# 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 intersection. 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 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). This area will be revised by a LOMR for Fox Ridge. A CLOMR for Fox Ridge has been approved Case No. 05-07-0395R.

### *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 eventually enters the 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 once when the final lot layout is complete; however the storage provided by the ponds will remain. Drainage easements will be added to the plat by separate instrument to cover the ponds.

### *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 Lot Grading Plan is Appendix G.

### *Runoff Characteristics*

Post-project runoff will exit the site though a proposed ditch connecting the proposed detention ponds to the Fox Ridge Lakes. The ditch will outlet to the Fox Ridge lake at the NP elevation. The ditch will have a 0.2% slope, bottom width of 22.0 ft, side slope of 4 to 1, and a 100-year depth of 1.2 ft. The post-project 100-year runoff from the Stonebridge Commercial Addition will be contained within the banks of the proposed ditch. The ditch was sized using Flow Master, Appendix H. The normal pool elevations (NP) of the of the Stonebridge Commercial detention ponds were set based on the on the proposed ditch.

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 NP elevations. The differing 100-year water surface elevations for the ponds are due to the increasing tailwater elevations. The CLOMR for Fox Ridge Addition defines a 100-year water surface elevation of 164.2 ft (1351.6 NGVD) and a 10-year water surface elevation of 163.0 ft (1350.4 NGVD) for the Fox Ridge Lake where the ditch will outlet. A tailwater elevation of 164.2 (1351.6 NGVD) was used for Pond “C” for the 100-year design storm. Tailwater was not considered for Pond “C” for the 2, 5, or 10-year design storms. The post-project time of concentrations were calculated using the FAA Method, Appendix E. The post-project basins were modeled in Hydraflow Hydrographs 2004 by Intelisolve, Appendix F. A notched weir was designed for Pond “C” to control runoff in minor design storms. Table 1 compares the pre-project and post-project flow rates exiting the site.

**Table 1. Stonebridge Commercial Runoff.**

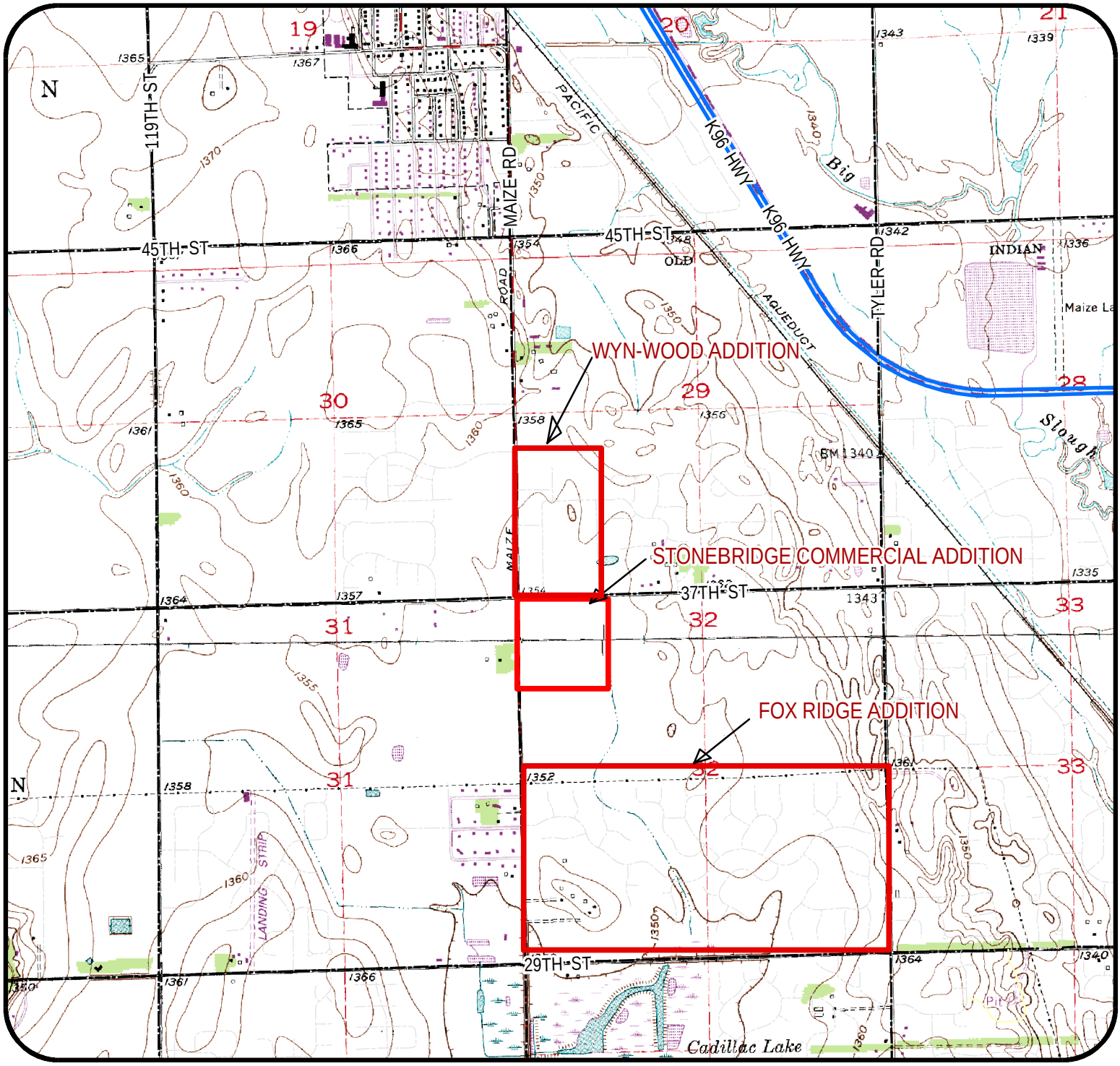
| Description | Design Storm Flows (cfs) | | | |
|---|---|---|---|---|
| | 2-Yr | 5-Yr | 10-Yr | 100-Yr |
| Pre-Project Total Flow to the South | 18.1 | 30.9 | 44.3 | 98.9 |
| Post-Project Total Flow to the South | 18.8 | 31.6 | 39.6 | 69.9 |

Runoff increases, from pre-project to post-project, in the 2 and 5-year event by 0.7 cfs. Runoff is decreases by 4.7 cfs in the 10-year event and 29.0 cfs in the 100-year event.

## 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 accommodate the post-project 100-year flow rate from the subject property. The ditch was also used to set the normal pool (NP) elevation for the proposed detention ponds. A notched weir was designed for Pond "C" to control runoff from minor storm events. Runoff increases, from pre-project to post-project, in the 2 and 5-year event by 0.7 cfs. Runoff is decreases by 4.7 cfs in the 10-year event and 29.0 cfs in the 100-year event.

# 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:

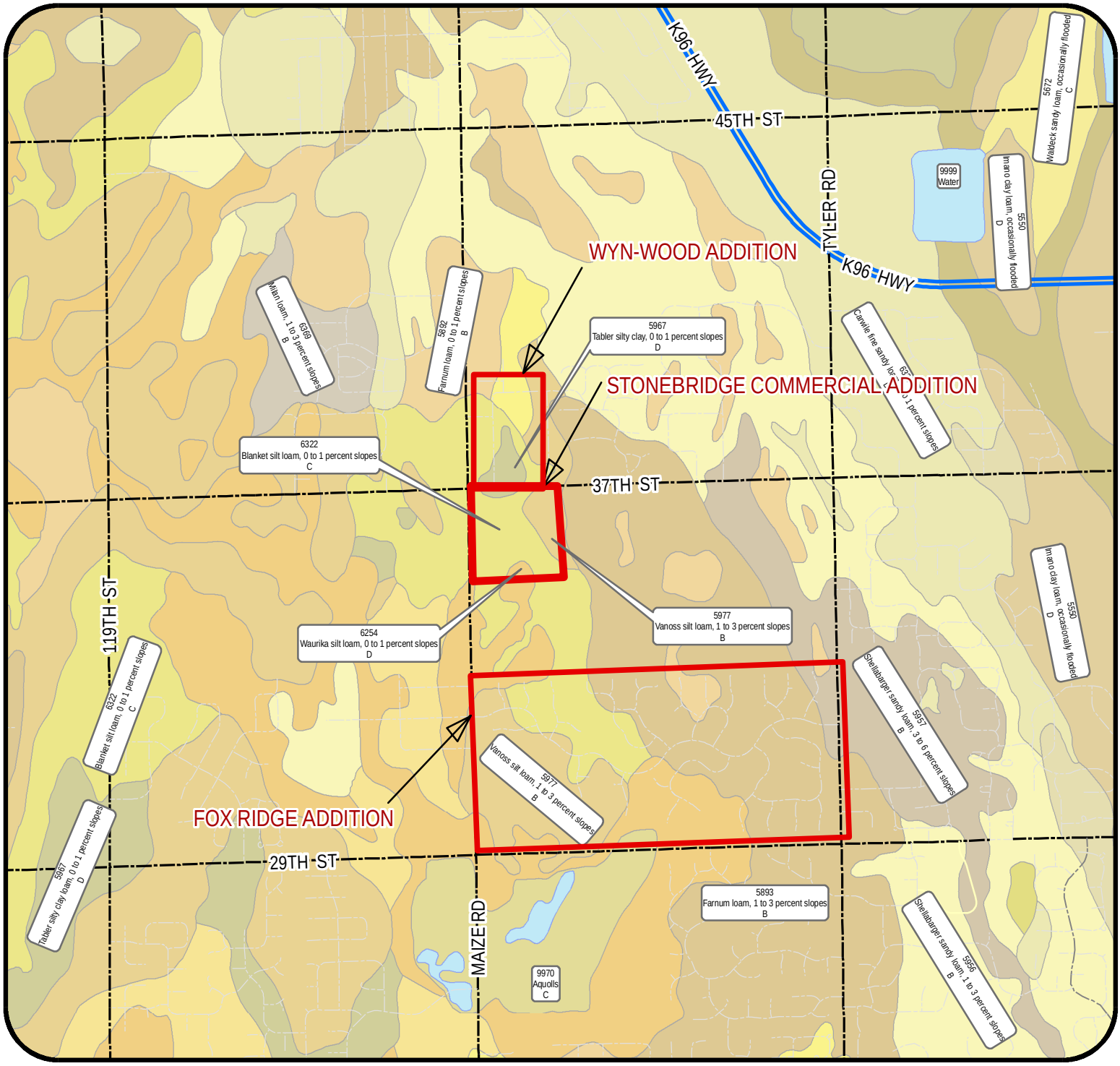
USGS - Sedgwick County, KS

Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

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

# Appendix B
# Soil Survey




1 0.5 0 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:

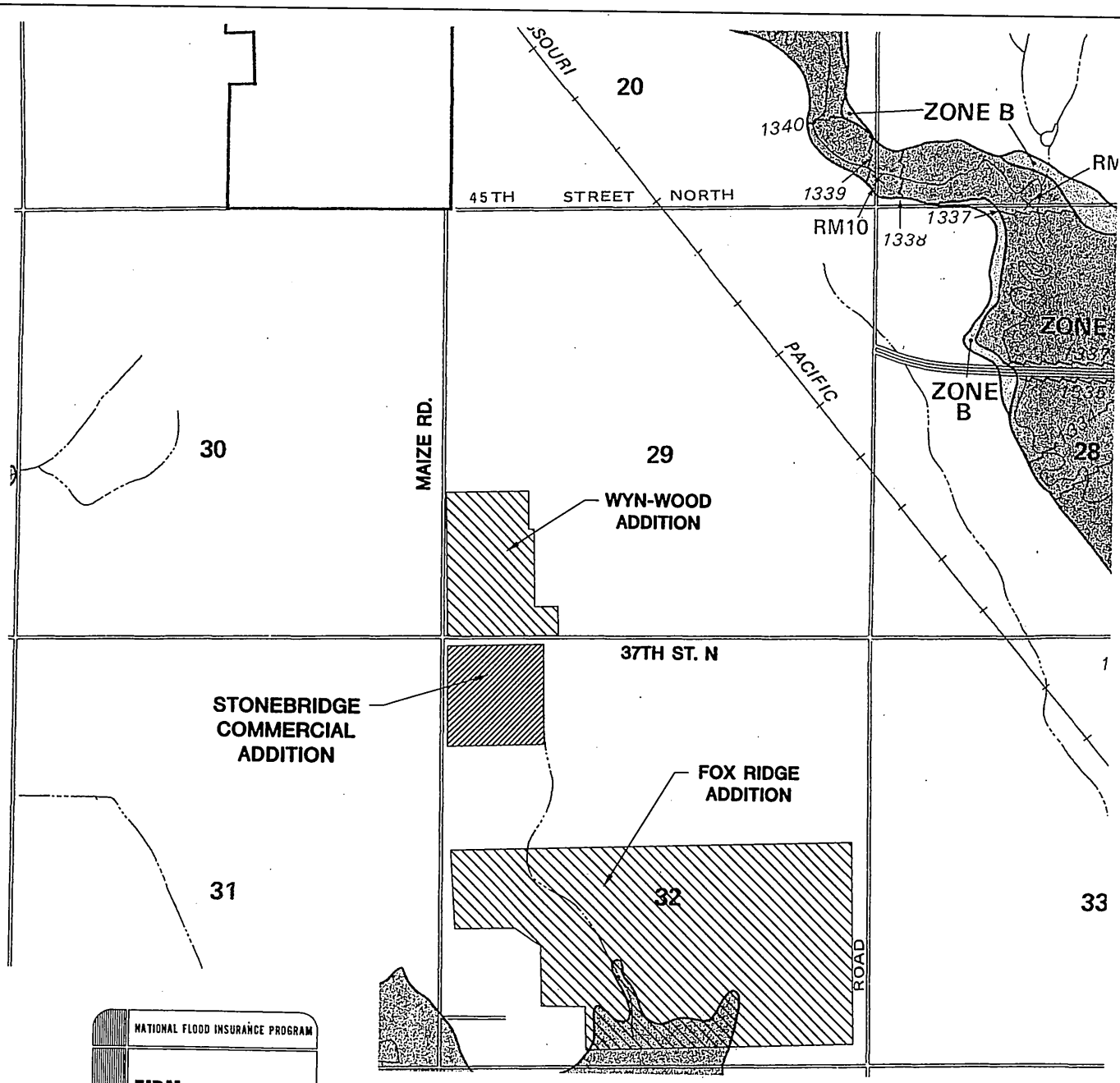
Soil Survey - Sedgwick County, KS

Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

| | |
|---|---|
| AJK | MAY 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

