006136

Department of Energy

Ohio Field Office
Fernald Closure Project
175 Tri-County Parkway
Springdale, Ohio 45246

JUN 21 2006

Mr. James A. Saric, Remedial Project Manager
United States Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0153-06

Mr. Thomas Schneider, Project Manager
Ohio Environmental Protection Agency
Southwest District Office
401 East Fifth Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF ADDENDA TO SECTIONS 12.5 AND 13.3 OF THE FINAL DESIGN CALCULATION PACKAGE FOR THE ON-SITE DISPOSAL FACILITY DUE TO CELL 8 EXPANSION

Enclosed for your information are addenda to Sections 12.5 and 13.3 of the final design calculation for the On-Site Disposal Facility (OSDF), Revision 2. The calculations support changes to the surface water management due to the Cell 8 expansion. Section 12.5 is entitled "OSDF Phase V, East 2000-Year Drainage Channel Evaluation." Section 13.3 is entitled "OSDF Phase V, Surface Water Management System Design and Post-Closure Hydrology."

If you have any questions or require additional information, please contact me at (513) 648-3139.

Sincerely,

Johnny Reising

Johnny W. Reising
Director

Enclosures

cc w/enclosures:
M. Cullerton, Tetra Tech
M. Shupe, HSI GeoTrans
AR Coordinator, Fluor Fernald, Inc./MS6

cc w/o enclosures:
J. Desormeau, DOE-OH/FCP
G. Jablonowski, USEPA-V, SRF-5J
S. Helmer, ODH
J. Chiou, Fluor Fernald, Inc./MS88
F. Johnston, Fluor Fernald, Inc./MS12
C. Murphy, Fluor Fernald, Inc./MS1

COMPUTATION COVER SHEET

SUBJECT OF COMPUTATIONS OSDF PHASE V, EAST 2000-YEAR DRAINAGE CHANNEL EVALUATION

Computations By:
(Cognizant Engineer)

Signature: Victoria Cheplak — Date: 1-21-04

Printed Name and Title: Victoria Cheplak, Senior Staff Engineer

Assumptions and Procedures Checked By:
(Checker)

Signature: [signature] — Date: 1-21-04

Printed Name and Title: Ganesh Gopalakrishnan, Senior Engineer

Computations Checked by:

Signature: Hollie Kinnecom — Date: 1-21-04

Printed Name and Title: Holly Kinnecom, Staff Engineer

Computations Backchecked by:
(Cognizant Engineer)

Signature: Victoria Cheplak — Date: 1-21-04

Printed Name and Title: Victoria Cheplak, Senior Staff Engineer

Approved by:
(PDP)

Signature: [signature] — Date: 1-21-04

Printed Name and Title: Ganesh Gopalakrishnan, Senior Engineer

Approved by:
(DTL/TETL)

Signature: Rudolph Bonaparte — Date: 1/22/04

Printed Name and Title: R. Bonaparte, Engineer of Record

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Submittal to FF/DOE/EPA	30 Jan 02	DGP for DBM	DGP	JFB
1	CFC Revision 1 Submittal to FF/DOE/EPA	23 Jan 04	VSC VJC	GG	RB
2A	DCN-Cell 8 Expansion	16 June 04	VSC VJC	GG	DKP
2B	DCN-Cell 8 Change in Side and Crest Slope	5 April 06	RT RJ	VSC VJC	DKP
2	DCN-Cell 8 Change in Side and Crest Slope	1 June 06	VJC for RT	VSC VJC	DKP

ADDENDUM TO SECTION 13.3

(REVISION 2B DUE TO CELL 8 CHANGE IN SIDE SLOPE & CREST SLOPE)

This addendum details the calculations that were revised within Section 13.3, OSDF Phase V, East 2000-Year Drainage Channel Evaluation, of the Final Design Calculation Package for the Fernald Environmental Management Project (FEMP), due to the re-design of the Cell 8 cover system. This re-design encompasses the increase in impacted material placement volume of Cell 8 through a change in side slope and crest slope. This addendum discusses the modifications made to this calculation package as Revision 2B and as associated with this modification.

For Revision 2B to this calculation package, the critical case for the drainage channel aligned along the east perimeter of the OSDF during the 2000-Year, 24-Hour Storm (i.e. the 2000-Year Drainage Channel) was evaluated to confirm the adequacy of the channel using the revised channel and OSDF geometry. This critical case is presented as the Heavy Vegetation Scenario, which considers Manning's n values of 0.24 for sheet flow and 0.07 for channel flow. The surface water management system was modified to reflect the design changes resulting from the expansion of Cell 8 and analyzed to verify the adequacy of the channel. For this submittal, only the Heavy Vegetation Scenario was modified; it should be noted that the Light and Moderate Vegetation Scenarios, detailed in this section, were not modified as they are less conservative than the critical Heavy Vegetation Scenario and are therefore not presented.

In order to present the results of this DCN analysis in an efficient manner, only the attachments that summarize the modifications and updated results for the 2000-Year Drainage Channel Evaluation with regard to the DCN are presented. These attachments are listed subsequently and explained in further detail.

- **Attachment A-1 – Layout of 2000-Year Storm Design Scenarios.** This layout demonstrates the revised configuration of the OSDF. Each surface water structure is labeled as identified in the hydrologic analysis.

- **Attachment A-2 – Nodal Network Diagram.** This diagram demonstrates the revised configuration of the surface water management system as a result of the DCN.

- **Attachment B-2 – Data for Calculation of Time of Concentration.** These data demonstrate the revised flow paths used to calculate the time of concentration for the revised configuration of subcatchments used in the hydrologic analysis.

- **Attachment C-1C – HydroCAD Output Reports – 2000-Year, 24-Hour Storm Event, 2000-Year Design Scenario – Heavy Vegetation.** This attachment provides the results of the hydrologic modeling for the 2000-Year Drainage Channel under the Heavy Vegetation Design Scenario for the 2000-Year, 24-Hour Storm, which is considered the critical case for these calculations.

- **Attachment C-2 – Weighted Curve Number Calculations.** These calculations present the revised areas and Curve Numbers for the revised configuration of subcatchments used in the hydrologic analysis.

- **Attachment C-3 – Tabulated Channel Analysis Results.** These results present the revised channel characteristics (i.e., geometry), flow within each channel, and hydraulic characteristics including peak flow depth and available freeboard, for the revised configuration of the 2000-Year Drainage Channel used in the hydrologic and hydraulic analysis.

Based on the analyses for the design change of the expansion of Cell 8, the 2000-Year Drainage Channel is adequate to convey the 2000-Year, 24-Hour Storm Event and provide the required freeboard.

ATTACHMENT A-1

LAYOUT OF 2000-YEAR STORM DESIGN SCENARIOS

LEGEND

SU... ...LIGNMENT LABEL AND BOUNDARY

REACH ALIGNMENT AND LABEL

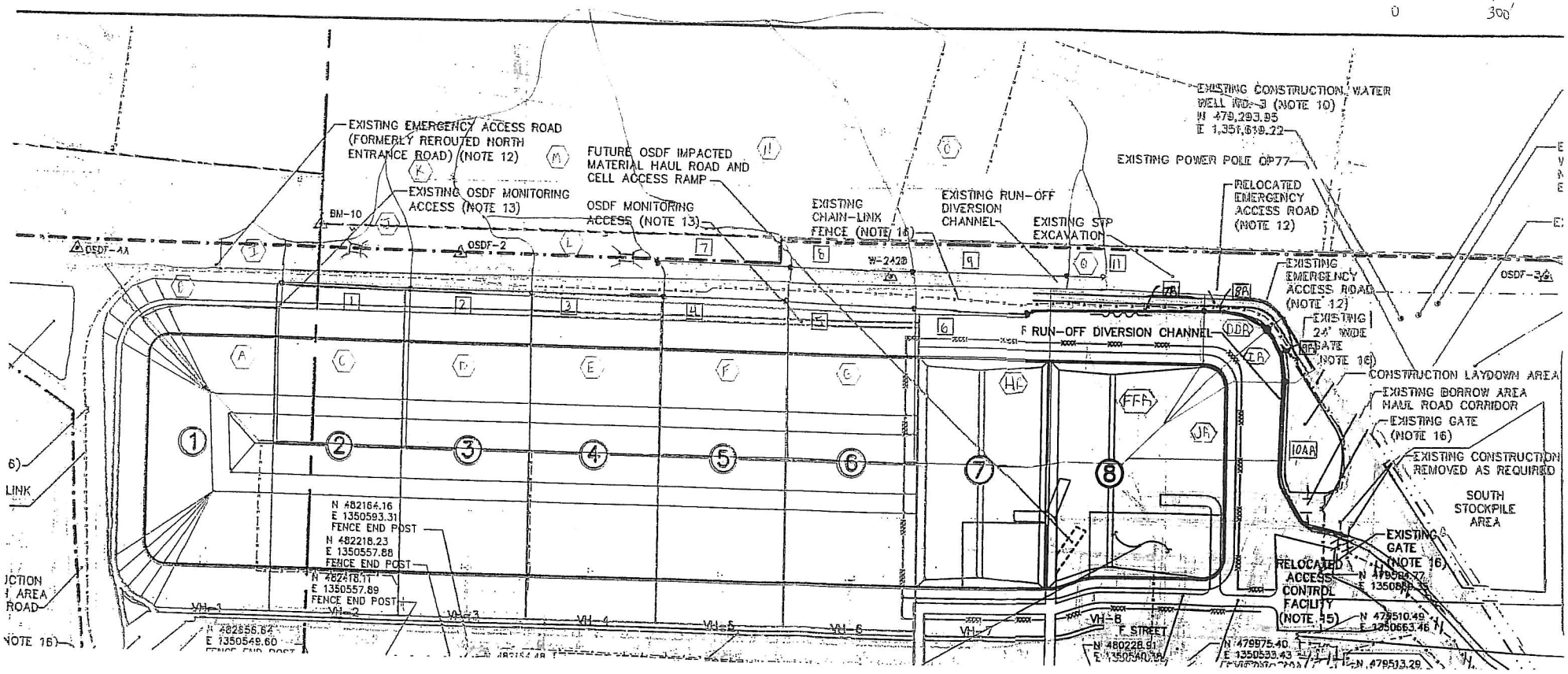
CULVERT

PH... E V

2000 YEAR STORM DESIGN SCEN.

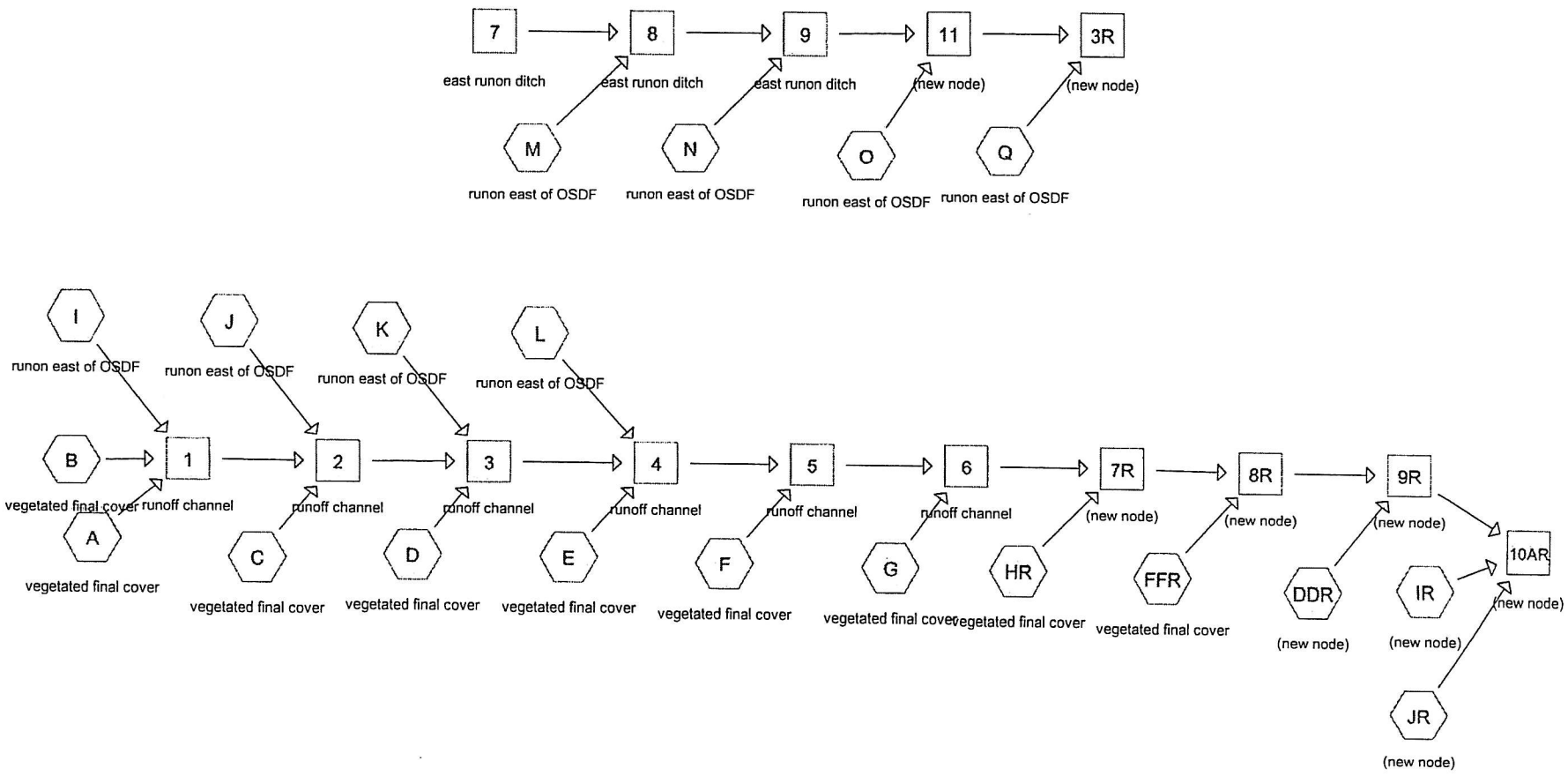
SCALE 1" = 300'

0 300'



ATTACHMENT A-2

NODAL NETWORK DIAGRAM



Subcat Reach Pond Link

Drainage Diagram for 2000 year storm-heavy
Prepared by {enter your company name here} 4/4/2006
HydroCAD® 7.10 s/n 000929 © 2005 HydroCAD Software Solutions LLC

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ATTACHMENT B-2

DATA FOR CALCULATION OF TIME OF CONCENTRATION

HYDROCAD™ INPUT PARAMETERS FOR THE CALCULATION OF TIME OF CONCENTRATION
2000 YEAR STORM DESIGN SCENARIO - HEAVY VEGETATION

2-year, 24-hr Design Rainfall Depth, $P_{2,24}$ = 2.60 inches

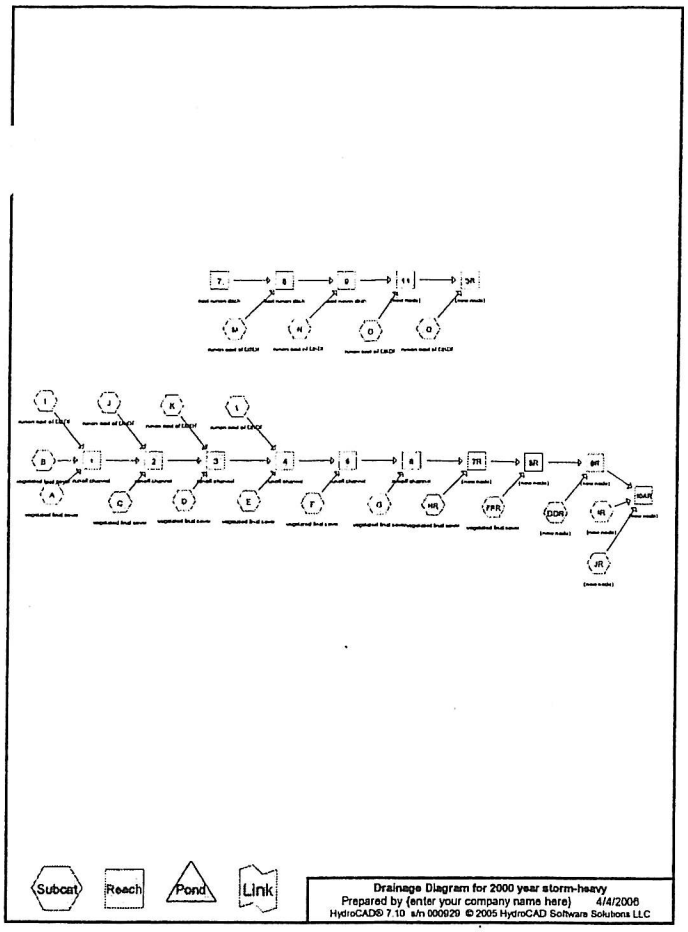
SUBCATCHMENT LABEL AND DESCRIPTION		SHEET FLOW 1				SHEET FLOW 2				SHEET FLOW 3				SHALLOW CONCENTRATED FLOW 1			SHALLOW CONCENTRATED FLOW 2			SHALLOW CONCENTRATED FLOW 3			SHALLOW CONCENTRATED FLOW 4			CHANNEL FLOW 1						CHANNEL FLOW 2					
No.	Description	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Bottom Width (ft)	Flow Depth (ft)	Sideslopes (ft/ft)	Manning's n	Longitudinal Slope (ft/ft)	Flow Length (ft)	Bottom Width (ft)	Flow Depth (ft)	Sideslopes (ft/ft)	Manning's n	Longitudinal Slope (ft/ft)
A	vegetated final cover	90	grass dense	0.240	0.0500	60	grass dense	0.240	0.1000	150	grass dense	0.240	0.1700	190	unpaved	0.1700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	vegetated final cover	90	grass dense	0.240	0.0750	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	0	2.03	6.0, 6.0	0.070	0.0250	320	0	2.03	4.0, 6.0	0.070	0.0075
C	vegetated final cover	90	grass dense	0.240	0.0500	60	grass dense	0.240	0.1000	150	grass dense	0.240	0.1700	190	unpaved	0.1700	-	-	-	-	-	-	-	-	-	370	0	2.33	6.0, 4.0	0.070	0.0035	-	-	-	-	-	-
D	vegetated final cover	90	grass dense	0.240	0.0500	60	grass dense	0.240	0.1000	150	grass dense	0.240	0.1700	180	unpaved	0.1700	-	-	-	-	-	-	-	-	-	200	0	2.86	6.0, 5.0	0.070	0.0083	150	0	2.86	6.0, 4.0	0.070	0.0045
DDR	vegetated final cover	300	grass dense	0.240	0.1430	-	-	-	-	-	-	-	-	80	unpaved	0.1430	15	paved	0.0400	25	unpaved	0.1667	-	-	-	190	0	4.50	4.0, 3.0	0.070	0.0071	-	-	-	-	-	-
E	vegetated final cover	90	grass dense	0.240	0.0500	60	grass dense	0.240	0.1000	150	grass dense	0.240	0.1700	170	unpaved	0.1700	-	-	-	-	-	-	-	-	-	50	0	3.32	6.0, 4.0	0.070	0.0045	320	0	3.32	6.0, 3.0	0.070	0.0105
F	vegetated final cover	90	grass dense	0.240	0.0500	60	grass dense	0.240	0.1000	150	grass dense	0.240	0.1700	175	unpaved	0.1700	-	-	-	-	-	-	-	-	-	360	0	3.68	4.0, 6.0	0.070	0.0050	-	-	-	-	-	-
FFR	vegetated final cover	70	grass dense	0.240	0.0500	90	grass dense	0.240	0.1000	140	grass dense	0.240	0.1667	135	unpaved	0.1667	15	paved	0.0400	20	unpaved	0.1667	-	-	-	610	0	4.00	6.0, 3.0	0.070	0.0050	-	-	-	-	-	-
G	vegetated final cover	90	grass dense	0.240	0.0500	60	grass dense	0.240	0.1000	150	grass dense	0.240	0.1700	175	unpaved	0.1700	-	-	-	-	-	-	-	-	-	370	0	3.86	3.0, 6.0	0.070	0.0050	-	-	-	-	-	-
HR	vegetated final cover	90	grass dense	0.240	0.0500	50	grass dense	0.240	0.1000	150	grass dense	0.240	0.1700	160	unpaved	0.1700	-	-	-	-	-	-	-	-	-	400	0	5.70	3.0, 6.0	0.070	0.0100	-	-	-	-	-	-
I	runon east of OSDI	240	grass dense	0.240	0.0500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55	0	2.03	4.0, 6.0	0.070	0.0075	-	-	-	-	-	-
IR	vegetated final cover	300	grass dense	0.240	0.1430	-	-	-	-	-	-	-	-	80	unpaved	0.1430	15	paved	0.0400	25	unpaved	0.1667	-	-	-	170	6	5.00	4.0, 3.0	0.070	0.0083	-	-	-	-	-	-
J	runon east of OSDF	300	grass dense	0.240	0.0158		-	-	-	-	-	-	-	100	unpaved	0.0158	-	-	-	-	-	-	-	-	-	150	0	2.33	6.0, 4.0	0.070	0.0035	-	-	-	-	-	-
JR	vegetated final cover	40	grass dense	0.240	0.0500	60	grass dense	0.240	0.1000	200	grass dense	0.240	0.1667	115	unpaved	0.1667	15	paved	0.0200	30	unpaved	0.1667				-	-	-	-	-	-	-	-	-	-	-	-
K	runon east of OSDF	300	grass dense	0.240	0.0070	-	-	-	-	-	-	-	-	290	unpaved	0.0200	-	-	-	-	-	-	-	-	-	250	0	2.86	6.0, 4.0	0.070	0.0045	-	-	-	-	-	-
L	runon east of OSDF	300	grass dense	0.240	0.0250	-	-	-	-	-	-	-	-	140	unpaved	0.0250	170	unpaved	0.0375	-	-	-	-	-	-	90	0	3.32	6.0, 3.0	0.070	0.0105	-	-	-	-	-	-
M	runon east of OSDF	300	grass dense	0.240	0.0100	-	-	-	-	-	-	-	-	350	unpaved	0.0139	180	unpaved	0.0167	-	-	-	-	-	-	360	0	0.82	4.0, 3.0	0.070	0.0125	-	-	-	-	-	-
N	runon east of OSDF	300	grass dense	0.240	0.0198	-	-	-	-	-	-	-	-	770	unpaved	0.0198	-	-	-	-	-	-	-	-	-	395	0	1.17	50.0, 3.0	0.070	0.0100	-	-	-	-	-	-
O	runon east of OSDF	300	grass dense	0.240	0.0200	-	-	-	-	-	-	-	-	420	unpaved	0.0200	-	-	-	-	-	-	-	-	-	250	0	1.17	60.0, 3.0	0.070	0.0100	-	-	-	-	-	-
Q	runon east of OSDF	300	grass dense	0.240	0.0200	-	-	-	-	-	-	-	-	250	unpaved	0.0200	-	-	-	-	-	-	-	-	-	170	0	4.08	5.7, 13.5	0.070	0.0100	-	-	-	-	-	-

ATTACHMENT C-1C

HydroCAD™ OUTPUT REPORTS

2,000-YEAR, 24-HOUR STORM EVENT

2,000-YEAR DESIGN SCENARIO – HEAVY VEGETATION



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

Subcatchment A: vegetated final cover Runoff Area=2.601 ac Runoff Depth>12.83"
Flow Length=490' Tc=25.4 min CN=99 Runoff=27.84 cfs 2.780 af

Subcatchment B: vegetated final cover Runoff Area=1.637 ac Runoff Depth>12.86"
Flow Length=540' Tc=12.1 min CN=99 Runoff=24.87 cfs 1.754 af

Subcatchment C: vegetated final cover Runoff Area=4.960 ac Runoff Depth>12.82"
Flow Length=860' Tc=29.9 min CN=99 Runoff=48.10 cfs 5.297 af

Subcatchment D: vegetated final cover Runoff Area=4.746 ac Runoff Depth>12.82"
Flow Length=830' Tc=28.2 min CN=99 Runoff=47.77 cfs 5.070 af

Subcatchment DDR: (new node) Runoff Area=0.730 ac Runoff Depth>12.84"
Flow Length=610' Tc=18.9 min CN=99 Runoff=9.17 cfs 0.781 af

Subcatchment E: vegetated final cover Runoff Area=4.946 ac Runoff Depth>12.82"
Flow Length=840' Tc=27.5 min CN=99 Runoff=50.54 cfs 5.285 af

Subcatchment F: vegetated final cover Runoff Area=4.814 ac Runoff Depth>12.82"
Flow Length=835' Tc=28.0 min CN=99 Runoff=48.59 cfs 5.143 af

Subcatchment FFR: vegetated final cover Runoff Area=5.510 ac Runoff Depth>12.82"
Flow Length=1,080' Tc=29.5 min CN=99 Runoff=53.96 cfs 5.885 af

Subcatchment G: vegetated final cover Runoff Area=4.946 ac Runoff Depth>12.82"
Flow Length=845' Tc=28.0 min CN=99 Runoff=49.93 cfs 5.284 af

Subcatchment HR: vegetated final cover Runoff Area=4.590 ac Runoff Depth>12.82"
Flow Length=850' Tc=26.2 min CN=99 Runoff=48.22 cfs 4.905 af

Subcatchment I: runon east of OSDF Runoff Area=0.530 ac Runoff Depth>11.71"
Flow Length=265' Tc=20.4 min CN=90 Runoff=6.24 cfs 0.517 af

Subcatchment IR: (new node) Runoff Area=0.810 ac Runoff Depth>12.84"
Flow Length=590' Tc=18.5 min CN=99 Runoff=10.28 cfs 0.867 af

Subcatchment J: runon east of OSDF Runoff Area=1.242 ac Runoff Depth>11.66"
Flow Length=550' Tc=44.5 min CN=90 Runoff=9.07 cfs 1.207 af

Subcatchment JR: (new node) Runoff Area=2.200 ac Runoff Depth>12.83"
Flow Length=460' Tc=23.1 min CN=99 Runoff=24.83 cfs 2.352 af

Subcatchment K: runon east of OSDF Runoff Area=2.623 ac Runoff Depth>11.10"
Flow Length=840' Tc=62.4 min CN=86 Runoff=14.65 cfs 2.425 af

Subcatchment L: runon east of OSDF Runoff Area=1.779 ac Runoff Depth>11.15"
Flow Length=700' Tc=37.2 min CN=86 Runoff=14.28 cfs 1.653 af

Subcatchment M: runon east of OSDF Runoff Area=7.234 ac Runoff Depth>11.10"
Flow Length=1,190' Tc=59.5 min CN=86 Runoff=41.83 cfs 6.693 af

Subcatchment N: runon east of OSDF Runoff Area=11.664 ac Runoff Depth>10.99"
Flow Length=1,465' Tc=48.4 min CN=85 Runoff=77.52 cfs 10.687 af

Subcatchment O: runon east of OSDF Runoff Area=10.935 ac Runoff Depth>11.14"
Flow Length=970' Tc=44.0 min CN=86 Runoff=78.19 cfs 10.149 af

Subcatchment Q: runon east of OSDF Runoff Area=1.520 ac Runoff Depth>11.28"
Flow Length=720' Tc=40.7 min CN=87 Runoff=11.56 cfs 1.428 af

Reach 1: runoff channel Peak Depth=2.59' Max Vel=1.5 fps Inflow=52.44 cfs 5.051 af
n=0.070 L=405.0' S=0.0035 '/' Capacity=1,099.51 cfs Outflow=49.07 cfs 5.034 af

Reach 2: runoff channel Peak Depth=2.94' Max Vel=2.2 fps Inflow=104.36 cfs 11.538 af
n=0.070 L=385.0' S=0.0064 '/' Capacity=880.57 cfs Outflow=102.73 cfs 11.513 af

Reach 3: runoff channel Peak Depth=3.58' Max Vel=2.7 fps Inflow=155.41 cfs 19.009 af
n=0.070 L=405.0' S=0.0075 '/' Capacity=681.67 cfs Outflow=153.39 cfs 18.973 af

Reach 3R: (new node) Inflow=180.08 cfs 28.844 af
Outflow=180.08 cfs 28.844 af

Reach 4: runoff channel Peak Depth=4.12' Max Vel=2.4 fps Inflow=206.22 cfs 25.911 af
n=0.070 L=395.0' S=0.0050 '/' Capacity=590.36 cfs Outflow=203.76 cfs 25.859 af

Reach 5: runoff channel Peak Depth=4.53' Max Vel=2.5 fps Inflow=236.60 cfs 31.002 af
n=0.070 L=405.0' S=0.0050 '/' Capacity=380.07 cfs Outflow=234.19 cfs 30.942 af

Reach 6: runoff channel Peak Depth=4.71' Max Vel=2.6 fps Inflow=262.61 cfs 36.226 af
n=0.070 L=490.0' S=0.0050 '/' Capacity=433.33 cfs Outflow=259.87 cfs 36.144 af

Reach 7: east runon ditch Peak Depth=0.00' Max Vel=0.0 fps
n=0.070 L=395.0' S=0.0125 '/' Capacity=104.13 cfs Outflow=0.00 cfs 0.000 af

7R: (new node) Peak Depth=4.81' Max Vel=2.6 fps Inflow=279.05 cfs 41.049 af
n=0.070 L=610.0' S=0.0050 '/' Capacity=496.85 cfs Outflow=275.08 cfs 40.936 af

.each 8: east runon ditch Peak Depth=1.01' Max Vel=1.3 fps Inflow=41.83 cfs 6.693 af
n=0.070 L=405.0' S=0.0100 '/' Capacity=768.96 cfs Outflow=41.21 cfs 6.667 af

Reach 8R: (new node) Peak Depth=5.10' Max Vel=3.3 fps Inflow=295.75 cfs 46.821 af
n=0.070 L=190.0' S=0.0071 '/' Capacity=456.66 cfs Outflow=294.87 cfs 46.788 af

Reach 9: east runon ditch Peak Depth=1.43' Max Vel=1.7 fps Inflow=110.42 cfs 17.353 af
n=0.070 L=475.0' S=0.0100 '/' Capacity=5,717.07 cfs Outflow=108.78 cfs 17.290 af

Reach 9R: (new node) Peak Depth=4.18' Max Vel=3.4 fps Inflow=296.23 cfs 47.570 af
n=0.070 L=170.0' S=0.0083 '/' Capacity=688.42 cfs Outflow=295.55 cfs 47.540 af

Reach 10AR: (new node) Peak Depth=4.00' Max Vel=2.7 fps Inflow=302.28 cfs 50.759 af
n=0.070 L=530.0' S=0.0050 '/' Capacity=1,078.23 cfs Outflow=300.23 cfs 50.631 af

Reach 11: (new node) Peak Depth=2.65' Max Vel=2.5 fps Inflow=171.73 cfs 27.440 af
n=0.070 L=170.0' S=0.0100 '/' Capacity=543.34 cfs Outflow=171.26 cfs 27.416 af

Total Runoff Area = 80.017 ac Runoff Volume = 80.165 af Average Runoff Depth = 12.02"

Subcatchment A: vegetated final cover

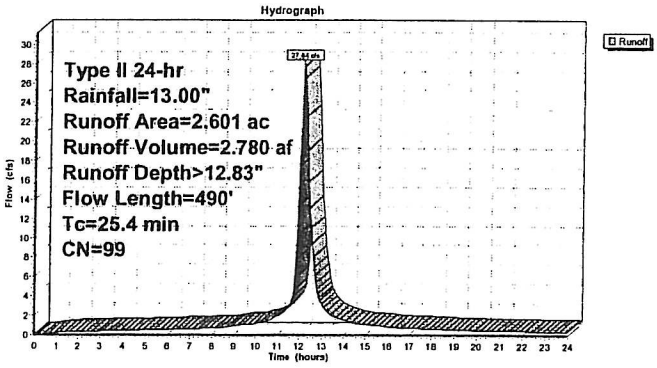
Runoff = 27.84 cfs @ 12.17 hrs, Volume= 2.780 af, Depth>12.83"

ıoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
,pe II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
2.601	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	90	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.5	60	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
9.3	150	0.1700	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.5	190	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25.4	490	Total			

Subcatchment A: vegetated final cover



Subcatchment B: vegetated final cover

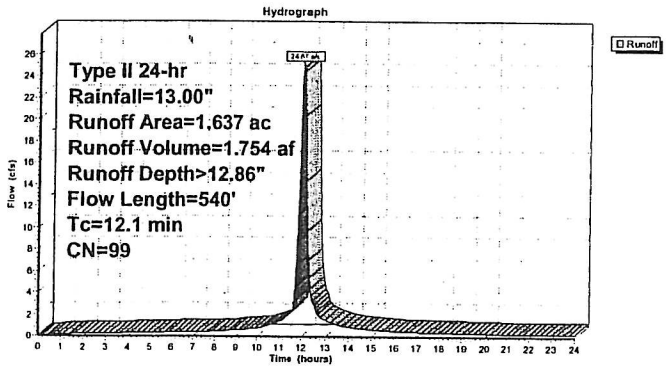
Runoff = 24.87 cfs @ 12.03 hrs, Volume= 1.754 af, Depth>12.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
1.637	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	90	0.0750	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.6	130	0.0250	3.4	83.06	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.03' Z= 6.0 '/' Top.W=24.36' n= 0.070
2.9	320	0.0075	1.8	37.74	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.03' Z= 4.0 & 6.0 '/' Top.W=20.30' n= 0.070
12.1	540	Total			

Subcatchment B: vegetated final cover



Subcatchment C: vegetated final cover

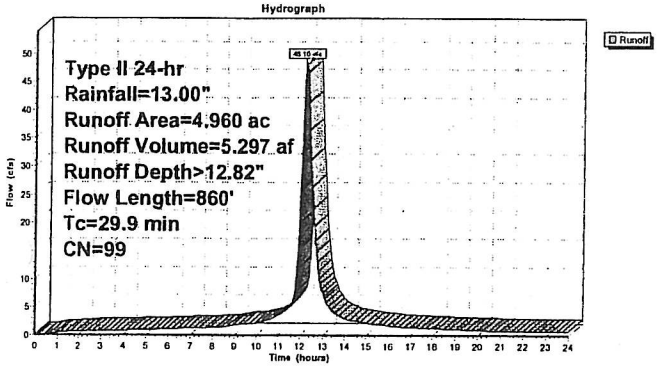
Runoff = 48.10 cfs @ 12.23 hrs, Volume= 5.297 af, Depth>12.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
4.960	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	90	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.5	60	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
9.3	150	0.1700	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.5	190	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.5	370	0.0035	1.4	37.24	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.33' Z= 6.0 & 4.0 '/' Top.W=23.30' n= 0.070
29.9	860	Total			

Subcatchment C: vegetated final cover



Subcatchment D: vegetated final cover

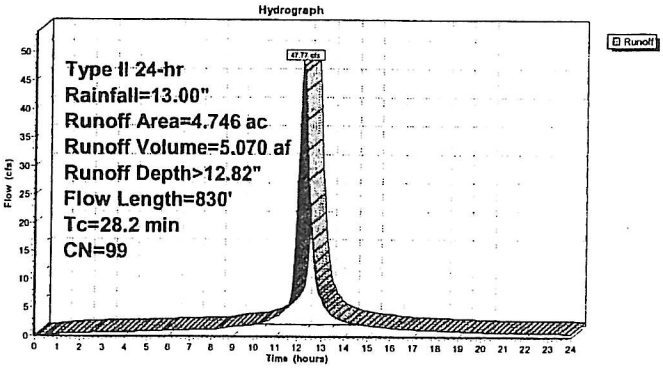
Runoff = 47.77 cfs @ 12.21 hrs, Volume= 5.070 af, Depth>12.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
4.746	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	90	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.5	60	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
9.3	150	0.1700	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.5	180	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	200	0.0083	2.4	109.24	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.86' Z= 6.0 & 5.0 '/' Top.W=31.46' n= 0.070
1.4	150	0.0045	1.8	72.93	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.86' Z= 6.0 & 4.0 '/' Top.W=28.60' n= 0.070
28.2	830	Total			

Subcatchment D: vegetated final cover



Subcatchment DDR: (new node)

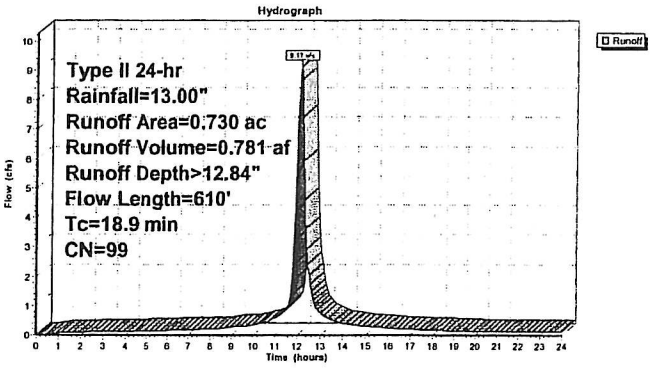
Runoff = 9.17 cfs @ 12.10 hrs, Volume= 0.781 af, Depth>12.84"

ıoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
,pe II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
0.730	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4	300	0.1430	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.2	80	0.1430	6.1		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	25	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	190	0.0071	3.0	211.96	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.50' Z= 4.0 & 3.0 '/' Top.W=31.50' n= 0.070
18.9	610	Total			

Subcatchment DDR: (new node)



Subcatchment E: vegetated final cover

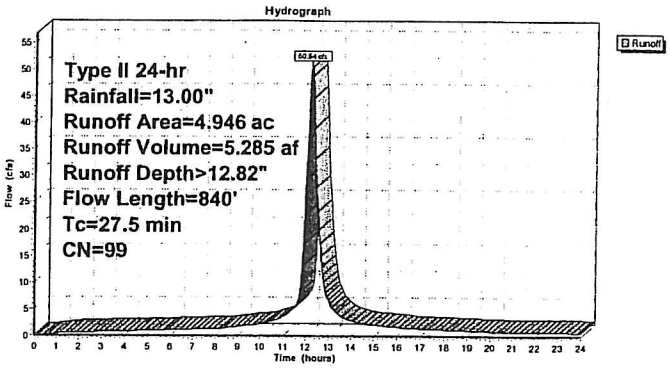
Runoff = 50.54 cfs @ 12.20 hrs, Volume= 5.285 af, Depth>12.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
4.946	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	90	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.5	60	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
9.3	150	0.1700	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.4	170	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	50	0.0045	2.0	108.55	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.32' Z= 6.0 & 4.0 '/' Top.W=33.20' n= 0.070
1.8	320	0.0105	3.0	148.58	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.32' Z= 6.0 & 3.0 '/' Top.W=29.88' n= 0.070
27.5	840	Total			

Subcatchment E: vegetated final cover



Subcatchment F: vegetated final cover

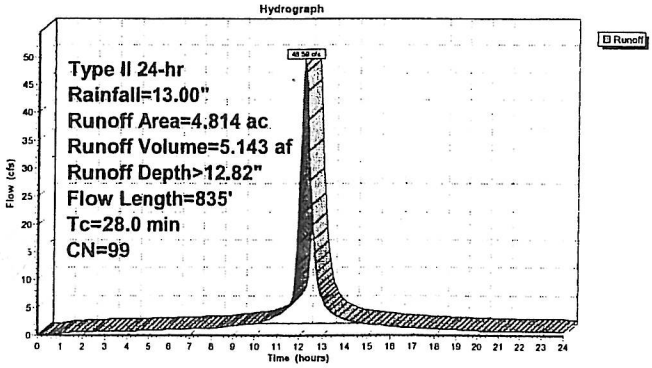
Runoff = 48.59 cfs @ 12.20 hrs, Volume= 5.143 af, Depth>12.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
4.814	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	90	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.5	60	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
9.3	150	0.1700	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.4	175	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	360	0.0050	2.2	150.56	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.68' Z= 4.0 & 6.0 '/' Top.W=36.80' n= 0.070
28.0	835	Total			

Subcatchment F: vegetated final cover



Subcatchment FFR: vegetated final cover

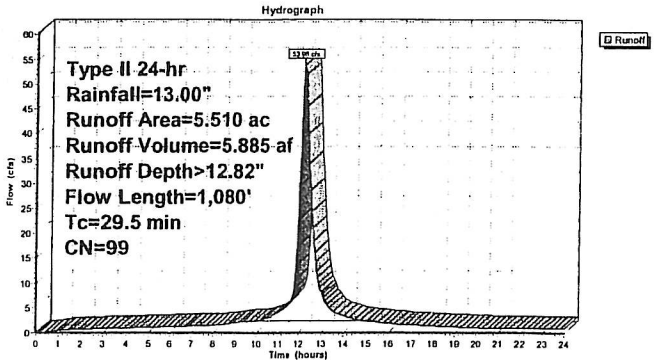
Runoff = 53.96 cfs @ 12.22 hrs, Volume= 5.885 af, Depth>12.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
5.510	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	70	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
7.6	90	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
8.9	140	0.1667	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.3	135	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	20	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.3	610	0.0050	2.3	168.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.00' Z= 6.0 & 3.0 '/' Top.W=36.00' n= 0.070
29.5	1,080	Total			

Subcatchment FFR: vegetated final cover



Subcatchment G: vegetated final cover

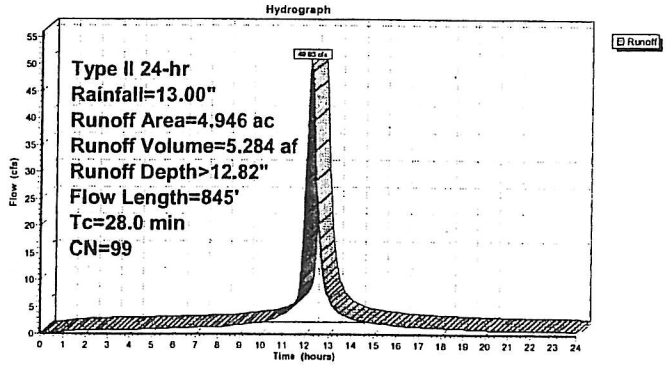
Runoff = 49.93 cfs @ 12.20 hrs, Volume= 5.284 af, Depth>12.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
4.946	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	90	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.5	60	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
9.3	150	0.1700	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.4	175	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	370	0.0050	2.3	153.25	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.86' Z= 3.0 & 6.0 '/' Top.W=34.74' n= 0.070
28.0	845	Total			

