# Preliminary Drainage Report for Stonebridge Commercial Addition

## Wichita, Sedgwick County, Kansas

## Location

The subject property is located in Wichita, Kansas. The site is located on the southeast corner of the 37th Street North and Maize Road. The Wyn-Wood Addition is north of the site and 37th Street. Fox Ridge Addition is approximately ¼ mile south of the subject property. U.S.D. #266, Maize School District, owns the land south and east of the site. The site is approximately 36 acres. The property lies in the northwest quarter of the northwest quarter of Section 32, Township 26 South, Range 1 West. The site is shown on the Maize, Kansas Quadrangle, Appendix A.

## Soil

According the NRCS (GIS) Sedgwick County Soil Survey (Appendix B), the following soils are found on the site:

- Tabler silty clay loam, 0 to 1 percent slopes, HSG "D"
- Waurika silt loam, 0 to 1 percent slopes, HSG "D"
- Vanoss silt loam, 1 to 3 percent slopes, HSG "B"
- Blanket silt loam, 0 to 1 percent slopes, HSG "C"

The hydrologic soil group (HSG) used to select runoff coefficients and curve numbers for this site is "C".

## Pre-Project Conditions

### *Development*

The site is currently agricultural land.

### *Landform and Slope*

Slopes across the site range from 0.2-2.0%. The site drains from north to south.

### *Drainage Conditions*

The site is in Zone C, areas of minimal flooding. The nearest Zone A, area within the 100-year floodplain, surrounds Cadillac Lake approximately ½-mile south of the site. (FIRM Panel 125, Sedgwick County, Kansas Unincorporated Areas, June 3, 1986) (Appendix C). CLOMR (Case No. 05-07-0395R) has been approved for the Fox Ridge Addition and a LOMR (Case No. 06-07-BB0P) is pending for Fox Ridge Addition. The flood plain was stopped at the north property line of Fox Ridge.

### *Runoff Characteristics*

Runoff sheet flows from north to south across the site. The stormwater sewer system within the Wyn-Wood Addition and the ditches along 37th Street North and Maize Road prevent runoff from

entering the property from offsite. Runoff from the site drains across the adjacent property to the south and flows into Fox Ridge lakes. The site was divided into three basins for modeling purposes. The basins are shown on the Drainage & Utility Plan, Appendix D. The time of concentration for each basin was calculated using the FAA Method, Appendix E. The basins were modeled, under pre-project conditions, using Hydraflow Hydrographs 2004 by Intelisolve, Appendix F.

## Post-Project Conditions

### *Development*

The site will include 10 small commercial lots 1 to 2 acres in size and one large commercial lot approximately 23 acres in size. Three detention ponds will be constructed within the large lot. The shape of the ponds may be modified when the final lot layout is complete; however the storage provided by the ponds will remain.

### *Landform and Slope*

Fill will be added to the lots to raise the building pads above the 100-year water surface elevation of the proposed ponds. Final grades have not been set; however the minimum slope in the streets and parking lots will be 0.5%. A Preliminary Four Corner Lot Grading Plan is in Appendix G.

### *Runoff Characteristics*

Post-project runoff will exit the site through a proposed ditch connecting the proposed Stonebridge Commercial detention ponds to Fox Ridge lakes, see site plan in Appendix H. The ditch will outlet to a Fox Ridge lake approximately 0.5 feet above the normal pool elevation. The ditch will have a 0.1% slope, bottom width of 10.0 ft, side slope of 4 to 1, and a 100-year depth of 2.3 ft. The ditch was sized using Flow Master, Appendix H.

The Drainage & Utility Plan, in Appendix D, shows the three proposed detention ponds that will be constructed to control the post-project flow rates. The ponds share the same normal pool elevations, 1350.4, and provide 10.0 ac-ft of storage in the 100-yr design storm. The CLOMR for Fox Ridge Addition defines the 100-year water surface elevation of 164.2 ft (1351.6 NGVD) and the 10-year water surface elevation of 163.0 ft (1350.4 NGVD) for the Fox Ridge lake.

The post-project times of concentration were calculated using the FAA Method, Appendix E. The post-project basins were modeled in Hydraflow Hydrographs 2004 by Intelisolve, Appendix F. Equalizing structures will connect the proposed ponds; enabling the ponds to function as a single detention pond. A tailwater elevation of 164.2 ft (1351.6 NGVD) was used for the 100-year design storm. A notched weir was designed as the pond outlet to control runoff during design flows. Table 1 compares the pre-project and post-project flow rates exiting the site.

**Table 1. Stonebridge Commercial Runoff.**

| Description | Design Storm Flows (cfs) | | | |
|---|---|---|---|---|
| | 2-Yr | 5-Yr | 10-Yr | 100-Yr |
| Pre-Project Total Flow to the South | 18.1 | 30.9 | 44.3 | 98.9 |
| Post-Project Total Flow to the South | 17.3 | 26.1 | 33.4 | 91.9 |

Runoff offsite to the south is reduced for the 2, 5, 10, and 100-yr design storms, from pre-project to post-project conditions.

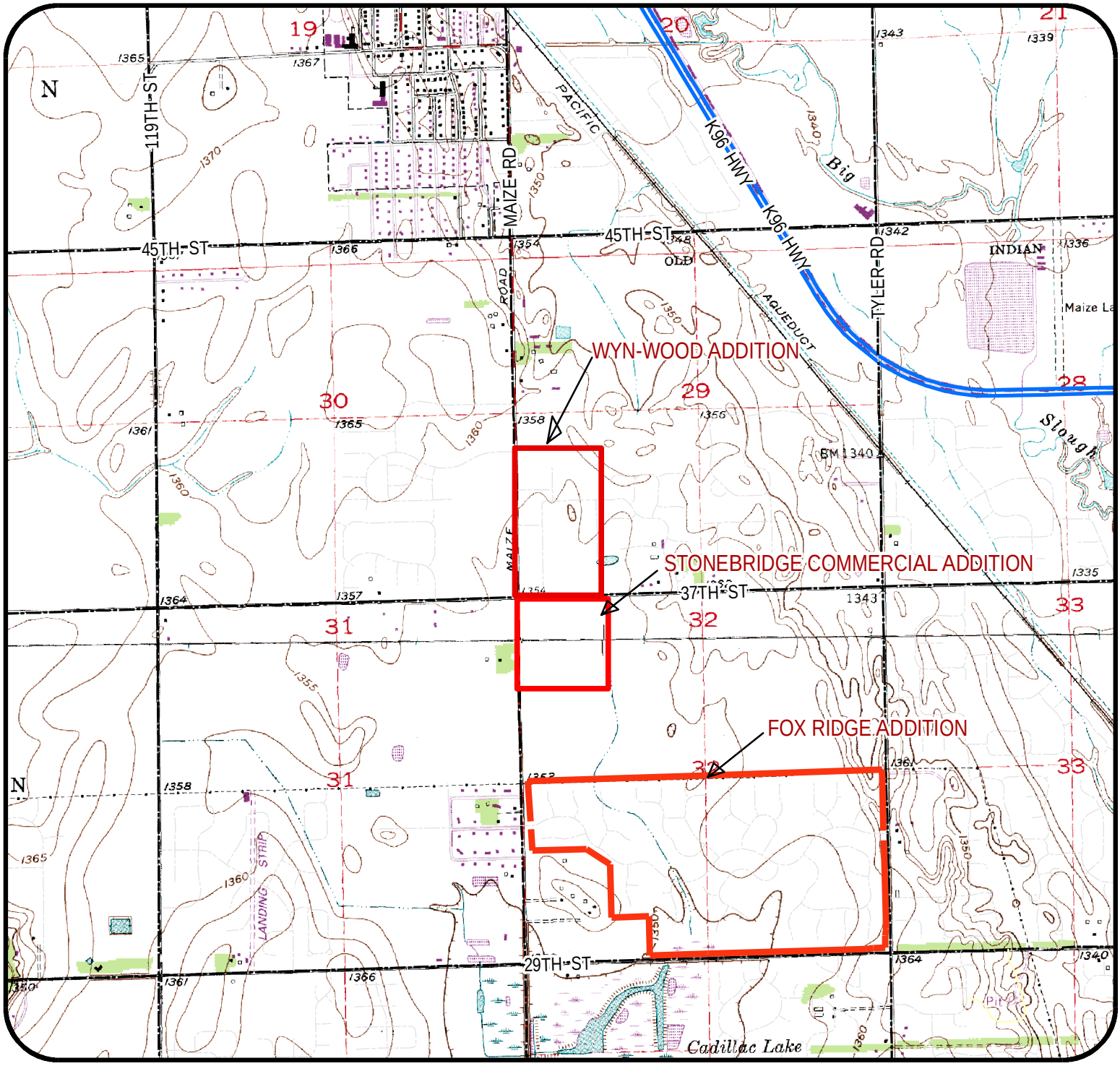
Storm water sewer (SWS) lines are proposed to convey storm water from the commercial lots to the three detention ponds. A preliminary layout of the SWS is shown on the Drainage and Utility

Plan, Appendix D. HydroFlow Storm Sewers 2005 was used to size the proposed system for the 5-year design storm. The storm sewer calculations are in Appendix I.

## Summary

Stonebridge Commercial Addition is located on the southeast corner of the intersection of 37th Street North and Maize Road. The property is approximately 36 acres and will develop for commercial use. Runoff from the site currently sheet flows across the property to the south into the Fox Ridge lakes. A ditch will be constructed along the east property line of the adjacent property to the south and into a Fox Ridge lake. This ditch will be sized to carry the post-project 100-year flow rate from the subject property. A notched weir was designed to control runoff from the site. Runoff offsite to the south is reduced for the 2, 5, 10, and 100-year design storms, from pre-project to post-project conditions.

# Appendix A
# Quadrangle




1 0.5 0 1 Miles

1,000 500 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 Feet

1 0.5 0 1 Kilometers

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STONEBRIDGE COMMERCIAL ADDITION

Project Name:

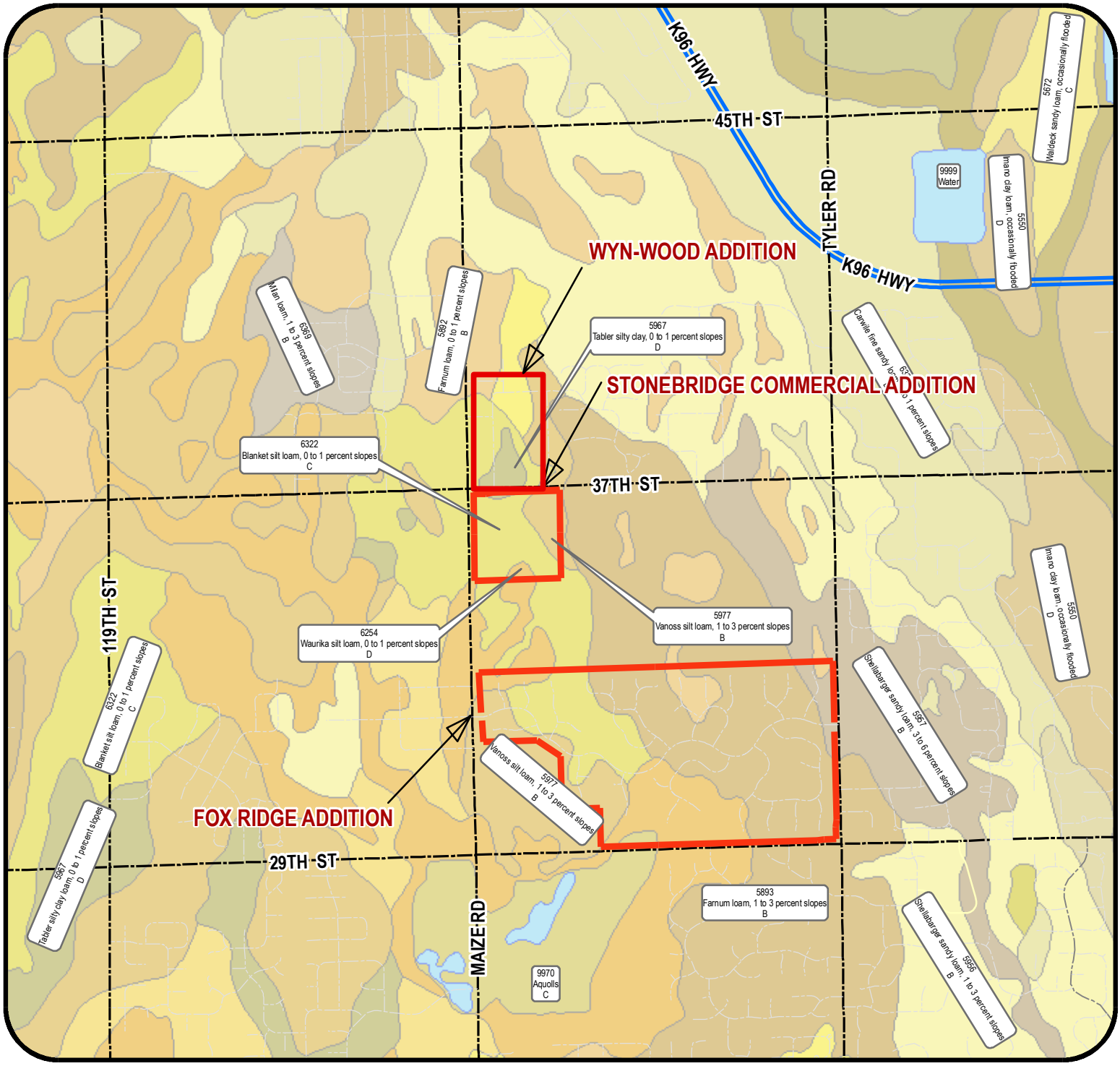
USGS - Sedgwick County, KS

Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

| | |
|---|---|
| AJK | AUGUST 2006 |
| Drawn By: | Date: |
| AJK / KLA | 05440 |
| Design / Review: | Job No.: |

# Appendix B
# Soil Survey




1 0.5 0 1 Miles

1,000 500 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 Feet

1 0.5 0 1 Kilometers

N W E S

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**Stonebridge Commercial Addition**

Project Name:

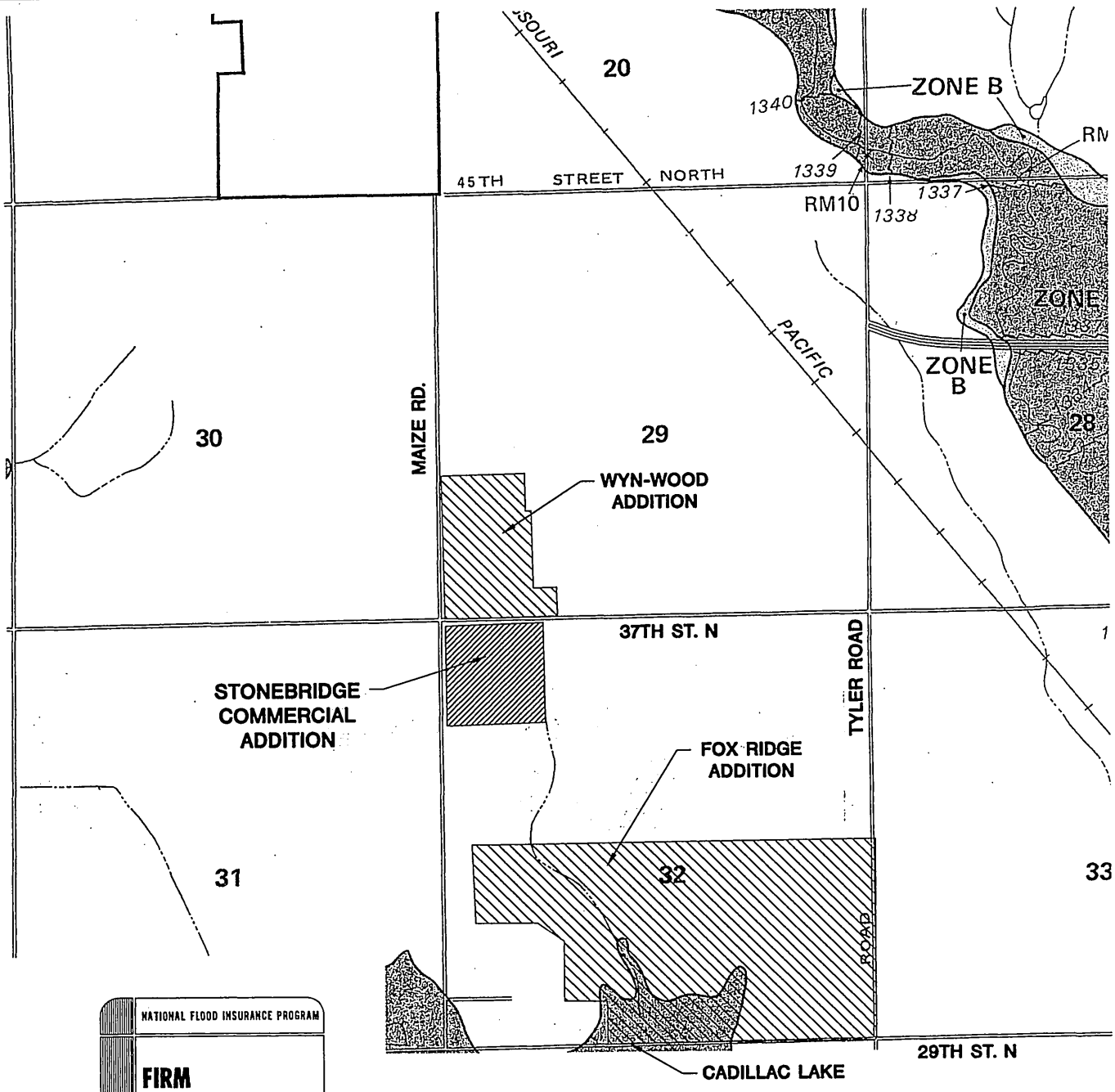
**Soil Survey - Sedgwick County, KS**

Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

| | |
|---|---|
| AJK | AUGUST 2006 |
| Drawn By: | Date: |
| AJK / KLA | 05440 |
| Design / Review: | Job No.: |

# Appendix C
# FIRM & FBFM




NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**
**FLOOD INSURANCE RATE MAP**

SEDGWICK, COUNTY, KANSAS
(UNINCORPORATED AREAS)

PANEL 125 OF 300

COMMUNITY-PANEL NUMBER
200321 0125 A

EFFECTIVE DATE:
JUNE 3, 1986

Federal Emergency Management Agency

APPROXIMATE SCALE
2000 0 2000 FEET

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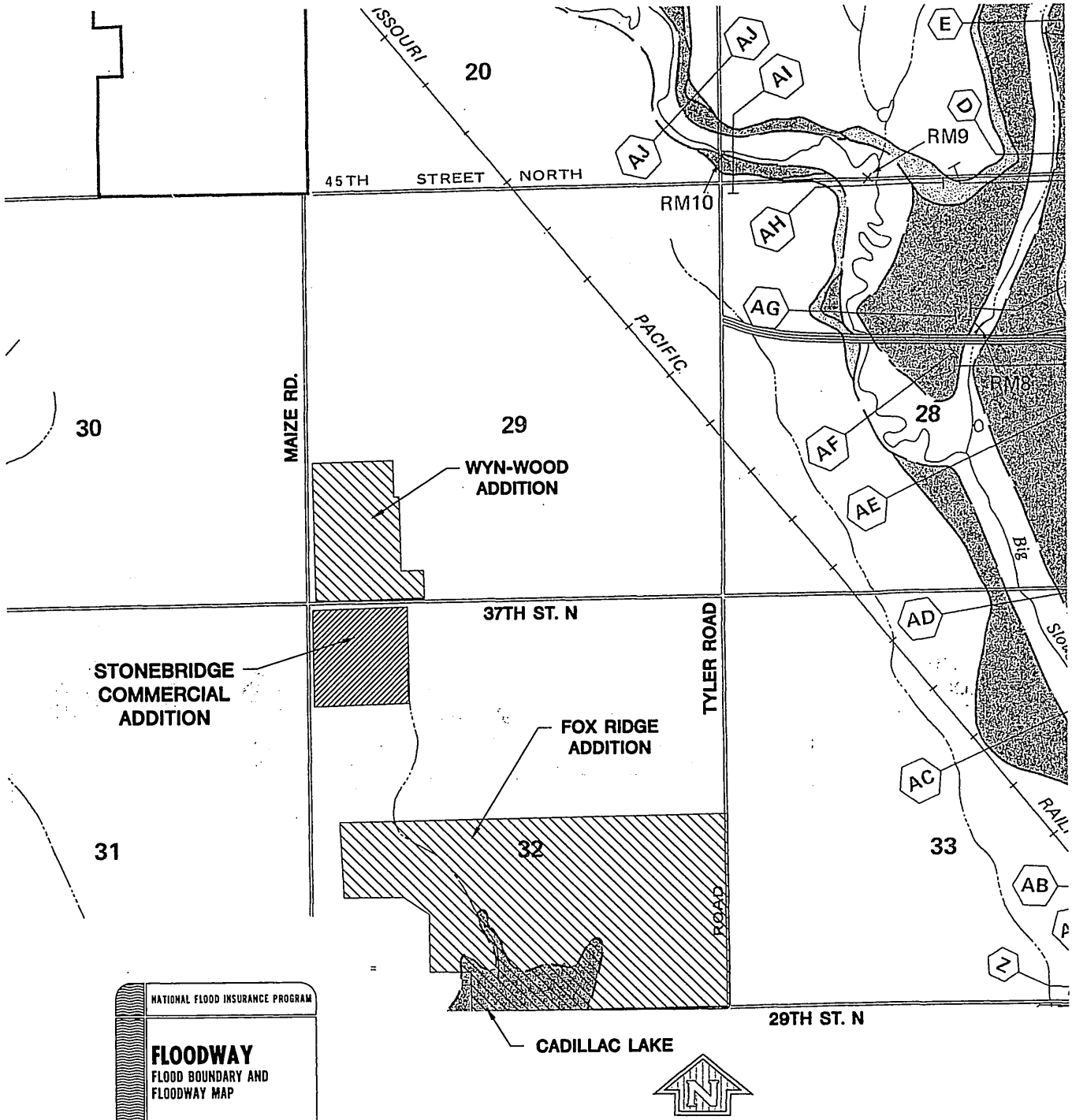
MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

STONEBRIDGE COMMERCIAL ADDITION
PROJECT NAME

FIRM PANEL 125 OF 300
SEDGWICK COUNTY, KANSAS
SHEET TITLE

| AJK | JFL | GJA |
|---|---|---|
| DESIGN BY: | DRAWN BY: | CHECKED BY: |
| AUGUST 2006 | 05440 | 1 / 1 |
| DATE | JOB NO. | SHEET/OF |




NATIONAL FLOOD INSURANCE PROGRAM

# FLOODWAY

FLOOD BOUNDARY AND FLOODWAY MAP

SEDGWICK, COUNTY, KANSAS
(UNINCORPORATED AREAS)

PANEL 125 OF 300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
200321 0125

EFFECTIVE DATE:
JUNE 3, 1986

Federal Emergency Management Agency


MKEC ENGINEERING CONSULTANTS, INC.

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


STONEBRIDGE COMMERCIAL ADDITION
PROJECT NAME

FBFM PANEL 125 OF 300
SEDGWICK COUNTY, KANSAS
SHEET TITLE

| AJK | KWS | GJA |
|---|---|---|
| DESIGN BY: | DRAWN BY: | CHECKED BY: |

| AUGUST 2006 | 05440 | 1 / 1 |
|---|---|---|
| DATE | JOB NO. | SHEET/OF |

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# Appendix D
# Preliminary Drainage & Utility Plan

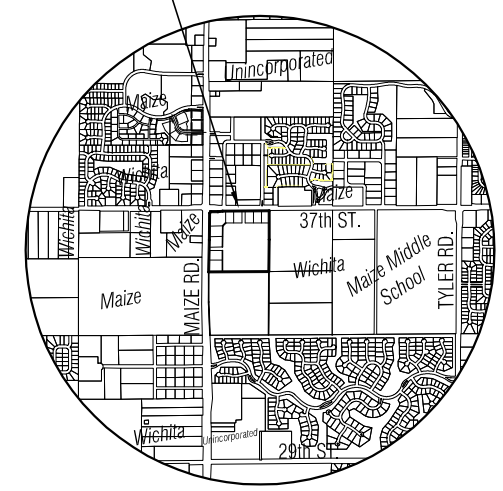
# NOTES

1. GEOGRAPHY: Located in the Northwest portion of the City of Wichita in an area currently transitioning from agricultural uses into urban residential, institutional and commercial uses with access to K-96 via Maize Rd. and or Ridge Rd. The surrounding land uses include urban residential to the Northwest and South, rural residential to the West, and agriculture production to the immediate South and East, and institutional uses East of the agriculture production.
2. LOT TOTAL - 11 Commercial parcels
3. ANNEXATION: Lies within the City of Wichita and adjoins the City of Maize to the North and West.
4. EXISTING USE: Agricultural
5. ZONING: Existing / proposed - "LC" w/ CUP DP 295 overlay THIS PLAT SHALL CONFORM TO THE RECITALS OF CUP DP 295.
6. PLAT AREA: Gross - 36.3 Ac.
   Net - 35.93 Ac.
7. SURVEY DATE: January, 2006 (by MKEC)
8. PUBLIC UTILITIES: Shall be extended to site. Municipal sanitary sewer shall be served from the East. Municipal water shall be served from existing mains to the North and West.
9. LEGAL DESCRIPTION: See hereon
10. ACCESS CONTROLS: Shall align with developments to the West and North and also conform to access management policies as shown hereon..
11. PROPOSED COMMERCIAL: According to CUP DP 295 the total number of buildings is limited to 16 with the following minimum building setbacks:
    Arterial Street setback = 35'
    Interior side setback = 15'
    Interior side setback = 35' **
    Exterior boundary setback = 100' **
    ** (if building has a gross floor area greater than 100,000 s.f.)
12. RESERVES: All reserves are platted for irrigation, landscaping, monuments, drainage, and utilities in designated areas. Reserve "C" is also platted for a private swimming pool, pool house, and parking.
13. FLOOD: According to FEMA FIRM Community Unit Panel 200321 0125A, Effective Date June 3rd, 1986; this property lies within flood zone "C", *"areas of minimal flooding."*
14. DRAINAGE: A drainage report shall accompany this plat. The property lies within a branch of the Sand Creek drainage basin, which drains to the Little Arkansas River located in Sedgwick County and generally draining from northeast to southwest.

# LEGAL DESCRIPTION

The North ½, NW. ¼, NW. ¼, Section 32, Township 26 South, Range 1 West, Sedgwick County Kansas, EXCEPT, road right-of-way on the West and North.
TOGETHER WITH,
The South ½, NW. ¼, NW. ¼, Section 32, Township 26 South, Range 1 West, Sedgwick County Kansas, EXCEPT, road right-of-way on the West.

