MUNICIPAL ENGINEERS, P.A.
Civil Engineers & Land Surveyors

Tuesday, August 03, 1999

Ms. Vicki Huang, P.E.
City Engineer's Office
City Hall - 7th Floor
455 North Main Street
Wichita Kansas 67202

Re: **Drainage Concept Plan - Smithmoor Commercial Addition**

Dear Ms. Huang:

I have done some additional calculations for the referenced drainage concept plan after our telephone discussion yesterday. You had expresses concern regarding our pre-developed condition flows. I have run some hydrographs for preexisting conditions which are attached. The peak flows are not significantly different than calculated earlier.

I order to address your concern regarding flooding to the east side of Greenwich Road, we propose the following:

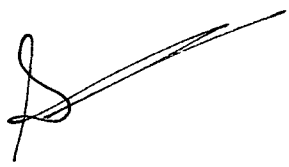
1. Flows within Smithmoor Commercial will be through storm sewers which will discharge at the southeast corner of the plat.

2. A 5 foot bottom ditch with 3:1 slopes will carry flows south to the detention pond. We will provide a 30 foot wide drainage easement for this ditch.

3. The pre-development flows for the detention pond were approximately 240 cfs. We are adding approximately 60 additional cfs from the commercial addition which is 20% additional flows. The existing pond is approximately 2.2 acres. We will add 0.5 (20 % of 2.2 acres) acres to the detention pond in order to maintain the same peak outflow from the pond. We will provide an additional easement (50' X 450' or 30' X 750') in order to construct this pond. Detailed calculations for this will be furnished at the time of development of Smithmoor Commercial Addition.

Please review this submittal and call me if you have questions or comments.

Sincerely,
MUNICIPAL ENGINEERS, P.A.



Babar M. Khan, P.E., L.S.

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e-mail: mepa@southwind.net

Hydrograph Report

55.7 CALCULATED EARLIER

Hyd. No. 1

EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 60.36 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 12.4 ac	Curve number	= 84
Basin Slope	= 1.4 %	Hydraulic length	= 800 ft
Tc method	= LAG	Time of conc. (Tc)	= 19.7 min
Total precip.	= 7.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 247,216 cuft, 5.675 acft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
4.60	0.01	7.90	0.66	11.20	3.98	14.50	3.10
4.70	0.02	8.00	0.68	11.30	4.37	14.60	3.03
4.80	0.04	8.10	0.71	11.40	4.94	14.70	2.97
4.90	0.05	8.20	0.74	11.50	5.59	14.80	2.91
5.00	0.07	8.30	0.77	11.60	7.00	14.90	2.85
5.10	0.08	8.40	0.81	11.70	10.51	15.00	2.79
5.20	0.10	8.50	0.86	11.80	17.99	15.10	2.73
5.30	0.12	8.60	0.92	11.90	32.53	15.20	2.67
5.40	0.14	8.70	0.97	12.00	49.44	15.30	2.61
5.50	0.15	8.80	1.03	12.10	60.36 <<	15.40	2.55
5.60	0.17	8.90	1.10	12.20	58.23	15.50	2.49
5.70	0.19	9.00	1.16	12.30	46.95	15.60	2.43
5.80	0.21	9.10	1.23	12.40	35.25	15.70	2.37
5.90	0.23	9.20	1.29	12.50	24.04	15.80	2.31
6.00	0.25	9.30	1.34	12.60	14.67	15.90	2.25
6.10	0.27	9.40	1.38	12.70	9.96	16.00	2.19
6.20	0.29	9.50	1.42	12.80	8.60	16.10	2.13
6.30	0.31	9.60	1.45	12.90	7.57	16.20	2.08
6.40	0.33	9.70	1.49	13.00	6.80	16.30	2.03
6.50	0.35	9.80	1.55	13.10	6.22	16.40	2.00
6.60	0.37	9.90	1.62	13.20	5.78	16.50	1.97
6.70	0.39	10.00	1.71	13.30	5.42	16.60	1.94
6.80	0.41	10.10	1.81	13.40	5.10	16.70	1.92
6.90	0.43	10.20	1.93	13.50	4.82	16.80	1.90
7.00	0.46	10.30	2.06	13.60	4.57	16.90	1.88
7.10	0.48	10.40	2.20	13.70	4.34	17.00	1.85
7.20	0.50	10.50	2.36	13.80	4.12	17.10	1.83
7.30	0.52	10.60	2.52	13.90	3.93	17.20	1.81
7.40	0.55	10.70	2.71	14.00	3.74	17.30	1.79
7.50	0.57	10.80	2.93	14.10	3.57	17.40	1.77
7.60	0.59	10.90	3.17	14.20	3.42	17.50	1.75
7.70	0.61	11.00	3.43	14.30	3.29	17.60	1.73
7.80	0.64	11.10	3.68	14.40	3.18	17.70	1.70

