

STORMWATER MANAGEMENT REPORT

“1471-1475 BRALEY ROAD CONDOMINIUMS”

**1471-1475 Braley Road
New Bedford, Massachusetts**

January 10, 2019

Prepared for:

Braley Woods Condominiums

1471-1475 Braley Road
New Bedford, MA

Prepared by:

InSite Engineering Services, LLC

InSite Professional Complex – Suite #1
1539 Fall River Avenue
Seekonk, MA 02771



SECTION I - INTRODUCTION

The existing Braley Woods Condominiums site is located east side of Braley Road in New Bedford, Massachusetts. The property is situated north of Susan Street and westerly of Mass State Route 140. The Condominium Association is proposing the repaving of the existing parking areas at 1471 and 1475 Braley Road.

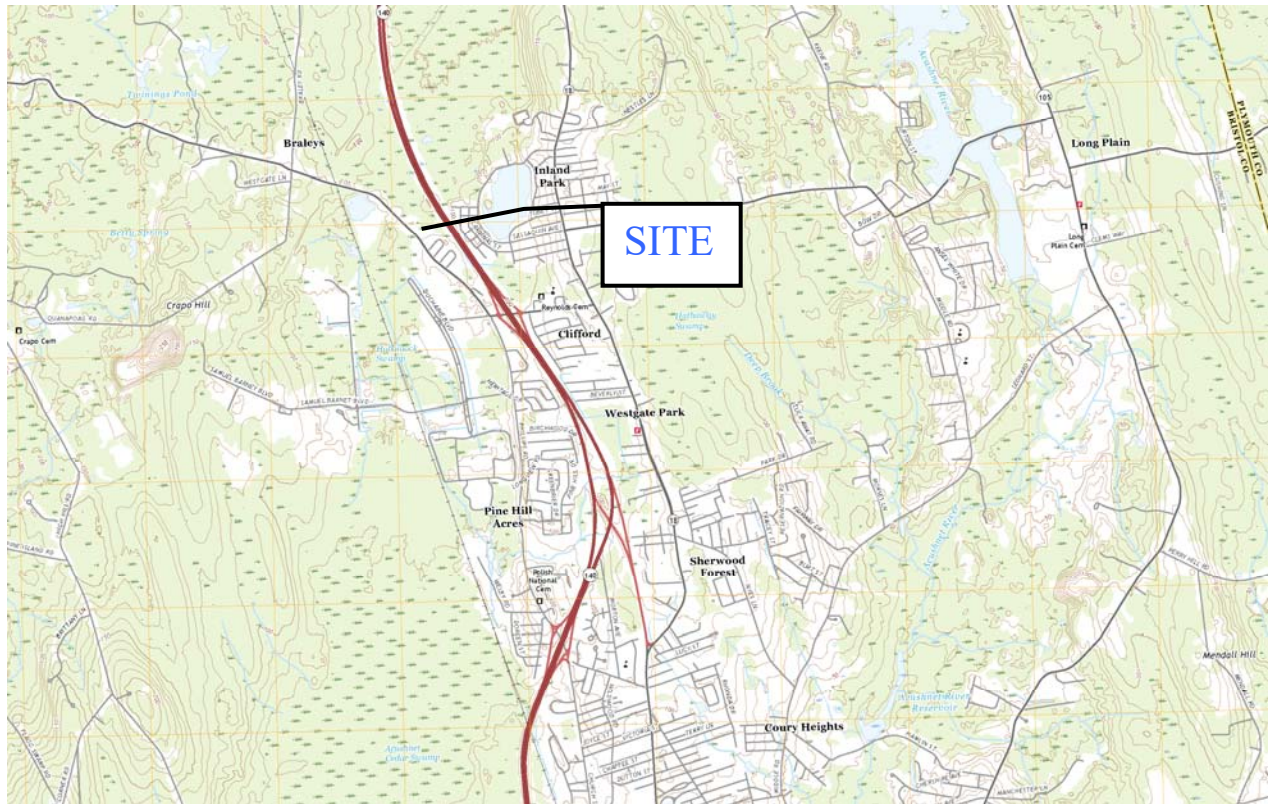
The condominium site parking will not create any additional parking spaces however will meet the required drainage standards of the New Bedford Department of Public Infrastructure (DPI). This drainage report is intended to be used in conjunction with the Site Plans of “NOI - 1471-1475 Braley Woods Condominium” in New Bedford, MA.

SECTION II - EXISTING SITE CONDITIONS

The existing project is shown on New Bedford Assessor Map 137 Lots 108 and 109. The proposed site comprises of 5.89± acres (lot 108) and 0.53 acres (lot 109) of land located within the New Bedford Zoning district “MUB”. Residential properties surround the existing site.

The site currently has two three story existing condominium building with associated parking areas. The site has gently sloping terrain running from south to north and east to west towards Braley Road. The majority of the stormwater flows are captured within to a closed drainage system consisting of two catch basins. Each catch basin has outlet pipes that are directed to an existing wetland to the north within Lot 108. This system has been in existence since the property was built. storm. The site is comprised of sand and gravel soils.

Locus Map



Soil Classification

The SCS Soil Maps designate two soil types, Sudbury and Pits, Hydrologic Soil Group” B” series soils. Refer to the soil map (see Figure 2) for Soil and Water Features from the *New Bedford, Massachusetts, Soil Survey* a cooperative effort of the United States Department of Agriculture (USDA), Soil Conservation Service, and the Massachusetts Agricultural Experiment Station.



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
39A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	6.4	14.3%
52A	Freetown muck, 0 to 1 percent slopes	20.0	44.6%
242B	Hinckley loamy sand, 3 to 8 percent slopes	0.7	1.6%
242C	Hinckley loamy sand, 8 to 15 percent slopes	0.4	0.9%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	12.4	27.6%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	2.7	5.9%
617	Pits - Udorthents complex, gravelly	2.2	5.0%
Totals for Area of Interest		45.0	100.0%

SECTION III - PROPOSED SITE CONDITIONS

Project Description

The owner proposes the construction of an auto sales facility with improvements described as follows:

- Repavement of existing parking lots
- Installation of drainage trench drain

Site Drainage Calculations

A comprehensive site drainage system was developed for a total contributing watershed of approximately $0.22 \pm$ acres for a 100-year design storm frequency. The stormwater runoff includes landscaping and paved surface. The drainage design includes two subareas. The total watershed area consists of a parking area along the south side and overflow from the upper parking lot to the east. The stormwater is directed to the west to a stormwater system consisting of a trench drain and deep sump catch basin

Times of concentrations (TOC) for the longest overland flow path within each area were determined using the TR-55 Method. Each flow path is represented individually the subarea calc sheets. A minimum of 5 minutes was taken for the initial TOC's. A weighted curve number CN, was derived for each subarea based on land usage and soil types

SECTION IV – STORMWATER MANAGEMENT SYSTEM DESIGN

No Untreated Stormwater

The stormwater management system for this site has utilized BMP's to control increased runoff and remove sediments and other pollutants prior to outfall discharge points to local closed drainage system. The use of a trench drains and deep sump catch basins are the BMP's utilized in the design.

Post-Development Peak Discharge Rates

Methodology

The stormwater system was designed using Technical Release 55 (TR55) - Second Edition, dated June, 1986. All stormwater management runoff hydrographs and peak discharge rate computations and detention pond modeling has been performed through the use of the **Hydrocad** V 10.00-13 Stormwater modeling software.

The rainfall duration intensity curves were developed from Bristol County, Tech Paper 40. The drainage analysis is based on the SCS method with a rainfall distribution Type III, for the 10-year, 50 year and 100-year design frequency storms.

2-year storm:	3.0 inches
10-year storm:	4.5 inches
25-year storm:	5.3 inches
100-year storm:	6.5 inches

Peak Runoff Analysis of Discharges

The objective of this analysis is to prove that post-development peak discharge rates do not exceed pre-development peak discharge rates. This was accomplished through the use of a stone diagram and bio retention basin which were designed for all the design frequency storms. The 100-year 24-hour storm event was evaluated to demonstrate that there is no infiltration overflow or increased flooding impacts offsite.

Calculations to meet the requirements for Standard 2 necessitate an analysis to review the characteristics of pre- and post-development watersheds. Evaluation of the contributing area(s), size, soil type(s), slope, and ground cover provides the necessary information required to develop rainfall event hydrographs. Rainfall event hydrographs are time/volume mathematical representations of how stormwater runoff volume is generated from different size storm events over a period of 24 hours for a specific watershed area. Each hydrograph depicts a bell shaped curve where the area under the curve represents the volume of stormwater flow in cubic feet per second (cfs).

Hydrographs were developed for each drainage subarea for pre-and post-development conditions and the peak discharge rate determined for each storm event.

The contributing watershed area was analyzed for pre-development and post-development conditions. Evaluation of the contributing area(s), size, soil type(s), slope, and ground cover provides the necessary information required to develop rainfall event hydrographs. Rainfall event hydrographs are time/volume mathematical representations of how stormwater runoff volume is generated from different size storm events over a period of 24 hours for a specific watershed area. Each hydrograph depicts a bell shaped curve where the area under the curve represents the volume of stormwater flow in cubic feet per second (cfs).

Hydrographs were developed for Pre and Post development conditions and the peak discharge rate determined for each storm event. The hydrographs demonstrate that the post-development runoff rates are less than the pre-development runoff rates without any stormwater controls. The decrease in runoff was due to lessening the amount of impervious areas. No stormwater management is required to manage post development flows.

TABLE 1: BRALEY ROAD CONDOMINIUMS WATERSHED AREA			
EXISTING CONDITIONS	TOTAL AREA	PROPOSED	TOTAL AREA
WATERSHED NAME	(ACRES)	CONDITIONS	
		WATERSHED NAME	(ACRES)
Pre-Construction		Post-Construction	
Pre	.22	Post 1A and 1B	0.22
TOTAL =	0.22	TOTAL =	0.22

EXISTING CONDITIONS			PROPOSED CONDITIONS		
WATERSHED	FREQUENCY	PEAK	WATERSHED	FREQUENCY	PEAK
AREA	STORM	DISCHARGE	AREA(S)	STORM	DISCHARGE
(ACRES)	(YEAR)	(CFS)	(ACRES)	(YEAR)	(CFS)
Pre 1	2	0.53	Post 1A and 1B	2	0.57
	10	0.85		10	0.90
	25	1.03		25	1.09
	100	1.35		100	1.42

Comparison of Pre- and Post-Development Peak Discharge Rates

The conclusion of the results shows that under post-development conditions, the peak discharge rates are slightly greater than the pre-development condition rates for the 2, 10-year, 25-year, and 100-year design frequency storms.

Erosion/Sediment Control (Standard 8)

Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.

The site shall be developed in a manner to minimize land disturbances. All erosion and sedimentation control measures are indicated on the construction drawings. Site specific areas of concern are:

- Silt sock installation at each catch basin
- A line of silt sock shall be installed prior to the start of construction to prevent eroded soils from depositing in the water quality basin, and a line of staked hay bales shall be installed as shown on the plans.

The following specific construction strategies, techniques, and erosion control measures are more specifically described as follows:

- Construction vehicles shall be limited to one access/egress point on the Braley Road, where a stone construction pad entrance will be provided.
- The Owner shall have the sole responsibility for the design implementation. He/they shall be responsible for ensuring that all contractors and subcontractors are aware of all provisions of the plans and specifications.
- Prior to the commencement of construction, a line of staked silt socks, properly and securely staked, will be placed at all perimeter controls i.e. construction toe of slopes adjacent to road.
- During grading operations, disturbed slopes will be mulched and vegetation established to prevent sediment erosion to the satisfaction of the engineer.
- No stockpile of materials and vehicle traffic shall take place in the location of the catch basins. These areas shall be surrounded by construction fencing to prevent soil compaction by construction vehicles.
- Suitable topsoil shall be stripped from the areas to be graded and stockpiled for later use.
- The contractor will be responsible for maintaining the soil erosion and sediment control measures use. All perimeter and interior controls shall be inspected weekly and following each significant rain event. Damaged controls shall be repaired immediately. Control measures will be maintained until stabilization of all disturbed areas is achieved, and after final inspection (with approval) of site improvements is performed.
- Sediment shall be removed once the volume reaches $\frac{1}{4}$ to $\frac{1}{2}$ the height of the silt fence or hay bale
- All stockpiles shall be surrounded by sediment controls

- Disturbed areas remaining idle for more than 14 days shall be stabilized with straw or grass seed mix.
- Dust shall be controlled at the site.
- All facilities used as temporary measures shall be cleaned prior to being put into final operation.
- No turbid waters are to be released beyond the project limits. Temporary sedimentation basins, tanks, and/or other measures should be utilized as necessary and at the discretion of the A/E to contain turbid water generated by dewatering operations or concentrated stormwater flows.
- All work performed on the site shall be sequenced appropriately with respect to weather and construction schedule to minimize the opportunity for sedimentation in water courses and beyond project limits.
- Accessible reserves of hay bales, stakes, or silt sock are to be maintained on site for routine maintenance and in the event of unanticipated problems requiring emergency response.
- No work is to occur on the downstream side of the perimeter controls. All perimeter controls serve as the project limit of disturbance.

Operation and Maintenance Plan (Standard 9)

All stormwater management systems must have an operation and maintenance plan to ensure that systems function as designed.

The Owner of Braley Road Condominiums and/or the subsequent Owner will be responsible for the operation and maintenance of the stormwater management system and all of its appurtenances.

General Notes

The Owner shall keep a written record of inspection dates and findings, maintenance operations, and all repairs. An inspection/maintenance checklist shall be utilized for the specified inspections. Records of inspections and maintenance shall be kept for at least three years, and available on reasonable notice for inspection by the conservation commission.

It shall be noted that clippings and other waste from maintenance of individual yards and the drainage facilities shall not be disposed within the conservation area.

Spills

In the event of oil or hazardous spills contact MassDEP 24hr response notification line at 888-304-1133 and the City of New Bedford DPW.

In the event of a spill, the Owner shall designate individuals to barricade paved waterways from the stone diagram with sand bags. At which time, the spill is contained and the contaminants are no longer present, sandbags shall be removed from the paved waterways.

No Illicit Discharges

The proposed Dorman's Auto Center project will issue to the issuing authority an *Illicit Discharge Compliance Statement* verifying that no illicit discharges exist on the site. The statement will be submitted prior to the discharge of any stormwater to post-construction BMPs.

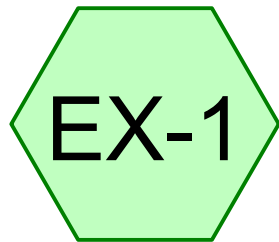
APPENDICES

APPENDIX A

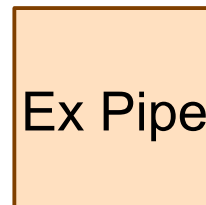
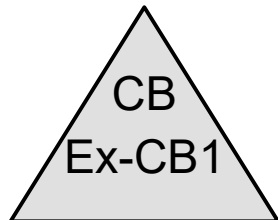
2, 10, 25 & 100-Year Storm Calculations (Pre and Post Construction)

- Drainage Diagram
- Area Listing
- Storm Event Summary Sheet
- Area Summaries
- Times of Concentration
- Hydrographs
- Outlet Structure (Post only)
- Basin Routing (Post only)
- Basin Volumes (Post only)

PRE-CONSTRUCTION 2, 10, 25, 100-YEAR STORM

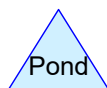
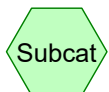


Lower parking



Existing CB1

10" outlet pipe



18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Printed 1/28/2019

Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.041	39	>75% Grass cover, Good, HSG A (EX-1)
0.185	98	Paved parking, HSG A (EX-1)
0.226	87	TOTAL AREA

18-045 Braley Condominiums 9-14-18*Type III 24-hr 2-Year Rainfall=3.40"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 3

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>1.96"

Tc=6.0 min CN=87 Runoff=0.54 cfs 0.037 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.25' Max Vel=4.02 fps Inflow=0.54 cfs 0.037 af

10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/' Capacity=2.85 cfs Outflow=0.53 cfs 0.037 af

Pond Ex-CB1: Existing CB1

Peak Elev=85.89' Inflow=0.54 cfs 0.037 af

Outflow=0.54 cfs 0.037 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.037 af Average Runoff Depth = 1.96"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

Summary for Subcatchment EX-1: Lower parking

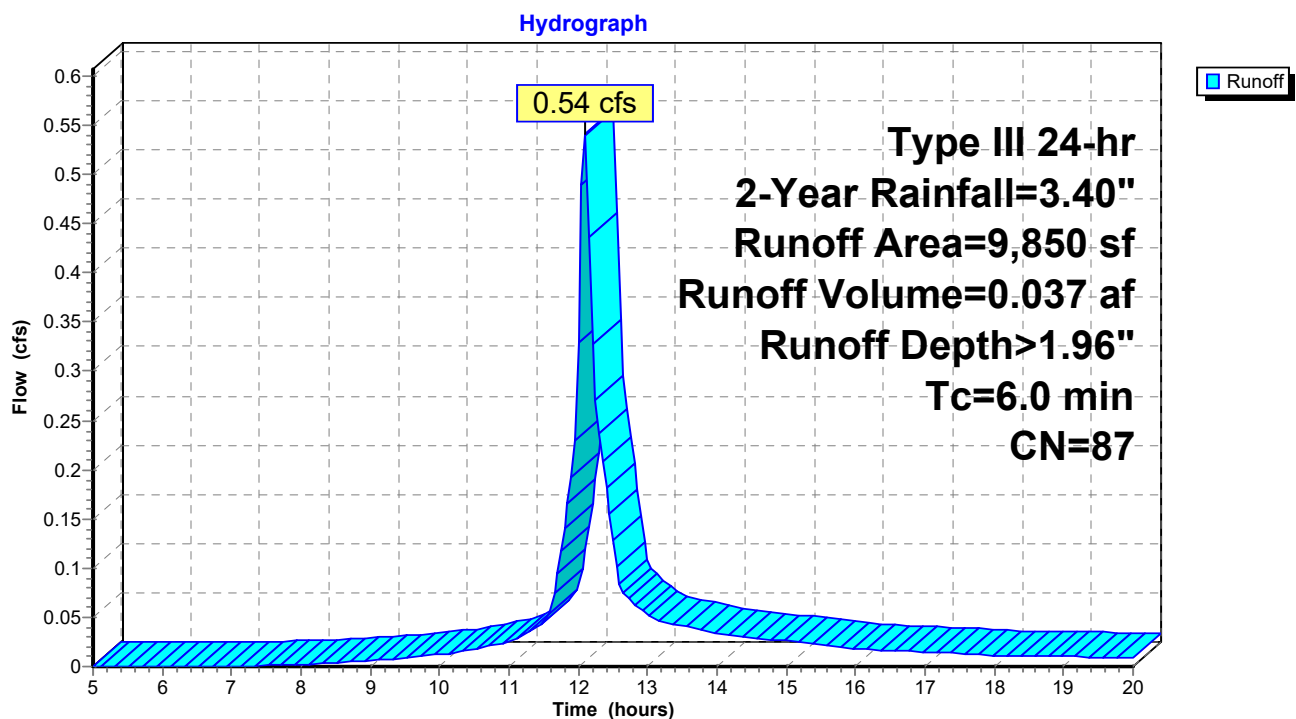
Runoff = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking



18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.40"

Printed 1/28/2019

Page 5

Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 1.96" for 2-Year event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af
Outflow = 0.53 cfs @ 12.10 hrs, Volume= 0.037 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.02 fps, Min. Travel Time= 0.5 min

Avg. Velocity= 1.49 fps, Avg. Travel Time= 1.3 min

Peak Storage= 15 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.25'

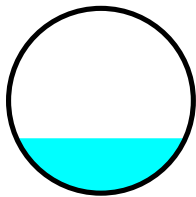
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe

n= 0.010 PVC, smooth interior

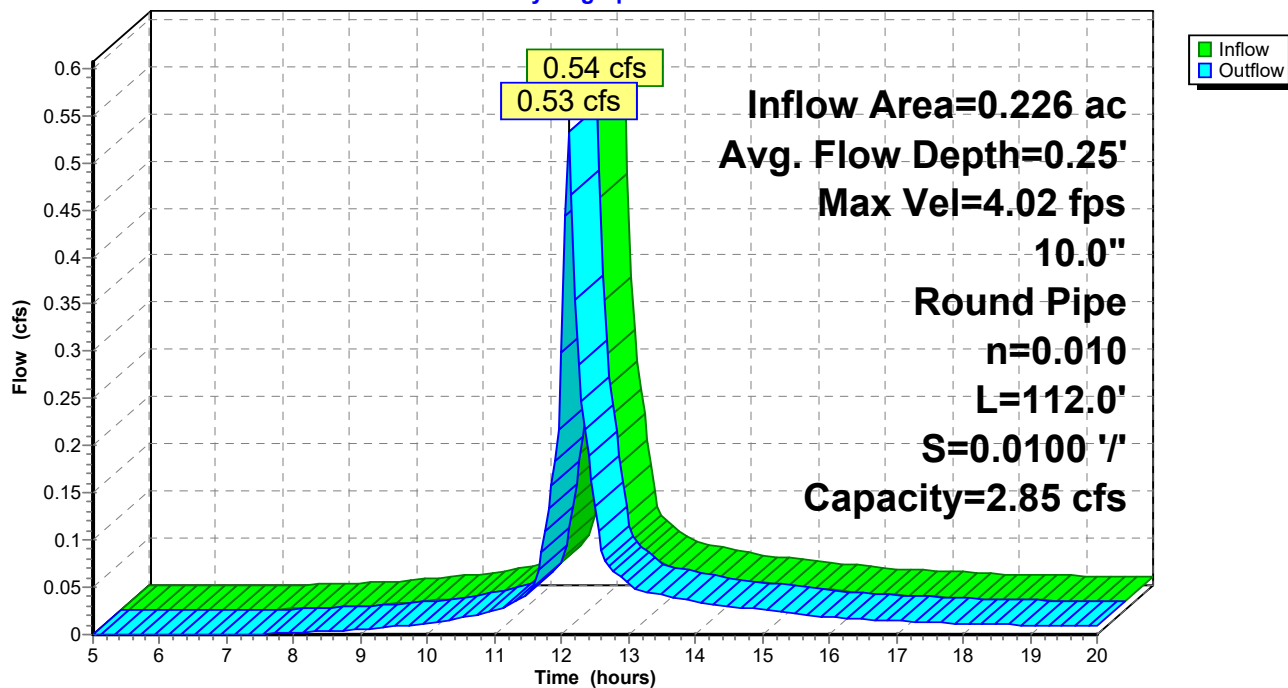
Length= 112.0' Slope= 0.0100 '/'

Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe

Hydrograph



Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 1.96" for 2-Year event
 Inflow = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af
 Outflow = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af

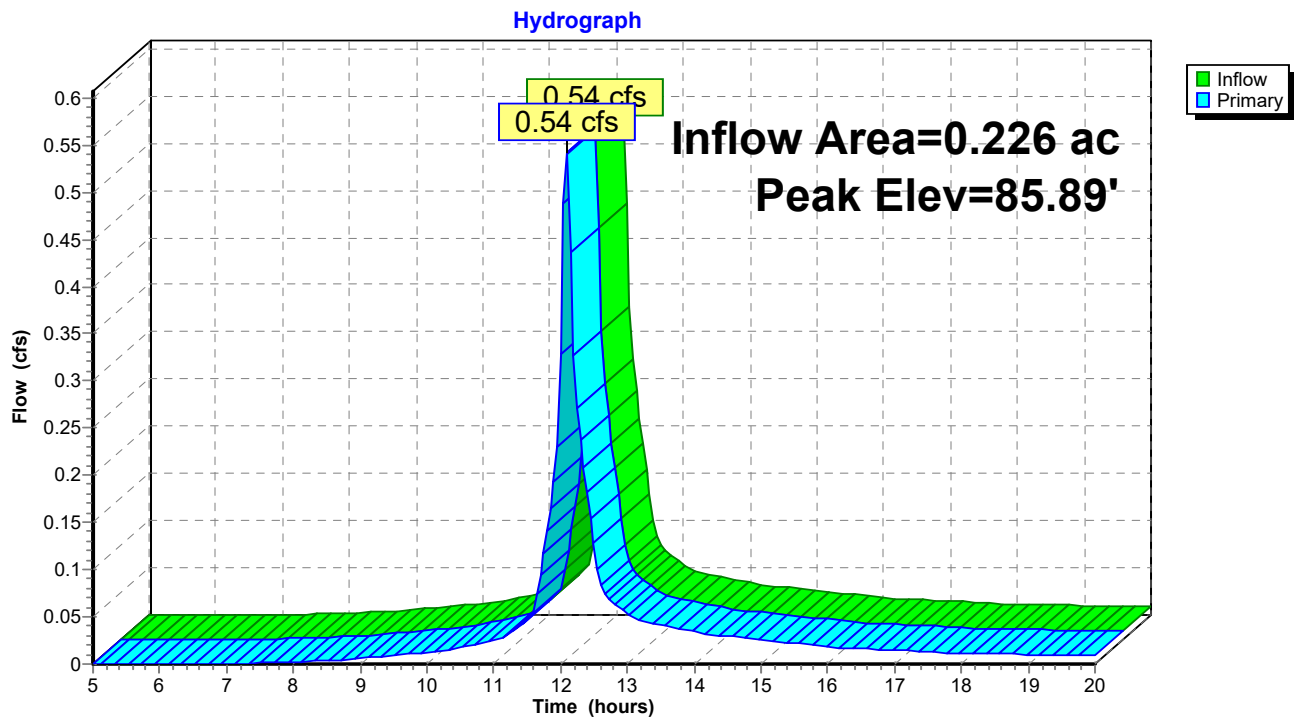
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 85.89' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.53 cfs @ 12.09 hrs HW=85.89' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.53 cfs @ 2.12 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1

18-045 Braley Condominiums 9-14-18*Type III 24-hr 10-Year Rainfall=4.80"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 7

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>3.18"

Tc=6.0 min CN=87 Runoff=0.86 cfs 0.060 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.31' Max Vel=4.58 fps Inflow=0.86 cfs 0.060 af

10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=0.85 cfs 0.060 af

Pond Ex-CB1: Existing CB1

Peak Elev=86.01' Inflow=0.86 cfs 0.060 af

Outflow=0.86 cfs 0.060 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.060 af Average Runoff Depth = 3.18"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 10-Year Rainfall=4.80"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 8

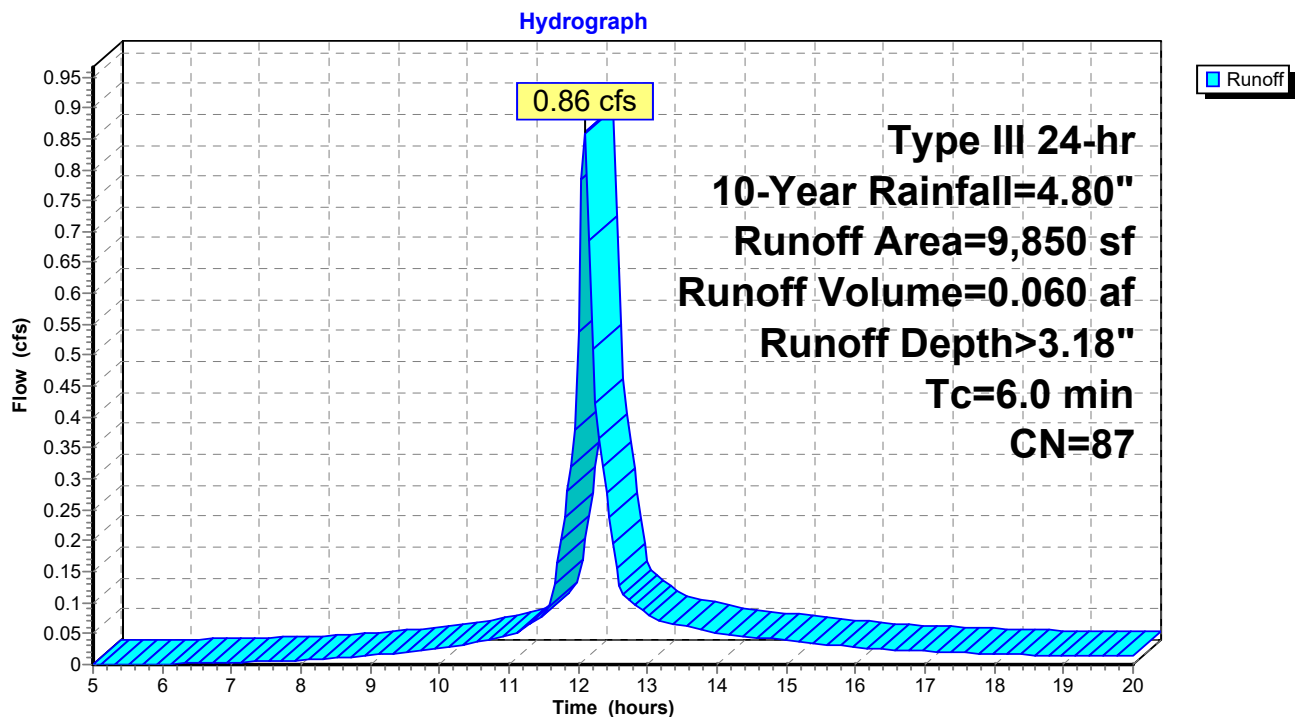
Summary for Subcatchment EX-1: Lower parking

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=4.80"

Printed 1/28/2019

Page 9

Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.18" for 10-Year event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.85 cfs @ 12.10 hrs, Volume= 0.060 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.58 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.65 fps, Avg. Travel Time= 1.1 min

Peak Storage= 21 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.31'

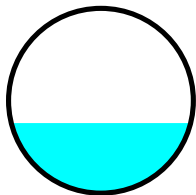
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe

n= 0.010 PVC, smooth interior

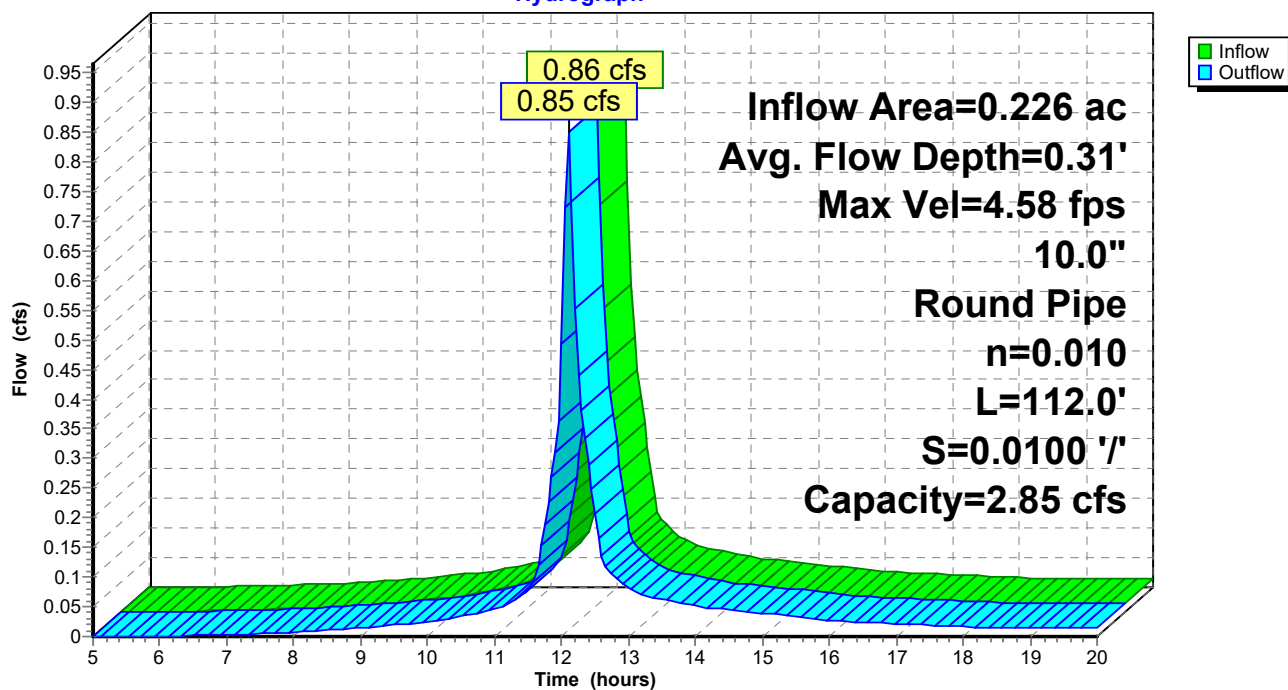
Length= 112.0' Slope= 0.0100 '/'

Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe

Hydrograph



Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.18" for 10-Year event
 Inflow = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af
 Outflow = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af

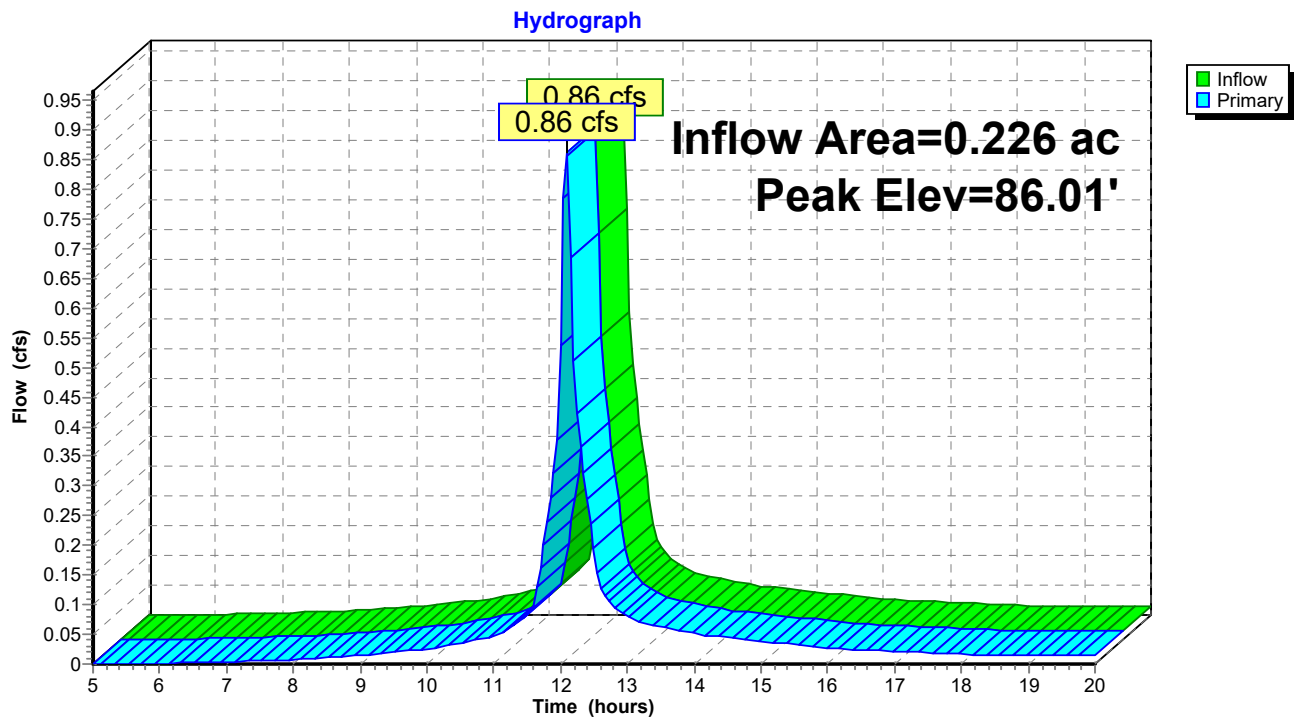
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.01' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.84 cfs @ 12.09 hrs HW=86.01' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.84 cfs @ 2.42 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1

18-045 Braley Condominiums 9-14-18*Type III 24-hr 25-Year Rainfall=5.60"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 11

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>3.90"

Tc=6.0 min CN=87 Runoff=1.05 cfs 0.074 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.35' Max Vel=4.82 fps Inflow=1.05 cfs 0.074 af

10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=1.03 cfs 0.073 af

Pond Ex-CB1: Existing CB1

Peak Elev=86.08' Inflow=1.05 cfs 0.074 af

Outflow=1.05 cfs 0.074 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.074 af Average Runoff Depth = 3.90"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 25-Year Rainfall=5.60"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 12

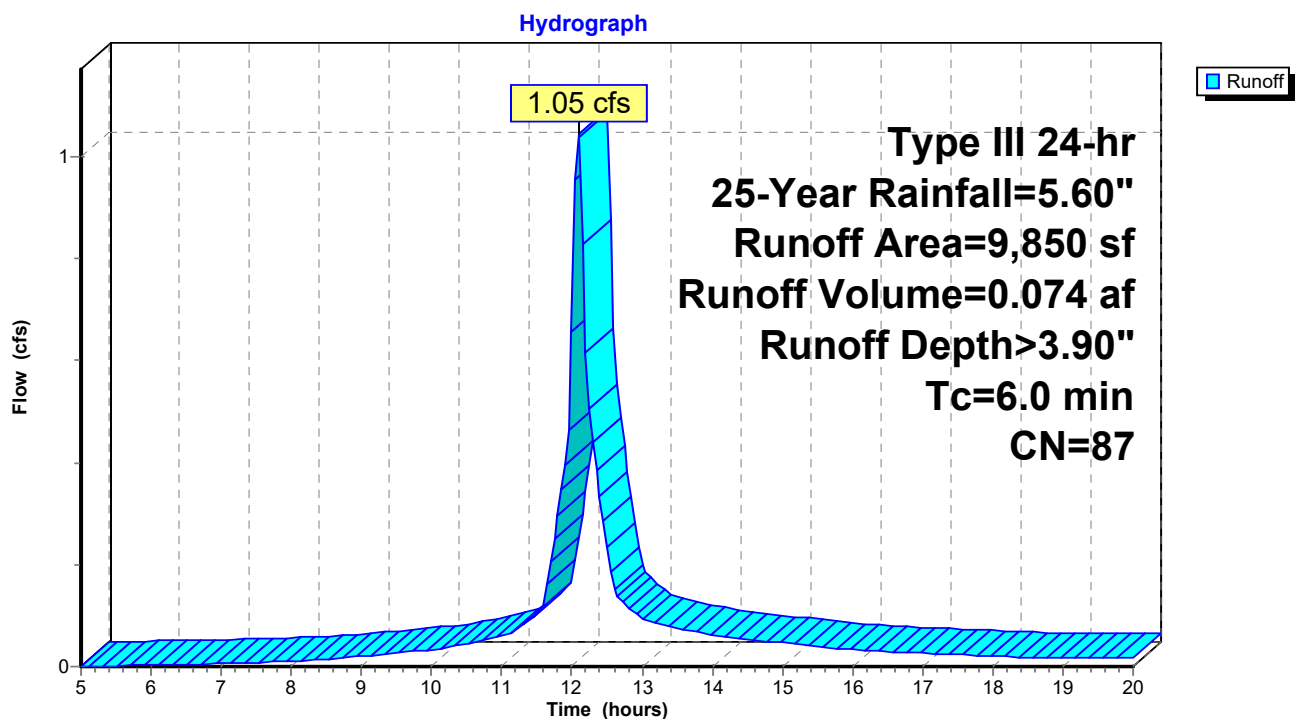
Summary for Subcatchment EX-1: Lower parking

Runoff = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af, Depth> 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=5.60"

Printed 1/28/2019

Page 13

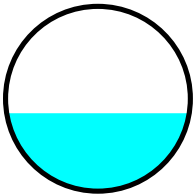
Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.90" for 25-Year event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af
Outflow = 1.03 cfs @ 12.10 hrs, Volume= 0.073 af, Atten= 1%, Lag= 0.6 min

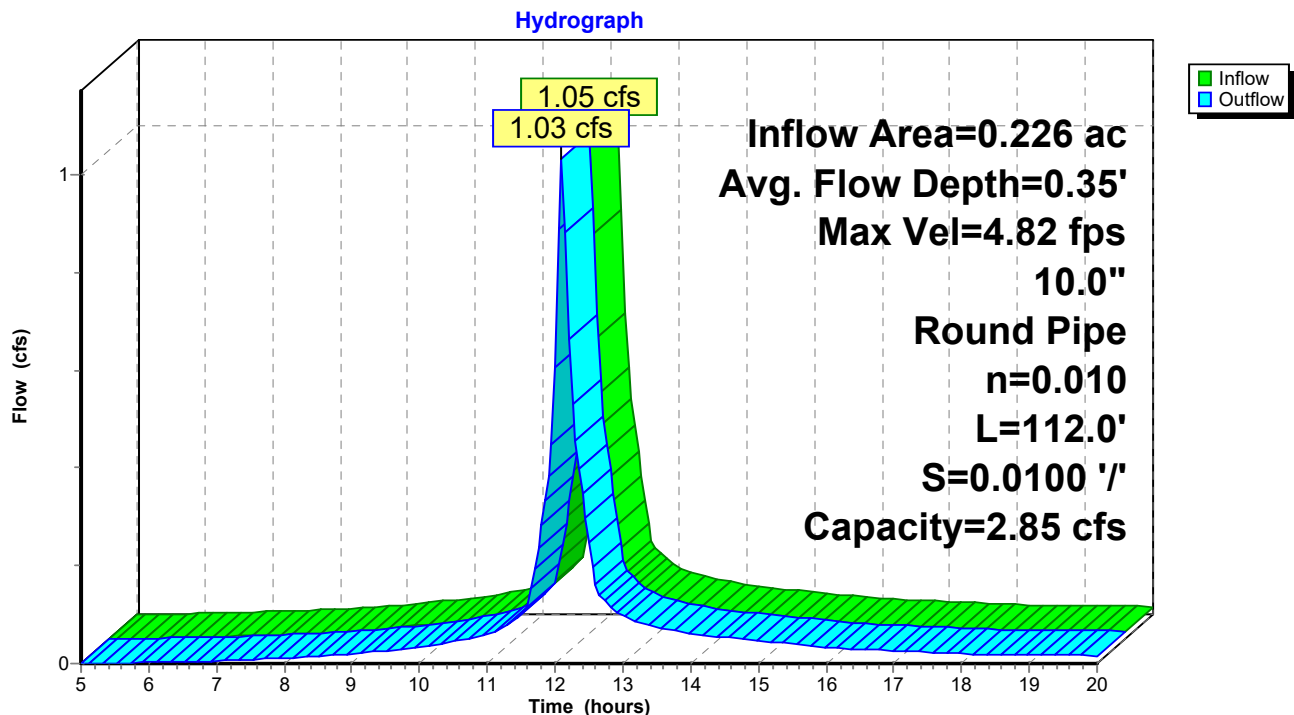
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.82 fps, Min. Travel Time= 0.4 min
Avg. Velocity= 1.74 fps, Avg. Travel Time= 1.1 min

Peak Storage= 24 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe



Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.90" for 25-Year event
 Inflow = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af
 Outflow = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af

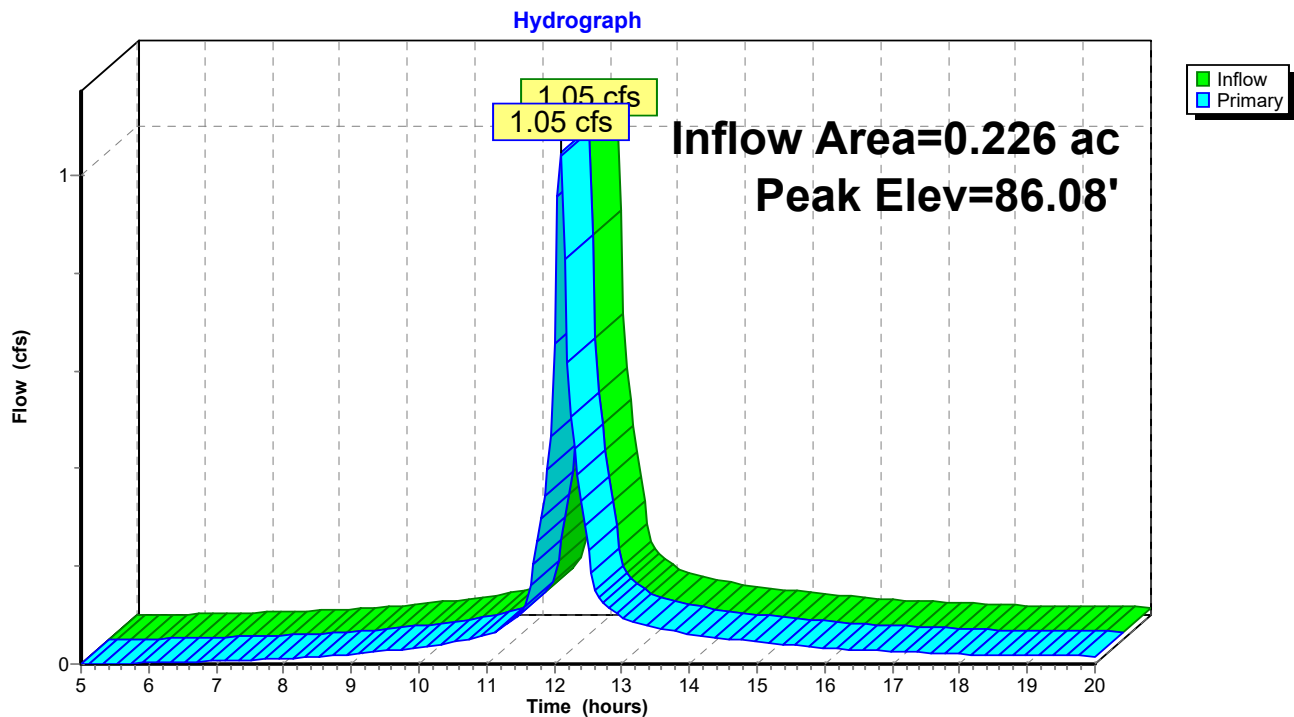
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.08' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.02 cfs @ 12.09 hrs HW=86.07' (Free Discharge)

