

DRAINAGE PLAN AND SUPPORTING CALCULATIONS

FOR

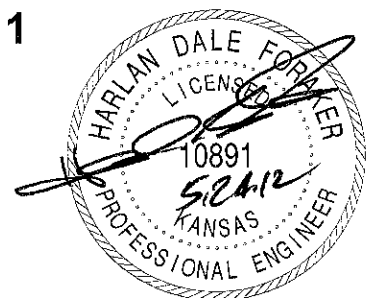
**BRUCE HARRIS ADDITION
WICHITA, KANSAS**

**PREPARED FOR:
HARRIS3 LLOC
BRUCE R. HARRIS, MANAGER
1223 N. ROCK RD, BLDG G, STE 300
WICHITA, KS 67206**

MAY 24TH, 2012

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)
Bruce Harris Addition
May 24th, 2012

CERTIFIED ENGINEERING DESIGN, P.A

1935 West Maple
Wichita, KS 67213-3311
(316)262-8808 Office
(316)262-1669 Fax

LETTER OF TRANSMITTAL

DATE: May 24th, 2012

TO: Mr. Scott Lindebak, P.E.
Engineering Division
City of Wichita
7th Floor, City Hall
455 N. Main
Wichita, KS 67202

RE: Drainage Plan
Bruce Harris Addition
Wichita, KS

FROM: Harlan D. Foraker, P.E. *HDF*

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 Bruce Harris Addition in Wichita, KS. This site is located on the east side of N. West St., about 350 ft north of the intersection of W. 3rd St. and N. West St. This site is currently developed as residential property with native grass cover. The SCS soil type present on the site is the Urban Land-Canadian Complex and is an unrated SCS soil type. The proposed improvements include adding a 15,800 s.f. building with parking area to the proposed lot. A proposed area inlet will be used to capture the runoff from the parking lot and building and divert it to the existing storm sewer system along West St. The total area of the proposed lot is 0.93 acres. An aerial photograph of the proposed plat site is located in the Appendix.

Offsite Conditions

It appears that 0.21 acres of offsite drainage enters the site from the north. The north property line of the site will match existing ground for proposed conditions and continue to allow the offsite drainage to flow east or west along the north property line. A copy of the USGS map is located in the Appendix.

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Bruce Harris Addition

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Description of Best Management Practices

The total disturbed area will be less than 1 acre. This means that water quality is not required for this site. Therefore there are no permanent structural stormwater management facilities incorporated into the site design.

Summary of Runoff Calculations

The proposed runoff calculations cause an increase in peak discharge for all storm series when compared with existing runoff calculations. However, since the proposed site area does not add an additional 1 acre of impervious area, no detention is required. Table 1 shows existing and developed runoff calculations.

Existing & Proposed Peak Runoff	
Description	Q (cfs)
Existing Basin A (2 yr.)	1.23
Existing Basin A (5 yr.)	1.66
Existing Basin A (10 yr.)	2.36
Existing Basin A (25 yr.)	2.89
Existing Basin A (100 yr.)	4.59
Proposed Basin A (2 yr.)	2.07
Proposed Basin A (5 yr.)	3.37
Proposed Basin A (10 yr.)	3.96
Proposed Basin A (25 yr.)	4.62
Proposed Basin A (100 yr.)	5.83

TABLE 1 – EXISTING AND PROPOSED 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 same 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.

Soil Types were determined from the Natural Resource Conservation Soil Survey website. The SCS soil type present is the Urban Land-Canadian Complex, which is an unrated SCS soil type. Therefore, it was assumed that this soil is an SCS type D soil.

Existing Conditions

The proposed plat site has been outlined as two existing drainage basins labeled "A" and "B". Drainage basin "A" sheet flows to the west across the site where it enters West St. and then dumps into existing storm sewer along West St. Drainage basin "A"

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 Bruce Harris Addition
 May 24th, 2012

is 0.22 acres with 0.09 acres of impervious area, and it has an average land slope near 1%. Drainage basin "B" sheet flows to the east across the property line. Drainage basin "B" is 0.70 acres with .04 acres of impervious area, and it has an average land slope near 1%. A summary of the existing drainage calculations can be seen in Table 2. The existing drainage basins can be seen on the 1" = 20' Existing Drainage Map located in the Appendix.