Subcatchment G: vegetated final cover



Subcatchment HR: vegetated final cover

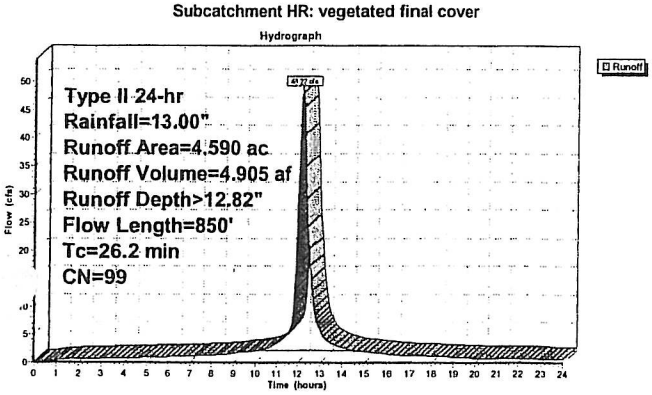
Runoff = 48.22 cfs @ 12.18 hrs, Volume= 4.905 af, Depth>12.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
4.590	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	90	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
4.8	50	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
9.3	150	0.1700	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.4	160	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.6	400	0.0100	4.2	612.82	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=5.70' Z= 3.0 & 6.0 '/' Top.W=51.30' n= 0.070
26.2	850	Total			

Subcatchment HR: vegetated final cover



Subcatchment I: runon east of OSDF

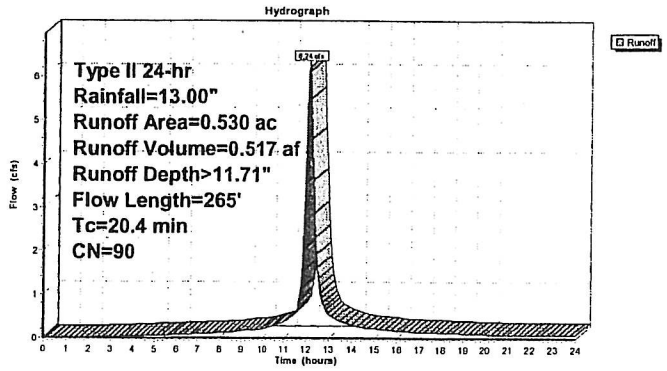
Runoff = 6.24 cfs @ 12.12 hrs, Volume= 0.517 af, Depth>11.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
0.530	90	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	210	0.0500	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.5	55	0.0075	1.8	37.74	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.03' Z= 4.0 & 6.0 '/' Top.W=20.30' n= 0.070
20.4	265	Total			

Subcatchment I: runon east of OSDF



Subcatchment IR: (new node)

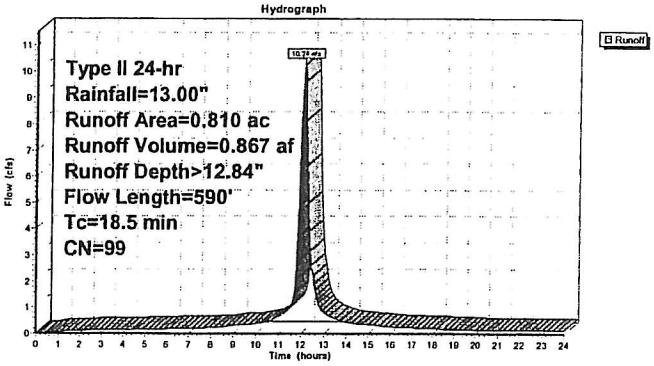
Runoff = 10.28 cfs @ 12.10 hrs, Volume= 0.867 af, Depth>12.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
0.810	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4	300	0.1430	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.2	80	0.1430	6.1		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	25	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	170	0.0083	3.8	448.16	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=5.00' Z= 4.0 & 3.0 '/' Top.W=41.00' n= 0.070
18.5	590	Total			

Subcatchment IR: (new node)



Subcatchment J: runon east of OSDF

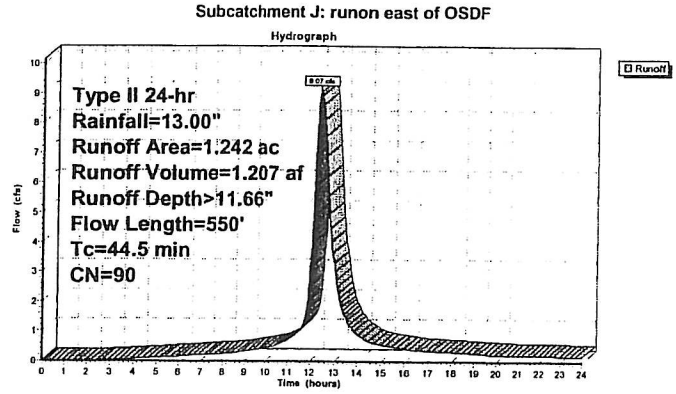
Runoff = 9.07 cfs @ 12.40 hrs, Volume= 1.207 af, Depth>11.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
1.242	90	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.9	300	0.0158	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.8	100	0.0158	2.0		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	150	0.0035	1.4	37.24	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.33' Z= 6.0 & 4.0 '/' Top.W=23.30' n= 0.070
44.5	550	Total			

Subcatchment J: runon east of OSDF



Subcatchment JR: (new node)

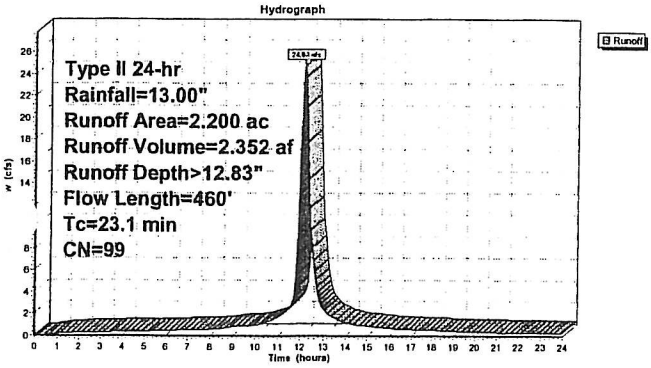
Runoff = 24.83 cfs @ 12.15 hrs, Volume= 2.352 af, Depth>12.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
2.200	99	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	40	0.0500	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.5	60	0.1000	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
11.8	200	0.1667	0.3		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.3	115	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0200	2.9		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	30	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23.1	460	Total			

Subcatchment JR: (new node)



Subcatchment K: runon east of OSDF

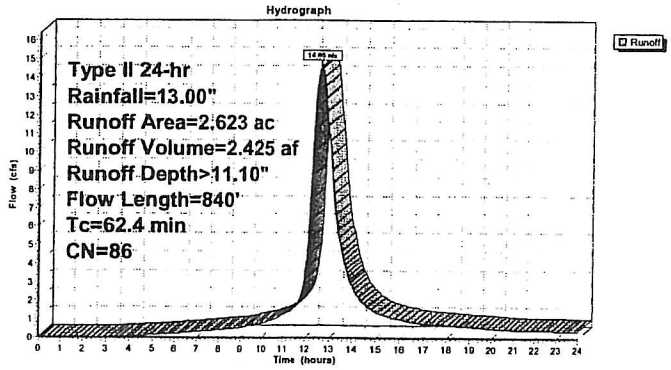
Runoff = 14.65 cfs @ 12.63 hrs, Volume= 2.425 af, Depth>11.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
2.623	86	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.0	300	0.0070	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
2.1	290	0.0200	2.3		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.3	250	0.0045	1.8	72.93	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.86' Z= 6.0 & 4.0 '/' Top.W=28.60' n= 0.070
62.4	840	Total			

Subcatchment K: runon east of OSDF



Subcatchment L: runon east of OSDF

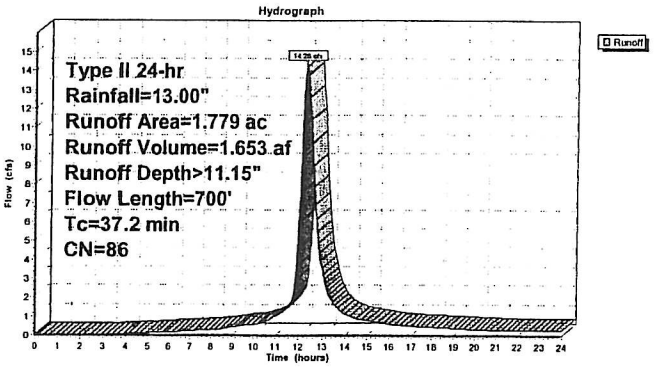
Runoff = 14.28 cfs @ 12.31 hrs, Volume= 1.653 af, Depth>11.15"

ff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
1.779	86	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.9	300	0.0250	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
0.9	140	0.0250	2.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	170	0.0375	3.1		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	90	0.0105	3.0	148.58	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.32' Z= 6.0 & 3.0 '/' Top.W=29.88' n= 0.070
37.2	700	Total			

Subcatchment L: runon east of OSDF



Subcatchment M: runon east of OSDF

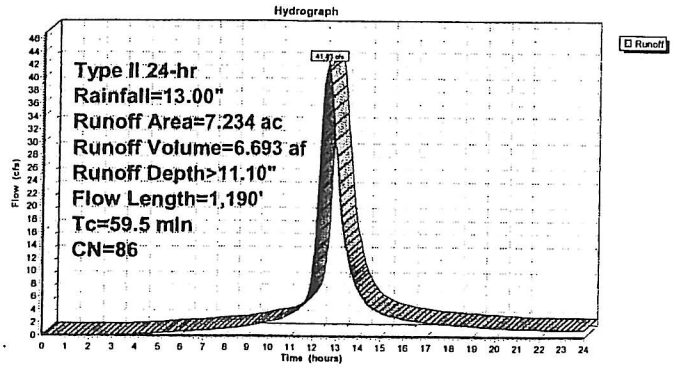
Runoff = 41.83 cfs @ 12.59 hrs, Volume= 6.693 af, Depth>11.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
7.234	86	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.3	300	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
3.1	350	0.0139	1.9		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	180	0.0167	2.1		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.7	360	0.0125	1.3	3.00	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=0.82' Z= 4.0 & 3.0 '/' Top.W=5.74' n= 0.070
59.5	1,190	Total			

Subcatchment M: runon east of OSDF



Subcatchment N: runon east of OSDF

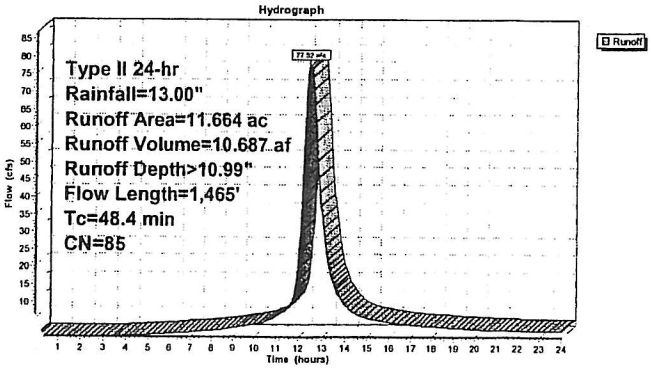
Runoff = 77.52 cfs @ 12.45 hrs, Volume= 10.687 af, Depth>10.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
11.664	85	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0198	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
5.7	770	0.0198	2.3		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	395	0.0100	1.5	61.88	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.17' Z= 58.0 & 3.0 '/' Top.W=71.37' n= 0.070
48.4	1,465	Total			

Subcatchment N: runon east of OSDF



Subcatchment O: runon east of OSDF

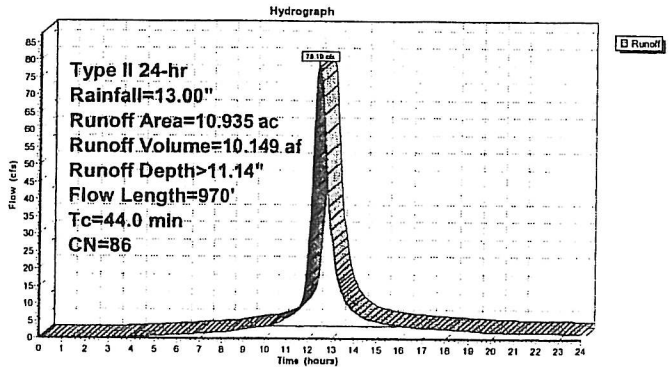
Runoff = 78.19 cfs @ 12.40 hrs, Volume= 10.149 af, Depth>11.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
10.935	86	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.1	300	0.0200	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
3.1	420	0.0200	2.3		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	250	0.0100	1.5	63.91	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.17' Z= 60.0 & 3.0 '/' Top.W=73.71' n= 0.070
44.0	970	Total			

Subcatchment O: runon east of OSDF



Subcatchment Q: runon east of OSDF

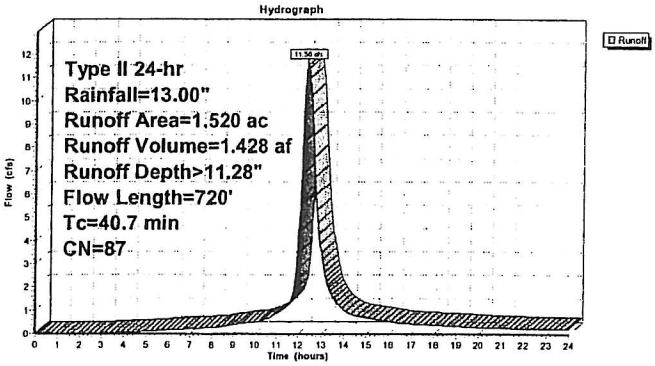
Runoff = 11.56 cfs @ 12.36 hrs, Volume= 1.428 af, Depth>11.28"

'off by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
e II 24-hr Rainfall=13.00"

Area (ac)	CN	Description
1.520	87	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.1	300	0.0200	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.60"
1.8	250	0.0200	2.3		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	170	0.0100	3.4	543.34	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.08' Z= 5.7 & 13.5 '/' Top.W=78.34' n= 0.070
40.7	720	Total			

Subcatchment Q: runon east of OSDF



Reach 1: runoff channel

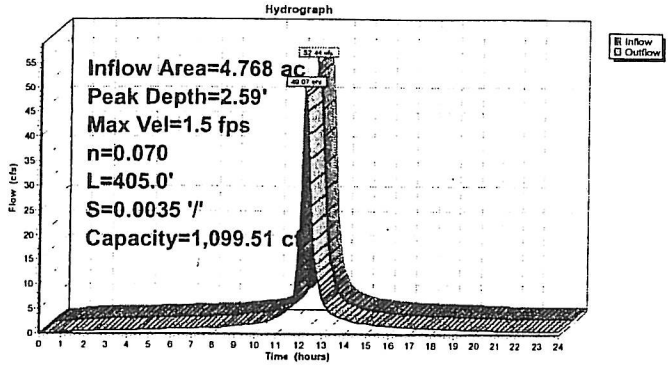
[65] Warning: Inlet elevation not specified

Inflow Area = 4.768 ac, Inflow Depth > 12.71"
Inflow = 52.44 cfs @ 12.08 hrs, Volume= 5.051 af
Outflow = 49.07 cfs @ 12.22 hrs, Volume= 5.034 af, Atten= 6%, Lag= 8.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.5 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.6 fps, Avg. Travel Time= 11.1 min

Peak Depth= 2.59' @ 12.14 hrs
Capacity at bank full= 1,099.51 cfs
0.00' x 8.29' deep channel, n= 0.070
Side Slope Z-value= 6.0 4.0 '/' Top Width= 82.90'
Length= 405.0' Slope= 0.0035 '/'

Reach 1: runoff channel



Reach 2: runoff channel

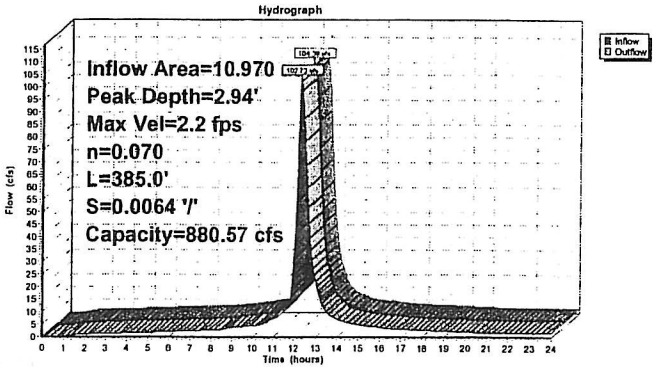
[65] Warning: Inlet elevation not specified

Inflow Area = 10.970 ac, Inflow Depth > 12.62"
Inflow = 104.36 cfs @ 12.23 hrs, Volume= 11.538 af
Outflow = 102.73 cfs @ 12.32 hrs, Volume= 11.513 af, Atten= 2%, Lag= 5.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.2 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.9 fps, Avg. Travel Time= 7.0 min

Peak Depth= 2.94' @ 12.27 hrs
Capacity at bank full= 880.57 cfs
0.00' x 6.57' deep channel, n= 0.070
Side Slope Z-value= 6.0 5.0 '/' Top Width= 72.27'
Length= 385.0' Slope= 0.0064 '/'

Reach 2: runoff channel



Reach 3: runoff channel

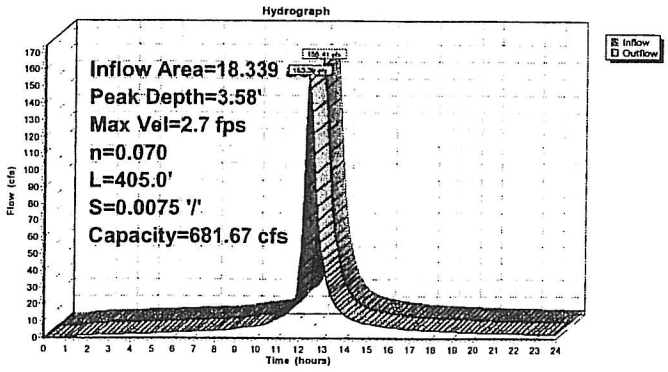
[65] Warning: Inlet elevation not specified

Inflow Area = 18.339 ac, Inflow Depth > 12.44"
Inflow = 155.41 cfs @ 12.30 hrs, Volume= 19.009 af
Outflow = 153.39 cfs @ 12.37 hrs, Volume= 18.973 af, Atten= 1%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.7 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 5.9 min

Peak Depth= 3.58' @ 12.33 hrs
Capacity at bank full= 681.67 cfs
0.00' x 6.26' deep channel, n= 0.070
Side Slope Z-value= 3.0 6.0 '/' Top Width= 56.34'
Length= 405.0' Slope= 0.0075 '/'

Reach 3: runoff channel



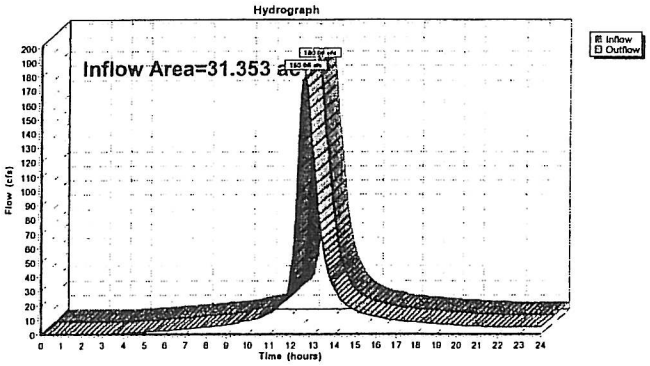
Reach 3R: (new node)

[40] Hint: Not Described (Outflow=Inflow)

ow Area = 31.353 ac, Inflow Depth > 11.04"
ow = 180.08 cfs @ 12.58 hrs, Volume= 28.844 af
utflow = 180.08 cfs @ 12.58 hrs, Volume= 28.844 af, Atten= 0%, Lag= 0.0 min

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

Reach 3R: (new node)



Reach 4: runoff channel

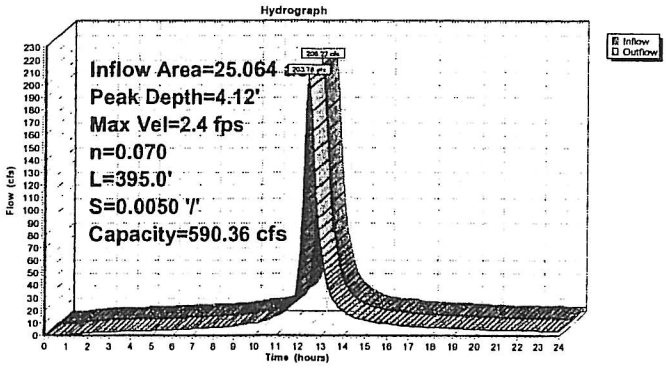
[65] Warning: Inlet elevation not specified

Inflow Area = 25.064 ac, Inflow Depth > 12.41"
Inflow = 206.22 cfs @ 12.34 hrs, Volume= 25.911 af
Outflow = 203.76 cfs @ 12.42 hrs, Volume= 25.859 af, Atten= 1%, Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.0 fps, Avg. Travel Time= 6.3 min

Peak Depth= 4.12' @ 12.37 hrs
Capacity at bank full= 590.36 cfs
0.00' x 6.14' deep channel, n= 0.070
Side Slope Z-value= 4.0 6.0 '/' Top Width= 61.40'
Length= 395.0' Slope= 0.0050 '/'

Reach 4: runoff channel



Reach 5: runoff channel

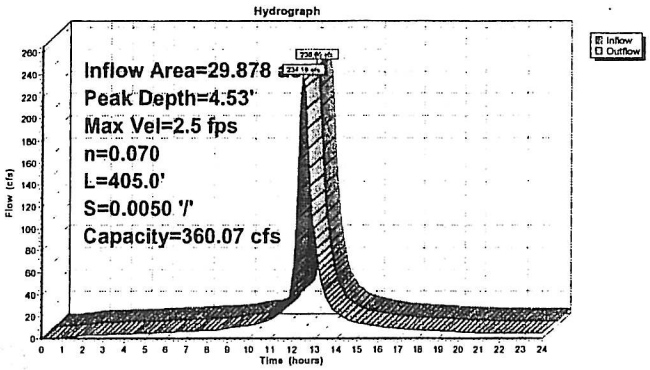
[65] Warning: Inlet elevation not specified

Inflow Area = 29.878 ac, Inflow Depth > 12.45"
Inflow = 236.60 cfs @ 12.39 hrs, Volume= 31.002 af
Outflow = 234.19 cfs @ 12.47 hrs, Volume= 30.942 af, Atten= 1%, Lag= 4.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 6.1 min

Peak Depth= 4.53' @ 12.42 hrs
Capacity at bank full= 360.07 cfs
0.00' x 5.32' deep channel, n= 0.070
Side Slope Z-value= 6.0 3.0 '/' Top Width= 47.88'
Length= 405.0' Slope= 0.0050 '/'

Reach 5: runoff channel



Reach 6: runoff channel

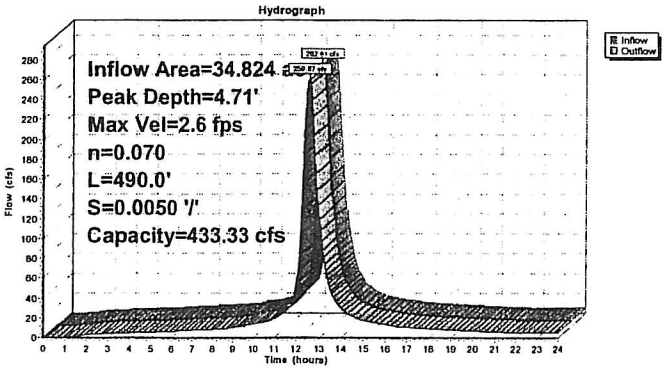
[65] Warning: Inlet elevation not specified

Inflow Area = 34.824 ac, Inflow Depth > 12.48"
Inflow = 262.61 cfs @ 12.44 hrs, Volume= 36.226 af
Outflow = 259.87 cfs @ 12.53 hrs, Volume= 36.144 af, Atten= 1%, Lag= 5.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.6 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 1.2 fps, Avg. Travel Time= 7.1 min

Peak Depth= 4.71' @ 12.48 hrs
Capacity at bank full= 433.33 cfs
0.00' x 5.70' deep channel, n= 0.070
Side Slope Z-value= 6.0 3.0 '/' Top Width= 51.30'
Length= 490.0' Slope= 0.0050 '/'

Reach 6: runoff channel



Reach 7: east runon ditch

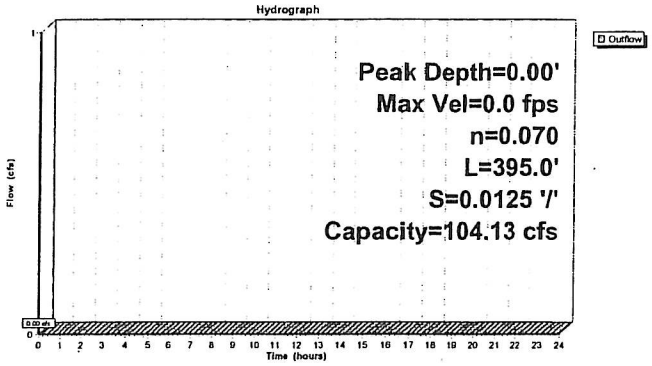
[43] Hint: Has no inflow (Outflow=Zero)

'ow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

outing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00' @ 0.00 hrs
Capacity at bank full= 104.13 cfs
0.00' x 3.10' deep channel, n= 0.070
Side Slope Z-value= 4.0 3.0 '/' Top Width= 21.70'
Length= 395.0' Slope= 0.0125 '/'

Reach 7: east runon ditch



Reach 7R: (new node)

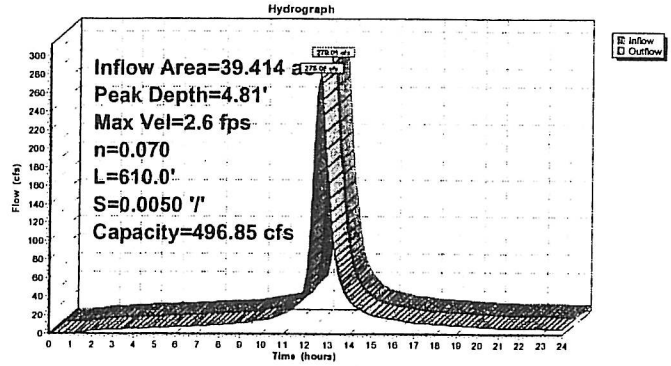
[65] Warning: Inlet elevation not specified

Inflow Area = 39.414 ac, Inflow Depth > 12.50"
Inflow = 279.05 cfs @ 12.51 hrs, Volume= 41.049 af
Outflow = 275.08 cfs @ 12.62 hrs, Volume= 40.936 af, Atten= 1%, Lag= 6.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.6 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 1.2 fps, Avg. Travel Time= 8.5 min

Peak Depth= 4.81' @ 12.56 hrs
Capacity at bank full= 496.85 cfs
0.00' x 6.00' deep channel, n= 0.070
Side Slope Z-value= 6.0 3.0 '/' Top Width= 54.00'
Length= 610.0' Slope= 0.0050 '/'

Reach 7R: (new node)



Reach 8: east runon ditch

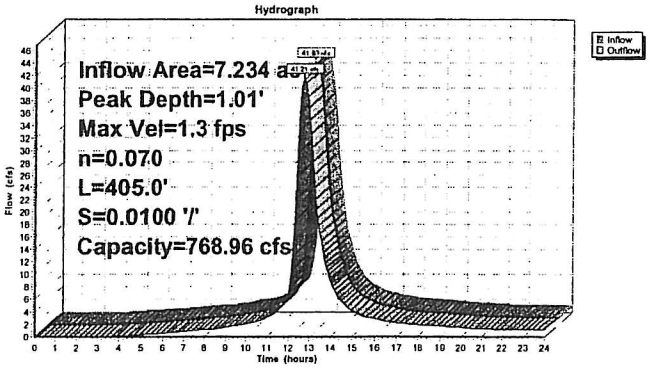
[65] Warning: Inlet elevation not specified

Inflow Area = 7.234 ac, Inflow Depth > 11.10"
Inflow = 41.83 cfs @ 12.59 hrs, Volume= 6.693 af
Outflow = 41.21 cfs @ 12.74 hrs, Volume= 6.667 af, Atten= 1%, Lag= 8.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.3 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 0.6 fps, Avg. Travel Time= 10.9 min

Peak Depth= 1.01' @ 12.66 hrs
Capacity at bank full= 768.96 cfs
0.00' x 3.01' deep channel, n= 0.070
Side Slope Z-value= 58.0 3.0 '/' Top Width= 183.61'
Length= 405.0' Slope= 0.0100 '/'

Reach 8: east runon ditch



Reach 8R: (new node)

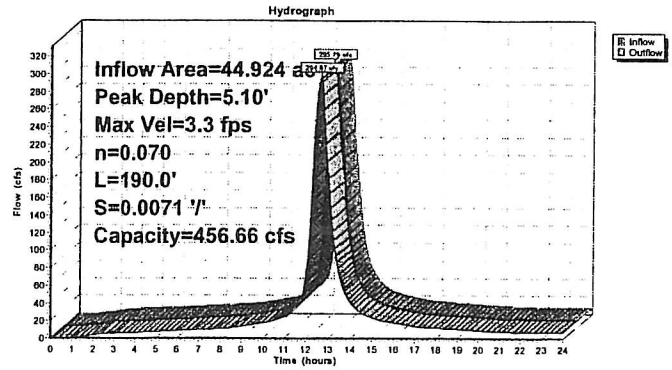
[65] Warning: Inlet elevation not specified

Inflow Area = 44.924 ac, Inflow Depth > 12.51"
Inflow = 295.75 cfs @ 12.60 hrs, Volume= 46.821 af
Outflow = 294.87 cfs @ 12.63 hrs, Volume= 46.788 af, Atten= 0%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.3 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 2.1 min

Peak Depth= 5.10' @ 12.61 hrs
Capacity at bank full= 456.66 cfs
0.00' x 6.00' deep channel, n= 0.070
Side Slope Z-value= 3.0 4.0 '/' Top Width= 42.00'
Length= 190.0' Slope= 0.0071 '/'

Reach 8R: (new node)



Reach 9: east runon ditch

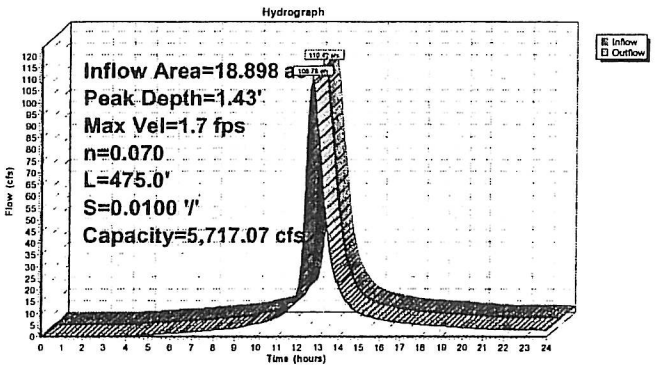
[65] Warning: Inlet elevation not specified

w Area = 18.898 ac, Inflow Depth > 11.02"
w = 110.42 cfs @ 12.54 hrs, Volume= 17.353 af
..flow = 108.78 cfs @ 12.68 hrs, Volume= 17.290 af, Atten= 1%, Lag= 8.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.7 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.8 fps, Avg. Travel Time= 10.2 min

Peak Depth= 1.43' @ 12.60 hrs
Capacity at bank full= 5,717.07 cfs
0.00' x 6.31' deep channel, n= 0.070
Side Slope Z-value= 60.0 3.0 '/' Top Width= 397.53'
Length= 475.0' Slope= 0.0100 '/'

Reach 9: east runon ditch



Reach 9R: (new node)

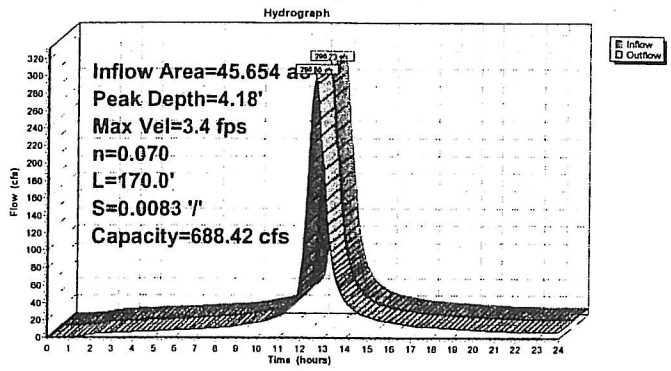
[65] Warning: Inlet elevation not specified

Inflow Area = 45.654 ac, Inflow Depth > 12.50"
Inflow = 296.23 cfs @ 12.62 hrs, Volume= 47.570 af
Outflow = 295.55 cfs @ 12.65 hrs, Volume= 47.540 af, Atten= 0%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.4 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 1.9 min

Peak Depth= 4.18' @ 12.63 hrs
Capacity at bank full= 688.42 cfs
6.00' x 6.00' deep channel, n= 0.070
Side Slope Z-value= 3.0 4.0 '/' Top Width= 48.00'
Length= 170.0' Slope= 0.0083 '/'

Reach 9R: (new node)



Reach 10AR: (new node)

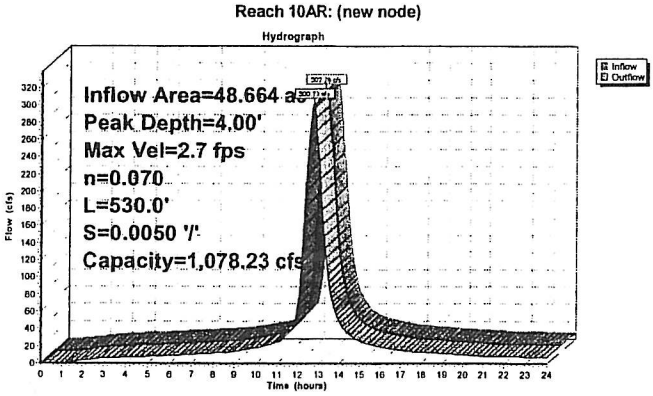
[65] Warning: Inlet elevation not specified

Inflow Area = 48.664 ac, Inflow Depth > 12.52"
Inflow = 302.28 cfs @ 12.64 hrs, Volume= 50.759 af
Outflow = 300.23 cfs @ 12.73 hrs, Volume= 50.631 af, Atten= 1%, Lag= 5.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.7 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.2 fps, Avg. Travel Time= 7.6 min

Peak Depth= 4.00' @ 12.68 hrs
Capacity at bank full= 1,078.23 cfs
10.00' x 7.00' deep channel, n= 0.070
Side Slope Z-value= 6.0 3.0 '/' Top Width= 73.00'
Length= 530.0' Slope= 0.0050 '/'

Reach 10AR: (new node)



Reach 11: (new node)

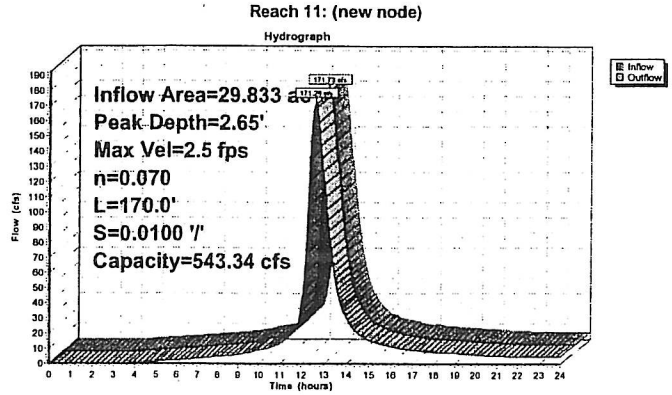
[65] Warning: Inlet elevation not specified

Inflow Area = 29.833 ac, Inflow Depth > 11.04"
Inflow = 171.73 cfs @ 12.56 hrs, Volume= 27.440 af
Outflow = 171.26 cfs @ 12.59 hrs, Volume= 27.416 af, Atten= 0%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.2 fps, Avg. Travel Time= 2.4 min

Peak Depth= 2.65' @ 12.57 hrs
Capacity at bank full= 543.34 cfs
0.00' x 4.08' deep channel, n= 0.070
Side Slope Z-value= 5.7 13.5 '/' Top Width= 78.34'
Length= 170.0' Slope= 0.0100 '/'

Reach 11: (new node)



ATTACHMENT C-2

WEIGHTED CURVE NUMBER CALCULATIONS

SUBCATCHMENT AREA AND HYDROCAD™ INPUT PARAMETERS FOR THE CALCULATION OF WEIGHTED CN
2000 YEAR STORM DESIGN SCENARIOS

Subcatchment Label	Area (acres)	Percent of Total Area %	HSG	Land Use Description	CN AMC = 2	Weighted CN AMC = 2	Weighted CN (2) AMC = 3
A	2.60	100%	B/C	vegetated final cover	74	(1) 98	99
B	1.64	100%	B/C	vegetated final cover	74	(1) 98	99
C	4.96	100%	B/C	vegetated final cover	74	(1) 98	99
D	4.75	100%	B/C	vegetated final cover	74	(1) 98	99
DDR	0.73	100%	B/C	vegetated final cover	74	(1) 98	99
E	4.95	100%	B/C	vegetated final cover	74	(1) 98	99
F	4.81	100%	B/C	vegetated final cover	74	(1) 98	99
FFR	5.51	100%	B/C	vegetated final cover	74	(1) 98	99
G	4.95	100%	B/C	vegetated final cover	74	(1) 98	99
HR	4.59	100%	B/C	vegetated final cover	74	(1) 98	99
I	0.53	100%	C	runon east of OSDF	79	79	90
IR	0.81	100%	B/C	vegetated final cover	74	(1) 98	99
J	1.24	100%	C	runon east of OSDF	79	79	90
JR	2.20	100%	B/C	vegetated final cover	74	(1) 98	99
K	2.62	65% 35%	B C	runon east of OSDF runon east of OSDF	69 79	73	86
L	1.78	70% 30%	B C	runon east of OSDF runon east of OSDF	69 79	72	86
M	7.23	60% 40%	B C	runon east of OSDF runon east of OSDF	69 79	73	86
N	11.66	75% 25%	B C	runon east of OSDF runon east of OSDF	69 79	72	85
O	10.94	65% 35%	B C	runon east of OSDF runon east of OSDF	69 79	73	86
Q	1.52	50% 50%	B C	runon east of OSDF runon east of OSDF	69 79	74	87

Note (1): The weighted curve number of the final cover system is assumed to be 98, as consistent with the *OSDF Final Design Package*, prepared by GeoSyntec Consultants for the United States Department of Engergy, Fernald Environmental Management Project, in May 1997.
Note (2): The Antecedent Moisture Condition (III) was calculated using the equation CN(III) = 23CN(II) / 10 + 0.13CN(II).

N/A - Not Applicable

ATTACHMENT C-3

TABULATED ANALYSIS RESULTS FOR CHANNELS

2000 YEAR STORM DESIGN SCENARIO - HEAVY VEGETATION
SUMMARY OF CHANNEL ANALYSIS RESULTS

Channel Identification			Channel Characteristics							Hydrologic Calculations		Hydraulic Calculations							
Channel Name[1]	Status	Design Scenario	Section Shape	Minimum Channel Depth (ft)	Longitudinal Slope[2] (%)	Manning n	Bottom Width B (ft)	Side Slope M_1:1	Side Slope M_2:1	HydroCAD Node	HydroCAD Q[3] (cfs)	Area of Flow A (sq ft)	Perimeter P (ft)	Hydraulic Radius, R (ft)	Peak Flow Depth[5] Y (ft)	Estimated Q[5] (cfs)	Channel Freeboard[4] (ft)	Peak Flow Velocity (fps)	Lining Type[6]
subcatchment B	existing	2000 DS	vee	11.90	0.35%	0.070	0	6	4	1	52.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
reach 1	existing	2000 DS	vee	8.29	0.35%	0.070	0	6	4	2	104.4	58.8	35.01	1.68	3.43	104.72	4.86	1.78	riprap
reach 2	existing	2000 DS	vee	6.57	0.64%	0.070	0	6	5	3	155.4	64.71	38.35	1.69	3.43	156.18	3.14	2.41	riprap
reach 3	new	2000 DS	vee	6.26	0.75%	0.070	0	6	3	4	206.2	71.64	36.89	1.94	3.99	205.62	2.27	2.87	riprap
reach 4	new	2000 DS	vee	6.14	0.50%	0.070	0	6	4	5	236.6	94.61	44.40	2.13	4.35	235.89	1.79	2.49	riprap
reach 5	new	2000 DS	vee	5.32	0.50%	0.070	0	6	3	6	262.6	99.83	43.54	2.29	4.71	261.31	0.61	2.62	riprap
reach 6	new	2000 DS	vee	5.70	0.50%	0.070	0	6	3	7R	279.1	104.98	44.65	2.35	4.83	279.45	0.87	2.66	riprap
reach 7	new	2000 DS	vee	3.10	1.25%	0.070	0	4	3	8	41.8	16.94	16.03	1.06	2.20	41.83	0.90	2.47	grass
reach 7R	new	2000 DS	vee	6.0	0.50%	0.070	0	3	6	8R	295.8	109.82	45.67	2.40	4.94	296.75	1.06	2.70	riprap
reach 8	new	2000 DS	vee	3.01	1.00%	0.070	0	58	3	9	110.4	64.13	88.70	0.72	1.45	109.94	1.56	1.71	grass
reach 8R	new	2000 DS	vee	6.0	0.71%	0.070	0	3	4	9R	296.2	91.04	37.16	2.45	5.10	296.83	0.90	3.26	riprap
reach 9	new	2000 DS	vee	6.31	1.00%	0.070	0	60	3	11	171.7	89.97	106.76	0.84	1.69	170.84	4.62	1.90	grass
reach 9R	new	2000 DS	trapezoidal	6.0	0.83%	0.070	6	3	4	10AR	302.3	87.65	36.74	2.39	4.22	303.53	1.78	3.46	riprap
reach 10AR	new	2000 DS	trapezoidal	7.0	0.50%	0.070	10	6	3	11	171.7	74.25	38.66	1.92	3.10	172.69	3.90	2.33	riprap
reach 11	new	2000 DS	vee	4.08	1.00%	0.070	0	5.7	13.5	3R	180.1	70.31	53.21	1.32	2.23	180.21	1.85	2.56	grass

2000 DS = 2000 Year Storm Design Scenario

Notes:
1. Channels are named after the corresponding subcatchment or reach.
2. Longitudinal slopes taken from existing topographic information and Construction Drawings.
3. Peak flow rates calculated by HydroCAD for each reach. See attachment C-1.
4. Calculated as the difference between minimum channel depth and peak flow depth.
5. Calculated flow rates using Manning's equation.
6. Maximum permissible velocity for grass lined channels is 5 fps.
   Maximum permissible velocity for riprap lined channels is 12 fps.

