DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

FOR

COUNTRY WALK

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
ENGINEERS
WICHITA, KANSAS

NOVEMBER 6, 1987

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

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Date 11.3.87 Page 1 of 5

Project Country Walk Addition

Item Drainage Plan System 100

This system will connect to an existing 36" RCP in an existing SWS located in Gatewood Street & will extend to the north & east to pick up runoff from Wichita Collegiate School. Since there is no good overflow location, design for Q_{100}.

I HYDROLOGY

Use Rational Formula $Q = cIA$

1. Determine "c"

Node	Soil Type	Hyd. Group	Land Use	C_{100}
104	Ia	D	School Campus	0.66
103	Ia	D	" "	0.66
102	Ia	D	1/4 Ac. Res.	0.76
101	Ia	D	1/4 Ac. Res	0.76
100	(End Section)			

2. Determine "I"

Node	T_c	I_{100}
104	15	7.37
103	15	7.37
102	15	7.37
101	15	7.37
100	(End Section)	

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Date 11·3·87 Page 2 of 5

Project Country Walk Addition

Item Drainage Plan System 100

3. Determine "A"

Node	Plan Units	Area - SF	Area Ac
104	21.10	211,000	4.84
103	16.10	161,000	3.69
102	2.16	21,600	0.50
101	1.20	12,000	0.28
100	(End Section)		

4. Determine "Q_{100}"

Node	C_{100}	I_{100}	A	Q_{100}
104	0.66	7.37	4.84	23.5
103	0.66	7.37	3.69	17.9
102	0.76	7.37	0.50	2.8
101	0.76	7.37	0.28	1.6
100	(End Section)			

```
100 j,  175.5000  100    3    5    4
110 t,country walk addition
120 t,drainage plan C
130 t,storm water sewer system 100 analysis
140 i,  104     0.66     4.84     0.00     0.00    23.50    15.00   197.50
150 i,  103     0.66     3.69     0.00     0.00    17.90    15.00   189.00
160 i,  102     0.76     0.50     0.00     0.00     2.80    15.00   184.00
170 i,  101     0.76     0.28     0.00     0.00     1.60    15.00   183.50
180 n,  100   178.50
190 p,  104  103   300.00   30 0.013  90.00   0.00
200 p,  103  102   230.00   36 0.013  45.00   0.00
210 p,  102  101   110.00   36 0.013  90.00   0.00
220 p,  101  100   135.00   36 0.013   0.50   0.00
230 e
```

Area

Q100 tc

Revised calc.

Date: 11-03-1987
Time: 23:28:43

Input File: cwalk100

country walk addition
drainage plan
storm water sewer system 100 analysis

Storm Frequency = 100-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
104	103	0.66	4.84	0.00	0.0	15.00	8.97	23.50	15.00	8.97	23.50	23.50	30"	4.79	300.00	1.04	16.04
103	102	0.66	3.69	0.00	0.0	15.00	8.97	17.90	16.04	8.74	17.44	40.94	36"	5.79	230.00	0.66	16.71
102	101	0.76	0.50	0.00	0.0	15.00	8.97	2.88	16.71	8.60	2.58	43.62	36"	6.17	110.00	0.30	17.00
101	100	0.76	0.28	0.00	0.0	15.00	8.97	1.60	17.00	8.54	1.52	45.14	36"	6.39	135.00	0.35	17.36

Date: 11-03-1987
Time: 23:28:43

Input File: cwalk100

country walk addition
drainage plan
storm water sewer system 100 analysis

Storm Frequency = 100-Year

1

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
104	0.00338	0.9848	0.0000	0.0000	0.0000	0.0000	0.0000	0.9848	182.9875	187.5000	4.51
103	0.00577	0.8654	0.0000	0.0165	0.0000	0.1779	0.6648	1.7236	182.0027	189.0000	7.00
102	0.00488	0.4705	0.0000	0.0071	0.0000	0.1133	0.1615	0.7524	180.2771	184.0000	3.72
101	0.00458	0.6185	0.0000	0.0042	0.0000	0.2957	0.1064	1.0247	179.5247	183.5000	3.98
100	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	178.5000	178.5000	0.00

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Date 11-4-87 Page 1 of 2

Project Country Walk Addition

Item Drainage Plan System 200

A portion of the proposed Country Walk Addition (Country Walk Court & a portion of Country Walk St) Will drain westerly & discharge into to Gatewood Street. The runoff from this area will be collected by 3 inlets in Gatewood St (See Project No 468-76-245-81683-000-000-001 - SWS # 337)

Since no new piping is proposed, no analysis of this SWS system is needed. Street flows for 2-year storm will be checked for Country Walk Street.

I HYDROLOGY

Use Rational Method $Q = CIA$

A. Determine "C"

Location	Soil Type	Hyd. Group	Land Use	C_2
N.S. Country Walk St. @ E.S. Gatewood.	Ia	D	Res, 1/4 Ac.	0.50
S.S. Country Walk St. @ E.S. Gatewood	Ia	D	Res, 1/4 Ac	0.50

B. Determine I

Location	t_c	I_2
N.S. Country Walk St.	15	3.83
S.S. Country Walk St.	15	3.83

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Date 11-4-87 Page 2 of 2

Project Country Walk Addition

Item Drainage Plan System 200

C. Determine "A"

Location	Plan. Units	Area - SF	Area - Ac.
N.S. Country Walk St.	8.90	89,000	2.04
S.S. Country Walk St.	2.76	27,600	0.63

D. Determine "Q"

Location	C_2	I_2	A	Q_2
N.S. Country Walk St.	0.50	3.83	2.04	3.9
S.S. Country Walk St.	0.50	3.83	0.63	1.2

II STREET FLOW - 2-YR.

Location	Q_2	street slope	d	d max	Comment
N.S. Country Walk St.	3.9	1.0%	0.29'	0.55'	OK
S.S. Country Walk St.	1.2	1.0%	0.19'	0.55'	OK

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Date 11·3·87 Page 1 of 10

Project Country Walk Addition

Item Drainage Plan System 300

I HYDROLOGY

Use Rational Formula: $Q = cIA$

1 Determine "C"

Node	Soil Type	Hydrologic Group	Land Use	C_2	C_{100}
308	Ia	D	1/4 Ac. Res.	0.50	0.76
307	Ia	D	1/4 Ac. Res.	0.50	0.76
306	Ia	D	1/4 Ac. Res.	0.50	0.76
305	Ia	D	1/4 Ac. Res.	0.50	0.76
304	Ia	D	1/4 Ac. Res.	0.50	0.76
303	Ia	D	1/4 Ac. Res.	0.50	0.76
302	Ia	D	1/4 Ac. Res.	0.50	0.76
301	Ia	D	1/4 Ac. Res.	0.50	0.76
300	(Manhole - Connect to Existing System)				

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Date 11.3.87 Page 2 of 10

Project Country Walk Addition

Item Drainage Plan System 300

2 Determine "I"

Node	t_c	I_2	I_{100}
308	15	3.83	7.37
307	15	3.83	7.37
306	15	3.83	7.37
305	15	3.83	7.37
304	15	3.83	7.37
303	15	3.83	7.37
302	15	3.83	7.37
301	15	3.83	7.37
300	(Manhole)		

3. Determine "A"

Node	Plan. Units	Area - SF	Area - Acre
308	1117	178,720	4.10
307	368	58,880	1.35
306	836	133,760	3.07
305	273	43,680	1.00
304	240	38,400	0.88
303	221	35,360	0.81
302	549	87,840	2.02
301	607	97,120	2.23
300	(Manhole)		

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Date 11·3·87 Page 3 of 10

Project Country Walk Addition

Item Drainage Plan System 300

4 Determine Q_2

Node	C_2	I_2	A	Q_2
308	0.50	3.83	4.10	7.9
307	0.50	3.83	1.35	2.6
306	0.50	3.83	3.07	5.9
305	0.50	3.83	1.00	1.9
304	0.50	3.83	0.88	1.7
303	0.50	3.83	0.81	1.6
302	0.50	3.83	2.02	3.9
301	0.50	3.83	2.23	4.3
300	(Manhole)			

Determine Q_{100}

Node	C_{100}	I_{100}	A	Q_{100}
308	0.76	7.37	4.10	23.0
307	0.76	7.37	1.35	7.6
306	0.76	7.37	3.07	17.2
305	0.76	7.37	1.00	5.6
304	0.76	7.37	0.88	4.9
303	0.76	7.37	0.81	4.5
302	0.76	7.37	2.02	11.3
301	0.76	7.37	2.23	12.5
300	(Manhole)			

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Date 11-3-87 Page 4 of 10

Project Country Walk Addition

Item Drainage Plan System 300

II FLOOD ROUTING / INLET SIZING (2-YR)

Node	Inlet Condition	L	Qapproach*	Qintercept†	Qbypass	to Node #
308	Sump	5'	7.9	7.9	0.0	-
307	Sump	5'	2.6	2.6	0.0	-
306	Sump	5'	5.9	5.9	0.0	-
305	Sump	5'	1.9	1.9	0.0	-
304	On Grade	5'	1.7	43% = 0.7	1.0	303
303	Sump	5'	1.6 + 1.0 = 2.6	2.6	0.0	-
302	Sump	5'	3.9	3.9	0.0	-
301	On Grade	5'	4.3	27% = 1.2	3.1	Existing Inlet in Gatewood St.
300	(Manhole)					

* Qapproach = Q_2

† Qintercept = Input Q in "Storm" Program.

