



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

DRAINAGE PLAN

NW MAIN PUMP STATION

Wichita, Sedgwick County, Kansas

303 S. TOPEKA
WICHITA, KANSAS
67202
316-262-2691
FAX
316-262-3003
www.pec1.com
designers@pec1.com

OFFICES IN:
WICHITA
TOPEKA
LAWRENCE

APRIL 2001



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

303 S. TOPEKA • WICHITA, KANSAS 67202 • 316-262-2691 • FAX 316-262-3003 • www.pec1.com • designers@pec1.com

NW Main Pump Station

Wichita, Sedgwick County, Kansas

04/02/2001

The NW Main Pump Station will be included in a 4.2-acre plat that will include a wastewater pump station, a detention facility, a future fire station and a commercial lot. The site is located southeast of 21st Street North and 135th Street West. The drainage plan, supporting computations and data for the NW Main Pump Station drainage plan are presented herein.

Hydrology

The proposed plat lies in the NW ¼, NW ¼, NW ¼, Section 12, T27S, R2W. The existing landscape is pasture with a small house and barns on the northeast portion. Existing trees are along the perimeter of the property. This property is drains toward Dry Creek, a Cowskin Creek Tributary.

A detention pond was designed as part of this plat to reduce developed runoff to pre-developed conditions. The detention pond uses an 8' weir as an outfall to the existing ditch along the south side of 21st Street North. Improvements are needed in the drainage ditch to achieve the required grade at the pond outfall. An entrance to 21st Street is planned and culvert pipes will be required under the entrance. There will also be drainage pipes required under the entrance to 135th Street West. As with the 21st Street ditch, the ditch along 135th Street West will need to be excavated and improved. The pipes and their sizes as well as the ditch slopes and elevations are illustrated on the Drainage Plan.

The proposed drainage plan collects storm water runoff from this plat as well as area to the east and south. Drainage from these areas will need to be directed towards the detention pond with swales, curb and gutter, flumes or storm sewer systems. Drainage from the south will need to be carried across Lot 3 to the detention pond.

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-1 models are included.

The analysis made is based on the available site data which includes the following: 1" = 50' topographic map with 1' contours of the site and adjacent areas, USGS topographic map, Sedgwick County Soil Survey Map and references noted herein.

Storm Sewer Design

A storm sewer system for the pump station site was not designed at this time. The pond was sized to accept most of the drainage from the pump station plat and to provide fill material to elevate the lots so they can be graded toward the pond.

Culvert Sizing

The FHWA's culvert program HY8 Ver. 6.1 was used to aid in the design of the culverts needed under the proposed access roads to the pump station. These culverts were sized to fit in the roadside ditches and not overly constrict the 100-yr flow.

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.

Existing Conditions

Soils

Bb-Blanket Silt Loam, 1-3% Slopes, Hydrologic Group C
 Vb-Vanoss Silt Loam, 1-3% Slopes, Hydrologic Group B

Runoff Coefficients

Pasture

-1-4% Slopes
 -tc=15 minutes (950 ft @ 1 ft/sec)

$i_2=3.80$ in/hr	Type B Soil	Type C Soil
$i_5=4.62$ in/hr	$C_2=0.22$	$C_2=0.28$
$i_{10}=5.21$ in/hr	$C_5=0.24$	$C_5=0.31$
$i_{100}=7.40$ in/hr	$C_{10}=0.30$	$C_{10}=0.39$
	$C_{100}=0.43$	$C_{100}=0.55$

1 Ac. Residential

-tc=24 minutes (1000 ft @ 0.7 ft/sec)

$i_2=3.00$ in/hr	Type B Soil	Type C Soil
$i_5=3.72$ in/hr	$C_2=0.33$	$C_2=0.37$
$i_{10}=4.23$ in/hr	$C_5=0.35$	$C_5=0.40$
$i_{100}=6.12$ in/hr	$C_{10}=0.40$	$C_{10}=0.48$
	$C_{100}=0.51$	$C_{100}=0.61$

Roadside

-38% Impervious
 -tc=15 minutes

$i_2=3.80$ in/hr	Type B Soil	Type C Soil
$i_5=4.62$ in/hr	$C_2=0.44$	$C_2=0.48$
$i_{10}=5.21$ in/hr	$C_5=0.46$	$C_5=0.51$
$i_{100}=7.40$ in/hr	$C_{10}=0.52$	$C_{10}=0.57$
	$C_{100}=0.61$	$C_{100}=0.68$

Developed Conditions

Light Commercial

-70% Impervious
 -tc=15 minutes

$i_2=3.80$ in/hr	Runoff Coefficients
$i_5=4.62$ in/hr	$C_2=0.68$
$i_{10}=5.21$ in/hr	$C_5=0.69$
$i_{100}=7.40$ in/hr	$C_{10}=0.73$
	$C_{100}=0.80$

21ST STREET NORTH

1354

1360

SCALE: 1" = 1000'