006136

COMPUTATION COVER SHEET

SUBJECT OF COMPUTATIONS OSDF PHASE V, SURFACE-WATER MANAGEMENT SYSTEM DESIGN AND POST-CLOSURE HYDROLOGY

Computations By: (Cognizant Engineer)
Signature: Victoria S. Cheplak — Date: 1-21-04
Printed Name and Title: Victoria S. Cheplak, Senior Staff Engineer

Assumptions and Procedures Checked By: (Checker)
Signature: [signature] — Date: 1-21-04
Printed Name and Title: Ganesh Gopalakrishnan, Senior Engineer

Computations Checked by:
Signature: Hollie Kinnecom — Date: 1-21-04
Printed Name and Title: Hollie Kinnecom, Staff Engineer

Computations Backchecked by: (Cognizant Engineer)
Signature: Victoria S. Cheplak — Date: 1-21-04
Printed Name and Title: Victoria S. Cheplak, Senior Staff Engineer

Approved by: (PDP)
Signature: [signature] — Date: 1-21-04
Printed Name and Title: Ganesh Gopalakrishnan, Senior Engineer

Approved by: (DTL/TETL)
Signature: Rudolph Bonaparte — Date: 1/22/04
Printed Name and Title: R. Bonaparte, Engineer of Record

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Submittal to FF/DOE/EPA	30 Jan 02	DBM	DGP	JFB
1	CFC Revision 1 Submittal to FF/DOE/EPA	23 Jan 04	VSC VSC	GG GG	RB
2A	DCN-Cell 8 Expansion	16 June 04	VSC VSC	GG GG	DKP
2B	DCN-Cell 8 Change in Side + Crest Slope	4 April 06	RJ RJ	VSC VSC	DKP
2	DCN-Cell 8 Change in Side and Crest Slope	1 June 06	VSC for RT	VSC VSC	DKP

ADDENDUM TO SECTION 12.5

(REVISION 2B DUE TO CELL 8 CHANGE IN SIDE SLOPE & CREST SLOPE)

This addendum details the calculations that were revised within Section 12.5, OSDF Phase V, Surface-Water Management System Design and Post-Closure Hydrology, of the Final Design Calculation Package for the Fernald Environmental Management Project (FEMP), due to the re-design of the Cell 8 cover system. This re-design encompasses the increase in impacted material placement volume of Cell 8 through a change in side slope and crest slope. This addendum discusses the modifications made to this calculation package as Revision 2B and as associated with this modification.

For Revision 2B to this calculation package, the critical case for the Surface-Water Management System Design was evaluated to confirm compliance with the Surface-Water Management and Erosion Control (SWMEC) Plan and the OSDF Design Criteria Package (DCP). This critical case is presented as the Construction Design Scenario, which considers the 25-Year, 24-Hour Storm. The surface water management system was modified to reflect the design changes resulting from the re-design of the Cell 8 cover ssytem and analyzed to verify the adequacy of the designed surface water management features. For this submittal, only the East and West OSDF Construction Design Scenarios were modified; it should be noted that Design Cases A through C, detailed in this section, are not impacted, and therefore, are not presented.

In order to present the results of this DCN analysis in an efficient manner, only the attachments that summarize the modifications and updated results for the surface water management system with regard to the DCN are presented. These attachments are listed subsequently and explained in further detail.

- **Attachment A-2 – Layout of Design Scenario and Design Case SWM Systems.** These layouts demonstrate the revised configuration of the OSDF. Each surface water structure is labeled as identified in the hydrologic analysis.

- **Attachment A-8 – Nodal Network Diagrams.** These diagrams demonstrate the revised configuration of the surface water management system as a result of the DCN.

- **Attachment B-4 – Data for Time of Concentration Calculations.** These data demonstrate the revised flow paths used to calculate the time of concentration for the revised configuration of subcatchments used in the hydrologic analysis.

- **Attachment C-1A – HydroCAD Output Reports – 25-Year, 24-Hour Storm Event, East OSDF Construction-Phase Design Scenario.** This attachment provides the results of the hydrologic modeling for the East OSDF Construction Design Scenario for the 25-Year, 24-Hour Storm, considered the critical case for these calculations.

- **Attachment C-1B – HydroCAD Output Reports – 25-Year, 24-Hour Storm Event, West OSDF Construction-Phase Design Scenario.** This attachment provides the results of the hydrologic modeling for the West OSDF Construction Design Scenario for the 25-Year, 24-Hour Storm, considered the critical case for these calculations.

- **Attachment C-2 – Weighted Curve Number Calculations.** These calculations present the revised areas and Curve Numbers for the revised configuration of subcatchments used in the hydrologic analysis.

- **Attachment C-3 – Tabulated Analysis Results for Channels.** These results present the revised channel characteristics (i.e., geometry), flow within each channel, and hydraulic characteristics including peak flow depth and available freeboard, for the revised configuration of channels used in the hydrologic and hydraulic analysis. The table has been modified to reflect these results for the East OSDF and West OSDF Construction Design Scenario only. The remainder of the table (i.e., features that have not been modified), has been shaded in gray.

- **Attachment C-4A – CulvertMaster Output Reports for Culverts.** These reports present the hydraulic analysis for the culverts. These reports are provided only for those culverts in the East and West OSDF Construction Design Scenario that were modified in design or were impacted by the DCN through altered flow rates.

- **Attachment C-4B – Tabulated Analysis Results for Culverts.** These results present the revised physical characteristics (i.e., geometry) and profile (i.e., inverts) of the revised configuration of culverts. The results also present the hydraulic capacity, structural capacity, and required outlet protection for these culverts as a result of flows analyzed based on the DCN. The table has been modified to reflect these results for the East OSDF and West OSDF Construction Design Scenario only. The remainder of the table (i.e., the features that have not been modified) has been shaded in gray.

Based on the analyses for the design change of the expansion of Cell 8, all channels and culverts are designed in accordance with the requirements of the SWMEC Plan and the DCP.

ATTACHMENT A-2

LAYOUT OF DESIGN SCENARIO AND DESIGN CASE SWM SYSTEMS

PHASE V

WEST OF DESIGN SCENARIO

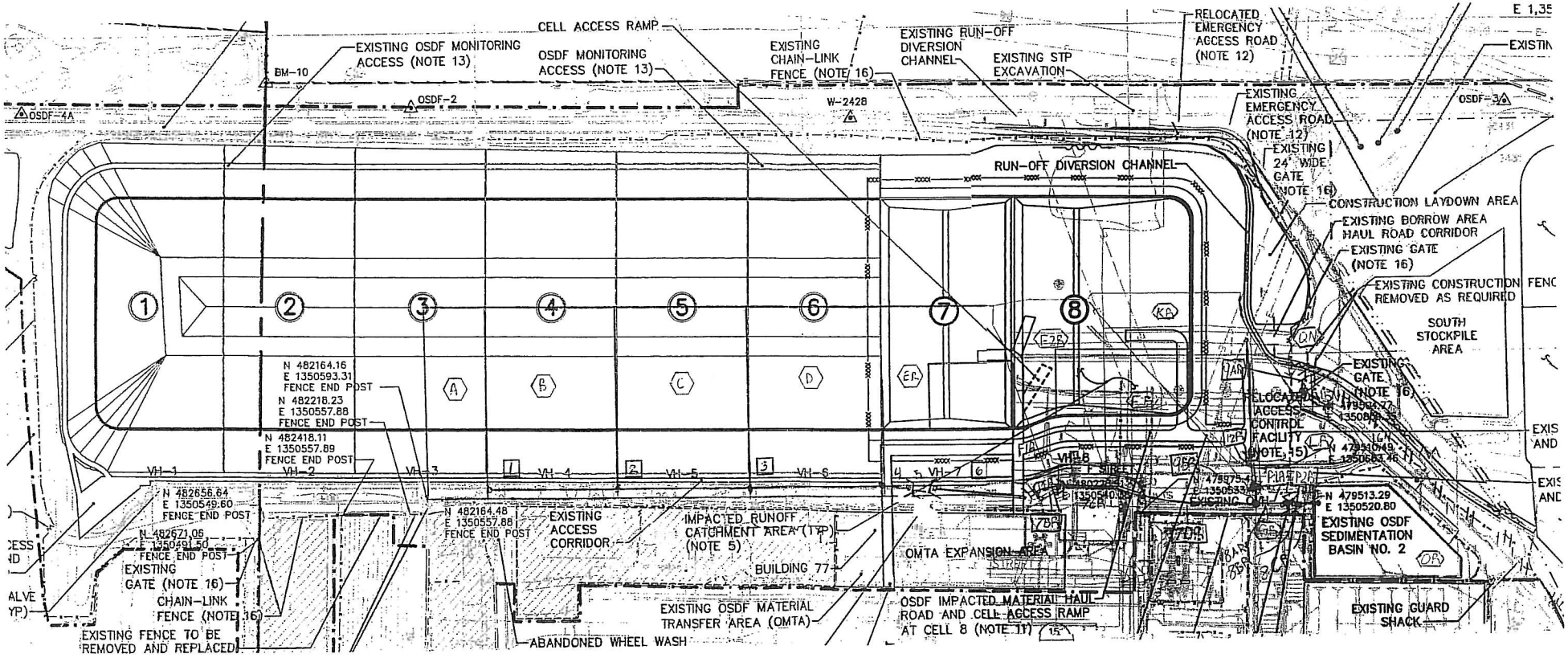
LEGEND

- SUBCATCHMENT LABEL AND BOUNDARY
- REACH ALIGNMENT AND LABEL
- CULVERT
- POND LABEL

SCALE 1" = 300'

0 300

N



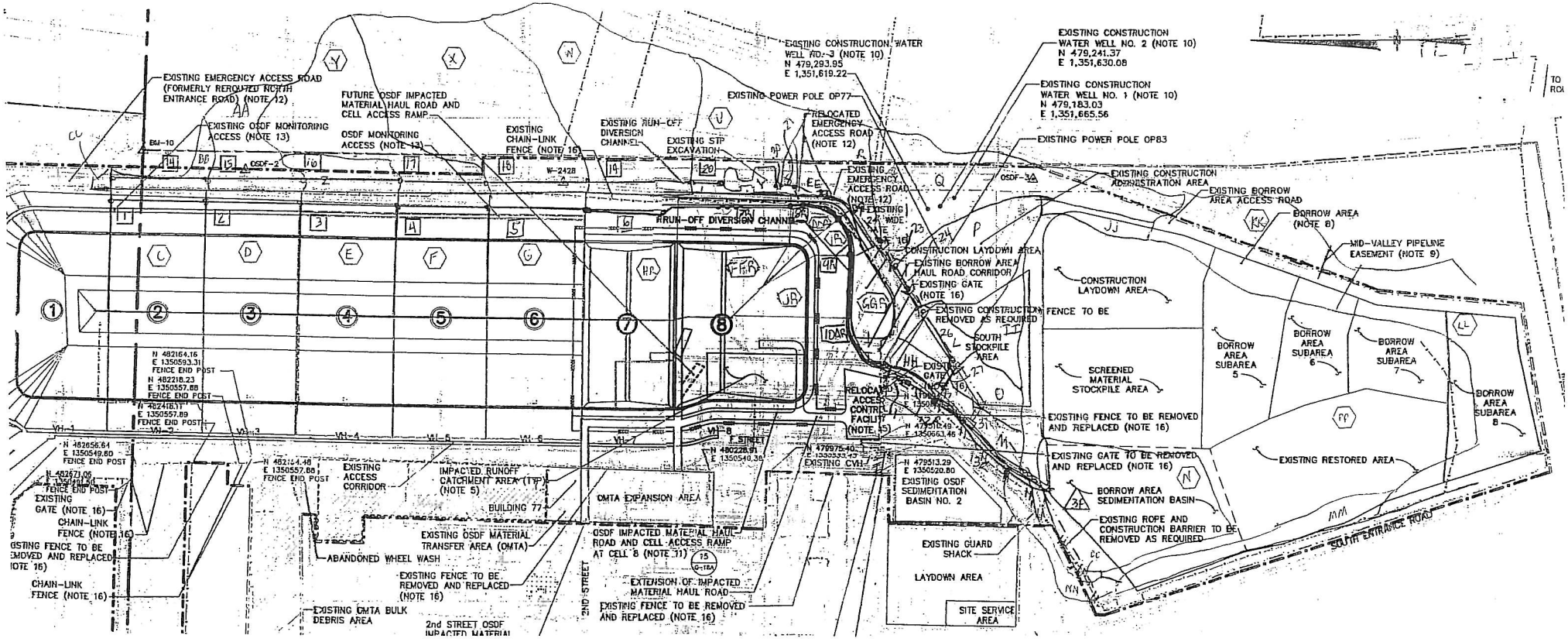
LEGEND

- SUBCATCHMENT LABEL AND BOUNDARY
- REACH ALIGNMENT AND LABEL
- CULVERT
- POND LABEL

PHASE V

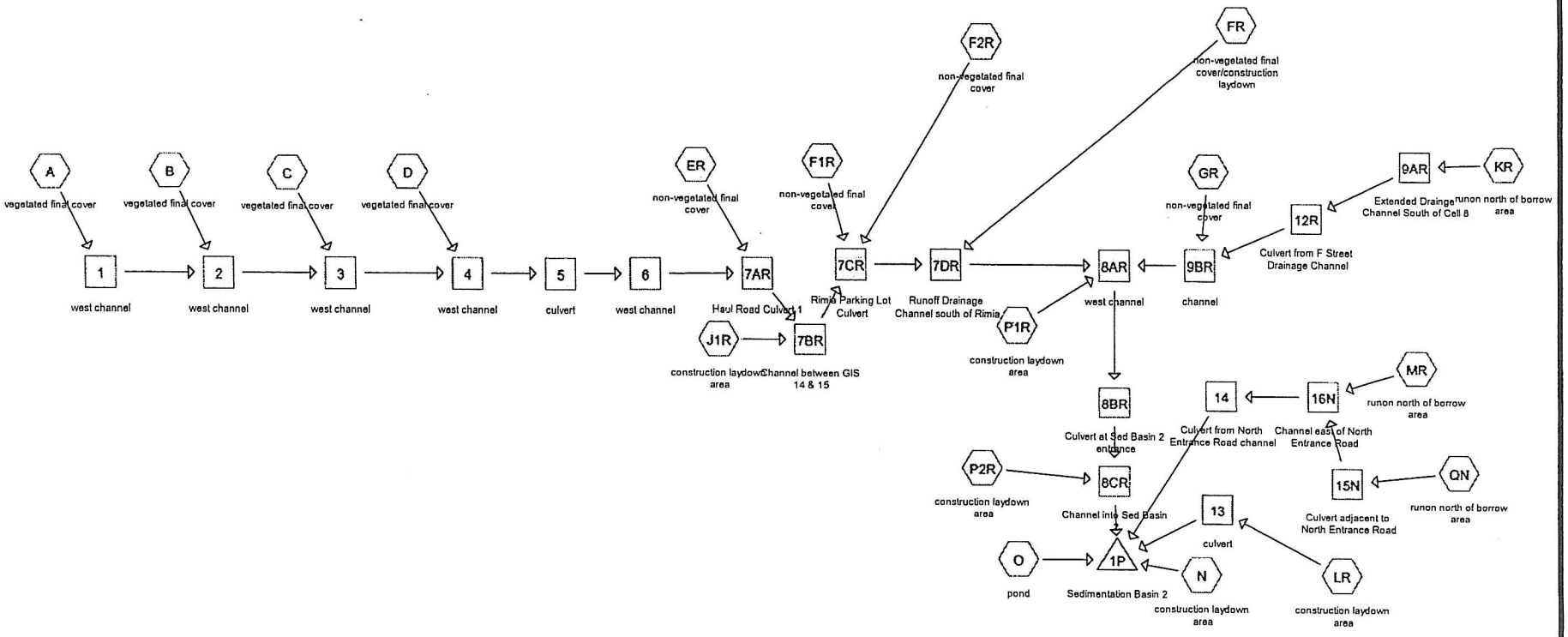
EAST OSDF DESIGN SCENARIO

SCALE 1" = 400'



ATTACHMENT A-8

NODAL NETWORK DIAGRAMS



Subcat Reach Pond Link

Drainage Diagram for West OSDF

Prepared by {enter your company name here} 4/3/2006

HydroCAD® 7.10 s/n 000929 © 2005 HydroCAD Software Solutions LLC

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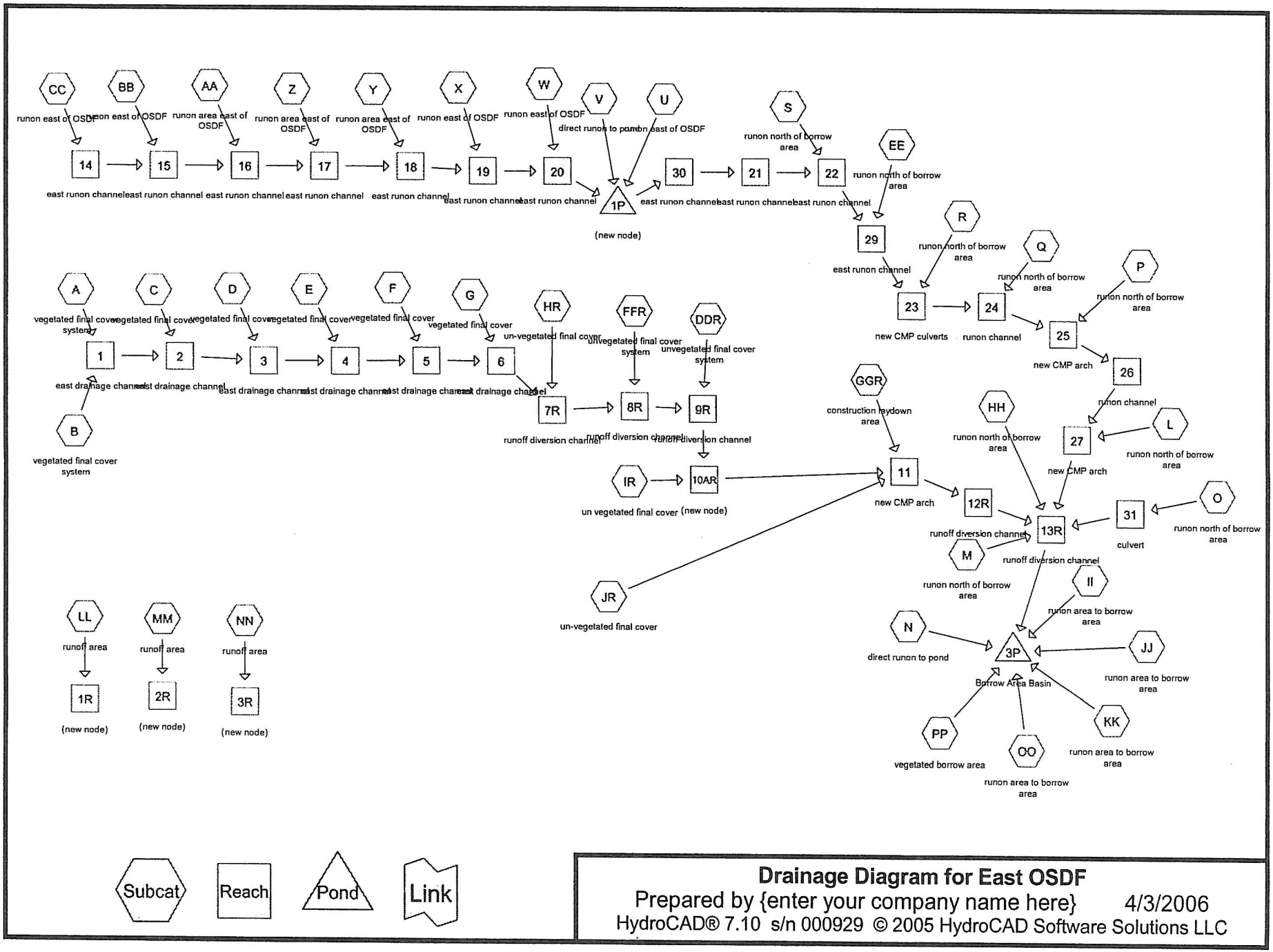


Drainage Diagram for East OSDF

Prepared by {enter your company name here} 4/3/2006

HydroCAD® 7.10 s/n 000929 © 2005 HydroCAD Software Solutions LLC

ATTACHMENT B-4

DATA FOR CALCULATION OF TIME OF CONCENTRATION

HYDROCAD™ INPUT PARAMETERS FOR THE CALCULATION OF TIME OF CONCENTRATION
WEST OSDF CONSTRUCTION DESIGN SCENARIO

2 year, 24-hr Design Rainfall Depth, $P_{2,24}$ 2.60 inches

SUBCATCHMENT LABEL AND DESCRIPTION		SHEET FLOW 1				SHEET FLOW 2				SHEET FLOW 3				SHALLOW CONCENTRATED FLOW 1			SHALLOW CONCENTRATED FLOW 2			SHALLOW CONCENTRATED FLOW 3			SHALLOW CONCENTRATED FLOW 4		
No	Description	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)
A	VEGETATED FINAL COVER	90	GRASS SHORT	0.150	0.0300	60	GRASS SHORT	0.150	0.1000	150	GRASS SHORT	0.150	0.1700	199	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
B	VEGETATED FINAL COVER	90	GRASS SHORT	0.150	0.0300	60	GRASS SHORT	0.150	0.1000	150	GRASS SHORT	0.150	0.1700	200	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
C	VEGETATED FINAL COVER	90	GRASS SHORT	0.150	0.0300	60	GRASS SHORT	0.150	0.1000	150	GRASS SHORT	0.150	0.1700	200	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
D	VEGETATED FINAL COVER	90	GRASS SHORT	0.150	0.0200	60	GRASS SHORT	0.150	0.1000	150	GRASS SHORT	0.150	0.1700	205	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
ER	NON VEGETATED FINAL COVER	110	SMOOTH	0.011	0.0625	45	SMOOTH	0.011	0.1110	150	SMOOTH	0.011	0.1700	200	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
FIR	NON VEGETATED FINAL COVER	90	SMOOTH	0.011	0.0530	50	SMOOTH	0.011	0.1000	150	SMOOTH	0.011	0.1670	200	UNPAVED	0.1670	-	-	-	-	-	-	-	-	-
FIR	NON VEGETATED FINAL COVER	120	SMOOTH	0.011	0.0500	180	SMOOTH	0.011	0.1667	-	-	-	-	200	UNPAVED	0.1667	60	UNPAVED	0.0850	-	-	-	-	-	-
FR	NON VEGETATED FINAL COVER	20	SMOOTH	0.011	0.1000	280	SMOOTH	0.011	0.1667	-	-	-	-	70	UNPAVED	0.1667	15	PAVED	0.0400	15	UNPAVED	0.1667	25	UNPAVED	0.0350
GR	NON VEGETATED FINAL COVER, RUNON NORTH OF DOORWAY AREA	280	SMOOTH	0.011	0.1667	20	SMOOTH	0.011	0.0400	-	-	-	-	20	PAVED	0.0400	30	UNPAVED	0.3333	100	UNPAVED	0.0400	-	-	-
JIR	CONSTRUCTION LAYDOWN	54	GRASS SHORT	0.150	0.1670	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KR	NON VEGETATED FINAL COVER, RUNON NORTH OF DOORWAY AREA	55	SMOOTH	0.011	0.0500	65	SMOOTH	0.011	0.1000	180	SMOOTH	0.011	0.1667	135	UNPAVED	0.1667	15	PAVED	0.0400	30	UNPAVED	0.1667	-	-	-
LR	CONSTRUCTION LAYDOWN	300	GRASS SHORT	0.150	0.0400	-	-	-	-	-	-	-	-	60	UNPAVED	0.0170	-	-	-	-	-	-	-	-	-
MR	RUNON NORTH OF DOORWAY AREA	40	GRASS SHORT	0.150	0.0985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	CONSTRUCTION LAYDOWN	170	GRASS SHORT	0.150	0.0250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	DIRECT RUNON TO POND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P1R	CONSTRUCTION LAYDOWN	100	GRASS SHORT	0.150	0.0385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P2R	CONSTRUCTION LAYDOWN	110	GRASS SHORT	0.150	0.0473	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QN	RUNON NORTH OF DOORWAY AREA	100	GRASS SHORT	0.150	0.0167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SUBCATCHMENT LABEL AND DESCRIPTION		CHANNEL FLOW 1						PIPE FLOW				CHANNEL FLOW 2					
No	Description	Flow Length (ft)	Bottom Width (ft)	Flow Depth (ft)	Sideslope (ft/ft)	Manning's n	Longitudinal Slope (ft/ft)	Flow Length (ft)	Diameter (in)	Manning's n	Longitudinal Slope (ft/ft)	Flow Length (ft)	Bottom Width (ft)	Flow Depth (ft)	Sideslope (ft/ft)	Manning's n	Longitudinal Slope (ft/ft)
A	VEGETATED FINAL COVER	180	0	2.00	3.0: 6.0	0.0150	0.0075	-	-	-	-	-	-	-	-	-	-
B	VEGETATED FINAL COVER	190	0	2.00	3.0: 6.0	0.0150	0.0075	60	72	0.013	0.0100	200	0	4.00	6.0: 2.0	0.150	0.0075
C	VEGETATED FINAL COVER	190	0	2.00	3.0: 6.0	0.0150	0.0075	60	72	0.013	0.0100	195	0	4.00	6.0: 2.0	0.150	0.0075
D	VEGETATED FINAL COVER	190	0	2.00	3.0: 6.0	0.0150	0.0075	60	72	0.013	0.0100	195	0	4.00	6.0: 2.0	0.150	0.0075
ER	NON VEGETATED FINAL COVER	510	0	3.50	3.0: 6.0	0.0150	0.0075	85	72	0.013	0.0029	-	-	-	-	-	-
FIR	NON VEGETATED FINAL COVER	160	0	3.50	3.0: 6.0	0.0150	0.0075	53	72	0.013	0.0750	-	-	-	-	-	-
FIR	NON VEGETATED FINAL COVER	-	-	-	-	-	-	78	72	0.013	0.0052	-	-	-	-	-	-
FR	NON VEGETATED FINAL COVER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GR	NON VEGETATED FINAL COVER, RUNON NORTH OF DOORWAY AREA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JIR	CONSTRUCTION LAYDOWN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KR	NON VEGETATED FINAL COVER, RUNON NORTH OF DOORWAY AREA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LR	CONSTRUCTION LAYDOWN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MR	RUNON NORTH OF DOORWAY AREA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	CONSTRUCTION LAYDOWN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	DIRECT RUNON TO POND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P1R	CONSTRUCTION LAYDOWN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P2R	CONSTRUCTION LAYDOWN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QN	RUNON NORTH OF DOORWAY AREA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

HYDROCAD™ INPUT PARAMETERS FOR THE CALCULATION OF TIME OF CONCENTRATION
EAST OSDF CONSTRUCTION DESIGN SCENARIO

2-year, 24-hr Design Rainfall Depth, $P_{2,24}$ = 2.60 inches

SUBCATCHMENT LABEL AND DESCRIPTION		SHEET FLOW 1				SHEET FLOW 2				SHEET FLOW 3			
No.	Description	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)
A	VEGETATED FINAL COVER	90	GRASS: SHORT	0.150	0.0500	60	GRASS: SHORT	0.150	0.1000	150	GRASS: SHORT	0.150	0.1700
B	VEGETATED FINAL COVER	50	GRASS: SHORT	0.150	0.1800	-	-	-	-	-	-	-	-
C	VEGETATED FINAL COVER	90	GRASS: SHORT	0.150	0.0500	60	GRASS: SHORT	0.150	0.1000	150	GRASS: SHORT	0.150	0.1700
D	VEGETATED FINAL COVER	90	GRASS: SHORT	0.150	0.0500	60	GRASS: SHORT	0.150	0.1000	150	GRASS: SHORT	0.150	0.1700
E	VEGETATED FINAL COVER	90	GRASS: SHORT	0.150	0.0500	60	GRASS: SHORT	0.150	0.1000	150	GRASS: SHORT	0.150	0.1700
F	VEGETATED FINAL COVER	90	GRASS: SHORT	0.150	0.0500	60	GRASS: SHORT	0.150	0.1000	150	GRASS: SHORT	0.150	0.1700
G	VEGETATED FINAL COVER	90	GRASS: SHORT	0.150	0.0500	60	GRASS: SHORT	0.150	0.1000	150	GRASS: SHORT	0.150	0.1700
HR	NON VEGETATED FINAL COVER	90	SMOOTH	0.011	0.0500	50	SMOOTH	0.011	0.1000	150	SMOOTH	0.011	0.1700
IR	NON VEGETATED FINAL COVER	300	SMOOTH	0.011	0.1430	-	-	-	-	-	-	-	-
JR	NON VEGETATED FINAL COVER	40	SMOOTH	0.011	0.0500	60	SMOOTH	0.011	0.1000	200	SMOOTH	0.011	0.1667
L	RUNON NORTH OF BORROW AREA	140	GRASS: SHORT	0.150	0.0200	-	-	-	-	-	-	-	-
M	RUNON NORTH OF BORROW AREA	170	GRASS: SHORT	0.150	0.0500	-	-	-	-	-	-	-	-
N	DIRECT RUNON TO POND	-	-	-	-	-	-	-	-	-	-	-	-
O	RUNON NORTH OF BORROW AREA	-	-	-	-	-	-	-	-	-	-	-	-
P	RUNON NORTH OF BORROW AREA	300	GRASS: SHORT	0.150	0.0150	-	-	-	-	-	-	-	-
Q	RUNON NORTH OF BORROW AREA	300	GRASS: SHORT	0.150	0.0260	-	-	-	-	-	-	-	-
R	RUNON NORTH OF BORROW AREA	300	GRASS: SHORT	0.150	0.0400	-	-	-	-	-	-	-	-
S	RUNON NORTH OF BORROW AREA	280	GRASS: SHORT	0.150	0.0150	-	-	-	-	-	-	-	-
U	RUNON EAST OF OSDF	300	GRASS: SHORT	0.150	0.0140	-	-	-	-	-	-	-	-
V	DIRECT RUNON TO POND	-	-	-	-	-	-	-	-	-	-	-	-
W	RUNON EAST OF OSDF	300	GRASS: SHORT	0.150	0.1780	-	-	-	-	-	-	-	-
X	RUNON EAST OF OSDF	300	GRASS: SHORT	0.150	0.0190	-	-	-	-	-	-	-	-
Y	RUNON EAST OF OSDF	300	GRASS: SHORT	0.150	0.0130	-	-	-	-	-	-	-	-
Z	RUNON EAST OF OSDF	300	GRASS: SHORT	0.150	0.0310	-	-	-	-	-	-	-	-
AA	RUNON AREA EAST OF OSDF	300	GRASS: SHORT	0.150	0.0800	-	-	-	-	-	-	-	-
BB	RUNON AREA EAST OF OSDF	110	GRASS: SHORT	0.150	0.0800	-	-	-	-	-	-	-	-
CC	RUNON AREA EAST OF OSDF	110	GRASS: SHORT	0.150	0.0800	-	-	-	-	-	-	-	-
DDR	NON VEGETATED FINAL COVER	300	SMOOTH	0.011	0.1430	-	-	-	-	-	-	-	-
EE	RUNON NORTH OF BORROW AREA	300	GRASS: SHORT	0.150	0.0230	-	-	-	-	-	-	-	-
FFR	NON VEGETATED FINAL COVER	70	SMOOTH	0.011	0.0500	90	SMOOTH	0.011	0.1000	140	SMOOTH	0.011	0.1667
GGR	CONSTRUCTION LAYDOWN	240	GRASS: SHORT	0.150	0.0180	-	-	-	-	-	-	-	-
HH	RUNON NORTH OF BORROW AREA	90	GRASS: SHORT	0.150	0.0100	-	-	-	-	-	-	-	-
II	RUNON AREA TO BORROW AREA	210	GRASS: SHORT	0.150	0.0400	-	-	-	-	-	-	-	-
JJ	RUNON AREA TO BORROW AREA	300	GRASS: SHORT	0.150	0.0250	-	-	-	-	-	-	-	-
KK	RUNON AREA TO BORROW AREA	300	GRASS: SHORT	0.150	0.0280	-	-	-	-	-	-	-	-
LL	RUNOFF	300	GRASS: SHORT	0.150	0.0240	-	-	-	-	-	-	-	-
MM	RUNOFF	100	GRASS: SHORT	0.150	0.0700	-	-	-	-	-	-	-	-
NN	RUNOFF	-	-	-	-	-	-	-	-	-	-	-	-
OO	RUNON AREA TO BORROW AREA	120	GRASS: SHORT	0.150	0.1660	-	-	-	-	-	-	-	-
PP	VEGETATED BORROW AREA	150	GRASS: SHORT	0.150	0.1660	150	GRASS: SHORT	0.150	0.0025	-	-	-	-

No.	SHALLOW CONCENTRATED FLOW 1			SHALLOW CONCENTRATED FLOW 2			SHALLOW CONCENTRATED FLOW 3			SHALLOW CONCENTRATED FLOW 4		
	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)
A	80	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-
C	170	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
D	170	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
E	170	UNPAVED	0.1700	-	-		-	-	-	-	-	-
F	170	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
G	170	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
HR	160	UNPAVED	0.1700	-	-	-	-	-	-	-	-	-
IR	80	UNPAVED	0.1430	15	PAVED	0.0400	25	UNPAVED	0.1667	-	-	-
JR	115	UNPAVED	0.1667	15	PAVED	0.0200	30	UNPAVED	0.1667			
L	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	-	-	-	-	-	-	-	-	-
N	-	-	-	-	-	-	-	-	-	-	-	-
O	-	-	-	-	-	-	-	-	-	-	-	-
P	350	UNPAVED	0.0070	-	-	-	-	-	-	-	-	-
Q	1280	UNPAVED	0.0260	-	-	-	-	-	-	-	-	-
R	350	UNPAVED	0.0400	-	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-	-	-	-	-
U	240	UNPAVED	0.0140	-	-	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-	-	-	-	-	-
W	400	UNPAVED	0.1780	-	-	-	-	-	-	-	-	-
X	730	UNPAVED	0.0190	-	-	-	-	-	-	-	-	-
Y	510	UNPAVED	0.0130	-	-	-	-	-	-	-	-	-
Z	250	UNPAVED	0.0310	-	-	-	-	-	-	-	-	-
AA	170	UNPAVED	0.0800	-	-	-	-	-	-	-	-	-
BB	-	-	-	-	-	-	-	-	-	-	-	-
CC	-	-	-	-	-	-	-	-	-	-	-	-
DDR	80	UNPAVED	0.1430	15	PAVED	0.0400	25	UNPAVED	0.1667	-	-	-
EE	80	UNPAVED	0.0230	-	-	-	-	-	-	-	-	-
FFR	135	UNPAVED	0.1667	15	PAVED	0.0400	20	UNPAVED	0.1667	-	-	-
GGR	55	UNPAVED	0.0145	-	-	-	-	-	-	-	-	-
HH	-	-	-	-	-	-	-	-	-	-	-	-
II	70	UNPAVED	0.1660	380	UNPAVED	0.0025	-	-	-	-	-	-
JJ	40	UNPAVED	0.0250	110	UNPAVED	0.1660	840	UNPAVED	0.0025	840	UNPAVED	0.0025
KK	150	UNPAVED	0.0140	110	UNPAVED	0.1660	630	UNPAVED	0.0030	630	UNPAVED	0.0030
LL	200	UNPAVED	0.0240	-	-	-	-	-	-	-	-	-
MM	-	-	-	-	-	-	-	-	-	-	-	-
NN	-	-	-	-	-	-	-	-	-	-	-	-
OO	-	-	-	-	-	-	-	-	-	-	-	-
PP	1190	UNPAVED	0.0025	-	-	-	-	-	-	-	-	-

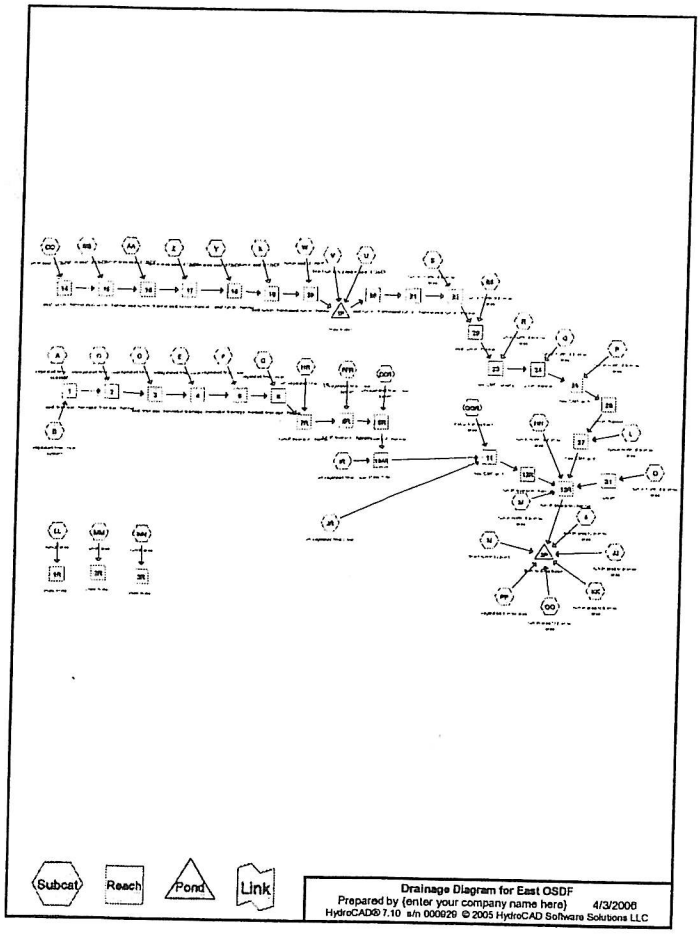
No.	CHANNEL FLOW 1						CHANNEL FLOW 2					
	Flow Length (ft)	Bottom Width (ft)	Flow Depth (ft)	Sideslopes (ft/ft)	Manning's n	Longitudinal Slope (ft/ft)	Flow Length (ft)	Bottom Width (ft)	Flow Depth (ft)	Sideslopes (ft/ft)	Manning's n	Longitudinal Slope (ft/ft)
A	-	-	-	-	-	-	-	-	-	-	-	-
B	450	0	1.62	6.0, 3.0	0.030	0.0045	-	-	-	-	-	-
C	400	0	1.32	6.0, 4.0	0.030	0.0045	-	-	-	-	-	-
D	250	0	1.29	5.0, 3.0	0.030	0.0045	150	0	1.59	4.0, 3.0	0.030	0.0050
E	380	0	1.66	4.0, 3.0	0.030	0.0050	-	-	-	-	-	-
F	390	0	1.19	4.0, 3.0	0.030	0.0050	-	-	-	-	-	-
G	410	0	[illegible]	4.0, 3.0	0.030	0.0050	-	-	-	-	-	-
HR	400	0	3.70	6.0, 3.0	0.030	0.0100	-	-	-	-	-	-
IR	170	6	5.00	3.0, 4.0	0.030	0.0083	-	-	-	-	-	-
JR	530	10	6.50	6.0, 3.0	0.030	0.0050	-	-	-	-	-	-
L	290	0	2.00	3.0, 3.0	0.030	0.0075	-	-	-	-	-	-
M	200	20	2.50	3.0, 3.0	0.030	0.0045	-	-	-	-	-	-
N	-	-		-	-	-	-	-	-	-	-	-
O	230	0	1.00	5.0, 5.0	0.030	0.0086	-	-	-	-	-	-
P	-	-		-	-	-	-	-	-	-	-	-
Q	-	-	-	-	-	-	-	-	-	-	-	-
R	-	-	-	-	-	-	-	-	-	-	-	-
S	30	0	3.00	3.0, 3.0	0.030	0.0100	-	-	-	-	-	-
U	-	-	-	-	-	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-	-	-	-	-	-
W	270	0	3.00	3.0, 30.0	0.030	0.0114	-	-	-	-	-	-
X	330	0	2.00	3.0, 3.0	0.030	0.0100	-	-	-	-	-	-
Y	340	0	2.00	5.0, 4.0	0.030	0.0110	-	-	-	-	-	-
Z	50	0	2.00	5.0, 4.0	0.030	0.0070	-	-	-	-	-	-
AA	300	0	2.00	3.0, 3.0	0.030	0.0070	-	-	-	-	-	-
BB	360	0	1.50	3.0, 5.0	0.030	0.0040	-	-	-	-	-	-
CC	-	-	-	-	-	-	-	-	-	-	-	-
DDR	190	0	4.50	3.0, 4.0	0.030	0.0071	-	-	-	-	-	
EE	40	0	4.00	3.0, 3.0	0.030	0.0100	-	-	-	-	-	-
FFR	610	0	4.00	6.0, 3.0	0.030	0.0050	-	-	-	-	-	-
GGR	-	-	-	-	-	-	-	-	-	-	-	-
HH	230	20	2.50	3.0, 3.0	0.030	0.0045	-	-	-	-	-	-
II	-	-	-	-	-	-	-	-	-	-	-	-
JJ	-	-	-	-	-	-	-	-	-	-	-	-
KK	-	-	-	-	-	-	-	-	-	-	-	-
LL	900	0	3.00	3.0, 3.0	0.030	0.0090	-	-	-	-	-	-
MM	980	0	3.00	5.0, 4.0	0.030	0.0060	-	-	-	-	-	-
NN	600	0	3.00	3.0, 3.0	0.030	0.0130	-	-	-	-	-	-
OO	-	-	-	-	-	-	-	-	-	-	-	-
PP	-	-		-	-	-	-	-	-	-	-	-

