DRAINAGE REPORT

FOR

MOORINGS 10th ADDITION
Wichita, Kansas

JUNE 2007

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: City of Wichita Date: June 14, 2007

Subdivision Name: Moorings 10th Addition Location: Wichita, Kansas

Total Land Area Of Ownership: 58 Acres

Type: ☐ Residential ☑ Commercial ☐ Industrial ☐ Recreation ☐ Municipal ☐ Other

Applicant: CBB Northlakes, LLC Contact: Kurt Bachman Phone #: (316) 838-6789

Engineer: MKEC Engineering Consultants, Inc. Contact: Kara Anderson, P.E. Phone # 684-9600

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

	Applicant			Engr	
Tab 1. Project Narrative	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Site Location Map, using USGS Map	✔		Figure 1.1		
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	✔		Tab 1.B		
C. Discussion of offsite conditions	✔		Tab 1.C		
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	✔		Tab 1.D		
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	✔		Tab 1.E		
F. Copy of the plat	✔		Figure 1.2		
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)	✔		Figure 1.3		
H. Professional Engineer seal, signature and date on cover of report	✔		Cover		
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	✔		Tab 1.I		

	Applicant			Engr	
Tab 2. Existing Conditions Runoff Calculations	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)	✔		Figure 2.1		
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	✔		Tab 2.B		
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	✔		Figure 2.2		
D. Total Site Area and Total Impervious Area (acres)	✔		Tab 2.D		
E. Benchmarks used for site control	✔		Figure 1.2		
F. Streams, creeks, and waterway labeled	✔		Figure 2.3		
G. Predominant soils from USDA soil surveys, and/or on site soil borings	✔		Figure 2.4		
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	✔		Tab 2.H		
I. Location of existing roads, buildings, parking lots and other impervious areas.	✔		Tab 2.I		

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J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	✔	☐	Tab 2.J	☐	☐
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✔	☐	Tab 2.K	☐	☐
L. Flow paths	✔	☐	Figure 2.2	☐	☐
M. Location and dimensions of existing channels, bridges or culvert crossings	✔	☐	Tab 2.M	☐	☐
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration	✔	☐	Tab 2.N	☐	☐
O. Assumed pre-developed runoff curve numbers	✔	☐	Tab 2.O	☐	☐
P. Existing time of concentrations used in calculations	✔	☐	Tab 2.P	☐	☐
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	✔	☐	Figure 2.5	☐	☐
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	✔	☐	Tab 2.R	☐	☐
S. Cross-section data for open channels	✔	☐	Tab 2.S	☐	☐
T. Ground water elevations, if applicable	✔	☐	Tab 2.T	☐	☐

	Applicant			**Engr**	
Tab 3. Post-Development Hydrologic Analysis	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)	✔	☐	Tab 3.A Figure 2.6	☐	☐
B. Proposed time of concentrations used in calculations	✔	☐	Tab 3.B	☐	☐
C. Assumed post-developed runoff curve numbers	✔	☐	Tab 3.C	☐	☐
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)	✔	☐	Figure 3.3	☐	☐
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	✔	☐	Figure 3.4	☐	☐
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities	✔	☐	Figure 2.6	☐	☐
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	✔	☐	Tab 3.G	☐	☐
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	✔	☐	Tab 3.H	☐	☐
I. Design water surface elevations and normal pool elevation for ponds.	✔	☐	Tab 3.I	☐	☐
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.	✔	☐	Tab 3.J	☐	☐
K. Proposed limits of clearing and grading	✔	☐	Tab 3.K	☐	☐
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	✔	☐	Figure 3.3	☐	☐
M. Location of existing and proposed utilities (e.g., water, sewer) and easements	✔	☐	Figure 3.3	☐	☐
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✔	☐	Figure 3.3	☐	☐
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	✔	☐	Tab 3.O	☐	☐

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P. Preliminary selection and location of stormwater controls	✔		Tab 3.P		
Q. Emergency overflow structure's flow path	✔		Tab 3.Q		
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)	✔		Tab 3.R		
S. The 100-year 24-hour HWL delineated on the plan for detention pond	✔		Tab 3.S		
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds	✔		Tab 3.T		
U. Stormwater Management Facilities located within a Reserve	✔		Tab 3.U		
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)	✔		Tab 3.V		
W. Off-site drainage easements or agreements required, where necessary	✔		Tab 3.W		

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

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

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Tab 1. Project Narrative

A. Location

The subject property is in the City of Wichita, Sedgwick County, Kansas. The proposed development is on the southwest corner of Meridian and 53rd Street. The site lies in the northwest and northeast quarters of Section 24, Township 26 South, Range 1 west. Meridian Street borders the site to the east, 53rd Street borders the site to the north and the Wichita Valley Center Floodway is just west of the Moorings 10th Addition. South of the site is the Moorings North Addition. The site is shown on the USGS Map, Figure 1.1.

B. Discussion of Development

Approximately 57.6 acres of Moorings 10th Addition will develop as residential lots ranging from ¼ to ½ acre in size. Space is provided for a reserve for a drainage corridor. Areas north and east of the proposed site were also considered developed for post-project conditions.

C. Discussion of Offsite

The area north of the site is anticipated for dense residential and commercial development. The area east of the site and adjacent to 53rd Street North is expected to develop as commercial, office and single and multi-family residential.

D. Summary of Runoff

The post project site will drain into the proposed dry detention pond located on site. The future residential area and portions of future commercial will also drain into this pond. The remaining future commercial/office area will drain directly into the channel east of the site. Approximately, 5.6 ac-ft of detention will be provided in the dry detention basin. Three 8'x3' reinforced concrete boxes (RCBs) will control flow from the detention basin. The 100-year water surface elevation for the dry detention basin is 1329.7. As shown in the table below, with the proposed detention, basin post-development flowrates are less than pre-development flows.

Comparison of Pre and Post-Development Flowrates

Description	Design Storm Flows (cfs)				
	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**100-Yr**
Pre-project Flow to Channel	111	191	249	342	483
Post-project Flow to Channel	106	183	238	327	462

E. Best Management Practices

Detention outlet channels will be protected against erosion. Detention facility side slopes will not exceed 3:1 (H:V). The site will be seeded or sodded after construction of grading and utilities are complete. The outlet structure of the dry detention basin will be protected against erosion.

F. Plat

The plat is included, Figure 1.2.

G. Preliminary Grading Plan

The preliminary lot grading plan is included, Figure 1.3.

H. Professional Engineer Seal

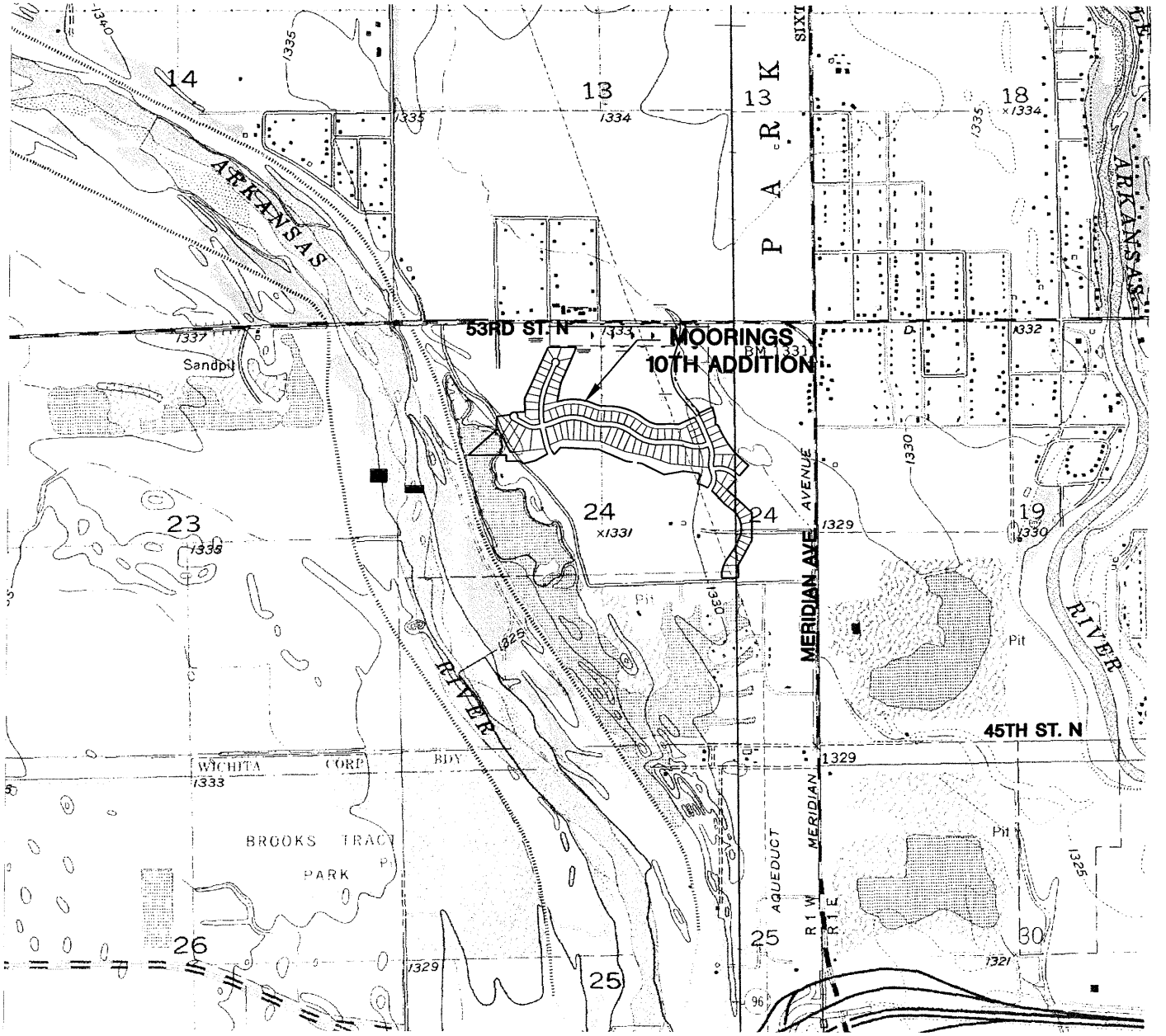
The cover of the report will be signed and dated.

I. CD

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

Figure 1.1

USGS Quadrangle Map



SCALE 1:24 000

1 MILE

7000 FEET

1 KILOMETER

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

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

MOORINGS 10TH ADDITION
PROJECT NAME

MAIZE & VALLEY CENTER QUADRANGLES
SHEET TITLE

TMH	SMB	TMH
DESIGN BY:	DRAWN BY:	CHECKED BY:
JUNE 2007	06608	1 / 1
DATE	JOB NO.	SHEET/OF

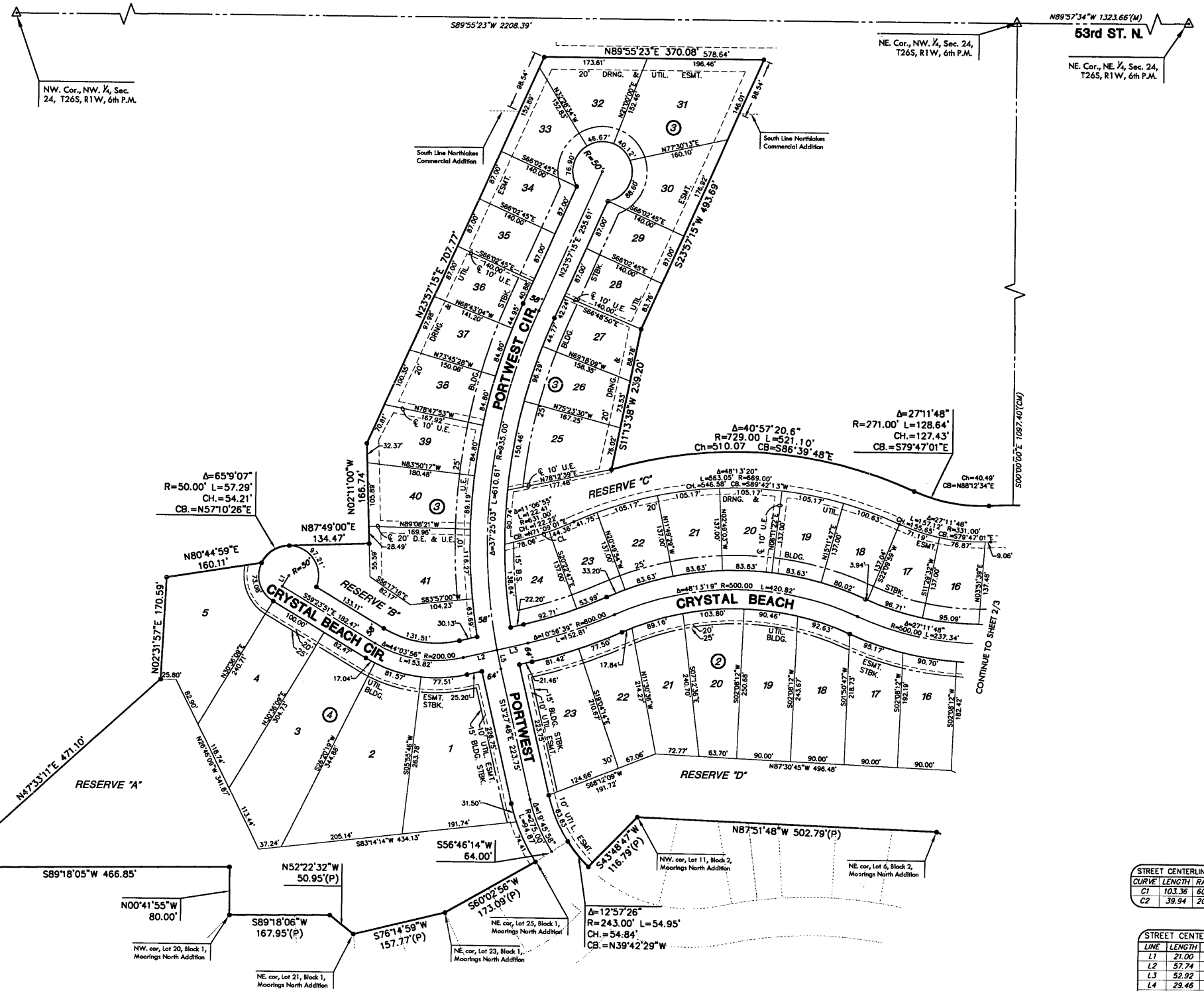
Figure 1.2

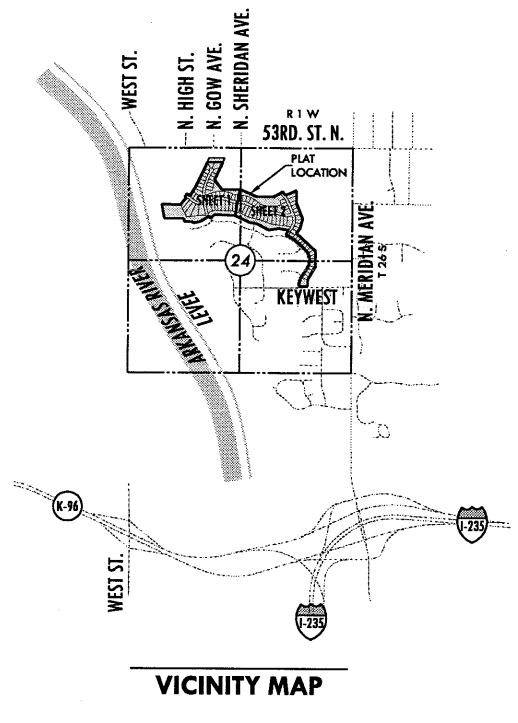
Plat

FINAL PLAT

THE MOORINGS TENTH ADDITION

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS





VICINITY MAP

N

1"=100' / 1 : 1200

100 0 100

Basis of Bearing: Kansas coordinate system of 1983 south zone grid bearing of N00°46'02"W along the E. Line of NE. ¼, Sec. 24, T26S, R1W, 6th P.M.

LEGEND

Date of Survey: July, 2006

- △ = Section corner Monument Found
- ◎ = Found ⅝" Rebar w/ MKEC CLS 39 id. cap
- ● = Set ⅝" Rebar w/ MKEC CLS 39 id. cap
- (M) = Measured
- (CM) = Calculated from measured
- (P) = Platted

STREET CENTERLINE CURVE TABLE			
CURVE	LENGTH	RADIUS	DELTA
C1	103.36	600.00	09°52'13"
C2	39.94	200.00	11°26'36"

STREET CENTERLINE TABLE		
LINE	LENGTH	BEARING
L1	21.00	S30°36'09"W
L2	57.74	N76°32'12"E
L3	52.92	N76°32'12"E
L4	29.46	N66°16'15"E
L5	32.00	N12°28'57"W
L6	28.00	S23°43'45"E
L7	69.71	N33°36'33"E
L8	65.62	N75°14'24"E

BENCH MARK

BM 1 City of Wichita disc northwest corner of Meridian and Keywest
Elev. = 1329.36 (NGVD 29)

BM 2 USGS gauging station top wall at southeast corner bridge 53rd and Arkansas River.
Elev.=1353.025 (NDVD 29)

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FINAL PLAT

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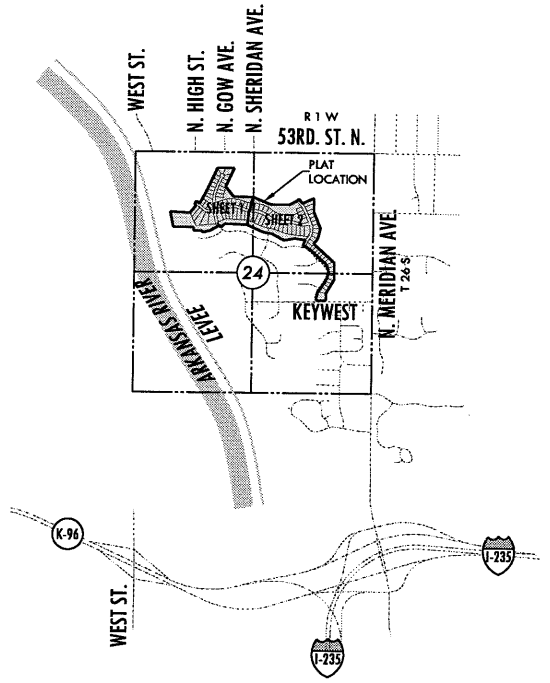

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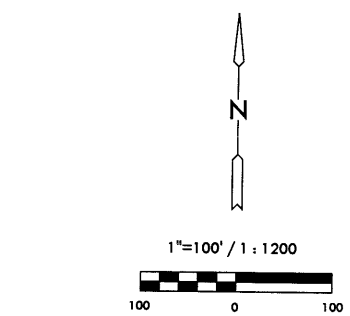

Basis of Bearing: Kansas coordinate system of 1983 south zone grid bearing of N00°46'02"W along the E. Line of NE. ¼, Sec. 24, T26S, R1W, 6th P.M.

