September 25, 2019

PROPOSED NEW BASIN CALCULATIONS FOR THE SEC OF COX & TYLERSVILLE REDEVELOPMENT

1) **CYS Calculation:** (See Attached Drainage Map)

1 year pre-development (1986 ±) (See Attached Pages 1-2)
CN = 79 - Bayer Becker (2005) + AMB (1986)
Tc = 1.0 hour - Bayer Becker (2005) + AMB (1986)
Area = 66 Ac

Q_1 peak = 34.52 CFS
1 yr Volume = 5.744 Ac. Ft.

1 year proposed development (2020 ±) (See Attached Pages 3-4)
CN = 91.3
Tc = .37 hours
Area = 66 Ac

Q_1 peak = 124.18 CFS
1 yr Volume = 10.37 Ac. Ft.

$\frac{10.37 \text{ Ac} - \text{ft} - 5.744 \text{ Ac} - \text{Ft}}{5.744 \text{ Ac. Ft.}} =$ 80.5%

10 yr is the CYS

2) **WQV:**

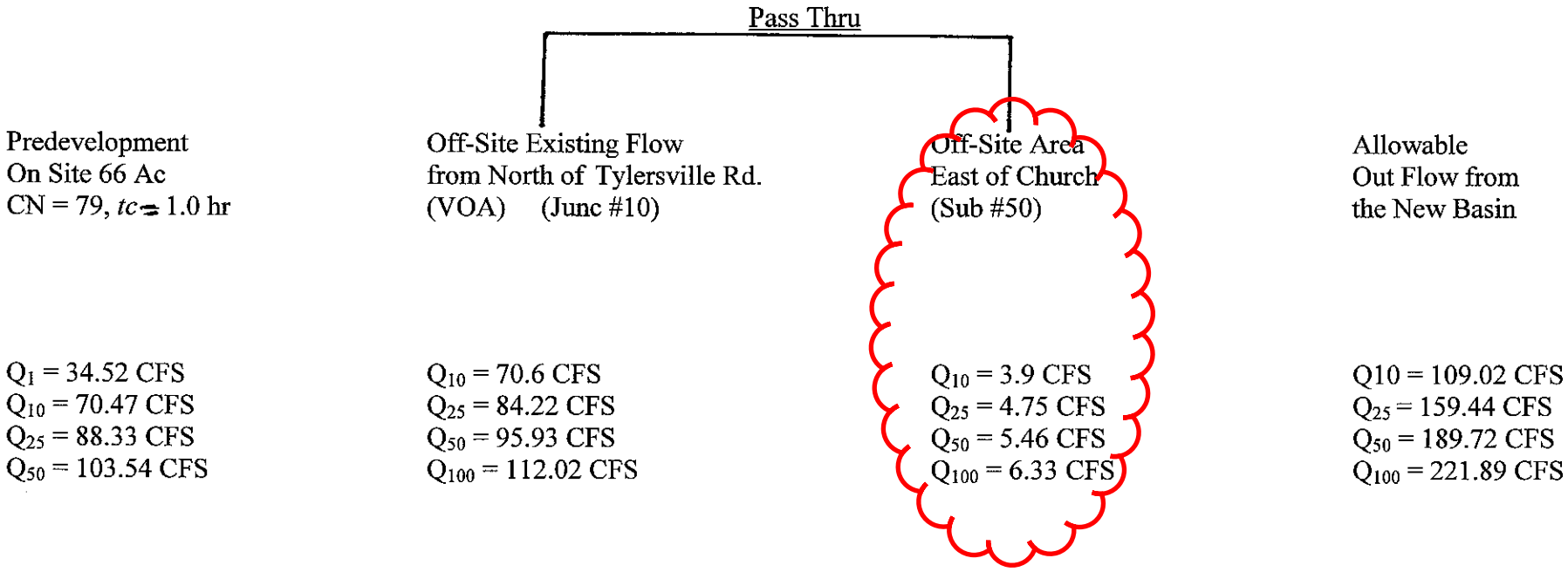
WQV = Rv x P x A/12

Rv = 0.05 + 0.9 (.76) = 0.734
P = 0.9 in
A = 66 Ac

WQV = .734 x .9 in x 66 Ac /12
= 3.633 Ac. Ft.
= 158,266.5 C.F.