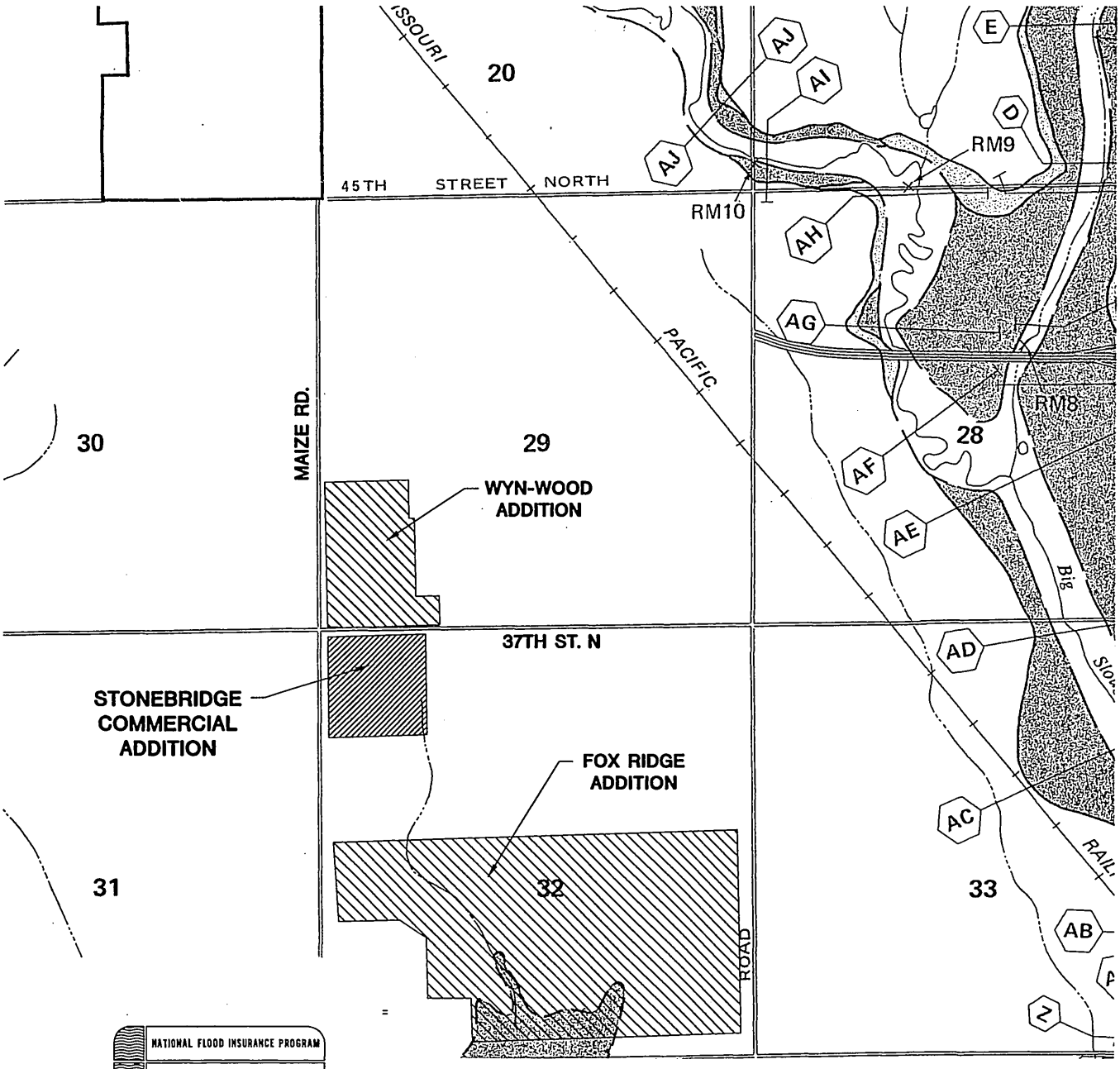
APPROXIMATE SCALE
2000 0 2000 FEET

J:\Civil\05440\dwg\Dmg\05440FIRM

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: |
| MAY 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

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

FBFM PANEL 125 OF 300
SEDGWICK COUNTY, KANSAS
SHEET TITLE

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

# Appendix D
# Preliminary Drainage & Utility Plan

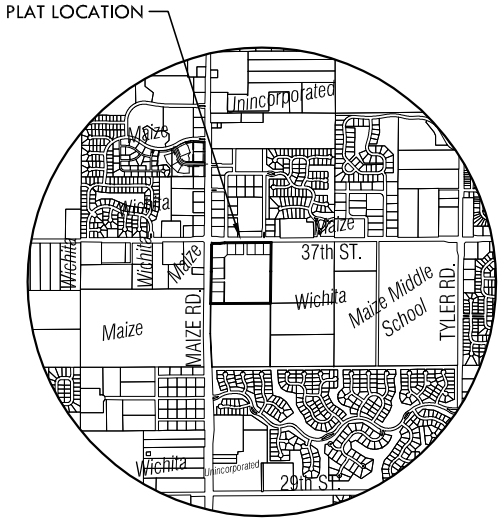
# NOTES

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)

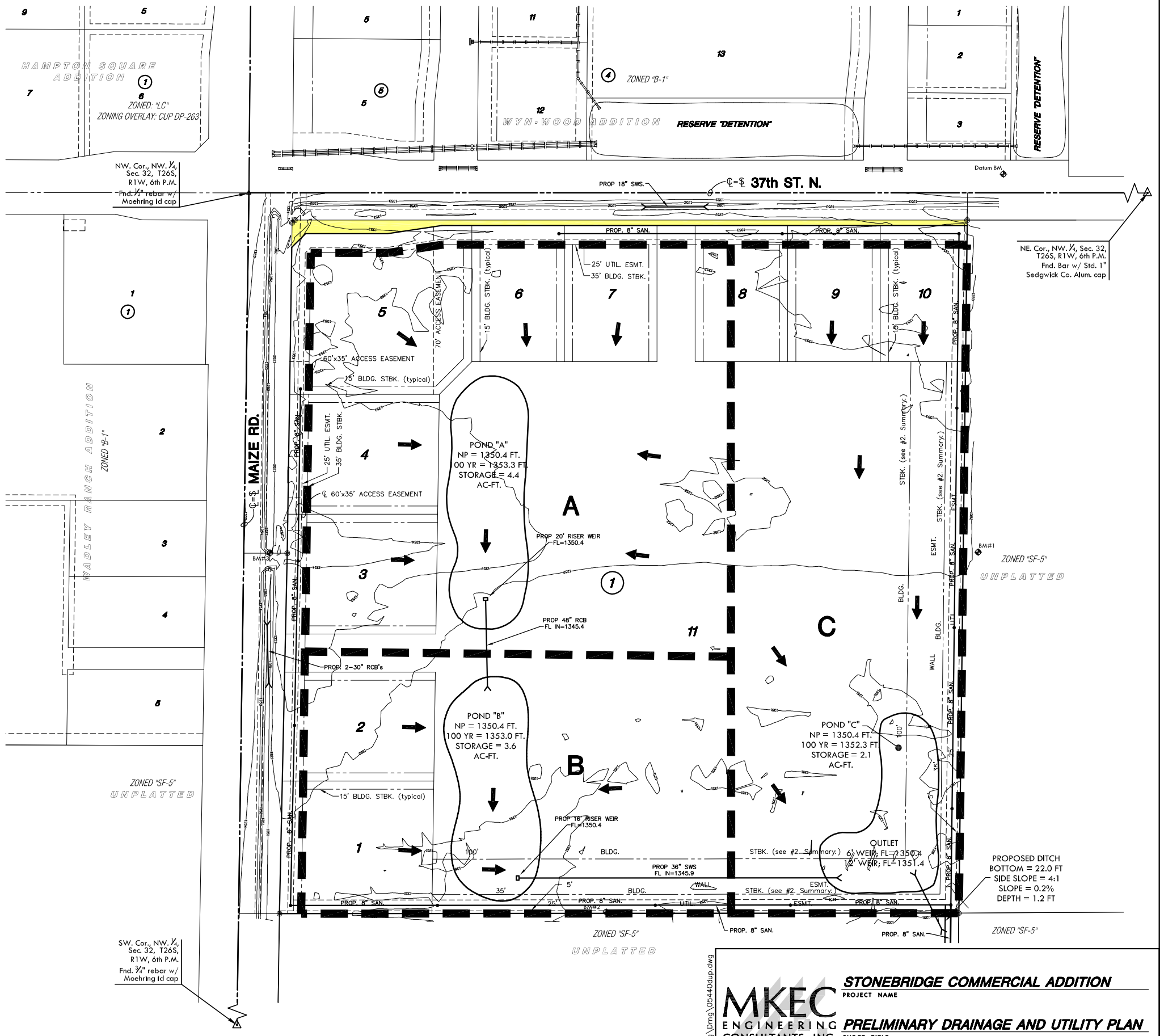
BM#3 - Square cut on N. end of on top of RCP 50' ± E. of the W. line of NW¼, Sec. 32, T26S, R1W and 660' ± S. of the N. line of said NW¼.
Elev.=1353.59 (NGVD 29)
166.19 (City Datum)

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 I
- DRAINAGE BOUNDARY
- A - DRAINAGE BOUNDARY LABEL
- FLOW ARROW

| MINIMUM PAD ELEVATIONS *LOWEST OPENINGS* | | |
|---|---|---|
| LOTS *(inclusive)* | BLOCK | ELEVATION *NGVD* |
| 1 - 2 | 1 | 1355.0 |
| 3 - 11 | 1 | 1355.3 |




| | | |
|---|---|---|
| MKEC ENGINEERING CONSULTANTS, INC. | STONEBRIDGE COMMERCIAL ADDITION (PROJECT NAME) | |
| | PRELIMINARY DRAINAGE AND UTILITY PLAN (SHEET TITLE) | |
| 411 N. WEBB ROAD<br>WICHITA, KS. 67206<br>316 - 684 - 9600 | AJK (DESIGN BY:) | JFL (DRAWN BY:) / GJA (CHECKED BY:) |
| | MAY 2006 (DATE) | 05440 (JOB NO.) / 1 / 1 (SHEET/OF) |

