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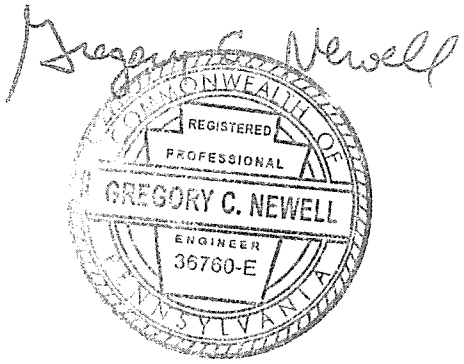
STORMWATER MANAGEMENT REPORT AND SITE DRAINAGE CALCULATIONS

LANCASTER AVENUE HOUSING

VILLANOVA UNIVERSITY
RADNOR TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA

VILLANOVA UNIVERSITY



Issued: December 5, 2014
Nave Newell No.: 2011-005.00

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STORMWATER MANAGEMENT REPORT AND SITE DRAINAGE CALCULATIONS
SUMMARY OF CONTENTS

WALDEN
LANCASTER COUNTY, LANCASTER, PA

I.

STORMWATER MANAGEMENT NARRATIVE – LANCASTER AVENUE HOUSING (LAH)

INTRODUCTION

Villanova University proposes to re-develop the existing parking lot on the southerly side of Lancaster Avenue (U.S. Route 30) ("*Main Lot*") to provide for six (6) dormitory buildings and associated retail uses, while reducing the impervious coverage.

The proposed plan for re-development of the "Main Lot" includes six proposed dormitory buildings that will accommodate on-campus housing as well as associated retail uses, at grade parking comprising 62 parking spaces, pedestrian pathways throughout the re-developed area that will ultimately provide a pedestrian link to the remaining areas of the campus, and a comprehensive storm water management system.

EXISTING CONDITIONS

The "Main Lot" is located on the southwesterly corner of Lancaster Avenue (Route 30) and Ithan Avenue, this site is almost entirely paved with at-grade parking. The property in question is Zoned 'Pi' – Planned Institutional. The entire parking lot currently drains overland to a drainage swale adjacent to the SEPTA Route 100 Line that discharges to the storm drainage system in Ithan Avenue. The site is located in the Darby Creek watershed (PA Chapter 93 Designation is "CWF, MF" – Coldwater Fish, Migratory Fish). Soils for this area of the campus are mapped as "Me" – Made Land Schist and Gneiss Materials and the hydrologic soils group is "B".

The following soils are mapped in the Re-Development Areas per the NRCS Web Soil Survey:

Me	Made Land, Schist and Gneiss Materials	HSG 'B'

STORM WATER MANAGEMENT CRITERIA

Storm water Management Design shall meet the following criteria:

<u>*Peak Rate Control*</u> – The Villanova University Re-Development is subject to the provisions of the Darby – Cobbs Creek Watershed criteria and Radnor Township Storm Water Management Ordinance (Chapter 245 of the Township's Municipal Code). The site in question is located in the Release Rate District designated B-2 and are subject to the following release rate criteria:

Predevelopment	Reduce to	Post-Development
2 year		1 year
5 year		2 year
10 year		5 year
25 year		5 year
50 year		10 year
100 year		100 year

The following values will be utilized for the 24 hour rainfall depths in accordance with Table F-1 from Ordinance Appendix 'F':

Year	24 Hour Rainfall Depth (in)
1	2.64
2	3.36
5	4.32
10	5.28
25	6.24
50	7.20
100	8.40

The ground cover condition for a Redevelopment Site for the Pre-Development Condition shall be based on actual land cover conditions, except that for NPDES Permitting 20% of existing impervious must be considered meadow for volume control calculations.

Storm Drainage Conveyance System – Storm Drains are designed in accordance with the Ordinance such that the pipes have adequate capacity to convey the 25 year storm. In addition, the storm drainage system is designed to accommodate the 100 year storm such that there would be no surcharging of storm inlets (this is done to insure all storm water is directed to the intended storm water management facilities). Storm drain design calculations are based on the Rational Method and on the PennDOT Region 5 IDF Curves per Figure 'F-4' of Ordinance Appendix 'F'.

Groundwater Recharge – The total volume of runoff retained corresponds with the approach designated the "One inch from Impervious Surface" per the Radnor Township Code. Since this project will be subject to a General NPDES Permit, calculations for estimating the required net 2 year volume will be prepared based on the NPDES Permit requirements and the Pennsylvania Best Management Practices Manual (2006) (PA BMP Manual) utilizing the Standard Worksheets – particularly Worksheet No. 4.

Calculations to estimate the net two year volume of runoff to be infiltrated from pre-development to post-development condition will be based on the criteria in the PA BMP Manual, Section 3.3.3 – Volume Control Guideline 1 (CG-1):

a. Do not increase the post-development total runoff volume for all storms equal to or less than the 2 year / 24 hour event.
b. Existing (pre-development) non-forested pervious areas must be considered meadow (good condition) or its equivalent.
c. Twenty (20) percent of existing impervious area, when present, shall be considered meadow (good condition) in the model for existing conditions for re-development (This is more conservative than the Township requirement).

In addition to the Net Two Year Volume of Runoff, the targeted Recharge Volume (Rev) will be evaluated utilizing the criteria of Section 245-22 of the Radnor Township Storm Water Management Ordinance as follows:
Rev = I * Impervious Area (Square Feet) / 12 inches = Rev in Cubic Feet (This value will be calculated for 1.0 inch of runoff for comparison to the NPDES required volume per CG-1).

In this case, there is a decrease in the impervious coverage from pre-development to post-development condition and as such, there will be no requirement to manage runoff volume

based on the NPDES Worksheet 4. The design calculations are therefore configured to show that the project will voluntarily comply with the Radnor Township Storm water Management Ordinance Section 245-22 indicating storm water Best Management Practices shall treat the one inch (1 inch) runoff event.

Water Quality Requirements

This project is required to meet the criteria of Section 245-23 of the Radnor Township Stormwater Management Ordinance. The required Water Quality Volume (WQv) will be calculated as follows:

WQv = [(P)(Rv)(A)] / 12

Where

WQv – Water Quality Volume (acre feet)

P = 1 inch

Rv = 0.05+0.009*I where I = Percent Impervious Surface Area

A = Area of project contributing to water quality BMP in acres

Infiltration Testing

Infiltration testing was conducted in the area of the proposed infiltration BMP's in September 2014. Test logs indicate fill material to a depth ranging from 1.5 feet to 7 feet. Due to the presences of fill and variable infiltration rates (some outside the acceptable range), the proposed infiltration systems interface is set at depths greater than 7 feet in order to be located within native soil. Per the geotechnical engineer, the native soil is expected to provide favorable infiltration rates. It should be noted that for the purpose of this study, no infiltration rate has been applied to the peak rate routing calculations.

Proposed Green Infrastructure/BMP's - Best Management Practices (POI 2A)

The Lancaster Avenue Housing Development is designed to meet the Peak Rate, Groundwater Recharge, and Water Quality Requirements of the Radnor Township Code (Chapter 245 Storm water Management Ordinance) as follows:

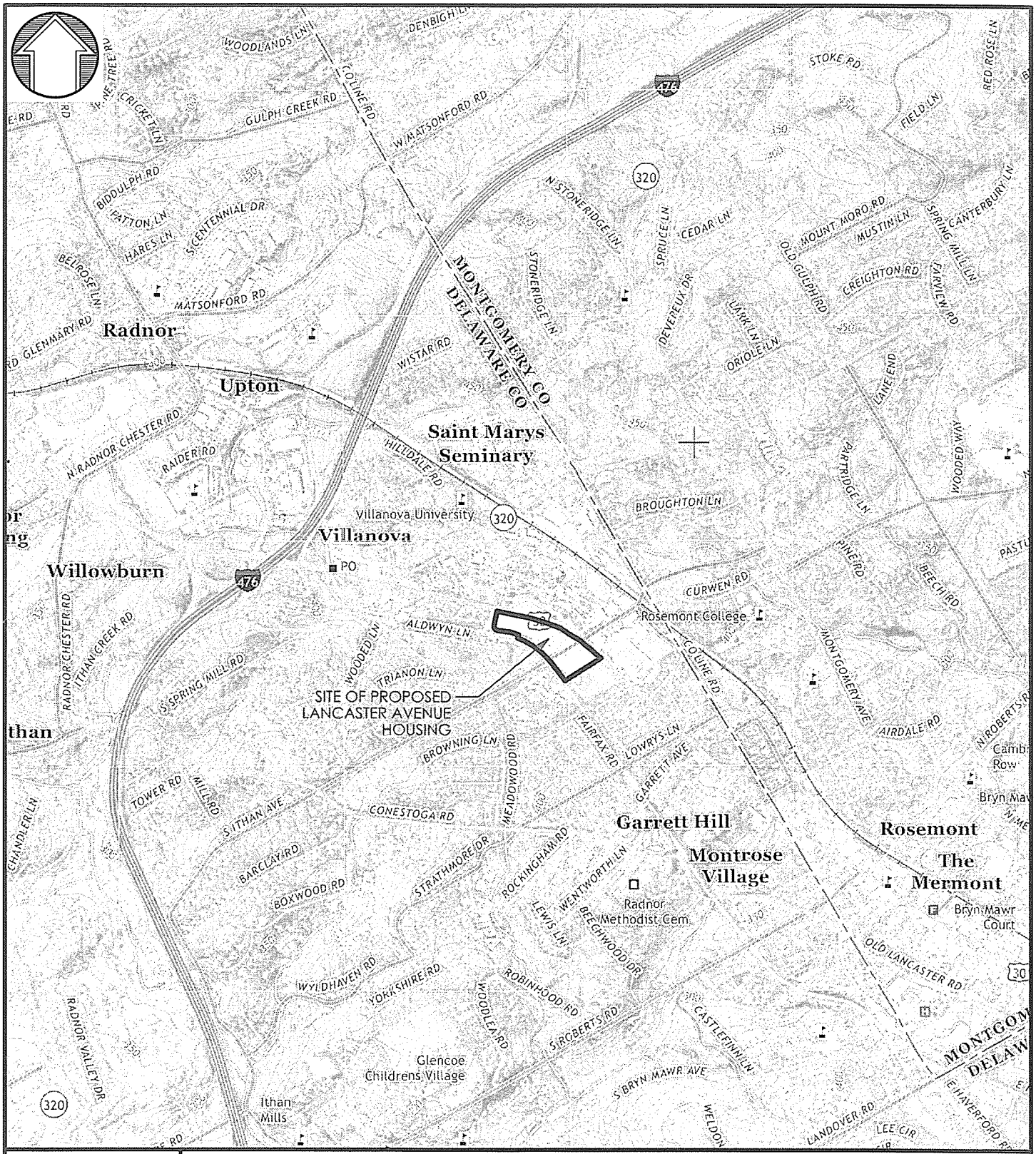
1. Ten rain gardens will be spaced around the site that will cumulatively treat approximately 1.25 inches of runoff.
2. Three subsurface combination detention/infiltration beds are proposed near the southeast corner of the "Main Lot" that will treat approximately 2.40 inches of runoff from the contributing area in addition to contributing to meeting the peak rate release requirements.
3. Two underground cisterns are proposed that will retain approximately 1.86 inches of runoff from a majority of roof areas of the proposed dormitory buildings. All of this collected runoff will be conveyed to the proposed cooling tower system to service heating / cooling needs of the proposed buildings.
4. One additional underground detention system will contribute to meeting the peak rate release requirements.

The average runoff treated by BMP's is 1.7 inches.

PADOT Lancaster Avenue (Route 30)(POI 2B)

Lancaster Avenue is proposed to be widened to accommodate a left turn lane onto North Ithan Avenue and a left turn lane from Lancaster Avenue onto Church Walk. The proposed additional impervious area generated by the widening is 3000 square feet. Existing run-off from Lancaster Avenue is collected via an existing inlet and pipe network that bypass the main lot and outfalls south of the Septa Route 100 rail line into the existing stream channel through the Aldwyn triangle. In order to mitigate the additional runoff from the widening, a city inlet is proposed to accept runoff from an equivalent 3000 square foot area which will drain to the onsite BMP's within POI 2A. Drainage Area 2B is proposed to maintain an equivalent square footage of impervious between pre and post development.

II.



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DRAWING NAME: USGS MAP - "NORRISTOWN" QUADRANGLE

PROJECT NAME: VILLANOVA UNIVERSITY
CICD DEVELOPMENT

SCALE:	DRAWN BY:	PROJECT NUMBER:	SHEET
1" = 2000'	MMB	2011-005	1 of 1
CHK'D BY:	APPROV. BY:	DATE:	
DAT	GCN	11/26/14	

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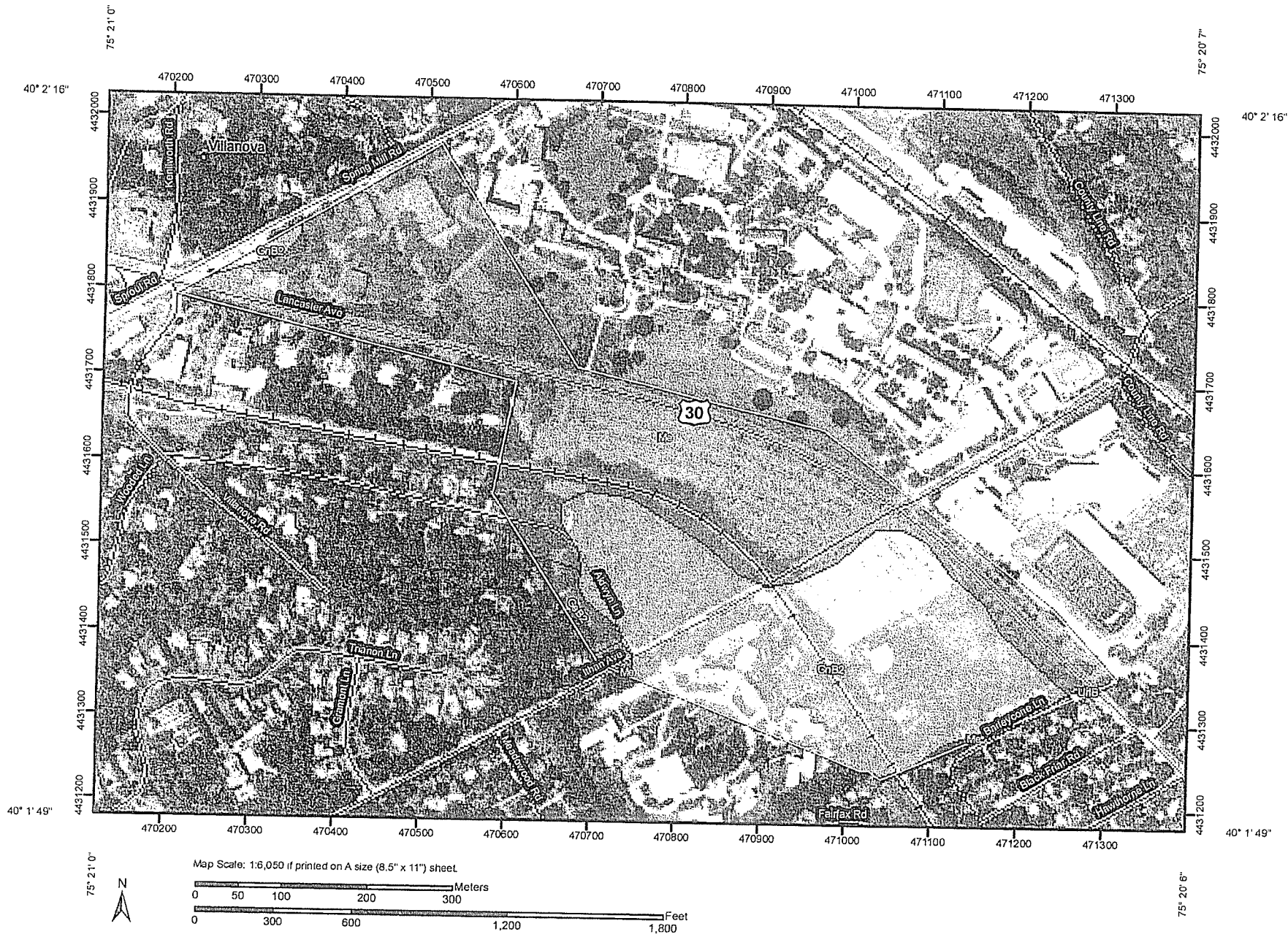
USER: mbruce

III.

Hydrologic Soil Group—Delaware County, Pennsylvania



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

5/1/2013
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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: 1:6,050 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

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 18N NAD83

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

Soil Survey Area: Delaware County, Pennsylvania
Survey Area Data: Version 6, Feb 24, 2009

Date(s) aerial images were photographed: Data not available.

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.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Delaware County, Pennsylvania (PA045)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GeB2	Glenelg channery silt loam, 3 to 8 percent slopes, moderately eroded	B	1.0	1.5%
GnB2	Glenville silt loam, 3 to 8 percent slopes, moderately eroded	C	26.2	40.5%
Me	Made land, schist and gneiss materials	B	37.5	57.9%
UrlB	Urban land-Gladstone complex, 0 to 8 percent slopes		0.1	0.2%
Totals for Area of Interest			64.8	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

IV.

TABLE F-1

DESIGN STORM RAINFALL AMOUNT (INCHES)

The design storm rainfall amount chosen for design should be obtained from the PennDOT region in which the site is located according to Figure F-2.

	Region 5						
	Precipitation Depth (in)						
Duration	1 Yr	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
5 min	0.33	0.38	0.45	0.50	0.56	0.63	0.68
15 min	0.64	0.75	0.90	1.00	1.15	1.35	1.50
1 hr	1.10	1.35	1.61	1.85	2.15	2.60	2.98
2 hrs	1.34	1.66	2.00	2.34	2.70	3.26	3.76
3 hrs	1.50	1.86	2.28	2.67	3.09	3.69	4.29
6 hrs	1.86	2.28	2.82	3.36	3.90	4.62	5.40
12 hrs	2.28	2.76	3.48	4.20	4.92	5.76	6.72
24 hrs	2.64	3.36	4.32	5.28	6.24	7.20	8.40

Source: "Field Manual of Pennsylvania Department of Transportation," Storm Intensity-Duration-Frequency Charts, PDT- IDF, May 1986.

TABLE F-2

RUNOFF CURVE NUMBERS

LAND USE DESCRIPTION	Hydrologic Condition	HYDROLOGIC SOIL GROUP A	B	C	D
Open Space					
Grass cover < 50%	Poor	68	79	86	89
Grass cover 50% to 75%	Fair	49	69	79	84
Grass cover > 75%	Good	39	61	74	80
Meadow		30	58	71	78
Agricultural					
Pasture, grassland, or range – Continuous forage for grazing	Poor	68	79	86	89
Pasture, grassland, or range – Continuous forage for grazing	Fair	49	69	79	84
Pasture, grassland, or range – Continuous forage for grazing	Good	39	61	74	80
Brush—brush-weed-grass mixture with brush the major element	Poor	48	67	77	83
Brush—brush-weed-grass mixture with brush the major element	Fair	35	56	70	77
Brush—brush-weed-grass mixture with brush the major element	Good	30	48	65	73
Fallow Bare soil	-------	77	86	91	94
Crop residue cover (CR)	Poor	76	85	90	93
	Good	74	83	88	90
Woods – grass combination (orchard or tree farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77

F-7

Commercial	(85% impervious)	89	92	94	95
Industrial	(72% impervious)	81	88	91	93
Institutional	(50% impervious)	71	82	88	90

Residential districts by average lot size:

	% Impervious				
1/8 acre or less * (townhouses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Farmstead		59	74	82	86
Smooth surfaces (concrete, asphalt, gravel, or bare compacted soil)		98	98	98	98
Water		98	98	98	98
Mining/newly graded areas (pervious areas only)		77	86	91	94

* Includes multi-family housing unless justified lower density can be provided.

Note: Existing site conditions of bare earth or fallow ground shall be considered as meadow when choosing a CN value.

Source: NRCS (SCS) TR-55

F-8

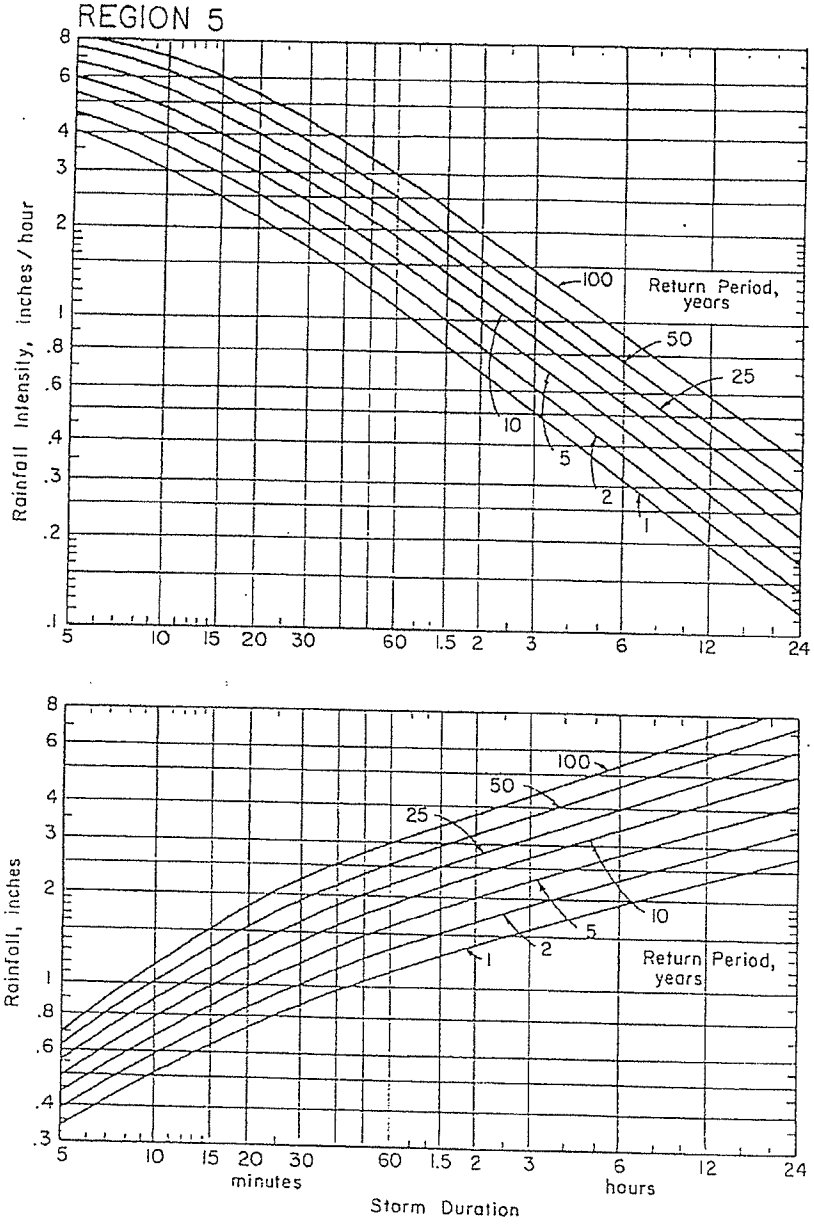
TABLE F-3

RATIONAL RUNOFF COEFFICIENTS

	HYDROLOGIC SOIL GROUP			
LAND USE DESCRIPTION	A	B	C	D
Cultivated land : without conservation treatment	.49	.67	.81	.88
: with conservation treatment	.27	.43	.61	.67
Pasture or range land: poor condition	.38	.63	.78	.84
: good condition	---*	.25	.51	.65
Meadow: good condition	---*	---*	.44	.61
Woods: thin stand, poor cover, no mulch	---*	.34	.59	.70
: good cover	---*	---*	.45	.59
Open spaces, lawns, parks, golf courses, cemeteries				
Good condition: grass cover on 75% or more of the area	---*	.25	.51	.65
Fair condition: grass cover on 50% to 75% of the area	---*	.45	.63	.74
Commercial and business areas (85% impervious)	.84	.90	.93	.96
Industrial districts (72% impervious)	.67	.81	.88	.92
Residential:				
Average lot size Average % impervious				
1/8 acre or less 65	.59	.76	.86	.90
1/4 acre 38	.25	.49	.67	.78
1/3 acre 30	---*	.49	.67	.78
1/2 acre 25	---*	.45	.65	.76
1 acre 20	---*	.41	.63	.74
Paved parking lots, roofs, driveways, etc.	.99	.99	.99	.99
Streets and roads:				
Paved with curbs and storm sewers	.99	.99	.99	.99
Gravel	.57	.76	.84	.88
Dirt	.49	.69	.80	.84

FIGURE F-4

PENNDOT REGION 5 STORM INTENSITY-DURATION-FREQUENCY CURVE



Source: "Field Manual of Pennsylvania Department of Transportation," Storm Intensity-Duration-Frequency Charts, PDT- IDF, May 1986.

F-6

TABLE F-4

MANNING'S ROUGHNESS COEFFICIENTS

Roughness Coefficients (Manning's "n") for Overland Flow

Surface Description	n
Dense growth	0.4 to 0.5
Pasture	0.3 to 0.4
Lawns	0.2 to 0.3
Bluegrass sod	0.2 to 0.5
Short grass prairie	0.1 to 0.2
Sparse vegetation	0.05 to 0.13
Bare clay-loam soil (eroded)	0.01 to 0.03
Concrete/asphalt:	
very shallow depths (less than 1/4 inch)	0.10 to 0.15
small depths (1/4 inch to several inches)	0.05 to 0.10

Roughness Coefficients (Manning's "n") for Channel Flow

Reach Description	n
Natural stream, clean, straight, no rifts or pools	0.03
Natural stream, clean, winding, some pools or shoals	0.04
Natural stream, winding, pools, shoals, stony with some weeds	0.05
Natural stream, sluggish deep pools and weeds	0.07
Natural stream or swale, very weedy or with timber underbrush	0.10
Concrete pipe, culvert, or channel	0.012
Corrugated metal pipe	0.012-0.027[1]
High density polyethylene (HDPE) pipe	
Corrugated	0.021-0.029[2]
Smooth lined	0.012-0.020[2]

[1] Depending upon type, coating, and diameter

[2] Values recommended by the American Concrete Pipe Association, check manufacturer's recommended value./

Source: U.S. Army Corps of Engineers, HEC-1 Users Manual

V.

Volume Calculations for Section 245-22 and 245-23 of the Radnor Township Storm Water Management Ordinance

POI No. 2A – Main Lot – Lancaster Avenue Housing (LAH)

1. *Calculation of Net Two Year Runoff Volume* – Calculated utilizing Worksheet 4 from the PaDEP's BMP Manual = -4960 CF (decreased impervious area results in a volume credit).

2. *Calculation of the Retention (Infiltration) Volume based on a Runoff Depth of 1.0 inch for all Impervious Surfaces:*
   Rev = I x Impervious Area (S.F.) / 12 inches = Volume (CF)
   Impervious Area = 212,810 SF
   I = 1.0 inches
   Rev = **17,727 CF** (Greater of Rev and WQV)

3. *Water Quality Volume per Section 245-23 :*
   WQv = [(P)(Rv)(A)]/12
   P = 1.0 Inch
   Rv = 0.05+0.009(I) where I = % Impervious Coverage
   A = Project Area = 412,470 SF or 9.469 Acres
   Impervious Surface Area = 212,810 SF or 51.6% Impervious Coverage
   Rv = 0.05+0.009(51.6) = 0.5144
   WQv = [(1.0)(0.5144)(9.469)]/12 = 0.406 Acre Feet or 17,681 CF

4. *Water Quality Volume Treated*

Rain Gardens 1 through 10	*6,950 CF*
Infiltration Systems 1 through 3	*11,761 CF*
Subtotal Volume Treated	*18,711 CF > 17,727 CF*
Cisterns 1 and 2	*11,539 CF*
Total Volume treated	*30,250 CF*

Equivalent Runoff Depth treated: 30,250/17,727 = 1.71 inches

Villanova University – CICD Development

Volume Summary

Rain Garden No. 1 (RG-1)

Impervious Surface Area	=	*9247*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*771*	*CF*
Storage Volume	=	***687***	***CF***
Equivalent Runoff Depth Treated	=	*0.89*	*in.**

Rain Garden No. 2 (RG-2)

Impervious Surface Area	=	*3307*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*276*	*CF*
Storage Volume	=	***285***	***CF***
Equivalent Runoff Depth Treated	=	*1.03*	*in.*

Rain Garden No. 3 (RG-3)

Impervious Surface Area	=	*8867*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*739*	*CF*
Storage Volume	=	***856***	***CF***
Equivalent Runoff Depth Treated	=	*1.16*	*in.*

Rain Garden No. 4 (RG-4)

Impervious Surface Area	=	*5065*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*422*	*CF*
Storage Volume	=	***487***	***CF***
Equivalent Runoff Depth Treated	=	*1.15*	*in.*

Rain Garden No. 5 (RG-5)

Impervious Surface Area	=	*7319*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*610*	*CF*
Storage Volume	=	***696***	***CF***
Equivalent Runoff Depth Treated	=	*1.14*	*in.*

Rain Garden No. 6 (RG-6)

Impervious Surface Area	=	*6626*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*552*	*CF*
Storage Volume	=	***558***	***CF***
Equivalent Runoff Depth Treated	=	*1.01*	*in.*

Rain Garden No. 7 (RG-7)

Impervious Surface Area	=	*5047*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*421*	*CF*
Storage Volume	=	***760***	***CF***
Equivalent Runoff Depth Treated	=	*1.81*	*in.*

Rain Garden No. 8 (RG-8)

Impervious Surface Area	=	*7183*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*599*	*CF*
Storage Volume	=	***950***	***CF***
Equivalent Runoff Depth Treated	=	*1.59*	*in.*

Rain Garden No. 9 (RG-9)

Impervious Surface Area	=	*4385*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*365*	*CF*
Storage Volume	=	***813***	***CF***
Equivalent Runoff Depth Treated	=	*2.22*	*in.*

Rain Garden No. 10 (RG-10)

Impervious Surface Area	=	*9215*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*768*	*CF*
Storage Volume	=	***858***	***CF***
Equivalent Runoff Depth Treated	=	*1.12*	*in.*

Cistern No. 1

Impervious Surface Area	=	*55818*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*4652*	*CF*
Storage Volume	=	***10336***	***CF***
Equivalent Runoff Depth Treated	=	*2.22*	*in.*

Cistern No. 2

Impervious Surface Area	=	*8839*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*737*	*CF*
Storage Volume	=	***1203***	***CF***
Equivalent Runoff Depth Treated	=	*1.63*	*in.*

Infiltration System No. 1

Impervious Surface Area	=	*42610*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*3551*	*CF*
Storage Volume	=	***6361***	***CF***
Equivalent Runoff Depth Treated	=	*1.79*	*in.*

Infiltration System No. 2

Impervious Surface Area	=	*25785*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*2149*	*CF*
Storage Volume	=	***4446***	***CF***
Equivalent Runoff Depth Treated	=	*2.07*	*in.*

Infiltration System No. 3

Impervious Surface Area	=	*7411*	*SF*
Runoff Volume - Impervious Surface Area (1.0 inch runoff)	=	*618*	*CF*
Storage Volume	=	***954***	***CF***
Equivalent Runoff Depth Treated	=	*1.54*	*in.*

**RG-1 outfall is contributing to Infiltration System No. 1 which accommodates the remaining 0.1" of runoff*

K:\11Proj\11005\Proj_Data\Support_Data\SWM\Report\SWM Volume Summary.docx

Cooling Tower Seasonal Demand and Cistern Capacities

Cistern 1 & 2				
Storage =		11073 cubic feet	82837 gallons*	
Cooling Tower Usage	**Season**	**Demand gal/min.****	**Demand gal/day*****	**Duration (cooling tower supply) days**
	Summer	72	103,680	0.80
	Winter	10	14,400	5.75

* 7.481 x cubic feet = gallons
** Seasonal demand provided by MEP Engineer
*** gal/day = gal/minute * 1440 minutes/day

WORKSHEET 4. CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

PROJECT: Villanova University - Lancaster Ave. Housing
Drainage Area: POI 2A
2-Year Rainfall: 3.36 inches

Total Site Area: 9.469 acres
Protected Site Area: 0.000 acres
Managed Area: 9.469 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	I_a (0.2 x S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woodland	B		0.000	55	8.18	1.64	0.30	0
Woodland	C		0.000	70	4.29	0.86	0.92	0
Woodland	D		0.000	77	2.99	0.60	1.33	0
Meadow	B	87966	2.019	58	7.24	1.45	0.40	2927
Meadow	C		0.000	71	4.08	0.82	0.98	0
Meadow	D		0.000	78	2.82	0.56	1.39	0
Meadow (20% from Imperv.)	B	61408	1.410	58	7.24	1.45	0.40	2043
Meadow (20% from Ithan.)	B	2996	0.069	58	7.24	1.45	0.40	100
Meadow (20% from Imperv.)	D		0.000	78	2.82	0.56	1.39	0
Impervious	B	245634	5.639	98	0.20	0.04	3.13	64007
Impervious (Ithan Road)	C	11983	0.275	98	0.20	0.04	3.13	3122
Impervious	D		0.000	98	0.20	0.04	3.13	0
TOTAL:		409987	9.412					72199

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	I_a (0.2 x S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woodland	B		0.000	55	8.18	1.64	0.30	0
Woodland	C		0.000	70	4.29	0.86	0.92	0
Woodland	D		0.000	77	2.99	0.60	1.33	0
Meadow	B		0.000	58	7.24	1.45	0.40	0
Meadow	C		0.000	71	4.08	0.82	0.98	0
Meadow	D		0.000	78	2.82	0.56	1.39	0
Lawn	B	185040	4.248	61	6.39	1.28	0.51	7882
Lawn	C		0.000	74	3.51	0.70	1.14	0
Lawn	D		0.000	80	2.50	0.50	1.53	0
Impervious	B	212810	4.885	98	0.20	0.04	3.13	55453
Impervious (Ithan Road)	B	14979	0.344	98	0.20	0.04	3.13	3903
Impervious	D		0.000	98	0.20	0.04	3.13	0
TOTAL:		412829	9.477					67238

2-Year Volume Increase (ft^3)	-4960 ft^3

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P - 0.2S)^2 / (P + 0.8S) = (P-I_a)^2 / ((P-I_a) + S)$
   P = 2-Year Rainfall (in)
   S = (1000 / CN) - 10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

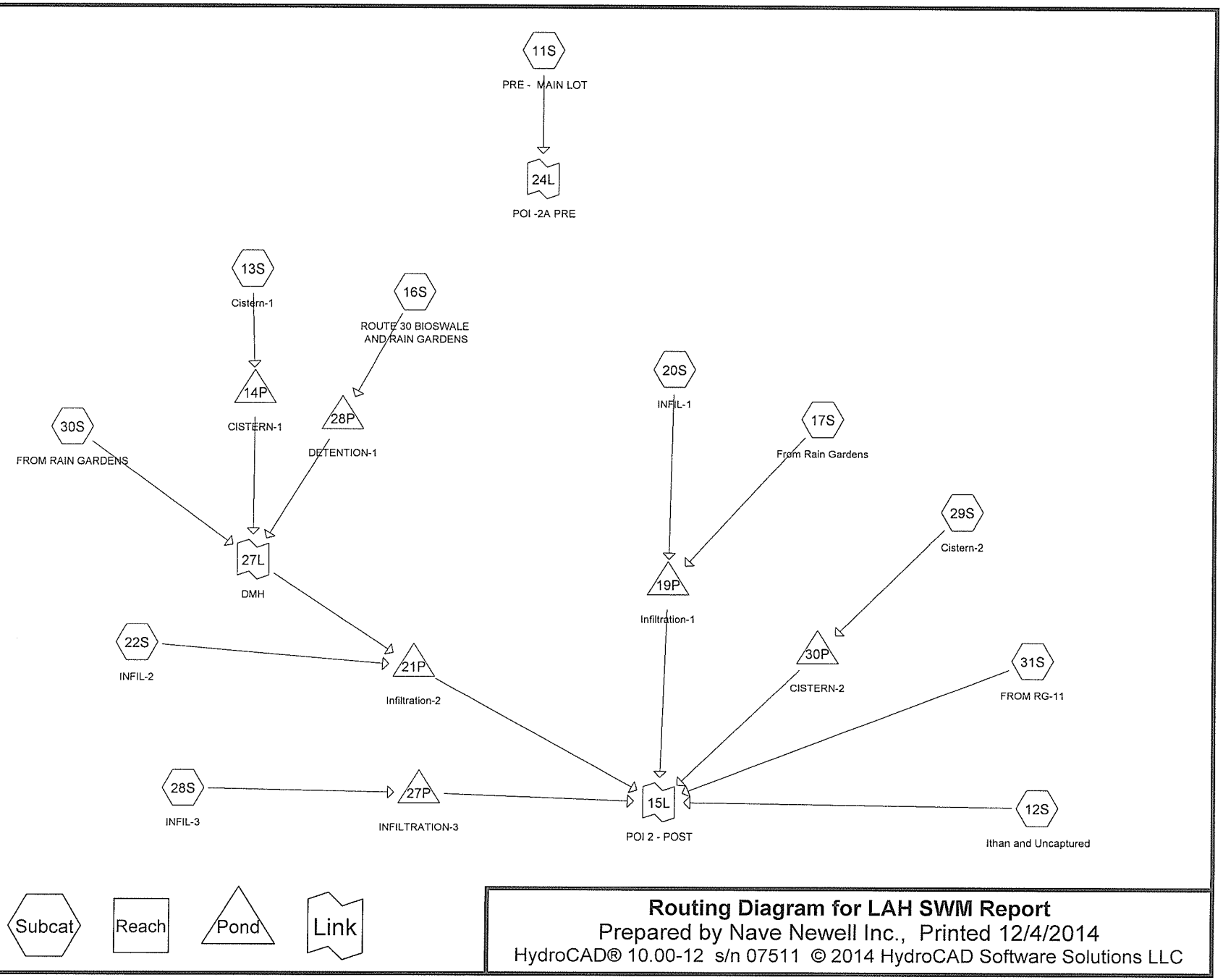
VI.

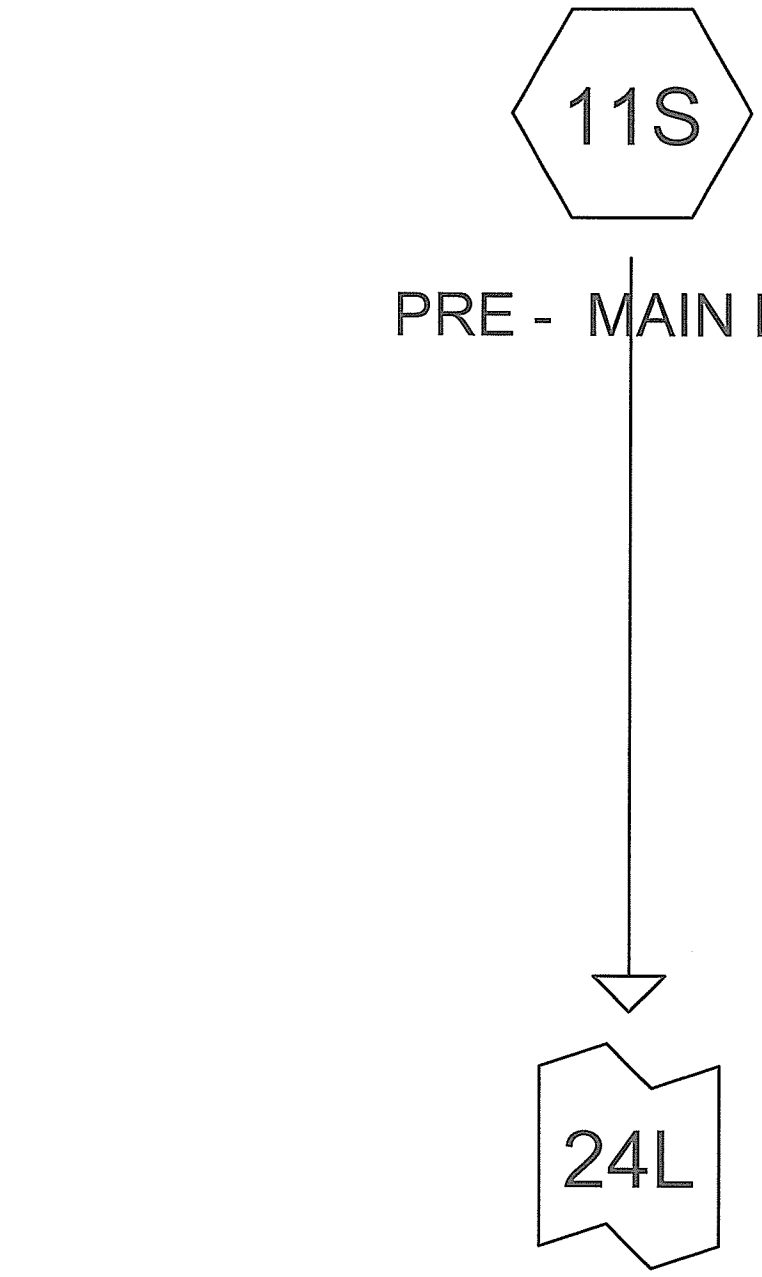
POI 2A SUMMARY OF FLOWS
Pre-Development/Post Development

STORM	Pre-Development (CFS)	Allowable Flow (CFS)	Post Development Flow (CFS)	% of Allowable (CFS)
1	22.70		8.29	36.52
2	31.67	22.70	11.68	51.45
5	43.69	31.67	16.44	51.91
10	55.70	43.69	21.99	50.33
25	67.65	43.69	30.23	69.19
50	79.53	55.70	39.99	71.80
100	94.31	94.31	51.21	54.30

No Detention Credit taken for Volume detained in Cisterns, Infiltration Systems, and Rain Gardens

VII.


11S
PRE - MAIN LOT
24L
POI -2A PRE
13S
Cistern-1
16S
ROUTE 30 BIOSWALE AND RAIN GARDENS
14P
CISTERN-1
28P
DETENTION-1
30S
FROM RAIN GARDENS
20S
INFIL-1
17S
From Rain Gardens
29S
Cistern-2
27L
DMH
19P
Infiltration-1
22S
INFIL-2
21P
Infiltration-2
30P
CISTERN-2
31S
FROM RG-11
28S
INFIL-3
27P
INFILTRATION-3
15L
POI 2 - POST
12S
Ithan and Uncaptured
Subcat
Reach
Pond
Link
Routing Diagram for LAH SWM Report
Prepared by Nave Newell Inc., Printed 12/4/2014
HydroCAD® 10.00-12 s/n 07511 © 2014 HydroCAD Software Solutions LLC



Subcat Reach Pond Link

Routing Diagram for LAH SWM Report_No Cistern Credit
Prepared by Nave Newell Inc., Printed 12/4/2014
HydroCAD® 10.00-12 s/n 07511 © 2014 HydroCAD Software Solutions LLC

Events for Link 24L: POI -2A PRE

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
1-yr	22.70	22.70	**0.00**
2-yr	31.67	31.67	0.00
5-yr	43.69	43.69	0.00
10-yr	55.70	55.70	0.00
25-yr	67.65	67.65	0.00
50-yr	79.53	79.53	0.00
100-yr	**94.31**	**94.31**	0.00

Summary for Subcatchment 11S: PRE - MAIN LOT

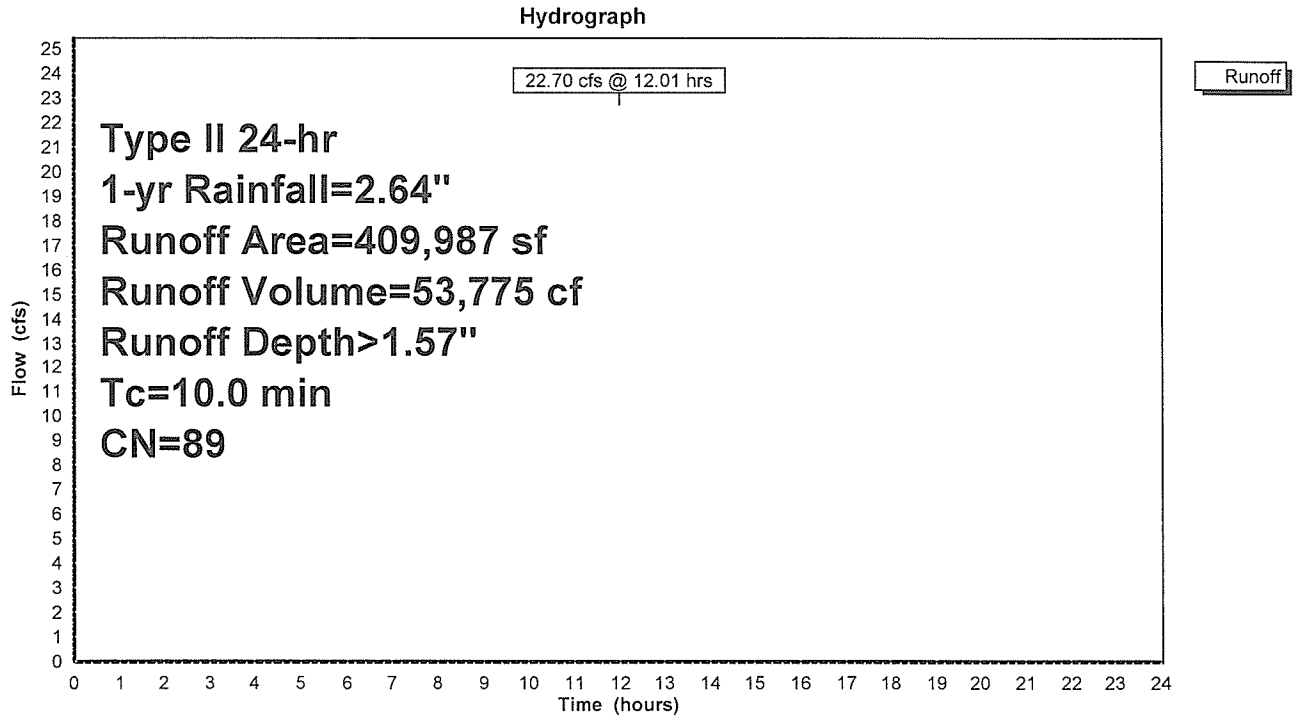
Runoff = 22.70 cfs @ 12.01 hrs, Volume= 53,775 cf, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

Area (sf)	CN	Description
87,966	58	Meadow, non-grazed, HSG B
322,021	98	Paved parking, HSG B
409,987	89	Weighted Average
87,966		21.46% Pervious Area
322,021		78.54% Impervious Area

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

Subcatchment 11S: PRE - MAIN LOT



Summary for Subcatchment 11S: PRE - MAIN LOT

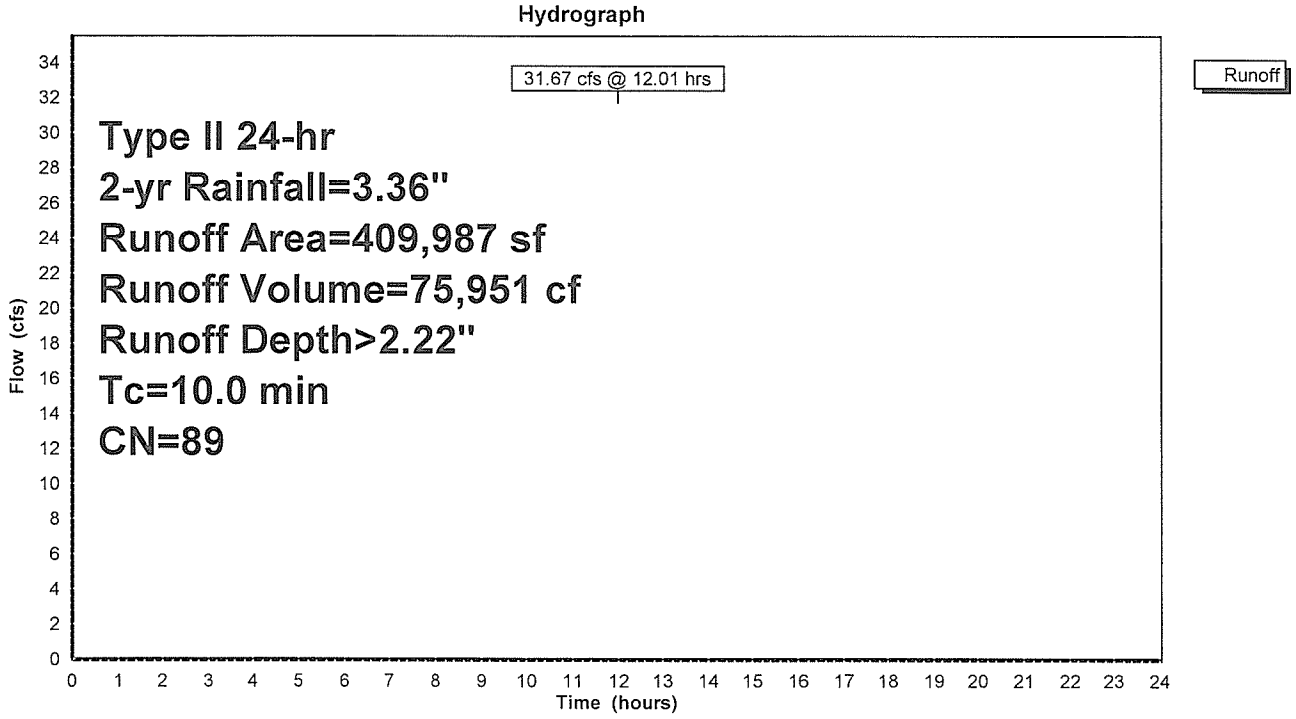
Runoff = 31.67 cfs @ 12.01 hrs, Volume= 75,951 cf, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

Area (sf)	CN	Description
87,966	58	Meadow, non-grazed, HSG B
322,021	98	Paved parking, HSG B
409,987	89	Weighted Average
87,966		21.46% Pervious Area
322,021		78.54% Impervious Area

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

Subcatchment 11S: PRE - MAIN LOT



Summary for Subcatchment 11S: PRE - MAIN LOT

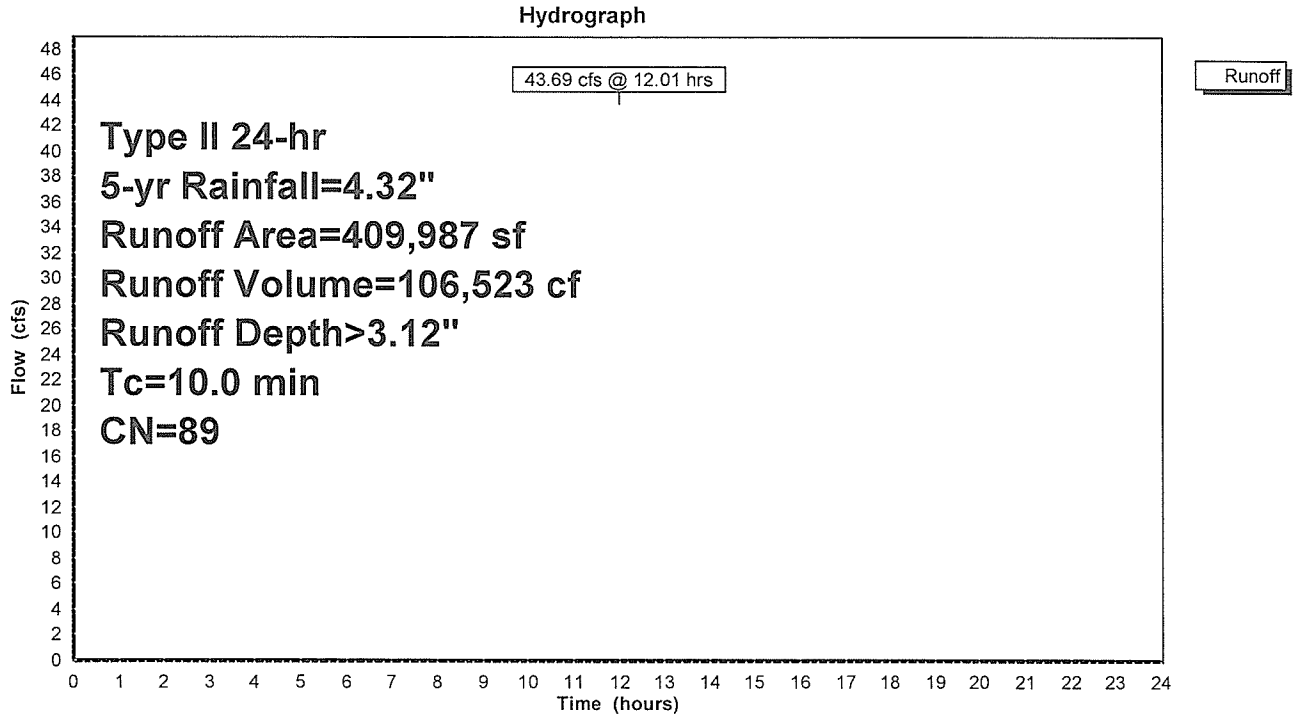
Runoff = 43.69 cfs @ 12.01 hrs, Volume= 106,523 cf, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

Area (sf)	CN	Description
87,966	58	Meadow, non-grazed, HSG B
322,021	98	Paved parking, HSG B
409,987	89	Weighted Average
87,966		21.46% Pervious Area
322,021		78.54% Impervious Area

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

Subcatchment 11S: PRE - MAIN LOT



Summary for Subcatchment 11S: PRE - MAIN LOT

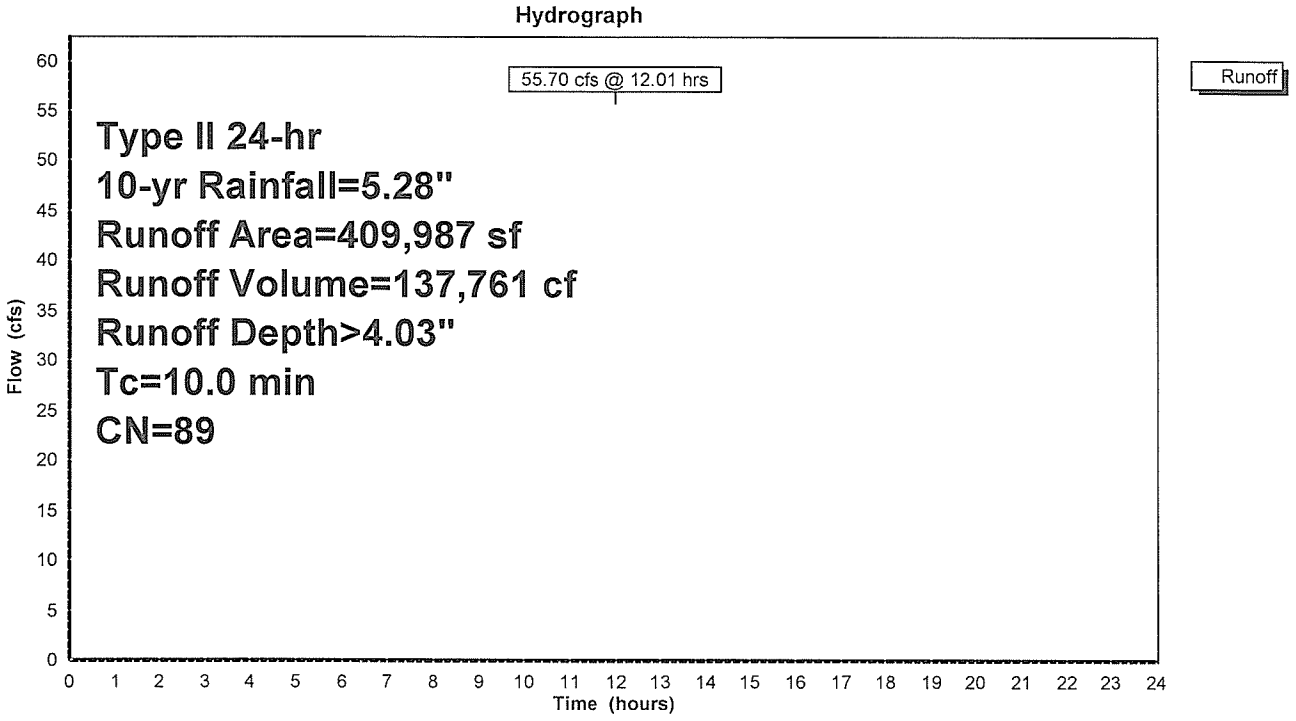
Runoff = 55.70 cfs @ 12.01 hrs, Volume= 137,761 cf, Depth> 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

Area (sf)	CN	Description
87,966	58	Meadow, non-grazed, HSG B
322,021	98	Paved parking, HSG B
409,987	89	Weighted Average
87,966		21.46% Pervious Area
322,021		78.54% Impervious Area

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

Subcatchment 11S: PRE - MAIN LOT



Summary for Subcatchment 11S: PRE - MAIN LOT

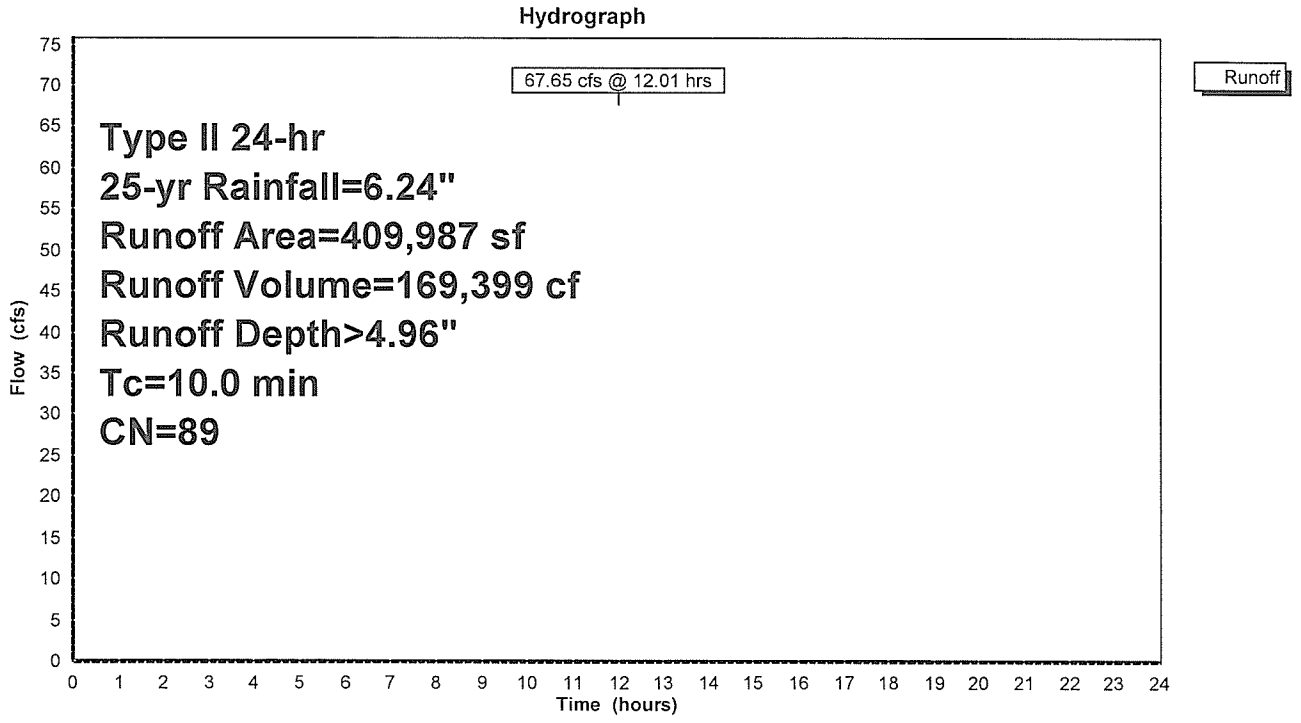
Runoff = 67.65 cfs @ 12.01 hrs, Volume= 169,399 cf, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

Area (sf)	CN	Description
87,966	58	Meadow, non-grazed, HSG B
322,021	98	Paved parking, HSG B
409,987	89	Weighted Average
87,966		21.46% Pervious Area
322,021		78.54% Impervious Area

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

Subcatchment 11S: PRE - MAIN LOT



Summary for Subcatchment 11S: PRE - MAIN LOT

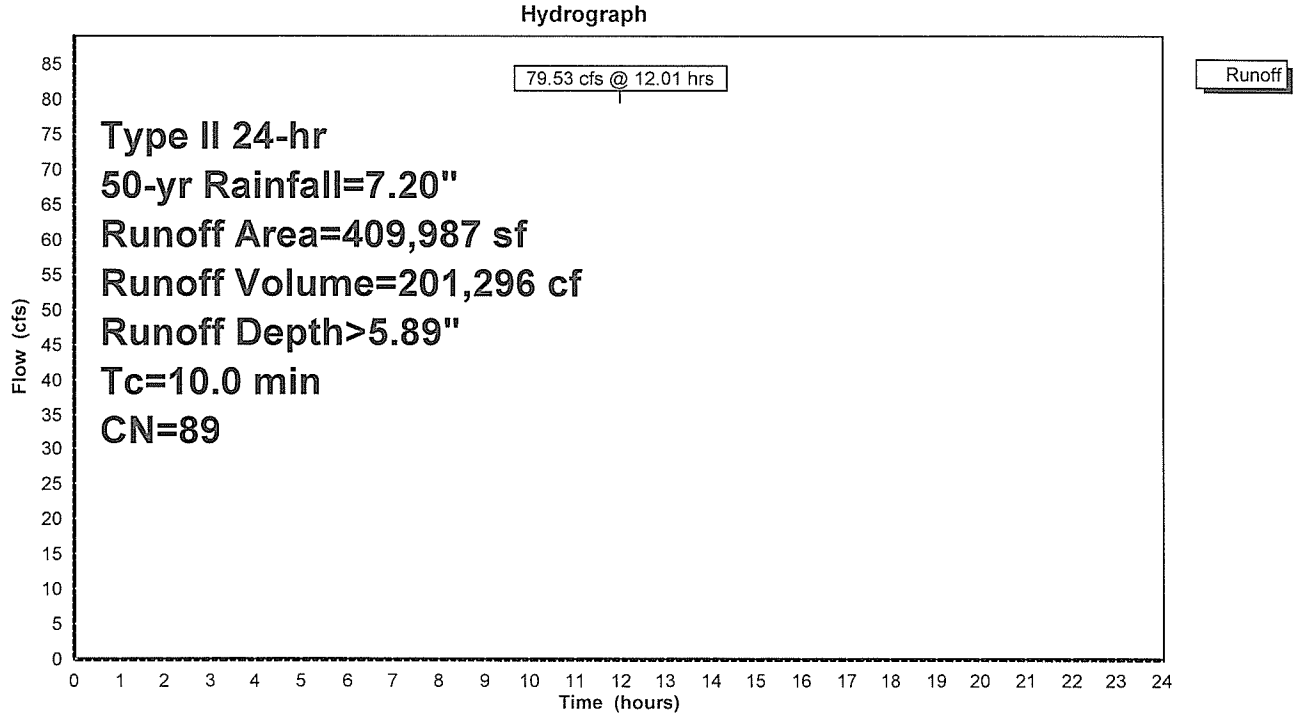
Runoff = 79.53 cfs @ 12.01 hrs, Volume= 201,296 cf, Depth> 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

Area (sf)	CN	Description
87,966	58	Meadow, non-grazed, HSG B
322,021	98	Paved parking, HSG B
409,987	89	Weighted Average
87,966		21.46% Pervious Area
322,021		78.54% Impervious Area

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

Subcatchment 11S: PRE - MAIN LOT



Summary for Subcatchment 11S: PRE - MAIN LOT

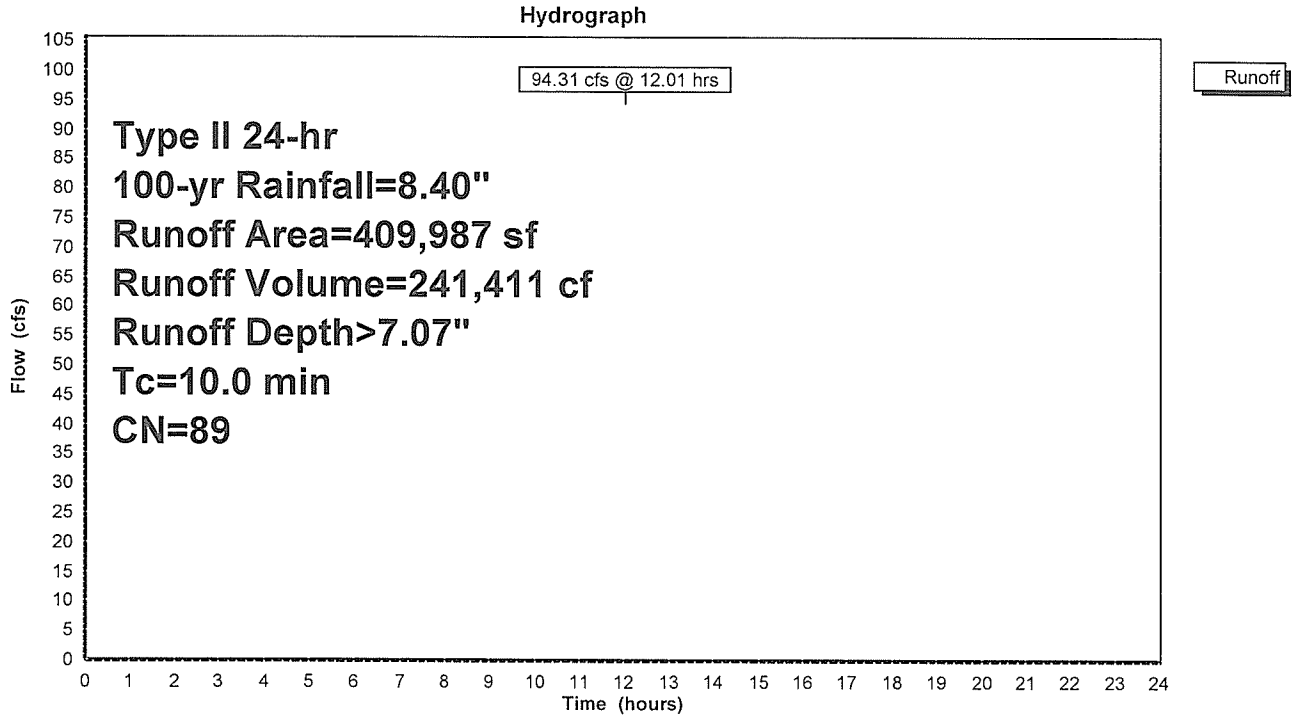
Runoff = 94.31 cfs @ 12.01 hrs, Volume= 241,411 cf, Depth> 7.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

Area (sf)	CN	Description
87,966	58	Meadow, non-grazed, HSG B
322,021	98	Paved parking, HSG B
409,987	89	Weighted Average
87,966		21.46% Pervious Area
322,021		78.54% Impervious Area

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

Subcatchment 11S: PRE - MAIN LOT

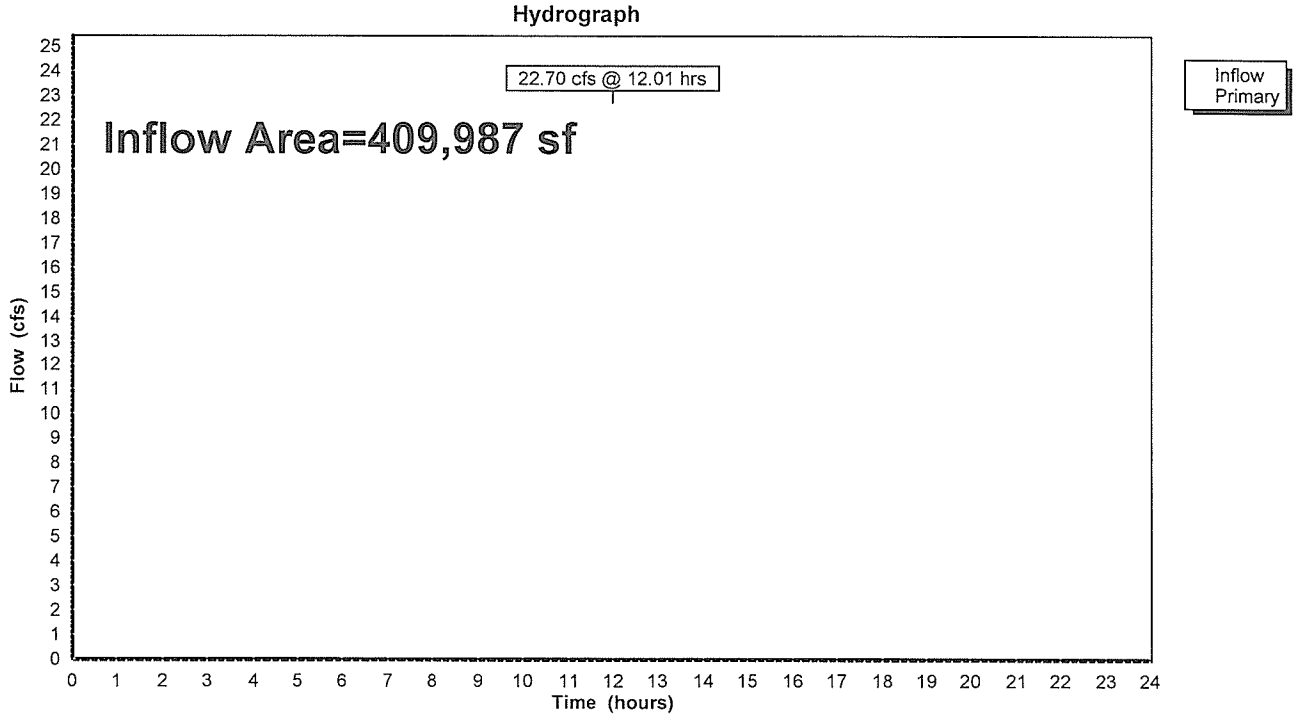


Summary for Link 24L: POI -2A PRE

Inflow Area = 409,987 sf, 78.54% Impervious, Inflow Depth > 1.57" for 1-yr event
Inflow = 22.70 cfs @ 12.01 hrs, Volume= 53,775 cf
Primary = 22.70 cfs @ 12.01 hrs, Volume= 53,775 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 24L: POI -2A PRE

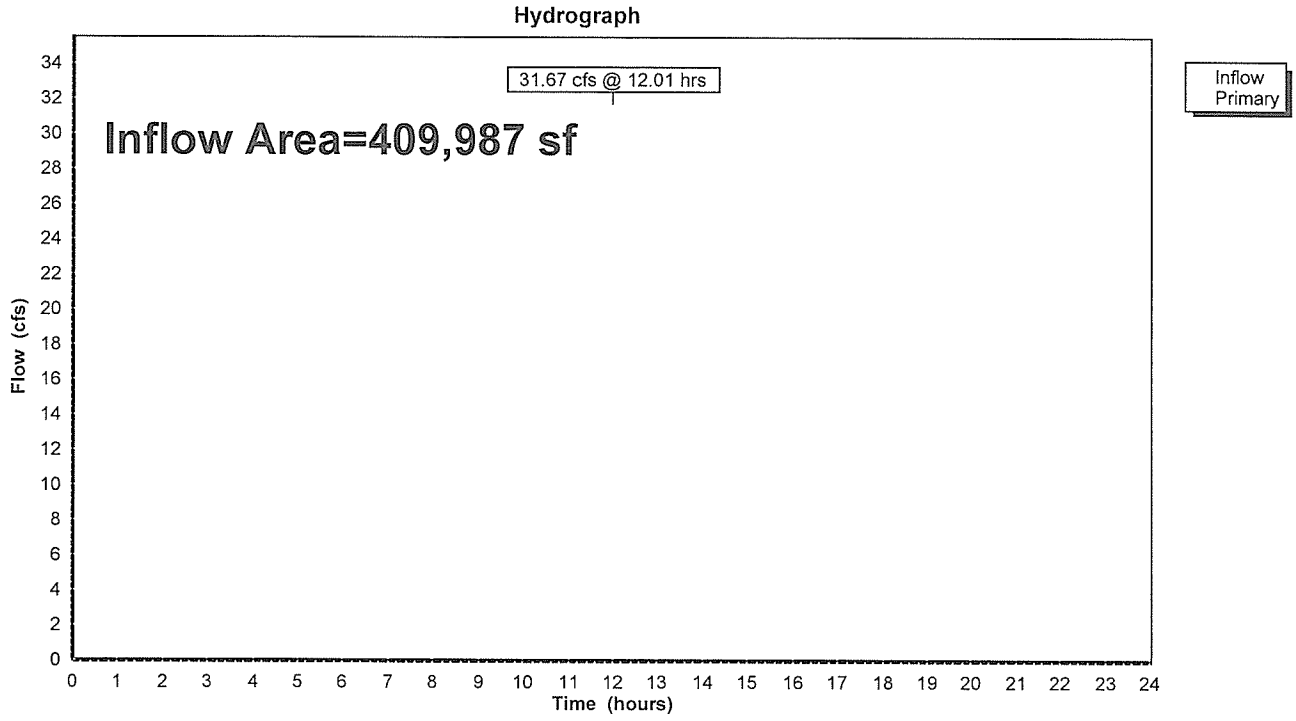


Summary for Link 24L: POI -2A PRE

Inflow Area = 409,987 sf, 78.54% Impervious, Inflow Depth > 2.22" for 2-yr event
Inflow = 31.67 cfs @ 12.01 hrs, Volume= 75,951 cf
Primary = 31.67 cfs @ 12.01 hrs, Volume= 75,951 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 24L: POI -2A PRE

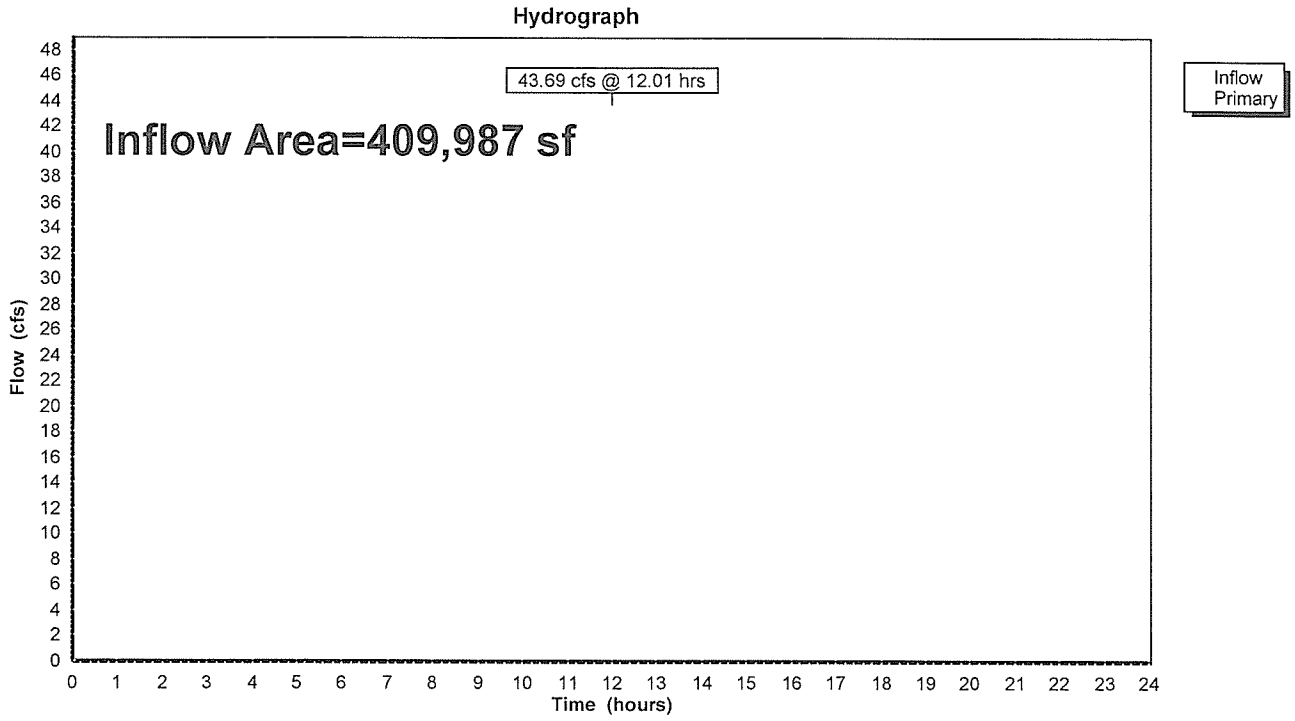


Summary for Link 24L: POI -2A PRE

Inflow Area = 409,987 sf, 78.54% Impervious, Inflow Depth > 3.12" for 5-yr event
Inflow = 43.69 cfs @ 12.01 hrs, Volume= 106,523 cf
Primary = 43.69 cfs @ 12.01 hrs, Volume= 106,523 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 24L: POI -2A PRE

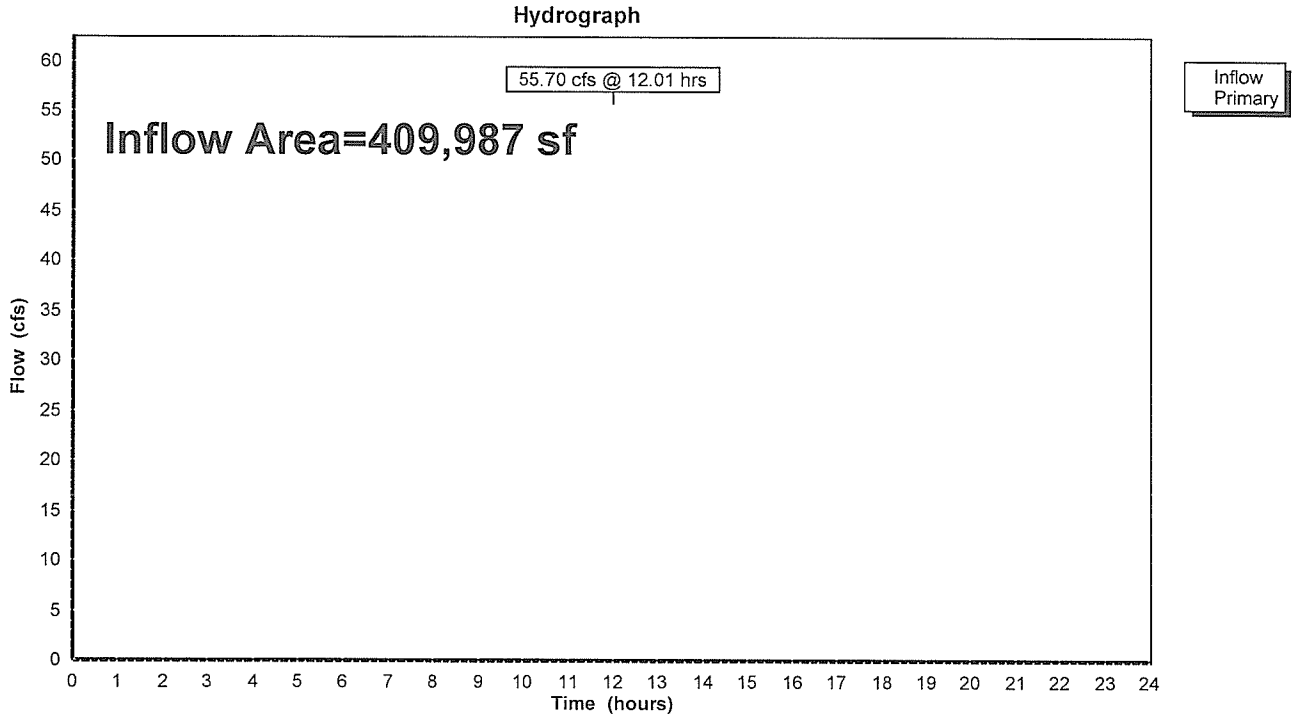


Summary for Link 24L: POI -2A PRE

Inflow Area = 409,987 sf, 78.54% Impervious, Inflow Depth > 4.03" for 10-yr event
Inflow = 55.70 cfs @ 12.01 hrs, Volume= 137,761 cf
Primary = 55.70 cfs @ 12.01 hrs, Volume= 137,761 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 24L: POI -2A PRE

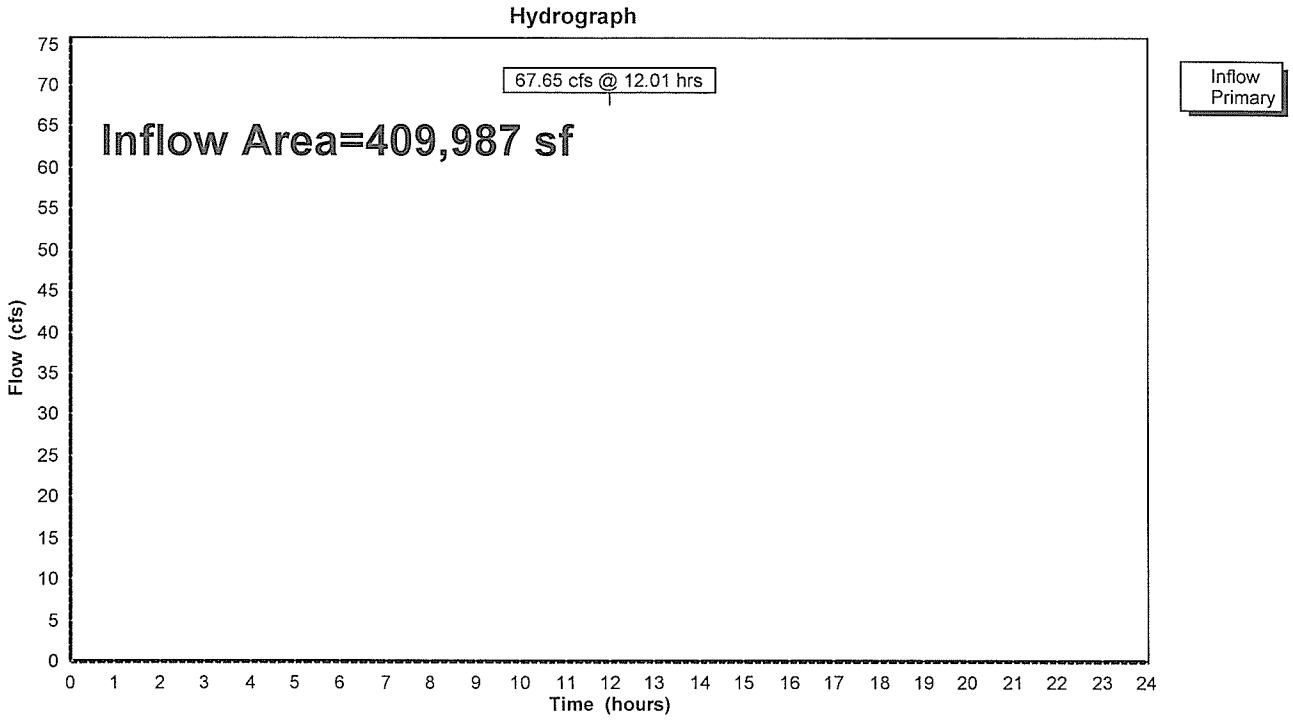


Summary for Link 24L: POI -2A PRE

Inflow Area = 409,987 sf, 78.54% Impervious, Inflow Depth > 4.96" for 25-yr event
Inflow = 67.65 cfs @ 12.01 hrs, Volume= 169,399 cf
Primary = 67.65 cfs @ 12.01 hrs, Volume= 169,399 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 24L: POI -2A PRE

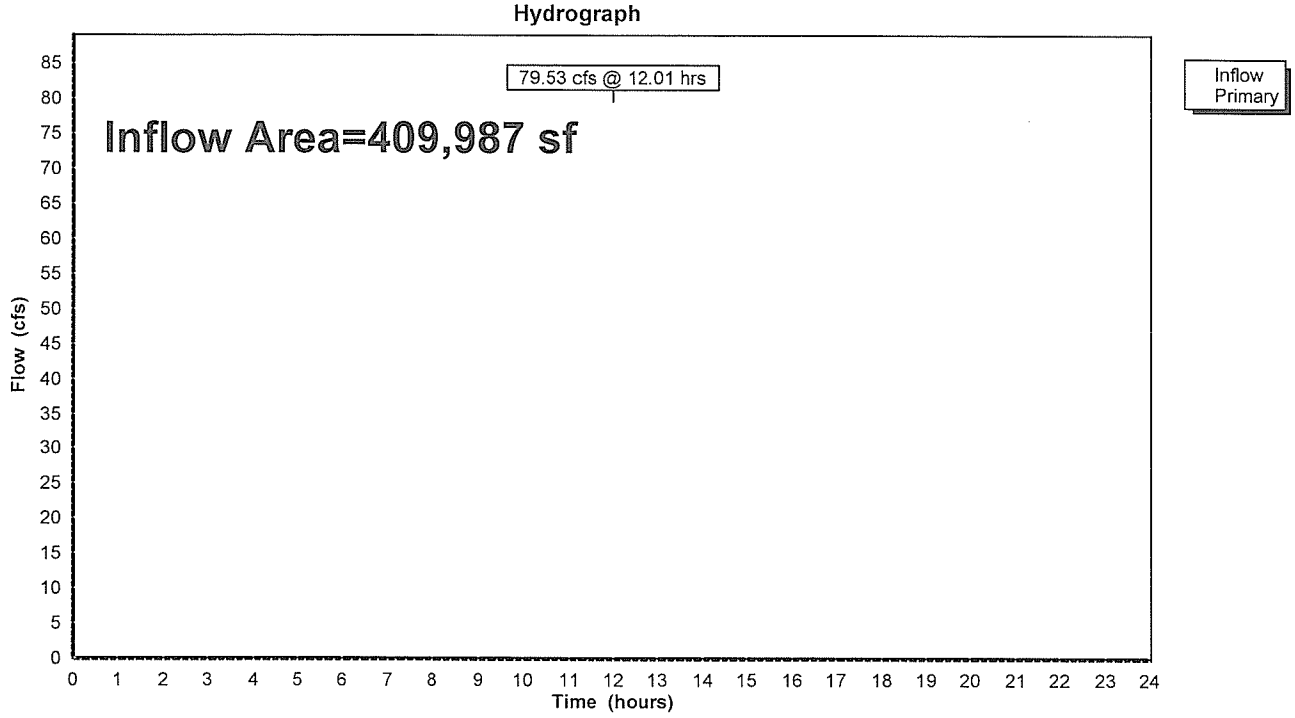


Summary for Link 24L: POI -2A PRE

Inflow Area = 409,987 sf, 78.54% Impervious, Inflow Depth > 5.89" for 50-yr event
Inflow = 79.53 cfs @ 12.01 hrs, Volume= 201,296 cf
Primary = 79.53 cfs @ 12.01 hrs, Volume= 201,296 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 24L: POI -2A PRE

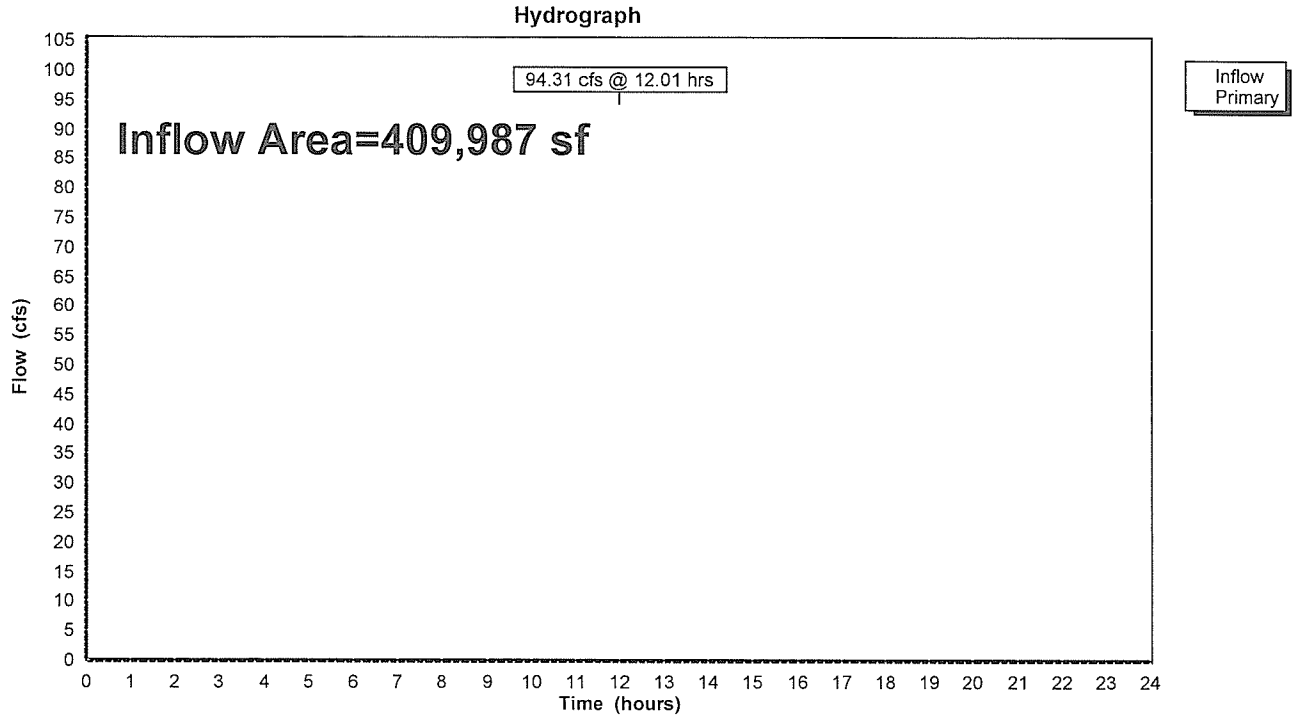


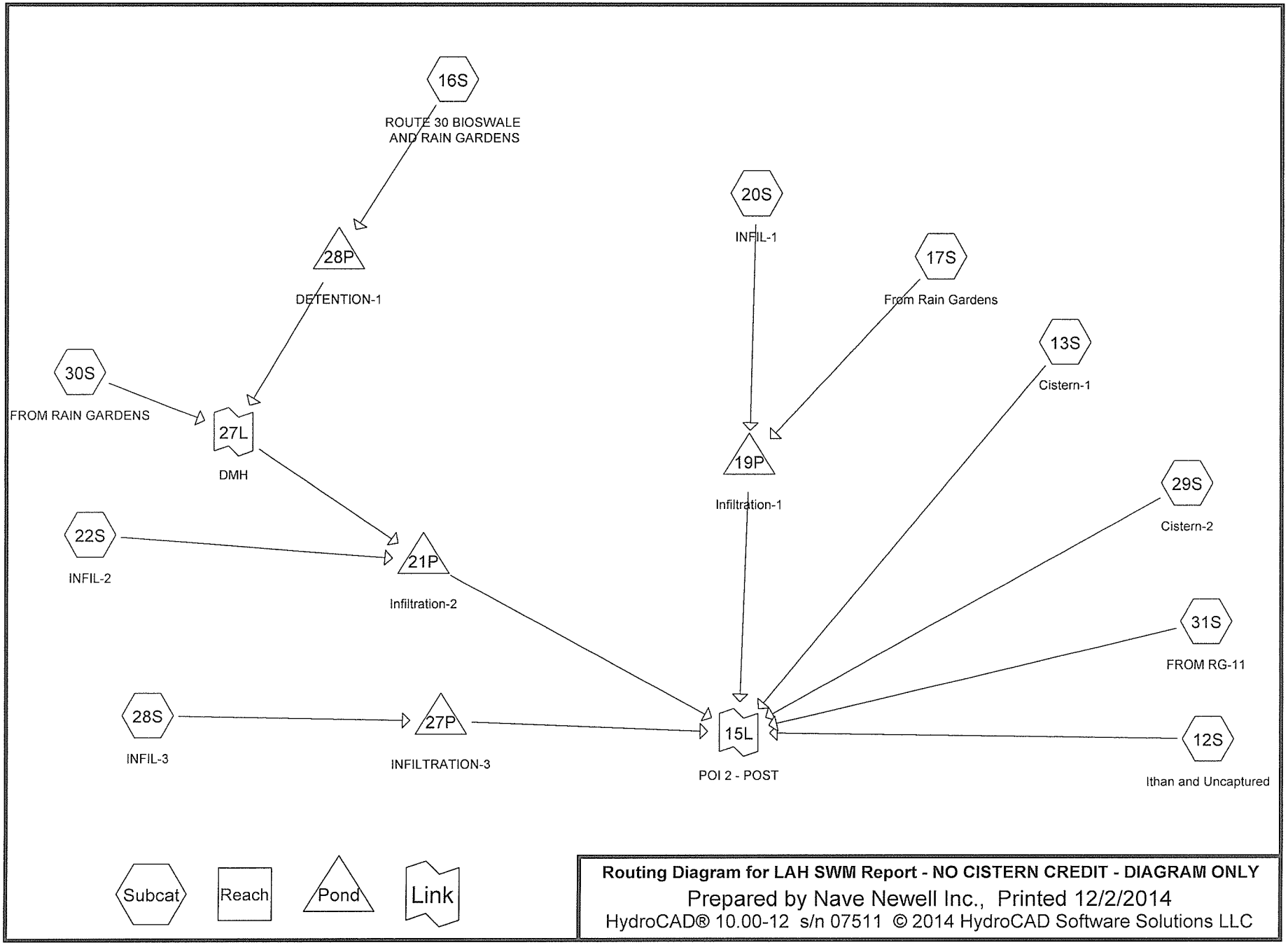
Summary for Link 24L: POI -2A PRE

Inflow Area = 409,987 sf, 78.54% Impervious, Inflow Depth > 7.07" for 100-yr event
Inflow = 94.31 cfs @ 12.01 hrs, Volume= 241,411 cf
Primary = 94.31 cfs @ 12.01 hrs, Volume= 241,411 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 24L: POI -2A PRE




16S
ROUTE 30 BIOSWALE AND RAIN GARDENS
28P
DETENTION-1
20S
INFIL-1
17S
From Rain Gardens
13S
Cistern-1
30S
FROM RAIN GARDENS
27L
DMH
19P
Infiltration-1
29S
Cistern-2
22S
INFIL-2
21P
Infiltration-2
31S
FROM RG-11
28S
INFIL-3
27P
INFILTRATION-3
15L
POI 2 - POST
12S
Ithan and Uncaptured
Subcat
Reach
Pond
Link
Routing Diagram for LAH SWM Report - NO CISTERN CREDIT - DIAGRAM ONLY
Prepared by Nave Newell Inc., Printed 12/2/2014
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Events for Link 15L: POI 2A - POST

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
1-yr	8.29	8.29	**0.00**
2-yr	11.68	11.68	0.00
5-yr	16.44	16.44	0.00
10-yr	21.99	21.99	0.00
25-yr	30.23	30.23	0.00
50-yr	39.99	39.99	0.00
100-yr	**51.21**	**51.21**	0.00

Summary for Subcatchment 20S: INFIL-1

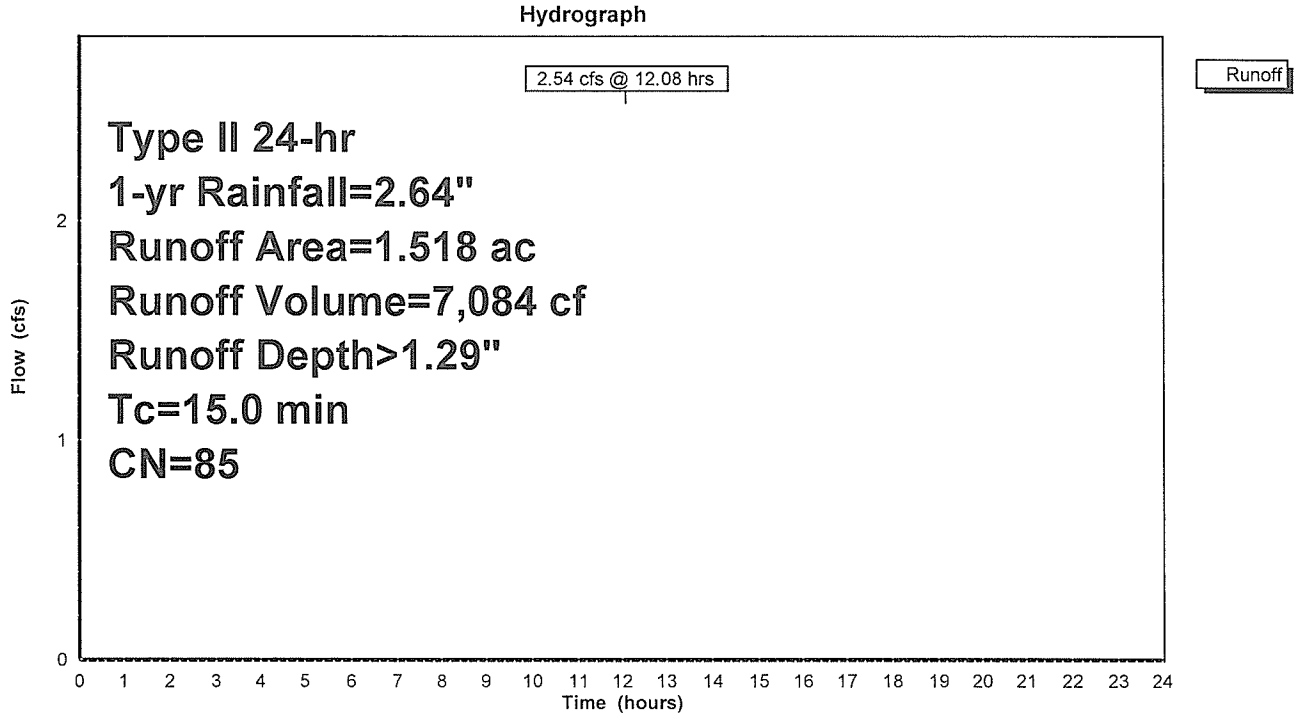
Runoff = 2.54 cfs @ 12.08 hrs, Volume= 7,084 cf, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