PLAT LOCATION




**VICINITY MAP**

# BENCH MARKS

Datum BM - Top of "T" post 35' ± N. of the N. line of NW¼, Sec. 32, T26S, R1W and 1384' ± E. of NW. corner of said NW¼.
Elev. = 1353.54 (NGVD 29)
166.14 (City Datum)

BM#1 - Top of "T" post 660' ± S. of the N. line of NW ¼, Sec. 32, T26S, R1W and 1325' ± E. of W. line of said NW¼.
Elev.= 1351.69(NGVD 29)
164.29 (City Datum)

BM#2 - Top of "T" post 675' ± E. of the W. line of NW¼, Sec. 32, T26S, R1W and 1320' ± S. of the N. line of said NW¼.
Elev.=1351.79 (NGVD 29)
164.39 (City Datum)

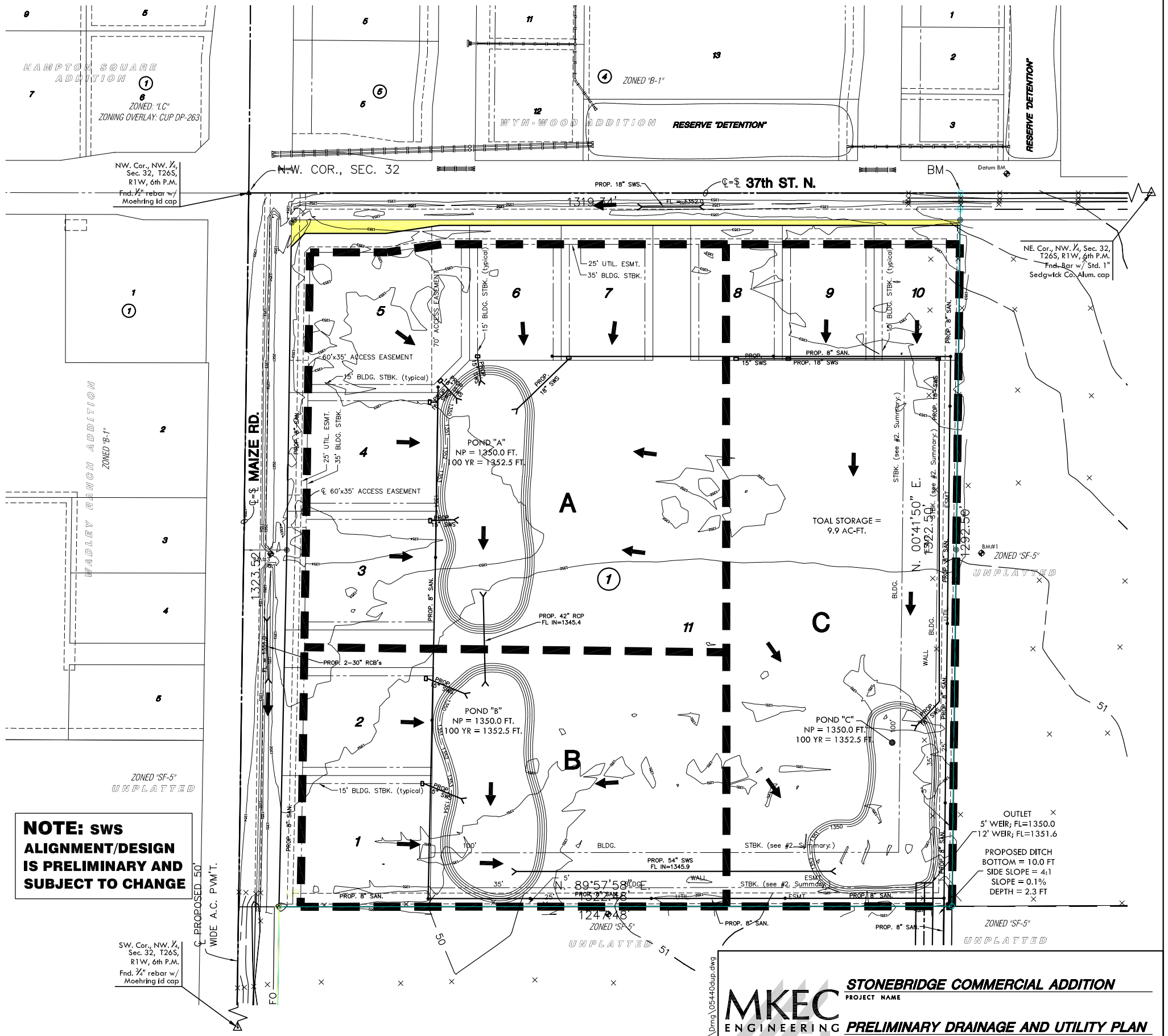
BM#3 - Square cut on N. end of on top of RCP 50' ± E. of the W. line of NW¼, Sec. 32, T26S, R1W and 660' ± S. of the N. line of said NW¼.
Elev.=1353.59 (NGVD 29)
166.19 (City Datum)

NORTH
100 0 100 200
1"=100'
1 : 1,200

# LEGEND

- 6IN - CONIFEROUS TREE & DIAMETER
- 3IN - DECIDUOUS TREE & DIAMETER
- SN - SIGN
- PP - POWER POLE AND GUY ANCHOR
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SECTION CORNER
- BM - BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELECTRIC LINE
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE !
- DRAINAGE BOUNDARY
- A - DRAINAGE BOUNDARY LABEL
- FLOW ARROW

| MINIMUM PAD ELEVATIONS *LOWEST OPENINGS* | | |
|---|---|---|
| LOTS *(inclusive)* | BLOCK | ELEVATION *NGVD* |
| 1 - 2 | 1 | 1355.5 |
| 3 - 11 | 1 | 1355.5 |




**NOTE: SWS ALIGNMENT/DESIGN IS PRELIMINARY AND SUBJECT TO CHANGE**

REVISED 11-06: UPDATED DITCH SIZE AND DETENTION PONDS 100-YEAR WATER SURFACE ELEVATIONS

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

**STONEBRIDGE COMMERCIAL ADDITION**
PROJECT NAME

**PRELIMINARY DRAINAGE AND UTILITY PLAN**
SHEET TITLE

| AJK | JFL | GJA |
|---|---|---|
| DESIGN BY: | DRAWN BY: | CHECKED BY: |
| AUGUST 2006 | 05440 | 1 / 1 |
| DATE | JOB NO. | SHEET/OF |

# Appendix E
# Time of Concentration Calculations

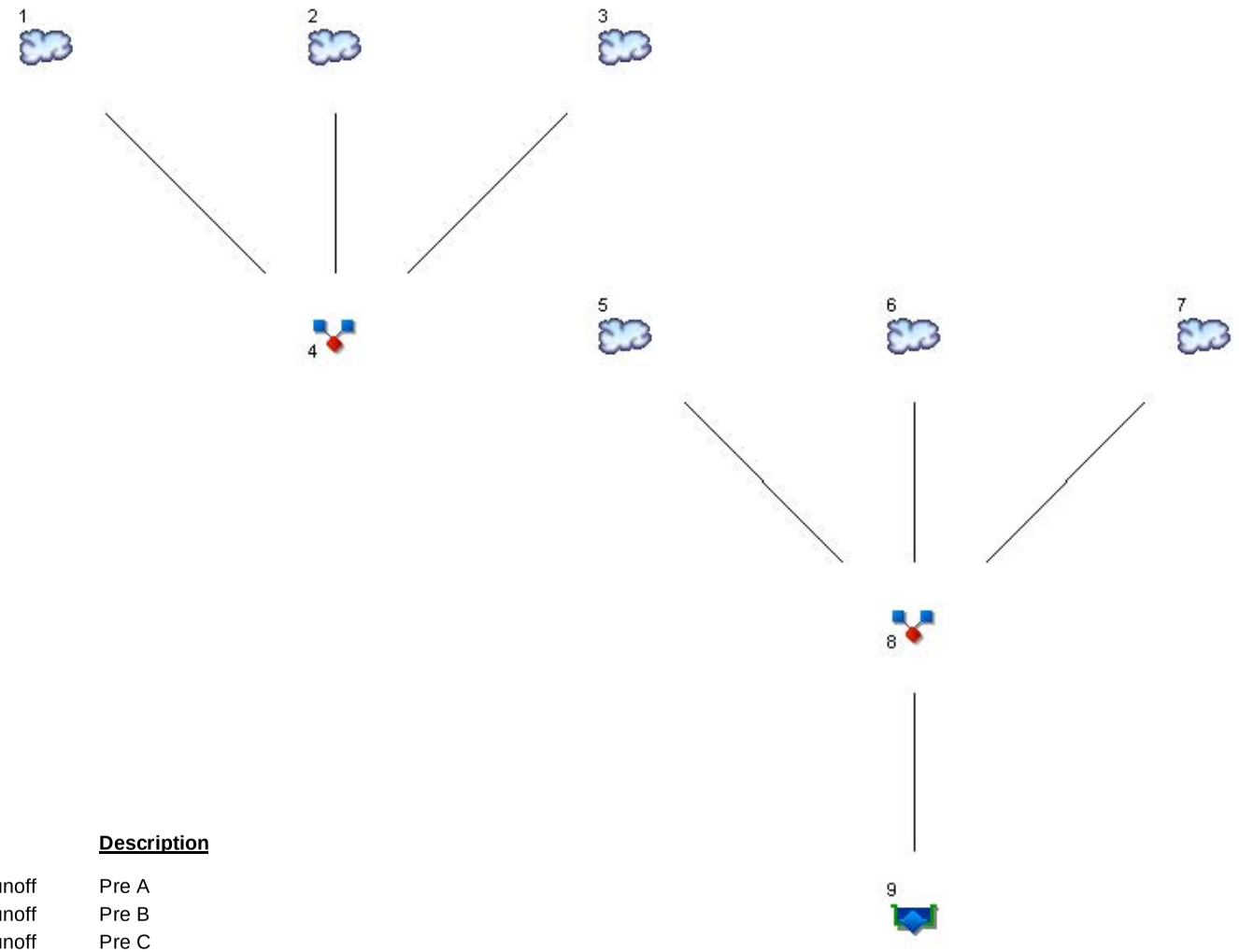
Time of Concentration Calculations by the FAA method

*Stonbridge Commercial*

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

| Area Name | Land Use | Soil Group | Maximum Elevation | Minimum Elevation | Flow Length (L) | Rational Runoff Coefficient, C | | | | Time of Concentration (min), Tc | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2-Year | 5-Year | 10-Year | 100-Year | 2-Year | 5-Year | 10-Year | 100-Year |
| *Pre-Developed* | | | | | | | | | | | | | |
| *A* | *Agricultural - Pasture - Slopes <1%* | *C* | *166.0* | *163.6* | *820* | 0.26 | 0.29 | 0.37 | 0.53 | 65.2 | 62.9 | 56.7 | 44.2 |
| *B* | *Agricultural - Pasture - Slopes <1%* | *C* | *166.0* | *163.4* | *550* | 0.26 | 0.29 | 0.37 | 0.53 | 45.5 | 43.9 | 39.6 | 30.9 |
| *C* | *Agricultural - Pasture - Slopes <1%* | *C* | *166.0* | *163.4* | *1,200* | 0.26 | 0.29 | 0.37 | 0.53 | 87.2 | 84.1 | 75.8 | 59.2 |
| *Post-Project* | | | | | | | | | | | | | |
| *A* | *Business - Downtown* | *C* | *166.0* | *163.0* | *800* | 0.84 | 0.85 | 0.87 | 0.91 | 18.4 | 17.6 | 16.2 | 15.0 |
| B | *Business - Downtown* | *C* | 165.0 | 163.0 | 420 | 0.84 | 0.85 | 0.87 | 0.91 | 15.0 | 15.0 | 15.0 | 15.0 |
| C | *Business - Downtown* | *C* | 166.0 | 163.0 | 1,000 | 0.84 | 0.85 | 0.87 | 0.91 | 22.1 | 21.3 | 19.6 | 16.2 |

# Appendix F
# Hydraflow Hydrographs Output




## Legend

| Hyd. | Origin | Description |
|---|---|---|
| 1 | SCS Runoff | Pre A |
| 2 | SCS Runoff | Pre B |
| 3 | SCS Runoff | Pre C |
| 4 | Combine | Pre-Proj South |
| 5 | SCS Runoff | Post A |
| 6 | SCS Runoff | Post B |
| 7 | SCS Runoff | Post C |
| 8 | Combine | Post Project A,B,C |
| 9 | Reservoir | Combined Detention |

# 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 | SCS Runoff | 7.688 | 6 | 756 | 1.383 | ---- | ------ | ------ | Pre A |
| 2 | SCS Runoff | 6.314 | 6 | 744 | 0.857 | ---- | ------ | ------ | Pre B |
| 3 | SCS Runoff | 5.710 | 6 | 768 | 1.226 | ---- | ------ | ------ | Pre C |
| 4 | Combine | 18.06 | 6 | 756 | 3.466 | 1, 2, 3 | ------ | ------ | Pre-Proj South |
| 5 | SCS Runoff | 40.11 | 6 | 720 | 2.926 | ---- | ------ | ------ | Post A |
| 6 | SCS Runoff | 25.93 | 6 | 720 | 1.892 | ---- | ------ | ------ | Post B |
| 7 | SCS Runoff | 29.44 | 6 | 726 | 2.816 | ---- | ------ | ------ | Post C |
| 8 | Combine | 90.35 | 6 | 720 | 7.634 | 5, 6, 7 | ------ | ------ | Post Project A,B,C |
| 9 | Reservoir | 17.31 | 6 | 756 | 7.634 | 8 | 1351.03 | 3.958 | Combined Detention |

# 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 | SCS Runoff | 13.14 | 6 | 756 | 2.269 | ---- | ------ | ------ | Pre A |
| 2 | SCS Runoff | 10.71 | 6 | 744 | 1.405 | ---- | ------ | ------ | Pre B |
| 3 | SCS Runoff | 9.785 | 6 | 768 | 2.011 | ---- | ------ | ------ | Pre C |
| 4 | Combine | 30.85 | 6 | 756 | 5.684 | 1, 2, 3 | ------ | ------ | Pre-Proj South |
| 5 | SCS Runoff | 54.17 | 6 | 720 | 4.016 | ---- | ------ | ------ | Post A |
| 6 | SCS Runoff | 35.03 | 6 | 720 | 2.596 | ---- | ------ | ------ | Post B |
| 7 | SCS Runoff | 39.82 | 6 | 726 | 3.865 | ---- | ------ | ------ | Post C |
| 8 | Combine | 122.24 | 6 | 720 | 10.477 | 5, 6, 7 | ------ | ------ | Post Project A,B,C |
| 9 | Reservoir | 26.05 | 6 | 750 | 10.476 | 8 | 1351.35 | 5.290 | Combined Detention |

# 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 | SCS Runoff | 18.89 | 6 | 750 | 2.843 | ---- | ------ | ------ | Pre A |
| 2 | SCS Runoff | 16.34 | 6 | 738 | 1.896 | ---- | ------ | ------ | Pre B |
| 3 | SCS Runoff | 13.76 | 6 | 762 | 2.525 | ---- | ------ | ------ | Pre C |
| 4 | Combine | 44.29 | 6 | 744 | 7.264 | 1, 2, 3 | ------ | ------ | Pre-Proj South |
| 5 | SCS Runoff | 63.30 | 6 | 720 | 4.733 | ---- | ------ | ------ | Post A |
| 6 | SCS Runoff | 40.93 | 6 | 720 | 3.060 | ---- | ------ | ------ | Post B |
| 7 | SCS Runoff | 46.57 | 6 | 726 | 4.555 | ---- | ------ | ------ | Post C |
| 8 | Combine | 142.96 | 6 | 720 | 12.348 | 5, 6, 7 | ------ | ------ | Post Project A,B,C |
| 9 | Reservoir | 33.42 | 6 | 750 | 11.192 | 8 | 1351.62 | 6.411 | Combined Detention |

