

DRAINAGE REPORT

FOR

FOLIAGE ADDITION
Wichita, Kansas

JANUARY 2008



Public Works, Engineering Division Final Drainage Plan Submittal Checklist

Reviewer: _____	Date: _____
Subdivision Name: _____	Location: _____
Total Land Area Of Ownership: _____ Acres	
Type: _____ Residential _____ Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other	
Applicant: _____	Contact: _____ Phone #: _____
Engineer: _____	Contact: _____ Phone #: _____

Please check the appropriate box:

I = Included; NA = Non-Applicable; R= Required prior to development
(If "NA" is checked, an explanation must be entered)

Tab 1. Project Narrative	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Site Location Map, using USGS Map					
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain					
C. Discussion of offsite conditions					
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series					
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design					
F. Copy of the plat					
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)					
H. Professional Engineer seal, signature and date on cover of report					
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover					

Tab 2. Existing Conditions Runoff Calculations	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)					
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)					
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)					
D. Total Site Area and Total Impervious Area (acres)					
E. Benchmarks used for site control					
F. Streams, creeks, and waterway labeled					
G. Predominant soils from USDA soil surveys, and/or on site soil borings					
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted					
I. Location of existing roads, buildings, parking lots and other impervious areas.					



J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements					
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow					
L. Flow paths					
M. Location and dimensions of existing channels, bridges or culvert crossings					
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration					
O. Assumed pre-developed runoff curve numbers					
P. Existing time of concentrations used in calculations					
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site					
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)					
S. Cross-section data for open channels					
T. Ground water elevations, if applicable					

Tab 3. Post-Development Hydrologic Analysis	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)					
B. Proposed time of concentrations used in calculations					
C. Assumed post-developed runoff curve numbers					
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)					
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration					
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities					
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary					
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)					
I. Design water surface elevations and normal pool elevation for ponds.					
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.					
K. Proposed limits of clearing and grading					
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.					
M. Location of existing and proposed utilities (e.g., water, sewer) and easements					
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow					
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings					



P. Preliminary selection and location of stormwater controls					
Q. Emergency overflow structure's flow path					
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)					
S. The 100-year 24-hour HWL delineated on the plan for detention pond					
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds					
U. Stormwater Management Facilities located within a Reserve					
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)					
W. Off-site drainage easements or agreements required, where necessary					

Tab 4. Floodplain Submittal	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Provide source of flood profile					
B. Nearest base flood elevations					
C. Delineation of pre-developed regulatory floodplain/floodway limits					
D. Delineation of post-developed regulatory floodplain and floodway limits					
E. Floodplain boundary determination per elevation (project limits shown)					
F. Provide source of floodway data table and discharges					
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits					
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions					
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)					
J. Flood plains and floodways located within a Reserve, where necessary					

Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	Applicant			Engr	
	I/R	NA	Explanation / Location in Plan	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)					
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)					
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.					
D. Kansas Department of Transportation					
E. Sedgwick County Right-of-way Permit					

Tab 1. Project Narrative

A. Location

The subject property is in the city of Wichita, Sedgwick County, Kansas. The proposed development is located north of 13th Street North, west of Webb Road, in the southeast ¼ of the southeast ¼ of Section 8, Township 27 South, Range 2 East. The entire Foliage Addition is approximately 17.5 acres, the platted area is 7.1 acres. The Waterfront Addition is east of the site. The site is shown on the USGS Map, Figure 1.1.

B. Discussion of Development

Approximately 7.1 acres will be developed for retail/commercial use; this area is the only area currently being platted. Future use for the Foliage development includes residential development north of the commercial area. Detention is provided for the Foliage Addition in the Waterfront Development, east of the site across Webb Road. Detention calculations and detailed information regarding the detention provided for the Foliage Addition can be found in *Drainage Report for Waterfront Commercial, Waterfront Residential, and Greenwich Office Park Revised August 2007*.

C. Discussion of Offsite

The site is surrounded by residential development to the west and north, Webb Road to the east and 13th Street to the south.

D. Summary of Runoff

The site drains northwest to southeast. Elevations vary from 1384 in the north part of the site to 1370 in the southeast corner. Runoff is conveyed under Webb Road and to the Waterfront detention pond. Detailed detention analysis is reported in *Drainage Report for Waterfront Commercial, Waterfront Residential, and Greenwich Office Park Revised August 2007*. A comparison of pre and post-project flow rates is shown in the following table.

Comparison of Pre and Post-Development Flowrates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Pre-project out of Beech Lake	224	396	527	1167
Post-Project out of Beech Lake	219	392	517	1111

E. Best Management Practices

The site will be seeded or sodded after construction of grading and utilities are complete. Inlets will be kept clear of debris to ensure proper drainage of the site.

F. Plat

The plat is included, Figure 1.2.

G. Preliminary Grading Plan

The preliminary lot grading plan is included, Figure 1.3.

H. Professional Engineer Seal

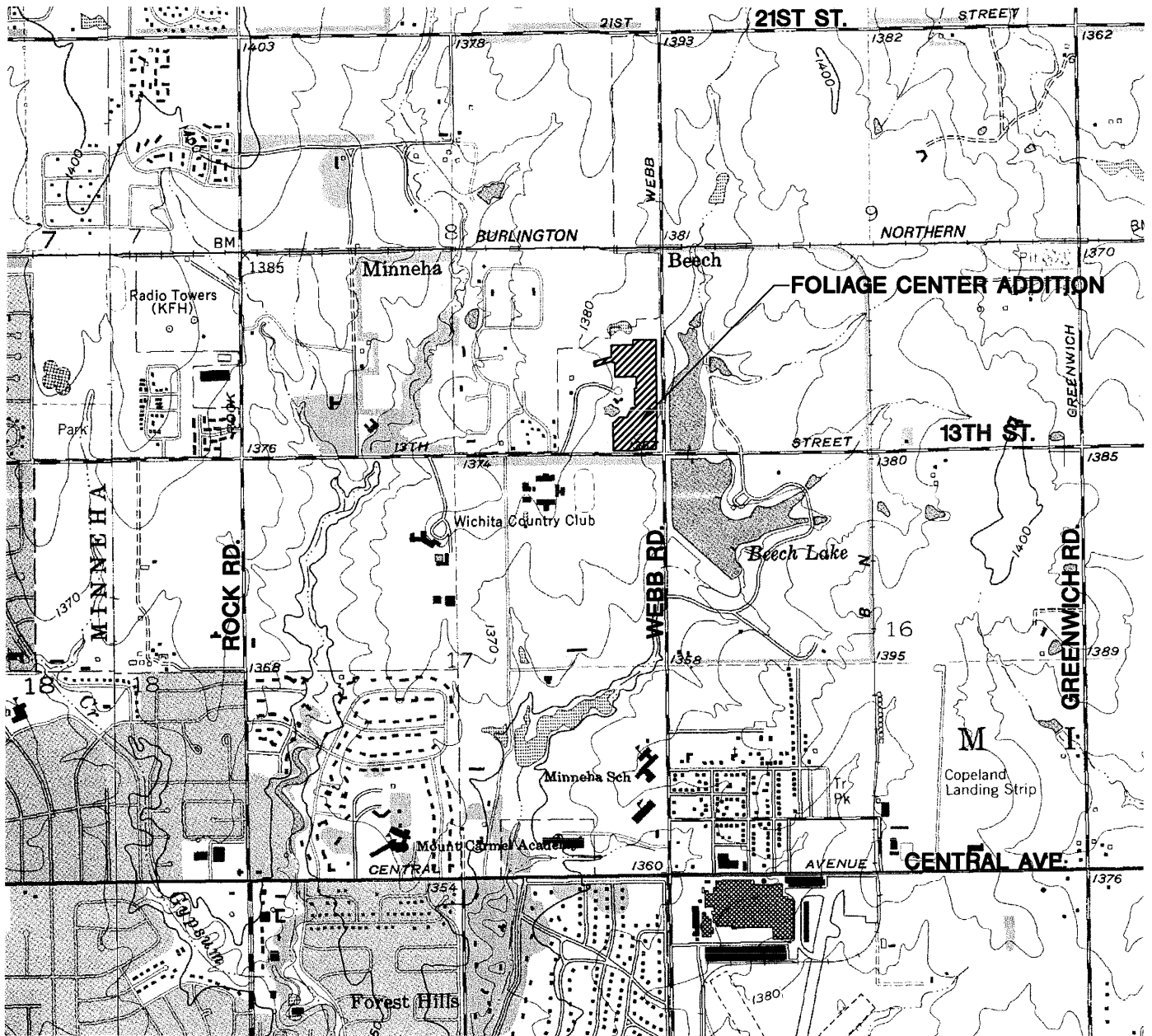
The cover of the report will be signed and dated.