	Area (ac)	CN	Description
	0.619	98	Paved parking, HSG B
	0.268	61	>75% Grass cover, Good, HSG B
*	0.359	98	Roof (Rear Courtyard)
*	0.272	61	Lawn (Rear Courtyard)
	1.518	85	Weighted Average
	0.540		35.57% Pervious Area
	0.978		64.43% Impervious Area

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

Subcatchment 20S: INFIL-1



Summary for Subcatchment 20S: INFIL-1

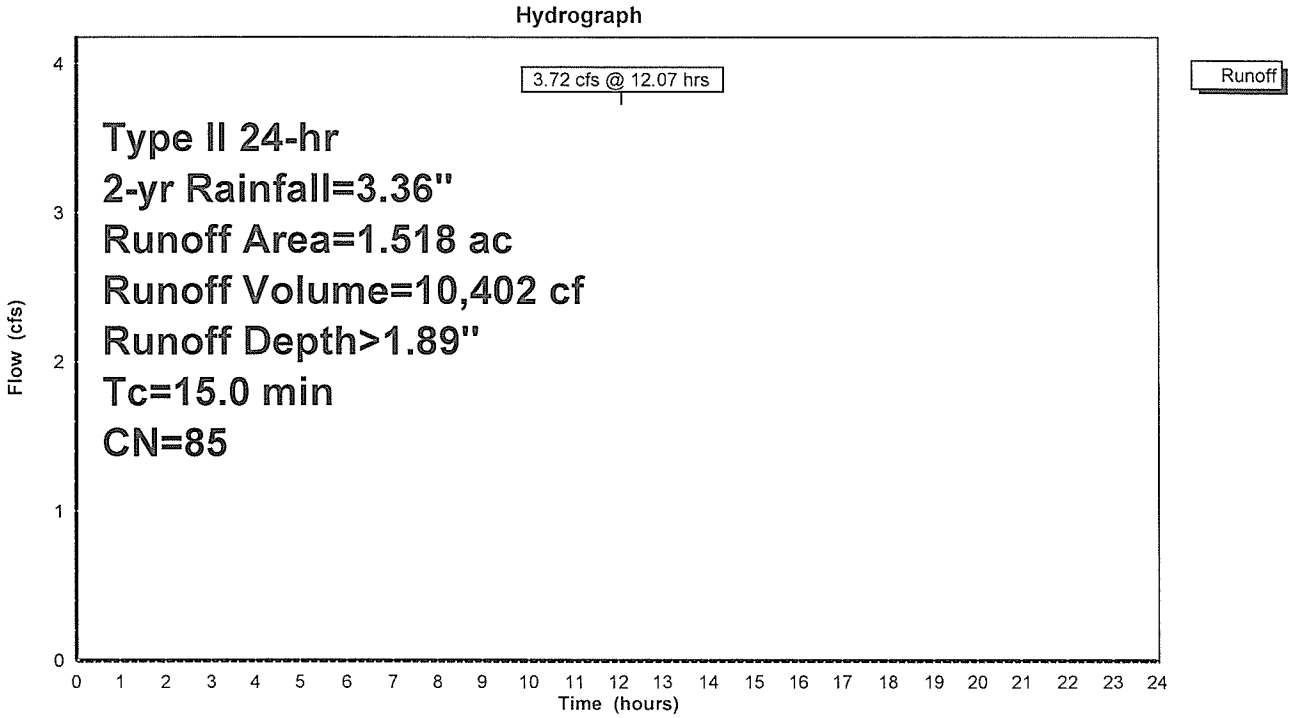
Runoff = 3.72 cfs @ 12.07 hrs, Volume= 10,402 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

	Area (ac)	CN	Description
	0.619	98	Paved parking, HSG B
	0.268	61	>75% Grass cover, Good, HSG B
*	0.359	98	Roof (Rear Courtyard)
*	0.272	61	Lawn (Rear Courtyard)
	1.518	85	Weighted Average
	0.540		35.57% Pervious Area
	0.978		64.43% Impervious Area

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

Subcatchment 20S: INFIL-1



Summary for Subcatchment 20S: INFIL-1

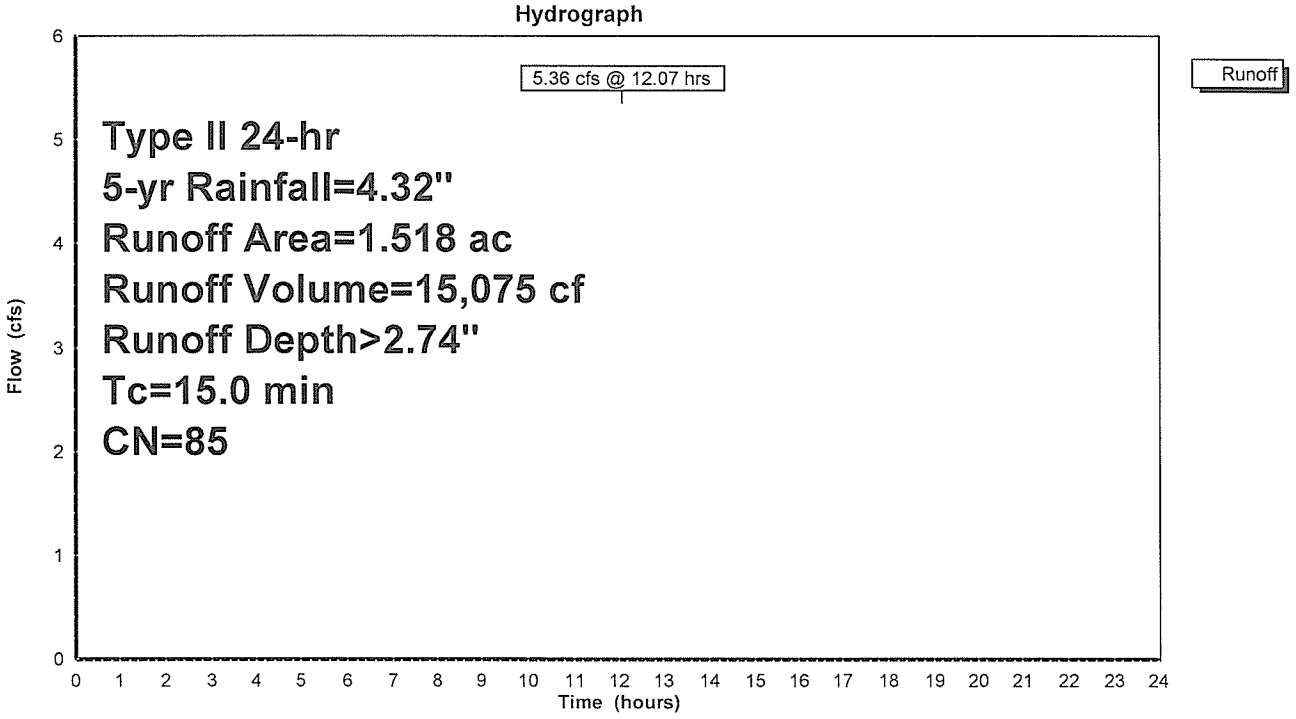
Runoff = 5.36 cfs @ 12.07 hrs, Volume= 15,075 cf, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

	Area (ac)	CN	Description
	0.619	98	Paved parking, HSG B
	0.268	61	>75% Grass cover, Good, HSG B
*	0.359	98	Roof (Rear Courtyard)
*	0.272	61	Lawn (Rear Courtyard)
	1.518	85	Weighted Average
	0.540		35.57% Pervious Area
	0.978		64.43% Impervious Area

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

Subcatchment 20S: INFIL-1



Summary for Subcatchment 20S: INFIL-1

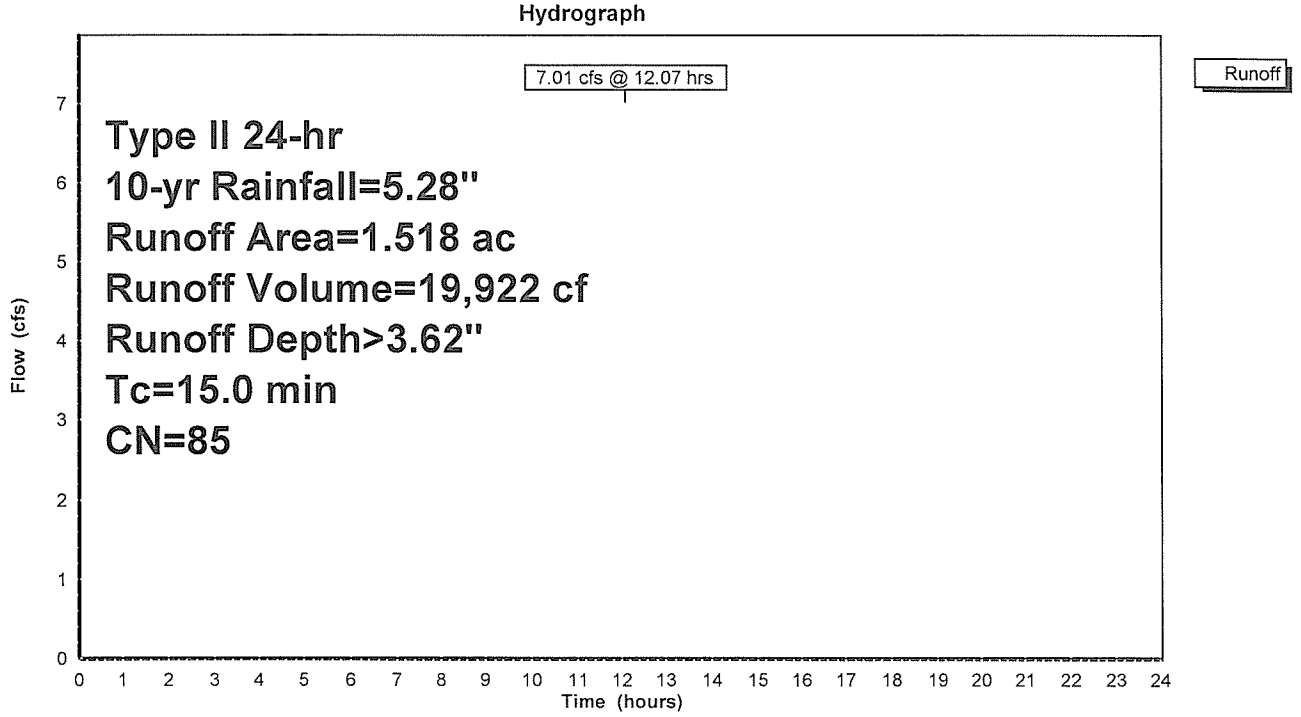
Runoff = 7.01 cfs @ 12.07 hrs, Volume= 19,922 cf, Depth> 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

	Area (ac)	CN	Description
	0.619	98	Paved parking, HSG B
	0.268	61	>75% Grass cover, Good, HSG B
*	0.359	98	Roof (Rear Courtyard)
*	0.272	61	Lawn (Rear Courtyard)
	1.518	85	Weighted Average
	0.540		35.57% Pervious Area
	0.978		64.43% Impervious Area

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

Subcatchment 20S: INFIL-1



Summary for Subcatchment 20S: INFIL-1

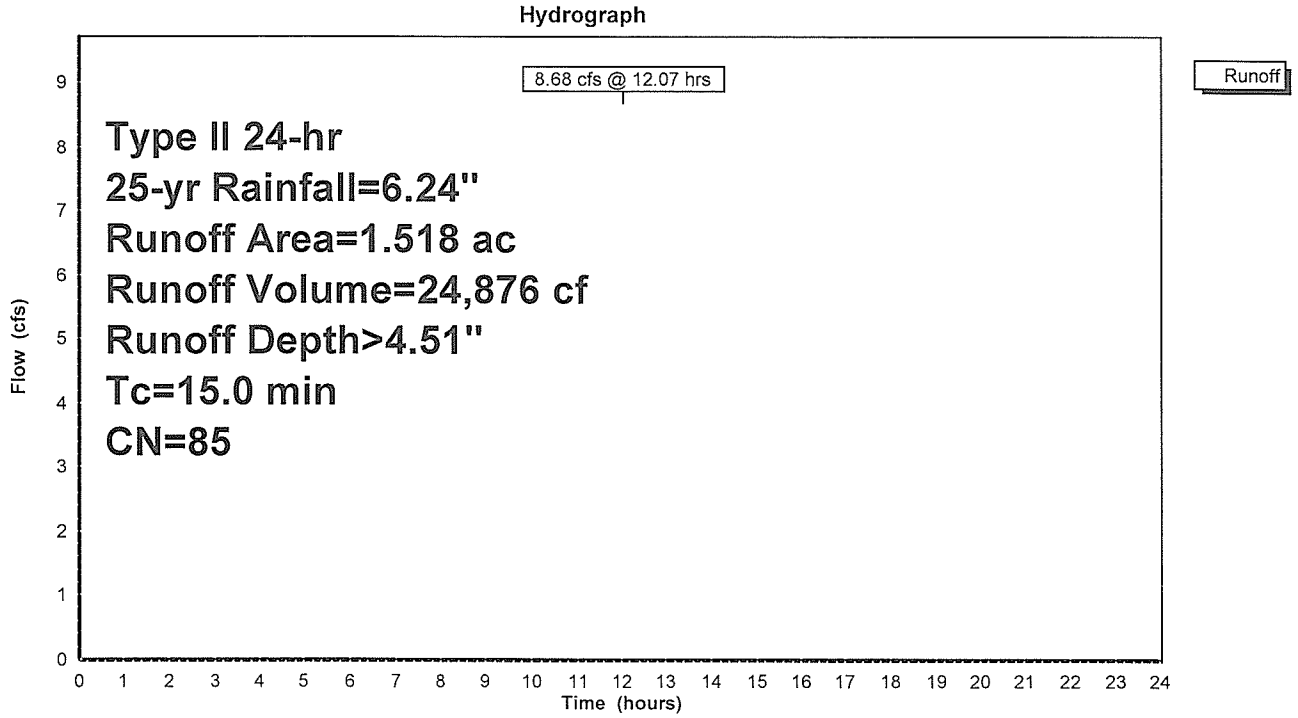
Runoff = 8.68 cfs @ 12.07 hrs, Volume= 24,876 cf, Depth> 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

	Area (ac)	CN	Description
	0.619	98	Paved parking, HSG B
	0.268	61	>75% Grass cover, Good, HSG B
*	0.359	98	Roof (Rear Courtyard)
*	0.272	61	Lawn (Rear Courtyard)
	1.518	85	Weighted Average
	0.540		35.57% Pervious Area
	0.978		64.43% Impervious Area

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

Subcatchment 20S: INFIL-1



Summary for Subcatchment 20S: INFIL-1

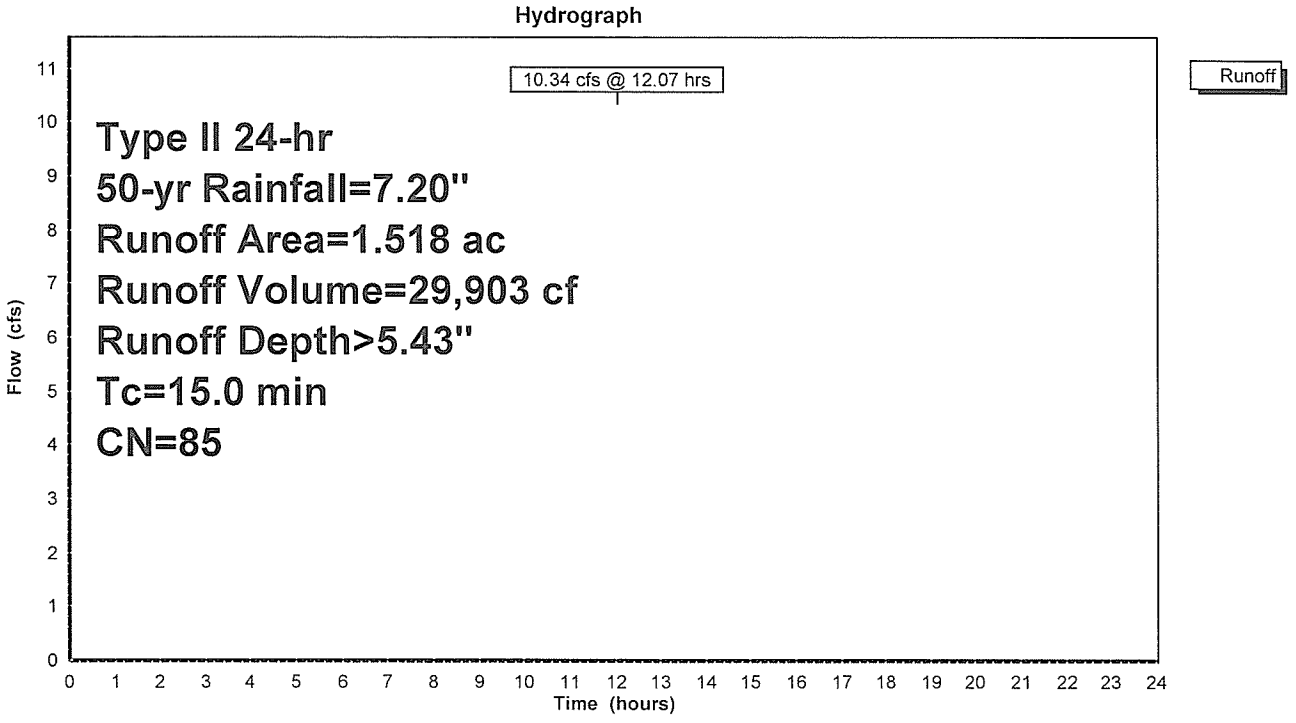
Runoff = 10.34 cfs @ 12.07 hrs, Volume= 29,903 cf, Depth> 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

	Area (ac)	CN	Description
	0.619	98	Paved parking, HSG B
	0.268	61	>75% Grass cover, Good, HSG B
*	0.359	98	Roof (Rear Courtyard)
*	0.272	61	Lawn (Rear Courtyard)
	1.518	85	Weighted Average
	0.540		35.57% Pervious Area
	0.978		64.43% Impervious Area

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

Subcatchment 20S: INFIL-1



Summary for Subcatchment 20S: INFIL-1

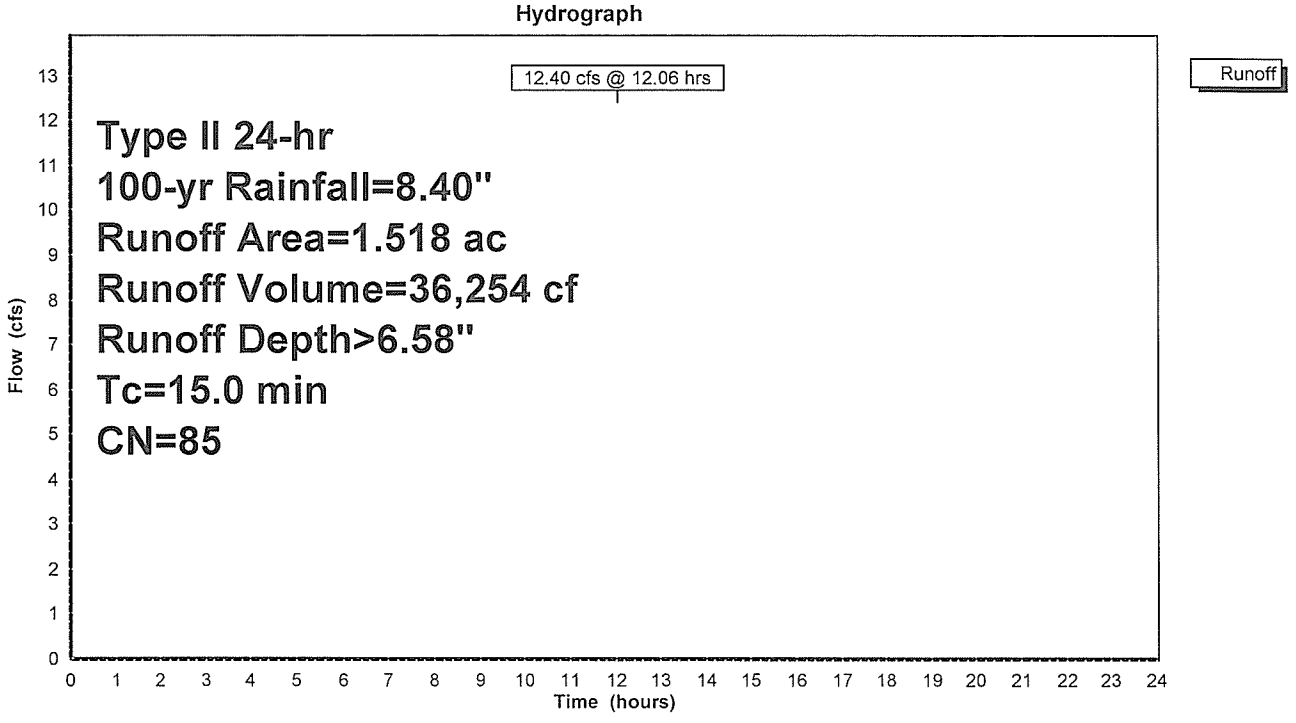
Runoff = 12.40 cfs @ 12.06 hrs, Volume= 36,254 cf, Depth> 6.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

	Area (ac)	CN	Description
	0.619	98	Paved parking, HSG B
	0.268	61	>75% Grass cover, Good, HSG B
*	0.359	98	Roof (Rear Courtyard)
*	0.272	61	Lawn (Rear Courtyard)
	1.518	85	Weighted Average
	0.540		35.57% Pervious Area
	0.978		64.43% Impervious Area

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

Subcatchment 20S: INFIL-1



Summary for Subcatchment 17S: From Rain Gardens

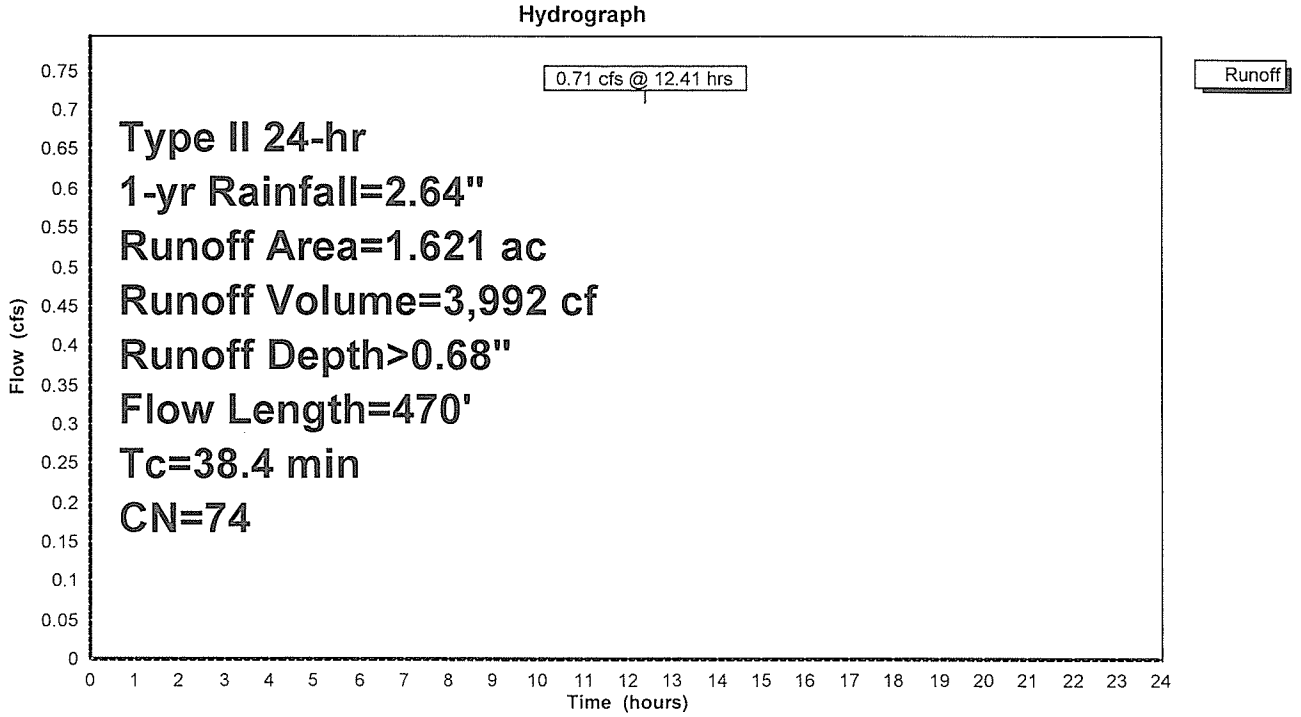
Runoff = 0.71 cfs @ 12.41 hrs, Volume= 3,992 cf, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

	Area (ac)	CN	Description
	0.945	61	>75% Grass cover, Good, HSG B
*	0.585	98	Sidewalks/roofs
	0.091	61	>75% Grass cover, Good, HSG B
	1.621	74	Weighted Average
	1.036		63.91% Pervious Area
	0.585		36.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.2	100	0.0050	0.04		**Sheet Flow, Sheet flow - courtyard** Grass: Bermuda n= 0.410 P2= 3.36"
0.6	60	0.0100	1.61		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
0.6	310	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 PVC, smooth interior
38.4	470	Total			

Subcatchment 17S: From Rain Gardens



Summary for Subcatchment 17S: From Rain Gardens

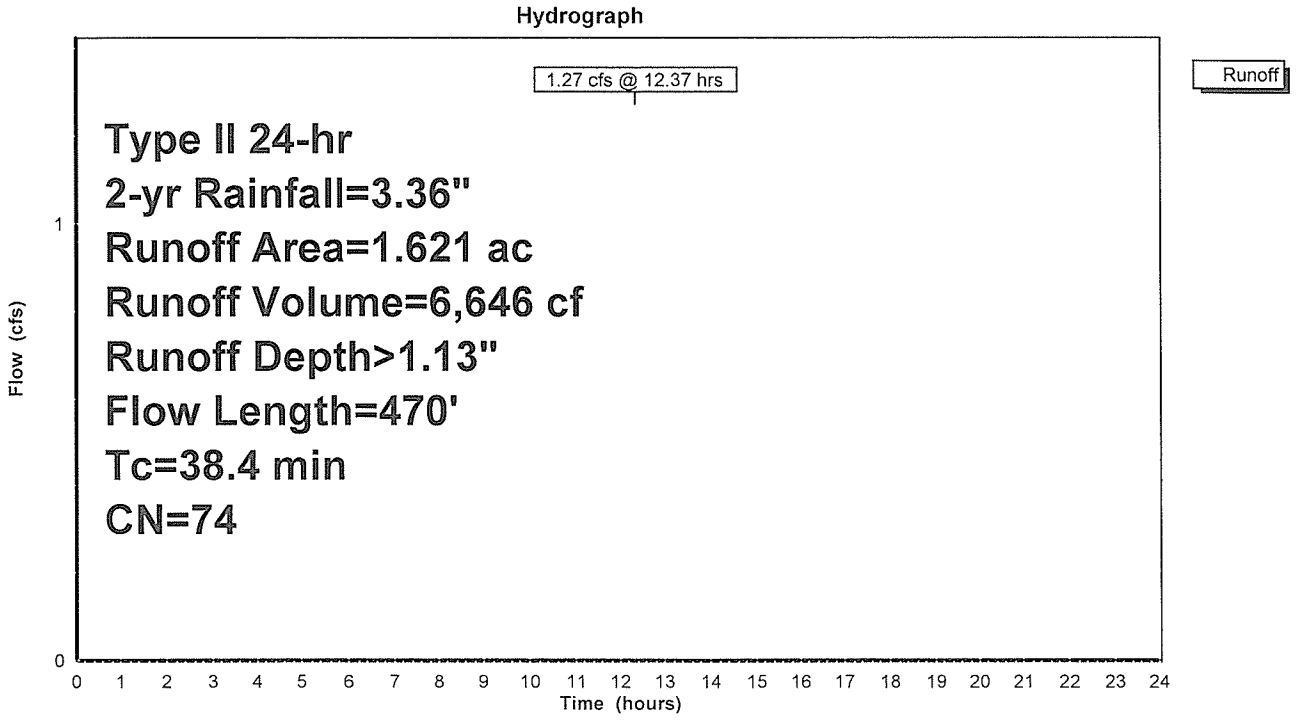
Runoff = 1.27 cfs @ 12.37 hrs, Volume= 6,646 cf, Depth> 1.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

	Area (ac)	CN	Description
	0.945	61	>75% Grass cover, Good, HSG B
*	0.585	98	Sidewalks/roofs
	0.091	61	>75% Grass cover, Good, HSG B
	1.621	74	Weighted Average
	1.036		63.91% Pervious Area
	0.585		36.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.2	100	0.0050	0.04		**Sheet Flow, Sheet flow - courtyard** Grass: Bermuda n= 0.410 P2= 3.36"
0.6	60	0.0100	1.61		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
0.6	310	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 PVC, smooth interior
38.4	470	Total			

Subcatchment 17S: From Rain Gardens



Summary for Subcatchment 17S: From Rain Gardens

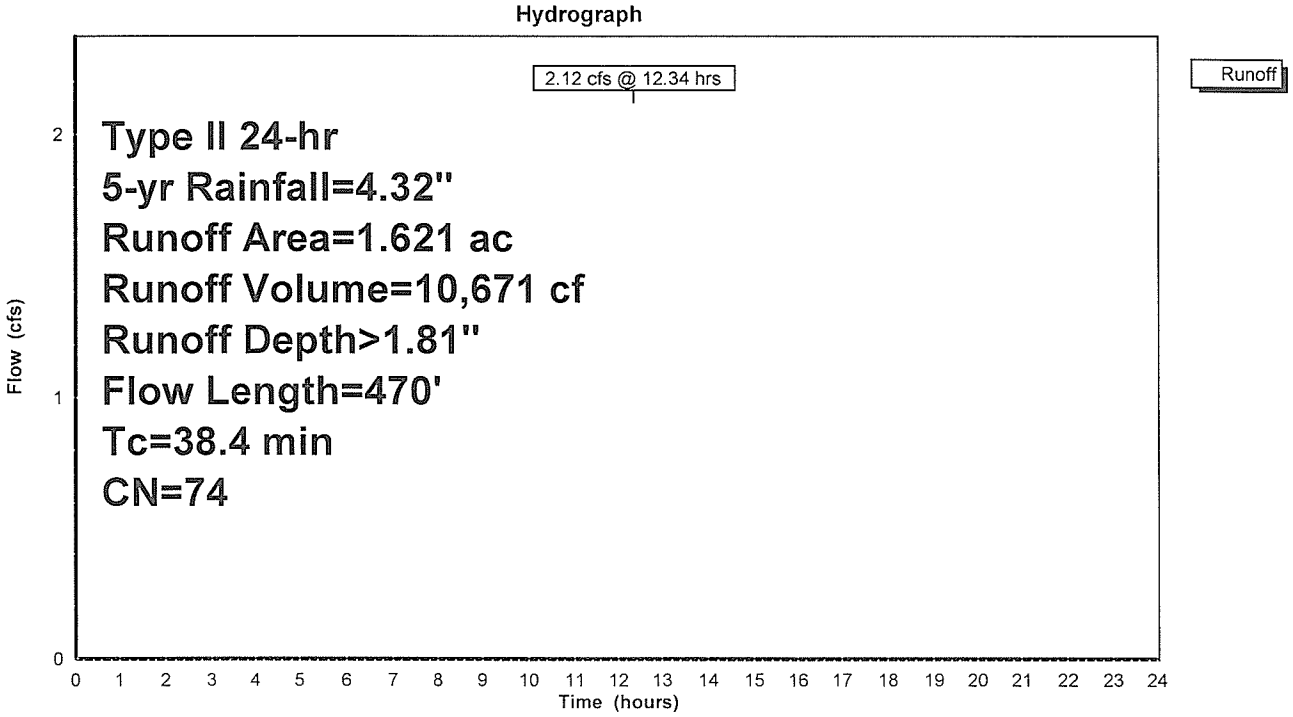
Runoff = 2.12 cfs @ 12.34 hrs, Volume= 10,671 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

	Area (ac)	CN	Description
	0.945	61	>75% Grass cover, Good, HSG B
*	0.585	98	Sidewalks/roofs
	0.091	61	>75% Grass cover, Good, HSG B
	1.621	74	Weighted Average
	1.036		63.91% Pervious Area
	0.585		36.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.2	100	0.0050	0.04		**Sheet Flow, Sheet flow - courtyard** Grass: Bermuda n= 0.410 P2= 3.36"
0.6	60	0.0100	1.61		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
0.6	310	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 PVC, smooth interior
38.4	470	Total			

Subcatchment 17S: From Rain Gardens



Summary for Subcatchment 17S: From Rain Gardens

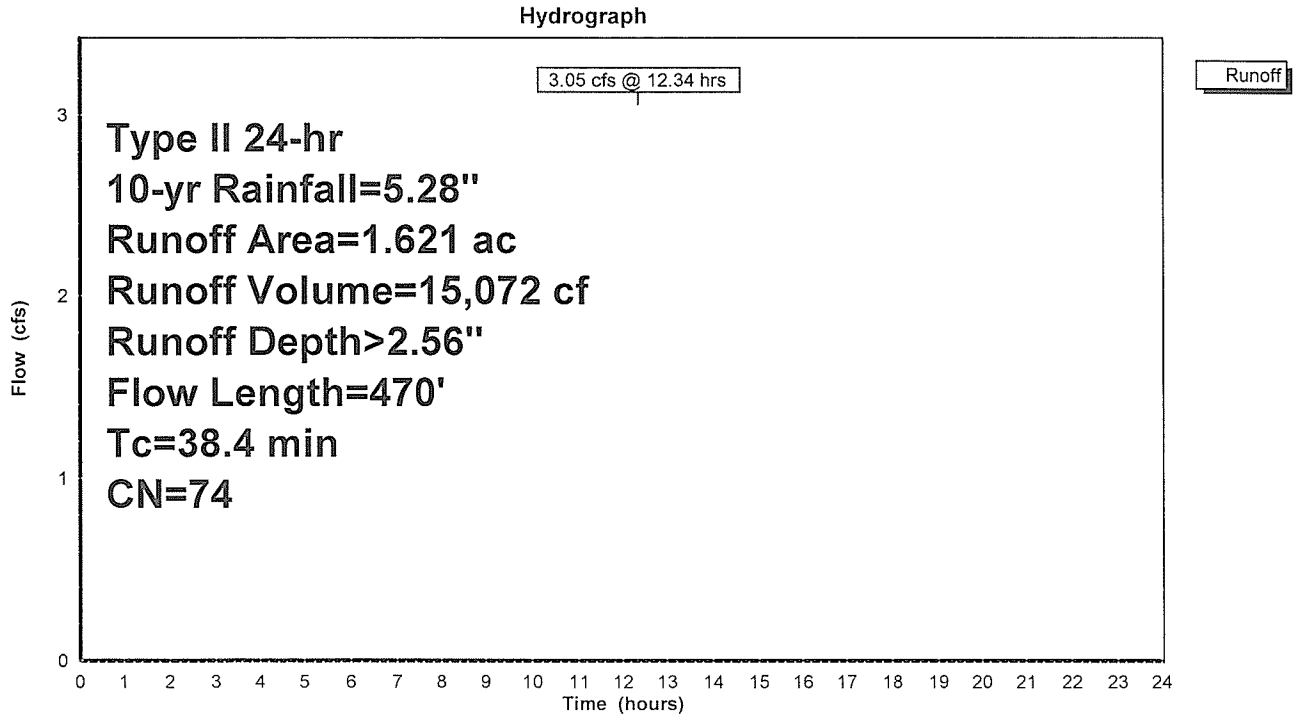
Runoff = 3.05 cfs @ 12.34 hrs, Volume= 15,072 cf, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

	Area (ac)	CN	Description
	0.945	61	>75% Grass cover, Good, HSG B
*	0.585	98	Sidewalks/roofs
	0.091	61	>75% Grass cover, Good, HSG B
	1.621	74	Weighted Average
	1.036		63.91% Pervious Area
	0.585		36.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.2	100	0.0050	0.04		**Sheet Flow, Sheet flow - courtyard** Grass: Bermuda n= 0.410 P2= 3.36"
0.6	60	0.0100	1.61		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
0.6	310	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 PVC, smooth interior
38.4	470	Total			

Subcatchment 17S: From Rain Gardens



Summary for Subcatchment 17S: From Rain Gardens

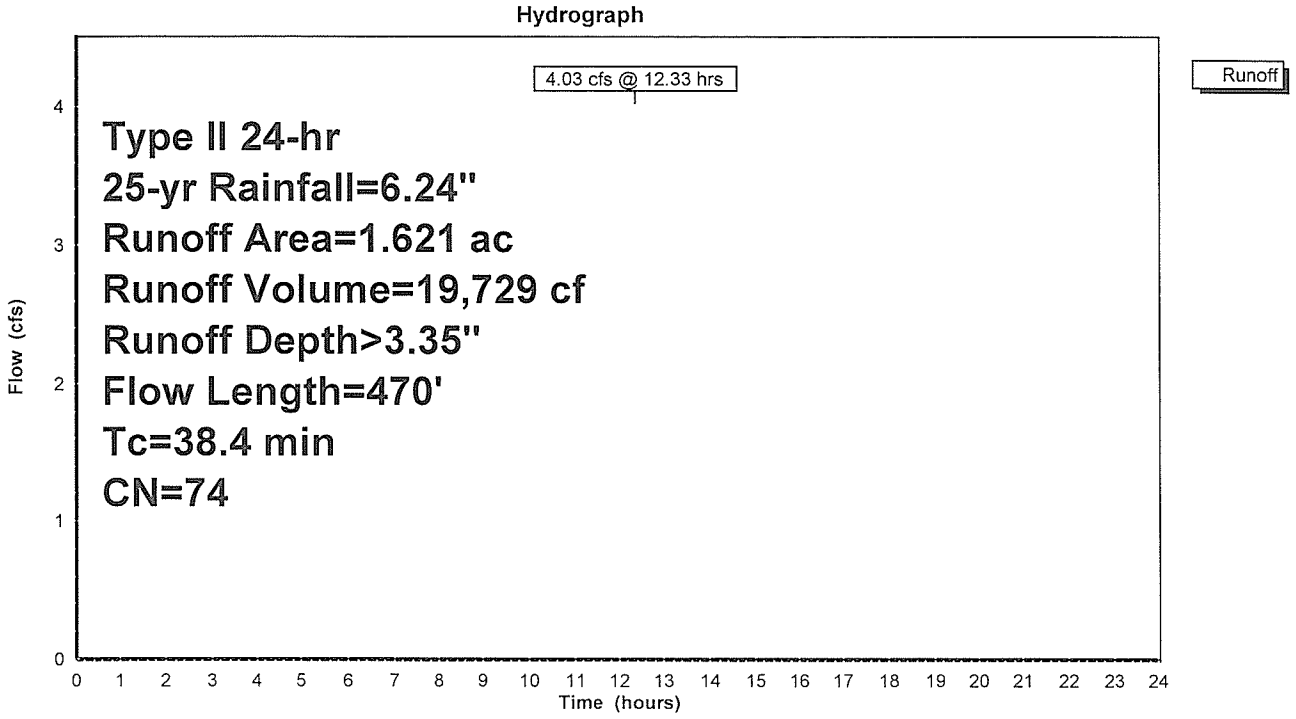
Runoff = 4.03 cfs @ 12.33 hrs, Volume= 19,729 cf, Depth> 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

	Area (ac)	CN	Description
	0.945	61	>75% Grass cover, Good, HSG B
*	0.585	98	Sidewalks/roofs
	0.091	61	>75% Grass cover, Good, HSG B
	1.621	74	Weighted Average
	1.036		63.91% Pervious Area
	0.585		36.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.2	100	0.0050	0.04		**Sheet Flow, Sheet flow - courtyard** Grass: Bermuda n= 0.410 P2= 3.36"
0.6	60	0.0100	1.61		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
0.6	310	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 PVC, smooth interior
38.4	470	Total			

Subcatchment 17S: From Rain Gardens



Summary for Subcatchment 17S: From Rain Gardens

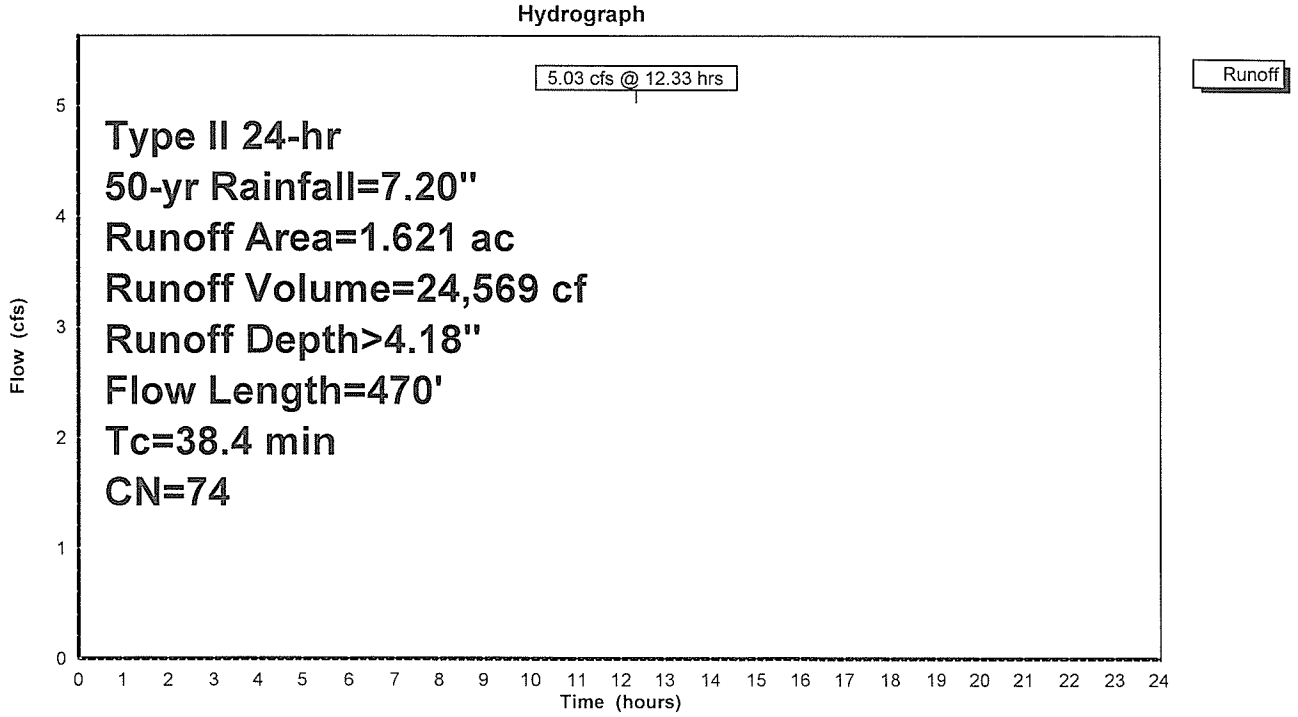
Runoff = 5.03 cfs @ 12.33 hrs, Volume= 24,569 cf, Depth> 4.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

	Area (ac)	CN	Description
	0.945	61	>75% Grass cover, Good, HSG B
*	0.585	98	Sidewalks/roofs
	0.091	61	>75% Grass cover, Good, HSG B
	1.621	74	Weighted Average
	1.036		63.91% Pervious Area
	0.585		36.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.2	100	0.0050	0.04		**Sheet Flow, Sheet flow - courtyard** Grass: Bermuda n= 0.410 P2= 3.36"
0.6	60	0.0100	1.61		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
0.6	310	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 PVC, smooth interior
38.4	470	Total			

Subcatchment 17S: From Rain Gardens



Summary for Subcatchment 17S: From Rain Gardens

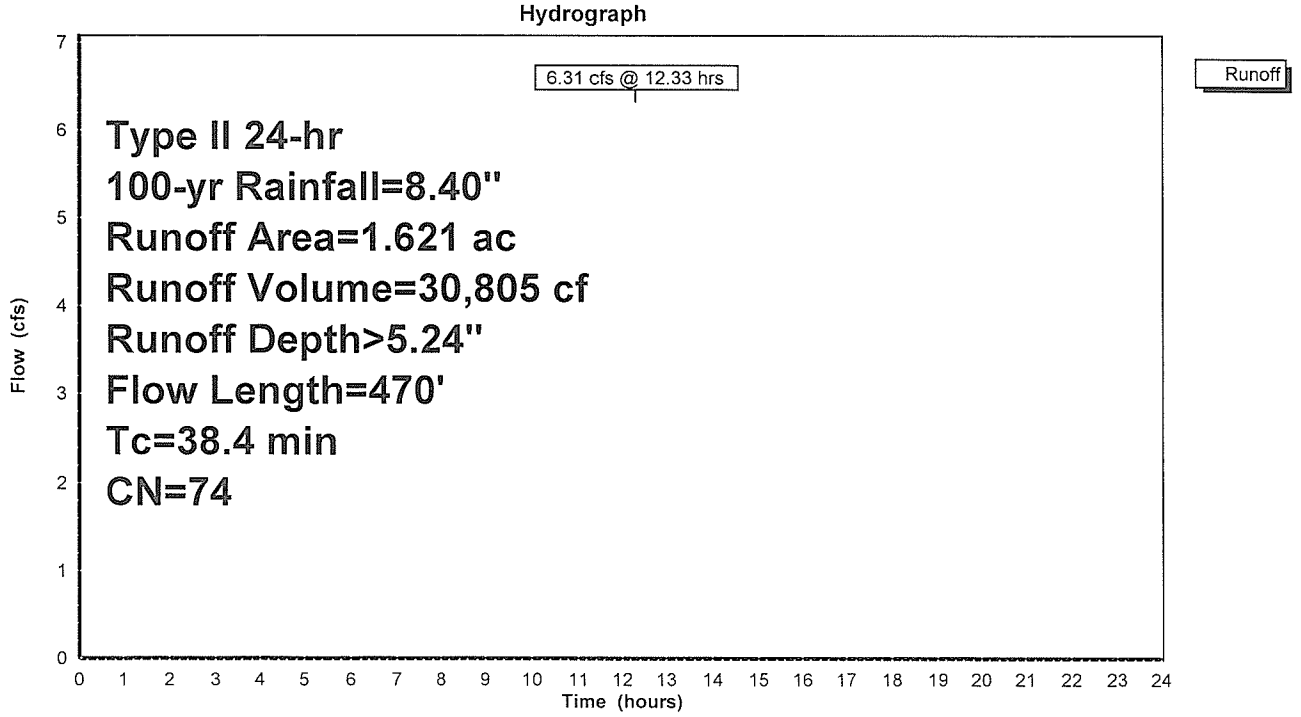
Runoff = 6.31 cfs @ 12.33 hrs, Volume= 30,805 cf, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

	Area (ac)	CN	Description
	0.945	61	>75% Grass cover, Good, HSG B
*	0.585	98	Sidewalks/roofs
	0.091	61	>75% Grass cover, Good, HSG B
	1.621	74	Weighted Average
	1.036		63.91% Pervious Area
	0.585		36.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.2	100	0.0050	0.04		**Sheet Flow, Sheet flow - courtyard** Grass: Bermuda n= 0.410 P2= 3.36"
0.6	60	0.0100	1.61		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
0.6	310	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 PVC, smooth interior
38.4	470	Total			

Subcatchment 17S: From Rain Gardens



Events for Pond 19P: Infiltration-1

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	2.79	0.34	424.31	7,843
2-yr	4.25	1.18	424.71	9,780
5-yr	6.33	2.97	425.09	11,489
10-yr	8.48	4.95	425.47	12,963
25-yr	10.67	6.90	426.02	14,505
50-yr	12.89	10.59	426.31	15,248
100-yr	**15.67**	**12.24**	**426.80**	**16,490**

Summary for Pond 19P: Infiltration-1

Inflow Area = 136,735 sf, 49.79% Impervious, Inflow Depth > 0.97" for 1-yr event
Inflow = 2.79 cfs @ 12.08 hrs, Volume= 11,076 cf
Outflow = 0.34 cfs @ 13.39 hrs, Volume= 8,941 cf, Atten= 88%, Lag= 78.1 min
Primary = 0.34 cfs @ 13.39 hrs, Volume= 8,941 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 423.30' Surf.Area= 6,399 sf Storage= 2,560 cf
Peak Elev= 424.31' @ 13.39 hrs Surf.Area= 6,399 sf Storage= 7,843 cf (5,284 cf above start)

Plug-Flow detention time= 349.5 min calculated for 6,381 cf (58% of inflow)
Center-of-Mass det. time= 143.5 min (1,001.4 - 857.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	422.30'	8,200 cf	**49.00'W x 130.60'L x 4.50'H Field A** 28,797 cf Overall - 8,298 cf Embedded = 20,500 cf x 40.0% Voids
#2A	423.30'	8,298 cf	**ADS_StormTech SC-740**x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 10 rows
		16,497 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	423.30'	**30.0" Round Culvert** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 423.30' / 422.00' S= 0.0371 '/' Cc= 0.900 n= 0.110, Flow Area= 4.91 sf
#2	Device 1	426.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.8' Crest Height
#3	Device 1	423.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	424.30'	**15.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.34 cfs @ 13.39 hrs HW=424.31' (Free Discharge)
└─**1=Culvert** (Passes 0.34 cfs of 1.98 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 3.85 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.24 fps)

Pond 19P: Infiltration-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech®SC-740 (ADSStormTech®SC-740)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 10 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

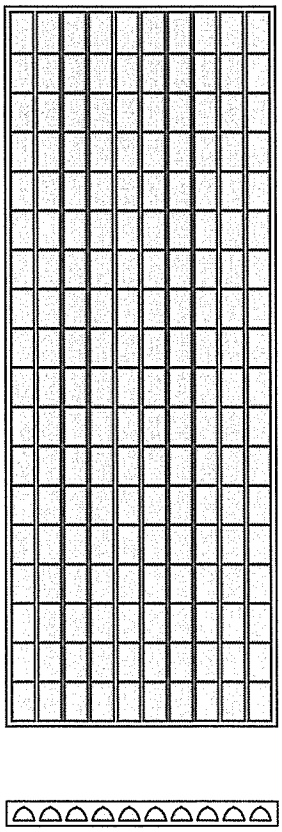
18 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 128.60' Row Length +12.0" End Stone x 2 = 130.60' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
12.0" Base + 30.0" Chamber Height + 12.0" Cover = 4.50' Field Height

180 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 10 Rows = 8,297.6 cf Chamber Storage

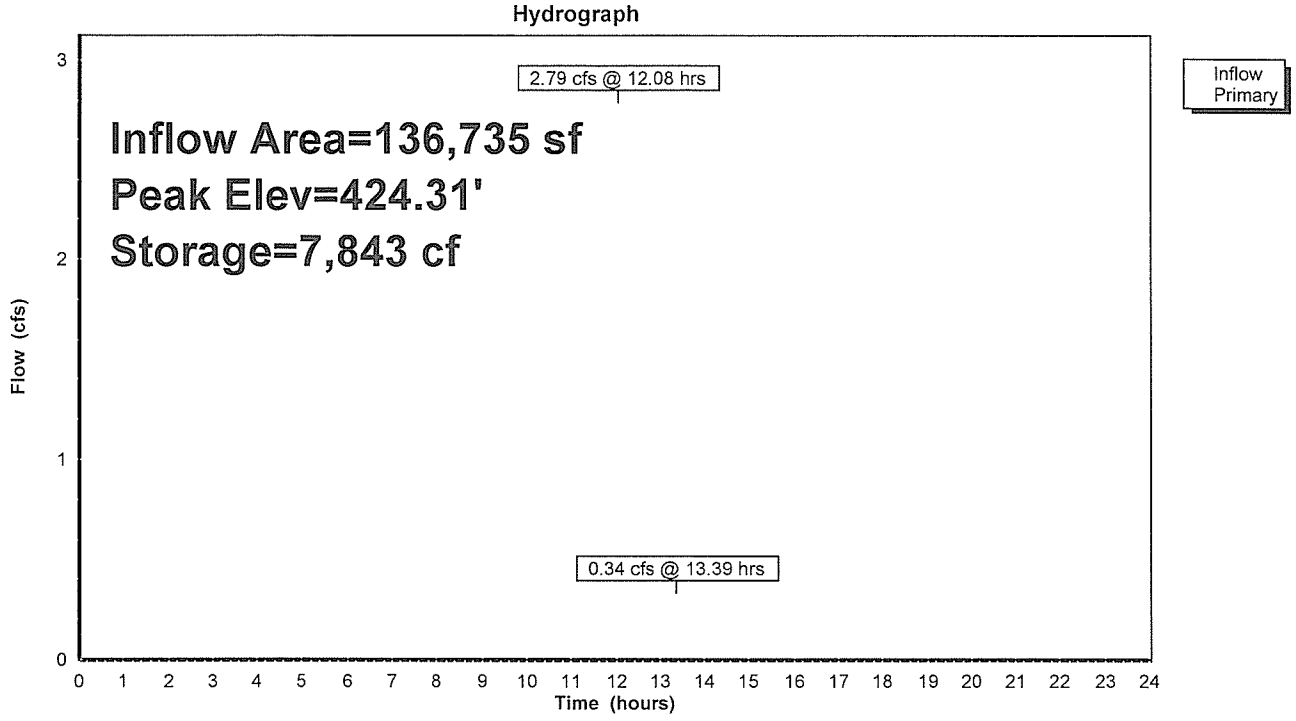
28,797.3 cf Field - 8,297.6 cf Chambers = 20,499.7 cf Stone x 40.0% Voids = 8,199.9 cf Stone Storage

Chamber Storage + Stone Storage = 16,497.5 cf = 0.379 af
Overall Storage Efficiency = 57.3%

180 Chambers
1,066.6 cy Field
759.2 cy Stone



Pond 19P: Infiltration-1



Summary for Pond 19P: Infiltration-1

Inflow Area = 136,735 sf, 49.79% Impervious, Inflow Depth > 1.50" for 2-yr event
Inflow = 4.25 cfs @ 12.08 hrs, Volume= 17,047 cf
Outflow = 1.18 cfs @ 12.70 hrs, Volume= 14,613 cf, Atten= 72%, Lag= 37.1 min
Primary = 1.18 cfs @ 12.70 hrs, Volume= 14,613 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 423.30' Surf.Area= 6,399 sf Storage= 2,560 cf
Peak Elev= 424.71' @ 12.70 hrs Surf.Area= 6,399 sf Storage= 9,780 cf (7,220 cf above start)

Plug-Flow detention time= 267.3 min calculated for 12,053 cf (71% of inflow)
Center-of-Mass det. time= 119.6 min (966.4 - 846.8)

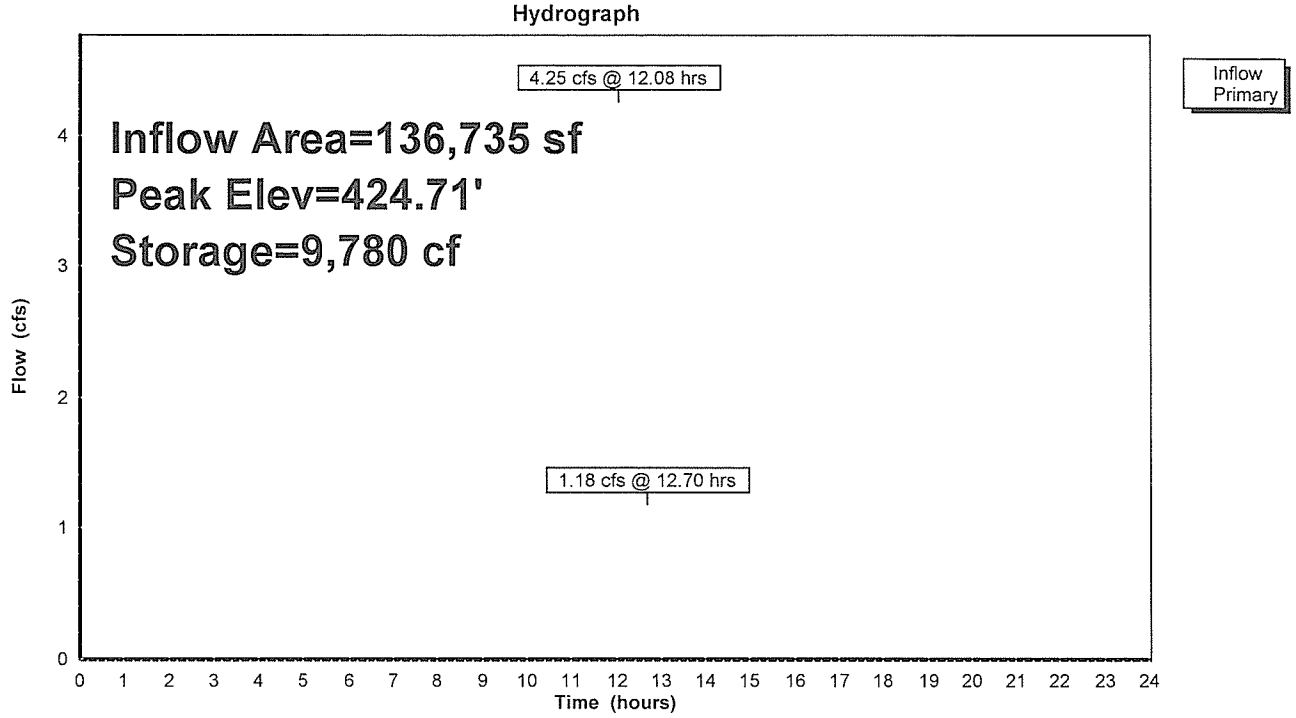
Volume	Invert	Avail.Storage	Storage Description
#1A	422.30'	8,200 cf	**49.00'W x 130.60'L x 4.50'H Field A** 28,797 cf Overall - 8,298 cf Embedded = 20,500 cf x 40.0% Voids
#2A	423.30'	8,298 cf	**ADS_StormTech SC-740** x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 10 rows
		16,497 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	423.30'	**30.0" Round Culvert** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 423.30' / 422.00' S= 0.0371 '/' Cc= 0.900 n= 0.110, Flow Area= 4.91 sf
#2	Device 1	426.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.8' Crest Height
#3	Device 1	423.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	424.30'	**15.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.18 cfs @ 12.70 hrs HW=424.71' (Free Discharge)
└**1=Culvert** (Passes 1.18 cfs of 3.79 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.43 cfs @ 4.91 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.75 cfs @ 2.17 fps)

Pond 19P: Infiltration-1



Summary for Pond 19P: Infiltration-1

Inflow Area = 136,735 sf, 49.79% Impervious, Inflow Depth > 2.26" for 5-yr event
Inflow = 6.33 cfs @ 12.08 hrs, Volume= 25,746 cf
Outflow = 2.97 cfs @ 12.46 hrs, Volume= 22,821 cf, Atten= 53%, Lag= 22.9 min
Primary = 2.97 cfs @ 12.46 hrs, Volume= 22,821 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 423.30' Surf.Area= 6,399 sf Storage= 2,560 cf
Peak Elev= 425.09' @ 12.46 hrs Surf.Area= 6,399 sf Storage= 11,489 cf (8,929 cf above start)

Plug-Flow detention time= 196.5 min calculated for 20,261 cf (79% of inflow)
Center-of-Mass det. time= 88.0 min (924.3 - 836.3)

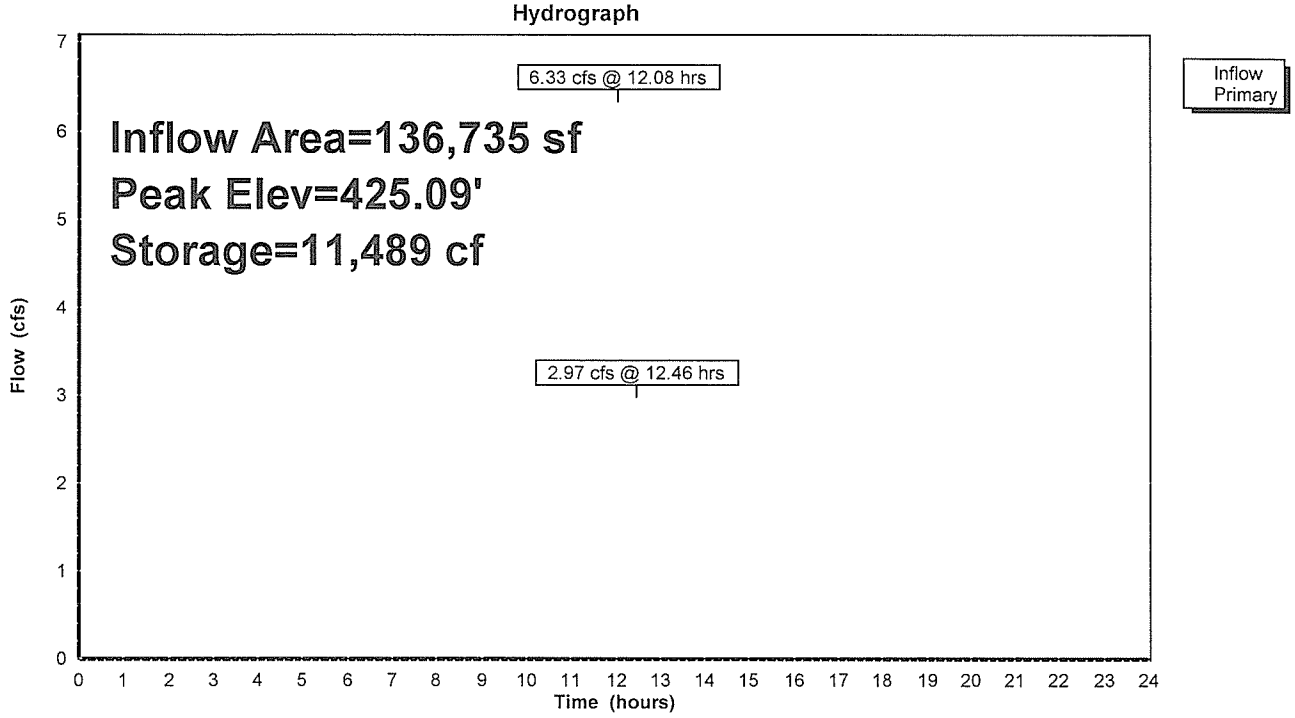
Volume	Invert	Avail.Storage	Storage Description
#1A	422.30'	8,200 cf	**49.00'W x 130.60'L x 4.50'H Field A** 28,797 cf Overall - 8,298 cf Embedded = 20,500 cf x 40.0% Voids
#2A	423.30'	8,298 cf	**ADS_StormTech SC-740** x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 10 rows
		16,497 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	423.30'	**30.0" Round Culvert** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 423.30' / 422.00' S= 0.0371 '/' Cc= 0.900 n= 0.110, Flow Area= 4.91 sf
#2	Device 1	426.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.8' Crest Height
#3	Device 1	423.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	424.30'	**15.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.97 cfs @ 12.46 hrs HW=425.09' (Free Discharge)
└**1=Culvert** (Passes 2.97 cfs of 5.88 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.50 cfs @ 5.74 fps)
  └**4=Orifice/Grate** (Orifice Controls 2.47 cfs @ 3.02 fps)

Pond 19P: Infiltration-1



Summary for Pond 19P: Infiltration-1

Inflow Area = 136,735 sf, 49.79% Impervious, Inflow Depth > 3.07" for 10-yr event
Inflow = 8.48 cfs @ 12.08 hrs, Volume= 34,994 cf
Outflow = 4.95 cfs @ 12.35 hrs, Volume= 31,511 cf, Atten= 42%, Lag= 15.8 min
Primary = 4.95 cfs @ 12.35 hrs, Volume= 31,511 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 423.30' Surf.Area= 6,399 sf Storage= 2,560 cf
Peak Elev= 425.47' @ 12.35 hrs Surf.Area= 6,399 sf Storage= 12,963 cf (10,404 cf above start)

Plug-Flow detention time= 157.5 min calculated for 28,951 cf (83% of inflow)
Center-of-Mass det. time= 68.5 min (897.1 - 828.5)

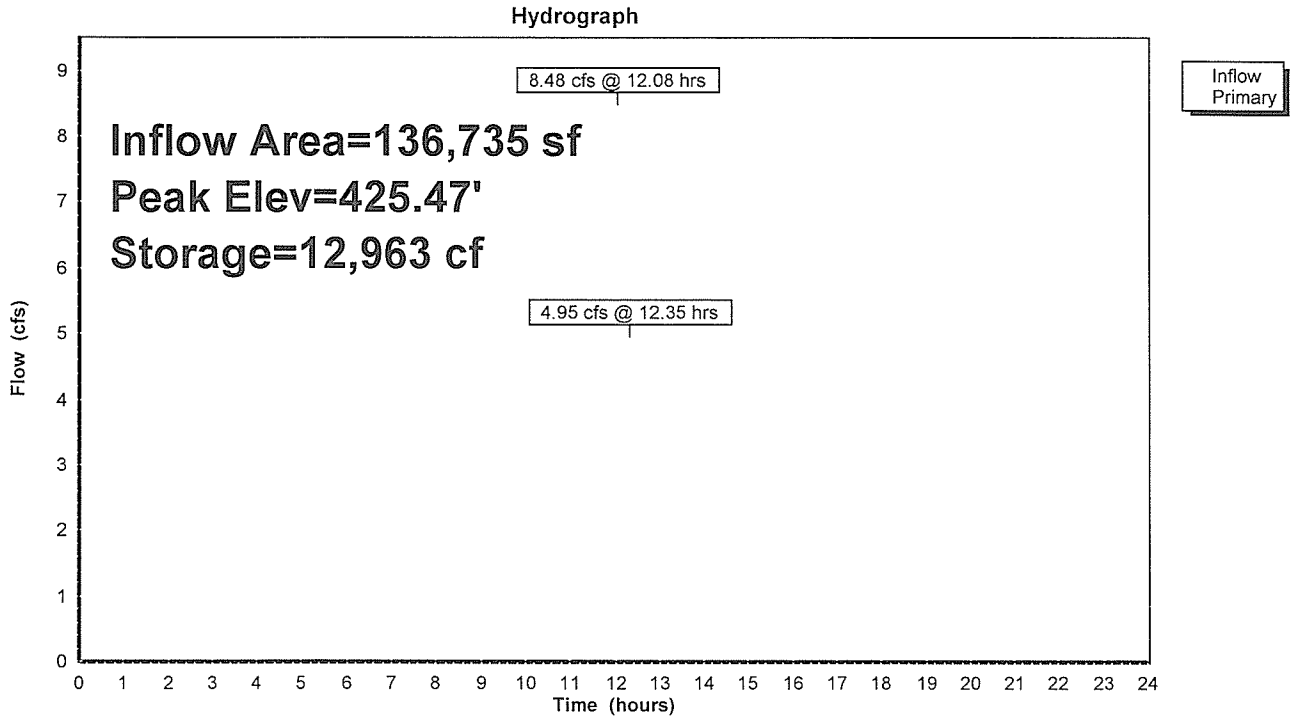
Volume	Invert	Avail.Storage	Storage Description
#1A	422.30'	8,200 cf	**49.00'W x 130.60'L x 4.50'H Field A** 28,797 cf Overall - 8,298 cf Embedded = 20,500 cf x 40.0% Voids
#2A	423.30'	8,298 cf	**ADS_StormTech SC-740**x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 10 rows
		16,497 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	423.30'	**30.0" Round Culvert** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 423.30' / 422.00' S= 0.0371 '/' Cc= 0.900 n= 0.110, Flow Area= 4.91 sf
#2	Device 1	426.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.8' Crest Height
#3	Device 1	423.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	424.30'	**15.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=4.95 cfs @ 12.35 hrs HW=425.47' (Free Discharge)
└**1=Culvert** (Passes 4.95 cfs of 8.09 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.56 cfs @ 6.46 fps)
  └**4=Orifice/Grate** (Orifice Controls 4.39 cfs @ 3.68 fps)

Pond 19P: Infiltration-1



Summary for Pond 19P: Infiltration-1

Inflow Area = 136,735 sf, 49.79% Impervious, Inflow Depth > 3.91" for 25-yr event
Inflow = 10.67 cfs @ 12.08 hrs, Volume= 44,606 cf
Outflow = 6.90 cfs @ 12.29 hrs, Volume= 40,575 cf, Atten= 35%, Lag= 12.6 min
Primary = 6.90 cfs @ 12.29 hrs, Volume= 40,575 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 423.30' Surf.Area= 6,399 sf Storage= 2,560 cf
Peak Elev= 426.02' @ 12.29 hrs Surf.Area= 6,399 sf Storage= 14,505 cf (11,945 cf above start)

Plug-Flow detention time= 133.2 min calculated for 37,999 cf (85% of inflow)
Center-of-Mass det. time= 56.0 min (878.3 - 822.3)

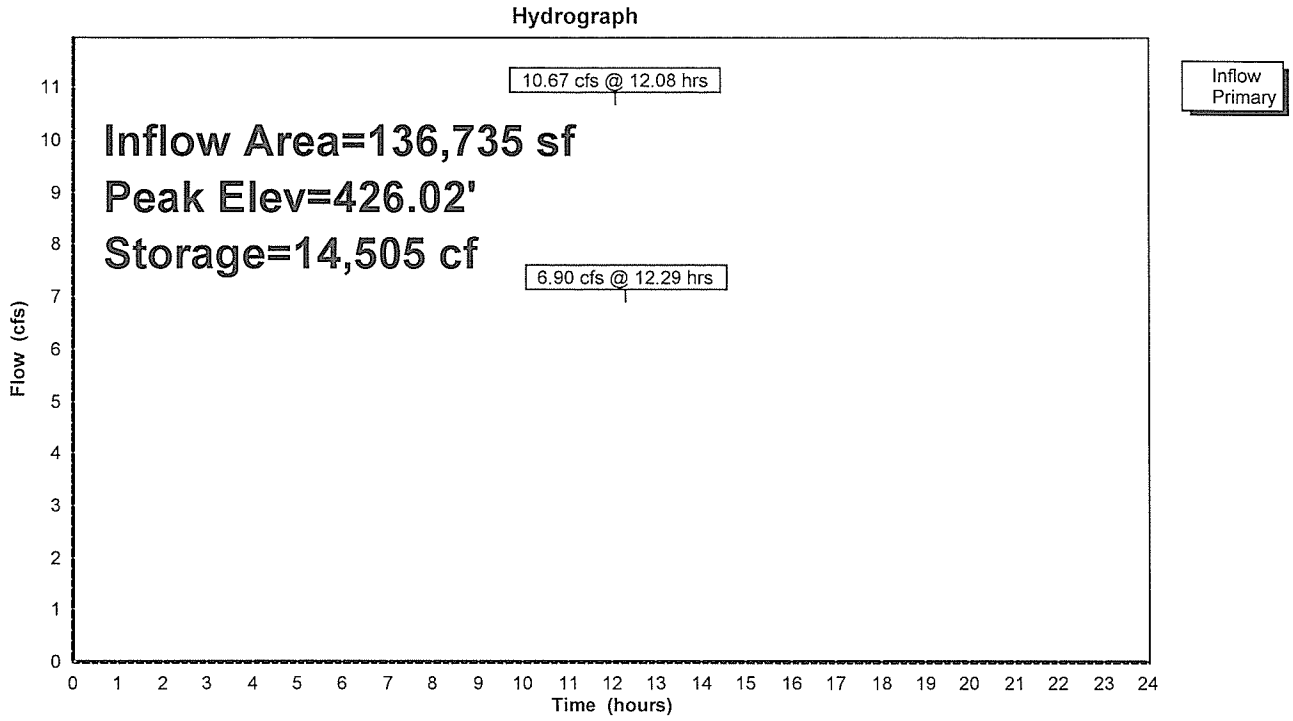
Volume	Invert	Avail.Storage	Storage Description
#1A	422.30'	8,200 cf	**49.00'W x 130.60'L x 4.50'H Field A** 28,797 cf Overall - 8,298 cf Embedded = 20,500 cf x 40.0% Voids
#2A	423.30'	8,298 cf	**ADS_StormTech SC-740** x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 10 rows
		16,497 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	423.30'	**30.0" Round Culvert** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 423.30' / 422.00' S= 0.0371 '/' Cc= 0.900 n= 0.110, Flow Area= 4.91 sf
#2	Device 1	426.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.8' Crest Height
#3	Device 1	423.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	424.30'	**15.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=6.88 cfs @ 12.29 hrs HW=426.02' (Free Discharge)
└**1=Culvert** (Passes 6.88 cfs of 11.02 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.48 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.64 cfs @ 7.39 fps)
  └**4=Orifice/Grate** (Orifice Controls 6.19 cfs @ 5.04 fps)

Pond 19P: Infiltration-1



Summary for Pond 19P: Infiltration-1

Inflow Area = 136,735 sf, 49.79% Impervious, Inflow Depth > 4.78" for 50-yr event
Inflow = 12.89 cfs @ 12.08 hrs, Volume= 54,472 cf
Outflow = 10.59 cfs @ 12.19 hrs, Volume= 49,943 cf, Atten= 18%, Lag= 6.4 min
Primary = 10.59 cfs @ 12.19 hrs, Volume= 49,943 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 423.30' Surf.Area= 6,399 sf Storage= 2,560 cf
Peak Elev= 426.31' @ 12.19 hrs Surf.Area= 6,399 sf Storage= 15,248 cf (12,688 cf above start)

Plug-Flow detention time= 116.5 min calculated for 47,383 cf (87% of inflow)
Center-of-Mass det. time= 47.0 min (864.2 - 817.2)

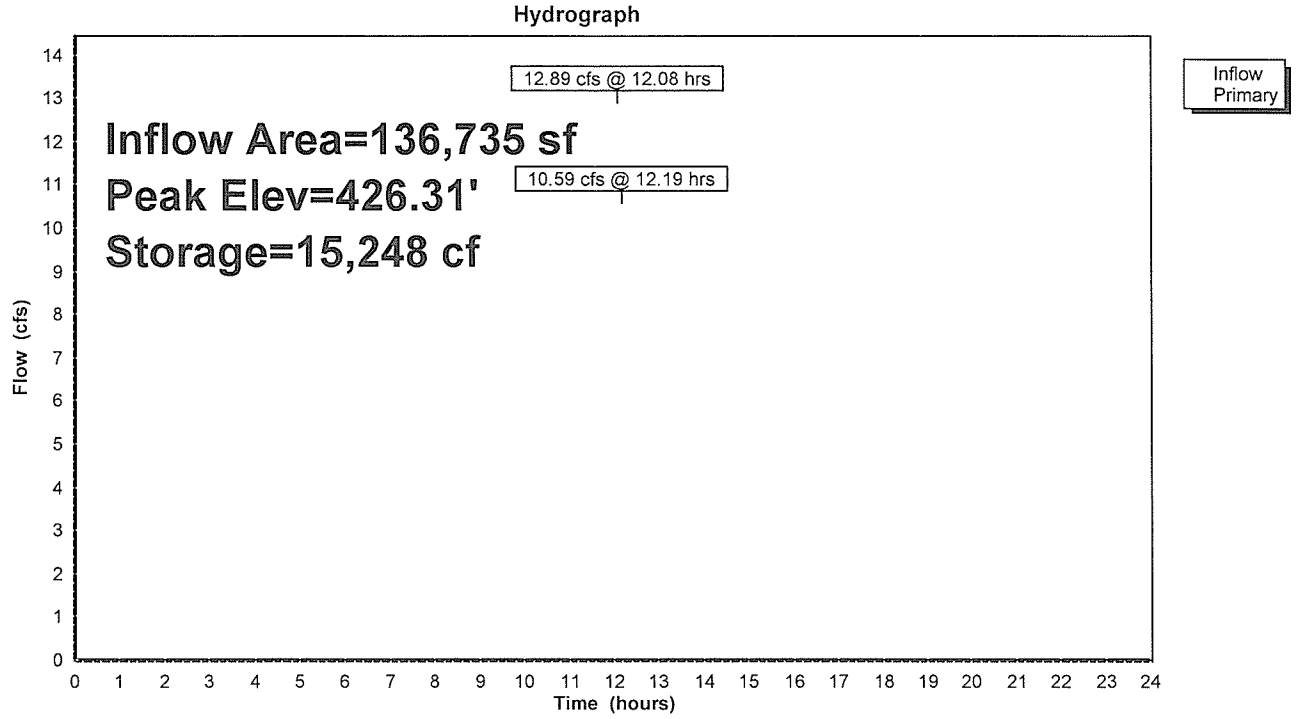
Volume	Invert	Avail.Storage	Storage Description
#1A	422.30'	8,200 cf	**49.00'W x 130.60'L x 4.50'H Field A** 28,797 cf Overall - 8,298 cf Embedded = 20,500 cf x 40.0% Voids
#2A	423.30'	8,298 cf	**ADS_StormTech SC-740**x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 10 rows
		16,497 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	423.30'	**30.0" Round Culvert** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 423.30' / 422.00' S= 0.0371 '/' Cc= 0.900 n= 0.110, Flow Area= 4.91 sf
#2	Device 1	426.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.8' Crest Height
#3	Device 1	423.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	424.30'	**15.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=10.58 cfs @ 12.19 hrs HW=426.31' (Free Discharge)
└**1=Culvert** (Passes 10.58 cfs of 12.03 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.94 cfs @ 1.91 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.68 cfs @ 7.83 fps)
  └**4=Orifice/Grate** (Orifice Controls 6.96 cfs @ 5.67 fps)

Pond 19P: Infiltration-1



Summary for Pond 19P: Infiltration-1

Inflow Area = 136,735 sf, 49.79% Impervious, Inflow Depth > 5.89" for 100-yr event
Inflow = 15.67 cfs @ 12.08 hrs, Volume= 67,059 cf
Outflow = 12.24 cfs @ 12.37 hrs, Volume= 62,002 cf, Atten= 22%, Lag= 17.2 min
Primary = 12.24 cfs @ 12.37 hrs, Volume= 62,002 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 423.30' Surf.Area= 6,399 sf Storage= 2,560 cf
Peak Elev= 426.80' @ 12.22 hrs Surf.Area= 6,399 sf Storage= 16,490 cf (13,930 cf above start)

Plug-Flow detention time= 102.1 min calculated for 59,417 cf (89% of inflow)
Center-of-Mass det. time= 39.5 min (851.4 - 811.9)

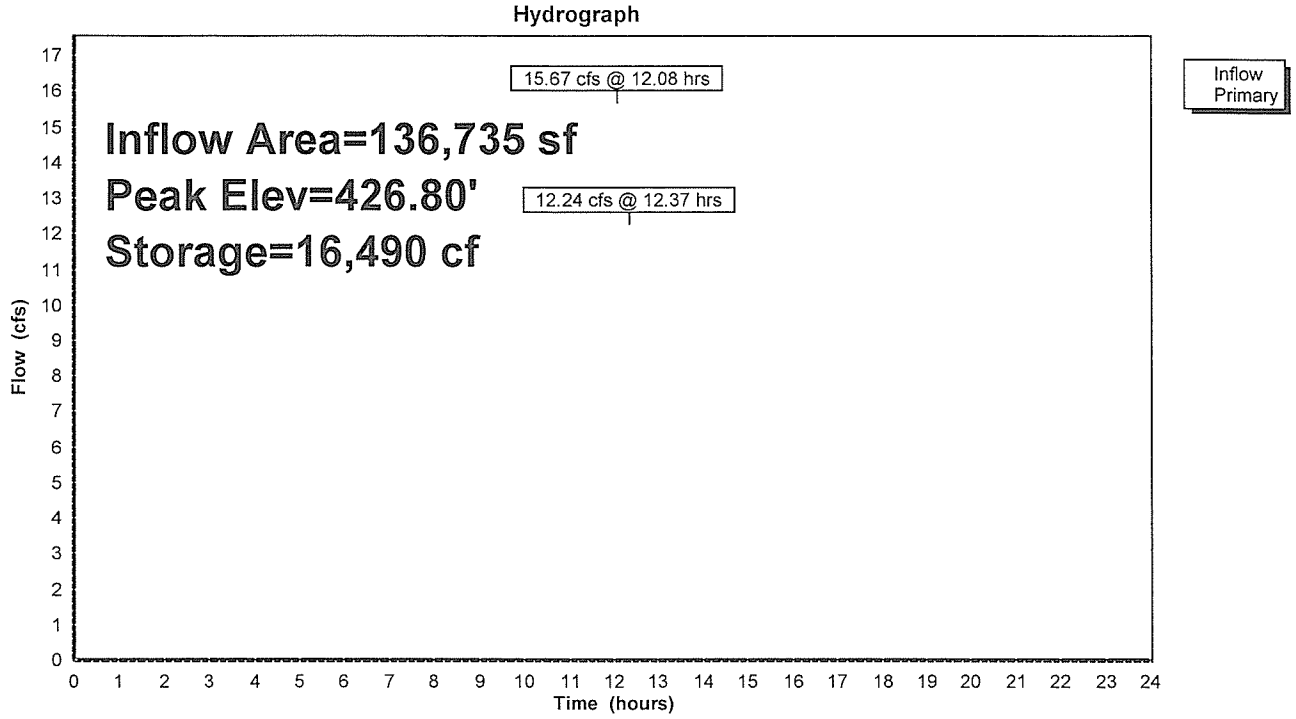
Volume	Invert	Avail.Storage	Storage Description
#1A	422.30'	8,200 cf	**49.00'W x 130.60'L x 4.50'H Field A** 28,797 cf Overall - 8,298 cf Embedded = 20,500 cf x 40.0% Voids
#2A	423.30'	8,298 cf	**ADS_StormTech SC-740** x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 10 rows
		16,497 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	423.30'	**30.0" Round Culvert** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 423.30' / 422.00' S= 0.0371 '/' Cc= 0.900 n= 0.110, Flow Area= 4.91 sf
#2	Device 1	426.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.8' Crest Height
#3	Device 1	423.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	424.30'	**15.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=12.25 cfs @ 12.37 hrs HW=426.48' (Free Discharge)
└**1=Culvert** (Barrel Controls 12.25 cfs @ 2.54 fps)
  ├**2=Sharp-Crested Rectangular Weir** (Passes < 5.74 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 0.70 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 7.37 cfs potential flow)

Pond 19P: Infiltration-1



Summary for Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS

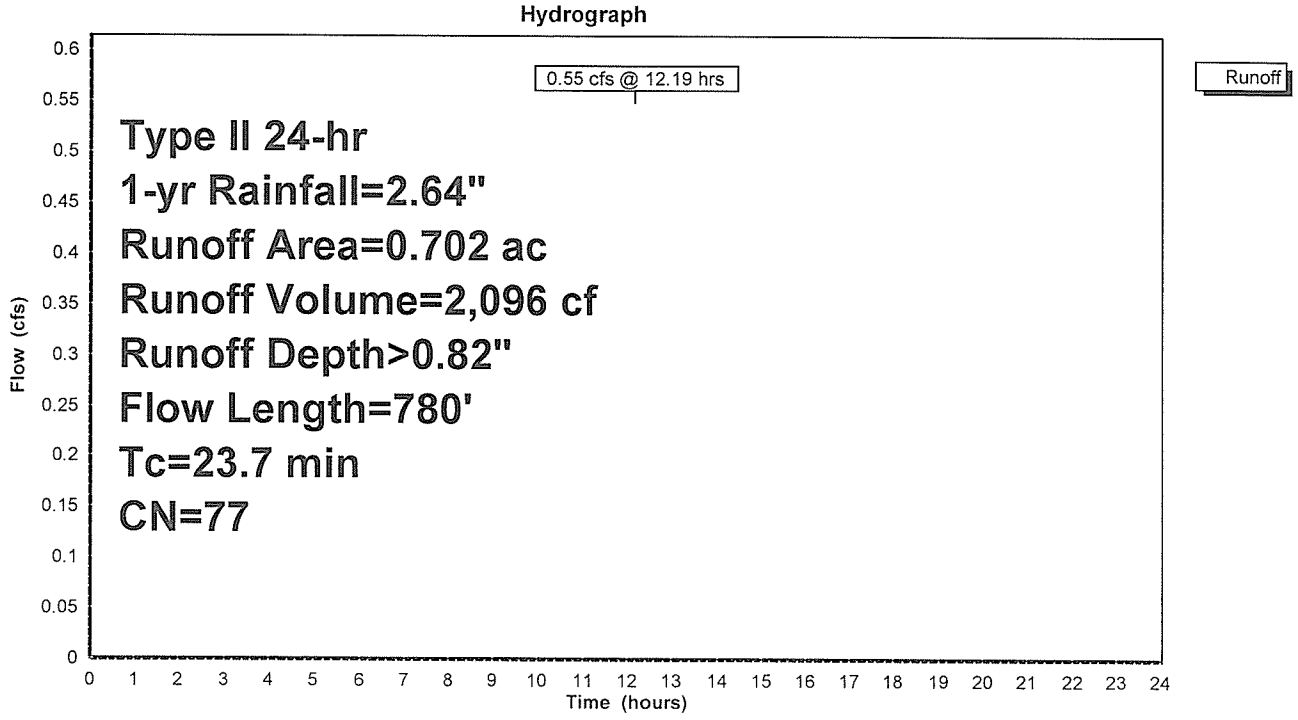
Runoff = 0.55 cfs @ 12.19 hrs, Volume= 2,096 cf, Depth> 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

	Area (ac)	CN	Description
*	0.312	98	Sidewalks/seating
	0.390	61	>75% Grass cover, Good, HSG B
	0.702	77	Weighted Average
	0.390		55.56% Pervious Area
	0.312		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0200	0.08		**Sheet Flow, sheet flow** Grass: Bermuda n= 0.410 P2= 3.36"
1.2	120	0.0100	1.61		**Shallow Concentrated Flow, overland grass to RG** Unpaved Kv= 16.1 fps
1.1	560	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
23.7	780	Total			

Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS



Summary for Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS

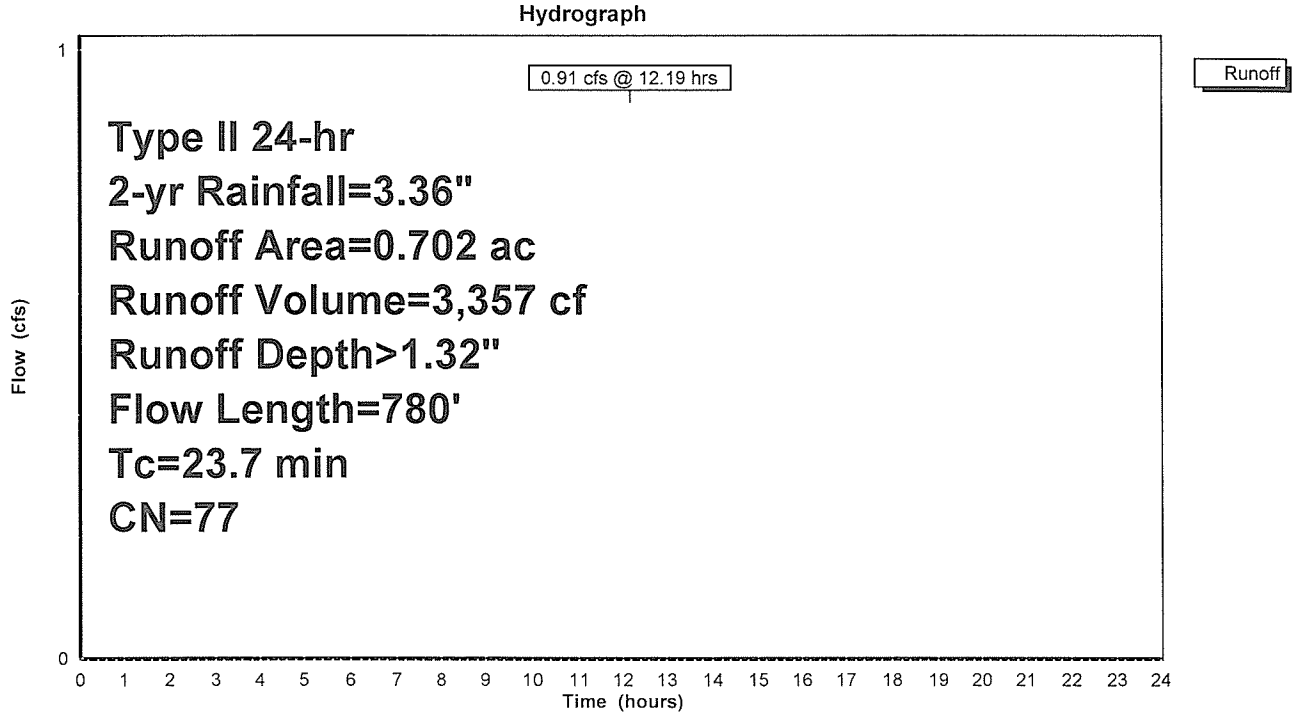
Runoff = 0.91 cfs @ 12.19 hrs, Volume= 3,357 cf, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

	Area (ac)	CN	Description
*	0.312	98	Sidewalks/seating
	0.390	61	>75% Grass cover, Good, HSG B
	0.702	77	Weighted Average
	0.390		55.56% Pervious Area
	0.312		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0200	0.08		**Sheet Flow, sheet flow** Grass: Bermuda n= 0.410 P2= 3.36"
1.2	120	0.0100	1.61		**Shallow Concentrated Flow, overland grass to RG** Unpaved Kv= 16.1 fps
1.1	560	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
23.7	780	Total			

Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS



Summary for Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS

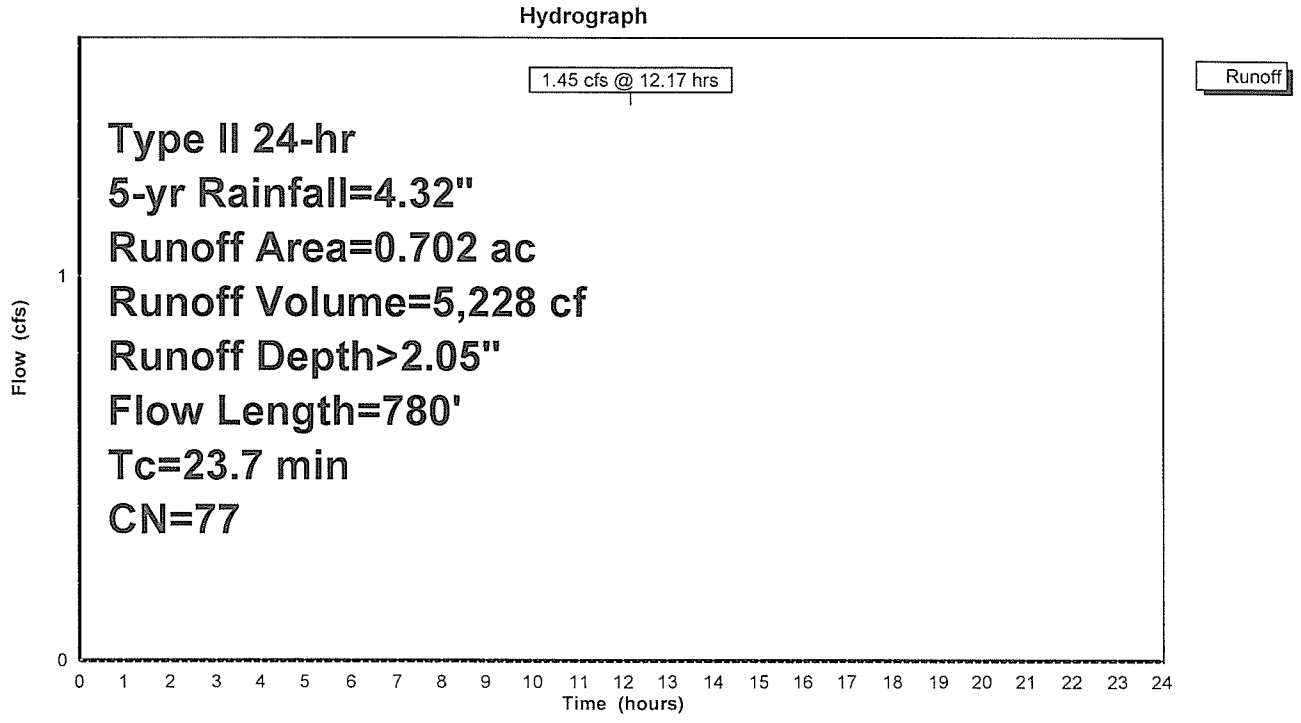
Runoff = 1.45 cfs @ 12.17 hrs, Volume= 5,228 cf, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

	Area (ac)	CN	Description
*	0.312	98	Sidewalks/seating
	0.390	61	>75% Grass cover, Good, HSG B
	0.702	77	Weighted Average
	0.390		55.56% Pervious Area
	0.312		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0200	0.08		**Sheet Flow, sheet flow** Grass: Bermuda n= 0.410 P2= 3.36"
1.2	120	0.0100	1.61		**Shallow Concentrated Flow, overland grass to RG** Unpaved Kv= 16.1 fps
1.1	560	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
23.7	780	Total			

Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS



Summary for Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS

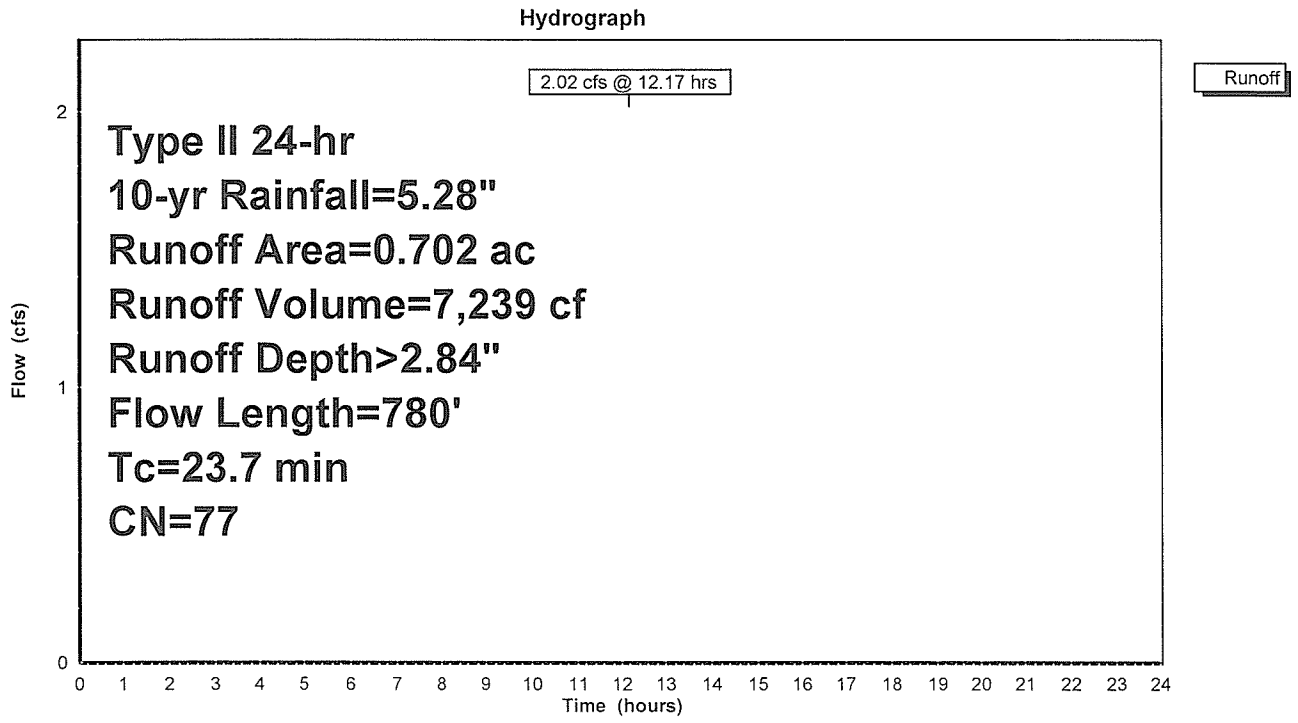
Runoff = 2.02 cfs @ 12.17 hrs, Volume= 7,239 cf, Depth> 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

	Area (ac)	CN	Description
*	0.312	98	Sidewalks/seating
	0.390	61	>75% Grass cover, Good, HSG B
	0.702	77	Weighted Average
	0.390		55.56% Pervious Area
	0.312		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0200	0.08		**Sheet Flow, sheet flow** Grass: Bermuda n= 0.410 P2= 3.36"
1.2	120	0.0100	1.61		**Shallow Concentrated Flow, overland grass to RG** Unpaved Kv= 16.1 fps
1.1	560	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
23.7	780	Total			

Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS



Summary for Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS

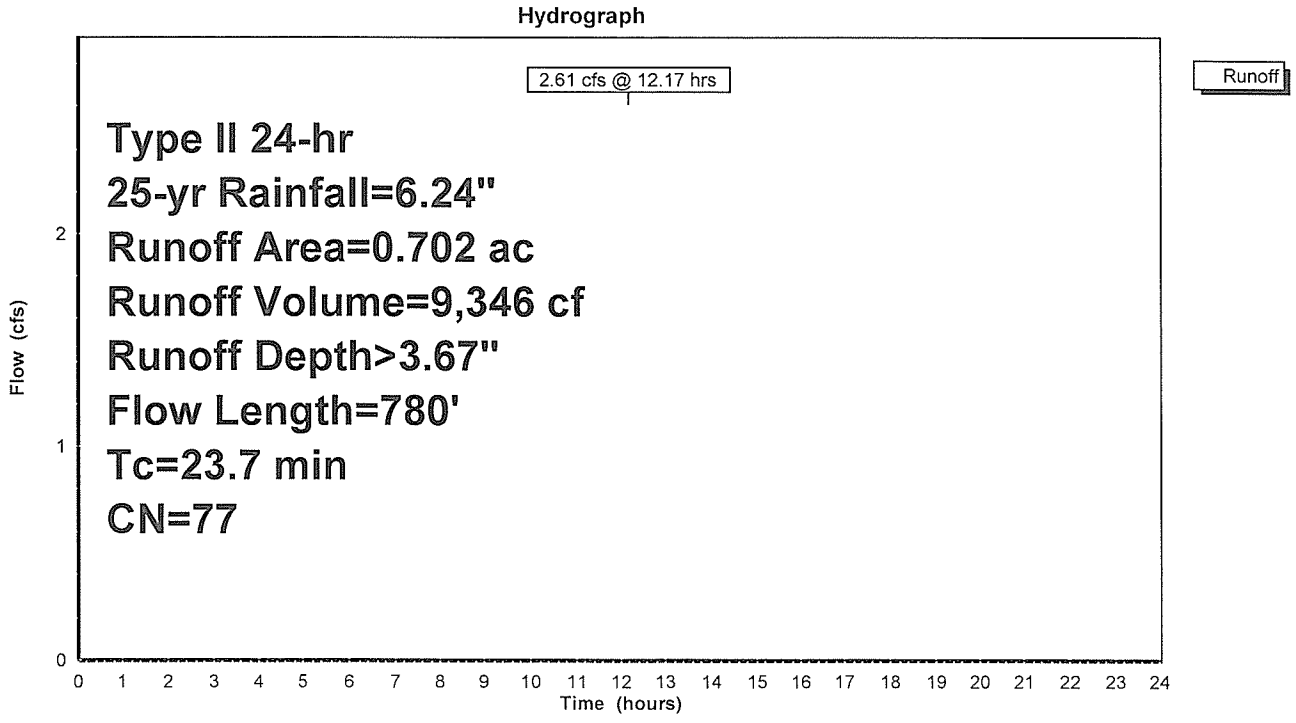
Runoff = 2.61 cfs @ 12.17 hrs, Volume= 9,346 cf, Depth> 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

	Area (ac)	CN	Description
*	0.312	98	Sidewalks/seating
	0.390	61	>75% Grass cover, Good, HSG B
	0.702	77	Weighted Average
	0.390		55.56% Pervious Area
	0.312		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0200	0.08		**Sheet Flow, sheet flow** Grass: Bermuda n= 0.410 P2= 3.36"
1.2	120	0.0100	1.61		**Shallow Concentrated Flow, overland grass to RG** Unpaved Kv= 16.1 fps
1.1	560	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
23.7	780	Total			

Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS



Summary for Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS

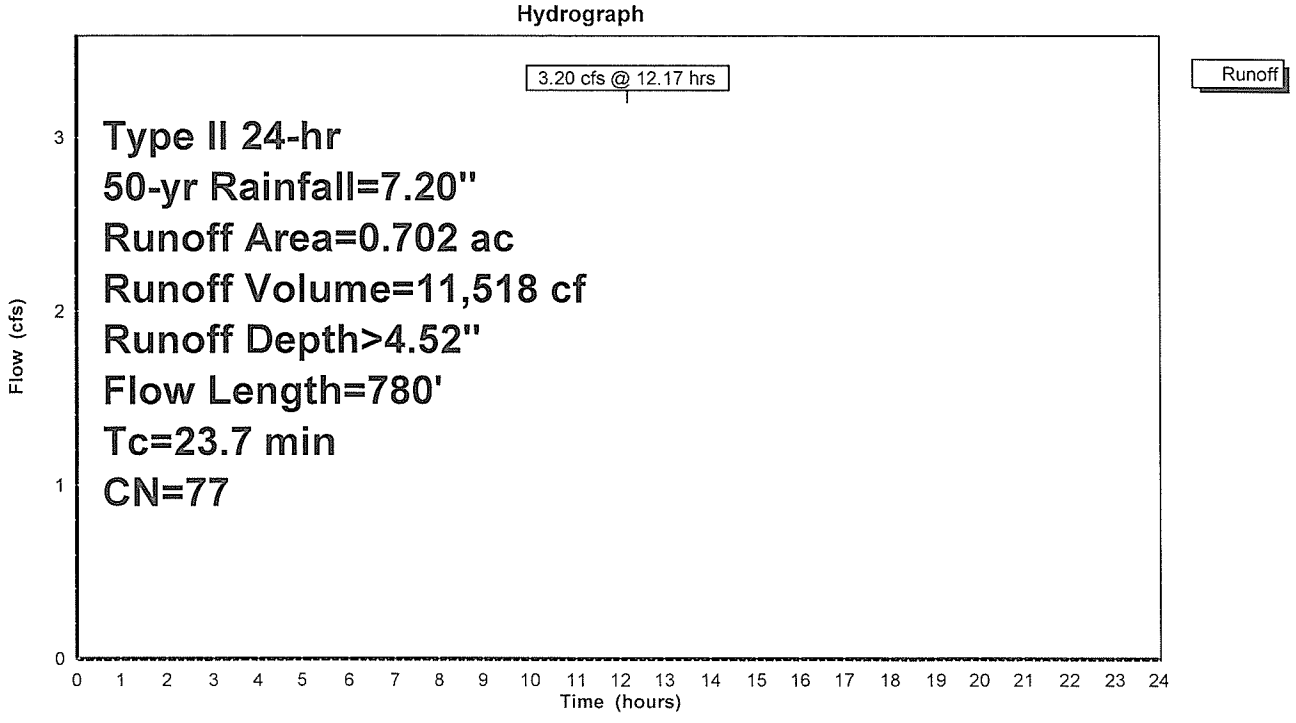
Runoff = 3.20 cfs @ 12.17 hrs, Volume= 11,518 cf, Depth> 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

	Area (ac)	CN	Description
*	0.312	98	Sidewalks/seating
	0.390	61	>75% Grass cover, Good, HSG B
	0.702	77	Weighted Average
	0.390		55.56% Pervious Area
	0.312		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0200	0.08		**Sheet Flow, sheet flow** Grass: Bermuda n= 0.410 P2= 3.36"
1.2	120	0.0100	1.61		**Shallow Concentrated Flow, overland grass to RG** Unpaved Kv= 16.1 fps
1.1	560	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
23.7	780	Total			

Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS



Summary for Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS

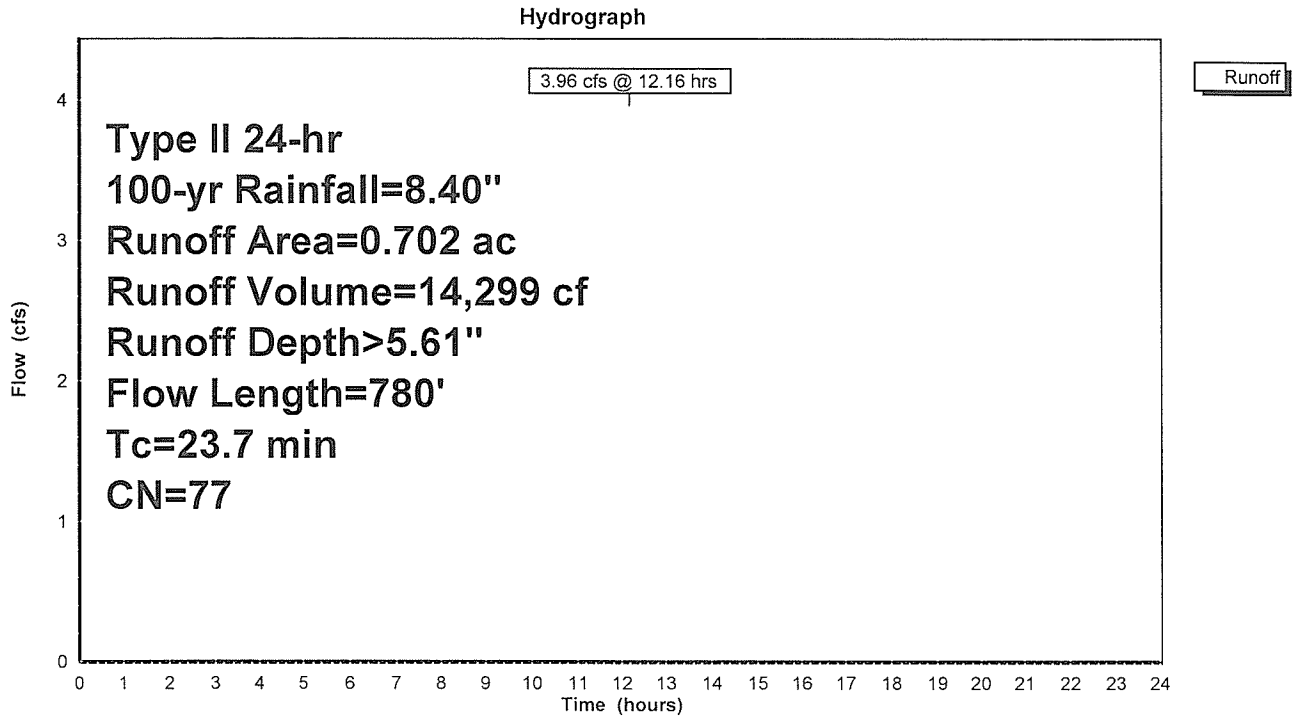
Runoff = 3.96 cfs @ 12.16 hrs, Volume= 14,299 cf, Depth> 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

	Area (ac)	CN	Description
*	0.312	98	Sidewalks/seating
	0.390	61	>75% Grass cover, Good, HSG B
	0.702	77	Weighted Average
	0.390		55.56% Pervious Area
	0.312		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0200	0.08		**Sheet Flow, sheet flow** Grass: Bermuda n= 0.410 P2= 3.36"
1.2	120	0.0100	1.61		**Shallow Concentrated Flow, overland grass to RG** Unpaved Kv= 16.1 fps
1.1	560	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
23.7	780	Total			

Subcatchment 16S: ROUTE 30 BIOSWALE AND RAIN GARDENS



Events for Pond 28P: DETENTION-1

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	0.55	0.24	425.50	571
2-yr	0.91	0.30	425.69	1,030
5-yr	1.45	0.39	426.03	1,828
10-yr	2.02	0.47	426.42	2,722
25-yr	2.61	0.55	426.87	3,679
50-yr	3.20	0.63	427.38	4,680
100-yr	**3.96**	**1.19**	**428.11**	**5,723**

Summary for Pond 28P: DETENTION-1

Inflow Area = 30,579 sf, 44.44% Impervious, Inflow Depth > 0.82" for 1-yr event
Inflow = 0.55 cfs @ 12.19 hrs, Volume= 2,096 cf
Outflow = 0.24 cfs @ 0.00 hrs, Volume= 2,586 cf, Atten= 56%, Lag= 0.0 min
Primary = 0.24 cfs @ 0.00 hrs, Volume= 2,586 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 425.50' Surf.Area= 2,856 sf Storage= 571 cf
Peak Elev= 425.50' @ 0.00 hrs Surf.Area= 2,856 sf Storage= 571 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	425.00'	3,122 cf	**63.25'W x 45.16'L x 4.00'H Field A** 11,425 cf Overall - 3,620 cf Embedded = 7,805 cf x 40.0% Voids
#2A	425.50'	3,620 cf	**ADS_StormTech SC-740** x 78 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 13 rows
		6,742 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**18.0" Round Culvert** L= 39.0' Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.30' S= 0.0179 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	428.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	425.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.24 cfs @ 0.00 hrs HW=425.50' (Free Discharge)
└**1=Culvert** (Passes 0.24 cfs of 1.24 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Orifice Controls 0.24 cfs @ 2.78 fps)

Pond 28P: DETENTION-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech®SC-740 (ADSStormTech®SC-740)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 13 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

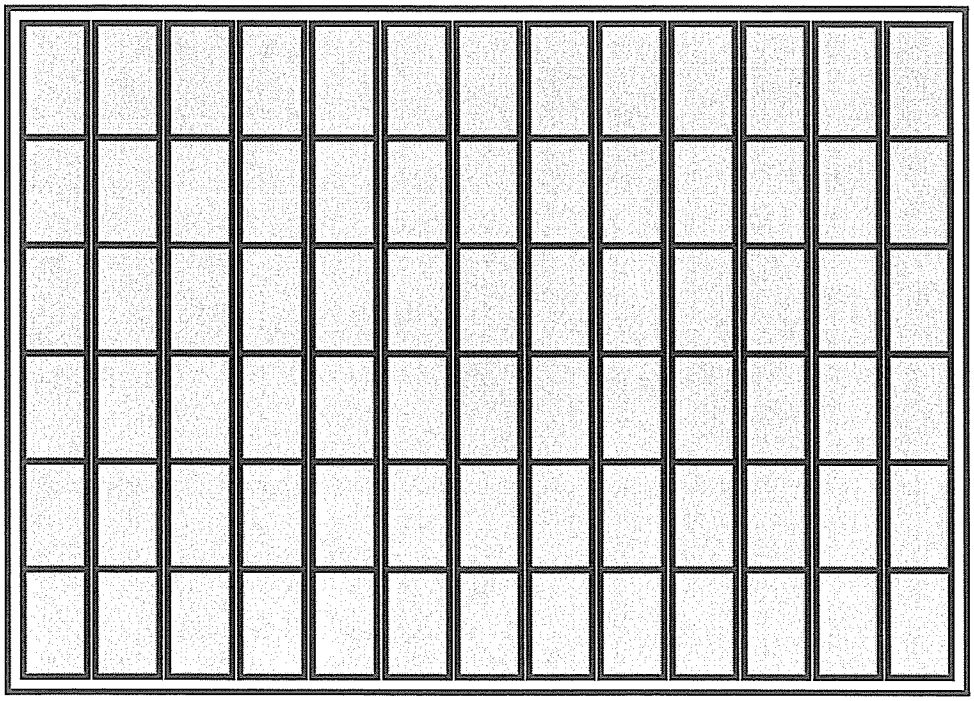
6 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 43.16' Row Length +12.0" End Stone x 2 = 45.16' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Base + 30.0" Chamber Height + 12.0" Cover = 4.00' Field Height

78 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 13 Rows = 3,620.1 cf Chamber Storage

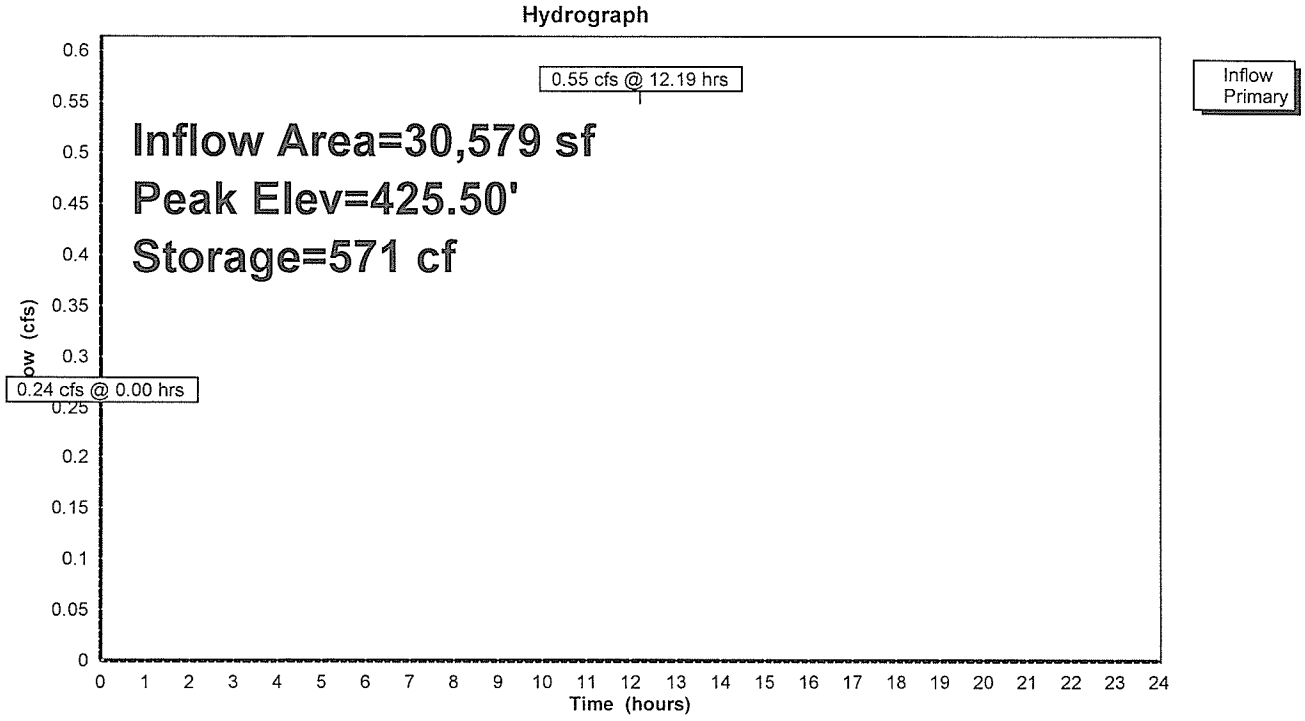
11,425.1 cf Field - 3,620.1 cf Chambers = 7,805.0 cf Stone x 40.0% Voids = 3,122.0 cf Stone Storage

Chamber Storage + Stone Storage = 6,742.1 cf = 0.155 af
Overall Storage Efficiency = 59.0%

78 Chambers
423.2 cy Field
289.1 cy Stone



Pond 28P: DETENTION-1



Summary for Pond 28P: DETENTION-1

Inflow Area = 30,579 sf, 44.44% Impervious, Inflow Depth > 1.32" for 2-yr event
Inflow = 0.91 cfs @ 12.19 hrs, Volume= 3,357 cf
Outflow = 0.30 cfs @ 12.57 hrs, Volume= 3,830 cf, Atten= 67%, Lag= 23.1 min
Primary = 0.30 cfs @ 12.57 hrs, Volume= 3,830 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 425.50' Surf.Area= 2,856 sf Storage= 571 cf
Peak Elev= 425.69' @ 12.57 hrs Surf.Area= 2,856 sf Storage= 1,030 cf (459 cf above start)

Plug-Flow detention time= 51.9 min calculated for 3,259 cf (97% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

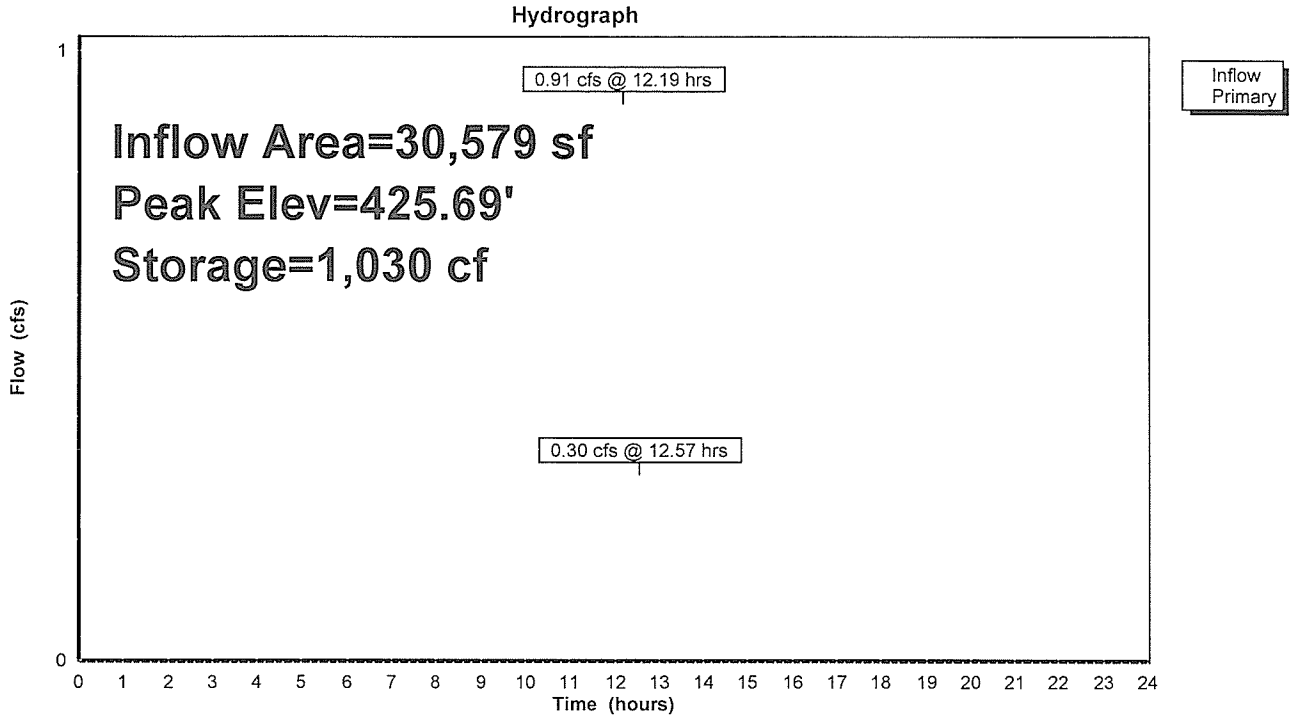
Volume	Invert	Avail.Storage	Storage Description
#1A	425.00'	3,122 cf	**63.25'W x 45.16'L x 4.00'H Field A** 11,425 cf Overall - 3,620 cf Embedded = 7,805 cf x 40.0% Voids
#2A	425.50'	3,620 cf	**ADS_StormTech SC-740** x 78 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 13 rows
		6,742 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**18.0" Round Culvert** L= 39.0' Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.30' S= 0.0179 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	428.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	425.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.30 cfs @ 12.57 hrs HW=425.69' (Free Discharge)
└**1=Culvert** (Passes 0.30 cfs of 2.26 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Orifice Controls 0.30 cfs @ 3.49 fps)

Pond 28P: DETENTION-1



Summary for Pond 28P: DETENTION-1

Inflow Area = 30,579 sf, 44.44% Impervious, Inflow Depth > 2.05" for 5-yr event
Inflow = 1.45 cfs @ 12.17 hrs, Volume= 5,228 cf
Outflow = 0.39 cfs @ 12.63 hrs, Volume= 5,679 cf, Atten= 73%, Lag= 27.6 min
Primary = 0.39 cfs @ 12.63 hrs, Volume= 5,679 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 425.50' Surf.Area= 2,856 sf Storage= 571 cf
Peak Elev= 426.03' @ 12.63 hrs Surf.Area= 2,856 sf Storage= 1,828 cf (1,257 cf above start)

Plug-Flow detention time= 58.7 min calculated for 5,108 cf (98% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

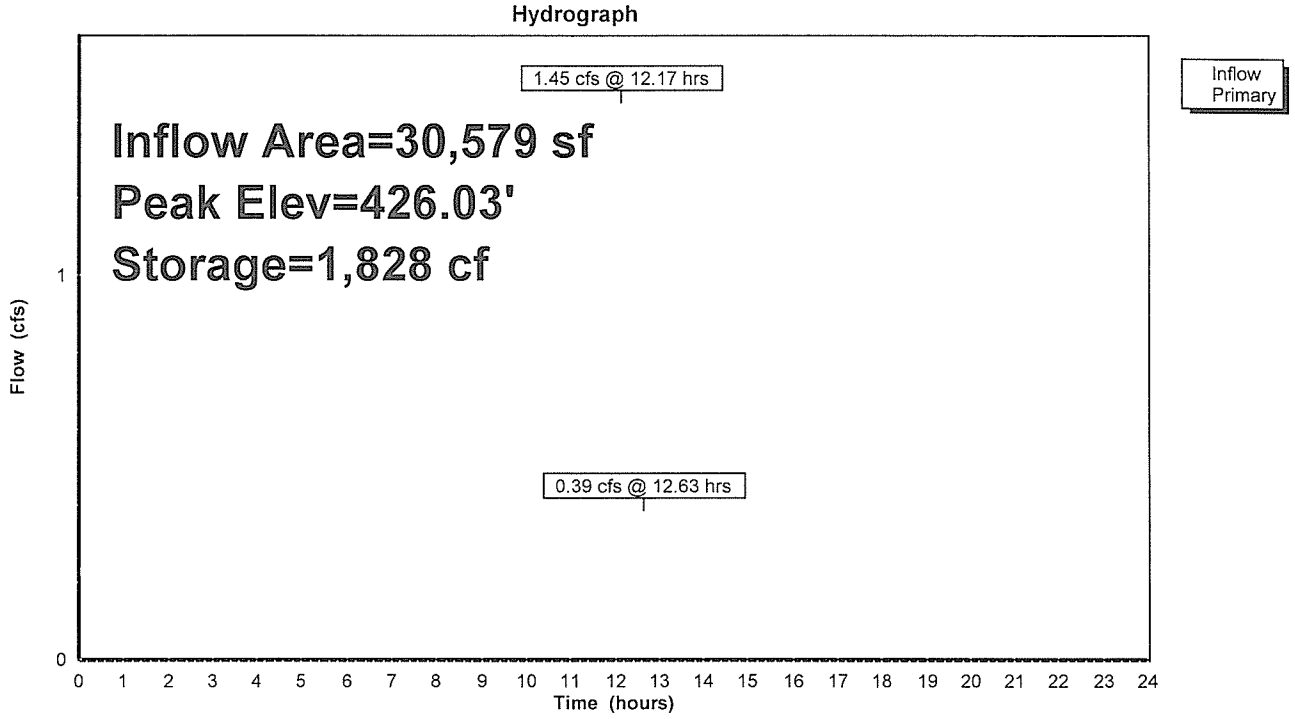
Volume	Invert	Avail.Storage	Storage Description
#1A	425.00'	3,122 cf	**63.25'W x 45.16'L x 4.00'H Field A** 11,425 cf Overall - 3,620 cf Embedded = 7,805 cf x 40.0% Voids
#2A	425.50'	3,620 cf	**ADS_StormTech SC-740** x 78 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 13 rows
		6,742 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**18.0" Round Culvert** L= 39.0' Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.30' S= 0.0179 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	428.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	425.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.39 cfs @ 12.63 hrs HW=426.03' (Free Discharge)
└─**1=Culvert** (Passes 0.39 cfs of 4.48 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.39 cfs @ 4.48 fps)

Pond 28P: DETENTION-1



Summary for Pond 28P: DETENTION-1

Inflow Area = 30,579 sf, 44.44% Impervious, Inflow Depth > 2.84" for 10-yr event
Inflow = 2.02 cfs @ 12.17 hrs, Volume= 7,239 cf
Outflow = 0.47 cfs @ 12.68 hrs, Volume= 7,672 cf, Atten= 77%, Lag= 30.4 min
Primary = 0.47 cfs @ 12.68 hrs, Volume= 7,672 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 425.50' Surf.Area= 2,856 sf Storage= 571 cf
Peak Elev= 426.42' @ 12.68 hrs Surf.Area= 2,856 sf Storage= 2,722 cf (2,151 cf above start)

Plug-Flow detention time= 67.3 min calculated for 7,098 cf (98% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

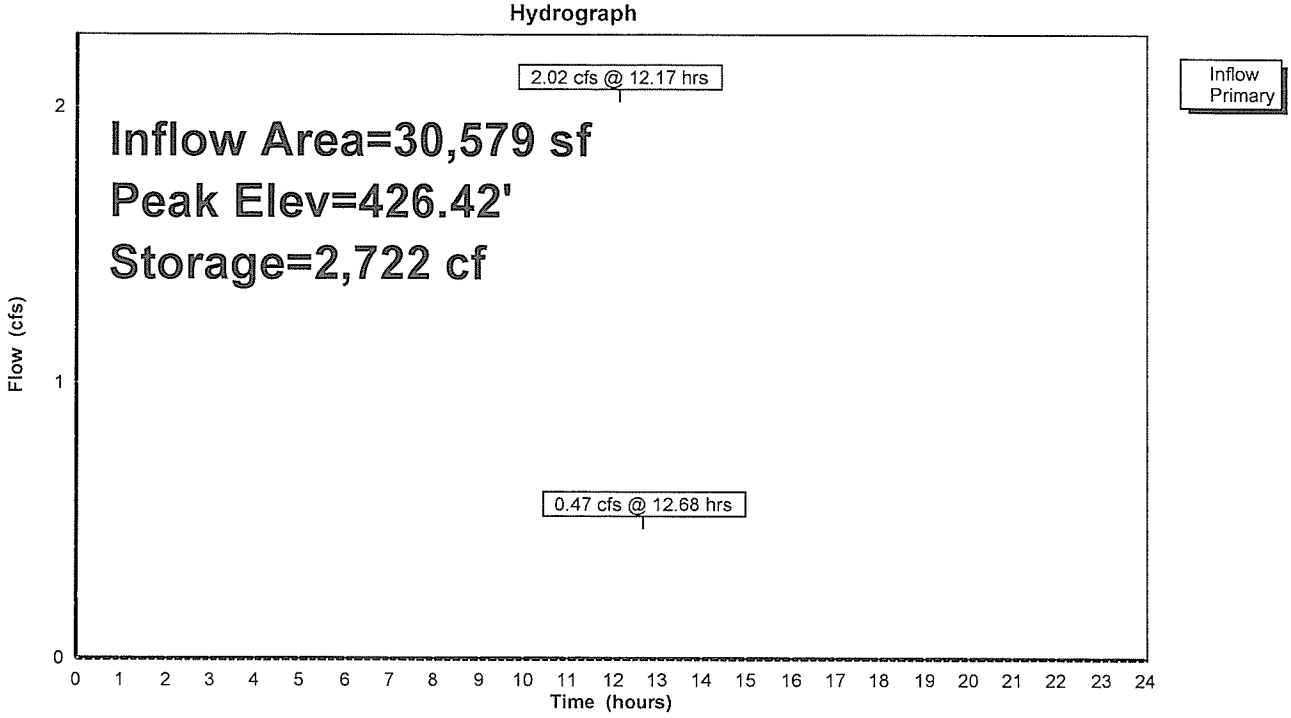
Volume	Invert	Avail.Storage	Storage Description
#1A	425.00'	3,122 cf	**63.25'W x 45.16'L x 4.00'H Field A** 11,425 cf Overall - 3,620 cf Embedded = 7,805 cf x 40.0% Voids
#2A	425.50'	3,620 cf	**ADS_StormTech SC-740** x 78 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 13 rows
		6,742 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**18.0" Round Culvert** L= 39.0' Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.30' S= 0.0179 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	428.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	425.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.47 cfs @ 12.68 hrs HW=426.42' (Free Discharge)
└**1=Culvert** (Passes 0.47 cfs of 7.04 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Orifice Controls 0.47 cfs @ 5.40 fps)

Pond 28P: DETENTION-1



Summary for Pond 28P: DETENTION-1

Inflow Area = 30,579 sf, 44.44% Impervious, Inflow Depth > 3.67" for 25-yr event
Inflow = 2.61 cfs @ 12.17 hrs, Volume= 9,346 cf
Outflow = 0.55 cfs @ 12.71 hrs, Volume= 9,762 cf, Atten= 79%, Lag= 32.5 min
Primary = 0.55 cfs @ 12.71 hrs, Volume= 9,762 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 425.50' Surf.Area= 2,856 sf Storage= 571 cf
Peak Elev= 426.87' @ 12.71 hrs Surf.Area= 2,856 sf Storage= 3,679 cf (3,108 cf above start)

Plug-Flow detention time= 75.8 min calculated for 9,187 cf (98% of inflow)
Center-of-Mass det. time= 16.8 min (846.3 - 829.5)

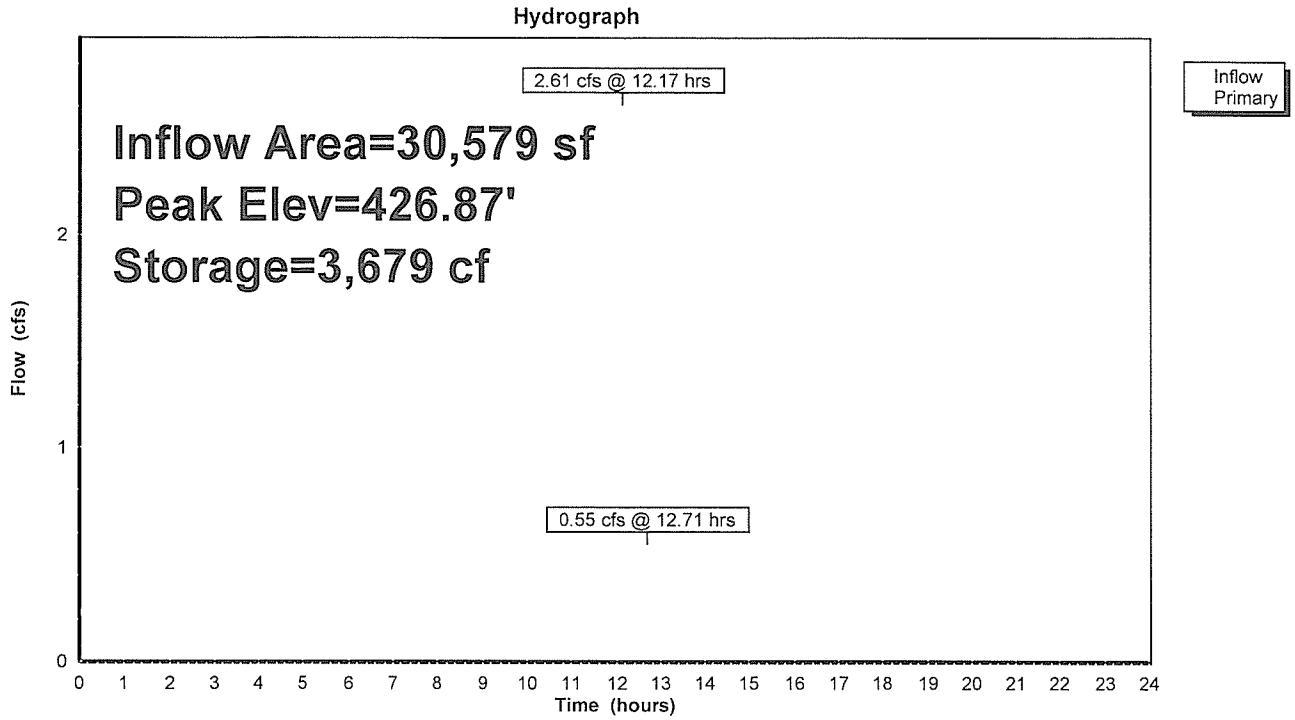
Volume	Invert	Avail.Storage	Storage Description
#1A	425.00'	3,122 cf	**63.25'W x 45.16'L x 4.00'H Field A** 11,425 cf Overall - 3,620 cf Embedded = 7,805 cf x 40.0% Voids
#2A	425.50'	3,620 cf	**ADS_StormTech SC-740** x 78 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 13 rows
		6,742 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**18.0" Round Culvert** L= 39.0' Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.30' S= 0.0179 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	428.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	425.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.55 cfs @ 12.71 hrs HW=426.87' (Free Discharge)
└─**1=Culvert** (Passes 0.55 cfs of 9.00 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.55 cfs @ 6.28 fps)

Pond 28P: DETENTION-1



Summary for Pond 28P: DETENTION-1

Inflow Area = 30,579 sf, 44.44% Impervious, Inflow Depth > 4.52" for 50-yr event
Inflow = 3.20 cfs @ 12.17 hrs, Volume= 11,518 cf
Outflow = 0.63 cfs @ 12.73 hrs, Volume= 11,918 cf, Atten= 80%, Lag= 34.0 min
Primary = 0.63 cfs @ 12.73 hrs, Volume= 11,918 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 425.50' Surf.Area= 2,856 sf Storage= 571 cf
Peak Elev= 427.38' @ 12.73 hrs Surf.Area= 2,856 sf Storage= 4,681 cf (4,109 cf above start)

Plug-Flow detention time= 83.7 min calculated for 11,347 cf (99% of inflow)
Center-of-Mass det. time= 34.3 min (858.0 - 823.7)

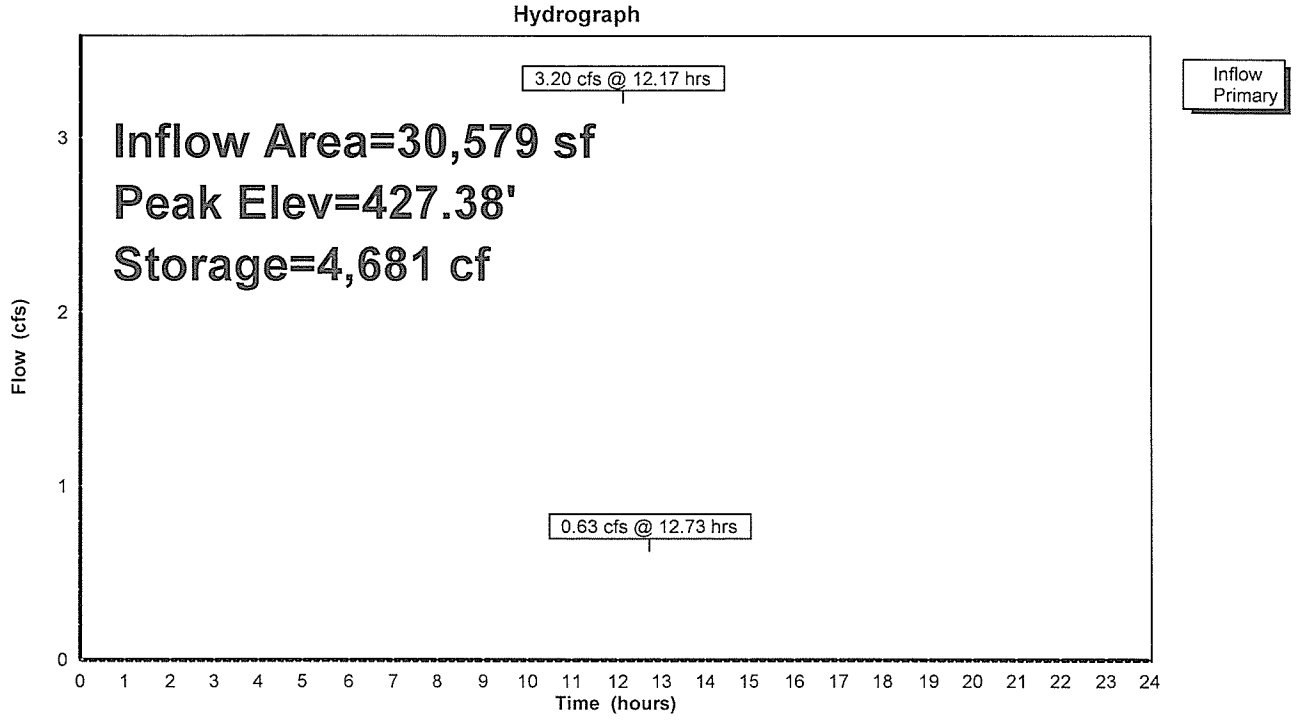
Volume	Invert	Avail.Storage	Storage Description
#1A	425.00'	3,122 cf	**63.25'W x 45.16'L x 4.00'H Field A** 11,425 cf Overall - 3,620 cf Embedded = 7,805 cf x 40.0% Voids
#2A	425.50'	3,620 cf	**ADS_StormTech SC-740** x 78 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 13 rows
		6,742 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**18.0" Round Culvert** L= 39.0' Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.30' S= 0.0179 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	428.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	425.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.63 cfs @ 12.73 hrs HW=427.38' (Free Discharge)
└**1=Culvert** (Passes 0.63 cfs of 10.86 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Orifice Controls 0.63 cfs @ 7.16 fps)

Pond 28P: DETENTION-1



Summary for Pond 28P: DETENTION-1

Inflow Area = 30,579 sf, 44.44% Impervious, Inflow Depth > 5.61" for 100-yr event
Inflow = 3.96 cfs @ 12.16 hrs, Volume= 14,299 cf
Outflow = 1.19 cfs @ 12.56 hrs, Volume= 14,682 cf, Atten= 70%, Lag= 24.0 min
Primary = 1.19 cfs @ 12.56 hrs, Volume= 14,682 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 425.50' Surf.Area= 2,856 sf Storage= 571 cf
Peak Elev= 428.11' @ 12.56 hrs Surf.Area= 2,856 sf Storage= 5,723 cf (5,151 cf above start)

Plug-Flow detention time= 87.9 min calculated for 14,110 cf (99% of inflow)
Center-of-Mass det. time= 47.1 min (864.8 - 817.6)

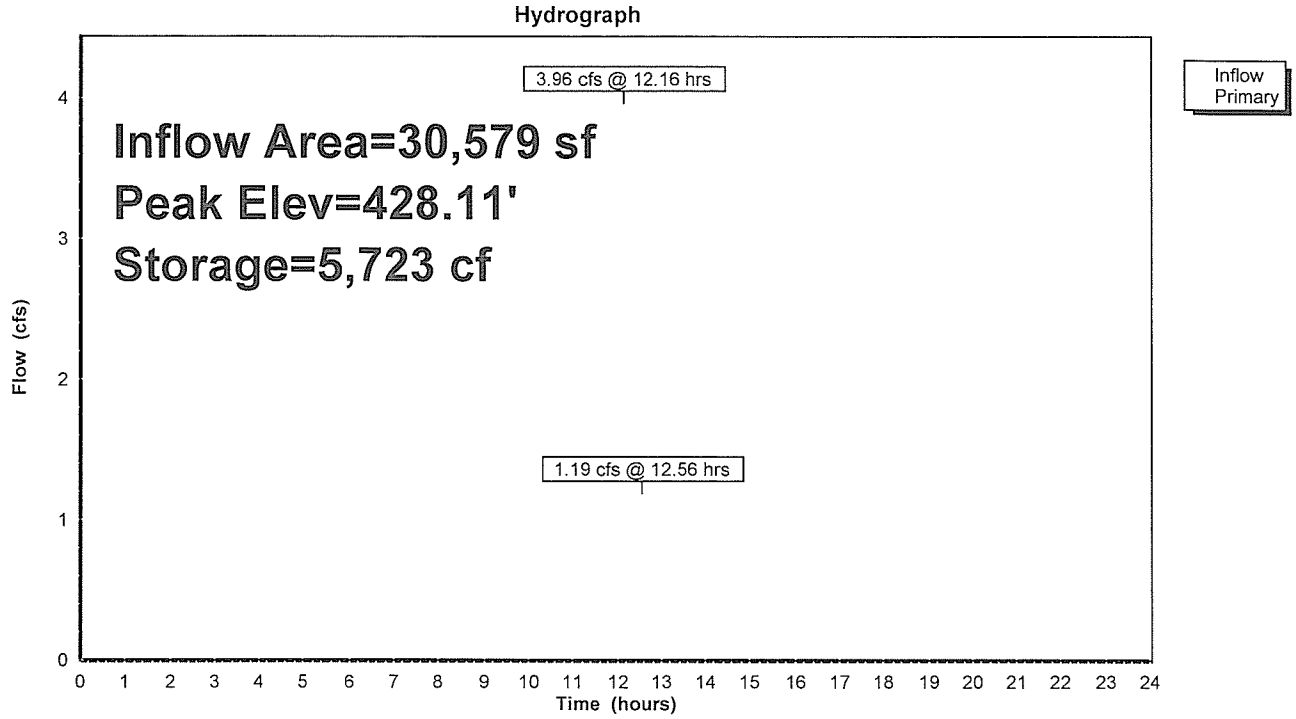
Volume	Invert	Avail.Storage	Storage Description
#1A	425.00'	3,122 cf	**63.25'W x 45.16'L x 4.00'H Field A** 11,425 cf Overall - 3,620 cf Embedded = 7,805 cf x 40.0% Voids
#2A	425.50'	3,620 cf	**ADS_StormTech SC-740**x 78 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 13 rows
		6,742 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**18.0" Round Culvert** L= 39.0' Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.30' S= 0.0179 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	428.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	425.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.18 cfs @ 12.56 hrs HW=428.11' (Free Discharge)
└**1=Culvert** (Passes 1.18 cfs of 13.06 cfs potential flow)
├**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.46 cfs @ 1.09 fps)
└**3=Orifice/Grate** (Orifice Controls 0.72 cfs @ 8.26 fps)

Pond 28P: DETENTION-1



Summary for Subcatchment 30S: FROM RAIN GARDENS

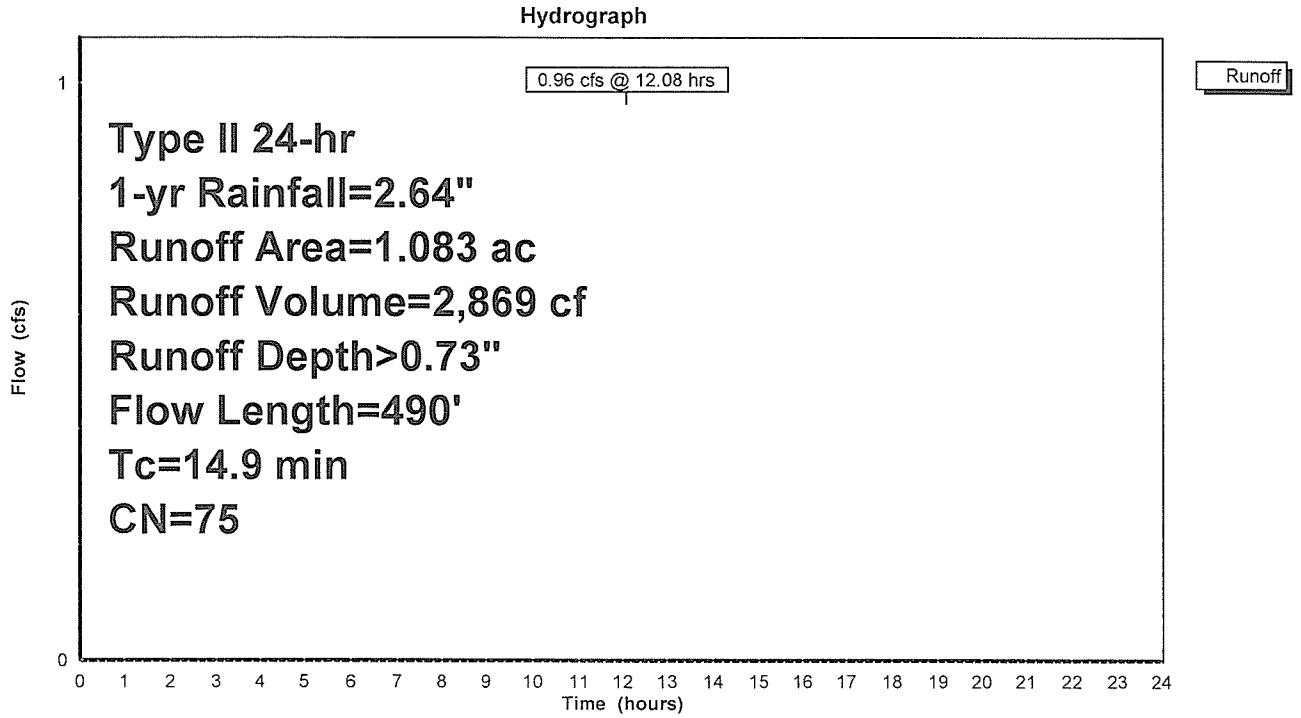
Runoff = 0.96 cfs @ 12.08 hrs, Volume= 2,869 cf, Depth> 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

	Area (ac)	CN	Description
*	0.289	98	sidewalks
	0.664	61	>75% Grass cover, Good, HSG B
	0.130	98	Paved parking, HSG B
	1.083	75	Weighted Average
	0.664		61.31% Pervious Area
	0.419		38.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0200	0.12		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 3.36"
0.3	30	0.0100	1.61		**Shallow Concentrated Flow, overland grass** Unpaved Kv= 16.1 fps
0.7	360	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
14.9	490	Total			

Subcatchment 30S: FROM RAIN GARDENS



Summary for Subcatchment 30S: FROM RAIN GARDENS

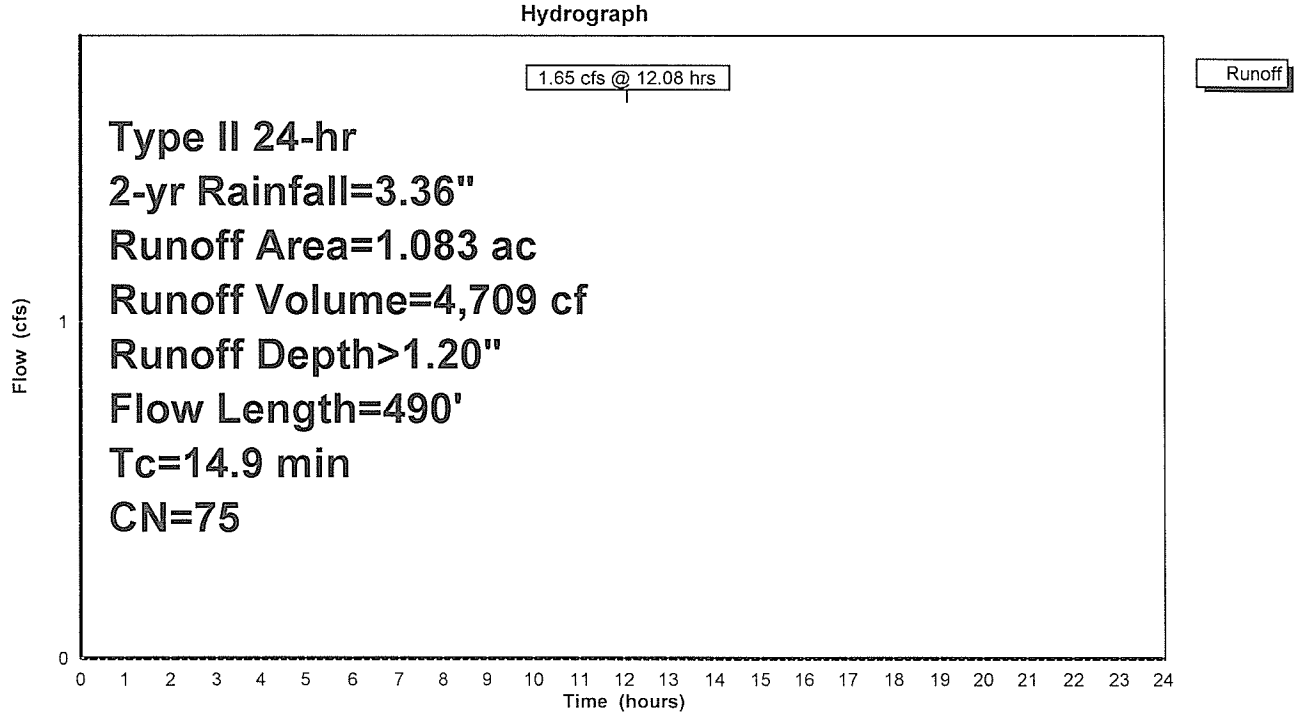
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 4,709 cf, Depth> 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

	Area (ac)	CN	Description
*	0.289	98	sidewalks
	0.664	61	>75% Grass cover, Good, HSG B
	0.130	98	Paved parking, HSG B
	1.083	75	Weighted Average
	0.664		61.31% Pervious Area
	0.419		38.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0200	0.12		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 3.36"
0.3	30	0.0100	1.61		**Shallow Concentrated Flow, overland grass** Unpaved Kv= 16.1 fps
0.7	360	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
14.9	490	Total			

Subcatchment 30S: FROM RAIN GARDENS



Summary for Subcatchment 30S: FROM RAIN GARDENS

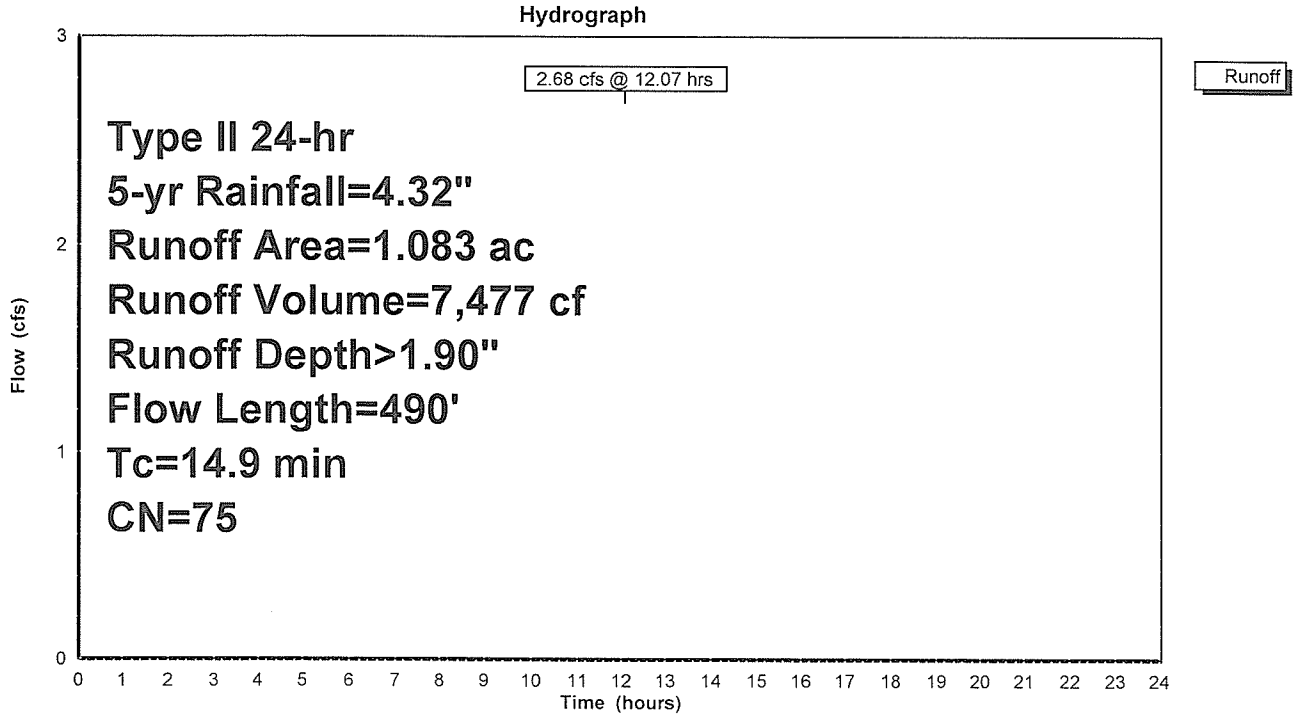
Runoff = 2.68 cfs @ 12.07 hrs, Volume= 7,477 cf, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

	Area (ac)	CN	Description
*	0.289	98	sidewalks
	0.664	61	>75% Grass cover, Good, HSG B
	0.130	98	Paved parking, HSG B
	1.083	75	Weighted Average
	0.664		61.31% Pervious Area
	0.419		38.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0200	0.12		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 3.36"
0.3	30	0.0100	1.61		**Shallow Concentrated Flow, overland grass** Unpaved Kv= 16.1 fps
0.7	360	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
14.9	490	Total			

Subcatchment 30S: FROM RAIN GARDENS



Summary for Subcatchment 30S: FROM RAIN GARDENS

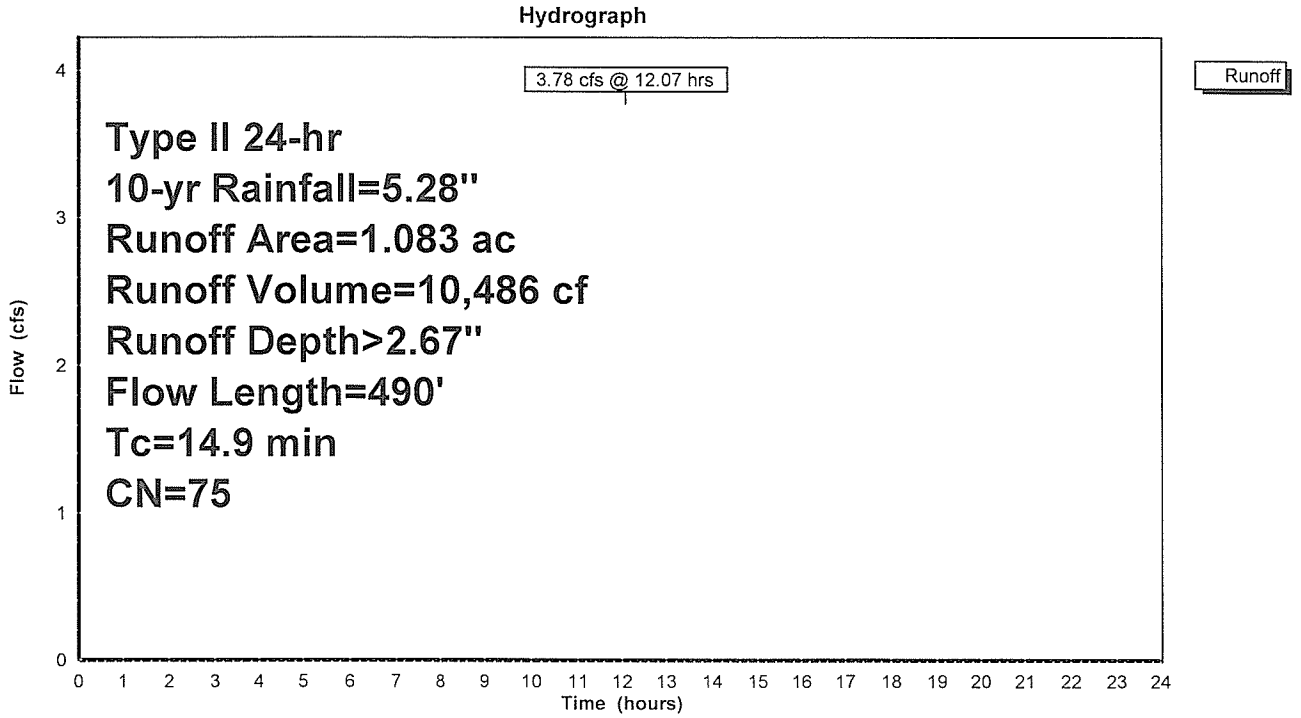
Runoff = 3.78 cfs @ 12.07 hrs, Volume= 10,486 cf, Depth> 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

	Area (ac)	CN	Description
*	0.289	98	sidewalks
	0.664	61	>75% Grass cover, Good, HSG B
	0.130	98	Paved parking, HSG B
	1.083	75	Weighted Average
	0.664		61.31% Pervious Area
	0.419		38.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0200	0.12		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 3.36"
0.3	30	0.0100	1.61		**Shallow Concentrated Flow, overland grass** Unpaved Kv= 16.1 fps
0.7	360	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
14.9	490	Total			

Subcatchment 30S: FROM RAIN GARDENS



Summary for Subcatchment 30S: FROM RAIN GARDENS

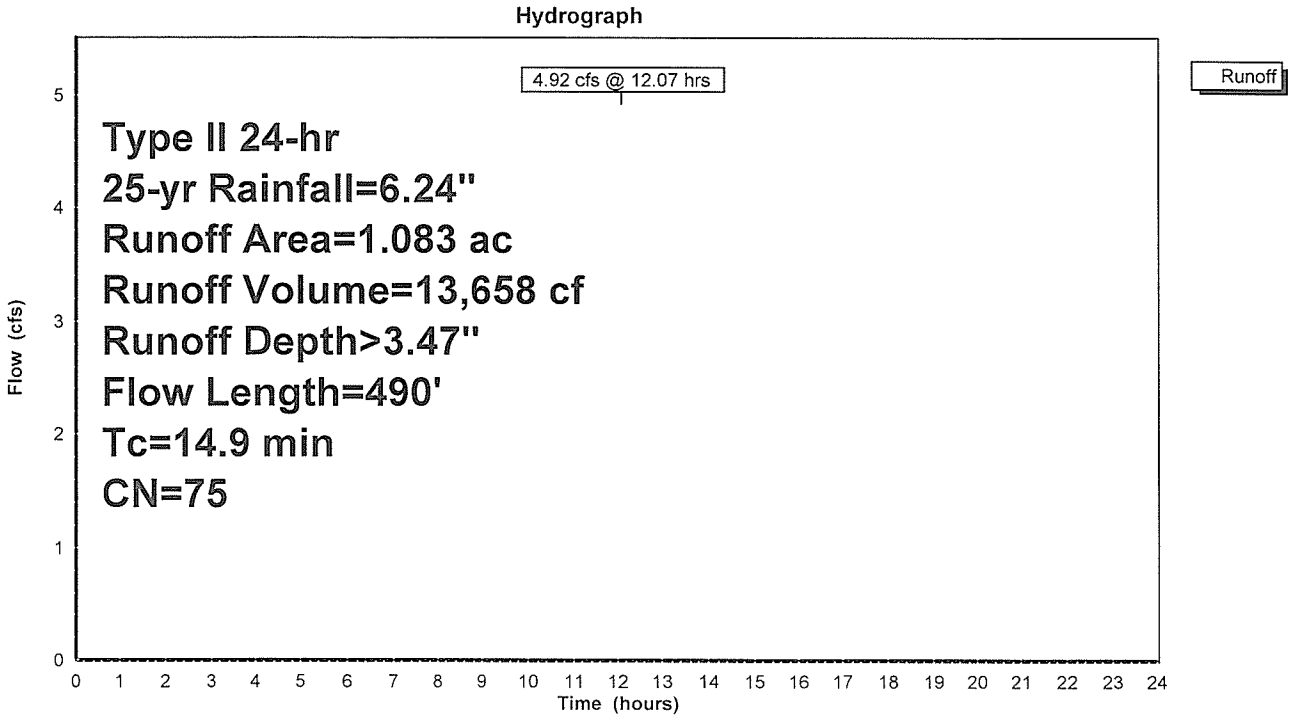
Runoff = 4.92 cfs @ 12.07 hrs, Volume= 13,658 cf, Depth> 3.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

	Area (ac)	CN	Description
*	0.289	98	sidewalks
	0.664	61	>75% Grass cover, Good, HSG B
	0.130	98	Paved parking, HSG B
	1.083	75	Weighted Average
	0.664		61.31% Pervious Area
	0.419		38.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0200	0.12		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 3.36"
0.3	30	0.0100	1.61		**Shallow Concentrated Flow, overland grass** Unpaved Kv= 16.1 fps
0.7	360	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
14.9	490	Total			

Subcatchment 30S: FROM RAIN GARDENS



Summary for Subcatchment 30S: FROM RAIN GARDENS

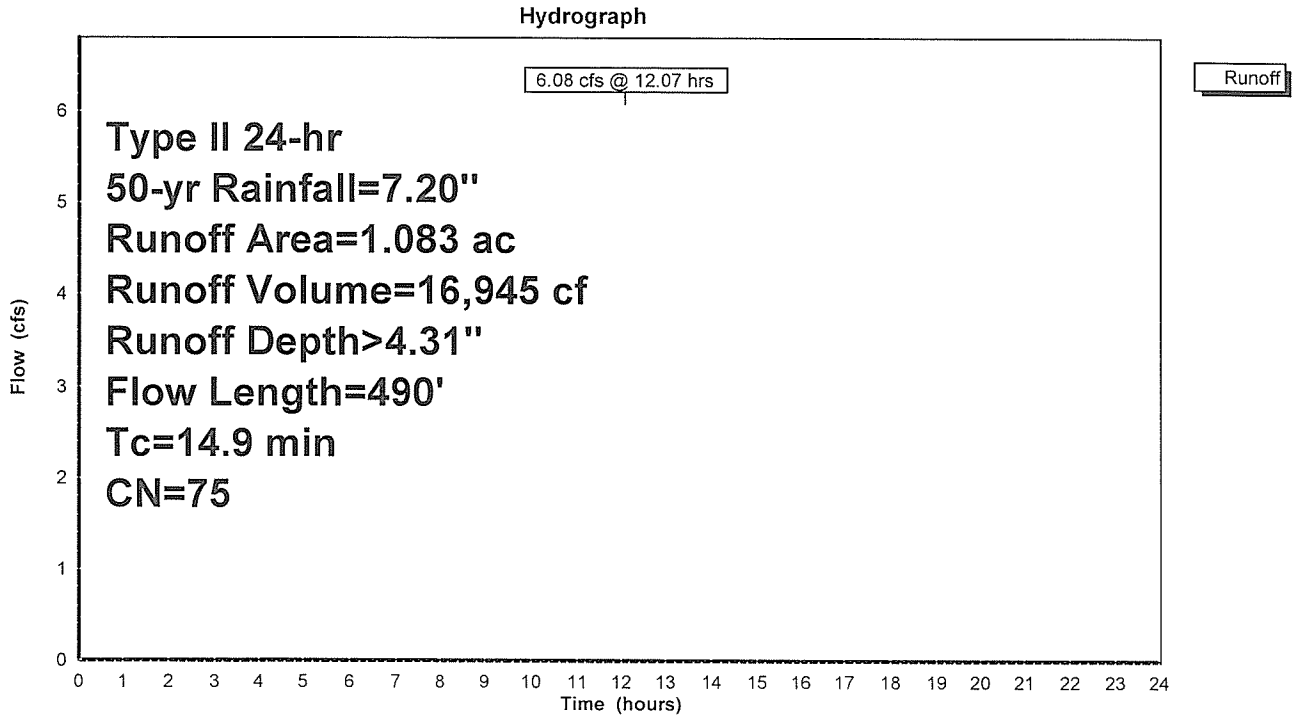
Runoff = 6.08 cfs @ 12.07 hrs, Volume= 16,945 cf, Depth> 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

	Area (ac)	CN	Description
*	0.289	98	sidewalks
	0.664	61	>75% Grass cover, Good, HSG B
	0.130	98	Paved parking, HSG B
	1.083	75	Weighted Average
	0.664		61.31% Pervious Area
	0.419		38.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0200	0.12		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 3.36"
0.3	30	0.0100	1.61		**Shallow Concentrated Flow, overland grass** Unpaved Kv= 16.1 fps
0.7	360	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
14.9	490	Total			

Subcatchment 30S: FROM RAIN GARDENS



Summary for Subcatchment 30S: FROM RAIN GARDENS

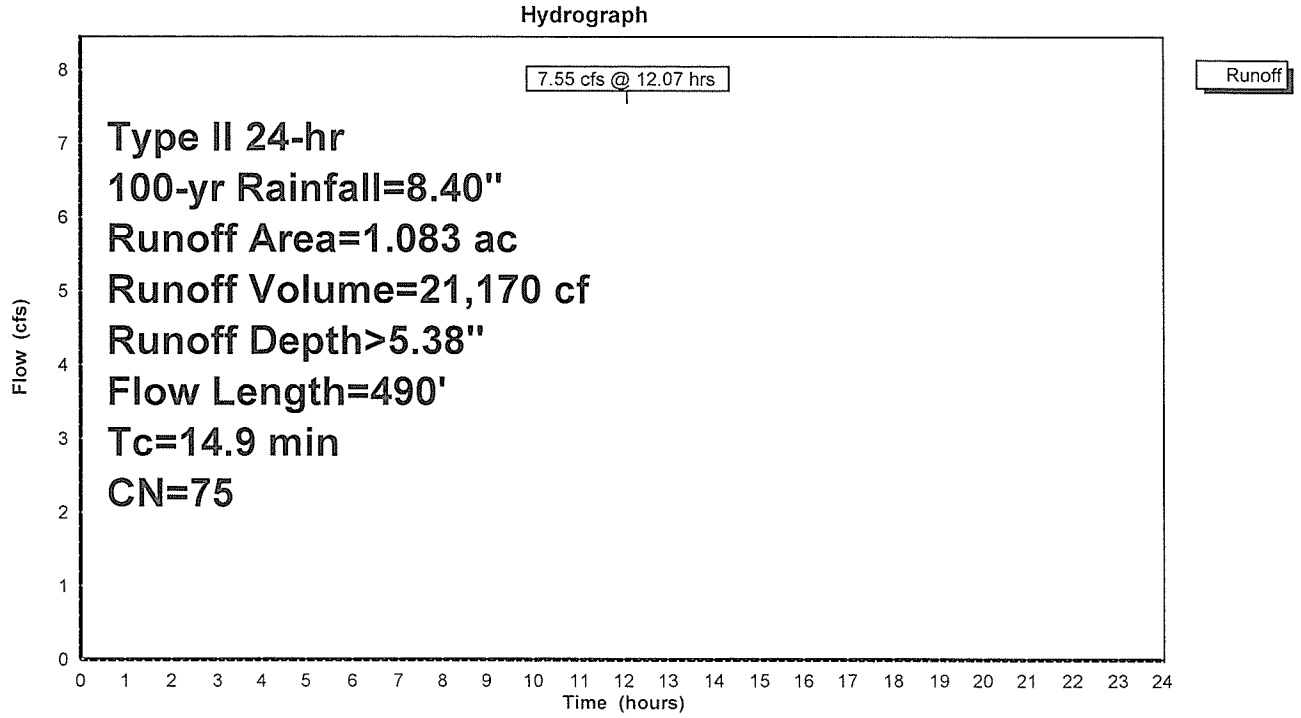
Runoff = 7.55 cfs @ 12.07 hrs, Volume= 21,170 cf, Depth> 5.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

	Area (ac)	CN	Description
*	0.289	98	sidewalks
	0.664	61	>75% Grass cover, Good, HSG B
	0.130	98	Paved parking, HSG B
	1.083	75	Weighted Average
	0.664		61.31% Pervious Area
	0.419		38.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0200	0.12		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 3.36"
0.3	30	0.0100	1.61		**Shallow Concentrated Flow, overland grass** Unpaved Kv= 16.1 fps
0.7	360	0.0100	8.51	26.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
14.9	490	Total			

Subcatchment 30S: FROM RAIN GARDENS

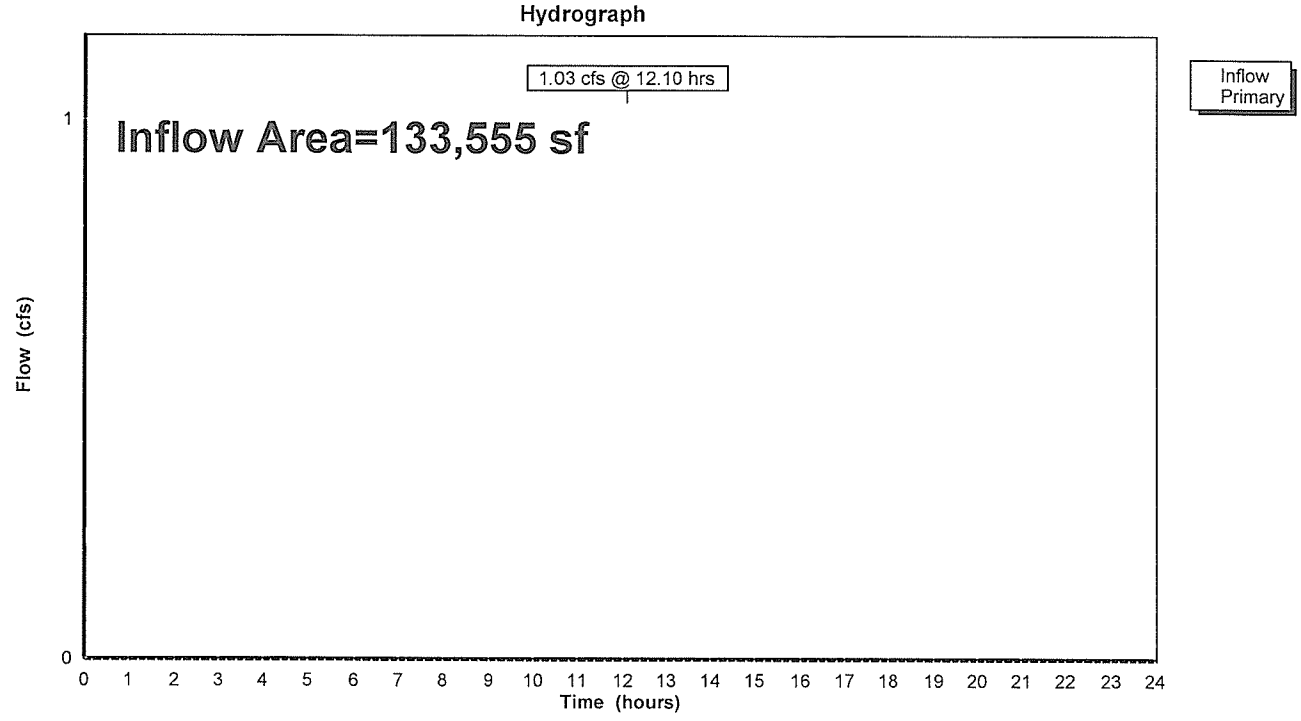


Summary for Link 27L: DMH

Inflow Area = 133,555 sf, 65.62% Impervious, Inflow Depth > 0.49" for 1-yr event
Inflow = 1.03 cfs @ 12.10 hrs, Volume= 5,456 cf
Primary = 1.03 cfs @ 12.10 hrs, Volume= 5,456 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 27L: DMH

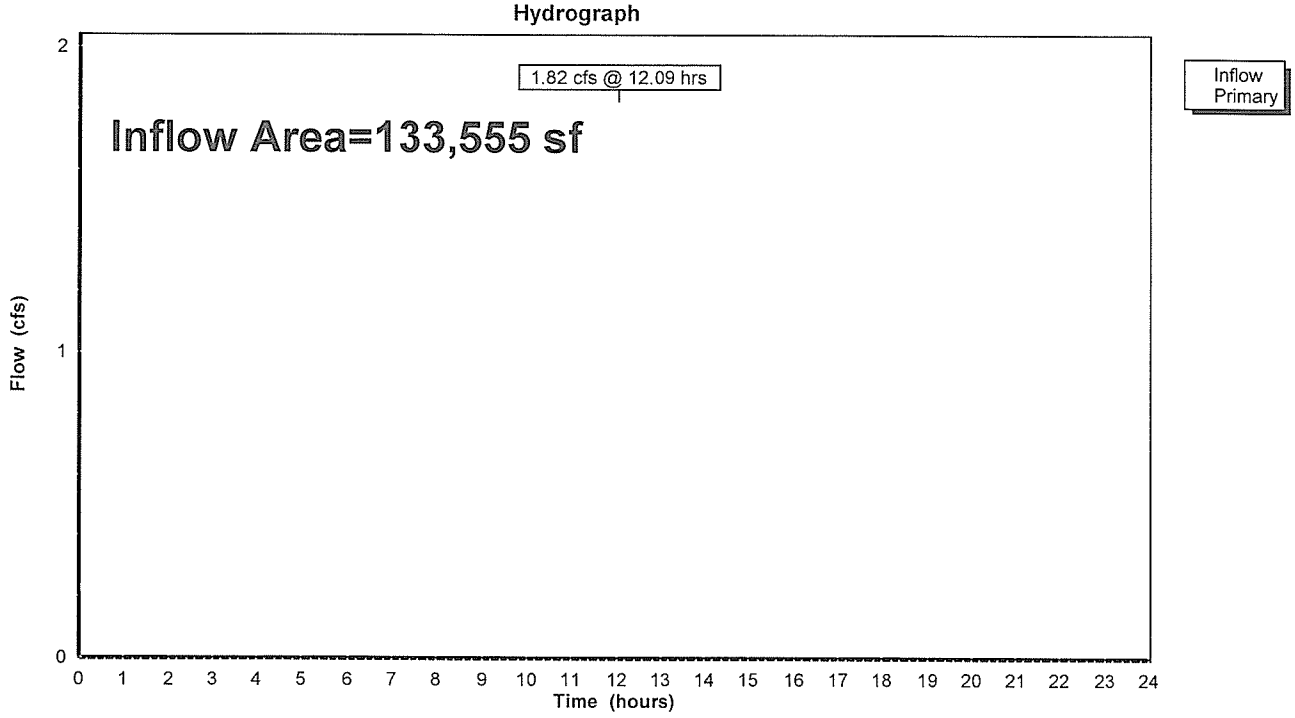


Summary for Link 27L: DMH

Inflow Area = 133,555 sf, 65.62% Impervious, Inflow Depth > 0.98" for 2-yr event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 10,899 cf
Primary = 1.82 cfs @ 12.09 hrs, Volume= 10,899 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 27L: DMH

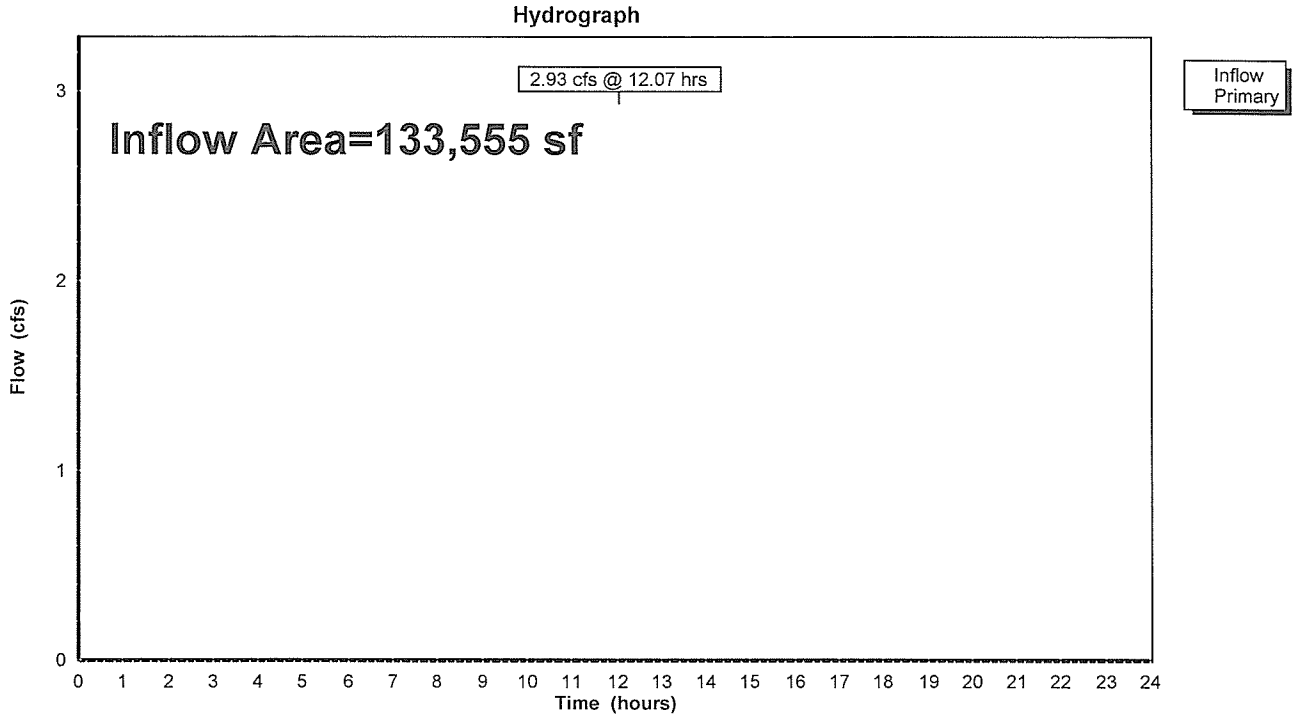


Summary for Link 27L: DMH

Inflow Area = 133,555 sf, 65.62% Impervious, Inflow Depth > 1.79" for 5-yr event
Inflow = 2.93 cfs @ 12.07 hrs, Volume= 19,953 cf
Primary = 2.93 cfs @ 12.07 hrs, Volume= 19,953 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 27L: DMH

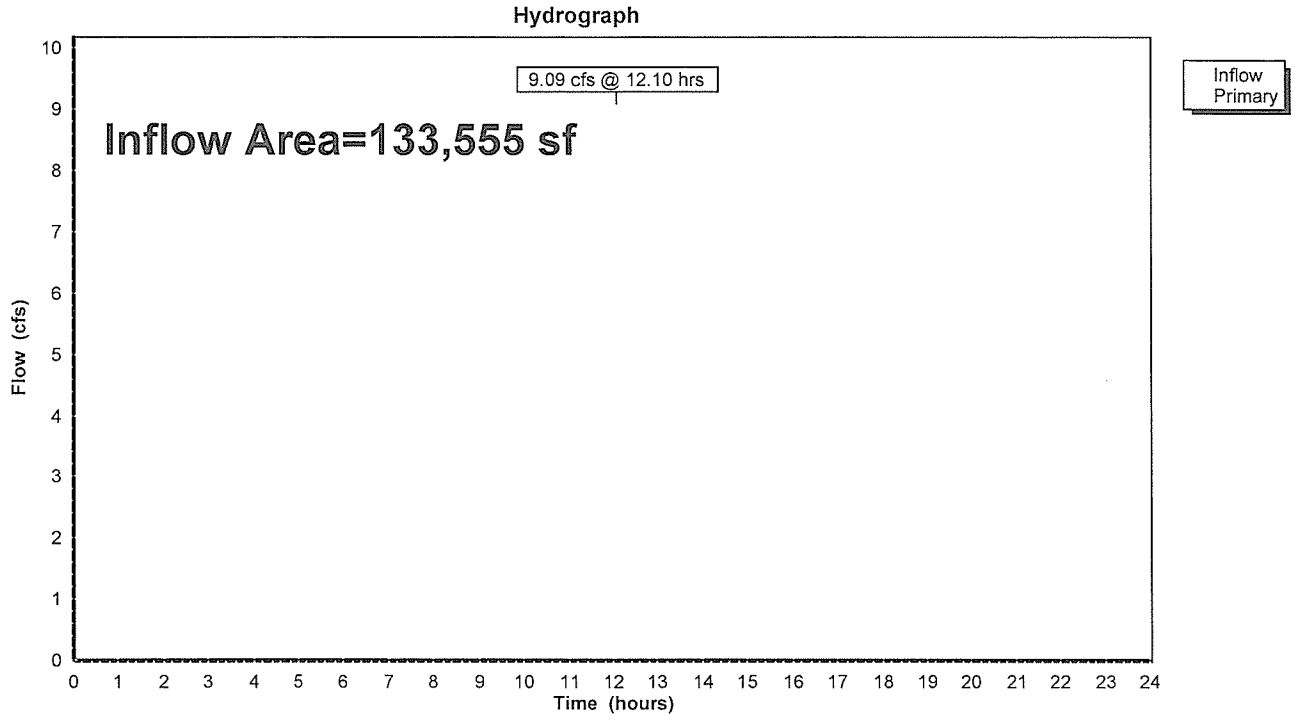


Summary for Link 27L: DMH

Inflow Area = 133,555 sf, 65.62% Impervious, Inflow Depth > 2.64" for 10-yr event
Inflow = 9.09 cfs @ 12.10 hrs, Volume= 29,395 cf
Primary = 9.09 cfs @ 12.10 hrs, Volume= 29,395 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 27L: DMH

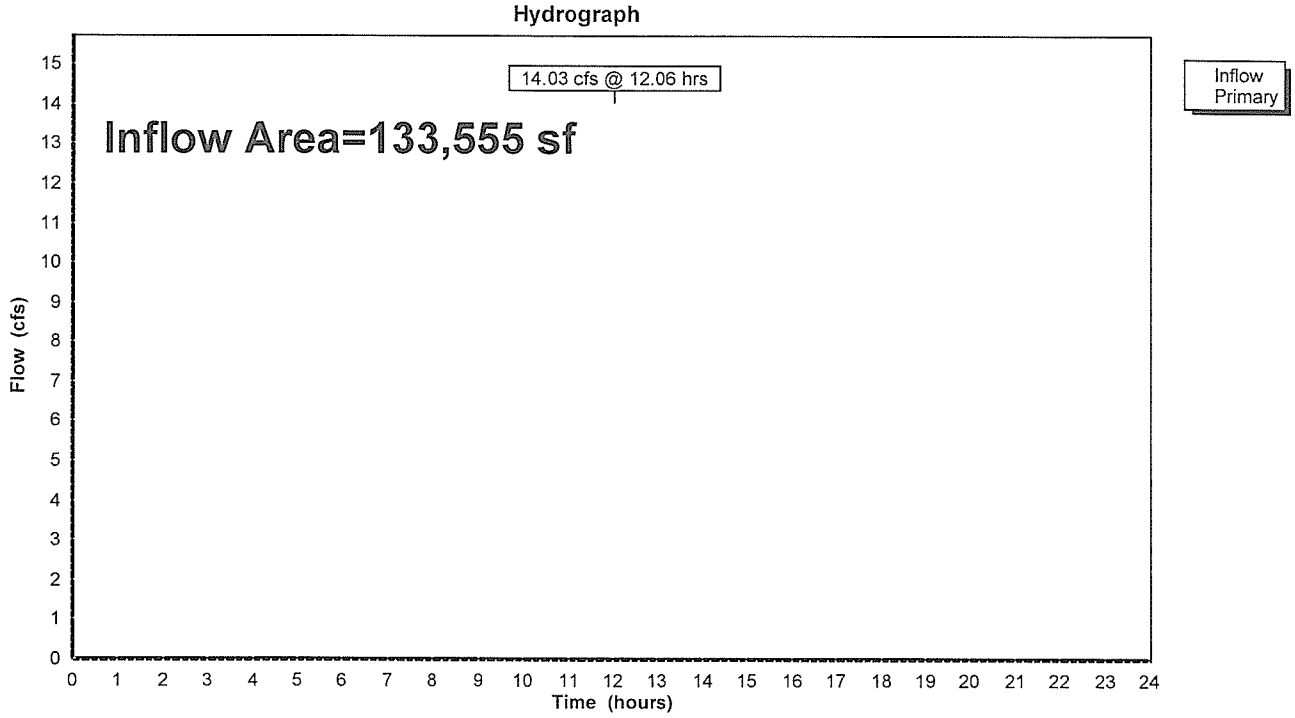


Summary for Link 27L: DMH

Inflow Area = 133,555 sf, 65.62% Impervious, Inflow Depth > 3.51" for 25-yr event
Inflow = 14.03 cfs @ 12.06 hrs, Volume= 39,099 cf
Primary = 14.03 cfs @ 12.06 hrs, Volume= 39,099 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 27L: DMH

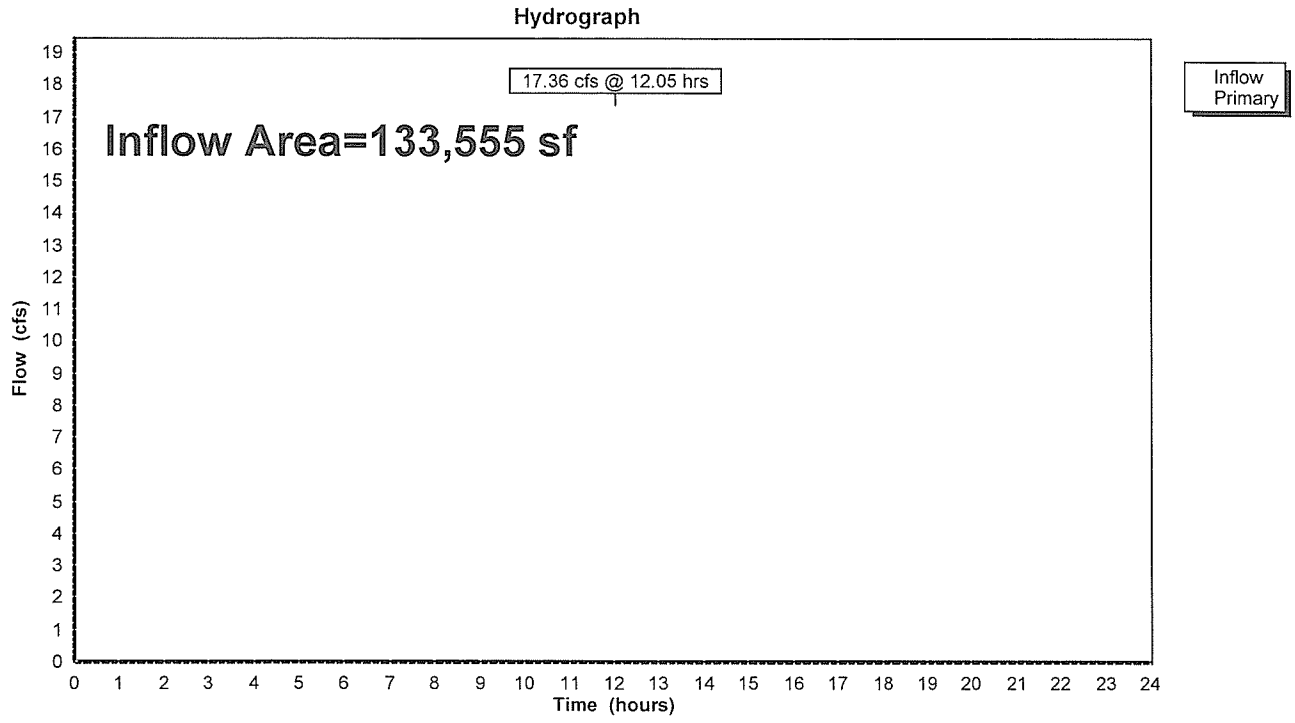


Summary for Link 27L: DMH

Inflow Area = 133,555 sf, 65.62% Impervious, Inflow Depth > 4.40" for 50-yr event
Inflow = 17.36 cfs @ 12.05 hrs, Volume= 48,986 cf
Primary = 17.36 cfs @ 12.05 hrs, Volume= 48,986 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 27L: DMH

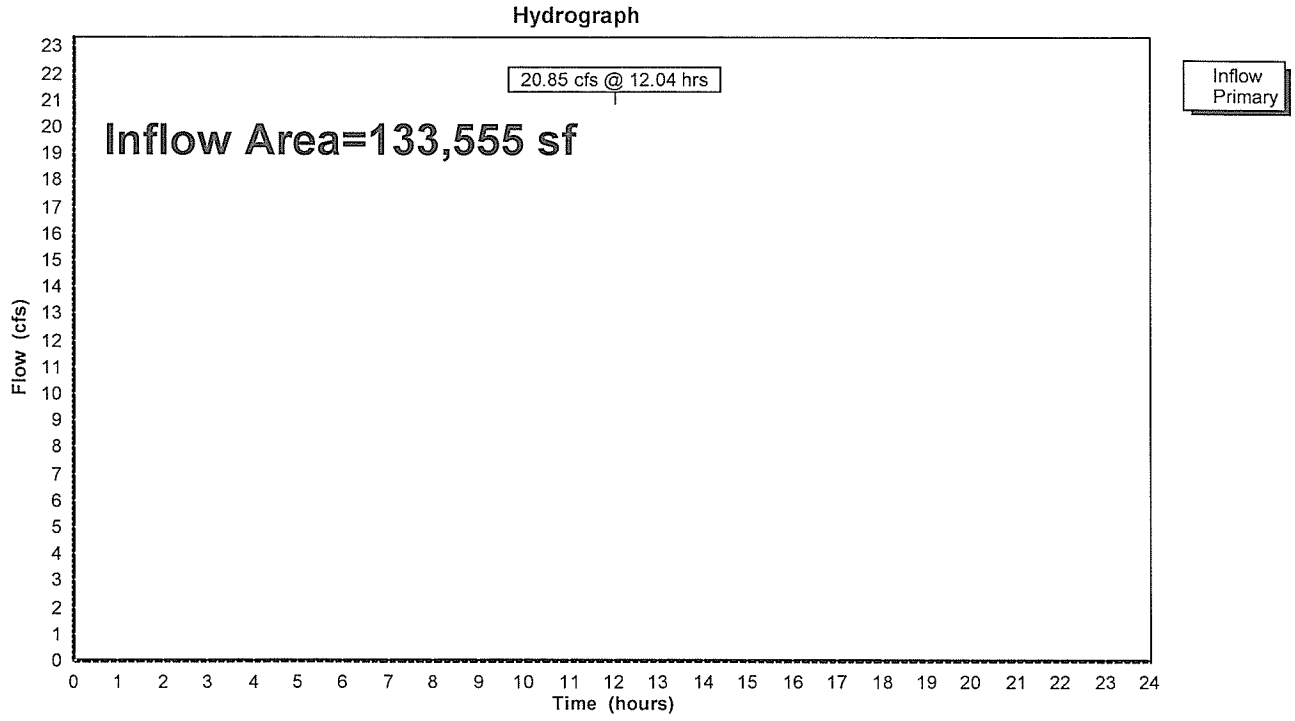


Summary for Link 27L: DMH

Inflow Area = 133,555 sf, 65.62% Impervious, Inflow Depth > 5.53" for 100-yr event
Inflow = 20.85 cfs @ 12.04 hrs, Volume= 61,530 cf
Primary = 20.85 cfs @ 12.04 hrs, Volume= 61,530 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 27L: DMH



Summary for Subcatchment 22S: INFIL-2

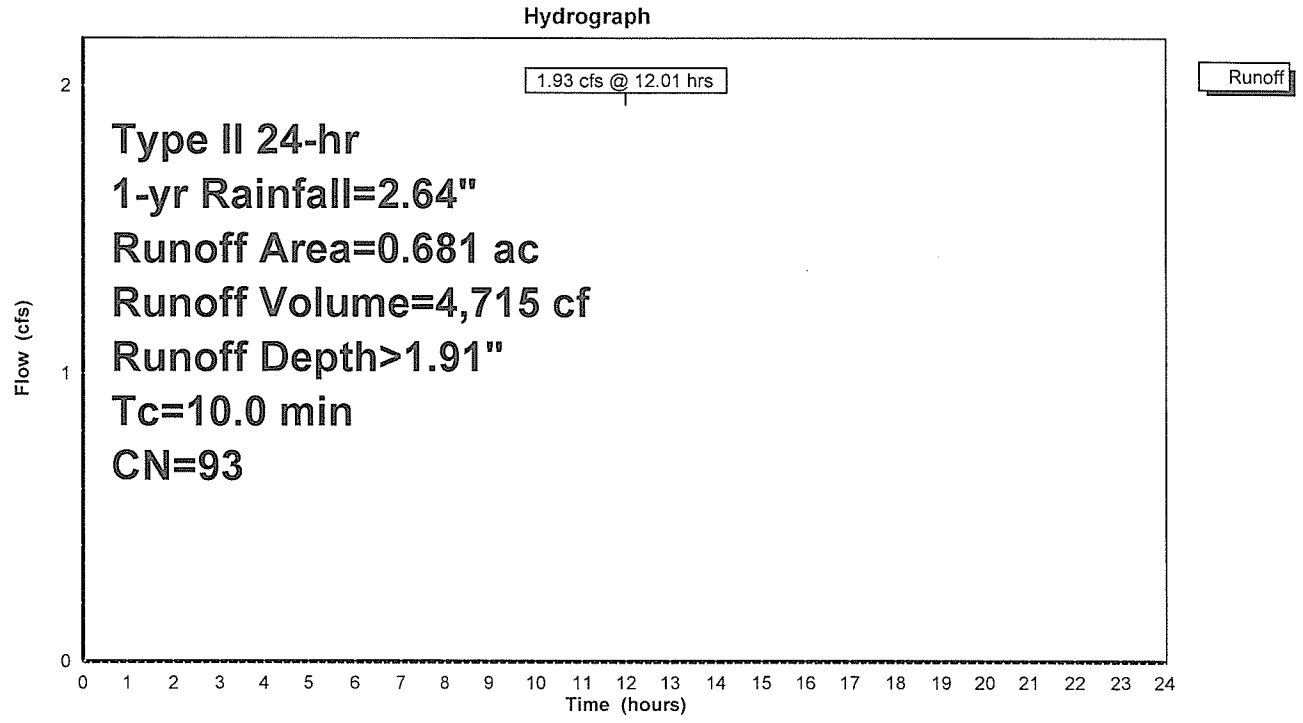
Runoff = 1.93 cfs @ 12.01 hrs, Volume= 4,715 cf, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

Area (ac)	CN	Description
0.592	98	Paved parking, HSG B
0.089	61	>75% Grass cover, Good, HSG B
0.681	93	Weighted Average
0.089		13.07% Pervious Area
0.592		86.93% Impervious Area