CLEARWATER

1350

Creek

12

1350

1350

1358

15TH STREET WEST

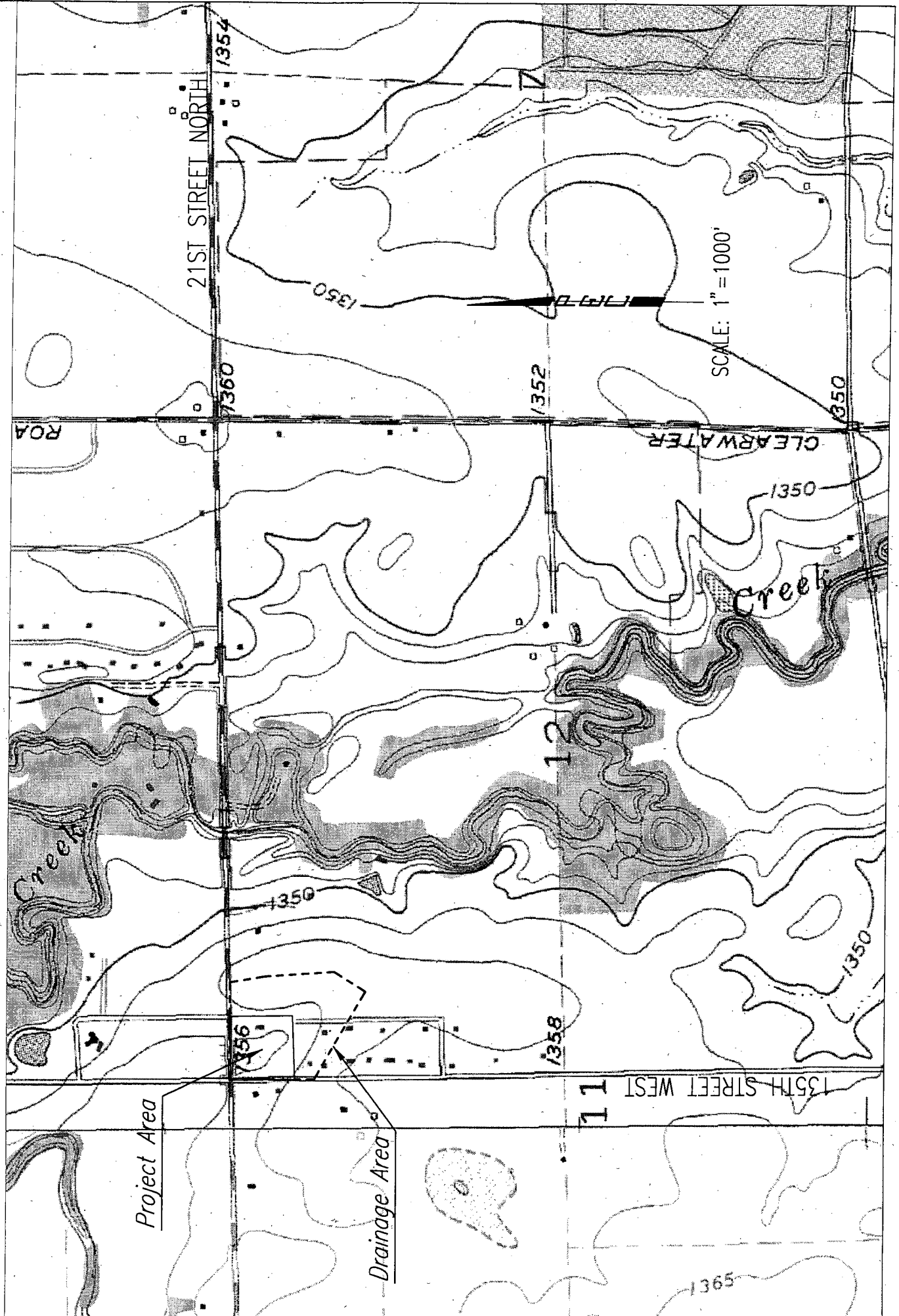
11

Project Area

Drainage Area

1356

1365



Hydrology

Existing Conditions

Basin	Area (Acres)	Existing Land Use	Soil Type	Time of Concentration	C ₂	C ₅	C ₁₀	C ₁₀₀	i ₂ in/hr	i ₅ in/hr	i ₁₀ in/hr	i ₁₀₀ in/hr	Q ₂ (cfs)	Q ₅ (cfs)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
A	0.64	Roadside (38% Impervious)	C	15 minutes	8.00	0.51	0.57	0.68	3.80	4.62	5.21	7.40	19.5	1.5	1.9	3.2
B	0.15	Roadside (38% Impervious)	B	15 minutes	0.44	0.46	0.52	0.61	3.80	4.62	5.21	7.40	0.3	0.3	0.4	0.7
C	0.54	Pasture	0.23 Ac. B, 0.31 Ac. C	15 minutes	0.25	0.28	0.35	0.50	3.80	4.62	5.21	7.40	0.5	0.7	1.0	2.0
D	0.96	Roadside (38% Impervious)	B	15 minutes	0.44	0.46	0.52	0.61	3.80	4.62	5.21	7.40	1.6	2.0	2.6	4.3
E	3.61	Pasture	1.04 Ac. B, 2.57 Ac. C	15 minutes	0.26	0.29	0.36	0.52	3.80	4.62	5.21	7.40	3.6	4.8	6.8	13.9
F	0.72	Pasture	C	15 minutes	0.28	0.31	0.39	0.55	3.80	4.62	5.21	7.40	0.8	1.0	1.5	2.9
G	6.23	Pasture	B	15 minutes	0.22	0.24	0.30	0.43	3.80	4.62	5.21	7.40	5.2	6.9	9.7	19.8
H	2.53	1 Ac. Residential	B	24 minutes	0.33	0.35	0.40	0.51	3.00	3.72	4.23	6.12	2.5	3.3	4.3	7.9
I	0.75	1 Ac. Residential	C	24 minutes	0.37	0.40	0.48	0.61	3.00	3.72	4.23	6.12	0.8	1.1	1.5	2.8
Total													34.7	21.8	29.7	57.6

Developed Conditions

Basin	Area (Acres)	Existing Land Use	Soil Type	Time of Concentration	C ₂	C ₅	C ₁₀	C ₁₀₀	i ₂ in/hr	i ₅ in/hr	i ₁₀ in/hr	i ₁₀₀ in/hr	Q ₂ (cfs)	Q ₅ (cfs)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
A	0.64	Roadside (38% Impervious)	C	15 minutes	8.00	0.51	0.57	0.68	3.80	4.62	5.21	7.40	19.5	1.5	1.9	3.2
B	0.15	Roadside (38% Impervious)	B	15 minutes	0.44	0.46	0.52	0.61	3.80	4.62	5.21	7.40	0.3	0.3	0.4	0.7
C	0.54	Light Commercial	N/A	15 minutes	0.68	0.69	0.73	0.80	3.80	4.62	5.21	7.40	1.4	1.7	2.1	3.2
D	0.96	Roadside (38% Impervious)	B	15 minutes	0.44	0.46	0.52	0.61	3.80	4.62	5.21	7.40	1.6	2.0	2.6	4.3
E	3.61	Light Commercial	N/A	15 minutes	0.68	0.69	0.73	0.80	3.80	4.62	5.21	7.40	9.3	11.5	13.7	21.4
F	0.72	Pasture	C	15 minutes	0.28	0.31	0.39	0.55	3.80	4.62	5.21	7.40	0.8	1.0	1.5	2.9
G	6.23	Pasture	B	15 minutes	0.22	0.24	0.30	0.43	3.80	4.62	5.21	7.40	5.2	6.9	9.7	19.8
H	2.53	1 Ac. Residential	B	24 minutes	0.33	0.35	0.40	0.51	3.00	3.72	4.23	6.12	2.5	3.3	4.3	7.9
I	0.75	1 Ac. Residential	C	24 minutes	0.37	0.40	0.48	0.61	3.00	3.72	4.23	6.12	0.8	1.1	1.5	2.8
Total													41.3	29.4	37.7	66.2

NW Main Pump Station
Drainage Plan
PEC Project No. 36-99452-4-042

Detention System

Detention pond with a weir outfall to the ditch along the south side of 21st Street.

