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Remington Place
Wichita, Sedgwick County, Kansas
01/03/01

Remington Place is a residential and residential business development in northeast Wichita. It consists of 128 residential lots and 1 lot for future church development. There are also two small office lots on the west side of the plat. Development plans include single family homes, a church, two small office buildings, streets, parking, open space, ponds and utilities.

Hydrology

The proposed plat lies in the E ½, NW ¼, Section 9, T27S, R2E of the 6th P.M. The plat borders 21st Street North and Burlington Northern Railroad Tracks on the south. The soils on-site consist of Goessel silty clay and Irwin silty clay loam. These soils are classified in hydrologic group D. The existing landscape is vacant pasture with trees on all sides and across the middle of the property. This property is almost entirely on a small ridge. There are 5-6 existing drainage basins or storm water discharge points. The west half of the plat eventually drains southwest into a Gypsum Creek tributary. The eastern half of the plat drains east to a Fourmile Creek tributary.

For runoff calculations, Remington Place was divided into 6 major basins, each with its own discharge. Two of the basins were relatively small and were included as part of a larger basin (See Drainage Plan for Systems 1-4). The southeast basin (System 2), also relatively small, was routed to the southwest (System 1) instead of having a separate outfall. This lowered the high water elevation of proposed Pond #4 without significantly increasing the discharge from System 1. In the three systems with ponds, all have decreased the developed runoff to less than existing conditions.

Using the Army Corp of Engineer's program HEC-HMS, each of the three systems was modeled with runoff based on the Rational Method. The ponds were included to determine water elevations in the 100-year design storm.

Runoff coefficients were estimated based on tables presented in the Design Aids section and existing land use. A map showing the basin boundaries, drainage calculations and HEC-HMS models are included.

The analysis made is based on the available site data which includes the following: 1" = 100' topographic map with 2' contours of the site and adjacent areas, USGS topographic map, Sedgwick County Soil Survey Map and references noted herein.

Storm Sewer Design

Storm sewer systems were designed for each of the three detention systems. One of the goals of this plat is to maximize the number of lots that can accommodate a view-out or walk-out style basement. By using backyard storm sewer, almost all of the lots at Remington Place are view-out or walk-out lots. To reduce the chance of flooding, all of the backyard storm sewers have been designed to handle the 100-year design storm. The grading plan also limits the chance of flooding by establishing maximum grade elevations on the lot lines that are at least 1.5' below the minimum opening on the adjacent lots. The storm sewer systems were designed using Haestad's StormCAD. The pond outfalls were designed using HY8 version 6.1, a culvert design program by the Federal Highway Administration. The pond outfalls were designed for the 100-year design storm and to limit the discharge to less than existing conditions.

Design Aids

This section includes material used to assist in designing the drainage system. A 1"=100' scale drainage plan map is enclosed in the pocket.

References

Design of Urban Highway Drainage - The State of the Art, by Reitz & Jens, Inc., April 1980.

Drainage of Highway Pavements, Hydraulic Engineering Circular #12, by Tye Engineering, Inc., March 1984.

Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita, Kansas, 1985.

Soil Survey of Sedgwick County, Kansas, US Department of Agriculture, Soil Conservation Service, 1979.

```
---------- Beginning Calculation Cycle ----------
Discharge: 4.00 cfs  at node I-3
Discharge: 8.90 cfs  at node I-4
Discharge: 16.60 cfs  at node I-5
Discharge: 18.30 cfs  at node I-6
Discharge: 23.40 cfs  at node I-7
Discharge: 34.30 cfs  at node I-8
Discharge: 40.30 cfs  at node I-9
Discharge: 11.20 cfs  at node I-1
Discharge: 25.50 cfs  at node I-2
Discharge: 65.80 cfs  at node Outlet
Beginning iteration 1
Discharge: 4.00 cfs  at node I-3
Discharge: 8.90 cfs  at node I-4
Discharge: 16.60 cfs  at node I-5
Discharge: 18.30 cfs  at node I-6
Discharge: 23.40 cfs  at node I-7
Discharge: 34.30 cfs  at node I-8
Discharge: 40.30 cfs  at node I-9
Discharge: 11.20 cfs  at node I-1
Discharge: 25.50 cfs  at node I-2
Discharge: 65.80 cfs  at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error:  0.0
** Warning: Design constraints not met.
** Problem: Flooding in system
Warning: No Duration data exists in IDF Table
Information: P-11 Surcharged condition
Information: P-12 Surcharged condition
Information: P-1 Surcharged condition
Information: P-8 Surcharged condition
Information: P-7 Surcharged condition
Violation: P-7 does not meet minimum cover constraint at upstream end.
Information: I-7 The hydraulic grade exceeds the Rim/Ground elevation
Information: I-7 Flooding condition.
Information: P-6 Surcharged condition
Violation: P-6 does not meet minimum cover constraint at downstream end.
Information: P-5 Surcharged condition
Information: P-4 Surcharged condition
Information: I-4 The hydraulic grade exceeds the Rim/Ground elevation
Information: I-4 Flooding condition.
Information: P-3 Surcharged condition
Information: I-3 The hydraulic grade exceeds the Rim/Ground elevation
Information: I-3 Flooding condition.
--------------------- Calculations Complete ----------------------

** Analysis Options **
Friction method:  Manning's Formula
HGL Convergence Test:  0.001000
Maximum Network Traversals:  5
Number of Pipe Profile Steps:  5
Discharge Convergence Test:  0.001000
Maximum Design Passes:  3
```

---------- Network Quick View ----------

				Hydraulic Grade	
Label	Length	Size	Discharge	Upstream	Downstream
P-1	45.00	24 inch	11.20	208.44	208.33
P-3	200.00	18 inch	4.00	206.14	205.85
P-4	105.00	18 inch	8.90	206.60	205.85
P-5	45.00	24 inch	16.60	205.63	205.39
P-6	140.00	30 inch	18.30	205.28	205.00
P-7	165.00	36 inch	23.40	204.95	204.75
P-8	35.00	42 inch	34.30	204.65	204.61

P-11	170.00	42 inch	40.30	204.47	204.20
P-12	285.00	24 inch	25.50	207.82	204.20

		Elevations		
Label	Discharge	Ground	Upstream HGL	Downstream HGL
I-1	11.20	209.50	208.44	208.44
I-2	25.50	209.50	208.33	207.82
I-3	4.00	205.80	205.85	205.85
I-4	8.90	205.80	205.85	205.85
I-5	16.60	208.55	205.85	205.63
I-6	18.30	208.55	205.39	205.28
I-7	23.40	205.00	205.00	204.95
I-8	34.30	206.50	204.75	204.65
I-9	40.30	206.50	204.61	204.47
Outlet	65.80	205.00	204.20	204.20

Elapsed: 0 minute(s) 1 second(s)

Pipe Report

Pipe	Upstream Node	Downstream Node	Additional Flow (cfs)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Average Velocity (ft/s)
P-1	I-1	I-2	11.20	11.20	45.00	0.002889	24 inch	0.013	12.16	203.91	203.78	209.50	209.50	3.59	3.72	208.44	208.33	3.57
P-12	I-2	Outlet	14.30	25.50	285.00	0.024561	24 inch	0.013	35.45	203.00	196.00	209.50	205.00	4.50	7.00	207.82	204.20	8.12
P-3	I-3	I-4	4.00	4.00	200.00	0.003000	18 inch	0.013	5.75	202.70	202.10	205.80	205.80	1.60	2.20	206.14	205.85	2.26
P-4	I-4	I-5	4.90	8.90	105.00	0.003048	18 inch	0.013	5.80	201.99	201.67	205.80	208.55	2.31	5.38	206.60	205.85	5.04
P-5	I-5	I-6	7.70	16.60	45.00	0.002000	24 inch	0.013	10.12	201.57	201.48	208.55	208.55	4.98	5.07	205.63	205.39	5.28
P-6	I-6	I-7	1.70	18.30	140.00	0.002000	30 inch	0.013	18.34	201.38	201.10	208.55	205.00	4.67	1.40	205.28	205.00	3.73
P-7	I-7	I-8	5.10	23.40	165.00	0.001515	36 inch	0.013	25.96	201.00	200.75	205.00	206.50	1.00	2.75	204.95	204.75	3.31
P-8	I-8	I-9	10.90	34.30	35.00	0.001429	42 inch	0.013	38.02	200.65	200.60	206.50	206.50	2.35	2.40	204.65	204.61	3.57
P-11	I-9	Outlet	6.00	40.30	170.00	0.026471	42 inch	0.013	163.68	200.50	196.00	206.50	205.00	2.50	5.50	204.47	204.20	4.19
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

System 4

Soil Type "D"

Existing

Time of Concentration
15 minutes

Pasture - 1-4% Slopes
C_2=0.26
C_5=0.31
C_{10}=0.41
C_{100}=0.61

Existing Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	t_c (minutes)
System 4	12.63	12.5	18.1	27.0	57.0	15

Developed

Time of Concentration=15 min
i_2=3.80 in/hr
i_5=4.62 in/hr
i_{10}=5.21 in/hr
i_{100}=7.40 in/hr

1/4 Ac. Residential
C_2=0.50
C_5=0.54
C_{10}=0.62
C_{100}=0.76

Commercial (80-85% Imp.)
C_2=0.74
C_5=0.76
C_{10}=0.79
C_{100}=0.84

Developed Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Inlet (node)	Land Use
KK	0.51	0.97	1.28	1.65	2.88	403	Residential
LL	1.53	2.92	3.83	4.96	8.63	Pond #5	Residential
MM	2.01	3.81	5.00	6.48	11.28	401	Residential
NN	7.76	21.83	27.26	31.95	48.26	Pond #6	Commercial
VV	0.81	1.54	2.02	2.62	4.56	402	Residential
Total	12.63	31.07	39.39	47.66	75.61		

Discharge - 100-yr Design Storm	
Pond #6	42.2 cfs

Pond #5

System 4

Elevation City Datum	Area Acres	Storage Volume Acre-feet	Discharge cfs
206	0.31	0	0
207	0.36	0.34	9
208	0.41	0.73	9
209	0.46	1.17	9

Pond #5 Outfall
Routed to Pond #6
15" RCP
Flowline Elevation at Pond #5 = 203.0
Flowline Elevation at Pond #6 = 192.5

Pond Outflow determined from Storm Sewer Run
See System 4B for SWS design

Static Water Surface in Pond #5 = 206.0

HW_{100}=	207.1	City Datum
Q_{100}=	9.0	cfs

Inlet Sizing

Using Chart 11. Grate Inlet Capacity in Sump Conditions:

Basin	Node	Q_{100} (cfs)	Minimum Size	Type	Ponding Depth (feet)
Pond #5	404	9	2'x4'	Area	0.4

Area Inlets were sized as follows:

2'x2' Area Inlet

Neenah Grate R-4826

1.3 Square Feet of Open Area
8 feet Perimeter

2'x4' Area Inlet

Neenah Grate R-4853-A

3.1 Square Feet of Open Area
11.5 feet Perimeter

4'x4' Area Inlet

2- Neenah Grates R-4853-A

6.2 Square Feet of Open Space
15.5 feet Perimeter

Pond #6

System 4

Elevation City Datum	Area Acres	Storage Volume Acre-feet	Discharge cfs
195	0.74	0	0
196	0.81	0.78	16
197	0.89	1.63	45.25
198	0.97	2.56	83.14
199	1.06	3.57	128

Pond #6 Outfall
Routed Offsite to the east
5' Broadcrested Weir
Flowline Elevation at Pond #6 = 195.0
$Q=C*L*h^{3/2}$ C=3.2 L=5'

Static Water Surface in Pond #6 = 195.0

HW_{100}=	196.9	City Datum
Q_{100}=	42.2	cfs

HMS * Summary of Results

Project : Remington Place Run Name : Run 34

Start of Run : 11Jan00 0000 Basin Model : System 4
End of Run : 12Jan00 0600 Met. Model : 2-Year Storm
Execution Time : 18Dec00 1201 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin LL	3.6767	11 Jan 00 1210	0.37473	0.002
Basin KK	1.2256	11 Jan 00 1210	0.12491	0.001
Basin VV	1.9465	11 Jan 00 1210	0.19839	0.001
Pond #5	4.1740	11 Jan 00 1220	0.69803	0.004
Basin NN	19.795	11 Jan 00 1210	2.1868	0.012
Basin MM	4.8302	11 Jan 00 1210	0.49229	0.003
Pond #6	15.606	11 Jan 00 1230	3.3771	0.020

HMS * Summary of Results for Pond #5

Project : Remington Place Run Name : Run 34

Start of Run	: 11Jan00 0000	Basin Model	: System 4
End of Run	: 12Jan00 0600	Met. Model	: 2-Year Storm
Execution Time	: 18Dec00 1201	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 6.8487 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 4.1740 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1220
Total Inflow	: 2.94 (in)	Peak Storage	: 0.15768 (in)
Total Outflow	: 2.94 (in)	Peak Elevation	: 206.46 (in

HMS * Summary of Results for Pond #6

Project : Remington Place Run Name : Run 34

Start of Run	: 11Jan00 0000	Basin Model	: System 4
End of Run	: 12Jan00 0600	Met. Model	: 2-Year Storm
Execution Time	: 18Dec00 1201	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 28.110 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 15.606 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1230
Total Inflow	: 3.21 (in)	Peak Storage	: 0.76081 (in)
Total Outflow	: 3.21 (in)	Peak Elevation	: 195.98 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 35

Start of Run : 11Jan00 0000 Basin Model : System 4
End of Run : 12Jan00 0600 Met. Model : 5-Year Storm
Execution Time : 18Dec00 1202 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin LL	4.9450	11 Jan 00 1210	0.51301	0.002
Basin KK	1.6483	11 Jan 00 1210	0.17100	0.001
Basin VV	2.6179	11 Jan 00 1210	0.27159	0.001
Pond #5	5.6445	11 Jan 00 1220	0.95560	0.004
Basin NN	26.052	11 Jan 00 1210	2.8977	0.012
Basin MM	6.4964	11 Jan 00 1210	0.67395	0.003
Pond #6	22.623	11 Jan 00 1220	4.5272	0.020

HMS * Summary of Results for Pond #5

Project : Remington Place Run Name : Run 35

Start of Run	: 11Jan00 0000	Basin Model	: System 4
End of Run	: 12Jan00 0600	Met. Model	: 5-Year Storm
Execution Time	: 18Dec00 1202	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 9.2113 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 5.6445 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1220
Total Inflow	: 4.02 (in)	Peak Storage	: 0.21324 (in)
Total Outflow	: 4.02 (in)	Peak Elevation	: 206.63 (in

HMS * Summary of Results for Pond #6

Project : Remington Place Run Name : Run 35

Start of Run	: 11Jan00 0000	Basin Model	: System 4
End of Run	: 12Jan00 0600	Met. Model	: 5-Year Storm
Execution Time	: 18Dec00 1202	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 37.284 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 22.623 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1220
Total Inflow	: 4.30 (in)	Peak Storage	: 0.97413 (in)
Total Outflow	: 4.30 (in)	Peak Elevation	: 196.23 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 36

Start of Run : 11Jan00 0000 Basin Model : System 4
End of Run : 12Jan00 0600 Met. Model : 10-Year Storm
Execution Time : 18Dec00 1202 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin LL	5.7468	11 Jan 00 1210	0.60140	0.002
Basin KK	1.9156	11 Jan 00 1210	0.20047	0.001
Basin VV	3.0424	11 Jan 00 1210	0.31839	0.001
Pond #5	6.5740	11 Jan 00 1220	1.1202	0.004
Basin NN	30.030	11 Jan 00 1210	3.3502	0.012
Basin MM	7.5497	11 Jan 00 1210	0.79007	0.003
Pond #6	27.015	11 Jan 00 1220	5.2605	0.020

HMS * Summary of Results for Pond #5

Project : Remington Place **Run Name : Run 36**

Start of Run	**: 11Jan00 0000**	**Basin Model**	**: System 4**
End of Run	**: 12Jan00 0600**	**Met. Model**	**: 10-Year Storm**
Execution Time	**: 18Dec00 1202**	**Control Specs**	**: 24 Hour Rainfall**

Computed Results

Peak Inflow	**: 10.705 (cfs)**	**Date/Time of Peak Inflow**	**: 11 Jan 00 1210**
Peak Outflow	**: 6.5740 (cfs)**	**Date/Time of Peak Outflow**	**: 11 Jan 00 1220**
Total Inflow	**: 4.72 (in)**	**Peak Storage**	**: 0.24835 (in)**
Total Outflow	**: 4.72 (in)**	**Peak Elevation**	**: 206.73 (in**

HMS * Summary of Results for Pond #6

Project : Remington Place Run Name : Run 36

Start of Run	: 11Jan00 0000	Basin Model	: System 4
End of Run	: 12Jan00 0600	Met. Model	: 10-Year Storm
Execution Time	: 18Dec00 1202	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 43.106 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 27.015 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1220
Total Inflow	: 5.00 (in)	Peak Storage	: 1.1028 (in)
Total Outflow	: 5.00 (in)	Peak Elevation	: 196.38 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 11

Start of Simulation : 11Jan00 0000 Basin Model : System 4
End of Simulation : 12Jan00 0600 Precip Model : 100-Year Storm
Execution Time : 30Nov00 0954 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
Basin LL	8.5895	11 Jan 00 1200	0.91320	0.002390625
Basin KK	2.8632	11 Jan 00 1200	0.30440	0.000796875
Basin VV	4.5474	11 Jan 00 1200	0.48346	0.001265625
Pond #5	9.0000	11 Jan 00 1210	1.7011	0.004453125
Basin NN	44.260	11 Jan 00 1200	5.0161	0.012125
Basin MM	11.284	11 Jan 00 1200	1.1997	0.003140625
Pond #6	42.246	11 Jan 00 1210	7.9169	0.019718750

HMS * Summary of Results for Pond #5

Project : Remington Place Run Name : Run 11

Start of Simulation	: 11Jan00 0000	Basin Model	: System 4
End of Simulation	: 12Jan00 0600	Precip Model	: 100-Year Storm
Execution Time	: 30Nov00 0954	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 16.000 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1200
Peak Outflow	: 9.0000 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1210
Total Inflow	: 7.16 (in)	Peak Storage	: 0.37874(ac-ft)
Total Outflow	: 7.16 (in)	Peak Elevation	: 207.10(ft)

