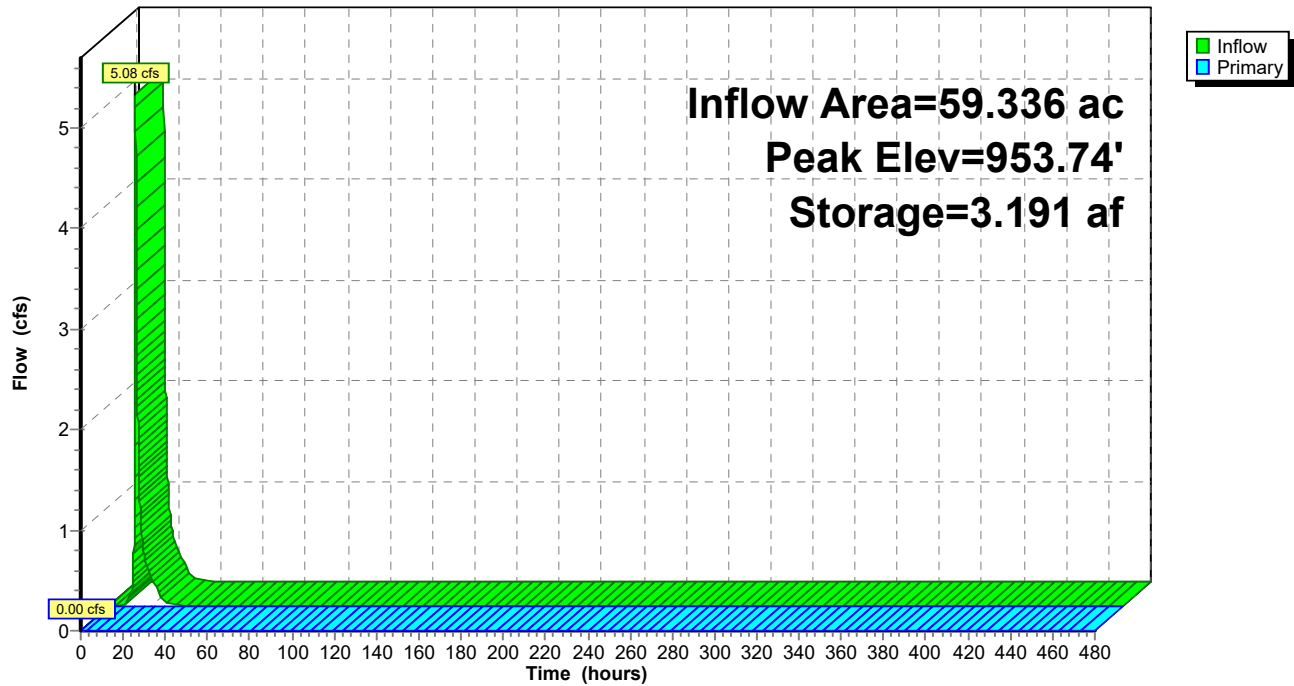
Existing
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 6/8/2021

Page 25

Pond 20P: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 26

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=0.75"
Tc=30.0 min CN=78/98 Runoff=11.97 cfs 1.191 af

Subcatchment9S: S Chelsea Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=0.89"
Tc=40.0 min CN=78/98 Runoff=33.27 cfs 3.975 af

Subcatchment11S: Chelsea Road Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=0.92"
Tc=30.0 min CN=78/98 Runoff=15.05 cfs 1.512 af

Subcatchment12S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=1.90"
Tc=15.0 min CN=58/98 Runoff=12.85 cfs 0.928 af

Subcatchment13S: School and Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=0.94"
Tc=18.0 min CN=78/98 Runoff=25.34 cfs 1.935 af

Subcatchment23S: Dundas Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=1.19"
Tc=20.0 min CN=78/98 Runoff=7.32 cfs 0.594 af

Reach 14R: To TH-01 Existing Landlocked Basin Inflow=9.32 cfs 1.785 af
Outflow=9.32 cfs 1.785 af

Reach 15R: West Inflow=6.74 cfs 1.142 af
Outflow=6.74 cfs 1.142 af

Reach 24R: SE Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 16P: TH-28A Walmart Existing Pond Peak Elev=958.86' Storage=0.395 af Inflow=12.85 cfs 0.928 af
Primary=5.11 cfs 0.927 af Secondary=0.00 cfs 0.000 af Outflow=5.11 cfs 0.927 af

Pond 17P: School Blvd Pond Peak Elev=957.76' Storage=1.633 af Inflow=25.34 cfs 1.935 af
Discarded=0.26 cfs 1.935 af Primary=0.00 cfs 0.000 af Outflow=0.26 cfs 1.935 af

Pond 18P: N Chelsea Peak Elev=958.91' Storage=0.342 af Inflow=11.97 cfs 1.191 af
Primary=5.35 cfs 1.191 af Secondary=0.00 cfs 0.000 af Outflow=5.35 cfs 1.191 af

Pond 19P: Chelsea Road Pond Peak Elev=954.75' Storage=0.584 af Inflow=15.05 cfs 1.512 af
Discarded=0.12 cfs 0.370 af Primary=6.74 cfs 1.142 af Secondary=0.00 cfs 0.000 af Outflow=6.85 cfs 1.512 af

Pond 20P: S Chelsea Peak Elev=957.22' Storage=7.153 af Inflow=38.24 cfs 4.902 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 10.136 af Average Runoff Depth = 0.95"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 27

Summary for Subcatchment 8S: N Chelsea

Runoff = 11.97 cfs @ 12.46 hrs, Volume= 1.191 af, Depth= 0.75"

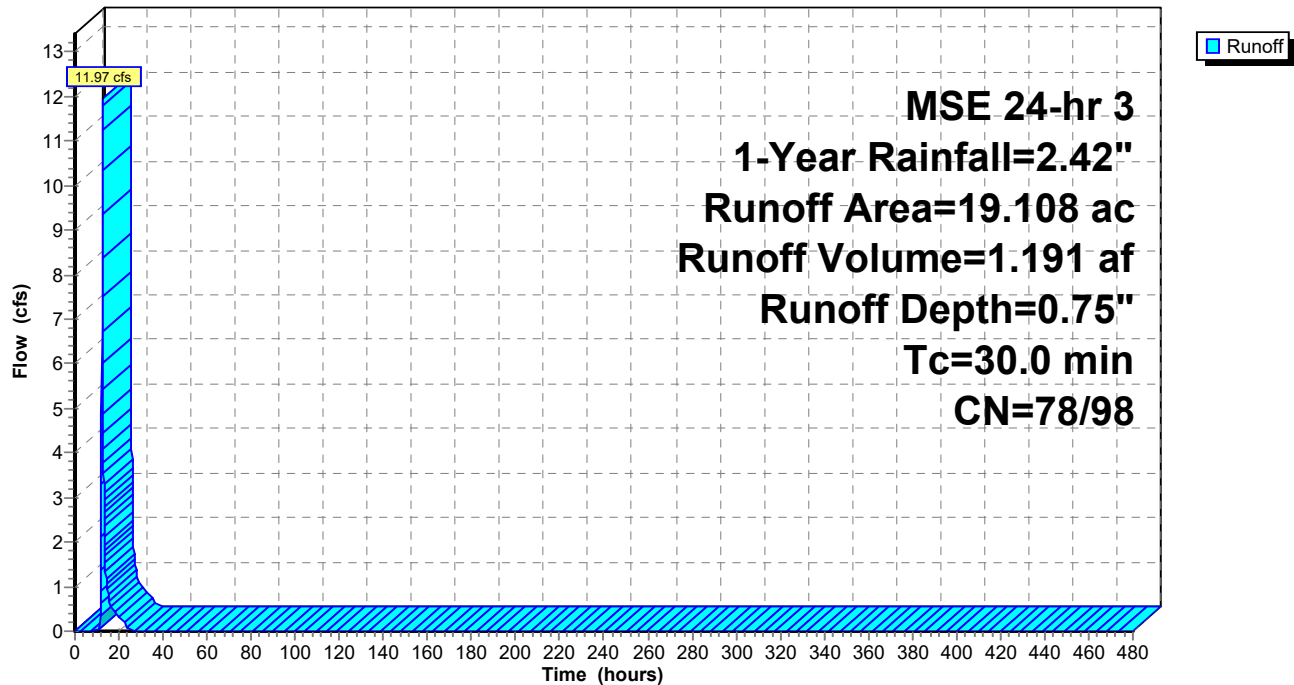
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 28

Summary for Subcatchment 9S: S Chelsea

Runoff = 33.27 cfs @ 12.59 hrs, Volume= 3.975 af, Depth= 0.89"

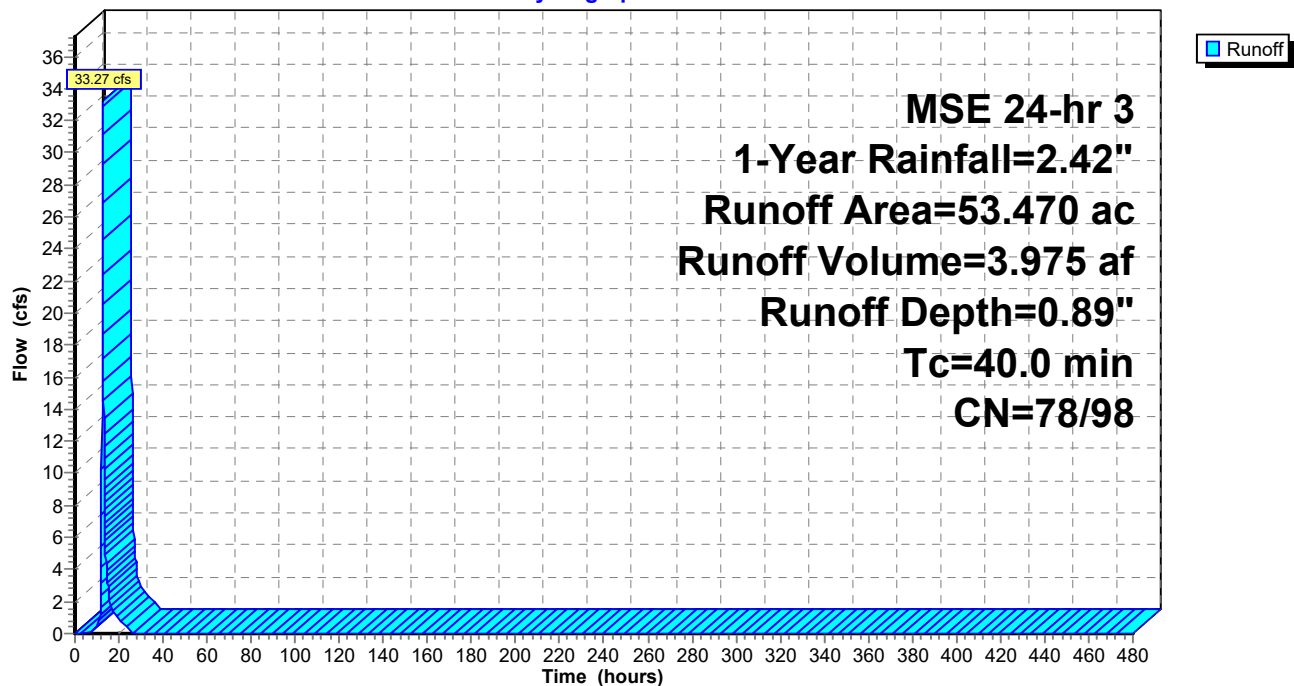
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 29

Summary for Subcatchment 11S: Chelsea Road

Runoff = 15.05 cfs @ 12.45 hrs, Volume= 1.512 af, Depth= 0.92"

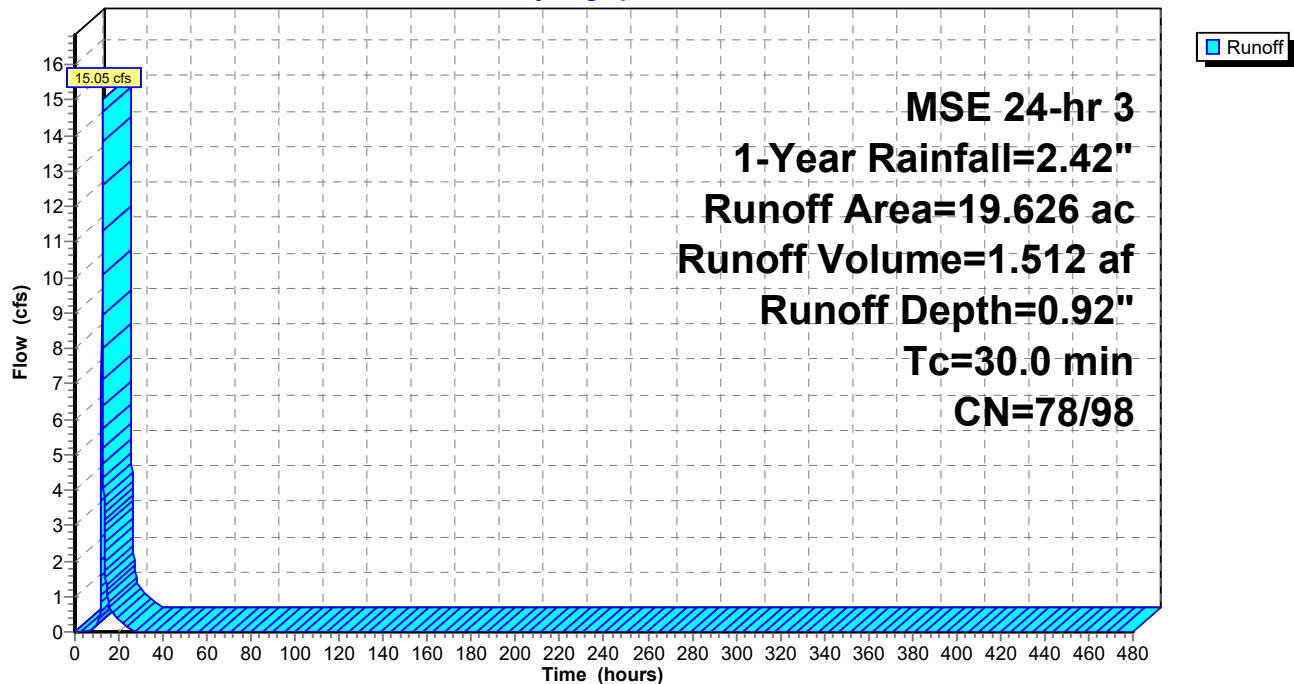
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 30

Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 12.85 cfs @ 12.23 hrs, Volume= 0.928 af, Depth= 1.90"

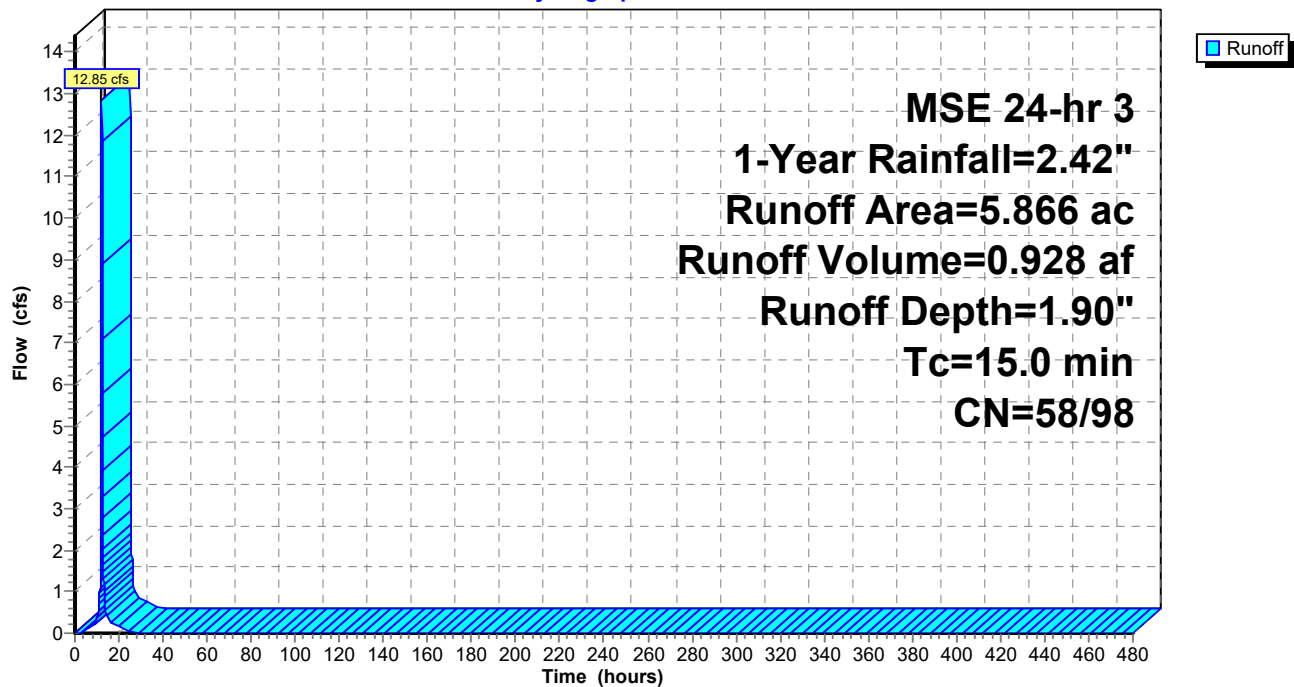
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 31

Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 25.34 cfs @ 12.28 hrs, Volume= 1.935 af, Depth= 0.94"

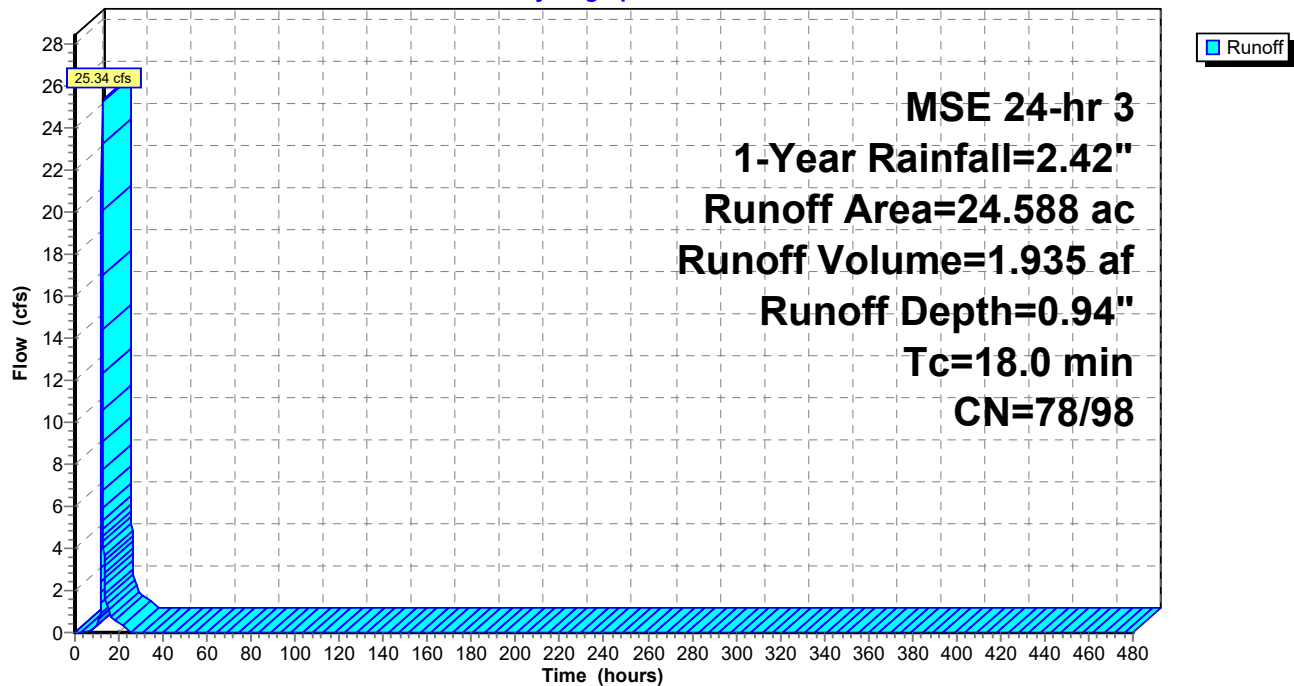
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 32

Summary for Subcatchment 23S: Dundas

Runoff = 7.32 cfs @ 12.30 hrs, Volume= 0.594 af, Depth= 1.19"

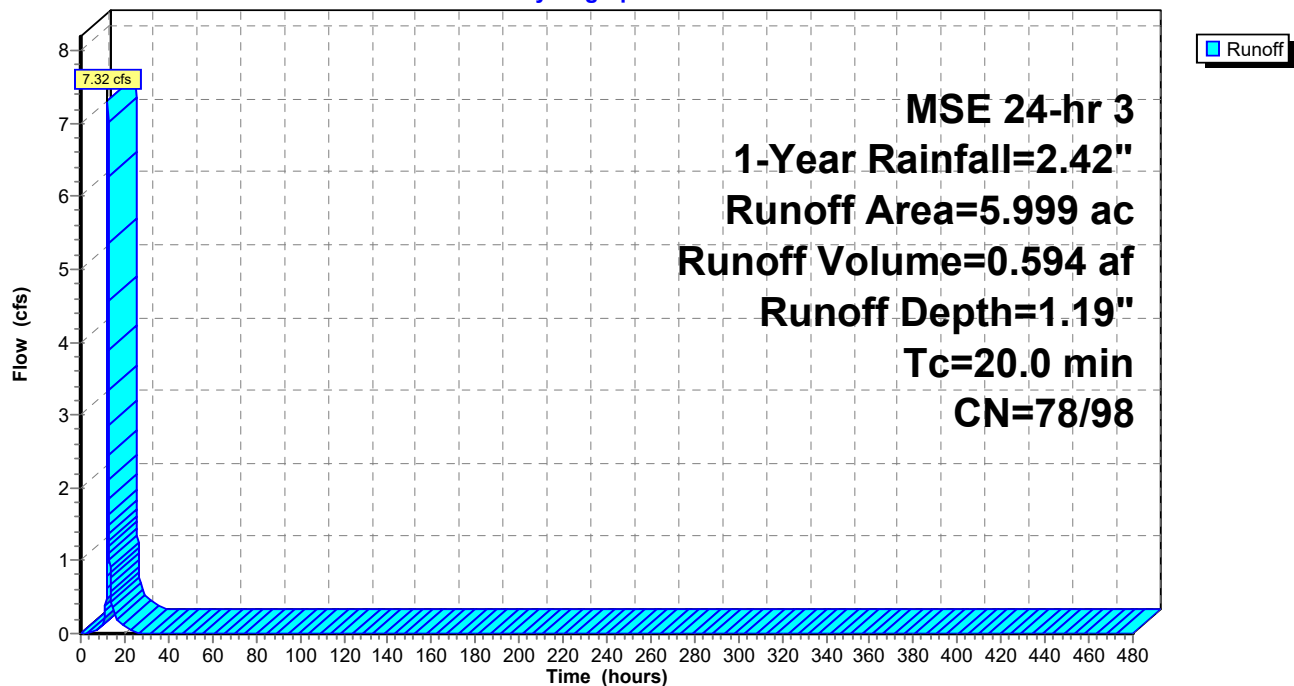
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

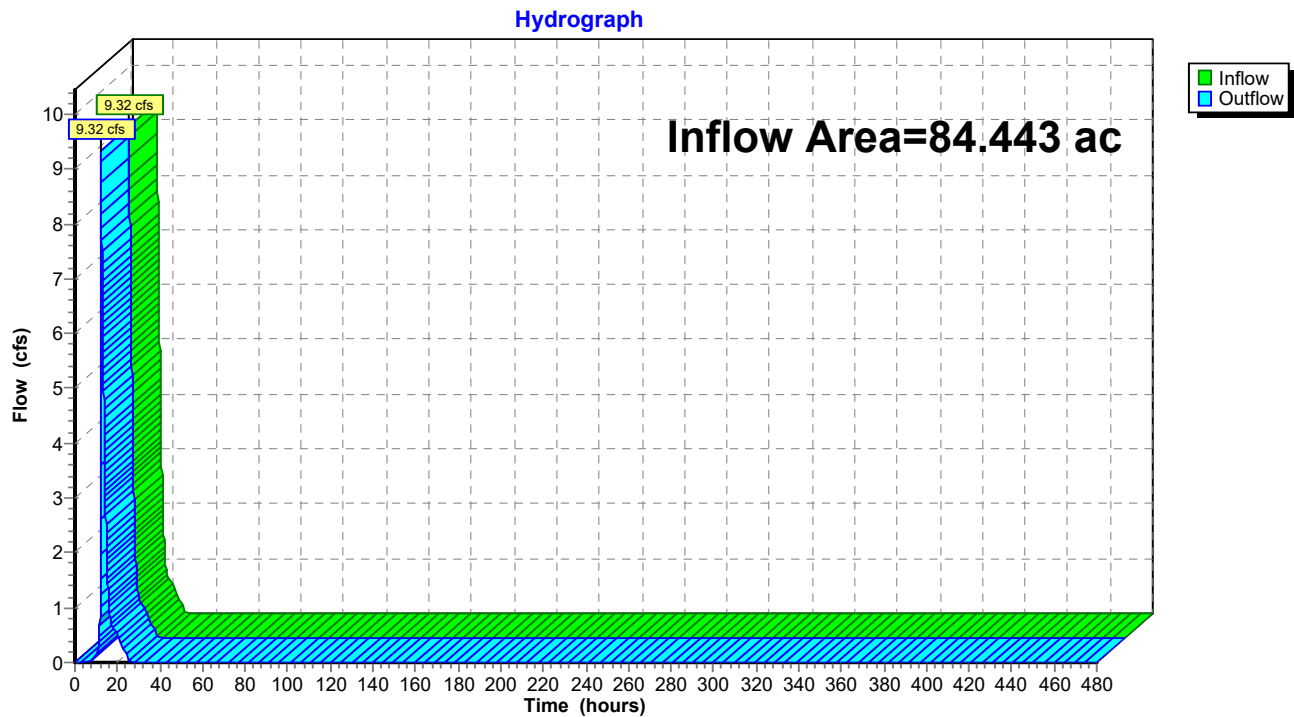
Page 33

Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.25" for 1-Year event
Inflow = 9.32 cfs @ 12.35 hrs, Volume= 1.785 af
Outflow = 9.32 cfs @ 12.35 hrs, Volume= 1.785 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 34

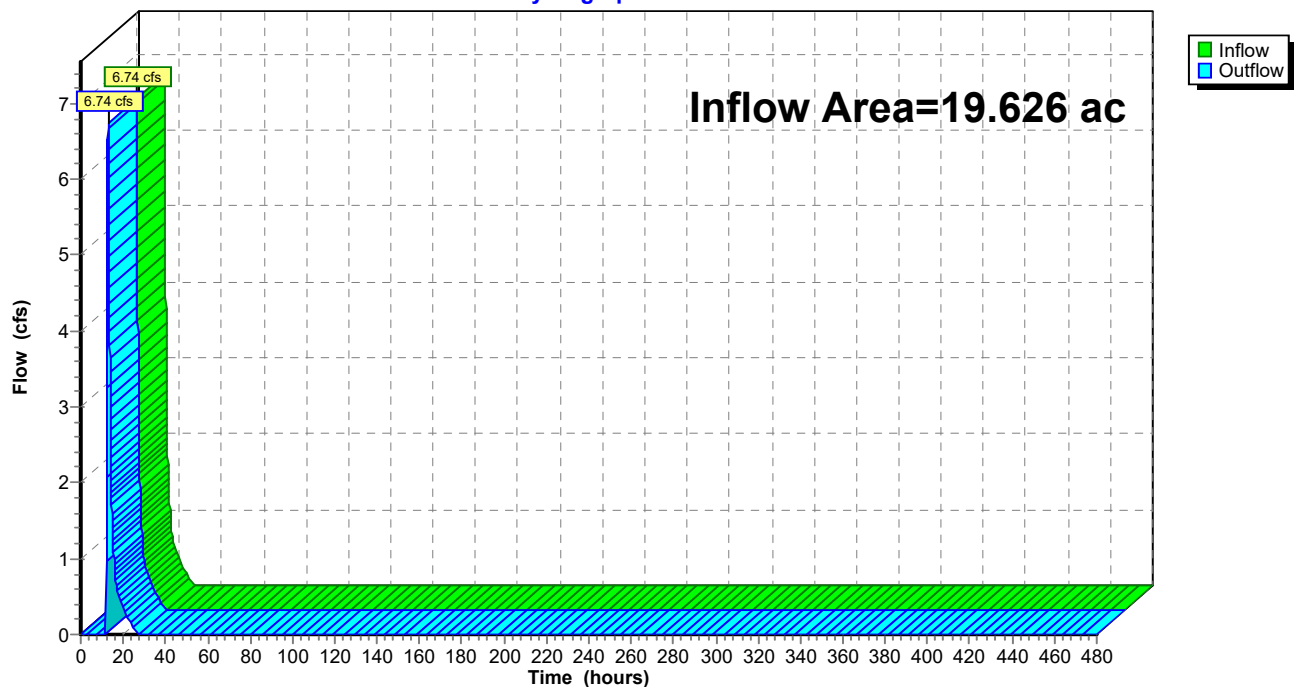
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 0.70" for 1-Year event
Inflow = 6.74 cfs @ 12.87 hrs, Volume= 1.142 af
Outflow = 6.74 cfs @ 12.87 hrs, Volume= 1.142 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

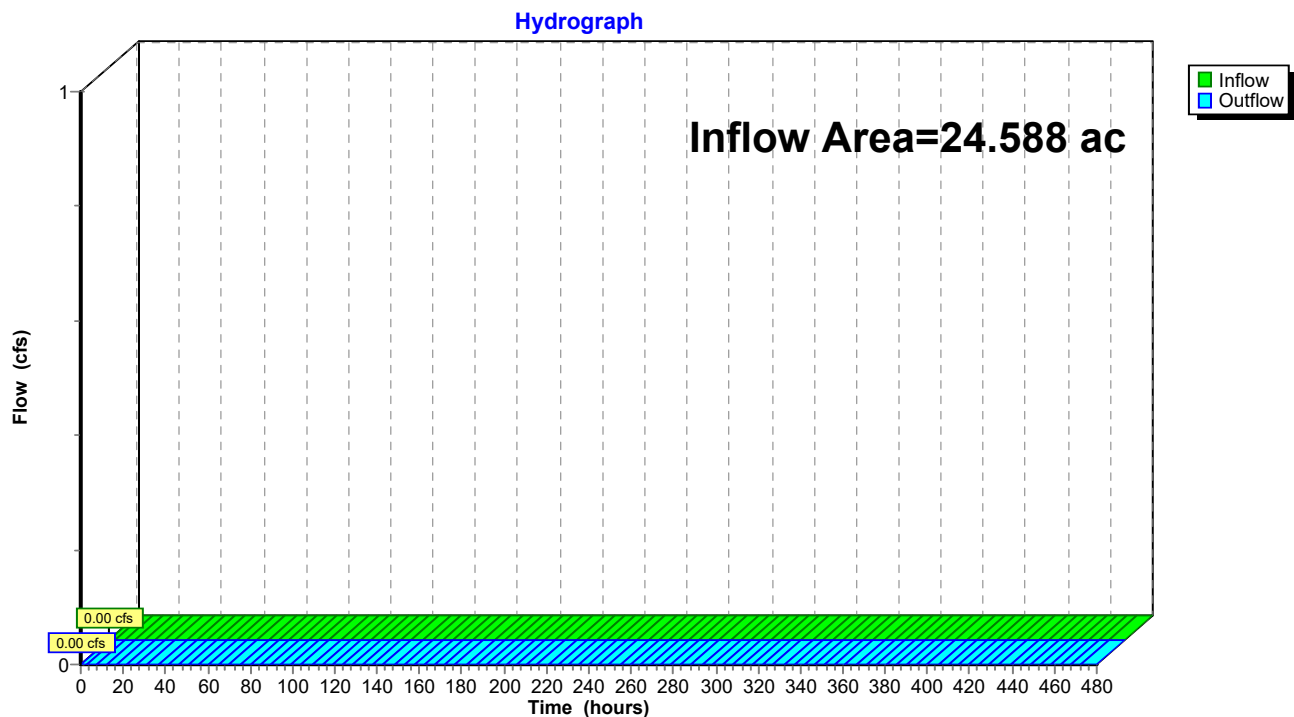
Page 35

Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 36

Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 1.90" for 1-Year event
 Inflow = 12.85 cfs @ 12.23 hrs, Volume= 0.928 af
 Outflow = 5.11 cfs @ 12.48 hrs, Volume= 0.927 af, Atten= 60%, Lag= 15.5 min
 Primary = 5.11 cfs @ 12.48 hrs, Volume= 0.927 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.86' @ 12.48 hrs Surf.Area= 0.498 ac Storage= 0.395 af

Plug-Flow detention time= 169.1 min calculated for 0.927 af (100% of inflow)
 Center-of-Mass det. time= 171.2 min (937.8 - 766.6)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=5.11 cfs @ 12.48 hrs HW=958.86' TW=953.81' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 5.11 cfs @ 3.95 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

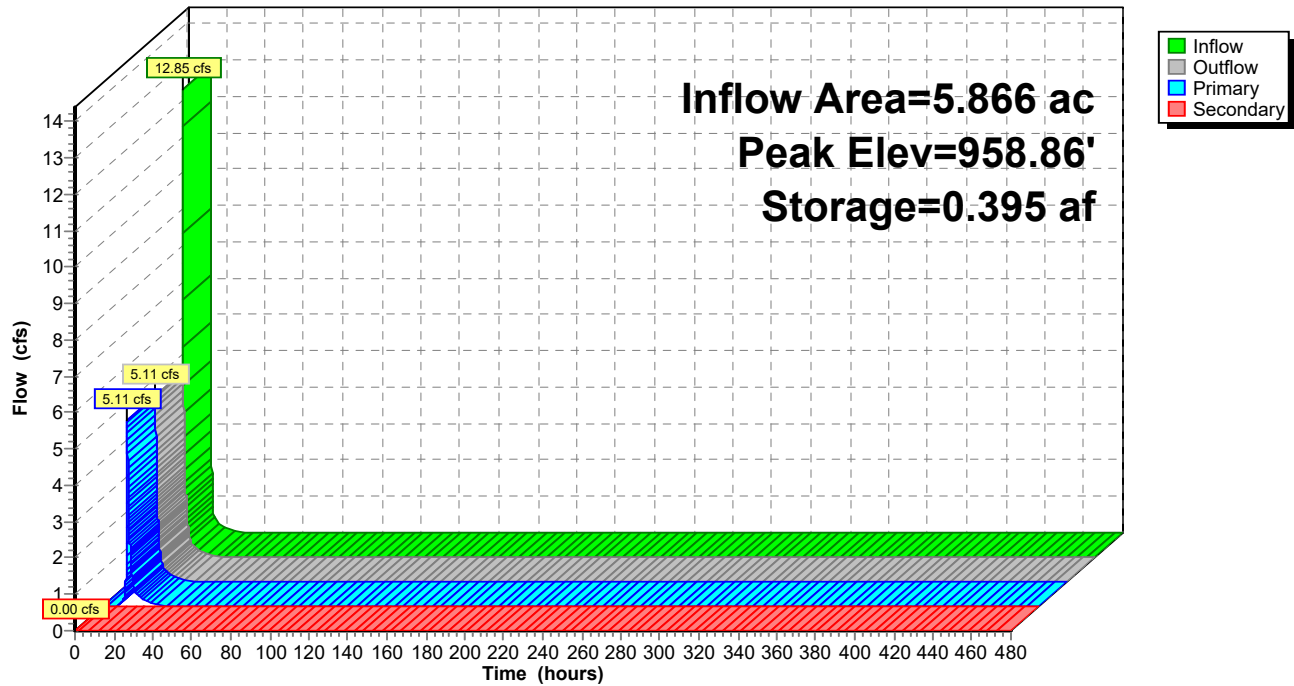
Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 37

Pond 16P: TH-28A Walmart Existing Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 38

Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.94" for 1-Year event
 Inflow = 25.34 cfs @ 12.28 hrs, Volume= 1.935 af
 Outflow = 0.26 cfs @ 22.37 hrs, Volume= 1.935 af, Atten= 99%, Lag= 605.3 min
 Discarded = 0.26 cfs @ 22.37 hrs, Volume= 1.935 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 957.76' @ 22.37 hrs Surf.Area= 0.573 ac Storage= 1.633 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 2,788.6 min (3,606.3 - 817.7)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.26 cfs @ 22.37 hrs HW=957.76' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.26 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

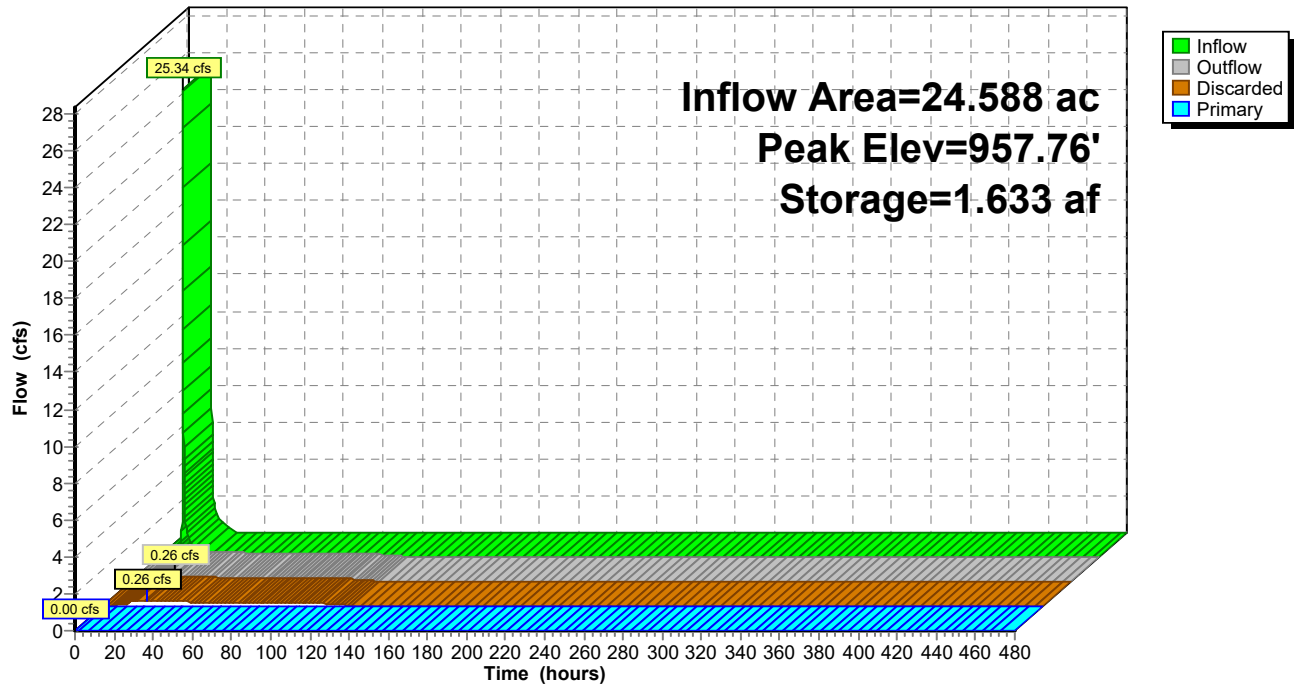
Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 39

Pond 17P: School Blvd Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 40

Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 0.75" for 1-Year event
 Inflow = 11.97 cfs @ 12.46 hrs, Volume= 1.191 af
 Outflow = 5.35 cfs @ 12.91 hrs, Volume= 1.191 af, Atten= 55%, Lag= 26.7 min
 Primary = 5.35 cfs @ 12.91 hrs, Volume= 1.191 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 958.91' @ 12.91 hrs Surf.Area= 0.555 ac Storage= 0.342 af

Plug-Flow detention time= 40.6 min calculated for 1.191 af (100% of inflow)

Center-of-Mass det. time= 39.3 min (891.1 - 851.8)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 ' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=5.35 cfs @ 12.91 hrs HW=958.91' TW=0.00' (Dynamic Tailwater)↑ **1=RCP_Round 18"** (Barrel Controls 5.35 cfs @ 4.60 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

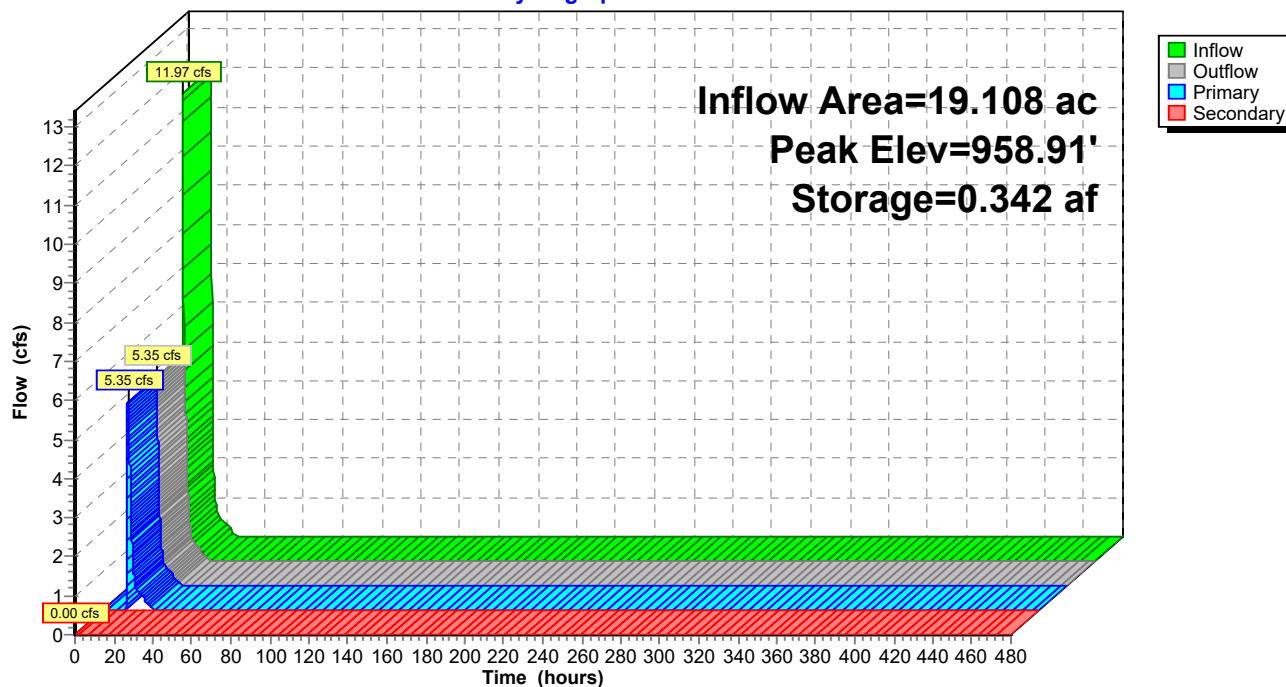
Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 41

Pond 18P: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 42

Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 0.92" for 1-Year event
 Inflow = 15.05 cfs @ 12.45 hrs, Volume= 1.512 af
 Outflow = 6.85 cfs @ 12.87 hrs, Volume= 1.512 af, Atten= 54%, Lag= 25.2 min
 Discarded = 0.12 cfs @ 12.87 hrs, Volume= 0.370 af
 Primary = 6.74 cfs @ 12.87 hrs, Volume= 1.142 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 954.75' @ 12.87 hrs Surf.Area= 0.256 ac Storage= 0.584 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 425.2 min (1,255.9 - 830.7)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.12 cfs @ 12.87 hrs HW=954.75' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=6.73 cfs @ 12.87 hrs HW=954.75' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 6.73 cfs @ 4.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

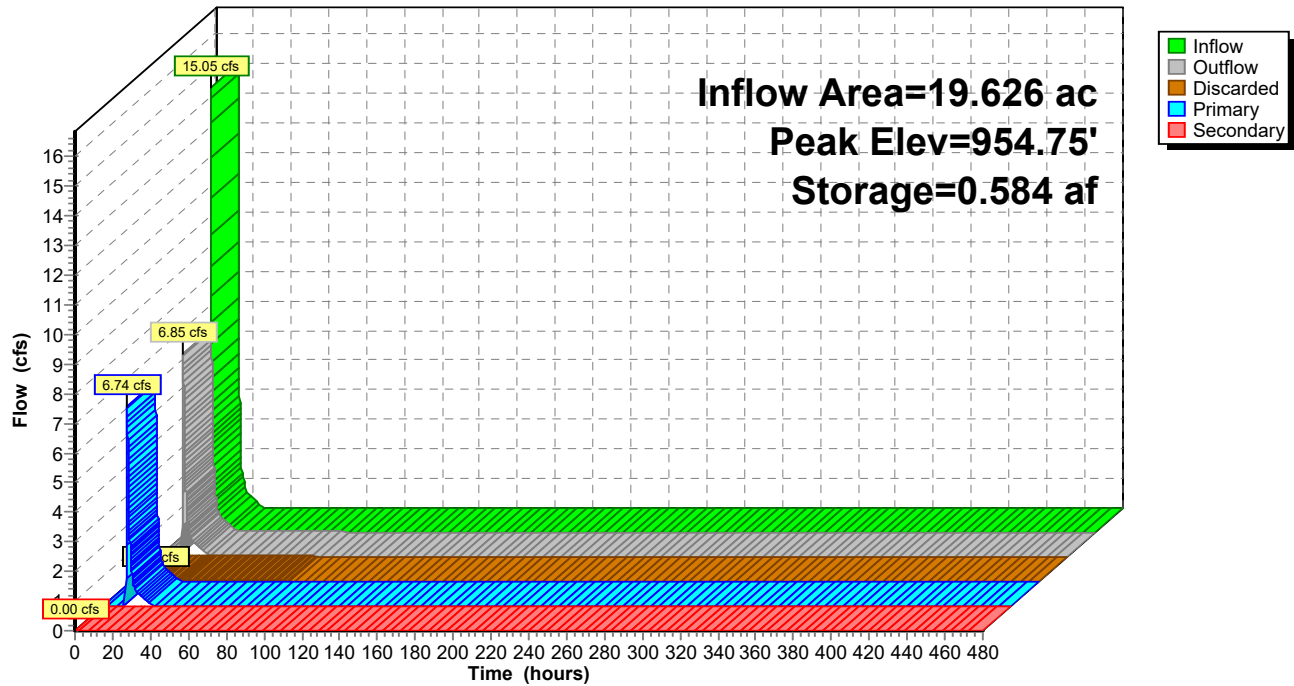
Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 43

Pond 19P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 44

Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 0.99" for 1-Year event
 Inflow = 38.24 cfs @ 12.58 hrs, Volume= 4.902 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 957.22' @ 480.00 hrs Surf.Area= 2.135 ac Storage= 7.153 af (4.902 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)↑**1=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

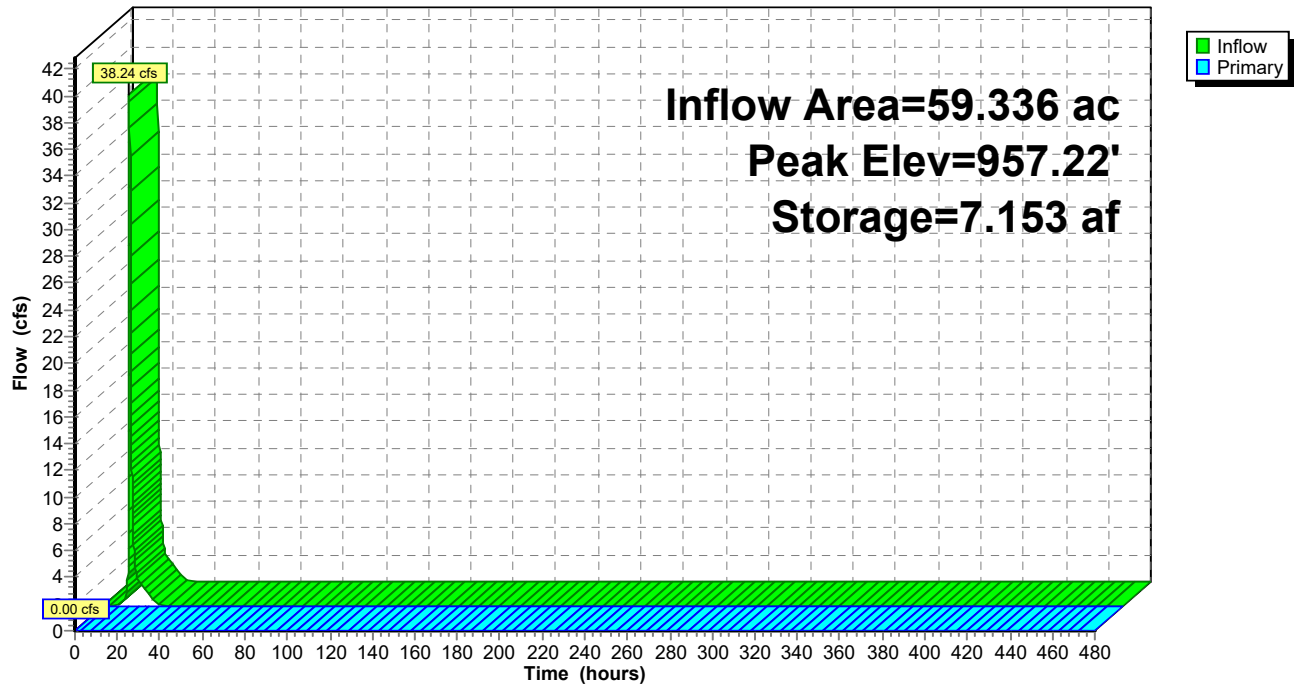
Existing
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 6/8/2021

Page 45

Pond 20P: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 46

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea	Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=0.49" Tc=30.0 min CN=78/98 Runoff=7.48 cfs 0.787 af
Subcatchment9S: S Chelsea	Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=0.62" Tc=40.0 min CN=78/98 Runoff=22.27 cfs 2.773 af
Subcatchment11S: Chelsea Road	Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=0.65" Tc=30.0 min CN=78/98 Runoff=10.20 cfs 1.065 af
Subcatchment12S: Walmart Pond	Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=1.53" Tc=15.0 min CN=58/98 Runoff=10.52 cfs 0.748 af
Subcatchment13S: School and	Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=0.67" Tc=18.0 min CN=78/98 Runoff=17.31 cfs 1.370 af
Subcatchment23S: Dundas	Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=0.89" Tc=20.0 min CN=78/98 Runoff=5.35 cfs 0.443 af
Reach 14R: To TH-01 Existing Landlocked Basin	Inflow=6.50 cfs 1.230 af Outflow=6.50 cfs 1.230 af
Reach 15R: West	Inflow=3.69 cfs 0.703 af Outflow=3.69 cfs 0.703 af
Reach 24R: SE	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Pond 16P: TH-28A Walmart Existing Pond	Peak Elev=958.74' Storage=0.336 af Inflow=10.52 cfs 0.748 af Primary=3.88 cfs 0.747 af Secondary=0.00 cfs 0.000 af Outflow=3.88 cfs 0.747 af
Pond 17P: School Blvd Pond	Peak Elev=956.79' Storage=1.109 af Inflow=17.31 cfs 1.370 af Discarded=0.23 cfs 1.370 af Primary=0.00 cfs 0.000 af Outflow=0.23 cfs 1.370 af
Pond 18P: N Chelsea	Peak Elev=958.63' Storage=0.203 af Inflow=7.48 cfs 0.787 af Primary=3.59 cfs 0.787 af Secondary=0.00 cfs 0.000 af Outflow=3.59 cfs 0.787 af
Pond 19P: Chelsea Road Pond	Peak Elev=954.22' Storage=0.456 af Inflow=10.20 cfs 1.065 af Discarded=0.10 cfs 0.362 af Primary=3.69 cfs 0.703 af Secondary=0.00 cfs 0.000 af Outflow=3.80 cfs 1.065 af
Pond 20P: S Chelsea	Peak Elev=956.44' Storage=5.771 af Inflow=26.06 cfs 3.520 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 7.186 af Average Runoff Depth = 0.67"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 47

Summary for Subcatchment 8S: N Chelsea

Runoff = 7.48 cfs @ 12.48 hrs, Volume= 0.787 af, Depth= 0.49"

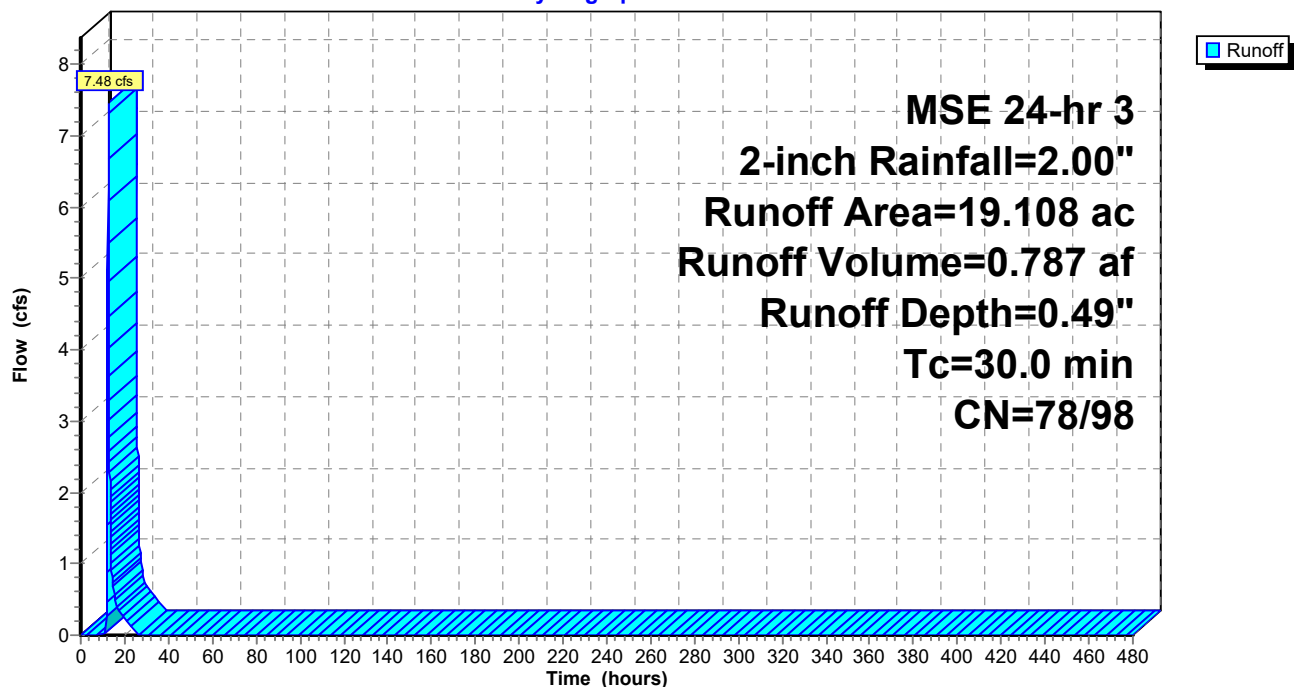
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 48

Summary for Subcatchment 9S: S Chelsea

Runoff = 22.27 cfs @ 12.60 hrs, Volume= 2.773 af, Depth= 0.62"

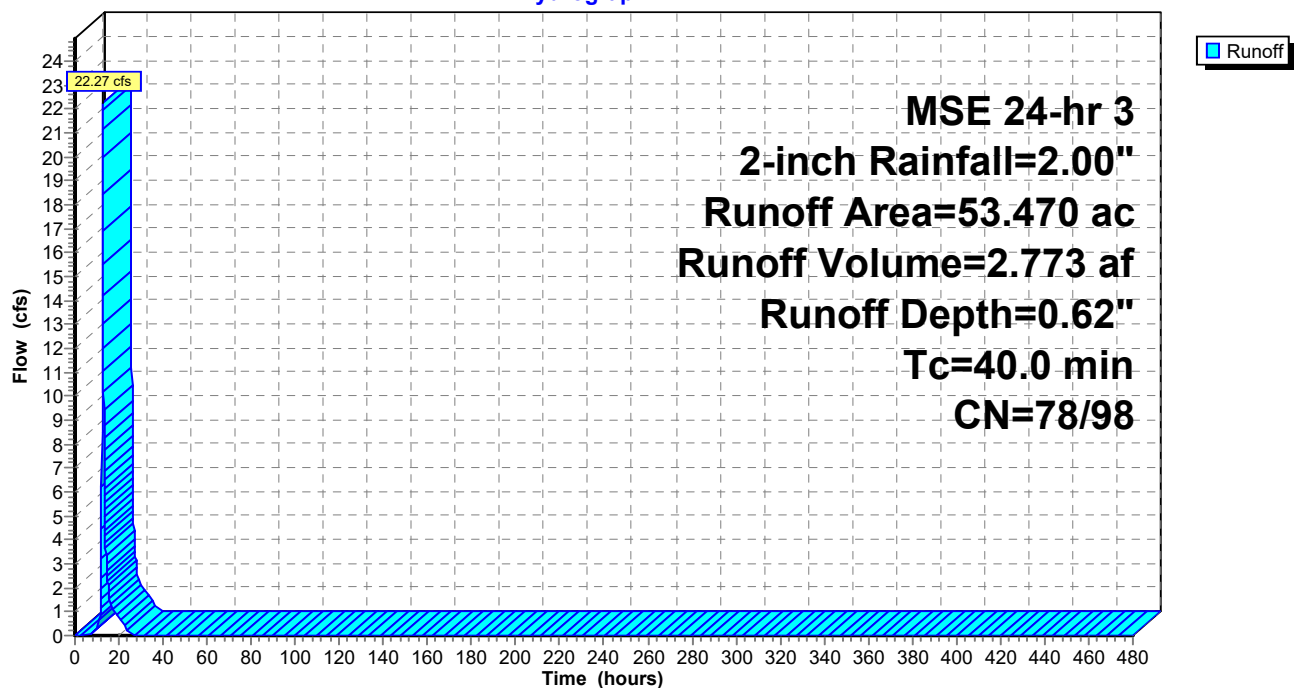
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 49

Summary for Subcatchment 11S: Chelsea Road

Runoff = 10.20 cfs @ 12.46 hrs, Volume= 1.065 af, Depth= 0.65"

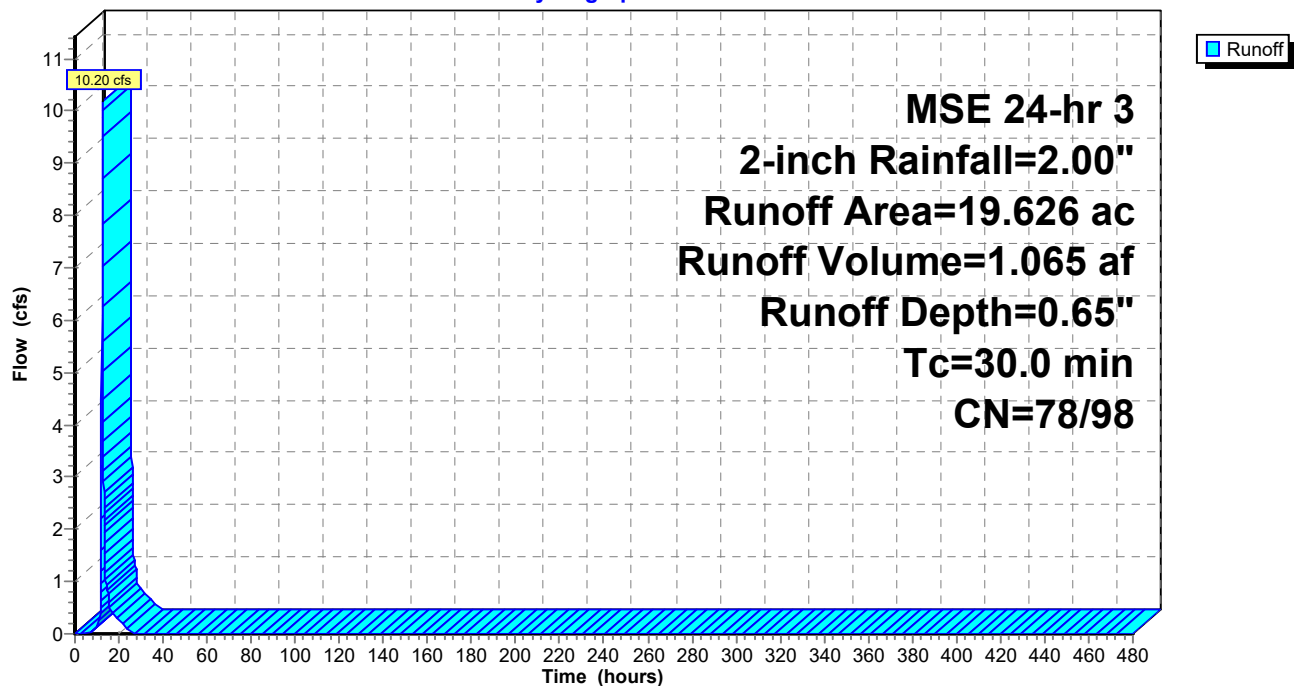
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 50

Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 10.52 cfs @ 12.23 hrs, Volume= 0.748 af, Depth= 1.53"

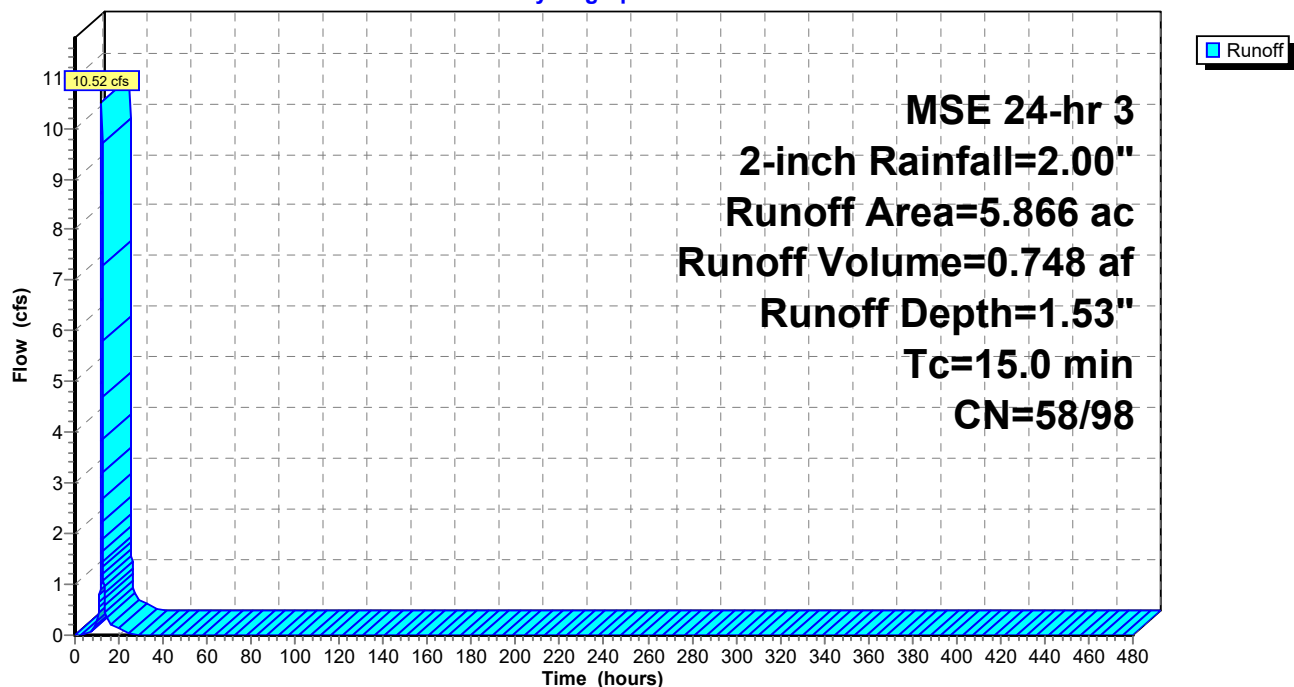
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 51

Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 17.31 cfs @ 12.29 hrs, Volume= 1.370 af, Depth= 0.67"

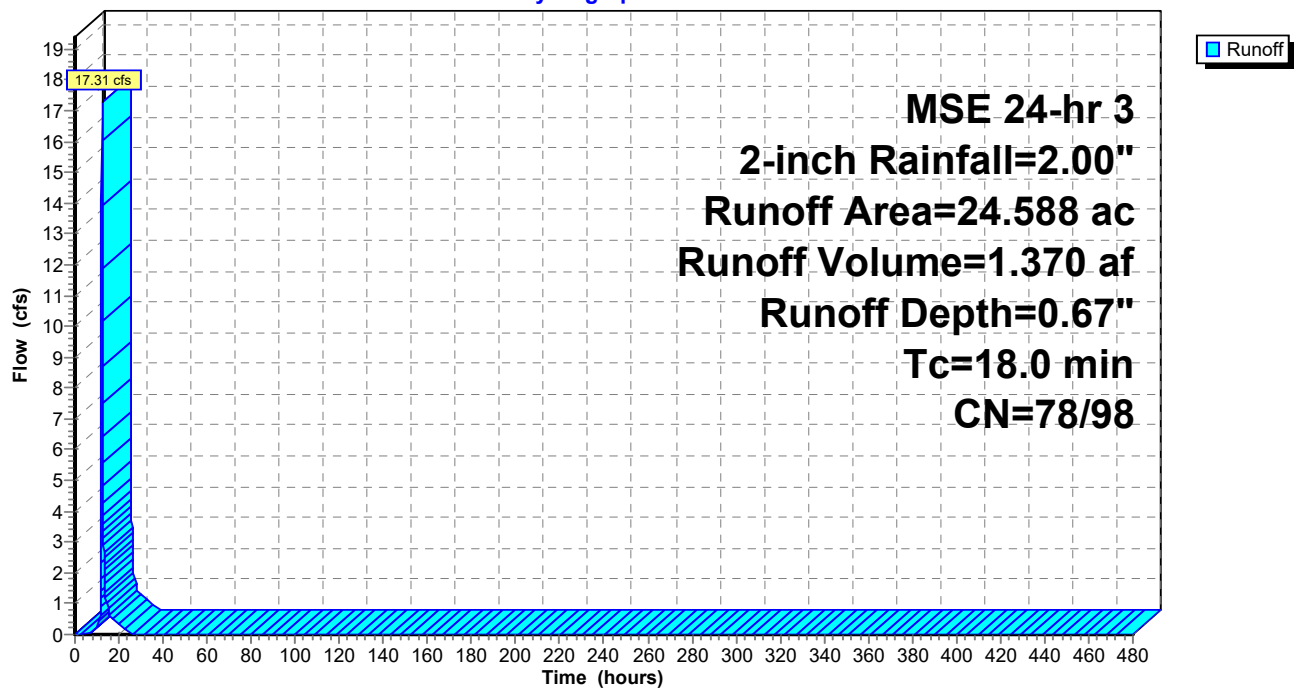
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 52

Summary for Subcatchment 23S: Dundas

Runoff = 5.35 cfs @ 12.30 hrs, Volume= 0.443 af, Depth= 0.89"

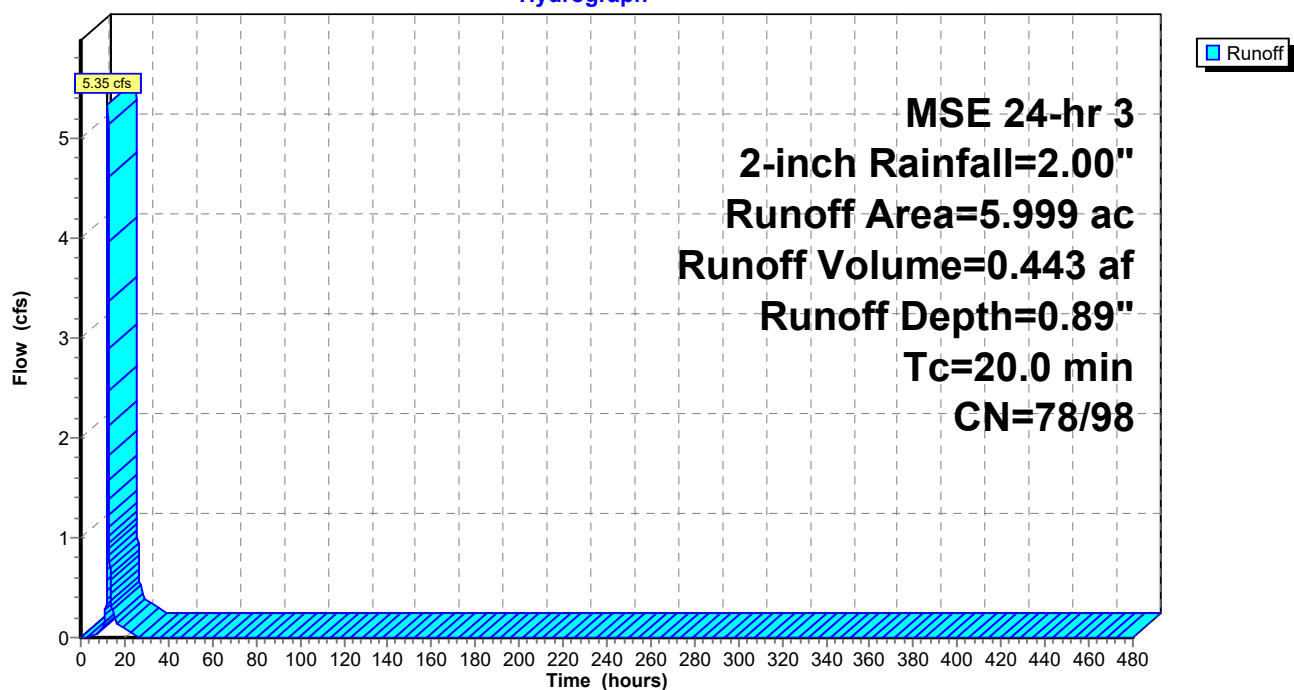
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

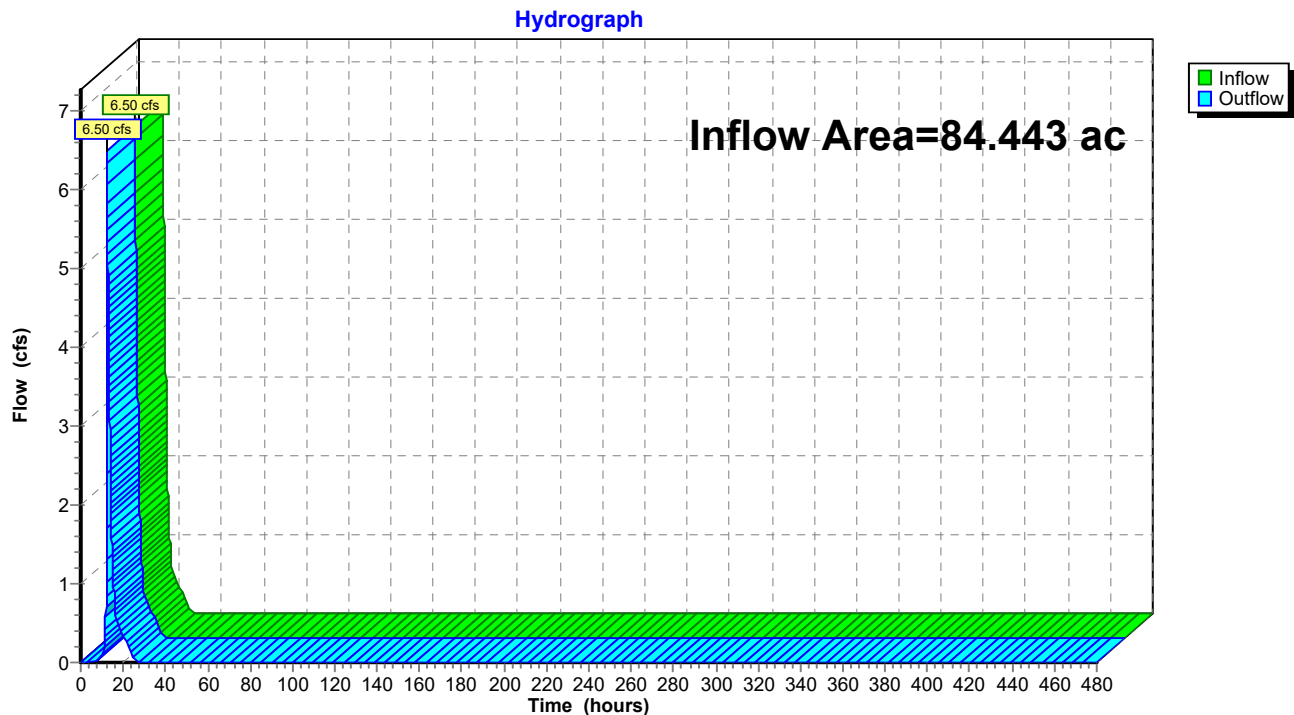
Page 53

Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.17" for 2-inch event
Inflow = 6.50 cfs @ 12.35 hrs, Volume= 1.230 af
Outflow = 6.50 cfs @ 12.35 hrs, Volume= 1.230 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 54

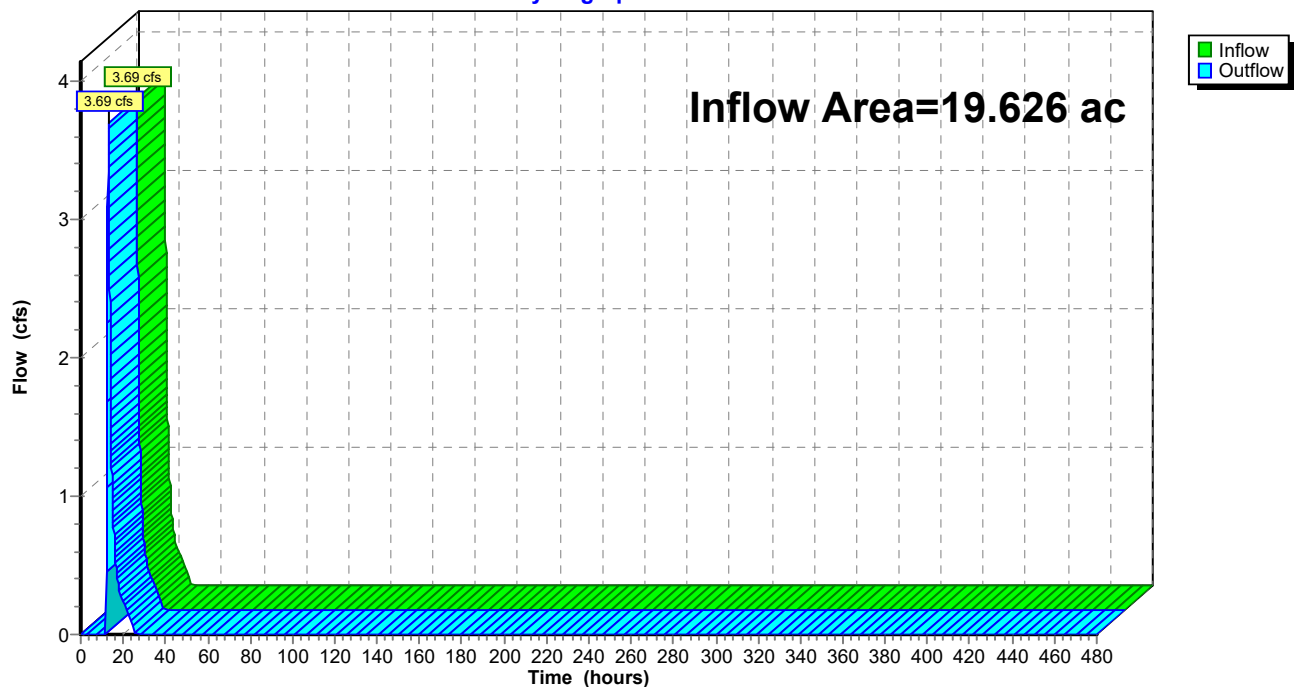
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 0.43" for 2-inch event
Inflow = 3.69 cfs @ 12.99 hrs, Volume= 0.703 af
Outflow = 3.69 cfs @ 12.99 hrs, Volume= 0.703 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

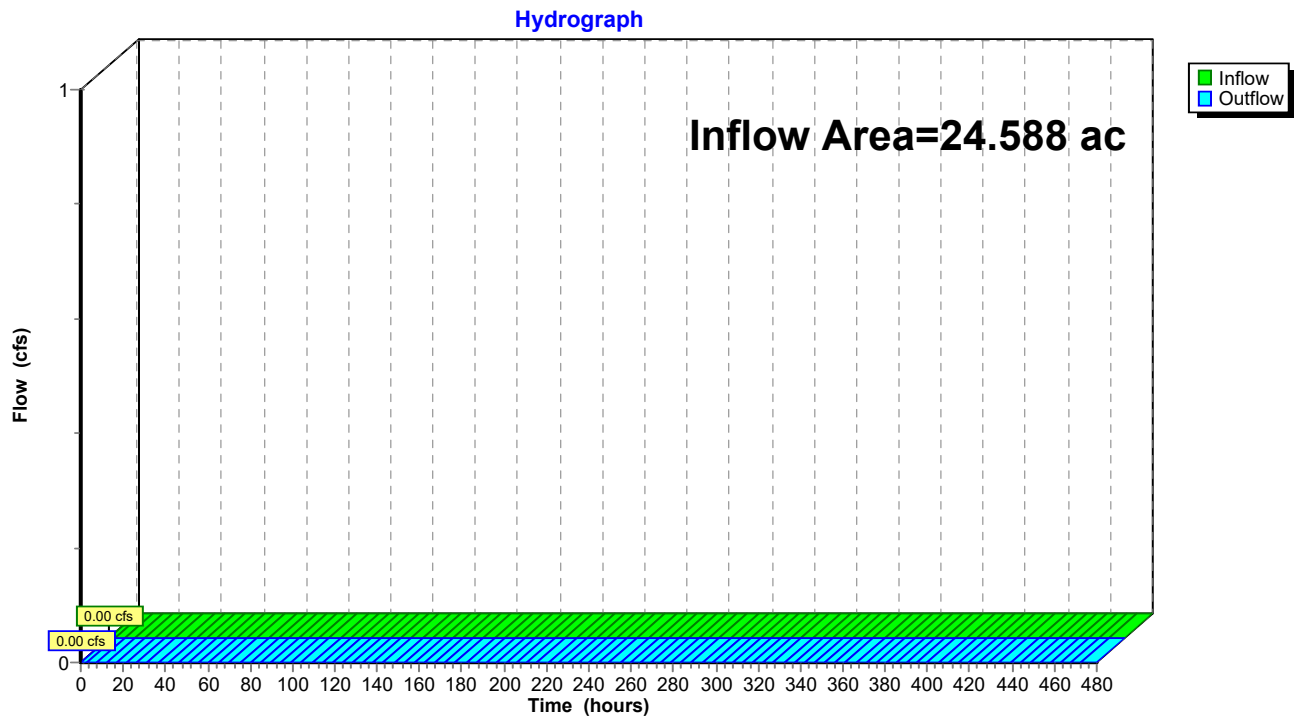
Page 55

Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 2-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 56

Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 1.53" for 2-inch event
 Inflow = 10.52 cfs @ 12.23 hrs, Volume= 0.748 af
 Outflow = 3.88 cfs @ 12.50 hrs, Volume= 0.747 af, Atten= 63%, Lag= 16.6 min
 Primary = 3.88 cfs @ 12.50 hrs, Volume= 0.747 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.74' @ 12.50 hrs Surf.Area= 0.487 ac Storage= 0.336 af

Plug-Flow detention time= 195.9 min calculated for 0.747 af (100% of inflow)
 Center-of-Mass det. time= 195.3 min (964.9 - 769.6)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=3.88 cfs @ 12.50 hrs HW=958.74' TW=953.44' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 3.88 cfs @ 3.66 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

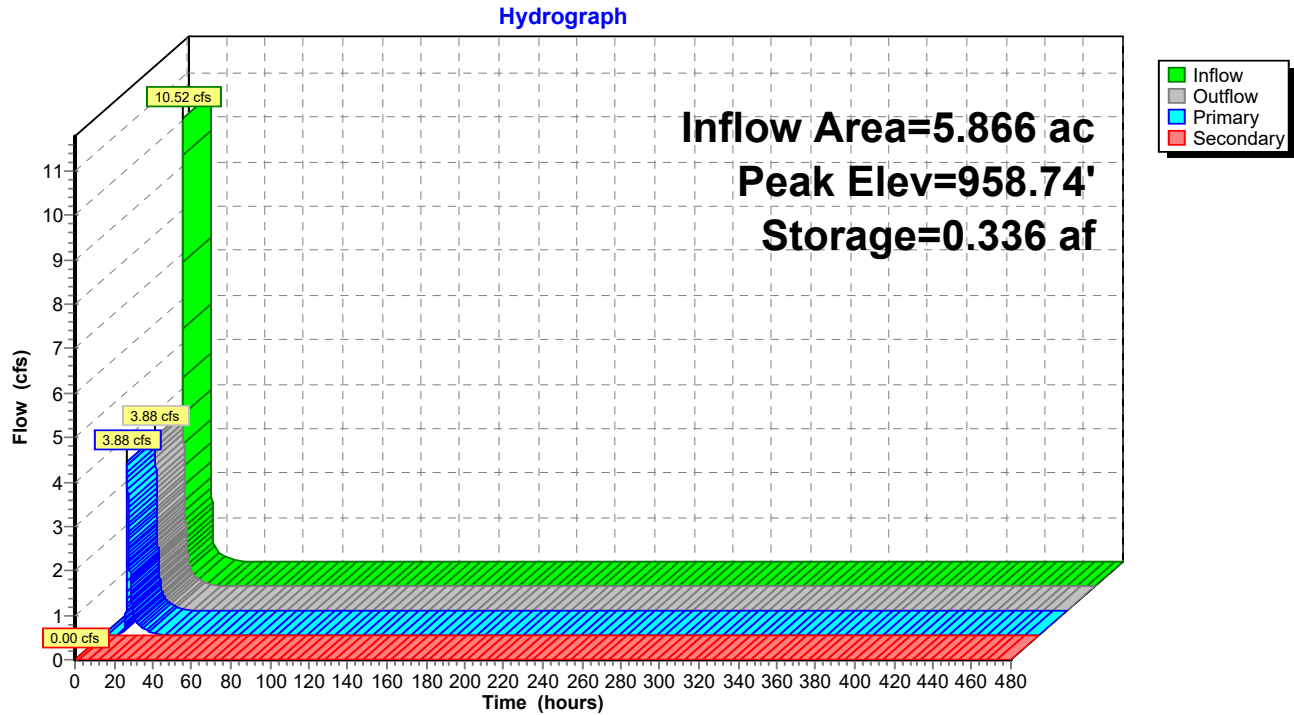
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 57

Pond 16P: TH-28A Walmart Existing Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 58

Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.67" for 2-inch event
 Inflow = 17.31 cfs @ 12.29 hrs, Volume= 1.370 af
 Outflow = 0.23 cfs @ 21.78 hrs, Volume= 1.370 af, Atten= 99%, Lag= 569.7 min
 Discarded = 0.23 cfs @ 21.78 hrs, Volume= 1.370 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 956.79' @ 21.78 hrs Surf.Area= 0.506 ac Storage= 1.109 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 2,138.7 min (2,960.6 - 822.0)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.23 cfs @ 21.78 hrs HW=956.79' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 0.23 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

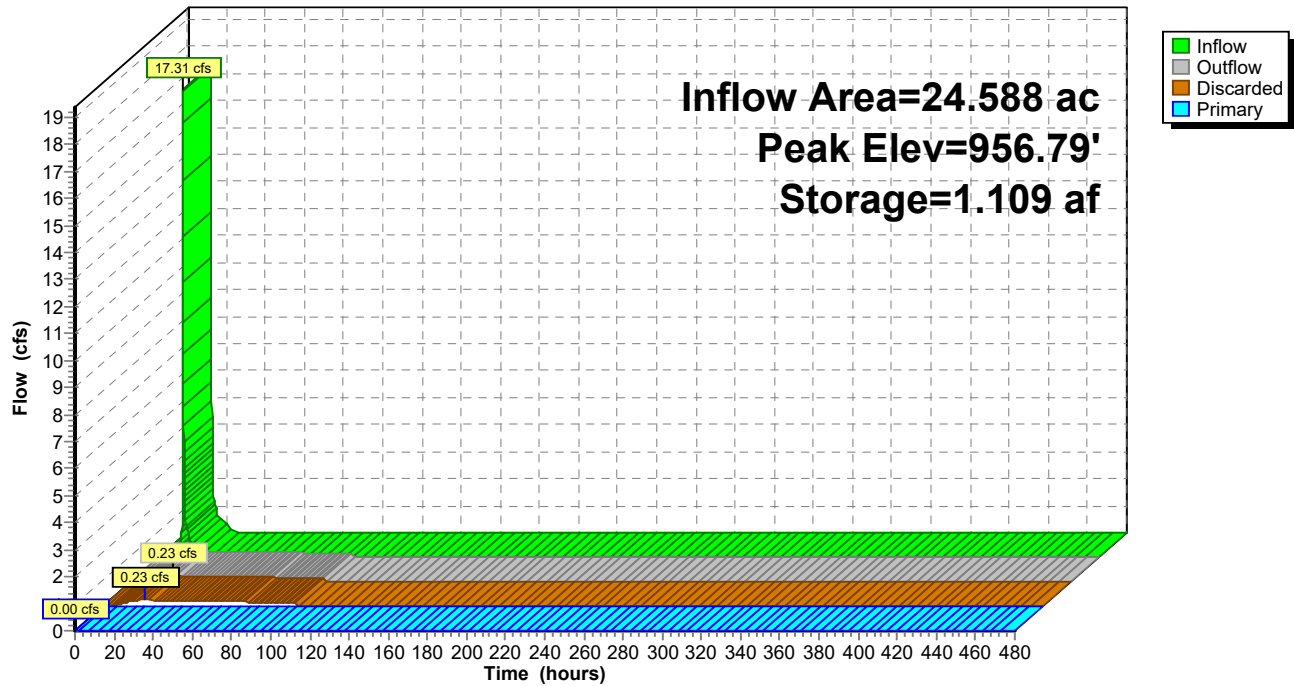
Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 59

Pond 17P: School Blvd Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 60

Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 0.49" for 2-inch event
 Inflow = 7.48 cfs @ 12.48 hrs, Volume= 0.787 af
 Outflow = 3.59 cfs @ 12.91 hrs, Volume= 0.787 af, Atten= 52%, Lag= 25.9 min
 Primary = 3.59 cfs @ 12.91 hrs, Volume= 0.787 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 958.63' @ 12.91 hrs Surf.Area= 0.425 ac Storage= 0.203 af

Plug-Flow detention time= 36.1 min calculated for 0.787 af (100% of inflow)

Center-of-Mass det. time= 36.3 min (898.0 - 861.7)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 ' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.59 cfs @ 12.91 hrs HW=958.63' TW=0.00' (Dynamic Tailwater)↑ **1=RCP_Round 18"** (Barrel Controls 3.59 cfs @ 4.24 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

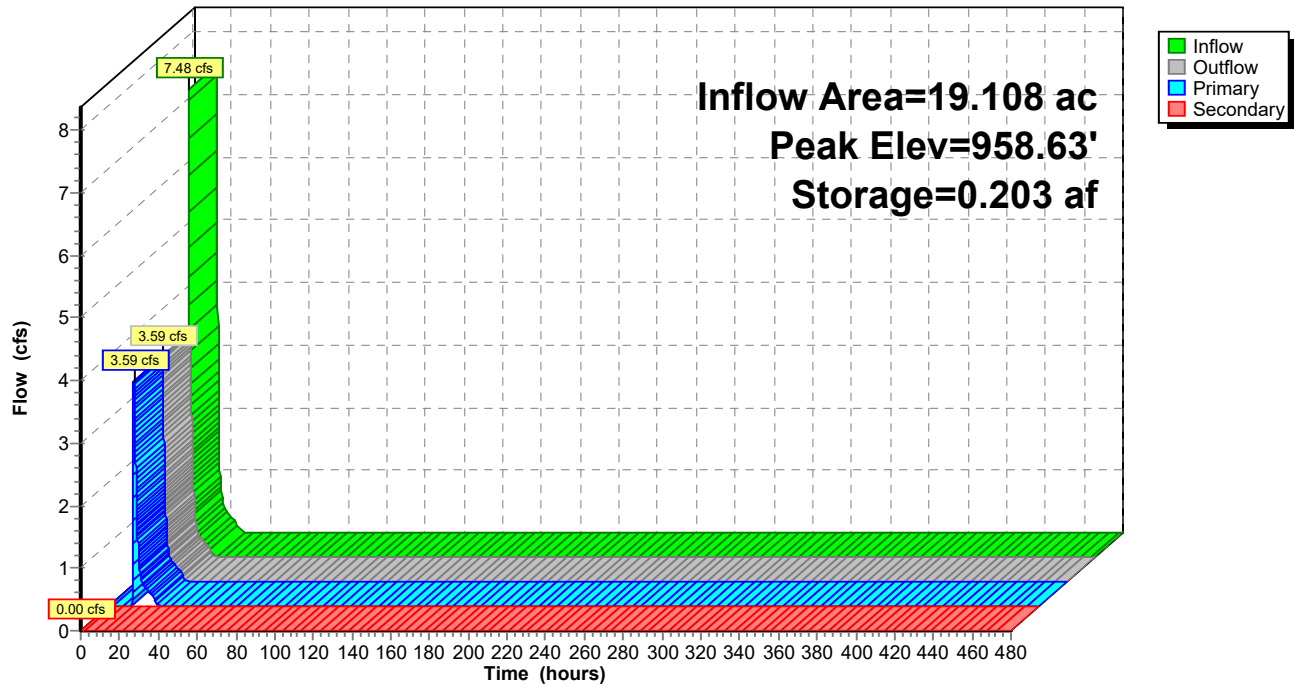
Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 61

Pond 18P: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 62

Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 0.65" for 2-inch event
 Inflow = 10.20 cfs @ 12.46 hrs, Volume= 1.065 af
 Outflow = 3.80 cfs @ 12.99 hrs, Volume= 1.065 af, Atten= 63%, Lag= 31.8 min
 Discarded = 0.10 cfs @ 12.99 hrs, Volume= 0.362 af
 Primary = 3.69 cfs @ 12.99 hrs, Volume= 0.703 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 954.22' @ 12.99 hrs Surf.Area= 0.227 ac Storage= 0.456 af

Plug-Flow detention time= 579.1 min calculated for 1.065 af (100% of inflow)
 Center-of-Mass det. time= 579.4 min (1,414.7 - 835.3)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.10 cfs @ 12.99 hrs HW=954.22' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=3.69 cfs @ 12.99 hrs HW=954.22' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 3.69 cfs @ 3.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

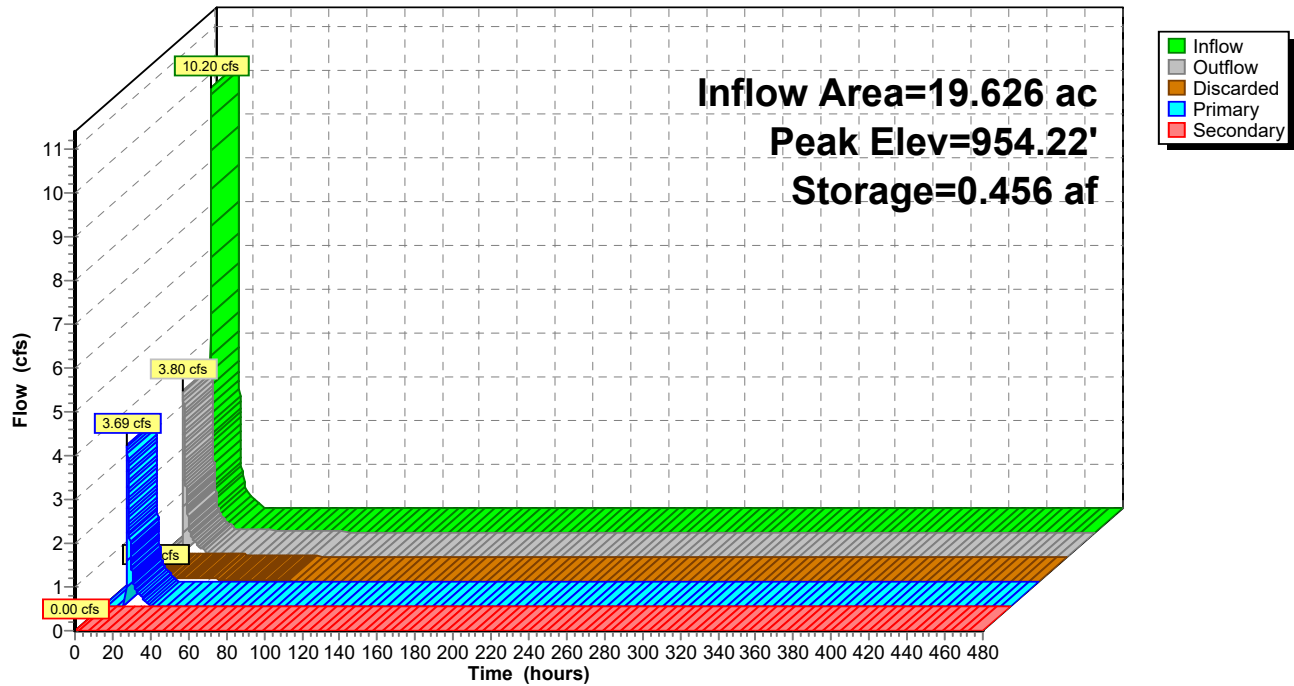
Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 63

Pond 19P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 64

Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 0.71" for 2-inch event
 Inflow = 26.06 cfs @ 12.59 hrs, Volume= 3.520 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 956.44' @ 480.00 hrs Surf.Area= 1.410 ac Storage= 5.771 af (3.520 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

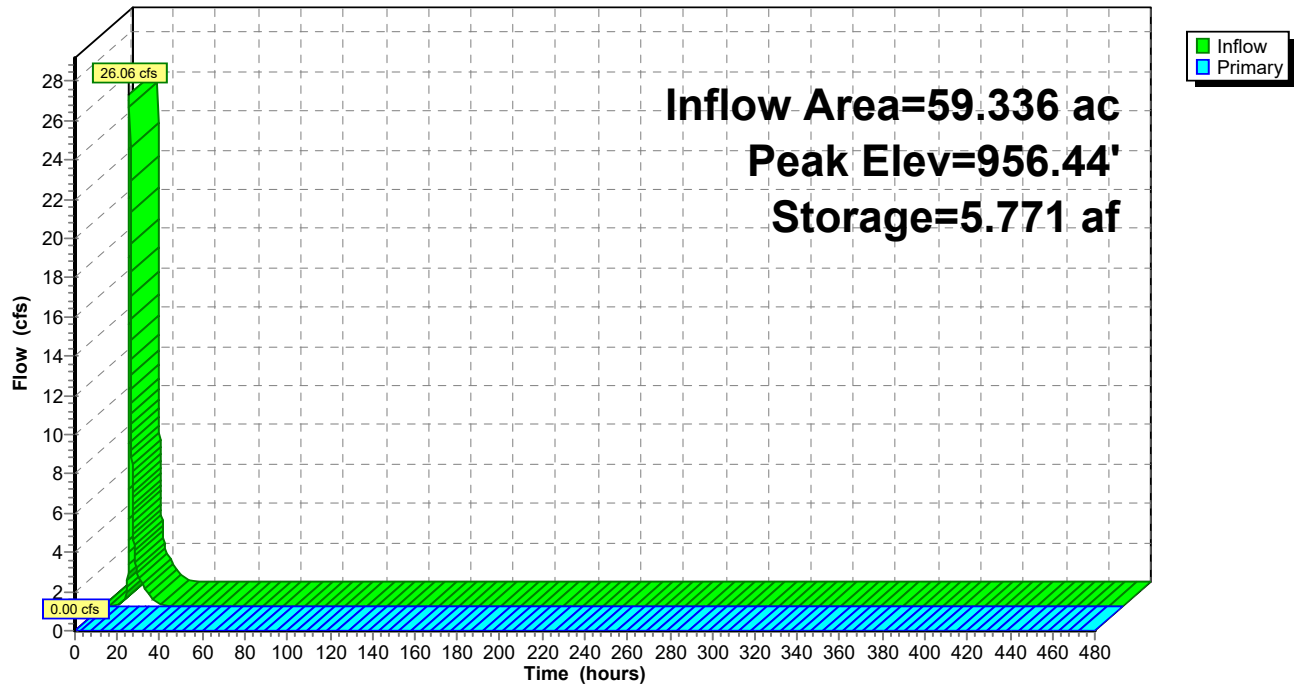
Existing
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 6/8/2021

Page 65

Pond 20P: S Chelsea

Hydrograph



Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea	Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=1.03" Tc=30.0 min CN=78/98 Runoff=16.95 cfs 1.638 af
Subcatchment9S: S Chelsea	Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=1.19" Tc=40.0 min CN=78/98 Runoff=45.32 cfs 5.288 af
Subcatchment11S: Chelsea Road	Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=1.22" Tc=30.0 min CN=78/98 Runoff=20.32 cfs 1.999 af
Subcatchment12S: Walmart Pond	Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=2.27" Tc=15.0 min CN=58/98 Runoff=15.23 cfs 1.111 af
Subcatchment13S: School and	Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=1.24" Tc=18.0 min CN=78/98 Runoff=34.03 cfs 2.548 af
Subcatchment23S: Dundas	Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=1.51" Tc=20.0 min CN=78/98 Runoff=9.41 cfs 0.756 af
Reach 14R: To TH-01 Existing Landlocked Basin	Inflow=12.35 cfs 2.394 af Outflow=12.35 cfs 2.394 af
Reach 15R: West	Inflow=9.43 cfs 1.622 af Outflow=9.43 cfs 1.622 af
Reach 24R: SE	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Pond 16P: TH-28A Walmart Existing Pond	Peak Elev=958.98' Storage=0.452 af Inflow=15.23 cfs 1.111 af Primary=6.39 cfs 1.110 af Secondary=0.00 cfs 0.000 af Outflow=6.39 cfs 1.110 af
Pond 17P: School Blvd Pond	Peak Elev=958.67' Storage=2.198 af Inflow=34.03 cfs 2.548 af Discarded=0.31 cfs 2.549 af Primary=0.00 cfs 0.000 af Outflow=0.31 cfs 2.549 af
Pond 18P: N Chelsea	Peak Elev=959.18' Storage=0.510 af Inflow=16.95 cfs 1.638 af Primary=7.07 cfs 1.638 af Secondary=0.00 cfs 0.000 af Outflow=7.07 cfs 1.638 af
Pond 19P: Chelsea Road Pond	Peak Elev=955.32' Storage=0.741 af Inflow=20.32 cfs 1.999 af Discarded=0.13 cfs 0.377 af Primary=9.43 cfs 1.622 af Secondary=0.00 cfs 0.000 af Outflow=9.56 cfs 1.999 af
Pond 20P: S Chelsea	Peak Elev=957.84' Storage=8.648 af Inflow=51.50 cfs 6.397 af Outflow=0.00 cfs 0.000 af
Total Runoff Area = 128.657 ac Runoff Volume = 13.340 af Average Runoff Depth = 1.24" 85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac	

Summary for Subcatchment 8S: N Chelsea

Runoff = 16.95 cfs @ 12.45 hrs, Volume= 1.638 af, Depth= 1.03"

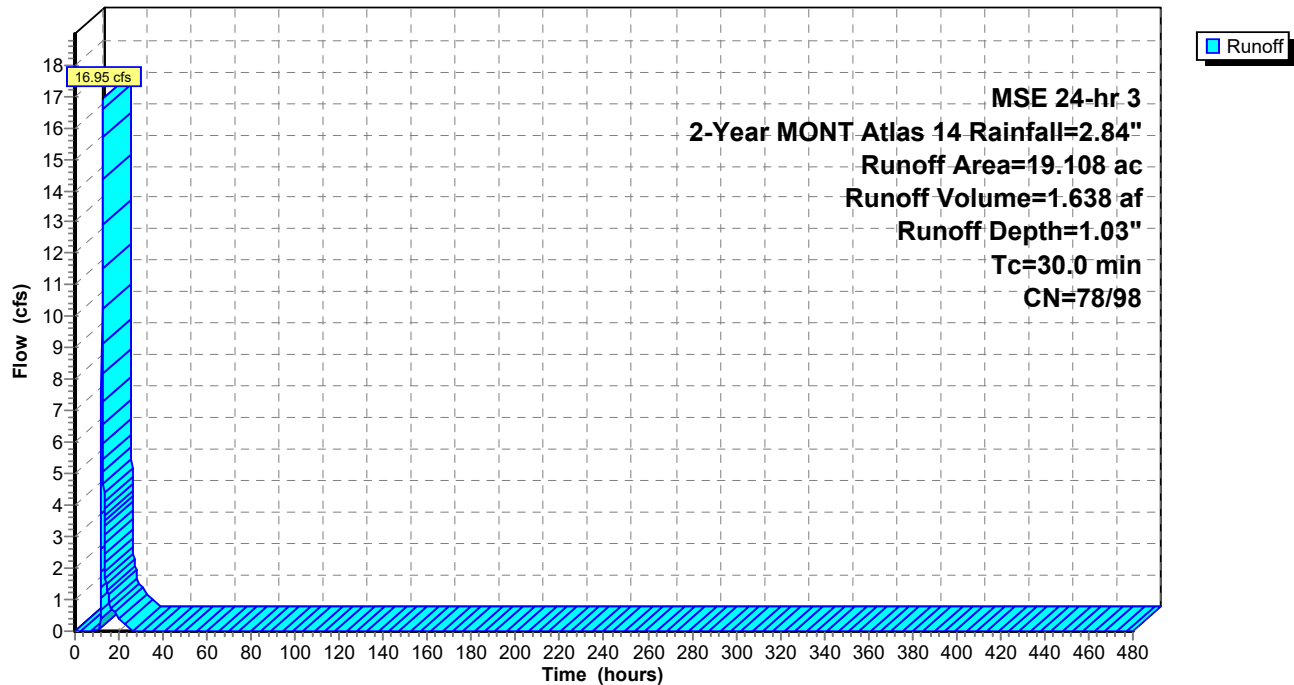
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



Summary for Subcatchment 9S: S Chelsea

Runoff = 45.32 cfs @ 12.58 hrs, Volume= 5.288 af, Depth= 1.19"

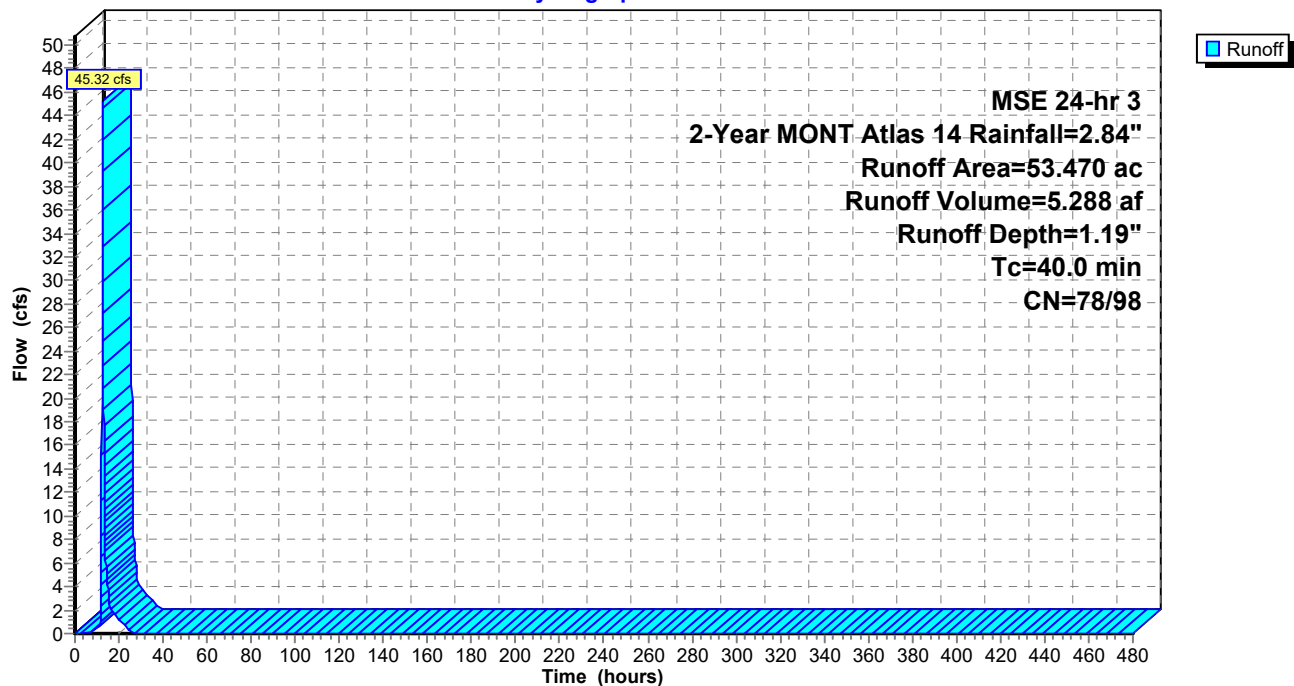
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



Summary for Subcatchment 11S: Chelsea Road

Runoff = 20.32 cfs @ 12.44 hrs, Volume= 1.999 af, Depth= 1.22"

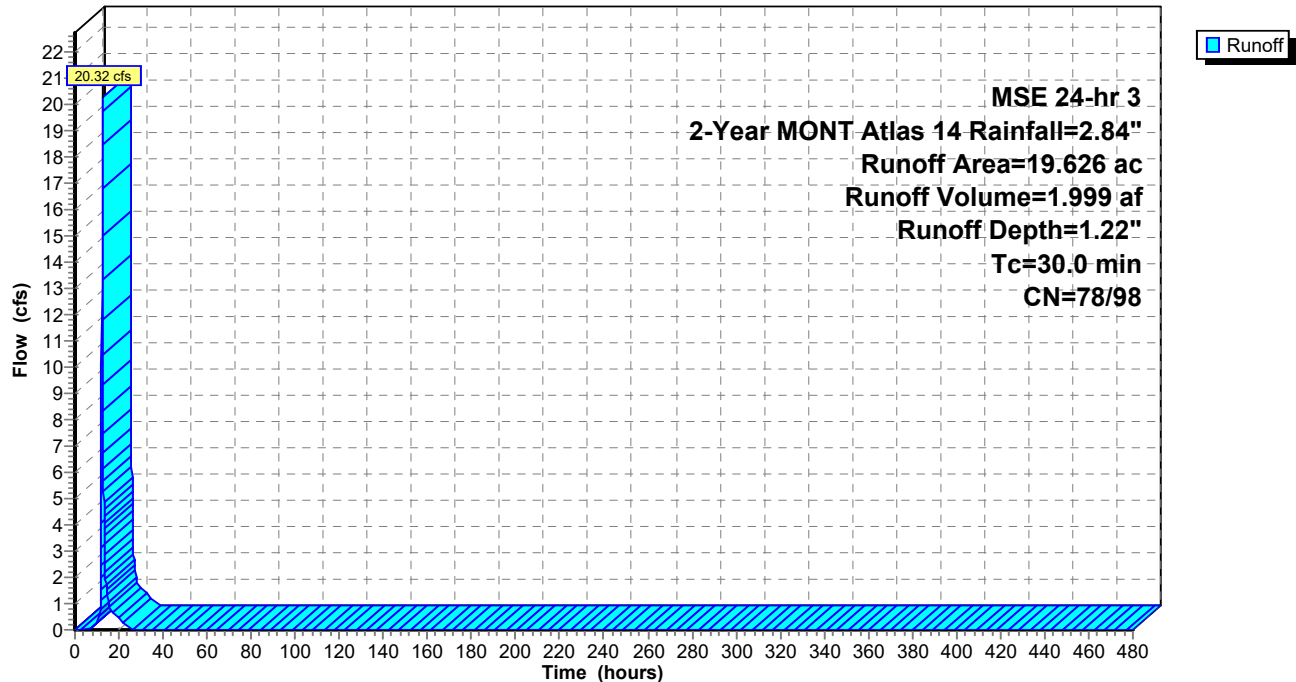
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 15.23 cfs @ 12.23 hrs, Volume= 1.111 af, Depth= 2.27"

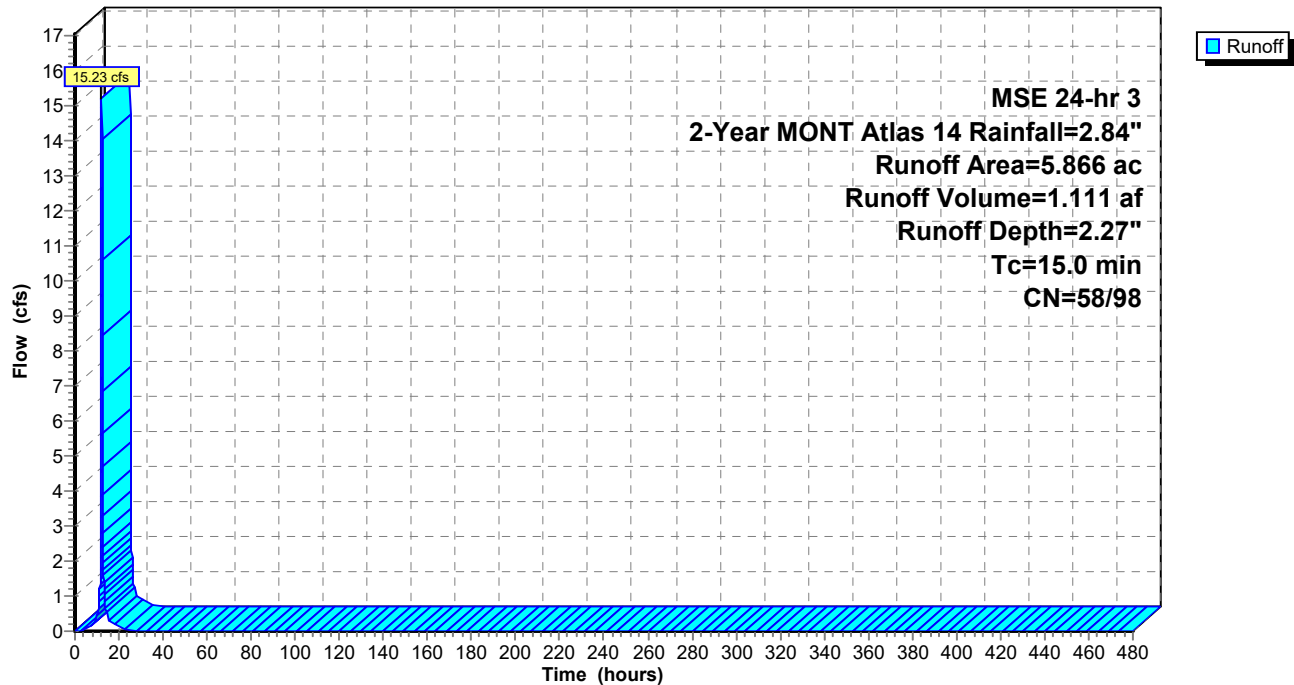
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 34.03 cfs @ 12.28 hrs, Volume= 2.548 af, Depth= 1.24"

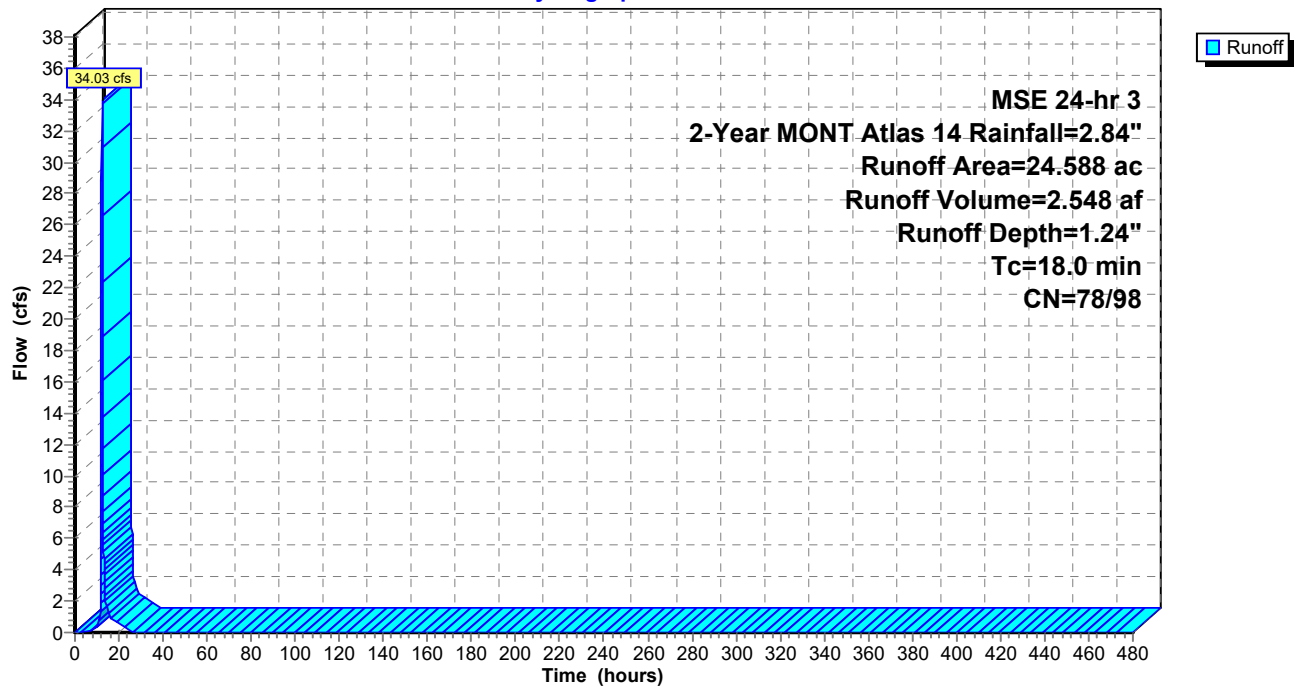
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



Summary for Subcatchment 23S: Dundas

Runoff = 9.41 cfs @ 12.30 hrs, Volume= 0.756 af, Depth= 1.51"

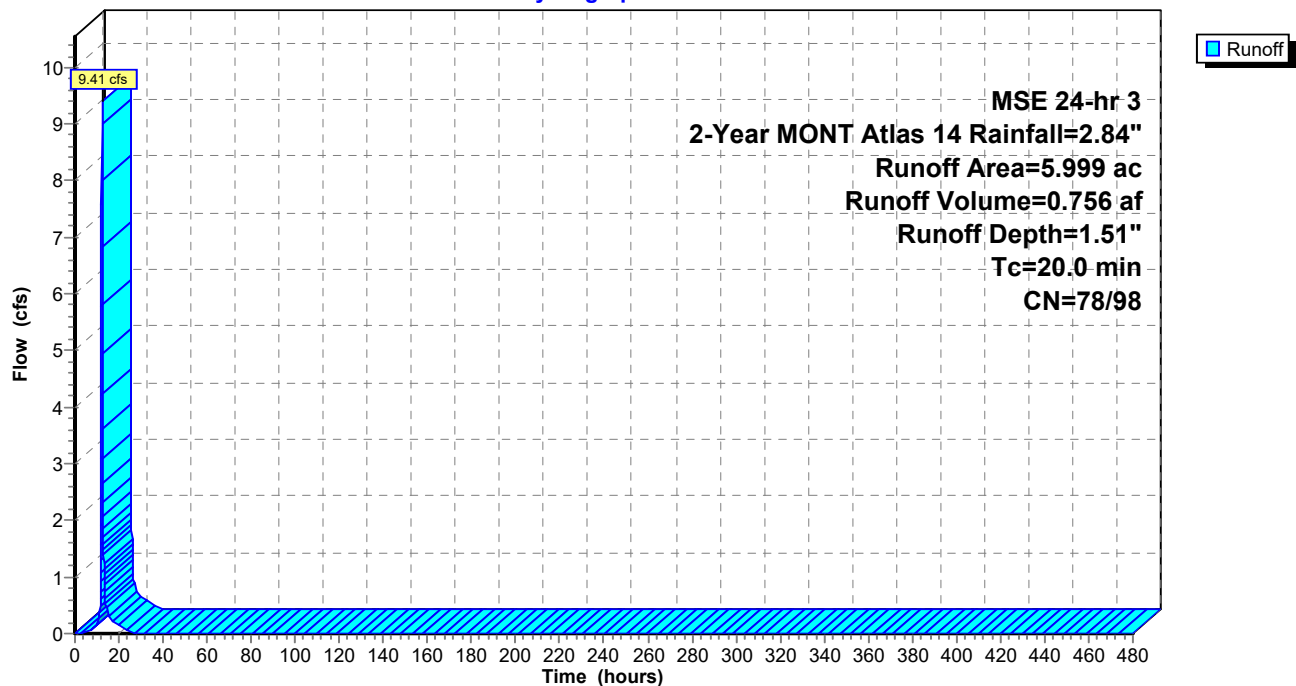
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph

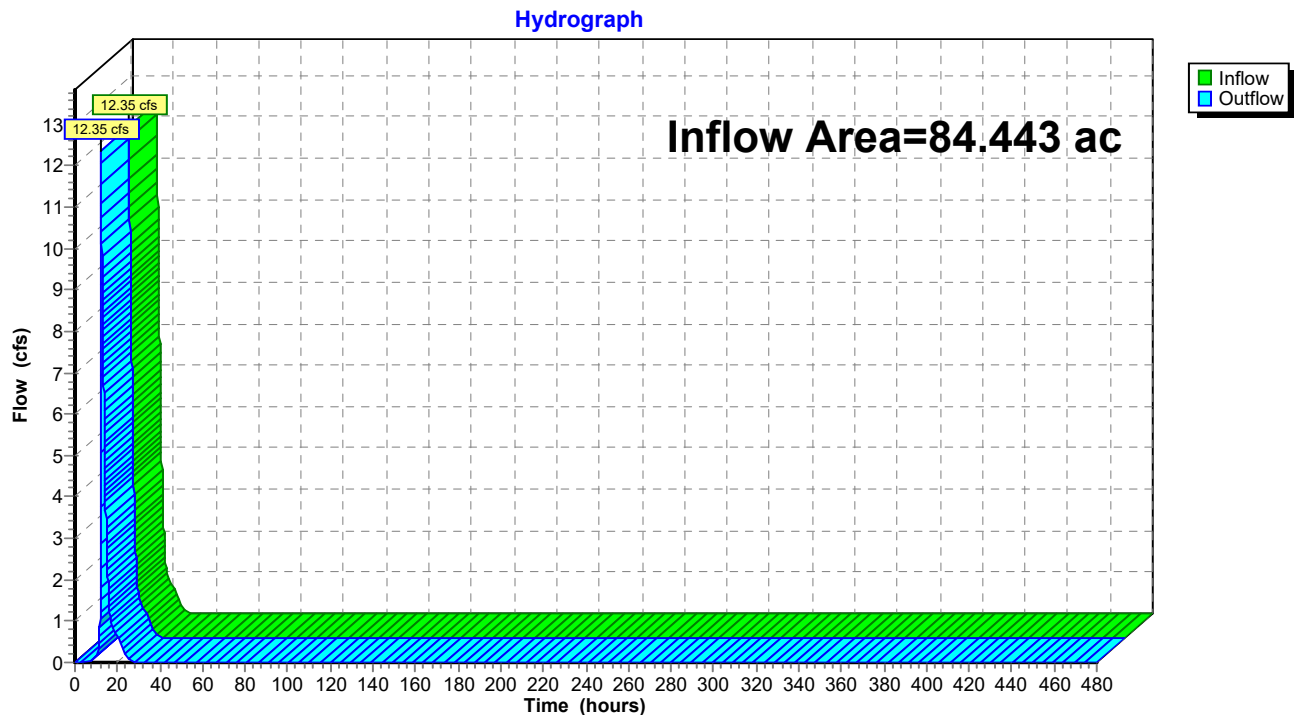


Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.34" for 2-Year MONT Atlas 14 event
Inflow = 12.35 cfs @ 12.35 hrs, Volume= 2.394 af
Outflow = 12.35 cfs @ 12.35 hrs, Volume= 2.394 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



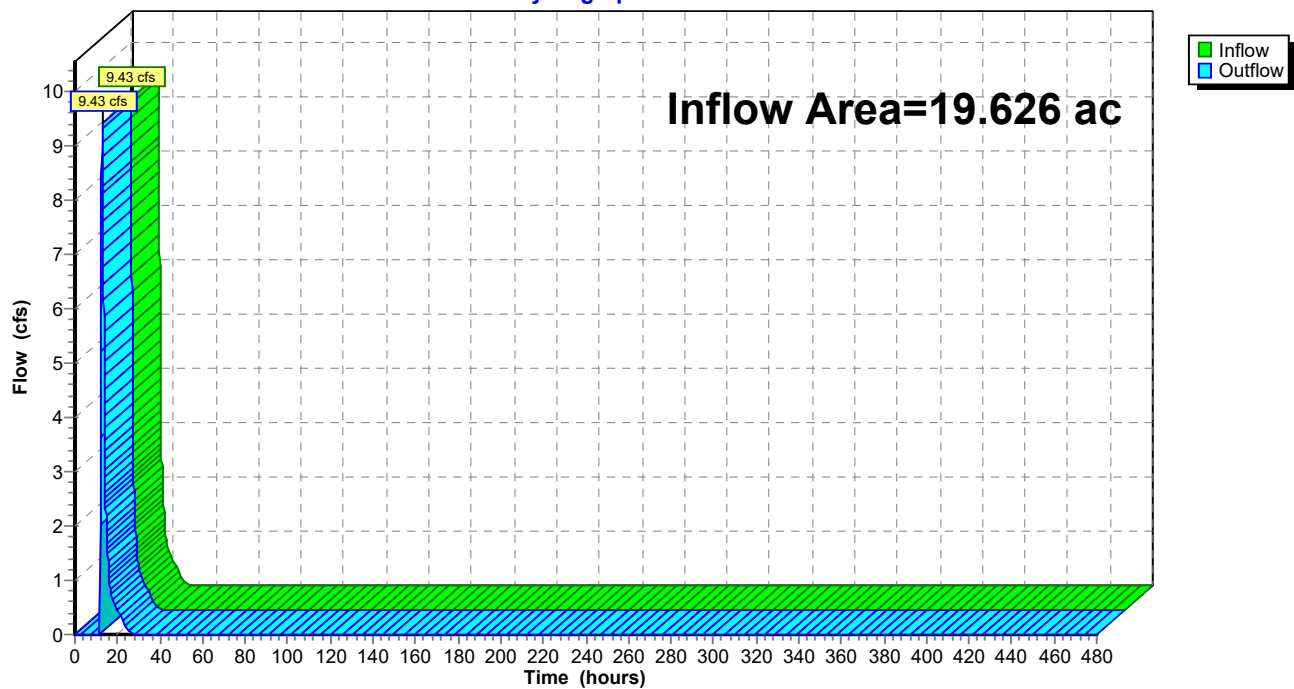
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 0.99" for 2-Year MONT Atlas 14 event
Inflow = 9.43 cfs @ 12.84 hrs, Volume= 1.622 af
Outflow = 9.43 cfs @ 12.84 hrs, Volume= 1.622 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