I. CD

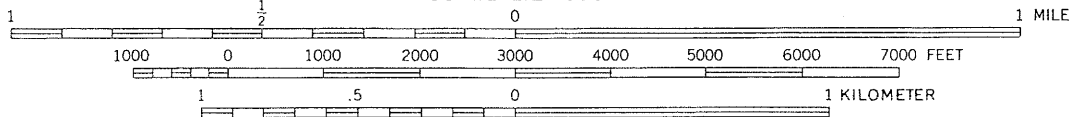
A CD of the drainage report in PDF format is attached to the inside front cover of the bound report.

Figure 1.1

USGS Quadrangle Map



SCALE 1:24 000



CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



J:\CIVIL\04274\DWG\DRNG\QUAD MAP.DWG

<p>MKEC ENGINEERING CONSULTANTS, INC.</p> <p>411 N. WEBB ROAD WICHITA, KS. 67206 316-684-9600</p>	<p>FOLIAGE CENTER ADDITION PROJECT NAME</p> <p>USGS GEOLOGICAL SURVEY EAST WICHITA, KANSAS QUADRANGLE SHEET TITLE</p>		
	<p>AJK DESIGN BY:</p>	<p>CMJ DRAWN BY:</p>	<p>GJA CHECKED BY:</p>
	<p>DECEMBER 2007 DATE</p>	<p>04274 JOB NO.</p>	<p>1 / 1 SHEET/OF</p>

Figure 1.2

Plat

FINAL PLAT

FOLIAGE CENTER ADDITION

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

PLANNING COMMISSION CERTIFICATE

This plat of "FOLIAGE CENTER ADDITION" has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this _____ day of _____, 2008

WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

M.S. Mitchell, Chair

John L. Schlegel, Secretary

GOVERNING BODY CERTIFICATE

The declarations shown on this plat are hereby accepted and this plat is hereby approved by the governing body of the City of Wichita, Kansas.

Dated this _____ day of _____, 2008

At the direction of the City Council.

Carl Brewer, Mayor

Karen Sublett, City Clerk

TRANSFER RECORD

STATE OF KANSAS, SEDGWICK COUNTY} ss:

Entered on transfer record this _____ day of _____, 2008

Don Brace, County Clerk

REGISTER OF DEEDS CERTIFICATE

This is to certify that this instrument was filed for record in the Register of Deeds office this day of _____, 2008, at _____ o'clock _____ M., and is duly recorded.

Bill Meek, Register of Deeds

Tonya E. Buckingham, Deputy

COUNTY SURVEYOR

Reviewed in accordance with K.S.A. 58-2005 on this _____ day of _____, 2008.

Trida L. Robello, LS #1246
Deputy County Surveyor
Sedgwick County, Kansas

MKEC
ENGINEERING
CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 6884 - 9600

CERTIFICATE OF SURVEY

I, Gregory J. Allison, a registered land surveyor in Kansas, do hereby certify that I have been in responsible charge of surveying and plating of "FOLIAGE CENTER ADDITION", an addition to Wichita, Sedgwick County, Kansas, into a Lot, a Block, and Streets the same being accurately set forth in the accompanying plat and described herein:

A tract of land lying in the Southeast Quarter, Section 8, Township 27 South, Range 2 East, of the 6th Principal Meridian, Wichita, Sedgwick County, Kansas; said tract being more particularly described as follows:
BEGINNING at the southeast corner of said Southeast Quarter, thence along the south line of said Southeast Quarter, S89°04'48"W, 619.98 feet; thence N00°55'13"W, 416.88 feet; thence N89°04'48"E, 20.17 feet; thence N43°08'45"E, 90.57 feet; thence N89°04'48"E, 99.83 feet; thence N26°32'56"E, 133.03 feet; thence N89°04'48"E, 48.13 feet; thence N00°53'35"W, 32.10 feet; thence S89°04'48"W, 10.64 feet; thence N00°53'35"W, 128.04 feet; thence N89°06'25"E, 278.42 feet to a point lying 60.00 feet west of the east line of said Southeast Quarter, thence N89°06'25"E, 60.00 feet to said east line; thence along said east line, S00°53'35"E, 759.97 feet to the POINT OF BEGINNING.

All reserves, streets, easements, setbacks, and access controls, together with, that portion of easement recorded on Film 476, Page 289, together with, that portion of easement recorded on Film 532, Page 1100, together with, that portion of easement recorded on Film 843, Page 888, together with, all of an easement recorded on Film 518, Page 849, together with that portion of easement for right-of-way recorded on Film 1624, Page 1445, together with all other public dedications or rights-of-way(s) within the above described property are hereby vacated and replatted by virtue of K.S.A. 12-512(b).

I hereby certify that the details of this plat are correct to the best of my knowledge and belief this _____ day of _____, 2008.

Gregory J. Allison, P.E. LS #1257
MKEC Engineering Consultants, Inc.
411 North Webb Road
Wichita, Kansas 67206

OWNER'S CERTIFICATE

Know all men by these presents that we the undersigned property owners of the land above set forth in the Registered Land Surveyor's Certificate, have caused the same to be surveyed and platted into a Lot, and a Block, Streets the same to be known as "FOLIAGE CENTER ADDITION", an addition to Wichita, Sedgwick County, Kansas.

Easements for the construction and maintenance of public utilities, as indicated hereon, are hereby granted to and for the use of the public. The wall easements are non-exclusive and are platted for the construction and maintenance of a private wall; utilities may cross under the private wall.

The streets are hereby dedicated to and for the use of the public.

All abutters rights of access to or from 13th Street over and across the south line of "FOLIAGE CENTER ADDITION," provided however, Lot 1 is allowed a full movement connection to 13th Street as indicated hereon. All abutters rights of access to or from Webb Road over and across the east line of "FOLIAGE CENTER ADDITION," provided however, Lot 1 is allowed two full movement connections to Webb Road as indicated hereon. These access controls are hereby granted to the City of Wichita, Kansas.

A drainage plan has been developed for this plat and all drainage easements, right-of-way, or reserves shall remain at established grades or as modified with the approval of the applicable City or County Engineer, and unobstructed to allow for the conveyance of storm water. Lot 1 shall be required to adhere to the minimum pad elevation as per the "Minimum Pad Elevations" table shown hereon.

This plat shall adhere and conform to the recitals of CUP 2005-09, DP-282 as approved and filed at the Wichita-Sedgwick County Metropolitan Planning Area Department.

BEECH LAKE INVESTMENT, LLC, a Kansas limited liability company

Johnny Stevens, manager

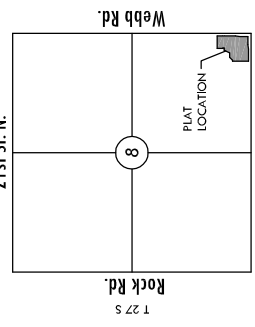
STATE OF KANSAS, SEDGWICK COUNTY} ss:

This instrument was acknowledged before me on _____ day of _____, 2008, by Johnny Stevens, and Stephen L. Clark, managers, Beech Lake Investment, LLC, a Kansas limited liability company.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