HMS * Summary of Results for Pond #6

Project : Remington Place Run Name : Run 11

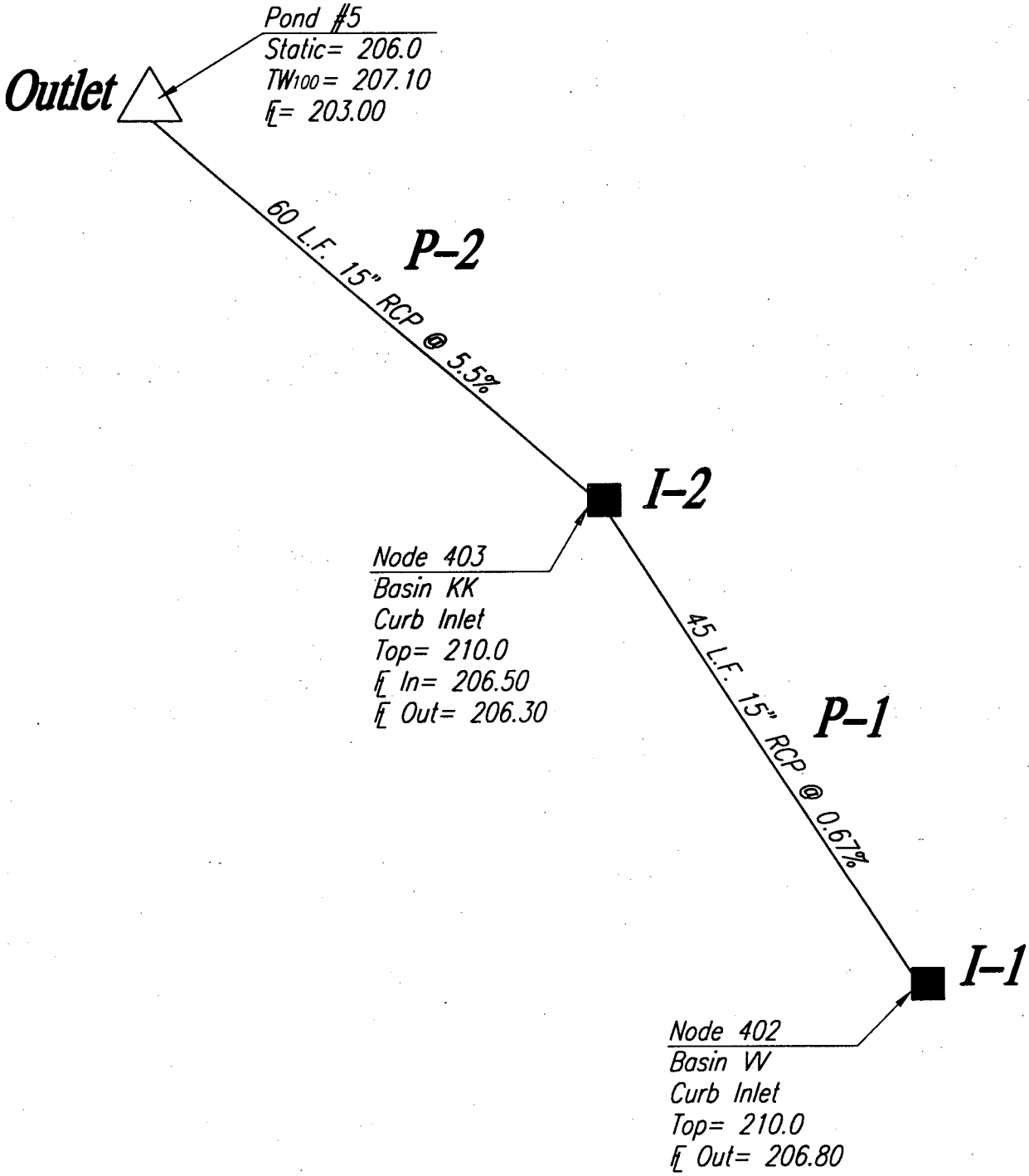
Start of Simulation	: 11Jan00 0000	Basin Model	: System 4
End of Simulation	: 12Jan00 0600	Precip Model	: 100-Year Storm
Execution Time	: 30Nov00 0954	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 63.871 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1200
Peak Outflow	: 42.246 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1210
Total Inflow	: 7.53 (in)	Peak Storage	: 1.5493(ac-ft)
Total Outflow	: 7.53 (in)	Peak Elevation	: 196.91(ft)

100-YR. DESIGN STORM

SYSTEM 4A



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January 5, 2001

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------------------ Beginning Calculation Cycle -------------------
Discharge: 4.50 cfs  at node I-1
Discharge: 7.40 cfs  at node I-2
Discharge: 7.40 cfs  at node Outlet
Beginning iteration 1
Discharge: 4.50 cfs  at node I-1
Discharge: 7.40 cfs  at node I-2
Discharge: 7.40 cfs  at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error:  0.0
Warning: No Duration data exists in IDF Table
Information: P-2 Surcharged condition
Information: P-1 Surcharged condition
--------------------- Calculations Complete ----------------------

** Analysis Options **
Friction method:  Manning's Formula
HGL Convergence Test:  0.001000
Maximum Network Traversals:  5
Number of Pipe Profile Steps:  5
Discharge Convergence Test:  0.001000
Maximum Design Passes:  3


 ----------------- Network Quick View  ------------------------
```

Label	Length	Size	Discharge	Hydraulic Grade Upstream	Hydraulic Grade Downstream
P-1	45.00	15 inch	4.50	208.39	208.17
P-2	60.00	15 inch	7.40	207.89	207.10

Label	Discharge	Elevations Ground	Elevations Upstream HGL	Elevations Downstream HGL
I-1	4.50	210.00	208.39	208.39
I-2	7.40	210.00	208.17	207.89
Outlet	7.40	208.20	207.10	207.10

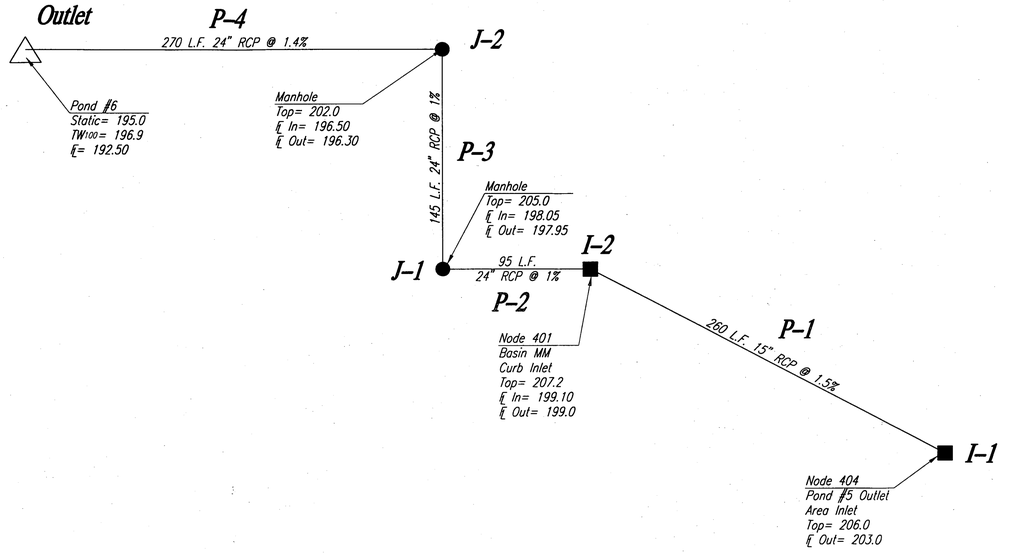
```
Elapsed: 0 minute(s) 0 second(s)
```

Pipe Report

Pipe	Upstream Node	Downstream Node	Additional Flow (cfs)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Average Velocity (ft/s)
P-1	I-1	I-2	4.50	4.50	45.00	0.006667	15 inch	0.013	5.27	206.80	206.50	210.00	210.00	1.95	2.25	208.39	208.17	3.67
P-2	I-2	Outlet	2.90	7.40	60.00	0.055000	15 inch	0.013	15.15	206.30	203.00	210.00	208.20	2.45	3.95	207.89	207.10	6.03
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

100-YR. DESIGN STORM

SYSTEM 4B



Professional **E**ngineering **C**onsultants, P.A.
303 S. TOPEKA • WICHITA, KANSAS 67202
316-262-2691 • FAX 316-262-3003

January 5, 2001

```
------------------ Beginning Calculation Cycle ------------------
Discharge: 9.00 cfs  at node I-1
Discharge: 20.30 cfs  at node I-2
Discharge: 20.30 cfs  at node J-1
Discharge: 20.30 cfs  at node J-2
Discharge: 20.30 cfs  at node Outlet
Beginning iteration 1
Discharge: 9.00 cfs  at node I-1
Discharge: 20.30 cfs  at node I-2
Discharge: 20.30 cfs  at node J-1
Discharge: 20.30 cfs  at node J-2
Discharge: 20.30 cfs  at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error:  0.0
** Problem: Flooding in system
Warning: No Duration data exists in IDF Table
Information: P-4 Surcharged condition
Information: P-3 Surcharged condition
Information: P-2 Surcharged condition
Information: P-1 Surcharged condition
Information: I-1 The hydraulic grade exceeds the Rim/Ground elevation
Information: I-1 Flooding condition.
--------------------- Calculations Complete ---------------------

** Analysis Options **
Friction method:  Manning's Formula
HGL Convergence Test:  0.001000
Maximum Network Traversals:  5
Number of Pipe Profile Steps:  5
Discharge Convergence Test:  0.001000
Maximum Design Passes:  3

---------------- Network Quick View ------------------------
```

Label	Length	Size	Discharge	Hydraulic Grade Upstream	Hydraulic Grade Downstream
P-1	260.00	15 inch	9.00	207.03	201.98
P-2	95.00	24 inch	20.30	201.66	200.89
P-3	145.00	24 inch	20.30	200.57	199.40
P-4	270.00	24 inch	20.30	199.07	196.90

Label	Discharge	Elevations Ground	Elevations Upstream HGL	Elevations Downstream HGL
I-1	9.00	206.00	206.00	206.00
I-2	20.30	207.20	201.98	201.66
J-1	20.30	205.00	200.89	200.57
J-2	20.30	202.00	199.40	199.07
Outlet	20.30	198.00	196.90	196.90