1=Orifice/Grate (Orifice Controls 1.02 cfs @ 2.57 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1

18-045 Braley Condominiums 9-14-18*Type III 24-hr 100-Year Rainfall=7.00"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 15

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>5.18"
Tc=6.0 min CN=87 Runoff=1.37 cfs 0.098 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.41' Max Vel=5.17 fps Inflow=1.37 cfs 0.098 af
10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=1.35 cfs 0.098 af

Pond Ex-CB1: Existing CB1

Peak Elev=86.19' Inflow=1.37 cfs 0.098 af
Outflow=1.37 cfs 0.098 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.098 af Average Runoff Depth = 5.18"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 100-Year Rainfall=7.00"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 16

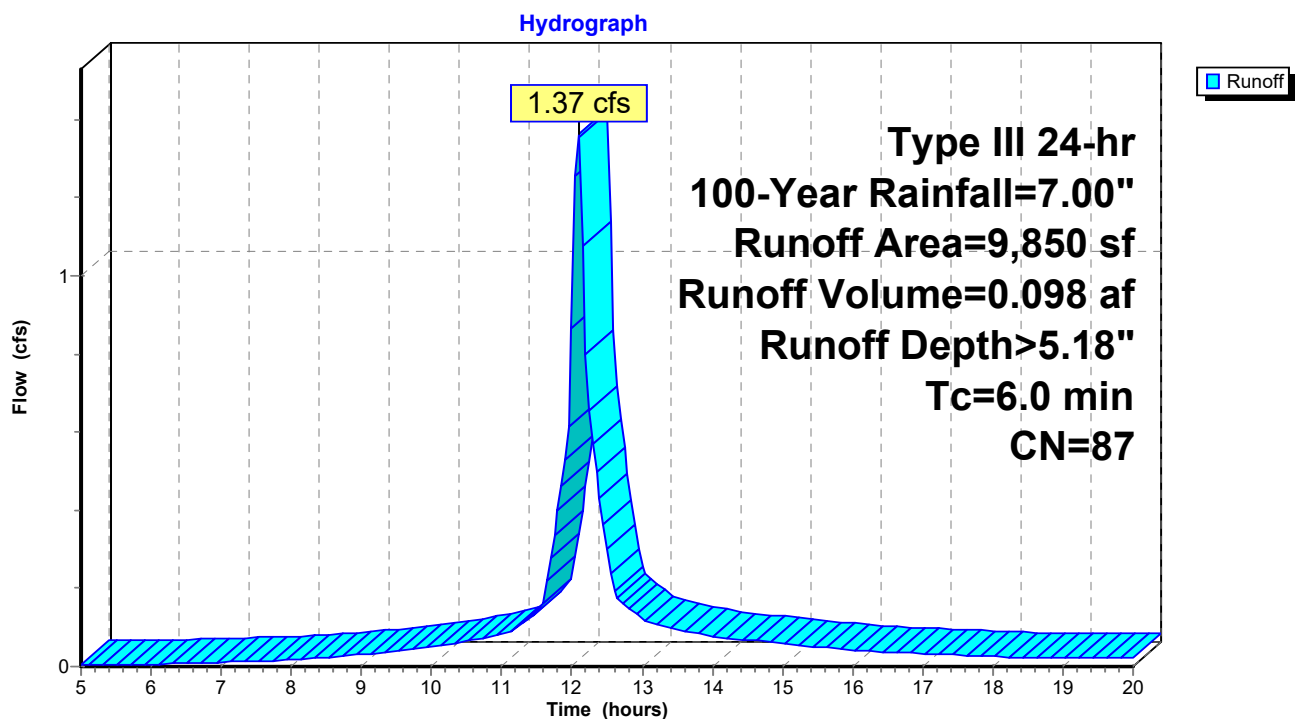
Summary for Subcatchment EX-1: Lower parking

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.00"

Printed 1/28/2019

Page 17

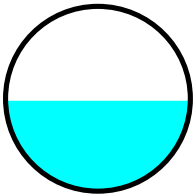
Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 5.18" for 100-Year event
Inflow = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af
Outflow = 1.35 cfs @ 12.10 hrs, Volume= 0.098 af, Atten= 1%, Lag= 0.6 min

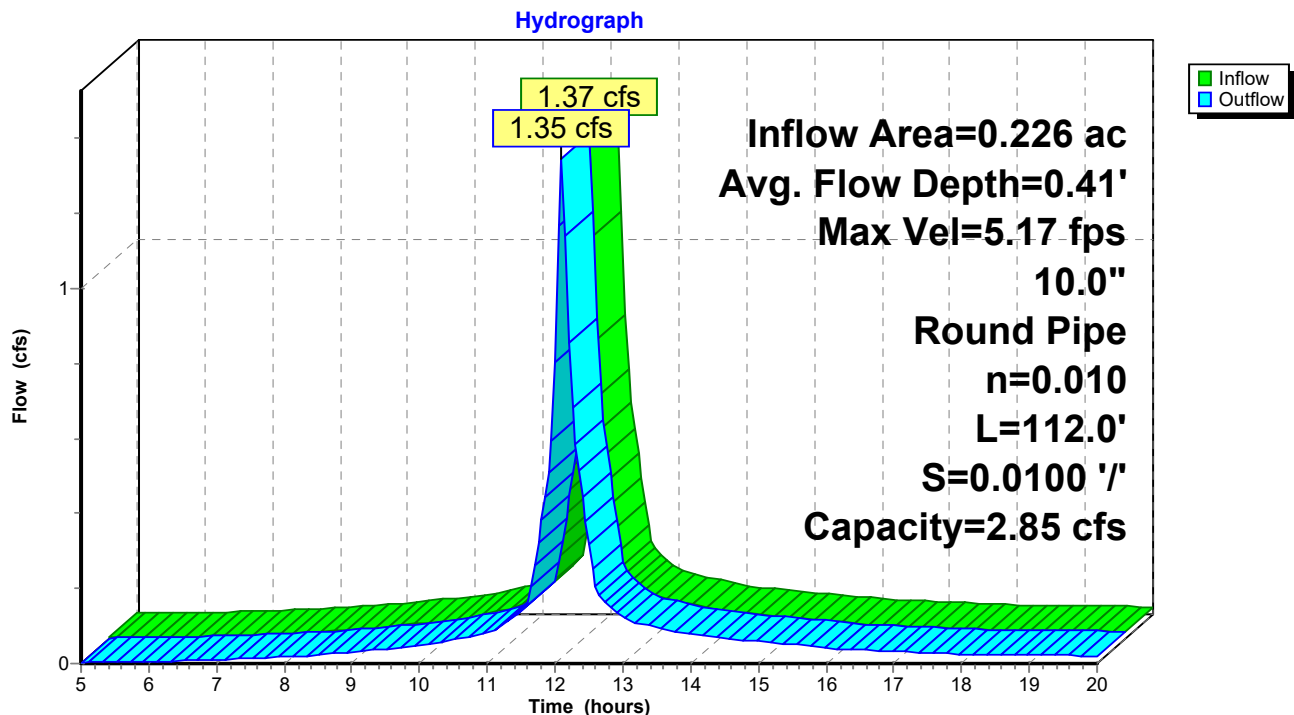
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.17 fps, Min. Travel Time= 0.4 min
Avg. Velocity= 1.92 fps, Avg. Travel Time= 1.0 min

Peak Storage= 30 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe



Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 5.18" for 100-Year event
 Inflow = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af
 Outflow = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af

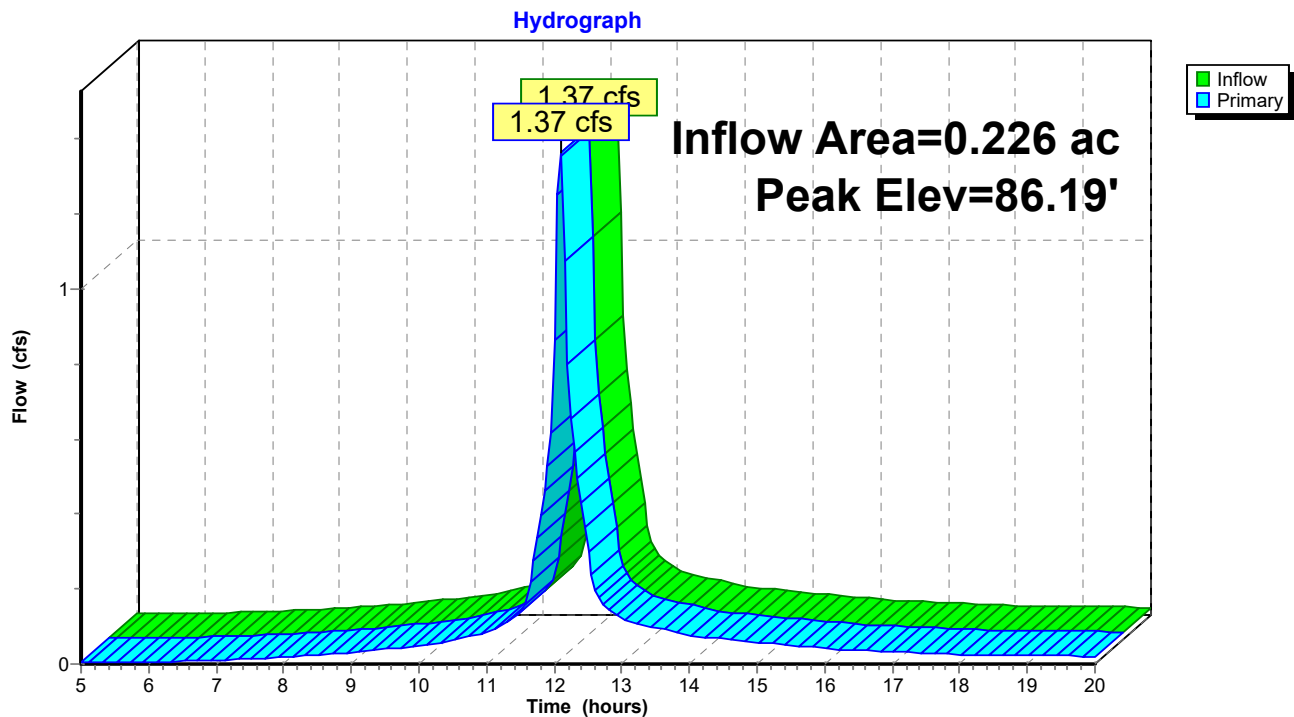
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.19' @ 12.09 hrs

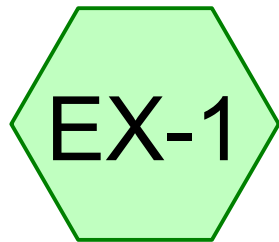
Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.33 cfs @ 12.09 hrs HW=86.18' (Free Discharge)

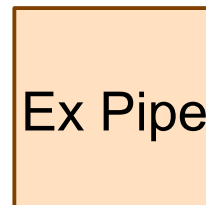
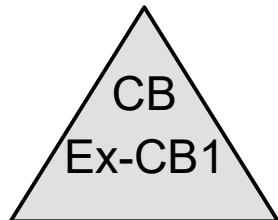
1=Orifice/Grate (Orifice Controls 1.33 cfs @ 2.80 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1

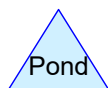
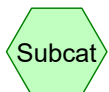


Lower parking



Existing CB1

10" outlet pipe



18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Printed 1/28/2019

Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.041	39	>75% Grass cover, Good, HSG A (EX-1)
0.185	98	Paved parking, HSG A (EX-1)
0.226	87	TOTAL AREA

18-045 Braley Condominiums 9-14-18*Type III 24-hr 2-Year Rainfall=3.40"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 3

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>1.96"

Tc=6.0 min CN=87 Runoff=0.54 cfs 0.037 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.25' Max Vel=4.02 fps Inflow=0.54 cfs 0.037 af

10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=0.53 cfs 0.037 af

Pond Ex-CB1: Existing CB1

Peak Elev=85.89' Inflow=0.54 cfs 0.037 af

Outflow=0.54 cfs 0.037 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.037 af Average Runoff Depth = 1.96"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.40"

Printed 1/28/2019

Page 4

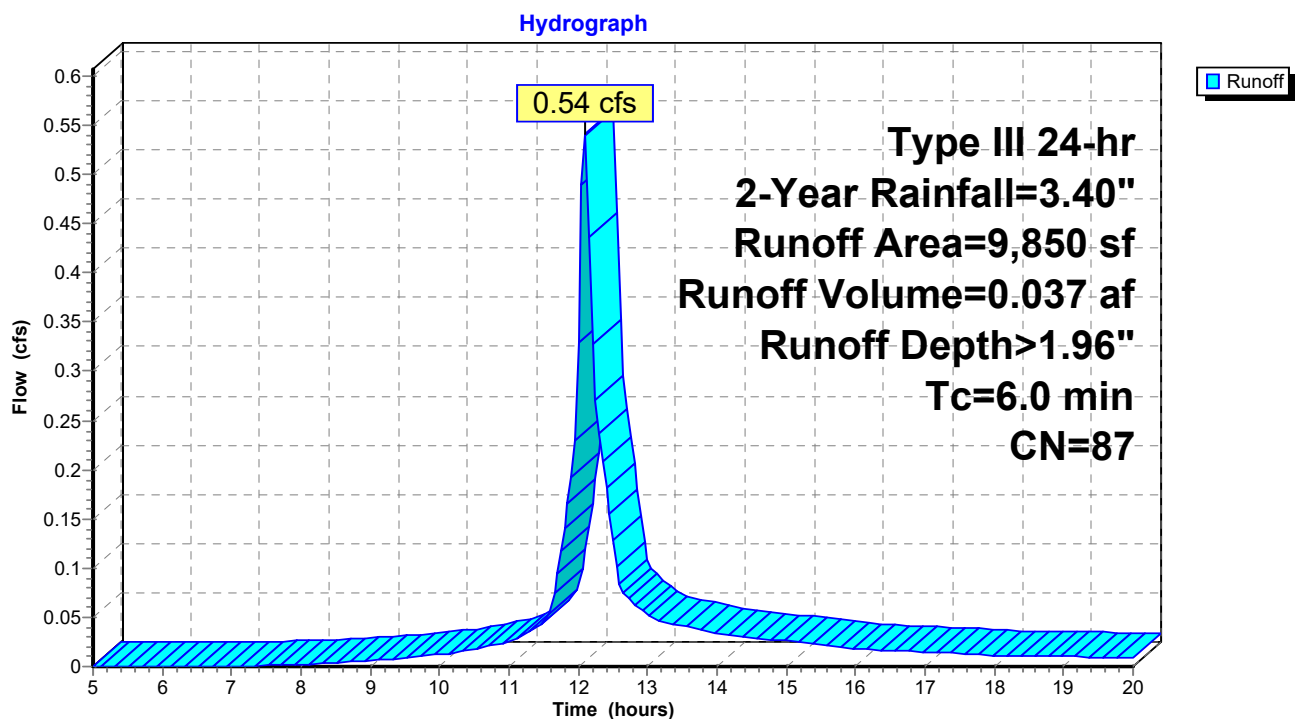
Summary for Subcatchment EX-1: Lower parking

Runoff = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.40"

Printed 1/28/2019

Page 5

Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 1.96" for 2-Year event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af
Outflow = 0.53 cfs @ 12.10 hrs, Volume= 0.037 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.02 fps, Min. Travel Time= 0.5 min

Avg. Velocity= 1.49 fps, Avg. Travel Time= 1.3 min

Peak Storage= 15 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.25'

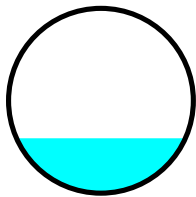
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe

n= 0.010 PVC, smooth interior

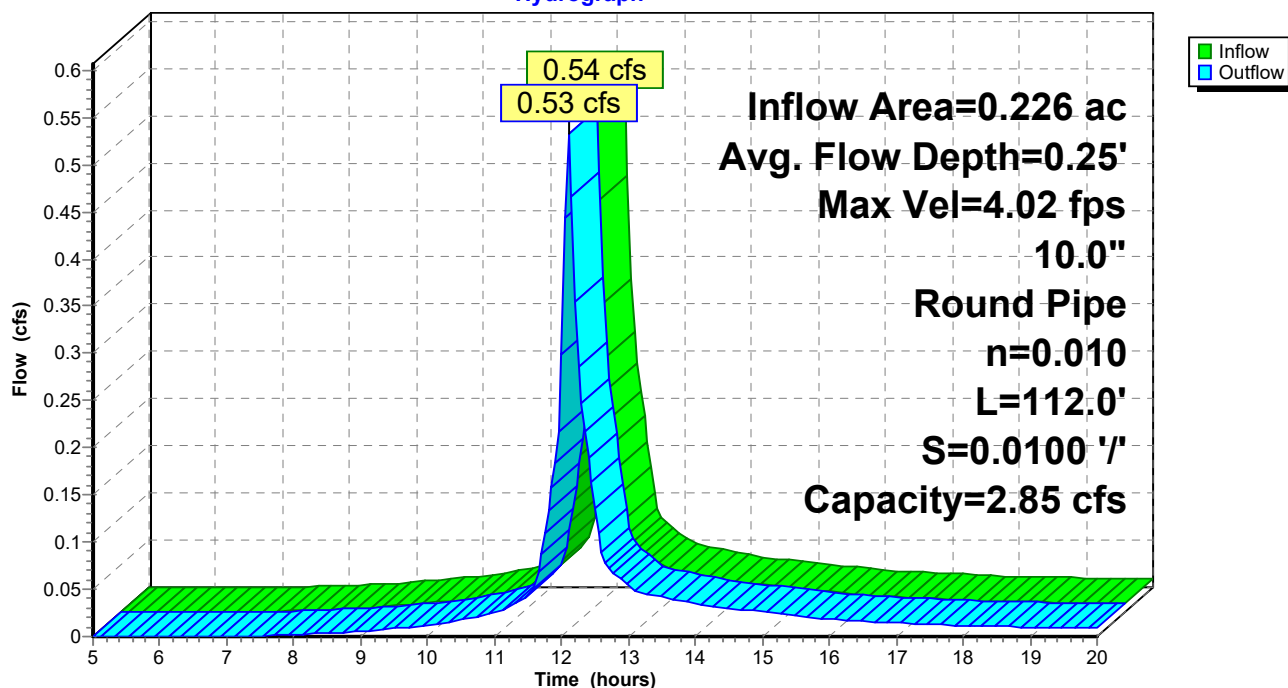
Length= 112.0' Slope= 0.0100 '/'

Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe

Hydrograph



Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 1.96" for 2-Year event
 Inflow = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af
 Outflow = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af

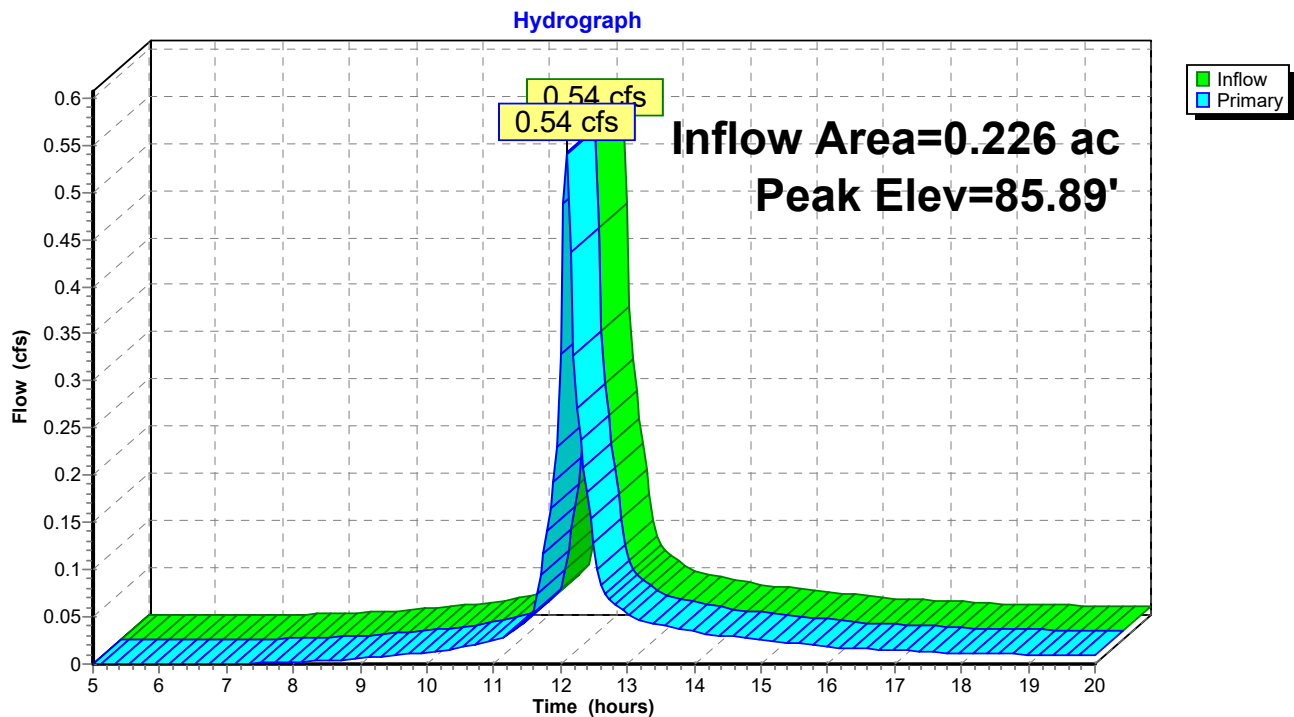
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 85.89' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.53 cfs @ 12.09 hrs HW=85.89' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.53 cfs @ 2.12 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1