Existing Peak Runoff					
Description	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Existing Basin A (2 yr.)	0.50	15	3.83	0.22	0.42
Existing Basin A (5 yr.)	0.54	15	4.56	0.22	0.54
Existing Basin A (10 yr.)	0.62	15	5.22	0.22	0.71
Existing Basin A (25 yr.)	0.64	15	6.06	0.22	0.85
Existing Basin A (100 yr.)	0.76	15	7.37	0.22	1.23
Existing Basin B (2 yr.)	0.3	15	3.83	0.70	0.80
Existing Basin B (5 yr.)	0.35	15	4.56	0.70	1.12
Existing Basin B (10 yr.)	0.45	15	5.22	0.70	1.64
Existing Basin B (25 yr.)	0.48	15	6.06	0.70	2.04
Existing Basin B (100 yr.)	0.65	15	7.37	0.70	3.35
Offsite Drainage (2 yr.)	0.57	15	3.83	0.21	0.46
Offsite Drainage (5 yr.)	0.61	15	4.56	0.21	0.58
Offsite Drainage (10 yr.)	0.66	15	5.22	0.21	0.72
Offsite Drainage (25 yr.)	0.68	15	6.06	0.21	0.87
Offsite Drainage (100 yr.)	0.79	15	7.37	0.21	1.22

Table 2 – Existing Runoff Calculations

The total 100 yr peak discharge for the existing site is 4.59 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 15-20 ft. A Static Water Level Map of Existing Wells is located in the Appendix.

III. TAB 3 – POST-DEVELOPMENT HYDROLOGIC ANALYSIS

Developed Conditions

The proposed plat site will contain a 15,800 s.f. building with parking area. For proposed conditions, this site has been divided into 3 drainage basins labeled 1, 2, and 3. Drainage basin 1 drains to a 2'x4' area inlet located in the center of the parking lot. A proposed 15" RCP carries the water to the existing storm sewer system along West St. Drainage basins 2 and 3 sheet flow across the proposed property lines. The runoff from drainage basins 2 and 3 is very minimal and will have no adverse impact on surrounding properties. A summary of the developed drainage calculations can be seen in Table 3. The developed drainage basin can be seen on the 1"=20' Proposed Drainage Map located in the Appendix.

Proposed Peak Runoff					
Description	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Proposed Basin 1 (2 yr.)	0.86	15	2.83	0.80	1.95
Proposed Basin 1 (5 yr.)	0.86	15	4.56	0.80	3.14
Proposed Basin 1 (10 yr.)	0.87	15	5.22	0.80	3.63
Proposed Basin 1 (25 yr.)	0.87	15	6.06	0.80	4.22
Proposed Basin 1 (100 yr.)	0.88	15	7.37	0.80	5.19
Proposed Basin 2 (2 yr.)	0.30	15	2.83	0.10	0.08
Proposed Basin 2 (5 yr.)	0.35	15	4.56	0.10	0.16
Proposed Basin 2 (10 yr.)	0.45	15	5.22	0.10	0.23
Proposed Basin 2 (25 yr.)	0.48	15	6.06	0.10	0.29
Proposed Basin 2 (100 yr.)	0.65	15	7.37	0.10	0.48
Proposed Basin 3 (2 yr.)	0.50	15	2.83	0.03	0.04
Proposed Basin 3 (5 yr.)	0.53	15	4.56	0.03	0.07
Proposed Basin 3 (10 yr.)	0.60	15	5.22	0.03	0.09
Proposed Basin 3 (25 yr.)	0.62	15	6.06	0.03	0.11
Proposed Basin 3 (100 yr.)	0.73	15	7.37	0.03	0.16

Table 3 – Proposed Runoff Calculations

The total 100 yr peak discharge for the proposed site is 5.83 cfs. This gives an increase in the peak discharge of about 1.24 cfs for the 100 yr design storm. Since the proposed development will not add 1 acre of impervious area, no detention is required. The proposed building will have a finished floor elevation of 1309.40. This means that most of the runoff from the site will drain into the existing storm sewer along West St. Therefore, more runoff will drain to the storm sewer system along West St. from this property than existing conditions allowed. However, the increase in runoff is not large enough to cause a substantial increase in discharge.