```
Elapsed: 0 minute(s) 1 second(s)
```

Pipe Report

Pipe	Upstream Node	Downstream Node	Additional Flow (cfs)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Average Velocity (ft/s)
P-1	I-1	I-2	9.00	9.00	260.00	0.015000	15 inch	0.013	7.91	203.00	199.10	206.00	207.20	1.75	6.85	207.03	201.98	7.33
P-2	I-2	J-1	11.30	20.30	95.00	0.010000	24 inch	0.013	22.62	199.00	198.05	207.20	205.00	6.20	4.95	201.66	200.89	6.46
P-3	J-1	J-2	N/A	20.30	145.00	0.010000	24 inch	0.013	22.62	197.95	196.50	205.00	202.00	5.05	3.50	200.57	199.40	6.46
P-4	J-2	Outlet	N/A	20.30	270.00	0.014074	24 inch	0.013	26.84	196.30	192.50	202.00	198.00	3.70	3.50	199.07	196.90	6.46
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Inlet Sizing

100-year Design Storm

-All inlets are located in sump locations

Basin	Node	Q_{100}	Minimum Size	Type	Ponding Depth (feet)
B	101	3.37	5'	Curb 1A	0.3
C	102	2.24	5'	Curb 1A	0.24
D	103	10.3	10'	Curb 1A	0.48
E	104	13.4	10'	Curb 1A	0.5
J	205	2.4	2'x2'	Area	0.23
K	204	3.7	2'x2'	Area	0.3
L	203	6.84	2'x2'	Area	0.45
M	202	6.42	5'	Curb 1A	0.5
N	201	3.98	5'	Curb 1A	0.35
O	120	5.48	2'x2'	Area	0.38
P	118	5.75	2'x2'	Area	0.4
Q	119	8.72	2'x4'	Area	0.39
R	115	5.8	2'x2'	Area	0.4
S	116	9.25	2'x4'	Area	0.41
T	117	1.57	2'x2'	Area	0.17
U	121	1.85	2'x2'	Area	0.18
W	109	6.63	5'	Curb 1A	0.5
X	105	8.5	10'	Curb 1A	0.42
Y	110	3.12	2'x2'	Area	0.3
Z	111	4.31	2'x2'	Area	0.34
AA	112	3.63	2'x2'	Area	0.32
BB	113	3.64	2'x2'	Area	0.32
CC	114	6.26	2'x2'	Area	0.42
DD	307	5.14	2'x2'	Area	0.38
FF	305	4.91	2'x2'	Area	0.36
GG	306	3.97	2'x2'	Area	0.3
II	308	14.3	10'	Curb 1A	0.55
JJ	309	11.24	10'	Curb 1A	0.5
KK	403	2.88	5'	Curb 1A	0.28
MM	401	11.28	10'	Curb 1A	0.5
OO	304	7.72	5'	Curb 1A	0.6
PP	303	1.66	5'	Curb 1A	0.2
QQ	302	10.95	10'	Curb 1A	0.49
RR	301	6.01	5'	Curb 1A	0.47
TT	106	7.27	5'	Curb 1A	0.55
UU	108	6.38	5'	Curb 1A	0.48
VV	402	4.56	5'	Curb 1A	0.38
Pond #1	123	52.8	4'x4'	Area	2.6
Pond #3	122	11.2	2'x4'	Area	0.48
Pond #4	206	13.8	2'x4'	Area	0.55
Pond #5	404	9	2'x4'	Area	0.4
Pond #7	310	43.9	4'x4'	Area	1

Note: To minimize risk of plugged inlets, all area inlets in backyards shall be no smaller than 2'x4' in size.

Remington Place
PEC Project No. 36-00479-1-2090

Inlet Sizing was based on City of Wichita Std. Type 1A Curb Inlets with openings of 5 or 10 feet.

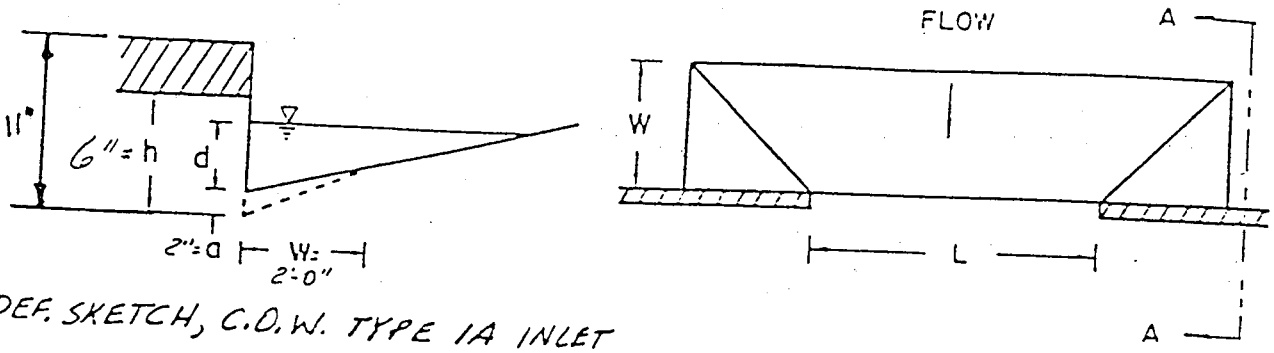
Curb Inlets
Ponding depth <0.8' for Standard Curb (6 5/8")
Ponding depth <0.6' for Roll Curb (3 5/8")

Area Inlets were sized as follows:

2'x2' Area Inlet
Neenah Grate R-4826
1.3 Square Feet of Open Area
8 feet Perimeter

2'x4' Area Inlet
Neenah Grate R-4853-A
3.1 Square Feet of Open Area
11.5 feet Perimeter

4'x4' Area Inlet
2- Neenah Grates R-4853-A
6.2 Square Feet of Open Space
15.5 feet Perimeter



DEF. SKETCH, C.O.W. TYPE 1A INLET

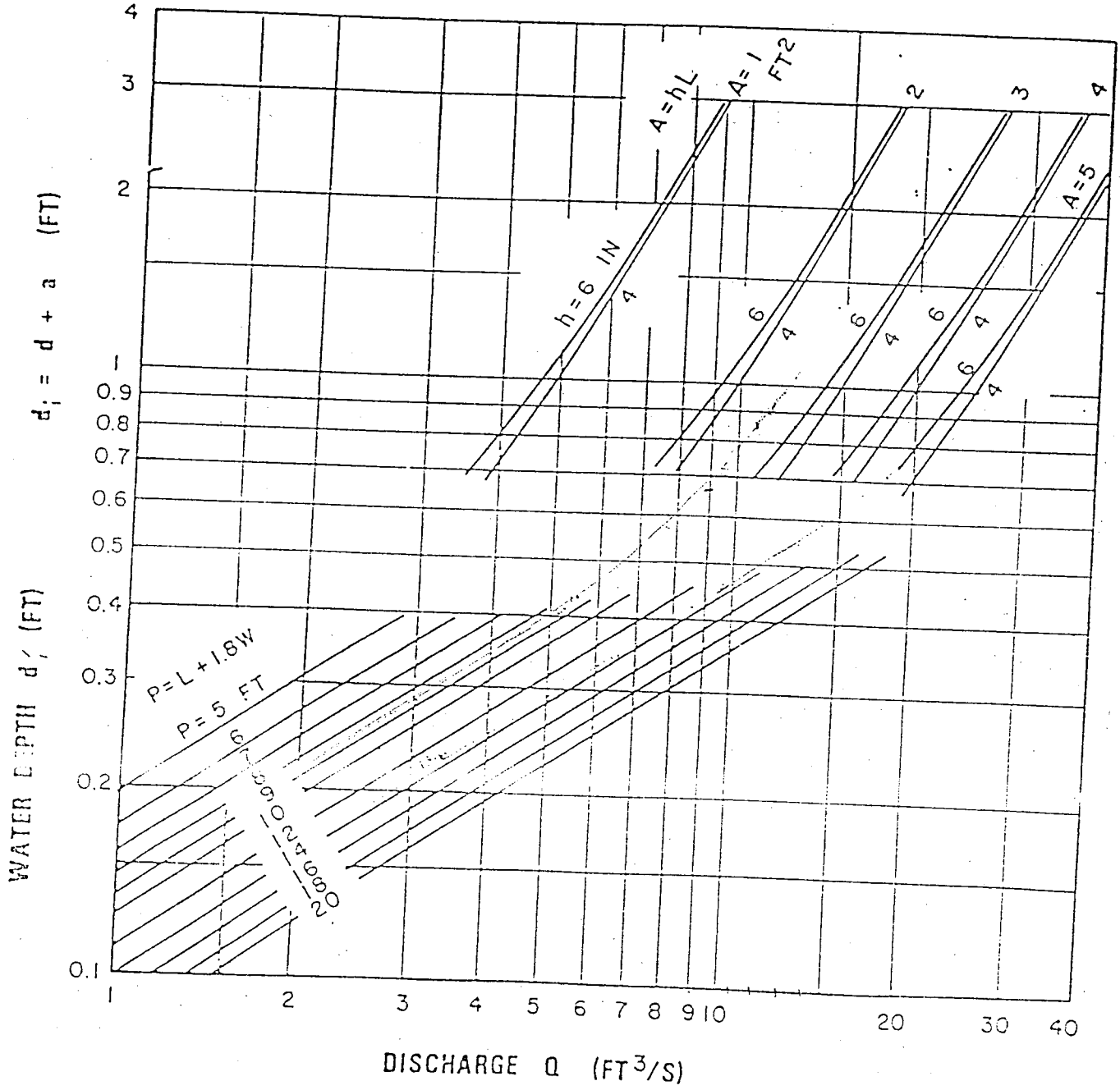


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, FHWA, May 1984

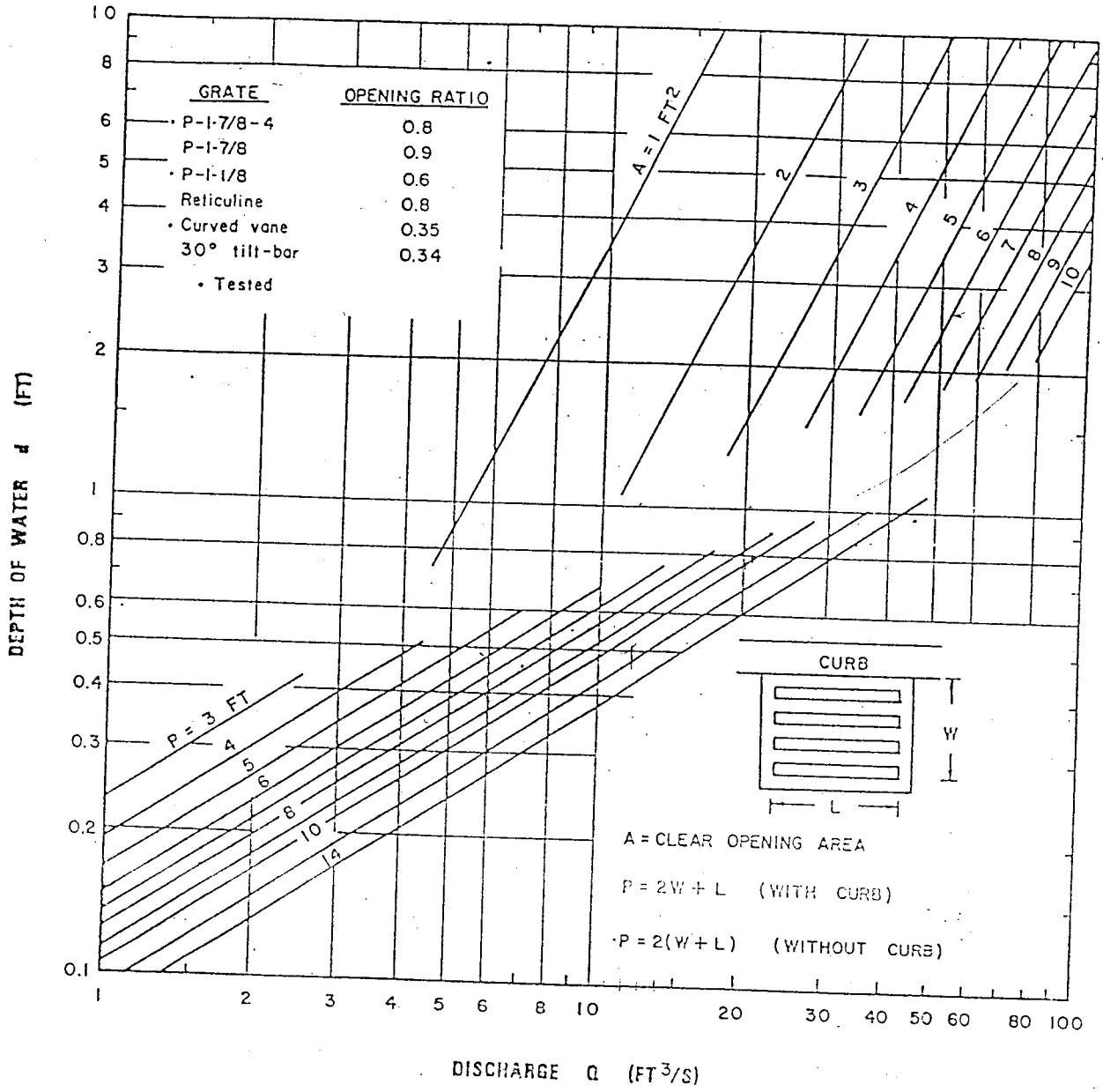


CHART 11. Grate inlet capacity in sump conditions.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR 1984

Street Capacity

2-Year Design Storm

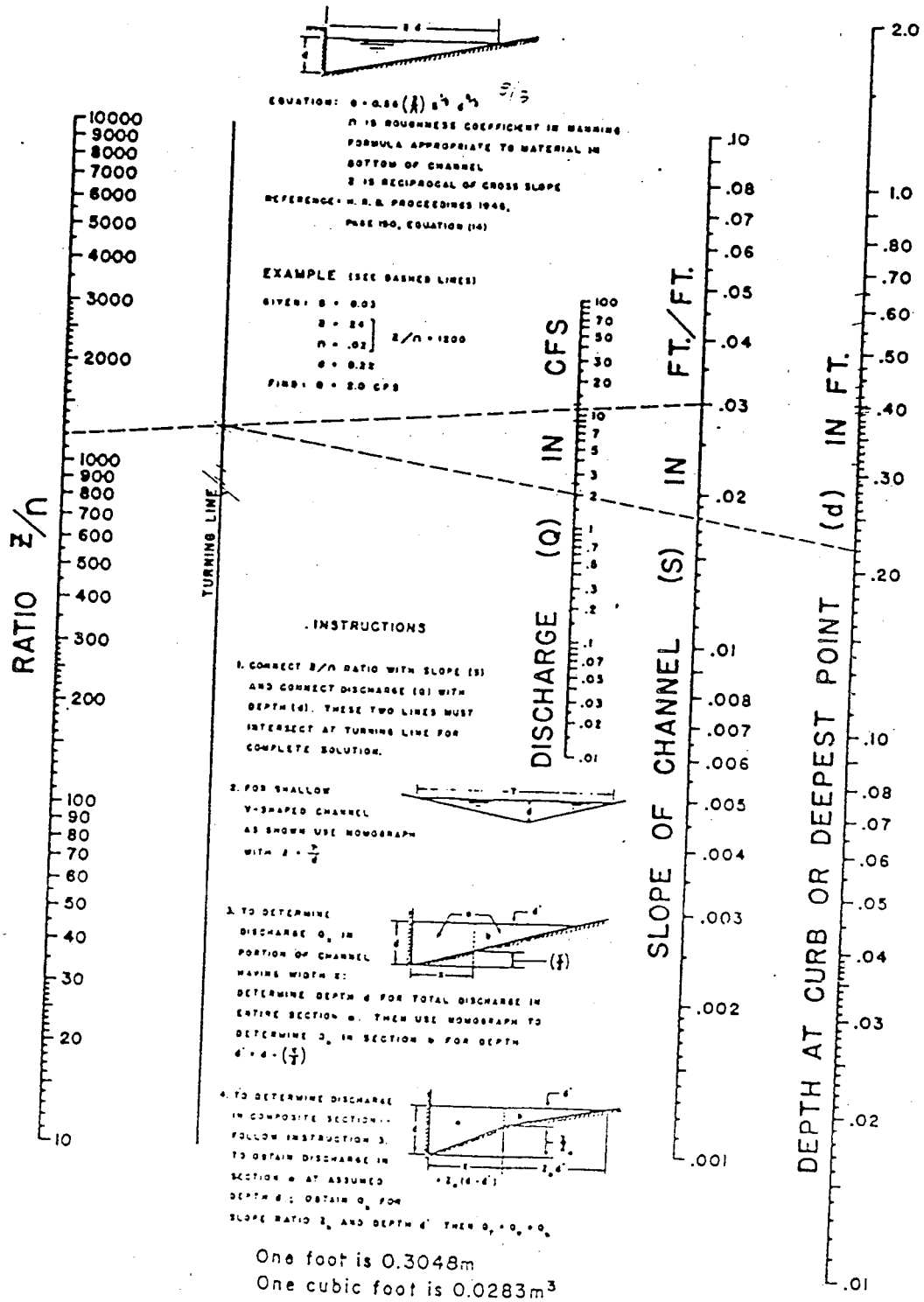
Residential - Local Street
Allowable Depth = 0.55' for Standard Curb (6 5/8")
Allowable Depth = 0.3' for Roll Curb (3 5/8")

No Curb Overtopping
Minimum Street Slope = 0.5%
Street Cross Slope = 3/8"/ft
Q_2 Maximum = 13 cfs in the street (Std. Curb)
Q_2 Maximum = 3 cfs in the street (Roll Curb)

Basin(s)	Q_2 (cfs)	Std. Curb	Roll Curb
A	6.11	OK	OK for Lots 22, Blk 7, Lot 12, Blk 3 & Lot 31, Blk 6
B	1.14	OK	OK
C	0.76	OK	OK
D	3.48	OK	OK
E	4.53	OK	OK
M	2.17	OK	OK
N	1.35	OK	OK
EE	9.84	OK	OK
X	2.87	OK	OK
TT	2.45	OK	OK
R	1.96	OK	OK
P	1.94	OK	OK
W	2.24	OK	OK
UU	2.15	OK	OK
VV	1.54	OK	OK
KK	0.97	OK	OK
MM	3.81	OK	OK
OO	2.61	OK	OK
QQ	3.7	OK	OK Except northwest edge of Reserve "G"
PP	0.56	OK	OK
RR	2.03	OK	OK
JJ	3.8	OK	OK
II	4.83	OK	OK

See Enclosed Map for Curb Limits

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS



One foot is 0.3048m

One cubic foot is $0.0283 m^3$

Street Capacity

100-Year Design Storm

Residential - Local Street
Allowable Depth = 0.85' for Standard Curb (6 5/8")
Allowable Depth = 0.6' for Roll Curb (3 5/8")

29' Bk-Bk
Std. Curb $Q=764.5*(slope)^{1/2}$
Roll Curb $Q=331.3*(slope)^{1/2}$

35' Bk-Bk
Roll Curb $Q=420.88*(slope)^{1/2}$

Basin(s)	Street Width	Q_{100} (cfs)	Q_{max} (cfs)	Slope (Min.)	Roll Curb
A	35'	18.1	42.09	1%	OK
B+C	35'	5.61	29.76	0.50%	OK
D+E	35'	23.7	42.09	1%	OK
M+N	35'	10.4	29.76	0.50%	OK
EE	35'	22	29.76	0.50%	OK
X+TT	35'	15.8	29.76	0.50%	OK
R	29'	5.8	23.43	0.50%	OK
P	29'	5.75	23.43	0.50%	OK
W+UU	29'	13	25.66	0.60%	OK
VV+KK	29'	7.44	29.63	0.80%	OK
MM	29'	11.28	33.13	1%	OK
OO+QQ	29'	18.7	23.43	0.50%	OK
OO+PP	29'	9.38	23.43	0.50%	OK
QQ+RR	29'	16.96	23.43	0.50%	OK
JJ+II	35'	25.5	29.76	0.50%	OK

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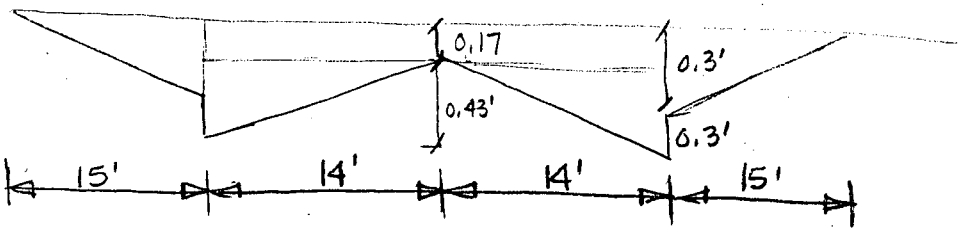
www.pec1.com • designers@pec1.com

Project _____ Date _____

Item _____ By _____

100-yr. design storm

58' Right-of-Way (Roll Curb)



$$n = \frac{(2 \times 14.5 \times 0.03)_{\text{grass}} + (2 \times 2.8 \times 0.013)_{\text{curb}} + (2 \times 12 \times 0.016)_{\text{asphalt}}}{58.6 \text{ ft}}$$

$= 0.022641638$

$A = (2 \times \frac{1}{2} \times 0.3 \times 15) + (28 \times 0.17) + (\frac{1}{2} \times 2 \times 0.3 \times 14)$

$A = 13.46$ sq. ft

$P = 58.6$

$R = A/P = \frac{13.46}{58.6} = 0.2297 \qquad R^{2/3} = 0.37506$

$Q = \frac{1.486}{n} A \cdot R^{2/3} \sqrt{S}$

$Q = 331.3 \sqrt{S}$

$S_{min} = 0.5\%$

$Q_{min} = 23.4$ cfs

$S = 1\%$

$Q = 33$ cfs

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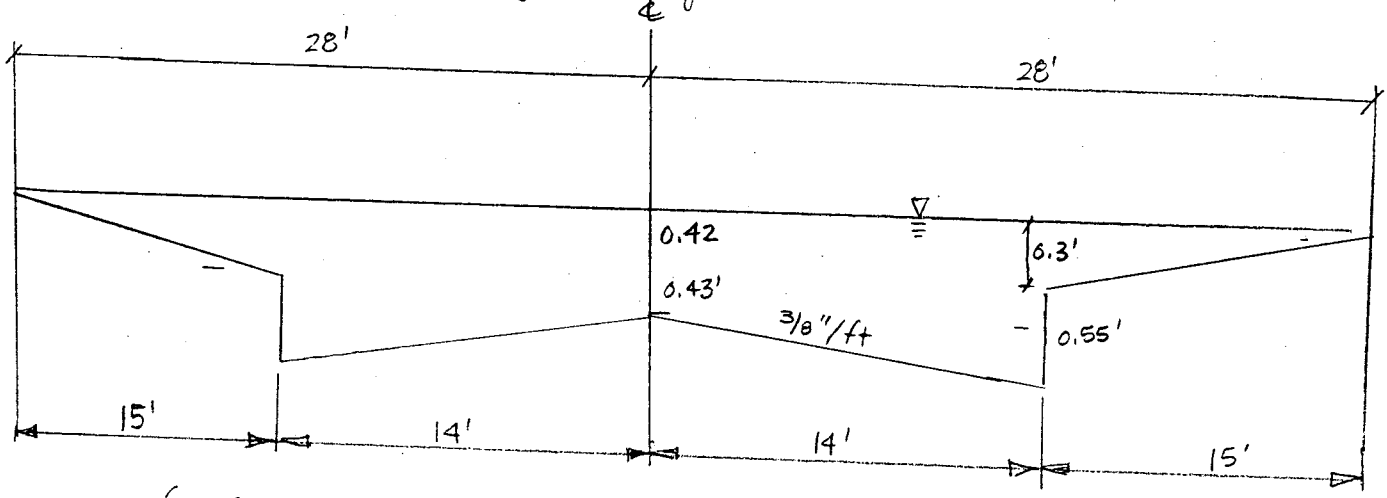
Project Remington Place Date 12/15/00

Item Street Capacity By KER

100-year design storm

29' Bk - Bk in 58' of Right-of-Way (Std. Curb 6 5/8")



$$n = \frac{(2 \times 14.5 \times 0.03)_{\text{Grass}} + (2 \times 3.05 \times 0.013)_{\text{curb}} + (2 \times 12 \times 0.016)_{\text{asphalt}}}{59.1}$$

$n = 0.0226$

$A = (2 \times \frac{1}{2} \times 15 \times 0.3) + (28 \times 0.42) + (2 \times \frac{1}{2} \times 14 \times 0.43)$

$= 22.28$ sq. ft

$P = 59.1$ ft

$R = A/P = 22.28/59.1 = 0.377 \qquad R^{2/3} = 0.5219$

$Q = \frac{1.486}{n} \cdot A \cdot R^{2/3} \sqrt{S}$

$Q = 764.5\sqrt{S}$

S minimum = 0.5%

$Q_{min} = 54$ cfs

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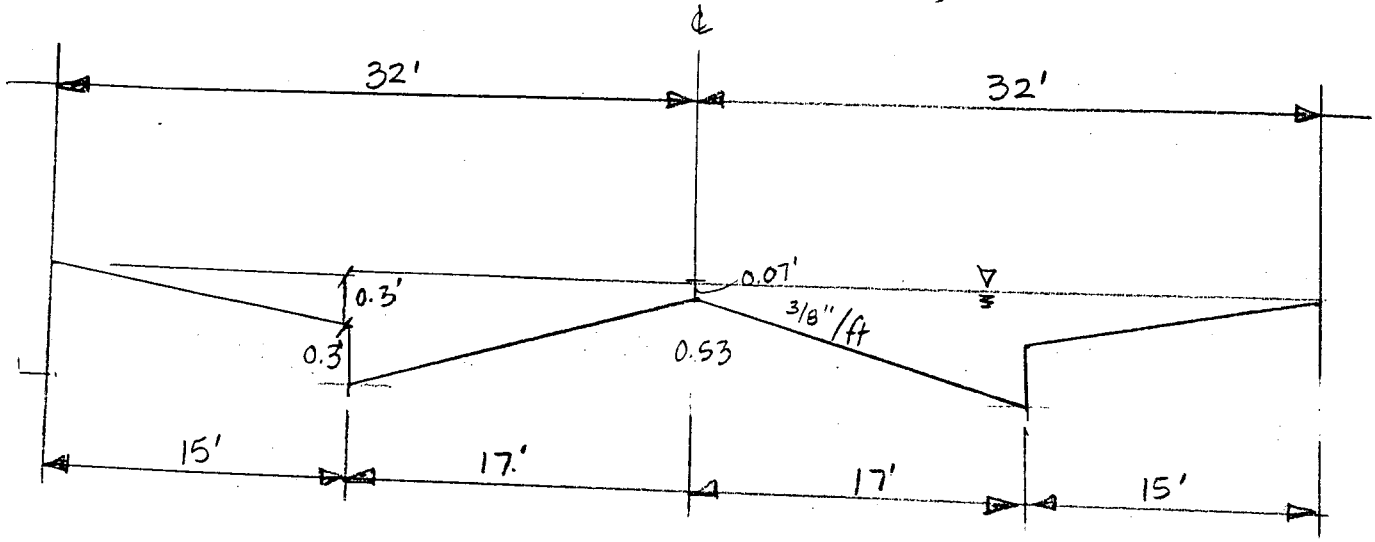
Project Street Capacity Date

Item 100-yr design storm By

35' Bk-Bk in 64' w/ roll curb (3⅝")



$$n = \frac{(2 \times 14.5 \times 0.03) + (2 \times 2.8 \times 0.013) + (2 \times 15 \times 0.016)}{64.6}$$ (grass)

$$= \frac{0.87 + 0.0728 + 0.48}{64.6} = 0.022024767$$

$$A = (2 \times \tfrac{1}{2} \times 15 \times 0.3) + (2 \times \tfrac{1}{2} \times 17 \times 0.53) + (0.07 \times 34)$$

$$= 15.89$$

$$P = 64.6$$

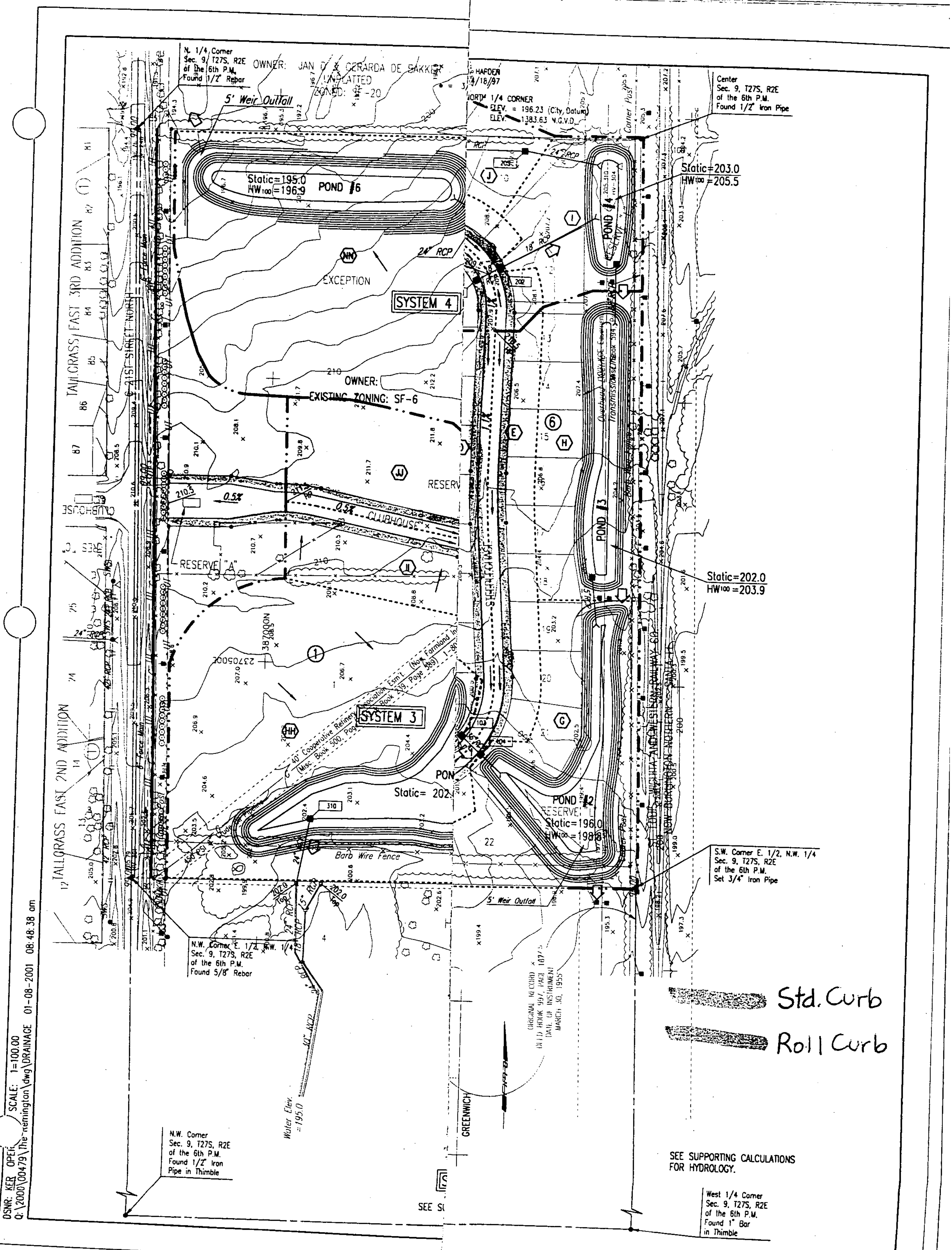
$$R = \frac{A}{P} = \frac{15.89}{64.6} = 0.24598 \qquad R^{2/3} = 0.39258$$

$$Q = \frac{1.486}{n} \cdot A \cdot R^{2/3} \sqrt{S}$$

$$Q = 420.88 \sqrt{S}$$

$S_{minimum} = 0.5\%$

$$Q_{min} = 29.8 \text{ cfs}$$



OWNER: JAN D. & GERARDA DE BAKKER
UNPLATTED
ZONED: SF-20
N. 1/4 Corner Sec. 9, T27S, R2E of the 6th P.M. Found 1/2" Rebar
5' Weir Outfall
NORTH 1/4 CORNER ELEV. = 196.23 (City Datum) ELEV. = 1383.63 N.G.V.D.
Center Sec. 9, T27S, R2E of the 6th P.M. Found 1/2" Iron Pipe
Static=195.0
HW100=196.9
POND 6
Static=203.0
HW100=205.5
POND 4
24" RCP
18" RCP
EXCEPTION
SYSTEM 4
TALLGRASS EAST 3RD ADDITION
41ST STREET NORTH
OWNER:
EXISTING ZONING: SF-6
RESERVE
CLUBHOUSE
0.5%
RESERVE "A"
POND 3
Static=202.0
HW100=203.9
STEEPLECHASE
SYSTEM 3
40' Cooperative Refinery Association Esmt. (Now Farmland Ind.) (Misc. Book 500, Page 519, Page 589)
Static= 202.
POND 2
RESERVE
Static=196.0
HW100=198.8
Barb Wire Fence
TALLGRASS EAST 2ND ADDITION
THE WICHITA AND WESTERN RAILWAY CO. NOW BURLINGTON NORTHERN - SANTA FE
S.W. Corner E. 1/2, N.W. 1/4 Sec. 9, T27S, R2E of the 6th P.M. Set 3/4" Iron Pipe
5' Weir Outfall
N.W. Corner E. 1/2, N.W. 1/4 Sec. 9, T27S, R2E of the 6th P.M. Found 5/8" Rebar
ORIGINAL RECORD DEED BOOK 997, PAGE 1072 DATE OF INSTRUMENT MARCH 30, 1955
Std. Curb
Roll Curb
Water Elev. =195.0
GREENWICH
N.W. Corner Sec. 9, T27S, R2E of the 6th P.M. Found 1/2" Iron Pipe in Thimble
SEE SUPPORTING CALCULATIONS FOR HYDROLOGY.
West 1/4 Corner Sec. 9, T27S, R2E of the 6th P.M. Found 1" Bar in Thimble
DSNR: KER OPER:
SCALE: 1=100.00
Q:\2000\00479\The Remington\dwg\DRAINAGE 01-08-2001 08:48:38 am

ATTACHMENT E

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forrest with Heavy Ground Litter or Meadow	0.08	0.11	0.14	0.16	0.18	0.19	0.20	0.22	0.23	0.25	0.35	0.42	0.50	0.55	0.60	0.66	0.70	0.75	0.80	1.10
Fallow or Minimum Tillage Cultivation	0.15	0.21	0.26	0.29	0.33	0.35	0.39	0.41	0.44	0.46	0.65	0.80	0.92	1.10	1.20	1.30	1.40	1.50	1.60	2.10
Short Grass Pasture or Lawns	0.23	0.32	0.38	0.44	0.50	0.53	0.58	0.62	0.66	0.70	1.00	1.20	1.40	1.60	1.80	1.90	2.00	2.10	2.20	3.20
Almost Bare Ground	0.32	0.44	0.53	0.62	0.69	0.75	0.82	0.87	0.92	0.98	1.40	1.70	1.90	2.10	2.30	2.50	2.70	2.90	3.10	4.40
Grassed Waterway	0.50	0.68	0.83	0.95	1.10	1.20	1.30	1.40	1.50	1.60	2.20	2.60	3.00	3.40	3.70	4.00	4.30	4.60	4.80	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.63	0.89	1.10	1.30	1.50	1.60	1.70	1.80	1.90	2.00	2.80	3.40	4.00	4.50	4.90	5.30	5.70	6.00	6.20	9.00

ATTACHMENT D (3 pages)

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
Single-Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	25	100
Single Family (Soil Group A)						
1/8 Acre	50	0.47	0.50	0.54		0.60
1/4 Acre	38	0.39	0.41	0.45		0.52
1/3 Acre	30	0.33	0.35	0.39		0.47
1/2 Acre	25	0.30	0.31	0.35		0.44
3/4 Acre	22	0.28	0.29	0.33		0.42
1 Acre	20	0.26	0.28	0.32		0.40
Multi-Family (Soil Group A)						
Multi-Unit (detached)	60	0.55	0.57	0.61		0.67
Multi-Unit (attached)	65	0.58	0.60	0.64		0.70
Apartments	75	0.65	0.68	0.72		0.77
3. Industrial:						
Light Areas	70	0.68	0.69	0.73		0.80
Heavy Areas	80	0.74	0.76	0.79		0.84
4. Playgrounds:	15	0.33	0.35	0.42		0.55
5. Schools:	40	0.49	0.51	0.56		0.66
Railroad Yard Areas:	30	0.43	0.45	0.50		0.62
7. Undeveloped Urban Areas: Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59		0.68
8. Streets:						
Paved	99	0.87	0.88	0.90		0.93
Gravel	00	0.24	0.26	0.33		0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88		0.89
10. Roofs:	90	0.80	0.85	0.90		0.93
11. Urban Lawn Areas (See Note No. 1 below):						
Soil Group A						
Slope less than 1%	00	0.08	0.09	0.13		0.23
Slope 1% to 4%	00	0.12	0.13	0.17		0.27
Slope more than 4%	00	0.16	0.17	0.21		0.31
Soil Group B						
Slope less than 1%	00	0.16 0.26	0.18	0.24		0.37
Slope 1% to 4%	00	0.20	0.22	0.28		0.41
Slope more than 4%	00	0.24	0.26	0.32		0.45
Soil Group C						
Slope less than 1%	00	0.24	0.27	0.35		0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.43	0.53
Slope more than 4%.	00	0.28	0.31	0.39		0.55

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Soil Group D					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for large basins.

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY KANSAS
(revised June 1997)

This table contains average rainfall intensities in inches per hour.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.91	5.64	6.64	7.38	8.48	9.34	10.20
0:06	4.62	5.34	6.33	7.07	8.15	9.00	9.84
0:07	4.38	5.09	6.08	6.80	7.86	8.69	9.52
0:08	4.17	4.87	5.85	6.56	7.60	8.41	9.22
0:09	4.00	4.68	5.63	6.33	7.34	8.14	8.93
0:10	3.84	4.50	5.43	6.11	7.10	7.87	8.64
0:11	3.70	4.34	5.25	5.90	6.86	7.61	8.36
0:12	3.56	4.19	5.07	5.71	6.64	7.36	8.09
0:13	3.44	4.05	4.91	5.53	6.43	7.14	7.84
0:14	3.33	3.92	4.76	5.36	6.24	6.92	7.61
0:15	3.22	3.80	4.62	5.21	6.06	6.73	7.40
0:16	3.12	3.69	4.49	5.07	5.91	6.56	7.21
0:17	3.03	3.58	4.37	4.94	5.76	6.40	7.04
0:18	2.94	3.48	4.26	4.82	5.63	6.26	6.88
0:19	2.85	3.39	4.16	4.71	5.50	6.12	6.74
0:20	2.77	3.30	4.06	4.60	5.38	5.99	6.60
0:21	2.70	3.22	3.97	4.50	5.27	5.87	6.47
0:22	2.63	3.14	3.88	4.41	5.17	5.76	6.35
0:23	2.56	3.07	3.80	4.32	5.07	5.65	6.23
0:24	2.50	3.00	3.72	4.23	4.97	5.54	6.12
0:25	2.44	2.93	3.64	4.15	4.88	5.44	6.01
0:26	2.38	2.87	3.57	4.07	4.79	5.35	5.90
0:27	2.33	2.81	3.50	4.00	4.70	5.26	5.80
0:28	2.27	2.75	3.44	3.92	4.62	5.17	5.71
0:29	2.23	2.69	3.37	3.86	4.54	5.08	5.61
0:30	2.18	2.64	3.31	3.79	4.47	4.99	5.52
0:31	2.14	2.59	3.26	3.72	4.39	4.91	5.43
0:32	2.09	2.54	3.20	3.66	4.32	4.83	5.34
0:33	2.05	2.50	3.14	3.60	4.25	4.76	5.26
0:34	2.02	2.45	3.09	3.54	4.18	4.68	5.18
0:35	1.98	2.41	3.04	3.48	4.12	4.61	5.10
0:36	1.94	2.37	2.99	3.43	4.05	4.54	5.02
0:37	1.91	2.33	2.94	3.38	3.99	4.47	4.95
0:38	1.88	2.29	2.90	3.32	3.93	4.40	4.87
0:39	1.85	2.25	2.85	3.27	3.87	4.34	4.80
0:40	1.82	2.22	2.81	3.23	3.82	4.28	4.73
0:41	1.79	2.18	2.77	3.18	3.76	4.22	4.67
0:42	1.76	2.15	2.73	3.13	3.71	4.16	4.60
0:43	1.73	2.12	2.69	3.09	3.66	4.10	4.54
0:44	1.71	2.09	2.65	3.05	3.61	4.04	4.48
0:45	1.68	2.06	2.62	3.01	3.56	3.99	4.42
0:46	1.66	2.03	2.58	2.96	3.51	3.94	4.36
0:47	1.63	2.00	2.55	2.93	3.47	3.89	4.30
0:48	1.61	1.97	2.51	2.89	3.42	3.84	4.25
0:49	1.59	1.95	2.48	2.85	3.38	3.79	4.20
0:50	1.57	1.92	2.45	2.81	3.34	3.74	4.15

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY KANSAS
(revised June 1997)

This table contains average rainfall intensities in inches per hour.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:51	1.55	1.90	2.42	2.78	3.30	3.70	4.10
0:52	1.53	1.87	2.39	2.75	3.26	3.65	4.05
0:53	1.51	1.85	2.36	2.71	3.22	3.61	4.00
0:54	1.49	1.83	2.33	2.68	3.18	3.57	3.95
0:55	1.47	1.80	2.30	2.65	3.14	3.53	3.91
0:56	1.45	1.78	2.28	2.62	3.11	3.49	3.86
0:57	1.43	1.76	2.25	2.59	3.07	3.45	3.82
0:58	1.41	1.74	2.22	2.56	3.04	3.41	3.78
0:59	1.40	1.72	2.20	2.53	3.01	3.37	3.74
1:00	1.38	1.70	2.17	2.50	2.97	3.34	3.70
1:05	1.30	1.61	2.06	2.38	2.82	3.17	3.52
1:10	1.23	1.53	1.96	2.26	2.69	3.02	3.35
1:15	1.17	1.45	1.87	2.16	2.57	2.89	3.20
1:20	1.11	1.38	1.79	2.06	2.46	2.77	3.07
1:25	1.06	1.32	1.71	1.98	2.36	2.65	2.95
1:30	1.01	1.27	1.64	1.90	2.27	2.55	2.83
1:35	0.97	1.21	1.58	1.83	2.18	2.46	2.73
1:40	0.93	1.16	1.52	1.76	2.10	2.37	2.63
1:45	0.89	1.12	1.46	1.70	2.03	2.29	2.54
1:50	0.86	1.08	1.41	1.64	1.96	2.21	2.46
1:55	0.82	1.04	1.36	1.58	1.89	2.13	2.38
2:00	0.79	1.00	1.31	1.53	1.83	2.07	2.30
2:05	0.76	0.97	1.27	1.48	1.77	2.00	2.23
2:10	0.74	0.93	1.23	1.43	1.72	1.94	2.16
2:15	0.71	0.90	1.19	1.39	1.67	1.88	2.10
2:20	0.69	0.87	1.15	1.35	1.62	1.83	2.04
2:25	0.66	0.85	1.12	1.31	1.57	1.78	1.98
2:30	0.64	0.82	1.09	1.27	1.53	1.73	1.93
2:35	0.62	0.80	1.06	1.24	1.49	1.68	1.88
2:40	0.61	0.78	1.03	1.21	1.45	1.64	1.83
2:45	0.59	0.75	1.01	1.18	1.42	1.60	1.79
2:50	0.57	0.74	0.98	1.15	1.38	1.56	1.74
2:55	0.56	0.72	0.96	1.12	1.35	1.53	1.70
3:00	0.55	0.70	0.94	1.10	1.32	1.49	1.67
3:15	0.51	0.66	0.88	1.03	1.24	1.40	1.57
3:30	0.48	0.62	0.83	0.97	1.17	1.32	1.48
3:45	0.45	0.59	0.78	0.92	1.11	1.26	1.40
4:00	0.43	0.56	0.75	0.88	1.06	1.20	1.34
4:15	0.41	0.53	0.71	0.84	1.01	1.14	1.28
4:30	0.40	0.51	0.68	0.80	0.97	1.10	1.22
4:45	0.38	0.49	0.66	0.77	0.93	1.05	1.17
5:00	0.37	0.47	0.63	0.74	0.89	1.01	1.13
5:15	0.36	0.46	0.61	0.72	0.86	0.98	1.09
5:30	0.35	0.44	0.59	0.69	0.83	0.94	1.05
5:45	0.34	0.43	0.57	0.67	0.81	0.91	1.02
6:00	0.33	0.42	0.55	0.65	0.78	0.88	0.98

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY KANSAS
(revised June 1997)

This table contains average rainfall intensities in inches per hour.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
6:30	0.31	0.39	0.52	0.61	0.73	0.83	0.92
7:00	0.29	0.37	0.49	0.58	0.69	0.78	0.87
7:30	0.28	0.35	0.47	0.55	0.66	0.74	0.83
8:00	0.27	0.34	0.45	0.52	0.62	0.70	0.78
8:30	0.26	0.32	0.43	0.50	0.60	0.67	0.75
9:00	0.25	0.31	0.41	0.47	0.57	0.64	0.71
9:30	0.24	0.30	0.39	0.45	0.54	0.61	0.68
10:00	0.23	0.29	0.38	0.44	0.52	0.59	0.66
10:30	0.22	0.28	0.36	0.42	0.50	0.57	0.63
11:00	0.21	0.27	0.35	0.41	0.48	0.55	0.61
11:30	0.21	0.26	0.34	0.39	0.47	0.53	0.59
12:00	0.20	0.25	0.33	0.38	0.45	0.51	0.57
13:00	0.19	0.24	0.31	0.36	0.42	0.48	0.53
14:00	0.18	0.22	0.29	0.33	0.40	0.45	0.50
15:00	0.17	0.21	0.27	0.32	0.38	0.43	0.47
16:00	0.16	0.20	0.26	0.30	0.36	0.40	0.45
17:00	0.15	0.19	0.25	0.29	0.34	0.39	0.43
18:00	0.15	0.18	0.24	0.27	0.33	0.37	0.41
19:00	0.14	0.18	0.23	0.26	0.31	0.35	0.39
20:00	0.14	0.17	0.22	0.25	0.30	0.34	0.38
21:00	0.13	0.16	0.21	0.24	0.29	0.33	0.36
22:00	0.13	0.16	0.20	0.23	0.28	0.31	0.35
23:00	0.12	0.15	0.20	0.23	0.27	0.30	0.34
24:00	0.12	0.15	0.19	0.22	0.26	0.29	0.32

Remington Place

Soil Type "D"

Existing

Time of Concentration
Varies - See Table

Pasture - 1-4% Slopes
C_2=0.26
C_5=0.31
C_{10}=0.41
C_{100}=0.61

Existing Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	t_c (minutes)
System 1	37.04	27.6	41.0	61.8	133.3	26
System 2	10.75	10.6	15.4	23.0	48.5	15
System 3	20.64	20.4	29.6	44.1	93.2	15
System 4	12.63	12.5	18.1	27.0	57.0	15
Total	81.06	71.1	104.0	155.8	332.0	

Developed

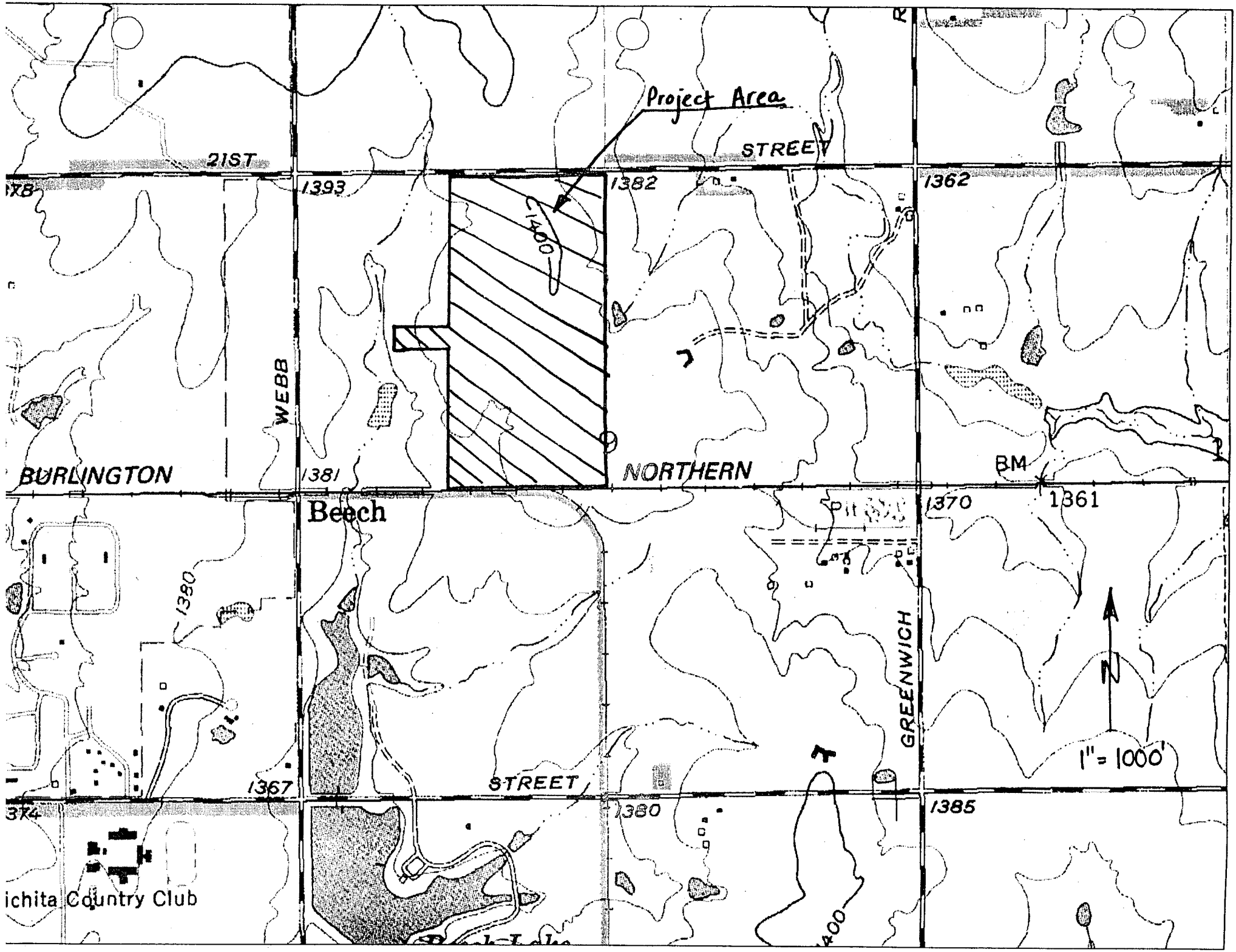
Time of Concentration=15 min
i_2=3.80 in/hr
i_5=4.62 in/hr
i_{10}=5.21 in/hr
i_{100}=7.40 in/hr

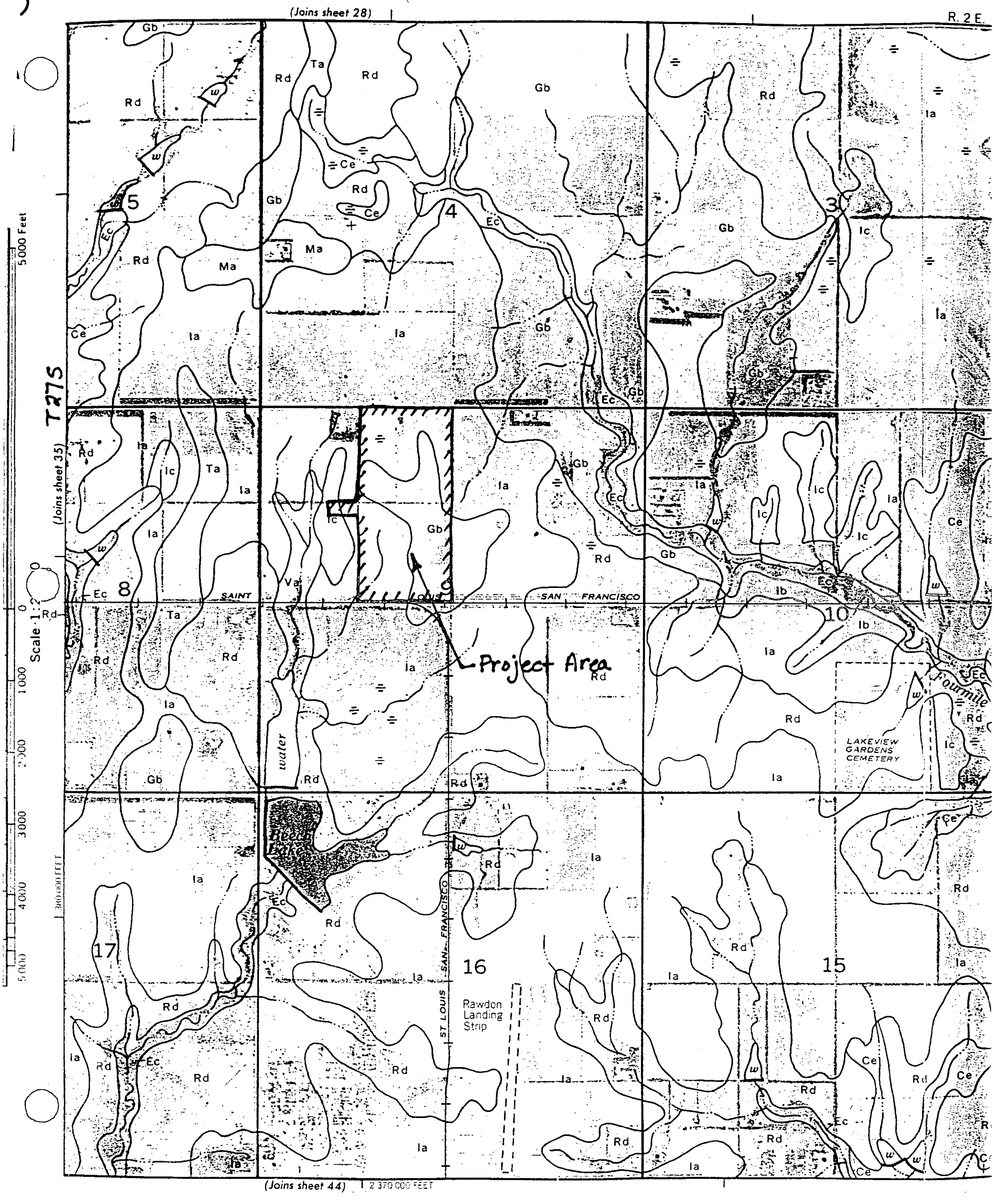
1/4 Ac. Residential
C_2=0.50
C_5=0.54
C_{10}=0.62
C_{100}=0.76

Commercial (80-85% Imp.)
C_2=0.74
C_5=0.76
C_{10}=0.79
C_{100}=0.84

Developed Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Inlet (node)	System
A	3.21	6.11	8.02	10.38	18.08	Offsite	1
B	0.60	1.14	1.49	1.93	3.37	101	1
C	0.40	0.76	0.99	1.29	2.24	102	1
D	1.83	3.48	4.57	5.92	10.30	103	1
E	2.38	4.53	5.95	7.70	13.41	104	1
F	1.41	2.68	3.51	4.55	7.92	Offsite	1
G	3.18	6.05	7.94	10.28	17.90	Pond #2	1
H	2.28	4.33	5.69	7.36	12.82	Pond #3	1
I	1.43	2.71	3.56	4.61	8.02	Pond #4	2
J	0.43	0.81	1.06	1.38	2.40	205	2
K	0.66	1.25	1.64	2.12	3.70	204	2
L	1.22	2.31	3.04	3.93	6.84	203	2
M	1.14	2.17	2.85	3.69	6.42	202	2
N	0.71	1.35	1.77	2.29	3.98	201	2
O	0.97	1.85	2.43	3.15	5.48	120	1
P	1.02	1.94	2.55	3.30	5.75	118	1
Q	1.55	2.95	3.87	5.01	8.72	119	1
R	1.03	1.96	2.57	3.33	5.80	115	1
S	1.64	3.12	4.10	5.31	9.25	116	1
T	0.28	0.53	0.70	0.90	1.57	117	1
U	0.33	0.63	0.82	1.06	1.85	121	1
V	6.06	11.52	15.13	19.59	34.10	Pond #1	1
W	1.18	2.24	2.94	3.81	6.63	109	1
X	1.51	2.87	3.77	4.88	8.50	105	1
Y	0.56	1.06	1.39	1.79	3.12	110	1
Z	0.77	1.46	1.91	2.47	4.31	111	1
AA	0.65	1.23	1.61	2.09	3.63	112	1
BB	0.65	1.23	1.61	2.09	3.64	113	1
CC	1.11	2.11	2.78	3.59	6.26	114	1
DD	0.91	1.74	2.28	2.95	5.14	311	3
EE	5.18	9.84	12.91	16.72	29.11	Offsite	2
FF	0.87	1.66	2.18	2.82	4.91	305	3
GG	0.71	1.34	1.76	2.28	3.97	306	3
HH	6.42	12.20	16.02	20.74	36.11	Pond #7	3
II	2.54	4.83	6.34	8.21	14.30	308	3
JJ	2.00	3.80	4.99	6.45	11.24	309	3
KK	0.51	0.97	1.28	1.65	2.86	403	4
LL	1.53	2.92	3.83	4.96	8.63	Pond #5	4
MM	2.01	3.81	5.00	6.48	11.28	401	4
NN	7.76	14.75	19.37	25.08	43.66	Pond #6	4
OO	1.37	2.61	3.42	4.43	7.72	304	3
PP	0.30	0.56	0.74	0.96	1.66	303	3
QQ	1.95	3.70	4.86	6.29	10.95	302	3
RR	1.07	2.03	2.67	3.45	6.01	301	3
SS	2.50	4.76	6.25	8.09	14.08	Pond #7	3
TT	1.29	2.45	3.22	4.17	7.27	106	1
UU	1.13	2.15	2.83	3.66	6.38	108	1
VV	0.81	1.54	2.02	2.62	4.56	402	4
Total	81.06	154.01	202.22	261.83	455.87		

HYDROLOGIC SUMMARY


Project Area
21ST
STREET
1393
1382
1362
1400
WEBB
BURLINGTON
1381
NORTHERN
BM
1370
1361
Beech
1380
GREENWICH
N
1" = 1000'
1367
STREET
1380
1385
ichita Country Club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R. 2 E.
T27S
(Joins sheet 35)
(Joins sheet 44)
5000 Feet
Scale 1:2
2 370 000 FEET
300 000 FEET
5
4
3
8
10
17
16
15
Project Area
SAINT LOUIS SAN FRANCISCO
ST LOUIS SAN FRANCISCO
water
Beech Lake
Fourmile
LAKEVIEW GARDENS CEMETERY
Rawdon Landing Strip

Remington Place
PEC Project No. 36-00479-1-2090

System 1

Soil Type "D"

Existing

Time of Concentration
Length = 1550 feet
Slope = 1-2%
Velocity = 1 ft/sec
t_c 26 minutes

i_2=2.87 in/hr
i_5=3.57 in/hr
i_{10}=4.07 in/hr
i_{100}=5.90 in/hr

Pasture - 1-4% Slopes
C_2=0.26
C_5=0.31
C_{10}=0.41
C_{100}=0.61

Existing Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	t_c (minutes)
System 1	37.04	27.6	41.0	61.8	133.3	26

Developed

Time of Concentration=15 min
i_2=3.80 in/hr
i_5=4.62 in/hr
i_{10}=5.21 in/hr
i_{100}=7.40 in/hr

1/4 Ac. Residential
C_2=0.50
C_5=0.54
C_{10}=0.62
C_{100}=0.76

Discharge - 100-yr Design Storm	
Pond #2	74.3 cfs
Basin A	18.1 cfs
Basin F	7.9 cfs
Total	100.3 cfs

Developed Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Inlet (node)
A	3.21	6.11	8.02	10.38	18.08	Offsite
B	0.60	1.14	1.49	1.93	3.37	101
C	0.40	0.76	0.99	1.29	2.24	102
D	1.83	3.48	4.57	5.92	10.30	103
E	2.38	4.53	5.95	7.70	13.41	104
F	1.41	2.68	3.51	4.55	7.92	Offsite
G	3.18	6.05	7.94	10.28	17.90	Pond #2
H	2.28	4.33	5.69	7.36	12.82	Pond #3
O	0.97	1.85	2.43	3.15	5.48	120
P	1.02	1.94	2.55	3.30	5.75	118
Q	1.55	2.95	3.87	5.01	8.72	119
R	1.03	1.96	2.57	3.33	5.80	115
S	1.64	3.12	4.10	5.31	9.25	116
T	0.28	0.53	0.70	0.90	1.57	117
U	0.33	0.63	0.82	1.06	1.85	121
V	6.06	11.52	15.13	19.59	34.10	Pond #1
W	1.18	2.24	2.94	3.81	6.63	109
X	1.51	2.87	3.77	4.88	8.50	105
Y	0.56	1.06	1.39	1.79	3.12	110
Z	0.77	1.46	1.91	2.47	4.31	111
AA	0.65	1.23	1.61	2.09	3.63	112
BB	0.65	1.23	1.61	2.09	3.64	113
CC	1.11	2.11	2.78	3.59	6.26	114
TT	1.29	2.45	3.22	4.17	7.27	106
UU	1.13	2.15	2.83	3.66	6.38	108
Total	37.04	70.37	92.40	119.64	208.30	

Pond #1

System 1

Elevation City Datum	Area Acres	Storage Volume Acre-feet	Discharge cfs
198	1.46	0	0
198.8	1.588	1.232	0
199	1.62	1.54	16.2
200	1.79	3.24	41.4
201	1.96	5.11	56

Pond #1 Outfall
Routed to Pond #2
120 L.F. 36" RCP
Flowline Elevation at Pond #1 = 194.0
Flowline Elevation at Pond #2 = 192.8
Tail Water = 198.8 (High Water in Pond #2)
Static Water Surface in Pond #1 = 198.0

HW_{100}= 200.8 City Datum
Q_{100}= 49.8 cfs

Inlet Sizing

Using Chart 11. Grate Inlet Capacity in Sump Conditions:

Basin	Node	Q_{100} (cfs)	Minimum Size	Type	Ponding Depth (feet)
Pond #1	123	49.8	4'x4'	Area	2.4

Area Inlets were sized as follows:

2'x2' Area Inlet
Neenah Grate R-4826
1.3 Square Feet of Open Area
8 feet Perimeter

2'x4' Area Inlet
Neenah Grate R-4853-A
3.1 Square Feet of Open Area
11.5 feet Perimeter

4'x4' Area Inlet
2- Neenah Grates R-4853-A
6.2 Square Feet of Open Space
15.5 feet Perimeter

CURRENT DATE: 01-03-2001
CURRENT TIME: 08:31:32

FILE DATE: 01-03-2001
FILE NAME: REMING1

Pond #1 Outlet
36" RCP to Pond #2

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS / SHAPE / MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	194.00	192.80	120.01	1 RCP	3.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: REMING1 DATE: 01-03-2001

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
198.80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
198.87	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.08	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.43	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.91	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
200.54	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
201.30	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
202.20	70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
203.25	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
204.43	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
205.75	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: REMING1 DATE: 01-03-2001

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
198.80	0.000	0.00	0.00	0.00
198.87	0.000	10.00	0.00	0.00
199.08	0.000	20.00	0.00	0.00
199.43	0.000	30.00	0.00	0.00
199.91	0.000	40.00	0.00	0.00
200.54	0.000	50.00	0.00	0.00
201.30	0.000	60.00	0.00	0.00
202.20	0.000	70.00	0.00	0.00
203.25	0.000	80.00	0.00	0.00
204.43	0.000	90.00	0.00	0.00
205.75	0.000	100.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 01-03-2001 FILE DATE: 01-03-2001
CURRENT TIME: 08:31:32 FILE NAME: REMING1

PERFORMANCE CURVE FOR CULVERT 1 - 1(3.00 (ft) BY 3.00 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	198.80	0.00	4.80	0-NF	0.00	0.00	0.00	6.00	0.00	0.00
10.00	198.87	1.34	4.87	4-FFt	0.74	0.99	3.00	6.00	1.41	0.00
20.00	199.08	2.09	5.08	4-FFt	1.07	1.43	3.00	6.00	2.83	0.00
30.00	199.43	2.69	5.43	4-FFt	1.34	1.77	3.00	6.00	4.24	0.00
40.00	199.91	3.29	5.91	4-FFt	1.59	2.06	3.00	6.00	5.66	0.00
