

DRAINAGE PLAN AND SUPPORTING CALCULATIONS

FOR

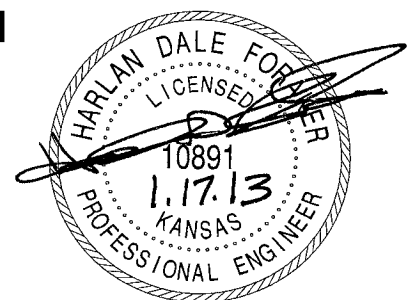
**CITY VIEW ESTATES
WICHITA, KANSAS**

**PREPARED FOR:
SAVOY COMPANY, P.A.
433 S. HYDRAULIC
WICHITA, KS 67211**

JANUARY 15TH, 2013

PREPARED BY:

**CERTIFIED ENGINEERING DESIGN, P.A.
1935 WEST MAPLE
WICHITA, KANSAS 67213-3311
(316)262-8808 PHONE
(316)262-1669 FAX**



Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
January 15th, 2013

CERTIFIED ENGINEERING DESIGN, P.A
1935 West Maple
Wichita, KS 67213-3311
(316)262-8808 Office
(316)262-1669 Fax

LETTER OF TRANSMITTAL

DATE: January 15th, 2013

TO: Mr. Scott Lindebak, P.E.
Engineering Division
City of Wichita
8th Floor, City Hall
455 N. Main
Wichita, KS 67202

RE: Drainage Plan
City View Estates
Wichita, KS

FROM: Harlan D. Foraker, P.E.

cc: Mr. Mark Savoy, Savoy Company, P.A.

I. TAB 1 – PROJECT NARRATIVE:

Discussion of Development

The goal of this report is to analyze the existing drainage patterns and design the proposed drainage system to serve the City View Estates in Wichita, KS. This site is located east of the intersection of S. City View and W. University Ave. This site is undeveloped and consists of native grass. The SCS soil type present on the site is the Milan Loam and is a SCS type B soil. The proposed improvements include adding a residential development to the property. The total area of the proposed lot is 0.51 acres. An aerial photograph of the proposed plat site is located in the Appendix.

Offsite Conditions

It appears that no offsite drainage enters the site from surrounding properties based on looking at the LIDAR data for the City of Wichita. A copy of the USGS map is located in the Appendix.

Description of Best Management Practices

The proposed plat site is only being platted. Therefore there are no best management practices incorporated into the site design at this time.

The proposed runoff calculations cause an increase in peak discharge for all storm series when compared with existing runoff calculations. However, since the increase in impervious area is less than 1 acre, no detention is required. Table 1 shows existing and developed runoff calculations.

Existing Peak Runoff						
Description	<i>Percent Impervious (%)</i>	<i>C</i>	<i>T_c</i>	<i>I (in./hr)</i>	<i>Area (acres)</i>	<i>Q (cfs)</i>
Existing Sub-Basin (2 yr.)	0	0.20	15	3.83	0.51	0.39
Existing Sub-Basin (5 yr.)		0.22	15	4.56	0.51	0.51
Existing Sub-Basin (10 yr.)		0.28	15	5.22	0.51	0.75
Existing Sub-Basin (25 yr.)		0.30	15	6.06	0.51	0.93
Existing Sub-Basin (100 yr.)		0.41	15	7.37	0.51	1.54
Developed Sub-basin (2 yr.)	20	0.32	15	3.83	0.51	0.63
Developed Sub-basin (5 yr.)		0.35	15	4.56	0.51	0.81
Developed Sub-basin (10 yr.)		0.40	15	5.22	0.51	1.06
Developed Sub-basin (25 yr.)		0.42	15	6.06	0.51	1.30
Developed Sub-basin (100 yr.)		0.51	15	7.37	0.51	1.92

TABLE 1 – EXISTING AND DEVELOPED RUNOFF CALCULATIONS

II. TAB 2 – EXISTING CONDITIONS RUNOFF CALCULATIONS

Runoff Method

The rational method was used to compute the peak discharges for existing and proposed conditions. Rational 'C' factors were assigned to the existing site and proposed improvements from the City of Wichita Storm Water Manual. Rainfall intensity tables from the manual were utilized to determine the rainfall intensity for the 2, 5, 10, 25, and 100 year design storms. The Soil Conservation Service TR-55 manual was used to compute the time of concentration for the drainage areas. A design assumption was made as follows: that the minimum time of concentration is 15 minutes. Time of concentration calculations can be seen in the Appendix.

Soil Types were determined from the Natural Resource Conservation Soil Survey website. The SCS soil type present is the Milan Loam, which is a SCS type B soil.