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L5	32.00	N12°28'57"W
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FINAL PLAT
THE MOORINGS TENTH ADDITION
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

CERTIFICATE OF SURVEY

A contiguous tract of land lying within portions of The Moorings North Addition, an addition to Wichita, Sedgwick County, Kansas, AND portions of Northlakes Commercial Addition, to Sedgwick County, Kansas, AND portions of the Northwest Quarter and Northeast Quarter, Section 24, Township 26 South, Range 1 West, of the 6th Principal Meridian, Wichita, Sedgwick County, Kansas, AND portions of Government Lot 1, said Section 24; said contiguous tract of land being more particularly described as follows:

COMMENCING at the southeast corner of the Southeast Quarter, said Section 24, thence along the east line of said Southeast Quarter on a Kansas coordinate system 1983 south zone bearing of N00°42'24"W, 2064.68 feet; thence N88°23'36"E, 1251.05 feet to the POINT OF BEGINNING, being the northeast corner of Keywest Street right of way and Sandkey Street right of way as platted by said The Moorings North Addition and being on a point on a curve to the right; thence along the easterly lines of said The Moorings North Addition for the next five (5) courses: beginning with and along said curve 280.76 feet, said curve having a central angle of 39°55'05", a radius of 403.00 feet, and a long chord distance of 275.12 feet, bearing N18°21'07"E to a point on a reverse curve to the left; thence along said curve 279.38 feet, said curve having a central angle of 15°30'41", a radius of 1032.00 feet, and a long chord distance of 278.53 feet, bearing N30°33'21"E to a point on a compound curve to the left; thence along said curve 438.13 feet, said curve having a central angle of 81°40'44", a radius of 307.34 feet, and a long chord distance of 401.97 feet, bearing N18°02'21"W to a point on a curve to the right; thence along said curve 180.80 feet, said curve having a central angle of 19°11'01", a radius of 540.00 feet, and a long chord distance of 179.96 feet, bearing N49°17'13"W to a point on a reverse curve to the left; thence along said curve 354.34 feet, said curve having a central angle of 33°26'48", a radius of 607.00 feet, and a long chord distance of 349.33 feet, bearing N56°25'07"W to the southeast corner of Lot 1, Block 3 of said The Moorings North Addition; thence along the east line of said Lot 1, N17°33'26"E, 97.63 feet; thence along the north line of Block 3 of said The Moorings North Addition for the next four (4) courses: thence N19°56'33"W, 33.14 feet; thence N81°54'48"W, 199.89 feet; thence S79°32'31"W, 239.50 feet; thence N63°03'32"W, 305.80 feet; thence N81°36'11"W, 194.61 feet to the northwest corner of Lot 1, Block 2 of said The Moorings North Addition; thence along the north line of said Block 2 for the next three (3) courses; thence N67°10'14"W, 385.49 feet; thence N87°51'48"W, 502.79 feet; thence S43°48'47"W, 116.79 feet to the most southwesterly corner of Lot 11 said Block 2 being a point on a non-tangent curve to the right; thence along said curve and along the east right of way of Bayview Street 54.95 feet, said curve having a central angle of 12°57'26", a radius of 243.00 feet, and a long chord distance of 54.84 feet, bearing N39°42'29"W; thence S56°46'14"W, 64.00 feet to the northeast corner of Lot 25, Block 1 of said The Moorings North Addition; thence along the most north line of said Block 1 through the next 4 courses; thence S60°02'56"W, 173.09 feet; thence S76°14'59"W, 157.77 feet; thence N52°22'32"W, 50.95 feet; thence S89°18'06"W, 167.95 feet to the PI on the north line of Lot 20, Block 1 of said The Moorings North Addition; thence N00°41'55"W, 80.00 feet to a point on the north line of Reserve "A" of said The Moorings North Addition; thence along said north line S89°18'05"W, 466.85 feet to the northwest corner of said Reserve "A", also being the northwest corner of said The Moorings North Addition; thence N47°33'11"W, 471.10 feet; thence N02°31'57"E, 170.59 feet; thence N80°44'59"E, 160.11 feet to a point on a non-tangent curve to the right; thence along said curve 57.29 feet, said curve having a central angle of 65°09'07", a radius of 50.00 feet, and a long chord distance of 54.21 feet, bearing N57°10'26"E; thence N87°49'00"E, 134.47 feet; thence N02°11'00"W, 166.74 feet; thence N23°57'15"E, 707.77 feet; thence N89°55'23"E, 370.08 feet; thence S23°57'15"W, 493.69 feet; thence S39°58'57"E, 239.20 feet to a point on a non-tangent curve to the right; thence along said curve 521.10 feet, said curve having a central angle of 40°57'21", a radius of 729.00 feet, and a long chord distance of 510.07 feet, bearing S88°39'48"E to a point on a reverse curve to the left; thence along said curve 128.64 feet, said curve having a central angle of 27°11'48", a radius of 271.00 feet, and a long chord distance of 127.43 feet, bearing S79°47'01"E to a point on a reverse curve to the right; thence along said curve 546.91 feet, said curve having a central angle of 42°59'03", a radius of 729.00 feet, a long chord distance of 534.17 feet, bearing S71°53'24"E to a point on a reverse curve to the left; thence along said curve 211.64 feet, said curve having a central angle of 44°44'45", a radius of 271.00 feet, a long chord distance of 206.30 feet, bearing S72°48'14"E to a point on a reverse curve to the right; thence along said curve 201.44 feet, said curve having a central angle of 11°12'58", a radius of 1029.00 feet, a long chord distance of 201.11 feet, bearing S89°32'08"E; thence N66°16'15"E, 292.76 feet to a point on a non-tangent curve to the left; thence along said curve 24.30 feet, said curve having a centralangle of 02°12'11", a radius of 632.00 feet, and a long chord distance of 24.30 feet, bearing N34°11'48"E; thence N66°16'15"E, 200.29 feet to a point on a non-tangent curve; thence along said curve 208.68 feet, said curve having a central angle of 09°28'10", a radius of 1262.63 feet, a long chord distance of 208.44 feet, bearing S14°37'21"E; thence S00°53'19"E, 85.92 feet; thence N89°39'27"E, 32.74 feet to a point on a non-tangent curve to the left; thence along said curve 654.77 feet, said curve having a central angle of 29°42'44", a radius of 1262.63 feet, a long chord distance of 647.45 feet, bearing S38°24'02"E; thence S41°26'22"W, 415.47 feet; thence S48°33'38"E, 428.14 feet; thence S00°46'02"E, 352.85 feet; thence S29°18'36"W, 360.06 feet; thence S01°36'24"E, 155.00 feet to a point on the north right of way line of said Keywest Street; thence along said north right of way line S88°23'36"W, 218.37 feet to the POINT OF BEGINNING.

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

Easements for the construction and maintenance of public utilities and drainage, as indicated on the accompanying plat are hereby granted to the public.

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

Reserves "A" and "D" are platted for drainage, ponds, boat docks, sea wall beach and fences. Reserve "B" and "C" are platted for drainage, berms, landscape, irrigation, utilities confined by easements, and open spaces. Reserve "E" is platted for drainage, utilities confined by easements, sidewalks, landscaping and irrigation. Reserve "F" is platted for private pool, pool house, private park, parking, berms, landscaping, irrigation, open spaces and utilities confined by easements. The Reserves shall be owned and maintained by a homeowner's association and are reserved for uses stated.

A drainage plan has been developed for this plat drainage easements, rights-of-way, or reserves shall remain at established grades or as modified with the approval of the applicable City or County Engineer, and unobstructed to allow for the conveyance of storm water.

OWNER'S CERTIFICATES

CBB NORTHLAKES, LLC, a Kansas limited liability company

_____________________, Member
Kurt Bachman, Member

_____________________, Member
Brad Bachman, Member

STATE OF KANSAS, SEDGWICK COUNTY} ss:

This instrument was acknowledged before me on this ____ day of __________, 2007, Brad Bachman and Kurt Bachman, Members, CBB Northlakes, LLC, a Kansas limited liability company.

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

_____________________, Notary Public
Notary Public

My Term Expires: ______________.

PLANNING COMMISSION CERTIFICATE

This plat of "THE MOORINGS 10th ADDITION" has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this ____ day of __________, 2007

WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

_____________________, Chair
Darrell A. Downing, Chair

Attest:

_____________________, Secretary
John L. Schlegel, Secretary

AFFIX SEAL

GOVERNING BODY CERTIFICATE

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

Dated this ____ day of __________, 2007

At the direction of the City Council.

_____________________, Mayor
Carl Brewer, Mayor

AFFIX SEAL

Attest:

_____________________, City Clerk
Karen Sublett, City Clerk

TRANSFER RECORD

STATE OF KANSAS, SEDGWICK COUNTY} ss:

Entered on transfer record this ____ day of __________, 2007

_____________________, County Clerk
Don Brace, County Clerk

AFFIX SEAL

REGISTER OF DEEDS CERTIFICATE

This is to certify that this instrument was filed for record in the Register of Deeds office this ____ day of __________, 2007, at ________ o'clock _M; and is duly recorded.

_____________________, Register of Deeds
Bill Meek, Register of Deeds

AFFIX SEAL

Attest:

_____________________, Deputy
Tonya E. Buckingham, Deputy

COUNTY SURVEYOR

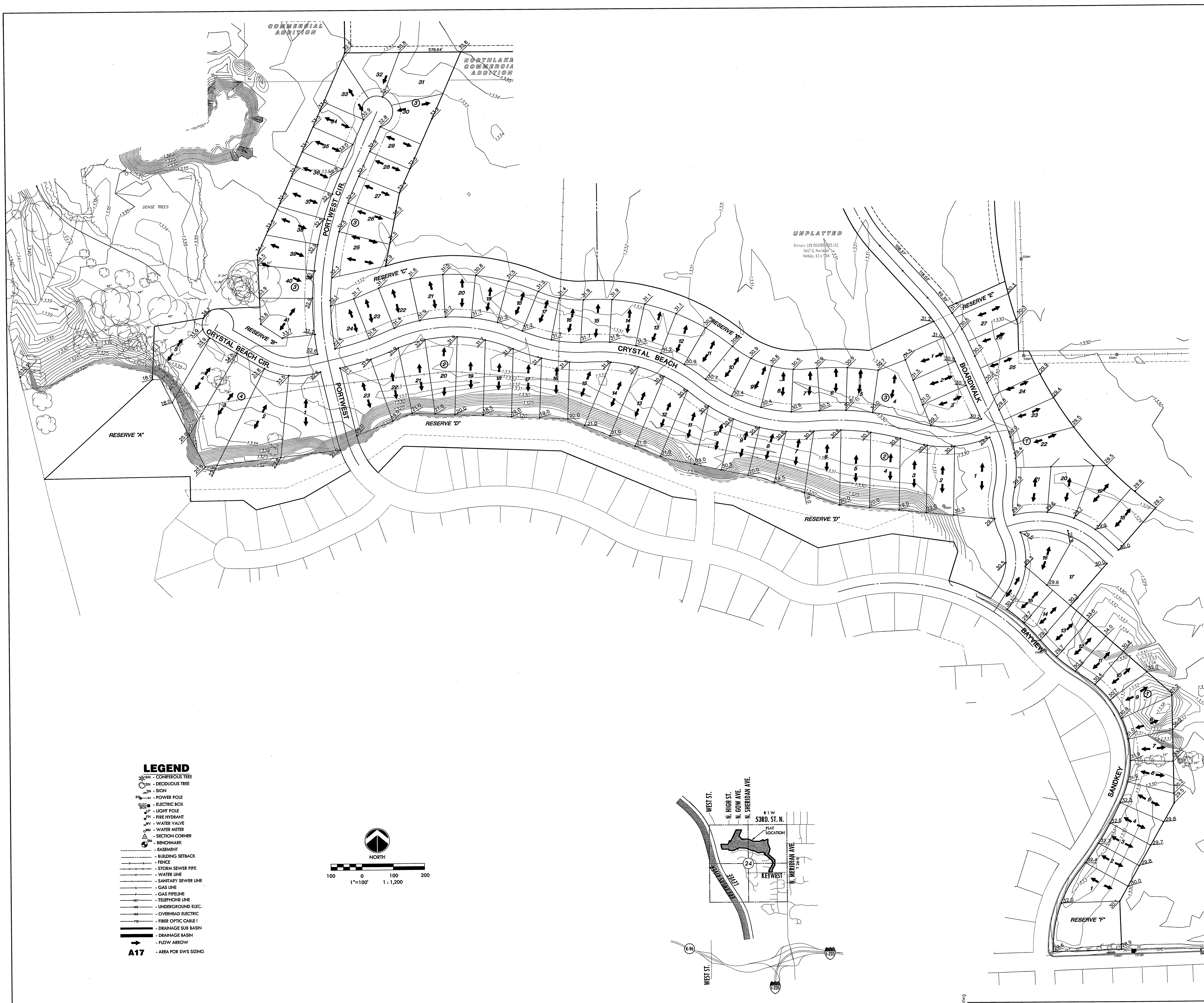
Reviewed in accordance with K.S.A. 58-2005 on this ____ day of __________, 2007.

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

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

Figure 1.3

Preliminary Grading Plan


COMMERCIAL ADDITION
NORTHLAKE COMMERCIAL ADDITION
UNPLATTED
PORTWEST CIR
PORTWEST
CRYSTAL BEACH
CRYSTAL BEACH CIR.
BOARDWALK
BAYVIEW
SANDKEY
RESERVE "A"
RESERVE "B"
RESERVE "C"
RESERVE "D"
RESERVE "E"
RESERVE "F"
DENSE TREES
LEGEND
- CONIFEROUS TREE
- DECIDUOUS TREE
- SIGN
- POWER POLE
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SECTION CORNER
- BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELEC.
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE !
- DRAINAGE SUB BASIN
- DRAINAGE BASIN
- FLOW ARROW
A17 - AREA FOR SWS SIZING
NORTH
100 0 100 200
1"=100' 1 : 1,200
WEST ST.
N. HIGH ST.
N. GOW AVE.
N. SHERIDAN AVE.
53RD. ST. N.
PLAT LOCATION
N. MERIDIAN AVE.
KEYWEST
LEVEE
ARKANSAS RIVER
VICINITY MAP

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

PROJECT NAME	MOORINGS 10TH ADDITION
SHEET TITLE	PRELIMINARY LOT GRADING PLAN
DESIGN BY: TMH	DRAWN BY: DM CMJ
CHECKED BY: KLA	
DATE: JUNE 2007	JOB NO.: 06608
SHEET/OF: 1 / 1	

Tab 2. Existing Conditions Runoff Calculations

A. Orthophotograph

The aerial photograph is included, Figure 2.1.

B. Runoff Method

The site was modeled using the SCS Hydrograph method in Hydraflow Hydrographs 2004 by Intelisolve.

C. Existing Topography

Slopes across the site ranged from 0.2-1%. An existing lake is adjacent to the property on the south. Elevations on the site ranged from 1333 feet to 1320 near the pond edge. The existing topography is shown on the Existing Conditions Drawing, Figure 2.2.

D. Site Areas

The Moorings 10th Addition is 57.6 acres. Approximately, 29 acres adjacent to Moorings 10th is future residential and 41 acres is future office/commercial. These adjacent areas were evaluated in this drainage report.

E. Benchmarks

Benchmarks used for site control are included on the plat provided previously under Tab 1, Figure 1.2.

F. Streams, Creeks, and Waterways

The platted area is located in Zone X, areas protected by levees from the 1% annual chance storm, as shown on the Sedgwick County February 2, 2007, Kansas FIRM Panels 195 & 213 of 700, Figure 2.3. The Arkansas River is adjacent to the west property line. The Arkansas River is in Zone A floodplain. A levee runs parallel to the river, adjacent to the property. Another channel drains from north to south along the east property line. Improvements for this channel are proposed by others.

G. Soils

According to the NRCS (SCS) Sedgwick County Soil Survey, Figure 2.4, soils on the site are:

- Tabler silty clay loam, 0 to 1 percent slopes, HSG “D”
- Irwin silty clay loam, 3 to 7 percent slopes, HSG “D”
- Blanket silt loam, 1 to 3 percent slopes, HSG “C”

The Hydraulic Soil Group “D” was used for calculations on the site. Upstream of the site, the drainage area is primarily made up of Elandco silt loam, rarely flooded, HSG “B”. Hydraulic Soil Group “B” was used for the basin.

H. Natural Features

An existing lake is adjacent to the property on the south. The Arkansas River is adjacent to the west property line. Another channel drains from north to south along the east property line of

Moorings 10th Addition. A drainage corridor transects the property west to east. The property is currently undeveloped land.

I. Location of Existing Impervious Areas

Currently the site is undeveloped agricultural land with no impervious area.

J. Location of Existing Utilities

Water, sewer and electric have been installed in various locations throughout Moorings North Addition, just south of the platted area. There are no existing utilities in the platted area.

K. Location of Existing Conveyance Systems

Stormsewer has been installed in various locations throughout Moorings North Addition; however, the platted area has no existing stormsewer.

L. Flow Paths

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

M. Location and Sizes of Existing Structures

There are no existing structures in the area identified on the plat as Moorings 10th Addition. Downstream, the site drains into a channel with 10' bottom and 3.5:1 side slopes and then into an existing 11'x8' RCB.

N. Existing Conditions Hydrologic Analysis

The site was divided into drainage areas as shown on the pre-project drainage boundary drawing, Figure 2.5. These drainage areas include the offsite area and also undeveloped land adjacent to the site. All of these basins drain into the channel east of the site.

For the 100-year storm under existing conditions, Baughman reported a flow of 450 cfs reaching 53rd St. N. from the north watershed. For the same scenario, MKEC Engineering Consultants, Inc. determined a flow of 455 cfs coming from the offsite watershed to 53rd St. N.

The resulting pre-project flows are reported in the table below. Runoff calculations are in Figure 2.6.

Pre-Development Flowrates

Description	Design Storm Flows (cfs)				
	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**100-Yr**
Flow to Channel	111	191	249	342	483

O. Pre-Developed Runoff Curve Numbers

The curve number used for pre-developed conditions is 81 for onsite and a weighted curve number of 71.4 for the offsite watershed.

P. Existing Time of Concentration

The time of concentrations for pre-development conditions are shown in the following table. Time of concentration calculations are in Figure 2.7.

Existing Times of Concentration

Area	T_c minutes	Curve Number
Offsite	380.8	71.4
To Outlet	56.7	81.0
To Pond	48.0	81.0
WS1	27.9	81.0
WS2	40.4	81.0
WS3	24.2	81.0
To Moorings North Pond	15.0	81.0

Q. Downstream Drainage Capacity

The channel east of the site is being modified by others and will be designed to accommodate post-project flows from Moorings 10th Addition.

R. Existing Structural Elevations

There are no existing structures on site.

S. Open Channels

The channel east of the site has a drainage area of 1,350 acres according to plans from Baughman. An additional area drains south to the levee and would be blocked from entering the river by the levee and blocked from entering the channel by 53rd Street. Existing 42" pipes with flap gates carry flow from this area into the Arkansas River. We have been in contact with the Army Corps of Engineers and are awaiting information on the design of these structures and detention required for these structures to function. In addition, there is an existing drainage corridor that transects the site west to east.

T. Groundwater Elevations

Groundwater in the area is at an elevation ranging from 1321.0 west of the site to 1316.0 east of the site. The groundwater elevation of Crystal Lake is 1324.9.

Figure 2.1

Orthophotograph

N

SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

J:\CIVIL\06608\DWG\DRNG\06608AERIAL.DWG

MKEC ENGINEERING CONSULTANTS, INC.