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Date 11·3·87 Page 5 of 10

Project Country Walk Addition

Item Drainage Plan System 300

III STREET FLOW - 2 YR STORM

Node	Q_2	Distribution	street slope, %	d	dmax	Comment
308	7.9	15% (W) = 1.2	0.50	0.21	0.55'	OK
		85% (E) = 6.7	0.32	0.43	0.55'	OK
307	2.6	100% (N) = 2.6	0.32	0.31	0.55'	OK
306	5.9	100% (N) = 5.9	0.32	0.41	0.55'	OK
305	1.9	50% (N) = 0.9	0.32	0.20	0.55'	OK
		50% (S) = 1.0	0.32	0.21	0.55'	OK
304	1.7	100% (N) = 1.7	1.00	0.21	0.55'	OK
303	1.6 + 1.0 = 2.6	70% (N) = 1.8	0.50	0.24	0.55'	OK
		30% (S) = 0.8	0.32	0.19	0.55'	OK
302	3.9	30% (S) = 1.1	0.50	0.20	0.55'	OK
		70% (N) = 2.8	1.70	0.23	0.55'	OK
301	4.3	100% (N) = 4.3	1.70	0.28	0.55'	OK

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ZIP CODE / 67211

Date 11-3-87 Page 6 of 10

Project Country Walk Addition

Item Drainage Plan System 300

IV STREET FLOW - 100-YR STORM

Location	Contributing Nodes			Q_{100}	Q_2 (pipe)	Qstreet: $Q_{100} - Q_{2(pipe)}$	street slope	Max * street Flow	Comment
Cypress St. (approaching Nodes 306, 307)	100%	308	=	23.0					
	100%	307	=	7.6					
	100%	306	=	17.2					
				47.8	7.9	39.9	0.32%	43.8	OK
Cypress St. (approaching Node 304)	100%	308	=	23.0					
	100%	307	=	7.6					
	100%	306	=	17.2					
	100%	305	=	5.6					
	100%	304	=	4.9					
	50%	301	=	6.3					
				64.6	18.0	46.6	1.00%	77.4	OK
Cypress St (approaching Node's 301, 302)	100%	308		23.0					
	100%	307		7.6					
	100%	306		17.2					
	100%	305		5.6					
	100%	304		4.9					
	100%	303		4.5					
	70%	302		7.9					
	100%	301		12.5					
				83.2	21.0	62.2	1.70%	100.9	OK

* From Page 7

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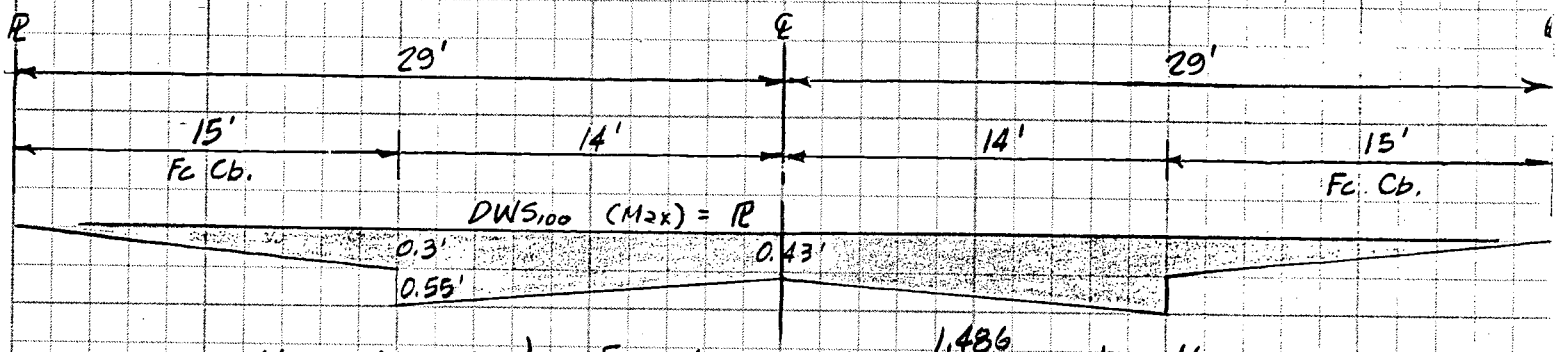
Date 11-4-87 Page 7 of 10

Project Country Walk Addition

Item Drainage Plan System 300

Determine Maximum Street Flow for the Following Street Section.



Use Manning's Equation: $Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$

$$n = \frac{(2 \times 14.5 \times 0.03) + (2 \times 3.05 \times 0.013) + (2 \times 12 \times 0.016)}{59.1}$$

$$n = \frac{(0.87) + (0.0793) + (0.384)}{59.1} = \frac{1.333}{59.1}$$

$n = 0.02256$

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

$A = (4.5) + (12.04) + (5.88)$

$A = 22.42$

$P = (2 \times 15) + (2 \times 0.55) + (2 \times 14)$

$P = 30 + 1.10 + 28$

$P = 59.1$

$R = A/P = 22.42/59.1 = 0.379357$

$R^{2/3} = (0.379357)^{2/3} = 0.524$

$Q = 1.486/n\ AR^{2/3} S^{1/2} = \frac{1.486}{0.02256} \times 22.42 \times 0.524 \times S^{1/2}$

$Q = 773.8\ S^{1/2}$

8/10

```
100 j,  173.2000  300    3    9    8
110 t,country walk addition
120 t,drainage plan
130 t,storm water sewer system 300 analysis
140 i,  300     0.50     4.10     0.00     0.00     7.90    15.00   184.00
150 i,  307     0.50     1.35     0.00     0.00     2.60    15.00   182.50
160 i,  306     0.50     3.07     0.00     0.00     5.90    15.00   182.50
170 i,  305     0.50     1.00     0.00     0.00     1.90    15.00   182.50
180 i,  304     0.50     0.88     0.00     0.00     0.70    15.00   180.00
190 i,  303     0.50     0.91     0.00     0.00     2.60    15.00   179.00
200 i,  302     0.50     2.02     0.00     0.00     3.90    15.00   174.50
210 i,  301     0.50     2.22     0.00     0.00     1.20    15.00   174.50
220 m,  300   173.20
230 p,  308  306   330.00   18 0.013  20.00   0.00
240 p,  307  306    35.00   15 0.013 110.00   0.00
250 p,  306  305   140.00   24 0.013  30.00   0.00
260 p,  305  304   330.00   24 0.013  30.00   0.00
270 p,  304  303   160.00   24 0.013  40.00   0.00
280 p,  303  302   300.00   27 0.013  70.00   0.00
290 p,  302  301    35.00   30 0.013   0.00   0.00
300 p,  301  300   100.00   36 0.013  70.00   0.00
310 e
```

Date: 11-03-1987
Time: 22:34:54

Input File: cwalk300

country walk addition
drainage plan
storm water sewer system 300 analysis

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
308	306	0.50	4.10	0.00	0.0	15.00	4.06	7.90	15.00	4.06	7.90	7.90	18"	4.47	350.00	1.30	16.30
307	306	0.50	1.35	0.00	0.0	15.00	4.06	2.60	15.00	4.06	2.60	2.60	15"	2.12	35.00	0.28	15.28
306	305	0.50	3.07	0.00	0.0	15.00	4.06	5.90	16.30	3.93	5.71	16.15	24"	5.14	140.00	0.45	16.76
305	304	0.50	1.00	0.00	0.0	15.00	4.06	1.90	16.76	3.89	1.82	17.97	24"	5.72	330.00	0.96	17.72
304	303	0.50	0.88	0.00	0.0	15.00	4.06	0.70	17.72	3.90	0.66	18.62	24"	5.93	160.00	0.45	18.17
303	302	0.50	0.81	0.00	0.0	15.00	4.06	2.60	18.17	3.77	2.41	21.03	27"	5.29	300.00	0.95	19.12
302	301	0.50	2.02	0.00	0.0	15.00	4.06	3.70	19.12	3.69	3.53	24.58	30"	5.01	35.00	0.12	19.23
301	300	0.50	2.23	0.00	0.0	15.00	4.06	1.20	19.23	3.68	1.09	25.67	36"	3.63	100.00	0.46	19.69

Date: 11-03-1987
Time: 22:34:56

Input File: cwalk300

country walk addition
drainage plan
storm water sewer system 300 analysis

Storm Frequency = 2-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
306	0.00566	1.9796	0.0000	0.0000	0.0000	0.0000	0.0000	1.9796	182.2044	184.0000	1.80
307	0.09162	0.0567	0.0000	0.0000	0.0000	0.0000	0.0000	0.0567	180.2815	182.5000	2.22
306	0.00599	0.7131	0.0000	0.0109	0.0000	0.0255	0.6550	1.4036	180.2248	182.5000	2.28
305	0.00631	2.0812	0.0000	0.0098	0.0000	0.0549	0.2242	2.3700	178.8212	182.5000	3.68
304	0.00573	1.0541	0.0000	0.0038	0.0000	0.0679	0.1064	1.2643	176.4511	180.0000	3.55
303	0.00461	1.3858	0.0000	0.0022	0.0000	0.1031	0.0364	1.5455	175.1869	179.0000	3.81
302	0.00359	0.1257	0.0000	0.0090	0.0000	0.1507	0.1034	0.3989	173.6414	174.5000	0.86
301	0.00149	0.1481	0.0000	0.0369	0.0000	0.0000	-0.1425	0.0426	173.2426	174.5000	1.26
300	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	173.2000	173.2000	0.00

