Stormwater Report

MEIJER

(SEQ) Tenny Ave/Sunset Drive
Waukesha, Wisconsin

Issue/Revision Date
July 10, 2013
September 25, 2013
June 11, 2014

Prepared by
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GF Project Number
20110540.0

GreenbergFarrow

Table of Contents

Page

List of Tables

List of Figures

List of Appendices

1.0 Introduction

This drainage analysis was prepared for the Meijer project located in Waukesha, Wisconsin for submission to the City of Waukesha. The property is 31.48 acres in size and is located on Tenny Avenue and Sunset Drive in Waukesha, Wisconsin.

The project will include the construction of a 192,940 sf building, fuel center, entrance drives, parking areas, landscape areas and stormwater management facilities.

2.0 Stormwater Management

2.1 Existing Conditions

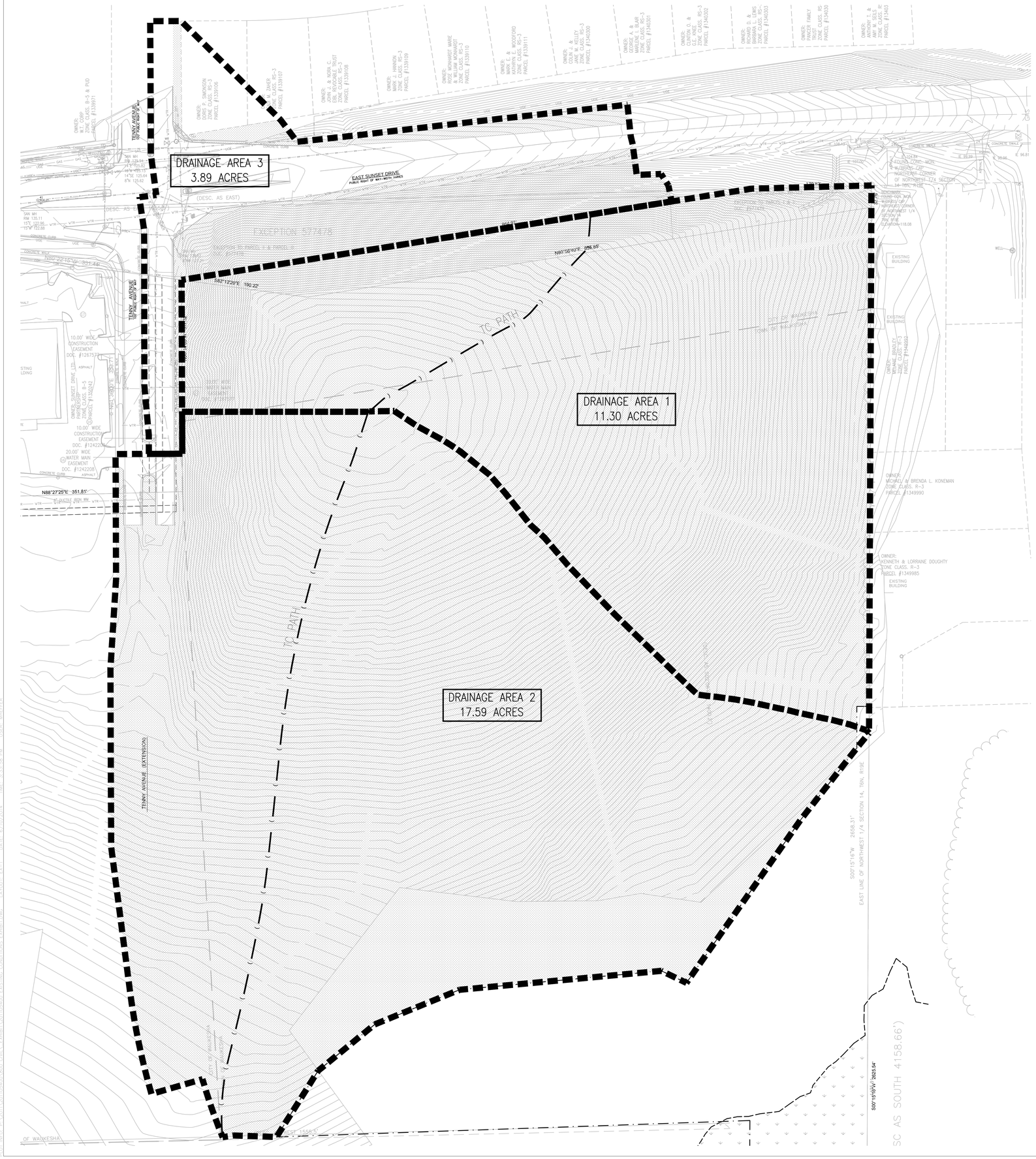
The overall hydrologic study area totals 32.78 acres. Under existing conditions, the site is undeveloped and vegetated with woods and grass. Under existing conditions, the site contains three (3) drainage areas: Drainage Area 1, Drainage Area 2 and Drainage Area 3 (refer to *Existing Conditions Exhibit,* EX-1).

Drainage Area 1 sheet flows to Sunset Drive where it is conveyed via drainage ditches located within Sunset Drive ROW. Drainage Area 2 sheet flows to the south towards the adjacent environmental corridor and wetland. Drainage Area 3 is off-site road drainage within Tenny Avenue and Sunset Drive, which is currently not receiving water quality pre-treatment, nor peak rate of discharge control prior to discharging to the existing drainage ditches located within Sunset Drive ROW.

2.2 Proposed Conditions

Under proposed conditions, the site contains five (5) drainage areas: Drainage Area 1, Drainage Area 2, Drainage Area 3, Drainage Area 4 and Drainage Area 5 (refer to *Proposed Conditions Exhibit,* EX-2).

Stormwater management facilities for water quality control and attenuation of the peak rate of stormwater runoff include two (2) detention ponds: North Detention Pond and South Detention Pond. North Detention Pond will be wet detention, while the South Detention Pond will be dry infiltration with pre-treatment from a wet forebay.



LEGEND:

- TOTAL SITE AREA
- TOTAL DRAINAGE AREA = 32.78 ACRES = 11.30 (DA1) + 17.59 (DA2) + 3.89 (DA3)
- TIME OF CONCENTRATION = 466' (DA1)
- TIME OF CONCENTRATION = 1,113' (DA2)
- 650 EXISTING CONTOUR
- EXISTING OPEN SPACE AREA = 30.67 ACRES = 11.28 (DA1) + 17.42 (DA2) + 1.97 (DA3)

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

EXISTING CONDITIONS

GreenbergFarrow
21 S. Evergreen Ave., Suite 200
Arlington Heights, Illinois 60005
t: 847 788 9200 f: 847 788 9536

Store: 276
801 EAST SUNSET DRIVE (MAIN)
831 EAST SUNSET DRIVE (CONV.)
(SEQ) TENNY AVE & SUNSET DR
WAUKESHA, WISCONSIN

meijer

PROFESSIONAL IN CHARGE
KERI WILLIAMS P.E.
PROFESSIONAL ENGINEER
LICENSE NO. 42288-6

06/11/14	FINAL PLAN RE-SUBMITTAL
09/25/13	FINAL PLAN
07/31/13	CITY RESUBMITTAL
07/10/13	CITY RESUBMITTAL
06/11/13	WAUKESHA WATER UTILITY
04/30/13	PLAN COMMISSION SUBMITTAL

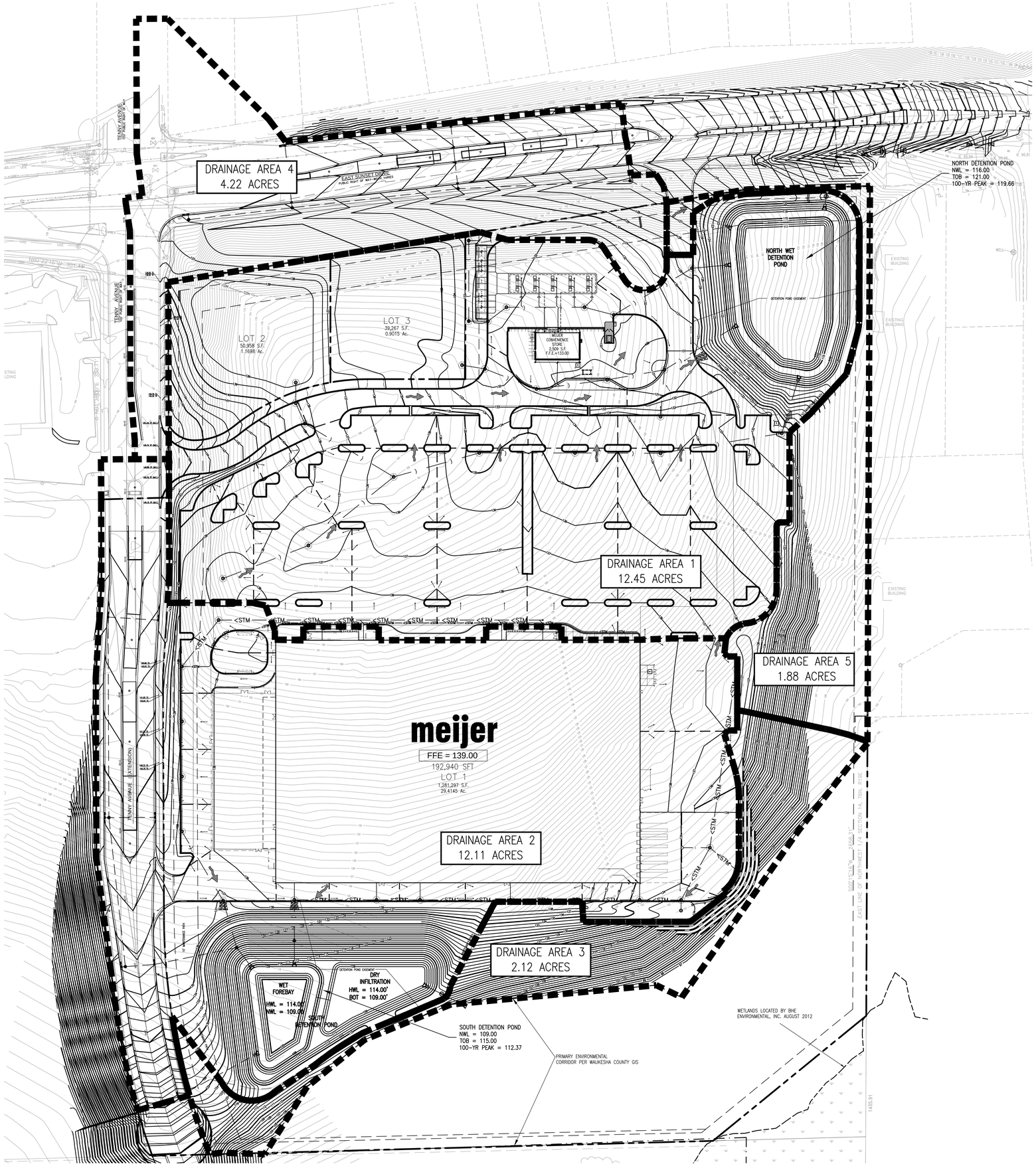
Drawn By	E. CARRANZA
Reviewer	J. COYLE
Manager	K. WILLIAMS
Prof in Charge	K. WILLIAMS, P.E.

Hard copy is intended to be 30"x42" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

PROJECT NO.
J120944276

SHEET NO.
EX-1

GreenbergFarrow Project No. 20110540.0



LEGEND:

- TOTAL SITE AREA
- TOTAL DRAINAGE AREA = 32.78 ACRES
  TIME OF CONCENTRATION = 10 MIN (ASSUMED)
- PROPOSED RIDGE LINE
- 650 EXISTING CONTOUR LINE
- 650 PROPOSED CONTOUR LINE
- STM> STM> PROPOSED STORM SEWER LINE
- PROPOSED OVERLAND FLOW ROUTE

PROPOSED PERVIOUS AREA = 10.20 ACRES*
= 2.21 (DA1) + 2.09 (DA2) + 2.08 (DA3) + 1.95 (DA4) + 1.87 (DA5)

PROPOSED IMPERVIOUS = 21.33 ACRES*
= 9.45 (DA1) + 9.56 (DA2) + 0.04 (DA3) + 2.27 (DA4) + 0.01 (DA5)

* ASSUMES 80/20 IMPERVIOUS/PERVIOUS RATIO FOR LOT 2 AND LOT 3

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

PROPOSED CONDITIONS

GreenbergFarrow
21 S. Evergreen Ave., Suite 200
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t: 847 788 9200 f: 847 788 9536

Store: 276
801 EAST SUNSET DRIVE (MAIN)
831 EAST SUNSET DRIVE (CONV.)
(SEQ) TENNY AVE & SUNSET DR
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PROJECT NO.
J120944276

SHEET NO.
EX-2

GreenbergFarrow Project No. 20110540.0

Under proposed conditions, the project site will sheet flow to a storm drain collection system (i.e., catchbasins and storm sewer pipes), which outfall to the proposed detention ponds. The outlet control structures within the stormwater management facilities consist of a bleed-down device and vertical weirs.

Approximately 4.22 acres of stormwater runoff from existing Tenny Avenue and proposed improvements within Sunset Drive is proposed to be detained within the North Detention Pond. Approximately 4.22 acres of existing Tenny Avenue and proposed improvements within Sunset Drive will be collected and conveyed via a storm sewer collection system to the North Detention Pond where water quality and quantity control will occur.

Future development of Lot 2 and Lot 3 were accounted for in the overall stormwater management design of North Detention Pond. Stormwater runoff from Lot 2 and Lot 3 will be collected and conveyed via storm drain collection system to the North Detention Pond. The maximum percent impervious for each lot was assumed 80% impervious surface.

A proposed roadside ditch is shown along the south side of Sunset Drive, adjacent to the North Detention Pond. The North detention pond will outfall via an outlet control structure with an 15-inch dia. pipe to the proposed storm manhole located within Sunset Drive ROW. An emergency overflow weir will be constructed in the berm embankment of North detention pond to control storm events in excess of the 100-year storm. The overflow weir will be designed with riprap to minimize runoff velocity and erosion. The overflow weir for the North Detention Pond will outfall to the proposed roadside ditch in Sunset Drive.

Stormwater runoff from proposed Tenny Avenue improvements will be collected and conveyed via a storm sewer collection system to the South Detention Pond where water quality and quantity control will occur.

The outlet control structure located within the South detention pond will outfall to the adjacent environmental corridor and wetland. An emergency overflow weir will be constructed in the berm embankment of South detention pond to control storm events in excess of the 100-year storm. The overflow weir will be designed with riprap to minimize runoff velocity and erosion.

A minimum of one-foot of freeboard will be provided within the detention ponds for the 100-year, 24-hour storm event.

3.0 Stormwater Management Compliance

The site design incorporates the stormwater quantity control, water quality standards and total suspended solids performance standards as outlined by the City of Waukesha *Stormwater Management Criteria* (revised 01/06/09), and the Wisconsin Department of Natural Resources (DNR) *Chapter NR 151 Runoff Management Subchapter III – Non-Agricultural Performance Standards.*

TSS Removal

Wisconsin Department of Natural Resources (DNR), NR 151.12, Post-construction performance standards for new development and redevelopment (5) Requirements, (a) Total Suspended Solids 1., and the *City of Waukesha, Chapter 32, Section 32.10 Storm Water Management Plan Requirements, 2. Total Suspended Solids A. (i.)*:

For new development, by design, reduce to the maximum extent practicable, the total suspended solids load by 80%, based on an average annual rainfall, as compared to no runoff management controls.

Pollutant loading model, WinSLAMM (Source Loading and Management Model for Windows) was used to evaluate the efficiency of the design in reducing TSS. The model determines the runoff from a series of normal rainfall events and calculates the pollutant loading created by these rainfall events. WinSLAMM was used to demonstrate that the project site will remove an average TSS rate of 84%, which exceeds the 80% requirement (refer to Appendix C, *WinSlamm TSS Removal*).

Peak Discharge Rates

City of Waukesha, Chapter 32, Section 32.04 Storm Water Management Plan Requirements, (d)(1.) Peak Discharge:

The calculated post-development peak stormwater discharge rates shall not exceed the calculated pre-development discharge rates for the 2-year, 10-year, and 100-year, 24-hour storm design storms.

Under proposed conditions, hydrologic/hydraulic analyses were performed utilizing the computer program HydroCAD©. In order to determine the peak rate of discharge for proposed conditions, runoff hydrographs were generated for the 2-year, 10-year and 100-year, 24-hour storm events using the SCS TR-20 Method (refer to Appendix B, *HydroCAD Input/Output*).

Under proposed conditions, the post-development runoff hydrographs were flood routed through the proposed stormwater management facilities. The 100-year, 24-hour storm event was evaluated to demonstrate that there will not be increased flooding impacts off-site.

The following tables summarize the existing and proposed post-development discharge rates determined in the hydrologic/hydraulic analyses performed for the project site.

Table 1 Comparison of Peak Runoff Discharge Rates for Sunset Drive-Ditch System (HydroCAD© Reach, Sunset Drive)

Existing Proposed Peak Runoff		Proposed Proposed Peak Runoff	
Storm Event (24-Hour)	**Rates (cfs)**	**Storm Event (24-Hour)**	**Rates (cfs)**
2-Year	6.50	2-Year	1.54
10-Year	18.90	10-Year	8.19
100-year	39.00	100-Year	15.35

cfs – cubic feet per second

Table 2 Comparison of Peak Runoff Discharge Rates for South Property (HydroCAD© Reach, South)

Existing Proposed Peak Runoff		Proposed Proposed Peak Runoff	
Storm Event (24-Hour)	**Rates (cfs)**	**Storm Event (24-Hour)**	**Rates (cfs)**
2-Year	1.22	2-Year	1.18
10-Year	10.57	10-Year	10.34
100-year	29.35	100-Year	18.24

cfs – cubic feet per second

Infiltration

Based on the *Subsurface Exploration and Foundation Evaluation-Revised, Proposed Meijer Waukesha Site, Waukesha, Wisconsin* dated 05/30/13, and prepared by Midwest Engineering Services, Inc. (MES), geotechnical borings identified as SW-2, SW-3, and SW-4 were performed within the limits of the proposed detention ponds (refer to Appendix A, *Supporting Documentation* for excerpts from the geotechnical report).

On 09/04/13, the WDNR: Bryan Hartsook and Maureen McBroom reviewed the proposed TSS removal and stormwater management design of the North Detention Pond and South Detention Pond. Dry infiltration was considered within the North Detention Pond to further reduce stormwater runoff rates and volume, however infiltration of stormwater from a fuel center is not permitted per WDNR regulations. Therefore, the WDNR recommended that the North Detention Pond be designed wet detention.

Two (2) borings within the South Detention Pond extended to at least 5 feet below the proposed bottom of infiltration devices to ensure that the NR 151 separation distance requirements are met.

Soil data for geotechnical boring SW-3 within the vicinity of the pond was reviewed. The WDNR requires the least permeable infiltration rate within 5-feet from the bottom of the pond to the NWL. The South Detention Pond is an exception where the more permeable layer is closer to the bottom of the pond. The WDNR infiltration rate as determined by the soil textures for the South Detention Pond is 3.60 in/hr (based on Table 2 of the Site Evaluation for Stormwater Infiltration (1002) document which the MES report references).

The South Detention Pond will be dry infiltration with a wet forebay. The WDNR requires pretreatment of stormwater runoff prior to infiltrating (i.e., wet forebay at all storm sewer inlet areas).

4.0 Storm Sewer Pipe Design

The proposed storm drainage collection system will be designed for a minimum 10-year storm frequency utilizing the Rational Method.

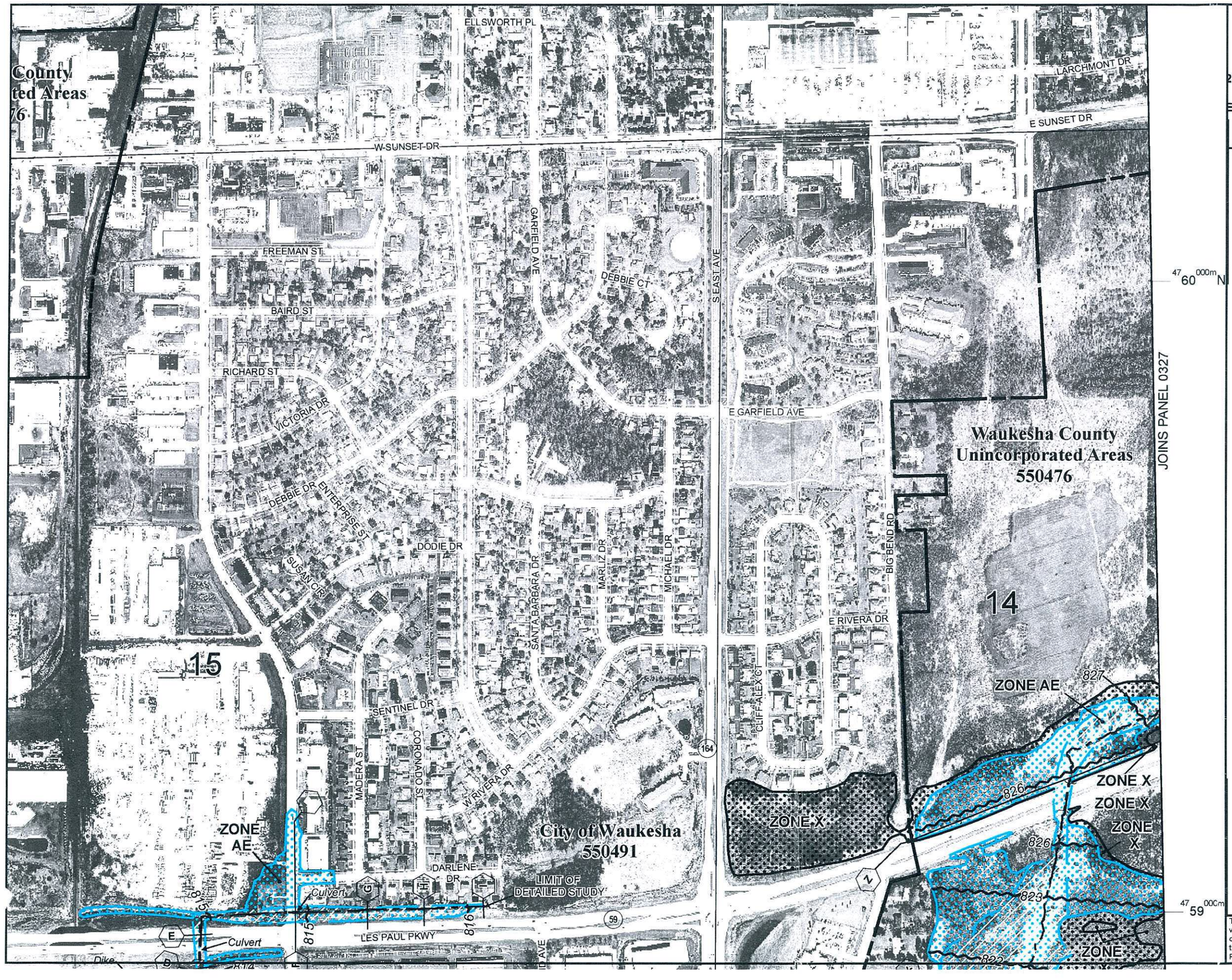
See Appendix D for storm sewer calculations with hydraulic grade line.

Other design criteria used in the closed pipe system include:

- 10-year storm frequency with a minimum inlet time of concentrations of 10 minutes
- 100-year storm frequency with a minimum inlet time of concentrations of 10 minutes
- Minimum Velocity though pipes of 2.0 feet per second
- Maximum Velocity through pipes of 10.0 feet per second

Appendix A

Supporting Documentation



MAP SCALE 1" = 500'

250 0 500 1000 FEET METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0326F

FIRM

FLOOD INSURANCE RATE MAP

WAUKESHA COUNTY, WISCONSIN
AND INCORPORATED AREAS

PANEL 326 OF 500
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WAUKESHA COUNTY	550476	0326	F
WAUKESHA CITY OF	550491	0326	F

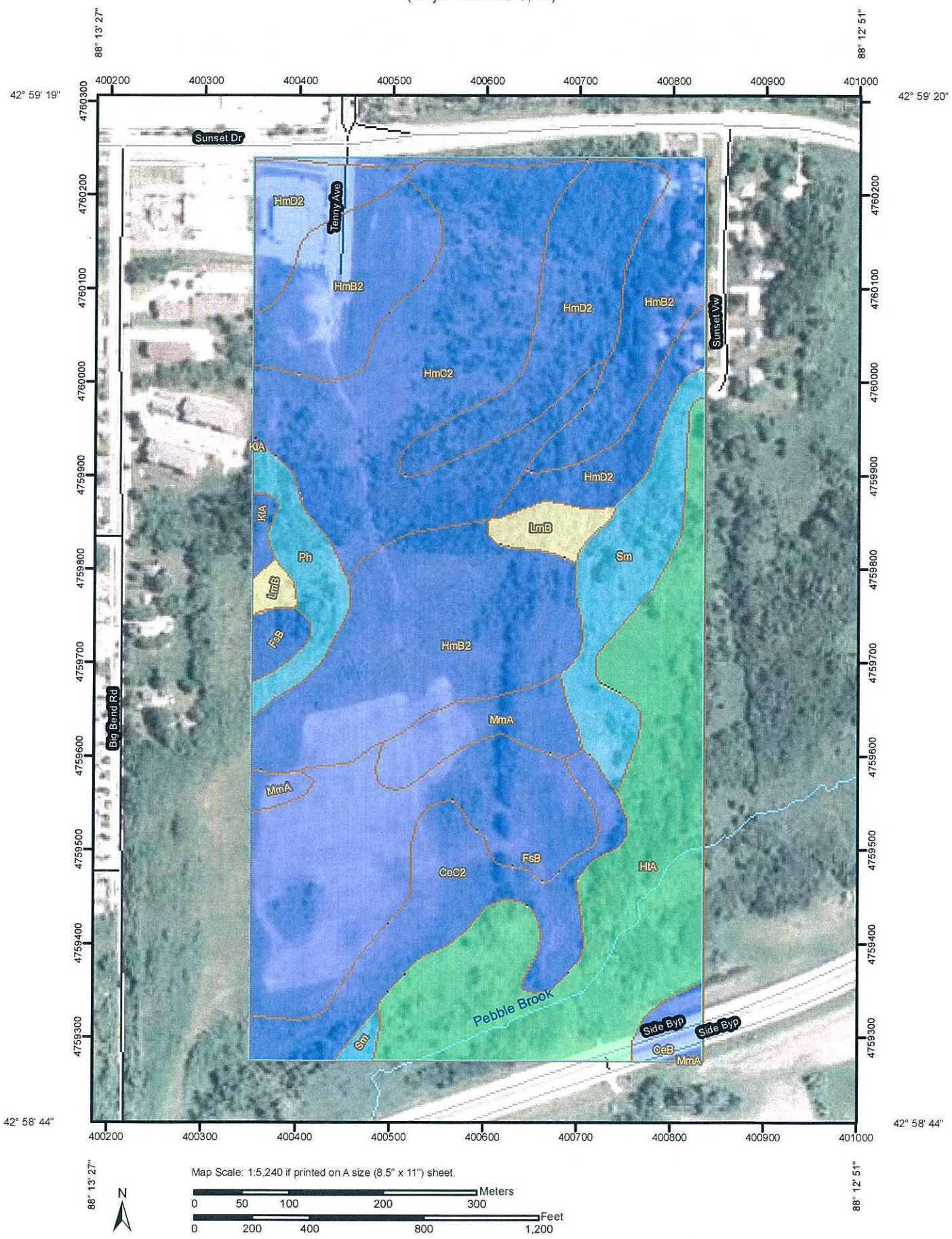
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
55133C0326F

EFFECTIVE DATE
NOVEMBER 19, 2008

Federal Emergency Management Agency

Hydrologic Soil Group—Milwaukee and Waukesha Counties, Wisconsin
(Meijer - Waukesha, WI)



Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Milwaukee and Waukesha Counties, Wisconsin (WI602)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CeB	Casco loam, 2 to 6 percent slopes	B	1.1	1.0%
CeC2	Casco loam, 6 to 12 percent slopes, eroded	B	8.1	7.0%
FsB	Fox silt loam, 2 to 6 percent slopes	B	14.3	12.4%
HmB2	Hochheim loam, 2 to 6 percent slopes, eroded	B	25.5	22.1%
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded	B	18.4	15.9%
HmD2	Hochheim loam, 12 to 20 percent slopes, eroded	B	13.2	11.4%
HtA	Houghton muck, 0 to 2 percent slopes	A/D	19.7	17.1%
KlA	Kendall silt loam, 1 to 3 percent slopes	B	0.4	0.4%
LmB	Lamartine silt loam, 1 to 4 percent slopes	C	1.8	1.6%
MmA	Matherton silt loam, 1 to 3 percent slopes	B	3.5	3.1%
Ph	Pella silt loam	B/D	3.0	2.6%
Sm	Sebewa silt loam	B/D	6.2	5.4%
Totals for Area of Interest			**115.2**	**100.0%**

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,240 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Milwaukee and Waukesha Counties, Wisconsin
Survey Area Data: Version 6, Aug 14, 2010

Date(s) aerial images were photographed: 6/16/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

SUBSURFACE EXPLORATION AND FOUNDATION EVALUATION - REVISED

Proposed Meijer Waukesha Store
Sunset Drive and Tenny Avenue
GF No. 20110540.0
Waukesha, Wisconsin

Prepared for
Site Development Manager - Properties
Meijer, Inc.
2929 Walker Ave., NW
Grand Rapids, Michigan 549504

GreenbergFarrow
21 South Evergreen Ave., Suite 200
Arlington Heights, Illinois 60005

MES Project No. 7-123104R

May 30, 2013

STORMWATER MANAGEMENT AREA CONSIDERATIONS

Borings SW-2, SW-3, and SW-4 were performed in the area of the proposed stormwater management basins. The subgrade soils encountered in these borings have been classified in general accordance with the USDA textural soil classification system. Estimated infiltration rates for various soil types are shown in Table 2 of the Site Evaluation for Stormwater Infiltration (1002) document, which is published by the Wisconsin Department of Natural Resources Conservation Practice Standards.

Soil Texture[1]	Design Infiltration Rate Without Measurement Inches/hour
Coarse sand or coarser (COS)	3.60
Loamy coarse sand (LCOS)	3.60
Sand (S)	3.60
Loamy sand (LS)	1.63
Sandy loam (SL)	0.50
Loam (L)	0.24
Silt loam (Si, L)	0.13
Sandy clay loam (SCL)	0.11
Clay loam (CL)	0.03
Silty Clay loam (Si, CL)	0.04
Sandy clay (SC)	0.04
Silty clay (Si, C)	0.07
Clay (C)	0.07

[1]Use sandy loam design infiltration for fine sand, loamy fine sand, very fine sand, and loamy fine sand soil textures.

NR-151 guidelines indicate infiltration rates shall be based on the least permeable soil horizon within 5 feet of the bottom elevation of the proposed infiltration system.

As indicated by the client, the bottom of the proposed northeast and southwest basins are estimated to be at about EL. 899 and EL. 911, respectively. The soil encountered at the bottom of basin elevation of EL. 899 at SW-2, and extending to EL. 894.0, consisted of silty clay which has an estimated infiltration rate of 0.07 inches per hour, based on Table 2 above. This rate is less than 0.6 inches per hour, and the clay is therefore exempt from the infiltration requirements of NR151.12(5)(c) under NR151.12(5)(c)6a.

At SW-3 and SW-4, in the area of the southwest basin, the soils extending from near the surface (EL. 887.5) consisted of gravelly loamy sand to gravelly loam. The least permeable of these soils is the gravelly loam, with an estimated Table 2 infiltration rate of 0.24 inches per hour. This rate is also less than 0.6 inches per hour. However, field verification testing of the actual in-situ infiltration rate for these materials is required under Step C5 of the Site Evaluation for Stormwater Infiltration document, to confirm they are exempt [under NR151.12(5)(c)6a].

It must be recognized that other areas of the site may be exempt or excluded from the infiltration requirements of NR151.12(5)(c) under other provisions (dependent upon the final bottom elevation), such as NR151.12(5)(c)5e or 5i, due to groundwater or the lack of a layer of sufficient thickness containing soils with sufficient fines content. In addition, it must be recognized that the soils across the site are in a dense to very dense condition, and infiltration rates within such materials may vary substantially from the estimates provided in Table 2.

The preceding infiltration rate estimates are intended only for use in preliminary planning. In-situ testing, such as with a double ring infiltrometer, along with test pits in other areas of the basins are recommended to allow more detailed evaluation of subsurface conditions, including groundwater levels, and to provide more representative infiltration rates to be used in the final basin design. It is recommended that the bottom of the stormwater management area be observed by qualified geotechnical personnel at the time of construction to verify the soil types. The type of basin and intended use, such as being "wet" or "dry", must be carefully considered when evaluating infiltration rates.

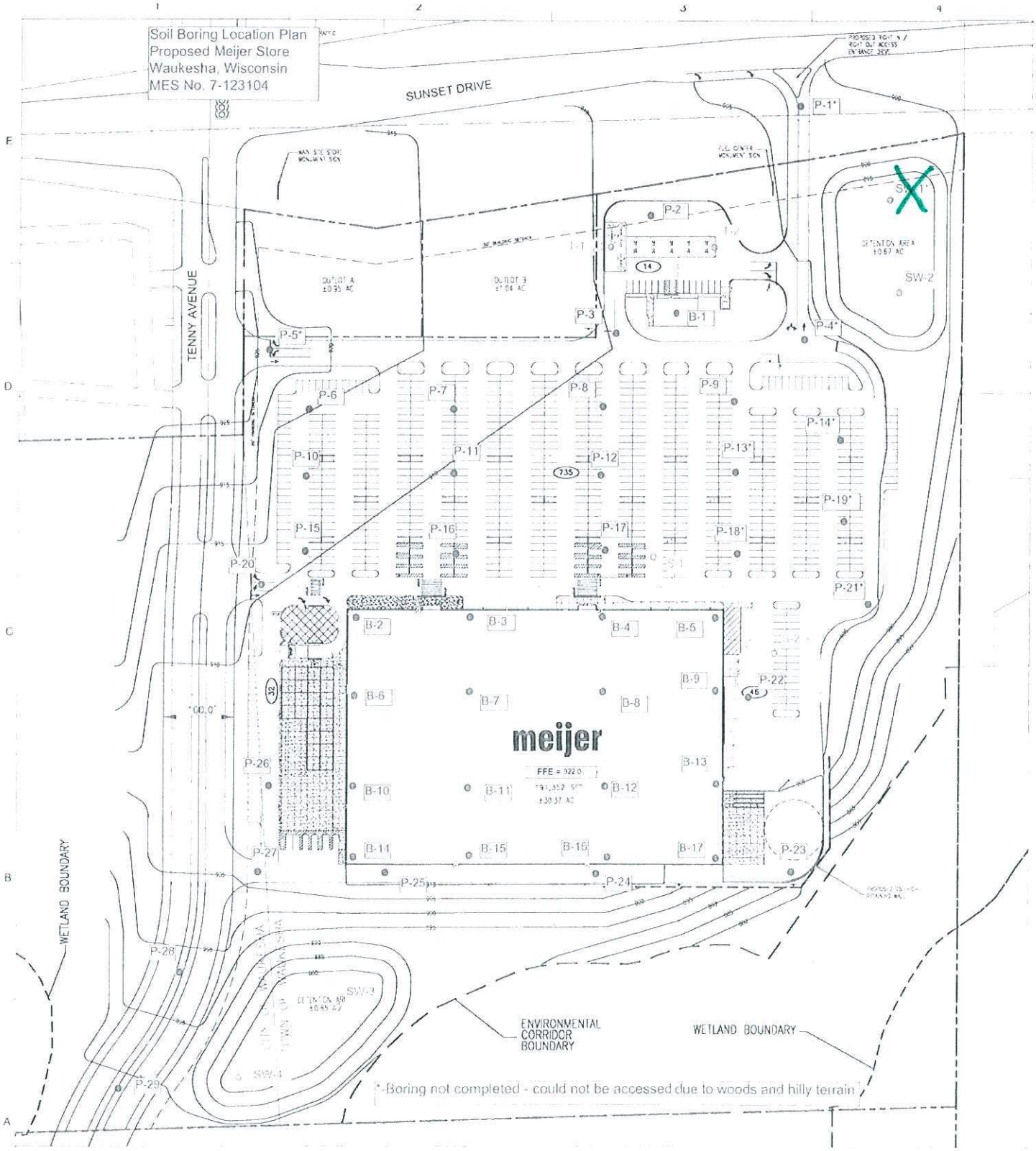
It must be recognized that actual infiltration rates will be somewhat variable depending upon the uniformity, in-place density, and/or grading of the subsoils below the individual basin or trench footprint. It should also be recognized that the performance of the basin could be affected by other factors such as densification by construction equipment and sedimentation. A maintenance program must be developed to address the removal of sedimentation and or organic materials should they develop. Additionally, it is recommended that the basin design be performed by an experienced civil engineering firm, and that thorough review of applicable codes (especially NR151) and regulations be performed. Proper design and construction of sidewalls and berms will also be essential for proper basin performance.