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

Subcatchment 22S: INFIL-2



Summary for Subcatchment 22S: INFIL-2

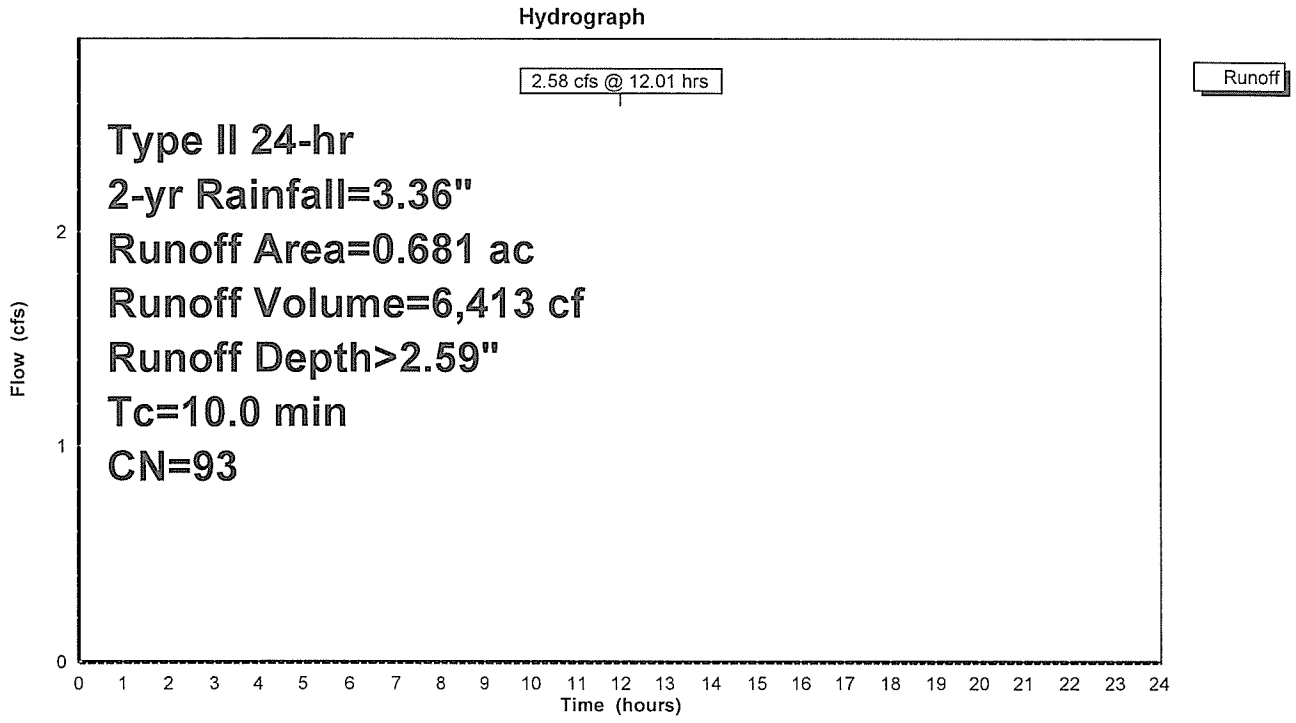
Runoff = 2.58 cfs @ 12.01 hrs, Volume= 6,413 cf, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

Area (ac)	CN	Description
0.592	98	Paved parking, HSG B
0.089	61	>75% Grass cover, Good, HSG B
0.681	93	Weighted Average
0.089		13.07% Pervious Area
0.592		86.93% Impervious Area

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

Subcatchment 22S: INFIL-2



Summary for Subcatchment 22S: INFIL-2

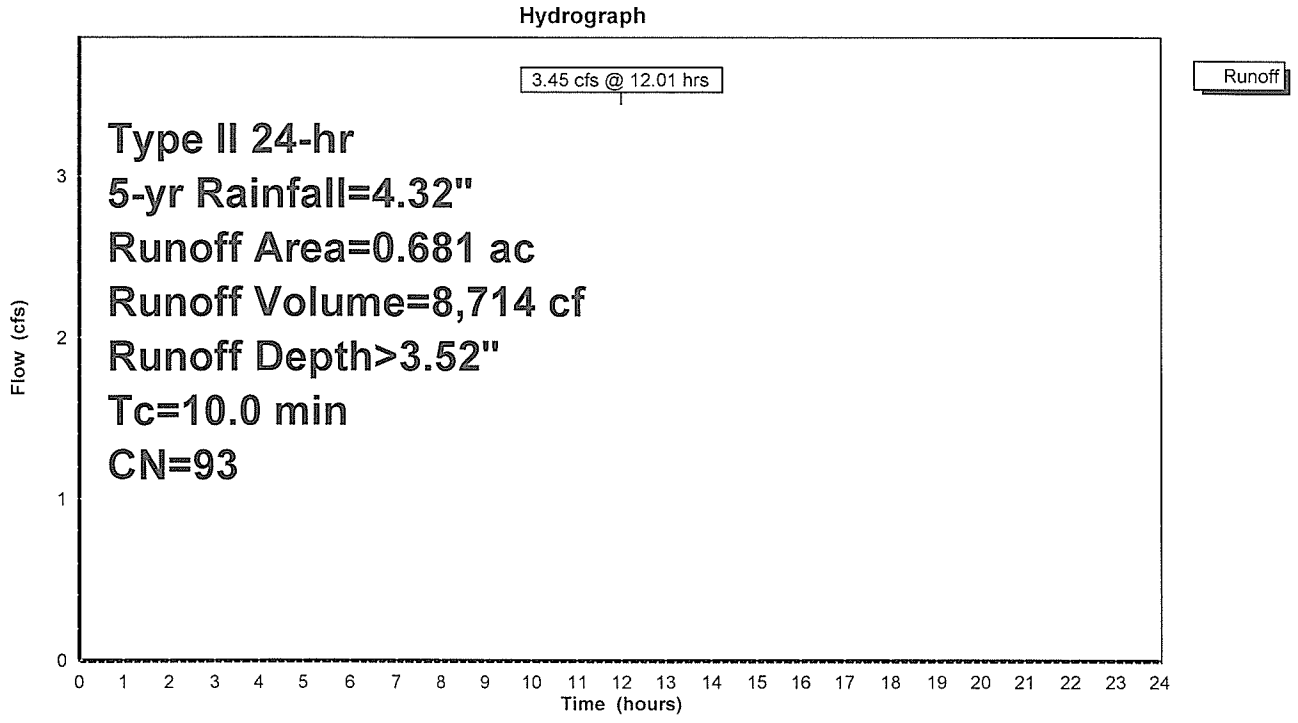
Runoff = 3.45 cfs @ 12.01 hrs, Volume= 8,714 cf, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

Area (ac)	CN	Description
0.592	98	Paved parking, HSG B
0.089	61	>75% Grass cover, Good, HSG B
0.681	93	Weighted Average
0.089		13.07% Pervious Area
0.592		86.93% Impervious Area

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

Subcatchment 22S: INFIL-2



Summary for Subcatchment 22S: INFIL-2

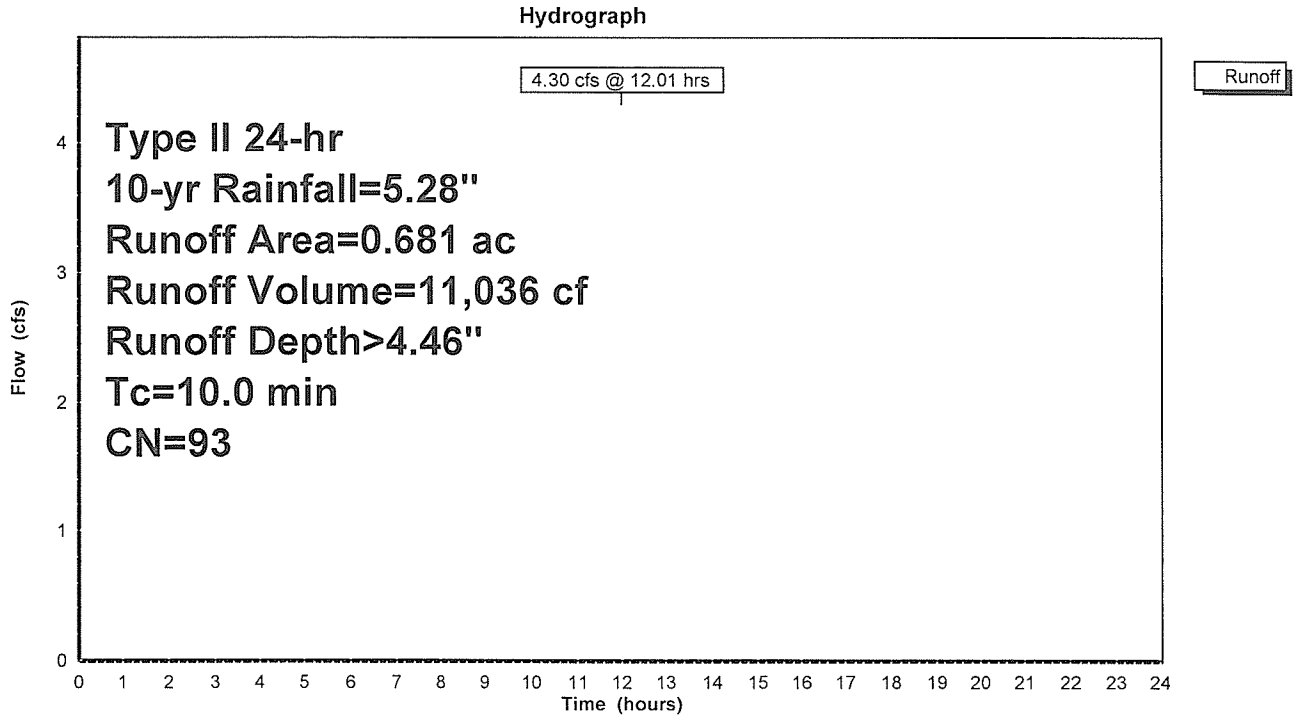
Runoff = 4.30 cfs @ 12.01 hrs, Volume= 11,036 cf, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

Area (ac)	CN	Description
0.592	98	Paved parking, HSG B
0.089	61	>75% Grass cover, Good, HSG B
0.681	93	Weighted Average
0.089		13.07% Pervious Area
0.592		86.93% Impervious Area

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

Subcatchment 22S: INFIL-2



Summary for Subcatchment 22S: INFIL-2

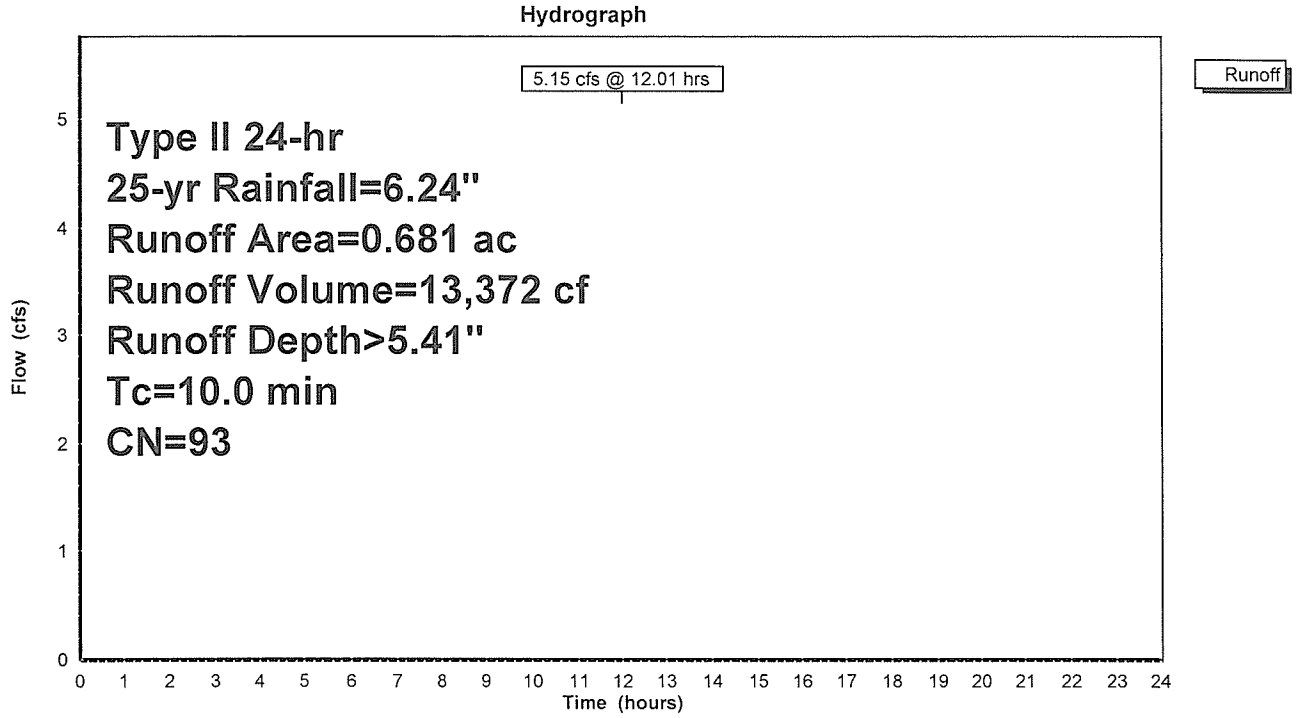
Runoff = 5.15 cfs @ 12.01 hrs, Volume= 13,372 cf, Depth> 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

Area (ac)	CN	Description
0.592	98	Paved parking, HSG B
0.089	61	>75% Grass cover, Good, HSG B
0.681	93	Weighted Average
0.089		13.07% Pervious Area
0.592		86.93% Impervious Area

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

Subcatchment 22S: INFIL-2



Summary for Subcatchment 22S: INFIL-2

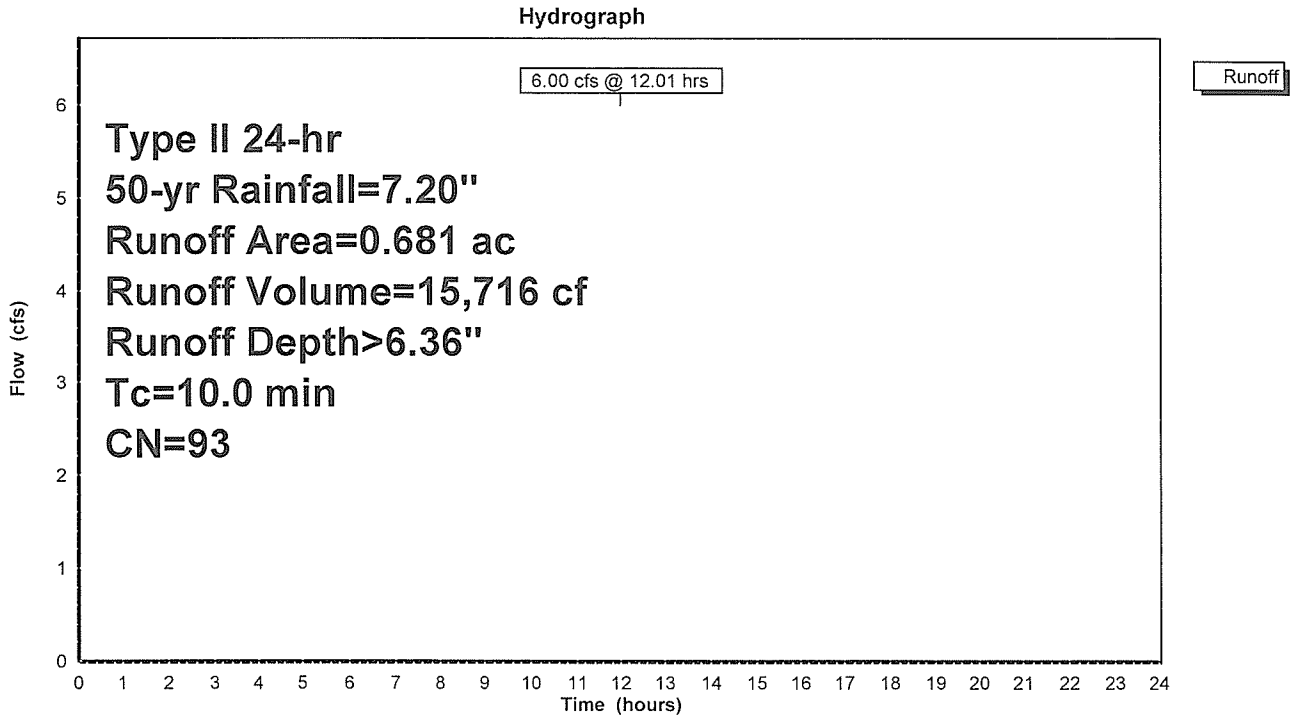
Runoff = 6.00 cfs @ 12.01 hrs, Volume= 15,716 cf, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

Area (ac)	CN	Description
0.592	98	Paved parking, HSG B
0.089	61	>75% Grass cover, Good, HSG B
0.681	93	Weighted Average
0.089		13.07% Pervious Area
0.592		86.93% Impervious Area

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

Subcatchment 22S: INFIL-2



Summary for Subcatchment 22S: INFIL-2

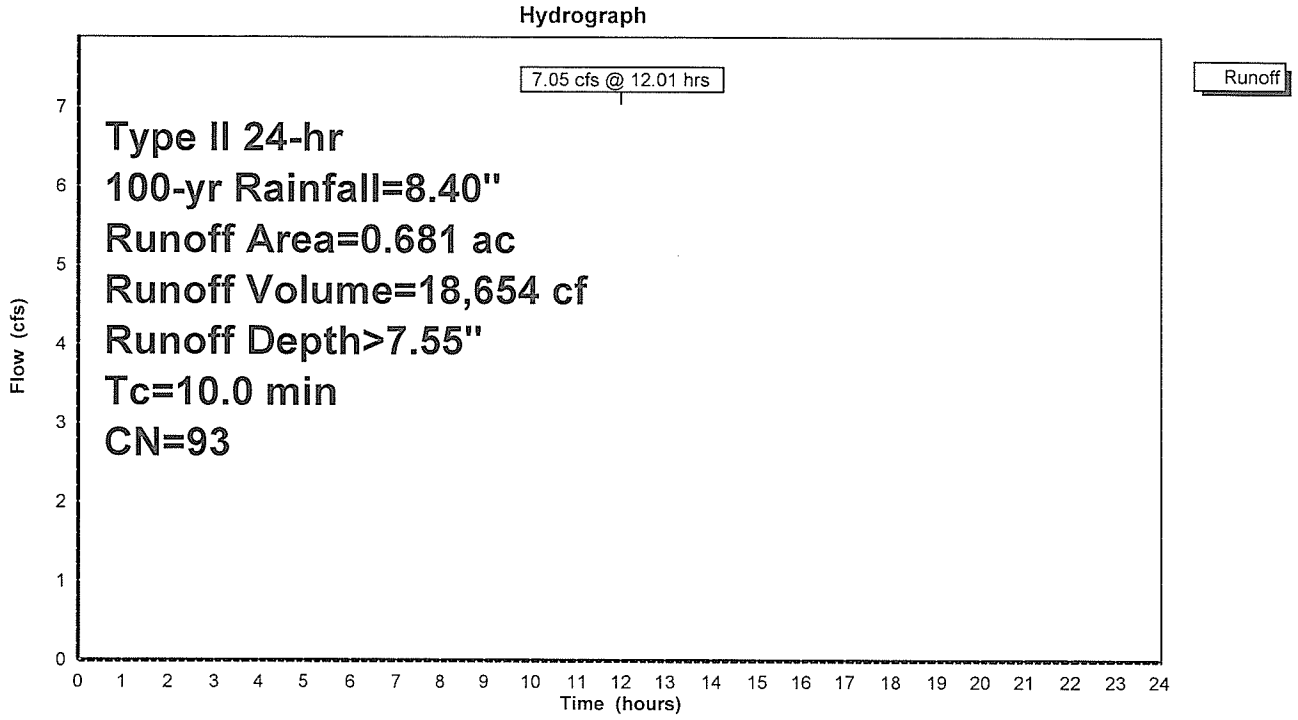
Runoff = 7.05 cfs @ 12.01 hrs, Volume= 18,654 cf, Depth> 7.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

Area (ac)	CN	Description
0.592	98	Paved parking, HSG B
0.089	61	>75% Grass cover, Good, HSG B
0.681	93	Weighted Average
0.089		13.07% Pervious Area
0.592		86.93% Impervious Area

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

Subcatchment 22S: INFIL-2



Events for Pond 21P: Infiltration-2

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	2.78	0.27	420.42	7,451
2-yr	4.16	0.80	420.72	8,707
5-yr	6.08	2.72	421.09	10,190
10-yr	11.98	9.17	421.56	11,883
25-yr	18.63	16.76	421.88	12,782
50-yr	23.06	20.20	422.28	13,668
100-yr	**27.61**	**23.51**	**422.92**	**15,058**

Summary for Pond 21P: Infiltration-2

Inflow Area = 163,219 sf, 69.50% Impervious, Inflow Depth > 0.75" for 1-yr event
Inflow = 2.78 cfs @ 12.03 hrs, Volume= 10,171 cf
Outflow = 0.27 cfs @ 13.54 hrs, Volume= 8,086 cf, Atten= 90%, Lag= 90.3 min
Primary = 0.27 cfs @ 13.54 hrs, Volume= 8,086 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 419.00' Surf.Area= 5,489 sf Storage= 2,196 cf
Peak Elev= 420.42' @ 13.54 hrs Surf.Area= 5,489 sf Storage= 7,451 cf (5,256 cf above start)

Plug-Flow detention time= 444.7 min calculated for 5,884 cf (58% of inflow)
Center-of-Mass det. time= 214.7 min (1,013.6 - 798.9)

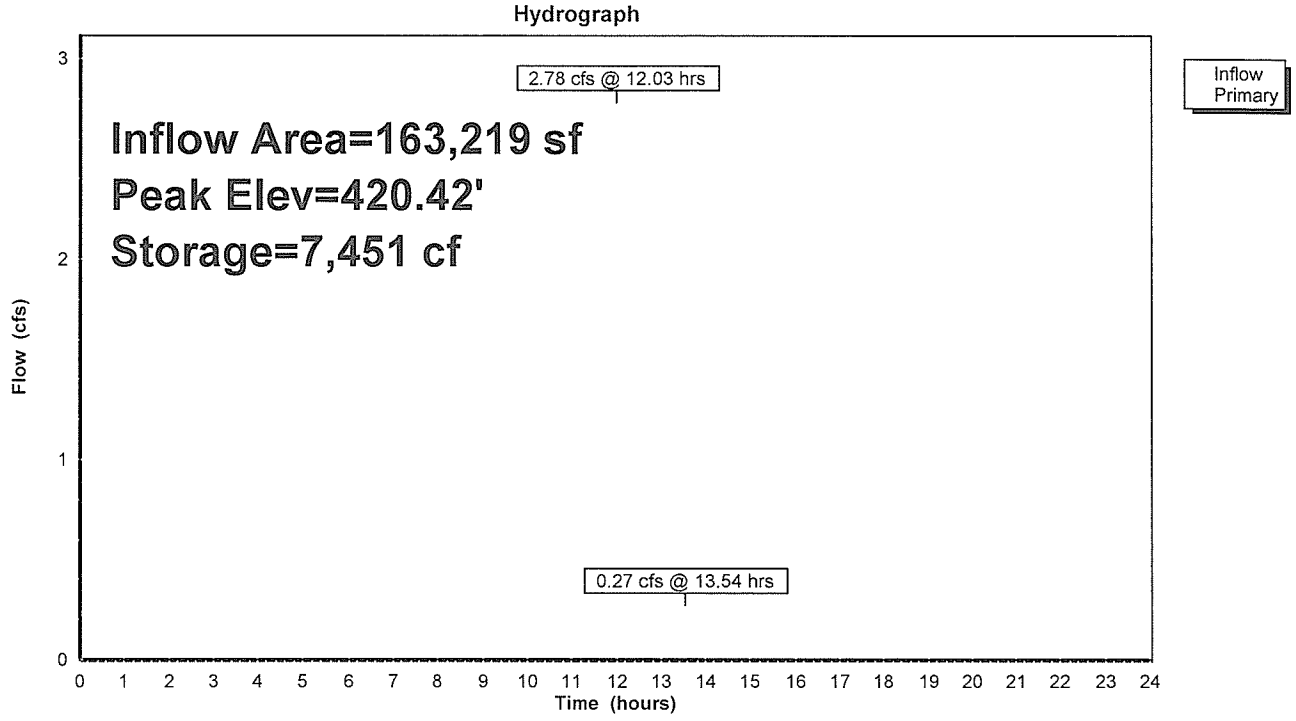
Volume	Invert	Avail.Storage	Storage Description
#1A	418.00'	8,135 cf	**53.75'W x 102.12'L x 5.00'H Field A** 27,444 cf Overall - 7,106 cf Embedded = 20,338 cf x 40.0% Voids
#2A	419.50'	7,106 cf	**ADS_StormTech SC-740**x 154 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 11 rows
		15,241 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	419.50'	**24.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 419.50' / 417.80' S= 0.1000 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	421.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	421.00'	**48.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	420.50'	**18.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	419.50'	**3.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.27 cfs @ 13.54 hrs HW=420.42' (Free Discharge)
└**1=Culvert** (Passes 0.27 cfs of 4.60 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Orifice/Grate** (Orifice Controls 0.27 cfs @ 4.29 fps)

Pond 21P: Infiltration-2



Summary for Pond 21P: Infiltration-2

Inflow Area = 163,219 sf, 69.50% Impervious, Inflow Depth > 1.27" for 2-yr event
Inflow = 4.16 cfs @ 12.03 hrs, Volume= 17,313 cf
Outflow = 0.80 cfs @ 12.58 hrs, Volume= 13,820 cf, Atten= 81%, Lag= 32.8 min
Primary = 0.80 cfs @ 12.58 hrs, Volume= 13,820 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 419.00' Surf.Area= 5,489 sf Storage= 2,196 cf
Peak Elev= 420.72' @ 12.58 hrs Surf.Area= 5,489 sf Storage= 8,707 cf (6,511 cf above start)

Plug-Flow detention time= 339.9 min calculated for 11,616 cf (67% of inflow)
Center-of-Mass det. time= 153.7 min (1,003.0 - 849.4)

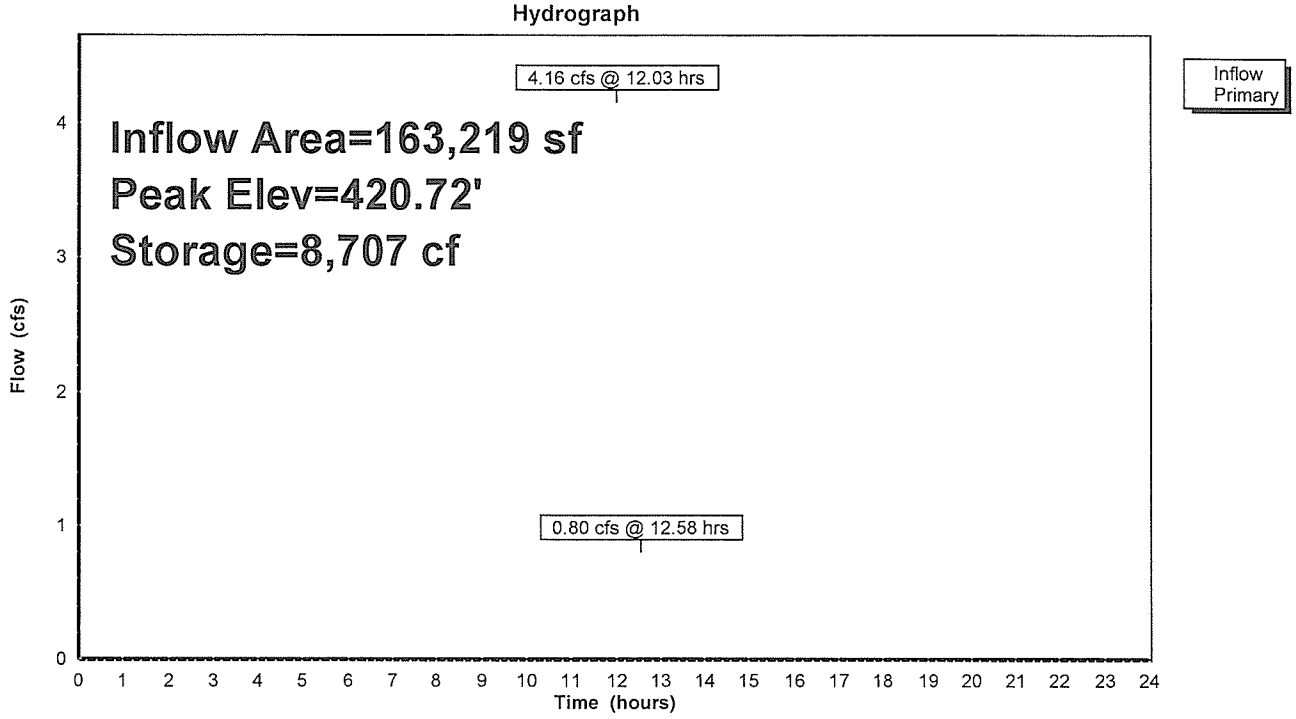
Volume	Invert	Avail.Storage	Storage Description
#1A	418.00'	8,135 cf	**53.75'W x 102.12'L x 5.00'H Field A** 27,444 cf Overall - 7,106 cf Embedded = 20,338 cf x 40.0% Voids
#2A	419.50'	7,106 cf	**ADS_StormTech SC-740**x 154 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 11 rows
		15,241 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	419.50'	**24.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 419.50' / 417.80' S= 0.1000 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	421.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	421.00'	**48.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	420.50'	**18.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	419.50'	**3.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.79 cfs @ 12.58 hrs HW=420.72' (Free Discharge)
└**1=Culvert** (Passes 0.79 cfs of 7.50 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Orifice Controls 0.48 cfs @ 1.49 fps)
  └**5=Orifice/Grate** (Orifice Controls 0.31 cfs @ 5.02 fps)

Pond 21P: Infiltration-2



Summary for Pond 21P: Infiltration-2

Inflow Area = 163,219 sf, 69.50% Impervious, Inflow Depth > 2.11" for 5-yr event
Inflow = 6.08 cfs @ 12.03 hrs, Volume= 28,666 cf
Outflow = 2.72 cfs @ 12.33 hrs, Volume= 24,354 cf, Atten= 55%, Lag= 18.0 min
Primary = 2.72 cfs @ 12.33 hrs, Volume= 24,354 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 419.00' Surf.Area= 5,489 sf Storage= 2,196 cf
Peak Elev= 421.09' @ 12.33 hrs Surf.Area= 5,489 sf Storage= 10,190 cf (7,994 cf above start)

Plug-Flow detention time= 205.4 min calculated for 22,145 cf (77% of inflow)
Center-of-Mass det. time= 89.3 min (930.1 - 840.8)

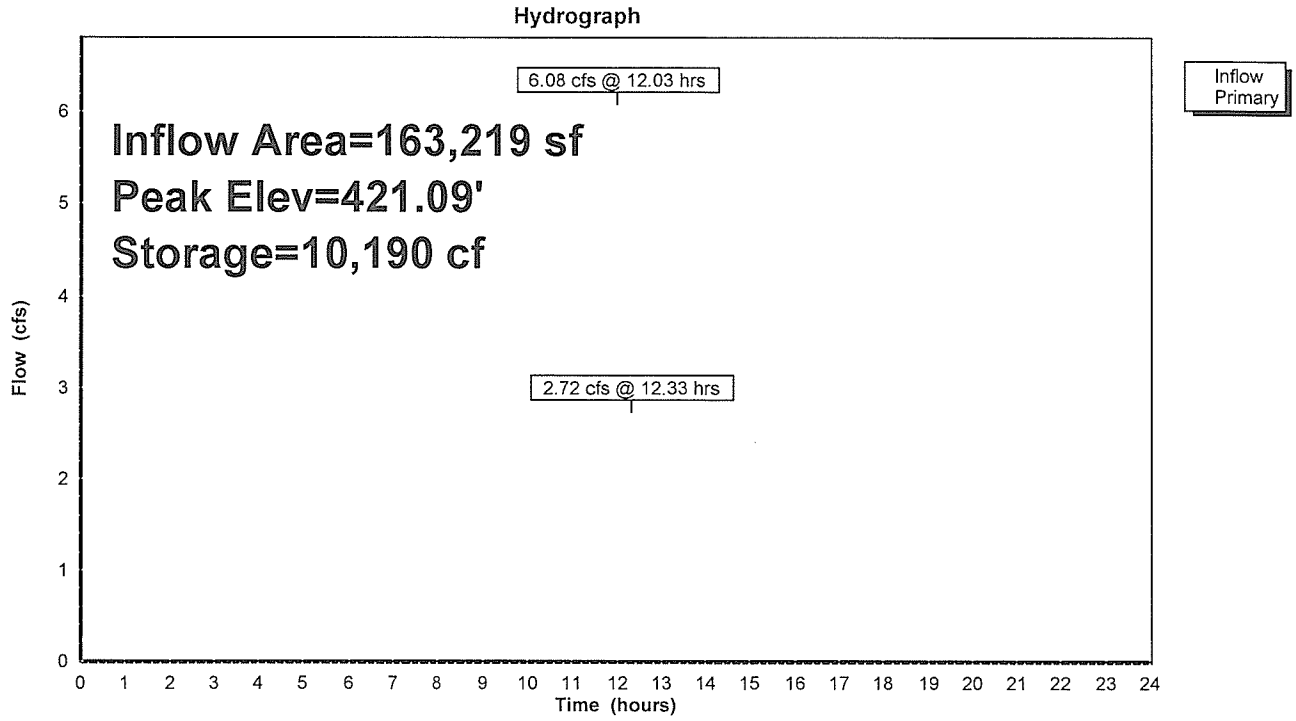
Volume	Invert	Avail.Storage	Storage Description
#1A	418.00'	8,135 cf	**53.75'W x 102.12'L x 5.00'H Field A** 27,444 cf Overall - 7,106 cf Embedded = 20,338 cf x 40.0% Voids
#2A	419.50'	7,106 cf	**ADS_StormTech SC-740**x 154 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 11 rows
		15,241 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	419.50'	**24.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 419.50' / 417.80' S= 0.1000 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	421.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	421.00'	**48.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	420.50'	**18.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	419.50'	**3.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.72 cfs @ 12.33 hrs HW=421.09' (Free Discharge)
└**1=Culvert** (Passes 2.72 cfs of 11.45 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 0.94 fps)
  ├**4=Orifice/Grate** (Orifice Controls 2.04 cfs @ 2.72 fps)
  └**5=Orifice/Grate** (Orifice Controls 0.36 cfs @ 5.82 fps)

Pond 21P: Infiltration-2



Events for Pond 21P: Infiltration-2

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	2.78	0.27	420.42	7,451
2-yr	4.16	0.80	420.72	8,707
5-yr	6.08	2.72	421.09	10,190
10-yr	11.98	9.17	421.56	11,883
25-yr	18.63	16.76	421.88	12,782
50-yr	23.06	20.20	422.28	13,668
100-yr	**27.61**	**23.51**	**422.92**	**15,058**

Summary for Pond 21P: Infiltration-2

Inflow Area = 163,219 sf, 69.50% Impervious, Inflow Depth > 2.97" for 10-yr event
Inflow = 11.98 cfs @ 12.09 hrs, Volume= 40,431 cf
Outflow = 9.17 cfs @ 12.16 hrs, Volume= 35,469 cf, Atten= 23%, Lag= 4.0 min
Primary = 9.17 cfs @ 12.16 hrs, Volume= 35,469 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 419.00' Surf.Area= 5,489 sf Storage= 2,196 cf
Peak Elev= 421.56' @ 12.16 hrs Surf.Area= 5,489 sf Storage= 11,883 cf (9,687 cf above start)

Plug-Flow detention time= 149.6 min calculated for 33,255 cf (82% of inflow)
Center-of-Mass det. time= 59.7 min (891.5 - 831.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	418.00'	8,135 cf	**53.75'W x 102.12'L x 5.00'H Field A** 27,444 cf Overall - 7,106 cf Embedded = 20,338 cf x 40.0% Voids
#2A	419.50'	7,106 cf	**ADS_StormTech SC-740**x 154 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 11 rows
		15,241 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	419.50'	**24.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 419.50' / 417.80' S= 0.1000 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	421.50'	**6.0' long Sharp-Crested Rectangular Weir**2 End Contraction(s) 1.0' Crest Height
#3	Device 1	421.00'	**48.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	420.50'	**18.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	419.50'	**3.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=9.16 cfs @ 12.16 hrs HW=421.56' (Free Discharge)
└**1=Culvert** (Passes 9.16 cfs of 15.58 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.30 cfs @ 0.81 fps)
  ├**3=Orifice/Grate** (Orifice Controls 5.20 cfs @ 2.60 fps)
  ├**4=Orifice/Grate** (Orifice Controls 3.24 cfs @ 4.32 fps)
  └**5=Orifice/Grate** (Orifice Controls 0.42 cfs @ 6.70 fps)

Pond 21P: Infiltration-2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech®SC-740 (ADSStormTech®SC-740)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 11 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

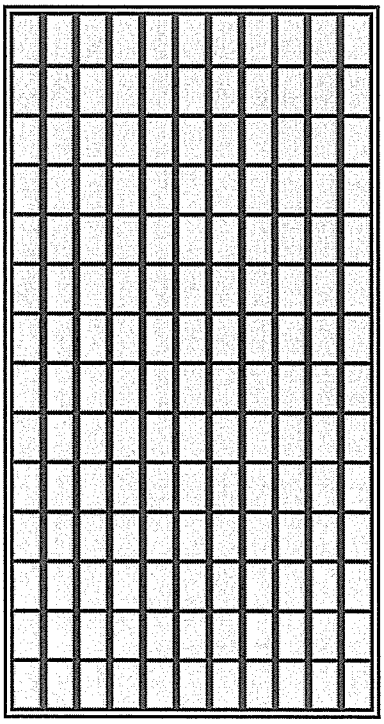
14 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 100.12' Row Length +12.0" End Stone x 2 = 102.12' Base Length
11 Rows x 51.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 53.75' Base Width
18.0" Base + 30.0" Chamber Height + 12.0" Cover = 5.00' Field Height

154 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 11 Rows = 7,105.9 cf Chamber Storage

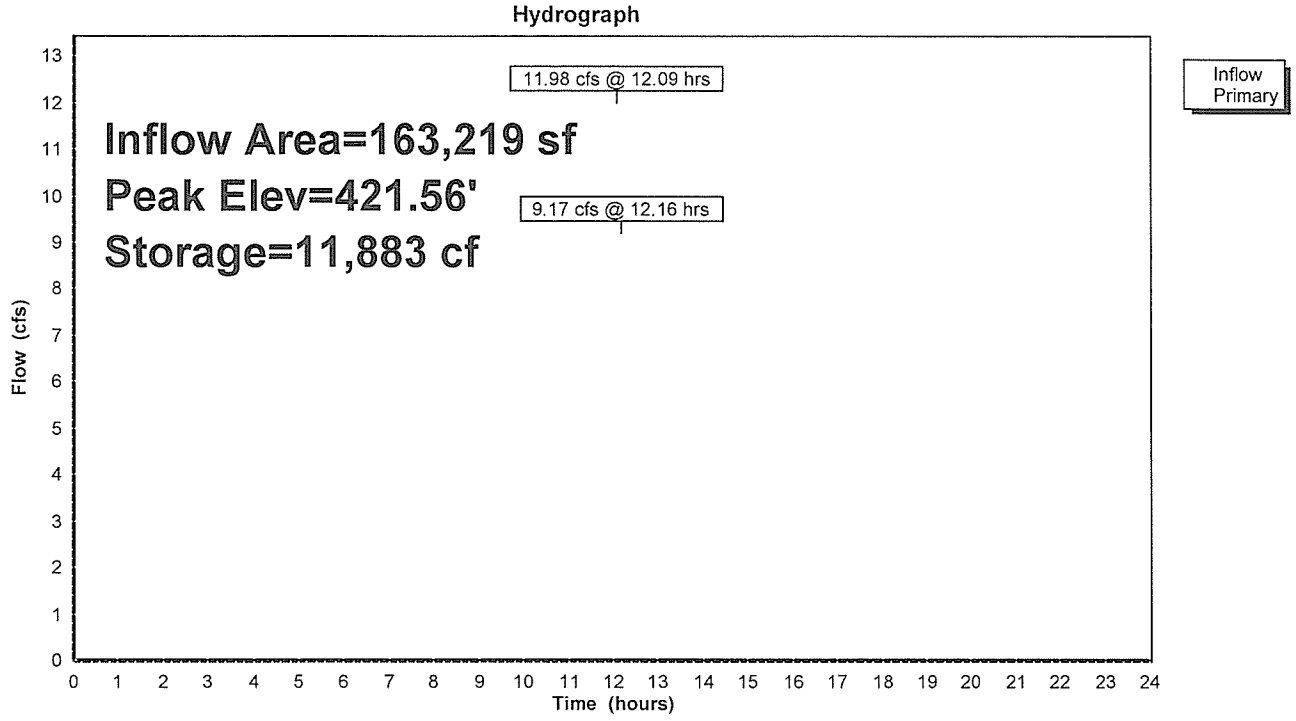
27,444.3 cf Field - 7,105.9 cf Chambers = 20,338.4 cf Stone x 40.0% Voids = 8,135.4 cf Stone Storage

Chamber Storage + Stone Storage = 15,241.2 cf = 0.350 af
Overall Storage Efficiency = 55.5%

154 Chambers
1,016.5 cy Field
753.3 cy Stone



Pond 21P: Infiltration-2



Summary for Pond 21P: Infiltration-2

Inflow Area = 163,219 sf, 69.50% Impervious, Inflow Depth > 3.86" for 25-yr event
Inflow = 18.63 cfs @ 12.05 hrs, Volume= 52,471 cf
Outflow = 16.76 cfs @ 12.09 hrs, Volume= 47,016 cf, Atten= 10%, Lag= 2.6 min
Primary = 16.76 cfs @ 12.09 hrs, Volume= 47,016 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 419.00' Surf.Area= 5,489 sf Storage= 2,196 cf
Peak Elev= 421.88' @ 12.09 hrs Surf.Area= 5,489 sf Storage= 12,783 cf (10,587 cf above start)

Plug-Flow detention time= 120.0 min calculated for 44,797 cf (85% of inflow)
Center-of-Mass det. time= 44.5 min (870.8 - 826.2)

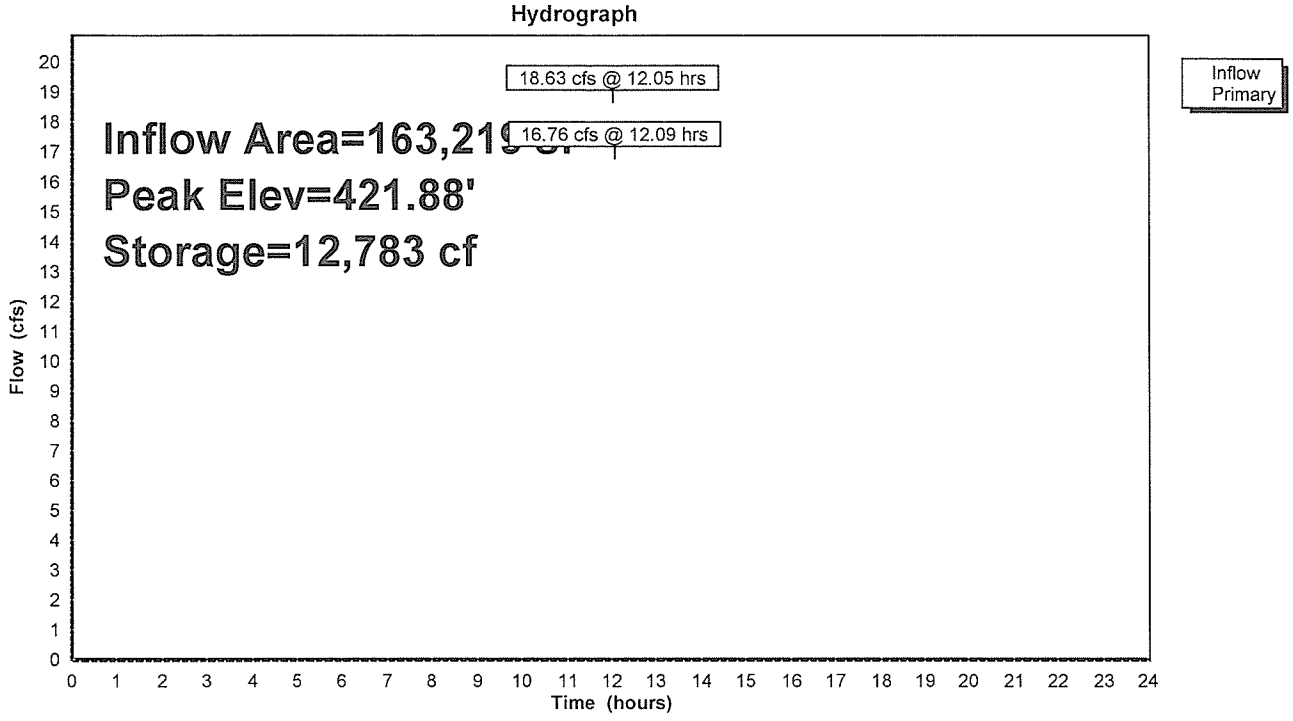
Volume	Invert	Avail.Storage	Storage Description
#1A	418.00'	8,135 cf	**53.75'W x 102.12'L x 5.00'H Field A** 27,444 cf Overall - 7,106 cf Embedded = 20,338 cf x 40.0% Voids
#2A	419.50'	7,106 cf	**ADS_StormTech SC-740** x 154 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 11 rows
		15,241 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	419.50'	**24.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 419.50' / 417.80' S= 0.1000 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	421.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	421.00'	**48.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	420.50'	**18.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	419.50'	**3.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=16.72 cfs @ 12.09 hrs HW=421.88' (Free Discharge)
↑**1=Culvert** (Passes 16.72 cfs of 17.79 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.81 cfs @ 2.12 fps)
3=Orifice/Grate (Orifice Controls 7.61 cfs @ 3.81 fps)
4=Orifice/Grate (Orifice Controls 3.84 cfs @ 5.12 fps)
5=Orifice/Grate (Orifice Controls 0.45 cfs @ 7.24 fps)

Pond 21P: Infiltration-2



Summary for Pond 21P: Infiltration-2

Inflow Area = 163,219 sf, 69.50% Impervious, Inflow Depth > 4.76" for 50-yr event
Inflow = 23.06 cfs @ 12.04 hrs, Volume= 64,702 cf
Outflow = 20.20 cfs @ 12.09 hrs, Volume= 59,032 cf, Atten= 12%, Lag= 3.2 min
Primary = 20.20 cfs @ 12.09 hrs, Volume= 59,032 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 419.00' Surf.Area= 5,489 sf Storage= 2,196 cf
Peak Elev= 422.28' @ 12.09 hrs Surf.Area= 5,489 sf Storage= 13,668 cf (11,473 cf above start)

Plug-Flow detention time= 102.7 min calculated for 56,832 cf (88% of inflow)
Center-of-Mass det. time= 37.4 min (859.8 - 822.4)

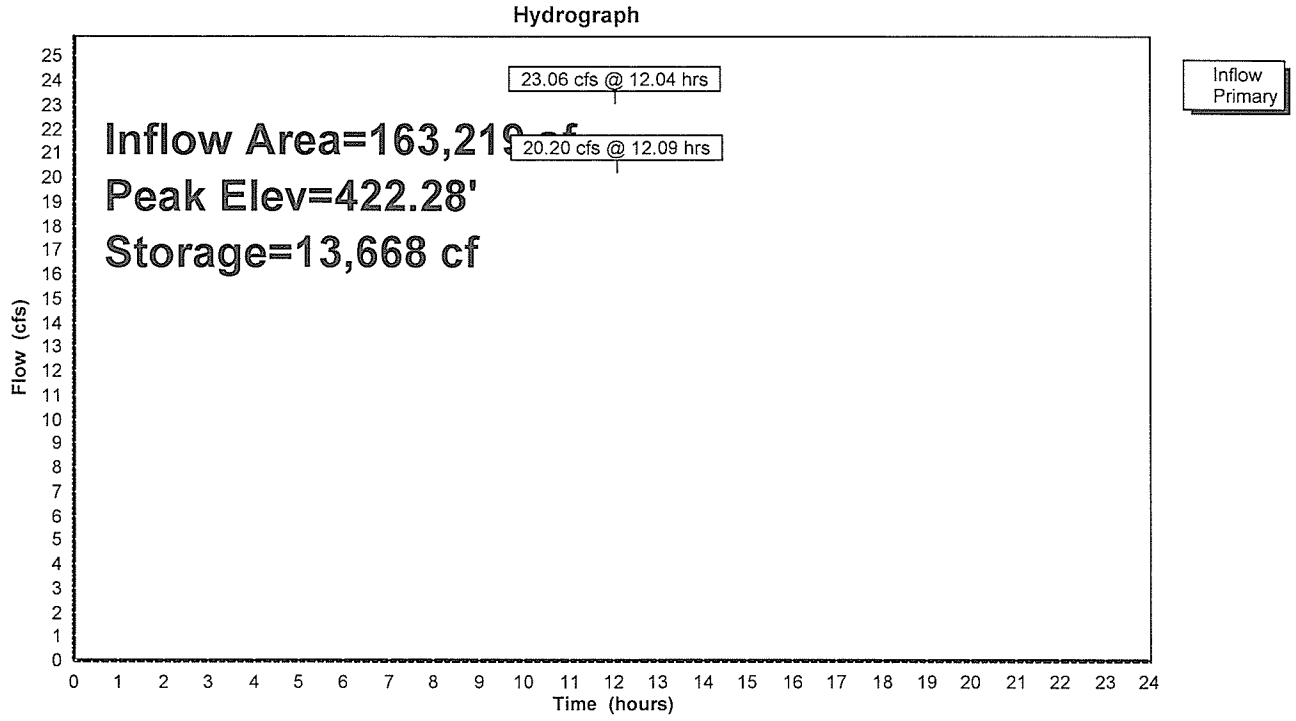
Volume	Invert	Avail.Storage	Storage Description
#1A	418.00'	8,135 cf	**53.75'W x 102.12'L x 5.00'H Field A** 27,444 cf Overall - 7,106 cf Embedded = 20,338 cf x 40.0% Voids
#2A	419.50'	7,106 cf	**ADS_StormTech SC-740** x 154 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 11 rows
		15,241 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	419.50'	**24.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 419.50' / 417.80' S= 0.1000 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	421.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	421.00'	**48.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	420.50'	**18.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	419.50'	**3.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=20.20 cfs @ 12.09 hrs HW=422.28' (Free Discharge)
└**1=Culvert** (Inlet Controls 20.20 cfs @ 6.43 fps)
  ├**2=Sharp-Crested Rectangular Weir** (Passes < 14.51 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 9.76 cfs potential flow)
  ├**4=Orifice/Grate** (Passes < 4.47 cfs potential flow)
  └**5=Orifice/Grate** (Passes < 0.49 cfs potential flow)

Pond 21P: Infiltration-2



Summary for Pond 21P: Infiltration-2

Inflow Area = 163,219 sf, 69.50% Impervious, Inflow Depth > 5.90" for 100-yr event
Inflow = 27.61 cfs @ 12.03 hrs, Volume= 80,184 cf
Outflow = 23.51 cfs @ 12.09 hrs, Volume= 74,355 cf, Atten= 15%, Lag= 3.6 min
Primary = 23.51 cfs @ 12.09 hrs, Volume= 74,355 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 419.00' Surf.Area= 5,489 sf Storage= 2,196 cf
Peak Elev= 422.92' @ 12.09 hrs Surf.Area= 5,489 sf Storage= 15,058 cf (12,862 cf above start)

Plug-Flow detention time= 88.5 min calculated for 72,125 cf (90% of inflow)
Center-of-Mass det. time= 32.3 min (850.5 - 818.1)

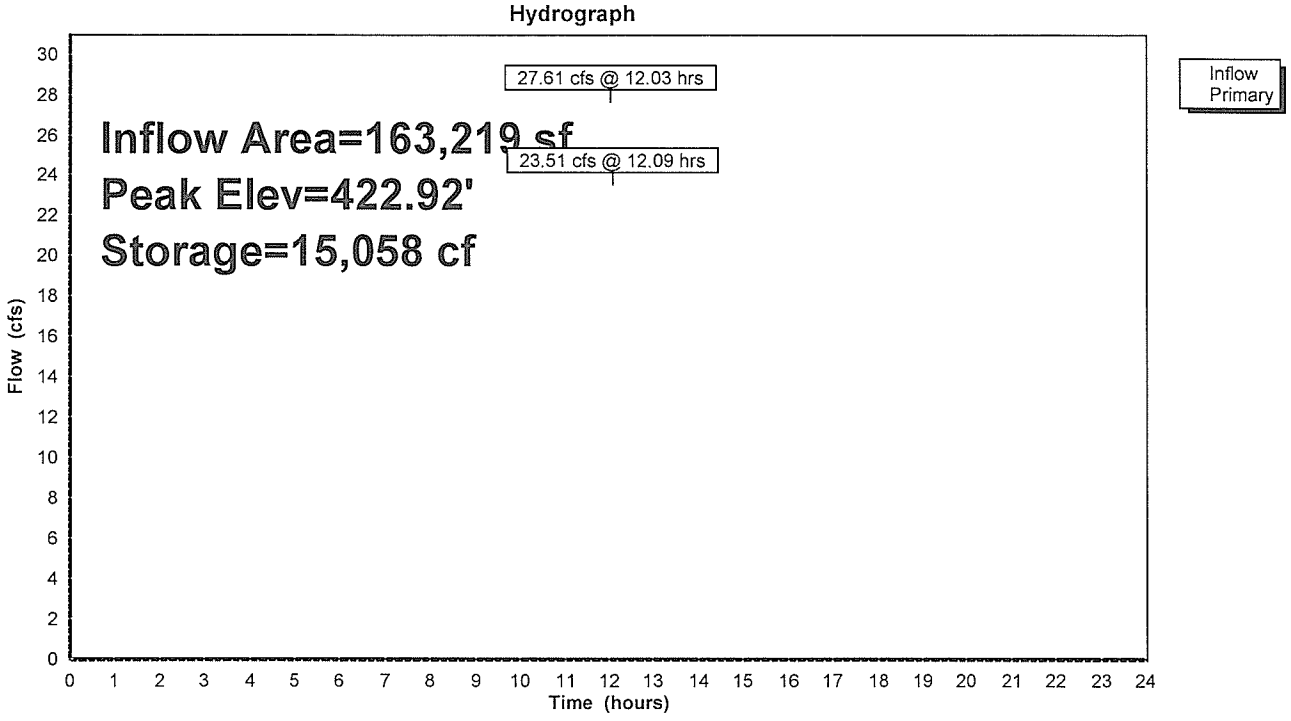
Volume	Invert	Avail.Storage	Storage Description
#1A	418.00'	8,135 cf	**53.75'W x 102.12'L x 5.00'H Field A** 27,444 cf Overall - 7,106 cf Embedded = 20,338 cf x 40.0% Voids
#2A	419.50'	7,106 cf	**ADS_StormTech SC-740** x 154 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 11 rows
		15,241 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	419.50'	**24.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 419.50' / 417.80' S= 0.1000 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	421.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	421.00'	**48.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	420.50'	**18.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	419.50'	**3.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=23.50 cfs @ 12.09 hrs HW=422.91' (Free Discharge)
└**1=Culvert** (Inlet Controls 23.50 cfs @ 7.48 fps)
  ├**2=Sharp-Crested Rectangular Weir** (Passes < 36.89 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 12.41 cfs potential flow)
  ├**4=Orifice/Grate** (Passes < 5.31 cfs potential flow)
  └**5=Orifice/Grate** (Passes < 0.55 cfs potential flow)

Pond 21P: Infiltration-2



Summary for Subcatchment 28S: INFIL-3

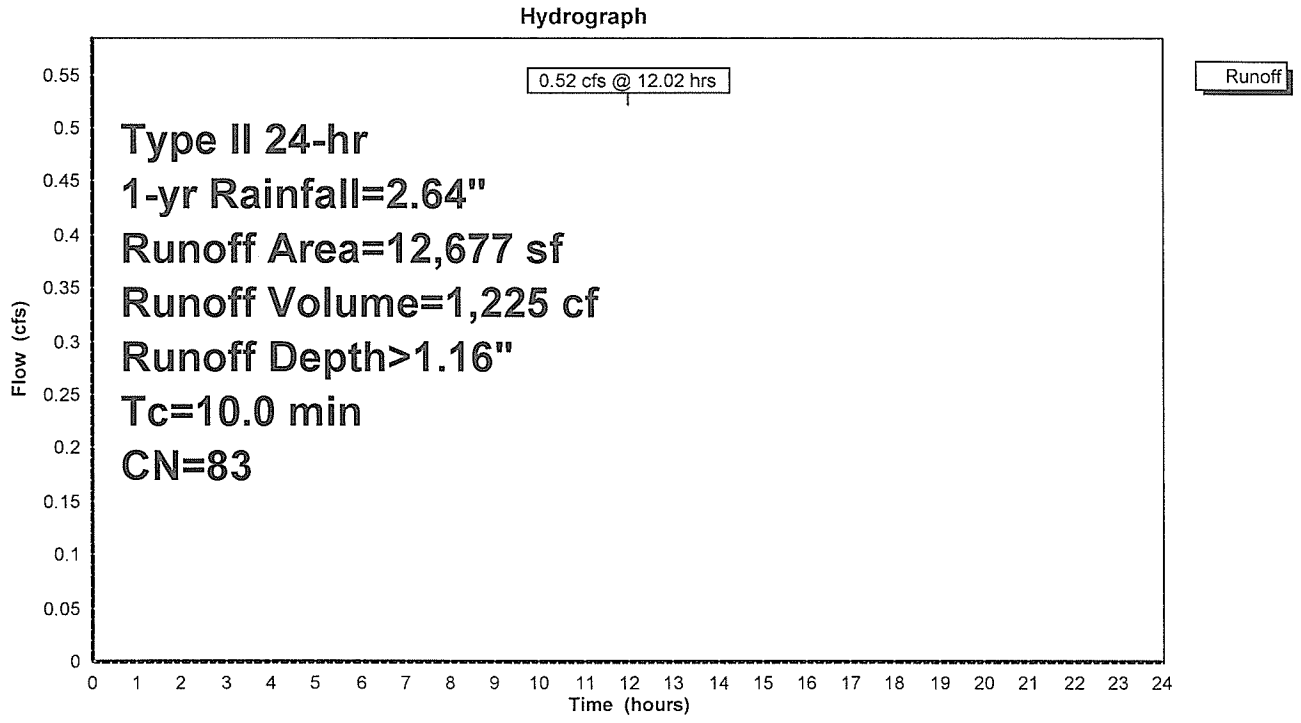
Runoff = 0.52 cfs @ 12.02 hrs, Volume= 1,225 cf, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

Area (sf)	CN	Description
7,411	98	Paved parking, HSG B
5,266	61	>75% Grass cover, Good, HSG B
12,677	83	Weighted Average
5,266		41.54% Pervious Area
7,411		58.46% Impervious Area

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

Subcatchment 28S: INFIL-3



Summary for Subcatchment 28S: INFIL-3

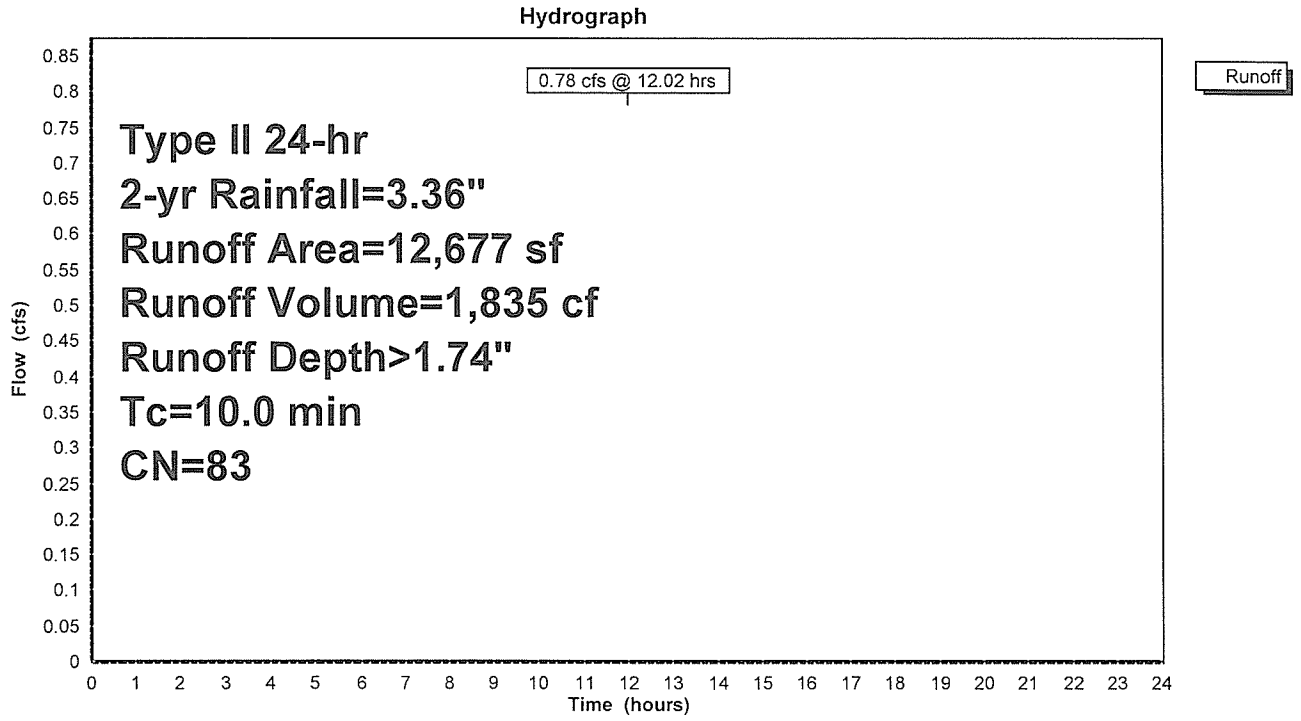
Runoff = 0.78 cfs @ 12.02 hrs, Volume= 1,835 cf, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

Area (sf)	CN	Description
7,411	98	Paved parking, HSG B
5,266	61	>75% Grass cover, Good, HSG B
12,677	83	Weighted Average
5,266		41.54% Pervious Area
7,411		58.46% Impervious Area

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

Subcatchment 28S: INFIL-3



Summary for Subcatchment 28S: INFIL-3

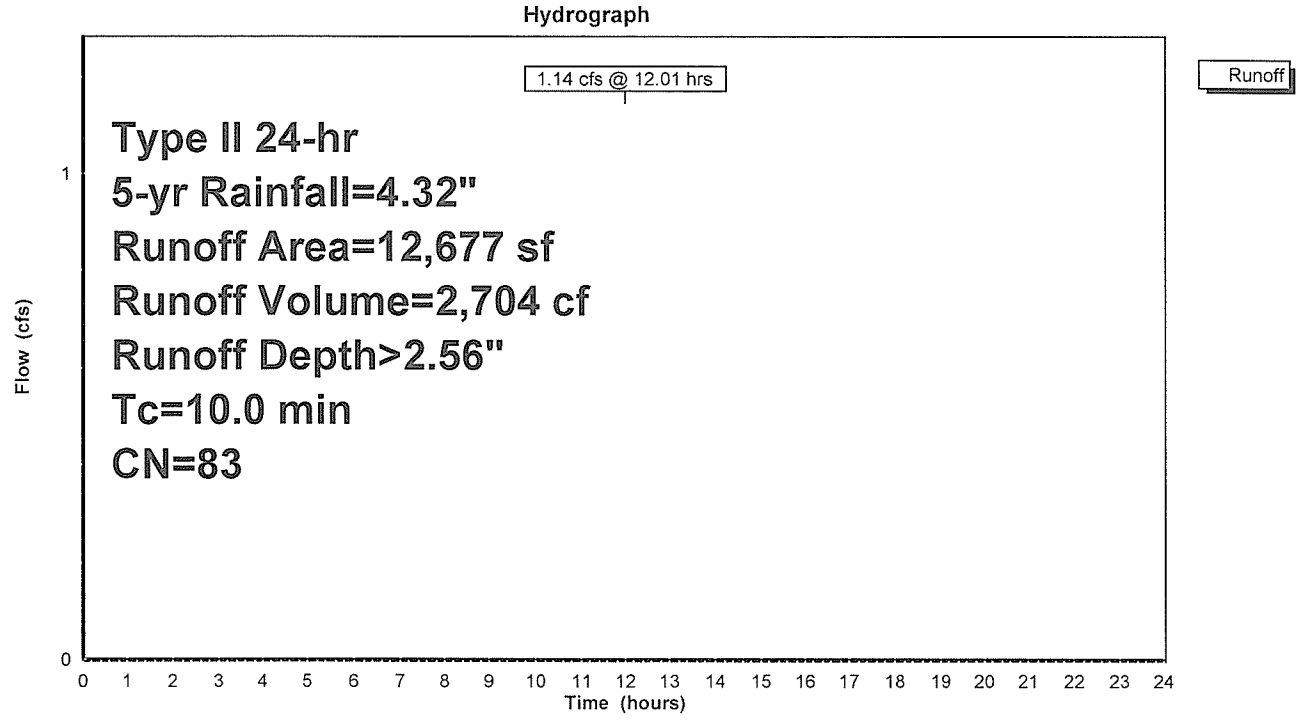
Runoff = 1.14 cfs @ 12.01 hrs, Volume= 2,704 cf, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

Area (sf)	CN	Description
7,411	98	Paved parking, HSG B
5,266	61	>75% Grass cover, Good, HSG B
12,677	83	Weighted Average
5,266		41.54% Pervious Area
7,411		58.46% Impervious Area

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

Subcatchment 28S: INFIL-3



Summary for Subcatchment 28S: INFIL-3

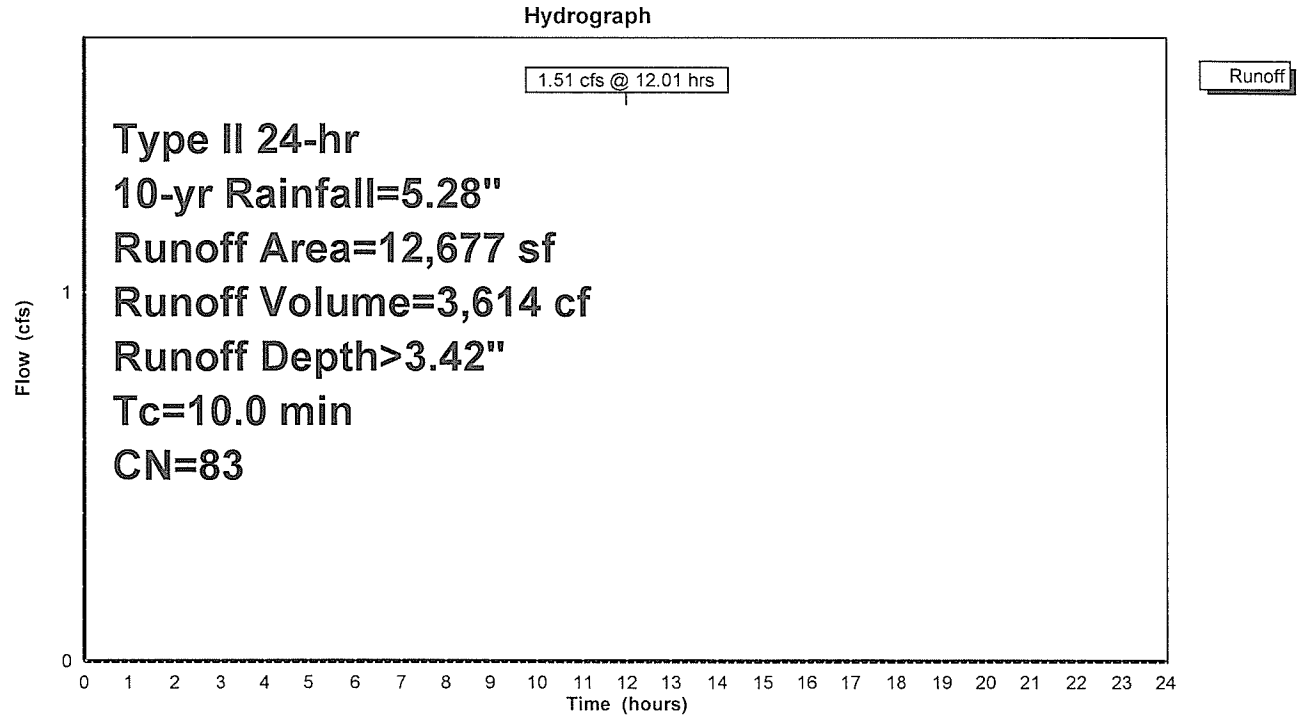
Runoff = 1.51 cfs @ 12.01 hrs, Volume= 3,614 cf, Depth> 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

Area (sf)	CN	Description
7,411	98	Paved parking, HSG B
5,266	61	>75% Grass cover, Good, HSG B
12,677	83	Weighted Average
5,266		41.54% Pervious Area
7,411		58.46% Impervious Area

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

Subcatchment 28S: INFIL-3



Summary for Subcatchment 28S: INFIL-3

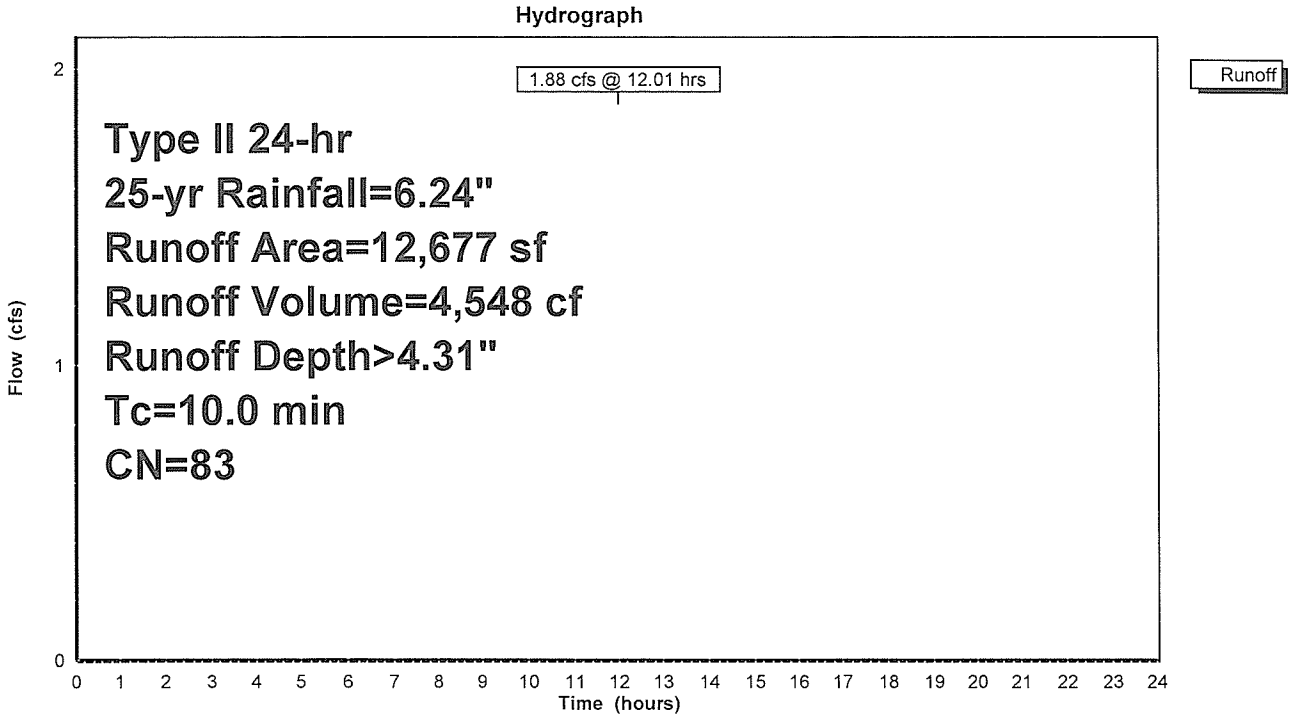
Runoff = 1.88 cfs @ 12.01 hrs, Volume= 4,548 cf, Depth> 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

Area (sf)	CN	Description
7,411	98	Paved parking, HSG B
5,266	61	>75% Grass cover, Good, HSG B
12,677	83	Weighted Average
5,266		41.54% Pervious Area
7,411		58.46% Impervious Area

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

Subcatchment 28S: INFIL-3



Summary for Subcatchment 28S: INFIL-3

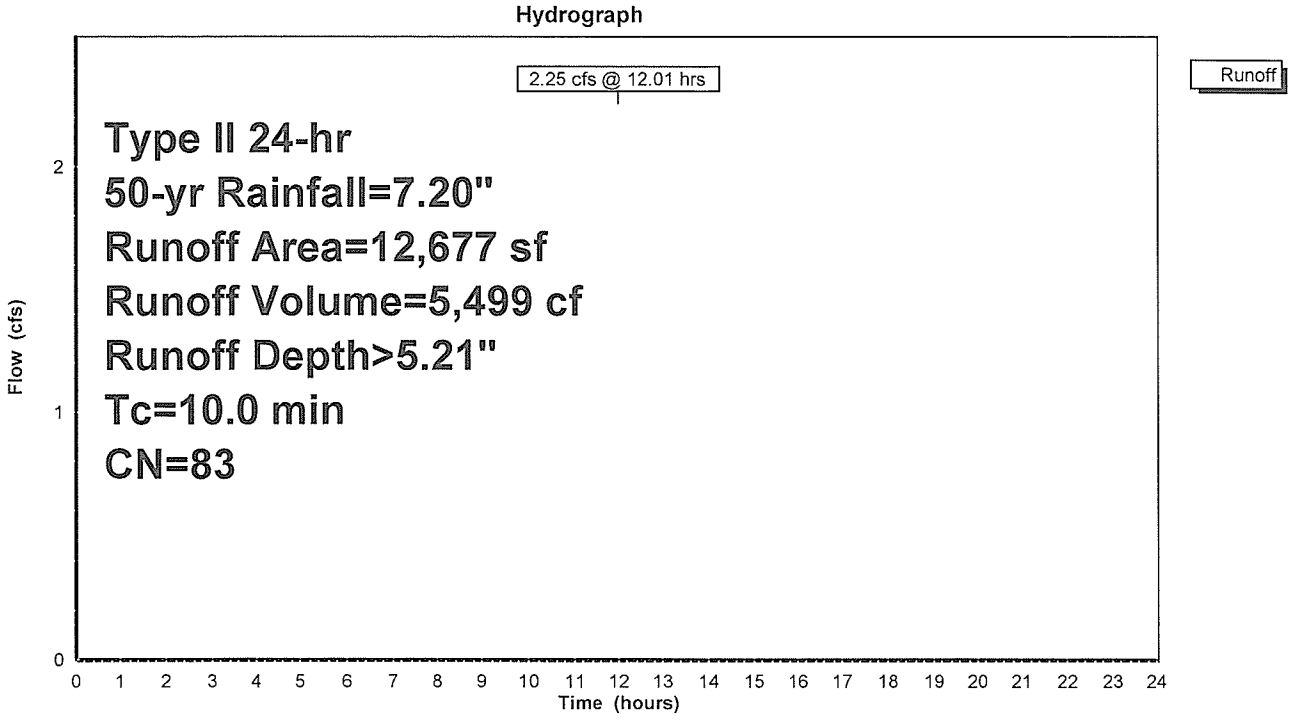
Runoff = 2.25 cfs @ 12.01 hrs, Volume= 5,499 cf, Depth> 5.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

Area (sf)	CN	Description
7,411	98	Paved parking, HSG B
5,266	61	>75% Grass cover, Good, HSG B
12,677	83	Weighted Average
5,266		41.54% Pervious Area
7,411		58.46% Impervious Area

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

Subcatchment 28S: INFIL-3



Summary for Subcatchment 28S: INFIL-3

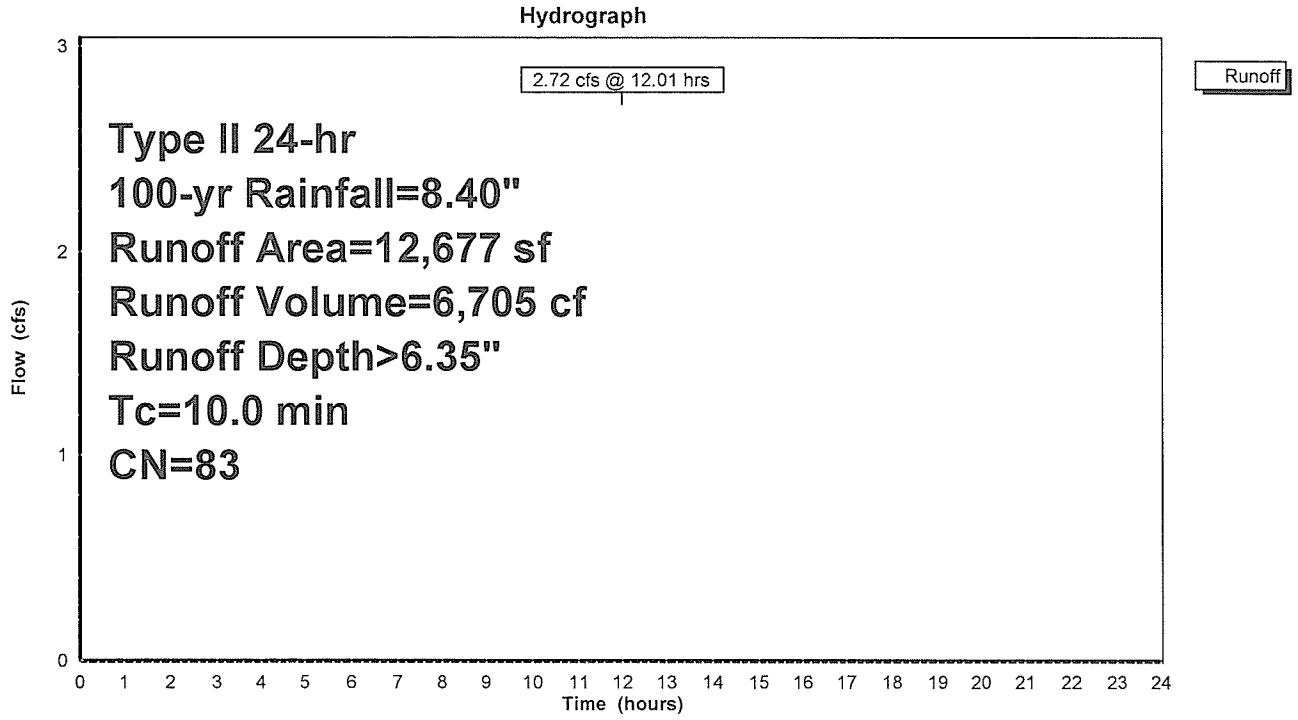
Runoff = 2.72 cfs @ 12.01 hrs, Volume= 6,705 cf, Depth> 6.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

Area (sf)	CN	Description
7,411	98	Paved parking, HSG B
5,266	61	>75% Grass cover, Good, HSG B
12,677	83	Weighted Average
5,266		41.54% Pervious Area
7,411		58.46% Impervious Area

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

Subcatchment 28S: INFIL-3



Events for Pond 27P: INFILTRATION-3

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	0.52	0.13	416.44	924
2-yr	0.78	0.29	416.65	1,127
5-yr	1.14	0.64	416.85	1,322
10-yr	1.51	0.89	417.06	1,514
25-yr	1.88	1.09	417.29	1,722
50-yr	2.25	1.28	417.54	1,940
100-yr	**2.72**	**1.50**	**417.89**	**2,223**

Summary for Pond 27P: INFILTRATION-3

Inflow Area = 12,677 sf, 58.46% Impervious, Inflow Depth > 6.35" for 100-yr event
Inflow = 2.72 cfs @ 12.01 hrs, Volume= 6,705 cf
Outflow = 1.50 cfs @ 12.12 hrs, Volume= 6,586 cf, Atten= 45%, Lag= 6.5 min
Primary = 1.50 cfs @ 12.12 hrs, Volume= 6,586 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 416.00' Surf.Area= 1,221 sf Storage= 489 cf
Peak Elev= 417.89' @ 12.12 hrs Surf.Area= 1,221 sf Storage= 2,223 cf (1,735 cf above start)

Plug-Flow detention time= 93.6 min calculated for 6,095 cf (91% of inflow)
Center-of-Mass det. time= 27.9 min (820.9 - 793.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	415.00'	1,601 cf	**39.50'W x 30.92'L x 4.50'H Field A** 5,496 cf Overall - 1,493 cf Embedded = 4,003 cf x 40.0% Voids
#2A	416.00'	1,493 cf	**ADS_StormTech SC-740**x 32 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 8 rows
		3,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	416.00'	**24.0" Round Culvert** L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 416.00' / 414.90' S= 0.0478 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	418.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	416.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.50'	**8.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.50 cfs @ 12.12 hrs HW=417.89' (Free Discharge)
└**1=Culvert** (Passes 1.50 cfs of 14.38 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.31 cfs @ 6.40 fps)
  └**4=Orifice/Grate** (Orifice Controls 1.18 cfs @ 5.32 fps)

Pond 27P: INFILTRATION-3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech®SC-740 (ADSStormTech®SC-740)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 8 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

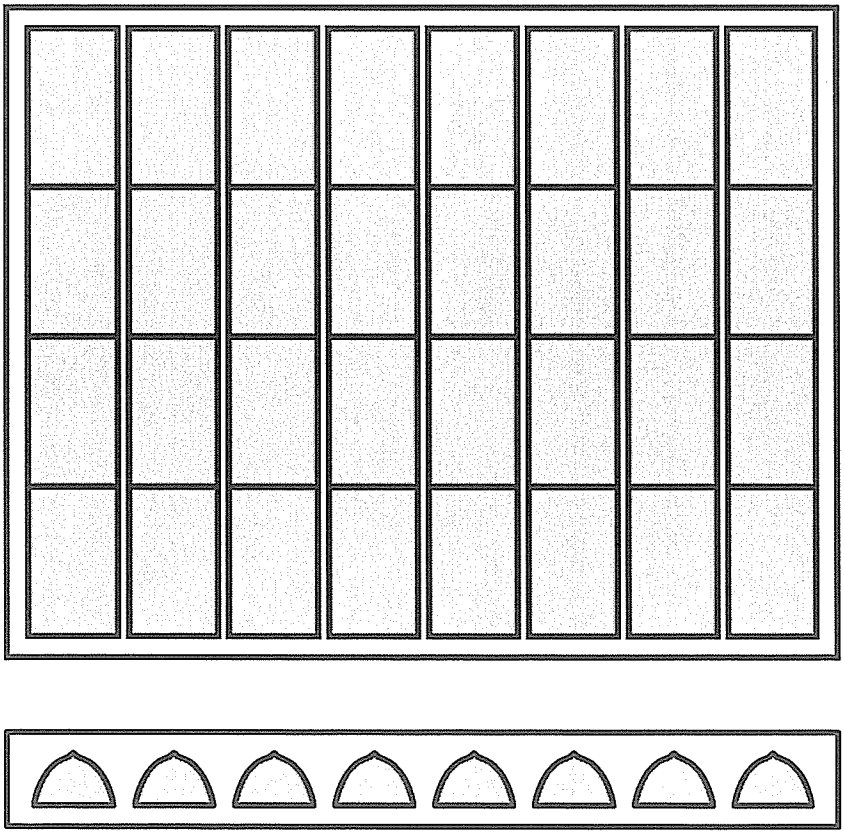
4 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 28.92' Row Length +12.0" End Stone x 2 = 30.92' Base Length
8 Rows x 51.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 39.50' Base Width
12.0" Base + 30.0" Chamber Height + 12.0" Cover = 4.50' Field Height

32 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 8 Rows = 1,492.8 cf Chamber Storage

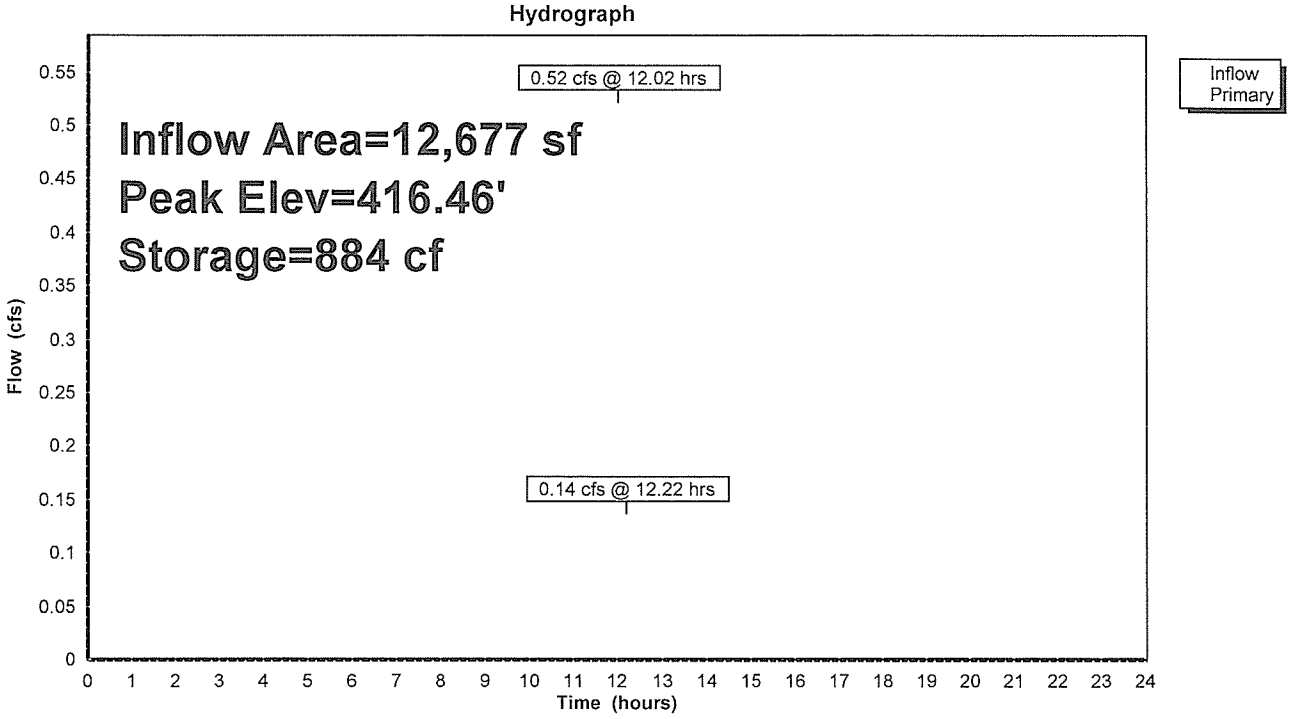
5,496.0 cf Field - 1,492.8 cf Chambers = 4,003.2 cf Stone x 40.0% Voids = 1,601.3 cf Stone Storage

Chamber Storage + Stone Storage = 3,094.1 cf = 0.071 af
Overall Storage Efficiency = 56.3%

32 Chambers
203.6 cy Field
148.3 cy Stone



Pond 27P: INFILTRATION-3



Summary for Pond 27P: INFILTRATION-3

Inflow Area = 12,677 sf, 58.46% Impervious, Inflow Depth > 1.74" for 2-yr event
Inflow = 0.78 cfs @ 12.02 hrs, Volume= 1,835 cf
Outflow = 0.32 cfs @ 12.16 hrs, Volume= 1,774 cf, Atten= 59%, Lag= 8.3 min
Primary = 0.32 cfs @ 12.16 hrs, Volume= 1,774 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 416.00' Surf.Area= 1,140 sf Storage= 456 cf
Peak Elev= 416.67' @ 12.16 hrs Surf.Area= 1,140 sf Storage= 1,072 cf (616 cf above start)

Plug-Flow detention time= 188.1 min calculated for 1,318 cf (72% of inflow)
Center-of-Mass det. time= 38.4 min (867.9 - 829.6)

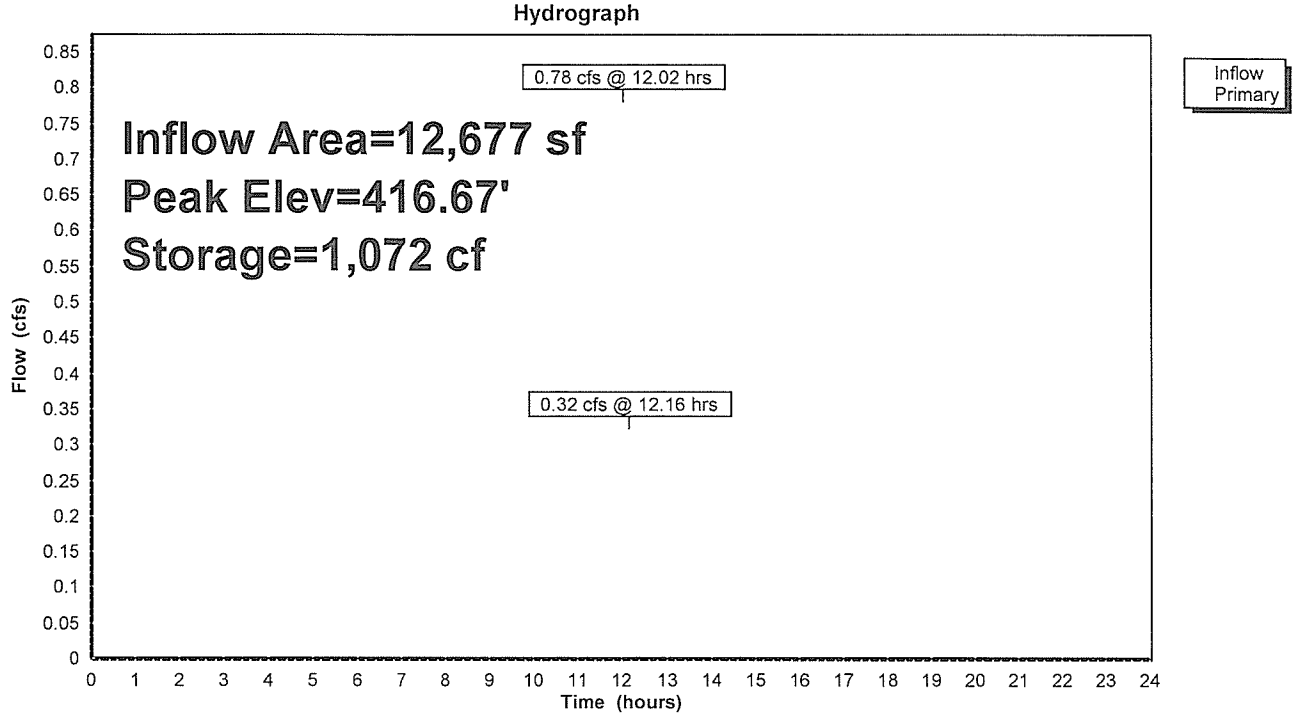
Volume	Invert	Avail.Storage	Storage Description
#1A	415.00'	1,496 cf	**25.25'W x 45.16'L x 4.50'H Field A** 5,131 cf Overall - 1,392 cf Embedded = 3,739 cf x 40.0% Voids
#2A	416.00'	1,392 cf	**ADS_StormTech SC-740** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
		2,888 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	416.00'	**18.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 416.00' / 415.68' S= 0.0145 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	418.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	416.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.50'	**8.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.32 cfs @ 12.16 hrs HW=416.67' (Free Discharge)
└**1=Culvert** (Passes 0.32 cfs of 2.09 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.17 cfs @ 3.55 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.15 cfs @ 1.32 fps)

Pond 27P: INFILTRATION-3



Summary for Pond 27P: INFILTRATION-3

Inflow Area = 12,677 sf, 58.46% Impervious, Inflow Depth > 2.56" for 5-yr event
Inflow = 1.14 cfs @ 12.01 hrs, Volume= 2,704 cf
Outflow = 0.67 cfs @ 12.12 hrs, Volume= 2,630 cf, Atten= 41%, Lag= 6.0 min
Primary = 0.67 cfs @ 12.12 hrs, Volume= 2,630 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 416.00' Surf.Area= 1,140 sf Storage= 456 cf
Peak Elev= 416.87' @ 12.12 hrs Surf.Area= 1,140 sf Storage= 1,254 cf (798 cf above start)

Plug-Flow detention time= 144.2 min calculated for 2,174 cf (80% of inflow)
Center-of-Mass det. time= 32.6 min (851.2 - 818.6)

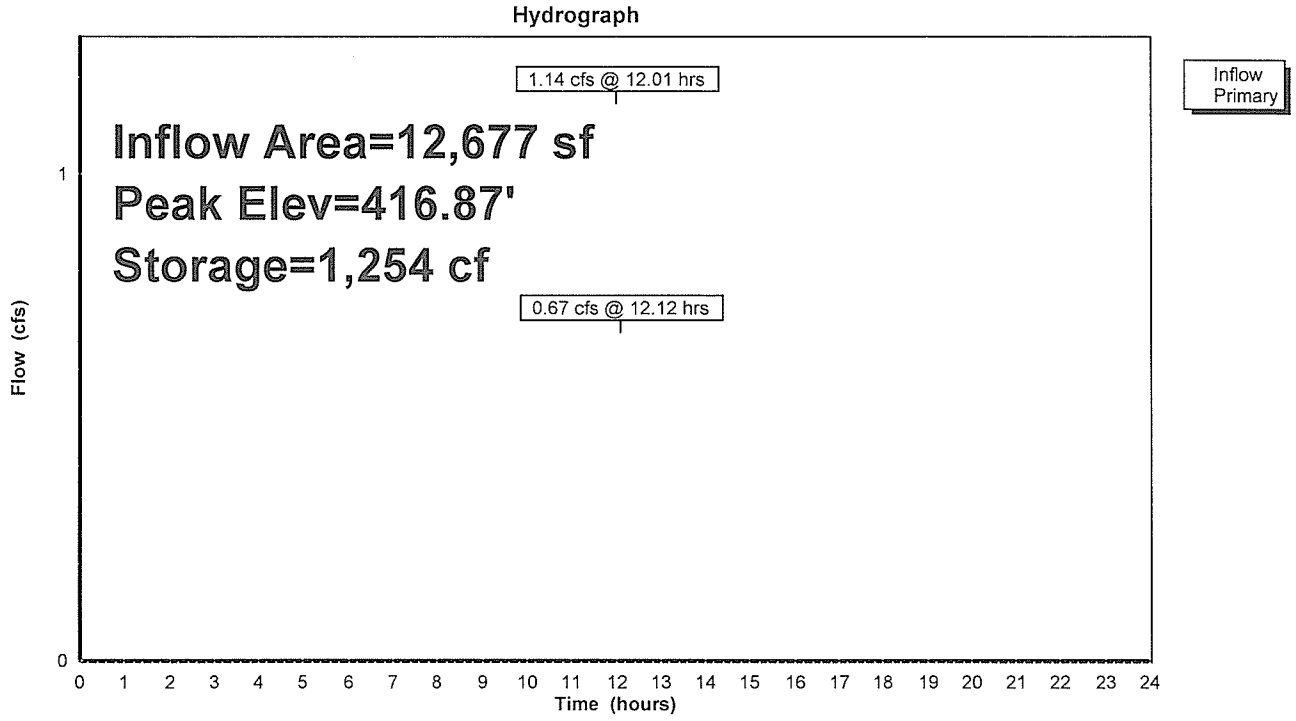
Volume	Invert	Avail.Storage	Storage Description
#1A	415.00'	1,496 cf	**25.25'W x 45.16'L x 4.50'H Field A** 5,131 cf Overall - 1,392 cf Embedded = 3,739 cf x 40.0% Voids
#2A	416.00'	1,392 cf	**ADS_StormTech SC-740** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
		2,888 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	416.00'	**18.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 416.00' / 415.68' S= 0.0145 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	418.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	416.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.50'	**8.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.67 cfs @ 12.12 hrs HW=416.87' (Free Discharge)
↑**1=Culvert** (Passes 0.67 cfs of 3.23 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
3=Orifice/Grate (Orifice Controls 0.20 cfs @ 4.16 fps)
4=Orifice/Grate (Orifice Controls 0.47 cfs @ 2.11 fps)

Pond 27P: INFILTRATION-3



Events for Pond 27P: INFILTRATION-3

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	0.52	0.13	416.44	924
2-yr	0.78	0.29	416.65	1,127
5-yr	1.14	0.64	416.85	1,322
10-yr	1.51	0.89	417.06	1,514
25-yr	1.88	1.09	417.29	1,722
50-yr	2.25	1.28	417.54	1,940
100-yr	**2.72**	**1.50**	**417.89**	**2,223**

Summary for Pond 27P: INFILTRATION-3

Inflow Area = 12,677 sf, 58.46% Impervious, Inflow Depth > 3.42" for 10-yr event
Inflow = 1.51 cfs @ 12.01 hrs, Volume= 3,614 cf
Outflow = 0.92 cfs @ 12.11 hrs, Volume= 3,530 cf, Atten= 39%, Lag= 5.8 min
Primary = 0.92 cfs @ 12.11 hrs, Volume= 3,530 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 416.00' Surf.Area= 1,140 sf Storage= 456 cf
Peak Elev= 417.09' @ 12.11 hrs Surf.Area= 1,140 sf Storage= 1,439 cf (983 cf above start)

Plug-Flow detention time= 120.8 min calculated for 3,073 cf (85% of inflow)
Center-of-Mass det. time= 29.8 min (840.2 - 810.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	415.00'	1,496 cf	**25.25'W x 45.16'L x 4.50'H Field A** 5,131 cf Overall - 1,392 cf Embedded = 3,739 cf x 40.0% Voids
#2A	416.00'	1,392 cf	**ADS_StormTech SC-740** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
		2,888 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	416.00'	**18.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 416.00' / 415.68' S= 0.0145 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	418.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	416.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.50'	**8.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.92 cfs @ 12.11 hrs HW=417.09' (Free Discharge)
└**1=Culvert** (Passes 0.92 cfs of 4.55 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.72 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.69 cfs @ 3.10 fps)

Pond 27P: INFILTRATION-3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech®SC-740 (ADSStormTech®SC-740)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 8 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