18-045 Braley Condominiums 9-14-18*Type III 24-hr 10-Year Rainfall=4.80"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 7

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>3.18"

Tc=6.0 min CN=87 Runoff=0.86 cfs 0.060 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.31' Max Vel=4.58 fps Inflow=0.86 cfs 0.060 af

10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=0.85 cfs 0.060 af

Pond Ex-CB1: Existing CB1

Peak Elev=86.01' Inflow=0.86 cfs 0.060 af

Outflow=0.86 cfs 0.060 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.060 af Average Runoff Depth = 3.18"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 10-Year Rainfall=4.80"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 8

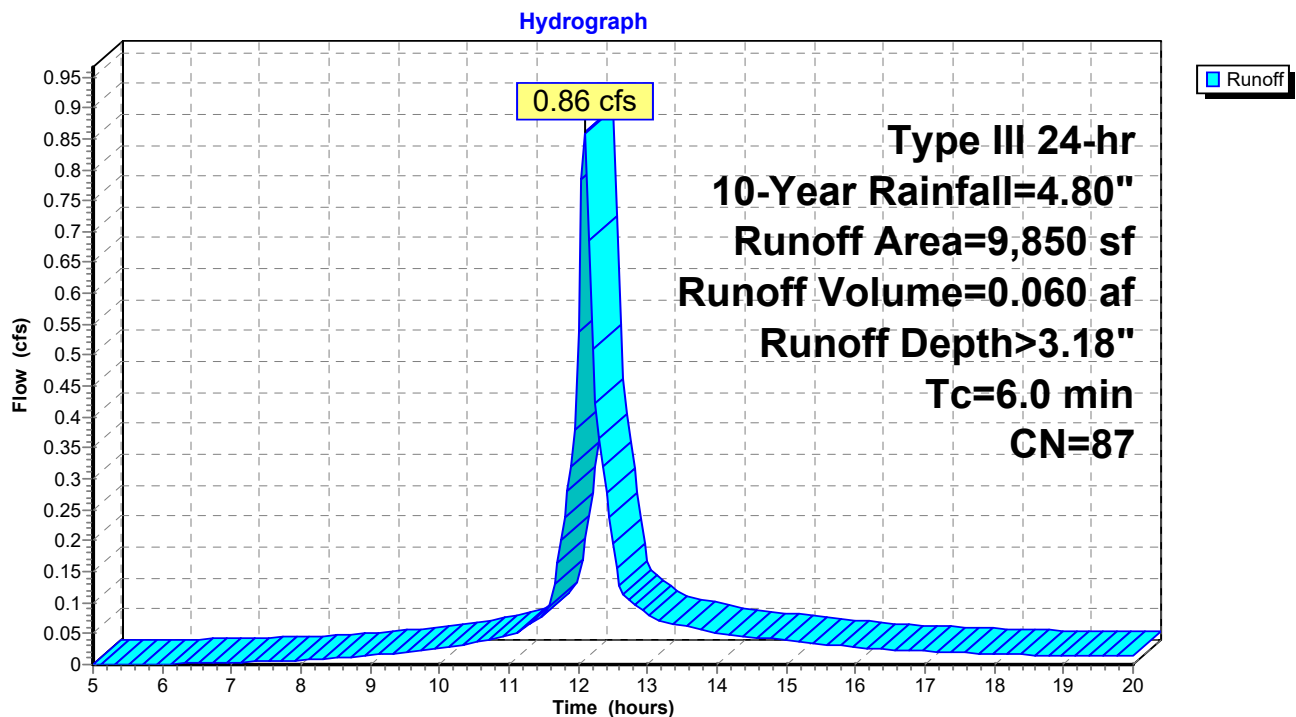
Summary for Subcatchment EX-1: Lower parking

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=4.80"

Printed 1/28/2019

Page 9

Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.18" for 10-Year event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.85 cfs @ 12.10 hrs, Volume= 0.060 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.58 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.65 fps, Avg. Travel Time= 1.1 min

Peak Storage= 21 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.31'

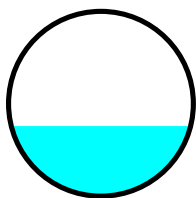
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe

n= 0.010 PVC, smooth interior

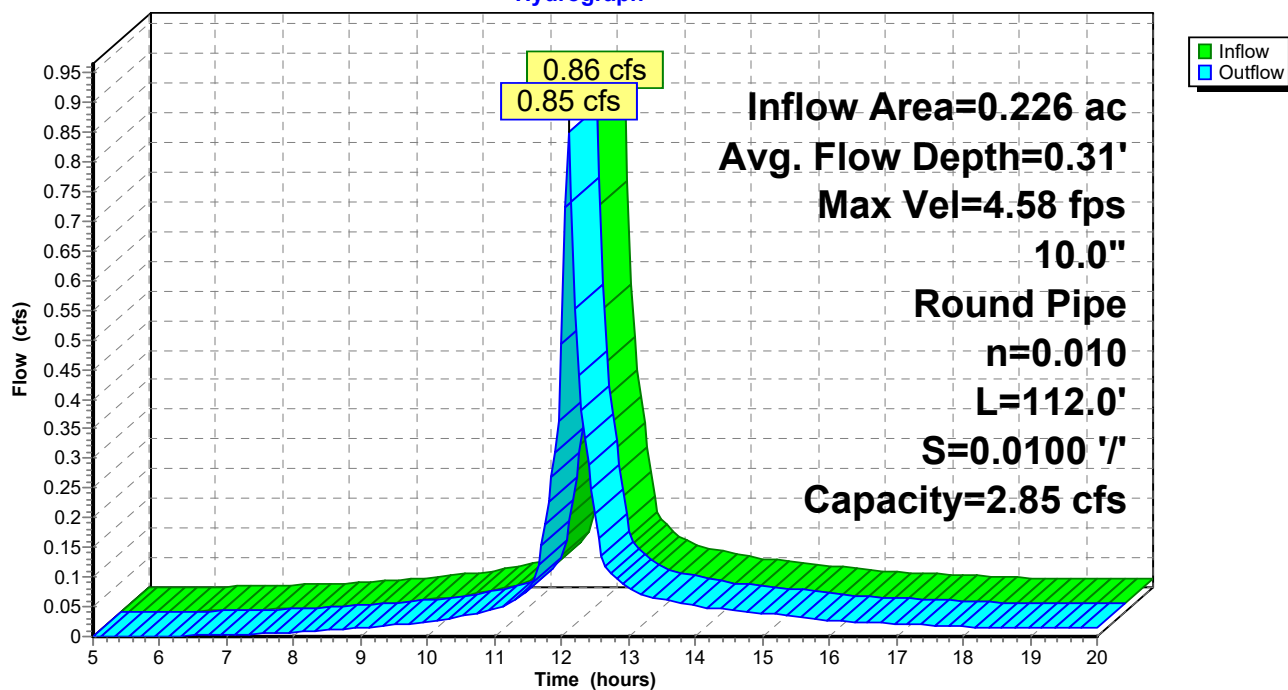
Length= 112.0' Slope= 0.0100 '/'

Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe

Hydrograph



18-045 Braley Condominiums 9-14-18

Type III 24-hr 10-Year Rainfall=4.80"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 10

Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.18" for 10-Year event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
Primary = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 86.01' @ 12.09 hrs

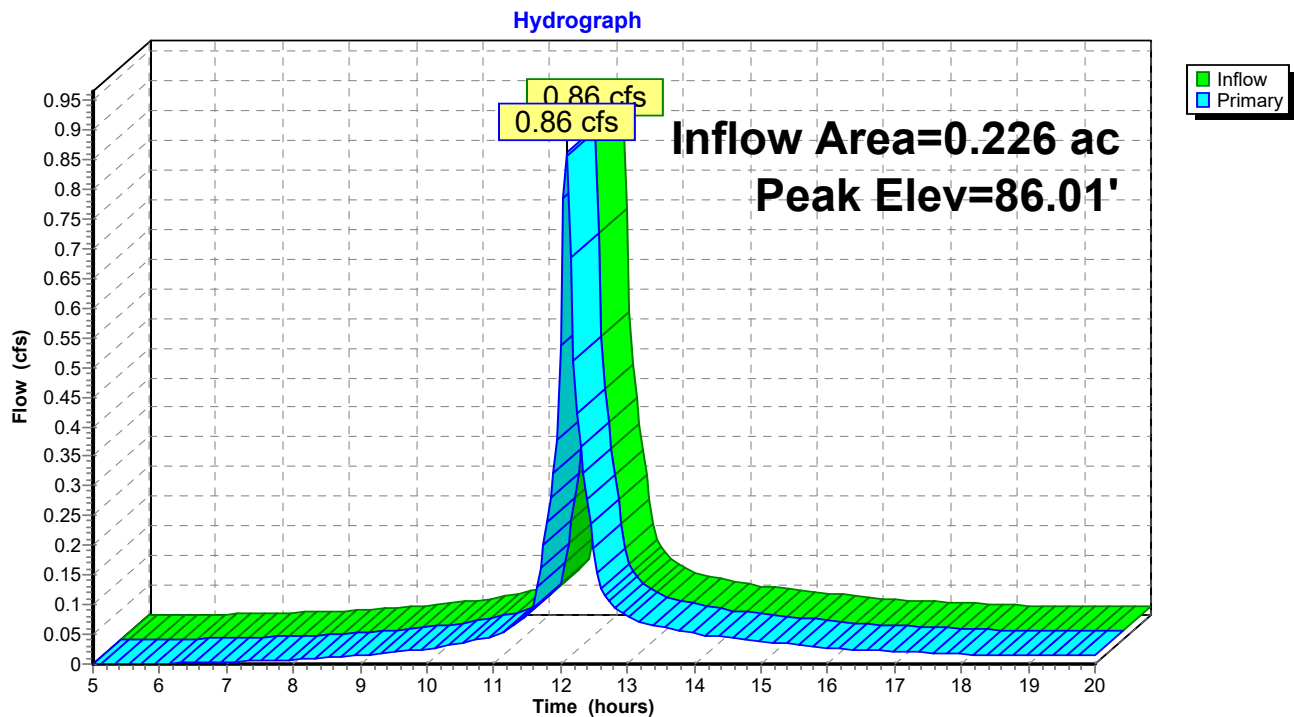
Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.84 cfs @ 12.09 hrs HW=86.01' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.84 cfs @ 2.42 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1



18-045 Braley Condominiums 9-14-18*Type III 24-hr 25-Year Rainfall=5.60"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 11

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>3.90"
Tc=6.0 min CN=87 Runoff=1.05 cfs 0.074 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.35' Max Vel=4.82 fps Inflow=1.05 cfs 0.074 af
10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=1.03 cfs 0.073 af

Pond Ex-CB1: Existing CB1

Peak Elev=86.08' Inflow=1.05 cfs 0.074 af
Outflow=1.05 cfs 0.074 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.074 af Average Runoff Depth = 3.90"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 25-Year Rainfall=5.60"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 12

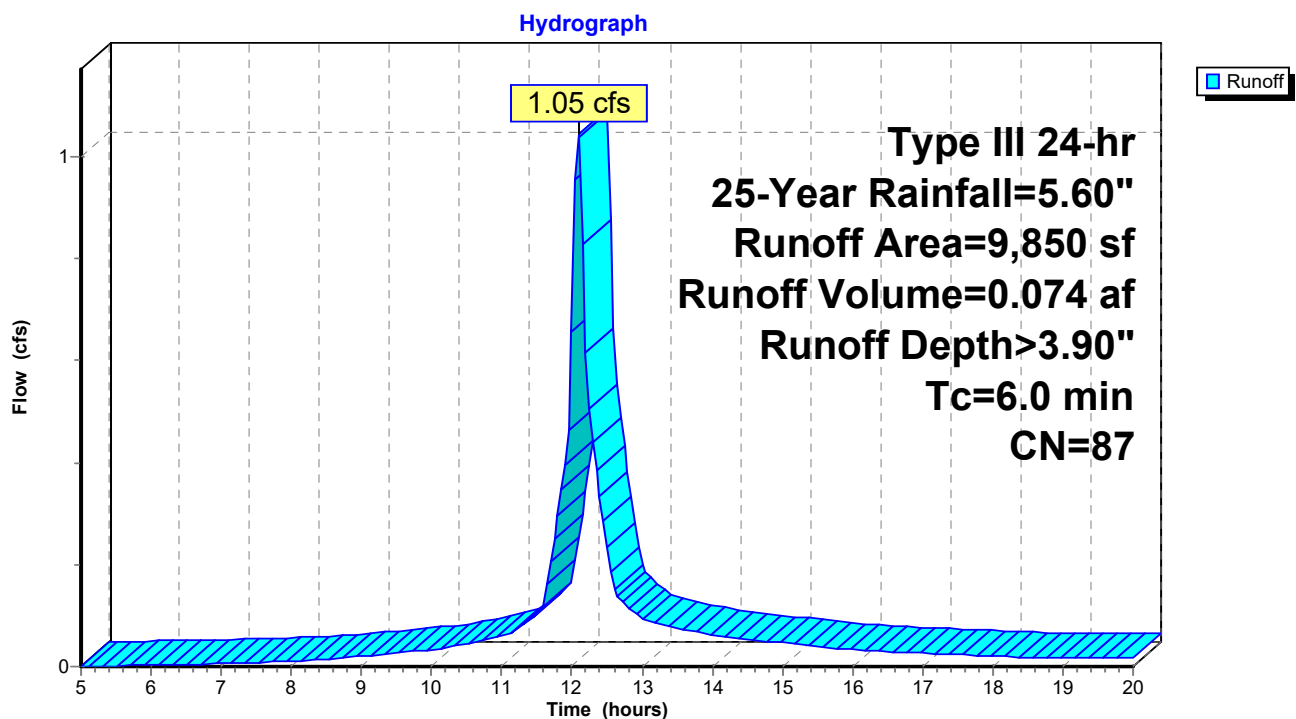
Summary for Subcatchment EX-1: Lower parking

Runoff = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af, Depth> 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=5.60"

Printed 1/28/2019

Page 13

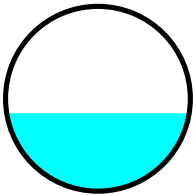
Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.90" for 25-Year event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af
Outflow = 1.03 cfs @ 12.10 hrs, Volume= 0.073 af, Atten= 1%, Lag= 0.6 min

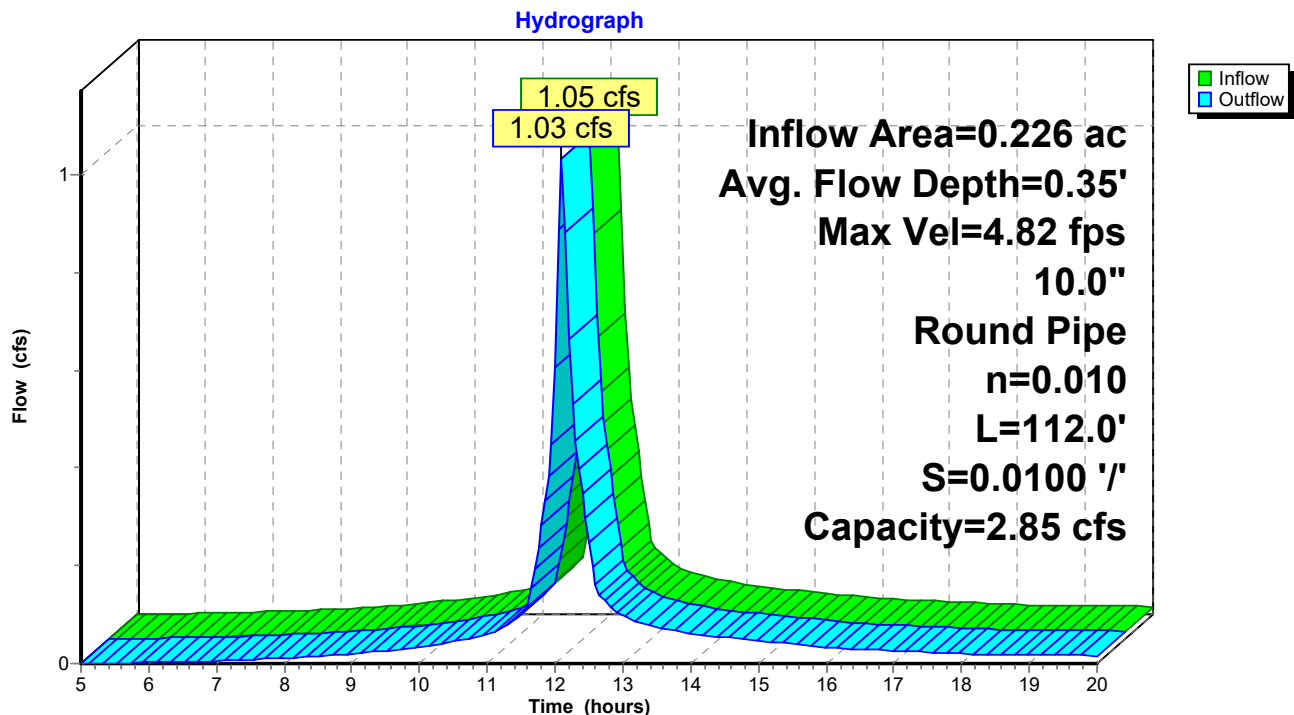
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.82 fps, Min. Travel Time= 0.4 min
Avg. Velocity= 1.74 fps, Avg. Travel Time= 1.1 min

Peak Storage= 24 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe



Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 3.90" for 25-Year event
 Inflow = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af
 Outflow = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.08' @ 12.09 hrs

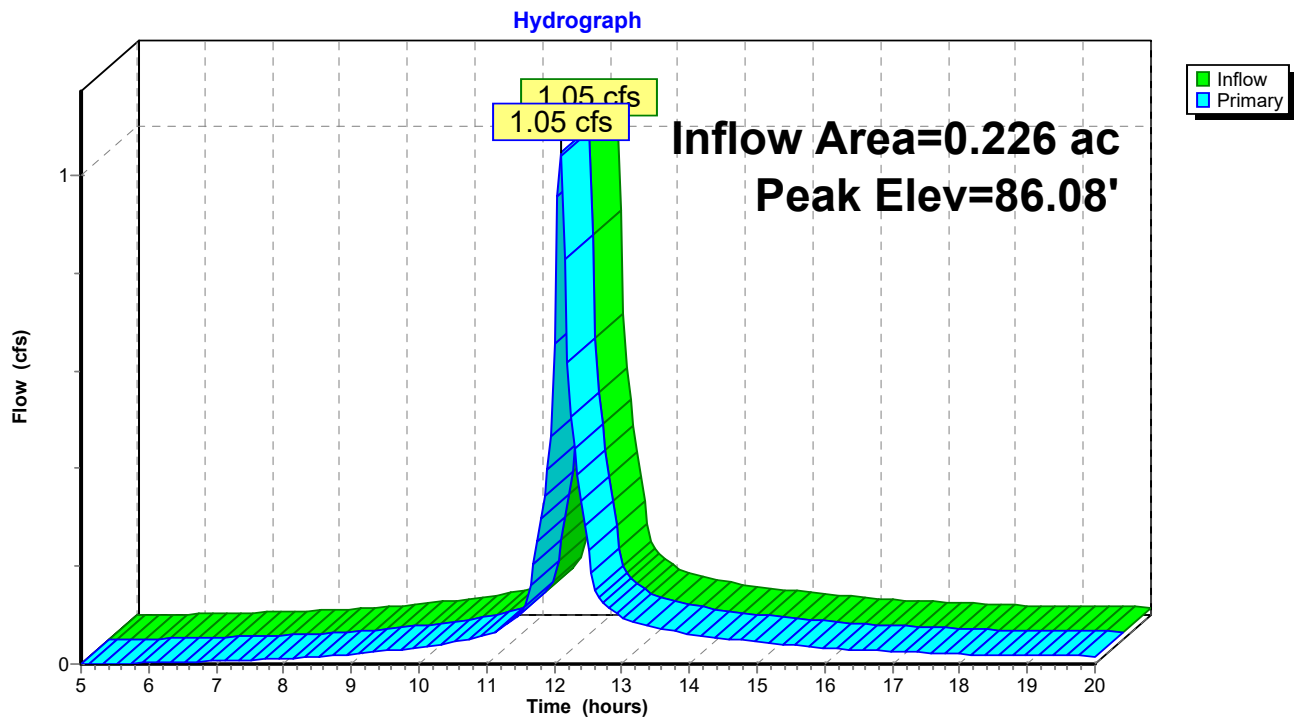
Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.02 cfs @ 12.09 hrs HW=86.07' (Free Discharge)

1=Orifice/Grate (Orifice Controls 1.02 cfs @ 2.57 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1



18-045 Braley Condominiums 9-14-18*Type III 24-hr 100-Year Rainfall=7.00"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 15

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Lower parking

Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>5.18"
Tc=6.0 min CN=87 Runoff=1.37 cfs 0.098 af

Reach Ex Pipe: 10" outlet pipe

Avg. Flow Depth=0.41' Max Vel=5.17 fps Inflow=1.37 cfs 0.098 af
10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=1.35 cfs 0.098 af

Pond Ex-CB1: Existing CB1

Peak Elev=86.19' Inflow=1.37 cfs 0.098 af
Outflow=1.37 cfs 0.098 af

Total Runoff Area = 0.226 ac Runoff Volume = 0.098 af Average Runoff Depth = 5.18"
18.27% Pervious = 0.041 ac 81.73% Impervious = 0.185 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 100-Year Rainfall=7.00"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 16