Existing Conditions

The proposed plat site has been outlined as one drainage basin. This drainage basin sheet flows to the northeast across the site where it enters an existing offsite pond located about 150 ft to the northeast of this property. This drainage basin is 0.51 acres with no impervious area, and has an average land slope near 3%. A summary of the existing drainage calculations can be seen in Table 2. The existing drainage basin can be seen on the Existing and Developed Drainage map located in the Appendix.

Existing Peak Runoff						
Description	Percent Impervious (%)	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Existing Sub-Basin (2 yr.)	0	0.20	15	3.83	0.51	0.39
Existing Sub-Basin (5 yr.)		0.22	15	4.56	0.51	0.51
Existing Sub-Basin (10 yr.)		0.28	15	5.22	0.51	0.75
Existing Sub-Basin (25 yr.)		0.30	15	6.06	0.51	0.93
Existing Sub-Basin (100 yr.)		0.41	15	7.37	0.51	1.54

Table 2 – Existing Runoff Calculations

The 100 yr peak discharge for the existing basin is 1.54 cfs.

Ground Water Elevations

According to the Kansas Geological Survey’s Kansas Water Well Database, the static water surface elevation of the ground water in this area is around 30-40 ft.

III. TAB 3 – POST-DEVELOPMENT HYDROLOGIC ANALYSIS

Developed Conditions

The proposed plat site will contain one residential development. For developed conditions, the site will continue to drain the same as existing conditions. The only change to the site will be the addition of impervious area due to the residential development. Therefore, the rational “C” factors for each design storm will be raised to model the addition of impervious area. The amount of proposed impervious area was assumed to be 20% of the property limits. A summary of the developed drainage calculations can be seen in Table 3. The developed drainage basin can be seen on the Existing and Developed Drainage Map located in the Appendix.

Developed Peak Runoff						
Description	Percent Impervious (%)	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Developed Sub-basin (2 yr.)	20	0.32	15	3.83	0.51	0.63
Developed Sub-basin (5 yr.)		0.35	15	4.56	0.51	0.81
Developed Sub-basin (10 yr.)		0.40	15	5.22	0.51	1.06
Developed Sub-basin (25 yr.)		0.42	15	6.06	0.51	1.30
Developed Sub-basin (100 yr.)		0.51	15	7.37	0.51	1.92

Table 3 – Developed Runoff Calculations

The 100 yr peak discharge for the developed basin is 1.92 cfs. This gives an increase in the peak discharge of about 0.38 cfs for the 100 yr design storm. The existing pond located to the northeast of the site should safely handle the increase in runoff. The improvements on the lot shall be graded to positively drain to the existing pond.

Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
January 15th, 2013

Stormwater Quality

The proposed land disturbance will be less than 1 acre, therefore no stormwater quality will be required for this site.

IV. TAB 4 – FLOODPLAIN SUBMITTAL

FEMA Floodplain Boundary

There is no FEMA floodplain located on this property. A copy of the FEMA floodplain map is attached for review in the Appendix.