50.00	200.54	3.99	6.54	4-FFt	1.83	2.29	3.00	6.00	7.07	0.00
60.00	201.30	4.84	7.30	4-FFt	2.08	2.49	3.00	6.00	8.49	0.00
70.00	202.20	5.86	8.20	4-FFt	2.38	2.65	3.00	6.00	9.90	0.00
80.00	203.25	7.07	9.25	4-FFt	3.00	2.81	3.00	6.00	11.32	0.00
90.00	204.43	8.43	10.43	4-FFt	3.00	2.97	3.00	6.00	12.73	0.00
100.00	205.75	9.95	11.75	4-FFt	3.00	3.00	3.00	6.00	14.15	0.00

El. inlet face invert 194.00 ft El. outlet invert 192.80 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	194.00 ft
OUTLET STATION	120.00 ft
OUTLET ELEVATION	192.80 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0100
CULVERT LENGTH ALONG SLOPE	120.01 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 01-03-2001
CURRENT TIME: 08:31:32

FILE DATE: 01-03-2001
FILE NAME: REMING1

TAILWATER

CONSTANT WATER SURFACE ELEVATION
198.80

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	35.00 ft
CREST LENGTH	150.00 ft
OVERTOPPING CREST ELEVATION	201.50 ft

Pond #2

System 1

Elevation City Datum	Area Acres	Storage Volume Acre-feet	Discharge cfs
196	0.7	0	0
197	0.82	0.76	16
198	0.93	1.64	45
199	1.05	2.63	83
200	1.17	3.74	128

Pond #2 Outfall
Routed Offsite to the west
5' Broadcrested Weir
Flowline Elevation at Pond #2 = 196.0
$Q=C*L*h^{3/2}$ C=3.2 L=5'

Static Water Surface in Pond #2 = 196.0

HW_{100}=	198.8	City Datum
Q_{100}=	77.0	cfs

Pond #3

System 1

Elevation City Datum	Area Acres	Storage Volume Acre-feet	Discharge cfs
202	0.53	0	0
203	0.63	0.58	10.3
204	0.73	1.26	11.3
205	0.83	2.04	12

Pond #3 Outfall
Routed to Pond #2
120 L.F. 15" RCP
Flowline Elevation at Pond #3 = 197.1
Flowline Elevation at Pond #2 = 193.5
Tail Water = 198.8 (High Water in Pond #2)
Static Water Surface in Pond #3 = 202.0

HW_{100}=	203.9	City Datum
Q_{100}=	11.2	cfs

Inlet Sizing

Using Chart 11. Grate Inlet Capacity in Sump Conditions:

Basin	Node	Q_{100} (cfs)	Minimum Size	Type	Ponding Depth (feet)
Pond #3	122	11.2	2'x4'	Area	0.48

Area Inlets were sized as follows:

2'x2' Area Inlet

Neenah Grate R-4826

1.3 Square Feet of Open Area
8 feet Perimeter

2'x4' Area Inlet

Neenah Grate R-4853-A

3.1 Square Feet of Open Area
11.5 feet Perimeter

4'x4' Area Inlet

2- Neenah Grates R-4853-A

6.2 Square Feet of Open Space
15.5 feet Perimeter

CURRENT DATE: 12-18-2000
CURRENT TIME: 09:45:27

FILE DATE: 12-18-2000
FILE NAME: REMING2

Pond #3 Outlet
15" RCP
Routed to Pond #2

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	197.10	193.50	120.05	1 RCP	1.25	1.25	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: REMING2 DATE: 12-18-2000

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
199.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.06	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.23	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.51	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.92	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
199.99	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
201.06	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
201.81	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
202.67	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
203.65	10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
204.74	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: REMING2 DATE: 12-18-2000

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
199.00	0.000	0.00	0.00	0.00
199.06	0.000	1.20	0.00	0.00
199.23	0.000	2.40	0.00	0.00
199.51	0.000	3.60	0.00	0.00
199.92	0.000	4.80	0.00	0.00
199.99	0.000	5.00	0.00	0.00
201.06	0.000	7.20	0.00	0.00
201.81	0.000	8.40	0.00	0.00
202.67	0.000	9.60	0.00	0.00
203.65	0.000	10.80	0.00	0.00
204.74	0.000	12.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 12-18-2000 FILE DATE: 12-18-2000
CURRENT TIME: 09:45:27 FILE NAME: REMING2

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.25 (ft) BY 1.25 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	199.00	0.00	1.90	0-NF	0.00	0.00	0.00	5.50	0.00	0.00
1.20	199.06	0.57	1.96	4-FFt	0.26	0.43	1.25	5.50	0.98	0.00
2.40	199.23	0.89	2.13	4-FFt	0.38	0.62	1.25	5.50	1.96	0.00
3.60	199.51	1.16	2.41	4-FFt	0.46	0.76	1.25	5.50	2.93	0.00
4.80	199.92	1.43	2.82	4-FFt	0.54	0.89	1.25	5.50	3.91	0.00
5.00	199.99	1.48	2.89	4-FFt	0.56	0.90	1.25	5.50	4.07	0.00
7.20	201.06	2.18	3.96	4-FFt	0.69	1.06	1.25	5.50	5.87	0.00
8.40	201.81	2.67	4.71	4-FFt	0.76	1.14	1.25	5.50	6.84	0.00
9.60	202.67	3.25	5.57	4-FFt	0.84	1.21	1.25	5.50	7.82	0.00
10.80	203.65	3.90	6.55	4-FFt	0.92	1.25	1.25	5.50	8.80	0.00
12.00	204.74	4.62	7.64	4-FFt	1.01	1.25	1.25	5.50	9.78	0.00

El. inlet face invert 197.10 ft El. outlet invert 193.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	197.10 ft
OUTLET STATION	120.00 ft
OUTLET ELEVATION	193.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0300
CULVERT LENGTH ALONG SLOPE	120.05 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.25 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 12-18-2000
CURRENT TIME: 09:45:27

FILE DATE: 12-18-2000
FILE NAME: REMING2

TAILWATER

CONSTANT WATER SURFACE ELEVATION
199.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	205.00 ft

Pond #4

System 1

Elevation City Datum	Area Acres	Storage Volume Acre-feet	Discharge cfs
203	0.26	0	0
204	0.31	0.29	9.6
205	0.36	0.63	12.6
206	0.41	1.02	14.9

Pond #4 Outfall
Routed to Pond #3
100 L.F. 18" RCP
Flowline Elevation at Pond #4 = 200.0
Flowline Elevation at Pond #3 = 199.0

Static Water Surface in Pond #4 = 203.0

HW_{100}= 205.5 City Datum
Q_{100}= 13.8 cfs

Inlet Sizing

Using Chart 11. Grate Inlet Capacity in Sump Conditions:

Basin	Node	Q_{100} (cfs)	Minimum Size	Type	Ponding Depth (feet)
Pond #4	206	13.8	2'x4'	Area	0.55

Area Inlets were sized as follows:

2'x2' Area Inlet

Neenah Grate R-4826

1.3 Square Feet of Open Area
8 feet Perimeter

2'x4' Area Inlet

Neenah Grate R-4853-A

3.1 Square Feet of Open Area
11.5 feet Perimeter

4'x4' Area Inlet

2- Neenah Grates R-4853-A

6.2 Square Feet of Open Space
15.5 feet Perimeter

CURRENT DATE: 12-18-2000
CURRENT TIME: 09:46:50

FILE DATE: 12-18-2000
FILE NAME: REMING6

Pond #4 Outlet
18" RCP
Routed to Pond #3

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	200.00	199.00	100.00	1 RCP	1.50	1.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: REMING6 DATE: 12-18-2000

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
202.60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
202.66	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
202.84	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
203.14	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
203.57	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
204.11	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
204.78	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
205.57	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
206.48	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
207.50	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
208.66	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: REMING6 DATE: 12-18-2000

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
202.60	0.000	0.00	0.00	0.00
202.66	0.000	2.00	0.00	0.00
202.84	0.000	4.00	0.00	0.00
203.14	0.000	6.00	0.00	0.00
203.57	0.000	8.00	0.00	0.00
204.11	0.000	10.00	0.00	0.00
204.78	0.000	12.00	0.00	0.00
205.57	0.000	14.00	0.00	0.00
206.48	0.000	16.00	0.00	0.00
207.50	0.000	18.00	0.00	0.00
208.66	0.000	20.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 12-18-2000 FILE DATE: 12-18-2000
CURRENT TIME: 09:46:50 FILE NAME: REMING6

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	202.60	0.00	2.60	0-NF	0.00	0.00	0.00	3.60	0.00	0.00
2.00	202.66	0.73	2.66	4-FFt	0.42	0.53	1.50	3.60	1.13	0.00
4.00	202.84	1.13	2.84	4-FFt	0.61	0.76	1.50	3.60	2.26	0.00
6.00	203.14	1.46	3.14	4-FFt	0.77	0.94	1.50	3.60	3.40	0.00
8.00	203.57	1.82	3.57	4-FFt	0.93	1.09	1.50	3.60	4.53	0.00
10.00	204.11	2.26	4.11	4-FFt	1.09	1.22	1.50	3.60	5.66	0.00
12.00	204.78	2.82	4.78	4-FFt	1.33	1.31	1.50	3.60	6.79	0.00
14.00	205.57	3.48	5.57	4-FFt	1.50	1.40	1.50	3.60	7.92	0.00
16.00	206.48	4.25	6.48	4-FFt	1.50	1.49	1.50	3.60	9.05	0.00
18.00	207.50	5.12	7.50	4-FFt	1.50	1.50	1.50	3.60	10.19	0.00
20.00	208.66	6.08	8.66	4-FFt	1.50	1.50	1.50	3.60	11.32	0.00

El. inlet face invert 200.00 ft El. outlet invert 199.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	200.00 ft
OUTLET STATION	100.00 ft
OUTLET ELEVATION	199.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0100
CULVERT LENGTH ALONG SLOPE	100.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 12-18-2000
CURRENT TIME: 09:46:50

FILE DATE: 12-18-2000
FILE NAME: REMING6

TAILWATER

CONSTANT WATER SURFACE ELEVATION
202.60

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	50.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	206.00 ft

HMS * Summary of Results

Project : Remington Place Run Name : Run 19

Start of Run : 11Jan00 0000 Basin Model : Pond 1-Revised
End of Run : 12Jan00 0600 Met. Model : 2-Year Storm
Execution Time : 08Dec00 0837 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin CC	2.6674	11 Jan 00 1210	0.27186	0.002
Basin AA	1.5620	11 Jan 00 1210	0.15920	0.001
Basin BB	1.5620	11 Jan 00 1210	0.15920	0.001
Basin Z	1.8504	11 Jan 00 1210	0.18859	0.001
Basin Y	1.3457	11 Jan 00 1210	0.13716	0.001
Basin B	1.4418	11 Jan 00 1210	0.14695	0.001
Basin C	0.96123	11 Jan 00 1210	0.097969	0.001
Basin V	14.563	11 Jan 00 1210	1.4842	0.009
Basin R	2.4752	11 Jan 00 1210	0.25227	0.002
Basin S	3.9410	11 Jan 00 1210	0.40167	0.003
Basin T	0.67286	11 Jan 00 1210	0.068578	0.000
Basin W	5.5511	11 Jan 00 1210	0.56577	0.004
Basin X	6.7286	11 Jan 00 1210	0.68578	0.004
Basin O	2.3310	11 Jan 00 1210	0.23757	0.002
Basin Q	3.7247	11 Jan 00 1210	0.37963	0.002
Basin U	0.79301	11 Jan 00 1210	0.080824	0.001
Pond #1	23.109	11 Jan 00 1230	3.7773	0.034
Basin L	2.9317	11 Jan 00 1210	0.29881	0.002
Basin K	1.5860	11 Jan 00 1210	0.16165	0.001
Basin M	2.7395	11 Jan 00 1210	0.27921	0.002
Basin J	1.0333	11 Jan 00 1210	0.10532	0.001
Basin N	1.7062	11 Jan 00 1210	0.17389	0.001
Basin I	3.4364	11 Jan 00 1210	0.35024	0.002
Pond #4	11.445	11 Jan 00 1210	1.3691	0.009
Basin H	5.4790	11 Jan 00 1210	0.55842	0.004
Pond #3	9.1097	11 Jan 00 1230	1.9275	0.012
Basin G	7.6417	11 Jan 00 1210	0.77885	0.005
Basin D	4.3976	11 Jan 00 1210	0.44821	0.003
Basin E	5.7193	11 Jan 00 1210	0.58292	0.004
Pond #2	31.432	11 Jan 00 1250	7.5147	0.058

HMS * Summary of Results for Pond #1

Project : Remington Place Run Name : Run 19

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 2-Year Storm
Execution Time	: 08Dec00 0837	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 52.171 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 23.109 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1230
Total Inflow	: 2.94 (in)	Peak Storage	: 2.5738 (in)
Total Outflow	: 2.09 (in)	Peak Elevation	: 199.61 (in

HMS * Summary of Results for Pond #2

Project : Remington Place Run Name : Run 19

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 2-Year Storm
Execution Time	: 08Dec00 0837	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 41.974 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1220
Peak Outflow	: 31.432 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1250
Total Inflow	: 2.44 (in)	Peak Storage	: 1.2283 (in)
Total Outflow	: 2.44 (in)	Peak Elevation	: 197.53 (in

HMS * Summary of Results for Pond #3

Project : Remington Place Run Name : Run 19

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 2-Year Storm
Execution Time	: 08Dec00 0837	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 16.924 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 9.1097 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1230
Total Inflow	: 2.94 (in)	Peak Storage	: 0.51298 (in)
Total Outflow	: 2.94 (in)	Peak Elevation	: 202.88 (in

HMS * Summary of Results for Pond #4

Project : Remington Place Run Name : Run 19

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 2-Year Storm
Execution Time	: 08Dec00 0837	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 13.433 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 11.445 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1210
Total Inflow	: 2.94 (in)	Peak Storage	: 0.12716 (in)
Total Outflow	: 2.94 (in)	Peak Elevation	: 204.95 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 20

Start of Run : 11Jan00 0000 Basin Model : Pond 1-Revised
End of Run : 12Jan00 0600 Met. Model : 5-Year Storm
Execution Time : 08Dec00 0838 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin CC	3.5875	11 Jan 00 1210	0.37218	0.002
Basin AA	2.1008	11 Jan 00 1210	0.21794	0.001
Basin BB	2.1008	11 Jan 00 1210	0.21794	0.001
Basin Z	2.4887	11 Jan 00 1210	0.25818	0.001
Basin Y	1.8099	11 Jan 00 1210	0.18777	0.001
Basin B	1.9392	11 Jan 00 1210	0.20118	0.001
Basin C	1.2928	11 Jan 00 1210	0.13412	0.001
Basin V	19.586	11 Jan 00 1210	2.0319	0.009
Basin R	3.3290	11 Jan 00 1210	0.34536	0.002
Basin S	5.3005	11 Jan 00 1210	0.54989	0.003
Basin T	0.90497	11 Jan 00 1210	0.093884	0.000
Basin W	7.4660	11 Jan 00 1210	0.77454	0.004
Basin X	9.0497	11 Jan 00 1210	0.93884	0.004
Basin O	3.1351	11 Jan 00 1210	0.32524	0.002
Basin Q	5.0096	11 Jan 00 1210	0.51971	0.002
Basin U	1.0666	11 Jan 00 1210	0.11065	0.001
Pond #1	36.340	11 Jan 00 1220	5.7393	0.034
Basin L	3.9431	11 Jan 00 1210	0.40906	0.002
Basin K	2.1331	11 Jan 00 1210	0.22130	0.001
Basin M	3.6845	11 Jan 00 1210	0.38224	0.002
Basin J	1.3898	11 Jan 00 1210	0.14418	0.001
Basin N	2.2947	11 Jan 00 1210	0.23806	0.001
Basin I	4.6218	11 Jan 00 1210	0.47948	0.002
Pond #4	13.125	11 Jan 00 1220	1.8743	0.009
Basin H	7.3690	11 Jan 00 1210	0.76448	0.004
Pond #3	10.486	11 Jan 00 1240	2.6388	0.012
Basin G	10.278	11 Jan 00 1210	1.0663	0.005
Basin D	5.9146	11 Jan 00 1210	0.61360	0.003
Basin E	7.6922	11 Jan 00 1210	0.79801	0.004
Pond #2	48.020	11 Jan 00 1240	10.856	0.058

HMS * Summary of Results for Pond #1

Project : Remington Place Run Name : Run 20

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 5-Year Storm
Execution Time	: 08Dec00 0838	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 70.167 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 36.340 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1220
Total Inflow	: 4.02 (in)	Peak Storage	: 3.1658 (in)
Total Outflow	: 3.17 (in)	Peak Elevation	: 199.96 (in

HMS * Summary of Results for Pond #2

Project : Remington Place Run Name : Run 20

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 5-Year Storm
Execution Time	: 08Dec00 0838	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 62.606 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1220
Peak Outflow	: 48.020 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1240
Total Inflow	: 3.52 (in)	Peak Storage	: 1.7187 (in)
Total Outflow	: 3.52 (in)	Peak Elevation	: 198.08 (in

HMS * Summary of Results for Pond #3

Project : Remington Place Run Name : Run 20

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 5-Year Storm
Execution Time	: 08Dec00 0838	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 20.304 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 10.486 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1240
Total Inflow	: 4.02 (in)	Peak Storage	: 0.70633 (in)
Total Outflow	: 4.02 (in)	Peak Elevation	: 203.19 (in

HMS * Summary of Results for Pond #4

Project : Remington Place Run Name : Run 20

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 5-Year Storm
Execution Time	: 08Dec00 0838	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 18.067 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 13.125 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1220
Total Inflow	: 4.02 (in)	Peak Storage	: 0.21762 (in)
Total Outflow	: 4.02 (in)	Peak Elevation	: 205.23 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 21

Start of Run : 11Jan00 0000 Basin Model : Pond 1-Revised
End of Run : 12Jan00 0600 Met. Model : 10-Year Storm
Execution Time : 08Dec00 0840 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin CC	4.1692	11 Jan 00 1210	0.43631	0.002
Basin AA	2.4414	11 Jan 00 1210	0.25550	0.001
Basin BB	2.4414	11 Jan 00 1210	0.25550	0.001
Basin Z	2.8922	11 Jan 00 1210	0.30266	0.001
Basin Y	2.1034	11 Jan 00 1210	0.22012	0.001
Basin B	2.2536	11 Jan 00 1210	0.23584	0.001
Basin C	1.5024	11 Jan 00 1210	0.15723	0.001
Basin V	22.762	11 Jan 00 1210	2.3820	0.009
Basin R	3.8687	11 Jan 00 1210	0.40486	0.002
Basin S	6.1599	11 Jan 00 1210	0.64463	0.003
Basin T	1.0517	11 Jan 00 1210	0.11006	0.000
Basin W	8.6765	11 Jan 00 1210	0.90799	0.004
Basin X	10.517	11 Jan 00 1210	1.1006	0.004
Basin O	3.6434	11 Jan 00 1210	0.38128	0.002
Basin Q	5.8219	11 Jan 00 1210	0.60926	0.002
Basin U	1.2395	11 Jan 00 1210	0.12971	0.001
Pond #1	40.722	11 Jan 00 1230	6.9935	0.034
Basin L	4.5824	11 Jan 00 1210	0.47955	0.002
Basin K	2.4790	11 Jan 00 1210	0.25943	0.001
Basin M	4.2819	11 Jan 00 1210	0.44810	0.002
Basin J	1.6151	11 Jan 00 1210	0.16902	0.001
Basin N	2.6668	11 Jan 00 1210	0.27908	0.001
Basin I	5.3712	11 Jan 00 1210	0.56209	0.002
Pond #4	13.612	11 Jan 00 1220	2.1973	0.009
Basin H	8.5638	11 Jan 00 1210	0.89620	0.004
Pond #3	10.692	11 Jan 00 1250	3.0935	0.012
Basin G	11.944	11 Jan 00 1210	1.2500	0.005
Basin D	6.8736	11 Jan 00 1210	0.71932	0.003
Basin E	8.9394	11 Jan 00 1210	0.93551	0.004
Pond #2	56.358	11 Jan 00 1240	12.992	0.058

HMS * Summary of Results for Pond #1

Project : Remington Place Run Name : Run 21

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 10-Year Storm
Execution Time	: 08Dec00 0840	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 81.544 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 40.722 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1230
Total Inflow	: 4.72 (in)	Peak Storage	: 3.5705 (in)
Total Outflow	: 3.87 (in)	Peak Elevation	: 200.18 (in

HMS * Summary of Results for Pond #2

Project : Remington Place Run Name : Run 21

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 10-Year Storm
Execution Time	: 08Dec00 0840	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 73.025 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 56.358 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1240
Total Inflow	: 4.22 (in)	Peak Storage	: 1.9359 (in)
Total Outflow	: 4.22 (in)	Peak Elevation	: 198.30 (in

HMS * Summary of Results for Pond #3

Project : Remington Place Run Name : Run 21

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 10-Year Storm
Execution Time	: 08Dec00 0840	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 21.796 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 10.692 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1250
Total Inflow	: 4.72 (in)	Peak Storage	: 0.84634 (in)
Total Outflow	: 4.72 (in)	Peak Elevation	: 203.39 (in

HMS * Summary of Results for Pond #4

Project : Remington Place Run Name : Run 21

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 10-Year Storm
Execution Time	: 08Dec00 0840	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 20.996 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 13.612 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1220
Total Inflow	: 4.72 (in)	Peak Storage	: 0.28960 (in)
Total Outflow	: 4.72 (in)	Peak Elevation	: 205.44 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 37

Start of Run : 11Jan00 0000 Basin Model : Pond 1-Revised
End of Run : 12Jan00 0600 Met. Model : 100-Year Storm
Execution Time : 03Jan01 0835 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin CC	6.2316	11 Jan 00 1210	0.66620	0.002
Basin AA	3.6491	11 Jan 00 1210	0.39011	0.001
Basin BB	3.6491	11 Jan 00 1210	0.39011	0.001
Basin Z	4.3228	11 Jan 00 1210	0.46214	0.001
Basin Y	3.1439	11 Jan 00 1210	0.33610	0.001
Basin B	3.3684	11 Jan 00 1210	0.36011	0.001
Basin C	2.2456	11 Jan 00 1210	0.24007	0.001
Basin V	34.021	11 Jan 00 1210	3.6371	0.009
Basin R	5.7825	11 Jan 00 1210	0.61818	0.002
Basin S	9.2071	11 Jan 00 1210	0.98429	0.003
Basin T	1.5719	11 Jan 00 1210	0.16805	0.000
Basin W	12.968	11 Jan 00 1210	1.3864	0.004
Basin X	15.719	11 Jan 00 1210	1.6805	0.004
Basin O	5.4456	11 Jan 00 1210	0.58217	0.002
Basin Q	8.7018	11 Jan 00 1210	0.93027	0.002
Basin U	1.8526	11 Jan 00 1210	0.19806	0.001
Pond #1	49.770	11 Jan 00 1230	11.810	0.034
Basin L	6.8492	11 Jan 00 1210	0.73222	0.002
Basin K	3.7053	11 Jan 00 1210	0.39612	0.001
Basin M	6.4000	11 Jan 00 1210	0.68420	0.002
Basin J	2.4140	11 Jan 00 1210	0.25808	0.001
Basin N	3.9860	11 Jan 00 1210	0.42613	0.001
Basin I	8.0281	11 Jan 00 1210	0.85825	0.002
Pond #4	13.768	11 Jan 00 1230	3.3550	0.009
Basin H	12.800	11 Jan 00 1210	1.3684	0.004
Pond #3	11.150	11 Jan 00 1320	4.7234	0.012
Basin G	17.853	11 Jan 00 1210	1.9086	0.005
Basin D	10.274	11 Jan 00 1210	1.0983	0.003
Basin E	13.361	11 Jan 00 1210	1.4284	0.004
Pond #2	74.303	11 Jan 00 1230	20.968	0.058

HMS * Summary of Results for Pond #1

Project : Remington Place Run Name : Run 37

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 100-Year Storm
Execution Time	: 03Jan01 0835	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 121.88 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 49.770 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1230
Total Inflow	: 7.20 (in)	Peak Storage	: 4.6692 (in)
Total Outflow	: 6.53 (in)	Peak Elevation	: 200.76 (in

HMS * Summary of Results for Pond #2

Project : Remington Place Run Name : Run 37

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 100-Year Storm
Execution Time	: 03Jan01 0835	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 93.815 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 74.303 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1230
Total Inflow	: 6.81 (in)	Peak Storage	: 2.4034 (in)
Total Outflow	: 6.81 (in)	Peak Elevation	: 198.77 (in

HMS * Summary of Results for Pond #3

Project : Remington Place Run Name : Run 37

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 100-Year Storm
Execution Time	: 03Jan01 0835	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 25.299 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 11.150 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1320
Total Inflow	: 7.20 (in)	Peak Storage	: 1.1581 (in)
Total Outflow	: 7.20 (in)	Peak Elevation	: 203.85 (in

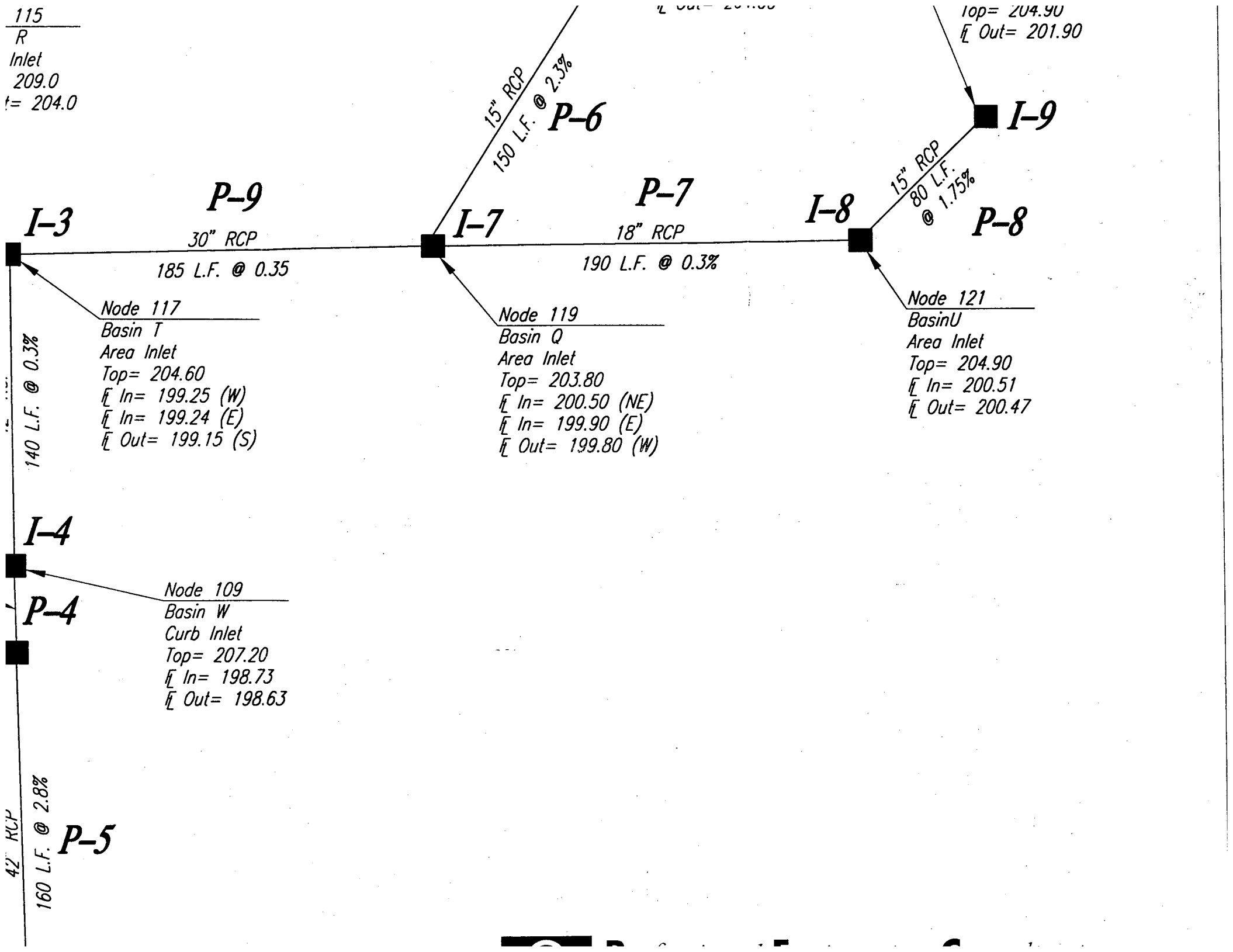
HMS * Summary of Results for Pond #4

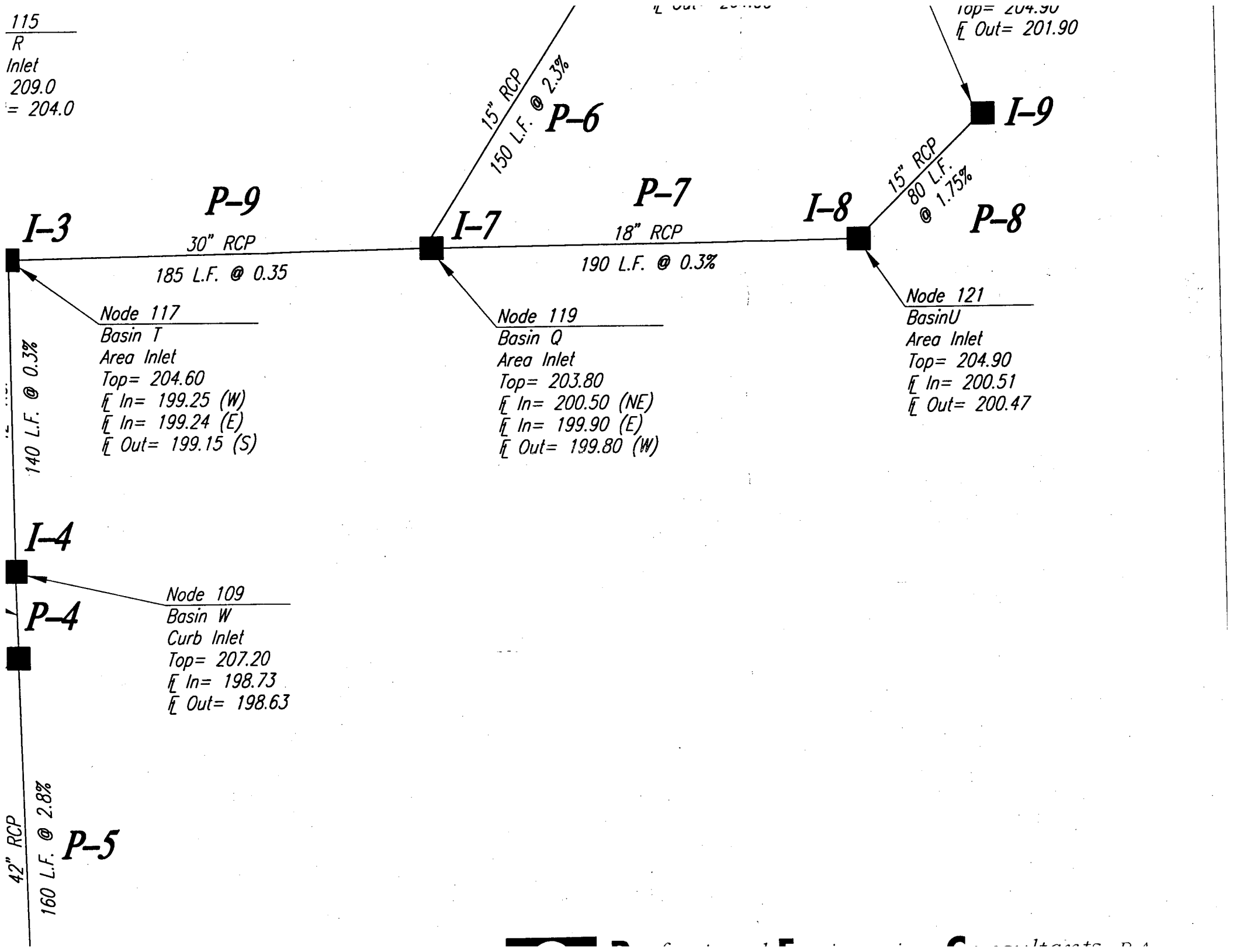
Project : Remington Place Run Name : Run 37

Start of Run	: 11Jan00 0000	Basin Model	: Pond 1-Revised
End of Run	: 12Jan00 0600	Met. Model	: 100-Year Storm
Execution Time	: 03Jan01 0835	Control Specs	: 24 Hour Rainfall

Computed Results

Peak Inflow	: 31.383 (cfs)	Date/Time of Peak Inflow	: 11 Jan 00 1210
Peak Outflow	: 13.768 (cfs)	Date/Time of Peak Outflow	: 11 Jan 00 1230
Total Inflow	: 7.20 (in)	Peak Storage	: 0.82802 (in)
Total Outflow	: 7.20 (in)	Peak Elevation	: 205.51 (in


115
R
Inlet
209.0
t= 204.0
140 L.F. @ 0.3%
42" RCP
160 L.F. @ 2.8%
P-5
I-4
P-4
Node 109
Basin W
Curb Inlet
Top= 207.20
℄ In= 198.73
℄ Out= 198.63
I-3
P-9
30" RCP
185 L.F. @ 0.35
Node 117
Basin T
Area Inlet
Top= 204.60
℄ In= 199.25 (W)
℄ In= 199.24 (E)
℄ Out= 199.15 (S)
15" RCP
150 L.F. @ 2.3%
P-6
I-7
P-7
18" RCP
190 L.F. @ 0.3%
Node 119
Basin Q
Area Inlet
Top= 203.80
℄ In= 200.50 (NE)
℄ In= 199.90 (E)
℄ Out= 199.80 (W)
I-8
15" RCP
80 L.F.
@ 1.75%
P-8
Node 121
BasinU
Area Inlet
Top= 204.90
℄ In= 200.51
℄ Out= 200.47
I-9
Top= 204.90
℄ Out= 201.90


115
R
Inlet
209.0
= 204.0
15" RCP
150 L.F. @ 2.3%
P-6
Top= 204.90
℄ Out= 201.90
I-9
15" RCP
80 L.F.
@ 1.75%
P-8
P-9
30" RCP
185 L.F. @ 0.35
I-3
I-7
P-7
18" RCP
190 L.F. @ 0.3%
I-8
Node 117
Basin T
Area Inlet
Top= 204.60
℄ In= 199.25 (W)
℄ In= 199.24 (E)
℄ Out= 199.15 (S)
Node 119
Basin Q
Area Inlet
Top= 203.80
℄ In= 200.50 (NE)
℄ In= 199.90 (E)
℄ Out= 199.80 (W)
Node 121
BasinU
Area Inlet
Top= 204.90
℄ In= 200.51
℄ Out= 200.47
140 L.F. @ 0.3%
I-4
Node 109
Basin W
Curb Inlet
Top= 207.20
℄ In= 198.73
℄ Out= 198.63
P-4
42" RCP
160 L.F. @ 2.8%
P-5

