

Drainage Report for The Executive at White Tail 2nd Addition Wichita, Kansas

Location

The subject property lies in the northwest quarter of the northeast quarter of Section 15, Township 27 South, Range 2 East. The property abuts 13th Street North on the north and Highway K-96 on the west. The properties to the south and east are developed as single family residences. The site was previously platted as The Executive at White Tail 1st Addition. The total site area is approximately 4.3 acres.

Soils

According to the NRCS (SCS) Sedgwick County Soil Survey, the majority of the drainage watershed soil is Irwin silty clay Loam, with 1-3 percent slopes and a Hydrological Soil Group (HSG) of "D". The northwest corner and the southeast corner of the site are Rosehill Silty Clay, with 1-3 percent slopes and a HSG of "D." See Appendix A for soil survey map.

Pre-developed Conditions

Current Development

The property is currently undeveloped and lies between developed properties. The property was previously platted as The Executive at White Tail Addition.

Current Landform and Slope

The slopes in the area range between 1-3%. Elevations vary from 1381 ft in the southwest corner to 1373 ft in the northwest and southeast corners.

Current Drainage Conditions

No portion of the site is included in a regulatory floodplain. A copy of the effective FEMA map (FIRM Panel 150, Sedgwick County, June 3, 1986) is attached as Appendix B.

Current Runoff Characteristics

No runoff enters the site from surrounding areas. A high point is located in the southwest area of the site with all surrounding ground draining away from this point. See Appendix C for USGS quadrangle map showing the site. The site is divided into three drainage areas. See Appendix D for a map of existing drainage patterns. Drainage area "A" comprises approximately the west half of the property and drains into a ditch that flows north along the western edge of the site (K-96). Drainage area "B" covers the northeast corner of the property and drains north onto the south side of 13th Street North. The runoff is then directed east to an inlet and north across 13th Street North and discharged

into an existing pond located on the north side of 13th Street. Drainage area “C” is the eastern and southeast section of the property. This area drains to the southeast off the property into a ditch flowing east.

The rational method was used to calculate current runoff through the site. Time of concentration values ranged from 15-28 minutes and were based on runoff coefficients. The coefficients ranged from 0.30 to 0.65 and were determined using the soil type, percent impervious area, storm frequency, and slope.

Table 1 shows the flow rates for 2, 5, 10, and 100 year events before development. The table displays the three drainage areas and the total flows for the entire site. Detailed calculations are included in Appendix E.

Table 1: Pre-development runoff.

| Drainage Area | 2-year (cfs) | 5-year (cfs) | 10-year (cfs) | 100-year (cfs) |
|----------------------|---------------------|---------------------|----------------------|-----------------------|
| A | 1.6 | 2.3 | 3.6 | 8.1 |
| B | 1.1 | 1.6 | 2.5 | 5.9 |
| C | 1.5 | 2.1 | 3.3 | 6.7 |
| TOTAL | 4.1 | 5.9 | 9.3 | 20.7 |

Post-developed Conditions

Proposed Development

The property will be developed as an office park. In addition to the buildings, parking lots and grass areas will be added.

Proposed Landform and Slope

The proposed development will affect the overall landform slope and basic drainage patterns on the property. The parking lots and building sites will decrease the overall slope. The Lot Grading Plan is in Appendix F.

Proposed Runoff Characteristics

Current runoff characteristics will be affected by the proposed development. The majority of the site will be covered by impervious areas such as buildings and parking lots. The site will drain from the center of the property. A existing stormwater sewer along the south property line collects the water from drainage area “C.” Then routes the runoff east through another inlet and into an existing 30” RCP. This pipe continues east and discharges into an existing retention/detention pond. Drainage area “B” will continue to drain to the north onto 13th Street North. Drainage area “A” will drain into an 18” RCP on the northwest side of the property and then into the existing manhole on the south side of 13th Street. An analysis for the proposed and existing stormwater sewer north of the site is included in Appendix G. Although runoff into the stormwater sewer system will be increased in the 5-year design storm, the capacity of the existing system is adequate to handle the additional flow. Some detention will be provided in the parking

area for large storm events. See Appendix H for the Drainage and Utility Plan. Proposed drainage patterns will closely follow those proposed by the original White Tail Addition drainage plan prepared by Professional Engineering Consultants.

Table 2 shows the 2, 5, 10, and 100-year post-development runoff values. The runoff values increased for all events. The time of concentrations decreased with a range of 15-17 minutes. The runoff coefficients increased due to an increase in impervious area and ranged from 0.68 to 0.80. Detailed calculations are included in Appendix E.

Table 2: Post-development runoff.

| Drainage Area | 2-year (cfs) | 5-year (cfs) | 10-year (cfs) | 100-year (cfs) |
|----------------------|---------------------|---------------------|----------------------|-----------------------|
| A | 4.5 | 5.4 | 6.5 | 10.1 |
| B | 2.6 | 3.2 | 3.9 | 6.0 |
| C | 4.2 | 5.1 | 6.1 | 9.5 |
| TOTAL | 11.3 | 13.6 | 16.5 | 25.5 |

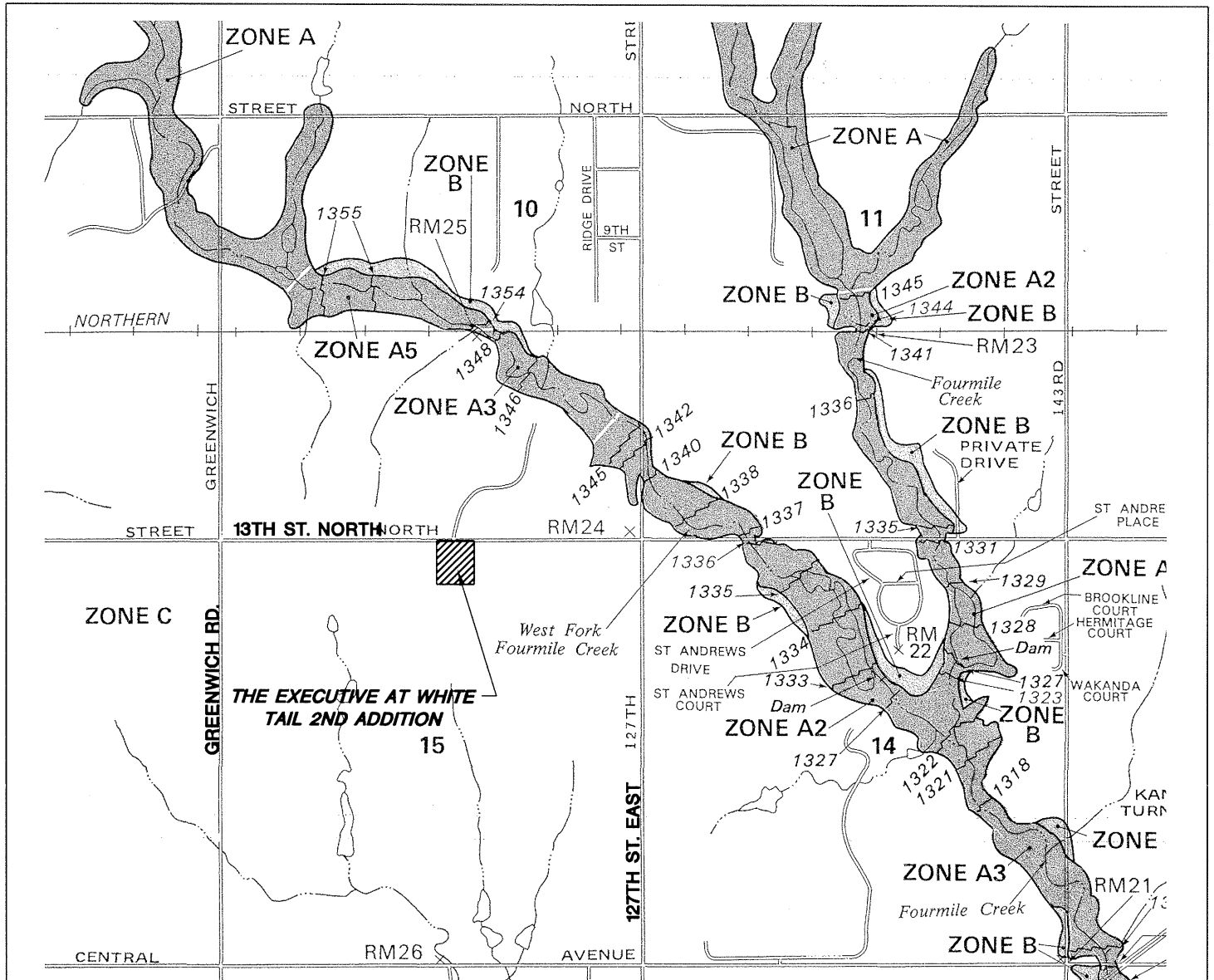
Summary

The site is approximately 4.3 acres of land on the southeast corner of 13th Street North and Highway K-96. The property is currently undeveloped with slopes ranging from 1-3%. An office park is proposed for the site. This will increase the amount of runoff for all rainfall events, especially the 2 and 5-year events. The site will continue to drain in the same directions as existing conditions with more concentrated outlets for runoff. Stormwater sewers will be added to handle the additional runoff. The proposed drainage patterns closely follow those shown in the original drainage plan for White Tail Addition. Most of the site will drain to existing stormwater sewer systems, and will discharge into existing retention/detention ponds. The existing system appears to be adequate to handle the increased runoff, and additional detention should not be required. Grading for the site will be such that proper escape routes will be provided for large storm events.