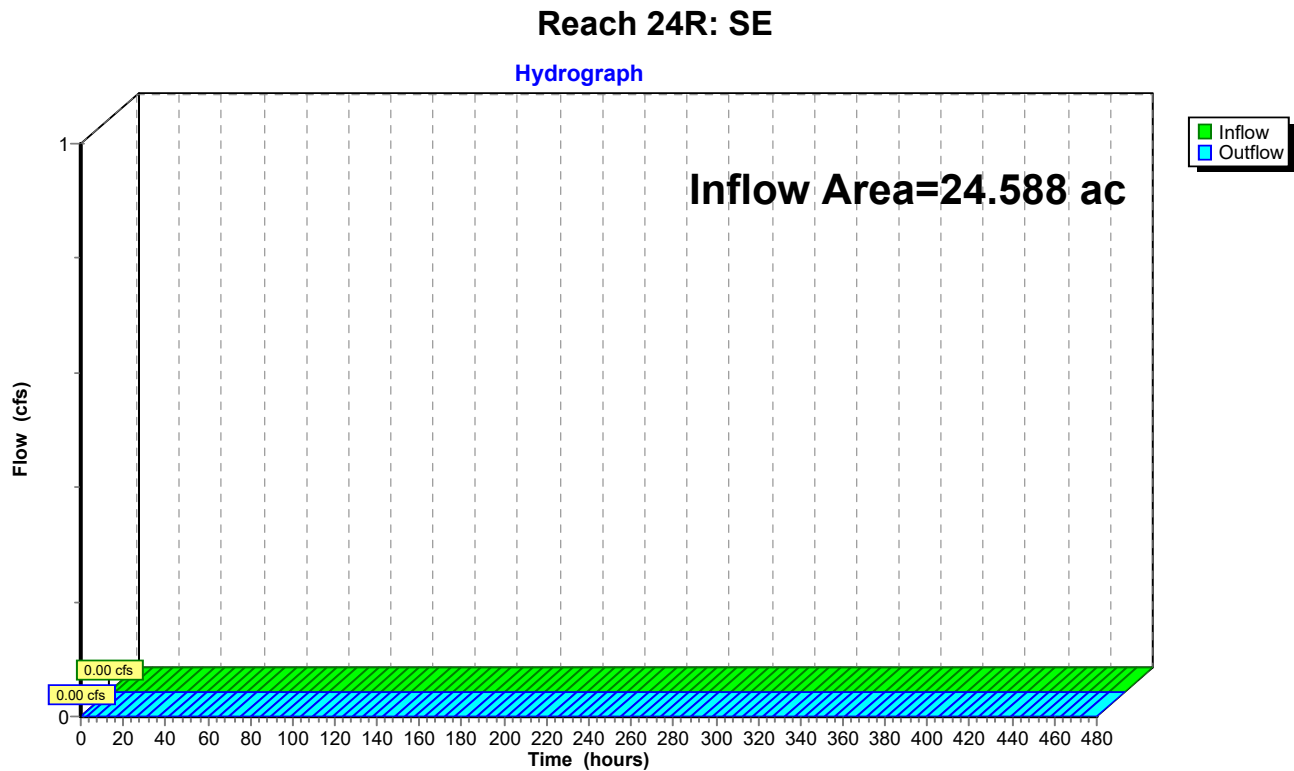
Hydrograph



Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 2-Year MONT Atlas 14 event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3



Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 2.27" for 2-Year MONT Atlas 14 event
 Inflow = 15.23 cfs @ 12.23 hrs, Volume= 1.111 af
 Outflow = 6.39 cfs @ 12.47 hrs, Volume= 1.110 af, Atten= 58%, Lag= 14.7 min
 Primary = 6.39 cfs @ 12.47 hrs, Volume= 1.110 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.98' @ 12.47 hrs Surf.Area= 0.508 ac Storage= 0.452 af

Plug-Flow detention time= 171.5 min calculated for 1.109 af (100% of inflow)
 Center-of-Mass det. time= 173.4 min (937.6 - 764.2)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

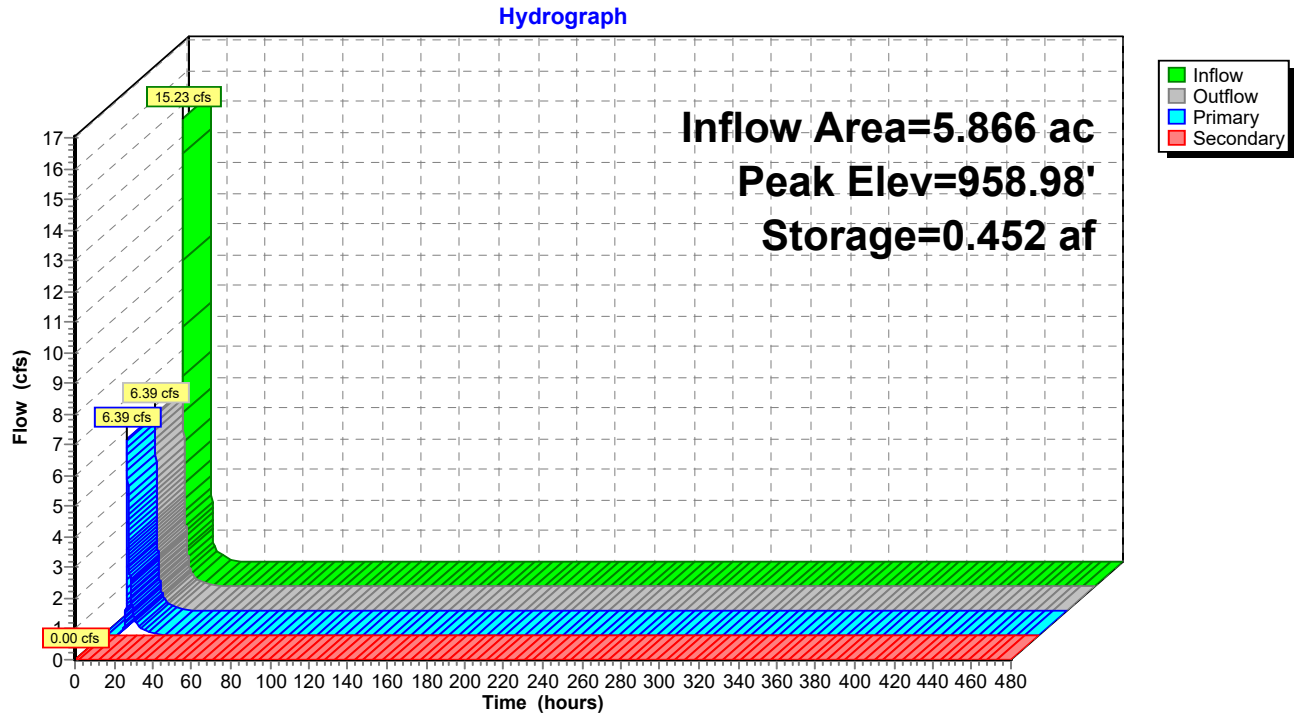
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=6.38 cfs @ 12.47 hrs HW=958.97' TW=954.21' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 6.38 cfs @ 4.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 16P: TH-28A Walmart Existing Pond



Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 1.24" for 2-Year MONT Atlas 14 event
 Inflow = 34.03 cfs @ 12.28 hrs, Volume= 2.548 af
 Outflow = 0.31 cfs @ 22.57 hrs, Volume= 2.549 af, Atten= 99%, Lag= 617.2 min
 Discarded = 0.31 cfs @ 22.57 hrs, Volume= 2.549 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.67' @ 22.57 hrs Surf.Area= 0.678 ac Storage= 2.198 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 3,353.9 min (4,167.9 - 814.0)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

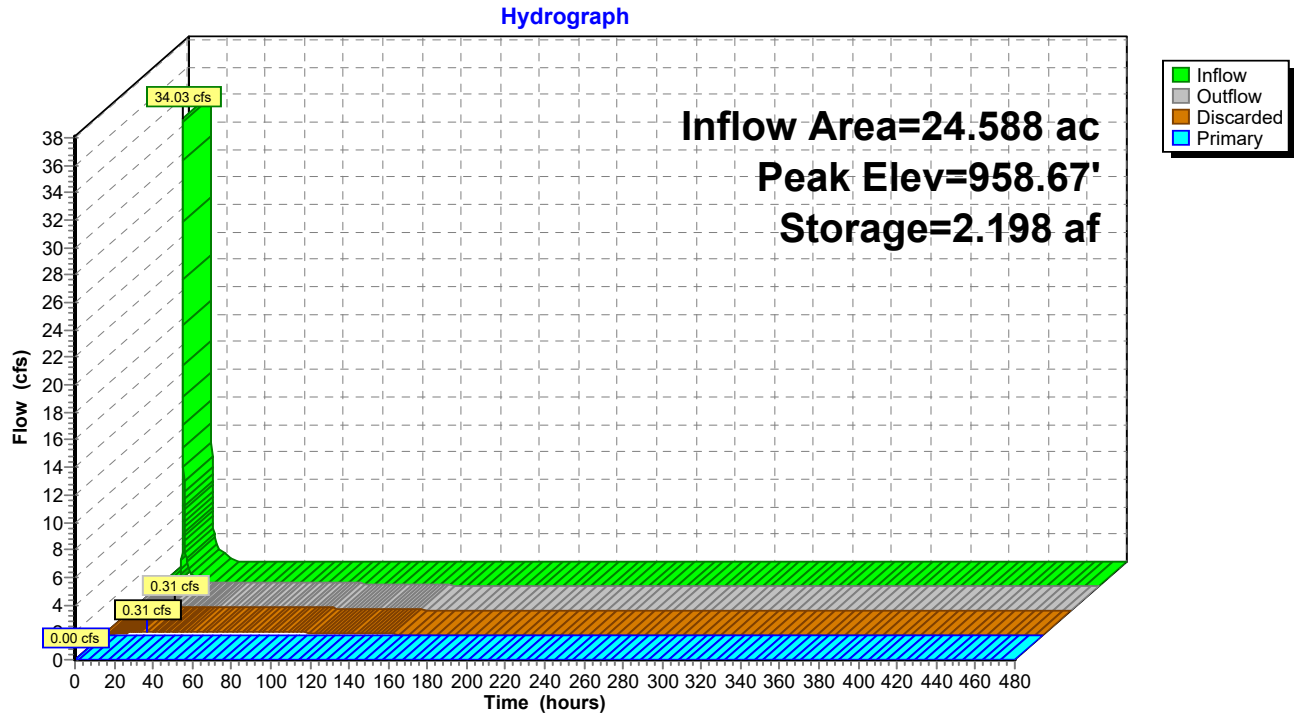
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.31 cfs @ 22.57 hrs HW=958.67' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)
 ↑**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 17P: School Blvd Pond



Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 1.03" for 2-Year MONT Atlas 14 event
 Inflow = 16.95 cfs @ 12.45 hrs, Volume= 1.638 af
 Outflow = 7.07 cfs @ 12.92 hrs, Volume= 1.638 af, Atten= 58%, Lag= 27.9 min
 Primary = 7.07 cfs @ 12.92 hrs, Volume= 1.638 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.18' @ 12.92 hrs Surf.Area= 0.678 ac Storage= 0.510 af

Plug-Flow detention time= 42.5 min calculated for 1.638 af (100% of inflow)
 Center-of-Mass det. time= 42.6 min (887.3 - 844.8)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

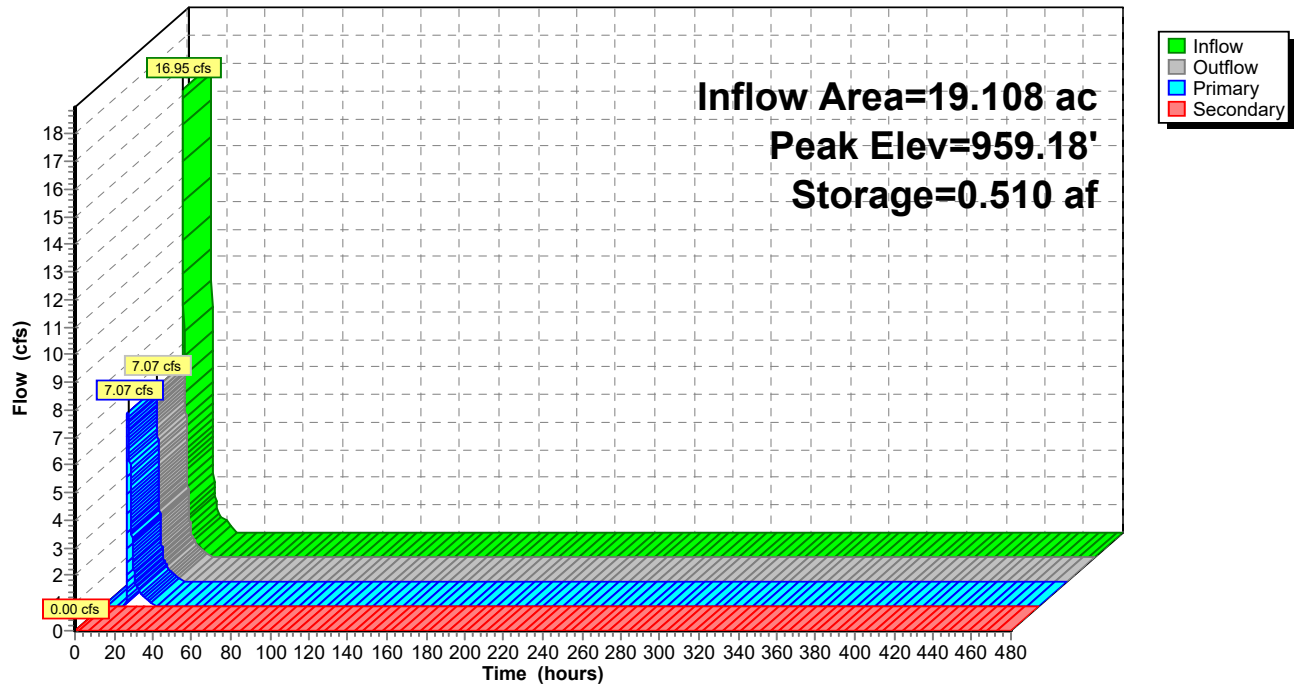
Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 ' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=7.06 cfs @ 12.92 hrs HW=959.18' TW=0.00' (Dynamic Tailwater)
 ↑1=RCP_Round 18" (Barrel Controls 7.06 cfs @ 4.89 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 18P: N Chelsea

Hydrograph



Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 1.22" for 2-Year MONT Atlas 14 event
 Inflow = 20.32 cfs @ 12.44 hrs, Volume= 1.999 af
 Outflow = 9.56 cfs @ 12.84 hrs, Volume= 1.999 af, Atten= 53%, Lag= 24.0 min
 Discarded = 0.13 cfs @ 12.84 hrs, Volume= 0.377 af
 Primary = 9.43 cfs @ 12.84 hrs, Volume= 1.622 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 955.32' @ 12.84 hrs Surf.Area= 0.291 ac Storage= 0.741 af

Plug-Flow detention time= 334.7 min calculated for 1.999 af (100% of inflow)
 Center-of-Mass det. time= 335.0 min (1,161.9 - 826.8)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

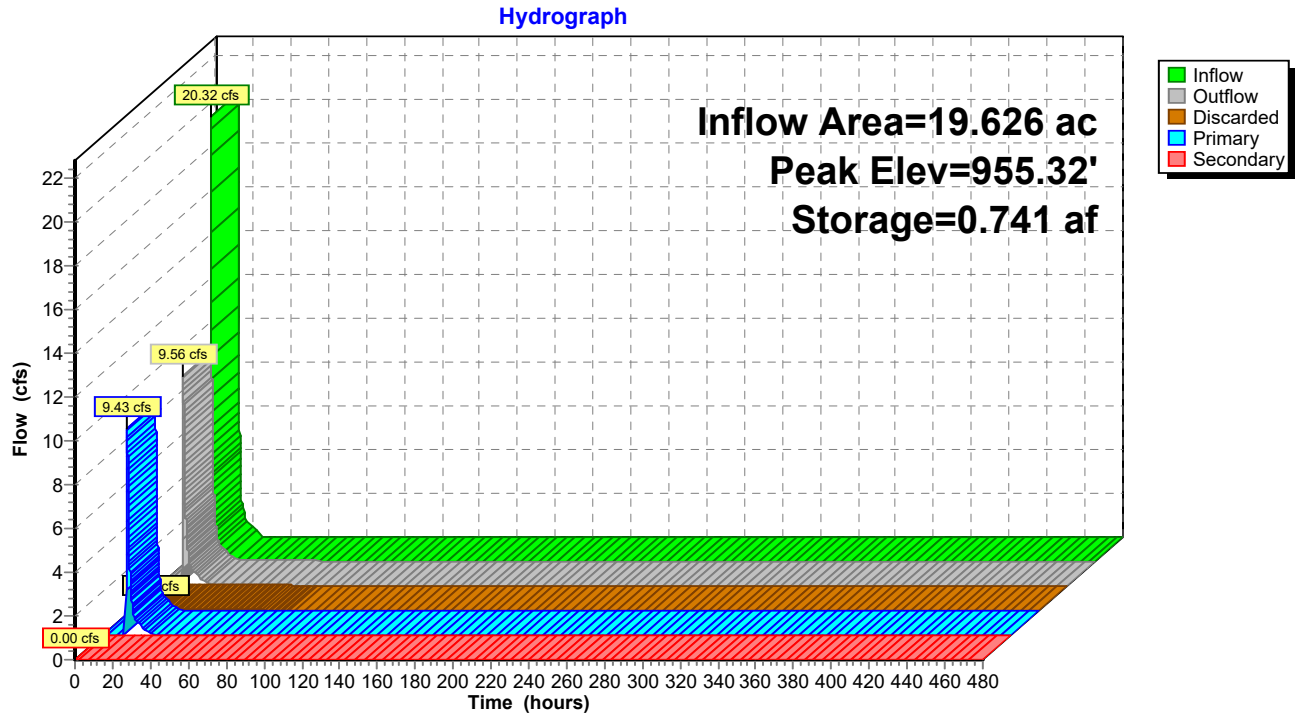
Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.13 cfs @ 12.84 hrs HW=955.32' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=9.42 cfs @ 12.84 hrs HW=955.32' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 9.42 cfs @ 5.33 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 19P: Chelsea Road Pond



Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 1.29" for 2-Year MONT Atlas 14 event
 Inflow = 51.50 cfs @ 12.57 hrs, Volume= 6.397 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 957.84' @ 480.00 hrs Surf.Area= 2.709 ac Storage= 8.648 af (6.397 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)

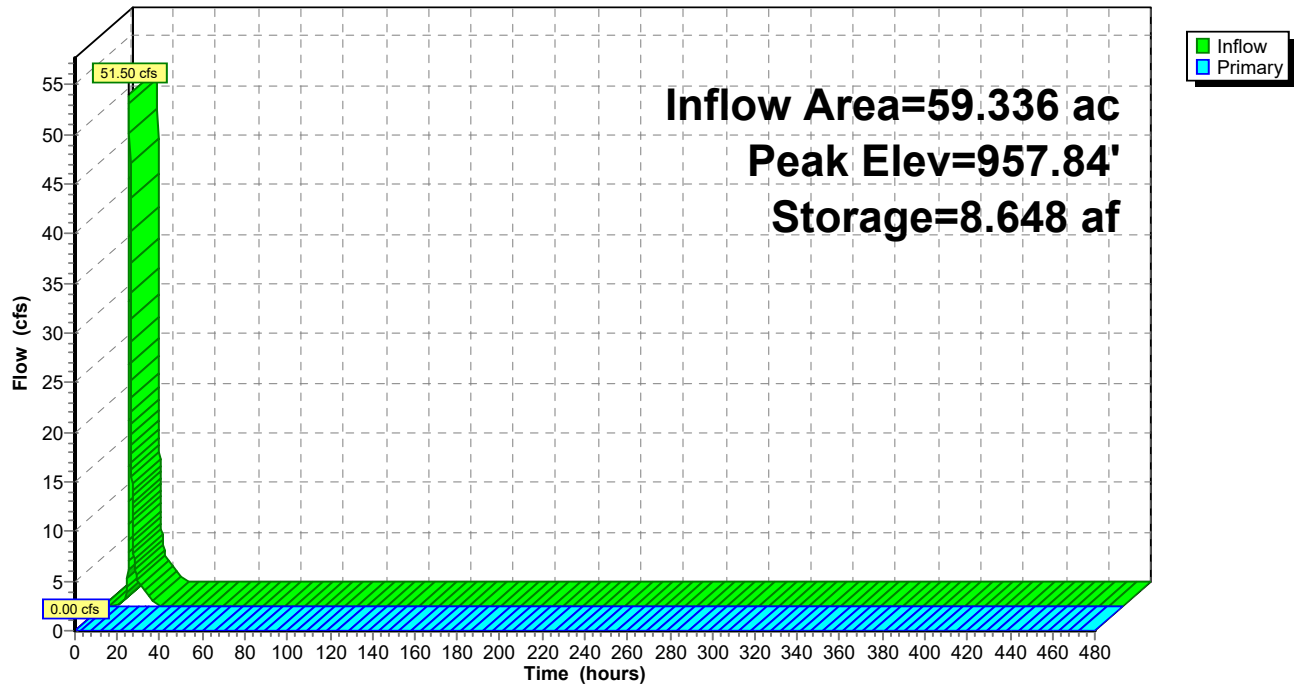
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)
 ↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 20P: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 86

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea	Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=1.14" Tc=30.0 min CN=78/98 Runoff=18.94 cfs 1.818 af
Subcatchment9S: S Chelsea	Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=1.30" Tc=40.0 min CN=78/98 Runoff=50.12 cfs 5.811 af
Subcatchment11S: Chelsea Road	Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=1.34" Tc=30.0 min CN=78/98 Runoff=22.42 cfs 2.193 af
Subcatchment12S: Walmart Pond	Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=2.42" Tc=15.0 min CN=58/98 Runoff=16.15 cfs 1.181 af
Subcatchment13S: School and	Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=1.36" Tc=18.0 min CN=78/98 Runoff=37.47 cfs 2.793 af
Subcatchment23S: Dundas	Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=1.64" Tc=20.0 min CN=78/98 Runoff=10.24 cfs 0.819 af
Reach 14R: To TH-01 Existing Landlocked Basin	Inflow=13.54 cfs 2.637 af Outflow=13.54 cfs 2.637 af
Reach 15R: West	Inflow=10.57 cfs 1.814 af Outflow=10.57 cfs 1.814 af
Reach 24R: SE	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Pond 16P: TH-28A Walmart Existing Pond	Peak Elev=959.02' Storage=0.474 af Inflow=16.15 cfs 1.181 af Primary=6.88 cfs 1.163 af Secondary=0.00 cfs 0.000 af Outflow=6.88 cfs 1.163 af
Pond 17P: School Blvd Pond	Peak Elev=959.00' Storage=2.422 af Inflow=37.47 cfs 2.793 af Discarded=0.33 cfs 2.793 af Primary=0.00 cfs 0.000 af Outflow=0.33 cfs 2.793 af
Pond 18P: N Chelsea	Peak Elev=959.28' Storage=0.581 af Inflow=18.94 cfs 1.818 af Primary=7.68 cfs 1.818 af Secondary=0.00 cfs 0.000 af Outflow=7.68 cfs 1.818 af
Pond 19P: Chelsea Road Pond	Peak Elev=955.54' Storage=0.804 af Inflow=22.42 cfs 2.193 af Discarded=0.14 cfs 0.380 af Primary=10.57 cfs 1.814 af Secondary=0.00 cfs 0.000 af Outflow=10.71 cfs 2.193 af
Pond 20P: S Chelsea	Peak Elev=958.04' Storage=9.225 af Inflow=56.77 cfs 6.974 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 14.615 af Average Runoff Depth = 1.36"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 87

Summary for Subcatchment 8S: N Chelsea

Runoff = 18.94 cfs @ 12.45 hrs, Volume= 1.818 af, Depth= 1.14"

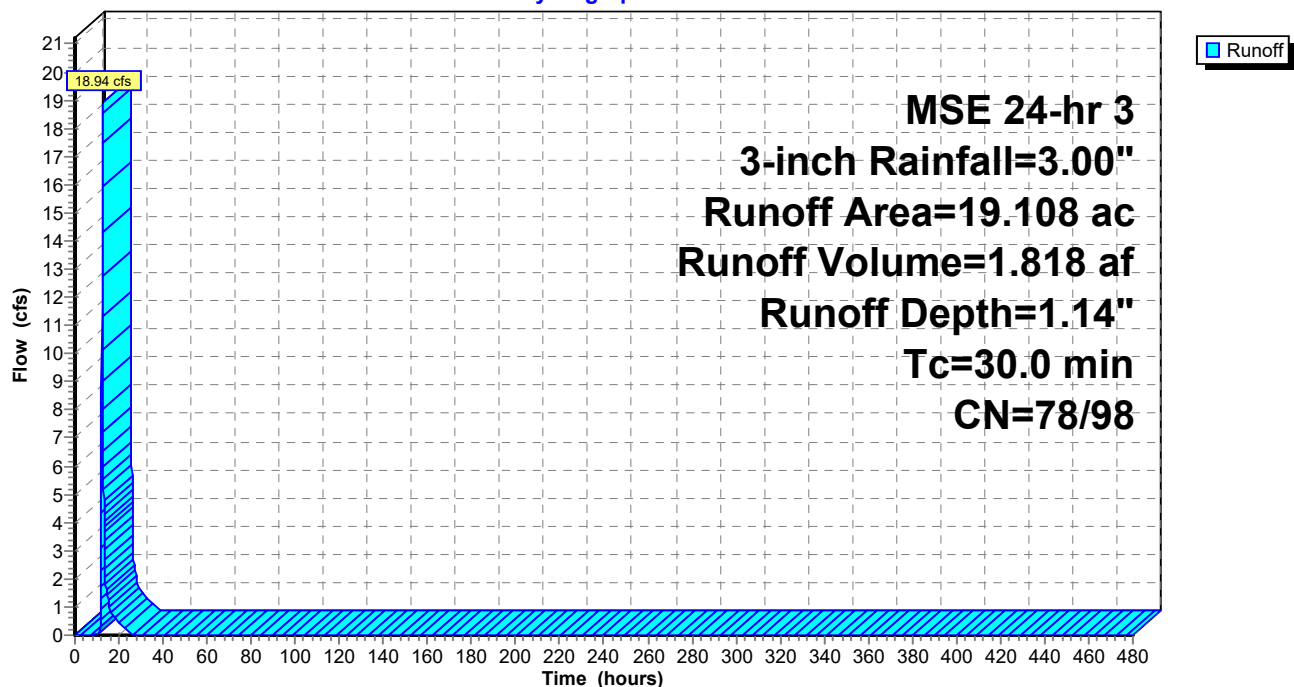
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 3-inch Rainfall=3.00"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 88

Summary for Subcatchment 9S: S Chelsea

Runoff = 50.12 cfs @ 12.58 hrs, Volume= 5.811 af, Depth= 1.30"

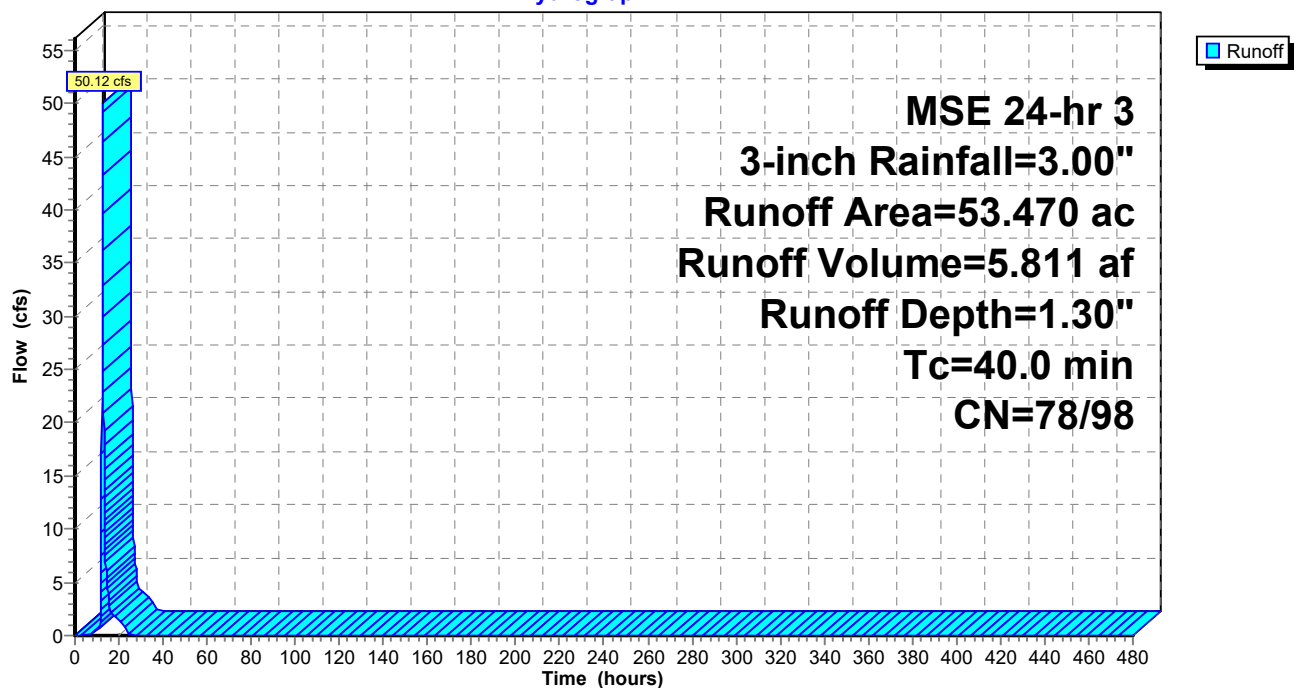
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 3-inch Rainfall=3.00"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 89

Summary for Subcatchment 11S: Chelsea Road

Runoff = 22.42 cfs @ 12.44 hrs, Volume= 2.193 af, Depth= 1.34"

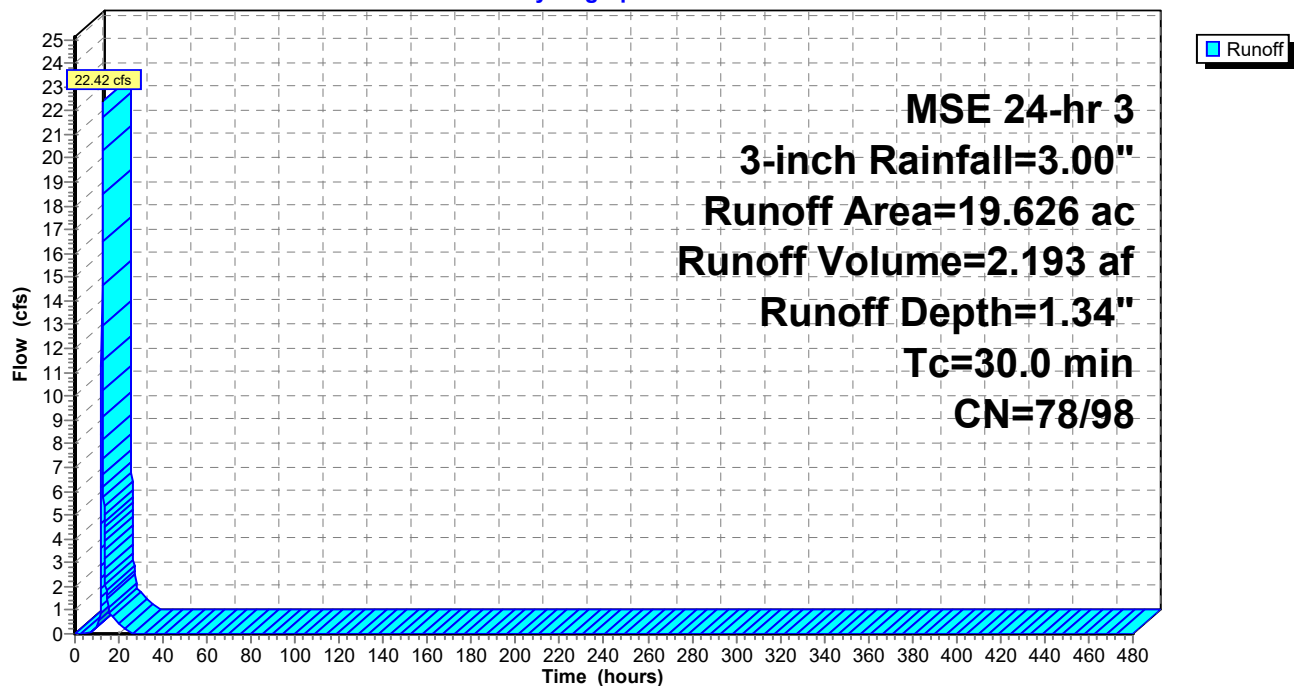
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 3-inch Rainfall=3.00"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 90

Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 16.15 cfs @ 12.23 hrs, Volume= 1.181 af, Depth= 2.42"

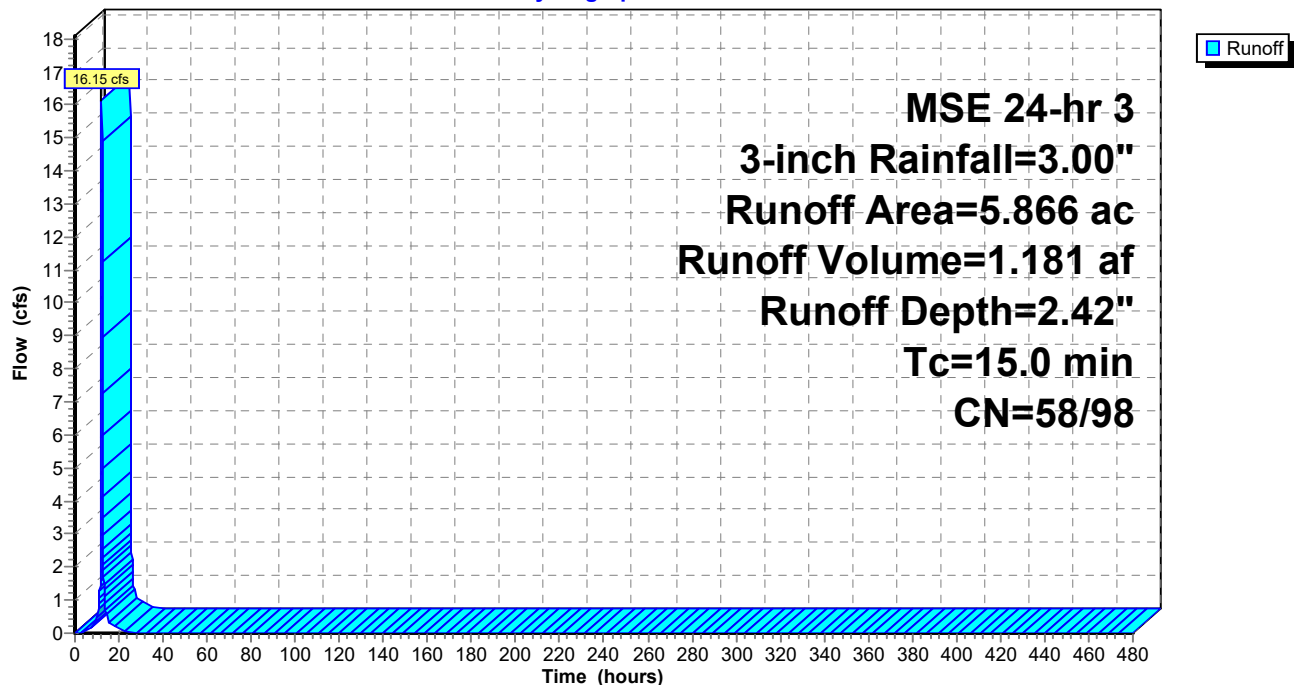
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 3-inch Rainfall=3.00"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 91

Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 37.47 cfs @ 12.28 hrs, Volume= 2.793 af, Depth= 1.36"

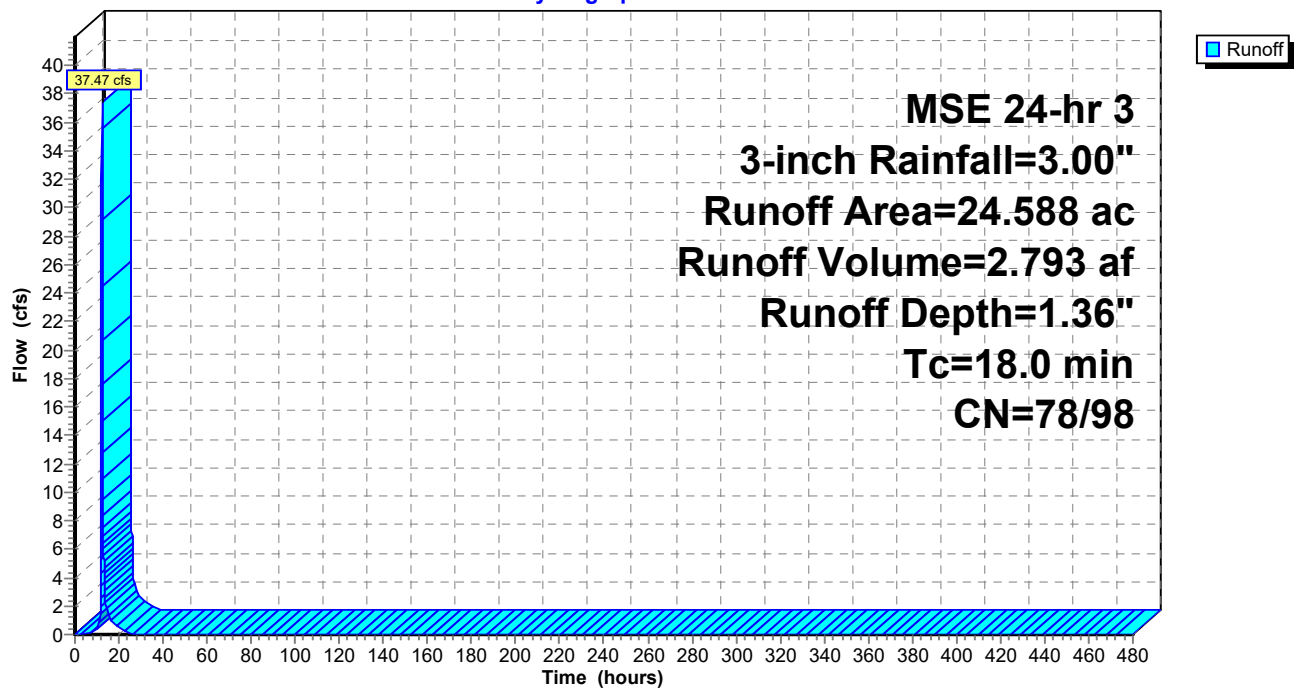
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 3-inch Rainfall=3.00"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 92

Summary for Subcatchment 23S: Dundas

Runoff = 10.24 cfs @ 12.30 hrs, Volume= 0.819 af, Depth= 1.64"

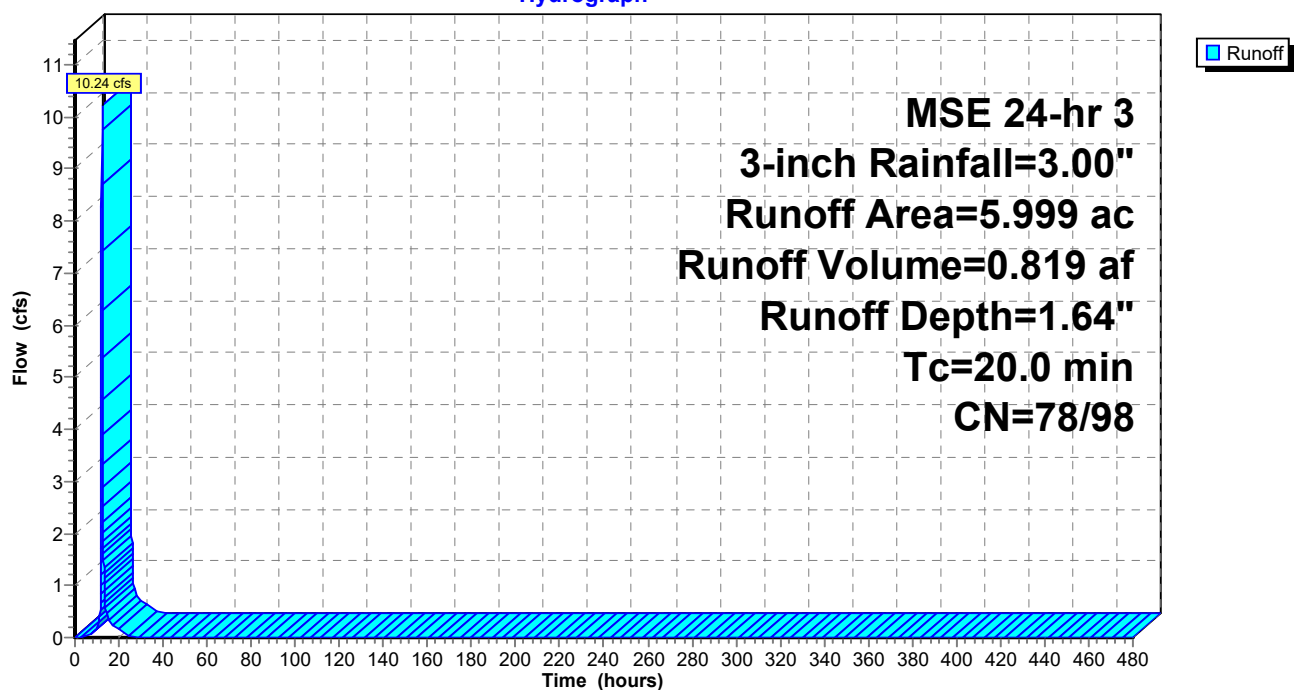
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 3-inch Rainfall=3.00"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

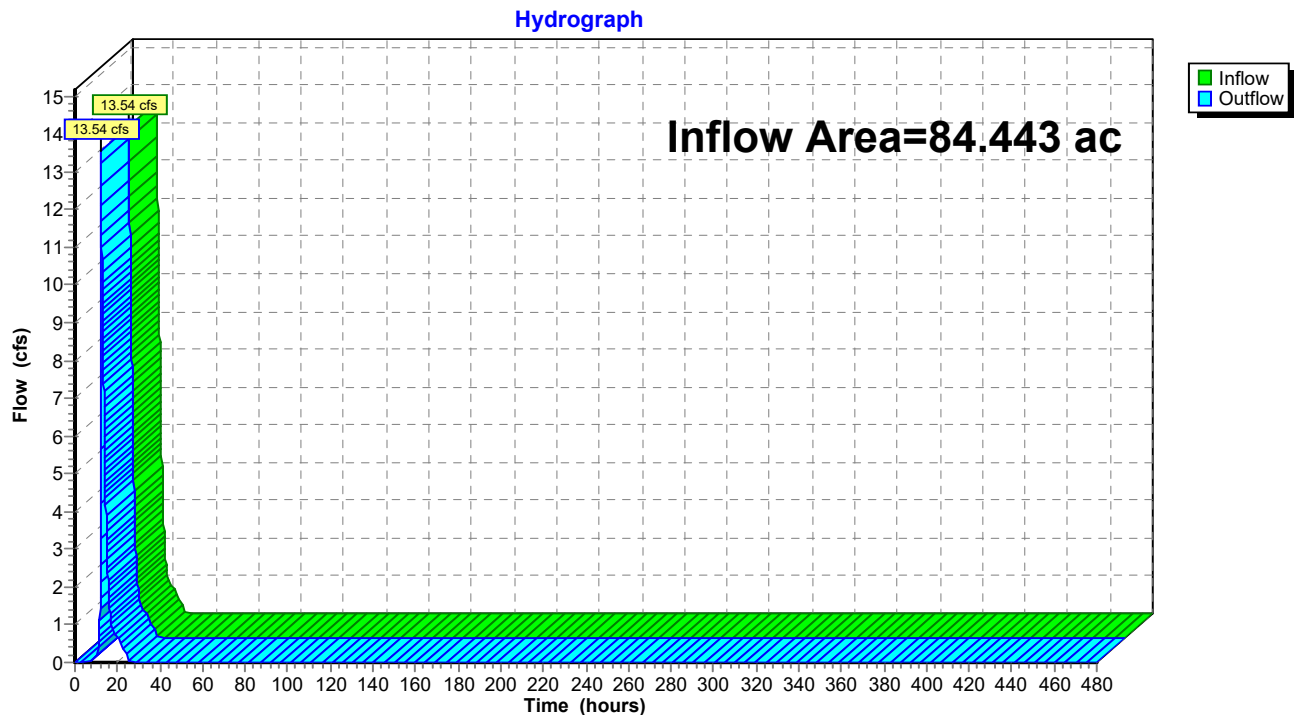
Page 93

Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.37" for 3-inch event
Inflow = 13.54 cfs @ 12.35 hrs, Volume= 2.637 af
Outflow = 13.54 cfs @ 12.35 hrs, Volume= 2.637 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 94

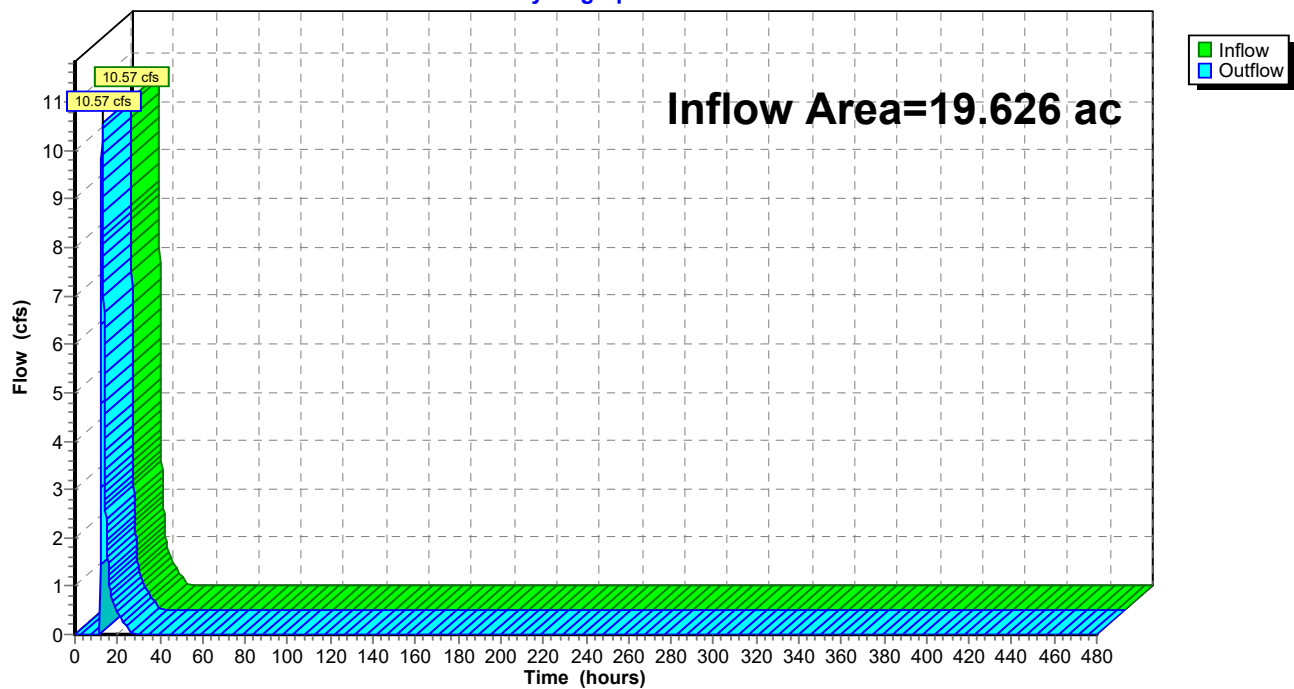
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 1.11" for 3-inch event
Inflow = 10.57 cfs @ 12.83 hrs, Volume= 1.814 af
Outflow = 10.57 cfs @ 12.83 hrs, Volume= 1.814 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

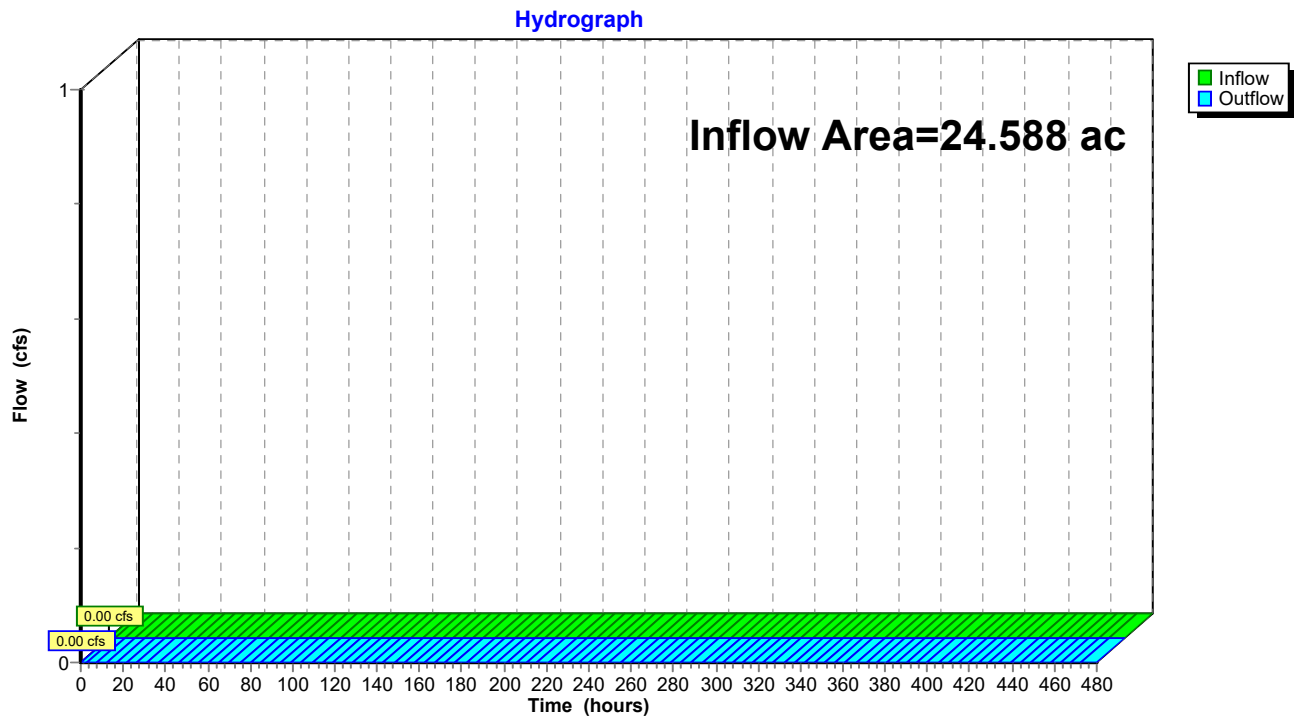
Page 95

Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 3-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 96

Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 2.42" for 3-inch event
 Inflow = 16.15 cfs @ 12.23 hrs, Volume= 1.181 af
 Outflow = 6.88 cfs @ 12.47 hrs, Volume= 1.163 af, Atten= 57%, Lag= 14.5 min
 Primary = 6.88 cfs @ 12.47 hrs, Volume= 1.163 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 959.02' @ 12.47 hrs Surf.Area= 0.512 ac Storage= 0.474 af

Plug-Flow detention time= 128.6 min calculated for 1.163 af (98% of inflow)

Center-of-Mass det. time= 119.7 min (883.2 - 763.5)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 ' S= 0.0870 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=6.87 cfs @ 12.47 hrs HW=959.02' TW=954.38' (Dynamic Tailwater)↑ **1=RCP_Round 24"** (Inlet Controls 6.87 cfs @ 4.29 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

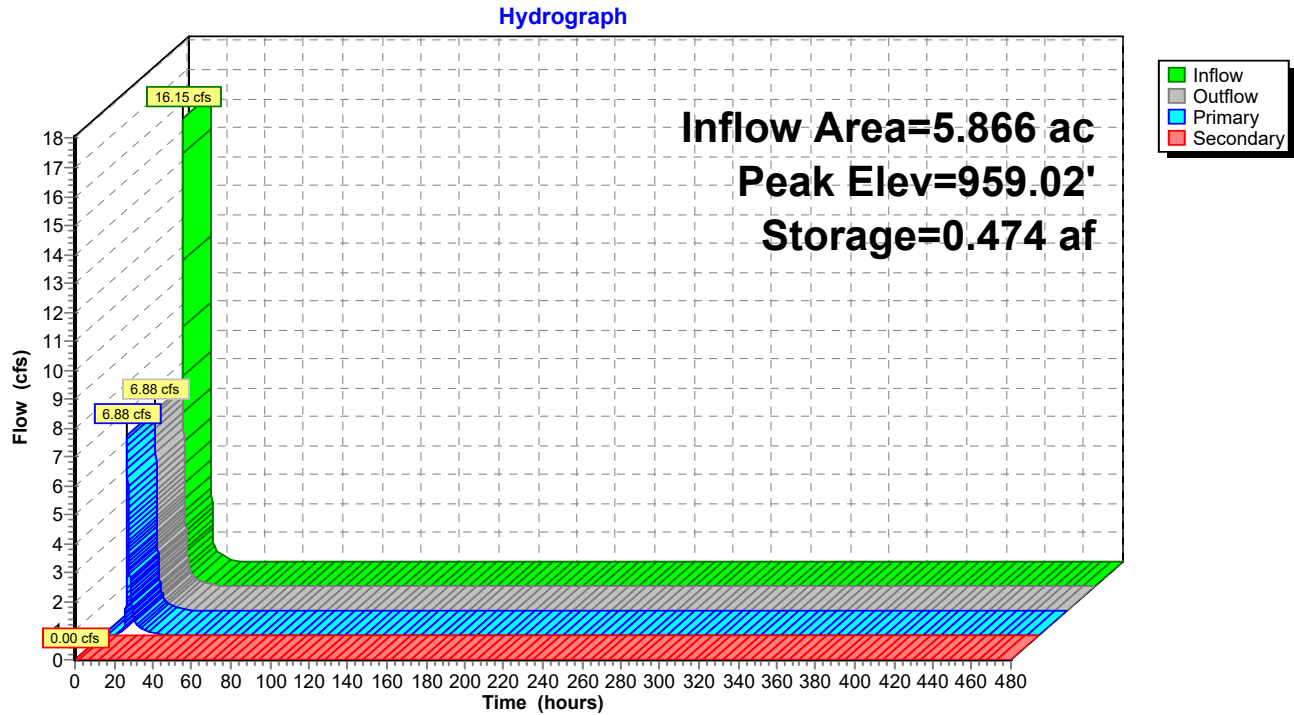
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 97

Pond 16P: TH-28A Walmart Existing Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 98

Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 1.36" for 3-inch event
 Inflow = 37.47 cfs @ 12.28 hrs, Volume= 2.793 af
 Outflow = 0.33 cfs @ 22.62 hrs, Volume= 2.793 af, Atten= 99%, Lag= 620.5 min
 Discarded = 0.33 cfs @ 22.62 hrs, Volume= 2.793 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.00' @ 22.62 hrs Surf.Area= 0.719 ac Storage= 2.422 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 3,538.0 min (4,350.7 - 812.8)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.33 cfs @ 22.62 hrs HW=959.00' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)

↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

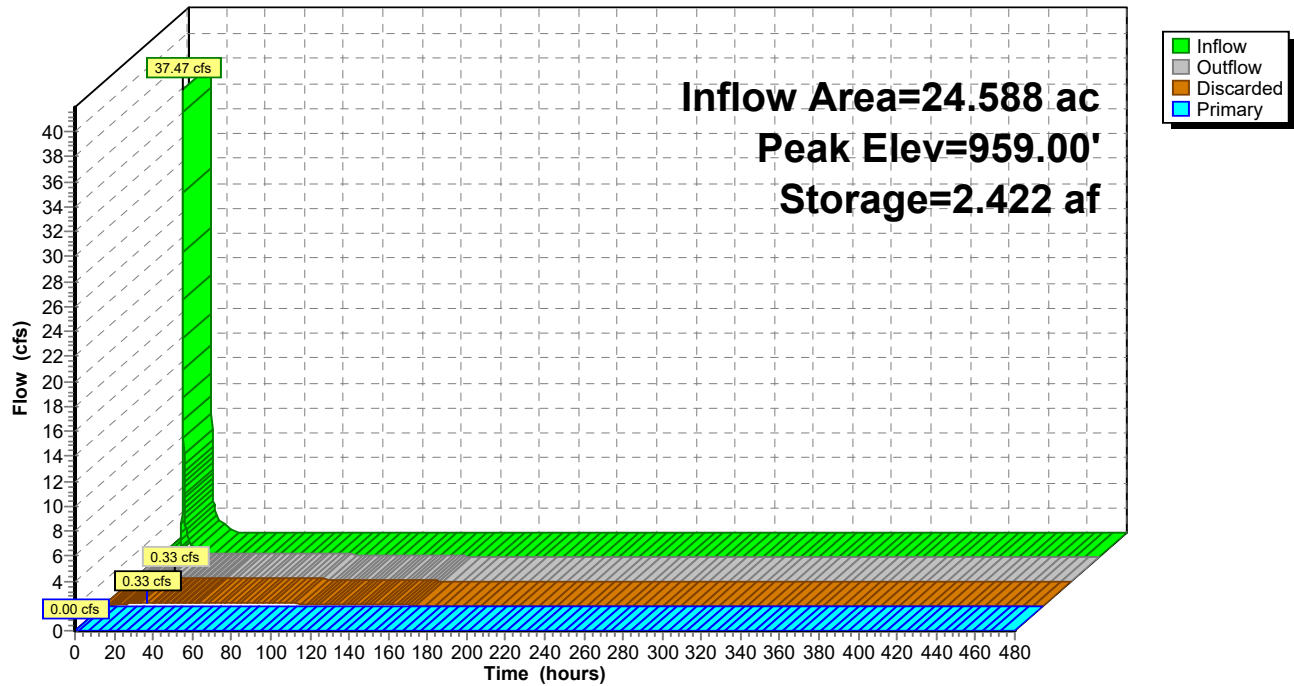
Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 99

Pond 17P: School Blvd Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 100

Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 1.14" for 3-inch event
 Inflow = 18.94 cfs @ 12.45 hrs, Volume= 1.818 af
 Outflow = 7.68 cfs @ 12.92 hrs, Volume= 1.818 af, Atten= 59%, Lag= 28.4 min
 Primary = 7.68 cfs @ 12.92 hrs, Volume= 1.818 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 959.28' @ 12.92 hrs Surf.Area= 0.724 ac Storage= 0.581 af

Plug-Flow detention time= 45.3 min calculated for 1.818 af (100% of inflow)

Center-of-Mass det. time= 43.9 min (886.5 - 842.5)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 ' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=7.67 cfs @ 12.92 hrs HW=959.28' TW=0.00' (Dynamic Tailwater)

↑1=RCP_Round 18" (Barrel Controls 7.67 cfs @ 4.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)

↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

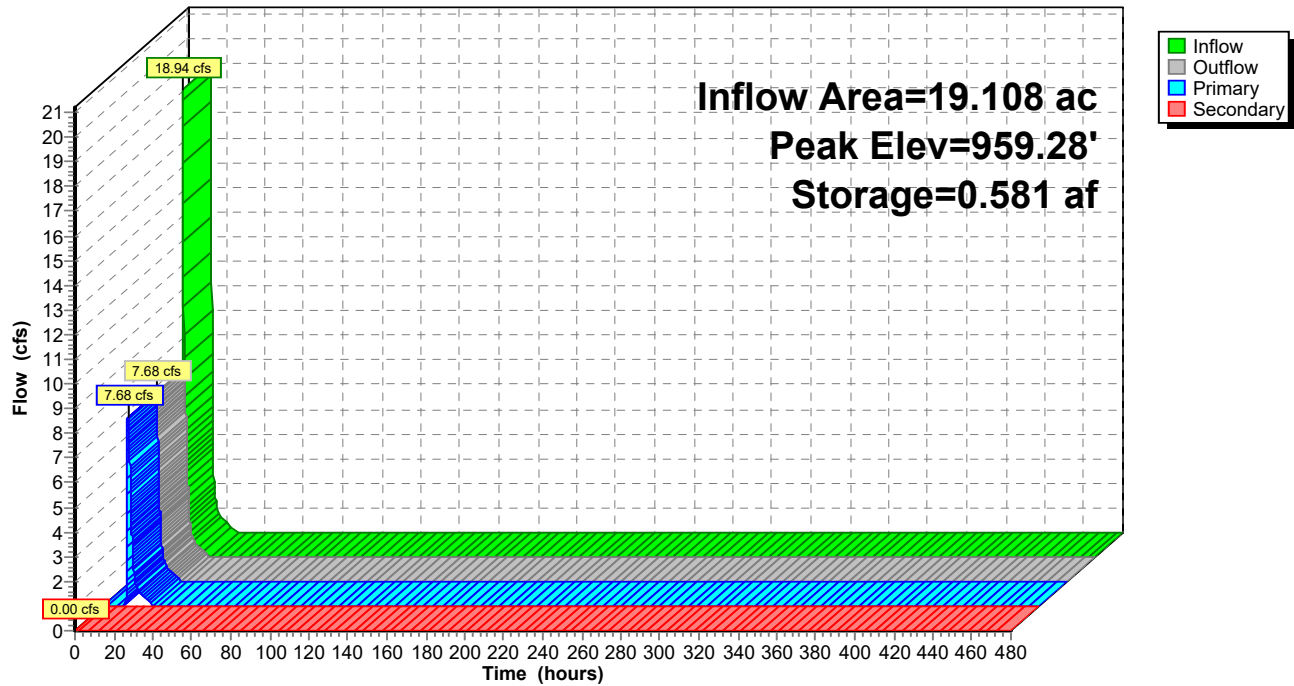
Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 101

Pond 18P: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 102

Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 1.34" for 3-inch event
 Inflow = 22.42 cfs @ 12.44 hrs, Volume= 2.193 af
 Outflow = 10.71 cfs @ 12.83 hrs, Volume= 2.193 af, Atten= 52%, Lag= 23.5 min
 Discarded = 0.14 cfs @ 12.83 hrs, Volume= 0.380 af
 Primary = 10.57 cfs @ 12.83 hrs, Volume= 1.814 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 955.54' @ 12.83 hrs Surf.Area= 0.305 ac Storage= 0.804 af

Plug-Flow detention time= 309.7 min calculated for 2.193 af (100% of inflow)
 Center-of-Mass det. time= 310.1 min (1,135.6 - 825.5)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.14 cfs @ 12.83 hrs HW=955.53' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=10.56 cfs @ 12.83 hrs HW=955.53' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 10.56 cfs @ 5.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

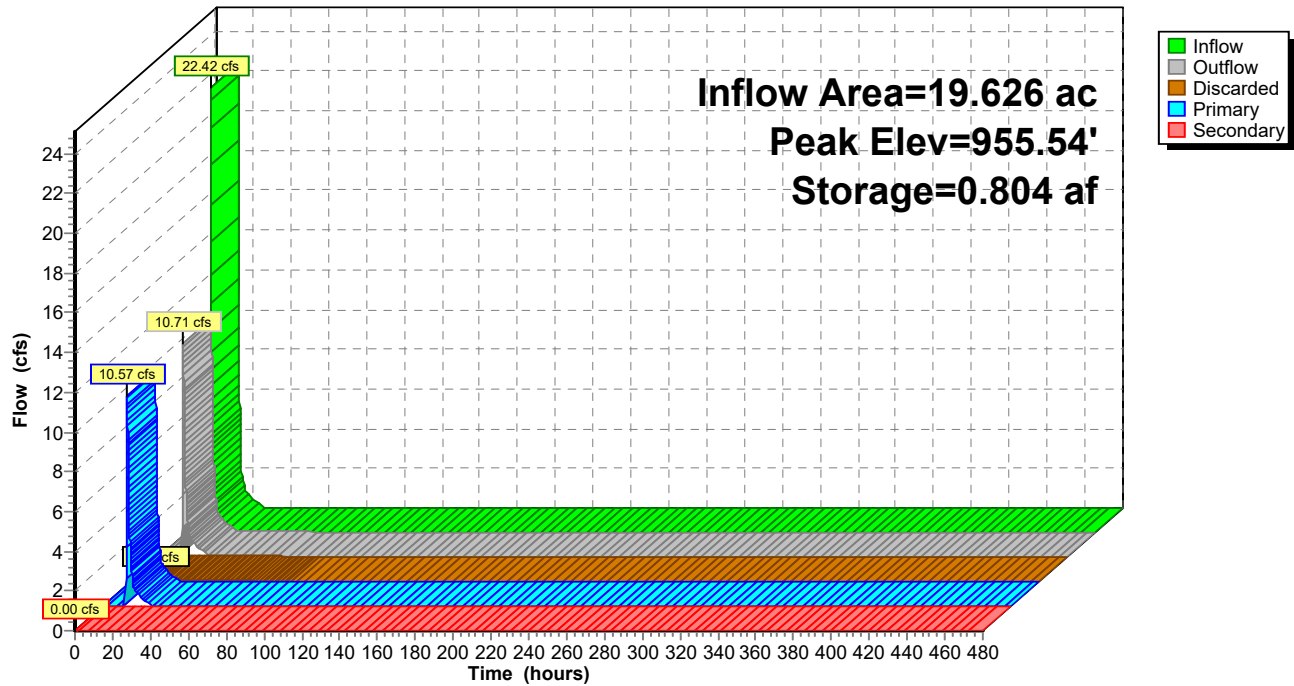
Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 103

Pond 19P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 104

Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 1.41" for 3-inch event
 Inflow = 56.77 cfs @ 12.57 hrs, Volume= 6.974 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 958.04' @ 480.00 hrs Surf.Area= 3.010 ac Storage= 9.225 af (6.974 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

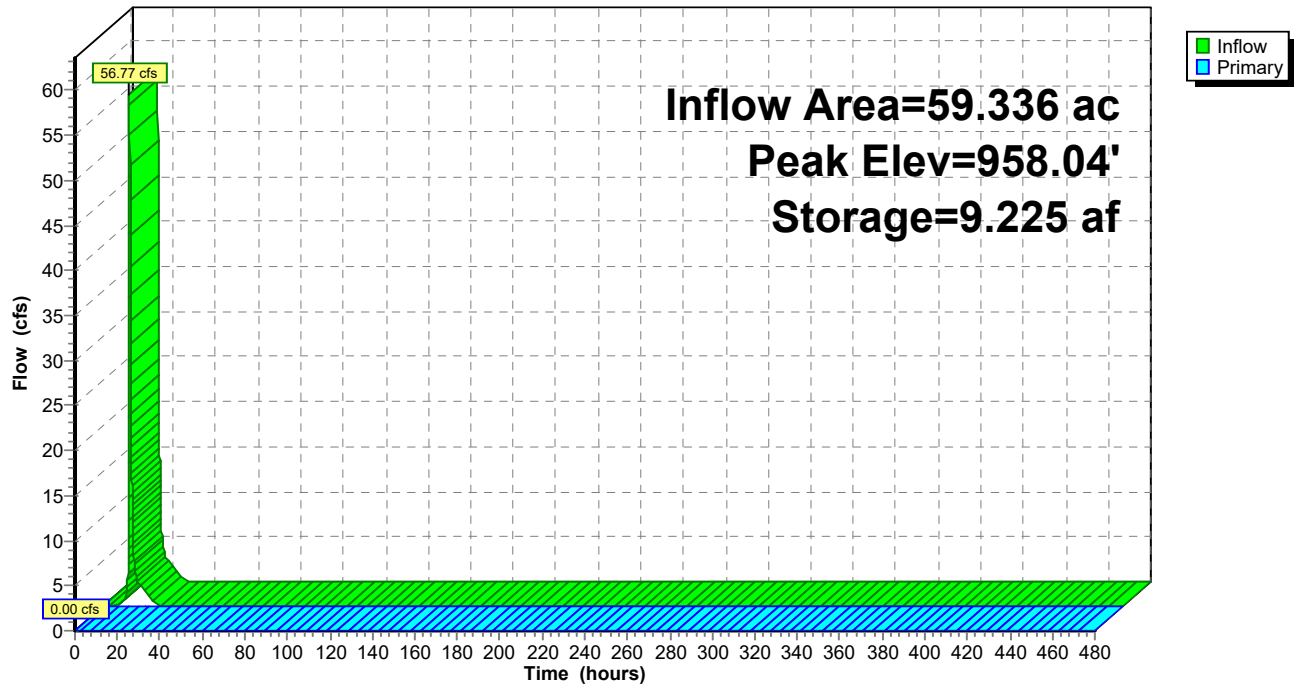
Existing
MSE 24-hr 3 3-inch Rainfall=3.00"

Printed 6/8/2021

Page 105

Pond 20P: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 106

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=1.53"
Tc=30.0 min CN=78/98 Runoff=25.84 cfs 2.443 af

Subcatchment9S: S Chelsea Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=1.71"
Tc=40.0 min CN=78/98 Runoff=66.67 cfs 7.620 af

Subcatchment11S: Chelsea Road Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=1.75"
Tc=30.0 min CN=78/98 Runoff=29.64 cfs 2.862 af

Subcatchment12S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=2.90"
Tc=15.0 min CN=58/98 Runoff=19.25 cfs 1.416 af

Subcatchment13S: School and Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=1.77"
Tc=18.0 min CN=78/98 Runoff=49.31 cfs 3.635 af

Subcatchment23S: Dundas Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=2.07"
Tc=20.0 min CN=78/98 Runoff=13.04 cfs 1.036 af

Reach 14R: To TH-01 Existing Landlocked Basin Inflow=17.55 cfs 3.479 af
Outflow=17.55 cfs 3.479 af

Reach 15R: West Inflow=13.17 cfs 2.474 af
Outflow=13.17 cfs 2.474 af

Reach 24R: SE Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 16P: TH-28A Walmart Existing Pond Peak Elev=959.15' Storage=0.543 af Inflow=19.25 cfs 1.416 af
Primary=8.54 cfs 1.188 af Secondary=0.00 cfs 0.000 af Outflow=8.54 cfs 1.188 af

Pond 17P: School Blvd Pond Peak Elev=959.99' Storage=3.201 af Inflow=49.31 cfs 3.635 af
Discarded=0.39 cfs 3.635 af Primary=0.00 cfs 0.000 af Outflow=0.39 cfs 3.635 af

Pond 18P: N Chelsea Peak Elev=959.62' Storage=0.847 af Inflow=25.84 cfs 2.443 af
Primary=9.26 cfs 2.443 af Secondary=0.00 cfs 0.000 af Outflow=9.26 cfs 2.443 af

Pond 19P: Chelsea Road Pond Peak Elev=956.28' Storage=1.048 af Inflow=29.64 cfs 2.862 af
Discarded=0.16 cfs 0.388 af Primary=13.17 cfs 2.474 af Secondary=0.00 cfs 0.000 af Outflow=13.33 cfs 2.862 af

Pond 20P: S Chelsea Peak Elev=958.52' Storage=11.058 af Inflow=74.89 cfs 8.808 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 19.012 af Average Runoff Depth = 1.77"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 107

Summary for Subcatchment 8S: N Chelsea

Runoff = 25.84 cfs @ 12.44 hrs, Volume= 2.443 af, Depth= 1.53"

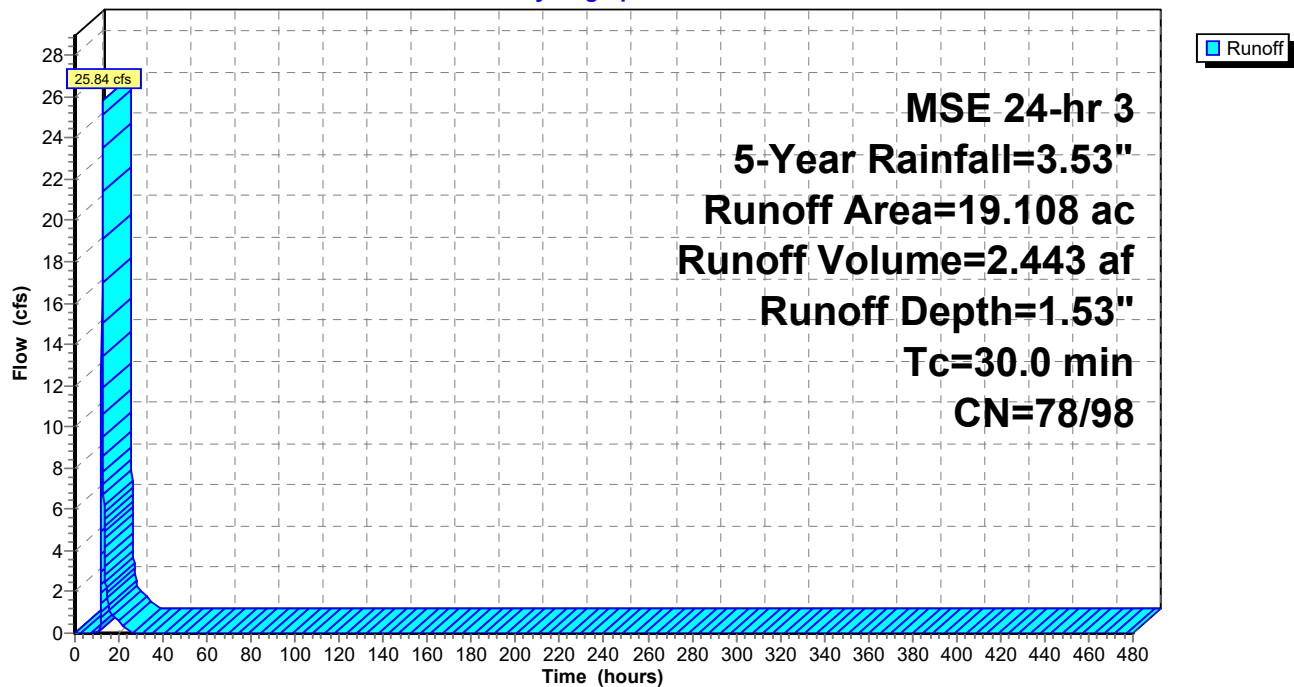
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 5-Year Rainfall=3.53"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 108

Summary for Subcatchment 9S: S Chelsea

Runoff = 66.67 cfs @ 12.57 hrs, Volume= 7.620 af, Depth= 1.71"

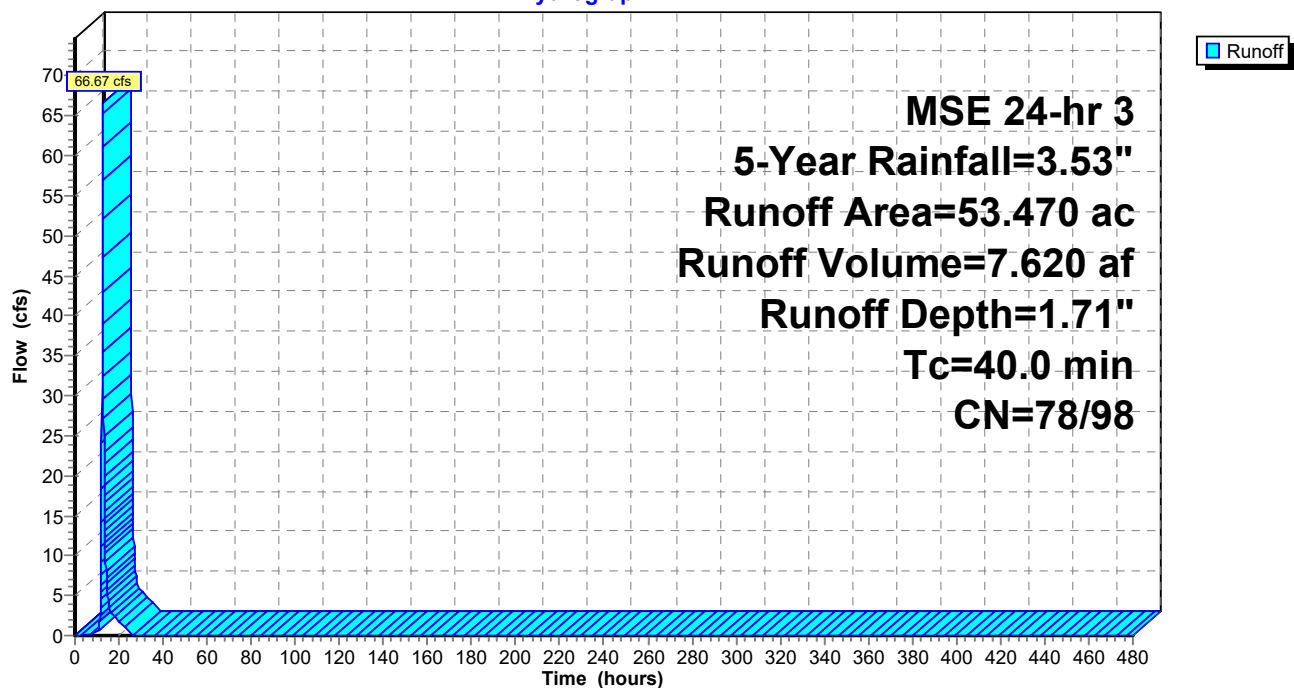
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 5-Year Rainfall=3.53"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 109

Summary for Subcatchment 11S: Chelsea Road

Runoff = 29.64 cfs @ 12.44 hrs, Volume= 2.862 af, Depth= 1.75"

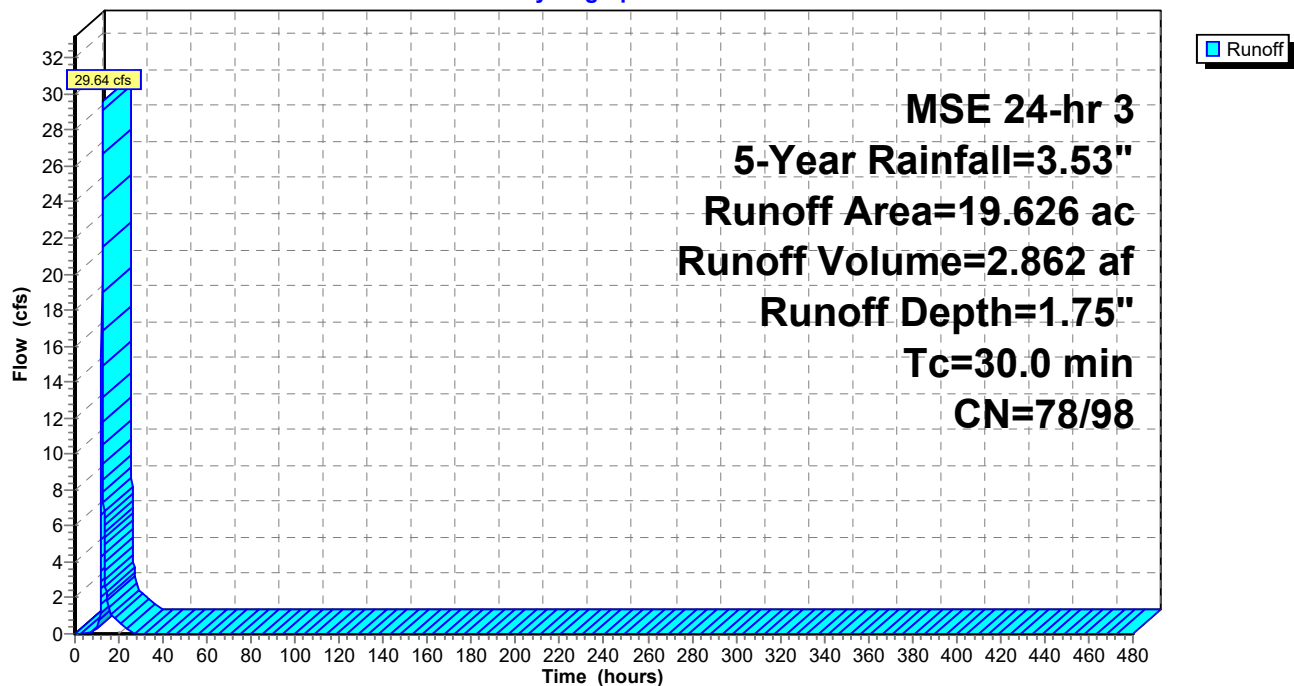
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 5-Year Rainfall=3.53"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 110

Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 19.25 cfs @ 12.23 hrs, Volume= 1.416 af, Depth= 2.90"

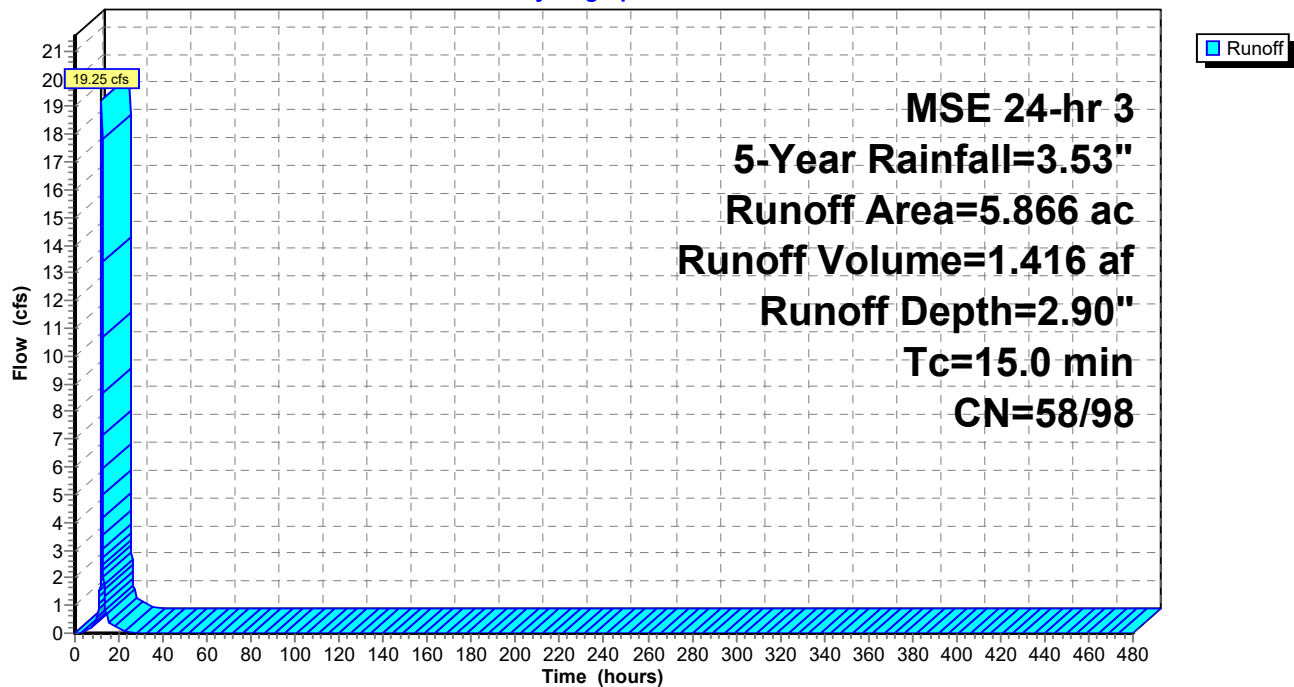
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 5-Year Rainfall=3.53"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 111

Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 49.31 cfs @ 12.28 hrs, Volume= 3.635 af, Depth= 1.77"

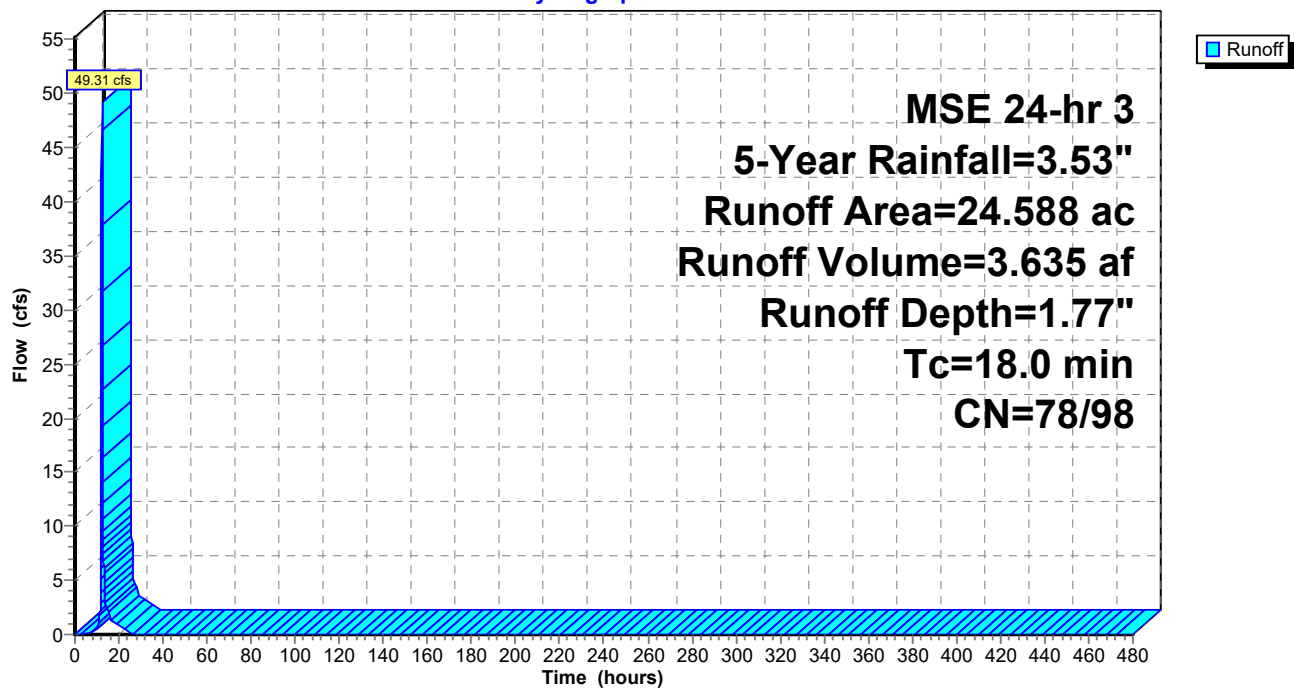
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 5-Year Rainfall=3.53"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 112

Summary for Subcatchment 23S: Dundas

Runoff = 13.04 cfs @ 12.30 hrs, Volume= 1.036 af, Depth= 2.07"

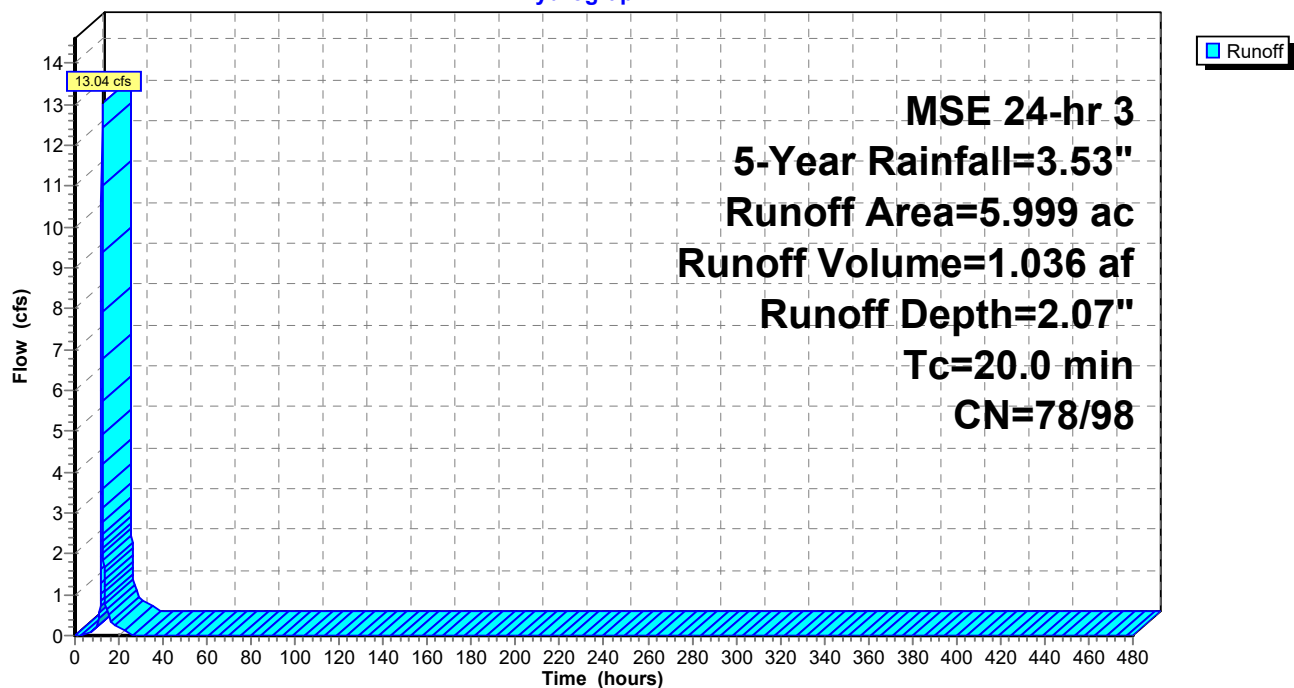
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 5-Year Rainfall=3.53"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

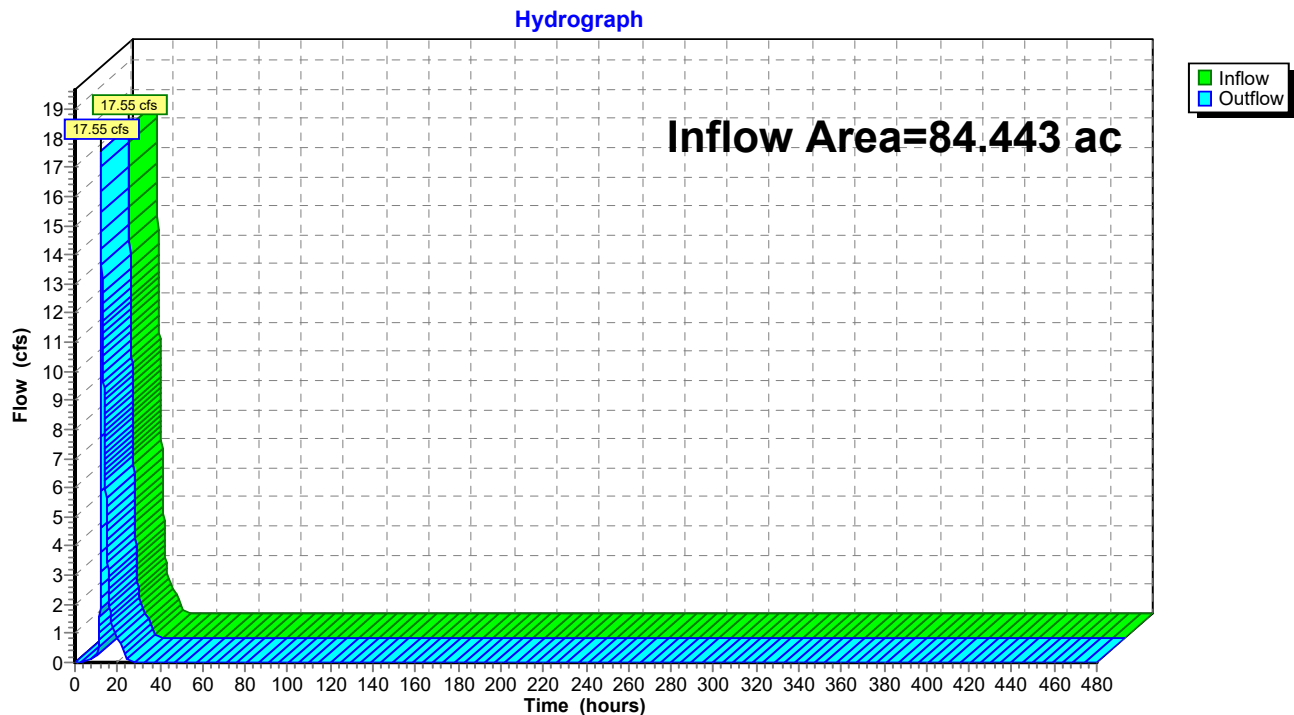
Page 113

Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.49" for 5-Year event
Inflow = 17.55 cfs @ 12.34 hrs, Volume= 3.479 af
Outflow = 17.55 cfs @ 12.34 hrs, Volume= 3.479 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 114

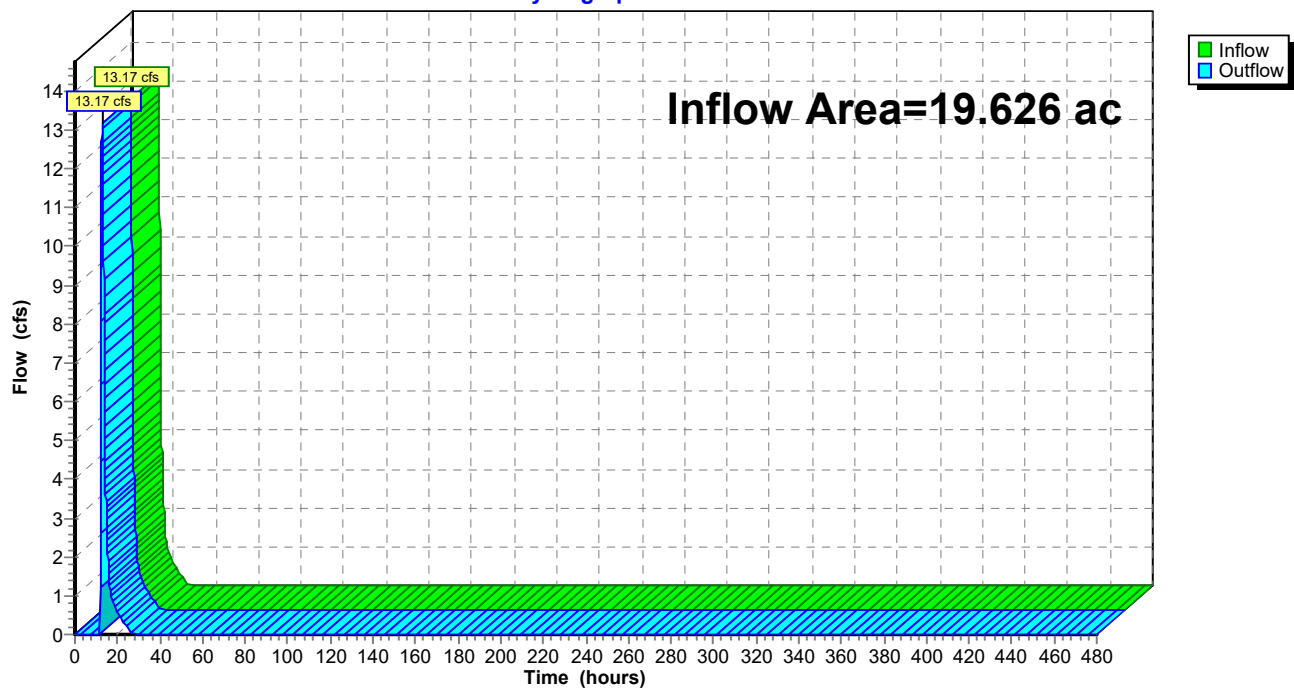
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 1.51" for 5-Year event
Inflow = 13.17 cfs @ 12.85 hrs, Volume= 2.474 af
Outflow = 13.17 cfs @ 12.85 hrs, Volume= 2.474 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

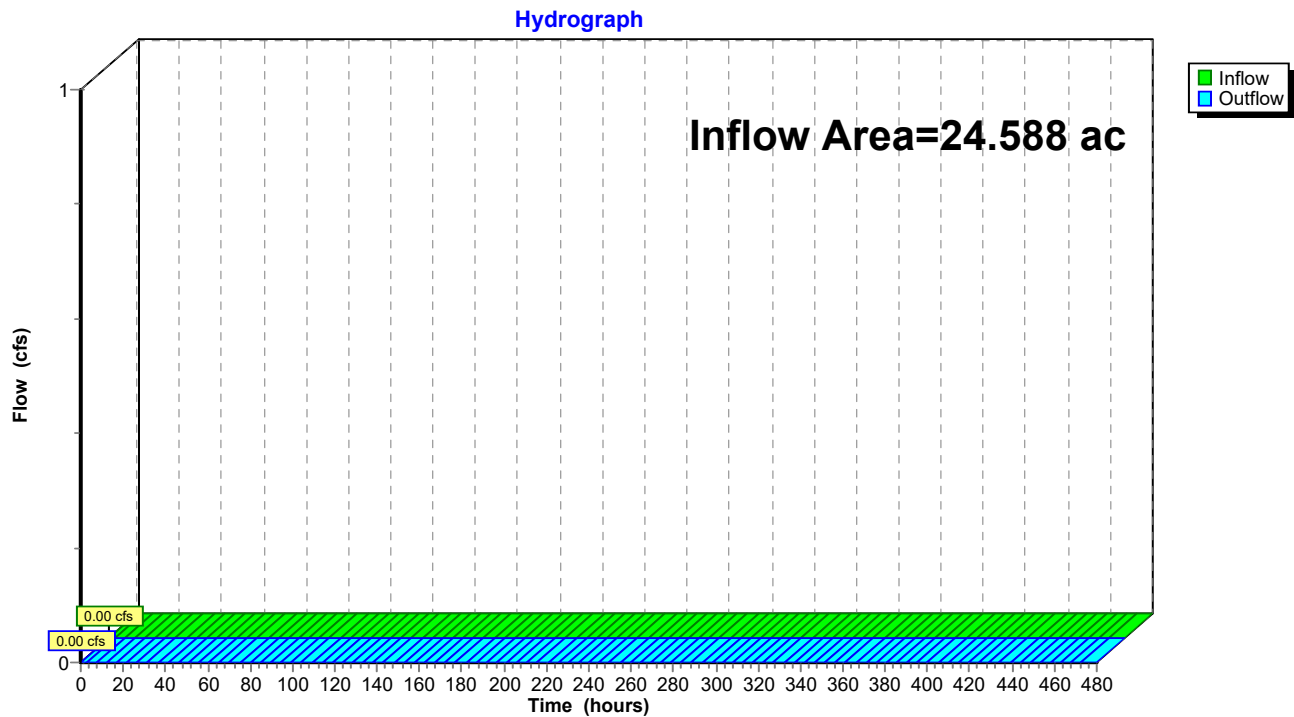
Page 115

Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 5-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 116

Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 2.90" for 5-Year event
 Inflow = 19.25 cfs @ 12.23 hrs, Volume= 1.416 af
 Outflow = 8.54 cfs @ 12.46 hrs, Volume= 1.188 af, Atten= 56%, Lag= 13.9 min
 Primary = 8.54 cfs @ 12.46 hrs, Volume= 1.188 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.15' @ 12.46 hrs Surf.Area= 0.524 ac Storage= 0.543 af

Plug-Flow detention time= 79.2 min calculated for 1.188 af (84% of inflow)
 Center-of-Mass det. time= 25.7 min (787.0 - 761.4)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 ' S= 0.0870 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=8.53 cfs @ 12.46 hrs HW=959.15' TW=954.95' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 8.53 cfs @ 4.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

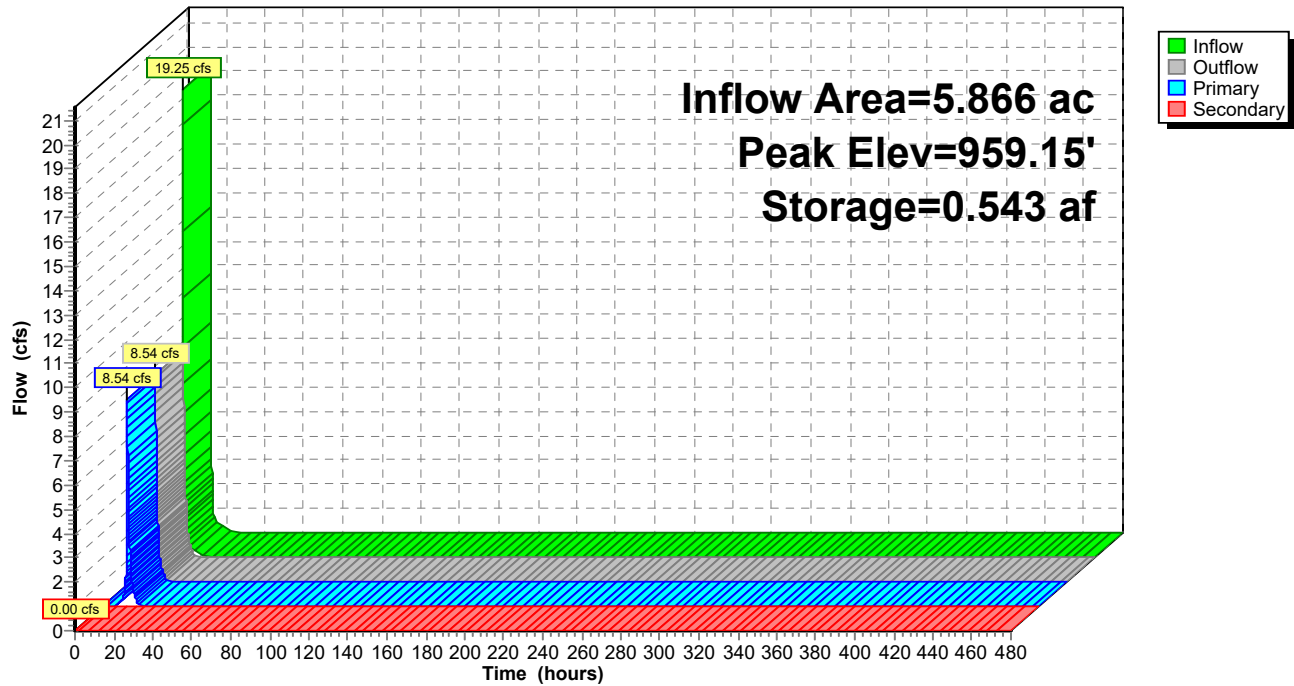
Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 117

Pond 16P: TH-28A Walmart Existing Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 118

Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 1.77" for 5-Year event
 Inflow = 49.31 cfs @ 12.28 hrs, Volume= 3.635 af
 Outflow = 0.39 cfs @ 22.78 hrs, Volume= 3.635 af, Atten= 99%, Lag= 630.3 min
 Discarded = 0.39 cfs @ 22.78 hrs, Volume= 3.635 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.99' @ 22.78 hrs Surf.Area= 0.849 ac Storage= 3.201 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 4,085.4 min (4,894.4 - 809.1)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.39 cfs @ 22.78 hrs HW=959.99' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

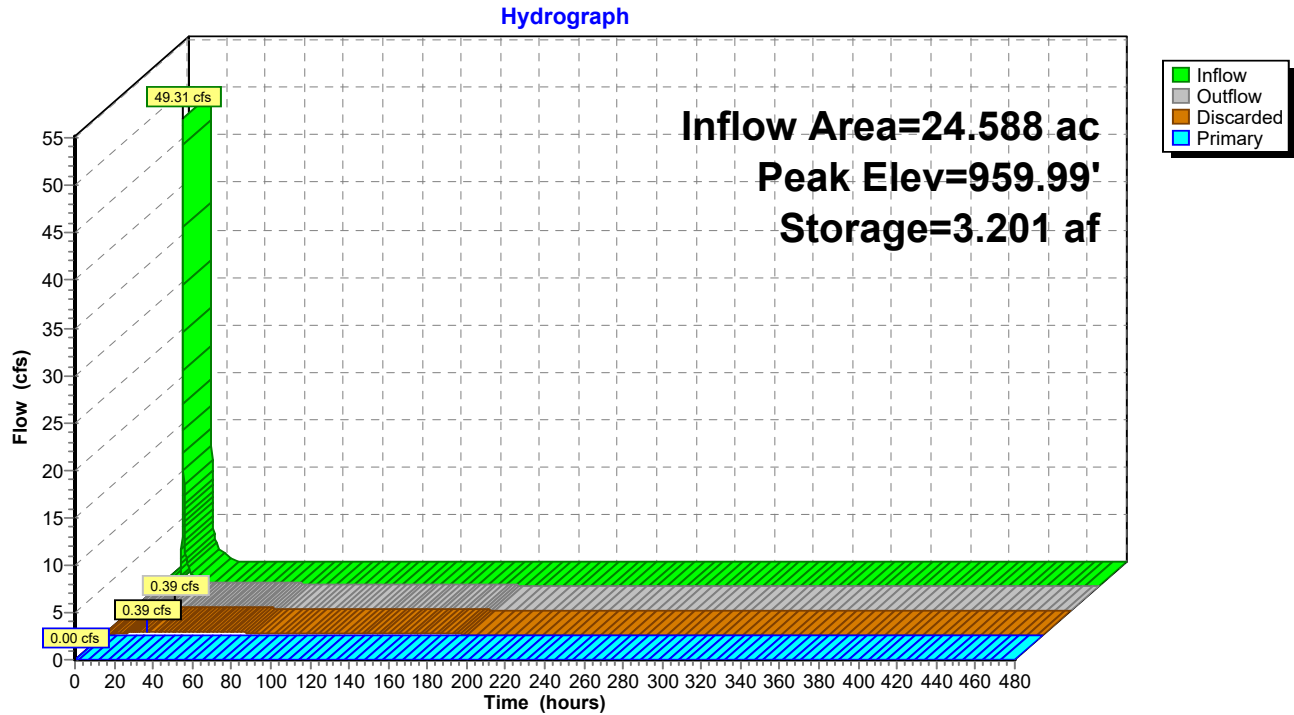
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 119

Pond 17P: School Blvd Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 120

Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 1.53" for 5-Year event
 Inflow = 25.84 cfs @ 12.44 hrs, Volume= 2.443 af
 Outflow = 9.26 cfs @ 12.96 hrs, Volume= 2.443 af, Atten= 64%, Lag= 31.3 min
 Primary = 9.26 cfs @ 12.96 hrs, Volume= 2.443 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 959.62' @ 12.96 hrs Surf.Area= 0.876 ac Storage= 0.847 af

Plug-Flow detention time= 49.4 min calculated for 2.442 af (100% of inflow)

Center-of-Mass det. time= 49.4 min (885.8 - 836.3)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 ' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=9.26 cfs @ 12.96 hrs HW=959.62' TW=0.00' (Dynamic Tailwater)↑ **1=RCP_Round 18"** (Barrel Controls 9.26 cfs @ 5.27 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

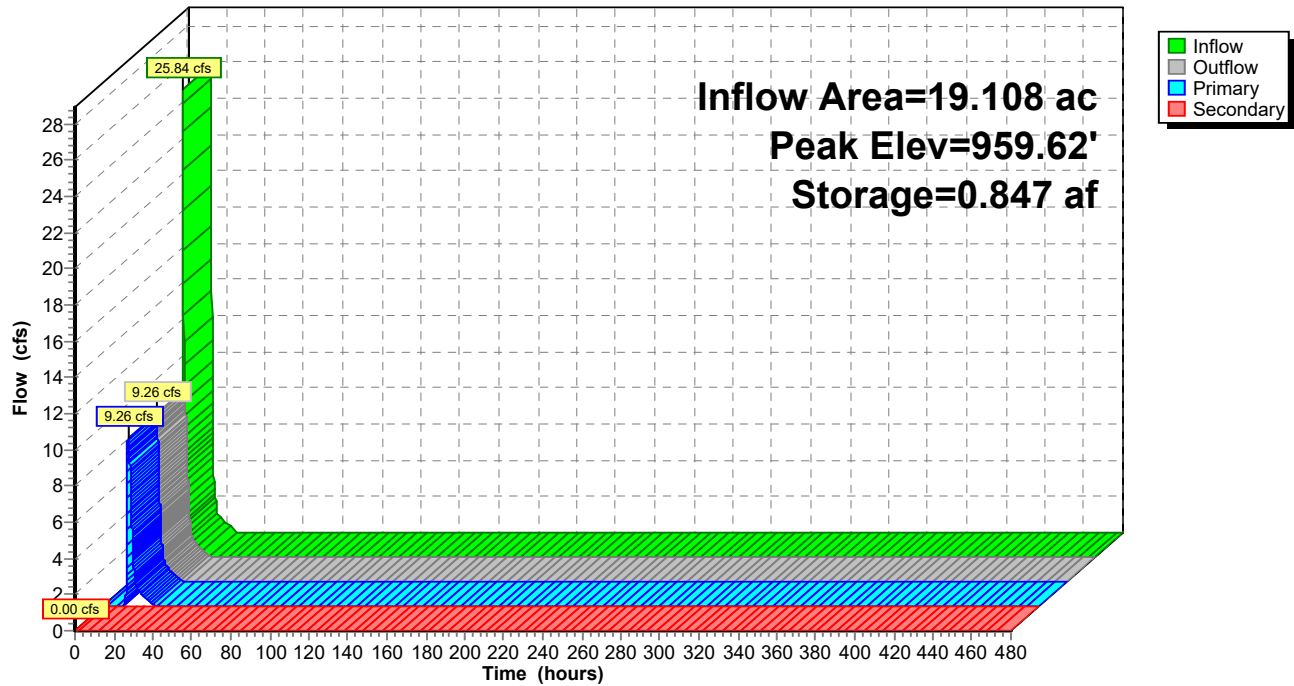
Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 121

Pond 18P: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 122

Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 1.75" for 5-Year event
 Inflow = 29.64 cfs @ 12.44 hrs, Volume= 2.862 af
 Outflow = 13.33 cfs @ 12.85 hrs, Volume= 2.862 af, Atten= 55%, Lag= 24.7 min
 Discarded = 0.16 cfs @ 12.85 hrs, Volume= 0.388 af
 Primary = 13.17 cfs @ 12.85 hrs, Volume= 2.474 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 956.28' @ 12.85 hrs Surf.Area= 0.353 ac Storage= 1.048 af

Plug-Flow detention time= 250.4 min calculated for 2.862 af (100% of inflow)
 Center-of-Mass det. time= 250.7 min (1,072.3 - 821.6)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.16 cfs @ 12.85 hrs HW=956.28' (Free Discharge)
 ↑**3=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=13.17 cfs @ 12.85 hrs HW=956.28' TW=0.00' (Dynamic Tailwater)
 ↑**1=RCP_Round 18"** (Inlet Controls 13.17 cfs @ 7.45 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

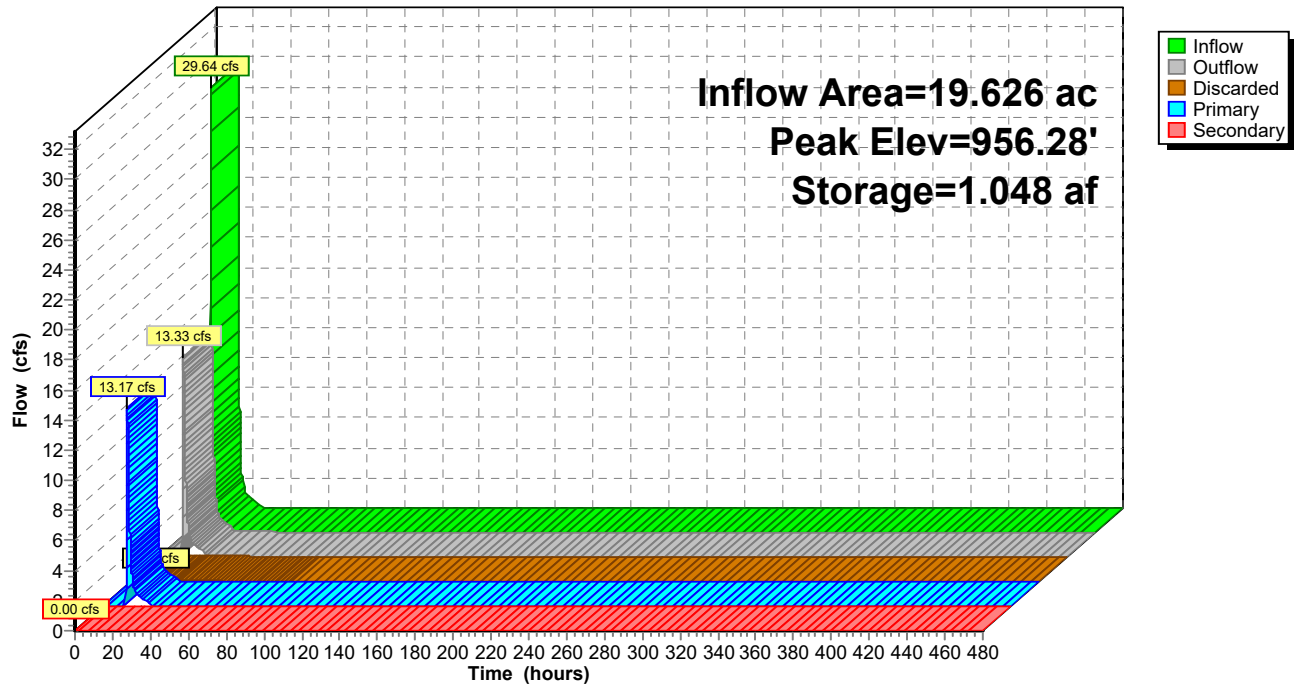
Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 123

Pond 19P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 124

Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 1.78" for 5-Year event
 Inflow = 74.89 cfs @ 12.56 hrs, Volume= 8.808 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af

Peak Elev= 958.52' @ 480.00 hrs Surf.Area= 4.689 ac Storage= 11.058 af (8.808 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

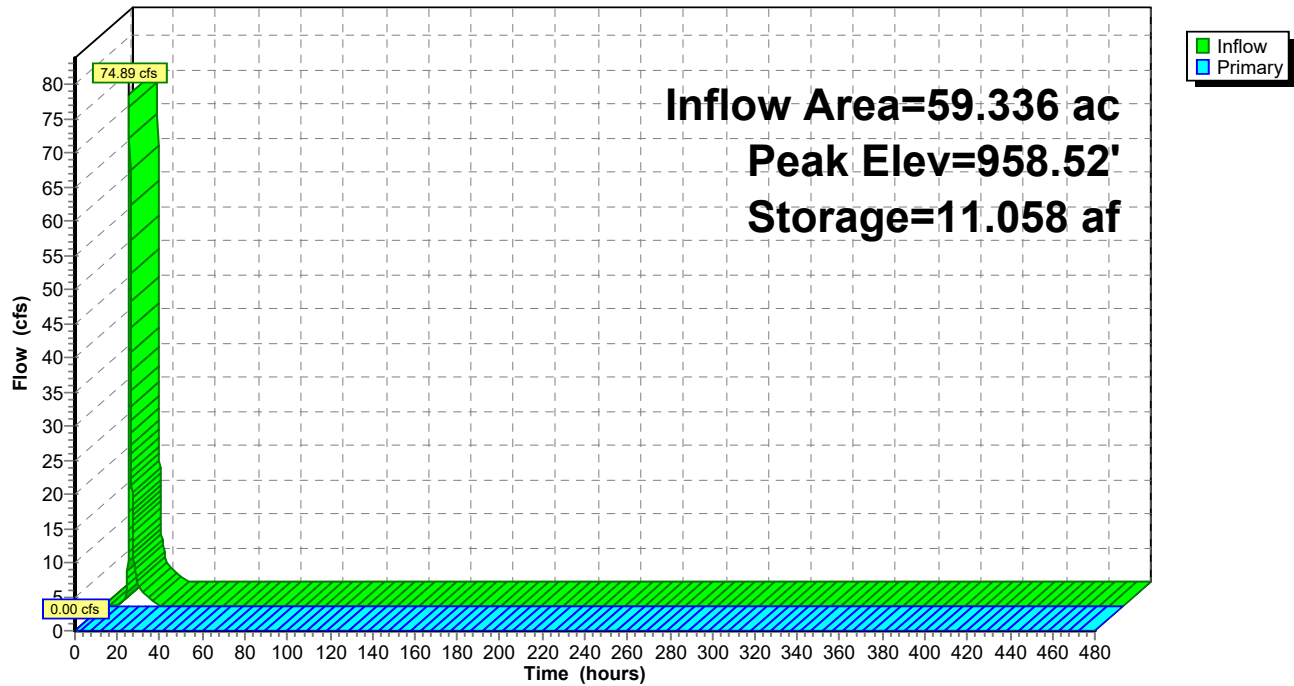
Existing
MSE 24-hr 3 5-Year Rainfall=3.53"

Printed 6/8/2021

Page 125

Pond 20P: S Chelsea

Hydrograph



Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=4.37"
 Tc=30.0 min CN=78/98 Runoff=6.33 cfs 6.966 af

Subcatchment9S: S Chelsea Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=4.60"
 Tc=40.0 min CN=78/98 Runoff=17.96 cfs 20.498 af

Subcatchment11S: Chelsea Road Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=4.65"
 Tc=30.0 min CN=78/98 Runoff=6.76 cfs 7.607 af

Subcatchment12S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=6.02"
 Tc=15.0 min CN=58/98 Runoff=2.41 cfs 2.944 af

Subcatchment13S: School and Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=4.68"
 Tc=18.0 min CN=78/98 Runoff=8.68 cfs 9.593 af

Subcatchment23S: Dundas Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=5.06"
 Tc=20.0 min CN=78/98 Runoff=2.22 cfs 2.532 af

Reach 14R: To TH-01 Existing Landlocked Basin Inflow=7.19 cfs 9.498 af
 Outflow=7.19 cfs 9.498 af

Reach 15R: West Inflow=6.14 cfs 6.067 af
 Outflow=6.14 cfs 6.067 af

Reach 24R: SE Inflow=0.00 cfs 0.000 af
 Outflow=0.00 cfs 0.000 af

Pond 16P: TH-28A Walmart Existing Pond Peak Elev=960.25' Storage=1.180 af Inflow=2.41 cfs 2.944 af
 Primary=1.39 cfs 1.765 af Secondary=0.00 cfs 0.000 af Outflow=1.39 cfs 1.765 af

Pond 17P: School Blvd Pond Peak Elev=960.76' Storage=4.221 af Inflow=8.68 cfs 9.593 af
 Discarded=0.82 cfs 9.593 af Primary=0.00 cfs 0.000 af Outflow=0.82 cfs 9.593 af

Pond 18P: N Chelsea Peak Elev=958.91' Storage=0.342 af Inflow=6.33 cfs 6.966 af
 Primary=5.35 cfs 6.966 af Secondary=0.00 cfs 0.000 af Outflow=5.35 cfs 6.966 af

Pond 19P: Chelsea Road Pond Peak Elev=954.64' Storage=0.557 af Inflow=6.76 cfs 7.607 af
 Discarded=0.11 cfs 1.541 af Primary=6.14 cfs 6.067 af Secondary=0.00 cfs 0.000 af Outflow=6.25 cfs 7.607 af

Pond 20P: S Chelsea Peak Elev=960.25' Storage=24.514 af Inflow=19.33 cfs 22.264 af
 Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 50.140 af Average Runoff Depth = 4.68"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

Summary for Subcatchment 8S: N Chelsea

Runoff = 6.33 cfs @ 121.69 hrs, Volume= 6.966 af, Depth= 4.37"

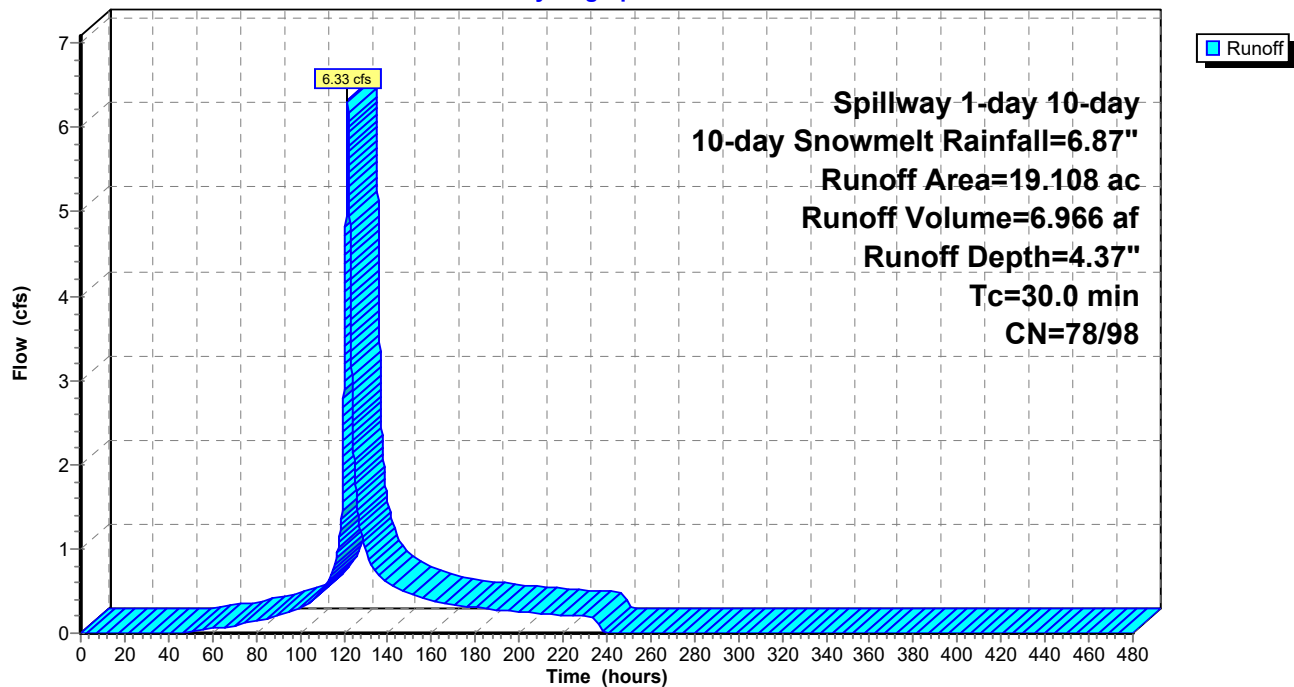
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



Summary for Subcatchment 9S: S Chelsea

Runoff = 17.96 cfs @ 121.84 hrs, Volume= 20.498 af, Depth= 4.60"

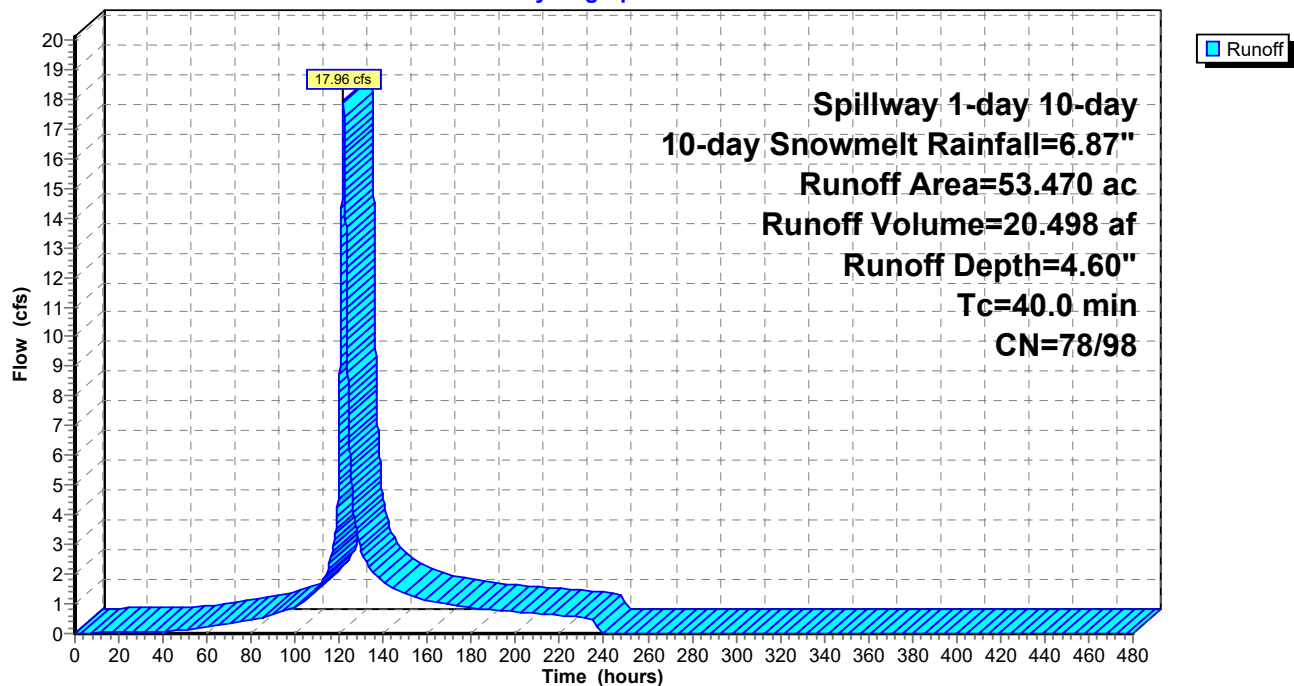
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