# Table of Contents



## 100 - Year

# 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 | SCS Runoff | 39.80 | 6 | 738 | 5.130 | ---- | ------ | ------ | Pre A |
| 2 | SCS Runoff | 30.39 | 6 | 732 | 3.508 | ---- | ------ | ------ | Pre B |
| 3 | SCS Runoff | 31.83 | 6 | 750 | 4.747 | ---- | ------ | ------ | Pre C |
| 4 | Combine | 98.85 | 6 | 738 | 13.386 | 1, 2, 3 | ------ | ------ | Pre-Proj South |
| 5 | SCS Runoff | 96.28 | 6 | 720 | 7.360 | ---- | ------ | ------ | Post A |
| 6 | SCS Runoff | 62.25 | 6 | 720 | 4.759 | ---- | ------ | ------ | Post B |
| 7 | SCS Runoff | 86.87 | 6 | 720 | 6.640 | ---- | ------ | ------ | Post C |
| 8 | Combine | 245.39 | 6 | 720 | 18.759 | 5, 6, 7 | ------ | ------ | Post Project A,B,C |
| 9 | Reservoir | 91.93 | 6 | 738 | 13.665 | 8 | 1352.53 | 9.995 | Combined Detention |

# Hydrograph Plot

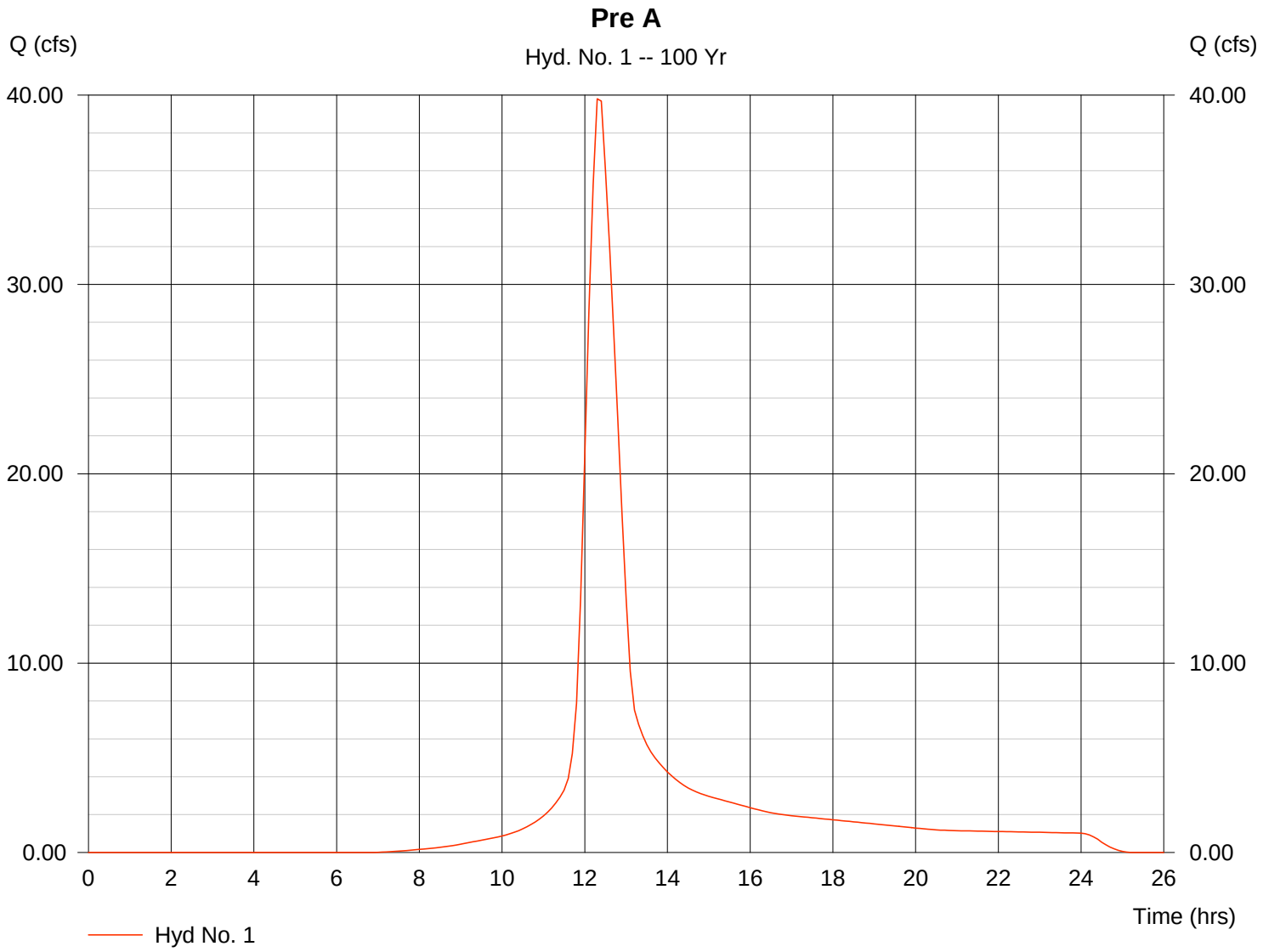
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 1

Pre A

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 39.80 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 13.300 ac | Curve number | = 74 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 44.20 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 5.130 acft



# Hydrograph Plot

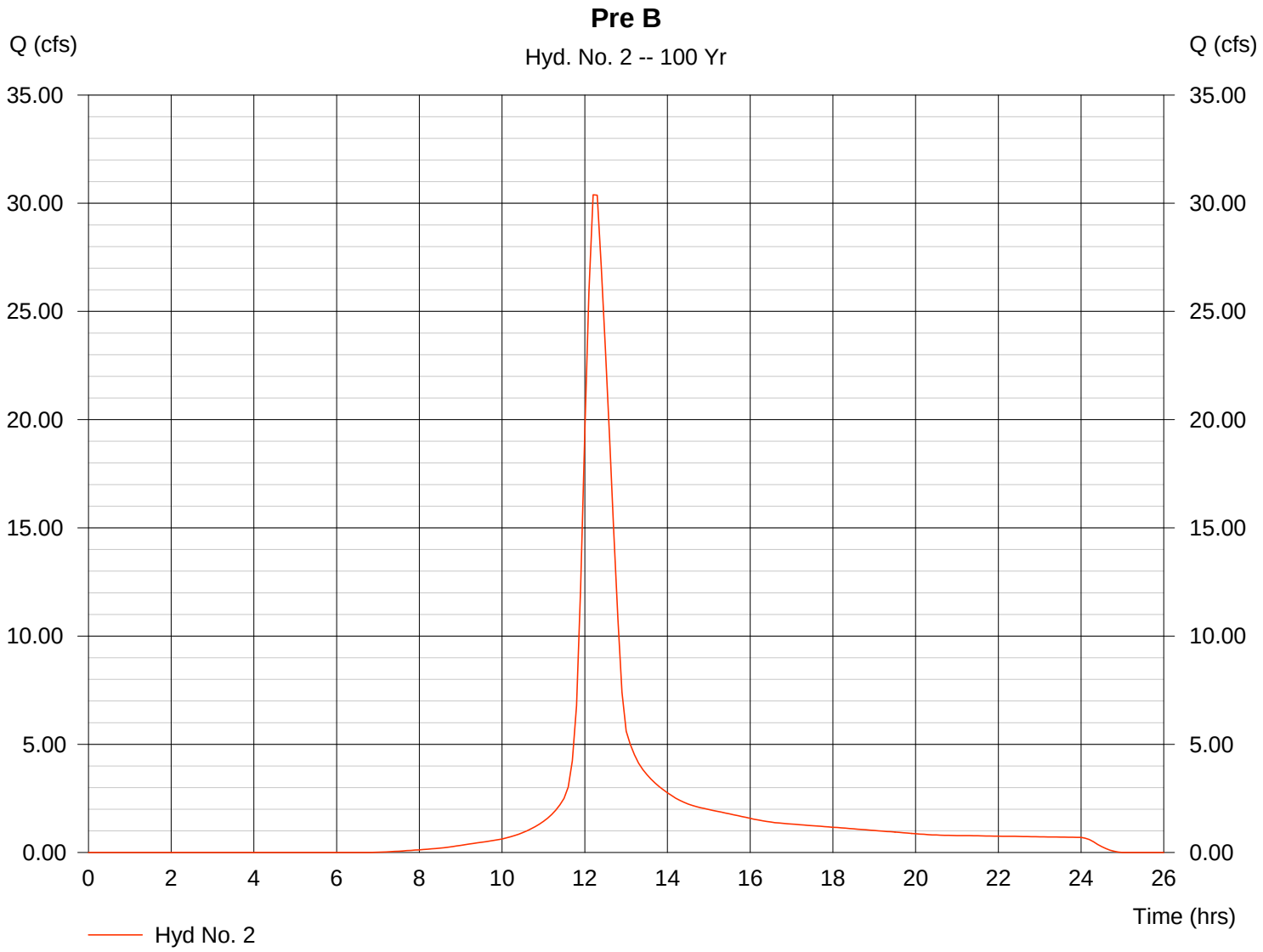
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 2

Pre B

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 30.39 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 8.600 ac | Curve number | = 74 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 30.90 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 3.508 acft



# Hydrograph Plot

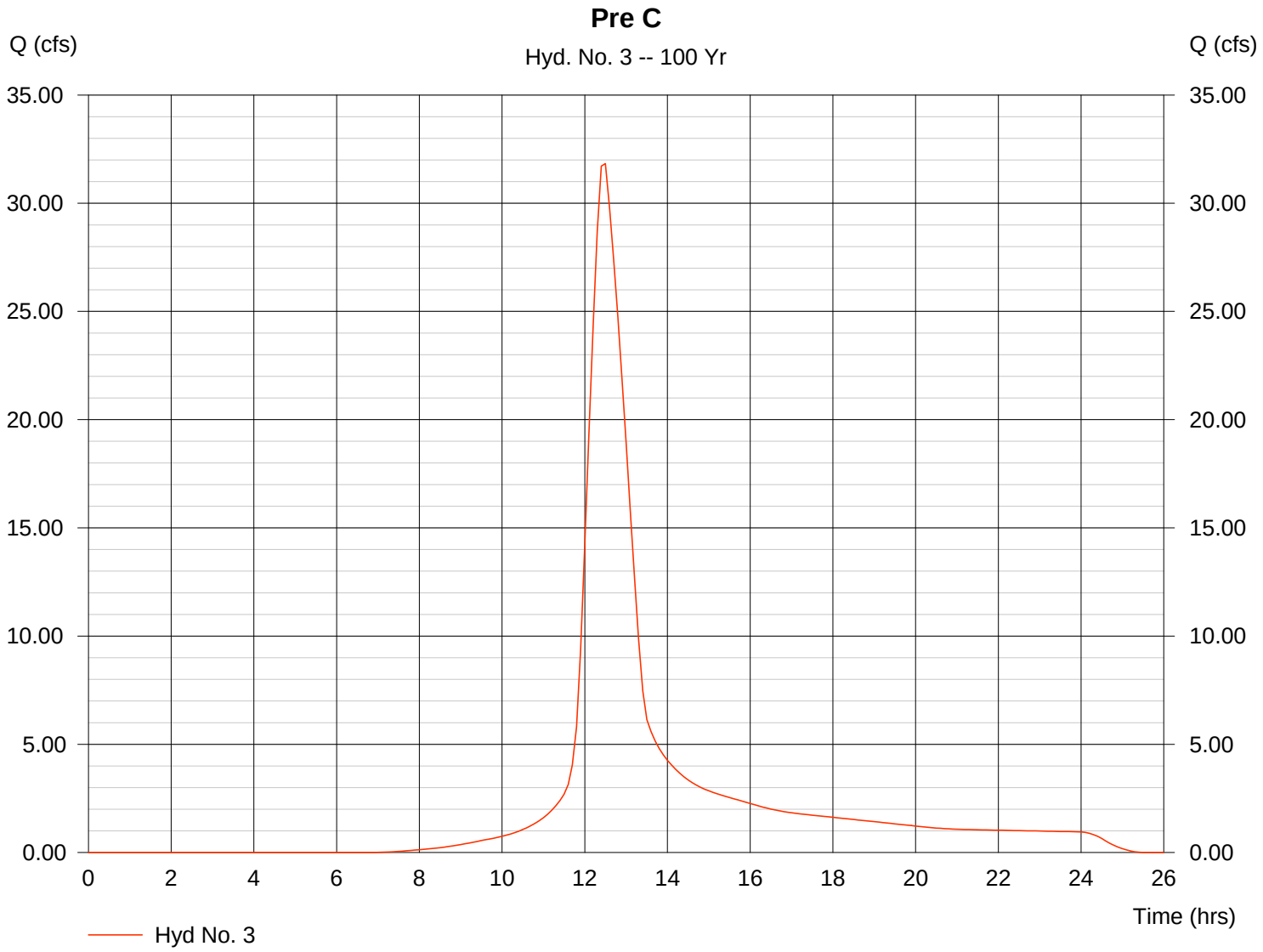
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 3

Pre C

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 31.83 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 12.000 ac | Curve number | = 74 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 59.20 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 4.747 acft