Appendix A

Soil Survey

Appendix B
FIRM & FBFM



NATIONAL FLOOD INSURANCE PROGRAM


FIRM
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
(UNINCORPORATED AREAS)

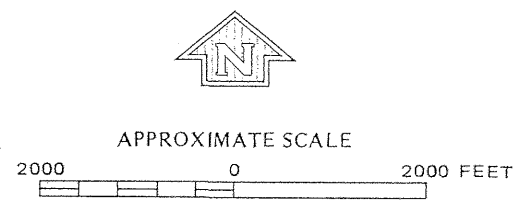

PANEL 150 OF 300

COMMUNITY-PANEL NUMBER
200321 0150 A

EFFECTIVE DATE:
JUNE 3, 1986



Federal Emergency Management Agency

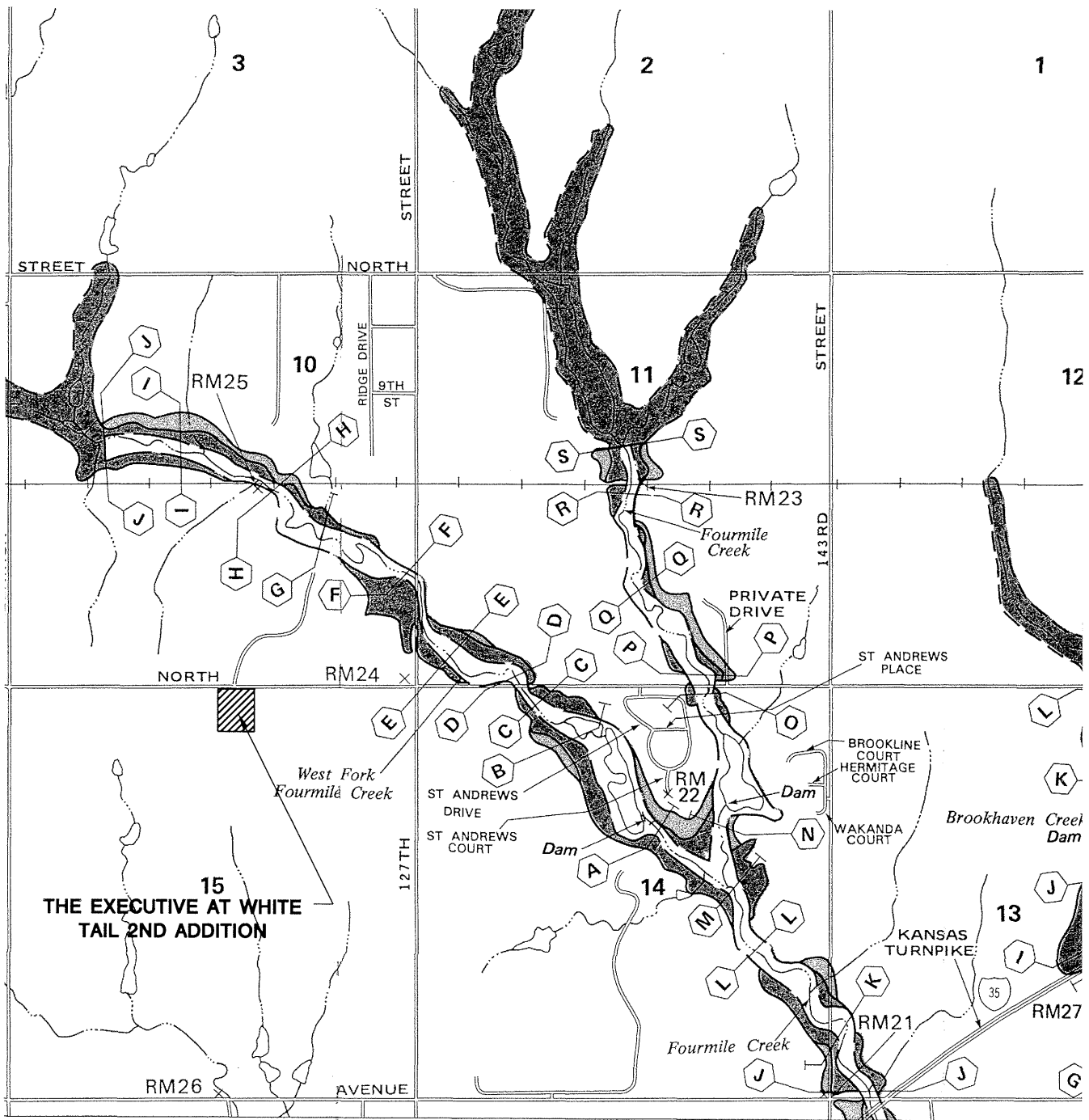
MKEC
ENGINEERING CONSULTANTS
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

THE EXECUTIVE AT WHITE TAIL 2ND ADDITION
PROJECT NAME

FIRM PANEL 150 OF 300 SEDGWICK COUNTY, KANSAS
SHEET TITLE

| | | |
|--------------------------|-----------------------|------------------------|
| DESIGN BY: <i>AJK</i> | DRAWN BY: <i>KWS</i> | CHECKED BY: <i>GJA</i> |
| DATE: <i>AUGUST 2005</i> | JOB NO.: <i>02155</i> | SHEET/OF: <i>1 / 1</i> |

H:\CIVIL\02155\DWG\PROP\DRNG\02155\FIRM.DWG



FLOODWAY
FLOOD BOUNDARY AND
FLOODWAY MAP

SEDGWICK COUNTY,
KANSAS
(UNINCORPORATED AREAS)

PANEL 150 OF 300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
200321 0150