V. TAB 5 – FEDERAL, STATE, AND LOCAL PERMITS

A. US Army Corps of Engineers

Not Applicable

B. Kansas Department of Agriculture

Not Applicable

C. Federal Emergency Management Agency (FEMA)

Not Applicable

D. Kansas Department of Transportation

Not Applicable

E. Sedgwick County Right-of-way Permit

Not Applicable

Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
January 15th, 2013

APPENDIX

Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
January 15th, 2013

GENERAL MAPS

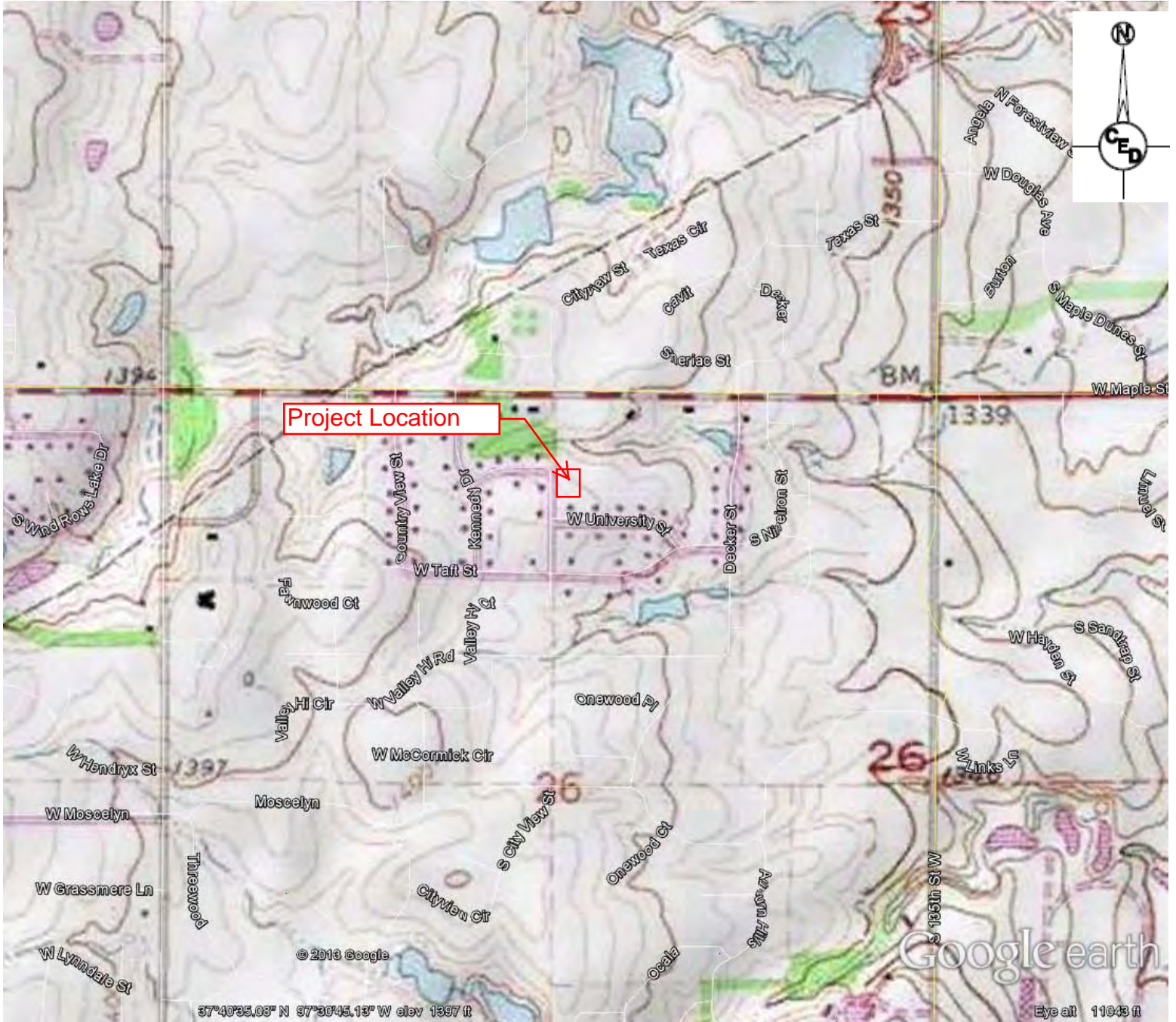
Aerial Photo

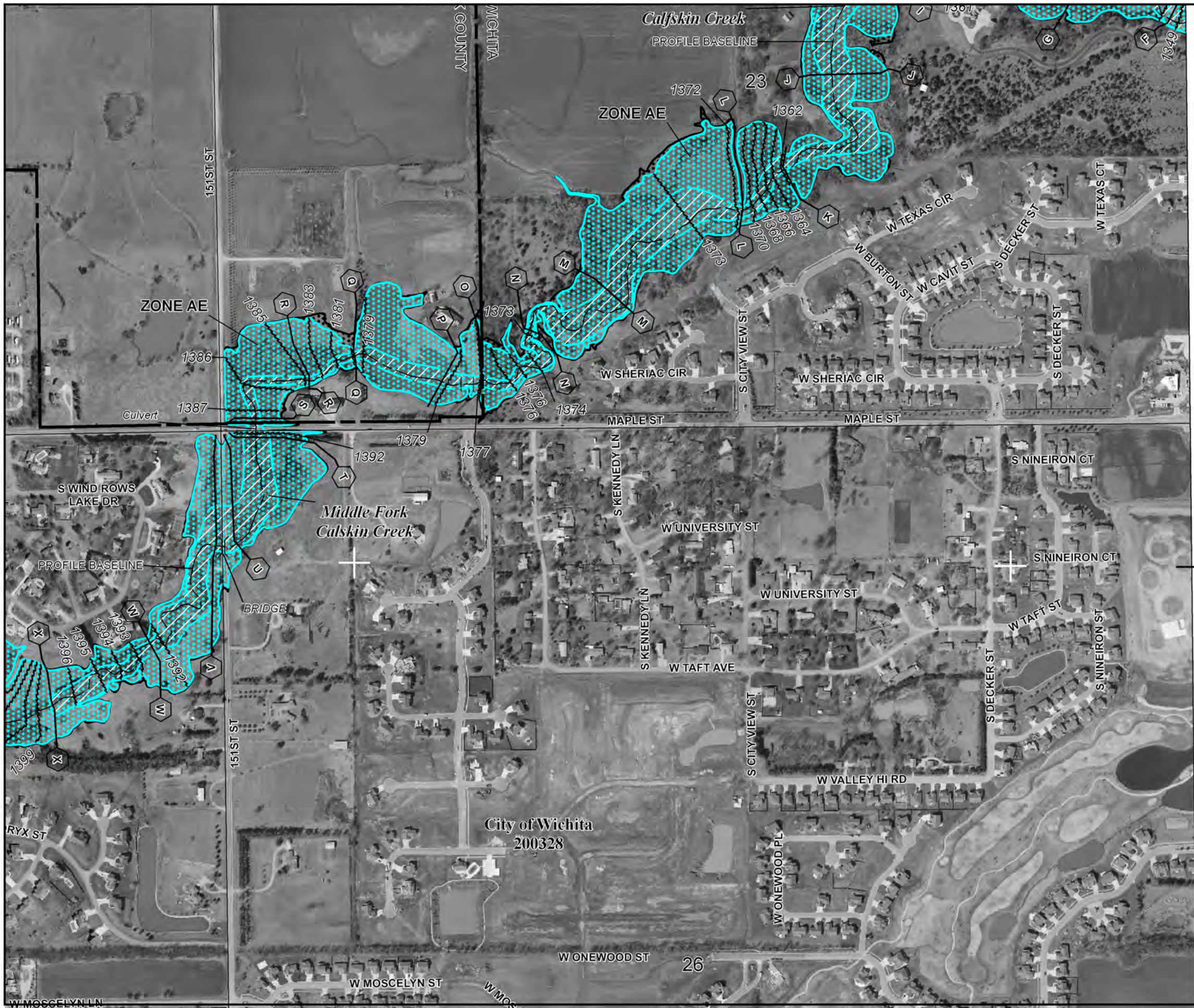
City View Estates
East of the Intersection of
University Ave and City View St.
Wichita, Sedgwick County, KS
CED Job # 20132086



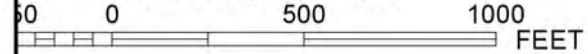
Quad Map

City View Estates
East of the Intersection of
University Ave and City View St.
Wichita, Sedgwick County, KS
CED Job # 20132086





MAP SCALE 1" = 500'



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0317F

FIRM
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
AND INCORPORATED AREAS

PANEL 317 OF 700
(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0317	F
WICHITA, CITY OF	200328	0317	F

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.