3) **Allowable Outflow:** (See Attached Pages 5-11)

10 yr is the CYS



SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.8000 in
Rain Dir = C:\Haestad\PROJECTS\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\Haestad\PROJECTS\
HYG File - ID = - SUBAREA 90 1
Tc = 1.0000 hrs
Drainage Area = 66.000 acres Runoff CN= 79

==========
Computational Time Increment = .13333 hrs
Computed Peak Time = 12.5333 hrs
Computed Peak Flow = 34.75 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.5500 hrs
Peak Flow, Interpolated Output = 34.52 cfs
==========

DRAINAGE AREA

ID:SUBAREA 90
CN = 79
Area = 66.000 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff

1.0444 in
5.744 ac-ft

HYG Volume... 5.744 ac-ft (area under HYG curve)

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

Time Concentration, Tc = 1.00000 hrs (ID: SUBAREA 90)
Computational Incr, Tm = .13333 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 = 74.78 cfs
Unit peak time Tp = .66667 hrs
Unit receding limb, Tr = 2.66667 hrs
Total unit time, Tb = 3.33333 hrs

Existing
Pre

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Butler

Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.8000	Synthetic Curve	TypeII 24hr
5	3.6000	Synthetic Curve	TypeII 24hr
10	4.1000	Synthetic Curve	TypeII 24hr
25	4.7000	Synthetic Curve	TypeII 24hr
50	5.2000	Synthetic Curve	TypeII 24hr
100	5.8000	Synthetic Curve	TypeII 24hr
2	2.9000	Synthetic Curve	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
*JUNC 30	JCT	1	5.744		12.5500	34.52		
*JUNC 30	JCT	5	9.042		12.5000	56.07		
*JUNC 30	JCT	10	11.247		12.5000	70.47		
*JUNC 30	JCT	25	13.999		12.5000	88.33		
*JUNC 30	JCT	50	16.360		12.5000	103.54		
*JUNC 30	JCT	100	19.259		12.5000	122.09		
*JUNC 30	JCT	2	6.137		12.5500	37.10		
SUBAREA 90	AREA	1	5.744		12.5500	34.52		
SUBAREA 90	AREA	5	9.042		12.5000	56.07		
SUBAREA 90	AREA	10	11.247		12.5000	70.47		
SUBAREA 90	AREA	25	13.999		12.5000	88.33		
SUBAREA 90	AREA	50	16.360		12.5000	103.54		
SUBAREA 90	AREA	100	19.259		12.5000	122.09		
SUBAREA 90	AREA	2	6.137		12.5500	37.10		

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.8000 in
Rain Dir = C:\Haestad\PROJECTS\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\Haestad\PROJECTS\
HYG File - ID = - SUBAREA 90 1
Tc = .3700 hrs
Drainage Area = 66.000 acres Runoff CN= 91

==========
Computational Time Increment = .04933 hrs
Computed Peak Time = 12.0867 hrs
Computed Peak Flow = 124.70 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 124.18 cfs
==========

DRAINAGE AREA

ID:SUBAREA 90
CN = 91
Area = 66.000 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.8856 in
10.371 ac-ft

HYG Volume... 10.370 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .37000 hrs (ID: SUBAREA 90)
Computational Incr, Tm = .04933 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 = 202.11 cfs
Unit peak time Tp = .24667 hrs
Unit receding limb, Tr = .98667 hrs
Total unit time, Tb = 1.23333 hrs