Summary for Subcatchment 11S: Chelsea Road

Runoff = 6.76 cfs @ 121.69 hrs, Volume= 7.607 af, Depth= 4.65"

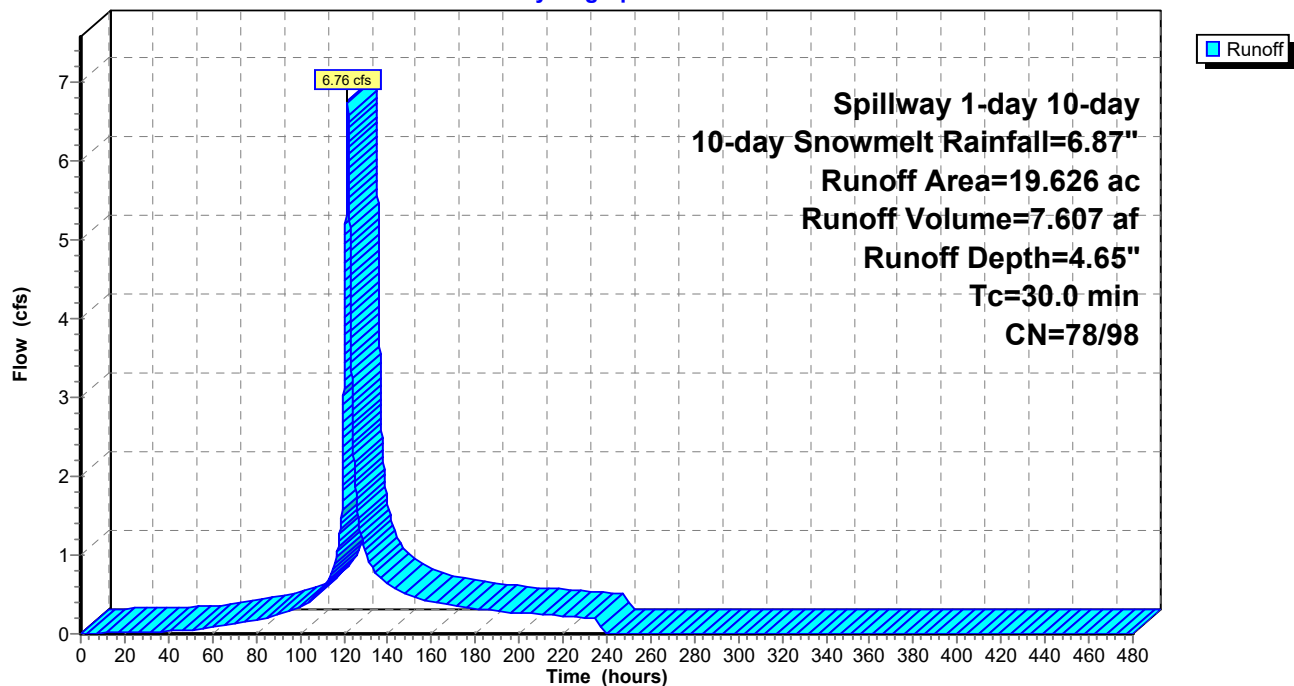
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 2.41 cfs @ 121.44 hrs, Volume= 2.944 af, Depth= 6.02"

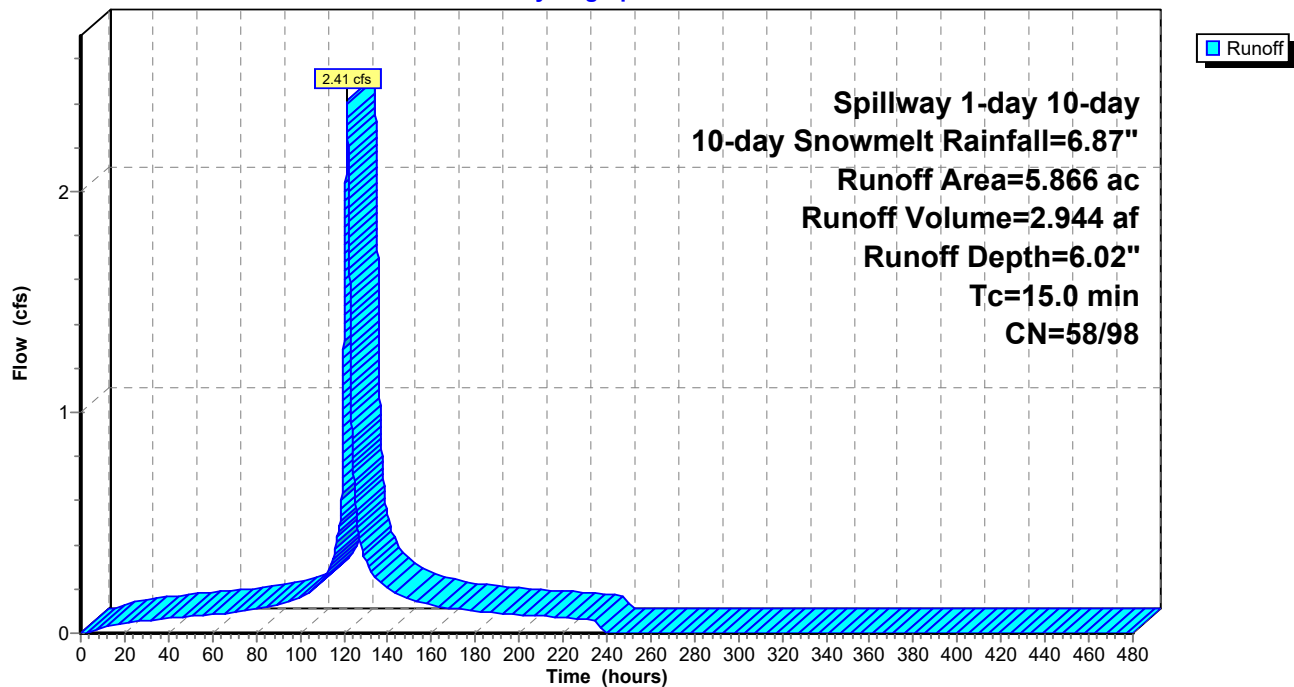
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

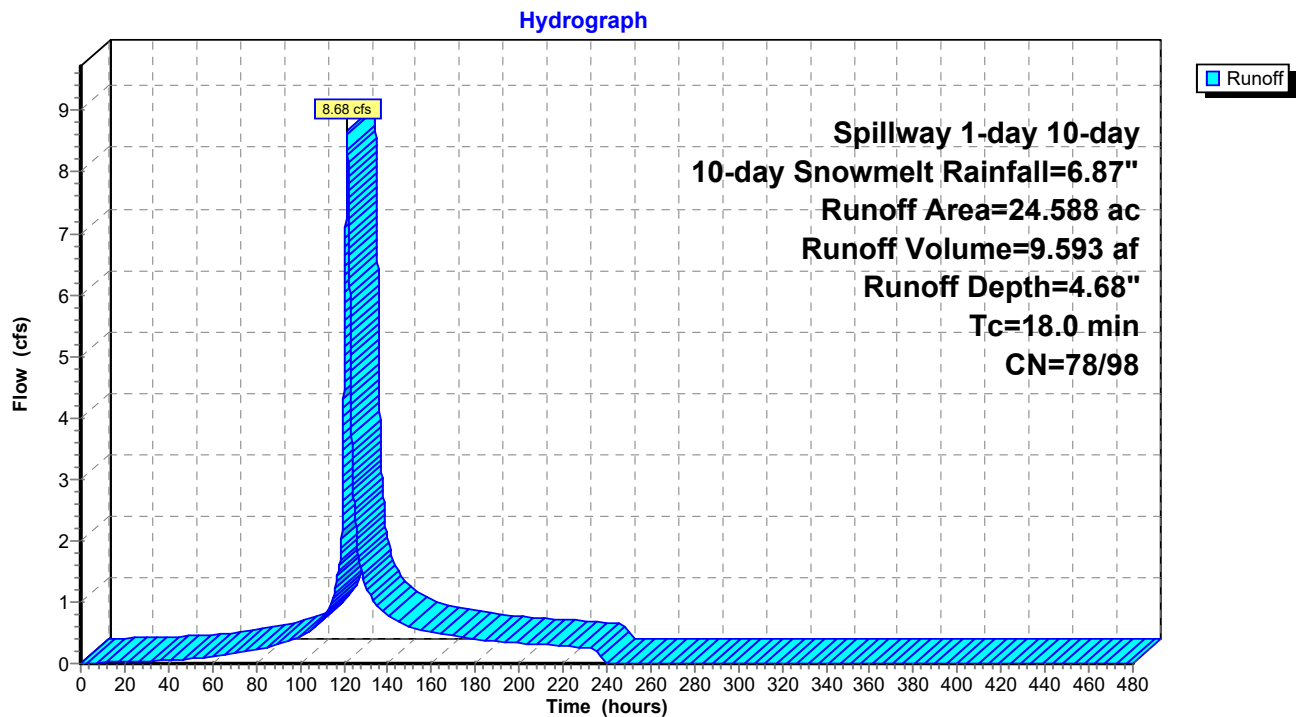
Runoff = 8.68 cfs @ 121.50 hrs, Volume= 9.593 af, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area



Summary for Subcatchment 23S: Dundas

Runoff = 2.22 cfs @ 121.52 hrs, Volume= 2.532 af, Depth= 5.06"

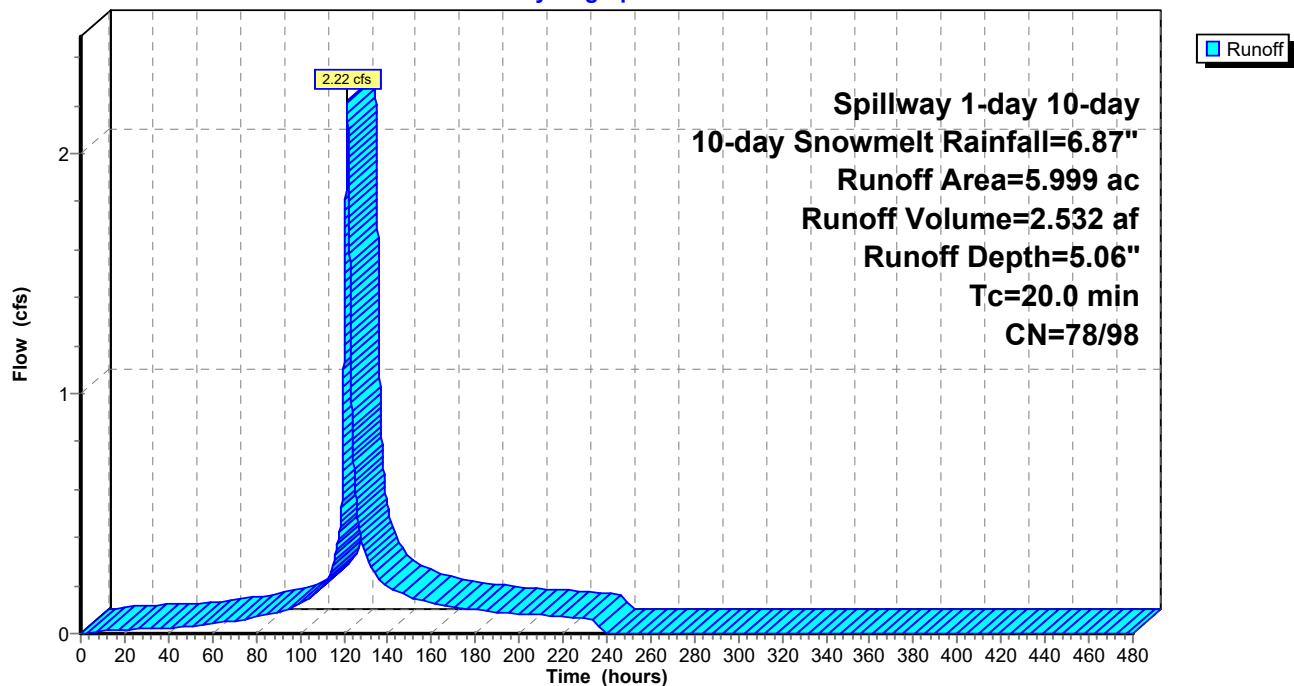
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph

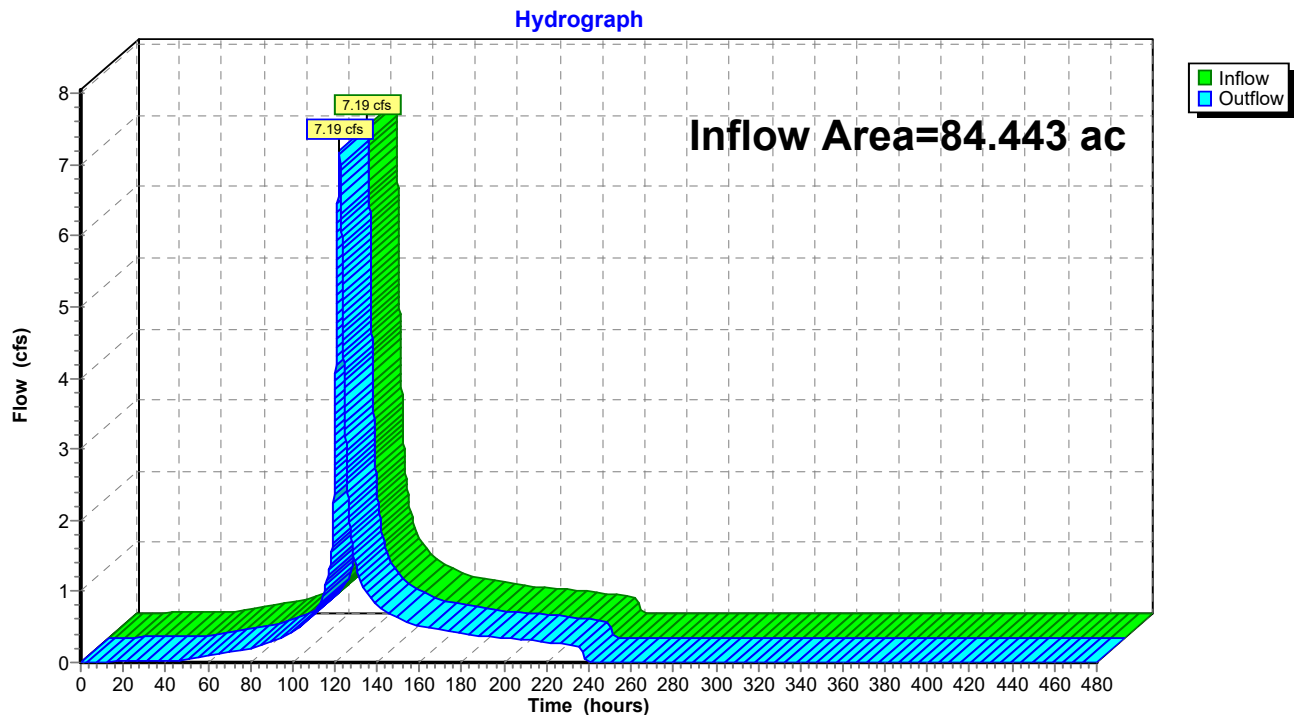


Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 1.35" for 10-day Snowmelt event
Inflow = 7.19 cfs @ 122.14 hrs, Volume= 9.498 af
Outflow = 7.19 cfs @ 122.14 hrs, Volume= 9.498 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



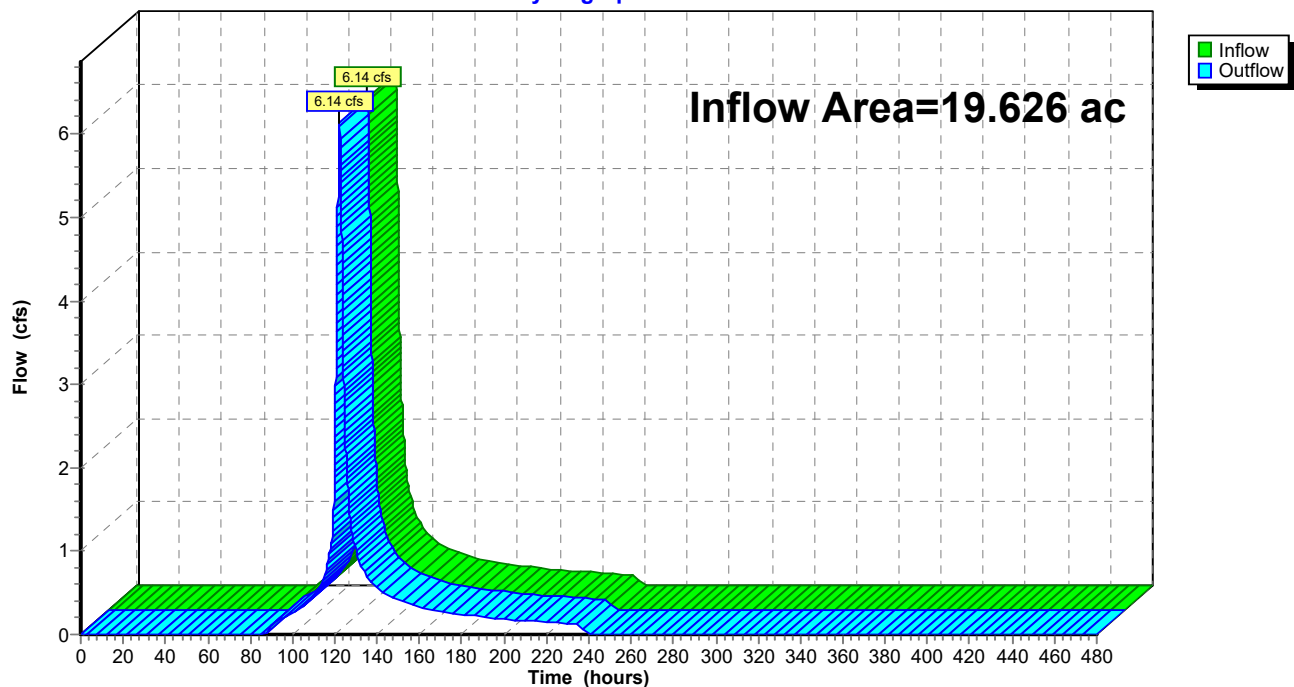
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 3.71" for 10-day Snowmelt event
Inflow = 6.14 cfs @ 122.15 hrs, Volume= 6.067 af
Outflow = 6.14 cfs @ 122.15 hrs, Volume= 6.067 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

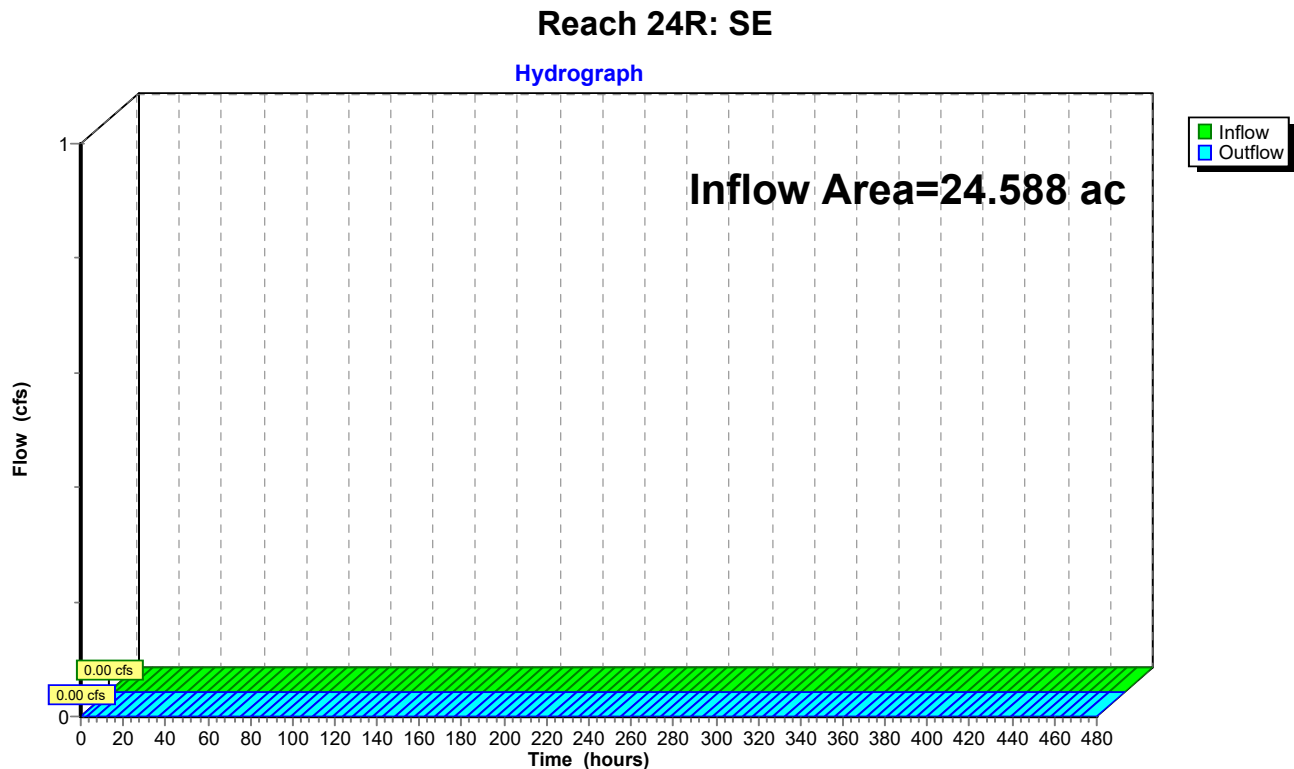
Hydrograph



Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 10-day Snowmelt event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3



Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 6.02" for 10-day Snowmelt event
 Inflow = 2.41 cfs @ 121.44 hrs, Volume= 2.944 af
 Outflow = 1.39 cfs @ 121.65 hrs, Volume= 1.765 af, Atten= 42%, Lag= 12.6 min
 Primary = 1.39 cfs @ 121.65 hrs, Volume= 1.765 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.25' @ 240.13 hrs Surf.Area= 0.666 ac Storage= 1.180 af

Plug-Flow detention time= 916.1 min calculated for 1.765 af (60% of inflow)
 Center-of-Mass det. time= (not calculated: outflow precedes inflow)

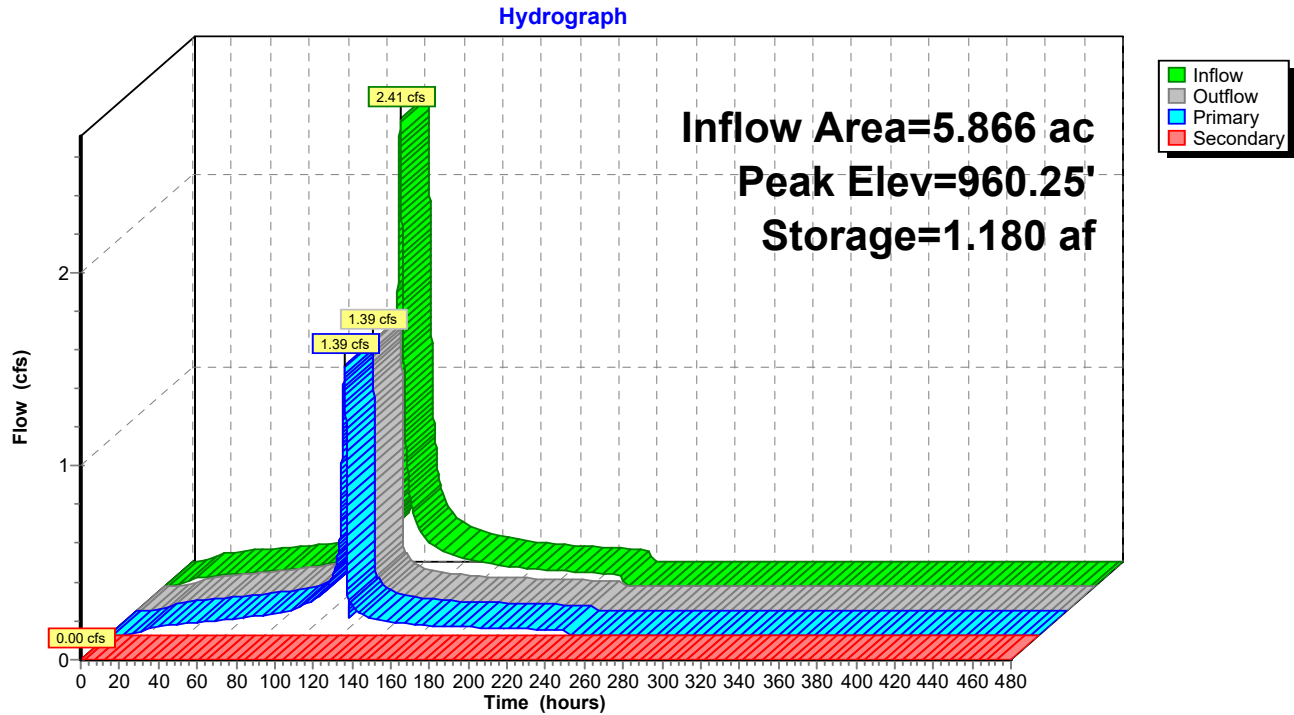
Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.39 cfs @ 121.65 hrs HW=958.56' TW=958.32' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Outlet Controls 1.39 cfs @ 2.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 16P: TH-28A Walmart Existing Pond



Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 4.68" for 10-day Snowmelt event
 Inflow = 8.68 cfs @ 121.50 hrs, Volume= 9.593 af
 Outflow = 0.82 cfs @ 138.85 hrs, Volume= 9.593 af, Atten= 91%, Lag= 1,041.1 min
 Discarded = 0.82 cfs @ 138.85 hrs, Volume= 9.593 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.76' @ 138.85 hrs Surf.Area= 1.800 ac Storage= 4.221 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 3,948.8 min (12,142.8 - 8,194.0)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

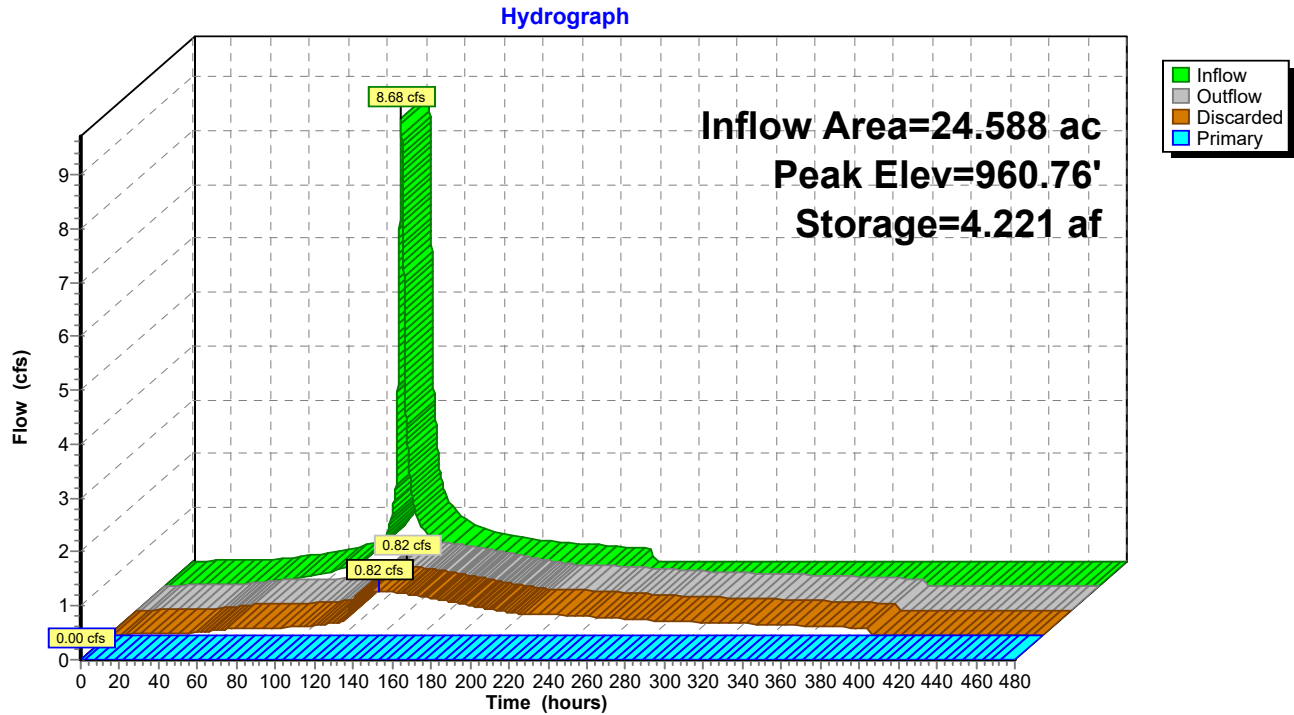
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65			
2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88			

Discarded OutFlow Max=0.82 cfs @ 138.85 hrs HW=960.76' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.82 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 17P: School Blvd Pond



Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 4.37" for 10-day Snowmelt event
 Inflow = 6.33 cfs @ 121.69 hrs, Volume= 6.966 af
 Outflow = 5.35 cfs @ 122.47 hrs, Volume= 6.966 af, Atten= 15%, Lag= 46.5 min
 Primary = 5.35 cfs @ 122.47 hrs, Volume= 6.966 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.91' @ 122.47 hrs Surf.Area= 0.555 ac Storage= 0.342 af

Plug-Flow detention time= 35.0 min calculated for 6.965 af (100% of inflow)
 Center-of-Mass det. time= 35.0 min (8,422.8 - 8,387.8)

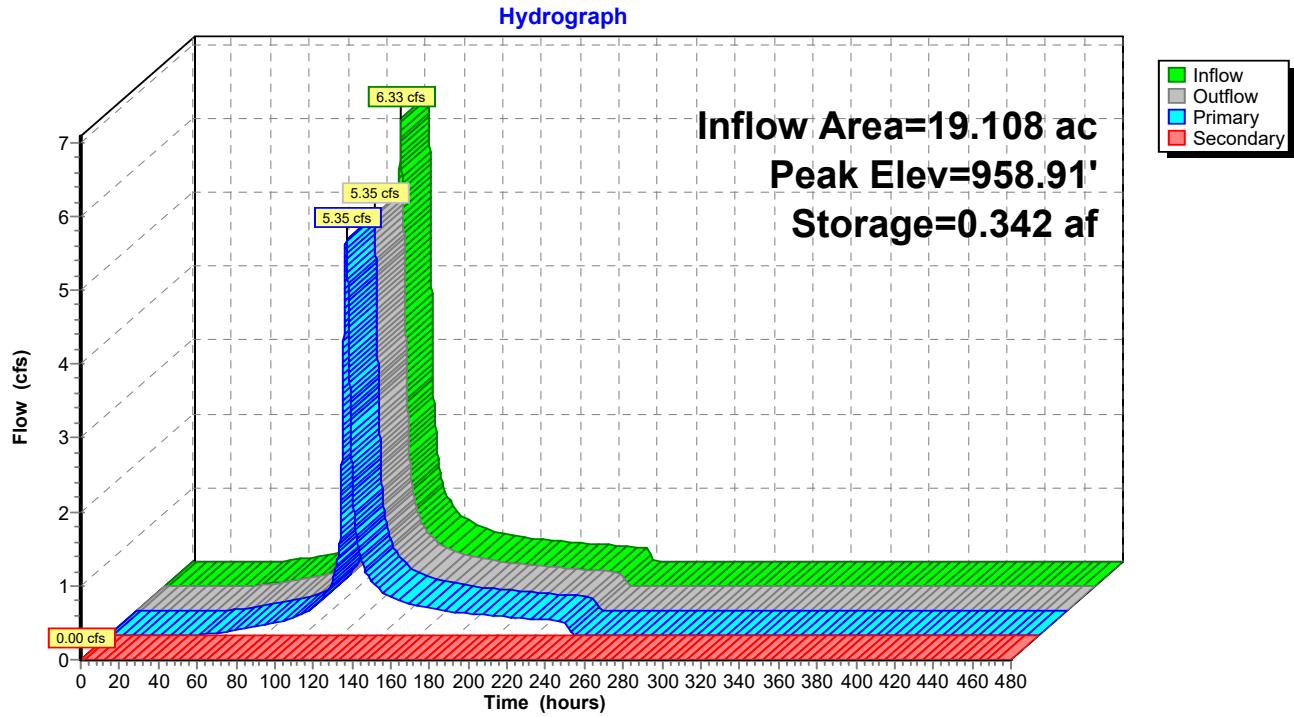
Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 ' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=5.35 cfs @ 122.47 hrs HW=958.91' TW=0.00' (Dynamic Tailwater)
 ↑1=RCP_Round 18" (Barrel Controls 5.35 cfs @ 4.60 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 18P: N Chelsea



Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 4.65" for 10-day Snowmelt event
 Inflow = 6.76 cfs @ 121.69 hrs, Volume= 7.607 af
 Outflow = 6.25 cfs @ 122.15 hrs, Volume= 7.607 af, Atten= 8%, Lag= 27.8 min
 Discarded = 0.11 cfs @ 122.15 hrs, Volume= 1.541 af
 Primary = 6.14 cfs @ 122.15 hrs, Volume= 6.067 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 954.64' @ 122.15 hrs Surf.Area= 0.250 ac Storage= 0.557 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 432.5 min (8,654.7 - 8,222.1)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.11 cfs @ 122.15 hrs HW=954.64' (Free Discharge)

↑ **3=Exfiltration** (Exfiltration Controls 0.11 cfs)

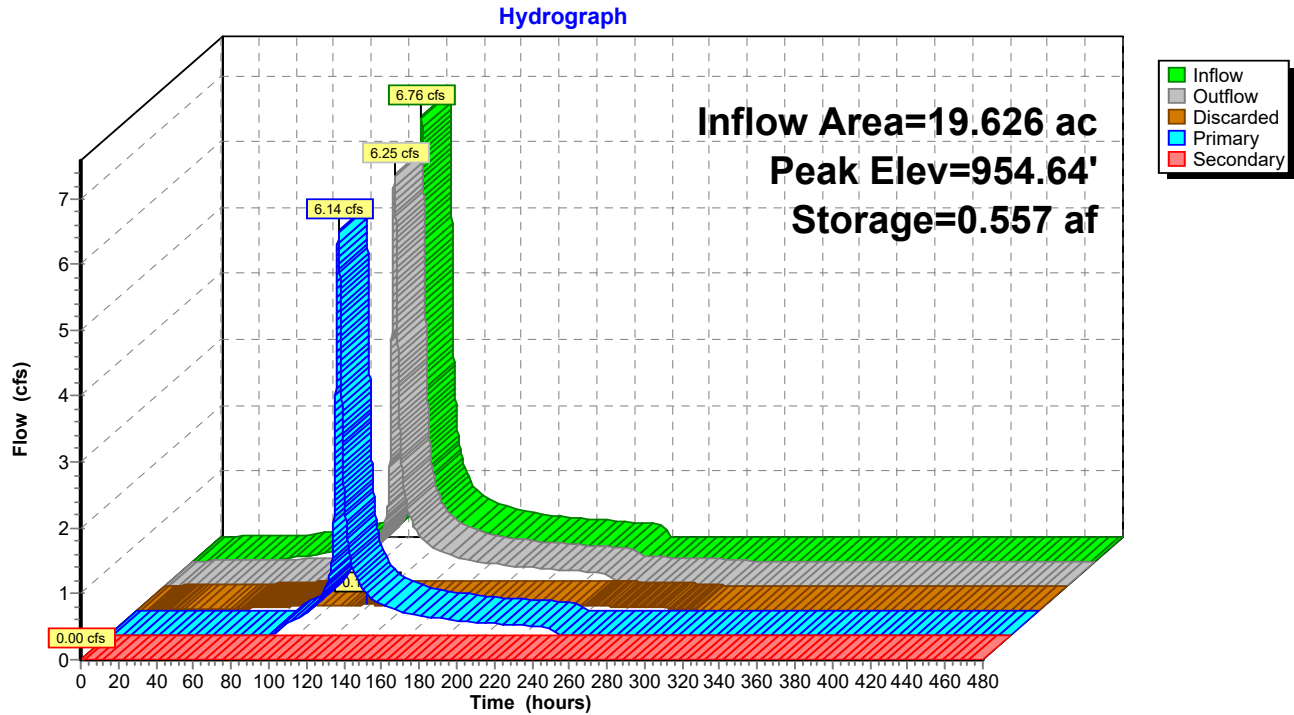
Primary OutFlow Max=6.14 cfs @ 122.15 hrs HW=954.64' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 18"** (Barrel Controls 6.14 cfs @ 4.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)

↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 19P: Chelsea Road Pond



Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 4.50" for 10-day Snowmelt event
 Inflow = 19.33 cfs @ 121.82 hrs, Volume= 22.264 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 960.25' @ 480.00 hrs Surf.Area= 11.020 ac Storage= 24.514 af (22.264 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

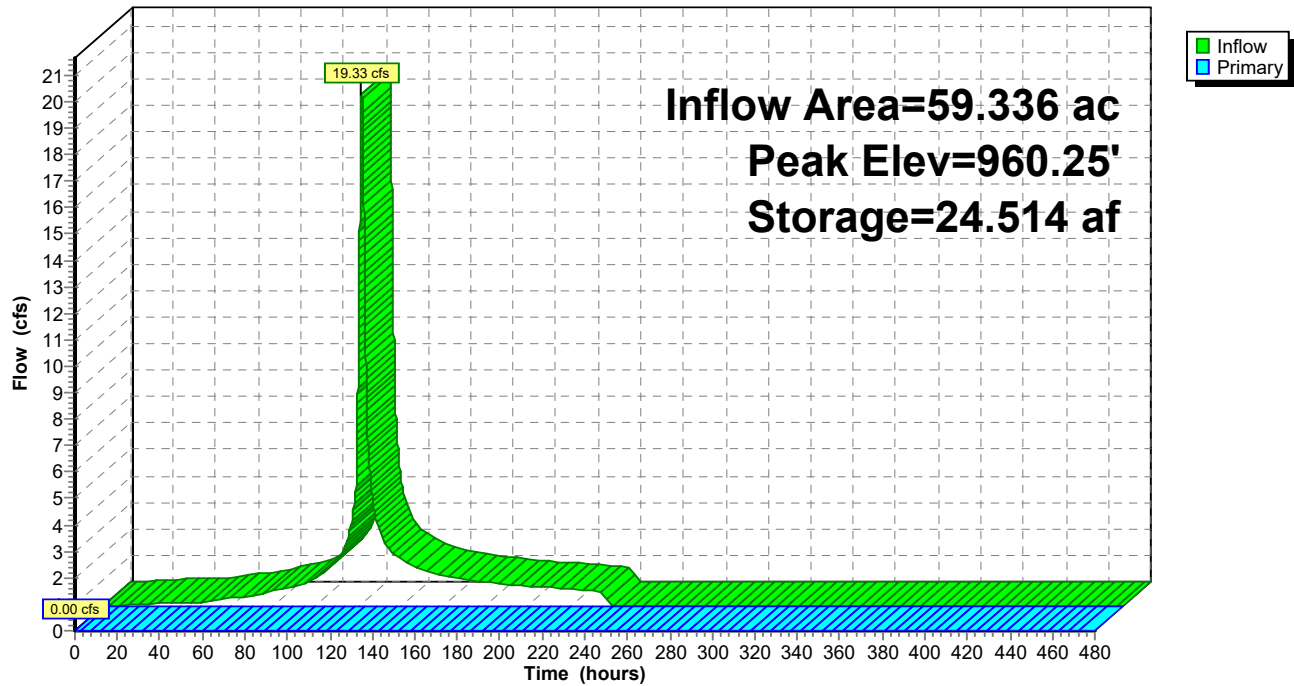
Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)
 ↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 20P: S Chelsea

Hydrograph



Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=2.08"
 Tc=30.0 min CN=78/98 Runoff=35.35 cfs 3.310 af

Subcatchment9S: S Chelsea Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=2.27"
 Tc=40.0 min CN=78/98 Runoff=89.33 cfs 10.111 af

Subcatchment11S: Chelsea Road Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=2.31"
 Tc=30.0 min CN=78/98 Runoff=39.49 cfs 3.782 af

Subcatchment12S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=3.53"
 Tc=15.0 min CN=58/98 Runoff=23.36 cfs 1.726 af

Subcatchment13S: School and Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=2.34"
 Tc=18.0 min CN=78/98 Runoff=65.69 cfs 4.791 af

Subcatchment23S: Dundas Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=2.66"
 Tc=20.0 min CN=78/98 Runoff=16.82 cfs 1.330 af

Reach 14R: To TH-01 Existing Landlocked Basin Inflow=22.84 cfs 4.640 af
 Outflow=22.84 cfs 4.640 af

Reach 15R: West Inflow=15.69 cfs 3.383 af
 Outflow=15.69 cfs 3.383 af

Reach 24R: SE Inflow=0.00 cfs 0.000 af
 Outflow=0.00 cfs 0.000 af

Pond 16P: TH-28A Walmart Existing Pond Peak Elev=959.32' Storage=0.631 af Inflow=23.36 cfs 1.726 af
 Primary=10.72 cfs 1.270 af Secondary=0.00 cfs 0.000 af Outflow=10.72 cfs 1.270 af

Pond 17P: School Blvd Pond Peak Elev=960.68' Storage=4.082 af Inflow=65.69 cfs 4.791 af
 Discarded=0.77 cfs 4.791 af Primary=0.00 cfs 0.000 af Outflow=0.77 cfs 4.791 af

Pond 18P: N Chelsea Peak Elev=960.04' Storage=1.260 af Inflow=35.35 cfs 3.310 af
 Primary=10.87 cfs 3.310 af Secondary=0.00 cfs 0.000 af Outflow=10.87 cfs 3.310 af

Pond 19P: Chelsea Road Pond Peak Elev=957.28' Storage=1.434 af Inflow=39.49 cfs 3.782 af
 Discarded=0.19 cfs 0.399 af Primary=15.69 cfs 3.383 af Secondary=0.00 cfs 0.000 af Outflow=15.88 cfs 3.782 af

Pond 20P: S Chelsea Peak Elev=958.99' Storage=13.632 af Inflow=99.62 cfs 11.381 af
 Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 25.050 af Average Runoff Depth = 2.34"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

Summary for Subcatchment 8S: N Chelsea

Runoff = 35.35 cfs @ 12.44 hrs, Volume= 3.310 af, Depth= 2.08"

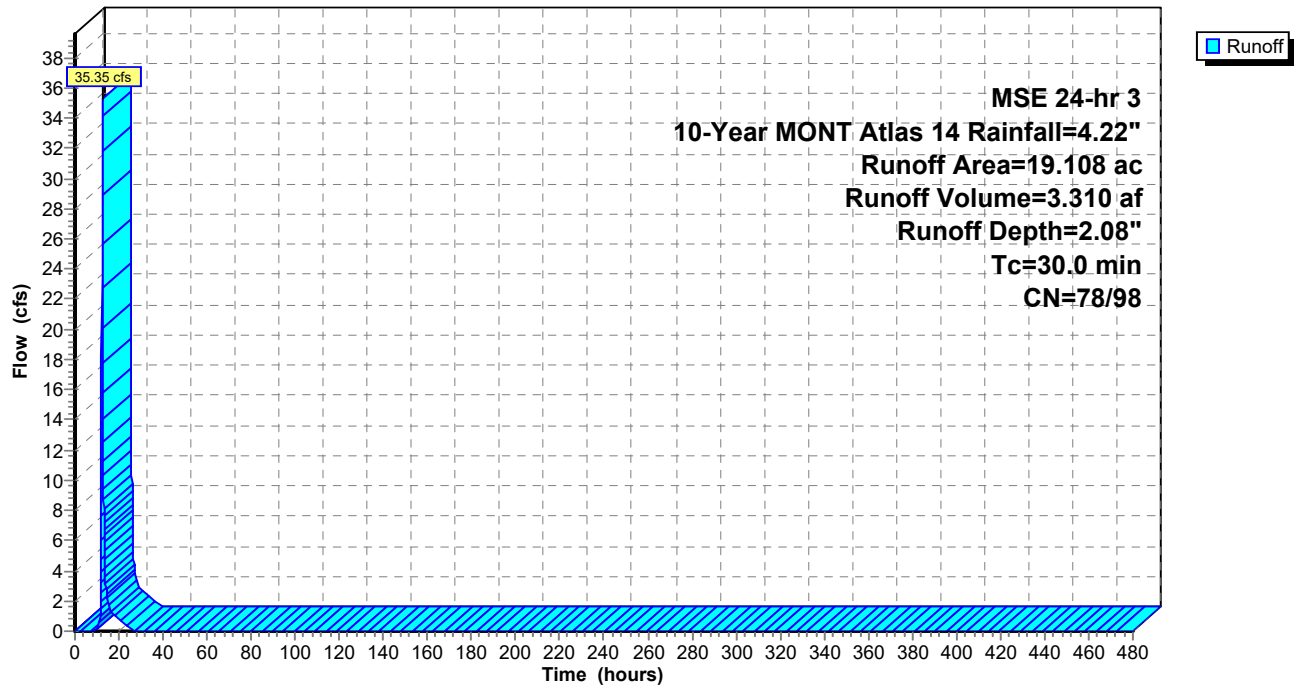
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



Summary for Subcatchment 9S: S Chelsea

Runoff = 89.33 cfs @ 12.56 hrs, Volume= 10.111 af, Depth= 2.27"

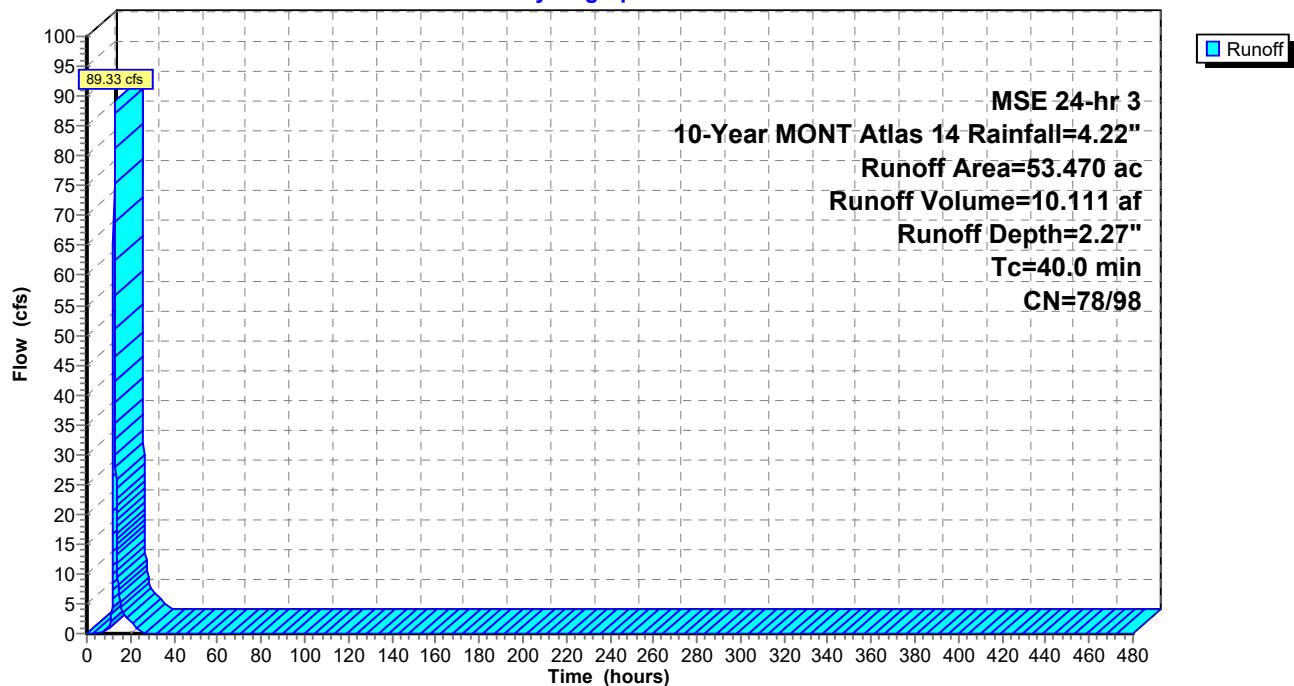
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



Summary for Subcatchment 11S: Chelsea Road

Runoff = 39.49 cfs @ 12.43 hrs, Volume= 3.782 af, Depth= 2.31"

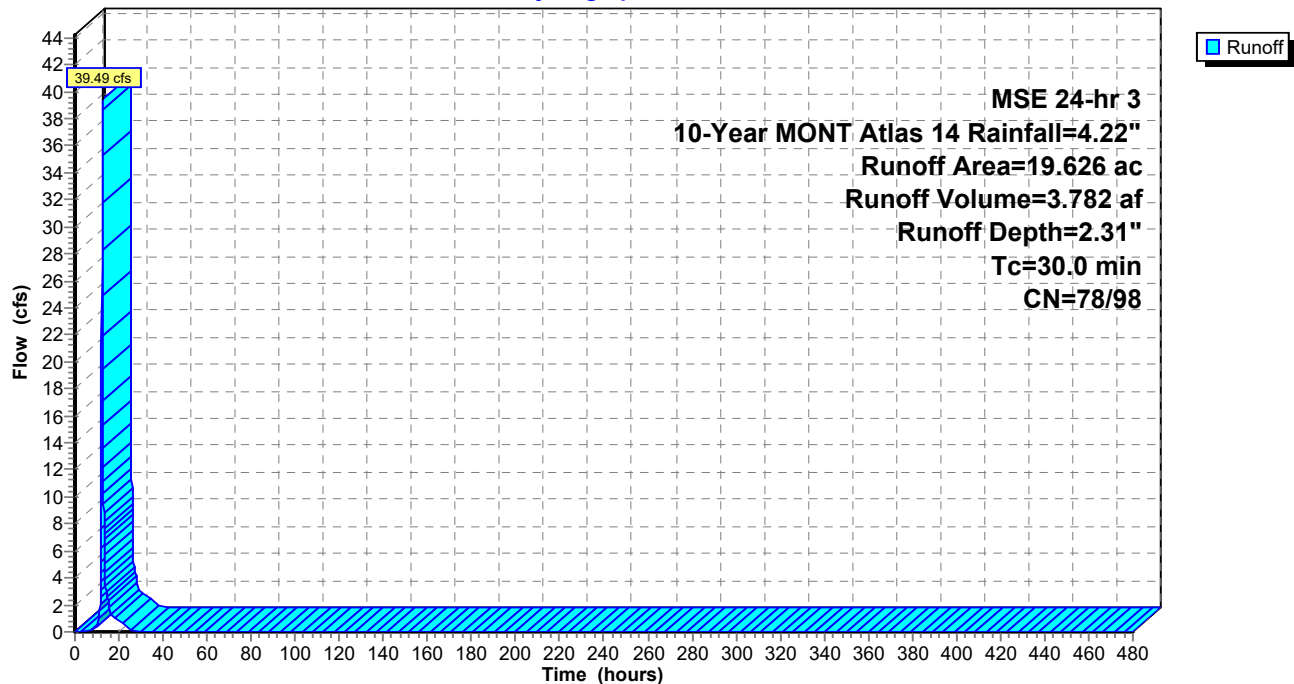
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 23.36 cfs @ 12.23 hrs, Volume= 1.726 af, Depth= 3.53"

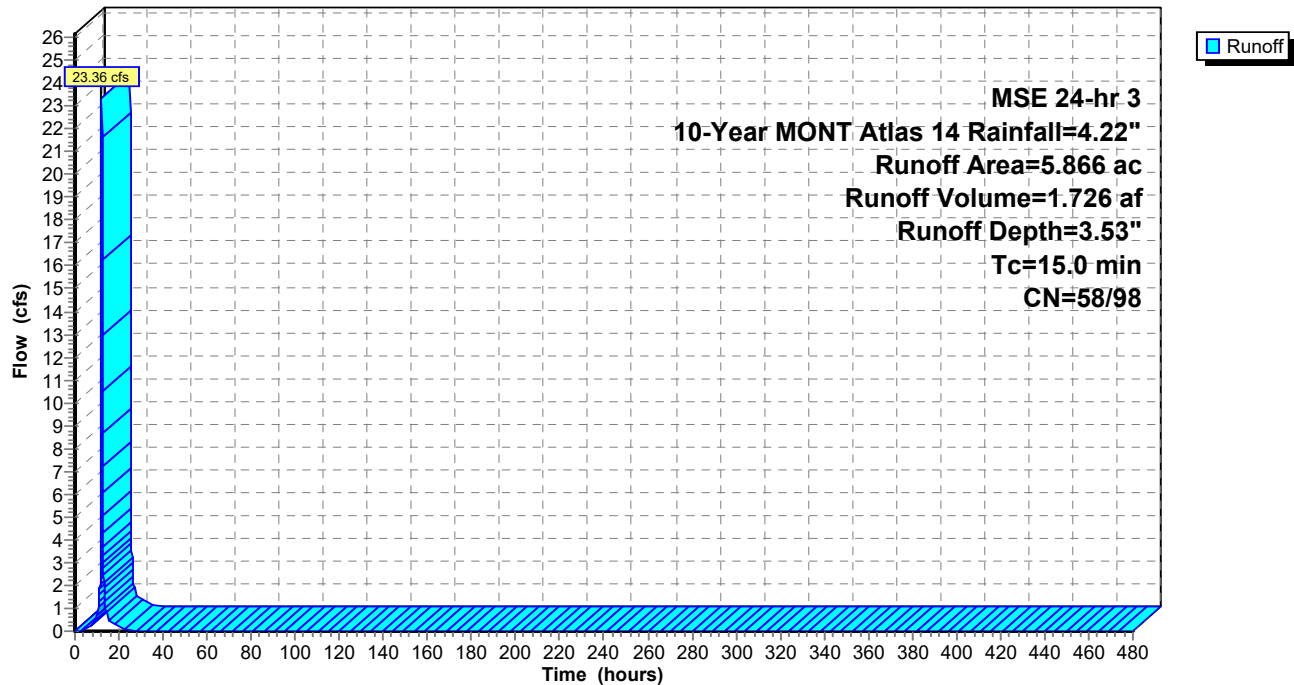
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 65.69 cfs @ 12.27 hrs, Volume= 4.791 af, Depth= 2.34"

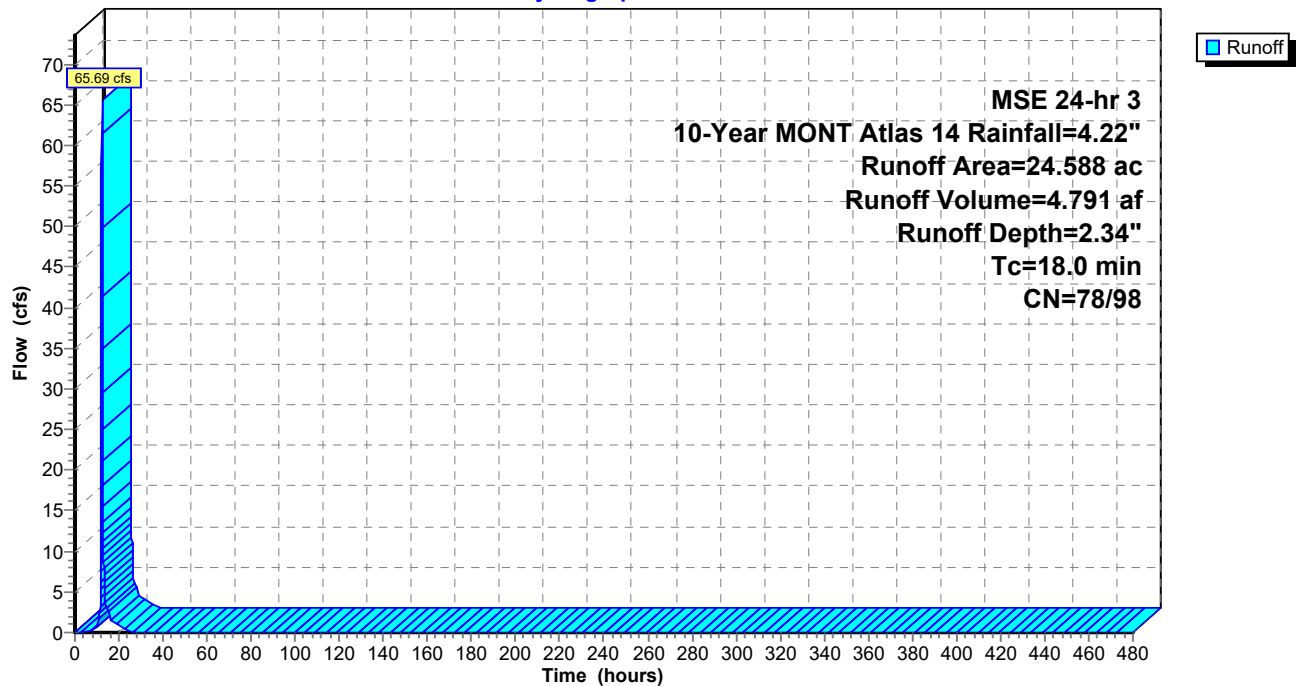
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



Summary for Subcatchment 23S: Dundas

Runoff = 16.82 cfs @ 12.30 hrs, Volume= 1.330 af, Depth= 2.66"

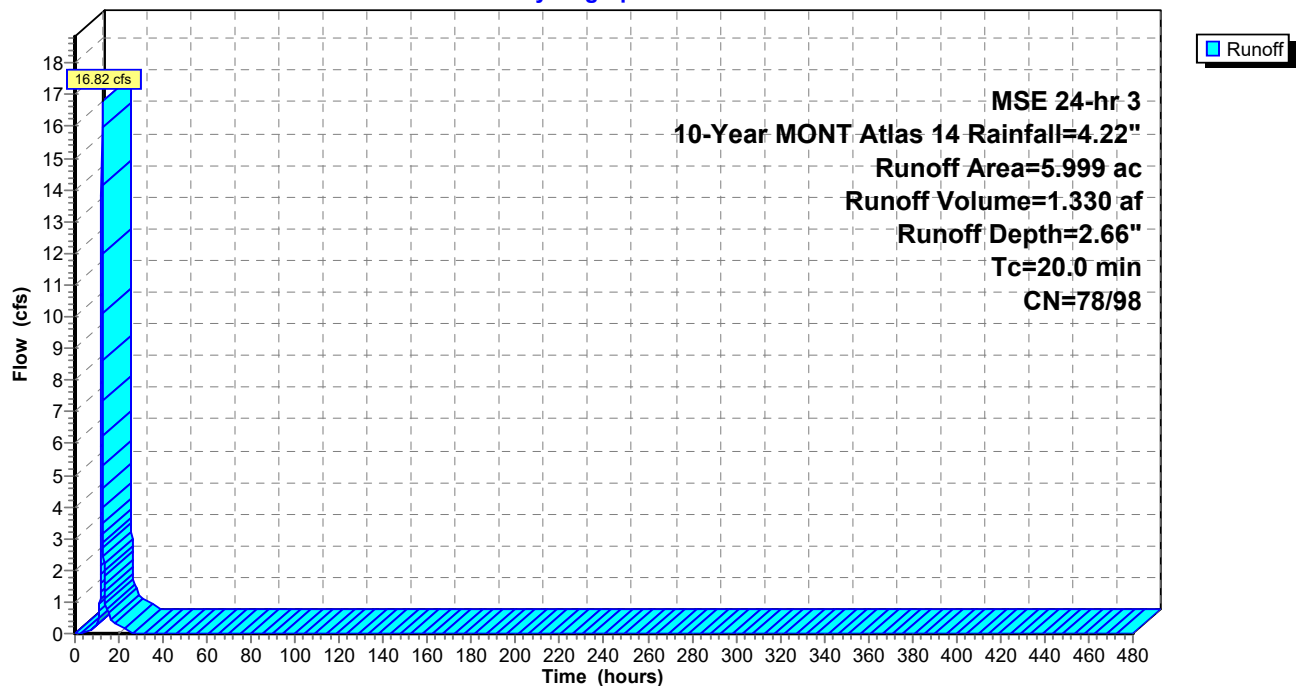
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph

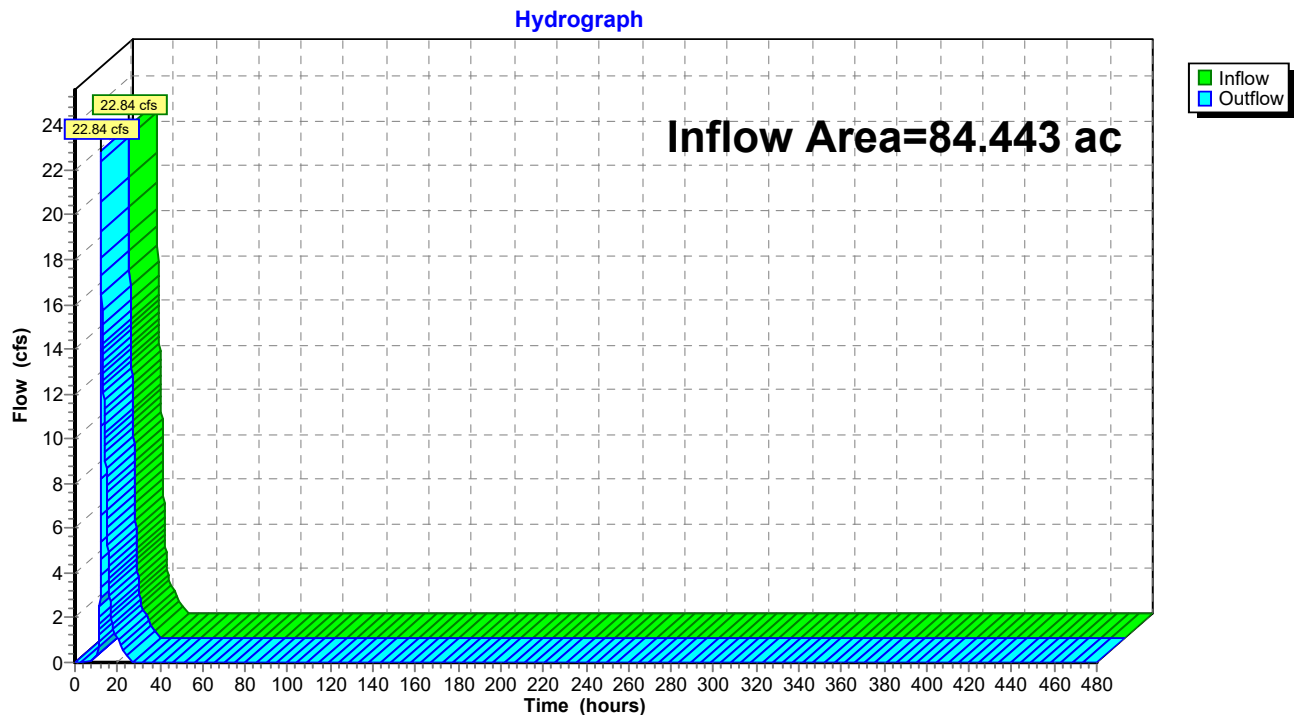


Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.66" for 10-Year MONT Atlas 14 event
Inflow = 22.84 cfs @ 12.33 hrs, Volume= 4.640 af
Outflow = 22.84 cfs @ 12.33 hrs, Volume= 4.640 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



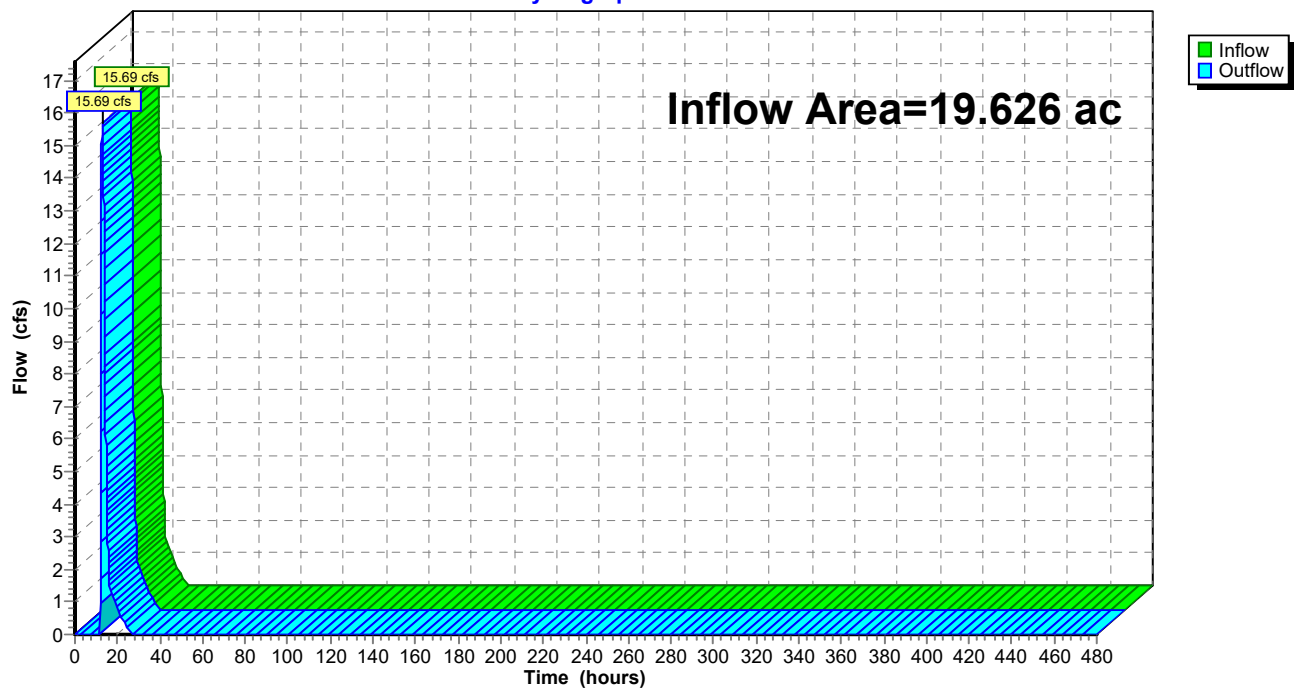
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 2.07" for 10-Year MONT Atlas 14 event
Inflow = 15.69 cfs @ 12.88 hrs, Volume= 3.383 af
Outflow = 15.69 cfs @ 12.88 hrs, Volume= 3.383 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph

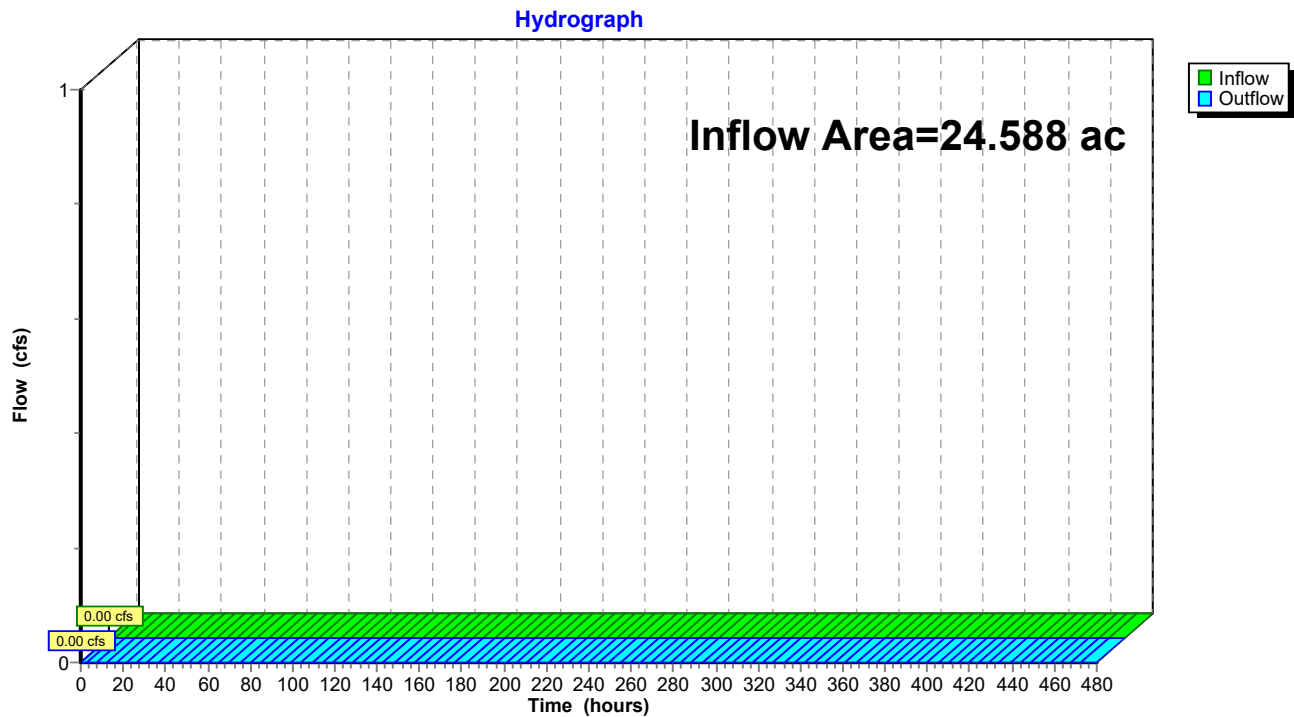


Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.00" for 10-Year MONT Atlas 14 event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE



Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 3.53" for 10-Year MONT Atlas 14 event
 Inflow = 23.36 cfs @ 12.23 hrs, Volume= 1.726 af
 Outflow = 10.72 cfs @ 12.45 hrs, Volume= 1.270 af, Atten= 54%, Lag= 13.4 min
 Primary = 10.72 cfs @ 12.45 hrs, Volume= 1.270 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.32' @ 12.45 hrs Surf.Area= 0.539 ac Storage= 0.631 af

Plug-Flow detention time= 74.4 min calculated for 1.270 af (74% of inflow)
 Center-of-Mass det. time= 9.1 min (768.3 - 759.2)

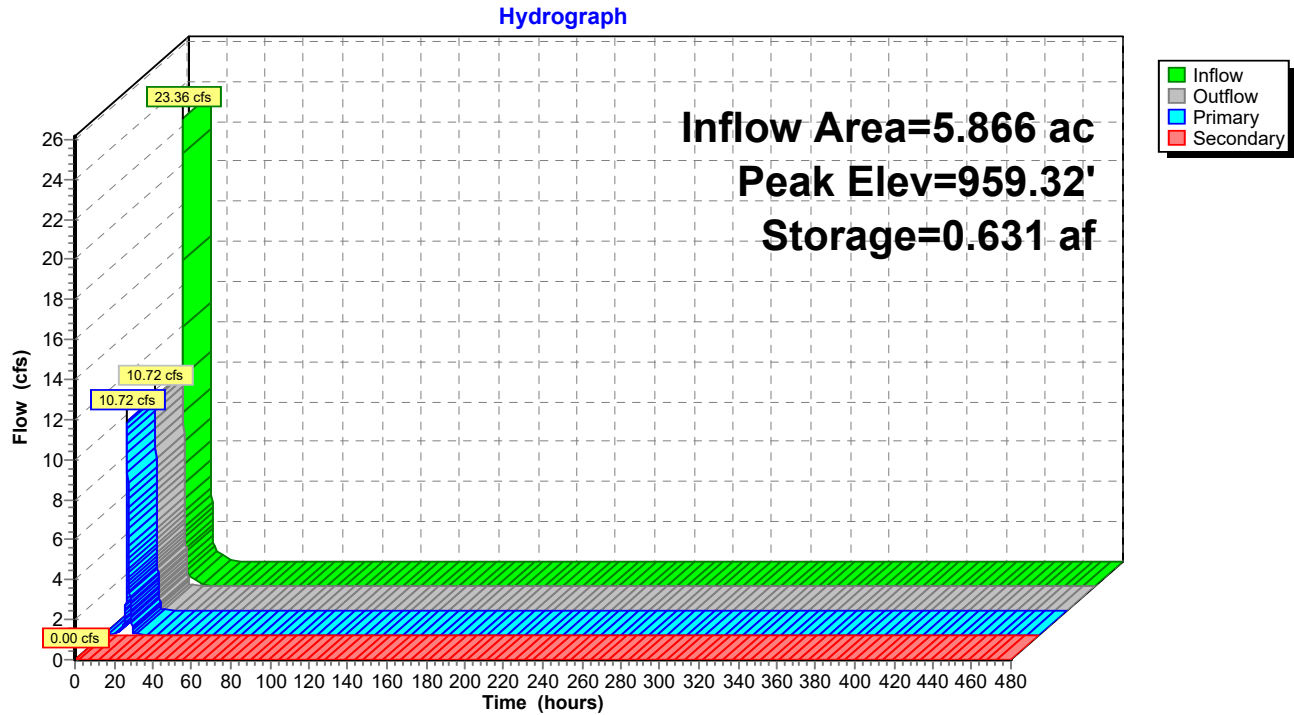
Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=10.72 cfs @ 12.45 hrs HW=959.32' TW=955.72' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 10.72 cfs @ 4.88 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 16P: TH-28A Walmart Existing Pond



Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 2.34" for 10-Year MONT Atlas 14 event
 Inflow = 65.69 cfs @ 12.27 hrs, Volume= 4.791 af
 Outflow = 0.77 cfs @ 21.10 hrs, Volume= 4.791 af, Atten= 99%, Lag= 529.5 min
 Discarded = 0.77 cfs @ 21.10 hrs, Volume= 4.791 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.68' @ 21.10 hrs Surf.Area= 1.701 ac Storage= 4.082 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 4,029.9 min (4,834.9 - 805.0)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

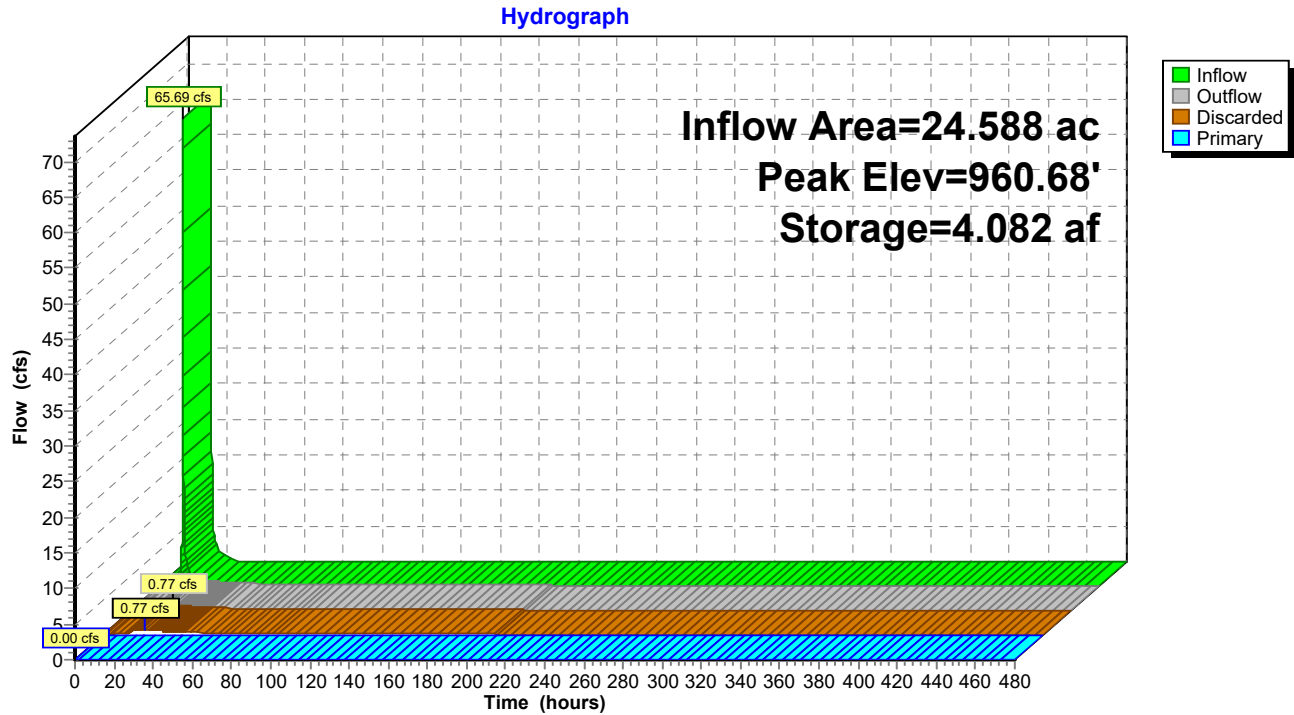
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65			
2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88			

Discarded OutFlow Max=0.77 cfs @ 21.10 hrs HW=960.68' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.77 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=954.00' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 17P: School Blvd Pond



Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 2.08" for 10-Year MONT Atlas 14 event
 Inflow = 35.35 cfs @ 12.44 hrs, Volume= 3.310 af
 Outflow = 10.87 cfs @ 13.02 hrs, Volume= 3.310 af, Atten= 69%, Lag= 35.1 min
 Primary = 10.87 cfs @ 13.02 hrs, Volume= 3.310 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.04' @ 13.02 hrs Surf.Area= 1.101 ac Storage= 1.260 af

Plug-Flow detention time= 58.6 min calculated for 3.310 af (100% of inflow)
 Center-of-Mass det. time= 58.7 min (888.8 - 830.2)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

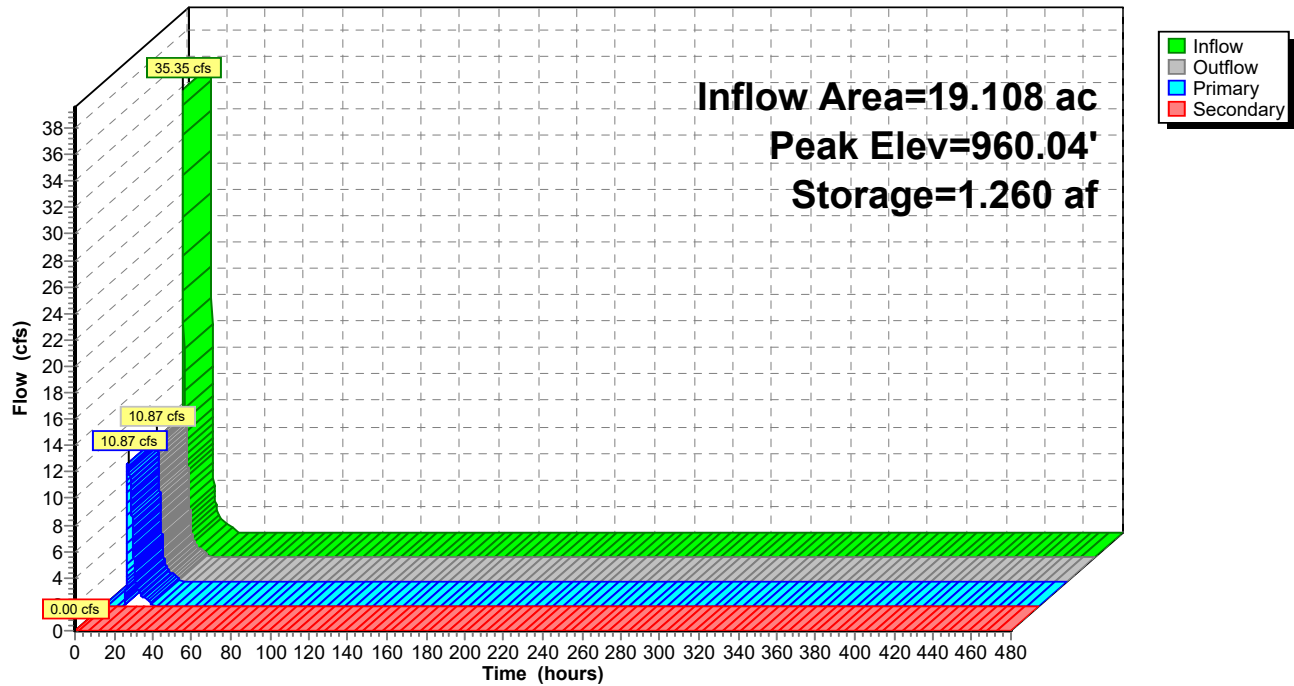
Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=10.87 cfs @ 13.02 hrs HW=960.04' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Inlet Controls 10.87 cfs @ 6.15 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 18P: N Chelsea

Hydrograph



Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 2.31" for 10-Year MONT Atlas 14 event
 Inflow = 39.49 cfs @ 12.43 hrs, Volume= 3.782 af
 Outflow = 15.88 cfs @ 12.88 hrs, Volume= 3.782 af, Atten= 60%, Lag= 27.2 min
 Discarded = 0.19 cfs @ 12.88 hrs, Volume= 0.399 af
 Primary = 15.69 cfs @ 12.88 hrs, Volume= 3.383 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 957.28' @ 12.88 hrs Surf.Area= 0.417 ac Storage= 1.434 af

Plug-Flow detention time= 205.5 min calculated for 3.781 af (100% of inflow)
 Center-of-Mass det. time= 205.9 min (1,023.3 - 817.4)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

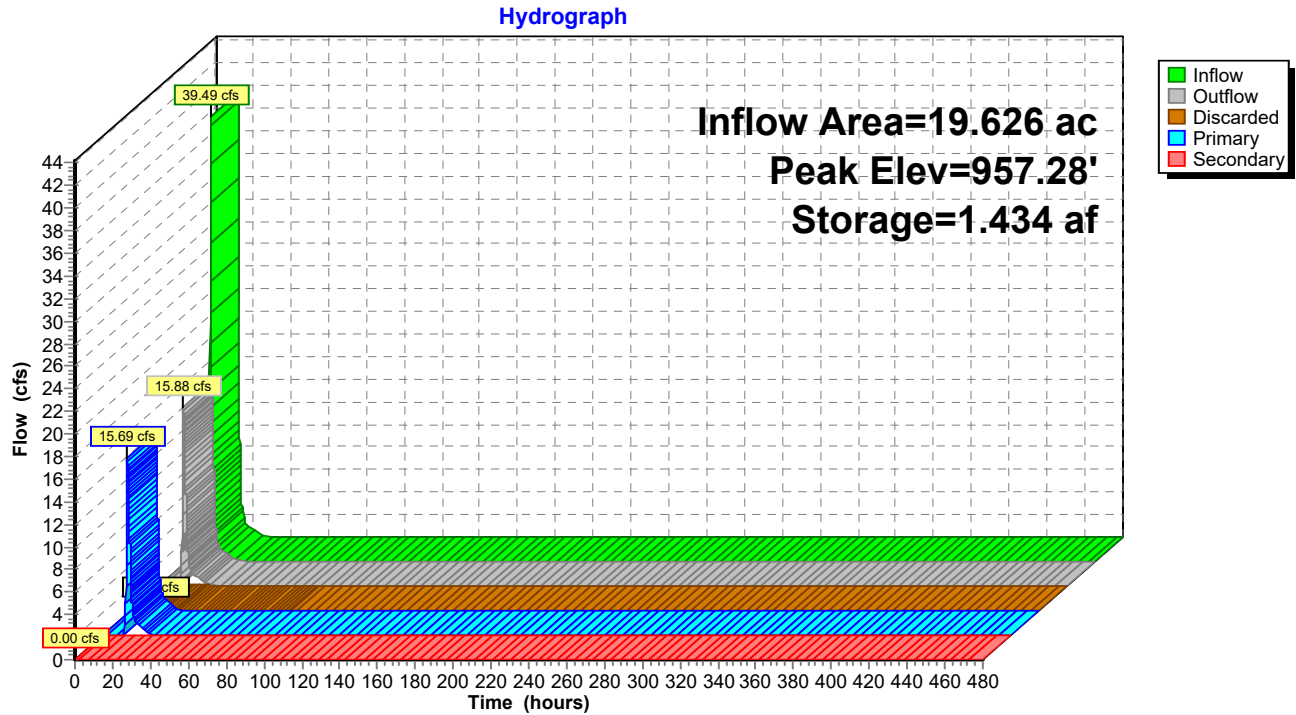
Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.19 cfs @ 12.88 hrs HW=957.28' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=15.68 cfs @ 12.88 hrs HW=957.28' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Inlet Controls 15.68 cfs @ 8.88 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 19P: Chelsea Road Pond



Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 2.30" for 10-Year MONT Atlas 14 event
 Inflow = 99.62 cfs @ 12.56 hrs, Volume= 11.381 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 958.99' @ 480.00 hrs Surf.Area= 6.335 ac Storage= 13.632 af (11.381 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)

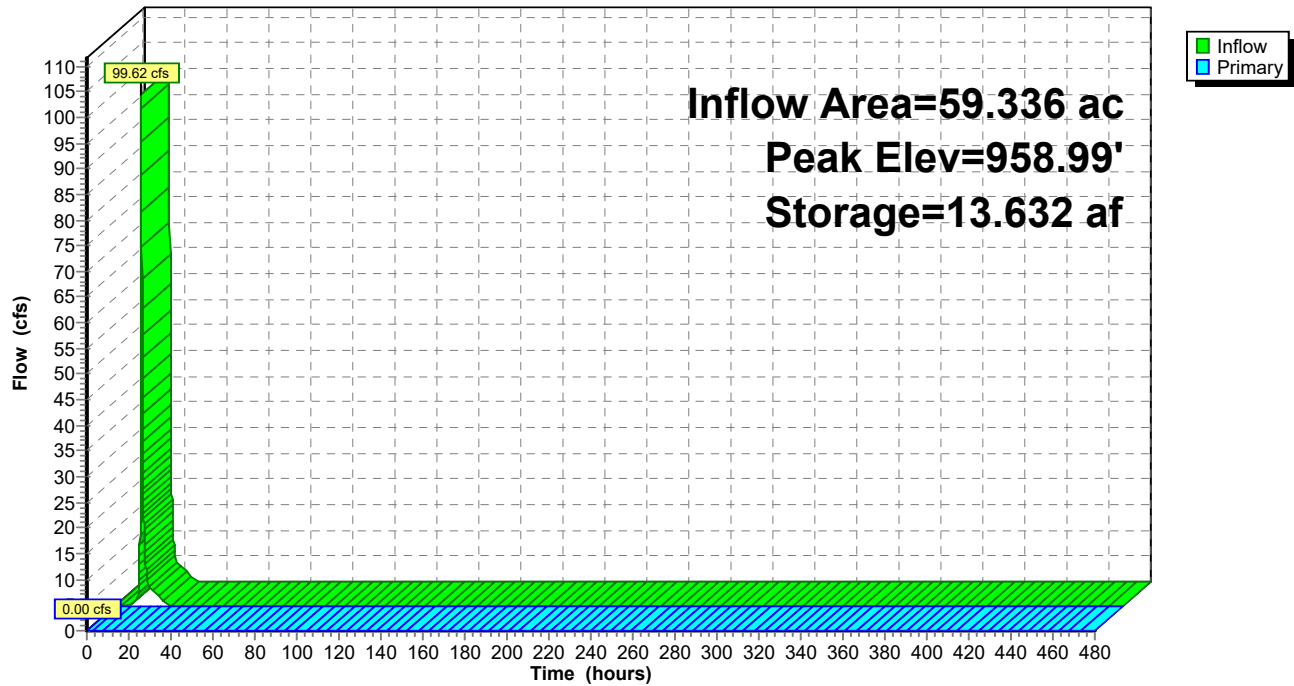
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 20P: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 166

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=2.88"
Tc=30.0 min CN=78/98 Runoff=49.18 cfs 4.588 af

Subcatchment9S: S Chelsea Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=3.09"
Tc=40.0 min CN=78/98 Runoff=122.19 cfs 13.757 af

Subcatchment11S: Chelsea Road Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=3.13"
Tc=30.0 min CN=78/98 Runoff=53.74 cfs 5.126 af

Subcatchment12S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=4.42"
Tc=15.0 min CN=58/98 Runoff=29.17 cfs 2.163 af

Subcatchment13S: School and Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=3.16"
Tc=18.0 min CN=78/98 Runoff=89.06 cfs 6.479 af

Subcatchment23S: Dundas Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=3.51"
Tc=20.0 min CN=78/98 Runoff=22.24 cfs 1.755 af

Reach 14R: To TH-01 Existing Landlocked Basin Inflow=30.17 cfs 6.344 af
Outflow=30.17 cfs 6.344 af

Reach 15R: West Inflow=18.52 cfs 4.711 af
Outflow=18.52 cfs 4.711 af

Reach 24R: SE Inflow=1.62 cfs 0.710 af
Outflow=1.62 cfs 0.710 af

Pond 16P: TH-28A Walmart Existing Pond Peak Elev=959.54' Storage=0.753 af Inflow=29.17 cfs 2.163 af
Primary=13.71 cfs 1.429 af Secondary=0.00 cfs 0.000 af Outflow=13.71 cfs 1.429 af

Pond 17P: School Blvd Pond Peak Elev=961.17' Storage=5.053 af Inflow=89.06 cfs 6.479 af
Discarded=1.05 cfs 5.769 af Primary=1.62 cfs 0.710 af Outflow=2.66 cfs 6.479 af

Pond 18P: N Chelsea Peak Elev=960.52' Storage=1.930 af Inflow=49.18 cfs 4.588 af
Primary=12.36 cfs 4.588 af Secondary=0.00 cfs 0.000 af Outflow=12.36 cfs 4.588 af

Pond 19P: Chelsea Road Pond Peak Elev=958.62' Storage=2.046 af Inflow=53.74 cfs 5.126 af
Discarded=0.23 cfs 0.415 af Primary=18.52 cfs 4.711 af Secondary=0.00 cfs 0.000 af Outflow=18.75 cfs 5.126 af

Pond 20P: S Chelsea Peak Elev=959.51' Storage=17.437 af Inflow=135.36 cfs 15.186 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 33.868 af Average Runoff Depth = 3.16"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 167

Summary for Subcatchment 8S: N Chelsea

Runoff = 49.18 cfs @ 12.43 hrs, Volume= 4.588 af, Depth= 2.88"

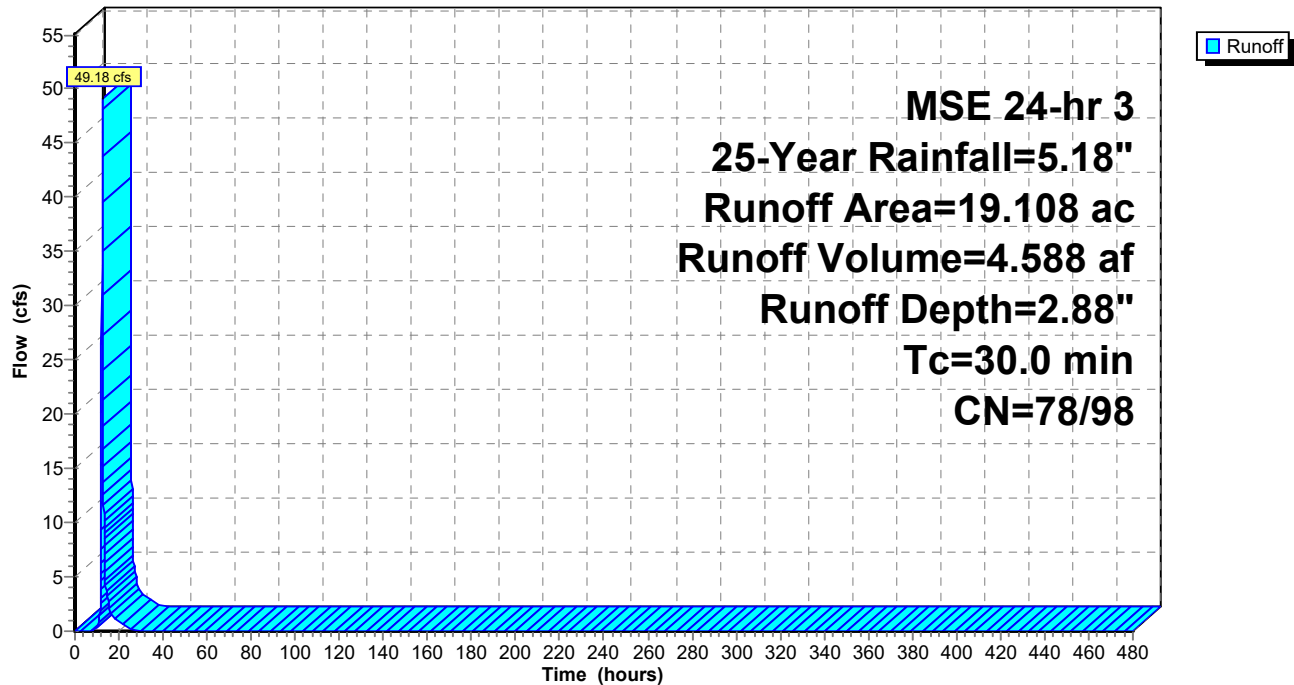
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 168

Summary for Subcatchment 9S: S Chelsea

Runoff = 122.19 cfs @ 12.56 hrs, Volume= 13.757 af, Depth= 3.09"

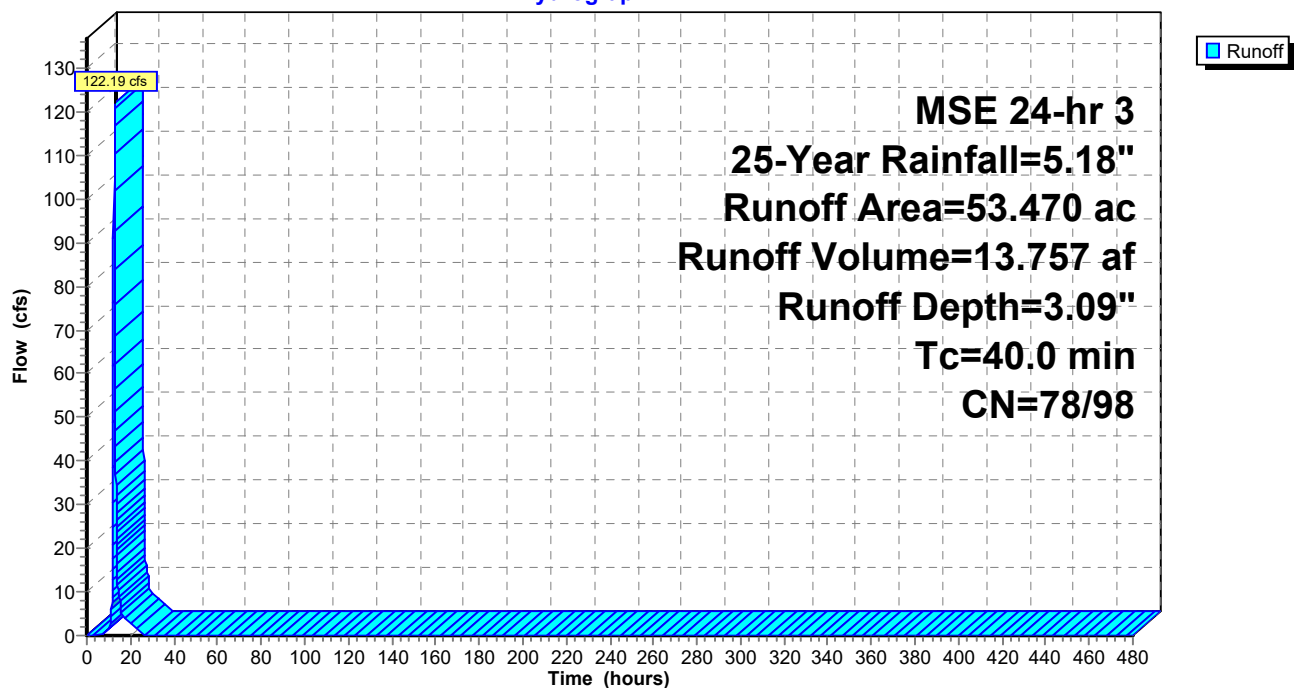
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 169

Summary for Subcatchment 11S: Chelsea Road

Runoff = 53.74 cfs @ 12.43 hrs, Volume= 5.126 af, Depth= 3.13"

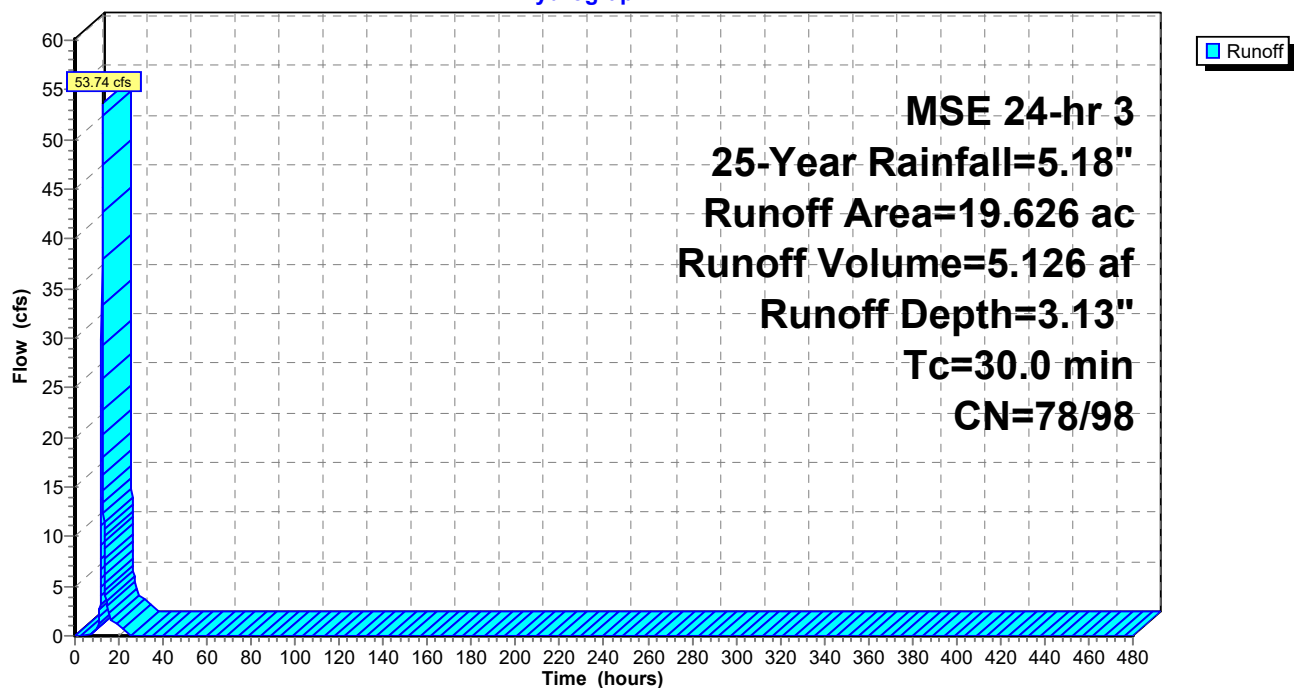
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 170

Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 29.17 cfs @ 12.23 hrs, Volume= 2.163 af, Depth= 4.42"

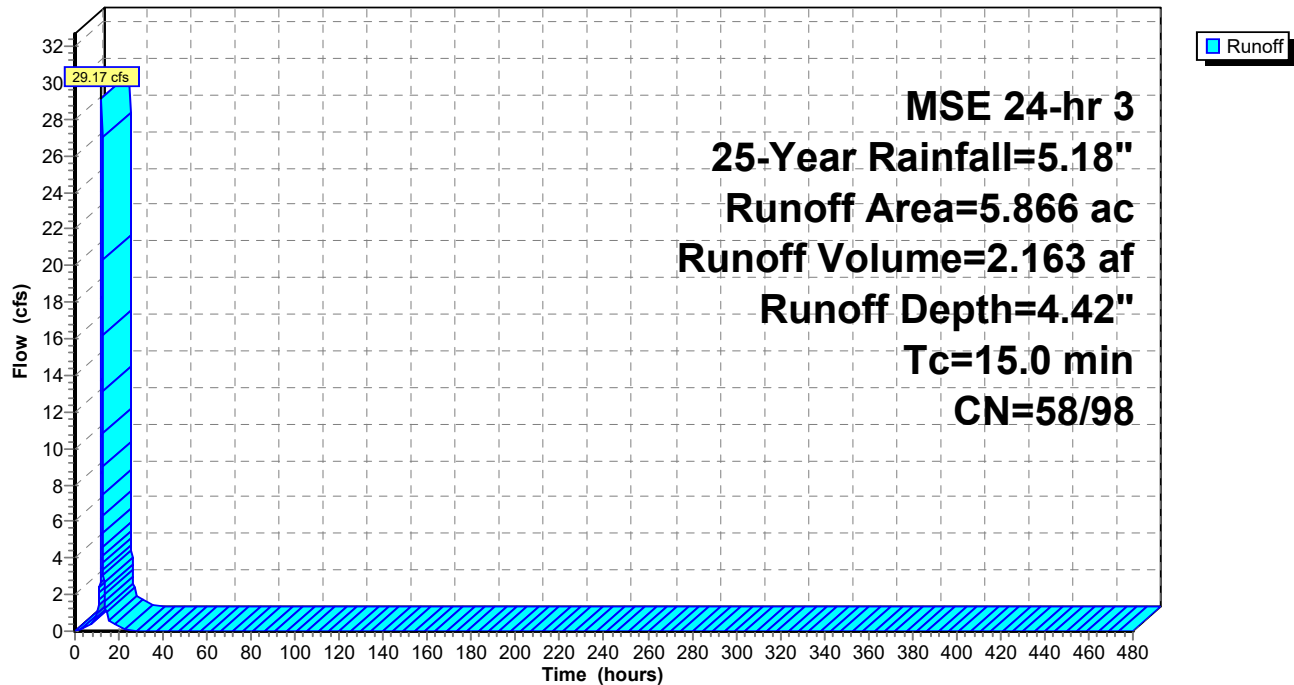
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 171

Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 89.06 cfs @ 12.27 hrs, Volume= 6.479 af, Depth= 3.16"

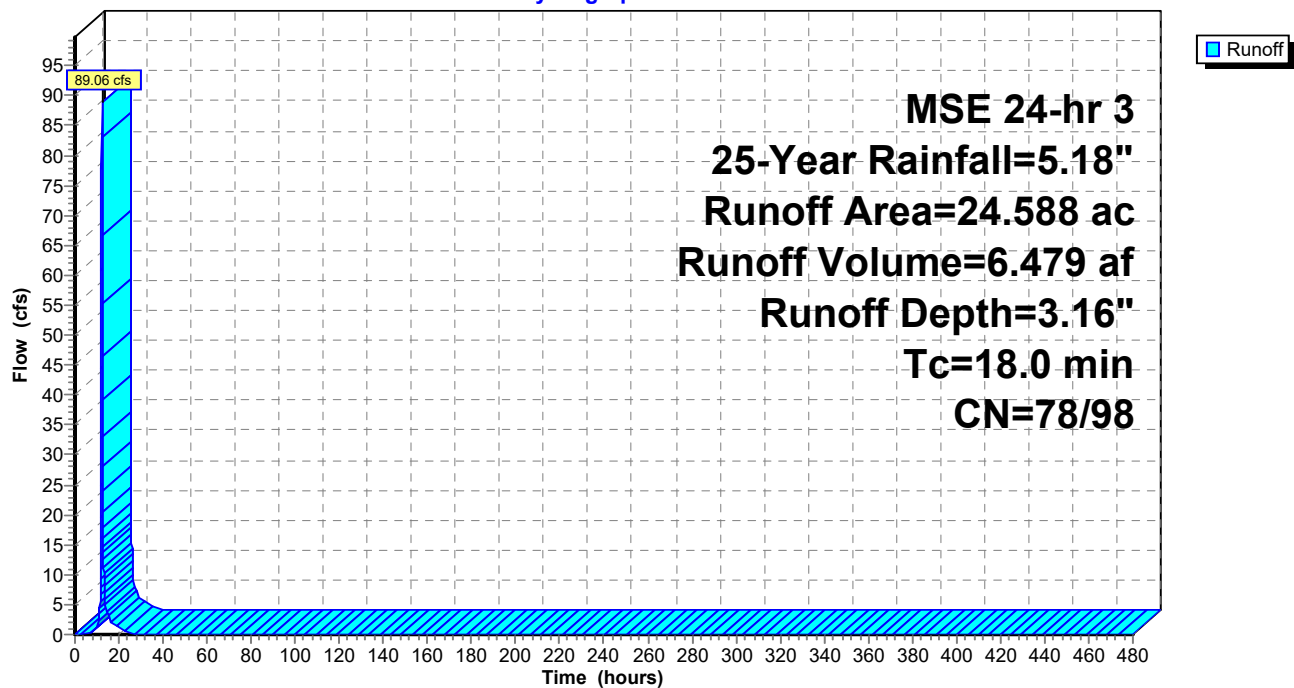
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 172

Summary for Subcatchment 23S: Dundas

Runoff = 22.24 cfs @ 12.29 hrs, Volume= 1.755 af, Depth= 3.51"

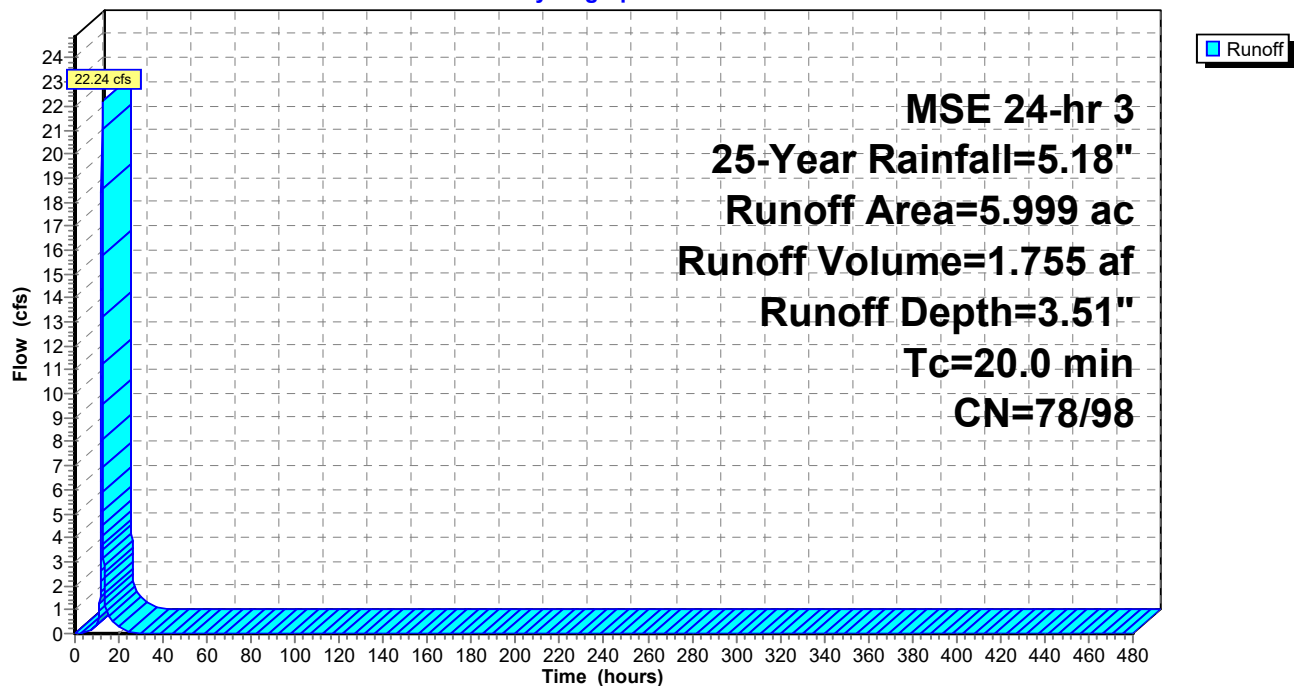
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

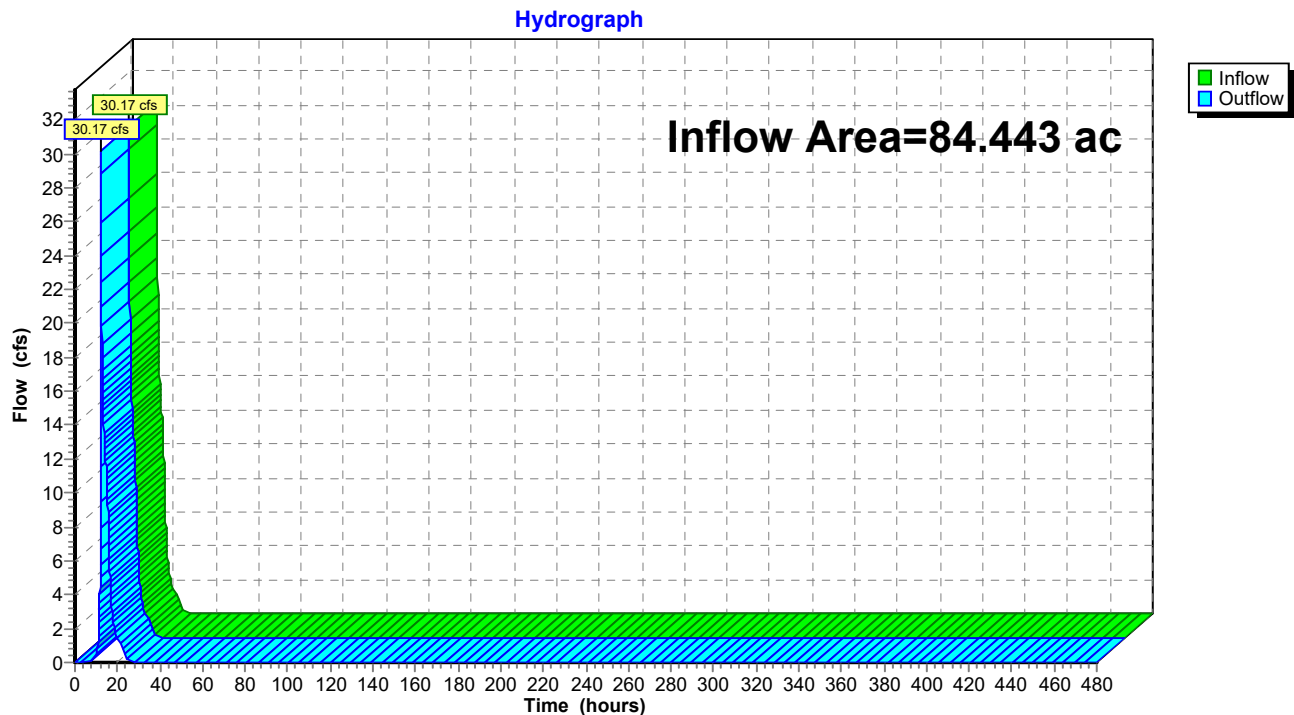
Page 173

Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 0.90" for 25-Year event
Inflow = 30.17 cfs @ 12.32 hrs, Volume= 6.344 af
Outflow = 30.17 cfs @ 12.32 hrs, Volume= 6.344 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 174

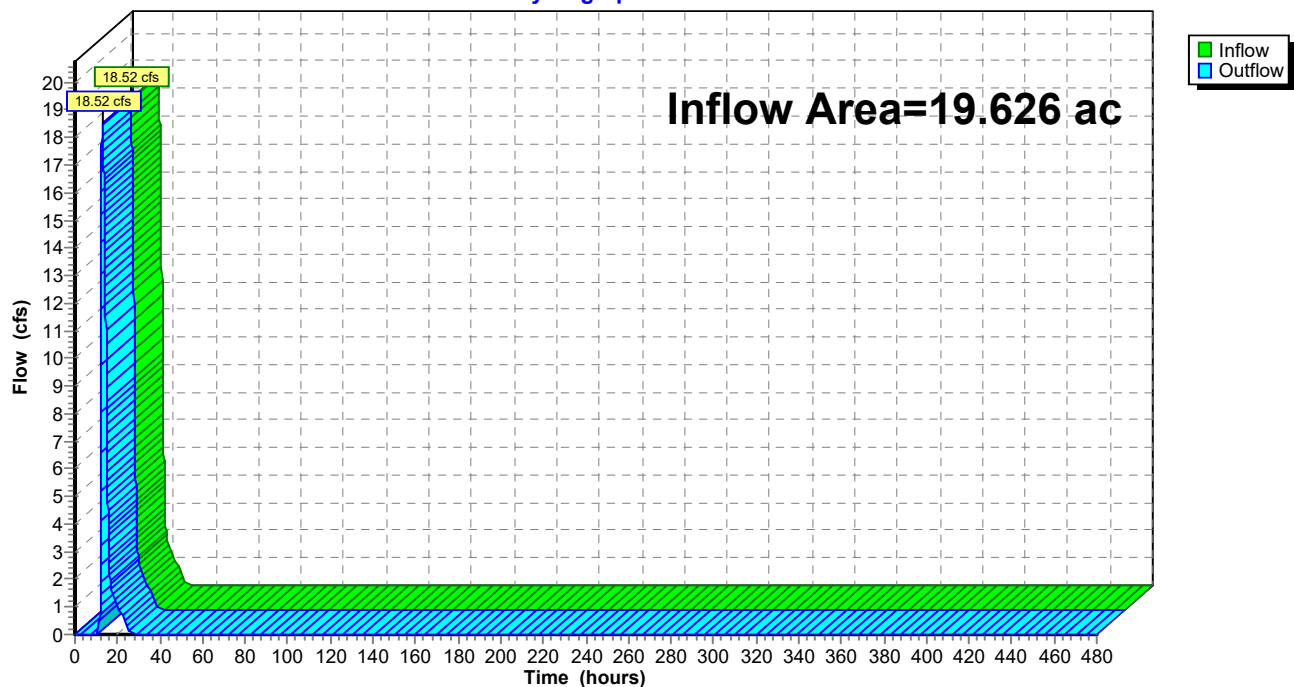
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 2.88" for 25-Year event
Inflow = 18.52 cfs @ 12.94 hrs, Volume= 4.711 af
Outflow = 18.52 cfs @ 12.94 hrs, Volume= 4.711 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 175

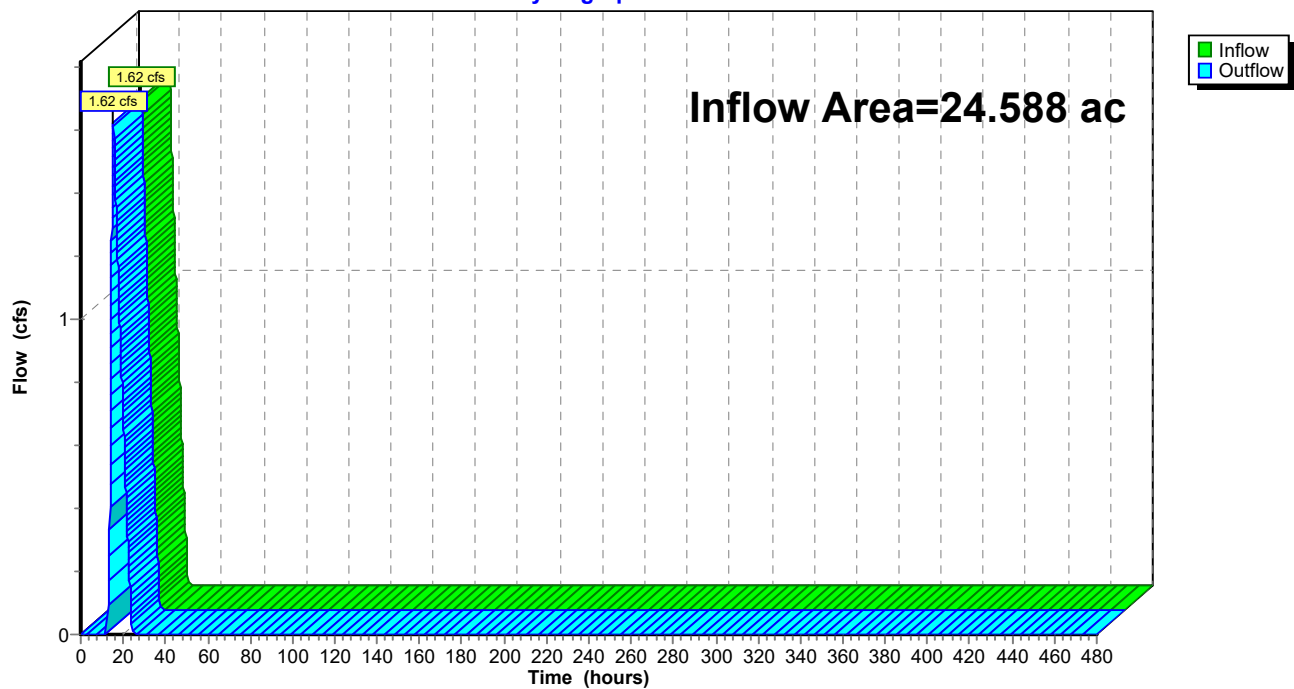
Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 0.35" for 25-Year event
Inflow = 1.62 cfs @ 15.31 hrs, Volume= 0.710 af
Outflow = 1.62 cfs @ 15.31 hrs, Volume= 0.710 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 176

Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 4.42" for 25-Year event
 Inflow = 29.17 cfs @ 12.23 hrs, Volume= 2.163 af
 Outflow = 13.71 cfs @ 12.44 hrs, Volume= 1.429 af, Atten= 53%, Lag= 13.0 min
 Primary = 13.71 cfs @ 12.44 hrs, Volume= 1.429 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.54' @ 12.44 hrs Surf.Area= 0.559 ac Storage= 0.753 af

Plug-Flow detention time= 88.5 min calculated for 1.429 af (66% of inflow)
 Center-of-Mass det. time= 12.8 min (769.7 - 757.0)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=13.69 cfs @ 12.44 hrs HW=959.54' TW=956.67' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 13.69 cfs @ 5.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

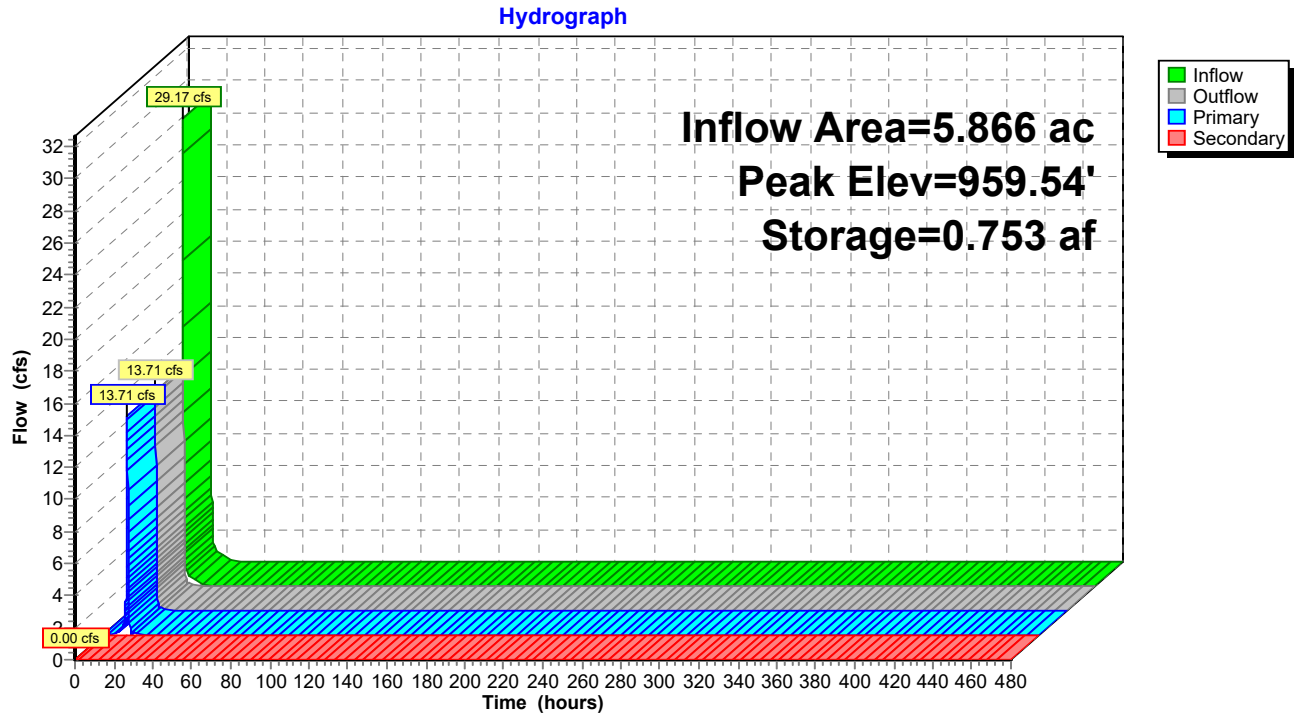
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 177

Pond 16P: TH-28A Walmart Existing Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 178

Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 3.16" for 25-Year event
 Inflow = 89.06 cfs @ 12.27 hrs, Volume= 6.479 af
 Outflow = 2.66 cfs @ 15.31 hrs, Volume= 6.479 af, Atten= 97%, Lag= 182.4 min
 Discarded = 1.05 cfs @ 15.31 hrs, Volume= 5.769 af
 Primary = 1.62 cfs @ 15.31 hrs, Volume= 0.710 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 961.17' @ 15.31 hrs Surf.Area= 2.305 ac Storage= 5.053 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 3,480.7 min (4,281.2 - 800.4)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=1.05 cfs @ 15.31 hrs HW=961.17' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 1.05 cfs)

Primary OutFlow Max=1.62 cfs @ 15.31 hrs HW=961.17' TW=0.00' (Dynamic Tailwater)

↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 1.62 cfs @ 0.96 fps)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

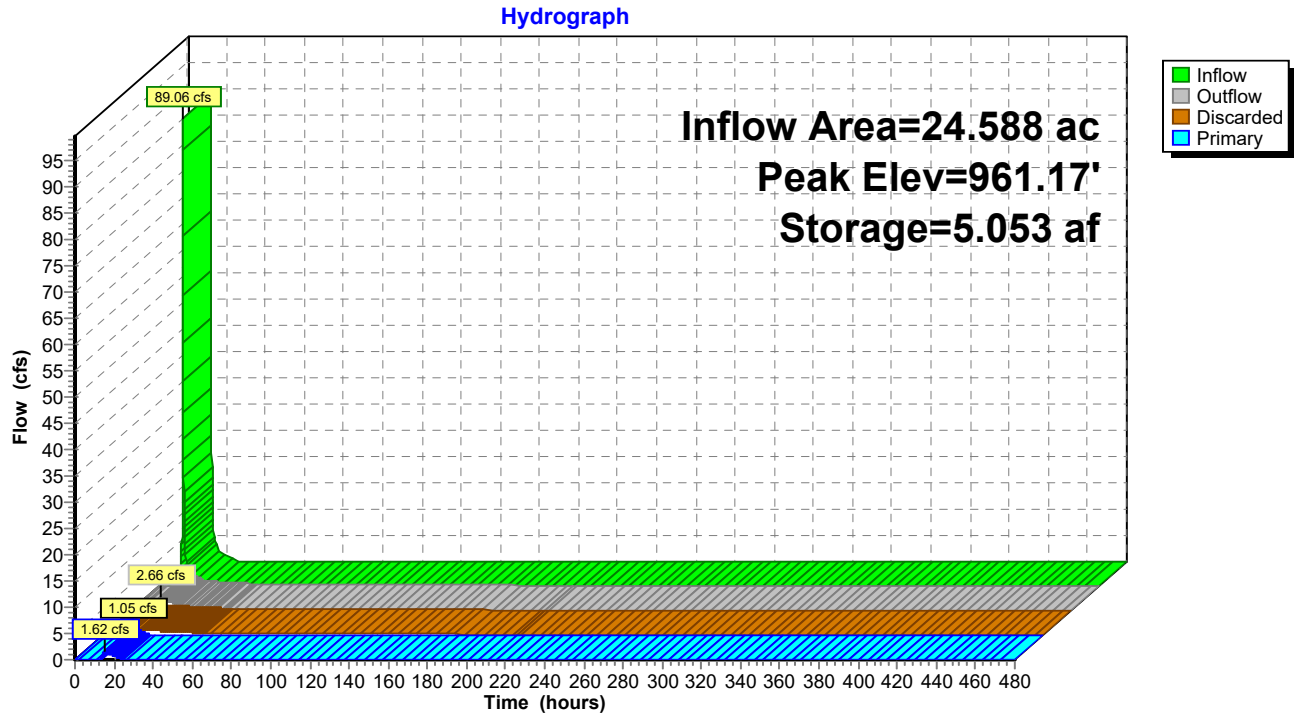
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 179