ATTACHMENT C-1A

HydroCAD™ OUTPUT REPORTS

EAST OSDF CONSTRUCTION-PHASE DESIGN SCENARIO

25-YEAR, 24-HOUR STORM EVENT



006136

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

Subcatchment A: vegetated final cover system Runoff Area=1.964 ac Runoff Depth>2.89"
Flow Length=380' Tc=17.3 min CN=83 Runoff=6.81 cfs 0.473 af

Subcatchment AA: runon area east of OSDF Runoff Area=2.708 ac Runoff Depth>2.12"
Flow Length=770' Tc=16.8 min CN=74 Runoff=6.97 cfs 0.478 af

Subcatchment B: vegetated final cover system Runoff Area=1.179 ac Runoff Depth>2.90"
Flow Length=500' Tc=6.2 min CN=83 Runoff=5.75 cfs 0.285 af

Subcatchment BB: runon east of OSDF Runoff Area=0.761 ac Runoff Depth>2.54"
Flow Length=470' Tc=9.1 min CN=79 Runoff=3.03 cfs 0.161 af

Subcatchment C: vegetated final cover Runoff Area=5.209 ac Runoff Depth>2.89"
Flow Length=870' Tc=20.7 min CN=83 Runoff=16.37 cfs 1.255 af

Subcatchment CC: runon east of OSDF Runoff Area=0.121 ac Runoff Depth>2.54"
Flow Length=110' Tc=6.7 min CN=79 Runoff=0.52 cfs 0.026 af

Subcatchment D: vegetated final cover Runoff Area=5.131 ac Runoff Depth>2.89"
Flow Length=870' Tc=20.1 min CN=83 Runoff=16.39 cfs 1.236 af

Subcatchment DDR: unvegetated final cover system Runoff Area=0.730 ac Runoff Depth>3.48"
Flow Length=610' Tc=2.4 min CN=89 Runoff=4.49 cfs 0.212 af

Subcatchment E: vegetated final cover Runoff Area=5.092 ac Runoff Depth>2.89"
Flow Length=850' Tc=19.7 min CN=83 Runoff=16.48 cfs 1.227 af

Subcatchment EE: runon north of borrow area Runoff Area=0.925 ac Runoff Depth>2.36"
Flow Length=420' Tc=25.4 min CN=77 Runoff=2.10 cfs 0.182 af

Subcatchment F: vegetated final cover Runoff Area=5.053 ac Runoff Depth>2.89"
Flow Length=860' Tc=19.7 min CN=83 Runoff=16.35 cfs 1.217 af

Subcatchment FFR: unvegetated final cover system Runoff Area=5.510 ac Runoff Depth>3.48"
Flow Length=1,080' Tc=4.5 min CN=89 Runoff=33.37 cfs 1.599 af

Subcatchment G: vegetated final cover Runoff Area=5.309 ac Runoff Depth>2.89"
Flow Length=880' Tc=19.8 min CN=83 Runoff=17.13 cfs 1.279 af

Subcatchment GGR: construction laydown area Runoff Area=1.550 ac Runoff Depth>2.44"
Flow Length=295' Tc=23.3 min CN=78 Runoff=3.86 cfs 0.316 af

Subcatchment HH: runon north of borrow area Runoff Area=0.548 ac Runoff Depth>2.54"
Flow Length=320' Tc=13.9 min CN=79 Runoff=1.86 cfs 0.116 af

Subcatchment HR: un-vegetated final cover Runoff Area=4.590 ac Runoff Depth>3.48"
Flow Length=850' Tc=3.2 min CN=89 Runoff=28.80 cfs 1.333 af

Subcatchment II: runon area to borrow area Runoff Area=1.669 ac Runoff Depth>1.66"
Flow Length=660' Tc=23.0 min CN=68 Runoff=2.73 cfs 0.230 af

Subcatchment IR: un vegetated final cover Runoff Area=0.810 ac Runoff Depth>3.48"
Flow Length=590' Tc=2.2 min CN=89 Runoff=5.01 cfs 0.235 af

Subcatchment JJ: runon area to borrow area Runoff Area=0.914 ac Runoff Depth>1.24"
Flow Length=1,290' Tc=41.9 min CN=62 Runoff=0.69 cfs 0.094 af

Subcatchment JR: un-vegetated final cover Runoff Area=2.200 ac Runoff Depth>3.48"
Flow Length=990' Tc=3.5 min CN=89 Runoff=13.73 cfs 0.639 af

Subcatchment KK: runon area to borrow area Runoff Area=5.893 ac Runoff Depth>1.37"
Flow Length=1,190' Tc=36.4 min CN=64 Runoff=5.63 cfs 0.674 af

Subcatchment L: runon north of borrow area Runoff Area=1.683 ac Runoff Depth>2.28"
Flow Length=430' Tc=15.4 min CN=76 Runoff=4.88 cfs 0.320 af

Subcatchment LL: runoff area Runoff Area=7.049 ac Runoff Depth>1.18"
Flow Length=1,400' Tc=28.1 min CN=61 Runoff=6.61 cfs 0.693 af

Subcatchment M: runon north of borrow area Runoff Area=1.000 ac Runoff Depth>2.54"
Flow Length=370' Tc=12.1 min CN=79 Runoff=3.60 cfs 0.212 af

Subcatchment MM: runoff area Runoff Area=1.943 ac Runoff Depth>1.19"
Flow Length=1,080' Tc=9.9 min CN=61 Runoff=3.30 cfs 0.192 af

Subcatchment N: direct runon to pond Runoff Area=7.818 ac Runoff Depth>4.46"
Tc=1.0 min CN=98 Runoff=57.89 cfs 2.908 af

Subcatchment NN: runoff area Runoff Area=1.274 ac Runoff Depth>1.53"
Flow Length=600' Tc=1.4 min CN=66 Runoff=3.78 cfs 0.162 af

Subcatchment O: runon north of borrow area Runoff Area=1.317 ac Runoff Depth>2.55"
Flow Length=230' Tc=1.3 min CN=79 Runoff=6.54 cfs 0.279 af

Subcatchment OO: runon area to borrow area Runoff Area=0.399 ac Runoff Depth>1.52"
Flow Length=120' Tc=5.4 min CN=66 Runoff=1.06 cfs 0.051 af

ıtchment P: runon north of borrow area Runoff Area=5.238 ac Runoff Depth>2.19"
Flow Length=650' Tc=33.7 min CN=75 Runoff=9.16 cfs 0.955 af

Subcatchment PP: vegetated borrow area Runoff Area=40.964 ac Runoff Depth>1.36"
Flow Length=1,490' Tc=65.5 min CN=64 Runoff=25.40 cfs 4.631 af

Subcatchment Q: runon north of borrow area Runoff Area=7.700 ac Runoff Depth>1.95"
Flow Length=1,580' Tc=31.8 min CN=72 Runoff=12.29 cfs 1.252 af

Subcatchment R: runon north of borrow area Runoff Area=2.612 ac Runoff Depth>2.11"
Flow Length=650' Tc=21.6 min CN=74 Runoff=5.83 cfs 0.460 af

Subcatchment S: runon north of borrow area Runoff Area=0.402 ac Runoff Depth>2.44"
Flow Length=310' Tc=27.9 min CN=78 Runoff=0.89 cfs 0.082 af

Subcatchment U: runon east of OSDF Runoff Area=4.149 ac Runoff Depth>1.95"
Flow Length=540' Tc=32.3 min CN=72 Runoff=6.57 cfs 0.674 af

Subcatchment V: direct runon to pond Runoff Area=0.274 ac Runoff Depth>4.46"
Tc=1.0 min CN=98 Runoff=2.03 cfs 0.102 af

Subcatchment W: runon east of OSDF Runoff Area=10.593 ac Runoff Depth>1.96"
Flow Length=970' Tc=12.6 min CN=72 Runoff=28.88 cfs 1.733 af

Subcatchment X: runon east of OSDF Runoff Area=11.853 ac Runoff Depth>1.87"
Flow Length=1,360' Tc=33.4 min CN=71 Runoff=17.50 cfs 1.851 af

Subcatchment Y: runon area east of OSDF Runoff Area=6.522 ac Runoff Depth>2.03"
Flow Length=1,150' Tc=36.8 min CN=73 Runoff=9.84 cfs 1.101 af

Subcatchment Z: runon area east of OSDF Runoff Area=1.606 ac Runoff Depth>1.96"
Flow Length=600' Tc=23.7 min CN=72 Runoff=3.11 cfs 0.262 af

Reach 1: east drainage channel Peak Depth=0.99' Max Vel=2.1 fps Inflow=10.81 cfs 0.758 af
n=0.030 L=420.0' S=0.0045 '/' Capacity=754.76 cfs Outflow=10.06 cfs 0.756 af

Reach 1R: (new node) Peak Depth=0.33' Max Vel=5.4 fps Inflow=6.61 cfs 0.693 af
D=72.0" n=0.010 L=100.0' S=0.0100 '/' Capacity=1,101.12 cfs Outflow=6.59 cfs 0.693 af

Reach 2: east drainage channel Peak Depth=1.54' Max Vel=2.7 fps Inflow=26.37 cfs 2.010 af
n=0.030 L=420.0' S=0.0045 '/' Capacity=1,205.98 cfs Outflow=25.59 cfs 2.005 af

Reach 2R: (new node) Peak Depth=0.24' Max Vel=4.3 fps Inflow=3.30 cfs 0.192 af
D=72.0" n=0.010 L=100.0' S=0.0100 '/' Capacity=1,101.12 cfs Outflow=3.25 cfs 0.192 af

Reach 3: east drainage channel Peak Depth=1.87' Max Vel=3.3 fps Inflow=40.77 cfs 3.241 af
n=0.030 L=420.0' S=0.0050 '/' Capacity=1,563.67 cfs Outflow=39.76 cfs 3.234 af

Reach 3R: (new node) Peak Depth=0.25' Max Vel=4.5 fps Inflow=3.78 cfs 0.162 af
D=72.0" n=0.010 L=100.0' S=0.0100 '/' Capacity=1,101.12 cfs Outflow=3.72 cfs 0.162 af

Reach 4: east drainage channel Peak Depth=2.07' Max Vel=3.5 fps Inflow=53.10 cfs 4.461 af
n=0.030 L=420.0' S=0.0050 '/' Capacity=1,106.53 cfs Outflow=52.07 cfs 4.451 af

Reach 5: east drainage channel Peak Depth=2.01' Max Vel=3.5 fps Inflow=63.69 cfs 5.669 af
n=0.030 L=440.0' S=0.0050 '/' Capacity=182.58 cfs Outflow=62.69 cfs 5.656 af

Reach 6: east drainage channel Peak Depth=1.87' Max Vel=4.6 fps Inflow=73.28 cfs 6.935 af
n=0.030 L=480.0' S=0.0100 '/' Capacity=258.21 cfs Outflow=72.46 cfs 6.923 af

Reach 7R: runoff diversion channel Peak Depth=2.14' Max Vel=3.6 fps Inflow=75.24 cfs 8.256 af
n=0.030 L=610.0' S=0.0050 '/' Capacity=393.21 cfs Outflow=74.18 cfs 8.233 af

Reach 8R: runoff diversion channel Peak Depth=1.73' Max Vel=3.7 fps Inflow=77.19 cfs 9.832 af
n=0.030 L=190.0' S=0.0071 '/' Capacity=989.53 cfs Outflow=76.74 cfs 9.825 af

Reach 9R: runoff diversion channel Peak Depth=1.51' Max Vel=4.5 fps Inflow=77.10 cfs 10.037 af
n=0.030 L=170.0' S=0.0083 '/' Capacity=1,307.31 cfs Outflow=76.74 cfs 10.030 af

Reach 10AR: (new node) Peak Depth=1.37' Max Vel=3.4 fps Inflow=77.12 cfs 10.265 af
n=0.030 L=530.0' S=0.0050 '/' Capacity=2,114.41 cfs Outflow=76.26 cfs 10.235 af

Reach 11: new CMP arch Peak Depth=1.57' Max Vel=6.6 fps Inflow=78.55 cfs 11.189 af
D=72.0" n=0.010 L=40.0' S=0.0022 '/' Capacity=522.31 cfs Outflow=78.50 cfs 11.188 af

Reach 12R: runoff diversion channel Peak Depth=1.15' Max Vel=3.7 fps Inflow=78.50 cfs 11.188 af
n=0.030 L=240.0' S=0.0063 '/' Capacity=317.79 cfs Outflow=78.00 cfs 11.174 af

Reach 13R: runoff diversion channel Peak Depth=1.25' Max Vel=4.3 fps Inflow=143.58 cfs 21.140 af
n=0.030 L=450.0' S=0.0067 '/' Capacity=346.63 cfs Outflow=142.73 cfs 21.088 af

Reach 14: east runon channel Peak Depth=0.33' Max Vel=0.9 fps Inflow=0.52 cfs 0.026 af
n=0.030 L=420.0' S=0.0040 '/' Capacity=22.78 cfs Outflow=0.38 cfs 0.025 af

Reach 15: east runon channel Peak Depth=0.64' Max Vel=1.8 fps Inflow=3.20 cfs 0.186 af
n=0.030 L=420.0' S=0.0063 '/' Capacity=61.62 cfs Outflow=2.82 cfs 0.186 af

Reach 16: east runon channel Peak Depth=0.98' Max Vel=2.6 fps Inflow=9.76 cfs 0.664 af
n=0.030 L=420.0' S=0.0074 '/' Capacity=256.58 cfs Outflow=9.33 cfs 0.661 af

Reach 17: east runon channel Peak Depth=0.92' Max Vel=3.2 fps Inflow=12.43 cfs 0.923 af
n=0.030 L=420.0' S=0.0125 '/' Capacity=436.18 cfs Outflow=12.07 cfs 0.921 af

Reach 18: east runon channel Peak Depth=1.38' Max Vel=3.7 fps Inflow=21.43 cfs 2.022 af
n=0.030 L=440.0' S=0.0100 '/' Capacity=169.20 cfs Outflow=20.99 cfs 2.017 af

Reach 19: east runon channel Peak Depth=0.91' Max Vel=2.8 fps Inflow=38.43 cfs 3.868 af
n=0.030 L=470.0' S=0.0090 '/' Capacity=911.12 cfs Outflow=37.75 cfs 3.855 af

Reach 20: east runon channel Peak Depth=1.87' Max Vel=4.2 fps Inflow=43.35 cfs 5.587 af
n=0.030 L=75.0' S=0.0083 '/' Capacity=153.84 cfs Outflow=43.26 cfs 5.586 af

Reach 21: east runon channel Peak Depth=1.84' Max Vel=4.5 fps Inflow=45.89 cfs 6.150 af
n=0.030 L=65.0' S=0.0100 '/' Capacity=169.20 cfs Outflow=45.84 cfs 6.148 af

Reach 22: east runon channel Peak Depth=1.85' Max Vel=4.5 fps Inflow=46.33 cfs 6.230 af
n=0.030 L=190.0' S=0.0100 '/' Capacity=364.40 cfs Outflow=46.18 cfs 6.225 af

Reach 23: new CMP culverts Peak Depth=1.31' Max Vel=5.4 fps Inflow=48.76 cfs 6.861 af
D=72.0" n=0.018 L=92.0' S=0.0059 '/' Capacity=468.67 cfs Outflow=48.70 cfs 6.858 af

Reach 24: runon channel Peak Depth=1.19' Max Vel=4.0 fps Inflow=57.15 cfs 8.110 af
n=0.030 L=160.0' S=0.0075 '/' Capacity=153.54 cfs Outflow=56.99 cfs 8.102 af

Reach 25: new CMP arch Peak Depth=1.49' Max Vel=5.9 fps Inflow=64.24 cfs 9.057 af
D=72.0" n=0.018 L=53.0' S=0.0060 '/' Capacity=475.34 cfs Outflow=64.22 cfs 9.055 af

Reach 26: runon channel Peak Depth=2.20' Max Vel=4.4 fps Inflow=64.22 cfs 9.055 af
n=0.030 L=300.0' S=0.0075 '/' Capacity=90.11 cfs Outflow=64.05 cfs 9.044 af

Reach 27: new CMP arch Peak Depth=1.64' Max Vel=5.2 fps Inflow=65.00 cfs 9.364 af
D=72.0" n=0.018 L=106.0' S=0.0042 '/' Capacity=398.58 cfs Outflow=64.89 cfs 9.360 af

Reach 29: east runon channel Peak Depth=1.86' Max Vel=4.6 fps Inflow=47.10 cfs 6.407 af
n=0.030 L=230.0' S=0.0100 '/' Capacity=255.23 cfs Outflow=46.92 cfs 6.400 af

Reach 30: east runon channel Peak Depth=1.84' Max Vel=4.5 fps Inflow=45.98 cfs 6.150 af
n=0.030 L=30.0' S=0.0100 '/' Capacity=104.05 cfs Outflow=45.89 cfs 6.150 af

Reach 31: culvert Peak Depth=0.34' Max Vel=5.1 fps Inflow=6.54 cfs 0.279 af
D=72.0" n=0.012 L=80.0' S=0.0125 '/' Capacity=1,025.91 cfs Outflow=6.34 cfs 0.279 af

Pond 1P: (new node) Peak Elev=593.91' Storage=1.584 af Inflow=49.32 cfs 6.362 af
Outflow=45.98 cfs 6.150 af

Pond 3P: Borrow Area Basin Peak Elev=574.21' Storage=29.662 af Inflow=174.95 cfs 29.676 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 172.262 ac Runoff Volume = 31.186 af Average Runoff Depth = 2.17"

Subcatchment A: vegetated final cover system

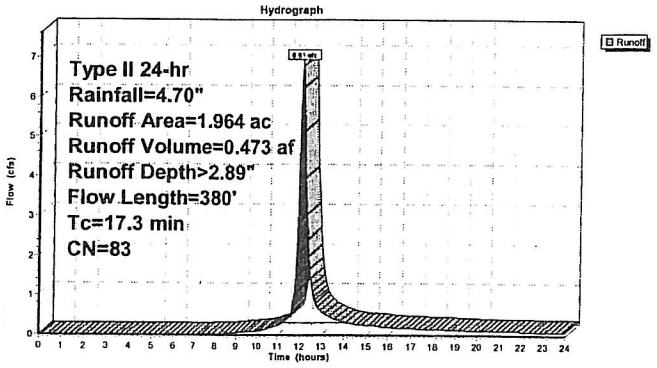
Runoff = 6.81 cfs @ 12.10 hrs, Volume= 0.473 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.964	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.2	80	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.3	380	Total			

Subcatchment A: vegetated final cover system



Subcatchment AA: runon area east of OSDF

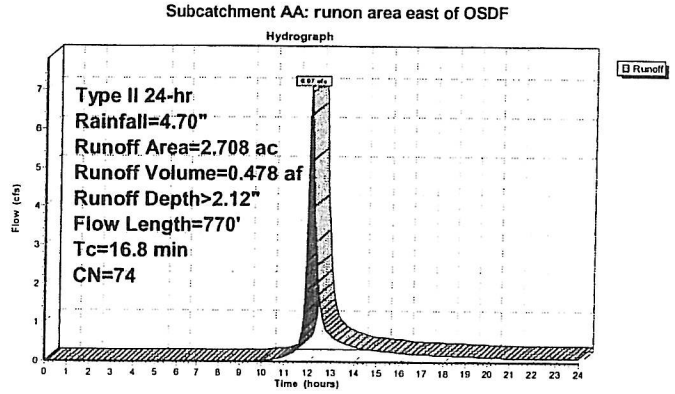
Runoff = 6.97 cfs @ 12.10 hrs, Volume= 0.478 af, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
2.708	74	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300	0.0800	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.6	170	0.0800	4.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	300	0.0070	4.0	48.01	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 '/' Top.W=12.00' n= 0.030
16.8	770	Total			

Subcatchment AA: runon area east of OSDF



Subcatchment B: vegetated final cover system

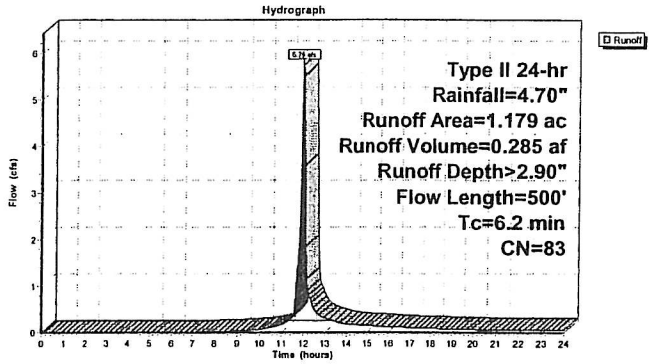
Runoff = 5.75 cfs @ 11.97 hrs, Volume= 0.285 af, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.179	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.1800	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.6	450	0.0045	2.1	9.75	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.02' Z= 6.0 & 3.0 '/' Top.W=9.18' n= 0.030
6.2	500	Total			

Subcatchment B: vegetated final cover system



Subcatchment BB: runon east of OSDF

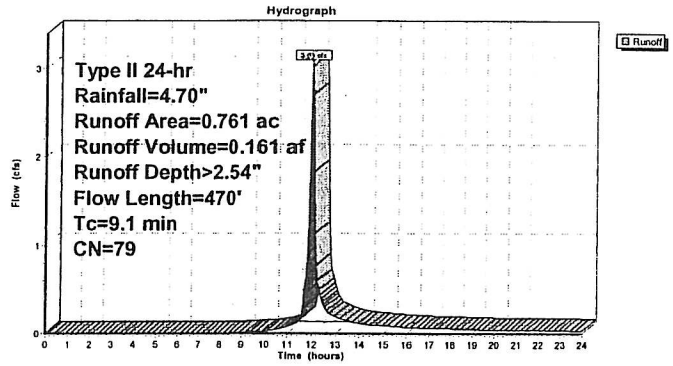
Runoff = 3.03 cfs @ 12.01 hrs, Volume= 0.161 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.761	79	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	110	0.0800	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
2.4	360	0.0040	2.5	22.78	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.50' Z= 3.0 & 5.0 '/' Top.W=12.00' n= 0.030
9.1	470	Total			

Subcatchment BB: runon east of OSDF



Subcatchment C: vegetated final cover

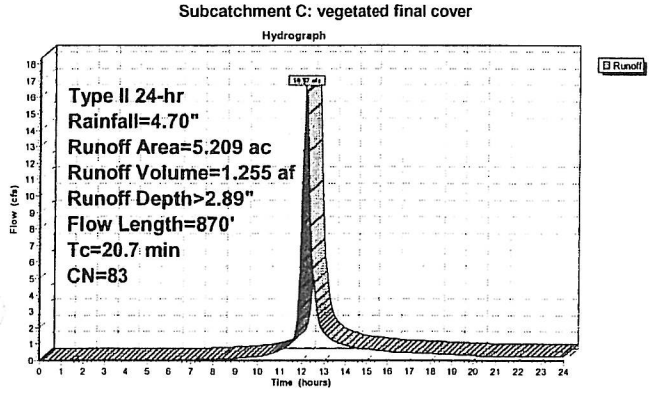
Runoff = 16.37 cfs @ 12.13 hrs, Volume= 1.255 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.209	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.4	170	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.2	400	0.0045	2.1	10.88	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.02' Z= 6.0 & 4.0 '/' Top.W=10.20' n= 0.030
20.7	870	Total			

Subcatchment C: vegetated final cover



Subcatchment CC: runon east of OSDF

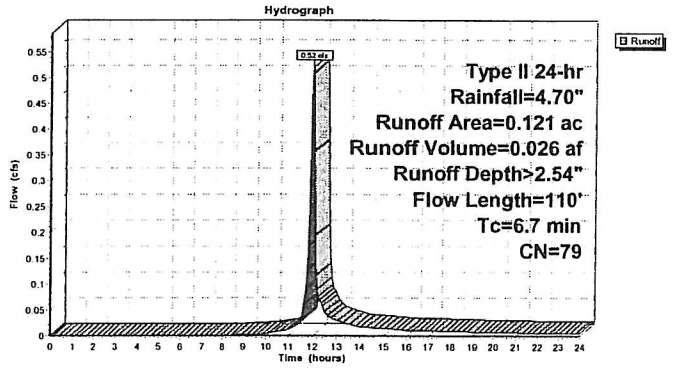
Runoff = 0.52 cfs @ 11.98 hrs, Volume= 0.026 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.121	79	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	110	0.0800	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"

Subcatchment CC: runon east of OSDF



Subcatchment D: vegetated final cover

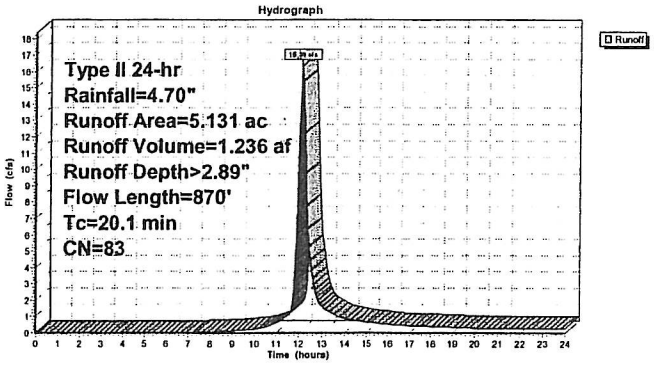
Runoff = 16.39 cfs @ 12.13 hrs, Volume= 1.236 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.131	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.4	170	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	250	0.0045	2.4	16.16	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.29' Z= 5.0 & 3.0 '/' Top.W=10.32' n= 0.030
0.9	150	0.0050	2.9	25.90	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.59' Z= 4.0 & 3.0 '/' Top.W=11.13' n= 0.030
20.1	870	Total			

Subcatchment D: vegetated final cover



Subcatchment DDR: unvegetated final cover system

[49] Hint: Tc<2dt may require smaller dt

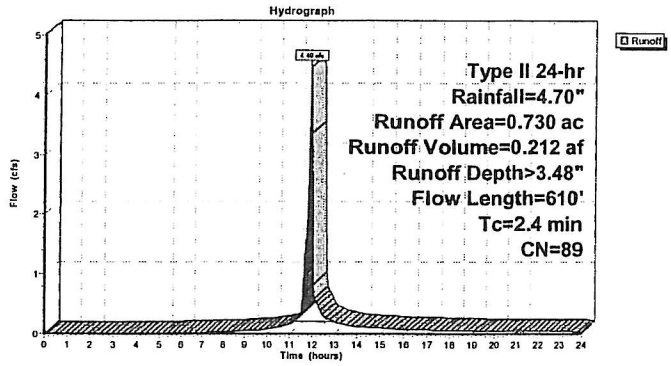
Runoff = 4.49 cfs @ 11.92 hrs, Volume= 0.212 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.730	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	300	0.1430	3.4		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.2	80	0.1430	6.1		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	25	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	190	0.0071	7.0	494.58	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.50' Z= 3.0 & 4.0 '/' Top.W=31.50' n= 0.030
2.4	610	Total			

Subcatchment DDR: unvegetated final cover system



Subcatchment E: vegetated final cover

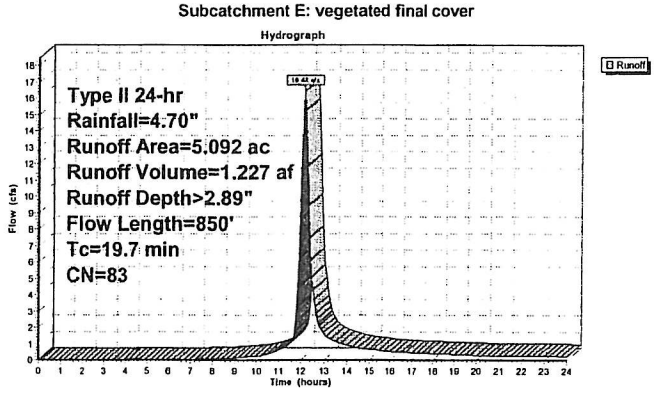
Runoff = 16.48 cfs @ 12.12 hrs, Volume= 1.227 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.092	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.4	170	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.2	380	0.0050	2.9	26.33	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.60' Z= 4.0 & 3.0 '/' Top.W=11.20' n= 0.030
19.7	850	Total			

Subcatchment E: vegetated final cover



Subcatchment EE: runon north of borrow area

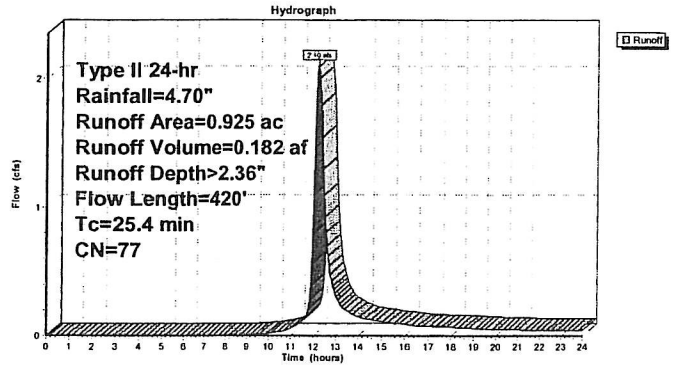
Runoff = 2.10 cfs @ 12.19 hrs, Volume= 0.182 af, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.925	77	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.8	300	0.0230	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.5	80	0.0230	2.4		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	40	0.0100	7.6	364.40	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.00' Z= 3.0 '/' Top.W=24.00' n= 0.030
25.4	420	Total			

Subcatchment EE: runon north of borrow area



Subcatchment F: vegetated final cover

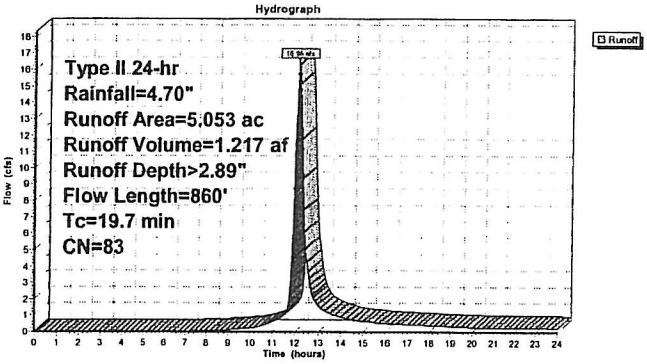
Runoff = 16.35 cfs @ 12.12 hrs, Volume= 1.217 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.053	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.4	170	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.2	390	0.0050	2.9	26.33	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.60' Z= 4.0 & 3.0 '/' Top.W=11.20' n= 0.030
19.7	860	Total			

Subcatchment F: vegetated final cover



Subcatchment FFR: unvegetated final cover system

[49] Hint: Tc<2dt may require smaller dt

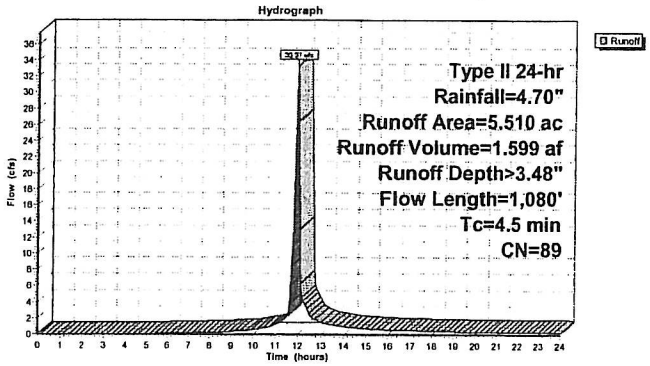
Runoff = 33.37 cfs @ 11.95 hrs, Volume= 1.599 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.510	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0500	1.7		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.6	90	0.1000	2.3		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.8	140	0.1667	3.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.3	135	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	20	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	610	0.0050	5.5	393.21	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.00' Z= 6.0 & 3.0 '/' Top.W=36.00' n= 0.030
4.5	1,080	Total			

Subcatchment FFR: unvegetated final cover system



Subcatchment G: vegetated final cover

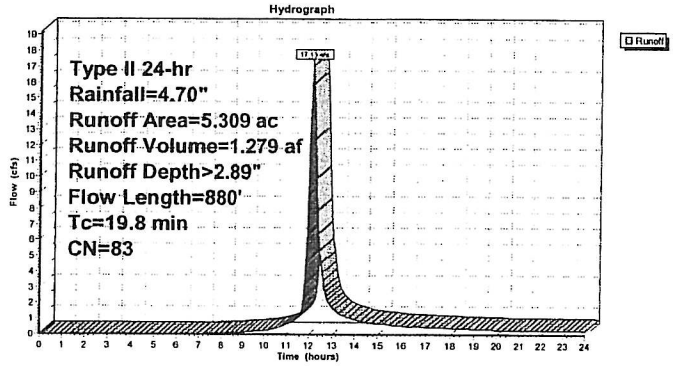
Runoff = 17.13 cfs @ 12.12 hrs, Volume= 1.279 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.309	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.4	170	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.3	410	0.0050	2.9	26.33	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.60' Z= 4.0 & 3.0 '/' Top.W=11.20' n= 0.030
19.8	880	Total			

Subcatchment G: vegetated final cover



Subcatchment GGR: construction laydown area

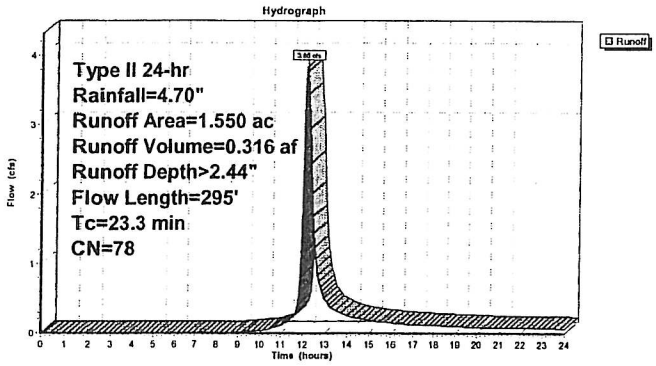
Runoff = 3.86 cfs @ 12.17 hrs, Volume= 0.316 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.550	78	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	240	0.0180	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.5	55	0.0145	1.9		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23.3	295	Total			

Subcatchment GGR: construction laydown area



Subcatchment HH: runon north of borrow area

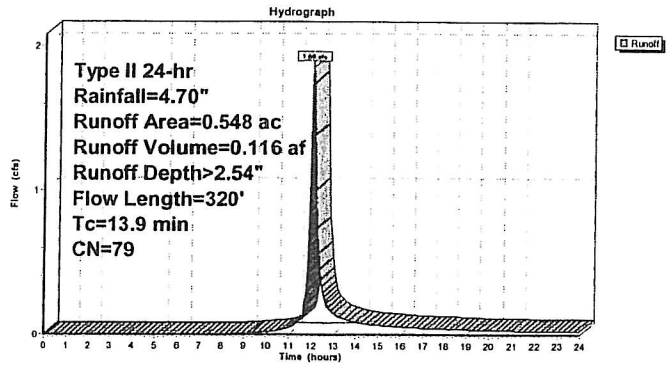
Runoff = 1.86 cfs @ 12.06 hrs, Volume= 0.116 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.548	79	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	90	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.7	230	0.0045	5.1	352.87	**Trap/Vee/Rect Channel Flow,** Bot.W=20.00' D=2.50' Z= 3.0 '/' Top.W=35.00' n= 0.030
13.9	320	Total			

Subcatchment HH: runon north of borrow area



Subcatchment HR: un-vegetated final cover

[49] Hint: Tc<2dt may require smaller dt

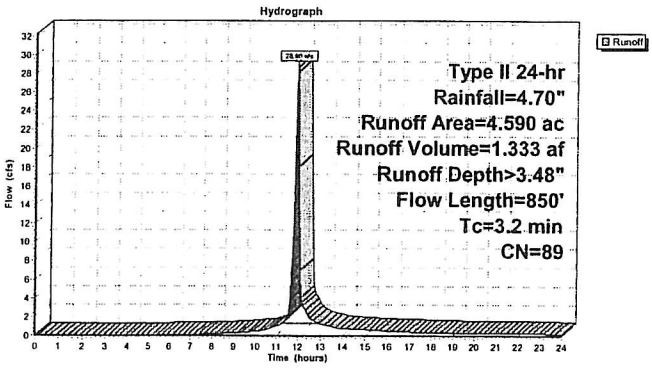
Runoff = 28.80 cfs @ 11.93 hrs, Volume= 1.333 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
4.590	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	90	0.0500	1.8		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.4	50	0.1000	2.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.8	150	0.1700	3.2		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.4	160	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	400	0.0100	9.8	1,429.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=5.70' Z= 6.0 & 3.0 '/' Top.W=51.30' n= 0.030
3.2	850	Total			

Subcatchment HR: un-vegetated final cover



Subcatchment II: runon area to borrow area

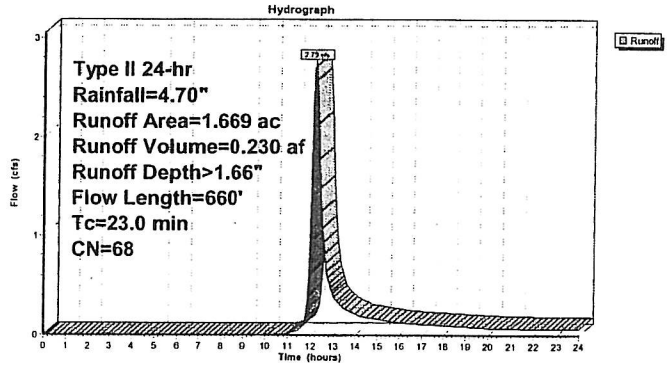
Runoff = 2.73 cfs @ 12.17 hrs, Volume= 0.230 af, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.669	68	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	210	0.0400	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.2	70	0.1660	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.9	380	0.0025	0.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23.0	660	Total			

Subcatchment II: runon area to borrow area



Subcatchment IR: un vegetated final cover

[49] Hint: Tc<2dt may require smaller dt

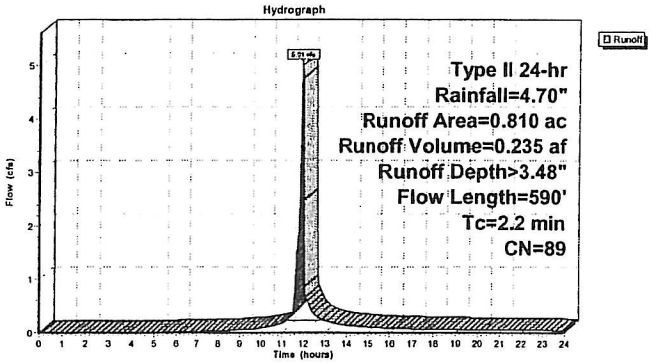
Runoff = 5.01 cfs @ 11.92 hrs, Volume= 0.235 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.810	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	300	0.1430	3.4		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.2	80	0.1430	6.1		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	25	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	170	0.0083	8.9	1,045.70	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=5.00' Z= 3.0 & 4.0 '/' Top.W=41.00' n= 0.030
2.2	590	Total			

Subcatchment IR: un vegetated final cover



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Subcatchment JJ: runon area to borrow area

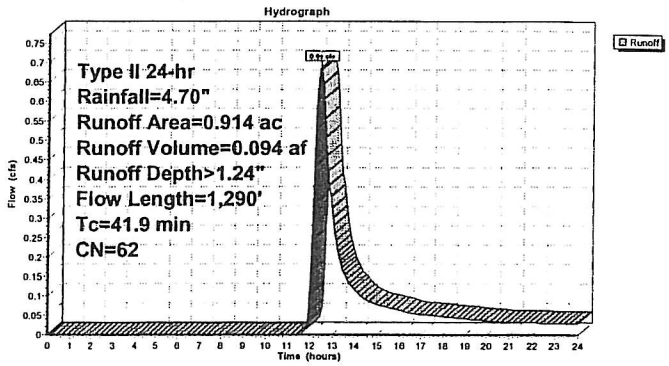
Runoff = 0.69 cfs @ 12.44 hrs, Volume= 0.094 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.914	62	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.9	300	0.0250	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.3	40	0.0250	2.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	110	0.1660	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.4	840	0.0025	0.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
41.9	1,290	Total			

Subcatchment JJ: runon area to borrow area



Subcatchment JR: un-vegetated final cover

[49] Hint: Tc<2dt may require smaller dt

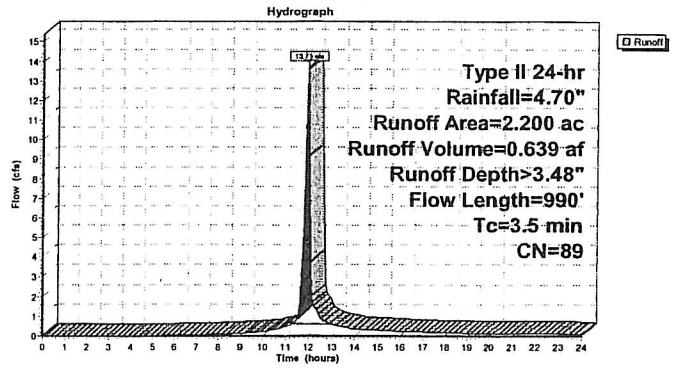
Runoff = 13.73 cfs @ 11.94 hrs, Volume= 0.639 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
2.200	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	40	0.0500	1.5		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.5	60	0.1000	2.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
1.0	200	0.1667	3.3		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.3	115	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0200	2.9		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	30	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	530	0.0050	8.3	2,114.41	**Trap/Vee/Rect Channel Flow,** Bot.W=10.00' D=6.50' Z= 6.0 & 3.0 '/' Top.W=68.50' n= 0.030
3.5	990	Total			