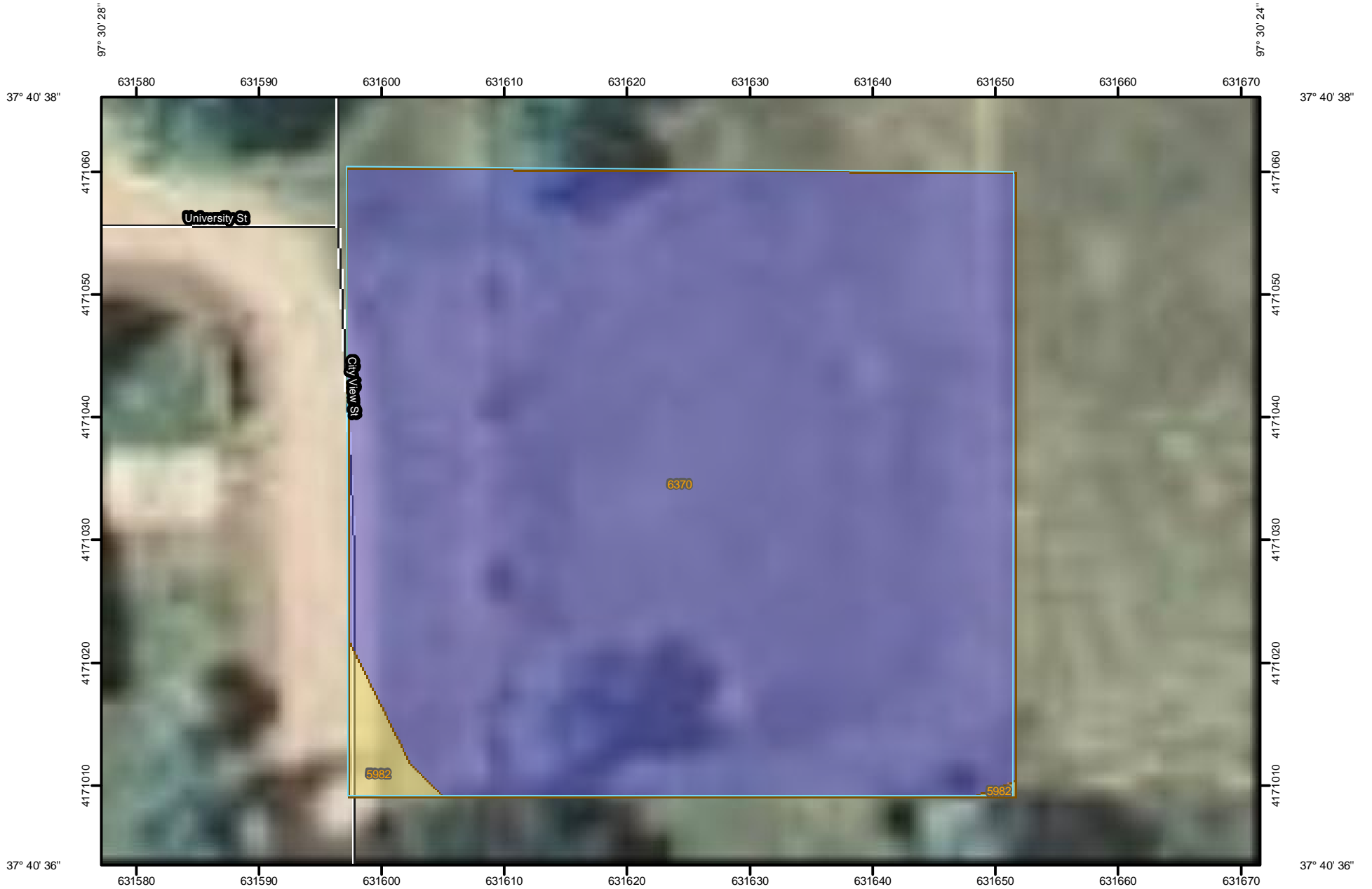
MAP NUMBER
20173C0317F
MAP REVISED
MAY 2, 2012

Federal Emergency Management Agency

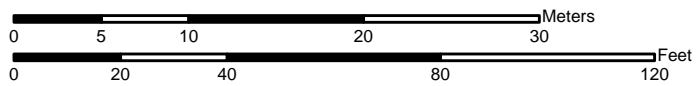
JOINS PANEL 0336

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

Hydrologic Soil Group—Sedgwick County, Kansas
(City View Estates)




Map Scale: 1:448 if printed on A size (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 A

 A/D


 B

 B/D

 C

 C/D


 D

 Not rated or not available

Political Features

 Cities

Water Features

 Streams and Canals


Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

MAP INFORMATION

Map Scale: 1:448 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 14N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sedgwick County, Kansas
Survey Area Data: Version 8, Sep 20, 2012

Date(s) aerial images were photographed: 6/30/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Sedgwick County, Kansas (KS173)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5982	Nalim loam, 1 to 3 percent slopes	C	0.0	1.6%
6370	Milan loam, 3 to 6 percent slopes	B	0.7	98.4%
Totals for Area of Interest			0.7	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

