303 S. TOPEKA ▫ WICHITA, KANSAS 67202

Professional Engineering Consultants, P.A.

RETURN POSTAGE GUARANTEED

To: DRIANAGE PLAN AND SUPPORTING CALCULATIONS
FOR
ANIMAL SERVICES CAMPUS
AN ADDITION TO WICHITA,
SEDGWICK COUNTY, KANSAS
PEC PROJECT NO. 36-05028-002-1324

LETTER OF TRANSMITTAL

Professional Engineering Consultants, P.A.
303 S. TOPEKA ▪ WICHITA, KANSAS 67202 ▪ 316-262-2691 ▪ FAX 316-262-3003
www.pec1.com ▪ designers@pec1.com

TO: Dept. of Public Works, Engineering Dept.
7th Floor City Hall
455 N. Main
Wichita, KS 67202

PROJECT NO.: 36-05028-2-1324
PROJECT: Animal Services Campus

ATTENTION: Scott Lindebak

DATE: July 27, 2006

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
2			**Drainage Report**

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS:

Scott - Enclosed are two copies of the drainage report for the Animal Services Campus Addition.

RECEIVED
JUL 28 2006
CITY ENGINEERING

COPY TO: file

SIGNED Rob Hartman

If enclosures are not as noted, kindly notify us at once.


Existing Shelter
KHS
WAS
Off-Leash
Off-Leash
Off-Leash/ Detention Area
20' opening
51'
40'
20'
wdm architects
NOT TO SCALE
06.13.2010

ANIMAL SERVICES CAMPUS ADDITION
Wichita, Sedgwick County, Kansas
06/23/06

Animal Services Campus Addition is a 22.9 acre, industrial/business development in Wichita, Sedgwick County, Kansas. The development consists of streets, buildings and a proposed detention basin located in the southern portion of the lot. This report contains a drawing of the drainage plan along with supporting calculations. The project location is shown in Figure 1 (FIGURES).

Existing Conditions

The plat lies in the SE 1/4, Section 34, T26S, R1E. The soil on-site mostly consists of Farnum Loam (1 to 3 percent slopes) and Elandco Slit Loam classified in hydrologic group B (FIGURES, Figure 3). The land is classified as 30% Industrial and 70% Undeveloped Area with slopes ranging from 1% to 3%.

Under existing conditions, the development can be divided into 3 basins (Labeled Basins A, B and C on Drainage Plan Map). The majority of existing runoff leaves the site over a 2.85' weir located in the southern portion of Basin A. The peak discharge (Q100) leaving the site at this location under existing conditions is 62 cfs.

Hydrology

The objective of the hydrologic analysis was to ensure that developed conditions would not worsen flooding conditions to downstream properties. Since Basins B & C are not disturbed with the development, the conditions in these basins will not change. Basin A is where all the construction is planned (DEVELOPED CONDITIONS, Development Concept Plan). Based on preliminary calculations, sufficient storage must reduce the 78 cfs for the proposed development to no greater than 62 cfs. Peak discharges were first estimated using the Rational Method, and then refined by developing a hydrologic model of the entire basin using the USACE HEC-1 computer program HEC-1 enables the user to consider in detail the effects of detention storage in the basin.

The HEC-1 program is capable of performing complex hydrologic computations that relate detention storage to pond elevations and discharge rates during the occurrence of a major storm, and therefore was used to analyze the effects of planned detention storage.

Hydrology calculations were provided to estimate peak discharges for "pre" and "post" project conditions. Computations were made for both the undeveloped and developed condition of the basin.

Existing Pre-developed Conditions for Basin A

Drainage Area= 18.9 AC
Estimated Tc= 1280 ft. / 0.50 ft./sec =2560 sec. =43 min.
C100= 0.74
i100= 4.49 in./hr.
Q100= (0.74)(4.49)(18.9)= 62.4 cfs

Developed Conditions for Basin A

Drainage Area= 18.9 AC
Estimated Tc= 1280 ft. / 0.65 ft./sec =1970 sec. =33 min.
C100= 0.77
i100= 5.14 in./hr.
Q100= (0.77)(5.14)(18.9)= 74.8 cfs
The HEC-1 Analysis computed the Q100 to be a comparable 74.0 cfs.

Developed Conditions

Development of any rural basin almost always increases the impervious area, shortens flow paths, and makes them hydraulically more efficient. The resulting effect is to increase both the volume and rate of runoff caused by a major storm. In order to offset these effects, it is proposed to construct a detention basin in southern portion of the development. This dry detention basin will have a 5 foot weir for outlet control.

Results

The final results of the analysis confirm that by adding the detention basin in the southern portion of the development, the runoff leaving the site during the 100-year, 24-hour storm will not be increased.

As shown in the HEC-1 analysis (DEVELOPED CONDITIONS), the Q100 leaving the site controlled by a 5 foot weir is 60 cfs, which is less than the existing conditions Q100 of 62 cfs.

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.

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

EXISTING CONDITIONS

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

EXISTING BASIN A

Total Area 18.90 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	95%	0%	5%	100%
Acres	0.00	17.96	0.00	0.95	18.90

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
	0%	35%	0%	0%	0%	65%
Acres	0.00	6.62	0.00	0.00	0.00	12.29

	Existing	
Length of Flow	1280	ft
Slope	1.52	%
Waterflow Desc	bare / short grass	
Avg Velocity	0.50	ft/sec
Tc	0.71	hours

15 min <= Tc <= 24 hrs

43 min.

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

EXISTING BASIN A (CONT.)

Runoff Coefficients * Used Soil Group D To Be Conservative

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.59	2.14	18.90	23.82
5	0.61	2.64	18.90	30.21
10	0.65	3.09	18.90	38.08
25	0.68	3.61	18.90	46.29
50	0.71	4.08	18.90	54.36
100	0.74	4.49	18.90	62.37

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

EXISTING BASIN B

Total Area 3.20 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	100%	0%	0%	100%
Acres	0.00	3.20	0.00	0.00	3.20

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	3.20

	Existing	
Length of Flow	885	ft
Slope	1.70	%
Waterflow Desc	bare / short grass	
Avg Velocity	0.50	ft/sec
Tc	0.49	hours

15 min <= Tc <= 24 hrs

30 min.

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

EXISTING BASIN B (CONT.)

Runoff Coefficients * Used Soil Group D To Be Conservative

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	2.67	3.20	4.61
5	0.56	3.24	3.20	5.81
10	0.61	3.76	3.20	7.34
25	0.64	4.39	3.20	8.99
50	0.67	4.94	3.20	10.59
100	0.70	5.40	3.20	12.10

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

EXISTING BASIN C

Total Area 0.80 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	100%	0%	0%	100%
Acres	0.00	0.80	0.00	0.00	0.80

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.80

	Existing	
Length of Flow	325	ft
Slope	4.30	%
Waterflow Desc	bare / short grass	
Avg Velocity	1.00	ft/sec
Tc	0.09	hours

15 min <= Tc <= 24 hrs

15 min.

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

EXISTING BASIN C (CONT.)

Runoff Coefficients * Used Soil Group D To Be Conservative

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.83	0.80	1.65
5	0.56	4.56	0.80	2.04
10	0.61	5.22	0.80	2.55
25	0.64	6.06	0.80	3.10
50	0.67	6.78	0.80	3.63
100	0.70	7.37	0.80	4.13

Developed Conditions

HHS
OAK - Level
OAK - Level
OAK - Level
Existing

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

DEVELOPED BASIN A

Total Area 18.90 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	95%	0%	5%	100%
Acres	0.00	17.96	0.00	0.95	18.90

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	70%	0%	0%	0%	30%
Acres	0.00	13.23	0.00	0.00	0.00	5.67

	Existing		
Length of Flow	1280	ft	
Slope	1.52	%	
Waterflow Desc	bare / short grass		15 min <= Tc <= 24 hrs
Avg Velocity	0.65	ft/sec	
Tc	0.55	hours	33 min.

