



**P**rofessional **E**ngineering **C**onsultants, P.A.

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**Payday Motors Addition**  
**Wichita, Sedgwick County, Kansas**  
05/15/2001

Payday Motors Addition is a commercial plat on the west side of Broadway between Mac Arthur and 47<sup>th</sup> Street South. The plat will consist of a commercial lot, utilities and a storm water detention system. The drainage plan and supporting computations for Payday Motors Addition are presented herein.

**Hydrology**

The proposed plat lies within the SE ¼, Section 17, T28S, R1E. The existing landscape is grass pasture with some trees near the eastern property line.

The existing landscape is relatively flat, therefore drainage from surrounding land is minimal. There is a slight swale towards Broadway, which is included in the FEMA 100-year flood boundaries for the Big Slough South. The FEMA flood plain limits are shown on the drainage plan. The BFE for this area is 1274.0 M.S.L.

Most of the storm water runoff from this plat is directed towards the proposed 20' drainage easement from this plat to Broadway. A 23"x14" RCPHE has been sized for that easement to convey the 100-year runoff to the storm sewer along Broadway.

Detention storage was built into the storm water system. There will be localized flooding during storm events, with the local 100-year storm elevation reaching 1272.4 M.S.L. If the storm sewer were to become overloaded or plugged for some reason, the overflow elevation is about 1274.2 M.S.L. To reduce the chance that proposed structures will flood, it is recommended that the minimum opening on any structure for this lot be 1275.2 M.S.L. This elevation is the required minimum of 1.0 feet above the BFE as well.

Runoff coefficients were estimated based on the City of Wichita's Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation and proposed development. 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" = 30' topographic map with 1' contours of the site and adjacent areas and references noted herein.

### **Culvert Sizing**

The Federal Highway Administration's culvert program, HY8 Ver. 6.1, was used to aid in the design of the detention area outfall. A 23"x14" RCPE is required for the outfall from the detention area to limit the discharge and storage volume. The program outputs are included.

### **Design Aids**

This section includes material used to assist in designing the drainage system. A 1"=30' 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, by City of Wichita, May 1985.



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Project Nelson Tucker Property

Date 1/3/00

Item Drainage Calcs.

By KER

Existing Conditions

Area (Total) = 5.4 Acres

Soil Type - Wa. (Sh. No. 50)  
Waldeck sandy loam  
"C"

1.4 Ac developed with some asphalt and buildings  
~ 30% Impervious

$C_2 = 0.43$

$t_c = 15 \text{ min}$

$i_2 = 3.8$

$C_5 = 0.46$

$i_5 = 4.62$

$C_{10} = 0.53$

$i_{10} = 5.21$

$C_{100} = 0.65$

$i_{100} = 7.4$

Pasture / Open Space slopes less than 1% (+0.02)

$C_2 = 0.26$

A = 4.0 Acres

$C_5 = 0.29$

$C_{10} = 0.37$

$C_{100} = 0.53$

Time of Concentration

600' at 0.5'/sec

$i_2 = 3.3$

$i_5 = 4.06$

$i_{10} = 4.60$

$i_{100} = 6.60$

$t_c = 20 \text{ minutes}$

$Q_2 = 2.29 + 3.43 = 5.72 \text{ cfs} = 5.7 \text{ cfs}$

$Q_5 = 2.98 + 4.71 = 7.69 \text{ cfs} = 7.7 \text{ cfs}$

$Q_{10} = 3.87 + 6.81 = 10.68 \text{ cfs} = 10.7 \text{ cfs}$

$Q_{100} = 6.73 + 13.99 = 20.72 = 20.7 \text{ cfs}$



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Project Payday Motors  
Item Drainage Plan