CONSTRUCTION CONSIDERATIONS

Groundwater Control

Based upon the test borings, the long term groundwater level is judged to have generally been below the maximum depths explored at the time of the exploration. On the basis of these observations and the planned floor slab and surface grades, no major difficulty with groundwater control is expected in most areas. For isolated perched zones (such as believed to be representative of B-2, B-6, and B-29), and where excavations extend less than a few inches below the groundwater level, a gravity drainage system and filtered sump pumps should be adequate. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics. In addition, more comprehensive dewatering with a series of sump pumps may be required if excavations are required in lower areas of the site, or encroaching upon wetlands.

Since the foundation materials are subject to softening when exposed to free moisture, every effort should be made to keep excavations dry. Discharge water from roof drains should be



MEIJER PROPERTY SITE PLAN

midwest engineering services, inc.

SOIL BORING LOG: SW-2

Project: Proposed Meijer Store

Project No.: 7-123104

Location: Waukesha, WI

Drill Date: August 15, 2012

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 910.0	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 — 909.0	6"± 10YR, 4/3, Brown, SILT LOAM, roots (2,vf), 0, cr, mvfr - moist (Topsoil) 0.13 in/hr	1-SS	11	-	-	11	-	
2 — 908.0	10YR, 4/3, Brown SILT LOAM, 1, sbk, f, mvfr - moist	2-SS	42	-	-	2	-	
3 — 907.0								
4 — 906.0								
5 — 905.0	EXTREMELY GRAVELLY FINE SAND, 0, sg, ml - moist	3-SS	42	-	-	2	-	
6 — 904.0								
7 — 903.0		4-SS	35	-	-	2	-	
8 — 902.0								
9 — 901.0	10YR, 6/3, Pale Brown, GRAVELLY SAND, 0, sg, ml - moist	5-SS	26	-	-	3	-	
10 — 900.0								
11 — 899.0		6-SS	48	-	-	3	-	
12 — 898.0	7.5YR, 5/4, Brown, Silty CLAY, 1, abk, f, mfi - moist							
13 — 897.0		7-SS	33	4.5	-	17	-	
14 — 896.0								
15 — 895.0		8-SS	42	-	-	17	-	
16 — 894.0								
17 — 893.0	10YR, 6/3, Pale Brown, VERY GRAVELLY SAND, 0, sg, ml - moist	9-SS	85	-	-	2	-	
18 — 892.0								
19 — 891.0		10-SS	58	-	-	2	-	
20 — 890.0								

End of Boring: 20'

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: None

Water Level $_{\text{Upon Completion}}$: None

Caved at $_{\text{Upon Completion}}$: 13 ± ft (El. 897±)

Delay Time: hr(s)

Water Level $_{\text{delayed}}$: ± ft (El. 910±) after hr(s) ▼

Caved at $_{\text{delayed}}$: ± ft (El. 910±) after hr(s)

Additional Comments:

Boring Location Offset:

Reason for Offset:

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual.*

midwest engineering services, inc.

SOIL BORING LOG: SW-3

Project: Proposed Meijer Store

Project No.: 7-123104

Location: Waukesha, WI

Drill Date: August 9, 2012

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 892.5	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 891.5	12"± 10YR, 4/3, Brown, SILT LOAM, roots (2,vf), 0, cr, mvfr - moist (Topsoil) 0.13 IN/HR	1-SS	20	-	-	6	-	
2 / 890.5	10YR, 6/4, Light Yellowish Brown, VERY GRAVELLY FINE SAND, roots (1,vf),							
3 / 889.5	← POND BOT = 109.08 0, sg, ml - moist (3.60 IN/HR)	2-SS	63	-	-	2	-	
4 / 888.5								
5 / 887.5	10YR, 6/3, Pale Brown, VERY GRAVELLY SAND, 0, sg, ml - moist	3-SS	33	-	-	7	-	
6 / 886.5								
7 / 885.5		4-SS	42	-	-	6	-	
8 / 884.5	10YR, 6/4, Light Yellowish Brown, VERY GRAVELLY LOAM, 1, sbk, vf, mvfr - moist							
9 / 883.5		5-SS	36	-	-	7	-	
10 / 882.5								
11 / 881.5	10YR, 5/4, Yellowish Brown, VERY GRAVELLY LOAMY SAND, 0, sg, ml - moist	6-SS	88	-	-	5	-	
12 / 880.5								
13 / 879.5		7-SS	50/5"	-	-	2	-	
14 / 878.5								
15 / 877.5	10YR, 6/4, Light Yellowish Brown, GRAVELLY LOAM, 10YR, 3/6, Dark Yellowish Brown, f, 1, d, spots, 1, sbk, f, mvfr - moist	8-SS	50/5"	-	-	10	-	
16 / 876.5								
17 / 875.5	10YR, 6/4, Light Yellowish Brown, VERY GRAVELLY SAND, 0, sg, ml - moist	9-SS	50/4"	-	-	8	-	
18 / 874.5								
19 / 873.5	10YR, 5/1, Gray, VERY GRAVELLY SAND, 0, sg, ml - moist	10-SS	50/5"	-	-	5	-	
20 / 872.5								

End of Boring: 20'

Notes:

Auger refusal experienced during initial attempt at 1 foot. Borehole offset 4 feet south.

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: None

Water Level $_{\text{Upon Completion}}$: None

Caved at $_{\text{Upon Completion}}$: 8 ± ft (El. 884.5±)

Delay Time: hr(s)

Water Level $_{\text{delayed}}$: ± ft (El. 892.5±) after hr(s) ▼

Caved at $_{\text{delayed}}$: ± ft (El. 892.5±) after hr(s)

Additional Comments:

Boring Location Offset:

Reason for Offset:

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual.*

midwest engineering services, inc.

SOIL BORING LOG: SW-4

Project: Proposed Meijer Store

Project No.: 7-123104

Location: Waukesha, WI

Drill Date: August 9, 2012

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 887.5	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 — 886.5	8"± 10YR, 4/3, Brown, SILT LOAM, roots (2,vf), 0, cr, mvfr - moist (Topsoil)	1-SS	22	-	-	6	-	
2 — 885.5	10YR, 6/4, Light Yellowish Brown, VERY GRAVELLY FINE SAND, roots (1,vf), 0, sg, ml - moist	2-SS	50/4"	-	-	3	-	
3 — 884.5								
4 — 883.5								
5 — 882.5		3-SS	56	-	-	7	-	
6 — 881.5								
7 — 880.5	10YR, 5/6, Yellowish Brown, VERY GRAVELLY LOAM, 5YR, 4/4, Reddish Brown, f, 1, d, spots, 1, sbk, f, mvfr - moist	4-SS	33	-	-	8	-	
8 — 879.5								
9 — 878.5		5-SS	35	-	-	8	-	
10 — 877.5								
11 — 876.5		6-SS	36	-	-	8	-	
12 — 875.5	10YR, 5/3, Brown, GRAVELLY SAND, 0m sg, ml - moist							
13 — 874.5		7-SS	64	-	-	6	-	
14 — 873.5								
15 — 872.5	10YR, 6/4, Light Yellowish Brown, GRAVELLY VERY FINE SAND, 0, sg, ml - moist	8-SS	84/9"	-	-	7	-	
16 — 871.5								
17 — 870.5		9-SS	92/11"	-	-	8	-	
18 — 869.5	10YR, 6/3, Pale Brown, VERY GRAVELLY SAND, 0, sg, ml - moist							
19 — 868.5		10-SS	89/8"	-	-	5	-	
20 — 867.5								

End of Boring: 20'

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: None

Water Level $_{\text{Upon Completion}}$: None

Caved at $_{\text{Upon Completion}}$: 9 ± ft (El. 878.5±)

Delay Time: hr(s)

Water Level $_{\text{delayed}}$: ± ft (El. 887.5±) after hr(s) ▼

Caved at $_{\text{delayed}}$: ± ft (El. 887.5±) after hr(s)

Additional Comments:

Boring Location Offset:

Reason for Offset:

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual.*

Appendix B

HydroCAD Input/Output

Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jun 10 2014

North Detention Basin Spillway

Trapezoidal Weir

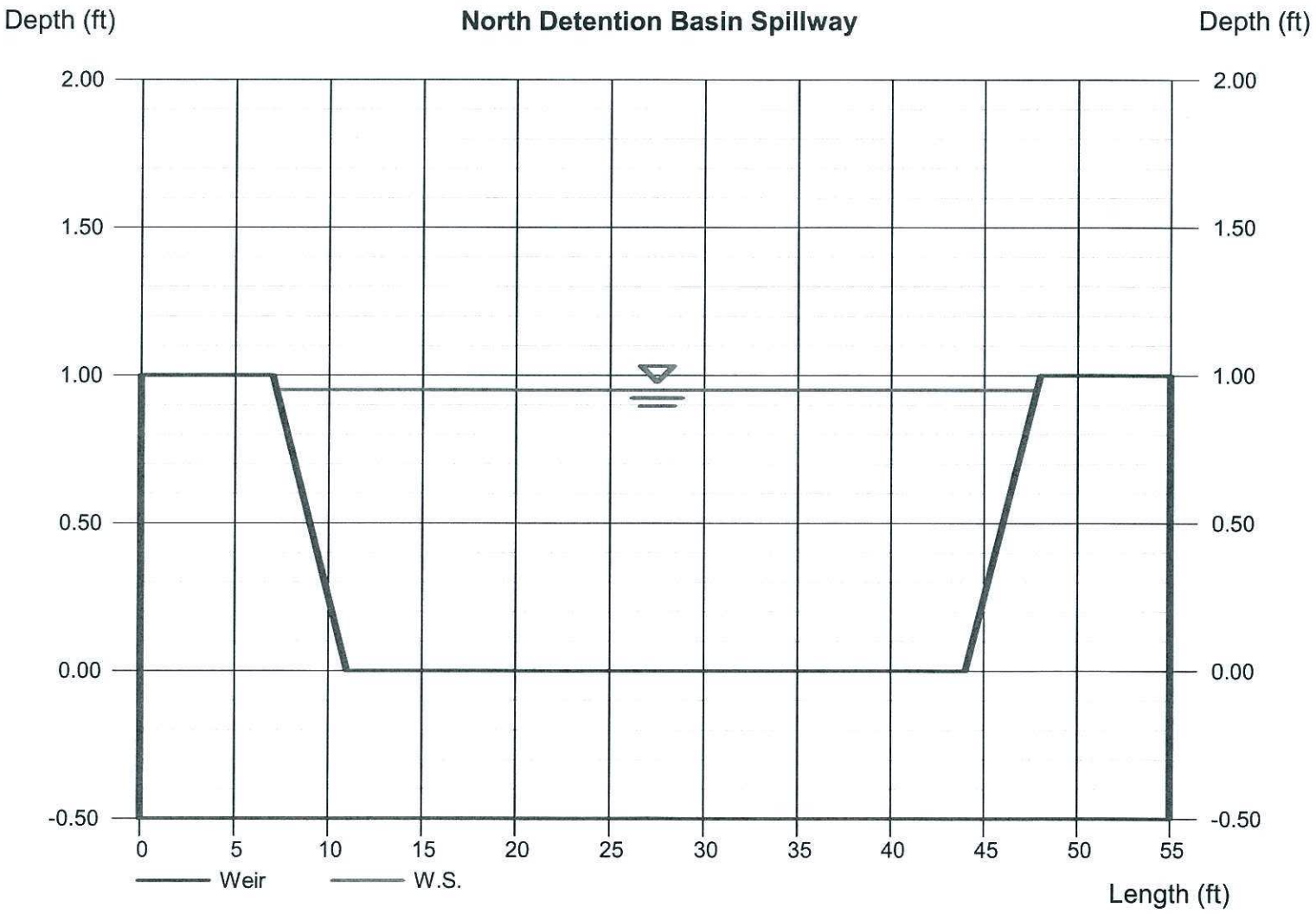
Crest	= Sharp
Bottom Length (ft)	= 33.00
Total Depth (ft)	= 1.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 102.59

Highlighted

Depth (ft)	= 0.95
Q (cfs)	= 102.59
Area (sqft)	= 34.96
Velocity (ft/s)	= 2.93
Top Width (ft)	= 40.60



Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jun 10 2014

South Detention Basin Spillway

Trapezoidal Weir

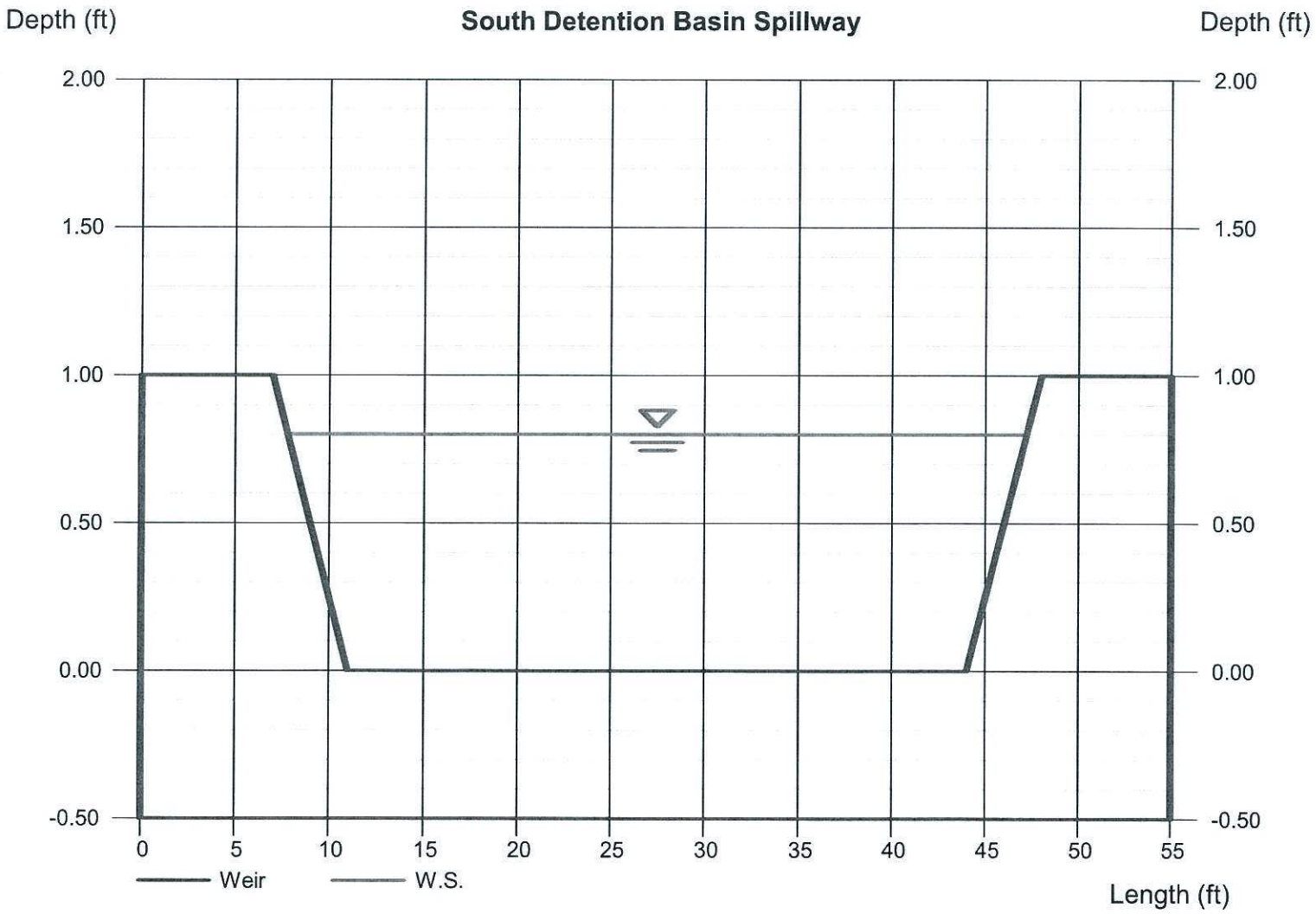
Crest	= Sharp
Bottom Length (ft)	= 33.00
Total Depth (ft)	= 1.00
Side Slope (z:1)	= 4.00

Calculations

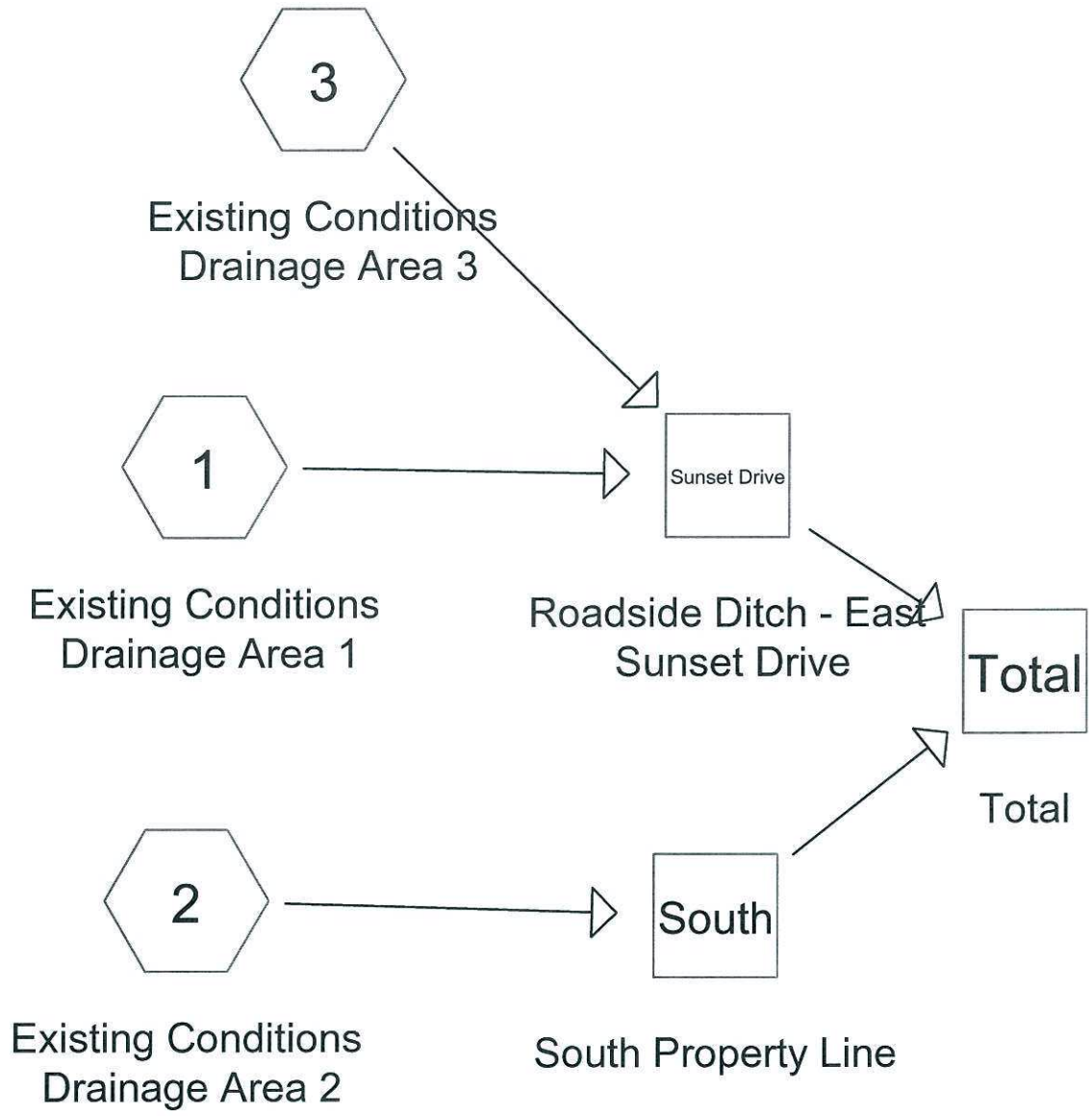
Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 78.18

Highlighted

Depth (ft)	= 0.80
Q (cfs)	= 78.18
Area (sqft)	= 28.96
Velocity (ft/s)	= 2.70
Top Width (ft)	= 39.40



2-Year, 24-Hour Storm Event
(2.7-inches of rainfall)



Subcat Reach Pond Link

Drainage Diagram for WKS-EXISTING-06-11-14
Prepared by Microsoft, Printed 6/10/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Existing Conditions Runoff Area=11.300 ac 0.00% Impervious Runoff Depth>0.26"
Flow Length=466' Tc=16.7 min CN=61 Runoff=1.74 cfs 0.241 af

Subcatchment 2: Existing Conditions Runoff Area=17.590 ac 0.97% Impervious Runoff Depth>0.18"
Flow Length=1,113' Tc=17.2 min CN=58 Runoff=1.22 cfs 0.268 af

Subcatchment 3: Existing Conditions Runoff Area=3.890 ac 49.36% Impervious Runoff Depth>0.97"
Tc=10.0 min CN=79 Runoff=5.66 cfs 0.315 af

Reach South: South Property Line Inflow=1.22 cfs 0.268 af
Outflow=1.22 cfs 0.268 af

Reach Sunset Drive: Roadside Ditch - East Sunset Drive Inflow=6.50 cfs 0.556 af
Outflow=6.50 cfs 0.556 af

Reach Total: Total Inflow=6.98 cfs 0.824 af
Outflow=6.98 cfs 0.824 af

Total Runoff Area = 32.780 ac Runoff Volume = 0.824 af Average Runoff Depth = 0.30"
93.62% Pervious = 30.690 ac 6.38% Impervious = 2.090 ac

Summary for Subcatchment 1: Existing Conditions Drainage Area 1

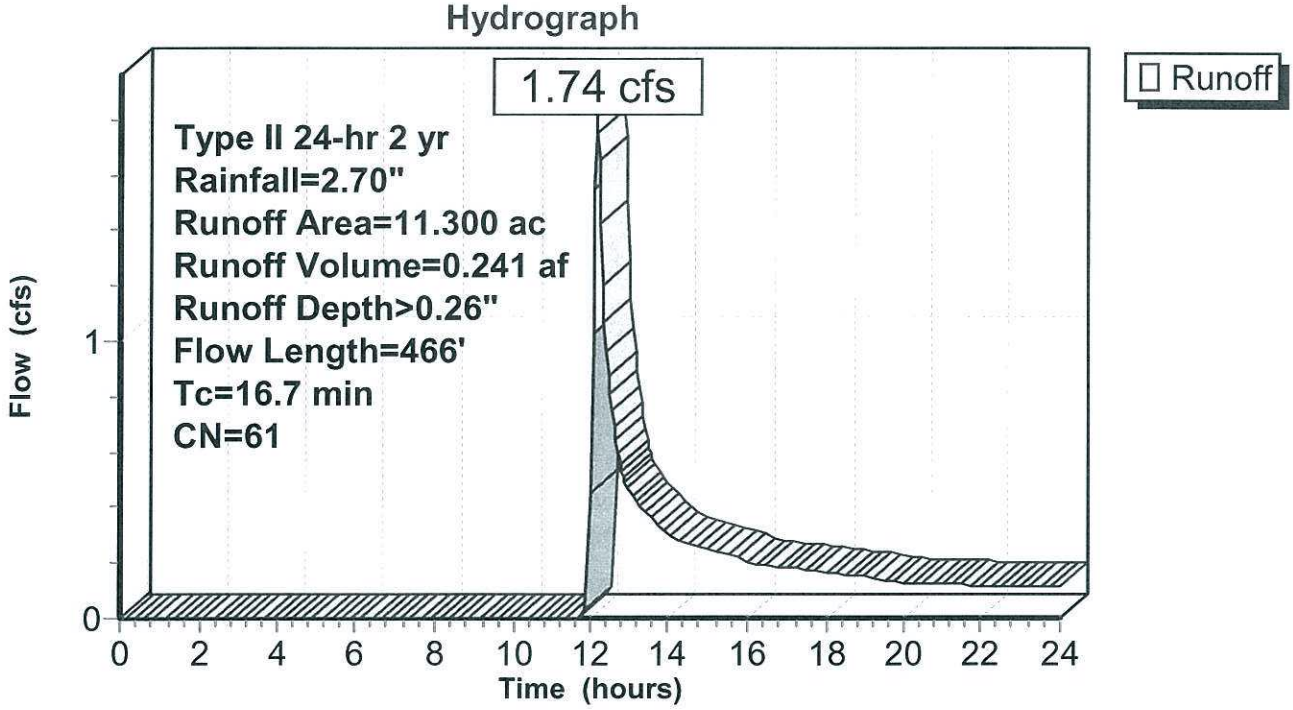
Runoff = 1.74 cfs @ 12.16 hrs, Volume= 0.241 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

Area (ac)	CN	Description
11.300	61	>75% Grass cover, Good, HSG B
11.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	100	0.0200	0.11		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.70"
1.2	366	0.1000	5.09		**Shallow Concentrated Flow, SC-1** Unpaved Kv= 16.1 fps
16.7	466	Total			

Subcatchment 1: Existing Conditions Drainage Area 1



Summary for Subcatchment 2: Existing Conditions Drainage Area 2

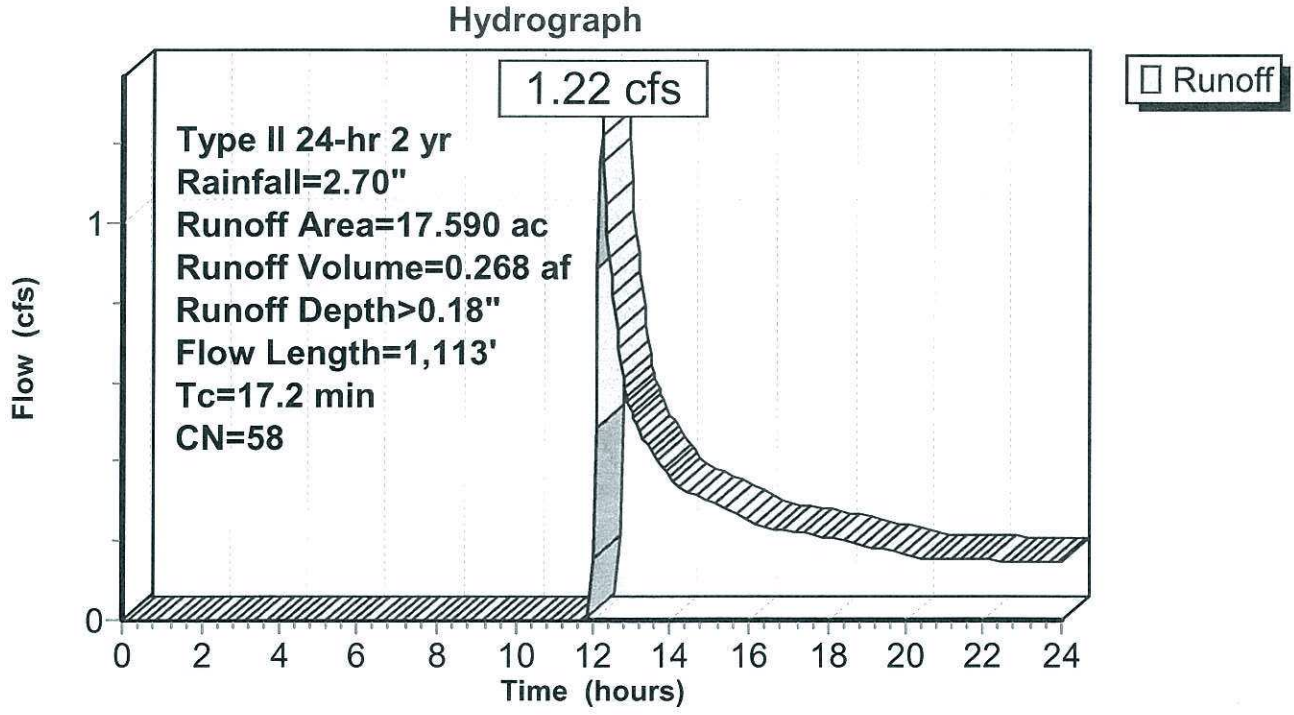
Runoff = 1.22 cfs @ 12.20 hrs, Volume= 0.268 af, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

	Area (ac)	CN	Description
	17.420	58	Woods/grass comb., Good, HSG B
*	0.170	98	Existing Impervious Tenny Ave.
	17.590	58	Weighted Average
	17.420		99.03% Pervious Area
	0.170		0.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0282	0.12		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.70"
3.7	1,013	0.0790	4.53		**Shallow Concentrated Flow, SC-1** Unpaved Kv= 16.1 fps
17.2	1,113	Total			

Subcatchment 2: Existing Conditions Drainage Area 2



Summary for Subcatchment 3: Existing Conditions Drainage Area 3

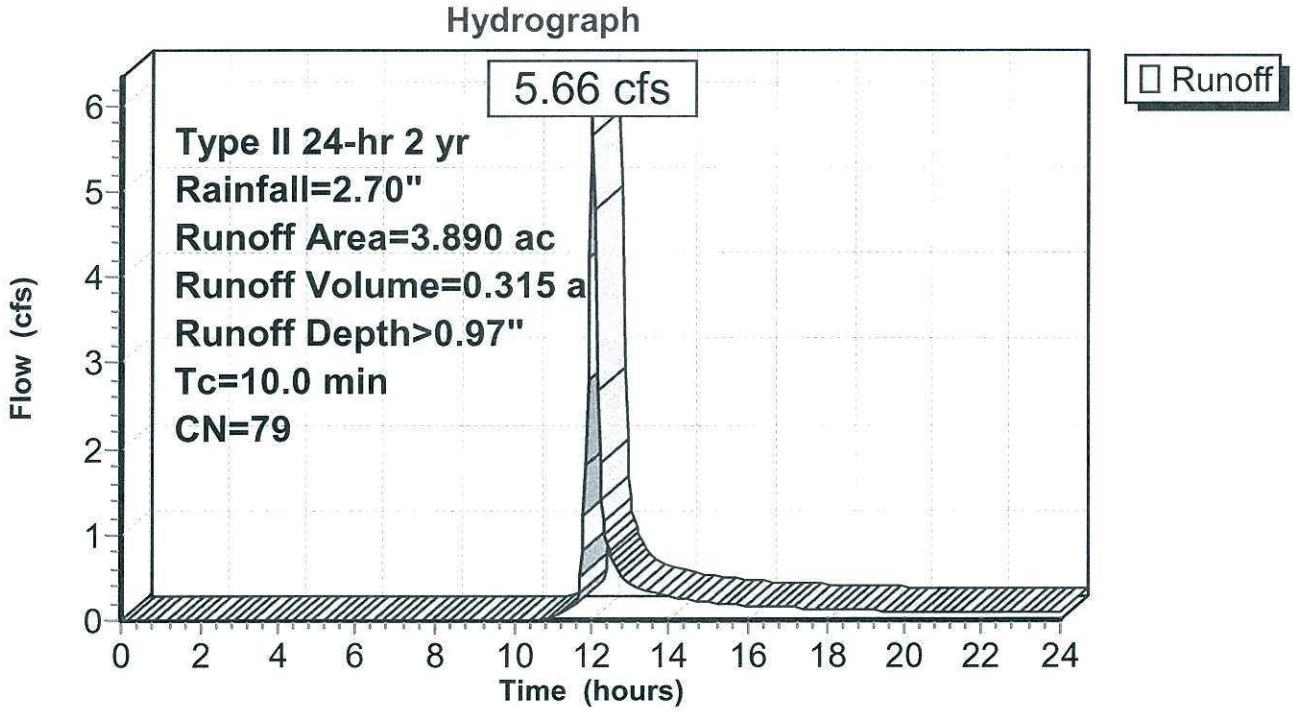
Runoff = 5.66 cfs @ 12.02 hrs, Volume= 0.315 af, Depth> 0.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

	Area (ac)	CN	Description
	1.970	61	>75% Grass cover, Good, HSG B
*	1.920	98	Impervious Area
	3.890	79	Weighted Average
	1.970		50.64% Pervious Area
	1.920		49.36% Impervious Area