Project: **ANIMAL SERVICES CAMPUS ADDITION**
Date: 6/22/2006
Prep. By: BMM

Manual Input

DEVELOPED BASIN A (CONT.)

Runoff Coefficients * Used Soil Group D To Be Conservative

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.64	2.67	18.90	32.20
5	0.65	3.24	18.90	39.86
10	0.69	3.76	18.90	49.32
25	0.72	4.39	18.90	59.49
50	0.74	4.94	18.90	69.09
100	0.77	5.14	18.90	74.80

Developed Condition Stage-Storage Relationships used for HEC-1 Analysis

	Static Pond Elevation (FT)	Surface Area (Acres)	Surface Area (S.F.)	Perimeter (L.F.)	Equiv. Rectangle Length (FT)	Equiv. Rectangle Width (FT)
DRY	1333.00	0.626	27269	810	319.71	85.29
DETENTION	1334.00	0.702	30573		327.71	93.29
BASIN	1335.00	0.781	34005		335.71	101.29
	1336.00	0.862	37565		343.71	109.29
	1337.00	0.947	41253		351.71	117.29

ANIMAL SERVICES CAMPUS ADDITION DRAINAGE PLAN

Assumed Outlet Condition for Proposed Dry Detention Basin

80.0	Maximum Q (cfs)
5.000	Weir Width (feet)
1333.00	Weir Elevation
2.700	Weir Flow Coeffecient (Never > 3.089)

Q (cfs)	Weir Width (feet)	Weir Elevation	q	Weir Flow Coeff.	Energy Head (feet)	**Water Surface Elevation**
0.0	5.000	1333.00	0.0	2.700	0.00	**1333.00**
8.0	5.000	1333.00	1.6	2.700	0.71	**1333.71**
16.0	5.000	1333.00	3.2	2.700	1.12	**1334.12**
24.0	5.000	1333.00	4.8	2.700	1.47	**1334.47**
32.0	5.000	1333.00	6.4	2.700	1.78	**1334.78**
40.0	5.000	1333.00	8.0	2.700	2.06	**1335.06**
48.0	5.000	1333.00	9.6	2.700	2.33	**1335.33**
56.0	5.000	1333.00	11.2	2.700	2.58	**1335.58**
64.0	5.000	1333.00	12.8	2.700	2.82	**1335.82**
72.0	5.000	1333.00	14.4	2.700	3.05	**1336.05**
80.0	5.000	1333.00	16.0	2.700	3.27	**1336.27**

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN  1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE  23JUN06  TIME  09:12:49    *
*                                       *
*****************************************
```


```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         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 -AMSKK- 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


```
          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

            1           ID      ANIMAL SERVICES
            2           ID      DRAINAGE PLAN (6/23/06) - PROPOSED CONDITIONS
            3           ID      100-YEAR, 6-HOUR STORM
*** LIST ***
*** FREE ***
                        *DIAGRAM
            4           IT      15 27SEP99    1200       0 28SEP99    2000
            5           IN      15 27SEP99    1200
            6           IO       0       5
            7           JR    PREC     7.8
                        *
                        *
                        *

            8           KK    BASA
                        *
                        *     18.9 ACRES
                        *
            9           BA   0.030
           10           PB    1.00
           11           PC   0.000   0.182   0.192   0.202   0.213   0.227   0.240   0.259   0.276   0.305
           12           PC   0.333   0.455   0.780   0.822   0.865   0.887   0.908   0.925   0.940   0.953
           13           PC   0.965   0.974   0.982   0.992   1.000
           14           LS       0      85       0
           15           UD   0.500
                        *
                        *
                        *

           16           KK     DET
                        *
                        *  5' WIDE WEIR AT ELEVATION 1333.00 ASSUMED AS A WEIR TO MODEL OVERLAND FLOW
                        *  LEAVING DRY DETENTION BASIN.
                        *
           17           RS       1    ELEV  1333.0
           18           SA   0.626   0.702   0.781   0.862   0.947
           19           SE  1333.0  1334.0  1335.0  1336.0  1337.0
           20           SQ       0       8      16      24      32      40      48      56      64      72
           21           SQ      80
           22           SE  1333.0 1333.71 1334.12 1334.47 1334.78 1335.06 1335.33 1335.58 1335.82 1336.05
           23           SE 1336.27
                        *
                        *
                        *
           24           ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8        BASA
                V
                V
    16         DET
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN  1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   23JUN06  TIME  09:12:49   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

ANIMAL SERVICES
DRAINAGE PLAN (6/23/06) - PROPOSED CONDITIONS
100-YEAR, 6-HOUR STORM

```
  6 IO          OUTPUT CONTROL VARIABLES
                     IPRNT         0  PRINT CONTROL
                     IPLOT         5  PLOT CONTROL
                     QSCAL        0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                     NMIN        15  MINUTES IN COMPUTATION INTERVAL
                    IDATE    27SEP99  STARTING DATE
                    ITIME      1200  STARTING TIME
                       NQ       129  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE    28SEP99  ENDING DATE
                   NDTIME      2000  ENDING TIME
                   ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL      .25 HOURS
                     TOTAL TIME BASE    32.00 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
                   7.80
```

*** ***

```
          **************
          *            *
  8 KK    *      BASA  *
          *            *
          **************

  5 IN          TIME DATA FOR INPUT TIME SERIES
                    JXMIN        15  TIME INTERVAL IN MINUTES
                   JXDATE    27SEP99  STARTING DATE
                   JXTIME      1200  STARTING TIME

             SUBBASIN RUNOFF DATA

  9 BA          SUBBASIN CHARACTERISTICS
                    TAREA       .03  SUBBASIN AREA

                PRECIPITATION DATA

 10 PB              STORM      1.00  BASIN TOTAL PRECIPITATION

 11 PI            INCREMENTAL PRECIPITATION PATTERN
                    .18       .01       .01       .01       .01       .01       .02       .02       .03       .03
                    .12       .32       .04       .04       .02       .02       .02       .01       .01       .01
                    .01       .01       .01       .01

 14 LS          SCS LOSS RATE
                    STRTL       .35  INITIAL ABSTRACTION
                   CRVNBR     85.00  CURVE NUMBER
                    RTIMP       .00  PERCENT IMPERVIOUS AREA