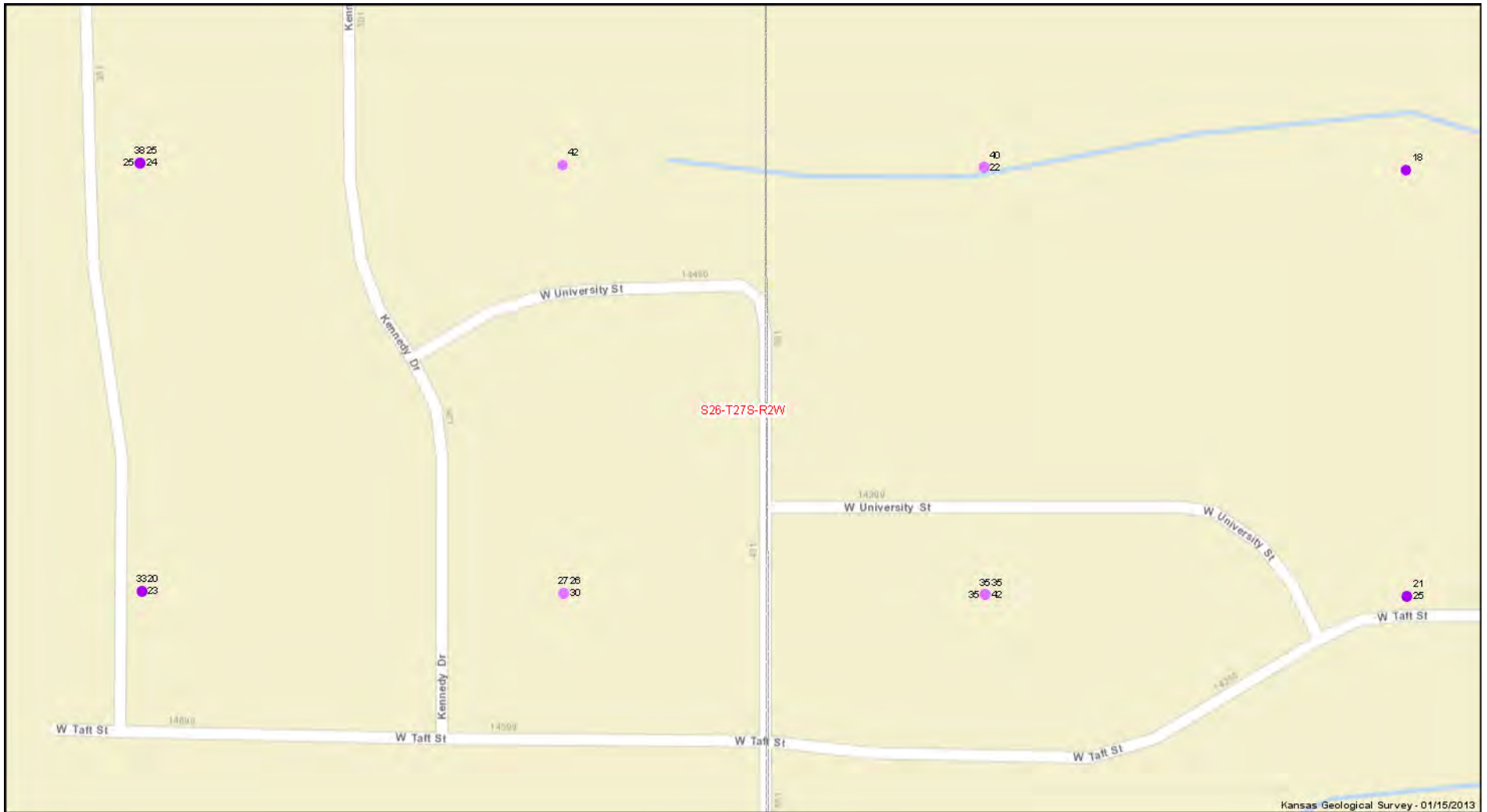
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