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

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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

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Bruce Harris Addition
May 24th, 2012

APPENDIX

Mr. Scott Lindebak, P.E., (Con't)
Bruce Harris Addition
May 24th, 2012

GENERAL MAPS

Aerial Photo

Bruce Harris Addition
350 ft N. of the Intersection of W. 3rd St. N. and N. West St.
Wichita, Kansas, 67203
CED Job # 20122031



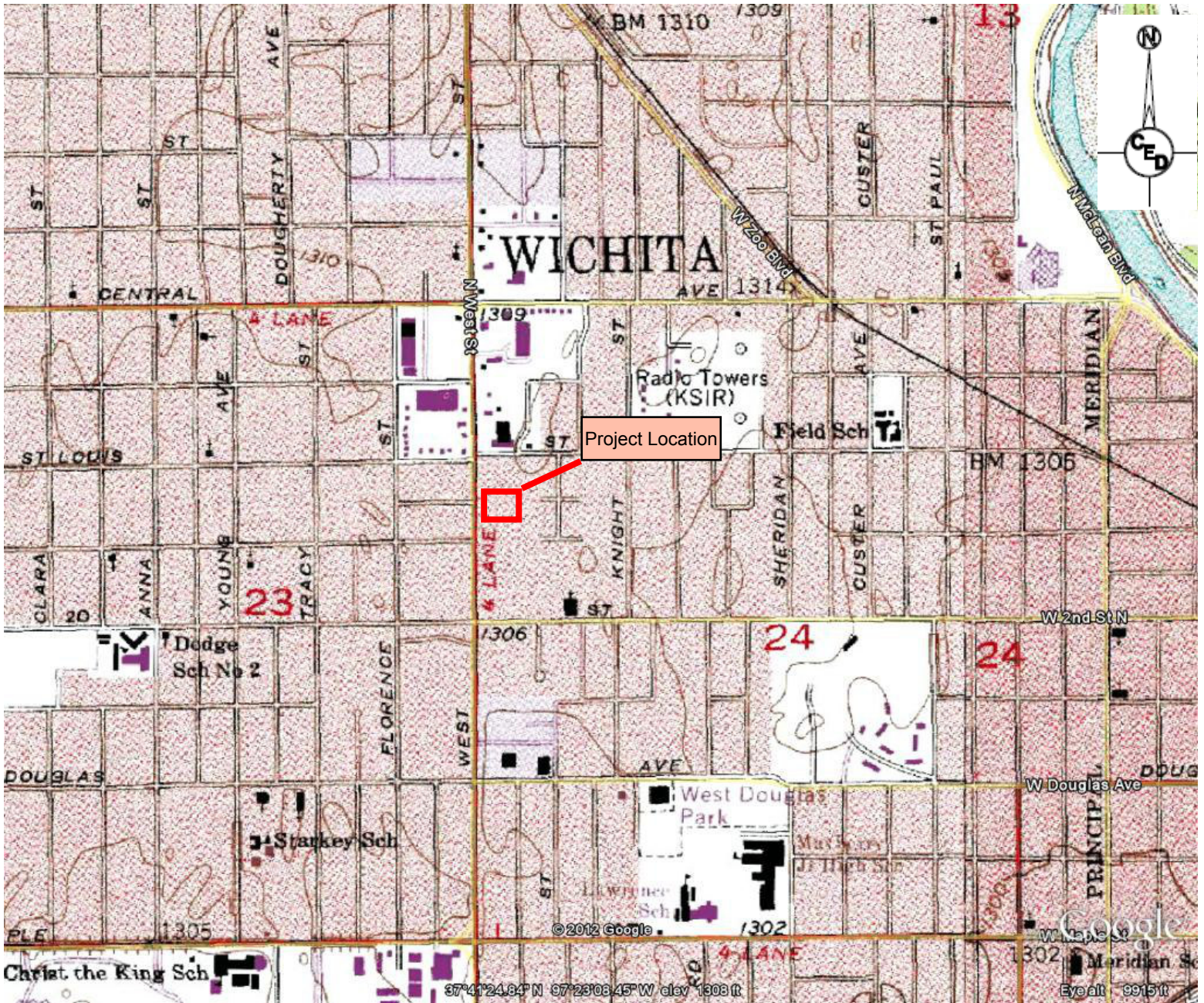
Quad Map

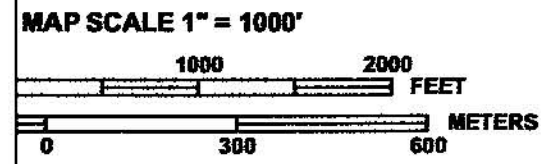
Bruce Harris Addition

350 ft N. of the Intersection of W. 3rd St. N. and N. West St.