Subcatchment JR: un-vegetated final cover



Subcatchment KK: runon area to borrow area

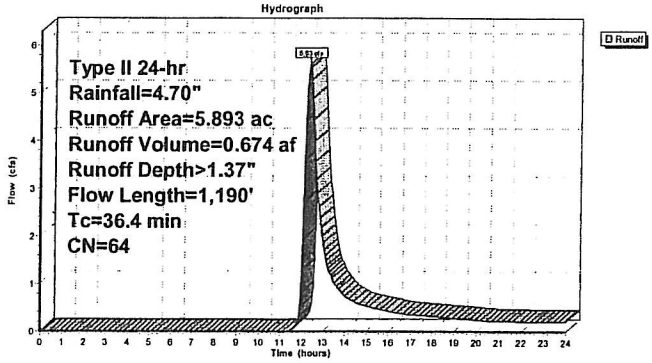
Runoff = 5.63 cfs @ 12.36 hrs, Volume= 0.674 af, Depth> 1.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.893	64	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	300	0.0280	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
1.3	150	0.0140	1.9		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	110	0.1660	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.9	630	0.0030	0.9		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
36.4	1,190	Total			

Subcatchment KK: runon area to borrow area



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Subcatchment L: runon north of borrow area

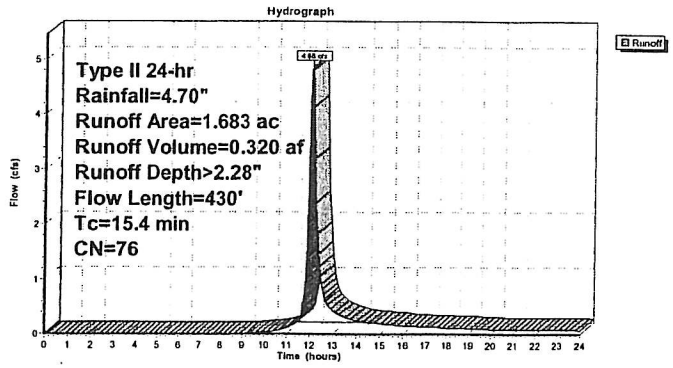
Runoff = 4.88 cfs @ 12.08 hrs, Volume= 0.320 af, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.683	76	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	140	0.0200	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
1.2	290	0.0075	4.1	49.70	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 '/' Top.W=12.00' n= 0.030
15.4	430	Total			

Subcatchment L: runon north of borrow area



Subcatchment LL: runoff area

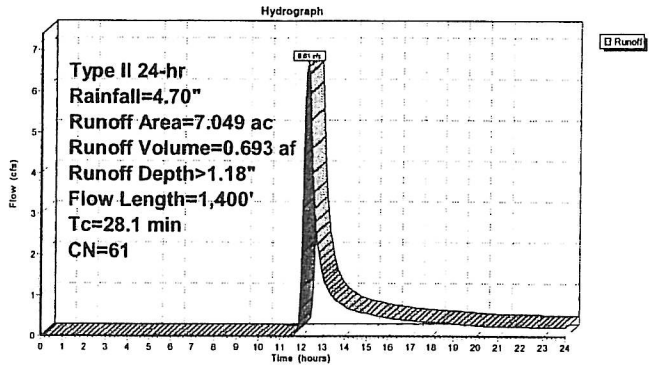
Runoff = 6.61 cfs @ 12.25 hrs, Volume= 0.693 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
7.049	61	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.3	300	0.0240	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
1.3	200	0.0240	2.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	900	0.0090	5.9	160.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.00' Z= 3.0 '/' Top.W=18.00' n= 0.030
28.1	1,400	Total			

Subcatchment LL: runoff area



Subcatchment M: runon north of borrow area

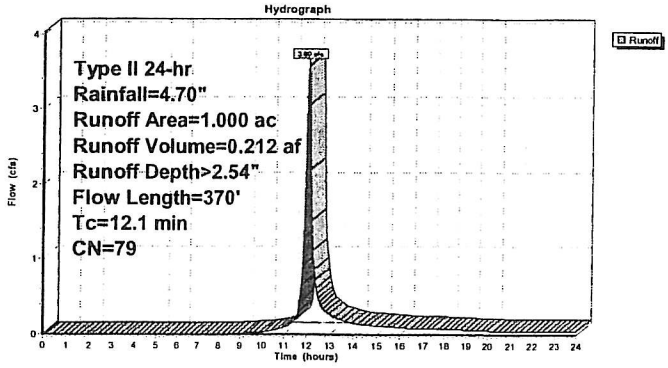
Runoff = 3.60 cfs @ 12.04 hrs, Volume= 0.212 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.000	79	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	170	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.6	200	0.0045	5.1	352.87	**Trap/Vee/Rect Channel Flow,** Bot.W=20.00' D=2.50' Z= 3.0 '/' Top.W=35.00' n= 0.030
12.1	370	Total			

Subcatchment M: runon north of borrow area



Subcatchment MM: runoff area

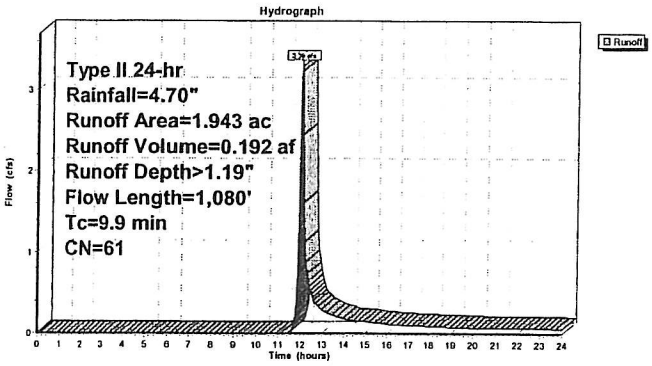
Runoff = 3.30 cfs @ 12.03 hrs, Volume= 0.192 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.943	61	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0700	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.3	980	0.0060	4.9	200.34	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.00' Z= 5.0 & 4.0 '/' Top.W=27.00' n= 0.030
9.9	1,080	Total			

Subcatchment MM: runoff area



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Subcatchment N: direct runon to pond

[49] Hint: Tc<2dt may require smaller dt

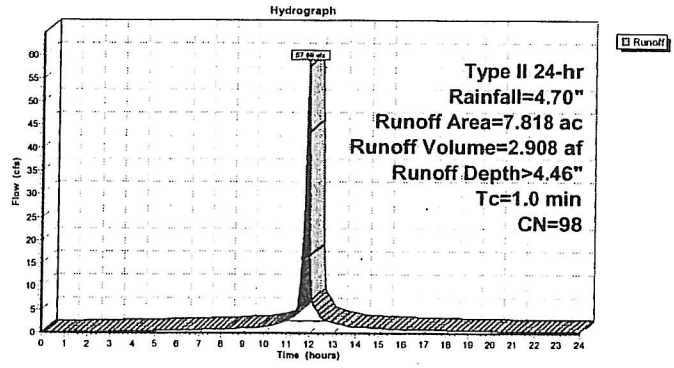
Runoff = 57.89 cfs @ 11.90 hrs, Volume= 2.908 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
7.818	98	

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

Subcatchment N: direct runon to pond



Subcatchment NN: runoff area

[49] Hint: Tc<2dt may require smaller dt

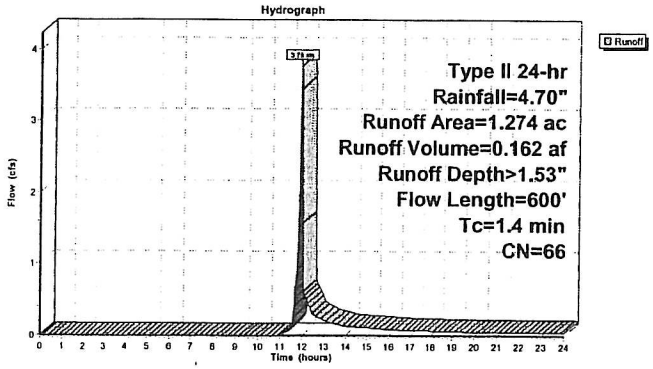
Runoff = 3.78 cfs @ 11.92 hrs, Volume= 0.162 af, Depth> 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.274	66	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	600	0.0130	7.1	192.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.00' Z= 3.0 '/' Top.W=18.00' n= 0.030

Subcatchment NN: runoff area



Subcatchment O: runon north of borrow area

[49] Hint: Tc<2dt may require smaller dt

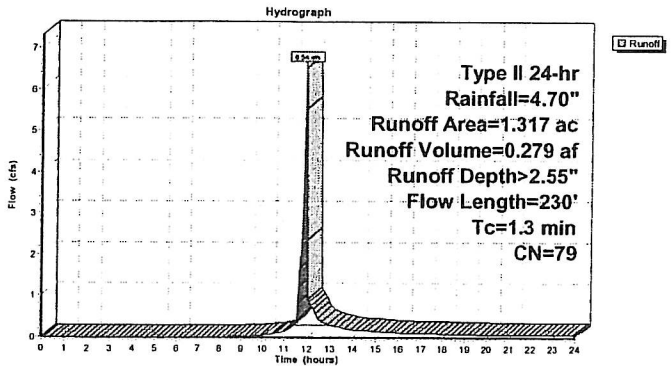
Runoff = 6.54 cfs @ 11.91 hrs, Volume= 0.279 af, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.317	79	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	230	0.0086	2.9	14.28	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.00' Z= 5.0 '/' Top.W=10.00' n= 0.030

Subcatchment O: runon north of borrow area



Subcatchment OO: runon area to borrow area

[49] Hint: Tc<2dt may require smaller dt

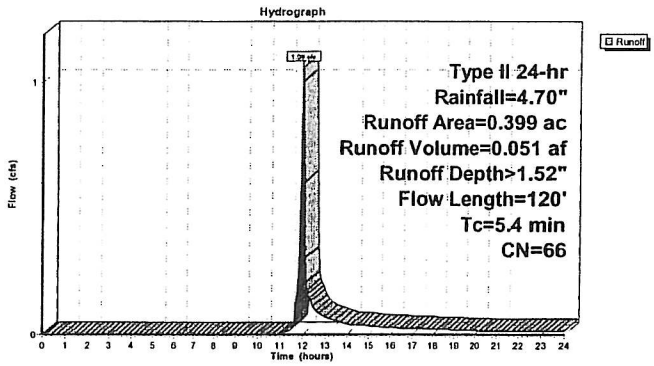
Runoff = 1.06 cfs @ 11.97 hrs, Volume= 0.051 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.399	66	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	120	0.1660	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"

Subcatchment OO: runon area to borrow area



Subcatchment P: runon north of borrow area

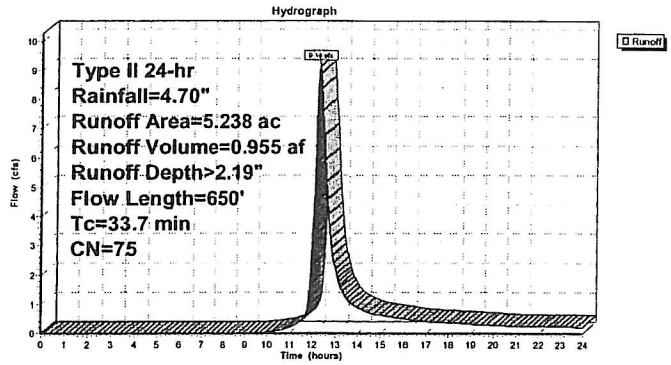
Runoff = 9.16 cfs @ 12.30 hrs, Volume= 0.955 af, Depth> 2.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.238	75	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.4	300	0.0150	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
4.3	350	0.0070	1.3		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
33.7	650	Total			

Subcatchment P: runon north of borrow area



Subcatchment PP: vegetated borrow area

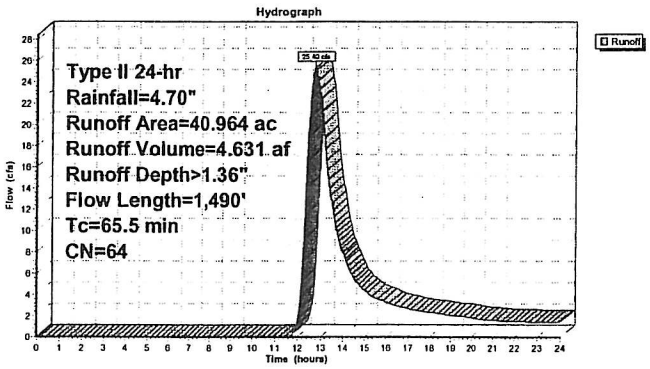
Runoff = 25.40 cfs @ 12.75 hrs, Volume= 4.631 af, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
40.964	64	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	150	0.1660	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
34.5	150	0.0025	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
24.6	1,190	0.0025	0.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
65.5	1,490	Total			

Subcatchment PP: vegetated borrow area



Subcatchment Q: runon north of borrow area

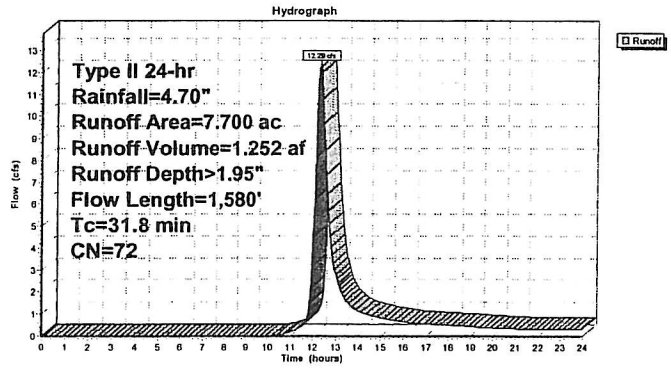
Runoff = 12.29 cfs @ 12.28 hrs, Volume= 1.252 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
7.700	72	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	300	0.0260	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
8.2	1,280	0.0260	2.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
31.8	1,580	Total			

Subcatchment Q: runon north of borrow area



Subcatchment R: runon north of borrow area

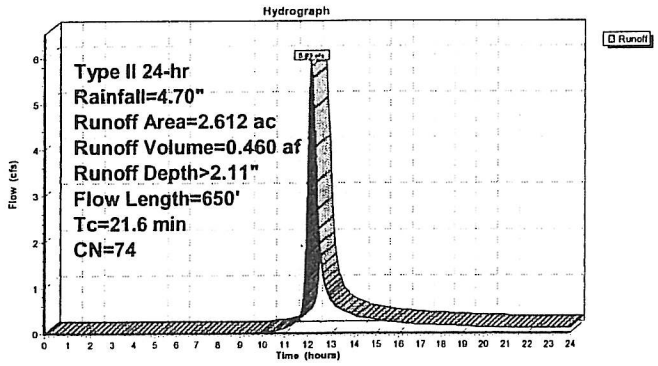
Runoff = 5.83 cfs @ 12.15 hrs, Volume= 0.460 af, Depth> 2.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
2.612	74	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	300	0.0400	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
1.8	350	0.0400	3.2		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
21.6	650	Total			

Subcatchment R: runon north of borrow area



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Subcatchment S: runon north of borrow area

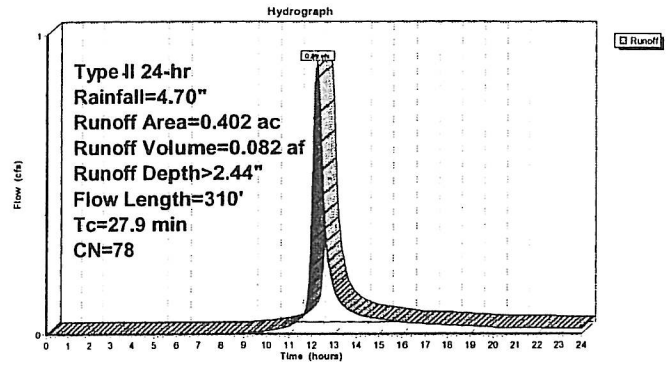
Runoff = 0.89 cfs @ 12.22 hrs, Volume= 0.082 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.402	78	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.8	280	0.0150	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.1	30	0.0100	6.3	169.20	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.00' Z= 3.0 '/' Top.W=18.00' n= 0.030
27.9	310	Total			

Subcatchment S: runon north of borrow area



Subcatchment U: runon east of OSDF

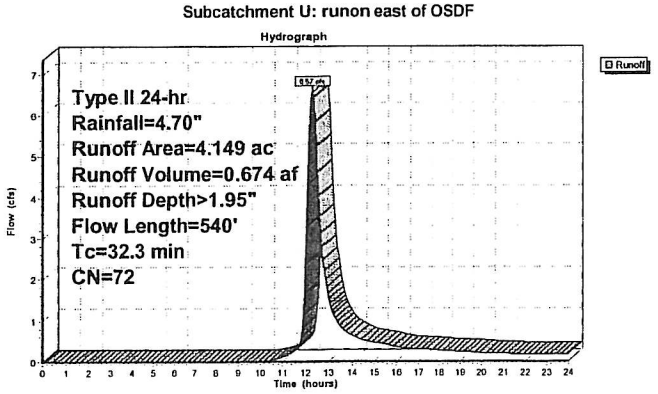
Runoff = 6.57 cfs @ 12.28 hrs, Volume= 0.674 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
4.149	72	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	300	0.0140	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
2.1	240	0.0140	1.9		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
32.3	540	Total			

Subcatchment U: runon east of OSDF



Subcatchment V: direct runon to pond

[49] Hint: Tc<2dt may require smaller dt

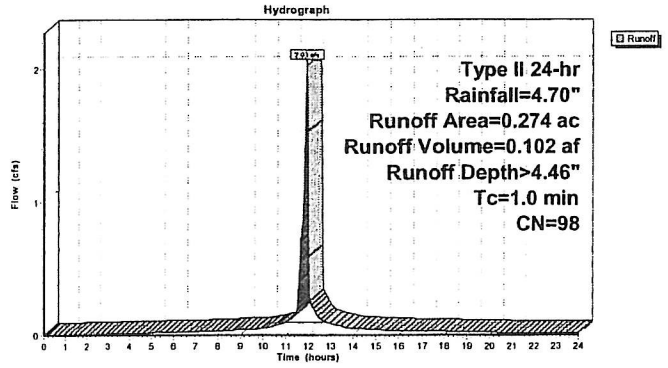
Runoff = 2.03 cfs @ 11.90 hrs, Volume= 0.102 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.274	98	

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

Subcatchment V: direct runon to pond



Subcatchment W: runon east of OSDF

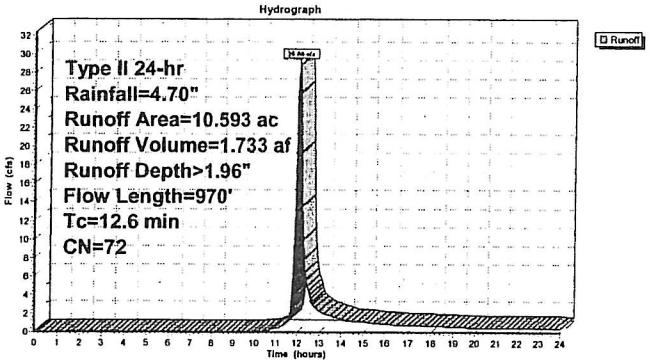
Runoff = 28.88 cfs @ 12.05 hrs, Volume= 1.733 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
10.593	72	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	300	0.1780	0.5		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
1.0	400	0.1780	6.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	270	0.0114	6.9	1,025.43	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.00' Z= 3.0 & 30.0 '/' Top.W=99.00' n= 0.030
12.6	970	Total			

Subcatchment W: runon east of OSDF



Subcatchment X: runon east of OSDF

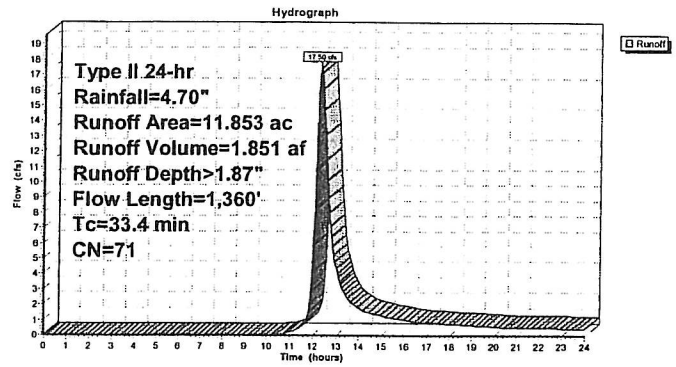
Runoff = 17.50 cfs @ 12.30 hrs, Volume= 1.851 af, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
11.853	71	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.7	300	0.0190	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
5.5	730	0.0190	2.2		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	330	0.0100	4.8	57.39	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 '/' Top.W=12.00' n= 0.030
33.4	1,360	Total			

Subcatchment X: runon east of OSDF



Subcatchment Y: runon area east of OSDF

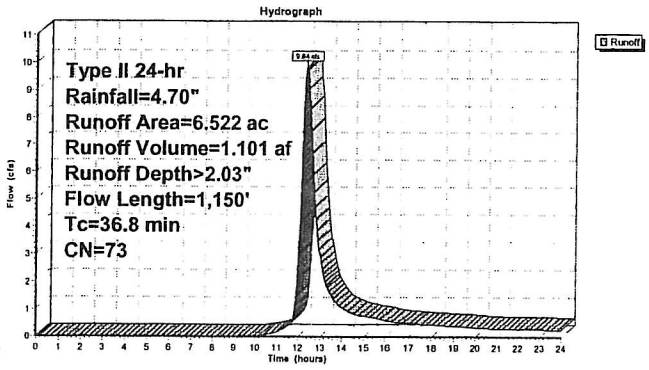
Runoff = 9.84 cfs @ 12.34 hrs, Volume= 1.101 af, Depth> 2.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
6.522	73	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1	300	0.0130	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
4.6	510	0.0130	1.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	340	0.0110	5.1	92.00	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 5.0 & 4.0 '/' Top.W=18.00' n= 0.030
36.8	1,150	Total			

Subcatchment Y: runon area east of OSDF



Subcatchment Z: runon area east of OSDF

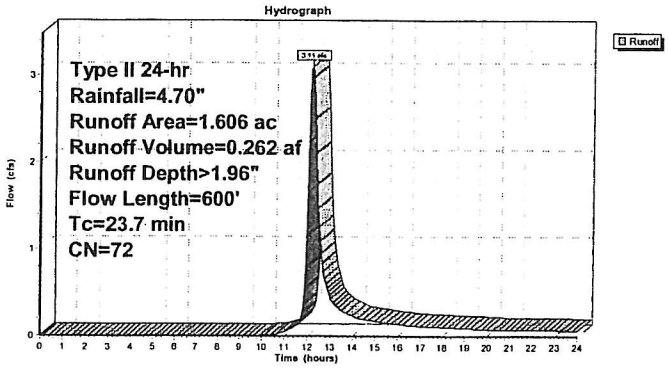
Runoff = 3.11 cfs @ 12.18 hrs, Volume= 0.262 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.606	72	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	300	0.0310	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
1.5	250	0.0310	2.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	50	0.0070	4.1	73.39	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 5.0 & 4.0 '/' Top.W=18.00' n= 0.030
23.7	600	Total			

Subcatchment Z: runon area east of OSDF



Reach 1: east drainage channel

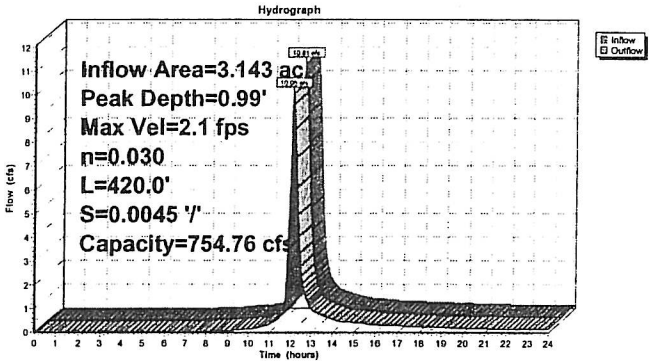
[65] Warning: Inlet elevation not specified

Inflow Area = 3.143 ac, Inflow Depth > 2.90"
Inflow = 10.81 cfs @ 12.01 hrs, Volume= 0.758 af
Outflow = 10.06 cfs @ 12.11 hrs, Volume= 0.756 af, Atten= 7%, Lag= 6.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.1 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.8 fps, Avg. Travel Time= 8.5 min

Peak Depth= 0.99' @ 12.05 hrs
Capacity at bank full= 754.76 cfs
0.00' x 5.00' deep channel, n= 0.030
Side Slope Z-value= 6.0 4.0 '/' Top Width= 50.00'
Length= 420.0' Slope= 0.0045 '/'

Reach 1: east drainage channel



Reach 1R: (new node)

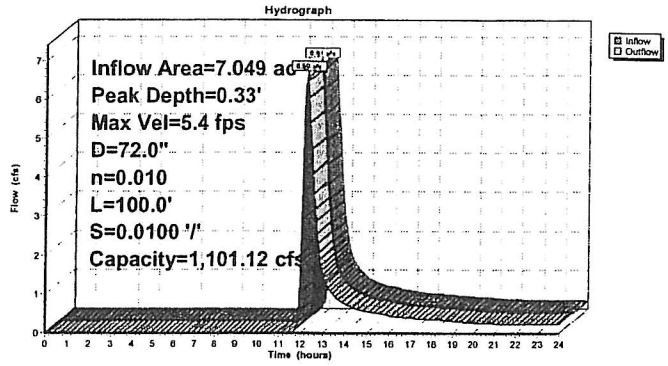
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 7.049 ac, Inflow Depth > 1.18"
Inflow = 6.61 cfs @ 12.25 hrs, Volume= 0.693 af
Outflow = 6.59 cfs @ 12.26 hrs, Volume= 0.693 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.5 fps, Avg. Travel Time= 0.7 min

Peak Depth= 0.33' @ 12.26 hrs
Capacity at bank full= 1,101.12 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.010
Length= 100.0' Slope= 0.0100 '/'

Reach 1R: (new node)



Reach 2: east drainage channel

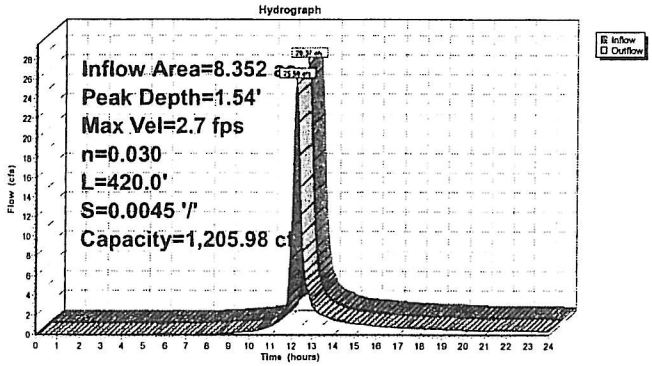
[65] Warning: Inlet elevation not specified

Inflow Area = 8.352 ac, Inflow Depth > 2.89"
Inflow = 26.37 cfs @ 12.12 hrs, Volume= 2.010 af
Outflow = 25.59 cfs @ 12.20 hrs, Volume= 2.005 af, Atten= 3%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.7 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 6.3 min

Peak Depth= 1.54' @ 12.16 hrs
Capacity at bank full= 1,205.98 cfs
0.00' x 6.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 5.0 '/' Top Width= 52.00'
Length= 420.0' Slope= 0.0045 '/'

Reach 2: east drainage channel



Reach 2R: (new node)

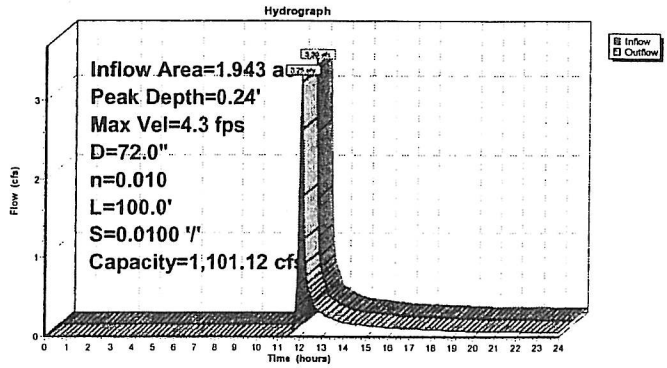
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 1.943 ac, Inflow Depth > 1.19"
Inflow = 3.30 cfs @ 12.03 hrs, Volume= 0.192 af
Outflow = 3.25 cfs @ 12.04 hrs, Volume= 0.192 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.3 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 0.9 min

Peak Depth= 0.24' @ 12.04 hrs
Capacity at bank full= 1,101.12 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.010
Length= 100.0' Slope= 0.0100 '/'

Reach 2R: (new node)



Reach 3: east drainage channel

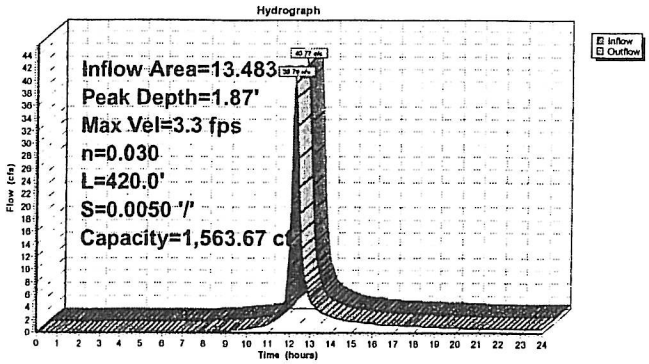
[65] Warning: Inlet elevation not specified

Inflow Area = 13.483 ac, Inflow Depth > 2.88"
Inflow = 40.77 cfs @ 12.17 hrs, Volume= 3.241 af
Outflow = 39.76 cfs @ 12.24 hrs, Volume= 3.234 af, Atten= 2%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.3 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 5.3 min

Peak Depth= 1.87' @ 12.20 hrs
Capacity at bank full= 1,563.67 cfs
0.00' x 7.40' deep channel, n= 0.030
Side Slope Z-value= 3.0 4.0 '/' Top Width= 51.80'
Length= 420.0' Slope= 0.0050 '/'

Reach 3: east drainage channel



Reach 3R: (new node)

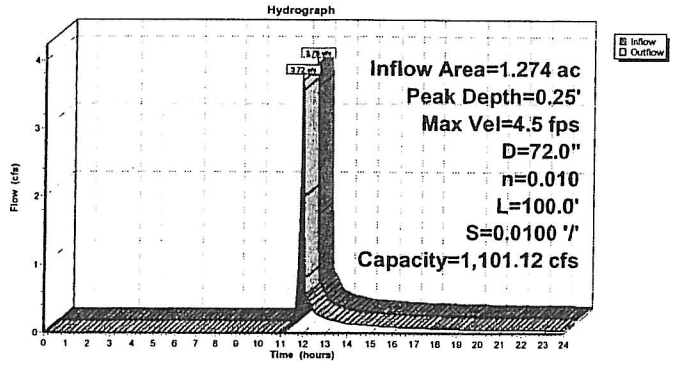
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 1.274 ac, Inflow Depth > 1.53"
Inflow = 3.78 cfs @ 11.92 hrs, Volume= 0.162 af
Outflow = 3.72 cfs @ 11.93 hrs, Volume= 0.162 af, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.5 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 0.9 min

Peak Depth= 0.25' @ 11.92 hrs
Capacity at bank full= 1,101.12 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.010
Length= 100.0' Slope= 0.0100 '/'

Reach 3R: (new node)



Reach 4: east drainage channel

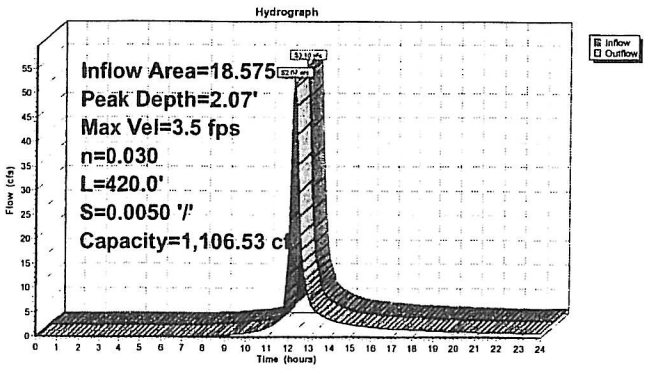
[65] Warning: Inlet elevation not specified

Inflow Area = 18.575 ac, Inflow Depth > 2.88"
Inflow = 53.10 cfs @ 12.21 hrs, Volume= 4.461 af
Outflow = 52.07 cfs @ 12.27 hrs, Volume= 4.451 af, Atten= 2%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.5 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 4.9 min

Peak Depth= 2.07' @ 12.23 hrs
Capacity at bank full= 1,106.53 cfs
0.00' x 6.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 4.0 '/' Top Width= 45.50'
Length= 420.0' Slope= 0.0050 '/'

Reach 4: east drainage channel



Reach 5: east drainage channel

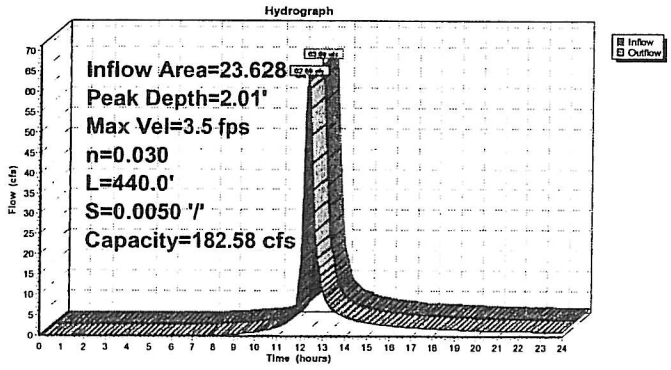
[65] Warning: Inlet elevation not specified

Inflow Area = 23.628 ac, Inflow Depth > 2.88"
Inflow = 63.69 cfs @ 12.24 hrs, Volume= 5.669 af
Outflow = 62.69 cfs @ 12.30 hrs, Volume= 5.656 af, Atten= 2%, Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.5 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 5.1 min

Peak Depth= 2.01' @ 12.27 hrs
Capacity at bank full= 182.58 cfs
0.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 6.0 '/' Top Width= 27.00'
Length= 440.0' Slope= 0.0050 '/'

Reach 5: east drainage channel



Reach 6: east drainage channel

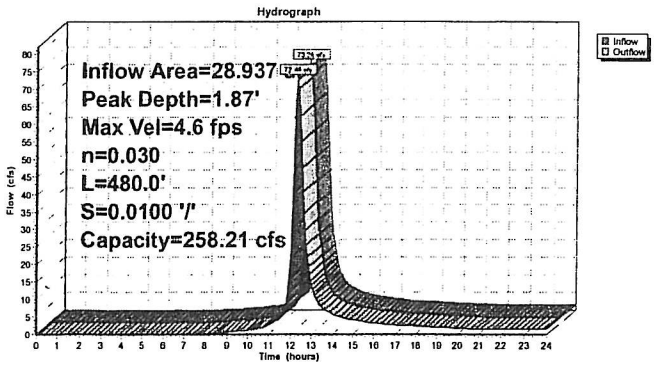
[65] Warning: Inlet elevation not specified

Inflow Area = 28.937 ac, Inflow Depth > 2.88"
Inflow = 73.28 cfs @ 12.27 hrs, Volume= 6.935 af
Outflow = 72.46 cfs @ 12.32 hrs, Volume= 6.923 af, Atten= 1%, Lag= 3.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.6 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 2.0 fps, Avg. Travel Time= 4.1 min

Peak Depth= 1.87' @ 12.29 hrs
Capacity at bank full= 258.21 cfs
0.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 6.0 '/' Top Width= 27.00'
Length= 480.0' Slope= 0.0100 '/'

Reach 6: east drainage channel



Reach 7R: runoff diversion channel

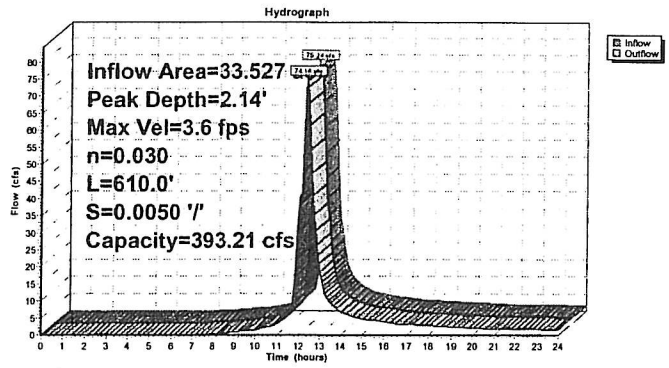
[65] Warning: Inlet elevation not specified

Inflow Area = 33.527 ac, Inflow Depth > 2.95"
Inflow = 75.24 cfs @ 12.32 hrs, Volume= 8.256 af
Outflow = 74.18 cfs @ 12.40 hrs, Volume= 8.233 af, Atten= 1%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.6 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 6.9 min

Peak Depth= 2.14' @ 12.36 hrs
Capacity at bank full= 393.21 cfs
0.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 6.0 '/' Top Width= 36.00'
Length= 610.0' Slope= 0.0050 '/'

Reach 7R: runoff diversion channel



Reach 8R: runoff diversion channel

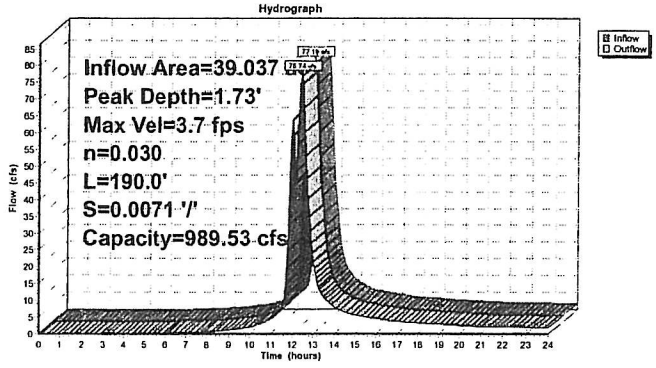
[65] Warning: Inlet elevation not specified

Inflow Area = 39.037 ac, Inflow Depth > 3.02"
Inflow = 77.19 cfs @ 12.40 hrs, Volume= 9.832 af
Outflow = 76.74 cfs @ 12.42 hrs, Volume= 9.825 af, Atten= 1%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.7 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 2.0 min

Peak Depth= 1.73' @ 12.41 hrs
Capacity at bank full= 989.53 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
0.00' x 4.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 4.0 '/' Top Width= 31.50'
Length= 190.0' Slope= 0.0071 '/'

Reach 8R: runoff diversion channel



Reach 9R: runoff diversion channel

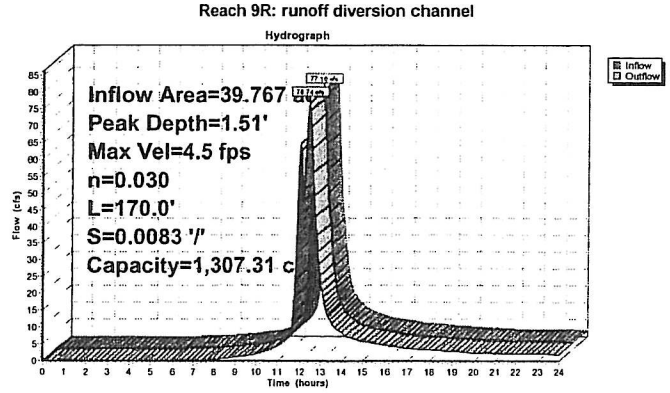
[65] Warning: Inlet elevation not specified

Inflow Area = 39.767 ac, Inflow Depth > 3.03"
Inflow = 77.10 cfs @ 12.42 hrs, Volume= 10.037 af
Outflow = 76.74 cfs @ 12.44 hrs, Volume= 10.030 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.5 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.7 fps, Avg. Travel Time= 1.7 min

Peak Depth= 1.51' @ 12.43 hrs
Capacity at bank full= 1,307.31 cfs
6.00' x 5.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 4.0 '/' Top Width= 44.50'
Length= 170.0' Slope= 0.0083 '/'

Reach 9R: runoff diversion channel



Reach 10AR: (new node)

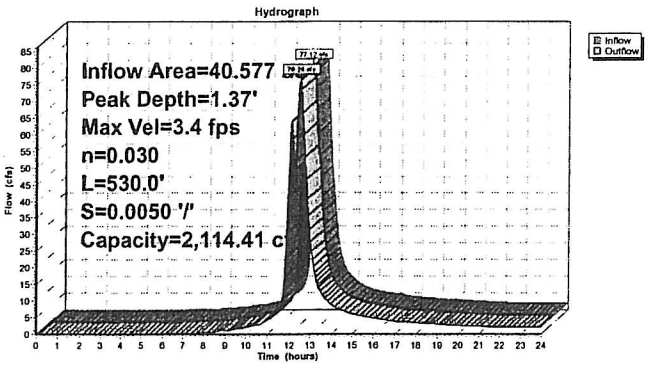
[65] Warning: Inlet elevation not specified

Inflow Area = 40.577 ac, Inflow Depth > 3.04"
Inflow = 77.12 cfs @ 12.44 hrs, Volume= 10.265 af
Outflow = 76.26 cfs @ 12.52 hrs, Volume= 10.235 af, Atten= 1%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.4 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 7.1 min

Peak Depth= 1.37' @ 12.47 hrs
Capacity at bank full= 2,114.41 cfs
10.00' x 6.50' deep channel, n= 0.030
Side Slope Z-value= 6.0 3.0 '/' Top Width= 68.50'
Length= 530.0' Slope= 0.0050 '/'

Reach 10AR: (new node)



Reach 11: new CMP arch

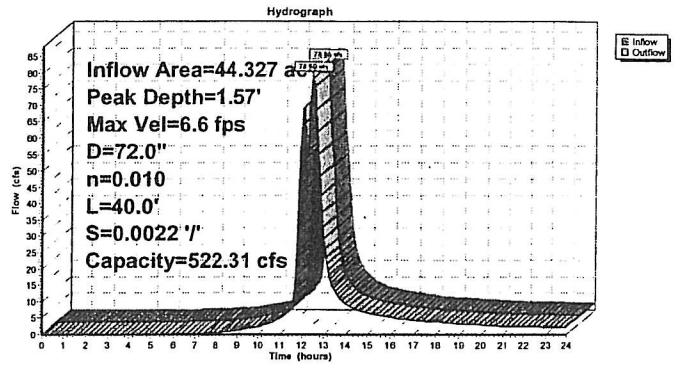
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 44.327 ac, Inflow Depth > 3.03"
Inflow = 78.55 cfs @ 12.51 hrs, Volume= 11.189 af
Outflow = 78.50 cfs @ 12.52 hrs, Volume= 11.188 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.6 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.6 fps, Avg. Travel Time= 0.3 min