Notary Public: _____

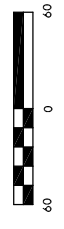
My Term Expires: _____



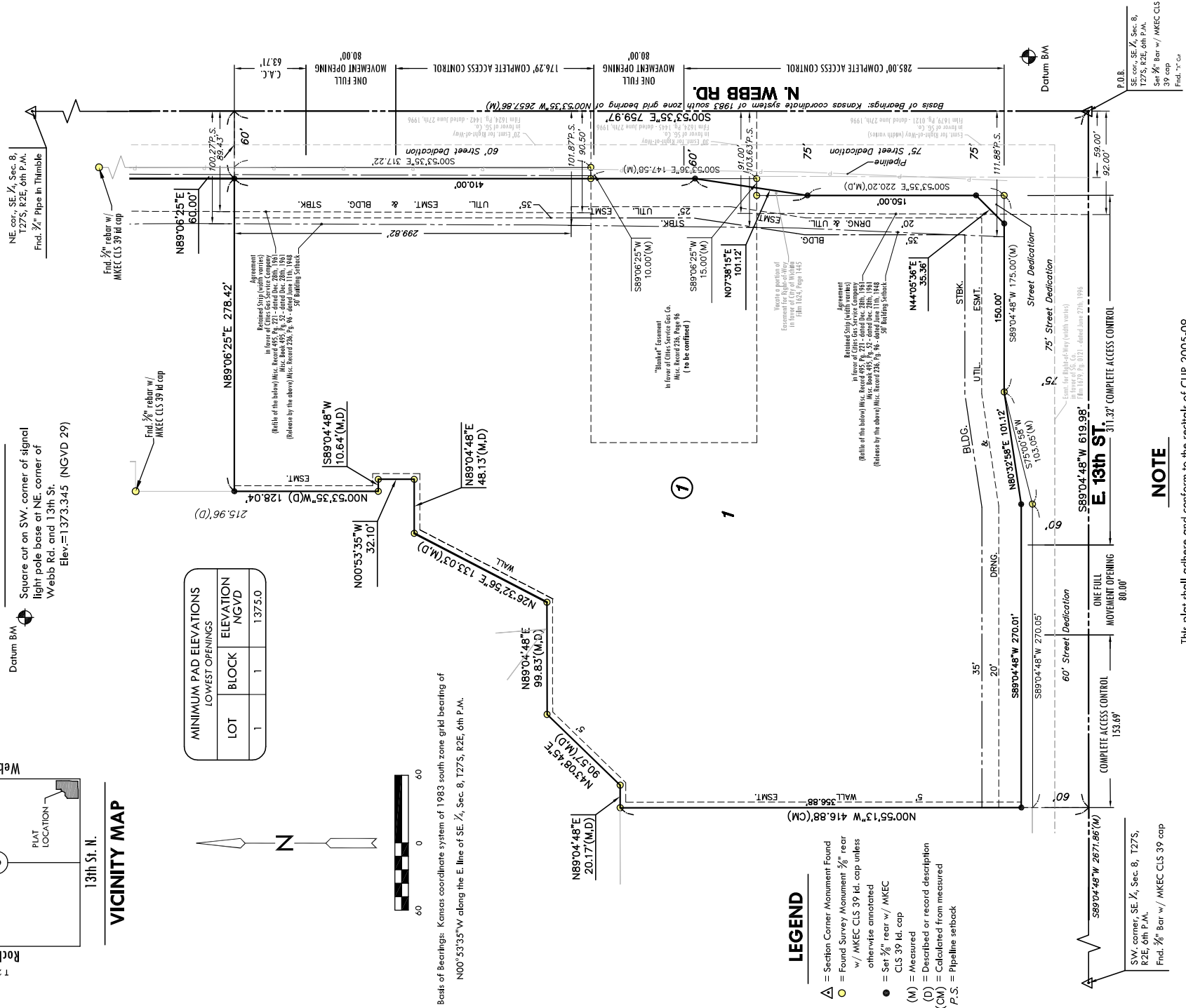
BENCH MARK

Square cut on SW. corner of signal light pole base at NE. corner of Webb Rd. and 13th St.
Elev.=1373.345 (NGVD 29)

MINIMUM PAD ELEVATIONS LOWEST OPENINGS		
LOT	BLOCK	ELEVATION NGVD
1	1	1375.0



Basis of Bearings: Kansas coordinate system of 1983 south zone grid bearing of N00°53'35"W along the E. line of SE. 1/4, Sec. 8, T27S, R2E, 6th P.M.



LEGEND

- △ = Section Corner Monument Found
- = Found Survey Monument 3/8" rear w/ MKEC CLS 39 Id. cap unless otherwise annotated
- = Set 3/8" rear w/ MKEC CLS 39 Id. cap
- (M) = Measured
- (D) = Described or record description
- (CM) = Calculated from measured
- P.S. = Pipeline setback

NOTE

This plat shall adhere and conform to the recitals of CUP 2005-09, DP-282 as approved and filed at the Wichita-Sedgwick County Metropolitan Planning Area Department.

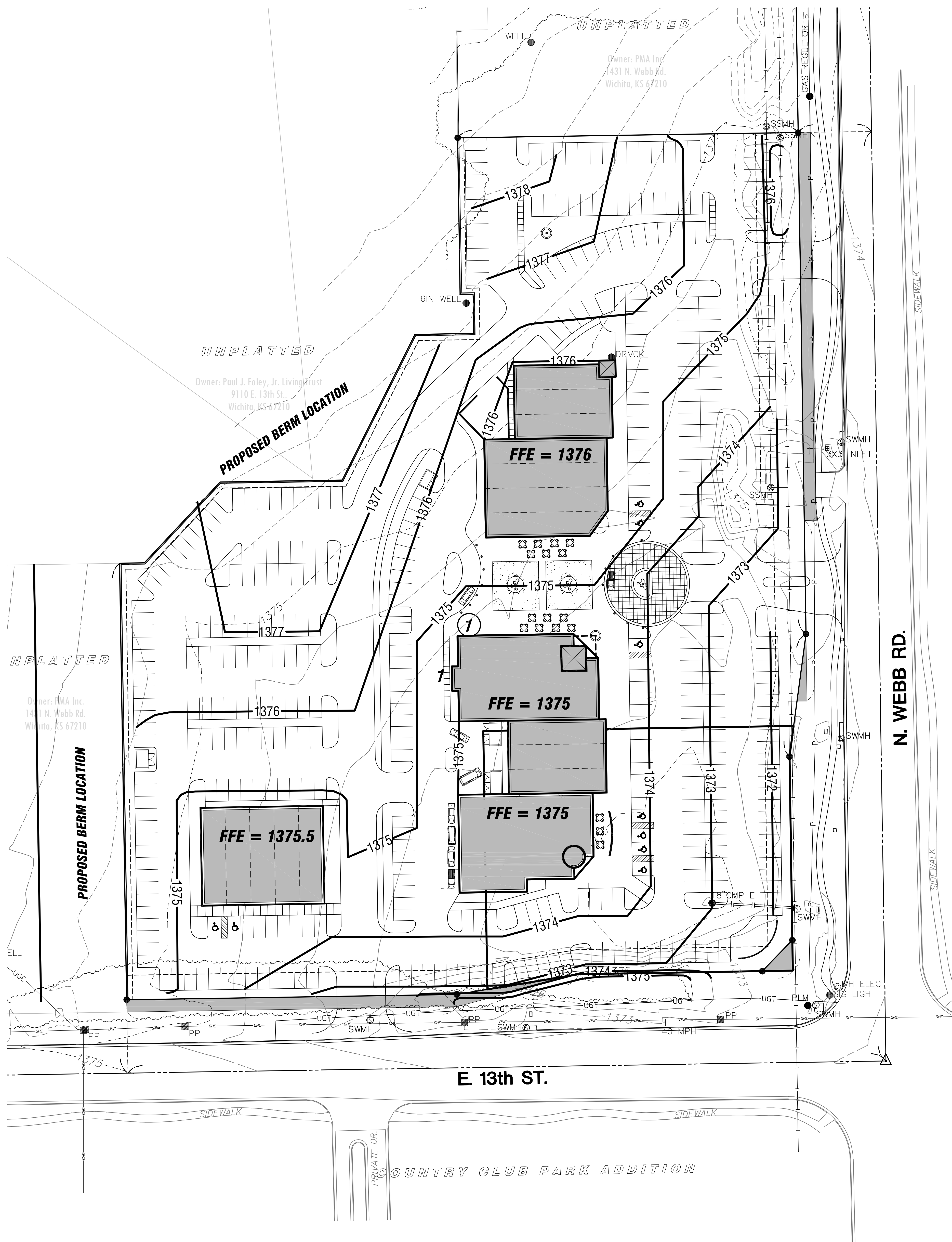
SE. cor., SE. 1/4, Sec. 8, T27S, R2E, 6th P.M.
Set 3/8" Bar w/ MKEC CLS 39 cap
F.O.B.
Fid. "C"

Figure 1.3

Preliminary Grading Plan

FOLIAGE ADDITION

PRELIMINARY GRADING STUDY

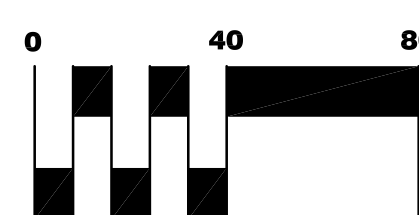


LEGEND

- PROPOSED CONTOUR
- EXISTING CONTOUR



NORTH



JANUARY 2008

MKEC
ENGINEERING
CONSULTANTS, INC.

411 N. WEBB ROAD
WICHITA, KS. 67206
316.684.9600

Tab 2. Existing Conditions Runoff Calculations

A. Orthophotograph

The aerial photograph is included, Figure 2.1.

B. Runoff Method

The SCS method in TR-20 was used to model the site. In the TR-20 model, the Foliage Addition is represented by TR-20 ID 061 and 055.

C. Existing Topography

Elevations on the site range from 1384 feet to 1370 feet at the southeast property line. The existing topography is shown on the Existing Conditions Drawing, Figure 2.2.

D. Site Areas

The platted portion of the Foliage Addition is approximately 7.1 acres. This drainage report considers the entire Foliage Addition, 17.5 acres.

E. Benchmarks

The benchmark used for site is a square cut located on the southwest corner of signal light pole base at the northeast corner of Webb Road and 13th Street, Figure 1.2. NGVD 29 datum is used in this report.