# Hydrograph Plot

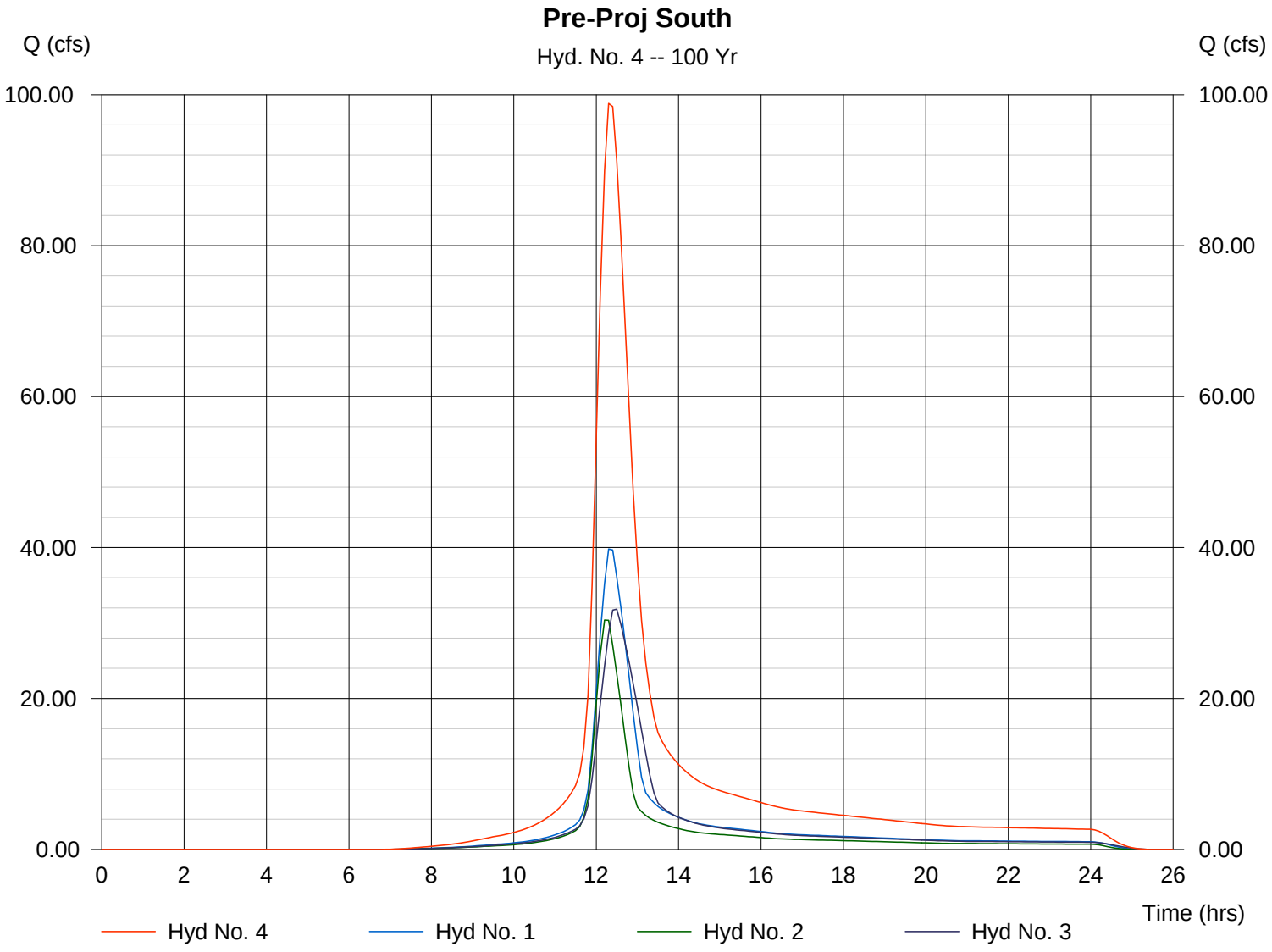
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 4

Pre-Proj South

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 98.85 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Inflow hyds. | = 1, 2, 3 | | |

Hydrograph Volume = 13.386 acft



# Hydrograph Plot

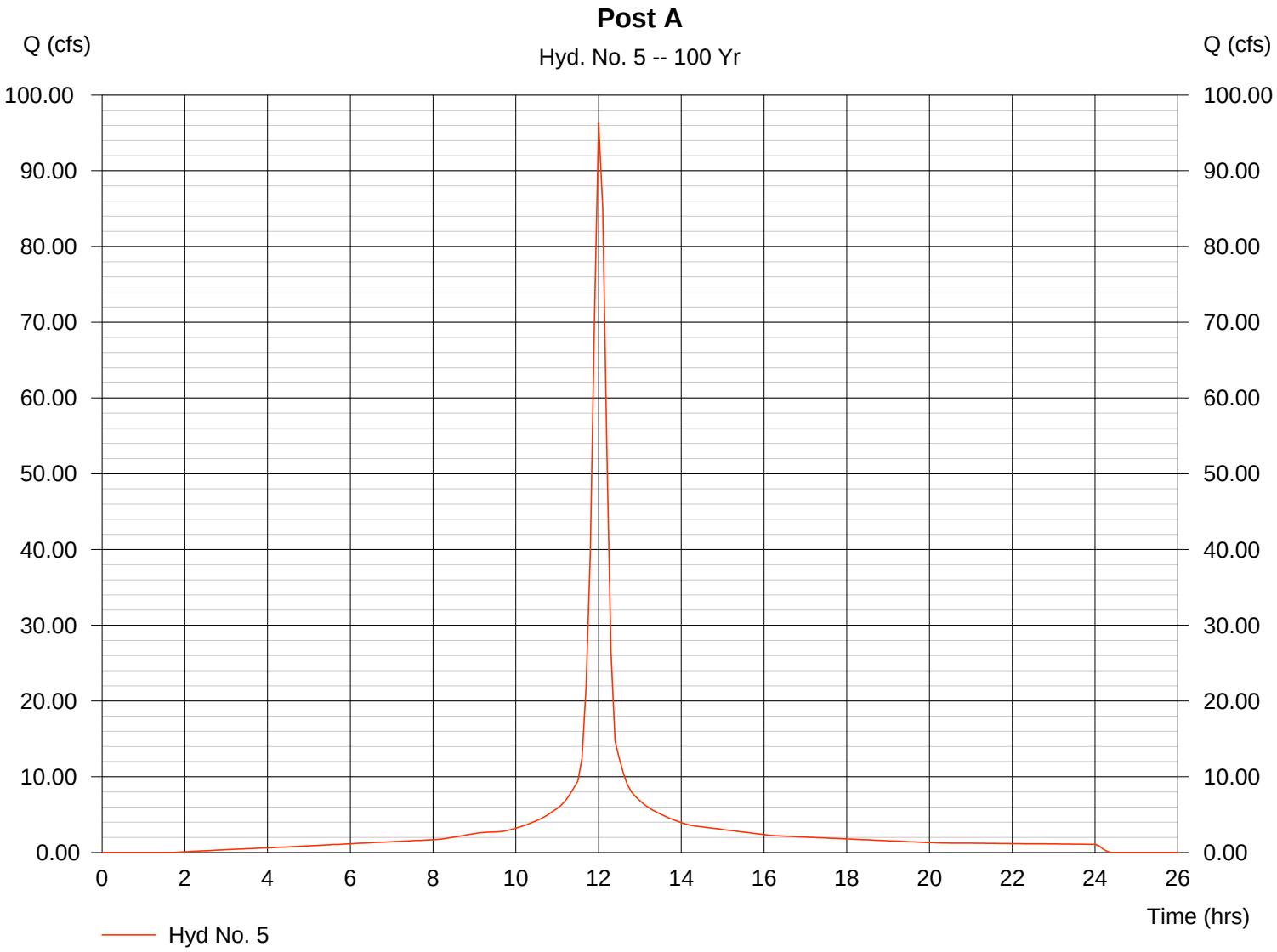
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 5

Post A

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 96.28 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 13.300 ac | Curve number | = 94 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 15.00 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 7.360 acft



# Hydrograph Plot

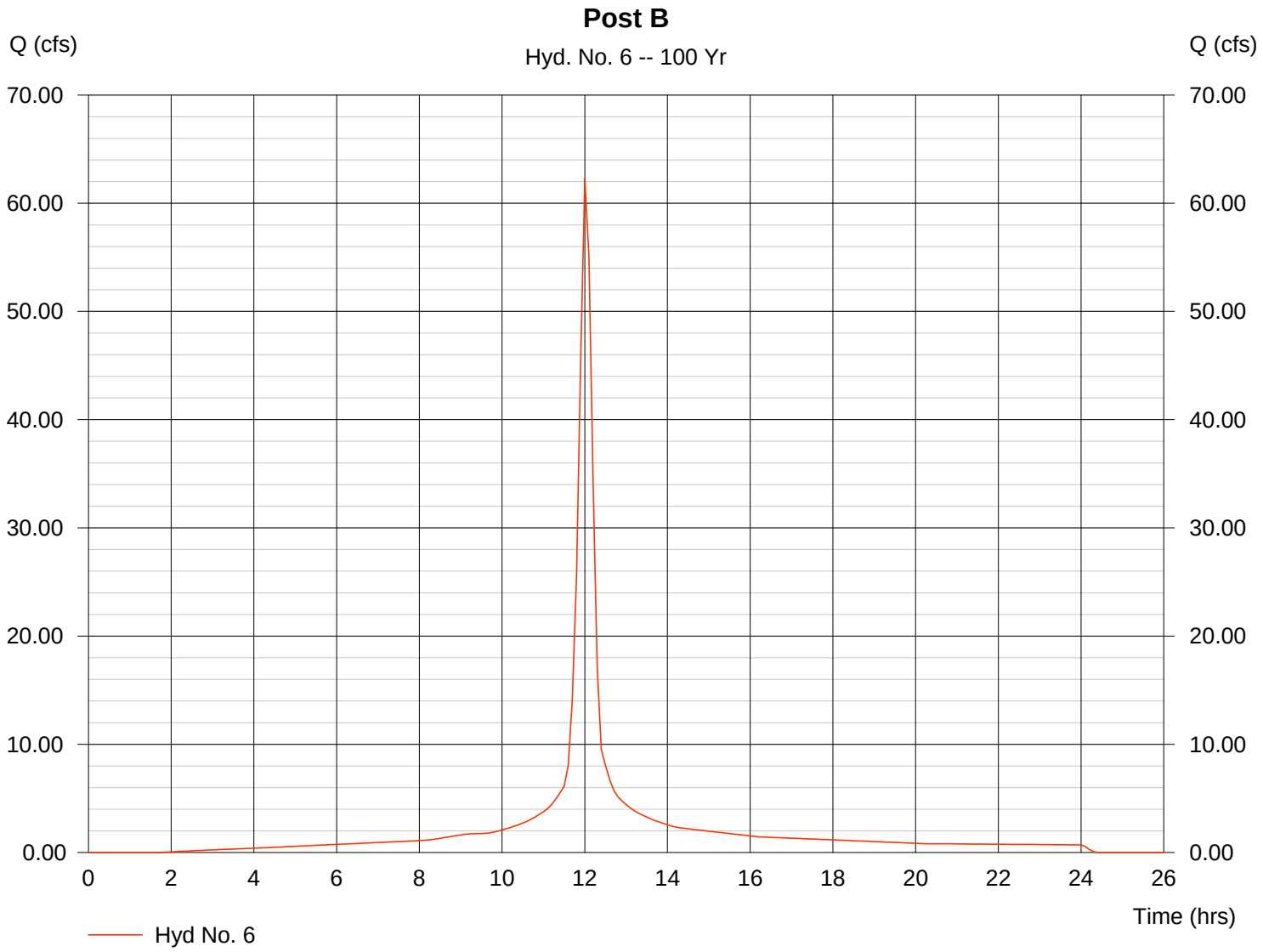
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 6

Post B

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 62.25 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 8.600 ac | Curve number | = 94 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 15.00 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 4.759 acft



# Hydrograph Plot

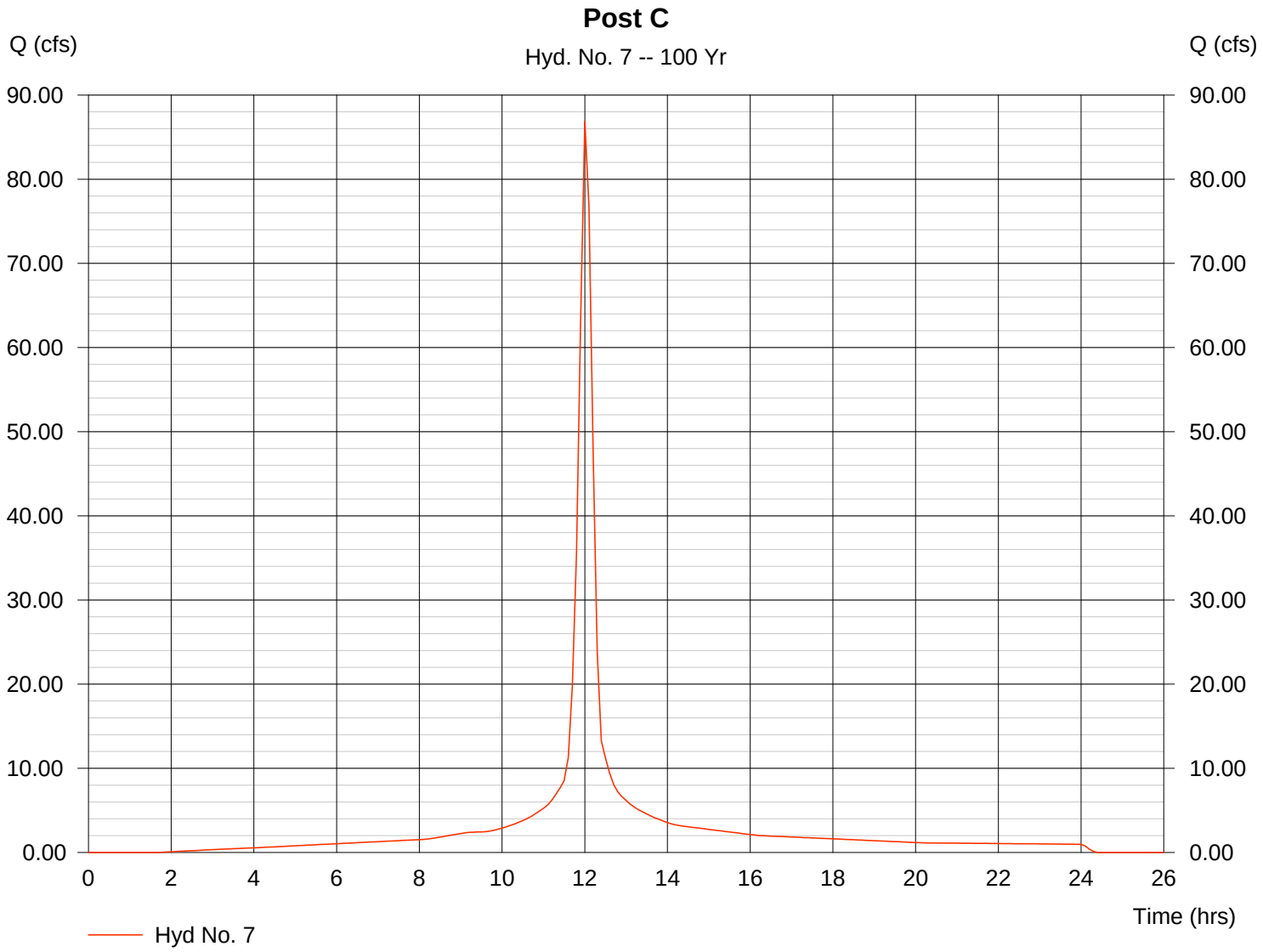
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 7