Peak Depth= 1.57' @ 12.51 hrs
Capacity at bank full= 522.31 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.010
Length= 40.0' Slope= 0.0022 '/'

Reach 11: new CMP arch



Reach 12R: runoff diversion channel

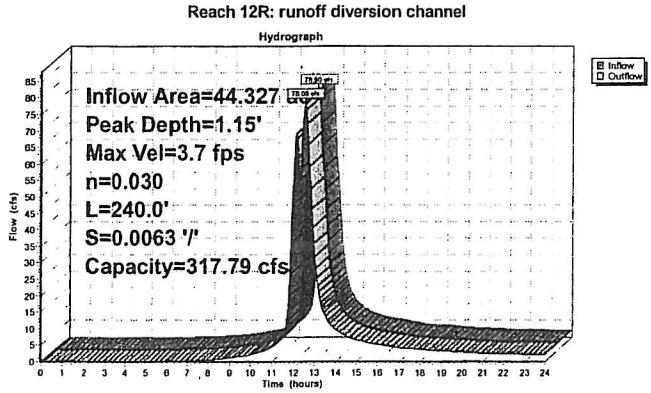
[65] Warning: Inlet elevation not specified

Inflow Area = 44.327 ac, Inflow Depth > 3.03"
Inflow = 78.50 cfs @ 12.52 hrs, Volume= 11.188 af
Outflow = 78.00 cfs @ 12.55 hrs, Volume= 11.174 af, Atten= 1%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.7 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.2 fps, Avg. Travel Time= 3.2 min

Peak Depth= 1.15' @ 12.53 hrs
Capacity at bank full= 317.79 cfs
14.00' x 2.45' deep channel, n= 0.030
Side Slope Z-value= 3.0 4.3 '/' Top Width= 31.89'
Length= 240.0' Slope= 0.0063 '/'

Reach 12R: runoff diversion channel



Reach 13R: runoff diversion channel

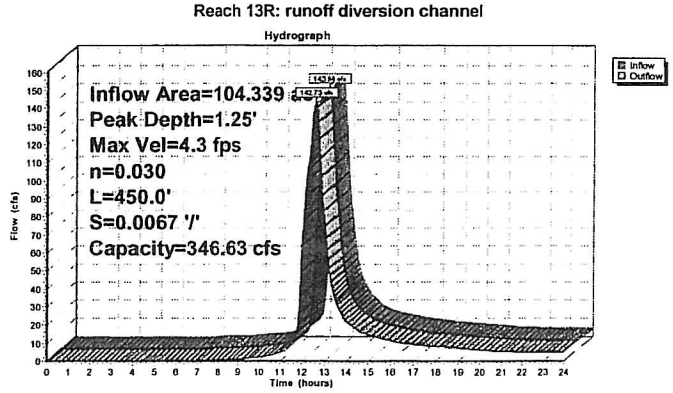
[65] Warning: Inlet elevation not specified

Inflow Area = 104.339 ac, Inflow Depth > 2.43"
Inflow = 143.58 cfs @ 12.53 hrs, Volume= 21.140 af
Outflow = 142.73 cfs @ 12.58 hrs, Volume= 21.088 af, Atten= 1%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.3 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 5.5 min

Peak Depth= 1.25' @ 12.55 hrs
Capacity at bank full= 346.63 cfs
23.11' x 2.06' deep channel, n= 0.030
Side Slope Z-value= 2.3 4.0 '/' Top Width= 36.09'
Length= 450.0' Slope= 0.0067 '/'

Reach 13R: runoff diversion channel



Reach 14: east runon channel

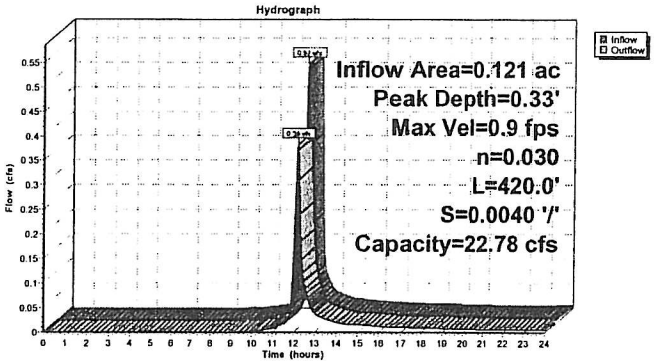
[65] Warning: Inlet elevation not specified

Inflow Area = 0.121 ac, Inflow Depth > 2.54"
Inflow = 0.52 cfs @ 11.98 hrs, Volume= 0.026 af
Outflow = 0.38 cfs @ 12.17 hrs, Volume= 0.025 af, Atten= 27%, Lag= 11.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.9 fps, Min. Travel Time= 7.6 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 19.1 min

Peak Depth= 0.33' @ 12.04 hrs
Capacity at bank full= 22.78 cfs
0.00' x 1.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 5.0 '/' Top Width= 12.00'
Length= 420.0' Slope= 0.0040 '/'

Reach 14: east runon channel



Reach 15: east runon channel

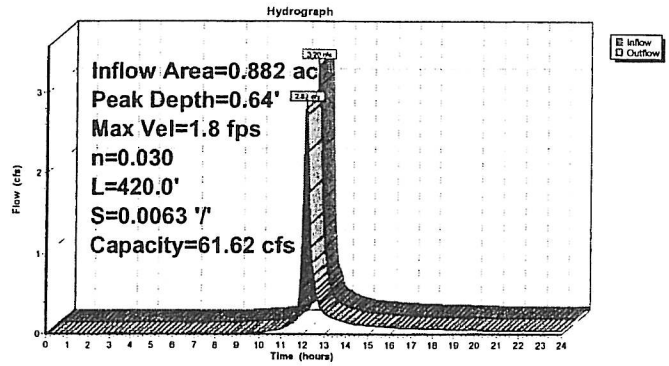
[65] Warning: Inlet elevation not specified

Inflow Area = 0.882 ac, Inflow Depth > 2.54"
Inflow = 3.20 cfs @ 12.01 hrs, Volume= 0.186 af
Outflow = 2.82 cfs @ 12.12 hrs, Volume= 0.186 af, Atten= 12%, Lag= 6.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.8 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.7 fps, Avg. Travel Time= 9.9 min

Peak Depth= 0.64' @ 12.05 hrs
Capacity at bank full= 61.62 cfs
0.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 5.0 '/' Top Width= 16.00'
Length= 420.0' Slope= 0.0063 '/'

Reach 15: east runon channel



Reach 16: east runon channel

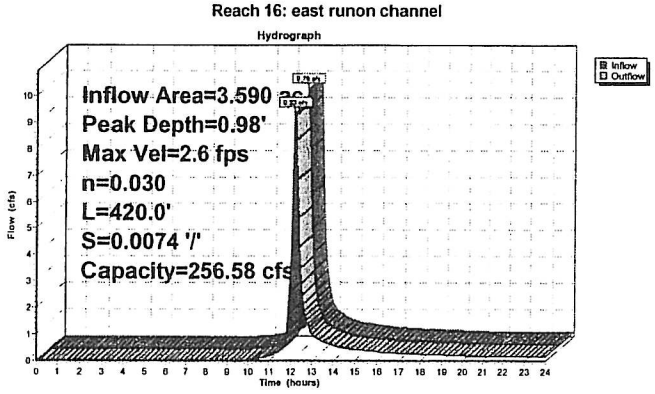
[65] Warning: Inlet elevation not specified

Inflow Area = 3.590 ac, Inflow Depth > 2.22"
Inflow = 9.76 cfs @ 12.10 hrs, Volume= 0.664 af
Outflow = 9.33 cfs @ 12.19 hrs, Volume= 0.661 af, Atten= 4%, Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.6 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.0 fps, Avg. Travel Time= 6.7 min

Peak Depth= 0.98' @ 12.14 hrs
Capacity at bank full= 256.58 cfs
0.00' x 3.40' deep channel, n= 0.030
Side Slope Z-value= 2.5 5.0 '/' Top Width= 25.50'
Length= 420.0' Slope= 0.0074 '/'

Reach 16: east runon channel



Reach 17: east runon channel

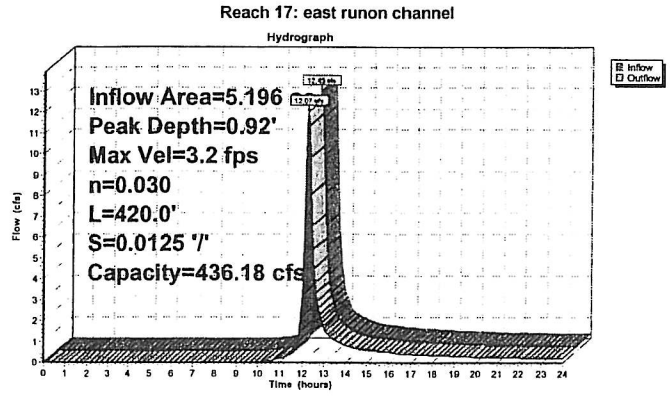
[65] Warning: Inlet elevation not specified

Inflow Area = 5.196 ac, Inflow Depth > 2.13"
Inflow = 12.43 cfs @ 12.18 hrs, Volume= 0.923 af
Outflow = 12.07 cfs @ 12.25 hrs, Volume= 0.921 af, Atten= 3%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.2 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 5.3 min

Peak Depth= 0.92' @ 12.21 hrs
Capacity at bank full= 436.18 cfs
0.00' x 3.50' deep channel, n= 0.030
Side Slope Z-value= 4.0 5.0 '/' Top Width= 31.50'
Length= 420.0' Slope= 0.0125 '/'

Reach 17: east runon channel



Reach 18: east runon channel

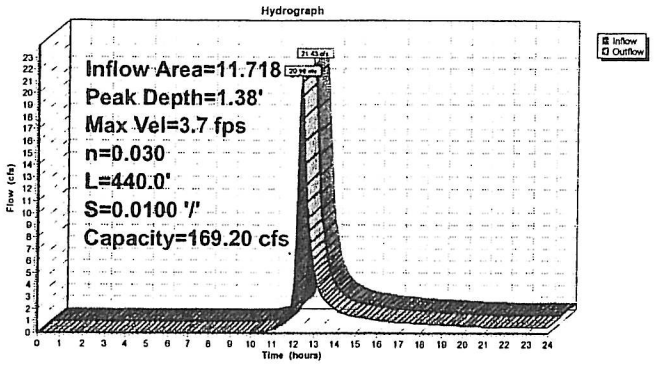
[65] Warning: Inlet elevation not specified

Inflow Area = 11.718 ac, Inflow Depth > 2.07"
Inflow = 21.43 cfs @ 12.27 hrs, Volume= 2.022 af
Outflow = 20.99 cfs @ 12.33 hrs, Volume= 2.017 af, Atten= 2%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.7 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 4.5 min

Peak Depth= 1.38' @ 12.30 hrs
Capacity at bank full= 169.20 cfs
0.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 440.0' Slope= 0.0100 '/'

Reach 18: east runon channel



Reach 19: east runon channel

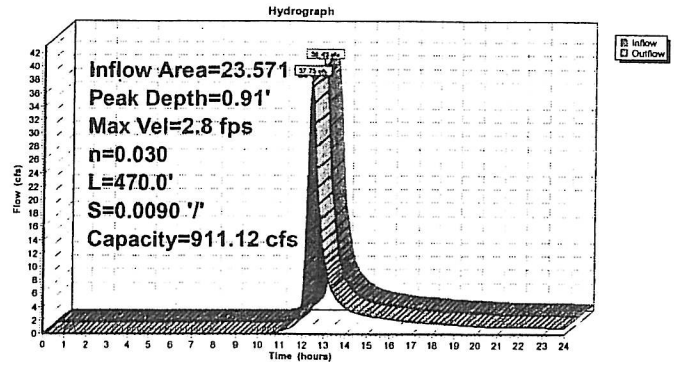
[65] Warning: Inlet elevation not specified

Inflow Area = 23.571 ac, Inflow Depth > 1.97"
Inflow = 38.43 cfs @ 12.32 hrs, Volume= 3.868 af
Outflow = 37.75 cfs @ 12.41 hrs, Volume= 3.855 af, Atten= 2%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.8 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.2 fps, Avg. Travel Time= 6.4 min

Peak Depth= 0.91' @ 12.36 hrs
Capacity at bank full= 911.12 cfs
0.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 30.0 '/' Top Width= 99.00'
Length= 470.0' Slope= 0.0090 '/'

Reach 19: east runon channel



Reach 20: east runon channel

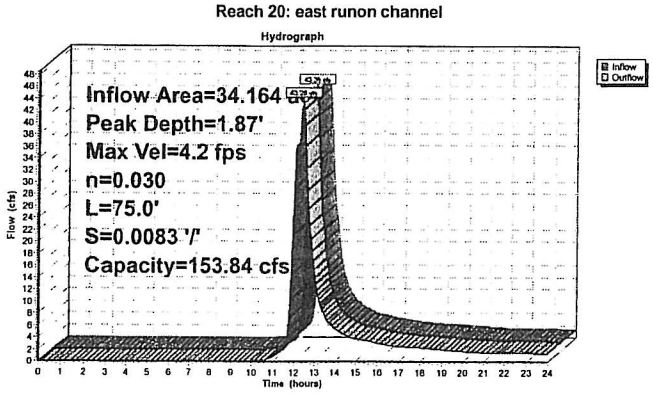
[65] Warning: Inlet elevation not specified

Inflow Area = 34.164 ac, Inflow Depth > 1.96"
Inflow = 43.35 cfs @ 12.39 hrs, Volume= 5.587 af
Outflow = 43.26 cfs @ 12.40 hrs, Volume= 5.586 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.2 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.0 fps, Avg. Travel Time= 0.6 min

Peak Depth= 1.87' @ 12.39 hrs
Capacity at bank full= 153.84 cfs
0.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 75.0' Slope= 0.0083 '/'

Reach 20: east runon channel



Reach 21: east runon channel

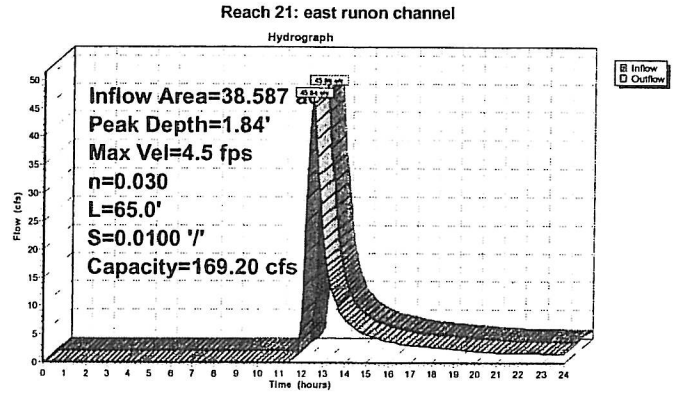
[65] Warning: Inlet elevation not specified

Inflow Area = 38.587 ac, Inflow Depth > 1.91"
Inflow = 45.89 cfs @ 12.48 hrs, Volume= 6.150 af
Outflow = 45.84 cfs @ 12.49 hrs, Volume= 6.148 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.5 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 0.6 min

Peak Depth= 1.84' @ 12.48 hrs
Capacity at bank full= 169.20 cfs
0.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 65.0' Slope= 0.0100 '/'

Reach 21: east runon channel



Reach 22: east runon channel

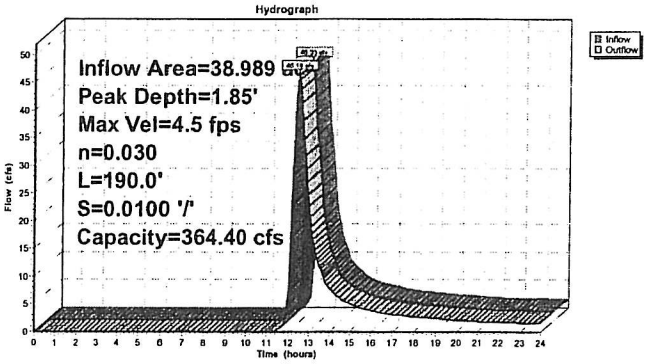
[65] Warning: Inlet elevation not specified

Inflow Area = 38.989 ac, Inflow Depth > 1.92"
Inflow = 46.33 cfs @ 12.49 hrs, Volume= 6.230 af
Outflow = 46.18 cfs @ 12.51 hrs, Volume= 6.225 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.5 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 1.7 min

Peak Depth= 1.85' @ 12.49 hrs
Capacity at bank full= 364.40 cfs
0.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 190.0' Slope= 0.0100 '/'

Reach 22: east runon channel



Reach 23: new CMP culverts

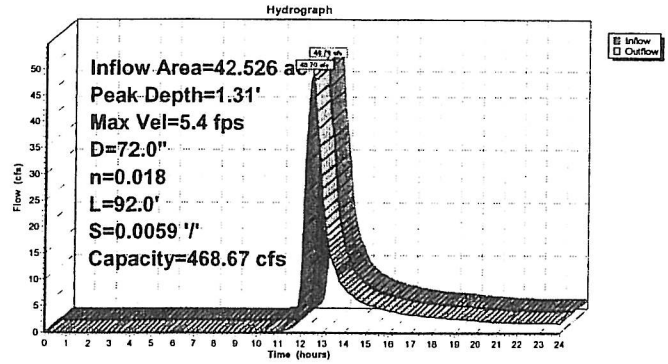
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 42.526 ac, Inflow Depth > 1.94"
Inflow = 48.76 cfs @ 12.51 hrs, Volume= 6.861 af
Outflow = 48.70 cfs @ 12.52 hrs, Volume= 6.858 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.1 fps, Avg. Travel Time= 0.7 min

Peak Depth= 1.31' @ 12.52 hrs
Capacity at bank full= 468.67 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.018
Length= 92.0' Slope= 0.0059 '/'

Reach 23: new CMP culverts



Reach 24: runon channel

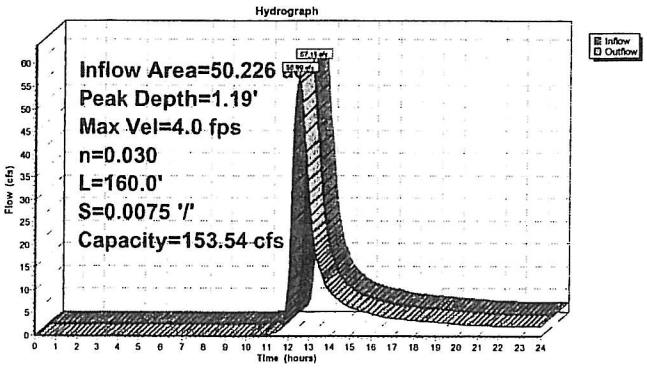
[65] Warning: Inlet elevation not specified

Inflow Area = 50.226 ac, Inflow Depth > 1.94"
Inflow = 57.15 cfs @ 12.47 hrs, Volume= 8.110 af
Outflow = 56.99 cfs @ 12.49 hrs, Volume= 8.102 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.0 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 1.9 min

Peak Depth= 1.19' @ 12.48 hrs
Capacity at bank full= 153.54 cfs
8.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 20.50'
Length= 160.0' Slope= 0.0075 '/'

Reach 24: runon channel



Reach 25: new CMP arch

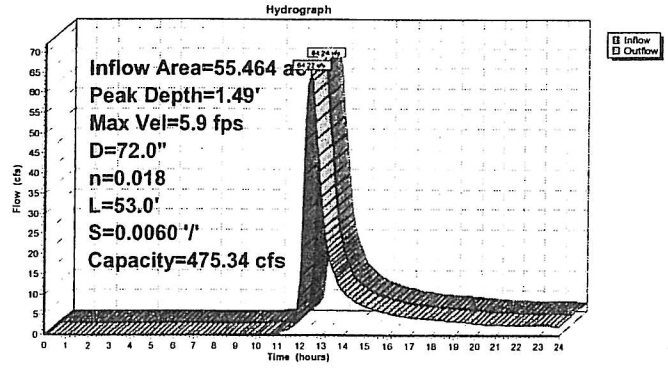
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 55.464 ac, Inflow Depth > 1.96"
Inflow = 64.24 cfs @ 12.45 hrs, Volume= 9.057 af
Outflow = 64.22 cfs @ 12.46 hrs, Volume= 9.055 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.9 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.3 fps, Avg. Travel Time= 0.4 min

Peak Depth= 1.49' @ 12.45 hrs
Capacity at bank full= 475.34 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.018
Length= 53.0' Slope= 0.0060 '/'

Reach 25: new CMP arch



Reach 26: runon channel

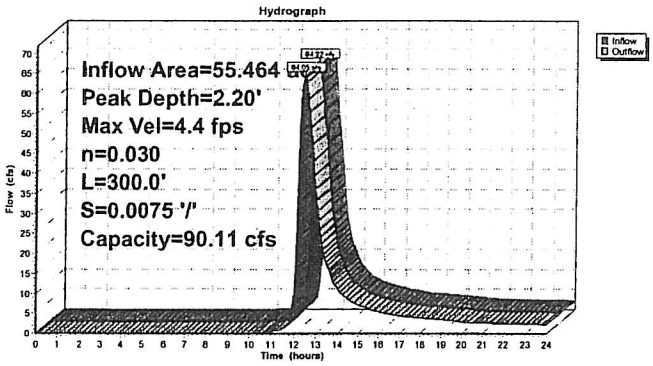
[65] Warning: Inlet elevation not specified

Inflow Area = 55.464 ac, Inflow Depth > 1.96"
Inflow = 64.22 cfs @ 12.46 hrs, Volume= 9.055 af
Outflow = 64.05 cfs @ 12.49 hrs, Volume= 9.044 af, Atten= 0%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.4 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 2.7 min

Peak Depth= 2.20' @ 12.47 hrs
Capacity at bank full= 90.11 cfs
0.00' x 2.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 300.0' Slope= 0.0075 '/'

Reach 26: runon channel



Reach 27: new CMP arch

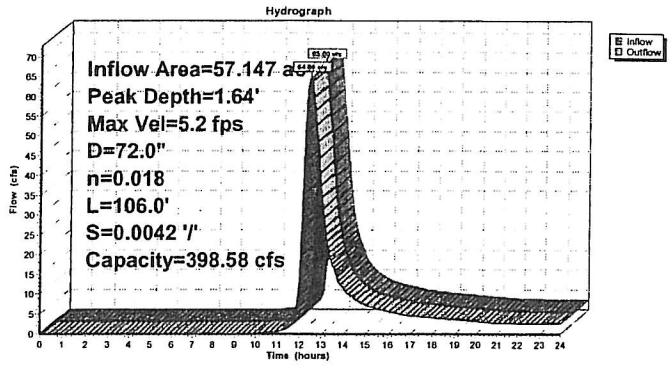
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 57.147 ac, Inflow Depth > 1.97"
Inflow = 65.00 cfs @ 12.48 hrs, Volume= 9.364 af
Outflow = 64.89 cfs @ 12.49 hrs, Volume= 9.360 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 5.2 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.0 fps, Avg. Travel Time= 0.9 min

Peak Depth= 1.64' @ 12.49 hrs
Capacity at bank full= 398.58 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.018
Length= 106.0' Slope= 0.0042 '/'

Reach 27: new CMP arch



Reach 29: east runon channel

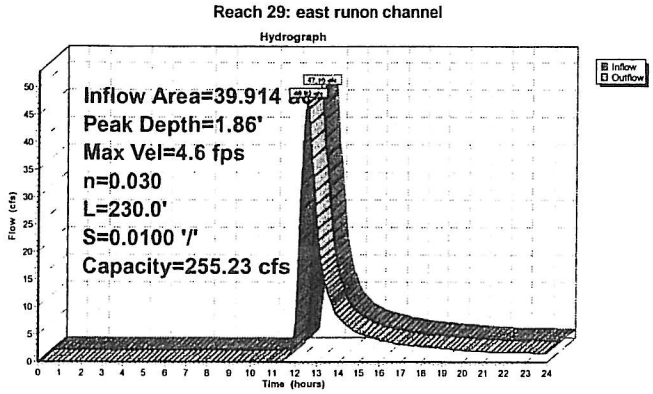
[65] Warning: Inlet elevation not specified

Inflow Area = 39.914 ac, Inflow Depth > 1.93"
Inflow = 47.10 cfs @ 12.50 hrs, Volume= 6.407 af
Outflow = 46.92 cfs @ 12.53 hrs, Volume= 6.400 af, Atten= 0%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.6 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 2.0 min

Peak Depth= 1.86' @ 12.51 hrs
Capacity at bank full= 255.23 cfs
0.00' x 3.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 21.00'
Length= 230.0' Slope= 0.0100 '/'

Reach 29: east runon channel



Reach 30: east runon channel

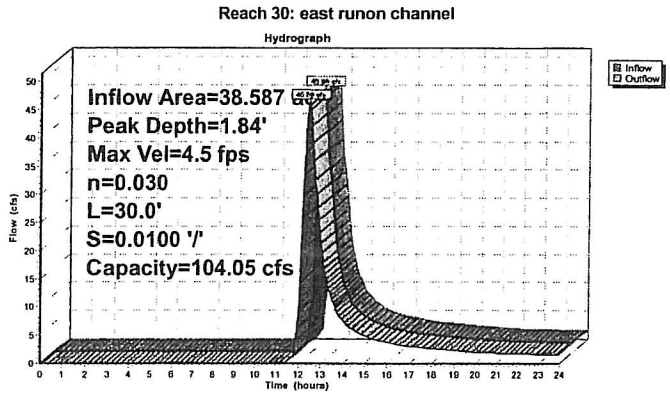
[65] Warning: Inlet elevation not specified

Inflow Area = 38.587 ac, Inflow Depth > 1.91"
Inflow = 45.98 cfs @ 12.48 hrs, Volume= 6.150 af
Outflow = 45.89 cfs @ 12.48 hrs, Volume= 6.150 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.5 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 0.3 min

Peak Depth= 1.84' @ 12.48 hrs
Capacity at bank full= 104.05 cfs
0.00' x 2.50' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 30.0' Slope= 0.0100 '/'

Reach 30: east runon channel



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Reach 31: culvert

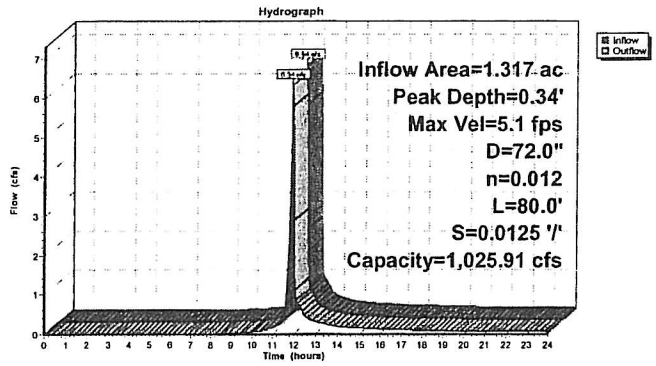
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 1.317 ac, Inflow Depth > 2.55"
Inflow = 6.54 cfs @ 11.91 hrs, Volume= 0.279 af
Outflow = 6.34 cfs @ 11.91 hrs, Volume= 0.279 af, Atten= 3%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.1 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 0.8 min

Peak Depth= 0.34' @ 11.91 hrs
Capacity at bank full= 1,025.91 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.012
Length= 80.0' Slope= 0.0125 '/'

Reach 31: culvert



Pond 1P: (new node)

Inflow Area = 38.587 ac, Inflow Depth > 1.98"
Inflow = 49.32 cfs @ 12.39 hrs, Volume= 6.362 af
Outflow = 45.98 cfs @ 12.48 hrs, Volume= 6.150 af, Atten= 7%, Lag= 5.4 min
Primary = 45.98 cfs @ 12.48 hrs, Volume= 6.150 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Starting Elev= 592.00' Surf.Area= 0.342 ac Storage= 0.691 af
Peak Elev= 593.91' @ 12.48 hrs Surf.Area= 0.609 ac Storage= 1.584 af (0.893 af above start)
Plug-Flow detention time= 101.8 min calculated for 5.448 af (86% of inflow)
Center-of-Mass det. time= 18.3 min (878.5 - 860.2)

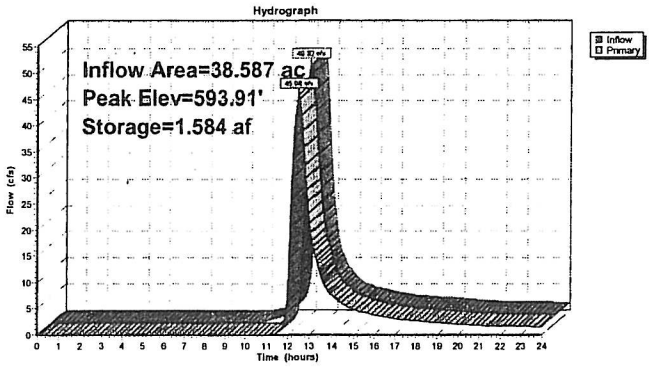
Volume	Invert	Avail.Storage	Storage Description
#1	589.30'	1.634 af	**Custom Stage Data (Conic)** Listed below

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
589.30	0.186	0.000	0.000	0.186
590.00	0.210	0.139	0.139	0.211
591.00	0.278	0.243	0.382	0.279
592.00	0.342	0.309	0.691	0.344
593.00	0.463	0.401	1.092	0.465
594.00	0.624	0.542	1.634	0.627

Device	Routing	Invert	Outlet Devices
#1	Primary	592.00'	**Special & User-Defined** Head (feet) 0.00 0.01 0.18 0.51 1.01 1.34 1.67 2.00 Disch. (cfs) 0.000 0.000 0.080 1.330 8.210 17.570 31.730 51.470

Primary OutFlow Max=45.80 cfs @ 12.48 hrs HW=593.91' (Free Discharge)
└1=**Special & User-Defined** (Custom Controls 45.80 cfs)

Pond 1P: (new node)



Pond 3P: Borrow Area Basin

Inflow Area = 161.996 ac, Inflow Depth > 2.20"
Inflow = 174.95 cfs @ 12.59 hrs, Volume= 29.676 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 574.21' @ 24.00 hrs Surf.Area= 7.679 ac Storage= 29.662 af
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	570.00'	35.760 af	**Custom Stage Data (Conic)** Listed below

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
570.00	6.391	0.000	0.000	6.391
571.00	6.687	6.538	6.538	6.690
572.00	7.017	6.851	13.390	7.023
573.00	7.290	7.153	20.543	7.300
574.00	7.613	7.451	27.994	7.626
575.00	7.921	7.766	35.760	7.938

Device	Routing	Invert	Outlet Devices
#1	Device 2	575.30'	**48.0" Horiz. Orifice/Grate X 2.00** Limited to weir flow C= 0.600
#2	Primary	569.80'	**48.0" x 200.0' long Culvert X 2.00** Ke= 0.700 Outlet Invert= 569.00' S= 0.0040 '/' Cc= 0.900 n= 0.024
#3	Primary	578.00'	**20.0' long Broad-Crested Rectangular Weir** Head (feet) 0.50 1.00 1.50 2.00 2.50 3.00 4.00 5.00 Coef. (English) 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=570.00' (Free Discharge)
├2=**Culvert** (Passes 0.00 cfs of 0.26 cfs potential flow)
│└1=**Orifice/Grate** (Controls 0.00 cfs)
└3=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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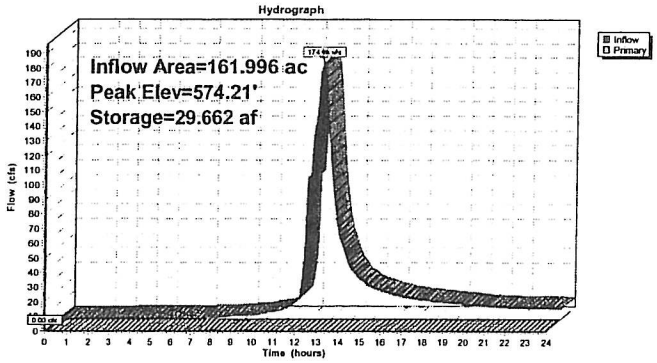
Pond 3P: Borrow Area Basin

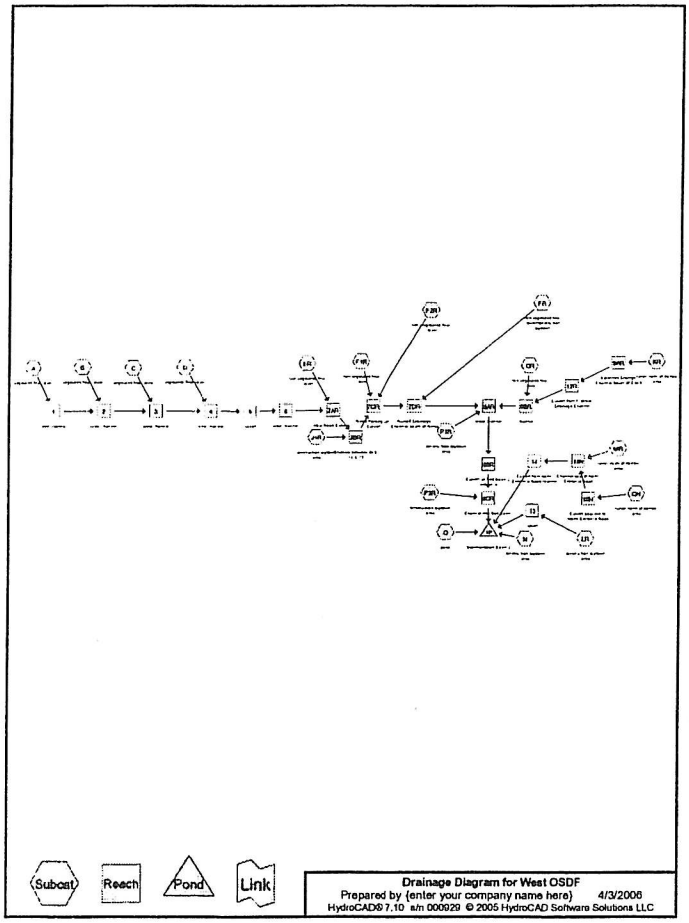


ATTACHMENT C-1B

HydroCAD™ OUTPUT REPORTS

WEST OSDF CONSTRUCTION-PHASE DESIGN SCENARIO

25-YEAR, 24-HOUR STORM EVENT



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

Subcatchment A: vegetated final cover Runoff Area=2.730 ac Runoff Depth>2.89"
Flow Length=670' Tc=18.3 min CN=83 Runoff=9.20 cfs 0.658 af

Subcatchment B: vegetated final cover Runoff Area=5.342 ac Runoff Depth>2.89"
Flow Length=950' Tc=19.0 min CN=83 Runoff=17.63 cfs 1.287 af

Subcatchment C: vegetated final cover Runoff Area=5.399 ac Runoff Depth>2.89"
Flow Length=945' Tc=19.0 min CN=83 Runoff=17.82 cfs 1.301 af

Subcatchment D: vegetated final cover Runoff Area=5.530 ac Runoff Depth>2.89"
Flow Length=950' Tc=19.0 min CN=83 Runoff=18.25 cfs 1.332 af

Subcatchment ER: non-vegetated final cover Runoff Area=5.320 ac Runoff Depth>3.48"
Flow Length=1,100' Tc=4.2 min CN=89 Runoff=32.56 cfs 1.544 af

Subcatchment F1R: non-vegetated final cover Runoff Area=0.918 ac Runoff Depth>3.48"
Flow Length=703' Tc=2.9 min CN=89 Runoff=5.78 cfs 0.267 af

Subcatchment F2R: non-vegetated final cover Runoff Area=2.730 ac Runoff Depth>3.48"
Flow Length=638' Tc=2.8 min CN=89 Runoff=17.20 cfs 0.793 af

Subcatchment FR: non-vegetated final cover/construction lay Runoff Area=2.910 ac Runoff Depth>3.49"
Flow Length=425' Tc=1.9 min CN=89 Runoff=18.22 cfs 0.845 af

Subcatchment GR: non-vegetated final cover Runoff Area=0.270 ac Runoff Depth>3.48"
Flow Length=450' Tc=2.3 min CN=89 Runoff=1.67 cfs 0.078 af

Subcatchment J1R: construction laydown area Runoff Area=0.312 ac Runoff Depth>2.81"
Flow Length=54' Tc=2.8 min CN=82 Runoff=1.66 cfs 0.073 af

Subcatchment KR: runon north of borrow area Runoff Area=3.020 ac Runoff Depth>3.48"
Flow Length=480' Tc=2.5 min CN=89 Runoff=19.05 cfs 0.877 af

Subcatchment LR: construction laydown area Runoff Area=1.540 ac Runoff Depth>2.79"
Flow Length=360' Tc=30.7 min CN=82 Runoff=3.69 cfs 0.358 af

Subcatchment MR: runon north of borrow area Runoff Area=0.675 ac Runoff Depth>2.54"
Flow Length=40' Tc=2.8 min CN=79 Runoff=3.30 cfs 0.143 af

Subcatchment N: construction laydown area Runoff Area=1.043 ac Runoff Depth>2.80"
Flow Length=170' Tc=15.2 min CN=82 Runoff=3.73 cfs 0.244 af

Subcatchment O: pond Runoff Area=2.252 ac Runoff Depth>4.46"
Tc=1.0 min CN=98 Runoff=16.67 cfs 0.838 af

Subcatchment P1R: construction laydown area Runoff Area=0.490 ac Runoff Depth>2.81"
Flow Length=100' Tc=8.4 min CN=82 Runoff=2.20 cfs 0.115 af

Subcatchment P2R: construction laydown area Runoff Area=0.214 ac Runoff Depth>2.81"
Flow Length=110' Tc=8.3 min CN=82 Runoff=0.96 cfs 0.050 af

Subcatchment QN: runon north of borrow area Runoff Area=0.170 ac Runoff Depth>2.54"
Flow Length=100' Tc=11.8 min CN=79 Runoff=0.62 cfs 0.036 af

Reach 1: west channel Peak Depth=0.94' Max Vel=2.5 fps Inflow=9.20 cfs 0.658 af
n=0.030 L=400.0' S=0.0075 '/' Capacity=424.60 cfs Outflow=8.87 cfs 0.656 af

Reach 2: west channel Peak Depth=1.39' Max Vel=3.3 fps Inflow=25.75 cfs 1.943 af
n=0.030 L=400.0' S=0.0075 '/' Capacity=424.60 cfs Outflow=25.10 cfs 1.939 af

Reach 3: west channel Peak Depth=1.66' Max Vel=3.7 fps Inflow=41.23 cfs 3.240 af
n=0.030 L=400.0' S=0.0075 '/' Capacity=424.60 cfs Outflow=40.35 cfs 3.234 af

Reach 4: west channel Peak Depth=1.86' Max Vel=4.0 fps Inflow=55.70 cfs 4.566 af
n=0.030 L=90.0' S=0.0076 '/' Capacity=426.17 cfs Outflow=55.45 cfs 4.565 af

Reach 5: culvert Peak Depth=1.52' Max Vel=4.9 fps Inflow=55.45 cfs 4.565 af
D=72.0" n=0.024 L=95.0' S=0.0075 '/' Capacity=396.64 cfs Outflow=55.23 cfs 4.563 af

Reach 6: west channel Peak Depth=1.86' Max Vel=4.0 fps Inflow=55.23 cfs 4.563 af
n=0.030 L=380.0' S=0.0075 '/' Capacity=424.60 cfs Outflow=54.31 cfs 4.555 af

Reach 7AR: Haul Road Culvert 1 Peak Depth=2.44' Max Vel=5.4 fps Inflow=57.96 cfs 6.100 af
D=72.0" n=0.024 L=81.5' S=0.0053 '/' Capacity=166.63 cfs Outflow=57.80 cfs 6.098 af

Reach 7BR: Channel between GIS 14 & 15 Peak Depth=2.37' Max Vel=2.6 fps Inflow=57.98 cfs 6.171 af
n=0.030 L=100.0' S=0.0023 '/' Capacity=200.78 cfs Outflow=57.49 cfs 6.167 af

Reach 7CR: Rimia Parking Lot Culvert Peak Depth=1.90' Max Vel=8.4 fps Inflow=65.26 cfs 7.227 af
D=72.0" n=0.013 L=296.0' S=0.0049 '/' Capacity=296.41 cfs Outflow=63.02 cfs 7.222 af

Reach 7DR: Runoff Drainage Channel south Peak Depth=1.49' Max Vel=3.5 fps Inflow=78.17 cfs 8.067 af
n=0.030 L=340.0' S=0.0062 '/' Capacity=1,440.47 cfs Outflow=73.93 cfs 8.054 af

Reach 8AR: west channel Peak Depth=2.09' Max Vel=3.9 fps Inflow=91.38 cfs 9.118 af
n=0.030 L=75.0' S=0.0048 '/' Capacity=405.20 cfs Outflow=90.36 cfs 9.114 af

Reach 8BR: Culvert at Sed Basin 2 entrance Peak Depth=1.67' Max Vel=7.0 fps Inflow=90.36 cfs 9.114 af
D=72.0" n=0.013 L=30.0' S=0.0040 '/' Capacity=535.70 cfs Outflow=90.13 cfs 9.114 af

Reach 8CR: Channel into Sed Basin 2 Peak Depth=2.17' Max Vel=6.7 fps Inflow=91.07 cfs 9.164 af
n=0.030 L=62.7' S=0.0159 '/' Capacity=728.12 cfs Outflow=90.57 cfs 9.162 af

Reach 9AR: Extended Drainge Channel Sout Peak Depth=0.77' Max Vel=1.6 fps Inflow=19.05 cfs 0.877 af
n=0.030 L=395.0' S=0.0020 '/' Capacity=102.00 cfs Outflow=15.94 cfs 0.872 af