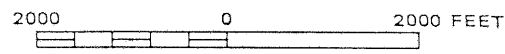
EFFECTIVE DATE:
JUNE 3, 1986



Federal Emergency Management Agency



APPROXIMATE SCALE



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

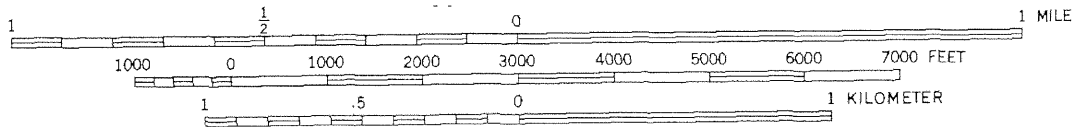
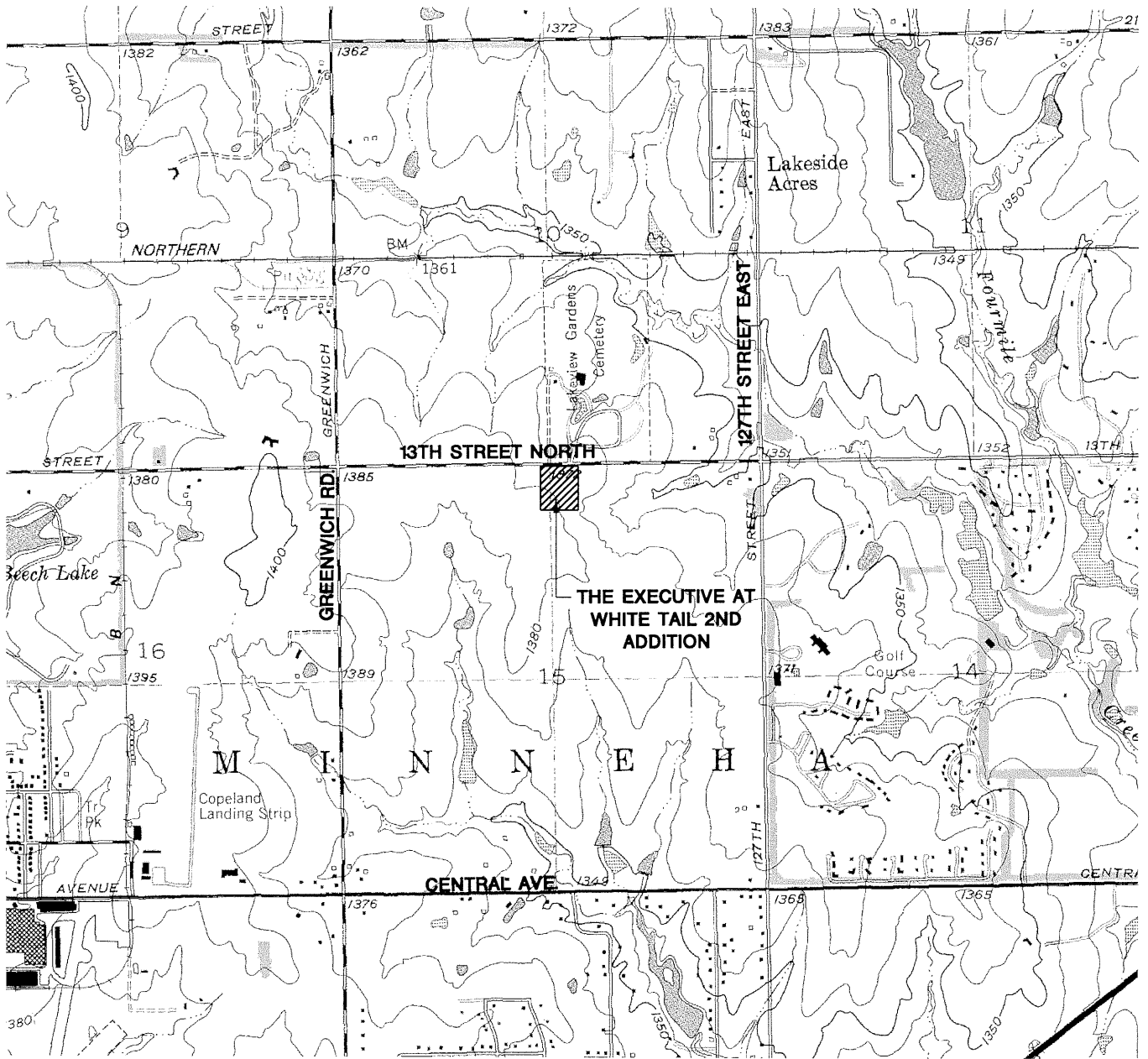
**THE EXECUTIVE AT
WHITE TAIL 2ND ADDITION**
PROJECT NAME

FLOOD BOUNDARY AND FLOODWAY MAP
SHEET TITLE

| | | |
|---------------------|------------------|--------------------|
| AJK DESIGN BY: | KWS DRAWN BY: | GJA CHECKED BY: |
| AUGUST 2005 DATE | 02155 JOB NO. | 1 / 1 SHEET/OF |

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Appendix C
Quadrangle



CONTOUR INTERVAL 10 FEET
 NATIONAL GEODETIC VERTICAL DATUM OF 1929

K:\CIVIL\02155\DWG\PROPS.DWG 0215504.DWG



**THE EXECUTIVE AT
 WHITE TAIL 2ND ADDITION**
 PROJECT NAME

ANDOVER, KANSAS QUADRANGLE
 SHEET TITLE

| | | | | | |
|------------|--------------------|-----------|--------------|--------------------------|------------|
| DESIGN BY: | <i>AJK</i> | DRAWN BY: | <i>KWS</i> | CHECKED BY: | <i>GJA</i> |
| DATE: | <i>AUGUST 2005</i> | JOB NO.: | <i>02155</i> | SHEET/OF <i>1 / 1</i> | |

Appendix D
Existing Drainage Patterns

LEGEND

- GAS METER
- GROUND YARD LIGHT
- YARD LIGHT ON POLE
- TRAFFIC SIGNAL MANHOLE
- SPRINKLER HEAD
- WALL
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- IRRIGATION CONTROL VALVE
- GRATE INLET
- TELEPHONE RISER
- INLET
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- TELEPHONE LINE
- UNDERGROUND ELECTRIC LINE
- OVERHEAD ELECTRIC
- BENCH MARK
- STORM WATER MANHOLE
- SANITARY SEWER MANHOLE
- TELEPHONE MANHOLE
- SECTION CORNER
- 5/8" REBAR/AMKC
- C.S. #39 SET
- PROPERTY CORNER FOUND

NW. Cor. NE 1/4, Sec. 15
127th S, R2E, 6th P.M.
Frd. 1/2" Smooth Bar

BN#1



BENCH MARK

BN#1
0.25 mile East of Greenwidge on 13th St. N.
(K-96 & 13th St.) C.O.W. Bench mark NW.
corner of bridge on concrete sidewalk
ELEV. = 1391.42 NGVD
204.22 City Datum

BN#2
R.R. spike in S. face guy pole at NW. cor.,
Lot 136, Block 4, White Tail Addition
ELEV. = 1376.27 NGVD
188.87 City Datum

NOTES

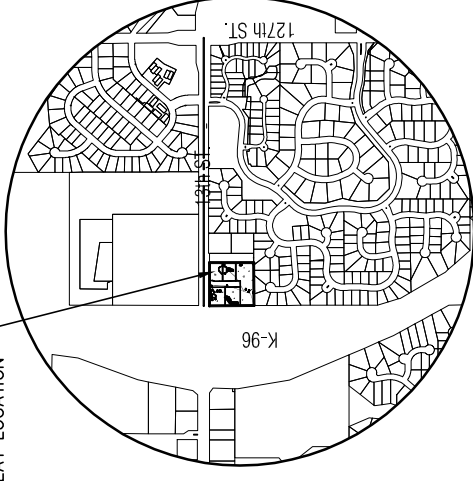
1. ZONING: LIMITED COMMERCIAL "LC"
2. RESERVE "A" IS PLATTED FOR PRIVATE STREETS, UTILITIES, DRAINAGE, PARKING, LANDSCAPING, IRRIGATION, MONUMENTS, BERMING, AND SIDEWALKS
3. BUILDING SETBACK FOR ALL LOT IS 0 FEET

LEGAL DESCRIPTION

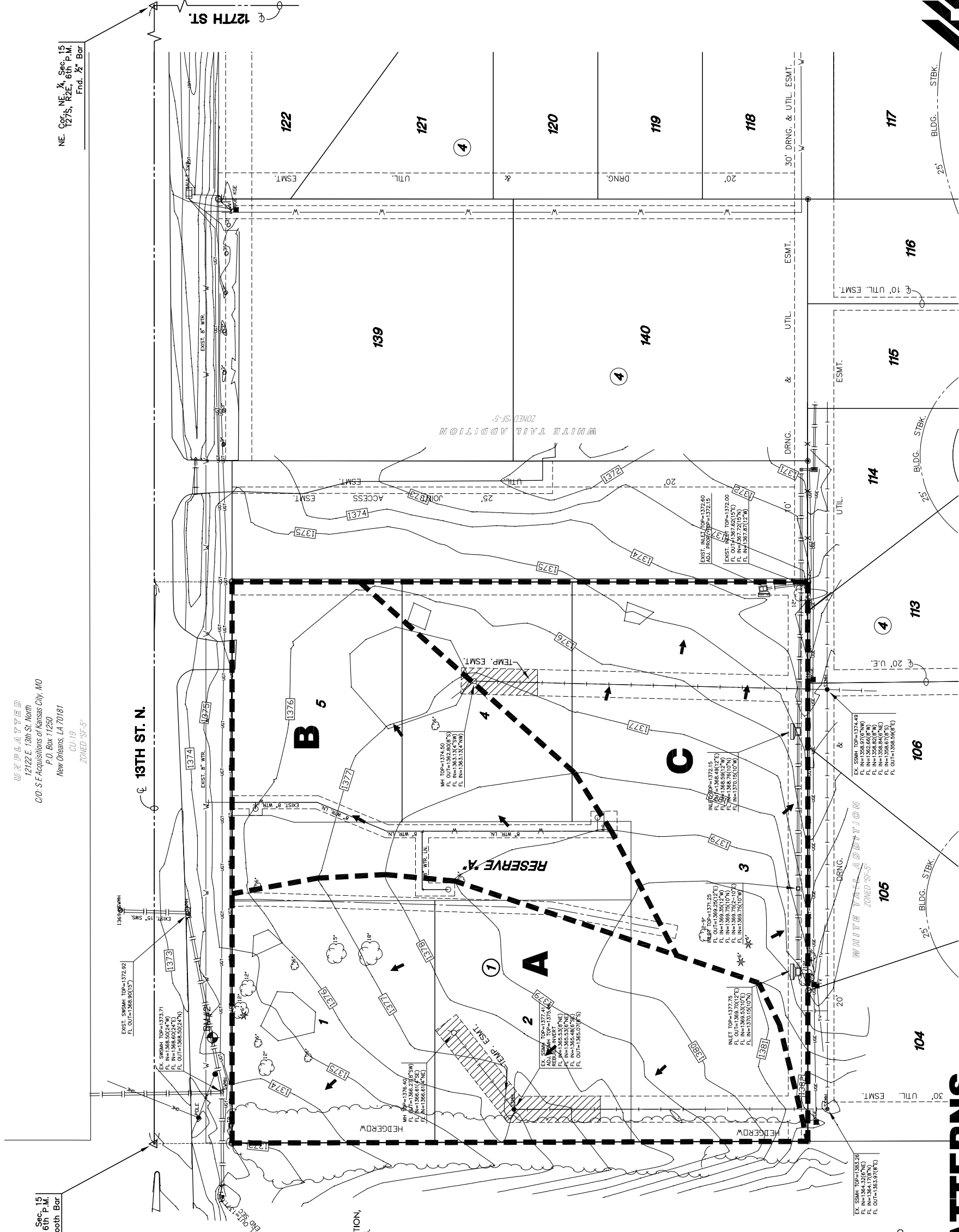
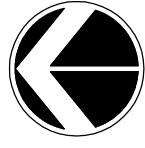
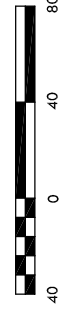
A REPLAT OF: ALL OF THE EXECUTIVE AT WHITE TAIL ADDITION,
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KS.