Date 1/4/00  
By KER

Developed Conditions

Area = 5.4 Acres  
Developed 80% Impervious

$t_c = 15$  min

$C_2 = 0.74$   
 $C_5 = 0.76$   
 $C_{10} = 0.79$   
 $C_{100} = 0.84$

$i_2 = 3.80$   
 $i_5 = 4.62$   
 $i_{10} = 5.21$   
 $i_{100} = 7.40$

Basin A = 4.6 ac

Basin B = 0.8 ac

	Basin A	Basin B
$Q_2 =$ cfs	$Q_2 = 12.9$ cfs	$Q_2 = 2.2$ cfs
$Q_5 =$ cfs	$Q_5 = 16.2$ cfs	$Q_5 = 2.8$ cfs
$Q_{10} =$ cfs	$Q_{10} = 18.9$ cfs	$Q_{10} = 3.3$ cfs
$Q_{100} =$ cfs	$Q_{100} = 28.6$ cfs	$Q_{100} = 5.0$ cfs

Detention Estimate (100-year design storm)

$$S = (1000/CN) - 10 = 0.752688172$$

$$CN = 93 \quad (80\% \text{ imp})$$

$$P = 7.8''$$

$Q = 6.96''$

$VR = 133,984.3$

\* From Figure 9  
City of Derby Stormwater  
Management Criteria

$Q_r = 20.4$  cfs       $Q_i = 32.9$  cfs

$\frac{Q_r}{Q_i} = \frac{20.4}{32.9} = 0.62$

$\frac{V_s}{V_r} = 0.23$

$V_s = 0.71$  Acres-ft storage required

# HMS \* Summary of Results

Project : Payday Motors

Run Name : Run 1

Start of Run : 11Jan00 0000 Basin Model : Developed  
 End of Run : 12Jan00 0600 Met. Model : 100-Year Storm  
 Execution Time : 14May01 1533 Control Specs : 24 Hour Rainfall

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Basin A	28.558	11 Jan 00 1210	3.0221	0.008
Detention Area	11.120	11 Jan 00 1230	3.0221	0.008

## Detention Area

<u>Elev.</u>	<u>Area (Ac.)</u>	<u>Volume (Ac-ft.)</u>	<u>Q<sub>100</sub> out</u>
1270.14	0	0	0
1271.0	0.09	0.039	3.5 cfs
1272.0	0.67	0.38	10.22 cfs
1273.0	1.95	1.31	12.45 cfs

$HW_{100} = 1272.4$

$Q_{100} = 11.1 \text{ cfs}$

## Outlet

TW = 1270.3 (Top of N-S Pipe)

H<sub>in</sub> = 1270.14

H<sub>out</sub> = 1269.0

23" x 14" RCPE

HMS \* Summary of Results for Basin A

Project : Payday Motors      Run Name : Run 1

Start of Run : 11Jan00 0000    Basin Model : Developed  
End of Run : 12Jan00 0600    Met. Model : 100-Year Storm  
Execution Time : 14May01 1533    Control Specs : 24 Hour Rainfall

Computed Results

Peak Discharge : 28.558 (cfs)    Date/Time of Peak Discharge : 11 Jan 00 1210  
Total Precipitation : 7.80 (in)    Total Direct Runoff : 7.08 (in)  
Total Loss : 0.72 (in)    Total Baseflow : 0.00 (in)  
Total Excess : 7.08 (in)    Total Discharge : 7.08 (in)

HMS \* Summary of Results for Detention Area

Project : Payday Motors      Run Name : Run.1

Start of Run : 11Jan00 0000    Basin Model : Developed  
End of Run : 12Jan00 0600    Met. Model : 100-Year Storm  
Execution Time : 14May01 1533    Control Specs : 24 Hour Rainfall

Computed Results

Peak Inflow : 28.558 (cfs)    Date/Time of Peak Inflow : 11 Jan 00 1210  
Peak Outflow : 11.120 (cfs)    Date/Time of Peak Outflow : 11 Jan 00 1230  
Total Inflow : 7.08 (in)      Peak Storage : 0.75522 (in)  
Total Outflow : 7.08 (in)      Peak Elevation : 1272.4 (in)

HMS \* Summary of Results for Detention  
Area

Project : Payday Motors Run Name : Run 1

Start of Run : 11Jan00 0000 Basin Model : Developed  
End of Run : 12Jan00 0600 Met. Model : 100-Year Storm  
Execution Time : 14May01 1533 Control Specs : 24 Hour Rainfall