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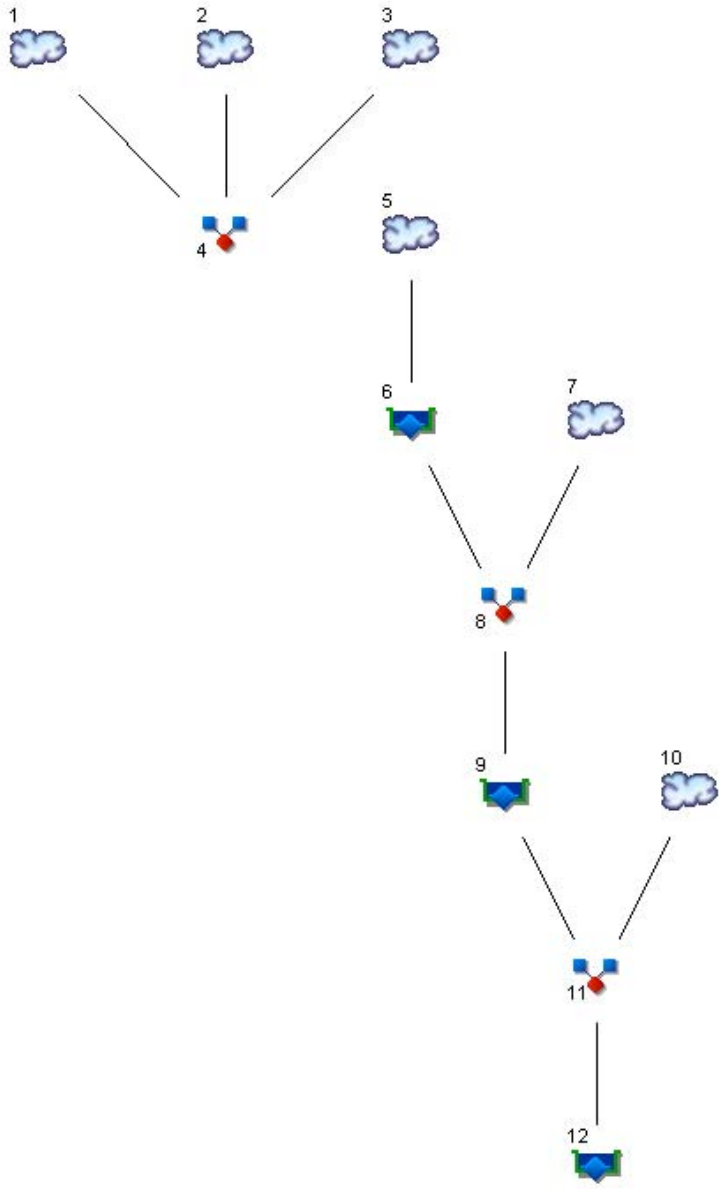
# Appendix E
# Time of Concentration Calculations

# *Time of Concentration Calculations*
## Stonebridge Commercial Addition

**Soil Group** C

| Area Name | C 2-yr | C 5-yr | C 10-yr | C 100-yr | Land Use | Maximum Elevation | Minimum Elevation | Flow Length (L) | $T_c$ 2-yr | $T_c$ 5-yr | $T_c$ 10-yr | $T_c$ 100-yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre-Developed | | | | | | | | | | | | |
| A | 0.26 | 0.29 | 0.37 | 0.53 | Agricultural - Pasture - Slopes <1% | 166.0 | 163.6 | 820 | 65.2 | 62.9 | 56.7 | 44.2 |
| B | 0.26 | 0.29 | 0.37 | 0.53 | Agricultural - Pasture - Slopes <1% | 166.0 | 163.4 | 550 | 45.5 | 43.9 | 39.6 | 30.9 |
| C | 0.26 | 0.29 | 0.37 | 0.53 | Agricultural - Pasture - Slopes <1% | 166.0 | 163.4 | 1200 | 87.2 | 84.1 | 75.8 | 59.2 |
| Post-Project | | | | | | | | | | | | |
| A | 0.68 | 0.69 | 0.73 | 0.80 | Business - Neighborhood | 166.0 | 163.0 | 800 | 29.7 | 28.9 | 26.1 | 21.2 |
| B | 0.68 | 0.69 | 0.73 | 0.80 | Business - Neighborhood | 165.0 | 163.0 | 420 | 19.8 | 19.4 | 17.5 | 15.0 |
| C | 0.68 | 0.69 | 0.73 | 0.80 | Business - Neighborhood | 166.0 | 163.0 | 1000 | 35.7 | 34.9 | 31.5 | 25.5 |

# 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 | Reservoir | Pond A |
| 7 | SCS Runoff | Post B |
| 8 | Combine | Into Pond B |
| 9 | Reservoir | Pond B |
| 10 | SCS Runoff | Post C |
| 11 | Combine | Into Pond C |
| 12 | Reservoir | Pond C |

# Table of Contents



## 100 - Year

**Summary Report** ..... **5**
**Hydrograph Reports** ..... **6**
Hydrograph No. 1, SCS Runoff, Pre A ..... 6
Hydrograph No. 2, SCS Runoff, Pre B ..... 7
Hydrograph No. 3, SCS Runoff, Pre C ..... 8
Hydrograph No. 4, Combine, Pre-Proj South ..... 9
Hydrograph No. 5, SCS Runoff, Post A ..... 10
Hydrograph No. 6, Reservoir, Pond A ..... 11
Pond Report ..... 12
Hydrograph No. 7, SCS Runoff, Post B ..... 13
Hydrograph No. 8, Combine, Into Pond B ..... 14
Hydrograph No. 9, Reservoir, Pond B ..... 15
Pond Report ..... 16
Hydrograph No. 10, SCS Runoff, Post C ..... 17
Hydrograph No. 11, Combine, Into Pond C ..... 18
Hydrograph No. 12, Reservoir, Pond C ..... 19
Pond Report ..... 20

# 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 | 27.27 | 6 | 732 | 3.219 | ---- | ------ | ------ | Post A |
| 6 | Reservoir | 15.57 | 6 | 756 | 1.635 | 5 | 1351.60 | 1.733 | Pond A |
| 7 | SCS Runoff | 21.10 | 6 | 726 | 2.018 | ---- | ------ | ------ | Post B |
| 8 | Combine | 21.10 | 6 | 726 | 3.653 | 6, 7 | ------ | ------ | Into Pond B |
| 9 | Reservoir | 13.02 | 6 | 774 | 2.444 | 8 | 1351.52 | 1.519 | Pond B |
| 10 | SCS Runoff | 24.61 | 6 | 732 | 2.904 | ---- | ------ | ------ | Post C |
| 11 | Combine | 24.61 | 6 | 732 | 5.348 | 9, 10 | ------ | ------ | Into Pond C |
| 12 | Reservoir | 18.75 | 6 | 774 | 5.348 | 11 | 1351.36 | 1.029 | Pond C |

# 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 | 44.14 | 6 | 726 | 4.283 | ---- | ------ | ------ | Post A |
| 6 | Reservoir | 20.71 | 6 | 750 | 2.239 | 5 | 1352.01 | 2.362 | Pond A |
| 7 | SCS Runoff | 35.03 | 6 | 720 | 2.596 | ---- | ------ | ------ | Post B |
| 8 | Combine | 35.03 | 6 | 720 | 4.836 | 6, 7 | ------ | ------ | Into Pond B |
| 9 | Reservoir | 16.63 | 6 | 762 | 3.204 | 8 | 1351.87 | 2.022 | Pond B |
| 10 | SCS Runoff | 33.31 | 6 | 732 | 3.985 | ---- | ------ | ------ | Post C |
| 11 | Combine | 38.86 | 6 | 744 | 7.190 | 9, 10 | ------ | ------ | Into Pond C |
| 12 | Reservoir | 31.56 | 6 | 762 | 7.189 | 11 | 1351.63 | 1.332 | Pond C |

# 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 | 51.61 | 6 | 726 | 5.048 | ---- | ------ | ------ | Post A |
| 6 | Reservoir | 24.22 | 6 | 750 | 2.544 | 5 | 1352.28 | 2.783 | Pond A |
| 7 | SCS Runoff | 40.93 | 6 | 720 | 3.060 | ---- | ------ | ------ | Post B |
| 8 | Combine | 40.93 | 6 | 720 | 5.605 | 6, 7 | ------ | ------ | Into Pond B |
| 9 | Reservoir | 19.74 | 6 | 762 | 3.829 | 8 | 1352.10 | 2.349 | Pond B |
| 10 | SCS Runoff | 38.96 | 6 | 732 | 4.697 | ---- | ------ | ------ | Post C |
| 11 | Combine | 47.91 | 6 | 744 | 8.526 | 9, 10 | ------ | ------ | Into Pond C |
| 12 | Reservoir | 39.60 | 6 | 762 | 8.526 | 11 | 1351.75 | 1.471 | Pond C |

# 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 | 78.59 | 6 | 726 | 7.850 | ---- | ------ | ------ | Post A |
| 6 | Reservoir | 34.93 | 6 | 750 | 4.067 | 5 | 1353.30 | 4.445 | Pond A |
| 7 | SCS Runoff | 62.25 | 6 | 720 | 4.759 | ---- | ------ | ------ | Post B |
| 8 | Combine | 62.25 | 6 | 720 | 8.826 | 6, 7 | ------ | ------ | Into Pond B |
| 9 | Reservoir | 27.85 | 6 | 768 | 6.331 | 8 | 1352.96 | 3.638 | Pond B |
| 10 | SCS Runoff | 70.91 | 6 | 726 | 7.083 | ---- | ------ | ------ | Post C |
| 11 | Combine | 80.80 | 6 | 732 | 13.414 | 9, 10 | ------ | ------ | Into Pond C |
| 12 | Reservoir | 69.89 | 6 | 738 | 12.114 | 11 | 1352.27 | 2.082 | Pond C |

# Hydrograph Plot

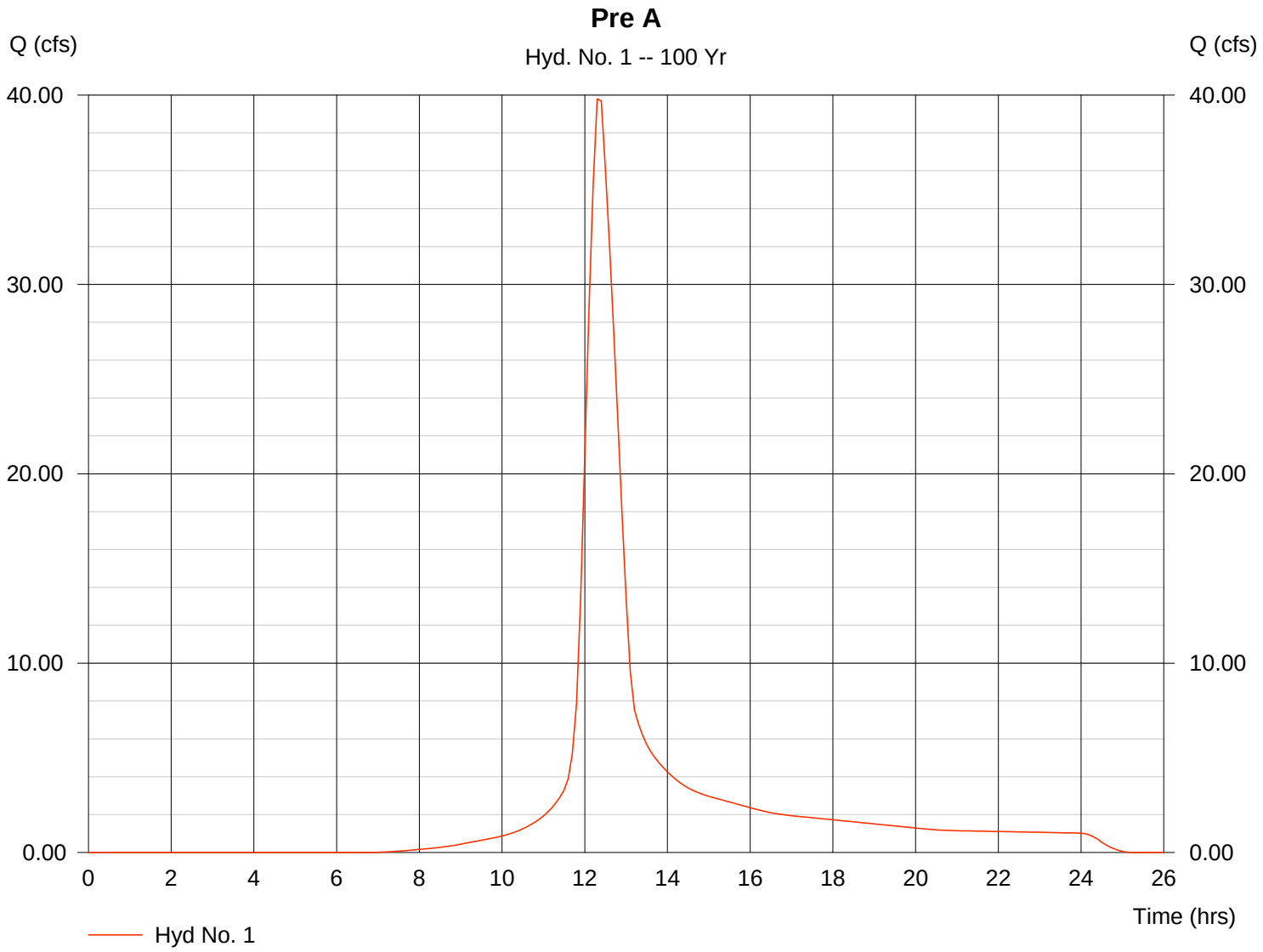
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## 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