Pond 17P: School Blvd Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 180

Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 2.88" for 25-Year event
 Inflow = 49.18 cfs @ 12.43 hrs, Volume= 4.588 af
 Outflow = 12.36 cfs @ 13.12 hrs, Volume= 4.588 af, Atten= 75%, Lag= 41.0 min
 Primary = 12.36 cfs @ 13.12 hrs, Volume= 4.588 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.52' @ 13.12 hrs Surf.Area= 1.693 ac Storage= 1.930 af

Plug-Flow detention time= 74.0 min calculated for 4.588 af (100% of inflow)
 Center-of-Mass det. time= 74.0 min (897.7 - 823.6)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=12.36 cfs @ 13.12 hrs HW=960.52' TW=0.00' (Dynamic Tailwater)
 ↑1=RCP_Round 18" (Inlet Controls 12.36 cfs @ 7.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

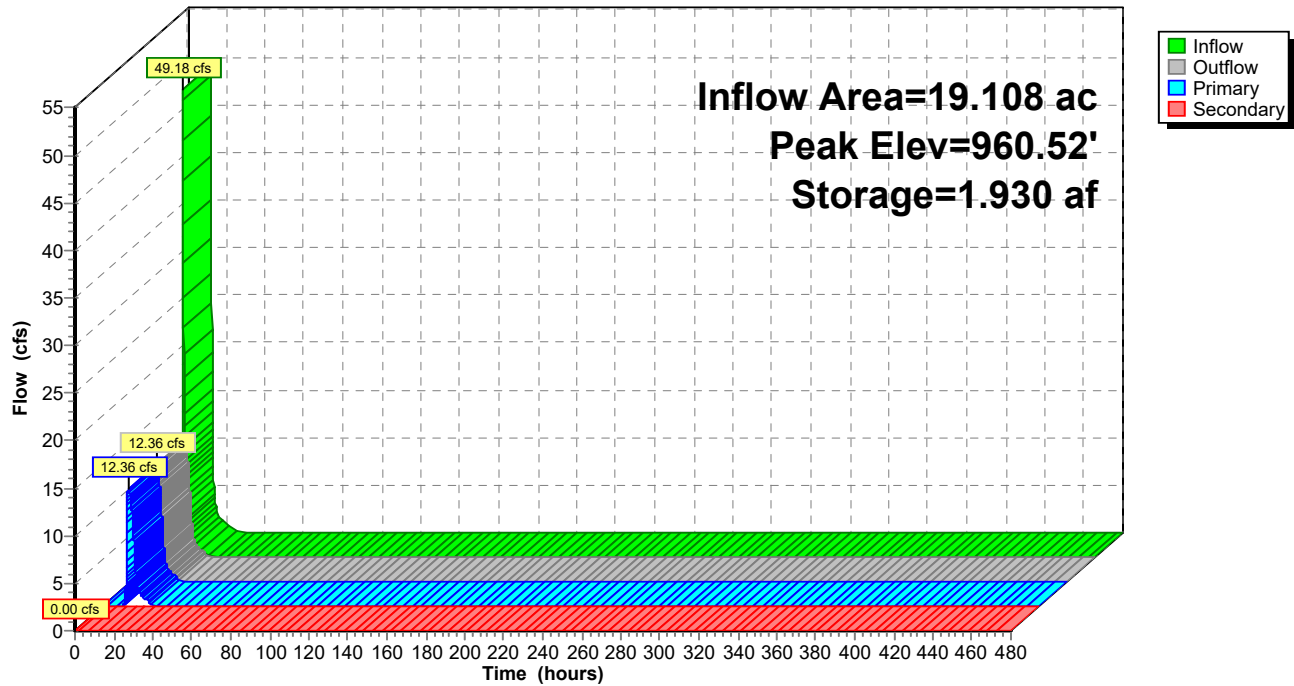
Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 181

Pond 18P: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 182

Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 3.13" for 25-Year event
 Inflow = 53.74 cfs @ 12.43 hrs, Volume= 5.126 af
 Outflow = 18.75 cfs @ 12.94 hrs, Volume= 5.126 af, Atten= 65%, Lag= 30.5 min
 Discarded = 0.23 cfs @ 12.94 hrs, Volume= 0.415 af
 Primary = 18.52 cfs @ 12.94 hrs, Volume= 4.711 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.62' @ 12.94 hrs Surf.Area= 0.497 ac Storage= 2.046 af

Plug-Flow detention time= 172.3 min calculated for 5.125 af (100% of inflow)
 Center-of-Mass det. time= 172.7 min (985.4 - 812.7)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.23 cfs @ 12.94 hrs HW=958.62' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=18.52 cfs @ 12.94 hrs HW=958.62' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Inlet Controls 18.52 cfs @ 10.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

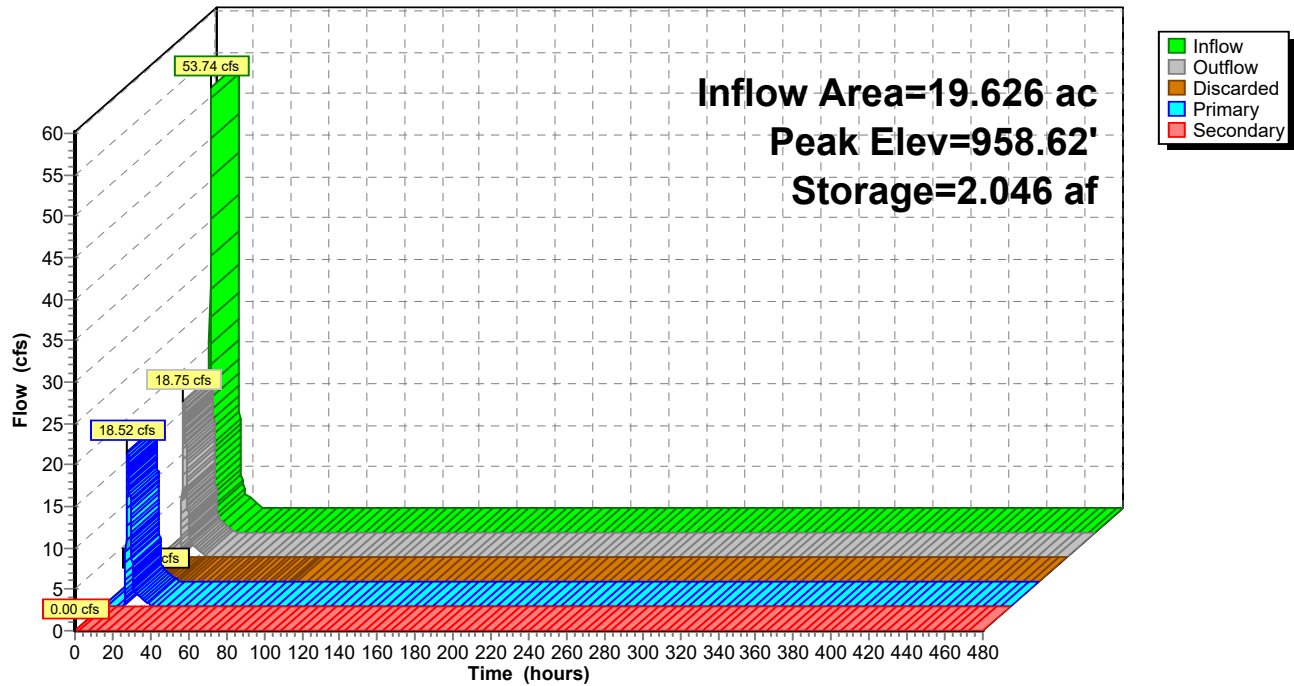
Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 183

Pond 19P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 184

Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 3.07" for 25-Year event
 Inflow = 135.36 cfs @ 12.55 hrs, Volume= 15.186 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af

Peak Elev= 959.51' @ 480.00 hrs Surf.Area= 8.182 ac Storage= 17.437 af (15.186 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

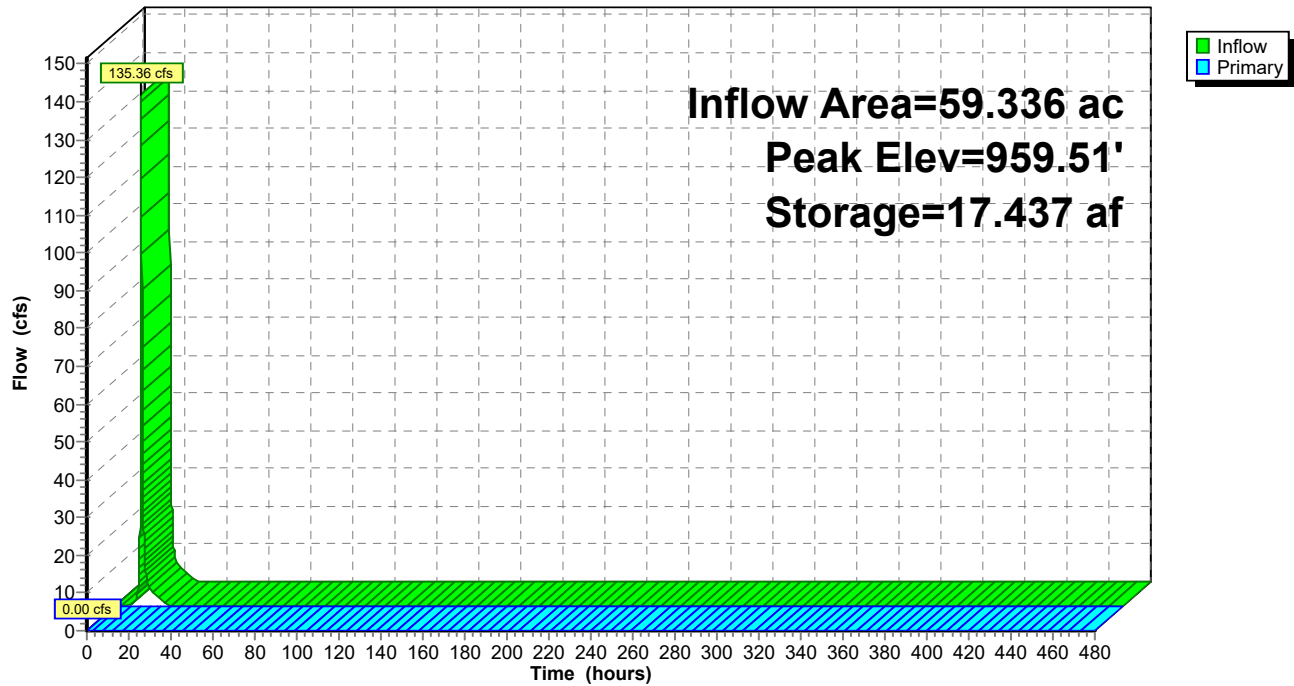
Existing
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 6/8/2021

Page 185

Pond 20P: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 186

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=3.61"
Tc=30.0 min CN=78/98 Runoff=61.65 cfs 5.754 af

Subcatchment9S: S Chelsea Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=3.83"
Tc=40.0 min CN=78/98 Runoff=151.73 cfs 17.067 af

Subcatchment11S: Chelsea Road Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=3.88"
Tc=30.0 min CN=78/98 Runoff=66.59 cfs 6.345 af

Subcatchment12S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=5.22"
Tc=15.0 min CN=58/98 Runoff=34.32 cfs 2.550 af

Subcatchment13S: School and Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=3.91"
Tc=18.0 min CN=78/98 Runoff=110.00 cfs 8.009 af

Subcatchment23S: Dundas Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=4.28"
Tc=20.0 min CN=78/98 Runoff=27.07 cfs 2.138 af

Reach 14R: To TH-01 Existing Landlocked Basin Inflow=36.18 cfs 7.892 af
Outflow=36.18 cfs 7.892 af

Reach 15R: West Inflow=20.51 cfs 5.915 af
Outflow=20.51 cfs 5.915 af

Reach 24R: SE Inflow=6.35 cfs 2.127 af
Outflow=6.35 cfs 2.127 af

Pond 16P: TH-28A Walmart Existing Pond Peak Elev=959.90' Storage=0.960 af Inflow=34.32 cfs 2.550 af
Primary=16.18 cfs 1.592 af Secondary=0.00 cfs 0.000 af Outflow=16.18 cfs 1.590 af

Pond 17P: School Blvd Pond Peak Elev=961.40' Storage=5.622 af Inflow=110.00 cfs 8.009 af
Discarded=1.18 cfs 5.882 af Primary=6.35 cfs 2.127 af Outflow=7.52 cfs 8.009 af

Pond 18P: N Chelsea Peak Elev=960.86' Storage=2.585 af Inflow=61.65 cfs 5.754 af
Primary=13.33 cfs 5.754 af Secondary=0.00 cfs 0.000 af Outflow=13.33 cfs 5.754 af

Pond 19P: Chelsea Road Pond Peak Elev=959.69' Storage=2.629 af Inflow=66.59 cfs 6.345 af
Discarded=0.27 cfs 0.430 af Primary=20.51 cfs 5.915 af Secondary=0.00 cfs 0.000 af Outflow=20.79 cfs 6.345 af

Pond 20P: S Chelsea Peak Elev=959.90' Storage=20.910 af Inflow=167.35 cfs 18.660 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 41.862 af Average Runoff Depth = 3.90"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 187

Summary for Subcatchment 8S: N Chelsea

Runoff = 61.65 cfs @ 12.43 hrs, Volume= 5.754 af, Depth= 3.61"

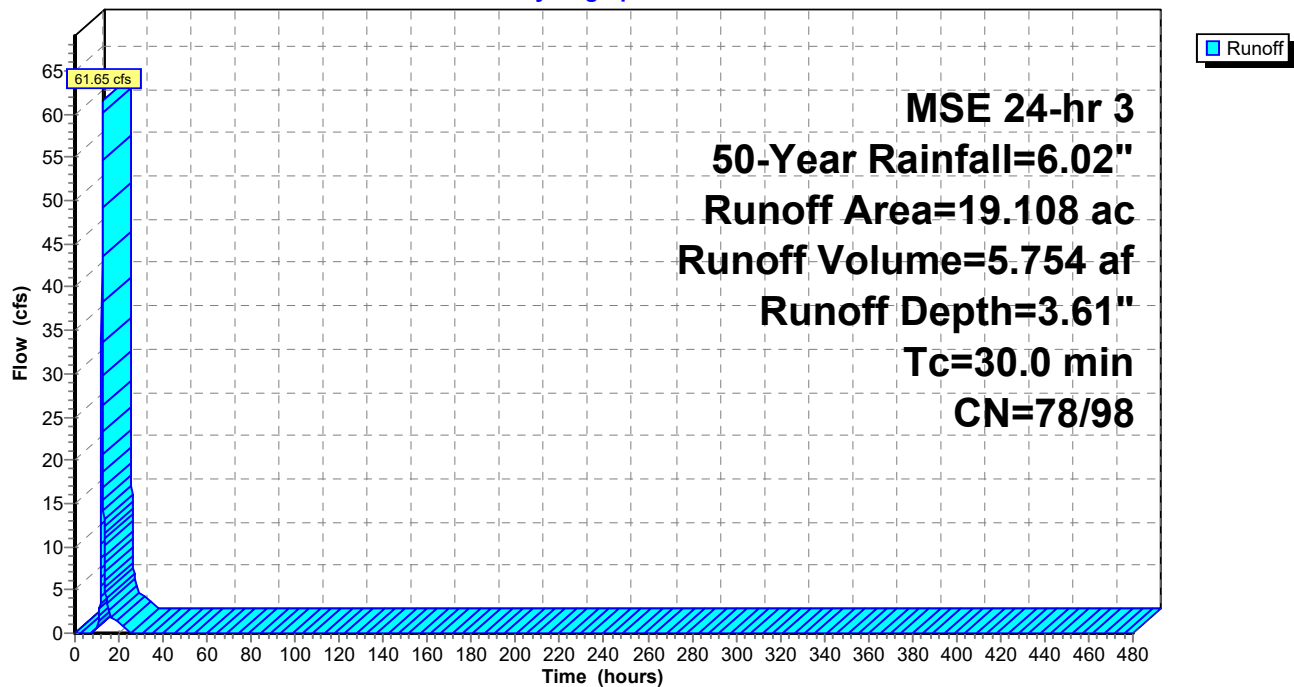
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 188

Summary for Subcatchment 9S: S Chelsea

Runoff = 151.73 cfs @ 12.55 hrs, Volume= 17.067 af, Depth= 3.83"

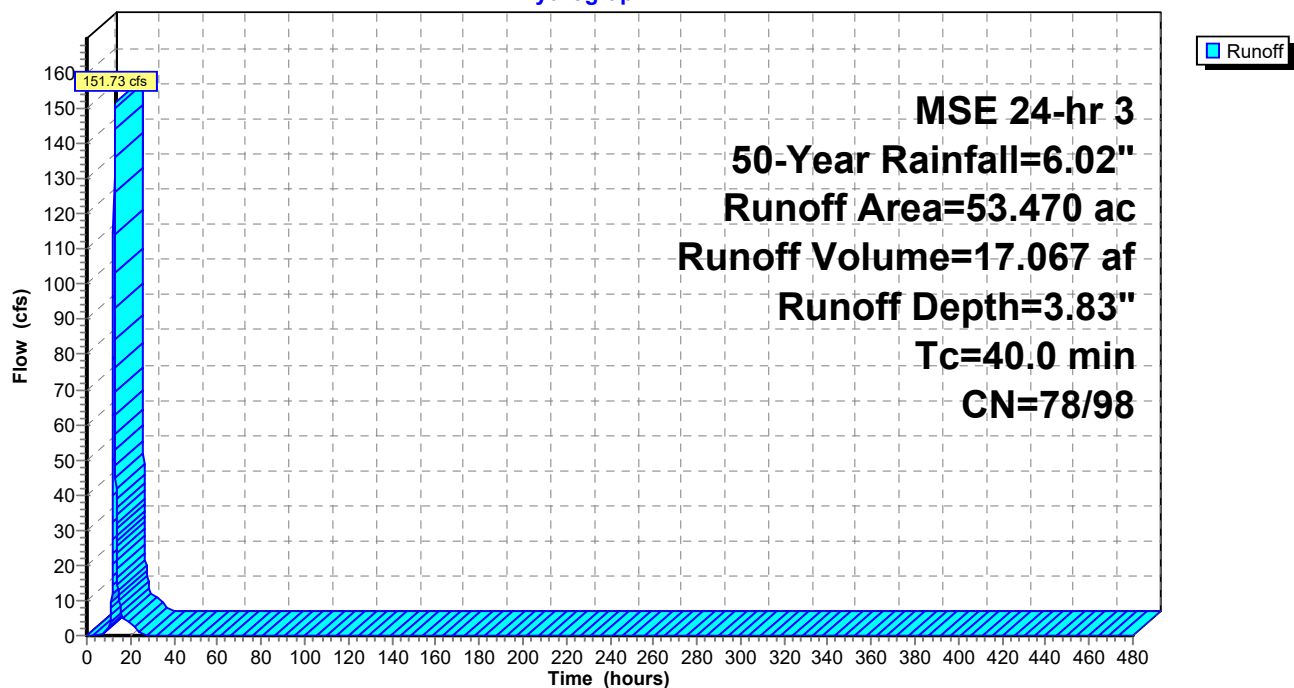
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 189

Summary for Subcatchment 11S: Chelsea Road

Runoff = 66.59 cfs @ 12.42 hrs, Volume= 6.345 af, Depth= 3.88"

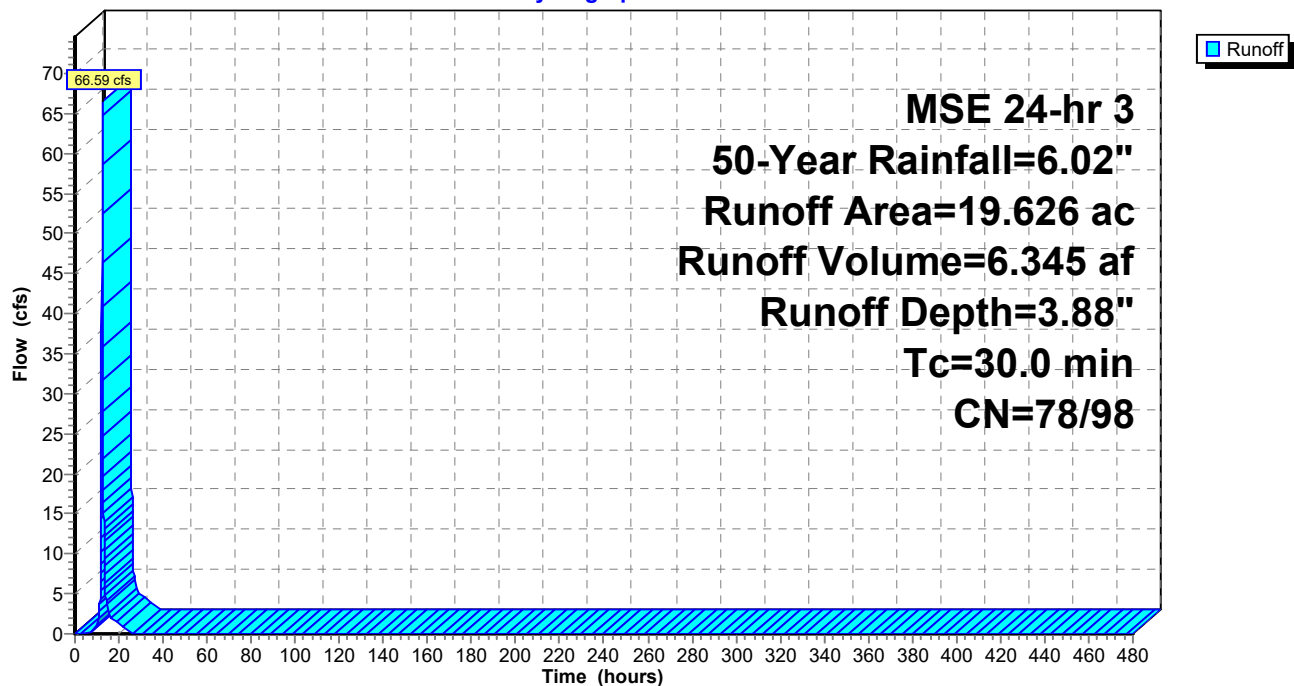
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 190

Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 34.32 cfs @ 12.23 hrs, Volume= 2.550 af, Depth= 5.22"

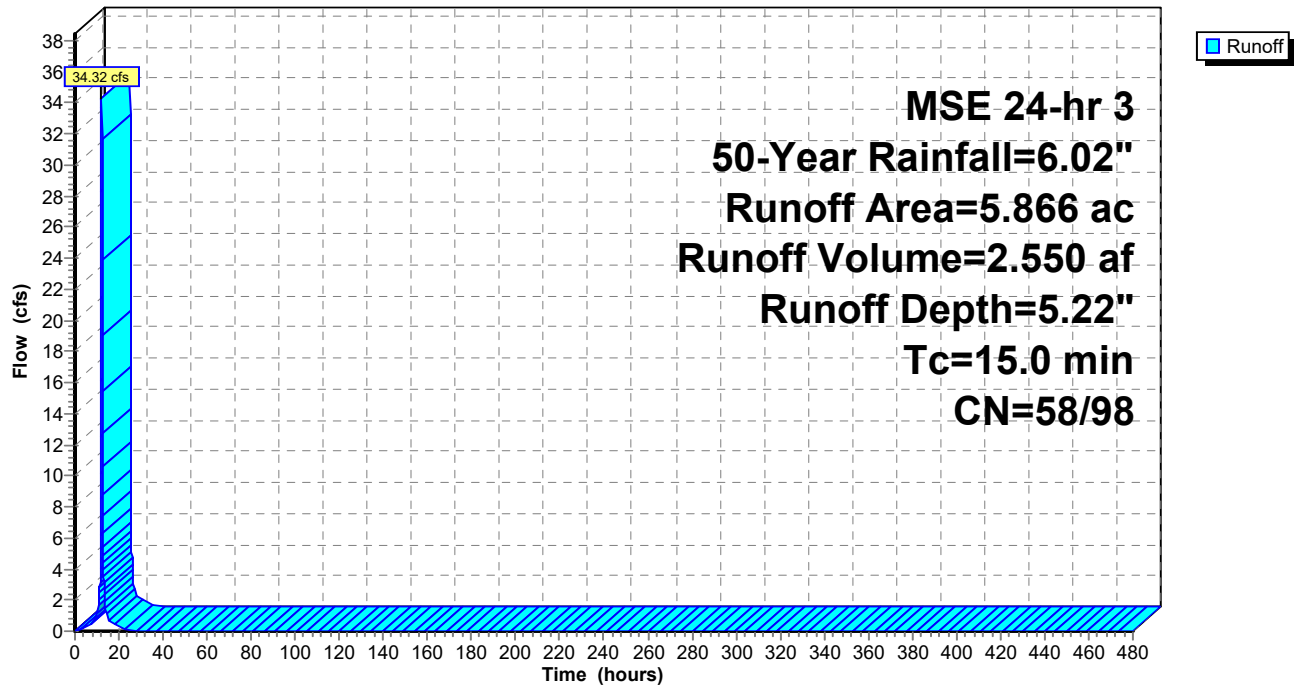
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 191

Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

Runoff = 110.00 cfs @ 12.27 hrs, Volume= 8.009 af, Depth= 3.91"

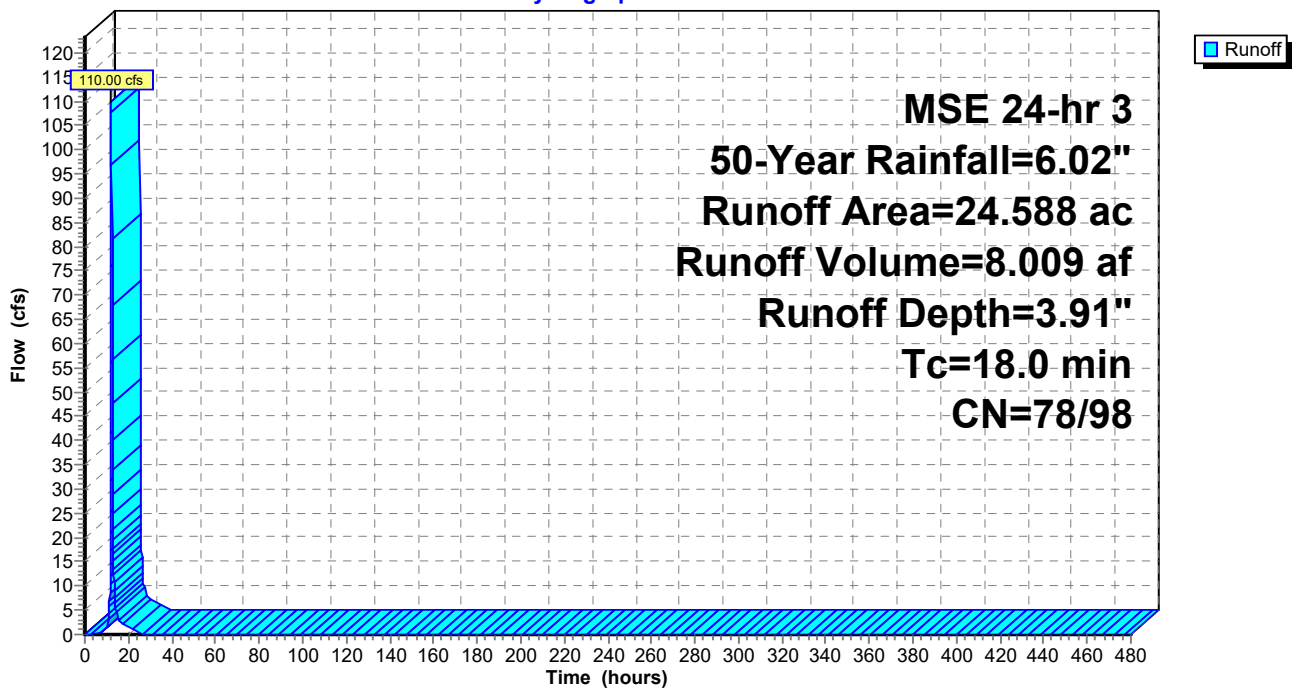
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 192

Summary for Subcatchment 23S: Dundas

Runoff = 27.07 cfs @ 12.29 hrs, Volume= 2.138 af, Depth= 4.28"

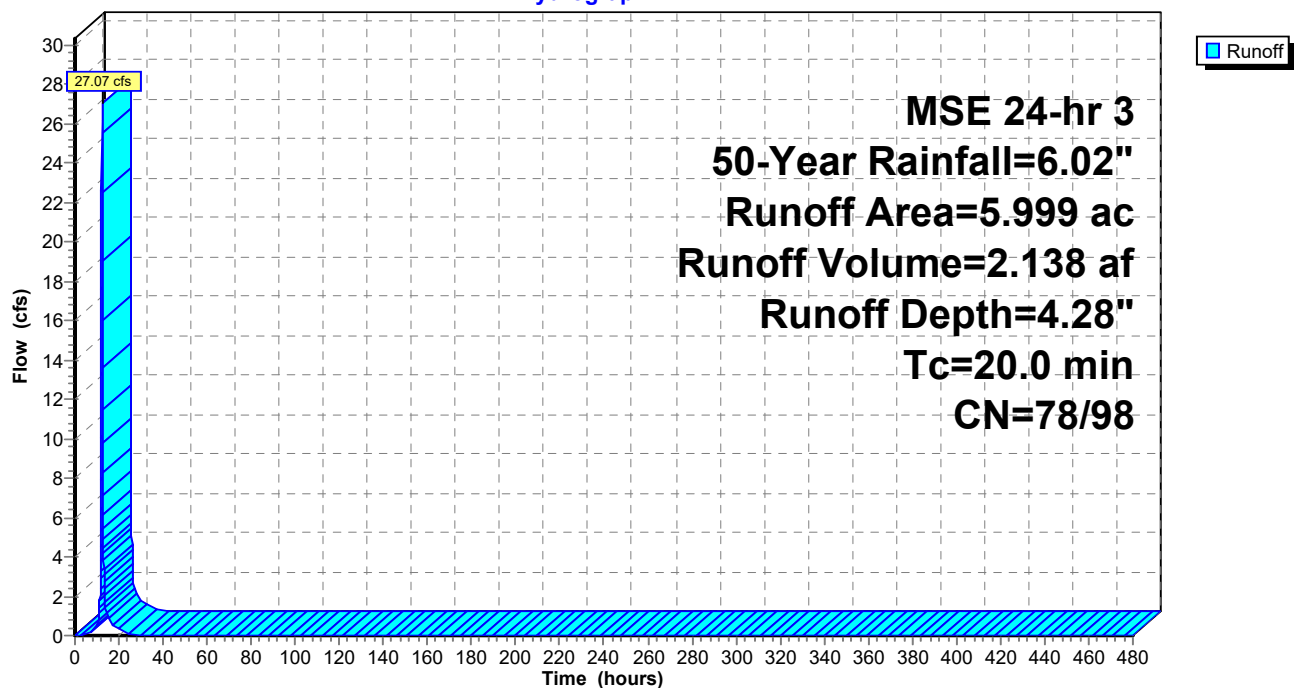
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

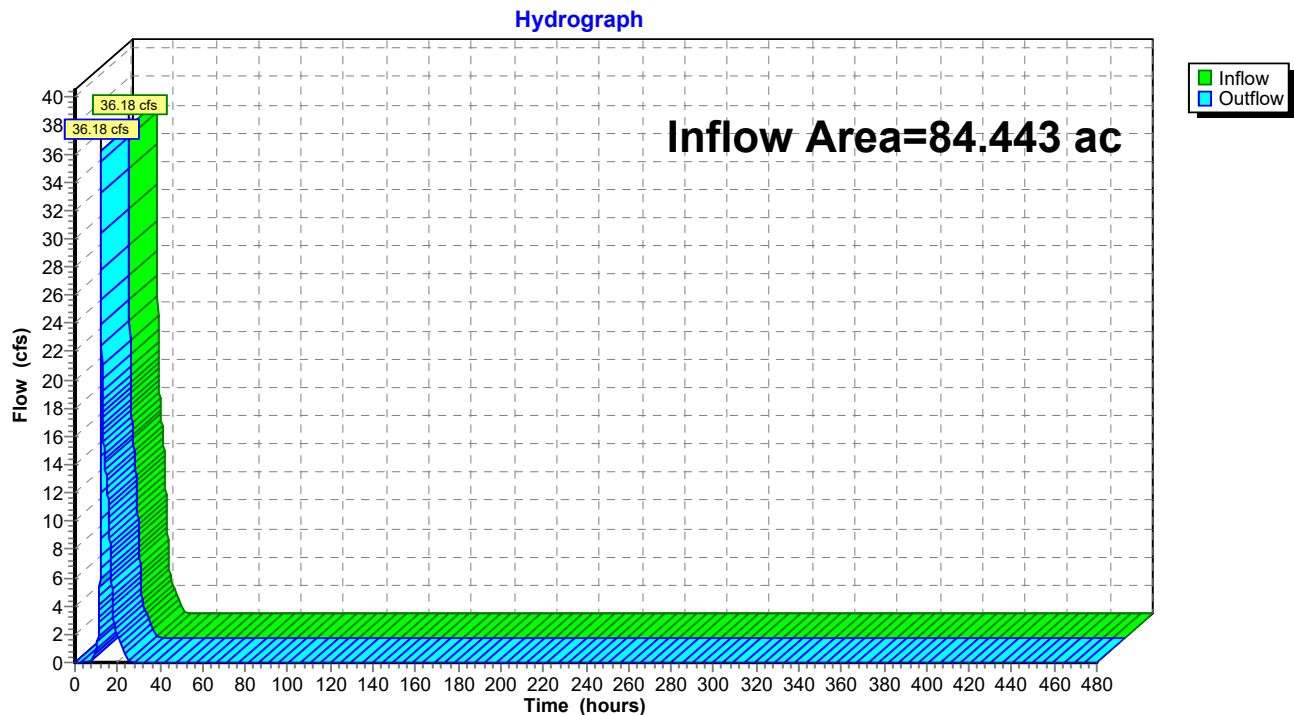
Page 193

Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 1.12" for 50-Year event
Inflow = 36.18 cfs @ 12.31 hrs, Volume= 7.892 af
Outflow = 36.18 cfs @ 12.31 hrs, Volume= 7.892 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 194

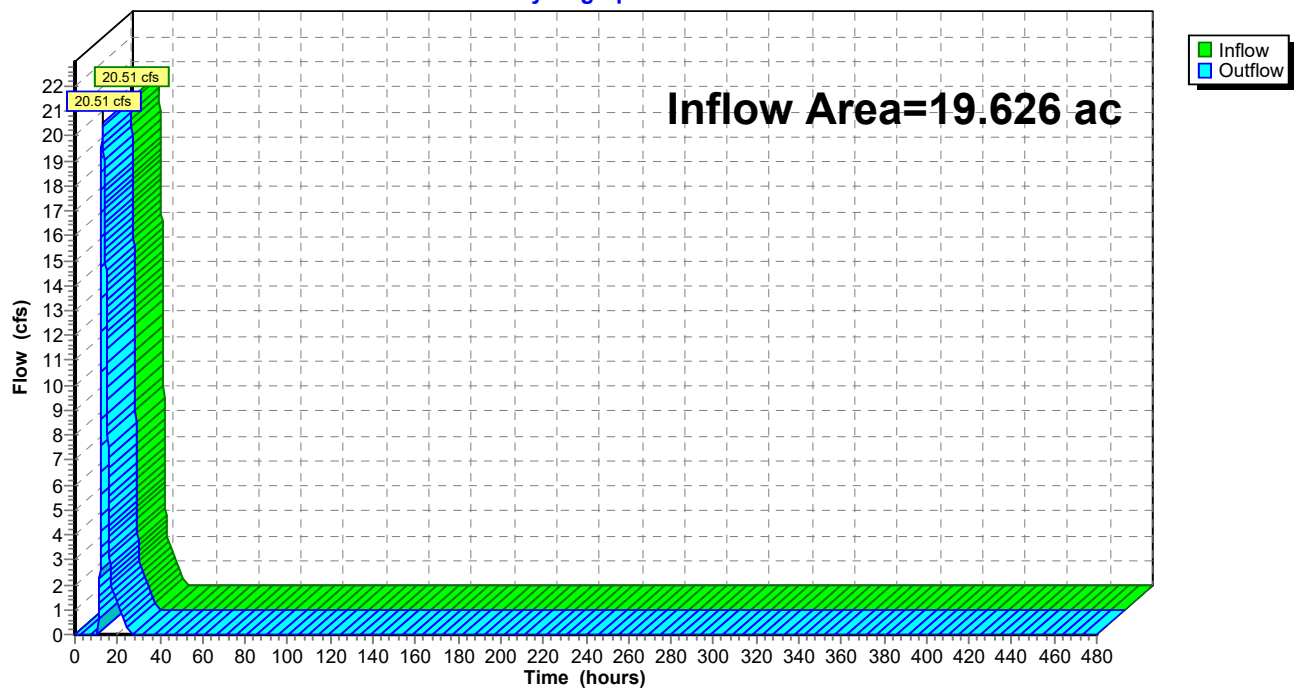
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 3.62" for 50-Year event
Inflow = 20.51 cfs @ 12.98 hrs, Volume= 5.915 af
Outflow = 20.51 cfs @ 12.98 hrs, Volume= 5.915 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 195

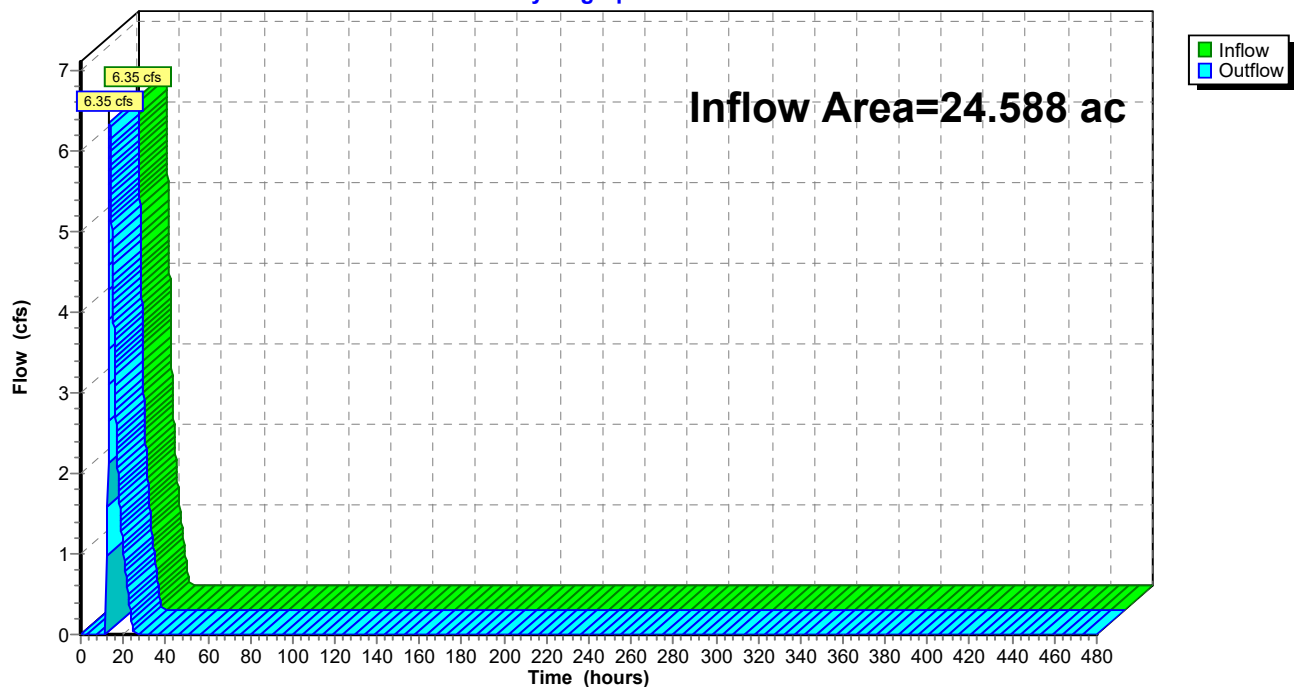
Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 1.04" for 50-Year event
Inflow = 6.35 cfs @ 13.69 hrs, Volume= 2.127 af
Outflow = 6.35 cfs @ 13.69 hrs, Volume= 2.127 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 196

Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 5.22" for 50-Year event
 Inflow = 34.32 cfs @ 12.23 hrs, Volume= 2.550 af
 Outflow = 16.18 cfs @ 12.44 hrs, Volume= 1.590 af, Atten= 53%, Lag= 13.0 min
 Primary = 16.18 cfs @ 12.44 hrs, Volume= 1.592 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.90' @ 24.90 hrs Surf.Area= 0.591 ac Storage= 0.960 af

Plug-Flow detention time= 76.7 min calculated for 1.590 af (62% of inflow)
 Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=16.16 cfs @ 12.44 hrs HW=959.73' TW=957.26' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 16.16 cfs @ 5.60 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

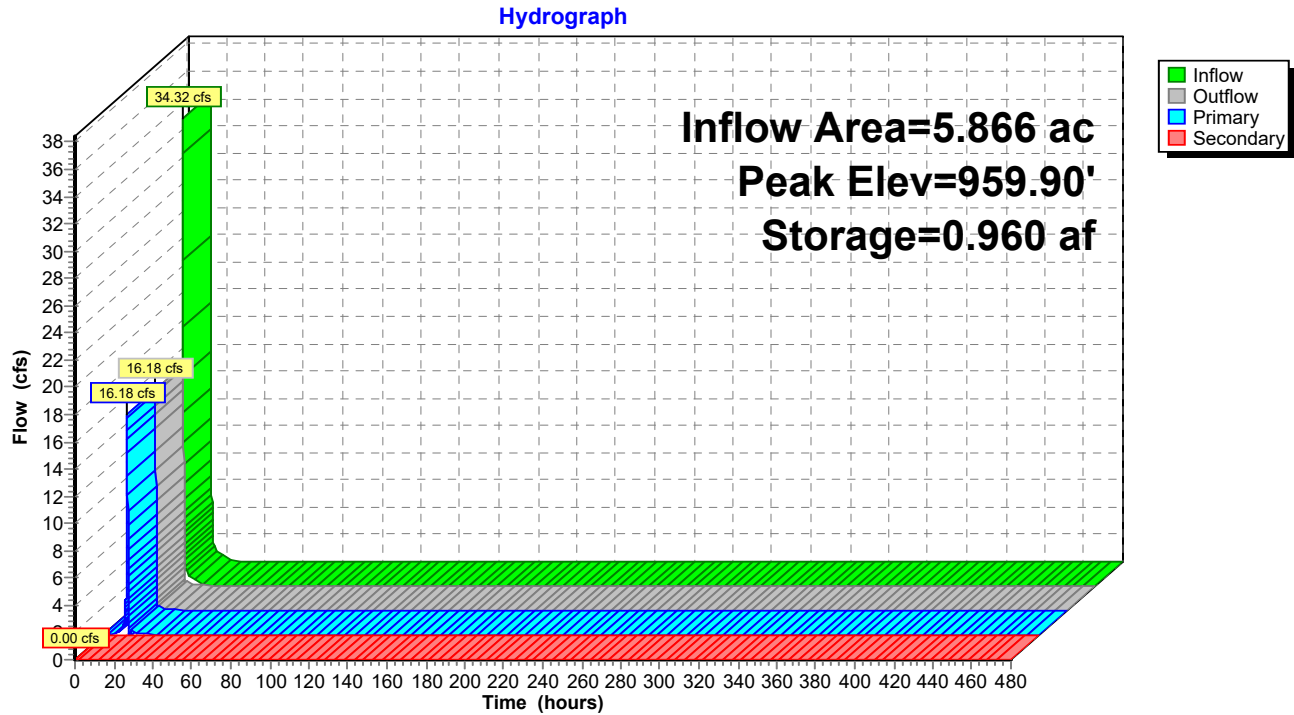
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 197

Pond 16P: TH-28A Walmart Existing Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 198

Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 3.91" for 50-Year event
 Inflow = 110.00 cfs @ 12.27 hrs, Volume= 8.009 af
 Outflow = 7.52 cfs @ 13.69 hrs, Volume= 8.009 af, Atten= 93%, Lag= 85.1 min
 Discarded = 1.18 cfs @ 13.69 hrs, Volume= 5.882 af
 Primary = 6.35 cfs @ 13.69 hrs, Volume= 2.127 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 961.40' @ 13.69 hrs Surf.Area= 2.594 ac Storage= 5.622 af

Plug-Flow detention time= 2,859.1 min calculated for 8.008 af (100% of inflow)
 Center-of-Mass det. time= 2,860.0 min (3,657.1 - 797.1)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=1.18 cfs @ 13.69 hrs HW=961.40' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 1.18 cfs)

Primary OutFlow Max=6.34 cfs @ 13.69 hrs HW=961.40' TW=0.00' (Dynamic Tailwater)

↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 6.34 cfs @ 1.58 fps)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

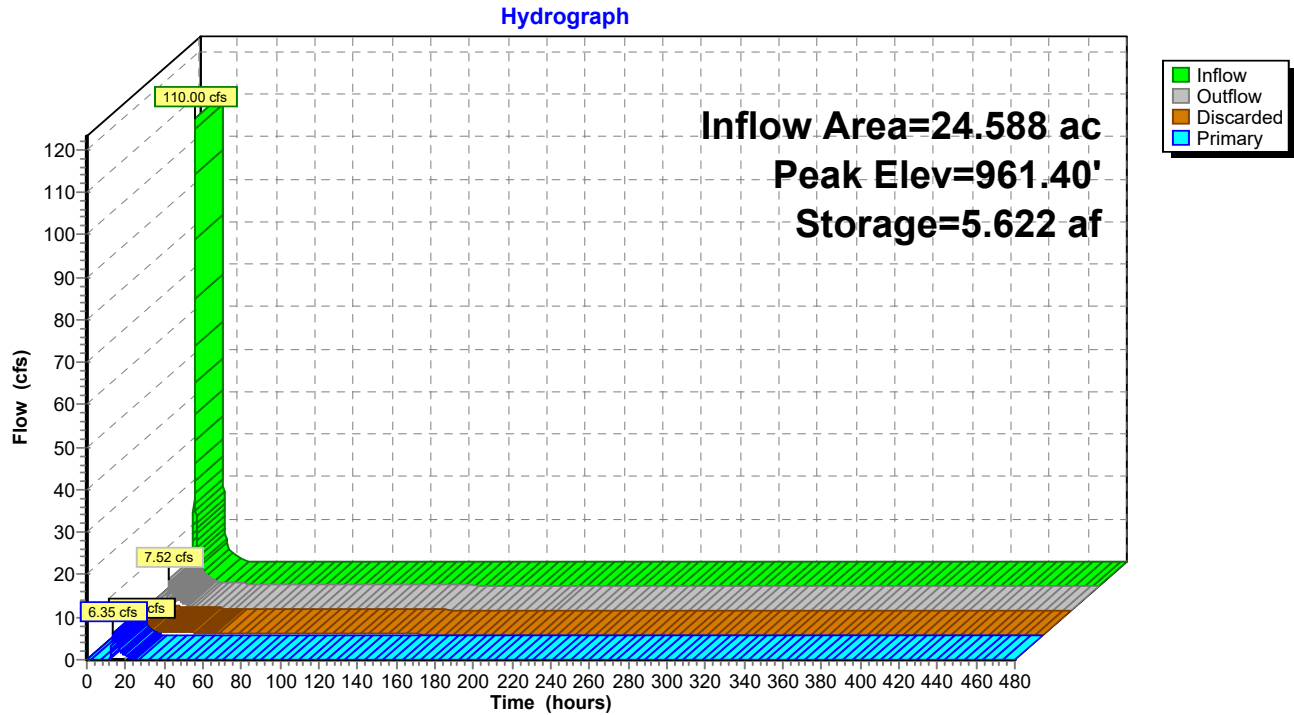
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 199

Pond 17P: School Blvd Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 200

Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 3.61" for 50-Year event
 Inflow = 61.65 cfs @ 12.43 hrs, Volume= 5.754 af
 Outflow = 13.33 cfs @ 13.20 hrs, Volume= 5.754 af, Atten= 78%, Lag= 46.2 min
 Primary = 13.33 cfs @ 13.20 hrs, Volume= 5.754 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.86' @ 13.20 hrs Surf.Area= 2.118 ac Storage= 2.585 af

Plug-Flow detention time= 89.0 min calculated for 5.753 af (100% of inflow)
 Center-of-Mass det. time= 89.0 min (908.2 - 819.2)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=13.33 cfs @ 13.20 hrs HW=960.86' TW=0.00' (Dynamic Tailwater)
 ↑1=RCP_Round 18" (Inlet Controls 13.33 cfs @ 7.54 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=957.66' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

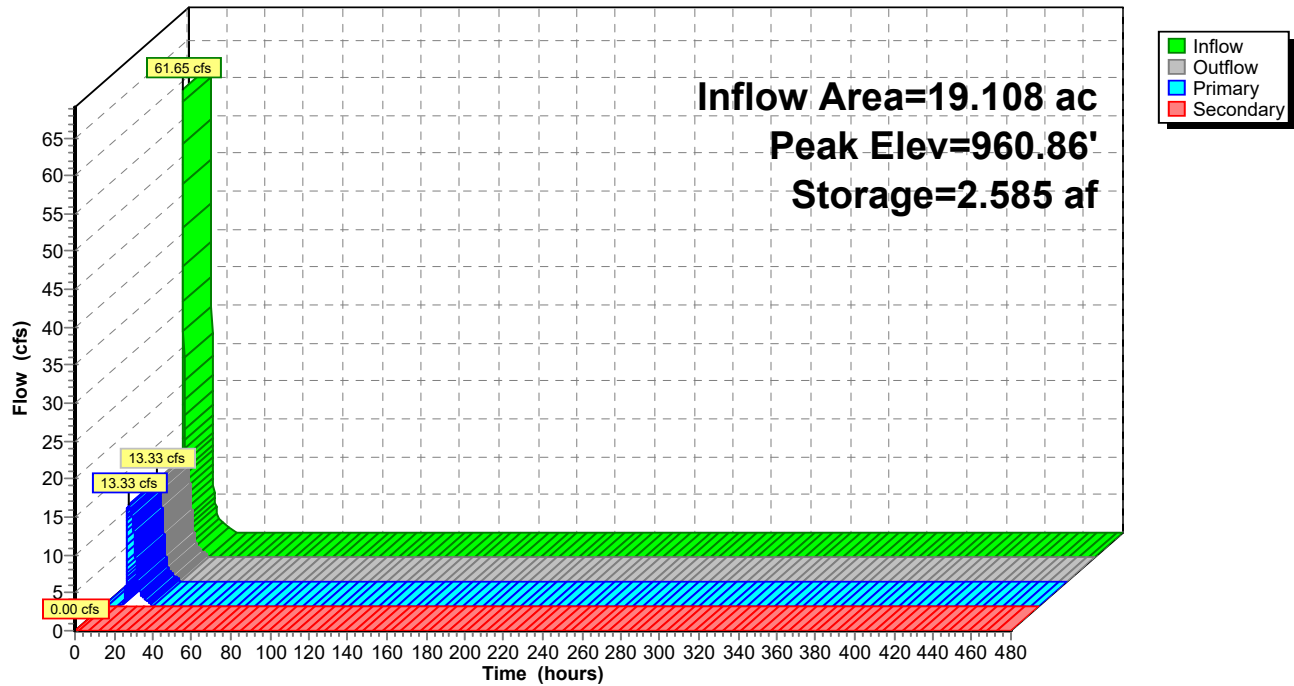
Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 201

Pond 18P: N Chelsea

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 202

Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 3.88" for 50-Year event
 Inflow = 66.59 cfs @ 12.42 hrs, Volume= 6.345 af
 Outflow = 20.79 cfs @ 12.98 hrs, Volume= 6.345 af, Atten= 69%, Lag= 33.2 min
 Discarded = 0.27 cfs @ 12.98 hrs, Volume= 0.430 af
 Primary = 20.51 cfs @ 12.98 hrs, Volume= 5.915 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.69' @ 12.98 hrs Surf.Area= 0.603 ac Storage= 2.629 af

Plug-Flow detention time= 157.0 min calculated for 6.344 af (100% of inflow)
 Center-of-Mass det. time= 157.3 min (966.6 - 809.3)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.27 cfs @ 12.98 hrs HW=959.69' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.27 cfs)

Primary OutFlow Max=20.51 cfs @ 12.98 hrs HW=959.69' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Inlet Controls 20.51 cfs @ 11.61 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

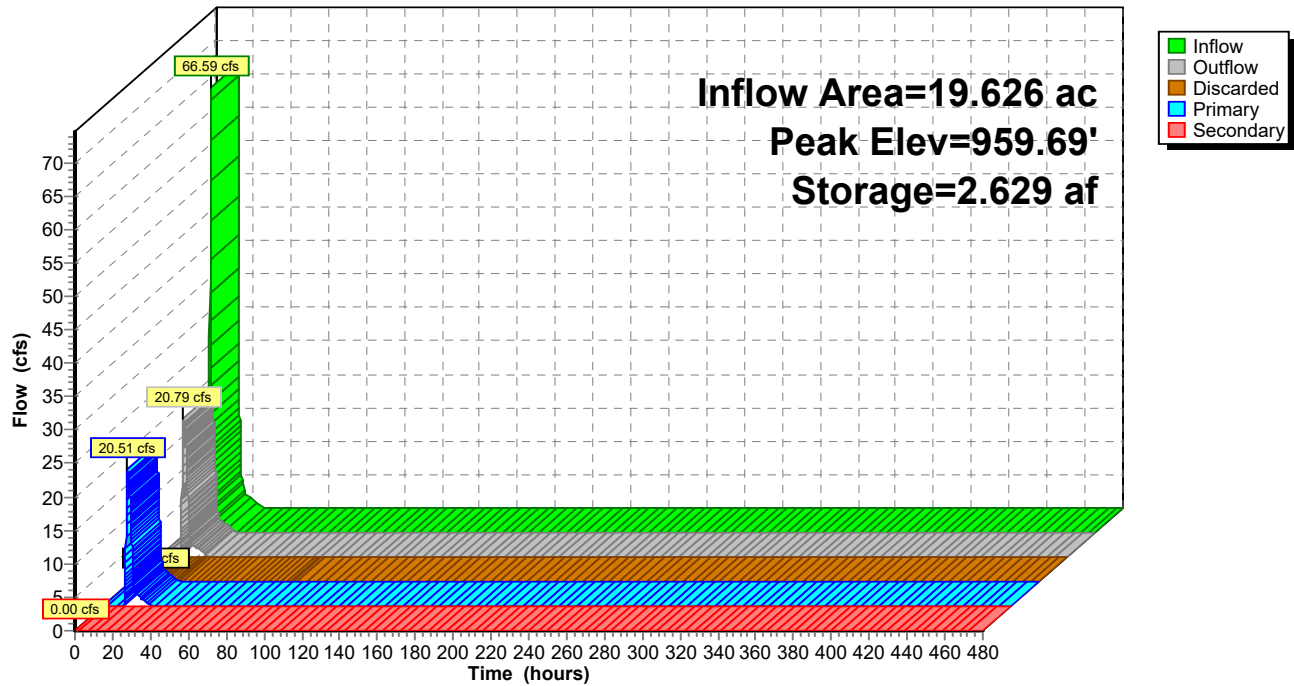
Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 203

Pond 19P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 204

Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 3.77" for 50-Year event
 Inflow = 167.35 cfs @ 12.55 hrs, Volume= 18.660 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 959.90' @ 26.25 hrs Surf.Area= 9.562 ac Storage= 20.910 af (18.660 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

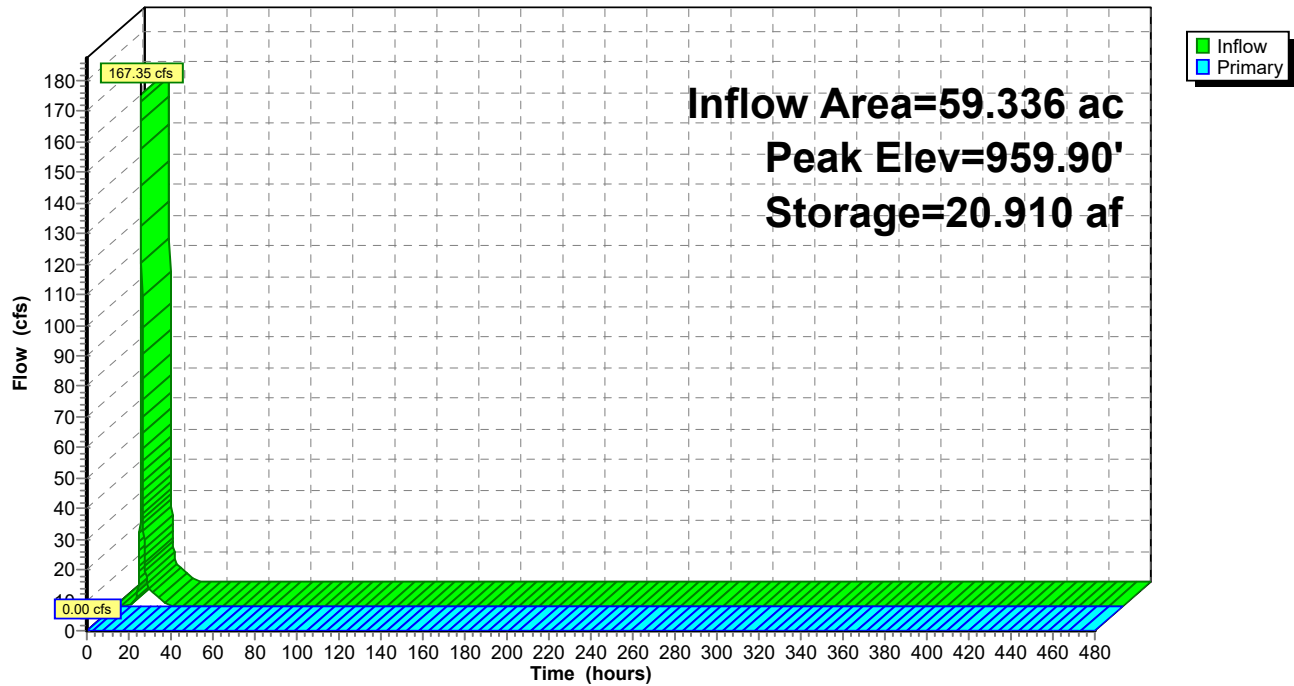
Existing
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 6/8/2021

Page 205

Pond 20P: S Chelsea

Hydrograph



Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment8S: N Chelsea Runoff Area=19.108 ac 0.78% Impervious Runoff Depth=4.37"
 Tc=30.0 min CN=78/98 Runoff=74.53 cfs 6.966 af

Subcatchment9S: S Chelsea Runoff Area=53.470 ac 10.70% Impervious Runoff Depth=4.60"
 Tc=40.0 min CN=78/98 Runoff=182.07 cfs 20.498 af

Subcatchment11S: Chelsea Road Runoff Area=19.626 ac 12.94% Impervious Runoff Depth=4.65"
 Tc=30.0 min CN=78/98 Runoff=79.73 cfs 7.607 af

Subcatchment12S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=6.02"
 Tc=15.0 min CN=58/98 Runoff=39.57 cfs 2.944 af

Subcatchment13S: School and Runoff Area=24.588 ac 14.28% Impervious Runoff Depth=4.68"
 Tc=18.0 min CN=78/98 Runoff=131.44 cfs 9.593 af

Subcatchment23S: Dundas Runoff Area=5.999 ac 31.11% Impervious Runoff Depth=5.06"
 Tc=20.0 min CN=78/98 Runoff=32.01 cfs 2.532 af

Reach 14R: To TH-01 Existing Landlocked Basin Inflow=42.06 cfs 9.498 af
 Outflow=42.06 cfs 9.498 af

Reach 15R: West Inflow=29.66 cfs 7.163 af
 Outflow=29.66 cfs 7.163 af

Reach 24R: SE Inflow=13.14 cfs 3.634 af
 Outflow=13.14 cfs 3.634 af

Pond 16P: TH-28A Walmart Existing Pond Peak Elev=960.25' Storage=1.178 af Inflow=39.57 cfs 2.944 af
 Primary=18.33 cfs 1.771 af Secondary=0.00 cfs 0.000 af Outflow=18.33 cfs 1.766 af

Pond 17P: School Blvd Pond Peak Elev=961.62' Storage=6.218 af Inflow=131.44 cfs 9.593 af
 Discarded=1.30 cfs 5.959 af Primary=13.14 cfs 3.634 af Outflow=14.44 cfs 9.593 af

Pond 18P: N Chelsea Peak Elev=961.16' Storage=3.257 af Inflow=74.53 cfs 6.966 af
 Primary=14.10 cfs 6.873 af Secondary=1.46 cfs 0.094 af Outflow=15.56 cfs 6.966 af

Pond 19P: Chelsea Road Pond Peak Elev=960.45' Storage=3.124 af Inflow=79.73 cfs 7.607 af
 Discarded=0.32 cfs 0.444 af Primary=21.82 cfs 6.898 af Secondary=7.84 cfs 0.266 af Outflow=29.97 cfs 7.607 af

Pond 20P: S Chelsea Peak Elev=960.25' Storage=24.519 af Inflow=199.96 cfs 22.269 af
 Outflow=0.00 cfs 0.000 af

Total Runoff Area = 128.657 ac Runoff Volume = 50.140 af Average Runoff Depth = 4.68"
85.37% Pervious = 109.833 ac 14.63% Impervious = 18.824 ac

Summary for Subcatchment 8S: N Chelsea

Runoff = 74.53 cfs @ 12.42 hrs, Volume= 6.966 af, Depth= 4.37"

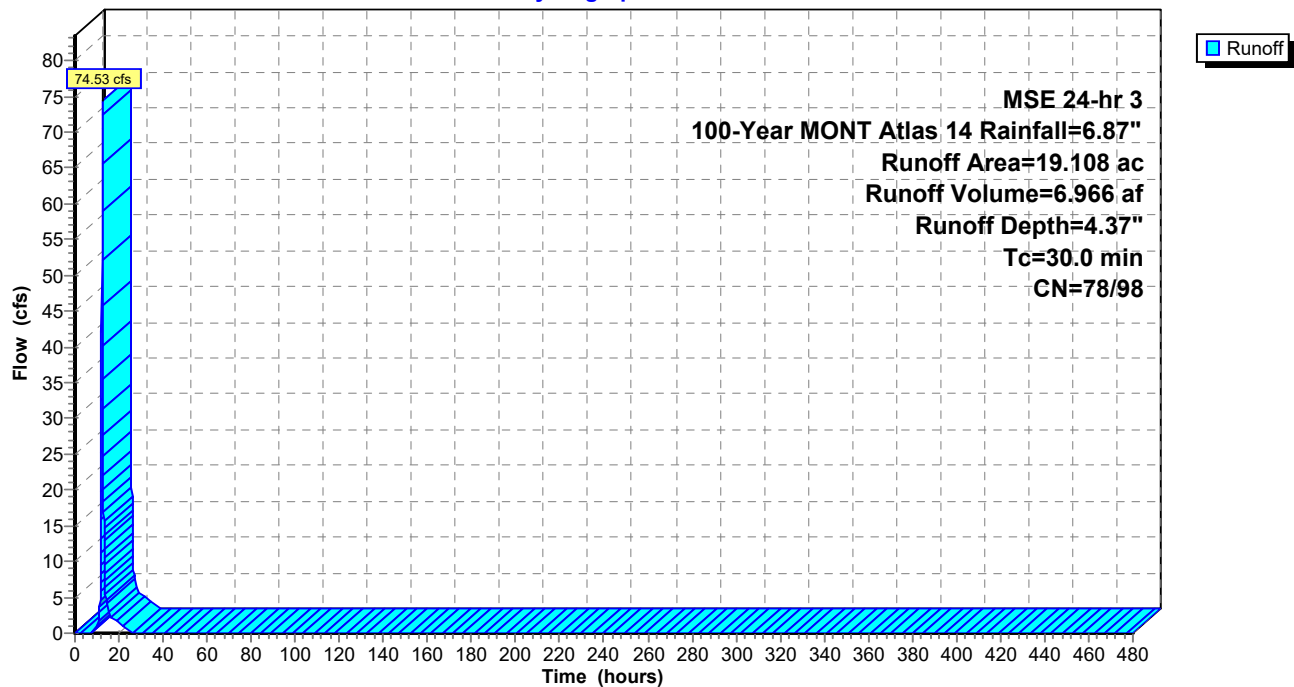
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
0.298	89	Paved roads w/open ditches, 50% imp, HSG B
18.810	78	Row crops, straight row, Good, HSG B
19.108	78	Weighted Average
18.959	78	99.22% Pervious Area
0.149	98	0.78% Impervious Area

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

Subcatchment 8S: N Chelsea

Hydrograph



Summary for Subcatchment 9S: S Chelsea

Runoff = 182.07 cfs @ 12.55 hrs, Volume= 20.498 af, Depth= 4.60"

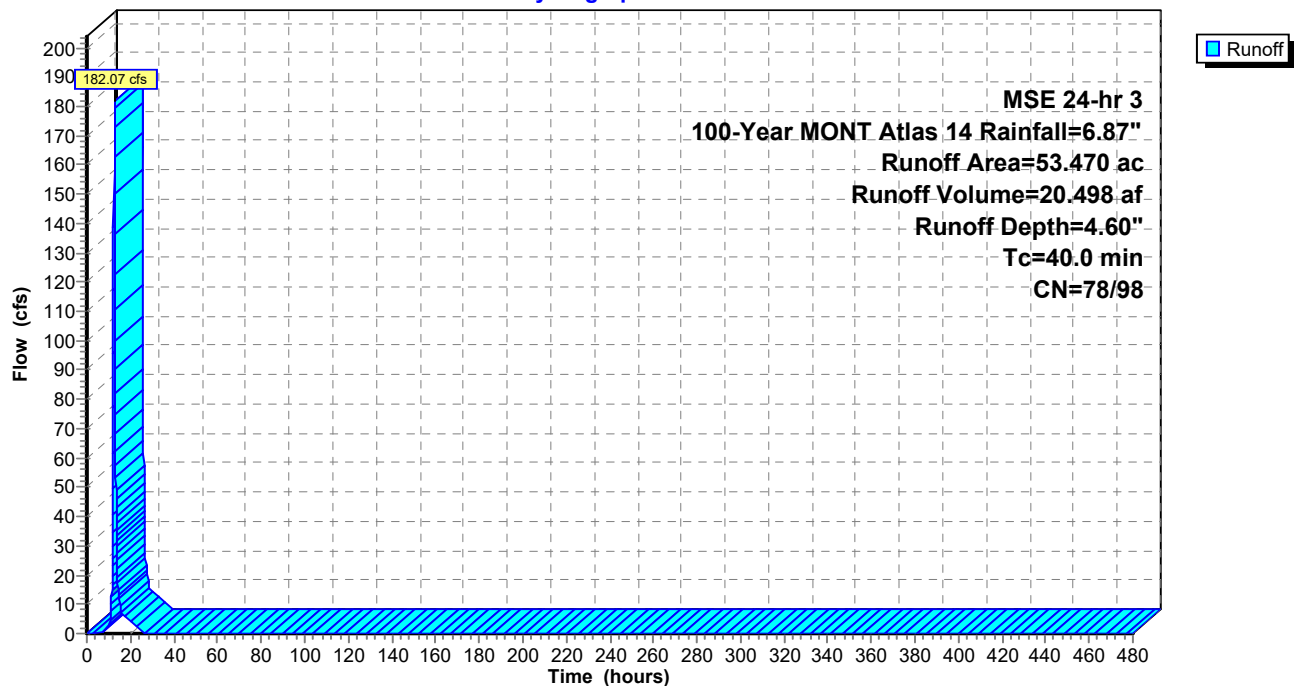
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
4.232	89	Paved roads w/open ditches, 50% imp, HSG B
* 4.239	92	Urban commercial, 85% imp, HSG B
44.999	78	Row crops, straight row, Good, HSG B
53.470	80	Weighted Average
47.751	78	89.30% Pervious Area
5.719	98	10.70% Impervious Area

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

Subcatchment 9S: S Chelsea

Hydrograph



Summary for Subcatchment 11S: Chelsea Road

Runoff = 79.73 cfs @ 12.42 hrs, Volume= 7.607 af, Depth= 4.65"

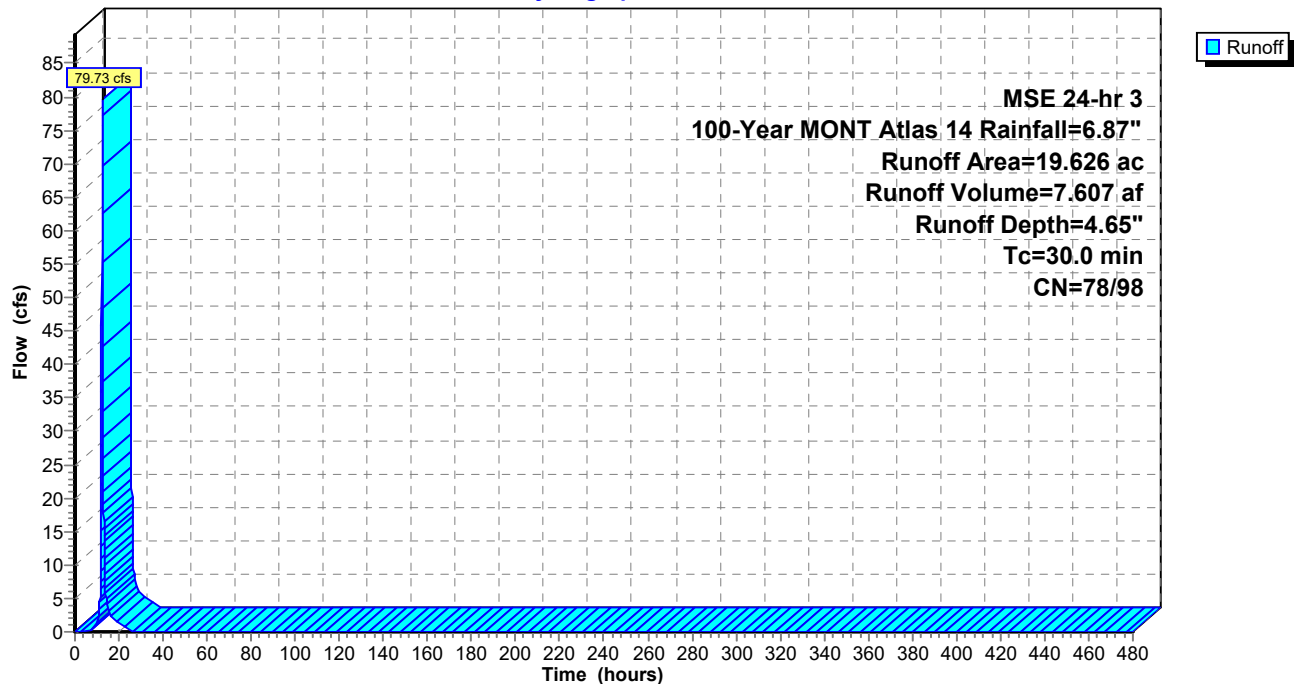
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
2.043	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
* 0.097	98	Water Surface
15.512	78	Row crops, straight row, Good, HSG B
19.626	80	Weighted Average
17.086	78	87.06% Pervious Area
2.540	98	12.94% Impervious Area

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

Subcatchment 11S: Chelsea Road

Hydrograph



Summary for Subcatchment 12S: Walmart Pond Drainage Area

Runoff = 39.57 cfs @ 12.23 hrs, Volume= 2.944 af, Depth= 6.02"

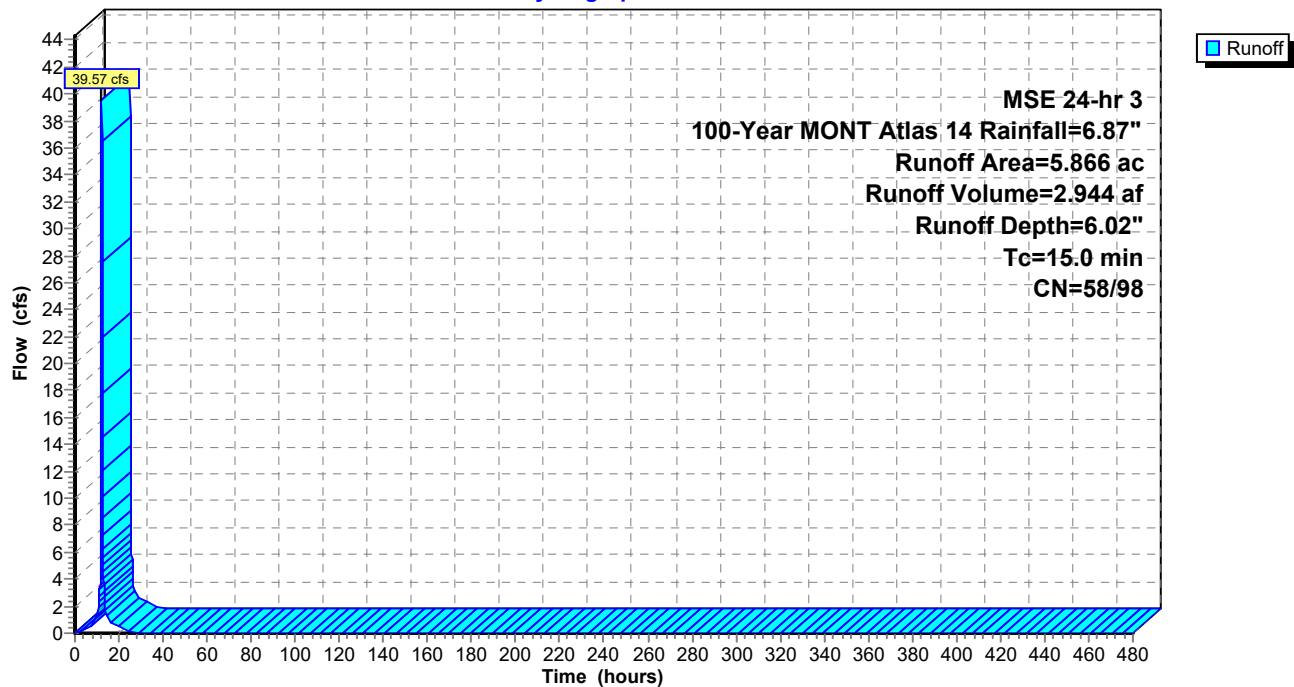
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 12S: Walmart Pond Drainage Area

Hydrograph



Summary for Subcatchment 13S: School and Edmonson Pond Drainage Area

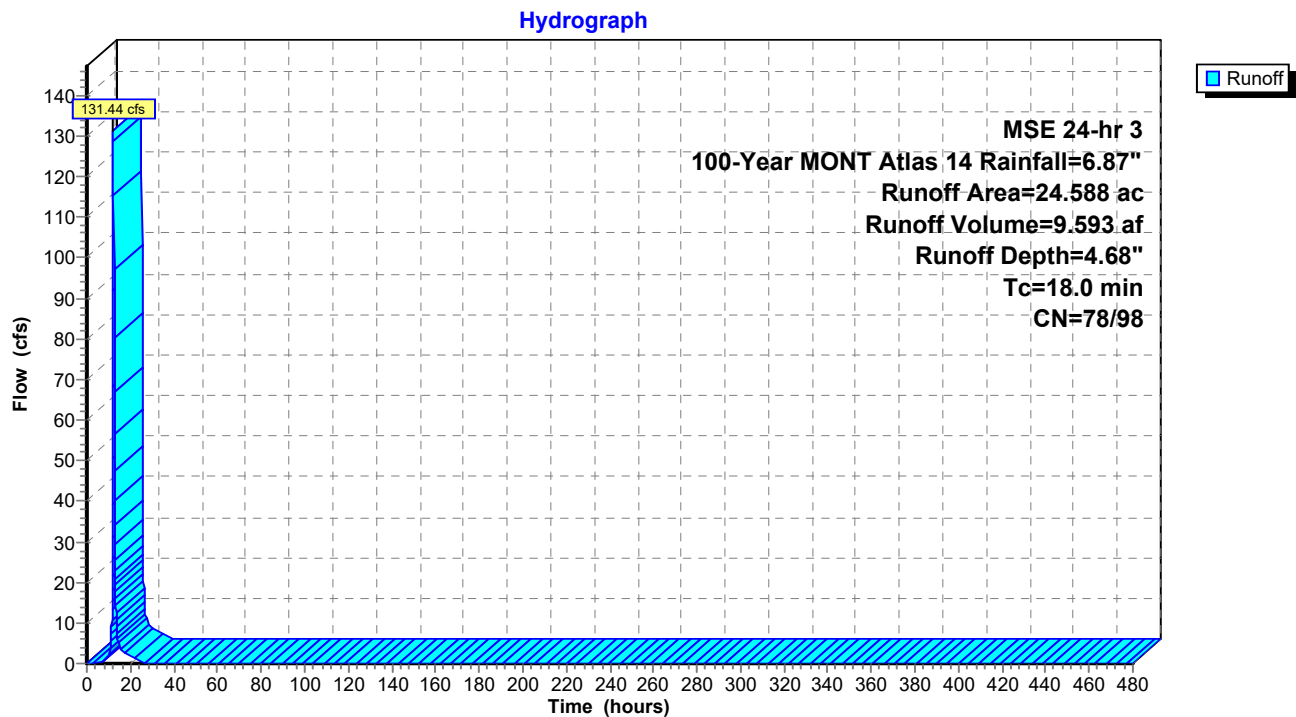
Runoff = 131.44 cfs @ 12.27 hrs, Volume= 9.593 af, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
2.987	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 1.880	85	R4: 1/8 acre lots, 65% imp, HSG B
* 0.776	98	Water Surface
18.922	78	Row crops, straight row, Good, HSG B
24.588	81	Weighted Average
21.077	78	85.72% Pervious Area
3.511	98	14.28% Impervious Area

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

Subcatchment 13S: School and Edmonson Pond Drainage Area



Summary for Subcatchment 23S: Dundas

Runoff = 32.01 cfs @ 12.29 hrs, Volume= 2.532 af, Depth= 5.06"

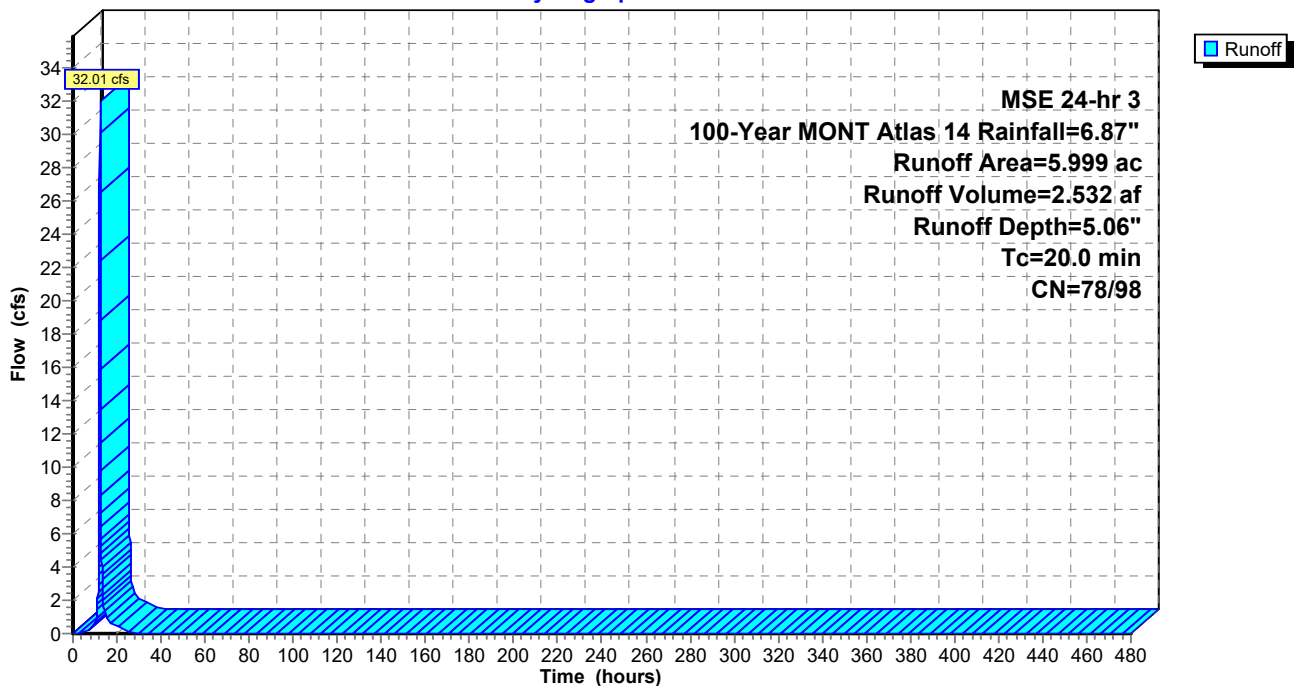
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
2.405	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.781	92	Urban commercial, 85% imp, HSG B
2.813	78	Row crops, straight row, Good, HSG B
5.999	84	Weighted Average
4.133	78	68.89% Pervious Area
1.866	98	31.11% Impervious Area

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

Subcatchment 23S: Dundas

Hydrograph

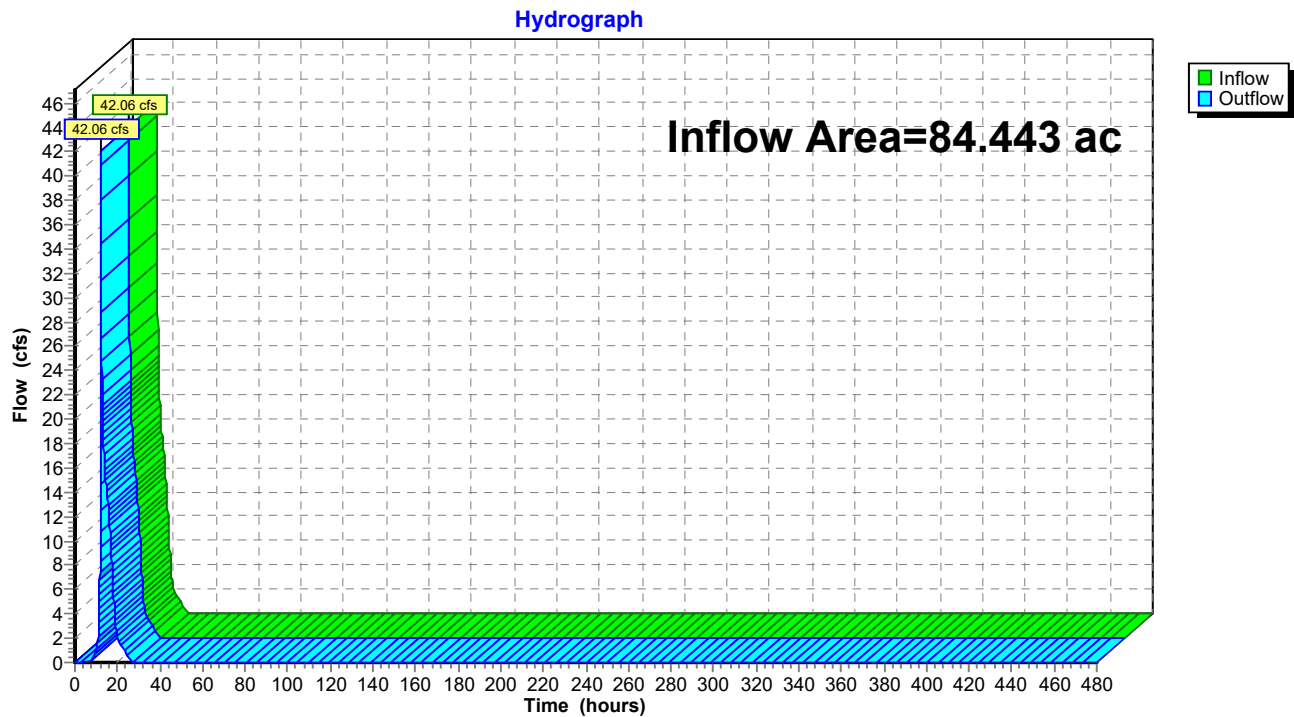


Summary for Reach 14R: To TH-01 Existing Landlocked Basin

Inflow Area = 84.443 ac, 15.13% Impervious, Inflow Depth = 1.35" for 100-Year MONT Atlas 14 event
Inflow = 42.06 cfs @ 12.31 hrs, Volume= 9.498 af
Outflow = 42.06 cfs @ 12.31 hrs, Volume= 9.498 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 14R: To TH-01 Existing Landlocked Basin



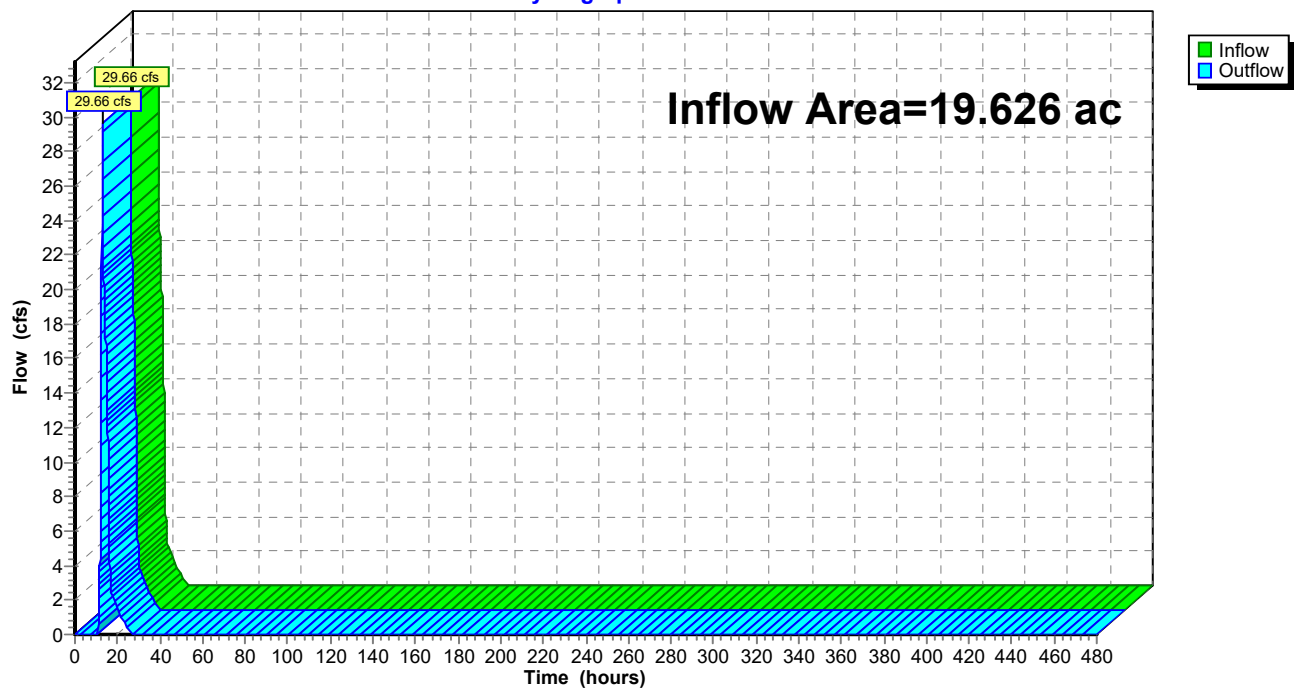
Summary for Reach 15R: West

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 4.38" for 100-Year MONT Atlas 14 event
Inflow = 29.66 cfs @ 12.89 hrs, Volume= 7.163 af
Outflow = 29.66 cfs @ 12.89 hrs, Volume= 7.163 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 15R: West

Hydrograph



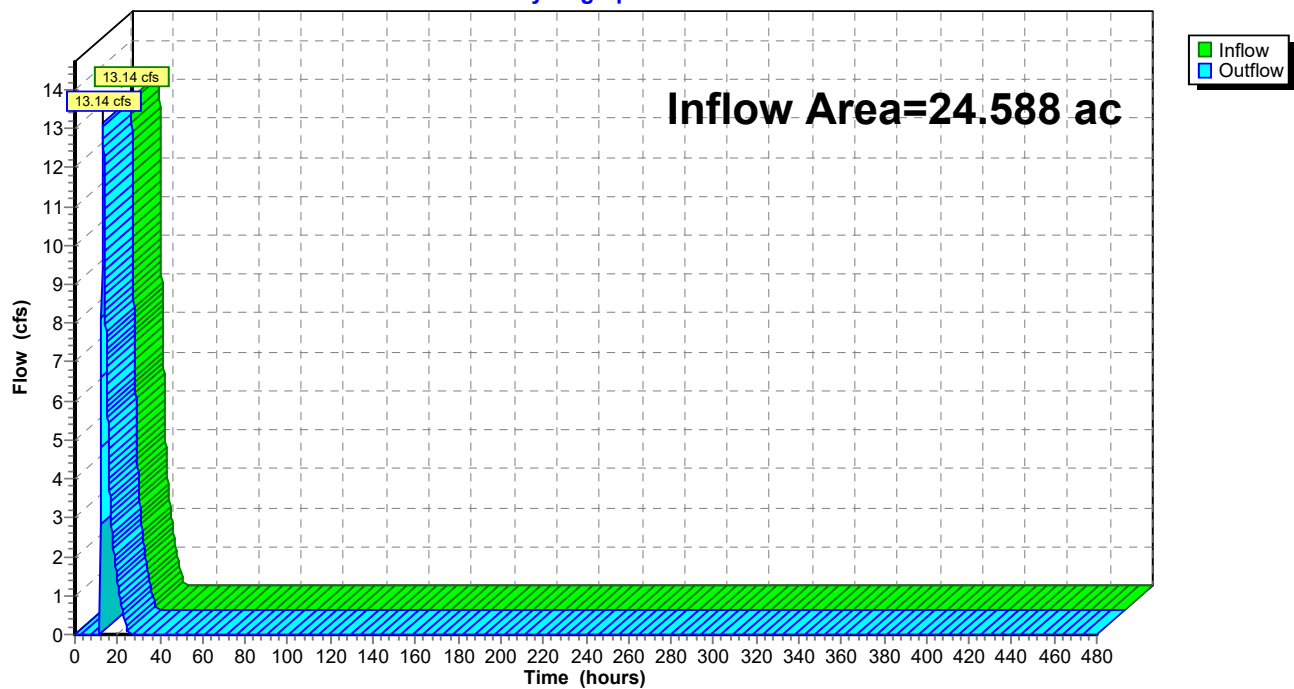
Summary for Reach 24R: SE

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 1.77" for 100-Year MONT Atlas 14 event
Inflow = 13.14 cfs @ 13.23 hrs, Volume= 3.634 af
Outflow = 13.14 cfs @ 13.23 hrs, Volume= 3.634 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 24R: SE

Hydrograph



Summary for Pond 16P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 6.02" for 100-Year MONT Atlas 14 event
 Inflow = 39.57 cfs @ 12.23 hrs, Volume= 2.944 af
 Outflow = 18.33 cfs @ 12.45 hrs, Volume= 1.766 af, Atten= 54%, Lag= 13.2 min
 Primary = 18.33 cfs @ 12.45 hrs, Volume= 1.771 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.25' @ 24.80 hrs Surf.Area= 0.665 ac Storage= 1.178 af

Plug-Flow detention time= 78.3 min calculated for 1.766 af (60% of inflow)
 Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

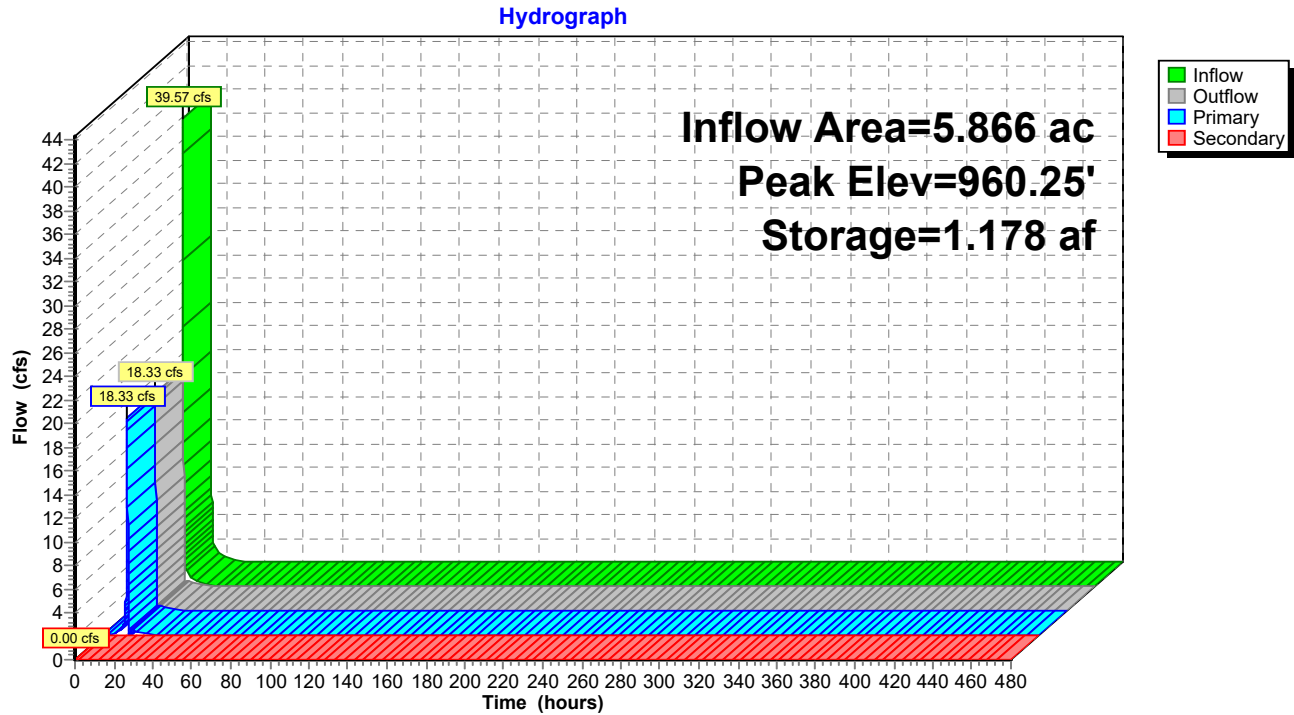
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=18.32 cfs @ 12.45 hrs HW=959.92' TW=957.79' (Dynamic Tailwater)
 ↑ **1=RCP_Round 24"** (Inlet Controls 18.32 cfs @ 5.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 16P: TH-28A Walmart Existing Pond



Summary for Pond 17P: School Blvd Pond

Inflow Area = 24.588 ac, 14.28% Impervious, Inflow Depth = 4.68" for 100-Year MONT Atlas 14 event
 Inflow = 131.44 cfs @ 12.27 hrs, Volume= 9.593 af
 Outflow = 14.44 cfs @ 13.23 hrs, Volume= 9.593 af, Atten= 89%, Lag= 57.9 min
 Discarded = 1.30 cfs @ 13.23 hrs, Volume= 5.959 af
 Primary = 13.14 cfs @ 13.23 hrs, Volume= 3.634 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 961.62' @ 13.23 hrs Surf.Area= 2.866 ac Storage= 6.218 af

Plug-Flow detention time= 2,413.7 min calculated for 9.592 af (100% of inflow)
 Center-of-Mass det. time= 2,414.6 min (3,208.9 - 794.3)

Volume	Invert	Avail.Storage	Storage Description
#1	954.00'	18.770 af	Custom Stage Data (Prismatic) Listed below (Recalc)

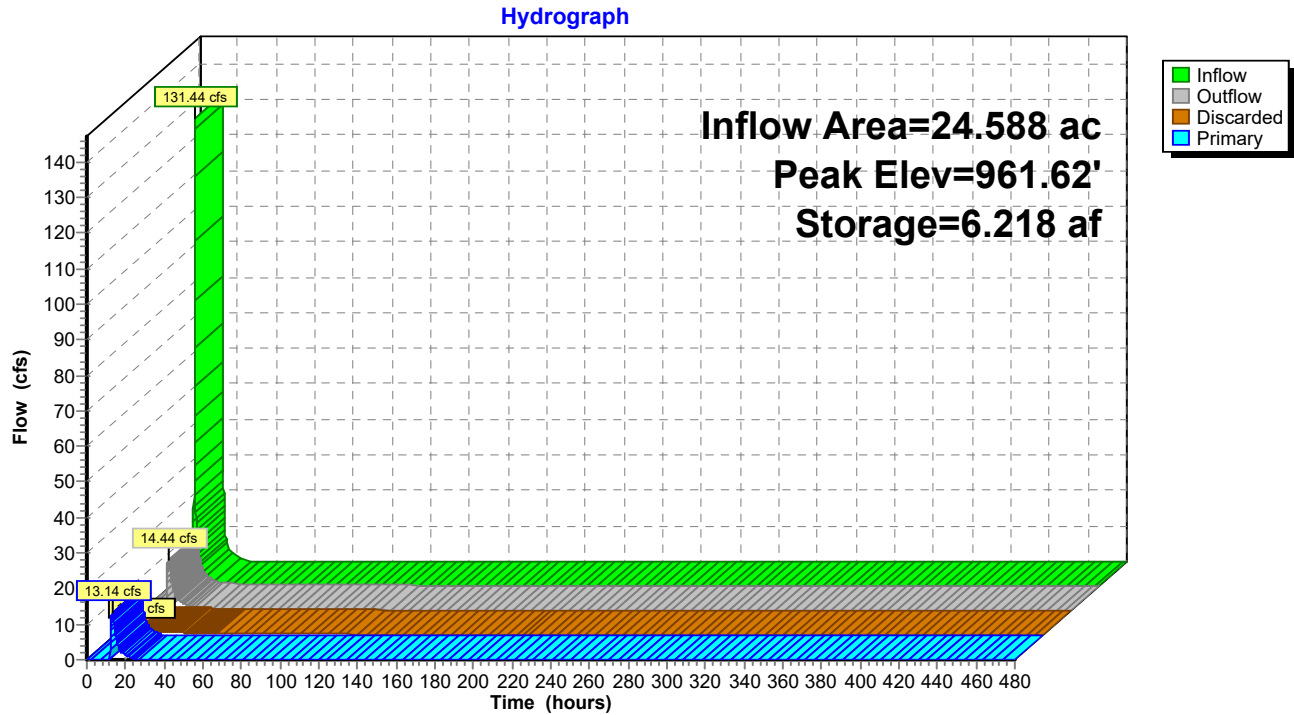
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
954.00	0.280	0.000	0.000
956.00	0.450	0.730	0.730
958.00	0.590	1.040	1.770
960.00	0.850	1.440	3.210
962.00	3.340	4.190	7.400
964.00	8.030	11.370	18.770

Device	Routing	Invert	Outlet Devices
#1	Discarded	954.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65			
2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88			

Discarded OutFlow Max=1.30 cfs @ 13.23 hrs HW=961.62' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 1.30 cfs)

Primary OutFlow Max=13.14 cfs @ 13.23 hrs HW=961.62' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 13.14 cfs @ 2.12 fps)

Pond 17P: School Blvd Pond



Summary for Pond 18P: N Chelsea

Inflow Area = 19.108 ac, 0.78% Impervious, Inflow Depth = 4.37" for 100-Year MONT Atlas 14 event
 Inflow = 74.53 cfs @ 12.42 hrs, Volume= 6.966 af
 Outflow = 15.56 cfs @ 13.21 hrs, Volume= 6.966 af, Atten= 79%, Lag= 46.9 min
 Primary = 14.10 cfs @ 13.21 hrs, Volume= 6.873 af
 Secondary = 1.46 cfs @ 13.21 hrs, Volume= 0.094 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 961.16' @ 13.21 hrs Surf.Area= 2.479 ac Storage= 3.257 af

Plug-Flow detention time= 103.4 min calculated for 6.966 af (100% of inflow)
 Center-of-Mass det. time= 102.0 min (917.4 - 815.4)

Volume	Invert	Avail.Storage	Storage Description
#1	957.66'	5.786 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
957.66	0.010	0.000	0.000
958.00	0.140	0.026	0.026
960.00	1.050	1.190	1.216
962.00	3.520	4.570	5.786

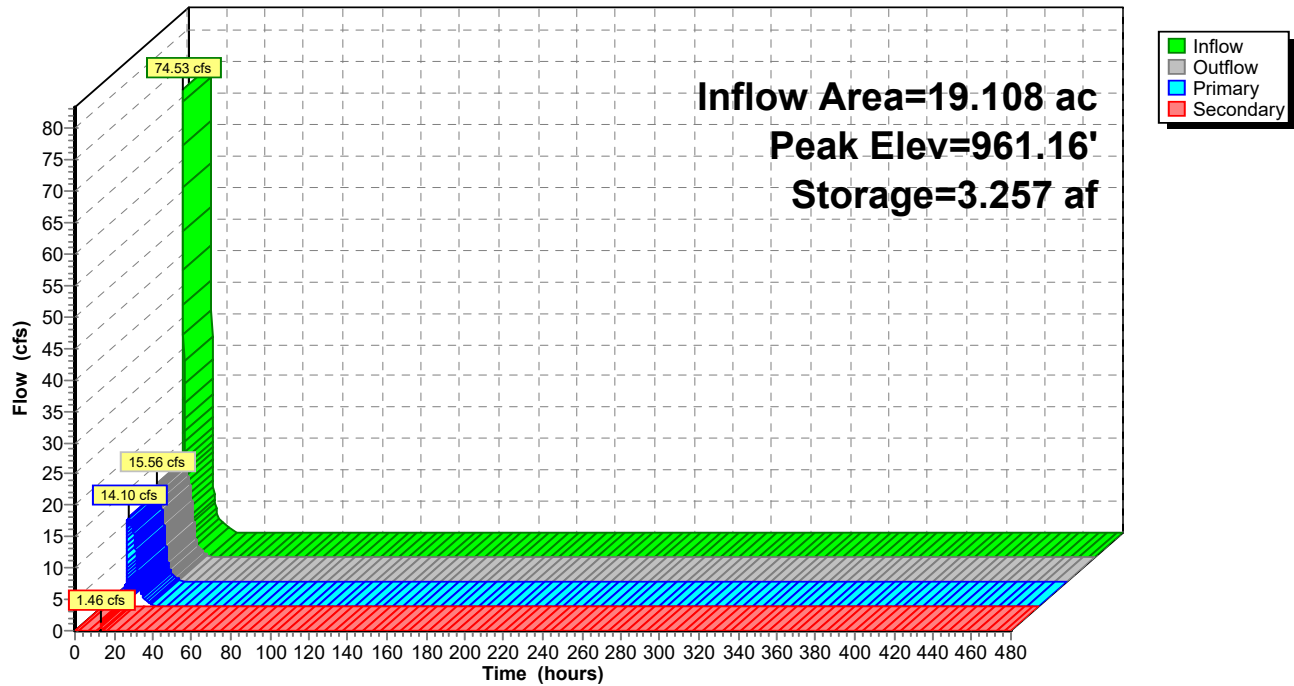
Device	Routing	Invert	Outlet Devices
#1	Primary	957.66'	18.0" Round RCP_Round 18" L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 957.66' / 957.42' S= 0.0200 ' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=14.10 cfs @ 13.21 hrs HW=961.16' TW=0.00' (Dynamic Tailwater)
 ↑1=RCP_Round 18" (Inlet Controls 14.10 cfs @ 7.98 fps)

Secondary OutFlow Max=1.45 cfs @ 13.21 hrs HW=961.16' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 1.45 cfs @ 0.93 fps)

Pond 18P: N Chelsea

Hydrograph



Summary for Pond 19P: Chelsea Road Pond

Inflow Area = 19.626 ac, 12.94% Impervious, Inflow Depth = 4.65" for 100-Year MONT Atlas 14 event
 Inflow = 79.73 cfs @ 12.42 hrs, Volume= 7.607 af
 Outflow = 29.97 cfs @ 12.89 hrs, Volume= 7.607 af, Atten= 62%, Lag= 28.3 min
 Discarded = 0.32 cfs @ 12.89 hrs, Volume= 0.444 af
 Primary = 21.82 cfs @ 12.89 hrs, Volume= 6.898 af
 Secondary = 7.84 cfs @ 12.89 hrs, Volume= 0.266 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.45' @ 12.89 hrs Surf.Area= 0.695 ac Storage= 3.124 af

Plug-Flow detention time= 144.2 min calculated for 7.606 af (100% of inflow)
 Center-of-Mass det. time= 144.6 min (950.9 - 806.3)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

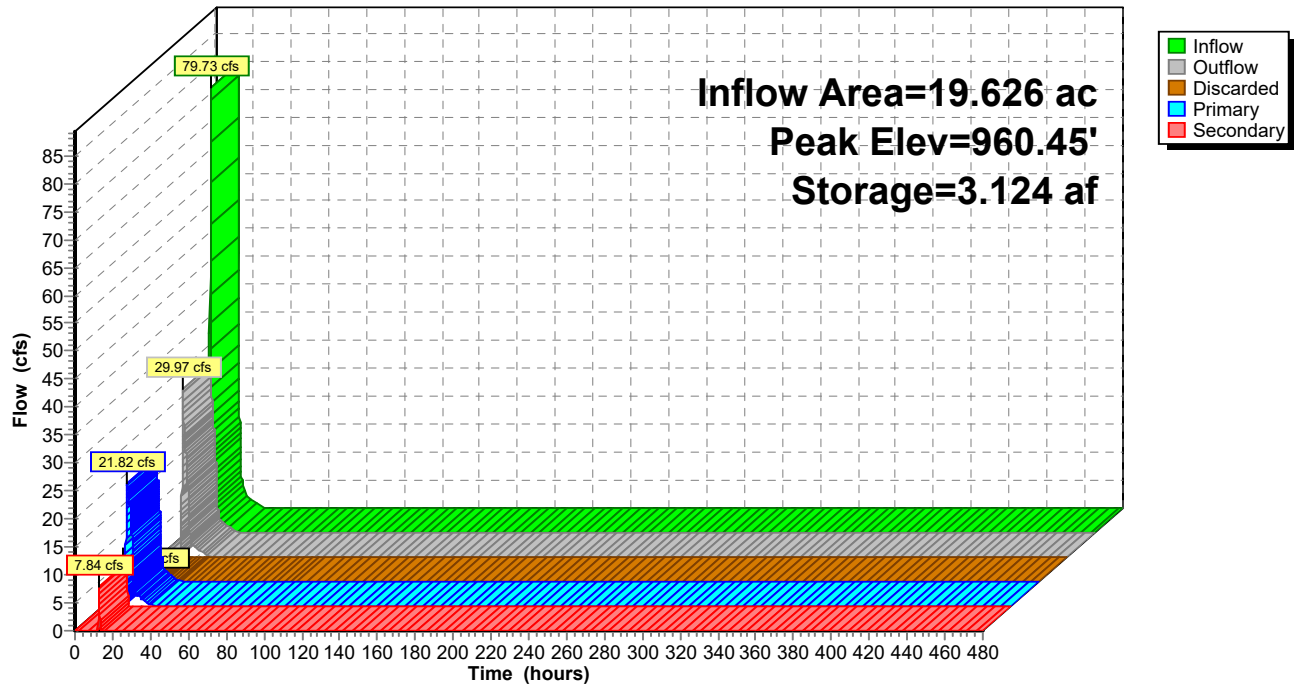
Discarded OutFlow Max=0.32 cfs @ 12.89 hrs HW=960.45' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=21.82 cfs @ 12.89 hrs HW=960.45' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Inlet Controls 21.82 cfs @ 12.35 fps)

Secondary OutFlow Max=7.81 cfs @ 12.89 hrs HW=960.45' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 7.81 cfs @ 1.72 fps)

Pond 19P: Chelsea Road Pond

Hydrograph



Summary for Pond 20P: S Chelsea

Inflow Area = 59.336 ac, 18.13% Impervious, Inflow Depth = 4.50" for 100-Year MONT Atlas 14 event
 Inflow = 199.96 cfs @ 12.54 hrs, Volume= 22.269 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 0.708 ac Storage= 2.250 af
 Peak Elev= 960.25' @ 104.15 hrs Surf.Area= 11.022 ac Storage= 24.519 af (22.269 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	948.00'	50.480 af	Custom Stage Data (Prismatic) Listed below (Recalc)

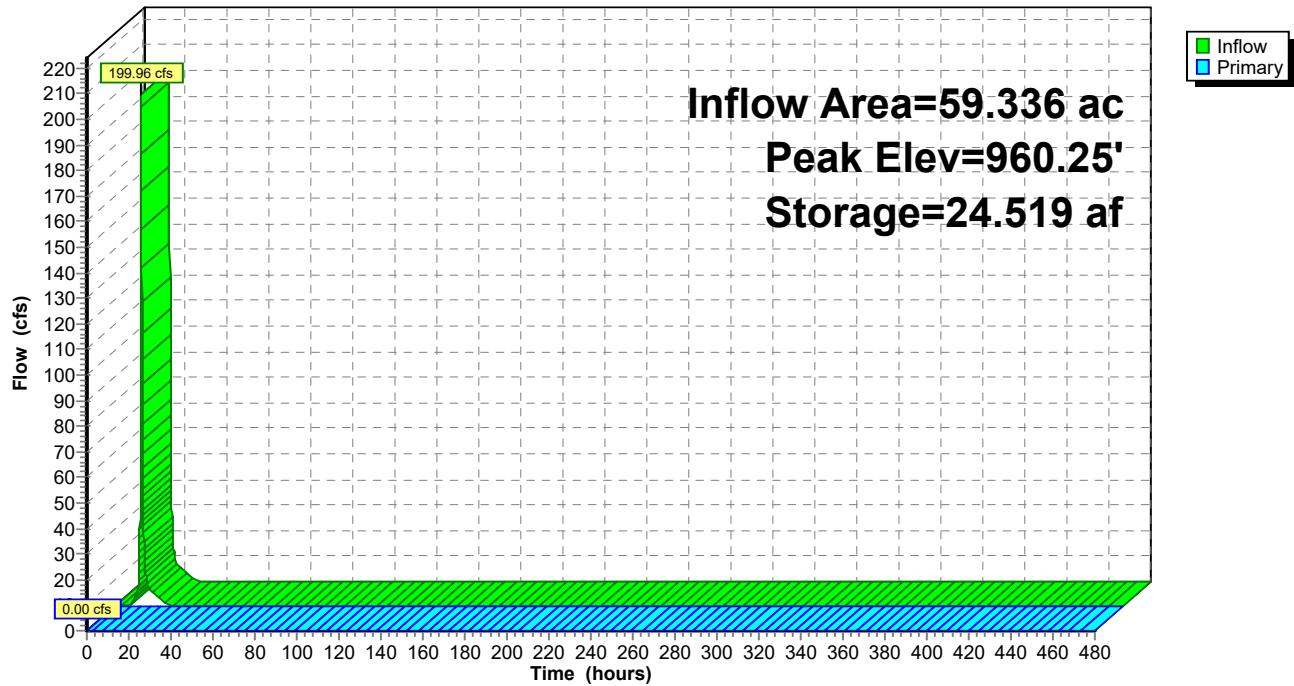
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
948.00	0.240	0.000	0.000
950.00	0.500	0.740	0.740
956.00	1.000	4.500	5.240
958.00	2.860	3.860	9.100
960.00	9.910	12.770	21.870
962.00	18.700	28.610	50.480

Device	Routing	Invert	Outlet Devices
#1	Primary	961.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

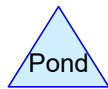
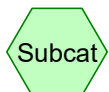
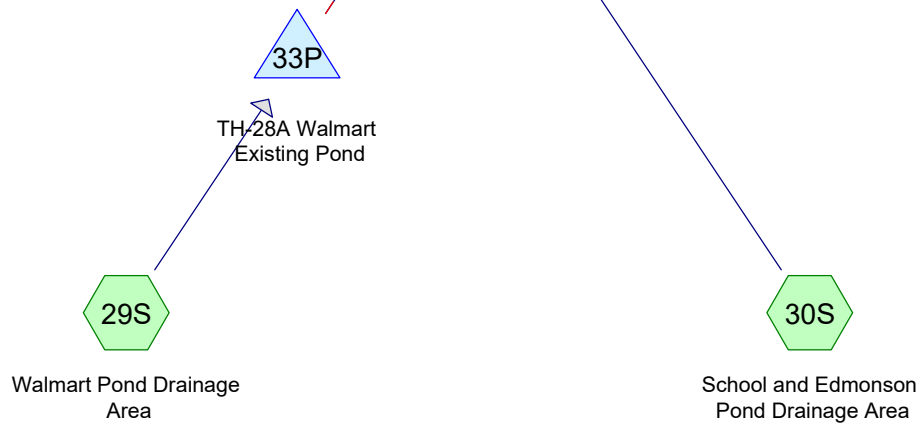
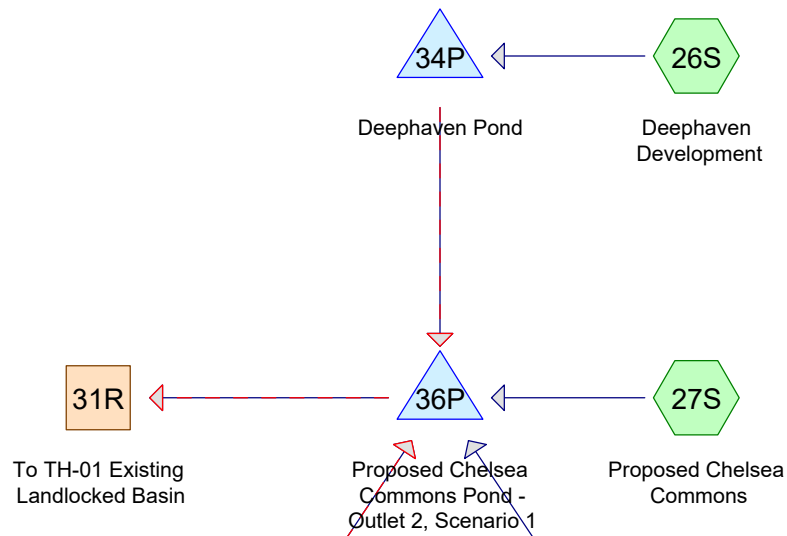
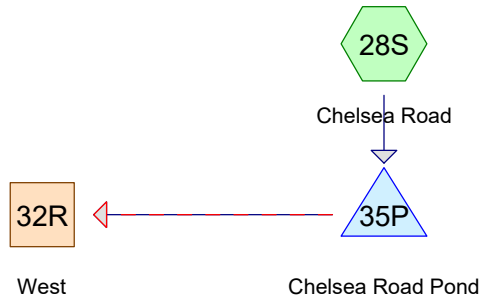
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)
 ↑1=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 20P: S Chelsea

Hydrograph



Proposed



Routing Diagram for 017991-000 Chelsea Commons Scenario 1

Prepared by WSB, Printed 7/23/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 7/23/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
13.513	77	1/4 acre lots, 38% imp, HSG B (26S)
1.083	75	1/4 acre lots, 38% imp, HSG B (28S)
0.604	61	>75% Grass cover, Good, HSG B (30S)
0.023	92	Offsite: Urban commercial, 85% imp, HSG B (30S)
24.780	69	Park: 50-75% Grass cover, Fair, HSG B (26S, 27S)
9.560	89	Paved roads w/open ditches, 50% imp, HSG B (26S, 27S, 28S, 30S)
6.601	85	R4: 1/8 acre lots, 65% imp, HSG B (30S)
32.031	85	Res: 1/8 acre lots, 65% imp, HSG B (27S)
24.180	92	Urban commercial, 85% imp, HSG B (27S, 29S)
1.974	88	Urban industrial, 72% imp, HSG B (28S)
1.221	98	Water Surface (28S, 29S, 30S)
13.089	98	Water Surface, HSG B (26S, 27S)
128.659	84	TOTAL AREA

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 7/23/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 3

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
127.438	HSG B	26S, 27S, 28S, 29S, 30S
0.000	HSG C	
0.000	HSG D	
1.221	Other	28S, 29S, 30S
128.659		TOTAL AREA

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 7/23/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 4

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	14.596	0.000	0.000	0.000	14.596	1/4 acre lots, 38% imp	
0.000	0.604	0.000	0.000	0.000	0.604	>75% Grass cover, Good	
0.000	0.023	0.000	0.000	0.000	0.023	Offsite: Urban commercial, 85% imp	
0.000	24.780	0.000	0.000	0.000	24.780	Park: 50-75% Grass cover, Fair	
0.000	9.560	0.000	0.000	0.000	9.560	Paved roads w/open ditches, 50% imp	
0.000	6.601	0.000	0.000	0.000	6.601	R4: 1/8 acre lots, 65% imp	
0.000	32.031	0.000	0.000	0.000	32.031	Res: 1/8 acre lots, 65% imp	
0.000	24.180	0.000	0.000	0.000	24.180	Urban commercial, 85% imp	
0.000	1.974	0.000	0.000	0.000	1.974	Urban industrial, 72% imp	
0.000	13.089	0.000	0.000	1.221	14.310	Water Surface	
0.000	127.438	0.000	0.000	1.221	128.659	TOTAL AREA	

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

Printed 7/23/2021

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Page 5

Pipe Listing (selected 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	33P	958.00	956.00	23.0	0.0870	0.012	24.0	0.0	0.0
2	34P	955.88	955.44	72.0	0.0061	0.013	18.0	0.0	0.0
3	35P	953.13	953.00	20.0	0.0065	0.013	18.0	0.0	0.0
4	36P	950.00	947.99	675.0	0.0030	0.013	24.0	0.0	0.0
5	36P	956.00	953.34	430.0	0.0062	0.013	18.0	0.0	0.0

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 6

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=0.29"
Tc=30.0 min CN=65/98 Runoff=3.95 cfs 0.380 af

Subcatchment27S: Proposed Chelsea Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=0.45"
Tc=30.0 min CN=67/98 Runoff=35.54 cfs 3.420 af

Subcatchment28S: Chelsea Road Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=0.45"
Tc=15.0 min CN=70/98 Runoff=2.87 cfs 0.195 af

Subcatchment29S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=0.68"
Tc=15.0 min CN=58/98 Runoff=4.91 cfs 0.332 af

Subcatchment30S: School and Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=0.48"
Tc=18.0 min CN=66/98 Runoff=5.44 cfs 0.401 af

Reach 31R: To TH-01 Existing Landlocked Basin Inflow=0.35 cfs 3.352 af
Outflow=0.35 cfs 3.352 af

Reach 32R: West Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 33P: TH-28A Walmart Existing Pond Peak Elev=958.40' Storage=0.176 af Inflow=4.91 cfs 0.332 af
Primary=1.21 cfs 0.331 af Secondary=0.00 cfs 0.000 af Outflow=1.21 cfs 0.331 af

Pond 34P: Deephaven Pond Peak Elev=955.77' Storage=0.254 af Inflow=3.95 cfs 0.380 af
Discarded=0.17 cfs 0.380 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.380 af

Pond 35P: Chelsea Road Pond Peak Elev=952.49' Storage=0.144 af Inflow=2.87 cfs 0.195 af
Discarded=0.06 cfs 0.195 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.195 af

Pond 36P: Proposed Chelsea Commons Peak Elev=952.81' Storage=186.031 af Inflow=40.48 cfs 4.153 af
Primary=0.35 cfs 3.352 af Secondary=0.00 cfs 0.000 af Outflow=0.35 cfs 3.352 af

Total Runoff Area = 128.659 ac Runoff Volume = 4.729 af Average Runoff Depth = 0.44"
44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 7

Summary for Subcatchment 26S: Deephaven Development

Runoff = 3.95 cfs @ 12.41 hrs, Volume= 0.380 af, Depth= 0.29"

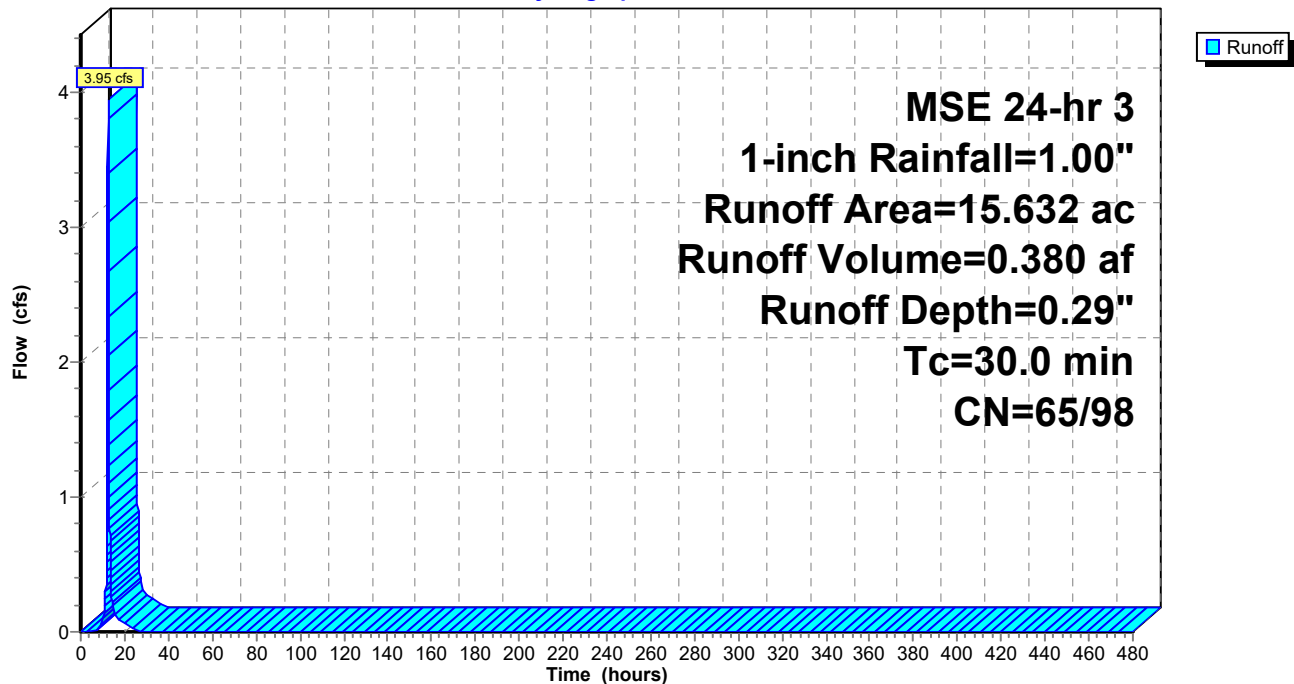
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

	Area (ac)	CN	Description
*	1.444	69	Park: 50-75% Grass cover, Fair, HSG B
	0.079	89	Paved roads w/open ditches, 50% imp, HSG B
	0.596	98	Water Surface, HSG B
*	13.513	77	1/4 acre lots, 38% imp, HSG B
	15.632	77	Weighted Average
	9.862	65	63.09% Pervious Area
	5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 8

Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 35.54 cfs @ 12.41 hrs, Volume= 3.420 af, Depth= 0.45"

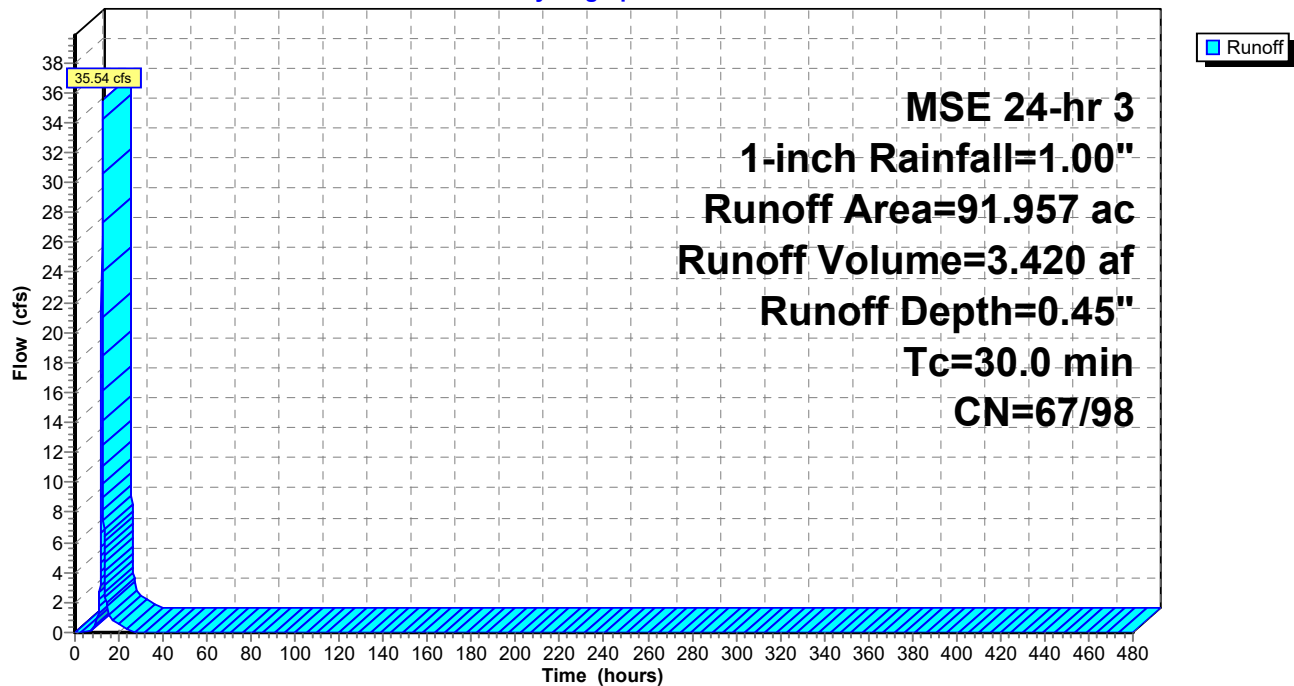
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
* 23.336	69	Park: 50-75% Grass cover, Fair, HSG B
5.435	89	Paved roads w/open ditches, 50% imp, HSG B
12.493	98	Water Surface, HSG B
* 18.662	92	Urban commercial, 85% imp, HSG B
* 32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
91.957	84	Weighted Average
40.064	67	43.57% Pervious Area
51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 9

Summary for Subcatchment 28S: Chelsea Road

Runoff = 2.87 cfs @ 12.23 hrs, Volume= 0.195 af, Depth= 0.45"

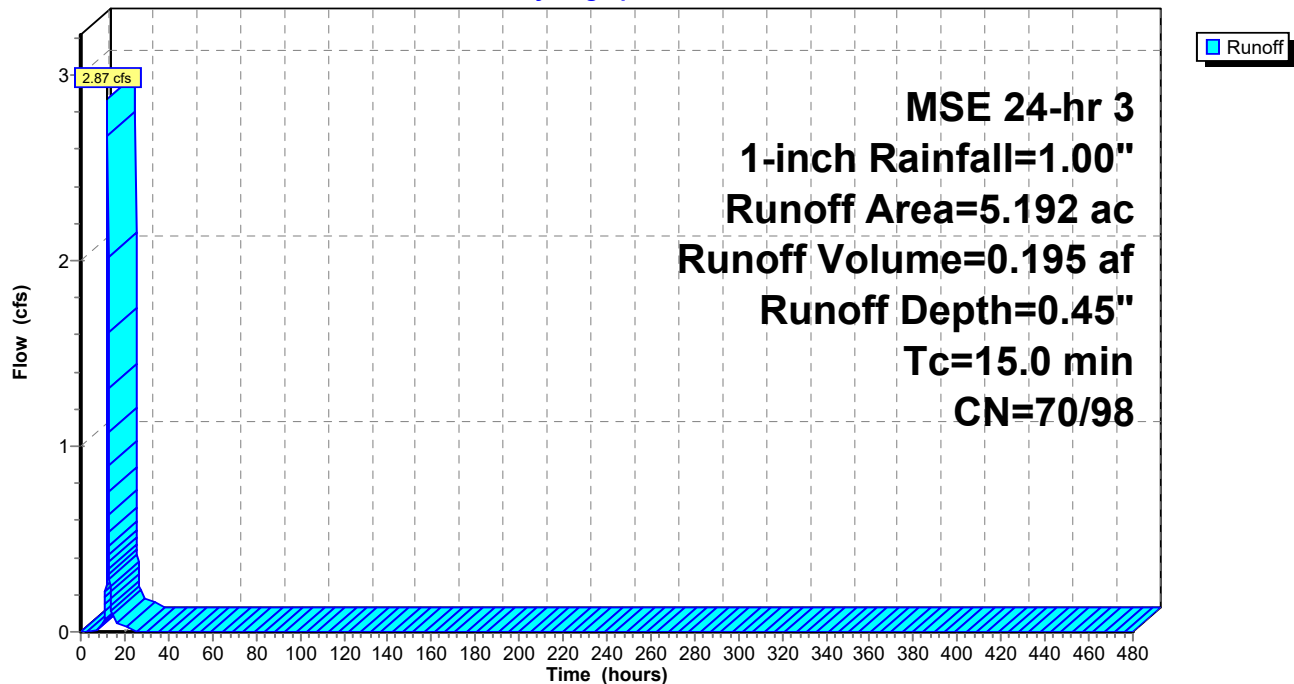
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 10

Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 4.91 cfs @ 12.23 hrs, Volume= 0.332 af, Depth= 0.68"

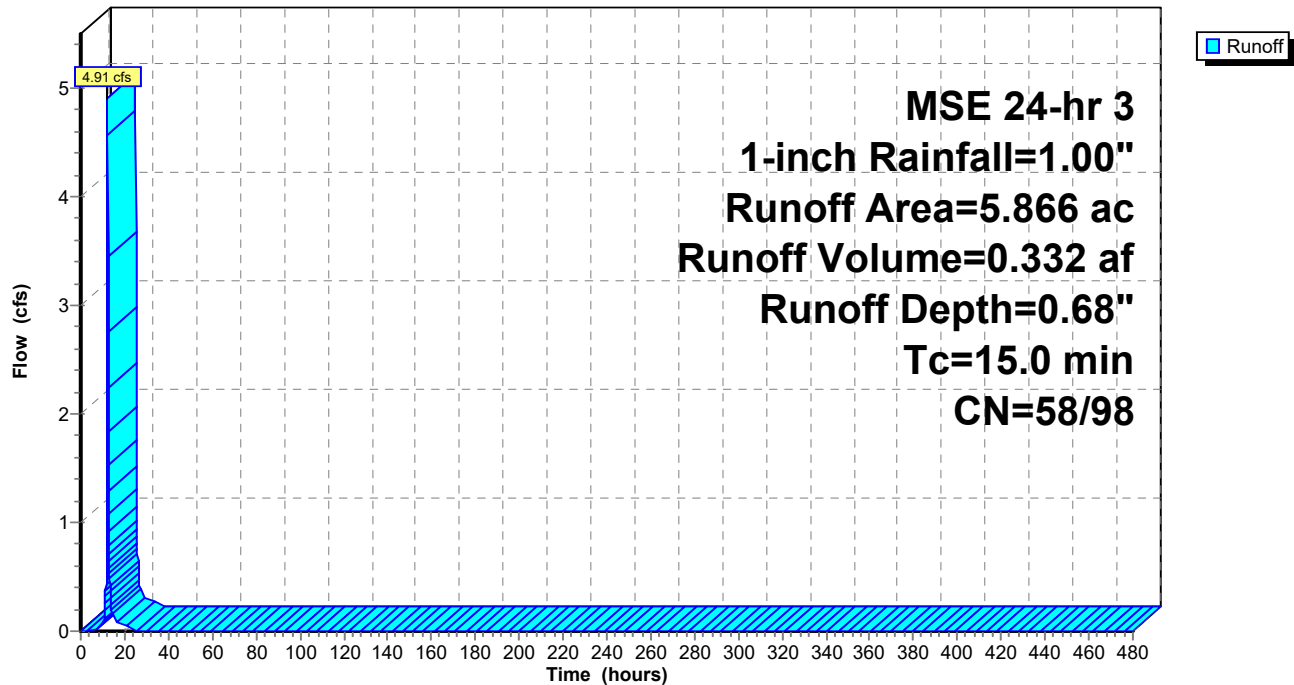
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 11

Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

Runoff = 5.44 cfs @ 12.27 hrs, Volume= 0.401 af, Depth= 0.48"

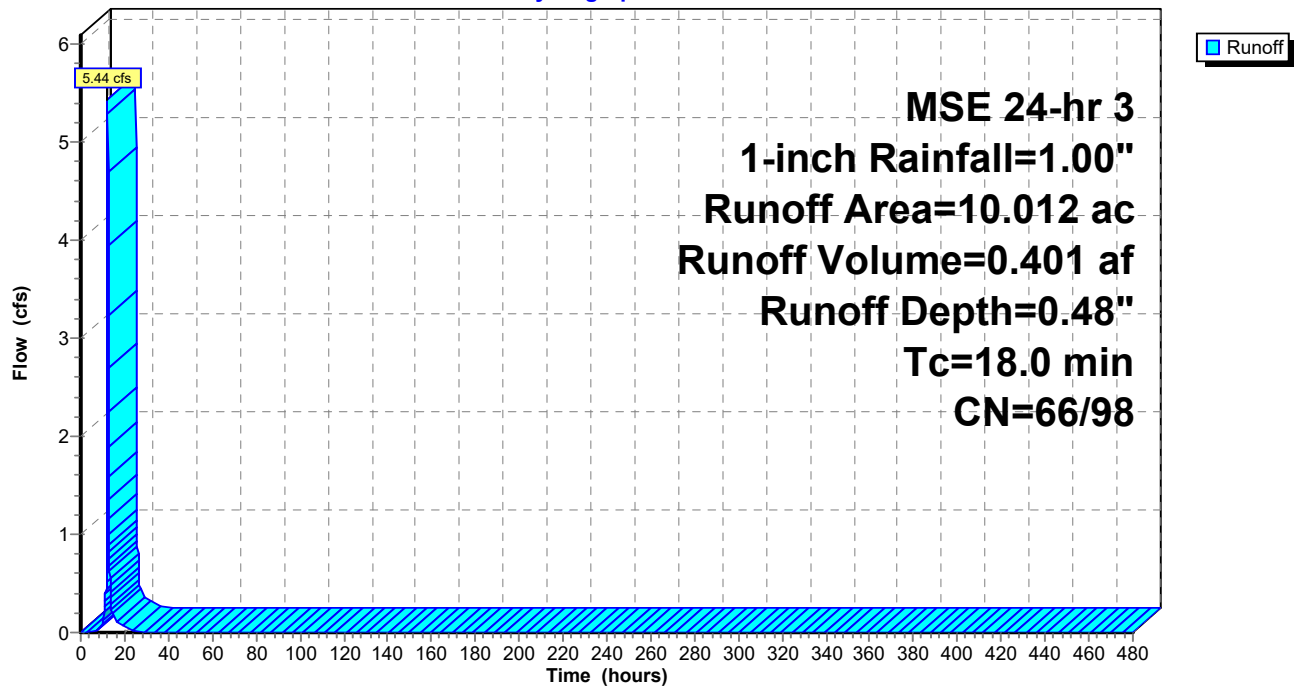
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-inch Rainfall=1.00"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

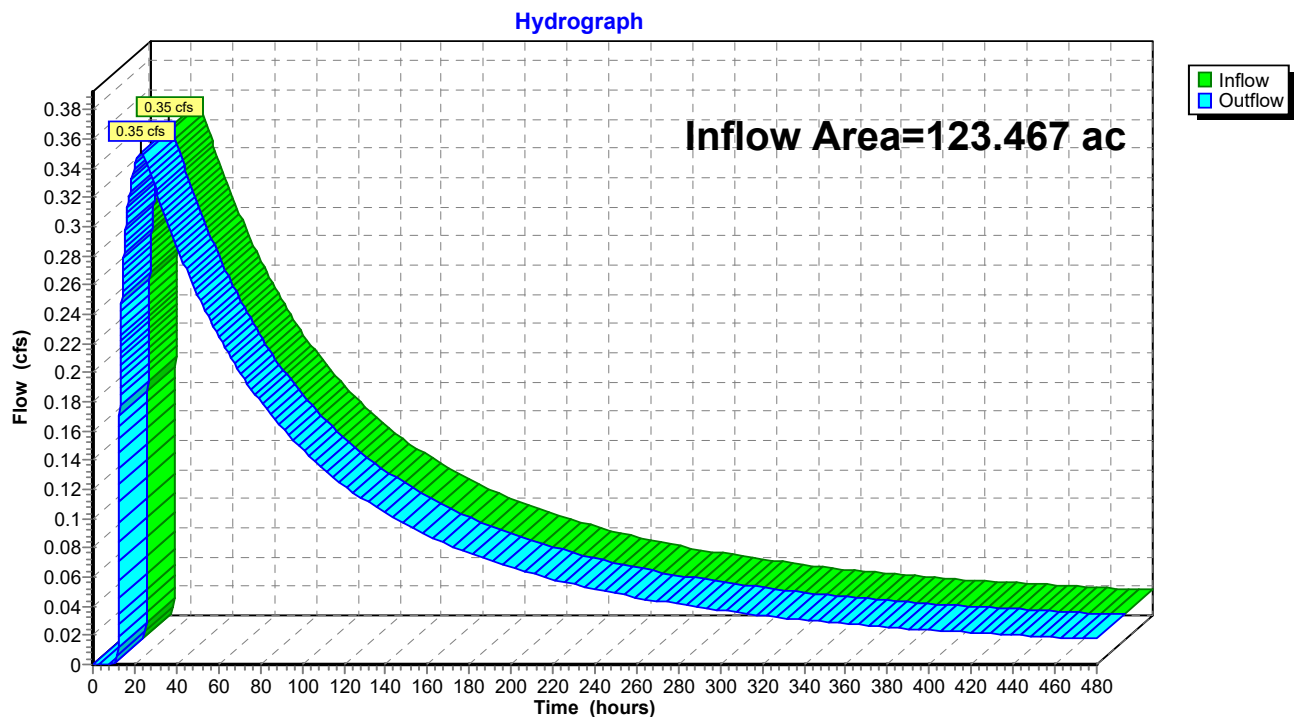
Page 12

Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 0.33" for 1-inch event
Inflow = 0.35 cfs @ 23.18 hrs, Volume= 3.352 af
Outflow = 0.35 cfs @ 23.18 hrs, Volume= 3.352 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 13

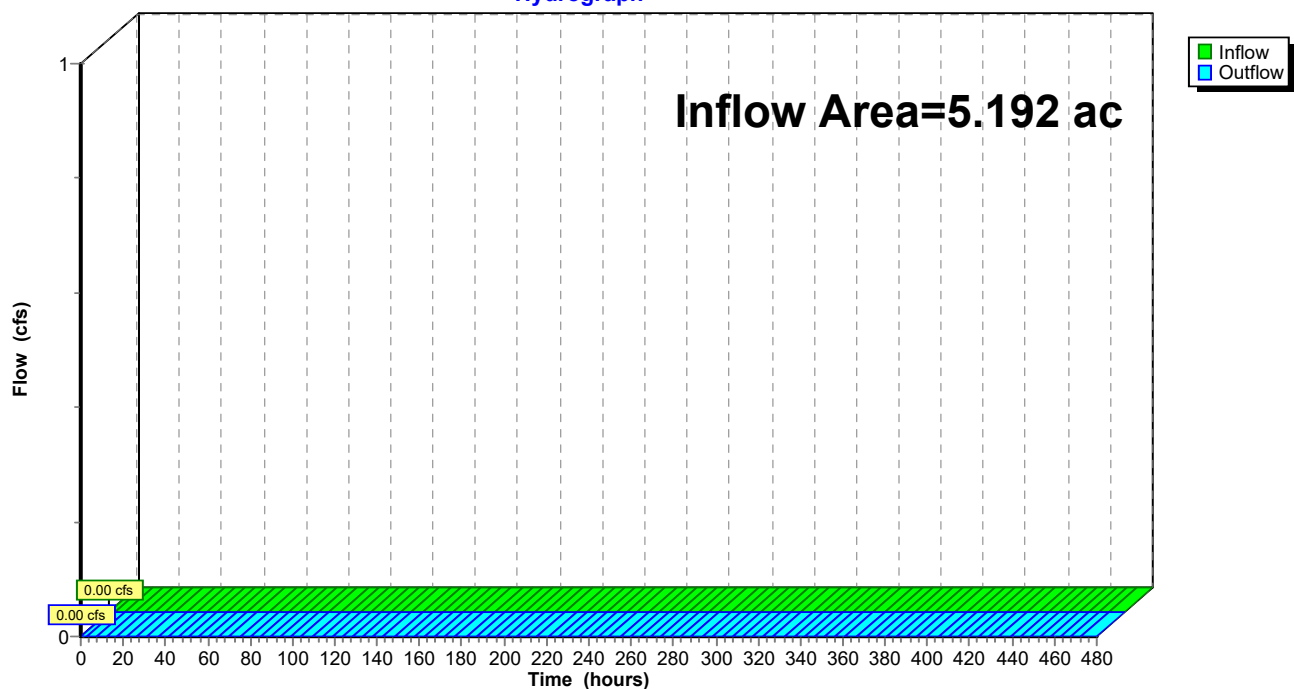
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 0.00" for 1-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 14

Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 0.68" for 1-inch event
 Inflow = 4.91 cfs @ 12.23 hrs, Volume= 0.332 af
 Outflow = 1.21 cfs @ 12.62 hrs, Volume= 0.331 af, Atten= 75%, Lag= 23.5 min
 Primary = 1.21 cfs @ 12.62 hrs, Volume= 0.331 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 958.40' @ 12.62 hrs Surf.Area= 0.456 ac Storage= 0.176 af

Plug-Flow detention time= 326.2 min calculated for 0.331 af (100% of inflow)

Center-of-Mass det. time= 325.1 min (1,108.9 - 783.8)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.21 cfs @ 12.62 hrs HW=958.40' TW=952.67' (Dynamic Tailwater)↑**1=RCP_Round 24"** (Inlet Controls 1.21 cfs @ 2.69 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)↑**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

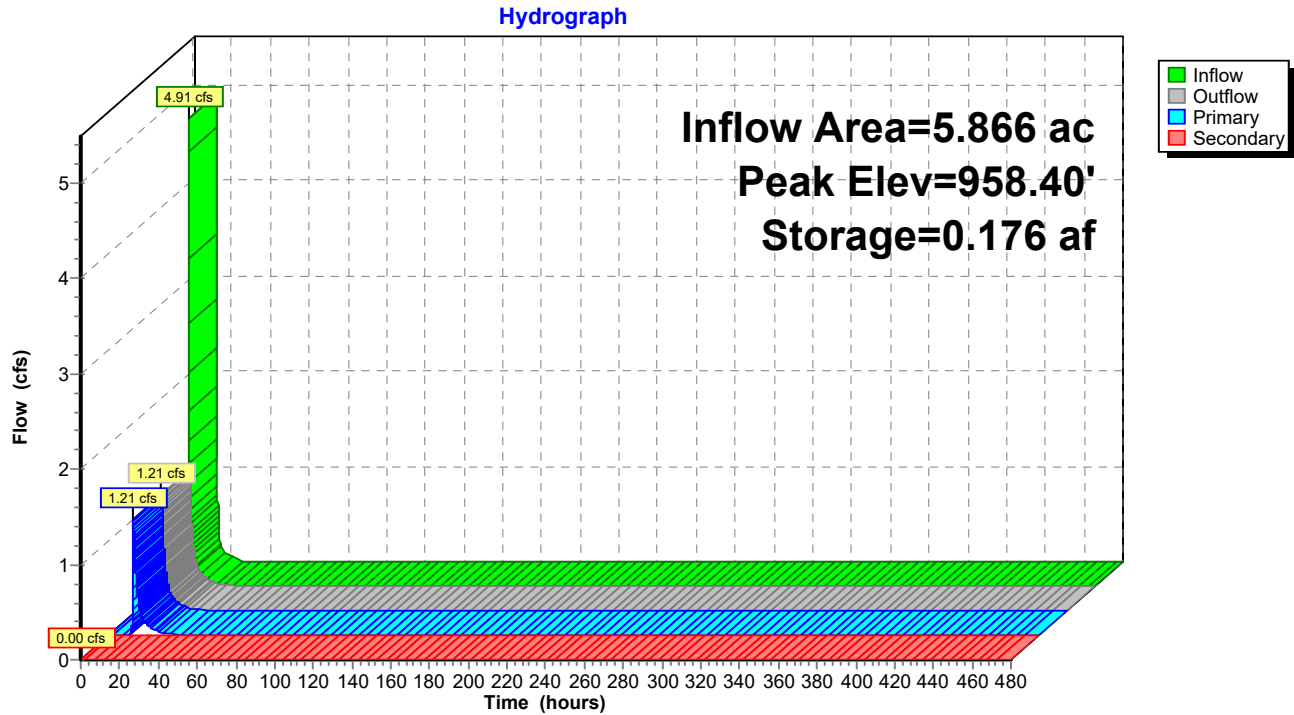
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 15

Pond 33P: TH-28A Walmart Existing Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 16

Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 0.29" for 1-inch event
 Inflow = 3.95 cfs @ 12.41 hrs, Volume= 0.380 af
 Outflow = 0.17 cfs @ 15.28 hrs, Volume= 0.380 af, Atten= 96%, Lag= 171.8 min
 Discarded = 0.17 cfs @ 15.28 hrs, Volume= 0.380 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 955.77' @ 15.28 hrs Surf.Area= 0.380 ac Storage= 0.254 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 632.5 min (1,430.3 - 797.8)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 17

Discarded OutFlow Max=0.17 cfs @ 15.28 hrs HW=955.77' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)

↑ **2=RCP_Round 18"** (Controls 0.00 cfs)

↑ **3=Orifice/Grate** (Controls 0.00 cfs)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

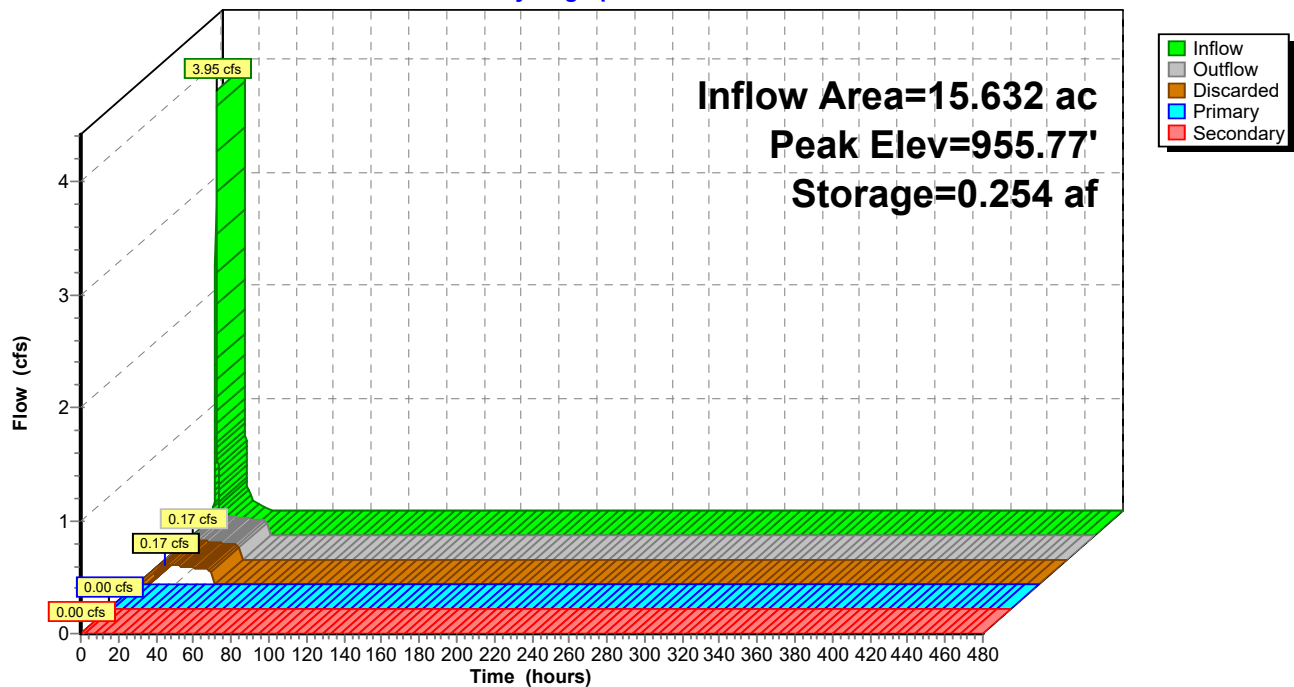
↑ **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)

↑ **6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 34P: Deephaaven Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 18

Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 0.45" for 1-inch event
 Inflow = 2.87 cfs @ 12.23 hrs, Volume= 0.195 af
 Outflow = 0.06 cfs @ 15.41 hrs, Volume= 0.195 af, Atten= 98%, Lag= 190.6 min
 Discarded = 0.06 cfs @ 15.41 hrs, Volume= 0.195 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 952.49' @ 15.41 hrs Surf.Area= 0.134 ac Storage= 0.144 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,115.1 min (1,900.5 - 785.4)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.06 cfs @ 15.41 hrs HW=952.49' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

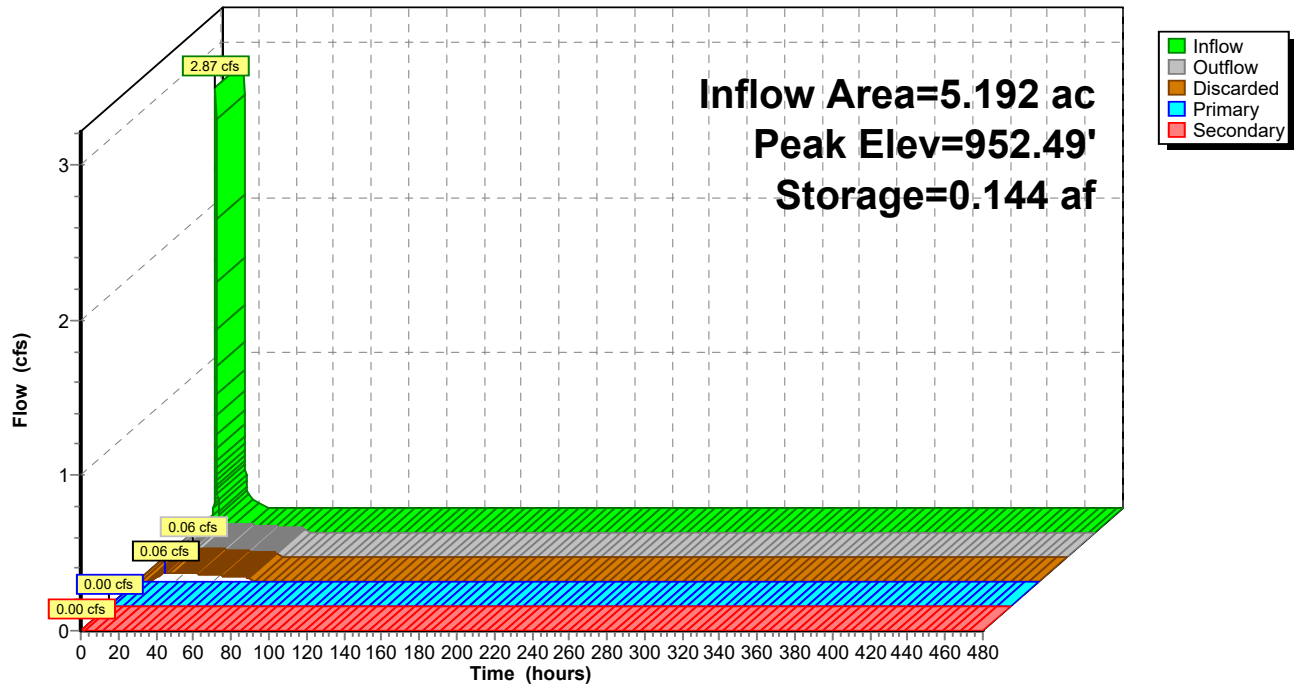
Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 19

Pond 35P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 20

Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 0.40" for 1-inch event
 Inflow = 40.48 cfs @ 12.40 hrs, Volume= 4.153 af
 Outflow = 0.35 cfs @ 23.18 hrs, Volume= 3.352 af, Atten= 99%, Lag= 647.0 min
 Primary = 0.35 cfs @ 23.18 hrs, Volume= 3.352 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af

Peak Elev= 952.81' @ 23.18 hrs Surf.Area= 12.413 ac Storage= 186.031 af (3.820 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= 7,224.2 min (8,045.7 - 821.5)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-inch Rainfall=1.00"

Printed 7/23/2021

Page 21

Primary OutFlow Max=0.35 cfs @ 23.18 hrs HW=952.81' TW=0.00' (Dynamic Tailwater)

1=RCP_Round 24" (Passes 0.35 cfs of 13.45 cfs potential flow)

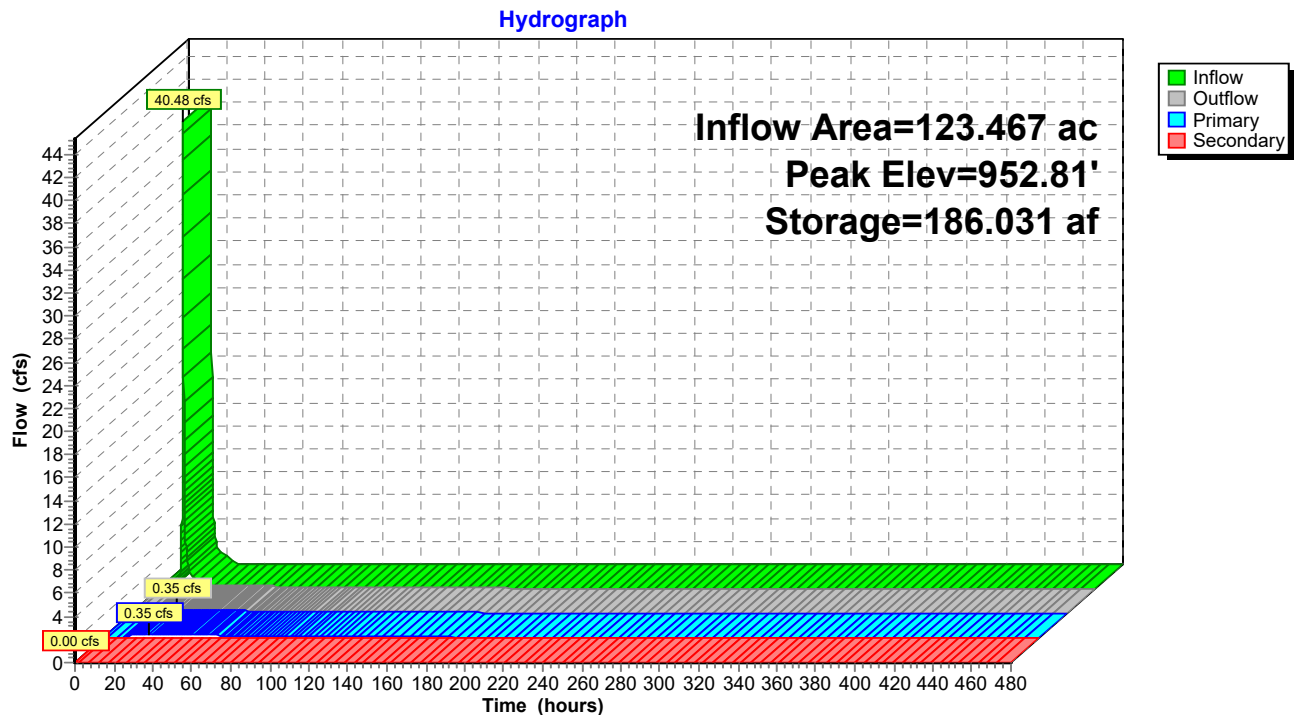
2=Orifice/Grate (Orifice Controls 0.35 cfs @ 1.90 fps)

3=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 22

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=0.98"
Tc=30.0 min CN=65/98 Runoff=11.60 cfs 1.274 af

Subcatchment27S: Proposed Chelsea Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=1.38"
Tc=30.0 min CN=67/98 Runoff=100.47 cfs 10.557 af

Subcatchment28S: Chelsea Road Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=1.42"
Tc=15.0 min CN=70/98 Runoff=8.41 cfs 0.617 af

Subcatchment29S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=1.90"
Tc=15.0 min CN=58/98 Runoff=12.85 cfs 0.928 af

Subcatchment30S: School and Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=1.45"
Tc=18.0 min CN=66/98 Runoff=15.00 cfs 1.209 af

Reach 31R: To TH-01 Existing Landlocked Basin Inflow=1.81 cfs 11.750 af
Outflow=1.81 cfs 11.750 af

Reach 32R: West Inflow=1.45 cfs 0.266 af
Outflow=1.45 cfs 0.266 af

Pond 33P: TH-28A Walmart Existing Pond Peak Elev=958.86' Storage=0.395 af Inflow=12.85 cfs 0.928 af
Primary=5.11 cfs 0.927 af Secondary=0.00 cfs 0.000 af Outflow=5.11 cfs 0.927 af

Pond 34P: Deephaven Pond Peak Elev=957.42' Storage=0.986 af Inflow=11.60 cfs 1.274 af
Discarded=0.22 cfs 1.246 af Primary=0.06 cfs 0.029 af Secondary=0.00 cfs 0.000 af Outflow=0.28 cfs 1.274 af

Pond 35P: Chelsea Road Pond Peak Elev=953.77' Storage=0.359 af Inflow=8.41 cfs 0.617 af
Discarded=0.09 cfs 0.350 af Primary=1.45 cfs 0.266 af Secondary=0.00 cfs 0.000 af Outflow=1.54 cfs 0.617 af

Pond 36P: Proposed Chelsea Peak Elev=953.39' Storage=193.325 af Inflow=116.12 cfs 12.721 af
Primary=1.81 cfs 11.750 af Secondary=0.00 cfs 0.000 af Outflow=1.81 cfs 11.750 af

Total Runoff Area = 128.659 ac Runoff Volume = 14.584 af Average Runoff Depth = 1.36"
44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 23

Summary for Subcatchment 26S: Deephaven Development

Runoff = 11.60 cfs @ 12.43 hrs, Volume= 1.274 af, Depth= 0.98"

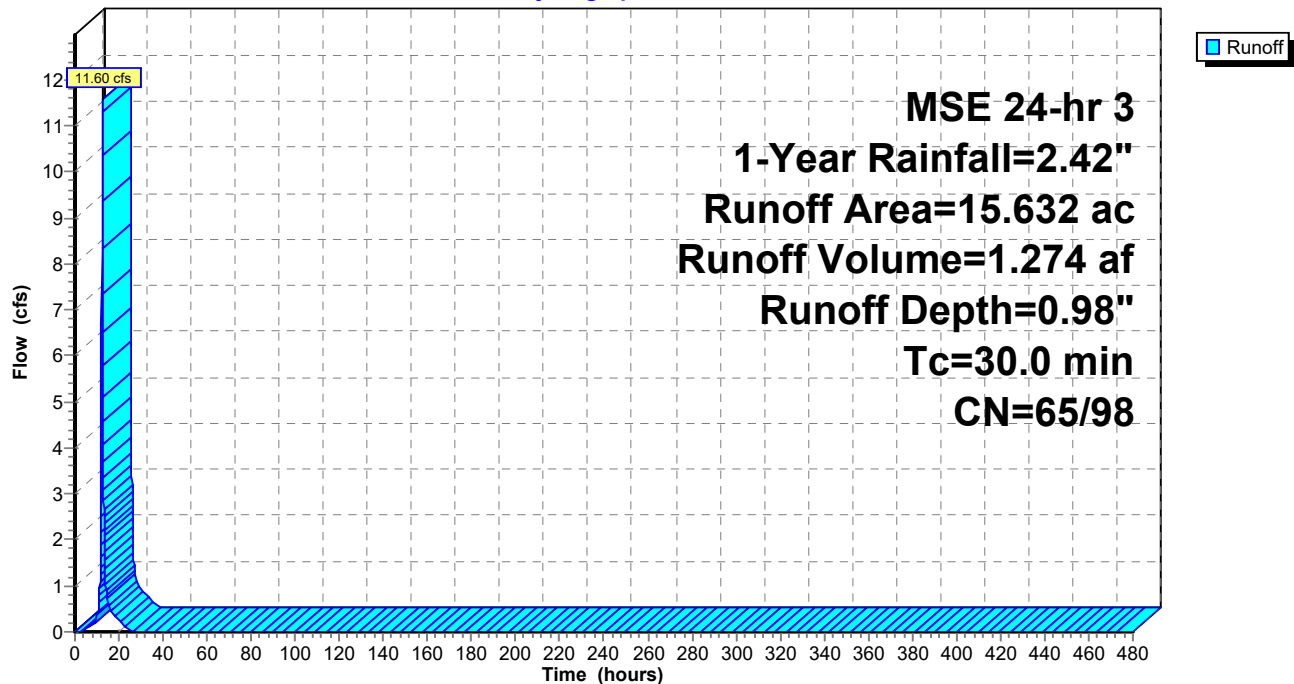
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 24

Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 100.47 cfs @ 12.42 hrs, Volume= 10.557 af, Depth= 1.38"

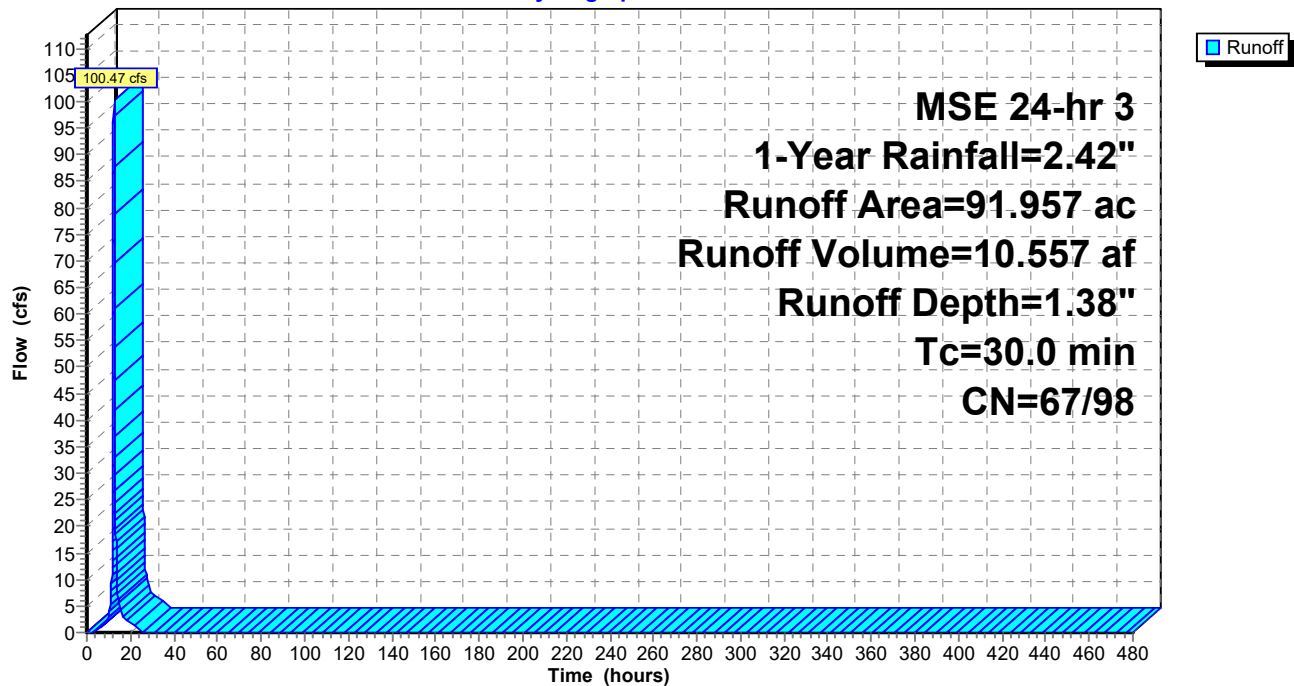
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
* 23.336	69	Park: 50-75% Grass cover, Fair, HSG B
5.435	89	Paved roads w/open ditches, 50% imp, HSG B
12.493	98	Water Surface, HSG B
* 18.662	92	Urban commercial, 85% imp, HSG B
* 32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
91.957	84	Weighted Average
40.064	67	43.57% Pervious Area
51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 25

Summary for Subcatchment 28S: Chelsea Road

Runoff = 8.41 cfs @ 12.23 hrs, Volume= 0.617 af, Depth= 1.42"

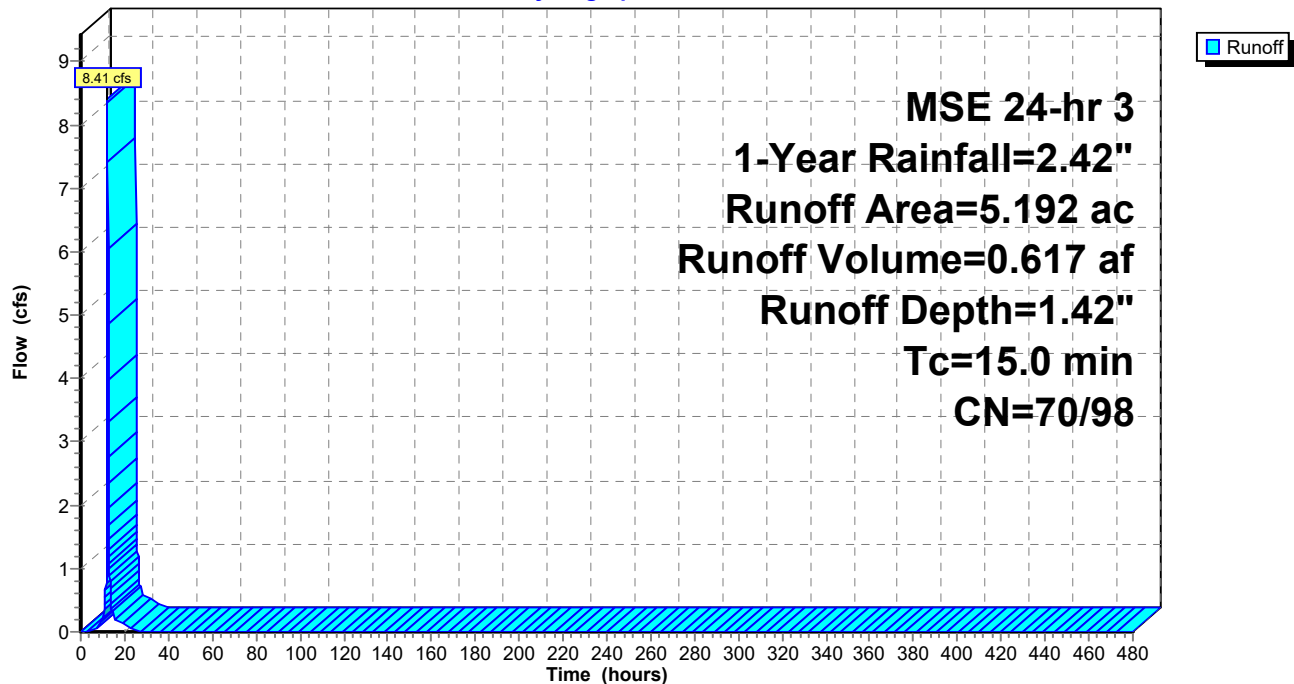
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 26

Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 12.85 cfs @ 12.23 hrs, Volume= 0.928 af, Depth= 1.90"

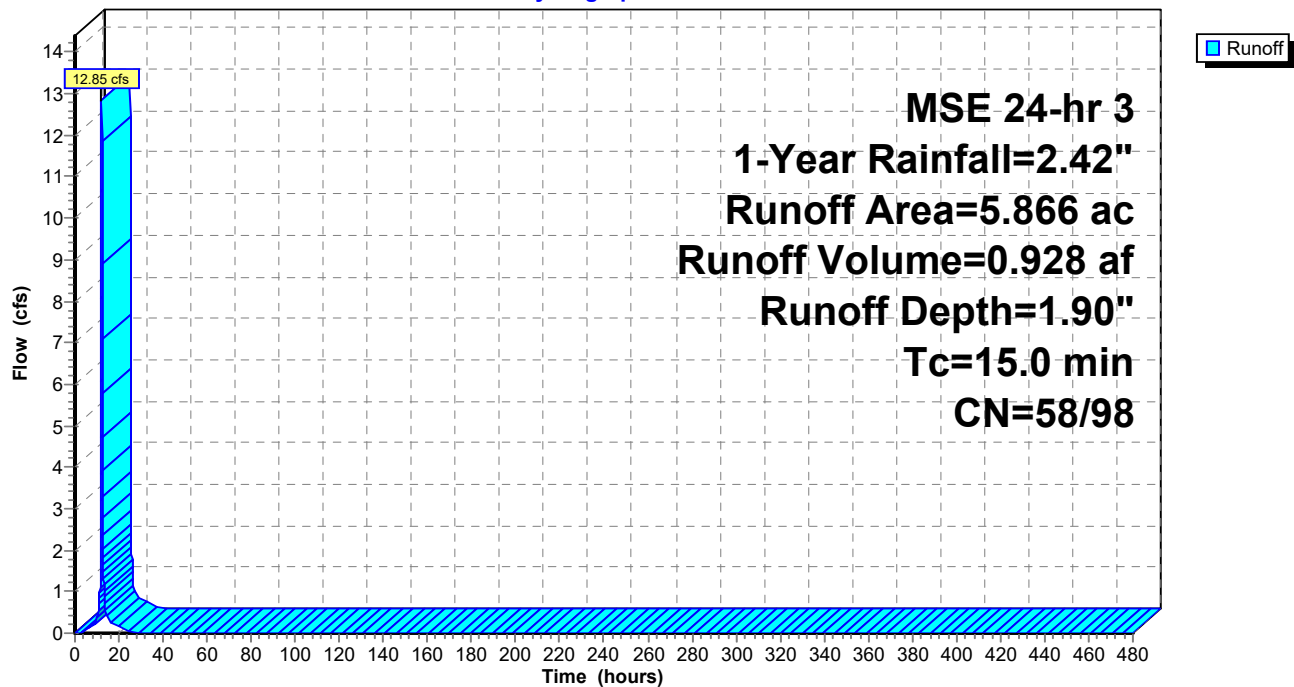
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 27

Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

Runoff = 15.00 cfs @ 12.27 hrs, Volume= 1.209 af, Depth= 1.45"

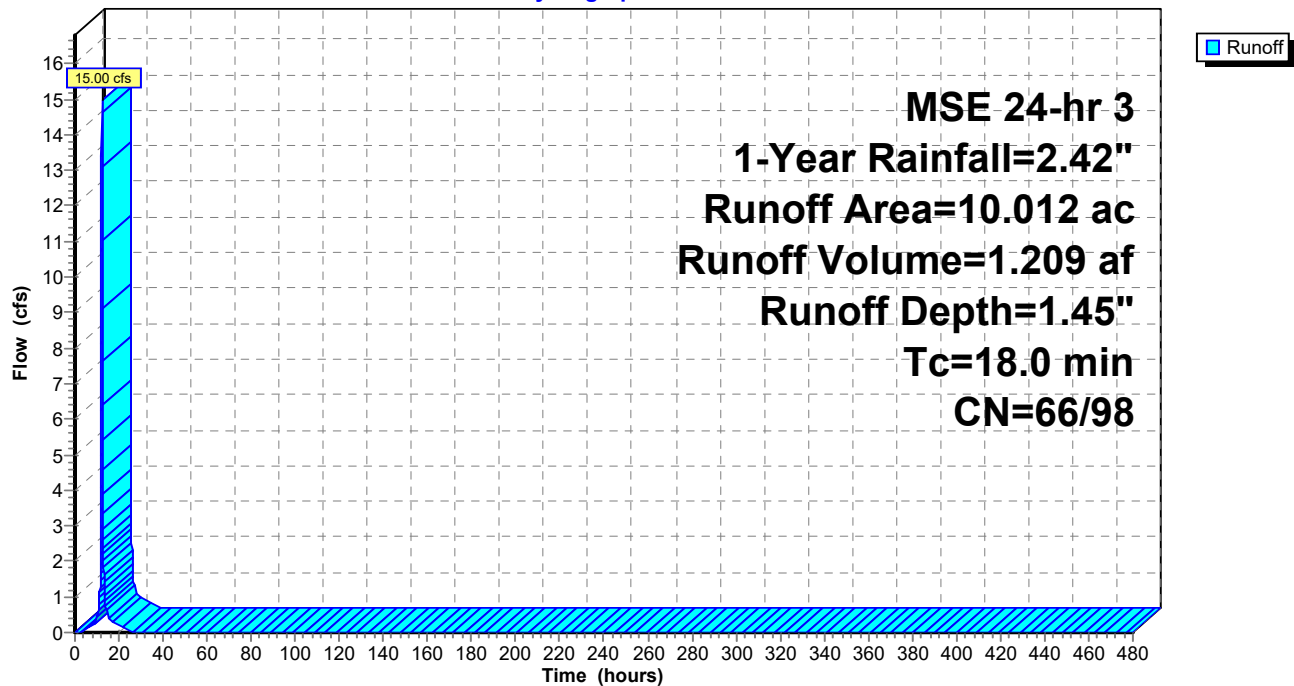
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

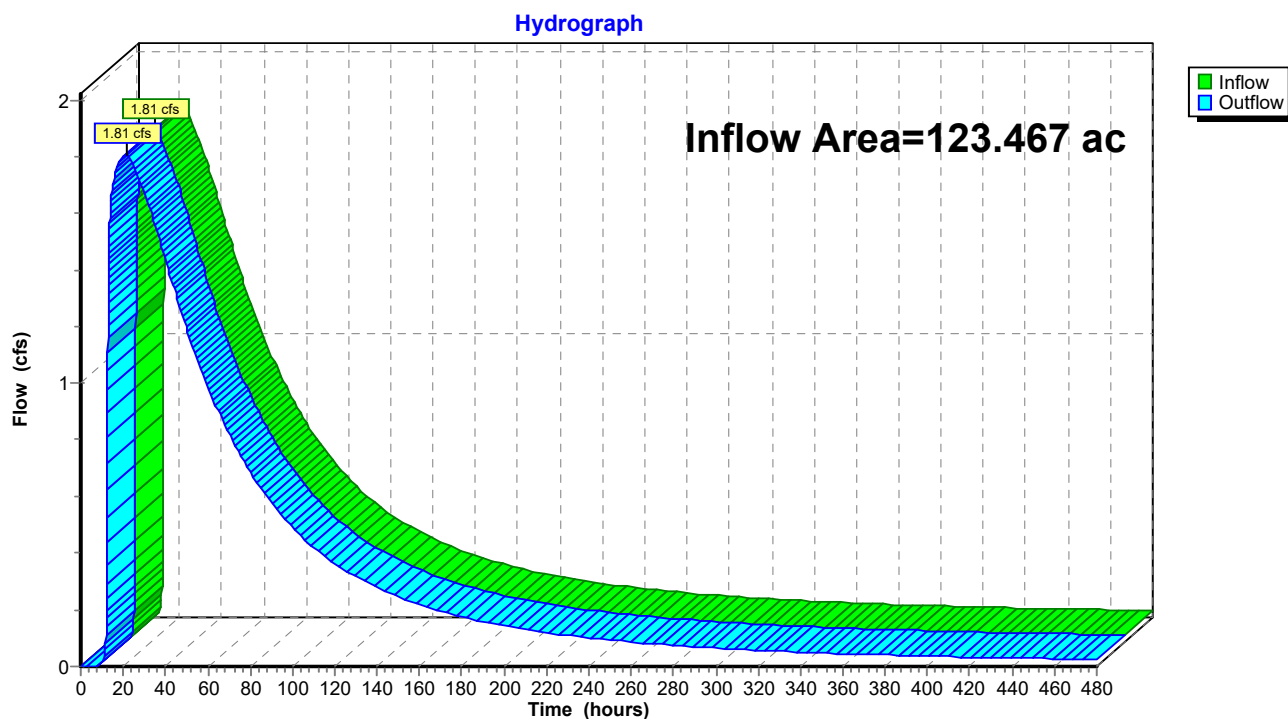
Page 28

Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 1.14" for 1-Year event
Inflow = 1.81 cfs @ 21.33 hrs, Volume= 11.750 af
Outflow = 1.81 cfs @ 21.33 hrs, Volume= 11.750 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 29

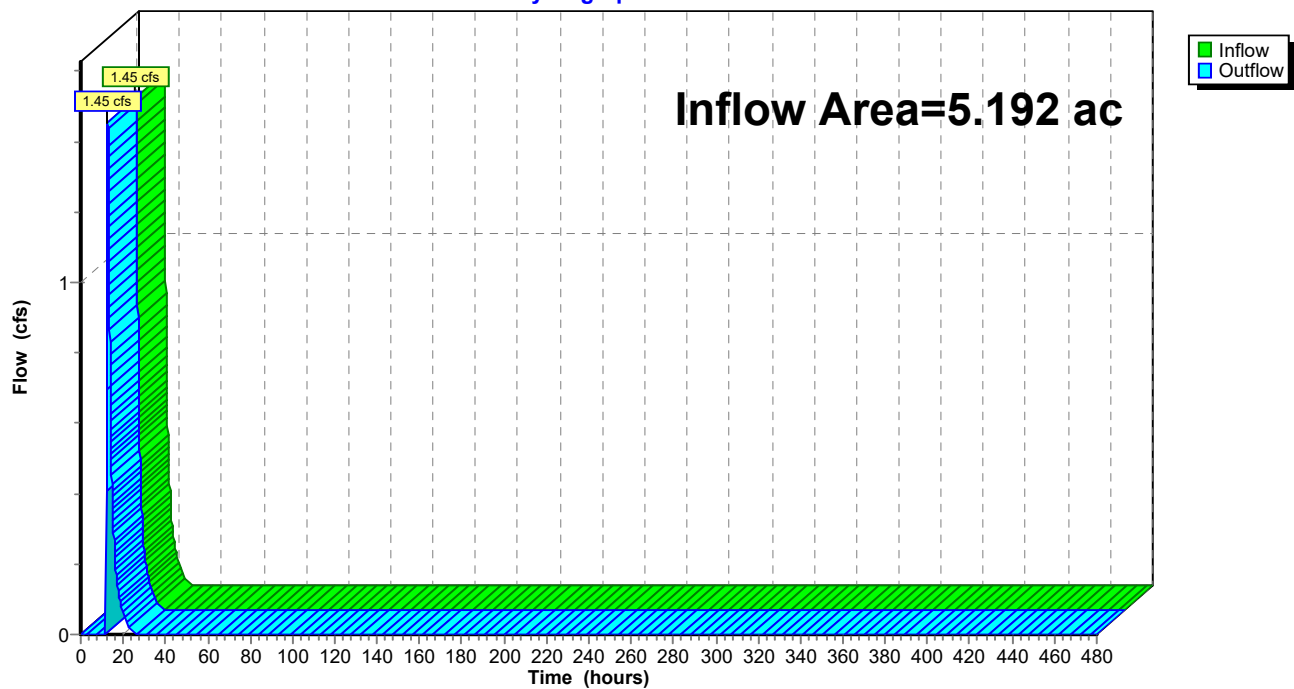
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 0.62" for 1-Year event
Inflow = 1.45 cfs @ 12.73 hrs, Volume= 0.266 af
Outflow = 1.45 cfs @ 12.73 hrs, Volume= 0.266 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 30

Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 1.90" for 1-Year event
 Inflow = 12.85 cfs @ 12.23 hrs, Volume= 0.928 af
 Outflow = 5.11 cfs @ 12.48 hrs, Volume= 0.927 af, Atten= 60%, Lag= 15.5 min
 Primary = 5.11 cfs @ 12.48 hrs, Volume= 0.927 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 958.86' @ 12.48 hrs Surf.Area= 0.498 ac Storage= 0.395 af

Plug-Flow detention time= 170.0 min calculated for 0.927 af (100% of inflow)

Center-of-Mass det. time= 172.1 min (938.7 - 766.6)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=5.11 cfs @ 12.48 hrs HW=958.86' TW=952.95' (Dynamic Tailwater)↑ **1=RCP_Round 24"** (Inlet Controls 5.11 cfs @ 3.95 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

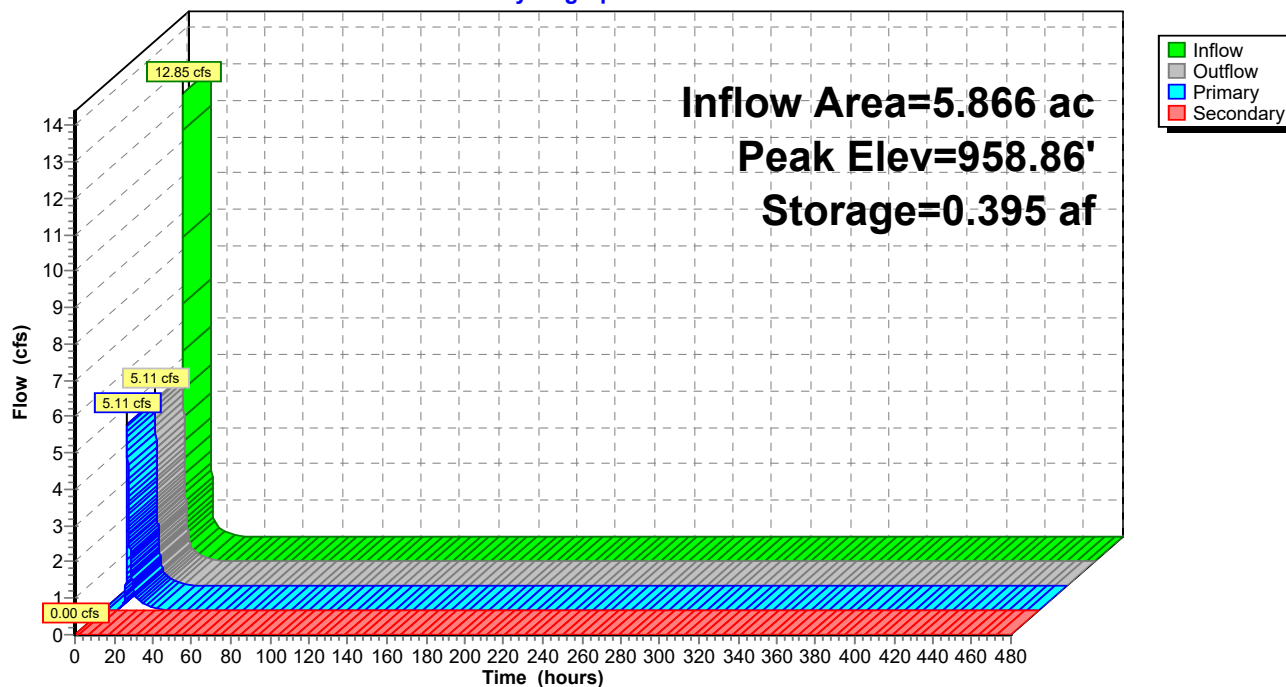
Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 31

Pond 33P: TH-28A Walmart Existing Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 32

Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 0.98" for 1-Year event
 Inflow = 11.60 cfs @ 12.43 hrs, Volume= 1.274 af
 Outflow = 0.28 cfs @ 19.35 hrs, Volume= 1.274 af, Atten= 98%, Lag= 415.1 min
 Discarded = 0.22 cfs @ 19.35 hrs, Volume= 1.246 af
 Primary = 0.06 cfs @ 19.35 hrs, Volume= 0.029 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 957.42' @ 19.35 hrs Surf.Area= 0.495 ac Storage= 0.986 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,817.9 min (2,618.4 - 800.5)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 33

Discarded OutFlow Max=0.22 cfs @ 19.35 hrs HW=957.42' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.06 cfs @ 19.35 hrs HW=957.42' TW=953.38' (Dynamic Tailwater)

↑ **2=RCP_Round 18"** (Passes 0.06 cfs of 6.68 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.16 fps)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

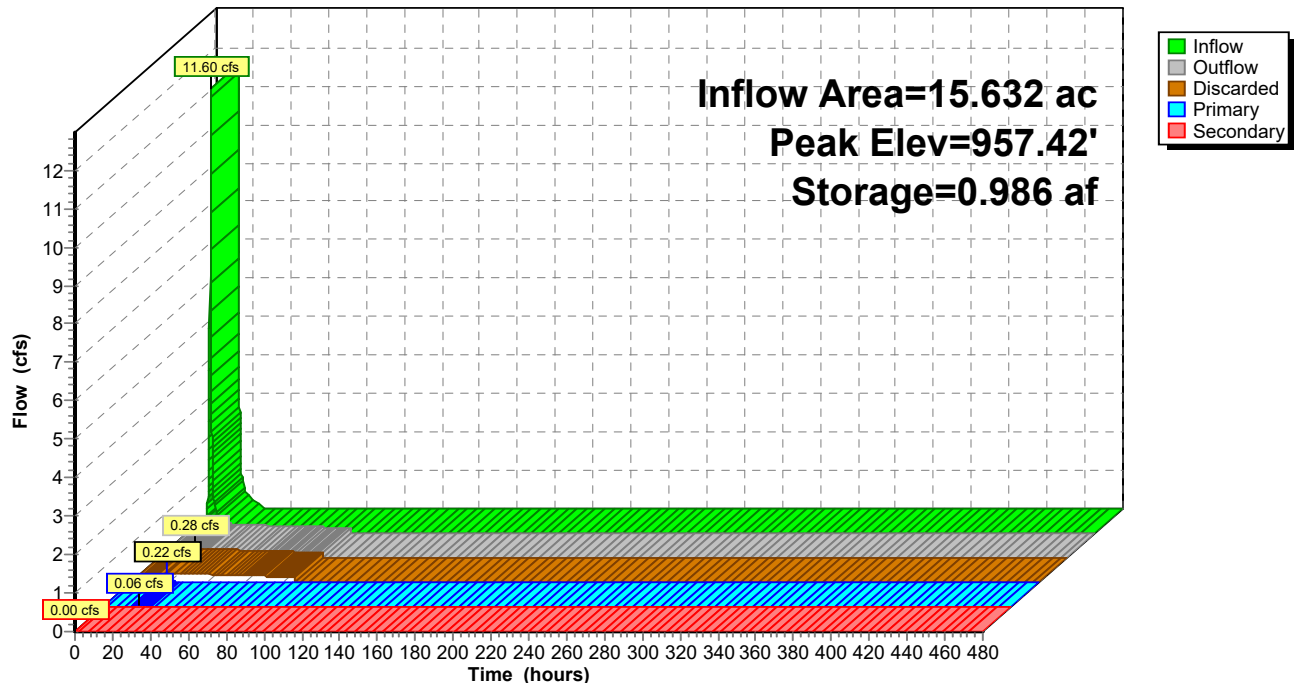
↑ **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)

↑ **6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 34P: Deephaaven Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 34

Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 1.42" for 1-Year event
 Inflow = 8.41 cfs @ 12.23 hrs, Volume= 0.617 af
 Outflow = 1.54 cfs @ 12.73 hrs, Volume= 0.617 af, Atten= 82%, Lag= 30.1 min
 Discarded = 0.09 cfs @ 12.73 hrs, Volume= 0.350 af
 Primary = 1.45 cfs @ 12.73 hrs, Volume= 0.266 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 953.77' @ 12.73 hrs Surf.Area= 0.202 ac Storage= 0.359 af

Plug-Flow detention time= 928.3 min calculated for 0.616 af (100% of inflow)
 Center-of-Mass det. time= 928.6 min (1,706.5 - 777.9)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

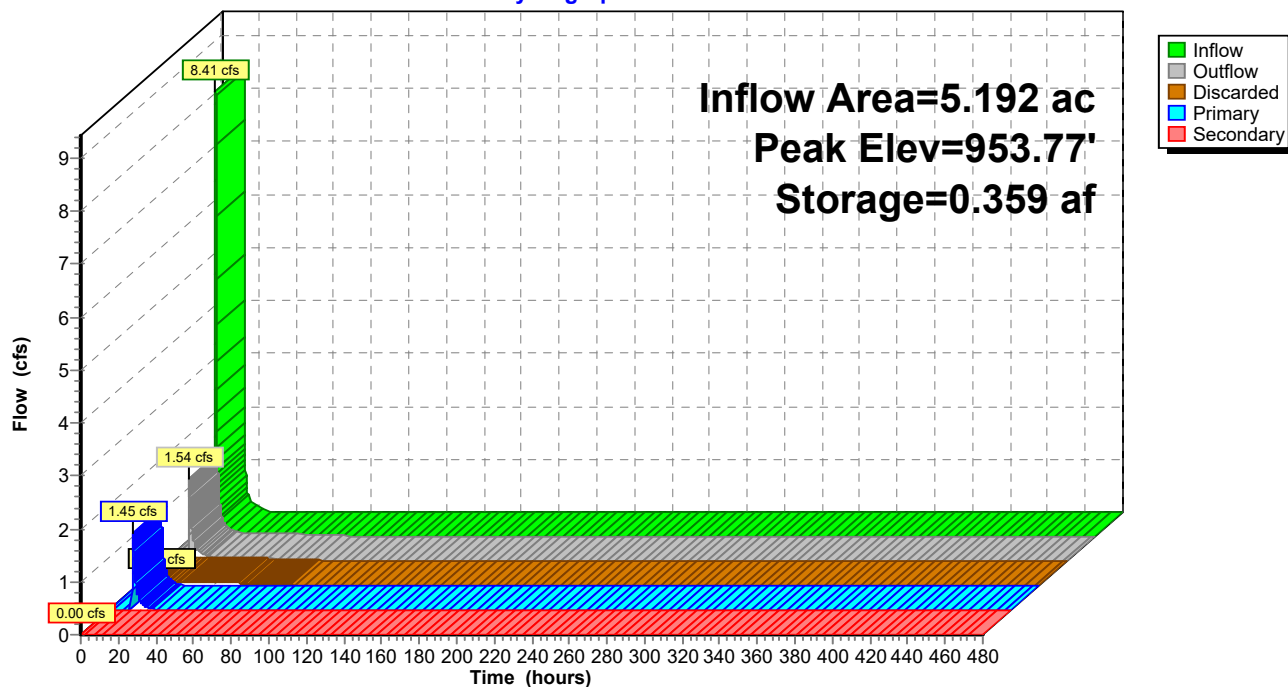
Discarded OutFlow Max=0.09 cfs @ 12.73 hrs HW=953.77' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=1.45 cfs @ 12.73 hrs HW=953.77' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 1.45 cfs @ 3.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 35P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 36

Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 1.24" for 1-Year event
 Inflow = 116.12 cfs @ 12.40 hrs, Volume= 12.721 af
 Outflow = 1.81 cfs @ 21.33 hrs, Volume= 11.750 af, Atten= 98%, Lag= 535.6 min
 Primary = 1.81 cfs @ 21.33 hrs, Volume= 11.750 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af

Peak Elev= 953.39' @ 21.33 hrs Surf.Area= 12.758 ac Storage= 193.325 af (11.114 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= 4,879.7 min (5,680.8 - 801.1)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 1-Year Rainfall=2.42"

Printed 7/23/2021

Page 37

Primary OutFlow Max=1.81 cfs @ 21.33 hrs HW=953.39' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 24"** (Passes 1.81 cfs of 14.76 cfs potential flow)

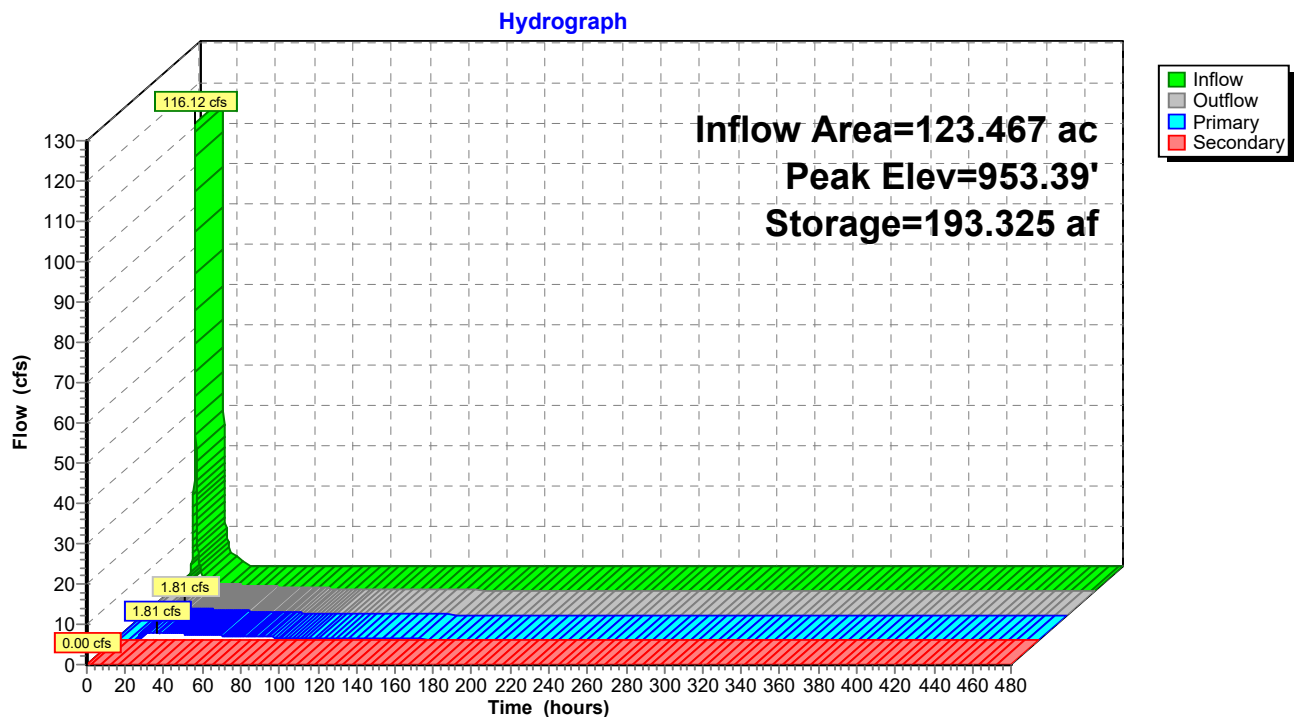
↑ **2=Orifice/Grate** (Orifice Controls 1.81 cfs @ 3.31 fps)

↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

↑ **4=Culvert** (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 38

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=0.74"
Tc=30.0 min CN=65/98 Runoff=8.83 cfs 0.964 af

Subcatchment27S: Proposed Chelsea Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=1.08"
Tc=30.0 min CN=67/98 Runoff=78.91 cfs 8.252 af

Subcatchment28S: Chelsea Road Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=1.11"
Tc=15.0 min CN=70/98 Runoff=6.53 cfs 0.481 af

Subcatchment29S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=1.53"
Tc=15.0 min CN=58/98 Runoff=10.52 cfs 0.748 af

Subcatchment30S: School and Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=1.14"
Tc=18.0 min CN=66/98 Runoff=11.88 cfs 0.951 af

Reach 31R: To TH-01 Existing Landlocked Basin Inflow=1.40 cfs 9.015 af
Outflow=1.40 cfs 9.015 af

Reach 32R: West Inflow=0.56 cfs 0.139 af
Outflow=0.56 cfs 0.139 af

Pond 33P: TH-28A Walmart Existing Pond Peak Elev=958.74' Storage=0.336 af Inflow=10.52 cfs 0.748 af
Primary=3.88 cfs 0.747 af Secondary=0.00 cfs 0.000 af Outflow=3.88 cfs 0.747 af

Pond 34P: Deephaven Pond Peak Elev=956.87' Storage=0.725 af Inflow=8.83 cfs 0.964 af
Discarded=0.21 cfs 0.964 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.21 cfs 0.964 af

Pond 35P: Chelsea Road Pond Peak Elev=953.51' Storage=0.309 af Inflow=6.53 cfs 0.481 af
Discarded=0.09 cfs 0.342 af Primary=0.56 cfs 0.139 af Secondary=0.00 cfs 0.000 af Outflow=0.65 cfs 0.481 af

Pond 36P: Proposed Chelsea Commons Peak Elev=953.20' Storage=190.939 af Inflow=91.12 cfs 9.950 af
Primary=1.40 cfs 9.015 af Secondary=0.00 cfs 0.000 af Outflow=1.40 cfs 9.015 af

Total Runoff Area = 128.659 ac Runoff Volume = 11.396 af Average Runoff Depth = 1.06"
44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 39

Summary for Subcatchment 26S: Deephaven Development

Runoff = 8.83 cfs @ 12.42 hrs, Volume= 0.964 af, Depth= 0.74"

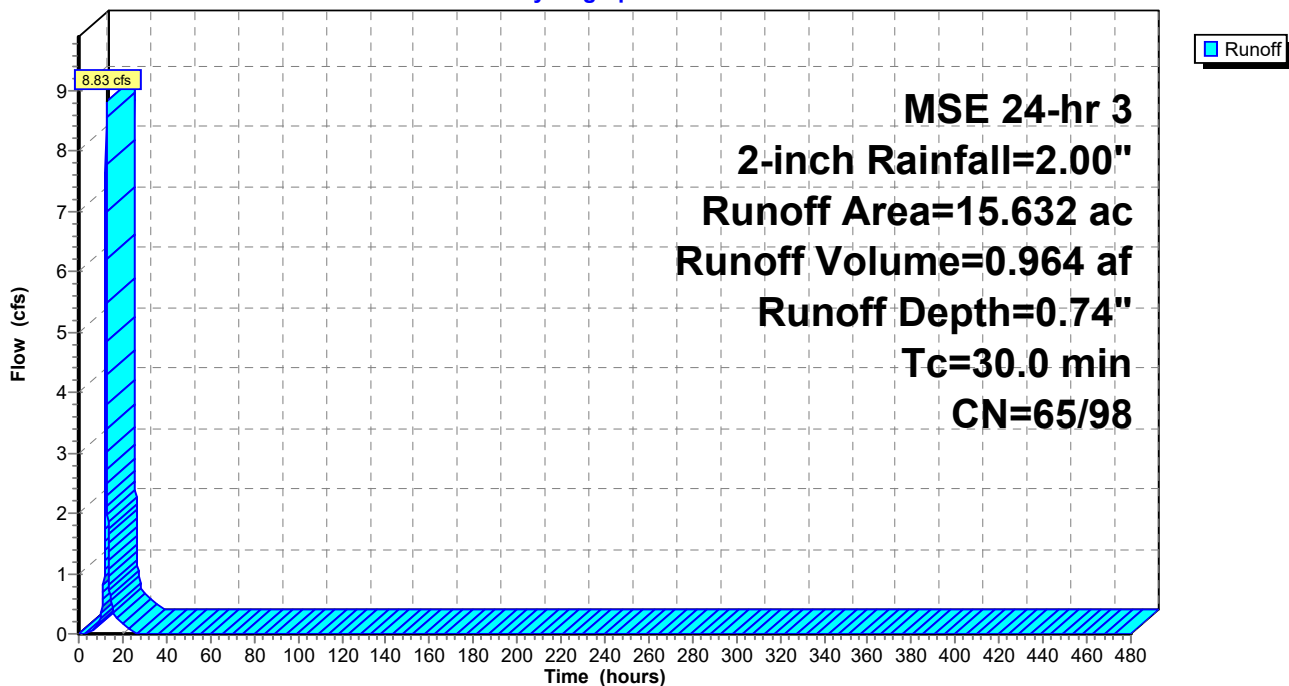
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 40

Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 78.91 cfs @ 12.42 hrs, Volume= 8.252 af, Depth= 1.08"

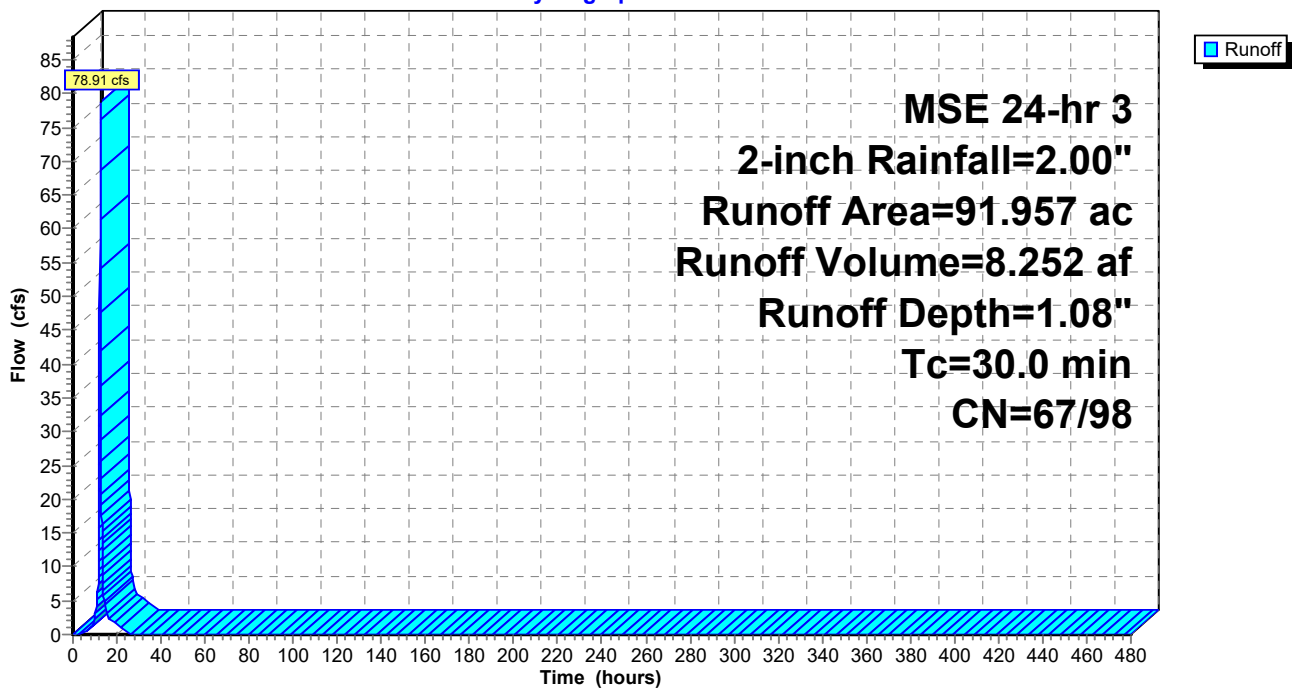
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
* 23.336	69	Park: 50-75% Grass cover, Fair, HSG B
5.435	89	Paved roads w/open ditches, 50% imp, HSG B
12.493	98	Water Surface, HSG B
* 18.662	92	Urban commercial, 85% imp, HSG B
* 32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
91.957	84	Weighted Average
40.064	67	43.57% Pervious Area
51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 41

Summary for Subcatchment 28S: Chelsea Road

Runoff = 6.53 cfs @ 12.23 hrs, Volume= 0.481 af, Depth= 1.11"

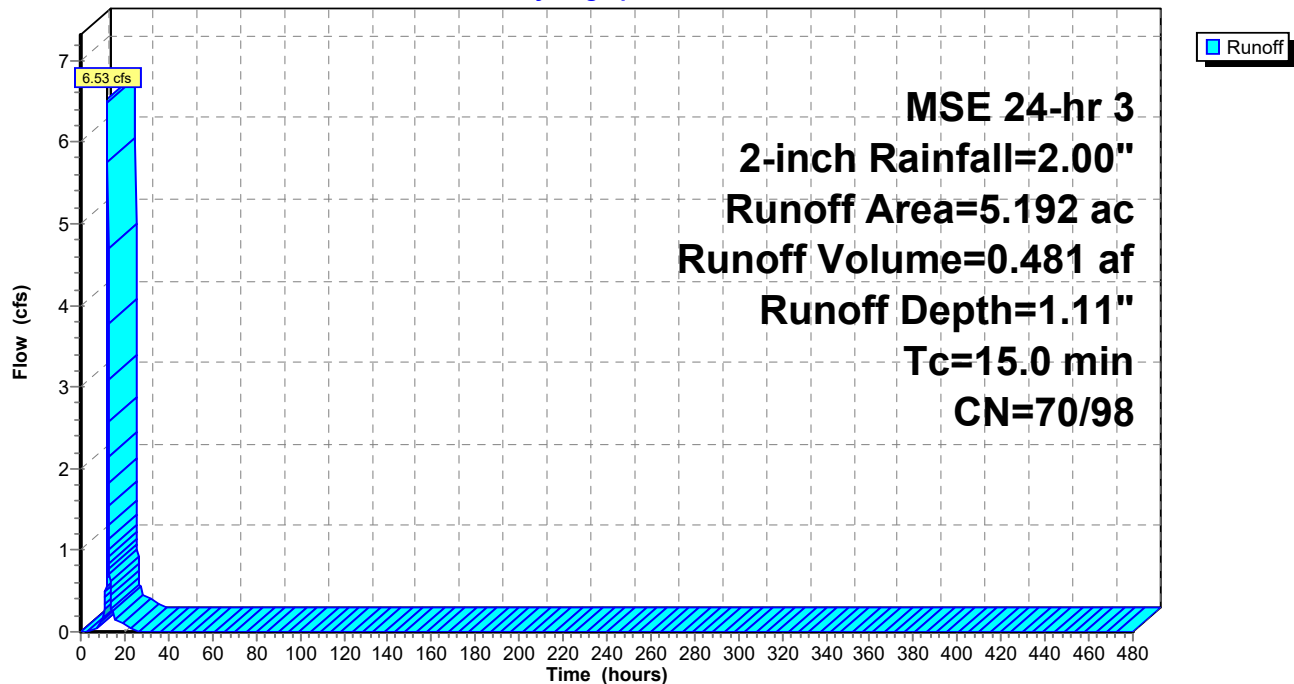
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 42

Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 10.52 cfs @ 12.23 hrs, Volume= 0.748 af, Depth= 1.53"

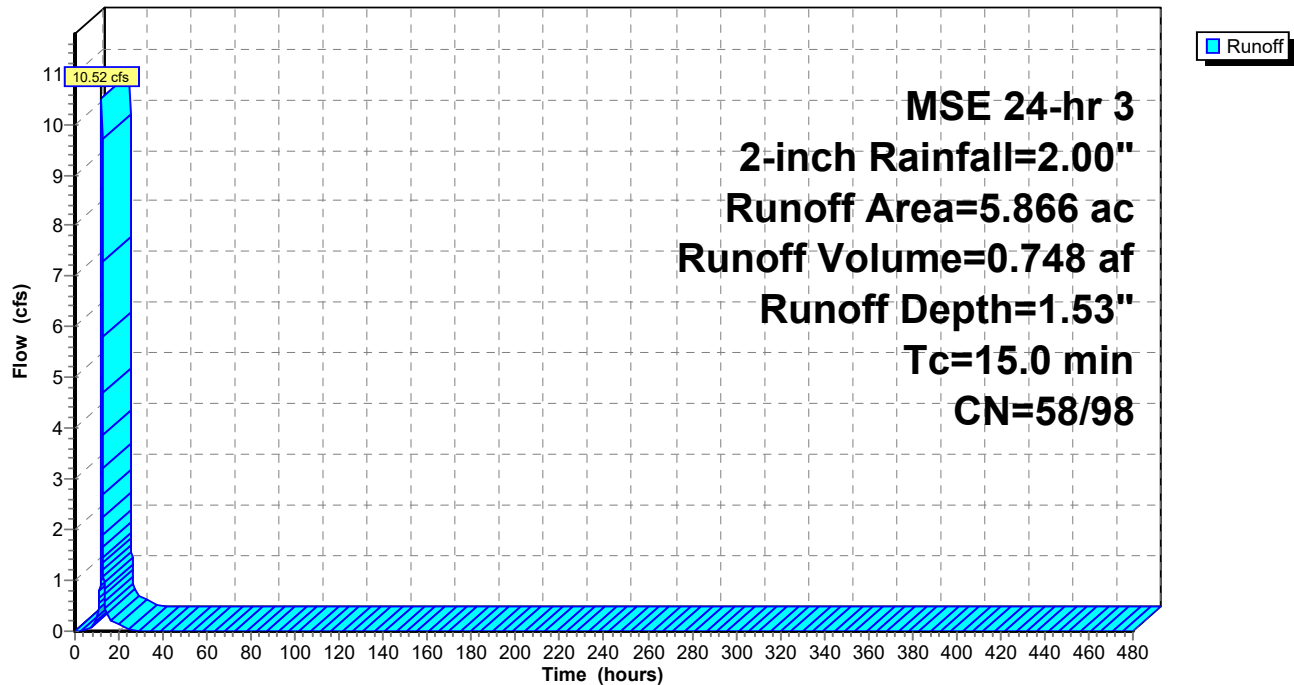
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 43

Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

Runoff = 11.88 cfs @ 12.27 hrs, Volume= 0.951 af, Depth= 1.14"

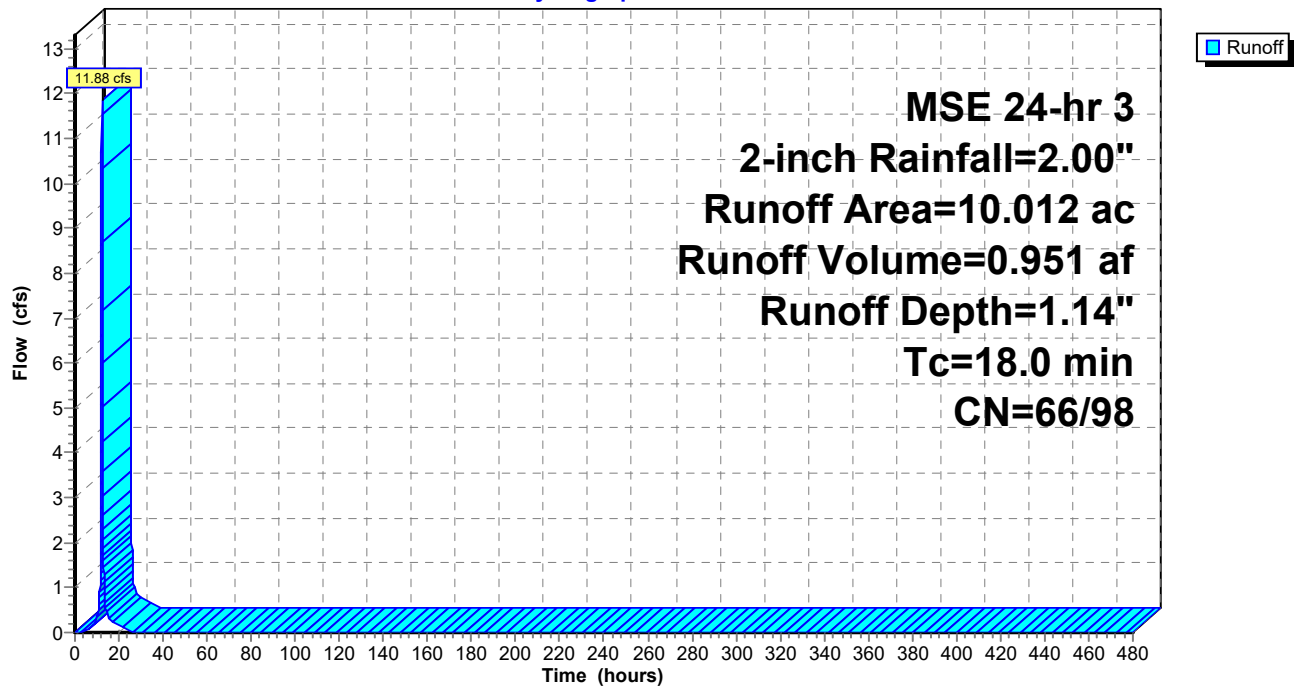
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-inch Rainfall=2.00"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

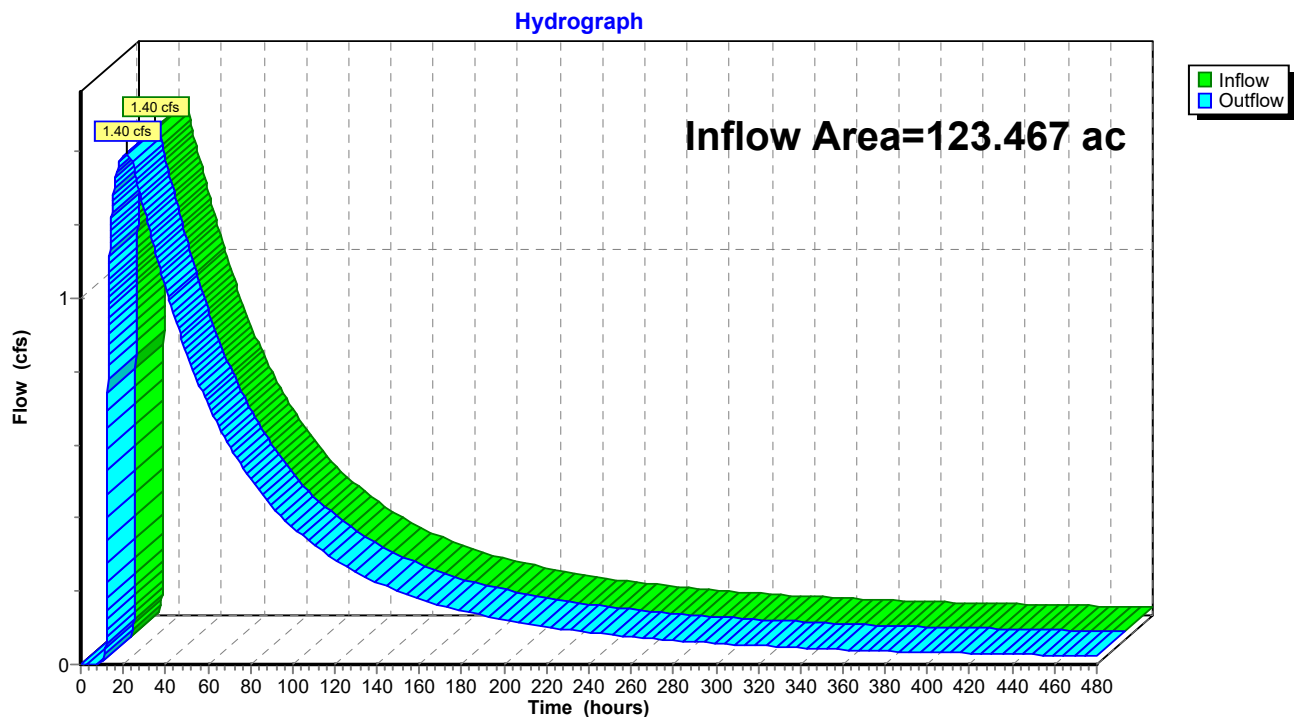
Page 44

Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 0.88" for 2-inch event
Inflow = 1.40 cfs @ 21.30 hrs, Volume= 9.015 af
Outflow = 1.40 cfs @ 21.30 hrs, Volume= 9.015 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 45

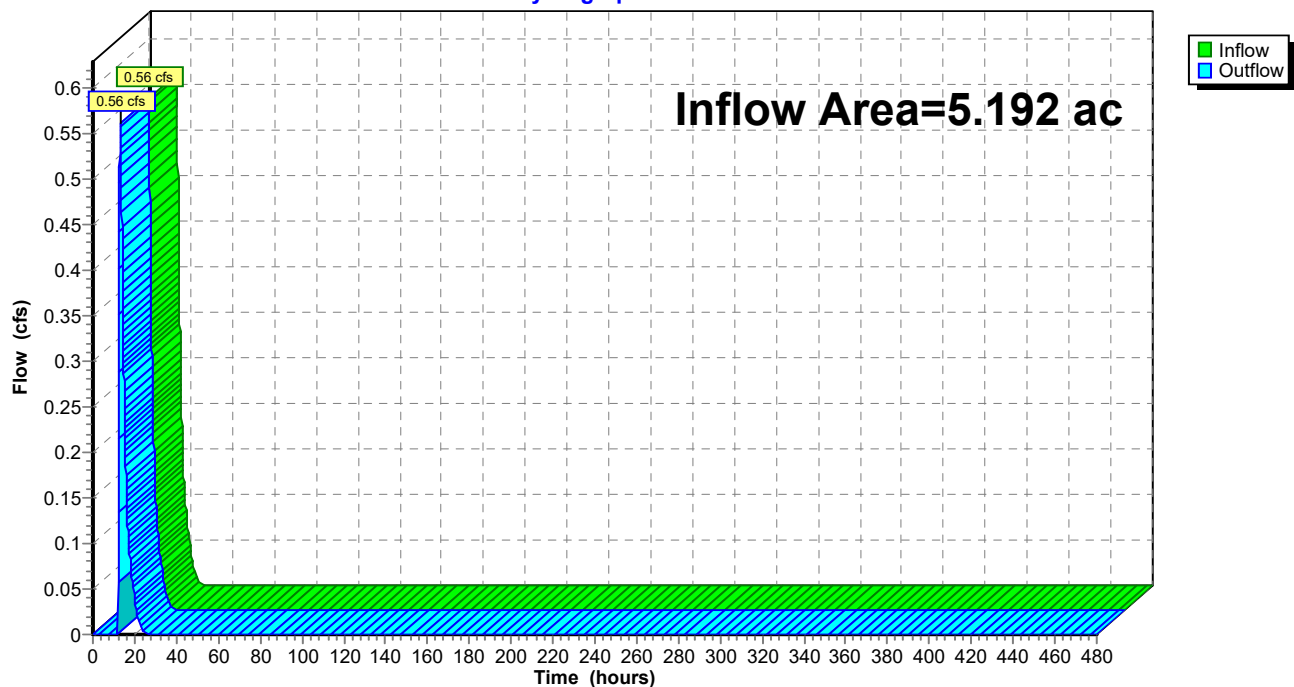
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 0.32" for 2-inch event
Inflow = 0.56 cfs @ 13.24 hrs, Volume= 0.139 af
Outflow = 0.56 cfs @ 13.24 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 46

Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 1.53" for 2-inch event
 Inflow = 10.52 cfs @ 12.23 hrs, Volume= 0.748 af
 Outflow = 3.88 cfs @ 12.50 hrs, Volume= 0.747 af, Atten= 63%, Lag= 16.6 min
 Primary = 3.88 cfs @ 12.50 hrs, Volume= 0.747 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 958.74' @ 12.50 hrs Surf.Area= 0.487 ac Storage= 0.336 af

Plug-Flow detention time= 195.9 min calculated for 0.747 af (100% of inflow)

Center-of-Mass det. time= 195.3 min (964.9 - 769.6)

Volume	Invert	Avail.Storage	Storage Description

#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices

#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 ' S= 0.0870 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=3.88 cfs @ 12.50 hrs HW=958.74' TW=952.86' (Dynamic Tailwater)↑ **1=RCP_Round 24"** (Inlet Controls 3.88 cfs @ 3.66 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

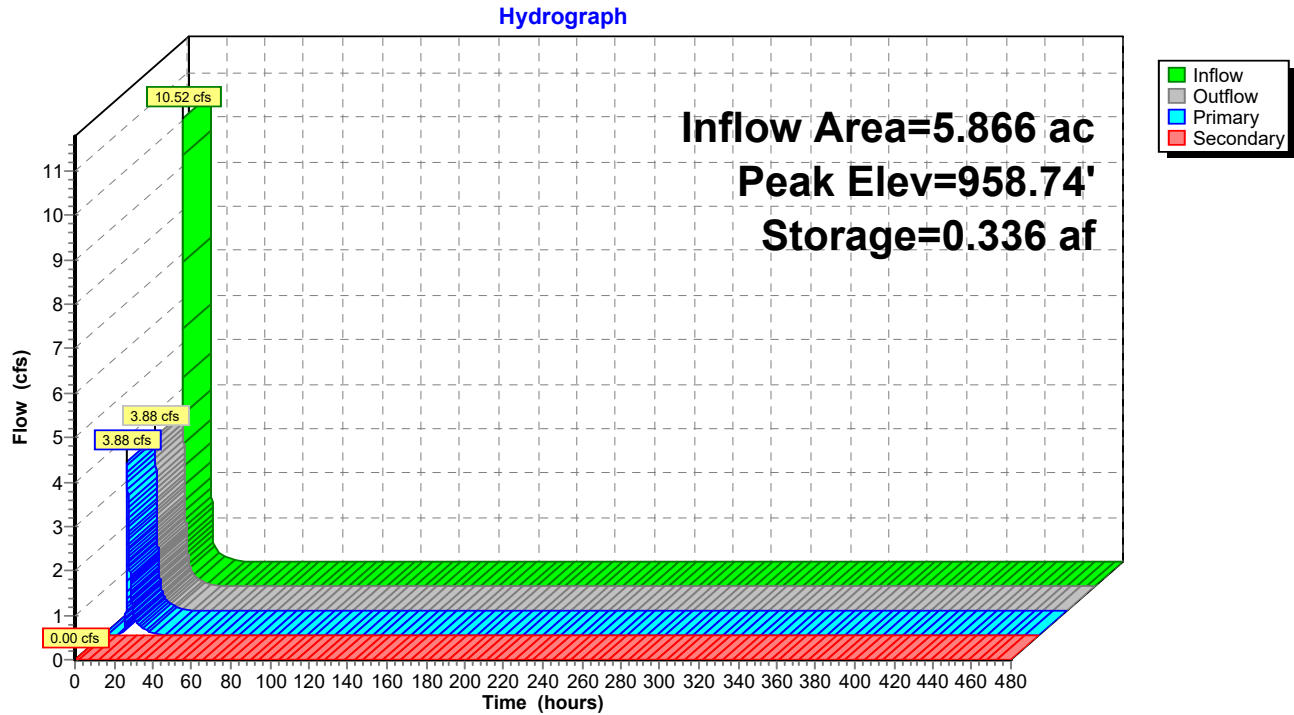
HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 47

Pond 33P: TH-28A Walmart Existing Pond



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 48

Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 0.74" for 2-inch event
 Inflow = 8.83 cfs @ 12.42 hrs, Volume= 0.964 af
 Outflow = 0.21 cfs @ 19.34 hrs, Volume= 0.964 af, Atten= 98%, Lag= 415.5 min
 Discarded = 0.21 cfs @ 19.34 hrs, Volume= 0.964 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 956.87' @ 19.34 hrs Surf.Area= 0.462 ac Storage= 0.725 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,475.4 min (2,275.3 - 799.9)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 49

Discarded OutFlow Max=0.21 cfs @ 19.34 hrs HW=956.87' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)

↑2=RCP_Round 18" (Controls 0.00 cfs)

↑3=Orifice/Grate (Controls 0.00 cfs)

↑4=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

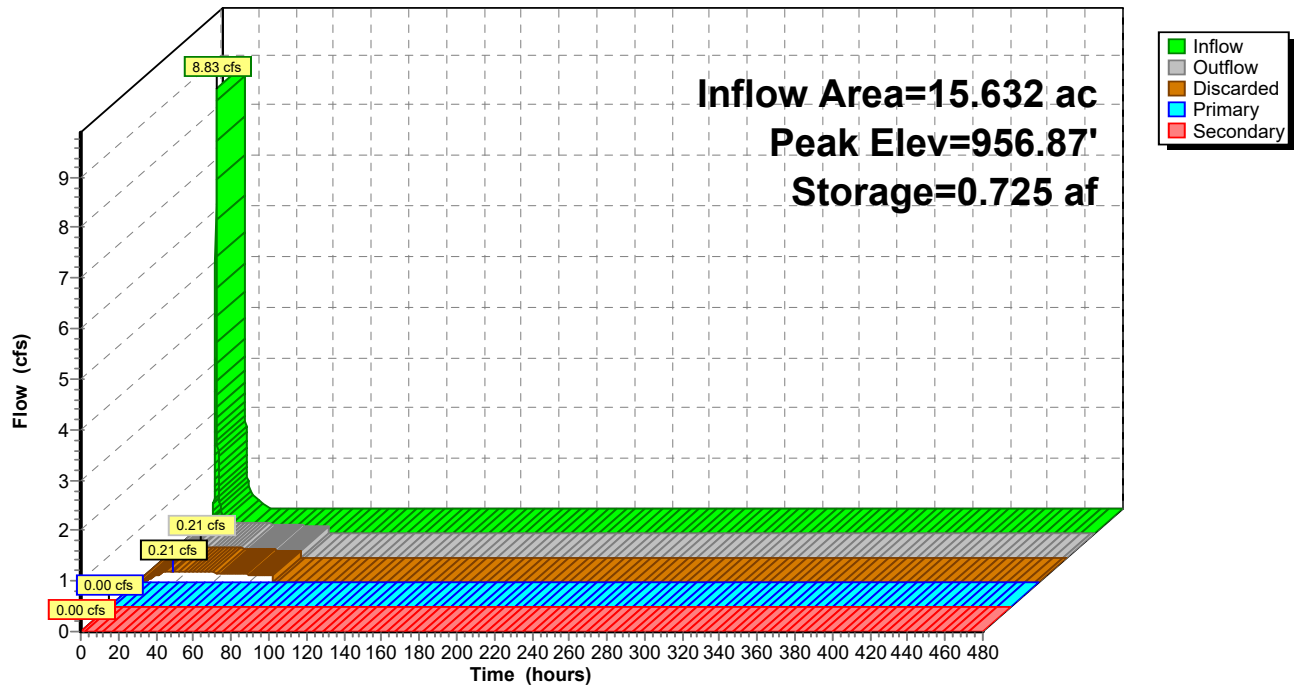
↑5=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)

↑6=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 34P: Deephaaven Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 50

Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 1.11" for 2-inch event
 Inflow = 6.53 cfs @ 12.23 hrs, Volume= 0.481 af
 Outflow = 0.65 cfs @ 13.24 hrs, Volume= 0.481 af, Atten= 90%, Lag= 60.7 min
 Discarded = 0.09 cfs @ 13.24 hrs, Volume= 0.342 af
 Primary = 0.56 cfs @ 13.24 hrs, Volume= 0.139 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 953.51' @ 13.24 hrs Surf.Area= 0.188 ac Storage= 0.309 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,147.7 min (1,927.2 - 779.5)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.09 cfs @ 13.24 hrs HW=953.51' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.56 cfs @ 13.24 hrs HW=953.51' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 0.56 cfs @ 2.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

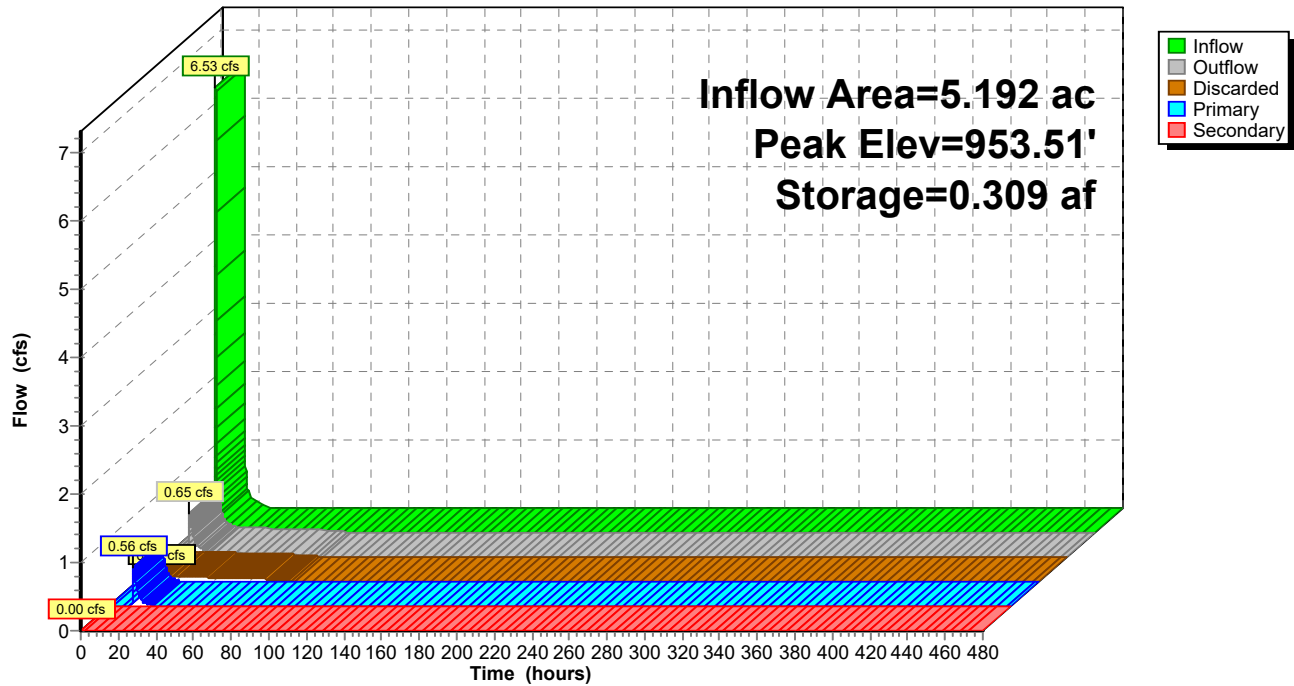
Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 51

Pond 35P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 52

Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 0.97" for 2-inch event
 Inflow = 91.12 cfs @ 12.40 hrs, Volume= 9.950 af
 Outflow = 1.40 cfs @ 21.30 hrs, Volume= 9.015 af, Atten= 98%, Lag= 534.1 min
 Primary = 1.40 cfs @ 21.30 hrs, Volume= 9.015 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af

Peak Elev= 953.20' @ 21.30 hrs Surf.Area= 12.645 ac Storage= 190.939 af (8.728 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= 5,232.9 min (6,036.7 - 803.8)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 2-inch Rainfall=2.00"

Printed 7/23/2021

Page 53

Primary OutFlow Max=1.40 cfs @ 21.30 hrs HW=953.20' TW=0.00' (Dynamic Tailwater)

1=RCP_Round 24" (Passes 1.40 cfs of 14.35 cfs potential flow)

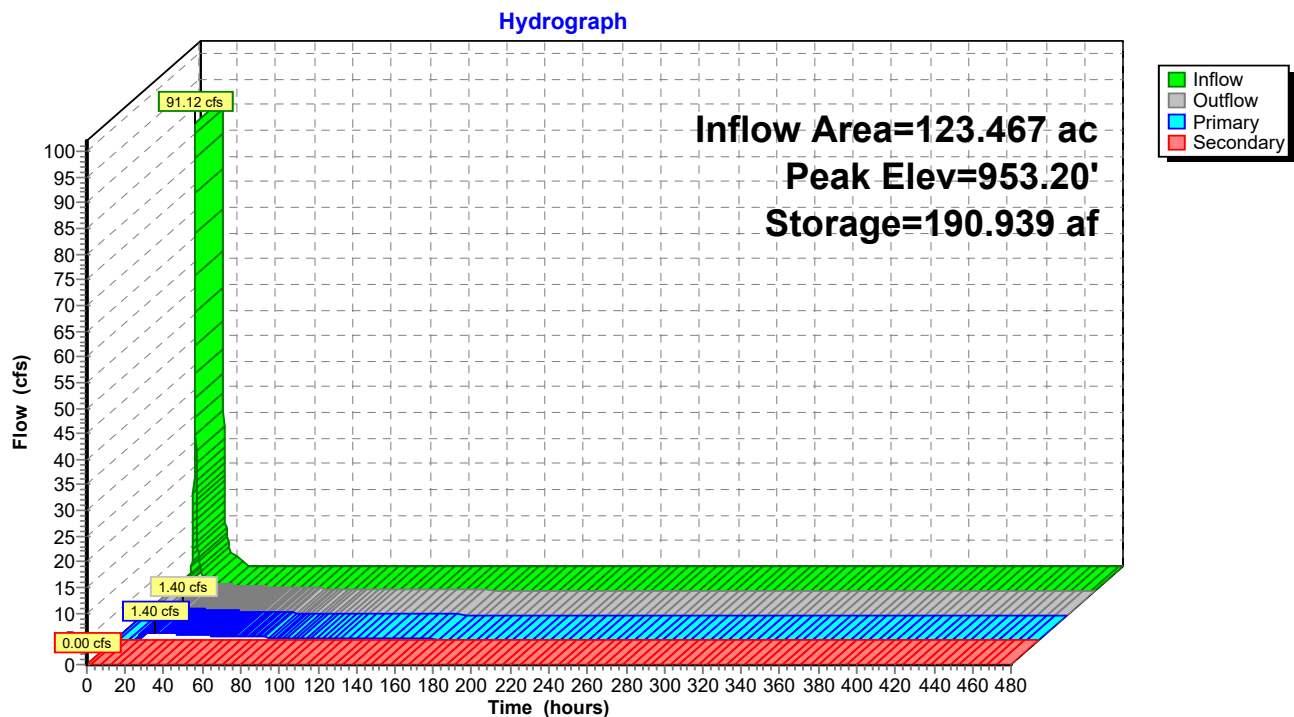
2=Orifice/Grate (Orifice Controls 1.40 cfs @ 2.85 fps)

3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=1.24"
Tc=30.0 min CN=65/98 Runoff=14.84 cfs 1.612 af

Subcatchment27S: Proposed Chelsea Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=1.69"
Tc=30.0 min CN=67/98 Runoff=123.79 cfs 12.977 af

Subcatchment28S: Chelsea Road Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=1.75"
Tc=15.0 min CN=70/98 Runoff=10.41 cfs 0.758 af

Subcatchment29S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=2.27"
Tc=15.0 min CN=58/98 Runoff=15.23 cfs 1.111 af

Subcatchment30S: School and Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=1.77"
Tc=18.0 min CN=66/98 Runoff=18.38 cfs 1.478 af

Reach 31R: To TH-01 Existing Landlocked Basin Inflow=2.18 cfs 14.874 af
Outflow=2.18 cfs 14.874 af

Reach 32R: West Inflow=2.62 cfs 0.402 af
Outflow=2.62 cfs 0.402 af

Pond 33P: TH-28A Walmart Existing Pond Peak Elev=958.98' Storage=0.452 af Inflow=15.23 cfs 1.111 af
Primary=6.39 cfs 1.110 af Secondary=0.00 cfs 0.000 af Outflow=6.39 cfs 1.110 af

Pond 34P: Deephaven Pond Peak Elev=957.71' Storage=1.134 af Inflow=14.84 cfs 1.612 af
Discarded=0.23 cfs 1.295 af Primary=0.63 cfs 0.317 af Secondary=0.00 cfs 0.000 af Outflow=0.86 cfs 1.612 af

Pond 35P: Chelsea Road Pond Peak Elev=954.02' Storage=0.411 af Inflow=10.41 cfs 0.758 af
Discarded=0.10 cfs 0.357 af Primary=2.62 cfs 0.402 af Secondary=0.00 cfs 0.000 af Outflow=2.71 cfs 0.758 af

Pond 36P: Proposed Chelsea Peak Elev=953.61' Storage=196.115 af Inflow=143.10 cfs 15.882 af
Primary=2.18 cfs 14.874 af Secondary=0.00 cfs 0.000 af Outflow=2.18 cfs 14.874 af

Total Runoff Area = 128.659 ac Runoff Volume = 17.936 af Average Runoff Depth = 1.67"
44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

Summary for Subcatchment 26S: Deephaven Development

Runoff = 14.84 cfs @ 12.43 hrs, Volume= 1.612 af, Depth= 1.24"

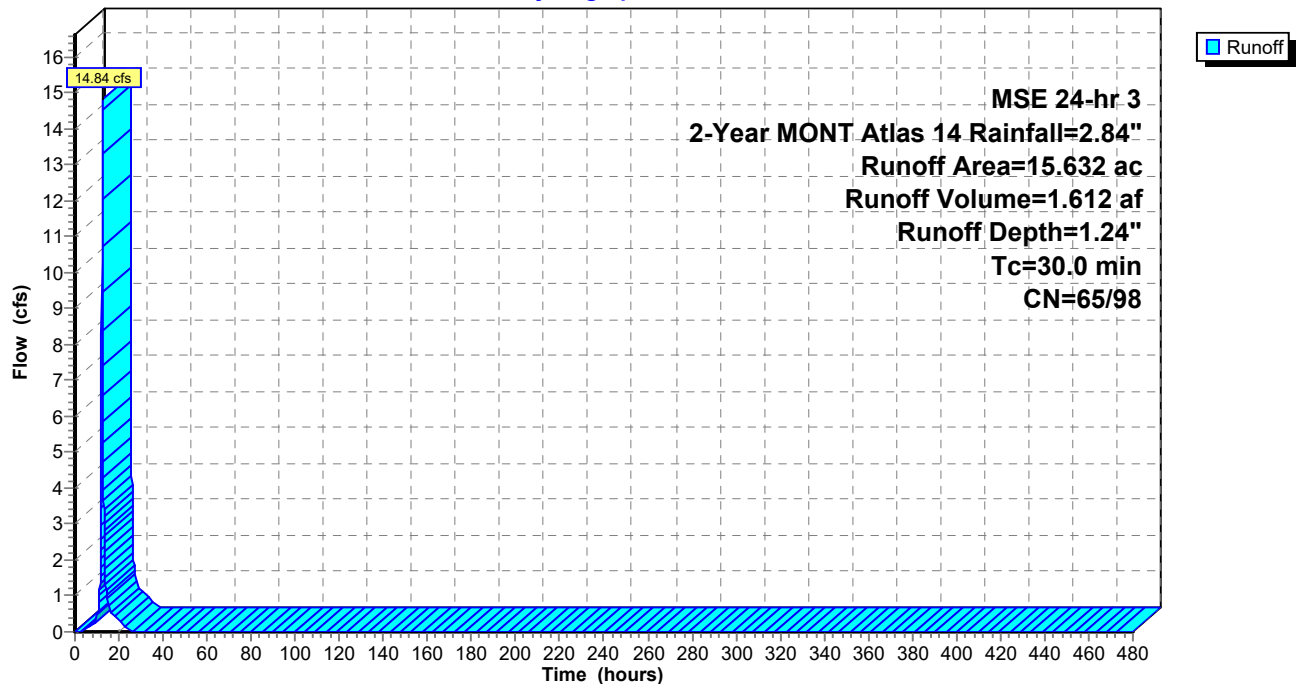
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 123.79 cfs @ 12.42 hrs, Volume= 12.977 af, Depth= 1.69"

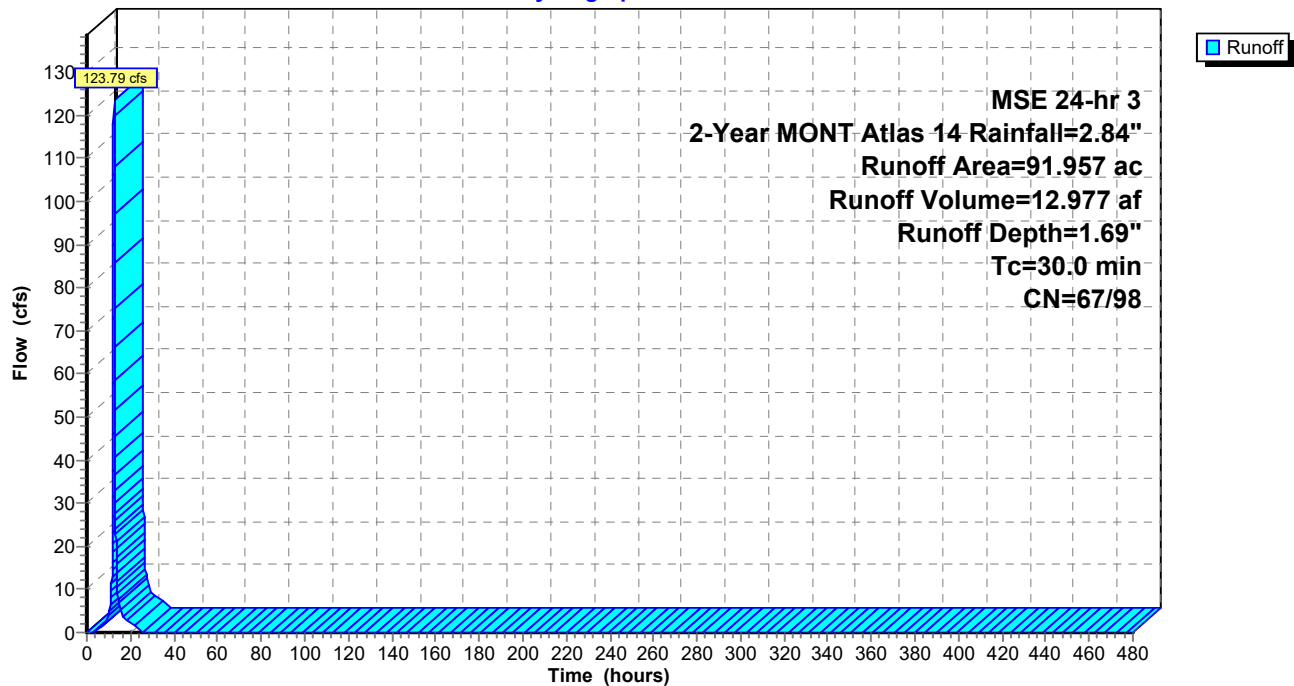
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
* 23.336	69	Park: 50-75% Grass cover, Fair, HSG B
5.435	89	Paved roads w/open ditches, 50% imp, HSG B
12.493	98	Water Surface, HSG B
* 18.662	92	Urban commercial, 85% imp, HSG B
* 32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
91.957	84	Weighted Average
40.064	67	43.57% Pervious Area
51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



Summary for Subcatchment 28S: Chelsea Road

Runoff = 10.41 cfs @ 12.23 hrs, Volume= 0.758 af, Depth= 1.75"

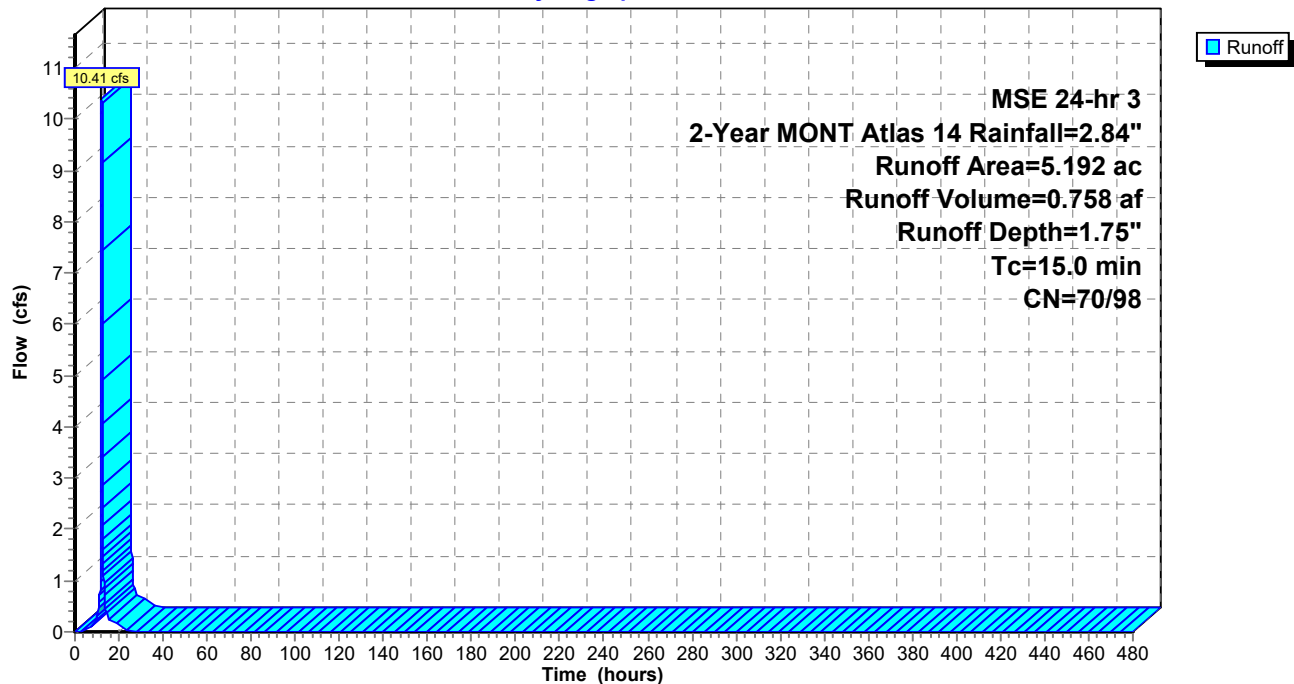
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 15.23 cfs @ 12.23 hrs, Volume= 1.111 af, Depth= 2.27"

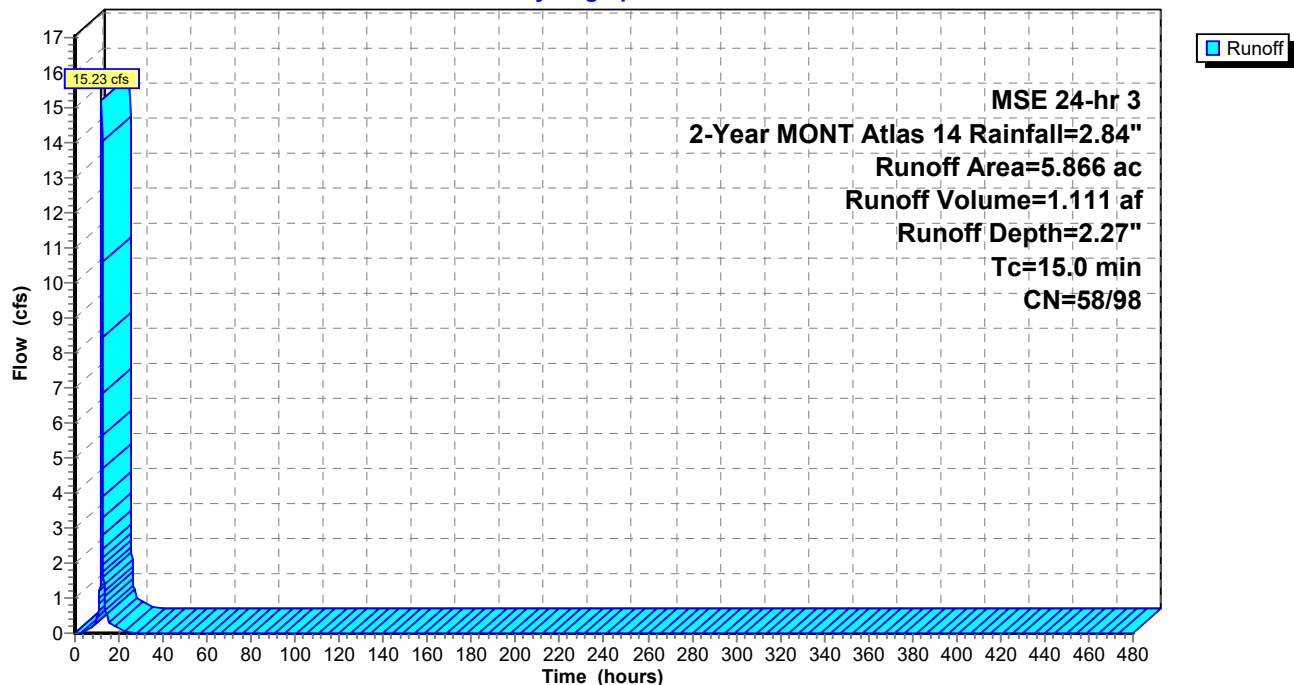
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