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

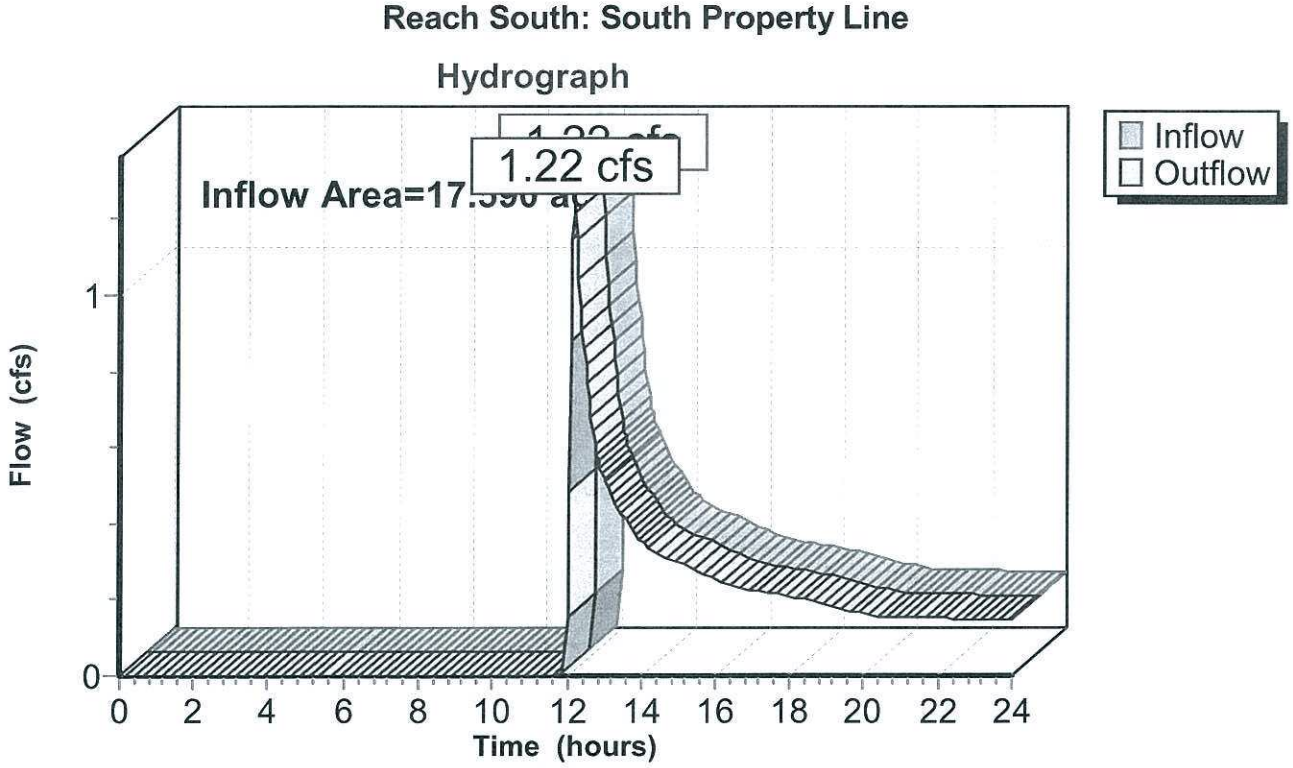
Subcatchment 3: Existing Conditions Drainage Area 3



Summary for Reach South: South Property Line

Inflow Area = 17.590 ac, 0.97% Impervious, Inflow Depth > 0.18" for 2 yr event
Inflow = 1.22 cfs @ 12.20 hrs, Volume= 0.268 af
Outflow = 1.22 cfs @ 12.20 hrs, Volume= 0.268 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

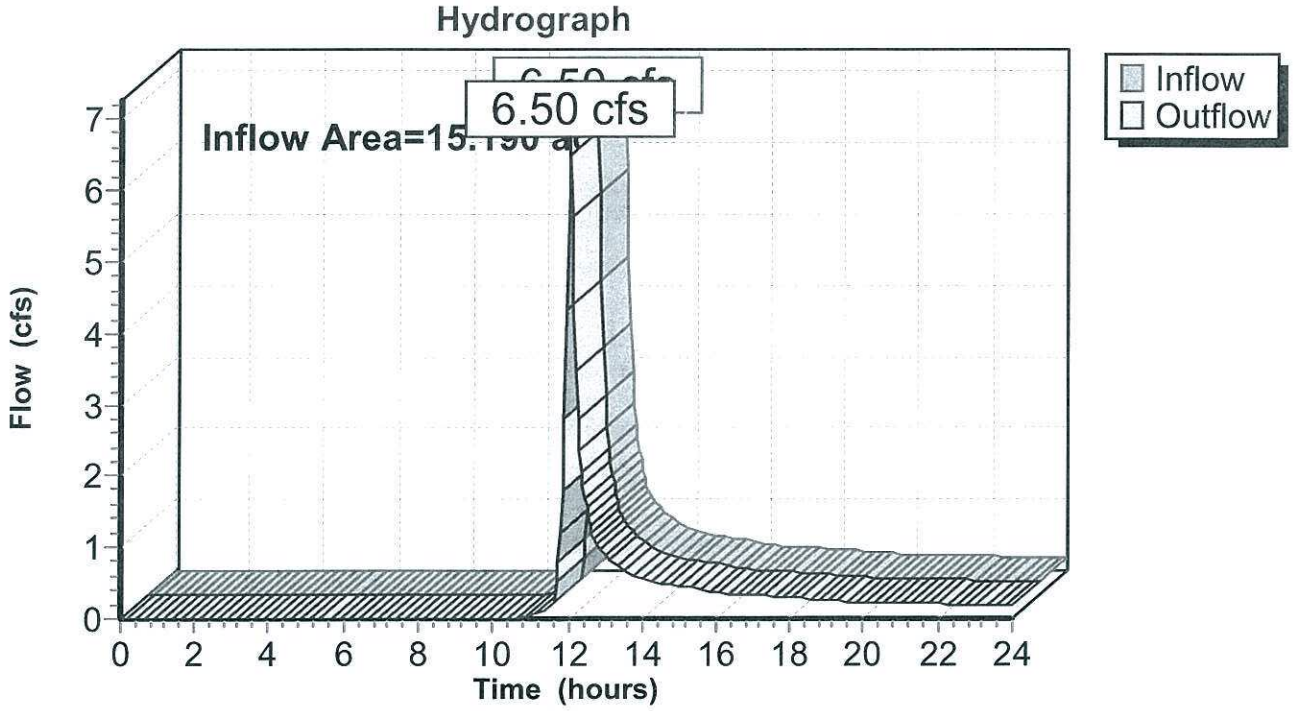


Summary for Reach Sunset Drive: Roadside Ditch - East Sunset Drive

Inflow Area = 15.190 ac, 12.64% Impervious, Inflow Depth > 0.44" for 2 yr event
Inflow = 6.50 cfs @ 12.04 hrs, Volume= 0.556 af
Outflow = 6.50 cfs @ 12.04 hrs, Volume= 0.556 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

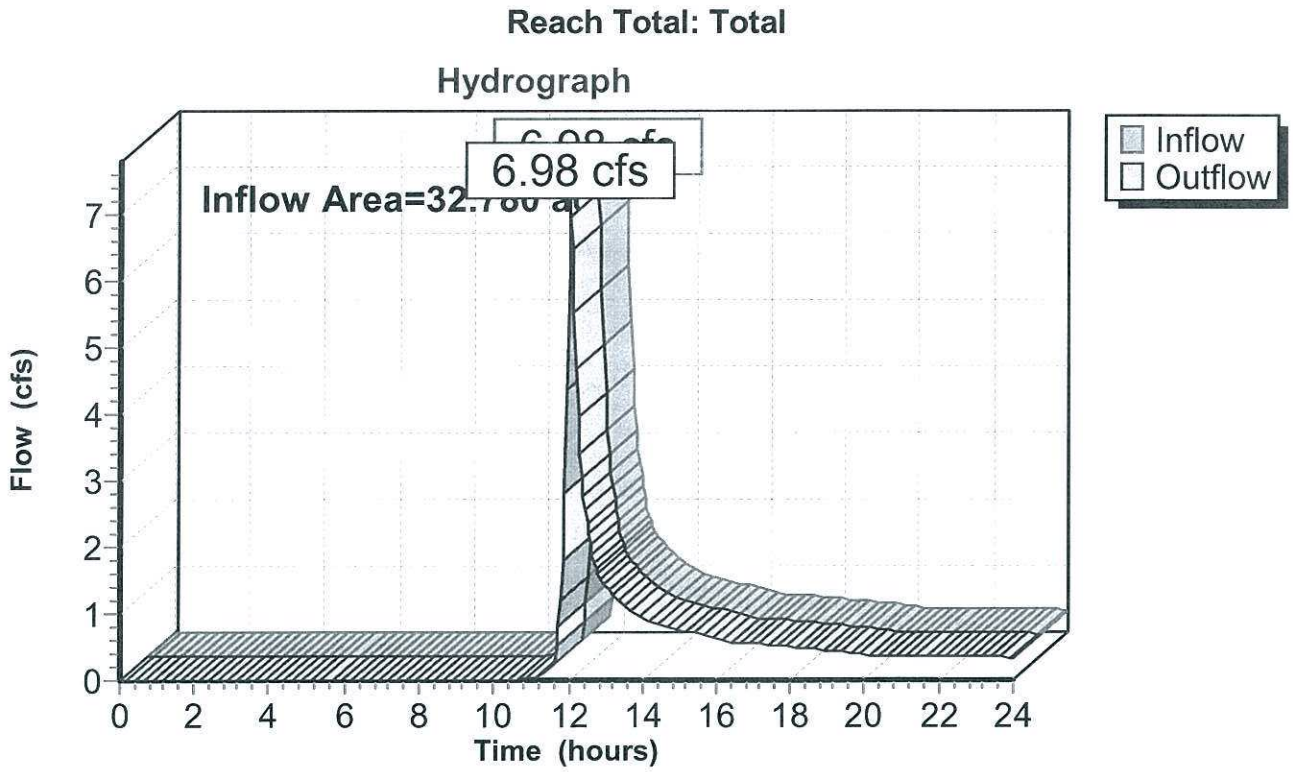
Reach Sunset Drive: Roadside Ditch - East Sunset Drive



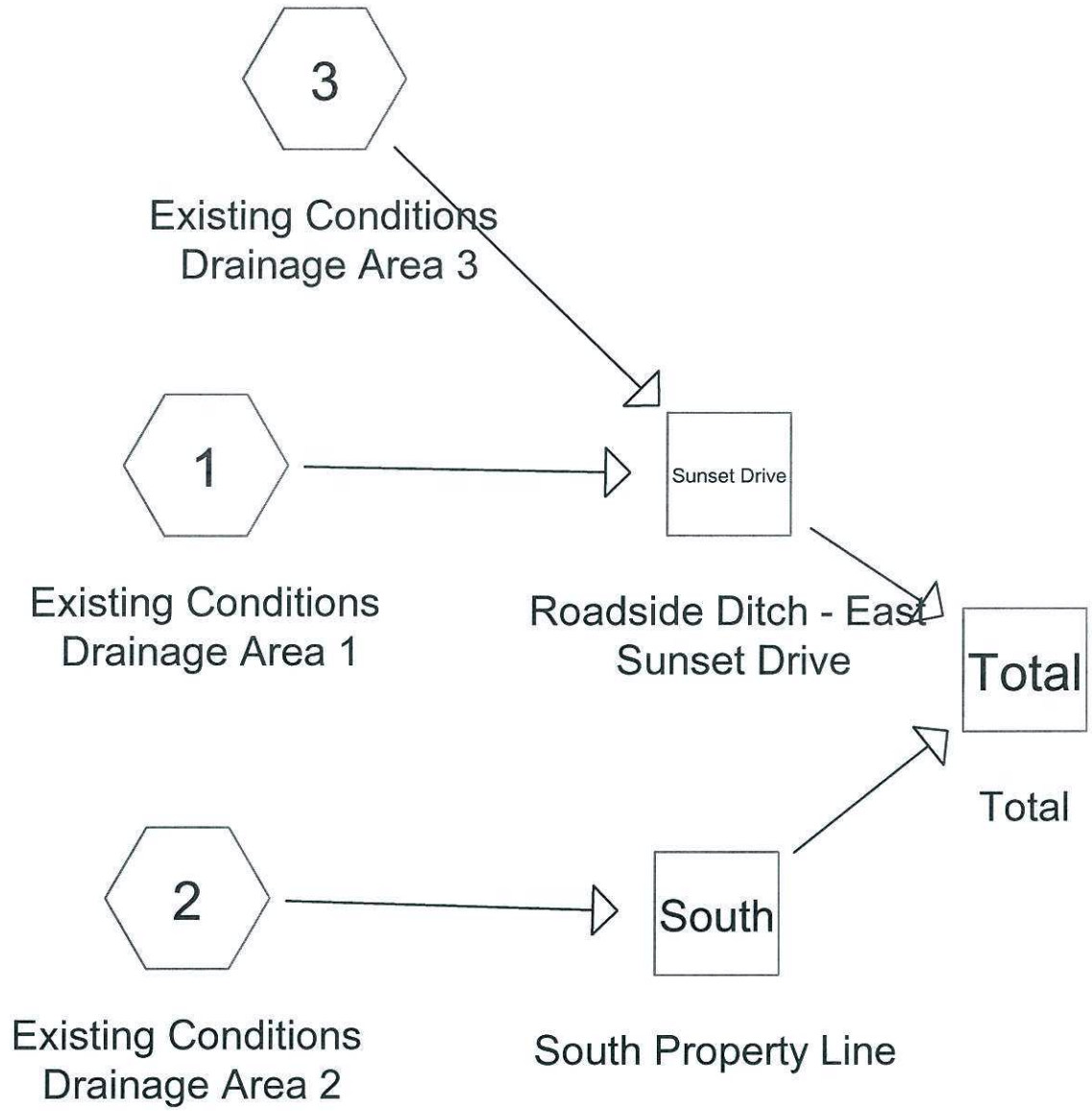
Summary for Reach Total: Total

Inflow Area = 32.780 ac, 6.38% Impervious, Inflow Depth > 0.30" for 2 yr event
Inflow = 6.98 cfs @ 12.06 hrs, Volume= 0.824 af
Outflow = 6.98 cfs @ 12.06 hrs, Volume= 0.824 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



10-Year, 24-Hour Storm Event
(4.0-inches of rainfall)



Subcat Reach Pond Link

Drainage Diagram for WKS-EXISTING-06-11-14
Prepared by Microsoft, Printed 6/10/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Existing Conditions Runoff Area=11.300 ac 0.00% Impervious Runoff Depth>0.81"
Flow Length=466' Tc=16.7 min CN=61 Runoff=9.37 cfs 0.760 af

Subcatchment 2: Existing Conditions Runoff Area=17.590 ac 0.97% Impervious Runoff Depth>0.66"
Flow Length=1,113' Tc=17.2 min CN=58 Runoff=10.57 cfs 0.968 af

Subcatchment 3: Existing Conditions Runoff Area=3.890 ac 49.36% Impervious Runoff Depth>1.96"
Tc=10.0 min CN=79 Runoff=11.57 cfs 0.635 af

Reach South: South Property Line Inflow=10.57 cfs 0.968 af
Outflow=10.57 cfs 0.968 af

Reach Sunset Drive: Roadside Ditch - East Sunset Drive Inflow=18.90 cfs 1.395 af
Outflow=18.90 cfs 1.395 af

Reach Total: Total Inflow=27.82 cfs 2.363 af
Outflow=27.82 cfs 2.363 af

Total Runoff Area = 32.780 ac Runoff Volume = 2.363 af Average Runoff Depth = 0.86"
93.62% Pervious = 30.690 ac 6.38% Impervious = 2.090 ac

Summary for Subcatchment 1: Existing Conditions Drainage Area 1

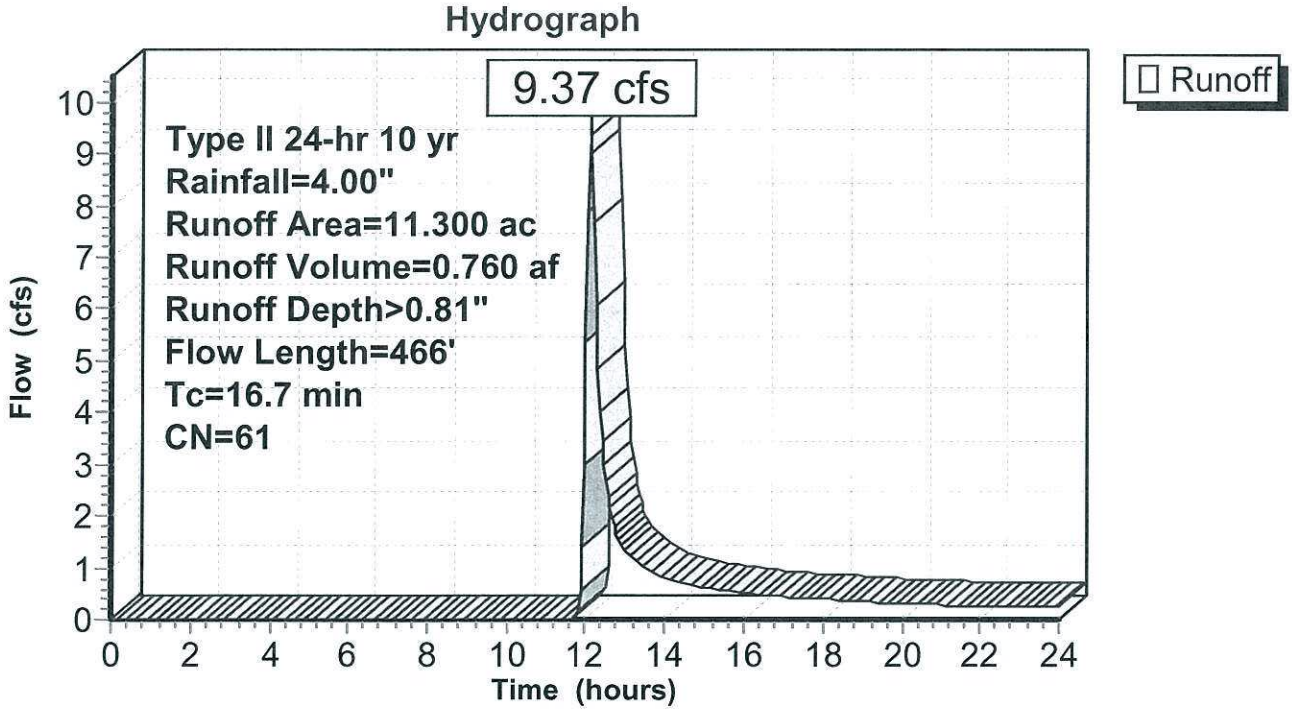
Runoff = 9.37 cfs @ 12.12 hrs, Volume= 0.760 af, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

Area (ac)	CN	Description
11.300	61	>75% Grass cover, Good, HSG B
11.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	100	0.0200	0.11		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.70"
1.2	366	0.1000	5.09		**Shallow Concentrated Flow, SC-1** Unpaved Kv= 16.1 fps
16.7	466	Total			

Subcatchment 1: Existing Conditions Drainage Area 1



Summary for Subcatchment 2: Existing Conditions Drainage Area 2

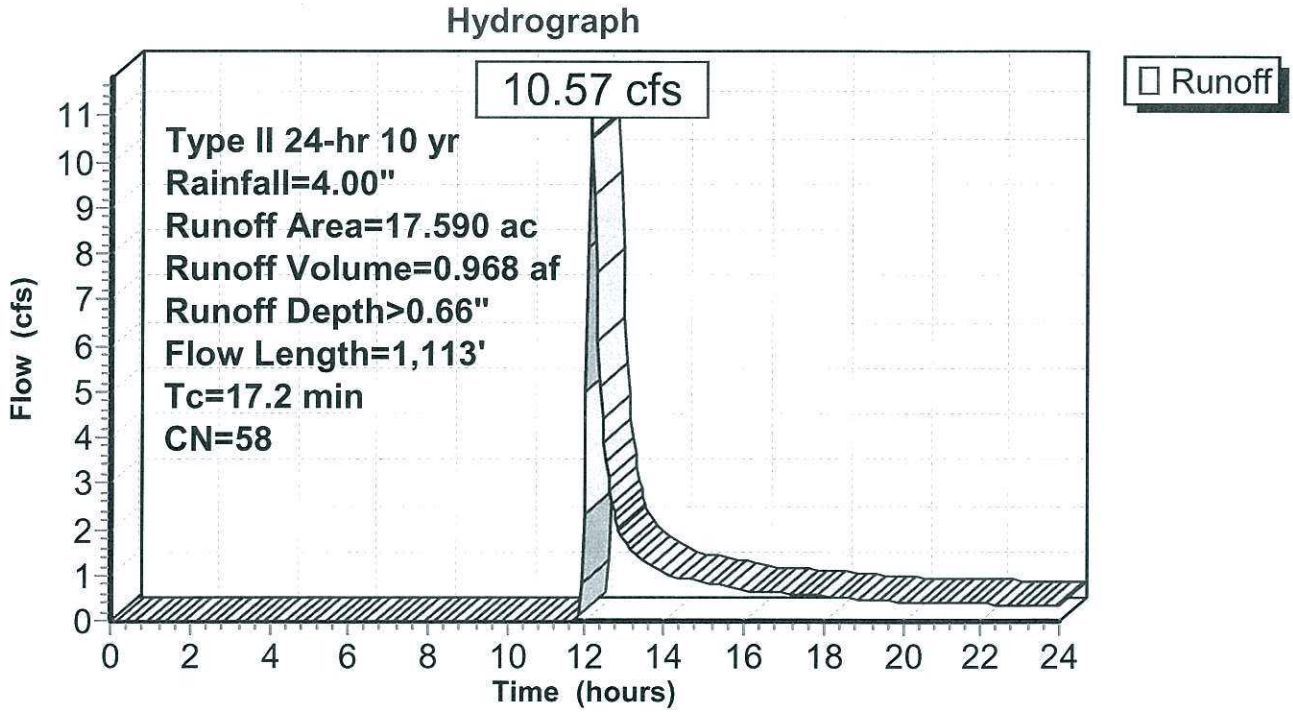
Runoff = 10.57 cfs @ 12.13 hrs, Volume= 0.968 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

	Area (ac)	CN	Description
	17.420	58	Woods/grass comb., Good, HSG B
*	0.170	98	Existing Impervious Tenny Ave.
	17.590	58	Weighted Average
	17.420		99.03% Pervious Area
	0.170		0.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0282	0.12		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.70"
3.7	1,013	0.0790	4.53		**Shallow Concentrated Flow, SC-1** Unpaved Kv= 16.1 fps
17.2	1,113	Total			

Subcatchment 2: Existing Conditions Drainage Area 2



Summary for Subcatchment 3: Existing Conditions Drainage Area 3

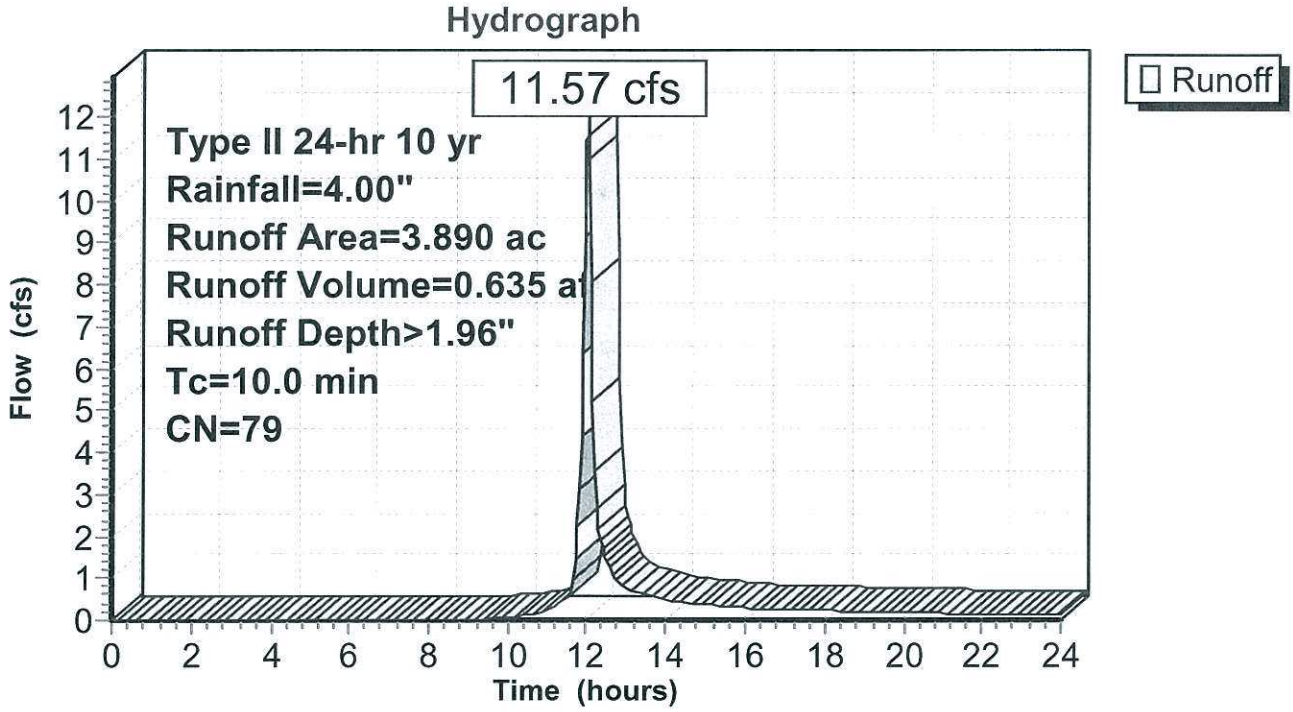
Runoff = 11.57 cfs @ 12.02 hrs, Volume= 0.635 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

	Area (ac)	CN	Description
	1.970	61	>75% Grass cover, Good, HSG B
*	1.920	98	Impervious Area
	3.890	79	Weighted Average
	1.970		50.64% Pervious Area
	1.920		49.36% Impervious Area

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

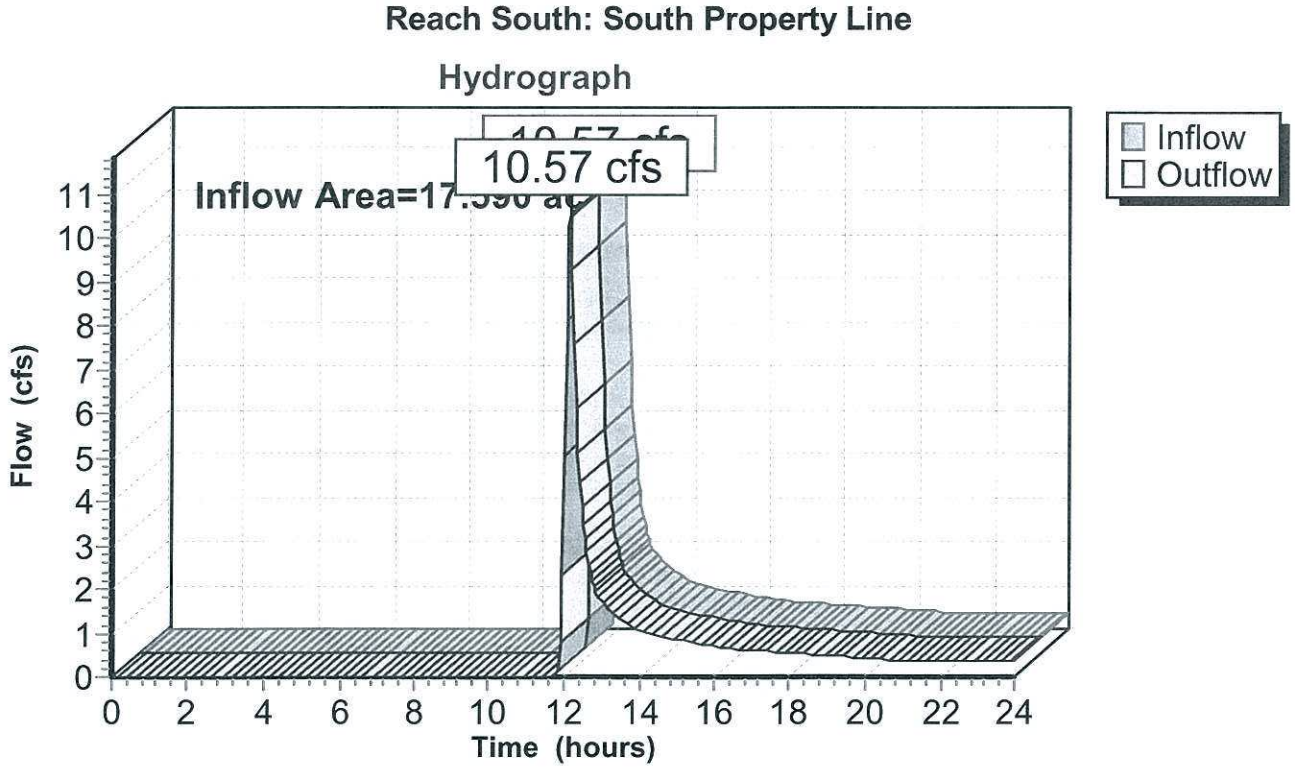
Subcatchment 3: Existing Conditions Drainage Area 3



Summary for Reach South: South Property Line

Inflow Area = 17.590 ac, 0.97% Impervious, Inflow Depth > 0.66" for 10 yr event
Inflow = 10.57 cfs @ 12.13 hrs, Volume= 0.968 af
Outflow = 10.57 cfs @ 12.13 hrs, Volume= 0.968 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

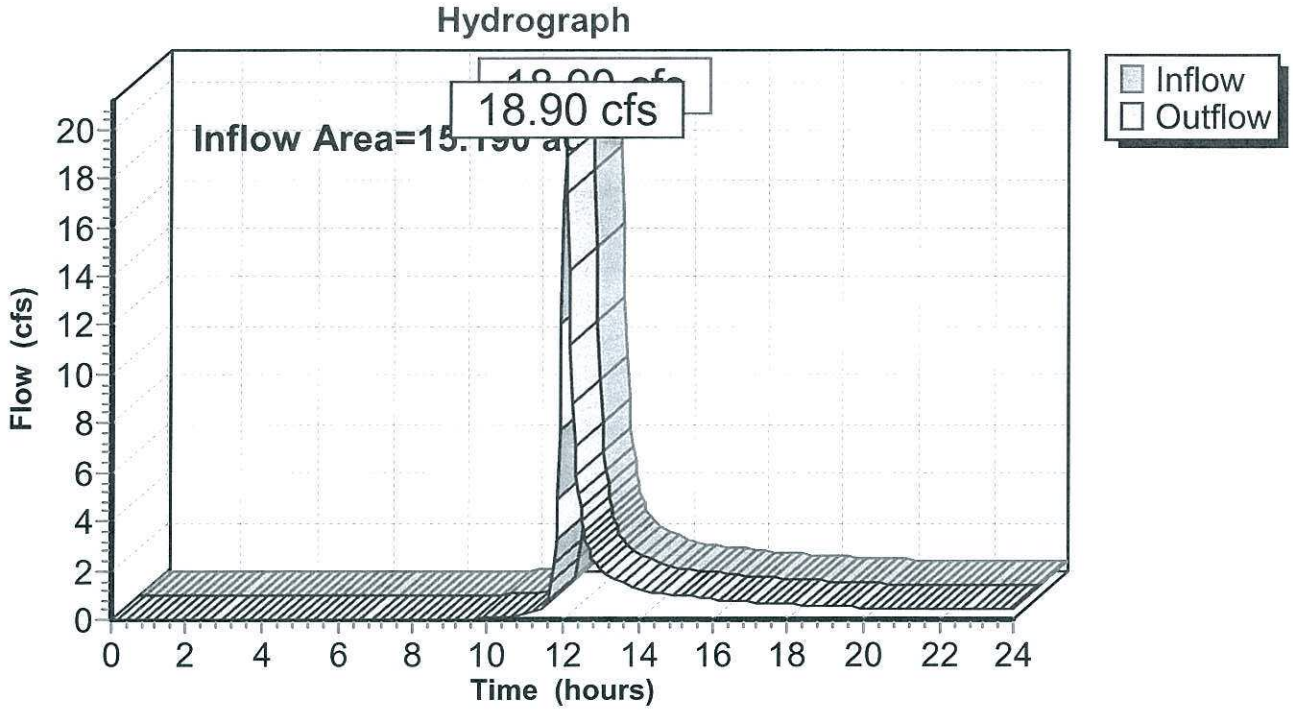


Summary for Reach Sunset Drive: Roadside Ditch - East Sunset Drive

Inflow Area = 15.190 ac, 12.64% Impervious, Inflow Depth > 1.10" for 10 yr event
Inflow = 18.90 cfs @ 12.05 hrs, Volume= 1.395 af
Outflow = 18.90 cfs @ 12.05 hrs, Volume= 1.395 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

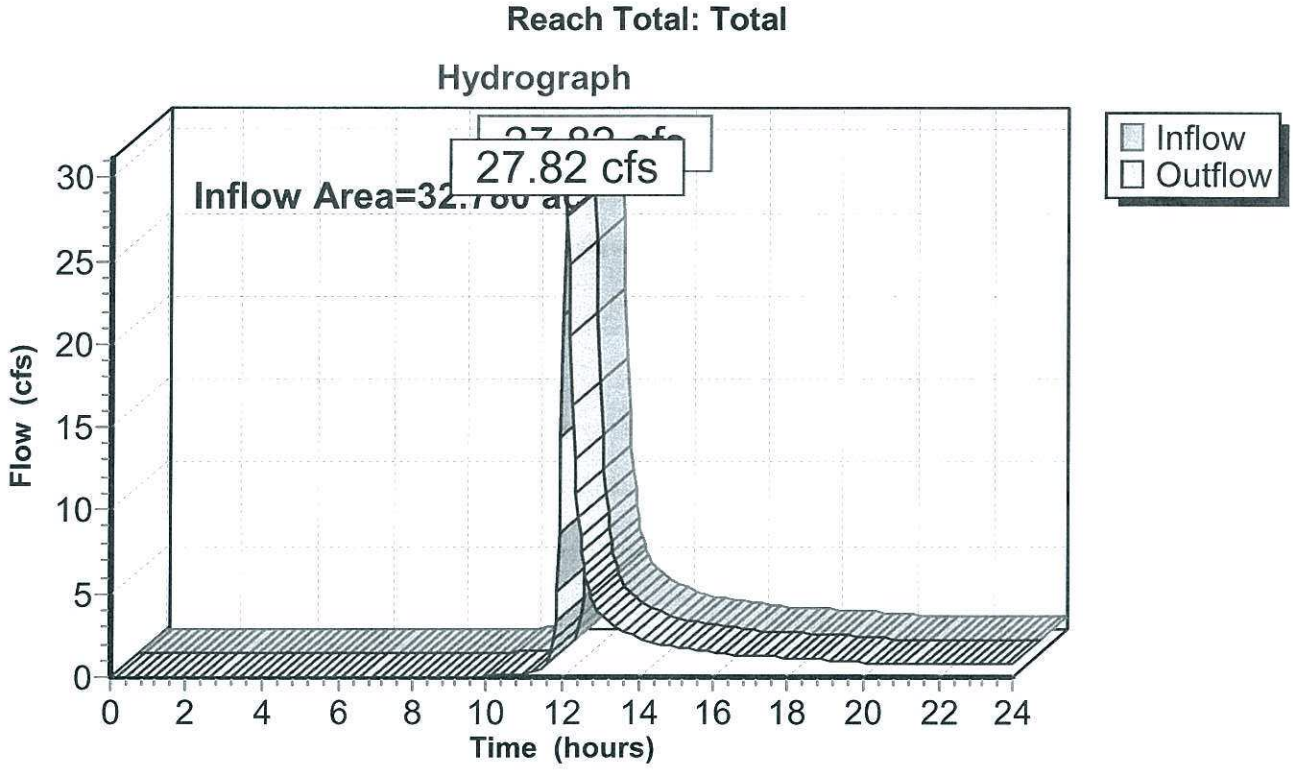
Reach Sunset Drive: Roadside Ditch - East Sunset Drive