K-96

PLAT LOCATION



VICINITY MAP



NW. Cor. NE 1/4, Sec. 15
127th S, R2E, 6th P.M.
Frd. 1/2" Smooth Bar

BN#1



EXISTING DRAINAGE PATTERNS
THE EXECUTIVE AT WHITE TAIL 2ND ADDITION

Appendix E

Flow Calculations

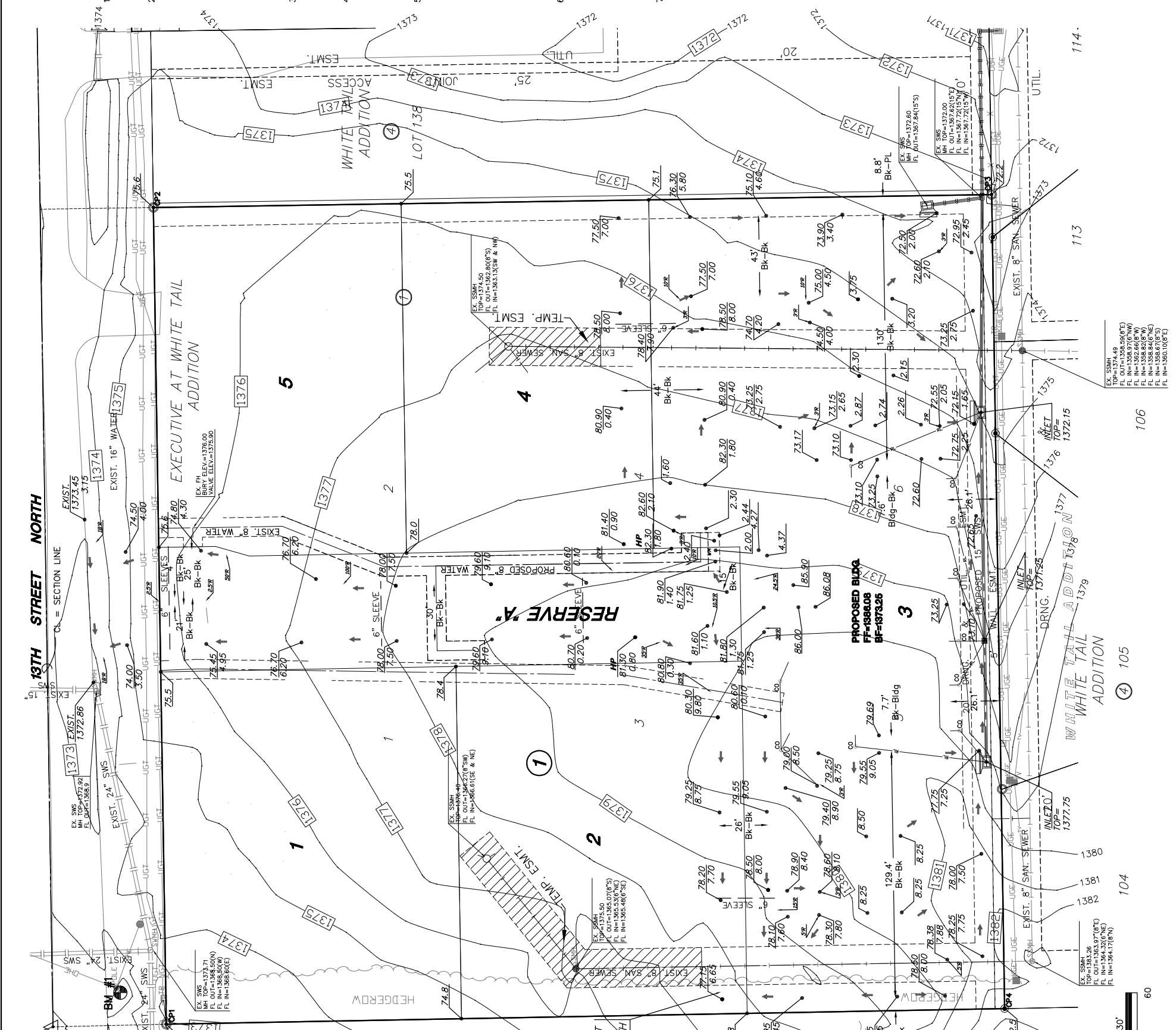
**THE EXECUTIVE AT WHITE TAIL 2ND ADDITION
WICHITA, SEDGWICK COUNTY, KANSAS
FLOW OFFSITE
BY THE RATIONAL METHOD**

| Area ID | Area ac | Accum. Area ac | Land Use | % Impervious | Runoff Coefficients | | | | Time of Concentration | | | | Rainfall Intensity | | | | | Storm Flows | | | |
|---------|------------|-------------------|--------------------------|-----------------|---------------------|------|------|------|-----------------------|------------|-------------|--------------|--------------------|---------------|----------------|-----------------|-----------|-------------|------------|-------------|--|
| | | | | | C2 | C5 | C10 | C100 | Tc2 (min) | Tc5 min | Tc10 min | Tc100 min | I2 (in/hr) | I5 (in/hr) | I10 (in/hr) | I100 (in/hr) | Q2 cfs | Q5 cfs | Q10 cfs | Q100 cfs | |
| A | 1.70 | | Urban Lawn - Slopes 1-4% | 0 | 0.30 | 0.35 | 0.45 | 0.65 | 24 | 22 | 19 | 15 | 3.10 | 3.81 | 4.71 | 7.37 | 1.58 | 2.27 | 3.60 | 8.14 | |
| B | 1.24 | | Urban Lawn - Slopes 1-4% | 0 | 0.30 | 0.35 | 0.45 | 0.65 | 28 | 26 | 22 | 16 | 2.84 | 3.57 | 4.40 | 7.37 | 1.06 | 1.55 | 2.46 | 5.94 | |
| C | 1.39 | | Urban Lawn - Slopes 1-4% | 0 | 0.30 | 0.35 | 0.45 | 0.65 | 18 | 17 | 15 | 15 | 3.51 | 4.31 | 5.22 | 7.37 | 1.46 | 2.10 | 3.27 | 6.66 | |
| Total | | 4.33 | Urban Lawn - Slopes 1-4% | 0 | 0.30 | 0.35 | 0.45 | 0.65 | | | | | | | | | 4.10 | 5.91 | 9.32 | 20.74 | |
| A | 1.71 | | Business - Neighborhood | 70 | 0.68 | 0.69 | 0.73 | 0.80 | 15 | 15 | 15 | 15 | 3.83 | 4.56 | 5.22 | 7.37 | 4.45 | 5.38 | 6.52 | 10.08 | |
| B | 1.01 | | Business - Neighborhood | 70 | 0.68 | 0.69 | 0.73 | 0.80 | 15 | 15 | 15 | 15 | 3.83 | 4.56 | 5.22 | 7.37 | 2.63 | 3.18 | 3.85 | 5.95 | |
| C | 1.61 | | Business - Neighborhood | 70 | 0.68 | 0.69 | 0.73 | 0.80 | 15 | 15 | 15 | 15 | 3.83 | 4.56 | 5.22 | 7.37 | 4.19 | 5.07 | 6.14 | 9.49 | |
| Total | | 4.33 | Business - Neighborhood | 70 | 0.68 | 0.69 | 0.73 | 0.80 | | | | | | | | | 11.28 | 13.62 | 16.50 | 25.53 | |