F. Streams, Creeks, and Waterways

No portion of the site is included in a regulatory floodplain. The site is in Zone X, areas outside the 0.2% annual chance event, as shown on FIRM Panel 0378E of 700, Sedgwick County, Kansas February 2, 2007 in Figure 2.3.

G. Soils

According to the NRCS (SCS) Sedgwick County Soil Survey, Figure 2.4, soils on the site are Rosehill silty clay 1 to 3 percent slopes, (Rd – HSG “D”) and Irwin silty clay loam 1 to 3 percent slopes, (Ia, - HSG “D”). The Hydraulic Soil Group used to select runoff coefficients and curve numbers is “D”.

H. Natural Features

There is an existing private pond west of the site, an existing detention pond north of the proposed residential development and the Waterfront detention pond is east of the site across Webb Road. The Foliage Addition does not have any natural waterways on site.

I. Location of Existing Impervious Areas

A majority of the site is undeveloped open land. There is an existing garage and a few small structures near the center of the site.

J. Location of Existing Utilities

An existing 30-inch water line runs north and south on the east side of Webb Road. An existing sanitary sewer line runs north and south along the east property line of the Foliage Addition.

K. Location of Existing Conveyance Systems

There are two existing stormwater sewer systems (SWS) running along the south and east sides of the property. The SWS east of the property drains into the Waterfront ponds east of Webb Road. The SWS south of the site flows south along Webb Road and drains into an existing ditch where it is routed into the Lake Point lakes. Berms limit the amount of flow entering the streets. Therefore, the majority of the site drains to a low spot located in the southeast corner of the site, where it ponds until an 18" corrugated metal pipe (CMP) is able to drain the runoff into the SWS south of the site. There are 2-3'x5' reinforced concrete boxes (RCB) just north of the future residential site. These boxes convey flow from the TR-20 055 Basin under Webb Road and into the Waterfront pond.

L. Flow Paths

Flow paths are shown on the Existing Conditions Drawing, Figure 2.2.

M. Location and Sizes of Existing Structures

There is an existing area inlet, 3'x3' in dimension, on the east property line that directs flow into a 21" SWS that conveys flow under Webb Road into the Waterfront pond. There is also a "silted-in" inlet with a top elevation of 1372.34 just south of the 3'x3' area inlet. An 18-inch CMP is located in the southeast corner of the site. Two 3'x5' RCBs are just north of the future residential development of the Foliage Addition. These boxes convey flow under Webb Road and into the Waterfront pond.

N. Existing Conditions Hydrologic Analysis

The on and offsite areas were analyzed in TR-20 as a part of a larger system of basins that flow into the Waterfront ponds. The Foliage Addition is part of two basins, Basin 055 and 061, which contribute runoff to the Waterfront pond system, Existing Conditions drawing, Figure 2.4.

The resulting pre-project flows are reported in the table below. Runoff calculations are in the Waterfront drainage report.

Pre-Development Flowrates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Pre-project out of Beech Lake	224	396	527	1167

O. Pre-Developed Runoff Curve Numbers

A weighted curve number of 86.5 was used for Basin 055 and a curve number of 84.0 was used for basin 061. Coefficient calculations are in Figure 2.5.

P. Existing Time of Concentration

The time of concentration for pre-development conditions is shown in the following table. Time of concentration calculations are in Figure 2.5.

Existing Time of Concentration and Rational Coefficient

TR-20 Basin ID	T _c	Rational Coefficient
	minutes	
055	48.2	0.59
061	18.9	0.41

Q. Downstream Drainage Capacity

The Waterfront ponds have the capacity to detain runoff from the Foliage Addition and maintain pre-project flow rates from Beech Lake.

R. Existing Structural Elevations

There is an existing garage on-site with a finished floor elevation of 1381.31.

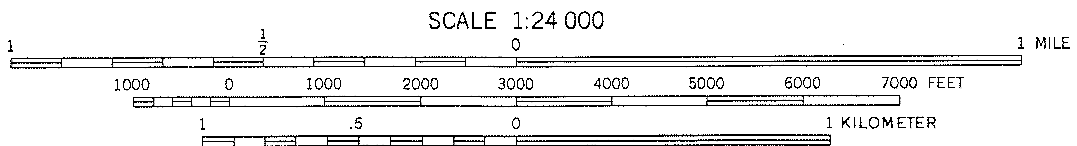
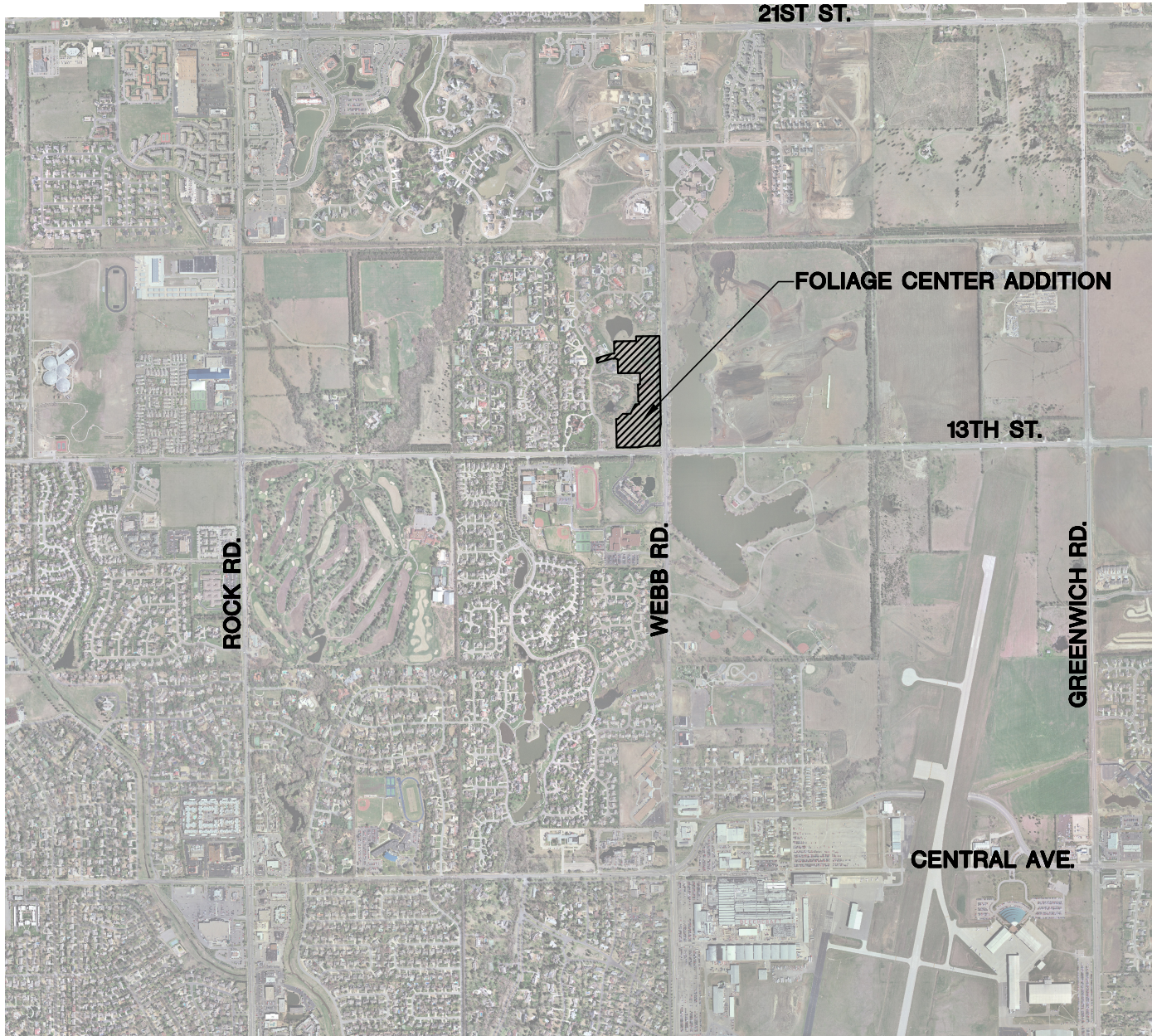
S. Open Channels

There are no open channels on-site.

T. Groundwater Elevations

Groundwater elevations are not applicable for this project.