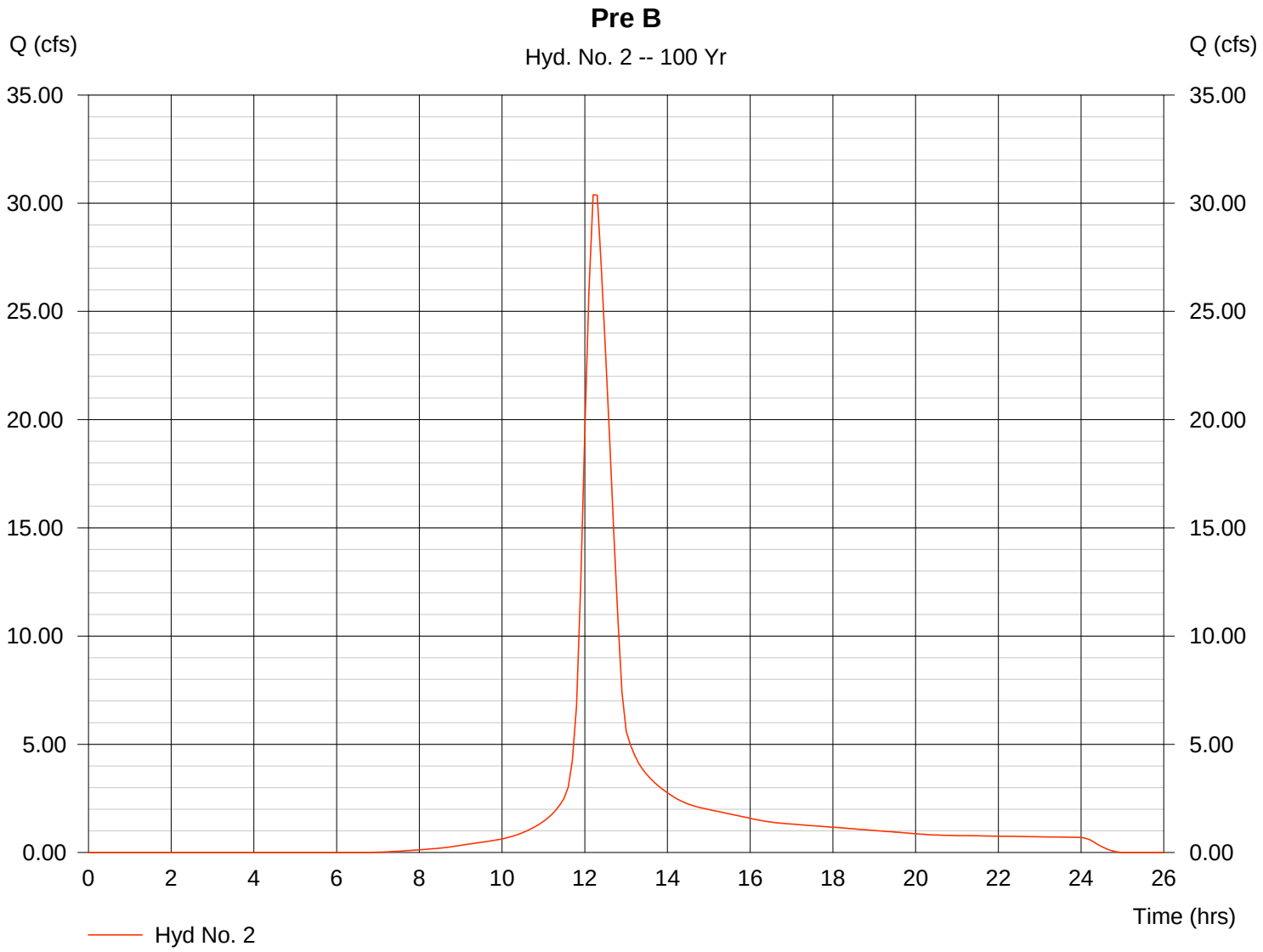
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## 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

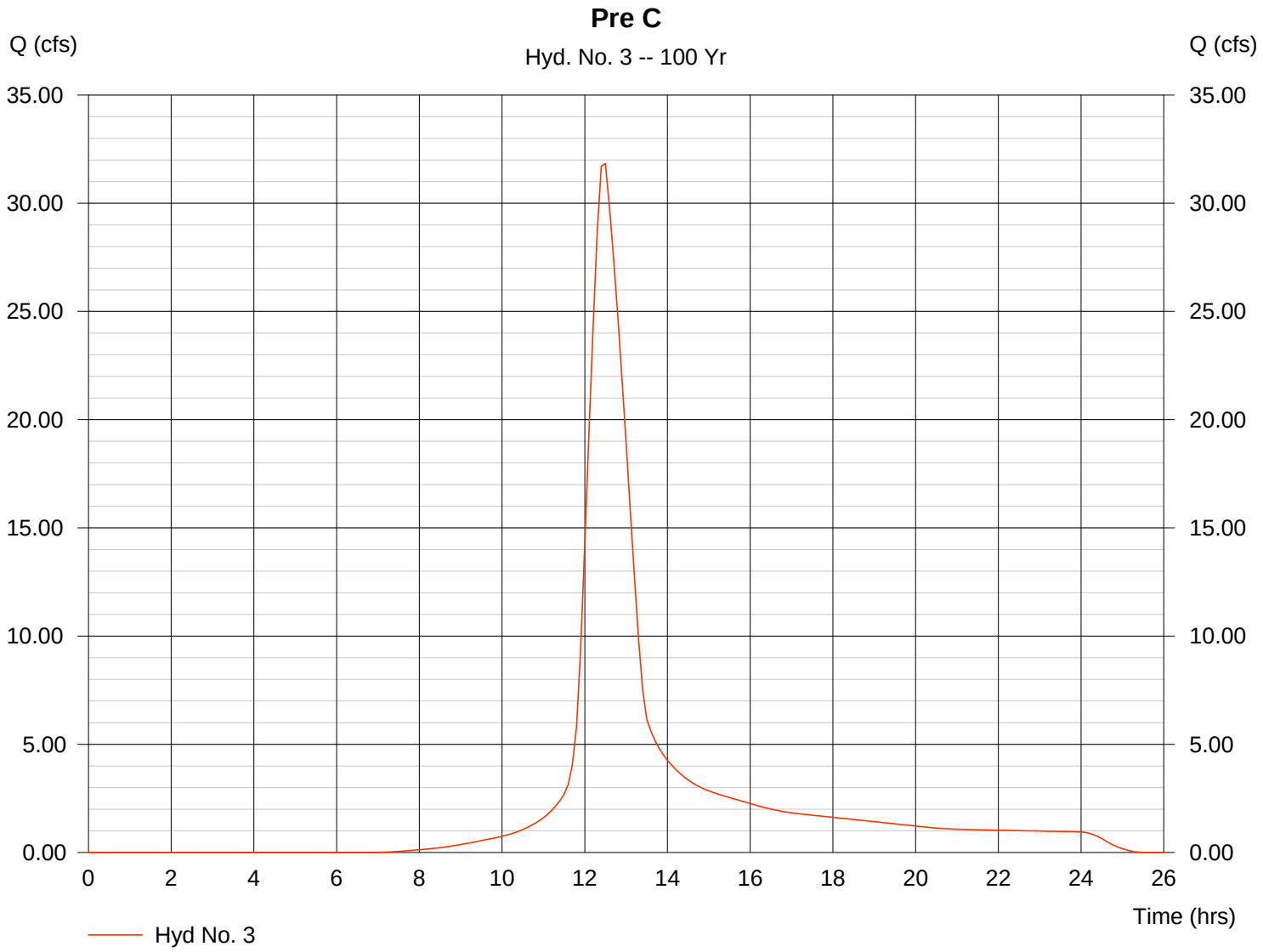
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## 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

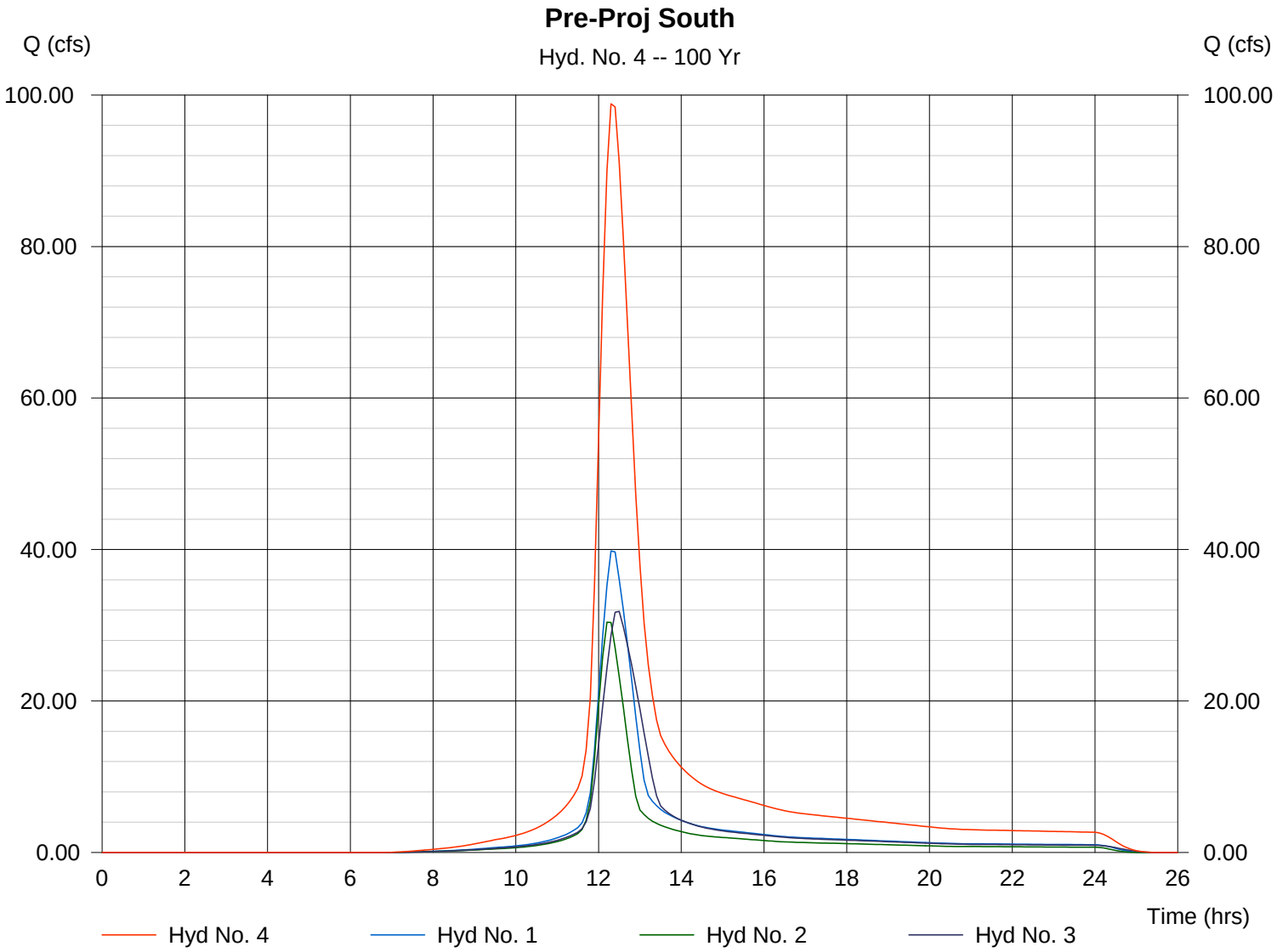
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## 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