```
------------------ Beginning Calculation Cycle ------------------
Discharge: 5.80 cfs  at node I-1
Discharge: 15.05 cfs  at node I-2
Discharge: 5.75 cfs  at node I-6
Discharge: 5.48 cfs  at node I-9
Discharge: 7.33 cfs  at node I-8
Discharge: 21.80 cfs  at node I-7
Discharge: 38.42 cfs  at node I-3
Discharge: 45.05 cfs  at node I-4
Discharge: 51.43 cfs  at node I-5
Discharge: 51.43 cfs  at node Outlet
Beginning iteration 1
Discharge: 5.80 cfs  at node I-1
Discharge: 15.05 cfs  at node I-2
Discharge: 5.75 cfs  at node I-6
Discharge: 5.48 cfs  at node I-9
Discharge: 7.33 cfs  at node I-8
Discharge: 21.80 cfs  at node I-7
Discharge: 38.42 cfs  at node I-3
Discharge: 45.05 cfs  at node I-4
Discharge: 51.43 cfs  at node I-5
Discharge: 51.43 cfs  at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error:  0.0
Warning: No Duration data exists in IDF Table
Information: P-2 Surcharged condition
Information: P-9 Surcharged condition
Information: P-7 Surcharged condition
Information: P-8 Surcharged condition
--------------------- Calculations Complete ----------------------