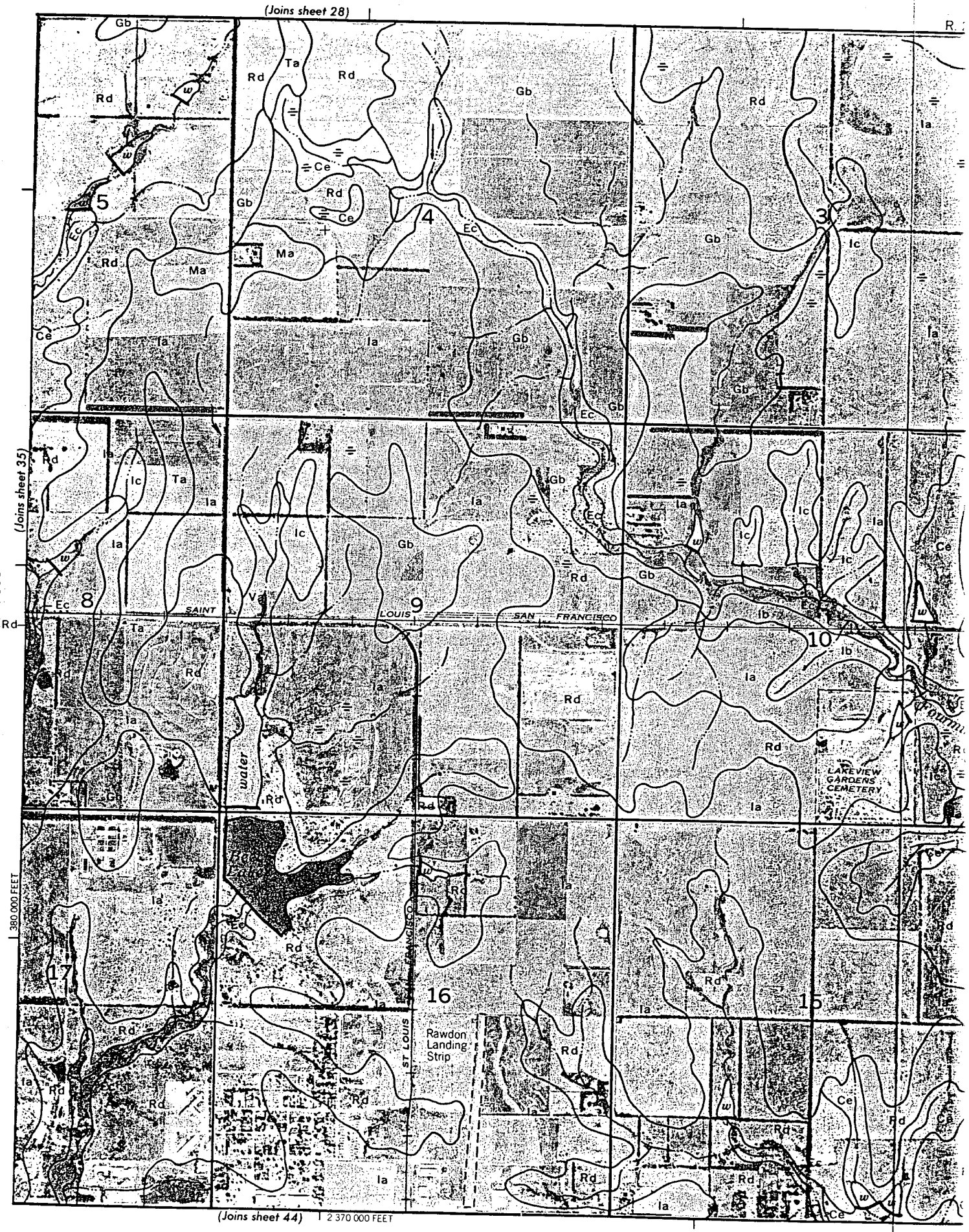

(Joins sheet 28)
(Joins sheet 35)
(Joins sheet 44)
N
1 Mile
5000 Feet
Scale 1:20000
380,000 FEET
2 370 000 FEET
SAINT LOUIS SAN FRANCISCO
ST LOUIS SAN FRANCISCO
water
Rawdon Landing Strip
LAKEVIEW GARDENS CEMETERY
Gb
Rd
Ta
Ce
Ec
Ma
Ia
Ic
Ib
Vb
5
4
3
8
9
10
17
16
15

EXHIBIT NO. 1

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Clime silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Vanoss silt loam, 0 to 1 percent slopes
Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent lopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

(3 pages)

ATTACHMENT D

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	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
6. 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	0.18	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	0.53
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 basins 320 acres or larger.

April 15, 1986

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

CITY OF WICHITA, KANSAS

RAINFALL INTENSITY TABLE FOR SEDGWICK COUNTY, KANSAS

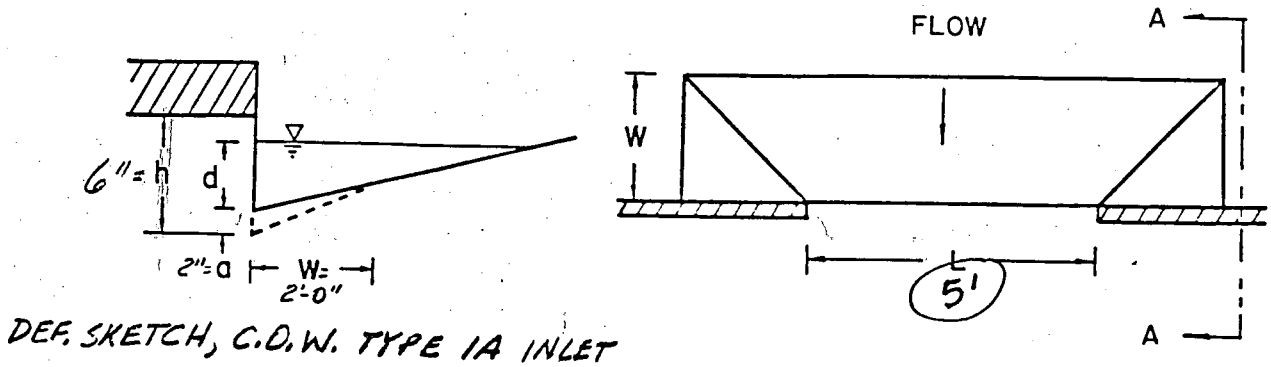
The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40 Modified to NWS Hydro-35, 1977 During First Hour

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
44	1.75	2.11	2.61	3.05	3.57	4.03	4.43
45	1.73	2.08	2.57	3.01	3.52	3.98	4.38

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
46	1.70	2.05	2.54	2.97	3.48	3.93	4.33
47	1.67	2.02	2.50	2.93	3.44	3.88	4.28
48	1.66	2.00	2.47	2.90	3.39	3.84	4.23
49	1.64	1.97	2.44	2.86	3.35	3.79	4.18
50	1.61	1.95	2.41	2.83	3.32	3.75	4.13
51	1.59	1.92	2.38	2.79	3.28	3.71	4.09
52	1.56	1.89	2.35	2.76	3.24	3.67	4.05
53	1.54	1.86	2.33	2.73	3.20	3.63	4.00
54	1.52	1.84	2.30	2.70	3.17	3.59	3.96
55	1.50	1.81	2.27	2.67	3.14	3.55	3.92
56	1.47	1.79	2.25	2.64	3.10	3.51	3.88
57	1.45	1.76	2.22	2.61	3.07	3.48	3.84
58	1.43	1.74	2.20	2.59	3.04	3.44	3.81
59	1.42	1.72	2.18	2.56	3.01	3.41	3.77
60	1.40	1.69	2.15	2.53	2.98	3.37	3.73
61	1.38	1.67	2.13	2.51	2.95	3.34	3.70
62	1.36	1.65	2.11	2.48	2.92	3.31	3.67
63	1.34	1.63	2.09	2.46	2.89	3.28	3.63
64	1.33	1.61	2.07	2.44	2.86	3.25	3.60
65	1.31	1.59	2.05	2.41	2.84	3.22	3.57
66	1.30	1.57	2.03	2.39	2.81	3.19	3.54
67	1.28	1.56	2.01	2.37	2.79	3.16	3.51
68	1.26	1.54	1.99	2.35	2.76	3.13	3.48
69	1.25	1.52	1.97	2.33	2.74	3.10	3.45
70	1.24	1.50	1.95	2.31	2.71	3.08	3.42
71	1.22	1.49	1.93	2.28	2.69	3.05	3.39
72	1.21	1.47	1.92	2.26	2.67	3.02	3.36
73	1.20	1.46	1.90	2.25	2.64	3.00	3.34
74	1.18	1.44	1.88	2.23	2.63	2.98	3.31
75	1.17	1.43	1.86	2.21	2.61	2.95	3.29
76	1.16	1.41	1.85	2.19	2.58	2.93	3.26
77	1.15	1.40	1.83	2.17	2.55	2.90	3.24
78	1.13	1.38	1.82	2.15	2.53	2.88	3.22
79	1.12	1.37	1.80	2.14	2.50	2.86	3.19
80	1.11	1.36	1.79	2.12	2.48	2.84	3.16
81	1.10	1.34	1.77	2.10	2.46	2.82	3.13
82	1.09	1.33	1.76	2.08	2.43	2.79	3.10
83	1.08	1.32	1.74	2.06	2.41	2.76	3.07
84	1.07	1.31	1.73	2.04	2.39	2.74	3.04
85	1.06	1.30	1.72	2.02	2.37	2.71	3.01
86	1.05	1.28	1.70	2.00	2.34	2.69	2.99
87	1.04	1.27	1.69	1.99	2.32	2.66	2.96
88	1.03	1.26	1.68	1.97	2.30	2.64	2.93
89	1.02	1.25	1.68	1.95	2.28	2.62	2.91
90	1.01	1.24	1.66	1.93	2.26	2.59	2.88