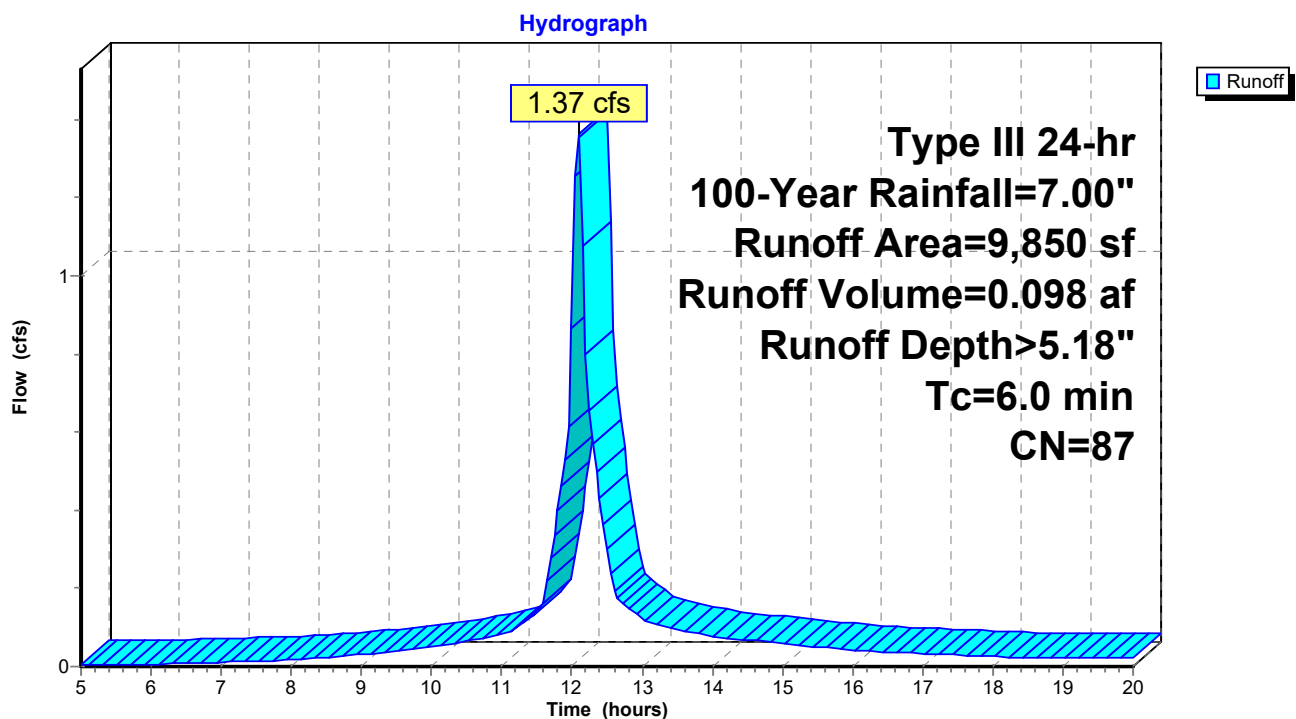
Summary for Subcatchment EX-1: Lower parking

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment EX-1: Lower parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.00"

Printed 1/28/2019

Page 17

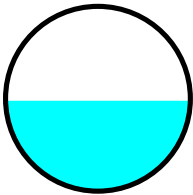
Summary for Reach Ex Pipe: 10" outlet pipe

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 5.18" for 100-Year event
Inflow = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af
Outflow = 1.35 cfs @ 12.10 hrs, Volume= 0.098 af, Atten= 1%, Lag= 0.6 min

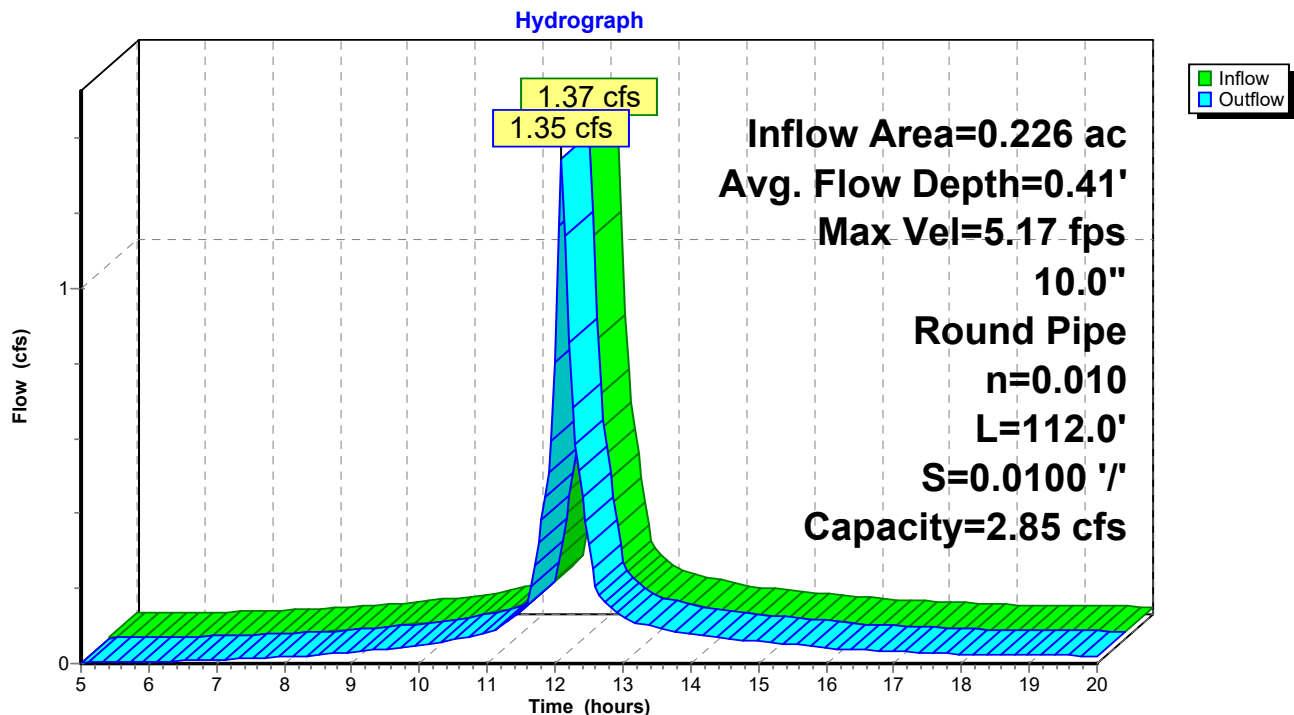
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.17 fps, Min. Travel Time= 0.4 min
Avg. Velocity= 1.92 fps, Avg. Travel Time= 1.0 min

Peak Storage= 30 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Ex Pipe: 10" outlet pipe



Summary for Pond Ex-CB1: Existing CB1

Inflow Area = 0.226 ac, 81.73% Impervious, Inflow Depth > 5.18" for 100-Year event
 Inflow = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af
 Outflow = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af

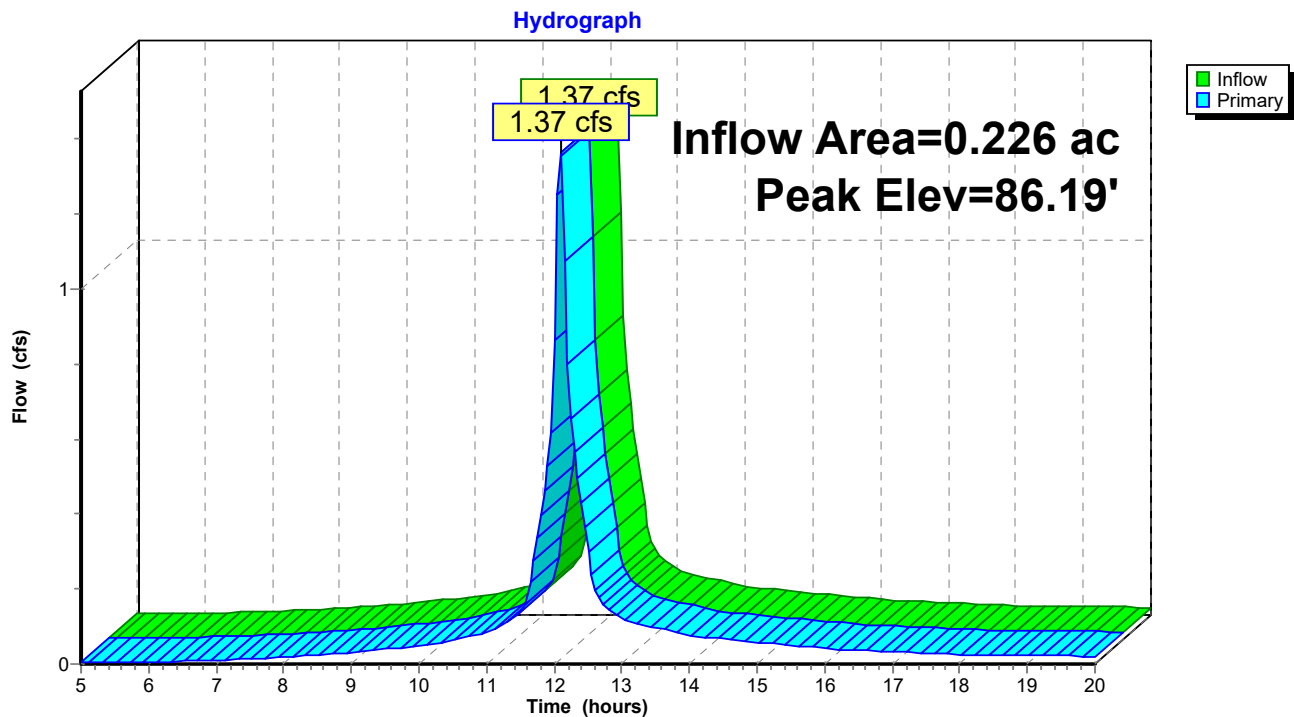
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.19' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

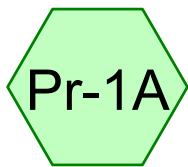
Primary OutFlow Max=1.33 cfs @ 12.09 hrs HW=86.18' (Free Discharge)

1=Orifice/Grate (Orifice Controls 1.33 cfs @ 2.80 fps)

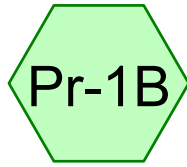
2=Orifice/Grate (Controls 0.00 cfs)

Pond Ex-CB1: Existing CB1

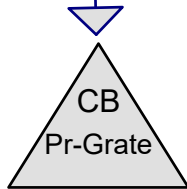
POST-CONSTRUCTION 2, 10, 25, 100-YEAR STORM



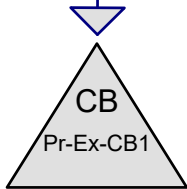
Lower parking to grate



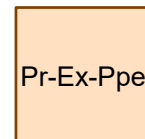
Lower Parking



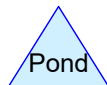
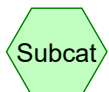
Proposed Grate



Existing CB1



10" Outlet Pipe



18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Printed 1/28/2019

Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.041	39	>75% Grass cover, Good, HSG A (Pr-1B)
0.196	98	Paved parking, HSG A (Pr-1A, Pr-1B)
0.237	88	TOTAL AREA

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 3

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	Pr-Ex-Ppe	85.50	84.38	112.0	0.0100	0.010	10.0	0.0	0.0

18-045 Braley Condominiums 9-14-18*Type III 24-hr 2-Year Rainfall=3.40"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 4

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Pr-1A: Lower parking to Runoff Area=0.011 ac 100.00% Impervious Runoff Depth>2.96"
Tc=6.0 min CN=98 Runoff=0.04 cfs 0.003 af

Subcatchment Pr-1B: Lower Parking Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>1.96"
Tc=6.0 min CN=87 Runoff=0.54 cfs 0.037 af

Reach Pr-Ex-Ppe: 10" Outlet Pipe Avg. Flow Depth=0.25' Max Vel=4.10 fps Inflow=0.58 cfs 0.040 af
10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=0.57 cfs 0.040 af

Pond Pr-Ex-CB1: Existing CB1 Peak Elev=85.91' Inflow=0.58 cfs 0.040 af
Outflow=0.58 cfs 0.040 af

Pond Pr-Grate: Proposed Grate Peak Elev=87.29' Inflow=0.04 cfs 0.003 af
Outflow=0.04 cfs 0.003 af

Total Runoff Area = 0.237 ac Runoff Volume = 0.040 af Average Runoff Depth = 2.01"
17.43% Pervious = 0.041 ac 82.57% Impervious = 0.196 ac

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.40"

Printed 1/28/2019

Page 5

Summary for Subcatchment Pr-1A: Lower parking to grate

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 2.96"

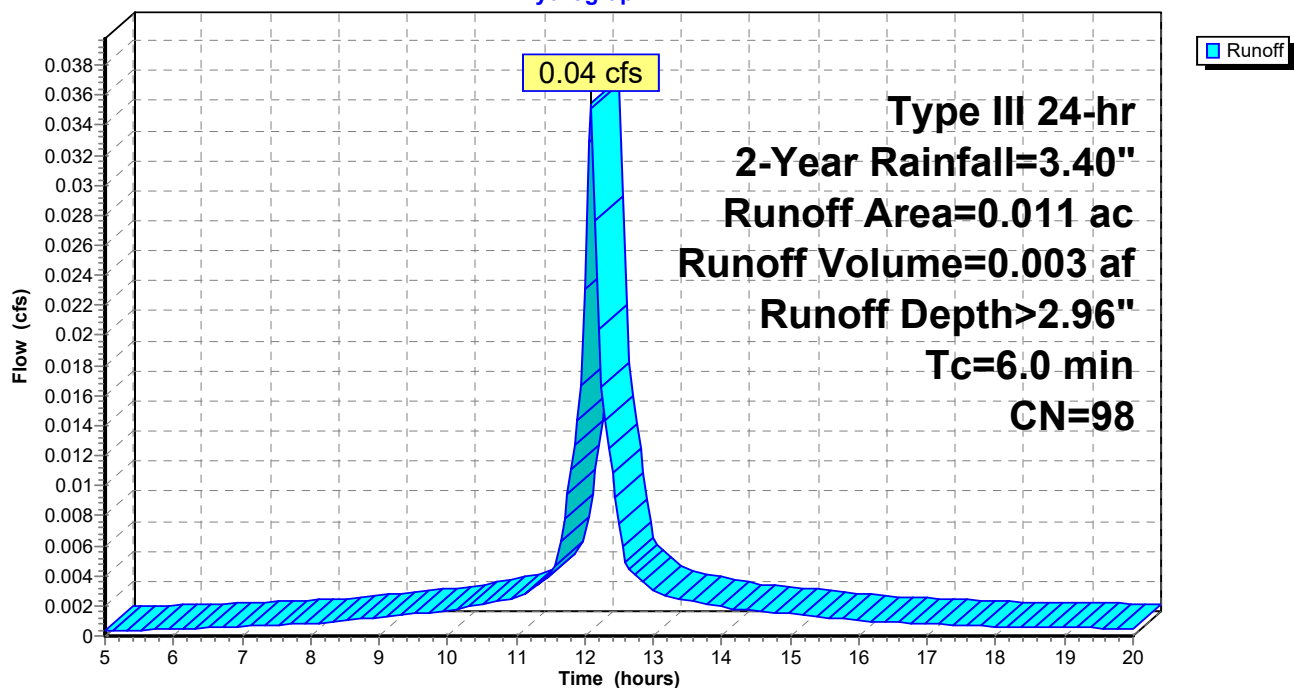
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.011	98	Paved parking, HSG A
0.011		100.00% Impervious Area

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

Subcatchment Pr-1A: Lower parking to grate

Hydrograph



18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.40"

Printed 1/28/2019

Page 6

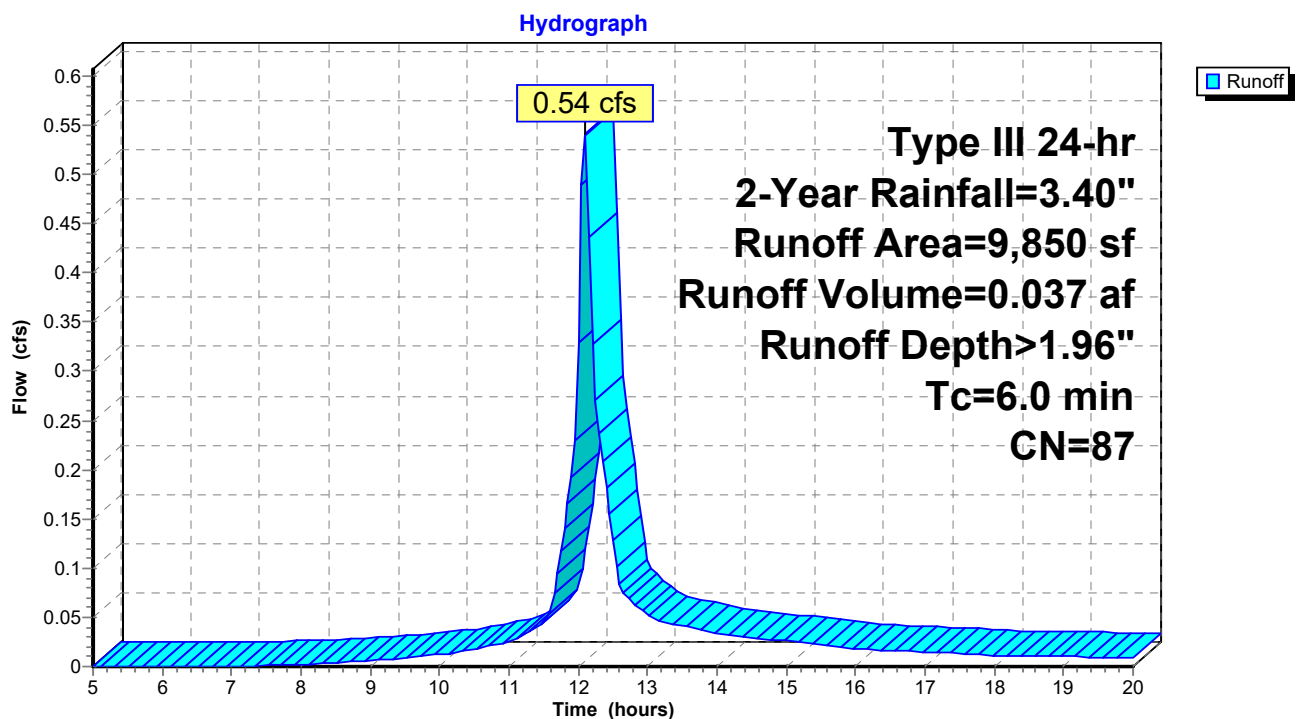
Summary for Subcatchment Pr-1B: Lower Parking

Runoff = 0.54 cfs @ 12.09 hrs, Volume= 0.037 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment Pr-1B: Lower Parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.40"

Printed 1/28/2019

Page 7

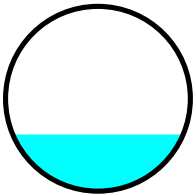
Summary for Reach Pr-Ex-Ppe: 10" Outlet Pipe

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 2.01" for 2-Year event
Inflow = 0.58 cfs @ 12.09 hrs, Volume= 0.040 af
Outflow = 0.57 cfs @ 12.10 hrs, Volume= 0.040 af, Atten= 2%, Lag= 0.7 min

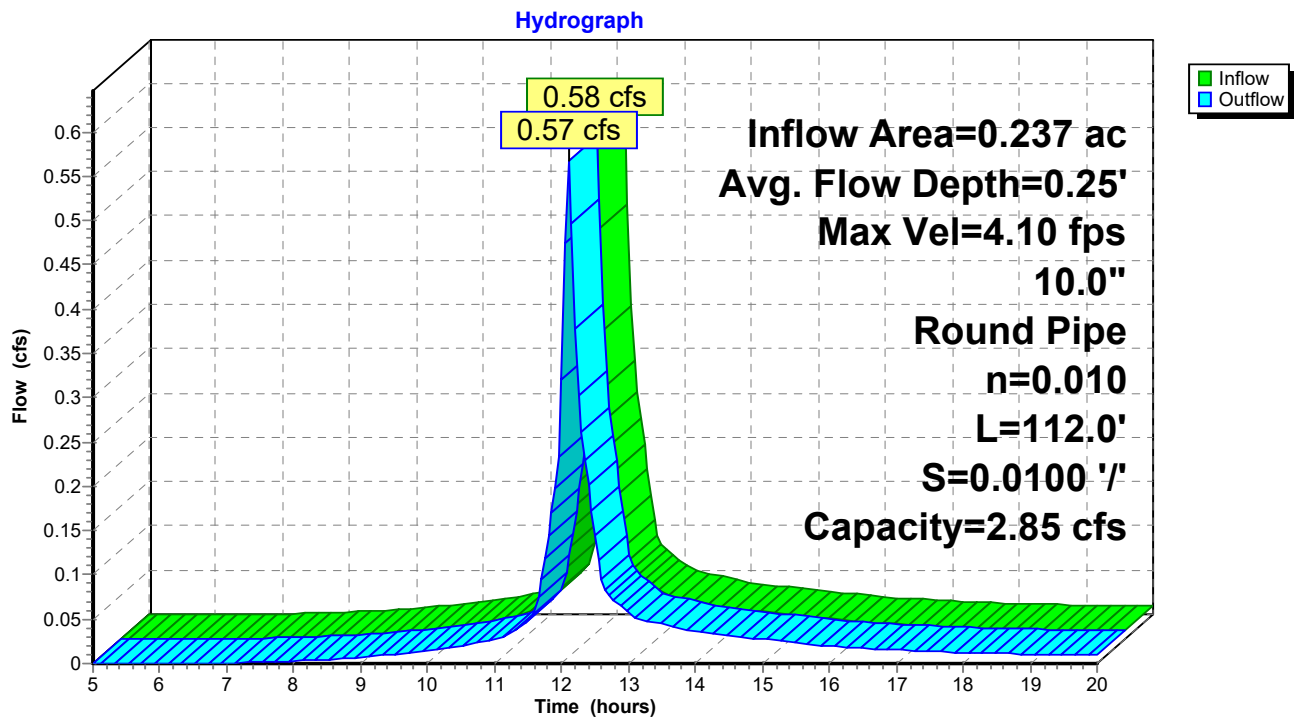
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.10 fps, Min. Travel Time= 0.5 min
Avg. Velocity= 1.40 fps, Avg. Travel Time= 1.3 min

Peak Storage= 16 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Pr-Ex-Ppe: 10" Outlet Pipe



Summary for Pond Pr-Ex-CB1: Existing CB1

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 2.01" for 2-Year event
 Inflow = 0.58 cfs @ 12.09 hrs, Volume= 0.040 af
 Outflow = 0.58 cfs @ 12.09 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.58 cfs @ 12.09 hrs, Volume= 0.040 af