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

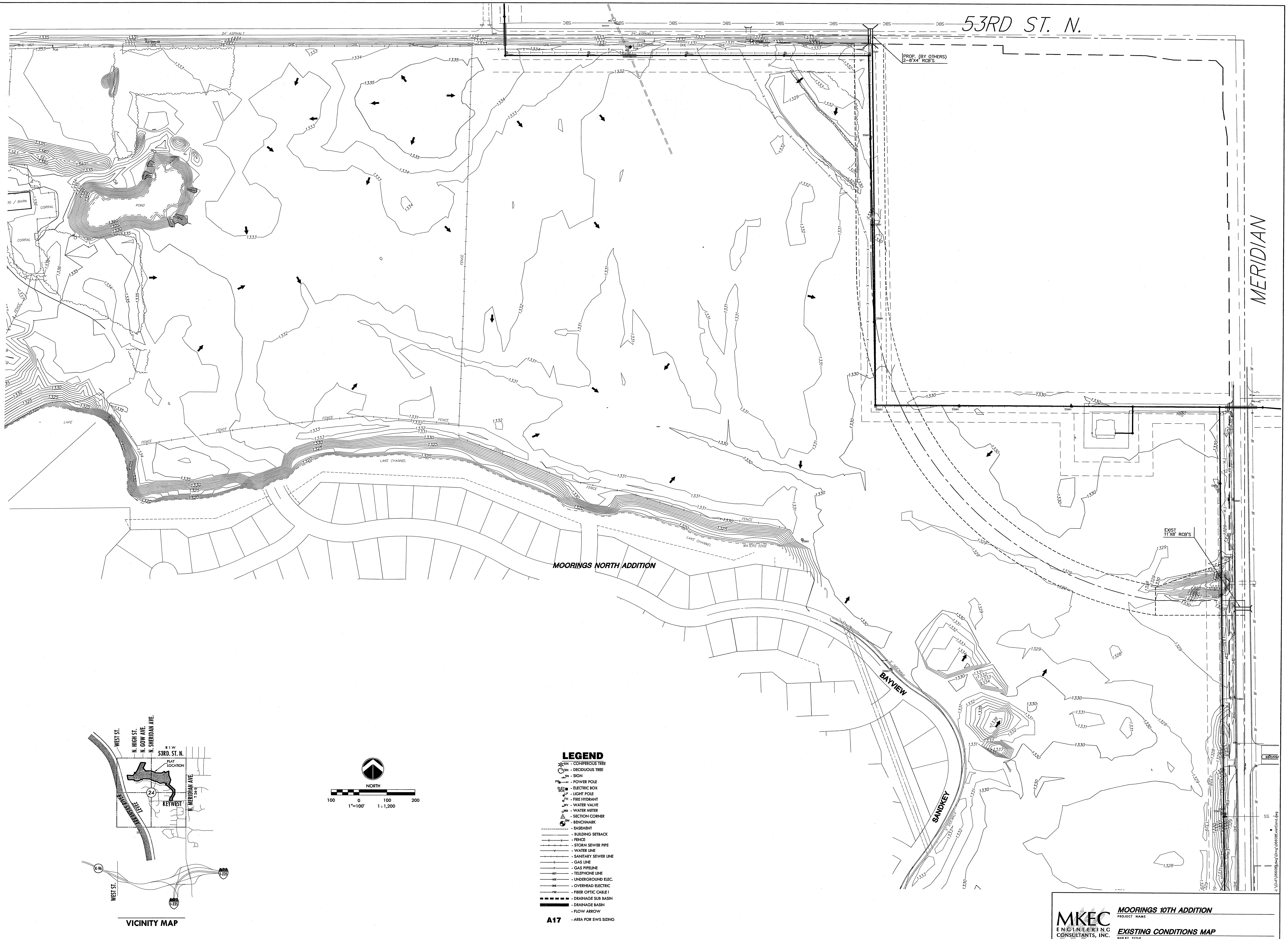
MOORINGS 10TH ADDITION
PROJECT NAME

PARK & KECHI AERIAL
SHEET TITLE

TMH	SMB	KLA
DESIGN BY:	DRAWN BY:	CHECKED BY:
JUNE 2007	06608	1 / 1
DATE	JOB NO.	SHEET/OF

Figure 2.2

Existing Conditions Drawing


53RD ST. N.
MERIDIAN
PROP. (BY OTHERS) 2-8'X4' RCB'S
EXIST 11'X8' RCB'S
POND
CORRAL
LAKE
LAKE CHANNEL
FENCE
WATERS EDGE
MOORINGS NORTH ADDITION
BAYVIEW
SANDKEY
NORTH
100 0 100 200
1"=100' 1 : 1,200
LEGEND
- CONIFEROUS TREE
- DECIDUOUS TREE
- SIGN
- POWER POLE
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SECTION CORNER
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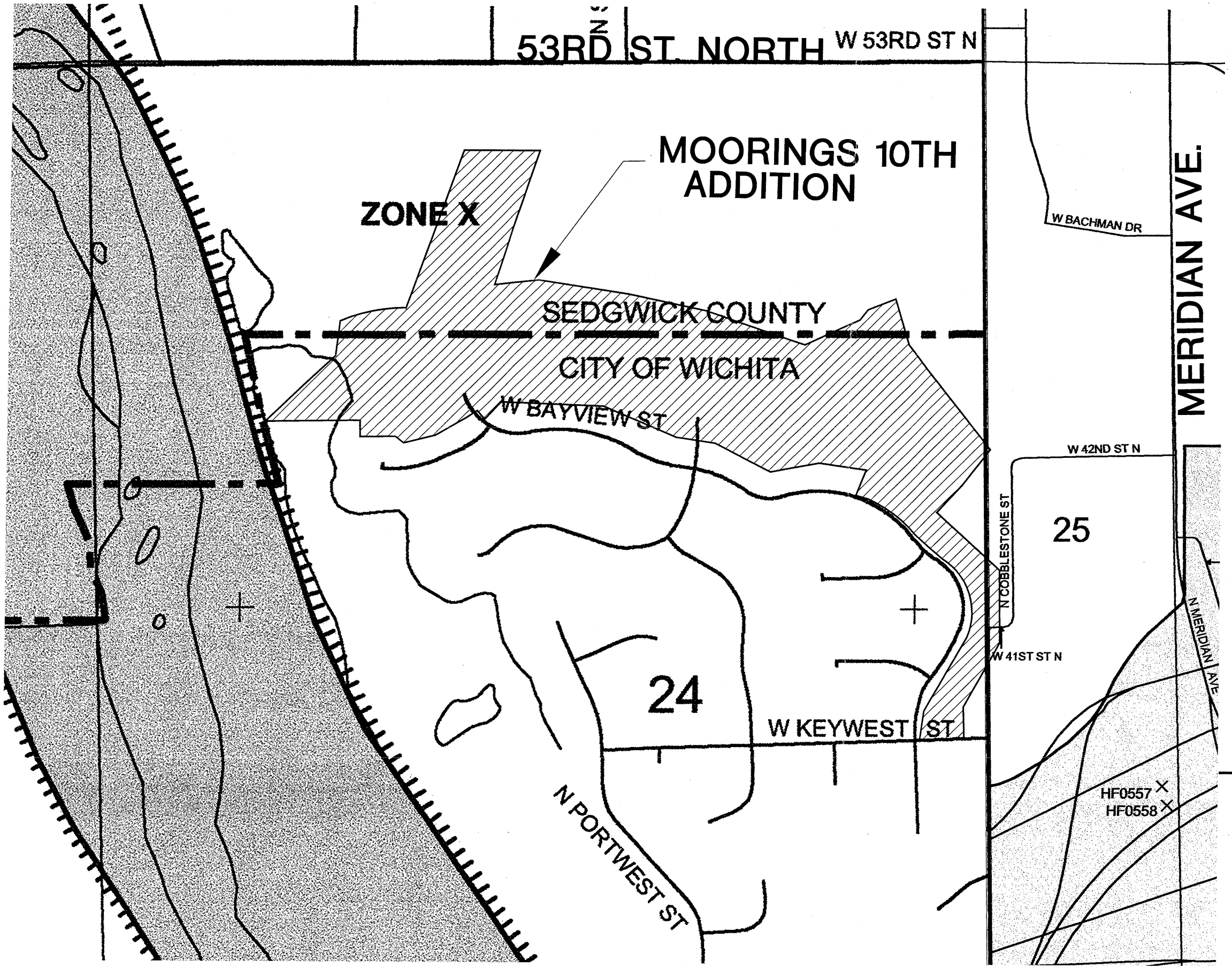
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELEC.
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- DRAINAGE SUB BASIN
- DRAINAGE BASIN
- FLOW ARROW
A17 - AREA FOR SWS SIZING
VICINITY MAP
WEST ST.
N. HIGH ST.
N. GOW AVE.
N. SHERIDAN AVE.
53RD. ST. N.
PLAT LOCATION
KEYWEST
N. MERIDIAN AVE.
LEVEE
ARKANSAS RIVER

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

MOORINGS 10TH ADDITION (PROJECT NAME)		
EXISTING CONDITIONS MAP (SHEET TITLE)		
TMH (DESIGN BY:)	SMB (DRAWN BY:)	KLA (CHECKED BY:)
JUNE 2007 (DATE)	06608 (JOB NO.)	1 / 1 (SHEET/OF)

Figure 2.3

FIRM



NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0213E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
AND INCORPORATED AREAS

PANEL 213 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PARK CITY, CITY OF	200963	0213	E
SEDGWICK COUNTY	200321	0213	E
WICHITA, CITY OF	200328	0213	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
20173C0213E

EFFECTIVE DATE
FEBRUARY 2, 2007
Federal Emergency Management Agency

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

J:\CIVIL\06608\DWG\DRNG\06608FIRM.DWG

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

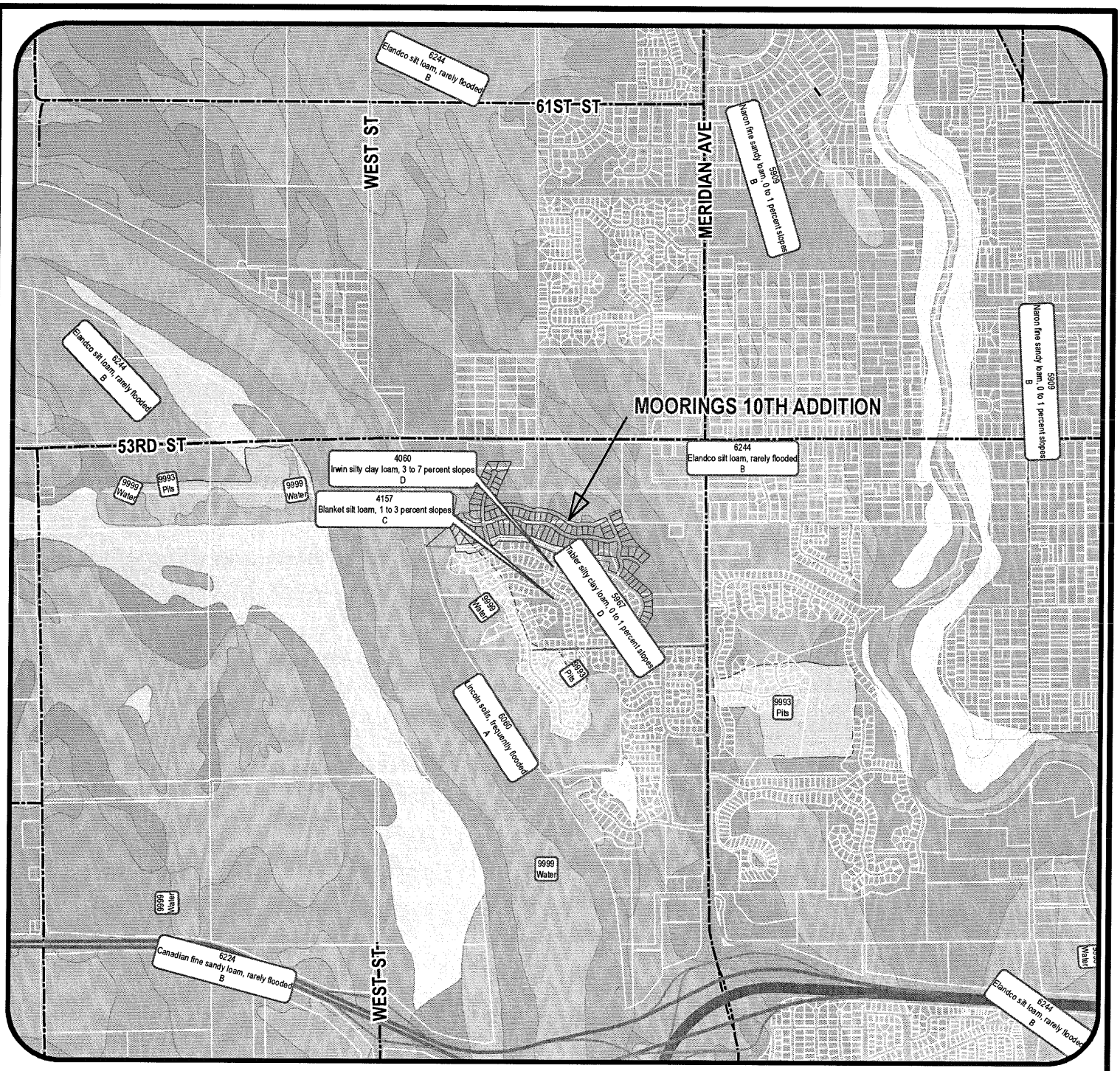
MOORINGS 10TH ADDITION
PROJECT NAME

FIRM PANEL 195 & 213 OF 700
SEDGWICK COUNTY, KANSAS
SHEET TITLE

KLA	*SMB*	*KLA*
DESIGN BY:	DRAWN BY:	CHECKED BY:
JUNE 2007	*06608*	*1 / 1*
DATE	JOB NO.	SHEET/OF

Figure 2.4

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 8,000 9,000 Feet

1 0.5 0 1 Kilometers

N
W E
S

J:\Civil\06608\dwg\DRNG\nrcs-soil.mxd

MOORINGS 10TH ADDITION

Project Name:

Soil Survey - Sedgwick County, KS

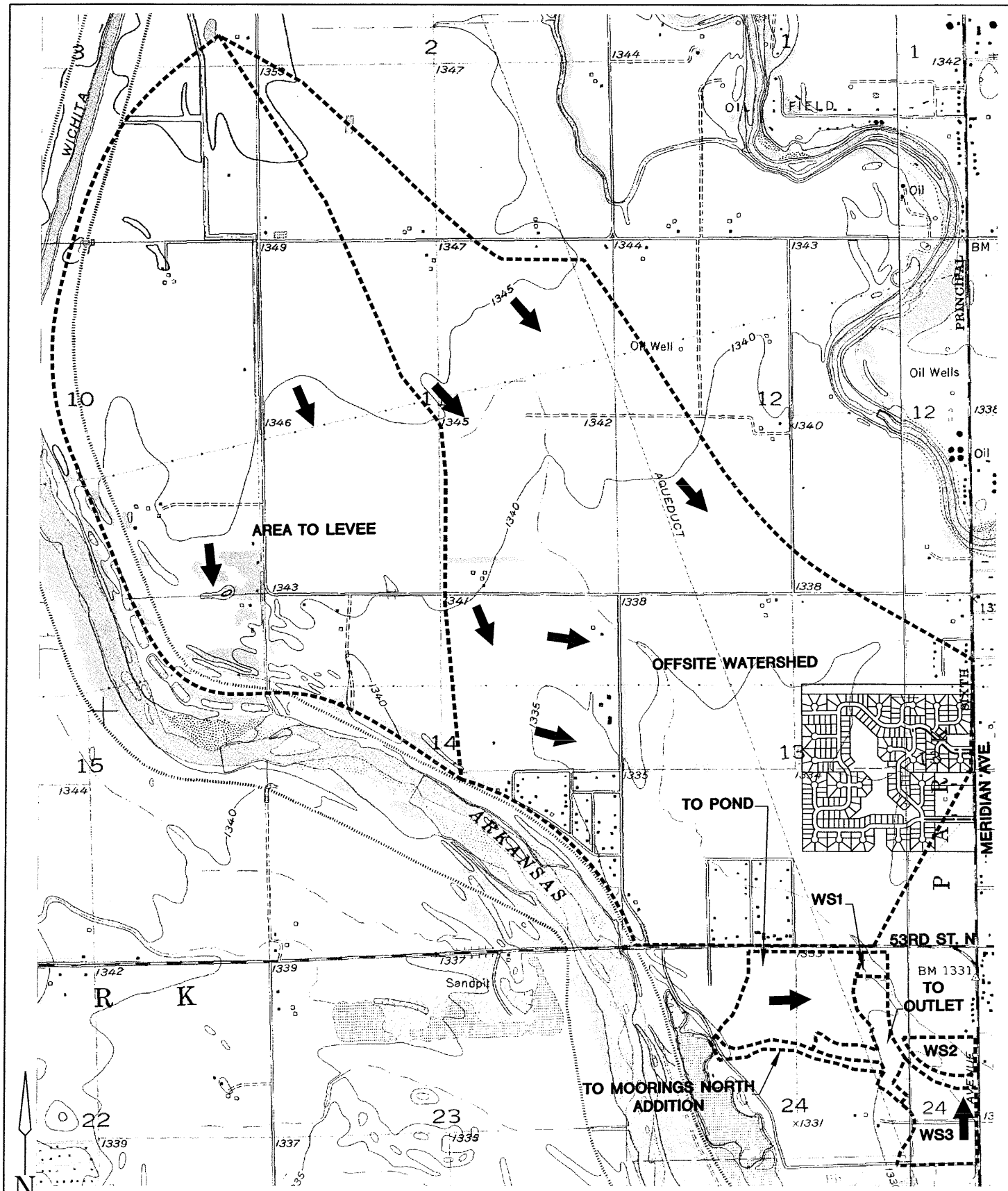
Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

CMJ	June 2007
Drawn By:	Date:
TMH/KLA	06608
Design / Review:	Job No.:

Figure 2.5

Pre-project Drainage Boundaries



MKEC ENGINEERING CONSULTANTS, INC.

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

MOORINGS 10TH ADDITION
PROJECT NAME

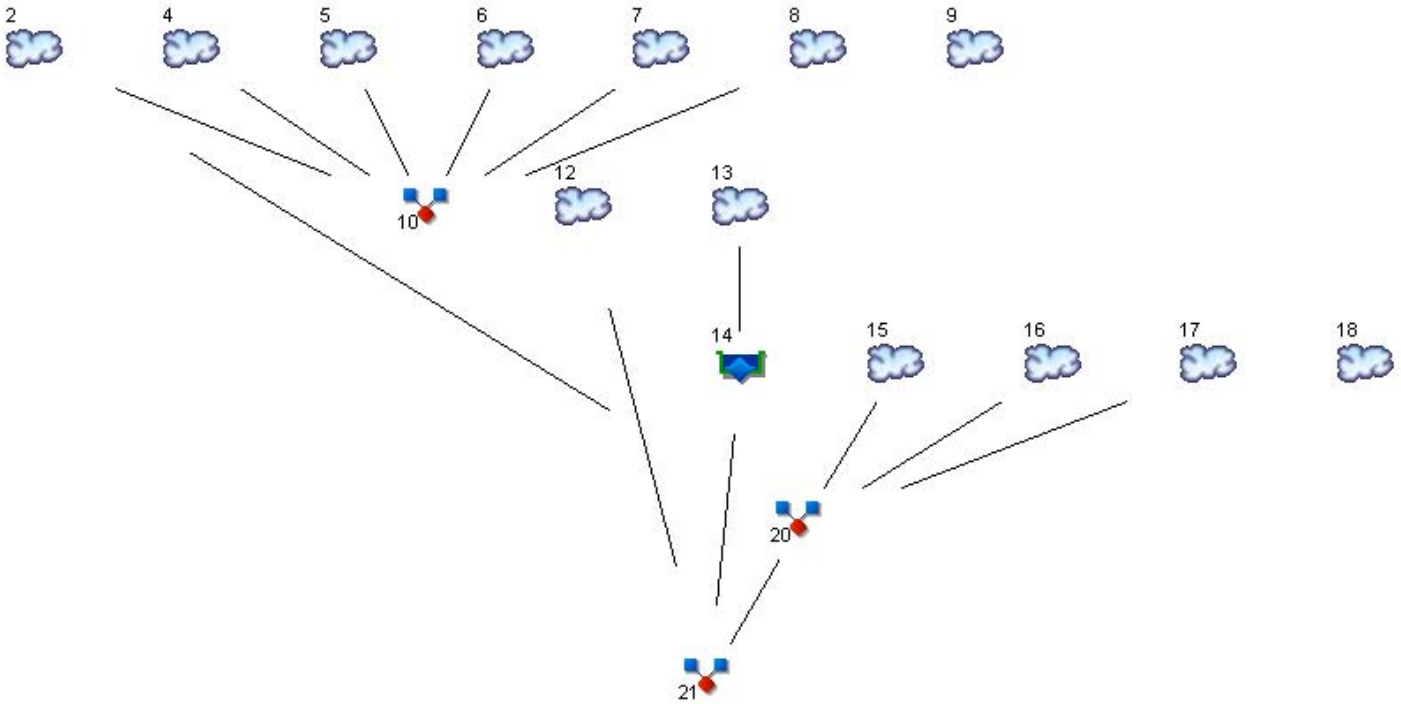
PRE-PROJECT WATERSHED BOUNDARY
SHEET TITLE

TMH	SMB	TMH
DESIGN BY:	DRAWN BY:	CHECKED BY:
JUNE 2007	06608	1 / 1
DATE	JOB NO.	SHEET/OF

J:\CIVIL\06608\DWG\DRNG\06608PREBNDRY.DWG

Figure 2.6

Hydraflow Hydrographs



Legend

Hyd.	Origin	Description
2	SCS Runoff	Offsite
4	SCS Runoff	PRE to Outlet
5	SCS Runoff	PRE to Pond
6	SCS Runoff	PRE WS1
7	SCS Runoff	PRE WS2
8	SCS Runoff	PRE WS3
9	SCS Runoff	PRE TO MOORING N.
10	Combine	PRE TO CHANNEL
12	SCS Runoff	POST TO OUTLET
13	SCS Runoff	POST TO POND
14	Reservoir	DETENTION POND
15	SCS Runoff	POST WS1
16	SCS Runoff	POST WS2
17	SCS Runoff	POST WS3
18	SCS Runoff	POST TO MOORING N.
20	Combine	POST TO CHANNEL
21	Combine	POST