Runoff = 18.38 cfs @ 12.27 hrs, Volume= 1.478 af, Depth= 1.77"

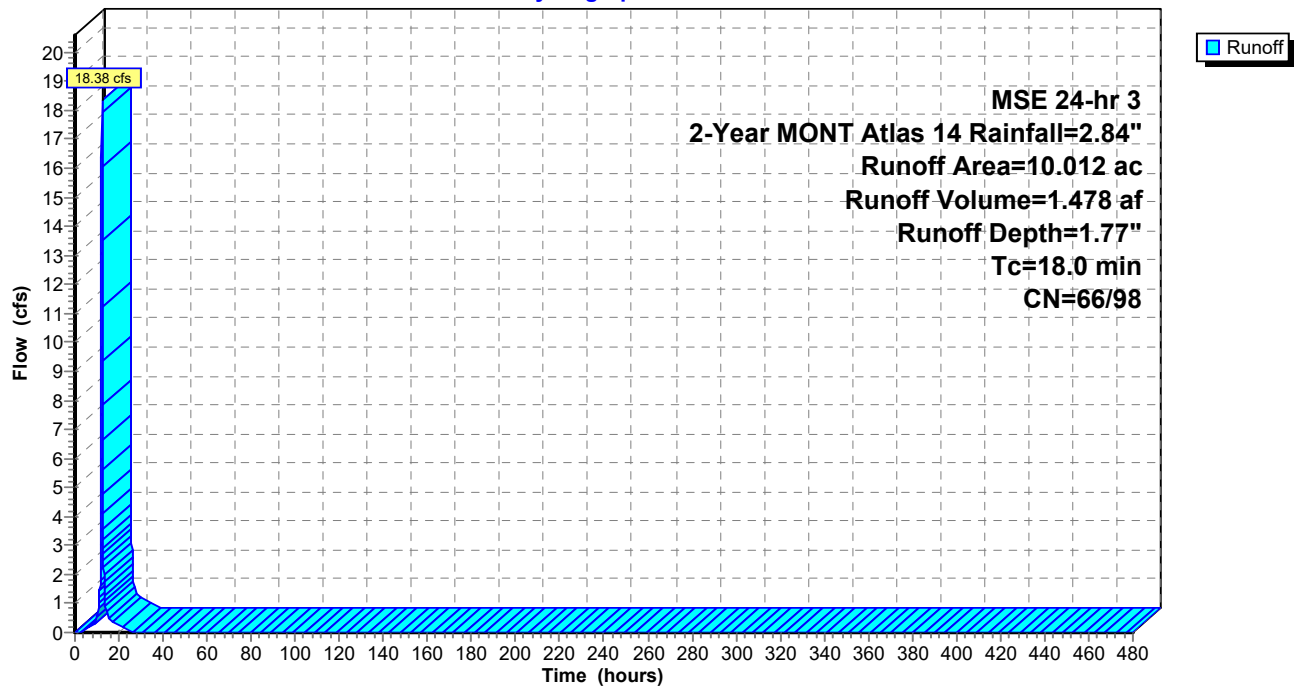
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 2-Year MONT Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

Hydrograph

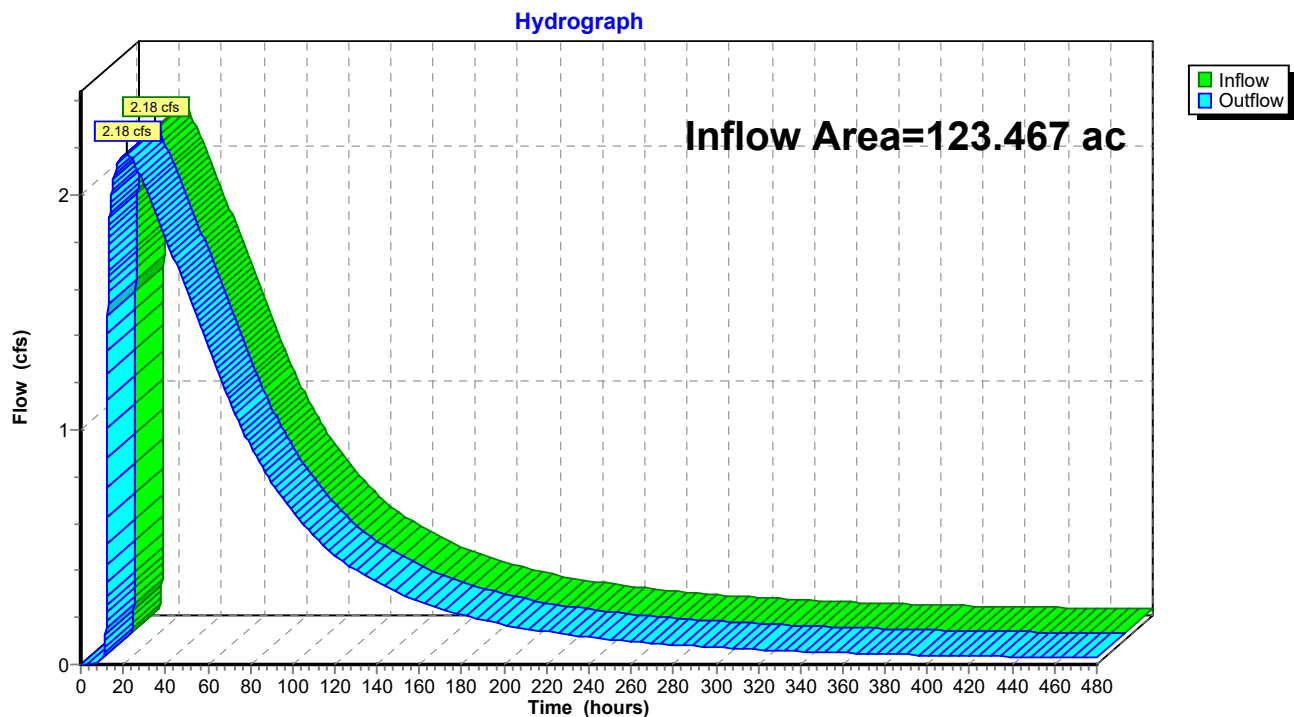


Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 1.45" for 2-Year MONT Atlas 14 event
Inflow = 2.18 cfs @ 21.63 hrs, Volume= 14.874 af
Outflow = 2.18 cfs @ 21.63 hrs, Volume= 14.874 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



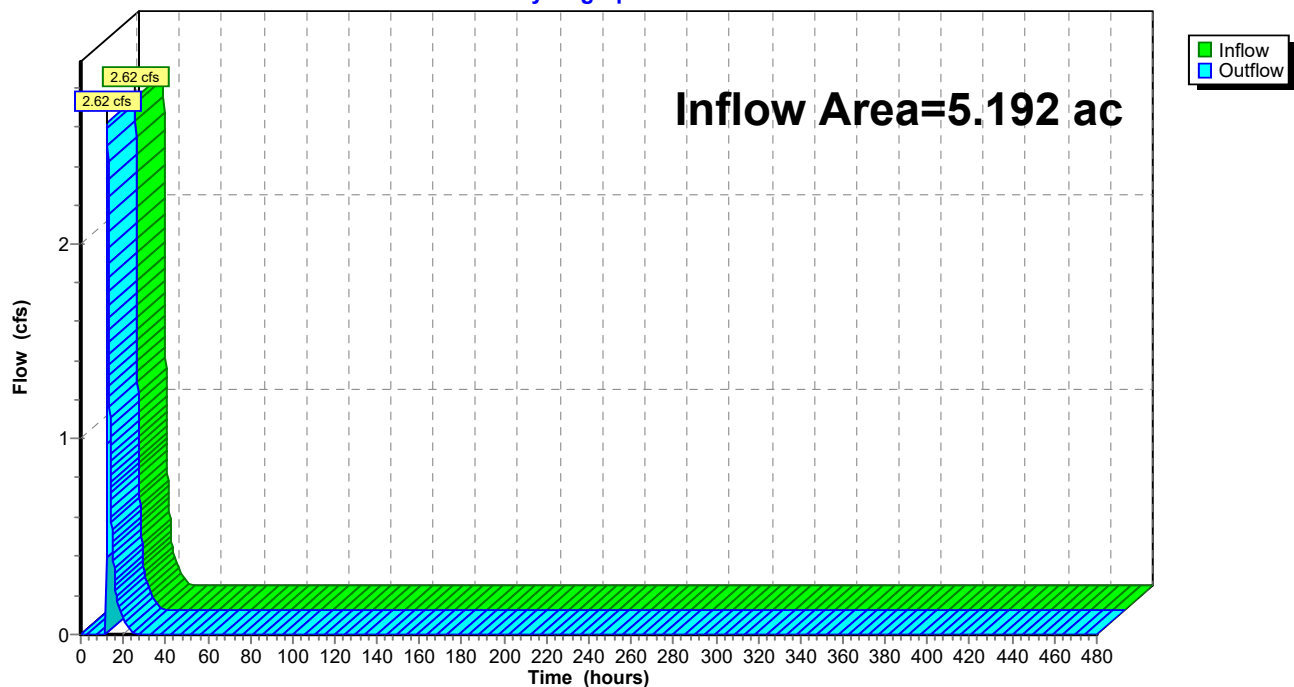
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 0.93" for 2-Year MONT Atlas 14 event
Inflow = 2.62 cfs @ 12.62 hrs, Volume= 0.402 af
Outflow = 2.62 cfs @ 12.62 hrs, Volume= 0.402 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 2.27" for 2-Year MONT Atlas 14 event
 Inflow = 15.23 cfs @ 12.23 hrs, Volume= 1.111 af
 Outflow = 6.39 cfs @ 12.47 hrs, Volume= 1.110 af, Atten= 58%, Lag= 14.7 min
 Primary = 6.39 cfs @ 12.47 hrs, Volume= 1.110 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.98' @ 12.47 hrs Surf.Area= 0.508 ac Storage= 0.452 af

Plug-Flow detention time= 153.1 min calculated for 1.110 af (100% of inflow)
 Center-of-Mass det. time= 155.3 min (919.6 - 764.2)

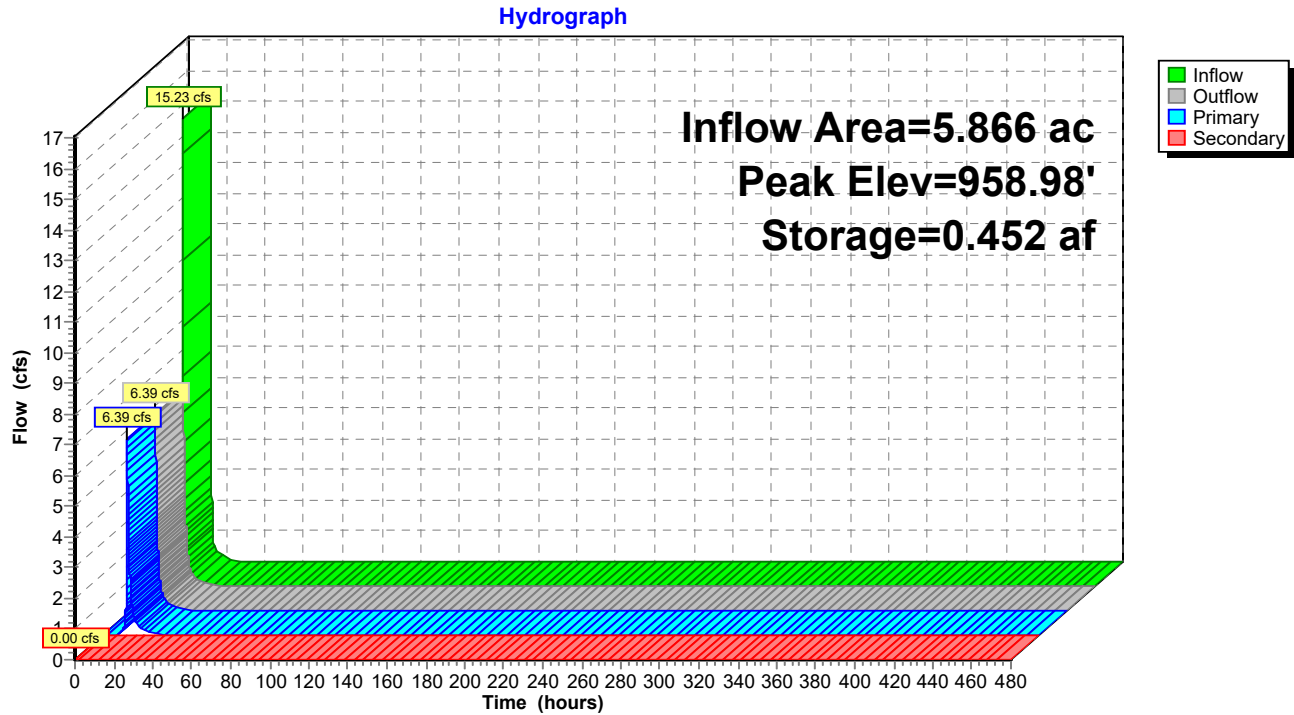
Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=6.38 cfs @ 12.47 hrs HW=958.97' TW=953.04' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 6.38 cfs @ 4.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 33P: TH-28A Walmart Existing Pond



Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 1.24" for 2-Year MONT Atlas 14 event
 Inflow = 14.84 cfs @ 12.43 hrs, Volume= 1.612 af
 Outflow = 0.86 cfs @ 15.24 hrs, Volume= 1.612 af, Atten= 94%, Lag= 168.3 min
 Discarded = 0.23 cfs @ 15.24 hrs, Volume= 1.295 af
 Primary = 0.63 cfs @ 15.24 hrs, Volume= 0.317 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 957.71' @ 15.24 hrs Surf.Area= 0.513 ac Storage= 1.134 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,560.9 min (2,361.4 - 800.5)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

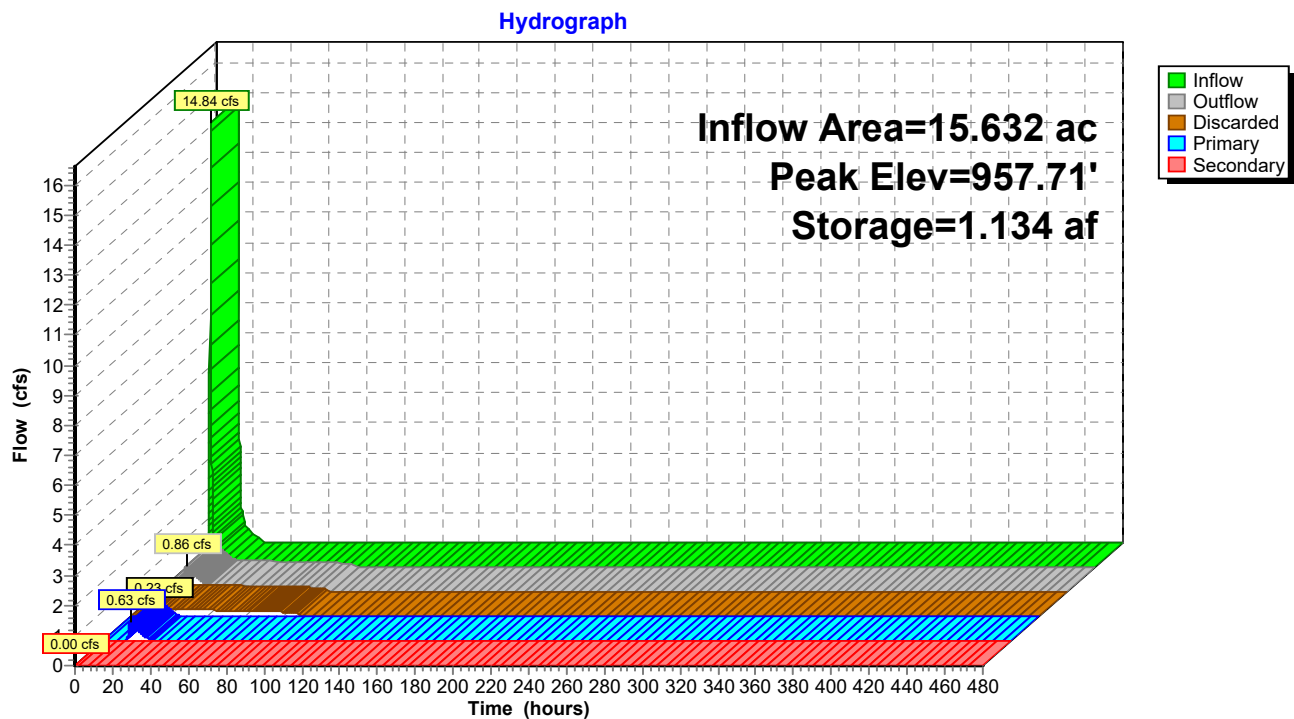
Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.23 cfs @ 15.24 hrs HW=957.71' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=0.63 cfs @ 15.24 hrs HW=957.71' TW=953.53' (Dynamic Tailwater)
 ↳2=RCP_Round 18" (Passes 0.63 cfs of 8.06 cfs potential flow)
 ↳3=Orifice/Grate (Orifice Controls 0.63 cfs @ 2.18 fps)
 ↳4=Broad-Crested Rectangular Weir(Controls 0.00 cfs)
 ↳5=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)
 ↳6=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 34P: Deephaaven Pond



Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 1.75" for 2-Year MONT Atlas 14 event
 Inflow = 10.41 cfs @ 12.23 hrs, Volume= 0.758 af
 Outflow = 2.71 cfs @ 12.62 hrs, Volume= 0.758 af, Atten= 74%, Lag= 23.2 min
 Discarded = 0.10 cfs @ 12.62 hrs, Volume= 0.357 af
 Primary = 2.62 cfs @ 12.62 hrs, Volume= 0.402 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 954.02' @ 12.62 hrs Surf.Area= 0.216 ac Storage= 0.411 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 777.3 min (1,553.7 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

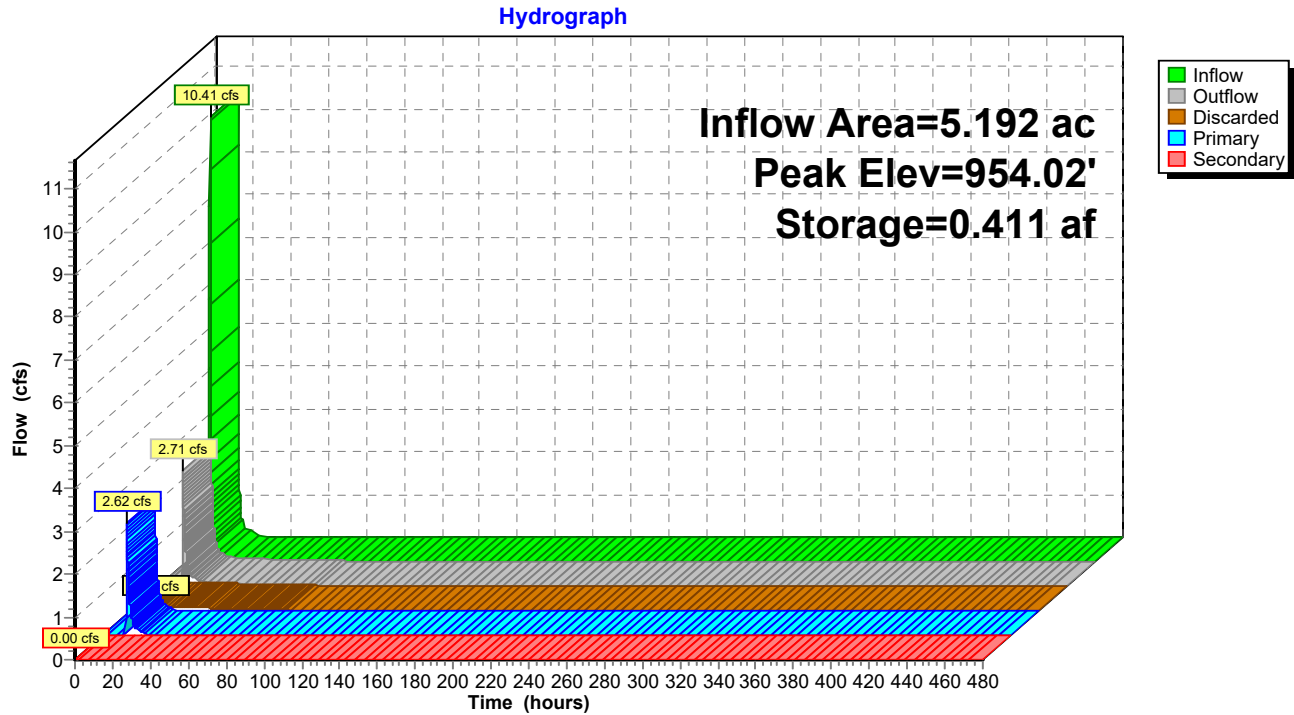
Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.10 cfs @ 12.62 hrs HW=954.02' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=2.61 cfs @ 12.62 hrs HW=954.02' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 2.61 cfs @ 3.45 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 35P: Chelsea Road Pond



Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 1.54" for 2-Year MONT Atlas 14 event
 Inflow = 143.10 cfs @ 12.40 hrs, Volume= 15.882 af
 Outflow = 2.18 cfs @ 21.63 hrs, Volume= 14.874 af, Atten= 98%, Lag= 553.6 min
 Primary = 2.18 cfs @ 21.63 hrs, Volume= 14.874 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af
 Peak Elev= 953.61' @ 21.63 hrs Surf.Area= 12.888 ac Storage= 196.115 af (13.904 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 4,697.6 min (5,500.0 - 802.4)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=2.18 cfs @ 21.63 hrs HW=953.61' TW=0.00' (Dynamic Tailwater)

1=RCP_Round 24" (Passes 2.18 cfs of 15.23 cfs potential flow)

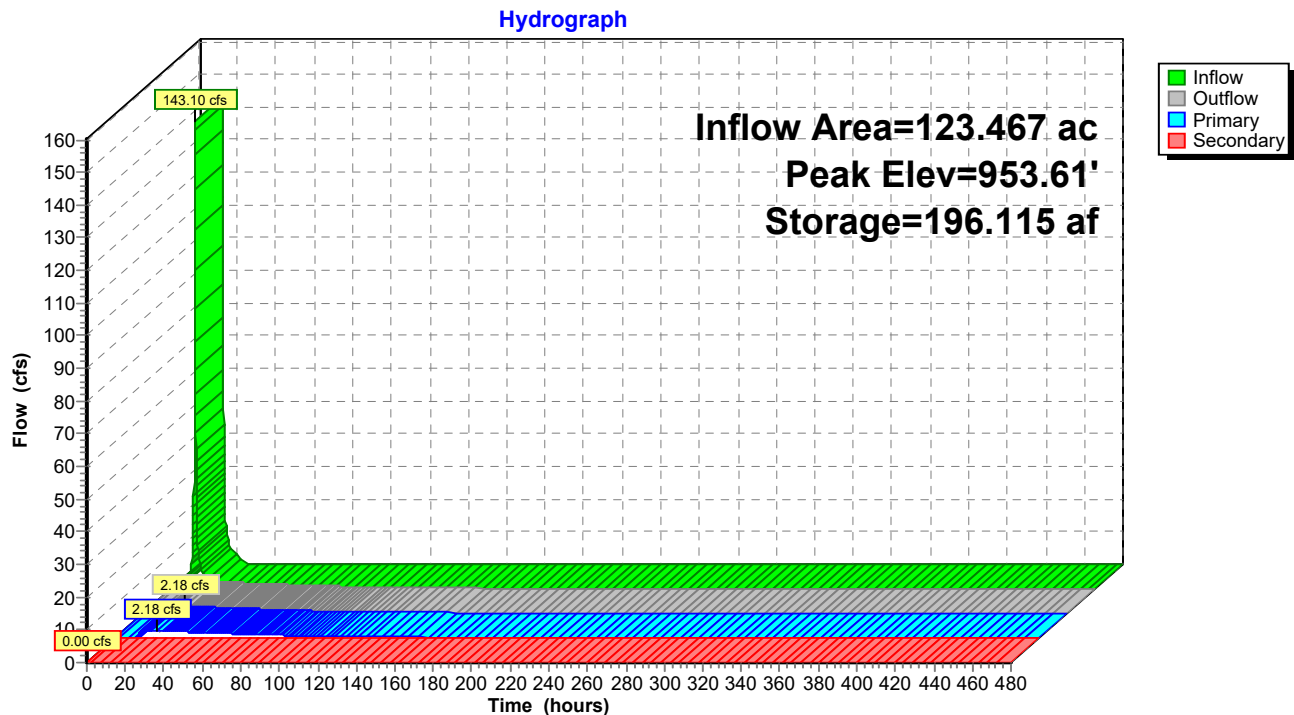
2=Orifice/Grate (Orifice Controls 2.18 cfs @ 4.00 fps)

3=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=4.34"
 Tc=30.0 min CN=65/98 Runoff=4.75 cfs 5.656 af

Subcatchment27S: Proposed Chelsea Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=5.14"
 Tc=30.0 min CN=67/98 Runoff=32.46 cfs 39.371 af

Subcatchment28S: Chelsea Road Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=5.28"
 Tc=15.0 min CN=70/98 Runoff=1.94 cfs 2.286 af

Subcatchment29S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=6.02"
 Tc=15.0 min CN=58/98 Runoff=2.41 cfs 2.944 af

Subcatchment30S: School and Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=5.25"
 Tc=18.0 min CN=66/98 Runoff=3.66 cfs 4.379 af

Reach 31R: To TH-01 Existing Landlocked Basin Inflow=3.26 cfs 46.438 af
 Outflow=3.26 cfs 46.438 af

Reach 32R: West Inflow=1.63 cfs 0.949 af
 Outflow=1.63 cfs 0.949 af

Pond 33P: TH-28A Walmart Existing Pond Peak Elev=958.52' Storage=0.233 af Inflow=2.41 cfs 2.944 af
 Primary=2.02 cfs 2.943 af Secondary=0.00 cfs 0.000 af Outflow=2.02 cfs 2.943 af

Pond 34P: Deephaven Pond Peak Elev=958.19' Storage=1.384 af Inflow=4.75 cfs 5.656 af
 Discarded=0.25 cfs 3.917 af Primary=2.15 cfs 1.739 af Secondary=0.00 cfs 0.000 af Outflow=2.39 cfs 5.656 af

Pond 35P: Chelsea Road Pond Peak Elev=953.81' Storage=0.367 af Inflow=1.94 cfs 2.286 af
 Discarded=0.09 cfs 1.337 af Primary=1.63 cfs 0.949 af Secondary=0.00 cfs 0.000 af Outflow=1.72 cfs 2.286 af

Pond 36P: Proposed Chelsea Peak Elev=954.46' Storage=207.276 af Inflow=38.33 cfs 48.433 af
 Primary=3.26 cfs 46.438 af Secondary=0.00 cfs 0.000 af Outflow=3.26 cfs 46.438 af

Total Runoff Area = 128.659 ac Runoff Volume = 54.637 af Average Runoff Depth = 5.10"
44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

Summary for Subcatchment 26S: Deephaven Development

Runoff = 4.75 cfs @ 121.69 hrs, Volume= 5.656 af, Depth= 4.34"

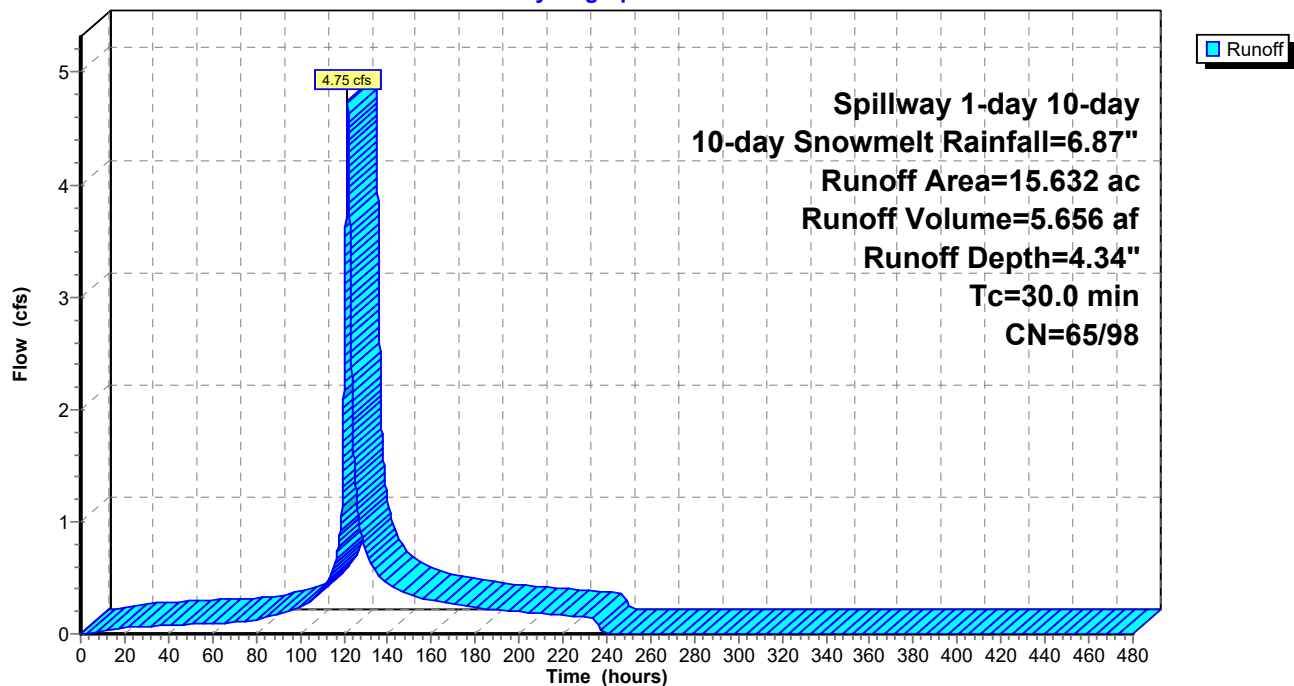
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 32.46 cfs @ 121.68 hrs, Volume= 39.371 af, Depth= 5.14"

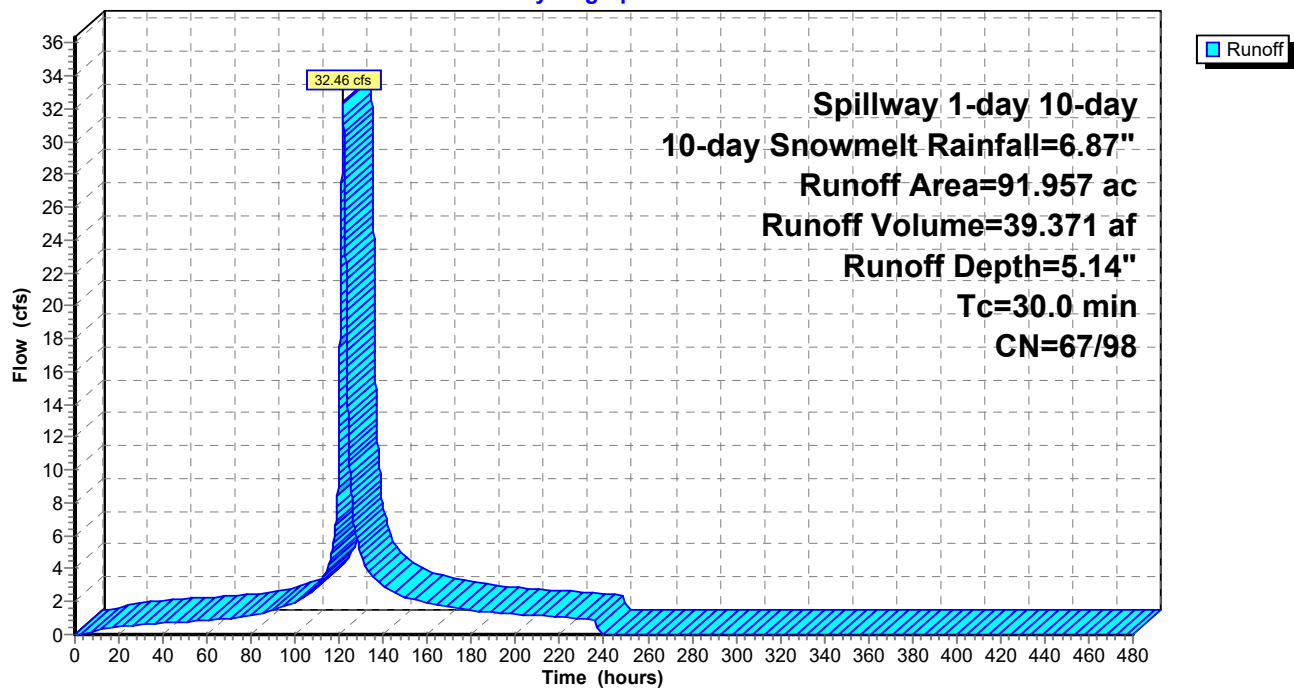
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
* 23.336	69	Park: 50-75% Grass cover, Fair, HSG B
5.435	89	Paved roads w/open ditches, 50% imp, HSG B
12.493	98	Water Surface, HSG B
* 18.662	92	Urban commercial, 85% imp, HSG B
* 32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
91.957	84	Weighted Average
40.064	67	43.57% Pervious Area
51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



Summary for Subcatchment 28S: Chelsea Road

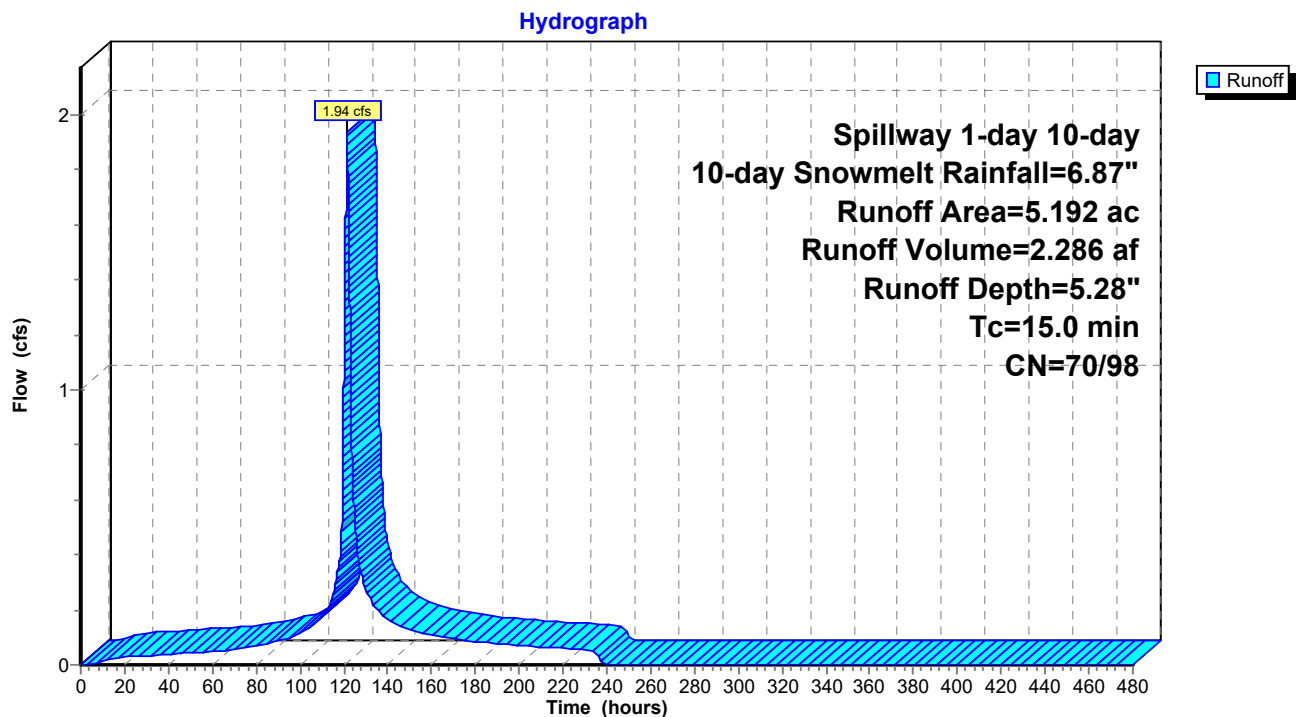
Runoff = 1.94 cfs @ 121.44 hrs, Volume= 2.286 af, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road



Summary for Subcatchment 29S: Walmart Pond Drainage Area

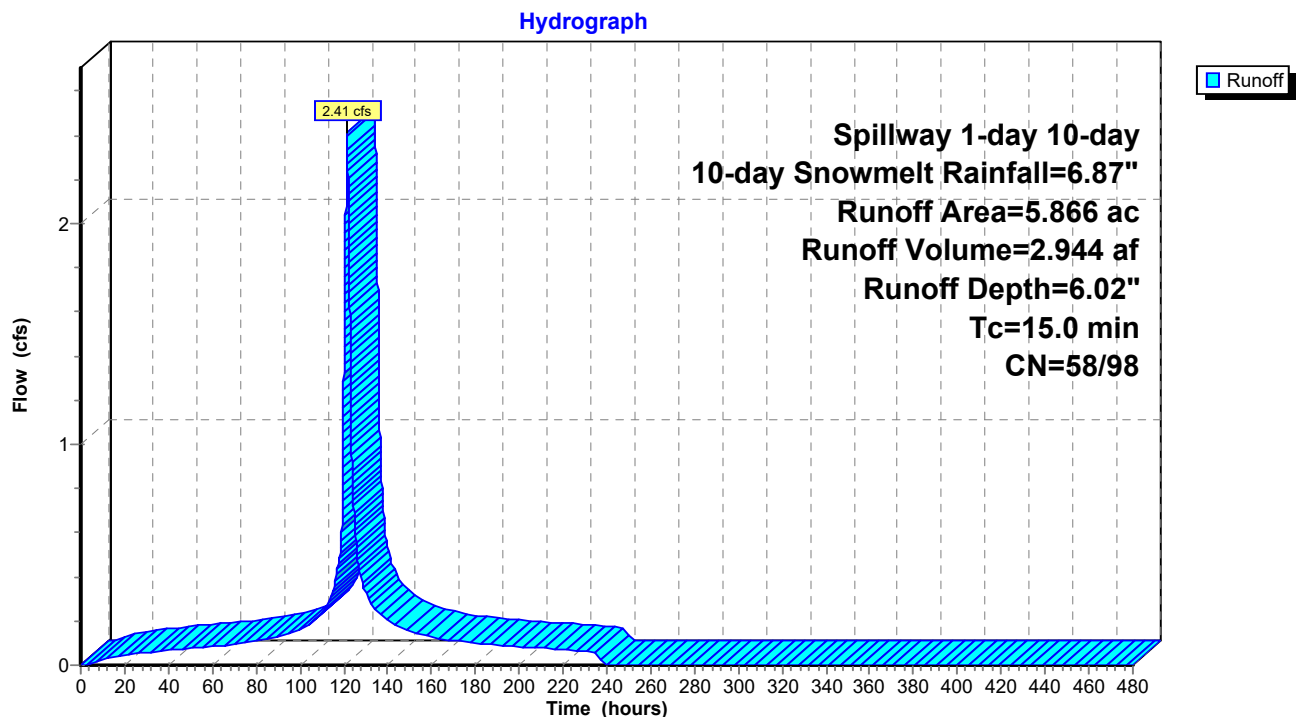
Runoff = 2.41 cfs @ 121.44 hrs, Volume= 2.944 af, Depth= 6.02"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area



Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

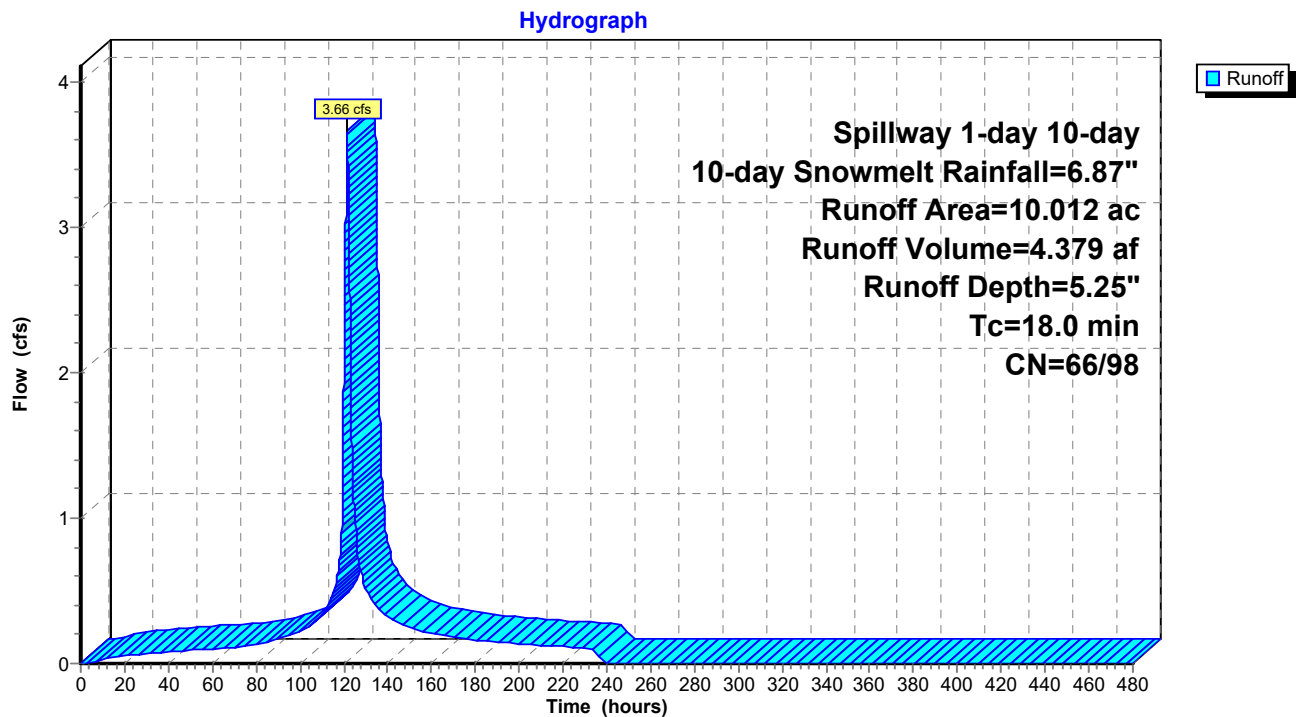
Runoff = 3.66 cfs @ 121.49 hrs, Volume= 4.379 af, Depth= 5.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 Spillway 1-day 10-day 10-day Snowmelt Rainfall=6.87"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

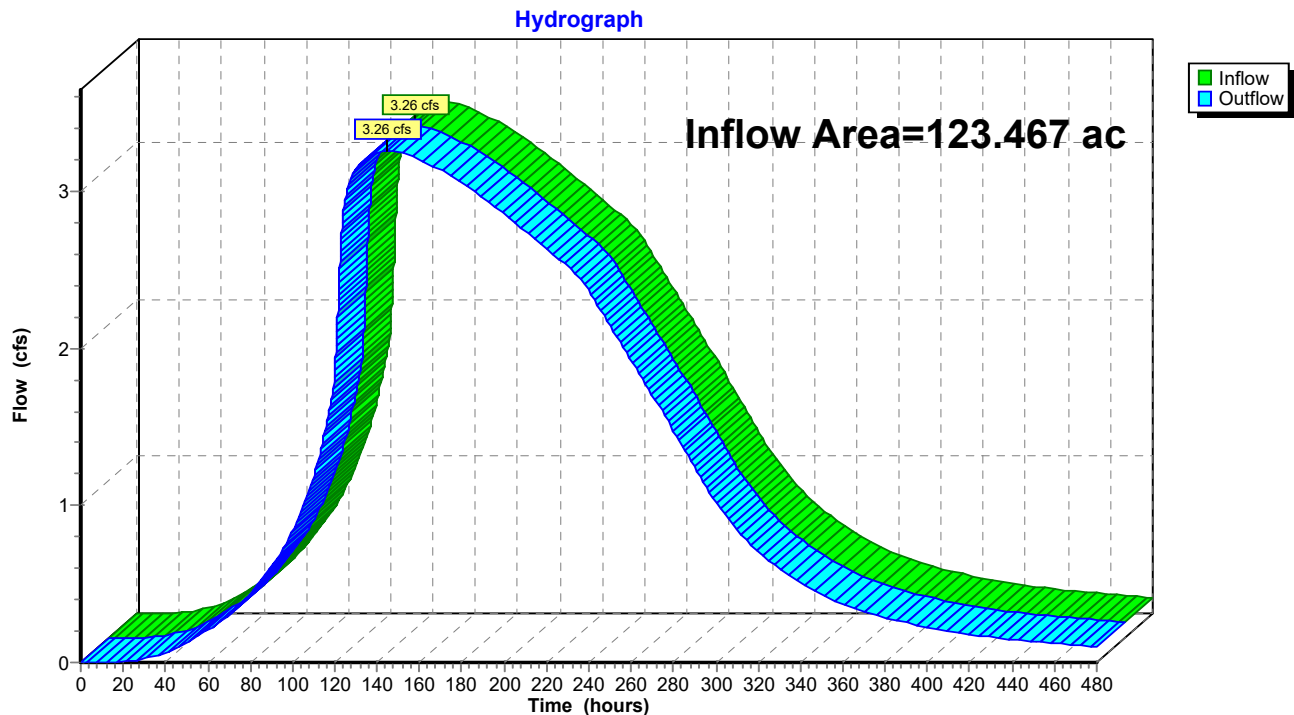


Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 4.51" for 10-day Snowmelt event
Inflow = 3.26 cfs @ 144.59 hrs, Volume= 46.438 af
Outflow = 3.26 cfs @ 144.59 hrs, Volume= 46.438 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



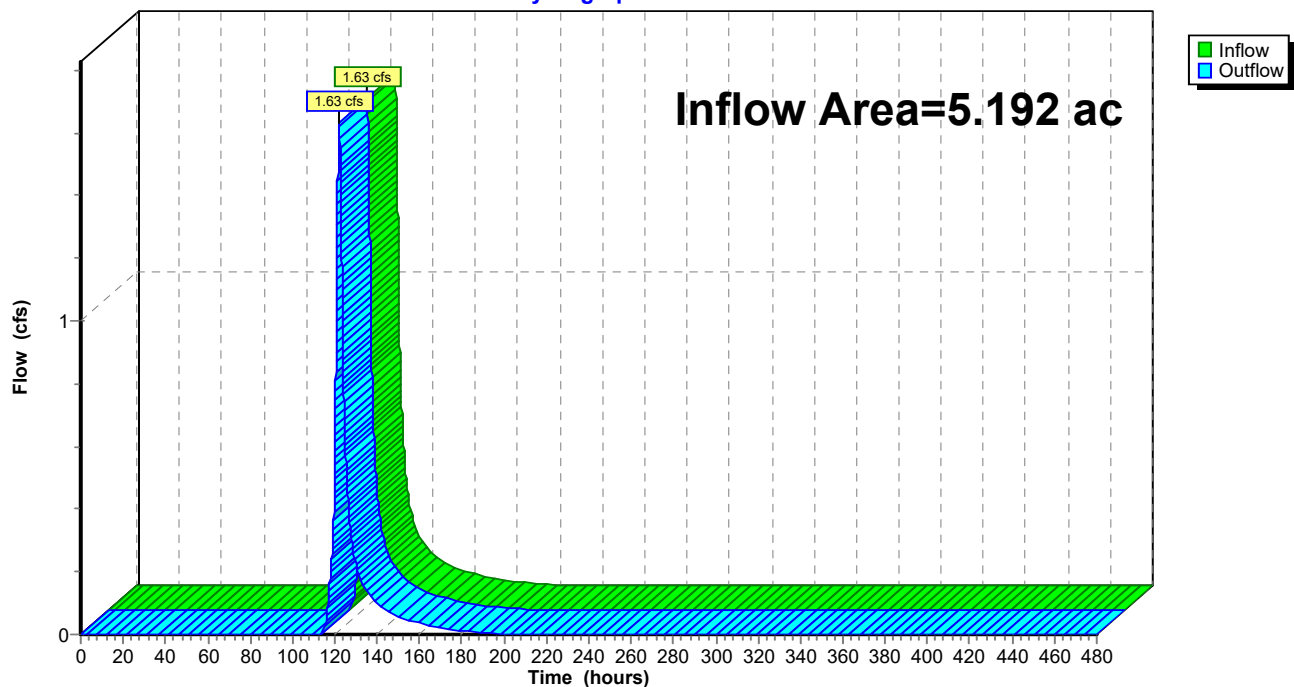
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 2.19" for 10-day Snowmelt event
Inflow = 1.63 cfs @ 121.96 hrs, Volume= 0.949 af
Outflow = 1.63 cfs @ 121.96 hrs, Volume= 0.949 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 6.02" for 10-day Snowmelt event
 Inflow = 2.41 cfs @ 121.44 hrs, Volume= 2.944 af
 Outflow = 2.02 cfs @ 122.11 hrs, Volume= 2.943 af, Atten= 16%, Lag= 40.4 min
 Primary = 2.02 cfs @ 122.11 hrs, Volume= 2.943 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.52' @ 122.11 hrs Surf.Area= 0.467 ac Storage= 0.233 af

Plug-Flow detention time= 261.7 min calculated for 2.943 af (100% of inflow)
 Center-of-Mass det. time= 260.6 min (7,774.2 - 7,513.6)

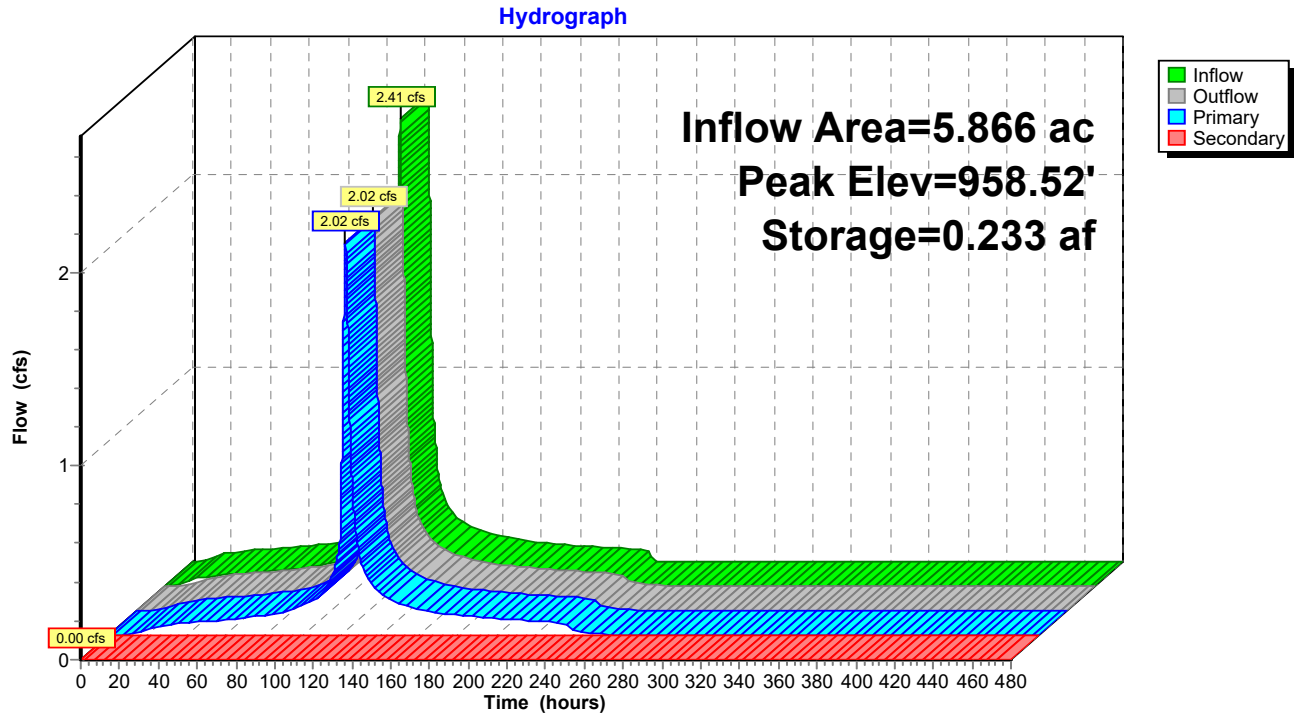
Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=2.02 cfs @ 122.11 hrs HW=958.52' TW=953.80' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 2.02 cfs @ 3.08 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 33P: TH-28A Walmart Existing Pond



Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 4.34" for 10-day Snowmelt event
 Inflow = 4.75 cfs @ 121.69 hrs, Volume= 5.656 af
 Outflow = 2.39 cfs @ 123.63 hrs, Volume= 5.656 af, Atten= 50%, Lag= 116.5 min
 Discarded = 0.25 cfs @ 123.63 hrs, Volume= 3.917 af
 Primary = 2.15 cfs @ 123.63 hrs, Volume= 1.739 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.19' @ 123.63 hrs Surf.Area= 0.542 ac Storage= 1.384 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,475.4 min (9,518.5 - 8,043.2)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

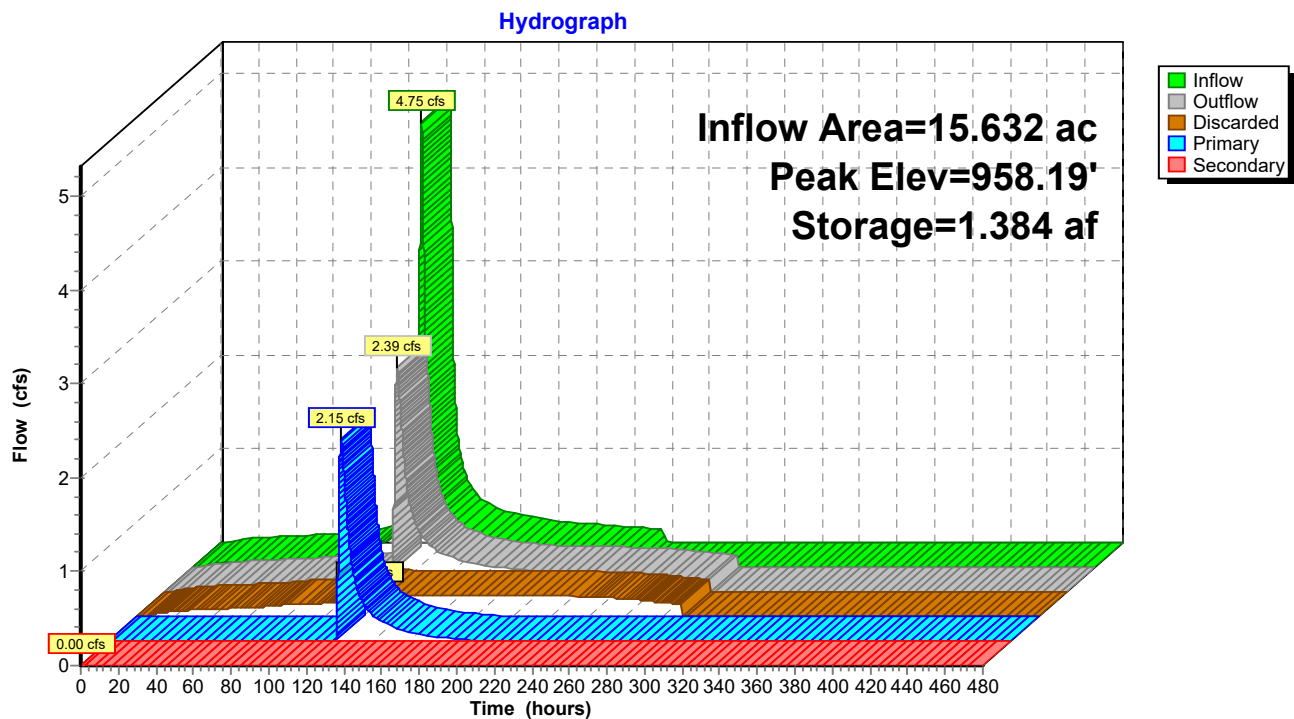
Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.25 cfs @ 123.63 hrs HW=958.19' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=2.15 cfs @ 123.63 hrs HW=958.19' TW=954.06' (Dynamic Tailwater)
↑2=RCP_Round 18" (Passes 2.15 cfs of 9.43 cfs potential flow)
↑3=Orifice/Grate (Orifice Controls 2.15 cfs @ 3.20 fps)
↑4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
↑5=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)
↑6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 34P: Deephaaven Pond



Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 5.28" for 10-day Snowmelt event
 Inflow = 1.94 cfs @ 121.44 hrs, Volume= 2.286 af
 Outflow = 1.72 cfs @ 121.96 hrs, Volume= 2.286 af, Atten= 11%, Lag= 31.2 min
 Discarded = 0.09 cfs @ 121.96 hrs, Volume= 1.337 af
 Primary = 1.63 cfs @ 121.96 hrs, Volume= 0.949 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 953.81' @ 121.96 hrs Surf.Area= 0.204 ac Storage= 0.367 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1,072.1 min (8,849.2 - 7,777.0)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

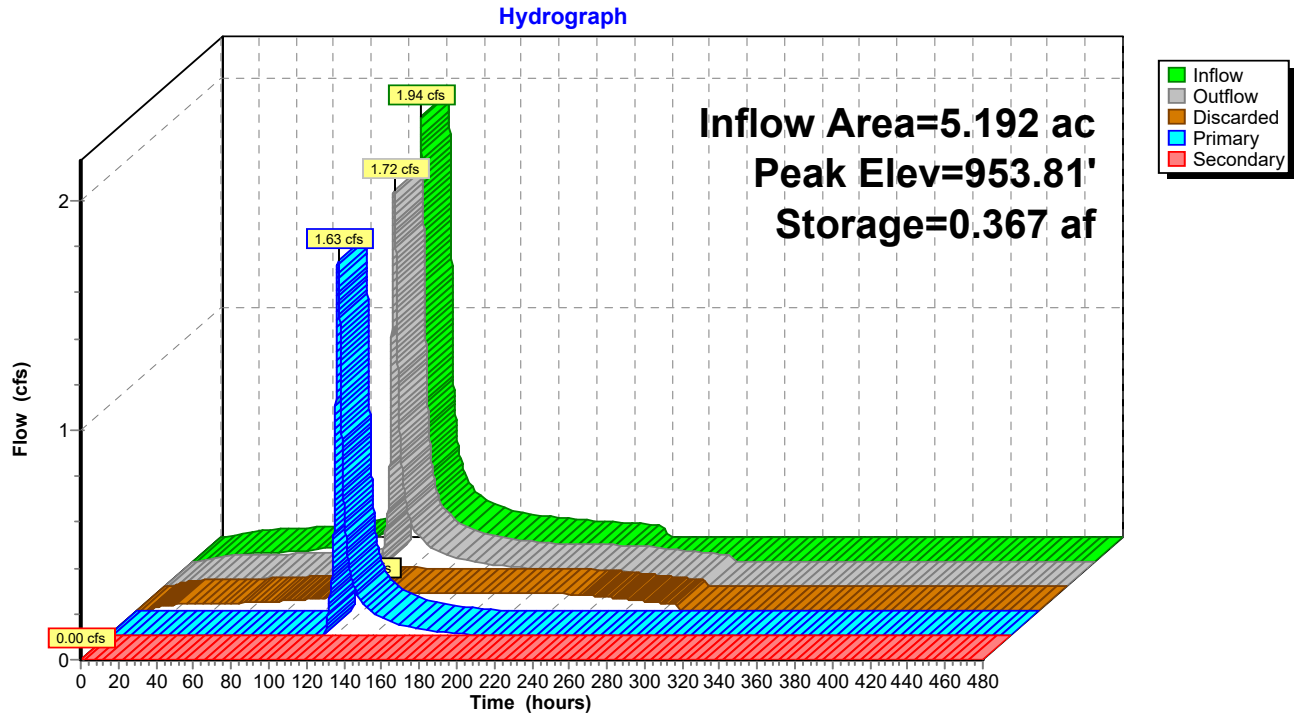
Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.09 cfs @ 121.96 hrs HW=953.81' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=1.63 cfs @ 121.96 hrs HW=953.81' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 1.63 cfs @ 3.08 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 35P: Chelsea Road Pond



Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 4.71" for 10-day Snowmelt event
 Inflow = 38.33 cfs @ 121.70 hrs, Volume= 48.433 af
 Outflow = 3.26 cfs @ 144.59 hrs, Volume= 46.438 af, Atten= 91%, Lag= 1,373.1 min
 Primary = 3.26 cfs @ 144.59 hrs, Volume= 46.438 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af
 Peak Elev= 954.46' @ 144.59 hrs Surf.Area= 13.399 ac Storage= 207.276 af (25.065 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 4,596.4 min (12,396.6 - 7,800.2)

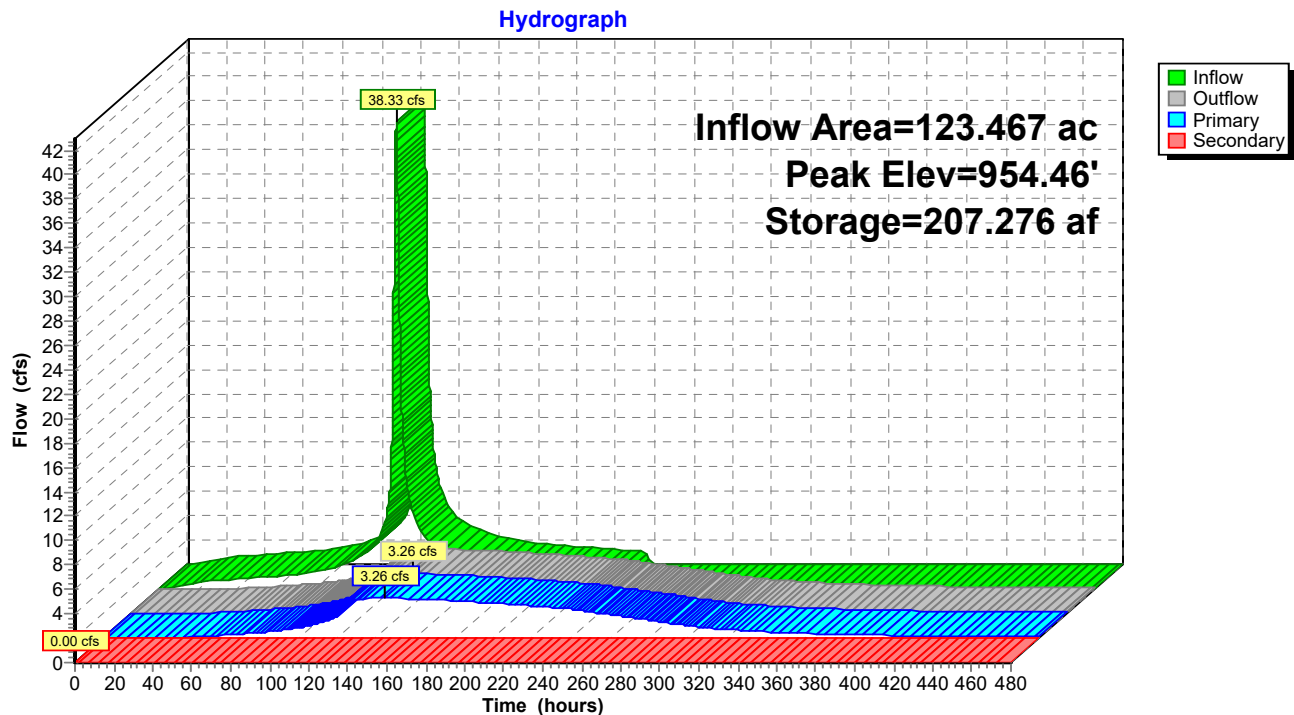
Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=3.26 cfs @ 144.59 hrs HW=954.46' TW=0.00' (Dynamic Tailwater)
 1=RCP_Round 24" (Passes 3.26 cfs of 16.92 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 3.26 cfs @ 5.97 fps)
 3=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)
 4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven

Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=2.20"

Tc=30.0 min CN=65/98 Runoff=27.56 cfs 2.868 af

Subcatchment27S: Proposed Chelsea

Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=2.81"

Tc=30.0 min CN=67/98 Runoff=207.95 cfs 21.513 af

Subcatchment28S: Chelsea Road

Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=2.90"

Tc=15.0 min CN=70/98 Runoff=17.43 cfs 1.256 af

Subcatchment29S: Walmart Pond

Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=3.53"

Tc=15.0 min CN=58/98 Runoff=23.36 cfs 1.726 af

Subcatchment30S: School and

Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=2.90"

Tc=18.0 min CN=66/98 Runoff=30.44 cfs 2.421 af

Reach 31R: To TH-01 Existing Landlocked Basin

Inflow=3.19 cfs 26.045 af

Outflow=3.19 cfs 26.045 af

Reach 32R: West

Inflow=6.83 cfs 0.884 af

Outflow=6.83 cfs 0.884 af

Pond 33P: TH-28A Walmart Existing Pond

Peak Elev=959.32' Storage=0.631 af Inflow=23.36 cfs 1.726 af

Primary=10.72 cfs 1.725 af Secondary=0.00 cfs 0.000 af Outflow=10.72 cfs 1.725 af

Pond 34P: Deephaven Pond

Peak Elev=958.84' Storage=1.755 af Inflow=27.56 cfs 2.868 af

Discarded=0.27 cfs 1.358 af Primary=3.42 cfs 1.510 af Secondary=0.00 cfs 0.000 af Outflow=3.68 cfs 2.868 af

Pond 35P: Chelsea Road Pond

Peak Elev=954.77' Storage=0.588 af Inflow=17.43 cfs 1.256 af

Discarded=0.12 cfs 0.372 af Primary=6.83 cfs 0.884 af Secondary=0.00 cfs 0.000 af Outflow=6.94 cfs 1.256 af

Pond 36P: Proposed Chelsea

Peak Elev=954.39' Storage=206.376 af Inflow=240.13 cfs 27.169 af

Primary=3.19 cfs 26.045 af Secondary=0.00 cfs 0.000 af Outflow=3.19 cfs 26.045 af

Total Runoff Area = 128.659 ac Runoff Volume = 29.783 af Average Runoff Depth = 2.78"

44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

Summary for Subcatchment 26S: Deephaven Development

Runoff = 27.56 cfs @ 12.43 hrs, Volume= 2.868 af, Depth= 2.20"

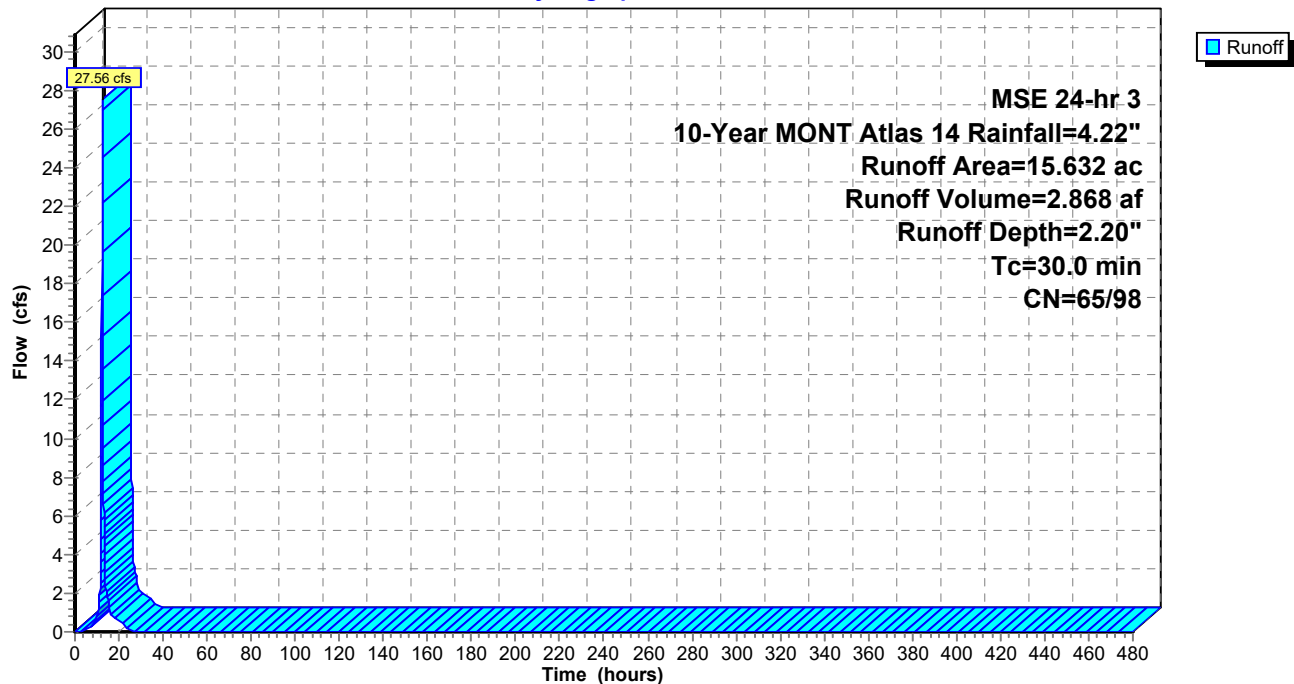
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 207.95 cfs @ 12.42 hrs, Volume= 21.513 af, Depth= 2.81"

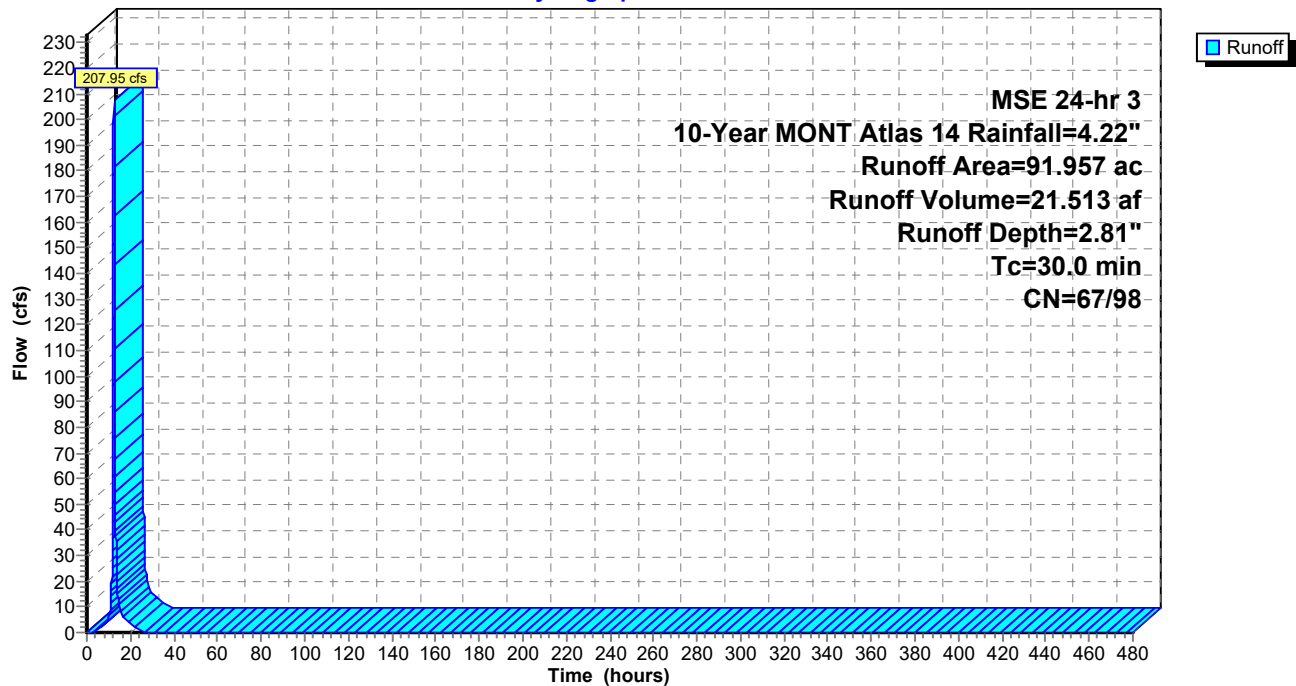
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

	Area (ac)	CN	Description
*	23.336	69	Park: 50-75% Grass cover, Fair, HSG B
	5.435	89	Paved roads w/open ditches, 50% imp, HSG B
	12.493	98	Water Surface, HSG B
*	18.662	92	Urban commercial, 85% imp, HSG B
*	32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
	91.957	84	Weighted Average
	40.064	67	43.57% Pervious Area
	51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



Summary for Subcatchment 28S: Chelsea Road

Runoff = 17.43 cfs @ 12.23 hrs, Volume= 1.256 af, Depth= 2.90"

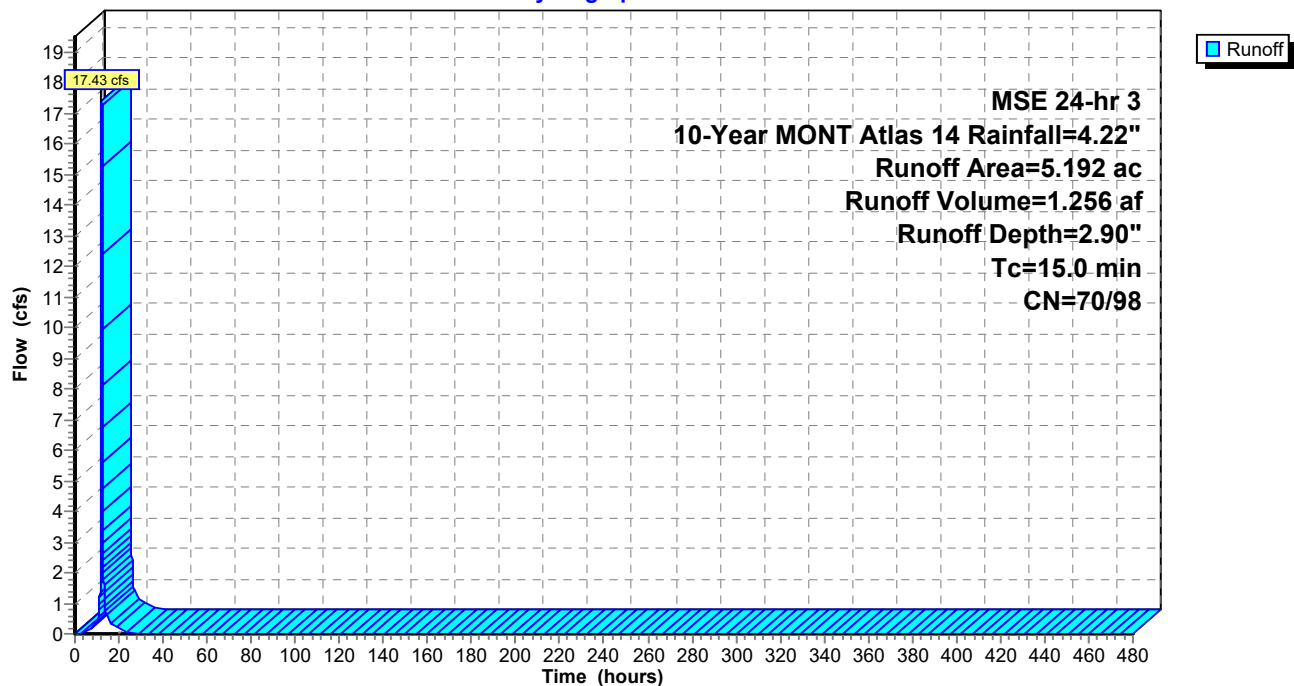
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 23.36 cfs @ 12.23 hrs, Volume= 1.726 af, Depth= 3.53"

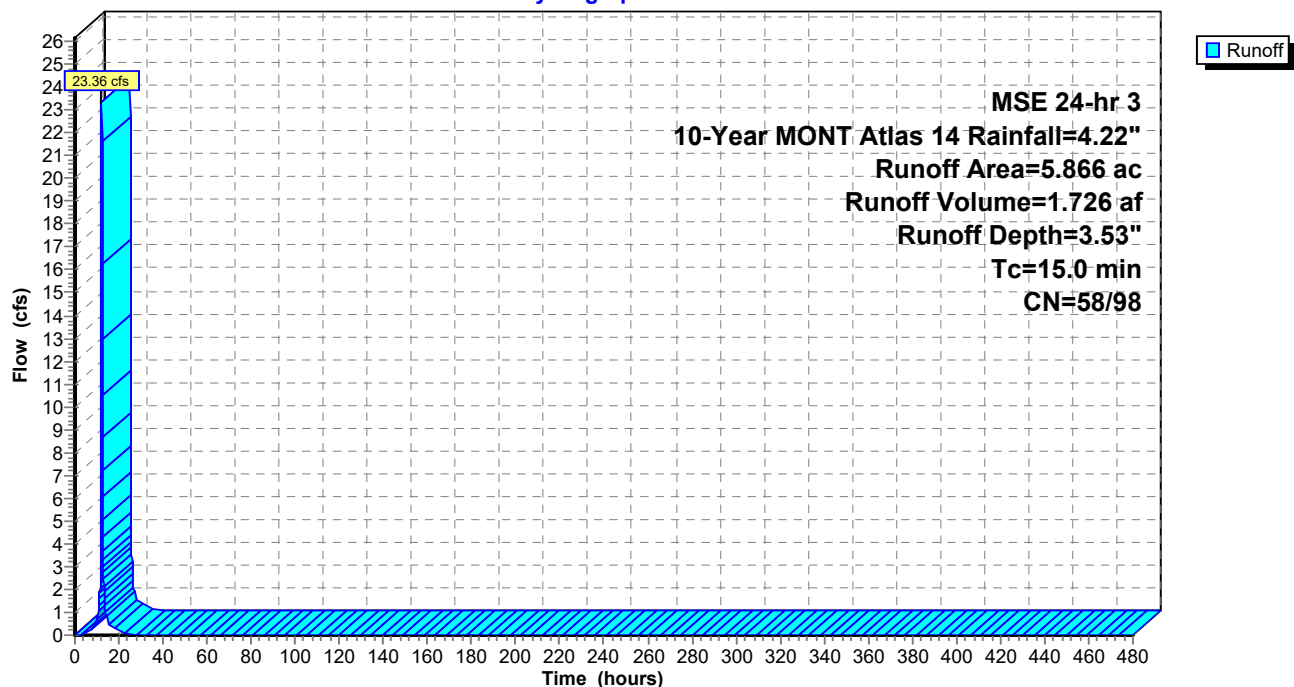
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

Runoff = 30.44 cfs @ 12.27 hrs, Volume= 2.421 af, Depth= 2.90"

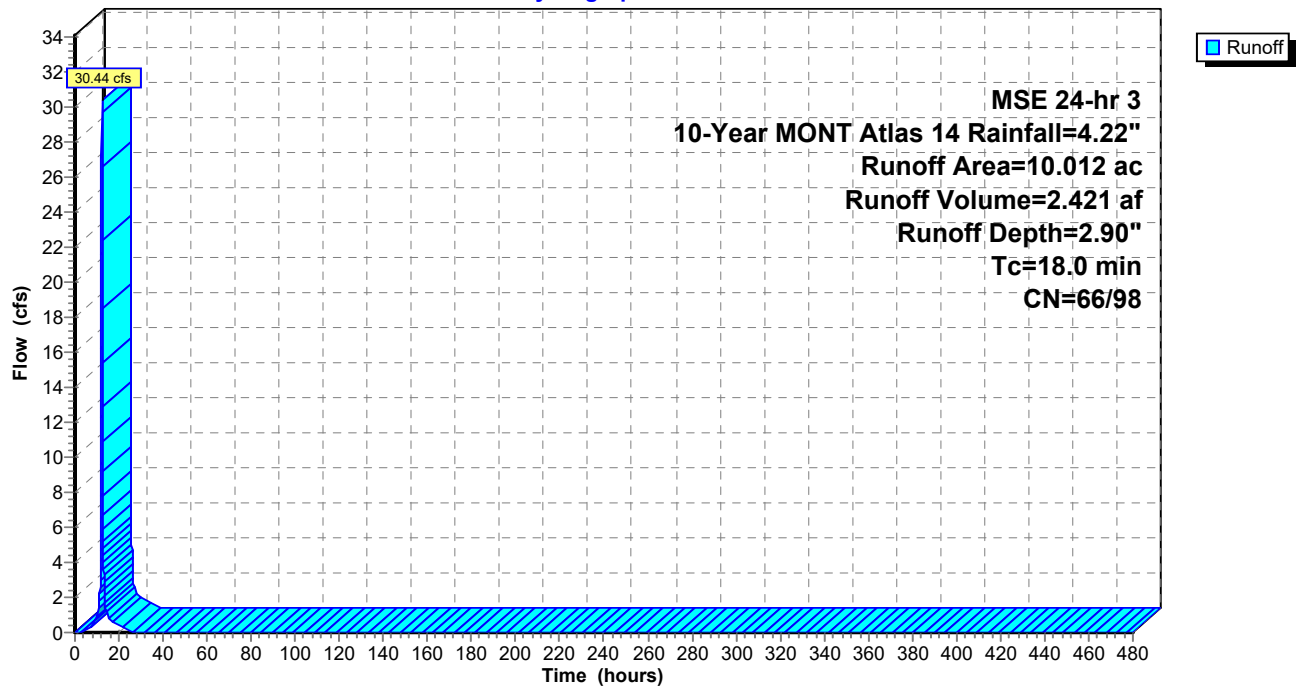
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 10-Year MONT Atlas 14 Rainfall=4.22"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

Hydrograph

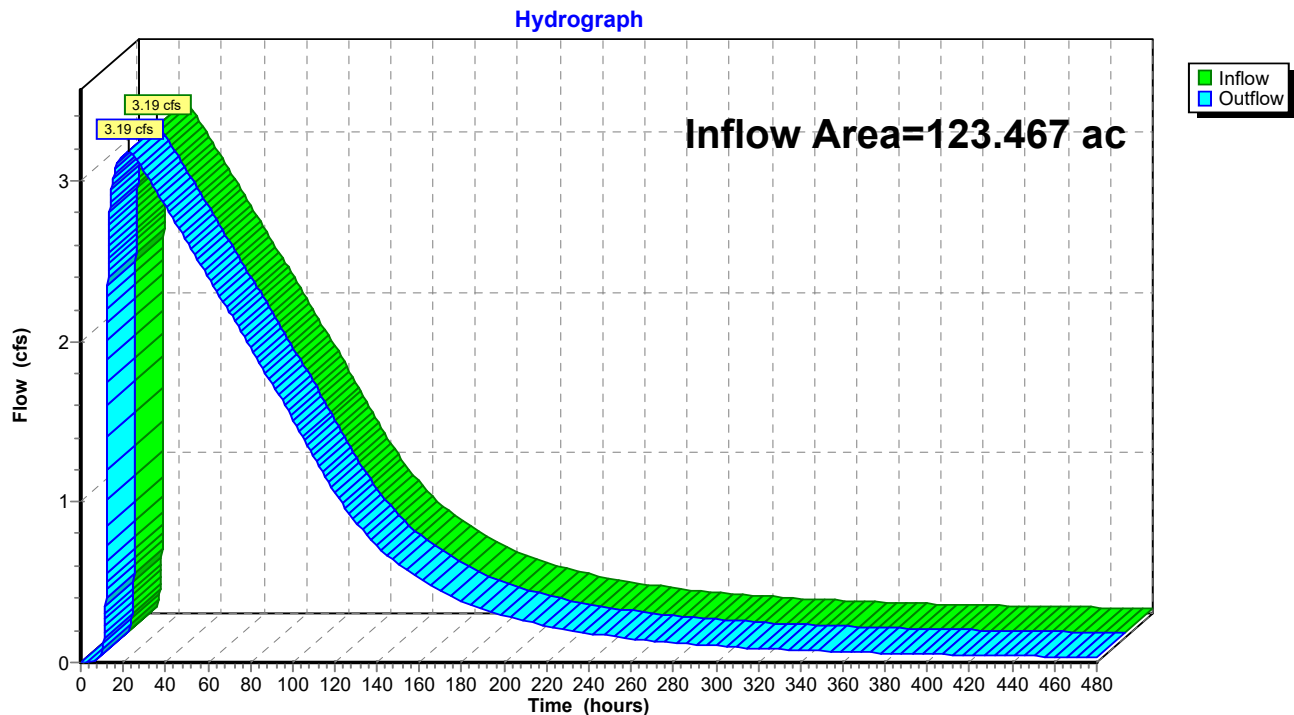


Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 2.53" for 10-Year MONT Atlas 14 event
Inflow = 3.19 cfs @ 22.21 hrs, Volume= 26.045 af
Outflow = 3.19 cfs @ 22.21 hrs, Volume= 26.045 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



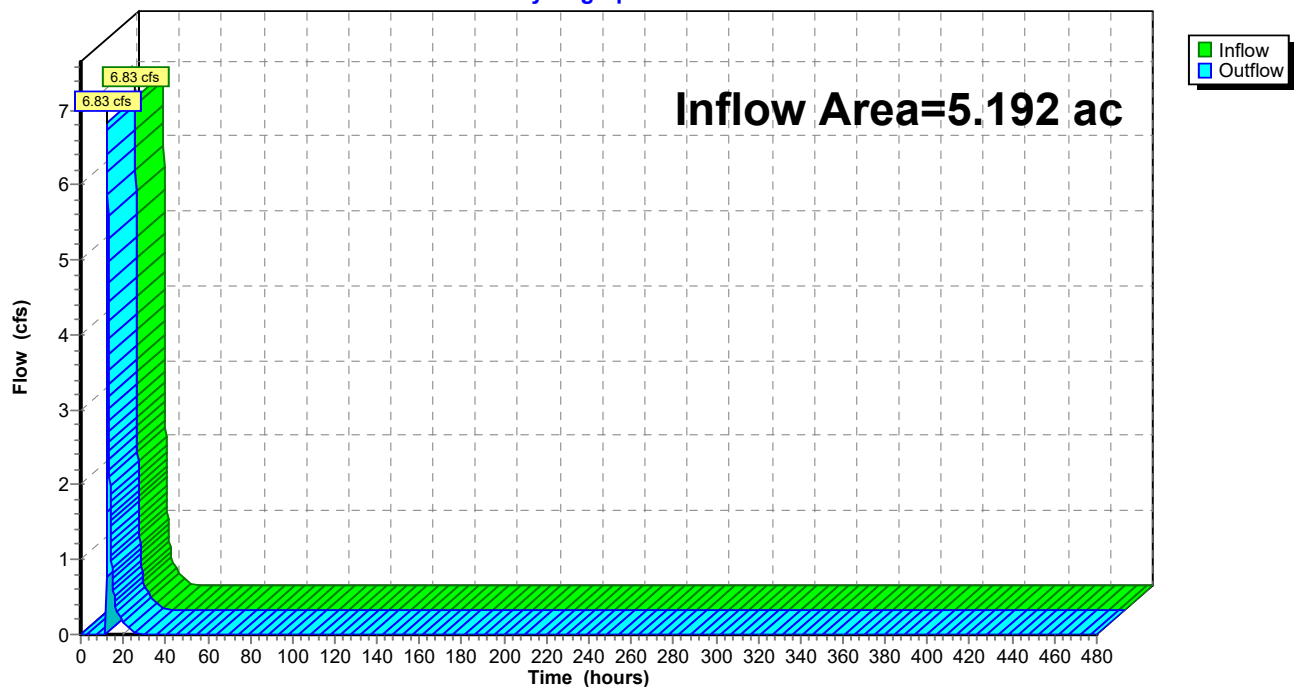
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 2.04" for 10-Year MONT Atlas 14 event
Inflow = 6.83 cfs @ 12.50 hrs, Volume= 0.884 af
Outflow = 6.83 cfs @ 12.50 hrs, Volume= 0.884 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 3.53" for 10-Year MONT Atlas 14 event
 Inflow = 23.36 cfs @ 12.23 hrs, Volume= 1.726 af
 Outflow = 10.72 cfs @ 12.45 hrs, Volume= 1.725 af, Atten= 54%, Lag= 13.4 min
 Primary = 10.72 cfs @ 12.45 hrs, Volume= 1.725 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.32' @ 12.45 hrs Surf.Area= 0.539 ac Storage= 0.631 af

Plug-Flow detention time= 119.7 min calculated for 1.725 af (100% of inflow)
 Center-of-Mass det. time= 121.9 min (881.1 - 759.2)

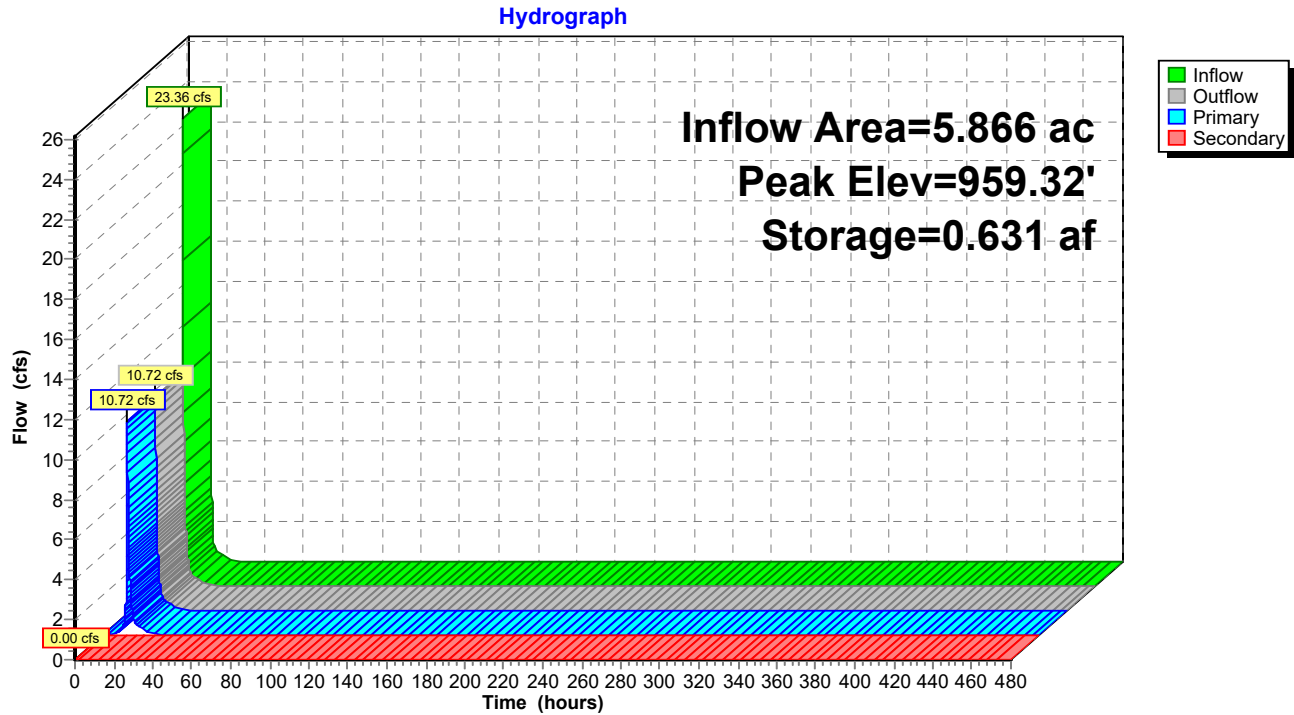
Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=10.72 cfs @ 12.45 hrs HW=959.32' TW=953.36' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 10.72 cfs @ 4.88 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 33P: TH-28A Walmart Existing Pond



Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 2.20" for 10-Year MONT Atlas 14 event
 Inflow = 27.56 cfs @ 12.43 hrs, Volume= 2.868 af
 Outflow = 3.68 cfs @ 13.65 hrs, Volume= 2.868 af, Atten= 87%, Lag= 73.0 min
 Discarded = 0.27 cfs @ 13.65 hrs, Volume= 1.358 af
 Primary = 3.42 cfs @ 13.65 hrs, Volume= 1.510 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 958.84' @ 13.65 hrs Surf.Area= 0.585 ac Storage= 1.755 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 984.9 min (1,784.1 - 799.2)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

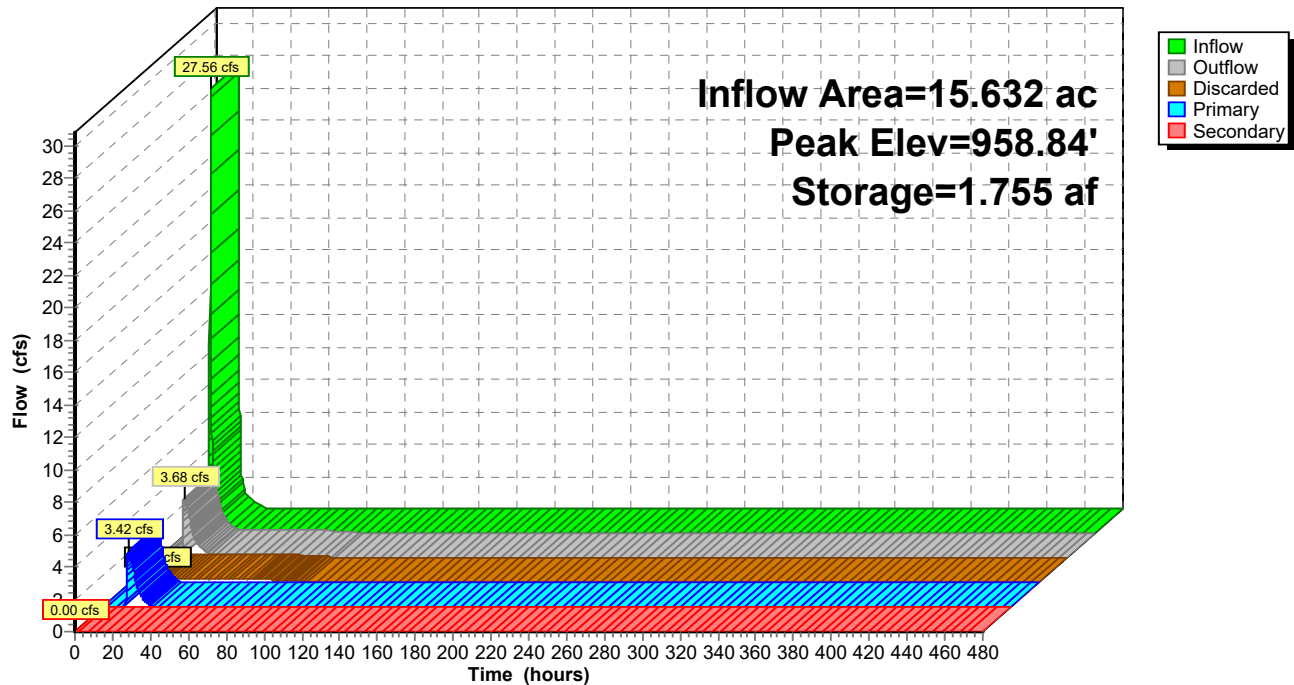
Discarded OutFlow Max=0.27 cfs @ 13.65 hrs HW=958.84' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.27 cfs)

Primary OutFlow Max=3.42 cfs @ 13.65 hrs HW=958.84' TW=954.05' (Dynamic Tailwater)
↑2=RCP_Round 18" (Passes 3.42 cfs of 11.66 cfs potential flow)
↑3=Orifice/Grate (Orifice Controls 3.42 cfs @ 5.00 fps)
↑4=Broad-Crested Rectangular Weir(Controls 0.00 cfs)
↑5=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)
↑6=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 34P: Deephaaven Pond

Hydrograph



Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 2.90" for 10-Year MONT Atlas 14 event
 Inflow = 17.43 cfs @ 12.23 hrs, Volume= 1.256 af
 Outflow = 6.94 cfs @ 12.50 hrs, Volume= 1.256 af, Atten= 60%, Lag= 15.9 min
 Discarded = 0.12 cfs @ 12.50 hrs, Volume= 0.372 af
 Primary = 6.83 cfs @ 12.50 hrs, Volume= 0.884 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 954.77' @ 12.50 hrs Surf.Area= 0.257 ac Storage= 0.588 af

Plug-Flow detention time= 505.4 min calculated for 1.255 af (100% of inflow)
 Center-of-Mass det. time= 505.7 min (1,278.7 - 772.9)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

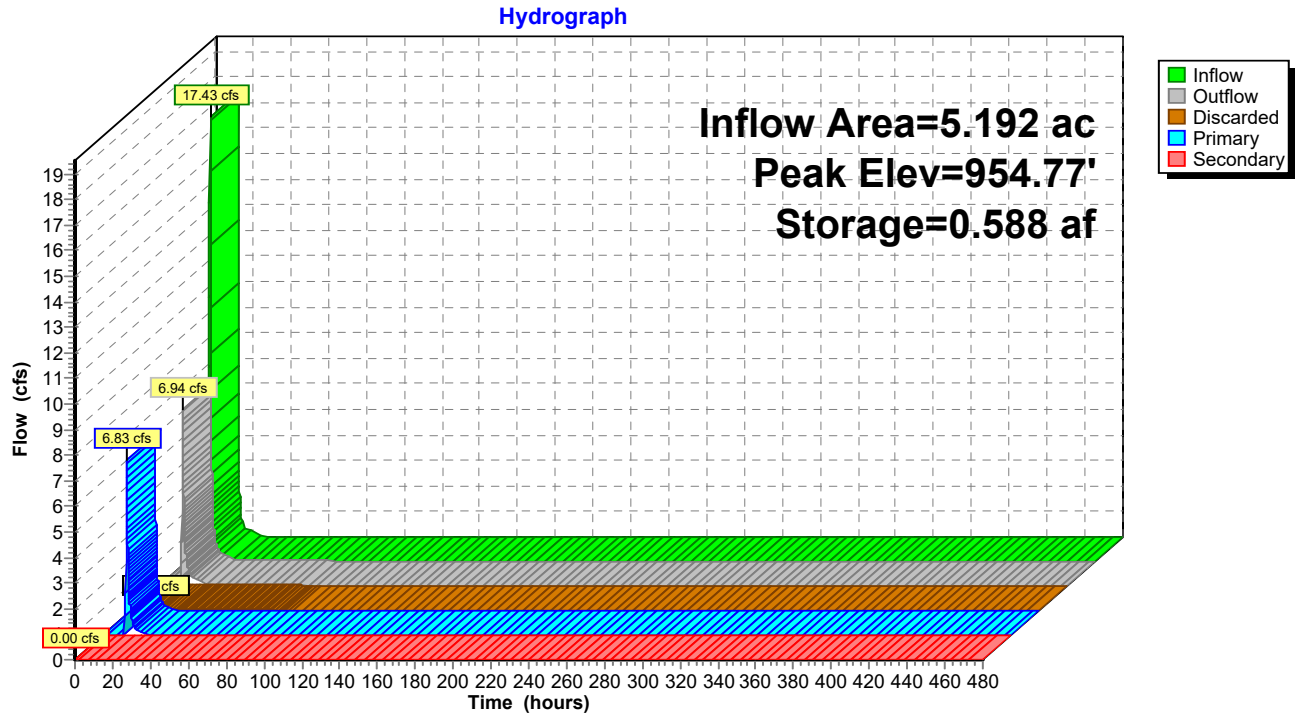
Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.12 cfs @ 12.50 hrs HW=954.76' (Free Discharge)
 ↑**3=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=6.82 cfs @ 12.50 hrs HW=954.76' TW=0.00' (Dynamic Tailwater)
 ↑**1=RCP_Round 18"** (Barrel Controls 6.82 cfs @ 4.41 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 35P: Chelsea Road Pond



Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 2.64" for 10-Year MONT Atlas 14 event
 Inflow = 240.13 cfs @ 12.40 hrs, Volume= 27.169 af
 Outflow = 3.19 cfs @ 22.21 hrs, Volume= 26.045 af, Atten= 99%, Lag= 588.8 min
 Primary = 3.19 cfs @ 22.21 hrs, Volume= 26.045 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af
 Peak Elev= 954.39' @ 22.21 hrs Surf.Area= 13.359 ac Storage= 206.376 af (24.165 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 4,709.0 min (5,510.7 - 801.7)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=3.19 cfs @ 22.21 hrs HW=954.39' TW=0.00' (Dynamic Tailwater)

1=RCP_Round 24" (Passes 3.19 cfs of 16.80 cfs potential flow)

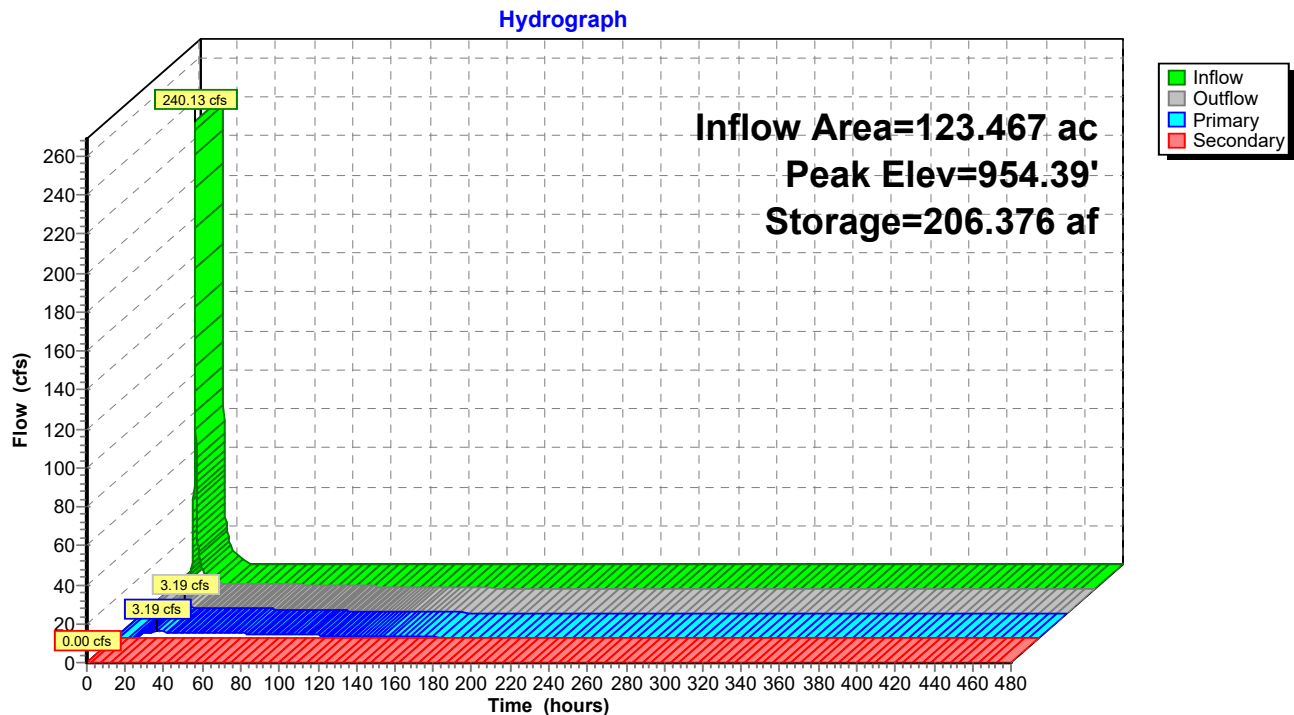
2=Orifice/Grate (Orifice Controls 3.19 cfs @ 5.84 fps)

3=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 102

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=2.94"
Tc=30.0 min CN=65/98 Runoff=37.49 cfs 3.835 af

Subcatchment27S: Proposed Chelsea Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=3.63"
Tc=30.0 min CN=67/98 Runoff=270.46 cfs 27.817 af

Subcatchment28S: Chelsea Road Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=3.75"
Tc=15.0 min CN=70/98 Runoff=22.57 cfs 1.620 af

Subcatchment29S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=4.42"
Tc=15.0 min CN=58/98 Runoff=29.17 cfs 2.163 af

Subcatchment30S: School and Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=3.73"
Tc=18.0 min CN=66/98 Runoff=39.32 cfs 3.114 af

Reach 31R: To TH-01 Existing Landlocked Basin Inflow=3.76 cfs 34.327 af
Outflow=3.76 cfs 34.327 af

Reach 32R: West Inflow=9.06 cfs 1.241 af
Outflow=9.06 cfs 1.241 af

Pond 33P: TH-28A Walmart Existing Pond Peak Elev=959.54' Storage=0.753 af Inflow=29.17 cfs 2.163 af
Primary=13.71 cfs 2.162 af Secondary=0.00 cfs 0.000 af Outflow=13.71 cfs 2.162 af

Pond 34P: Deephaven Pond Peak Elev=959.79' Storage=2.337 af Inflow=37.49 cfs 3.835 af
Discarded=0.29 cfs 1.396 af Primary=4.68 cfs 2.439 af Secondary=0.00 cfs 0.000 af Outflow=4.98 cfs 3.835 af

Pond 35P: Chelsea Road Pond Peak Elev=955.26' Storage=0.723 af Inflow=22.57 cfs 1.620 af
Discarded=0.13 cfs 0.380 af Primary=9.06 cfs 1.241 af Secondary=0.00 cfs 0.000 af Outflow=9.19 cfs 1.620 af

Pond 36P: Proposed Chelsea Peak Elev=954.96' Storage=214.121 af Inflow=312.90 cfs 35.532 af
Primary=3.76 cfs 34.327 af Secondary=0.00 cfs 0.000 af Outflow=3.76 cfs 34.327 af

Total Runoff Area = 128.659 ac Runoff Volume = 38.549 af Average Runoff Depth = 3.60"
44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 103

Summary for Subcatchment 26S: Deephaven Development

Runoff = 37.49 cfs @ 12.43 hrs, Volume= 3.835 af, Depth= 2.94"

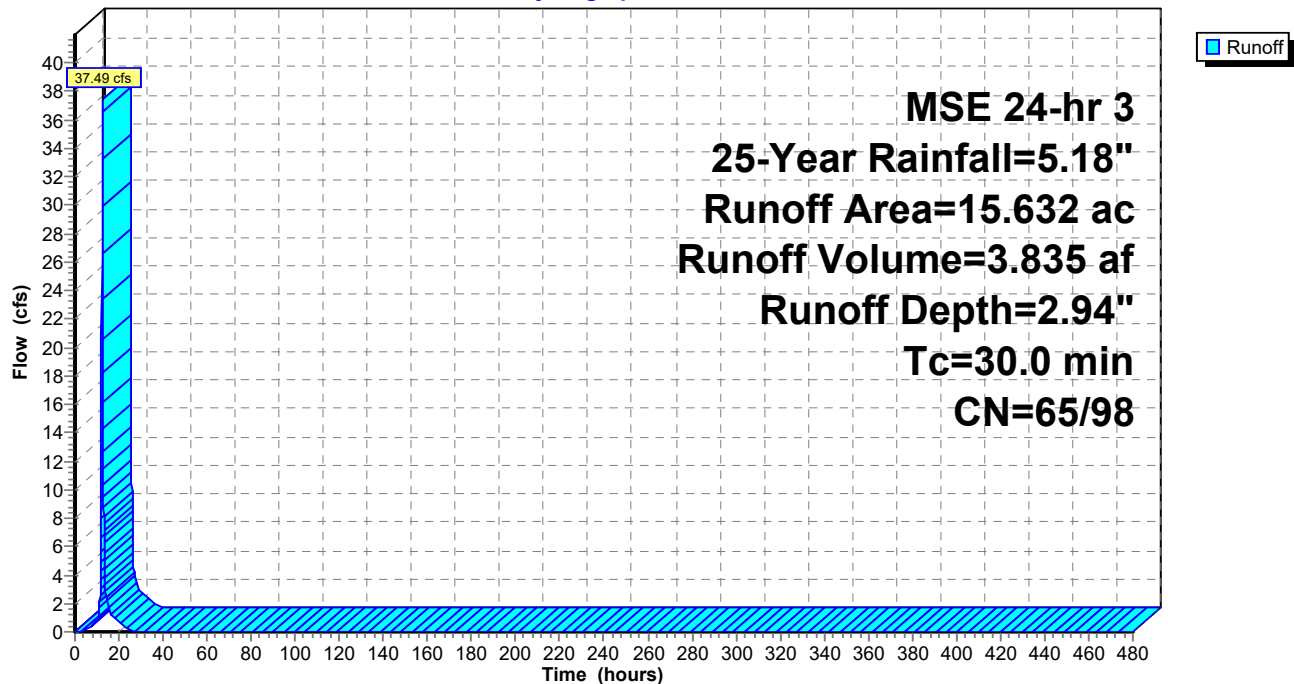
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 104

Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 270.46 cfs @ 12.42 hrs, Volume= 27.817 af, Depth= 3.63"

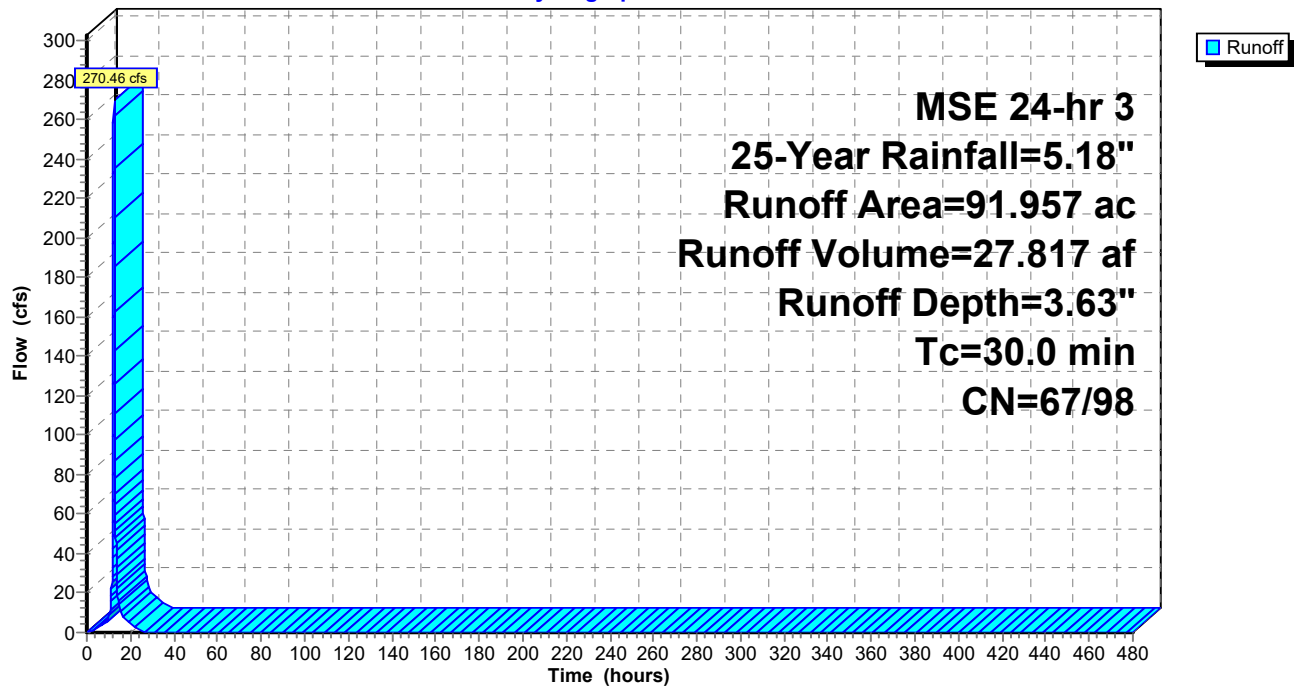
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

	Area (ac)	CN	Description
*	23.336	69	Park: 50-75% Grass cover, Fair, HSG B
	5.435	89	Paved roads w/open ditches, 50% imp, HSG B
	12.493	98	Water Surface, HSG B
*	18.662	92	Urban commercial, 85% imp, HSG B
*	32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
	91.957	84	Weighted Average
	40.064	67	43.57% Pervious Area
	51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 105

Summary for Subcatchment 28S: Chelsea Road

Runoff = 22.57 cfs @ 12.23 hrs, Volume= 1.620 af, Depth= 3.75"

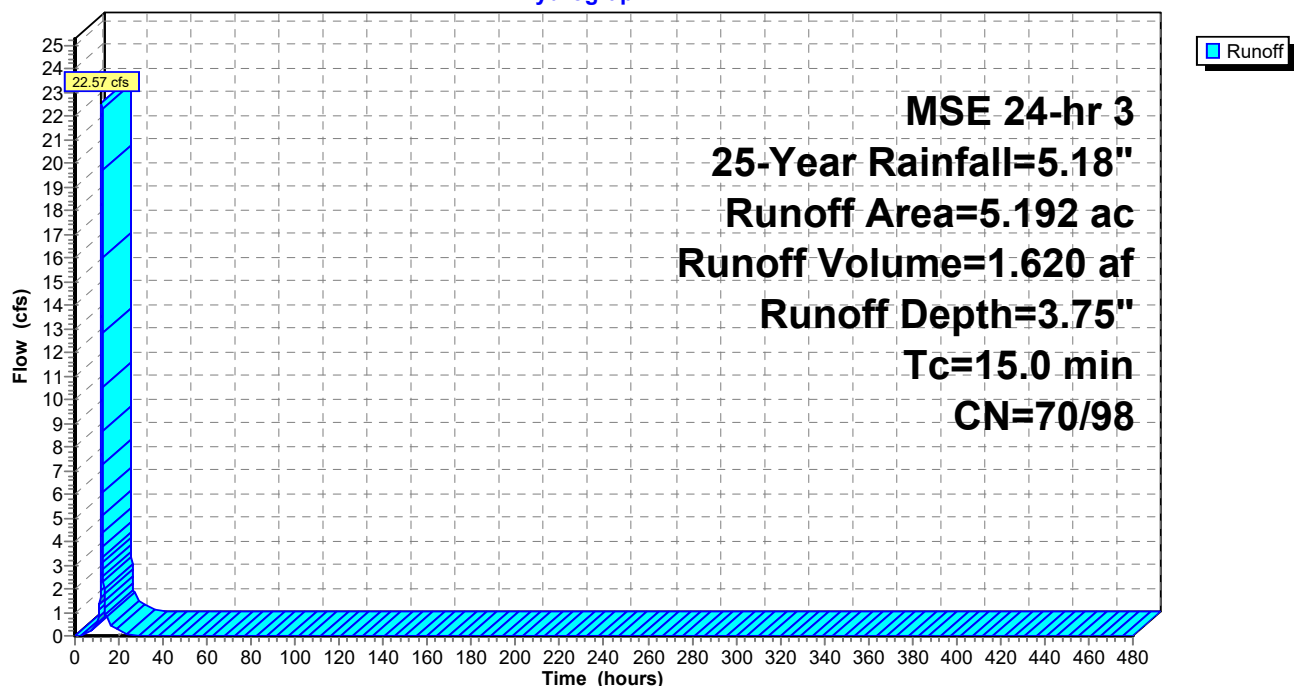
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 106

Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 29.17 cfs @ 12.23 hrs, Volume= 2.163 af, Depth= 4.42"

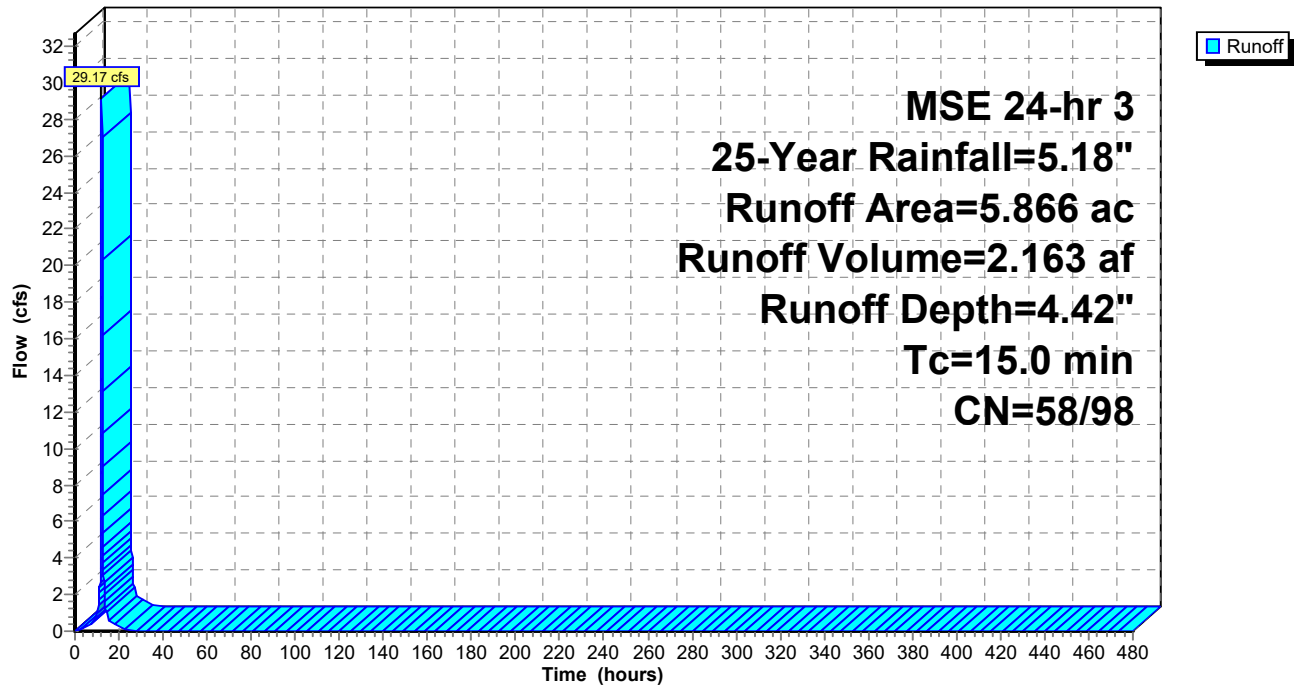
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 107

Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

Runoff = 39.32 cfs @ 12.27 hrs, Volume= 3.114 af, Depth= 3.73"

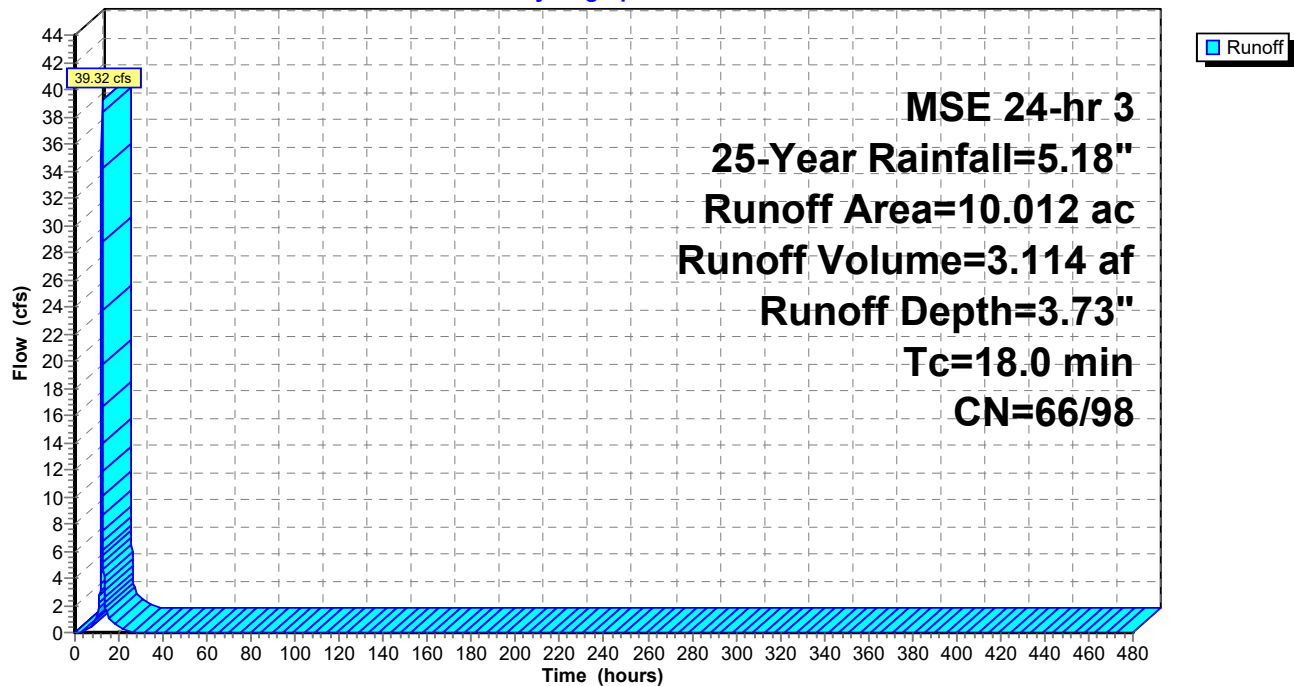
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25-Year Rainfall=5.18"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

Hydrograph

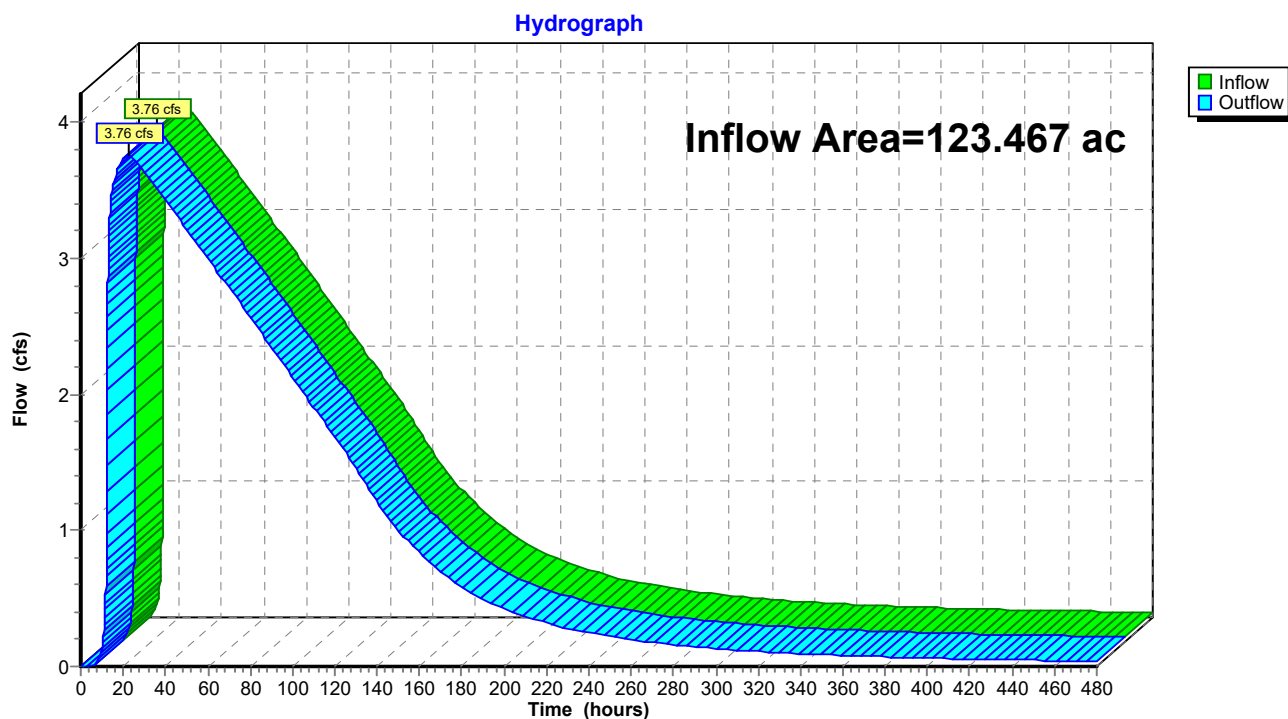


Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 3.34" for 25-Year event
 Inflow = 3.76 cfs @ 22.61 hrs, Volume= 34.327 af
 Outflow = 3.76 cfs @ 22.61 hrs, Volume= 34.327 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 109