Reach 9BR: channel Peak Depth=0.61' Max Vel=2.3 fps Inflow=16.31 cfs 0.950 af
n=0.030 L=76.0' S=0.0050 '/' Capacity=566.70 cfs Outflow=16.03 cfs 0.949 af

Reach 12R: Culvert from F Street Drainage Peak Depth=0.96' Max Vel=5.4 fps Inflow=15.94 cfs 0.872 af
D=72.0" n=0.013 L=65.0' S=0.0046 '/' Capacity=287.72 cfs Outflow=15.83 cfs 0.871 af

Reach 13: culvert Peak Depth=0.41' Max Vel=4.3 fps Inflow=3.69 cfs 0.358 af
D=72.0" n=0.013 L=120.0' S=0.0083 '/' Capacity=386.61 cfs Outflow=3.68 cfs 0.358 af

Reach 14: Culvert from North Entrance Road Peak Depth=0.27' Max Vel=3.5 fps Inflow=3.29 cfs 0.178 af
D=72.0" n=0.024 L=112.0' S=0.0321 '/' Capacity=822.56 cfs Outflow=3.21 cfs 0.178 af

Reach 15N: Culvert adjacent to North Entran Peak Depth=0.17' Max Vel=2.6 fps Inflow=0.62 cfs 0.036 af
D=72.0" n=0.010 L=55.0' S=0.0055 '/' Capacity=406.62 cfs Outflow=0.61 cfs 0.036 af

Reach 16N: Channel east of North Entrance Peak Depth=0.91' Max Vel=2.2 fps Inflow=3.69 cfs 0.179 af
n=0.030 L=382.0' S=0.0069 '/' Capacity=71.46 cfs Outflow=3.29 cfs 0.178 af

Pond 1P: Sedimentation Basin 2 Peak Elev=575.69' Storage=8.969 af Inflow=101.95 cfs 10.780 af
Outflow=3.50 cfs 1.922 af

Total Runoff Area = 40.865 ac Runoff Volume = 10.839 af Average Runoff Depth = 3.18"

Subcatchment A: vegetated final cover

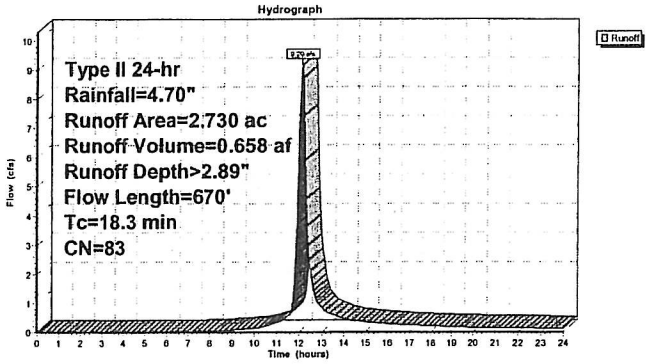
Runoff = 9.20 cfs @ 12.11 hrs, Volume= 0.658 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
2.730	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.5	190	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	180	0.0075	4.2	75.84	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 & 6.0 '/' Top.W=18.00' n= 0.030
18.3	670	Total			

Subcatchment A: vegetated final cover



Subcatchment B: vegetated final cover

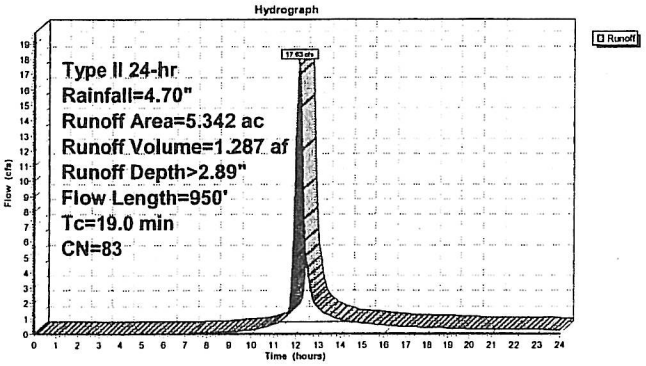
Runoff = 17.63 cfs @ 12.11 hrs, Volume= 1.287 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.342	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.5	200	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	190	0.0075	4.2	75.84	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 & 6.0 '/' Top.W=18.00' n= 0.030
0.1	60	0.0100	15.0	423.51	**Circular Channel (pipe),** Diam= 72.0" Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.013
0.5	200	0.0075	6.6	424.60	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.00' Z= 6.0 & 2.0 '/' Top.W=32.00' n= 0.030
19.0	950	Total			

Subcatchment B: vegetated final cover



Subcatchment C: vegetated final cover

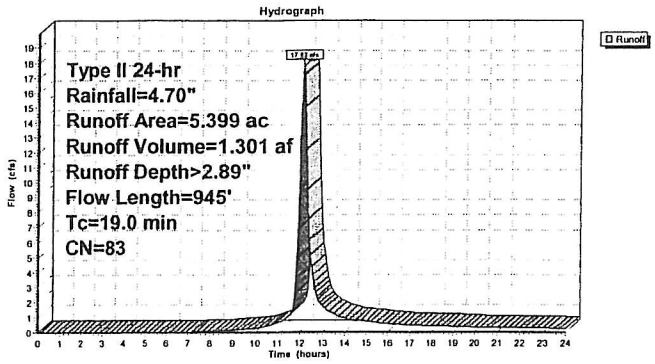
Runoff = 17.82 cfs @ 12.11 hrs, Volume= 1.301 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.399	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.5	200	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	190	0.0075	4.2	75.84	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 & 6.0 '/' Top.W=18.00' n= 0.030
0.1	60	0.0100	15.0	423.51	**Circular Channel (pipe),** Diam= 72.0" Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.013
0.5	195	0.0075	6.6	424.60	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.00' Z= 6.0 & 2.0 '/' Top.W=32.00' n= 0.030
19.0	945	Total			

Subcatchment C: vegetated final cover



Subcatchment D: vegetated final cover

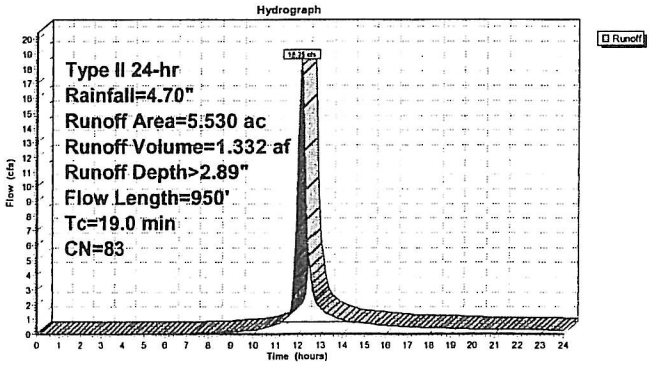
Runoff = 18.25 cfs @ 12.11 hrs, Volume= 1.332 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.530	83	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	90	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
3.8	60	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
6.4	150	0.1700	0.4		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.5	205	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	190	0.0075	4.2	75.84	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 & 6.0 '/' Top.W=18.00' n= 0.030
0.1	60	0.0100	15.0	423.51	**Circular Channel (pipe),** Diam= 72.0" Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.013
0.5	195	0.0075	6.6	424.60	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=4.00' Z= 6.0 & 2.0 '/' Top.W=32.00' n= 0.030
19.0	950	Total			

Subcatchment D: vegetated final cover



Subcatchment ER: non-vegetated final cover

[49] Hint: Tc<2dt may require smaller dt

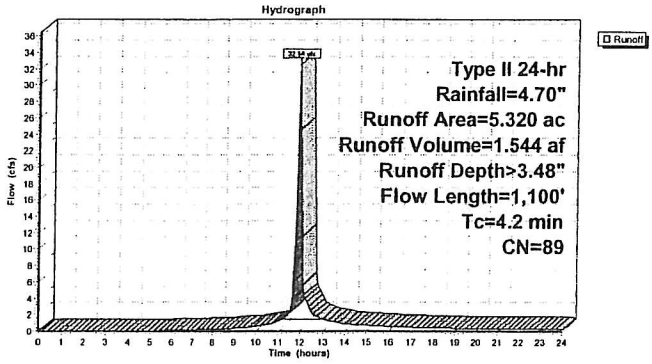
Runoff = 32.56 cfs @ 11.94 hrs, Volume= 1.544 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
5.320	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	110	0.0625	2.0		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.4	45	0.1110	2.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.8	150	0.1700	3.2		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.60"
0.5	200	0.1700	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	510	0.0075	6.1	337.31	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.50' Z= 3.0 & 6.0 '/' Top.W=31.50' n= 0.030
0.2	85	0.0029	8.1	228.07	**Circular Channel (pipe),** Diam= 72.0" Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.013
4.2	1,100	Total			

Subcatchment ER: non-vegetated final cover



Subcatchment F1R: non-vegetated final cover

[49] Hint: Tc<2dt may require smaller dt

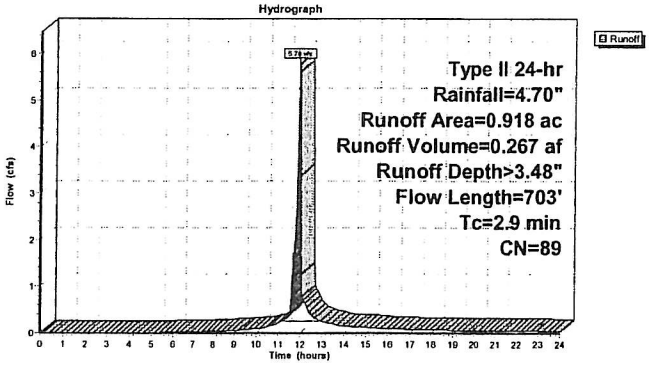
Runoff = 5.78 cfs @ 11.93 hrs, Volume= 0.267 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.918	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	90	0.0530	1.8		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.4	50	0.1000	2.0		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.8	150	0.1670	3.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.5	200	0.1670	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	160	0.0075	6.1	337.31	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=3.50' Z= 6.0 & 3.0 '/' Top.W=31.50' n= 0.030
0.0	53	0.0580	36.1	1,019.94	**Circular Channel (pipe),** Diam= 72.0" Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.013
2.9	703	Total			

Subcatchment F1R: non-vegetated final cover



Subcatchment F2R: non-vegetated final cover

[49] Hint: Tc<2dt may require smaller dt

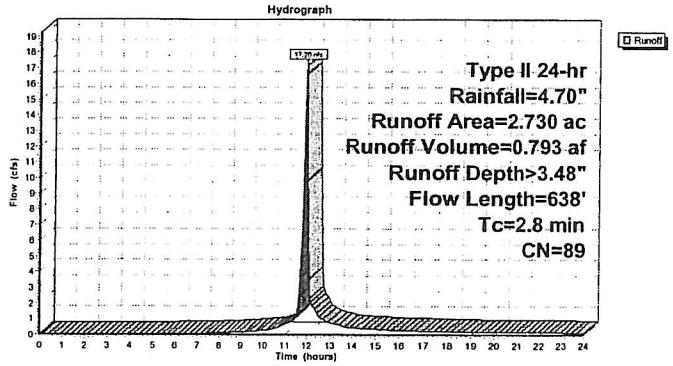
Runoff = 17.20 cfs @ 11.93 hrs, Volume= 0.793 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
2.730	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	120	0.0500	1.8		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.9	180	0.1667	3.2		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.5	200	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	60	0.0830	4.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	78	0.0052	10.8	305.40	**Circular Channel (pipe),** Diam= 72.0" Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.013
2.8	638	Total			

Subcatchment F2R: non-vegetated final cover



Subcatchment FR: non-vegetated final cover/construction laydown

[49] Hint: Tc<2dt may require smaller dt

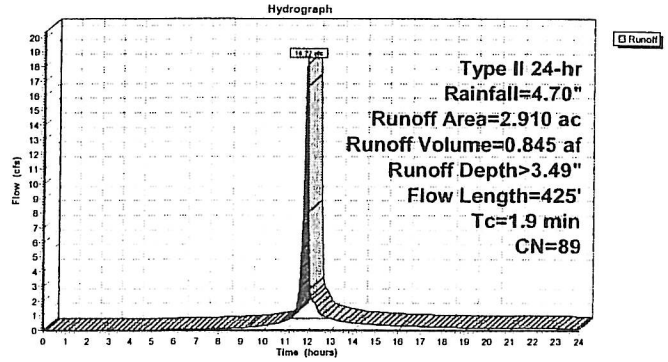
Runoff = 18.22 cfs @ 11.91 hrs, Volume= 0.845 af, Depth> 3.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
2.910	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.1000	1.7		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
1.3	280	0.1667	3.5		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.2	70	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.0	15	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	25	0.0330	2.9		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	425	Total			

Subcatchment FR: non-vegetated final cover/construction laydown



Subcatchment GR: non-vegetated final cover

[49] Hint: Tc<2dt may require smaller dt

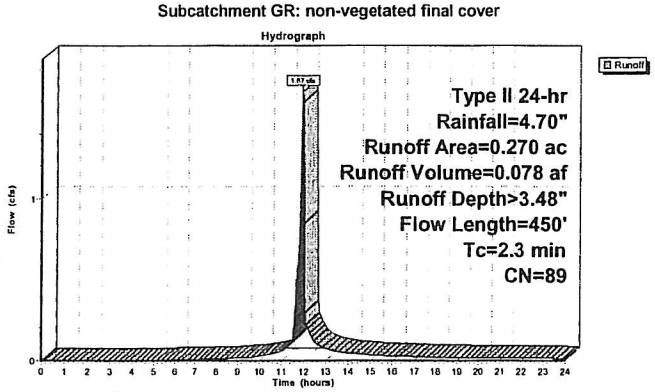
Runoff = 1.67 cfs @ 11.92 hrs, Volume= 0.078 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.270	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	280	0.1667	3.5		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.3	20	0.0400	1.2		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.1	20	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	30	0.3333	9.3		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	100	0.0400	3.2		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.3	450	Total			

Subcatchment GR: non-vegetated final cover



Subcatchment J1R: construction laydown area

[49] Hint: Tc<2dt may require smaller dt

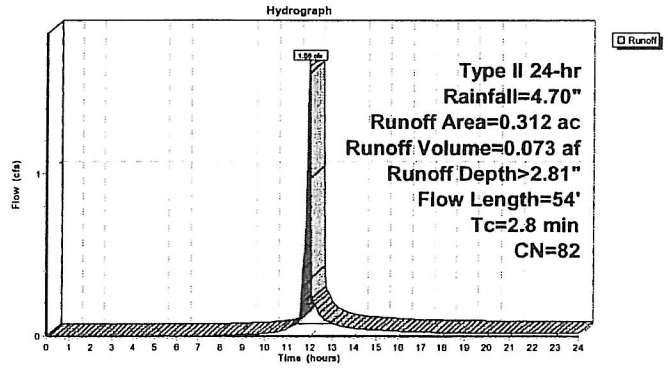
Runoff = 1.66 cfs @ 11.93 hrs, Volume= 0.073 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.312	82	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	54	0.1670	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"

Subcatchment J1R: construction laydown area



Subcatchment KR: runon north of borrow area

[49] Hint: Tc<2dt may require smaller dt

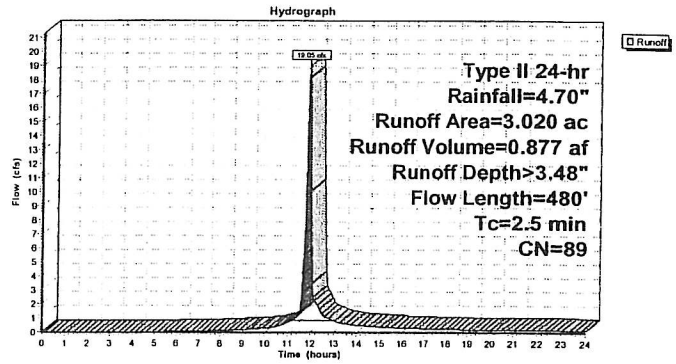
Runoff = 19.05 cfs @ 11.93 hrs, Volume= 0.877 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
3.020	89	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	55	0.0500	1.6		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.5	65	0.1000	2.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.9	180	0.1667	3.2		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.55"
0.3	135	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	15	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	30	0.1667	6.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	480	Total			

Subcatchment KR: runon north of borrow area



Subcatchment LR: construction laydown area

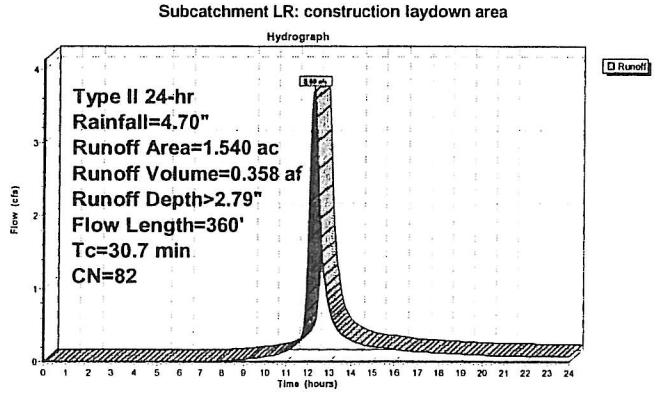
Runoff = 3.69 cfs @ 12.25 hrs, Volume= 0.358 af, Depth> 2.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.540	82	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	300	0.0140	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"
0.5	60	0.0170	2.1		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
30.7	360	Total			

Subcatchment LR: construction laydown area



Subcatchment MR: runon north of borrow area

[49] Hint: Tc<2dt may require smaller dt

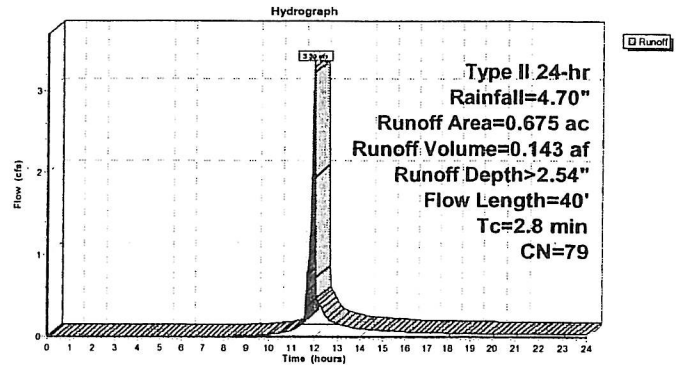
Runoff = 3.30 cfs @ 11.93 hrs, Volume= 0.143 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.675	79	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	40	0.0985	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.60"

Subcatchment MR: runon north of borrow area



Subcatchment N: construction laydown area

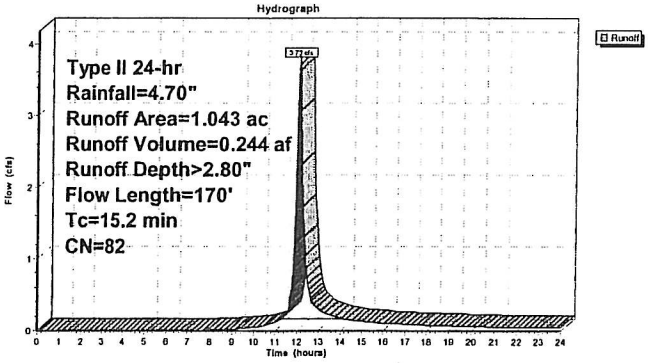
Runoff = 3.73 cfs @ 12.07 hrs, Volume= 0.244 af, Depth> 2.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
1.043	82	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	170	0.0250	0.2		Sheet Flow, Grass: Short n= 0.150 P2= 2.60"

Subcatchment N: construction laydown area



Subcatchment O: pond

[49] Hint: Tc<2dt may require smaller dt

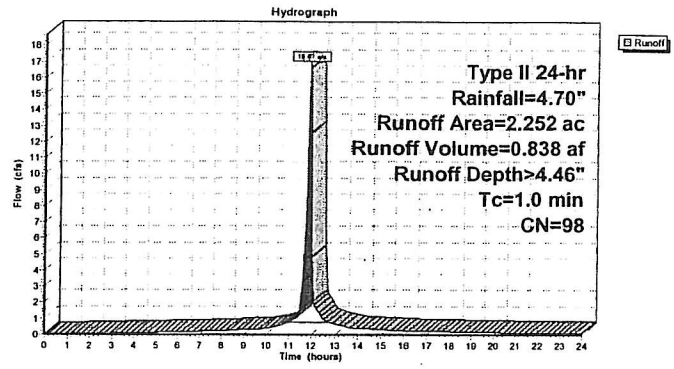
Runoff = 16.67 cfs @ 11.90 hrs, Volume= 0.838 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
2.252	98	

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

Subcatchment O: pond



Subcatchment P1R: construction laydown area

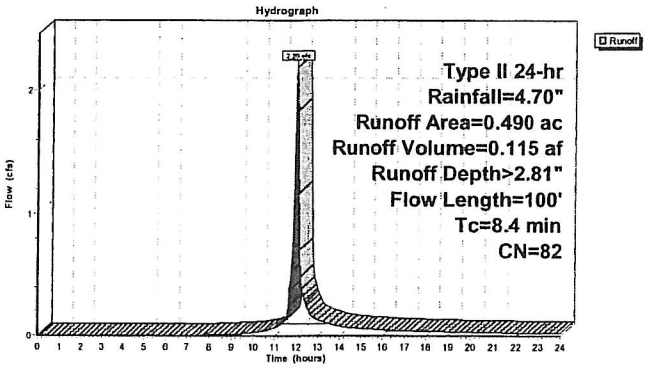
Runoff = 2.20 cfs @ 12.00 hrs, Volume= 0.115 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.490	82	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0385	0.2		Sheet Flow, Grass: Short n= 0.150 P2= 2.60"

Subcatchment P1R: construction laydown area



Subcatchment P2R: construction laydown area

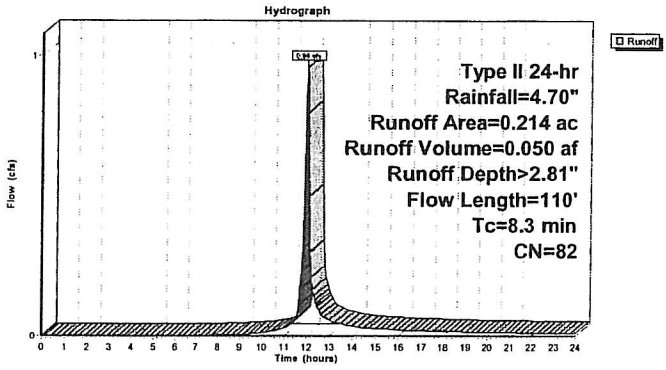
Runoff = 0.96 cfs @ 12.00 hrs, Volume= 0.050 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.214	82	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	110	0.0473	0.2		Sheet Flow, Grass: Short n= 0.150 P2= 2.60"

Subcatchment P2R: construction laydown area



Subcatchment QN: runon north of borrow area

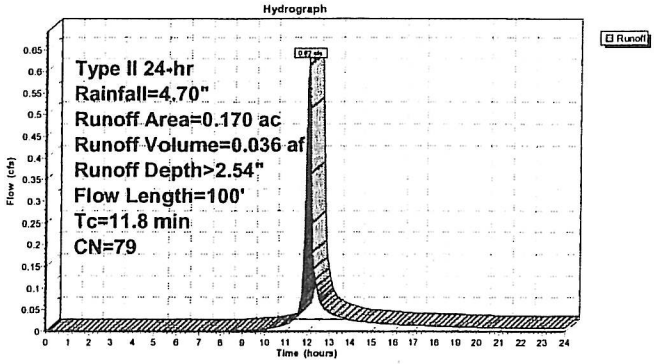
Runoff = 0.62 cfs @ 12.04 hrs, Volume= 0.036 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.70"

Area (ac)	CN	Description
0.170	79	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0167	0.1		Sheet Flow, Grass: Short n= 0.150 P2= 2.55"

Subcatchment QN: runon north of borrow area



Reach 1: west channel

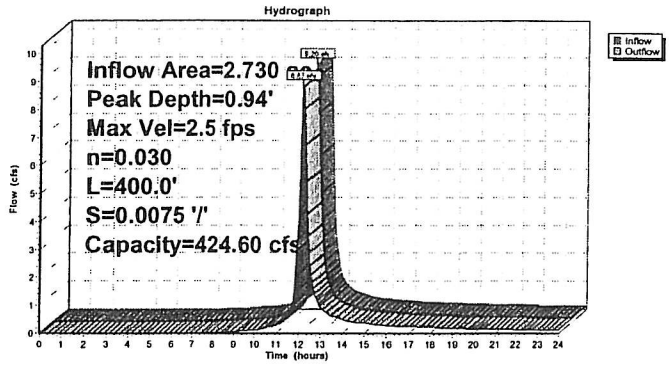
[65] Warning: Inlet elevation not specified

Inflow Area = 2.730 ac, Inflow Depth > 2.89"
Inflow = 9.20 cfs @ 12.11 hrs, Volume= 0.658 af
Outflow = 8.87 cfs @ 12.19 hrs, Volume= 0.656 af, Atten= 4%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.0 fps, Avg. Travel Time= 6.6 min

Peak Depth= 0.94' @ 12.14 hrs
Capacity at bank full= 424.60 cfs
0.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 6.0 '/' Top Width= 32.00'
Length= 400.0' Slope= 0.0075 '/'

Reach 1: west channel



Reach 2: west channel

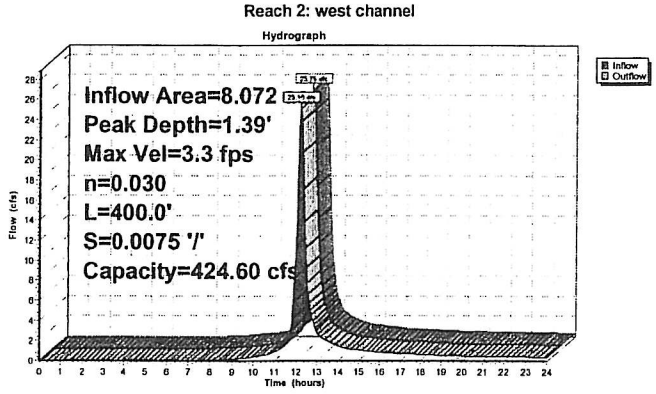
[65] Warning: Inlet elevation not specified

Inflow Area = 8.072 ac, Inflow Depth > 2.89"
Inflow = 25.75 cfs @ 12.14 hrs, Volume= 1.943 af
Outflow = 25.10 cfs @ 12.20 hrs, Volume= 1.939 af, Atten= 3%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.3 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 5.1 min

Peak Depth= 1.39' @ 12.16 hrs
Capacity at bank full= 424.60 cfs
0.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 6.0 '/' Top Width= 32.00'
Length= 400.0' Slope= 0.0075 '/'

Reach 2: west channel



Reach 3: west channel

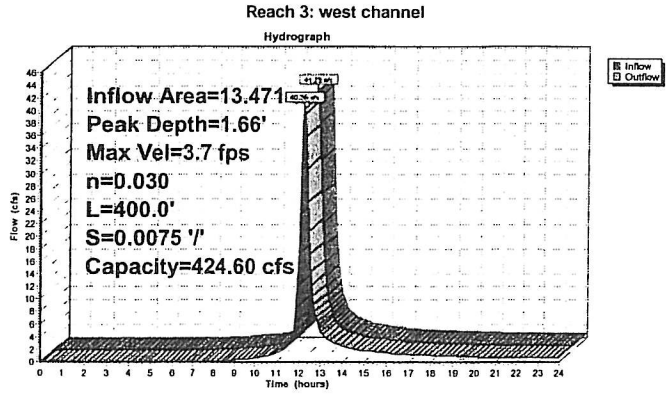
[65] Warning: Inlet elevation not specified

Inflow Area = 13.471 ac, Inflow Depth > 2.89"
Inflow = 41.23 cfs @ 12.16 hrs, Volume= 3.240 af
Outflow = 40.35 cfs @ 12.22 hrs, Volume= 3.234 af, Atten= 2%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.7 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 4.5 min

Peak Depth= 1.66' @ 12.19 hrs
Capacity at bank full= 424.60 cfs
0.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 6.0 '/' Top Width= 32.00'
Length= 400.0' Slope= 0.0075 '/'

Reach 3: west channel



Reach 4: west channel

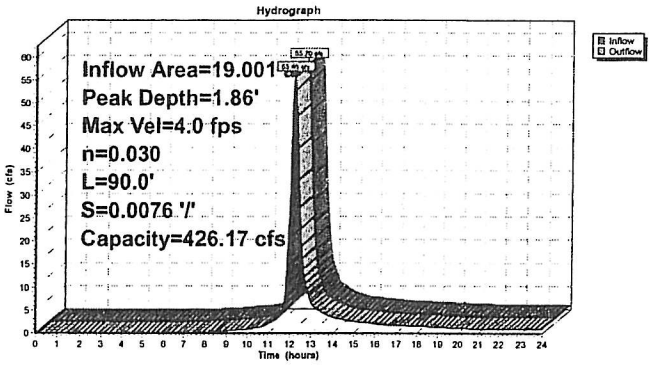
[65] Warning: Inlet elevation not specified

Inflow Area = 19.001 ac, Inflow Depth > 2.88"
Inflow = 55.70 cfs @ 12.19 hrs, Volume= 4.566 af
Outflow = 55.45 cfs @ 12.20 hrs, Volume= 4.565 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.0 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 0.9 min

Peak Depth= 1.86' @ 12.19 hrs
Capacity at bank full= 426.17 cfs
0.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 6.0 '/' Top Width= 32.00'
Length= 90.0' Slope= 0.0076 '/'

Reach 4: west channel



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Reach 5: culvert

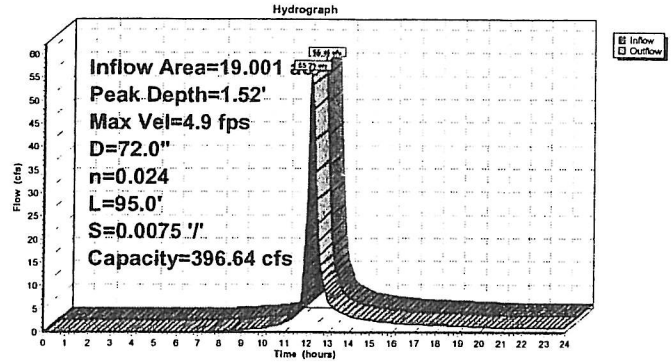
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 19.001 ac, Inflow Depth > 2.88"
Inflow = 55.45 cfs @ 12.20 hrs, Volume= 4.565 af
Outflow = 55.23 cfs @ 12.21 hrs, Volume= 4.563 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.9 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.7 fps, Avg. Travel Time= 0.9 min

Peak Depth= 1.52' @ 12.20 hrs
Capacity at bank full= 396.64 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.024
Length= 95.0' Slope= 0.0075 '/'

Reach 5: culvert



Reach 6: west channel

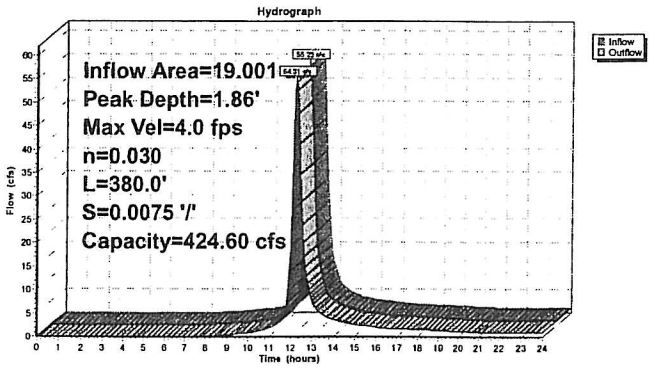
[65] Warning: Inlet elevation not specified

Inflow Area = 19.001 ac, Inflow Depth > 2.88"
Inflow = 55.23 cfs @ 12.21 hrs, Volume= 4.563 af
Outflow = 54.31 cfs @ 12.25 hrs, Volume= 4.555 af, Atten= 2%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.0 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 3.9 min

Peak Depth= 1.86' @ 12.23 hrs
Capacity at bank full= 424.60 cfs
0.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 6.0 2.0 '/' Top Width= 32.00'
Length= 380.0' Slope= 0.0075 '/'

Reach 6: west channel



Reach 7AR: Haul Road Culvert 1

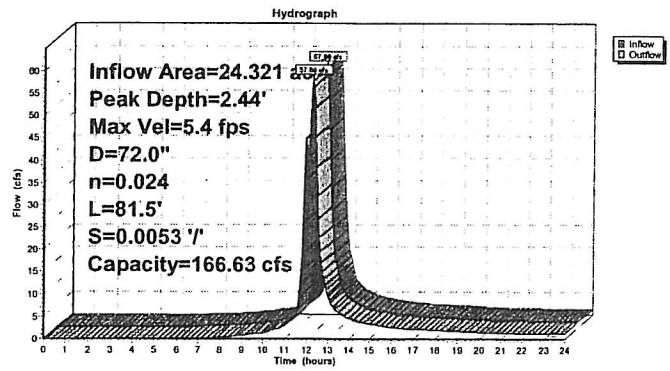
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 24.321 ac, Inflow Depth > 3.01"
Inflow = 57.96 cfs @ 12.25 hrs, Volume= 6.100 af
Outflow = 57.80 cfs @ 12.26 hrs, Volume= 6.098 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 0.7 min

Peak Depth= 2.44' @ 12.25 hrs
Capacity at bank full= 166.63 cfs
72.0" Diameter Pipe, n= 0.024
Length= 81.5' Slope= 0.0053 '/'

Reach 7AR: Haul Road Culvert 1



Reach 7BR: Channel between GIS 14 & 15

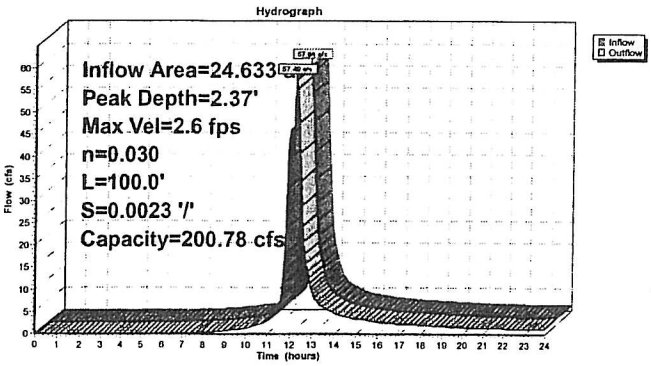
[65] Warning: Inlet elevation not specified

Inflow Area = 24.633 ac, Inflow Depth > 3.01"
Inflow = 57.98 cfs @ 12.26 hrs, Volume= 6.171 af
Outflow = 57.49 cfs @ 12.28 hrs, Volume= 6.167 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.6 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 1.6 min

Peak Depth= 2.37' @ 12.27 hrs
Capacity at bank full= 200.78 cfs
0.00' x 3.77' deep channel, n= 0.030
Side Slope Z-value= 6.0 2.0 '/' Top Width= 30.16'
Length= 100.0' Slope= 0.0023 '/'

Reach 7BR: Channel between GIS 14 & 15



Reach 7CR: Rimia Parking Lot Culvert

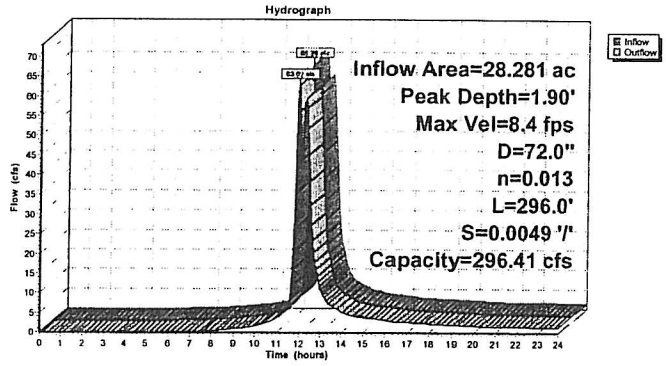
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 28.281 ac, Inflow Depth > 3.07"
Inflow = 65.26 cfs @ 11.96 hrs, Volume= 7.227 af
Outflow = 63.02 cfs @ 11.98 hrs, Volume= 7.222 af, Atten= 3%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.4 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 3.1 fps, Avg. Travel Time= 1.6 min

Peak Depth= 1.90' @ 11.97 hrs
Capacity at bank full= 296.41 cfs
72.0" Diameter Pipe, n= 0.013
Length= 296.0' Slope= 0.0049 '/'

Reach 7CR: Rimia Parking Lot Culvert



Reach 7DR: Runoff Drainage Channel south of Rimia

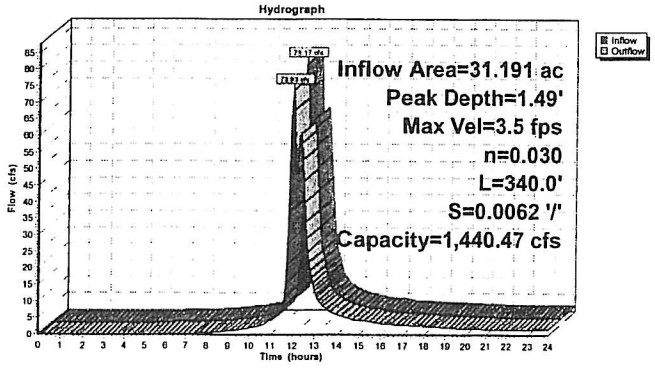
[65] Warning: Inlet elevation not specified

Inflow Area = 31.191 ac, Inflow Depth > 3.10"
Inflow = 78.17 cfs @ 11.95 hrs, Volume= 8.067 af
Outflow = 73.93 cfs @ 12.00 hrs, Volume= 8.054 af, Atten= 5%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.5 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 4.1 min

Peak Depth= 1.49' @ 11.98 hrs
Capacity at bank full= 1,440.47 cfs
4.00' x 5.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 10.0 '/' Top Width= 74.00'
Length= 340.0' Slope= 0.0062 '/'

Reach 7DR: Runoff Drainage Channel south of Rimia



Reach 8AR: west channel

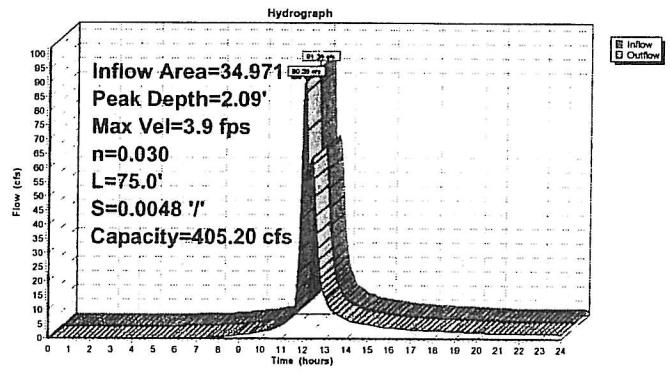
[65] Warning: Inlet elevation not specified

Inflow Area = 34.971 ac, Inflow Depth > 3.13"
Inflow = 91.38 cfs @ 12.01 hrs, Volume= 9.118 af
Outflow = 90.36 cfs @ 12.02 hrs, Volume= 9.114 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.9 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 0.9 min

Peak Depth= 2.09' @ 12.01 hrs
Capacity at bank full= 405.20 cfs
4.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 4.2 2.6 '/' Top Width= 31.20'
Length= 75.0' Slope= 0.0048 '/'

Reach 8AR: west channel



Reach 8BR: Culvert at Sed Basin 2 entrance

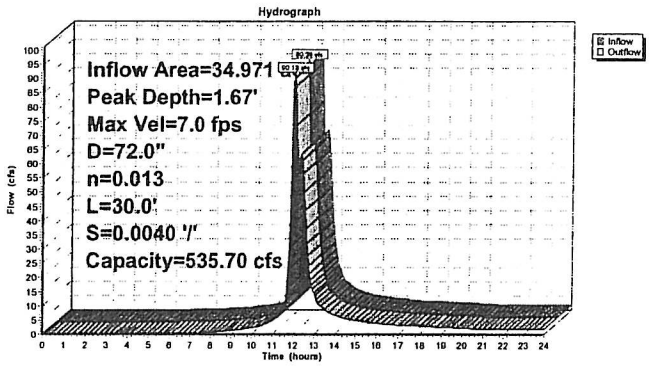
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 34.971 ac, Inflow Depth > 3.13"
Inflow = 90.36 cfs @ 12.02 hrs, Volume= 9.114 af
Outflow = 90.13 cfs @ 12.02 hrs, Volume= 9.114 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.0 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.5 fps, Avg. Travel Time= 0.2 min

Peak Depth= 1.67' @ 12.02 hrs
Capacity at bank full= 535.70 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.013
Length= 30.0' Slope= 0.0040 '/'

Reach 8BR: Culvert at Sed Basin 2 entrance



Reach 8CR: Channel into Sed Basin 2

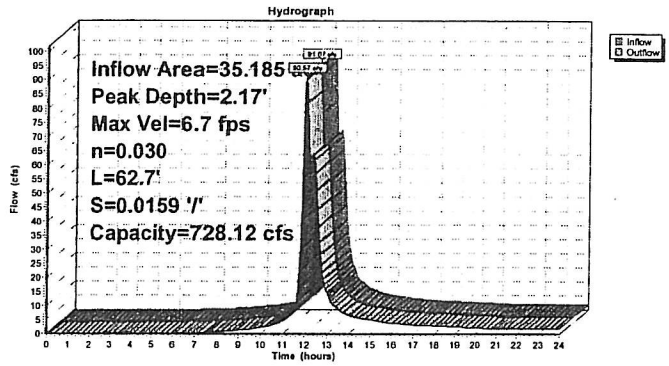
[65] Warning: Inlet elevation not specified

Inflow Area = 35.185 ac, Inflow Depth > 3.13"
Inflow = 91.07 cfs @ 12.02 hrs, Volume= 9.164 af
Outflow = 90.57 cfs @ 12.02 hrs, Volume= 9.162 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.7 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.7 fps, Avg. Travel Time= 0.4 min