Post C

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 86.87 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 12.000 ac | Curve number | = 94 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 16.20 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 6.640 acft



# Hydrograph Plot

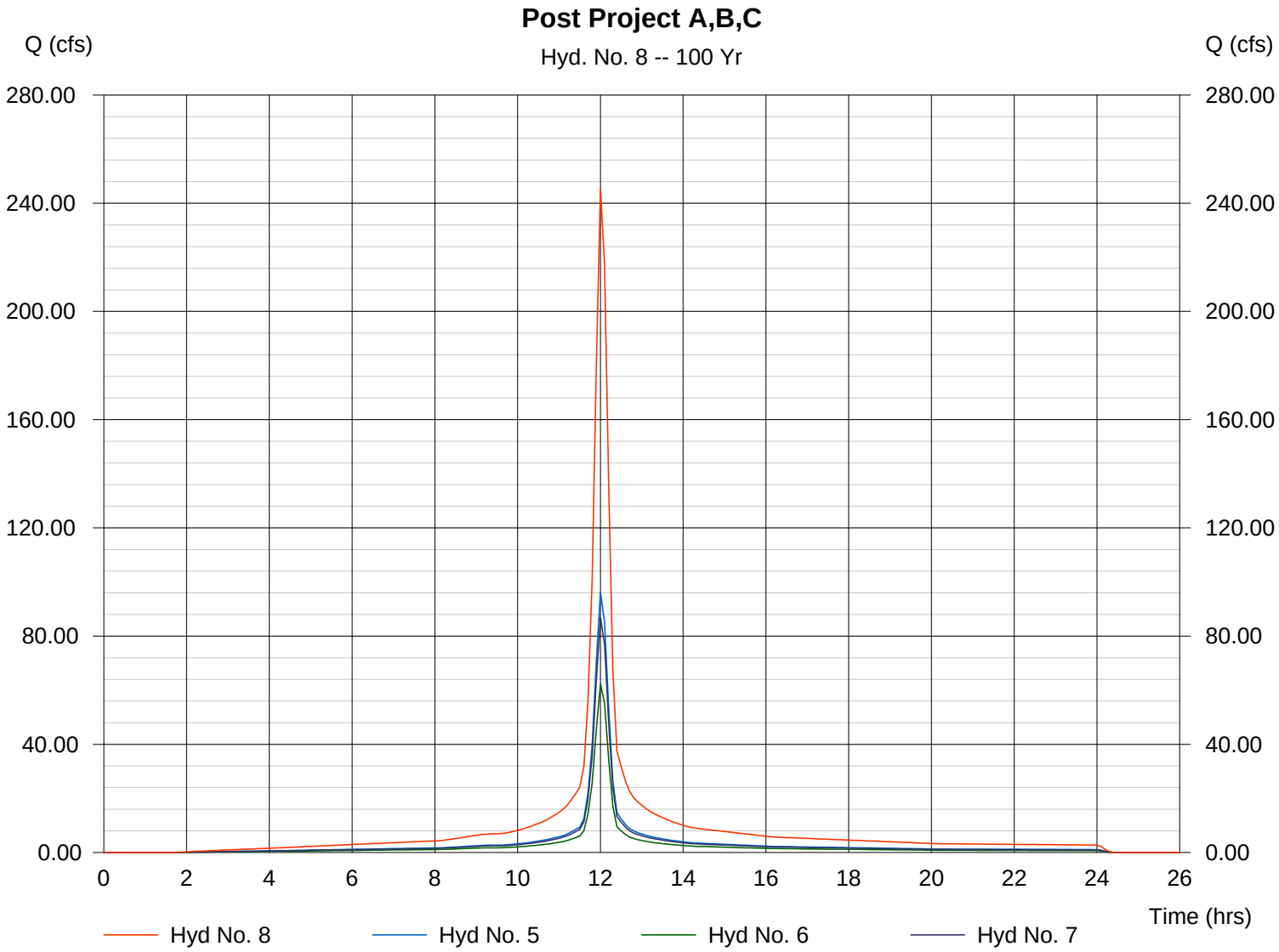
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 8

Post Project A,B,C

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 245.39 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Inflow hyds. | = 5, 6, 7 | | |

Hydrograph Volume = 18.759 acft



# Hydrograph Plot

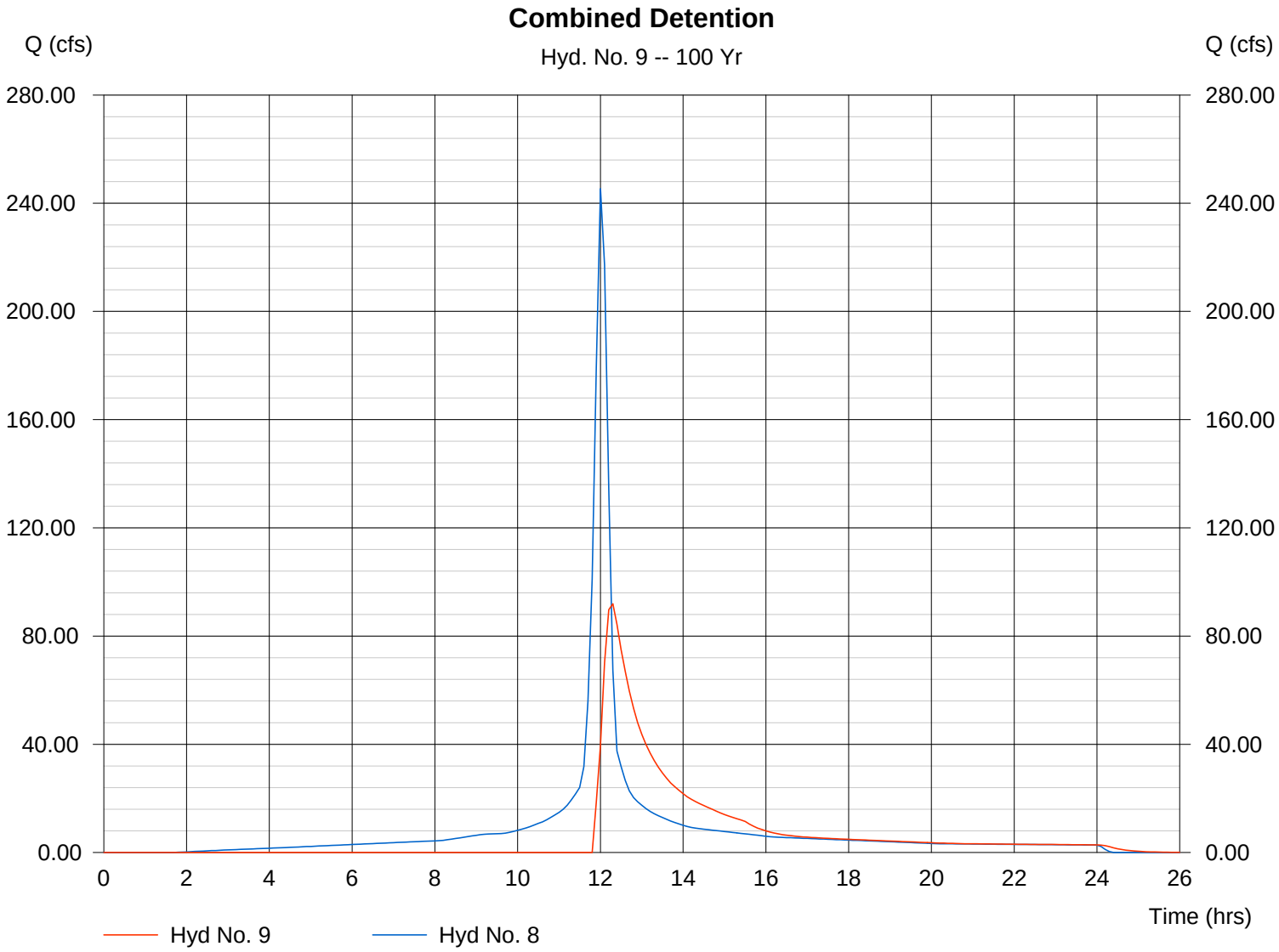
Hydraflow Hydrographs by Intelisolve | Thursday, Nov 9 2006, 2:7 PM

## Hyd. No. 9

Combined Detention

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 91.93 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 6 min |
| Inflow hyd. No. | = | 8 | Max. Elevation | = | 1352.53 ft |
| Reservoir name | = | Pond | Max. Storage | = | 9.995 acft |

Storage Indication method used. | Hydrograph Volume = 13.665 acft



# Pond Report



## Pond No. 1 - Pond

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (acft) | Total storage (acft) |
|---|---|---|---|---|
| 0.00 | 1350.00 | 161,572 | 0.000 | 0.000 |
| 1.00 | 1351.00 | 174,013 | 3.852 | 3.852 |
| 2.00 | 1352.00 | 186,755 | 4.141 | 7.993 |
| 3.00 | 1353.00 | 142,767 | 3.782 | 11.775 |
| 4.00 | 1354.00 | 162,669 | 3.506 | 15.281 |

### Culvert / Orifice Structures

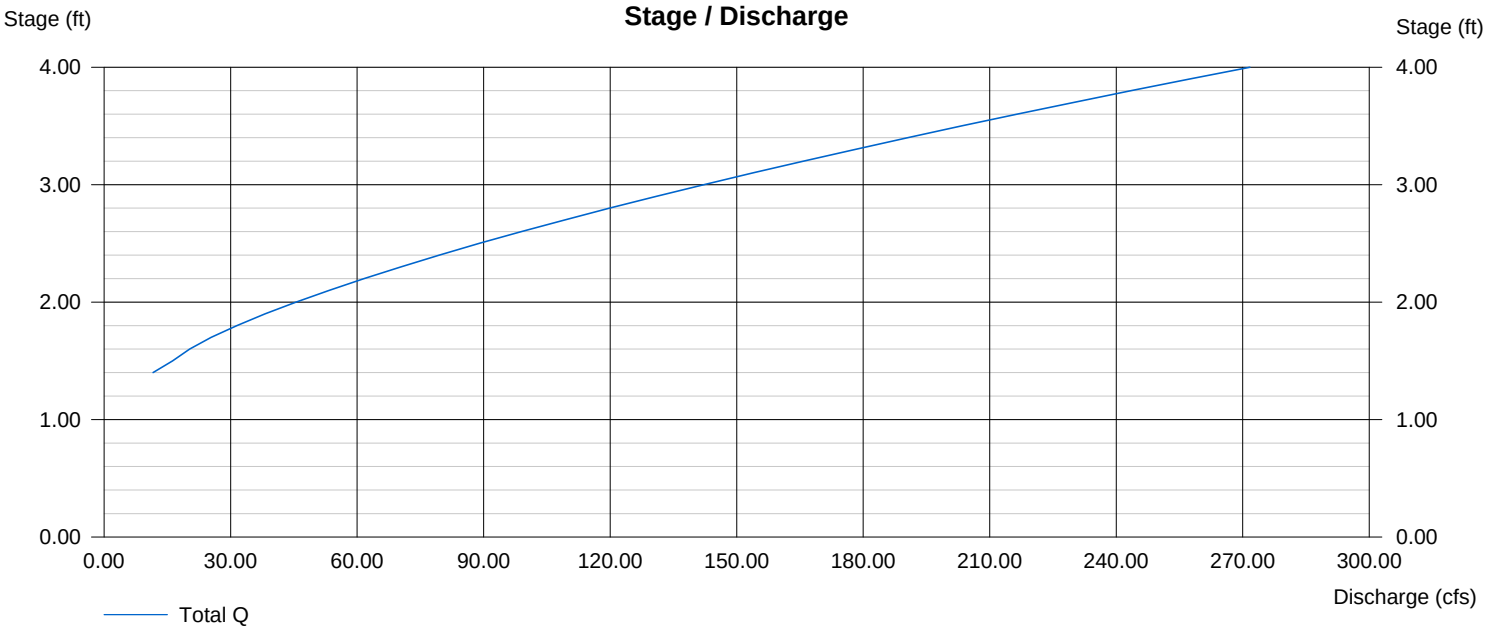
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Rise (in)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 0 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **N-Value** | = .013 | .000 | .000 | .000 |
| **Orif. Coeff.** | = 0.60 | 0.00 | 0.00 | 0.00 |
| **Multi-Stage** | = n/a | No | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 5.00 | 12.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 1350.00 | 1351.60 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 0.00 | 0.00 |
| **Weir Type** | = Rect | Rect | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfiltration =** 0.000 in/hr (Contour) Tailwater Elev. = 1351.30 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control. Weir riser checked for orifice conditions.