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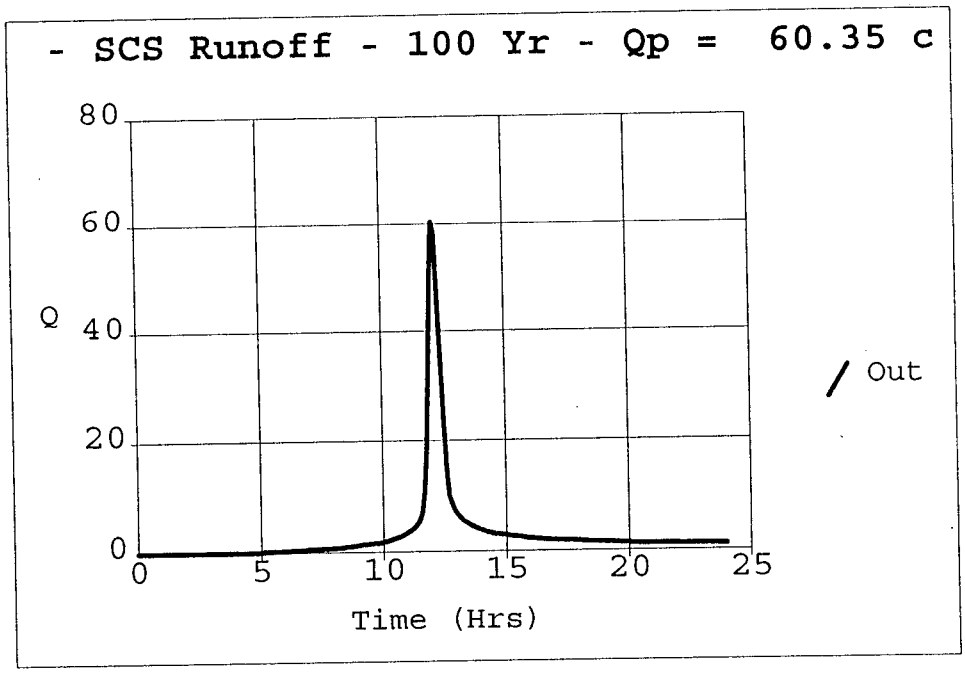
Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
17.80	1.68	22.80	1.03
17.90	1.66	22.90	1.03
18.00	1.64	23.00	1.02
18.10	1.62	23.10	1.02
18.20	1.60	23.20	1.02
18.30	1.58	23.30	1.01
18.40	1.55	23.40	1.01
18.50	1.53	23.50	1.00
18.60	1.51	23.60	1.00
18.70	1.49	23.70	0.99
18.80	1.47	23.80	0.99
18.90	1.45	23.90	0.99
19.00	1.42	24.00	0.98
19.10	1.40	24.10	0.90
19.20	1.38	24.20	0.73
19.30	1.36	24.30	0.49
19.40	1.34	24.40	0.29
19.50	1.32	24.50	0.15
19.60	1.29	24.60	0.05
19.70	1.27		
19.80	1.25		
19.90	1.23	*...End*	
20.00	1.21		
20.10	1.19		
20.20	1.17		
20.30	1.15		
20.40	1.14		
20.50	1.13		
20.60	1.13		
20.70	1.12		
20.80	1.12		
20.90	1.11		
21.00	1.11		
21.10	1.11		
21.20	1.10		
21.30	1.10		
21.40	1.09		
21.50	1.09		
21.60	1.08		
21.70	1.08		
21.80	1.08		
21.90	1.07		
22.00	1.07		
22.10	1.06		
22.20	1.06		
22.30	1.05		
22.40	1.05		
22.50	1.05		
22.60	1.04		
22.70	1.04		