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
91	1.00	1.23	1.65	1.92	2.24	2.57	2.86
92	1.00	1.22	1.63	1.90	2.22	2.55	2.83
93	0.99	1.21	1.62	1.89	2.20	2.53	2.81
94	0.98	1.20	1.61	1.87	2.19	2.51	2.79
95	0.97	1.19	1.59	1.85	2.17	2.49	2.76
96	0.96	1.18	1.58	1.84	2.15	2.46	2.74
97	0.96	1.17	1.57	1.82	2.13	2.44	2.72
98	0.95	1.16	1.56	1.81	2.12	2.42	2.70
99	0.94	1.15	1.54	1.80	2.10	2.41	2.67
100	0.93	1.14	1.53	1.78	2.08	2.39	2.65
101	0.93	1.13	1.52	1.77	2.07	2.39	2.65
102	0.92	1.13	1.51	1.75	2.05	2.35	2.61
103	0.91	1.12	1.50	1.74	2.04	2.33	2.59
104	0.90	1.11	1.49	1.73	2.02	2.31	2.57
105	0.90	1.10	1.47	1.72	2.01	2.30	2.55
106	0.89	1.09	1.46	1.70	1.99	2.28	2.54
107	0.88	1.09	1.45	1.69	1.98	2.26	2.52
108	0.88	1.08	1.44	1.68	1.96	2.25	2.50
109	0.87	1.07	1.43	1.67	1.95	2.23	2.48
110	0.87	1.06	1.42	1.65	1.93	2.21	2.46
111	0.86	1.06	1.41	1.64	1.92	2.20	2.45
112	0.85	1.05	1.40	1.63	1.91	2.18	2.43
113	0.85	1.04	1.39	1.62	1.89	2.17	2.41
114	0.84	1.03	1.38	1.61	1.88	2.15	2.40
115	0.84	1.03	1.37	1.60	1.87	2.14	2.38
116	0.83	1.02	1.36	1.59	1.86	2.12	2.36
117	0.82	1.01	1.36	1.58	1.84	2.11	2.35
118	0.82	1.01	1.35	1.57	1.83	2.09	2.33
119	0.81	1.00	1.34	1.56	1.82	2.08	2.32
120	0.81	0.99	1.33	1.55	1.81	2.07	2.30

DURATION IN HOURS	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
2	0.81	0.99	1.33	1.55	1.81	2.07	2.30
3	0.59	0.72	0.97	1.13	1.32	1.51	1.68
4	0.47	0.58	0.78	0.91	1.06	1.21	1.35
5	0.40	0.49	0.66	0.77	0.89	1.02	1.14
6	0.35	0.42	0.57	0.67	0.78	0.89	0.99
8	0.28	0.34	0.46	0.53	0.62	0.71	0.79
10	0.23	0.29	0.39	0.45	0.52	0.60	0.67
12	0.20	0.25	0.33	0.39	0.45	0.52	0.58
18	0.15	0.18	0.24	0.28	0.33	0.38	0.42
24	0.12	0.15	0.20	0.23	0.27	0.31	0.34



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

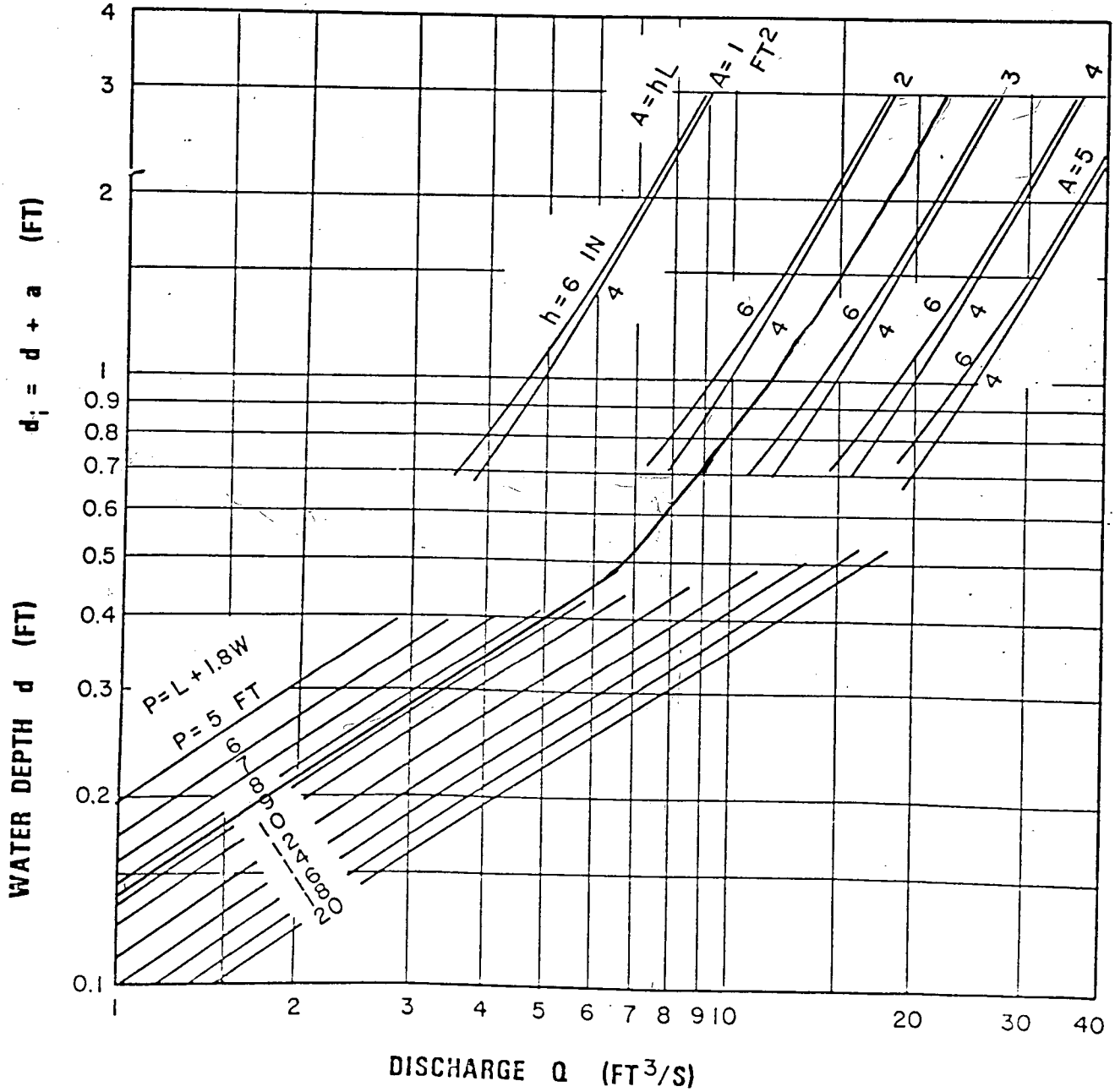


CHART 12. Depressed curb-opening inlet capacity in sump locations.

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

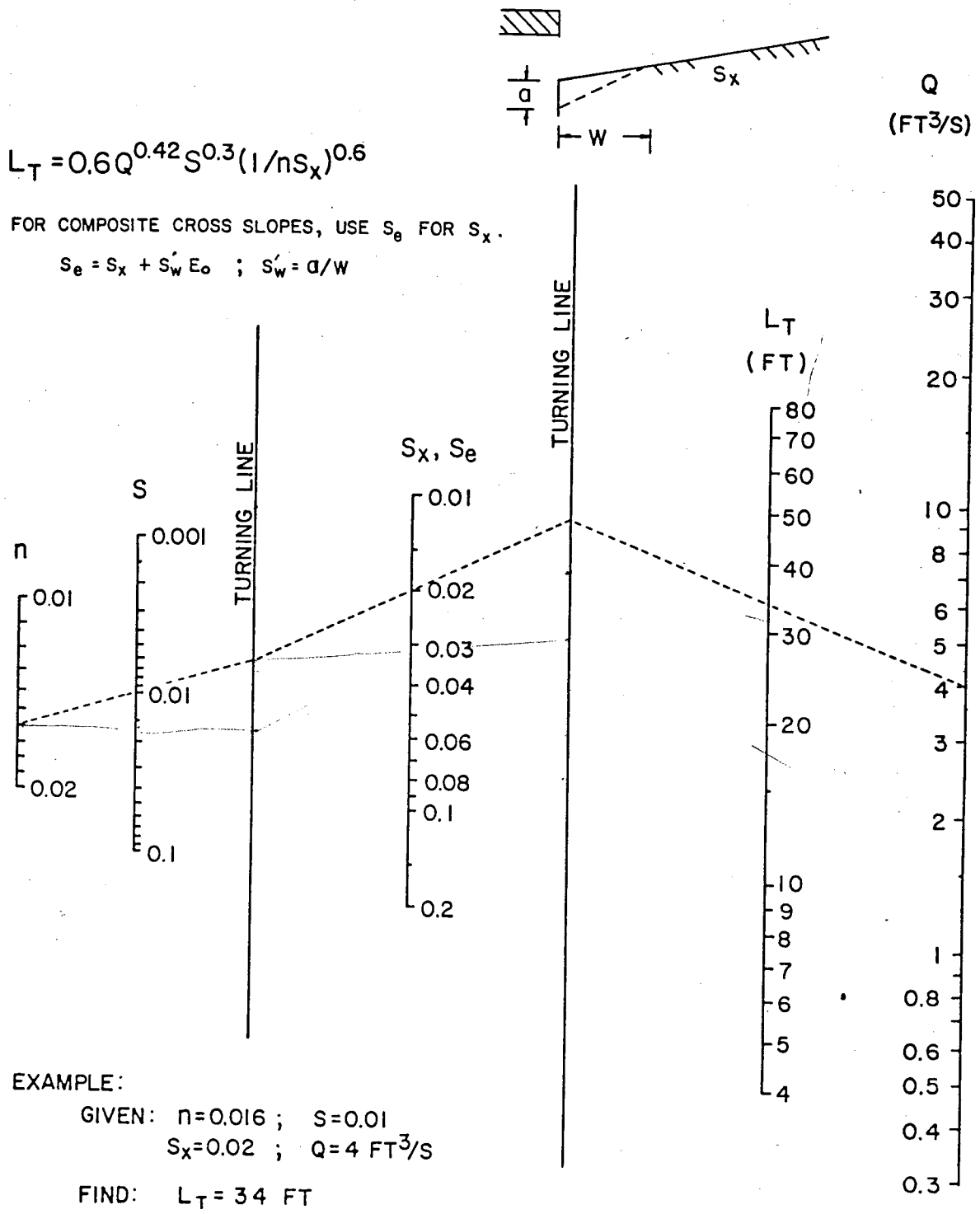


CHART 9. Curb-opening and slotted drain inlet length for total interception.