Wichita, Kansas, 67203

CED Job # 20122031





PANEL 0335E

FIRM
FLOOD INSURANCE RATE MAP
SEDGWICK COUNTY,
KANSAS
AND INCORPORATED AREAS

PANEL 335 OF 700
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

WARNING! THIS AREA IS BEING PROTECTED BY AN ANNUAL CHANCE FLOOD DIKE, OR OTHER STRUCTURE. FAILURE OF THIS STRUCTURE OR FAILURE OF THIS STRUCTURE WHICH COULD RESULT IN ELEVATIONS AND WATER PROTECTION, FLOOD DAMAGE, AND LOSS OF LIFE AND PROPERTY ARE STRONGLY RECOMMENDED. SEE THE NOTICE TO USER.

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0335	E
WICHITA, CITY OF	200328	0335	E

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
20173C0335E
EFFECTIVE DATE
FEBRUARY 2, 2007
Federal Emergency Management Agency

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

Wichita - Valley Center Floodway JOINS PANEL 0345

37° 41' 15"
 97° 22' 30"



97° 23' 22"




Map Scale: 1:518 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


 Urban land-Canadian complex, 0 to 3 percent slopes

 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: 1:518 if printed on A size (8.5" x 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 7, Nov 30, 2010

Date(s) aerial images were photographed: 6/20/2006

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.

Map Unit Name

Map Unit Name— Summary by Map Unit — Sedgwick County, Kansas (KS173)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6250	Urban land-Canadian complex, 0 to 3 percent slopes	Urban land-Canadian complex, 0 to 3 percent slopes	1.1	100.0%
Totals for Area of Interest			1.1	100.0%

Description

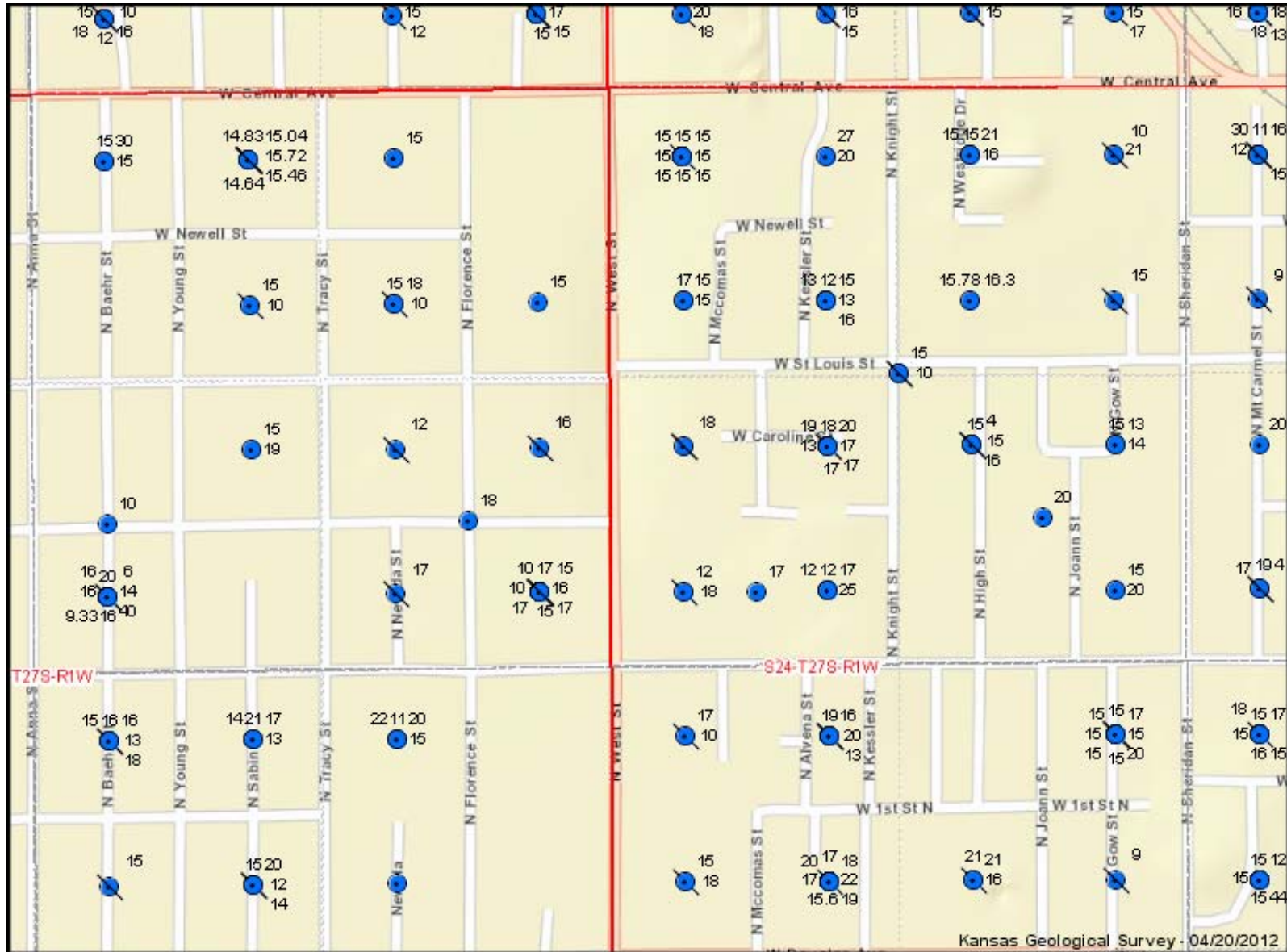
A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Static Water Level Depth of Surrounding Wells (ft)