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	
2	SCS Runoff	-------	-------	103.26	-------	178.61	233.35	321.13	-------	454.92	Offsite
4	SCS Runoff	-------	-------	5.844	-------	9.179	11.46	14.97	-------	20.10	PRE to Outlet
5	SCS Runoff	-------	-------	38.75	-------	60.68	75.59	98.40	-------	131.46	PRE to Pond
6	SCS Runoff	-------	-------	2.938	-------	4.574	5.682	7.373	-------	9.819	PRE WS1
7	SCS Runoff	-------	-------	7.074	-------	11.08	13.80	17.96	-------	24.00	PRE WS2
8	SCS Runoff	-------	-------	29.76	-------	46.33	57.55	74.69	-------	99.46	PRE WS3
9	SCS Runoff	-------	-------	10.64	-------	16.47	20.41	26.42	-------	35.09	PRE TO MOORING N.
10	Combine	2, 4, 5, 6, 7, 8,	-------	110.82	-------	190.85	248.78	341.52	-------	482.57	PRE TO CHANNEL
12	SCS Runoff	-------	-------	17.21	-------	24.39	29.09	36.13	-------	46.13	POST TO OUTLET
13	SCS Runoff	-------	-------	94.56	-------	128.65	150.82	183.87	-------	230.81	POST TO POND
14	Reservoir	13	-------	72.37	-------	100.10	118.31	146.49	-------	187.20	DETENTION POND
15	SCS Runoff	-------	-------	6.665	-------	8.937	10.41	12.62	-------	15.75	POST WS1
16	SCS Runoff	-------	-------	17.99	-------	24.16	28.16	34.15	-------	42.65	POST WS2
17	SCS Runoff	-------	-------	59.18	-------	82.63	97.92	120.76	-------	153.17	POST WS3
18	SCS Runoff	-------	-------	16.42	-------	22.60	26.62	32.62	-------	41.13	POST TO MOORING N.
20	Combine	2, 15, 16, 17,	-------	106.04	-------	182.59	238.10	327.05	-------	462.49	POST TO CHANNEL
21	Combine	12, 14, 20	-------	156.70	-------	225.28	271.79	344.65	-------	478.08	POST

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
2	SCS Runoff	103.26	6	1098	121.040	----	------	------	Offsite
4	SCS Runoff	5.844	6	804	2.574	----	------	------	PRE to Outlet
5	SCS Runoff	38.75	6	744	8.504	----	------	------	PRE to Pond
6	SCS Runoff	2.938	6	732	0.434	----	------	------	PRE WS1
7	SCS Runoff	7.074	6	744	1.553	----	------	------	PRE WS2
8	SCS Runoff	29.76	6	732	4.392	----	------	------	PRE WS3
9	SCS Runoff	10.64	6	726	1.161	----	------	------	PRE TO MOORING N.
10	Combine	110.82	6	1032	138.495	2, 4, 5, 6, 7, 8,	------	------	PRE TO CHANNEL
12	SCS Runoff	17.21	6	744	3.652	----	------	------	POST TO OUTLET
13	SCS Runoff	94.56	6	732	13.896	----	------	------	POST TO POND
14	Reservoir	72.37	6	756	13.896	13	1328.92	2.802	DETENTION POND
15	SCS Runoff	6.665	6	726	0.748	----	------	------	POST WS1
16	SCS Runoff	17.99	6	732	2.678	----	------	------	POST WS2
17	SCS Runoff	59.18	6	726	6.424	----	------	------	POST WS3
18	SCS Runoff	16.42	6	726	1.796	----	------	------	POST TO MOORING N.
20	Combine	106.04	6	1086	130.890	2, 15, 16, 17,	------	------	POST TO CHANNEL
21	Combine	156.70	6	744	148.438	12, 14, 20	------	------	POST

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
2	SCS Runoff	178.61	6	1062	204.336	----	------	------	Offsite
4	SCS Runoff	9.179	6	798	3.941	----	------	------	PRE to Outlet
5	SCS Runoff	60.68	6	744	13.021	----	------	------	PRE to Pond
6	SCS Runoff	4.574	6	732	0.664	----	------	------	PRE WS1
7	SCS Runoff	11.08	6	744	2.377	----	------	------	PRE WS2
8	SCS Runoff	46.33	6	732	6.725	----	------	------	PRE WS3
9	SCS Runoff	16.47	6	726	1.778	----	------	------	PRE TO MOORING N.
10	Combine	190.85	6	1008	231.064	2, 4, 5, 6, 7, 8,	------	------	PRE TO CHANNEL
12	SCS Runoff	24.39	6	744	5.190	----	------	------	POST TO OUTLET
13	SCS Runoff	128.65	6	732	19.147	----	------	------	POST TO POND
14	Reservoir	100.10	6	756	19.146	13	1329.14	3.544	DETENTION POND
15	SCS Runoff	8.937	6	726	1.018	----	------	------	POST WS1
16	SCS Runoff	24.16	6	732	3.646	----	------	------	POST WS2
17	SCS Runoff	82.63	6	726	9.069	----	------	------	POST WS3
18	SCS Runoff	22.60	6	726	2.504	----	------	------	POST TO MOORING N.
20	Combine	182.59	6	1056	218.069	2, 15, 16, 17,	------	------	POST TO CHANNEL
21	Combine	225.28	6	744	242.406	12, 14, 20	------	------	POST

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
2	SCS Runoff	233.35	6	1050	263.943	----	------	------	Offsite
4	SCS Runoff	11.46	6	798	4.877	----	------	------	PRE to Outlet
5	SCS Runoff	75.59	6	744	16.116	----	------	------	PRE to Pond
6	SCS Runoff	5.682	6	732	0.822	----	------	------	PRE WS1
7	SCS Runoff	13.80	6	744	2.942	----	------	------	PRE WS2
8	SCS Runoff	57.55	6	732	8.323	----	------	------	PRE WS3
9	SCS Runoff	20.41	6	726	2.200	----	------	------	PRE TO MOORING N.
10	Combine	248.78	6	1002	297.023	2, 4, 5, 6, 7, 8,	------	------	PRE TO CHANNEL
12	SCS Runoff	29.09	6	744	6.213	----	------	------	POST TO OUTLET
13	SCS Runoff	150.82	6	732	22.607	----	------	------	POST TO POND
14	Reservoir	118.31	6	750	22.606	13	1329.28	4.016	DETENTION POND
15	SCS Runoff	10.41	6	726	1.196	----	------	------	POST WS1
16	SCS Runoff	28.16	6	732	4.282	----	------	------	POST WS2
17	SCS Runoff	97.92	6	726	10.825	----	------	------	POST WS3
18	SCS Runoff	26.62	6	726	2.973	----	------	------	POST TO MOORING N.
20	Combine	238.10	6	1044	280.245	2, 15, 16, 17,	------	------	POST TO CHANNEL
21	Combine	271.79	6	744	309.065	12, 14, 20	------	------	POST

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
2	SCS Runoff	321.13	6	1032	358.688	----	------	------	Offsite
4	SCS Runoff	14.97	6	792	6.323	----	------	------	PRE to Outlet
5	SCS Runoff	98.40	6	744	20.894	----	------	------	PRE to Pond
6	SCS Runoff	7.373	6	732	1.065	----	------	------	PRE WS1
7	SCS Runoff	17.96	6	744	3.814	----	------	------	PRE WS2
8	SCS Runoff	74.69	6	732	10.790	----	------	------	PRE WS3
9	SCS Runoff	26.42	6	726	2.852	----	------	------	PRE TO MOORING N.
10	Combine	341.52	6	990	401.575	2, 4, 5, 6, 7, 8,	------	------	PRE TO CHANNEL
12	SCS Runoff	36.13	6	744	7.763	----	------	------	POST TO OUTLET
13	SCS Runoff	183.87	6	732	27.819	----	------	------	POST TO POND
14	Reservoir	146.49	6	750	27.818	13	1329.48	4.701	DETENTION POND
15	SCS Runoff	12.62	6	726	1.463	----	------	------	POST WS1
16	SCS Runoff	34.15	6	732	5.238	----	------	------	POST WS2
17	SCS Runoff	120.76	6	726	13.480	----	------	------	POST WS3
18	SCS Runoff	32.62	6	726	3.680	----	------	------	POST TO MOORING N.
20	Combine	327.05	6	1026	378.869	2, 15, 16, 17,	------	------	POST TO CHANNEL
21	Combine	344.65	6	744	414.450	12, 14, 20	------	------	POST

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
2	SCS Runoff	454.92	6	1020	501.861	----	------	------	Offsite
4	SCS Runoff	20.10	6	792	8.445	----	------	------	PRE to Outlet
5	SCS Runoff	131.46	6	744	27.907	----	------	------	PRE to Pond
6	SCS Runoff	9.819	6	732	1.423	----	------	------	PRE WS1
7	SCS Runoff	24.00	6	744	5.095	----	------	------	PRE WS2
8	SCS Runoff	99.46	6	732	14.412	----	------	------	PRE WS3
9	SCS Runoff	35.09	6	726	3.810	----	------	------	PRE TO MOORING N.
10	Combine	482.57	6	984	559.144	2, 4, 5, 6, 7, 8,	------	------	PRE TO CHANNEL
12	SCS Runoff	46.13	6	744	9.996	----	------	------	POST TO OUTLET
13	SCS Runoff	230.81	6	732	35.292	----	------	------	POST TO POND
14	Reservoir	187.20	6	750	35.292	13	1329.74	5.617	DETENTION POND
15	SCS Runoff	15.75	6	726	1.845	----	------	------	POST WS1
16	SCS Runoff	42.65	6	732	6.607	----	------	------	POST WS2
17	SCS Runoff	153.17	6	726	17.303	----	------	------	POST WS3
18	SCS Runoff	41.13	6	726	4.696	----	------	------	POST TO MOORING N.
20	Combine	462.49	6	1014	527.617	2, 15, 16, 17,	------	------	POST TO CHANNEL
21	Combine	478.08	6	996	572.905	12, 14, 20	------	------	POST

Hydrograph Plot

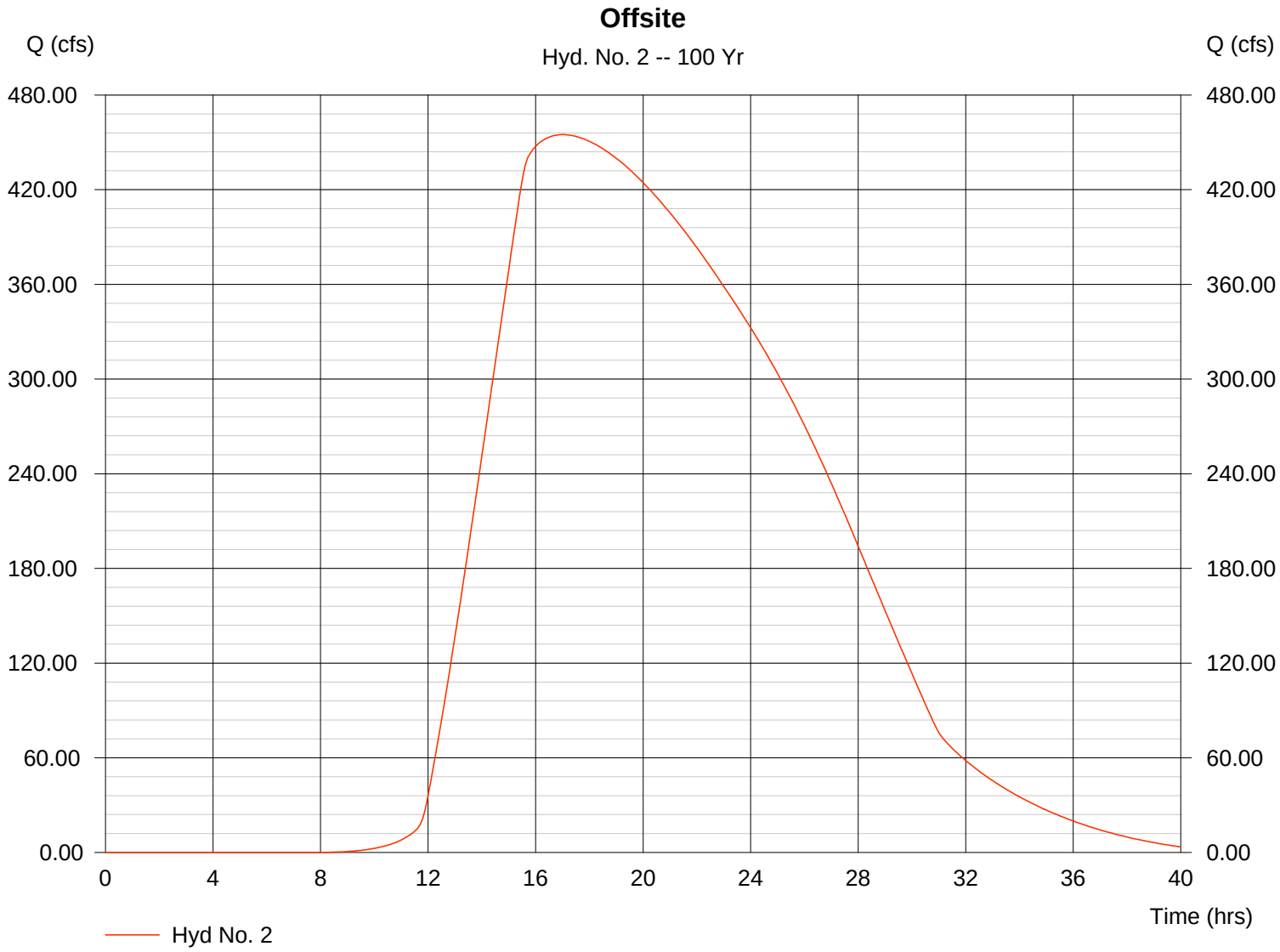
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 2

Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 454.92 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1350.000 ac	Curve number	= 71.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 380.80 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 501.861 acft



TR55 Tc Worksheet

Hyd. No. 2

Offsite

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.011		0.011		0.011		
Flow length (ft)	=	0.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	0.00		0.00		0.00		
Land slope (%)	=	0.00		0.00		0.00		
Travel Time (min)	**=**	**0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow								
Flow length (ft)	=	6800.00		0.00		0.00		
Watercourse slope (%)	=	0.10		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	0.51		0.00		0.00		
Travel Time (min)	**=**	**222.13**	**+**	**0.00**	**+**	**0.00**	**=**	**222.13**
Channel Flow								
X sectional flow area (sqft)	=	168.00		0.00		0.00		
Wetted perimeter (ft)	=	100.00		0.00		0.00		
Channel slope (%)	=	0.10		0.00		0.00		
Manning's n-value	=	0.050		0.015		0.015		
Velocity (ft/s)	=	1.33		0.00		0.00		
Flow length (ft)	=	12700.0		0.0		0.0		
Travel Time (min)	**=**	**158.66**	**+**	**0.00**	**+**	**0.00**	**=**	**158.66**

Total Travel Time, Tc ..... 380.80 min

Hydrograph Plot

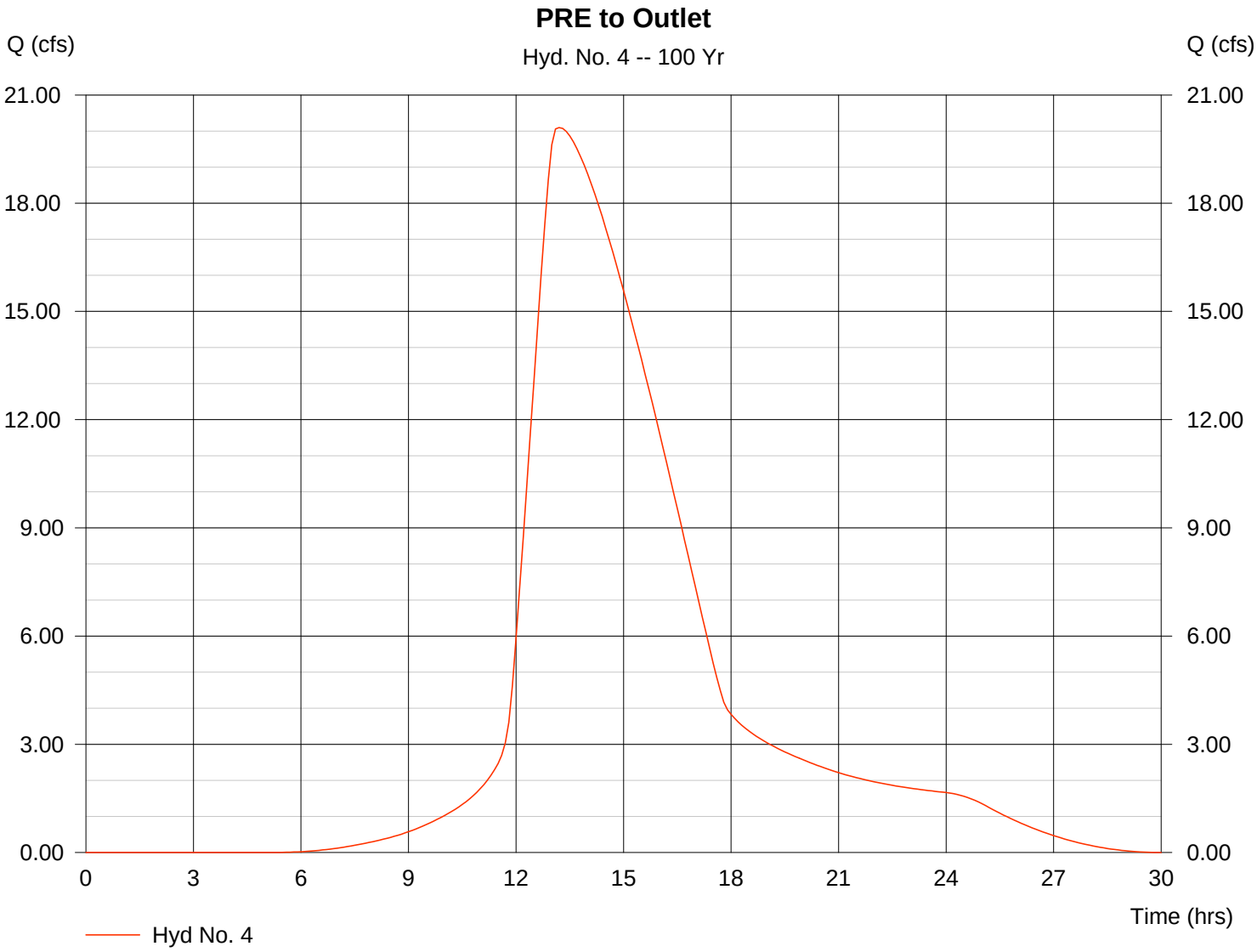
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 4

PRE to Outlet

Hydrograph type	= SCS Runoff	Peak discharge	= 20.10 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 18.400 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 116.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 8.445 acft