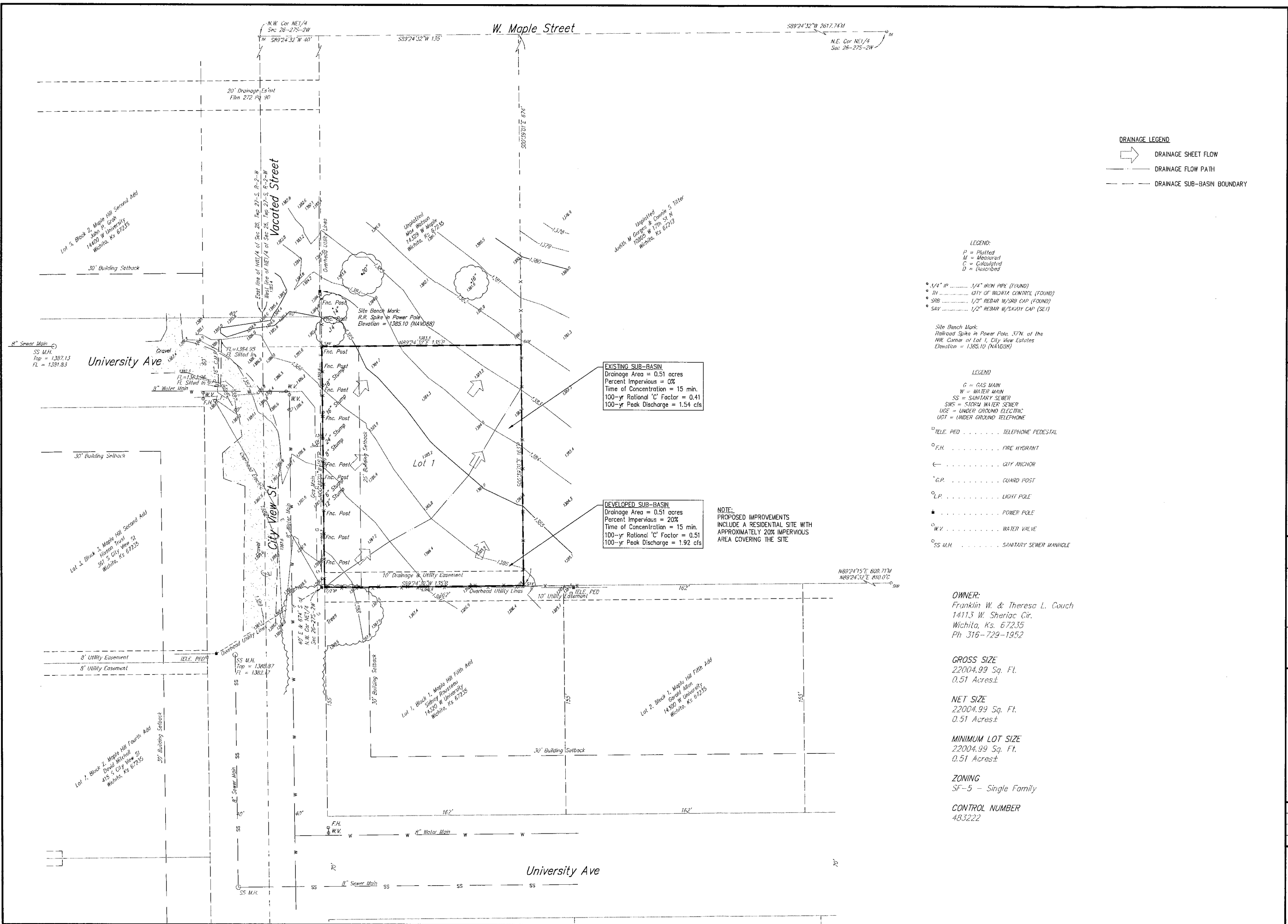
Tie-break Rule: Higher

Static Water Level Depth (ft)

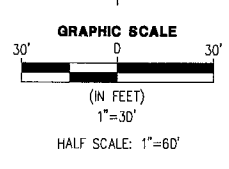
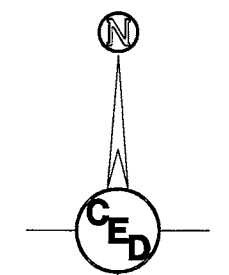
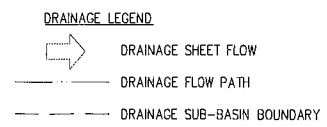


Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
January 15th, 2013

EXISTING AND DEVELOPED DRAINAGE MAP



REV.	DESCRIPTION	DATE



- LEGEND:**
- P = Plotted
 - M = Measured
 - C = Calculated
 - D = Unsubscribed
- 1/4" IP 1/4" IRON PIPE (FOUND)
 - DI CITY OF WICHITA CONTROL (FOUND)
 - SRB 1/2" REBAR W/SRB CAP (FOUND)
 - SAY 1/2" REBAR W/SAYV CAP (SET)

Site Bench Mark:
 Railroad Spike in Power Pole, SW of the
 NW Corner of Lot 1, City View Estates
 Elevation = 1385.10 (NAVD83)

- LEGEND**
- G = GAS MAIN
 - W = WATER MAIN
 - SS = SANITARY SEWER
 - SWS = STORM WATER SEWER
 - UGE = UNDER GROUND ELECTRIC
 - UT = UNDER GROUND TELEPHONE
- TELE. PED TELEPHONE PEDESTAL
 - F.H. FIRE HYDRANT
 - GUY ANCHOR
 - G.P. GUARD POST
 - L.P. LIGHT POLE
 - POWER POLE
 - W.V. WATER VALVE
 - SS M.H. SANITARY SEWER MANHOLE

EXISTING SUB-BASIN
 Drainage Area = 0.51 acres
 Percent Impervious = 0%
 Time of Concentration = 15 min.
 100-yr Rational 'C' Factor = 0.41
 100-yr Peak Discharge = 1.54 cfs

DEVELOPED SUB-BASIN
 Drainage Area = 0.51 acres
 Percent Impervious = 20%
 Time of Concentration = 15 min.
 100-yr Rational 'C' Factor = 0.51
 100-yr Peak Discharge = 1.92 cfs