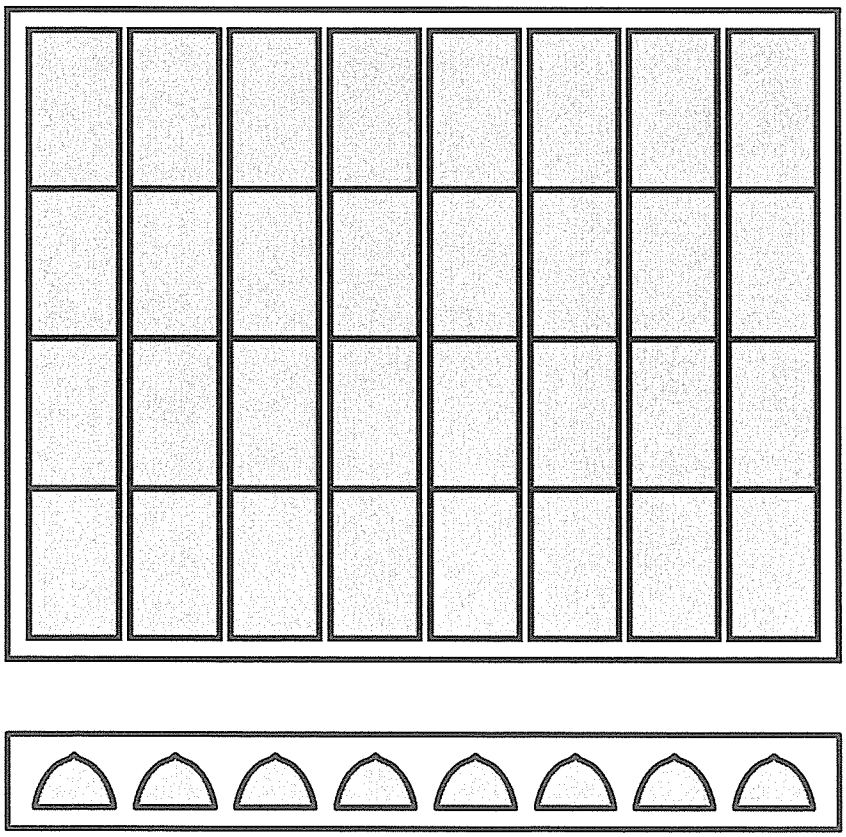
4 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 28.92' Row Length +12.0" End Stone x 2 = 30.92' Base Length
8 Rows x 51.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 39.50' Base Width
12.0" Base + 30.0" Chamber Height + 12.0" Cover = 4.50' Field Height

32 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 8 Rows = 1,492.8 cf Chamber Storage

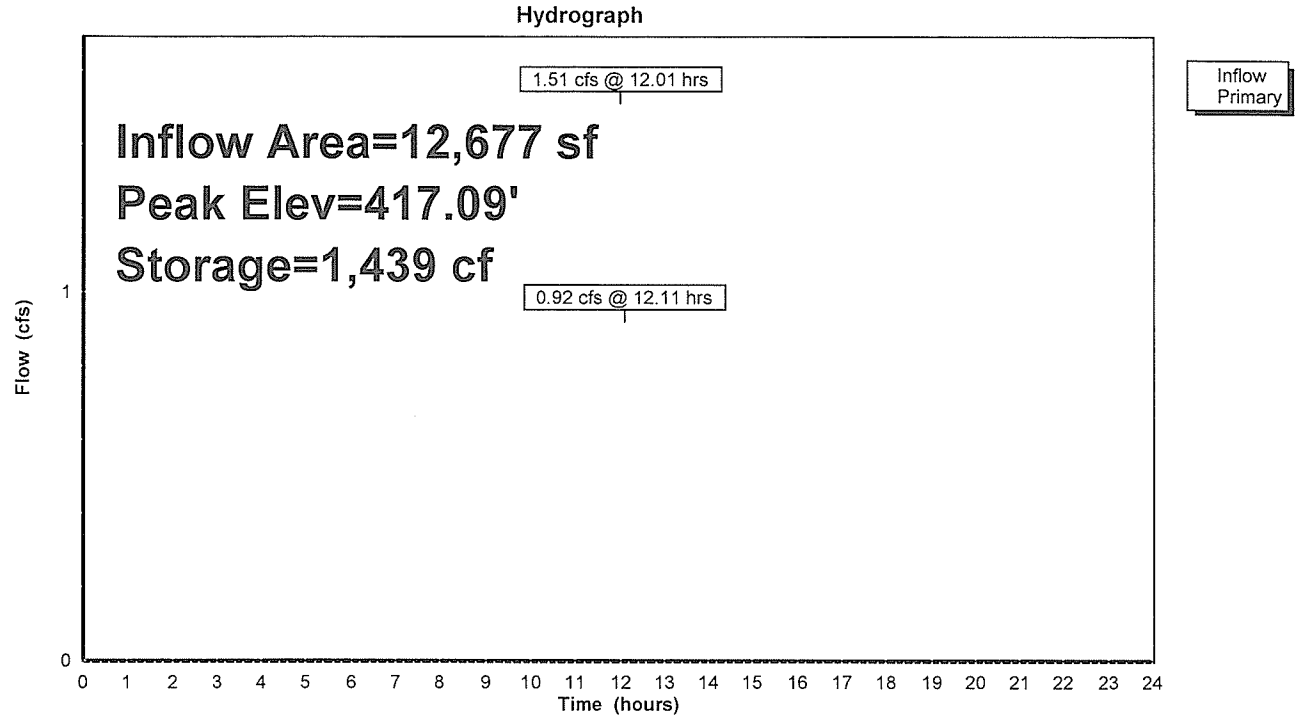
5,496.0 cf Field - 1,492.8 cf Chambers = 4,003.2 cf Stone x 40.0% Voids = 1,601.3 cf Stone Storage

Chamber Storage + Stone Storage = 3,094.1 cf = 0.071 af
Overall Storage Efficiency = 56.3%

32 Chambers
203.6 cy Field
148.3 cy Stone



Pond 27P: INFILTRATION-3



Summary for Pond 27P: INFILTRATION-3

Inflow Area = 12,677 sf, 58.46% Impervious, Inflow Depth > 4.31" for 25-yr event
Inflow = 1.88 cfs @ 12.01 hrs, Volume= 4,548 cf
Outflow = 1.12 cfs @ 12.11 hrs, Volume= 4,456 cf, Atten= 40%, Lag= 5.9 min
Primary = 1.12 cfs @ 12.11 hrs, Volume= 4,456 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 416.00' Surf.Area= 1,140 sf Storage= 456 cf
Peak Elev= 417.33' @ 12.11 hrs Surf.Area= 1,140 sf Storage= 1,640 cf (1,184 cf above start)

Plug-Flow detention time= 106.6 min calculated for 3,998 cf (88% of inflow)
Center-of-Mass det. time= 28.1 min (832.0 - 803.9)

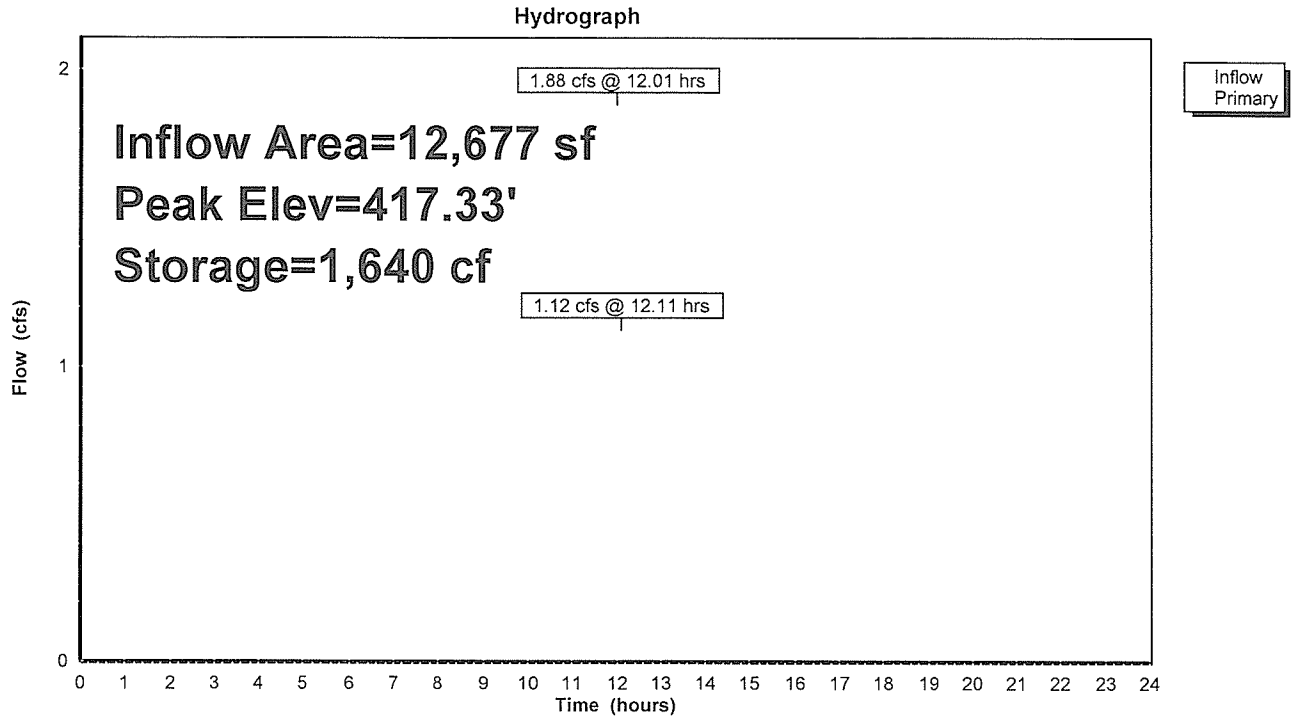
Volume	Invert	Avail.Storage	Storage Description
#1A	415.00'	1,496 cf	**25.25'W x 45.16'L x 4.50'H Field A** 5,131 cf Overall - 1,392 cf Embedded = 3,739 cf x 40.0% Voids
#2A	416.00'	1,392 cf	**ADS_StormTech SC-740** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
		2,888 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	416.00'	**18.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 416.00' / 415.68' S= 0.0145 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	418.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	416.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.50'	**8.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.12 cfs @ 12.11 hrs HW=417.33' (Free Discharge)
└**1=Culvert** (Passes 1.12 cfs of 6.11 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.26 cfs @ 5.27 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.87 cfs @ 3.90 fps)

Pond 27P: INFILTRATION-3



Summary for Pond 27P: INFILTRATION-3

Inflow Area = 12,677 sf, 58.46% Impervious, Inflow Depth > 5.21" for 50-yr event
Inflow = 2.25 cfs @ 12.01 hrs, Volume= 5,499 cf
Outflow = 1.31 cfs @ 12.11 hrs, Volume= 5,399 cf, Atten= 42%, Lag= 6.1 min
Primary = 1.31 cfs @ 12.11 hrs, Volume= 5,399 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 416.00' Surf.Area= 1,140 sf Storage= 456 cf
Peak Elev= 417.59' @ 12.11 hrs Surf.Area= 1,140 sf Storage= 1,851 cf (1,395 cf above start)

Plug-Flow detention time= 97.2 min calculated for 4,943 cf (90% of inflow)
Center-of-Mass det. time= 27.0 min (825.5 - 798.6)

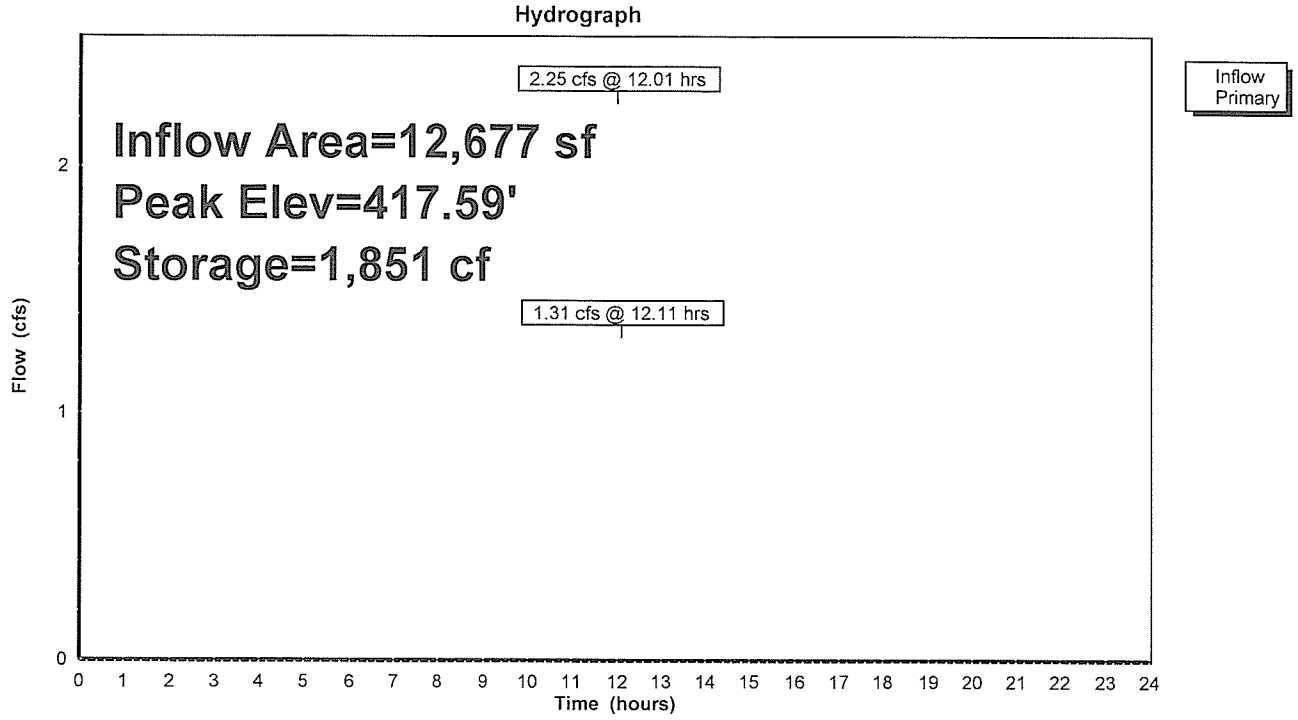
Volume	Invert	Avail.Storage	Storage Description
#1A	415.00'	1,496 cf	**25.25'W x 45.16'L x 4.50'H Field A** 5,131 cf Overall - 1,392 cf Embedded = 3,739 cf x 40.0% Voids
#2A	416.00'	1,392 cf	**ADS_StormTech SC-740** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
		2,888 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	416.00'	**18.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 416.00' / 415.68' S= 0.0145 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	418.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	416.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.50'	**8.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.31 cfs @ 12.11 hrs HW=417.59' (Free Discharge)
↑**1=Culvert** (Passes 1.31 cfs of 7.79 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
3=Orifice/Grate (Orifice Controls 0.29 cfs @ 5.82 fps)
4=Orifice/Grate (Orifice Controls 1.03 cfs @ 4.62 fps)

Pond 27P: INFILTRATION-3



Summary for Pond 27P: INFILTRATION-3

Inflow Area = 12,677 sf, 58.46% Impervious, Inflow Depth > 6.35" for 100-yr event
Inflow = 2.72 cfs @ 12.01 hrs, Volume= 6,705 cf
Outflow = 1.54 cfs @ 12.12 hrs, Volume= 6,594 cf, Atten= 43%, Lag= 6.3 min
Primary = 1.54 cfs @ 12.12 hrs, Volume= 6,594 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 416.00' Surf.Area= 1,140 sf Storage= 456 cf
Peak Elev= 417.96' @ 12.12 hrs Surf.Area= 1,140 sf Storage= 2,125 cf (1,669 cf above start)

Plug-Flow detention time= 88.4 min calculated for 6,136 cf (92% of inflow)
Center-of-Mass det. time= 26.0 min (819.1 - 793.1)

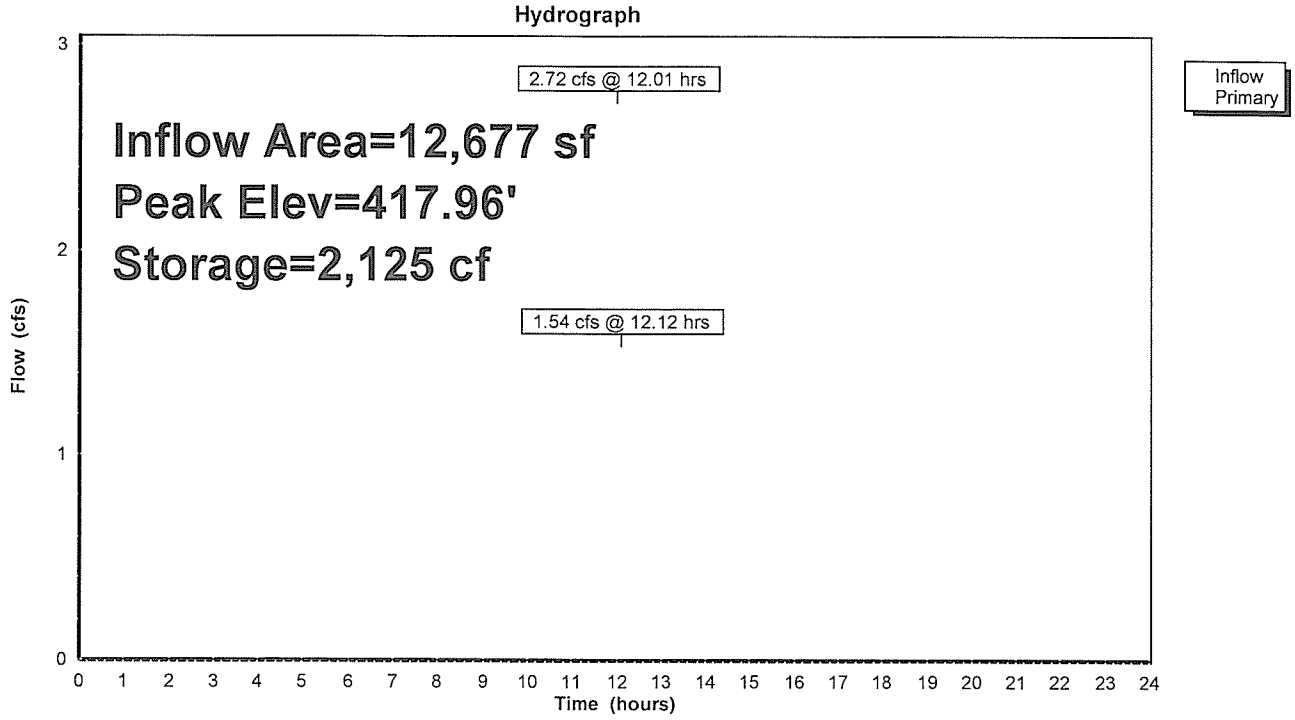
Volume	Invert	Avail.Storage	Storage Description
#1A	415.00'	1,496 cf	**25.25'W x 45.16'L x 4.50'H Field A** 5,131 cf Overall - 1,392 cf Embedded = 3,739 cf x 40.0% Voids
#2A	416.00'	1,392 cf	**ADS_StormTech SC-740** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
		2,888 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	416.00'	**18.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 416.00' / 415.68' S= 0.0145 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	418.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	416.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.50'	**8.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.54 cfs @ 12.12 hrs HW=417.96' (Free Discharge)
└**1=Culvert** (Passes 1.54 cfs of 9.36 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 6.52 fps)
  └**4=Orifice/Grate** (Orifice Controls 1.22 cfs @ 5.47 fps)

Pond 27P: INFILTRATION-3



Summary for Subcatchment 13S: Cistern-1

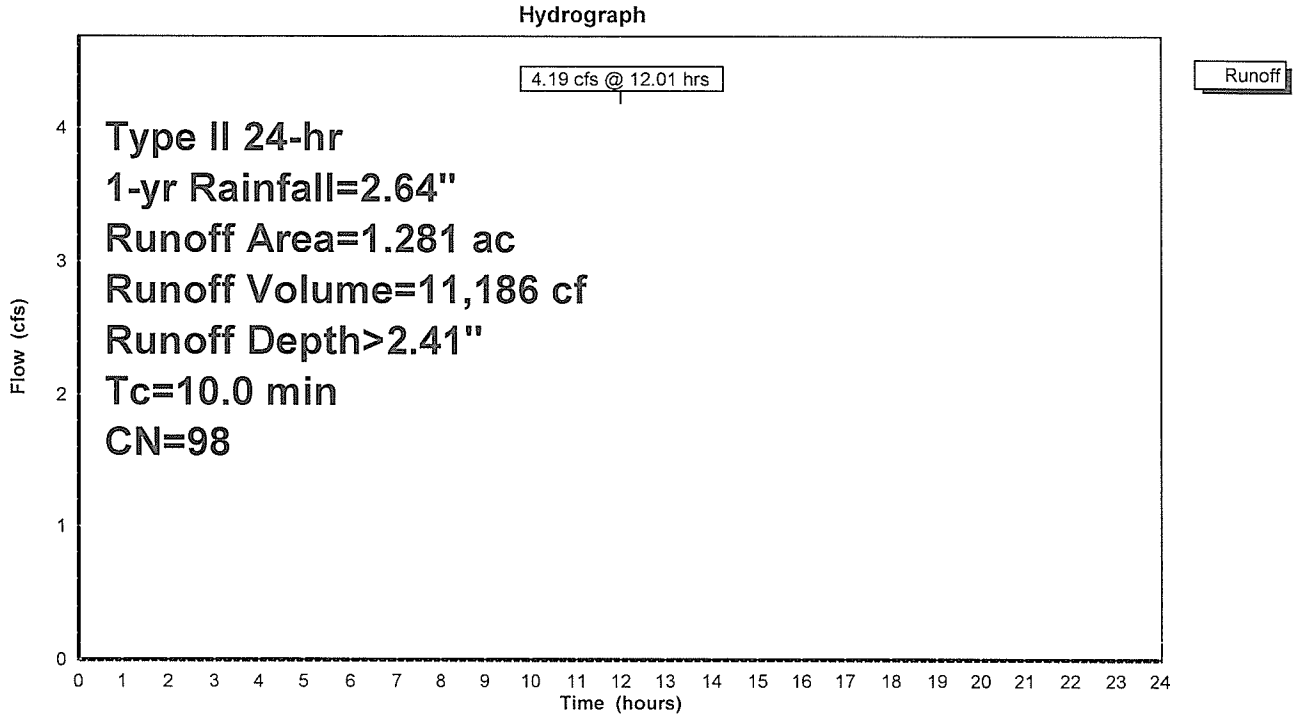
Runoff = 4.19 cfs @ 12.01 hrs, Volume= 11,186 cf, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

Area (ac)	CN	Description
0.538	98	Roofs, HSG B
0.743	98	Roofs, HSG B
1.281	98	Weighted Average
1.281		100.00% Impervious Area

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

Subcatchment 13S: Cistern-1



Summary for Subcatchment 13S: Cistern-1

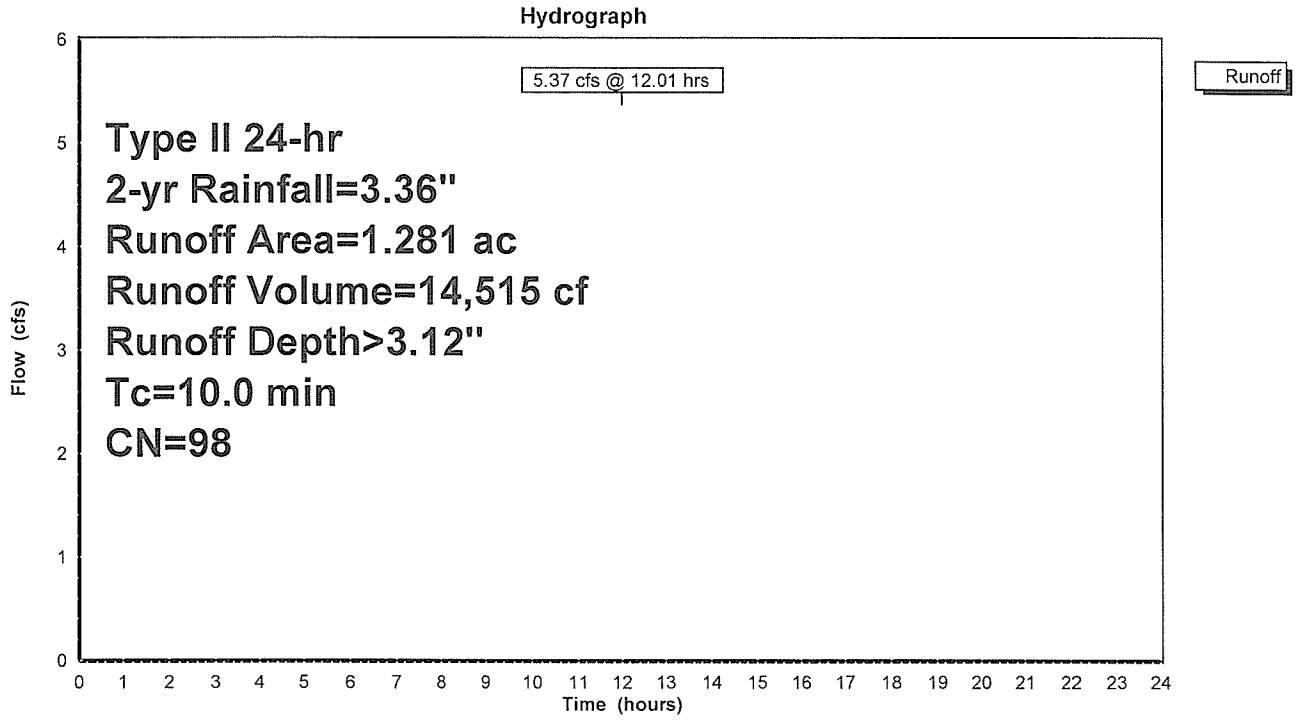
Runoff = 5.37 cfs @ 12.01 hrs, Volume= 14,515 cf, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

Area (ac)	CN	Description
0.538	98	Roofs, HSG B
0.743	98	Roofs, HSG B
1.281	98	Weighted Average
1.281		100.00% Impervious Area

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

Subcatchment 13S: Cistern-1



Summary for Subcatchment 13S: Cistern-1

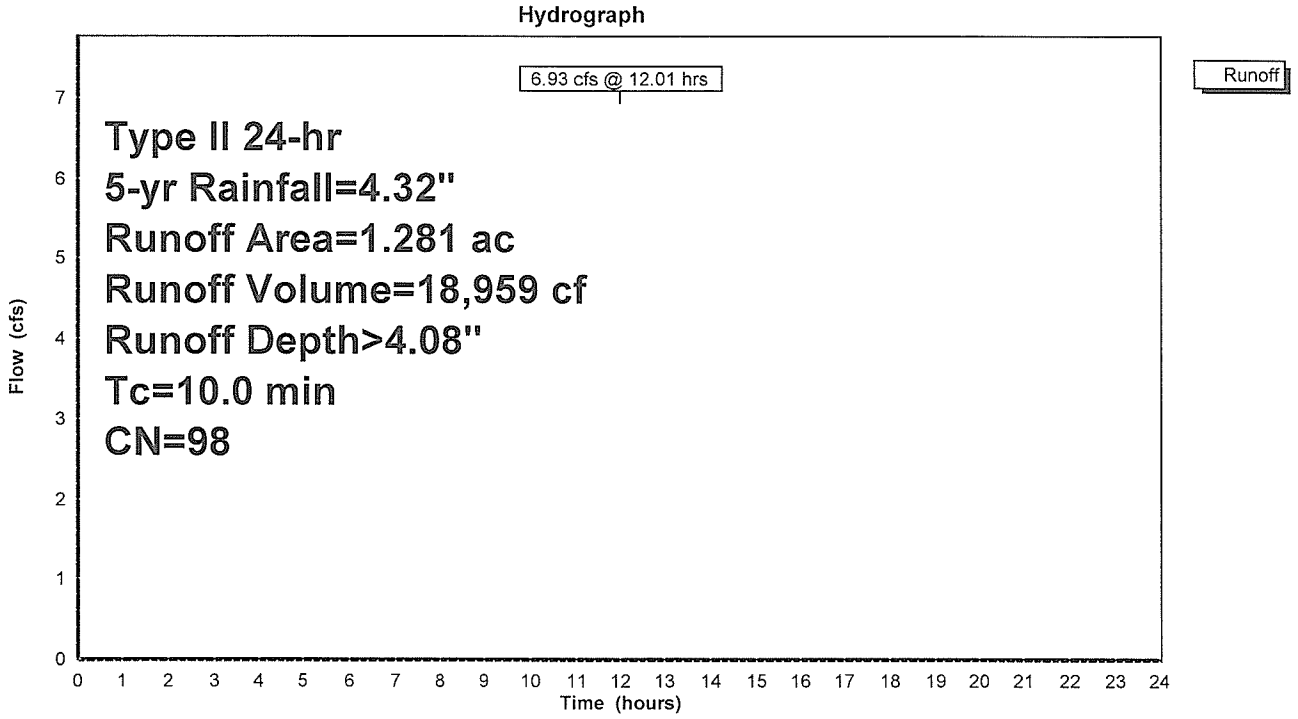
Runoff = 6.93 cfs @ 12.01 hrs, Volume= 18,959 cf, Depth> 4.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

Area (ac)	CN	Description
0.538	98	Roofs, HSG B
0.743	98	Roofs, HSG B
1.281	98	Weighted Average
1.281		100.00% Impervious Area

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

Subcatchment 13S: Cistern-1



Summary for Subcatchment 13S: Cistern-1

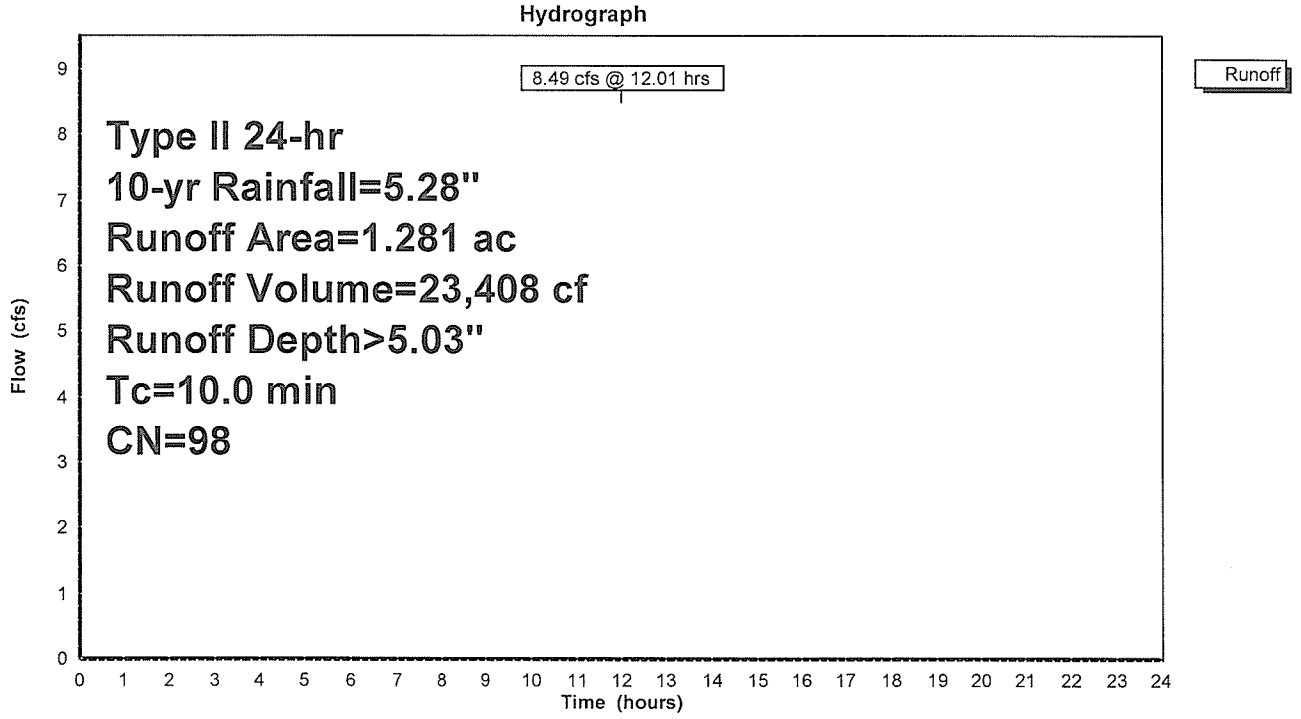
Runoff = 8.49 cfs @ 12.01 hrs, Volume= 23,408 cf, Depth> 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

Area (ac)	CN	Description
0.538	98	Roofs, HSG B
0.743	98	Roofs, HSG B
1.281	98	Weighted Average
1.281		100.00% Impervious Area

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

Subcatchment 13S: Cistern-1



Summary for Subcatchment 13S: Cistern-1

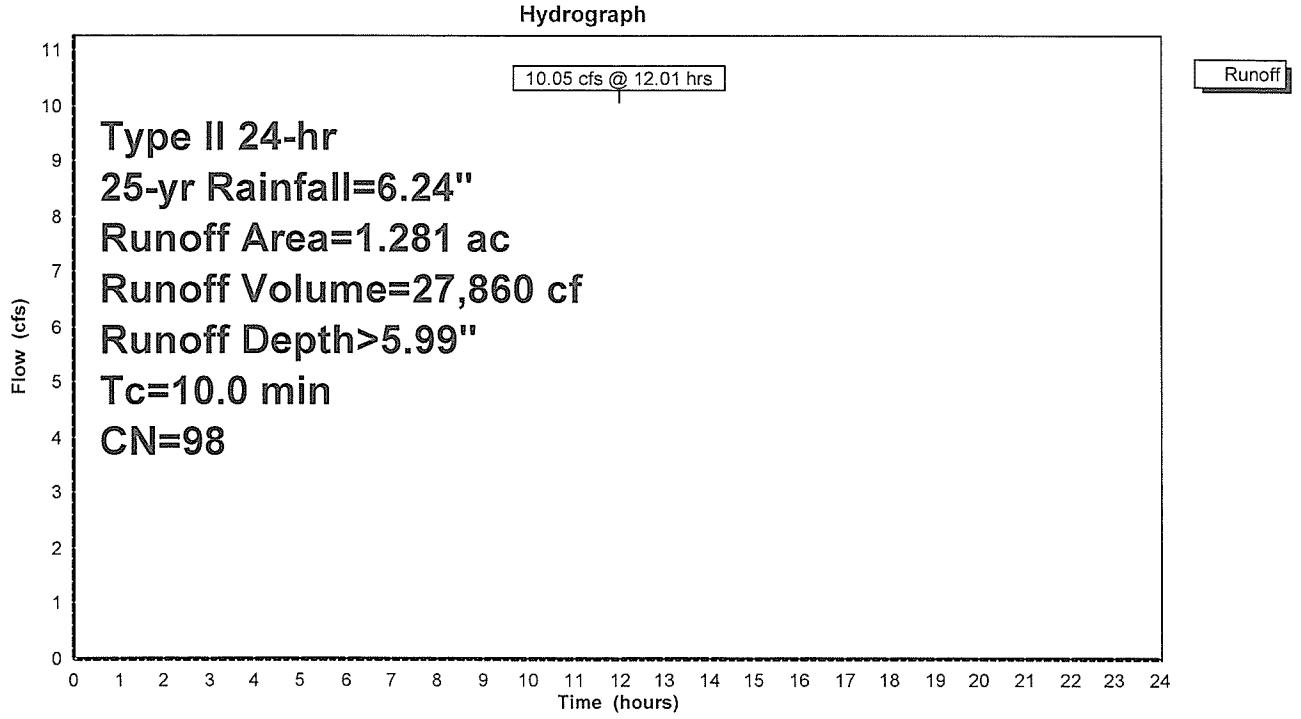
Runoff = 10.05 cfs @ 12.01 hrs, Volume= 27,860 cf, Depth> 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

Area (ac)	CN	Description
0.538	98	Roofs, HSG B
0.743	98	Roofs, HSG B
1.281	98	Weighted Average
1.281		100.00% Impervious Area

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

Subcatchment 13S: Cistern-1



Summary for Subcatchment 13S: Cistern-1

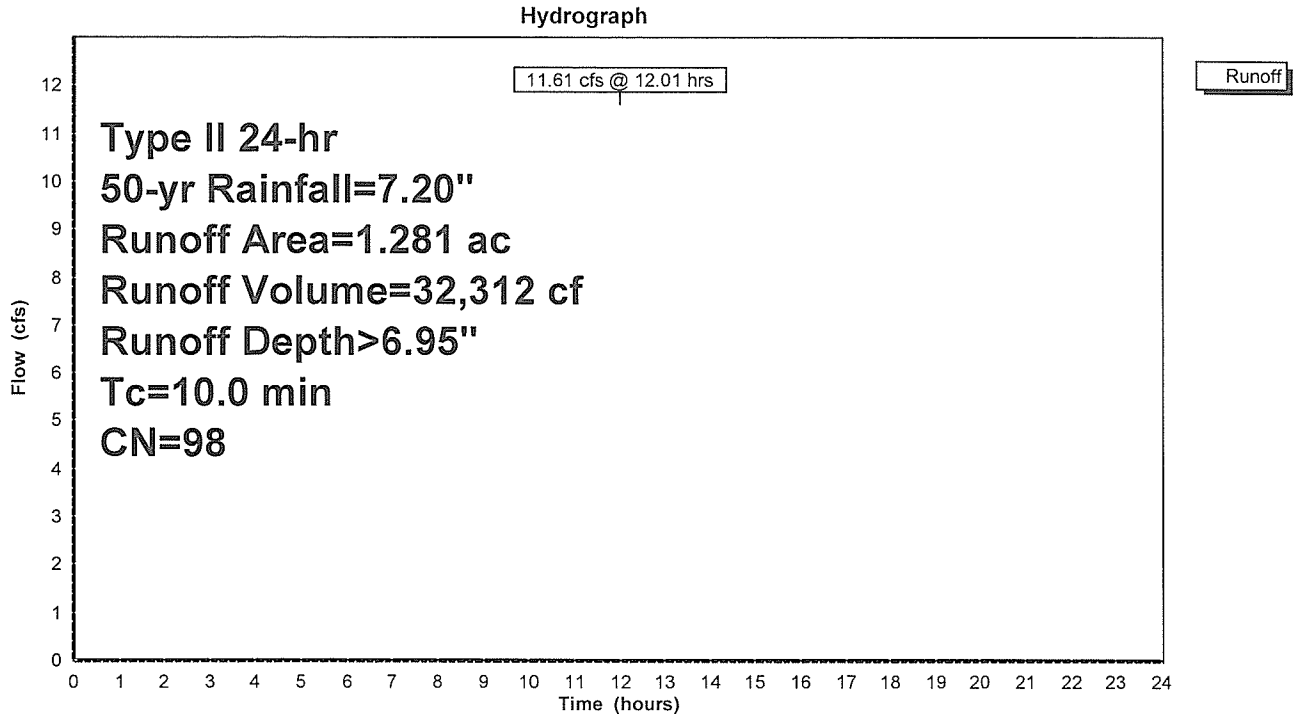
Runoff = 11.61 cfs @ 12.01 hrs, Volume= 32,312 cf, Depth> 6.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

Area (ac)	CN	Description
0.538	98	Roofs, HSG B
0.743	98	Roofs, HSG B
1.281	98	Weighted Average
1.281		100.00% Impervious Area

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

Subcatchment 13S: Cistern-1



Summary for Subcatchment 13S: Cistern-1

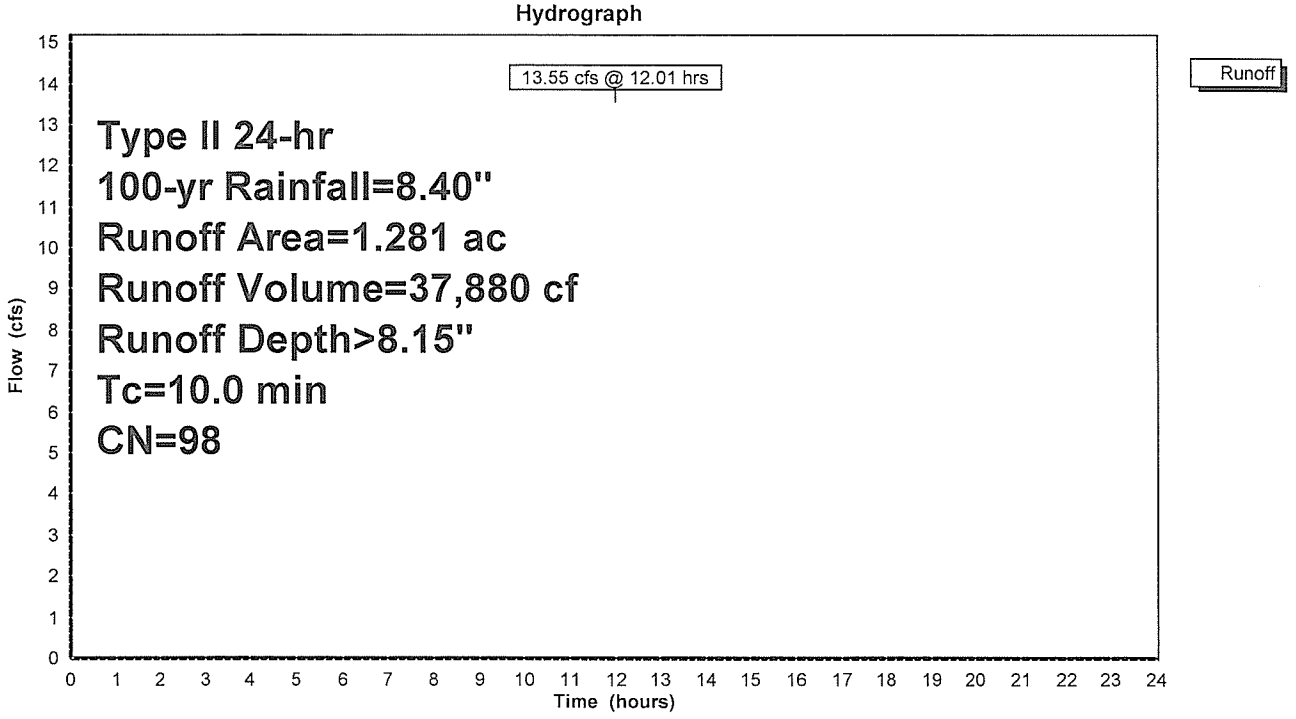
Runoff = 13.55 cfs @ 12.01 hrs, Volume= 37,880 cf, Depth> 8.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

Area (ac)	CN	Description
0.538	98	Roofs, HSG B
0.743	98	Roofs, HSG B
1.281	98	Weighted Average
1.281		100.00% Impervious Area

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

Subcatchment 13S: Cistern-1



Events for Pond 14P: CISTERN-1

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	4.19	0.00	427.71	11,186
2-yr	5.37	0.12	428.13	12,200
5-yr	6.93	1.04	428.26	12,469
10-yr	8.49	5.15	428.55	13,114
25-yr	10.05	8.82	428.74	13,528
50-yr	11.61	11.11	428.84	13,752
100-yr	**13.55**	**13.16**	**428.93**	**13,940**

Summary for Pond 14P: CISTERN-1

Inflow Area = 55,800 sf,100.00% Impervious, Inflow Depth > 2.41" for 1-yr event
Inflow = 4.19 cfs @ 12.01 hrs, Volume= 11,186 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 427.71' @ 24.00 hrs Surf.Area= 5,471 sf Storage= 11,186 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1A	424.50'	7,017 cf	**82.25'W x 66.52'L x 4.50'H Field A** 24,620 cf Overall - 7,077 cf Embedded = 17,543 cf x 40.0% Voids
#2A	425.50'	7,077 cf	**ADS_StormTech SC-740** x 153 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 17 rows
		14,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	424.00'	**24.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 424.00' / 423.80' S= 0.0125 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	428.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=424.50' (Free Discharge)
↑—**1=Culvert** (Passes 0.00 cfs of 1.35 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 14P: CISTERN-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech®SC-740 (ADSStormTech®SC-740)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 17 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

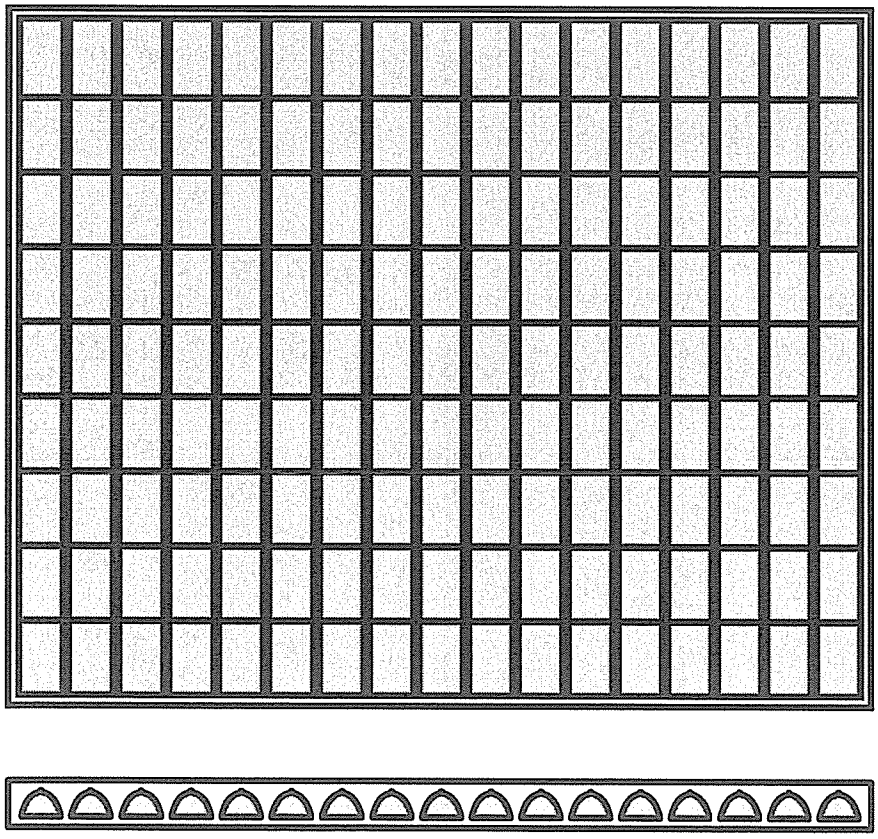
9 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 64.52' Row Length +12.0" End Stone x 2 = 66.52' Base Length
17 Rows x 51.0" Wide + 6.0" Spacing x 16 + 12.0" Side Stone x 2 = 82.25' Base Width
12.0" Base + 30.0" Chamber Height + 12.0" Cover = 4.50' Field Height

153 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 17 Rows = 7,076.9 cf Chamber Storage

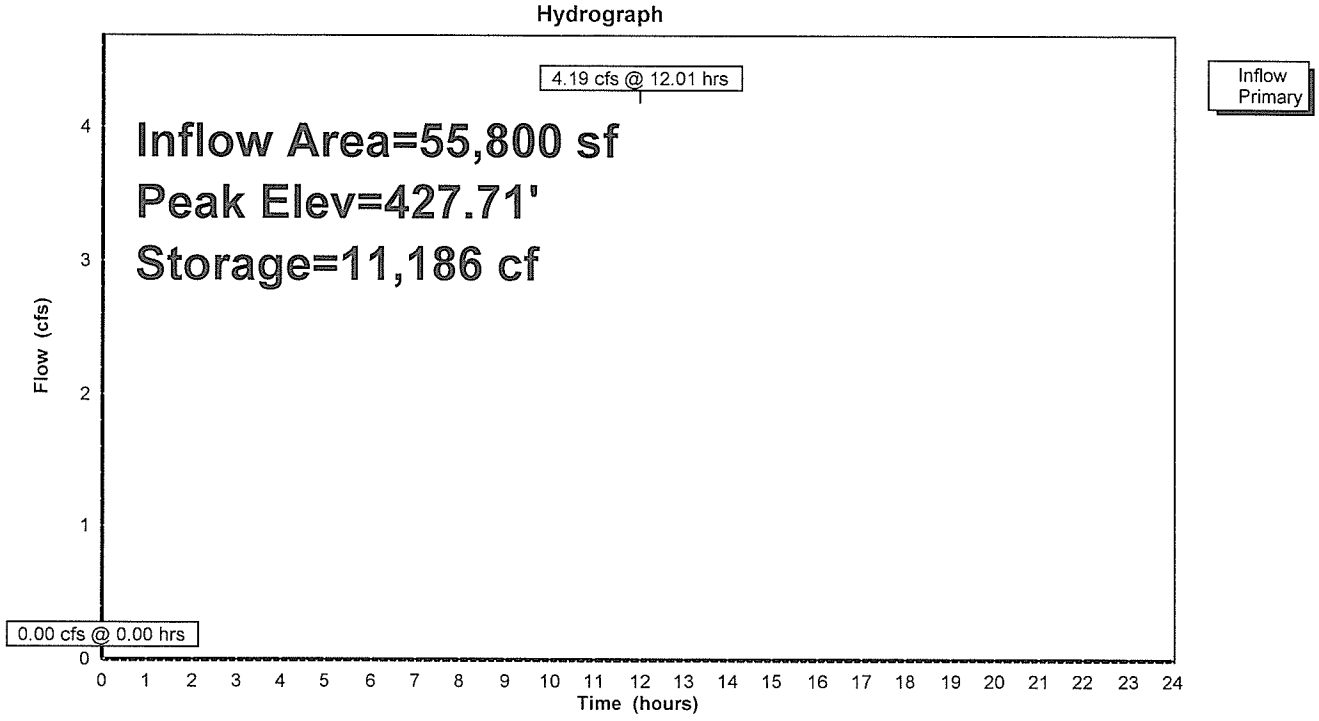
24,620.1 cf Field - 7,076.9 cf Chambers = 17,543.2 cf Stone x 40.0% Voids = 7,017.3 cf Stone Storage

Chamber Storage + Stone Storage = 14,094.2 cf = 0.324 af
Overall Storage Efficiency = 57.2%

153 Chambers
911.9 cy Field
649.7 cy Stone



Pond 14P: CISTERN-1



Summary for Pond 14P: CISTERN-1

Inflow Area = 55,800 sf,100.00% Impervious, Inflow Depth > 3.12" for 2-yr event
Inflow = 5.37 cfs @ 12.01 hrs, Volume= 14,515 cf
Outflow = 0.12 cfs @ 15.45 hrs, Volume= 2,360 cf, Atten= 98%, Lag= 206.4 min
Primary = 0.12 cfs @ 15.45 hrs, Volume= 2,360 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 428.13' @ 15.45 hrs Surf.Area= 5,471 sf Storage= 12,200 cf

Plug-Flow detention time= 650.7 min calculated for 2,359 cf (16% of inflow)
Center-of-Mass det. time= 369.8 min (1,123.8 - 753.9)

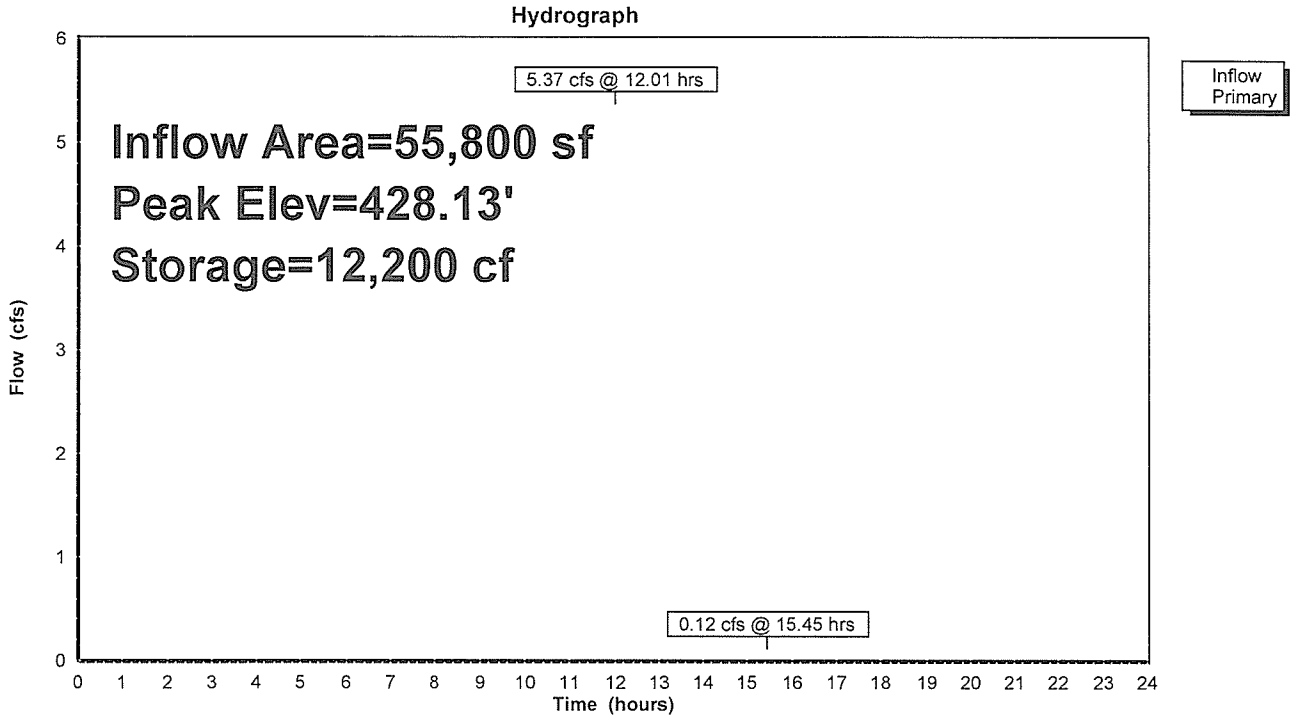
Volume	Invert	Avail.Storage	Storage Description
#1A	424.50'	7,017 cf	**82.25'W x 66.52'L x 4.50'H Field A** 24,620 cf Overall - 7,077 cf Embedded = 17,543 cf x 40.0% Voids
#2A	425.50'	7,077 cf	**ADS_StormTech SC-740** x 153 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 17 rows
		14,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	424.00'	**24.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 424.00' / 423.80' S= 0.0125 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	428.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.11 cfs @ 15.45 hrs HW=428.13' (Free Discharge)
↑—**1=Culvert** (Passes 0.11 cfs of 26.78 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.61 fps)

Pond 14P: CISTERN-1



Summary for Pond 14P: CISTERN-1

Inflow Area = 55,800 sf,100.00% Impervious, Inflow Depth > 4.08" for 5-yr event
Inflow = 6.93 cfs @ 12.01 hrs, Volume= 18,959 cf
Outflow = 1.04 cfs @ 12.32 hrs, Volume= 6,796 cf, Atten= 85%, Lag= 18.7 min
Primary = 1.04 cfs @ 12.32 hrs, Volume= 6,796 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 428.26' @ 12.32 hrs Surf.Area= 5,471 sf Storage= 12,469 cf

Plug-Flow detention time= 355.8 min calculated for 6,793 cf (36% of inflow)
Center-of-Mass det. time= 191.3 min (940.3 - 749.0)

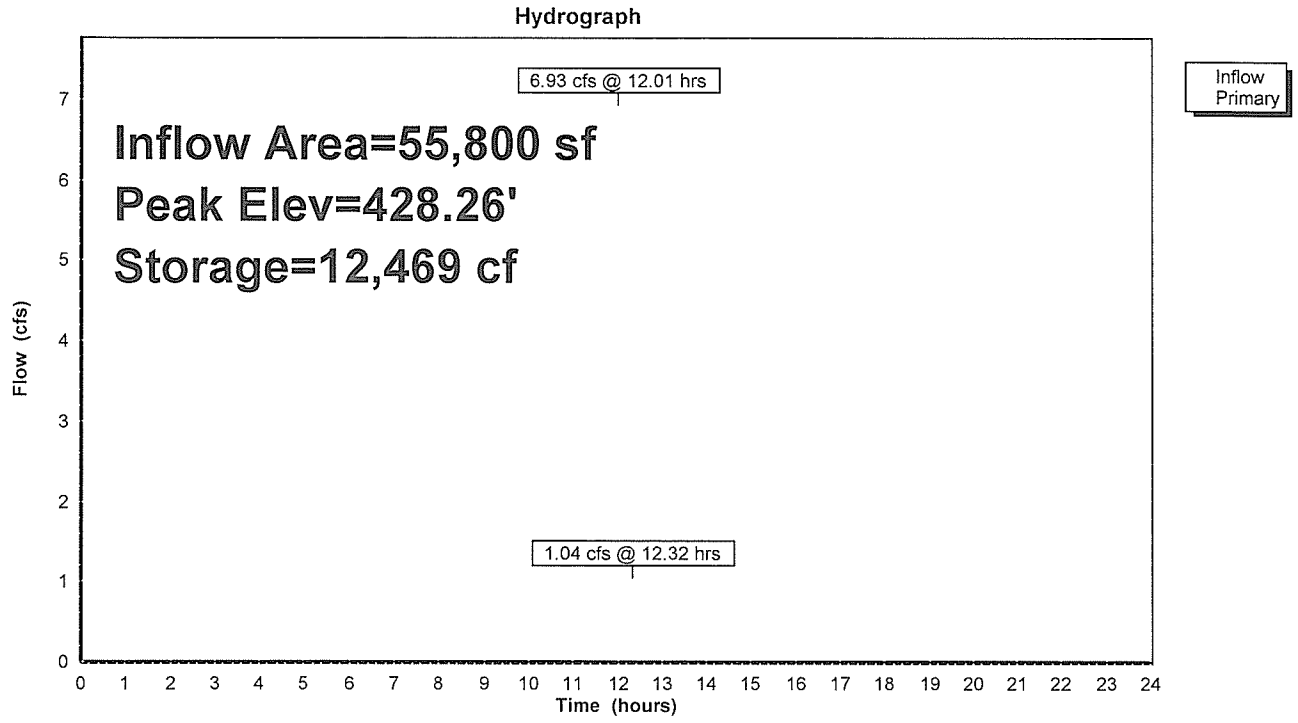
Volume	Invert	Avail.Storage	Storage Description
#1A	424.50'	7,017 cf	**82.25'W x 66.52'L x 4.50'H Field A** 24,620 cf Overall - 7,077 cf Embedded = 17,543 cf x 40.0% Voids
#2A	425.50'	7,077 cf	**ADS_StormTech SC-740** x 153 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 17 rows
		14,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	424.00'	**24.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 424.00' / 423.80' S= 0.0125 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	428.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=1.03 cfs @ 12.32 hrs HW=428.26' (Free Discharge)
↑—**1=Culvert** (Passes 1.03 cfs of 27.30 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.03 cfs @ 1.32 fps)

Pond 14P: CISTERN-1



Summary for Pond 14P: CISTERN-1

Inflow Area = 55,800 sf,100.00% Impervious, Inflow Depth > 5.03" for 10-yr event
Inflow = 8.49 cfs @ 12.01 hrs, Volume= 23,408 cf
Outflow = 5.15 cfs @ 12.11 hrs, Volume= 11,236 cf, Atten= 39%, Lag= 5.9 min
Primary = 5.15 cfs @ 12.11 hrs, Volume= 11,236 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 428.55' @ 12.11 hrs Surf.Area= 5,471 sf Storage= 13,114 cf

Plug-Flow detention time= 272.6 min calculated for 11,231 cf (48% of inflow)
Center-of-Mass det. time= 139.6 min (885.1 - 745.5)

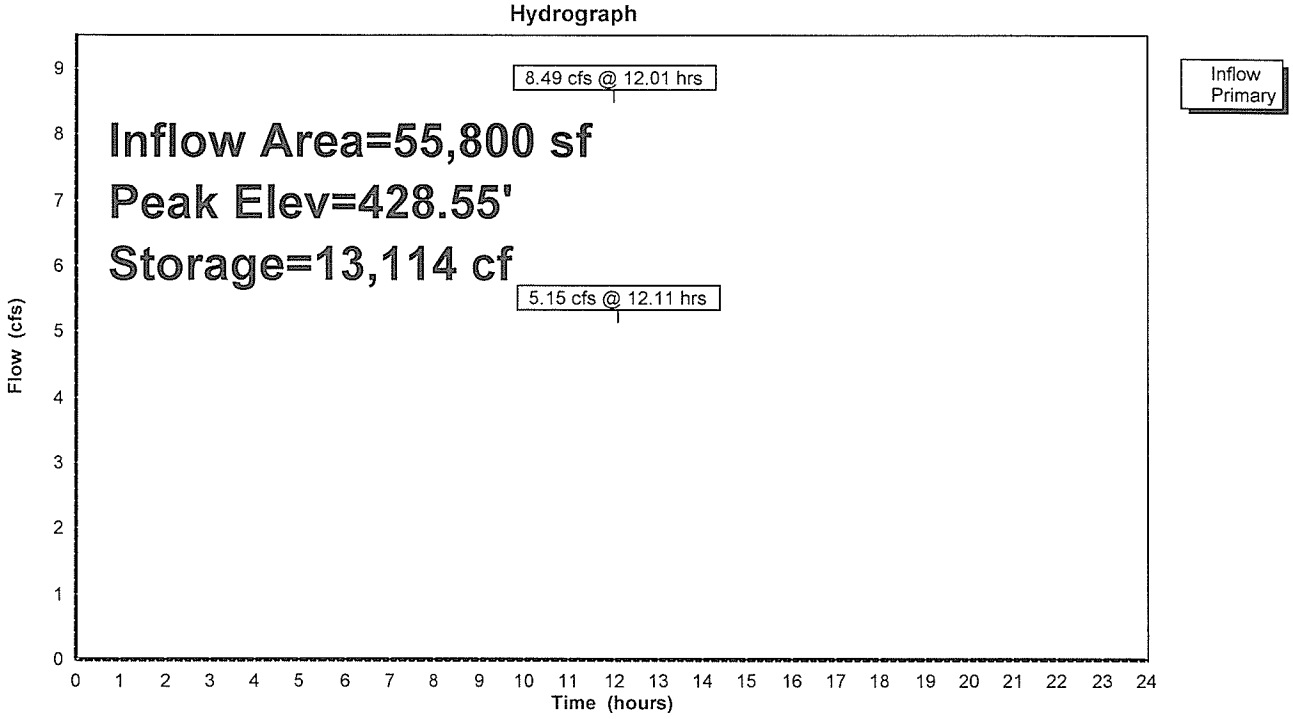
Volume	Invert	Avail.Storage	Storage Description
#1A	424.50'	7,017 cf	**82.25'W x 66.52'L x 4.50'H Field A** 24,620 cf Overall - 7,077 cf Embedded = 17,543 cf x 40.0% Voids
#2A	425.50'	7,077 cf	**ADS_StormTech SC-740** x 153 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 17 rows
		14,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	424.00'	**24.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 424.00' / 423.80' S= 0.0125 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	428.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=5.14 cfs @ 12.11 hrs HW=428.55' (Free Discharge)
↑—**1=Culvert** (Passes 5.14 cfs of 28.51 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 5.14 cfs @ 2.32 fps)

Pond 14P: CISTERN-1



Summary for Pond 14P: CISTERN-1

Inflow Area = 55,800 sf,100.00% Impervious, Inflow Depth > 5.99" for 25-yr event
Inflow = 10.05 cfs @ 12.01 hrs, Volume= 27,860 cf
Outflow = 8.82 cfs @ 12.06 hrs, Volume= 15,679 cf, Atten= 12%, Lag= 2.9 min
Primary = 8.82 cfs @ 12.06 hrs, Volume= 15,679 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 428.74' @ 12.06 hrs Surf.Area= 5,471 sf Storage= 13,528 cf

Plug-Flow detention time= 235.2 min calculated for 15,672 cf (56% of inflow)
Center-of-Mass det. time= 117.1 min (860.0 - 742.9)

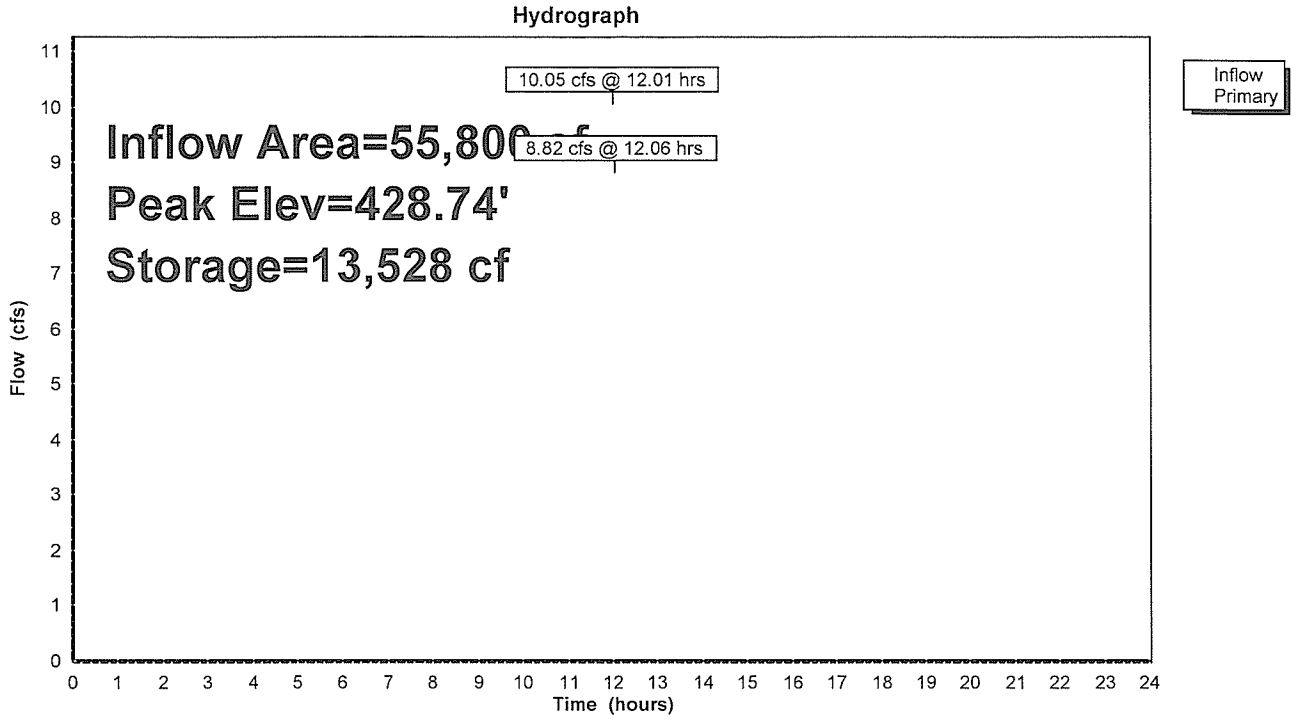
Volume	Invert	Avail.Storage	Storage Description
#1A	424.50'	7,017 cf	**82.25'W x 66.52'L x 4.50'H Field A** 24,620 cf Overall - 7,077 cf Embedded = 17,543 cf x 40.0% Voids
#2A	425.50'	7,077 cf	**ADS_StormTech SC-740** x 153 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 17 rows
		14,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	424.00'	**24.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 424.00' / 423.80' S= 0.0125 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	428.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=8.81 cfs @ 12.06 hrs HW=428.74' (Free Discharge)
↑—**1=Culvert** (Passes 8.81 cfs of 29.26 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.81 cfs @ 2.82 fps)

Pond 14P: CISTERN-1



Summary for Pond 14P: CISTERN-1

Inflow Area = 55,800 sf,100.00% Impervious, Inflow Depth > 6.95" for 50-yr event
Inflow = 11.61 cfs @ 12.01 hrs, Volume= 32,312 cf
Outflow = 11.11 cfs @ 12.04 hrs, Volume= 20,123 cf, Atten= 4%, Lag= 1.7 min
Primary = 11.11 cfs @ 12.04 hrs, Volume= 20,123 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 428.84' @ 12.04 hrs Surf.Area= 5,471 sf Storage= 13,752 cf

Plug-Flow detention time= 213.6 min calculated for 20,114 cf (62% of inflow)
Center-of-Mass det. time= 104.7 min (845.5 - 740.9)

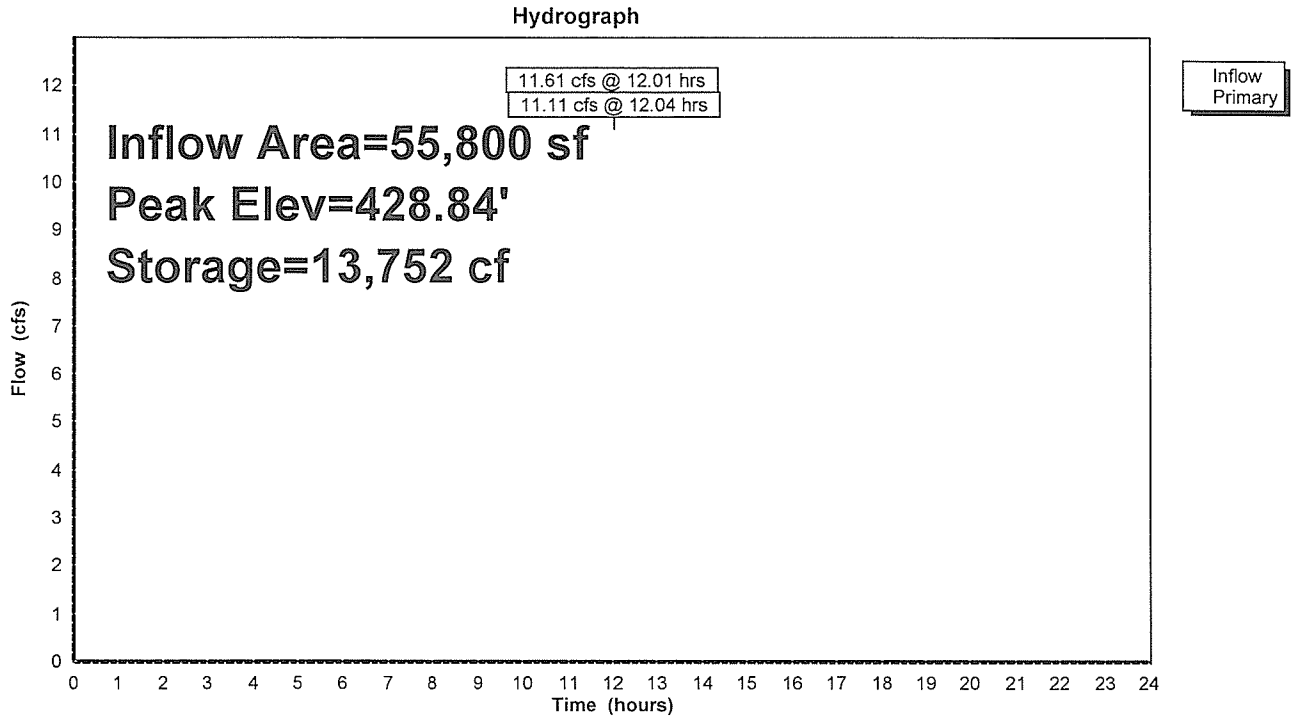
Volume	Invert	Avail.Storage	Storage Description
#1A	424.50'	7,017 cf	**82.25'W x 66.52'L x 4.50'H Field A** 24,620 cf Overall - 7,077 cf Embedded = 17,543 cf x 40.0% Voids
#2A	425.50'	7,077 cf	**ADS_StormTech SC-740**x 153 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 17 rows
		14,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	424.00'	**24.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 424.00' / 423.80' S= 0.0125 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	428.10'	**5.0' long Sharp-Crested Rectangular Weir**2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=11.09 cfs @ 12.04 hrs HW=428.84' (Free Discharge)
↑—**1=Culvert** (Passes 11.09 cfs of 29.65 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 11.09 cfs @ 3.08 fps)

Pond 14P: CISTERN-1



Summary for Pond 14P: CISTERN-1

Inflow Area = 55,800 sf,100.00% Impervious, Inflow Depth > 8.15" for 100-yr event
Inflow = 13.55 cfs @ 12.01 hrs, Volume= 37,880 cf
Outflow = 13.16 cfs @ 12.03 hrs, Volume= 25,679 cf, Atten= 3%, Lag= 1.4 min
Primary = 13.16 cfs @ 12.03 hrs, Volume= 25,679 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 428.93' @ 12.03 hrs Surf.Area= 5,471 sf Storage= 13,940 cf

Plug-Flow detention time= 196.4 min calculated for 25,668 cf (68% of inflow)
Center-of-Mass det. time= 95.2 min (834.1 - 738.9)

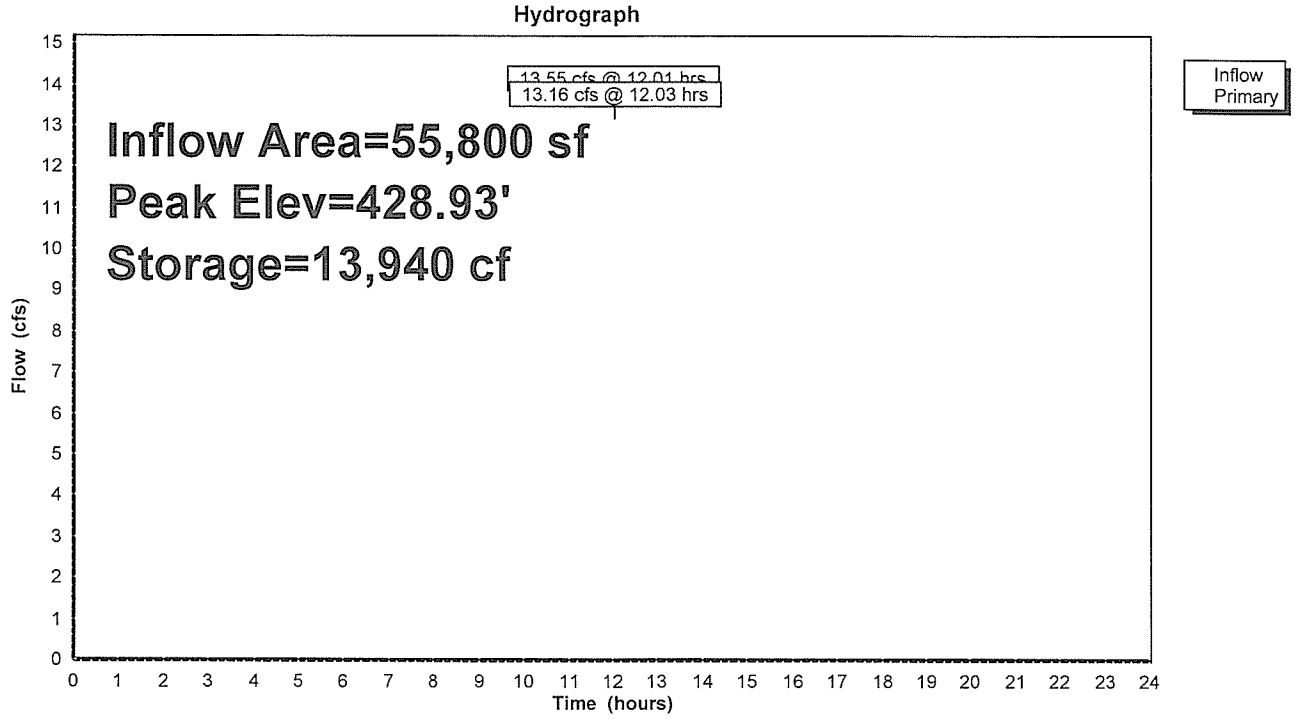
Volume	Invert	Avail.Storage	Storage Description
#1A	424.50'	7,017 cf	**82.25'W x 66.52'L x 4.50'H Field A** 24,620 cf Overall - 7,077 cf Embedded = 17,543 cf x 40.0% Voids
#2A	425.50'	7,077 cf	**ADS_StormTech SC-740** x 153 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 17 rows
		14,094 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	424.00'	**24.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 424.00' / 423.80' S= 0.0125 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	428.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=13.15 cfs @ 12.03 hrs HW=428.93' (Free Discharge)
↑—**1=Culvert** (Passes 13.15 cfs of 29.98 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 13.15 cfs @ 3.28 fps)

Pond 14P: CISTERN-1



Summary for Subcatchment 29S: Cistern-2

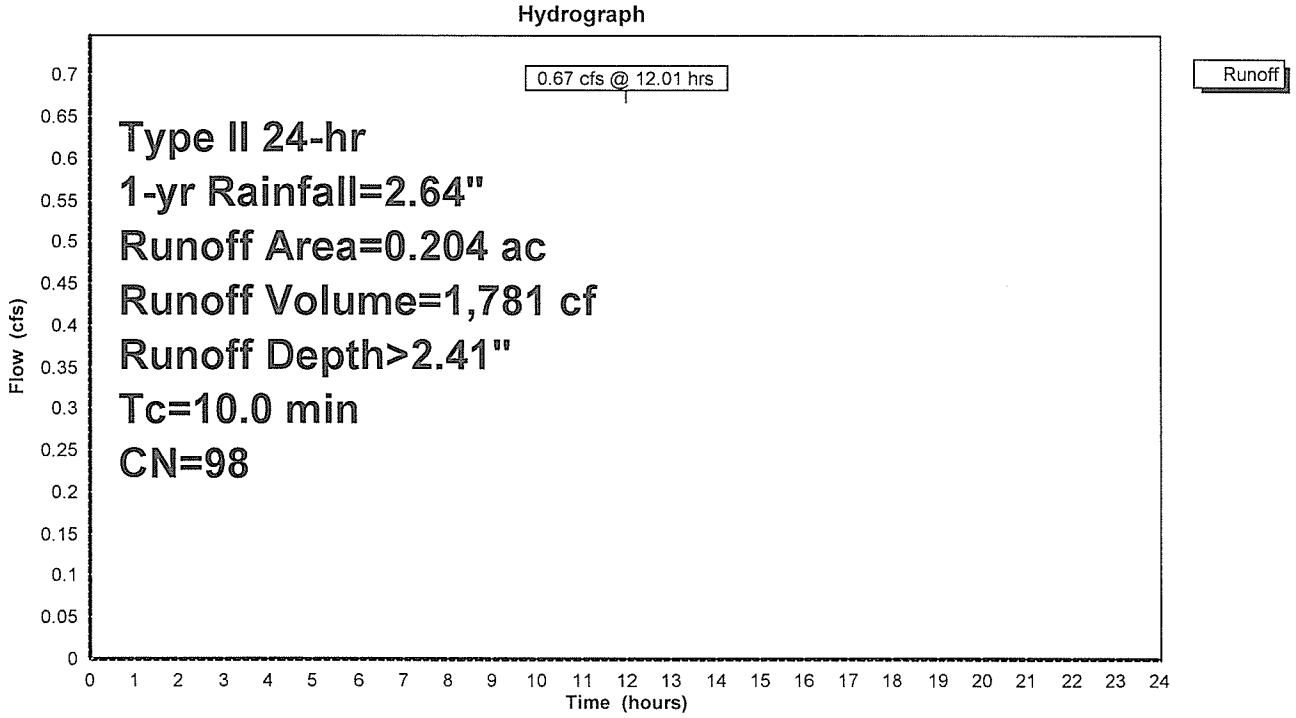
Runoff = 0.67 cfs @ 12.01 hrs, Volume= 1,781 cf, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

	Area (ac)	CN	Description
*	0.122	98	Equipment Area Roof
*	0.082	98	Lower Roof
	0.204	98	Weighted Average
	0.204		100.00% Impervious Area

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

Subcatchment 29S: Cistern-2



Summary for Subcatchment 29S: Cistern-2

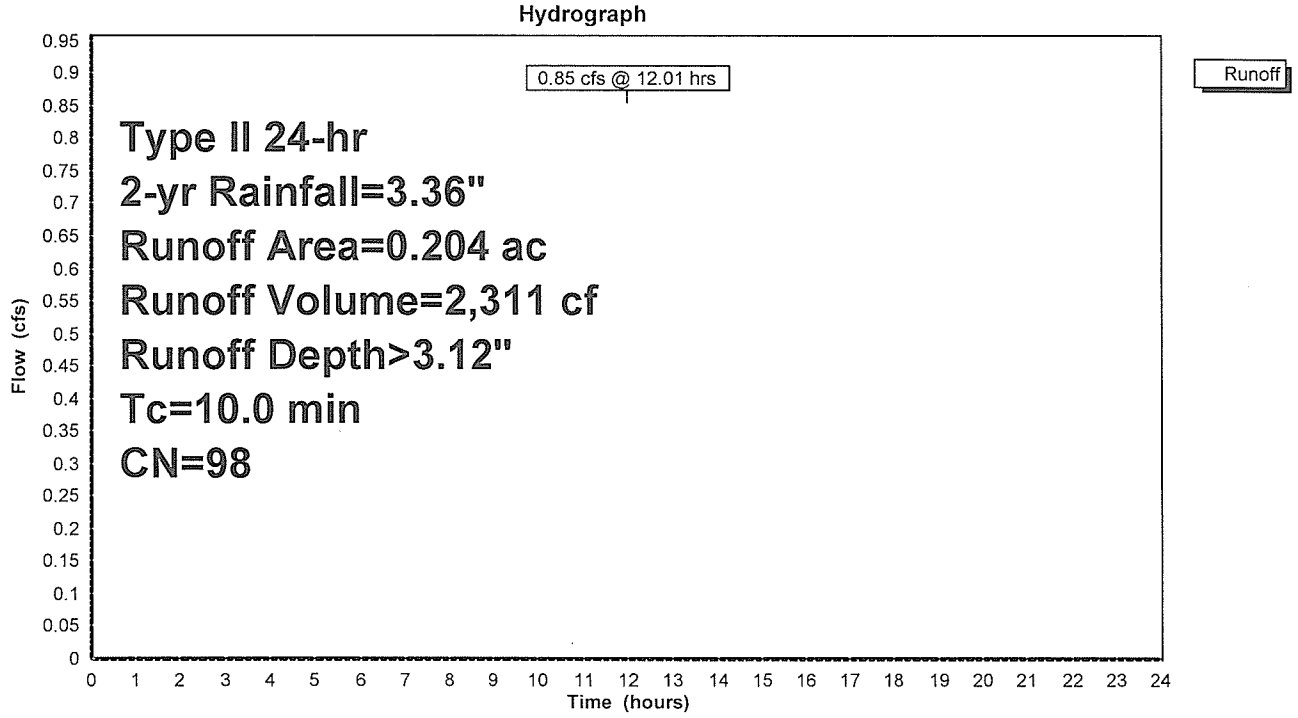
Runoff = 0.85 cfs @ 12.01 hrs, Volume= 2,311 cf, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

	Area (ac)	CN	Description
*	0.122	98	Equipment Area Roof
*	0.082	98	Lower Roof
	0.204	98	Weighted Average
	0.204		100.00% Impervious Area

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

Subcatchment 29S: Cistern-2



Summary for Subcatchment 29S: Cistern-2

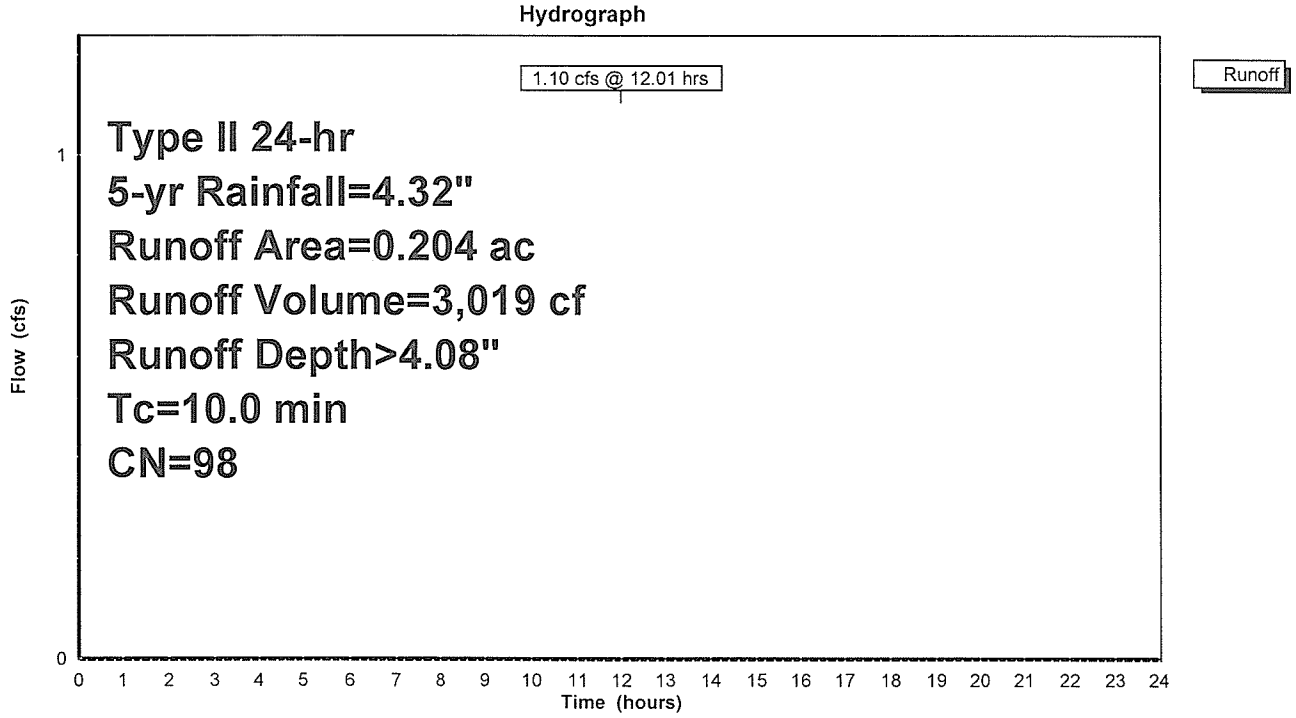
Runoff = 1.10 cfs @ 12.01 hrs, Volume= 3,019 cf, Depth> 4.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

	Area (ac)	CN	Description
*	0.122	98	Equipment Area Roof
*	0.082	98	Lower Roof
	0.204	98	Weighted Average
	0.204		100.00% Impervious Area

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

Subcatchment 29S: Cistern-2



Summary for Subcatchment 29S: Cistern-2

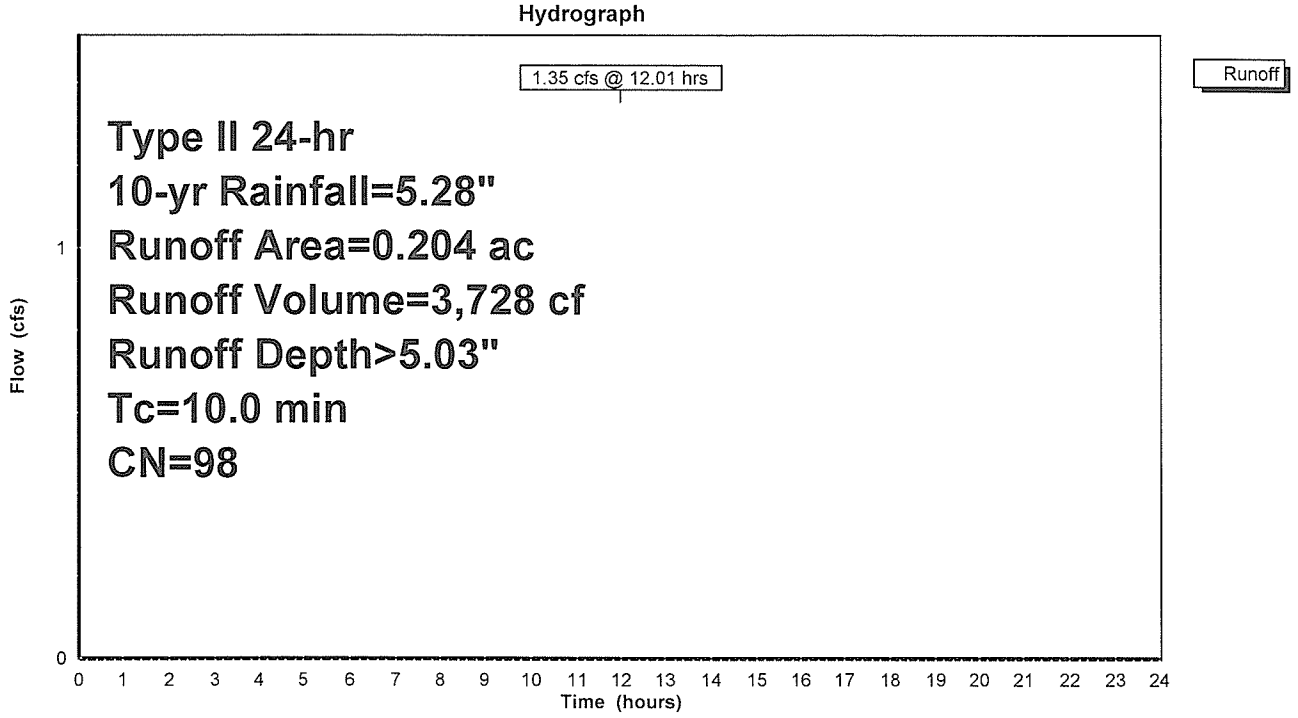
Runoff = 1.35 cfs @ 12.01 hrs, Volume= 3,728 cf, Depth> 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

	Area (ac)	CN	Description
*	0.122	98	Equipment Area Roof
*	0.082	98	Lower Roof
	0.204	98	Weighted Average
	0.204		100.00% Impervious Area

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

Subcatchment 29S: Cistern-2



Summary for Subcatchment 29S: Cistern-2

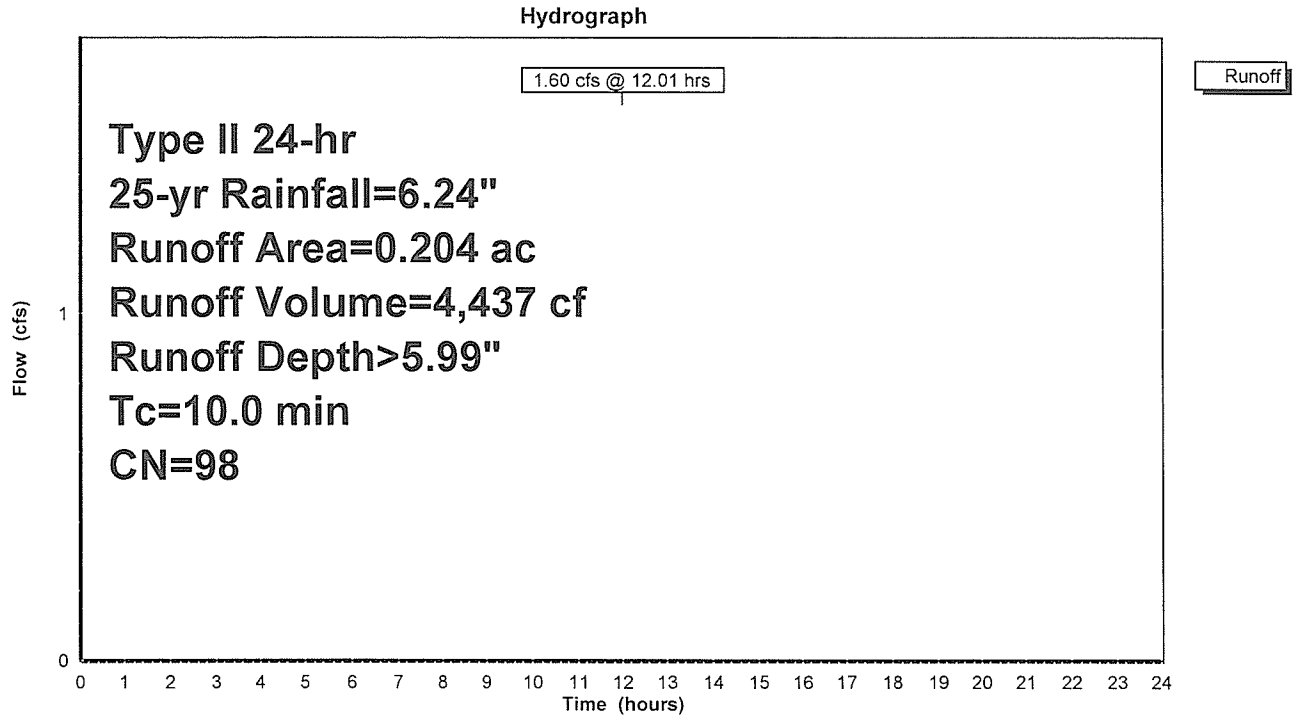
Runoff = 1.60 cfs @ 12.01 hrs, Volume= 4,437 cf, Depth> 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

	Area (ac)	CN	Description
*	0.122	98	Equipment Area Roof
*	0.082	98	Lower Roof
	0.204	98	Weighted Average
	0.204		100.00% Impervious Area

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

Subcatchment 29S: Cistern-2



Summary for Subcatchment 29S: Cistern-2

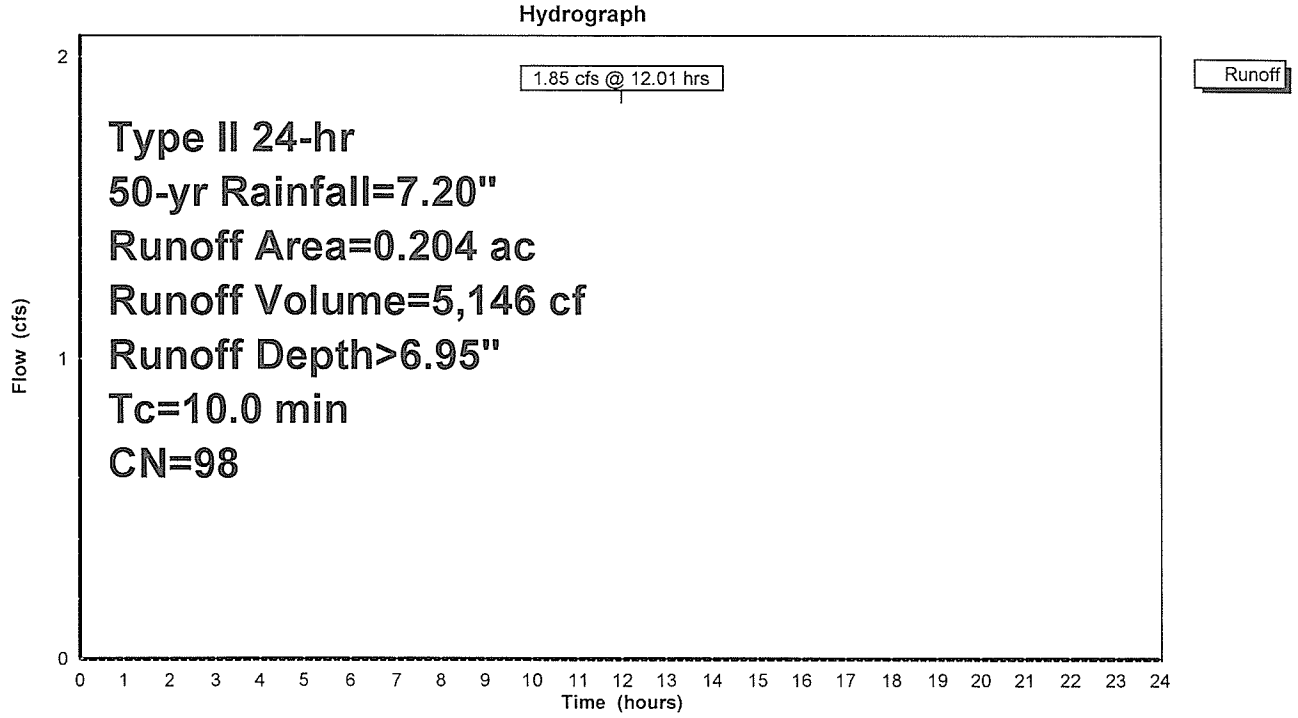
Runoff = 1.85 cfs @ 12.01 hrs, Volume= 5,146 cf, Depth> 6.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

	Area (ac)	CN	Description
*	0.122	98	Equipment Area Roof
*	0.082	98	Lower Roof
	0.204	98	Weighted Average
	0.204		100.00% Impervious Area

