DETENTION CALCULATIONS

VIA CHRISTI – ST. JOESEPH WEST

AN ADDITION TO

WICHITA, SEDGWICK COUNTY, KANSAS

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MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID WICHITA.RNQ COW25100

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID
2-yr	3.6000	Synthetic Curve	SCSTYPES	TypeII 24hr
5-yr	4.5600	Synthetic Curve	SCSTYPES	TypeII 24hr
100-yr	7.6800	Synthetic Curve	SCSTYPES	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
BASIN		AREA	2	1.062		12.0500	15.23		
BASIN		AREA	5	1.464		12.0500	20.72		
BASIN		AREA	100	2.815		12.0500	38.45		
*OUTLET		JCT	2	1.060		12.3500	3.64		
*OUTLET		JCT	5	1.462		12.3000	5.79		
*OUTLET		JCT	100	2.814		12.3500	9.23		
POND	IN	POND	2	1.062		12.0500	15.23		
POND	IN	POND	5	1.464		12.0500	20.72		
POND	IN	POND	100	2.815		12.0500	38.45		
POND	OUT	POND	2	1.060		12.3500	3.64	1318.13	.487
POND	OUT	POND	5	1.462		12.3000	5.79	1318.51	.651
POND	OUT	POND	100	2.814		12.3500	9.23	1319.86	1.229

JOB TITLE NOT SPECIFIED
Click Project Summary on the File Menu to enter title

DESIGN STORMS SUMMARY

Design Storm File,ID = WICHITA.RNQ COW25100

Storm Tag Name = 2-yr

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 3.6000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 5-yr

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 5 yr
Total Rainfall Depth= 4.5600 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100-yr

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.6800 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.6000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\
HYG File - ID = - BASIN 2-yr
Tc = .2500 hrs
Drainage Area = 5.400 acres Runoff CN= 88

==========
Computational Time Increment = .03333 hrs
Computed Peak Time = 12.0333 hrs
Computed Peak Flow = 15.39 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 15.23 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 88
Area = 5.400 acres
S = 1.3636 in
0.2S = .2727 in

Cumulative Runoff

2.3600 in
1.062 ac-ft

HYG Volume... 1.062 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .25000 hrs (ID: None Selected)
Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 24.47 cfs
Unit peak time Tp = .16667 hrs
Unit receding limb, Tr = .66667 hrs
Total unit time, Tb = .83333 hrs

S/N: 121201A06A8A Baughman Company PA
PondPack Ver: 7.5 (767) Compute Time: 09:04:33 Date: 08-19-2004

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 24.0000 hrs Rain Depth = 4.5600 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\
HYG File - ID = - BASIN 5-yr
Tc = .2500 hrs
Drainage Area = 5.400 acres Runoff CN= 88

==========
Computational Time Increment = .03333 hrs
Computed Peak Time = 12.0333 hrs
Computed Peak Flow = 20.96 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 20.72 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 88
Area = 5.400 acres
S = 1.3636 in
0.2S = .2727 in

Cumulative Runoff

3.2527 in
1.464 ac-ft

HYG Volume... 1.464 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .25000 hrs (ID: None Selected)
Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 24.47 cfs
Unit peak time Tp = .16667 hrs
Unit receding limb, Tr = .66667 hrs
Total unit time, Tb = .83333 hrs

S/N: 121201A06A8A Baughman Company PA
PondPack Ver: 7.5 (767) Compute Time: 09:04:33 Date: 08-19-2004

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.6800 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\
HYG File - ID = - BASIN 100-yr
Tc = .2500 hrs
Drainage Area = 5.400 acres Runoff CN= 88

==========
Computational Time Increment = .03333 hrs
Computed Peak Time = 12.0333 hrs
Computed Peak Flow = 39.02 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 38.45 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 88
Area = 5.400 acres
S = 1.3636 in
0.2S = .2727 in

Cumulative Runoff

6.2556 in
2.815 ac-ft

HYG Volume... 2.815 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .25000 hrs (ID: None Selected)
Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 24.47 cfs
Unit peak time Tp = .16667 hrs
Unit receding limb, Tr = .66667 hrs
Total unit time, Tb = .83333 hrs

S/N: 121201A06A8A Baughman Company PA
PondPack Ver: 7.5 (767) Compute Time: 09:04:33 Date: 08-19-2004

File.... F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\POND.PPW

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
1317.00	-----	.4300	.0000	.000	.000
1320.00	-----	.4300	1.2900	1.290	1.290