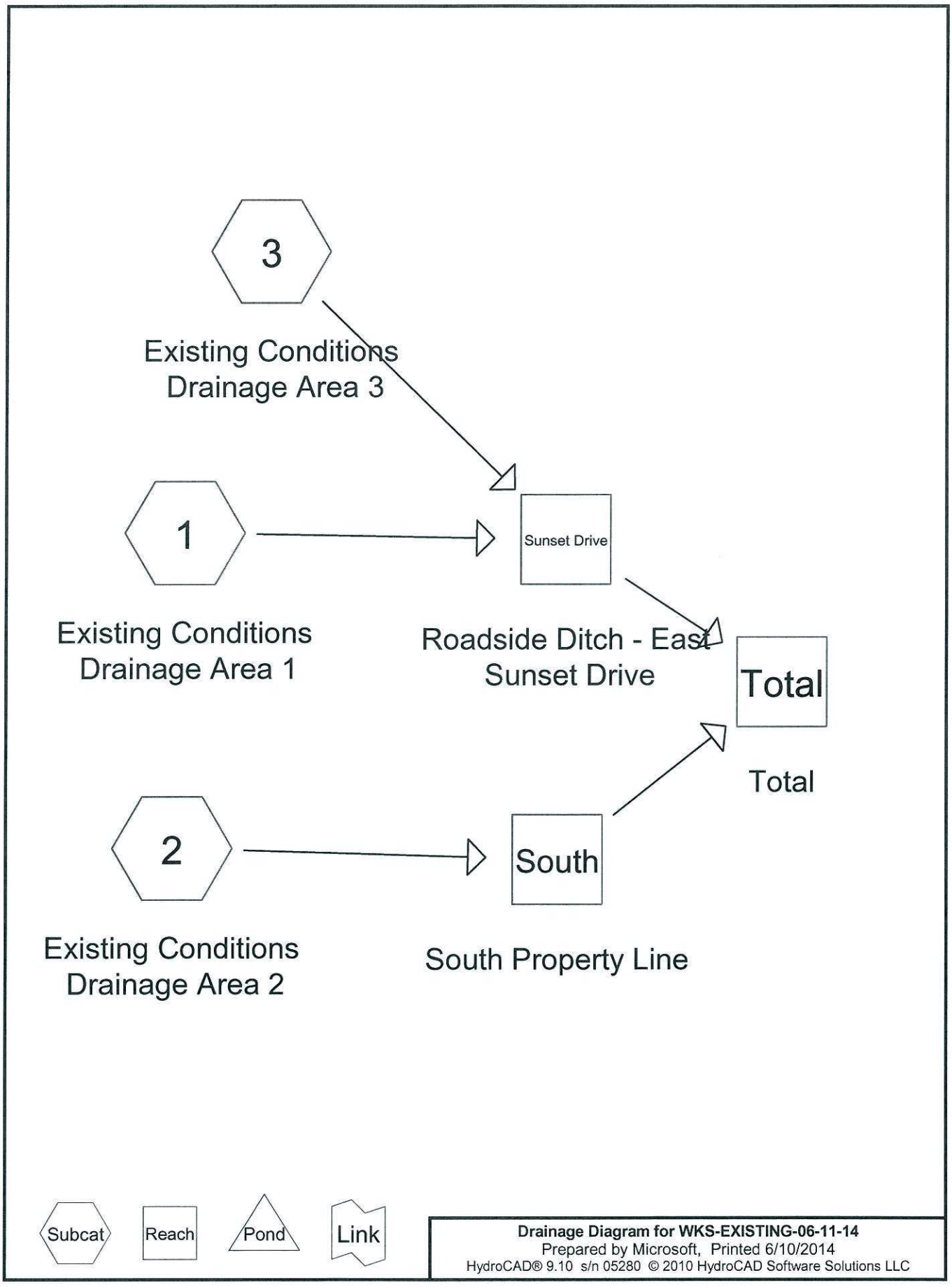
Summary for Reach Total: Total

Inflow Area = 32.780 ac, 6.38% Impervious, Inflow Depth > 0.86" for 10 yr event
Inflow = 27.82 cfs @ 12.08 hrs, Volume= 2.363 af
Outflow = 27.82 cfs @ 12.08 hrs, Volume= 2.363 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



100-Year, 24-Hour Storm Event
(5.60-inches of rainfall)



Drainage Diagram for WKS-EXISTING-06-11-14
Prepared by Microsoft, Printed 6/10/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Existing Conditions Runoff Area=11.300 ac 0.00% Impervious Runoff Depth>1.73"
Flow Length=466' Tc=16.7 min CN=61 Runoff=22.82 cfs 1.632 af

Subcatchment 2: Existing Conditions Runoff Area=17.590 ac 0.97% Impervious Runoff Depth>1.50"
Flow Length=1,113' Tc=17.2 min CN=58 Runoff=29.35 cfs 2.205 af

Subcatchment 3: Existing Conditions Runoff Area=3.890 ac 49.36% Impervious Runoff Depth>3.32"
Tc=10.0 min CN=79 Runoff=19.46 cfs 1.075 af

Reach South: South Property Line Inflow=29.35 cfs 2.205 af
Outflow=29.35 cfs 2.205 af

Reach Sunset Drive: Roadside Ditch - East Sunset Drive Inflow=39.00 cfs 2.708 af
Outflow=39.00 cfs 2.708 af

Reach Total: Total Inflow=65.99 cfs 4.912 af
Outflow=65.99 cfs 4.912 af

Total Runoff Area = 32.780 ac Runoff Volume = 4.912 af Average Runoff Depth = 1.80"
93.62% Pervious = 30.690 ac 6.38% Impervious = 2.090 ac

Summary for Subcatchment 1: Existing Conditions Drainage Area 1

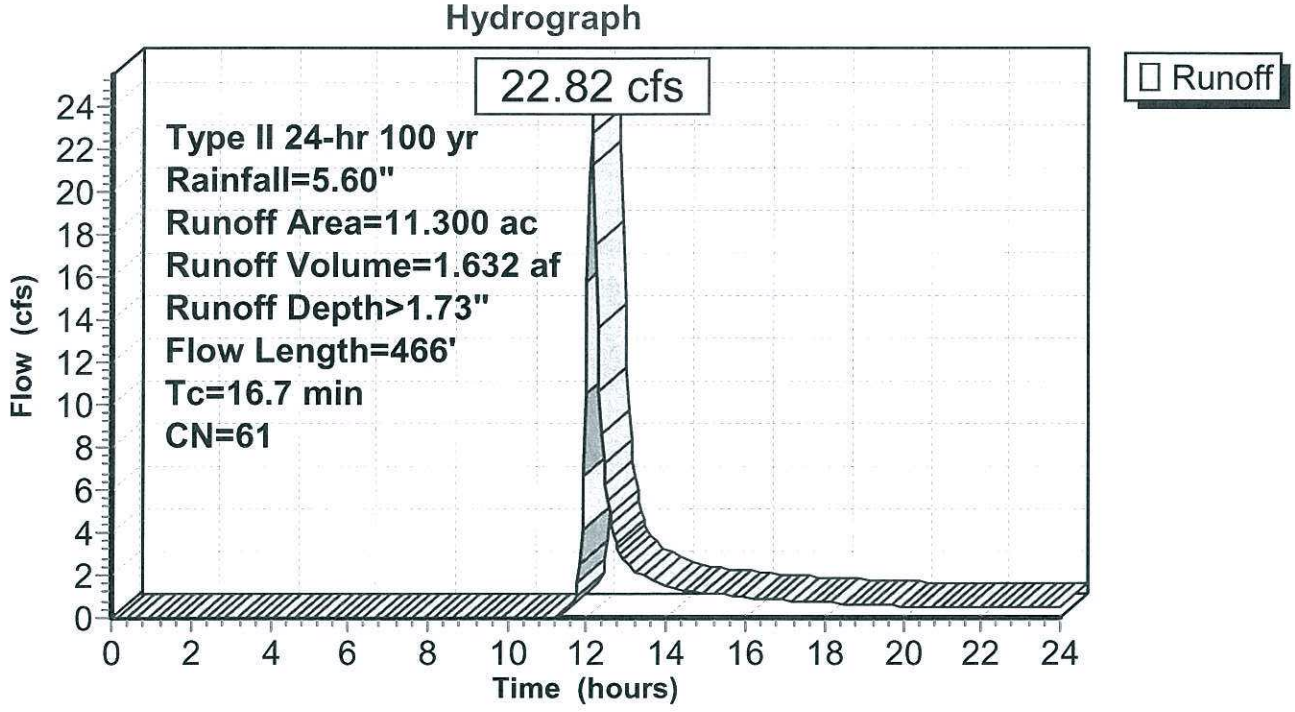
Runoff = 22.82 cfs @ 12.10 hrs, Volume= 1.632 af, Depth> 1.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

Area (ac)	CN	Description
11.300	61	>75% Grass cover, Good, HSG B
11.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	100	0.0200	0.11		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.70"
1.2	366	0.1000	5.09		**Shallow Concentrated Flow, SC-1** Unpaved Kv= 16.1 fps
16.7	466	Total			

Subcatchment 1: Existing Conditions Drainage Area 1



Summary for Subcatchment 2: Existing Conditions Drainage Area 2

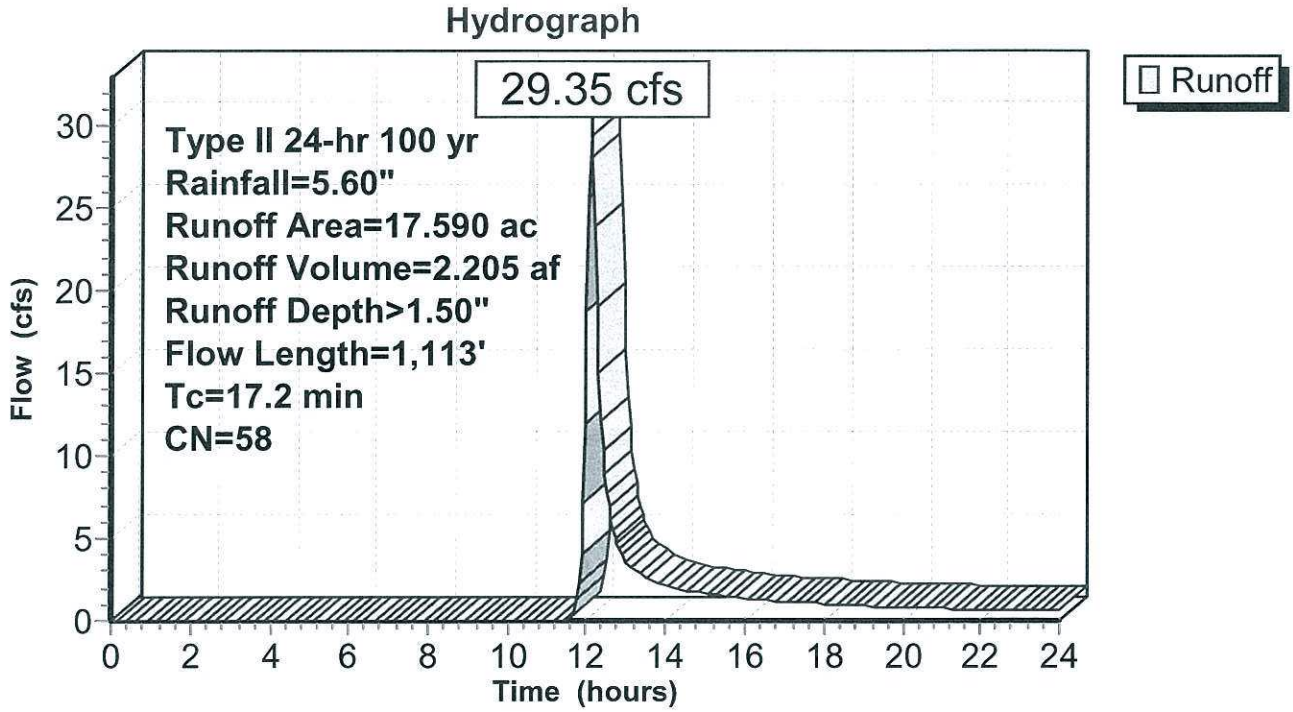
Runoff = 29.35 cfs @ 12.11 hrs, Volume= 2.205 af, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

	Area (ac)	CN	Description
	17.420	58	Woods/grass comb., Good, HSG B
*	0.170	98	Existing Impervious Tenny Ave.
	17.590	58	Weighted Average
	17.420		99.03% Pervious Area
	0.170		0.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0282	0.12		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.70"
3.7	1,013	0.0790	4.53		**Shallow Concentrated Flow, SC-1** Unpaved Kv= 16.1 fps
17.2	1,113	Total			

Subcatchment 2: Existing Conditions Drainage Area 2



Summary for Subcatchment 3: Existing Conditions Drainage Area 3

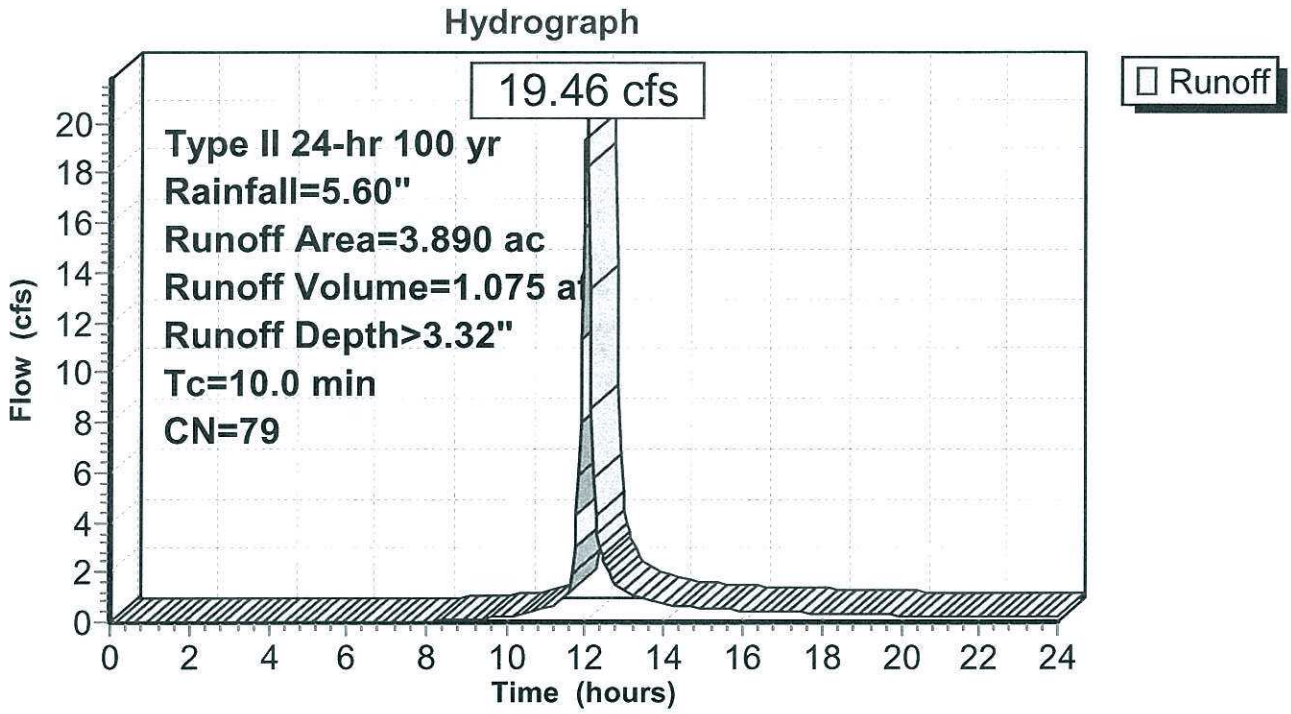
Runoff = 19.46 cfs @ 12.01 hrs, Volume= 1.075 af, Depth> 3.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

	Area (ac)	CN	Description
	1.970	61	>75% Grass cover, Good, HSG B
*	1.920	98	Impervious Area
	3.890	79	Weighted Average
	1.970		50.64% Pervious Area
	1.920		49.36% Impervious Area

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

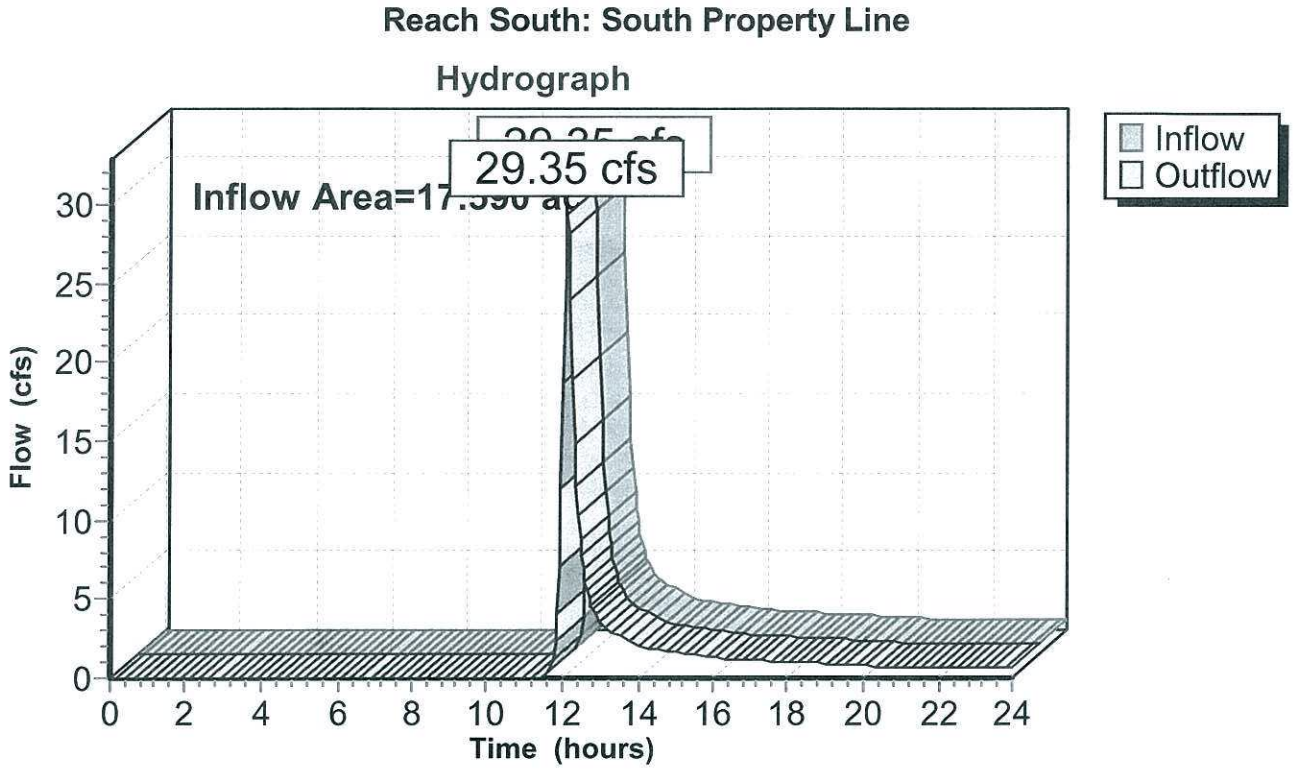
Subcatchment 3: Existing Conditions Drainage Area 3



Summary for Reach South: South Property Line

Inflow Area = 17.590 ac, 0.97% Impervious, Inflow Depth > 1.50" for 100 yr event
Inflow = 29.35 cfs @ 12.11 hrs, Volume= 2.205 af
Outflow = 29.35 cfs @ 12.11 hrs, Volume= 2.205 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

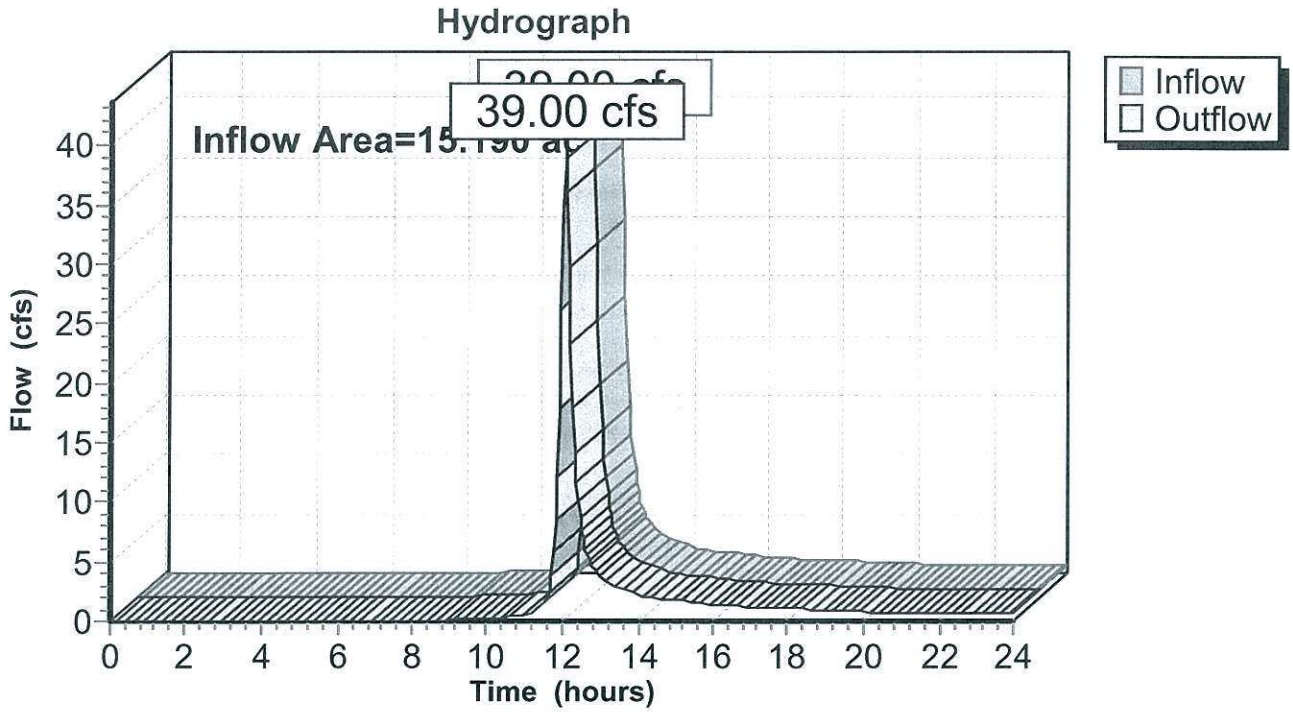


Summary for Reach Sunset Drive: Roadside Ditch - East Sunset Drive

Inflow Area = 15.190 ac, 12.64% Impervious, Inflow Depth > 2.14" for 100 yr event
Inflow = 39.00 cfs @ 12.05 hrs, Volume= 2.708 af
Outflow = 39.00 cfs @ 12.05 hrs, Volume= 2.708 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

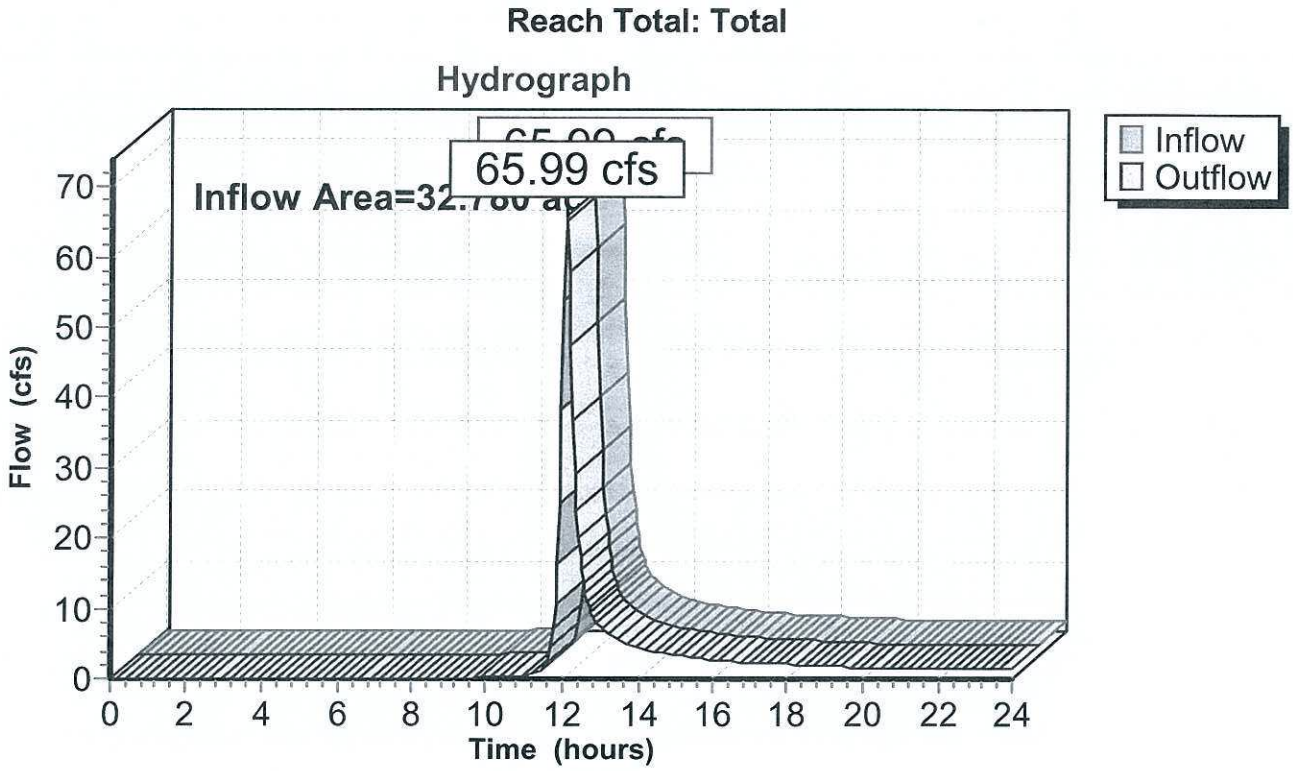
Reach Sunset Drive: Roadside Ditch - East Sunset Drive



Summary for Reach Total: Total

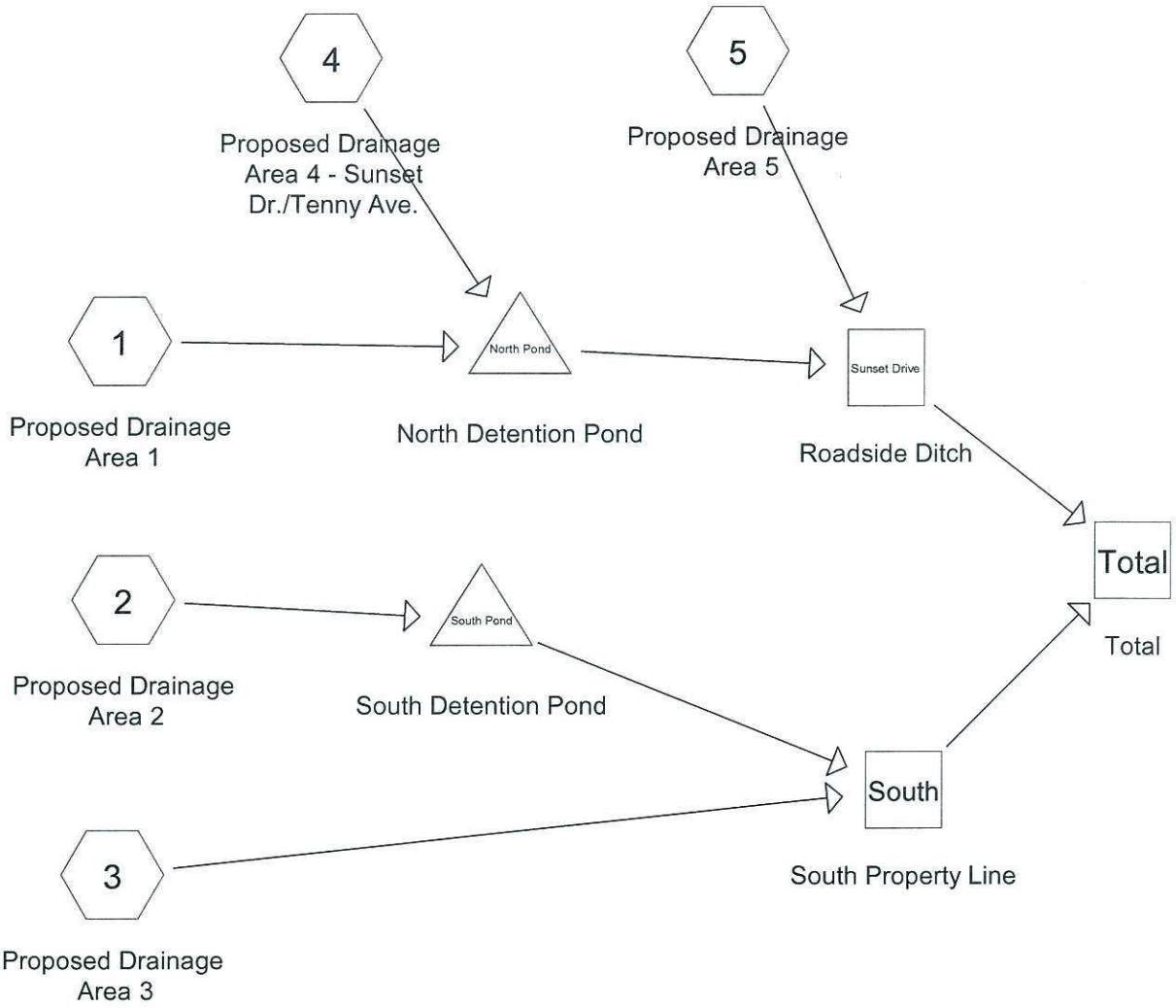
Inflow Area = 32.780 ac, 6.38% Impervious, Inflow Depth > 1.80" for 100 yr event
Inflow = 65.99 cfs @ 12.08 hrs, Volume= 4.912 af
Outflow = 65.99 cfs @ 12.08 hrs, Volume= 4.912 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



PROPOSED CONDITIONS

2-Year, 24-Hour Storm Event
(2.7-inches of rainfall)



Subcat Reach Pond Link

Drainage Diagram for WKS-PROPOSED-06-11-14
Prepared by Microsoft, Printed 6/10/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Proposed Drainage Area Runoff Area=12.450 ac 81.17% Impervious Runoff Depth>1.79"
Tc=10.0 min CN=91 Runoff=33.17 cfs 1.857 af

Subcatchment 2: Proposed Drainage Area Runoff Area=12.110 ac 81.16% Impervious Runoff Depth>1.79"
Tc=10.0 min CN=91 Runoff=32.27 cfs 1.806 af

Subcatchment 3: Proposed Drainage Area 3 Runoff Area=2.120 ac 0.00% Impervious Runoff Depth>0.26"
Tc=10.0 min CN=61 Runoff=0.45 cfs 0.045 af

Subcatchment 4: Proposed Drainage Area Runoff Area=4.220 ac 53.82% Impervious Runoff Depth>1.08"
Tc=10.0 min CN=81 Runoff=6.91 cfs 0.381 af

Subcatchment 5: Proposed Drainage Area 5 Runoff Area=1.880 ac 3.72% Impervious Runoff Depth>0.23"
Tc=10.0 min CN=60 Runoff=0.32 cfs 0.036 af

Reach South: South Property Line Inflow=1.18 cfs 0.428 af
Outflow=1.18 cfs 0.428 af

Reach Sunset Drive: Roadside Ditch Inflow=1.54 cfs 1.411 af
Outflow=1.54 cfs 1.411 af

Reach Total: Total Inflow=2.69 cfs 1.839 af
Outflow=2.69 cfs 1.839 af

Pond North Pond: North Detention Pond Peak Elev=117.65' Storage=1.383 af Inflow=40.06 cfs 2.238 af
Primary=1.50 cfs 1.374 af Secondary=0.00 cfs 0.000 af Outflow=1.50 cfs 1.374 af

Pond South Pond: South Detention Pond Peak Elev=110.83' Storage=0.801 af Inflow=32.27 cfs 1.806 af
Discarded=2.07 cfs 1.418 af Primary=0.85 cfs 0.383 af Secondary=0.00 cfs 0.000 af Outflow=2.91 cfs 1.801 af

Total Runoff Area = 32.780 ac Runoff Volume = 4.126 af Average Runoff Depth = 1.51"
32.04% Pervious = 10.504 ac 67.96% Impervious = 22.276 ac

Summary for Subcatchment 1: Proposed Drainage Area 1

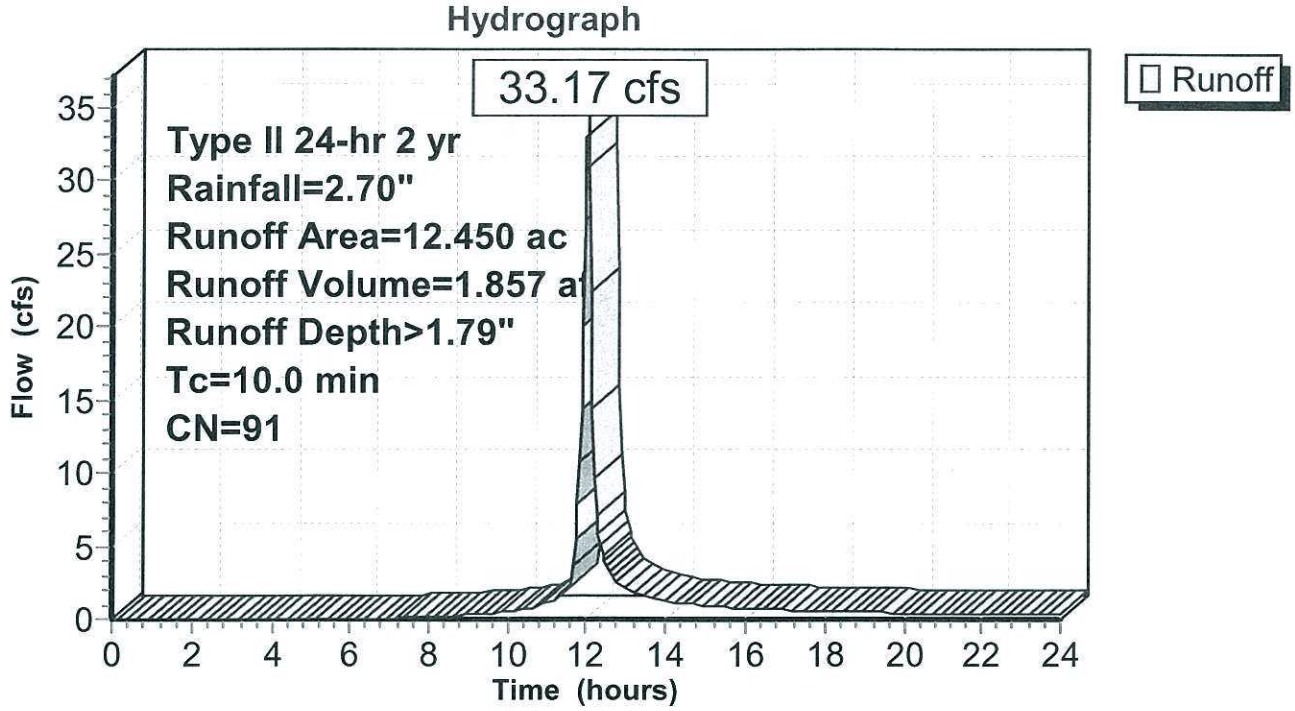
Runoff = 33.17 cfs @ 12.01 hrs, Volume= 1.857 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