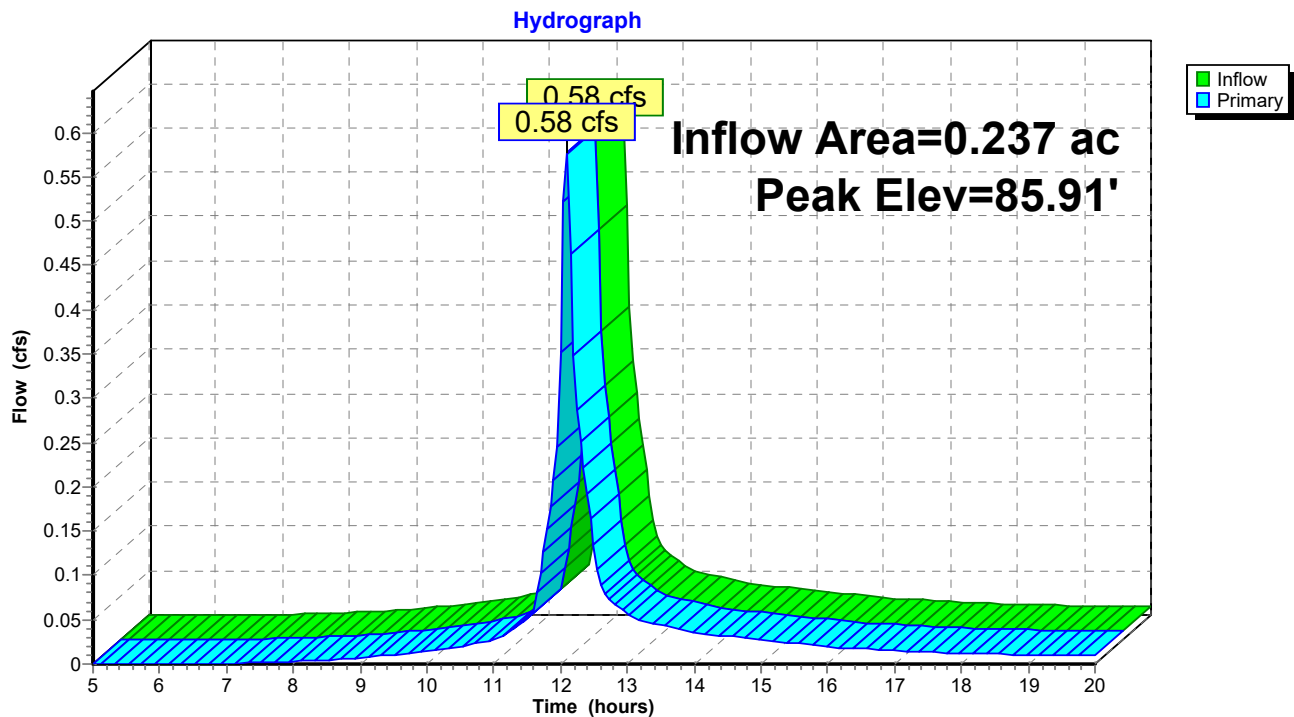
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 85.91' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.56 cfs @ 12.09 hrs HW=85.90' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.56 cfs @ 2.16 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Ex-CB1: Existing CB1

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.40"

Printed 1/28/2019

Page 9

Summary for Pond Pr-Grate: Proposed Grate

Inflow Area = 0.011 ac, 100.00% Impervious, Inflow Depth > 2.96" for 2-Year event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af
Outflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 87.29' @ 12.09 hrs

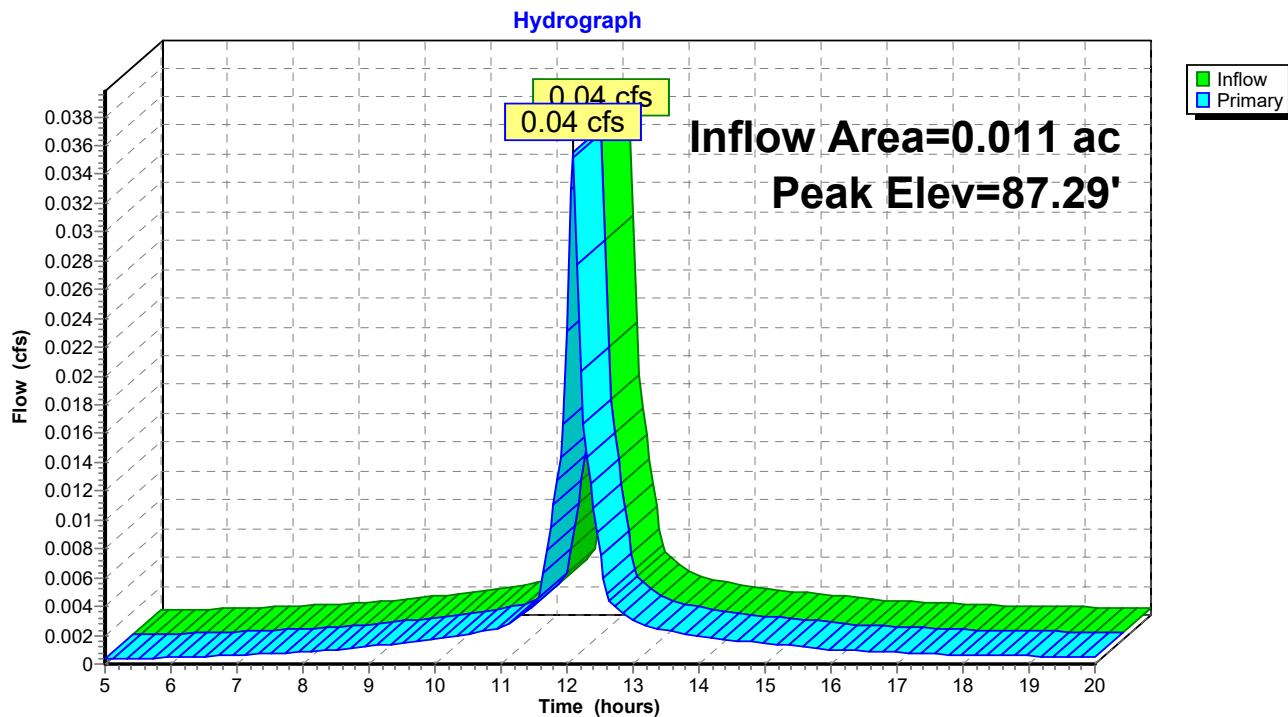
Device	Routing	Invert	Outlet Devices
#1	Primary	87.20'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	88.70'	0.8" x 4.8" Horiz. Orifice/Grate X 34.00 columns X 2 rows C= 0.600 in 12.0" x 240.0" Grate (9% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.03 cfs @ 12.09 hrs HW=87.29' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.03 cfs @ 1.04 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Grate: Proposed Grate



18-045 Braley Condominiums 9-14-18*Type III 24-hr 10-Year Rainfall=4.80"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 10

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Pr-1A: Lower parking to Runoff Area=0.011 ac 100.00% Impervious Runoff Depth>4.24"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.004 af

Subcatchment Pr-1B: Lower Parking Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>3.18"
Tc=6.0 min CN=87 Runoff=0.86 cfs 0.060 af

Reach Pr-Ex-Ppe: 10" Outlet Pipe Avg. Flow Depth=0.32' Max Vel=4.65 fps Inflow=0.91 cfs 0.064 af
10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=0.90 cfs 0.064 af

Pond Pr-Ex-CB1: Existing CB1 Peak Elev=86.03' Inflow=0.91 cfs 0.064 af
Outflow=0.91 cfs 0.064 af

Pond Pr-Grate: Proposed Grate Peak Elev=87.31' Inflow=0.05 cfs 0.004 af
Outflow=0.05 cfs 0.004 af

Total Runoff Area = 0.237 ac Runoff Volume = 0.064 af Average Runoff Depth = 3.23"
17.43% Pervious = 0.041 ac 82.57% Impervious = 0.196 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 10-Year Rainfall=4.80"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 11

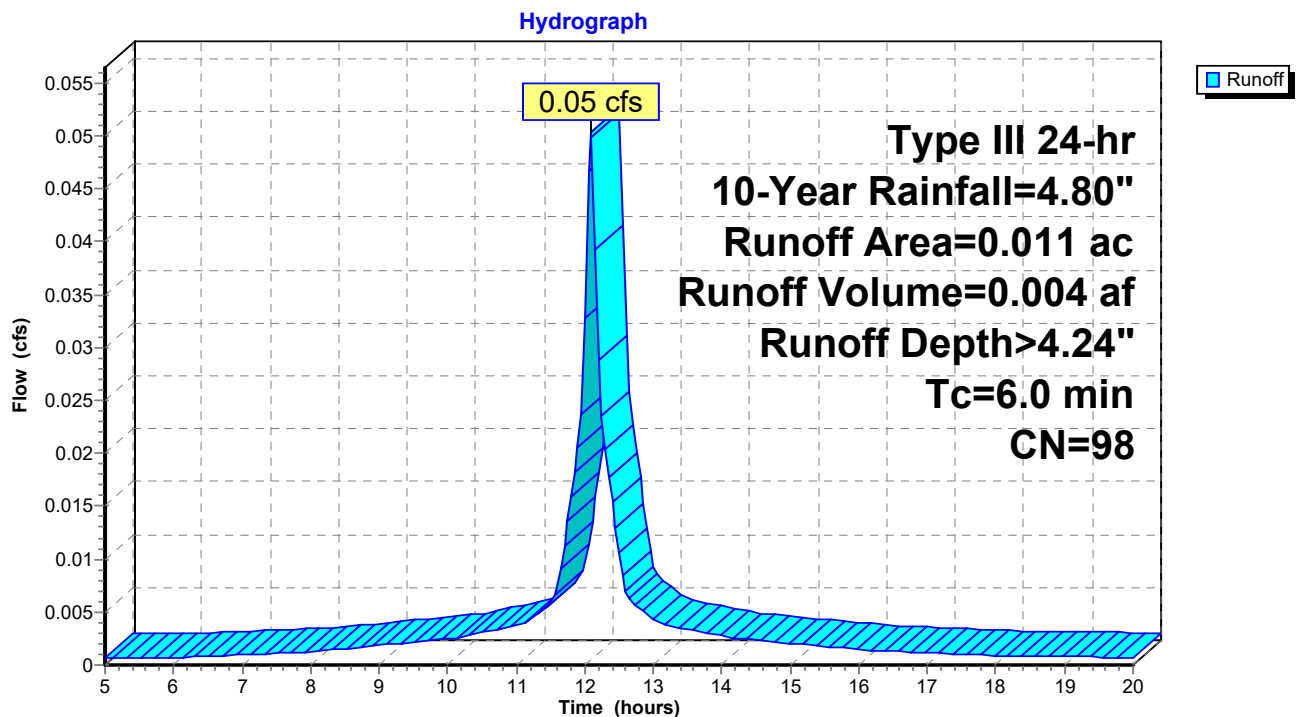
Summary for Subcatchment Pr-1A: Lower parking to grate

Runoff = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Depth> 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.011	98	Paved parking, HSG A
0.011		100.00% Impervious Area

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

Subcatchment Pr-1A: Lower parking to grate

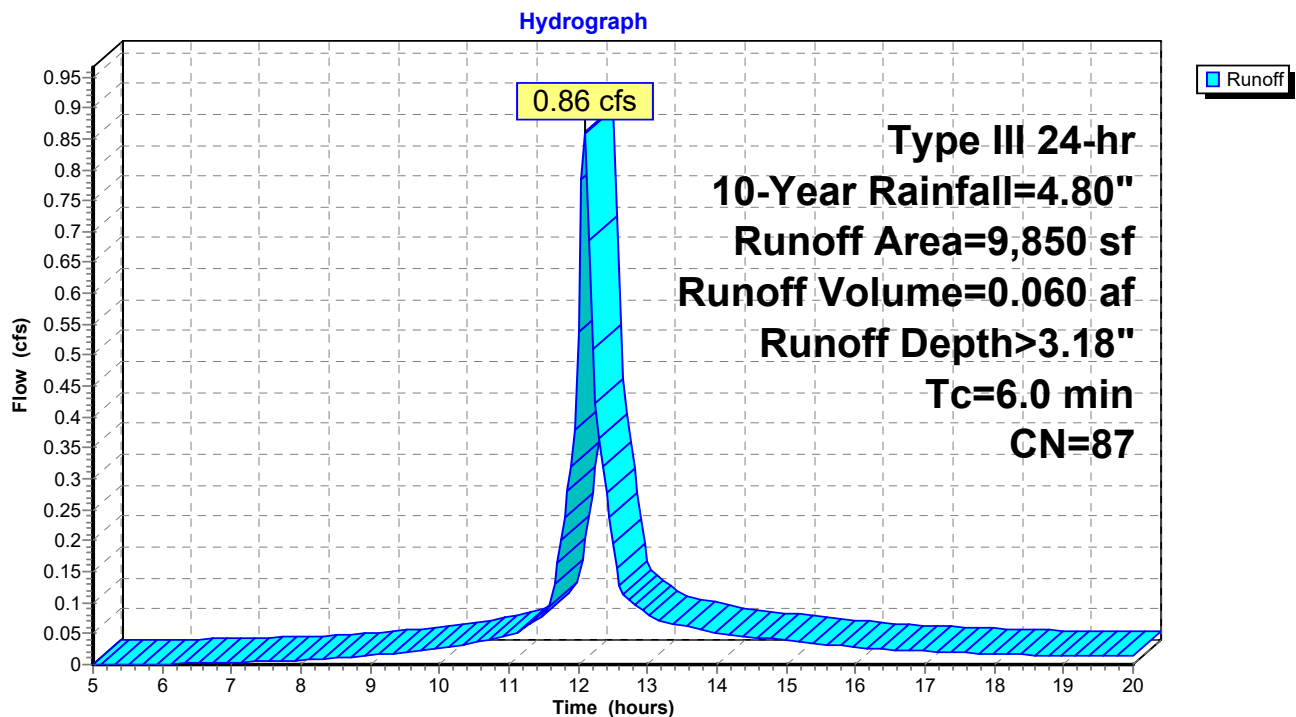
Summary for Subcatchment Pr-1B: Lower Parking

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment Pr-1B: Lower Parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=4.80"

Printed 1/28/2019

Page 13

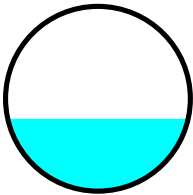
Summary for Reach Pr-Ex-Ppe: 10" Outlet Pipe

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 3.23" for 10-Year event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 0.064 af
Outflow = 0.90 cfs @ 12.10 hrs, Volume= 0.064 af, Atten= 1%, Lag= 0.6 min

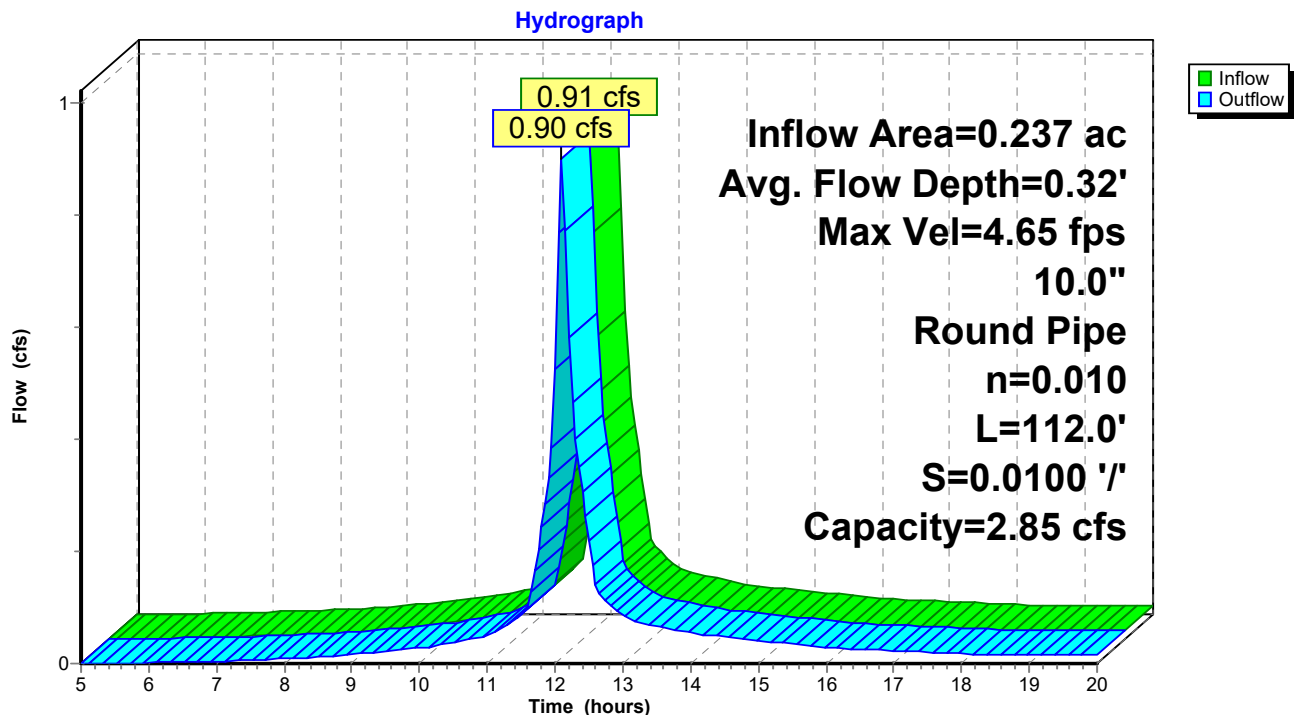
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.65 fps, Min. Travel Time= 0.4 min
Avg. Velocity= 1.65 fps, Avg. Travel Time= 1.1 min

Peak Storage= 22 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Pr-Ex-Ppe: 10" Outlet Pipe



Summary for Pond Pr-Ex-CB1: Existing CB1

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 3.23" for 10-Year event
 Inflow = 0.91 cfs @ 12.09 hrs, Volume= 0.064 af
 Outflow = 0.91 cfs @ 12.09 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.91 cfs @ 12.09 hrs, Volume= 0.064 af

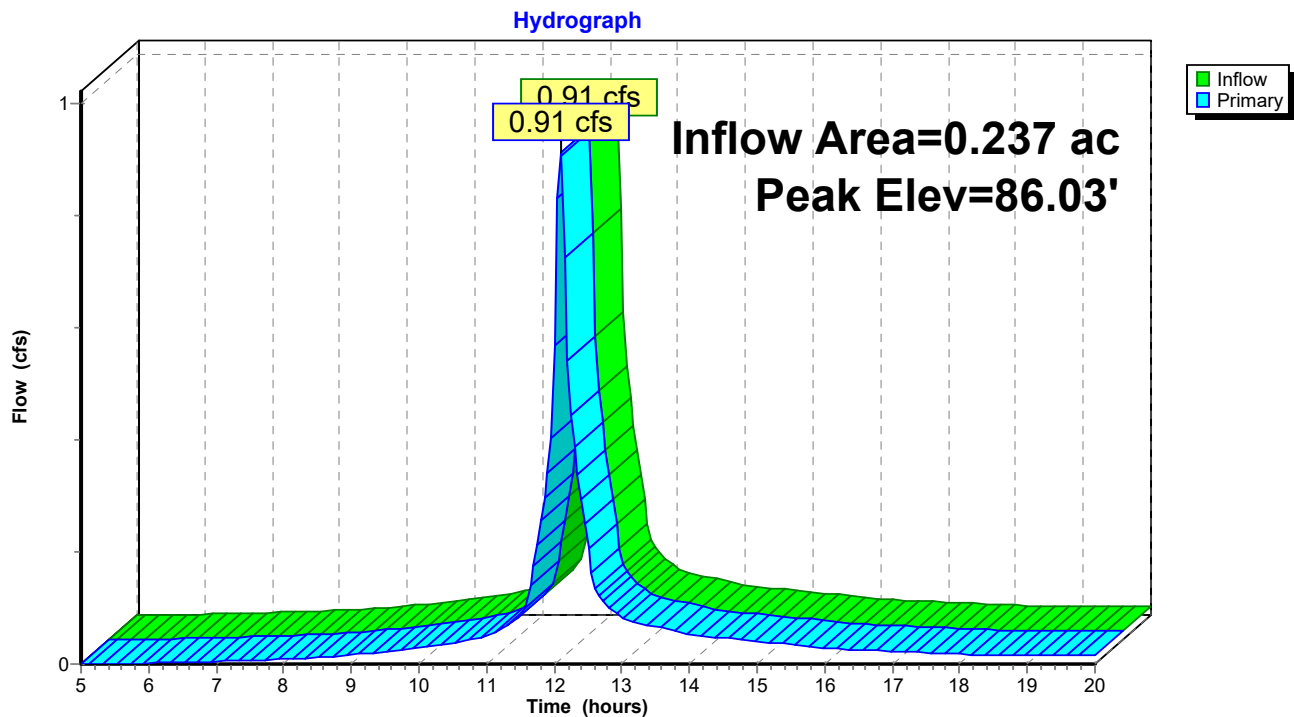
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.03' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 12.09 hrs HW=86.02' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.89 cfs @ 2.47 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Ex-CB1: Existing CB1

Summary for Pond Pr-Grate: Proposed Grate

Inflow Area = 0.011 ac, 100.00% Impervious, Inflow Depth > 4.24" for 10-Year event
 Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af
 Outflow = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af

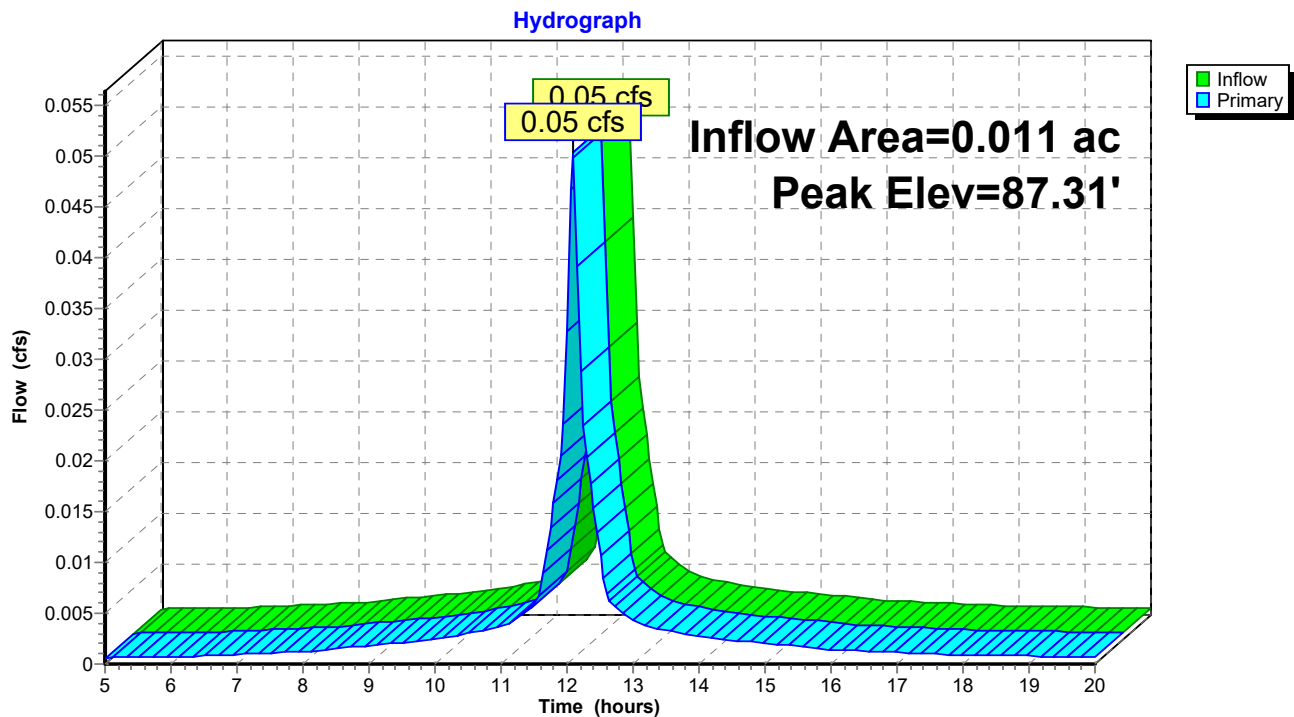
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 87.31' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	87.20'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	88.70'	0.8" x 4.8" Horiz. Orifice/Grate X 34.00 columns X 2 rows C= 0.600 in 12.0" x 240.0" Grate (9% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 12.09 hrs HW=87.31' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.05 cfs @ 1.13 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Grate: Proposed Grate