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\POND.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 1317.00 ft
Increment = .25 ft
Max. Elev.= 1320.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Culvert-Circular TW SETUP, DS Channel	CV	--->	TW	1317.000	1320.000

OUTLET STRUCTURE INPUT DATA

Structure ID = CV
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	1.5000	ft
Upstream Invert	=	1317.00	ft
Dnstream Invert	=	1316.20	ft
Horiz. Length	=	220.00	ft
Barrel Length	=	220.00	ft
Barrel Slope	=	.00364	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.5000	(forward entrance loss)
Kb	=	.018213	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0098
Inlet Control M	=	2.0000
Inlet Control c	=	.03980
Inlet Control Y	=	.6700
T1 ratio (HW/D)	=	1.158
T2 ratio (HW/D)	=	1.305
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 1318.74 ft ---> Flow = 7.58 cfs
At T2 Elev = 1318.96 ft ---> Flow = 8.66 cfs

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft

Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

S/N: 121201A06A8A Baughman Company PA
PondPack Ver: 7.5 (767) Compute Time: 09:04:33 Date: 08-19-2004

Type.... Composite Rating Curve
Name.... OUTLET

File.... F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\POND.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
1317.00	.00	Free Outfall		None contributing
1317.25	.21	Free Outfall		CV
1317.50	.79	Free Outfall		CV
1317.75	1.71	Free Outfall		CV
1318.00	2.90	Free Outfall		CV
1318.25	4.28	Free Outfall		CV
1318.50	5.72	Free Outfall		CV
1318.75	6.97	Free Outfall		CV
1319.00	7.65	Free Outfall		CV
1319.25	8.11	Free Outfall		CV
1319.50	8.58	Free Outfall		CV
1319.75	9.04	Free Outfall		CV
1320.00	9.49	Free Outfall		CV

Type.... Pond Routing Summary
Name.... POND OUT Tag: 2-yr
File.... F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\POND.PPW
Storm... TypeII 24hr Tag: 2-yr

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\
Inflow HYG file = NONE STORED - POND IN 2-yr
Outflow HYG file = NONE STORED - POND OUT 2-yr

Pond Node Data = POND
Pond Volume Data = POND
Pond Outlet Data = OUTLET

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	1317.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	15.23 cfs	at	12.0500 hrs
Peak Outflow	=	3.64 cfs	at	12.3500 hrs
Peak Elevation	=	1318.13 ft		
Peak Storage	=	.487 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	1.062
- Infiltration	=	.000
- HYG Vol OUT	=	1.060
- Retained Vol	=	.002
Unrouted Vol	=	-.000 ac-ft (.002% of Inflow Volume)

Type.... Pond Routing Summary
Name.... POND OUT Tag: 5-yr
File.... F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\POND.PPW
Storm... TypeII 24hr Tag: 5-yr

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\
Inflow HYG file = NONE STORED - POND IN 5-yr
Outflow HYG file = NONE STORED - POND OUT 5-yr

Pond Node Data = POND
Pond Volume Data = POND
Pond Outlet Data = OUTLET

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	1317.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	20.72 cfs	at	12.0500 hrs
Peak Outflow	=	5.80 cfs	at	12.3000 hrs
Peak Elevation	=	1318.51 ft		
Peak Storage	=	.651 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	1.464
- Infiltration	=	.000
- HYG Vol OUT	=	1.462
- Retained Vol	=	.002
Unrouted Vol	=	-.000 ac-ft (.002% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\HYDRO\PROJECTS\VIACHRISTI-STJOE\
Inflow HYG file = NONE STORED - POND IN 100-yr
Outflow HYG file = NONE STORED - POND OUT 100-yr

Pond Node Data = POND
Pond Volume Data = POND
Pond Outlet Data = OUTLET

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	= 1317.00	ft
Starting Volume	= .000	ac-ft
Starting Outflow	= .00	cfs
Starting Infiltr.	= .00	cfs
Starting Total Qout	= .00	cfs
Time Increment	= .0500	hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	= 38.45	cfs	at	12.0500 hrs
Peak Outflow	= 9.23	cfs	at	12.3500 hrs
Peak Elevation	= 1319.86	ft		
Peak Storage	= 1.229	ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	2.815
- Infiltration	=	.000
- HYG Vol OUT	=	2.814
- Retained Vol	=	.002
Unrouted Vol	=	-.000 ac-ft (.001% of Inflow Volume)