** Analysis Options **
Friction method:  Manning's Formula
HGL Convergence Test:  0.001000
Maximum Network Traversals:  5
Number of Pipe Profile Steps:  5
Discharge Convergence Test:  0.001000
Maximum Design Passes:  3
```

---------- Network Quick View ----------

Label	Length	Size	Discharge	Hydraulic Grade Upstream	Hydraulic Grade Downstream
P-1	150.00	15 inch	5.80	204.97	202.83
P-2	115.00	24 inch	15.05	202.66	202.15
P-3	140.00	42 inch	38.42	201.98	201.84
P-4	40.00	42 inch	45.05	201.63	201.57
P-5	160.00	42 inch	51.43	201.28	201.00
P-6	150.00	15 inch	5.75	204.97	202.82
P-7	190.00	18 inch	7.33	203.75	202.82
P-8	80.00	15 inch	5.48	204.46	203.88
P-9	185.00	30 inch	21.80	202.67	202.15

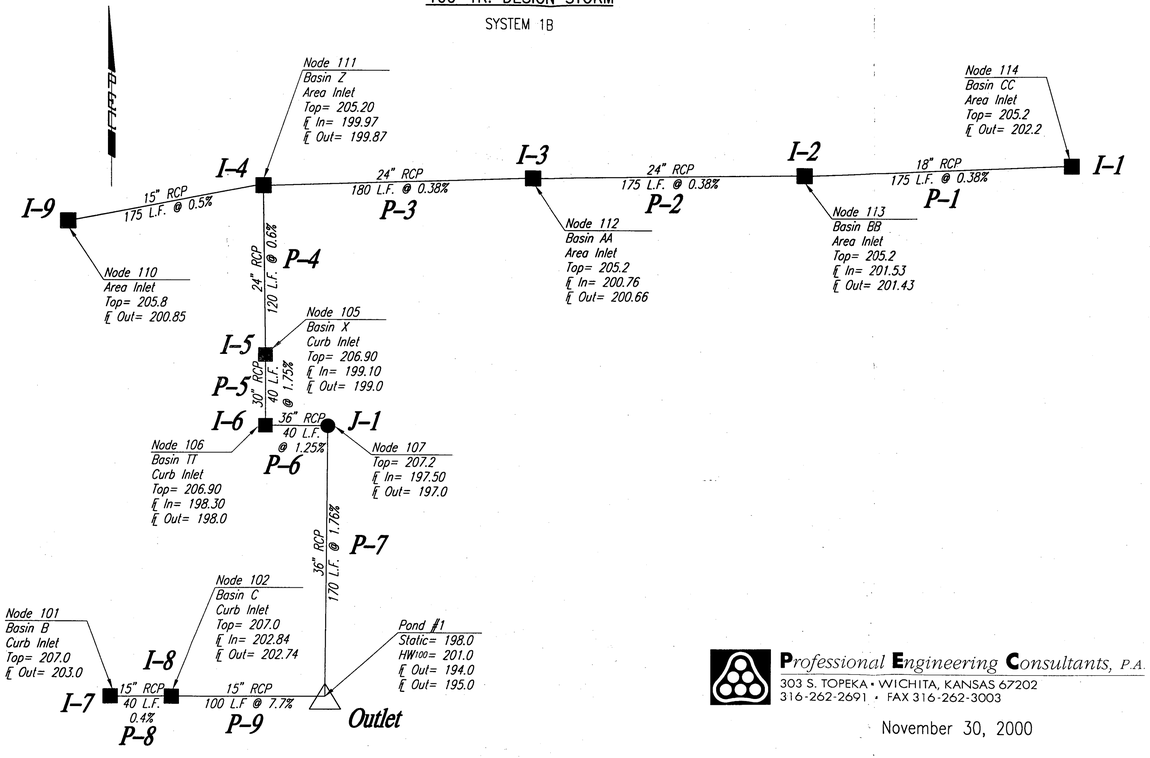
Label	Discharge	Elevations Ground	Elevations Upstream HGL	Elevations Downstream HGL
Outlet	51.43	202.00	201.00	201.00
I-1	5.80	209.00	204.97	204.97
I-2	15.05	203.10	202.83	202.66
I-3	38.42	204.60	202.15	201.98
I-4	45.05	207.20	201.84	201.63
I-5	51.43	207.20	201.57	201.28
I-6	5.75	209.00	204.97	204.97
I-7	21.80	203.80	202.82	202.67
I-8	7.33	204.90	203.88	203.75
I-9	5.48	204.90	204.46	204.46

Pipe Report

Pipe	Upstream Node	Downstream Node	Additional Flow (cfs)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Average Velocity (ft/s)
P-8	I-9	I-8	5.48	5.48	80.00	0.016625	15 inch	0.013	8.33	201.90	200.57	204.90	204.90	1.75	3.08	204.46	203.88	4.47
P-7	I-8	I-7	1.85	7.33	190.00	0.003000	18 inch	0.013	5.75	200.47	199.90	204.90	203.80	2.93	2.40	203.75	202.82	4.15
P-6	I-6	I-7	5.75	5.75	150.00	0.023333	15 inch	0.013	9.87	204.00	200.50	209.00	203.80	3.75	2.05	204.97	202.82	5.15
P-9	I-7	I-3	8.72	21.80	185.00	0.003027	30 inch	0.013	22.57	199.80	199.24	203.80	204.60	1.50	2.86	202.67	202.15	4.44
P-1	I-1	I-2	5.80	5.80	150.00	0.026000	15 inch	0.013	10.42	204.00	200.10	209.00	203.10	3.75	1.75	204.97	202.83	5.19
P-2	I-2	I-3	9.25	15.05	115.00	0.003043	24 inch	0.013	12.48	199.60	199.25	203.10	204.60	1.50	3.35	202.66	202.15	4.79
P-3	I-3	I-4	1.57	38.42	140.00	0.003000	42 inch	0.013	55.10	199.15	198.73	204.60	207.20	1.95	4.97	201.98	201.84	4.43
P-4	I-4	I-5	6.63	45.05	40.00	0.003000	42 inch	0.013	55.10	198.63	198.51	207.20	207.20	5.07	5.19	201.63	201.57	5.09
P-5	I-5	Outlet	6.38	51.43	160.00	0.027562	42 inch	0.013	167.02	198.41	194.00	207.20	202.00	5.29	4.50	201.28	201.00	5.72
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

100-YR. DESIGN STORM

SYSTEM 1B

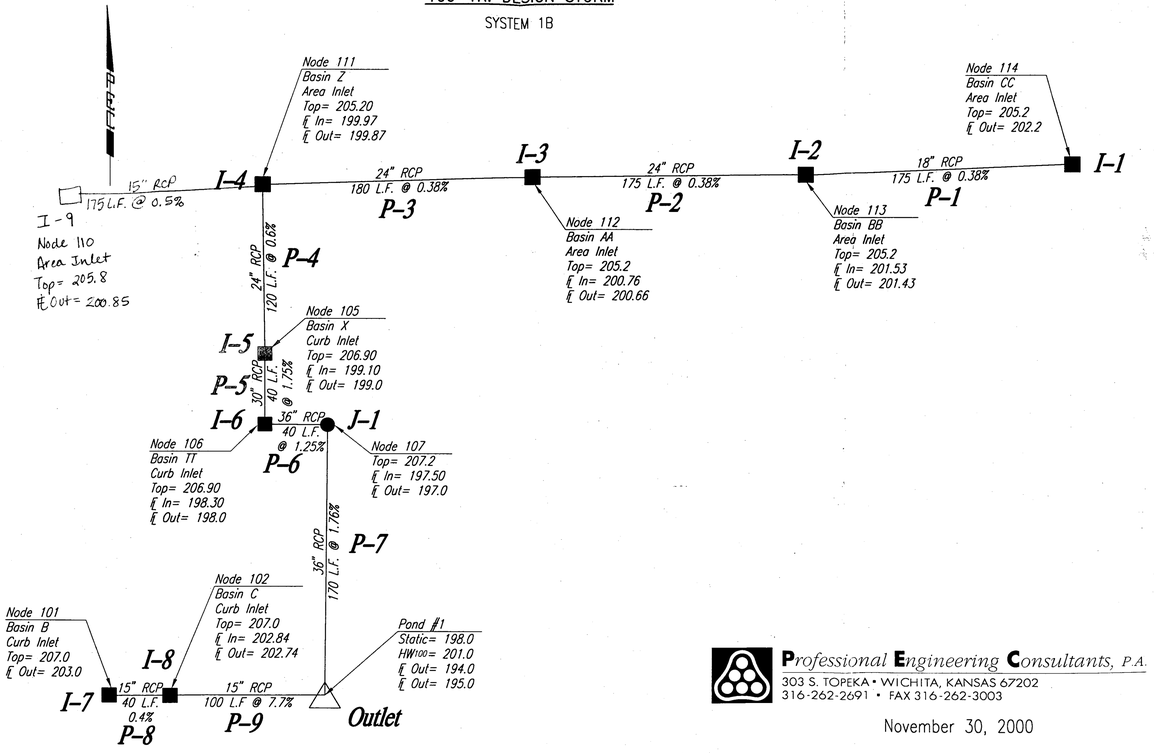


Professional Engineering Consultants, P.A.
303 S. TOPEKA • WICHITA, KANSAS 67202
316-262-2691 • FAX 316-262-3003

November 30, 2000

100-YR. DESIGN STORM

SYSTEM 1B



Professional Engineering Consultants, P.A.
303 S. TOPEKA • WICHITA, KANSAS 67202
316-262-2691 • FAX 316-262-3003

November 30, 2000