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Butler

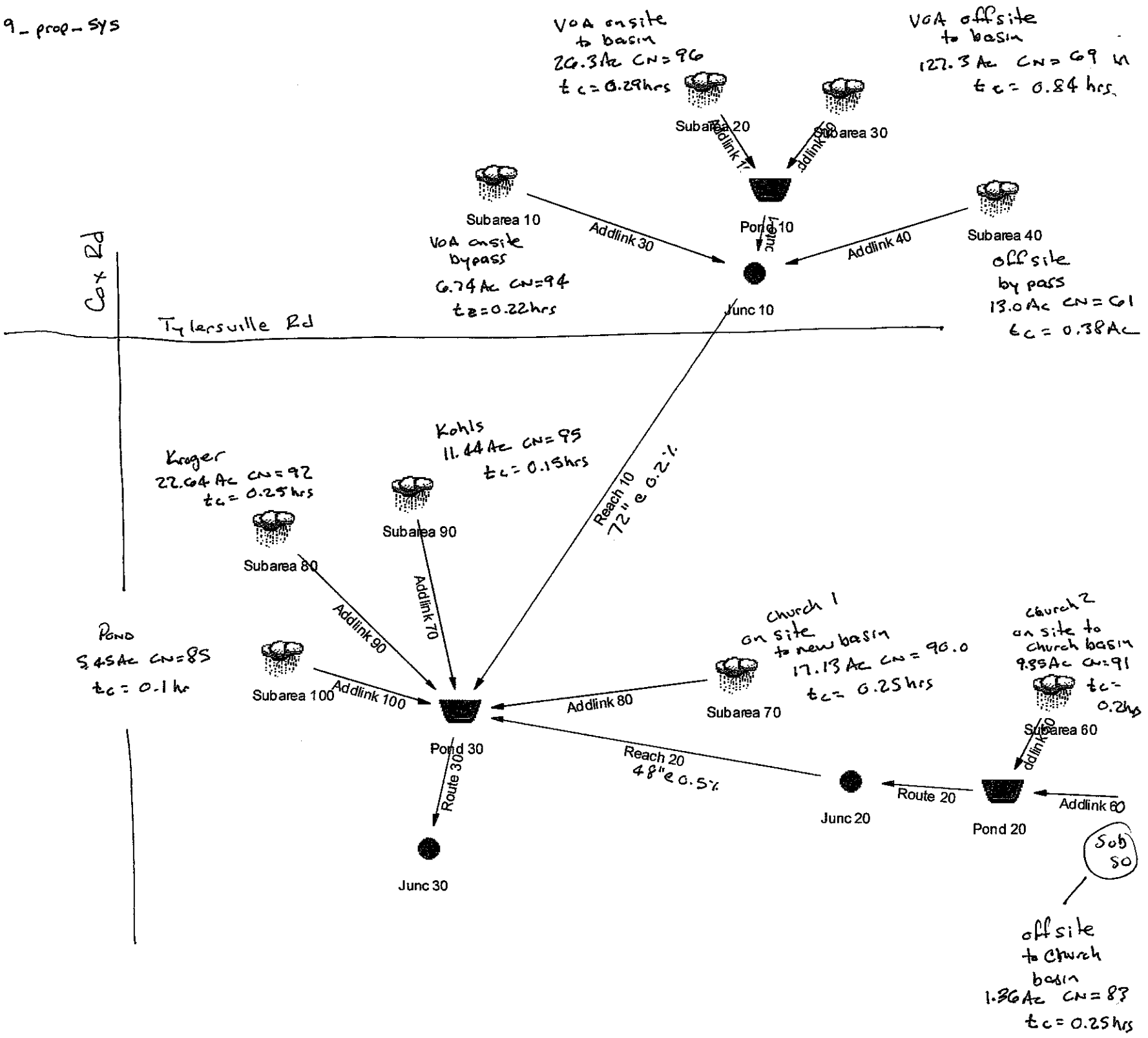
Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.8000	Synthetic Curve	TypeII 24hr
5	3.6000	Synthetic Curve	TypeII 24hr
10	4.1000	Synthetic Curve	TypeII 24hr
25	4.7000	Synthetic Curve	TypeII 24hr
50	5.2000	Synthetic Curve	TypeII 24hr
100	5.8000	Synthetic Curve	TypeII 24hr
2	2.9000	Synthetic Curve	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
*JUNC 30	JCT	1	10.370		12.1000	124.18		
*JUNC 30	JCT	5	14.496		12.1000	171.73		
*JUNC 30	JCT	10	17.121		12.1000	201.45		
*JUNC 30	JCT	25	20.300		12.1000	237.00		
*JUNC 30	JCT	50	22.969		12.1000	266.54		
*JUNC 30	JCT	100	26.187		12.1000	301.86		
*JUNC 30	JCT	2	10.879		12.1000	130.11		
SUBAREA 90	AREA	1	10.370		12.1000	124.18		
SUBAREA 90	AREA	5	14.496		12.1000	171.73		
SUBAREA 90	AREA	10	17.121		12.1000	201.45		
SUBAREA 90	AREA	25	20.300		12.1000	237.00		
SUBAREA 90	AREA	50	22.969		12.1000	266.54		
SUBAREA 90	AREA	100	26.187		12.1000	301.86		
SUBAREA 90	AREA	2	10.879		12.1000	130.11		

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MASTER DESIGN STORM SUMMARY

Network Storm Collection: Butler

Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.8000	Synthetic Curve	TypeII 24hr
5	3.6000	Synthetic Curve	TypeII 24hr
10	4.1000	Synthetic Curve	TypeII 24hr
25	4.7000	Synthetic Curve	TypeII 24hr
50	5.2000	Synthetic Curve	TypeII 24hr
100	5.8000	Synthetic Curve	TypeII 24hr
2	2.9000	Synthetic Curve	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 cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
JUNC 10	JCT	1	552733		12.7000	36.53		
JUNC 10	JCT	5	869871		12.7500	57.82		
JUNC 10	JCT	10	1087485		12.8000	70.60		
JUNC 10	JCT	25	1363837		12.6000	84.22		
JUNC 10	JCT	50	1604522		12.1000	95.93		
JUNC 10	JCT	100	1903581		12.1000	112.02		
JUNC 10	JCT	2	589901		12.7000	39.19		
JUNC 20	JCT	1	70359		12.2500	7.87		
JUNC 20	JCT	5	99075		12.2000	15.18		
JUNC 20	JCT	10	117403		12.1500	20.25		
JUNC 20	JCT	25	139654		12.1500	26.89		
JUNC 20	JCT	50	158356		12.1500	32.67		
JUNC 20	JCT	100	180940		12.1500	38.85		
JUNC 20	JCT	2	73895		12.2500	8.66		