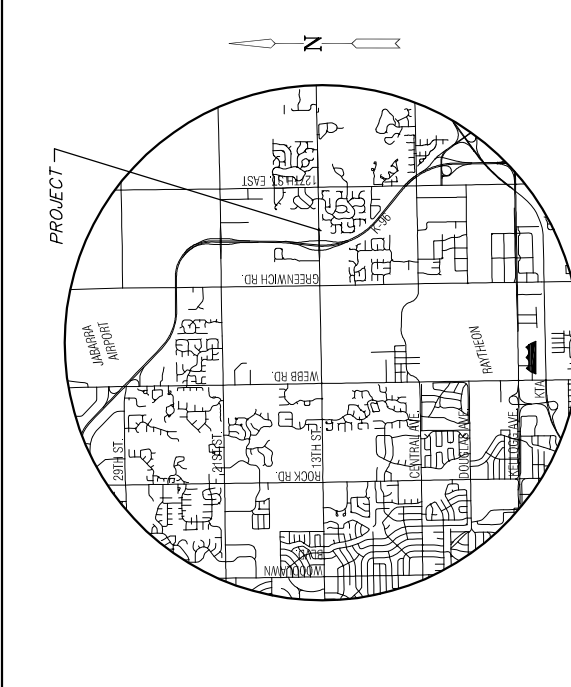
Appendix F
Lot Grading Plan

NW COR. - NE 1/4
SEC. 15, T27S, R2E
OF THE 6TH P.M.
FOUND PK. NAIL
N1694520.B2.E1688946.45
K-96

137H STREET NORTH
SECTION LINE
EXIST. 24" SWS
EXIST. 16" WATER
EXIST. 16" WATER
EXIST. 16" WATER



- ### GENERAL NOTES
- UNLESS SHOWN OR STATED OTHERWISE ON THESE DRAWINGS, MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF WICHITA CONCRETE PAVEMENT AND ASPHALTIC CONCRETE PAVEMENT SPECIFICATIONS.
 - CONTRACTOR WILL BE REQUIRED TO PROVIDE A MINIMUM ADVANCE NOTICE OF SEVENTY-TWO (72) HOURS TO UTILITY COMPANIES PRIOR TO STARTING ANY EXCAVATION AS FOLLOWS:
KANSAS ONE-CALL
1-800-344-7233
OR 687-2470 (LOCAL WICHITA)
 - THE CONTRACTOR MUST NOTIFY THE FOLLOWING IN CASE OF AN EMERGENCY:
SBC (TELEPHONE) 800-870-8390
COX COMMUNICATIONS (CABLE) 262-0661
WESTAR (ELECTRIC) 383-8600
KANSAS GAS SERVICE (GAS) 832-3101
CITY OF WICHITA WATER & SEWER MAINT. 262-6000
AQUILA (GAS) 946-0096
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRESERVING PROPERTY IRONS. THE CONTRACTOR WILL BE REQUIRED TO RE-ESTABLISH ANY PROPERTY IRONS WHICH ARE DAMAGED OR DESTROYED BY HIS CONSTRUCTION OPERATIONS. SUCH IRONS SHALL BE RE-ESTABLISHED BY A LICENSED LAND SURVEYOR IN ACCORDANCE WITH STATE LAWS.
 - EXISTING UTILITIES AND THEIR LOCATIONS, AS SHOWN ON THE PLANS REPRESENT THE BEST INFORMATION OBTAINABLE FOR DESIGN. LOCATION INFORMATION HAS BEEN OBTAINED FROM THE VARIOUS UTILITY COMPANIES AND FROM THEIR RECORD DRAWINGS. RECORD DRAWINGS OR COMPANY PROVIDED FIELD LOCATIONS ON THE PLANS SHOWN ARE NOT GUARANTEED. ADDITIONAL EXISTING UTILITIES MAY ALSO BE ENCOUNTERED.
 - RUBBLE FROM THE REMOVAL OF MISCELLANEOUS STRUCTURES AND EXCESS EXCAVATION WHICH IS TO BE WASTED SHALL BE DISPOSED OF ON SITES TO BE PROVIDED BY THE CONTRACTOR. THESE SITES SHALL BE APPROVED BY THE ENGINEER AS TO SUITABILITY, APPEARANCE AND SITE LOCATION. LOCATIONS THAT, IN THE OPINION OF THE ENGINEER, WILL DISPOSEL SITES MUST BE APPROVED BY THE KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT. MATERIAL EITHER STOCKPILED OR DISPOSED OF IN A FLOOD PLAIN WOULD REQUIRE A KANSAS STATE BOARD OF AGRICULTURE PERMIT. ANY MATERIAL DUMPED IN WATERS OF THE UNITED STATES OR WETLANDS IS SUBJECT TO U.S. CORPS OF ENGINEERS PERMITTING REGULATIONS. ANY MATERIAL BURIED OR STOCKPILED BEYOND APPROVED CONSTRUCTION LIMITS WOULD REQUIRE ADDITIONAL ARCHAEOLOGICAL INVESTIGATIONS UNLESS BURIED IN A PREVIOUSLY APPROVED BORROW LOCATION.
 - A SAW CUT OF AT LEAST ONE-HALF THE DEPTH OF THE EXISTING SURFACE COURSE OR ONE-FOURTH THE DEPTH OF THE EXISTING TOTAL PAVEMENT THICKNESS SHALL BE PROVIDED AT LOCATIONS WHERE PROPOSED CONSTRUCTION ABUTS AN EXISTING SURFACE OR PAVEMENT FOR WHICH PARTIAL REMOVAL OF THAT SURFACE OR PAVEMENT IS REQUIRED. JOINTS WILL NOT BE PERMITTED AND FOR SUCH INSTANCES THE LIMITS OF REMOVAL SHALL EXTEND TO THE EXISTING JOINT. SUCH SAW CUTS WILL NOT BE PAID FOR DIRECTLY AND THIS COST SHALL BE CONSIDERED AS SUBSIDIARY TO THE REMOVAL OF SURFACE OR PAVEMENT. CONTRACTOR SHALL RESEED AND MULCH ALL DISTURBED AREAS. COST SHALL BE CONSIDERED SUBSIDIARY TO SITE RESTORATION.



LEGAL

Lots 5 & 6, Block 1 Executive at White Tail Addition,
Sedgewick County, Kansas.

SITE NOTES

PLAT AREA - 4.33± = ACRES MORE OR LESS.
ZONING: LC - "LIGHT COMMERCIAL"

FLOOD ZONE

PANEL 200321 150A - JUNE 3, 1986
ZONE: C - Areas of minimal flooding.

BENCHMARKS

BM #1 Railroad spike in the South face of a guy pole 20' East and 34' South of the Northwest corner of the NE 1/4, Sec. 15, T27S, R2E. ELEV.=1376.26
BM #2 2nd power pole West of the Southeast corner of Lakeview Cemetery, 1025' East and 38' North of the Northwest corner of the NE 1/4, Sec. 15, T27S, R2E. ELEV.=1367.00
BM #3 Chiseled square the North end of the median island on the South side of 13th St. North and Whitetail. 639' West and 52' South of the Northeast corner of the NE 1/4, Sec. 15, T27S, R2E. ELEV.=1353.315

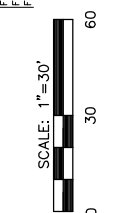
LEGEND

| | | |
|-----|-------------|-------------|
| CP1 | N1694461.31 | E1688947.87 |
| CP2 | N1694468.03 | E1689376.75 |
| CP3 | N1694027.99 | E1689383.54 |
| CP4 | N1694021.16 | E1688956.08 |

PROP. REINFORCED CONC.
TRANSITION CURB
6" SLEEVE (Depth=30")
TREE REMOVAL
PROPOSED SPOT ELEVATIONS
RAINLEADER
CLEANOUT
PAVEMENT TRANSITION