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

Subcatchment 29S: Cistern-2



Summary for Subcatchment 29S: Cistern-2

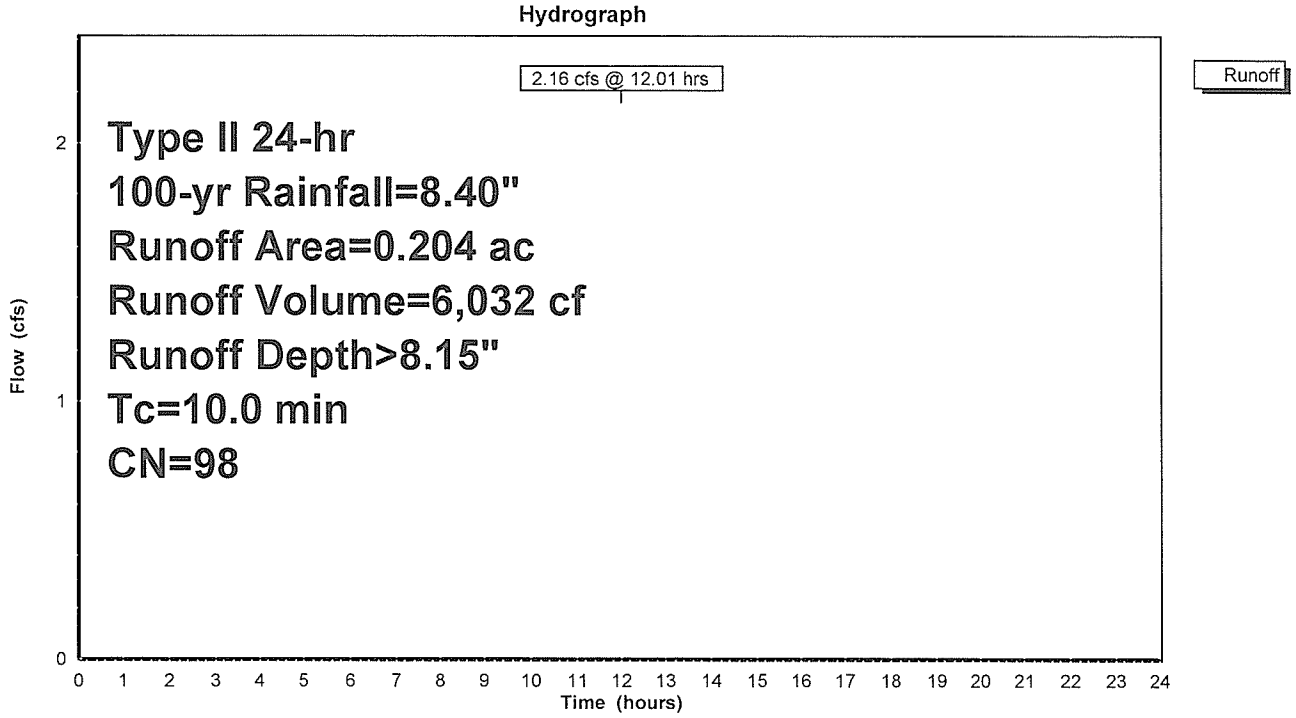
Runoff = 2.16 cfs @ 12.01 hrs, Volume= 6,032 cf, Depth> 8.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

	Area (ac)	CN	Description
*	0.122	98	Equipment Area Roof
*	0.082	98	Lower Roof
	0.204	98	Weighted Average
	0.204		100.00% Impervious Area

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

Subcatchment 29S: Cistern-2



Events for Pond 30P: CISTERN-2

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	0.67	0.01	416.51	1,652
2-yr	0.85	0.06	416.53	1,659
5-yr	1.10	0.72	416.68	1,705
10-yr	1.35	1.32	416.76	1,732
25-yr	1.60	1.59	416.80	1,743
50-yr	1.85	1.84	416.83	1,752
100-yr	**2.16**	**2.15**	**416.86**	**1,763**

Summary for Pond 30P: CISTERN-2

Inflow Area = 8,886 sf,100.00% Impervious, Inflow Depth > 2.41" for 1-yr event
Inflow = 0.67 cfs @ 12.01 hrs, Volume= 1,781 cf
Outflow = 0.01 cfs @ 19.01 hrs, Volume= 130 cf, Atten= 99%, Lag= 419.7 min
Primary = 0.01 cfs @ 19.01 hrs, Volume= 130 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 416.51' @ 19.01 hrs Surf.Area= 780 sf Storage= 1,652 cf

Plug-Flow detention time= 903.8 min calculated for 130 cf (7% of inflow)
Center-of-Mass det. time= 514.8 min (1,274.1 - 759.3)

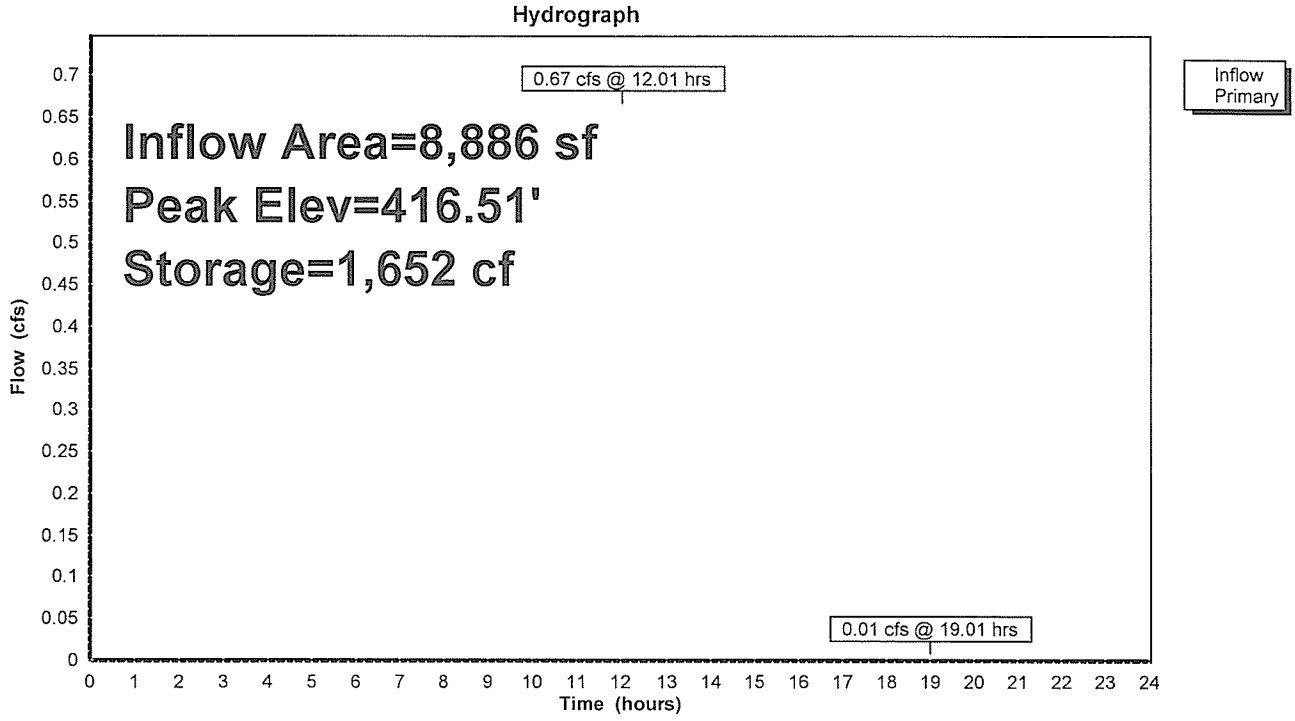
Volume	Invert	Avail.Storage	Storage Description
#1A	413.00'	876 cf	**20.50'W x 38.04'L x 4.00'H Field A** 3,119 cf Overall - 930 cf Embedded = 2,189 cf x 40.0% Voids
#2A	413.50'	930 cf	**ADS_StormTech SC-740** x 20 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 4 rows
		1,806 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	413.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 413.00' / 412.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	416.50'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 19.01 hrs HW=416.51' (Free Discharge)
↑—**1=Culvert** (Passes 0.00 cfs of 6.56 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.26 fps)

Pond 30P: CISTERN-2



Summary for Pond 30P: CISTERN-2

Inflow Area = 8,886 sf,100.00% Impervious, Inflow Depth > 3.12" for 2-yr event
Inflow = 0.85 cfs @ 12.01 hrs, Volume= 2,311 cf
Outflow = 0.06 cfs @ 12.75 hrs, Volume= 660 cf, Atten= 93%, Lag= 44.3 min
Primary = 0.06 cfs @ 12.75 hrs, Volume= 660 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 416.53' @ 12.75 hrs Surf.Area= 780 sf Storage= 1,659 cf

Plug-Flow detention time= 425.1 min calculated for 660 cf (29% of inflow)
Center-of-Mass det. time= 236.4 min (990.3 - 753.9)

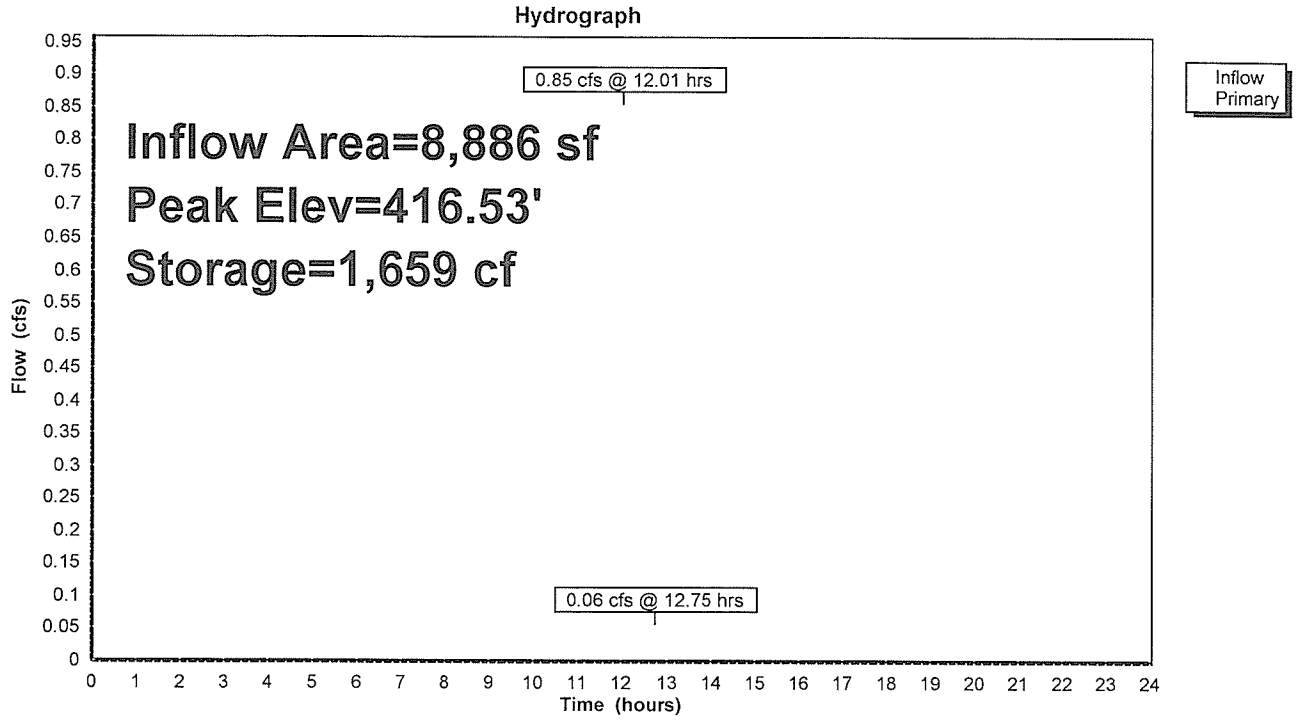
Volume	Invert	Avail.Storage	Storage Description
#1A	413.00'	876 cf	**20.50'W x 38.04'L x 4.00'H Field A** 3,119 cf Overall - 930 cf Embedded = 2,189 cf x 40.0% Voids
#2A	413.50'	930 cf	**ADS_StormTech SC-740** x 20 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 4 rows
		1,806 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	413.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 413.00' / 412.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	416.50'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=0.05 cfs @ 12.75 hrs HW=416.53' (Free Discharge)
└─**1=Culvert** (Passes 0.05 cfs of 6.58 cfs potential flow)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.57 fps)

Pond 30P: CISTERN-2



Summary for Pond 30P: CISTERN-2

Inflow Area = 8,886 sf,100.00% Impervious, Inflow Depth > 4.08" for 5-yr event
Inflow = 1.10 cfs @ 12.01 hrs, Volume= 3,019 cf
Outflow = 0.72 cfs @ 12.10 hrs, Volume= 1,367 cf, Atten= 35%, Lag= 5.4 min
Primary = 0.72 cfs @ 12.10 hrs, Volume= 1,367 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 416.68' @ 12.10 hrs Surf.Area= 780 sf Storage= 1,705 cf

Plug-Flow detention time= 281.7 min calculated for 1,367 cf (45% of inflow)
Center-of-Mass det. time= 144.6 min (893.6 - 749.0)

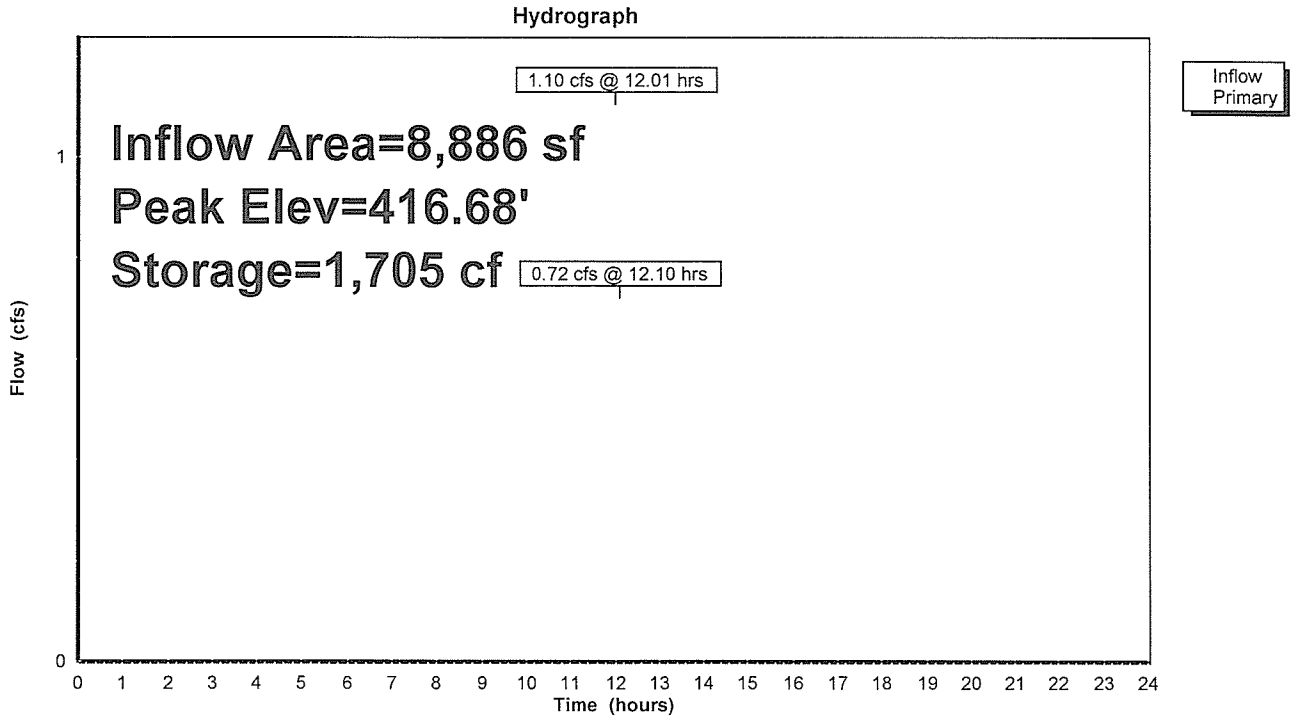
Volume	Invert	Avail.Storage	Storage Description
#1A	413.00'	876 cf	**20.50'W x 38.04'L x 4.00'H Field A** 3,119 cf Overall - 930 cf Embedded = 2,189 cf x 40.0% Voids
#2A	413.50'	930 cf	**ADS_StormTech SC-740** x 20 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 4 rows
		1,806 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	413.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 413.00' / 412.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	416.50'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=0.72 cfs @ 12.10 hrs HW=416.68' (Free Discharge)
↑—**1=Culvert** (Passes 0.72 cfs of 6.74 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.72 cfs @ 1.38 fps)

Pond 30P: CISTERN-2



Events for Pond 30P: CISTERN-2

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	0.67	0.01	416.51	1,652
2-yr	0.85	0.06	416.53	1,659
5-yr	1.10	0.72	416.68	1,705
10-yr	1.35	1.32	416.76	1,732
25-yr	1.60	1.59	416.80	1,743
50-yr	1.85	1.84	416.83	1,752
100-yr	**2.16**	**2.15**	**416.86**	**1,763**

Summary for Pond 30P: CISTERN-2

Inflow Area = 8,886 sf,100.00% Impervious, Inflow Depth > 5.03" for 10-yr event
Inflow = 1.35 cfs @ 12.01 hrs, Volume= 3,728 cf
Outflow = 1.32 cfs @ 12.03 hrs, Volume= 2,075 cf, Atten= 2%, Lag= 1.3 min
Primary = 1.32 cfs @ 12.03 hrs, Volume= 2,075 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 416.76' @ 12.03 hrs Surf.Area= 780 sf Storage= 1,732 cf

Plug-Flow detention time= 232.7 min calculated for 2,074 cf (56% of inflow)
Center-of-Mass det. time= 114.7 min (860.2 - 745.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	413.00'	876 cf	**20.50'W x 38.04'L x 4.00'H Field A** 3,119 cf Overall - 930 cf Embedded = 2,189 cf x 40.0% Voids
#2A	413.50'	930 cf	**ADS_StormTech SC-740** x 20 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 4 rows
		1,806 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	413.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 413.00' / 412.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	416.50'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=1.32 cfs @ 12.03 hrs HW=416.76' (Free Discharge)
↑—**1=Culvert** (Passes 1.32 cfs of 6.83 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.32 cfs @ 1.70 fps)

Pond 30P: CISTERN-2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech®SC-740 (ADSStormTech®SC-740)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 4 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

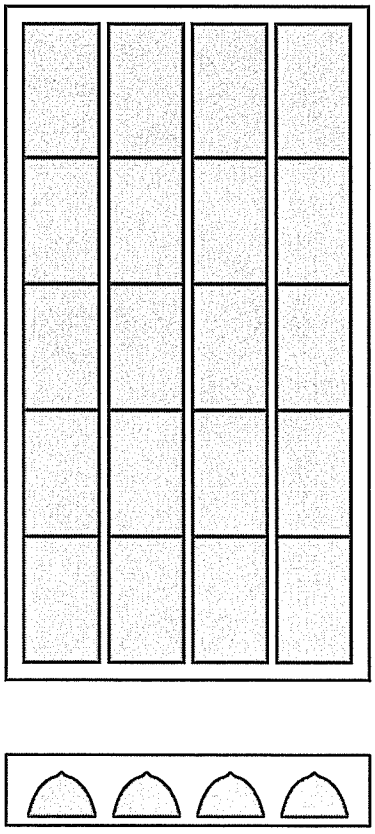
5 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 36.04' Row Length +12.0" End Stone x 2 = 38.04' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Base + 30.0" Chamber Height + 12.0" Cover = 4.00' Field Height

20 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 4 Rows = 930.2 cf Chamber Storage

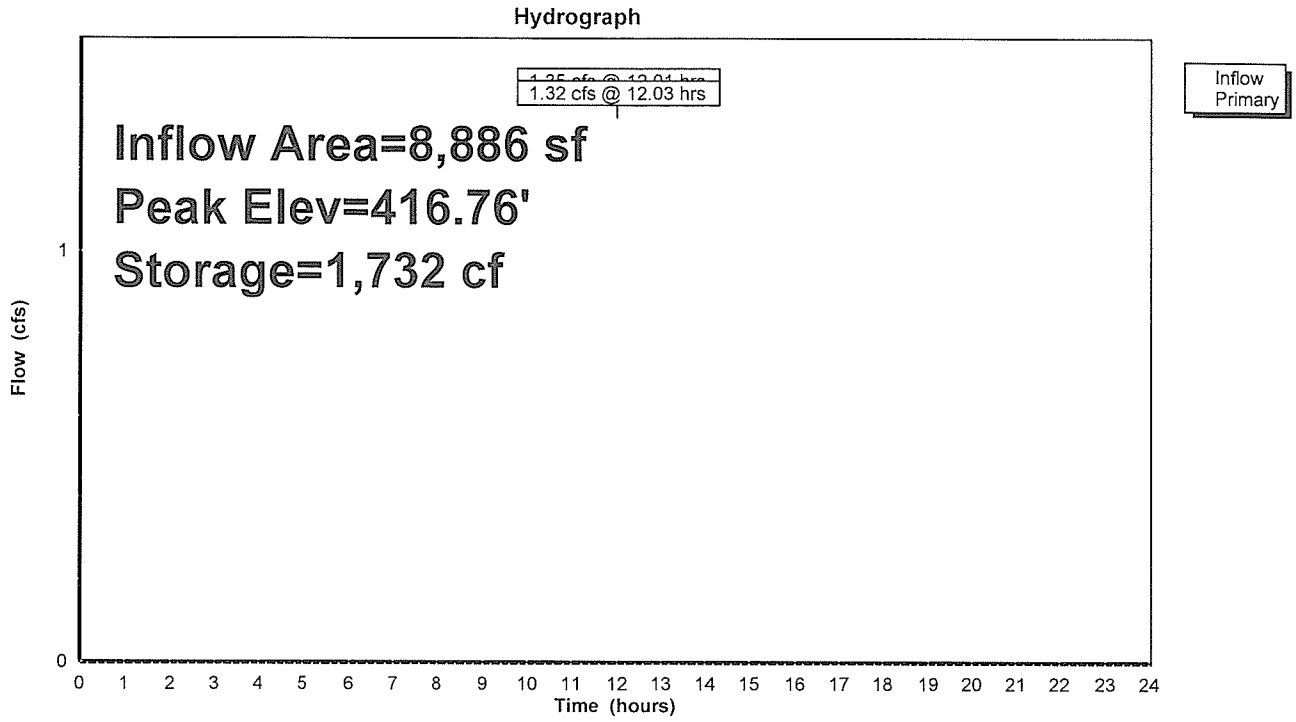
3,119.3 cf Field - 930.2 cf Chambers = 2,189.1 cf Stone x 40.0% Voids = 875.6 cf Stone Storage

Chamber Storage + Stone Storage = 1,805.8 cf = 0.041 af
Overall Storage Efficiency = 57.9%

20 Chambers
115.5 cy Field
81.1 cy Stone



Pond 30P: CISTERN-2



Summary for Pond 30P: CISTERN-2

Inflow Area = 8,886 sf,100.00% Impervious, Inflow Depth > 5.99" for 25-yr event
Inflow = 1.60 cfs @ 12.01 hrs, Volume= 4,437 cf
Outflow = 1.59 cfs @ 12.02 hrs, Volume= 2,784 cf, Atten= 1%, Lag= 0.6 min
Primary = 1.59 cfs @ 12.02 hrs, Volume= 2,784 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 416.80' @ 12.02 hrs Surf.Area= 780 sf Storage= 1,743 cf

Plug-Flow detention time= 207.9 min calculated for 2,782 cf (63% of inflow)
Center-of-Mass det. time= 100.3 min (843.2 - 742.9)

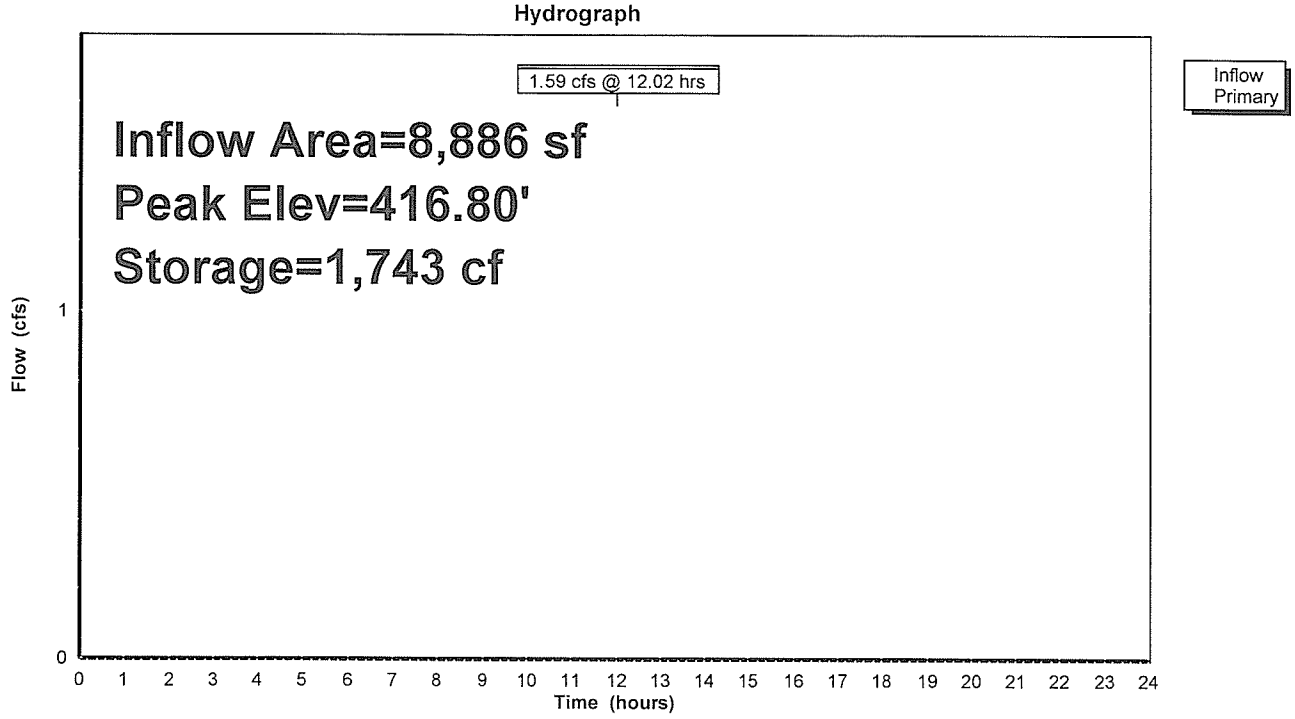
Volume	Invert	Avail.Storage	Storage Description
#1A	413.00'	876 cf	**20.50'W x 38.04'L x 4.00'H Field A** 3,119 cf Overall - 930 cf Embedded = 2,189 cf x 40.0% Voids
#2A	413.50'	930 cf	**ADS_StormTech SC-740** x 20 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 4 rows
		1,806 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	413.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 413.00' / 412.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	416.50'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=1.59 cfs @ 12.02 hrs HW=416.80' (Free Discharge)
↑**1=Culvert** (Passes 1.59 cfs of 6.87 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.59 cfs @ 1.82 fps)

Pond 30P: CISTERN-2



Summary for Pond 30P: CISTERN-2

Inflow Area = 8,886 sf,100.00% Impervious, Inflow Depth > 6.95" for 50-yr event
Inflow = 1.85 cfs @ 12.01 hrs, Volume= 5,146 cf
Outflow = 1.84 cfs @ 12.02 hrs, Volume= 3,492 cf, Atten= 1%, Lag= 0.6 min
Primary = 1.84 cfs @ 12.02 hrs, Volume= 3,492 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 416.83' @ 12.02 hrs Surf.Area= 780 sf Storage= 1,752 cf

Plug-Flow detention time= 192.5 min calculated for 3,491 cf (68% of inflow)
Center-of-Mass det. time= 91.8 min (832.7 - 740.9)

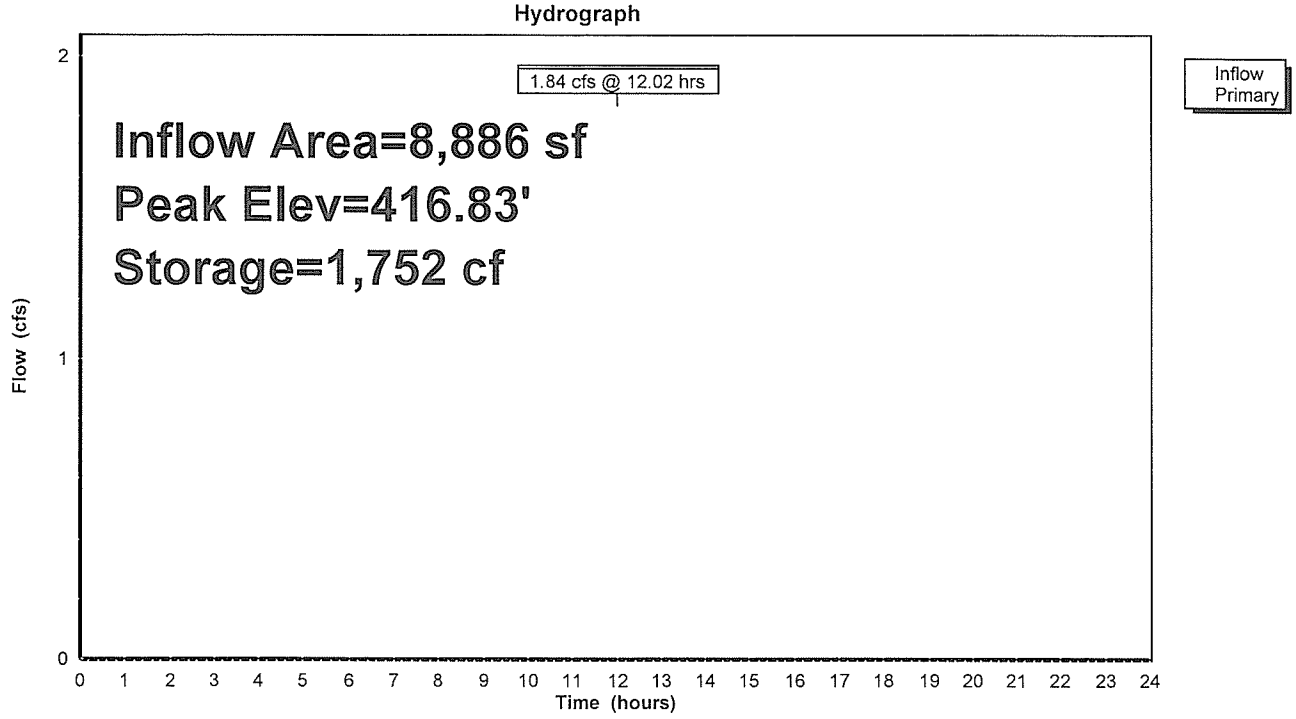
Volume	Invert	Avail.Storage	Storage Description
#1A	413.00'	876 cf	**20.50'W x 38.04'L x 4.00'H Field A** 3,119 cf Overall - 930 cf Embedded = 2,189 cf x 40.0% Voids
#2A	413.50'	930 cf	**ADS_StormTech SC-740** x 20 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 4 rows
		1,806 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	413.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 413.00' / 412.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	416.50'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=1.83 cfs @ 12.02 hrs HW=416.83' (Free Discharge)
↑—**1=Culvert** (Passes 1.83 cfs of 6.90 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.83 cfs @ 1.91 fps)

Pond 30P: CISTERN-2



Summary for Pond 30P: CISTERN-2

Inflow Area = 8,886 sf,100.00% Impervious, Inflow Depth > 8.15" for 100-yr event
Inflow = 2.16 cfs @ 12.01 hrs, Volume= 6,032 cf
Outflow = 2.15 cfs @ 12.02 hrs, Volume= 4,378 cf, Atten= 1%, Lag= 0.6 min
Primary = 2.15 cfs @ 12.02 hrs, Volume= 4,378 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 416.86' @ 12.02 hrs Surf.Area= 780 sf Storage= 1,763 cf

Plug-Flow detention time= 179.3 min calculated for 4,378 cf (73% of inflow)
Center-of-Mass det. time= 85.1 min (823.9 - 738.9)

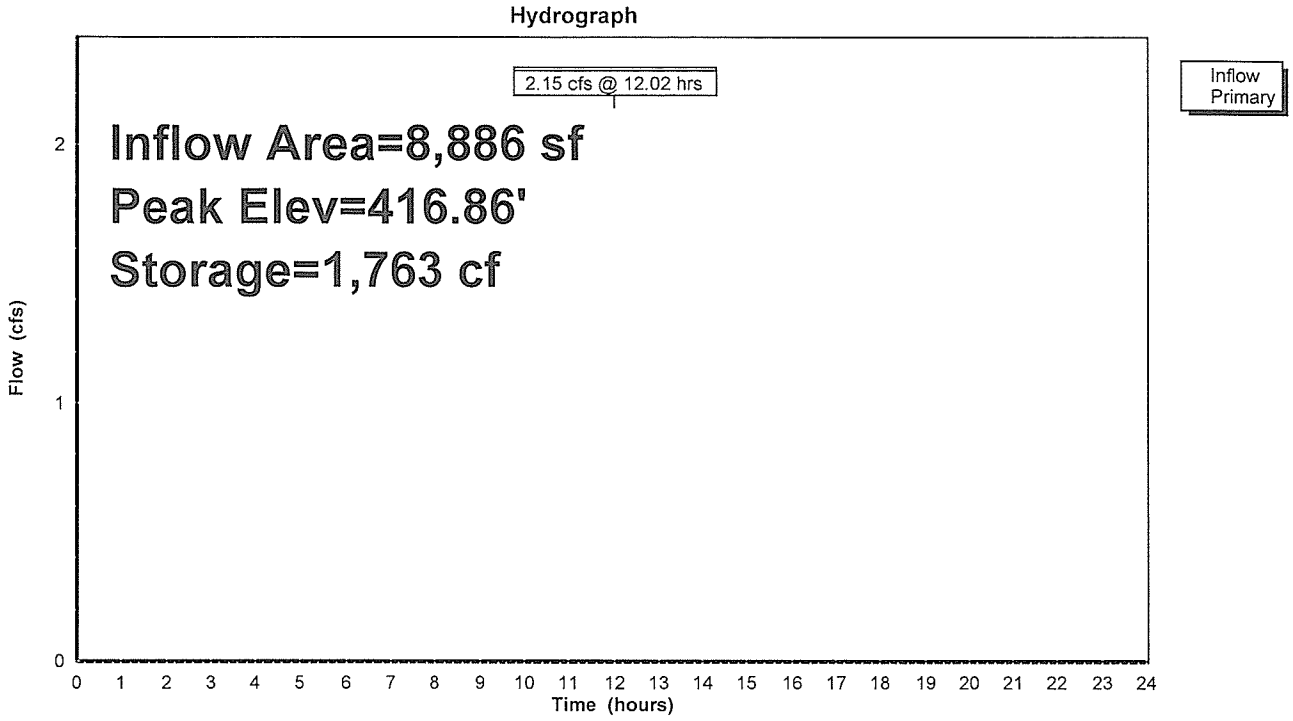
Volume	Invert	Avail.Storage	Storage Description
#1A	413.00'	876 cf	**20.50'W x 38.04'L x 4.00'H Field A** 3,119 cf Overall - 930 cf Embedded = 2,189 cf x 40.0% Voids
#2A	413.50'	930 cf	**ADS_StormTech SC-740** x 20 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 4 rows
		1,806 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	413.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 413.00' / 412.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	416.50'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=2.14 cfs @ 12.02 hrs HW=416.86' (Free Discharge)
↑**1=Culvert** (Passes 2.14 cfs of 6.94 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.14 cfs @ 2.01 fps)

Pond 30P: CISTERN-2



Summary for Subcatchment 31S: FROM RG-11

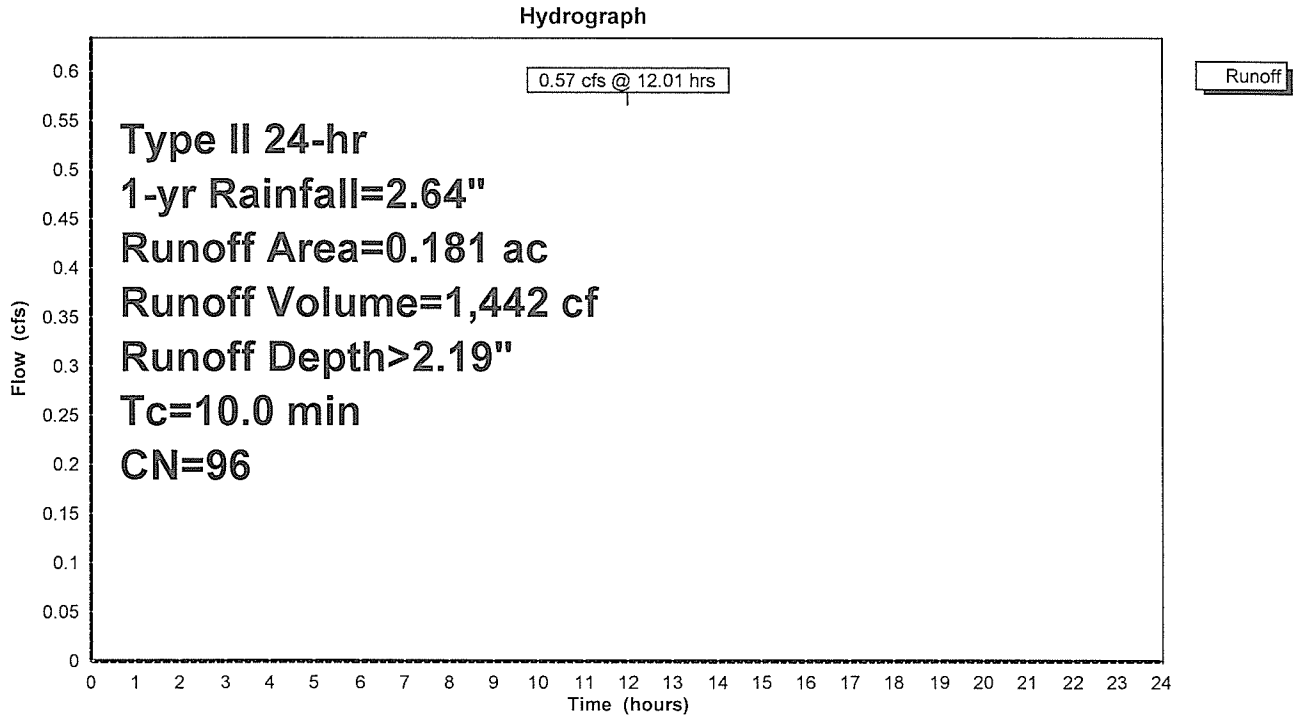
Runoff = 0.57 cfs @ 12.01 hrs, Volume= 1,442 cf, Depth> 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

	Area (ac)	CN	Description
*	0.032	98	Portion of sidewalk
*	0.140	98	Plaza
	0.009	61	>75% Grass cover, Good, HSG B
	0.181	96	Weighted Average
	0.009		4.97% Pervious Area
	0.172		95.03% Impervious Area

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

Subcatchment 31S: FROM RG-11



Summary for Subcatchment 31S: FROM RG-11

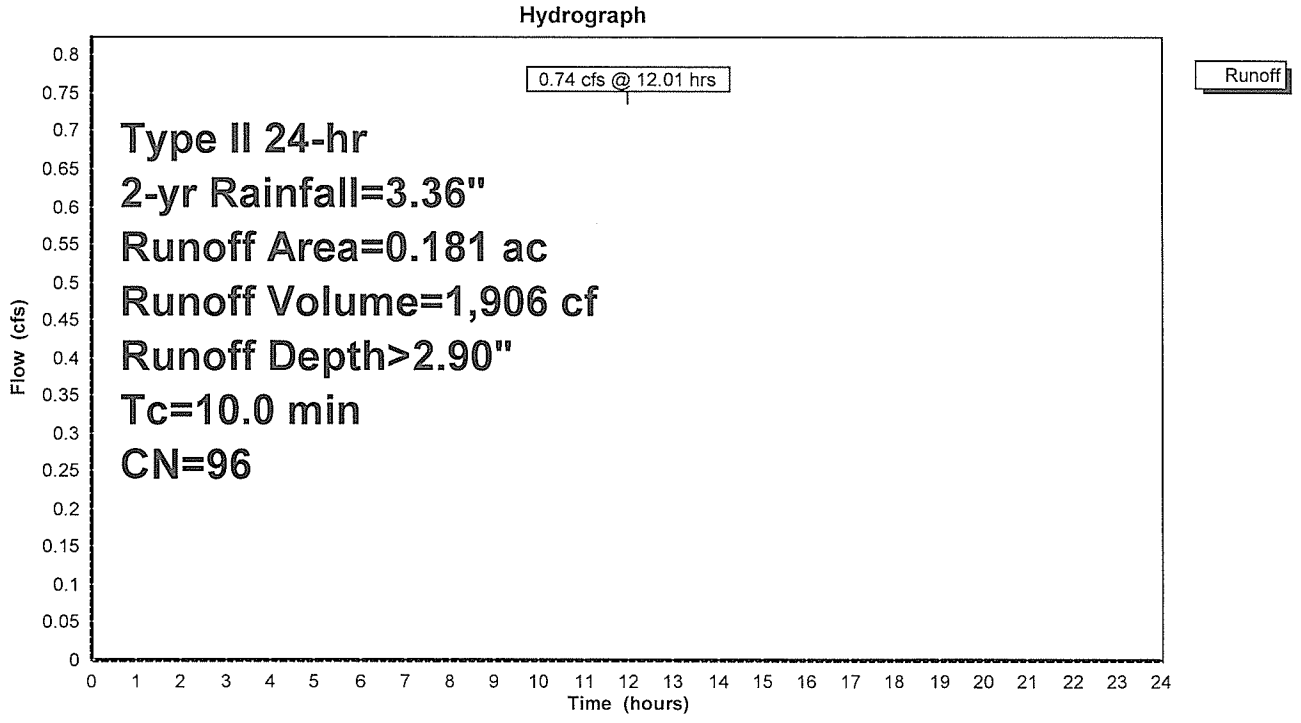
Runoff = 0.74 cfs @ 12.01 hrs, Volume= 1,906 cf, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

	Area (ac)	CN	Description
*	0.032	98	Portion of sidewalk
*	0.140	98	Plaza
	0.009	61	>75% Grass cover, Good, HSG B
	0.181	96	Weighted Average
	0.009		4.97% Pervious Area
	0.172		95.03% Impervious Area

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

Subcatchment 31S: FROM RG-11



Summary for Subcatchment 31S: FROM RG-11

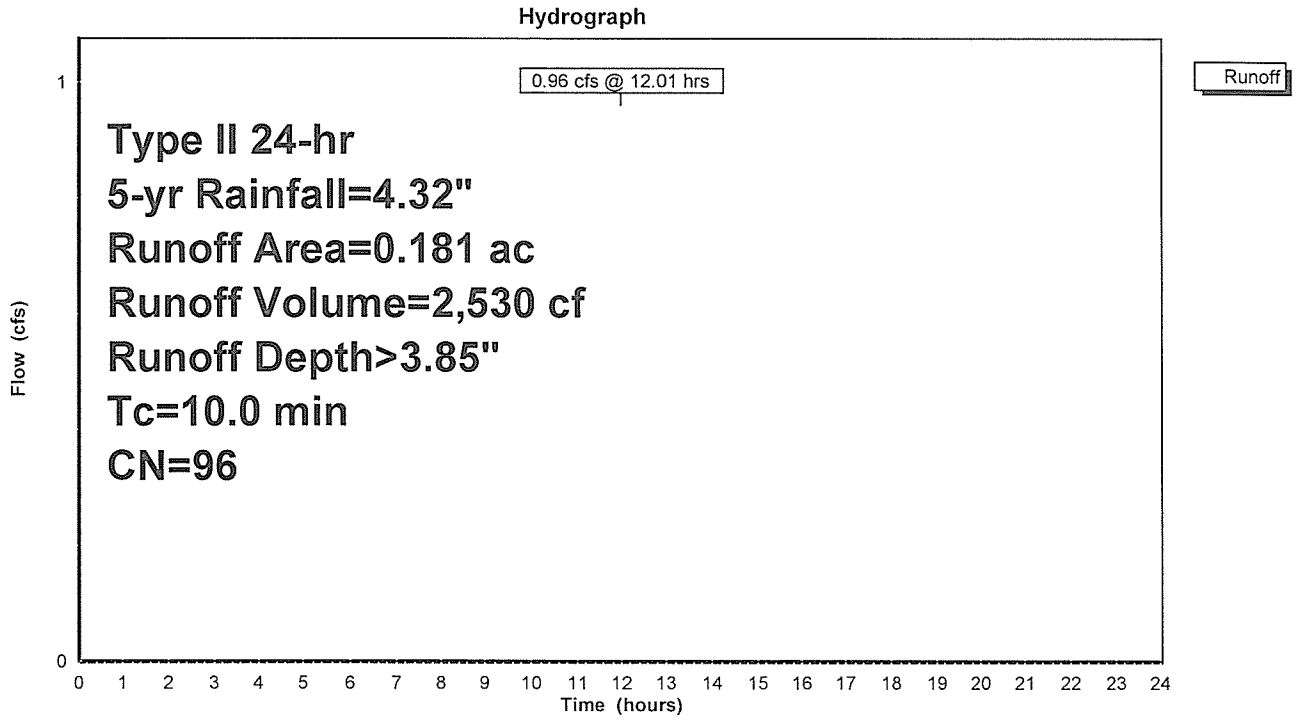
Runoff = 0.96 cfs @ 12.01 hrs, Volume= 2,530 cf, Depth> 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

	Area (ac)	CN	Description
*	0.032	98	Portion of sidewalk
*	0.140	98	Plaza
	0.009	61	>75% Grass cover, Good, HSG B
	0.181	96	Weighted Average
	0.009		4.97% Pervious Area
	0.172		95.03% Impervious Area

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

Subcatchment 31S: FROM RG-11



Summary for Subcatchment 31S: FROM RG-11

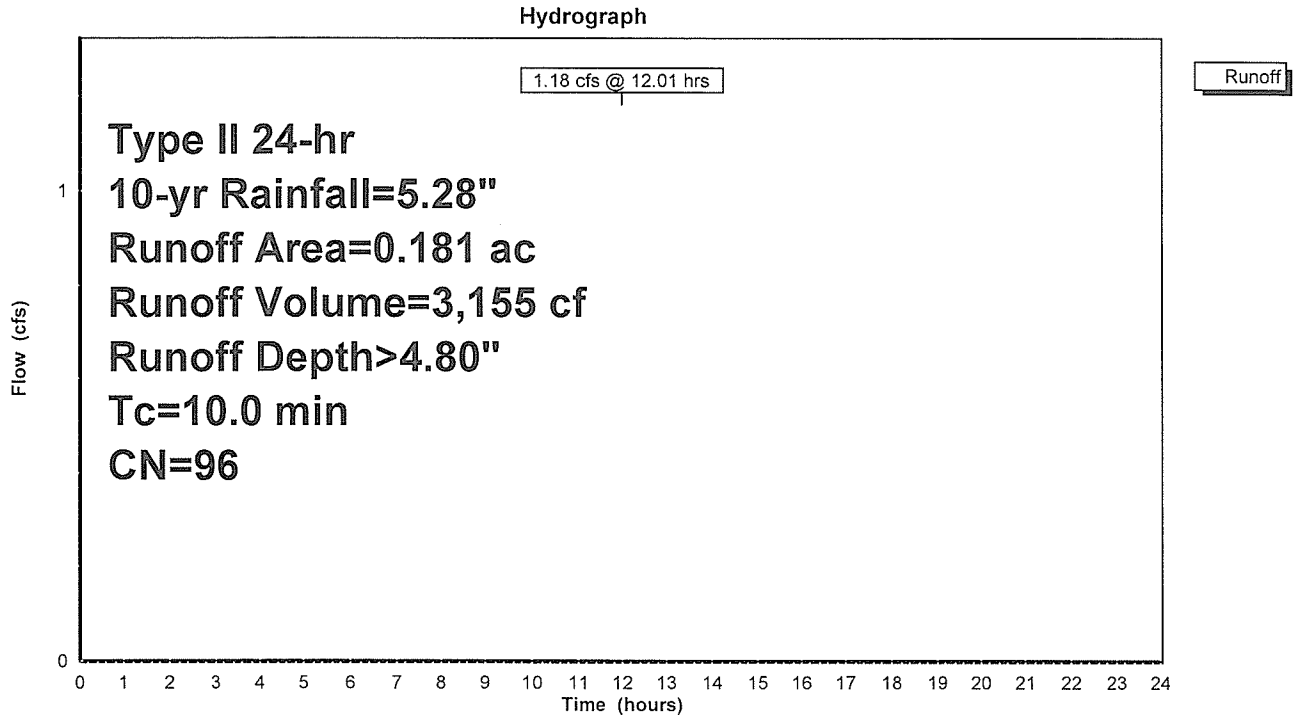
Runoff = 1.18 cfs @ 12.01 hrs, Volume= 3,155 cf, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

	Area (ac)	CN	Description
*	0.032	98	Portion of sidewalk
*	0.140	98	Plaza
	0.009	61	>75% Grass cover, Good, HSG B
	0.181	96	Weighted Average
	0.009		4.97% Pervious Area
	0.172		95.03% Impervious Area

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

Subcatchment 31S: FROM RG-11



Summary for Subcatchment 31S: FROM RG-11

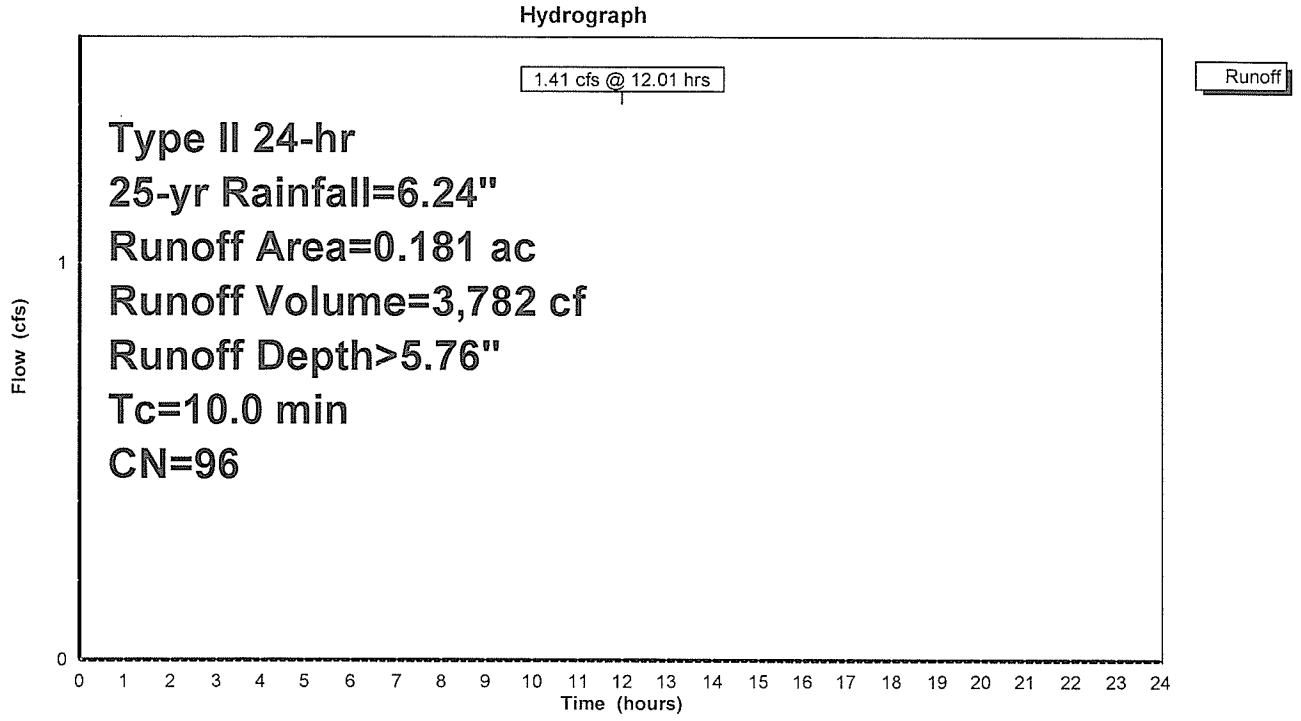
Runoff = 1.41 cfs @ 12.01 hrs, Volume= 3,782 cf, Depth> 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

	Area (ac)	CN	Description
*	0.032	98	Portion of sidewalk
*	0.140	98	Plaza
	0.009	61	>75% Grass cover, Good, HSG B
	0.181	96	Weighted Average
	0.009		4.97% Pervious Area
	0.172		95.03% Impervious Area

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

Subcatchment 31S: FROM RG-11



Summary for Subcatchment 31S: FROM RG-11

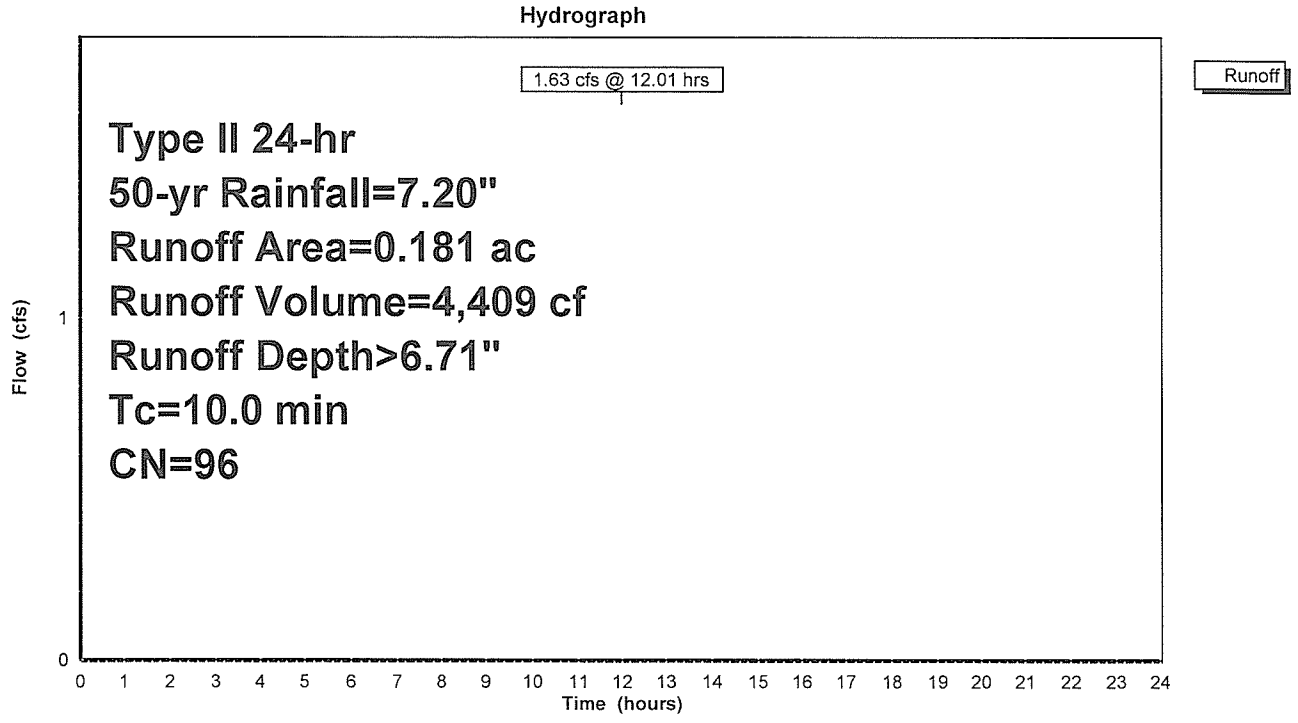
Runoff = 1.63 cfs @ 12.01 hrs, Volume= 4,409 cf, Depth> 6.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

	Area (ac)	CN	Description
*	0.032	98	Portion of sidewalk
*	0.140	98	Plaza
	0.009	61	>75% Grass cover, Good, HSG B
	0.181	96	Weighted Average
	0.009		4.97% Pervious Area
	0.172		95.03% Impervious Area

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

Subcatchment 31S: FROM RG-11



Summary for Subcatchment 31S: FROM RG-11

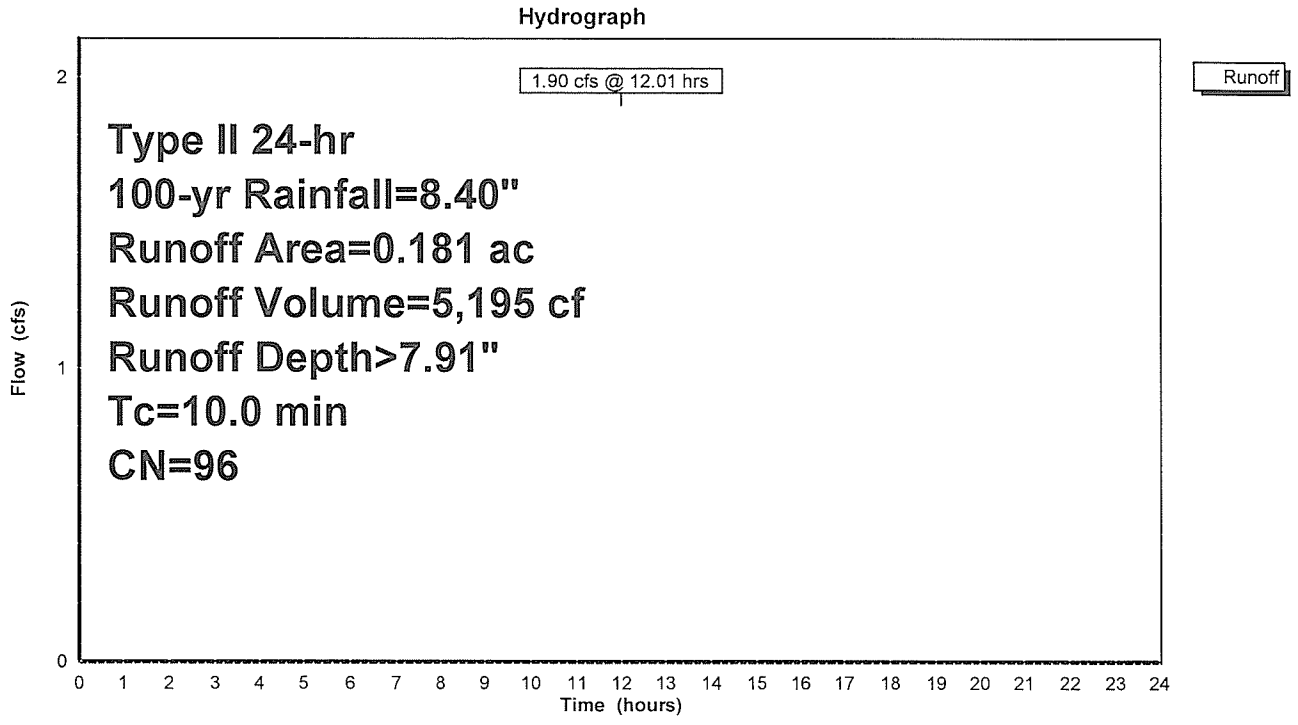
Runoff = 1.90 cfs @ 12.01 hrs, Volume= 5,195 cf, Depth> 7.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

	Area (ac)	CN	Description
*	0.032	98	Portion of sidewalk
*	0.140	98	Plaza
	0.009	61	>75% Grass cover, Good, HSG B
	0.181	96	Weighted Average
	0.009		4.97% Pervious Area
	0.172		95.03% Impervious Area

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

Subcatchment 31S: FROM RG-11



Summary for Subcatchment 12S: Ithan and Uncaptured

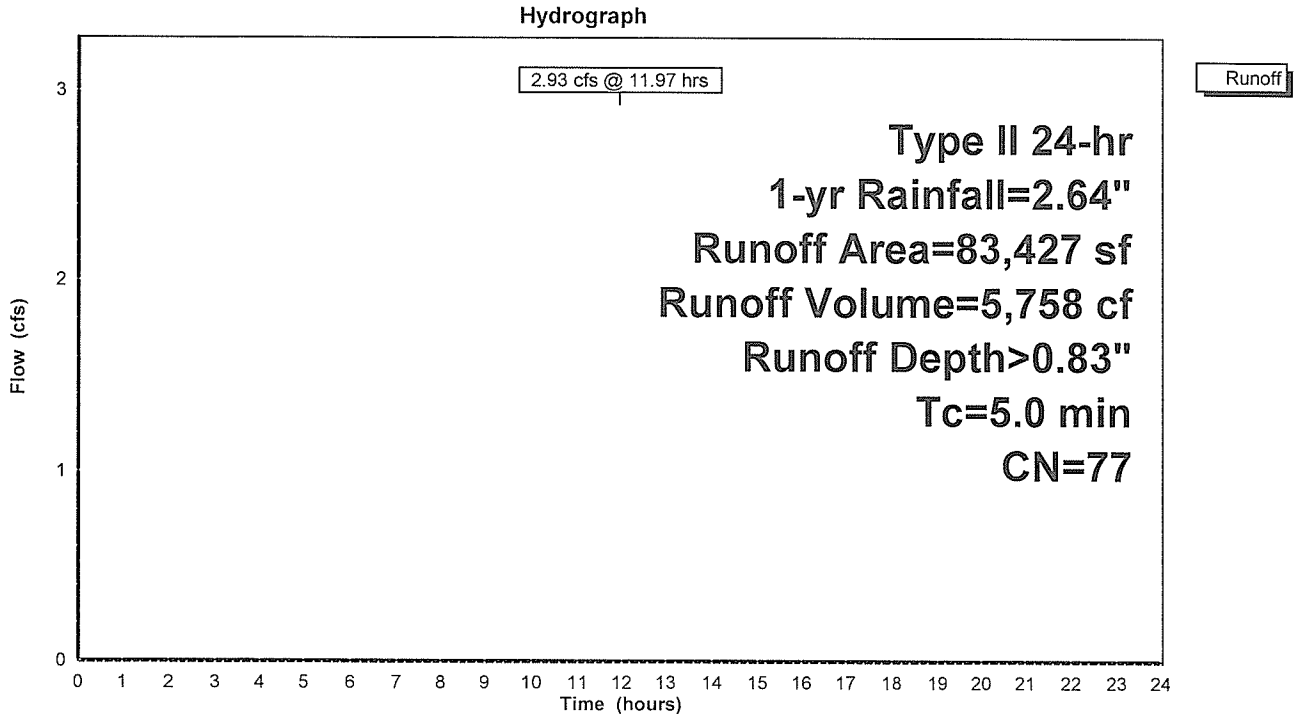
Runoff = 2.93 cfs @ 11.97 hrs, Volume= 5,758 cf, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.64"

	Area (sf)	CN	Description
	14,428	98	Paved parking, HSG B
	566	61	>75% Grass cover, Good, HSG B
*	6,839	98	Lower Level Driveway Pavement
*	4,530	85	offsite contributing
*	57,064	69	uncaptured slope
	83,427	77	Weighted Average
	62,160		74.51% Pervious Area
	21,267		25.49% Impervious Area

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

Subcatchment 12S: Ithan and Uncaptured



Summary for Subcatchment 12S: Ithan and Uncaptured

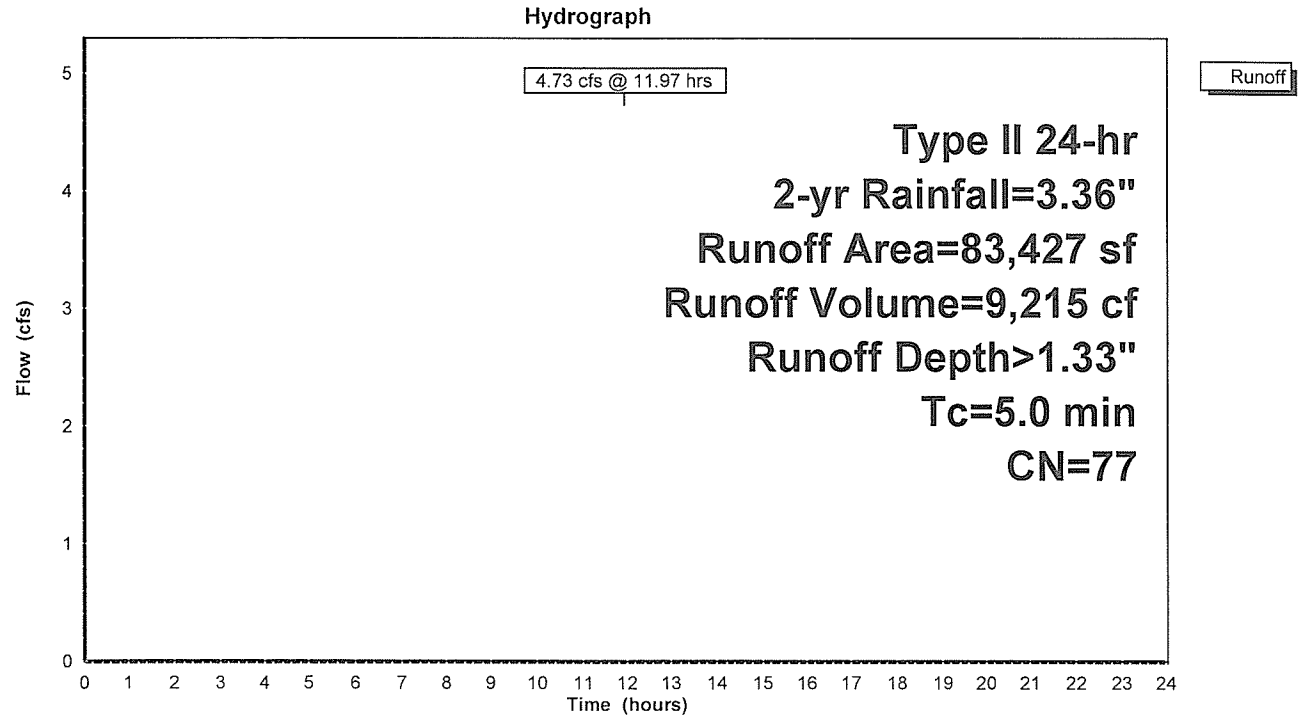
Runoff = 4.73 cfs @ 11.97 hrs, Volume= 9,215 cf, Depth> 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.36"

	Area (sf)	CN	Description
	14,428	98	Paved parking, HSG B
	566	61	>75% Grass cover, Good, HSG B
*	6,839	98	Lower Level Driveway Pavement
*	4,530	85	offsite contributing
*	57,064	69	uncaptured slope
	83,427	77	Weighted Average
	62,160		74.51% Pervious Area
	21,267		25.49% Impervious Area

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

Subcatchment 12S: Ithan and Uncaptured



Summary for Subcatchment 12S: Ithan and Uncaptured

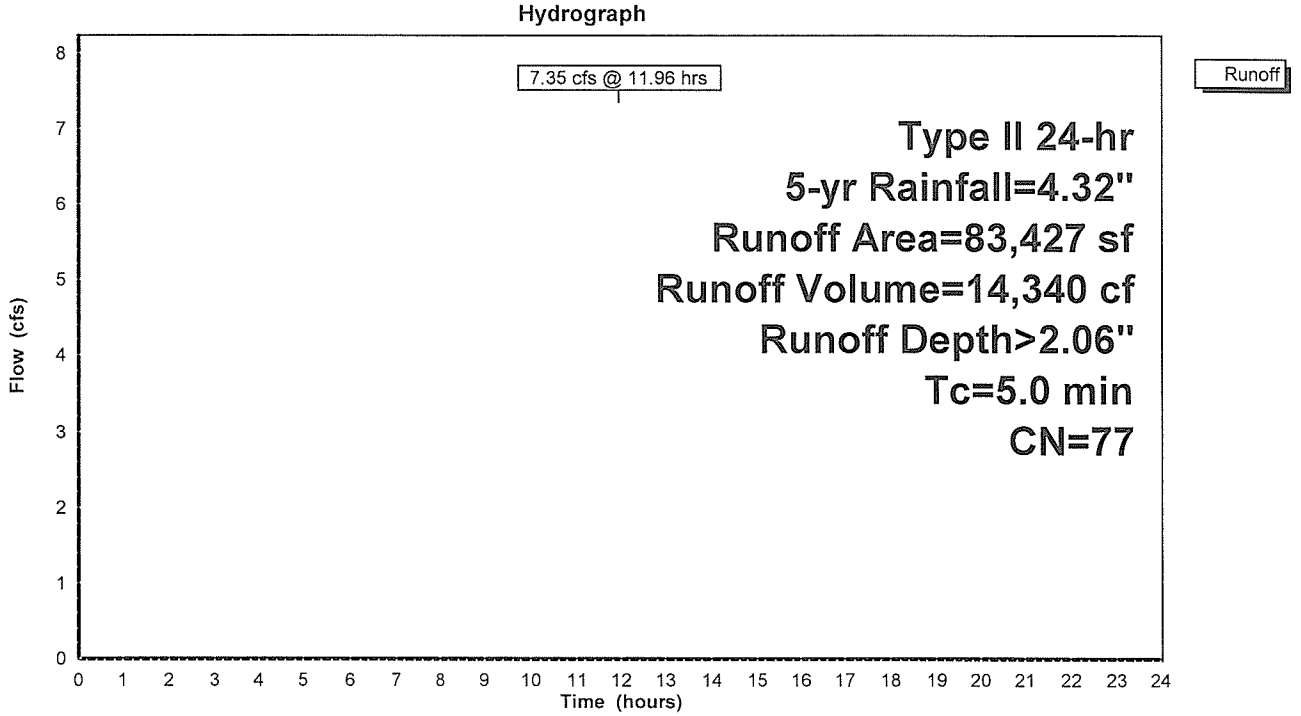
Runoff = 7.35 cfs @ 11.96 hrs, Volume= 14,340 cf, Depth> 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.32"

	Area (sf)	CN	Description
	14,428	98	Paved parking, HSG B
	566	61	>75% Grass cover, Good, HSG B
*	6,839	98	Lower Level Driveway Pavement
*	4,530	85	offsite contributing
*	57,064	69	uncaptured slope
	83,427	77	Weighted Average
	62,160		74.51% Pervious Area
	21,267		25.49% Impervious Area

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

Subcatchment 12S: Ithan and Uncaptured



Summary for Subcatchment 12S: Ithan and Uncaptured

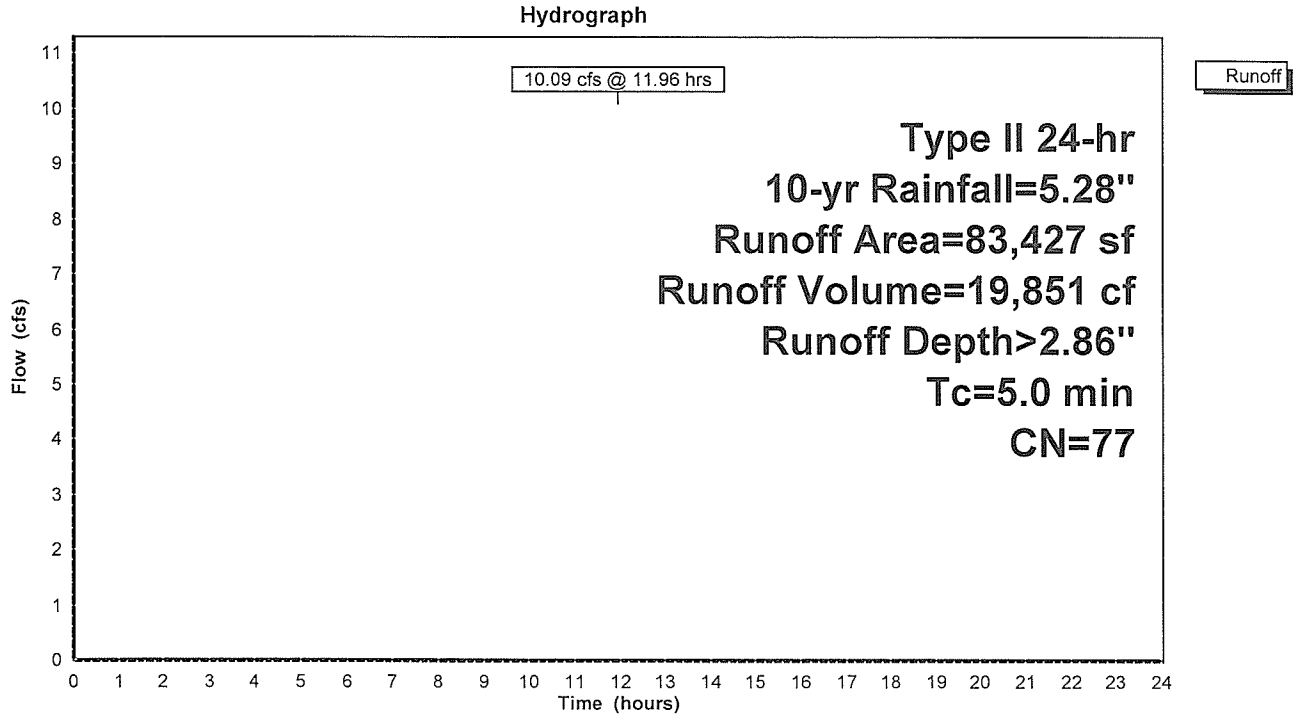
Runoff = 10.09 cfs @ 11.96 hrs, Volume= 19,851 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=5.28"

	Area (sf)	CN	Description
	14,428	98	Paved parking, HSG B
	566	61	>75% Grass cover, Good, HSG B
*	6,839	98	Lower Level Driveway Pavement
*	4,530	85	offsite contributing
*	57,064	69	uncaptured slope
	83,427	77	Weighted Average
	62,160		74.51% Pervious Area
	21,267		25.49% Impervious Area

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

Subcatchment 12S: Ithan and Uncaptured



Summary for Subcatchment 12S: Ithan and Uncaptured

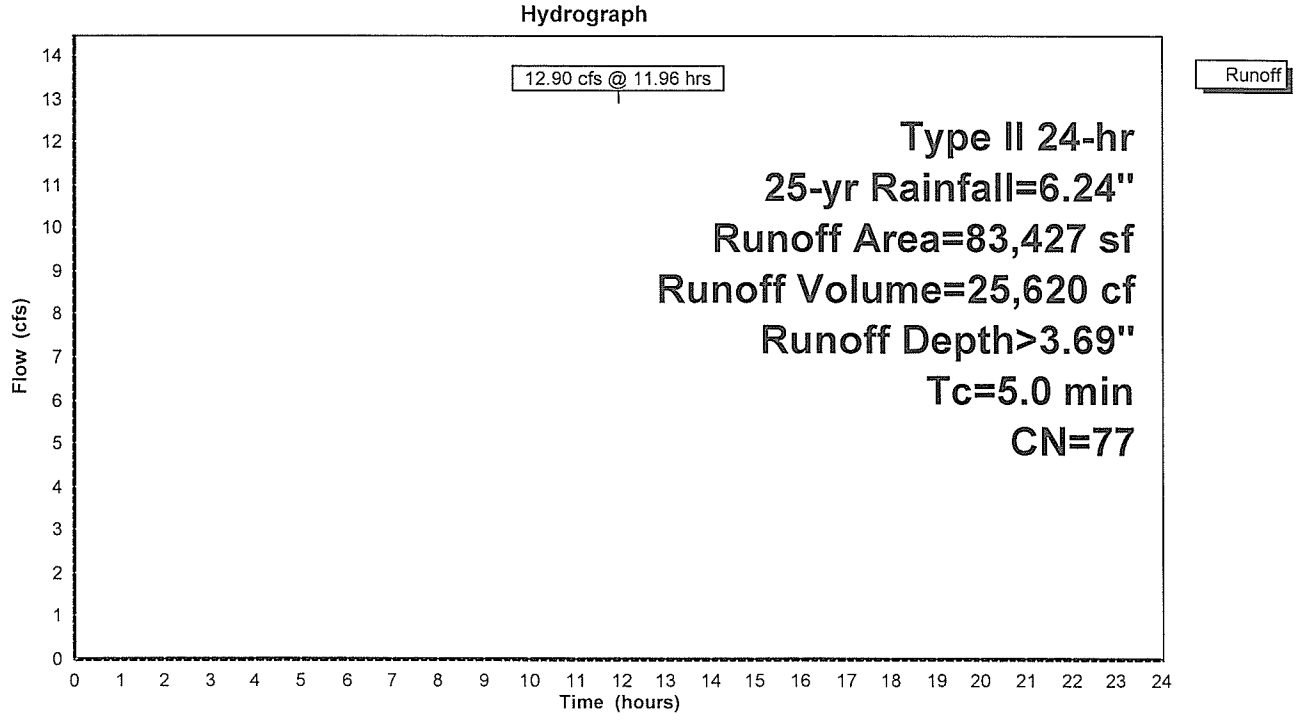
Runoff = 12.90 cfs @ 11.96 hrs, Volume= 25,620 cf, Depth> 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=6.24"

	Area (sf)	CN	Description
	14,428	98	Paved parking, HSG B
	566	61	>75% Grass cover, Good, HSG B
*	6,839	98	Lower Level Driveway Pavement
*	4,530	85	offsite contributing
*	57,064	69	uncaptured slope
	83,427	77	Weighted Average
	62,160		74.51% Pervious Area
	21,267		25.49% Impervious Area

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

Subcatchment 12S: Ithan and Uncaptured



Summary for Subcatchment 12S: Ithan and Uncaptured

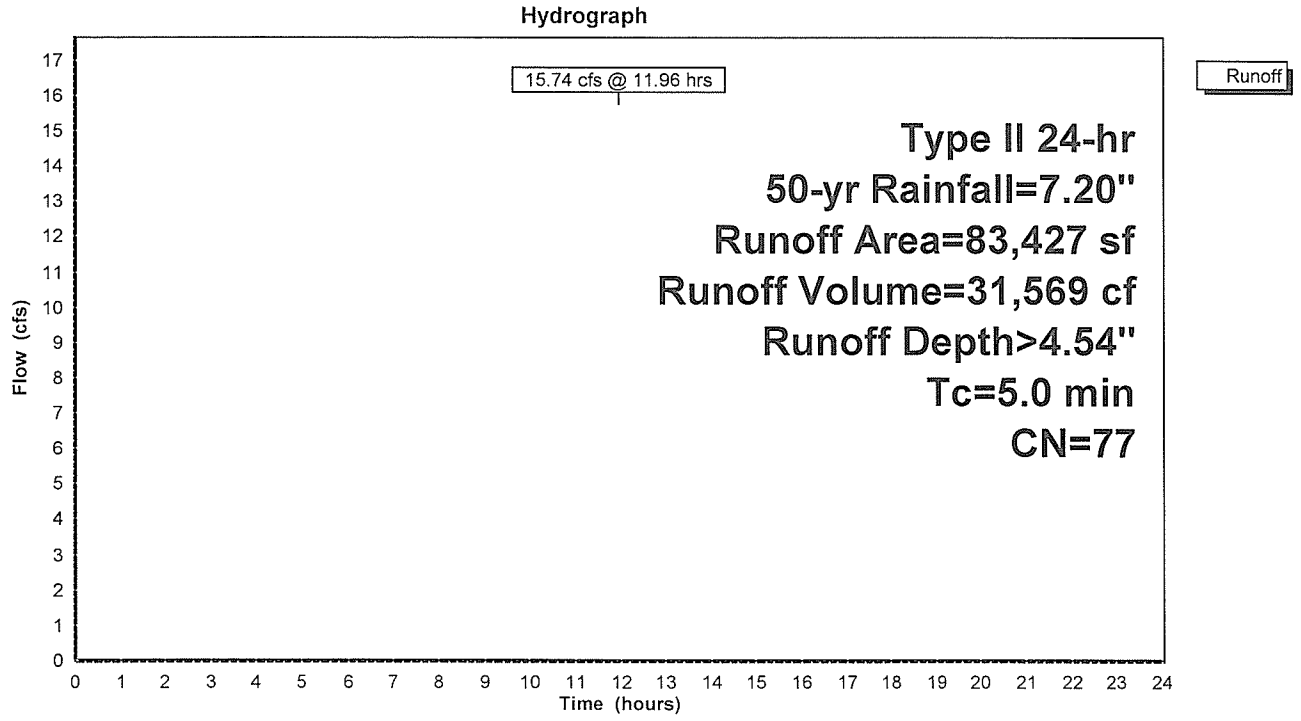
Runoff = 15.74 cfs @ 11.96 hrs, Volume= 31,569 cf, Depth> 4.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=7.20"

	Area (sf)	CN	Description
	14,428	98	Paved parking, HSG B
	566	61	>75% Grass cover, Good, HSG B
*	6,839	98	Lower Level Driveway Pavement
*	4,530	85	offsite contributing
*	57,064	69	uncaptured slope
	83,427	77	Weighted Average
	62,160		74.51% Pervious Area
	21,267		25.49% Impervious Area

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

Subcatchment 12S: Ithan and Uncaptured



Summary for Subcatchment 12S: Ithan and Uncaptured

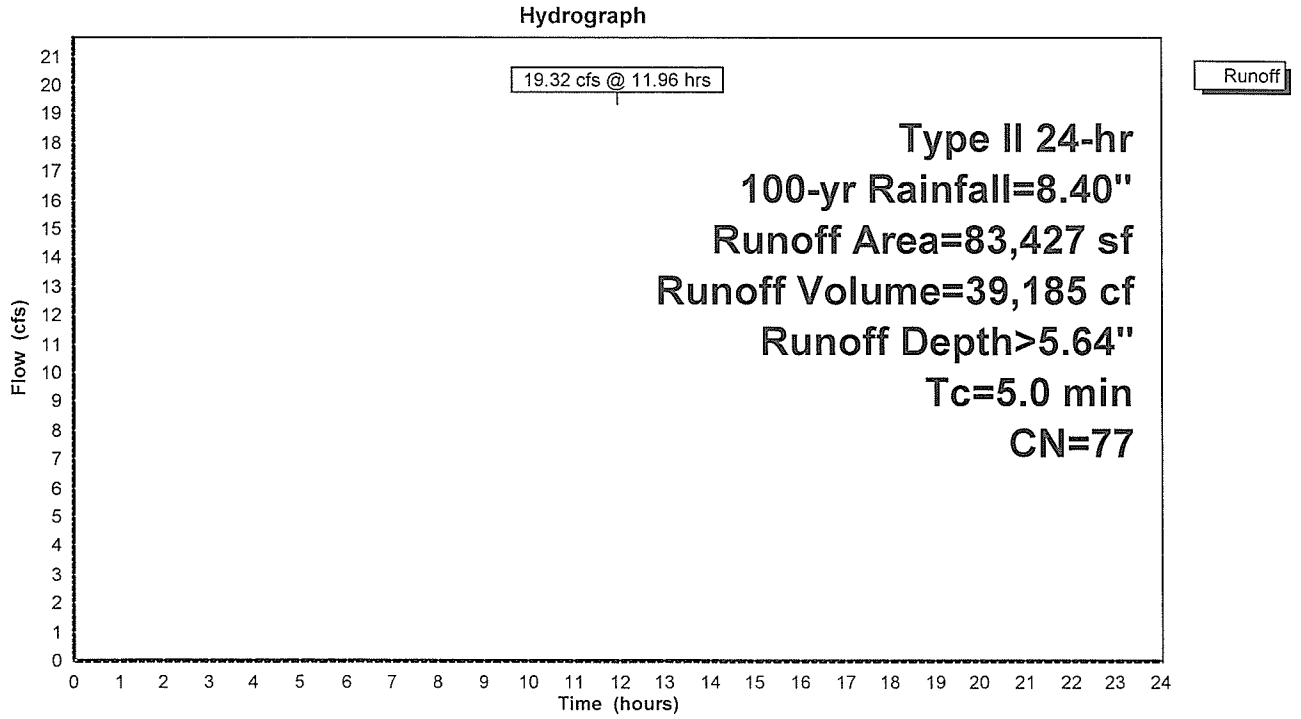
Runoff = 19.32 cfs @ 11.96 hrs, Volume= 39,185 cf, Depth> 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=8.40"

	Area (sf)	CN	Description
	14,428	98	Paved parking, HSG B
	566	61	>75% Grass cover, Good, HSG B
*	6,839	98	Lower Level Driveway Pavement
*	4,530	85	offsite contributing
*	57,064	69	uncaptured slope
	83,427	77	Weighted Average
	62,160		74.51% Pervious Area
	21,267		25.49% Impervious Area

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

Subcatchment 12S: Ithan and Uncaptured



Summary for Link 15L: POI 2A - POST

Inflow Area = 412,829 sf, 54.88% Impervious, Inflow Depth > 1.12" for 1-yr event
Inflow = 8.29 cfs @ 11.99 hrs, Volume= 38,365 cf
Primary = 8.29 cfs @ 11.99 hrs, Volume= 38,365 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 15L: POI 2A - POST

Inflow Area = 412,829 sf, 54.88% Impervious, Inflow Depth > 1.65" for 2-yr event
Inflow = 11.68 cfs @ 11.99 hrs, Volume= 56,769 cf
Primary = 11.68 cfs @ 11.99 hrs, Volume= 56,769 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 15L: POI 2A - POST

Inflow Area = 412,829 sf, 54.88% Impervious, Inflow Depth > 2.41" for 5-yr event
Inflow = 16.44 cfs @ 11.98 hrs, Volume= 83,057 cf
Primary = 16.44 cfs @ 11.98 hrs, Volume= 83,057 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 15L: POI 2A - POST

Inflow Area = 412,829 sf, 54.88% Impervious, Inflow Depth > 3.22" for 10-yr event
Inflow = 21.99 cfs @ 11.99 hrs, Volume= 110,678 cf
Primary = 21.99 cfs @ 11.99 hrs, Volume= 110,678 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 15L: POI 2A - POST

Inflow Area = 412,829 sf, 54.88% Impervious, Inflow Depth > 4.05" for 25-yr event
Inflow = 30.23 cfs @ 12.01 hrs, Volume= 139,288 cf
Primary = 30.23 cfs @ 12.01 hrs, Volume= 139,288 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 15L: POI 2A - POST

Inflow Area = 412,829 sf, 54.88% Impervious, Inflow Depth > 4.90" for 50-yr event
Inflow = 39.99 cfs @ 12.00 hrs, Volume= 168,664 cf
Primary = 39.99 cfs @ 12.00 hrs, Volume= 168,664 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 15L: POI 2A - POST

Inflow Area = 412,829 sf, 54.88% Impervious, Inflow Depth > 5.99" for 100-yr event
Inflow = 51.21 cfs @ 12.00 hrs, Volume= 206,219 cf
Primary = 51.21 cfs @ 12.00 hrs, Volume= 206,219 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

VIII.