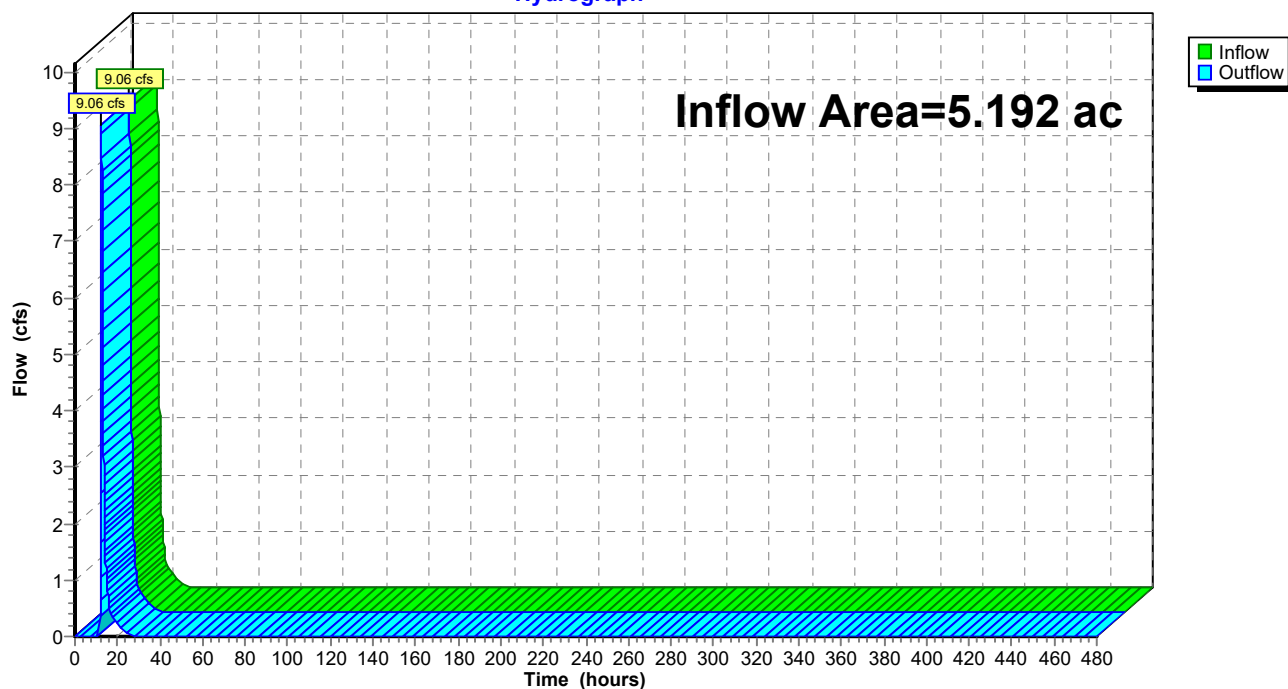
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 2.87" for 25-Year event
Inflow = 9.06 cfs @ 12.49 hrs, Volume= 1.241 af
Outflow = 9.06 cfs @ 12.49 hrs, Volume= 1.241 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 110

Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 4.42" for 25-Year event
 Inflow = 29.17 cfs @ 12.23 hrs, Volume= 2.163 af
 Outflow = 13.71 cfs @ 12.44 hrs, Volume= 2.162 af, Atten= 53%, Lag= 13.0 min
 Primary = 13.71 cfs @ 12.44 hrs, Volume= 2.162 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.54' @ 12.44 hrs Surf.Area= 0.559 ac Storage= 0.753 af

Plug-Flow detention time= 106.2 min calculated for 2.162 af (100% of inflow)
 Center-of-Mass det. time= 108.3 min (865.3 - 757.0)

Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=13.69 cfs @ 12.44 hrs HW=959.54' TW=953.60' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 13.69 cfs @ 5.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

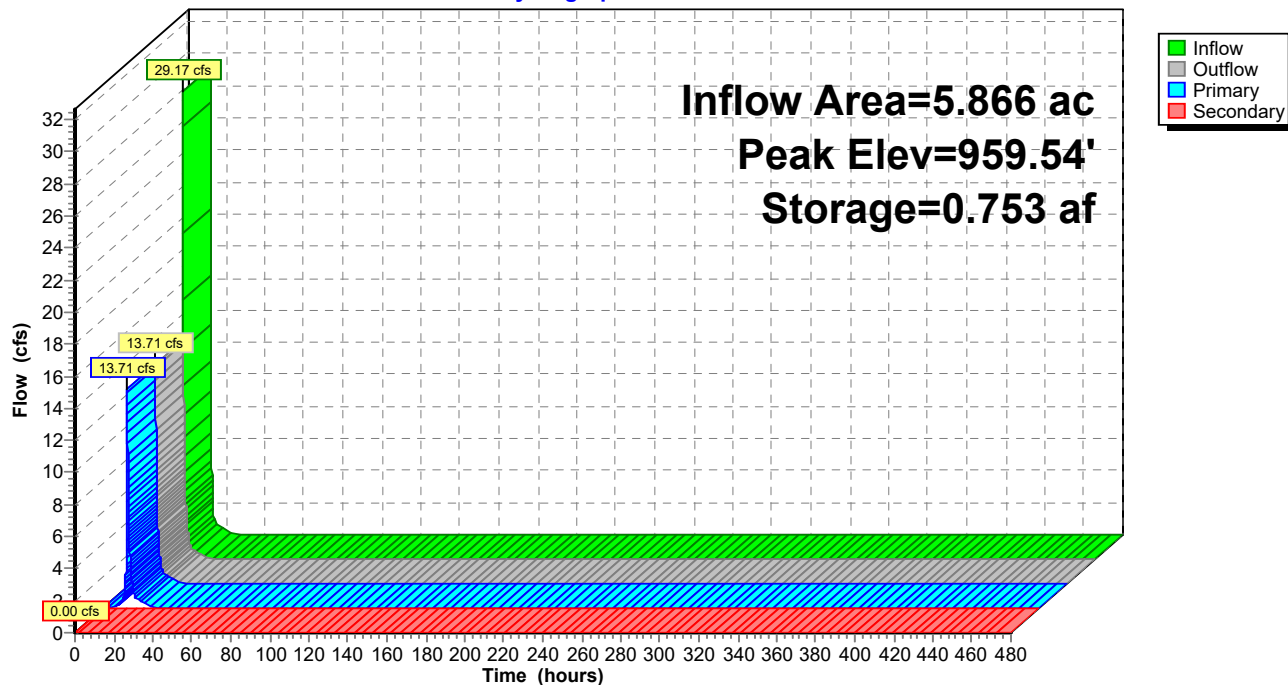
Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 111

Pond 33P: TH-28A Walmart Existing Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 112

Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 2.94" for 25-Year event
 Inflow = 37.49 cfs @ 12.43 hrs, Volume= 3.835 af
 Outflow = 4.98 cfs @ 13.63 hrs, Volume= 3.835 af, Atten= 87%, Lag= 72.1 min
 Discarded = 0.29 cfs @ 13.63 hrs, Volume= 1.396 af
 Primary = 4.68 cfs @ 13.63 hrs, Volume= 2.439 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.79' @ 13.63 hrs Surf.Area= 0.646 ac Storage= 2.337 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 804.9 min (1,602.8 - 797.9)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 113

Discarded OutFlow Max=0.29 cfs @ 13.63 hrs HW=959.79' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=4.68 cfs @ 13.63 hrs HW=959.79' TW=954.50' (Dynamic Tailwater)

↑ **2=RCP_Round 18"** (Passes 4.68 cfs of 14.26 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 4.68 cfs @ 6.85 fps)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

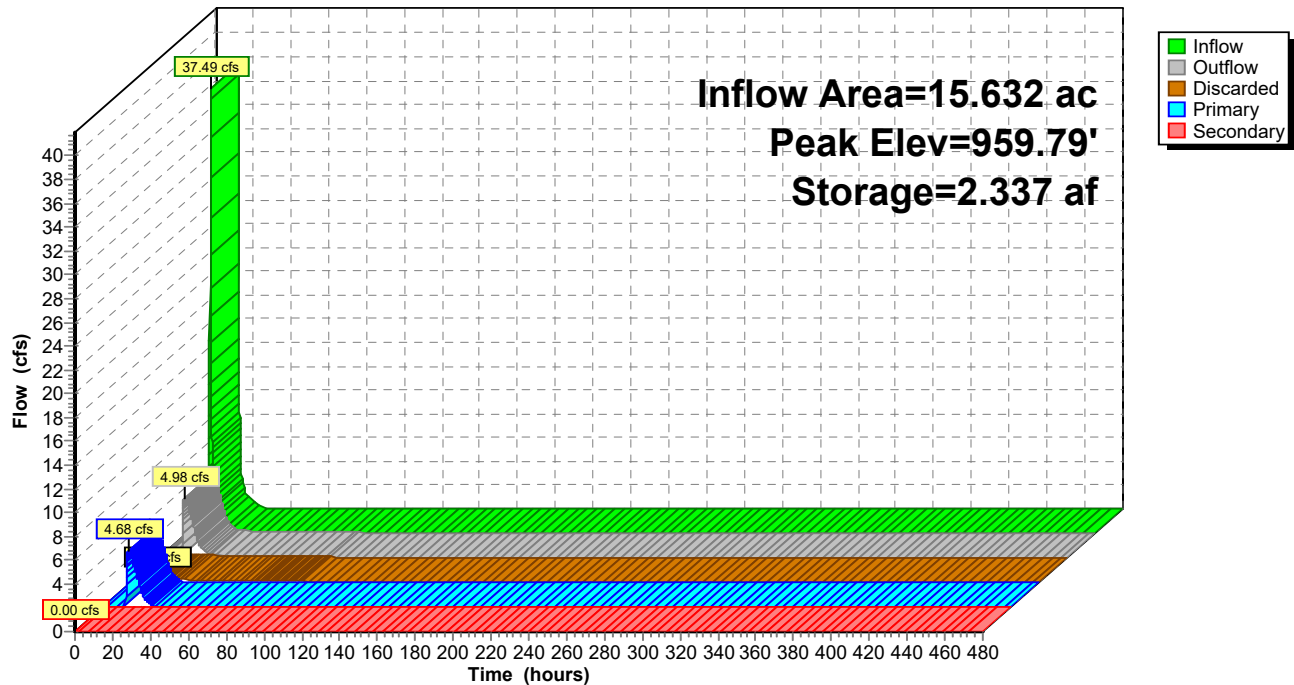
↑ **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)

↑ **6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 34P: Deephaven Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 114

Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 3.75" for 25-Year event
 Inflow = 22.57 cfs @ 12.23 hrs, Volume= 1.620 af
 Outflow = 9.19 cfs @ 12.49 hrs, Volume= 1.620 af, Atten= 59%, Lag= 15.4 min
 Discarded = 0.13 cfs @ 12.49 hrs, Volume= 0.380 af
 Primary = 9.06 cfs @ 12.49 hrs, Volume= 1.241 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 955.26' @ 12.49 hrs Surf.Area= 0.287 ac Storage= 0.723 af

Plug-Flow detention time= 409.3 min calculated for 1.620 af (100% of inflow)
 Center-of-Mass det. time= 409.6 min (1,180.6 - 771.0)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.13 cfs @ 12.49 hrs HW=955.26' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=9.05 cfs @ 12.49 hrs HW=955.26' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 9.05 cfs @ 5.12 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

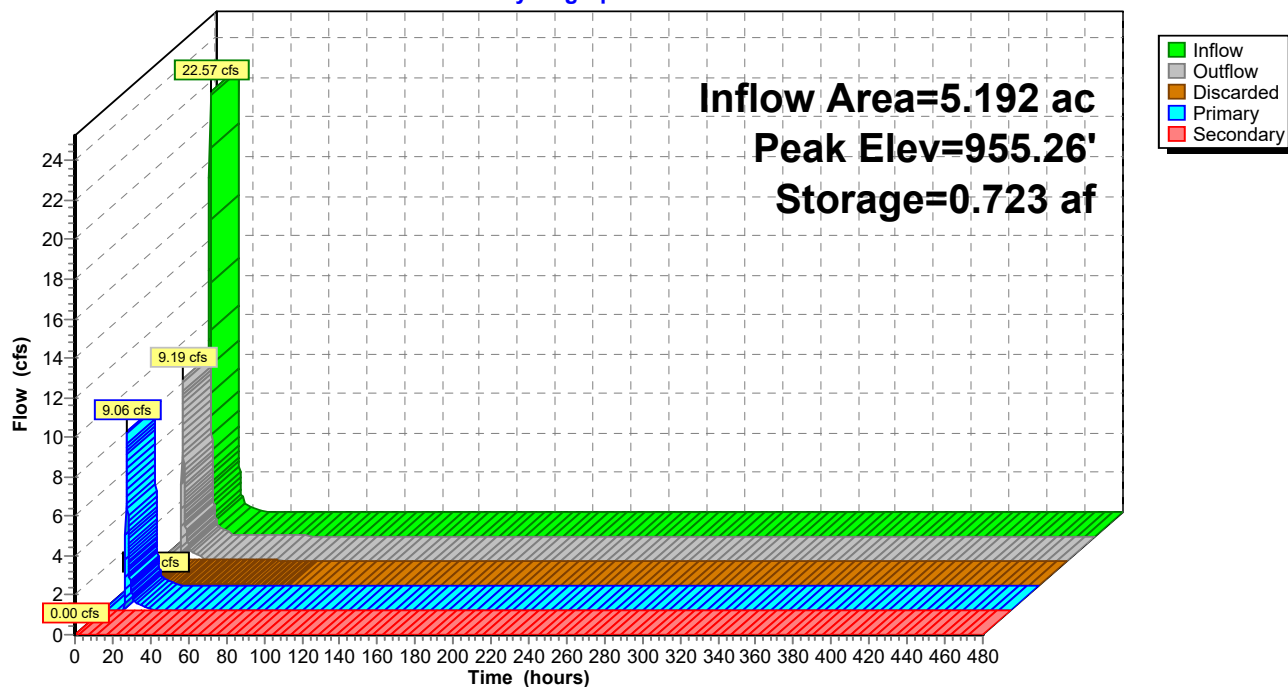
Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 115

Pond 35P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"

Printed 7/23/2021

Page 116

Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 3.45" for 25-Year event
 Inflow = 312.90 cfs @ 12.40 hrs, Volume= 35.532 af
 Outflow = 3.76 cfs @ 22.61 hrs, Volume= 34.327 af, Atten= 99%, Lag= 612.2 min
 Primary = 3.76 cfs @ 22.61 hrs, Volume= 34.327 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af

Peak Elev= 954.96' @ 22.61 hrs Surf.Area= 13.704 ac Storage= 214.121 af (31.910 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= 4,929.0 min (5,731.6 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 25-Year Rainfall=5.18"
Printed 7/23/2021
Page 117

Primary OutFlow Max=3.76 cfs @ 22.61 hrs HW=954.96' TW=0.00' (Dynamic Tailwater)

1=RCP_Round 24" (Passes 3.76 cfs of 17.85 cfs potential flow)

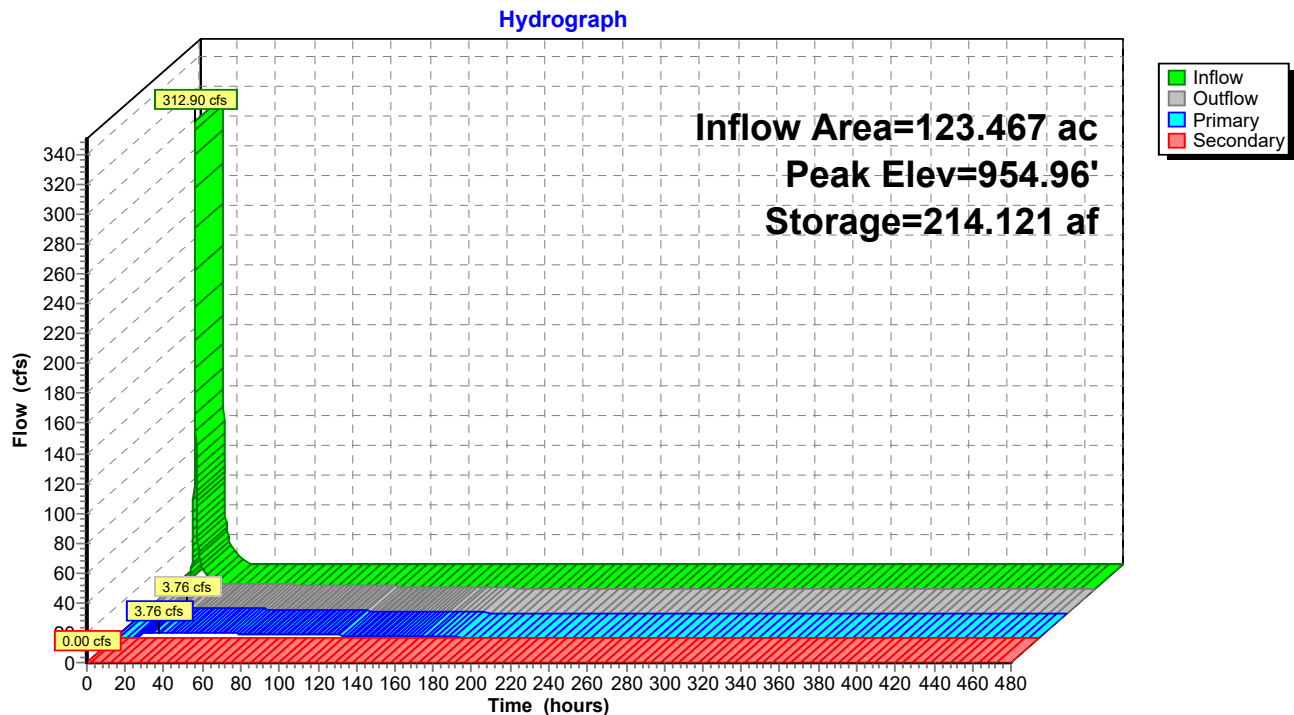
2=Orifice/Grate (Orifice Controls 3.76 cfs @ 6.89 fps)

3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 118

Time span=0.00-480.00 hrs, dt=0.05 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment26S: Deephaven Runoff Area=15.632 ac 36.91% Impervious Runoff Depth=3.63"
Tc=30.0 min CN=65/98 Runoff=46.63 cfs 4.725 af

Subcatchment27S: Proposed Chelsea Runoff Area=91.957 ac 56.43% Impervious Runoff Depth=4.37"
Tc=30.0 min CN=67/98 Runoff=326.80 cfs 33.501 af

Subcatchment28S: Chelsea Road Runoff Area=5.192 ac 56.80% Impervious Runoff Depth=4.50"
Tc=15.0 min CN=70/98 Runoff=27.17 cfs 1.948 af

Subcatchment29S: Walmart Pond Runoff Area=5.866 ac 85.89% Impervious Runoff Depth=5.22"
Tc=15.0 min CN=58/98 Runoff=34.32 cfs 2.550 af

Subcatchment30S: School and Runoff Area=10.012 ac 60.83% Impervious Runoff Depth=4.48"
Tc=18.0 min CN=66/98 Runoff=47.31 cfs 3.737 af

Reach 31R: To TH-01 Existing Landlocked Basin Inflow=4.20 cfs 41.802 af
Outflow=4.20 cfs 41.802 af

Reach 32R: West Inflow=11.11 cfs 1.562 af
Outflow=11.11 cfs 1.562 af

Pond 33P: TH-28A Walmart Existing Pond Peak Elev=959.73' Storage=0.862 af Inflow=34.32 cfs 2.550 af
Primary=16.18 cfs 2.549 af Secondary=0.00 cfs 0.000 af Outflow=16.18 cfs 2.549 af

Pond 34P: Deephaven Pond Peak Elev=960.64' Storage=2.907 af Inflow=46.63 cfs 4.725 af
Discarded=0.32 cfs 1.431 af Primary=5.58 cfs 3.294 af Secondary=0.00 cfs 0.000 af Outflow=5.90 cfs 4.725 af

Pond 35P: Chelsea Road Pond Peak Elev=955.64' Storage=0.838 af Inflow=27.17 cfs 1.948 af
Discarded=0.14 cfs 0.386 af Primary=11.11 cfs 1.562 af Secondary=0.00 cfs 0.000 af Outflow=11.25 cfs 1.948 af

Pond 36P: Proposed Chelsea Peak Elev=955.47' Storage=221.160 af Inflow=378.99 cfs 43.081 af
Primary=4.20 cfs 41.802 af Secondary=0.00 cfs 0.000 af Outflow=4.20 cfs 41.802 af

Total Runoff Area = 128.659 ac Runoff Volume = 46.460 af Average Runoff Depth = 4.33"
44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 119

Summary for Subcatchment 26S: Deephaven Development

Runoff = 46.63 cfs @ 12.43 hrs, Volume= 4.725 af, Depth= 3.63"

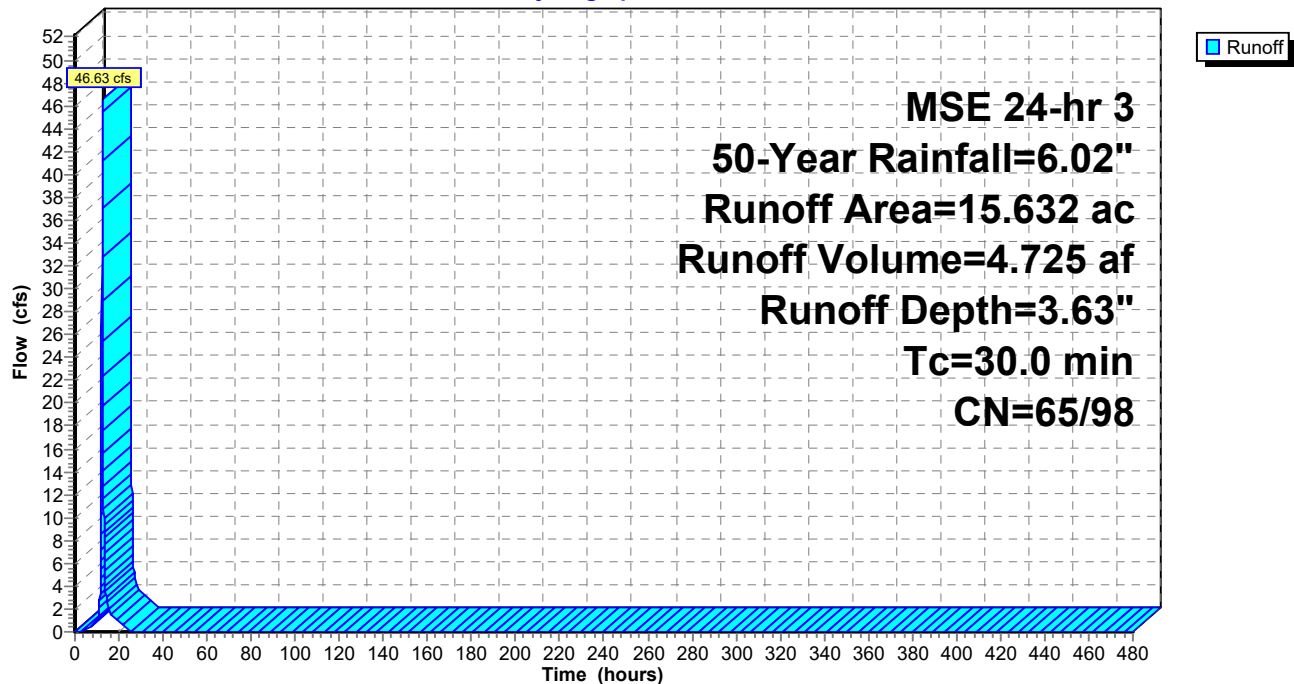
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 120

Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 326.80 cfs @ 12.42 hrs, Volume= 33.501 af, Depth= 4.37"

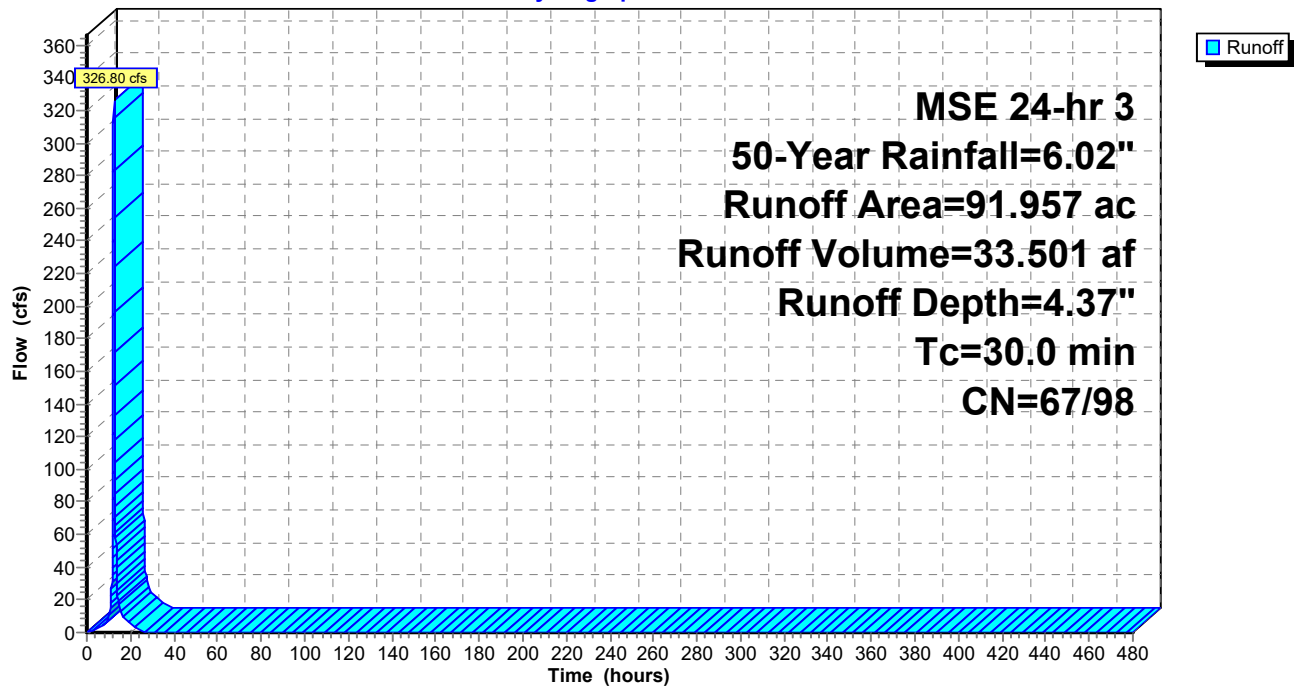
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

	Area (ac)	CN	Description
*	23.336	69	Park: 50-75% Grass cover, Fair, HSG B
	5.435	89	Paved roads w/open ditches, 50% imp, HSG B
	12.493	98	Water Surface, HSG B
*	18.662	92	Urban commercial, 85% imp, HSG B
*	32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
	91.957	84	Weighted Average
	40.064	67	43.57% Pervious Area
	51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 121

Summary for Subcatchment 28S: Chelsea Road

Runoff = 27.17 cfs @ 12.23 hrs, Volume= 1.948 af, Depth= 4.50"

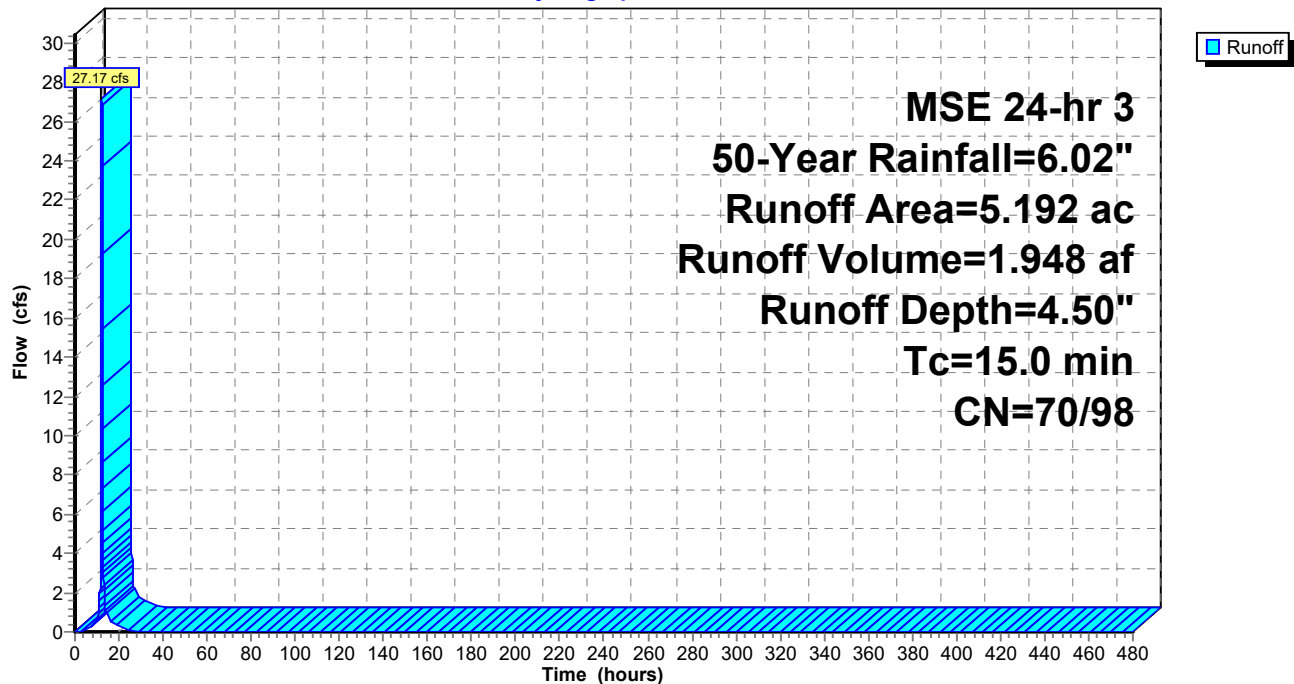
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 122

Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 34.32 cfs @ 12.23 hrs, Volume= 2.550 af, Depth= 5.22"

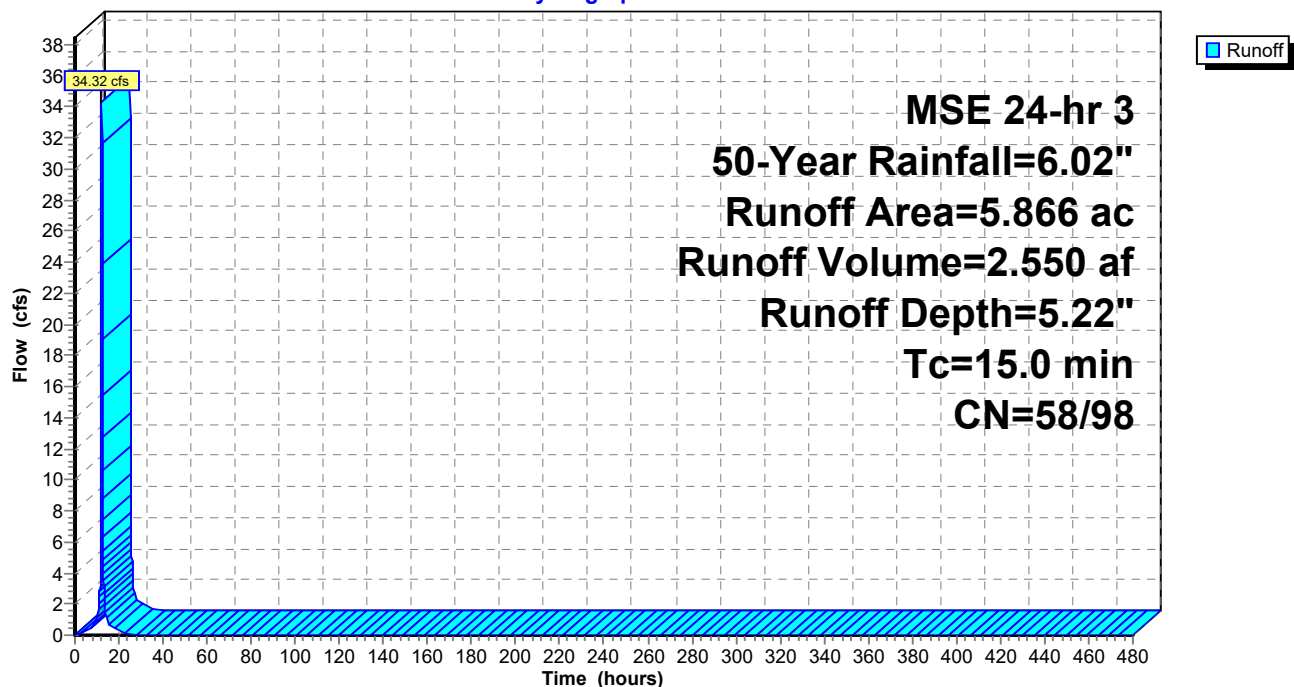
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 123

Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

Runoff = 47.31 cfs @ 12.27 hrs, Volume= 3.737 af, Depth= 4.48"

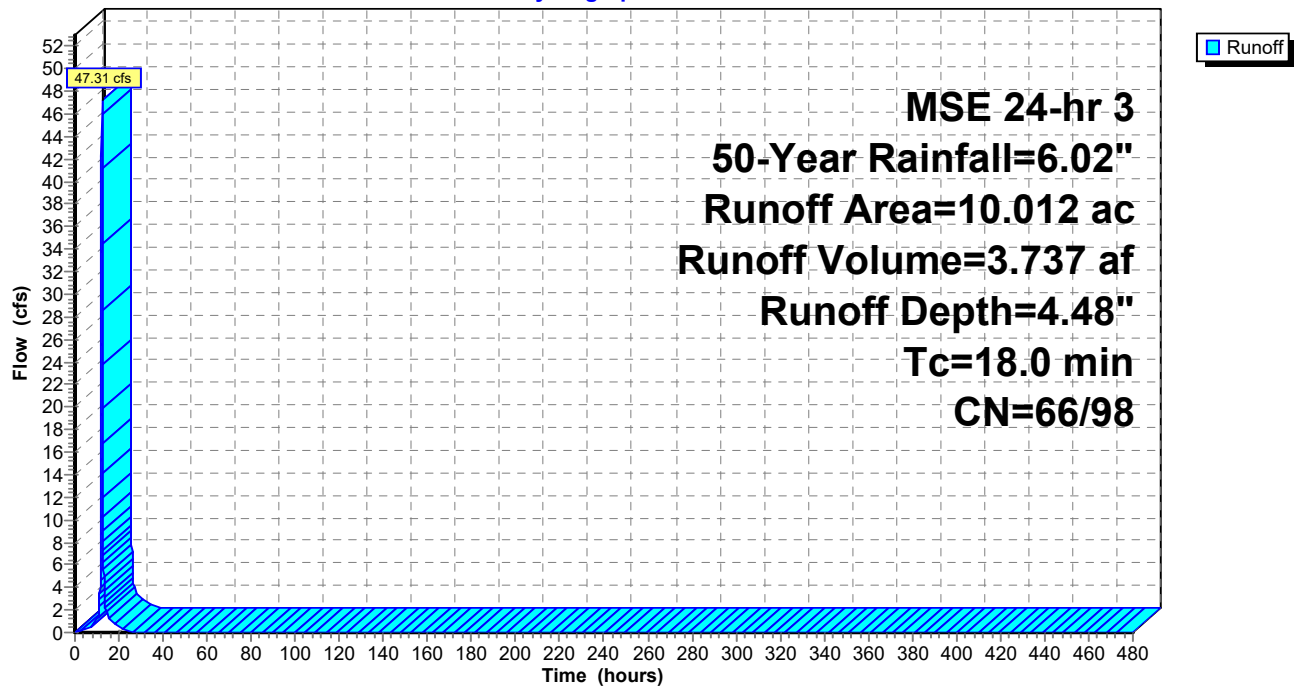
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 50-Year Rainfall=6.02"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

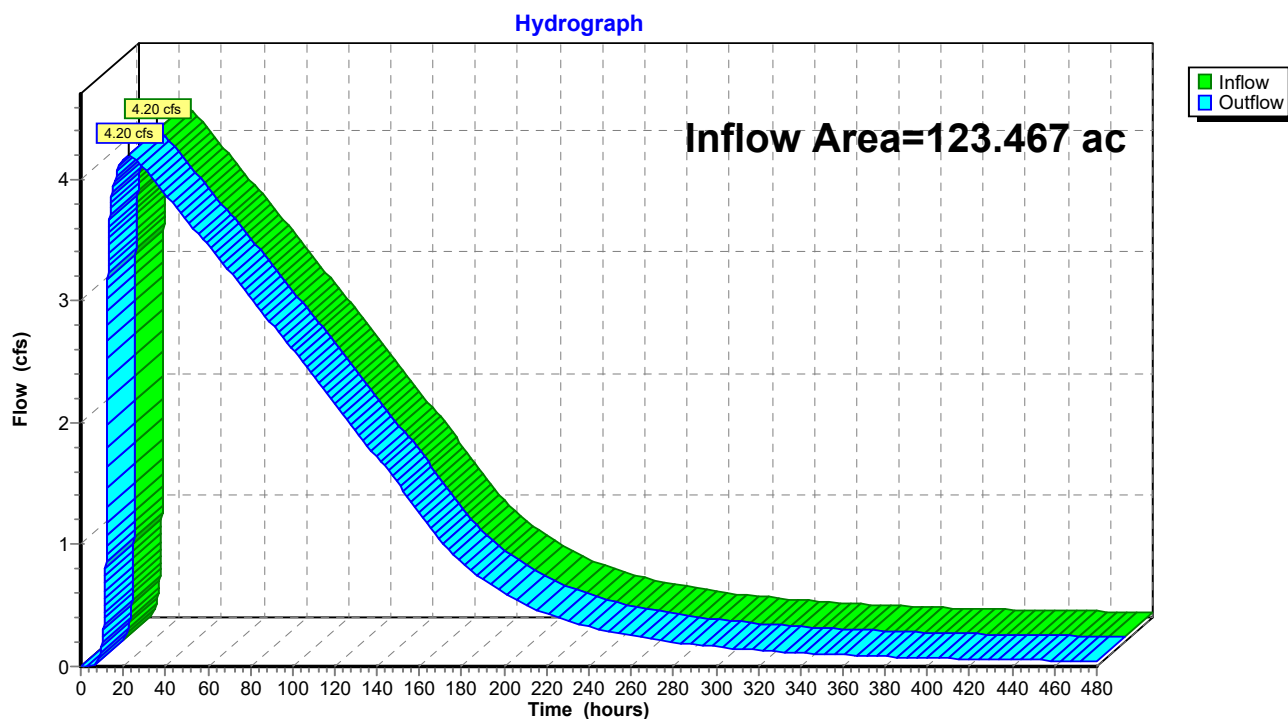
Page 124

Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 4.06" for 50-Year event
Inflow = 4.20 cfs @ 22.96 hrs, Volume= 41.802 af
Outflow = 4.20 cfs @ 22.96 hrs, Volume= 41.802 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 125

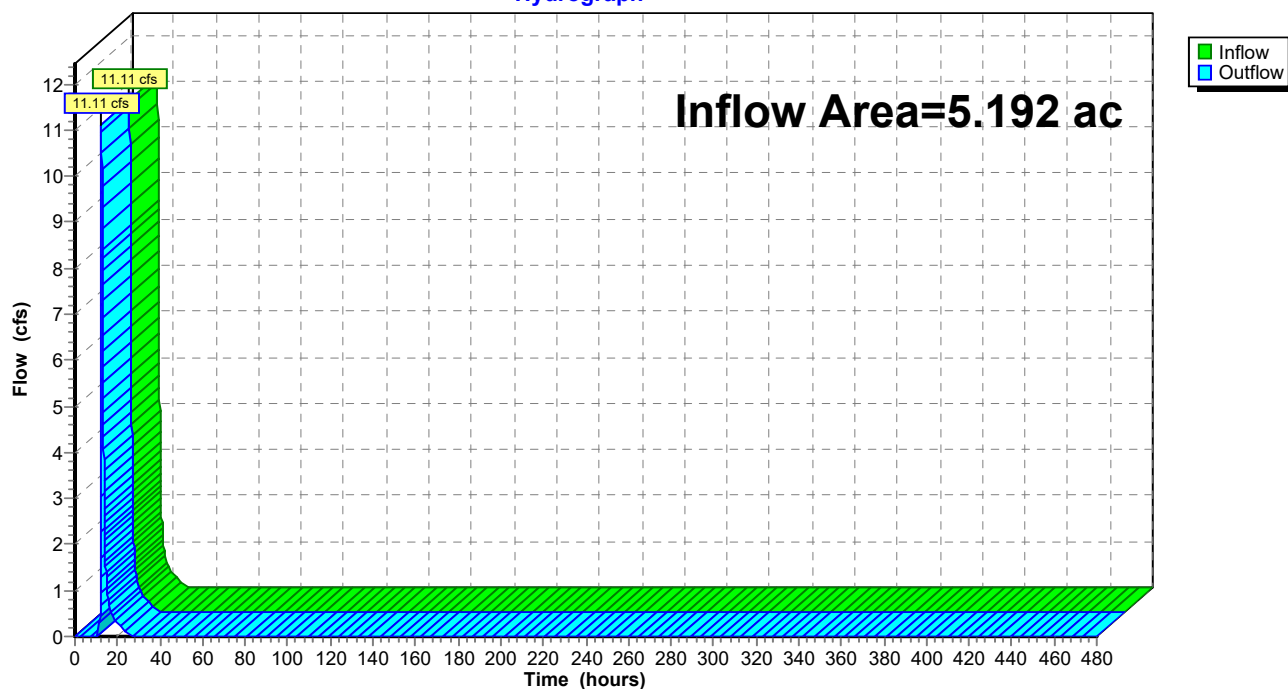
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 3.61" for 50-Year event
Inflow = 11.11 cfs @ 12.48 hrs, Volume= 1.562 af
Outflow = 11.11 cfs @ 12.48 hrs, Volume= 1.562 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 126

Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 5.22" for 50-Year event
 Inflow = 34.32 cfs @ 12.23 hrs, Volume= 2.550 af
 Outflow = 16.18 cfs @ 12.44 hrs, Volume= 2.549 af, Atten= 53%, Lag= 13.0 min
 Primary = 16.18 cfs @ 12.44 hrs, Volume= 2.549 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 959.73' @ 12.44 hrs Surf.Area= 0.576 ac Storage= 0.862 af

Plug-Flow detention time= 100.0 min calculated for 2.549 af (100% of inflow)

Center-of-Mass det. time= 99.7 min (855.2 - 755.5)

Volume	Invert	Avail.Storage	Storage Description

#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices

#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=16.16 cfs @ 12.44 hrs HW=959.73' TW=953.82' (Dynamic Tailwater)↑ **1=RCP_Round 24"** (Inlet Controls 16.16 cfs @ 5.60 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

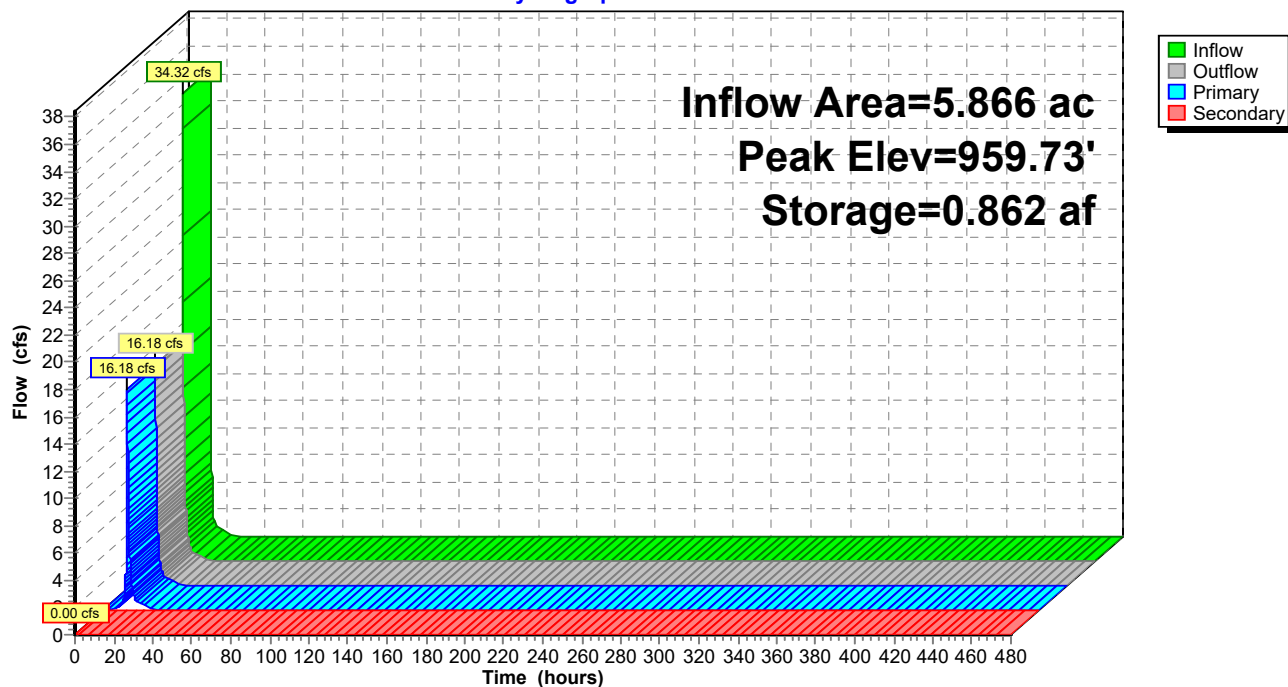
Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 127

Pond 33P: TH-28A Walmart Existing Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 128

Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 3.63" for 50-Year event
 Inflow = 46.63 cfs @ 12.43 hrs, Volume= 4.725 af
 Outflow = 5.90 cfs @ 13.65 hrs, Volume= 4.725 af, Atten= 87%, Lag= 73.7 min
 Discarded = 0.32 cfs @ 13.65 hrs, Volume= 1.431 af
 Primary = 5.58 cfs @ 13.65 hrs, Volume= 3.294 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 960.64' @ 13.65 hrs Surf.Area= 0.701 ac Storage= 2.907 af

Plug-Flow detention time= 713.3 min calculated for 4.724 af (100% of inflow)
 Center-of-Mass det. time= 713.7 min (1,510.3 - 796.7)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 129

Discarded OutFlow Max=0.32 cfs @ 13.65 hrs HW=960.64' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=5.58 cfs @ 13.65 hrs HW=960.64' TW=954.90' (Dynamic Tailwater)

↑2=RCP_Round 18" (Passes 5.58 cfs of 16.24 cfs potential flow)

↑3=Orifice/Grate (Orifice Controls 5.58 cfs @ 8.16 fps)

↑4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

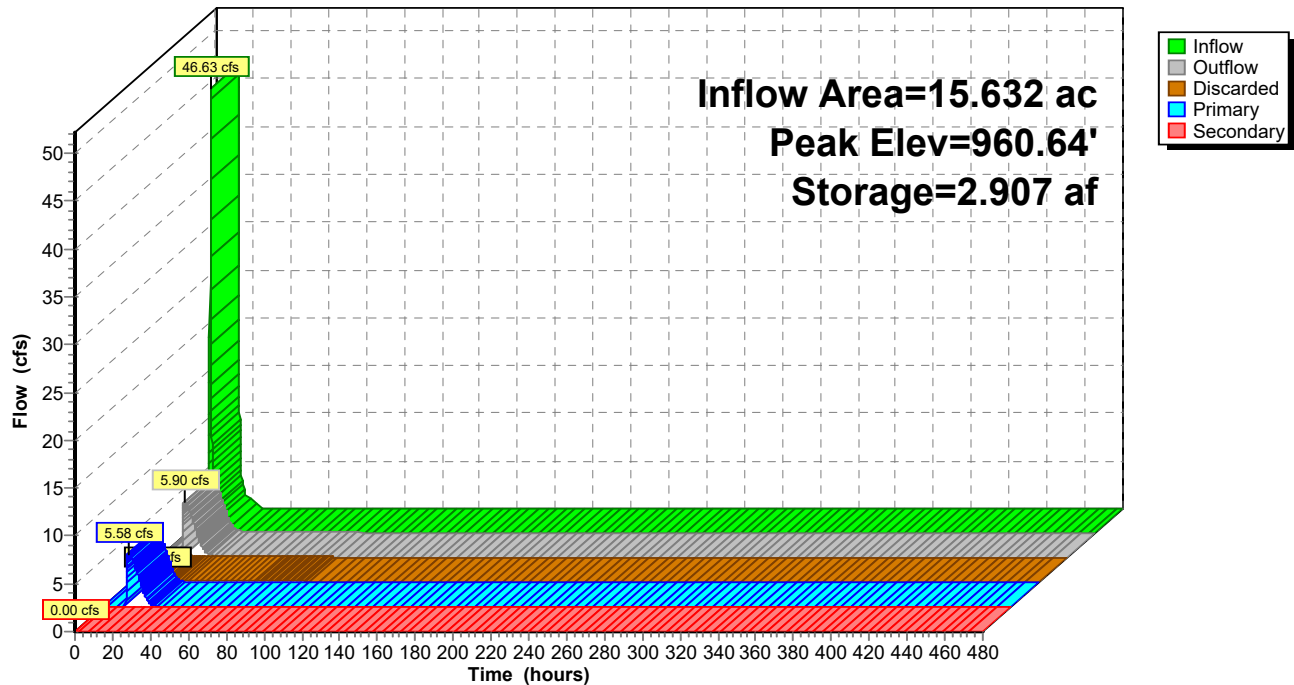
↑5=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)

↑6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 34P: Deephaven Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 130

Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 4.50" for 50-Year event
 Inflow = 27.17 cfs @ 12.23 hrs, Volume= 1.948 af
 Outflow = 11.25 cfs @ 12.48 hrs, Volume= 1.948 af, Atten= 59%, Lag= 15.1 min
 Discarded = 0.14 cfs @ 12.48 hrs, Volume= 0.386 af
 Primary = 11.11 cfs @ 12.48 hrs, Volume= 1.562 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 955.64' @ 12.48 hrs Surf.Area= 0.312 ac Storage= 0.838 af

Plug-Flow detention time= 352.8 min calculated for 1.948 af (100% of inflow)
 Center-of-Mass det. time= 353.1 min (1,122.7 - 769.6)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.14 cfs @ 12.48 hrs HW=955.64' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=11.09 cfs @ 12.48 hrs HW=955.64' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Barrel Controls 11.09 cfs @ 6.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

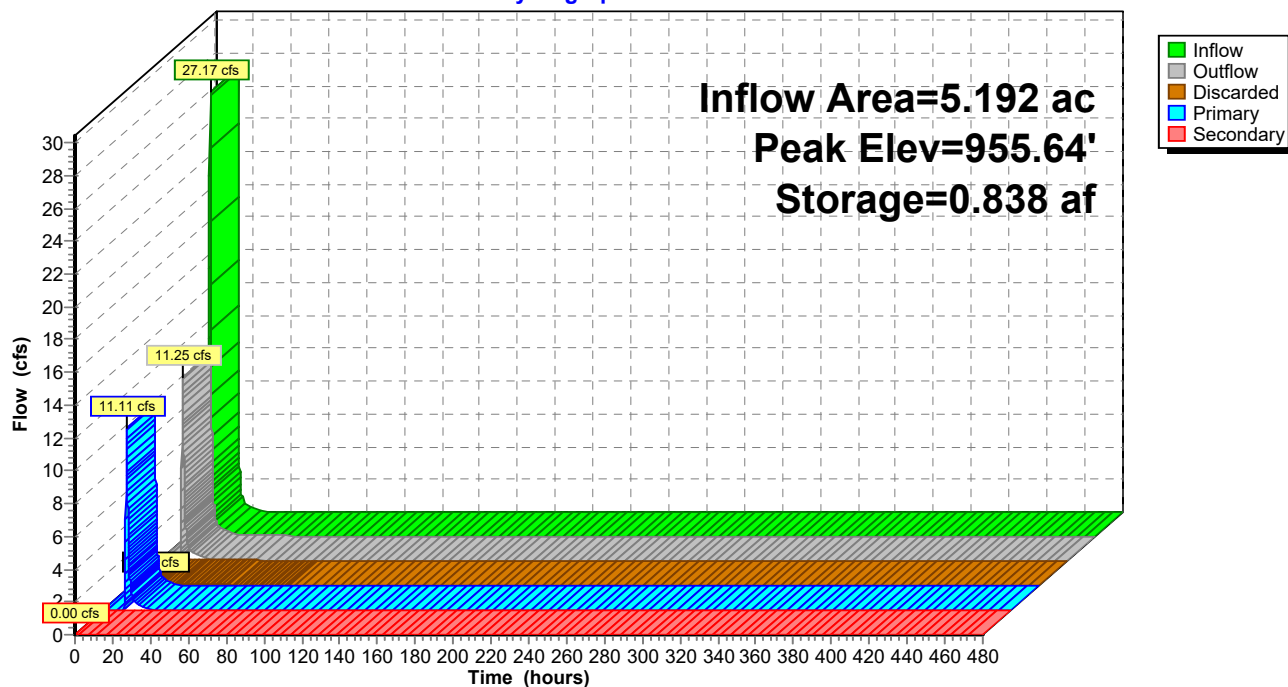
Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 131

Pond 35P: Chelsea Road Pond

Hydrograph



017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 132

Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 4.19" for 50-Year event
 Inflow = 378.99 cfs @ 12.40 hrs, Volume= 43.081 af
 Outflow = 4.20 cfs @ 22.96 hrs, Volume= 41.802 af, Atten= 99%, Lag= 633.8 min
 Primary = 4.20 cfs @ 22.96 hrs, Volume= 41.802 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af

Peak Elev= 955.47' @ 22.96 hrs Surf.Area= 14.011 ac Storage= 221.160 af (38.949 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= 5,170.0 min (5,973.9 - 803.9)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

017991-000 Chelsea Commons Scenario 1

Prepared by WSB

HydroCAD® 10.00-24 s/n 02050 © 2018 HydroCAD Software Solutions LLC

Proposed
MSE 24-hr 3 50-Year Rainfall=6.02"

Printed 7/23/2021

Page 133

Primary OutFlow Max=4.20 cfs @ 22.96 hrs HW=955.47' TW=0.00' (Dynamic Tailwater)

1=RCP_Round 24" (Passes 4.20 cfs of 18.74 cfs potential flow)

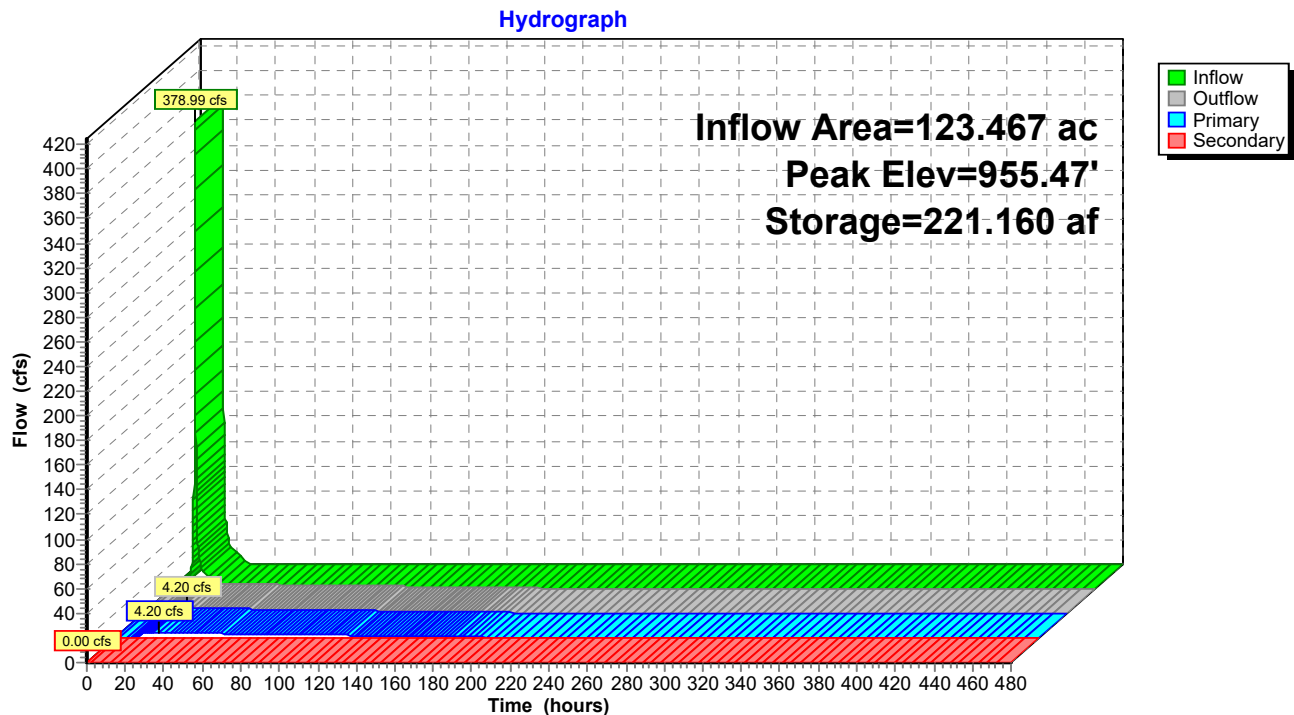
2=Orifice/Grate (Orifice Controls 4.20 cfs @ 7.69 fps)

3=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Tc=30.0 min CN=65/98 Runoff=56.23 cfs 5.656 af

Tc=30.0 min CN=67/98 Runoff=384.93 cfs 39.371 af

Tc=15.0 min CN=70/98 Runoff=31.90 cfs 2.286 af

Tc=15.0 min CN=58/98 Runoff=39.57 cfs 2.944 af

Tc=18.0 min CN=66/98 Runoff=55.54 cfs 4.379 af

Outflow=4.60 cfs 49.526 af

Outflow=12.45 cfs 1.894 af

Primary=18.33 cfs 2.944 af Secondary=0.00 cfs 0.000 af Outflow=18.33 cfs 2.944 af

Discarded=0.34 cfs 1.469 af Primary=6.35 cfs 4.187 af Secondary=0.00 cfs 0.000 af Outflow=6.70 cfs 5.656 af

Discarded=0.15 cfs 0.392 af Primary=12.45 cfs 1.894 af Secondary=0.00 cfs 0.000 af Outflow=12.60 cfs 2.286 af

Primary=4.60 cfs 49.526 af Secondary=0.00 cfs 0.000 af Outflow=4.60 cfs 49.526 af

44.24% Pervious = 56.918 ac 55.76% Impervious = 71.741 ac

Summary for Subcatchment 26S: Deephaven Development

Runoff = 56.23 cfs @ 12.42 hrs, Volume= 5.656 af, Depth= 4.34"

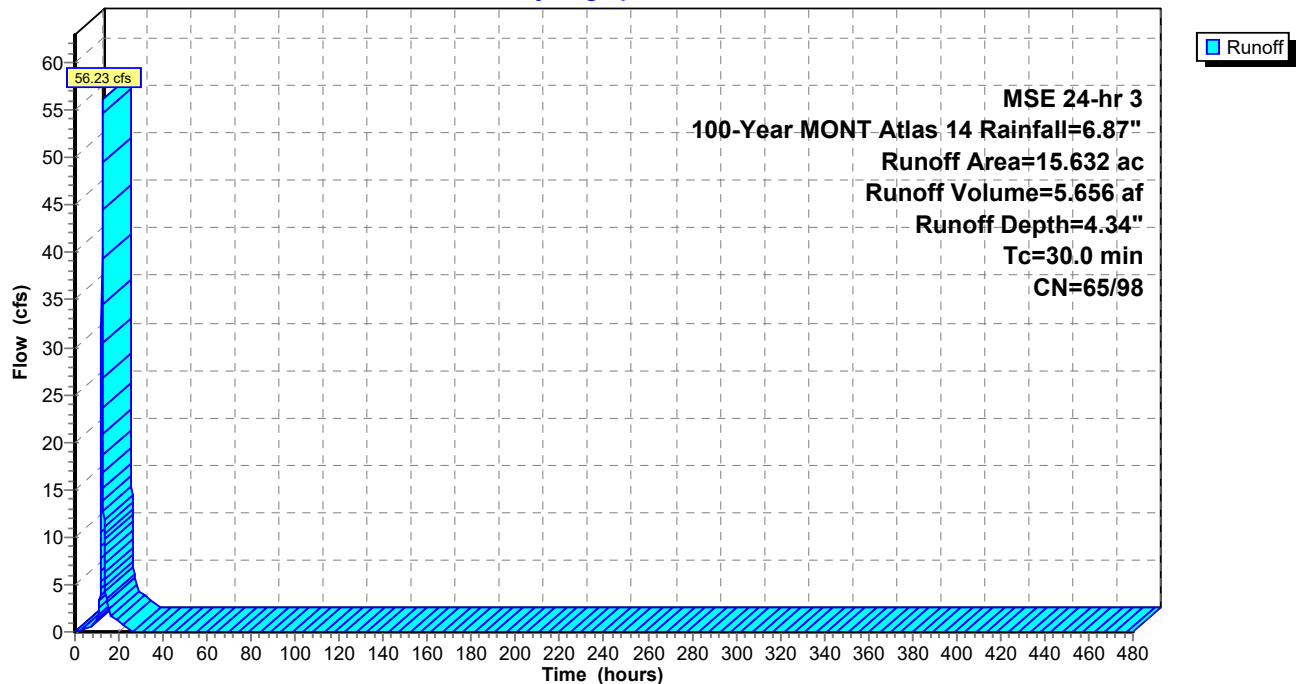
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
* 1.444	69	Park: 50-75% Grass cover, Fair, HSG B
0.079	89	Paved roads w/open ditches, 50% imp, HSG B
0.596	98	Water Surface, HSG B
* 13.513	77	1/4 acre lots, 38% imp, HSG B
15.632	77	Weighted Average
9.862	65	63.09% Pervious Area
5.770	98	36.91% Impervious Area

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

Subcatchment 26S: Deephaven Development

Hydrograph



Summary for Subcatchment 27S: Proposed Chelsea Commons

Runoff = 384.93 cfs @ 12.42 hrs, Volume= 39.371 af, Depth= 5.14"

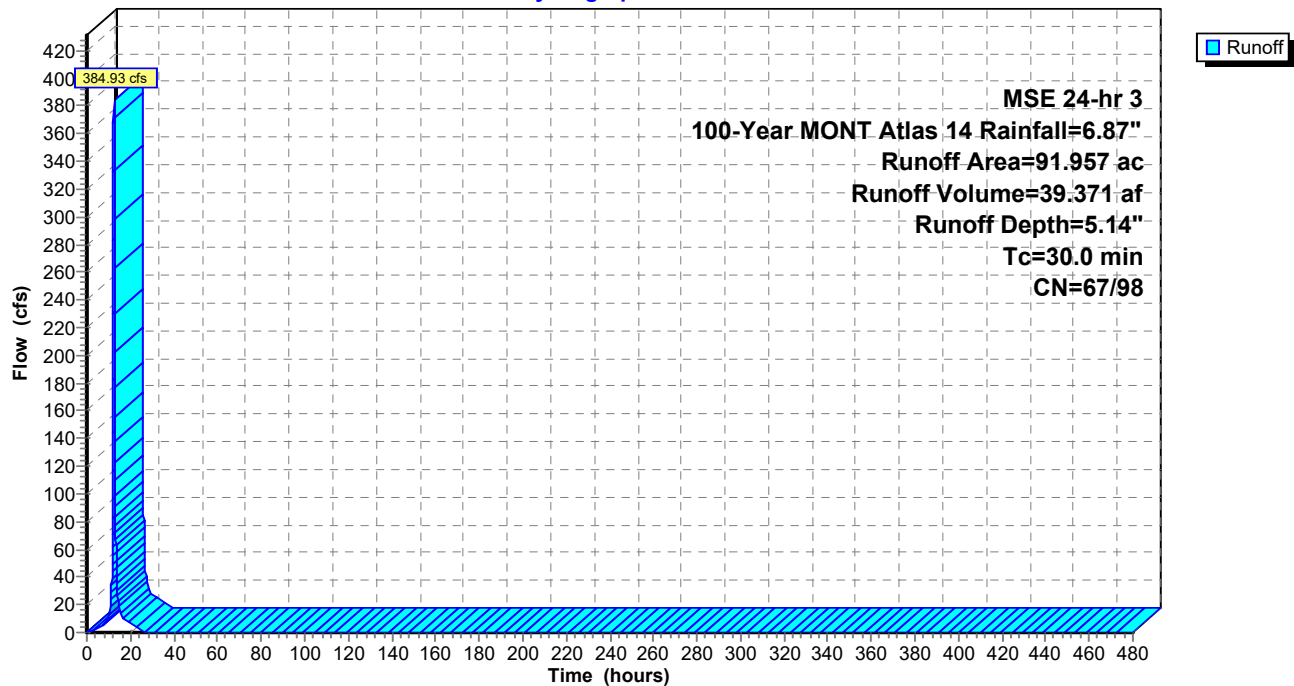
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
* 23.336	69	Park: 50-75% Grass cover, Fair, HSG B
5.435	89	Paved roads w/open ditches, 50% imp, HSG B
12.493	98	Water Surface, HSG B
* 18.662	92	Urban commercial, 85% imp, HSG B
* 32.031	85	Res: 1/8 acre lots, 65% imp, HSG B
91.957	84	Weighted Average
40.064	67	43.57% Pervious Area
51.893	98	56.43% Impervious Area

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

Subcatchment 27S: Proposed Chelsea Commons

Hydrograph



Summary for Subcatchment 28S: Chelsea Road

Runoff = 31.90 cfs @ 12.23 hrs, Volume= 2.286 af, Depth= 5.28"

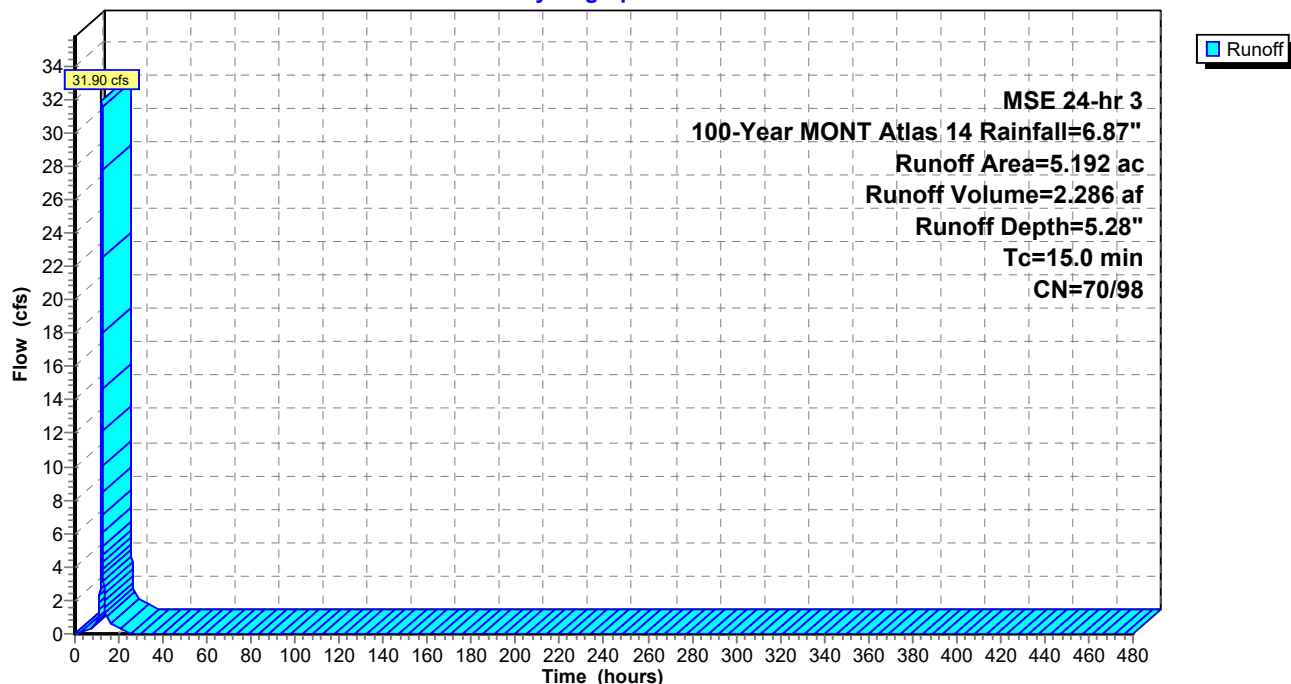
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
2.038	89	Paved roads w/open ditches, 50% imp, HSG B
1.974	88	Urban industrial, 72% imp, HSG B
1.083	75	1/4 acre lots, 38% imp, HSG B
* 0.097	98	Water Surface
5.192	86	Weighted Average
2.243	70	43.20% Pervious Area
2.949	98	56.80% Impervious Area

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

Subcatchment 28S: Chelsea Road

Hydrograph



Summary for Subcatchment 29S: Walmart Pond Drainage Area

Runoff = 39.57 cfs @ 12.23 hrs, Volume= 2.944 af, Depth= 6.02"

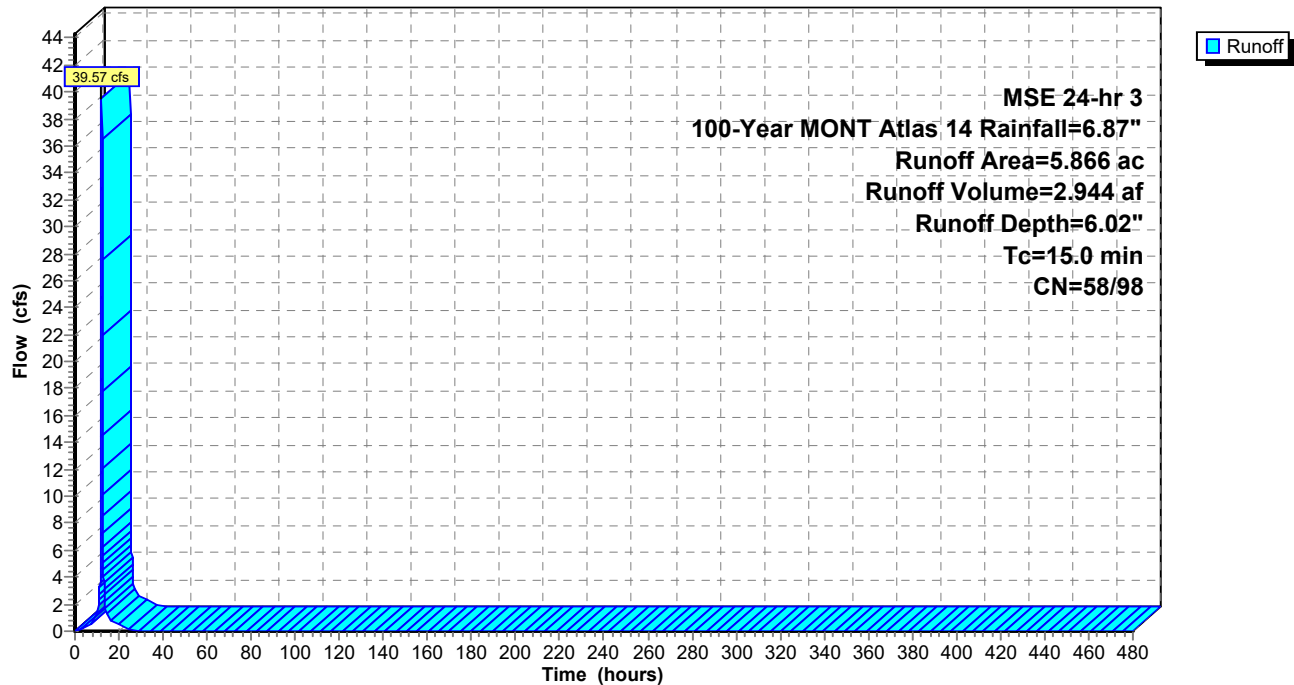
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
5.518	92	Urban commercial, 85% imp, HSG B
* 0.348	98	Water Surface
5.866	92	Weighted Average
0.828	58	14.11% Pervious Area
5.038	98	85.89% Impervious Area

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

Subcatchment 29S: Walmart Pond Drainage Area

Hydrograph



Summary for Subcatchment 30S: School and Edmonson Pond Drainage Area

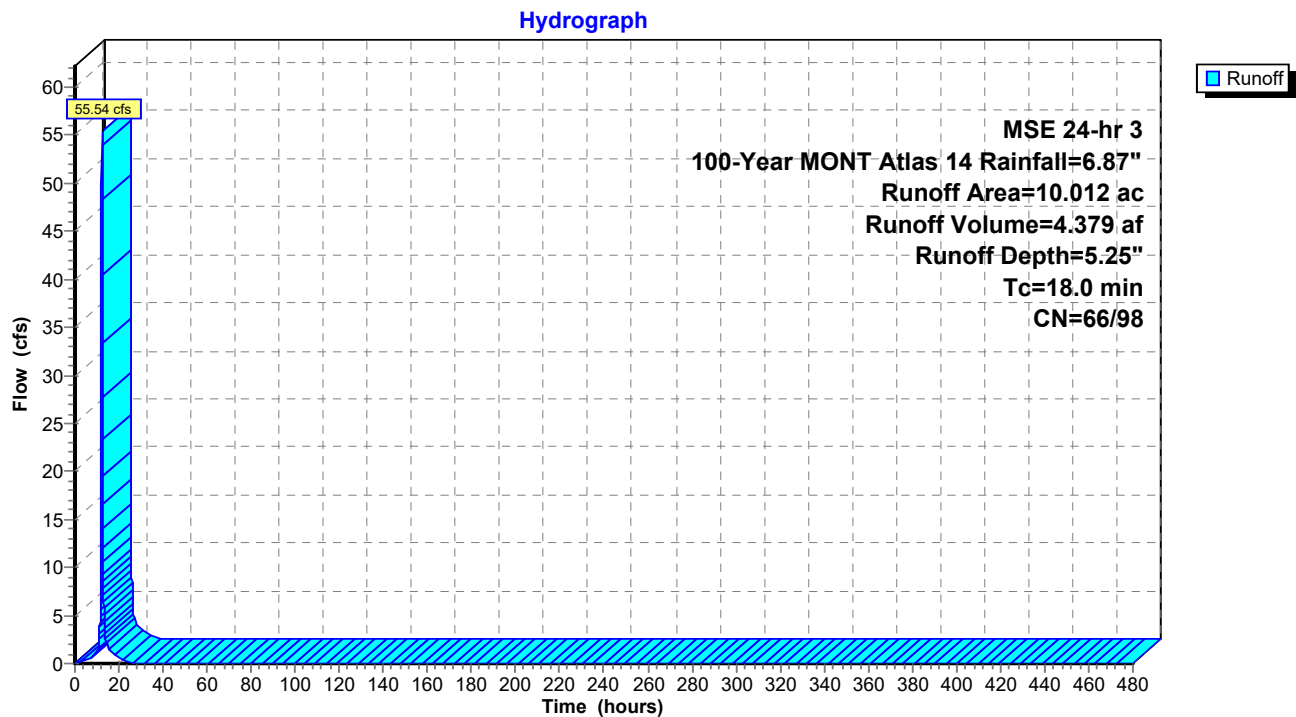
Runoff = 55.54 cfs @ 12.27 hrs, Volume= 4.379 af, Depth= 5.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-480.00 hrs, dt= 0.05 hrs
 MSE 24-hr 3 100-Year MONT Atlas 14 Rainfall=6.87"

Area (ac)	CN	Description
2.008	89	Paved roads w/open ditches, 50% imp, HSG B
* 0.023	92	Offsite: Urban commercial, 85% imp, HSG B
* 6.601	85	R4: 1/8 acre lots, 65% imp, HSG B
0.604	61	>75% Grass cover, Good, HSG B
* 0.776	98	Water Surface
10.012	85	Weighted Average
3.922	66	39.17% Pervious Area
6.090	98	60.83% Impervious Area

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

Subcatchment 30S: School and Edmonson Pond Drainage Area

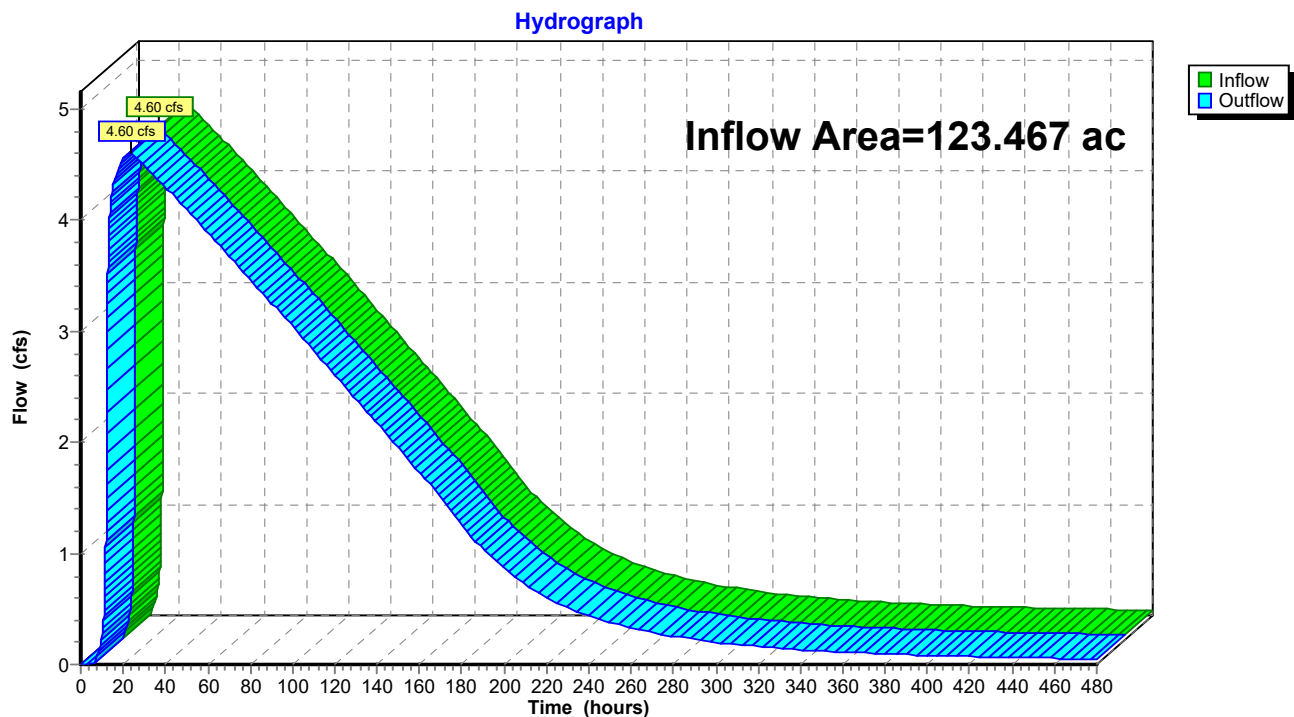


Summary for Reach 31R: To TH-01 Existing Landlocked Basin

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth > 4.81" for 100-Year MONT Atlas 14 event
Inflow = 4.60 cfs @ 23.37 hrs, Volume= 49.526 af
Outflow = 4.60 cfs @ 23.37 hrs, Volume= 49.526 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 31R: To TH-01 Existing Landlocked Basin



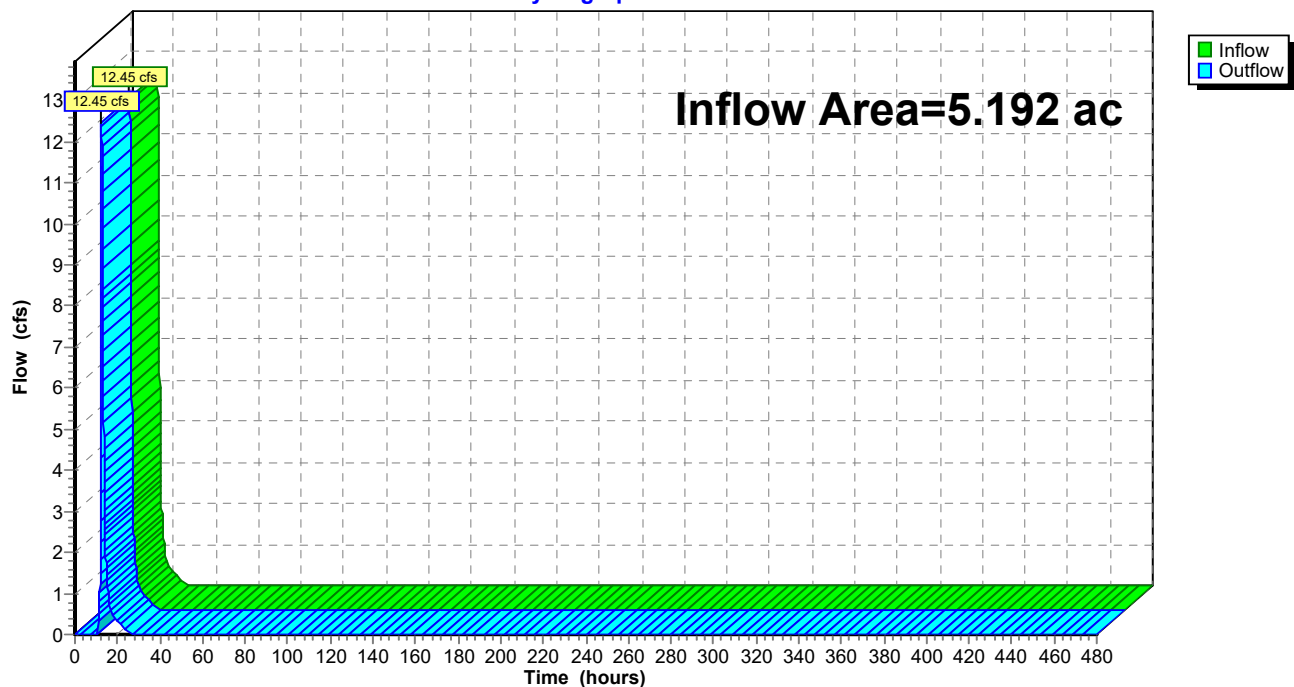
Summary for Reach 32R: West

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 4.38" for 100-Year MONT Atlas 14 event
Inflow = 12.45 cfs @ 12.49 hrs, Volume= 1.894 af
Outflow = 12.45 cfs @ 12.49 hrs, Volume= 1.894 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3

Reach 32R: West

Hydrograph



Summary for Pond 33P: TH-28A Walmart Existing Pond

Inflow Area = 5.866 ac, 85.89% Impervious, Inflow Depth = 6.02" for 100-Year MONT Atlas 14 event
 Inflow = 39.57 cfs @ 12.23 hrs, Volume= 2.944 af
 Outflow = 18.33 cfs @ 12.45 hrs, Volume= 2.944 af, Atten= 54%, Lag= 13.2 min
 Primary = 18.33 cfs @ 12.45 hrs, Volume= 2.944 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 959.93' @ 12.45 hrs Surf.Area= 0.593 ac Storage= 0.975 af

Plug-Flow detention time= 93.3 min calculated for 2.944 af (100% of inflow)
 Center-of-Mass det. time= 93.1 min (847.3 - 754.2)

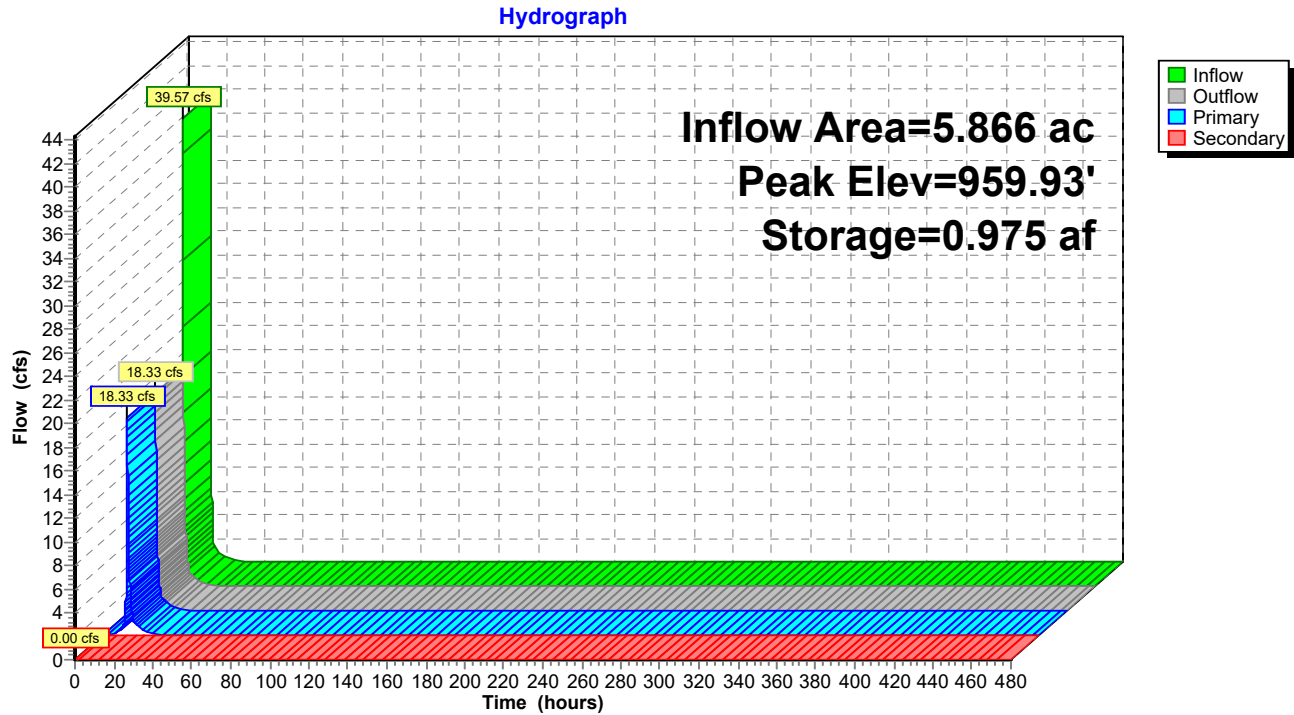
Volume	Invert	Avail.Storage	Storage Description
#1	958.00'	4.235 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
958.00	0.420	0.000	0.000
960.00	0.600	1.020	1.020
962.00	1.120	1.720	2.740
963.00	1.870	1.495	4.235

Device	Routing	Invert	Outlet Devices
#1	Primary	958.00'	24.0" Round RCP_Round 24" L= 23.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 958.00' / 956.00' S= 0.0870 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	961.00'	5.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=18.32 cfs @ 12.45 hrs HW=959.92' TW=954.07' (Dynamic Tailwater)
 ↑1=RCP_Round 24" (Inlet Controls 18.32 cfs @ 5.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=958.00' TW=952.50' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 33P: TH-28A Walmart Existing Pond



Summary for Pond 34P: Deephaven Pond

Inflow Area = 15.632 ac, 36.91% Impervious, Inflow Depth = 4.34" for 100-Year MONT Atlas 14 event
 Inflow = 56.23 cfs @ 12.42 hrs, Volume= 5.656 af
 Outflow = 6.70 cfs @ 13.69 hrs, Volume= 5.656 af, Atten= 88%, Lag= 75.7 min
 Discarded = 0.34 cfs @ 13.69 hrs, Volume= 1.469 af
 Primary = 6.35 cfs @ 13.69 hrs, Volume= 4.187 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 961.49' @ 13.69 hrs Surf.Area= 0.757 ac Storage= 3.528 af

Plug-Flow detention time= 656.9 min calculated for 5.655 af (100% of inflow)
 Center-of-Mass det. time= 657.2 min (1,452.7 - 795.5)

Volume	Invert	Avail.Storage	Storage Description
#1	955.00'	5.705 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
955.00	0.280	0.000	0.000
956.00	0.410	0.345	0.345
958.00	0.530	0.940	1.285
960.00	0.660	1.190	2.475
962.00	0.790	1.450	3.925
964.00	0.990	1.780	5.705

Device	Routing	Invert	Outlet Devices
#1	Discarded	955.00'	0.450 in/hr Exfiltration over Surface area
#2	Primary	955.88'	18.0" Round RCP_Round 18" L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 955.88' / 955.44' S= 0.0061 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	957.30'	11.2" Vert. Orifice/Grate C= 0.600
#4	Device 2	961.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 2	963.00'	5.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	963.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

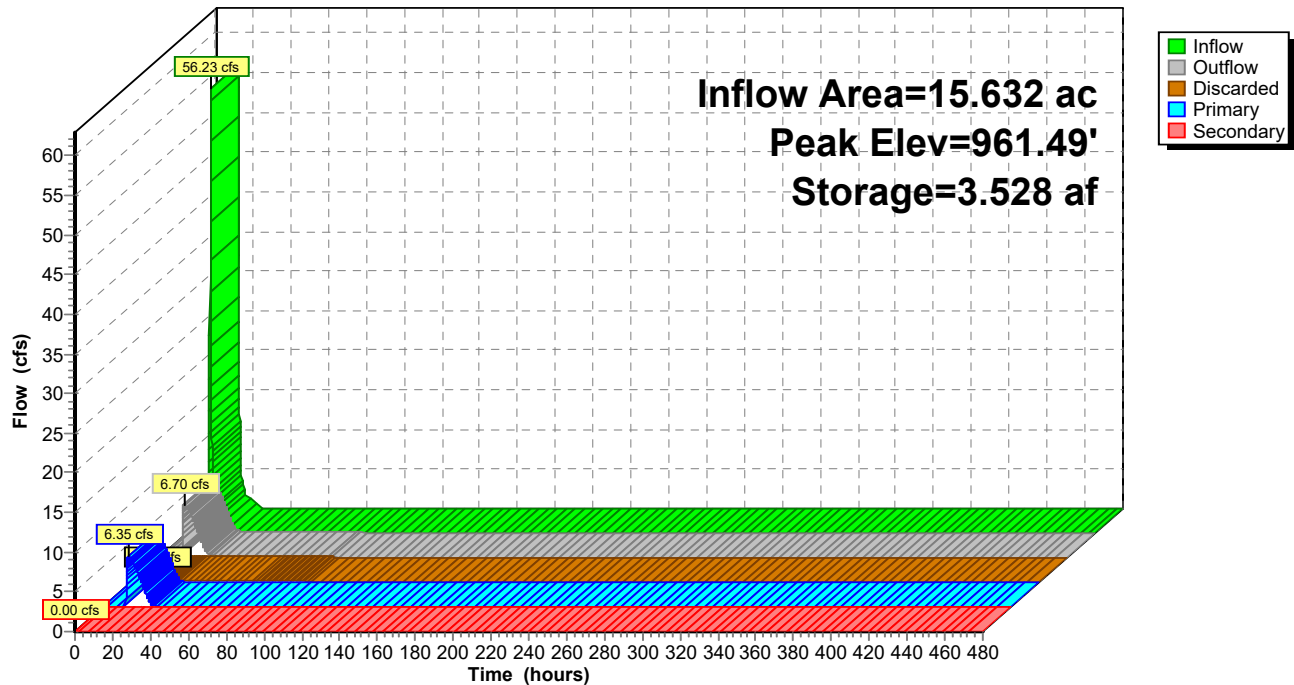
Discarded OutFlow Max=0.34 cfs @ 13.69 hrs HW=961.49' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=6.35 cfs @ 13.69 hrs HW=961.49' TW=955.31' (Dynamic Tailwater)
 ↳ **2=RCP_Round 18"** (Passes 6.35 cfs of 18.02 cfs potential flow)
 ↳ **3=Orifice/Grate** (Orifice Controls 6.35 cfs @ 9.29 fps)
 ↳ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↳ **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=955.00' TW=952.50' (Dynamic Tailwater)
 ↳ **6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 34P: Deephaaven Pond

Hydrograph



Summary for Pond 35P: Chelsea Road Pond

Inflow Area = 5.192 ac, 56.80% Impervious, Inflow Depth = 5.28" for 100-Year MONT Atlas 14 event
 Inflow = 31.90 cfs @ 12.23 hrs, Volume= 2.286 af
 Outflow = 12.60 cfs @ 12.49 hrs, Volume= 2.286 af, Atten= 60%, Lag= 15.8 min
 Discarded = 0.15 cfs @ 12.49 hrs, Volume= 0.392 af
 Primary = 12.45 cfs @ 12.49 hrs, Volume= 1.894 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 956.02' @ 12.49 hrs Surf.Area= 0.336 ac Storage= 0.960 af

Plug-Flow detention time= 311.3 min calculated for 2.286 af (100% of inflow)
 Center-of-Mass det. time= 311.6 min (1,080.0 - 768.3)

Volume	Invert	Avail.Storage	Storage Description
#1	951.00'	3.155 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
951.00	0.060	0.000	0.000
953.00	0.160	0.220	0.220
955.00	0.270	0.430	0.650
957.00	0.400	0.670	1.320
959.00	0.520	0.920	2.240
960.50	0.700	0.915	3.155

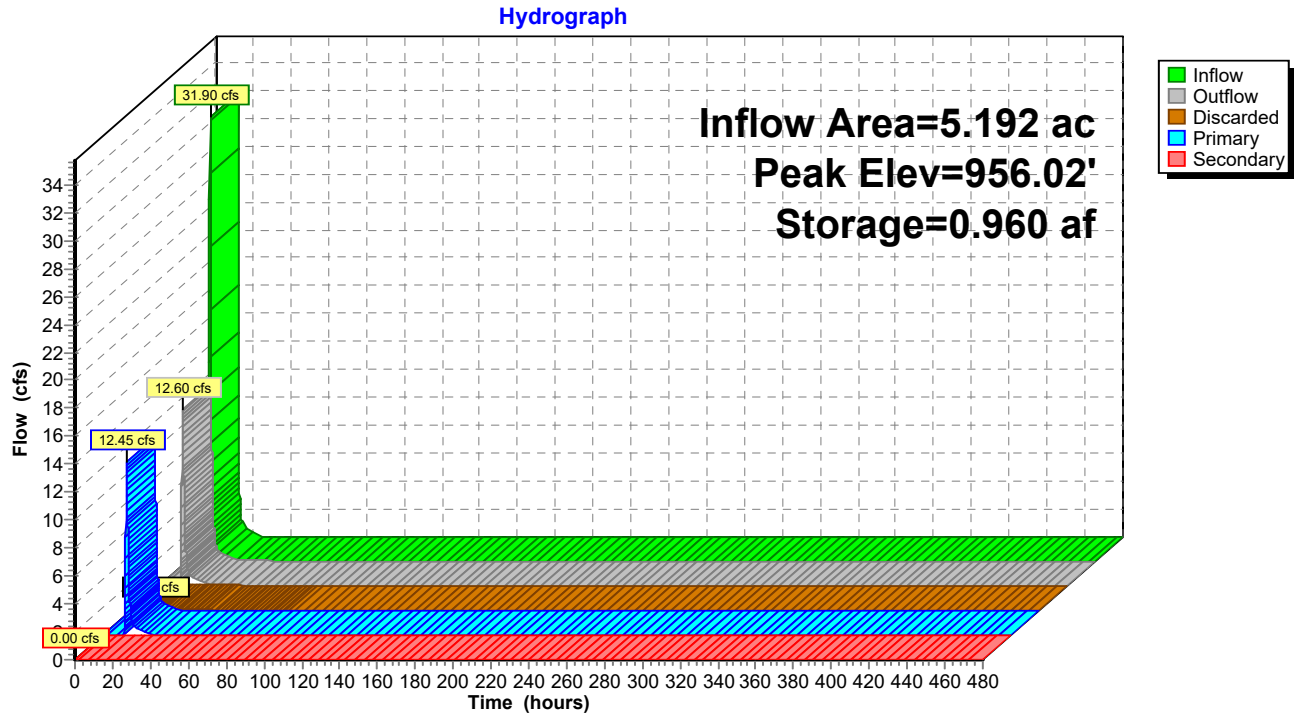
Device	Routing	Invert	Outlet Devices
#1	Primary	953.13'	18.0" Round RCP_Round 18" L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 953.13' / 953.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Secondary	960.00'	10.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	951.00'	0.450 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.15 cfs @ 12.49 hrs HW=956.02' (Free Discharge)
 ↑ **3=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=12.45 cfs @ 12.49 hrs HW=956.02' TW=0.00' (Dynamic Tailwater)
 ↑ **1=RCP_Round 18"** (Inlet Controls 12.45 cfs @ 7.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=951.00' TW=0.00' (Dynamic Tailwater)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 35P: Chelsea Road Pond



Summary for Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1

Inflow Area = 123.467 ac, 55.72% Impervious, Inflow Depth = 4.95" for 100-Year MONT Atlas 14 event
 Inflow = 446.11 cfs @ 12.40 hrs, Volume= 50.882 af
 Outflow = 4.60 cfs @ 23.37 hrs, Volume= 49.526 af, Atten= 99%, Lag= 658.0 min
 Primary = 4.60 cfs @ 23.37 hrs, Volume= 49.526 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-480.00 hrs, dt= 0.05 hrs / 3
 Starting Elev= 952.50' Surf.Area= 12.232 ac Storage= 182.211 af
 Peak Elev= 955.98' @ 23.37 hrs Surf.Area= 14.322 ac Storage= 228.454 af (46.243 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 5,434.0 min (6,239.5 - 805.5)

Volume	Invert	Avail.Storage	Storage Description
#1	930.00'	325.766 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
930.00	4.072	0.000	0.000
938.00	7.466	46.152	46.152
950.00	10.500	107.796	153.948
951.00	11.000	10.750	164.698
952.00	11.940	11.470	176.168
953.00	12.524	12.232	188.400
954.00	13.124	12.824	201.224
955.00	13.727	13.426	214.649
956.00	14.331	14.029	228.678
957.00	14.943	14.637	243.315
958.00	15.556	15.249	258.565
959.00	16.176	15.866	274.431
960.00	16.805	16.491	290.921
961.00	17.422	17.114	308.035
962.00	18.041	17.731	325.766

Device	Routing	Invert	Outlet Devices
#1	Primary	950.00'	24.0" Round RCP_Round 24" L= 675.0' Ke= 0.500 Inlet / Outlet Invert= 950.00' / 947.99' S= 0.0030 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	952.50'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	956.00'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Secondary	956.00'	18.0" Round Culvert L= 430.0' Ke= 0.500 Inlet / Outlet Invert= 956.00' / 953.34' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=4.60 cfs @ 23.37 hrs HW=955.98' TW=0.00' (Dynamic Tailwater)

1=RCP_Round 24" (Passes 4.60 cfs of 19.61 cfs potential flow)

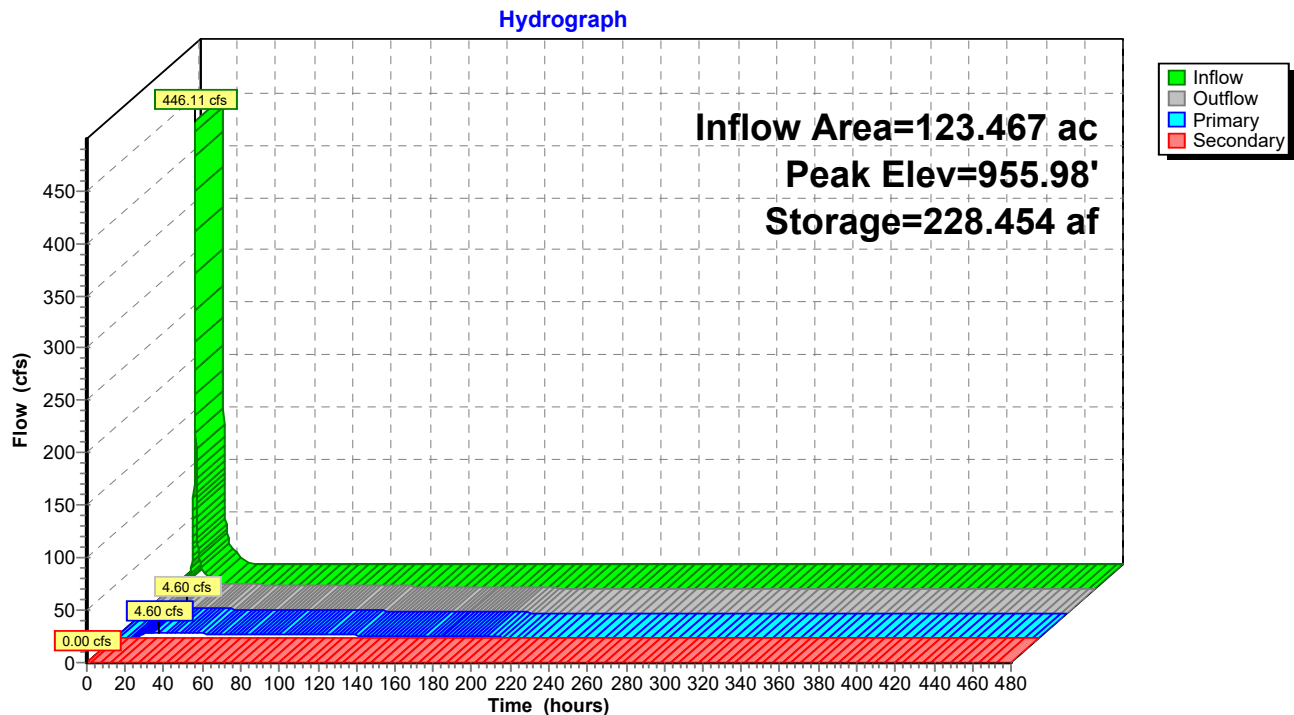
2=Orifice/Grate (Orifice Controls 4.60 cfs @ 8.43 fps)

3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=952.50' TW=0.00' (Dynamic Tailwater)

4=Culvert (Controls 0.00 cfs)

Pond 36P: Proposed Chelsea Commons Pond - Outlet 2, Scenario 1



Water Quantity Modeling Results:

Baseline 47-year Results:

Tank Size (gal) =	1,992,582	assume 0.5' total drawdown
Annual Runoff (gal) =	24,240,982	discharge out of tank
Annual Runoff (gal) = (May through Sept)	14,775,809	Runoff column
Potable Water Used (gal) =	2,612,220	potable water used for irrigation
Annual Runoff Occurances =	33.7	runoff events
Annual Runoff Occurances = (May through Sept)	13.1	Runoff Events (May through Sept)
Avg Annual Days Empty =	20	Days Empty
Days Empty = (May through Sept)	14.9	Days Empty (may through Sept)
Days Full =	108	Days Full
Days Full = (May through Sept)	0.0	Days Full (May through Sept)

No Rain in July over 47-years Results:

Tank Size (gal) =	1,992,582	assume 0.5' total drawdown
Annual Runoff (gal) =	20,255,303	discharge out of tank
Annual Runoff (gal) = (May through Sept)	10,790,130	Runoff column
Potable Water Used (gal) =	6,331,677	potable water used for irrigation
Annual Runoff Occurances =	30.9	runoff events
Annual Runoff Occurances = (May through Sept)	10.2	Runoff Events (May through Sept)
Avg Annual Days Empty =	44	Days Empty
Days Empty = (May through Sept)	38.7	Days Empty (may through Sept)
Days Full =	108	Days Full
Days Full = (May through Sept)	0.0	Days Full (May through Sept)

No Rain in July or August over 47-years Results:

Tank Size (gal) =	1,992,582	assume 0.5' total drawdown
Annual Runoff (gal) =	16,968,317	discharge out of tank
Annual Runoff (gal) = (May through Sept)	7,549,140	Runoff column
Potable Water Used (gal) =	10,462,334	potable water used for irrigation
Annual Runoff Occurances =	27.9	runoff events
Annual Runoff Occurances = (May through Sept)	7.5	Runoff Events (May through Sept)
Avg Annual Days Empty =	71	Days Empty
Days Empty = (May through Sept)	65.6	Days Empty (may through Sept)
Days Full =	107	Days Full
Days Full = (May through Sept)	0.0	Days Full (May through Sept)

Volume Control Calculations:

Required on an Event Basis:

Net New Impervious = 35 acres

Volume Abstraction Required (per Event) = 35 acres * (1.1 inches * (1 foot/12 inches))
= 3.2 acre-feet

Required on an Annual Basis:

Existing Runoff Volume = 17 acre-feet annually

Proposed Runoff Volume = 82 acre-feet annually

Volume Abstraction Required (Annually) = 82 - 17 = 65 acre-feet

Provided Volume Control via Stormwater Reuse:

Irrigable Area = 40 acres

Irrigation Rate = 0.75 inches/week

Functioning Time = 26 weeks/year

Volume Abstracted = 40 acres * (43560 sf/1 ac) * (0.75 inches/1 week) * (1 foot/12 inches) * (26 weeks/1 year)
= 2831400 cf/year = 65 acre-feet/year

* Runoff volumes were esitimated with SCS methodology. The equation used was taken from the MPCA 2000 Drainage Manual in section 3.6.

17 ac-feet of runoff annually

* Runoff volumes were estimated with SCS methodology. The equation used was taken from the MPCA 2000 Drainage Manual in section 3.6.

* Runoff volumes were estimated with SCS methodology. The equation used was taken from the MPCA 2000 Drainage Manual in section 3.6.

82 ac-feet of runoff annually

Water Quality Modeling Calculations:

Pollutant Outflows and Reductions from P8 Modeling:

Total Outflow Existing Conditions (P8 Model Results):

Variable	OVERALL Lbs/yr	S Chelsea Pond	N Chelsea Pond	Chelsea Road Pond
P0%	778.1	449.7	161.5	166.9
P10%	7029.6	1479.6	2670.1	2879.9
P30%	4735.2	639.3	1873.0	2222.9
P50%	2180.4	170.9	805.6	1203.9
P80%	593.7	28.7	217.3	347.8
TSS	14539.0	2318.5	5565.9	6654.6
TP	130.7	53.3	36.6	40.8
TKN	676.0	304.2	177.1	194.7
CU	15.5	6.9	4.1	4.5
PB	4.2	1.3	1.3	1.5
ZN	72.1	32.4	18.9	20.8
HC	521.7	164.6	165.6	191.4

Total Outflow Proposed Conditions with No Treatment (P8 Model Results):

Variable	OVERALL Lbs/yr	Chelsea Commons Pond	Deephaven Pond	Chelsea Road Pond
P0%	992.2	802.8	132.7	56.7
P10%	17081.0	13771.1	2300.6	1009.4
P30%	17081.0	13771.1	2300.6	1009.4
P50%	17073.3	13771.1	2300.6	1001.6
P80%	34116.6	27542.1	4601.2	1973.3
TSS	85351.9	68855.3	11503.0	4993.6
TP	295.5	238.5	39.7	17.2
TKN	1363.9	1101.4	183.2	79.3
CU	42.5	34.3	5.7	2.5
PB	17.3	14.0	2.3	1.0
ZN	145.5	117.5	19.5	8.5
HC	2168.5	1749.9	292.0	126.5

Total Outflow Proposed Conditions with Ponding (P8 Model Results):

Variable	OVERALL	Chelsea Commons Pond	Deephaven Pond	Chelsea Road Pond

	Lbs/yr			
P0%	754.7	662.5	68.6	23.6
P10%	3010.8	1459.9	1261.8	289.0
P30%	1402.0	369.1	869.3	163.7
P50%	529.2	103.9	378.1	47.2
P80%	116.8	17.0	94.3	5.6
TSS	5058.8	1949.9	2603.4	505.5
TP	93.7	73.0	16.5	4.3
TKN	527.0	426.5	78.8	21.7
CU	12.0	9.7	1.8	0.5
PB	2.4	1.7	0.6	0.1
ZN	56.2	45.5	8.4	2.3
HC	302.5	209.5	75.7	17.3

Pollutant Reduction from Stormwater Reuse:

Area Irrigated = 40 acres

Irrigation Rate = 1 inch/week

Duration = 26 weeks/year

TP Removed = 40 acres * 1 inch/week * 26 weeks/year * 0.3 mgTP/L * .50 Particulate TP removed from ponding * 0.288 lbs/year conversion factor

= 2449 lbs/year

TSS Removed = 40 acres * 1 inch/week * 26 weeks/year * 54.5 mgTSS/L * 0.15 TSS removed from ponding * 0.288 lbs/year conversion factor

= 45 lbs/year



GEOTECHNICAL REPORT

CHELSEA COMMONS AREA IMPROVEMENTS MONTICELLO, MINNESOTA

June 7, 2021

Prepared for:
City of Monticello
505 Walnut Street
Monticello, MN 55362

WSB PROJECT NO. 017991-000



GEOTECHNICAL REPORT

CHELSEA COMMONS MONTICELLO

**FOR
CITY OF MONTICELLO**

June 7, 2021



GEOTECHNICAL REPORT

CERTIFICATION

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Mark W. Osborn, PE

Date: June 7, 2021

Lic. No. 41362



June 7, 2021

Mr. Matt Leonard, PE
City Engineer/Public Works Director
City of Monticello
505 Walnut Street
Monticello, MN 55362

Re: Drilling Services
Chelsea Commons Area Improvements
Stormwater Management
Monticello, MN

We have conducted a geotechnical subsurface exploration program for the above referenced project. This report contains our soil boring logs, an evaluation of the conditions encountered in the borings and our discussion of soil properties and suitability for reuse as fill

If you have questions concerning this report or our recommendations, or for construction material testing for this project, please call us at 952.737.4660.

Sincerely,

WSB

A handwritten signature in blue ink, appearing to read "Mark Osborn", written over a light blue horizontal line.

Mark Osborn, PE
Senior Geotechnical Engineer

A handwritten signature in blue ink, appearing to read "Darin Hyatt", written over a light blue horizontal line.

Darin Hyatt, PE
Senior Geotechnical Engineer

Attachment:
Geotechnical Report

MWO/tmw

TABLE OF CONTENTS

TITLE SHEET

CERTIFICATION SHEET

LETTER OF TRANSMITTAL

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 Project Location	1
1.2 Project Description	1
1.3 Purpose and Project Scope of Services	1
2. PROCEDURES.....	2
2.1 Boring Layout and Soil Sampling Procedures	2
2.2 Groundwater Measurements and Borehole Abandonment	2
2.3 Boring Log Procedures and Qualifications	2
3. EXPLORATION RESULTS	3
3.1 Site and Geology	3
3.2 Subsurface Soil and Groundwater Conditions	3
3.3 Strength Characteristics	3
3.4 Groundwater Conditions	3
4. ENGINEERING ANALYSIS AND RECOMMENDATIONS	4
4.1 On-Site Soil Suitability as Backfill and Fill	4
4.2 Water Features (Ponds)	4
4.3 Construction Safety	4
4.4 Remarks	5
5. STANDARD OF CARE	6

Appendix A

Soil Boring Exhibit

Logs of Test Borings

Symbols and Terminology on Test Boring Log

Notice to Report Users Boring Log Information

Unified Soil Classification System (USCS)

1. INTRODUCTION

1.1 Project Location

The site is located to the southeast of Chelsea Road and Cedar Street in Monticello, Minnesota. The approximate soil boring locations can be found on the Soil Boring Exhibit in **Appendix A**.

1.2 Project Description

It is proposed to excavate the water features (North Pond and South Pond) as shown on the Soil Boring Exhibit. The City of Monticello (City) would like to determine the quality of the materials that are planned for excavation and our recommendations for their reuse as structural fills. We understand the City owned water features will be utilized as a public amenity.

The North Pond is planned to have a high water level (HWL) of 958.88 and an normal water level (NWL) of 955.00 while the South Pond will have a HWL of 956.81 and a NWL of 952.00. The water levels will be controlled by a series of storm water pipes with outlets to the City's storm water system.

1.3 Purpose and Project Scope of Services

The City of Monticello authorized this scope of service. In order to assist the design team we planned to drill four borings at planned locations within the pond excavation areas, review the soils in our laboratory, and prepare this geotechnical report. This stated purpose was a significant factor in determining the scope and level of service provided. Should the purpose of the report change the report immediately ceases to be valid and use of it without WSB's prior review and written authorization should be at the user's sole risk.

Our authorized scope of work has been limited to:

1. Clearing underground utilities utilizing Gopher State One Call.
2. Mobilization / demobilization of an all-terrain track mounted drill rig.
3. Drilling 4 standard penetration borings to about 15-foot depths.
4. Sealing the borings per Minnesota Department of Health procedures.
5. Perform soil classification and analysis.
6. Review of available project information and geologic data.
7. Providing this geotechnical report containing:
 - a. Summary of our findings.
 - b. Discussion of subsurface soil and groundwater conditions and how they may affect the proposed pond excavations.
 - c. Estimated infiltration rate of the soils.
 - d. A discussion of soils for use as structural fill and site fill.

2. PROCEDURES

2.1 Boring Layout and Soil Sampling Procedures

WSB completed four (4) standard penetration soil borings at the project site. The City of Monticello recommended the boring depths and selected the desired locations. A WSB survey crew staked and elevated the borings.

We completed the borings on May 19, 2021 with a track-mounted CME-55 drill rig operated by a two-person crew. The drill crew advanced the borings using continuous hollow stem augers. The drilling information is provided on the boring logs.

Generally, the drill crew sampled the soil in advance of the auger tip at two and one-half (2 ½) foot intervals to the termination depth of the boring. The soil samples were obtained using a split-barrel sampler which was driven into the ground during standard penetration tests in accordance with ASTM D 1586, Standard Method of Penetration Test and Split-Barrel Sampling of Soils. The materials encountered were described on field logs and representative samples were containerized and transported to our laboratory for further observation and testing.

Except when laboratory testing was completed, the samples were visually observed to estimate the distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We classified the soils according to type using the Unified Soil Classification System (USCS). A chart describing the USCS is included in **Appendix A**.

2.2 Groundwater Measurements and Borehole Abandonment

The drill crew observed the borings for free groundwater while drilling and after completion of the borings. These observations and measurements are noted on the boring logs. The crew then backfilled the borings to comply with Minnesota Department of Health regulations.

2.3 Boring Log Procedures and Qualifications

The subsurface conditions encountered by the borings are illustrated on the Logs of Test Borings in **Appendix A**. Similar soils were grouped into the strata shown on the boring logs, and the appropriate estimated USCS classification symbols were also added. The depths and thickness of the subsurface strata indicated on the boring logs were estimated from the drilling results.

The transition between materials (horizontal and vertical) is approximate and is usually far more gradual than shown. Information on actual subsurface conditions exists only at the specific locations indicated and is relevant only to the time exploration was performed. Subsurface conditions and groundwater levels at other locations may differ from conditions found at the indicated locations. The nature and extent of these conditions would not become evident until exposed by construction excavation. These stratification lines were used for our analytical purposes and, due to the aforementioned limitations, should not be used as a basis of design or construction cost estimates.

3. EXPLORATION RESULTS

3.1 Site and Geology

The site was a planted agricultural field at the time of drilling. Boring elevations ranged from 962.71 to 964.23 feet.

Geologic origins can be difficult to determine solely from boring samples. We referenced online geologic data of the area and used our experience to help determine geologic origin of the soils, however only a detailed geologic exploration would accurately determine the geologic history of the site.

The Wright County Geologic Atlas indicates the surficial geology of the area is mostly glacial outwash consisting of sand and gravel soils with occasional pockets of glacial till.

3.2 Subsurface Soil and Groundwater Conditions

The boring profile generally consisted of topsoil overlying glacial outwash deposits.

Topsoil

The topsoil encountered generally consisted of sands with clay that were organic to slightly organic. These soils were brown to dark brown in color and generally moist.

Glacial Outwash

The glacial outwash deposits generally consisted of sands with silt and gravel. These soils were brown to light brown in color and generally moist.

3.3 Strength Characteristics

The penetration resistance N-values of the materials encountered were recorded during drilling and are indicated as blows per foot (BPF). Those values provide an indication of soil strength characteristics and are located on the boring log sheets. Also, visual-manual classification techniques and apparent moisture contents were also utilized to make an engineering judgment of the consistency of the materials.

Table 1 presents a summary of the penetration resistances in the soils for the borings completed and remarks regarding the material strengths of the soils.

Table 1: Penetration Resistances

Soil Type	Classification	Penetration Resistances	Remarks
Glacial Outwash	SP, SP-SM	13 to 31* BPF	Generally medium dense

* BPF of 66 were encountered in cobbly granular deposits at Boring PB-3

The preceding is a generalized description of soil conditions at this site. Variations from the generalized profile exist and should be assessed from the boring logs, the normal geologic character of the deposits, and the soils uncovered during site excavation.

3.4 Groundwater Conditions

WSB took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of the report. Note that groundwater levels may fluctuate due to seasonal variations (e.g. precipitation, snowmelt and rainfall) and/or other factors not evident at the time of measurement.

No groundwater was encountered during the drilling process. The granular soils encountered generally have a high permeability that would allow for groundwater to readily enter the boreholes, as such, it is our opinion that a static groundwater level is below the depth explored by our borings.

4. ENGINEERING ANALYSIS AND RECOMMENDATIONS

4.1 On-Site Soil Suitability as Backfill and Fill

The glacial outwash sands with silt and gravel encountered are considered very favorable for use as structural backfill and fill. These soils are suitable for use below foundations, slabs, pavements, or any other structural areas as well as where the site grade is raised provided they are properly moisture conditioned and compacted.

These soils would be considered a low risk of frost susceptibility and should be suitable for placement near grade where freezing conditions can occur.

Cobbles within the glacial outwash are not desirable as they will create point load stresses and create non-uniform subgrade support. Soil with cobbles larger than six inches (6") should not be placed within 3 feet of foundations, slabs, grading grade of pavements, or in contact with utilities.

4.2 Water Features (Ponds)

The Sands (SP) and Sands with Silt (SP-SM) encountered at this site would generally be considered to have estimated infiltration rates of about 0.8 inches per hour, which are considered high. These estimations are based on information provided by the Minnesota Stormwater Manual Design infiltration rates dated April 20, 2020. These soils are generally good for infiltration ponds but poor for use in a retention pond. Furthermore, groundwater was not observed within the depths explored by our borings.

In order to retain water in the ponds, it appears that a pond liner will have to be constructed.

One option is a clay liner, which would consist of a layer of clayey soils (CL) with an in-place hydraulic conductivity of 1×10^{-7} centimeters per second (cm/s) or less. The thickness of the clay liner may be dependent on the pond depth. If the clay liner becomes dry it may shrink and crack leading to the necessity for pond liner reconstruction. The clay liner should be placed in lifts that do not exceed 8 inches and should be compacted at 0 to +3% of their optimum moisture content. Laboratory testing of the clay is recommended to ensure it meets the hydraulic conductivity requirements.

Another option would be to use a high-density polyethylene (HDPE) liner, polyvinyl chloride (PVC) liner or ethylene propylene diene terpolymer (EPDM) liner.

HDPE has low permeability, relatively long lifespan, good UV resistance, resistant to a wide range of chemicals and functions well in cold weather. A (PVC) liner may be considered, however, PVC is generally not UV resistant and must be covered with at least a foot of soil, has a shorter lifespan than HDPE and may crack in cold weather. EPDM liners also have a relatively long lifespan, are cited as being easy to work with, significantly more flexible and durable than HDPE or PVC, are UV resistant and maintain flexibility and resist cracking in cold weather conditions.

If an HDPE liner is utilized, it should have a minimum thickness of at least 30 mils. A smooth polyvinyl chloride (PVC) geomembrane may also be considered. EPDM liner material is normally 45 mil thick. These materials seams need to be properly welded and the liners need to be properly secured on the sides and lip to ensure they do not unravel.

Other options to consider would be using a rubber liner, bentonite clay, concrete liner, or synthetic materials such as geosynthetic clay liners and geomembranes.

With any liner, proper construction is essential and we recommend manufactures installation instructions be followed.

4.3 Construction Safety

All excavations should comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P "Excavations and Trenches". This document states that excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the job specifications.

The responsibility to provide safe working conditions on this site, for earthwork, building construction, or any associated operations is solely that of the contractor. This responsibility is not borne in any manner by WSB.

4.4 Remarks

The boring logs and related information included in this report are indicators of the subsurface conditions only at the specific locations indicated on the Soil Boring Exhibit and times noted on the Logs of Test Boring sheets in **Appendix A**. The subsurface conditions, including groundwater levels, at other locations on the site may differ significantly from conditions that existed at the time of sampling and at the boring locations.

The test borings were completed by WSB solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.

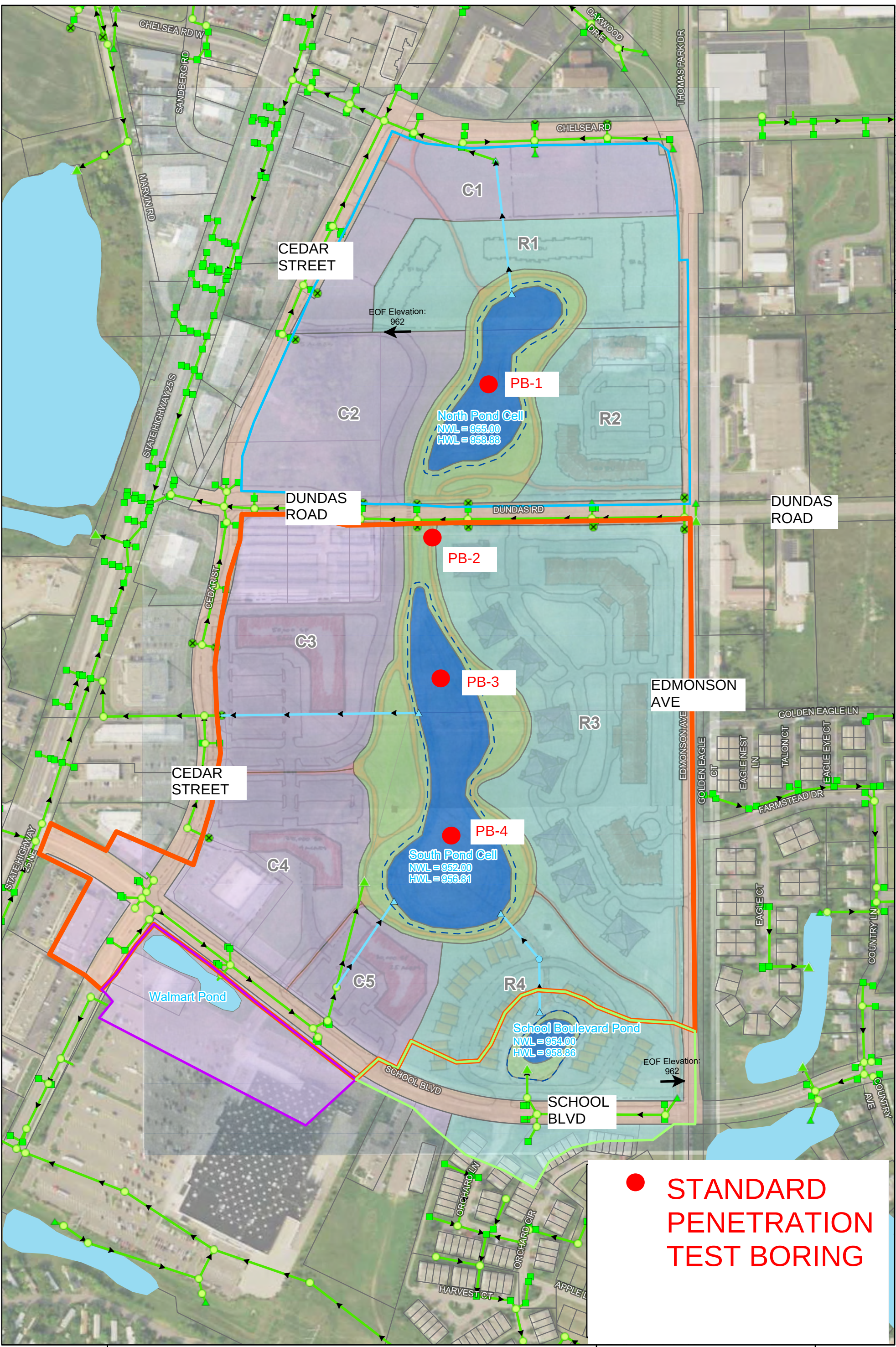
WSB has not performed observations, investigations, explorations, studies or testing that are not specifically listed in the scope of service. WSB should not be liable for failing to discover any condition whose discovery required the performance of services not authorized by the Agreement.