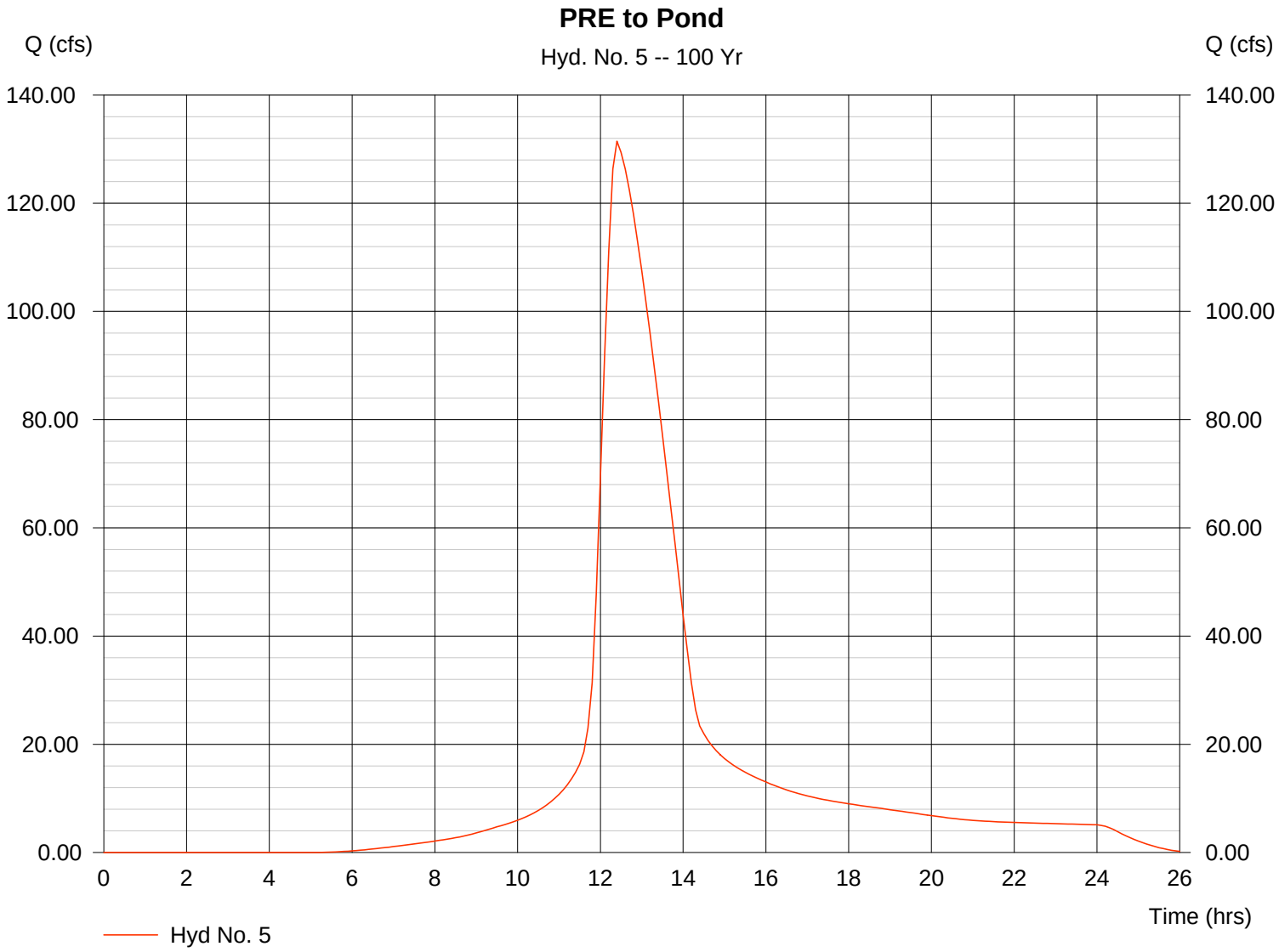
Hydrograph Plot

Hyd. No. 5

PRE to Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 131.46 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 60.800 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 48.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 27.907 acft



Hydrograph Plot

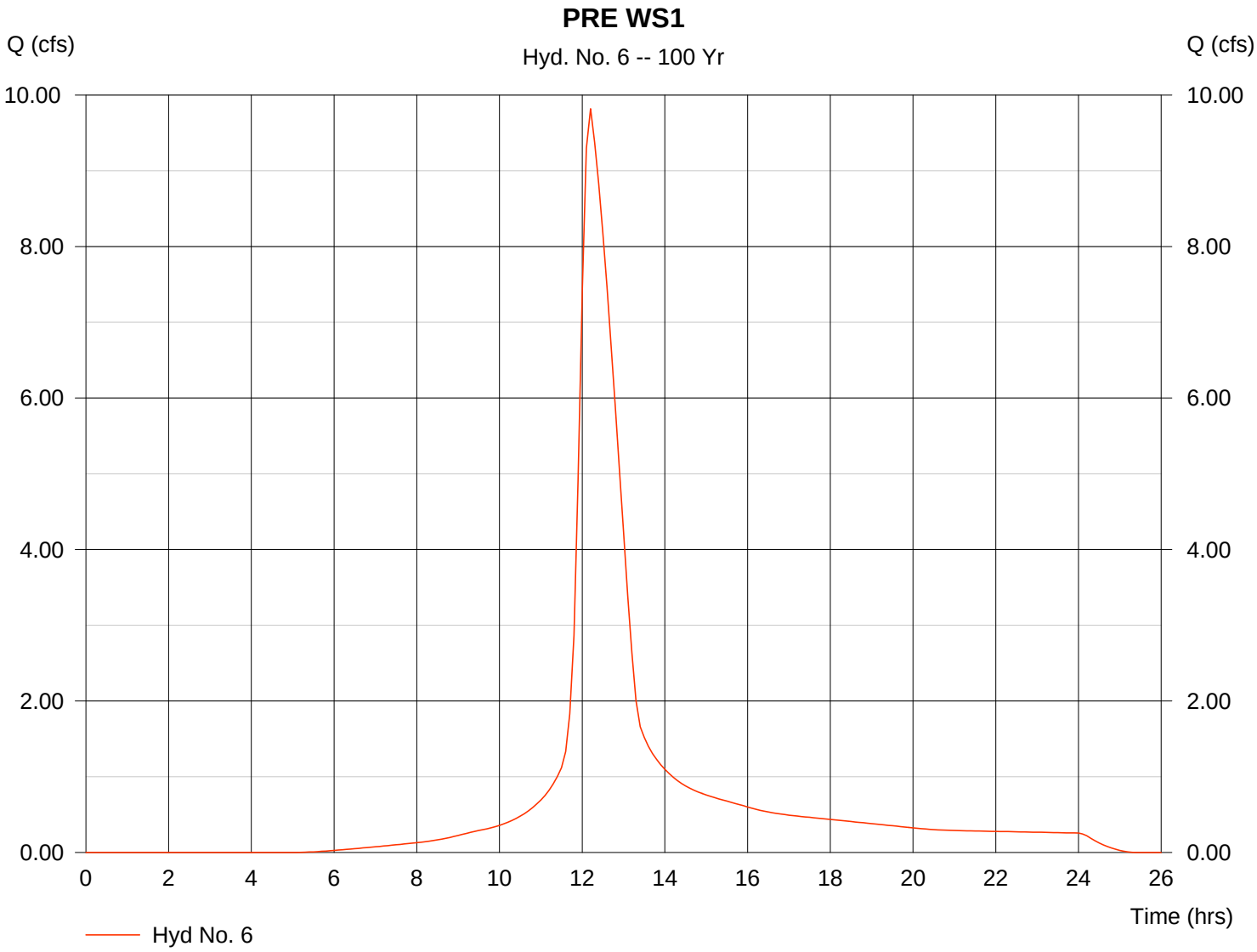
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 6

PRE WS1

Hydrograph type	= SCS Runoff	Peak discharge	= 9.819 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 3.100 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 27.90 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 1.423 acft



Hydrograph Plot

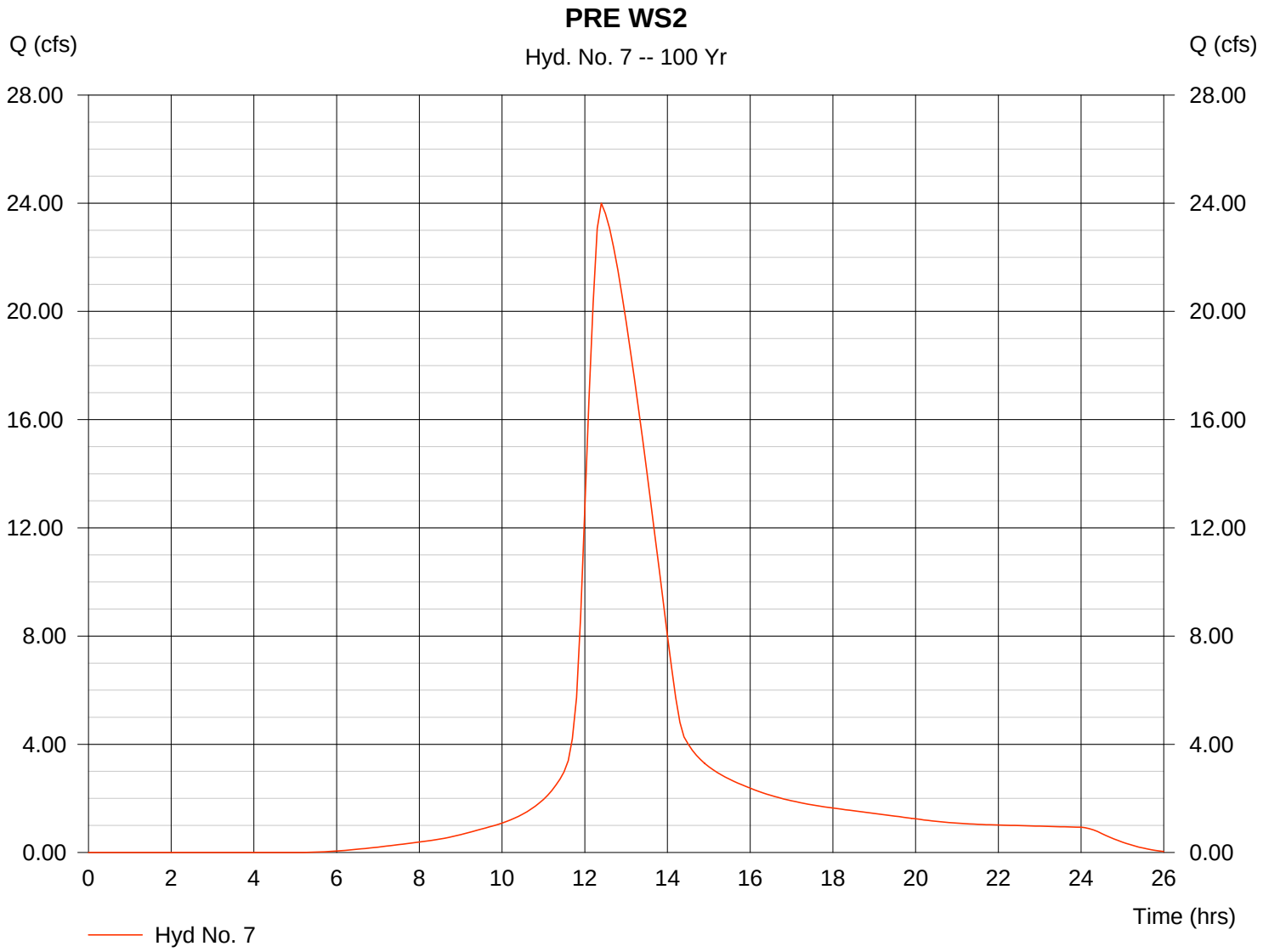
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 7

PRE WS2

Hydrograph type	= SCS Runoff	Peak discharge	= 24.00 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 11.100 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 40.40 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 5.095 acft



Hydrograph Plot

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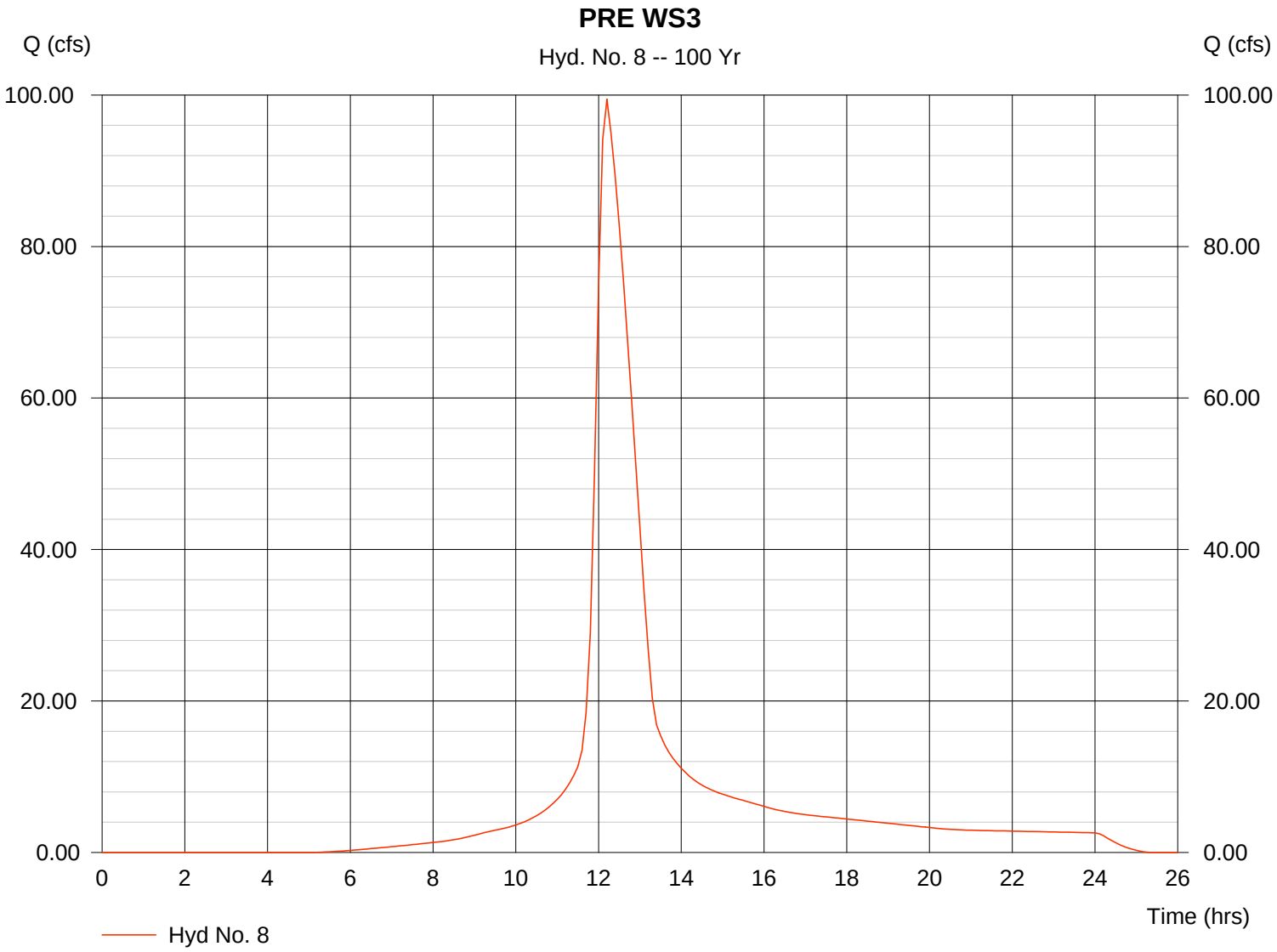
Hyd. No. 8

PRE WS3

Hydrograph type	= SCS Runoff	Peak discharge	= 99.46 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 31.400 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 24.20 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 14.412 acft



Hydrograph Plot

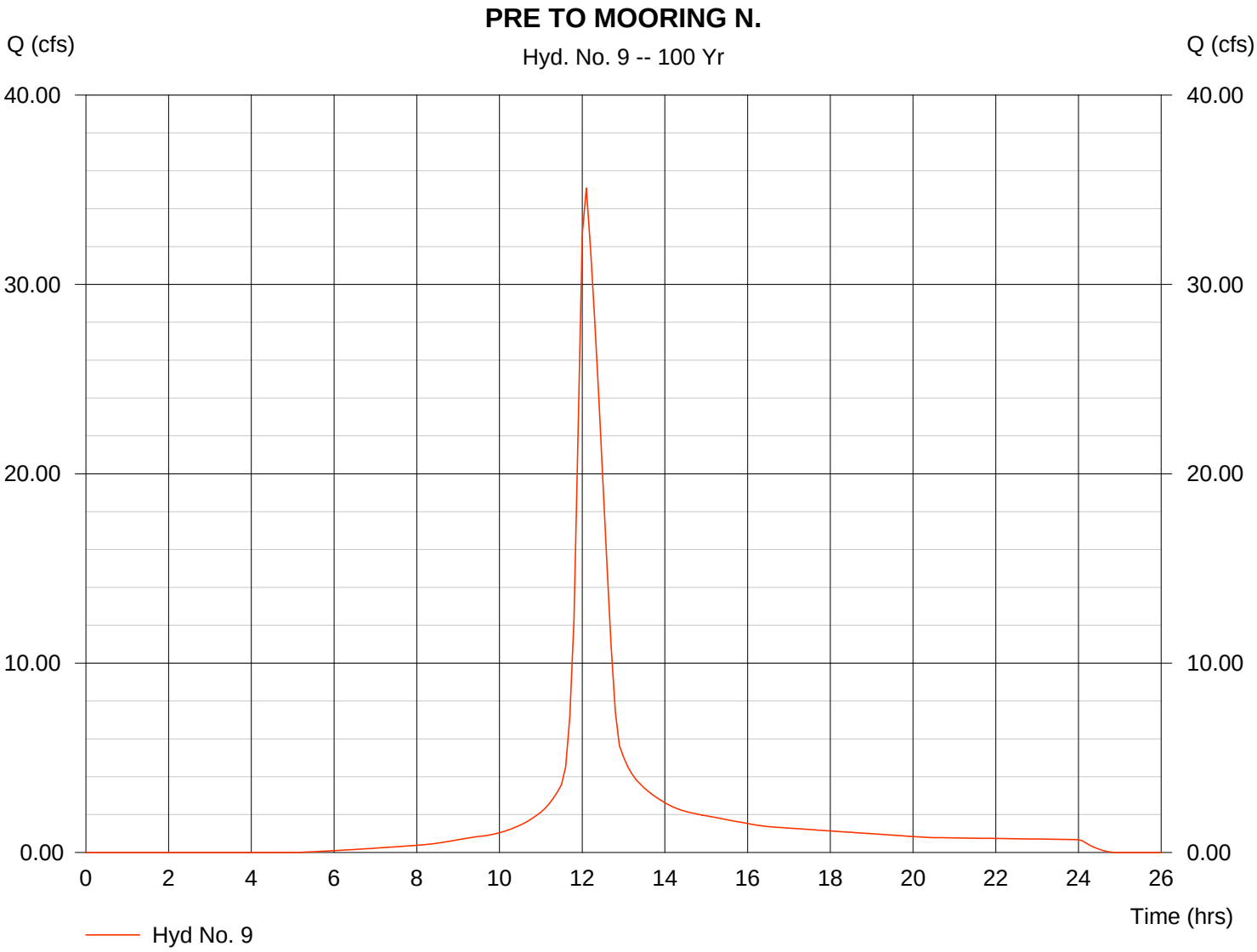
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 9

PRE TO MOORING N.