18-045 Braley Condominiums 9-14-18*Type III 24-hr 25-Year Rainfall=5.60"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 16

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Pr-1A: Lower parking to Runoff Area=0.011 ac 100.00% Impervious Runoff Depth>4.97"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment Pr-1B: Lower Parking Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>3.90"
Tc=6.0 min CN=87 Runoff=1.05 cfs 0.074 af

Reach Pr-Ex-Ppe: 10" Outlet Pipe Avg. Flow Depth=0.36' Max Vel=4.89 fps Inflow=1.10 cfs 0.078 af
10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=1.09 cfs 0.078 af

Pond Pr-Ex-CB1: Existing CB1 Peak Elev=86.10' Inflow=1.10 cfs 0.078 af
Outflow=1.10 cfs 0.078 af

Pond Pr-Grate: Proposed Grate Peak Elev=87.32' Inflow=0.06 cfs 0.005 af
Outflow=0.06 cfs 0.005 af

Total Runoff Area = 0.237 ac Runoff Volume = 0.078 af Average Runoff Depth = 3.95"
17.43% Pervious = 0.041 ac 82.57% Impervious = 0.196 ac

18-045 Braley Condominiums 9-14-18

Type III 24-hr 25-Year Rainfall=5.60"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 17

Summary for Subcatchment Pr-1A: Lower parking to grate

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth> 4.97"

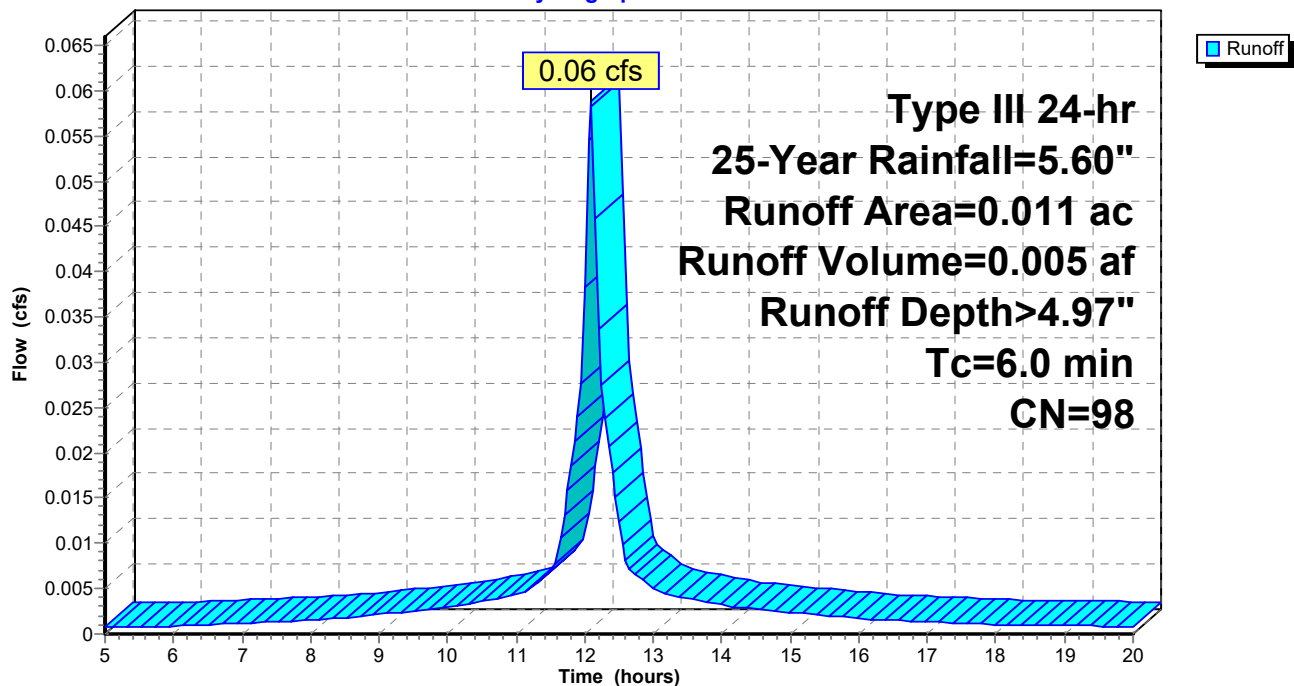
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.011	98	Paved parking, HSG A
0.011		100.00% Impervious Area

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

Subcatchment Pr-1A: Lower parking to grate

Hydrograph



18-045 Braley Condominiums 9-14-18

Type III 24-hr 25-Year Rainfall=5.60"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 18

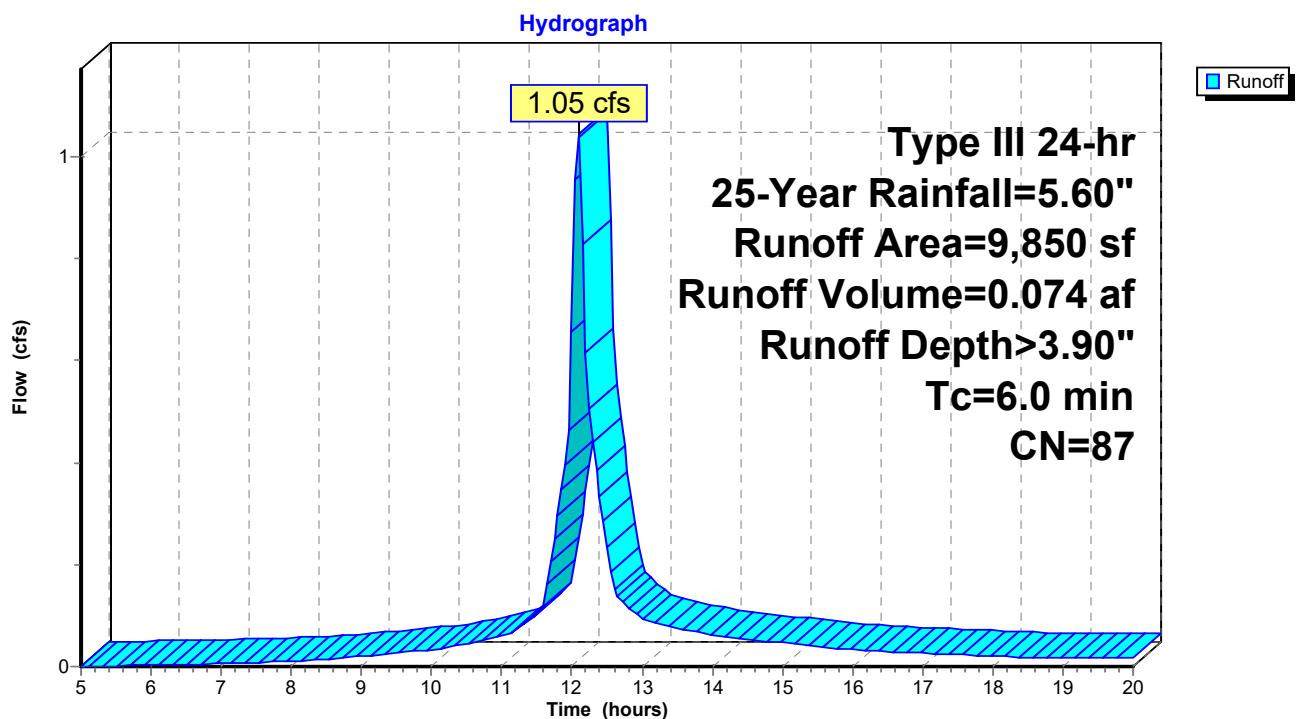
Summary for Subcatchment Pr-1B: Lower Parking

Runoff = 1.05 cfs @ 12.09 hrs, Volume= 0.074 af, Depth> 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment Pr-1B: Lower Parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=5.60"

Printed 1/28/2019

Page 19

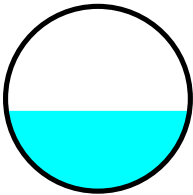
Summary for Reach Pr-Ex-Ppe: 10" Outlet Pipe

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 3.95" for 25-Year event
Inflow = 1.10 cfs @ 12.09 hrs, Volume= 0.078 af
Outflow = 1.09 cfs @ 12.10 hrs, Volume= 0.078 af, Atten= 1%, Lag= 0.6 min

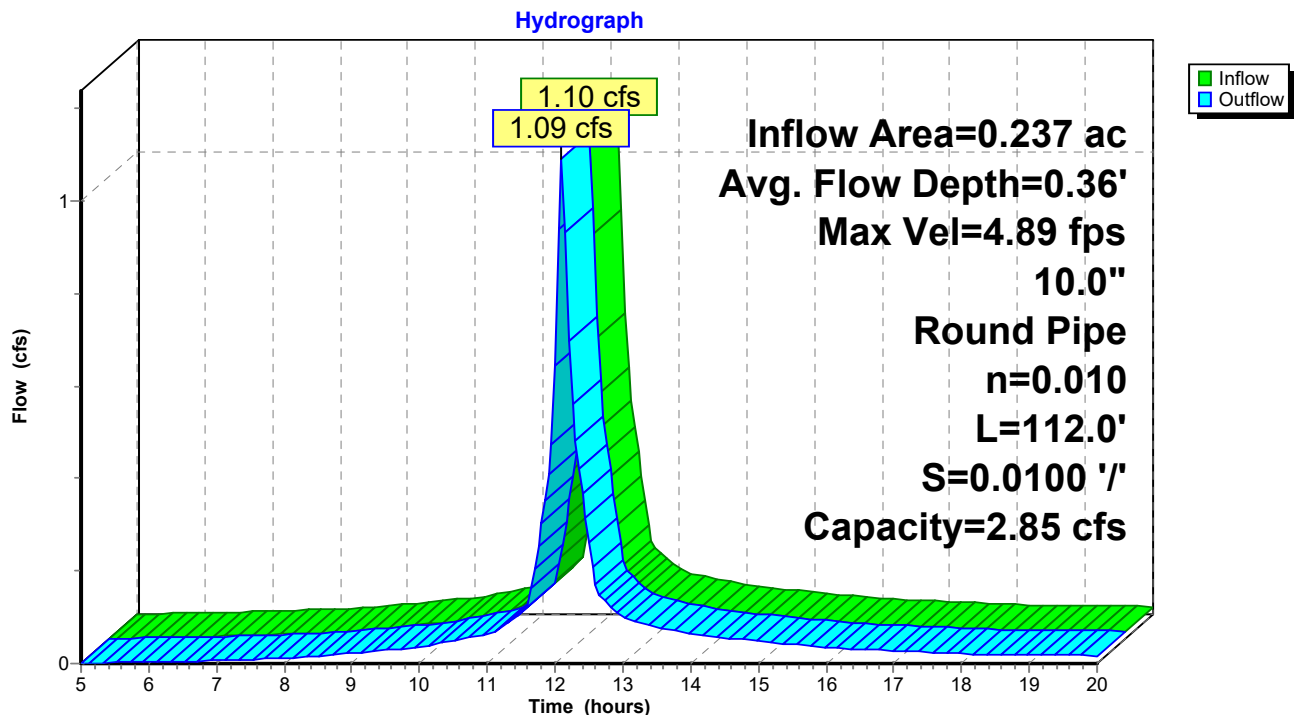
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.89 fps, Min. Travel Time= 0.4 min
Avg. Velocity= 1.78 fps, Avg. Travel Time= 1.0 min

Peak Storage= 25 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Pr-Ex-Ppe: 10" Outlet Pipe



Summary for Pond Pr-Ex-CB1: Existing CB1

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 3.95" for 25-Year event
 Inflow = 1.10 cfs @ 12.09 hrs, Volume= 0.078 af
 Outflow = 1.10 cfs @ 12.09 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.10 cfs @ 12.09 hrs, Volume= 0.078 af

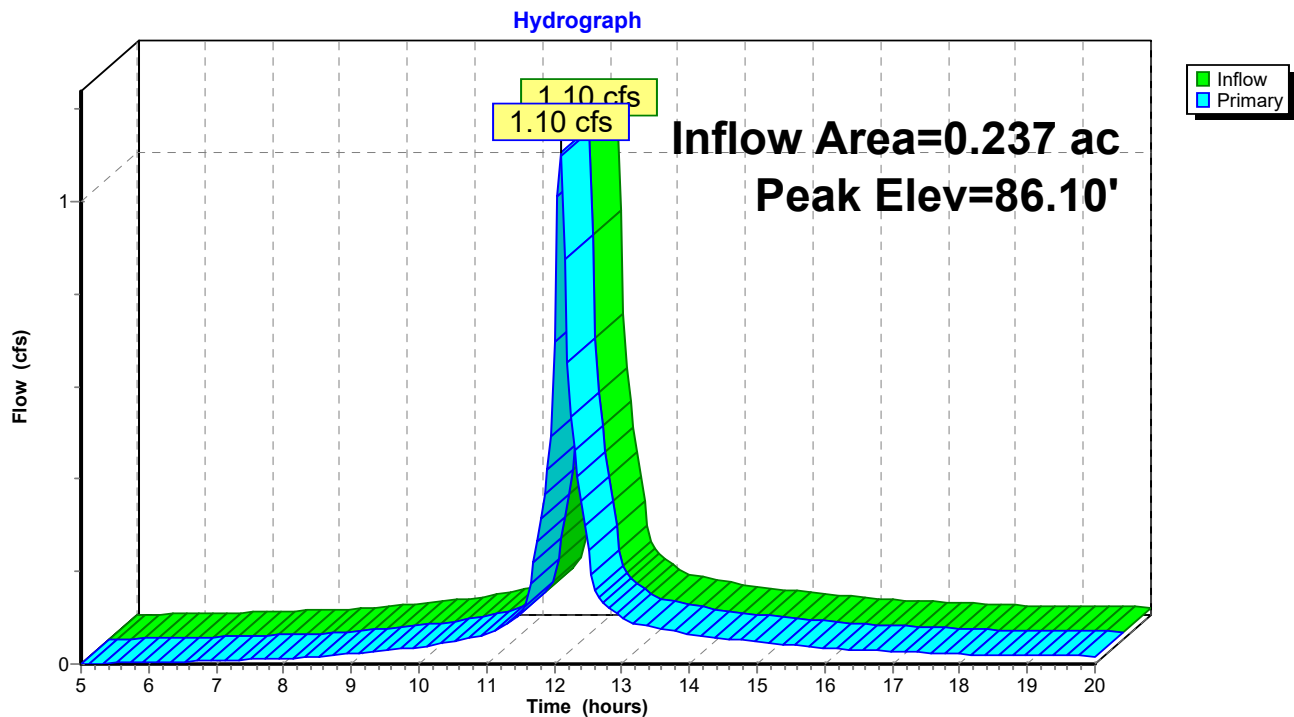
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.10' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.08 cfs @ 12.09 hrs HW=86.09' (Free Discharge)

1=Orifice/Grate (Orifice Controls 1.08 cfs @ 2.61 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Ex-CB1: Existing CB1

Summary for Pond Pr-Grate: Proposed Grate

Inflow Area = 0.011 ac, 100.00% Impervious, Inflow Depth > 4.97" for 25-Year event
 Inflow = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af
 Outflow = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af

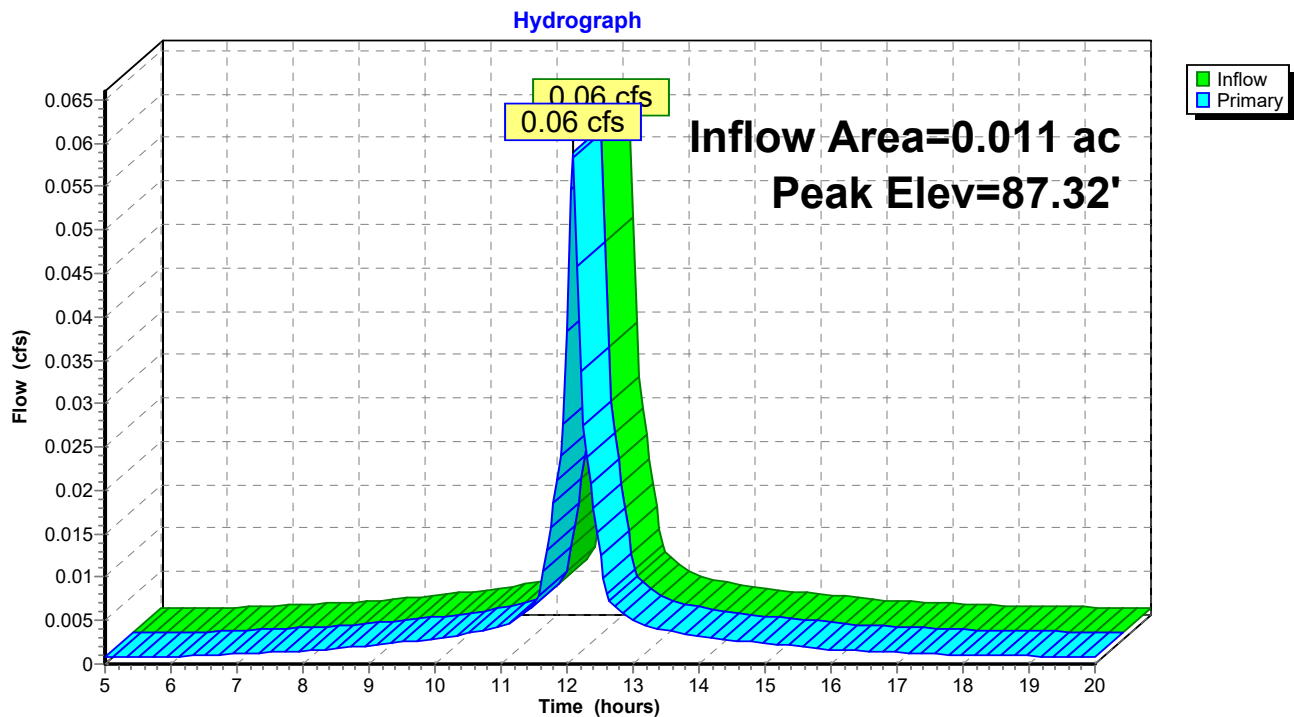
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 87.32' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	87.20'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	88.70'	0.8" x 4.8" Horiz. Orifice/Grate X 34.00 columns X 2 rows C= 0.600 in 12.0" x 240.0" Grate (9% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.06 cfs @ 12.09 hrs HW=87.32' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.06 cfs @ 1.18 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Grate: Proposed Grate

18-045 Braley Condominiums 9-14-18*Type III 24-hr 100-Year Rainfall=7.00"*

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 22

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Pr-1A: Lower parking to Runoff Area=0.011 ac 100.00% Impervious Runoff Depth>6.24"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.006 af

Subcatchment Pr-1B: Lower Parking Runoff Area=9,850 sf 81.73% Impervious Runoff Depth>5.18"
Tc=6.0 min CN=87 Runoff=1.37 cfs 0.098 af

Reach Pr-Ex-Ppe: 10" Outlet Pipe Avg. Flow Depth=0.42' Max Vel=5.24 fps Inflow=1.44 cfs 0.103 af
10.0" Round Pipe n=0.010 L=112.0' S=0.0100 '/ Capacity=2.85 cfs Outflow=1.42 cfs 0.103 af

Pond Pr-Ex-CB1: Existing CB1 Peak Elev=86.22' Inflow=1.44 cfs 0.103 af
Outflow=1.44 cfs 0.103 af

Pond Pr-Grate: Proposed Grate Peak Elev=87.34' Inflow=0.07 cfs 0.006 af
Outflow=0.07 cfs 0.006 af

Total Runoff Area = 0.237 ac Runoff Volume = 0.103 af Average Runoff Depth = 5.23"
17.43% Pervious = 0.041 ac 82.57% Impervious = 0.196 ac

Summary for Subcatchment Pr-1A: Lower parking to grate

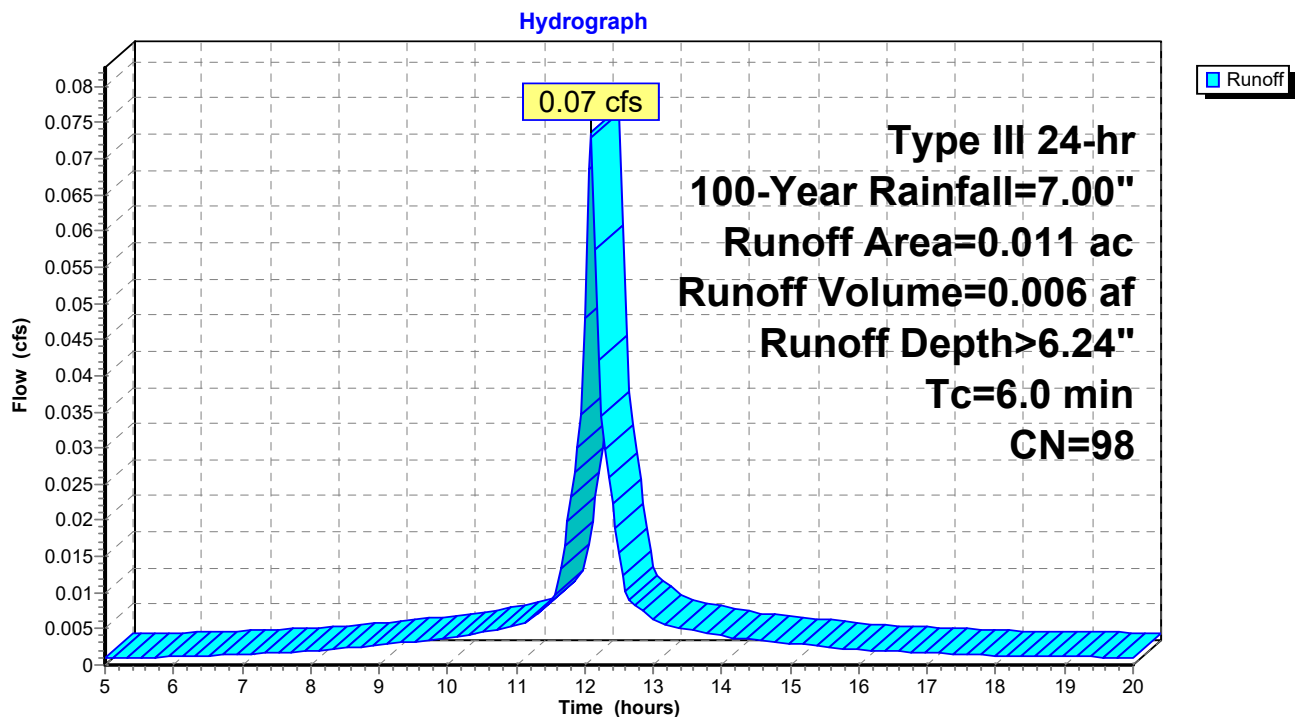
Runoff = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af, Depth> 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.011	98	Paved parking, HSG A
0.011		100.00% Impervious Area