# Appendix G
# Preliminary Four Corner Lot Grading Plan

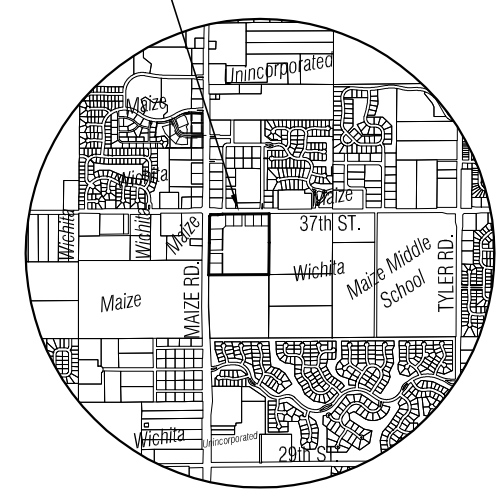
# NOTES

1. GEOGRAPHY: Located in the Northwest portion of the City of Wichita in an area currently transitioning from agricultural uses into urban residential, institutional and commercial uses with access to K-96 via Maize Rd. and or Ridge Rd. The surrounding land uses include urban residential to the Northwest and South, rural residential to the West, and agriculture production to the immediate South and East, and institutional uses East of the agriculture production.
2. LOT TOTAL - 11 Commercial parcels
3. ANNEXATION: Lies within the City of Wichita and adjoins the City of Maize to the North and West.
4. EXISTING USE: Agricultural
5. ZONING: Existing / proposed - "LC" w/ CUP DP 295 overlay THIS PLAT SHALL CONFORM TO THE RECITALS OF CUP DP 295.
6. PLAT AREA: Gross - 36.3 Ac.
   Net - 35.93 Ac.
7. SURVEY DATE: January, 2006 (by MKEC)
8. PUBLIC UTILITIES: Shall be extended to site. Municipal sanitary sewer shall be served from the East. Municipal water shall be served from existing mains to the North and West.
9. LEGAL DESCRIPTION: See hereon
10. ACCESS CONTROLS: Shall align with developments to the West and North and also conform to access management policies as shown hereon..
11. PROPOSED COMMERCIAL: According to CUP DP 295 the total number of buildings is limited to 16 with the following minimum building setbacks:
    Arterial Street setback = 35'
    Interior side setback = 15'
    Interior side setback = 35' **
    Exterior boundary setback = 100' **
    ** (if building has a gross floor area greater than 100,000 s.f.)
12. RESERVES: All reserves are platted for irrigation, landscaping, monuments, drainage, and utilities in designated areas. Reserve "C" is also platted for a private swimming pool, pool house, and parking.
13. FLOOD: According to FEMA FIRM Community Unit Panel 200321 0125A, Effective Date June 3rd, 1986; this property lies within flood zone "C", *"areas of minimal flooding."*
14. DRAINAGE: A drainage report shall accompany this plat. The property lies within a branch of the Sand Creek drainage basin, which drains to the Little Arkansas River located in Sedgwick County and generally draining from northeast to southwest.

# LEGAL DESCRIPTION

The North ½, NW. ¼, NW. ¼, Section 32, Township 26 South, Range 1 West, Sedgwick County Kansas, EXCEPT, road right-of-way on the West and North.
TOGETHER WITH,
The South ½, NW. ¼, NW. ¼, Section 32, Township 26 South, Range 1 West, Sedgwick County Kansas, EXCEPT, road right-of-way on the West.

PLAT LOCATION




**VICINITY MAP**

# BENCH MARKS

Datum BM - Top of "T" post 35' ± N. of the N. line of NW¼, Sec. 32, T26S, R1W and 1384' ± E. of NW. corner of said NW¼.
Elev. = 1353.54 (NGVD 29)
166.14 (City Datum)

BM#1 - Top of "T" post 660' ± S. of the N. line of NW ¼, Sec. 32, T26S, R1W and 1325' ± E. of W. line of said NW¼.
Elev.= 1351.69(NGVD 29)
164.29 (City Datum)

BM#2 - Top of "T" post 675' ± E. of the W. line of NW¼, Sec. 32, T26S, R1W and 1320' ± S. of the N. line of said NW¼.
Elev.=1351.79 (NGVD 29)
164.39 (City Datum)

BM#3 - Square cut on N. end of on top of RCP 50' ± E. of the W. line of NW¼, Sec. 32, T26S, R1W and 660' ± S. of the N. line of said NW¼.
Elev.=1353.59 (NGVD 29)
166.19 (City Datum)

NORTH

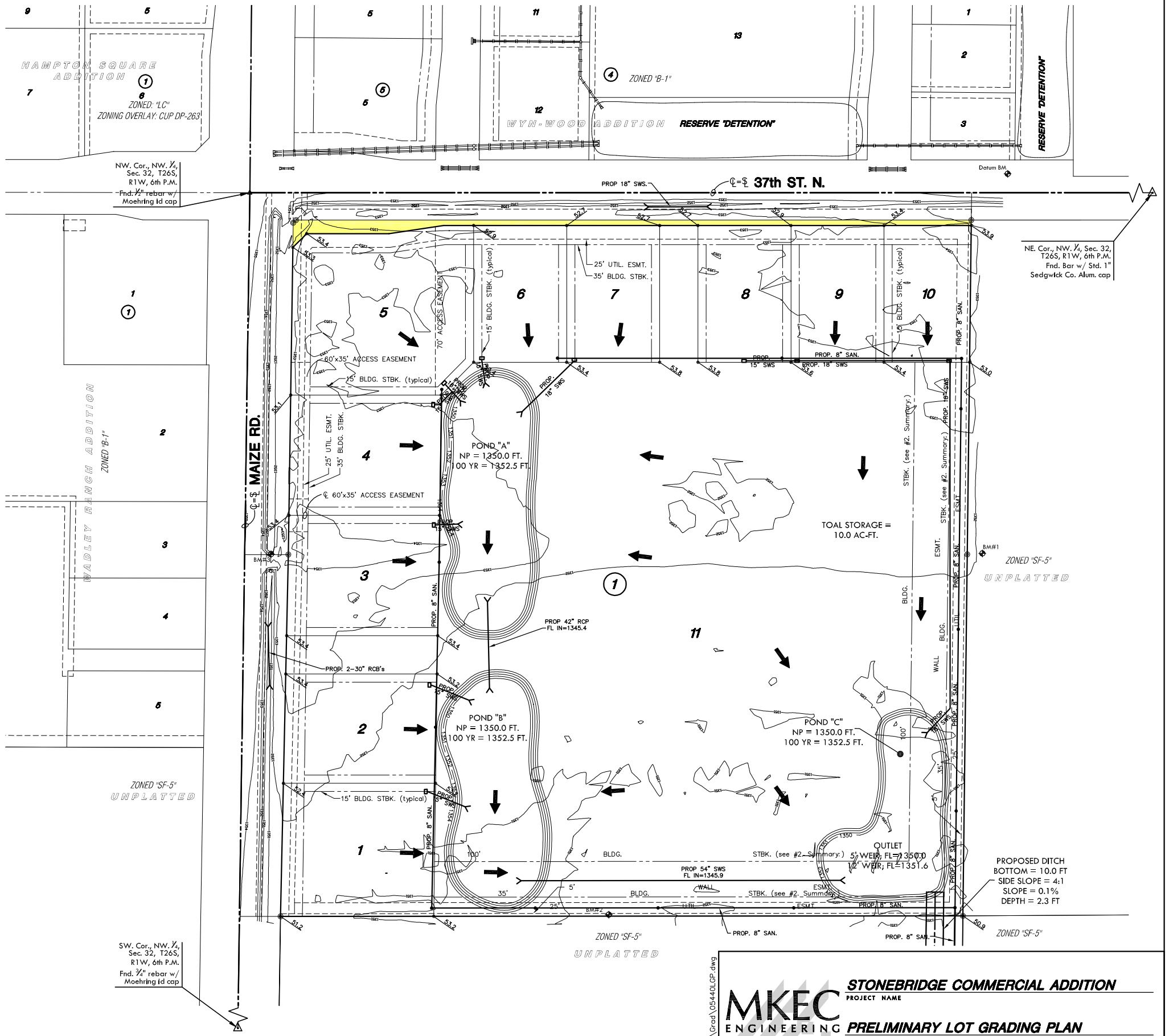
100 0 100 200

1"=100'
1 : 1,200

# LEGEND

- 6IN - CONIFEROUS TREE & DIAMETER
- 3IN - DECIDUOUS TREE & DIAMETER
- SN - SIGN
- PP - POWER POLE AND GUY ANCHOR
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SECTION CORNER
- BM - BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UGE - UNDERGROUND ELECTRIC LINE
- OHE - OVERHEAD ELECTRIC
- FOC - FIBER OPTIC CABLE !
- XX.X - SPOT ELEVATIONS
- FLOW ARROW

| MINIMUM PAD ELEVATIONS *LOWEST OPENINGS* | | |
|---|---|---|
| LOTS *(inclusive)* | BLOCK | ELEVATION *NGVD* |
| 1 - 2 | 1 | 1355.5 |
| 3 - 11 | 1 | 1355.5 |




REVISED 11-06: UPDATED DITCH SIZE AND DETENTION PONDS 100-YEAR WATER SURFACE ELEVATIONS

J:\Civil\05440\dwg\Grad\05440LGP.dwg

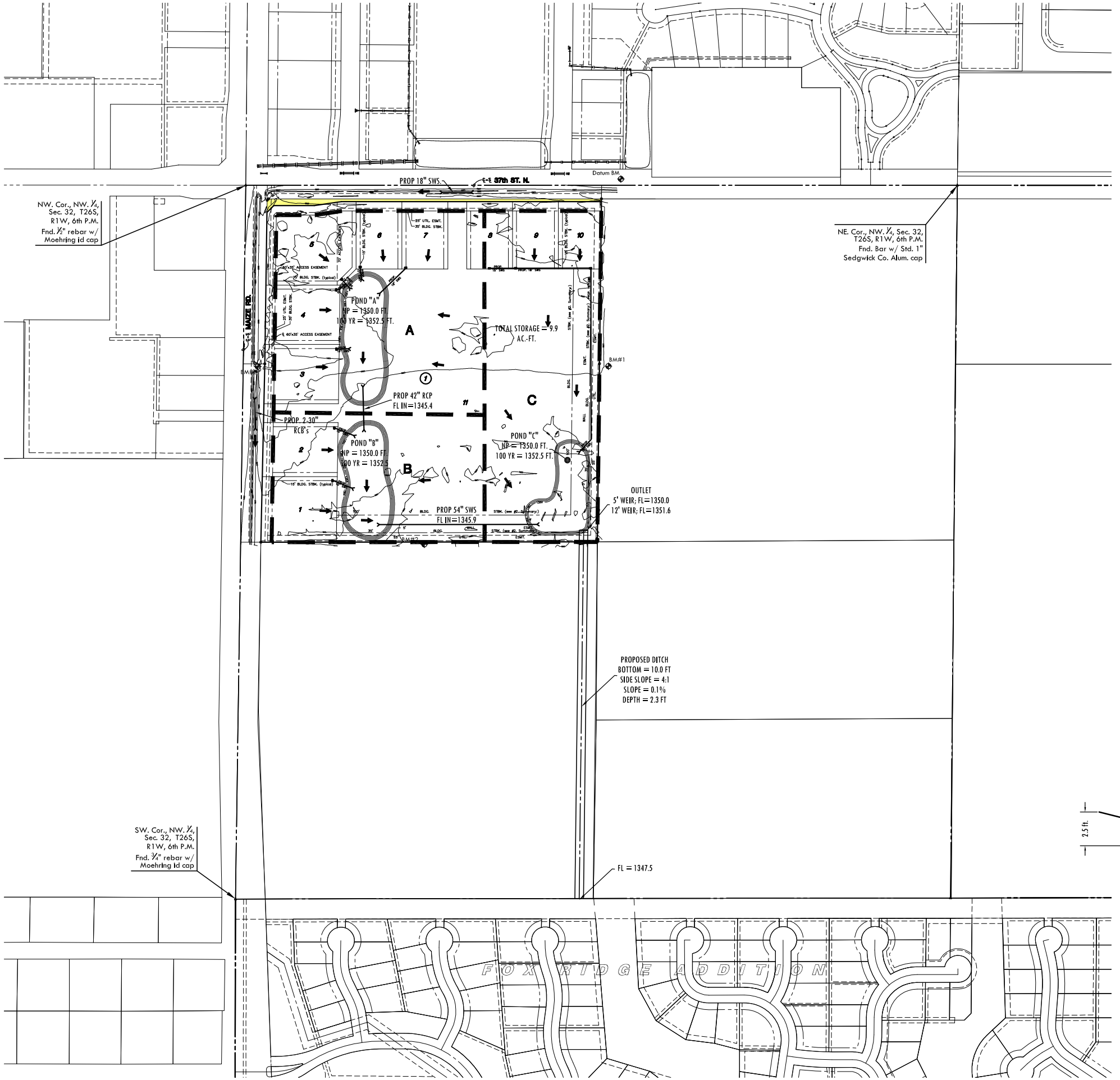
MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

**STONEBRIDGE COMMERCIAL ADDITION**
PROJECT NAME

**PRELIMINARY LOT GRADING PLAN**
SHEET TITLE

| AJK | JFL | GJA |
|---|---|---|
| DESIGN BY: | DRAWN BY: | CHECKED BY: |
| AUGUST 2006 | 05440 | 1 / 1 |
| DATE | JOB NO. | SHEET/OF |

# Appendix H
# FlowMaster Output and Drainage Ditch Plan and Section




## LEGEND

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- DIN - DECIDUOUS TREE & DIAMETER
- SN - SIGN
- PP - POWER POLE AND GUY ANCHOR
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SECTION CORNER
- BM - BENCHMARK
- EASEMENT
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- FENCE
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- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UGE - UNDERGROUND ELECTRIC LINE
- OHE - OVERHEAD ELECTRIC
- FOC - FIBER OPTIC CABLE I
- DRAINAGE BOUNDARY
- A - DRAINAGE BOUNDARY LABEL
- FLOW ARROW

NORTH

200 0 200 400

1"=200'

## NOTES

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166.14 (City Datum)

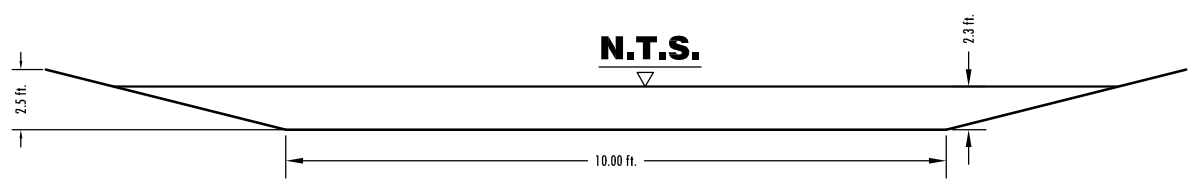
BM#1 — Top of "T" post 660' ± S. of the N. line of NW ¼, Sec. 32, T26S, R1W and 1325' ± E. of W. line of said NW ¼.
Elev.= 1351.69(NGVD 29)
164.29 (City Datum)

BM#2 — Top of "T" post 675' ± E. of the W. line of NW ¼, Sec. 32, T26S, R1W and 1320' ± S. of the N. line of said NW ¼.
Elev.=1351.79 (NGVD 29)
164.39 (City Datum)

BM#3 — Square cut on N. end of on top of RCP 50' ± E. of the W. line of NW ¼, Sec. 32, T26S, R1W and 660' ± S. of the N. line of said NW. ¼.
Elev.=1352.59 (NGVD 29)
166.19 (City Datum)

## LEGAL DESCRIPTION

The North ½, NW. ¼, NW. ¼, Section 32, Township 26 South, Range 1 West, Sedgwick County Kansas, EXCEPT, road right-of-way on the West and North.
TOGETHER WITH,
The South ½, NW. ¼, NW. ¼, Section 32, Township 26 South, Range 1 West, Sedgwick County Kansas, EXCEPT, road right-of-way on the West.