Drainage Areas

Inlet	A total	Lawn - B	Impervious	C wt	25 yr Q	100 yr Q
	SF	SF	SF		cfs	cfs
I-1	8096	1731	6365	0.83	***1.04***	**1.27**
I-2	3597	404	3193	0.91	***0.50***	**0.61**
I-3	980	0	980	0.99	***0.15***	**0.18**
I-4	8646	1349	7297	0.87	***1.16***	**1.42**
I-5	2972	203	2769	0.94	***0.43***	**0.52**
I-6	2556	200	2356	0.93	***0.37***	**0.45**
I-7	1521	0	1521	0.99	***0.23***	**0.28**
I-8	19603	5848	13755	0.77	***2.32***	**2.84**
I-9	15282	2923	12359	0.85	***1.99***	**2.44**
I-10	7784	729	7055	0.92	***1.10***	**1.35**
I-11	1700	674	1026	0.70	***0.18***	**0.22**
I-12	221	0	221	0.99	***0.03***	**0.04**
I-13	3851	196	3655	0.95	***0.56***	**0.69**
I-14	3200	200	3000	0.94	***0.46***	**0.57**
I-15	4918	0	4918	0.99	***0.75***	**0.92**
I-16	2600	0	2600	0.99	***0.40***	**0.48**
I-17	1036	0	1036	0.99	***0.16***	**0.19**
I-18	5040	0	5040	0.99	***0.77***	**0.94**
I-20	2266	0	2266	0.99	***0.35***	**0.42**
RD-1	4117	0	4117	0.99	***0.63***	**0.77**
RD-2	7288	0	7288	0.99	***1.11***	**1.36**
RD-3A	5809	0	5809	0.99	***0.88***	**1.08**
RD-3B	9368	0	9368	0.99	***1.43***	**1.74**
RD-4	5925	0	5925	0.99	***0.90***	**1.10**
RD-5	7177	0	7177	0.99	***1.09***	**1.34**
RD-6	4275	0	4275	0.99	***0.65***	**0.80**
RD-7	4115	0	4115	0.99	***0.63***	**0.77**
RD-8	5765	0	5765	0.99	***0.88***	**1.07**
RD-9	2044	0	2044	0.99	***0.31***	**0.38**
RD-10	2044	0	2044	0.99	***0.31***	**0.38**
RD-11	4269	0	4269	0.99	***0.65***	**0.79**
RD-12	5028	0	5028	0.99	***0.77***	**0.94**
YD-1	3422	2393	1029	0.47	***0.25***	**0.30**
YD-2	769	769	0	0.25	***0.03***	**0.04**
RG-1	14913	5667	9246	0.71	***1.63***	**1.99**
RG-2	15554	12247	3307	0.41	***0.97***	**1.19**
RG-3	15197	6330	8867	0.68	***1.59***	**1.95**
RG-4	13979	8915	5064	0.52	***1.11***	**1.36**
RG-5	24212	16893	7319	0.47	***1.76***	**2.16**
RG-6	12712	6085	6627	0.64	***1.24***	**1.52**
RG-7	11945	9326	2619	0.41	***0.76***	**0.93**
RG-8	18063	10879	7184	0.54	***1.51***	**1.85**
RG-9	9942	5557	4385	0.58	***0.88***	**1.08**
RG-10	19789	13573	6216	0.48	***1.47***	**1.80**
TD-1	10840	2921	7919	0.79	***1.32***	**1.61**

Q= (C wt) x I x (A total acres)

$$C\ wt = \frac{[0.99 \times (Impervious)] + [0.25 \times (Lawn - B)]}{A\ total}$$

I 25 =	6.70	in/hr; per PennDOT Road Design Manual, Vol
I 100 =	8.19	Fig. 2.10.4.2(E), Region 5 I.D.F., 5 min. durati
C =	0.25	Lawn - B
C =	0.99	Impervious

25-year

Conduit FlexTable: Villanova LAH Pipe / Node Report for Report (StormCAD - LAH.stc)

Upstream Node	Downstream Node	Length (ft)	Conduit Description	Slope (ft/ft)	Mannin g's n	Flow (Link) (ft³/s)	Full Capacity (ft³/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Average Velocity (ft/s)
I-15	MH-8	47.0	Circular Pipe - 18.0 in	0.038	0.012	5.48	22.14	414.90	413.12	418.80	416.00	415.80	415.00	10.39
I-16	I-15	112.0	Circular Pipe - 18.0 in	0.057	0.012	4.72	27.20	421.50	415.10	425.40	418.80	422.34	415.99	11.55
I-18	I-17	38.0	Circular Pipe - 18.0 in	0.007	0.012	2.03	9.59	427.17	426.90	432.00	430.60	427.71	427.66	4.30
INF-3 Outlet	MH-10	23.0	Circular Pipe - 24.0 in	0.017	0.012	22.58	32.32	414.90	414.50	423.75	424.00	420.02	419.82	7.19
INF-2 Outlet	INF-3 Outlet	81.0	Circular Pipe - 24.0 in	0.041	0.012	21.04	49.46	419.50	416.20	426.60	423.75	421.14	420.42	15.11
Cistern 1 Outlet	MH-2	94.0	Circular Pipe - 24.0 in	0.005	0.012	13.94	17.33	424.00	423.53	430.00	430.10	426.49	426.19	4.44
I-10	INF-3A	5.0	Circular Pipe - 12.0 in	0.020	0.012	1.33	5.46	416.10	416.00	421.30	422.50	417.97	417.96	1.69
I-11	I-10	47.0	Circular Pipe - 12.0 in	0.005	0.012	0.22	2.76	416.85	416.61	422.30	421.30	417.99	417.99	0.28
I-12	I-11	30.0	Circular Pipe - 12.0 in	0.005	0.012	0.03	2.73	417.20	417.05	420.90	422.30	417.99	417.99	1.19
I-13	INF-2C	9.0	Circular Pipe - 12.0 in	0.006	0.012	0.57	2.88	420.95	420.90	425.90	426.80	422.16	422.16	0.72
I-9	INF-2A	12.0	Circular Pipe - 12.0 in	0.192	0.012	2.01	16.90	421.80	419.50	428.17	428.35	422.40	422.16	14.48
MH-19	MH-23	28.0	Circular Pipe - 24.0 in	0.009	0.012	20.64	23.61	421.51	421.25	429.00	428.46	423.14	422.74	8.47
MH-18	MH-19	76.0	Circular Pipe - 24.0 in	0.005	0.012	20.64	17.33	422.09	421.71	429.95	429.00	424.11	423.58	6.57
MH-1	MH-18	67.0	Circular Pipe - 24.0 in	0.005	0.012	20.64	17.46	422.63	422.29	430.00	429.95	424.92	424.44	6.57
INF-1 Outlet	INF-1 Outfall	14.0	Circular Pipe - 30.0 in	0.093	0.012	12.24	135.40	423.30	422.00	428.40	423.00	424.47	422.68	17.12
I-8	INF-1B	6.0	Circular Pipe - 12.0 in	0.005	0.012	2.34	2.73	424.73	424.70	428.88	429.30	426.72	426.70	2.98
I-4	I-3	91.0	Circular Pipe - 18.0 in	0.005	0.012	4.61	8.09	430.08	429.62	435.53	435.00	430.90	430.43	4.73
I-7	I-6	64.0	Circular Pipe - 18.0 in	0.005	0.012	1.00	8.05	433.50	433.18	438.50	437.37	433.87	433.54	3.10
DET-1 Outlet	MH-2	47.0	Circular Pipe - 18.0 in	0.005	0.012	5.58	8.13	425.00	424.76	430.90	430.10	426.25	426.19	4.96
RG-8	DB-7	100.0	Circular Pipe - 12.0 in	0.005	0.012	1.52	2.73	428.58	428.08	435.00	435.34	429.77	429.62	1.94
RG-4	MH-1	36.0	Circular Pipe - 12.0 in	0.005	0.012	1.12	2.73	425.30	425.12	428.75	430.00	425.75	425.57	3.30
RG-10	MH-21	13.0	Circular Pipe - 12.0 in	0.005	0.012	1.48	2.83	431.00	430.93	433.50	434.00	431.52	431.44	3.65
RG-3	DB-5	38.0	Circular Pipe - 12.0 in	0.005	0.012	1.61	2.73	426.80	426.61	431.25	434.25	428.80	428.74	2.05
RG-2	DB-7	17.0	Circular Pipe - 12.0 in	0.005	0.012	0.98	2.81	430.80	430.71	435.00	435.34	431.22	431.12	3.26
RG-7	I-7	67.0	Circular Pipe - 12.0 in	0.005	0.012	0.76	2.71	434.00	433.67	437.75	438.50	434.36	434.03	2.96
MH-15	MH-20 Outfall to Exist Pipe	76.0	Circular Pipe - 24.0 in	0.005	0.012	15.00	17.33	424.90	424.52	431.50	431.50	426.34	425.92	6.21
MH-2	MH-1	100.0	Circular Pipe - 24.0 in	0.005	0.012	19.52	17.33	423.33	422.83	430.10	430.00	425.89	425.25	6.21
RD-8		13.0	Circular Pipe - 8.0 in	0.005	0.012	0.89	0.96	430.86	430.79	435.00	435.00	433.21	433.15	2.54
		24.0	Circular Pipe - 8.0 in	0.005	0.012	0.89	0.93	430.79	430.67	435.00	435.00	433.15	433.04	2.54
		156.0	Circular Pipe - 12.0 in	0.005	0.012	0.89	2.73	430.67	429.89	435.00	435.00	433.04	432.95	1.13
	RD-5	133.0	Circular Pipe - 12.0 in	0.005	0.012	1.52	2.74	429.89	429.22	435.00	435.00	432.95	432.75	1.93
		58.0	Circular Pipe - 15.0 in	0.005	0.012	4.49	4.95	427.42	427.13	435.00	435.00	429.41	429.17	3.66
	MH-3	45.0	Circular Pipe - 15.0 in	0.005	0.012	4.49	5.00	427.13	426.90	435.00	430.50	429.17	428.99	3.66
RD-1		176.0	Circular Pipe - 8.0 in	0.009	0.012	0.63	1.21	433.00	431.50	435.00	434.00	433.37	431.84	3.50
	MH-3	64.0	Circular Pipe - 8.0 in	0.063	0.012	0.63	3.27	431.50	427.50	434.00	430.50	431.87	428.99	7.24
RD-7		52.0	Circular Pipe - 12.0 in	0.010	0.012	0.63	3.78	433.00	432.50	435.00	435.00	433.33	432.96	3.57
		113.0	Circular Pipe - 12.0 in	0.009	0.012	0.63	3.63	432.50	431.50	435.00	435.00	432.96	432.95	3.47
RD-6		51.0	Circular Pipe - 12.0 in	0.020	0.012	0.66	5.40	434.00	433.00	436.00	435.00	434.34	433.24	4.67
	RD-5	113.0	Circular Pipe - 12.0 in	0.013	0.012	0.66	4.45	433.00	431.50	435.00	435.00	433.34	432.75	4.06
RD-5		237.0	Circular Pipe - 12.0 in	0.004	0.012	3.28	2.45	429.22	428.26	435.00	435.00	432.61	430.90	4.18
		91.0	Circular Pipe - 12.0 in	0.005	0.012	1.44	2.74	427.96	427.50	430.00	430.00	429.28	429.16	1.83
		24.0	Circular Pipe - 10.0 in	0.005	0.012	1.44	1.68	428.08	427.96	430.00	430.00	429.37	429.28	2.64
		58.0	Circular Pipe - 8.0 in	0.005	0.012	0.89	0.93	427.79	427.50	435.00	435.00	429.75	429.48	2.55
		16.0	Circular Pipe - 15.0 in	0.005	0.012	4.49	4.95	427.50	427.42	435.00	435.00	429.48	429.41	3.66
		24.0	Circular Pipe - 12.0 in	0.005	0.012	1.44	2.73	427.50	427.38	430.00	430.00	429.16	429.12	1.83
		74.0	Circular Pipe - 12.0 in	0.005	0.012	1.44	2.73	427.38	427.01	430.00	430.00	429.12	429.02	1.83

25-year

Conduit FlexTable: Villanova LAH Pipe / Node Report for Report (StormCAD - LAH.stc)

Upstream Node	Downstream Node	Length (ft)	Conduit Description	Slope (ft/ft)	Mannin g's n	Flow (Link) (ft³/s)	Full Capacity (ft³/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Average Velocity (ft/s)
		21.0	Circular Pipe - 12.0 in	0.005	0.012	1.12	2.79	427.49	427.38	430.00	430.00	429.13	429.11	1.42
	MH-3	143.0	Circular Pipe - 12.0 in	0.003	0.012	1.12	2.24	427.38	426.90	430.00	430.50	429.11	428.99	1.42
RG-1	I-5	35.0	Circular Pipe - 12.0 in	0.006	0.012	1.64	2.92	431.10	430.90	436.50	436.64	431.64	431.54	3.82
RD-10		130.0	Circular Pipe - 8.0 in	0.029	0.012	0.31	2.22	432.00	428.26	435.00	435.00	432.26	430.90	4.50
I-6	I-5	43.0	Circular Pipe - 18.0 in	0.005	0.012	1.37	8.14	433.00	432.78	437.37	436.64	433.44	433.20	3.42
I-5	I-4	83.0	Circular Pipe - 18.0 in	0.005	0.012	3.44	8.09	430.70	430.28	436.64	435.53	431.41	431.07	4.39
I-3	I-2	48.0	Circular Pipe - 18.0 in	0.005	0.012	4.76	8.05	429.42	429.18	435.00	433.78	430.26	430.01	4.74
I-2	I-1	77.0	Circular Pipe - 18.0 in	0.005	0.012	9.38	8.10	425.98	425.59	433.78	431.70	427.80	427.27	5.31
I-1	INF-1A	36.0	Circular Pipe - 18.0 in	0.005	0.012	10.42	8.05	425.40	425.22	431.70	430.80	427.00	426.70	5.90
DB-7	DB-6	76.0	Circular Pipe - 12.0 in	0.005	0.012	2.51	2.73	427.88	427.50	435.34	436.00	429.54	429.22	3.19
DB-6	DB-5	95.0	Circular Pipe - 12.0 in	0.005	0.012	2.51	2.74	427.30	426.82	436.00	434.25	429.14	428.74	3.19
DB-5	I-2	45.0	Circular Pipe - 12.0 in	0.005	0.012	4.11	2.76	426.41	426.18	434.25	433.78	428.53	428.01	5.24
RG-5	Cistern 1 Outlet	7.0	Circular Pipe - 12.0 in	0.006	0.012	1.78	2.92	425.30	425.26	428.75	430.00	426.66	426.64	2.26
RG-9	YD-2	16.0	Circular Pipe - 12.0 in	0.005	0.012	0.89	2.73	431.00	430.92	433.50	434.00	431.39	431.31	3.10
YD-1	YD-2	27.0	Circular Pipe - 12.0 in	0.005	0.012	0.25	2.78	430.70	430.56	434.00	434.00	430.91	430.76	2.20
DB-2	MH-22	13.0	Circular Pipe - 12.0 in	0.005	0.012	1.17	2.83	426.97	426.90	434.00	434.00	428.52	428.51	1.49
RG-6	I-18	26.0	Circular Pipe - 12.0 in	0.005	0.012	1.25	2.73	427.80	427.67	432.50	432.00	428.28	428.14	3.40
I-17	I-16	98.0	Circular Pipe - 18.0 in	0.051	0.012	4.33	25.70	426.70	421.70	430.60	425.40	427.50	422.51	10.81
I-19	MH-15	210.0	Circular Pipe - 24.0 in	0.005	0.012	15.00	17.33	426.15	425.10	434.50	431.50	427.59	426.64	6.21
MH-10	MH-8	20.0	Circular Pipe - 18.0 in	0.014	0.012	34.58	13.46	413.40	413.12	424.00	416.00	416.85	415.00	19.57
RD-3A		104.0	Circular Pipe - 8.0 in	0.005	0.012	0.89	0.93	428.31	427.79	435.00	435.00	430.23	429.75	2.55
RD-3B		94.0	Circular Pipe - 10.0 in	0.005	0.012	1.44	1.68	428.55	428.08	430.00	430.00	429.72	429.37	2.64
	Cistern 1B	22.0	Circular Pipe - 12.0 in	0.005	0.012	1.44	2.73	427.01	426.90	430.00	430.50	429.02	428.99	1.83
RD-2		102.0	Circular Pipe - 12.0 in	0.005	0.012	1.12	2.73	428.00	427.49	430.00	430.00	429.21	429.13	1.42
		164.0	Circular Pipe - 12.0 in	0.005	0.012	3.59	2.63	428.26	427.50	435.00	435.00	430.90	429.48	4.58
INF-1 Outfall	MH-10	4.0	Circular Pipe - 18.0 in	0.025	0.012	12.00	17.99	418.00	417.90	422.00	424.00	419.87	419.82	6.79
I-20	INF-3B	5.0	Circular Pipe - 12.0 in	0.020	0.012	0.35	5.46	416.10	416.00	423.75	423.75	417.96	417.96	0.44
RD-11		84.0	Circular Pipe - 8.0 in	0.024	0.012	0.66	2.02	433.00	431.00	435.00	433.25	433.38	431.26	5.17
		50.0	Circular Pipe - 8.0 in	0.020	0.012	0.66	1.85	431.00	430.00	433.25	432.50	431.38	430.27	4.85
		20.0	Circular Pipe - 12.0 in	0.005	0.012	0.66	2.73	416.00	415.90	432.50	418.25	416.50	416.50	2.86
RD-12	MH-20	113.0	Circular Pipe - 8.0 in	0.027	0.012	0.77	2.13	419.00	416.00	421.10	418.10	419.42	416.50	5.62
I-14		6.0	Circular Pipe - 18.0 in	0.005	0.013	0.47	7.43	434.75	434.72	436.50	435.00	435.01	434.97	2.35
YD-2	DB-2	177.0	Circular Pipe - 12.0 in	0.005	0.012	1.17	2.74	428.06	427.17	434.00	434.00	428.67	428.54	3.35

100-yr

Conduit FlexTable: Villanova LAH Pipe / Node Report for Report (StormCAD - LAH.stc)

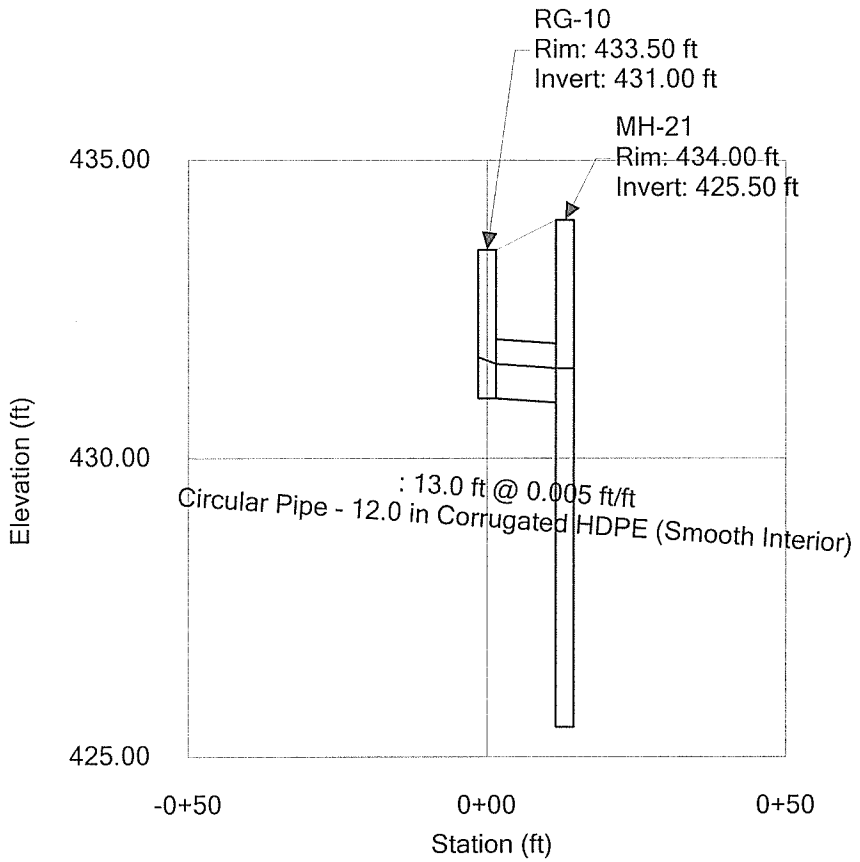
Upstream Node	Downstream Node	Length (ft)	Conduit Description	Slope (ft/ft)	Mannin g's n	Flow (Link) (ft³/s)	Full Capacity (ft³/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Average Velocity (ft/s)
I-15	MH-8	47.0	Circular Pipe - 18.0 in	0.038	0.012	6.22	22.14	414.90	413.12	418.80	416.00	415.86	415.00	10.76
I-16	I-15	112.0	Circular Pipe - 18.0 in	0.057	0.012	5.30	27.20	421.50	415.10	425.40	418.80	422.39	416.07	11.93
I-18	I-17	38.0	Circular Pipe - 18.0 in	0.007	0.012	2.48	9.59	427.17	426.90	432.00	430.60	427.77	427.72	4.55
INF-3 Outlet	MH-10	23.0	Circular Pipe - 24.0 in	0.017	0.012	22.58	32.32	414.90	414.50	423.75	424.00	420.02	419.82	7.19
INF-2 Outlet	INF-3 Outlet	81.0	Circular Pipe - 24.0 in	0.041	0.012	21.04	49.46	419.50	416.20	426.60	423.75	421.14	420.42	15.11
Cistern 1 Outlet	MH-2	94.0	Circular Pipe - 24.0 in	0.005	0.012	14.33	17.33	424.00	423.53	430.00	430.10	426.70	426.38	4.56
I-10	INF-3A	5.0	Circular Pipe - 12.0 in	0.020	0.012	1.62	5.46	416.10	416.00	421.30	422.50	417.97	417.96	2.07
I-11	I-10	47.0	Circular Pipe - 12.0 in	0.005	0.012	0.27	2.76	416.85	416.61	422.30	421.30	418.00	418.00	0.34
I-12	I-11	30.0	Circular Pipe - 12.0 in	0.005	0.012	0.04	2.73	417.20	417.05	420.90	422.30	418.01	418.01	1.27
I-13	INF-2C	9.0	Circular Pipe - 12.0 in	0.006	0.012	0.70	2.88	420.95	420.90	425.90	426.80	422.16	422.16	0.88
I-9	INF-2A	12.0	Circular Pipe - 12.0 in	0.192	0.012	2.46	16.90	421.80	419.50	428.17	428.35	422.47	422.16	15.34
MH-19	MH-23	28.0	Circular Pipe - 24.0 in	0.009	0.012	21.29	23.61	421.51	421.25	429.00	428.46	423.16	422.77	8.51
MH-18	MH-19	76.0	Circular Pipe - 24.0 in	0.005	0.012	21.29	17.33	422.09	421.71	429.95	429.00	424.19	423.62	6.78
MH-1	MH-18	67.0	Circular Pipe - 24.0 in	0.005	0.012	21.29	17.46	422.63	422.29	430.00	429.95	425.05	424.55	6.78
INF-1 Outlet	INF-1 Outfall	14.0	Circular Pipe - 30.0 in	0.093	0.012	12.24	135.40	423.30	422.00	428.40	423.00	424.47	422.68	17.12
I-8	INF-1B	6.0	Circular Pipe - 12.0 in	0.005	0.012	2.86	2.73	424.73	424.70	428.88	429.30	426.73	426.70	3.64
I-4	I-3	91.0	Circular Pipe - 18.0 in	0.005	0.012	5.64	8.09	430.08	429.62	435.53	435.00	431.00	430.56	4.95
I-7	I-6	64.0	Circular Pipe - 18.0 in	0.005	0.012	1.22	8.05	433.50	433.18	438.50	437.37	433.91	433.57	3.28
DET-1 Outlet	MH-2	47.0	Circular Pipe - 18.0 in	0.005	0.012	5.58	8.13	425.00	424.76	430.90	430.10	426.49	426.38	4.96
RG-8	DB-7	100.0	Circular Pipe - 12.0 in	0.005	0.012	1.86	2.73	428.58	428.08	435.00	435.34	431.30	431.06	2.37
RG-4	MH-1	36.0	Circular Pipe - 12.0 in	0.005	0.012	1.37	2.73	425.30	425.12	428.75	430.00	425.80	425.62	3.48
RG-10	MH-21	13.0	Circular Pipe - 12.0 in	0.005	0.012	1.81	2.83	431.00	430.93	433.50	434.00	431.58	431.50	3.82
RG-3	DB-5	38.0	Circular Pipe - 12.0 in	0.005	0.012	1.96	2.73	426.80	426.61	431.25	434.25	429.85	429.75	2.50
RG-2	DB-7	17.0	Circular Pipe - 12.0 in	0.005	0.012	1.20	2.81	430.80	430.71	435.00	435.34	431.26	431.17	3.44
RG-7	I-7	67.0	Circular Pipe - 12.0 in	0.005	0.012	0.93	2.71	434.00	433.67	437.75	438.50	434.41	434.08	3.13
MH-15	MH-20 Outfall to Exist Pipe	76.0	Circular Pipe - 24.0 in	0.005	0.012	15.00	17.33	424.90	424.52	431.50	431.50	426.34	425.92	6.21
MH-2	MH-1	100.0	Circular Pipe - 24.0 in	0.005	0.012	19.91	17.33	423.33	422.83	430.10	430.00	426.07	425.41	6.34
RD-8		13.0	Circular Pipe - 8.0 in	0.005	0.012	1.08	0.96	430.86	430.79	435.00	435.00	435.29	435.20	3.10
		24.0	Circular Pipe - 8.0 in	0.005	0.012	1.08	0.93	430.79	430.67	435.00	435.00	435.20	435.04	3.10
		156.0	Circular Pipe - 12.0 in	0.005	0.012	1.08	2.73	430.67	429.89	435.00	435.00	435.04	434.91	1.38
	RD-5	133.0	Circular Pipe - 12.0 in	0.005	0.012	1.86	2.74	429.89	429.22	435.00	435.00	434.91	434.61	2.36
		58.0	Circular Pipe - 15.0 in	0.005	0.012	5.48	4.95	427.42	427.13	435.00	435.00	429.62	429.27	4.47
	MH-3	45.0	Circular Pipe - 15.0 in	0.005	0.012	5.48	5.00	427.13	426.90	435.00	430.50	429.27	428.99	4.47
RD-1		176.0	Circular Pipe - 8.0 in	0.009	0.012	0.77	1.21	433.00	431.50	435.00	434.00	433.42	431.89	3.67
	MH-3	64.0	Circular Pipe - 8.0 in	0.063	0.012	0.77	3.27	431.50	427.50	434.00	430.50	431.92	428.99	7.67
RD-7		52.0	Circular Pipe - 12.0 in	0.010	0.012	0.77	3.78	433.00	432.50	435.00	435.00	434.98	434.96	0.99
		113.0	Circular Pipe - 12.0 in	0.009	0.012	0.77	3.63	432.50	431.50	435.00	435.00	434.96	434.91	0.99
RD-6		51.0	Circular Pipe - 12.0 in	0.020	0.012	0.81	5.40	434.00	433.00	436.00	435.00	434.66	434.66	4.94
	RD-5	113.0	Circular Pipe - 12.0 in	0.013	0.012	0.81	4.45	433.00	431.50	435.00	435.00	434.66	434.61	1.03
RD-5		237.0	Circular Pipe - 12.0 in	0.004	0.012	4.01	2.45	429.22	428.26	435.00	435.00	434.40	431.85	5.11
		91.0	Circular Pipe - 12.0 in	0.005	0.012	1.76	2.74	427.96	427.50	430.00	430.00	429.43	429.24	2.24
		24.0	Circular Pipe - 10.0 in	0.005	0.012	1.76	1.68	428.08	427.96	430.00	430.00	429.56	429.43	3.22
		58.0	Circular Pipe - 8.0 in	0.005	0.012	1.09	0.93	427.79	427.50	435.00	435.00	430.12	429.72	3.12
		16.0	Circular Pipe - 15.0 in	0.005	0.012	5.48	4.95	427.50	427.42	435.00	435.00	429.72	429.62	4.47
		24.0	Circular Pipe - 12.0 in	0.005	0.012	1.76	2.73	427.50	427.38	430.00	430.00	429.24	429.19	2.24
		74.0	Circular Pipe - 12.0 in	0.005	0.012	1.76	2.73	427.38	427.01	430.00	430.00	429.19	429.04	2.24

100-yr

Conduit FlexTable: Villanova LAH Pipe / Node Report for Report (StormCAD - LAH.stc)

Upstream Node	Downstream Node	Length (ft)	Conduit Description	Slope (ft/ft)	Mannin g's n	Flow (Link) (ft³/s)	Full Capacity (ft³/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Average Velocity (ft/s)
		21.0	Circular Pipe - 12.0 in	0.005	0.012	1.37	2.79	427.49	427.38	430.00	430.00	429.20	429.17	1.74
	MH-3	143.0	Circular Pipe - 12.0 in	0.003	0.012	1.37	2.24	427.38	426.90	430.00	430.50	429.17	428.99	1.74
RG-1	I-5	35.0	Circular Pipe - 12.0 in	0.006	0.012	2.00	2.92	431.10	430.90	436.50	436.64	431.71	431.64	4.00
RD-10		130.0	Circular Pipe - 8.0 in	0.029	0.012	0.38	2.22	432.00	428.26	435.00	435.00	432.29	431.85	4.76
I-6	I-5	43.0	Circular Pipe - 18.0 in	0.005	0.012	1.67	8.14	433.00	432.78	437.37	436.64	433.49	433.24	3.62
I-5	I-4	83.0	Circular Pipe - 18.0 in	0.005	0.012	4.20	8.09	430.70	430.28	436.64	435.53	431.49	431.19	4.62
I-3	I-2	48.0	Circular Pipe - 18.0 in	0.005	0.012	5.82	8.05	429.42	429.18	435.00	433.78	430.37	430.11	4.96
I-2	I-1	77.0	Circular Pipe - 18.0 in	0.005	0.012	11.47	8.10	425.98	425.59	433.78	431.70	428.34	427.56	6.49
I-1	INF-1A	36.0	Circular Pipe - 18.0 in	0.005	0.012	12.74	8.05	425.40	425.22	431.70	430.80	427.15	426.70	7.21
DB-7	DB-6	76.0	Circular Pipe - 12.0 in	0.005	0.012	3.06	2.73	427.88	427.50	435.34	436.00	430.94	430.47	3.90
DB-6	DB-5	95.0	Circular Pipe - 12.0 in	0.005	0.012	3.06	2.74	427.30	426.82	436.00	434.25	430.35	429.75	3.90
DB-5	I-2	45.0	Circular Pipe - 12.0 in	0.005	0.012	5.03	2.76	426.41	426.18	434.25	433.78	429.43	428.67	6.40
RG-5	Cistern 1 Outlet	7.0	Circular Pipe - 12.0 in	0.006	0.012	2.17	2.92	425.30	425.26	428.75	430.00	426.89	426.86	2.77
RG-9	YD-2	16.0	Circular Pipe - 12.0 in	0.005	0.012	1.09	2.73	431.00	430.92	433.50	434.00	431.44	431.36	3.27
YD-1	YD-2	27.0	Circular Pipe - 12.0 in	0.005	0.012	0.31	2.78	430.70	430.56	434.00	434.00	430.93	430.78	2.33
DB-2	MH-22	13.0	Circular Pipe - 12.0 in	0.005	0.012	1.43	2.83	426.97	426.90	434.00	434.00	428.53	428.51	1.82
RG-6	I-18	26.0	Circular Pipe - 12.0 in	0.005	0.012	1.53	2.73	427.80	427.67	432.50	432.00	428.34	428.20	3.58
I-17	I-16	98.0	Circular Pipe - 18.0 in	0.051	0.012	4.81	25.70	426.70	421.70	430.60	425.40	427.54	422.57	11.15
I-19	MH-15	210.0	Circular Pipe - 24.0 in	0.005	0.012	15.00	17.33	426.15	425.10	434.50	431.50	427.59	426.64	6.21
MH-10	MH-8	20.0	Circular Pipe - 18.0 in	0.014	0.012	34.58	13.46	413.40	413.12	424.00	416.00	416.85	415.00	19.57
RD-3A		104.0	Circular Pipe - 8.0 in	0.005	0.012	1.09	0.93	428.31	427.79	435.00	435.00	430.84	430.12	3.12
RD-3B		94.0	Circular Pipe - 10.0 in	0.005	0.012	1.76	1.68	428.55	428.08	430.00	430.00	430.07	429.56	3.22
	Cistern 1B	22.0	Circular Pipe - 12.0 in	0.005	0.012	1.76	2.73	427.01	426.90	430.00	430.50	429.04	428.99	2.24
RD-2		102.0	Circular Pipe - 12.0 in	0.005	0.012	1.37	2.73	428.00	427.49	430.00	430.00	429.32	429.20	1.74
		164.0	Circular Pipe - 12.0 in	0.005	0.012	4.39	2.63	428.26	427.50	435.00	435.00	431.85	429.72	5.59
INF-1 Outfall	MH-10	4.0	Circular Pipe - 18.0 in	0.025	0.012	12.00	17.99	418.00	417.90	422.00	424.00	419.87	419.82	6.79
I-20	INF-3B	5.0	Circular Pipe - 12.0 in	0.020	0.012	0.43	5.46	416.10	416.00	423.75	423.75	417.96	417.96	0.54
RD-11		84.0	Circular Pipe - 8.0 in	0.024	0.012	0.80	2.02	433.00	431.00	435.00	433.25	433.42	431.29	5.46
		50.0	Circular Pipe - 8.0 in	0.020	0.012	0.80	1.85	431.00	430.00	433.25	432.50	431.42	430.31	5.11
		20.0	Circular Pipe - 12.0 in	0.005	0.012	0.80	2.73	416.00	415.90	432.50	418.25	416.50	416.50	3.02
RD-12	MH-20	113.0	Circular Pipe - 8.0 in	0.027	0.012	0.94	2.13	419.00	416.00	421.10	418.10	419.46	416.50	5.92
I-14		6.0	Circular Pipe - 18.0 in	0.005	0.013	0.58	7.43	434.75	434.72	436.50	435.00	435.03	435.00	2.50
YD-2	DB-2	177.0	Circular Pipe - 12.0 in	0.005	0.012	1.43	2.74	428.06	427.17	434.00	434.00	428.76	428.55	3.52

Profile Report
Engineering Profile - RG-10 to MH-21 (StormCAD - LAH.stc)



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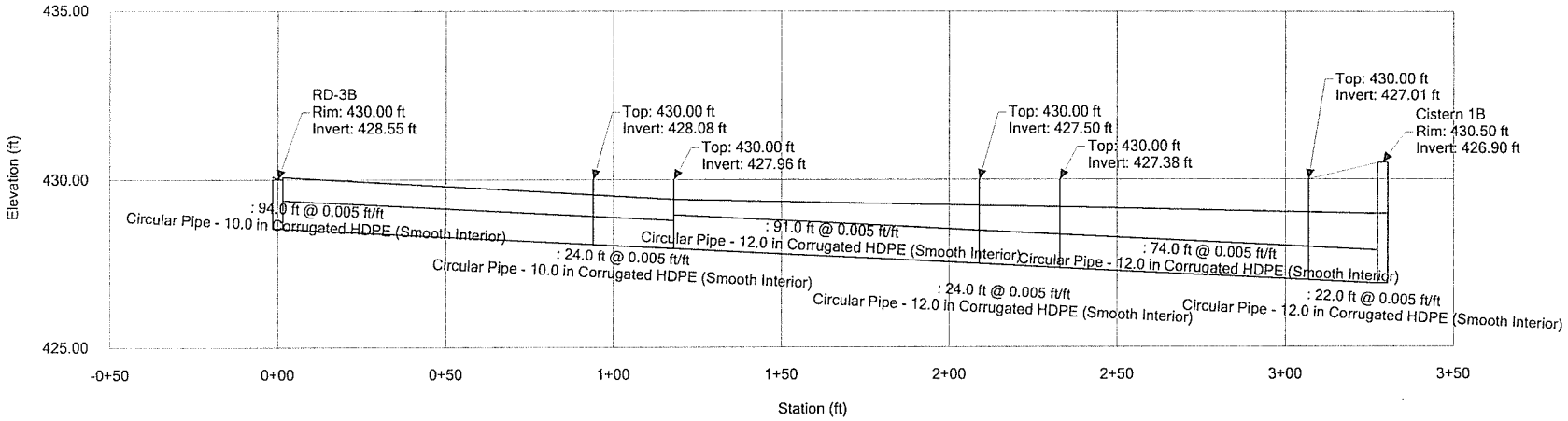
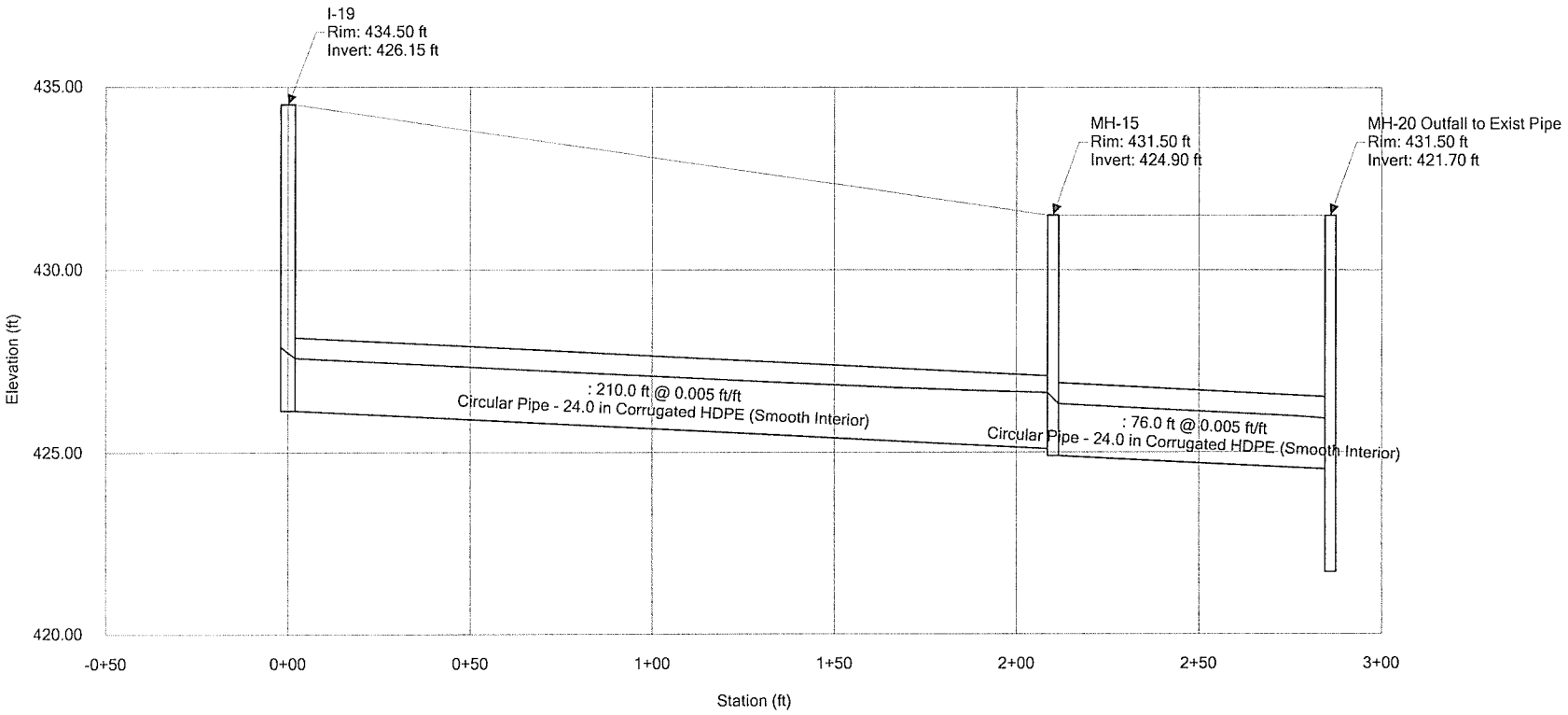
Profile Report
Engineering Profile - RD-3B to Cistern 1 (StormCAD - LAH.stc)



Profile Report
Engineering Profile - I-19 to MH-20 (StormCAD - LAH.stc)



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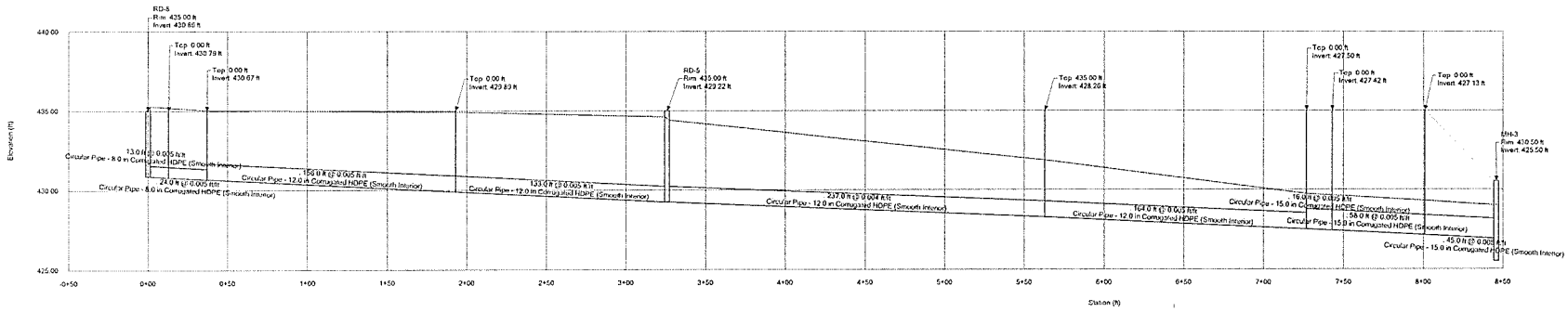
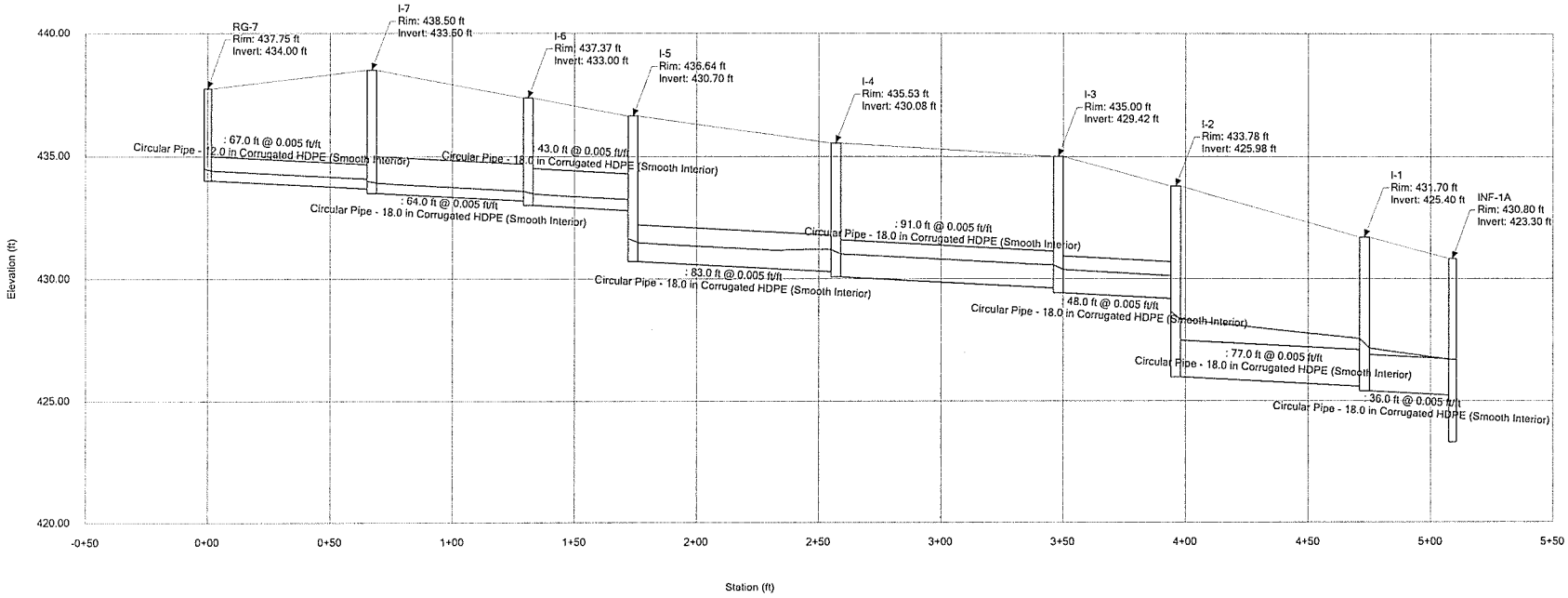
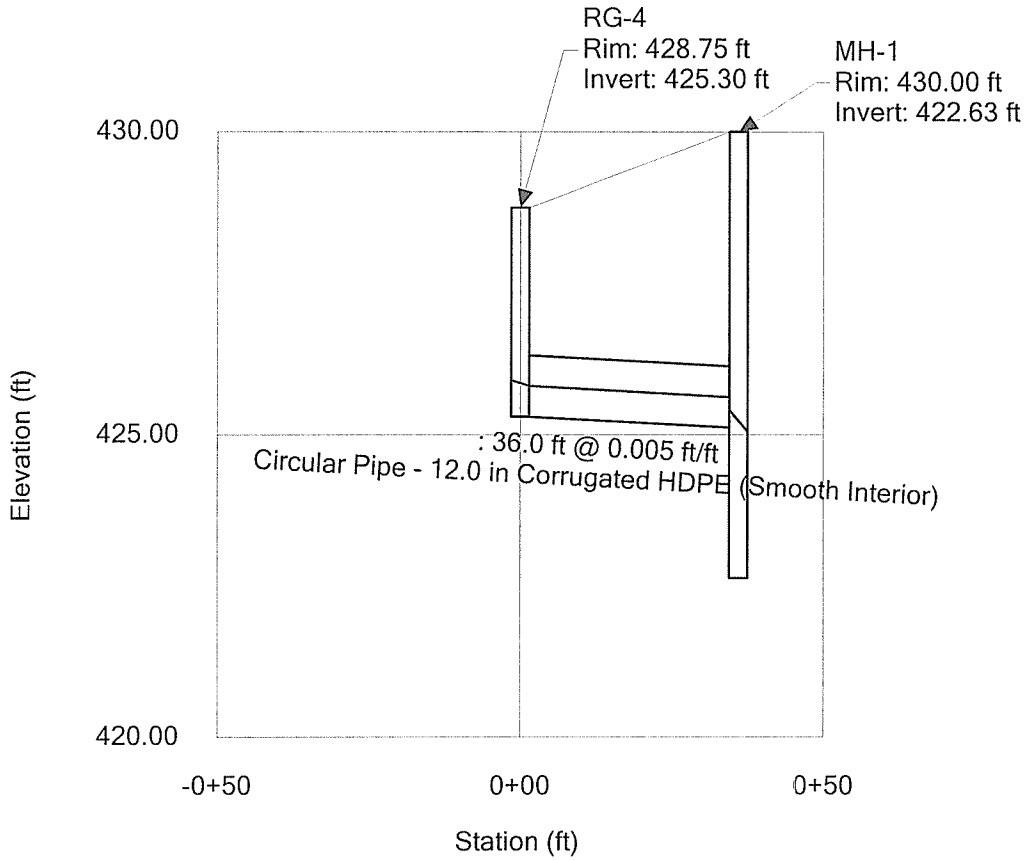
Profile Report
Engineering Profile - RD-8 (StormCAD - LAH.stc)



Profile Report
Engineering Profile - RG-7 to INF-1 (StormCAD - LAH.stc)



Profile Report
Engineering Profile - RG-4 to MH-1 (StormCAD - LAH.stc)



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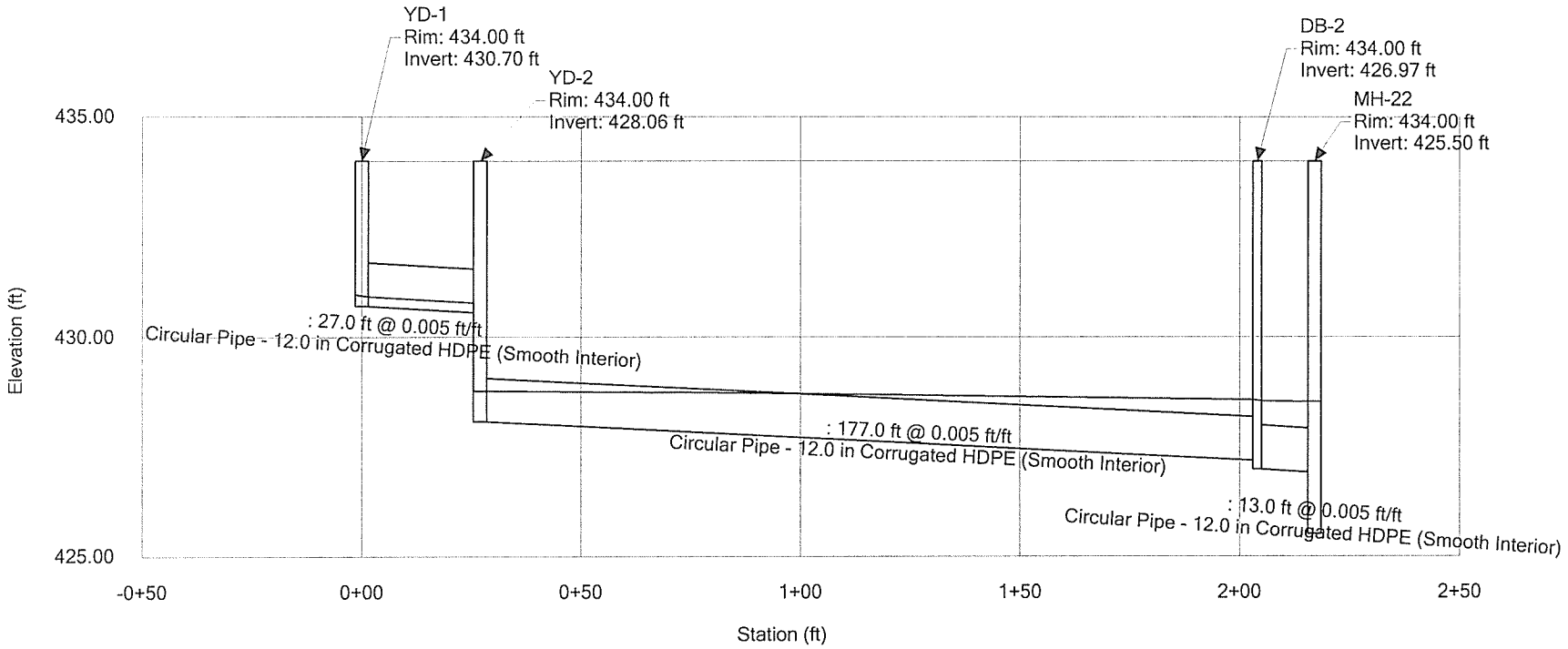
Profile Report
Engineering Profile - YD-1 to DET-1 (StormCAD - LAH.stc)



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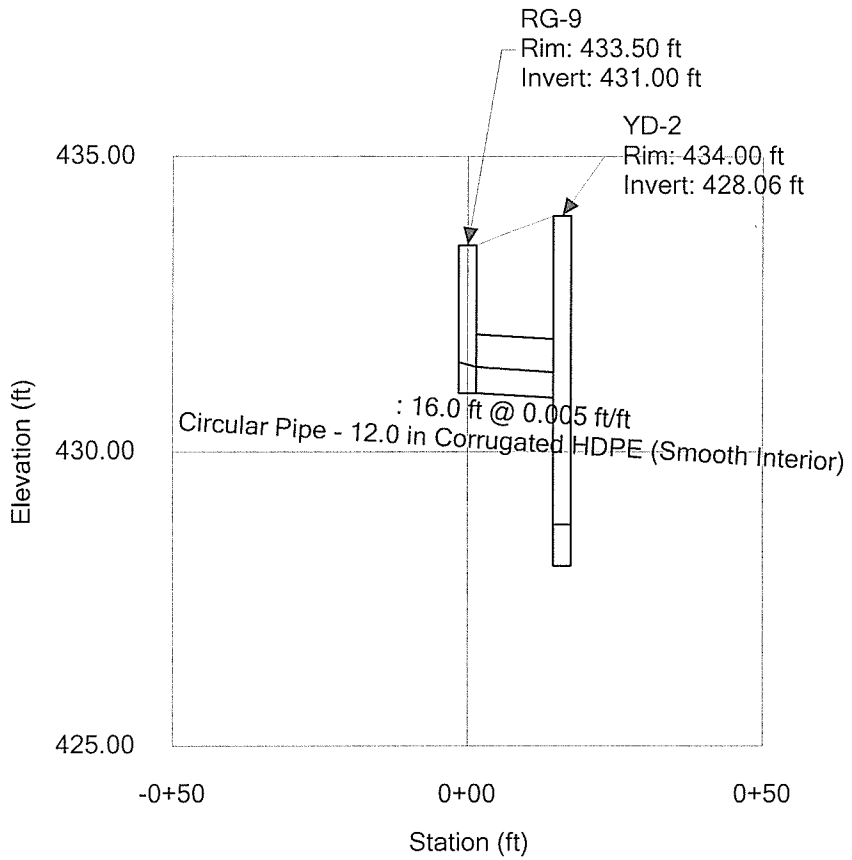
Profile Report
Engineering Profile - RG-9 to YD-2 (StormCAD - LAH.stc)



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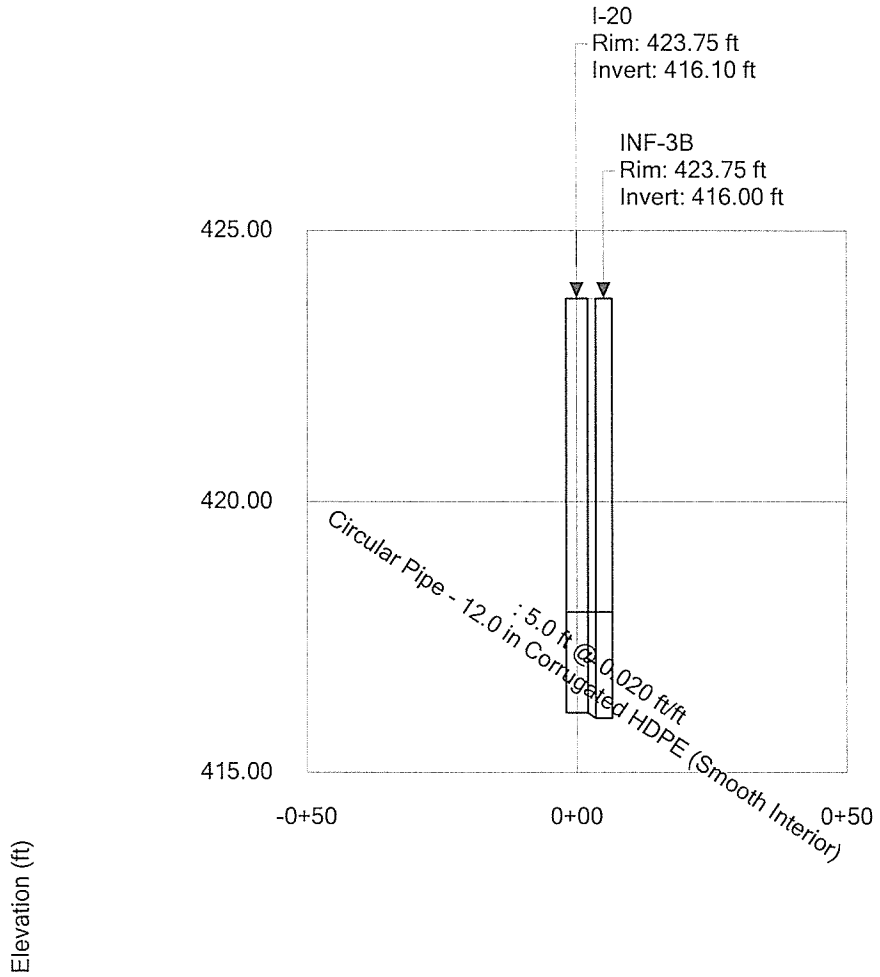
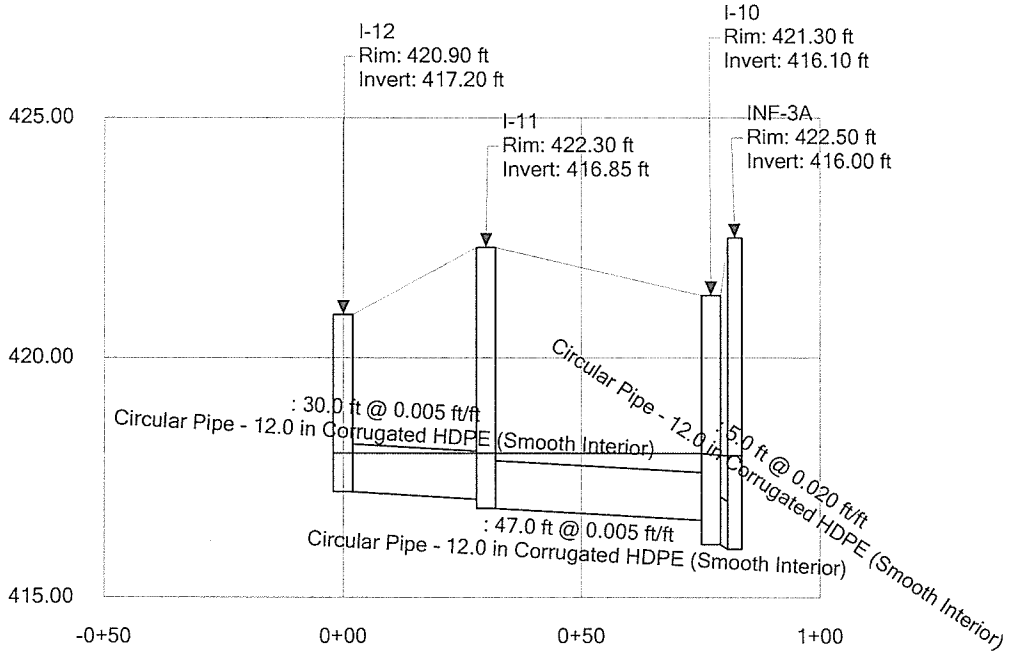
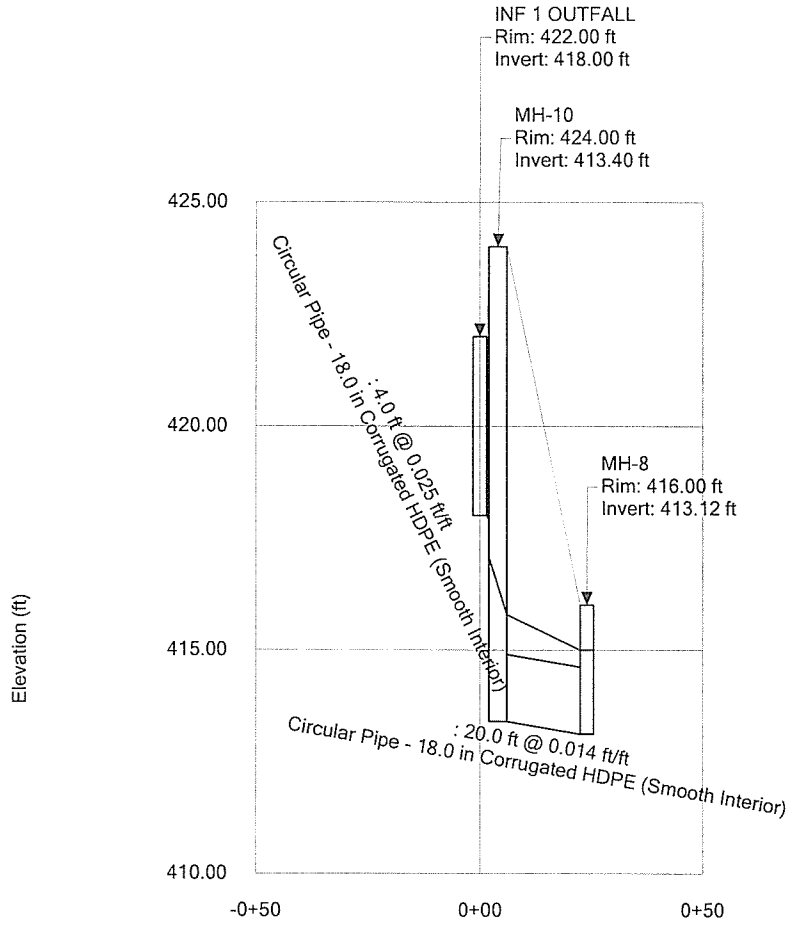
Engineering Profile - I-20 to INF-3 (StormCAD - LAH.stc)



Profile Report
Engineering Profile - I-12 to INF-3 (StormCAD - LAH.stc)



Profile Report
Engineering Profile - INF-1 to out (StormCAD - LAH.stc)



Profile Report
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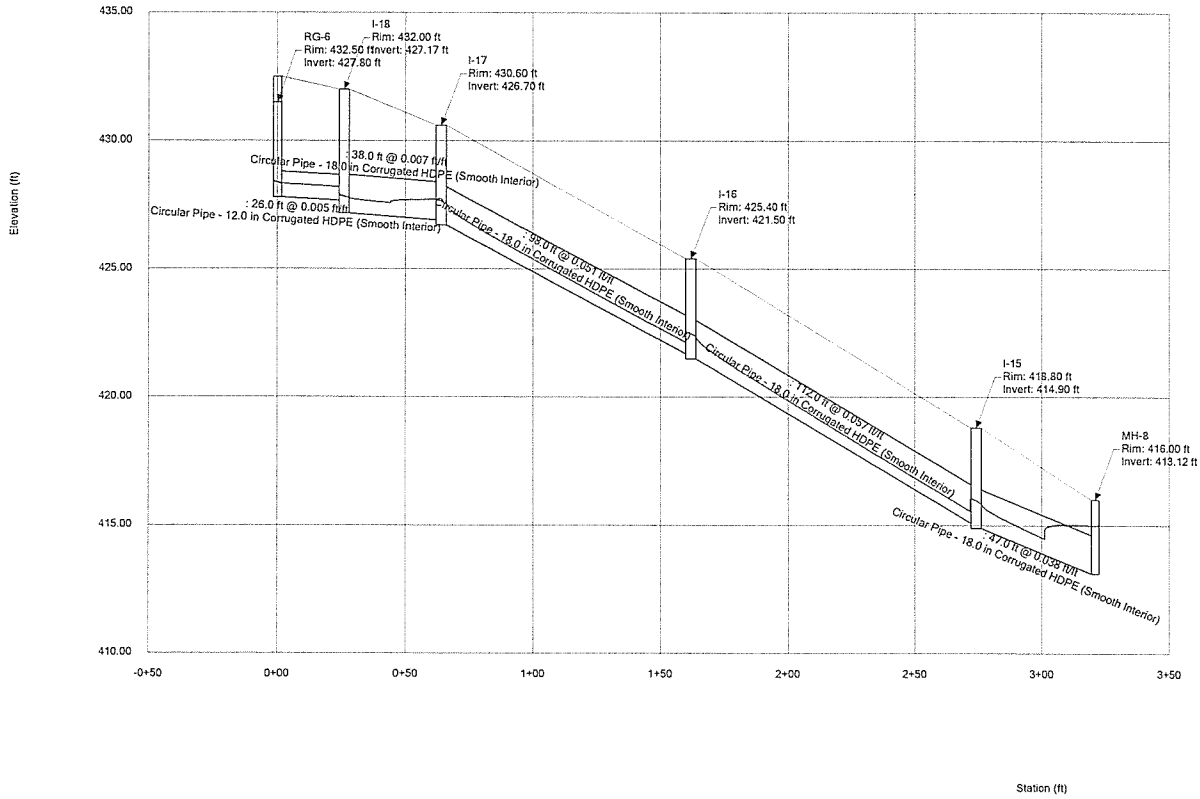
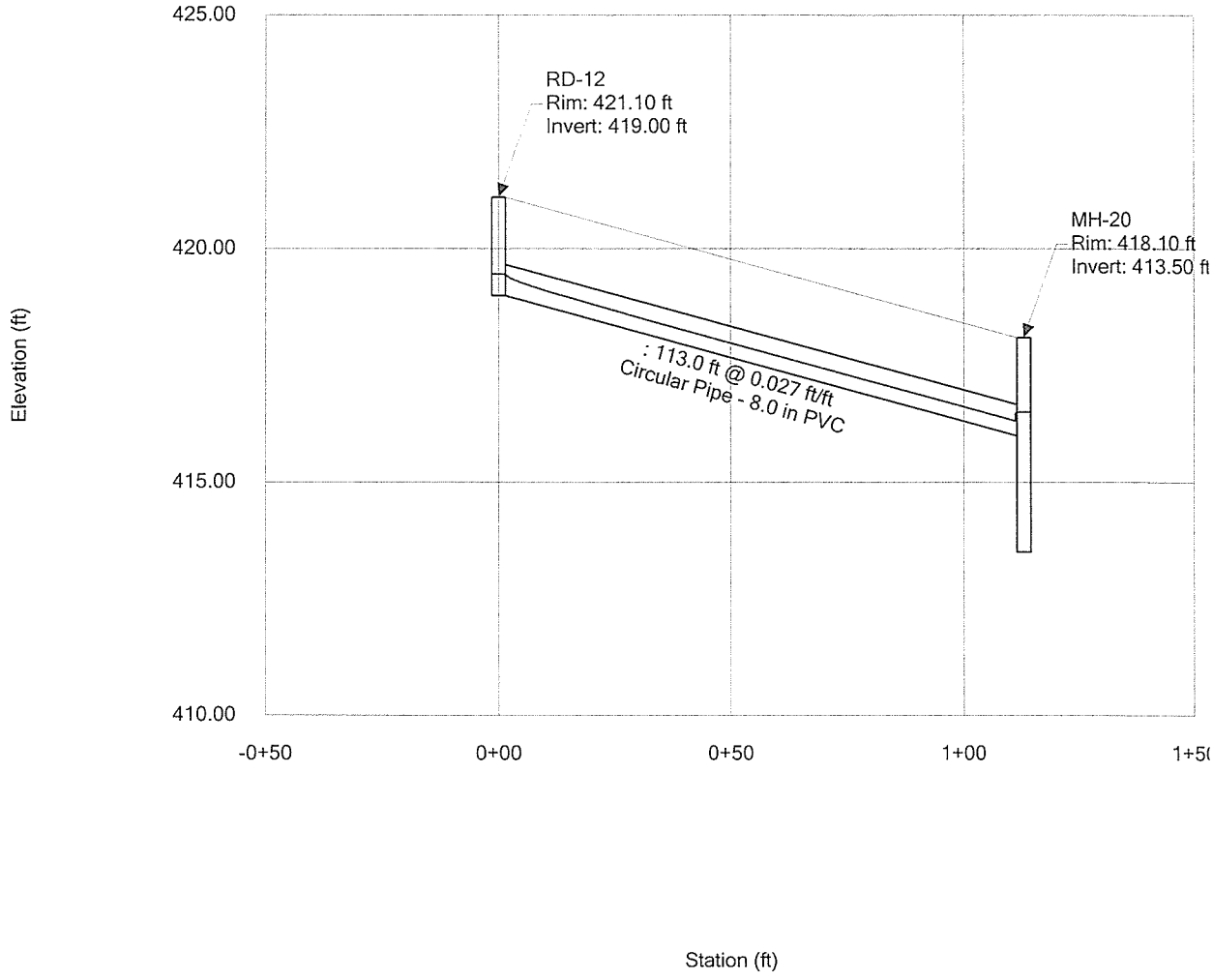


Profile Report
Engineering Profile - RD-12 (StormCAD - LAH.stc)



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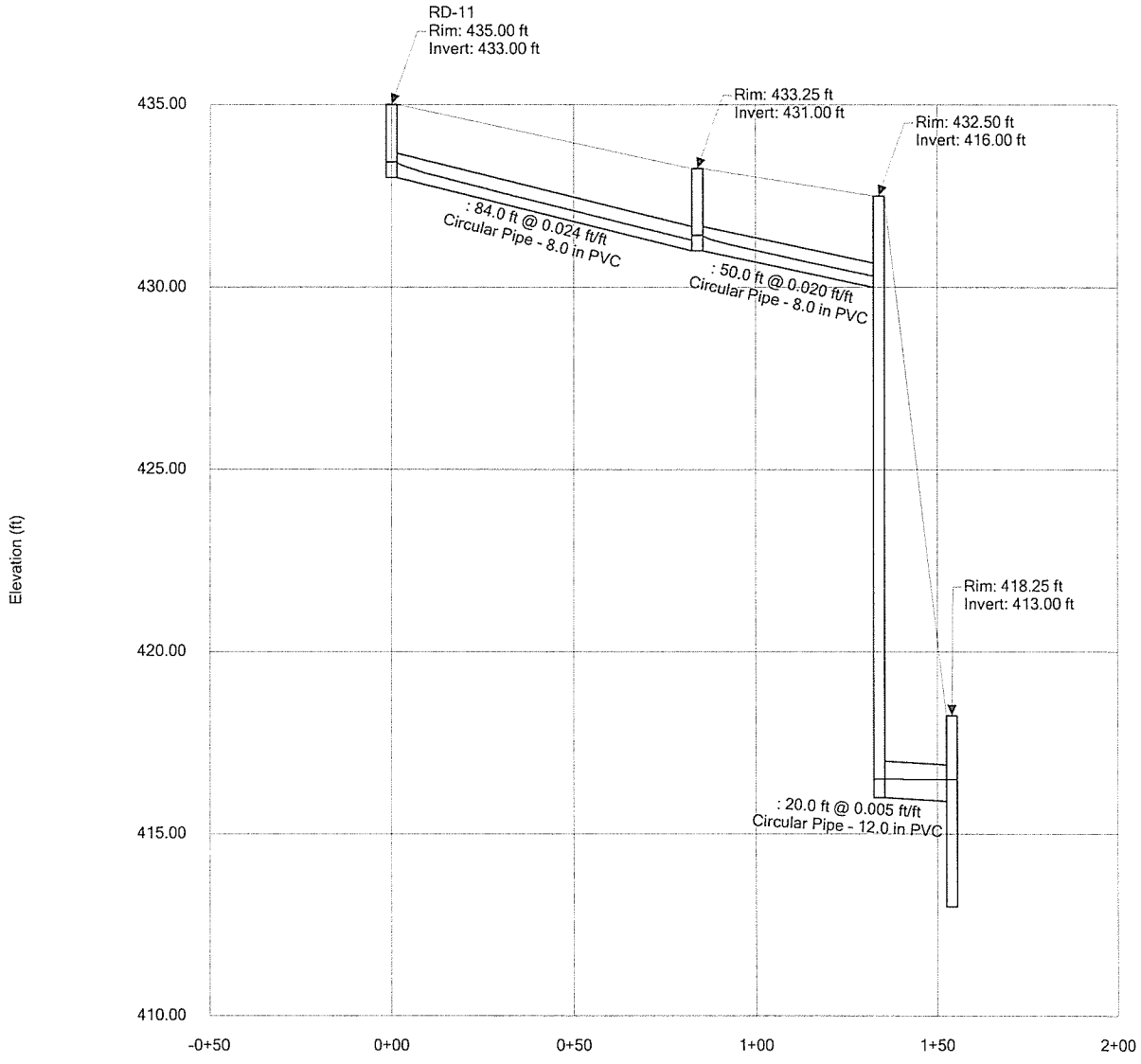
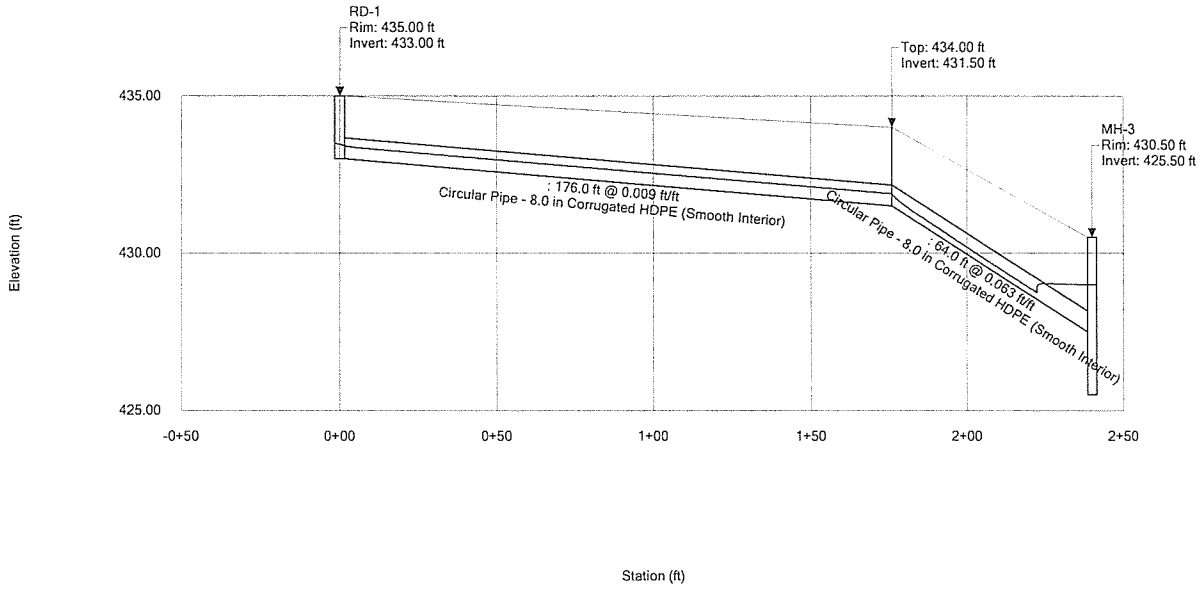
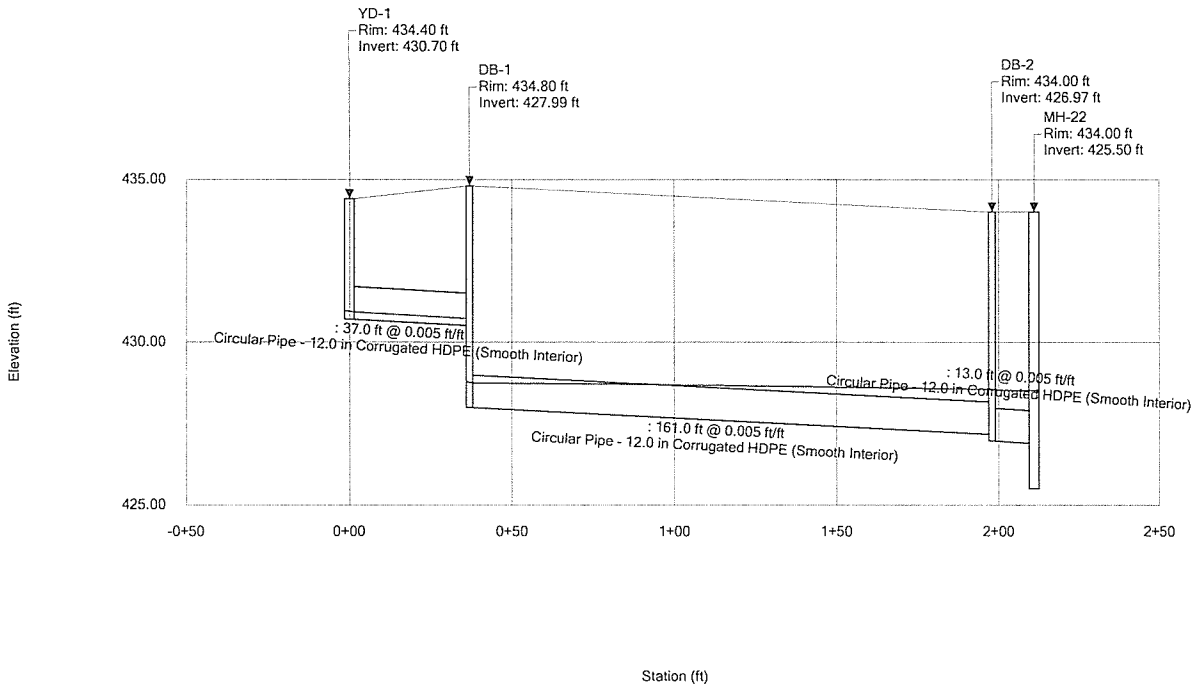
Engineering Profile - RD-11 (StormCAD - LAH.stc)



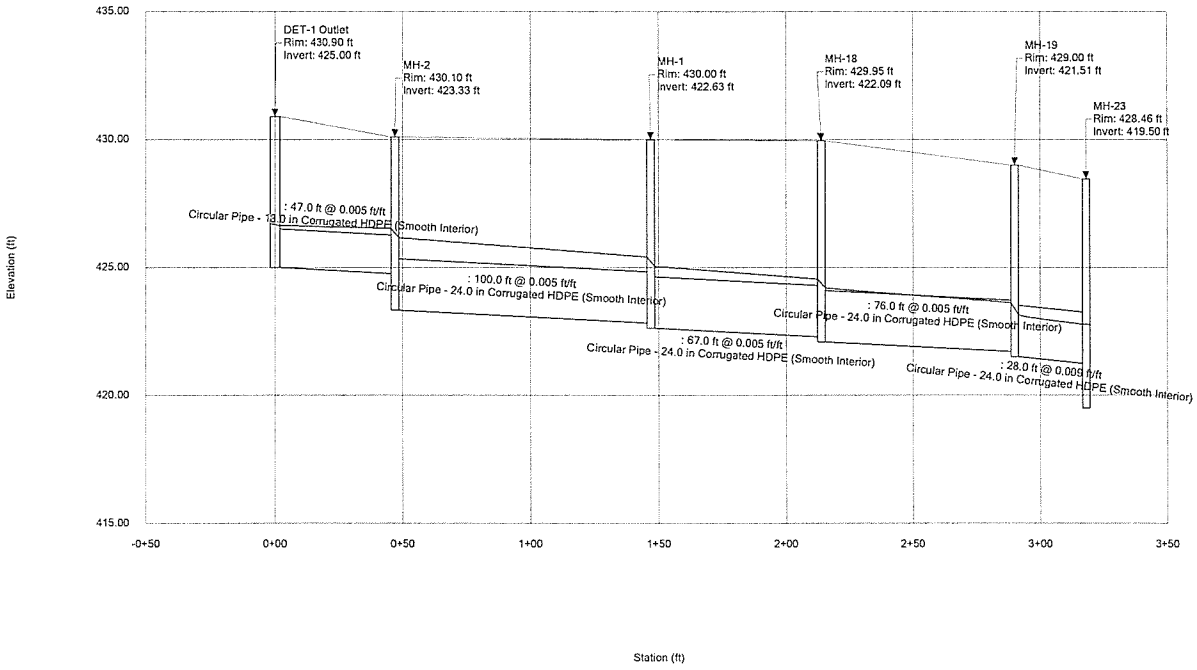
Profile Report
Engineering Profile - RD-1 to MH-3 (StormCAD - LAH.stc)



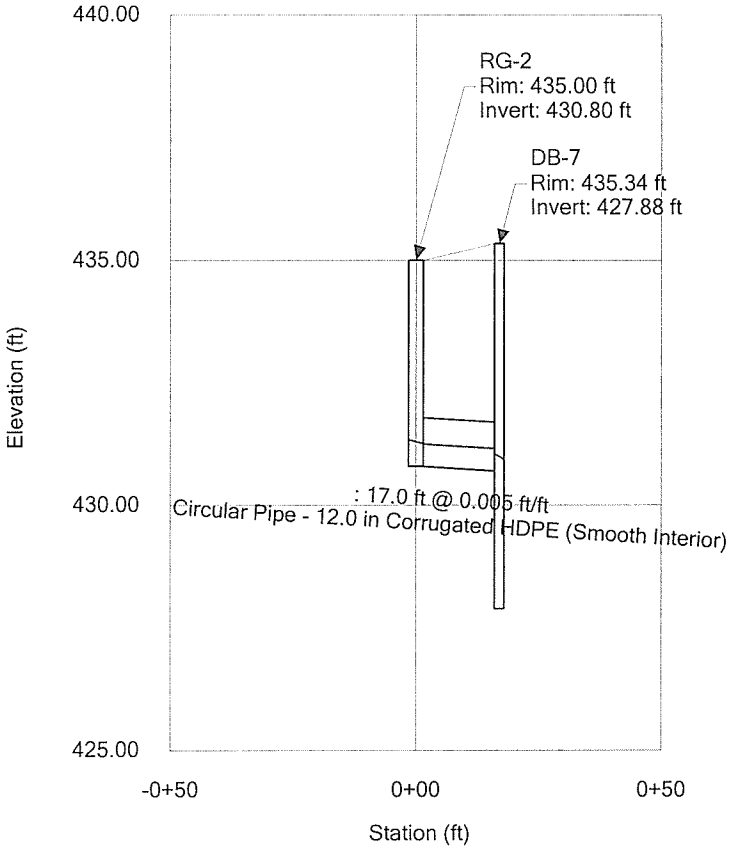
Profile Report
Engineering Profile - YD-1 to MH-22 (StormCAD - LAH.stc)



Profile Report
Engineering Profile - DET-1 OUT to MH-23 (StormCAD - LAH.stc)



Profile Report
Engineering Profile - RG-2 to DB-7 (StormCAD - LAH.stc)



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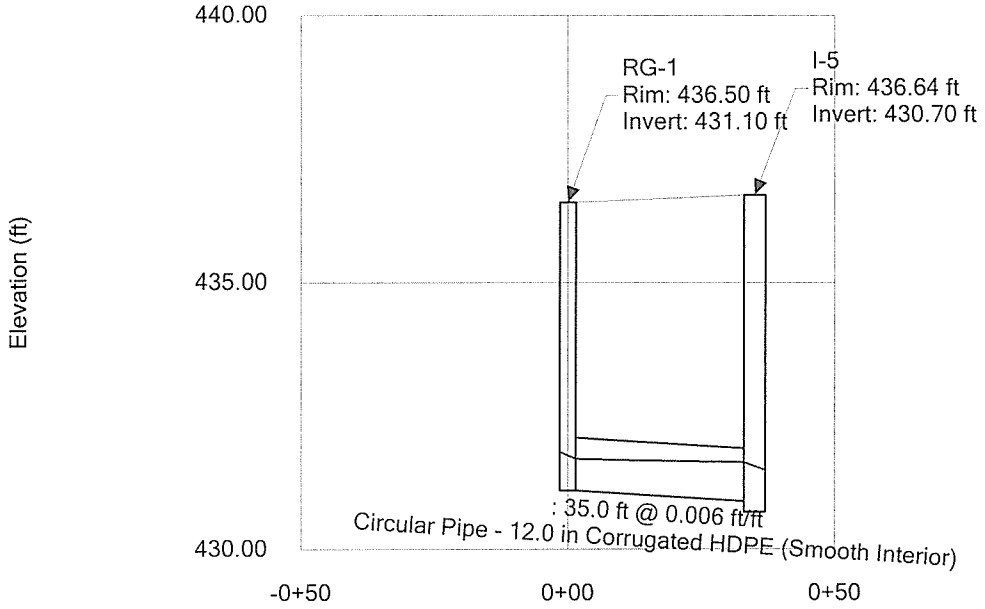
Profile Report
Engineering Profile - RG-1 to I-5 (StormCAD - LAH.stc)



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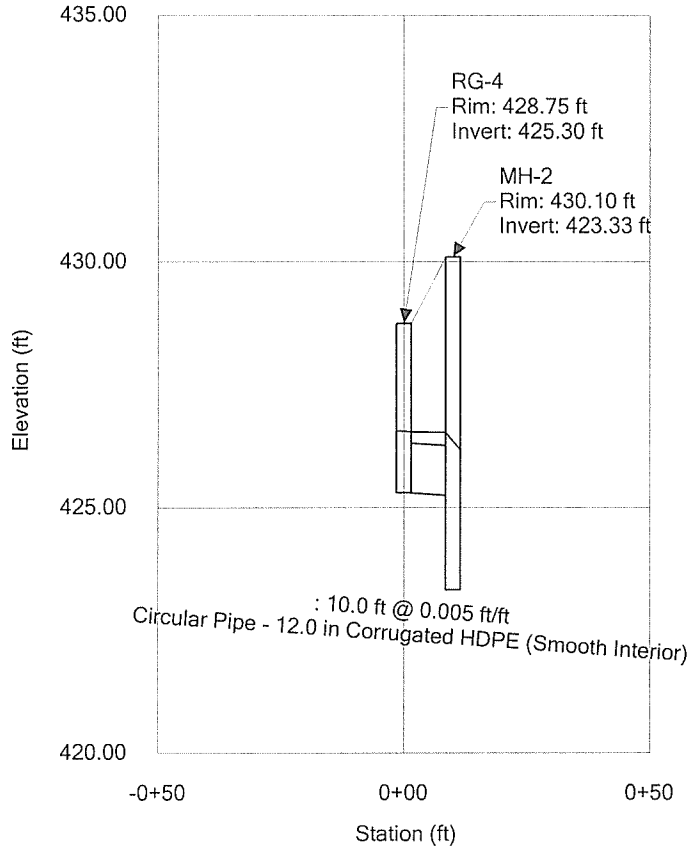
Profile Report
Engineering Profile - RG-4 to MH-2 (StormCAD - LAH.stc)



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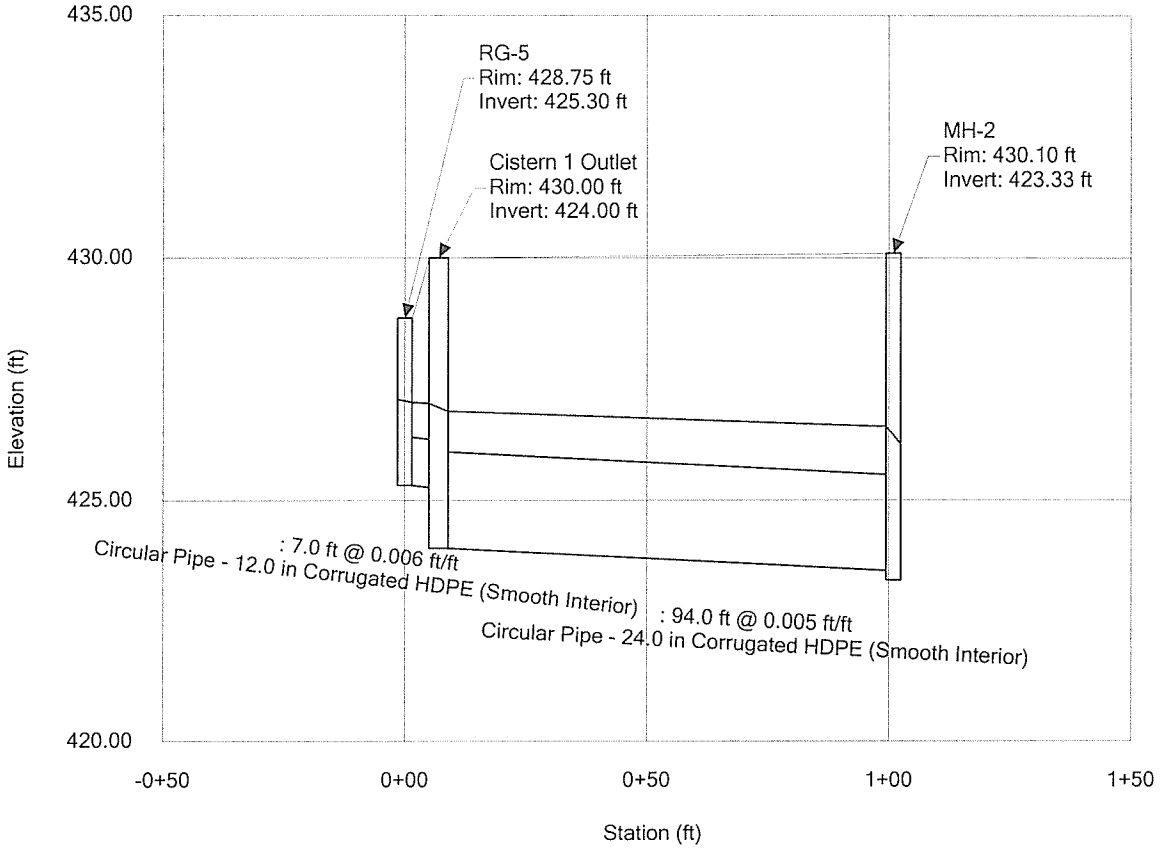
Profile Report
Engineering Profile - RG-5 to MH-2 (StormCAD - LAH.stc)



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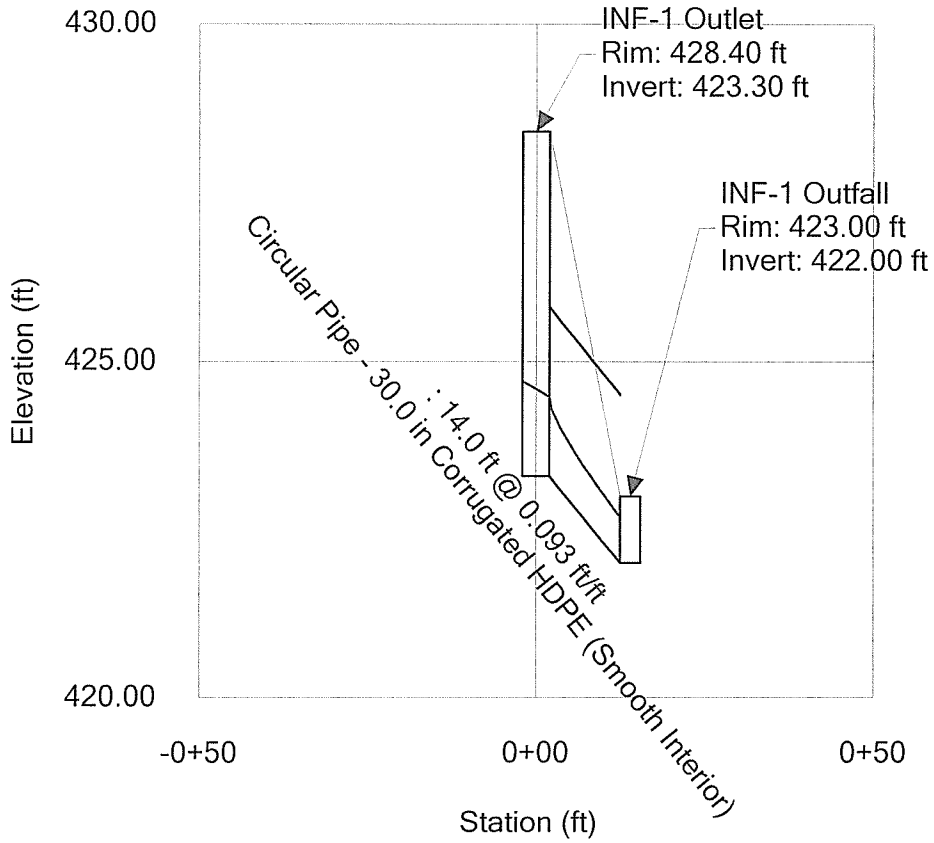
Profile Report

Engineering Profile - INF-1 Outlet to Outfall (StormCAD - LAH.stc)



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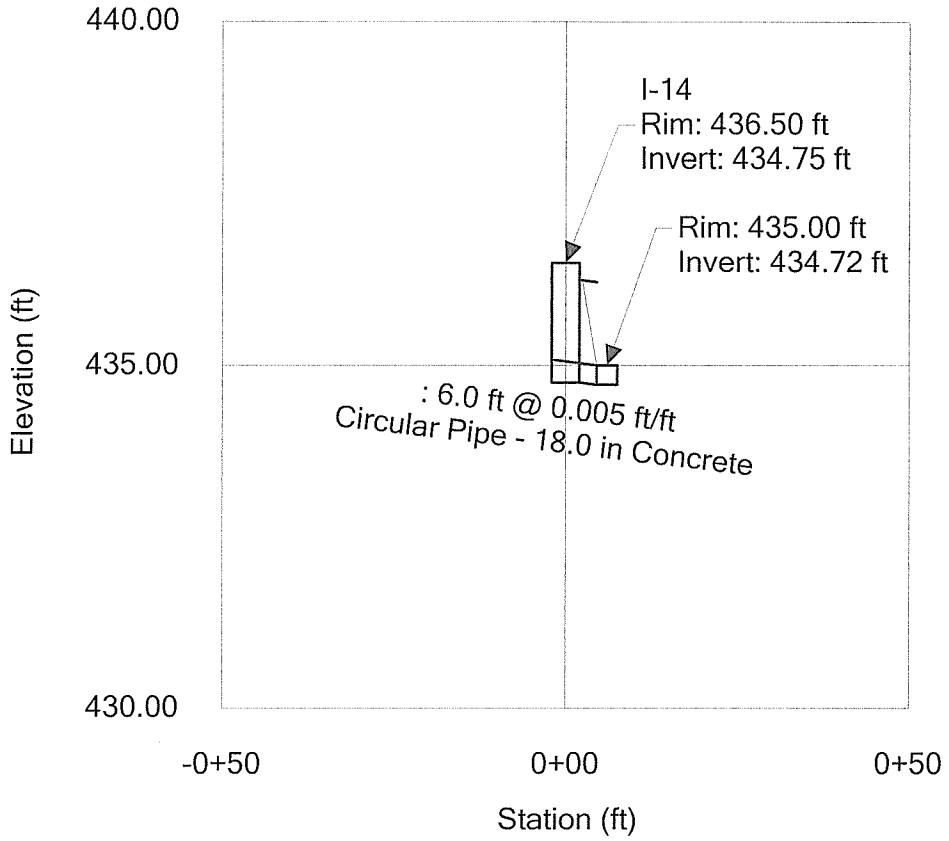
Profile Report
Engineering Profile - I-14 to Outfall (StormCAD - LAH.stc)



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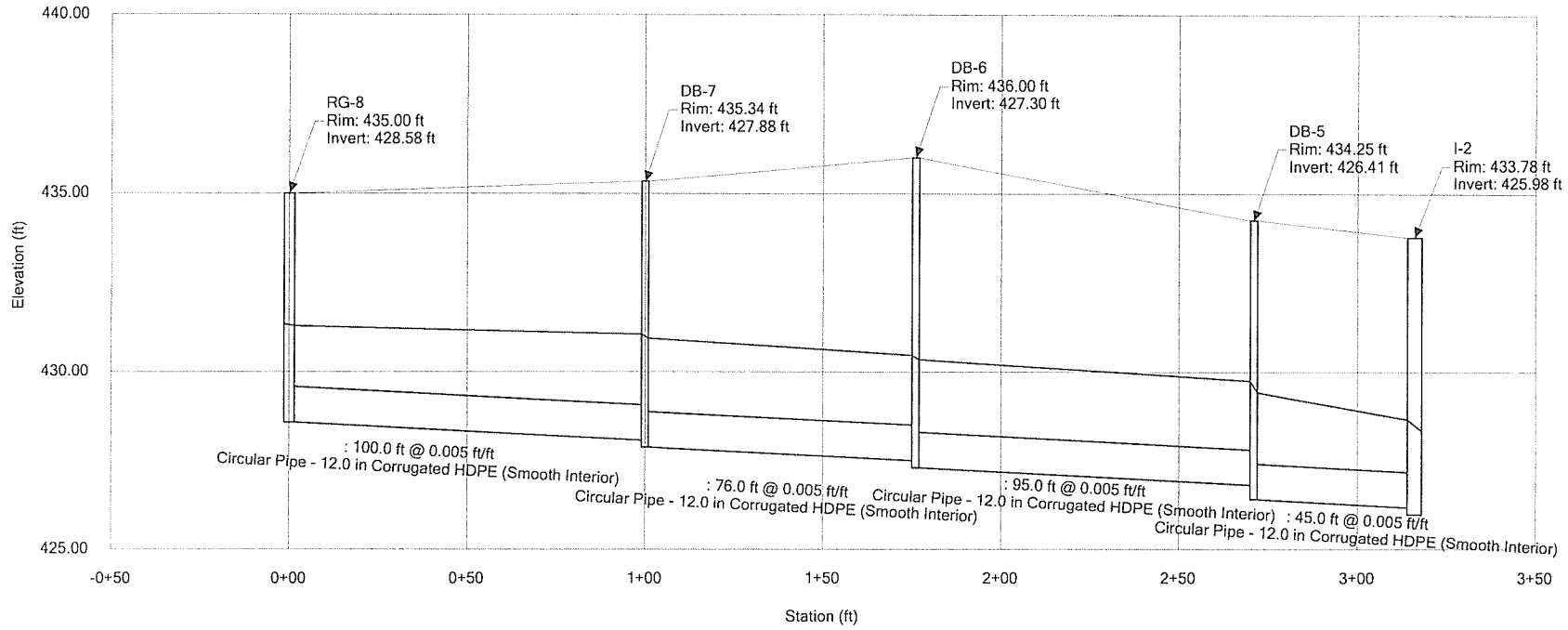
Profile Report
Engineering Profile - RG-8 to I-2 (StormCAD - LAH.stc)



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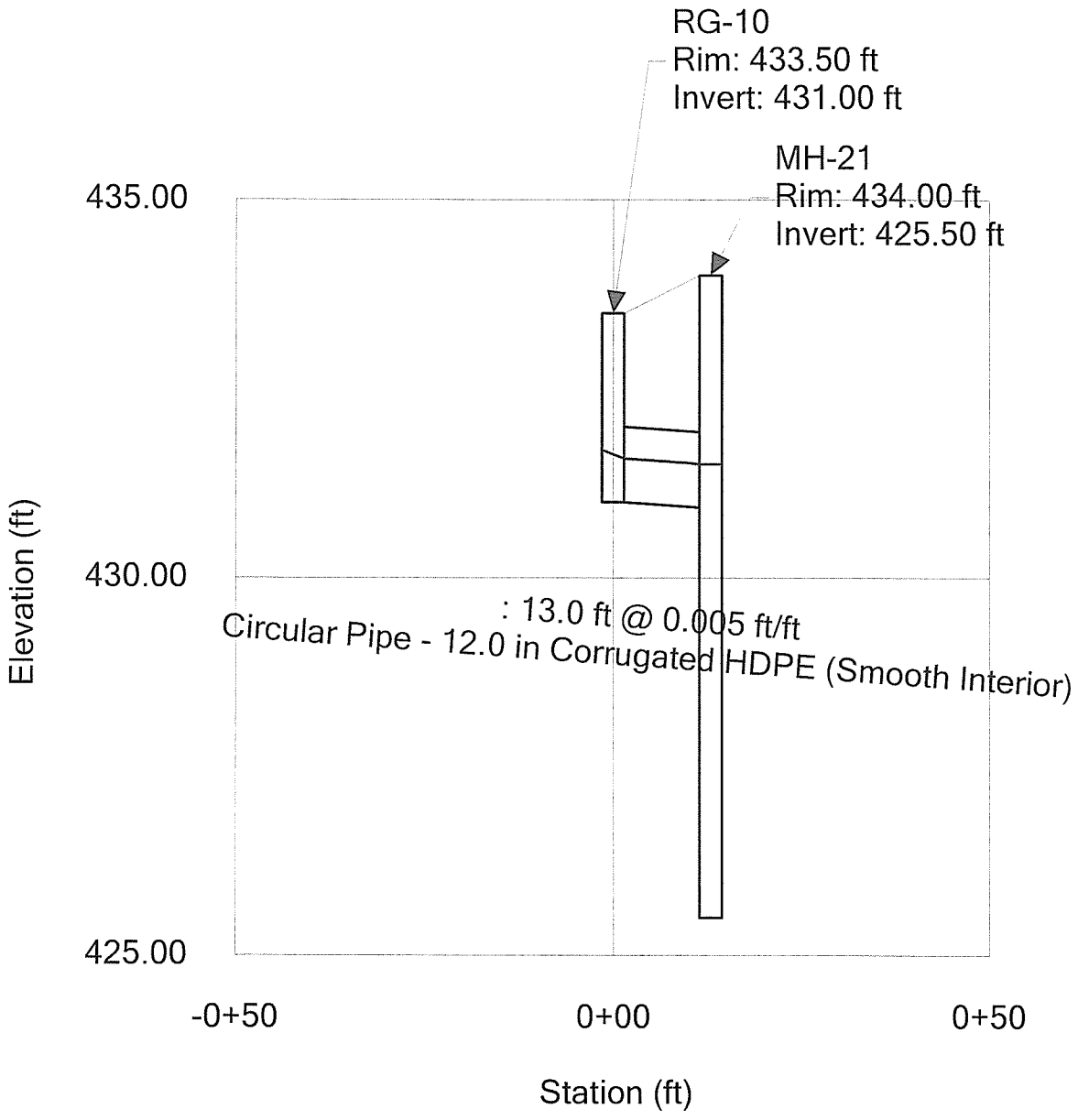
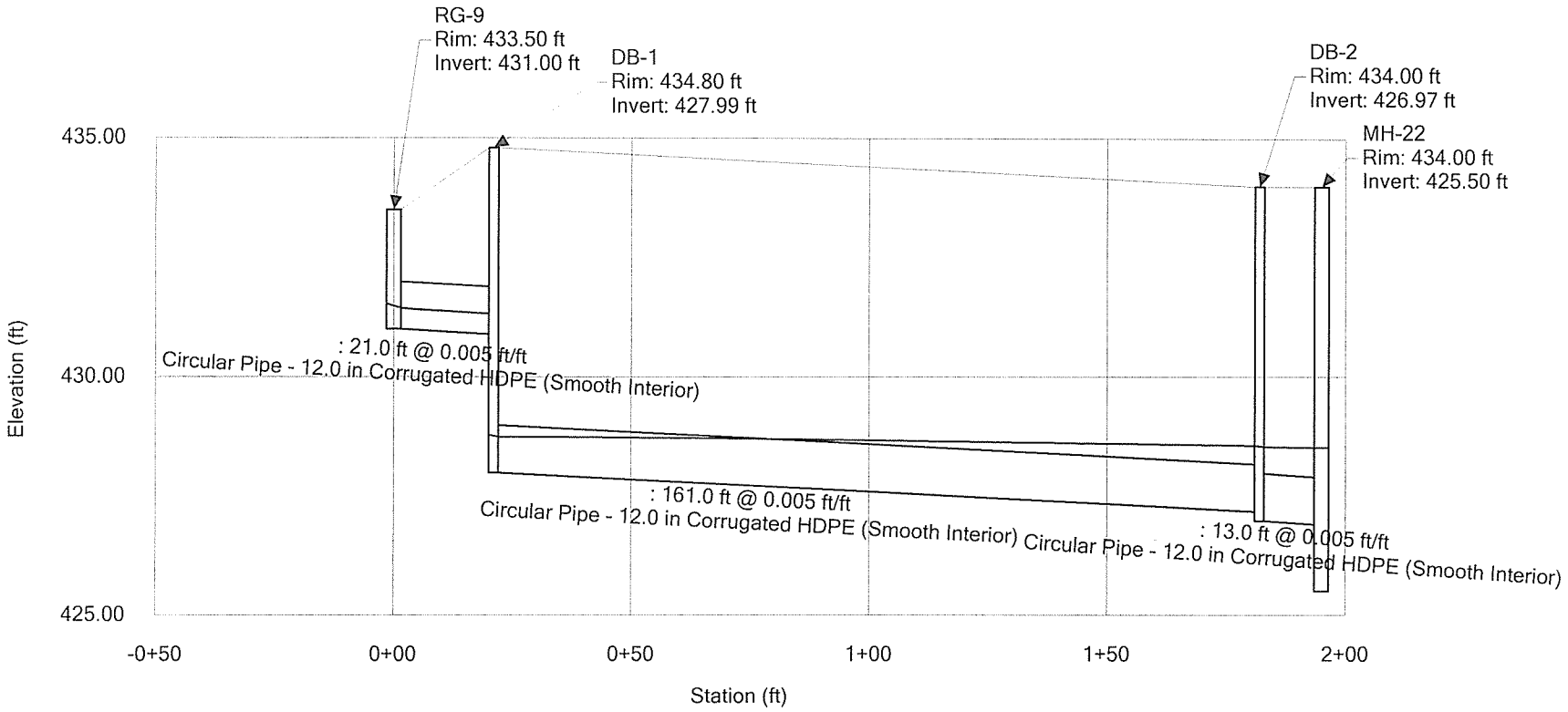
Engineering Profile - RG-10 to MH-21 (StormCAD - LAH.stc)

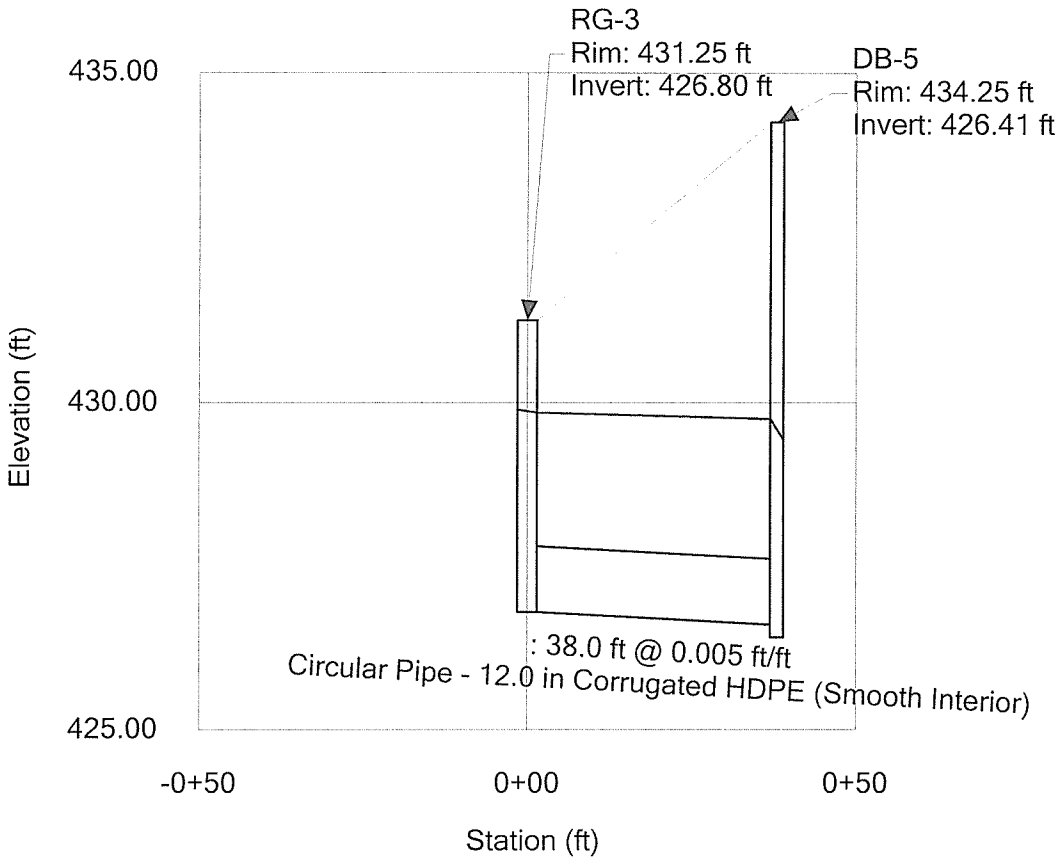


Profile Report
Engineering Profile - RG-9 to MH-22 (StormCAD - LAH.stc)



Profile Report

Engineering Profile - RG-3 to DB-5 (StormCAD - LAH.stc)



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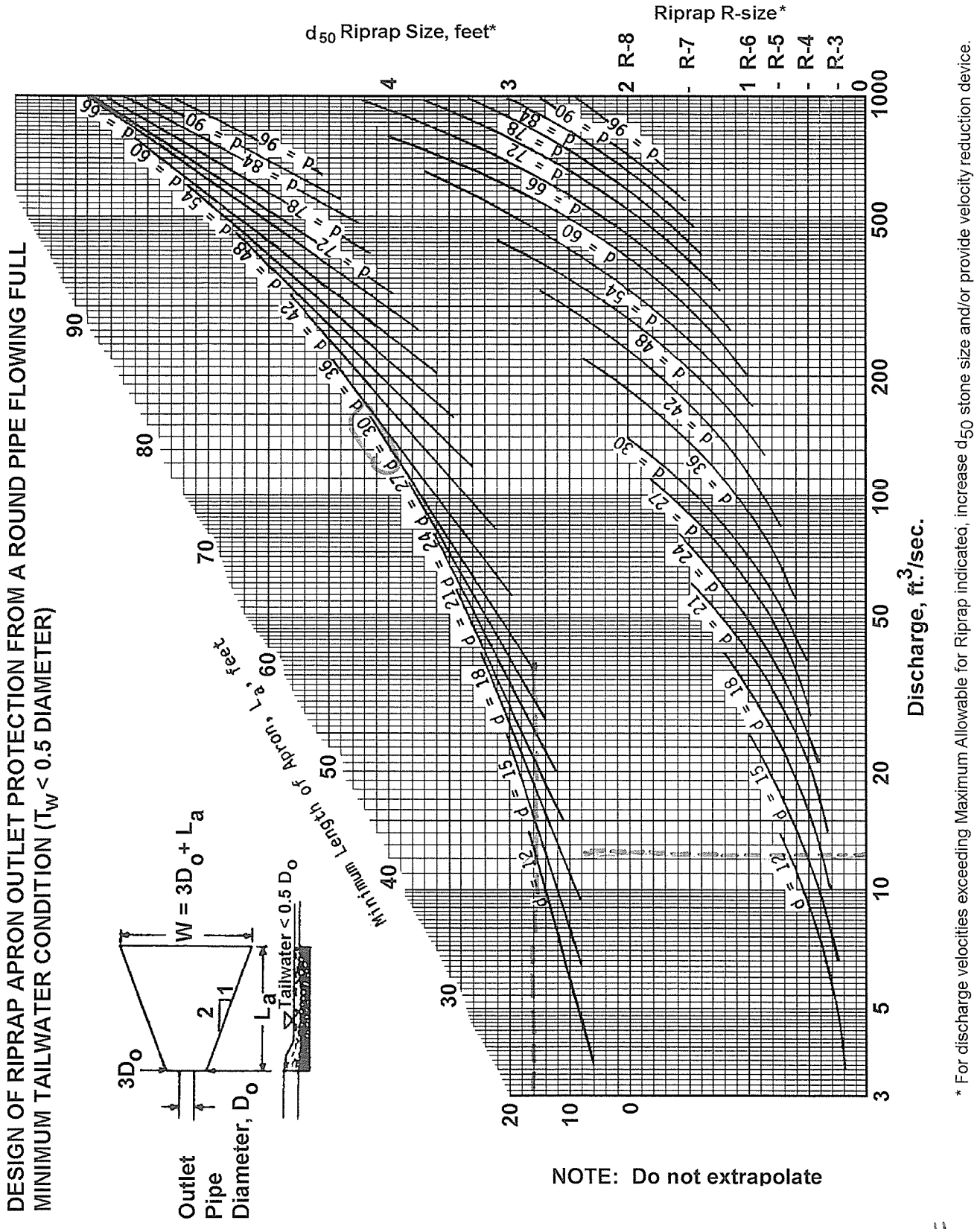
OS - Inf-1

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



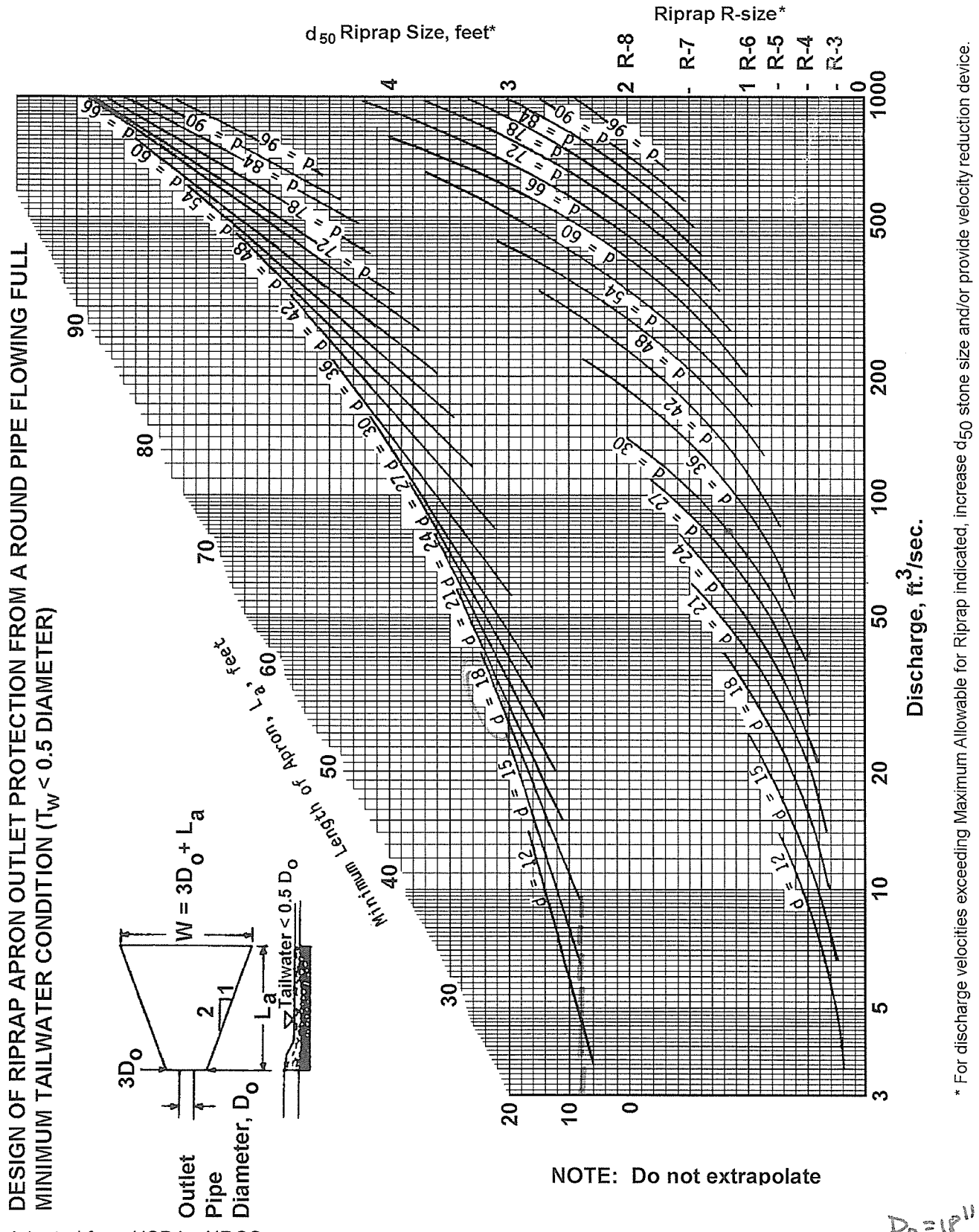
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Adapted from USDA - NRCS

Not to be used for Box Culverts

$D_o = 30''$
$V = 17.12$ ft/s
$Q = 12.24$ cfs
$L_a = 16'$
$W = 3(2.5') + 16' = 23.5'$

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

Not to be used for Box Culverts

$D_o = 18''$

$V = \frac{Q}{A}$ $Q = 0.57 cfs$ $A = \frac{\pi(.75)^2}{2} = .8836 ft^2$

$V = 0.645 ft/s$

$L_a = 8'$

$W = 3(1.5) + 8 = 12.5'$

IX.