Elevation	Area	Outflow
N.G.V.D.	Acres	cfs
1354.25	0.47	0
1355	0.58	16.6
1356	0.68	59.3

Weir Elevation = 1354.25

Weir Length = 8 ft

Weir Coefficient = 3.2

$$Q = C * L * h^{3/2}$$

Basins routed to existing Drainage
Structures (2-24"x37" CMPs)

Basin	Q ₁₀₀
A	3.2
B	0.7
C	3.2
D	4.3
Total	11.4

Basins routed to the pond

Basin	Q ₁₀₀
E	21.4
F	2.9
G	19.8
H	7.9
I	2.8
Total	54.8

Existing Q₁₀₀ = 57.6 cfs

Bypass = 11.4 cfs

Q₁₀₀ allowed out of the pond = 46.2 cfs

Using HEC-1:

Q₁₀₀ = 46 cfs

HW₁₀₀ = 1355.7

Northwest Main Pump Station

```
*****  
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *  
* MAY 1991 *  
* VERSION 4.0.1E *  
* Lahey F77L-EM/32 version 5.01 *  
* Dodson & Associates, Inc. *  
* RUN DATE 03/29/01 TIME 11:38:18 *  
*****
```

```
*****  
* U.S. ARMY CORPS OF ENGINEERS *  
* HYDROLOGIC ENGINEERING CENTER *  
* 609 SECOND STREET *  
* DAVIS, CALIFORNIA 95616 *  
* (916) 551-1748 *  
*****
```

```
X X XXXXXX XXXX X  
X X X X X XX  
X X X X X  
XXXXXX XXXX X XXXX X  
X X X X X  
X X X X X  
X X XXXXXX XXXX XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

Northwest Main Pump Station

HEC-1 INPUT

PAGE 1

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1	ID NW Pump Station
2	ID 21st N & 135th St W
3	ID 2, 5, 10, and 100 Year Storms
4	ID Professional Engineering Consultants
5	ID Wichita, Ks
6	ID KER 3/29/01
7	ID T:/DAR/HEC1/NW_PUMP.IH1
8	IT 6 12DEC97 0600 0 13DEC97 1154
9	IN 30 12DEC97 0600
10	IO 3 0
11	JR PREC .448718 .5902 .679487 1.000

*DIAGRAM

*

12	KK	BAS_E	Basin E-Light Commercial											
13	BA	.00564												
14	PB	7.8												
15	PC	0.08	.09	.10	.11	.12	.133	.147	.163	.181	.204			
16	PC	.235	.283	.663	.735	.772	.799	.820	.835	.850	.865			
17	PC	.880	.890	.900	.910	.916	.925	.934	.943	.952	.958			
18	PC	.964	.970	.976	.982	.988	.994	1.000						
19	LS	0	98	0										
20	UD	.15												

*

*

21	KK	BAS_F	Basin F- Existing Pasture											
22	BA	.00112												
23	PB	7.8												
24	PC	0.08	.09	.10	.11	.12	.133	.147	.163	.181	.204			
25	PC	.235	.283	.663	.735	.772	.799	.820	.835	.850	.865			
26	PC	.880	.890	.900	.910	.916	.925	.934	.943	.952	.958			
27	PC	.964	.970	.976	.982	.988	.994	1.000						
28	LS	0	75	0										
29	UD	.15												

*

30	KK	BAS_G	Basin G- Existing Pasture											
31	BA	.00973												
32	PB	7.8												
33	PC	0.08	.09	.10	.11	.12	.133	.147	.163	.181	.204			
34	PC	.235	.283	.663	.735	.772	.799	.820	.835	.850	.865			
35	PC	.880	.890	.900	.910	.916	.925	.934	.943	.952	.958			
36	PC	.964	.970	.976	.982	.988	.994	1.000						
37	LS	0	64	0										
38	UD	.15												

*

*

Northwest Main Pump Station

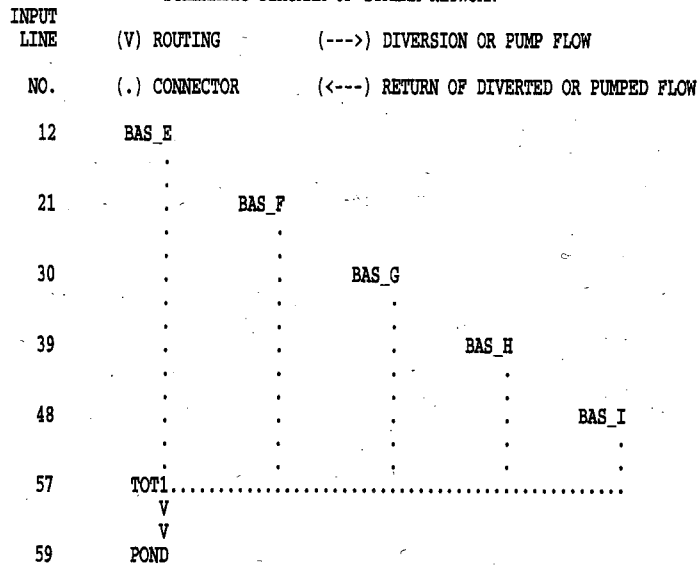
HEC-1 INPUT

PAGE 2

LINE	ID	1	2	3	4	5	6	7	8	9	10
39	KK	BAS H Basin H- 1 Ac. Residential									
40	BA	.00395									
41	PB	7.8									
42	PC	0.08	.09	.10	.11	.12	.133	.147	.163	.181	.204
43	PC	.235	.283	.663	.735	.772	.799	.820	.835	.850	.865
44	PC	.880	.890	.900	.910	.916	.925	.934	.943	.952	.958
45	PC	.964	.970	.976	.982	.988	.994	1.000			
46	LS	0	68	0							
47	UD	.24									
	*										
48	KK	BAS I Basin I- 1 Ac. Residential									
49	BA	.0012									
50	PB	7.8									
51	PC	0.08	.09	.10	.11	.12	.133	.147	.163	.181	.204
52	PC	.235	.283	.663	.735	.772	.799	.820	.835	.850	.865
53	PC	.880	.890	.900	.910	.916	.925	.934	.943	.952	.958
54	PC	.964	.970	.976	.982	.988	.994	1.000			
55	LS	0	73	0							
56	UD	.24									
	*										
57	KK	TOT1									
58	HC	5									
	*										
	*										
59	KK	POND									
60	RS	1	ELEV	54.25							
61	SA	.47	.58	.68							
62	SE	54.25	55	56							
63	SQ	0	16.6	59.3							
64	SE	54.25	55	56							
	*										
	*										
65	ZZ										

Northwest Main Pump Station

SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

Northwest Main Pump Station

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* Lahey F77L-EM/32 version 5.01 *
* Dodson & Associates, Inc. *
* RUN DATE 03/29/01 TIME 11:38:18 *
*****
```

```
*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *
*****
```

```
NW Pump Station
21st N & 135th St W
2, 5, 10, and 100 Year Storms
Professional Engineering Consultants
Wichita, Ks
KER 3/29/01
T:/DAR/HEC1/NW_PUMP.IH1
```

```
10 IO OUTPUT CONTROL VARIABLES
      IPRNT 3 PRINT CONTROL
      IPLOT 0 PLOT CONTROL
      QSCAL 0. HYDROGRAPH PLOT SCALE
```

```
IT HYDROGRAPH TIME DATA
      NMIN 6 MINUTES IN COMPUTATION INTERVAL
      IDATE 12DEC97 STARTING DATE
      ITIME 0600 STARTING TIME
      NQ 300 NUMBER OF HYDROGRAPH ORDINATES
      NDDATE 13DEC97 ENDING DATE
      NDTIME 1154 ENDING TIME
      ICENT 19 CENTURY MARK
```

```
COMPUTATION INTERVAL 0.10 HOURS
TOTAL TIME BASE 29.90 HOURS
```

```
ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT
```

```
JP MULTI-PLAN OPTION
      NPLAN 1 NUMBER OF PLANS
```

```
JR MULTI-RATIO OPTION
      RATIOS OF PRECIPITATION
      0.45 0.59 0.68 1.00
```