Figure 2.1
Orthophotograph



CONTOUR INTERVAL 5 FEET
 NATIONAL GEODETIC VERTICAL DATUM OF 1929

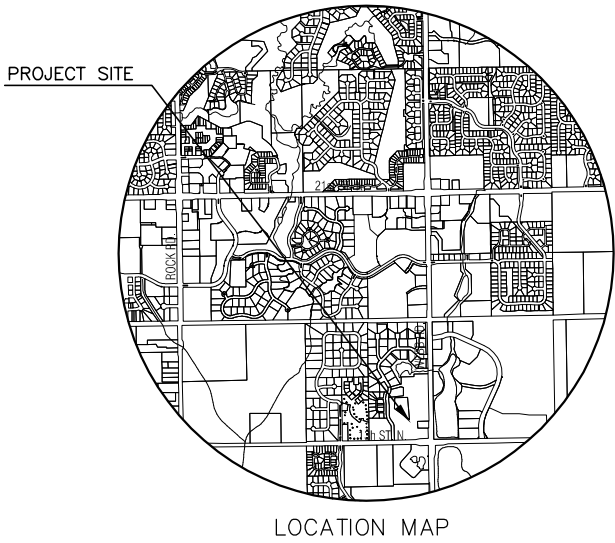
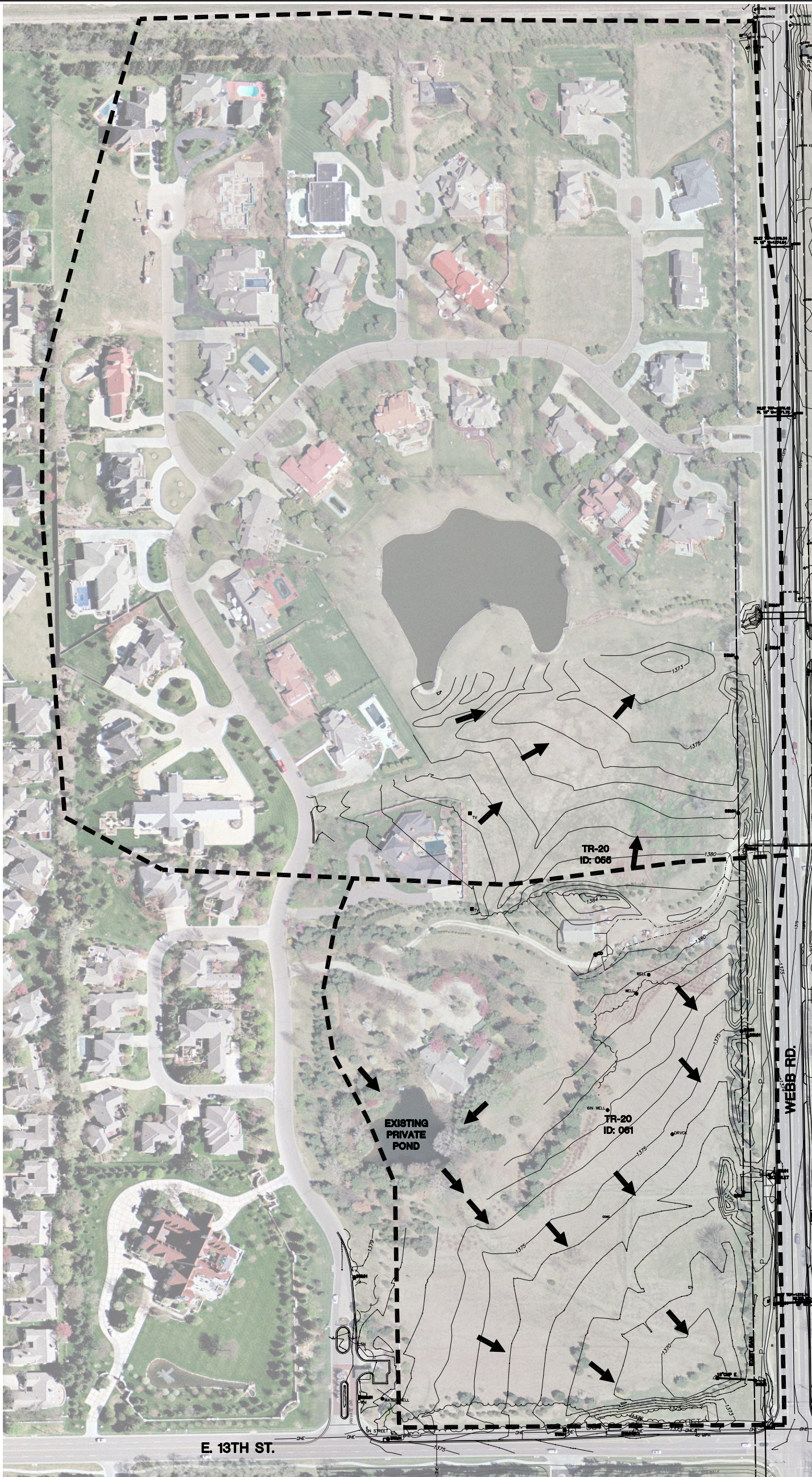


J:\CIVIL\04274\DWG\DRNG\QUAD MAP.DWG

MKEC ENGINEERING CONSULTANTS, INC. 411 N. WEBB ROAD WICHITA, KS. 67206 316 - 684 - 9600	FOLIAGE CENTER ADDITION PROJECT NAME		
	AERIAL MAP EAST WICHITA, KANSAS SHEET TITLE		
TMH DESIGN BY:	CMJ DRAWN BY:	TMH CHECKED BY:	
DECEMBER 2007 DATE	04274 JOB NO.	1 / 1 SHEET/OF	

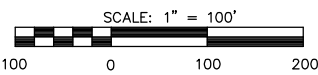
Figure 2.2

Existing Conditions Drawing



LEGEND

- CT - CONIFEROUS TREE
- DT - DECIDUOUS TREE
- SN - SIGN
- PP - POWER POLE
- EB - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SC - SECTION CORNER
- BM - BENCHMARK
- - EASEMENT
- - BUILDING SETBACK
- X-X- - FENCE
- S-S- - STORM SEWER PIPE
- W-W- - WATER LINE
- S-S- - SANITARY SEWER LINE
- G-G- - GAS LINE
- P-P- - GAS PIPELINE
- T-T- - TELEPHONE LINE
- U-U- - UNDERGROUND ELEC.
- O-O- - OVERHEAD ELECTRIC
- F-F- - FIBER OPTIC CABLE
- D-D- - DRAINAGE SUB BASIN
- - FLOW ARROW



BENCHMARK

Datum BM
 Square cut on SW. corner of signal light pole base at NE. corner of Webb Rd. and 13th St.
 Elev.=1373.345 (NGVD 29)

J:\Civil\04274\dwg\prop\drng\JAN_08\04274ExistBndrys.dwg

MKEC
 ENGINEERING
 CONSULTANTS, INC.

THE FOLIAGE ADDITION
 PROJECT NAME

PRE-PROJECT SITE DRAINAGE
 SHEET TITLE

411 N. WEBB ROAD
 WICHITA, KS. 67206
 316 - 684 - 9600

TMH
 DESIGN BY:

CMJ
 DRAWN BY:

KLA
 CHECKED BY:

JANUARY 2008
 DATE

04274
 JOB NO.

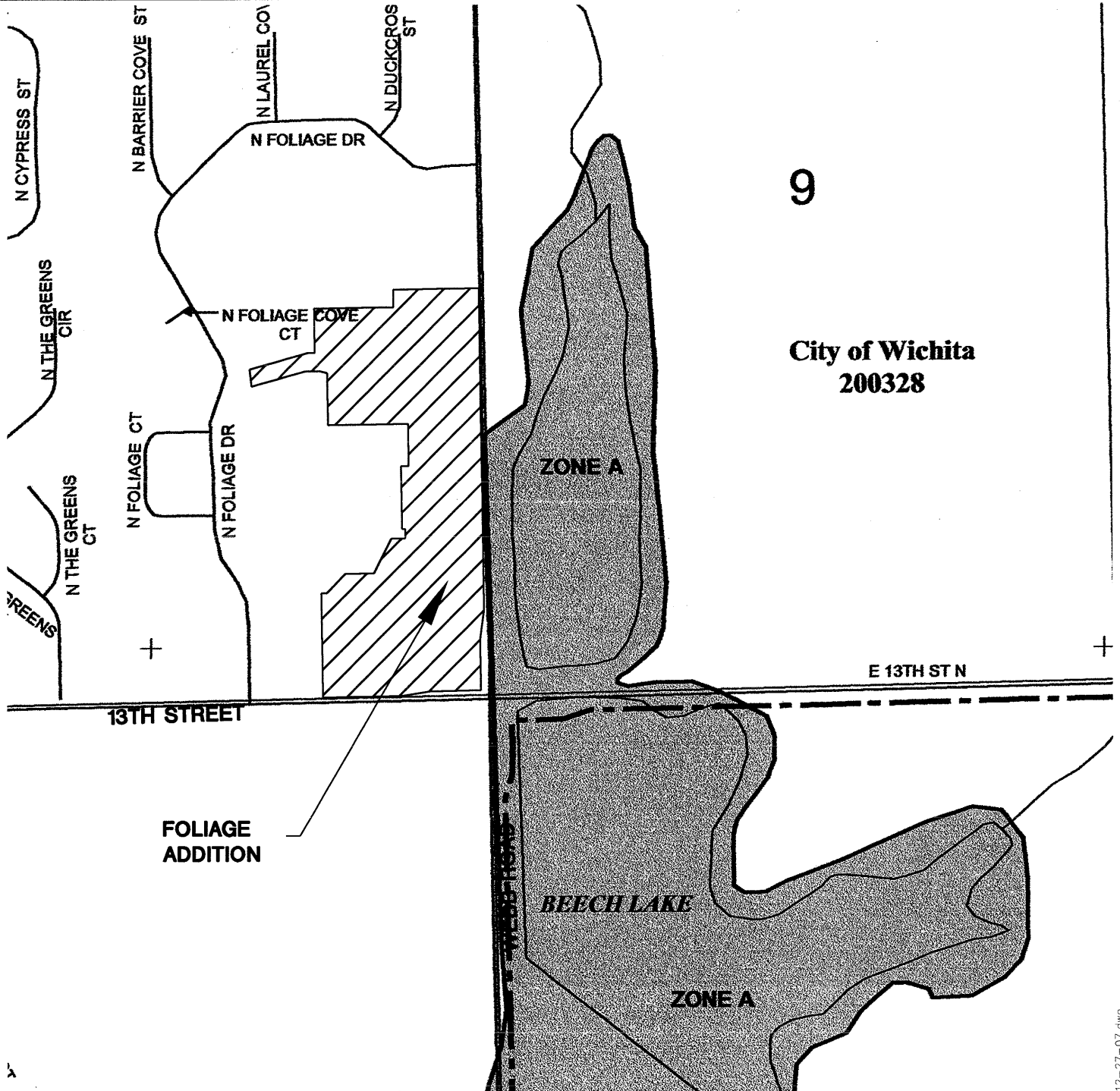
1 / 1
 SHEET/OF

Figure 2.3

FIRM

9

City of Wichita
200328



FOLIAGE
ADDITION

BEECH LAKE

ZONE A

E 13TH ST N

13TH STREET

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0378E

FIRM
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY,
KANSAS
AND INCORPORATED AREAS

PANEL 378 OF 700
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0378	E
WICHITA, CITY OF	200328	0378	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.

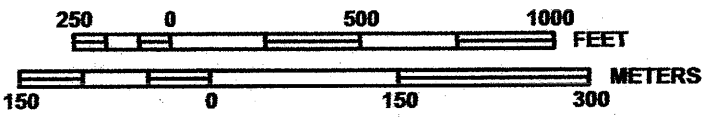
MAP NUMBER
20173C0378E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency



MAP SCALE 1" = 500'



MKEC
ENGINEERING
CONSULTANTS, INC.

411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

FOLIAGE ADDITION
PROJECT NAME

FIRM MAP
FIRM PANEL 373 OF 700
SHEET TITLE

TMH DESIGN BY:	CMJ DRAWN BY:	TMH CHECKED BY:
DECEMBER 2007 DATE	04274 JOB NO.	1 / 1 SHEET/OF

Figure 2.4
Soil Survey

Figure 2.5

Rational Coefficient and Time of Concentration Calculations

Time of Concentration Calculations by the FAA method
 The Waterfront Addition - Pre-Project Calculations

$$T_c = \frac{(1.1-C)L^{1/2}}{100 S^{1/3}}$$

Area Name	Land Use	Soil Group	Maximum Elevation	Minimum Elevation	Length (L)	Rational Runoff Coefficient, C			Time of Concentration (min), T _c			Time of Concentration (hr), T _c			CN	
						2-Year	5-Year	10-Year	2-Year	5-Year	10-Year	2-Year	5-Year	10-Year		
055	Undeveloped Urban	D	1385.0	1369.0	2800	0.52	0.54	0.59	66.6	64.3	58.5	1.1095	1.0713	0.9756	0.8034	86.5
061	Agricultural - Cultivated - Slopes 1-4%	D	1379.0	1370.0	600	0.26	0.31	0.41	32.4	30.4	26.6	0.5392	0.5071	0.4430	0.3146	84.0

SCS Runoff Curve Number Calculations

12/27/2007 4:40 PM

Project Name: The Waterfront Addition - Pre-Project
 Project Number: 02014
 Basin: TR-20 055

Total Area = 103.3 Acres
Total Area = 0.1614 sq. mi.
Composite Curve Number = 86.46

Land Use	Percent Impervious	Area/CN			
		Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatment	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residential - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

SCS Runoff Curve Number Calculations

1/2/2008 4:55 PM

Project Name: The Waterfront Addition - Pre-Project
 Project Number: 02014
 Basin: TR-20 061

Total Area = 17.5 Acres
Total Area = 0.0273 sq. mi.
Composite Curve Number = 84.00

Land Use	Percent Impervious	Area/CN			
		Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatment	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residential - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Time of Concentration Calculations by the FAA method
The Waterfront Addition - Post-Project Conditions Calculations

$$T_c = \frac{(1.1-C)L^{1/2}}{100 S^{1/3}}$$

Area Name	Land Use	Soil Group	Maximum Elevation	Minimum Elevation	Length (L)	Rational Runoff Coefficient, C			Time of Concentration (min), T _c			Time of Concentration (hr), T _c			CN			
						2-Year	5-Year	10-Year	2-Year	5-Year	10-Year	2-Year	5-Year	10-Year				
055	Business - Neighborhood	D	1385.0	1369.0	2800	0.68	0.69	0.73	0.80	48.2	47.1	42.5	34.4	0.8034	0.7843	0.7078	0.5739	92.2
061	Business - Neighborhood	D	1379.0	1370.0	600	0.68	0.69	0.73	0.80	16.2	15.8	15.0	15.0	0.2696	0.2632	0.2500	0.2500	95.0

SCS Runoff Curve Number Calculations

1/3/2008 9:13 AM

Project Name: The Waterfront Addition - Post-Project
 Project Number: 02014
 Basin: TR-20 055

Total Area = 103.3 Acres
Total Area = 0.1614 sq. mi.
Composite Curve Number = 92.19

Land Use	Percent Impervious	Area/CN			
		Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatment	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residential - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

SCS Runoff Curve Number Calculations

1/3/2008 9:13 AM

Project Name: The Waterfront Addition - Post-Project
 Project Number: 02014
 Basin: TR-20 061

Total Area = 17.5 Acres
Total Area = 0.0273 sq. mi.
Composite Curve Number = 95.00

Land Use	Percent Impervious	Area/CN			
		Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatment	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residential - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Tab 3. Post-Development Hydrologic Analysis

A. Proposed Conditions Hydrologic and Hydraulic Analysis

The post-project drainage boundaries are shown in Figure 3.1. The SCS method in TR-20 was used to analyze post-project conditions for the site. The runoff calculations are in the Waterfront drainage report and the resulting flows are in the table below.

Post-Development Flowrates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Post-Project out of Beech Lake	219	392	517	1111

Detention is provided for the developed Foliage Addition in the Waterfront pond just east of Webb Road. This drainage pattern matches closely to the current drainage configuration.

B. Proposed Time of Concentration

A post-project time of concentration of 34.4 and 15 minutes was calculated for Basin 055 and 061, respectively. Time of concentration calculations are in Figure 2.5.

C. Assumed Post-Developed Curve Numbers

A weighted curve number of 92.2 was calculated for Basin 055 and a curve number of 95 was determined for Basin 061. Curve number and rational coefficient calculations are in Figure 2.5.

Proposed Time of Concentration and Rational Coefficient

TR-20 Basin ID	T _c	Rational Coefficient
	minutes	
055	34.4	0.73
061	15	0.73

D. Proposed Contours for Detention

The proposed detention contours and detailed detention requirements are explained in the Waterfront Drainage Report. The 100-year water surface elevation of the Waterfront pond is 1372.0.

E. Preliminary SWS Sizing Calculations

The proposed stormsewer for the commercial area is sized for the 5-year design storm with overland escape routes for the 100-year storm. The existing 21-inch pipe under Webb Road does not have the capacity to convey the 100-year design storm from the Foliage Addition to the Waterfront pond. A 48-inch pipe will be constructed under Webb Road to convey the 100-year design storm from the Foliage Addition to the Waterfront detention pond. Hydraflow Stormsewers 2008 was used to size the proposed stormsewer, calculations are in Figure 3.2. A 15-minute minimum time of concentration was used for stormsewer calculations. The stormsewer for the future residential area is sized for the 2-year design storm.

F. Stage-Storage-Discharge

The stage-storage-discharge for the Waterfront pond is reported in the Waterfront Drainage report.