Mr. Scott Lindebak, P.E., (Con't)
Bruce Harris Addition
May 24th, 2012

EXISTING AND DEVELOPED DRAINAGE MAPS

SITE BENCH MARK:
 Square "□" cut top of curb
 Elevation = 1307.56 (NAVD 88)

Lot 1
 Ashford Addition

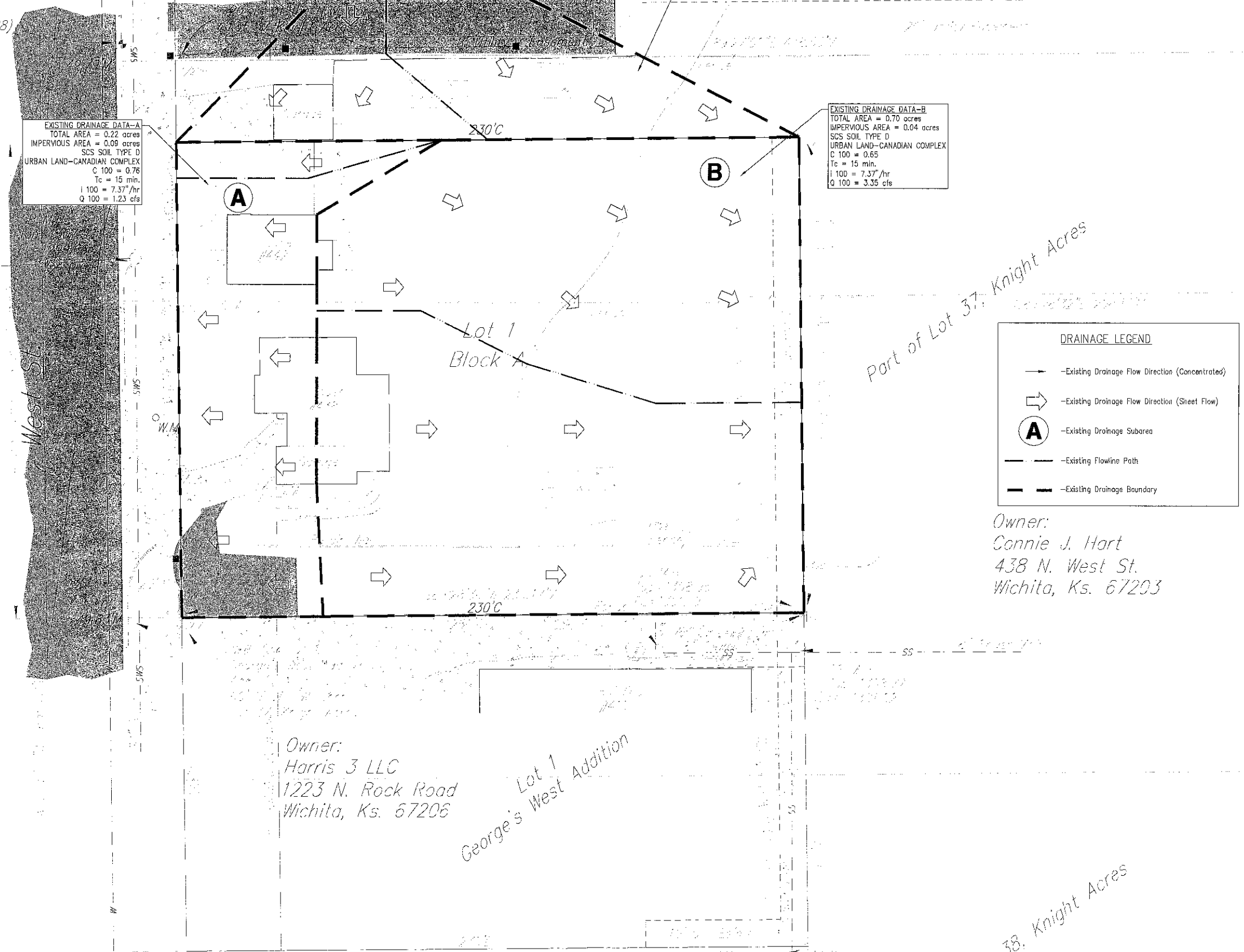
Owner:
 Hunan Restaurant & Club Inc.
 446 N. West St.
 Wichita, Ks. 67203