Peak Depth= 2.17' @ 12.02 hrs
Capacity at bank full= 728.12 cfs
1.17' x 5.00' deep channel, n= 0.030
Side Slope Z-value= 2.4 2.3 '/' Top Width= 24.67'
Length= 62.7' Slope= 0.0159 '/'

Reach 8CR: Channel into Sed Basin 2



Reach 9AR: Extended Drainge Channel South of Cell 8

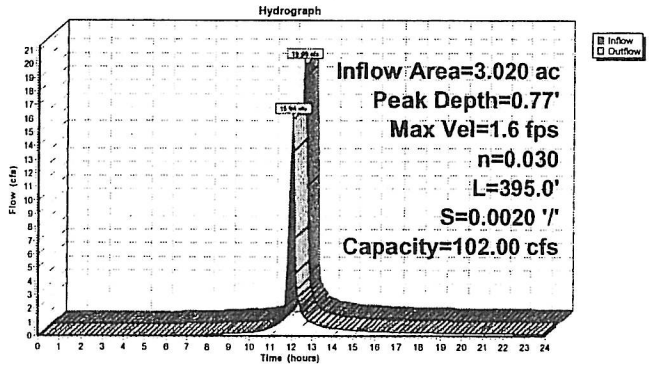
[65] Warning: Inlet elevation not specified

Inflow Area = 3.020 ac, Inflow Depth > 3.48"
Inflow = 19.05 cfs @ 11.93 hrs, Volume= 0.877 af
Outflow = 15.94 cfs @ 12.03 hrs, Volume= 0.872 af, Atten= 16%, Lag= 6.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.6 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 17.3 min

Peak Depth= 0.77' @ 11.96 hrs
Capacity at bank full= 102.00 cfs
10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 6.0 '/' Top Width= 28.00'
Length= 395.0' Slope= 0.0020 '/'

Reach 9AR: Extended Drainge Channel South of Cell 8



Reach 9BR: channel

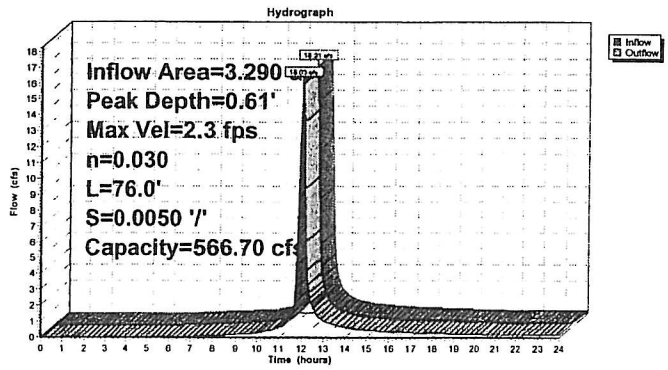
[65] Warning: Inlet elevation not specified

Inflow Area = 3.290 ac, Inflow Depth > 3.46"
Inflow = 16.31 cfs @ 12.03 hrs, Volume= 0.950 af
Outflow = 16.03 cfs @ 12.04 hrs, Volume= 0.949 af, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.3 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.6 fps, Avg. Travel Time= 2.3 min

Peak Depth= 0.61' @ 12.03 hrs
Capacity at bank full= 566.70 cfs
10.00' x 4.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 76.0' Slope= 0.0050 '/'

Reach 9BR: channel



Reach 12R: Culvert from F Street Drainage Channel

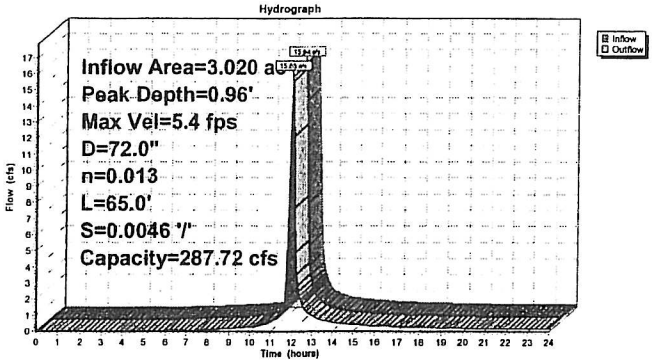
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 3.020 ac, Inflow Depth > 3.46"
Inflow = 15.94 cfs @ 12.03 hrs, Volume= 0.872 af
Outflow = 15.83 cfs @ 12.03 hrs, Volume= 0.871 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.4 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 0.7 min

Peak Depth= 0.96' @ 12.03 hrs
Capacity at bank full= 287.72 cfs
72.0" Diameter Pipe, n= 0.013
Length= 65.0' Slope= 0.0046 '/'

Reach 12R: Culvert from F Street Drainage Channel



Reach 13: culvert

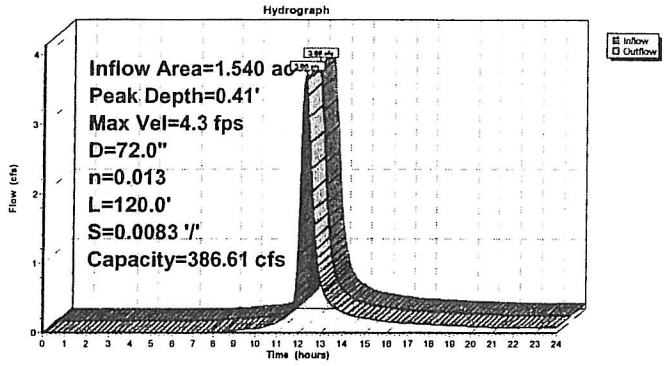
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 1.540 ac, Inflow Depth > 2.79"
Inflow = 3.69 cfs @ 12.25 hrs, Volume= 0.358 af
Outflow = 3.68 cfs @ 12.26 hrs, Volume= 0.358 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.3 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.7 fps, Avg. Travel Time= 1.2 min

Peak Depth= 0.41' @ 12.26 hrs
Capacity at bank full= 386.61 cfs
72.0" Diameter Pipe, n= 0.013
Length= 120.0' Slope= 0.0083 '/'

Reach 13: culvert



Reach 14: Culvert from North Entrance Road channel

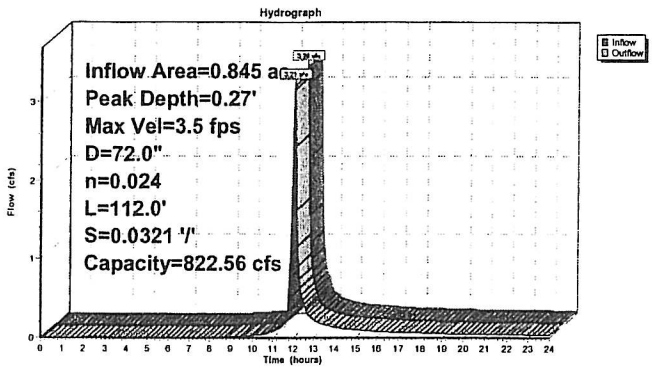
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 0.845 ac, Inflow Depth > 2.53"
Inflow = 3.29 cfs @ 12.01 hrs, Volume= 0.178 af
Outflow = 3.21 cfs @ 12.03 hrs, Volume= 0.178 af, Atten= 2%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.5 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 1.3 min

Peak Depth= 0.27' @ 12.02 hrs
Capacity at bank full= 822.56 cfs
A factor of 2.00 has been applied to the supplied storage and discharge data
72.0" Diameter Pipe, n= 0.024
Length= 112.0' Slope= 0.0321 '/'

Reach 14: Culvert from North Entrance Road channel



Reach 15N: Culvert adjacent to North Entrance Road

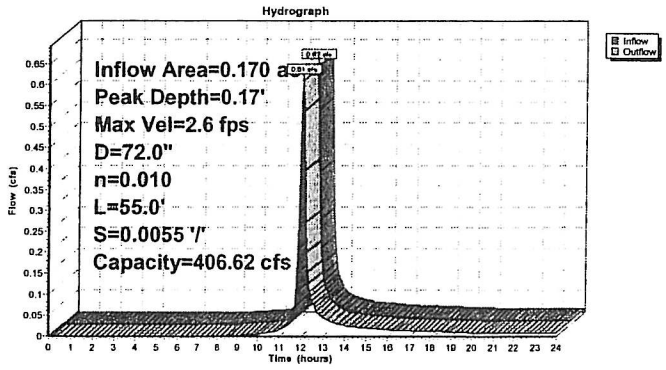
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow Area = 0.170 ac, Inflow Depth > 2.54"
Inflow = 0.62 cfs @ 12.04 hrs, Volume= 0.036 af
Outflow = 0.61 cfs @ 12.05 hrs, Volume= 0.036 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.6 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 0.7 min

Peak Depth= 0.17' @ 12.04 hrs
Capacity at bank full= 406.62 cfs
72.0" Diameter Pipe, n= 0.010
Length= 55.0' Slope= 0.0055 '/'

Reach 15N: Culvert adjacent to North Entrance Road



Reach 16N: Channel east of North Entrance Road

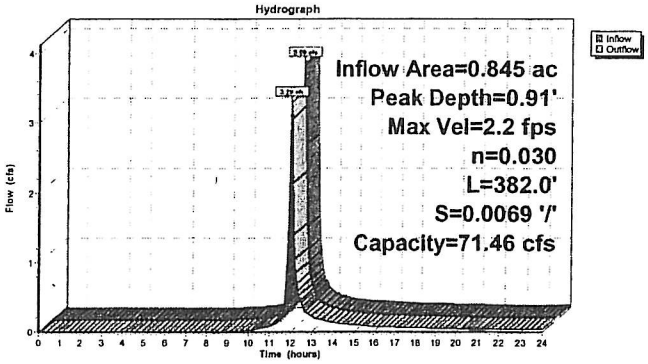
[65] Warning: Inlet elevation not specified

Inflow Area = 0.845 ac, Inflow Depth > 2.54"
Inflow = 3.69 cfs @ 11.94 hrs, Volume= 0.179 af
Outflow = 3.29 cfs @ 12.01 hrs, Volume= 0.178 af, Atten= 11%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.2 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.8 fps, Avg. Travel Time= 7.6 min

Peak Depth= 0.91' @ 11.97 hrs
Capacity at bank full= 71.46 cfs
0.00' x 2.88' deep channel, n= 0.030
Side Slope Z-value= 2.2 1.4 '/' Top Width= 10.37'
Length= 382.0' Slope= 0.0069 '/'

Reach 16N: Channel east of North Entrance Road



Pond 1P: Sedimentation Basin 2

Inflow Area = 40.865 ac, Inflow Depth > 3.17"
Inflow = 101.95 cfs @ 12.02 hrs, Volume= 10.780 af
Outflow = 3.50 cfs @ 17.65 hrs, Volume= 1.922 af, Atten= 97%, Lag= 338.3 min
Primary = 3.50 cfs @ 17.65 hrs, Volume= 1.922 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 575.69' @ 17.65 hrs Surf.Area= 1.993 ac Storage= 8.969 af
Plug-Flow detention time= 528.1 min calculated for 1.922 af (18% of inflow)
Center-of-Mass det. time= 357.5 min (1,171.4 - 813.8)

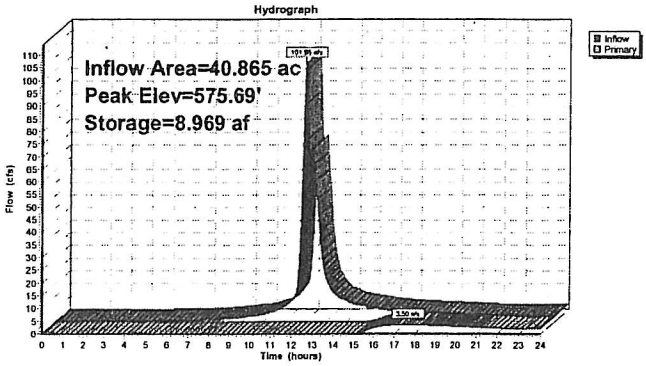
Volume	Invert	Avail.Storage	Storage Description
#1	570.50'	11.667 af	**Custom Stage Data (Conic)** Listed below

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
570.50	1.460	0.000	0.000	1.460
571.00	1.512	0.743	0.743	1.513
572.00	1.614	1.563	2.306	1.617
573.00	1.713	1.663	3.969	1.719
574.00	1.819	1.766	5.735	1.827
575.00	1.917	1.868	7.602	1.928
576.00	2.026	1.971	9.574	2.039
577.00	2.162	2.094	11.667	2.177

Device	Routing	Invert	Outlet Devices
#1	Device 2	575.50'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#2	Primary	570.78'	**36.0" x 680.0' long Culvert** Ke= 0.700 Outlet Invert= 563.30' S= 0.0110 '/' Cc= 0.900 n= 0.024
#3	Primary	576.00'	**20.0' long Broad-Crested Rectangular Weir** Head (feet) 0.50 1.00 1.50 2.00 2.50 3.00 4.00 5.00 Coef. (English) 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00

Primary OutFlow Max=3.49 cfs @ 17.65 hrs HW=575.69' (Free Discharge)
└─**2=Culvert** (Passes 3.49 cfs of 40.39 cfs potential flow)
  └─**1=Orifice/Grate** (Weir Controls 3.49 cfs @ 1.4 fps)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Sedimentation Basin 2



ATTACHMENT C-2

WEIGHTED CURVE NUMBER CALCULATIONS

RESULTS FOR THE CALCULATION OF WEIGHTED CN
West OSDF Construction Design Scenario

Subcatchment Label	Area (acres)	Percent of Total Area %	HSG	Land Use Description	CN	Weighted CN
A	2.73	100%	B/C	vegetated final cover	83	83
B	5.34	100%	B/C	vegetated final cover	83	83
C	5.40	100%	B/C	vegetated final cover	83	83
D	5.53	100%	B/C	vegetated final cover	83	83
ER	5.32	100%	B/C	unvegetated final cover	89	89
F1R	0.92	100%	B/C	unvegetated final cover	89	89
F2R	2.73	100%	B/C	unvegetated final cover	89	89
FR	2.91	100%	B/C	unvegetated final cover	89	89
GR	0.27	100%	B/C	unvegetated final cover	89	89
HR	0.14	100%	B/C	unvegetated final cover	89	89
J1R	0.31	100%	C	construction laydown	82	82
KR	3.02	100%	C	unvegetated final cover	89	89
LR	1.54	100%	C	construction laydown	82	82
MR	0.68	100%	C	runon north of borrow area	79	79
N	1.04	100%	C	construction laydown	82	82
O	2.25	100%	N/A	direct runon to pond	98	98
P1R	0.49	100%	C	construction laydown	82	82
P2R	0.21	100%	C	construction laydown	82	82
QN	0.17	100%	C	runon north of borrow area	79	79

SUBCATCHMENT AREA AND HYDROCAD™ INPUT PARAMETERS FOR THE CALCULATION OF WEIGHTED CN

East OSDF Construction Design Scenario

Subcatchment Label	Area (acres)	Percent of Total Area %	HSG	Land Use Description	CN	Weighted CN
A	1.96	100%	B/C	vegetated final cover	83	83
B	1.18	100%	B/C	vegetated final cover	83	83
C	5.21	100%	B/C	vegetated final cover	83	83
D	5.13	100%	B/C	vegetated final cover	83	83
E	5.09	100%	B/C	vegetated final cover	83	83
F	5.05	100%	B/C	vegetated final cover	83	83
G	5.31	100%	B/C	vegetated final cover	83	83
HR	4.59	100%	B/C	unvegetated final cover	89	89
IR	0.81	100%	B/C	unvegetated final cover	89	89
JR	2.20	100%	B/C	unvegetated final cover	89	89
L	1.68	30% 70%	B C	runon north of borrow area runon north of borrow area	69 79	76
M	1.00	100%	C	runon north of borrow area	79	79
N	7.82	100%	N/A	direct runon to pond	98	98
O	1.32	100%	C	runon north of borrow area	79	79
P	5.24	45% 55%	B C	runon north of borrow area runon north of borrow area	69 79	75
Q	7.70	70% 30%	B C	runon north of borrow area runon north of borrow area	69 79	72
R	2.61	55% 45%	B C	runon north of borrow area runon north of borrow area	69 79	74
S	0.40	10% 90%	B C	runon north of borrow area runon north of borrow area	69 79	78
U	4.15	70% 30%	B C	runon east of OSDF runon east of OSDF	69 79	72
V	0.27	100%	N/A	direct runon to pond	98	98
W	10.59	70% 30%	B C	runon east of OSDF runon east of OSDF	69 79	72
X	11.85	80% 20%	B C	runon east of OSDF runon east of OSDF	69 79	71
Y	6.52	60% 40%	B C	runon east of OSDF runon east of OSDF	69 79	73
Z	1.61	70% 30%	B C	runon east of OSDF runon east of OSDF	69 79	72
AA	2.71	55% 45%	B C	runon east of OSDF runon east of OSDF	69 79	74
BB	0.76	100%	C	runon east of OSDF	79	79
CC	0.12	100%	C	runon east of OSDF	79	79
DDR	0.73	100%	B/C	unvegetated final cover	89	89
EE	0.93	20% 80%	B C	runon north of borrow area runon north of borrow area	69 79	77
FFR	5.51	100%	B/C	unvegetated final cover	89	89
GGR	1.55	55% 45%	B C	construction laydown construction laydown	74 82	78
HH	0.55	100%	C	runon north of borrow area	79	79
II	1.67	50% 50%	B C	runon area to borrow area runon area to borrow area	61 74	68
JJ	0.91	93% 7%	B C	runon area to borrow area runon area to borrow area	61 74	62
KK	5.89	80% 20%	B C	runon area to borrow area runon area to borrow area	61 74	64
LL	7.05	100%	B	runoff	61	61
MM	1.94	100%	B	runoff	61	61
NN	1.27	60% 40%	B C	runoff runoff	61 74	66
OO	0.40	65% 35%	B C	runon area to borrow area runon area to borrow area	61 74	66
PP	40.96	80% 20%	B C	vegetated borrow area vegetated borrow area	61 74	64

N/A - Not Applicable

ATTACHMENT C-3

TABULATED ANALYSIS RESULTS FOR CHANNELS

OSDF CONSTRUCTION/FILLING PERIOD CONDITIONS
SUMMARY OF CHANNEL ANALYSIS RESULTS

Channel Identification			Channel Characteristics							Hydrologic Calculations		Hydraulic Calculations							
Channel Name[1]	Status	Design Scenario	Section Shape	Minimum Channel Depth (ft)	Longitudinal Slope[2] (%)	Manning n	Bottom Width B (ft)	Side Slope M_1:1	Side Slope M_2:1	HydroCAD Node	HydroCAD Q[4] (cfs)	Area of Flow A (sq ft)	Perimeter P (ft)	Hydraulic Radius, R (ft)	Peak Flow Depth[5] Y (ft)	Estimated Q[5] (cfs)	Channel Freeboard[7] (ft)	Peak Flow Velocity (fps)	Lining Type[6]
7R	new	E OSDF	vee	4.0	0.50%	0.030	0	3	6	8R	77.19	21.39	20.15	1.06	2.18	78.14	1.8	3.65	grass
8R	new	E OSDF	vee	4.5	0.71%	0.030	0	3	4	9R	77.10	17.56	16.32	1.08	2.24	77.18	2.3	4.39	grass
9R	new	E OSDF	trapezoidal	5.5	0.83%	0.030	6	3	4	10AR	77.12	17.04	17.00	1.00	1.51	77.22	4.0	4.53	grass
10AR	new	E OSDF	trapezoidal	6.5	0.50%	0.030	10	6	3	11	78.55	22.59	22.85	0.99	1.39	78.76	5.1	3.49	grass
12R	existing	E OSDF	trapezoidal	2.5	0.63%	0.030	14	3	4.3	12R + HH	80.36	21.38	22.87	0.93	1.17	80.57	1.3	3.77	grass
13R	existing	E OSDF	trapezoidal	2.1	0.67%	0.030	23.11	2.3	4	13R	143.58	33.81	31.40	1.08	1.25	144.40	0.8	4.27	grass
18	new	E OSDF	vee	3.0	1.00%	0.030	0	3	3	19	38.43	8.77	10.81	0.81	1.71	37.89	1.3	4.32	grass
19	new	E OSDF	vee	3.0	0.90%	0.030	0	3	3	20	43.35	10.05	11.57	0.87	1.83	43.07	1.2	4.29	grass
20	new	E OSDF	vee	3.0	0.83%	0.030	0	3	3	1P - U - V	40.72	9.94	11.51	0.86	1.82	40.77	1.2	4.10	grass
30	new	E OSDF	vee	2.5	1.00%	0.030	0	3	3	30	45.98	10.05	11.57	0.87	1.83	45.40	0.7	4.52	grass
21	new	E OSDF	vee	3.0	1.00%	0.030	0	3	3	22	46.33	10.27	11.70	0.88	1.85	46.74	1.2	4.55	grass
22	new	E OSDF	vee	4.0	1.00%	0.030	0	3	3	29	47.10	10.27	11.70	0.88	1.85	46.74	2.2	4.55	grass
29	new	E OSDF	vee	3.5	1.00%	0.030	0	3	3	23	48.76	10.49	11.83	0.89	1.87	48.10	1.6	4.58	grass
24	new	E OSDF	trapezoidal	2.0	0.75%	0.030	8.5	3	3	24	57.15	14.21	15.96	0.89	1.18	56.54	0.8	3.98	grass
26	new	E OSDF	vee	2.5	0.75%	0.030	0	3	3	27	65.00	14.52	13.91	1.04	2.20	64.26	0.3	4.43	grass
7BR	new	W OSDF	vee	3.8	0.23%	0.030	0	6	2	7BR	57.98	22.47	19.72	1.14	2.37	58.39	1.4	2.60	grass
7DR	existing	W OSDF	trapezoidal	5.0	0.62%	0.030	4	4	10	7DR	78.17	22.00	25.40	0.87	1.51	78.17	3.5	3.55	grass
8AR	existing	W OSDF	trapezoidal	4.0	0.48%	0.030	4	4.2	2.6	8AR	91.38	23.21	18.85	1.23	2.09	91.78	1.9	3.95	grass
8CR	existing	W OSDF	trapezoidal	5.0	1.59%	0.030	1.17	2.4	2.3	8CR	91.07	13.60	12.25	1.11	2.17	91.36	2.8	6.72	rip rap
9AR	new	W OSDF	trapezoidal	2.0	0.20%	0.030	10	3	6	9AR	19.05	11.58	17.77	0.65	0.84	19.32	1.2	1.67	grass
9BR	new	W OSDF	trapezoidal	4.0	0.50%	0.030	10	3	3	9BR	16.31	7.22	13.86	0.52	0.61	16.40	3.4	2.27	grass
16N	existing	W OSDF	vee	2.9	0.69%	0.030	0	2.2	1.4	16N	3.69	1.62	3.93	0.41	0.95	3.72	1.9	2.29	grass
2	existing	DC A	vee	3.0	1.50%	0.030	0	4	6	1 + G	8.82	2.81	7.63	0.37	0.75	8.77	2.3	3.12	grass
5	new	DC A	vee	2.5	0.34%	0.030	0	3	3	5	12.05	5.63	8.66	0.65	1.37	12.16	1.1	2.16	grass
6	new	DC A	vee	2.5	0.23%	0.030	0	3	3	6 + D	12.43	6.66	9.42	0.71	1.49	12.53	1.0	1.88	grass
7	existing	DC A	vee	2.0	2.00%	0.030	0	4	6	7 + E	21.87	5.10	10.36	0.49	1.01	22.41	1.0	4.39	grass
1	existing	DC B	vee	6.5	0.45%	0.030	0	5	3	1	45.68	14.44	15.70	0.92	1.90	45.51	4.6	3.15	grass
2	new	DC B	vee	7.4	0.50%	0.030	0	3	4	2	66.65	17.88	16.46	1.09	2.26	66.32	5.1	3.71	grass
3	new	DC B	vee	6.5	0.50%	0.030	0	3	4	3	64.14	17.56	16.32	1.08	2.24	64.77	4.3	3.69	grass
4	new	DC B	vee	3	0.50%	0.030	0	3	6	4	62.72	18.00	18.49	0.97	2.00	62.09	1.0	3.45	grass
5	new	DC B	vee	3	0.50%	0.030	0	3	6	5	62.18	18.00	18.49	0.97	2.00	62.09	1.0	3.45	grass
6A	new	DC B	trapezoidal	2.75	0.50%	0.030	5.73	3.2	6	6A	64.11	18.95	19.88	0.95	1.50	64.42	1.3	3.40	grass
6B	new	DC B	trapezoidal	2	0.50%	0.030	7.1	3.2	3.5	6B	65.36	18.19	17.59	1.03	1.50	65.32	0.5	3.59	grass
8	new	DC B	trapezoidal	1.28	1.00%	0.030	2	3	5	8	13.70	4.33	8.77	0.49	0.82	13.42	0.5	3.10	grass
9	new	DC B	vee	2.5	1.50%	0.030	0	3	3	9	13.96	3.50	6.83	0.51	1.08	13.62	1.4	3.89	grass
11	existing	DC B	vee	5	0.45%	0.030	0	6	4	11	20.89	8.45	13.27	0.64	1.30	20.84	3.7	2.47	grass
1	new	DC C	vee	4	0.75%	0.030	0	2	6	2	25.75	7.73	11.56	0.67	1.39	25.41	2.6	3.29	grass
2	new	DC C	vee	4	0.75%	0.030	0	2	6	3	41.23	11.16	13.89	0.80	1.67	41.45	2.3	3.72	grass
3	new	DC C	vee	4	0.75%	0.030	0	2	6	4	46.28	12.25	14.56	0.84	1.75	46.96	2.3	3.83	grass
4	new	DC C	vee	4	0.76%	0.030	0	2	6	5	45.14	11.70	14.23	0.82	1.71	44.45	2.3	3.80	grass

E OSDF = East OSDF Construction-Phase Design Scenario
W OSDF = West OSDF Construction-Phase Design Scenario
DC A = Design Case "A"
DC B = Design Case "B"

Notes:
1. Channels are named after the corresponding subcatchment or reach.
2. Longitudinal slopes taken from the Drawings.
4. Peak inflow rates calculated by HydroCAD for each reach. See attachment C-1.
5. Calculated flow rates using an iterative procedure and compared with flow from HydroCAD.
6. Maximum permissible velocity for grass lined channels is 5 fps.
7. Calculated as the difference between minimum available flow depth and peak flow depth.

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ATTACHMENT C-4A

CulvertMaster® OUTPUT REPORTS FOR CULVERTS

Culvert Designer/Analyzer Report
west node 7CR design

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elev	578.25	ft	Discharge	65.26	cfs
Headwater Depth/Height	1.16		Tailwater Elevation	575.01	ft
Inlet Control HW Elev.	578.22	ft	Control Type	Entrance Control	
Outlet Control HW Elev.	578.25	ft			

Grades					
Upstream Invert	574.96	ft	Downstream Invert	573.50	ft
Length	296.00	ft	Constructed Slope	0.004932	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.95	ft
Slope Type	Steep		Normal Depth	1.95	ft
Flow Regime	Supercritical		Critical Depth	2.07	ft
Velocity Downstream	8.61	ft/s	Critical Slope	0.004275	ft/ft

Section					
Section Shape	Horizontal Ellipse		Mannings Coefficient	0.013	
Section Material	Concrete		Span	4.44	ft
Section Size	34x53 inch		Rise	2.83	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	578.25	ft	Upstream Velocity Head	1.02	ft
Ke	0.20		Entrance Loss	0.20	ft

Inlet Control Properties					
Inlet Control HW Elev.	578.22	ft	Flow Control	Transition	
Inlet Type	Groove end with headwall (horizontal ellipse)		Area Full	10.2	ft²
K	0.00180		HDS 5 Chart	29	
M	2.50000		HDS 5 Scale	2	
C	0.02920		Equation Form	1	
Y	0.74000				

Culvert Designer/Analyzer Report
west node 8BR

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elev	575.56	ft	Discharge	90.36	cfs
Headwater Depth/Height	1.15		Tailwater Elevation	574.17	ft
Inlet Control HW Elev.	575.47	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	575.56	ft			

Grades					
Upstream Invert	572.12	ft	Downstream Invert	572.00	ft
Length	30.00	ft	Constructed Slope	0.004000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	2.19	ft
Slope Type	Mild		Normal Depth	2.74	ft
Flow Regime	Subcritical		Critical Depth	2.19	ft
Velocity Downstream	8.17	ft/s	Critical Slope	0.005887	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	575.56	ft	Upstream Velocity Head	0.87	ft
Ke	0.20		Entrance Loss	0.17	ft

Inlet Control Properties					
Inlet Control HW Elev.	575.47	ft	Flow Control	Transition	
Inlet Type	Groove end w/headwall		Area Full	14.1	ft^2
K	0.00180		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	2	
C	0.02920		Equation Form	1	
Y	0.74000				

Culvert Designer/Analyzer Report
west node 13

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elev	580.08	ft	Discharge	3.69	cfs
Headwater Depth/Height	0.72		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	580.03	ft	Control Type	Entrance Control	
Outlet Control HW Elev.	580.08	ft			

Grades					
Upstream Invert	579.00	ft	Downstream Invert	578.00	ft
Length	120.00	ft	Constructed Slope	0.008300	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.65	ft
Slope Type	Steep		Normal Depth	0.65	ft
Flow Regime	Supercritical		Critical Depth	0.73	ft
Velocity Downstream	5.06	ft/s	Critical Slope	0.005321	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	580.08	ft	Upstream Velocity Head	0.29	ft
Ke	0.20		Entrance Loss	0.06	ft

Inlet Control Properties					
Inlet Control HW Elev.	580.03	ft	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	1.8	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
west node 14 design

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	581.90	ft	Storm Event	Design	
Computed Headwater Elev	579.27	ft	Discharge	3.29	cfs
Headwater Depth/Height	0.26		Tailwater Elevation	0.00	ft
Inlet Control HW Elev.	579.11	ft	Control Type	Entrance Control	
Outlet Control HW Elev.	579.27	ft			

Grades					
Upstream Invert	578.60	ft	Downstream Invert	575.00	ft
Length	112.00	ft	Constructed Slope	0.032143	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.32	ft
Slope Type	Steep		Normal Depth	0.32	ft
Flow Regime	Supercritical		Critical Depth	0.40	ft
Velocity Downstream	4.08	ft/s	Critical Slope	0.013346	ft/ft

Section					
Section Shape	Arch		Mannings Coefficient	0.024	
Section Material	MCR 3x1 Corrugations Historic		Span	4.17	ft
Section Size	50 x 31 inch		Rise	2.58	ft
Number Sections	1				

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Outlet Control Properties					
Outlet Control HW Elev.	579.27	ft	Upstream Velocity Head	0.15	ft
Ke	0.90		Entrance Loss	0.13	ft

Inlet Control Properties					
Inlet Control HW Elev.	579.11	ft	Flow Control	Unsubmerged	
Inlet Type	CR structural plate, projecting		Area Full	8.4	ft²
K	0.03000		HDS 5 Chart	35	
M	1.50000		HDS 5 Scale	1	
C	0.04960		Equation Form	1	
Y	0.57000				

Culvert Designer/Analyzer Report
west node 15N design

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elev	584.56	ft	Discharge	0.62	cfs
Headwater Depth/Height	0.44		Tailwater Elevation	584.55	ft
Inlet Control HW Elev.	584.55	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	584.56	ft			

Grades					
Upstream Invert	583.90	ft	Downstream Invert	583.60	ft
Length	55.00	ft	Constructed Slope	0.005455	ft/ft

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.95	ft
Slope Type	Steep		Normal Depth	0.25	ft
Flow Regime	Subcritical		Critical Depth	0.29	ft
Velocity Downstream	0.53	ft/s	Critical Slope	0.002996	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.010	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	584.56	ft	Upstream Velocity Head	0.01	ft
Ke	0.20		Entrance Loss	0.00	ft

Inlet Control Properties					
Inlet Control HW Elev.	584.55	ft	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	1.8	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
west node 12 design

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elev	580.03	ft	Discharge	15.94	cfs
Headwater Depth/Height	1.13		Tailwater Elevation	578.08	ft
Inlet Control HW Elev.	579.99	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	580.03	ft			

Grades					
Upstream Invert	577.77	ft	Downstream Invert	577.47	ft
Length	63.76	ft	Constructed Slope	0.004768	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.44	ft
Slope Type	Mild		Normal Depth	1.68	ft
Flow Regime	Subcritical		Critical Depth	1.44	ft
Velocity Downstream	6.58	ft/s	Critical Slope	0.006595	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	580.03	ft	Upstream Velocity Head	0.53	ft
Ke	0.20		Entrance Loss	0.11	ft

Inlet Control Properties					
Inlet Control HW Elev.	579.99	ft	Flow Control	Transition	
Inlet Type	Groove end projecting		Area Full	3.1	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
east node 11

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elev	586.60	ft	Discharge	78.55	cfs
Headwater Depth/Height	1.30		Tailwater Elevation	584.73	ft
Inlet Control HW Elev.	586.60	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	586.60	ft			

Grades					
Upstream Invert	583.67	ft	Downstream Invert	583.58	ft
Length	40.00	ft	Constructed Slope	0.002355	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.79	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.79	ft
Velocity Downstream	7.74	ft/s	Critical Slope	0.004495	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.010	
Section Material	HDPE (Smooth Interior)		Span	2.25	ft
Section Size	27 inch		Rise	2.25	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	586.60	ft	Upstream Velocity Head	0.75	ft
Ke	0.20		Entrance Loss	0.15	ft

Inlet Control Properties					
Inlet Control HW Elev.	586.60	ft	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	11.9	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

ATTACHMENT C-4B

TABULATED ANALYSIS RESULTS FOR CULVERTS

OSDF CONSTRUCTION/FILLING PERIOD CONDITIONS
SUMMARY OF CULVERT ANALYSES RESULTS

CULVERT IDENTIFICATION			PHYSICAL CHARACTERISTICS OF CULVERT						CULVERT PROFILE				CULVERTMASTER[4] MODELING CHARACTERISTICS			HYDRAULIC CAPACITY					STRUCTURAL CAPACITY [6]				OUTLET PROTECTION [6]				
Culvert Name	Status [1]	Design Scenario	Material - Type	Entrance Loss Coefficient (Ke)	Manning's n	Entrance Configuration [2]	Number of Culverts - Diameter	Approximate Length (ft)	Inlet Invert Elevation (ft MSL)	Outlet Invert Elevation (ft MSL)	Slope ft/ft	Overtapping Elevation (ft MSL)	Entrance Configuration[3]	Entrance Loss Coefficient (Ke)	Number of Culverts - Diameter [5]	HydroCad Node / Peak Flow Rate (cfs)	Tailwater Elevation (ft MSL)	Calculated Headwater Depth - Inlet Control [4] (ft MSL)	Calculated Headwater Depth Outlet Control [4] (ft MSL)	Calculated Freeboard (ft)	Available Cover (ft)	Design Traffic Type	Minimum Required Cover (ft)	Structurally Stable	Outlet Velocity (ft/s)	Riprap Length at Inlet (ft)	Riprap Length at Outlet (ft)	d_{50} (in)	Thickness (in)
11a	existing	E OSDF	HDPE	0.2	0.010	Projecting	2 - 27 inch	40	583.67	583.58	0.0023	587.20	Groove - Projecting	0.2	3 - 27 inch	11R / 78.55	584.73	586.60	586.60	0.6	-	-	-	-	7.7	-	-	-	-
11b	existing	E OSDF	RCP	0.2	0.013	Projecting	1 - 30 inch	40																					
23	new	E OSDF	Helical CMP	0.9	0.018	Projecting	2 - 36 inch	92	586.32	585.78	0.0059	590.00	Projecting	0.9	2 - 36 inch	23 / 48.76	587.01	588.83	589.02	1.0	2.04	On Highway	2	yes	6.4	6	12	6	12
25	new	E OSDF	Helical CMP - Arch	0.9	0.016	Projecting	2 - 42 x 29 inch	53	584.85	584.53	0.0060	588.50	Thin Wall Projecting	0.9	2 - 42 x 29 inch	25 / 64.24	586.73	578.53	587.71	0.8	3.23	On Highway	2	yes	4.9	0	0	0	0
27	new	E OSDF	Helical CMP - Arch	0.9	0.018	Projecting	2 - 42 x 29 inch	106	582.80	582.36	0.0042	587.00	Thin Wall Projecting	0.9	2 - 42 x 29 inch	27 / 65.00	583.88	585.50	585.63	1.4	3.78	Off-Highway	3	yes	6.8	7	14	6	12
28R	new - temporary	E OSDF	Helical CMP - Arch	0.9	0.019	Projecting	2 - 49 x 33 inch	140	585.75	585.00	0.0054	592.39	Thin Wall Projecting	0.9	2 - 49 x 33 inch	28R / 77.45	586.01	587.87	588.02	4.4	3.89	Off-Highway	3	yes	6.9	8	16	6	12
31	existing	E OSDF	HDPE	0.9	0.012	Projecting	1 - 27 inch	80	584.00	583.00	0.0125	588.50	Groove - Projecting	0.9	1 - 27 inch	31 / 6.54	584.51	585.20	585.49	3.0	-	-	-	-	2.3	-	-	-	-
5	new - temporary	W OSDF	Helical CMP	0.9	0.024	Projecting	1 - 42 inch	95	560.68	579.98	0.0737	585.34	Projecting	0.9	1 - 42 inch	5 / 55.45	582.50	584.67	584.89	0.5	27.64	Off-Highway	3	yes	7.48	7	14	6	12
7AR	new	W OSDF	CMP	0.9	0.024	Projecting	1 - 42 inch	82	577.67	577.21	0.0053	582.57	Projecting	0.9	1 - 42 inch	7AR / 57.96	579.58	581.8	582.10	0.5	4.83	Off-Highway	3	yes	8.30	6	12	6	12
7CR	existing	W OSDF	RCP - Horizontal Ellipse	0.2	0.013	Concrete Headwall	1 - 34 x 53 inch	296	574.96	573.50	0.00493	580.00	Groove - Headwall	0.2	1 - 34 x 53 inch	7CR / 65.26	575.01	578.22	578.25	1.8	-	-	-	-	8.61	-	-	-	-
8BR	existing	W OSDF	RCP	0.2	0.013	Concrete Headwall	2 - 36 inch	30	572.12	572.00	0.00400	577.00	Groove - Headwall	0.2	2 - 36 inch	8BR / 90.36	574.17	575.47	575.56	1.4	-	-	-	-	8.17	-	-	-	-
12R	new	W OSDF	RCP	0.2	0.013	Projecting	1 - 24 inch	64	577.77	577.47	0.0047	580.50	Groove -Projecting	0.2	1 - 24 inch	12R / 15.94	578.08	579.99	580.03	0.5	4.21	On-Highway	2	yes	6.58	5	10	6	12
13	new	W OSDF	RCP	0.2	0.013	Projecting	1 - 18 inch	120	579.00	578.00	0.0083	582.33	Groove - Projecting	0.2	1 - 18 inch	13 / 3.69	N/A	580.03	580.08	2.3	2.33	On-Highway	2	yes	5.06	3	6	6	12
14	existing	W OSDF	CMP	0.9	0.024	Projecting	1 - 50 x 31 inch	112	578.60	575.00	0.0321	581.90	Projecting	0.9	1 - 50 x 31 inch	14 / 3.29	N/A	579.11	579.27	2.6	-	-	-	-	4.08	-	-	-	-
15N	existing	W OSDF	HDPE	0.2	0.010	Projecting	1 - 18 inch	55	583.90	583.60	0.0055	585.05	Groove - Projecting	0.2	1 - 18 inch	15N / 0.62	584.55	584.55	584.56	0.5	-	-	-	-	0.53	-	-	-	-
1	existing - temporary	DC A	CMPA - Arch	0.5	0.018	Flared End Section	1 - 13 x 17 inch	80	587.35	586.37	0.0123	590.00	Headwall	0.5	1 - 11 x 18 inch	1 / 2.02	586.80	587.97	588.03	2.0	-	-	-	-	3.3	-	-	-	-
3	existing - temporary	DC A	PVC	0.2	0.010	Concrete Headwall	2 - 18 inch	55	581.60	581.30	0.0055	585.50	Groove Headwall	0.2	2 - 18 inch	3 / 8.41	582.27	582.70	582.76	2.7	-	-	-	-	3.5	-	-	-	-
4	existing - temporary	DC A	PVC	0.2	0.010	Concrete Headwall	2 - 18 inch	60	582.70	581.50	0.0200	587.00	Groove Headwall	0.2	2 - 18 inch	4 / 1.00	582.94	583.4	583.45	3.5	-	-	-	-	1.1	-	-	-	-
8	new - temporary	DC A	Helical CMP	0.9	0.017	Projecting	2 - 30 inch	49	579.33	578.84	0.0100	582.50	Projecting	0.9	2 - 30 inch	8 / 24.73	579.84	581.13	581.38	1.1	2.32	On-Highway	2	yes	6.0	5	10	6	12
7	new - temporary	DC B	Helical CMP - Arch	0.9	0.019	Projecting	2 - 49 x 33 inch	92	586.95	586.53	0.0046	593.5	Thin Wall Projecting	0.9	2 - 49 x 33 inch	7 / 64.43	587.98	589.27	589.44	4.1	3.8	Off-Highway	3	yes	6.1	8	16	6	12
5	new - temporary	DC C	Helical CMP	0.9	0.018	Projecting	1 - 42 inch	95	580.68	579.98	0.0074	591.82	Projecting	0.9	1 - 42 inch	5 / 45.14	581.71	584.11	584.36	7.5	7.64	Off-Highway	3	yes	7.51	7	14	6	12

- E OSDF = East OSDF Construction-Phase Design Scenario
- W OSDF = West OSDF Construction-Phase Design Scenario
- DC A = Design Case "A"
- N/A = Not Applicable
- d_{50} = Average particle diameter

Notes
(1) New indicates a new culvert to be installed.
(2) Entrance configuration assumed.
(3) Dimensions and entrance configurations used in the Culvertmaster software package were selected to match existing culvert characteristics as closely as possible.
(4) Headwater depths calculated using Culvertmaster software package. Summary output presented for each culvert in Attachment C-4A.
(5) Grading is provided in the Construction Drawings
(6) Neither structural capacity nor outlet protection are evaluated for existing culverts.