*** **

```
*****
*
* BAS_E * Basin E-Light Commercial
*
*****
```

```
9 IN TIME DATA FOR INPUT TIME SERIES
      JXMIN 30 TIME INTERVAL IN MINUTES
      JXDATE 12DEC97 STARTING DATE
      JXTIME 600 STARTING TIME
```

SUBBASIN RUNOFF DATA

```
13 BA SUBBASIN CHARACTERISTICS
      TAREA 0.01 SUBBASIN AREA
```

PRECIPITATION DATA

```
14 PB STORM 7.80 BASIN TOTAL PRECIPITATION
```


Northwest Main Pump Station

0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

28 LS SCS LOSS RATE
 STRTL 0.67 INITIAL ABSTRACTION
 CRVNR 75.00 CURVE NUMBER
 RTIMP 0.00 PERCENT IMPERVIOUS AREA

29 UD SCS DIMENSIONLESS UNITGRAPH
 TLAG 0.15 LAG

UNIT HYDROGRAPH
 10 END-OF-PERIOD ORDINATES

	1.	3.	2.	1.	0.	0.	0.	0.	0.
TOTAL RAINFALL =	7.80,		TOTAL LOSS =	2.94,		TOTAL EXCESS =	4.86		
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW					
			6-HR	24-HR	72-HR	29.90-HR			
+	(CFS)	(HR)	(CFS)						
+	3.	6.00	0.	0.	0.	0.			
			(INCHES)	4.000	4.862	4.862	4.862		
			(AC-FT)	0.	0.	0.	0.		
			CUMULATIVE AREA =	0.00 SQ MI					

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_F
 FOR PLAN 1, RATIO = 0.45

TOTAL RAINFALL =	3.50,		TOTAL LOSS =	2.20,		TOTAL EXCESS =	1.30		
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW					
			6-HR	24-HR	72-HR	29.90-HR			
+	(CFS)	(HR)	(CFS)						
+	1.	6.00	0.	0.	0.	0.			
			(INCHES)	1.054	1.302	1.302	1.302		
			(AC-FT)	0.	0.	0.	0.		
			CUMULATIVE AREA =	0.00 SQ MI					

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_F
 FOR PLAN 1, RATIO = 0.59

TOTAL RAINFALL =	4.60,		TOTAL LOSS =	2.47,		TOTAL EXCESS =	2.13		
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW					
			6-HR	24-HR	72-HR	29.90-HR			
+	(CFS)	(HR)	(CFS)						
+	1.	6.00	0.	0.	0.	0.			
			(INCHES)	1.748	2.132	2.132	2.132		
			(AC-FT)	0.	0.	0.	0.		
			CUMULATIVE AREA =	0.00 SQ MI					

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_F
 FOR PLAN 1, RATIO = 0.68

TOTAL RAINFALL =	5.30,		TOTAL LOSS =	2.61,		TOTAL EXCESS =	2.69		
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW					
			6-HR	24-HR	72-HR	29.90-HR			
+	(CFS)	(HR)	(CFS)						
+	2.	6.00	0.	0.	0.	0.			
			(INCHES)	2.213	2.695	2.695	2.695		

Northwest Main Pump Station

	11.	24.	16.	7.	3.	1.	1.	0.	0.	0.
TOTAL RAINFALL =	7.80, TOTAL LOSS =		4.18, TOTAL EXCESS =		3.62					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW						
			6-HR	24-HR	72-HR	29.90-HR				
+ (CFS)	(HR)	(CFS)								
+ 20.	6.00	3.	1.	1.	1.	1.				
		(INCHES)	2.971	3.622	3.622	3.622				
		(AC-FT)	2.	2.	2.	2.				
		CUMULATIVE AREA =	0.01 SQ MI							

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_G
FOR PLAN 1, RATIO = 0.45

TOTAL RAINFALL =	3.50, TOTAL LOSS =		2.79, TOTAL EXCESS =		0.71					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW						
			6-HR	24-HR	72-HR	29.90-HR				
+ (CFS)	(HR)	(CFS)								
+ 3.	6.10	1.	0.	0.	0.	0.				
		(INCHES)	0.538	0.705	0.705	0.705				
		(AC-FT)	0.	0.	0.	0.				
		CUMULATIVE AREA =	0.01 SQ MI							