EXECUTIVE AT WHITETAIL PRUDENTIAL DINING-BEARD

PROJECT NAME
SHEET TITLE
MKEC
DESIGN BY: DAC
DRAWN BY: JTC
DATE: APRIL 2005
JOB NO.: 04308
JOB NO.: 04308
SHEET OF: CS / 11



Appendix G
Existing 24" RCP Pre and Post-Project

Drainage Report for The Executive at White Tail 2nd Addition Wichita, Kansas

Stormwater Sewer Calculations

Allowable flow through existing 24" RCP

Manning's Equation

$$Q = \frac{1.49}{n} * A * R_h^{2/3} * S^{1/2}$$

$$A = \left(\frac{24}{12}\right)^2 * \frac{\pi}{4} = 3.14 \text{ ft}^2$$

$$R_h = \frac{D}{4} = \frac{2 \text{ ft}}{4} = 0.5$$

$$S = 0.3\% = 0.003$$

$$n = 0.013$$

$$\therefore Q = 12.4 \text{ cfs}$$

Existing $Q_5 = 6.9 \text{ cfs} < 12.4 \text{ cfs}$; OK

Existing $Q_{100} = 21.6 \text{ cfs} > 12.4 \text{ cfs}$; NG

Prop $Q_5 = 10.7 \text{ cfs} < 12.4 \text{ cfs}$; OK

Prop $Q_{100} = 23.5 \text{ cfs} > 12.4 \text{ cfs}$; NG

The existing 24" RCP will still be able to handle a 5-year storm. The 100-year flow will continue to flow along existing drainage patterns.

Hydrograph Return Period Recap

| Hyd. No. | Hydrograph type (origin) | Inflow Hyd(s) | Peak Outflow (cfs) | | | | | | | | Hydrograph description |
|----------|--------------------------|---------------|--------------------|-------|-------|-------|-------|-------|-------|--------|------------------------|
| | | | 1-Yr | 2-Yr | 3-Yr | 5-Yr | 10-Yr | 25-Yr | 50-Yr | 100-Yr | |
| 1 | Rational | ----- | ----- | ----- | ----- | 2.42 | ----- | ----- | ----- | ----- | K-96 ROW |
| 2 | Rational | ----- | ----- | ----- | ----- | 4.48 | ----- | ----- | ----- | ----- | 13th Street |
| 3 | Rational | ----- | ----- | ----- | ----- | 2.27 | ----- | ----- | ----- | ----- | Pre A |
| 4 | Combine | 1, 2, 3 | ----- | ----- | ----- | 6.85 | ----- | ----- | ----- | ----- | Pre Flow to Pipe |
| 6 | Rational | ----- | ----- | ----- | ----- | 5.37 | ----- | ----- | ----- | ----- | Post A |
| 7 | Combine | 1, 2, 6 | ----- | ----- | ----- | 10.68 | ----- | ----- | ----- | ----- | Post Flow to Pipe |

Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (acft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (acft) | Hydrograph description |
|----------|--------------------------|-----------------|---------------------|--------------------|---------------|---------------|------------------------|------------------------|------------------------|
| 1 | Rational | 2.42 | 1 | 44 | 0.147 | --- | ----- | ----- | K-96 ROW |
| 2 | Rational | 4.48 | 1 | 15 | 0.093 | --- | ----- | ----- | 13th Street |
| 3 | Rational | 2.27 | 1 | 22 | 0.069 | --- | ----- | ----- | Pre A |
| 4 | Combine | 6.85 | 1 | 15 | 0.308 | 1, 2, 3 | ----- | ----- | Pre Flow to Pipe |
| 6 | Rational | 5.37 | 1 | 15 | 0.111 | --- | ----- | ----- | Post A |
| 7 | Combine | 10.68 | 1 | 15 | 0.350 | 1, 2, 6 | ----- | ----- | Post Flow to Pipe |

Proj. file: 5yr-Q 24in RCP.gpw

Return Period: 5 yr

Run date: 08-11-2005

Hydrograph Report

Hyd. No. 1

K-96 ROW

Hydrograph type = Rational
Storm frequency = 5 yrs
Drainage area = 2.7 ac
Intensity = 2.602 in/hr
IDF Curve = SedgwickCoKS.IDF

Peak discharge = 2.42 cfs
Time interval = 1 min
Runoff coeff. = 0.35
Time of conc. (Tc) = 44 min
Asc/Rec limb fact = 1/1

Hydrograph Volume = 0.147 acft

Hydrograph Discharge Table

| Time -- Outflow (hrs cfs) | Time -- Outflow (hrs cfs) |
|------------------------------|------------------------------|
| 0.37 1.21 | 0.93 1.76 |
| 0.38 1.27 | 0.95 1.71 |
| 0.40 1.32 | 0.97 1.65 |
| 0.42 1.38 | 0.98 1.60 |
| 0.43 1.43 | 1.00 1.54 |
| 0.45 1.49 | 1.02 1.49 |
| 0.47 1.54 | 1.03 1.43 |
| 0.48 1.60 | 1.05 1.38 |
| 0.50 1.65 | 1.07 1.32 |
| 0.52 1.71 | 1.08 1.27 |
| 0.53 1.76 | 1.10 1.21 |
| 0.55 1.82 | |
| 0.57 1.87 | |
| 0.58 1.93 | ...End |
| 0.60 1.98 | |
| 0.62 2.04 | |
| 0.63 2.09 | |
| 0.65 2.15 | |
| 0.67 2.20 | |
| 0.68 2.26 | |
| 0.70 2.31 | |
| 0.72 2.37 | |
| 0.73 2.42 << | |
| 0.75 2.37 | |
| 0.77 2.31 | |
| 0.78 2.26 | |
| 0.80 2.20 | |
| 0.82 2.15 | |
| 0.83 2.09 | |
| 0.85 2.04 | |
| 0.87 1.98 | |
| 0.88 1.93 | |
| 0.90 1.87 | |
| 0.92 1.82 | |

Hydrograph Report

Hyd. No. 2

13th Street

| | | | |
|-----------------|--------------------|--------------------|------------|
| Hydrograph type | = Rational | Peak discharge | = 4.48 cfs |
| Storm frequency | = 5 yrs | Time interval | = 1 min |
| Drainage area | = 1.1 ac | Runoff coeff. | = 0.88 |
| Intensity | = 4.549 in/hr | Time of conc. (Tc) | = 15 min |
| IDF Curve | = SedgwickCoKS.IDF | Asc/Rec limb fact | = 1/1 |

Hydrograph Volume = 0.093 acft

Hydrograph Discharge Table

Time -- Outflow (hrs cfs)

| | |
|------|---------|
| 0.13 | 2.39 |
| 0.15 | 2.69 |
| 0.17 | 2.99 |
| 0.18 | 3.29 |
| 0.20 | 3.59 |
| 0.22 | 3.89 |
| 0.23 | 4.18 |
| 0.25 | 4.48 << |
| 0.27 | 4.18 |
| 0.28 | 3.89 |
| 0.30 | 3.59 |
| 0.32 | 3.29 |
| 0.33 | 2.99 |
| 0.35 | 2.69 |
| 0.37 | 2.39 |

...End

Hydrograph Report

Hyd. No. 3

Pre A

| | | | |
|-----------------|--------------------|--------------------|------------|
| Hydrograph type | = Rational | Peak discharge | = 2.27 cfs |
| Storm frequency | = 5 yrs | Time interval | = 1 min |
| Drainage area | = 1.7 ac | Runoff coeff. | = 0.35 |
| Intensity | = 3.809 in/hr | Time of conc. (Tc) | = 22 min |
| IDF Curve | = SedgwickCoKS.IDF | Asc/Rec limb fact | = 1/1 |

Hydrograph Volume = 0.069 acft

Hydrograph Discharge Table

Time -- Outflow (hrs cfs)

| | |
|------|---------|
| 0.18 | 1.13 |
| 0.20 | 1.24 |
| 0.22 | 1.34 |
| 0.23 | 1.44 |
| 0.25 | 1.55 |
| 0.27 | 1.65 |
| 0.28 | 1.75 |
| 0.30 | 1.85 |
| 0.32 | 1.96 |
| 0.33 | 2.06 |
| 0.35 | 2.16 |
| 0.37 | 2.27 << |
| 0.38 | 2.16 |
| 0.40 | 2.06 |
| 0.42 | 1.96 |
| 0.43 | 1.85 |
| 0.45 | 1.75 |
| 0.47 | 1.65 |
| 0.48 | 1.55 |
| 0.50 | 1.44 |
| 0.52 | 1.34 |
| 0.53 | 1.24 |
| 0.55 | 1.13 |