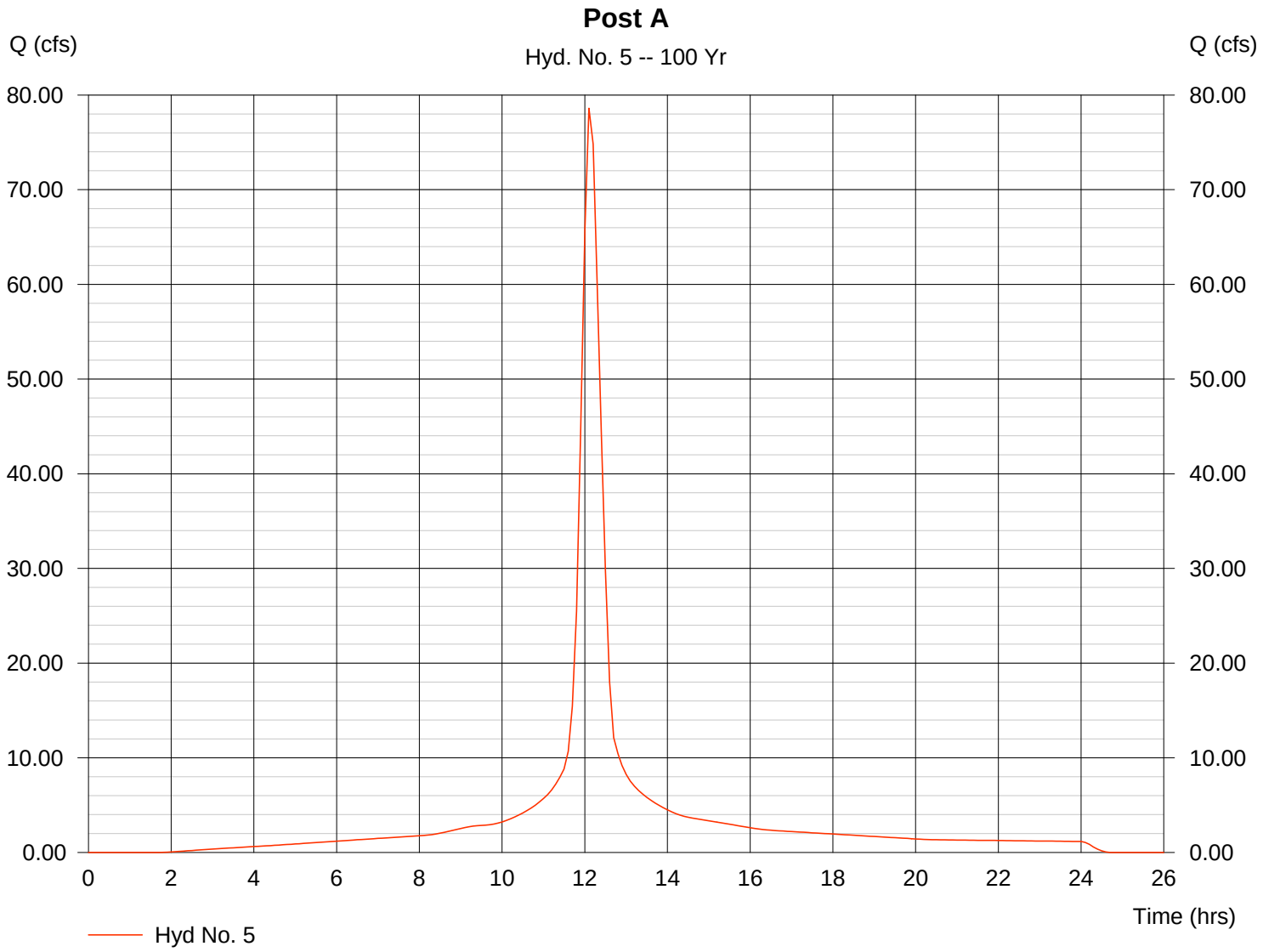
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 5

Post A

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 78.59 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) | = 21.20 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 7.850 acft



# Hydrograph Plot

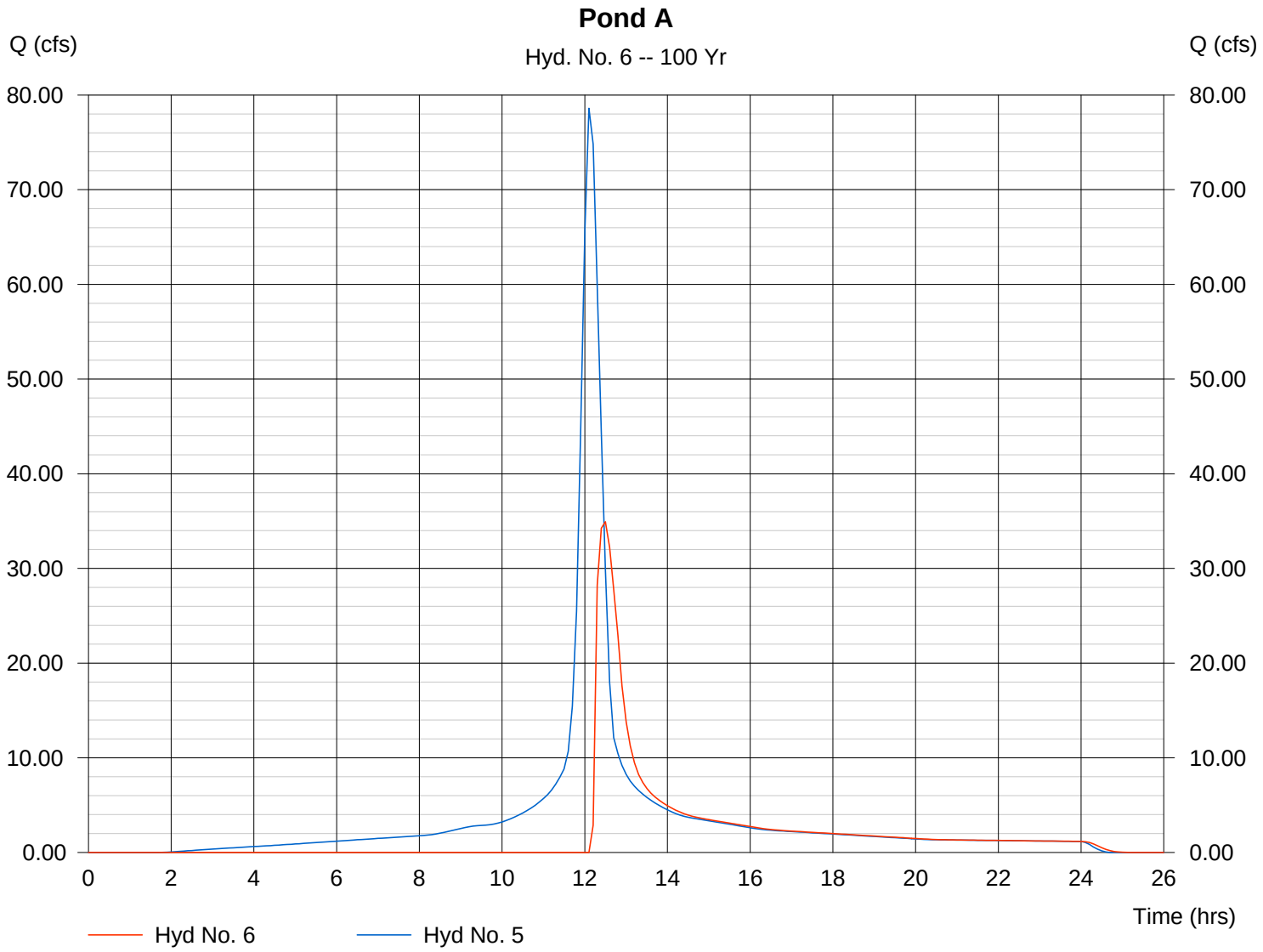
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 6

Pond A

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 34.93 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 6 min |
| Inflow hyd. No. | = | 5 | Max. Elevation | = | 1353.30 ft |
| Reservoir name | = | Pond A | Max. Storage | = | 4.445 acft |

Storage Indication method used. | Hydrograph Volume = 4.067 acft



# Pond Report



## Pond No. 6 - Pond A

### 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 | 1350.40 | 60,092 | 0.000 | 0.000 |
| 1.00 | 1351.40 | 64,530 | 1.430 | 1.430 |
| 2.00 | 1352.40 | 69,069 | 1.534 | 2.964 |
| 3.00 | 1353.40 | 73,708 | 1.639 | 4.603 |
| 4.00 | 1354.40 | 89,216 | 1.870 | 6.473 |

### Culvert / Orifice Structures

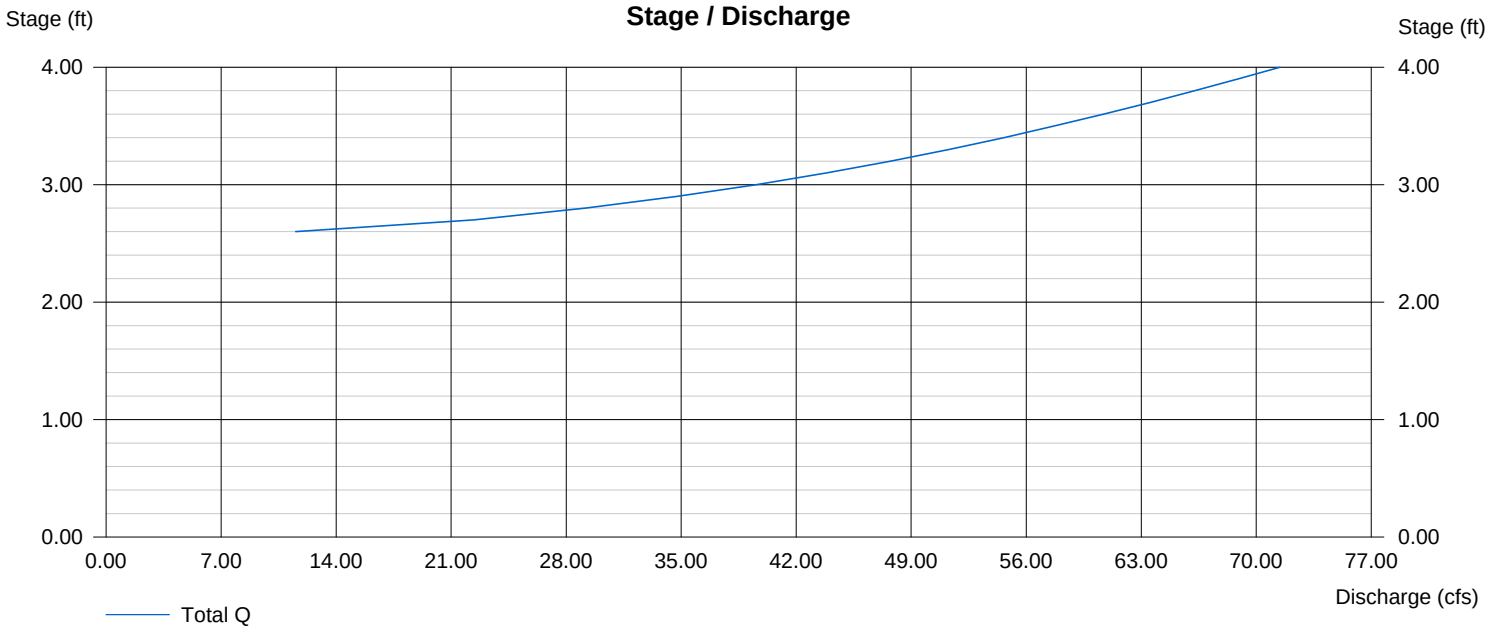
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Rise (in)** | = 48.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 48.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 1345.40 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 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)** | = 20.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 1350.40 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 0.00 | 0.00 | 0.00 |
| **Weir Type** | = Riser | --- | --- | --- |
| **Multi-Stage** | = Yes | No | No | No |