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 cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
*JUNC 30		JCT	1	981816	R	14.2500	27.82		
*JUNC 30		JCT	5	1481345	R	13.7000	57.75		
*JUNC 30		JCT	10	1815048	R	14.1000	60.22		
*JUNC 30		JCT	25	2232193	R	14.0000	79.74		
*JUNC 30		JCT	50	2591088	R	13.8500	98.24		
*JUNC 30		JCT	100	3032759	R	13.5500	121.06		
*JUNC 30		JCT	2	1041470	R	14.2000	30.25		
POND 10	IN	POND	1	486171		12.1000	76.71		
POND 10	IN	POND	5	768946		12.1000	116.65		
POND 10	IN	POND	10	963007		12.1000	144.65		
POND 10	IN	POND	25	1209414		12.1000	180.14		
POND 10	IN	POND	50	1423968		12.1000	210.94		
POND 10	IN	POND	100	1690481		12.1500	249.34		
POND 10	IN	POND	2	519303		12.1000	81.27		
POND 10	OUT	POND	1	486162		12.7500	34.11	880.96	114891
POND 10	OUT	POND	5	768937		12.8000	54.26	881.64	195710
POND 10	OUT	POND	10	962998		12.8500	66.36	882.05	258553
POND 10	OUT	POND	25	1209404		12.9000	78.93	882.56	345000
POND 10	OUT	POND	50	1423958		12.9500	87.81	883.01	429098
POND 10	OUT	POND	100	1690472		13.0000	100.74	883.54	533563
POND 10	OUT	POND	2	519295		12.7500	36.62	881.04	123525
POND 20	IN	POND	1	70381		12.0000	24.69		
POND 20	IN	POND	5	99097		12.0000	34.35		
POND 20	IN	POND	10	117425		12.0000	40.41		
POND 20	IN	POND	25	139675		12.0000	47.68		
POND 20	IN	POND	50	158377		12.0000	53.72		
POND 20	IN	POND	100	180962		12.0000	60.95		
POND 20	IN	POND	2	73917		12.0000	25.89		

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 cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
POND 20	OUT POND	1	70360		12.2500	7.87	885.97	27638
POND 20	OUT POND	5	99075		12.2000	15.18	886.26	36098
POND 20	OUT POND	10	117403		12.1500	20.25	886.41	40617
POND 20	OUT POND	25	139654		12.1500	26.89	886.57	45723
POND 20	OUT POND	50	158356		12.1500	32.67	886.68	49367
POND 20	OUT POND	100	180941		12.1500	38.85	886.79	53287
POND 20	OUT POND	2	73896		12.2500	8.66	886.01	28771
POND 30	IN POND	1	1018981		12.0500	159.05		
POND 30	IN POND	5	1519309		12.0500	221.50		
POND 30	IN POND	10	1853435		12.0500	263.48		
POND 30	IN POND	25	2270957		12.0500	316.91		
POND 30	IN POND	50	2630112		12.0500	367.77		
POND 30	IN POND	100	3072083		12.0500	424.92		
POND 30	IN POND	2	1078762		12.0500	166.61		
POND 30	OUT POND	1	981818	R	14.2500	27.82	874.99	475943
POND 30	OUT POND	5	1481346	R	13.7000	57.75	875.65	600944
POND 30	OUT POND	10	1815049	R	14.1000	60.22	876.38	744638
POND 30	OUT POND	25	2232193	R	14.0000	79.74	877.02	873360
POND 30	OUT POND	50	2591089	R	13.8500	98.24	877.36	943139
POND 30	OUT POND	100	3032760	R	13.5500	121.06	877.70	1012085
POND 30	OUT POND	2	1041471	R	14.2000	30.25	875.10	496873
SUBAREA 10	AREA	1	52772		12.0000	17.61		
SUBAREA 10	AREA	5	71758		12.0000	23.57		
SUBAREA 10	AREA	10	83728		12.0000	27.27		
SUBAREA 10	AREA	25	98157		12.0000	31.69		
SUBAREA 10	AREA	50	110222		12.0000	35.36		
SUBAREA 10	AREA	100	124735		12.0000	39.75		
SUBAREA 10	AREA	2	55131		12.0000	18.35		