Date	Time	Reservoir Storage (ac-ft)	Reservoir Elevation (ft)	Inflow (cfs)	Outflow (cfs)
10 Jan 00	2400	0.00000	1270.1	0.000	0.000
11 Jan 00	0010	0.00000	1270.1	0.000	0.000
11 Jan 00	0020	0.00000	1270.1	0.000	0.000
11 Jan 00	0030	0.00000	1270.1	0.000	0.000
11 Jan 00	0040	0.00000	1270.1	0.000	0.000
11 Jan 00	0050	0.00000	1270.1	0.000	0.000
11 Jan 00	0100	0.00000	1270.1	0.000	0.000
11 Jan 00	0110	0.00000	1270.1	0.000	0.000
11 Jan 00	0120	0.00000	1270.1	0.000	0.000
11 Jan 00	0130	0.00000	1270.1	0.000	0.000
11 Jan 00	0140	0.00000	1270.1	0.000	0.000
11 Jan 00	0150	0.00000	1270.1	0.000	0.000
11 Jan 00	0200	0.00000	1270.1	0.000	0.000
11 Jan 00	0210	0.00000	1270.1	0.000	0.000
11 Jan 00	0220	0.00000	1270.1	0.000	0.000
11 Jan 00	0230	0.00000	1270.1	0.000	0.000
11 Jan 00	0240	0.00000	1270.1	0.000	0.000
11 Jan 00	0250	0.00000	1270.1	0.000	0.000
11 Jan 00	0300	0.00000	1270.1	0.000	0.000
11 Jan 00	0310	0.00000	1270.1	0.000	0.000
11 Jan 00	0320	0.00000	1270.1	0.000	0.000
11 Jan 00	0330	0.00000	1270.1	0.000	0.000
11 Jan 00	0340	0.00000	1270.1	0.000	0.000
11 Jan 00	0350	0.00000	1270.1	0.000	0.000
11 Jan 00	0400	0.00000	1270.1	0.000	0.000
11 Jan 00	0410	0.00000	1270.1	0.000	0.000
11 Jan 00	0420	0.00000	1270.1	0.000	0.000
11 Jan 00	0430	0.00000	1270.1	0.000	0.000
11 Jan 00	0440	0.00000	1270.1	0.000	0.000
11 Jan 00	0450	0.00000	1270.1	0.000	0.000
11 Jan 00	0500	0.00000	1270.1	0.000	0.000
11 Jan 00	0510	0.00000	1270.1	0.000	0.000

Date	Time	Reservoir Storage (ac-ft)	Reservoir Elevation (ft)	Inflow (cfs)	Outflow (cfs)
11 Jan 00	0520	0.00000	1270.1	0.000	0.000
11 Jan 00	0530	0.00000	1270.1	0.000	0.000
11 Jan 00	0540	0.00000	1270.1	0.000	0.000
11 Jan 00	0550	0.00052	1270.2	0.121	0.046
11 Jan 00	0600	0.00575	1270.3	1.200	0.516
11 Jan 00	0610	0.01811	1270.5	2.736	1.625
11 Jan 00	0620	0.02485	1270.7	2.099	2.230
11 Jan 00	0630	0.01919	1270.6	1.031	1.722
11 Jan 00	0640	0.01196	1270.4	0.716	1.074
11 Jan 00	0650	0.00854	1270.3	0.626	0.766
11 Jan 00	0700	0.00724	1270.3	0.602	0.650
11 Jan 00	0710	0.00681	1270.3	0.597	0.611
11 Jan 00	0720	0.00673	1270.3	0.606	0.604
11 Jan 00	0730	0.00678	1270.3	0.614	0.608
11 Jan 00	0740	0.00685	1270.3	0.621	0.615
11 Jan 00	0750	0.00693	1270.3	0.628	0.622
11 Jan 00	0800	0.00701	1270.3	0.635	0.629
11 Jan 00	0810	0.00708	1270.3	0.641	0.636
11 Jan 00	0820	0.00752	1270.3	0.732	0.675
11 Jan 00	0830	0.00837	1270.3	0.817	0.751
11 Jan 00	0840	0.00906	1270.3	0.848	0.813
11 Jan 00	0850	0.00955	1270.4	0.893	0.857
11 Jan 00	0900	0.01001	1270.4	0.930	0.898
11 Jan 00	0910	0.01035	1270.4	0.947	0.929
11 Jan 00	0920	0.01080	1270.4	1.017	0.969
11 Jan 00	0930	0.01148	1270.4	1.080	1.030
11 Jan 00	0940	0.01201	1270.4	1.105	1.078
11 Jan 00	0950	0.01256	1270.4	1.180	1.127
11 Jan 00	1000	0.01329	1270.4	1.246	1.193
11 Jan 00	1010	0.01385	1270.4	1.272	1.243
11 Jan 00	1020	0.01482	1270.5	1.442	1.330
11 Jan 00	1030	0.01643	1270.5	1.595	1.474
11 Jan 00	1040	0.01769	1270.5	1.649	1.587
11 Jan 00	1050	0.01941	1270.6	1.929	1.742
11 Jan 00	1100	0.02206	1270.6	2.177	1.980
11 Jan 00	1110	0.02410	1270.7	2.263	2.163
11 Jan 00	1120	0.02747	1270.7	2.855	2.465
11 Jan 00	1130	0.03302	1270.9	3.381	2.964
11 Jan 00	1140	0.03733	1271.0	3.557	3.350
11 Jan 00	1150	0.10755	1271.2	14.841	4.851