G. Analysis of upstream/downstream impact

Runoff flows for all design storms remain the same or decrease from pre to post-development; therefore, upstream/downstream impacts are unchanged from current conditions.

H. Existing and Proposed Structural Elevations

Minimum pad elevations will be set at 1375.0, three feet above the 100-year water surface elevation of the Waterfront pond. When feasible, current grade will dictate structural elevations.

I. Pond Design Elevations

The Waterfront pond is designed to provide 167 ac-ft of detention and will have a 100-year water surface elevation of 1372.0.

J. Structure Details

Commercial and retail buildings are proposed for the platted addition of Foliage. Future development will include residential housing.

K. Limits of Clearing and Grading

The entire site will be cleared and graded.

L. Location of Impervious Areas

Roads, parking areas and buildings will be located as shown on the Drainage and Utility Plan, Figure 3.1.

M. Location of Utilities

An existing 30-inch water line runs north and south on the east side of Webb Road. An existing sanitary sewer line runs north and south along the east property line of the Foliage Addition. An existing water line runs south east and west south of 13th Street. Proposed utilities are shown on the Drainage and Utility Plan, Figure 3.1.

N. Location of Conveyance Systems

Proposed grading will direct runoff from the site to proposed and existing stormsewer, Figure 3.1.

O. Location of Channel Modifications

Channel modifications are not applicable to the Foliage Addition.

P. Selection and Location of Stormwater Controls

Stormwater controls consist of grading and paving to direct stormwater to the proposed inlets and stormsewer. The existing 18-inch CMP will not be utilized; all post-development runoff will be directed to the Waterfront pond.

Q. Emergency Overflow

Emergency overflows will be designed to flow overland to the Waterfront detention pond.

R. Freeboard

The Waterfront detention area will include a 1-foot freeboard for added safety.

S. 100-Year High Water Line

The 100-year water surface elevation for the Waterfront pond is 1372.0.

T. Lowest Openings

The lowest opening for the proposed buildings is 1375.0.

U. Stormwater Management Facilities

The final stormsewer line will be confined within a 20-foot public drainage easement.

V. Maintenance Responsibility

The maintenance of the reserve will be the responsibility of the owner.

W. Offsite-Drainage Easements

Not applicable to Foliage Addition.

Figure 3.1

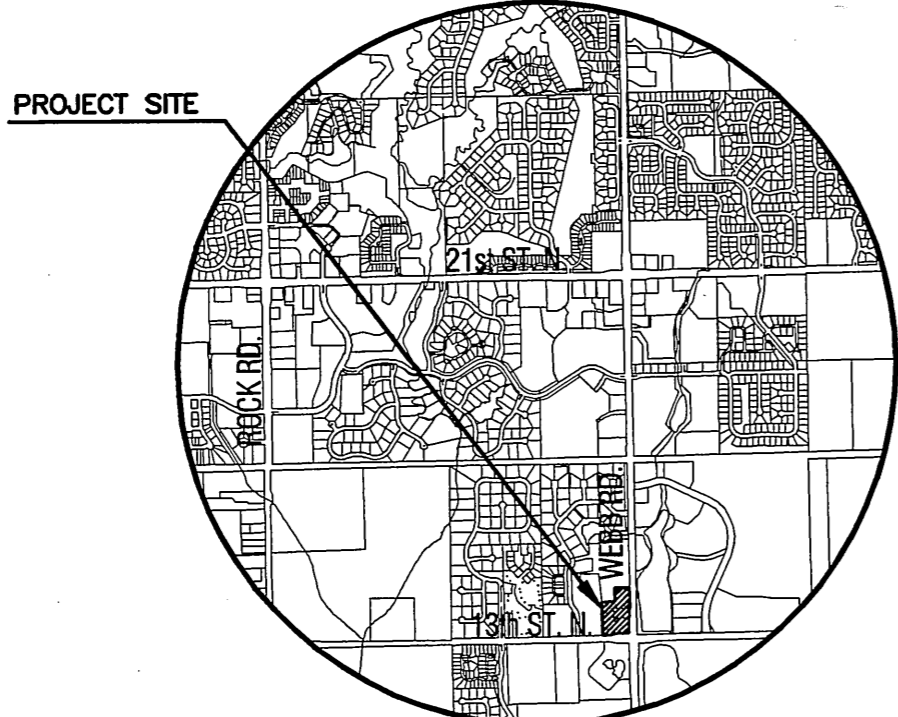
Drainage and Utility Plan



BENCH MARK
 Datum BM
 Square cut on SW. corner of signal light pole base at NE. corner of Webb Rd. and 13th St.
 Elev.=1373.345 (NGVD 29)

NOTE 1: FINAL SWS ALIGNMENT WILL BE DETERMINED WITH FINAL SITE LAYOUT AND WILL BE CONFINED IN A 20-FOOT PUBLIC DRAINAGE EASEMENT.

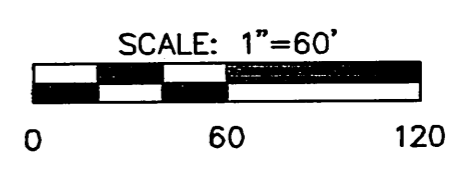
NOTE 2: STORM SEWER WAS SIZED AS FOLLOWS:
 RESIDENTIAL AREA= 2-YR. DESIGN STORM
 COMMERCIAL AREA= 5-YR. DESIGN STORM
 48" LINE CROSSING WEBB RD.= 100-YR. DESIGN STORM



LOCATION MAP

LEGEND

- ☆ - CONIFEROUS TREE
- - DECIDUOUS TREE
- SN - SIGN
- PP - POWER POLE
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SC - SECTION CORNER
- BM - BENCHMARK
- E - EASEMENT
- BS - BUILDING SETBACK
- - FENCE
- - STORM SEWER PIPE
- - WATER LINE
- - SANITARY SEWER LINE
- - GAS LINE
- - GAS PIPELINE
- - TELEPHONE LINE
- - UNDERGROUND ELEC.
- - OVERHEAD ELECTRIC
- - FIBER OPTIC CABLE 1
- - DRAINAGE SUB BASIN
- - FLOW ARROW
- - AREA FOR SWS SIZING