```
---------- Beginning Calculation Cycle ----------
Discharge: 6.26 cfs  at node I-1
Discharge: 9.90 cfs  at node I-2
Discharge: 13.53 cfs  at node I-3
Discharge: 17.84 cfs  at node I-4
Discharge: 26.34 cfs  at node I-5
Discharge: 33.61 cfs  at node I-6
Discharge: 33.61 cfs  at node J-1
Discharge: 3.37 cfs  at node I-7
Discharge: 5.61 cfs  at node I-8
Discharge: 39.22 cfs  at node Outlet
Beginning iteration 1
Discharge: 6.26 cfs  at node I-1
Discharge: 9.90 cfs  at node I-2
Discharge: 13.53 cfs  at node I-3
Discharge: 17.84 cfs  at node I-4
Discharge: 26.34 cfs  at node I-5
Discharge: 33.61 cfs  at node I-6
Discharge: 33.61 cfs  at node J-1
Discharge: 3.37 cfs  at node I-7
Discharge: 5.61 cfs  at node I-8
Discharge: 39.22 cfs  at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error:  0.0
Warning: No Duration data exists in IDF Table
Information: P-7 Surcharged condition
Information: P-6 Surcharged condition
Information: P-5 Surcharged condition
Information: P-4 Surcharged condition
Information: P-3 Surcharged condition
Information: P-2 Surcharged condition
Information: P-1 Surcharged condition
---------- Calculations Complete ----------