OFFSITE DRAINAGE DATA
 TOTAL AREA = 0.21 acres
 IMPERVIOUS AREA = 0.10 acres
 SCS SOIL TYPE D
 URBAN LAND-CANADIAN COMPLEX
 C 100 = 0.79
 Tc = 15 min.
 I 100 = 7.37"/hr
 Q 100 = 1.22 cfs

Owner:
 Saratoga Services Inc.
 P.O. Box 12976
 Wichita, Ks. 67277

EXISTING DRAINAGE DATA-A
 TOTAL AREA = 0.22 acres
 IMPERVIOUS AREA = 0.09 acres
 SCS SOIL TYPE D
 URBAN LAND-CANADIAN COMPLEX
 C 100 = 0.76
 Tc = 15 min.
 I 100 = 7.37"/hr
 Q 100 = 1.23 cfs

EXISTING DRAINAGE DATA-B
 TOTAL AREA = 0.70 acres
 IMPERVIOUS AREA = 0.04 acres
 SCS SOIL TYPE D
 URBAN LAND-CANADIAN COMPLEX
 C 100 = 0.65
 Tc = 15 min.
 I 100 = 7.37"/hr
 Q 100 = 3.35 cfs



DRAINAGE LEGEND

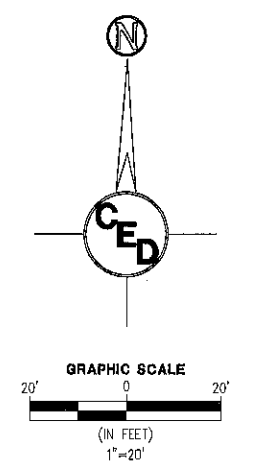
- Existing Drainage Flow Direction (Concentrated)
- Existing Drainage Flow Direction (Sheet Flow)
- Existing Drainage Subarea
- Existing Flowline Path
- Existing Drainage Boundary