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_G
FOR PLAN 1, RATIO = 0.59

TOTAL RAINFALL =	4.60, TOTAL LOSS =		3.27, TOTAL EXCESS =		1.33					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW						
			6-HR	24-HR	72-HR	29.90-HR				
+ (CFS)	(HR)	(CFS)								
+ 7.	6.10	1.	0.	0.	0.	0.				
		(INCHES)	1.052	1.329	1.329	1.329				
		(AC-FT)	1.	1.	1.	1.				
		CUMULATIVE AREA =	0.01 SQ MI							

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_G
FOR PLAN 1, RATIO = 0.68

TOTAL RAINFALL =	5.30, TOTAL LOSS =		3.52, TOTAL EXCESS =		1.78					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW						
			6-HR	24-HR	72-HR	29.90-HR				
+ (CFS)	(HR)	(CFS)								
+ 9.	6.10	1.	0.	0.	0.	0.				
		(INCHES)	1.429	1.779	1.779	1.779				
		(AC-FT)	1.	1.	1.	1.				
		CUMULATIVE AREA =	0.01 SQ MI							

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_G
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL =	7.80, TOTAL LOSS =		4.18, TOTAL EXCESS =		3.62					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW						
			6-HR	24-HR	72-HR	29.90-HR				
+ (CFS)	(HR)	(CFS)								

Northwest Main Pump Station

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_H
FOR PLAN 1, RATIO = 0.45

TOTAL RAINFALL = 3.50, TOTAL LOSS = 2.60, TOTAL EXCESS = 0.90

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 1.	6.10	(CFS) 0.	0.	0.	0.
		(INCHES) 0.703	0.901	0.901	0.901
		(AC-FT) 0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_H
FOR PLAN 1, RATIO = 0.59

TOTAL RAINFALL = 4.60, TOTAL LOSS = 3.00, TOTAL EXCESS = 1.60

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 3.	6.10	(CFS) 1.	0.	0.	0.
		(INCHES) 1.287	1.603	1.603	1.603
		(AC-FT) 0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_H
FOR PLAN 1, RATIO = 0.68

TOTAL RAINFALL = 5.30, TOTAL LOSS = 3.20, TOTAL EXCESS = 2.10

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 4.	6.10	(CFS) 1.	0.	0.	0.
		(INCHES) 1.701	2.096	2.096	2.096
		(AC-FT) 0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BAS_H
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.73, TOTAL EXCESS = 4.07

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 8.	6.10	(CFS) 1.	0.	0.	0.
		(INCHES) 3.340	4.068	4.068	4.068
		(AC-FT) 1.	1.	1.	1.

CUMULATIVE AREA = 0.00 SQ MI

*** **

* * *

48 KK

* BAS_I *

Basin I- 1 Ac. Residential

Northwest Main Pump Station

+	(CFS)	(HR)	(CFS)				
+	15.	6.00	3.	1.	1.	1.	1.
			(INCHES)	1.117	1.466	1.466	1.466
			(AC-FT)	1.	2.	2.	2.

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION TOT1
FOR PLAN 1, RATIO = 0.59

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
+	25.	6.00	(CFS)	4.	1.	1.
			(INCHES)	1.733	2.248	2.248
			(AC-FT)	2.	3.	3.

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION TOT1
FOR PLAN 1, RATIO = 0.68

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
+	31.	6.00	(CFS)	5.	2.	1.
			(INCHES)	2.157	2.781	2.781
			(AC-FT)	2.	3.	3.

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION TOT1
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
+	56.	6.00	(CFS)	9.	3.	2.
			(INCHES)	3.828	4.850	4.850
			(AC-FT)	4.	6.	6.

CUMULATIVE AREA = 0.02 SQ MI

*** ** ** ** **

* *
59 KK * POND *
* *

HYDROGRAPH ROUTING DATA

60 RS	STORAGE ROUTING			
	NSTPS	1	NUMBER OF SUBREACHES	
	ITYP	ELEV	TYPE OF INITIAL CONDITION	
	RSVRIC	54.25	INITIAL CONDITION	
	X	0.00	WORKING R AND D COEFFICIENT	
61 SA	AREA	0.5	0.6	0.7
62 SE	ELEVATION	54.25	55.00	56.00

Northwest Main Pump Station

CUMULATIVE AREA = 0.00 SQ MI

*** **

HYDROGRAPH AT STATION BAS_I
FOR PLAN 1, RATIO = 0.59

TOTAL RAINFALL = 4.60, TOTAL LOSS = 2.63, TOTAL EXCESS = 1.97

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 1.	6.10		0.	0.	0.	0.
		(INCHES)	1.610	1.974	1.974	1.974
		(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

*** **

HYDROGRAPH AT STATION BAS_I
FOR PLAN 1, RATIO = 0.68

TOTAL RAINFALL = 5.30, TOTAL LOSS = 2.78, TOTAL EXCESS = 2.52

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 2.	6.10		0.	0.	0.	0.
		(INCHES)	2.063	2.518	2.518	2.518
		(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

*** **

HYDROGRAPH AT STATION BAS_I
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 3.	6.10		0.	0.	0.	0.
		(INCHES)	3.811	4.633	4.633	4.633
		(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

* *
57 KK * TOT1 *
* *

58 HC HYDROGRAPH COMBINATION
ICOMP 5 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION TOT1
FOR PLAN 1, RATIO = 0.45

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR

Northwest Main Pump Station

63 SQ	DISCHARGE	0.	17.	59.
64 SE	ELEVATION	54.25	55.00	56.00

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	0.39	1.02
ELEVATION	54.25	55.00	56.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.39	1.02
OUTFLOW	0.00	16.60	59.30
ELEVATION	54.25	55.00	56.00

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.45

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	29.90-HR	
+ (CFS)	(HR)					
+ 11.	6.20	3.	1.	1.	1.	
		(INCHES)	1.115	1.466	1.466	1.466
		(AC-FT)	1.	2.	2.	2.
PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE				
		6-HR	24-HR	72-HR	29.90-HR	
+ (AC-FT)	(HR)					
+ 0.	6.20	0.	0.	0.	0.	
PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE				
		6-HR	24-HR	72-HR	29.90-HR	
+ (FEET)	(HR)					
+ 54.76	6.20	54.37	54.29	54.28	54.28	

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.59

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	29.90-HR	
+ (CFS)	(HR)					
+ 18.	6.20	4.	1.	1.	1.	
		(INCHES)	1.730	2.248	2.248	2.248
		(AC-FT)	2.	3.	3.	3.
PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE				
		6-HR	24-HR	72-HR	29.90-HR	
+ (AC-FT)	(HR)					
+ 0.	6.20	0.	0.	0.	0.	
PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE				
		6-HR	24-HR	72-HR	29.90-HR	
+ (FEET)	(HR)					
+ 55.04	6.20	54.43	54.31	54.30	54.30	