 15 UD          SCS DIMENSIONLESS UNITGRAPH
                    TLAG       .50  LAG

                                                          ***

WARNING *** TIME INTERVAL IS GREATER THAN .29*LAG

                                                  UNIT HYDROGRAPH
```

12 END-OF-PERIOD ORDINATES

7.	22.	22.	13.	7.	3.	2.	1.	0.	0.
0.	0.								

HYDROGRAPH AT STATION BASA

DA MON HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	DA MON HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
27 SEP 1200	1	.00	.00	.00	0.	28 SEP 0415	66	.00	.00	.00	0.
27 SEP 1215	2	.18	.18	.00	0.	28 SEP 0430	67	.00	.00	.00	0.
27 SEP 1230	3	.01	.01	.00	0.	28 SEP 0445	68	.00	.00	.00	0.
27 SEP 1245	4	.01	.01	.00	0.	28 SEP 0500	69	.00	.00	.00	0.
27 SEP 1300	5	.01	.01	.00	0.	28 SEP 0515	70	.00	.00	.00	0.
27 SEP 1315	6	.01	.01	.00	0.	28 SEP 0530	71	.00	.00	.00	0.
27 SEP 1330	7	.01	.01	.00	0.	28 SEP 0545	72	.00	.00	.00	0.
27 SEP 1345	8	.02	.02	.00	0.	28 SEP 0600	73	.00	.00	.00	0.
27 SEP 1400	9	.02	.02	.00	0.	28 SEP 0615	74	.00	.00	.00	0.
27 SEP 1415	10	.03	.03	.00	0.	28 SEP 0630	75	.00	.00	.00	0.
27 SEP 1430	11	.03	.03	.00	0.	28 SEP 0645	76	.00	.00	.00	0.
27 SEP 1445	12	.12	.12	.01	0.	28 SEP 0700	77	.00	.00	.00	0.
27 SEP 1500	13	.32	.25	.08	1.	28 SEP 0715	78	.00	.00	.00	0.
27 SEP 1515	14	.04	.03	.02	2.	28 SEP 0730	79	.00	.00	.00	0.
27 SEP 1530	15	.04	.03	.02	2.	28 SEP 0745	80	.00	.00	.00	0.
27 SEP 1545	16	.02	.01	.01	2.	28 SEP 0800	81	.00	.00	.00	0.
27 SEP 1600	17	.02	.01	.01	1.	28 SEP 0815	82	.00	.00	.00	0.
27 SEP 1615	18	.02	.01	.01	1.	28 SEP 0830	83	.00	.00	.00	0.
27 SEP 1630	19	.01	.01	.01	1.	28 SEP 0845	84	.00	.00	.00	0.
27 SEP 1645	20	.01	.01	.01	1.	28 SEP 0900	85	.00	.00	.00	0.
27 SEP 1700	21	.01	.01	.01	1.	28 SEP 0915	86	.00	.00	.00	0.
27 SEP 1715	22	.01	.00	.00	0.	28 SEP 0930	87	.00	.00	.00	0.
27 SEP 1730	23	.01	.00	.00	0.	28 SEP 0945	88	.00	.00	.00	0.
27 SEP 1745	24	.01	.01	.00	0.	28 SEP 1000	89	.00	.00	.00	0.
27 SEP 1800	25	.01	.00	.00	0.	28 SEP 1015	90	.00	.00	.00	0.
27 SEP 1815	26	.00	.00	.00	0.	28 SEP 1030	91	.00	.00	.00	0.
27 SEP 1830	27	.00	.00	.00	0.	28 SEP 1045	92	.00	.00	.00	0.
27 SEP 1845	28	.00	.00	.00	0.	28 SEP 1100	93	.00	.00	.00	0.
27 SEP 1900	29	.00	.00	.00	0.	28 SEP 1115	94	.00	.00	.00	0.
27 SEP 1915	30	.00	.00	.00	0.	28 SEP 1130	95	.00	.00	.00	0.
27 SEP 1930	31	.00	.00	.00	0.	28 SEP 1145	96	.00	.00	.00	0.
27 SEP 1945	32	.00	.00	.00	0.	28 SEP 1200	97	.00	.00	.00	0.
27 SEP 2000	33	.00	.00	.00	0.	28 SEP 1215	98	.00	.00	.00	0.
27 SEP 2015	34	.00	.00	.00	0.	28 SEP 1230	99	.00	.00	.00	0.
27 SEP 2030	35	.00	.00	.00	0.	28 SEP 1245	100	.00	.00	.00	0.
27 SEP 2045	36	.00	.00	.00	0.	28 SEP 1300	101	.00	.00	.00	0.
27 SEP 2100	37	.00	.00	.00	0.	28 SEP 1315	102	.00	.00	.00	0.
27 SEP 2115	38	.00	.00	.00	0.	28 SEP 1330	103	.00	.00	.00	0.
27 SEP 2130	39	.00	.00	.00	0.	28 SEP 1345	104	.00	.00	.00	0.
27 SEP 2145	40	.00	.00	.00	0.	28 SEP 1400	105	.00	.00	.00	0.
27 SEP 2200	41	.00	.00	.00	0.	28 SEP 1415	106	.00	.00	.00	0.
27 SEP 2215	42	.00	.00	.00	0.	28 SEP 1430	107	.00	.00	.00	0.
27 SEP 2230	43	.00	.00	.00	0.	28 SEP 1445	108	.00	.00	.00	0.
27 SEP 2245	44	.00	.00	.00	0.	28 SEP 1500	109	.00	.00	.00	0.
27 SEP 2300	45	.00	.00	.00	0.	28 SEP 1515	110	.00	.00	.00	0.
27 SEP 2315	46	.00	.00	.00	0.	28 SEP 1530	111	.00	.00	.00	0.
27 SEP 2330	47	.00	.00	.00	0.	28 SEP 1545	112	.00	.00	.00	0.
27 SEP 2345	48	.00	.00	.00	0.	28 SEP 1600	113	.00	.00	.00	0.
28 SEP 0000	49	.00	.00	.00	0.	28 SEP 1615	114	.00	.00	.00	0.