Hydrograph type	= SCS Runoff	Peak discharge	= 35.09 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 8.300 ac	Curve number	= 81
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	= 256

Hydrograph Volume = 3.810 acft



Hydrograph Plot

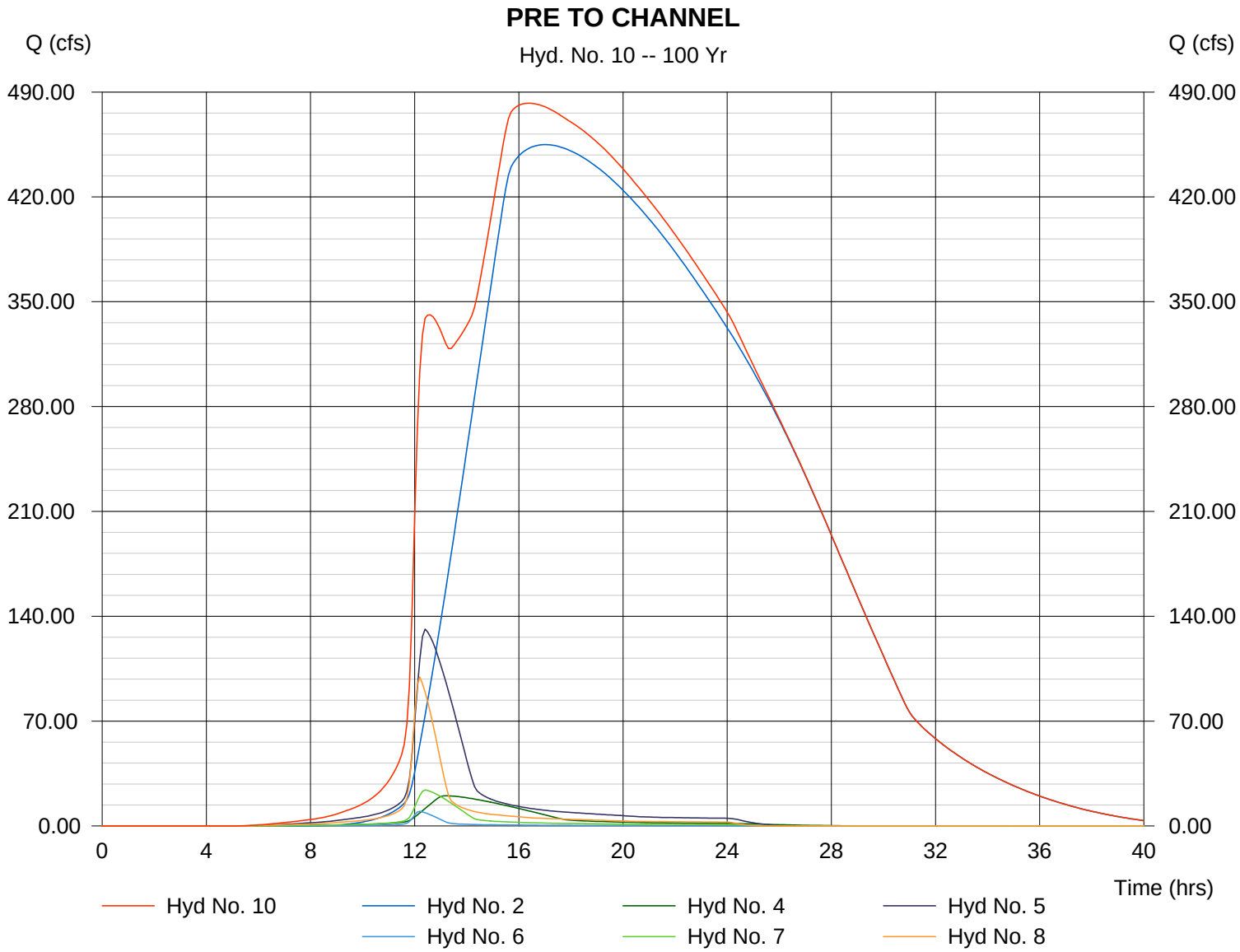
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 10

PRE TO CHANNEL

Hydrograph type	= Combine	Peak discharge	= 482.57 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 2, 4, 5, 6, 7, 8		

Hydrograph Volume = 559.144 acft



Hydrograph Plot

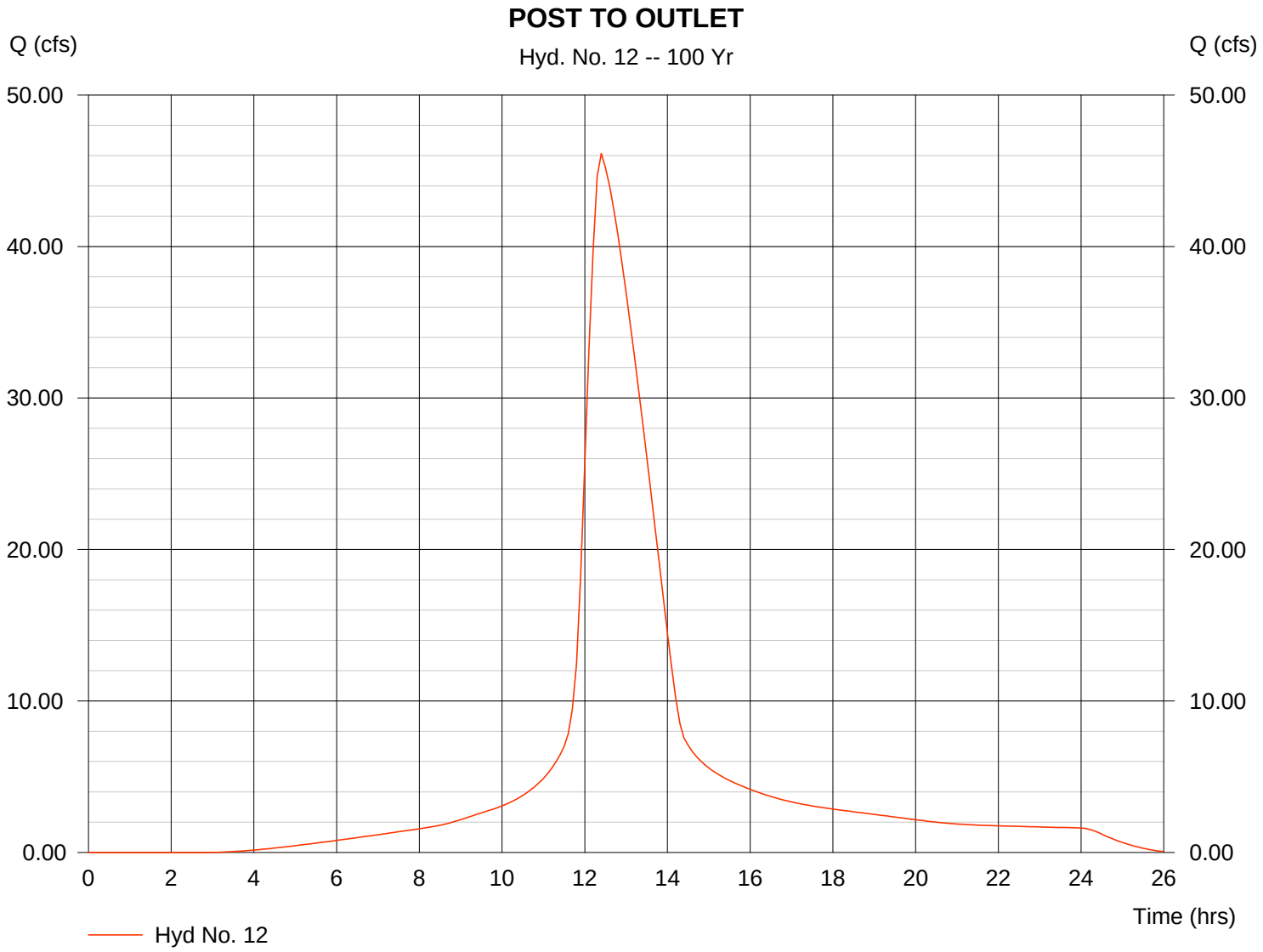
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 12

POST TO OUTLET

Hydrograph type	= SCS Runoff	Peak discharge	= 46.13 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 18.400 ac	Curve number	= 89.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 43.20 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 9.996 acft



Hydrograph Plot

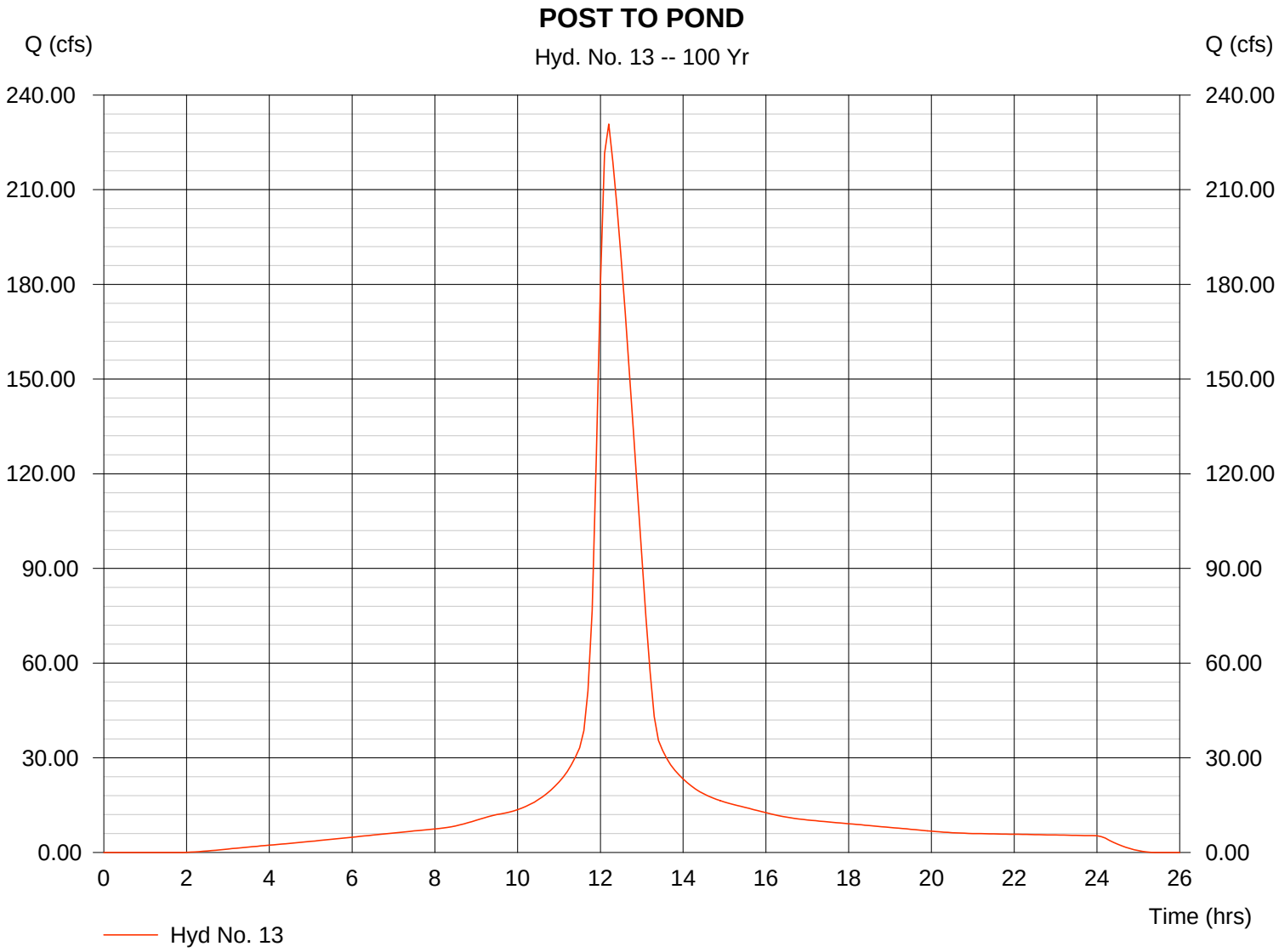
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 13

POST TO POND

Hydrograph type	= SCS Runoff	Peak discharge	= 230.81 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 60.800 ac	Curve number	= 93.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 25.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 35.292 acft



Hydrograph Plot

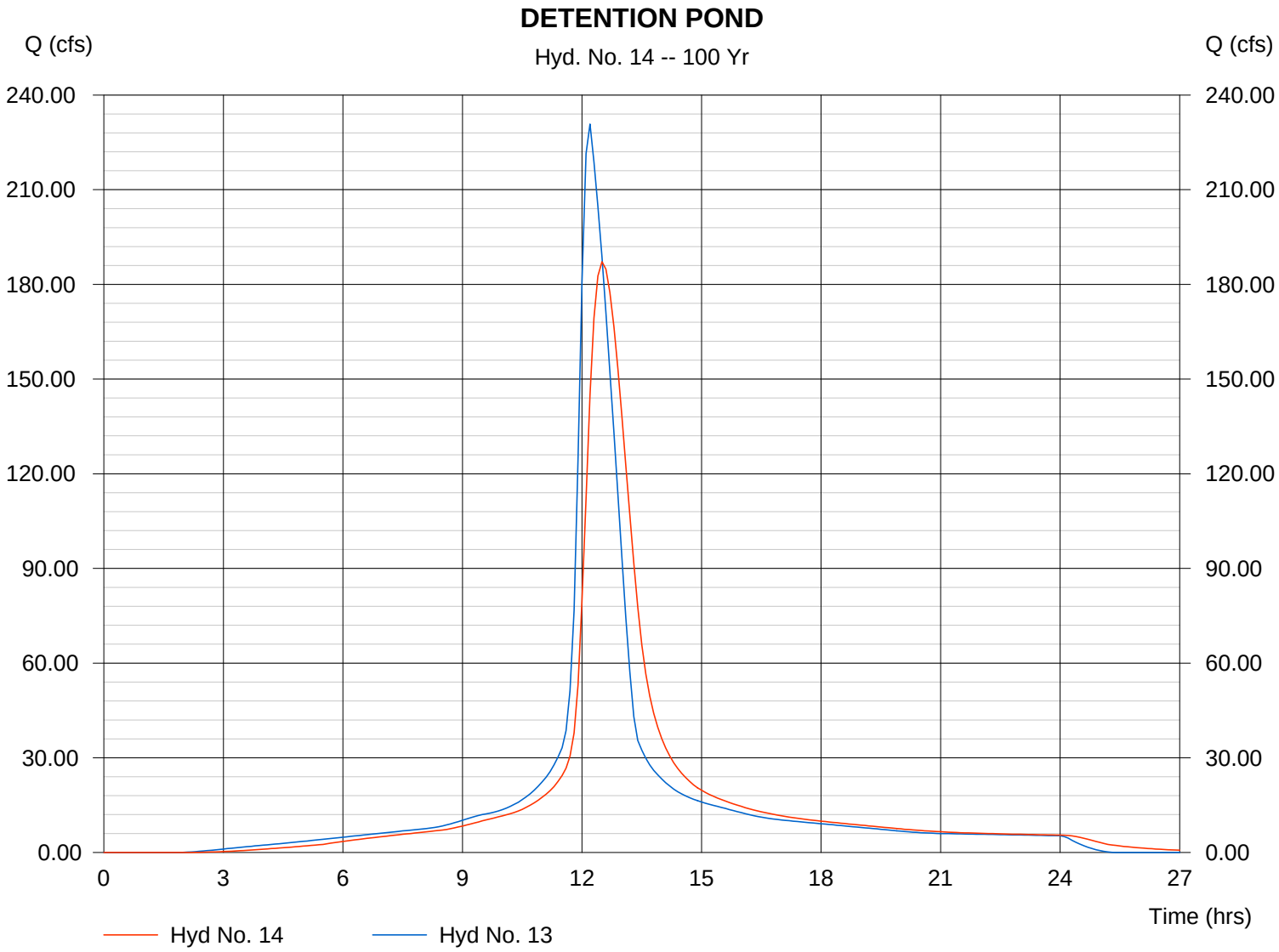
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 14

DETENTION POND

Hydrograph type	=	Reservoir	Peak discharge	=	187.20 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	13	Max. Elevation	=	1329.74 ft
Reservoir name	=	DETENTION POND	Max. Storage	=	5.617 acft

Storage Indication method used. | Hydrograph Volume = 35.292 acft



Pond Report

Pond No. 1 - DETENTION 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	1328.00	121,100	0.000	0.000
1.00	1329.00	143,700	3.039	3.039
2.00	1330.00	160,700	3.494	6.534
3.00	1331.00	203,800	4.184	10.717

Culvert / Orifice Structures

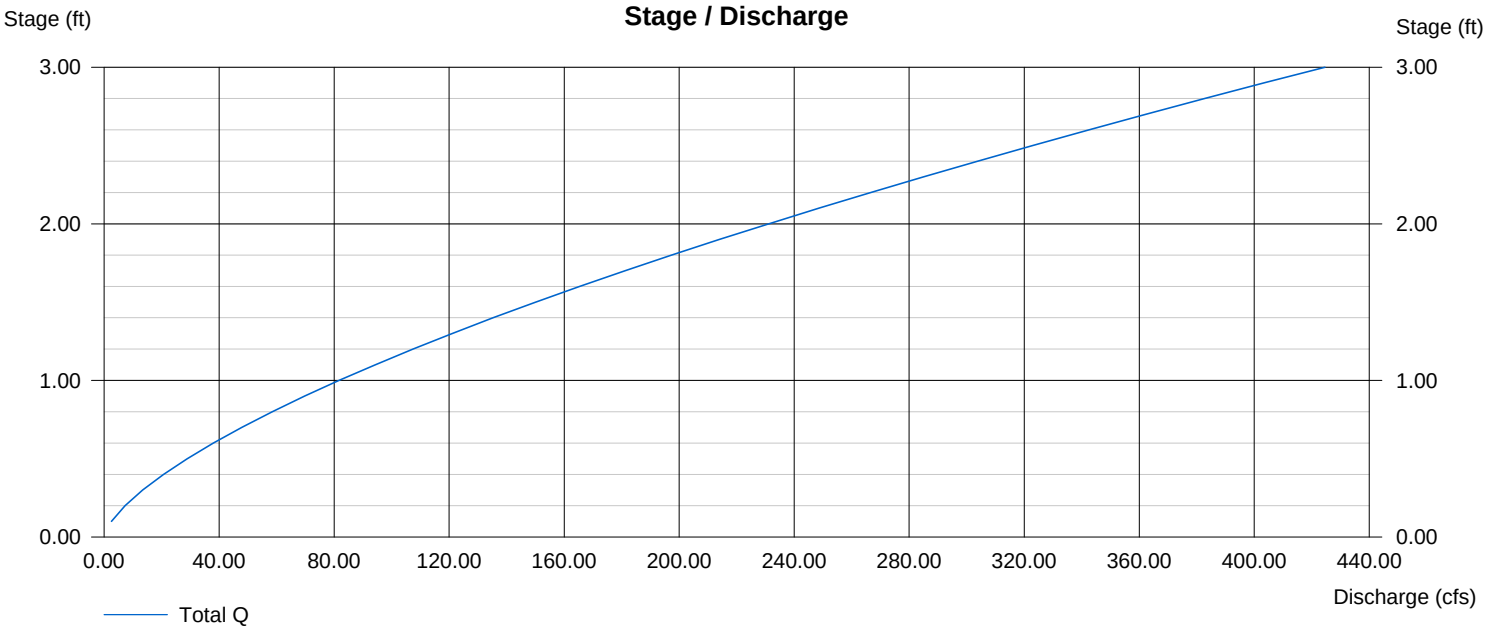
	[A]	[B]	[C]	[D]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 96.00	0.00	0.00	0.00
No. Barrels	= 3	0	0	0
Invert El. (ft)	= 1328.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