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

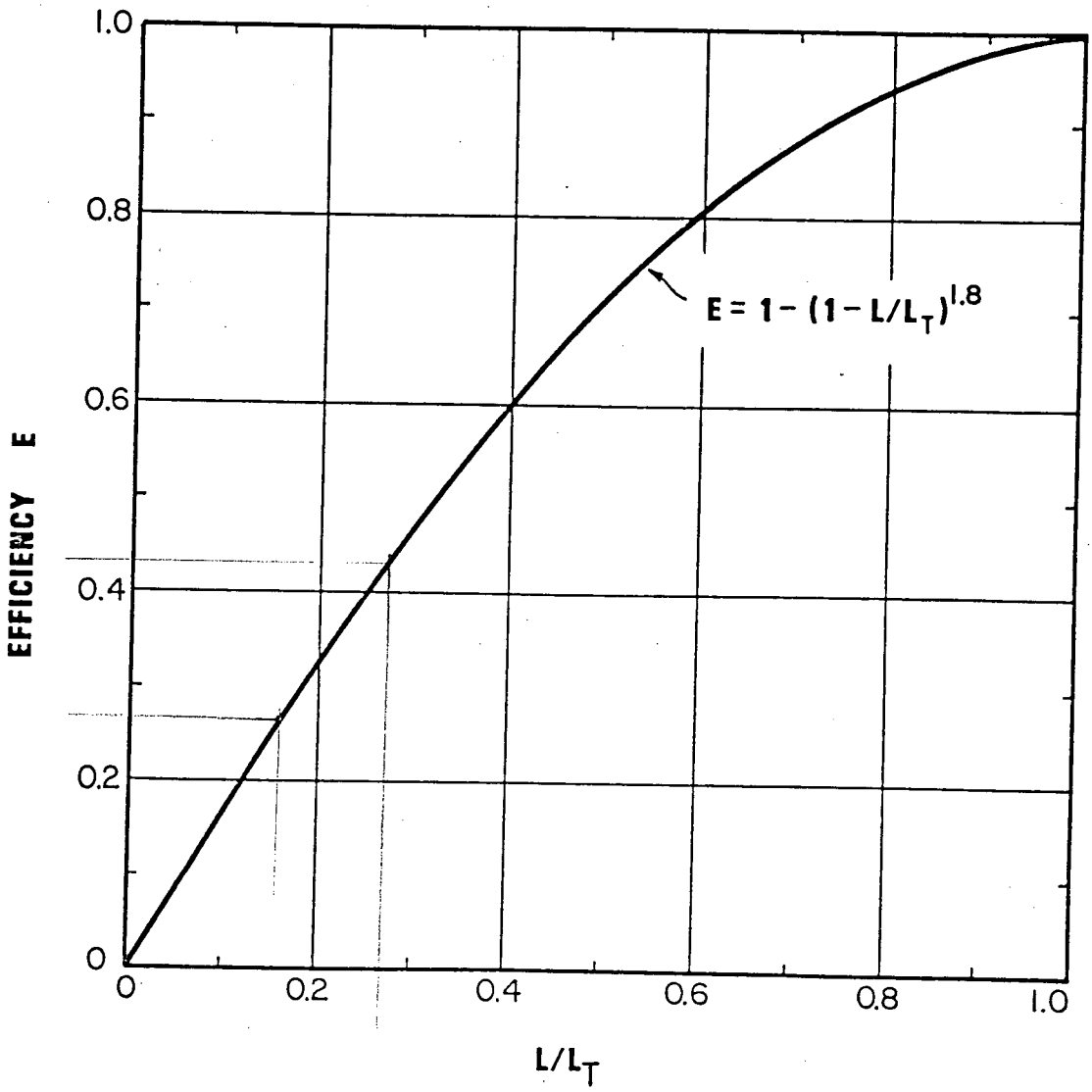
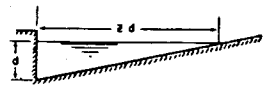


CHART 10. Curb-opening and slotted drain inlet interception efficiency.

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

Chart 1



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) s^{\frac{1}{2}} d^{\frac{8}{3}}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1946, PAGE 150, EQUATION (14)

EXAMPLE (SEE INSTRUCTION 1)

GIVEN: S = 0.03
z = 24, n = .02 } z/n = 1200
Q = 2 CFS

FIND: d = 0.22 BY FOLLOWING DASHED LINES

RATIO z/n

10000 9000 8000 7000 6000 5000 4000 3000 2000 1000 900 800 700 600 500 400 300 200 100 90 80 70 60 50 40 30 20 10

TURNING LINE

DISCHARGE (Q) IN CFS

100 70 50 30 20 10 7 5 3 2 1 .7 .5 .3 .2 .1 .07 .05 .03 .02 .01

SLOPE OF CHANNEL (S) IN FT./FT.

.10 .08 .07 .06 .05 .04 .03 .02 .01 .008 .007 .006 .005 .004 .003 .002 .001

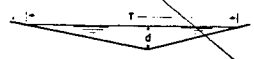
DEPTH AT CURB OR DEEPEST POINT (d) IN FT.

2.0 1.0 .80 .70 .60 .50 .40 .30 .20 .10 .08 .07 .06 .05 .04 .03 .02 .01

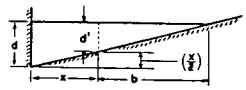
INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH POINT WHERE LINE CROSSES TURNING LINE READ DEPTH AT CURB (d). Q CAN BE FOUND FROM d BY CONNECTING d WITH CROSSING OF TURNING LINE.

2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH AS EXPLAINED IN INSTRUCTION 1 BUT WITH $z = \frac{T}{d}$.

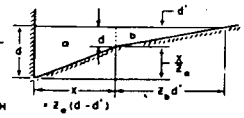


3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x:



DETERMINE DEPTH d FOR TOTAL DISCHARGE IN ENTIRE SECTION AS EXPLAINED IN 1. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION OF WIDTH b FOR DEPTH $d' = d - \left(\frac{x}{z}\right)$. THEN $Q_x = Q - Q_b$.

4. TO DETERMINE DISCHARGE (Q_T) IN COMPOSITE SECTION:— FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE (Q_a) IN SECTION a AT ASSUMED DEPTH d BASED ON AN EXTENSION OF SLOPE RATIO z_a TO INTERSECT WATER SURFACE; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH d'; $d' = d - \frac{x}{z_a}$. THEN $Q_T = Q_a + Q_b$.



BUREAU OF PUBLIC ROADS
REV. JAN. 1968

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

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Date 2.22.88 Page 1 of 15

Project Country Walk Addition

Item Revised Drainage Calculations

I HYDROLOGY

Use Rational Formula $Q = CIA$

Determine "C"

Node	Soil Group	Land Use	C_2	C_{100}
~~309~~	D	1/4 Ac Res	0.50	0.76
~~308~~	D	"	0.50	0.76
307	D	"	0.50	0.76
306	D	"	0.50	0.76
305	D	"	0.50	0.76
304	D	"	0.50	0.76
303	D	"	0.50	0.76
302	D	"	0.50	0.76
301	D	"	0.50	0.76
300	(Manhole - Connect to existing system)			

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Date 2.22.88 Page 2 of 15

Project Country Walk Addition

Item Revised Drainage Calculations

Determine "I"

Assume t_c = 15 minutes (All Nodes)

$\therefore$ I_2 = 3.83 (All Nodes)

I_{100} = 7.37 (All Nodes)

Determine "A"

Node	Plan. Units	Area SF	Area Ac.
~~309~~	~~16.94~~	~~169,400~~	~~3.89~~
~~308~~	~~7.62~~	~~76,200~~	~~1.75~~
307	5.71	57,100	1.31
306	4.44	44,400	~~1.02~~ 1.72
305	4.92	49,200	1.13
304	4.36	43,600	1.00
303	6.58	65,800	1.51
302	8.76	87,600	2.01
301	7.19	71,900	1.65
300	MH		

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Date 2.22.88 Page 3 of 15

Project Country Walk Addition

Item Revised Drainage Calcs.

Determine Q_2

Node	C_2	I_2	A	Q_2
~~309~~	~~0.50~~	~~3.83~~	~~3.89~~	~~7.4~~
~~308~~	~~0.50~~	~~3.83~~	~~1.75~~	~~3.4~~
307	0.50	3.83	1.31	2.5
306	0.50	3.83	1.72-1.02	2.0-3.3
305	0.50	3.83	1.13	2.2
304	0.50	3.83	1.00	1.9
303	0.50	3.83	1.51	2.9
302	0.50	3.83	2.01	3.8
301	0.50	3.83	1.65	3.2
300	(Manhole)			

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ZIP CODE / 67211

Date 2.22.88 Page 4 of 15

Project Country Walk Addition

Item Revised Drainage Calcs

Determine Q_{100}

Node	C_{100}	I_{100}	A	Q_{100}
~~309~~	~~0.76~~	~~7.37~~	~~3.89~~	~~21.8~~
~~308~~	~~0.76~~	~~7.37~~	~~1.75~~	~~9.8~~
307	0.76	7.37	1.31	7.3
306	0.76	7.37	1.72 ~~1.02~~	~~5.7~~ 9.6
305	0.76	7.37	1.13	6.3
304	0.76	7.37	1.00	5.6
303	0.76	7.37	1.51	8.5
302	0.76	7.37	2.01	11.3
301	0.76	7.37	1.65	9.2
300	MH			

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WICHITA, KANSAS
ZIP CODE / 67211

Date 2.22.88 Page 5 of 15

Project Country Walk Addition

Item Revised Drainage Calcs

II INLET SIZING / FLOOD ROUTING

Node	Inlet Condition	L	Qapproach*	Qintercept†	Qbypass	to
309	Sump	5'	7.4	7.4	0.0	-
308	On Grade	10'	3.4	76% = 2.6	0.8	306
307	On Grade	10'	2.5	85% = 2.1	0.4	304
306	On Grade	10'	~~2.0+0.8=2.8~~ 3.3	~~83% = 2.3~~ 2.7	~~-0.5~~ 0.6	305
305	Sump	5'	~~2.2+0.5=2.7~~ 0.6 2.8	~~2.7~~ 2.8	0.0	-
304	Sump	5'	1.9+0.4=2.3	2.3	0.0	-
303	Sump	5'	2.9	2.9	0.0	-
302	Sump	5'	3.8	3.8	0.0	-
301	Sump	5'	3.2	3.2	0.0	-
300	MH					