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 cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
SUBAREA 100	AREA	1	28124		11.9500	11.65		
SUBAREA 100	AREA	5	41615		11.9500	17.12		
SUBAREA 100	AREA	10	50392		11.9500	20.60		
SUBAREA 100	AREA	25	61164		11.9500	24.81		
SUBAREA 100	AREA	50	70293		11.9500	28.34		
SUBAREA 100	AREA	100	81388		11.9500	32.56		
SUBAREA 100	AREA	2	29763		11.9500	12.32		
SUBAREA 20	AREA	1	224882		12.0500	66.00		
SUBAREA 20	AREA	5	300186		12.0500	86.71		
SUBAREA 20	AREA	10	347447		12.0500	99.58		
SUBAREA 20	AREA	25	404286		12.0500	114.96		
SUBAREA 20	AREA	50	451726		12.0500	127.73		
SUBAREA 20	AREA	100	508717		12.0500	143.02		
SUBAREA 20	AREA	2	234266		12.0500	68.60		
SUBAREA 30	AREA	1	261290		12.4500	33.37		
SUBAREA 30	AREA	5	468761		12.4500	68.24		
SUBAREA 30	AREA	10	615561		12.4500	93.18		
SUBAREA 30	AREA	25	805128		12.4500	125.30		
SUBAREA 30	AREA	50	972242		12.4000	153.51		
SUBAREA 30	AREA	100	1181764		12.4000	189.16		
SUBAREA 30	AREA	2	285038		12.4500	37.28		
SUBAREA 40	AREA	1	13798		12.2000	2.00		
SUBAREA 40	AREA	5	29176		12.1500	6.00		
SUBAREA 40	AREA	10	40760		12.1500	9.27		
SUBAREA 40	AREA	25	56275		12.1500	13.68		
SUBAREA 40	AREA	50	70342		12.1500	17.66		
SUBAREA 40	AREA	100	88374		12.1500	22.74		
SUBAREA 40	AREA	2	15476		12.2000	2.41		

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 cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
SUBAREA 50	AREA	1	6355		12.0500	2.12		
SUBAREA 50	AREA	5	9592		12.0500	3.20		
SUBAREA 50	AREA	10	11716		12.0500	3.90		
SUBAREA 50	AREA	25	14336		12.0500	4.75		
SUBAREA 50	AREA	50	16566		12.0500	5.46		
SUBAREA 50	AREA	100	19284		12.0500	6.33		
SUBAREA 50	AREA	2	6746		12.0500	2.25		
SUBAREA 60	AREA	1	64026		12.0000	22.68		
SUBAREA 60	AREA	5	89505		12.0000	31.28		
SUBAREA 60	AREA	10	105709		12.0000	36.65		
SUBAREA 60	AREA	25	125339		12.0000	43.07		
SUBAREA 60	AREA	50	141811		12.0000	48.40		
SUBAREA 60	AREA	100	161678		12.0000	54.77		
SUBAREA 60	AREA	2	67171		12.0000	23.76		
SUBAREA 70	AREA	1	112013		12.0500	36.96		
SUBAREA 70	AREA	5	158050		12.0500	51.45		
SUBAREA 70	AREA	10	187427		12.0500	60.51		
SUBAREA 70	AREA	25	223084		12.0500	71.37		
SUBAREA 70	AREA	50	253047		12.0500	80.39		
SUBAREA 70	AREA	100	289225		12.0500	91.17		
SUBAREA 70	AREA	2	117682		12.0500	38.77		
SUBAREA 80	AREA	1	162136		12.0500	52.80		
SUBAREA 80	AREA	5	224572		12.0500	71.95		
SUBAREA 80	AREA	10	264155		12.0500	83.87		
SUBAREA 80	AREA	25	312024		12.0500	98.12		
SUBAREA 80	AREA	50	352139		12.0500	109.94		
SUBAREA 80	AREA	100	400475		12.0500	124.07		
SUBAREA 80	AREA	2	169860		12.0500	55.19		

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 cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
SUBAREA 90	AREA	1	93619		11.9500	34.04		
SUBAREA 90	AREA	5	126130		11.9500	45.14		
SUBAREA 90	AREA	10	146578		11.9500	52.03		
SUBAREA 90	AREA	25	171196		11.9500	60.25		
SUBAREA 90	AREA	50	191760		11.9500	67.08		
SUBAREA 90	AREA	100	216478		11.9500	75.24		
SUBAREA 90	AREA	2	97664		11.9500	35.44		