## CROSS SECTION FOR DITCH

J:\Civil\05440\dwg\Drng\05440_DITCH.dwg

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

**STONEBRIDGE COMMERCIAL ADDITION** — PROJECT NAME
**LOCATION OF DITCH TO FOX RIDGE** — SHEET TITLE

| AJK | JFL | GJA |
|---|---|---|
| DESIGN BY: | DRAWN BY: | CHECKED BY: |
| AUGUST 2006 | 05440 | 1 / 1 |
| DATE | JOB NO. | SHEET/OF |

# Ditch to Fox Ridge 0.1% Slope
## Worksheet for Trapezoidal Channel

| Project Description | |
|---|---|
| Project File | k:\wp\project\2005\05440 - stonebridge commercial\drainage\flowmaster\ditch to.fm2 |
| Worksheet | Ditch to Fox Ridge 0.001 ft/ft |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

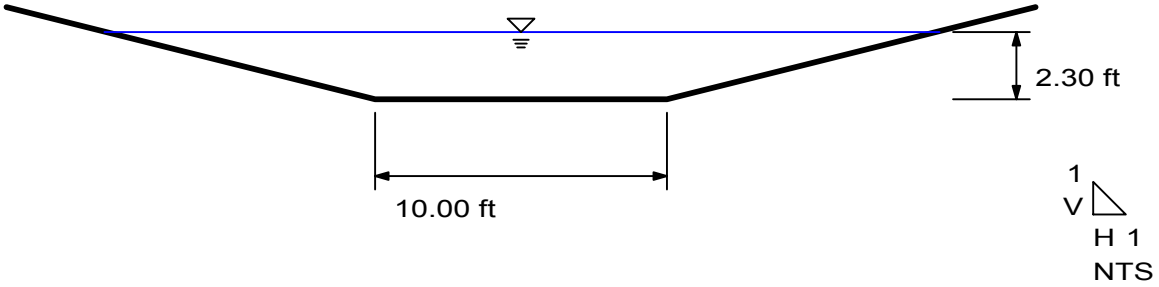
| Input Data | | |
|---|---|---|
| Mannings Coefficient | 0.030 | |
| Channel Slope | 0.001000 | ft/ft |
| Left Side Slope | 4.000000 | H : V |
| Right Side Slope | 4.000000 | H : V |
| Bottom Width | 10.00 | ft |
| Discharge | 92.00 | cfs |

| Results | | |
|---|---|---|
| Depth | 2.30 | ft |
| Flow Area | 44.29 | ft² |
| Wetted Perimeter | 29.00 | ft |
| Top Width | 28.44 | ft |
| Critical Depth | 1.17 | ft |
| Critical Slope | 0.013914 | ft/ft |
| Velocity | 2.08 | ft/s |
| Velocity Head | 0.07 | ft |
| Specific Energy | 2.37 | ft |
| Froude Number | 0.29 | |
| Flow is subcritical. | | |

# Ditch to Fox Ridge 0.1% Slope
## Cross Section for Trapezoidal Channel

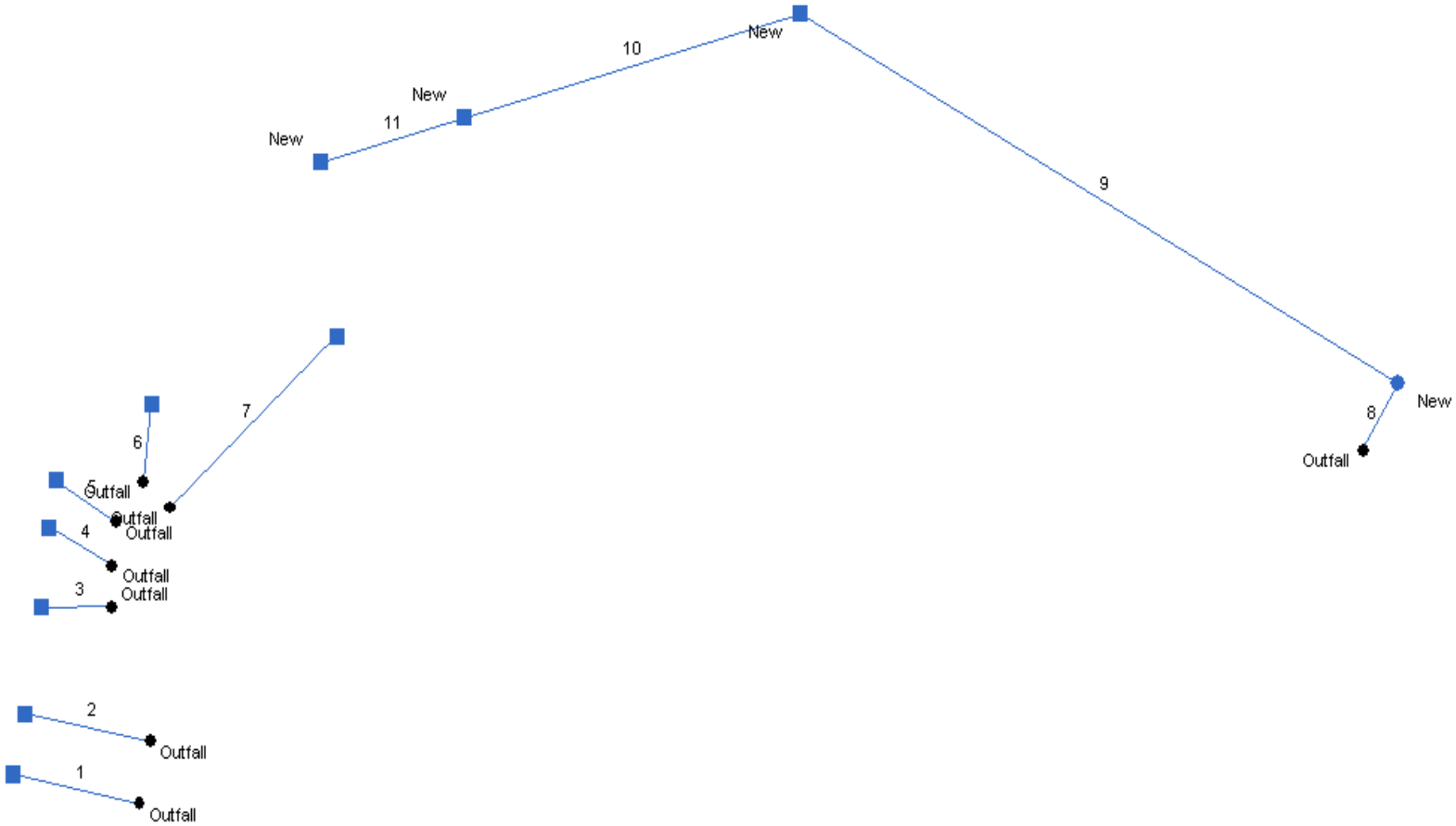
| Project Description | |
|---|---|
| Project File | k:\wp\project\2005\05440 - stonebridge commercial\drainage\flowmaster\ditch to.fm2 |
| Worksheet | Ditch to Fox Ridge 0.001 ft/ft |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | | |
|---|---|---|
| Mannings Coefficient | 0.030 | |
| Channel Slope | 0.001000 | ft/ft |
| Depth | 2.30 | ft |
| Left Side Slope | 4.000000 | H : V |
| Right Side Slope | 4.000000 | H : V |
| Bottom Width | 10.00 | ft |
| Discharge | 92.00 | cfs |



# Appendix I
# Preliminary Storm Sewer Design for Lots 1-10

# Hydraflow Plan View




| Project File: stonebridge_5yr.stm | No. Lines: 11 | 08-22-2006 |
|---|---|---|

# Storm Sewer Summary Report



| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns line No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Lot 1 | 4.59 | 15 c | 75.0 | 1353.00 | 1353.33 | 0.440 | 1353.86 | 1354.47 | 0.24 | 1354.71 | End |
| 2 | Lot 2 | 4.20 | 15 c | 75.0 | 1353.00 | 1353.33 | 0.440 | 1353.82 | 1354.40 | 0.22 | 1354.62 | End |
| 3 | Lot 3 | 4.23 | 15 c | 41.0 | 1353.30 | 1353.48 | 0.439 | 1354.12 | 1354.49 | 0.24 | 1354.74 | End |
| 4 | Lot 4 | 3.52 | 15 c | 42.0 | 1353.30 | 1353.48 | 0.428 | 1354.10 | 1354.36 | 0.23 | 1354.59 | End |
| 5 | Lot 5 | 5.28 | 18 c | 41.0 | 1353.30 | 1353.48 | 0.439 | 1354.22 | 1354.47 | 0.29 | 1354.75 | End |
| 6 | Lot 6 | 3.17 | 15 c | 41.0 | 1353.30 | 1353.48 | 0.439 | 1354.06 | 1354.29 | 0.22 | 1354.51 | End |
| 7 | Lot 7 | 5.64 | 18 c | 133.0 | 1353.30 | 1353.88 | 0.436 | 1354.21 | 1355.00 | 0.25 | 1355.25 | End |
| 8 | | 3.71 | 18 c | 41.0 | 1352.30 | 1352.34 | 0.097 | 1353.21 | 1353.34 | 0.14 | 1353.48 | End |
| 9 | Lot 8, 9, 10 | 3.93 | 18 c | 400.0 | 1352.30 | 1352.80 | 0.125 | 1353.64 | 1354.14 | 0.10 | 1354.23 | 8 |
| 10 | Lot 9 | 4.06 | 18 c | 204.0 | 1352.80 | 1353.16 | 0.177 | 1354.23 | 1354.49 | 0.05 | 1354.54 | 9 |
| 11 | Lot 8 | 1.60 | 15 c | 87.0 | 1353.30 | 1353.38 | 0.092 | 1354.60 | 1354.63 | 0.03 | 1354.66 | 10 |

Project File: stonebridge_5yr.stm | Number of lines: 11 | Run Date: 08-22-2006

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs.

# Storm Sewer Inventory Report



| Line No. | Alignment | | | | Flow Data | | | | Physical Data | | | | | | | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dnstr line No. | Line length (ft) | Defl angle (deg) | Junc type | Known Q (cfs) | Drng area (ac) | Runoff coeff (C) | Inlet time (min) | Invert El Dn (ft) | Line slope (%) | Invert El Up (ft) | Line size (in) | Line type | N value (n) | J-loss coeff (K) | Inlet/ Rim El (ft) | |
| 1 | End | 75.0 | -168.1 | Curb | 0.00 | 1.20 | 0.84 | 15.0 | 1353.00 | 0.44 | 1353.33 | 15 | Cir | 0.013 | 1.00 | 0.00 | Lot 1 |
| 2 | End | 75.0 | -168.7 | Curb | 0.00 | 1.10 | 0.84 | 15.0 | 1353.00 | 0.44 | 1353.33 | 15 | Cir | 0.013 | 1.00 | 0.00 | Lot 2 |
| 3 | End | 41.0 | 179.4 | Curb | 0.00 | 1.20 | 0.84 | 18.0 | 1353.30 | 0.44 | 1353.48 | 15 | Cir | 0.013 | 1.00 | 0.00 | Lot 3 |
| 4 | End | 42.0 | -151.4 | Curb | 0.00 | 1.00 | 0.84 | 18.0 | 1353.30 | 0.43 | 1353.48 | 15 | Cir | 0.013 | 1.00 | 0.00 | Lot 4 |
| 5 | End | 41.0 | -148.1 | Curb | 0.00 | 1.50 | 0.84 | 18.0 | 1353.30 | 0.44 | 1353.48 | 18 | Cir | 0.013 | 1.00 | 0.00 | Lot 5 |
| 6 | End | 41.0 | -83.4 | Curb | 0.00 | 0.90 | 0.84 | 18.0 | 1353.30 | 0.44 | 1353.48 | 15 | Cir | 0.013 | 1.00 | 0.00 | Lot 6 |
| 7 | End | 133.0 | -43.0 | Curb | 0.00 | 1.60 | 0.84 | 18.0 | 1353.30 | 0.44 | 1353.88 | 18 | Cir | 0.013 | 1.00 | 0.00 | Lot 7 |
| 8 | End | 41.0 | -60.0 | MH | 0.00 | 0.00 | 0.84 | 0.0 | 1352.30 | 0.10 | 1352.34 | 18 | Cir | 0.013 | 1.00 | 0.00 | |
| 9 | 8 | 400.0 | -90.7 | Curb | 0.00 | 0.00 | 0.84 | 0.0 | 1352.30 | 0.12 | 1352.80 | 18 | Cir | 0.013 | 1.13 | 0.00 | Lot 8, 9, 10 |
| 10 | 9 | 204.0 | -45.0 | Curb | 0.00 | 0.80 | 0.84 | 22.0 | 1352.80 | 0.18 | 1353.16 | 18 | Cir | 0.013 | 0.50 | 0.00 | Lot 9 |
| 11 | 10 | 87.0 | 0.0 | Curb | 0.00 | 0.50 | 0.84 | 22.0 | 1353.30 | 0.09 | 1353.38 | 15 | Cir | 0.013 | 1.00 | 0.00 | Lot 8 |

Project File: stonebridge_5yr.stm | Number of lines: 11 | Date: 08-22-2006