* $Q_{approach} = Q_2 + Q_{bypass\ from\ other\ inlets}$

† $Q_{intercept}$ = Q input in storm program

For inlets on grade see charts for % interception

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Date 2.22.88 Page 6 of 15

Project Country Walk Addition

Item Revised Drainage Calc's

III STREET FLOW - 2YR

Node	Q_2	Distribution	street slope	d	d_{max}	Comment
~~309~~	~~7.4~~	~~40% (W) = 3.0~~	~~1.04%~~	~~0.26'~~	~~0.30'~~	~~OK~~
		~~60% (E) = 4.4~~	~~0.34%~~	~~0.37'~~	~~0.55'~~	~~OK~~
~~308~~	~~3.4~~	~~100% (N) = 3.4~~	~~0.34%~~	~~0.33'~~	~~0.55'~~	~~OK~~
307	2.5	100% (N) = 2.5	0.32%	0.30'	0.30	OK
306	~~2.0~~ 3.3	100% (N) = ~~2.0~~ 3.3				
		+ bypass ~~0.8~~				
		~~2.8~~ 3.3	0.32%	~~0.31'~~ 0.33'	0.30	OK
305	2.2	= 100% (N) = 2.2				
		+ bypass ~~0.5~~ 0.6				
		~~2.7~~ 2.8	0.32%	~~0.31'~~ 0.32	0.30	OK
304	1.9	100% (N) = 1.9				
		+ bypass 0.4				
		2.3	1.04%	0.23'	0.30'	OK
303	2.9	= 100% (N) = 2.9	1.04%	0.25'	0.30'	OK
302	3.8	50% (N) = 1.9	1.52%	0.20'	0.30'	OK
		50% (E) = 1.9	= 0.32% (Exist. St.)	0.27'	0.55'	OK
301	3.2	= 100% (N) = 3.2	1.52%	0.25'	0.30'	OK

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ZIP CODE / 67211

Date 2.22.88 Page 7 of 15

Project Country Walk Addition

Item Revised Drainage Plan

III STREET FLOW - 100 YR

Qstreet = Q100 - Qpipe

Location	Contrib. Areas	Q100	Qpipe	Qstreet	st. slope	Qmax	Comment
Approaching 309 & 308 from E.	60% 309 / 100% 308	13.1 / 9.8 / ~~22.9~~	0.0	22.9	0.34%	45.0	OK Std Cb 0.3' Nk. Gr.
Approaching 307 & 306 from N.	100% 309	~~21.8~~					
	100% 308	~~9.8~~					
	100% 307	7.3					
	100% 306	~~5.7~~ 9.6					
		~~44.6~~ 16.9	0.0	16.9		22.8	
		10.0		34.6	0.32%	~~34.7~~	OK Roll Cb 0.4' WK Gr 0.3 (Min)
Approaching 305 from N	~~100%~~ 309	~~21.8~~					
	308	~~9.8~~					
	307	7.3					
	306	~~5.7~~ 9.6					
	305	6.3					
	40% 304	2.2					
		~~53.1~~ 25.4	4.8	20.6		22.8	
		~~14.3~~		38.8	0.32%	~~48.3~~	OK Roll Cb 0.5' WK Gr 0.3 (Min)
Approaching 304 from N	~~100%~~ 309	~~21.8~~					
	~~100%~~ 308	~~9.8~~					
	100% 307	7.3					
	100% 306	~~5.7~~ 9.6					
	100% 305	6.3					
	100% 304	5.6					
	50% 303	4.3					
		~~60.8~~ 33.1	7.5	25.6		41.2	
		~~16.9~~		~~43.9~~	1.04%	~~62.5~~	OK Roll Cb 0.4' WK Gr 0.3 (Min.)

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EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date 2·23·88 Page 8 of 15

Project Country Walk Addition

Item Revised Drainage Plan

100 YR STREET FLOW

Location	Contrib Areas		Q_{100}	Q_{pipe}	Q_{street}	street slope	Q_{max}	Comment
Approaching 303 from N.	100%	309	~~21.8~~					
		308	~~9.8~~					
		307	7.3					
		306	~~5.7~~ 9.6					
		305	6.3					
		304	5.6					
		303	8.5					
	50%	301	4.6	9.6	32.3		41.2	
			~~69.6~~ 41.9	~~19.0~~	50.6	1.04%	62.5	OK Roll Cb 0.4' WK Gr. 0.3 (Min)
Approaching 302 + 301 from N.	100%	309	~~21.8~~					
		308	~~9.8~~					
		307	7.3					
		306	5.7					
		305	6.3					
		304	5.6					
		303	8.5					
	50%	302	5.6					
	100%	301	9.2	12.3	39.8		49.8	
			~~79.2~~ 52.1	~~21.9~~	~~58.1~~	1.52%	~~75.5~~	OK Roll Cb. 0.4' WK Gr. 0.3' (Min)

9/15

```
100 j,  172.3000  300    3   10    9
110 t,Country walk addition
120 t,revised drainage calcs
130 t,storm water sewer system 300 analysis
140 i,  309     0.50     3.89     0.00     0.00     7.40    15.00   184.16
150 i,  308     0.50     1.75     0.00     0.00     2.60    15.00   183.85
160 i,  307     0.50     1.31     0.00     0.00     2.10    15.00   182.98
170 i,  306     0.50 1.72 1.02     0.00     0.00 2.7 2.30    15.00   182.90
180 i,  305     0.50     1.13     0.00     0.00 2.8 2.70    15.00   182.36
190 i,  304     0.50     1.00     0.00     0.00     2.30    15.00   180.57
200 i,  303     0.50     1.51     0.00     0.00     2.90    15.00   178.15
210 i,  302     0.50     2.01     0.00     0.00     3.80    15.00   173.38
220 i,  301     0.50     1.65     0.00     0.00     3.20    15.00   173.34
230 m,  300   172.30
240 p,  309  308    66.70   18 0.013    4.00    0.00
250 p,  308  306   292.00   18 0.013   17.00    0.00
260 p,  307  306    43.70   15 0.013   71.00    0.00
270 p,  306  305   164.10   24 0.013   41.00    0.00
280 p,  305  304   268.20   24 0.013   31.00    0.00
290 p,  304  303   219.50   24 0.013   39.00    0.00
300 p,  303  302   305.20   27 0.013   66.30    0.00
310 p,  302  301    36.00   36 0.013    4.00    0.00
320 p,  301  300    92.50   36 0.013   80.00    0.00
330 e
```

10/15

Date: 02-22-1988
Time: 17:49:02

Input File: cwalk300

country walk addition
revised drainage calcs
storm water sewer system 300 analysis

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
309	308	0.50	3.89	0.00	0.0	15.00	4.06	7.40	15.00	4.06	7.40	7.40	18"	4.19	66.70	0.27	15.27
308	306	0.50	1.75	0.00	0.0	15.00	4.06	2.69	15.27	4.03	2.58	9.98	18"	5.65	292.00	0.86	16.13
307	306	0.50	1.31	0.00	0.0	15.00	4.06	2.10	15.00	4.06	2.10	2.10	15"	1.71	43.70	0.43	15.43
306	305	0.50	1.02	0.00	0.0	15.00	4.06	2.30	16.13	3.95	2.24	14.28	24"	4.55	164.10	0.60	16.73
305	304	0.50	1.13	0.00	0.0	15.00	4.06	2.70	16.73	3.89	2.59	16.87	24"	5.37	268.20	0.83	17.56
304	303	0.50	1.00	0.00	0.0	15.00	4.06	2.30	17.56	3.82	2.16	19.03	24"	6.06	219.50	0.60	18.16
303	302	0.50	1.51	0.00	0.0	15.00	4.06	2.90	18.16	3.77	2.69	21.72	27"	5.46	305.20	0.93	19.10
302	301	0.50	2.01	0.00	0.0	15.00	4.06	3.80	19.10	3.69	3.46	25.18	36"	3.56	36.00	0.17	19.26
301	300	0.50	1.65	0.00	0.0	15.00	4.06	3.20	19.26	3.68	2.90	28.08	36"	3.97	92.50	0.39	19.65

11/15

Date: 02-22-1988
Time: 17:49:02

Input File: cwalk300

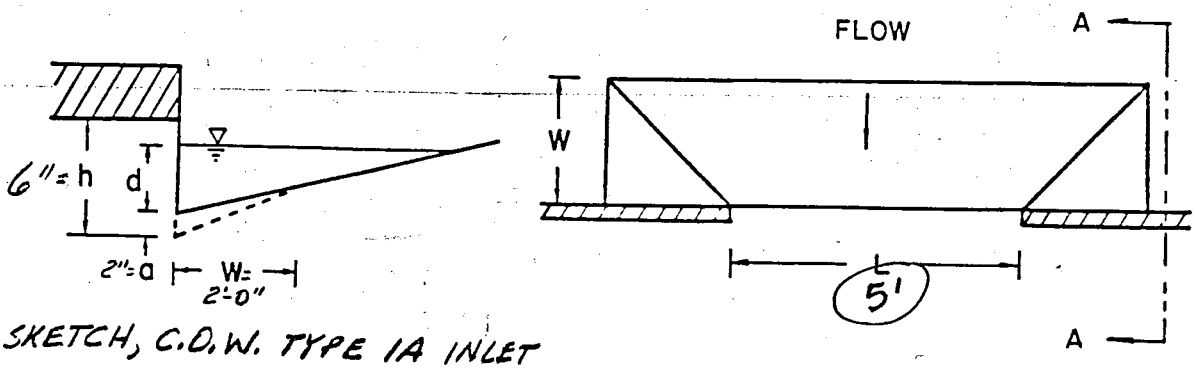
country walk addition
revised drainage calcs
storm water sewer system 300 analysis