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.68

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	29.90-HR	
+ (CFS)	(HR)					
+ 24.	6.20	5.	2.	1.	1.	
		(INCHES)	2.155	2.781	2.781	2.781

Northwest Main Pump Station

		(AC-FT)	2.	3.	3.	3.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
+ (AC-FT)	(HR)	6-HR	24-HR	72-HR	29.90-HR	
1.	6.20	0.	0.	0.	0.	
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
+ (FEET)	(HR)	6-HR	24-HR	72-HR	29.90-HR	
55.18	6.20	54.47	54.32	54.31	54.31	
CUMULATIVE AREA =		0.02 SQ MI				

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 1.00

			MAXIMUM AVERAGE FLOW			
PEAK FLOW	TIME		6-HR	24-HR	72-HR	29.90-HR
+ (CFS)	(HR)					
46.	6.10	(CFS)	9.	3.	2.	2.
		(INCHES)	3.822	4.850	4.850	4.850
		(AC-FT)	4.	6.	6.	6.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
+ (AC-FT)	(HR)	6-HR	24-HR	72-HR	29.90-HR	
1.	6.10	0.	0.	0.	0.	
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
+ (FEET)	(HR)	6-HR	24-HR	72-HR	29.90-HR	
55.68	6.10	54.60	54.36	54.34	54.34	
CUMULATIVE AREA =		0.02 SQ MI				

Northwest Main Pump Station

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION				
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	
				0.45	0.59	0.68	1.00	
HYDROGRAPH AT +	BAS_E	0.01	1	FLOW TIME	10. 6.00	13. 6.00	15. 6.00	23. 6.00
HYDROGRAPH AT +	BAS_F	0.00	1	FLOW TIME	1. 6.00	1. 6.00	2. 6.00	3. 6.00
HYDROGRAPH AT +	BAS_G	0.01	1	FLOW TIME	3. 6.10	7. 6.10	9. 6.10	20. 6.00
HYDROGRAPH AT +	BAS_H	0.00	1	FLOW TIME	1. 6.10	3. 6.10	4. 6.10	8. 6.10
HYDROGRAPH AT +	BAS_I	0.00	1	FLOW TIME	1. 6.10	1. 6.10	2. 6.10	3. 6.10
5 COMBINED AT +	TOT1	0.02	1	FLOW TIME	15. 6.00	25. 6.00	31. 6.00	56. 6.00
ROUTED TO +	POND	0.02	1	FLOW TIME	11. 6.20	18. 6.20	24. 6.20	46. 6.10
				** PEAK STAGES IN FEET **				
1				STAGE	54.76	55.04	55.18	55.68
				TIME	6.20	6.20	6.20	6.10

*** NORMAL END OF HEC-1 ***

CURRENT DATE: 02-12-2001
 CIRCLE TIME: 15:08:59

FILE DATE: 02-12-2001
 FILE NAME: NW_PUMP2

FHWA CULVERT ANALYSIS
 HY-8, VERSION 6.1

2 - 24" x 38" RCPE
 required under entrance
 to 21st Street North

C U L V N O.	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	1353.84	1353.63	70.00	2 RCPE	3.17	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: NW_PUMP2 DATE: 02-12-2001

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1353.84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1354.61	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1354.96	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1355.25	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1355.51	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1355.75	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1355.99	48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1356.23	56.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1356.29	58.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1356.85	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1357.29	80.0	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: NW_PUMP2 DATE: 02-12-2001

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1353.84	0.000	0.00	0.00	0.00
1354.61	0.000	8.00	0.00	0.00
1354.96	0.000	16.00	0.00	0.00
1355.25	0.000	24.00	0.00	0.00
1355.51	0.000	32.00	0.00	0.00
1355.75	0.000	40.00	0.00	0.00
1355.99	0.000	48.00	0.00	0.00
1356.23	0.000	56.00	0.00	0.00
1356.29	0.000	58.00	0.00	0.00
1356.85	0.000	72.00	0.00	0.00
1357.29	0.000	80.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 02-12-2001
CURRENT TIME: 15:08:59

FILE DATE: 02-12-2001
FILE NAME: NW_PUMP2

PERFORMANCE CURVE FOR CULVERT 1 - 2(3.17 (ft) BY 2.00 (ft)) RCPE

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW NORMAL TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1353.84	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
8.00	1354.61	0.69	0.77	3-M1t	0.54	0.52	0.60	0.60	3.00	1.41
16.00	1354.96	1.02	1.12	3-M1t	0.78	0.76	0.88	0.88	3.67	1.74
24.00	1355.25	1.35	1.41	3-M1t	0.97	0.95	1.08	1.08	4.24	1.95
32.00	1355.51	1.62	1.67	3-M1t	1.15	1.11	1.26	1.26	4.76	2.12
40.00	1355.75	1.85	1.91	3-M1t	1.33	1.25	1.41	1.41	5.23	2.25
48.00	1355.99	2.07	2.15	3-M1t	1.53	1.39	1.54	1.54	5.72	2.37
56.00	1356.23	2.32	2.39	3-M2t	2.00	1.50	1.66	1.66	6.20	2.47
58.00	1356.29	2.38	2.45	3-M2t	2.00	1.53	1.69	1.69	6.32	2.49
72.00	1356.85	2.91	3.01	3-M2t	2.00	1.68	1.88	1.88	7.26	2.64
80.00	1357.29	3.27	3.45	3-M2t	2.00	1.76	1.97	1.97	7.86	2.72

El. inlet face invert 1353.84 ft El. outlet invert 1353.63 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 1353.84 ft
OUTLET STATION 70.00 ft
OUTLET ELEVATION 1353.63 ft
NUMBER OF BARRELS 2
SLOPE (V/H) 0.0030
CULVERT LENGTH ALONG SLOPE 70.00 ft

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

BARREL SHAPE ELLIPTICAL
BARREL SPAN 3.17 ft
BARREL RISE 2.00 ft
BARREL MATERIAL CONCRETE
BARREL MANNING'S n 0.012
INLET TYPE CONVENTIONAL
INLET EDGE AND WALL GROOVED END PROJECTING
INLET DEPRESSION NONE