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



Hydrograph Plot

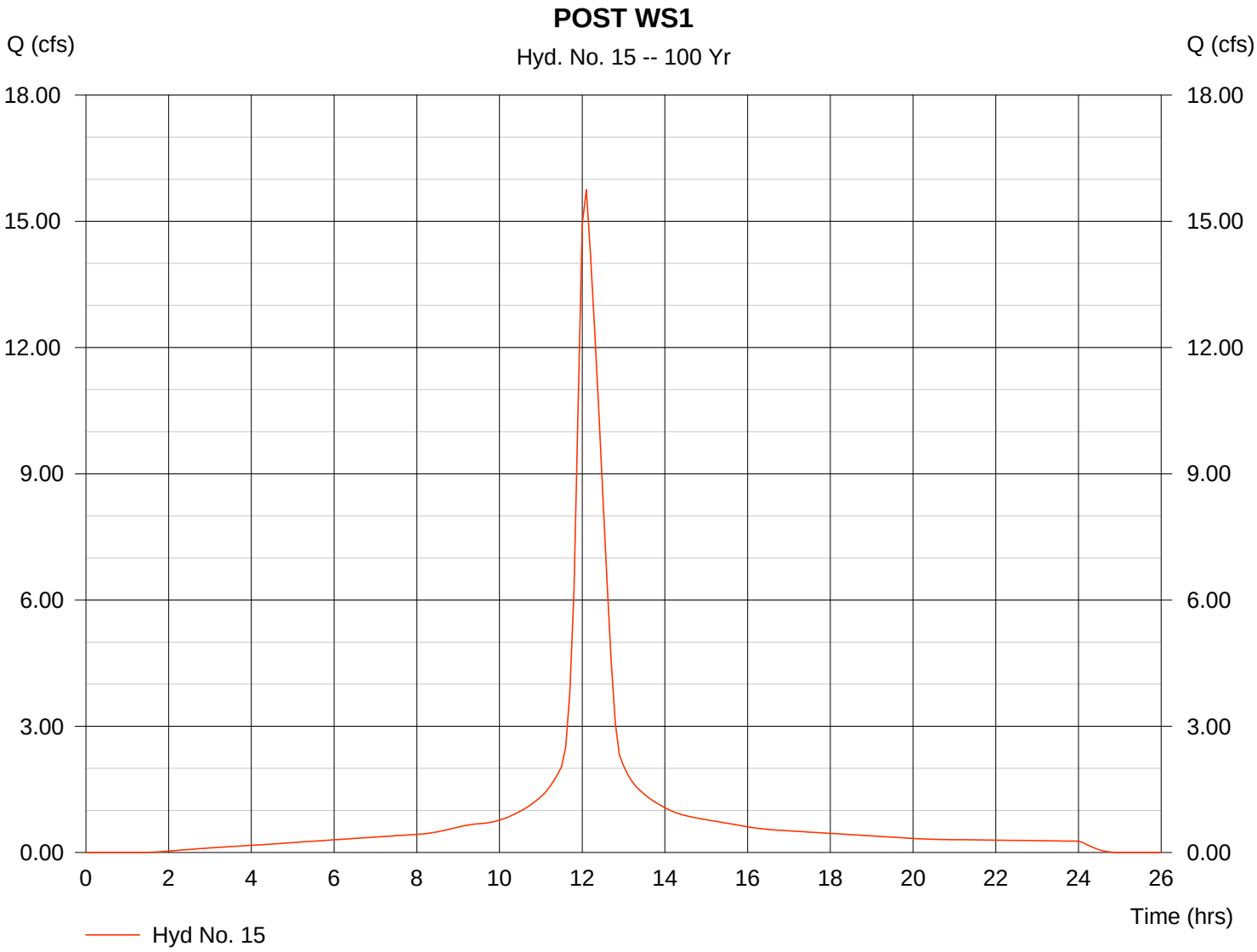
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 15

POST WS1

Hydrograph type	= SCS Runoff	Peak discharge	= 15.75 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 3.100 ac	Curve number	= 95
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	= 256

Hydrograph Volume = 1.845 acft



Hydrograph Plot

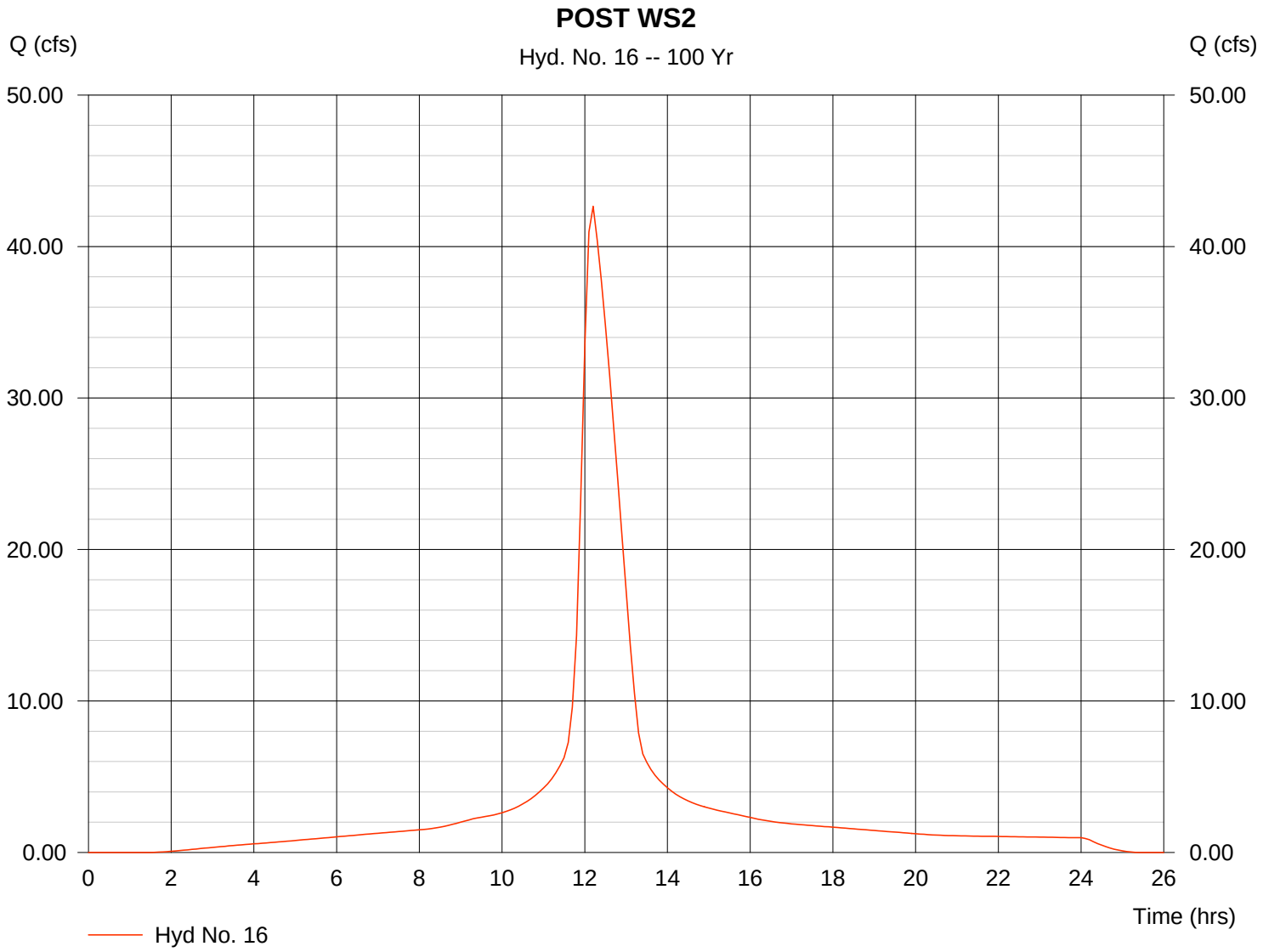
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 16

POST WS2

Hydrograph type	= SCS Runoff	Peak discharge	= 42.65 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 11.100 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 21.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 256

Hydrograph Volume = 6.607 acft



Hydrograph Plot

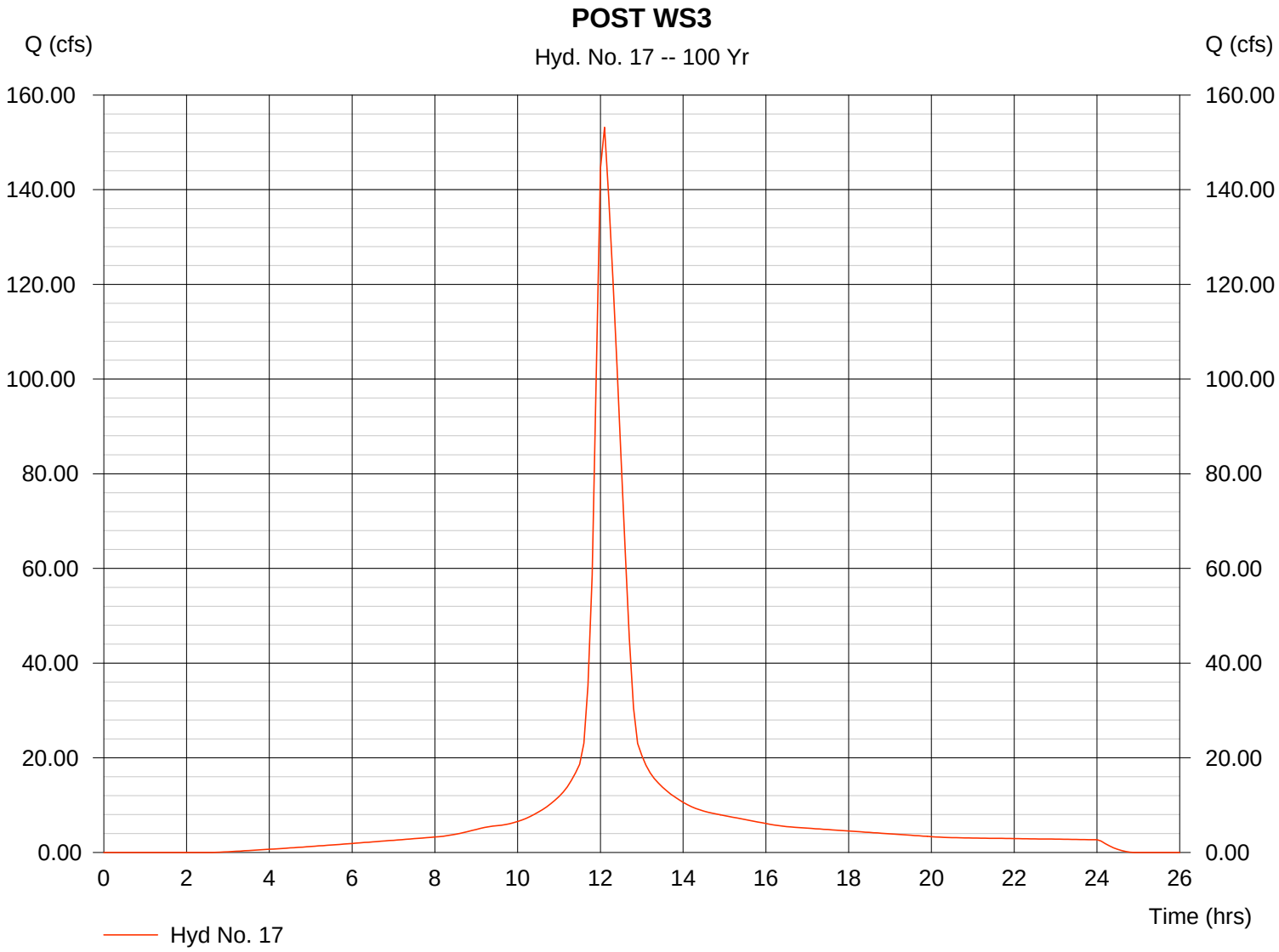
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 17

POST WS3

Hydrograph type	= SCS Runoff	Peak discharge	= 153.17 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 31.400 ac	Curve number	= 90.5
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	= 256

Hydrograph Volume = 17.303 acft



Hydrograph Plot

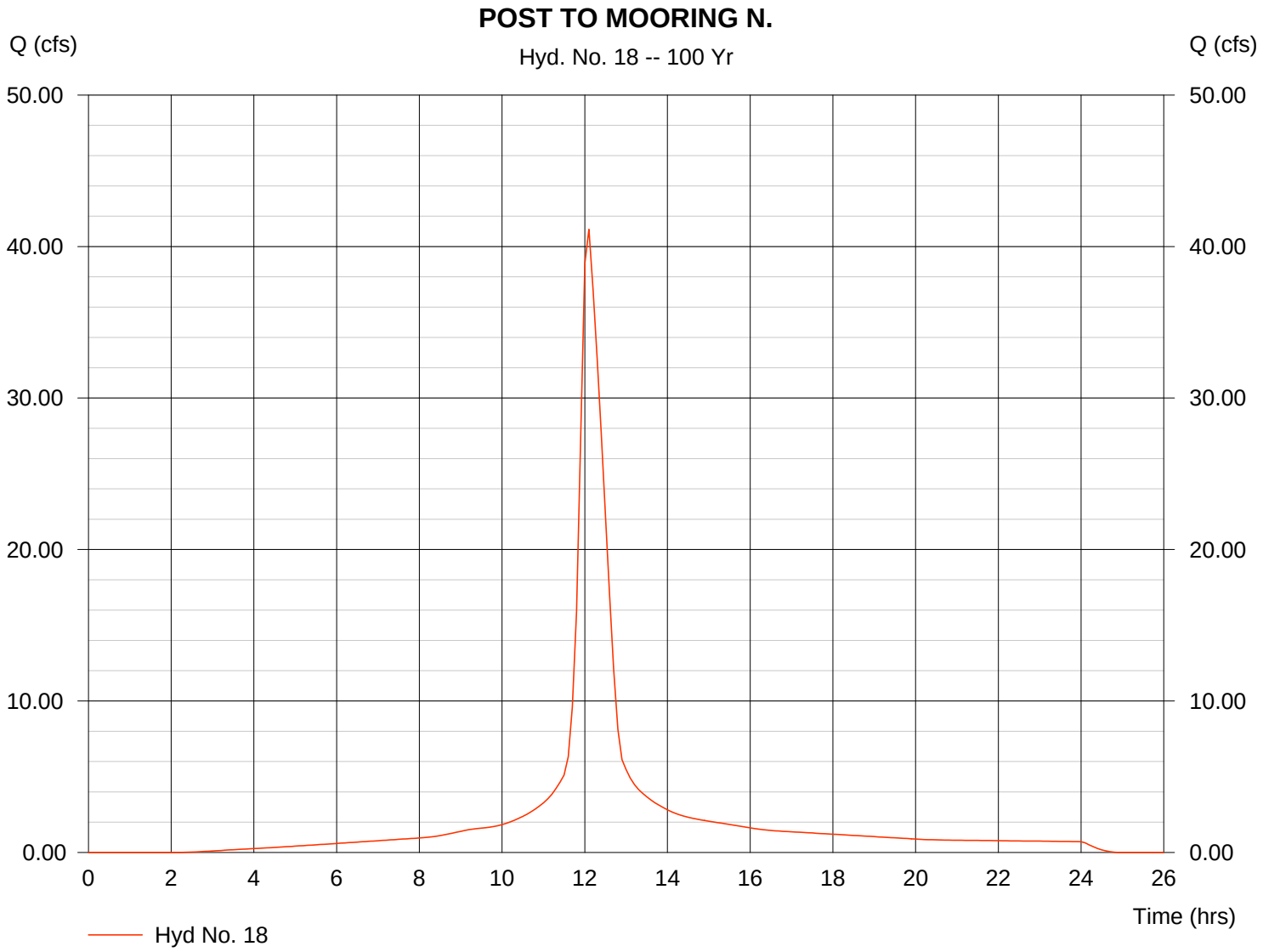
Hydraflow Hydrographs by Intelisolve | Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 18

POST TO MOORING N.

Hydrograph type	= SCS Runoff	Peak discharge	= 41.13 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 8.300 ac	Curve number	= 92
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	= 256

Hydrograph Volume = 4.696 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

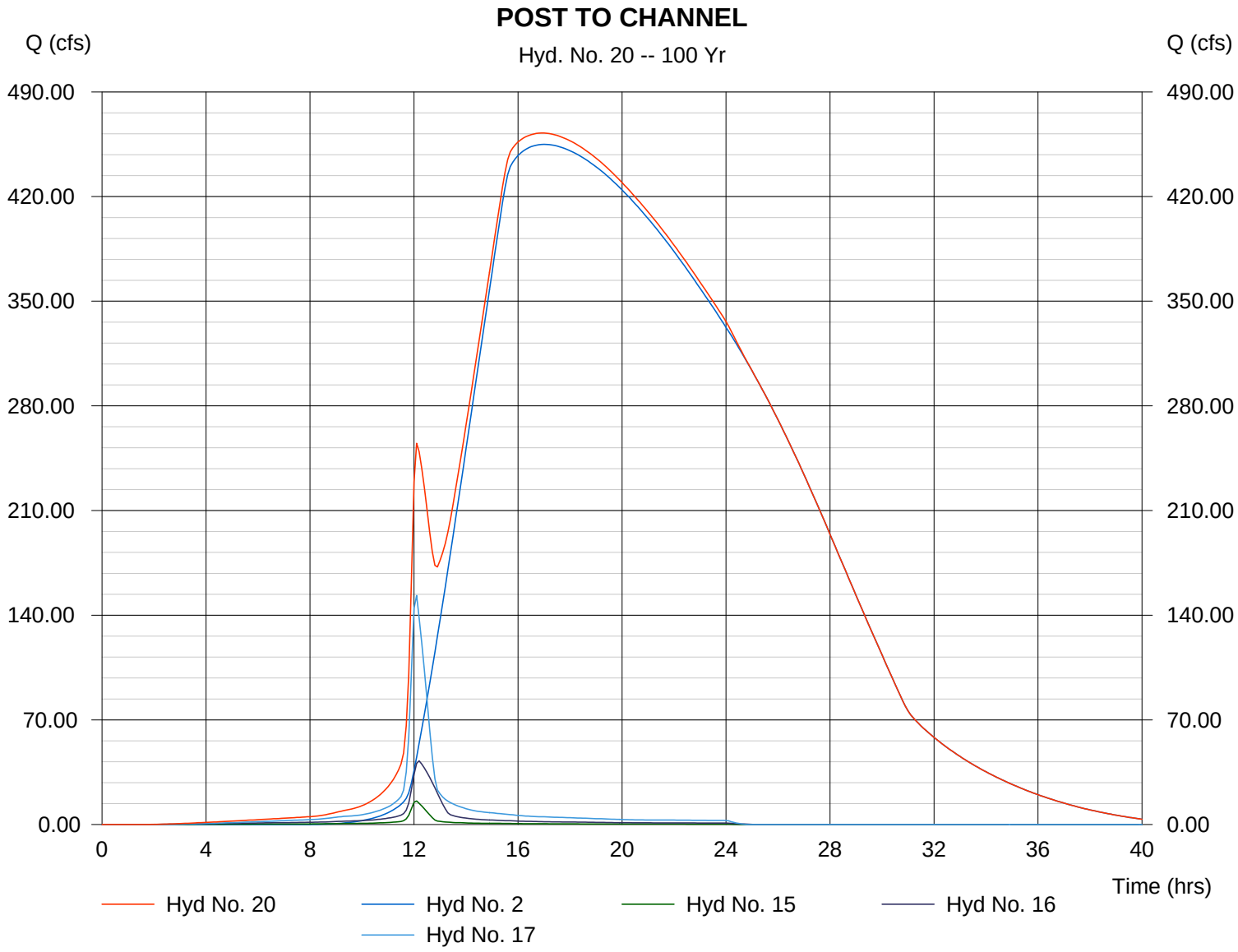
Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 20

POST TO CHANNEL

Hydrograph type	= Combine	Peak discharge	= 462.49 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 2, 15, 16, 17		

Hydrograph Volume = 527.617 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Thursday, Jun 14 2007, 12:9 PM

Hyd. No. 21

POST

Hydrograph type	=	Combine	Peak discharge	=	478.08 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyds.	=	12, 14, 20			