**Exfiltration =** 0.000 in/hr (Contour) Tailwater Elev. = 1352.96 ft

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



# Hydrograph Plot

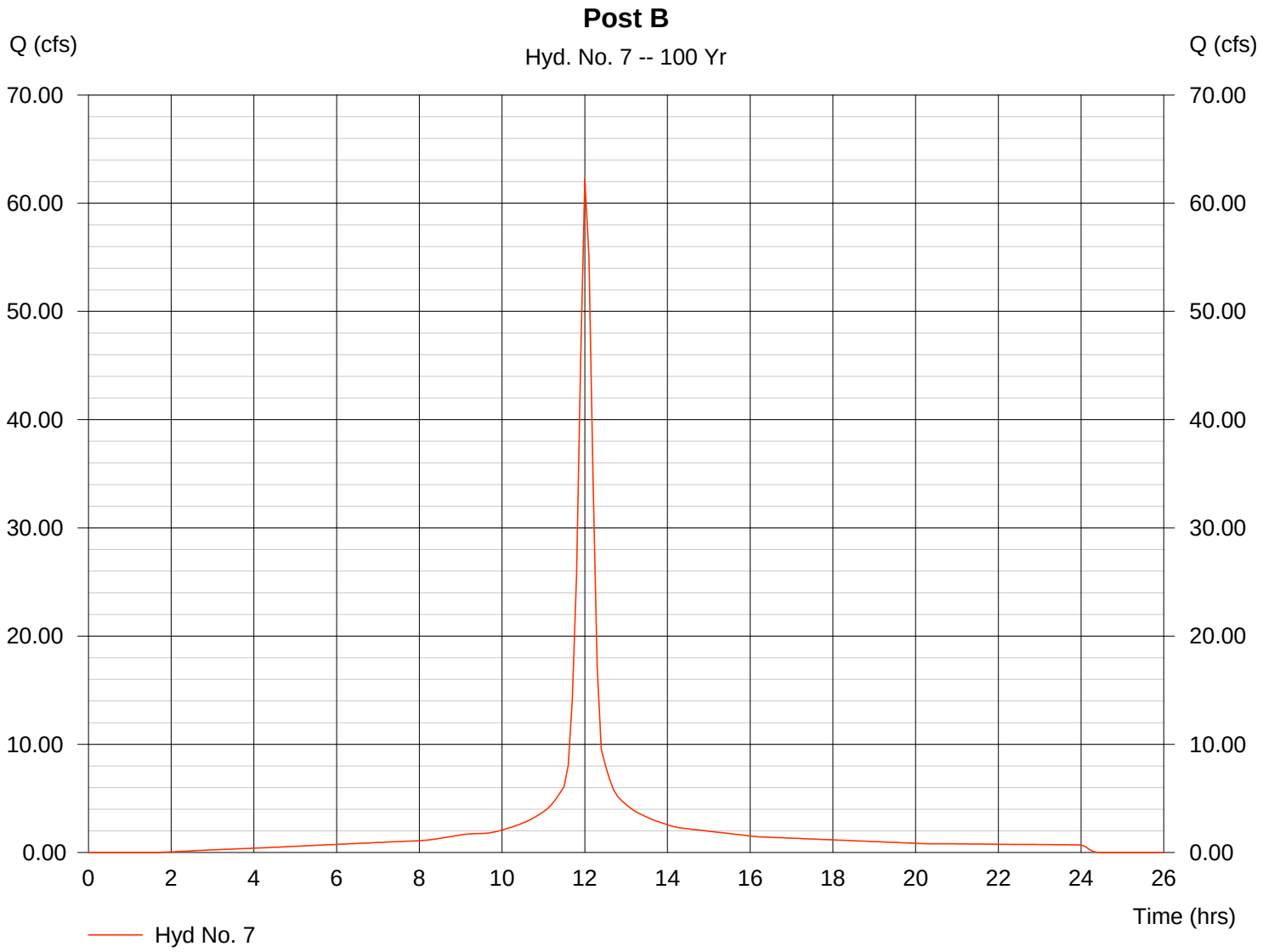
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 7

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

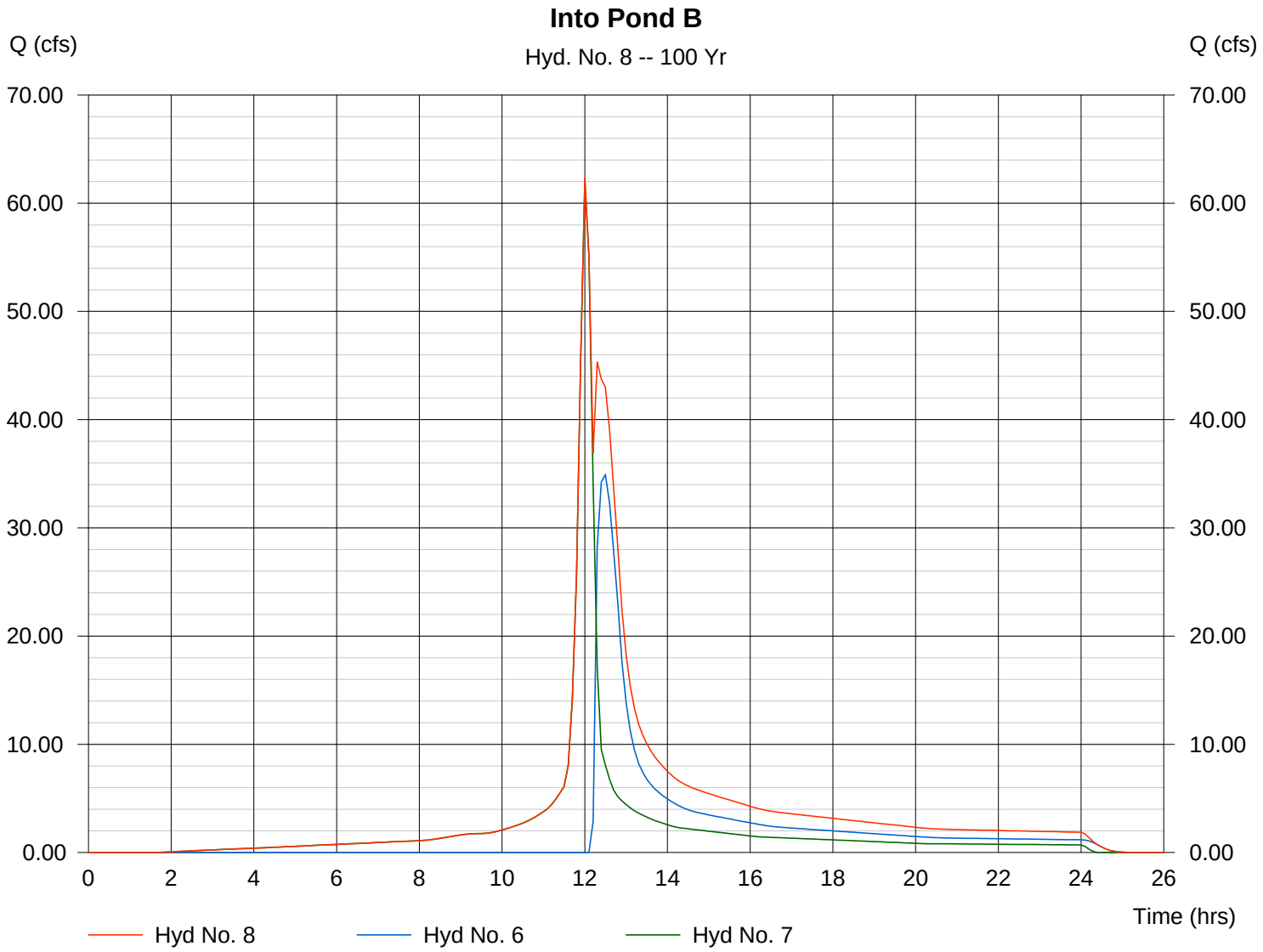
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 8

Into Pond B

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 62.25 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Inflow hyds. | = 6, 7 | | |

Hydrograph Volume = 8.826 acft



# Hydrograph Plot

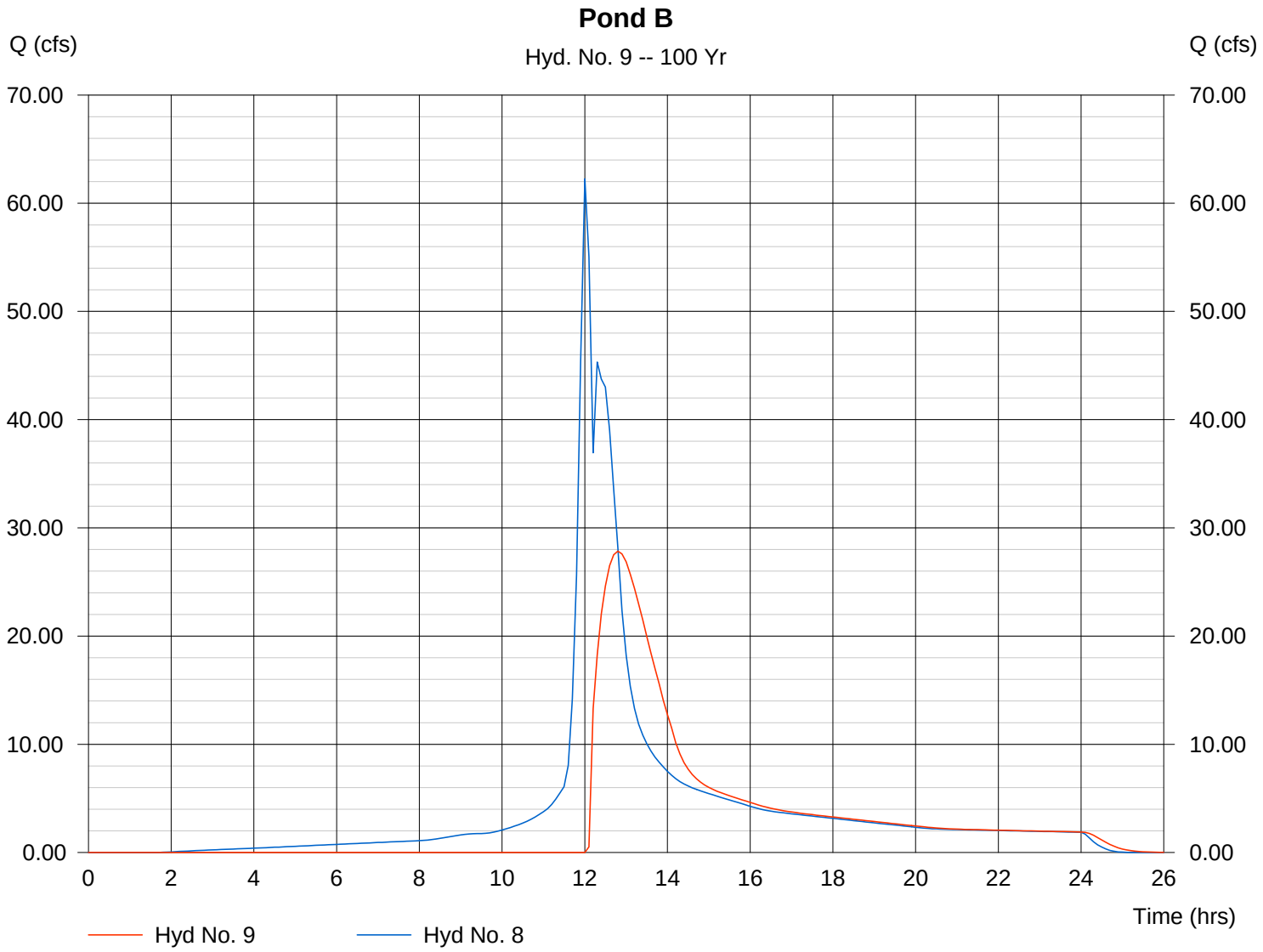
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 9

Pond B

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 27.85 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 6 min |
| Inflow hyd. No. | = | 8 | Max. Elevation | = | 1352.96 ft |
| Reservoir name | = | Pond B | Max. Storage | = | 3.638 acft |

Storage Indication method used. | Hydrograph Volume = 6.331 acft



# Pond Report



## Pond No. 1 - Pond B

### 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 | 1350.40 | 56,480 | 0.000 | 0.000 |
| 1.00 | 1351.40 | 60,573 | 1.344 | 1.344 |
| 2.00 | 1352.40 | 64,765 | 1.439 | 2.782 |
| 3.00 | 1353.40 | 69,059 | 1.536 | 4.318 |
| 4.00 | 1354.40 | 73,453 | 1.636 | 5.954 |

### Culvert / Orifice Structures

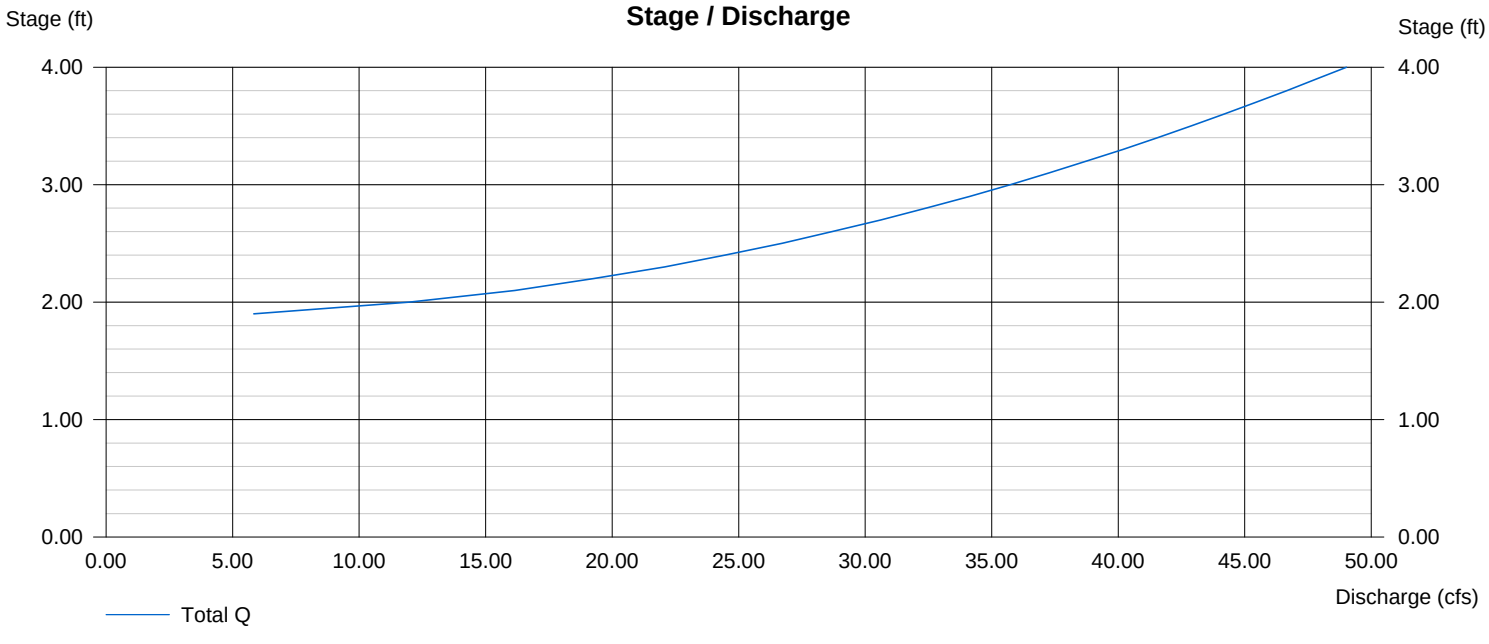
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Rise (in)** | = 36.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 36.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 1345.90 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 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)** | = 16.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 1350.40 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 0.00 | 0.00 | 0.00 |
| **Weir Type** | = Riser | --- | --- | --- |
| **Multi-Stage** | = Yes | No | No | No |