28 SEP 0015	50	.00	.00	.00	0.	28 SEP 1630	115	.00	.00	.00	0.
28 SEP 0030	51	.00	.00	.00	0.	28 SEP 1645	116	.00	.00	.00	0.
28 SEP 0045	52	.00	.00	.00	0.	28 SEP 1700	117	.00	.00	.00	0.
28 SEP 0100	53	.00	.00	.00	0.	28 SEP 1715	118	.00	.00	.00	0.
28 SEP 0115	54	.00	.00	.00	0.	28 SEP 1730	119	.00	.00	.00	0.
28 SEP 0130	55	.00	.00	.00	0.	28 SEP 1745	120	.00	.00	.00	0.
28 SEP 0145	56	.00	.00	.00	0.	28 SEP 1800	121	.00	.00	.00	0.
28 SEP 0200	57	.00	.00	.00	0.	28 SEP 1815	122	.00	.00	.00	0.
28 SEP 0215	58	.00	.00	.00	0.	28 SEP 1830	123	.00	.00	.00	0.
28 SEP 0230	59	.00	.00	.00	0.	28 SEP 1845	124	.00	.00	.00	0.
28 SEP 0245	60	.00	.00	.00	0.	28 SEP 1900	125	.00	.00	.00	0.
28 SEP 0300	61	.00	.00	.00	0.	28 SEP 1915	126	.00	.00	.00	0.
28 SEP 0315	62	.00	.00	.00	0.	28 SEP 1930	127	.00	.00	.00	0.
28 SEP 0330	63	.00	.00	.00	0.	28 SEP 1945	128	.00	.00	.00	0.
28 SEP 0345	64	.00	.00	.00	0.	28 SEP 2000	129	.00	.00	.00	0.
28 SEP 0400	65	.00	.00	.00	0.						

TOTAL RAINFALL = 1.00, TOTAL LOSS = .83, TOTAL EXCESS = .17

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	32.00-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2.	3.50		1.	0.	0.	0.
		(INCHES)	.174	.174	.174	.174
		(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = .03 SQ MI

WARNING *** TIME INTERVAL IS GREATER THAN .29*LAG

HYDROGRAPH AT STATION BASA
PLAN 1, RATIO = 7.80

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
27	SEP	1200	1	.00	.00	.00	0.	28	SEP	0415	66	.00	.00	.00	0.
27	SEP	1215	2	1.42	1.02	.40	3.	28	SEP	0430	67	.00	.00	.00	0.
27	SEP	1230	3	.08	.03	.05	9.	28	SEP	0445	68	.00	.00	.00	0.
27	SEP	1245	4	.08	.03	.05	10.	28	SEP	0500	69	.00	.00	.00	0.
27	SEP	1300	5	.09	.03	.06	8.	28	SEP	0515	70	.00	.00	.00	0.
27	SEP	1315	6	.11	.03	.07	6.	28	SEP	0530	71	.00	.00	.00	0.
27	SEP	1330	7	.10	.03	.07	6.	28	SEP	0545	72	.00	.00	.00	0.
27	SEP	1345	8	.15	.04	.11	6.	28	SEP	0600	73	.00	.00	.00	0.
27	SEP	1400	9	.13	.03	.10	7.	28	SEP	0615	74	.00	.00	.00	0.
27	SEP	1415	10	.23	.05	.17	8.	28	SEP	0630	75	.00	.00	.00	0.
27	SEP	1430	11	.22	.04	.17	10.	28	SEP	0645	76	.00	.00	.00	0.
27	SEP	1445	12	.95	.15	.80	16.	28	SEP	0700	77	.00	.00	.00	0.
27	SEP	1500	13	2.53	.21	2.32	42.	28	SEP	0715	78	.00	.00	.00	0.
27	SEP	1515	14	.33	.02	.31	74.	28	SEP	0730	79	.00	.00	.00	0.
27	SEP	1530	15	.34	.02	.32	72.	28	SEP	0745	80	.00	.00	.00	0.
27	SEP	1545	16	.17	.01	.16	52.	28	SEP	0800	81	.00	.00	.00	0.
27	SEP	1600	17	.16	.01	.16	34.	28	SEP	0815	82	.00	.00	.00	0.
27	SEP	1615	18	.13	.01	.13	24.	28	SEP	0830	83	.00	.00	.00	0.
27	SEP	1630	19	.12	.00	.11	17.	28	SEP	0845	84	.00	.00	.00	0.
27	SEP	1645	20	.10	.00	.10	13.	28	SEP	0900	85	.00	.00	.00	0.
27	SEP	1700	21	.09	.00	.09	11.	28	SEP	0915	86	.00	.00	.00	0.
27	SEP	1715	22	.07	.00	.07	9.	28	SEP	0930	87	.00	.00	.00	0.
27	SEP	1730	23	.06	.00	.06	7.	28	SEP	0945	88	.00	.00	.00	0.
27	SEP	1745	24	.08	.00	.08	6.	28	SEP	1000	89	.00	.00	.00	0.
27	SEP	1800	25	.06	.00	.06	6.	28	SEP	1015	90	.00	.00	.00	0.
27	SEP	1815	26	.00	.00	.00	5.	28	SEP	1030	91	.00	.00	.00	0.
27	SEP	1830	27	.00	.00	.00	3.	28	SEP	1045	92	.00	.00	.00	0.
27	SEP	1845	28	.00	.00	.00	2.	28	SEP	1100	93	.00	.00	.00	0.
27	SEP	1900	29	.00	.00	.00	1.	28	SEP	1115	94	.00	.00	.00	0.
27	SEP	1915	30	.00	.00	.00	0.	28	SEP	1130	95	.00	.00	.00	0.
27	SEP	1930	31	.00	.00	.00	0.	28	SEP	1145	96	.00	.00	.00	0.
27	SEP	1945	32	.00	.00	.00	0.	28	SEP	1200	97	.00	.00	.00	0.
27	SEP	2000	33	.00	.00	.00	0.	28	SEP	1215	98	.00	.00	.00	0.
27	SEP	2015	34	.00	.00	.00	0.	28	SEP	1230	99	.00	.00	.00	0.