NOTE:
 PROPOSED IMPROVEMENTS
 INCLUDE A RESIDENTIAL SITE WITH
 APPROXIMATELY 20% IMPERVIOUS
 AREA COVERING THE SITE

OWNER:
 Franklin W. & Theresa L. Couch
 14113 W. Sheriac Cir.
 Wichita, Ks. 67235
 Ph 316-729-1952

GROSS SIZE
 22004.99 Sq. Ft.
 0.51 Acres±

NET SIZE
 22004.99 Sq. Ft.
 0.51 Acres±

MINIMUM LOT SIZE
 22004.99 Sq. Ft.
 0.51 Acres±

ZONING
 SF-5 - Single Family

CONTROL NUMBER
 453222

CITY VIEW ESTATES
 WICHITA, SEDGWICK COUNTY, KS

CERTIFIED ENGINEERING DESIGN, P.A.
 CIVIL ENGINEERING SERVICES



1935 WEST MAPLE STREET
 WICHITA, KANSAS 67213
 PH.(316)262-8808 FAX.(316)262-1669



PROJECT NO.: 20132086
 ISSUE DATE: 1/15/13
 CONTACT: L. MILLS / H. FORAKER
 CHECKED BY:

EXISTING AND DEVELOPED DRAINAGE PLAN

Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
January 15th, 2013

TIME OF CONCENTRATION CALCS

Project	Logan Mills
Feature	Time of Concentration
Analyst	Logan Mills
Version	1/15/2013
Notes	... notes

Sheet	Subbasin	Number of Segments	Sheet Flow (mins)	Shallow Concentrated Flow (mins)	Open Channel Ditch Flow (mins)	Open Channel Pipe Flow (mins)	Open Channel General Flow (mins)	Other (mins)	Total Tc (mins)	Length (feet)	Drop (feet)	Avg. Slope (%)	Avg. Vel. (fps)	Lag (mins)	Lag (hours)	Area (acres)
1	Existing Basin	2	12.1	1.4	0.0	0.0	0.0	0.0	13.5	194	5	2.68	0.24	8.1	0.135	0.51
2	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
3	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
4	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
5	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
6	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
7	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
8	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
9	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
10	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
11	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
12	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
13	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
14	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	0.00	0.82	16.4	0.273	500
15	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
16	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
17	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
18	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
19	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
20	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
21	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
22	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
23	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
24	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
25	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500
26	0	6	20.3	2.4	0.1	0.2	0.1	4.2	27.3	1350	47	3.48	0.82	16.4	0.273	500

Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
January 15th, 2013

MISCELLANEOUS DRAINAGE INFORMATION

1988 Drainage Criteria Manual
City of Wichita, Kansas
Rainfall Intensity Table for Sedgwick County, KS

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.

Table 1 Rainfall Intensity Table (Duration 15 min – 120 min)

DURATION, in hours	DURATION, in minutes	RETURN PERIOD						
		1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0.0833	5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
0.1000	6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
0.1167	7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
0.1333	8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
0.1500	9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
0.1667	10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
0.1833	11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
0.2000	12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
0.2167	13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
0.2333	14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
0.2500	15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
0.2667	16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
0.2833	17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
0.3000	18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
0.3167	19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
0.3333	20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
0.3500	21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
0.3667	22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
0.3833	23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
0.4000	24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
0.4167	25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
0.4333	26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
0.4500	27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
0.4667	28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
0.4833	29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
0.5000	30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
0.5167	31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
0.5333	32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
0.5500	33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
0.5667	34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
0.5833	35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
0.6000	36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
0.6167	37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
0.6333	38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
0.6500	39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
0.6667	40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
0.6833	41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
0.7000	42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
0.7167	43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
0.7333	44	1.75	2.11	2.61	3.05	3.57	4.03	4.43

Table C-1 Rational C Values

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
<u>Business</u>					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
<u>Residential 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>Residential 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>Residential 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>Residential 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>Residential 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>Residential 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
<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

Appendix C

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
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
<u>Industrial</u>					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
<u>Playgrounds</u>					
	15	0.33	0.35	0.42	0.55
<u>Schools</u>					
	40	0.49	0.51	0.56	0.66
<u>Railroad Yard Areas</u>					
	30	0.43	0.45	0.50	0.62
<u>Undeveloped Urban Areas</u>					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
<u>Streets</u>					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
<u>Drive, Parking Lots and Walks:</u>					
	96	0.87	0.87	0.88	0.89
<u>Roofs</u>					
	90	0.80	0.85	0.90	0.93
<u>Urban Lawn Areas (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>Urban Lawn Areas (Soil Group B)</u>					
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
<u>Urban Lawn Areas (Soil Group C)</u>					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55
<u>Urban Lawn Areas (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