MKEC
 ENGINEERING CONSULTANTS, INC.
 411 N. WEBB ROAD
 WICHITA, KS. 67206
 316-684-9600

THE FOLIAGE ADDITION
 PROJECT NAME
DRAINAGE AND UTILITY PLAN
 SHEET TITLE

TMH DESIGN BY
 CMJ DRAWN BY
 TMH CHECKED BY

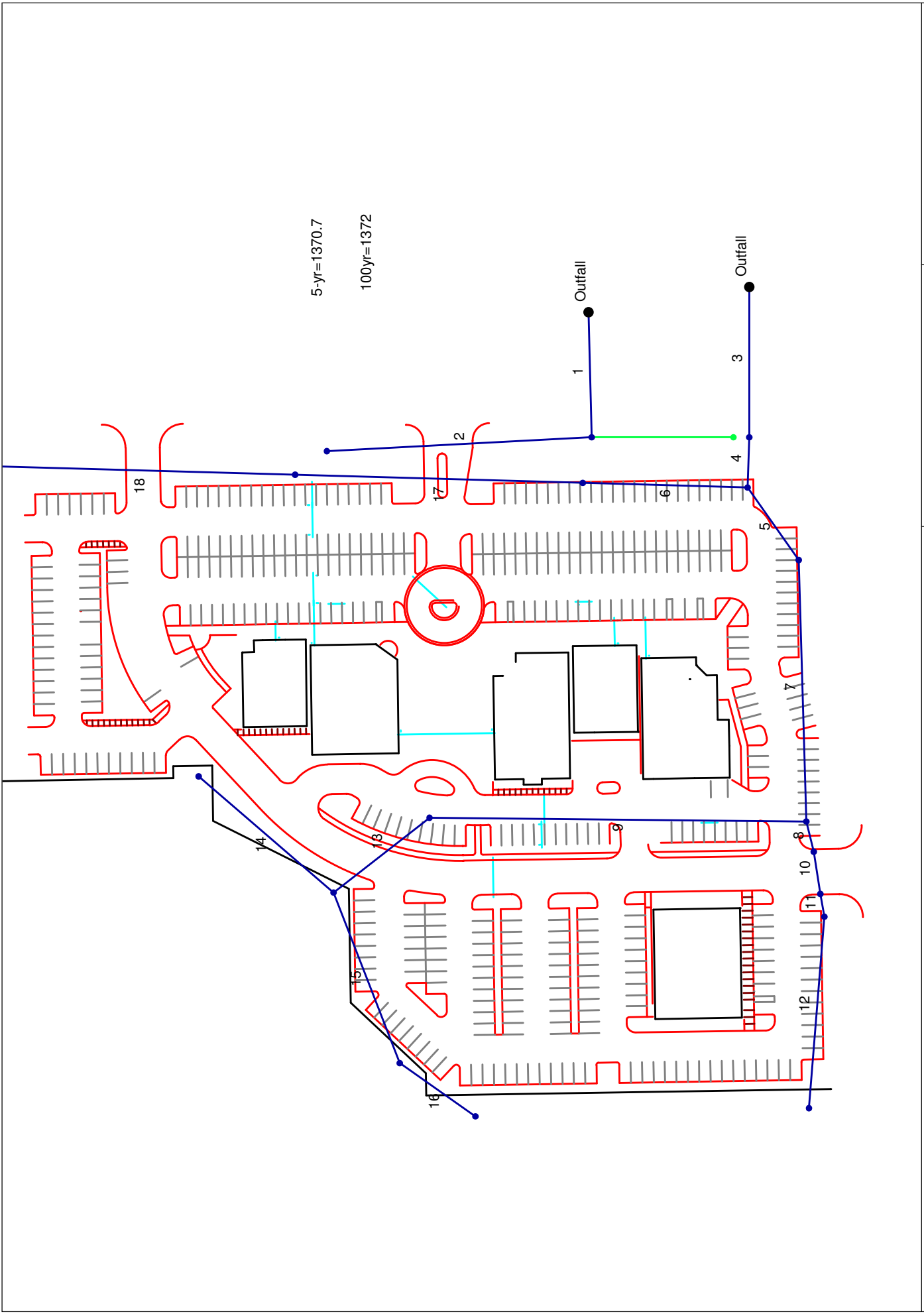
JANUARY 2008 DATE
 04274 JOB NO.
 1 / 1 SHEET OF

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Figure 3.2

Pipe Sizing Calculations

Hydraflow Storm Sewers Plan



Storm Sewer Tabulation

Station	Line	Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
			Incr (ac)	Total (ac)		Incr (min)	Syst (min)	Incr (in)	Slope (%)					Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)			
1	End	110	0.40	1.50	0.87	0.35	1.31	15.0	16.0	7.2	9.37	5.66	3.90	21	0.13	1368.10	1368.24	1372.00	1372.39	0.00	1372.34	
2	1	233	1.10	1.10	0.87	0.96	0.96	15.0	15.0	7.4	7.05	3.77	3.99	18	0.13	1368.74	1369.04	1372.74	1373.79	1372.34	1371.38	
3	End	132	0.40	16.80	0.87	0.35	11.96	15.0	43.4	4.5	53.34	51.62	4.24	48	0.13	1366.20	1366.37	1372.00	1372.18	0.00	1372.00	
4	3	44	0.70	16.40	0.87	0.61	11.62	15.0	43.3	4.5	51.85	24.59	7.34	36	0.14	1367.37	1367.43	1372.32	1372.59	1372.00	1372.00	
5	4	78	1.40	10.70	0.87	1.22	6.66	15.0	43.0	4.5	29.83	23.90	4.22	36	0.13	1367.63	1367.73	1374.40	1374.56	1372.00	1373.00	
6	4	145	0.70	5.00	0.87	0.61	4.35	15.0	17.0	7.0	30.49	44.01	4.31	36	0.44	1367.53	1368.16	1374.39	1374.69	1372.00	1372.00	
7	5	230	0.00	9.30	0.00	0.00	5.44	0.0	42.3	4.5	24.61	17.12	5.01	30	0.17	1368.23	1368.63	1374.81	1375.64	1373.00	1372.00	
8	7	27	0.20	2.50	0.87	0.17	2.02	15.0	17.7	6.9	13.91	11.48	4.43	24	0.26	1369.33	1369.40	1376.12	1376.22	1372.00	1372.00	
9	7	331	0.00	6.80	0.00	0.00	3.42	0.0	41.2	4.6	15.69	11.40	4.99	24	0.25	1369.13	1369.97	1376.03	1377.62	1372.00	1374.00	
10	8	37	0.60	2.30	0.87	0.52	1.85	15.0	17.5	6.9	12.76	11.08	4.06	24	0.24	1369.60	1369.69	1376.42	1376.54	1372.00	1373.00	
11	10	20	1.20	1.70	0.87	1.04	1.32	15.0	17.4	6.9	9.18	11.22	2.92	24	0.25	1369.89	1369.94	1376.79	1376.82	1373.00	1373.00	
12	11	169	0.50	0.50	0.56	0.28	0.28	15.0	15.0	7.4	2.06	6.96	1.17	18	0.44	1370.44	1371.18	1377.00	1377.07	1373.00	1376.00	
13	9	107	0.40	6.80	0.43	0.17	3.42	15.2	40.8	4.6	15.76	11.37	5.02	24	0.25	1370.17	1370.44	1377.88	1378.40	1374.00	1376.00	
14	13	156	2.00	2.00	0.43	0.86	0.86	40.0	40.0	4.7	4.01	4.26	3.27	15	0.44	1371.19	1371.87	1379.48	1380.08	1376.00	1377.00	
15	13	161	3.90	4.40	0.54	2.11	2.39	30.1	30.1	5.4	12.86	5.31	7.28	18	0.26	1371.14	1371.55	1379.25	1381.66	1376.00	1376.00	
16	15	81	0.50	0.50	0.56	0.28	0.28	15.0	15.0	7.4	2.06	4.30	1.68	15	0.44	1371.90	1372.26	1383.19	1383.27	1376.00	1376.00	
17	6	253	2.40	4.30	0.87	2.09	3.74	15.0	16.2	7.1	26.73	14.83	5.45	30	0.13	1368.66	1368.99	1374.84	1375.91	1372.00	0.00	
18	17	273	1.90	1.90	0.87	1.65	1.65	15.0	15.0	7.4	12.17	11.37	3.88	24	0.25	1369.59	1370.28	1376.37	1377.16	0.00	0.00	
19	End	77	1.70	3.10	0.56	0.95	1.74	15.0	17.9	6.8	11.88	4.03	9.71	15	0.39	1370.25	1370.55	1371.47	1373.95	0.00	1375.50	
20	19	48	0.00	1.40	0.00	0.00	0.78	0.0	17.8	6.9	5.38	2.86	6.85	12	0.65	1370.80	1371.11	1375.41	1376.51	1375.50	1376.50	
21	20	183	0.50	1.00	0.56	0.28	0.56	15.0	17.2	7.0	3.90	2.63	4.97	12	0.55	1371.21	1372.21	1377.58	1379.78	1376.50	1380.00	
22	21	134	0.20	0.50	0.56	0.11	0.28	15.0	16.3	7.1	1.99	2.55	2.54	12	0.51	1372.31	1373.00	1380.64	1381.06	1380.00	1380.00	
23	22	127	0.30	0.30	0.56	0.17	0.17	15.0	15.0	7.4	1.24	2.36	1.58	12	0.44	1373.10	1373.66	1381.17	1381.33	1380.00	1379.00	

Project File: 04274SWS.stm

Number of lines: 26

Run Date: 01-03-2008

NOTES: Intensity = 62.28 / (Inlet time + 10.10) ^ 0.66; Return period = 100 Yrs. ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station Line	To Line	Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
			Incr (ac)	Total (ac)		Incr (min)	Syst (min)	Size (in)	Slope (%)					Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)			
24	20	129	0.40	0.40	0.56	0.22	0.22	15.0	15.0	7.4	1.65	2.54	2.10	12	0.51	1371.21	1371.87	1377.90	1378.17	1376.50	1375.50	
25	End	181	0.80	1.60	0.56	0.45	0.90	15.0	15.1	7.3	6.58	2.63	8.41	12	0.55	1370.25	1371.24	1371.22	1377.06	0.00	1379.50	
26	25	32	0.80	0.80	0.56	0.45	0.45	15.0	15.0	7.4	3.30	2.35	4.20	12	0.43	1371.34	1371.48	1378.42	1378.69	1379.50	1379.50	

Project File: 04274SWS.stm

Number of lines: 26

Run Date: 01-03-2008

NOTES: Intensity = 62.28 / (Inlet time + 10.10) ^ 0.66; Return period = 100 Yrs. ; c = cir e = ellip b = box

Tab 4. Floodplain Submittal

Not applicable to Foliage Addition.

Tab 5. Permits

A. *US Army Corps of Engineers*

Not applicable to Foliage Addition.

B. *Kansas Department of Agriculture*

Not applicable to Foliage Addition.

C. *Federal Emergency Agency (FEMA)*

Not applicable to Foliage Addition.

D. *Kansas Department of Transportation*

Not applicable to Foliage Addition.

E. *Sedgwick County Right-of-way Permit*

Not applicable to Foliage Addition.