...End

Hydrograph Report

Hyd. No. 4

Pre Flow to Pipe

Hydrograph type = Combine
Storm frequency = 5 yrs
Inflow hyds. = 1, 2, 3

Peak discharge = 6.85 cfs
Time interval = 1 min

Hydrograph Volume = 0.308 acft

Hydrograph Discharge Table

| Time (hrs) | Hyd. 1 + (cfs) | Hyd. 2 + (cfs) | Hyd. 3 = (cfs) | Outflow (cfs) |
|------------|----------------|----------------|----------------|---------------|
| 0.13 | 0.44 | 2.39 | 0.82 | 3.66 |
| 0.15 | 0.50 | 2.69 | 0.93 | 4.11 |
| 0.17 | 0.55 | 2.99 | 1.03 | 4.57 |
| 0.18 | 0.61 | 3.29 | 1.13 | 5.03 |
| 0.20 | 0.66 | 3.59 | 1.24 | 5.48 |
| 0.22 | 0.72 | 3.89 | 1.34 | 5.94 |
| 0.23 | 0.77 | 4.18 | 1.44 | 6.40 |
| 0.25 | 0.83 | 4.48 << | 1.55 | 6.85 << |
| 0.27 | 0.88 | 4.18 | 1.65 | 6.71 |
| 0.28 | 0.94 | 3.89 | 1.75 | 6.57 |
| 0.30 | 0.99 | 3.59 | 1.85 | 6.43 |
| 0.32 | 1.05 | 3.29 | 1.96 | 6.29 |
| 0.33 | 1.10 | 2.99 | 2.06 | 6.15 |
| 0.35 | 1.16 | 2.69 | 2.16 | 6.01 |
| 0.37 | 1.21 | 2.39 | 2.27 << | 5.87 |
| 0.38 | 1.27 | 2.09 | 2.16 | 5.52 |
| 0.40 | 1.32 | 1.79 | 2.06 | 5.18 |
| 0.42 | 1.38 | 1.49 | 1.96 | 4.83 |
| 0.43 | 1.43 | 1.20 | 1.85 | 4.48 |
| 0.45 | 1.49 | 0.90 | 1.75 | 4.13 |
| 0.47 | 1.54 | 0.60 | 1.65 | 3.79 |
| 0.48 | 1.60 | 0.30 | 1.55 | 3.44 |

...End

Hydrograph Report

Hyd. No. 6

Post A

| | | | |
|-----------------|--------------------|--------------------|------------|
| Hydrograph type | = Rational | Peak discharge | = 5.37 cfs |
| Storm frequency | = 5 yrs | Time interval | = 1 min |
| Drainage area | = 1.7 ac | Runoff coeff. | = 0.69 |
| Intensity | = 4.549 in/hr | Time of conc. (Tc) | = 15 min |
| IDF Curve | = SedgwickCoKS.IDF | Asc/Rec limb fact | = 1/1 |

Hydrograph Volume = 0.111 acft

Hydrograph Discharge Table

Time -- Outflow (hrs cfs)

| | |
|------|---------|
| 0.13 | 2.86 |
| 0.15 | 3.22 |
| 0.17 | 3.58 |
| 0.18 | 3.94 |
| 0.20 | 4.29 |
| 0.22 | 4.65 |
| 0.23 | 5.01 |
| 0.25 | 5.37 << |
| 0.27 | 5.01 |
| 0.28 | 4.65 |
| 0.30 | 4.29 |
| 0.32 | 3.94 |
| 0.33 | 3.58 |
| 0.35 | 3.22 |
| 0.37 | 2.86 |

...End

Hydrograph Report

Hyd. No. 7

Post Flow to Pipe

Hydrograph type = Combine
Storm frequency = 5 yrs
Inflow hyds. = 1, 2, 6

Peak discharge = 10.68 cfs
Time interval = 1 min

Hydrograph Volume = 0.350 acft

Hydrograph Discharge Table

| Time (hrs) | Hyd. 1 + (cfs) | Hyd. 2 + (cfs) | Hyd. 6 = (cfs) | Outflow (cfs) |
|------------|----------------|----------------|----------------|---------------|
| 0.13 | 0.44 | 2.39 | 2.86 | 5.69 |
| 0.15 | 0.50 | 2.69 | 3.22 | 6.41 |
| 0.17 | 0.55 | 2.99 | 3.58 | 7.12 |
| 0.18 | 0.61 | 3.29 | 3.94 | 7.83 |
| 0.20 | 0.66 | 3.59 | 4.29 | 8.54 |
| 0.22 | 0.72 | 3.89 | 4.65 | 9.25 |
| 0.23 | 0.77 | 4.18 | 5.01 | 9.97 |
| 0.25 | 0.83 | 4.48 << | 5.37 << | 10.68 << |
| 0.27 | 0.88 | 4.18 | 5.01 | 10.08 |
| 0.28 | 0.94 | 3.89 | 4.65 | 9.47 |
| 0.30 | 0.99 | 3.59 | 4.29 | 8.87 |
| 0.32 | 1.05 | 3.29 | 3.94 | 8.27 |
| 0.33 | 1.10 | 2.99 | 3.58 | 7.67 |
| 0.35 | 1.16 | 2.69 | 3.22 | 7.07 |
| 0.37 | 1.21 | 2.39 | 2.86 | 6.47 |
| 0.38 | 1.27 | 2.09 | 2.50 | 5.86 |

...End

Hydrograph Return Period Recap

| Hyd. No. | Hydrograph type (origin) | Inflow Hyd(s) | Peak Outflow (cfs) | | | | | | | | Hydrograph description |
|----------|--------------------------|---------------|--------------------|-------|-------|-------|-------|-------|-------|--------|------------------------|
| | | | 1-Yr | 2-Yr | 3-Yr | 5-Yr | 10-Yr | 25-Yr | 50-Yr | 100-Yr | |
| 1 | Rational | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 10.01 | K-96 ROW |
| 2 | Rational | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 7.67 | 13th Street |
| 3 | Rational | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 8.14 | Pre A |
| 4 | Combine | 1, 2, 3 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 21.58 | Pre Flow to Pipe |
| 6 | Rational | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 10.08 | Post A |
| 7 | Combine | 1, 2, 6 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 23.52 | Post Flow to Pipe |

Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (acft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (acft) | Hydrograph description |
|----------|--------------------------|-----------------|---------------------|--------------------|---------------|---------------|------------------------|------------------------|------------------------|
| 1 | Rational | 10.01 | 1 | 26 | 0.358 | --- | ----- | ----- | K-96 ROW |
| 2 | Rational | 7.67 | 1 | 15 | 0.159 | --- | ----- | ----- | 13th Street |
| 3 | Rational | 8.14 | 1 | 15 | 0.168 | --- | ----- | ----- | Pre A |
| 4 | Combine | 21.58 | 1 | 15 | 0.685 | 1, 2, 3 | ----- | ----- | Pre Flow to Pipe |
| 6 | Rational | 10.08 | 1 | 15 | 0.208 | --- | ----- | ----- | Post A |
| 7 | Combine | 23.52 | 1 | 15 | 0.725 | 1, 2, 6 | ----- | ----- | Post Flow to Pipe |

| | | |
|-------------------------------|-----------------------|----------------------|
| Proj. file: 100Y-Q 24 RCP.gpw | Return Period: 100 yr | Run date: 08-11-2005 |
|-------------------------------|-----------------------|----------------------|

Hydrograph Report

Hyd. No. 1

K-96 ROW

| | | | |
|-----------------|--------------------|--------------------|-------------|
| Hydrograph type | = Rational | Peak discharge | = 10.01 cfs |
| Storm frequency | = 100 yrs | Time interval | = 1 min |
| Drainage area | = 2.7 ac | Runoff coeff. | = 0.65 |
| Intensity | = 5.789 in/hr | Time of conc. (Tc) | = 26 min |
| IDF Curve | = SedgwickCoKS.IDF | Asc/Rec limb fact | = 1/1 |

Hydrograph Volume = 0.358 acft

Hydrograph Discharge Table

Time -- Outflow (hrs cfs)

| | |
|------|----------|
| 0.22 | 5.00 |
| 0.23 | 5.39 |
| 0.25 | 5.77 |
| 0.27 | 6.16 |
| 0.28 | 6.54 |
| 0.30 | 6.93 |
| 0.32 | 7.31 |
| 0.33 | 7.70 |
| 0.35 | 8.08 |
| 0.37 | 8.47 |
| 0.38 | 8.85 |
| 0.40 | 9.24 |
| 0.42 | 9.62 |
| 0.43 | 10.01 << |
| 0.45 | 9.62 |
| 0.47 | 9.24 |
| 0.48 | 8.85 |
| 0.50 | 8.47 |
| 0.52 | 8.08 |
| 0.53 | 7.70 |
| 0.55 | 7.31 |
| 0.57 | 6.93 |
| 0.58 | 6.54 |
| 0.60 | 6.16 |
| 0.62 | 5.77 |
| 0.63 | 5.39 |
| 0.65 | 5.00 |