Owner:
 Connie J. Hart
 438 N. West St.
 Wichita, Ks. 67203

Owner:
 Harris 3 LLC
 1223 N. Rock Road
 Wichita, Ks. 67206

Lot 1
 George's West Addition

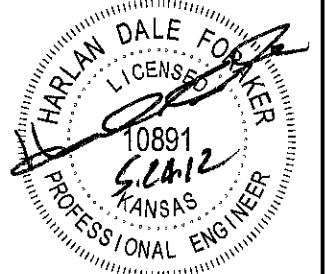
REV.	DESCRIPTION	DATE



BRUCE HARRIS ADDITION
 WICHITA, KS
 SEDGWICK COUNTY, KS

CERTIFIED ENGINEERING DESIGN, P.A.
 CIVIL ENGINEERING SERVICES

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



PROJECT NO.: 20122031
 ISSUE DATE: 04/23/12
 CONTACT: L. MILLS / H. FORAKER
 CHECKED BY:

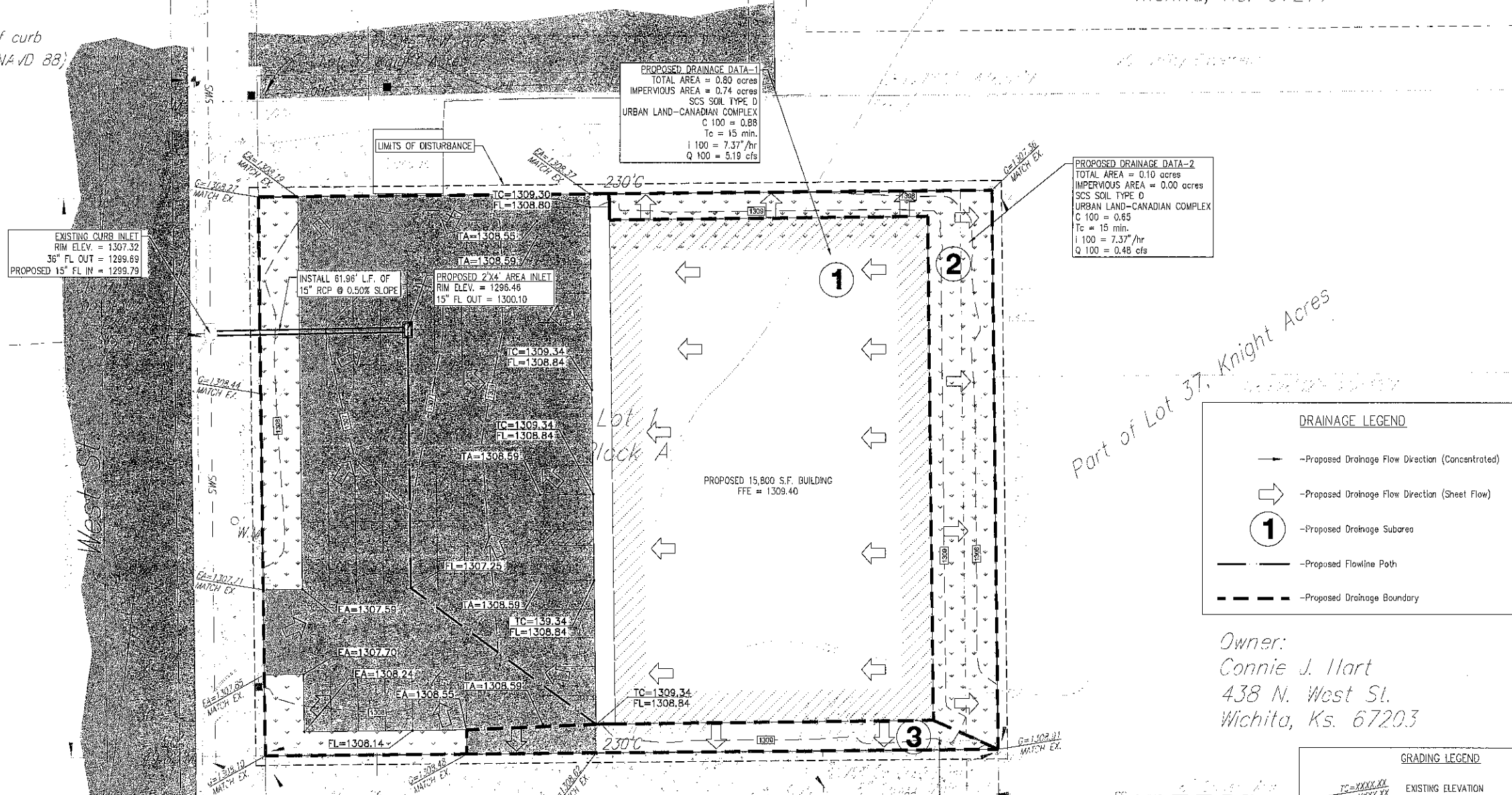
EXISTING DRAINAGE MAP

Lot 1
Ashford Addition

Owner:
Hunan Restaurant & Club Inc.
446 N. West St.
Wichita, Ks. 67203

Owner:
Saratoga Services Inc.
P.O. Box 12976
Wichita, Ks. 67277

SIT' BENCH MARK:
Square "17" cut top of curb
Elevation = 1307.56 (NAVD 88)



PROPOSED DRAINAGE DATA-1
TOTAL AREA = 0.80 acres
IMPERVIOUS AREA = 0.74 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.88
Tc = 15 min.
I 100 = 7.37"/hr
Q 100 = 5.19 cfs

PROPOSED DRAINAGE DATA-2
TOTAL AREA = 0.10 acres
IMPERVIOUS AREA = 0.00 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.65
Tc = 15 min.
I 100 = 7.37"/hr
Q 100 = 0.48 cfs

PROPOSED DRAINAGE DATA-3
TOTAL AREA = 0.03 acres
IMPERVIOUS AREA = 0.01 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.73
Tc = 15 min.
I 100 = 7.37"/hr
Q 100 = 0.16 cfs

EXISTING CURB INLET
RIM ELEV. = 1307.32
36" FL OUT = 1299.69
PROPOSED 15" FL IN = 1299.79

INSTALL 61.96' LF. OF
15" RCP @ 0.50% SLOPE