**Exfiltration =** 0.000 in/hr (Contour) Tailwater Elev. = 1352.27 ft

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



# Hydrograph Plot

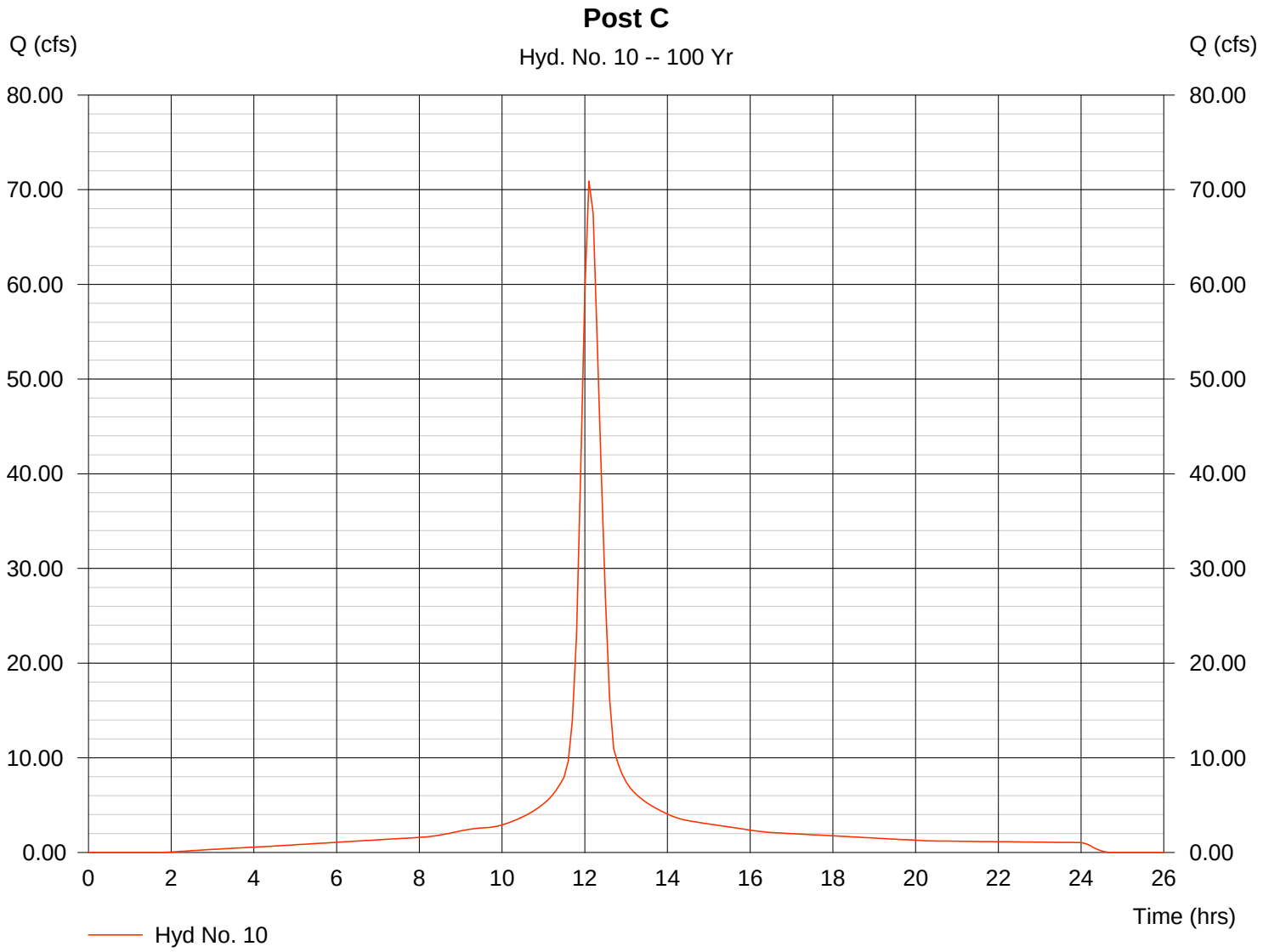
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 10

Post C

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 70.91 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) | = 25.50 min |
| Total precip. | = 7.80 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 7.083 acft



# Hydrograph Plot

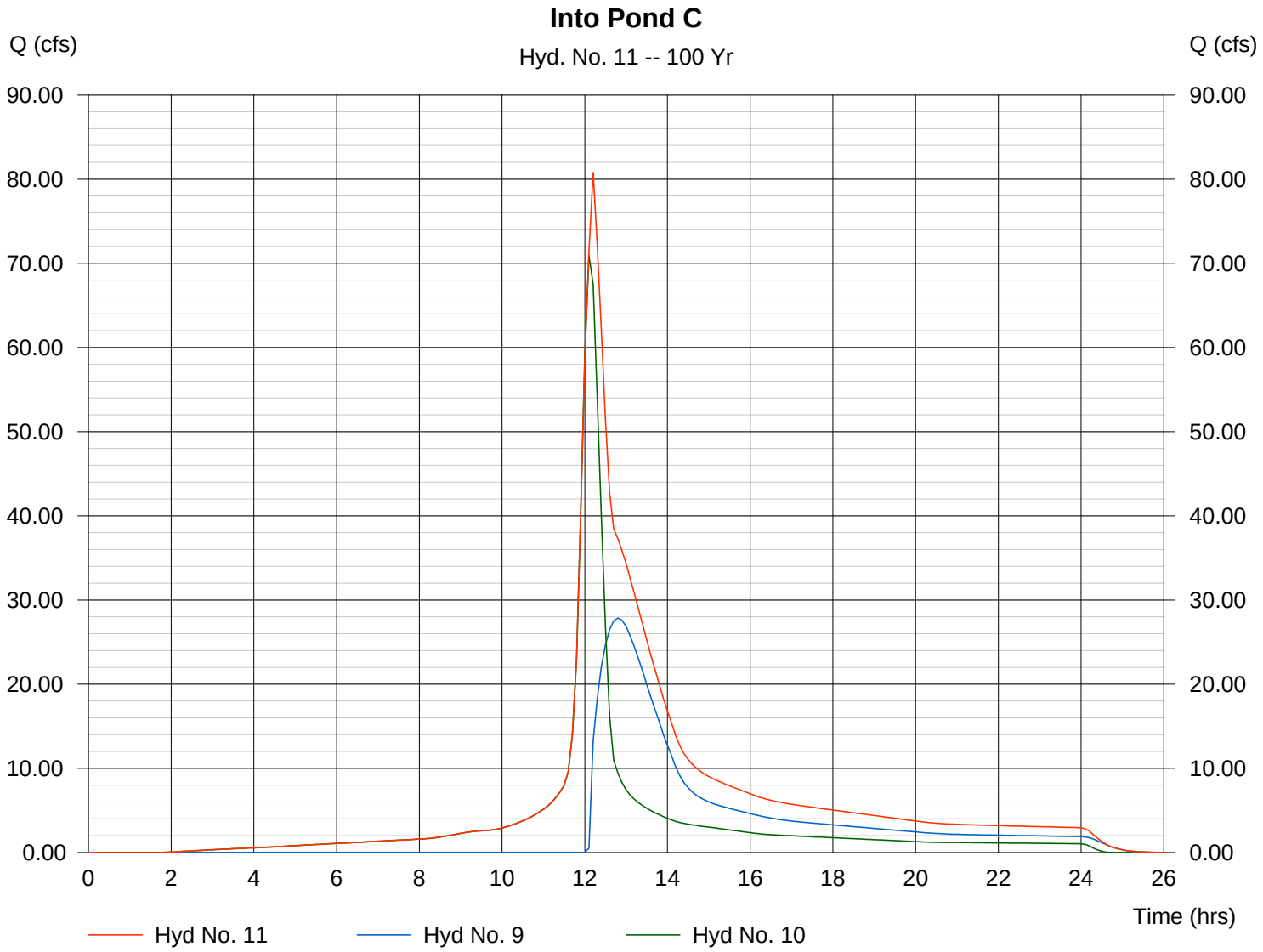
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 11

Into Pond C

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 80.80 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Inflow hyds. | = 9, 10 | | |

Hydrograph Volume = 13.414 acft



# Hydrograph Plot

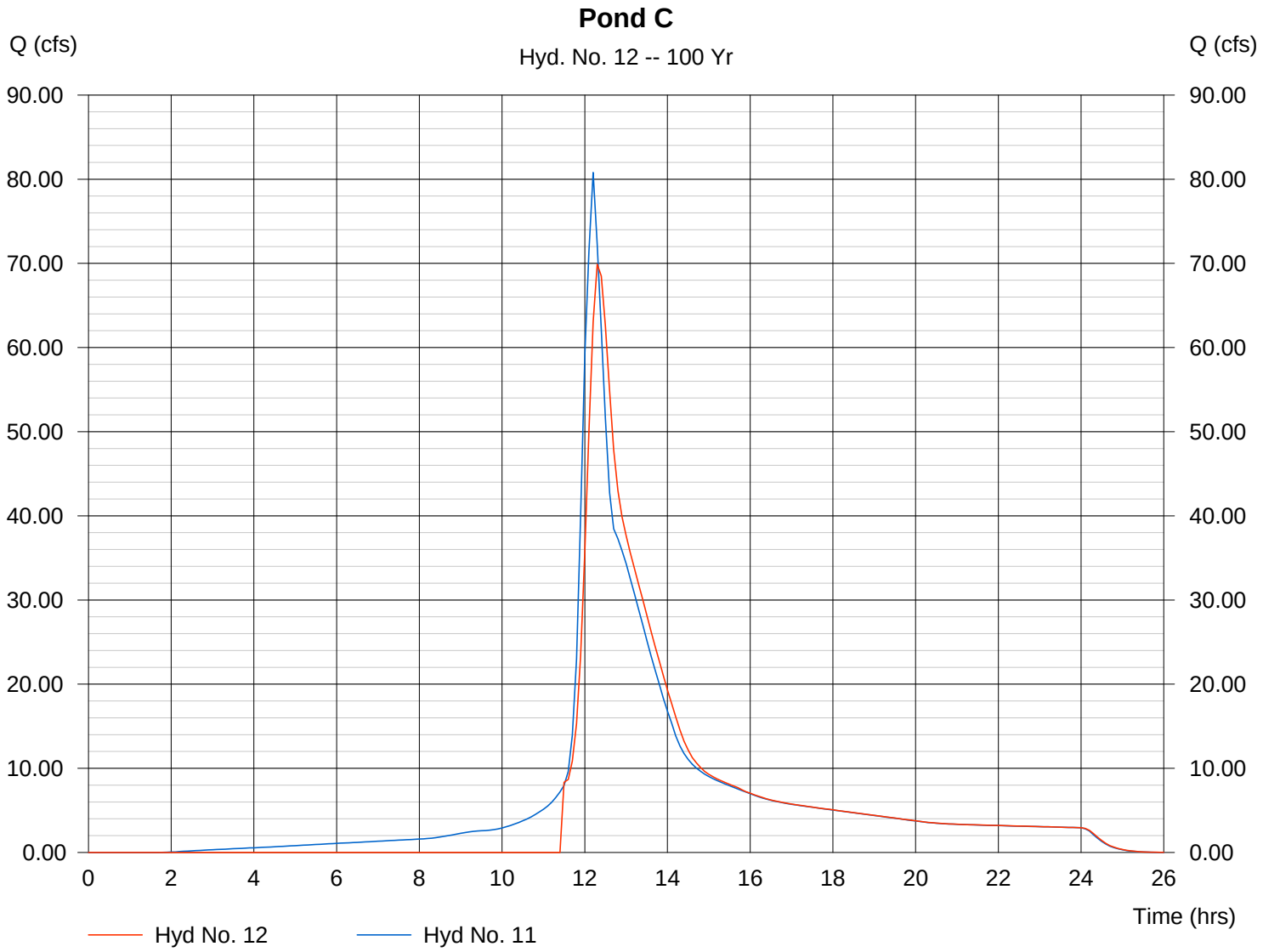
Hydraflow Hydrographs by Intelisolve | Wednesday, May 31 2006, 10:48 AM