...End

Hydrograph Report

Hyd. No. 2

13th Street

| | | | |
|-----------------|--------------------|--------------------|------------|
| Hydrograph type | = Rational | Peak discharge | = 7.67 cfs |
| Storm frequency | = 100 yrs | Time interval | = 1 min |
| Drainage area | = 1.1 ac | Runoff coeff. | = 0.93 |
| Intensity | = 7.365 in/hr | Time of conc. (Tc) | = 15 min |
| IDF Curve | = SedgwickCoKS.IDF | Asc/Rec limb fact | = 1/1 |

Hydrograph Volume = 0.159 acft

Hydrograph Discharge Table

Time -- Outflow (hrs cfs)

| | |
|------|---------|
| 0.13 | 4.09 |
| 0.15 | 4.60 |
| 0.17 | 5.11 |
| 0.18 | 5.63 |
| 0.20 | 6.14 |
| 0.22 | 6.65 |
| 0.23 | 7.16 |
| 0.25 | 7.67 << |
| 0.27 | 7.16 |
| 0.28 | 6.65 |
| 0.30 | 6.14 |
| 0.32 | 5.63 |
| 0.33 | 5.11 |
| 0.35 | 4.60 |
| 0.37 | 4.09 |

...End

Hydrograph Report

Hyd. No. 3

Pre A

| | | | |
|-----------------|--------------------|--------------------|------------|
| Hydrograph type | = Rational | Peak discharge | = 8.14 cfs |
| Storm frequency | = 100 yrs | Time interval | = 1 min |
| Drainage area | = 1.7 ac | Runoff coeff. | = 0.65 |
| Intensity | = 7.365 in/hr | Time of conc. (Tc) | = 15 min |
| IDF Curve | = SedgwickCoKS.IDF | Asc/Rec limb fact | = 1/1 |

Hydrograph Volume = 0.168 acft

Hydrograph Discharge Table

Time -- Outflow (hrs cfs)

| | |
|------|---------|
| 0.13 | 4.34 |
| 0.15 | 4.88 |
| 0.17 | 5.43 |
| 0.18 | 5.97 |
| 0.20 | 6.51 |
| 0.22 | 7.05 |
| 0.23 | 7.60 |
| 0.25 | 8.14 << |
| 0.27 | 7.60 |
| 0.28 | 7.05 |
| 0.30 | 6.51 |
| 0.32 | 5.97 |
| 0.33 | 5.43 |
| 0.35 | 4.88 |
| 0.37 | 4.34 |

...End

Hydrograph Report

Hyd. No. 4

Pre Flow to Pipe

Hydrograph type = Combine
Storm frequency = 100 yrs
Inflow hyds. = 1, 2, 3

Peak discharge = 21.58 cfs
Time interval = 1 min

Hydrograph Volume = 0.685 acft

Hydrograph Discharge Table

| Time (hrs) | Hyd. 1 + (cfs) | Hyd. 2 + (cfs) | Hyd. 3 = (cfs) | Outflow (cfs) |
|------------|----------------|----------------|----------------|---------------|
| 0.13 | 3.08 | 4.09 | 4.34 | 11.51 |
| 0.15 | 3.46 | 4.60 | 4.88 | 12.95 |
| 0.17 | 3.85 | 5.11 | 5.43 | 14.39 |
| 0.18 | 4.23 | 5.63 | 5.97 | 15.83 |
| 0.20 | 4.62 | 6.14 | 6.51 | 17.27 |
| 0.22 | 5.00 | 6.65 | 7.05 | 18.71 |
| 0.23 | 5.39 | 7.16 | 7.60 | 20.15 |
| 0.25 | 5.77 | 7.67 << | 8.14 << | 21.58 << |
| 0.27 | 6.16 | 7.16 | 7.60 | 20.92 |
| 0.28 | 6.54 | 6.65 | 7.05 | 20.25 |
| 0.30 | 6.93 | 6.14 | 6.51 | 19.58 |
| 0.32 | 7.31 | 5.63 | 5.97 | 18.91 |
| 0.33 | 7.70 | 5.11 | 5.43 | 18.24 |
| 0.35 | 8.08 | 4.60 | 4.88 | 17.57 |
| 0.37 | 8.47 | 4.09 | 4.34 | 16.90 |
| 0.38 | 8.85 | 3.58 | 3.80 | 16.23 |
| 0.40 | 9.24 | 3.07 | 3.26 | 15.56 |
| 0.42 | 9.62 | 2.56 | 2.71 | 14.89 |
| 0.43 | 10.01 << | 2.05 | 2.17 | 14.23 |
| 0.45 | 9.62 | 1.53 | 1.63 | 12.79 |
| 0.47 | 9.24 | 1.02 | 1.09 | 11.35 |

...End

Hydrograph Report

Hyd. No. 6

Post A

| | | | |
|-----------------|--------------------|--------------------|-------------|
| Hydrograph type | = Rational | Peak discharge | = 10.08 cfs |
| Storm frequency | = 100 yrs | Time interval | = 1 min |
| Drainage area | = 1.7 ac | Runoff coeff. | = 0.8 |
| Intensity | = 7.365 in/hr | Time of conc. (Tc) | = 15 min |
| IDF Curve | = SedgwickCoKS.IDF | Asc/Rec limb fact | = 1/1 |

Hydrograph Volume = 0.208 acft

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

| | |
|------|----------|
| 0.13 | 5.37 |
| 0.15 | 6.05 |
| 0.17 | 6.72 |
| 0.18 | 7.39 |
| 0.20 | 8.06 |
| 0.22 | 8.73 |
| 0.23 | 9.40 |
| 0.25 | 10.08 << |
| 0.27 | 9.40 |
| 0.28 | 8.73 |
| 0.30 | 8.06 |
| 0.32 | 7.39 |
| 0.33 | 6.72 |
| 0.35 | 6.05 |
| 0.37 | 5.37 |

...End

Hydrograph Report

Hyd. No. 7

Post Flow to Pipe

Hydrograph type = Combine
Storm frequency = 100 yrs
Inflow hyds. = 1, 2, 6

Peak discharge = 23.52 cfs
Time interval = 1 min

Hydrograph Volume = 0.725 acft

Hydrograph Discharge Table

| Time (hrs) | Hyd. 1 + (cfs) | Hyd. 2 + (cfs) | Hyd. 6 = (cfs) | Outflow (cfs) |
|------------|----------------|----------------|----------------|---------------|
| 0.13 | 3.08 | 4.09 | 5.37 | 12.54 |
| 0.15 | 3.46 | 4.60 | 6.05 | 14.11 |
| 0.17 | 3.85 | 5.11 | 6.72 | 15.68 |
| 0.18 | 4.23 | 5.63 | 7.39 | 17.25 |
| 0.20 | 4.62 | 6.14 | 8.06 | 18.82 |
| 0.22 | 5.00 | 6.65 | 8.73 | 20.39 |
| 0.23 | 5.39 | 7.16 | 9.40 | 21.95 |
| 0.25 | 5.77 | 7.67 << | 10.08 << | 23.52 << |
| 0.27 | 6.16 | 7.16 | 9.40 | 22.72 |
| 0.28 | 6.54 | 6.65 | 8.73 | 21.93 |
| 0.30 | 6.93 | 6.14 | 8.06 | 21.13 |
| 0.32 | 7.31 | 5.63 | 7.39 | 20.33 |
| 0.33 | 7.70 | 5.11 | 6.72 | 19.53 |
| 0.35 | 8.08 | 4.60 | 6.05 | 18.73 |
| 0.37 | 8.47 | 4.09 | 5.37 | 17.93 |
| 0.38 | 8.85 | 3.58 | 4.70 | 17.14 |
| 0.40 | 9.24 | 3.07 | 4.03 | 16.34 |
| 0.42 | 9.62 | 2.56 | 3.36 | 15.54 |
| 0.43 | 10.01 << | 2.05 | 2.69 | 14.74 |
| 0.45 | 9.62 | 1.53 | 2.02 | 13.17 |

...End

Appendix H
Drainage and Utility Plan