Date	Time	Reservoir Storage (ac-ft)	Reservoir Elevation (ft)	Inflow (cfs)	Outflow (cfs)
11 Jan 00	1210	0.53025	1272.2	28.558	10.580
11 Jan 00	1220	0.70922	1272.4	19.018	11.009
11 Jan 00	1230	0.75522	1272.4	9.790	11.120
11 Jan 00	1240	0.71835	1272.4	7.007	11.031
11 Jan 00	1250	0.64952	1272.3	4.897	10.866
11 Jan 00	1300	0.55933	1272.2	3.523	10.650
11 Jan 00	1310	0.45987	1272.1	3.096	10.412
11 Jan 00	1320	0.36004	1271.9	2.646	9.827
11 Jan 00	1330	0.27087	1271.7	2.302	8.069
11 Jan 00	1340	0.20028	1271.5	2.196	6.678
11 Jan 00	1350	0.14448	1271.3	1.958	5.579
11 Jan 00	1400	0.09938	1271.2	1.762	4.690
11 Jan 00	1410	0.06350	1271.1	1.702	3.983
11 Jan 00	1420	0.03581	1270.9	1.475	3.214
11 Jan 00	1430	0.02019	1270.6	1.282	1.812
11 Jan 00	1440	0.01543	1270.5	1.223	1.384
11 Jan 00	1450	0.01398	1270.4	1.205	1.254
11 Jan 00	1500	0.01354	1270.4	1.200	1.215
11 Jan 00	1510	0.01340	1270.4	1.198	1.203
11 Jan 00	1520	0.01336	1270.4	1.198	1.199
11 Jan 00	1530	0.01336	1270.4	1.198	1.199
11 Jan 00	1540	0.01336	1270.4	1.199	1.199
11 Jan 00	1550	0.01336	1270.4	1.199	1.199
11 Jan 00	1600	0.01336	1270.4	1.199	1.199
11 Jan 00	1610	0.01336	1270.4	1.199	1.199
11 Jan 00	1620	0.01262	1270.4	1.025	1.132
11 Jan 00	1630	0.01103	1270.4	0.868	0.990
11 Jan 00	1640	0.00979	1270.4	0.820	0.879
11 Jan 00	1650	0.00923	1270.3	0.806	0.828
11 Jan 00	1700	0.00902	1270.3	0.801	0.809
11 Jan 00	1710	0.00894	1270.3	0.800	0.802
11 Jan 00	1720	0.00892	1270.3	0.800	0.800
11 Jan 00	1730	0.00891	1270.3	0.800	0.800
11 Jan 00	1740	0.00891	1270.3	0.800	0.800
11 Jan 00	1750	0.00832	1270.3	0.660	0.746
11 Jan 00	1800	0.00705	1270.3	0.535	0.633
11 Jan 00	1810	0.00605	1270.3	0.497	0.543
11 Jan 00	1820	0.00605	1270.3	0.590	0.543
11 Jan 00	1830	0.00683	1270.3	0.680	0.613
11 Jan 00	1840	0.00752	1270.3	0.707	0.675