## Hyd. No. 12

Pond C

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 69.89 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 6 min |
| Inflow hyd. No. | = | 11 | Max. Elevation | = | 1352.27 ft |
| Reservoir name | = | Square Pond C | Max. Storage | = | 2.082 acft |

Storage Indication method used. | Hydrograph Volume = 12.114 acft



# Pond Report



## Pond No. 3 - Square Pond C

### Pond Data

Bottom LxW = 150.0 x 300.0 ft Side slope = 4.0:1 Bottom elev. = 1350.40 ft Depth = 3.20 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (acft) | Total storage (acft) |
|---|---|---|---|---|
| 0.00 | 1350.40 | 45,000 | 0.000 | 0.000 |
| 0.16 | 1350.56 | 45,578 | 0.166 | 0.166 |
| 0.32 | 1350.72 | 46,159 | 0.168 | 0.335 |
| 0.48 | 1350.88 | 46,743 | 0.171 | 0.505 |
| 0.64 | 1351.04 | 47,330 | 0.173 | 0.678 |
| 0.80 | 1351.20 | 47,921 | 0.175 | 0.853 |
| 0.96 | 1351.36 | 48,515 | 0.177 | 1.030 |
| 1.12 | 1351.52 | 49,112 | 0.179 | 1.210 |
| 1.28 | 1351.68 | 49,713 | 0.181 | 1.391 |
| 1.44 | 1351.84 | 50,317 | 0.184 | 1.575 |
| 1.60 | 1352.00 | 50,924 | 0.186 | 1.761 |
| 1.76 | 1352.16 | 51,534 | 0.188 | 1.949 |
| 1.92 | 1352.32 | 52,148 | 0.190 | 2.139 |
| 2.08 | 1352.48 | 52,765 | 0.193 | 2.332 |
| 2.24 | 1352.64 | 53,385 | 0.195 | 2.527 |
| 2.40 | 1352.80 | 54,009 | 0.197 | 2.724 |
| 2.56 | 1352.96 | 54,635 | 0.200 | 2.924 |
| 2.72 | 1353.12 | 55,265 | 0.202 | 3.125 |
| 2.88 | 1353.28 | 55,899 | 0.204 | 3.330 |
| 3.04 | 1353.44 | 56,535 | 0.206 | 3.536 |
| 3.20 | 1353.60 | 57,175 | 0.209 | 3.745 |

### Culvert / Orifice Structures

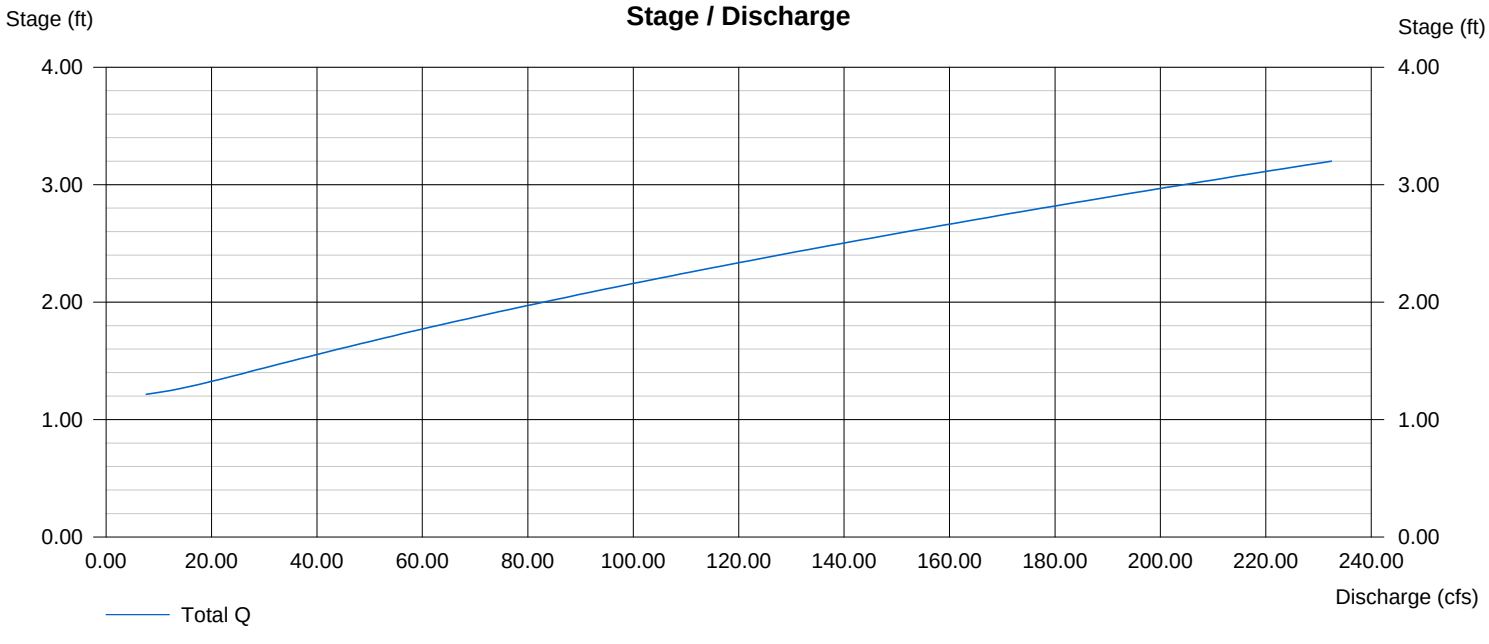
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Rise (in)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 0 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)**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

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 6.00 | 12.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 1350.40 | 1351.40 | 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 (Wet area) Tailwater Elev. = 1351.60 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Appendix G
# Preliminary Four Corner Lot Grading Plan

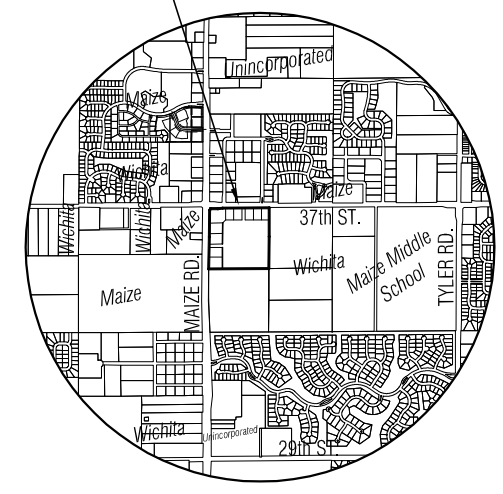
# NOTES

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 NW.¼.
Elev.=1351.79 (NGVD 29)
164.39 (City Datum)

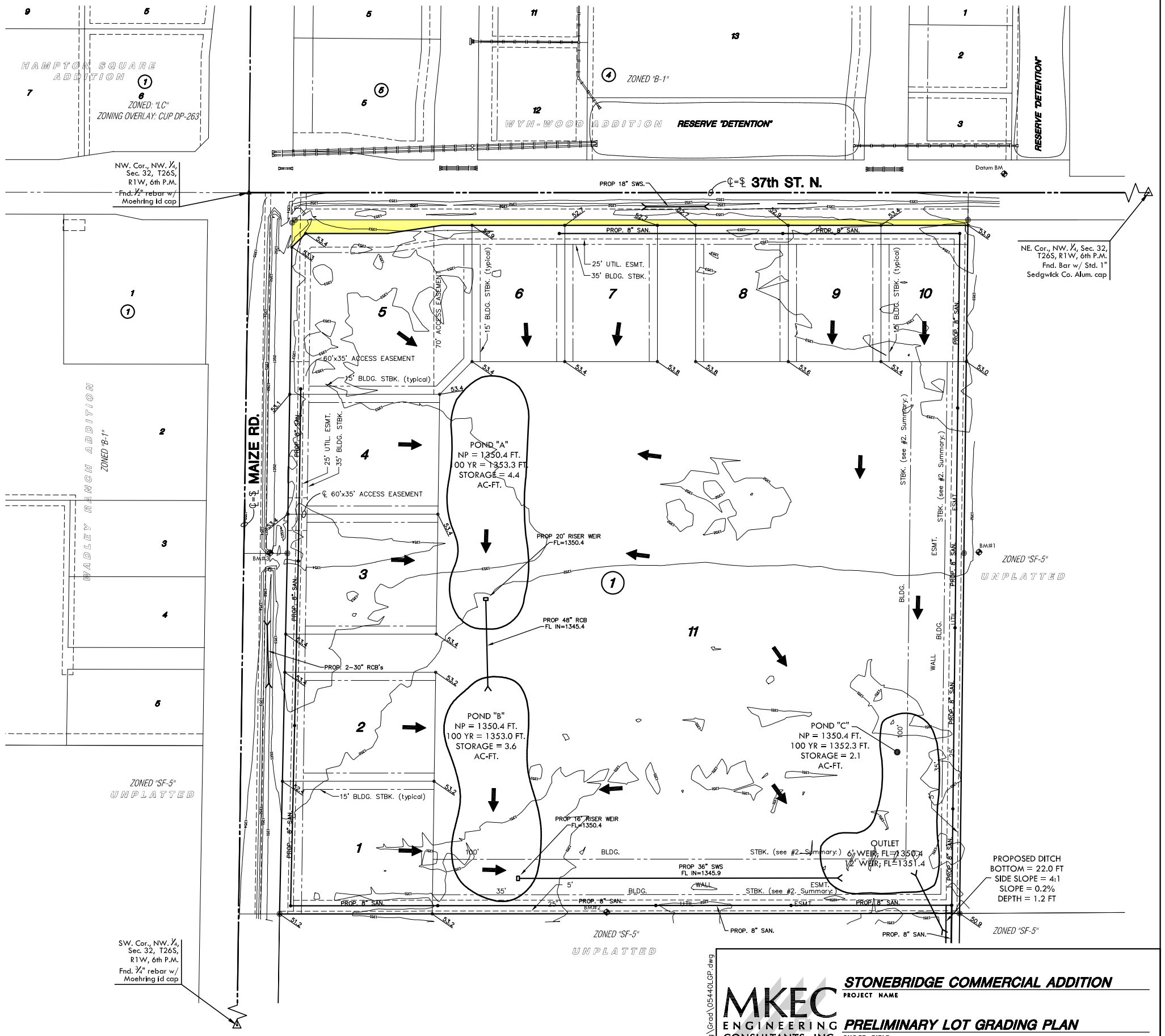
BM#3 – Square cut on N. end of on top of RCP 50' ± E. of the W. line of NW¼, Sec. 32, T26S, R1W and 660' ± S. of the N. line of said NW. ¼.
Elev.=1353.59 (NGVD 29)
166.19 (City Datum)

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
- UGT – 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 | 1355.0 |
| 3 - 11 | 1 | 1355.3 |




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: |
| MAY 2006 | 05440 | 1 / 1 |
| DATE | JOB NO. | SHEET/OF |

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

# Appendix H
# FlowMaster Output

# Ditch to Fox Ridge
## 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 |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | | |
|---|---|---|
| Mannings Coefficient | 0.030 | |
| Channel Slope | 0.002000 | ft/ft |
| Left Side Slope | 4.000000 | H : V |
| Right Side Slope | 4.000000 | H : V |
| Bottom Width | 22.00 | ft |
| Discharge | 70.00 | cfs |

| Results | | |
|---|---|---|
| Depth | 1.18 | ft |
| Flow Area | 31.67 | ft² |
| Wetted Perimeter | 31.77 | ft |
| Top Width | 31.48 | ft |
| Critical Depth | 0.65 | ft |
| Critical Slope | 0.015759 | ft/ft |
| Velocity | 2.21 | ft/s |
| Velocity Head | 0.08 | ft |
| Specific Energy | 1.26 | ft |
| Froude Number | 0.39 | |
| Flow is subcritical. | | |

# Ditch to Fox Ridge
## 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 |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | | |
|---|---|---|
| Mannings Coefficient | 0.030 | |
| Channel Slope | 0.002000 | ft/ft |
| Depth | 1.18 | ft |
| Left Side Slope | 4.000000 | H : V |
| Right Side Slope | 4.000000 | H : V |
| Bottom Width | 22.00 | ft |
| Discharge | 70.00 | cfs |