Storm Frequency = 2-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
309	0.00496	0.3310	0.0000	0.0000	0.0000	0.0000	0.0000	0.3310	182.4577	184.1600	1.70
308	0.00903	2.6376	0.0000	0.0223	0.0000	0.0032	0.4822	3.1448	182.1267	183.8500	1.72
307	0.00106	0.0462	0.0000	0.0000	0.0000	0.0000	0.0000	0.0462	179.0281	182.9600	3.93
306	0.00399	0.6541	0.0000	0.0349	0.0000	0.0383	0.1260	0.8533	178.9819	182.9000	3.92
305	0.00556	1.4914	0.0000	0.0127	0.0000	0.0625	0.2780	1.8443	178.1286	182.3600	4.23
304	0.00709	1.5536	0.0000	0.0122	0.0000	0.0623	0.2764	1.9046	176.2841	180.5700	4.29
303	0.00492	1.5016	0.0000	0.0213	0.0000	0.1045	0.0597	1.6871	174.3795	178.1500	3.77
302	0.00143	0.0613	0.0000	0.0533	0.0000	0.1597	-0.1474	0.1170	172.6924	173.3800	0.69
301	0.00177	0.1640	0.0000	0.0048	0.0000	0.0022	0.1043	0.2754	172.5754	173.3400	0.76
300	0.00000	0.0300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	172.3000	172.3000	0.00

12/15



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

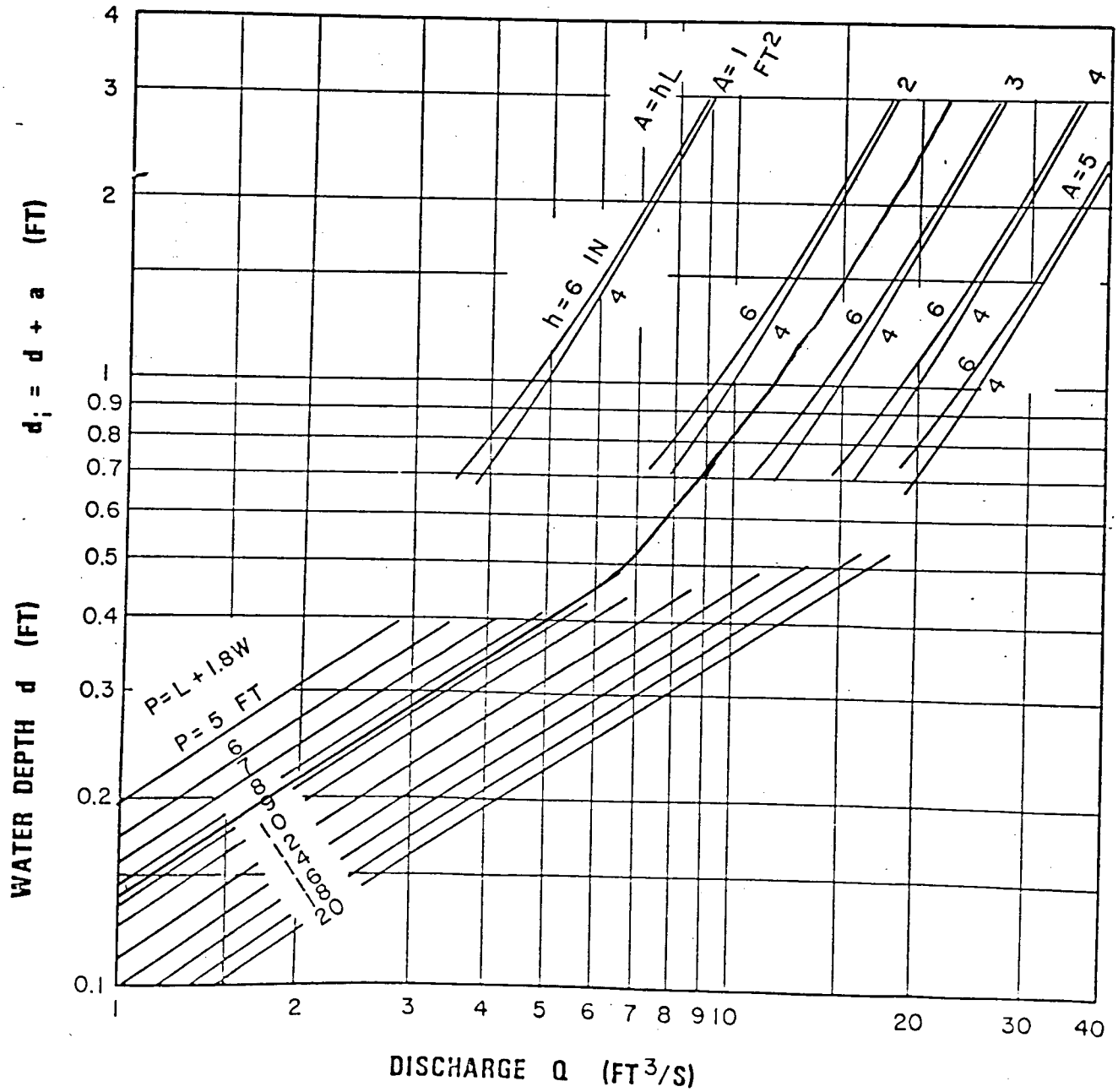


CHART 12. Depressed curb-opening inlet capacity in sump locations.

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

13/16

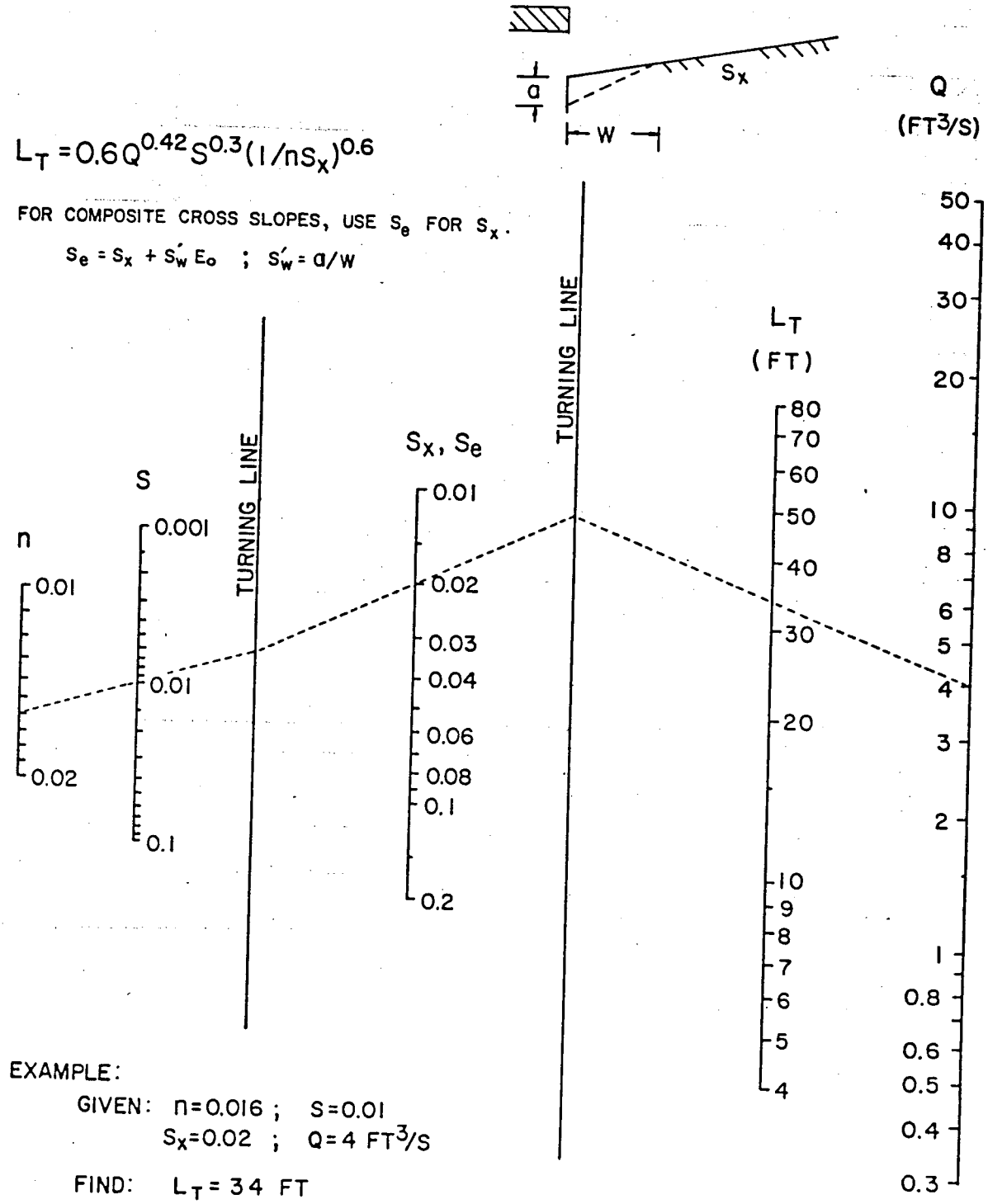


CHART 9. Curb-opening and slotted drain inlet length for total interception.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR. 1969