	Area (ac)	CN	Description
	9.310	98	Paved parking, HSG B
	2.206	61	>75% Grass cover, Good, HSG B
*	0.796	98	NWL pond @ 116.0
	0.138	85	Gravel roads, HSG B
	12.450	91	Weighted Average
	2.344		18.83% Pervious Area
	10.106		81.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Approx. TOC**

Subcatchment 1: Proposed Drainage Area 1



Summary for Subcatchment 2: Proposed Drainage Area 2

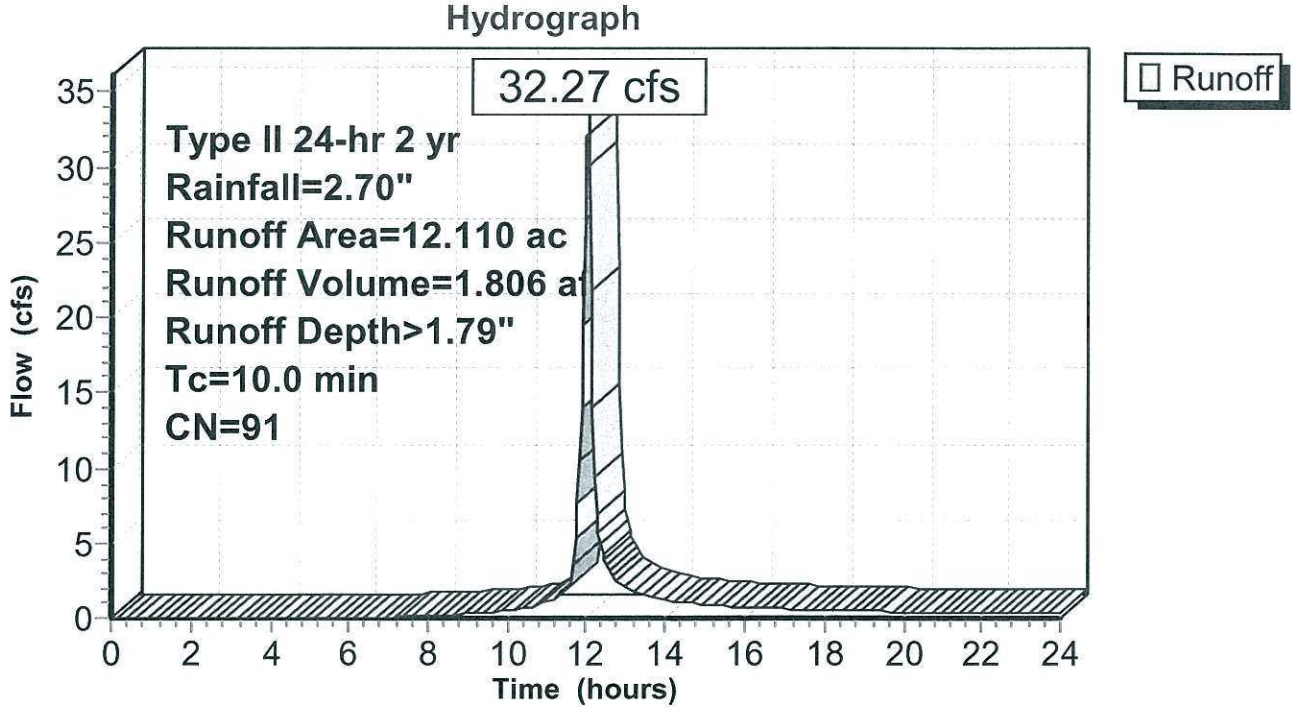
Runoff = 32.27 cfs @ 12.01 hrs, Volume= 1.806 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

	Area (ac)	CN	Description
	9.370	98	Paved parking, HSG B
	2.100	61	>75% Grass cover, Good, HSG B
*	0.459	98	Pond Bottom/NWL @ 109.0
	0.181	85	Gravel roads, HSG B
	12.110	91	Weighted Average
	2.281		18.84% Pervious Area
	9.829		81.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Approx. TOC**

Subcatchment 2: Proposed Drainage Area 2



Summary for Subcatchment 3: Proposed Drainage Area 3

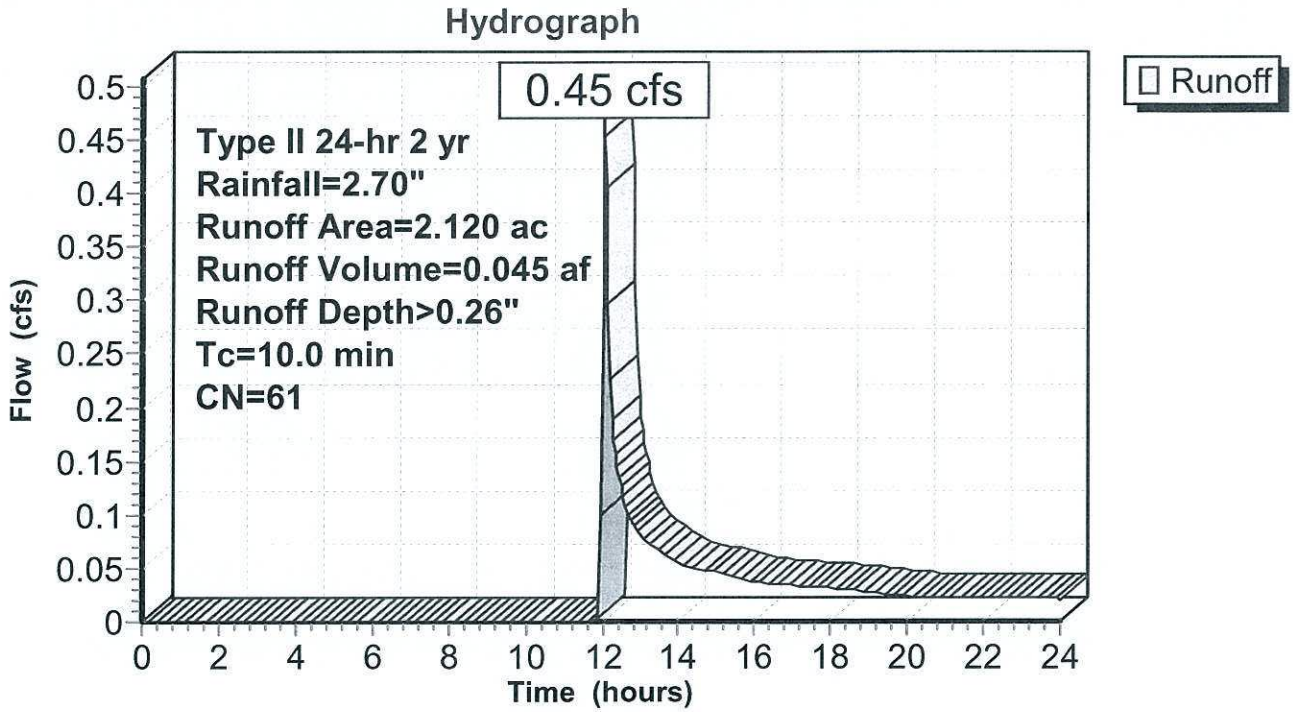
Runoff = 0.45 cfs @ 12.06 hrs, Volume= 0.045 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

Area (ac)	CN	Description
1.880	61	>75% Grass cover, Good, HSG B
0.240	58	Woods/grass comb., Good, HSG B
2.120	61	Weighted Average
2.120		100.00% Pervious Area

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

Subcatchment 3: Proposed Drainage Area 3



Summary for Subcatchment 4: Proposed Drainage Area 4 - Sunset Dr./Tenny Ave.

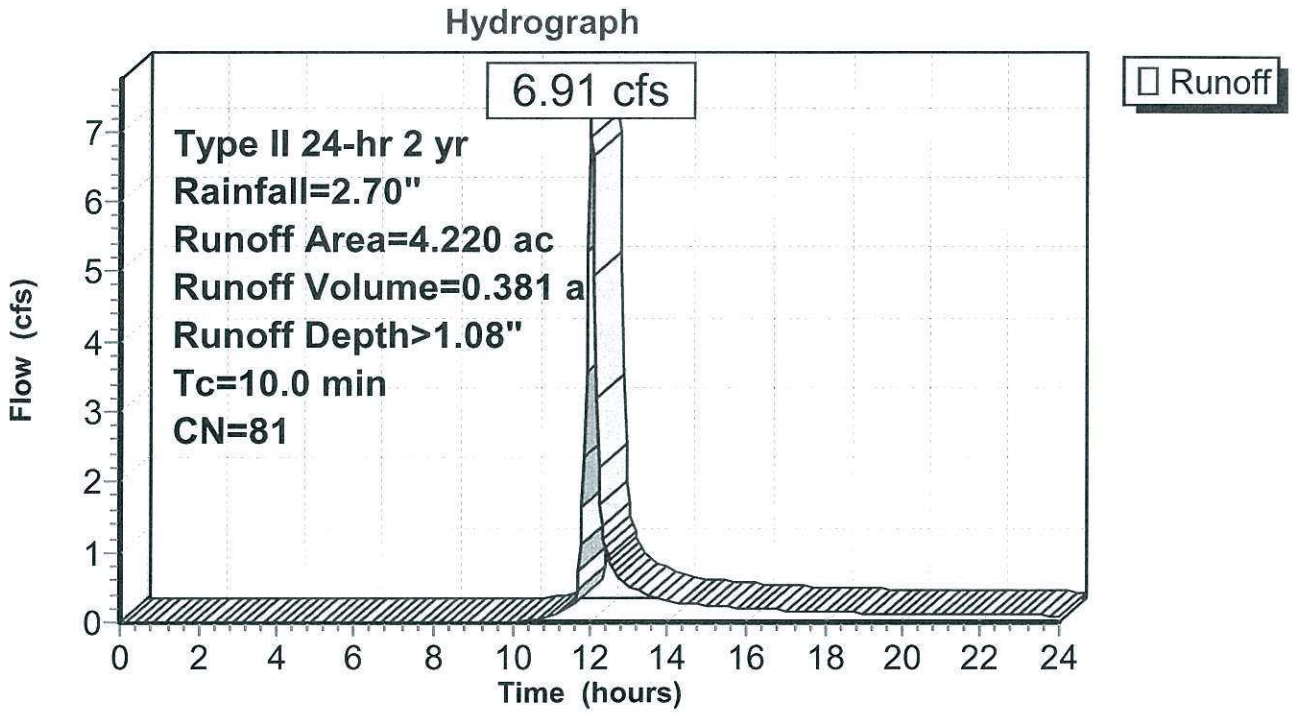
Runoff = 6.91 cfs @ 12.02 hrs, Volume= 0.381 af, Depth> 1.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

	Area (ac)	CN	Description
	1.949	61	>75% Grass cover, Good, HSG B
*	2.271	98	Impervious
	4.220	81	Weighted Average
	1.949		46.18% Pervious Area
	2.271		53.82% Impervious Area

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

Subcatchment 4: Proposed Drainage Area 4 - Sunset Dr./Tenny Ave.



Summary for Subcatchment 5: Proposed Drainage Area 5

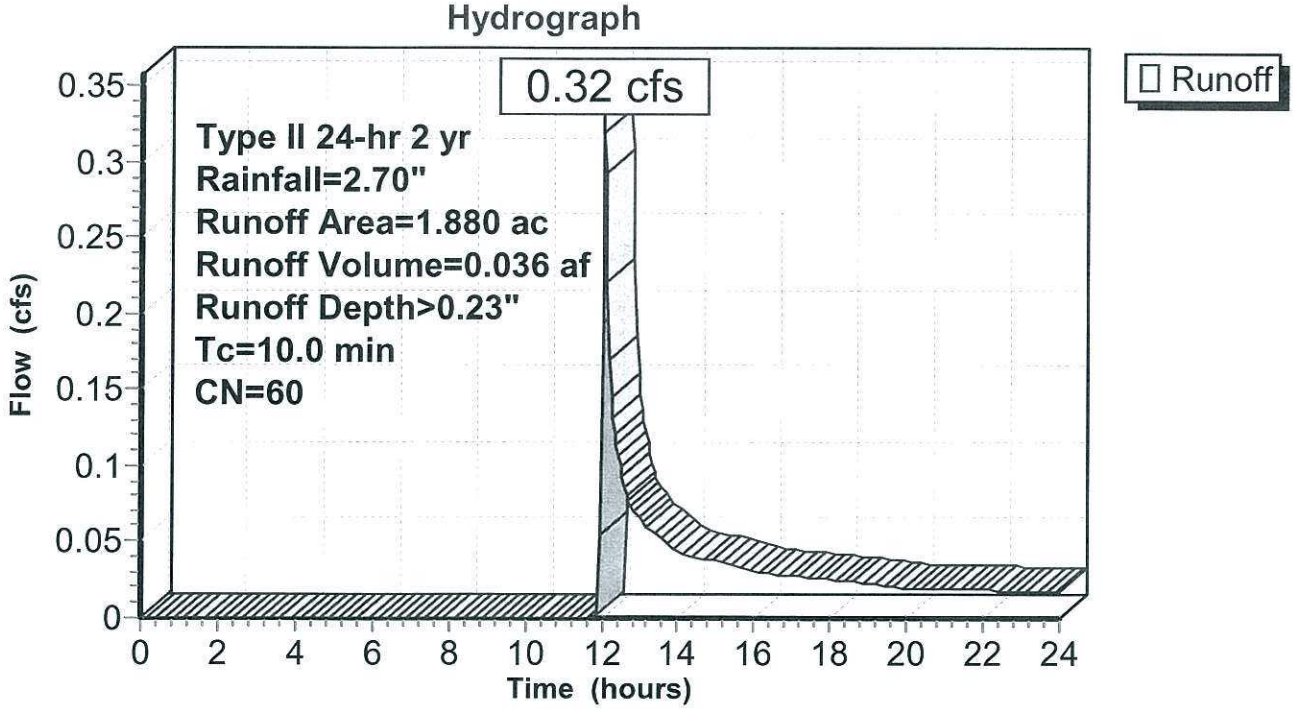
Runoff = 0.32 cfs @ 12.07 hrs, Volume= 0.036 af, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.70"

	Area (ac)	CN	Description
	0.630	61	>75% Grass cover, Good, HSG B
	1.180	58	Woods/grass comb., Good, HSG B
*	0.070	98	Impervious surface
	1.880	60	Weighted Average
	1.810		96.28% Pervious Area
	0.070		3.72% Impervious Area

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

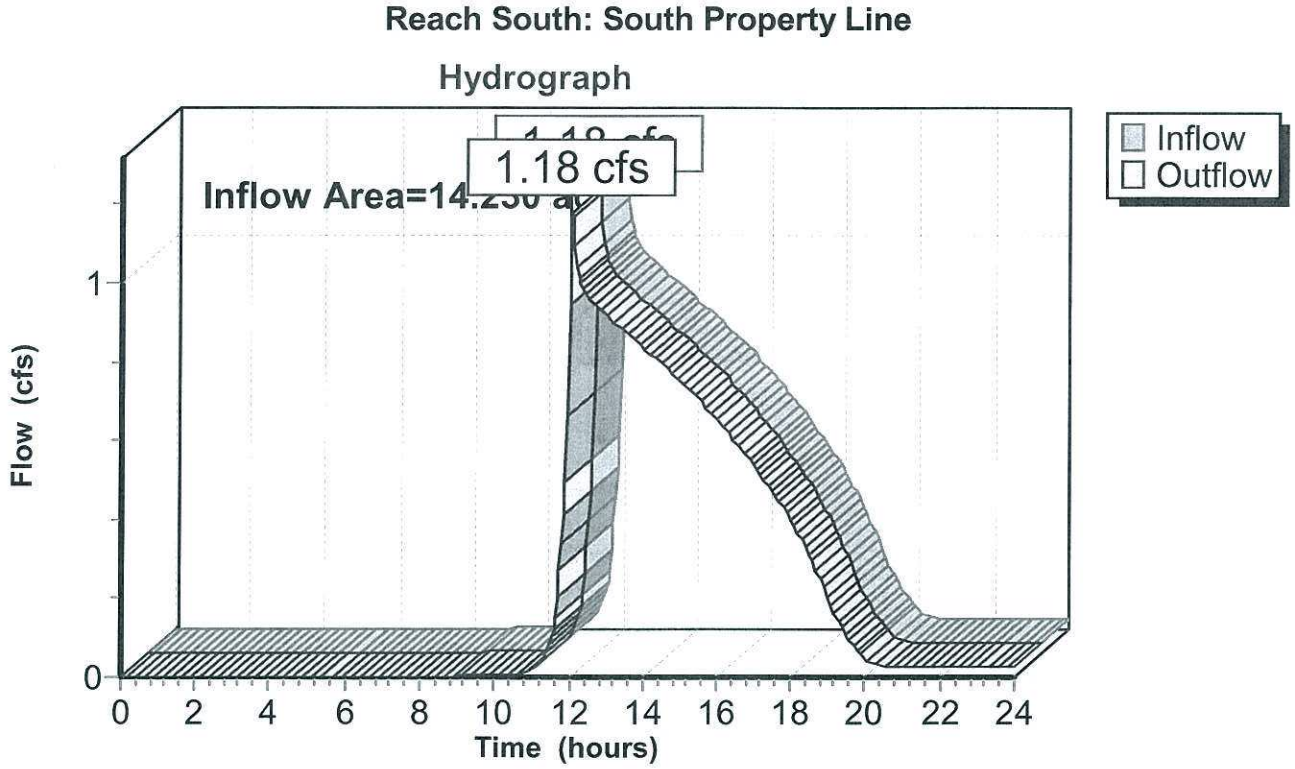
Subcatchment 5: Proposed Drainage Area 5



Summary for Reach South: South Property Line

Inflow Area = 14.230 ac, 69.07% Impervious, Inflow Depth > 0.36" for 2 yr event
Inflow = 1.18 cfs @ 12.08 hrs, Volume= 0.428 af
Outflow = 1.18 cfs @ 12.08 hrs, Volume= 0.428 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

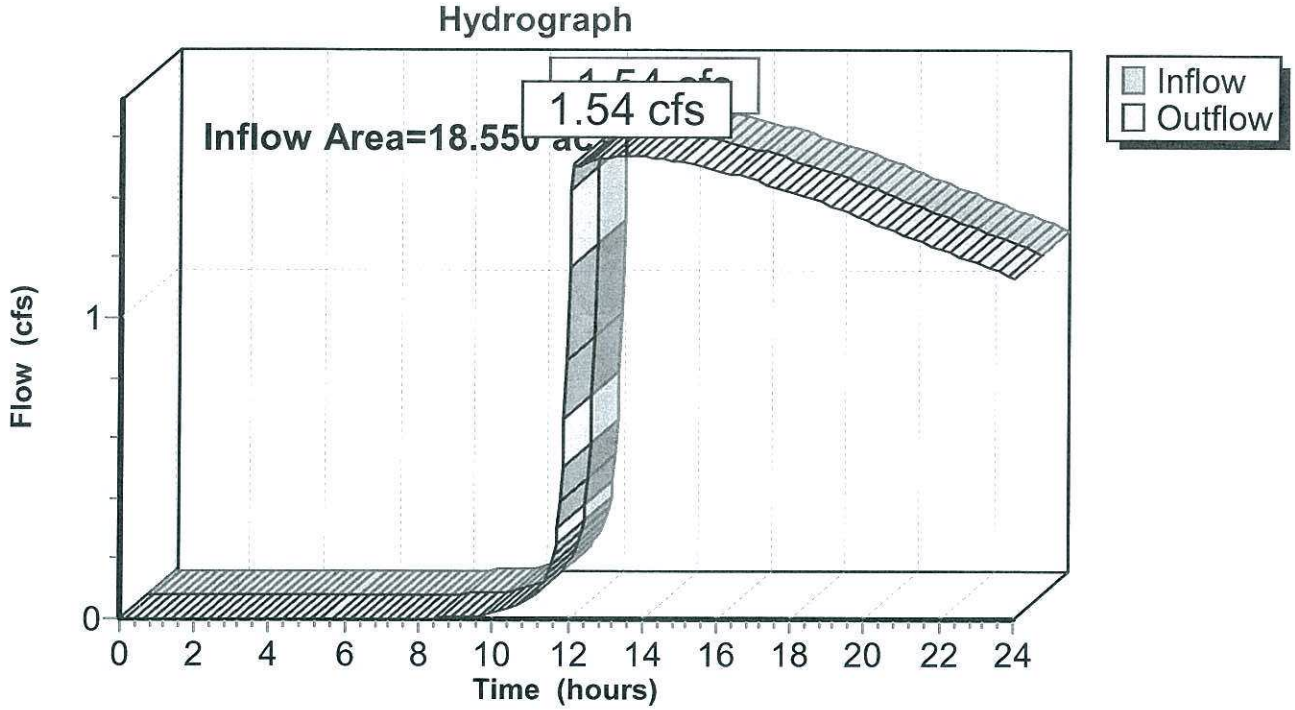


Summary for Reach Sunset Drive: Roadside Ditch

Inflow Area = 18.550 ac, 67.10% Impervious, Inflow Depth > 0.91" for 2 yr event
Inflow = 1.54 cfs @ 13.53 hrs, Volume= 1.411 af
Outflow = 1.54 cfs @ 13.53 hrs, Volume= 1.411 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

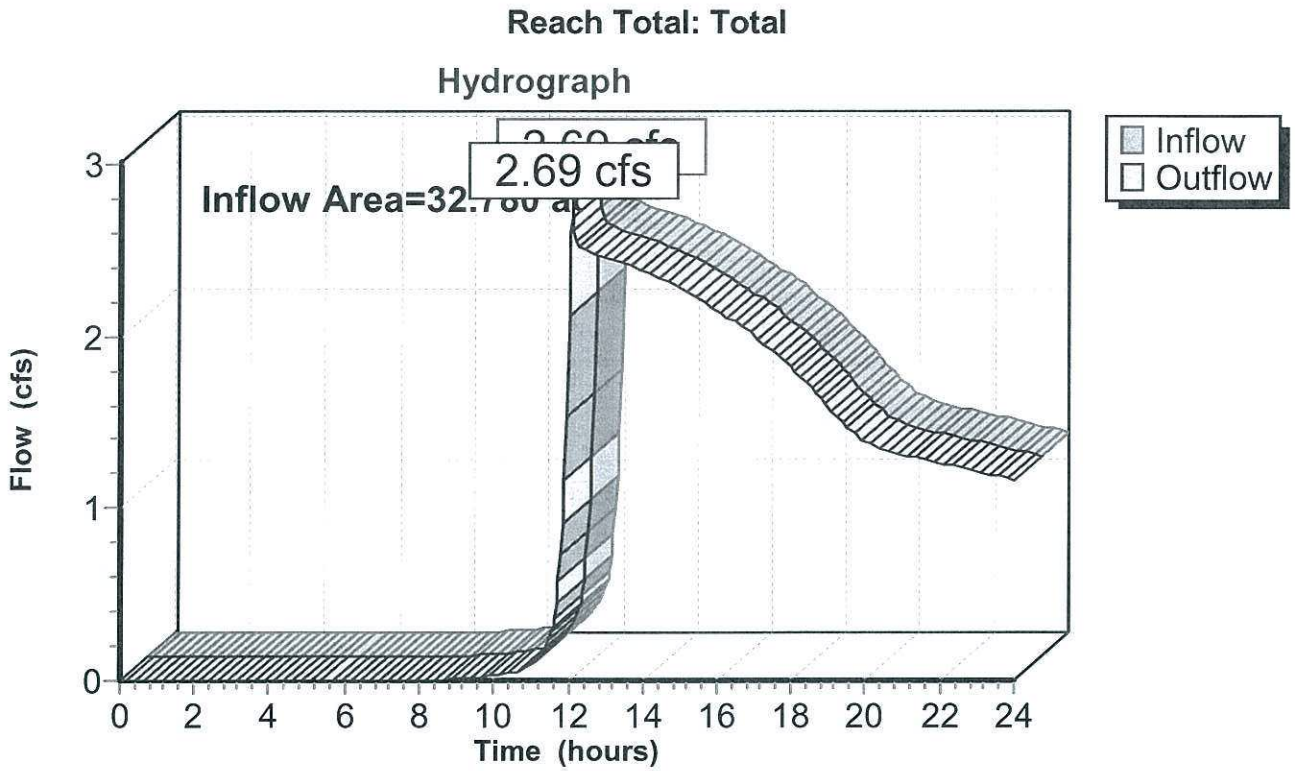
Reach Sunset Drive: Roadside Ditch



Summary for Reach Total: Total

Inflow Area = 32.780 ac, 67.96% Impervious, Inflow Depth > 0.67" for 2 yr event
Inflow = 2.69 cfs @ 12.10 hrs, Volume= 1.839 af
Outflow = 2.69 cfs @ 12.10 hrs, Volume= 1.839 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Summary for Pond North Pond: North Detention Pond

Inflow Area = 16.670 ac, 74.25% Impervious, Inflow Depth > 1.61" for 2 yr event
Inflow = 40.06 cfs @ 12.01 hrs, Volume= 2.238 af
Outflow = 1.50 cfs @ 14.03 hrs, Volume= 1.374 af, Atten= 96%, Lag= 120.9 min
Primary = 1.50 cfs @ 14.03 hrs, Volume= 1.374 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 117.65' @ 14.03 hrs Surf.Area= 0.879 ac Storage= 1.383 af

Plug-Flow detention time= 351.5 min calculated for 1.374 af (61% of inflow)
Center-of-Mass det. time= 243.1 min (1,058.1 - 815.0)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	4.621 af	**Custom Stage Data (Prismatic)** Listed below

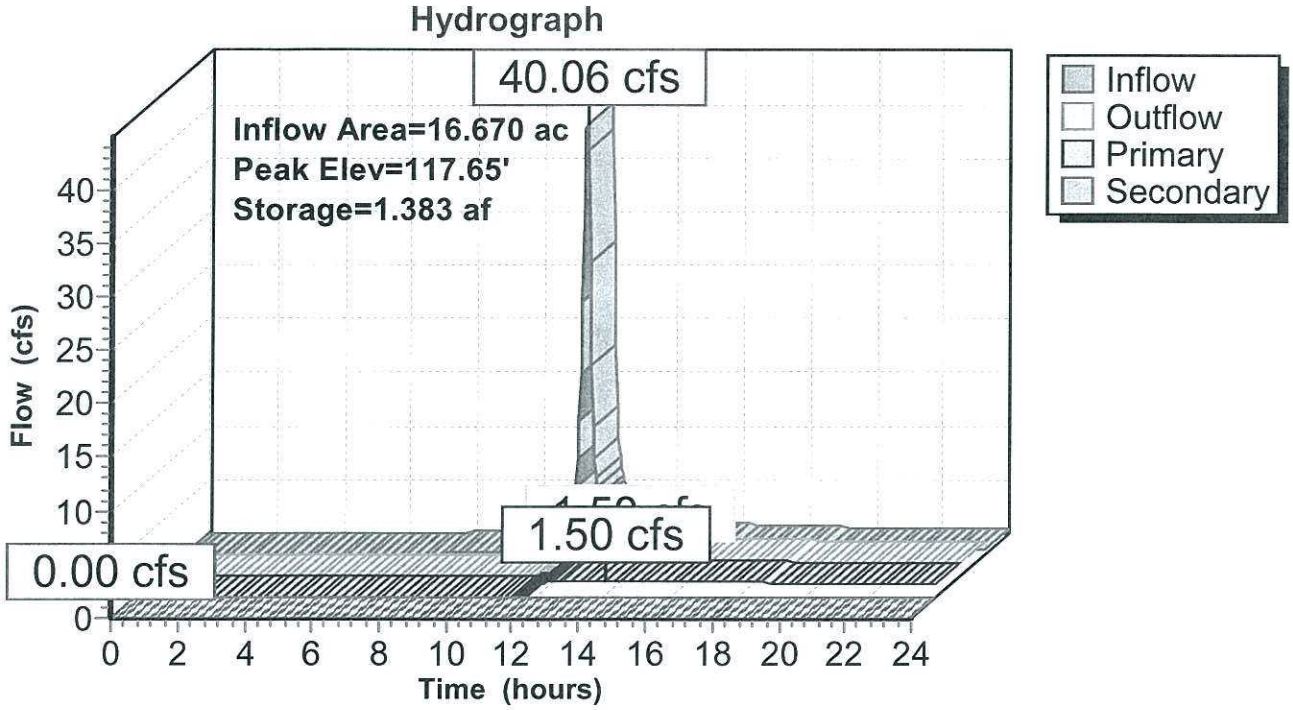
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
116.00	0.796	0.000	0.000
117.00	0.846	0.821	0.821
118.00	0.897	0.871	1.693
119.00	0.949	0.923	2.616
120.00	1.002	0.975	3.591
121.00	1.057	1.030	4.621

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**15.0" Round Culvert** L= 61.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 114.00' / 110.42' S= 0.0587 '/' Cc= 0.900 n= 0.013
#2	Device 1	116.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	118.00'	**6.0' 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	120.00'	**33.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.50 cfs @ 14.03 hrs HW=117.65' (Free Discharge)
↑**1=Culvert** (Passes 1.50 cfs of 9.06 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 1.50 cfs @ 5.60 fps)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.00' (Free Discharge)
↑**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond North Pond: North Detention Pond



Summary for Pond South Pond: South Detention Pond

Inflow Area = 12.110 ac, 81.16% Impervious, Inflow Depth > 1.79" for 2 yr event
Inflow = 32.27 cfs @ 12.01 hrs, Volume= 1.806 af
Outflow = 2.91 cfs @ 12.60 hrs, Volume= 1.801 af, Atten= 91%, Lag= 35.2 min
Discarded = 2.07 cfs @ 12.60 hrs, Volume= 1.418 af
Primary = 0.85 cfs @ 12.60 hrs, Volume= 0.383 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 110.83' @ 12.60 hrs Surf.Area= 0.569 ac Storage= 0.801 af

Plug-Flow detention time= 110.5 min calculated for 1.801 af (100% of inflow)
Center-of-Mass det. time= 108.7 min (917.0 - 808.3)

Volume	Invert	Avail.Storage	Storage Description
#1	109.00'	3.792 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
109.00	0.187	0.000	0.000
110.00	0.518	0.353	0.353
111.00	0.580	0.549	0.902
112.00	0.668	0.624	1.525
113.00	0.729	0.699	2.224
114.00	0.784	0.756	2.980
115.00	0.840	0.812	3.792

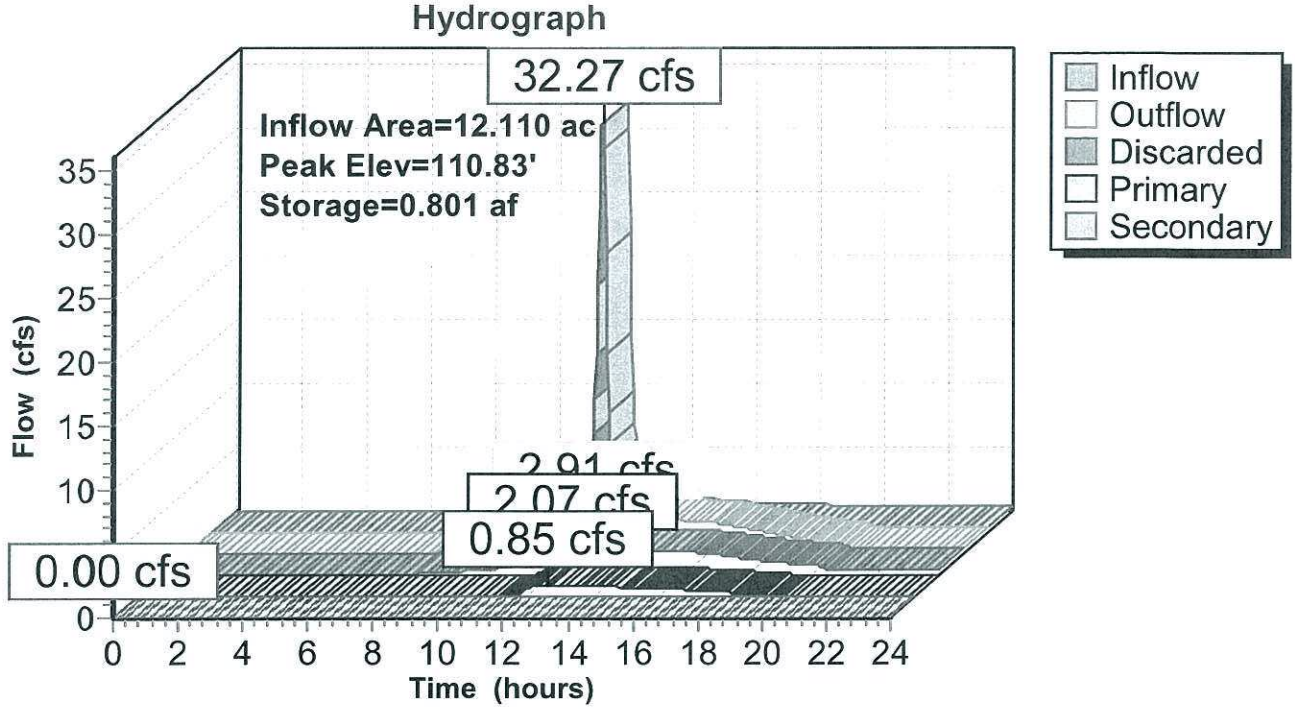
Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**18.0" Round Culvert** L= 32.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 109.00' / 108.00' S= 0.0313 '/' Cc= 0.900 n= 0.013
#2	Device 1	109.00'	**5.0" Vert. Orifice/Grate** C= 0.610
#3	Device 1	111.00'	**6.0' long x 0.5' breadth 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	114.00'	**33.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#5	Discarded	109.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=2.07 cfs @ 12.60 hrs HW=110.83' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 2.07 cfs)