Date	Time	Reservoir Storage (ac-ft)	Reservoir Elevation (ft)	Inflow (cfs)	Outflow (cfs)
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11 Jan 00	1900	0.00796	1270.3	0.719	0.714
11 Jan 00	1910	0.00800	1270.3	0.720	0.718
11 Jan 00	1920	0.00802	1270.3	0.720	0.720
11 Jan 00	1930	0.00802	1270.3	0.720	0.720
11 Jan 00	1940	0.00802	1270.3	0.720	0.720
11 Jan 00	1950	0.00802	1270.3	0.720	0.720
11 Jan 00	2000	0.00802	1270.3	0.720	0.720
11 Jan 00	2010	0.00802	1270.3	0.720	0.720
11 Jan 00	2020	0.00758	1270.3	0.615	0.680
11 Jan 00	2030	0.00663	1270.3	0.521	0.595
11 Jan 00	2040	0.00588	1270.3	0.493	0.528
11 Jan 00	2050	0.00554	1270.3	0.484	0.498
11 Jan 00	2100	0.00542	1270.3	0.481	0.486
11 Jan 00	2110	0.00537	1270.3	0.480	0.482
11 Jan 00	2120	0.00535	1270.3	0.480	0.481
11 Jan 00	2130	0.00535	1270.3	0.480	0.480
11 Jan 00	2140	0.00535	1270.3	0.480	0.480
11 Jan 00	2150	0.00535	1270.3	0.480	0.480
11 Jan 00	2200	0.00535	1270.3	0.480	0.480
11 Jan 00	2210	0.00535	1270.3	0.480	0.480
11 Jan 00	2220	0.00535	1270.3	0.480	0.480
11 Jan 00	2230	0.00535	1270.3	0.480	0.480
11 Jan 00	2240	0.00535	1270.3	0.480	0.480
11 Jan 00	2250	0.00535	1270.3	0.480	0.480
11 Jan 00	2300	0.00535	1270.3	0.480	0.480
11 Jan 00	2310	0.00535	1270.3	0.480	0.480
11 Jan 00	2320	0.00535	1270.3	0.480	0.480
11 Jan 00	2330	0.00535	1270.3	0.480	0.480
11 Jan 00	2340	0.00535	1270.3	0.480	0.480
11 Jan 00	2350	0.00535	1270.3	0.480	0.480
11 Jan 00	2400	0.00535	1270.3	0.480	0.480
12 Jan 00	0010	0.00535	1270.3	0.480	0.480
12 Jan 00	0020	0.00446	1270.2	0.271	0.400
12 Jan 00	0030	0.00256	1270.2	0.082	0.229
12 Jan 00	0040	0.00106	1270.2	0.025	0.095
12 Jan 00	0050	0.00039	1270.1	0.007	0.035
12 Jan 00	0100	0.00013	1270.1	0.002	0.012
12 Jan 00	0110	0.00004	1270.1	0.000	0.004
12 Jan 00	0120	0.00001	1270.1	0.000	0.001
12 Jan 00	0130	0.00000	1270.1	0.000	0.000
12 Jan 00	0140	0.00000	1270.1	0.000	0.000