14/15

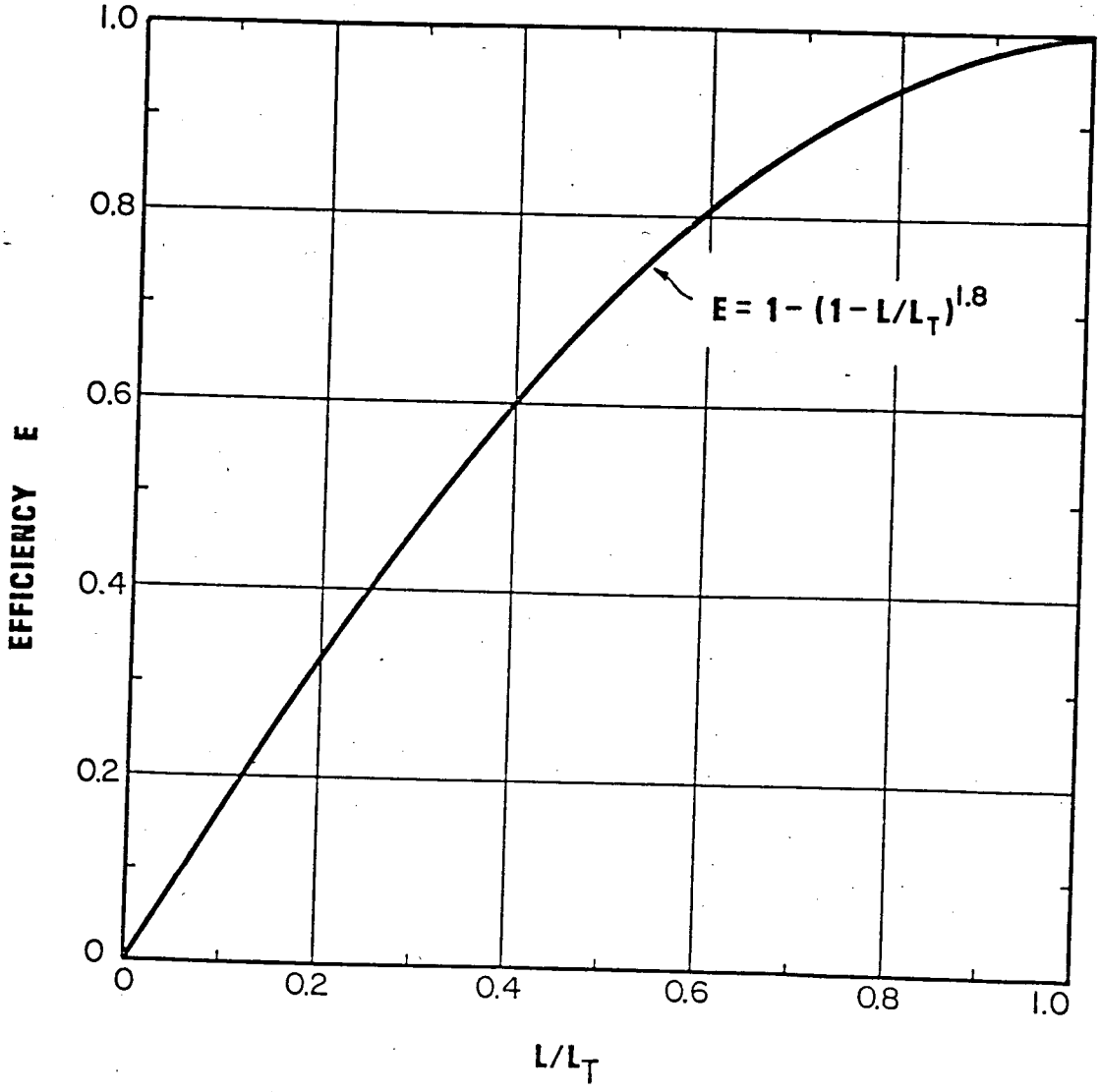


CHART 10. Curb-opening and slotted drain inlet interception efficiency.

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

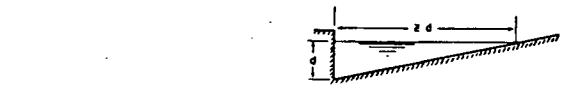
X-slope = 3/8"/1 = 0,03125 1

Z = 1/X-slope = 1/0,03125 = 32

n = 0,016

Z/n = 2000

Chart 1



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) s^{\frac{1}{2}} d^{\frac{8}{3}}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1946, PAGE 150, EQUATION (14)

EXAMPLE (SEE INSTRUCTION 1)

GIVEN: S = 0.03
z = 24
n = .02
z/n = 1200
Q = 20 CFS

FIND: d = 0.22 BY FOLLOWING DASHED LINES

RATIO z/n: 10000, 9000, 8000, 7000, 6000, 5000, 4000, 3000, 2000, 1000, 900, 800, 700, 600, 500, 400, 300, 200, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10

TURNING LINE

DISCHARGE (Q) IN CFS: 100, 70, 50, 30, 20, 10, 7, 5, 3, 2, 1, .7, .5, .3, .2, .1, .07, .05, .03, .02, .01

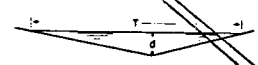
SLOPE OF CHANNEL (S) IN FT./FT.: .10, .08, .07, .06, .05, .04, .03, .02, .01, .008, .007, .006, .005, .004, .003, .002, .001

DEPTH AT CURB OR DEEPEST POINT (d) IN FT.: 2.0, 1.0, .80, .70, .60, .50, .40, .30, .20, .10, .08, .07, .06, .05, .04, .03, .02, .01

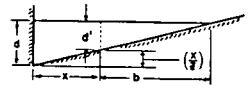
INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH POINT WHERE LINE CROSSES TURNING LINE READ DEPTH AT CURB (d) Q CAN BE FOUND FROM d BY CONNECTING d WITH CROSSING OF TURNING LINE.

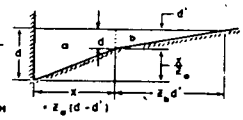
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH AS EXPLAINED IN INSTRUCTION 1 BUT WITH $z = \frac{T}{d}$.



3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH d FOR TOTAL DISCHARGE IN ENTIRE SECTION AS EXPLAINED IN 1. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION OF WIDTH b FOR DEPTH $d' = d - \left(\frac{x}{z}\right)$ THEN $Q_x = Q - Q_b$.



4. TO DETERMINE DISCHARGE (Q_T) IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE (Q_a) IN SECTION a AT ASSUMED DEPTH d BASED ON AN EXTENSION OF SLOPE RATIO z_a TO INTERSECT WATER SURFACE; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH d'; $d' = d - \frac{x}{z_a}$ THEN $Q_T = Q_a + Q_b$.



BUREAU OF PUBLIC ROADS
REV. JAN. 1968

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

```
100 j,  172.3000  300    3    6    7
110 t,country walk addition
120 t,revised revised drainage calculations (replat)
130 t,storm water sewer system 300 analysis
140 i,  307     0.50     1.31     0.00     0.00     3.10    15.00   182.99
150 i,  306     0.50     1.72     0.00     0.00     2.70    15.00   182.99
160 i,  305     0.50     1.13     0.00     0.00     2.30    15.00   182.36
170 i,  304     0.50     1.00     0.00     0.00     2.30    15.00   180.57
180 i,  303     0.50     1.51     0.00     0.00     2.90    15.00   178.15
190 i,  302     0.50     2.01     0.00     0.00     3.50    15.00   173.33
200 i,  301     0.50     1.65     0.00     0.00     3.20    15.00   173.34
210 m,  300   172.30
220 p,  307  306    43.70   15 0.013  71.00   0.00
230 p,  306  305   164.10   18 0.013  41.00   0.00
240 p,  305  304   268.20   18 0.013  31.00   0.00
250 p,  304  303   219.50   18 0.013  39.00   0.00
260 p,  303  302   305.20   24 0.013  66.00   0.00
270 p,  302  301    36.00   36 0.013   4.00   0.00
280 p,  301  300    92.50   36 0.013  60.00   0.00
290 e
```

Date: 04-23-1988
Time: 11:14:37

Input File: cwalkrev

country walk addition
revised revised drainage calculations (replat)
storm water sewer system 300 analysis

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
307	306	0.50	1.31	0.00	0.0	15.00	4.06	2.10	15.00	4.06	2.10	2.10	15"	1.71	43.70	0.43	15.43
306	305	0.50	1.72	0.00	0.0	15.00	4.06	2.70	15.43	4.01	2.67	4.77	18"	2.70	164.10	1.01	16.44
305	304	0.50	1.13	0.00	0.0	15.00	4.06	2.80	16.44	3.92	2.70	7.47	18"	4.23	268.20	1.06	17.50
304	303	0.50	1.00	0.00	0.0	15.00	4.06	2.30	17.50	3.82	2.17	9.64	18"	5.45	219.50	0.67	18.17
303	302	0.50	1.51	0.00	0.0	15.00	4.06	2.99	18.17	3.77	2.69	12.33	24"	3.92	305.20	1.30	19.46
302	301	0.50	2.91	0.00	0.0	15.00	4.06	3.80	19.46	3.67	3.43	15.76	36"	2.23	35.00	0.27	19.73
301	300	0.50	1.65	0.00	0.0	15.00	4.06	3.20	19.73	3.65	2.88	18.64	36"	2.64	72.50	0.38	20.02

Date: 04-25-1989
Time: 11:14:37

Input File: cwalkrev

country walk addition
revised revised drainage calculations (replat)
storm water sewer system 300 analysis

Storm Frequency = 2-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
307	0.00104	0.0462	0.0000	0.0000	0.0000	0.0000	0.0000	0.0462	178.1761	182.9900	4.80
306	0.00206	0.3385	0.0000	0.0060	0.0000	0.0171	0.2000	0.5631	178.1299	182.9000	4.77
305	0.00504	1.3572	0.0000	0.0164	0.0000	0.0220	0.3474	1.7431	177.5668	182.3600	4.79
304	0.00648	1.8480	0.0000	0.0184	0.0000	0.0386	0.4030	2.3081	175.8237	180.5700	4.75
303	0.00277	0.9065	0.0000	0.0446	0.0000	0.0947	-0.0243	1.0114	173.5156	178.1500	4.63
302	0.00056	0.0201	0.0000	0.0024	0.0000	0.0024	-0.0718	0.0531	172.5043	178.0300	5.53
301	0.00078	0.0722	0.0000	0.0031	0.0000	0.0069	0.0649	0.1412	172.4412	178.3400	5.90
300	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	172.3000	178.3000	5.00