5. STANDARD OF CARE

The recommendations and opinions contained in this report are based on our professional judgment. The soil testing and geotechnical engineering services performed for this project have been performed with the level of skill and diligence ordinarily exercised by reputable members of the same profession under similar circumstances, at the same time and in the same or a similar locale. No warranty, either expressed or implied, is made.

APPENDIX A

Soil Borings Exhibit
Logs of Test Borings
Symbols and Terminology on Test Boring Log
Notice to Report Users Boring Log Information
Unified Soil Classification Sheet (USCS)



● STANDARD PENETRATION TEST BORING



SOIL BORING EXHIBIT



0 300 Feet
1 inch = 300 feet



LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 963.41 ft

BORING NUMBER PB-1
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	17.5	35
		SAND WITH CLAY AND ORGANICS, dark brown, moist	SP-SC	Topsoil										
1	962	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense to dense	SP-SM	Glacial Outwash			HSA	1						
2	961													
3	960						SB	2	25					
4	959						HSA							
5	958						SB	3	25					
6	957						HSA							
7	956						SB	4	31					
8	955						HSA							
9	954						SB	5	18					
10	953	SAND WITH SILT AND GRAVEL, fine grained, light brown, moist, medium dense	SP-SM											
11	952	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense	SP-SM											
12	951						HSA							
13	950						SB	6	23					
14	949													

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS							START: 5/19/2021		END: 5/19/2021	
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:		Logged By:
								R. Kurth		MWO
5/19/2021	11:10 am	14.5	13	6	None		3 1/4" HSA 0' - 14.5'	Notes:		

GEOTECHNICAL N-VALUE - WSB GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECHNICAL LOGS.GPJ

LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 964.21 ft

BORING NUMBER PB-2
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	13	26
1	963	SAND WITH ORGANIC CLAY, Roots, dark brown, moist	SP-SC	Topsoil			HSA	1						
2	962	SAND WITH GRAVEL, fine to medium grained, brown, moist, medium dense	SP	Glacial Outwash			SB	2	13					
3	961						HSA							
4	960	SAND WITH SILT AND GRAVEL, fine grained, brown, moist, medium dense	SP-SM				SB	3	20					
5	959						HSA							
6	958						SB	4	20					
7	957						HSA							
8	956	SAND WITH SILT AND GRAVEL, fine to coarse grained, brown, moist, medium dense	SP-SM				SB	5	22					
9	955						HSA							
10	954						SB	6	16					
11	953						HSA							
12	952						SB							
13	951						HSA							
14	950						SB							

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS

START: 5/19/2021

END: 5/19/2021

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
5/19/2021	12:50 pm	14.5	13	6	None		3 1/4" HSA 0' - 14.5'	R. Kurth	MWO
								Notes:	

GEOTECHNICAL N-VALUE PLOT - WSB.GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECHNICAL LOGS.GPJ

LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 962.71 ft

BORING NUMBER PB-3

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	35	70
1	962	SAND WITH CLAY AND GRAVEL, slightly Organic, brown, moist	SP-SC	Topsoil			HSA	1						
2	961	SAND WITH SILT AND GRAVEL AND COBBLES, fine to medium grained, brown, moist, very dense	SP-SM	Glacial Outwash			SB	2	66					
3	960													
4	959						HSA							
5	958						SB	3	27					
6	957						HSA							
7	956													
8	955						SB	4	22					
9	954						HSA							
10	953						SB	5	24					
11	952													
12	951	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense	SP-SM				HSA							
13	950													
14	949						SB	6	17					

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS

START: 5/19/2021

END: 5/19/2021

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
5/19/2021	12:20 pm	14.5	13	3	None		3 1/4" HSA 0' - 14.5'	R. Kurth	MWO
								Notes:	

GEOTECHNICAL N-VALUE PLOT - WSB.GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECHNICAL LOGS.GPJ

LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 964.23 ft

BORING NUMBER PB-4

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	17.5	35
1	963	SAND WITH CLAY, slightly Organic, dark brown, moist	SP-SC	Topsoil			HSA	1						
2	962	SAND WITH GRAVEL, fine to medium grained, brown, moist, medium dense	SP	Glacial Outwash			SB	2	25					
3	961						HSA							
4	960						SB	3	31					
5	959	SAND WITH GRAVEL, fine grained, brown, moist, dense	SP				HSA							
6	958	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense	SP-SM				SB	4	24					
7	957						HSA							
8	956						SB	5	18					
9	955						HSA							
10	954						SB	6	15					
11	953	SAND WITH GRAVEL, fine grained, brown, moist, medium dense	SP-SM				HSA							
12	952						SB							
13	951						HSA							
14	950						SB							

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS

START: 5/19/2021

END: 5/19/2021

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
5/19/2021	11:50 am	14.5	13	5	None		3 1/4" HSA 0' - 14.5'	R. Kurth	MWO
								Notes:	

GEOTECHNICAL N-VALUE PLOT - WSB.GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECH\GINT LOGS.GPJ

SYMBOLS AND TERMINOLOGY ON TEST BORING LOG

SYMBOLS			
Drilling and Sampling		Laboratory Testing	
<u>Symbol</u>	<u>Description</u>	<u>Symbol</u>	<u>Description</u>
HSA	3 1/4" LD. Hollow Stem Auger	MC	Moisture content, % (ASTM D2216)
FA	Flight Auger	DD	Dry Density, pcf
HA	Hand Auger	LL	Liquid Limit (ASTM D4318)
RC	Size A, B, or N rotary casing	PL	Plastic Limit (ASTM D4318)
CS	Continuous split barrel sampling		
DM	Drilling Mud		- Inserts in last column
JW	Jetting Water		
SB	2" O.D. split barrel sampling	Qu	Unconfined compressive strength, psf (ASTM D2166)
_L	2 1/2" or 3 1/2" OD split barrel liner sampler	Pq	Penetrometer Reading, tsf (ASTM D1558)
_T	2" or 3" thin walled tube sample	Ts	Torvane Reading, ts
W	Wash sample	G	Specific Gravity (ASTM D854)
B	Bag sample	SL	Shrinkage limits (ASTM D427)
P	Test Pit sample	OC	Organic Content (ASTM D2974)
_Q	BQ, NQ, or PQ wire line system	SP	Swell Pressure, tsf (ASTM D4546)
_X	AX, BX, or NX double tube barrel	PS	Percent swell under pressure (ASTM D4546)
N	Standard penetration test, blow per foot	FS	Free swell, % (ASTM D4546)
CR	Core recovery, percent	SS	Shrink swell, % (ASTM D4546)
WL	Water level	pH	
n/a	no measurement recorded	SC	Sulfate content, parts/million or mg/l
		CC	Chloride content, parts/million or mg/l
		C	One dimensional consolidation (ASTM D2435)
		Qc	Triaxial compression (ASTM D2850 and D4767)
		DS	Direct Shear (ASTM D3080)
		K	Coefficient of permeability, cm/sec (ASTM D2434)
		P	Pinhole Test (ASTM D4647)
		DH	Double hydrometer (ASTM D4221)
		MA	Particle size analysis (ASTM D422)
		R	Laboratory electrical resistivity, ohm-cm (ASTM G57)
		VS	Field vane shear (ASTM D2573)
		RQD	Rock quality designation, percent
		IR	Infiltration Test (ASTM D3385)

TERMINOLOGY							
Particle Sizes				Soil Layering and Moisture			
<u>Type</u>	<u>Size Range</u>	<u>Term</u>	<u>Visual Observation</u>				
Boulders	> 12"	Lenses	Small pockets of different soils				
Cobbles	3" - 12"	Lamination	< 1/4" thick stratum				
Coarse gravel	3/4" - 3"	Layer	1/4" - 12" thick stratum				
Fine gravel	#4 sieve - 3/4"	Stratified	Altering lenses of varying materials or colors				
Coarse sand	#4 sieve - #10 sieve	Varved	Altering laminations of clay, silt, fine sand, or colors				
Medium sand	#10 sieve - #40 sieve	Dry	Powdery, no noticeable water				
Fine sand	#40 sieve - #200 sieve	Moist	Damp, below saturation				
Silt	100% passing #200 sieve, and > 0.002mm	Wet	MC above plastic limit				
Clay	100% passing #200 sieve, and < 0.002mm	Waterbearing	Pervious soil below water table				
		Saturated	Cohesive soil with MC above liquid limit				
Gravel Content				Standard Penetration Resistance (N-value)			
Coarse-Grained Soils		Fine-Grained Soils		Cohesionless Soils		Cohesive Soils	
<u>% Gravel</u>	<u>Description</u>	<u>% Gravel</u>	<u>Description</u>	<u>N-Value</u>	<u>Relative Density</u>	<u>N-Value</u>	<u>Consistency</u>
2 - 15	A little gravel	2 - 5	Trace of gravel	0 - 4	Very loose	0 - 4	Very soft
16 - 30	With gravel	5 - 15	a little gravel	5 - 10	Loose	5 - 8	Soft
31 - 49	Gravelly	16 - 30	with gravel	11 - 30	Medium dense	9 - 15	Firm
		31 - 49	Gravelly	31 - 50	Dense	16 - 30	Hard
				>50	Very dense	>30	Very hard

NOTICE TO REPORT USERS BORING LOG INFORMATION

Subsurface Profiles

The subsurface stratification lines on the graphic representation of the test borings show an approximate boundary between soil types or rock. The transition between materials is approximate and is usually far more gradual than shown. Estimating excavation depths, soil volumes, and other computations relying on the subsurface strata may not be possible to any degree of accuracy.

Water Level

WSB & Associates, Inc. took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of this report. The groundwater level may fluctuate due to seasonal variations caused by precipitation, snowmelt, rainfalls, construction or remediation activities, and/or other factors not evident at the time of measurement.

The actual determination of the subsurface water level is an interpretive process. Subsurface water level may not be accurately depicted by the levels indicated on the boring logs. Normally, a subsurface exploration obtains general information regarding subsurface features for design purposes. An accurate determination of subsurface water levels is not possible with a typical scope of work. The use of the subsurface water level information provided for estimating purposes or other site review can present a moderate to high risk of error.

The following information is obtained in the field and noted under "Water Level Measurements" at the bottom of the log.

Sample Depth:	The lowest depth of soil sampling at the time a water level measurement is taken.
Casing Depth:	The depth to the bottom of the casing or hollow stem auger at the time of water level measurement.
Cave-in Depth:	The depth at which a measuring tape stops in the bore hole.
Water Level:	The point in the bore hole at which free-standing water is encountered by a measure device from the surface.

Obstruction Depths

Obstructions and/or obstruction depths may be noted on the boring logs. Obstruction indicates the sampling equipment encountered resistance to penetration. It must be realized that continuation of drilling, the use of other drilling equipment or further exploration may provide information other than that depicted on the logs. The correlation of obstruction depths on the log with construction features such as rock excavation, foundation depths, or buried debris cannot normally be determined with any degree of accuracy. For example, penetration of weathered rock by soil sampling equipment may not correlate with removal by certain types of construction equipment. Using this information for estimating purposes often results in a high degree of misinterpretation.

Accurately identifying the obstruction or estimating depths where hard rock is present over the site requires a scope of service beyond the normal geotechnical exploration program. The risk of using the information noted on the boring logs for estimating purposes must be understood.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

$$GW \quad C_u = \frac{D_{60}}{D_{10}} \text{ greater than 4; } C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \text{ between 1 and 3}$$

GP Not meeting all gradation requirements for GW

GM Atterberg limits below "A" line or P.I. less than 4
 GC Atterberg limits above "A" line with P.I. greater than 7
 Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

$$SW \quad C_u = \frac{D_{60}}{D_{10}} \text{ greater than 4; } C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \text{ between 1 and 3}$$

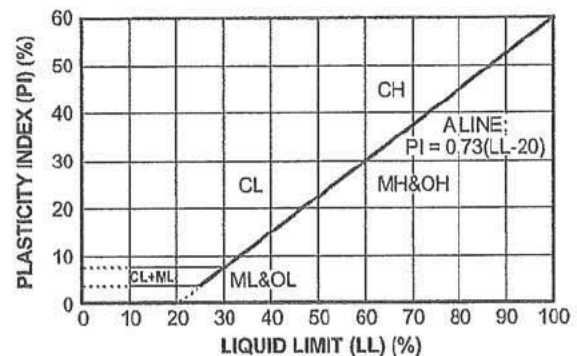
SP Not meeting all gradation requirements for GW

SM Atterberg limits below "A" line or P.I. less than 4
 SC Atterberg limits above "A" line with P.I. greater than 7
 Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent GW, GP, SW, SP
 More than 12 percent GM, GC, SM, SC
 5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART



Preliminary Opinion of Probable Construction Cost

Primary Outlet Chelsea Commons Pond

CITY OF MONTICELLO, MN

3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
CHELSEA COMMONS POND OUTLET				
MOBILIZATION	LS	1	\$ 20,000.00	\$ 20,000.00
TRAFFIC CONTROL	LS	1	\$ 10,000.00	\$ 10,000.00
24" RC PIPE STORM SEWER DES 3006 CL III	LF	730	\$ 120.00	\$ 87,600.00
REMOVE 15" RCP STORM PIPE	LF	60	\$ 20.00	\$ 1,200.00
CONSTRUCT DRAINAGE STRUCUTRE 60-4020	LF	36	\$ 160.00	\$ 5,760.00
REPLACE STREET	LS	1	\$ 20,000.00	\$ 20,000.00
REMOVE MANHOLE	LS	1	\$ 2,000.00	\$ 2,000.00
CONNECT TO EXISTING STORM SEWER	EACH	1	\$ 1,000.00	\$ 1,000.00
CONST DRAINAGE STRUCTURE DESIGN SPECIAL	EACH	1	\$ 8,000.00	\$ 8,000.00
SITE RESTORATION	SY	1630	\$ 10.00	\$ 16,300.00
EROSION AND SEDIMENT CONTROL	LS	1	\$ 5,000.00	\$ 5,000.00
SUBTOTAL				\$ 176,860.00
30% CONTINGENCY				\$ 53,140.00
GRAND TOTAL				\$ 230,000.00

Preliminary Opinion of Probable Construction Cost

Emergency Overflow Chelsea Commons Pond

CITY OF MONTICELLO, MN

3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
CHELSEA COMMONS POND EOF				
MOBILIZATION	LS	1	\$ 20,000.00	\$ 20,000.00
18" RC PIPE STORM SEWER DES 3006 CL III	LF	250	\$ 100.00	\$ 25,000.00
18" RC PIPE APRON WITH TRASH GUARD	EACH	1	\$ 2,000.00	\$ 2,000.00
CONNECT TO EXISTING STORM SEWER	EACH	1	\$ 1,500.00	\$ 1,500.00
SITE RESTORATION	SY	560	\$ 30.00	\$ 16,800.00
EROSION AND SEDIMENT CONTROL	LS	1	\$ 5,000.00	\$ 5,000.00
SUBTOTAL				\$ 70,300.00
30% +/- CONTINGENCY				\$ 19,700.00
GRAND TOTAL				\$ 90,000.00

Preliminary Opinion of Probable Construction Cost

School Blvd. Storm Sewer Diversion

CITY OF MONTICELLO, MN

3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
STORM SEWER DIVERSION				
MOBILIZATION	L S	1	\$ 20,000.00	\$ 20,000.00
72-4020	L F	10	\$ 800.00	\$ 8,000.00
48-4020	LF	20	\$ 500.00	\$ 10,000.00
15" RC PIPE SEWER CLASS III	L F	800	\$ 60.00	\$ 48,000.00
WEIR WALL WITH SLUICE GATE	L S	1	\$ 8,000.00	\$ 8,000.00
CONNECT TO EXISTING	EACH	3	\$ 1,000.00	\$ 3,000.00
RESTORATION	L S	1	\$ 10,000.00	\$ 10,000.00
PROPERTY ACQUISITION	L S	1	\$ 105,000.00	\$ 105,000.00
SUBTOTAL				\$ 212,000.00
30% +/- CONTINGENCY				\$ 63,000.00
GRAND TOTAL				\$ 275,000.00

Preliminary Opinion of Probable Construction Cost

City Water Augmentation System

CITY OF MONTICELLO, MN

3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
ANNUAL COST				
WATER	GAL	30118101	\$ 0.002	\$ 45,178.00
SUBTOTAL				\$ 45,178.00
30% +/- CONTINGENCY				\$ 13,522.00
GRAND TOTAL				\$ 58,700.00

Preliminary Opinion of Probable Construction Cost

City Water Augmentation System

CITY OF MONTICELLO, MN

3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
CAPITAL COST				
WATER	GAL	38904654	\$ 0.002	\$ 58,357.00
8-INCH WATERMAIN	LF	500	\$ 40.000	\$ 20,000.00
SUBTOTAL				\$ 78,357.00
30% +/- CONTINGENCY				\$ 23,500.00
GRAND TOTAL				\$ 101,857.00

Preliminary Opinion of Probable Construction Cost
Water level augmentation from DNR water to Chelsea Pond
CITY OF MONTICELLO, MN
3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
CAPITAL COST				
MOBILIZATION	LS	1	\$ 40,000.00	\$ 40,000.00
8" FORCEMAIN WATER LINE	LF	1200	\$ 75.00	\$ 90,000.00
PUMP STATION (SEE DESC. FOR EQUIPMENT INCLUDED)	EACH	1	\$ 150,000.00	\$ 150,000.00
ELECTRICAL SERVICE	LS	1	\$ 50,000.00	\$ 50,000.00
SUBTOTAL				\$ 330,000.00
30% +/- CONTINGENCY				\$ 100,000.00
GRAND TOTAL				\$ 430,000.00

Preliminary Opinion of Probable Construction Cost

Well Installation

CITY OF MONTICELLO, MN

3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
CAPITAL COST				
MOBILIZATION	LS	1	\$ 30,000.00	\$ 30,000.00
ELECTRICAL SERVICE	LS	1	\$ 50,000.00	\$ 50,000.00
PUMP	LS	1	\$ 80,000.00	\$ 80,000.00
SERVICE LINE	LF	100	\$ 50.00	\$ 5,000.00
PUMP HOUSE	LS	1	\$ 20,000.00	\$ 20,000.00
WET WELL	LS	1	\$ 30,000.00	\$ 30,000.00
VALVE	EACH	1	\$ 1,500.00	\$ 1,500.00
SUBTOTAL				\$ 216,500.00
30% +/- CONTINGENCY				\$ 67,850.00
GRAND TOTAL				\$ 290,000.00

Preliminary Opinion of Probable Construction Cost

Stormwater Reuse and irrigation system

CITY OF MONTICELLO, MN

3-Jun-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
CAPITAL COST				
MOBILIZATION	LS	1	\$ 50,000.00	\$ 50,000.00
ELECTRICAL SERVICE	LS	1	\$ 50,000.00	\$ 50,000.00
PUMPING STATION	LS	1	\$ 150,000.00	\$ 150,000.00
SERVICE LINE	LF	1000	\$ 50.00	\$ 50,000.00
INTAKE FLUME	LF	50	\$ 100.00	\$ 5,000.00
WET WELL	LS	1	\$ 30,000.00	\$ 30,000.00
VALVE	EACH	1	\$ 1,500.00	\$ 1,500.00
SUBTOTAL				\$ 336,500.00
30% +/- CONTINGENCY				\$ 100,950.00
GRAND TOTAL				\$ 443,100.00

Preliminary Opinion of Probable Construction Cost

Aeration System

CITY OF MONTICELLO, MN

22-Jul-21

DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION
CAPITAL COST				
FURNISH AND INSTALL	LS	1	\$ 100,000.00	\$ 100,000.00
MOBILIZATION	LS	1	\$ 5,930.80	\$ 5,930.80
RA4	EACH	2	\$ 3,700.00	\$ 7,400.00
RA2-PM	EACH	1	\$ 2,036.00	\$ 2,036.00
DIFFUSER	EACH	10	\$ 1,500.00	\$ 15,000.00
3/8" TUBING	100 LF	3	\$ 106.00	\$ 318.00
5/8" TUBING	100 LF	35	\$ 140.00	\$ 4,900.00
SUBTOTAL				\$ 135,584.80
30% +/- CONTINGENCY				\$ 40,415.20
GRAND TOTAL				\$ 176,000.00

Appendix C

Preliminary Grading Plan & Geotechnical Analysis



Cut/Fill Summary					
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill
EG-FG VOLM	1.00	1.00	3530247.15 Sq. Ft.	432306.91 Cu. Yd.	64610.47 Cu. Yd.
Totals			3530247.15 Sq. Ft.	432306.91 Cu. Yd.	64610.47 Cu. Yd.



GEOTECHNICAL REPORT

CHELSEA COMMONS AREA IMPROVEMENTS MONTICELLO, MINNESOTA

June 7, 2021

Prepared for:
City of Monticello
505 Walnut Street
Monticello, MN 55362

WSB PROJECT NO. 017991-000



GEOTECHNICAL REPORT

CHELSEA COMMONS MONTICELLO

**FOR
CITY OF MONTICELLO**

June 7, 2021



GEOTECHNICAL REPORT

CERTIFICATION

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Mark W. Osborn, PE

Date: June 7, 2021

Lic. No. 41362



June 7, 2021

Mr. Matt Leonard, PE
City Engineer/Public Works Director
City of Monticello
505 Walnut Street
Monticello, MN 55362

Re: Drilling Services
Chelsea Commons Area Improvements
Stormwater Management
Monticello, MN

We have conducted a geotechnical subsurface exploration program for the above referenced project. This report contains our soil boring logs, an evaluation of the conditions encountered in the borings and our discussion of soil properties and suitability for reuse as fill

If you have questions concerning this report or our recommendations, or for construction material testing for this project, please call us at 952.737.4660.

Sincerely,

WSB

A handwritten signature in blue ink, appearing to read "Mark Osborn".

Mark Osborn, PE
Senior Geotechnical Engineer

A handwritten signature in blue ink, appearing to read "Darin Hyatt".

Darin Hyatt, PE
Senior Geotechnical Engineer

Attachment:
Geotechnical Report

MWO/tmw

TABLE OF CONTENTS

TITLE SHEET

CERTIFICATION SHEET

LETTER OF TRANSMITTAL

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 Project Location	1
1.2 Project Description	1
1.3 Purpose and Project Scope of Services	1
2. PROCEDURES.....	2
2.1 Boring Layout and Soil Sampling Procedures	2
2.2 Groundwater Measurements and Borehole Abandonment	2
2.3 Boring Log Procedures and Qualifications	2
3. EXPLORATION RESULTS	3
3.1 Site and Geology	3
3.2 Subsurface Soil and Groundwater Conditions	3
3.3 Strength Characteristics	3
3.4 Groundwater Conditions	3
4. ENGINEERING ANALYSIS AND RECOMMENDATIONS	4
4.1 On-Site Soil Suitability as Backfill and Fill	4
4.2 Water Features (Ponds)	4
4.3 Construction Safety	4
4.4 Remarks	5
5. STANDARD OF CARE	6

Appendix A

Soil Boring Exhibit

Logs of Test Borings

Symbols and Terminology on Test Boring Log

Notice to Report Users Boring Log Information

Unified Soil Classification System (USCS)

1. INTRODUCTION

1.1 Project Location

The site is located to the southeast of Chelsea Road and Cedar Street in Monticello, Minnesota. The approximate soil boring locations can be found on the Soil Boring Exhibit in **Appendix A**.

1.2 Project Description

It is proposed to excavate the water features (North Pond and South Pond) as shown on the Soil Boring Exhibit. The City of Monticello (City) would like to determine the quality of the materials that are planned for excavation and our recommendations for their reuse as structural fills. We understand the City owned water features will be utilized as a public amenity.

The North Pond is planned to have a high water level (HWL) of 958.88 and an normal water level (NWL) of 955.00 while the South Pond will have a HWL of 956.81 and a NWL of 952.00. The water levels will be controlled by a series of storm water pipes with outlets to the City's storm water system.

1.3 Purpose and Project Scope of Services

The City of Monticello authorized this scope of service. In order to assist the design team we planned to drill four borings at planned locations within the pond excavation areas, review the soils in our laboratory, and prepare this geotechnical report. This stated purpose was a significant factor in determining the scope and level of service provided. Should the purpose of the report change the report immediately ceases to be valid and use of it without WSB's prior review and written authorization should be at the user's sole risk.

Our authorized scope of work has been limited to:

1. Clearing underground utilities utilizing Gopher State One Call.
2. Mobilization / demobilization of an all-terrain track mounted drill rig.
3. Drilling 4 standard penetration borings to about 15-foot depths.
4. Sealing the borings per Minnesota Department of Health procedures.
5. Perform soil classification and analysis.
6. Review of available project information and geologic data.
7. Providing this geotechnical report containing:
 - a. Summary of our findings.
 - b. Discussion of subsurface soil and groundwater conditions and how they may affect the proposed pond excavations.
 - c. Estimated infiltration rate of the soils.
 - d. A discussion of soils for use as structural fill and site fill.

2. PROCEDURES

2.1 Boring Layout and Soil Sampling Procedures

WSB completed four (4) standard penetration soil borings at the project site. The City of Monticello recommended the boring depths and selected the desired locations. A WSB survey crew staked and elevated the borings.

We completed the borings on May 19, 2021 with a track-mounted CME-55 drill rig operated by a two-person crew. The drill crew advanced the borings using continuous hollow stem augers. The drilling information is provided on the boring logs.

Generally, the drill crew sampled the soil in advance of the auger tip at two and one-half (2 ½) foot intervals to the termination depth of the boring. The soil samples were obtained using a split-barrel sampler which was driven into the ground during standard penetration tests in accordance with ASTM D 1586, Standard Method of Penetration Test and Split-Barrel Sampling of Soils. The materials encountered were described on field logs and representative samples were containerized and transported to our laboratory for further observation and testing.

Except when laboratory testing was completed, the samples were visually observed to estimate the distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We classified the soils according to type using the Unified Soil Classification System (USCS). A chart describing the USCS is included in **Appendix A**.

2.2 Groundwater Measurements and Borehole Abandonment

The drill crew observed the borings for free groundwater while drilling and after completion of the borings. These observations and measurements are noted on the boring logs. The crew then backfilled the borings to comply with Minnesota Department of Health regulations.

2.3 Boring Log Procedures and Qualifications

The subsurface conditions encountered by the borings are illustrated on the Logs of Test Borings in **Appendix A**. Similar soils were grouped into the strata shown on the boring logs, and the appropriate estimated USCS classification symbols were also added. The depths and thickness of the subsurface strata indicated on the boring logs were estimated from the drilling results.

The transition between materials (horizontal and vertical) is approximate and is usually far more gradual than shown. Information on actual subsurface conditions exists only at the specific locations indicated and is relevant only to the time exploration was performed. Subsurface conditions and groundwater levels at other locations may differ from conditions found at the indicated locations. The nature and extent of these conditions would not become evident until exposed by construction excavation. These stratification lines were used for our analytical purposes and, due to the aforementioned limitations, should not be used as a basis of design or construction cost estimates.

3. EXPLORATION RESULTS

3.1 Site and Geology

The site was a planted agricultural field at the time of drilling. Boring elevations ranged from 962.71 to 964.23 feet.

Geologic origins can be difficult to determine solely from boring samples. We referenced online geologic data of the area and used our experience to help determine geologic origin of the soils, however only a detailed geologic exploration would accurately determine the geologic history of the site.

The Wright County Geologic Atlas indicates the surficial geology of the area is mostly glacial outwash consisting of sand and gravel soils with occasional pockets of glacial till.

3.2 Subsurface Soil and Groundwater Conditions

The boring profile generally consisted of topsoil overlying glacial outwash deposits.

Topsoil

The topsoil encountered generally consisted of sands with clay that were organic to slightly organic. These soils were brown to dark brown in color and generally moist.

Glacial Outwash

The glacial outwash deposits generally consisted of sands with silt and gravel. These soils were brown to light brown in color and generally moist.

3.3 Strength Characteristics

The penetration resistance N-values of the materials encountered were recorded during drilling and are indicated as blows per foot (BPF). Those values provide an indication of soil strength characteristics and are located on the boring log sheets. Also, visual-manual classification techniques and apparent moisture contents were also utilized to make an engineering judgment of the consistency of the materials.

Table 1 presents a summary of the penetration resistances in the soils for the borings completed and remarks regarding the material strengths of the soils.

Table 1: Penetration Resistances

Soil Type	Classification	Penetration Resistances	Remarks
Glacial Outwash	SP, SP-SM	13 to 31* BPF	Generally medium dense

* BPF of 66 were encountered in cobbly granular deposits at Boring PB-3

The preceding is a generalized description of soil conditions at this site. Variations from the generalized profile exist and should be assessed from the boring logs, the normal geologic character of the deposits, and the soils uncovered during site excavation.

3.4 Groundwater Conditions

WSB took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of the report. Note that groundwater levels may fluctuate due to seasonal variations (e.g. precipitation, snowmelt and rainfall) and/or other factors not evident at the time of measurement.

No groundwater was encountered during the drilling process. The granular soils encountered generally have a high permeability that would allow for groundwater to readily enter the boreholes, as such, it is our opinion that a static groundwater level is below the depth explored by our borings.

4. ENGINEERING ANALYSIS AND RECOMMENDATIONS

4.1 On-Site Soil Suitability as Backfill and Fill

The glacial outwash sands with silt and gravel encountered are considered very favorable for use as structural backfill and fill. These soils are suitable for use below foundations, slabs, pavements, or any other structural areas as well as where the site grade is raised provided they are properly moisture conditioned and compacted.

These soils would be considered a low risk of frost susceptibility and should be suitable for placement near grade where freezing conditions can occur.

Cobbles within the glacial outwash are not desirable as they will create point load stresses and create non-uniform subgrade support. Soil with cobbles larger than six inches (6") should not be placed within 3 feet of foundations, slabs, grading grade of pavements, or in contact with utilities.

4.2 Water Features (Ponds)

The Sands (SP) and Sands with Silt (SP-SM) encountered at this site would generally be considered to have estimated infiltration rates of about 0.8 inches per hour, which are considered high. These estimations are based on information provided by the Minnesota Stormwater Manual Design infiltration rates dated April 20, 2020. These soils are generally good for infiltration ponds but poor for use in a retention pond. Furthermore, groundwater was not observed within the depths explored by our borings.

In order to retain water in the ponds, it appears that a pond liner will have to be constructed.

One option is a clay liner, which would consist of a layer of clayey soils (CL) with an in-place hydraulic conductivity of 1×10^{-7} centimeters per second (cm/s) or less. The thickness of the clay liner may be dependent on the pond depth. If the clay liner becomes dry it may shrink and crack leading to the necessity for pond liner reconstruction. The clay liner should be placed in lifts that do not exceed 8 inches and should be compacted at 0 to +3% of their optimum moisture content. Laboratory testing of the clay is recommended to ensure it meets the hydraulic conductivity requirements.

Another option would be to use a high-density polyethylene (HDPE) liner, polyvinyl chloride (PVC) liner or ethylene propylene diene terpolymer (EPDM) liner.

HDPE has low permeability, relatively long lifespan, good UV resistance, resistant to a wide range of chemicals and functions well in cold weather. A (PVC) liner may be considered, however, PVC is generally not UV resistant and must be covered with at least a foot of soil, has a shorter lifespan than HDPE and may crack in cold weather. EPDM liners also have a relatively long lifespan, are cited as being easy to work with, significantly more flexible and durable than HDPE or PVC, are UV resistant and maintain flexibility and resist cracking in cold weather conditions.

If an HDPE liner is utilized, it should have a minimum thickness of at least 30 mils. A smooth polyvinyl chloride (PVC) geomembrane may also be considered. EPDM liner material is normally 45 mil thick. These materials seams need to be properly welded and the liners need to be properly secured on the sides and lip to ensure they do not unravel.

Other options to consider would be using a rubber liner, bentonite clay, concrete liner, or synthetic materials such as geosynthetic clay liners and geomembranes.

With any liner, proper construction is essential and we recommend manufacturers installation instructions be followed.

4.3 Construction Safety

All excavations should comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P "Excavations and Trenches". This document states that excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the job specifications.

The responsibility to provide safe working conditions on this site, for earthwork, building construction, or any associated operations is solely that of the contractor. This responsibility is not borne in any manner by WSB.

4.4 Remarks

The boring logs and related information included in this report are indicators of the subsurface conditions only at the specific locations indicated on the Soil Boring Exhibit and times noted on the Logs of Test Boring sheets in **Appendix A**. The subsurface conditions, including groundwater levels, at other locations on the site may differ significantly from conditions that existed at the time of sampling and at the boring locations.

The test borings were completed by WSB solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.

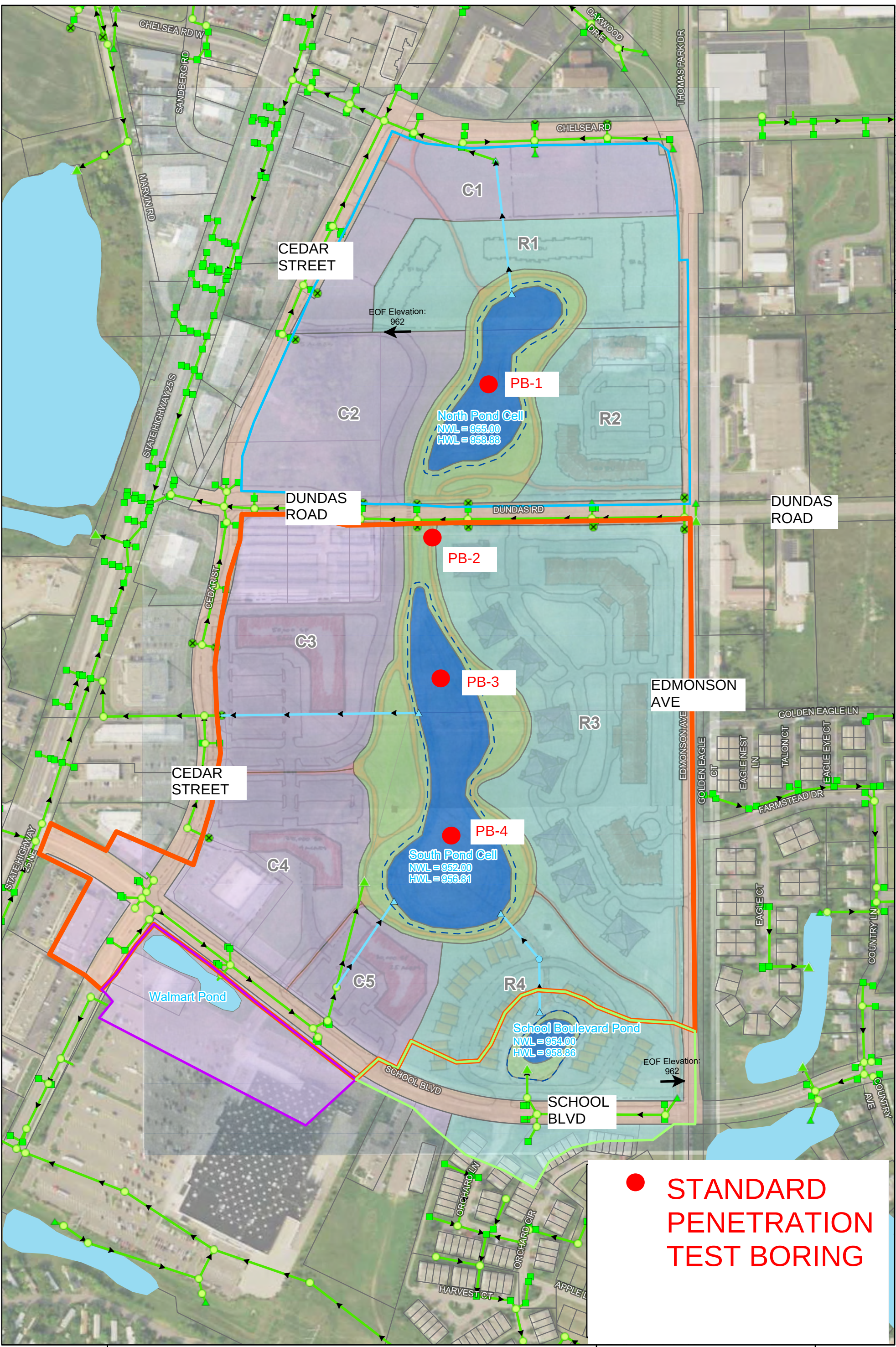
WSB has not performed observations, investigations, explorations, studies or testing that are not specifically listed in the scope of service. WSB should not be liable for failing to discover any condition whose discovery required the performance of services not authorized by the Agreement.

5. STANDARD OF CARE

The recommendations and opinions contained in this report are based on our professional judgment. The soil testing and geotechnical engineering services performed for this project have been performed with the level of skill and diligence ordinarily exercised by reputable members of the same profession under similar circumstances, at the same time and in the same or a similar locale. No warranty, either expressed or implied, is made.

APPENDIX A

Soil Borings Exhibit
Logs of Test Borings
Symbols and Terminology on Test Boring Log
Notice to Report Users Boring Log Information
Unified Soil Classification Sheet (USCS)



● STANDARD PENETRATION TEST BORING



SOIL BORING EXHIBIT



0 300 Feet
1 inch = 300 feet



LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 963.41 ft

BORING NUMBER PB-1
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	17.5	35
		SAND WITH CLAY AND ORGANICS, dark brown, moist	SP-SC	Topsoil										
1	962	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense to dense	SP-SM	Glacial Outwash			HSA	1						
2	961													
3	960						SB	2	25					
4	959						HSA							
5	958						SB	3	25					
6	957						HSA							
7	956						SB	4	31					
8	955						HSA							
9	954						SB	5	18					
10	953	SAND WITH SILT AND GRAVEL, fine grained, light brown, moist, medium dense	SP-SM											
11	952	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense	SP-SM											
12	951						HSA							
13	950						SB	6	23					
14	949													

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS							START: 5/19/2021		END: 5/19/2021	
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:		Logged By:
								R. Kurth		MWO
5/19/2021	11:10 am	14.5	13	6	None		3 1/4" HSA 0' - 14.5'	Notes:		

GEOTECHNICAL N-VALUE PLOT - WSB.GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECHNICAL LOGS.GPJ

LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 964.21 ft

BORING NUMBER PB-2
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	13	26
1	963	SAND WITH ORGANIC CLAY, Roots, dark brown, moist	SP-SC	Topsoil			HSA	1						
2	962	SAND WITH GRAVEL, fine to medium grained, brown, moist, medium dense	SP	Glacial Outwash			SB	2	13					
3	961						HSA							
4	960	SAND WITH SILT AND GRAVEL, fine grained, brown, moist, medium dense	SP-SM				SB	3	20					
5	959						HSA							
6	958						SB	4	20					
7	957						HSA							
8	956	SAND WITH SILT AND GRAVEL, fine to coarse grained, brown, moist, medium dense	SP-SM				SB	5	22					
9	955						HSA							
10	954						SB	6	16					
11	953						HSA							
12	952						SB							
13	951						HSA							
14	950						SB							

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS

START: 5/19/2021

END: 5/19/2021

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
5/19/2021	12:50 pm	14.5	13	6	None		3 1/4" HSA 0' - 14.5'	R. Kurth	MWO
								Notes:	

GEOTECHNICAL N-VALUE PLOT - WSB.GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECHNICAL LOGS.GPJ

LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 962.71 ft

BORING NUMBER PB-3
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	35	70
1	962	SAND WITH CLAY AND GRAVEL, slightly Organic, brown, moist	SP-SC	Topsoil			HSA	1						
2	961	SAND WITH SILT AND GRAVEL AND COBBLES, fine to medium grained, brown, moist, very dense	SP-SM	Glacial Outwash			SB	2	66					
3	960													
4	959						HSA							
5	958						SB	3	27					
6	957						HSA							
7	956													
8	955						SB	4	22					
9	954						HSA							
10	953						SB	5	24					
11	952													
12	951	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense	SP-SM				HSA							
13	950													
14	949						SB	6	17					

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS

START: 5/19/2021

END: 5/19/2021

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
5/19/2021	12:20 pm	14.5	13	3	None		3 1/4" HSA 0' - 14.5'	R. Kurth	MWO
								Notes:	

GEOTECHNICAL N-VALUE - WSB.GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECHNICAL LOGS.GPJ

LOG OF TEST BORING



PROJECT NAME: Chelsea Commons
CLIENT/WSB #: 017991-000

PROJECT LOCATION: Monticello, Minnesota
SURFACE ELEVATION: 964.23 ft

BORING NUMBER PB-4

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	17.5	35
1	963	SAND WITH CLAY, slightly Organic, dark brown, moist	SP-SC	Topsoil			HSA	1						
2	962	SAND WITH GRAVEL, fine to medium grained, brown, moist, medium dense	SP	Glacial Outwash			SB	2	25					
3	961						HSA							
4	960						SB	3	31					
5	959	SAND WITH GRAVEL, fine grained, brown, moist, dense	SP				HSA							
6	958	SAND WITH SILT AND GRAVEL, fine to medium grained, brown, moist, medium dense	SP-SM				SB	4	24					
7	957						HSA							
8	956						SB	5	18					
9	955						HSA							
10	954						SB	6	15					
11	953	SAND WITH GRAVEL, fine grained, brown, moist, medium dense	SP-SM				HSA							
12	952						SB							
13	951						HSA							
14	950						SB							

End of Boring 14.5 ft.

WATER LEVEL MEASUREMENTS

START: 5/19/2021

END: 5/19/2021

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
5/19/2021	11:50 am	14.5	13	5	None		3 1/4" HSA 0' - 14.5'	R. Kurth	MWO
								Notes:	

GEOTECHNICAL N-VALUE - WSB.GDT - 5/26/21 07:46 - K:\017991-000\GEOTECH-CMT\GEOTECH\GINT LOGS.GPJ

SYMBOLS AND TERMINOLOGY ON TEST BORING LOG

SYMBOLS			
Drilling and Sampling		Laboratory Testing	
<u>Symbol</u>	<u>Description</u>	<u>Symbol</u>	<u>Description</u>
HSA	3 1/4" LD. Hollow Stem Auger	MC	Moisture content, % (ASTM D2216)
FA	Flight Auger	DD	Dry Density, pcf
HA	Hand Auger	LL	Liquid Limit (ASTM D4318)
RC	Size A, B, or N rotary casing	PL	Plastic Limit (ASTM D4318)
CS	Continuous split barrel sampling		
DM	Drilling Mud		- Inserts in last column
JW	Jetting Water		
SB	2" O.D. split barrel sampling	Qu	Unconfined compressive strength, psf (ASTM D2166)
_L	2 1/2" or 3 1/2" OD split barrel liner sampler	Pq	Penetrometer Reading, tsf (ASTM D1558)
_T	2" or 3" thin walled tube sample	Ts	Torvane Reading, ts
W	Wash sample	G	Specific Gravity (ASTM D854)
B	Bag sample	SL	Shrinkage limits (ASTM D427)
P	Test Pit sample	OC	Organic Content (ASTM D2974)
_Q	BQ, NQ, or PQ wire line system	SP	Swell Pressure, tsf (ASTM D4546)
_X	AX, BX, or NX double tube barrel	PS	Percent swell under pressure (ASTM D4546)
N	Standard penetration test, blow per foot	FS	Free swell, % (ASTM D4546)
CR	Core recovery, percent	SS	Shrink swell, % (ASTM D4546)
WL	Water level	pH	
n/a	no measurement recorded	SC	Sulfate content, parts/million or mg/l
		CC	Chloride content, parts/million or mg/l
		C	One dimensional consolidation (ASTM D2435)
		Qc	Triaxial compression (ASTM D2850 and D4767)
		DS	Direct Shear (ASTM D3080)
		K	Coefficient of permeability, cm/sec (ASTM D2434)
		P	Pinhole Test (ASTM D4647)
		DH	Double hydrometer (ASTM D4221)
		MA	Particle size analysis (ASTM D422)
		R	Laboratory electrical resistivity, ohm-cm (ASTM G57)
		VS	Field vane shear (ASTM D2573)
		RQD	Rock quality designation, percent
		IR	Infiltration Test (ASTM D3385)

TERMINOLOGY							
Particle Sizes				Soil Layering and Moisture			
<u>Type</u>	<u>Size Range</u>	<u>Term</u>	<u>Visual Observation</u>				
Boulders	> 12"	Lenses	Small pockets of different soils				
Cobbles	3" - 12"	Lamination	< 1/4" thick stratum				
Coarse gravel	3/4" - 3"	Layer	1/4" - 12" thick stratum				
Fine gravel	#4 sieve - 3/4"	Stratified	Altering lenses of varying materials or colors				
Coarse sand	#4 sieve - #10 sieve	Varved	Altering laminations of clay, silt, fine sand, or colors				
Medium sand	#10 sieve - #40 sieve	Dry	Powdery, no noticeable water				
Fine sand	#40 sieve - #200 sieve	Moist	Damp, below saturation				
Silt	100% passing #200 sieve, and > 0.002mm	Wet	MC above plastic limit				
Clay	100% passing #200 sieve, and < 0.002mm	Waterbearing	Pervious soil below water table				
		Saturated	Cohesive soil with MC above liquid limit				
Gravel Content				Standard Penetration Resistance (N-value)			
Coarse-Grained Soils		Fine-Grained Soils		Cohesionless Soils		Cohesive Soils	
<u>% Gravel</u>	<u>Description</u>	<u>% Gravel</u>	<u>Description</u>	<u>N-Value</u>	<u>Relative Density</u>	<u>N-Value</u>	<u>Consistency</u>
2 - 15	A little gravel	2 - 5	Trace of gravel	0 - 4	Very loose	0 - 4	Very soft
16 - 30	With gravel	5 - 15	a little gravel	5 - 10	Loose	5 - 8	Soft
31 - 49	Gravelly	16 - 30	with gravel	11 - 30	Medium dense	9 - 15	Firm
		31 - 49	Gravelly	31 - 50	Dense	16 - 30	Hard
				>50	Very dense	>30	Very hard

NOTICE TO REPORT USERS BORING LOG INFORMATION

Subsurface Profiles

The subsurface stratification lines on the graphic representation of the test borings show an approximate boundary between soil types or rock. The transition between materials is approximate and is usually far more gradual than shown. Estimating excavation depths, soil volumes, and other computations relying on the subsurface strata may not be possible to any degree of accuracy.

Water Level

WSB & Associates, Inc. took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of this report. The groundwater level may fluctuate due to seasonal variations caused by precipitation, snowmelt, rainfalls, construction or remediation activities, and/or other factors not evident at the time of measurement.

The actual determination of the subsurface water level is an interpretive process. Subsurface water level may not be accurately depicted by the levels indicated on the boring logs. Normally, a subsurface exploration obtains general information regarding subsurface features for design purposes. An accurate determination of subsurface water levels is not possible with a typical scope of work. The use of the subsurface water level information provided for estimating purposes or other site review can present a moderate to high risk of error.

The following information is obtained in the field and noted under "Water Level Measurements" at the bottom of the log.

Sample Depth:	The lowest depth of soil sampling at the time a water level measurement is taken.
Casing Depth:	The depth to the bottom of the casing or hollow stem auger at the time of water level measurement.
Cave-in Depth:	The depth at which a measuring tape stops in the bore hole.
Water Level:	The point in the bore hole at which free-standing water is encountered by a measure device from the surface.

Obstruction Depths

Obstructions and/or obstruction depths may be noted on the boring logs. Obstruction indicates the sampling equipment encountered resistance to penetration. It must be realized that continuation of drilling, the use of other drilling equipment or further exploration may provide information other than that depicted on the logs. The correlation of obstruction depths on the log with construction features such as rock excavation, foundation depths, or buried debris cannot normally be determined with any degree of accuracy. For example, penetration of weathered rock by soil sampling equipment may not correlate with removal by certain types of construction equipment. Using this information for estimating purposes often results in a high degree of misinterpretation.

Accurately identifying the obstruction or estimating depths where hard rock is present over the site requires a scope of service beyond the normal geotechnical exploration program. The risk of using the information noted on the boring logs for estimating purposes must be understood.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

$$GW \quad C_u = \frac{D_{60}}{D_{10}} \text{ greater than 4; } C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \text{ between 1 and 3}$$

GP Not meeting all gradation requirements for GW

GM Atterberg limits below "A" line or P.I. less than 4
 GC Atterberg limits above "A" line with P.I. greater than 7
 Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

$$SW \quad C_u = \frac{D_{60}}{D_{10}} \text{ greater than 4; } C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \text{ between 1 and 3}$$

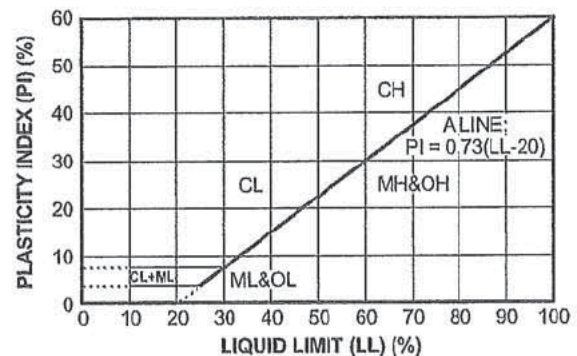
SP Not meeting all gradation requirements for GW

SM Atterberg limits below "A" line or P.I. less than 4
 SC Atterberg limits above "A" line with P.I. greater than 7
 Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent GW, GP, SW, SP
 More than 12 percent GM, GC, SM, SC
 5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART



Appendix D

Project Cost Summary & Detailed Estimates

Chelsea Commons Area Improvements - Estimated Project Costs - July 28, 2021

Preferred Pond Alternative

Required infrastructure			Phased Amenity-Level Improvements Prioritized and Added Over Time					
Baseline	Project Cost	Notes	Good	Project Cost	Notes	Great	Project Costs	Notes
Pond Construction	\$ 7,043,000	1,2,4	Additional Fountains (Includes Enhanced Storm Water Treatment)	\$ 451,000		Secondary Gateways	\$ 709,000	
	<i>Site Grading</i>		Bridges (southerly first, then northerly)	\$ 593,000		<i>Powerline Pathway System</i>		
	<i>Site Contouring</i>					Additional Vignette Areas		2
	<i>Pathway Subgrading</i>		Selected Vignette Areas	Not Included	4	<i>Complete finished spaces including seating, patios, furnishings</i>		
Water Quality/Fountain/Aeration	\$ 525,000	3	<i>Complete finished spaces including seating, patios, furnishings</i>			Edmonson Reconstruction - Urban Section	\$ 4,097,000	4
	<i>Water Augmentation</i>		NW Plaza	\$ 155,000		Edmonson Boulevard Parkway Improvements/Treatments	\$ 90,000	
	<i>Water Infiltration</i>					Additional "Best" Landscaping - Boulders, Cascades, Larger Trees		2
Removal of portion of Dundas Road	\$ 375,000					Additional Recreational Installations - Bocci, Checkers, etc.	Not Included	
Relocation of Dundas Utilities	\$ 392,000					Playground	\$ 1,035,000	
			Docks, Landings, Peninsulas at lake	\$ 173,000		1 Public Parking Lot (North Side Lot if needed) - Paved, Lighted	\$ 382,000	
Pond Pathway System	\$ 599,000		Pathway Width and Multi-level Enhancements (additional pathway spurs/areas)	\$ 71,000		3 Splash/Bubbler Area (jumping water fountain/splash area at ground level)	\$ 500,000	
	<i>Electrical Conduits for future lighting upgrades</i>		Pavilion (ideal size is reception for up to 300 people)	\$ 2,760,000		2 Pathway Surface Upgrades (boardwalk, cobblestone, pavers)	\$ 600,000	1
	<i>Basic pathway landscaping</i>		5 Public Art Installations	Not Included		4 Pathway Width and Multi-level Enhancements (additional pathway spurs/areas)	\$ 71,000	3
Erosion Control Landscaping	\$ 690,000		Major Gateways (2)	\$ 366,500		Rentals at Pavilion - Skates, Radio Boats, Paddleboats, Kayaks)	Not Included	
Major Gateways (2)	\$ 366,500					Holiday Decorations	Not Included	
	<i>Basic Amenity Lighting</i>					Clocktower	Not Included	
	<i>Pathway Lighting (include costs for color changing LED)</i>					Sound System/Music System/Wifi (speaker stations for ambient sounds)	\$ 50,000	2
	<i>Coordinated Signage</i>					Additional Public Art	Not Included	
	<i>Bridge Landing Plazas (Basic)</i>							
Basic Landscaping - incorporates seasonality and biome concept	\$ 539,000	5						
	<i>Pathway Surface Upgrades (stamped/colored/multi-level)</i>							
	<i>Basic Site Amenities - Trash receptacles, Benches, Bike Racks</i>							
Public Parking Lot (South Side Lot) - Paved, Lighted	\$ 753,000							
	<i>Park Area landscaping, grading, irrigation</i>							
Detailed Grading Plan (60-70% Level of Completion)	\$ 390,000							
Detailed Landscaping Plan	\$ 200,000							
Project Costs - Subtotal			\$ 11,872,500		Baseline	\$ 4,569,500		Good
						\$ 7,534,000		Great
<u>Notes/Assumptions</u>			<u>Notes/Assumptions</u>			<u>Notes/Assumptions</u>		
1. Site Grading & Site Contouring included with the Pond Construction group			1. Fishing pier does not include costs for boat docks			1. Pathway Surface Upgrades estimate includes approximate 300 lf of 8' wide boardwalk.		
2. Pond Construction includes outlet control and other modifications to existing storm sewer system			2. Pavilion costs includes costs for 3 gazebos			2. More details needed to provide refined estimate.		
3. Irrigation reuse and water level augmentation included with Water Quality/Fountain/Aeration group			3. Pathway Width and Multi-level Enhancements includes approximate 10% increase for estimate purposes			3. Pathway Width and Multi-level Enhancements includes approximate 10% increase for estimate purposes		
4 Costs do not include property or temp/perm easement acquisition			4. More details needed to provide refined estimate.			4. Edmonson Reconstruction costs include private utility relocation		
5. Includes costs for landscaping, additional stamped concrete, lighting and site amenities								

Intersection Improvements								
						Roundabouts at Intersections (does not include any ROW acquisition)		
						Chelsea / Cedar	\$	662,561
						School / Cedar	\$	821,220
						School / Edmonson	\$	704,250
						Chelsea / Edmonson	\$	617,370
Project Costs - Subtotal		\$	-	Baseline		\$	-	Good
							\$	2,805,000
								Great

OPINION OF PROBABLE COST - BASELINE

CHELSEA COMMONS
MONTICELLO

Design By: GT
Checked By: JLS

017991-000

Date: 8/2/2021

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
A. DUNDAS ROAD REMOVAL					
1	MOBILIZATION	LS	1	\$ 12,762.50	\$ 12,762.50
2	CLEARING	TREE	25	\$ 300.00	\$ 7,500.00
3	GRUBBING	TREE	25	\$ 250.00	\$ 6,250.00
4	REMOVE SIGN	EACH	15	\$ 40.00	\$ 600.00
5	SAWING BIT PAVEMENT (FULL DEPTH)	L F	100	\$ 3.00	\$ 300.00
6	REMOVE CURB & GUTTER	L F	2042	\$ 7.50	\$ 15,315.00
7	REMOVE BITUMINOUS PAVEMENT	S Y	16520	\$ 3.00	\$ 49,560.00
8	GEOTEXTILE FABRIC TYPE 4	S Y	19000	\$ 2.50	\$ 47,500.00
9	EXCAVATION - COMMON (P)	C Y	1840	\$ 10.00	\$ 18,400.00
10	EXCAVATION - SUBGRADE	C Y	300	\$ 10.00	\$ 3,000.00
10	SELECT GRANULAR EMBANKMENT (CV)	C Y	320	\$ 70.00	\$ 22,400.00
11	AGGREGATE BASE (CV) CLASS 5	C Y	110	\$ 70.00	\$ 7,700.00
12	TYPE SP 12.5 WEARING COURSE MIX (3;C)	TON	130	\$ 120.00	\$ 15,600.00
13	CONCRETE CURB & GUTTER DESIGN B612	L F	375	\$ 25.00	\$ 9,375.00
14	TRAFFIC CONTROL	LS	1	\$ 5,000.00	\$ 5,000.00
15	SILT FENCE; TYPE MS	L F	2000	\$ 3.00	\$ 6,000.00
16	SEDIMENT CONTROL LOG TYPE WOOD FIBER	L F	500	\$ 4.00	\$ 2,000.00
17	EROSION CONTROL BLANKETS CATEGORY 4	S Y	1000	\$ 4.50	\$ 4,500.00
18	SEEDING	ACRE	4	\$ 1,500.00	\$ 6,000.00
19	TRAFFIC CONTROL	LS	1	\$ 5,000.00	\$ 5,000.00
20	21" RC PIPE SEWER CLASS V	L F	150	\$ 75.00	\$ 11,250.00
21	CONST DRAINAGE STRUCTURE DESIGN SPECIAL (2X3)	EACH	4	\$ 2,500.00	\$ 10,000.00
22	CONNECT TO EXISTING STORM SEWER	EACH	1	\$ 2,000.00	\$ 2,000.00
23					
CONSTRUCTION TOTAL					\$ 268,012.50
CONTINGENCY TOTAL (15%)					\$ 40,201.88
SUBTOTAL					\$ 308,214.38
INDIRECT COST TOTAL (25%)					\$ 67,003.13
TOTAL					\$ 375,217.50
B. DUNDAS ROAD UTILITY IMPROVEMENTS					
24	MOBILIZATION	LS	1	\$ 13,338.33	\$ 13,338.33
25	REMOVE GATE VALVE & BOX	EACH	4	\$ 500.00	\$ 2,000.00
26	REMOVE HYDRANT	EACH	2	\$ 750.00	\$ 1,500.00
27	REMOVE WATER MAIN	LF	1045	\$ 7.50	\$ 7,837.50
28	REMOVE CURB STOP & BOX	EACH	12	\$ 200.00	\$ 2,400.00
29	REMOVE WATER SERVICE PIPE	EACH	240	\$ 5.00	\$ 1,200.00
30	REMOVE MANHOLE	EACH	4	\$ 750.00	\$ 3,000.00
31	REMOVE SEWER PIPE (SANITARY)	L F	1519	\$ 10.00	\$ 15,190.00
32	REMOVE SANITARY SERVICE PIPE	L F	120	\$ 10.00	\$ 1,200.00
33	REMOVE DRAINAGE STRUCTURE	EACH	11	\$ 500.00	\$ 5,500.00
34	REMOVE SEWER PIPE (STORM)	L F	180	\$ 20.00	\$ 3,600.00
35	ABANDON STORM SEWER	L F	1100	\$ 6.50	\$ 7,150.00
36	TRAFFIC CONTROL	LS	1	\$ 5,000.00	\$ 5,000.00
37	8" PVC PIPE SEWER	L F	686	\$ 75.00	\$ 51,450.00
38	CONSTRUCT 48" DIA SAN MANHOLE	EACH	3	\$ 3,000.00	\$ 9,000.00
39	CHIMNEY SEAL	EACH	3	\$ 250.00	\$ 750.00
40	CONNECT TO EXISTING SANITARY SEWER	EACH	2	\$ 2,500.00	\$ 5,000.00
41	REMOVE BITUMINOUS PAVEMENT	S Y	763	\$ 3.00	\$ 2,289.00
42	TYPE SP 9.5 WEARING COURSE MIX (2,B) 3.0" THICK	S Y	913	\$ 150.00	\$ 136,950.00
43	4" CONCRETE WALK	S F	200	\$ 15.00	\$ 3,000.00
44	7" CONCRETE PAVEMENT	S Y	23	\$ 50.00	\$ 1,150.00
45	REMOVE CURB & GUTTER	L F	40	\$ 5.00	\$ 200.00
46	CONCRETE CURB & GUTTER DESIGN B612	L F	40	\$ 35.00	\$ 1,400.00
47					
CONSTRUCTION TOTAL					\$ 280,104.83
CONTINGENCY TOTAL (15%)					\$ 42,015.72
SUBTOTAL					\$ 322,120.55
INDIRECT COST TOTAL (25%)					\$ 70,026.21
TOTAL					\$ 392,146.76
C. POND CONSTRUCTION & STORMWATER MANAGEMENT IMPROVEMENTS					
48	MOBILIZATION	LS	1	\$ 239,556.00	\$ 239,556.00
49	24" RC PIPE SEWER CLASS III	L F	1405	\$ 95.00	\$ 133,475.00
50	REMOVE SEWER PIPE (STORM)	L F	15	\$ 5.00	\$ 75.00
51	CONST DRAINAGE STRUCTURE DES 60-4020	LF	56	\$ 150.00	\$ 8,400.00
52	CONNECT TO EXISTING STORM SEWER	EACH	2	\$ 1,500.00	\$ 3,000.00
53	CONST DRAINAGE STRUCTURE DES SPEC (CONTROL STRUCTURE)	EACH	1	\$ 8,000.00	\$ 8,000.00
54	REMOVE MANHOLE	EACH	1	\$ 2,000.00	\$ 2,000.00
55	REMOVE CURB & GUTTER	L F	40	\$ 15.00	\$ 600.00
56	REMOVE BITUMINOUS PAVEMENT	S Y	490	\$ 10.00	\$ 4,900.00
57	AGGREGATE BASE (CV) CLASS 5	C Y	110	\$ 70.00	\$ 7,700.00
58	TYPE SP 12.5 WEARING COURSE MIX (3;C)	TON	120	\$ 120.00	\$ 14,400.00
59	CONCRETE CURB & GUTTER DESIGN B612	L F	40	\$ 35.00	\$ 1,400.00
60	SELECT GRANULAR EMBANKMENT (CV)	C Y	230	\$ 70.00	\$ 16,100.00
61	TRAFFIC CONTROL	LS	1	\$ 5,000.00	\$ 5,000.00
62	18" RC PIPE SEWER CLASS III	L F	250	\$ 100.00	\$ 25,000.00

63	18" RC PIPE APRON WITH TRASH GUARD	EACH	2	\$	2,000.00	\$	4,000.00
64	CONNECT TO EXISTING STORM SEWER	EACH	1	\$	1,500.00	\$	1,500.00
65	RAPID STABILIZATION METHOD 4	S Y	2500	\$	5.00	\$	12,500.00
66	STABILIZED CONSTRUCTION EXIT	EACH	3	\$	2,500.00	\$	7,500.00
67	SILT FENCE; TYPE MS	L F	5000	\$	2.50	\$	12,500.00
68	SEDIMENT CONTROL LOG TYPE WOOD FIBER	L F	1000	\$	2.50	\$	2,500.00
69	EROSION CONTROL BLANKETS CATEGORY 4	S Y	1000	\$	4.00	\$	4,000.00
70	SEEDING	ACRE	39	\$	1,000.00	\$	39,000.00
71	TOPSOIL STRIPPING 8"	CYEV	87600	\$	2.30	\$	201,480.00
72	SCARIFY & RECOMPACT STRUCTURAL AREAS	S Y	138000	\$	1.00	\$	138,000.00
73	EXCAVATE TO EMBANKMENT	CYEV	112600	\$	3.30	\$	371,580.00
74	MASS EXCAVATION	CYEV	304000	\$	2.40	\$	729,600.00
75	TOPSOIL RESPREAD	C Y	42700	\$	4.90	\$	209,230.00
76	HAUL & DISPOSE	CYEV	304000	\$	7.45	\$	2,264,800.00
77	FINISH & TOLERANCE POND	S Y	83300	\$	0.85	\$	70,805.00
78	CLAY LINER	C Y	19683	\$	25.00	\$	492,075.00
79							
					CONSTRUCTION TOTAL	\$	5,030,676.00
					CONTINGENCY TOTAL (15%)	\$	754,601.40
					SUBTOTAL	\$	5,785,277.40
					INDIRECT COST TOTAL (25%)	\$	1,257,669.00
					TOTAL	\$	7,042,946.40
D. WATER QUALITY							
80	MOBILIZATION	LS	1	\$	17,825.00	\$	17,825.00
81	FOUNTAIN	EACH	3	\$	15,000.00	\$	45,000.00
82	AERATORS	EACH	15.0	\$	5,000.00	\$	75,000.00
83	ELECTRICAL SERVICE	LS	1	\$	50,000.00	\$	50,000.00
84	PUMP STATION	LS	1	\$	150,000.00	\$	150,000.00
85	INTAKE FLUME	LS	50	\$	100.00	\$	5,000.00
86	WET WELL	LS	1	\$	30,000.00	\$	30,000.00
87	VALVE	LS	1	\$	1,500.00	\$	1,500.00
88							
					CONSTRUCTION TOTAL	\$	374,325.00
					CONTINGENCY TOTAL (15%)	\$	56,148.75
					SUBTOTAL	\$	430,473.75
					INDIRECT COST TOTAL (25%)	\$	93,581.25
					TOTAL	\$	524,055.00
E. POND PATHWAY SYSTEM							
89	MOBILIZATION	LS	1	\$	20,365.75	\$	20,365.75
90	4" CONCRETE WALK	S F	54000	\$	6.50	\$	351,000.00
91	2" NMC CONDUIT	L F	6480	\$	3.00	\$	19,440.00
92	CONIFEROUS SHRUB 2' HT CONT	SHRB	25	\$	75.00	\$	1,875.00
93	CONIFEROUS SHRUB 4' HT CONT	SHRB	25	\$	100.00	\$	2,500.00
94	DECIDUOUS SHRUB NO 5 CONT	SHRB	50	\$	100.00	\$	5,000.00
95	PERENNIAL NO 1 CONT	PLT	100	\$	20.00	\$	2,000.00
96	DECIDUOUS TREE 2" CAL B&B	TREE	10	\$	500.00	\$	5,000.00
97	CONIFEROUS TREE 8' HT B&B	TREE	10	\$	750.00	\$	7,500.00
98	SEEDING	ACRE	2	\$	1,500.00	\$	3,000.00
99	TURF ESTABLISHMENT	L S	1	\$	10,000.00	\$	10,000.00
100							
					CONSTRUCTION TOTAL	\$	427,680.75
					CONTINGENCY TOTAL (15%)	\$	64,152.11
					SUBTOTAL	\$	491,832.86
					INDIRECT COST TOTAL (25%)	\$	106,920.19
					TOTAL	\$	598,753.05
F. LAKE EDGE TREATMENT (EROSION CONTROL LANDSCAPING)							
101	MOBILIZATION	LS	1	\$	23,468.00	\$	23,468.00
102	LAKE EDGE TREATMENT - STRUCTURE: CONCRETE RETAINING WALL	L F	800	\$	300.00	\$	240,000.00
103	LAKE EDGE TREATMENT - NATURAL:					\$	-
104	RANDOM RIPRAP CLASS SPECIAL (BOULDERS)	EACH	670	\$	100.00	\$	67,000.00
105	SEEDING (NATURALIZED VEGETATION)	SY	2230.0	\$	10.00	\$	22,300.00
106	LAKE EDGE TREATMENT - LANDSCAPED:					\$	-
107	RANDOM RIPRAP CLASS SPECIAL (BOULDERS)	EACH	840	\$	100.00	\$	84,000.00
108	SEEDING (GARDENS/TURFGRASS)	SY	2803.0	\$	20.00	\$	56,060.00
109							
					CONSTRUCTION TOTAL	\$	492,828.00
					CONTINGENCY TOTAL (15%)	\$	73,924.20
					SUBTOTAL	\$	566,752.20
					INDIRECT COST TOTAL (25%)	\$	123,207.00
					TOTAL	\$	689,959.20
					GRAND TOTAL	\$	8,409,063.71

OPINION OF PROBABLE COST - GOOD

WSB Project: CHELSEA COMMONS
Project Location: MONTICELLO
City Project No.:
WSB Project No: 017991-000

Design By:	GT
Checked By:	JLS
Date:	8/4/2021

Item No.	MnDOT Specification No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
A. EDMONDSON BOULEVARD RECONSTRUCTION						
1	2021.501	MOBILIZATION	LS	1	\$ 139,368.70	\$ 139,368.70
2	2101.524	CLEARING	TREE	10	\$ 300.00	\$ 3,000.00
3	2101.524	GRUBBING	TREE	10	\$ 250.00	\$ 2,500.00
4	2104.502	REMOVE SIGN	EACH	20	\$ 40.00	\$ 800.00
5	2104.503	SAWING BIT PAVEMENT (FULL DEPTH)	L F	200	\$ 4.00	\$ 800.00
6	2104.503	REMOVE CURB & GUTTER	L F	100	\$ 7.50	\$ 750.00
7	2104.504	REMOVE BITUMINOUS PAVEMENT	S Y	10273	\$ 3.00	\$ 30,819.00
8	2105.504	GEOTEXTILE FABRIC TYPE 4	S Y	17990	\$ 2.50	\$ 44,975.00
9	2106.507	EXCAVATION - COMMON (P)	C Y	5450	\$ 27.50	\$ 149,875.00
10	2106.507	EXCAVATION - SUBGRADE	C Y	8180	\$ 27.50	\$ 224,950.00
11	2106.507	SELECT GRANULAR EMBANKMENT (CV)	C Y	8180	\$ 60.00	\$ 490,800.00
12	2112.519	SUBGRADE PREPARATION	RDST	33	\$ 250.00	\$ 8,250.00
13	2123.610	STREET SWEEPER	HOURL	25	\$ 300.00	\$ 7,500.00
14	2211.507	AGGREGATE BASE (CV) CLASS 5	C Y	5000	\$ 60.00	\$ 300,000.00
15	2130.523	WATER	MGAL	100	\$ 75.00	\$ 7,500.00
16	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	860	\$ 3.50	\$ 3,010.00
17	2360.509	TYPE SP 12.5 WEARING COURSE MIX (3;C)	TON	5090	\$ 75.00	\$ 381,750.00
18	2521.518	3" BITUMINOUS WALK	S F	65400	\$ 4.00	\$ 261,600.00
19	2531.504	7" CONCRETE DRIVEWAY	S F	500	\$ 10.00	\$ 5,000.00
20	2531.503	CONCRETE CURB & GUTTER DESIGN B618	L F	6540	\$ 20.00	\$ 130,800.00
21	2531.618	TRUNCATED DOMES	S F	500	\$ 50.00	\$ 25,000.00
22	2563.601	TRAFFIC CONTROL	LS	1	\$ 10,000.00	\$ 10,000.00
23	2564.518	SIGN PANELS TYPE C	S F	100	\$ 50.00	\$ 5,000.00
24	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	22	\$ 500.00	\$ 11,000.00
25	2571.524	CONIFEROUS TREE 8" HT B&B	TREE	22	\$ 750.00	\$ 16,500.00
26	2573.503	SILT FENCE; TYPE MS	L F	3440	\$ 2.50	\$ 8,600.00
27	2573.502	STORM DRAIN INLET CONTROL	EACH	20	\$ 250.00	\$ 5,000.00
28	2573.503	SEDIMENT CONTROL LOG TYPE WOOD FIBER	L F	3270	\$ 2.50	\$ 8,175.00
29	2574.507	COMMON TOPSOIL BORROW	C Y	730	\$ 25.00	\$ 18,250.00
30	2575.504	EROSION CONTROL BLANKETS CATEGORY 4	S Y	200	\$ 15.00	\$ 3,000.00
31	2575.505	SEEDING	ACRE	3	\$ 1,500.00	\$ 4,500.00
32	2582.518	CROSSWALK PAINT	S F	405	\$ 10.00	\$ 4,050.00
33	2582.503	4" SOLID LINE MULTI COMP	L F	6540	\$ 3.00	\$ 19,620.00
34	2582.518	PAVT MSSG MULTI COMP	S F	250	\$ 10.00	\$ 2,500.00
35				0		\$ -
36	2503.503	15" RC PIPE SEWER DES 3006 CLASS V	LF	1640	\$ 55.00	\$ 90,200.00
37	2503.503	18" RC PIPE SEWER DES 3006 CLASS V	LF	660	\$ 65.00	\$ 42,900.00
38	2503.503	21" RC PIPE SEWER DES 3006 CLASS V	LF	330	\$ 70.00	\$ 23,100.00
39	2503.602	CONNECT TO EXISTING STORM SEWER	EACH	2	\$ 2,000.00	\$ 4,000.00
40	2506.503	CONST DRAINAGE STRUCTURE DES 48-4020	LF	30	\$ 450.00	\$ 13,500.00
41	2506.602	CONST DRAINAGE STRUCTURE DESIGN SPEC (2X3)	EACH	17	\$ 2,000.00	\$ 34,000.00
42	2506.602	CASTING ASSEMBLY	EACH	20	\$ 750.00	\$ 15,000.00
43				0		\$ -
44	2504.602	6" GATE VALVE & BOX	EACH	4	\$ 2,200.00	\$ 8,800.00
45	2504.602	HYDRANT	EACH	2	\$ 2,500.00	\$ 5,000.00
46	2504.602	1" CORPORATION STOP	EACH	2	\$ 350.00	\$ 700.00
47	2504.602	1" CURB STOP & BOX	EACH	2	\$ 350.00	\$ 700.00
48	2504.603	6" WATERMAIN	L F	80	\$ 75.00	\$ 6,000.00
49	2504.603	1" TYPE PE PIPE	L F	80	\$ 50.00	\$ 4,000.00
50				0		\$ -
51	2503.602	8"X6" PVC WYE	EACH	4	\$ 750.00	\$ 3,000.00
52	2503.603	6" PVC SANITARY SERVICE PIPE	L F	160	\$ 85.00	\$ 13,600.00
53				0		\$ -
54	SPEC	PRIVATE UTILITY RELOCATION	LS	1	\$ 327,000.00	\$ 327,000.00
55				0		\$ -
CONSTRUCTION TOTAL						\$ 2,926,742.70
CONTINGENCY TOTAL (15%)						\$ 439,011.41
SUBTOTAL						\$ 3,365,754.11
INDIRECT COST TOTAL (25%)						\$ 731,685.68
TOTAL						\$ 4,097,439.78

B. MAJOR GATEWAY 1							
56	2021.501	MOBILIZATION	LS	1	\$	5,382.75	\$ 5,382.75
57	2105.601	SITE GRADING	LS	1	\$	2,500.00	\$ 2,500.00
58	2521.518	BOARDWALK	S F	2400	\$	7.50	\$ 18,000.00
57	2521.518	4" CONCRETE WALK	S F	500	\$	7.50	\$ 3,750.00
58	2531.504	STAMPED CONCRETE (PAVILION)	S Y	320	\$	100.00	\$ 32,000.00
59	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	3	\$	300.00	\$ 900.00
60	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	3	\$	250.00	\$ 750.00
61	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	28	\$	75.00	\$ 2,100.00
62	2571.527	PERENNIAL	PLT	43	\$	20.00	\$ 860.00
63	2574.507	COMMON TOPSOIL BORROW	C Y	366	\$	20.00	\$ 7,320.00
64	2573.503	SILT FENCE; TYPE MS	L F	150	\$	2.50	\$ 375.00
65	2575.505	SEEDING	ACRE	1	\$	1,500.00	\$ 1,500.00
66	2540.602	BIKE RACK	EACH	4	\$	400.00	\$ 1,600.00
67	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	2	\$	5,500.00	\$ 11,000.00
68	2540.602	BENCHES	EACH	3	\$	2,500.00	\$ 7,500.00
69	SPEC	SIGN PANELS TYPE SPECIAL	SF	50	\$	50.00	\$ 2,500.00
70	SPEC	IRRIGATION	LS	1	\$	15,000.00	\$ 15,000.00
						CONSTRUCTION TOTAL	\$ 113,037.75
						CONTINGENCY TOTAL (15%)	\$ 16,955.66
						SUBTOTAL	\$ 129,993.41
						INDIRECT COST TOTAL (25%)	\$ 28,259.44
						TOTAL	\$ 158,252.85
B. MAJOR GATEWAY 2							
71	2021.501	MOBILIZATION	LS	1	\$	6,889.35	\$ 6,889.35
72	2105.601	SITE GRADING	LS	1	\$	2,500.00	\$ 2,500.00
73	2521.518	4" CONCRETE WALK	S F	3300	\$	7.50	\$ 24,750.00
74	2531.504	STAMPED CONCRETE (PAVILION)	S Y	430	\$	100.00	\$ 43,000.00
75	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	5	\$	300.00	\$ 1,500.00
76	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	5	\$	250.00	\$ 1,250.00
77	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	25	\$	75.00	\$ 1,875.00
78	2571.527	PERENNIAL	PLT	38	\$	20.00	\$ 760.00
79	2574.507	COMMON TOPSOIL BORROW	C Y	552.6	\$	20.00	\$ 11,052.00
80	2573.503	SILT FENCE; TYPE MS	L F	200	\$	2.50	\$ 500.00
81	2575.505	SEEDING	ACRE	2	\$	1,500.00	\$ 3,000.00
82	2540.602	BIKE RACK	EACH	4	\$	400.00	\$ 1,600.00
83	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	2	\$	5,500.00	\$ 11,000.00
84	2540.602	BENCHES	EACH	1	\$	2,500.00	\$ 2,500.00
85	SPEC	SIGN PANELS TYPE SPECIAL	SF	50	\$	50.00	\$ 2,500.00
86	SPEC	IRRIGATION	LS	1	\$	30,000.00	\$ 30,000.00
						CONSTRUCTION TOTAL	\$ 144,676.35
						CONTINGENCY TOTAL (15%)	\$ 21,701.45
						SUBTOTAL	\$ 166,377.80
						INDIRECT COST TOTAL (25%)	\$ 36,169.09
						TOTAL	\$ 202,546.89
B. MAJOR GATEWAY 3							
87	2021.501	MOBILIZATION	LS	1	\$	8,115.45	\$ 8,115.45
88	2105.601	SITE GRADING	LS	1	\$	2,500.00	\$ 2,500.00
88	2521.518	4" CONCRETE WALK	S F	8020	\$	7.50	\$ 60,150.00
89	2531.504	STAMPED CONCRETE (PAVILION)	S Y	157	\$	100.00	\$ 15,700.00
90	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	6	\$	300.00	\$ 1,800.00
91	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	12	\$	250.00	\$ 3,000.00
92	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	50	\$	75.00	\$ 3,750.00
93	2571.527	PERENNIAL	PLT	150	\$	20.00	\$ 3,000.00
94	2574.507	COMMON TOPSOIL BORROW	C Y	901.7	\$	20.00	\$ 18,034.00
95	2573.503	SILT FENCE; TYPE MS	L F	150	\$	2.50	\$ 375.00
96	2575.505	SEEDING	ACRE	2	\$	1,500.00	\$ 3,000.00
97	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	2	\$	5,500.00	\$ 11,000.00
98	2540.602	BENCHES	EACH	3	\$	2,500.00	\$ 7,500.00
99	SPEC	SIGN PANELS TYPE SPECIAL	SF	50	\$	50.00	\$ 2,500.00
100	SPEC	IRRIGATION	LS	1	\$	30,000.00	\$ 30,000.00
						CONSTRUCTION TOTAL	\$ 170,424.45
						CONTINGENCY TOTAL (15%)	\$ 25,563.67
						SUBTOTAL	\$ 195,988.12
						INDIRECT COST TOTAL (25%)	\$ 42,606.11
						TOTAL	\$ 238,594.23

B. MAJOR GATEWAY 4						
101	2021.501	MOBILIZATION	LS	1	\$	4,524.00 \$ 4,524.00
102	2105.601	SITE GRADING	LS	1	\$	2,500.00 \$ 2,500.00
102	2521.518	4" CONCRETE WALK	S F	4360	\$	7.50 \$ 32,700.00
103	2531.504	STAMPED CONCRETE (PAVILION)	S Y	73	\$	100.00 \$ 7,300.00
104	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	3	\$	300.00 \$ 900.00
105	2571.524	CONIFEROUS TREE 8" HT B&B	TREE	3	\$	250.00 \$ 750.00
106	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	75	\$	75.00 \$ 5,625.00
107	2571.527	PERENNIAL	PLT	23.0	\$	20.00 \$ 460.00
108	2574.507	COMMON TOPSOIL BORROW	C Y	316	\$	20.00 \$ 6,320.00
109	2573.503	SILT FENCE; TYPE MS	L F	250	\$	2.50 \$ 625.00
110	2575.505	SEEDING	ACRE	1	\$	1,500.00 \$ 1,500.00
111	2540.602	BIKE RACK	EACH	2	\$	400.00 \$ 800.00
112	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	2	\$	5,500.00 \$ 11,000.00
113	2540.602	BENCHES	EACH	1	\$	2,500.00 \$ 2,500.00
114	SPEC	SIGN PANELS TYPE SPECIAL	SF	50	\$	50.00 \$ 2,500.00
115	SPEC	IRRIGATION	LS	1	\$	15,000.00 \$ 15,000.00
116				0		\$ -
					CONSTRUCTION TOTAL	\$ 95,004.00
					CONTINGENCY TOTAL (15%)	\$ 14,250.60
					SUBTOTAL	\$ 109,254.60
					INDIRECT COST TOTAL (25%)	\$ 23,751.00
					TOTAL	\$ 133,005.60
B. NW GATEWAY PLAZA						
117	2021.501	MOBILIZATION	LS	1	\$	5,240.38 \$ 5,240.38
118	2105.601	SITE GRADING	LS	1	\$	2,500.00 \$ 2,500.00
118	2521.518	4" CONCRETE WALK	S F	5910	\$	7.50 \$ 44,325.00
119	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	3	\$	300.00 \$ 900.00
120	2571.524	CONIFEROUS TREE 8" HT B&B	TREE	3	\$	250.00 \$ 750.00
121	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	75	\$	75.00 \$ 5,625.00
122	2571.527	PERENNIAL	PLT	23.0	\$	20.00 \$ 460.00
123	2574.507	COMMON TOPSOIL BORROW	C Y	316	\$	20.00 \$ 6,320.00
124	2573.503	SILT FENCE; TYPE MS	L F	251	\$	2.50 \$ 627.50
125	2575.505	SEEDING	ACRE	1	\$	1,500.00 \$ 1,500.00
126	2540.602	BIKE RACK	EACH	2	\$	400.00 \$ 800.00
127	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	2	\$	5,500.00 \$ 11,000.00
128	2540.602	BENCHES	EACH	1	\$	2,500.00 \$ 2,500.00
129	SPEC	SIGN PANELS TYPE SPECIAL	S F	50	\$	50.00 \$ 2,500.00
130	SPEC	MONUMENT	LS	1	\$	10,000.00 \$ 10,000.00
131	SPEC	IRRIGATION	LS	1	\$	15,000.00 \$ 15,000.00
					CONSTRUCTION TOTAL	\$ 110,047.88
					CONTINGENCY TOTAL (15%)	\$ 16,507.18
					SUBTOTAL	\$ 126,555.06
					INDIRECT COST TOTAL (25%)	\$ 27,511.97
					TOTAL	\$ 154,067.03
C. CITY PARK IMPROVEMENTS						
132	2021.501	MOBILIZATION	LS	1	\$	160,555.75 \$ 160,555.75
133	2105.504	GEOTEXTILE FABRIC TYPE 5	S Y	3028	\$	2.50 \$ 7,570.00
134	2105.601	SITE GRADING	LS	1	\$	15,000.00 \$ 15,000.00
135	2106.507	EXCAVATION - COMMON	C Y	925	\$	25.00 \$ 23,125.00
136	2106.507	EXCAVATION - SUBGRADE (P)	C Y	1514	\$	25.00 \$ 37,850.00
137	2211.507	AGGREGATE BASE (CV) CLASS 5 (P)	C Y	673	\$	30.00 \$ 20,190.00
138	2360.509	TYPE SP 9.5 WEARING COURSE MIX (2,B)	TON	257	\$	70.00 \$ 17,990.00
139	2360.509	TYPE SP 12.5 WEARING COURSE MIX (2,B)	TON	257	\$	70.00 \$ 17,990.00
140	2503.503	15" RC PIPE SEWER DES 3006 CLASS V	LF	500	\$	60.00 \$ 30,000.00
141	2503.602	CONNECT TO EXISTING STORM SEWER	EACH	1	\$	1,500.00 \$ 1,500.00
142	2506.503	CONST DRAINAGE STRUCTURE DES 48-4020	LF	12	\$	150.00 \$ 1,800.00
143	2506.602	CONST DRAINAGE STRUCTURE DESIGN SPEC (2X3)	EACH	6	\$	1,000.00 \$ 6,000.00
144	2521.518	4" CONCRETE WALK	S F	6800	\$	6.50 \$ 44,200.00
145	2531.503	CONCRETE CURB & GUTTER DESIGN B612	L F	680	\$	20.00 \$ 13,600.00
146	2564.518	SIGN PANELS TYPE C	S F	100	\$	50.00 \$ 5,000.00
147	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	24	\$	250.00 \$ 6,000.00
148	2571.524	CONIFEROUS TREE 8" HT B&B	TREE	24	\$	300.00 \$ 7,200.00
148	2574.507	COMMON TOPSOIL BORROW	C Y	100	\$	30.00 \$ 3,000.00
149	2573.503	SILT FENCE; TYPE MS	L F	1000	\$	2.50 \$ 2,500.00
150	2575.505	SEEDING	ACRE	4	\$	1,500.00 \$ 6,000.00
151	2582.503	4" SOLID LINE MULTI COMP	L F	4000	\$	2.00 \$ 8,000.00
152	2582.518	PAVT MSSG MULTI COMP	S F	100	\$	10.00 \$ 1,000.00
153	2540.602	BIKE RACK	EACH	2	\$	800.00 \$ 1,600.00
154	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	6	\$	5,500.00 \$ 33,000.00
155	2540.602	BENCHES	EACH	6	\$	2,500.00 \$ 15,000.00
156	2540.602	TABLES	EACH	6	\$	6,000.00 \$ 36,000.00
157	2540.602					
158	SPEC	PLAYGROUND	S F	18000	\$	40.00 \$ 720,000.00
159	2540.601	SHELTER BUILDING (PAVILLION)	EACH	1	\$	1,800,000.00 \$ 1,800,000.00
160	SPEC	GAZEBO	EACH	3	\$	40,000.00 \$ 120,000.00
161				0		\$ -
162	SPEC	FISHING PIER	LS	1	\$	120,000.00 \$ 120,000.00
163	SPEC	LANDING	LS	1	\$	30,000.00 \$ 30,000.00
164				0		\$ -
165	SPEC	IRRIGATION	LS	1	\$	60,000.00 \$ 60,000.00
166				0		\$ -
					CONSTRUCTION TOTAL	\$ 3,371,670.75
					CONTINGENCY TOTAL (15%)	\$ 505,750.61
					SUBTOTAL	\$ 3,877,421.36
					INDIRECT COST TOTAL (25%)	\$ 842,917.69
					TOTAL	\$ 4,720,339.05

D. ENHANCED PERIMETER TRAILS & LANDSCAPING						
167	2021.501	MOBILIZATION	LS	1	\$	16,571.25
168	2531.504	STAMPED CONCRETE (PATHWAY)	S Y	1473	\$	25.00
169	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	45	\$	5,500.00
170	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	18	\$	300.00
171	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	18	\$	250.00
172	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	467	\$	75.00
173	2571.527	PERENNIAL	PLT	700	\$	20.00
174	2540.602	BENCHES	EACH	10	\$	2,500.00
175				0		\$
					CONSTRUCTION TOTAL	\$ 384,821.25
					CONTINGENCY TOTAL (15%)	\$ 57,723.19
					SUBTOTAL	\$ 442,544.44
					INDIRECT COST TOTAL (25%)	\$ 96,205.31
					TOTAL	\$ 538,749.75
E. ENHANCED STORM WATER TREATMENT						
177	2021.501	MOBILIZATION	LS	1	\$	15,325.00
178	SPEC	FOUNTAIN	EACH	3	\$	15,000.00
179	SPEC	AERATORS	EACH	15	\$	5,000.00
180	SPEC	ELECTRICAL SERVICE	LS	1	\$	50,000.00
181	SPEC	PUMP STATION	LS	1	\$	80,000.00
182	SPEC	SERVICE LINE	LS	100	\$	50.00
183	SPEC	PUMP HOUSE	LS	1	\$	20,000.00
184	SPEC	WET WELL	LS	1	\$	30,000.00
185	SPEC	VALVE	LS	1	\$	1,500.00
186				0		\$
					CONSTRUCTION TOTAL	\$ 321,825.00
					CONTINGENCY TOTAL (15%)	\$ 48,273.75
					SUBTOTAL	\$ 370,098.75
					INDIRECT COST TOTAL (25%)	\$ 80,456.25
					TOTAL	\$ 450,555.00
F. MISC						
187	2402.601	PEDESTRIAN BRIDGE (PRIORITY #2)	S F	1150	\$	235.00
188	2402.601	PEDESTRIAN BRIDGE (PRIORITY #1)	S F	650	\$	235.00
189				0		\$
					CONSTRUCTION TOTAL	\$ 423,000.00
					CONTINGENCY TOTAL (15%)	\$ 63,450.00
					SUBTOTAL	\$ 486,450.00
					INDIRECT COST TOTAL (25%)	\$ 105,750.00
					TOTAL	\$ 592,200.00
					GRAND TOTAL	\$ 11,285,750.18

OPINION OF PROBABLE COST - BEST

WSB Project: CHELSEA COMMONS
Project Location: MONTICELLO
City Project No.:
WSB Project No: 017991-000

Design By:	GT
Checked By:	JLS

Date: 8/2/2021

Item No.	MnDOT Specification No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
A. EDMONDSON BOULEVARD IMPROVEMENTS						
1	2021.501	MOBILIZATION	LS	1	\$ 3,035.00	\$ 3,035.00
2	2563.601	TRAFFIC CONTROL	LS	1	\$ 10,000.00	\$ 10,000.00
3	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	22	\$ 500.00	\$ 11,000.00
4	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	22	\$ 750.00	\$ 16,500.00
5	2540.602	BIKE RACK	EACH	4	\$ 800.00	\$ 3,200.00
6	2540.602	BENCHES	EACH	8	\$ 2,500.00	\$ 20,000.00
CONSTRUCTION TOTAL						\$ 63,735.00
CONTINGENCY TOTAL (15%)						\$ 9,560.25
SUBTOTAL						\$ 73,295.25
INDIRECT COST TOTAL (25%)						\$ 15,933.75
TOTAL						\$ 89,229.00
B. SECONDARY GATEWAY 1						
7	2021.501	MOBILIZATION	LS	1	\$ 3,763.75	\$ 3,763.75
8	2105.601	SITE GRADING	LS	1	\$ 2,500.00	\$ 2,500.00
8	2521.518	4" CONCRETE WALK	S F	3520	\$ 7.50	\$ 26,400.00
9	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	2	\$ 300.00	\$ 600.00
10	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	2	\$ 250.00	\$ 500.00
11	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	29	\$ 75.00	\$ 2,175.00
12	2571.527	PERENNIAL	PLT	44	\$ 20.00	\$ 880.00
13	2574.507	COMMON TOPSOIL BORROW	C Y	339	\$ 20.00	\$ 6,780.00
14	2573.503	SILT FENCE; TYPE MS	L F	176	\$ 2.50	\$ 440.00
15	2575.505	SEEDING	ACRE	1	\$ 1,500.00	\$ 1,500.00
16	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	2	\$ 5,500.00	\$ 11,000.00
17	2540.602	BENCHES	EACH	3	\$ 2,500.00	\$ 7,500.00
18		IRRIGATION	LS	1	\$ 15,000.00	\$ 15,000.00
19						
CONSTRUCTION TOTAL						\$ 79,038.75
CONTINGENCY TOTAL (15%)						\$ 11,855.81
SUBTOTAL						\$ 90,894.56
INDIRECT COST TOTAL (25%)						\$ 19,759.69
TOTAL						\$ 110,654.25
B. SECONDARY GATEWAY 2						
20	2021.501	MOBILIZATION	LS	1	\$ 5,948.45	\$ 5,948.45
21	2105.601	SITE GRADING	LS	1	\$ 2,500.00	\$ 2,500.00
22	2521.518	4" CONCRETE WALK	S F	5960	\$ 7.50	\$ 44,700.00
23	2531.504	STAMPED CONCRETE (PAVILION)	S Y	430	\$ 25.00	\$ 10,750.00
24	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	3	\$ 300.00	\$ 900.00
25	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	4	\$ 250.00	\$ 1,000.00
26	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	48	\$ 75.00	\$ 3,600.00
27	2571.527	PERENNIAL	PLT	72	\$ 20.00	\$ 1,440.00
28	2574.507	COMMON TOPSOIL BORROW	C Y	366.7	\$ 20.00	\$ 7,334.00
29	2573.503	SILT FENCE; TYPE MS	L F	298	\$ 2.50	\$ 745.00
30	2575.505	SEEDING	ACRE	1	\$ 1,500.00	\$ 1,500.00
31	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	4	\$ 5,500.00	\$ 22,000.00
32	2540.602	BENCHES	EACH	3	\$ 2,500.00	\$ 7,500.00
33		IRRIGATION	LS	1	\$ 15,000.00	\$ 15,000.00
34						
CONSTRUCTION TOTAL						\$ 124,917.45
CONTINGENCY TOTAL (15%)						\$ 18,737.62
SUBTOTAL						\$ 143,655.07
INDIRECT COST TOTAL (25%)						\$ 31,229.36
TOTAL						\$ 174,884.43
B. SECONDARY GATEWAY 3						
35	2021.501	MOBILIZATION	LS	1	\$ 9,155.75	\$ 9,155.75
36	2105.601	SITE GRADING	LS	1	\$ 2,500.00	\$ 2,500.00
36	2521.518	4" CONCRETE WALK	S F	9000	\$ 7.50	\$ 67,500.00
37	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	5	\$ 300.00	\$ 1,500.00
38	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	6	\$ 250.00	\$ 1,500.00
39	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	142	\$ 75.00	\$ 10,650.00
40	2571.527	PERENNIAL	PLT	213	\$ 20.00	\$ 4,260.00
41	2574.507	COMMON TOPSOIL BORROW	C Y	754.0	\$ 20.00	\$ 15,080.00
42	2573.503	SILT FENCE; TYPE MS	L F	450	\$ 2.50	\$ 1,125.00
43	2575.505	SEEDING	ACRE	2	\$ 1,500.00	\$ 3,000.00
44	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	7	\$ 5,500.00	\$ 38,500.00
45	2540.602	BENCHES	EACH	3	\$ 2,500.00	\$ 7,500.00
46		IRRIGATION	LS	1	\$ 30,000.00	\$ 30,000.00

					CONTINGENCY TOTAL (15%)	\$	28,840.61
					SUBTOTAL	\$	221,111.36
					INDIRECT COST TOTAL (25%)	\$	48,067.69
					TOTAL	\$	269,179.05
B. SECONDARY GATEWAY 4							
48	2021.501	MOBILIZATION	LS	1	\$	5,241.88	5,241.88
49	2105.601	SITE GRADING	LS	1	\$	2,500.00	2,500.00
49	2521.518	4" CONCRETE WALK	S F	3500	\$	7.50	26,250.00
50	2531.504	STAMPED CONCRETE (PAVILION)	S Y	229	\$	25.00	5,725.00
51	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	2	\$	300.00	600.00
52	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	2	\$	250.00	500.00
53	2571.524	CONIFEROUS SHRUB 15" HT CONT	SHRB	75	\$	75.00	5,625.00
54	2571.527	PERENNIAL	PLT	43.0	\$	20.00	860.00
55	2574.507	COMMON TOPSOIL BORROW	C Y	542	\$	20.00	10,840.00
56	2573.503	SILT FENCE; TYPE MS	L F	175	\$	2.50	437.50
57	2575.505	SEEDING	ACRE	2	\$	1,500.00	3,000.00
58	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	2	\$	5,500.00	11,000.00
59	2540.602	BENCHES	EACH	3	\$	2,500.00	7,500.00
60		IRRIGATION	LS	1	\$	30,000.00	30,000.00
61				0			
					CONSTRUCTION TOTAL	\$	110,079.38
					CONTINGENCY TOTAL (15%)	\$	16,511.91
					SUBTOTAL	\$	126,591.28
					INDIRECT COST TOTAL (25%)	\$	27,519.84
					TOTAL	\$	154,111.13
C. CITY PARK IMPROVEMENTS							
62	2021.501	MOBILIZATION	LS	1	\$	12,991.63	12,991.63
63	2105.504	GEOTEXTILE FABRIC TYPE 5	S Y	3033	\$	2.50	7,582.50
64	2105.601	SITE GRADING	LS	1	\$	2,500.00	2,500.00
65	2106.507	EXCAVATION - COMMON	C Y	843	\$	25.00	21,075.00
66	2106.507	EXCAVATION - SUBGRADE (P)	C Y	1379	\$	25.00	34,475.00
67	2211.507	AGGREGATE BASE (CV) CLASS 5 (P)	C Y	613	\$	30.00	18,390.00
68	2360.509	TYPE SP 9.5 WEARING COURSE MIX (2,B)	TON	234	\$	70.00	16,380.00
69	2360.509	TYPE SP 12.5 WEARING COURSE MIX (2,B)	TON	234	\$	70.00	16,380.00
70	2503.503	15" RC PIPE SEWER DES 3006 CLASS V	LF	500	\$	60.00	30,000.00
71	2503.602	CONNECT TO EXISTING STORM SEWER	EACH	1	\$	1,500.00	1,500.00
72	2506.503	CONST DRAINAGE STRUCTURE DES 48-4020	LF	12	\$	150.00	1,800.00
73	2506.602	CONST DRAINAGE STRUCTURE DESIGN SPEC (2X3)	EACH	6	\$	1,000.00	6,000.00
74	2521.518	4" CONCRETE WALK	S F	6700	\$	6.50	43,550.00
75	2531.503	CONCRETE CURB & GUTTER DESIGN B612	L F	250	\$	20.00	5,000.00
76	2564.518	SIGN PANELS TYPE C	S F	100	\$	50.00	5,000.00
77	2571.524	DECIDUOUS TREE 2" CAL B&B	TREE	2	\$	250.00	500.00
78	2571.524	CONIFEROUS TREE 8' HT B&B	TREE	2	\$	300.00	600.00
79	2574.507	COMMON TOPSOIL BORROW	C Y	100	\$	30.00	3,000.00
80	2573.503	SILT FENCE; TYPE MS	L F	1000	\$	2.50	2,500.00
81	2582.503	4" SOLID LINE MULTI COMP	L F	4000	\$	2.00	8,000.00
82	2582.518	PAVT MSSG MULTI COMP	S F	100	\$	10.00	1,000.00
83	2540.602	BIKE RACK	EACH	2	\$	800.00	1,600.00
84	2545.502	LIGHTING UNIT TYPE SPECIAL	EACH	6	\$	5,500.00	33,000.00
85							
86		PLAYGROUND - BETTER	S F	18000	\$	56.00	1,008,000.00
87		SPLASH/BUBBLER PAD	EACH	1	\$	500,000.00	500,000.00
88		BOAT SLIPS	EACH	6	\$	3,500.00	21,000.00
89							
					CONSTRUCTION TOTAL	\$	272,824.13
					CONTINGENCY TOTAL (15%)	\$	40,923.62
					SUBTOTAL	\$	313,747.74
					INDIRECT COST TOTAL (25%)	\$	68,206.03
					TOTAL	\$	381,953.78
D. WATER QUALITY							
90	2501.503	8" FORCEMAIN WATER LINE	L F	1200	\$	60.00	72,000.00
91		PUMP STATION	LS	1	\$	150,000.00	150,000.00
92		ELECTRICAL SERVICE	LS	1	\$	50,000.00	50,000.00
93							
94							
95							
96							
97							
98							
					CONSTRUCTION TOTAL	\$	272,000.00
					CONTINGENCY TOTAL (15%)	\$	40,800.00
					SUBTOTAL	\$	312,800.00
					INDIRECT COST TOTAL (25%)	\$	68,000.00
					TOTAL	\$	380,800.00
E. MISC							
99	2021.501	MOBILIZATION	LS	1	\$	61,010.00	61,010.00
100		CASCADES	LS	1	\$	500,000.00	500,000.00
101		SOUND SYSTEM	LS	1	\$	50,000.00	50,000.00
102		BOARDWALK	SF	2400	\$	250.00	600,000.00
103		ADDITIONAL PATHWAY WIDTH AND SPURS	SF	10800	\$	6.50	70,200.00
104							

105					
106					
				CONSTRUCTION TOTAL	\$ 1,281,210.00
				CONTINGENCY TOTAL (15%)	\$ 192,181.50
				SUBTOTAL	\$ 1,473,391.50
				INDIRECT COST TOTAL (25%)	\$ 368,347.88
				TOTAL	\$ 1,841,739.38
				GRAND TOTAL	\$ 3,021,751.01

OPINION OF PROBABLE COST - GOOD - INTERSECTION IMPROVEMENTS - SIGNAL/STOP

WSB Project: CHELSEA COMMONS
Project Location: MONTICELLO
City Project No.:
WSB Project No: 017991-000

Design By:	GT
Checked By:	JLS
Date:	8/4/2021

Item No.	MnDOT Specification No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
A1. EDMONSON AVENUE & CHELSEA ROAD INTERSECTION IMPROVEMENTS (ALL-WAY STOP)						
1	2021.501	MOBILIZATION	LS	1	\$ 7,969.25	\$ 7,969.25
2	2104.502	REMOVE SIGN	EACH	5	\$ 40.00	\$ 200.00
3	2104.502	REMOVE DRAINAGE STRUCTURE	EACH	2	\$ 100.00	\$ 200.00
4	2104.503	SAWING BIT PAVEMENT (FULL DEPTH)	L F	160	\$ 3.00	\$ 480.00
5	2104.503	REMOVE CURB & GUTTER	L F	230	\$ 15.00	\$ 3,450.00
6	2104.504	REMOVE BITUMINOUS PAVEMENT	S Y	1980	\$ 6.00	\$ 11,880.00
7	2105.504	GEOTEXTILE FABRIC TYPE 4	S Y	350	\$ 5.00	\$ 1,750.00
8	2106.507	EXCAVATION - COMMON (P)	C Y	120	\$ 35.00	\$ 4,200.00
9	2106.507	EXCAVATION - SUBGRADE	C Y	150	\$ 35.00	\$ 5,250.00
10	2106.507	SELECT GRANULAR EMBANKMENT (CV)	C Y	150	\$ 45.00	\$ 6,750.00
11	2211.507	AGGREGATE BASE (CV) CLASS 5	C Y	80	\$ 45.00	\$ 3,600.00
12	2130.523	WATER	MGAL	25	\$ 75.00	\$ 1,875.00
13	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	20	\$ 5.00	\$ 100.00
14	2360.509	TYPE SP 12.5 WEARING COURSE MIX (3:C) (NEW PAVEMENT)	TON	39	\$ 150.00	\$ 5,850.00
15	2360.509	TYPE SP 12.5 WEARING COURSE MIX (3:C) (OVERLAY)	TON	336	\$ 150.00	\$ 50,400.00
16	2521.518	3" BITUMINOUS WALK	S F	500	\$ 10.00	\$ 5,000.00
17	2531.503	CONCRETE CURB & GUTTER DESIGN B618	L F	500	\$ 30.00	\$ 15,000.00
18	2531.618	TRUNCATED DOMES	S F	100	\$ 50.00	\$ 5,000.00
19	2563.601	TRAFFIC CONTROL	LS	1	\$ 10,000.00	\$ 10,000.00
20	2564.518	SIGN PANELS TYPE C	S F	100	\$ 50.00	\$ 5,000.00
21	2573.503	SILT FENCE; TYPE MS	L F	300	\$ 2.50	\$ 750.00
22	2573.503	SEDIMENT CONTROL LOG TYPE WOOD FIBER	L F	300	\$ 2.50	\$ 750.00
23	2582.518	CROSSWALK PAINT	S F	100	\$ 10.00	\$ 1,000.00
24	2582.503	4" SOLID LINE MULTI COMP	L F	300	\$ 3.00	\$ 900.00
25	2582.518	PAVT MSSG MULTI COMP	S F	100	\$ 10.00	\$ 1,000.00
26						
27	2504.602	ADJUST CASTING	EACH	5	\$ 800.00	\$ 4,000.00
28	2506.602	CONST DRAINAGE STRUCTURE DESIGN SPEC (2X3)	EACH	2	\$ 2,500.00	\$ 5,000.00
29	2503.602	CONNECT TO EXISTING STORM SEWER	EACH	2	\$ 2,500.00	\$ 5,000.00
30	2503.503	15" RC PIPE SEWER DES 3006 CLASS V	LF	50	\$ 80.00	\$ 4,000.00
31				0	\$ -	\$ -
32	2506.502	CASTING ASSEMBLY (SANITARY)	EACH	1	\$ 750.00	\$ 750.00
33	2506.602	CHIMNEY SEAL	EACH	1	\$ 250.00	\$ 250.00
34				0	\$ -	\$ -
CONSTRUCTION TOTAL						\$ 167,354.25
CONTINGENCY TOTAL (15%)						\$ 25,103.14
SUBTOTAL						\$ 192,457.39
INDIRECT COST TOTAL (25%)						\$ 41,838.56
TOTAL						\$ 234,295.95
B1. CEDAR STREET & SCHOOL BOULEVARD INTERSECTION IMPROVEMENTS (SIGNAL)						
35	2021.501	MOBILIZATION	LS	1	\$ 21,367.50	\$ 21,367.50
36	2104.502	REMOVE SIGN	EACH	10	\$ 40.00	\$ 400.00
37	2104.502	REMOVE DRAINAGE STRUCTURE	EACH	12	\$ 100.00	\$ 1,200.00
38	2104.503	SAWING BIT PAVEMENT (FULL DEPTH)	L F	200	\$ 5.00	\$ 1,000.00
39	2104.503	REMOVE CURB & GUTTER	L F	170	\$ 15.00	\$ 2,550.00
40	2104.504	REMOVE BITUMINOUS PAVEMENT	S Y	40	\$ 5.00	\$ 200.00
41	2104.504	REMOVE CONCRETE WALK	S F	1360	\$ 5.00	\$ 6,800.00
42	2105.504	GEOTEXTILE FABRIC TYPE 4	S Y	170	\$ 5.00	\$ 850.00
43	2106.507	EXCAVATION - COMMON (P)	C Y	70	\$ 35.00	\$ 2,450.00
44	2106.507	EXCAVATION - SUBGRADE	C Y	90	\$ 35.00	\$ 3,150.00
45	2106.507	SELECT GRANULAR EMBANKMENT (CV)	C Y	90	\$ 45.00	\$ 4,050.00
46	2211.507	AGGREGATE BASE (CV) CLASS 5	C Y	30	\$ 45.00	\$ 1,350.00
47	2130.523	WATER	MGAL	50	\$ 75.00	\$ 3,750.00
48	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	10	\$ 5.00	\$ 50.00
49	2360.509	TYPE SP 12.5 WEARING COURSE MIX (3:C) (NEW PAVEMENT)	TON	60	\$ 150.00	\$ 9,000.00
50	2521.518	4" CONCRETE WALK	S F	1500	\$ 10.00	\$ 15,000.00
51	2531.503	CONCRETE CURB & GUTTER DESIGN B618	L F	190	\$ 25.00	\$ 4,750.00
52	2531.618	TRUNCATED DOMES	S F	50	\$ 50.00	\$ 2,5

C1. EDMONSON AVENUE & SCHOOL BOULEVARD INTERSECTION IMPROVEMENTS (SIGNAL)						
63	2021.501	MOBILIZATION	LS	1	\$	34,745.50
64	2104.502	REMOVE SIGN	EACH	5	\$	40.00
65	2104.502	REMOVE DRAINAGE STRUCTURE	EACH	3	\$	100.00
66	2104.503	SAWING BIT PAVEMENT (FULL DEPTH)	L F	160	\$	3.00
67	2104.503	REMOVE CURB & GUTTER	L F	440	\$	15.00
68	2104.504	REMOVE BITUMINOUS PAVEMENT	S Y	1670	\$	5.00
69	2104.504	REMOVE BITUMINOUS WALK	S F	2940	\$	5.00
70	2105.504	GEOTEXTILE FABRIC TYPE 4	S Y	2710	\$	5.00
71	2106.507	EXCAVATION - COMMON (P)	C Y	1130	\$	35.00
72	2106.507	EXCAVATION - SUBGRADE	C Y	680	\$	35.00
73	2106.507	SELECT GRANULAR EMBANKMENT (CV)	C Y	680	\$	40.00
74	2211.507	AGGREGATE BASE (CV) CLASS 5	C Y	760	\$	40.00
75	2130.523	WATER	MGAL	50	\$	75.00
76	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	120	\$	5.00
77	2360.509	TYPE SP 12.5 WEARING COURSE MIX (3;C)	TON	770	\$	100.00
78	2521.518	3" BITUMINOUS WALK	S F	3230	\$	6.00
79	2521.518	6" CONCRETE WALK (MEDIANS)	S F	850	\$	10.00
80	2531.503	CONCRETE CURB & GUTTER DESIGN B618	L F	520	\$	25.00
81	2531.618	TRUNCATED DOMES	S F	200	\$	50.00
82	2563.601	TRAFFIC CONTROL	LS	1	\$	10,000.00
83	2564.518	SIGN PANELS TYPE C	S F	250	\$	2.50
84	2573.503	SILT FENCE; TYPE MS	L F	250	\$	2.50
85	2573.503	SEDIMENT CONTROL LOG TYPE WOOD FIBER	L F	250	\$	10.00
86	2582.518	CROSSWALK PAINT	S F	250	\$	3.00
87	2582.503	4" SOLID LINE MULTI COMP	L F	400	\$	10.00
88	2582.518	PAVT MSSG MULTI COMP	S F	100	\$	10.00
89						\$ -
90	2506.602	CONST DRAINAGE STRUCTURE DESIGN SPEC (2X3)	EACH	6	\$	1,200.00
91	2503.602	CONNECT TO EXISTING STORM SEWER	EACH	1	\$	1,500.00
92	2503.503	15" RC PIPE SEWER DES 3006 CLASS V	LF	300	\$	60.00
93						\$ -
94	2506.502	CASTING ASSEMBLY (SANITARY)	EACH	1	\$	700.00
95	2506.602	CHIMNEY SEAL	EACH	1	\$	250.00
96						\$ -
97	2504.602	ADJUST GATE VALVE	EACH	2	\$	200.00
98						\$ -
99	SPEC	TRAFFIC SIGNAL	LS	1	\$	350,000.00
100						\$ -
					CONSTRUCTION TOTAL	\$ 729,655.50
					CONTINGENCY TOTAL (15%)	\$ 109,448.33
					SUBTOTAL	\$ 839,103.83
					INDIRECT COST TOTAL (25%)	\$ 182,413.88
					TOTAL	\$ 1,021,517.70
D1. CEDAR STREET & CHELSEA ROAD INTERSECTION IMPROVEMENTS (SIGNAL)						
101	2021.501	MOBILIZATION	LS	1	\$	20,656.18
102	2104.503	SAWING BIT PAVEMENT (FULL DEPTH)	L F	320	\$	3.00
103	2104.503	REMOVE CURB & GUTTER	L F	320	\$	15.00
104	2104.504	REMOVE BITUMINOUS PAVEMENT	S Y	70	\$	5.00
105	2104.504	REMOVE CONCRETE WALK	S F	650.0	\$	5.00
106	2105.504	GEOTEXTILE FABRIC TYPE 4	S Y	250	\$	5.00
107	2106.507	EXCAVATION - COMMON (P)	C Y	110	\$	35.00
108	2106.507	EXCAVATION - SUBGRADE	C Y	130	\$	35.00
109	2106.507	SELECT GRANULAR EMBANKMENT (CV)	C Y	130	\$	40.00
110	2211.507	AGGREGATE BASE (CV) CLASS 5	C Y	70	\$	40.00
111	2130.523	WATER	MGAL	25	\$	75.00
112	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	11	\$	3.50
113	2360.509	TYPE SP 12.5 WEARING COURSE MIX (3;C)	TON	70	\$	150.00
114	2521.518	4" CONCRETE WALK	S F	650	\$	7.50
115	2531.503	CONCRETE CURB & GUTTER DESIGN B618	L F	340	\$	25.00
116	2531.618	TRUNCATED DOMES	S F	200	\$	50.00
117	2563.601	TRAFFIC CONTROL	LS	1	\$	10,000.00
118	2564.518	SIGN PANELS TYPE C	S F	50	\$	2.50
119	2573.503	SILT FENCE; TYPE MS	L F	200	\$	2.50
120	2573.503	SEDIMENT CONTROL LOG TYPE WOOD FIBER	L F	200	\$	10.00
121	2582.518	CROSSWALK PAINT	S F	200	\$	3.00
122	2582.503	4" SOLID LINE MULTI COMP	L F	300	\$	10.00
123	2582.518	PAVT MSSG MULTI COMP	S F	100	\$	10.00
124						
125	2504.602	ADJUST CASTING	EACH	2	\$	800.00
126	2506.602	CONST DRAINAGE STRUCTURE DESIGN SPEC (2X3)	EACH	2	\$	2,500.00
127	2503.602	CONNECT TO EXISTING STORM SEWER	EACH	1	\$	2,500.00
128	2503.503	15" RC PIPE SEWER DES 3006 CLASS V	LF	50	\$	80.00
129						\$ -
130	SPEC	TRAFFIC SIGNAL	LS	1	\$	320,000.00
131						
					CONSTRUCTION TOTAL	\$ 433,779.68
					CONTINGENCY TOTAL (15%)	\$ 65,066.95
					SUBTOTAL	\$ 498,846.63
					INDIRECT COST TOTAL (25%)	\$ 108,444.92
					TOTAL	\$ 607,291.55
					GRAND TOTAL	\$ 2,491,309.70

OPINION OF PROBABLE COST - BEST - INTERSECTION IMPROVEMENTS - ROUNDABOUTS

WSB Project: CHELSEA COMMONS
Project Location: MONTICELLO
City Project No.:
WSB Project No: 017991-000

<i>Design By:</i>	GT
<i>Checked By:</i>	JLS
<i>Date:</i>	8/4/2021

Item No.	MnDOT Specification No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
A2. CEDAR STREET & CHELSEA ROAD INTERSECTION IMPROVEMENTS (ROUNDAABOUT)						
1	2021.501	MOBILIZATION	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
2	2104.503	REMOVE CURB & GUTTER	LIN FT	2900	\$ 5.00	\$ 14,500.00
3	2104.504	REMOVE BITUMINOUS PAVEMENT	SQ YD	5745	\$ 5.50	\$ 31,597.50
4	2106.507	EXCAVATION - COMMON	CU YD	2875	\$ 8.00	\$ 23,000.00
5	2106.507	COMMON EMBANKMENT (CV)	CU YD	720	\$ 6.00	\$ 4,320.00
6	2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	715	\$ 35.00	\$ 25,025.00
7	2301.504	CONCRETE PAVEMENT 7.0"	SQ YD	340	\$ 37.00	\$ 12,580.00
8	2360.509	TYPE SP 9.5 WEARING COURSE MIX (4;F)	TON	510	\$ 72.00	\$ 36,720.00
9	2360.509	TYPE SP 12.5 NON WEAR COURSE MIX (4;B)	TON	340	\$ 60.00	\$ 20,400.00
10	2506.501	DRAINAGE	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
11	2521.518	4" CONCRETE WALK	SQ FT	7325	\$ 7.00	\$ 51,275.00
12	2531.503	CONCRETE CURB & GUTTER DESIGN B624	LIN FT	1805	\$ 30.00	\$ 54,150.00
13	2531.503	CONCRETE CURB & GUTTER DESIGN R424	LIN FT	210	\$ 34.00	\$ 7,140.00
14	2545.501	LIGHTING	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
15	2563.601	TRAFFIC CONTROL	LUMP SUM	1	\$ 6,000.00	\$ 6,000.00
16	2564.501	SIGNING	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
17	2575.501	TURF ESTABLISHMENT & EROSION CONTROL	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
18	2582.501	PAVEMENT MARKINGS	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
CONSTRUCTION TOTAL					\$	441,707.50
CONTINGENCY TOTAL (20%)					\$	88,341.50
SUBTOTAL					\$	530,049.00
INDIRECT COST TOTAL (25%)					\$	110,426.88
TOTAL					\$	640,475.88
B2. CEDAR STREET & SCHOOL BOULEVARD INTERSECTION IMPROVEMENTS (ROUNDAABOUT)						
19	2021.501	MOBILIZATION	LUMP SUM	1	\$ 25,000.00	\$ 25,000.00
20	2104.503	REMOVE CURB & GUTTER	LIN FT	3550	\$ 5.00	\$ 17,750.00
21	2104.504	REMOVE BITUMINOUS PAVEMENT	SQ YD	6060	\$ 5.50	\$ 33,330.00
22	2106.507	EXCAVATION - COMMON	CU YD	3535	\$ 7.00	\$ 24,745.00
23	2106.507	COMMON EMBANKMENT (CV)	CU YD	890	\$ 5.00	\$ 4,450.00
24	2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	880	\$ 35.00	\$ 30,800.00
25	2301.504	CONCRETE PAVEMENT 7.0"	SQ YD	315	\$ 37.00	\$ 11,655.00
26	2360.509	TYPE SP 9.5 WEARING COURSE MIX (4;F)	TON	555	\$ 72.00	\$ 39,960.00
27	2360.509	TYPE SP 12.5 NON WEAR COURSE MIX (4;B)	TON	370	\$ 60.00	\$ 22,200.00
28	2506.501	DRAINAGE	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
29	2521.518	4" CONCRETE WALK	SQ FT	15180	\$ 5.50	\$ 83,490.00
30	2531.503	CONCRETE CURB & GUTTER DESIGN B612	LIN FT	1880	\$ 28.00	\$ 52,640.00
31	2531.503	CONCRETE CURB & GUTTER DESIGN B624	LIN FT	1750	\$ 30.00	\$ 52,500.00
32	2531.503	CONCRETE CURB & GUTTER DESIGN R424	LIN FT	190	\$ 34.00	\$ 6,460.00
33	2545.501	LIGHTING	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
34	2563.601	TRAFFIC CONTROL	LUMP SUM	1	\$ 7,500.00	\$ 7,500.00
35	2564.501	SIGNING	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
36	2575.501	TURF ESTABLISHMENT & EROSION CONTROL	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
37	2582.501	PAVEMENT MARKINGS	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
CONSTRUCTION TOTAL					\$	547,480.00
CONTINGENCY TOTAL (20%)					\$	109,496.00
SUBTOTAL					\$	656,976.00
INDIRECT COST TOTAL (25%)					\$	136,870.00
TOTAL					\$	793,846.00

C2. EDMONSON AVENUE & SCHOOL BOULEVARD INTERSECTION IMPROVEMENTS (ROUNDBOUT)						
38	2021.501	MOBILIZATION	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
39	2104.503	REMOVE CURB & GUTTER	LIN FT	1072	\$ 5.00	\$ 5,360.00
40	2104.504	REMOVE BITUMINOUS PAVEMENT	SQ YD	4780	\$ 5.50	\$ 26,290.00
41	2106.507	EXCAVATION - COMMON	CU YD	2390	\$ 7.50	\$ 17,925.00
42	2106.507	COMMON EMBANKMENT (CV)	CU YD	600	\$ 5.25	\$ 3,150.00
43	2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	790	\$ 35.00	\$ 27,650.00
44	2301.504	CONCRETE PAVEMENT 7.0"	SQ YD	255	\$ 37.00	\$ 9,435.00
45	2360.509	TYPE SP 9.5 WEARING COURSE MIX (4;F)	TON	625	\$ 72.00	\$ 45,000.00
46	2360.509	TYPE SP 12.5 NON WEAR COURSE MIX (4;B)	TON	420	\$ 60.00	\$ 25,200.00
47	2506.501	DRAINAGE	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
48	2521.518	4" CONCRETE WALK	SQ FT	6630	\$ 7.00	\$ 46,410.00
49	2531.503	CONCRETE CURB & GUTTER DESIGN B612	SQ FT	1500	\$ 28.00	\$ 42,000.00
50	2531.503	CONCRETE CURB & GUTTER DESIGN B624	LIN FT	1810	\$ 30.00	\$ 54,300.00
51	2531.503	CONCRETE CURB & GUTTER DESIGN R424	LIN FT	170	\$ 34.00	\$ 5,780.00
52	2545.501	LIGHTING	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
53	2563.601	TRAFFIC CONTROL	LUMP SUM	1	\$ 6,000.00	\$ 6,000.00
54	2564.501	SIGNING	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
54	2575.501	TURF ESTABLISHMENT & EROSION CONTROL	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
55	2582.501	PAVEMENT MARKINGS	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
					CONSTRUCTION TOTAL	\$ 469,500.00
					CONTINGENCY TOTAL (20%)	\$ 93,900.00
					SUBTOTAL	\$ 563,400.00
					INDIRECT COST TOTAL (25%)	\$ 117,375.00
					TOTAL	\$ 680,775.00
D2. EDMONSON AVENUE & CHELSEA ROAD INTERSECTION IMPROVEMENTS (ROUNDBOUT)						
56	2021.501	MOBILIZATION	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
57	2104.503	REMOVE CURB & GUTTER	LIN FT	1340	\$ 5.00	\$ 6,700.00
58	2104.504	REMOVE BITUMINOUS PAVEMENT	SQ YD	3930	\$ 6.00	\$ 23,580.00
59	2106.507	EXCAVATION - COMMON	CU YD	2250	\$ 8.00	\$ 18,000.00
60	2106.507	COMMON EMBANKMENT (CV)	CU YD	575	\$ 6.00	\$ 3,450.00
61	2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	705	\$ 35.00	\$ 24,675.00
62	2301.504	CONCRETE PAVEMENT 7.0"	SQ YD	255	\$ 37.00	\$ 9,435.00
63	2360.509	TYPE SP 9.5 WEARING COURSE MIX (4;F)	TON	550	\$ 72.00	\$ 39,600.00
64	2360.509	TYPE SP 12.5 NON WEAR COURSE MIX (4;B)	TON	365	\$ 60.00	\$ 21,900.00
65	2506.501	DRAINAGE	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
66	2521.518	4" CONCRETE WALK	SQ FT	3390	\$ 7.00	\$ 23,730.00
66	2531.503	CONCRETE CURB & GUTTER DESIGN B612	LIN FT	870	\$ 28.00	\$ 24,360.00
67	2531.503	CONCRETE CURB & GUTTER DESIGN B624	LIN FT	1640	\$ 30.00	\$ 49,200.00
68	2531.503	CONCRETE CURB & GUTTER DESIGN R424	LIN FT	175	\$ 34.00	\$ 5,950.00
69	2545.501	LIGHTING	LUMP SUM	1	\$ 50,000.00	\$ 50,000.00
70	2563.601	TRAFFIC CONTROL	LUMP SUM	1	\$ 6,000.00	\$ 6,000.00
71	2564.501	SIGNING	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
72	2575.501	TURF ESTABLISHMENT & EROSION CONTROL	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
73	2582.501	PAVEMENT MARKINGS	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
					CONSTRUCTION TOTAL	\$ 411,580.00
					CONTINGENCY TOTAL (20%)	\$ 82,316.00
					SUBTOTAL	\$ 493,896.00
					INDIRECT COST TOTAL (25%)	\$ 102,895.00
					TOTAL	\$ 596,791.00
					GRAND TOTAL	\$ 2,711,887.88