CIRCUIT DATE: 02-12-2001
 CURRENT TIME: 15:08:59

FILE DATE: 02-12-2001
 FILE NAME: NW_PUMP2

TAILWATER

***** REGULAR CHANNEL CROSS SECTION *****

BOTTOM WIDTH 7.00 ft
 SIDE SLOPE H/V (X:1) 4.0
 CHANNEL SLOPE V/H (ft/ft) 0.003
 MANNING'S n (.01-0.1) 0.035
 CHANNEL INVERT ELEVATION 1353.63 ft
 CULVERT NO.1 OUTLET INVERT ELEVATION 1353.63 ft

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1353.63	0.000	0.00	0.00	0.00
8.00	1354.23	0.321	0.60	1.41	0.11
16.00	1354.51	0.327	0.88	1.74	0.16
24.00	1354.71	0.331	1.08	1.95	0.20
32.00	1354.89	0.333	1.26	2.12	0.23
40.00	1355.04	0.335	1.41	2.25	0.26
48.00	1355.17	0.336	1.54	2.37	0.29
56.00	1355.29	0.338	1.66	2.47	0.31
58.00	1355.32	0.338	1.69	2.49	0.32
72.00	1355.51	0.340	1.88	2.64	0.35
80.00	1355.60	0.341	1.97	2.72	0.37

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE PAVED
 EMBANKMENT TOP WIDTH 35.00 ft
 CREST LENGTH 50.00 ft
 OVERTOPPING CREST ELEVATION 1357.00 ft

CURRENT DATE: 02-08-2001
 CIRCLE TIME: 11:06:29

FILE DATE: 02-08-2001
 FILE NAME: NW_PUMP1

FHWA CULVERT ANALYSIS
 HY-8, VERSION 6.1

C U L V N O.	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	1356.20	1355.65	60.00	1 RCP	1.50	1.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

18" RCP required under
 entrance to 135th Street West

SUMMARY OF CULVERT FLOWS (cfs)

FILE: NW_PUMP1

DATE: 02-08-2001

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1356.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1356.68	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1356.92	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1357.03	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1357.29	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1357.44	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1357.58	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1357.73	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1357.88	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1358.05	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1358.24	10.0	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: NW_PUMP1

DATE: 02-08-2001

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1356.20	0.000	0.00	0.00	0.00
1356.68	0.000	1.00	0.00	0.00
1356.92	0.000	2.00	0.00	0.00
1357.03	0.000	2.50	0.00	0.00
1357.29	0.000	4.00	0.00	0.00
1357.44	0.000	5.00	0.00	0.00
1357.58	0.000	6.00	0.00	0.00
1357.73	0.000	7.00	0.00	0.00
1357.88	0.000	8.00	0.00	0.00
1358.05	0.000	9.00	0.00	0.00
1358.24	0.000	10.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 02-08-2001
CURRENT TIME: 11:06:29

FILE DATE: 02-08-2001
FILE NAME: NW_PUMP1

TAILWATER

***** REGULAR CHANNEL CROSS SECTION *****

SIDE SLOPE H/V (X:1) 4.0
CHANNEL SLOPE V/H (ft/ft) 0.010
MANNING'S n (.01-0.1) 0.035
CHANNEL INVERT ELEVATION 1355.65 ft
CULVERT NO.1 OUTLET INVERT ELEVATION 1355.65 ft

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1355.65	0.000	0.00	0.00	0.00
1.00	1356.06	0.399	0.41	1.46	0.26
2.00	1356.19	0.416	0.54	1.73	0.34
2.50	1356.23	0.422	0.58	1.83	0.37
4.00	1356.35	0.435	0.70	2.06	0.44
5.00	1356.41	0.441	0.76	2.18	0.47
6.00	1356.46	0.446	0.81	2.28	0.51
7.00	1356.51	0.450	0.86	2.37	0.54
8.00	1356.55	0.454	0.90	2.45	0.56
9.00	1356.59	0.457	0.94	2.52	0.59
10.00	1356.63	0.460	0.98	2.59	0.61

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH 35.00 ft
CREST LENGTH 50.00 ft
OVERTOPPING CREST ELEVATION 1358.20 ft

CURRENT DATE: 02-08-2001
CURRENT TIME: 11:06:29

FILE DATE: 02-08-2001
FILE NAME: NW_PUMP1

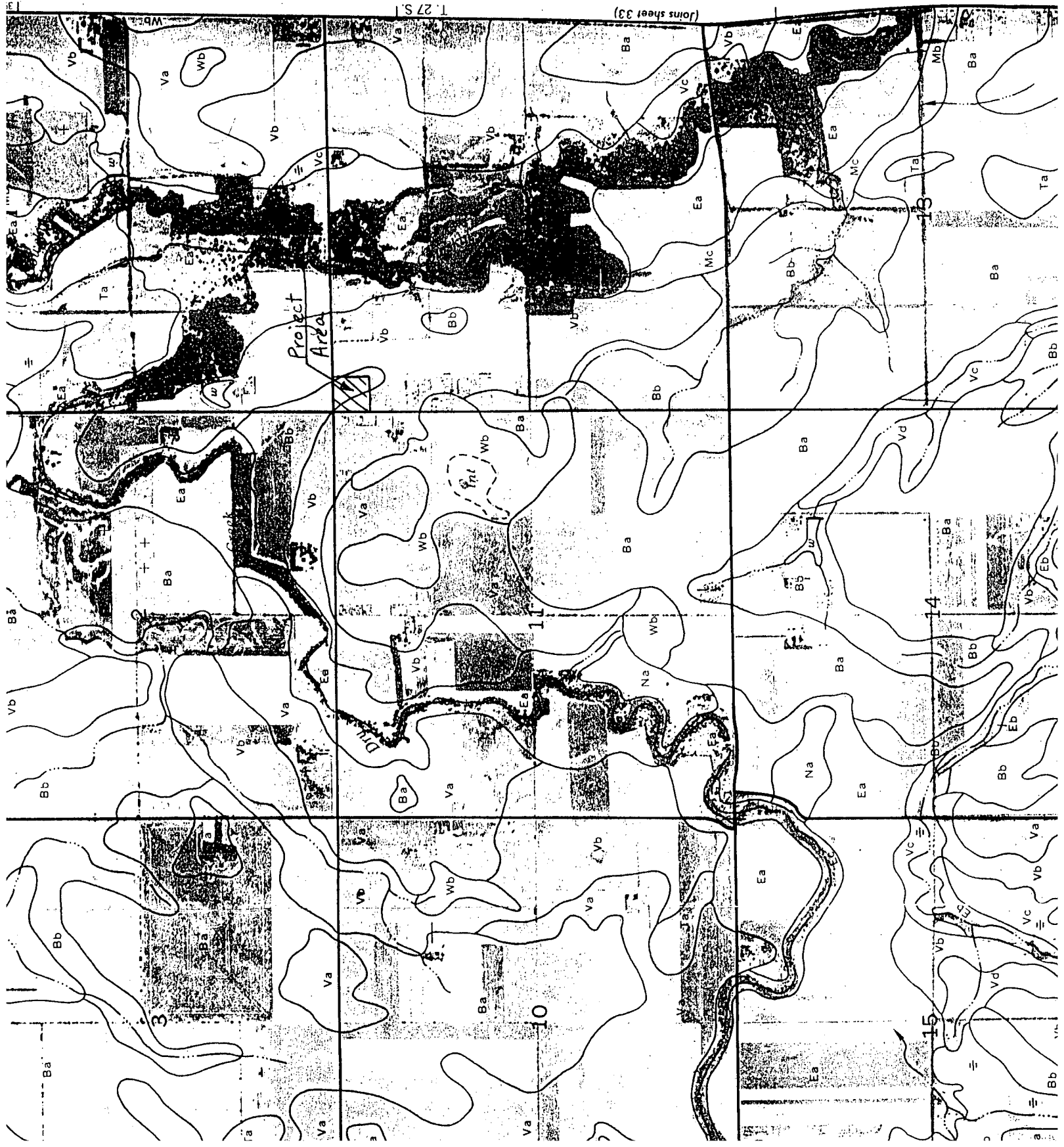
PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) RCP