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

Subcatchment Pr-1A: Lower parking to grate



18-045 Braley Condominiums 9-14-18

Type III 24-hr 100-Year Rainfall=7.00"

Prepared by {enter your company name here}

Printed 1/28/2019

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Page 24

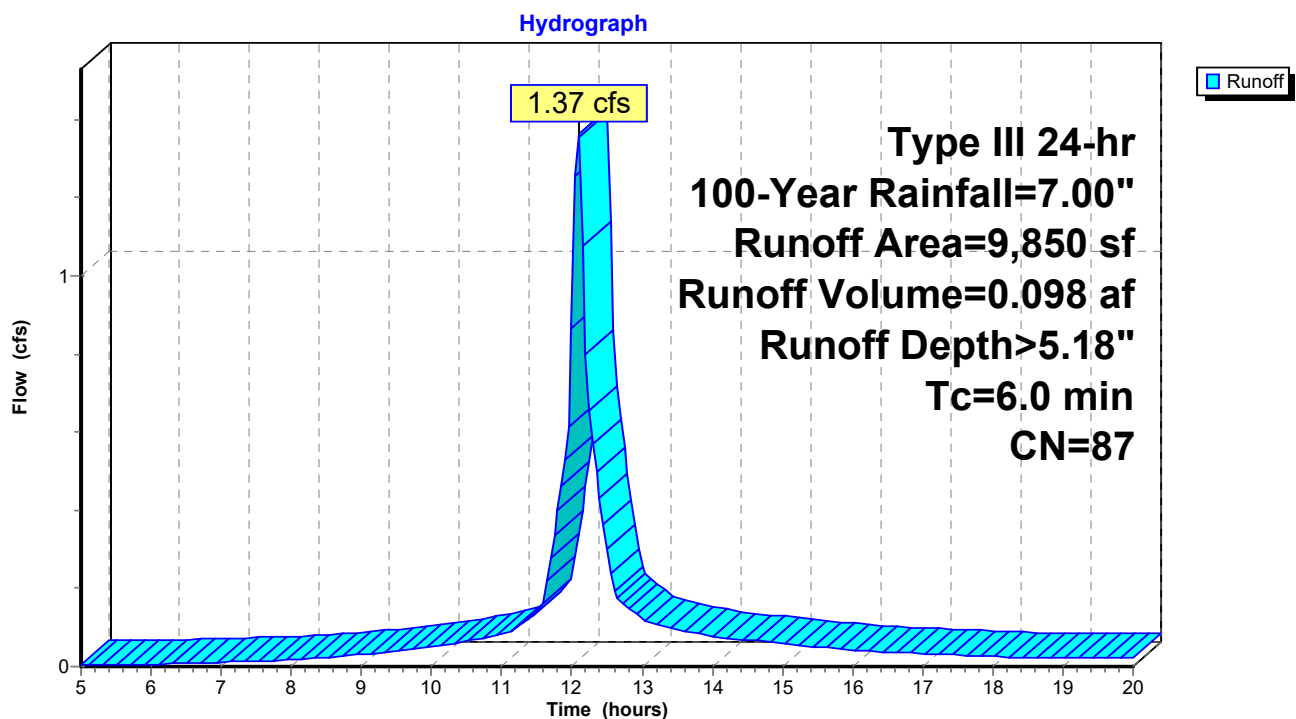
Summary for Subcatchment Pr-1B: Lower Parking

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 0.098 af, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
8,050	98	Paved parking, HSG A
1,800	39	>75% Grass cover, Good, HSG A
9,850	87	Weighted Average
1,800		18.27% Pervious Area
8,050		81.73% Impervious Area

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

Subcatchment Pr-1B: Lower Parking

18-045 Braley Condominiums 9-14-18

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 04448 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.00"

Printed 1/28/2019

Page 25

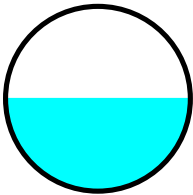
Summary for Reach Pr-Ex-Ppe: 10" Outlet Pipe

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 5.23" for 100-Year event
Inflow = 1.44 cfs @ 12.09 hrs, Volume= 0.103 af
Outflow = 1.42 cfs @ 12.10 hrs, Volume= 0.103 af, Atten= 1%, Lag= 0.6 min

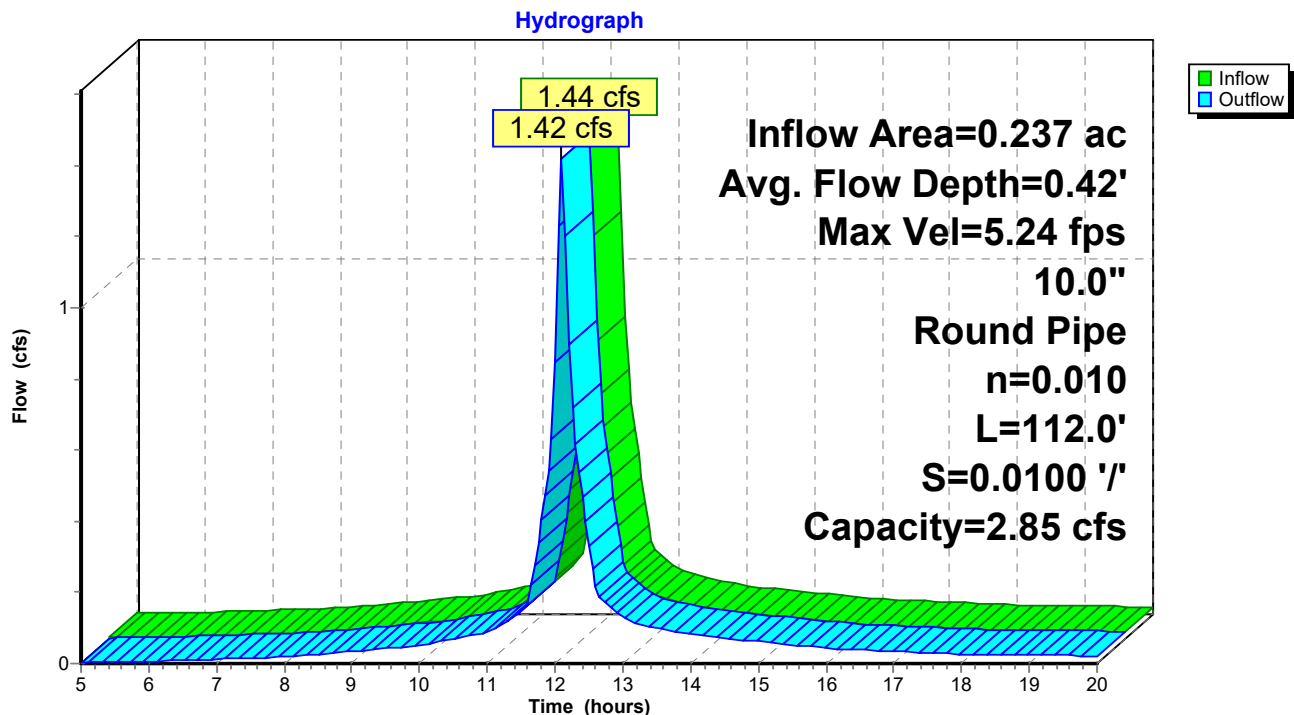
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.24 fps, Min. Travel Time= 0.4 min
Avg. Velocity= 1.96 fps, Avg. Travel Time= 1.0 min

Peak Storage= 31 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 112.0' Slope= 0.0100 '/'
Inlet Invert= 85.50', Outlet Invert= 84.38'



Reach Pr-Ex-Ppe: 10" Outlet Pipe



Summary for Pond Pr-Ex-CB1: Existing CB1

Inflow Area = 0.237 ac, 82.57% Impervious, Inflow Depth > 5.23" for 100-Year event
 Inflow = 1.44 cfs @ 12.09 hrs, Volume= 0.103 af
 Outflow = 1.44 cfs @ 12.09 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.44 cfs @ 12.09 hrs, Volume= 0.103 af

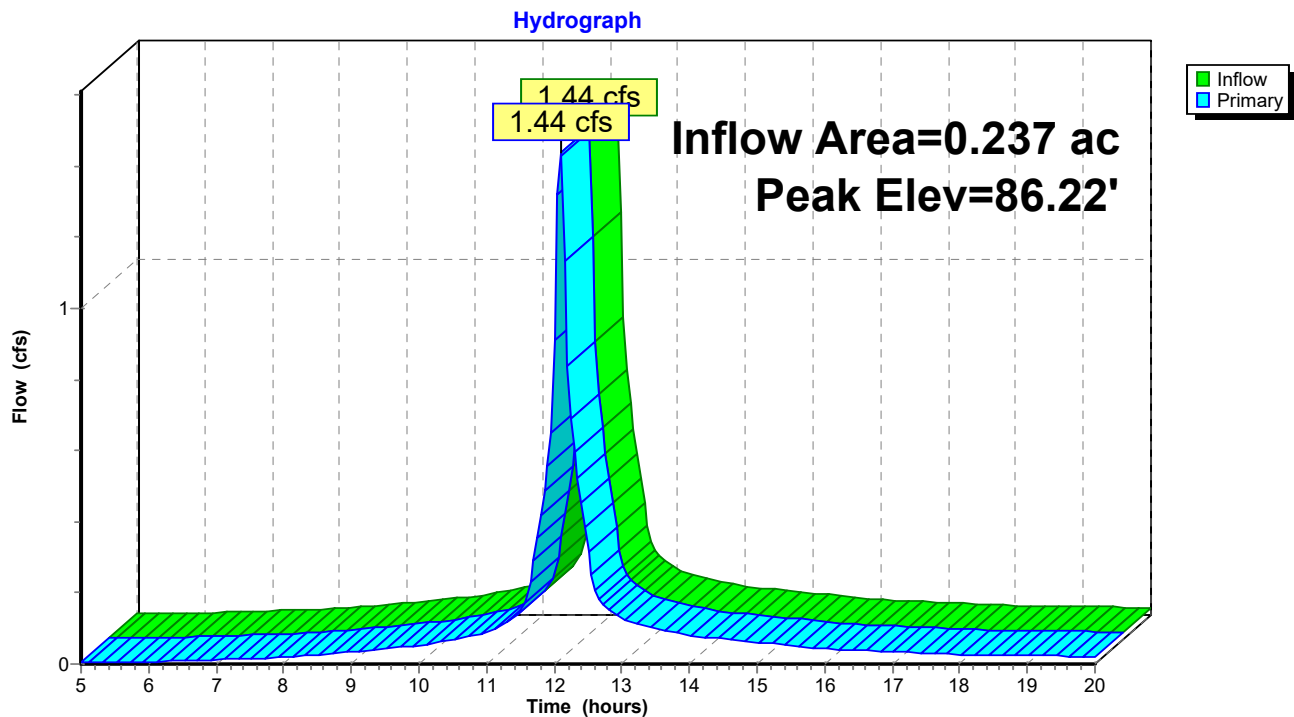
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 86.22' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.50'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	89.00'	1.0" x 1.0" Horiz. Orifice/Grate X 8.00 columns X 8 rows C= 0.600 in 24.0" x 24.0" Grate (11% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.40 cfs @ 12.09 hrs HW=86.20' (Free Discharge)

1=Orifice/Grate (Orifice Controls 1.40 cfs @ 2.86 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Ex-CB1: Existing CB1

Summary for Pond Pr-Grate: Proposed Grate

Inflow Area = 0.011 ac, 100.00% Impervious, Inflow Depth > 6.24" for 100-Year event
 Inflow = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af
 Outflow = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af

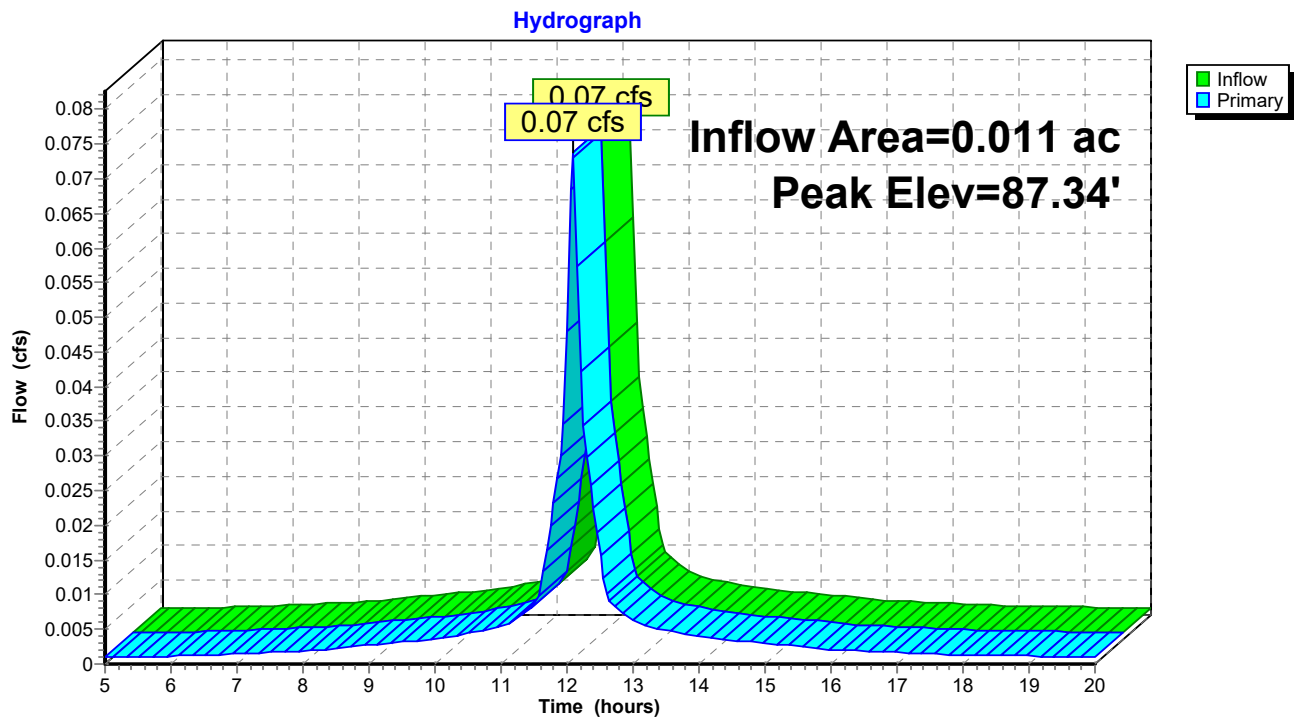
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 87.34' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	87.20'	10.0" Vert. Orifice/Grate C= 0.600
#2	Primary	88.70'	0.8" x 4.8" Horiz. Orifice/Grate X 34.00 columns X 2 rows C= 0.600 in 12.0" x 240.0" Grate (9% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.09 hrs HW=87.33' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.07 cfs @ 1.25 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond Pr-Grate: Proposed Grate

APPENDIX B –

Watershed Maps



EDGE OF WETLAND
BY NATURAL RESOURCE SERVICES, INC.

THREE
STORY
BUILDING
#1475

MAP 137 LOT 108
AREA= 256,976± S.F.
(5.899± ACRES)

UP# 44-A

50' WETLAND BUFFER

MAP 137 LOT 109
AREA= 23,110± S.F.
(0.531± ACRES)

WATERSHED AREA
EX-1

50' WETLAND BUFFER

CONCRETE CURB

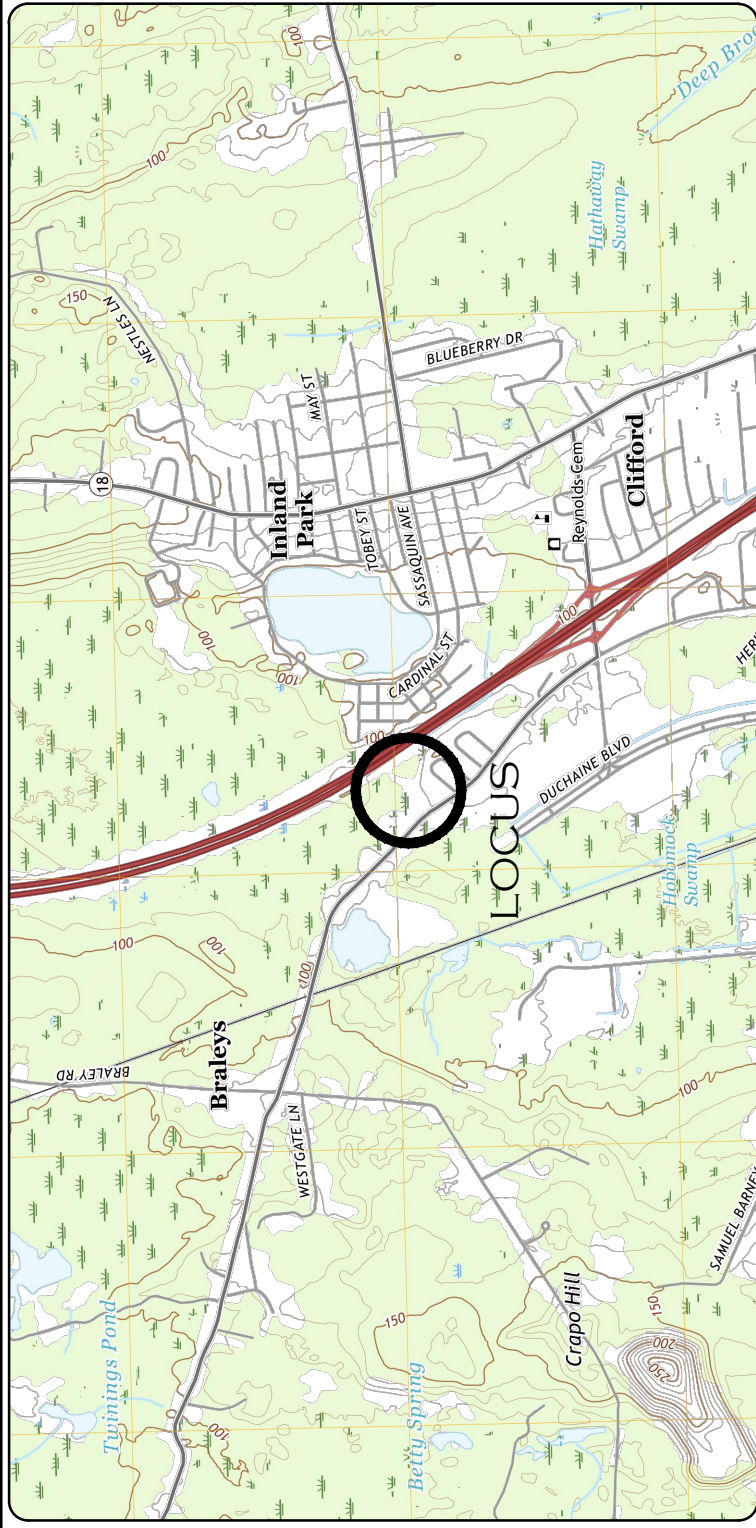
THREE
STORY
BUILDING
#1471

UP# 43

GENERAL NOTES:

1. LOT SHOWN IS DESIGNATED AS LOTS ON ASSESSORS MAP 27.
2. OWNER OF RECORD: - BRALEY WOODS CONDOMINIUM ASSOCIATION
C/O DAVE HEBERT - TRUSTEE
1471-1475 BRALEY ROAD
NEW BEDFORD, MA 02745
3. SITE IS NOT LOCATED WITHIN A FLOOD HAZARD ZONE AS SHOWN ON FIRM PANEL 25005C 0377F MAP
REVISED DATE JULY 7, 2009
4. ELEVATION DATUM BASED ON NAVD83 DATUM.
5. WETLANDS FLAGGED BY NATURAL RESOURCE SERVICES, INC. AND FIELD LOCATED BY INSITE
ENGINEERING SERVICES.

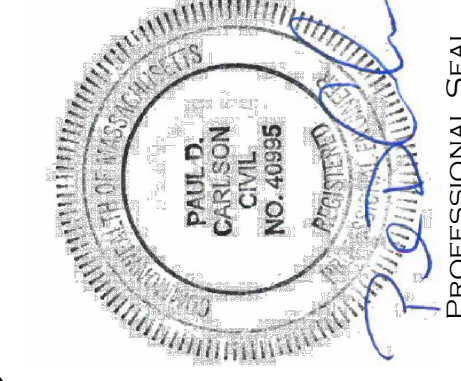
LOCATION (NOT TO SCALE) MAP



GRAPHIC SCALE



EXISTING WATERSHED



"BRALEY WOODS CONDOMINIUM"
1471-1475 BRALEY ROAD, NEW BEDFORD
ASSESSORS MAP 137 LOTS 108 AND 109

APPLICANT:
BRALEY WOODS CONDOMINIUMS C/O DAVE HEBERT
1471-1475 BRALEY ROAD, NEW BEDFORD, MA

JOB # 18045 SCALE: 1"= 10' DATE: SEPT 11, 2018
DRAWN BY: PDC

REVISED:



INSITE
Engineering Services, LLC
PROFESSIONAL ENGINEERS | LAND SURVEYORS
Precision. Clarity. Certainty.

SHEET
1
OF 1

INSITE Professional Complex, Suite 1
1539 Fall River Avenue, Seekonk, MA 02771
Phone: (508) 336-4500 Fax: (508) 336-4558
Web Address: InsiteEngineers.com