** Analysis Options **
Friction method:  Manning's Formula
HGL Convergence Test:  0.001000
Maximum Network Traversals:  5
Number of Pipe Profile Steps:  5
Discharge Convergence Test:  0.001000
Maximum Design Passes:  3


---------- Network Quick View ----------
```

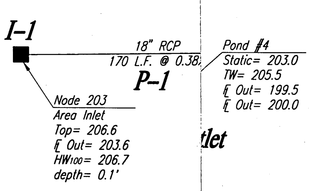
				Hydraulic Grade	
Label	Length	Size	Discharge	Upstream	Downstream
P-1	175.00	18 inch	6.26	205.09	204.47
P-2	175.00	24 inch	9.90	204.39	204.06
P-3	180.00	24 inch	13.53	203.91	203.27
P-4	120.00	24 inch	17.84	203.02	202.27
P-5	40.00	30 inch	26.34	202.05	201.88
P-6	40.00	36 inch	33.61	201.71	201.61
P-7	170.00	36 inch	33.61	201.43	201.00
P-8	40.00	15 inch	3.37	204.02	203.94
P-9	100.00	15 inch	5.61	203.70	201.00

		Elevations		
Label	Discharge	Ground	Upstream HGL	Downstream HGL
I-1	6.26	205.20	205.09	205.09
I-2	9.90	205.20	204.47	204.39
I-3	13.53	205.20	204.06	203.91
I-4	17.84	205.20	203.27	203.02
I-5	26.34	206.90	202.27	202.05
I-6	33.61	206.90	201.88	201.71
J-1	33.61	207.20	201.61	201.43

Outlet	39.22	202.00	201.00	201.00
I-7	3.37	207.00	204.02	204.02
I-8	5.61	207.00	203.94	203.70

Elapsed: 0 minute(s) 1 second(s)

Pipe	Upstream Node	Downstream Node	Additional Flow (cfs)	Discharge (cfs)	Length (ft)	Dam	Average Velocity (ft/s)
P-8	I-7	I-8	3.37	3.37	40.00	i3.94	3.04
P-9	I-8	Outlet	2.24	5.61	100.00	i1.00	5.06
P-1	I-1	I-2	6.26	6.26	175.00	i4.47	3.54
P-2	I-2	I-3	3.64	9.90	175.00	i4.06	3.15
P-3	I-3	I-4	3.63	13.53	180.00	i3.27	4.31
P-4	I-4	I-5	4.31	17.84	120.00	i2.27	5.68
P-5	I-5	I-6	8.50	26.34	40.00	i1.88	5.37
P-6	I-6	J-1	7.27	33.61	40.00	i1.61	4.75
P-7	J-1	Outlet	N/A	33.61	170.00	i1.00	4.75
	N/A	N/A	N/A	N/A	N/A	N/A	N/A



tlet

al Engineering Consultants, P.A.
• WICHITA, KANSAS 67202
• FAX 316-262-3003

January 5, 2001

```
------------------ Beginning Calculation Cycle -------------------
Discharge: 6.80 cfs  at node I-1
Discharge: 10.50 cfs  at node I-2
Discharge: 12.90 cfs  at node I-3
Discharge: 4.00 cfs  at node I-4
Discharge: 10.40 cfs  at node I-5
Discharge: 23.30 cfs  at node Outlet
Beginning iteration 1
Discharge: 6.80 cfs  at node I-1
Discharge: 10.50 cfs  at node I-2
Discharge: 12.90 cfs  at node I-3
Discharge: 4.00 cfs  at node I-4
Discharge: 10.40 cfs  at node I-5
Discharge: 23.30 cfs  at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error:  0.0
** Warning: Design constraints not met.
** Problem: Flooding in system
Warning: No Duration data exists in IDF Table
Information: P-3 Surcharged condition
Violation: P-3 does not meet minimum cover constraint at upstream end.
Information: P-5 Surcharged condition
Information: I-3 The hydraulic grade exceeds the Rim/Ground elevation
Information: I-3 Flooding condition.
Information: P-2 Surcharged condition
Information: P-4 Surcharged condition
Information: I-2 The hydraulic grade exceeds the Rim/Ground elevation
Information: I-2 Flooding condition.
Information: P-1 Surcharged condition
Information: I-1 The hydraulic grade exceeds the Rim/Ground elevation
Information: I-1 Flooding condition.
--------------------- Calculations Complete ----------------------

** Analysis Options **
Friction method:  Manning's Formula
HGL Convergence Test:  0.001000
Maximum Network Traversals:  5
Number of Pipe Profile Steps:  5
Discharge Convergence Test:  0.001000
Maximum Design Passes:  3

 ----------------- Network Quick View  ------------------------
```

Label	Length	Size	Discharge	Hydraulic Grade Upstream	Hydraulic Grade Downstream
P-1	170.00	18 inch	6.80	206.71	206.00
P-2	190.00	18 inch	10.50	207.40	205.50
P-3	130.00	24 inch	12.90	205.92	205.50
P-4	45.00	18 inch	4.00	207.70	207.63
P-5	190.00	18 inch	10.40	207.36	205.50

Label	Discharge	Elevations Ground	Elevations Upstream HGL	Elevations Downstream HGL
I-1	6.80	206.60	206.60	206.60
I-2	10.50	206.00	206.00	206.00
I-3	12.90	205.30	205.50	205.50
Outlet	23.30	207.00	205.50	205.50
I-4	4.00	209.50	207.70	207.70
I-5	10.40	209.50	207.63	207.36

Elapsed: 0 minute(s) 0 second(s)

Pipe	Upstream Node	Downstream Node	Additional Flow (cfs)	Discharge (cfs)	Length (ft)	Upstream GL (ft)	Average Velocity (ft/s)
P-4	I-4	I-5	4.00	4.00	45.00	207.63	2.26
P-5	I-5	Outlet	6.40	10.40	190.00	205.50	5.89
P-1	I-1	I-2	6.80	6.80	170.00	206.00	3.85
P-2	I-2	I-3	3.70	10.50	190.00	205.50	5.94
P-3	I-3	Outlet	2.40	12.90	130.00	205.50	4.11
	N/A	N/A	N/A	N/A	N/A	N/A	N/A

System 2

Soil Type "D"

Existing

Time of Concentration
Length = 750 feet
Velocity = 1 ft/sec
t_c 15 minutes

i_2=3.80 in/hr
i_5=4.62 in/hr
i_{10}=5.21 in/hr
i_{100}=7.40 in/hr

Pasture - 1-4% Slopes
C_2=0.26
C_5=0.31
C_{10}=0.41
C_{100}=0.61

Existing Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	t_c (minutes)
System 2	10.75	10.6	15.4	23.0	48.5	15

Developed

Time of Concentration=15 min
i_2=3.80 in/hr
i_5=4.62 in/hr
i_{10}=5.21 in/hr
i_{100}=7.40 in/hr

1/4 Ac. Residential
C_2=0.50
C_5=0.54
C_{10}=0.62
C_{100}=0.76

Discharge - 100-yr Design Storm
Basins I-N are routed to System 1
Basin EE =29.1 cfs

Developed Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Inlet (node)	System
I	1.43	2.71	3.56	4.61	8.02	Pond #4	2
J	0.43	0.81	1.06	1.38	2.40	205	2
K	0.66	1.25	1.64	2.12	3.70	204	2
L	1.22	2.31	3.04	3.93	6.84	203	2
M	1.14	2.17	2.85	3.69	6.42	202	2
N	0.71	1.35	1.77	2.29	3.98	201	2
EE	5.18	9.84	12.91	16.72	29.11	Offsite	2
Total	10.75	20.43	26.82	34.73	60.47		

System 3

Soil Type "D"

Existing

Time of Concentration
Varies

Pasture - 1-4% Slopes
C_2=0.26
C_5=0.31
C_{10}=0.41
C_{100}=0.61

Existing Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	t_c (minutes)
System 3	20.64	19.7	28.6	42.8	90.5	15

Developed

Time of Concentration=15 min
i_2=3.80 in/hr
i_5=4.62 in/hr
i_{10}=5.21 in/hr
i_{100}=7.40 in/hr

1/4 Ac. Residential
C_2=0.50
C_5=0.54
C_{10}=0.62
C_{100}=0.76

Commercial (80-85% Imp.)
C_2=0.74
C_5=0.76
C_{10}=0.79
C_{100}=0.84

Developed Basin	Area (acres)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Inlet (node)	Land Use
DD	0.91	1.74	2.28	2.95	5.14	311	Residential
FF	0.87	1.66	2.18	2.82	4.91	305	Residential
GG	0.71	1.34	1.76	2.28	3.97	306	Residential
HH	6.42	18.05	22.54	26.42	39.91	Pond #7	Commercial
II	2.54	6.45	8.15	9.79	15.35	308	70% Commercial
JJ	2.00	5.25	6.61	7.87	12.18	309	80% Commercial
OO	1.37	2.61	3.42	4.43	7.72	304	Residential
PP	0.30	0.56	0.74	0.96	1.66	303	Residential
QQ	1.95	3.70	4.86	6.29	10.95	302	Residential
RR	1.07	2.03	2.67	3.45	6.01	301	Residential
SS	2.50	4.76	6.25	8.09	14.08	307	Residential
Total	20.64	48.16	61.46	75.36	121.89		

Discharge - 100-yr Design Storm	
Pond #7	43.9 cfs

Pond #7

System 3

Elevation City Datum	Area Acres	Storage Volume Acre-feet	Discharge cfs
202	1.35	0	0
203	1.48	1.42	40.3
204	1.61	2.96	43.3
205	1.74	4.63	46

Pond #7 Outfall
Routed Offsite to the west
60 L.F. 24" RCP
Flowline Elevation at Pond #7 = 195.10
Flowline Elevation at Offsite Inlet = 194.50

Static Water Surface in Pond #7 = 202.0

HW_{100}= 204.2 City Datum
Q_{100}= 43.9 cfs

Inlet Sizing
Using Chart 11, Grate Inlet Capacity in Sump Conditions:

Basin	Node	Q_{100} (cfs)	Minimum Size	Type	Ponding Depth (feet)
Pond #7	310	43.9	4'x4'	Area	1

Area Inlets were sized as follows:

2'x2' Area Inlet
Neenah Grate R-4826
1.3 Square Feet of Open Area
8 feet Perimeter

2'x4' Area Inlet
Neenah Grate R-4853-A
3.1 Square Feet of Open Area
11.5 feet Perimeter

4'x4' Area Inlet
2- Neenah Grates R-4853-A
6.2 Square Feet of Open Space
15.5 feet Perimeter

CURRENT DATE: 11-29-2000
CURRENT TIME: 09:18:56

FILE DATE: 11-29-2000
FILE NAME: REMING3

Pond #7 Outfall
24" RCP connected to existing line in Hanley 2nd Addition

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS	SHAPE	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	195.10	194.50	60.00	1	RCP	2.00	2.00	.012	CONVENTIONAL
2									
3									
4									
5									
6									

SUMMARY OF CULVERT FLOWS (cfs) FILE: REMING3 DATE: 11-29-2000

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
195.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
196.34	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
197.01	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
197.74	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
198.73	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
200.04	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
201.65	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
203.53	42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
205.73	48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
208.48	54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
212.25	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: REMING3 DATE: 11-29-2000

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
195.10	0.000	0.00	0.00	0.00
196.34	0.000	6.00	0.00	0.00
197.01	0.000	12.00	0.00	0.00
197.74	0.000	18.00	0.00	0.00
198.73	0.000	24.00	0.00	0.00
200.04	0.000	30.00	0.00	0.00
201.65	0.000	36.00	0.00	0.00
203.53	0.000	42.00	0.00	0.00
205.73	0.000	48.00	0.00	0.00
208.48	0.000	54.00	0.00	0.00
212.25	0.000	60.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-29-2000
CURRENT TIME: 09:18:56

FILE DATE: 11-29-2000
FILE NAME: REMING3

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) RCP

DISCHARGE FLOW (cfs)	HEADWATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	195.10	0.00	0.00	0-NF	0.00	0.00	0.00	0.50	0.00	0.00
6.00	196.34	1.24	1.24	1-S2n	0.67	0.86	0.66	0.50	6.59	0.00
12.00	197.01	1.91	1.91	1-S2n	0.99	1.24	1.01	0.50	7.55	0.00
18.00	197.74	2.64	2.64	5-S2n	1.27	1.52	1.22	0.50	8.94	0.00
24.00	198.73	3.63	3.63	5-S2n	1.60	1.72	1.52	0.50	9.37	0.00
30.00	200.04	4.94	4.34	2-M2c	2.00	1.90	1.90	0.50	9.81	0.00
36.00	201.65	6.55	5.75	6-S2n	2.00	2.00	1.90	0.50	11.77	0.00
42.00	203.53	8.43	7.32	6-S2n	2.00	2.00	1.90	0.50	13.73	0.00
48.00	205.73	10.63	9.13	6-S2n	2.00	2.00	1.90	0.50	15.69	0.00
54.00	208.48	13.38	11.18	6-S2n	2.00	2.00	1.90	0.50	17.65	0.00
60.00	212.25	17.15	13.47	6-S2n	2.00	2.00	1.90	0.50	19.61	0.00

El. inlet face invert 195.10 ft El. outlet invert 194.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** INLET DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	195.10 ft
OUTLET STATION	60.00 ft
OUTLET ELEVATION	194.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0100
CULVERT LENGTH ALONG SLOPE	60.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-29-2000
CURRENT TIME: 09:18:56

FILE DATE: 11-29-2000
FILE NAME: REMING3

TAILWATER

CONSTANT WATER SURFACE ELEVATION
195.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	8.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	205.00 ft

HMS * Summary of Results

Project : Remington Place Run Name : Run 33

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 2-Year Storm
Execution Time : 18Dec00 1157 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin JJ	4.8061	11 Jan 00 1210	0.48984	0.003
Basin QQ	4.6860	11 Jan 00 1210	0.47760	0.003
Basin GG	1.7062	11 Jan 00 1210	0.17389	0.001
Basin RR	2.5713	11 Jan 00 1210	0.26207	0.002
Basin PP	0.72092	11 Jan 00 1210	0.073477	0.000
Basin DD	2.1868	11 Jan 00 1210	0.22288	0.001
Basin OO	3.2922	11 Jan 00 1210	0.33554	0.002
Basin FF	2.0907	11 Jan 00 1210	0.21308	0.001
Basin II	6.1038	11 Jan 00 1210	0.62210	0.004
Basin HH	16.377	11 Jan 00 1210	1.8092	0.010
Basin SS	6.0077	11 Jan 00 1210	0.61231	0.004
Pond #7	31.961	11 Jan 00 1220	5.2920	0.032

HMS * Summary of Results for Pond #7

Project : Remington Place Run Name : Run 33

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 2-Year Storm
Execution Time : 18Dec00 1157 Control Specs : 24 Hour Rainfall

Computed Results

Peak Inflow : 50.549 (cfs) Date/Time of Peak Inflow : 11 Jan 00 1210
Peak Outflow : 31.961 (cfs) Date/Time of Peak Outflow : 11 Jan 00 1220
Total Inflow : 3.08 (in) Peak Storage : 1.1262 (in)
Total Outflow : 3.08 (in) Peak Elevation : 202.79 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 30

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 5-Year Storm
Execution Time : 18Dec00 1137 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin JJ	6.4640	11 Jan 00 1210	0.67060	0.003
Basin QQ	6.3024	11 Jan 00 1210	0.65383	0.003
Basin GG	2.2947	11 Jan 00 1210	0.23806	0.001
Basin RR	3.4583	11 Jan 00 1210	0.35877	0.002
Basin PP	0.96961	11 Jan 00 1210	0.10059	0.000
Basin DD	2.9411	11 Jan 00 1210	0.30512	0.001
Basin OO	4.4279	11 Jan 00 1210	0.45936	0.002
Basin FF	2.8119	11 Jan 00 1210	0.29171	0.001
Basin II	8.2093	11 Jan 00 1210	0.85166	0.004
Basin HH	21.553	11 Jan 00 1210	2.3973	0.010
Basin SS	8.0800	11 Jan 00 1210	0.83825	0.006
Pond #7	40.506	11 Jan 00 1220	7.1653	0.032

HMS * Summary of Results for Pond #7

Project : Remington Place Run Name : Run 30

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 5-Year Storm
Execution Time : 18Dec00 1137 Control Specs : 24 Hour Rainfall

Computed Results

Peak Inflow : 67.512 (cfs) Date/Time of Peak Inflow : 11 Jan 00 1210
Peak Outflow : 40.506 (cfs) Date/Time of Peak Outflow : 11 Jan 00 1220
Total Inflow : 4.17 (in) Peak Storage : 1.5255 (in)
Total Outflow : 4.17 (in) Peak Elevation : 203.07 (in

HMS * Summary of Results for Pond #7

Project : Remington Place Run Name : Run 31

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 10-Year Storm
Execution Time : 18Dec00 1138 Control Specs : 24 Hour Rainfall

Computed Results

Peak Inflow : 78.255 (cfs) Date/Time of Peak Inflow : 11 Jan 00 1210
Peak Outflow : 41.110 (cfs) Date/Time of Peak Outflow : 11 Jan 00 1220
Total Inflow : 4.86 (in) Peak Storage : 1.8357 (in)
Total Outflow : 4.86 (in) Peak Elevation : 203.27 (in

HMS * Summary of Results

Project : Remington Place Run Name : Run 31

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 10-Year Storm
Execution Time : 18Dec00 1138 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin JJ	7.5121	11 Jan 00 1210	0.78614	0.003
Basin QQ	7.3243	11 Jan 00 1210	0.76649	0.003
Basin GG	2.6668	11 Jan 00 1210	0.27908	0.001
Basin RR	4.0190	11 Jan 00 1210	0.42058	0.002
Basin PP	1.1268	11 Jan 00 1210	0.11792	0.000
Basin DD	3.4180	11 Jan 00 1210	0.35769	0.001
Basin OO	5.1458	11 Jan 00 1210	0.53851	0.002
Basin FF	3.2678	11 Jan 00 1210	0.34197	0.001
Basin II	9.5404	11 Jan 00 1210	0.99840	0.004
Basin HH	26.844	11 Jan 00 1210	2.7717	0.010
Basin SS	9.3901	11 Jan 00 1210	0.98267	0.006
Pond #7	41.110	11 Jan 00 1220	8.3611	0.032

HMS * Summary of Results

Project : Remington Place Run Name : Run 32

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 100-Year Storm
Execution Time : 18Dec00 1138 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin JJ	11.228	11 Jan 00 1210	1.2004	0.003
Basin QQ	10.947	11 Jan 00 1210	1.1703	0.003
Basin GG	3.9860	11 Jan 00 1210	0.42613	0.001
Basin RR	6.0070	11 Jan 00 1210	0.64219	0.002
Basin PP	1.6842	11 Jan 00 1210	0.18005	0.000
Basin DD	5.1088	11 Jan 00 1210	0.54616	0.001
Basin OO	7.6913	11 Jan 00 1210	0.82224	0.002
Basin FF	4.8842	11 Jan 00 1210	0.52215	0.001
Basin II	14.260	11 Jan 00 1210	1.5244	0.004
Basin HH	36.592	11 Jan 00 1210	4.1068	0.010
Basin SS	14.035	11 Jan 00 1210	1.5004	0.006
Pond #7	43.884	11 Jan 00 1230	12.643	0.032

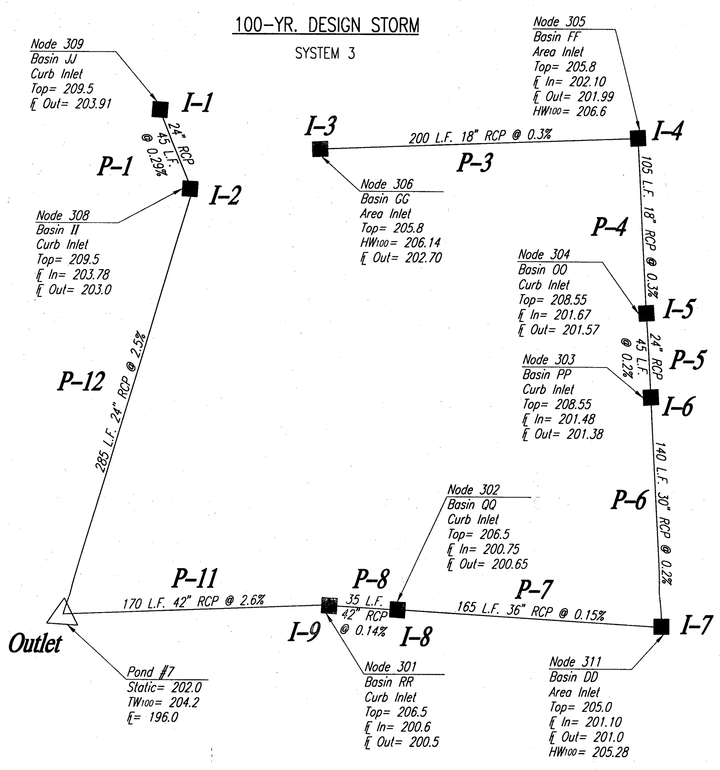
HMS * Summary of Results for Pond #7

Project : Remington Place Run Name : Run 32

Start of Run : 11Jan00 0000 Basin Model : System 3- Alternate
End of Run : 12Jan00 0600 Met. Model : 100-Year Storm
Execution Time : 18Dec00 1138 Control Specs : 24 Hour Rainfall

Computed Results

Peak Inflow : 116.42 (cfs) Date/Time of Peak Inflow : 11 Jan 00 1210
Peak Outflow : 43.884 (cfs) Date/Time of Peak Outflow : 11 Jan 00 1230
Total Inflow : 7.35 (in) Peak Storage : 3.3210 (in)
Total Outflow : 7.35 (in) Peak Elevation : 204.22 (in



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