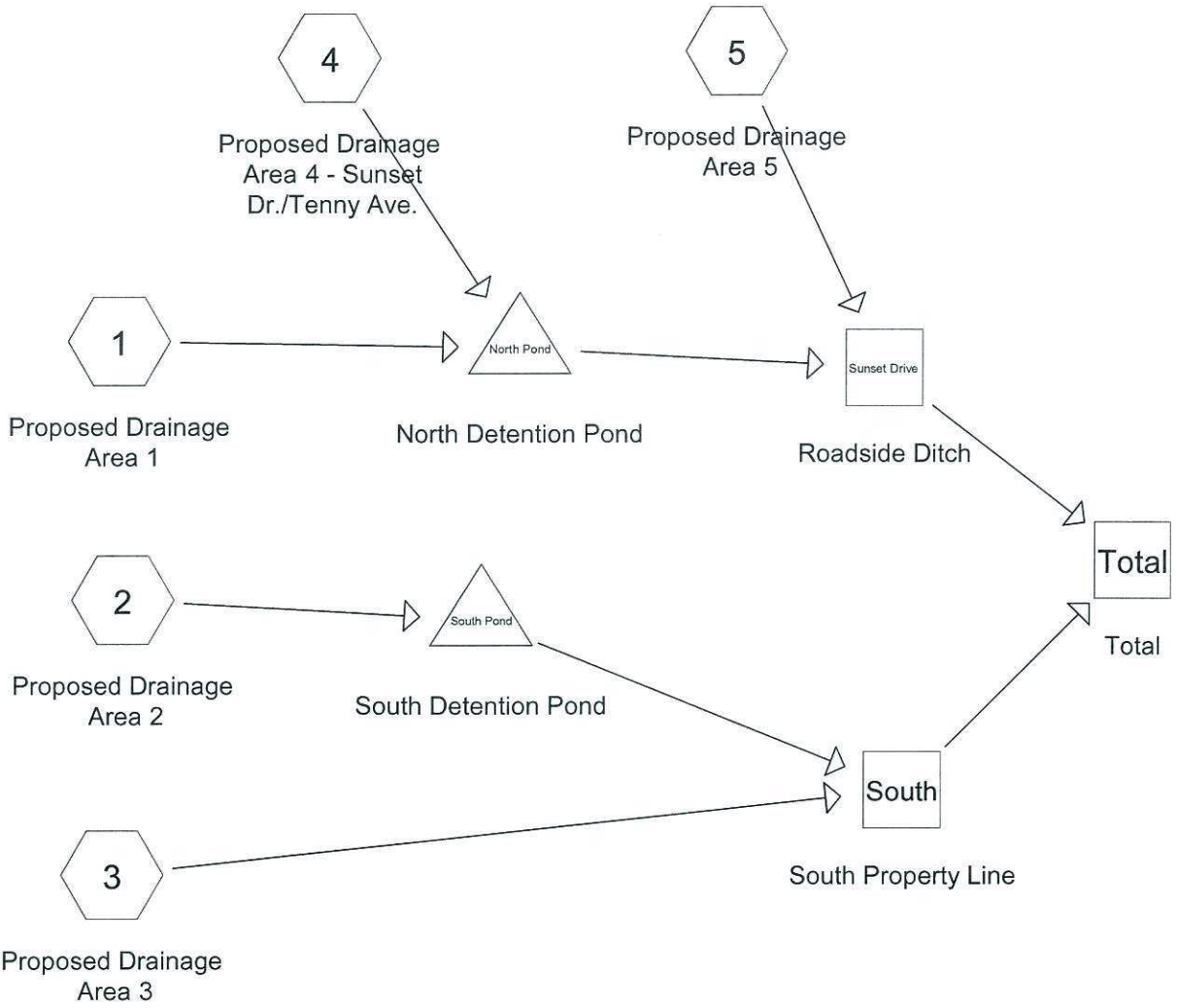
Primary OutFlow Max=0.85 cfs @ 12.60 hrs HW=110.83' (Free Discharge)
└**1=Culvert** (Passes 0.85 cfs of 8.82 cfs potential flow)
  └**2=Orifice/Grate** (Orifice Controls 0.85 cfs @ 6.23 fps)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=109.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond South Pond: South Detention Pond



10-Year, 24-Hour Storm Event
(4.0-inches of rainfall)



Subcat Reach Pond Link

Drainage Diagram for WKS-PROPOSED-06-11-14
Prepared by Microsoft, Printed 6/10/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Proposed Drainage Area Runoff Area=12.450 ac 81.17% Impervious Runoff Depth>3.01"
Tc=10.0 min CN=91 Runoff=54.42 cfs 3.125 af

Subcatchment 2: Proposed Drainage Area Runoff Area=12.110 ac 81.16% Impervious Runoff Depth>3.01"
Tc=10.0 min CN=91 Runoff=52.93 cfs 3.039 af

Subcatchment 3: Proposed Drainage Area 3 Runoff Area=2.120 ac 0.00% Impervious Runoff Depth>0.81"
Tc=10.0 min CN=61 Runoff=2.30 cfs 0.143 af

Subcatchment 4: Proposed Drainage Area Runoff Area=4.220 ac 53.82% Impervious Runoff Depth>2.12"
Tc=10.0 min CN=81 Runoff=13.55 cfs 0.744 af

Subcatchment 5: Proposed Drainage Area 5 Runoff Area=1.880 ac 3.72% Impervious Runoff Depth>0.76"
Tc=10.0 min CN=60 Runoff=1.87 cfs 0.119 af

Reach South: South Property Line Inflow=10.34 cfs 1.241 af
Outflow=10.34 cfs 1.241 af

Reach Sunset Drive: Roadside Ditch Inflow=8.19 cfs 2.678 af
Outflow=8.19 cfs 2.678 af

Reach Total: Total Inflow=17.69 cfs 3.919 af
Outflow=17.69 cfs 3.919 af

Pond North Pond: North Detention Pond Peak Elev=118.48' Storage=2.135 af Inflow=67.95 cfs 3.869 af
Primary=7.85 cfs 2.559 af Secondary=0.00 cfs 0.000 af Outflow=7.85 cfs 2.559 af

Pond South Pond: South Detention Pond Peak Elev=111.60' Storage=1.265 af Inflow=52.93 cfs 3.039 af
Discarded=2.30 cfs 1.934 af Primary=9.64 cfs 1.098 af Secondary=0.00 cfs 0.000 af Outflow=11.94 cfs 3.031 af

Total Runoff Area = 32.780 ac Runoff Volume = 7.171 af Average Runoff Depth = 2.62"
32.04% Pervious = 10.504 ac 67.96% Impervious = 22.276 ac

Summary for Subcatchment 1: Proposed Drainage Area 1

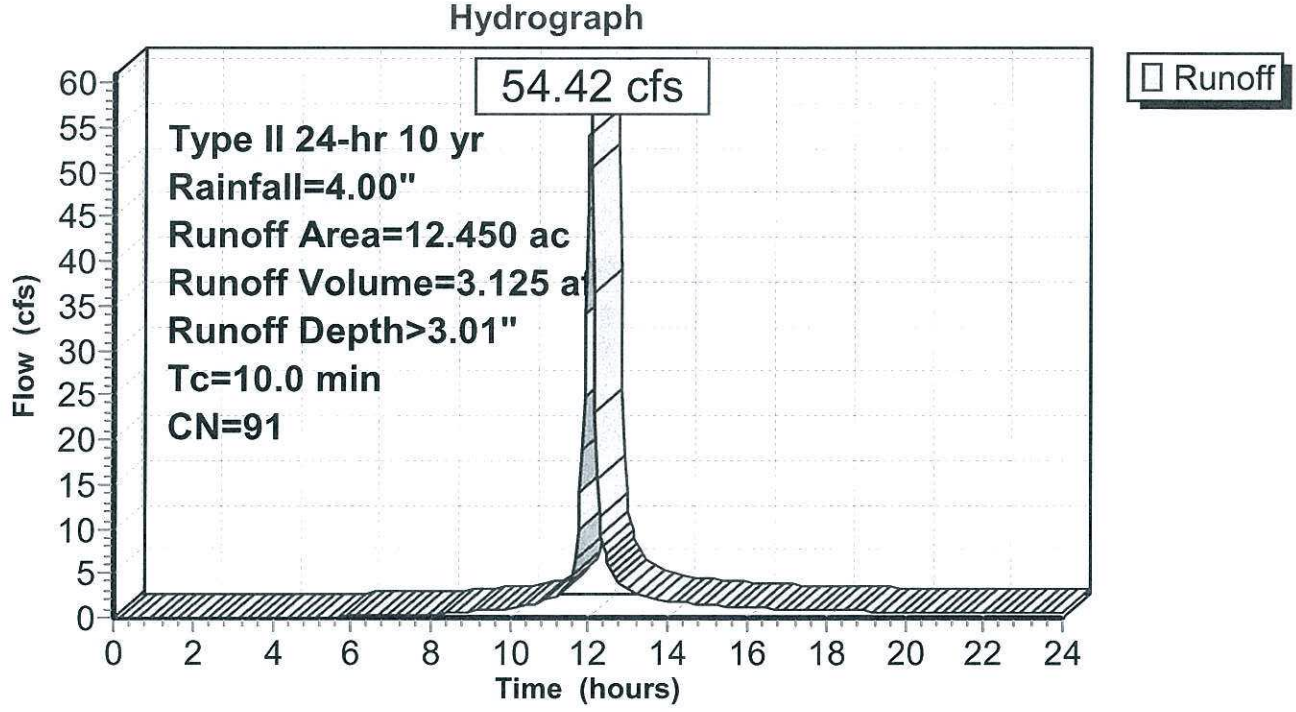
Runoff = 54.42 cfs @ 12.01 hrs, Volume= 3.125 af, Depth> 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

	Area (ac)	CN	Description
	9.310	98	Paved parking, HSG B
	2.206	61	>75% Grass cover, Good, HSG B
*	0.796	98	NWL pond @ 116.0
	0.138	85	Gravel roads, HSG B
	12.450	91	Weighted Average
	2.344		18.83% Pervious Area
	10.106		81.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Approx. TOC**

Subcatchment 1: Proposed Drainage Area 1



Summary for Subcatchment 2: Proposed Drainage Area 2

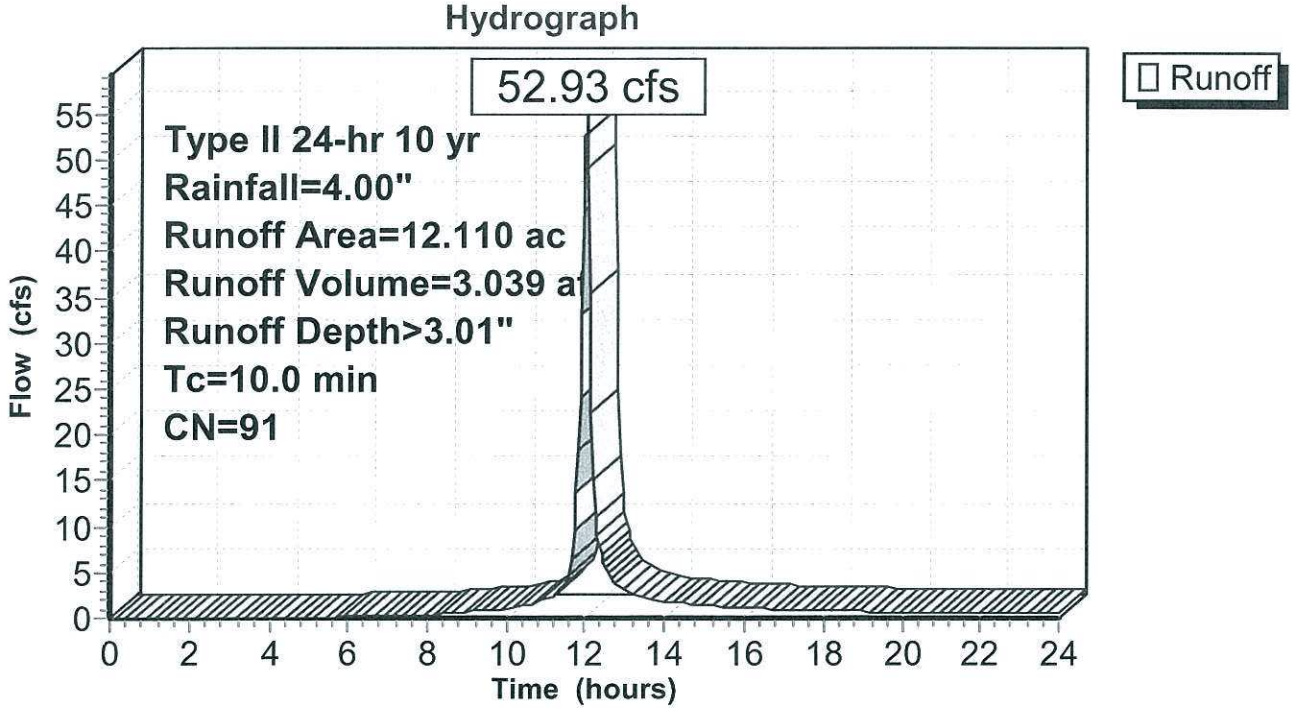
Runoff = 52.93 cfs @ 12.01 hrs, Volume= 3.039 af, Depth> 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

	Area (ac)	CN	Description
	9.370	98	Paved parking, HSG B
	2.100	61	>75% Grass cover, Good, HSG B
*	0.459	98	Pond Bottom/NWL @ 109.0
	0.181	85	Gravel roads, HSG B
	12.110	91	Weighted Average
	2.281		18.84% Pervious Area
	9.829		81.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Approx. TOC**

Subcatchment 2: Proposed Drainage Area 2



Summary for Subcatchment 3: Proposed Drainage Area 3

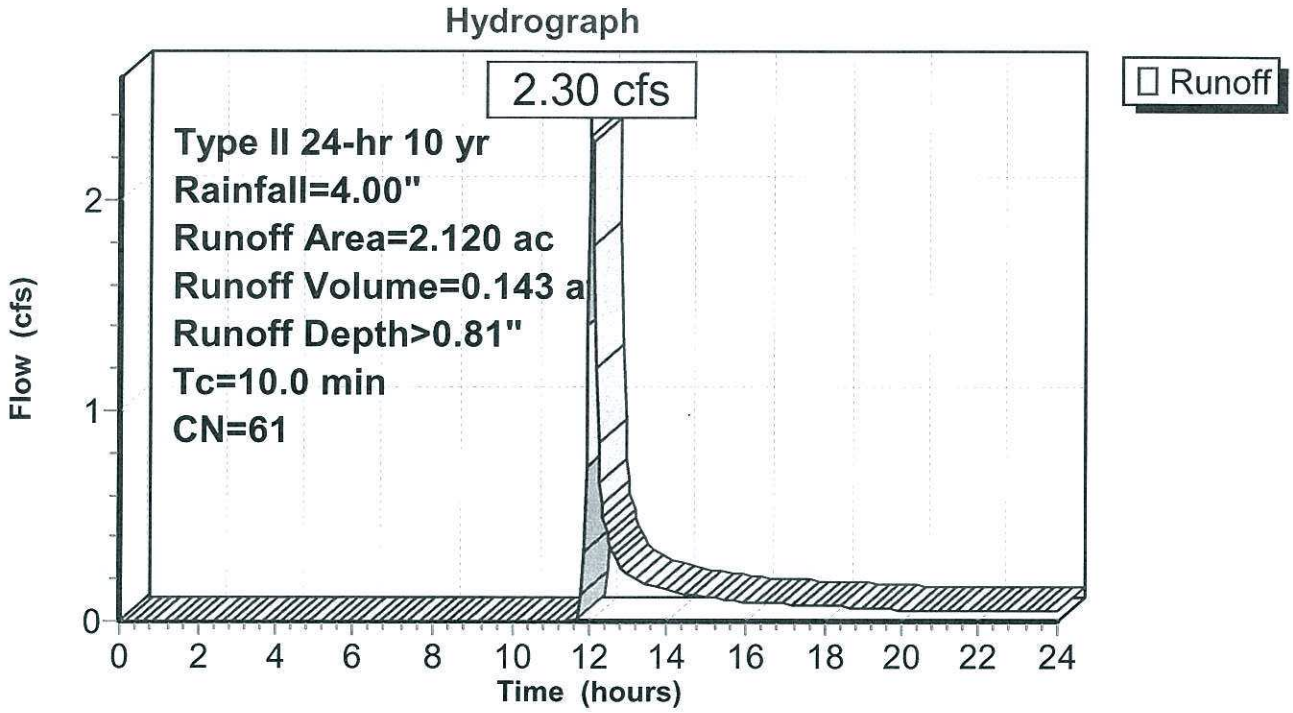
Runoff = 2.30 cfs @ 12.04 hrs, Volume= 0.143 af, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

Area (ac)	CN	Description
1.880	61	>75% Grass cover, Good, HSG B
0.240	58	Woods/grass comb., Good, HSG B
2.120	61	Weighted Average
2.120		100.00% Pervious Area

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

Subcatchment 3: Proposed Drainage Area 3



Summary for Subcatchment 4: Proposed Drainage Area 4 - Sunset Dr./Tenny Ave.

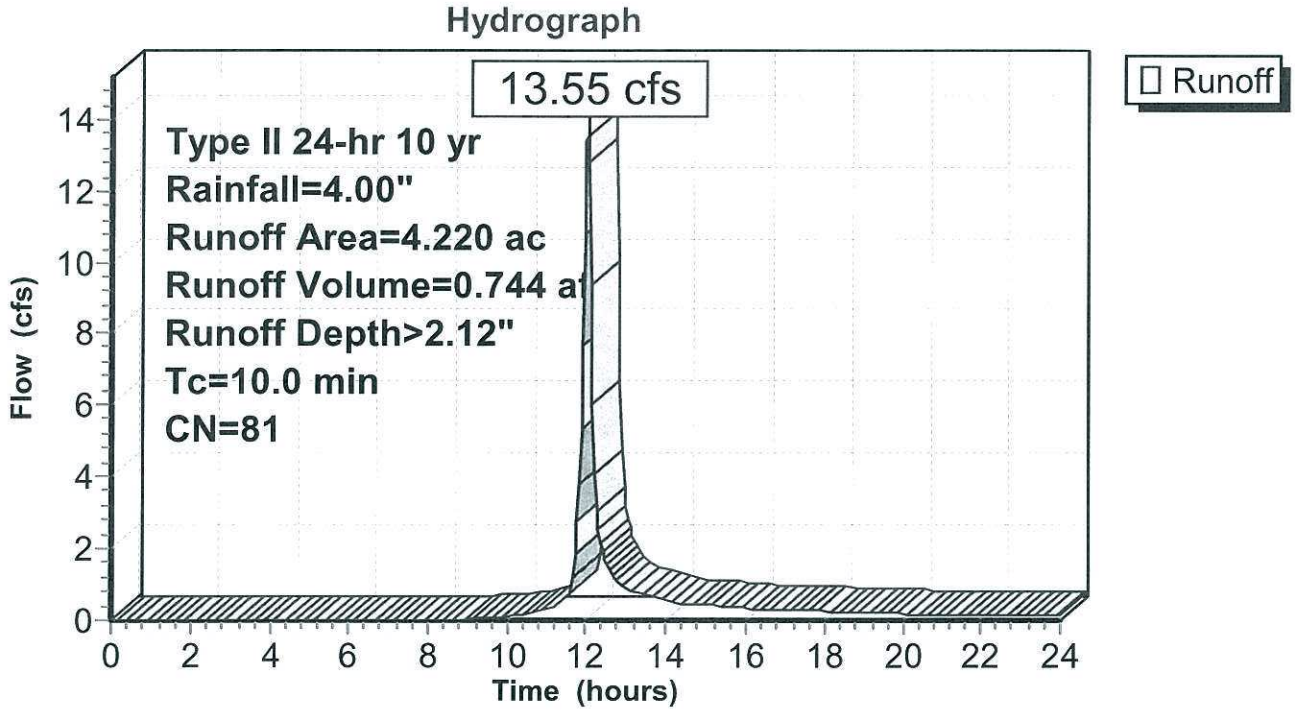
Runoff = 13.55 cfs @ 12.02 hrs, Volume= 0.744 af, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

	Area (ac)	CN	Description
	1.949	61	>75% Grass cover, Good, HSG B
*	2.271	98	Impervious
	4.220	81	Weighted Average
	1.949		46.18% Pervious Area
	2.271		53.82% Impervious Area

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

Subcatchment 4: Proposed Drainage Area 4 - Sunset Dr./Tenny Ave.



Summary for Subcatchment 5: Proposed Drainage Area 5

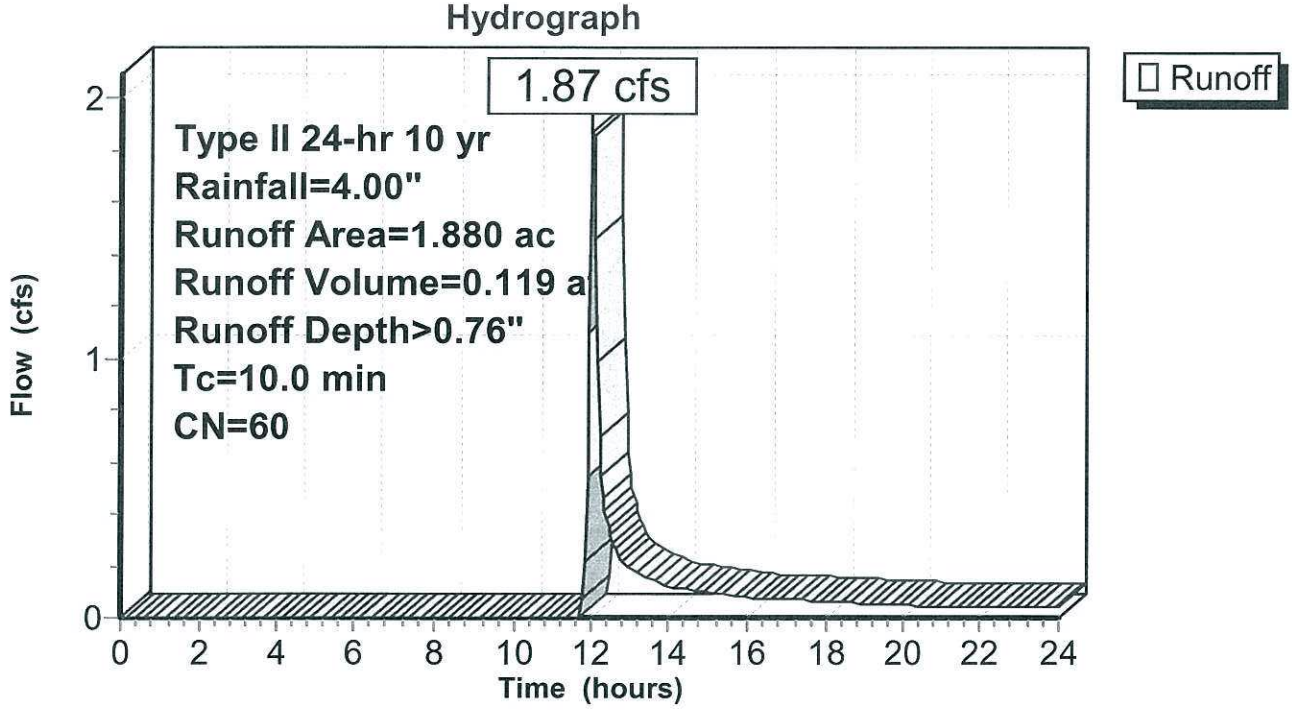
Runoff = 1.87 cfs @ 12.04 hrs, Volume= 0.119 af, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.00"

	Area (ac)	CN	Description
	0.630	61	>75% Grass cover, Good, HSG B
	1.180	58	Woods/grass comb., Good, HSG B
*	0.070	98	Impervious surface
	1.880	60	Weighted Average
	1.810		96.28% Pervious Area
	0.070		3.72% Impervious Area

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

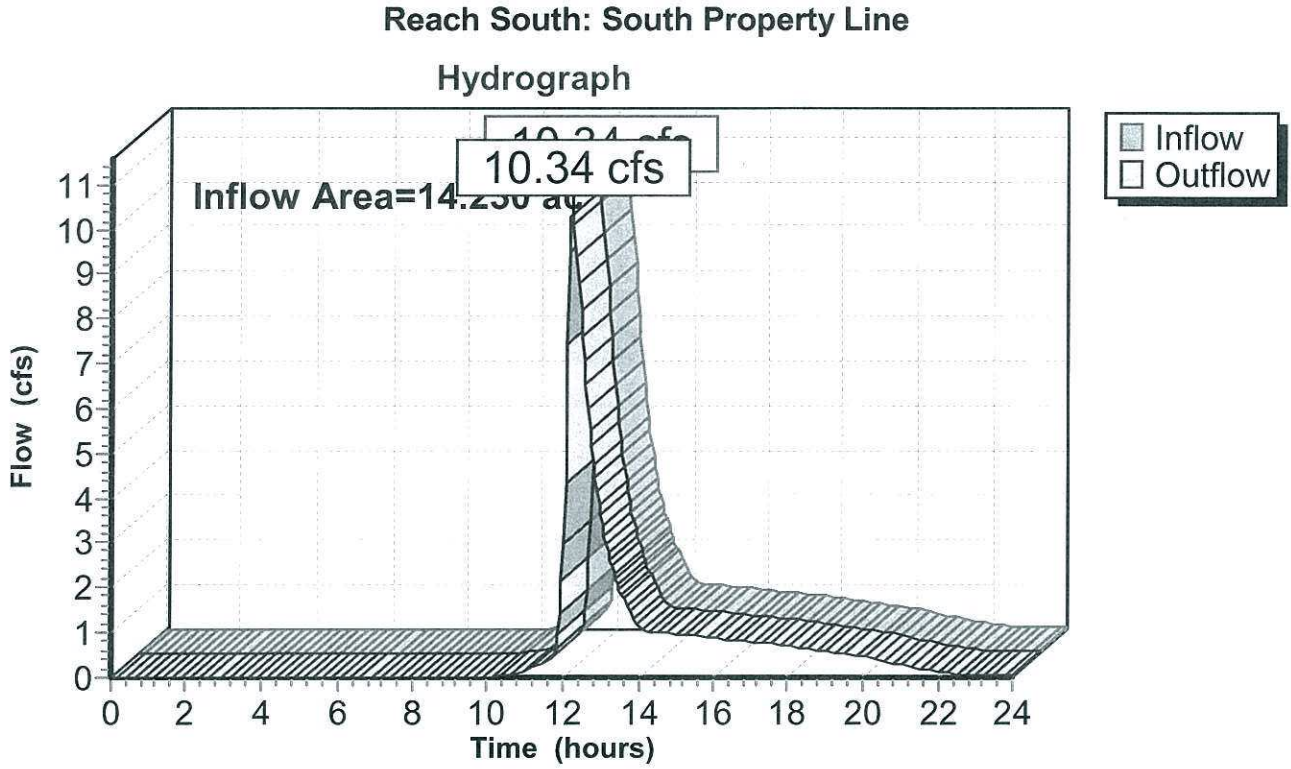
Subcatchment 5: Proposed Drainage Area 5



Summary for Reach South: South Property Line

Inflow Area = 14.230 ac, 69.07% Impervious, Inflow Depth > 1.05" for 10 yr event
Inflow = 10.34 cfs @ 12.23 hrs, Volume= 1.241 af
Outflow = 10.34 cfs @ 12.23 hrs, Volume= 1.241 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

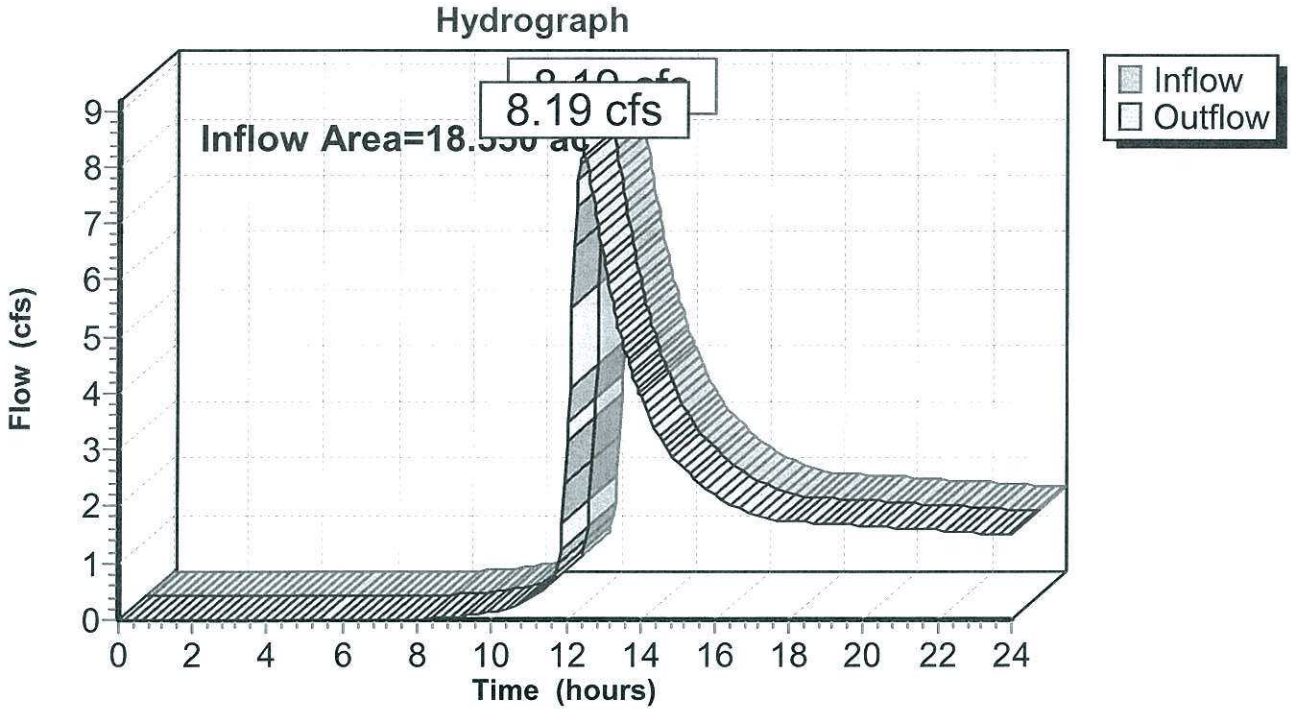


Summary for Reach Sunset Drive: Roadside Ditch

Inflow Area = 18.550 ac, 67.10% Impervious, Inflow Depth > 1.73" for 10 yr event
Inflow = 8.19 cfs @ 12.45 hrs, Volume= 2.678 af
Outflow = 8.19 cfs @ 12.45 hrs, Volume= 2.678 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach Sunset Drive: Roadside Ditch

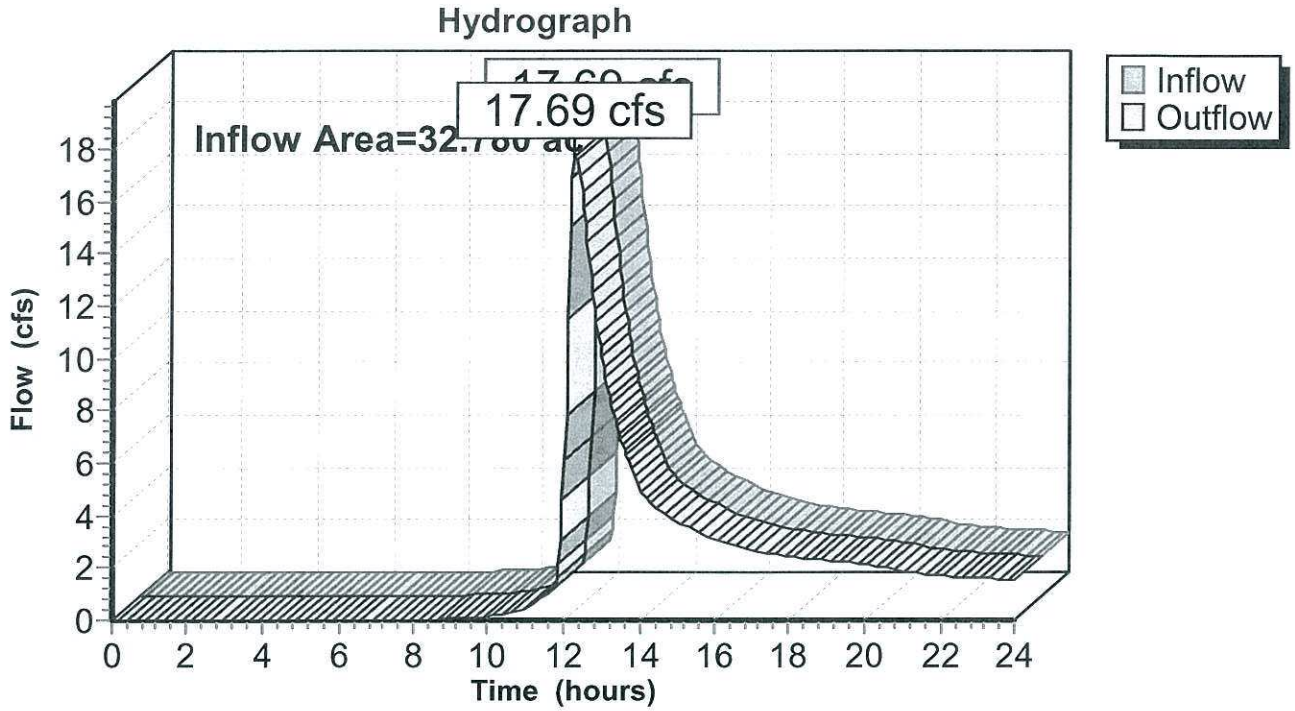


Summary for Reach Total: Total

Inflow Area = 32.780 ac, 67.96% Impervious, Inflow Depth > 1.43" for 10 yr event
Inflow = 17.69 cfs @ 12.29 hrs, Volume= 3.919 af
Outflow = 17.69 cfs @ 12.29 hrs, Volume= 3.919 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach Total: Total



Summary for Pond North Pond: North Detention Pond

Inflow Area = 16.670 ac, 74.25% Impervious, Inflow Depth > 2.79" for 10 yr event
Inflow = 67.95 cfs @ 12.01 hrs, Volume= 3.869 af
Outflow = 7.85 cfs @ 12.47 hrs, Volume= 2.559 af, Atten= 88%, Lag= 27.3 min
Primary = 7.85 cfs @ 12.47 hrs, Volume= 2.559 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 118.48' @ 12.47 hrs Surf.Area= 0.922 ac Storage= 2.135 af

Plug-Flow detention time= 268.6 min calculated for 2.554 af (66% of inflow)
Center-of-Mass det. time= 168.6 min (968.9 - 800.3)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	4.621 af	**Custom Stage Data (Prismatic)** Listed below