- SCS Runoff - 100 Yr - Qp = 60.35 c
80
60
40
20
0
Q
0
5
10
15
20
25
Time (Hrs)
Out

Hydrograph Report

40.9 CALCULATED EARLIER

Hyd. No. 1

EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 54.52 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 9.1 ac	Curve number	= 84
Basin Slope	= 1.5 %	Hydraulic length	= 800 ft
Tc method	= LAG	Time of conc. (Tc)	= 19 min
Total precip.	= 7.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 170,086 cuft, 3.905 acft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
4.60	0.02	7.90	0.48	11.20	2.99	14.50	2.07
4.70	0.03	8.00	0.49	11.30	3.45	14.60	2.03
4.80	0.04	8.10	0.51	11.40	3.97	14.70	1.99
4.90	0.05	8.20	0.53	11.50	4.52	14.80	1.95
5.00	0.06	8.30	0.57	11.60	6.20	14.90	1.91
5.10	0.07	8.40	0.60	11.70	11.27	15.00	1.86
5.20	0.09	8.50	0.64	11.80	20.91	15.10	1.82
5.30	0.10	8.60	0.68	11.90	38.49	15.20	1.78
5.40	0.11	8.70	0.72	12.00	54.52 <<	15.30	1.74
5.50	0.12	8.80	0.77	12.10	49.23	15.40	1.70
5.60	0.14	8.90	0.81	12.20	30.85	15.50	1.66
5.70	0.15	9.00	0.86	12.30	15.74	15.60	1.62
5.80	0.16	9.10	0.90	12.40	8.83	15.70	1.58
5.90	0.18	9.20	0.94	12.50	7.52	15.80	1.53
6.00	0.19	9.30	0.97	12.60	6.30	15.90	1.49
6.10	0.20	9.40	0.99	12.70	5.39	16.00	1.45
6.20	0.22	9.50	1.01	12.80	4.82	16.10	1.41
6.30	0.23	9.60	1.03	12.90	4.45	16.20	1.38
6.40	0.25	9.70	1.07	13.00	4.15	16.30	1.36
6.50	0.26	9.80	1.12	13.10	3.86	16.40	1.34
6.60	0.27	9.90	1.19	13.20	3.62	16.50	1.33
6.70	0.29	10.00	1.27	13.30	3.42	16.60	1.31
6.80	0.30	10.10	1.35	13.40	3.25	16.70	1.30
6.90	0.32	10.20	1.44	13.50	3.08	16.80	1.29
7.00	0.33	10.30	1.54	13.60	2.92	16.90	1.27
7.10	0.35	10.40	1.65	13.70	2.78	17.00	1.26
7.20	0.36	10.50	1.77	13.80	2.65	17.10	1.24
7.30	0.38	10.60	1.90	13.90	2.53	17.20	1.23
7.40	0.40	10.70	2.05	14.00	2.41	17.30	1.21
7.50	0.41	10.80	2.22	14.10	2.30	17.40	1.20
7.60	0.43	10.90	2.41	14.20	2.22	17.50	1.18
7.70	0.44	11.00	2.62	14.30	2.15	17.60	1.17
7.80	0.46	11.10	2.76	14.40	2.11	17.70	1.15