PROPOSED 2'x4' AREA INLET
RIM ELEV. = 1296.49
15" FL OUT = 1300.10

DRAINAGE LEGEND

- Proposed Drainage Flow Direction (Concentrated)
- Proposed Drainage Flow Direction (Sheet Flow)
- Proposed Drainage Subarea
- Proposed Flowline Path
- Proposed Drainage Boundary

GRADING LEGEND

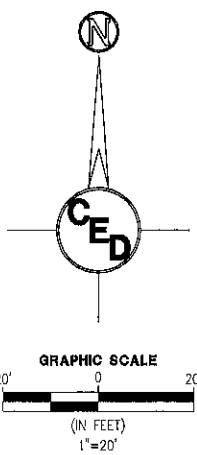
- EXISTING ELEVATION
- PROPOSED SPOT ELEVATIONS
- FL = FLOW LINE
- TC = TOP OF CURB
- G = GROUND
- EA = EDGE OF ASPHALT
- TA = TOP OF ASPHALT

SURVEY DISCLAIMER:
TOPOGRAPHIC SURVEY AND CONTOUR MAP USED IN PREPARING PLANS
WAS PROVIDED BY SAVOY COMPANY, P.A., 536 S. EMPORIA, SUITE 104,
WICHITA, KS. ENGINEER DOES NOT GUARANTEE SURVEY ELEVATIONS FOR
ACCURACY. CONTRACTOR SHALL VERIFY ELEVATIONS AND NOTIFY
ENGINEER OF ANY DISCREPANCIES.

Owner:
Harris 3 LLC
1223 N. Rock Road
Wichita, Ks. 67206

Owner:
Connie J. Hart
438 N. West St.
Wichita, Ks. 67203

REV.	DESCRIPTION	DATE

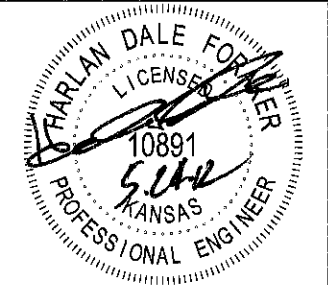


BRUCE HARRIS ADDITION
WICHITA, KS
SEDGWICK COUNTY, KS

CERTIFIED ENGINEERING DESIGN, P.A.
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1935 WEST MAPLE STREET
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PROJECT NO.: 20122031
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CHECKED BY:

**PROPOSED DRAINAGE
MAP**

Mr. Scott Lindebak, P.E., (Con't)
Bruce Harris Addition
May 24th, 2012

RAINFALL INTENSITY TABLE AND RATIONAL C VALUES

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