27	SEP	2030	35	.00	.00	.00	0.	28	SEP	1245	100	.00	.00	.00	0.
27	SEP	2045	36	.00	.00	.00	0.	28	SEP	1300	101	.00	.00	.00	0.
27	SEP	2100	37	.00	.00	.00	0.	28	SEP	1315	102	.00	.00	.00	0.
27	SEP	2115	38	.00	.00	.00	0.	28	SEP	1330	103	.00	.00	.00	0.
27	SEP	2130	39	.00	.00	.00	0.	28	SEP	1345	104	.00	.00	.00	0.
27	SEP	2145	40	.00	.00	.00	0.	28	SEP	1400	105	.00	.00	.00	0.
27	SEP	2200	41	.00	.00	.00	0.	28	SEP	1415	106	.00	.00	.00	0.
27	SEP	2215	42	.00	.00	.00	0.	28	SEP	1430	107	.00	.00	.00	0.
27	SEP	2230	43	.00	.00	.00	0.	28	SEP	1445	108	.00	.00	.00	0.
27	SEP	2245	44	.00	.00	.00	0.	28	SEP	1500	109	.00	.00	.00	0.
27	SEP	2300	45	.00	.00	.00	0.	28	SEP	1515	110	.00	.00	.00	0.
27	SEP	2315	46	.00	.00	.00	0.	28	SEP	1530	111	.00	.00	.00	0.
27	SEP	2330	47	.00	.00	.00	0.	28	SEP	1545	112	.00	.00	.00	0.
27	SEP	2345	48	.00	.00	.00	0.	28	SEP	1600	113	.00	.00	.00	0.
28	SEP	0000	49	.00	.00	.00	0.	28	SEP	1615	114	.00	.00	.00	0.
28	SEP	0015	50	.00	.00	.00	0.	28	SEP	1630	115	.00	.00	.00	0.
28	SEP	0030	51	.00	.00	.00	0.	28	SEP	1645	116	.00	.00	.00	0.
28	SEP	0045	52	.00	.00	.00	0.	28	SEP	1700	117	.00	.00	.00	0.
28	SEP	0100	53	.00	.00	.00	0.	28	SEP	1715	118	.00	.00	.00	0.
28	SEP	0115	54	.00	.00	.00	0.	28	SEP	1730	119	.00	.00	.00	0.
28	SEP	0130	55	.00	.00	.00	0.	28	SEP	1745	120	.00	.00	.00	0.
28	SEP	0145	56	.00	.00	.00	0.	28	SEP	1800	121	.00	.00	.00	0.
28	SEP	0200	57	.00	.00	.00	0.	28	SEP	1815	122	.00	.00	.00	0.
28	SEP	0215	58	.00	.00	.00	0.	28	SEP	1830	123	.00	.00	.00	0.
28	SEP	0230	59	.00	.00	.00	0.	28	SEP	1845	124	.00	.00	.00	0.
28	SEP	0245	60	.00	.00	.00	0.	28	SEP	1900	125	.00	.00	.00	0.
28	SEP	0300	61	.00	.00	.00	0.	28	SEP	1915	126	.00	.00	.00	0.
28	SEP	0315	62	.00	.00	.00	0.	28	SEP	1930	127	.00	.00	.00	0.
28	SEP	0330	63	.00	.00	.00	0.	28	SEP	1945	128	.00	.00	.00	0.
28	SEP	0345	64	.00	.00	.00	0.	28	SEP	2000	129	.00	.00	.00	0.
28	SEP	0400	65	.00	.00	.00	0.								

TOTAL RAINFALL = 7.80, TOTAL LOSS = 1.78, TOTAL EXCESS = 6.02

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	32.00-HR
(CFS)	(HR)					
		(CFS)				
74.	3.25		19.	5.	4.	4.
		(INCHES)	5.881	6.020	6.020	6.020
		(AC-FT)	9.	10.	10.	10.

CUMULATIVE AREA = .03 SQ MI

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          **************
          *            *
16 KK     *     DET    *
          *            *
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     HYDROGRAPH ROUTING DATA

17 RS     STORAGE ROUTING
               NSTPS          1  NUMBER OF SUBREACHES
                ITYP       ELEV  TYPE OF INITIAL CONDITION
               RSVRIC    1333.00  INITIAL CONDITION
                   X        .00 WORKING R AND D COEFFICIENT

18 SA          AREA          .6       .7       .8       .9       .9

19 SE          ELEVATION  1333.00  1334.00  1335.00  1336.00  1337.00

20 SQ          DISCHARGE        0.       8.      16.      24.      32.      40.      48.      56.      64.      72.
                               80.

22 SE          ELEVATION  1333.00  1333.71  1334.12  1334.47  1334.78  1335.06  1335.33  1335.58  1335.82  1336.05
                          1336.27

                                                ***

                                  COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00      .66     1.40     2.23     3.13
        ELEVATION    1333.00  1334.00  1335.00  1336.00  1337.00

                              COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00      .46      .66      .75     1.00     1.23     1.40     1.45     1.67     1.87