Date	Time	Reservoir Storage (ac-ft)	Reservoir Elevation (ft)	Inflow (cfs)	Outflow (cfs)
12 Jan 00	0150	0.00000	1270.1	0.000	0.000
12 Jan 00	0200	0.00000	1270.1	0.000	0.000
12 Jan 00	0210	0.00000	1270.1	0.000	0.000
12 Jan 00	0220	0.00000	1270.1	0.000	0.000
12 Jan 00	0230	0.00000	1270.1	0.000	0.000
12 Jan 00	0240	0.00000	1270.1	0.000	0.000
12 Jan 00	0250	0.00000	1270.1	0.000	0.000
12 Jan 00	0300	0.00000	1270.1	0.000	0.000
12 Jan 00	0310	0.00000	1270.1	0.000	0.000
12 Jan 00	0320	0.00000	1270.1	0.000	0.000
12 Jan 00	0330	0.00000	1270.1	0.000	0.000
12 Jan 00	0340	0.00000	1270.1	0.000	0.000
12 Jan 00	0350	0.00000	1270.1	0.000	0.000
12 Jan 00	0400	0.00000	1270.1	0.000	0.000
12 Jan 00	0410	0.00000	1270.1	0.000	0.000
12 Jan 00	0420	0.00000	1270.1	0.000	0.000
12 Jan 00	0430	0.00000	1270.1	0.000	0.000
12 Jan 00	0440	0.00000	1270.1	0.000	0.000
12 Jan 00	0450	0.00000	1270.1	0.000	0.000
12 Jan 00	0500	0.00000	1270.1	0.000	0.000
12 Jan 00	0510	0.00000	1270.1	0.000	0.000
12 Jan 00	0520	0.00000	1270.1	0.000	0.000
12 Jan 00	0530	0.00000	1270.1	0.000	0.000
12 Jan 00	0540	0.00000	1270.1	0.000	0.000
12 Jan 00	0550	0.00000	1270.1	0.000	0.000
12 Jan 00	0600	0.00000	1270.1	0.000	0.000

CURRENT DATE: 01-26-2000  
 CURRENT TIME: 16:39:32

FILE DATE: 01-26-2000  
 FILE NAME: PAYDAY

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	70.14	69.00	300.00	1 RCPE	1.92	1.17	.012	CONVENTIONAL
2								
3								
4								
5								
6								

Detention Basin  
 Outlet  
 23" x 14" RCPE

SUMMARY OF CULVERT FLOWS (cfs) FILE: PAYDAY DATE: 01-26-2000

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
70.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
70.89	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
71.52	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
71.78	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
72.32	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
76.76	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
79.61	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
82.97	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
86.84	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
91.24	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
96.15	30.0	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	0.0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PAYDAY DATE: 01-26-2000

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
70.30	0.000	0.00	0.00	0.00
70.89	0.000	3.00	0.00	0.00
71.52	0.000	6.00	0.00	0.00
71.78	0.000	9.00	0.00	0.00
72.32	0.000	12.00	0.00	0.00
76.76	0.000	15.00	0.00	0.00
79.61	0.000	18.00	0.00	0.00
82.97	0.000	21.00	0.00	0.00
86.84	0.000	24.00	0.00	0.00
91.24	0.000	27.00	0.00	0.00
96.15	0.000	30.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000



PRINT DATE: 01-26-2000  
CURRENT TIME: 16:39:32

FILE DATE: 01-26-2000  
FILE NAME: PAYDAY

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TAILWATER

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CONSTANT WATER SURFACE ELEVATION  
70.30

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ROADWAY OVERTOPPING DATA

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ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	30.00 ft
CREST LENGTH	400.00 ft
OVERTOPPING CREST ELEVATION	74.00 ft

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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
<b>1. Business:</b>					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
<b>2. Residential:</b>					
<u>Single Family (Soil Group D)</u>					
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
<u>Multi-Family (Soil Group D)</u>					
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
<u>Single Family (Soil Group C)</u>					
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
<u>Multi-Family (Soil Group C)</u>					
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
<u>Single-Family (Soil Group B)</u>					
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
<u>Multi-Family (Soil Group B)</u>					
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
<u>Single Family (Soil Group A)</u>						
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
<u>Multi-Family (Soil Group A)</u>						
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
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):						
<u>Soil Group A</u>						
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
<u>Soil Group B</u>						
Slope less than 1%	00	0.16	0.26	0.18		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
<u>Soil Group C</u>						
Slope less than 1%	00	0.24	0.27	0.35		0.51
Slope 1% to 4%	00	0.26	0.29	0.37		0.53
Slope more than 4%	00	0.28	0.31	0.39		0.55

<u>Land Use or Surface Characteristics</u>	<u>Percent Impervious</u>	<u>Frequency</u>			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Soil Group D</u>					
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.

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

# RAINFALL INTENSITIES

ABLE

## 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