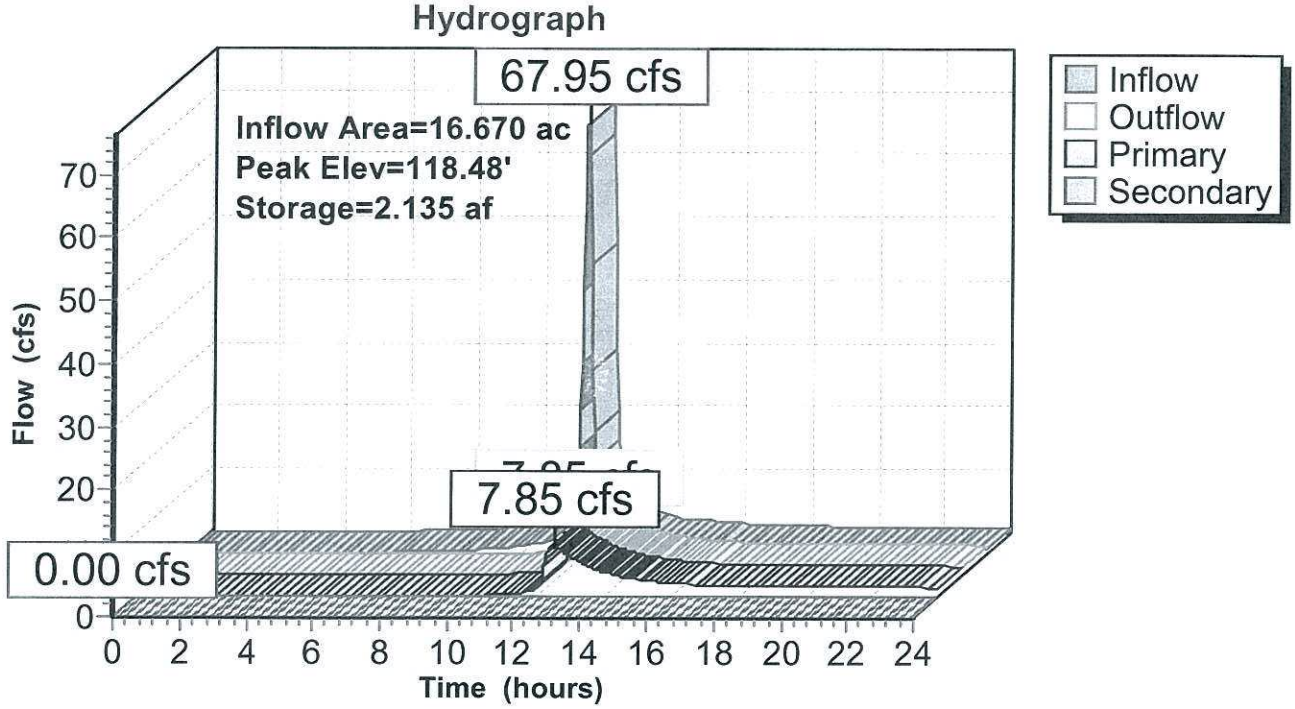
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
116.00	0.796	0.000	0.000
117.00	0.846	0.821	0.821
118.00	0.897	0.871	1.693
119.00	0.949	0.923	2.616
120.00	1.002	0.975	3.591
121.00	1.057	1.030	4.621

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**15.0" Round Culvert** L= 61.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 114.00' / 110.42' S= 0.0587 '/' Cc= 0.900 n= 0.013
#2	Device 1	116.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	118.00'	**6.0' 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	120.00'	**33.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.83 cfs @ 12.47 hrs HW=118.48' (Free Discharge)
└**1=Culvert** (Passes 7.83 cfs of 10.24 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.90 cfs @ 7.12 fps)
  └**3=Broad-Crested Rectangular Weir** (Weir Controls 5.93 cfs @ 2.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond North Pond: North Detention Pond



Summary for Pond South Pond: South Detention Pond

Inflow Area = 12.110 ac, 81.16% Impervious, Inflow Depth > 3.01" for 10 yr event
Inflow = 52.93 cfs @ 12.01 hrs, Volume= 3.039 af
Outflow = 11.94 cfs @ 12.25 hrs, Volume= 3.031 af, Atten= 77%, Lag= 14.2 min
Discarded = 2.30 cfs @ 12.25 hrs, Volume= 1.934 af
Primary = 9.64 cfs @ 12.25 hrs, Volume= 1.098 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 111.60' @ 12.25 hrs Surf.Area= 0.633 ac Storage= 1.265 af

Plug-Flow detention time= 115.3 min calculated for 3.031 af (100% of inflow)
Center-of-Mass det. time= 113.6 min (907.3 - 793.7)

Volume	Invert	Avail.Storage	Storage Description
#1	109.00'	3.792 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
109.00	0.187	0.000	0.000
110.00	0.518	0.353	0.353
111.00	0.580	0.549	0.902
112.00	0.668	0.624	1.525
113.00	0.729	0.699	2.224
114.00	0.784	0.756	2.980
115.00	0.840	0.812	3.792

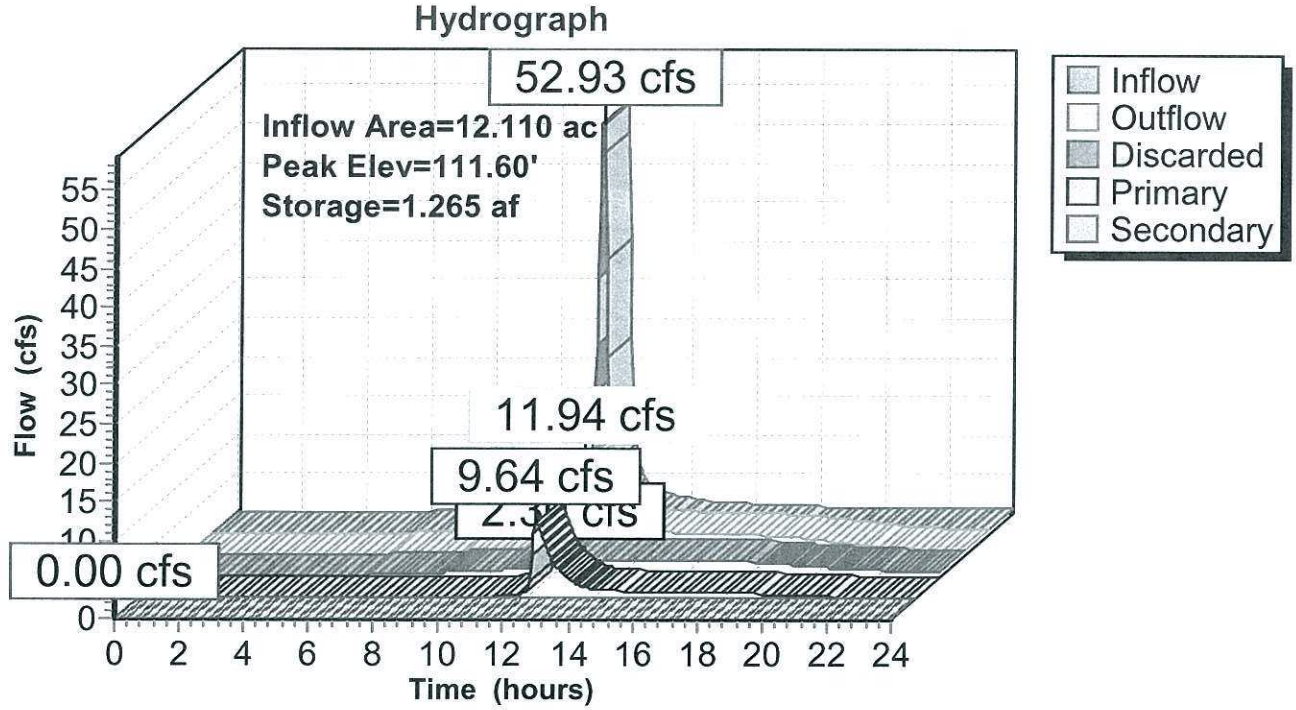
Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**18.0" Round Culvert** L= 32.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 109.00' / 108.00' S= 0.0313 '/' Cc= 0.900 n= 0.013
#2	Device 1	109.00'	**5.0" Vert. Orifice/Grate** C= 0.610
#3	Device 1	111.00'	**6.0' long x 0.5' breadth 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	114.00'	**33.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#5	Discarded	109.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=2.30 cfs @ 12.25 hrs HW=111.60' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 2.30 cfs)

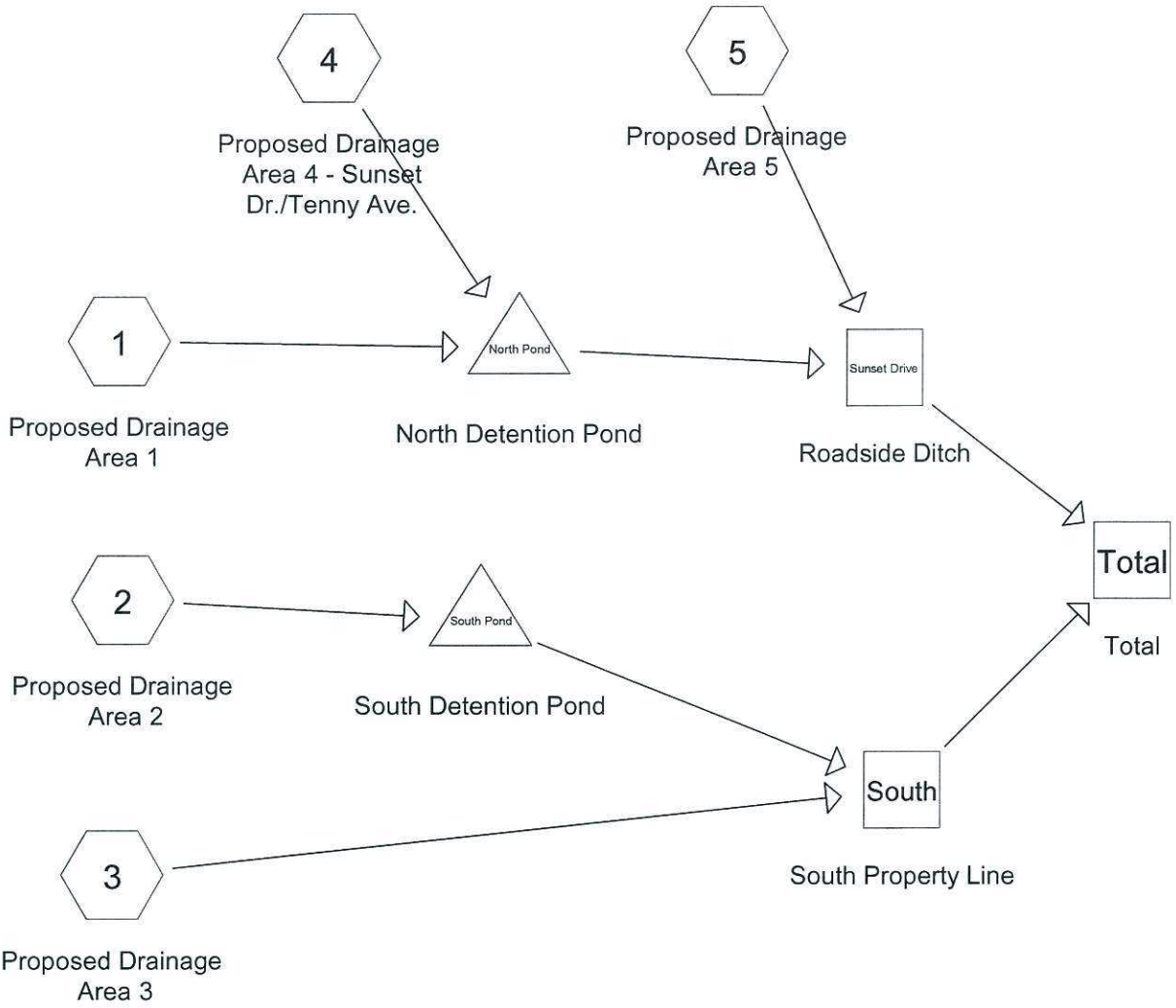
Primary OutFlow Max=9.60 cfs @ 12.25 hrs HW=111.60' (Free Discharge)
└**1=Culvert** (Passes 9.60 cfs of 11.57 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.03 cfs @ 7.57 fps)
  └**3=Broad-Crested Rectangular Weir** (Weir Controls 8.57 cfs @ 2.38 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=109.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond South Pond: South Detention Pond



100-Year, 24-Hour Storm Event
(5.60-inches of rainfall)



Subcat Reach Pond Link

Drainage Diagram for WKS-PROPOSED-06-11-14
Prepared by Microsoft, Printed 6/10/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Proposed Drainage Area Runoff Area=12.450 ac 81.17% Impervious Runoff Depth>4.56"
Tc=10.0 min CN=91 Runoff=80.37 cfs 4.729 af

Subcatchment 2: Proposed Drainage Area Runoff Area=12.110 ac 81.16% Impervious Runoff Depth>4.56"
Tc=10.0 min CN=91 Runoff=78.18 cfs 4.600 af

Subcatchment 3: Proposed Drainage Area 3 Runoff Area=2.120 ac 0.00% Impervious Runoff Depth>1.74"
Tc=10.0 min CN=61 Runoff=5.43 cfs 0.307 af

Subcatchment 4: Proposed Drainage Area Runoff Area=4.220 ac 53.82% Impervious Runoff Depth>3.51"
Tc=10.0 min CN=81 Runoff=22.23 cfs 1.236 af

Subcatchment 5: Proposed Drainage Area 5 Runoff Area=1.880 ac 3.72% Impervious Runoff Depth>1.66"
Tc=10.0 min CN=60 Runoff=4.57 cfs 0.260 af

Reach South: South Property Line Inflow=18.24 cfs 2.533 af
Outflow=18.24 cfs 2.533 af

Reach Sunset Drive: Roadside Ditch Inflow=15.35 cfs 4.714 af
Outflow=15.35 cfs 4.714 af

Reach Total: Total Inflow=33.59 cfs 7.247 af
Outflow=33.59 cfs 7.247 af

Pond North Pond: North Detention Pond Peak Elev=119.63' Storage=3.233 af Inflow=102.59 cfs 5.965 af
Primary=11.67 cfs 4.454 af Secondary=0.00 cfs 0.000 af Outflow=11.67 cfs 4.454 af

Pond South Pond: South Detention Pond Peak Elev=112.54' Storage=1.893 af Inflow=78.18 cfs 4.600 af
Discarded=2.54 cfs 2.330 af Primary=14.20 cfs 2.226 af Secondary=0.00 cfs 0.000 af Outflow=16.75 cfs 4.556 af

Total Runoff Area = 32.780 ac Runoff Volume = 11.132 af Average Runoff Depth = 4.08"
32.04% Pervious = 10.504 ac 67.96% Impervious = 22.276 ac

Summary for Subcatchment 1: Proposed Drainage Area 1

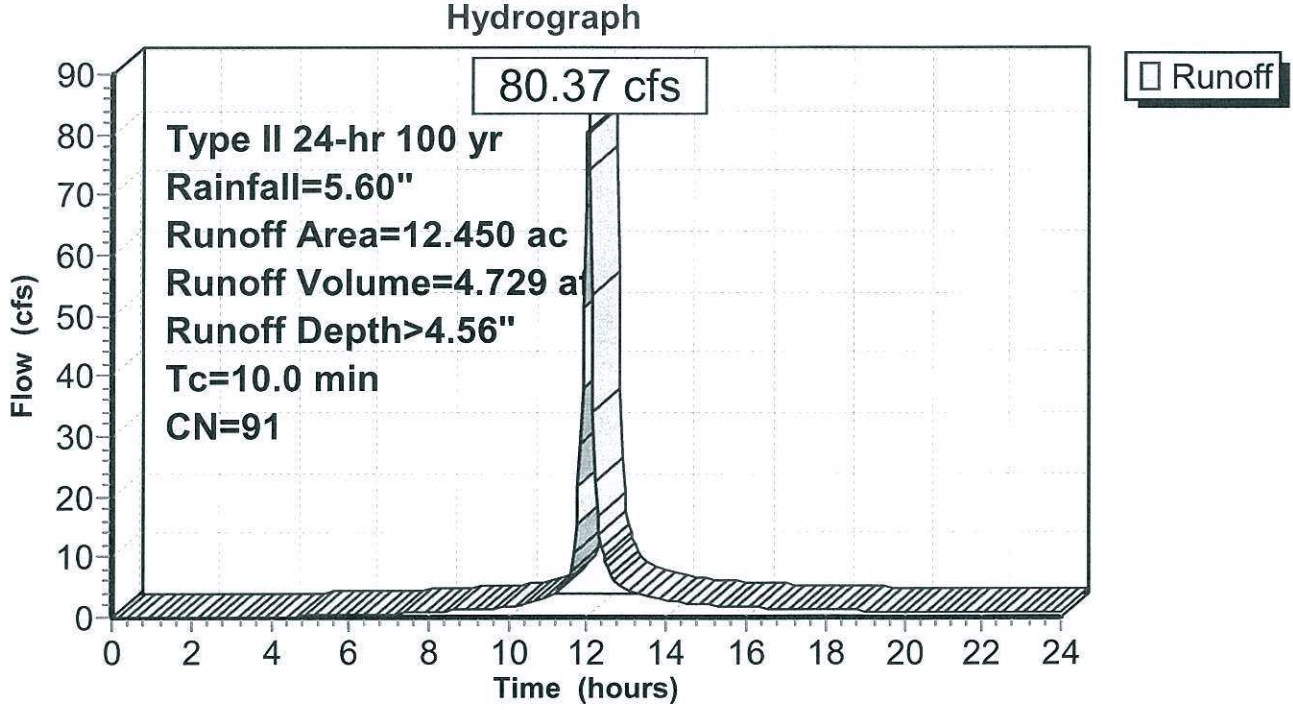
Runoff = 80.37 cfs @ 12.01 hrs, Volume= 4.729 af, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

	Area (ac)	CN	Description
	9.310	98	Paved parking, HSG B
	2.206	61	>75% Grass cover, Good, HSG B
*	0.796	98	NWL pond @ 116.0
	0.138	85	Gravel roads, HSG B
	12.450	91	Weighted Average
	2.344		18.83% Pervious Area
	10.106		81.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Approx. TOC**

Subcatchment 1: Proposed Drainage Area 1



Summary for Subcatchment 2: Proposed Drainage Area 2

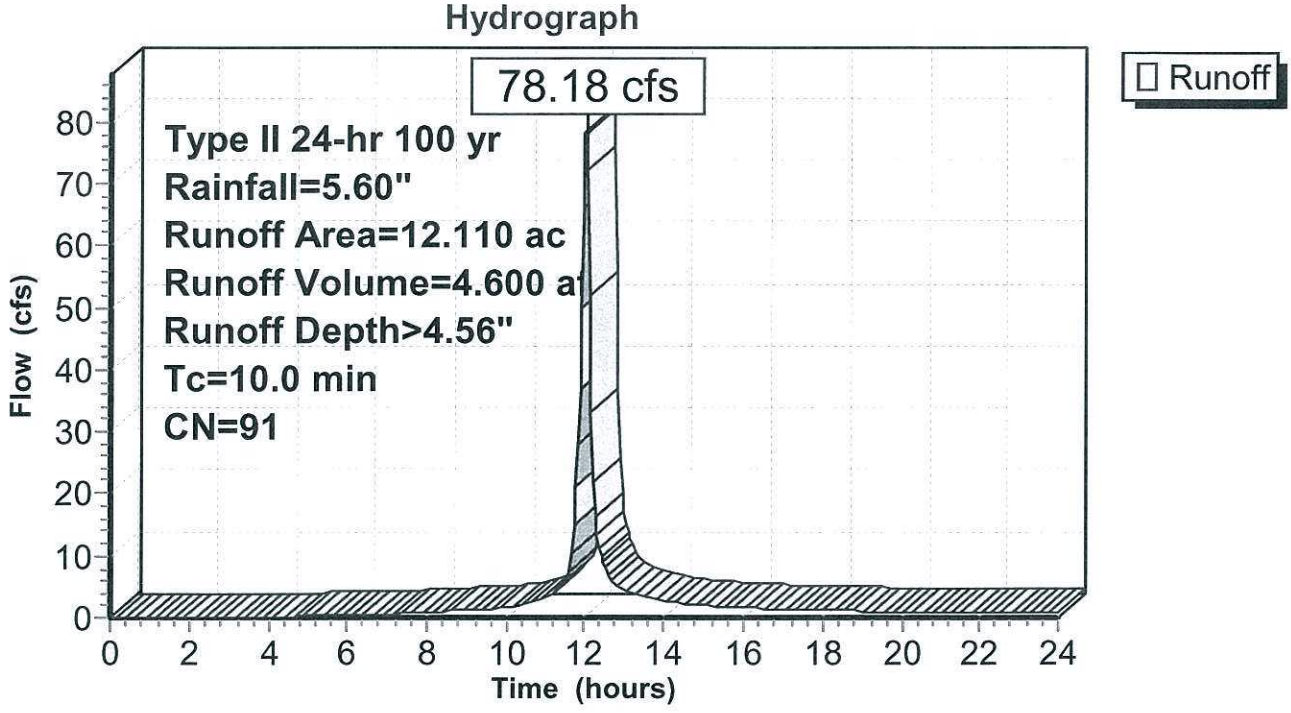
Runoff = 78.18 cfs @ 12.01 hrs, Volume= 4.600 af, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

	Area (ac)	CN	Description
	9.370	98	Paved parking, HSG B
	2.100	61	>75% Grass cover, Good, HSG B
*	0.459	98	Pond Bottom/NWL @ 109.0
	0.181	85	Gravel roads, HSG B
	12.110	91	Weighted Average
	2.281		18.84% Pervious Area
	9.829		81.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Approx. TOC**

Subcatchment 2: Proposed Drainage Area 2



Summary for Subcatchment 3: Proposed Drainage Area 3

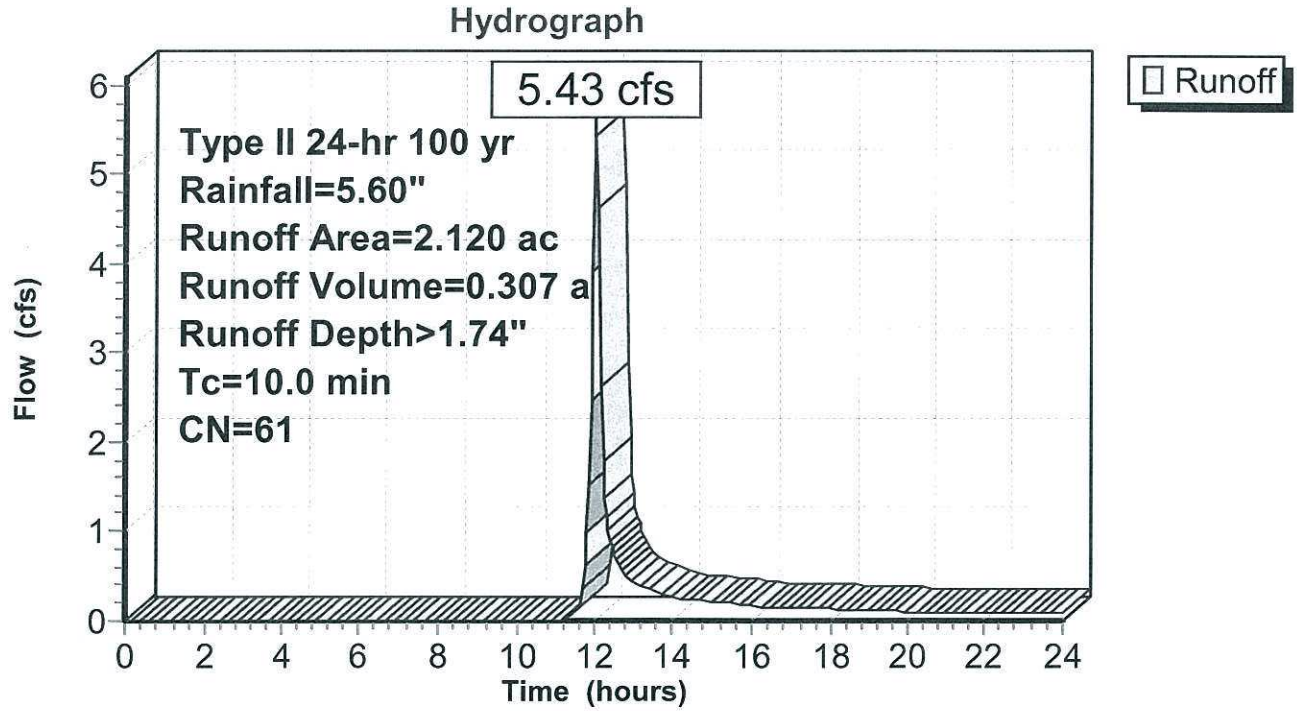
Runoff = 5.43 cfs @ 12.03 hrs, Volume= 0.307 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

Area (ac)	CN	Description
1.880	61	>75% Grass cover, Good, HSG B
0.240	58	Woods/grass comb., Good, HSG B
2.120	61	Weighted Average
2.120		100.00% Pervious Area

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

Subcatchment 3: Proposed Drainage Area 3



Summary for Subcatchment 4: Proposed Drainage Area 4 - Sunset Dr./Tenny Ave.

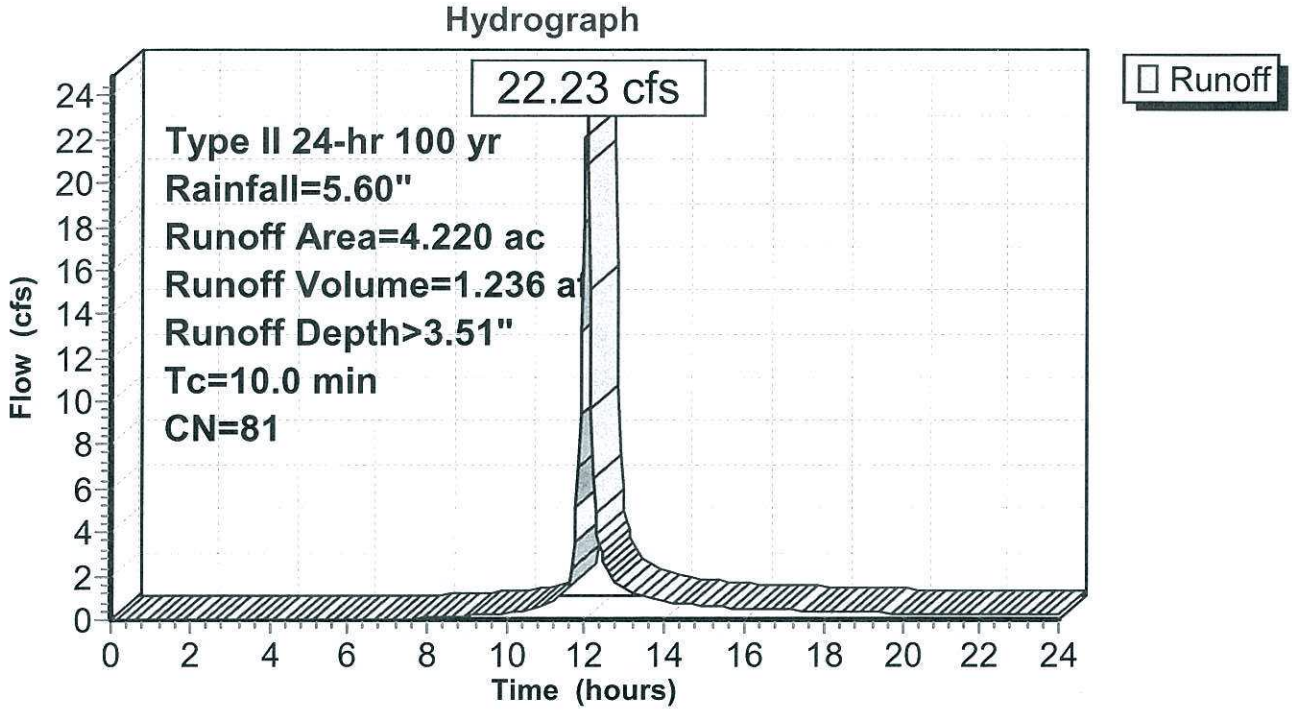
Runoff = 22.23 cfs @ 12.01 hrs, Volume= 1.236 af, Depth> 3.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

	Area (ac)	CN	Description
	1.949	61	>75% Grass cover, Good, HSG B
*	2.271	98	Impervious
	4.220	81	Weighted Average
	1.949		46.18% Pervious Area
	2.271		53.82% Impervious Area

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

Subcatchment 4: Proposed Drainage Area 4 - Sunset Dr./Tenny Ave.



Summary for Subcatchment 5: Proposed Drainage Area 5

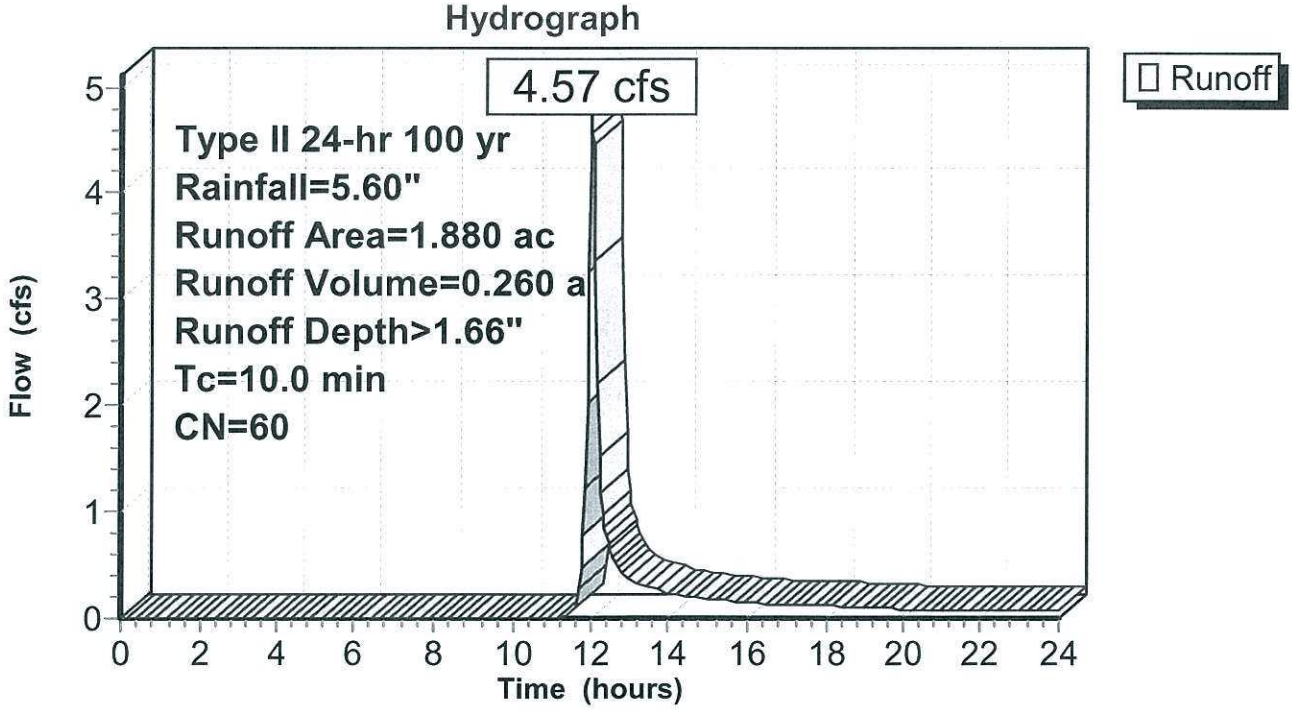
Runoff = 4.57 cfs @ 12.03 hrs, Volume= 0.260 af, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 yr Rainfall=5.60"

	Area (ac)	CN	Description
	0.630	61	>75% Grass cover, Good, HSG B
	1.180	58	Woods/grass comb., Good, HSG B
*	0.070	98	Impervious surface
	1.880	60	Weighted Average
	1.810		96.28% Pervious Area
	0.070		3.72% Impervious Area

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

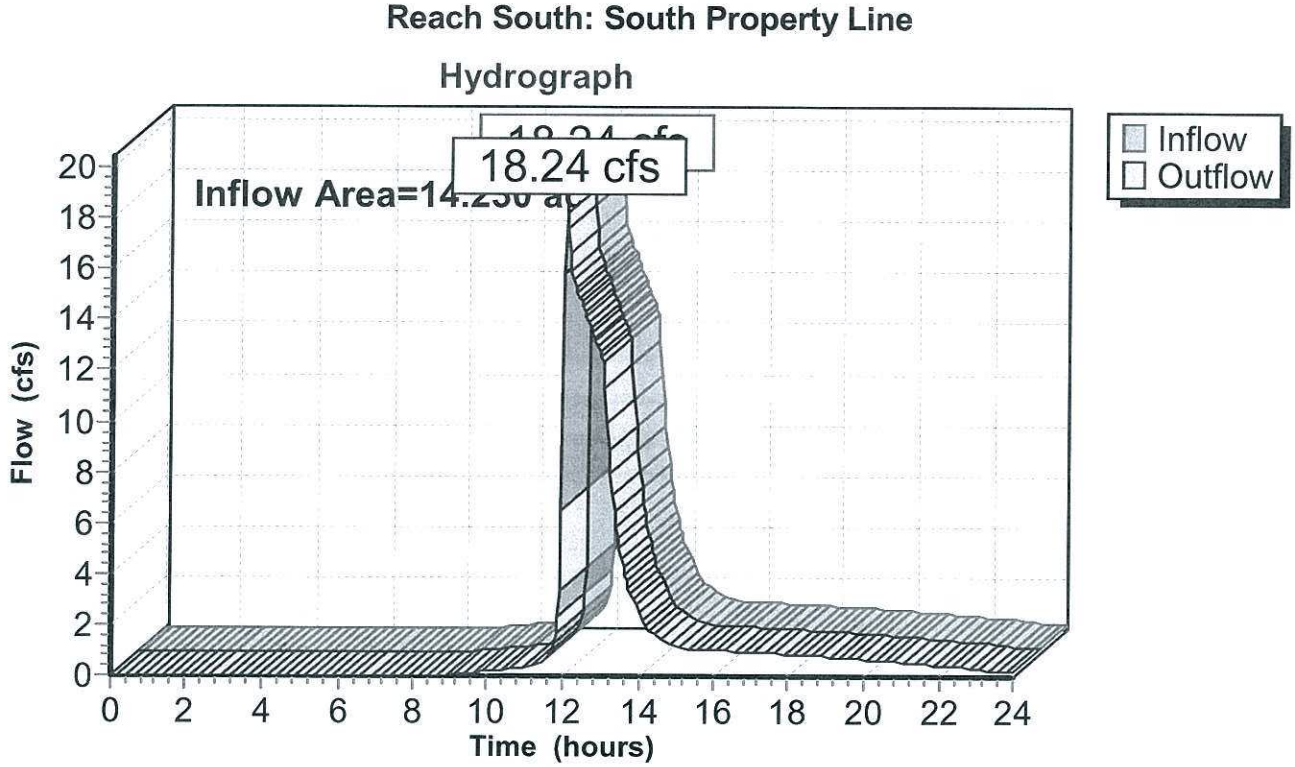
Subcatchment 5: Proposed Drainage Area 5



Summary for Reach South: South Property Line

Inflow Area = 14.230 ac, 69.07% Impervious, Inflow Depth > 2.14" for 100 yr event
Inflow = 18.24 cfs @ 12.07 hrs, Volume= 2.533 af
Outflow = 18.24 cfs @ 12.07 hrs, Volume= 2.533 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