          OUTFLOW        .00     8.00    13.66    16.00    24.00    32.00    38.28    40.00    48.00    56.00
        ELEVATION    1333.00  1333.71  1334.00  1334.12  1334.47  1334.78  1335.00  1335.06  1335.33  1335.58

          STORAGE       2.07     2.23     2.27     2.46     3.13
          OUTFLOW      64.00    70.26    72.00    80.00   106.55
        ELEVATION    1335.82  1336.00  1336.05  1336.27  1337.00
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HYDROGRAPH AT STATION DET
PLAN 1, RATIO = 7.80

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DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE
27 SEP 1200	1	0.	.0	1333.0	27 SEP 2245	44	0.	.0	1333.0	28 SEP 0930	87	0.	.0	1333.0
27 SEP 1215	2	0.	.0	1333.0	27 SEP 2300	45	0.	.0	1333.0	28 SEP 0945	88	0.	.0	1333.0
27 SEP 1230	3	2.	.1	1333.2	27 SEP 2315	46	0.	.0	1333.0	28 SEP 1000	89	0.	.0	1333.0
27 SEP 1245	4	4.	.3	1333.4	27 SEP 2330	47	0.	.0	1333.0	28 SEP 1015	90	0.	.0	1333.0
27 SEP 1300	5	6.	.3	1333.5	27 SEP 2345	48	0.	.0	1333.0	28 SEP 1030	91	0.	.0	1333.0
27 SEP 1315	6	6.	.4	1333.5	28 SEP 0000	49	0.	.0	1333.0	28 SEP 1045	92	0.	.0	1333.0
27 SEP 1330	7	6.	.4	1333.5	28 SEP 0015	50	0.	.0	1333.0	28 SEP 1100	93	0.	.0	1333.0
27 SEP 1345	8	6.	.3	1333.5	28 SEP 0030	51	0.	.0	1333.0	28 SEP 1115	94	0.	.0	1333.0
27 SEP 1400	9	6.	.4	1333.5	28 SEP 0045	52	0.	.0	1333.0	28 SEP 1130	95	0.	.0	1333.0
27 SEP 1415	10	6.	.4	1333.6	28 SEP 0100	53	0.	.0	1333.0	28 SEP 1145	96	0.	.0	1333.0
27 SEP 1430	11	7.	.4	1333.6	28 SEP 0115	54	0.	.0	1333.0	28 SEP 1200	97	0.	.0	1333.0
27 SEP 1445	12	9.	.5	1333.8	28 SEP 0130	55	0.	.0	1333.0	28 SEP 1215	98	0.	.0	1333.0
27 SEP 1500	13	18.	.8	1334.2	28 SEP 0145	56	0.	.0	1333.0	28 SEP 1230	99	0.	.0	1333.0
27 SEP 1515	14	39.	1.4	1335.0	28 SEP 0200	57	0.	.0	1333.0	28 SEP 1245	100	0.	.0	1333.0
27 SEP 1530	15	58.	1.9	1335.7	28 SEP 0215	58	0.	.0	1333.0	28 SEP 1300	101	0.	.0	1333.0
27 SEP 1545	16	60.	2.0	1335.7	28 SEP 0230	59	0.	.0	1333.0	28 SEP 1315	102	0.	.0	1333.0
27 SEP 1600	17	50.	1.7	1335.4	28 SEP 0245	60	0.	.0	1333.0	28 SEP 1330	103	0.	.0	1333.0
27 SEP 1615	18	38.	1.4	1335.0	28 SEP 0300	61	0.	.0	1333.0	28 SEP 1345	104	0.	.0	1333.0
27 SEP 1630	19	29.	1.1	1334.7	28 SEP 0315	62	0.	.0	1333.0	28 SEP 1400	105	0.	.0	1333.0
27 SEP 1645	20	22.	.9	1334.4	28 SEP 0330	63	0.	.0	1333.0	28 SEP 1415	106	0.	.0	1333.0
27 SEP 1700	21	17.	.8	1334.2	28 SEP 0345	64	0.	.0	1333.0	28 SEP 1430	107	0.	.0	1333.0
27 SEP 1715	22	14.	.7	1334.0	28 SEP 0400	65	0.	.0	1333.0	28 SEP 1445	108	0.	.0	1333.0
27 SEP 1730	23	11.	.6	1333.9	28 SEP 0415	66	0.	.0	1333.0	28 SEP 1500	109	0.	.0	1333.0
27 SEP 1745	24	9.	.5	1333.8	28 SEP 0430	67	0.	.0	1333.0	28 SEP 1515	110	0.	.0	1333.0
27 SEP 1800	25	8.	.5	1333.7	28 SEP 0445	68	0.	.0	1333.0	28 SEP 1530	111	0.	.0	1333.0
27 SEP 1815	26	7.	.4	1333.6	28 SEP 0500	69	0.	.0	1333.0	28 SEP 1545	112	0.	.0	1333.0
27 SEP 1830	27	6.	.4	1333.5	28 SEP 0515	70	0.	.0	1333.0	28 SEP 1600	113	0.	.0	1333.0
27 SEP 1845	28	5.	.3	1333.4	28 SEP 0530	71	0.	.0	1333.0	28 SEP 1615	114	0.	.0	1333.0
27 SEP 1900	29	4.	.2	1333.3	28 SEP 0545	72	0.	.0	1333.0	28 SEP 1630	115	0.	.0	1333.0
27 SEP 1915	30	3.	.2	1333.3	28 SEP 0600	73	0.	.0	1333.0	28 SEP 1645	116	0.	.0	1333.0
27 SEP 1930	31	2.	.1	1333.2	28 SEP 0615	74	0.	.0	1333.0	28 SEP 1700	117	0.	.0	1333.0
27 SEP 1945	32	2.	.1	1333.1	28 SEP 0630	75	0.	.0	1333.0	28 SEP 1715	118	0.	.0	1333.0
27 SEP 2000	33	1.	.1	1333.1	28 SEP 0645	76	0.	.0	1333.0	28 SEP 1730	119	0.	.0	1333.0