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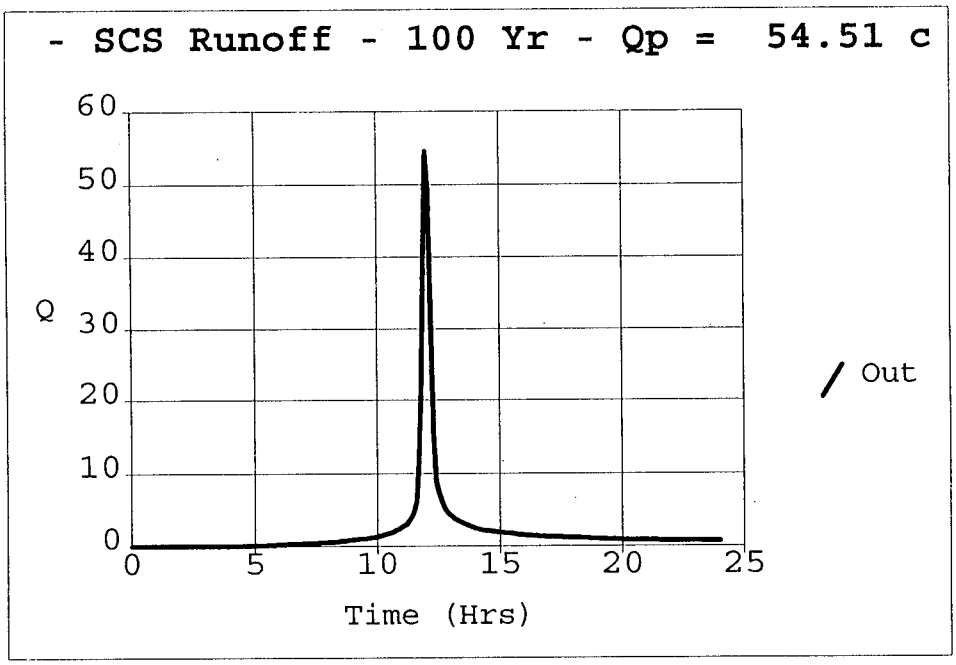
Hydrograph Discharge Table

Time (hrs)	Outflow cfs)	Time (hrs)	Outflow cfs)
17.80	1.14	22.80	0.71
17.90	1.12	22.90	0.70
18.00	1.11	23.00	0.70
18.10	1.09	23.10	0.70
18.20	1.08	23.20	0.69
18.30	1.06	23.30	0.69
18.40	1.05	23.40	0.69
18.50	1.03	23.50	0.69
18.60	1.02	23.60	0.68
18.70	1.00	23.70	0.68
18.80	0.99	23.80	0.68
18.90	0.97	23.90	0.67
19.00	0.96	24.00	0.67
19.10	0.94	24.10	0.54
19.20	0.93	24.20	0.27
19.30	0.92	24.30	0.09
19.40	0.90		
19.50	0.89		
19.60	0.87	*...End*	
19.70	0.86		
19.80	0.84		
19.90	0.83		
20.00	0.81		
20.10	0.80		
20.20	0.79		
20.30	0.78		
20.40	0.78		
20.50	0.77		
20.60	0.77		
20.70	0.77		
20.80	0.77		
20.90	0.76		
21.00	0.76		
21.10	0.76		
21.20	0.75		
21.30	0.75		
21.40	0.75		
21.50	0.74		
21.60	0.74		
21.70	0.74		
21.80	0.74		
21.90	0.73		
22.00	0.73		
22.10	0.73		
22.20	0.72		
22.30	0.72		
22.40	0.72		
22.50	0.72		
22.60	0.71		
22.70	0.71		


- SCS Runoff - 100 Yr - Qp = 54.51 c
60
50
40
30
20
10
0
Q
0
5
10
15
20
25
Time (Hrs)
Out