ADVANCED GeoServices
Engineering for the Environment. Planning for People.
1055 Andrew Drive, Suite A
West Chester, PA 19380-4293
tel 610.840.9100 fax 610.840.9199
www.advancedgeoservices.com

October 8, 2014 2014-3198-01

Villanova University
Maintenance Building 1st
Project Management
800 Lancaster Avenue
Villanova, PA 19085

Attention: Ms. Marilou Smith, LEED

INFILTRATION TEST REPORT
LAH DEVELOPMENT
VILLANOVA UNIVERSITY

Dear Ms. Smith:

Advanced GeoServices is pleased to present this summary of the infiltration testing performed for the proposed LAH Development at Villanova University. This work was performed in accordance with the infiltration testing scope of work included in our September 18, 2014 Service Agreement with Villanova University.

Infiltration testing was originally planned for a total of 40 locations, as shown on Drawings CU4.01, CU4.02, and CU4.03 developed by Voith & Mactavish Architects LLP and Robert A. M. Stern Architects LLP and included in the Request for Proposal. However, the two locations on the north side of Lancaster Avenue by the proposed future pedestrian bridge (TP-9 and TP-10) and the two locations within Pike Filed (TP-26 and TP-27) were eliminated from the present study. Thus, testing was performed at 36 locations.

Test Borings

To provide an indication of subsurface conditions, an initial boring was drilled at each infiltration test location to a depth of 7 feet to determine if any limiting zones (groundwater and/or rock) were present. No limiting zones were encountered at the test locations. The boring locations are shown on the attached drawings and logs of the borings are included in Appendix A.

Infiltration Testing

Infiltration testing was conducted at 36 locations via the Maryland Method (Maryland Stormwater Manual Appendix D.1) using test borings and 5-inch diameter casing. The test locations are shown on the attached drawings. The Maryland Method is an approved alternative for infiltration testing in the PADEP Manual (Appendix C) and provides the same measurements (infiltration rate in inches per hour). The tests were conducted on September 23, 24 and 26, 2014. The weather at the time of testing was generally partly sunny and warm (in the mid- 70°s F). A description of the test method is provided below.

- A secondary boring was drilled at each of the test locations adjacent to the initial boring used to characterize the subsurface conditions. The secondary boring was extended to the depth of 5 feet.
- A five-inch diameter PVC pipe was installed to the bottom of each borehole and the annular space around the pipe was backfilled with the drilling spoils.
- The pipes were filled with clean water to a depth of 24 inches above the bottom of the borehole (2 gallons of water) and allowed to pre-soak for 24 hours.
- Following the pre-soak, the pipes were refilled to a depth of 24 inches above the bottom of the borehole.
- Using a depth-to-water meter, the water levels in the pipes were monitored for a period of one hour and the data (time and depth) were recorded. This procedure (i.e., refilling to a depth of 24 inches above the bottom of the pipe and monitoring the water level for one hour) was repeated three additional times, for a total of four trials at each test location.

The field data is included in Appendix B and a summary of the results with the calculated infiltration rates are shown on the attached Table. The infiltration rate was calculated as the average of the last readings from the four trials at that location. Note that the listed infiltration rates are the calculated results; no factor of safety was applied.

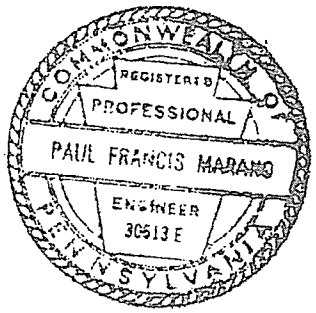
The infiltration rates calculated in this report are estimates based upon the conditions encountered at the test locations and the depths of the testing. The actual average infiltration rate for each stormwater feature will depend upon the soil types and soil densities encountered throughout the bottom of the feature.

We appreciate this opportunity to be of service to you. If you have any questions regarding the contents of this report, please contact us.

Very truly yours,

ADVANCED GEOSERVICES CORP.

Paul F. Marano, P.E.
Project Consultant



PFM:kk

Attachments

cc: A. Tweedie (Nave Newell)

TABLE

VILLANOVA UNIVERSITY LAH DEVELOPMENT
INFILTRATION TESTING RESULTS

Location	Test Depth (feet)	Test Elev. (feet)	Soil Type	Infiltration Rate (in/hr)
TP-1	5	400	silty fine sand	0.36
TP-2	5	402.5	silty coarse to fine sand	0.27
TP-3	5	409.5	silty coarse to fine sand	0.12
TP-4	5	414.25	silty coarse to fine sand	1.14
TP-5	5	418.25	silty coarse to fine sand	0.90
TP-6	5	430.5	silty fine sand	0.12
TP-7	5	431.25	silty fine sand	0.30
TP-8	5	431.5	silty fine sand	0.12
TP-9	5			
TP-10	5			
TP-11	5	433.75	fine sandy silt *	0.18
TP-12	5	432.5	clayey silt *	4.05
TP-13	5	430.5	coarse to fine sand and gravel *	0.27
TP-14	5	428.5	silty fine sand	0.90
TP-15	5	427.5	silty coarse to fine sand and gravel *	11.70
TP-16	5	426	silty coarse to fine sand *	0.03
TP-17	5	424.5	silty coarse to fine sand and gravel *	12.84
TP-18	5	424.25	silty coarse to fine sand and gravel *	1.23
TP-19	5	428.5	coarse to fine sand and gravel *	0.48
TP-20	5	423.5	clayey silt *	12.69
TP-21	5	428.25	coarse to fine sand and gravel *	16.44
TP-22	5	430.25	silty fine sand	0.30
TP-23	5	430.5	silty coarse to fine sand *	0.33
TP-24	5	423.25	clayey silt	3.66
TP-25	5	422.5	silty coarse to fine sand and gravel *	0.75
TP-26	5			
TP-27	5			
TP-28	5	397.5	fine sandy silt with clay	0.33
TP-29	5	401.5	silty fine sand	0.09
TP-30	5	414	silty fine sand	0.60
TP-31	5	417	silty coarse to fine sand	0.72
TP-32	5	422	silty coarse to fine sand	0.87
TP-33	5	424.5	silty fine sand	0.90
TP-34	5	425.5	silty fine sand	1.00
TP-35	5	431.5	clayey silt w/ concrete fragments*	9.06
TP-36	5	431	clayey silt	1.86
TP-37	5	430	sand gravel and cobbles *	1.29
TP-38	5	430	silty fine sand	0.63
TP-39	5	429	silty coarse to fine sand and gravel *	1.32
TP-40	5	429	silty sand and gravel	1.44

* Fill Material

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-1
September 23, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:23	0	0	3.27	0.00	0	0	0
10:53	30	30	3.3	0.03	0.03	0.72	0.72
11:23	30	60	3.31	0.01	0.04	0.24	0.48

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:23	0	0	3.04	0.00	0	0	0
11:53	30	30	3.06	0.02	0.02	0.48	0.48
12:23	30	60	3.07	0.01	0.03	0.24	0.36

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:23	0	0	3.01	0.00	0	0	0
12:53	30	30	3.02	0.01	0.01	0.24	0.24
1:23	30	60	3.03	0.01	0.02	0.24	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:23	0	0	3	0.00	0	0	0
1:53	30	30	3.02	0.02	0.02	0.48	0.48
2:23	30	60	3.03	0.01	0.03	0.24	0.36

Test conducted in silty fine sand (elev. 400)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-2
September 23, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:22	0	0	2.72	0.00	0	0	0
10:52	30	30	2.73	0.01	0.01	0.24	0.24
11:22	30	60	2.74	0.01	0.02	0.24	0.24

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:22	0	0	2.74	0.00	0	0	0
11:52	30	30	2.75	0.01	0.01	0.24	0.24
12:22	30	60	2.76	0.01	0.02	0.24	0.24

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:22	0	0	2.76	0.00	0	0	0
12:52	30	30	2.78	0.02	0.02	0.48	0.48
1:22	30	60	2.78	0.00	0.02	0.00	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:22	0	0	2.78	0.00	0	0	0
1:52	30	30	2.8	0.02	0.02	0.48	0.48
2:22	30	60	2.81	0.01	0.03	0.24	0.36

Test conducted in silty coarse to fine sand (elev. 402.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:20	0	0	2.82	0.00	0	0	0
10:50	30	30	2.84	0.02	0.02	0.48	0.48
11:20	30	60	2.84	0.00	0.02	0.00	0.24

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:20	0	0	2.84	0.00	0	0	0
11:50	30	30	2.85	0.01	0.01	0.24	0.24
12:20	30	60	2.85	0.00	0.01	0.00	0.12

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:20	0	0	2.85	0.00	0	0	0
12:50	30	30	2.85	0.00	0.00	0.00	0.00
1:20	30	60	2.85	0.00	0.00	0.00	0.00

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:20	0	0	2.85	0.00	0	0	0
1:50	30	30	2.85	0.00	0.00	0.00	0.00
2:20	30	60	2.86	0.01	0.01	0.24	0.12

Test conducted in silty coarse to fine sand (elev.409.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:19	0	0	3.05	0.00	0	0	0
10:49	30	30	3.11	0.06	0.06	1.44	1.44
11:19	30	60	3.18	0.07	0.13	1.68	1.56

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:19	0	0	3	0.00	0	0	0
11:49	30	30	3.06	0.06	0.06	1.44	1.44
12:19	30	60	3.11	0.05	0.11	1.20	1.32

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:19	0	0	3.02	0.00	0	0	0
12:49	30	30	3.06	0.04	0.04	0.96	0.96
1:19	30	60	3.09	0.03	0.07	0.72	0.84

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:19	0	0	3.01	0.00	0	0	0
1:49	30	30	3.05	0.04	0.04	0.96	0.96
2:19	30	60	3.08	0.03	0.07	0.72	0.84

Test conducted in silty coarse to fine sand (elev. 414.25)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:35	0	0	3.03	0.00	0	0	0
8:05	30	30	3.06	0.03	0.03	0.72	0.72
8:35	30	60	3.1	0.04	0.07	0.96	0.84

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:35	0	0	3.01	0.00	0	0	0
9:05	30	30	3.05	0.04	0.04	0.96	0.96
9:35	30	60	3.09	0.04	0.08	0.96	0.96

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:35	0	0	2.95	0.00	0	0	0
10:05	30	30	2.98	0.03	0.03	0.72	0.72
10:35	30	60	3.02	0.04	0.07	0.96	0.84

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:35	0	0	3.01	0.00	0	0	0
11:05	30	30	3.05	0.04	0.04	0.96	0.96
11:35	30	60	3.09	0.04	0.08	0.96	0.96

Test conducted in silty coarse to fine sand (elev. 418.25)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:30	0	0	2.97	0.00	0	0	0
8:00	30	30	2.97	0.00	0.00	0.00	0.00
8:30	30	60	2.98	0.01	0.01	0.24	0.12

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:30	0	0	2.98	0.00	0	0	0
9:00	30	30	2.98	0.00	0.00	0.00	0.00
9:30	30	60	2.99	0.01	0.01	0.24	0.12

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:30	0	0	2.99	0.00	0	0	0
10:00	30	30	3	0.01	0.01	0.24	0.24
10:30	30	60	3	0.00	0.01	0.00	0.12

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:30	0	0	3	0.00	0	0	0
11:00	30	30	3	0.00	0.00	0.00	0.00
11:30	30	60	3.01	0.01	0.01	0.24	0.12

Test conducted in silty fine sand (elev. 430.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:31	0	0	2.89	0.00	0	0	0
8:01	30	30	2.91	0.02	0.02	0.48	0.48
8:31	30	60	2.92	0.01	0.03	0.24	0.36

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:31	0	0	2.92	0.00	0	0	0
9:01	30	30	2.94	0.02	0.02	0.48	0.48
9:31	30	60	2.95	0.01	0.03	0.24	0.36

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:31	0	0	2.95	0.00	0	0	0
10:01	30	30	2.96	0.01	0.01	0.24	0.24
10:31	30	60	2.97	0.01	0.02	0.24	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:31	0	0	2.98	0.00	0	0	0
11:01	30	30	2.99	0.01	0.01	0.24	0.24
11:31	30	60	3	0.01	0.02	0.24	0.24

Test conducted in silty fine sand (elev. 431.25)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:32	0	0	2.68	0.00	0	0	0
8:02	30	30	2.68	0.00	0.00	0.00	0.00
8:32	30	60	2.68	0.00	0.00	0.00	0.00

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:32	0	0	2.68	0.00	0	0	0
9:02	30	30	2.69	0.01	0.01	0.24	0.24
9:32	30	60	2.69	0.00	0.01	0.00	0.12

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:32	0	0	2.69	0.00	0	0	0
10:02	30	30	2.7	0.01	0.01	0.24	0.24
10:32	30	60	2.71	0.01	0.02	0.24	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:32	0	0	2.71	0.00	0	0	0
11:02	30	30	2.71	0.00	0.00	0.00	0.00
11:32	30	60	2.72	0.01	0.01	0.24	0.12

Test conducted in silty fine sand (elev. 431.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:29	0	0	3.07	0.00	0	0	0
7:59	30	30	3.07	0.00	0.00	0.00	0.00
8:29	30	60	3.08	0.01	0.01	0.24	0.12

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:29	0	0	2.99	0.00	0	0	0
8:59	30	30	3	0.01	0.01	0.24	0.24
9:29	30	60	3.01	0.01	0.02	0.24	0.24

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:29	0	0	3.01	0.00	0	0	0
9:59	30	30	3.02	0.01	0.01	0.24	0.24
10:29	30	60	3.03	0.01	0.02	0.24	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:29	0	0	3.01	0.00	0	0	0
10:59	30	30	3.01	0.00	0.00	0.00	0.00
11:29	30	60	3.02	0.01	0.01	0.24	0.12

Test conducted in fine sandy silt (Fill) (elev. 433.75)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:27	0	0	2.91	0.00	0	0	0
7:57	30	30	3.1	0.19	0.19	4.56	4.56
8:27	30	60	3.3	0.20	0.39	4.80	4.68

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:27	0	0	3.01	0.00	0	0	0
8:57	30	30	3.18	0.17	0.17	4.08	4.08
9:27	30	60	3.33	0.15	0.32	3.60	3.84

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:27	0	0	3.03	0.00	0	0	0
9:57	30	30	3.17	0.14	0.14	3.36	3.36
10:27	30	60	3.35	0.18	0.32	4.32	3.84

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:27	0	0	3.03	0.00	0	0	0
10:57	30	30	3.2	0.17	0.17	4.08	4.08
11:27	30	60	3.35	0.15	0.32	3.60	3.84

Test conducted in clayey silt (Fill) (elev. 432.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:25	0	0	2.33	0.00	0	0	0
7:55	30	30	2.34	0.01	0.01	0.24	0.24
8:25	30	60	2.36	0.02	0.03	0.48	0.36

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:25	0	0	2.36	0.00	0	0	0
8:55	30	30	2.36	0.00	0.00	0.00	0.00
9:25	30	60	2.38	0.02	0.02	0.48	0.24

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:25	0	0	2.38	0.00	0	0	0
9:55	30	30	2.39	0.01	0.01	0.24	0.24
10:25	30	60	2.4	0.01	0.02	0.24	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:25	0	0	2.4	0.00	0	0	0
10:55	30	30	2.41	0.01	0.01	0.24	0.24
11:25	30	60	2.42	0.01	0.02	0.24	0.24

Test conducted in coarse to fine sand and gravel (Fill) (elev. 430.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:35	0	0	3.07	0.00	0	0	0
1:05	30	30	3.11	0.04	0.04	0.96	0.96
1:35	30	60	3.15	0.04	0.08	0.96	0.96

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:35	0	0	2.99	0.00	0	0	0
2:05	30	30	3.02	0.03	0.03	0.72	0.72
2:35	30	60	3.06	0.04	0.07	0.96	0.84

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:35	0	0	3.03	0.00	0	0	0
3:05	30	30	3.07	0.04	0.04	0.96	0.96
3:35	30	60	3.11	0.04	0.08	0.96	0.96

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
3:35	0	0	2.95	0.00	0	0	0
4:05	30	30	2.97	0.02	0.02	0.48	0.48
4:35	30	60	3.02	0.05	0.07	1.20	0.84

Test conducted in silty fine sand (elev. 428.50)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:38	0	0	2.8	0.00	0	0	0
1:08	30	30	3.45	0.65	0.65	15.60	15.60
1:38	30	60	3.87	0.42	1.07	10.08	12.84

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:38	0	0	2.93	0.00	0	0	0
2:08	30	30	3.53	0.60	0.60	14.40	14.40
2:38	30	60	3.89	0.36	0.96	8.64	11.52

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:38	0	0	2.94	0.00	0	0	0
3:08	30	30	3.51	0.57	0.57	13.68	13.68
3:38	30	60	3.91	0.40	0.97	9.60	11.64

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
3:38	0	0	3.04	0.00	0	0	0
4:08	30	30	3.55	0.51	0.51	12.24	12.24
4:38	30	60	3.94	0.39	0.90	9.36	10.80

Test conducted in silty coarse to fine sand and gravel (Fill) (elev. 427.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:40	0	0	2.57	0.00	0	0	0
1:10	30	30	2.57	0.00	0.00	0.00	0.00
1:40	30	60	2.57	0.00	0.00	0.00	0.00

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:40	0	0	2.57	0.00	0	0	0
2:10	30	30	2.57	0.00	0.00	0.00	0.00
2:40	30	60	2.57	0.00	0.00	0.00	0.00

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:40	0	0	2.57	0.00	0	0	0
3:10	30	30	2.58	0.01	0.01	0.24	0.24
3:40	30	60	2.58	0.00	0.01	0.00	0.12

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
3:40	0	0	2.58	0.00	0	0	0
4:10	30	30	2.58	0.00	0.00	0.00	0.00
4:40	30	60	2.58	0.00	0.00	0.00	0.00

Test conducted in silty coarse to fine sand (Fill) (elev. 426)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:42	0	0	2.89	0.00	0	0	0
1:12	30	30	3.84	0.95	0.95	22.80	22.80
1:42	30	60	4.1	0.26	1.21	6.24	14.52

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:42	0	0	3.07	0.00	0	0	0
2:12	30	30	3.64	0.57	0.57	13.68	13.68
2:42	30	60	3.93	0.29	0.86	6.96	10.32

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:42	0	0	3.04	0.00	0	0	0
3:12	30	30	3.72	0.68	0.68	16.32	16.32
3:42	30	60	4.09	0.37	1.05	8.88	12.60

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
3:42	0	0	3.02	0.00	0	0	0
4:12	30	30	3.78	0.76	0.76	18.24	18.24
4:42	30	60	4.18	0.40	1.16	9.60	13.92

Test conducted in silty coarse to fine sand and gravel (Fill) (elev. 424.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:45	0	0	3.03	0.00	0	0	0
1:15	30	30	3.08	0.05	0.05	1.20	1.20
1:45	30	60	3.15	0.07	0.12	1.68	1.44

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:45	0	0	2.89	0.00	0	0	0
2:15	30	30	2.94	0.05	0.05	1.20	1.20
2:45	30	60	3.01	0.07	0.12	1.68	1.44

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:45	0	0	3.01	0.00	0	0	0
3:15	30	30	3.05	0.04	0.04	0.96	0.96
3:45	30	60	3.09	0.04	0.08	0.96	0.96

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
3:45	0	0	3.01	0.00	0	0	0
4:15	30	30	3.06	0.05	0.05	1.20	1.20
4:45	30	60	3.1	0.04	0.09	0.96	1.08

Test conducted in silty coarse to fine sand and gravel (Fill) (elev. 424.25)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:22	0	0	3.01	0.00	0	0	0
7:52	30	30	3.03	0.02	0.02	0.48	0.48
8:22	30	60	3.05	0.02	0.04	0.48	0.48

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:22	0	0	3	0.00	0	0	0
8:52	30	30	3.02	0.02	0.02	0.48	0.48
9:22	30	60	3.04	0.02	0.04	0.48	0.48

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:22	0	0	3	0.00	0	0	0
9:52	30	30	3.02	0.02	0.02	0.48	0.48
10:22	30	60	3.04	0.02	0.04	0.48	0.48

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:22	0	0	3.01	0.00	0	0	0
10:52	30	30	3.03	0.02	0.02	0.48	0.48
11:22	30	60	3.05	0.02	0.04	0.48	0.48

Test conducted in coarse to fine sand and gravel (Fill) (elev. 428.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:31	0	0	3.03	0.00	0	0	0
8:01	30	30	3.82	0.79	0.79	18.96	18.96
8:31	30	60	4.34	0.52	1.31	12.48	15.72

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:31	0	0	3.01	0.00	0	0	0
9:01	30	30	3.92	0.91	0.91	21.84	21.84
9:31	30	60	4.32	0.40	1.31	9.60	15.72

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:31	0	0	3.02	0.00	0	0	0
10:01	30	30	3.92	0.90	0.90	21.60	21.60
10:31	30	60	4.38	0.46	1.36	11.04	16.32

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:31	0	0	3.45	0.00	0	0	0
11:01	30	30	4.04	0.59	0.59	14.16	14.16
11:31	30	60	4.3	0.26	0.85	6.24	10.20

Test conducted in clayey silt (Fill) (elev. 423.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:20	0	0	2.94	0.00	0	0	0
7:50	30	30	3.75	0.81	0.81	19.44	19.44
8:20	30	60	4.29	0.54	1.35	12.96	16.20

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:20	0	0	3.03	0.00	0	0	0
8:50	30	30	4.18	1.15	1.15	27.60	27.60
9:20	30	60	4.51	0.33	1.48	7.92	17.76

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:20	0	0	3.04	0.00	0	0	0
9:50	30	30	4.05	1.01	1.01	24.24	24.24
10:20	30	60	4.38	0.33	1.34	7.92	16.08

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:20	0	0	3.07	0.00	0	0	0
10:50	30	30	4.08	1.01	1.01	24.24	24.24
11:20	30	60	4.38	0.30	1.31	7.20	15.72

Test conducted in coarse to fine sand and gravel (Fill) (elev. 428.25)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:18	0	0	3.01	0.00	0	0	0
7:48	30	30	3.02	0.01	0.01	0.24	0.24
8:18	30	60	3.03	0.01	0.02	0.24	0.24

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:18	0	0	3.03	0.00	0	0	0
8:48	30	30	3.04	0.01	0.01	0.24	0.24
9:18	30	60	3.06	0.02	0.03	0.48	0.36

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:18	0	0	3.01	0.00	0	0	0
9:48	30	30	3.02	0.01	0.01	0.24	0.24
10:18	30	60	3.03	0.01	0.02	0.24	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:18	0	0	3	0.00	0	0	0
10:48	30	30	3.02	0.02	0.02	0.48	0.48
11:18	30	60	3.03	0.01	0.03	0.24	0.36

Test conducted in silty fine sand (elev. 430.25)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:17	0	0	2.99	0.00	0	0	0
7:47	30	30	3.01	0.02	0.02	0.48	0.48
8:17	30	60	3.02	0.01	0.03	0.24	0.36

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:17	0	0	3.02	0.00	0	0	0
8:47	30	30	3.03	0.01	0.01	0.24	0.24
9:17	30	60	3.04	0.01	0.02	0.24	0.24

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:17	0	0	3.01	0.00	0	0	0
9:47	30	30	3.01	0.00	0.00	0.00	0.00
10:17	30	60	3.03	0.02	0.02	0.48	0.24

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:17	0	0	2.98	0.00	0	0	0
10:47	30	30	3.01	0.03	0.03	0.72	0.72
11:17	30	60	3.02	0.01	0.04	0.24	0.48

Test conducted in silty coarse to fine sand (Fill) (elev. 430.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:56	0	0	2.76	0.00	0	0	0
12:26	30	30	3.02	0.26	0.26	6.24	6.24
12:56	30	60	3.2	0.18	0.44	4.32	5.28

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:56	0	0	2.97	0.00	0	0	0
1:26	30	30	3.13	0.16	0.16	3.84	3.84
1:56	30	60	3.25	0.12	0.28	2.88	3.36

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:56	0	0	3.03	0.00	0	0	0
2:26	30	30	3.17	0.14	0.14	3.36	3.36
2:56	30	60	3.28	0.11	0.25	2.64	3.00

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:56	0	0	2.91	0.00	0	0	0
3:26	30	30	3.06	0.15	0.15	3.60	3.60
3:56	30	60	3.16	0.10	0.25	2.40	3.00

Test conducted in clayey silt (elev. 423.25)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:58	0	0	3	0.00	0	0	0
12:28	30	30	3.04	0.04	0.04	0.96	0.96
12:58	30	60	3.07	0.03	0.07	0.72	0.84

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:58	0	0	2.98	0.00	0	0	0
1:28	30	30	3.01	0.03	0.03	0.72	0.72
1:58	30	60	3.04	0.03	0.06	0.72	0.72

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:58	0	0	2.95	0.00	0	0	0
2:28	30	30	2.98	0.03	0.03	0.72	0.72
2:58	30	60	3.01	0.03	0.06	0.72	0.72

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:58	0	0	3.01	0.00	0	0	0
3:28	30	30	3.04	0.03	0.03	0.72	0.72
3:58	30	60	3.07	0.03	0.06	0.72	0.72

Test conducted in silty coarse to fine sand and gravel (Fill) (elev. 422.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:06	0	0	3.06	0.00	0	0	0
10:36	30	30	3.08	0.02	0.02	0.48	0.48
11:06	30	60	3.1	0.02	0.04	0.48	0.48

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:06	0	0	3.01	0.00	0	0	0
11:36	30	30	3.02	0.01	0.01	0.24	0.24
12:06	30	60	3.03	0.01	0.02	0.24	0.24

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:06	0	0	3	0.00	0	0	0
12:36	30	30	3.02	0.02	0.02	0.48	0.48
1:06	30	60	3.03	0.01	0.03	0.24	0.36

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:06	0	0	3.01	0.00	0	0	0
1:36	30	30	3.02	0.01	0.01	0.24	0.24
2:06	30	60	3.03	0.01	0.02	0.24	0.24

Test conducted in fine sandy silt with clay (elev. 397.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:07	0	0	2.64	0.00	0	0	0
10:37	30	30	2.64	0.00	0.00	0.00	0.00
11:07	30	60	2.65	0.01	0.01	0.24	0.12

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:07	0	0	2.65	0.00	0	0	0
11:37	30	30	2.65	0.00	0.00	0.00	0.00
12:07	30	60	2.66	0.01	0.01	0.24	0.12

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:07	0	0	2.66	0.00	0	0	0
12:37	30	30	2.66	0.00	0.00	0.00	0.00
1:07	30	60	2.66	0.00	0.00	0.00	0.00

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:07	0	0	2.66	0.00	0	0	0
1:37	30	30	2.66	0.00	0.00	0.00	0.00
2:07	30	60	2.67	0.01	0.01	0.24	0.12

Test conductedd in silty fine sand (elev. 401.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:10	0	0	3.05	0.00	0	0	0
10:40	30	30	3.07	0.02	0.02	0.48	0.48
11:10	30	60	3.1	0.03	0.05	0.72	0.60

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:10	0	0	2.97	0.00	0	0	0
11:40	30	30	3	0.03	0.03	0.72	0.72
12:10	30	60	3.03	0.03	0.06	0.72	0.72

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:10	0	0	3	0.00	0	0	0
12:40	30	30	3.03	0.03	0.03	0.72	0.72
1:10	30	60	3.05	0.02	0.05	0.48	0.60

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:10	0	0	2.99	0.00	0	0	0
1:40	30	30	3.01	0.02	0.02	0.48	0.48
2:10	30	60	3.03	0.02	0.04	0.48	0.48

Test conducted in silty fine sand (elev. 414)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

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Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:13	0	0	3.04	0.00	0	0	0
10:43	30	30	3.07	0.03	0.03	0.72	0.72
11:13	30	60	3.1	0.03	0.06	0.72	0.72

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:13	0	0	3.01	0.00	0	0	0
11:43	30	30	3.05	0.04	0.04	0.96	0.96
12:13	30	60	3.07	0.02	0.06	0.48	0.72

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:13	0	0	3.01	0.00	0	0	0
12:43	30	30	3.04	0.03	0.03	0.72	0.72
1:13	30	60	3.07	0.03	0.06	0.72	0.72

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:13	0	0	3	0.00	0	0	0
1:43	30	30	3.03	0.03	0.03	0.72	0.72
2:13	30	60	3.06	0.03	0.06	0.72	0.72

Test conducted in silty coarse to fine sand (elev. 417)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-32
September 23, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:14	0	0	3.03	0.00	0	0	0
10:44	30	30	3.07	0.04	0.04	0.96	0.96
11:14	30	60	3.1	0.03	0.07	0.72	0.84

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:14	0	0	3.02	0.00	0	0	0
11:44	30	30	3.05	0.03	0.03	0.72	0.72
12:14	30	60	3.07	0.02	0.05	0.48	0.60

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:14	0	0	3	0.00	0	0	0
12:44	30	30	3.04	0.04	0.04	0.96	0.96
1:14	30	60	3.06	0.02	0.06	0.48	0.72

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:14	0	0	3	0.00	0	0	0
1:44	30	30	3.03	0.03	0.03	0.72	0.72
2:14	30	60	3.05	0.02	0.05	0.48	0.60

Test conducted in silty coarse to fine sand (elev. 422)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-33
September 24, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:26	0	0	3	0.00	0	0	0
7:56	30	30	3.04	0.04	0.04	0.96	0.96
8:26	30	60	3.08	0.04	0.08	0.96	0.96

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:26	0	0	3.03	0.00	0	0	0
8:56	30	30	3.06	0.03	0.03	0.72	0.72
9:26	30	60	3.1	0.04	0.07	0.96	0.84

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:26	0	0	3	0.00	0	0	0
9:56	30	30	3.03	0.03	0.03	0.72	0.72
10:26	30	60	3.07	0.04	0.07	0.96	0.84

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:26	0	0	3	0.00	0	0	0
10:56	30	30	3.05	0.05	0.05	1.20	1.20
11:26	30	60	3.08	0.03	0.08	0.72	0.96

Test conducted in silty fine sand (elev. 424.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-34
September 24, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:27	0	0	3.03	0.00	0	0	0
7:57	30	30	3.07	0.04	0.04	0.96	0.96
8:27	30	60	3.1	0.03	0.07	0.72	0.84

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:27	0	0	3.01	0.00	0	0	0
8:57	30	30	3.05	0.04	0.04	0.96	0.96
9:27	30	60	3.08	0.03	0.07	0.72	0.84

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:27	0	0	2.97	0.00	0	0	0
9:57	30	30	3	0.03	0.03	0.72	0.72
10:27	30	60	3.02	0.02	0.05	0.48	0.60

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:27	0	0	3	0.00	0	0	0
10:57	30	30	3.04	0.04	0.04	0.96	0.96
11:27	30	60	3.07	0.03	0.07	0.72	0.84

Test conducted in silty fine sand (elev. 425.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-35
September 26, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:08	0	0	2.95	0.00	0	0	0
7:38	30	30	3.59	0.64	0.64	15.36	15.36
8:08	30	60	3.81	0.22	0.86	5.28	10.32

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:08	0	0	3.05	0.00	0	0	0
8:38	30	30	3.53	0.48	0.48	11.52	11.52
9:08	30	60	3.76	0.23	0.71	5.52	8.52

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:08	0	0	3.03	0.00	0	0	0
9:38	30	30	3.51	0.48	0.48	11.52	11.52
10:08	30	60	3.77	0.26	0.74	6.24	8.88

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:08	0	0	3.08	0.00	0	0	0
10:38	30	30	3.54	0.46	0.46	11.04	11.04
11:08	30	60	3.79	0.25	0.71	6.00	8.52

Test conducted in clayey silt w/concrete fragments (Fill) (elev. 431.5)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-36
September 26, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:10	0	0	2.74	0.00	0	0	0
7:40	30	30	2.85	0.11	0:11	2.64	2.64
8:10	30	60	2.94	0.09	0.20	2.16	2.40

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:10	0	0	2.94	0.00	0	0	0
8:40	30	30	3.02	0.08	0.08	1.92	1.92
9:10	30	60	3.09	0.07	0.15	1.68	1.80

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:10	0	0	3	0.00	0	0	0
9:40	30	30	3.06	0.06	0.06	1.44	1.44
10:10	30	60	3.13	0.07	0.13	1.68	1.56

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:10	0	0	3.05	0.00	0	0	0
10:40	30	30	3.13	0.08	0.08	1.92	1.92
11:10	30	60	3.19	0.06	0.14	1.44	1.68

Test conducted in clayey silt (elev. 431)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-37
September 26, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:11	0	0	3.05	0.00	0	0	0
7:41	30	30	3.1	0.05	0.05	1.20	1.20
8:11	30	60	3.14	0.04	0.09	0.96	1.08

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:11	0	0	2.99	0.00	0	0	0
8:41	30	30	3.05	0.06	0.06	1.44	1.44
9:11	30	60	3.11	0.06	0.12	1.44	1.44

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:11	0	0	3	0.00	0	0	0
9:41	30	30	3.06	0.06	0.06	1.44	1.44
10:11	30	60	3.11	0.05	0.11	1.20	1.32

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:11	0	0	3.01	0.00	0	0	0
10:41	30	30	3.07	0.06	0.06	1.44	1.44
11:11	30	60	3.12	0.05	0.11	1.20	1.32

Test conducted in sand gravel and cobbles (Fill) (elev. 430)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-38
September 26, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
7:13	0	0	3.06	0.00	0	0	0
7:43	30	30	3.1	0.04	0.04	0.96	0.96
8:13	30	60	3.13	0.03	0.07	0.72	0.84

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
8:13	0	0	2.99	0.00	0	0	0
8:43	30	30	3.01	0.02	0.02	0.48	0.48
9:13	30	60	3.04	0.03	0.05	0.72	0.60

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
9:13	0	0	2.93	0.00	0	0	0
9:43	30	30	2.96	0.03	0.03	0.72	0.72
10:13	30	60	2.97	0.01	0.04	0.24	0.48

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
10:13	0	0	2.97	0.00	0	0	0
10:43	30	30	3.02	0.05	0.05	1.20	1.20
11:13	30	60	3.02	0.00	0.05	0.00	0.60

Test conducted in silty fine sand (elev. 430)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-39
September 26, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:53	0	0	2.95	0.00	0	0	0
12:23	30	30	3.01	0.06	0.06	1.44	1.44
12:53	30	60	3.06	0.05	0.11	1.20	1.32

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:53	0	0	3.02	0.00	0	0	0
1:23	30	30	3.07	0.05	0.05	1.20	1.20
1:53	30	60	3.13	0.06	0.11	1.44	1.32

Trial No. 3

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:53	0	0	2.99	0.00	0	0	0
2:23	30	30	3.04	0.05	0.05	1.20	1.20
2:53	30	60	3.1	0.06	0.11	1.44	1.32

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:53	0	0	2.98	0.00	0	0	0
3:23	30	30	3.04	0.06	0.06	1.44	1.44
3:53	30	60	3.09	0.05	0.11	1.20	1.32

Test conducted in silty coarse to fine sand and gravel (elev. 429)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate

Villanova University LAH Development
INFILTRATION TESTING RESULTS
TP-40
September 26, 2014

Trial No. 1

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
11:54	0	0	2.99	0.00	0	0	0
12:24	30	30	3.07	0.08	0.08	1.92	1.92
12:54	30	60	3.13	0.06	0.14	1.44	1.68

Trial No. 2

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
12:54	0	0	3.02	0.00	0	0	0
1:24	30	30	3.08	0.06	0.06	1.44	1.44
1:54	30	60	3.14	0.06	0.12	1.44	1.44

Trial No. 3

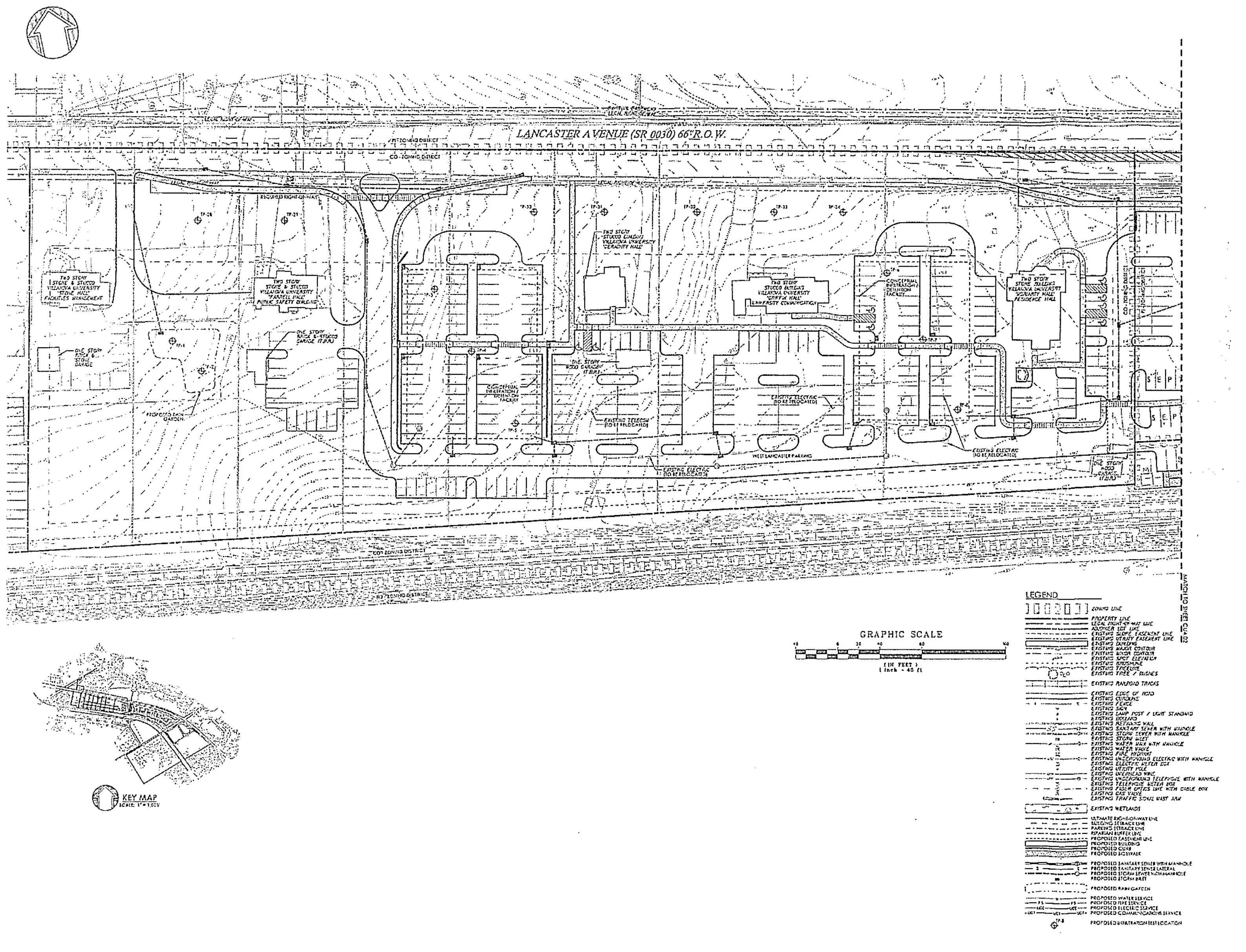
Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
1:54	0	0	3.02	0.00	0	0	0
2:24	30	30	3.08	0.06	0.06	1.44	1.44
2:54	30	60	3.14	0.06	0.12	1.44	1.44

Trial No. 4

Time	ti	T	Depth	hi	H	Ii	I
	(min)	(min)	(ft)	(ft)	(ft)	(in/hr)	(in/hr)
2:54	0	0	2.97	0.00	0	0	0
3:24	30	30	3.02	0.05	0.05	1.20	1.20
3:54	30	60	3.07	0.05	0.10	1.20	1.20

Test conducted in silty sand and gravel (elev. 429)

ti = duration of interval
T = cumulative time
Depth = distance from top of pipe to top of water level in pipe
hi = change in depth during interval
H = cumulative change in depth
Ii = infiltration rate for interval
I = cumulative infiltration rate



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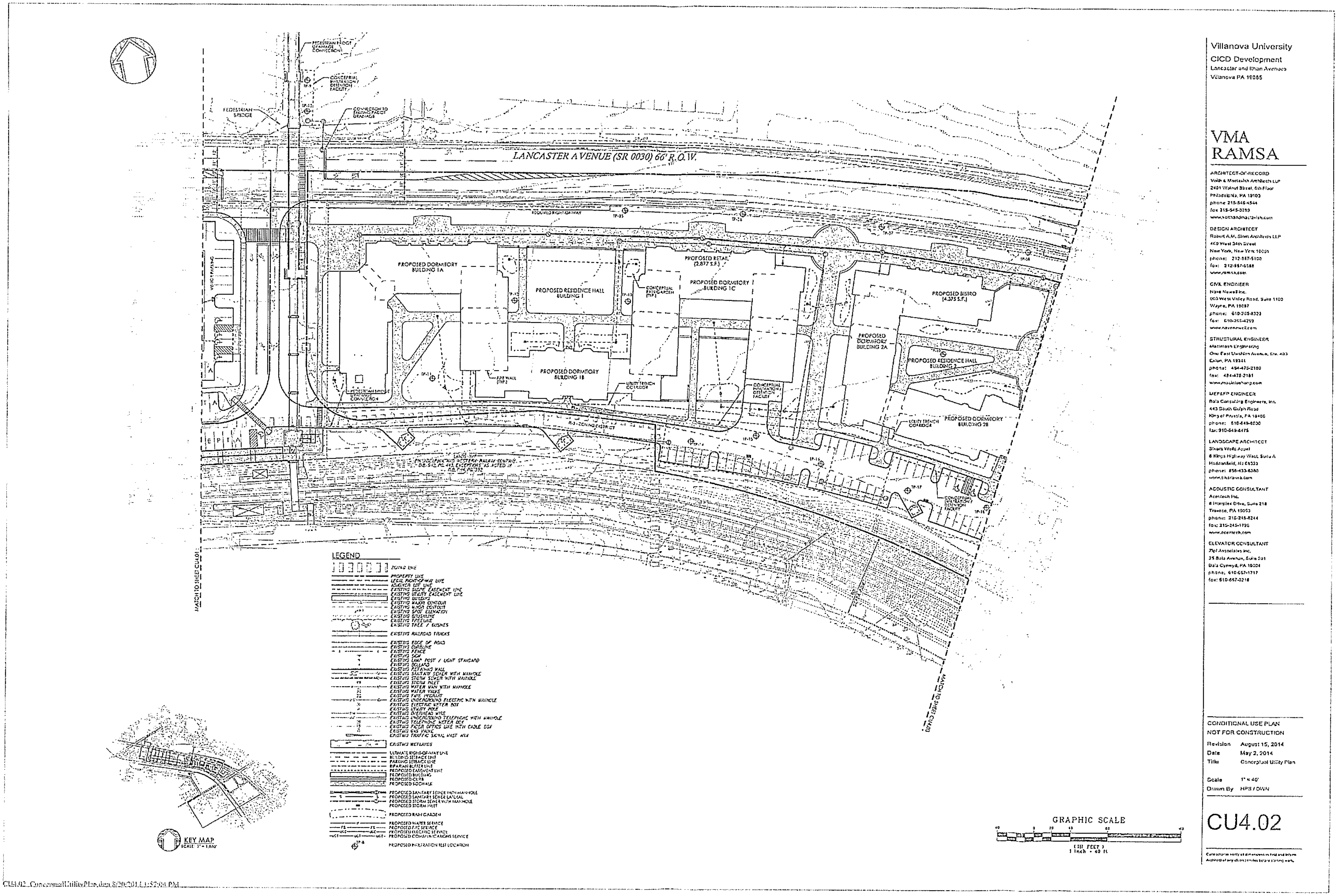
CONDITIONAL USE PLAN
NOT FOR CONSTRUCTION

Revision	August 15, 2014
Date	May 2, 2014
Title	Conceptual Utility Plan
Scale	1" = 40'
Drawn By	HPS / DWN

CU4.01

Contractor to verify all dimensions in field and inform Architect of any discrepancies before starting work.

CU4.01_ConceptualUtilityPlan.dwg 8/20/2014 2:42:55 PM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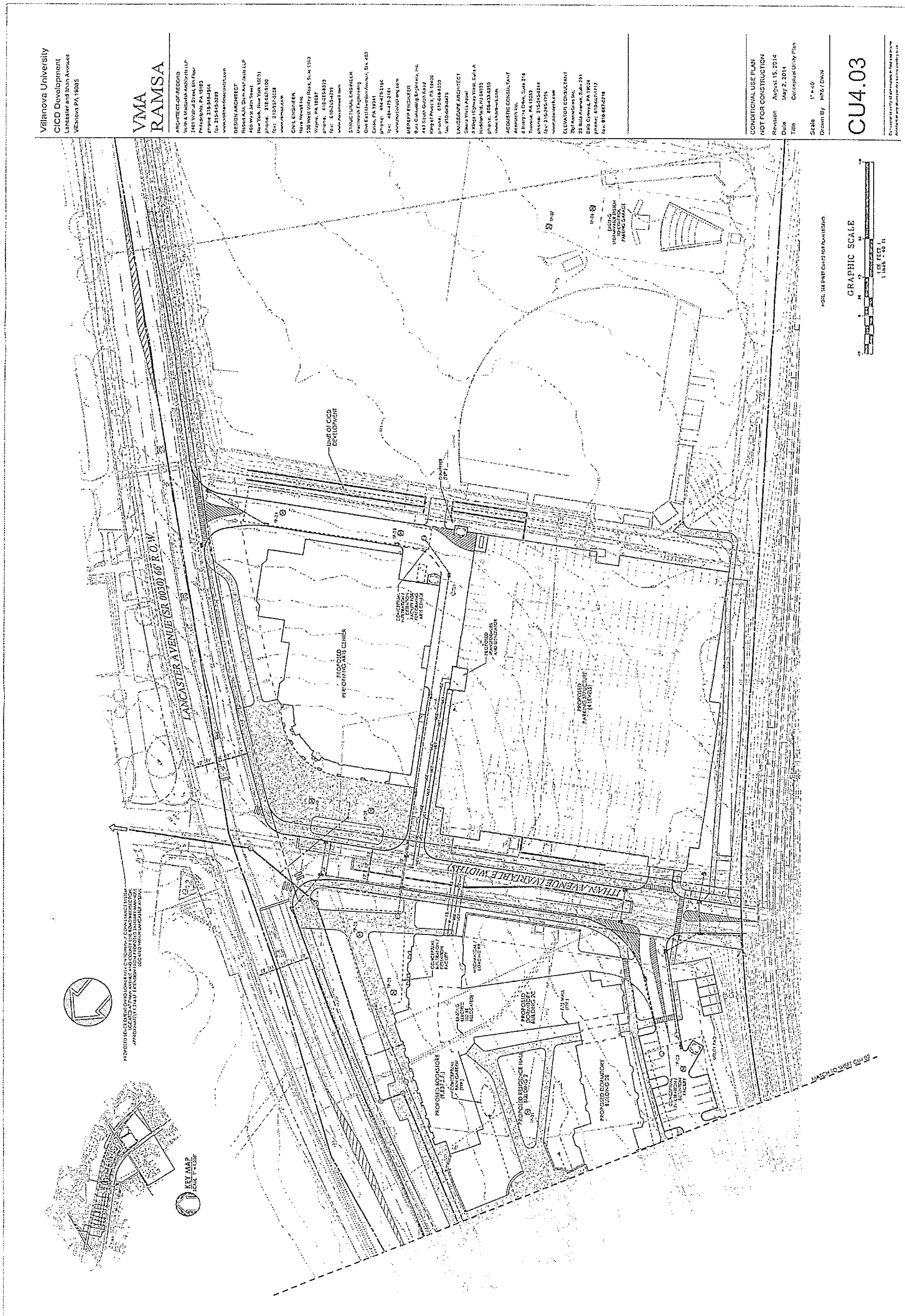
CONDITIONAL USE PLAN
NOT FOR CONSTRUCTION
Revision August 15, 2014
Date May 2, 2014
Title Conceptual Utility Plan
Scale 1" = 40'
Drawn By HPS / DWN
CU4.02
LANCASTER AVENUE (SR 0030) 66' R.O.W.
PEDESTRIAN BRIDGE
PROPOSED DORMITORY BUILDING 1A
PROPOSED RESIDENCE HALL BUILDING 1
PROPOSED RETAIL (2,877 S.F.)
PROPOSED DORMITORY BUILDING 1C
PROPOSED DORMITORY BUILDING 1B
PROPOSED BISTRO (4,375 S.F.)
PROPOSED DORMITORY BUILDING 2A
PROPOSED RESIDENCE HALL BUILDING 2
PROPOSED DORMITORY BUILDING 2B
LEGEND
GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.
KEY MAP
MATCH TO SHEET CU4.01
MATCH TO SHEET CU4.03


Villanova University
CICD Development
Lancaster and Ithan Avenues
Villanova PA 19085
VMA
RAMSA
CONDITIONAL USE PLAN
NOT FOR CONSTRUCTION
Revision August 15, 2014
Date May 2, 2014
Title Conceptual Utility Plan
CU4.03
GRAPHIC SCALE
LANCASTER AVENUE (SR 0030) 60' R.O.W.
ITHAN AVENUE (VARIABLE WIDTH)
PROPOSED PERFORMING ARTS CENTER
PROPOSED PARKING STRUCTURE (4 LEVELS)
KEY MAP

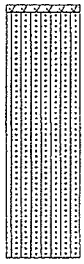
APPENDIX A

LOG OF TEST BORING

TEST BORING TP-1

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: None Encountered

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 405.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

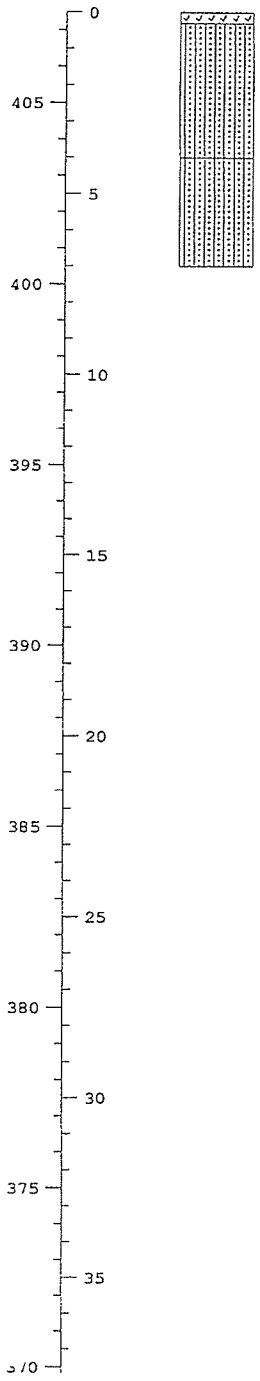
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
405 — 0		Topsoil with root mat. 405 / 0.2 Medium dense moist gray-brown silty fine SAND, trace clay. 404.8			
400 — 5		7.0			
395 — 10		Completion Depth = 7 feet 398 END OF TEST BORING @ 7.0 FT.			
385 — 20					
380 — 25					
375 — 30					
370 — 35					

LOG OF TEST BORING

TEST BORING TP-2

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: None Encountered

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 407.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds



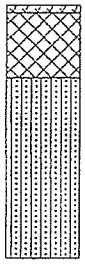
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
		Topsoil with grass root mat. 407.5			
		0.3			
		Medium dense moist orange-brown silty fine SAND. 407.2			
		4.0			
		Medium dense moist gray-brown silty coarse to fine SAND, trace gravel. 403.5			
		7.0			
		Completion Depth = 7 feet 400.5 END OF TEST BORING @ 7.0 FT.			

LOG OF TEST BORING

TEST BORING TP-3

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: None Encountered

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 414.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
414.5 / 0		Topsoil with grass root mat. 0.2			
414.3		Medium dense moist brown silty coarse to fine SAND, trace gravel. (FILL) 2.0			
412.5		Medium dense moist brown silty coarse to fine SAND. 7.0			
407.5		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			

410 — 5
405 — 10
400 — 15
395 — 20
390 — 25
385 — 30
380 — 35

LOG OF TEST BORING

TEST BORING TP-4

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: None Encountered

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 419.3 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

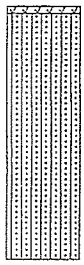
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
419.3 / 0		Aggregate SAND and GRAVEL.			
419.3 / 0.5		Medium dense moist brown silty fine SAND, trace gravel.			
418.8					
415 / 5					
7.0		Medium dense to dense moist gray-brown silty coarse to fine SAND.			
412.3		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			
410 / 10					
405 / 15					
400 / 20					
395 / 25					
390 / 30					
385 / 35					

LOG OF TEST BORING

TEST BORING TP-5

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: None Encountered

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 423.3 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

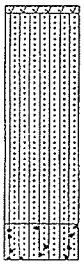
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 423.3		Topsoil with grass root mat. 0.2			
420 / 5		Medium dense to dense moist brown silty coarse to fine SAND. 423.1			
		7.0			
415 / 10		Completion Depth = 7 feet 416.3 END OF TEST BORING @ 7.0 FT.			
410 / 15					
405 / 20					
400 / 25					
395 / 30					
390 / 35					

LOG OF TEST BORING

TEST BORING TP-6

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: None Encountered

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 435.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

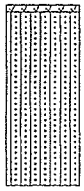
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
435 — 0		Topsoil with root mat. 435.5 0.2 Medium dense moist brown silty fine SAND. 435.3 6.0 Dense moist brown silty coarse to fine SAND with gravel. 429.5 7.0 428.5 Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			
430 — 5					
425 — 10					
415 — 20					
410 — 25					
405 — 30					
400 — 35					

LOG OF TEST BORING

TEST BORING TP-7

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: None Encountered

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 436.3 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
0 / 435		Topsoil root mat.	436.3			
			0.2			
		Medium dense to dense moist brown silty fine SAND.	436.1			
5 / 430			5.0			
		Completion Depth = 5 feet END OF TEST BORING @ 5.0 FT.	431.3			
10 / 425						
15 / 420						
20 / 415						
25 / 410						
30 / 405						
35						

LOG OF TEST BORING

TEST BORING TP-8

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 436.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
0 / 435		Topsoil with grass root mat.	436.5			
			0.3			
		Medium dense to dense moist brown silty fine SAND.	436.2			
5 / 430			7.0			
		Completion Depth = 7 feet	429.5			
10 / 425		END OF TEST BORING @ 7.0 FT.				
15 / 420						
20 / 415						
25 / 410						
30 / 405						
35						

LOG OF TEST BORING

TEST BORING TP-11

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 438.8 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
0 / 438.8		Asphalt.	438.8			
			0.4			
		Aggregate base course.	438.4			
			0.7			
		Medium dense moist brown fine sandy SILT. (FILL)	438.1			
			3.0			
435 / 5		Medium dense moist gray-brown fine sandy SILT, trace metal debris. (FILL)	435.8			
			7.0			
430 / 10		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.	431.8			
425 / 15						
420 / 20						
415 / 25						
410 / 30						
405 / 35						

LOG OF TEST BORING

TEST BORING TP-12

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 437.5 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
0 / 437.5		Asphalt.	437.5 0.4			
		Aggregate base course.	437.1 0.9			
		Medium dense moist brown silty coarse to fine SAND.	436.6			
		(FILL)	4.0			
5 / 433.5		Soft gray clayey SILT with wood, brick, and metal debris.	433.5 5.5			
		(FILL)	432			
		Soft dark gray black organic SILT.	7.0 430.5			
		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.				

435 — 430 — 425 — 420 — 415 — 410 — 405 — 400

10 — 15 — 20 — 25 — 30 — 35

LOG OF TEST BORING

TEST BORING TP-13

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 435.5 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

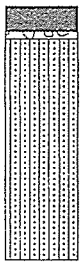
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
435 / 0		Asphalt. 435.5 / 0.4 Aggregate base course. 435.1 / 0.8 Medium dense moist gray coarse to fine SAND and GRAVEL, trace cobbles. 434.7 (FILL)			
430 / 5		5.0 Medium dense moist gray micaceous silty coarse to fine SAND. 430.5 (FILL) 7.0 / 428.5			
425 / 10		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			
415 / 20					
410 / 25					
405 / 30					
400 / 35					

LOG OF TEST BORING

TEST BORING TP-14

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

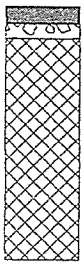
PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 433.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
0 / 433.5		Asphalt.	433.5			
		Aggregate base course.	0.7 432.8			
		Medium dense moist gray-brown micaceous silty fine SAND.	0.9 432.6			
7.0		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.	426.5			

LOG OF TEST BORING
TEST BORING TP-15

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 432.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 432.5		Asphalt. 0.5 / 432 Aggregate base course. 0.9 / 431.6 Loose gray-brown silty coarse to fine SAND and GRAVEL, trace concrete fragments. (FILL)			
7.0 / 425.5		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			

LOG OF TEST BORING

TEST BORING TP-16

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 431.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

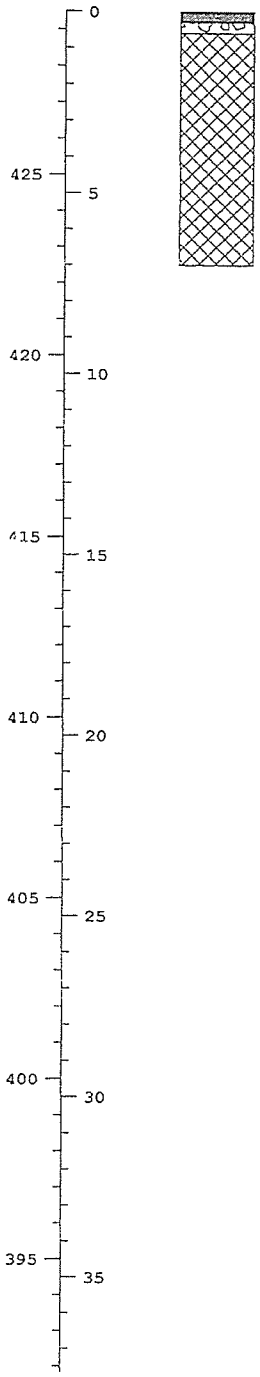
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 430		Asphalt. 431 0.4 Aggregate base course. 430.6 0.8 Medium dense moist brown silty coarse to fine SAND, trace gravel. 430.2 (FILL) 5.0 Concrete rubble. 426 7.0			
5 / 425		Completion Depth = 7 feet 424 END OF TEST BORING @ 7.0 FT.			
10 / 420					
15 / 415					
20 / 410					
25 / 405					
30 / 400					
35 / 395					

LOG OF TEST BORING

TEST BORING TP-17

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 429.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds



ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
		Asphalt.	429.5 0.3			
		Aggregate base course.	429.2 0.6			
		Loose moist brown silty coarse to fine SAND and GRAVEL, trace glass fragments. (FILL)	428.9			
			7.0			
		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.	422.5			

LOG OF TEST BORING

TEST BORING TP-18

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 429.3 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
0		Asphalt.	429.3			
			0.2			
		Aggregate base course.	429.1			
			0.6			
425 5		Loose, very moist silty coarse to fine SAND and GRAVEL, trace metal debris and batteries. (FILL)	428.5			
			7.0			
		Completion Depth = 7 feet	422.3			
420 10		END OF TEST BORING @ 7.0 FT.				
415 15						
410 20						
405 25						
400 30						
395 35						

LOG OF TEST BORING

TEST BORING TP-19

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 433.5 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
0		Asphalt.	433.5			
			0.5			
		Aggregate base course.	433			
			0.9			
		Loose to medium dense moist brown silty coarse to fine SAND.	432.6			
430		(FILL)	4.0			
5		Brown coarse to fine SAND and GRAVEL with concrete rubble.	429.5			
			6.0			
		Medium dense brown silty fine SAND.	427.5			
			7.0			
		Completion Depth = 7 feet	426.5			
425		END OF TEST BORING @ 7.0 FT.				
10						
420						
15						
415						
20						
410						
25						
405						
30						
400						
35						

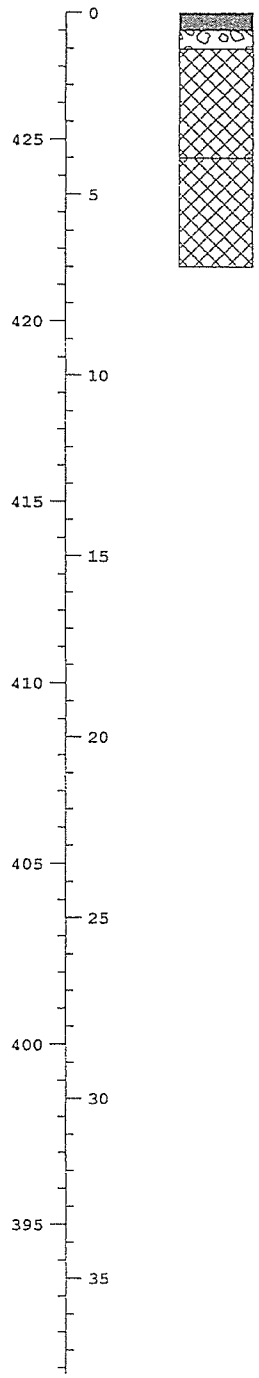
LOG OF TEST BORING

TEST BORING TP-20

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 428.5 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
428.5 / 0		Asphalt.			
428 / 0.5		Aggregate base course.			
427.5 / 1.0		Medium dense moist brown silty SAND. (FILL)			
424.5 / 4.0		Soft very moist gray clayey SILT, trace wood debris and ash. (FILL)			
421.5 / 7.0		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			



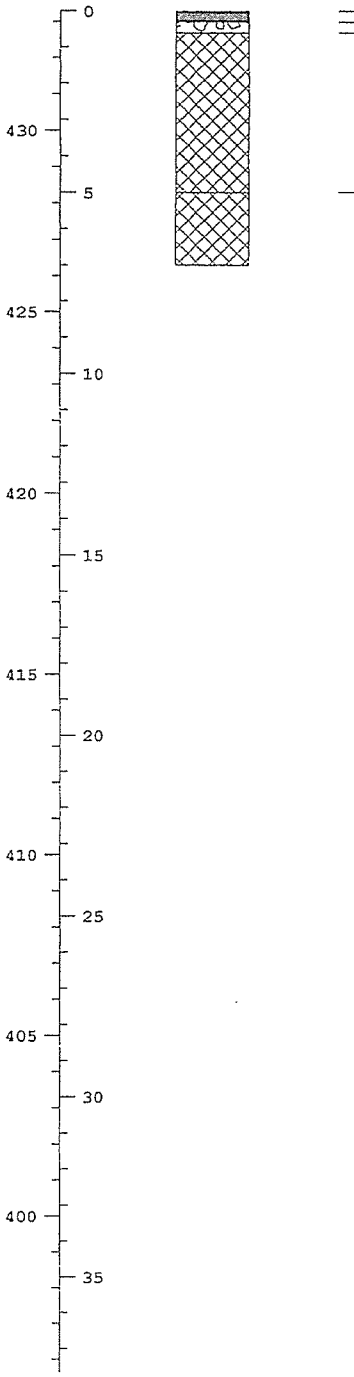
LOG OF TEST BORING

TEST BORING TP-21

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 433.3 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
433.3 / 0		Asphalt.			
433 / 0.3		Aggregate base course.			
432.7 / 0.6		Medium dense moist brown coarse to fine SAND and aggregate GRAVEL. (FILL)			
428.3 / 5.0		Soft very moist gray clayey SILT. (FILL)			
426.3 / 7.0		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			

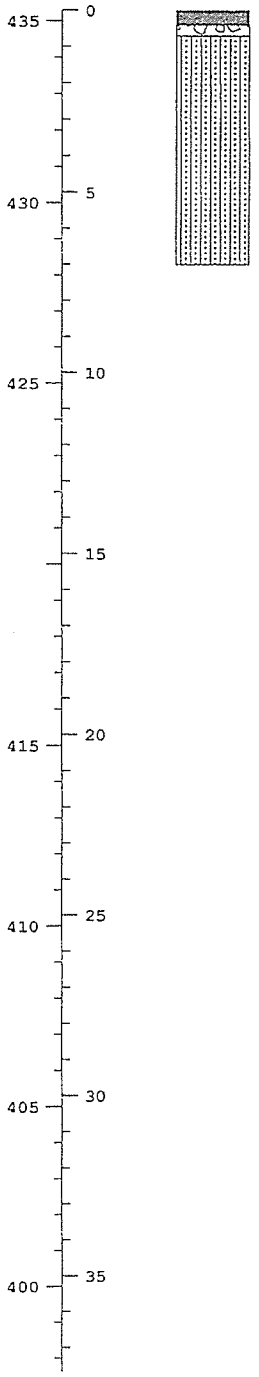


LOG OF TEST BORING

TEST BORING TP-22

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 435.3 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds



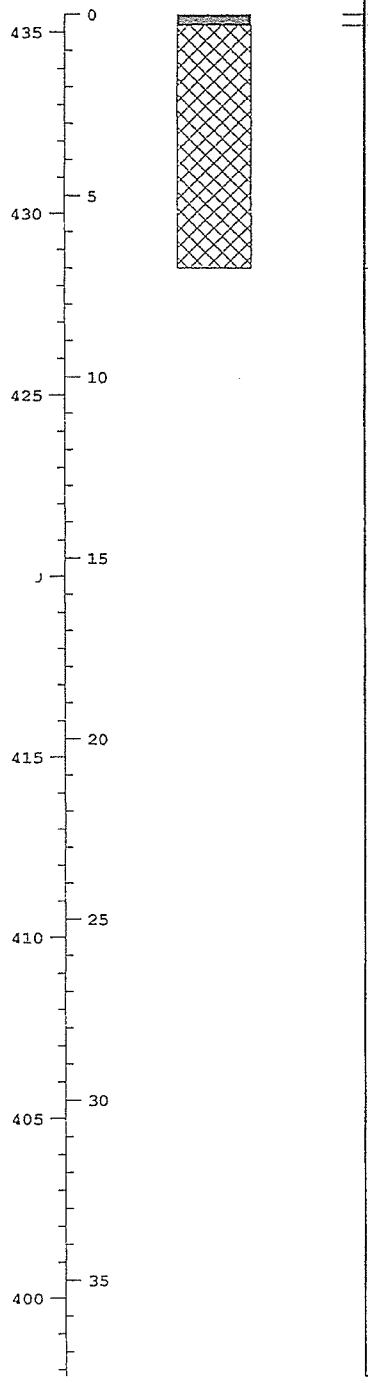
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
		Asphalt.	435.3 0.4			
		Aggregate base course.	434.9 0.7			
		Medium dense moist brown silty fine SAND.	434.6			
			7.0			
		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.	428.3			

LOG OF TEST BORING

TEST BORING TP-23

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 435.5 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds



ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
		Asphalt.	435.5 0.3			
		Medium dense moist brown silty coarse to fine SAND, trace cobbles. (FILL)	435.2			
			7.0			
		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.	428.5			

LOG OF TEST BORING

TEST BORING TP-24

DATE: 9/25/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 428.3 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description		SPT (N)	Moisture (%)	Other Tests
428.3 / 0		Asphalt.	428.3			
			0.4			
		Aggregate base course.	427.9			
			0.8			
		Dense moist brown-gray silty SAND and GRAVEL with cobbles. (FILL)	427.5			
			4.5			
425 / 5		Stiff moist light brown clayey SILT.	423.8			
			7.0			
421.3		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.				
420 / 10						
415 / 15						
410 / 20						
405 / 25						
400 / 30						
395 / 35						

LOG OF TEST BORING

TEST BORING TP-25

DATE: 9/25/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 427.5 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

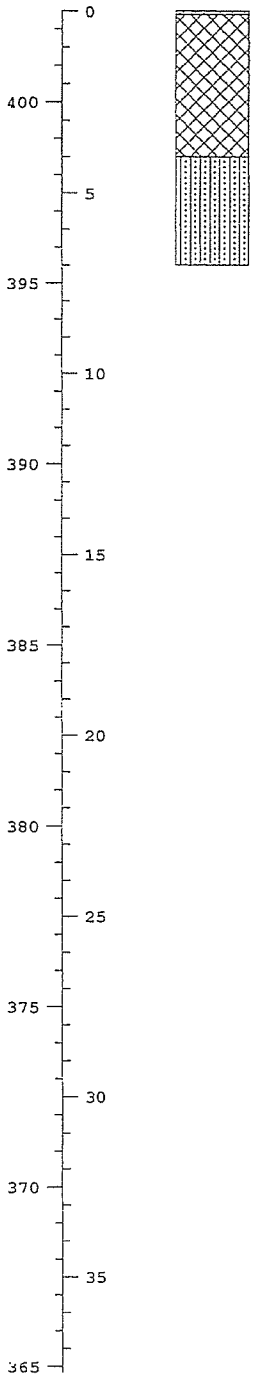
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 427.5		Asphalt. 0.4			
0.4 / 427.1		Aggregate base course. 0.8			
0.8 / 426.7		Dense moist brown silty coarse to fine SAND and GRAVEL, trace cobbles. (FILL)			
7.0 / 420.5		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			

425 — 5
420 — 10
415 — 15
410 — 20
405 — 25
400 — 30
395 — 35
390

LOG OF TEST BORING
TEST BORING TP-28

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 402.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

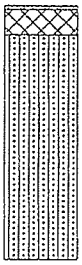


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
		Grass root mat. 402.5 0.1 Medium dense moist light brown silty fine SAND, trace gravel. 402.4 (FILL) 4.0			
		Medium dense moist fine sandy SILT with clay. 398.5 7.0			
		Completion Depth = 7 feet 395.5 END OF TEST BORING @ 7.0 FT.			

LOG OF TEST BORING
TEST BORING TP-29

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 406.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 406.5		Topsoil with root mat. 0.1 / 406.4			
		Aggregate GRAVEL and COBBLES. (FILL) 0.8 / 405.7			
5 / 400		Medium dense moist brown silty SAND, trace gravel. 7.0			
10 / 395		Completion Depth = 7 feet 399.5 END OF TEST BORING @ 7.0 FT.			
15 / 390					
20 / 385					
25 / 380					
30 / 375					
35					

LOG OF TEST BORING

TEST BORING TP-30

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 419.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

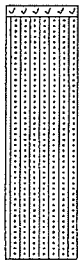
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 419		Grass root mat. 0.2			
		Medium dense moist brown silty fine SAND. 418.8			
5 / 415					
7.0 / 412		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			
10 / 410					
15 / 405					
20 / 400					
25 / 395					
30 / 390					
35 / 385					

LOG OF TEST BORING

TEST BORING TP-31

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

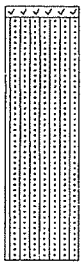
PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 422.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 420		Topsoil with grass root mat. 422 0.3 Medium dense moist brown silty coarse to fine SAND. 421.7			
5 / 415		7.0 Completion Depth = 7 feet 415 END OF TEST BORING @ 7.0 FT.			
10 / 410					
15 / 405					
20 / 400					
25 / 395					
30 / 390					
35					

LOG OF TEST BORING
TEST BORING TP-32

DATE: 9/22/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

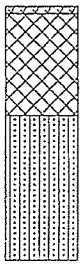
PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 427.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 427		Topsoil with grass root mat. 0.3			
425 / 2		Medium dense moist brown silty coarse to fine SAND. 426.7			
5					
420 / 7.0		Completion Depth = 7 feet 420 END OF TEST BORING @ 7.0 FT.			
10					
415					
15					
410					
20					
405					
25					
400					
30					
395					
35					

LOG OF TEST BORING
TEST BORING TP-33

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 429.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

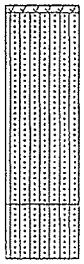
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 429.5		Topsoil with grass root mat. 0.2 / 429.5			
		Medium dense moist brown silty SAND. (FILL) 3.0 / 429.3			
425 / 5		Medium dense to dense silty fine SAND. 7.0 / 426.5			
420 / 10		Completion Depth = 7 feet 422.5 END OF TEST BORING @ 7.0 FT.			
415 / 15					
410 / 20					
405 / 25					
400 / 30					
395 / 35					

LOG OF TEST BORING

TEST BORING TP-34

DATE: 9/23/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 430.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
430 / 0		Topsoil with grass root mat. 430.5 0.2 Medium dense moist brown silty fine SAND. 430.3			
425 / 5		5.5 425 Dense moist brown silty coarse to fine SAND, trace gravel. 7.0			
420 / 10		423.5 Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			
415 / 15					
410 / 20					
405 / 25					
400 / 30					
395 / 35					

LOG OF TEST BORING

TEST BORING TP-35

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 436.5 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 436.5		Asphalt. 0.3			
0.3 / 436.2		Aggregate base course. 0.6			
0.6 / 435.9		Medium dense moist brown silty coarse to fine SAND. (FILL) 2.5			
2.5 / 434		Soft moist gray to black clayey SILT, trace concrete fragments and metal debris. (FILL) 7.0			
7.0 / 429.5		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.			

435 — 5 — 430 — 10 — 425 — 15 — 420 — 20 — 415 — 25 — 410 — 30 — 405 — 35

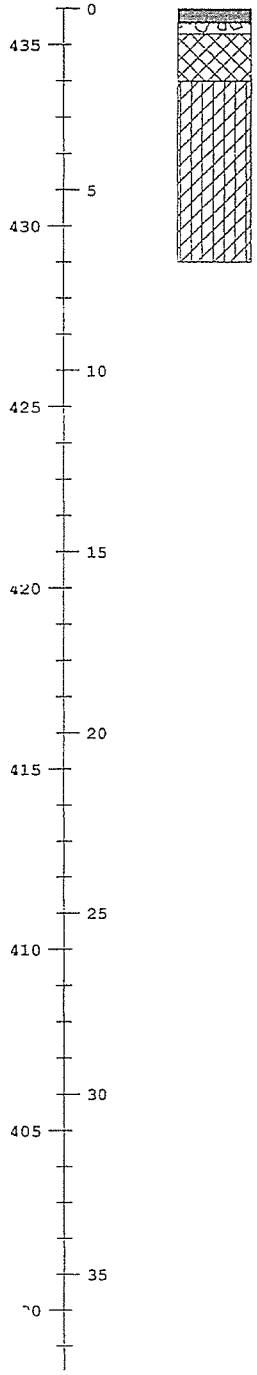
ADVANCED GEOSERVICES

LOG OF TEST BORING

TEST BORING TP-36

DATE: 9/24/14
PROJECT: Villanova University LAH Project
B[illegible]ING LOCATION: See Drawings
D[illegible]LING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 436.0 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds



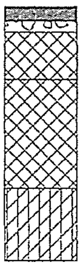
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
		Asphalt. 436 / 0.4			
		Aggregate base course. 435.6 / 0.7			
		Medium dense brown silty SAND and GRAVEL. (FILL) 435.3 / 2.0			
		Firm very moist brown gray clayey SILT. 434 / 7.0			
		Completion Depth = 7 feet 429 END OF TEST BORING @ 7.0 FT.			

LOG OF TEST BORING

TEST BORING TP-37

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 435.0 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

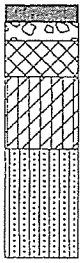
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	Elev. / Depth	SPT (N)	Moisture (%)	Other Tests
435 / 0		Asphalt.	435 / 0.4			
		Aggregate base course.	434.6 / 0.7			
		Medium dense moist brown silty coarse to fine SAND. (FILL)	434.3 / 2.0			
430 / 5		Dense moist brown SAND, GRAVEL and COBBLES. (FILL)	433 / 5.0			
		Firm moist gray brown clayey SILT.	430 / 7.0			
			428			
425 / 10		Completion Depth = 7 feet END OF TEST BORING @ 7.0 FT.				
15						
415 / 20						
410 / 25						
405 / 30						
400 / 35						

LOG OF TEST BORING

TEST BORING TP-38

DATE: 9/24/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 435.0 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

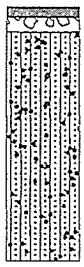
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
435 — 0		Asphalt. 435 / 0.5			
		Aggregate base course. 434.5 / 1.0			
		Medium dense moist gray brown silty SAND. (FILL) 434 / 2.0			
		Soft to firm very moist gray clayey SILT. 433 / 4.0			
430 — 5		Medium dense moist brown silty fine SAND. 431 / 7.0			
		Completion Depth = 7 feet 428 END OF TEST BORING @ 7.0 FT.			
425 — 10					
15					
415 — 20					
410 — 25					
405 — 30					
400 — 35					

LOG OF TEST BORING

TEST BORING TP-39

DATE: 9/25/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 434.0 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 434		Asphalt. 0.3			
		Aggregate base course. 433.7 0.7			
430 / 5		Medium dense moist brown silty coarse to fine SAND and GRAVEL. 433.3			
		7.0			
425 / 10		Completion Depth = 7 feet 427 END OF TEST BORING @ 7.0 FT.			
420 / 15					
415 / 20					
410 / 25					
405 / 30					
400 / 35					

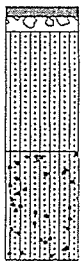
ADVANCED GEOSERVICES

LOG OF TEST BORING

TEST BORING TP-40

DATE: 9/25/14
PROJECT: Villanova University LAH Project
BORING LOCATION: See Drawings
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earth Core Services
WATER ENCOUNTERED AT: Dry at Completion

PROJECT NO.: 2014-3198-01
SURFACE ELEVATION: 434.0 ft.
CHECKED BY: PFM
DRILLER: T. Fryberger
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
0 / 434		Asphalt. 0.3			
		Aggregate base course. 433.7			
		Medium dense moist brown silty fine SAND. 0.7 / 433.3			
430 / 5		4.0			
		Medium dense moist brown silty SAND and GRAVEL. 430			
		7.0			
425 / 10		Completion Depth = 7 feet 427 END OF TEST BORING @ 7.0 FT.			
420 / 15					
415 / 20					
410 / 25					
405 / 30					
400 / 35					

ADVANCED GEOSERVICES

Appendix

20112071855
20112071869
20112071907
20112071937
PROJECT SERIAL NO. 20113021372

CALL BEFORE YOU DIG!

PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE – STOP CALL.

Pennsylvania One Call System, Inc.

1-800-242-1776

Villanova University

Lancaster Avenue Housing

Lancaster and Ithan Avenues

Villanova PA 19085

VMA
RAMSA

ARCHITECT-OF-RECORD
Voith & Mactavish Architects LLP
2401 Walnut Street, 6th Floor
Philadelphia, PA 19103
phone: 215-545-4544
fax: 215-545-3299
www.voithandmactavish.com

DESIGN ARCHITECT
Robert A.M. Stern Architects LLP
460 West 34th Street
New York, New York 10001
phone: 212-967-5100
fax: 212-967-5588
www.ramsa.com

CIVIL ENGINEER
Nave Newell Inc.
900 West Valley Road, Suite 1100
Wayne, PA 19087
phone: 610-265-8323
fax: 610-265-4299
www.navenewell.com

STRUCTURAL ENGINEER
MacIntosh Engineering
One East Uwchlan Avenue, Ste. 403
Exton, PA 19341
phone: 484-475-2180
fax: 484-475-2181
www.macintosheng.com

MEP&FP ENGINEER
Bala Consulting Engineers, Inc.
443 South Gulph Road
King of Prussia, PA 19406
phone: 610-649-8000
fax: 910-649-8475

LANDSCAPE ARCHITECT
Sikora Wells Appel
8 Kings Highway West, Suite A
Haddonfield, NJ 08033
phone: 856-433-6381
www.sikora-wa.com

ACOUSTIC CONSULTANT
Acentech Inc.
8 Interplex Drive, Suite 218
Trevose, PA 19053
phone: 215-245-8244
fax: 215-245-1796
www.acentech.com

ELEVATOR CONSULTANT
Zipf Associates Inc.
25 Bala Avenue, Suite 201
Bala Cynwyd, PA 19004
phone: 610-667-1717
fax: 610-667-0216

Gregory C. Newell

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
GREGORY C. NEWELL
ENGINEER
36760-E

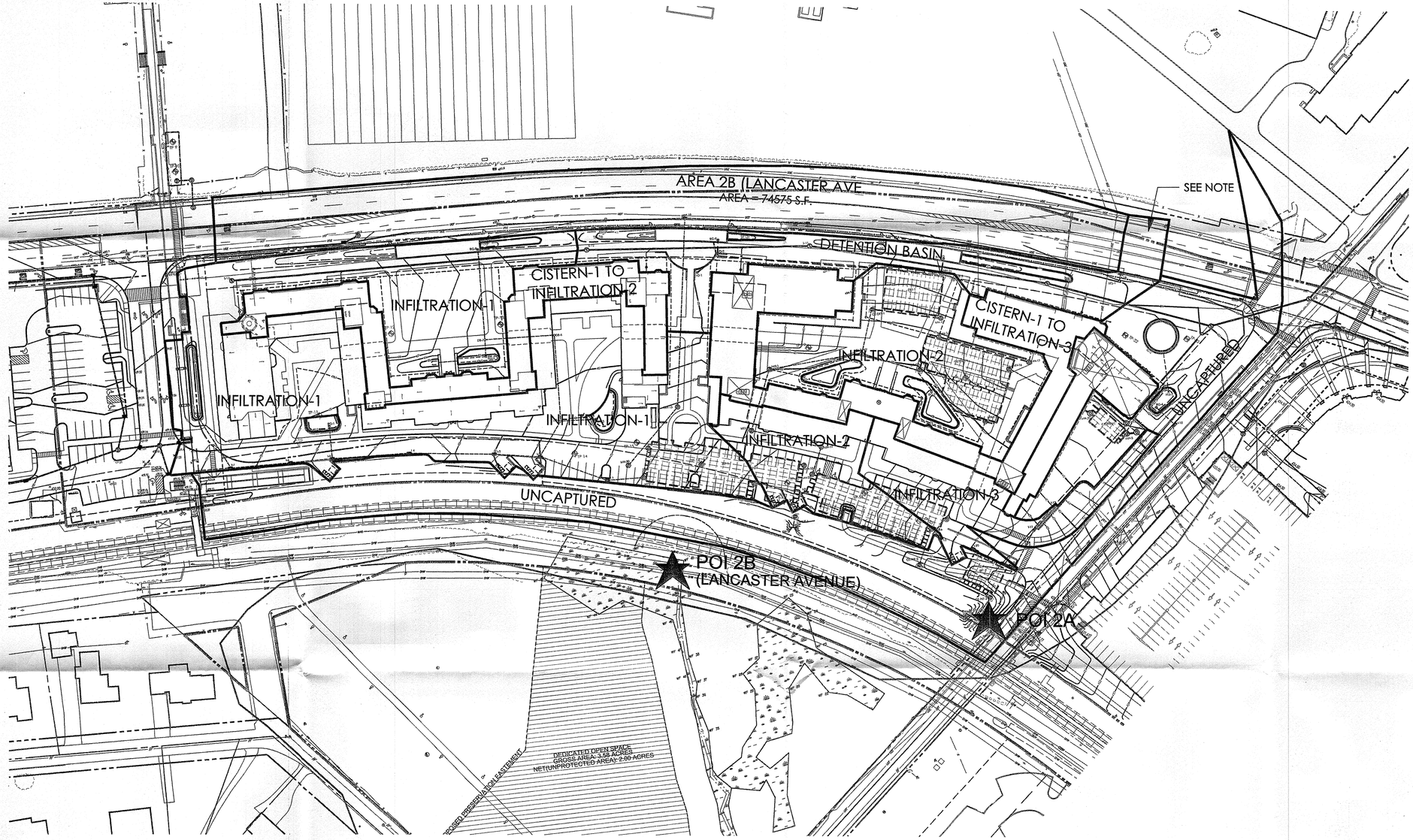
PRELIM. LAND DEVELOPMENT SUBMISSION

Revision	
Date	December 5, 2014
Title	Pre Development Drainage Plan
Scale	1" = 60'
Drawn By	MMB

1 OF 4

Sheet No. 1 of 4

Contractor to verify all dimensions in field and inform Architect of any discrepancies before starting work.



20112071855
20112071869
20112071907
20112071937
PROJECT SERIAL NO. 20112071972

CALL BEFORE YOU DIG!

PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE – STOP CALL.

Pennsylvania One Call System, Inc.

1-800-242-1776

PEAK RATE

INFILTRATION 1

CN = 85	CN = 74	TOTAL
Tc = 10 MIN	Tc = 38.4 MIN	AREA = 3.139 AC
A = 1.518 AC	A = 1.612 AC	

INFILTRATION 2

CN = 93	CN = 75	CN = 98	TOTAL
Tc = 10 MIN	Tc = 14.9 MIN	Tc = 10 MIN	AREA = 3.045 AC
A = 0.681 AC	A = 1.083 AC	A = 1.281 AC	

INFILTRATION 3

CN = 83
Tc = 10 MIN
A = 0.291 AC

DETENTION BASIN 1

CN = 77
Tc = 23.7 MIN
A = 0.702 AC

UNCAPTURED

CN = 77	CN = 96	CN = 98	TOTAL
Tc = 10 MIN	Tc = 10 MIN	Tc = 10 MIN	AREA = 2.301 AC
A = 1.916 AC	A = 0.181 AC	A = 0.204 AC	

LANCASTER AVENUE WIDENING

NOTE: 3000 S.F. FOR PROPOSED WIDENING IS OFFSET BY ADDING 3000 S.F. TO AREA 2A. THEREFORE, THERE IS NO IMPACT TO POI 2B.

Villanova University
Lancaster Avenue Housing
Lancaster and Ithan Avenues
Villanova PA 19085

VMA
RAMSA

ARCHITECT-OF-RECORD
Voith & Mactavish Architects LLP
2401 Walnut Street, 6th Floor
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PRELIM. LAND DEVELOPMENT SUBMISSION

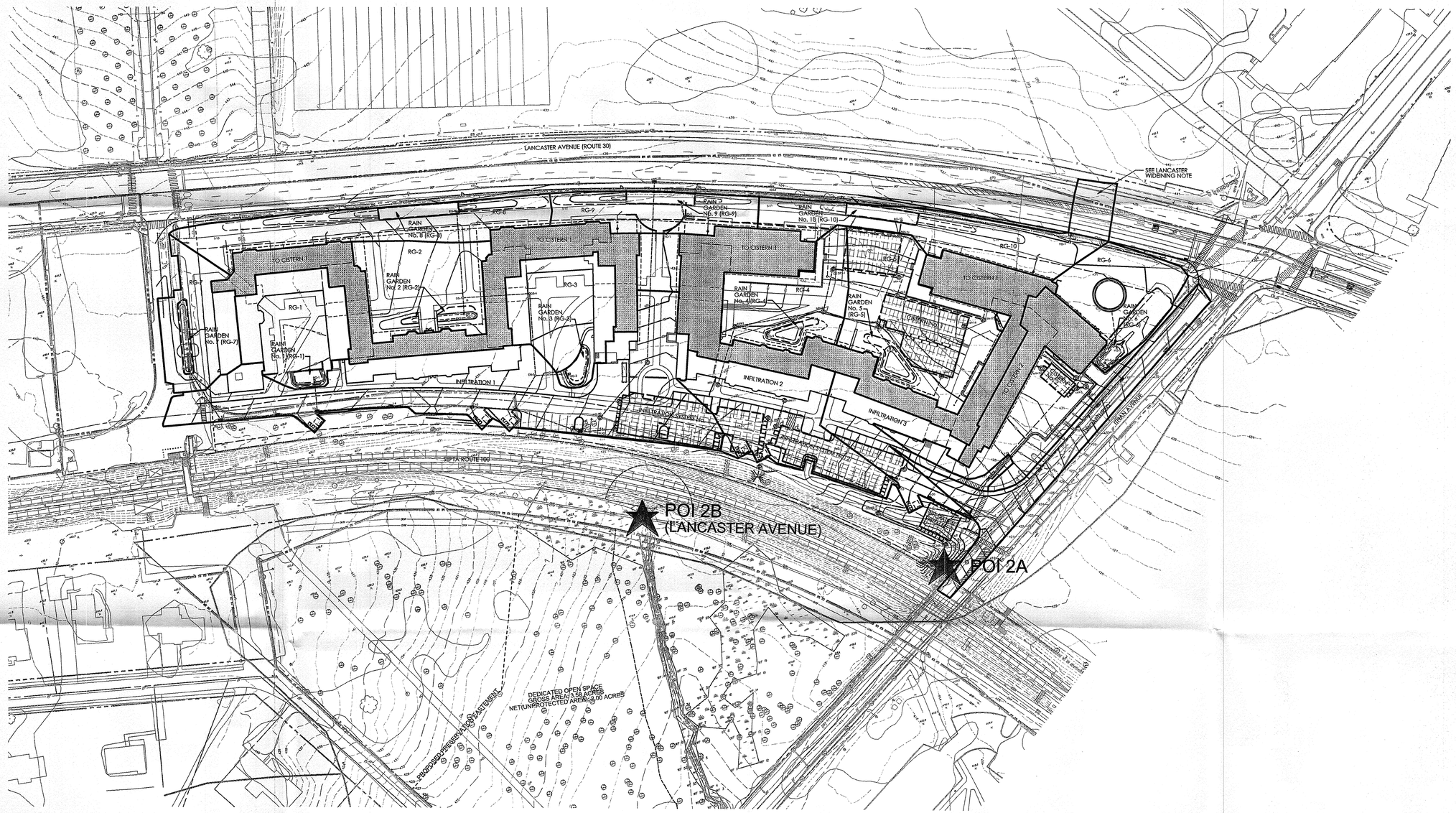
Revision

Date	December 5, 2014
Title	Post Development Drainage Plan
Scale	1" = 60'
Drawn By	MMB

2 OF 4

Sheet No. 2 of 4

Contractor to verify all dimensions in field and Inform Architect of any discrepancies before starting work.



LANCASTER AVENUE WIDENING

NOTE: 3000 S.F. FOR PROPOSED WIDENING IS OFFSET BY ADDING 3000 S.F. TO AREA 2A. THEREFORE, THERE IS NO IMPACT TO POI 2B.

IMPERVIOUS SURFACE TO BMPS

RG-1	9247 SF	RG-9	4385 SF
RG-2	3307 SF	RG-10	9215 SF
RG-3	8867 SF	CIS-1	155818 SF
RG-4	5065 SF	CIS-2	28839 SF
RG-5	7319 SF	INF-1	42610 SF
RG-6	6626 SF	INF-2	25785 SF
RG-7	5047 SF	INF-3	7411 SF
RG-8	7183 SF		

DRAINAGE AREA TO CISTERN No. 1 & 2

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft

20112071855
20112071869
20112071907
20112071937
PROJECT SERIAL NO. 20112071972

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PRELIM. LAND DEVELOPMENT SUBMISSION

Revision

Date	December 5, 2014
Title	Post Development Drainage Plan (Volume Management)
Scale	1" = 60'
Drawn By	MMB

3 OF 4

Sheet No. 3 of 4

Contractor to verify all dimensions in field and inform Architect of any discrepancies before starting work.

20112071855
20112071869
20112071907
20112071937
PROJECT SERIAL NO. 20112071972

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PRELIM. LAND DEVELOPMENT SUBMISSION

Revision	
Date	December 5, 2014
Title	Inlet Area Drainage Plan
Scale	1" = 60'
Drawn By	MMB

4 OF 4

Sheet No. 4 of 4

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