27 SEP 2015	34	1.	.0	1333.1	28 SEP 0700	77	0.	.0	1333.0	28 SEP 1745	120	0.	.0	1333.0
27 SEP 2030	35	1.	.0	1333.0	28 SEP 0715	78	0.	.0	1333.0	28 SEP 1800	121	0.	.0	1333.0
27 SEP 2045	36	0.	.0	1333.0	28 SEP 0730	79	0.	.0	1333.0	28 SEP 1815	122	0.	.0	1333.0
27 SEP 2100	37	0.	.0	1333.0	28 SEP 0745	80	0.	.0	1333.0	28 SEP 1830	123	0.	.0	1333.0
27 SEP 2115	38	0.	.0	1333.0	28 SEP 0800	81	0.	.0	1333.0	28 SEP 1845	124	0.	.0	1333.0
27 SEP 2130	39	0.	.0	1333.0	28 SEP 0815	82	0.	.0	1333.0	28 SEP 1900	125	0.	.0	1333.0
27 SEP 2145	40	0.	.0	1333.0	28 SEP 0830	83	0.	.0	1333.0	28 SEP 1915	126	0.	.0	1333.0
27 SEP 2200	41	0.	.0	1333.0	28 SEP 0845	84	0.	.0	1333.0	28 SEP 1930	127	0.	.0	1333.0
27 SEP 2215	42	0.	.0	1333.0	28 SEP 0900	85	0.	.0	1333.0	28 SEP 1945	128	0.	.0	1333.0
27 SEP 2230	43	0.	.0	1333.0	28 SEP 0915	86	0.	.0	1333.0	28 SEP 2000	129	0.	.0	1333.0

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	32.00-HR
+ (CFS)	(HR)					
		(CFS)				
+ 60.	3.75		19.	5.	4.	4.
		(INCHES)	5.740	6.020	6.020	6.020
		(AC-FT)	9.	10.	10.	10.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	32.00-HR
+ (AC-FT)	(HR)				
2.	3.75	1.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	32.00-HR
+ (FEET)	(HR)				
1335.71	3.75	1334.11	1333.30	1333.22	1333.22

CUMULATIVE AREA = .03 SQ MI

1

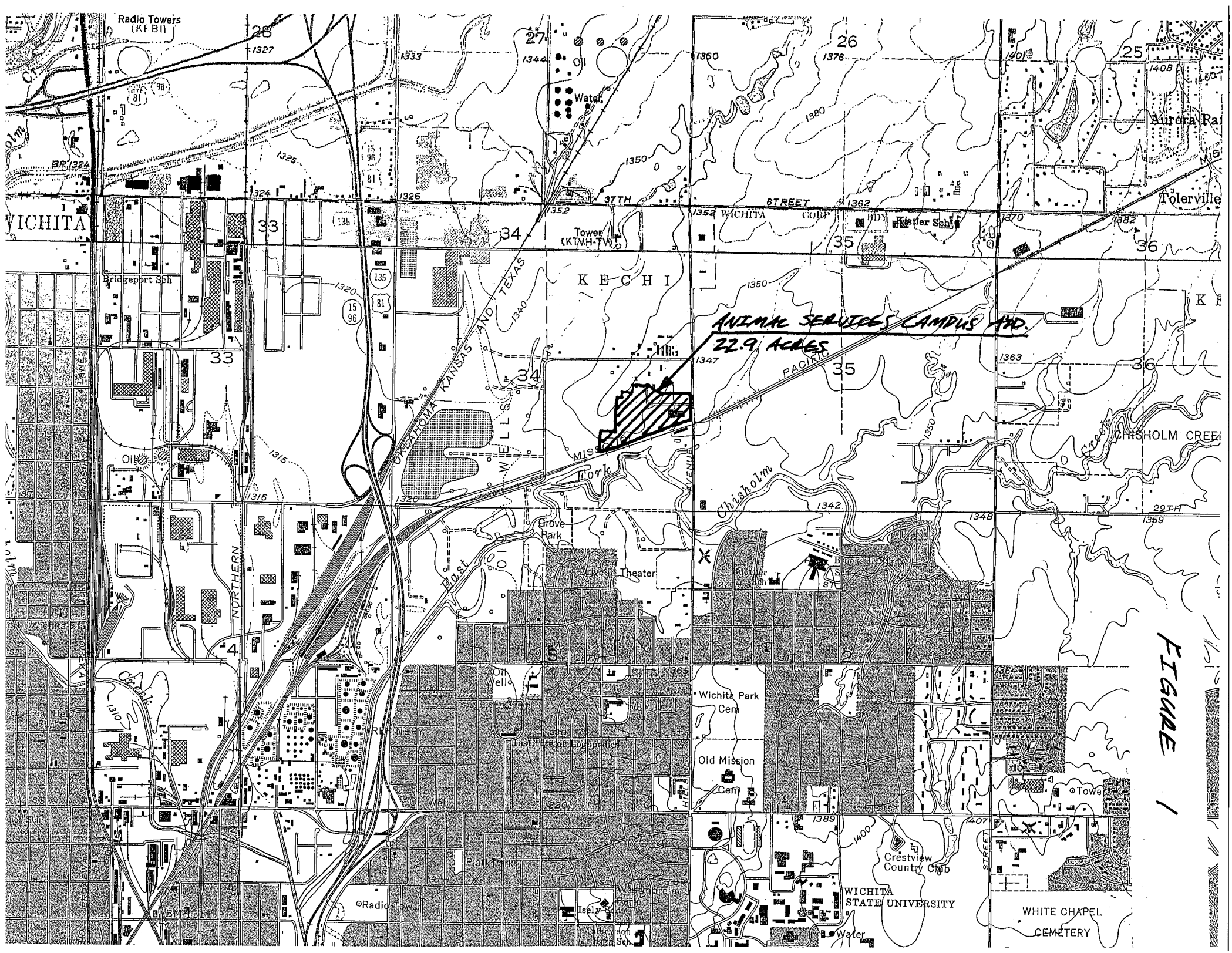
PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

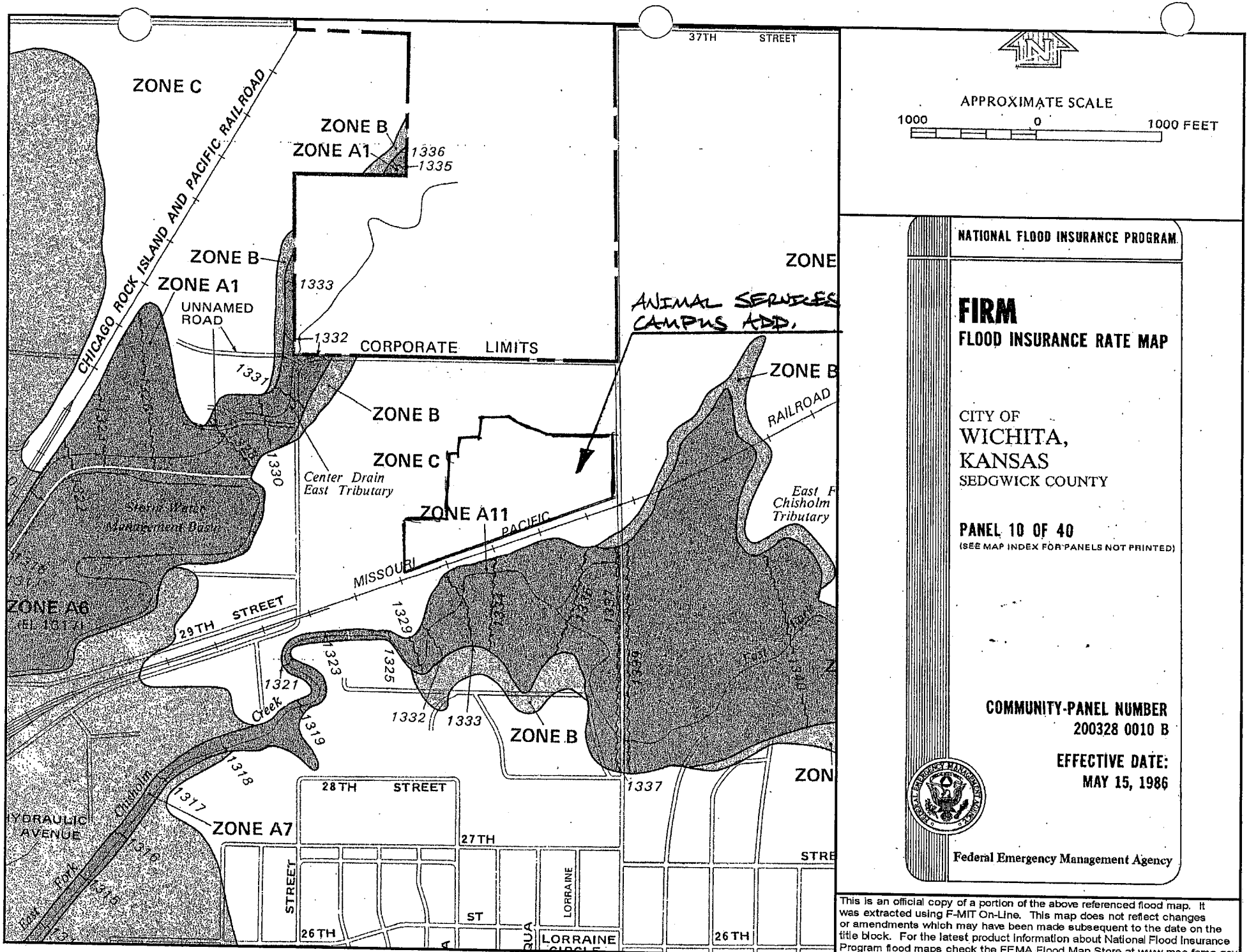
					RATIOS APPLIED TO PRECIPITATION
OPERATION	STATION	AREA	PLAN		RATIO 1
					7.80
HYDROGRAPH AT					
+	BASA	.03	1	FLOW	74.
				TIME	3.25
ROUTED TO					
+	DET	.03	1	FLOW	60.
				TIME	3.75

** PEAK STAGES IN FEET **
1 STAGE 1335.71
TIME 3.75

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

FIGURES


ANIMAL SERVICES CAMPUS AND.
22.9 ACRES
WICHITA
KECHI
Radio Towers (KFBI)
Water
Tower (KTWH-TV)
Bridgeport Sch
Oil
Grove Park
Drive-in Theater
Oil Wells
Wichita Park Cem
Old Mission Cem
Institute of Logopedics
Crestview Country Club
WICHITA STATE UNIVERSITY
WHITE CHAPEL CEMETERY
Radio Tower
Water
Tolerville
Aurora Ra
CHISHOLM CREEK
Chisholm Creek
East Fork
Chisholm
Creek
OKLAHOMA KANSAS AND TEXAS
PACIFIC
WELLS ST
NORTHERN
37TH
8TREET
29TH
FIGURE 1



This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

FIGURE 2

FIGURE 3

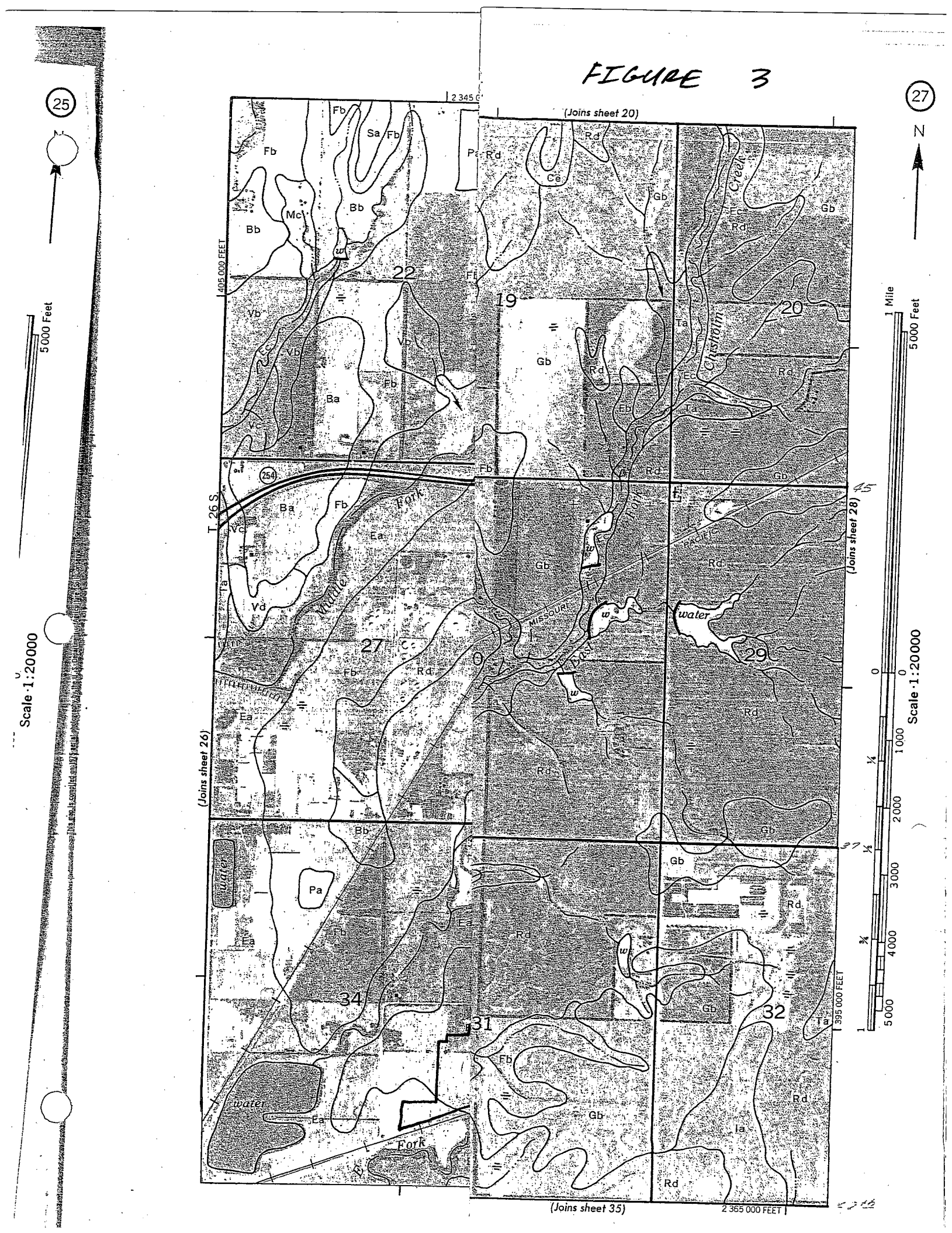

25
27
N
(Joins sheet 20)
2 345 000 FEET
405 000 FEET
22
19
20
Fb
Sa
Pa
Rd
Ce
Gb
Mc
Bb
Vb
Ba
Ta
Chisholm Creek
254
T 26 S
Ea
Vd
Wattle Fork
Missouri Pacific
water
27
29
Bb
Pa
34
31
32
Ia
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 35)
2 365 000 FEET
395 000 FEET
5000 Feet
1 Mile
Scale 1:20000
0
1000
2000
3000
4000
5000

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

DESIGN AIDS

County	Expected 24-hour Storm Rainfall in Inches						Normal Annual Precipitation
	Storm Frequency in Years						
	100	50	25	10	5	2	Inches
Pawnee	6.6	6.0	5.2	4.5	3.7	2.8	23.3
Phillips	6.0	5.5	4.8	4.1	3.4	2.5	23.6
Pottawatomie	7.5	6.6	5.9	5.1	4.3	3.4	33.6
Pratt	7.2	6.4	5.6	4.8	4.1	3.0	24.6
Rawlins	5.5	5.0	4.3	3.6	3.1	2.3	21.0
Reno	7.4	6.6	5.8	5.0	4.2	3.2	27.7
Republic	6.8	6.0	5.4	4.6	3.9	2.9	28.6
Rice	7.3	6.4	5.6	4.8	4.1	3.0	26.6
Riley	7.4	6.5	5.8	5.1	4.3	3.3	33.5
Rooks	6.1	5.7	4.9	4.1	3.4	2.5	23.9
Rush	6.5	5.9	5.0	4.3	3.6	2.7	23.3
Russell	6.7	5.9	5.2	4.4	3.7	2.8	26.8
Saline	7.3	6.4	5.7	4.9	4.1	3.1	28.4
Scott	5.7	5.3	4.5	3.8	3.2	2.4	20.2
Sedgwick	7.8	7.0	6.1	5.3	4.5	3.5	30.6
Seward	6.0	5.7	4.8	4.2	3.5	2.6	19.8
Shawnee	7.8	6.8	6.1	5.3	4.5	3.5	34.7
Sheridan	5.7	5.3	4.5	3.8	3.2	2.4	21.3