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	1356.20	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.00	1356.67	0.47	0.47	1-S2n	0.31	0.37	0.17	0.41	11.00	1.46
2.00	1356.92	0.72	0.72	1-S2n	0.43	0.53	0.33	0.54	7.10	1.73
2.50	1357.03	0.83	0.83	1-S2n	0.48	0.60	0.40	0.58	6.59	1.83
4.00	1357.29	1.09	1.09	1-S2n	0.63	0.76	0.56	0.70	6.57	2.06
5.00	1357.44	1.24	1.24	1-S2n	0.71	0.86	0.66	0.76	6.70	2.18
6.00	1357.58	1.38	1.38	1-S2n	0.79	0.94	0.80	0.81	6.27	2.28
7.00	1357.73	1.53	1.53	5-S2n	0.87	1.02	0.88	0.86	6.51	2.37
8.00	1357.88	1.68	1.68	5-S2n	0.95	1.09	0.89	0.90	7.30	2.45
9.00	1358.05	1.85	1.85	5-S2n	1.04	1.16	0.96	0.94	7.57	2.52
10.00	1358.24	2.04	2.04	5-S2n	1.13	1.22	1.02	0.98	7.86	2.59

El. inlet face invert 1356.20 ft El. outlet invert 1355.65 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 1356.20 ft
OUTLET STATION 60.00 ft
OUTLET ELEVATION 1355.65 ft
NUMBER OF BARRELS 1
SLOPE (V/H) 0.0092
CULVERT LENGTH ALONG SLOPE 60.00 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 GROOVED END PROJECTION
INLET DEPRESSION NONE



(Joins sheet 33)

T. 27 S.

Project Area

Dixie Creek

3

10

15

4

1

ATTACHMENT D

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

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

<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>
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:					
<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				
		<u>2</u>	<u>5</u>	<u>10</u>	<u>25</u>	<u>100</u>
<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
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):						
<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	0.40	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 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

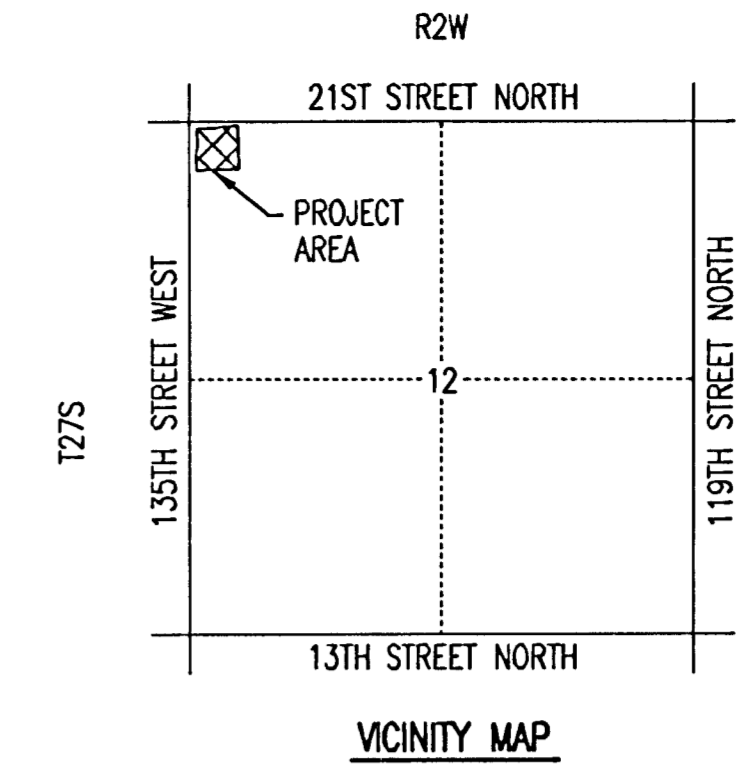
SEDGWICK COUNTY KANSAS
(revised June 1997)

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

DRAINAGE PLAN NW MAIN PUMP STATION TO WICHITA, SEDGWICK COUNTY, KANSAS

B.M. - CITY OF WICHITA BRASS DISC AT THE SOUTHWEST CORNER OF 135TH STREET
WEST AND 21ST STREET NORTH.
ELEV. = 1356.59 N.G.V.D.



SCALE : 1" = 50'

• = 3/4" IRON PIPE W/PEC CAP UNLESS OTHERWISE NOTED

LEGEND

- SOIL GROUP BOUNDARY
- ⊙ BASIN IDENTIFIER
- - - MINOR BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- ➡ MAJOR STORM WATER OVERFLOW (Q100)
- ➡ MINOR STORM WATER FLOW (Q2)
- ✕ SPOT ELEVATION
- FLOWLINE ELEVATION

SEE SUPPORTING CALCULATIONS FOR HYDROLOGY