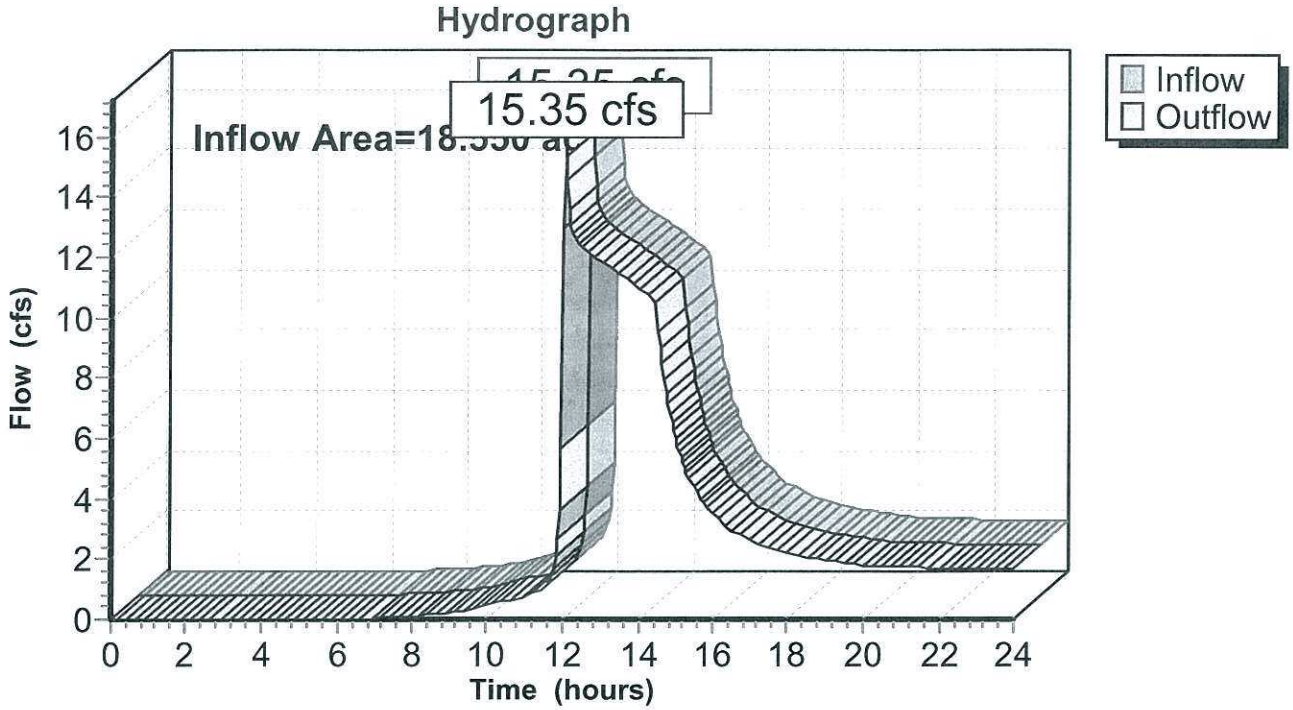


Summary for Reach Sunset Drive: Roadside Ditch

Inflow Area = 18.550 ac, 67.10% Impervious, Inflow Depth > 3.05" for 100 yr event
Inflow = 15.35 cfs @ 12.06 hrs, Volume= 4.714 af
Outflow = 15.35 cfs @ 12.06 hrs, Volume= 4.714 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach Sunset Drive: Roadside Ditch

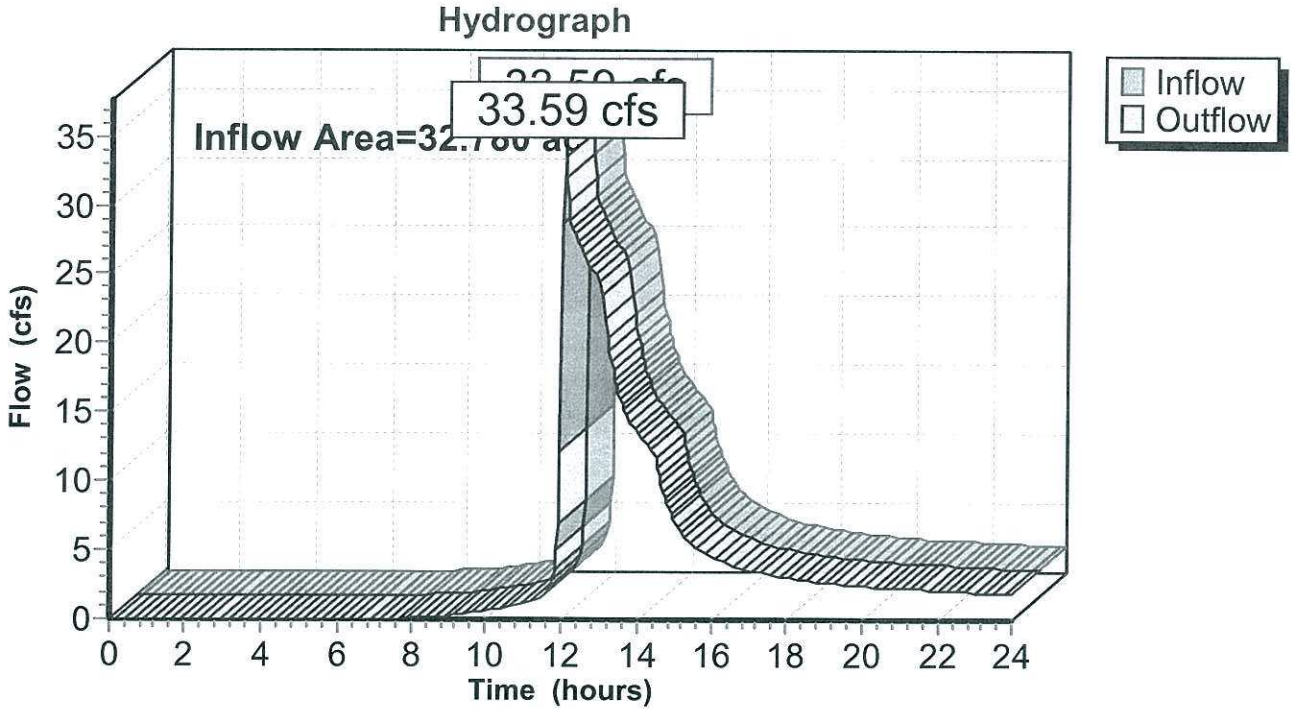


Summary for Reach Total: Total

Inflow Area = 32.780 ac, 67.96% Impervious, Inflow Depth > 2.65" for 100 yr event
Inflow = 33.59 cfs @ 12.06 hrs, Volume= 7.247 af
Outflow = 33.59 cfs @ 12.06 hrs, Volume= 7.247 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach Total: Total



Summary for Pond North Pond: North Detention Pond

Inflow Area = 16.670 ac, 74.25% Impervious, Inflow Depth > 4.29" for 100 yr event
Inflow = 102.59 cfs @ 12.01 hrs, Volume= 5.965 af
Outflow = 11.67 cfs @ 12.46 hrs, Volume= 4.454 af, Atten= 89%, Lag= 27.1 min
Primary = 11.67 cfs @ 12.46 hrs, Volume= 4.454 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.63' @ 12.46 hrs Surf.Area= 0.983 ac Storage= 3.233 af

Plug-Flow detention time= 213.1 min calculated for 4.454 af (75% of inflow)
Center-of-Mass det. time= 124.0 min (912.9 - 788.9)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	4.621 af	**Custom Stage Data (Prismatic)** Listed below

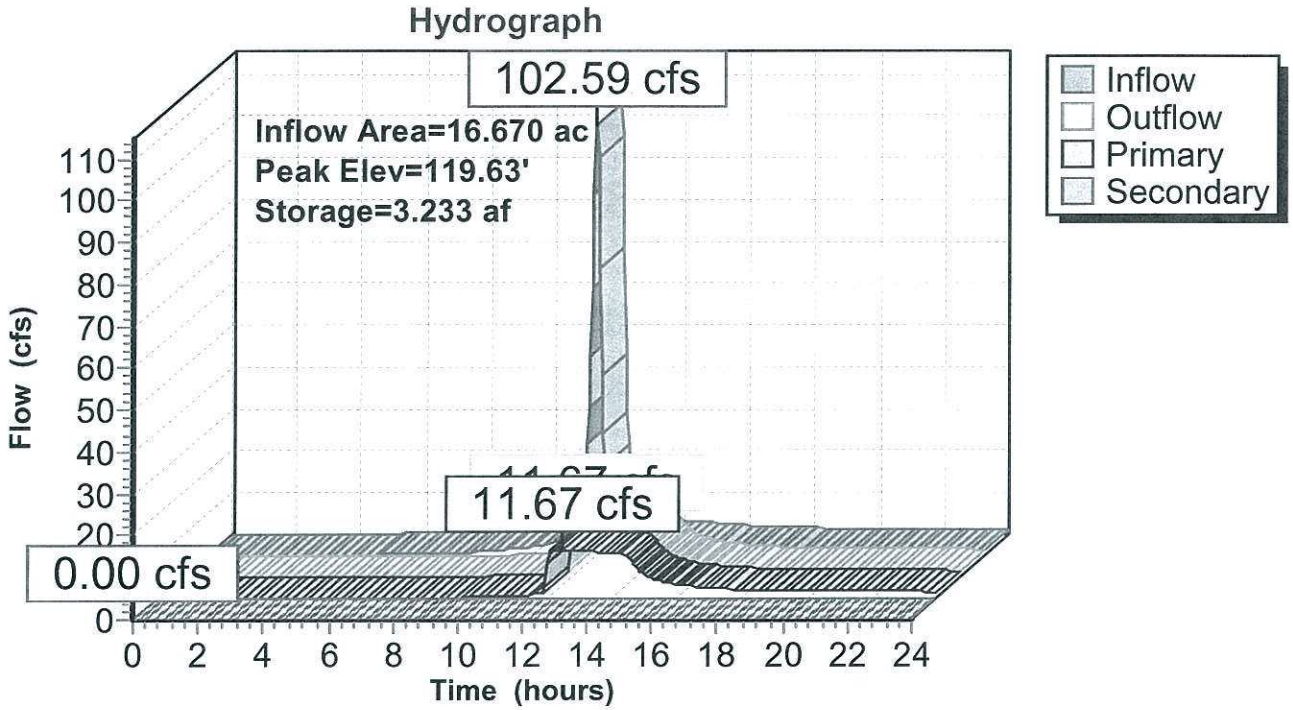
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
116.00	0.796	0.000	0.000
117.00	0.846	0.821	0.821
118.00	0.897	0.871	1.693
119.00	0.949	0.923	2.616
120.00	1.002	0.975	3.591
121.00	1.057	1.030	4.621

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**15.0" Round Culvert** L= 61.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 114.00' / 110.42' S= 0.0587 '/' Cc= 0.900 n= 0.013
#2	Device 1	116.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	118.00'	**6.0' 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	120.00'	**33.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=11.67 cfs @ 12.46 hrs HW=119.63' (Free Discharge)
↑**1=Culvert** (Inlet Controls 11.67 cfs @ 9.51 fps)
↑**2=Orifice/Grate** (Passes < 2.35 cfs potential flow)
3=Broad-Crested Rectangular Weir (Passes < 41.56 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.00' (Free Discharge)
↑**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond North Pond: North Detention Pond



Summary for Pond South Pond: South Detention Pond

Inflow Area = 12.110 ac, 81.16% Impervious, Inflow Depth > 4.56" for 100 yr event
Inflow = 78.18 cfs @ 12.01 hrs, Volume= 4.600 af
Outflow = 16.75 cfs @ 12.25 hrs, Volume= 4.556 af, Atten= 79%, Lag= 14.6 min
Discarded = 2.54 cfs @ 12.25 hrs, Volume= 2.330 af
Primary = 14.20 cfs @ 12.25 hrs, Volume= 2.226 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 112.54' @ 12.25 hrs Surf.Area= 0.701 ac Storage= 1.893 af

Plug-Flow detention time= 106.3 min calculated for 4.556 af (99% of inflow)
Center-of-Mass det. time= 100.1 min (882.5 - 782.4)

Volume	Invert	Avail.Storage	Storage Description
#1	109.00'	3.792 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
109.00	0.187	0.000	0.000
110.00	0.518	0.353	0.353
111.00	0.580	0.549	0.902
112.00	0.668	0.624	1.525
113.00	0.729	0.699	2.224
114.00	0.784	0.756	2.980
115.00	0.840	0.812	3.792

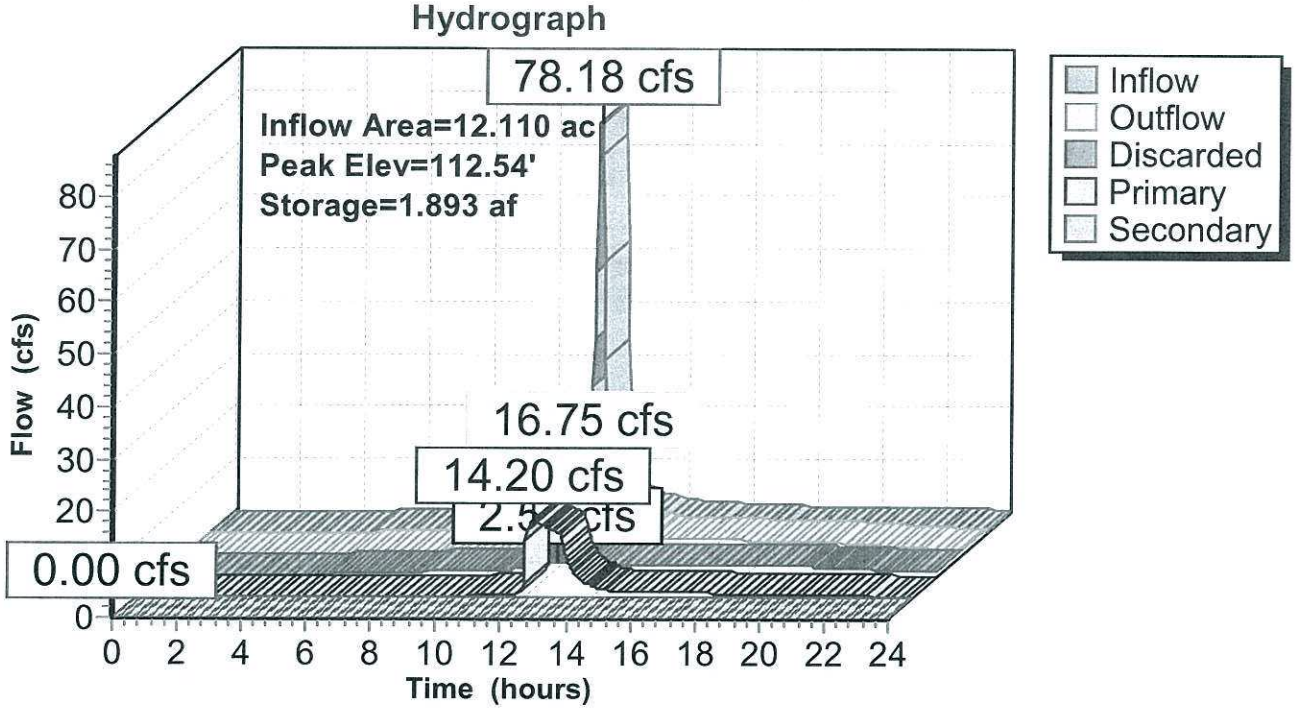
Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**18.0" Round Culvert** L= 32.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 109.00' / 108.00' S= 0.0313 '/' Cc= 0.900 n= 0.013
#2	Device 1	109.00'	**5.0" Vert. Orifice/Grate** C= 0.610
#3	Device 1	111.00'	**6.0' long x 0.5' breadth 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	114.00'	**33.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#5	Discarded	109.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=2.54 cfs @ 12.25 hrs HW=112.54' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 2.54 cfs)

Primary OutFlow Max=14.20 cfs @ 12.25 hrs HW=112.54' (Free Discharge)
└**1=Culvert** (Inlet Controls 14.20 cfs @ 8.04 fps)
  └**2=Orifice/Grate** (Passes < 1.22 cfs potential flow)
  └**3=Broad-Crested Rectangular Weir** (Passes < 37.94 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=109.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond South Pond: South Detention Pond



Appendix C

WinSlamm TSS Removal

GreenbergFarrow
21 S. Evergreen Ave.
Suite 200
Arlington Heights, IL 60005
847.788.9200

Meijer Store
Waukesha, WI

06-10-14
Job # 20110540.0

WINSLAMM SUMMARY

OVERALL TSS REMOVAL

AREA	AREA [AC]	TSS GENERATED [LBS]	TSS REMOVED [LBS]	% TSS REMOVED
North Pond	16.67	7588.0	6297.0	83.0%
South Pond	12.11	4092.0	3808.4	93.1%
Area 3 and 5	4.00	297.0	0.0	0.0%
TOTALS	**32.78**	**11977.0**	**10105.4**	**84.4%**

TSS REMOVAL PRIOR TO INFILTRATION

CONTROL PRACTICE	AREA [AC]	TSS INFLUENT [LBS]	TSS REMOVED [LBS]	% TSS REMOVED
Catch Basins	12.11	4092.0	776.0	19.0%
Wet Detention	12.11	3316.0	2015.0	60.8%
		TOTALS	**2791.0**	**68.2%**

INFILTRATION SUMMARY

Total Area [ac]	32.78	
Total Yearly Rainfall [in]	29.02	(Rainfall Depth from WinSLAMM, Milwaukee 1969)
Runoff Depth [in], Pe	22.55	
Infiltration Depth [in]	6.47	
Curve Number	61.00	(Existing Condition)
Potential Maximum Retention, S	6.39	
Total Yearly Rainfall Volume [cf]	3,453,130	
Total Yearly Runoff Volume [cf]	2,682,704	
Existing Yearly Infiltration Volume [cf]	770,426	
Proposed Yearly Infiltration Volume [cf]	673,724	(WinSLAMM Output)
Percent Infiltration	**87%**	

Pe = (P-0.2S)^2 / (P+0.8S)
P = Rainfall Depth [in]
S = 1000/CN - 10
CN = Curve Number

SLAMM for Windows Version 10.0.2

Data file name: P:\2011\201105400\800 Civil\999 Storm Water\WinSLAMM\Current\WKS North Pond.mdb
Data file description:
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO01.ppdx
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 03/28/69 Model Run End Date: 12/06/69
Date of run: 06-10-2014 Time of run: 13:57:27
Total Area Modeled (acres): 16.670
Years in Model Run: 0.67

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	1.006E+06	-	120.8	7588	-
Outfall Total with Controls:	1.004E+06	0.20%	20.59	1291	82.99%
Annualized Total After Outfall Controls:	1.508E+06			1939	

Data file name: P:\2011\201105400\800 Civil\999 Storm Water\WinSLAMM\Current\WKS North Pond.mdb
WinSLAMM Version 10.0.2
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO01.ppdx
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 03/28/69 Study period ending date: 12/06/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Date: 06-10-2014 Time: 13:57:38
Site information:

LU# 1 - Commercial: Commercial 1 Total area (ac): 16.670
1 - Roofs 1: 0.060 ac. Flat Connected
13 - Paved Parking 1: 11.659 ac. Connected
45 - Large Landscaped Areas 1: 4.155 ac. Silty
70 - Water Body Areas: 0.796 ac.

Control Practice 1: Wet Detention Pond CP# 1 (DS) - DS Wet Pond # 1
Particle Size Distribution file name: C:\WinSLAMM Files\NURP.CPZ
Initial stage elevation (ft): 5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:
Outlet type: Sharp Crested Weir
1. Sharp crested weir length (ft): 6
2. Sharp crested weir height from invert: 3
3. Sharp crested weir invert elevation above datum (ft): 7
Outlet type: Orifice 1
1. Orifice diameter (ft): 0.58
2. Number of orifices: 1
3. Invert elevation above datum (ft): 5
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 33
2. Weir crest width (ft): 10
3. Height of weir opening (cfs): 1
4. Height from datum to bottom of weir opening: 9
Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.4700	0.00	0.00

2	1.00	0.5100	0.00
0.00			
3	2.00	0.5500	0.00
0.00			
4	3.00	0.6000	0.00
0.00			
5	4.00	0.6400	0.00
0.00			
6	5.00	0.8000	0.00
0.00			
7	6.00	0.8500	0.00
0.00			
8	7.00	0.9000	0.00
0.00			
9	8.00	0.9500	0.00
0.00			
10	9.00	1.0000	0.00
0.00			
11	10.00	1.0500	0.00
0.00			

Control Practice 2: Catchbasin Cleaning CP# 1 (DS) - DS Catchbasins # 2

1. Fraction of area served by catchbasins = 1.00
2. Catchbasin density (catchbasins/acre) = 1
3. Average sump depth below catchbasin outlet invert (feet) = 2
4. Depth of sediment in catchbasin sump at beginning of study period (ft) = 0
5. Typical outlet pipe diameter (ft) = 2
6. Typical outlet pipe Mannings n = 0.01
7. Typical outlet pipe slope (ft/ft) = 0.01
8. Typical catchbasin sump surface area (square feet) = 19.6
9. Total catchbasin depth (feet) = 8
10. Inflow hydrograph peak to average flow ratio = 3.8
11. Leakage rate through sump bottom (in/hr) = 0
12. Catchbasin Critical Particle Size File Name: C:\WinSLAMM Files\NURP.CPZ
13. Catchbasin cleaning frequency: Annually

Data file name: P:\2011\201105400\800 Civil\999 Storm Water\WinSLAMM\Current\WKS South Pond-INFILTRATION plus WETBOTTOM.mdb
WinSLAMM Version 10.0.2
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO01.ppdx
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 03/28/69 Study period ending date: 12/06/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Date: 06-10-2014 Time: 14:43:38
Site information:

Pre-Development Area Description	Pre-Development Area (ac)	Pre-Development CN
	28.680	58
Total Area (ac)/Composite CN	28.680	58

LU# 1 - Commercial: Commercial 1 Total area (ac): 12.110
1 - Roofs 1: 4.430 ac. Flat Connected
13 - Paved Parking 1: 5.121 ac. Connected
45 - Large Landscaped Areas 1: 2.100 ac. Silty
70 - Water Body Areas: 0.459 ac.

Control Practice 1: Catchbasin Cleaning CP# 1 (DS) - DS Catchbasins # 2
1. Fraction of area served by catchbasins = 1.00
2. Catchbasin density (catchbasins/acre) = 1
3. Average sump depth below catchbasin outlet invert (feet) = 2
4. Depth of sediment in catchbasin sump at beginning of study period (ft) = 0
5. Typical outlet pipe diameter (ft) = 2
6. Typical outlet pipe Mannings n = 0.01
7. Typical outlet pipe slope (ft/ft) = 0.01
8. Typical catchbasin sump surface area (square feet) = 19.6
9. Total catchbasin depth (feet) = 8
10. Inflow hydrograph peak to average flow ratio = 3.8
11. Leakage rate through sump bottom (in/hr) = 0
12. Catchbasin Critical Particle Size File Name: C:\WinSLAMM Files\NURP.CPZ
13. Catchbasin cleaning frequency: Annually

Control Practice 2: Biofilter CP# 1 (DS) - DS Biofilters # 1
1. Top area (square feet) = 16570
2. Bottom aea (square feet) = 8150
3. Depth (ft): 6
4. Biofilter width (ft) - for Cost Purposes Only: 120

5. Infiltration rate (in/hr) = 3.6
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Fraction of rock filled volume as voids = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil void ratio = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: C:\WinSLAMM Files\NURP.CPZ
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

Outlet type: Sharp Crested Weir
1. Weir length (ft): 6
2. Invert elevation above datum (ft): 2

Outlet type: Broad Crested Weir
1. Weir crest length (ft): 33
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 5

Outlet type: Surface Discharge Pipe
1. Surface discharge pipe outlet diameter (ft): 0.42
2. Pipe invert elevation above datum (ft): 0
3. Number of surface pipe outlets: 1

Control Practice 3: Wet Detention Pond CP# 1 (DS) - DS Wet Pond # 2

Particle Size Distribution file name: C:\WinSLAMM Files\NURP.CPZ
Initial stage elevation (ft): 4
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:

Outlet type: Orifice 1
1. Orifice diameter (ft): 0.33
2. Number of orifices: 2
3. Invert elevation above datum (ft): 4

Outlet type: Broad Crested Weir
1. Weir crest length (ft): 130
2. Weir crest width (ft): 3
3. Height of weir opening (cfs): 1
4. Height from datum to bottom of weir opening: 5

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.1100	0.00	0.00
2	1.00	0.1300	0.00	0.00
3	2.00	0.1600	0.00	0.00
4	3.00	0.1800	0.00	0.00
5	4.00	0.2700	0.00	0.00
6	5.00	0.3300	0.00	0.00
7	6.00	0.3700	0.00	

0.00				
	8	7.00	0.7300	0.00
0.00				
	9	8.00	0.7800	0.00
0.00				

SLAMM for Windows Version 10.0.2

Data file name: P:\2011\201105400\800 Civil\999 Storm Water\WinSLAMM\Current\WKS South Pond-INFILTRATION plus WETBOTTOM.mdb
Data file description:
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO01.ppdx
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 03/28/69 Model Run End Date: 12/06/69
Date of run: 06-10-2014 Time of run: 14:43:26
Total Area Modeled (acres): 12.110
Years in Model Run: 0.67

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	813598	-	80.57	4092	-
Outfall Total with Controls:	135749	83.31%	33.47	283.6	93.07%
Annualized Total After Outfall Controls:	203902			426.0	

Data file name: P:\2011\201105400\800 Civil\999 Storm Water\WinSLAMM\Current\WKS AREA 3 and 5.mdb
WinSLAMM Version 10.0.2
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO02.ppdx
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 03/28/69 Study period ending date: 12/06/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Date: 06-10-2014 Time: 13:25:22
Site information:
Franklin Meijer - Water Quality Model
LU# 1 - Commercial: Commercial 1 Total area (ac): 4.000
13 - Paved Parking 1: 0.010 ac. Disconnected Silty
45 - Large Landscaped Areas 1: 3.990 ac. Silty

Data file name: P:\2011\201105400\800 Civil\999 Storm Water\WinSLAMM\Current\WKS AREA 3 and 5.mdb
Data file description: Franklin Meijer - Water Quality Model
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO02.ppdx
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 03/28/69 Model Run End Date: 12/06/69
Date of run: 06-10-2014 Time of run: 13:25:05
Total Area Modeled (acres): 4.000
Years in Model Run: 0.67

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	20978	-	226.8	297.0	-
Outfall Total with Controls:	20978	0.00%	226.8	297.0	0.00%
Annualized Total After Outfall Controls:	31510			446.0	

Appendix D

Storm Sewer Pipe Calculations

Line No.	Line ID	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Total CxA	Tc (min)	i Sys (in/hr)	Incr Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Length (ft)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Invert Up (ft)	Invert Dn (ft)	HGL Up (ft)	HGL Dn (ft)	
1	10-OUT	0.95	6.98	0.86	5.91	13.8	4.21	3.91	24.84	25.89	80.3	30	0.40	6.01	130.75	116.00	116.32	116.00	118.28	117.96	
2	9-10	0.69	6.03	0.88	5.09	13.3	4.27	2.91	21.71	29.73	180.9	24	1.02	9.05	133.50	130.75	128.10	126.25	129.76	127.52	
3	8-9	0.84	5.34	0.89	4.48	13.0	4.31	3.58	19.33	27.10	126.0	24	0.85	7.09	134.00	133.50	129.17	128.10	130.75 j	129.76	
4	7-8	0.84	4.50	0.86	3.73	12.5	4.38	3.46	16.34	23.62	141.0	24	0.65	6.40	134.50	134.00	130.08	129.17	131.54 j	130.75	
5	6-7	0.93	3.66	0.88	3.01	12.0	4.45	3.92	13.40	20.88	130.8	24	0.50	5.79	135.20	134.50	130.74	130.08	132.06 j	131.54	
6	5-6	0.81	1.28	0.84	1.04	11.0	4.61	3.26	4.78	15.24	161.3	18	1.25	3.80	136.25	135.20	132.75	130.74	133.59 j	132.06	
7	4-5	0.47	0.47	0.76	0.36	10.0	4.79	1.71	1.71	4.63	134.8	12	1.00	3.12	137.25	136.25	134.10	132.75	134.66 j	133.59	
8	3-6	0.10	1.45	0.90	1.16	10.3	4.73	0.43	5.46	14.10	152.7	18	1.07	4.13	138.40	135.20	132.37	130.74	133.27 j	132.06	
9	2-3	0.10	1.35	0.90	1.07	10.1	4.76	0.43	5.07	13.71	32.7	18	1.01	4.69	138.40	138.40	132.70	132.37	133.57 j	133.27	
10	1-2	1.25	1.25	0.78	0.98	10.0	4.79	4.67	4.67	8.34	30.4	15	0.99	5.11	138.00	138.40	133.00	132.70	133.87	133.57	
11	22-OUT	0.23	0.85	0.90	0.74	15.1	4.04	0.99	3.00	9.18	49.4	15	2.02	5.48	128.10	116.00	117.00	116.00	117.70	116.49	
12	21-22	0.00	0.62	0.00	0.54	14.4	4.13	0.00	2.22	4.63	134.0	12	1.00	5.02	132.60	128.10	122.17	120.83	122.81	121.32	
13	42-21	0.25	0.62	0.84	0.54	14.1	4.16	1.00	2.23	4.70	44.7	12	1.03	5.06	132.00	132.60	124.50	124.04	125.14	124.53	
14	41-42	0.00	0.37	0.00	0.33	13.1	4.29	0.00	1.40	4.63	115.0	12	1.00	3.11	131.90	132.00	125.65	124.50	126.15 j	125.14	
15	18-41	0.15	0.37	0.86	0.33	12.8	4.33	0.62	1.42	4.69	34.1	12	1.03	3.59	131.00	131.90	126.00	125.65	126.50	126.15	
16	39-OUT	0.00	1.75	0.00	1.40	12.6	4.36	0.00	6.10	8.34	30.0	15	1.67	6.61	121.00	109.00	109.50	109.00	110.50	109.79	
17	38-39	0.25	1.75	0.90	1.40	12.4	4.39	1.08	6.15	15.75	71.0	15	3.52	8.94	136.50	121.00	118.50	116.00	119.50	116.54	
18	37-38	0.29	1.50	0.76	1.18	11.9	4.46	1.05	5.24	8.37	118.7	15	0.99	6.28	137.00	136.50	129.40	128.22	130.33	128.94	
19	36-37	0.31	1.21	0.81	0.95	11.7	4.50	1.20	4.30	4.74	81.0	12	1.05	5.78	137.10	137.00	130.25	129.40	131.12 j	130.33	
20	35-36	0.31	0.90	0.81	0.70	11.4	4.55	1.20	3.20	4.74	81.0	12	1.05	4.69	137.10	137.10	131.10	130.25	131.87 j	131.12	
21	34-35	0.26	0.59	0.70	0.45	10.9	4.63	0.87	2.10	5.27	81.0	12	1.30	3.68	137.15	137.10	132.15	131.10	132.77 j	131.87	
22	33-34	0.33	0.33	0.82	0.27	10.0	4.79	1.29	1.29	4.15	87.2	12	0.80	3.01	137.50	137.15	132.85	132.15	133.33 j	132.77	

Project File: WKS Stormsewers.stm | Number of lines: 31 | Date: 6/9/2014

NOTES: Intensity = 29.34 / (Inlet time + 6.90) ^ 0.64 -- Return period = 10 Yrs. ; ** Critical depth

Line No.	Line ID	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Total CxA	Tc (min)	i Sys (in/hr)	Incr Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Length (ft)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Invert Up (ft)	Invert Dn (ft)	HGL Up (ft)	HGL Dn (ft)	
23	15-OUT	0.30	2.95	0.64	2.18	11.4	4.56	0.00	9.93	28.24	125.9	18	7.23	10.53	130.40	116.00	125.10	116.00	126.31	116.61	
24	13-15	0.43	2.45	0.69	1.85	10.7	4.66	1.42	8.62	18.33	88.8	18	1.80	5.82	130.70	130.40	126.70	125.10	127.84 j	126.31	
25	44-13	0.14	2.02	0.72	1.55	10.4	4.71	0.48	7.31	8.36	101.8	15	0.99	6.37	132.40	130.70	127.71	126.70	128.79 j	127.84	
26	12-44	0.76	1.88	0.76	1.45	10.2	4.76	2.76	6.90	8.47	81.5	15	1.02	6.19	131.80	132.40	128.54	127.71	129.59 j	128.79	
27	11-12	1.12	1.12	0.78	0.87	10.0	4.79	4.18	4.18	8.28	34.0	15	0.97	4.32	133.00	131.80	128.87	128.54	129.70 j	129.59	
28	14-15	0.20	0.20	0.70	0.14	10.0	4.79	0.67	0.67	5.57	69.1	12	1.45	3.01	131.40	130.40	127.00	126.00	127.34	126.31	
29	20-18	0.00	0.22	0.00	0.20	12.4	4.39	0.00	0.87	4.69	28.3	12	1.03	2.63	132.00	131.00	126.29	126.00	126.68 j	126.50	
30	17-20	0.00	0.22	0.00	0.20	10.8	4.65	0.00	0.92	4.64	118.7	12	1.00	3.18	132.50	132.00	127.48	126.29	127.88	126.68	
31	16-17	0.22	0.22	0.90	0.20	10.0	4.79	0.95	0.95	4.63	56.0	12	1.00	3.18	131.00	132.50	128.04	127.48	128.45	127.88	

Project File: WKS Stormsewers.stm | Number of lines: 31 | Date: 6/9/2014

NOTES: Intensity = 29.34 / (Inlet time + 6.90) ^ 0.64 -- Return period = 10 Yrs. ; ** Critical depth

PROPOSED LEGEND:

- PROPERTY LINE / SITE AREA
- PROPOSED CURB & GUTTER
- PROPOSED RIDGE LINE
- STM> PROPOSED STORM SEWER LINE
- 650 PROPOSED CONTOUR
- PROPOSED DRAINAGE DIRECTION
- TRIBUTARY AREA BOUNDARY
- (1) TRIBUTARY AREA DESIGNATION
- 0.56 AC TRIBUTARY AREA [ACRES]
- PROPOSED STORM STRUCTURE

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

DRAINAGE AREA PLAN

GreenbergFarrow
21 S. Evergreen Ave., Suite 200
Arlington Heights, Illinois 60005
t: 847 788 9200 f: 847 788 9536

Store: 276
801 EAST SUNSET DRIVE (MAIN)
831 EAST SUNSET DRIVE (CONV.)
(SEQ) TENNY AVE & SUNSET DR
WAUKESHA, WISCONSIN

meijer

PROFESSIONAL IN CHARGE
KERI WILLIAMS P.E.
PROFESSIONAL ENGINEER
LICENSE NO. 42288-6

06/11/14	FINAL PLAN RE-SUBMITTAL
09/25/13	FINAL PLAN
07/31/13	CITY RESUBMITTAL
07/10/13	CITY RESUBMITTAL
06/11/13	WAUKESHA WATER UTILITY
04/30/13	PLAN COMMISSION SUBMITTAL

Drawn By	E. CARRANZA
Reviewer	J. COYLE
Manager	K. WILLIAMS
Prof in Charge	K. WILLIAMS, P.E.

Hard copy is intended to be 30"x42" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

PROJECT NO.
J120944276

SHEET NO.
DA-1

GreenbergFarrow Project No. 20110540.0