Sherman	5.3	4.8	4.2	3.5	3.0	2.2	16.7
Smith	6.3	5.7	5.0	4.2	3.5	2.6	24.4
Stafford	7.1	6.2	5.5	4.7	4.0	2.9	25.1
Stanton	5.6	5.2	4.5	3.8	3.2	2.4	15.8
Stevens	5.9	5.5	4.7	4.1	3.4	2.5	19.7
Sumner	8.0	7.1	6.2	5.4	4.6	3.6	34.0

April 15, 1986

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

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 (t_c)	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	i = 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

ATTACHMENT A CONTINUED
Page 2

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

ATTACHMENT B

DRAINAGE CRITERIA MANUAL

INCREMENTAL INFILTRATION VALUES IN INCHES

Time Minutes**	SCS Hydrologic Soil Group A	B	C	D
5	.33	.26	.19	.12
10	.25	.17	.09	.04
15	.18	.11	.05	.02
20	.13	.07	.03	.02
25	.10	.05	.03	.02
30	.08	.05	.03	.02
35	.08	.05	.03	.02
40	.08	.05	.03	.02
45	.08	.05	.03	.02
50	.08	.05	.03	.02
55	.08	.05	.03	.02
60	.08	.05	.03	.02
65	.08	.05	.03	.02
70	.08	.05	.03	.02
75	.08	.05	.03	.02
80	.08	.05	.03	.02
85	.08	.05	.03	.02
90	.08	.05	.03	.02
95	.08	.05	.03	.02
100	.08	.05	.03	.02
105	.08	.05	.03	.02
110	.08	.05	.03	.02
115	.08	.05	.03	.02
120				

**Time at end of the time increment

NOTE: Values for 125 minutes and additional 5 minute increments shall be the same as those shown for 120 minutes.

ATTACHMENT C

DRAINAGE CITERIA MANUAL

DEPRESSION STORAGE LOSSES

Surface Type	Total Loss (Inches)
Impervious:	
Paved Areas	0.1
Flat Roofs	0.1
Sloped Roofs	0.05
Pervious:	
Lawns and Grass	0.3
Wooded Areas and Open Fields	0.4

(3 pages)

ATTACHMENT D

DRAINAGE CRITERIA

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 rface 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
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 rface 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.

ATTACHMENT E

DRAINAGE CRITERIA

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
Forest with Heavy Ground Litter or Meadow	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.21	0.28	0.33	0.39	0.46	0.53	0.60	0.72	1.10
Fallow or Minimum Tillage Cultivation	0.06	0.08	0.10	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.29	0.40	0.51	0.66	0.78	0.91	1.05	1.20	1.44	2.10
Short Grass Pasture or Lawns	0.09	0.13	0.15	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.45	0.60	0.77	0.96	1.17	1.33	1.50	1.68	1.98	3.20
Almost Bare Ground	0.16	0.22	0.28	0.31	0.35	0.38	0.41	0.44	0.46	0.49	0.70	0.85	1.05	1.26	1.50	1.75	2.03	2.32	2.79	4.40
Grassed Waterway	0.35	0.48	0.58	0.67	0.77	0.84	0.91	0.98	1.05	1.12	1.54	1.82	2.10	2.38	2.78	3.20	3.66	4.14	4.56	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.44	0.62	0.77	0.91	1.05	1.12	1.19	1.26	1.33	1.40	2.00	2.55	3.20	3.83	4.41	5.04	5.70	6.00	6.20	9.00

ATTACHMENT F

DETERMINATION OF DIMENSIONLESS WATERSHED CONVEYANCE FACTOR (Ø)

$$\emptyset = \emptyset_1 + \emptyset_2$$

$\emptyset_1$	Classification
0.6	Extensive channel improvement and storm sewer system, closed conduit channel system
0.7	Moderate channel improvement and storm sewer system.
0.8	Some channel improvement and storm sewers, mainly cleaning and enlargement of existing channel.
0.9	Little channel improvement and storm sewers.
1.0	Natural channel conditions.

$\emptyset_2$	Classification
0.0	No channel vegetation.
0.1	Light channel vegetation.
0.2	Moderate channel vegetation.
0.3	Heavy channel vegetation.

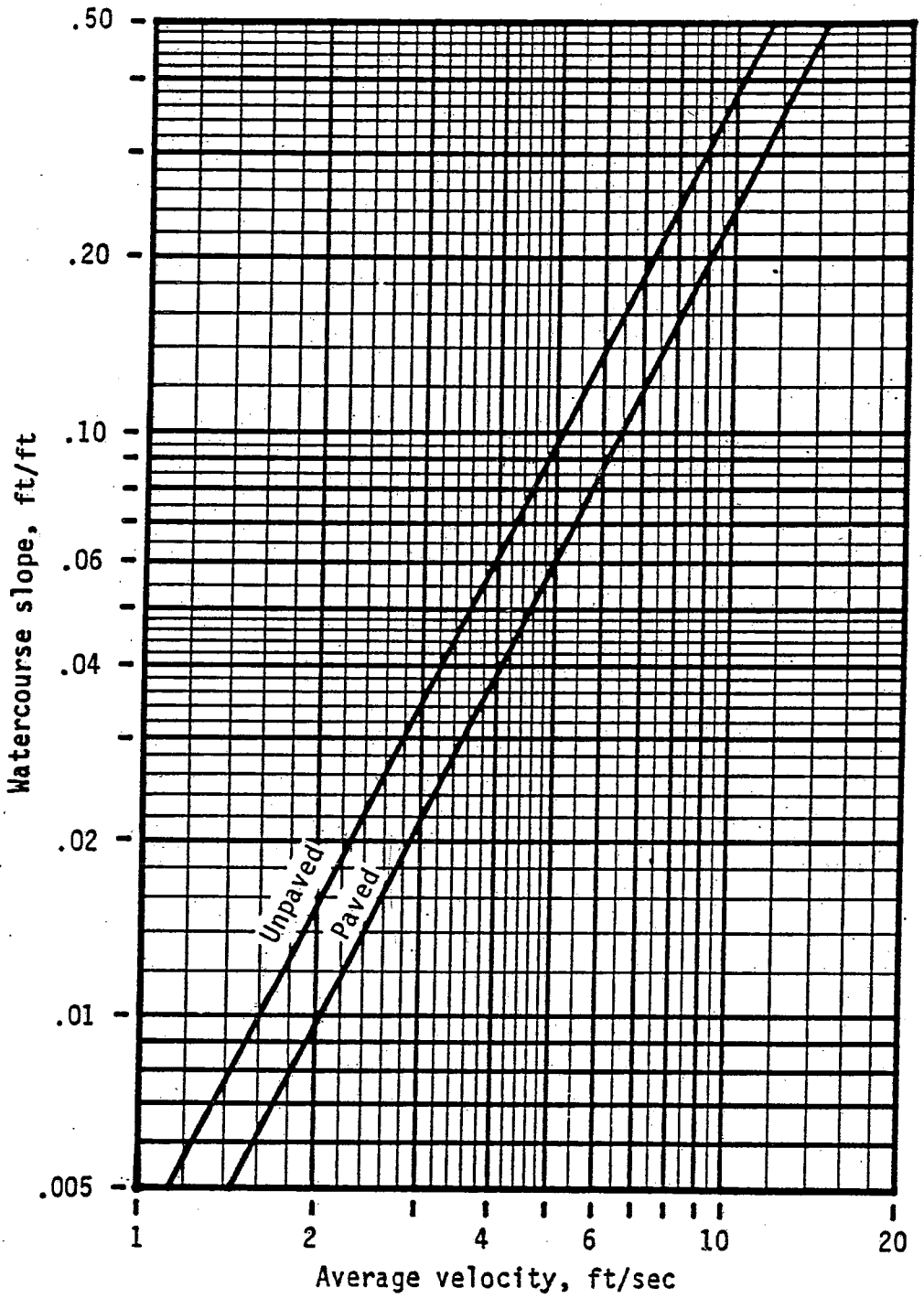


Figure 3-1.—Average velocities for estimating travel time for shallow concentrated flow.

PLAN MAPS