Hydrograph Volume = 572.905 acft

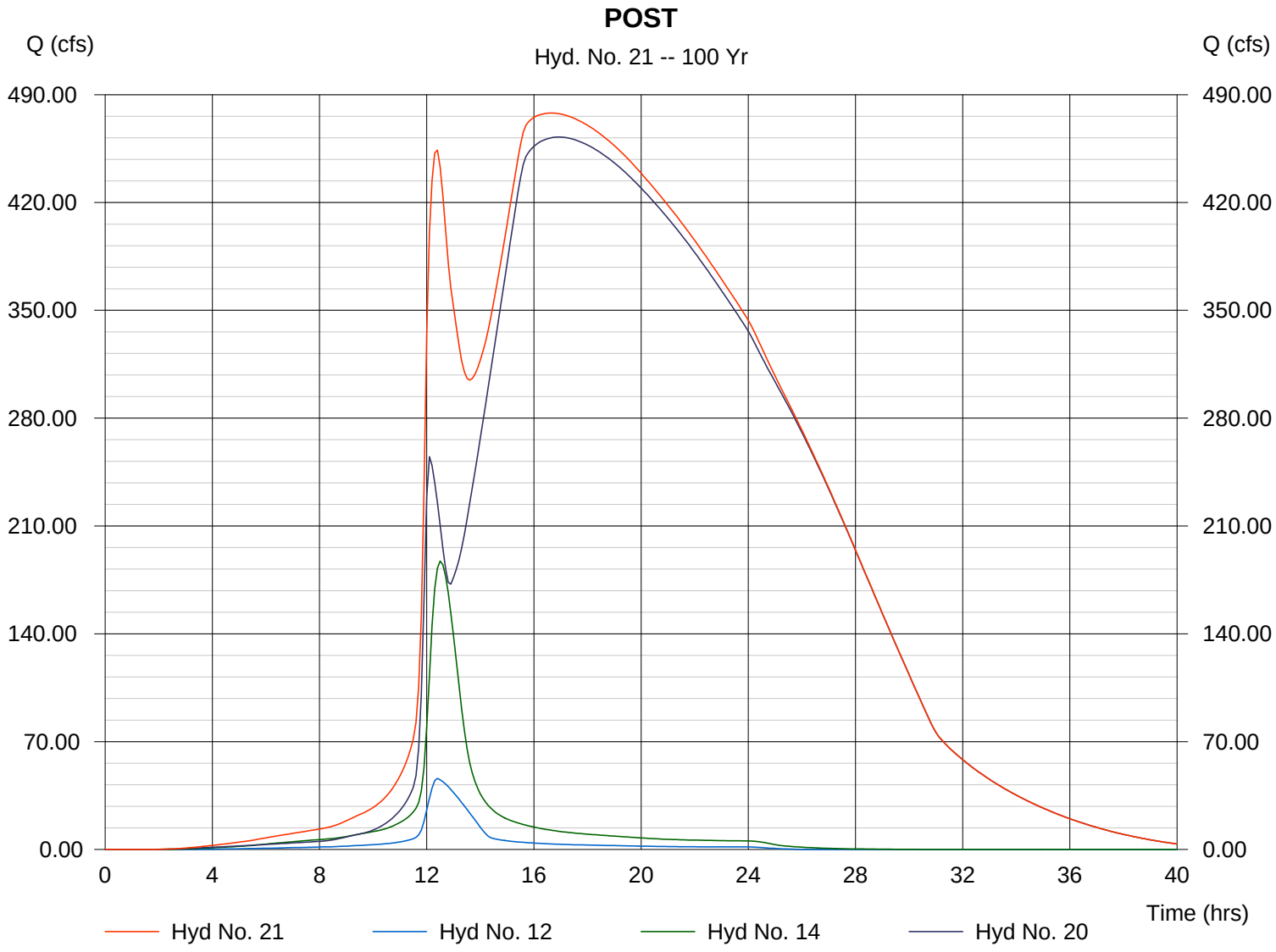


Figure 2.7

Time of Concentration Calculations

Time of Concentration Calculations by the FAA method

The Moorings 10th Addition

Project Number 06608

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

Area Name	Land Use	Soil Group	Maximum Elevation	Minimum Elevation	Length (L)	Rational Runoff Coefficient, C				Time of Concentration (min), T_c				Time of Concentration (hr), T_c				CN	Area acres
						2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year		
Offsite Watershed	*Residential - 1/3 Acre*	*B*	*1353.0*	*1330.0*	*16,125*	0.39	0.41	0.47	0.57	310.6	301.8	280.3	231.8	5.18	5.03	4.67	3.86	71.44	1350.00
PRE-PROJECT																			
To Outlet	*Agricultural - Pasture - Slopes 1-4%*	*D*	*1337.8*	*1330.0*	*1,569*	0.32	0.37	0.47	0.67	70.2	65.7	56.7	38.7	1.17	1.10	0.95	0.65	81.00	18.40
To Pond	*Agricultural - Cultivated - Slopes <1%*	*D*	*1335.1*	*1330.5*	*902*	0.24	0.29	0.39	0.59	58.2	54.8	48.0	34.5	0.97	0.91	0.80	0.58	82.81	60.80
WS1	*Agricultural - Cultivated - Slopes <1%*	*D*	*1332.0*	*1329.0*	*396*	0.24	0.29	0.39	0.59	33.8	31.8	27.9	20.0	0.56	0.53	0.46	0.33	81.00	3.10
WS2	*Agricultural - Cultivated - Slopes <1%*	*D*	*1332.1*	*1329.0*	*626*	0.24	0.29	0.39	0.59	49.0	46.1	40.4	29.0	0.82	0.77	0.67	0.48	81.00	11.10
WS3	*Agricultural - Cultivated - Slopes 1-4%*	*D*	*1338.0*	*1329.0*	*535*	0.26	0.31	0.41	0.61	29.4	27.7	24.2	17.2	0.49	0.46	0.40	0.29	81.00	31.40
To Mooring N. Addition Pond	*Agricultural - Pasture - Slopes 1-4%*	*D*	*1335.0*	*1320.0*	*130*	0.32	0.37	0.47	0.67	15.0	15.0	15.0	15.0	0.25	0.25	0.25	0.25	92.00	8.30
POST-PROJECT																			
To outlet	*Residential - 1/4 Acre*	*D*	*1337.8*	*1330.0*	*1,569*	0.50	0.54	0.62	0.76	54.0	50.4	43.2	30.6	0.90	0.84	0.72	0.51	89.74	18.40
To Pond	*Industrial - Light*	*D*	*1335.1*	*1330.5*	*902*	0.68	0.69	0.73	0.80	28.4	27.7	25.0	20.3	0.47	0.46	0.42	0.34	93.45	60.80
WS1	*Business - Neighborhood*	*D*	*1332.0*	*1329.0*	*396*	0.68	0.69	0.73	0.80	16.5	16.1	15.0	15.0	0.28	0.27	0.25	0.25	95.00	3.10
WS2	*Business - Neighborhood*	*D*	*1332.1*	*1329.0*	*626*	0.68	0.69	0.73	0.80	23.9	23.3	21.1	17.1	0.40	0.39	0.35	0.28	95.00	11.10
WS3	*Industrial - Light*	*D*	*1338.0*	*1329.0*	*535*	0.68	0.69	0.73	0.80	15.0	15.0	15.0	15.0	0.25	0.25	0.25	0.25	90.46	31.40
To Mooring N. Addition Pond	*Industrial - Light*	*D*				0.68	0.69	0.73	0.80	15.0	15.0	15.0	15.0	0.25	0.25	0.25	0.25	92.00	8.30

Tab 3. Post-Development Hydrologic Analysis

A. Proposed Conditions Hydrologic and Hydraulic Analysis

The post-project drainage boundaries are shown in Figure 3.1. Hydraflow Hydrographs, 2004 by Intelisolve was used to complete the hydrologic analysis for Moorings 10th Addition. The runoff calculations are in Figure 2.6 and the resulting flows are in the table below.

Post-Development Flowrates

Description	Design Storm Flows (cfs)				
	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**100-Yr**
Flow to Channel	106	183	238	327	462

For the 100-year storm, under developed conditions, Baughman reported a flow of 370 cfs reaching 53rd St. N. from the north watershed. The decrease in flow from pre to post development is from the detention that is provided upstream. Due to different modeling software and details of the detention, we were unable to reproduce the detention in our modeling, thus the pre-project flowrate was used.

B. Proposed Time of Concentration

The time of concentration was calculated using the FAA method. The following table shows the post-development time of concentrations. Time of concentration calculations are in Figure 2.7

Proposed Time of Concentrations

Area	T_c	Curve Number
	minutes	
Offsite	380.8	71.4
To Outlet	43.2	89.7
To Pond	25.0	93.5
WS1	15.0	95.0
WS2	21.1	95.0
WS3	15.0	90.5
To Moorings North Pond	15.0	92.0

C. Assumed Post-Developed Curve Numbers

A weighted curve number was used for each watershed. Curve number calculations are in Figure 3.2

D. Proposed Contours for Detention

The drainage corridor as shown on the drainage and utility plan, Figure 3.3, will be modified to provide 5.6 ac-ft. of dry detention. The dry detention basin will be designed as a dry, grassy swale

that will promote sediment filtration and infiltration of stormwater along the corridor before it reaches the channel.

E. Preliminary SWS Sizing Calculations

Using 2-year design flows obtained from the rational method, Mannings equation was used to size storm sewer pipes for Moorings 10th Addition. Calculations are in Figure 3.4.

F. Stage-Storage-Discharge

The stage-storage-discharge for the dry detention pond is in Figure 2.6.

G. Analysis of upstream/downstream impact

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

H. Existing and Proposed Structural Elevations

There are no existing structures on site. Where applicable, minimum pad elevations will be set 3 feet above the 100-year water surface elevation. When feasible, current grade will dictate structural elevations.

I. Pond Design Elevations

The drainage corridor will be engineered as a dry detention basin to provide 5.6 ac-ft. of detention and will have a 100-year water surface elevation of 1329.7. Three 8'x3' RCBs under Boardwalk Street are proposed for the outlet control structure.

J. Structure Details

Moorings 10th Addition will consist of commercial and office buildings as well as single and multi-family homes.

K. Limits of Clearing and Grading

The entire site will be cleared and graded.

L. Location of Impervious Areas

The commercial and office developments along 53rd Street and Meridian Avenue will have the highest percentage of impervious area. Roads will be located as shown on the drainage and utility plan, Figure 3.3.

M. Location of Utilities

Proposed utilities are shown on the drainage and utility plan, Figure 3.3.

N. Location of Conveyance Systems

Stormsewer will carry flow from the paving and backyards into the dry detention basin or channel. Proposed stormsewer lines are shown on the drainage and utility plan, Figure 3.3.

O. Location of Channel Modifications

The channel east of the site is being modified by others.

P. Selection and Location of Stormwater Controls

Stormwater controls consist of curb and area inlets, located throughout the Addition, stormsewer sized to handle the 2-year flows in the residential areas and 5-year flows in the commercial areas, a 5.6 ac-ft. dry detention basin and three 8'x3' RCBs to control discharge from the drainage swale.

Q. Emergency Overflow

The drainage swale will emergency overflow to the channel east of the site.

R. Freeboard

The drainage swale design will include a 1-foot freeboard for added safety.

S. 100-Year High Water Line

Moorings 10th Addition is located in areas without a determined 100-year water surface elevation. The 100-year design flow was run through a Flowmaster model of the typical channel cross-section, Figure 3.5. This model of the channel was used to calculate a 100-year water surface elevation of 1326.0 in the channel adjacent to the property. The 100-year water surface elevation for the dry detention basin is 1329.7.

T. Lowest Openings

The lowest openings for lots adjacent to the drainage swale will be set at 1332.7. The lowest opening for lots adjacent to the channel will be 1329.0. All other lots will be graded to maintain at least 0.5% slope in the streets and 2% in the backyards.

U. Stormwater Management Facilities

The detention corridor onsite is located within a reserve.

V. Maintenance Responsibility

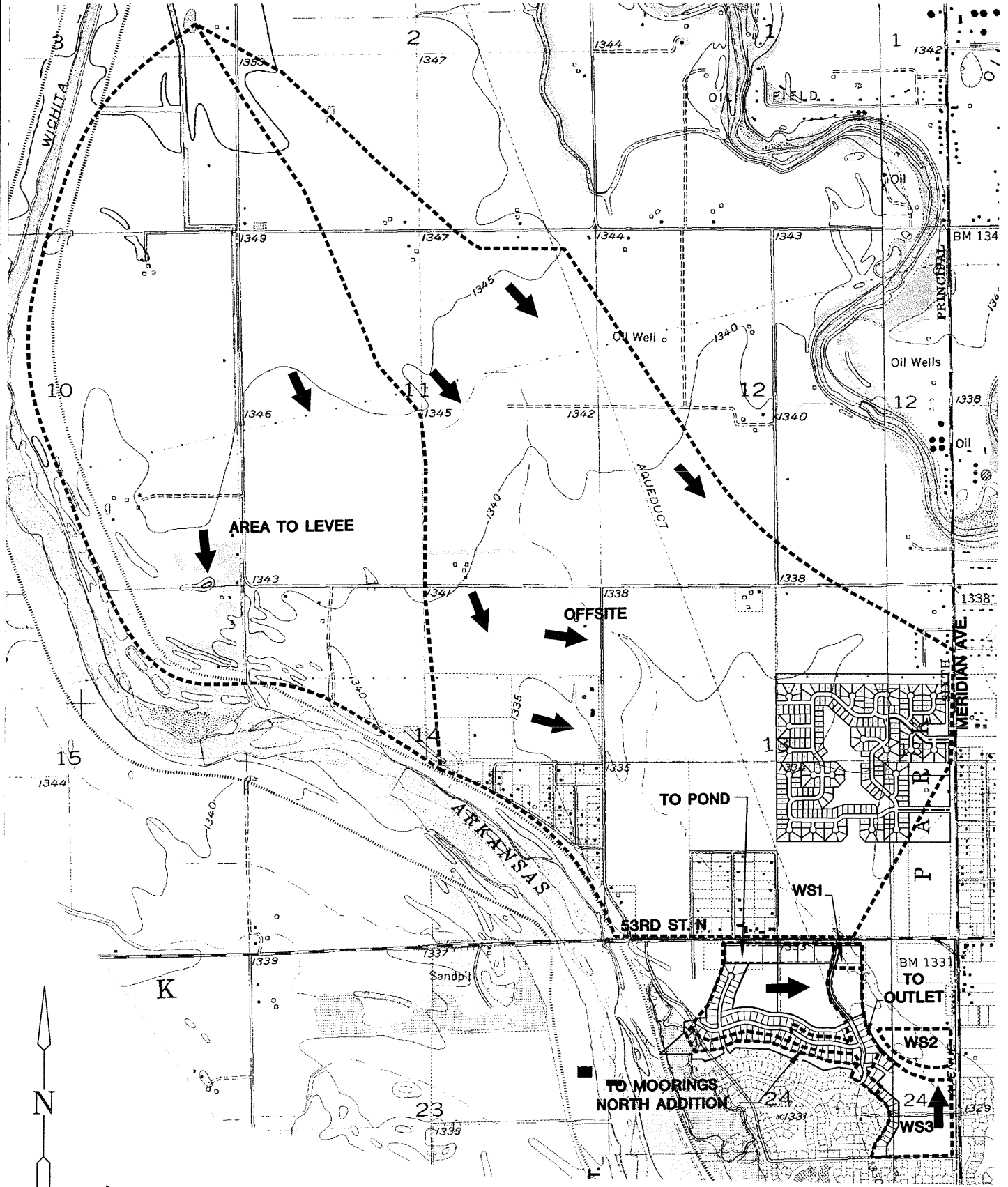
The maintenance of the reserve will be the responsibility of the owner until it is turned over to the homeowners association.

W. Offsite-Drainage Easements

Not applicable to Moorings 10th Addition.

Figure 3.1

Post-project Drainage Boundaries



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MKEC ENGINEERING CONSULTANTS, INC.

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

MOORINGS 10TH ADDITION
PROJECT NAME

POST-PROJECT WATERSHED BOUNDARY
SHEET TITLE

TMH	SMB	KLA
DESIGN BY:	DRAWN BY:	CHECKED BY:
JUNE 2007	06608	1 / 1
DATE	JOB NO.	SHEET/OF

Figure 3.2

Curve Number Calculations

Project Name: _____
Project Number: _____
Basin: Pre Project Offsite

Total Area = 1350.0 Acres
Total Area = 2.1094 sq. mi.
Composite Curve Number = 71.44

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method	-				75.5
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

1200.0

150.0

Project Name: The Moorings
Project Number:
Basin: Pre Project outlet

Total Area = 18.4 Acres
Total Area = 0.0288 sq. mi.
Composite Curve Number = 81.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method	-				75.7
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

SCS Runoff Curve Number Calculations

Project Name: The Moorings
Project Number:
Basin: Pre Project Pond

Total Area = 60.8 Acres
Total Area = 0.0950 sq. mi.
Composite Curve Number = 82.81

Land Use	Percent Impervious	Area/CN Hydrological Soil Group A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	55.0 81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					80.8
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	5.8 100

Project Name: The Moorings
Project Number:
Basin: Pre Project WS1

Total Area = 3.1 Acres
Total Area = 0.0048 sq. mi.
Composite Curve Number = 81.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	3.1 81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

SCS Runoff Curve Number Calculations

Project Name: The Moorings
Project Number:
Basin: Pre Project WS 2

Total Area = 11.1 Acres
Total Area = 0.0173 sq. mi.
Composite Curve Number = 81.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: The Moorings
Project Number:
Basin: Pre Project WS3

Total Area = 31.4 Acres
Total Area = 0.0491 sq. mi.
Composite Curve Number = 81.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: The Moorings
Project Number:
Basin: Pre To Moorings N. Addition Pond

Total Area = 8.3 Acres
Total Area = 0.0130 sq. mi.
Composite Curve Number = 81.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: The Moorings
Project Number:
Basin: Post Project outlet

Total Area = 18.4 Acres
Total Area = 0.0288 sq. mi.
Composite Curve Number = 89.74

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method	-				75.7
Commercial and business	85	89	92	94	6.3 95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	12.1 87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: The Moorings
Project Number:
Basin: Post Project Pond

Total Area = 60.8 Acres
Total Area = 0.0950 sq. mi.
Composite Curve Number = 93.45

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					80.8
Commercial and business	85	89	92	94	13.9 95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	41.1 92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	5.8 100

Project Name: The Moorings
Project Number:
Basin: Post Project WS1

Total Area = 3.1 Acres
Total Area = 0.0048 sq. mi.
Composite Curve Number = 95.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	3.1 95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: The Moorings
Project Number:
Basin: Post Project WS2

Total Area = 11.1 Acres
Total Area = 0.0173 sq. mi.
Composite Curve Number = 95.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	11.1 95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: The Moorings
Project Number:
Basin: Post Project WS3

Total Area = 31.4 Acres
Total Area = 0.0491 sq. mi.
Composite Curve Number = 90.46

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	6.5 95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	11.3 92
Residential - 1/4 acre	38	61	75	83	13.6 87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: The Moorings
Project Number:
Basin: Post To Moorings N. Addition Pond

Total Area = 8.3 Acres
Total Area = 0.0130 sq. mi.
Composite Curve Number = 92.00

Land Use	Percent Impervious	Area/CN Hydrological Soil Group			
		A	B	C	D
Cultivated land without conservation treatment	0	72	81	88	91
Cultivated land with conservation treatement	0	62	71	78	81
Pasture or range land - poor condition	0	68	79	86	89
Pasture or range land - good condition	0	39	61	74	80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
WCC -weighted curve number APWA method					81.3
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residentail - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	-	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - gravel	-	76	85	89	91
Streets and roads - dirt	-	72	82	87	89
Lake/Pond	100	100	100	100	100

Figure 3.3

Drainage and Utility Plan


53RD ST. N.
MERIDIAN
PROP. (BY OTHERS) 2-8'X4' RCB'S
3 - 8'x3' RCB FL=1328.0
DRY DETENTION BASIN 100-YEAR ELEV.=1329.7
PROP. 18" SWS (2-YR)
FL IN=1304.54
FL OUT=1304.44
CHANNEL
PROP. 12" SWS (2-YR)
EXIST 11'X8' RCB'S
PROP. 36" SWS (100-YR)
PROP 24" SWS (100-YR)
LAKE CHANNEL
WATERS EDGE
POND
LAKE
FENCE
VICINITY MAP
WEST ST.
N. HIGH ST.
N. GOW AVE.
N. SHERIDAN AVE.
53RD. ST. N.
N. MERIDIAN AVE.
KEYWEST
PLAT LOCATION
LEVEE
LEGEND
- CONIFEROUS TREE
- DECIDUOUS TREE
- SIGN
- POWER POLE
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SECTION CORNER
- BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELEC.
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE I
- DRAINAGE SUB BASIN
- DRAINAGE BASIN
- FLOW ARROW
A17 - AREA FOR SWS SIZING
NORTH
100 0 100 200
1"=100' 1 : 1,200

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

MOORINGS 10TH ADDITION PROJECT NAME		
PRELIMINARY DRAINAGE & UTILITY PLAN SHEET TITLE		
TMH DESIGN BY:	SMB DRAWN BY:	KLA CHECKED BY:
JUNE 2007 DATE	06608 JOB NO.	1 / 1 SHEET/OF

J:\Civil\06608\dwg\Drng\06608DUP.dwg

Figure 3.4

Pipe Sizing Calculations

Time of Concentration Calculations by the FAA method, Runoff by Rational Method, Pipe sizing by Manning's Equatior

Moorings 10th Addition

$$T_c = \frac{(1.1-C)L^{\frac{1}{2}}}{100S^{\frac{1}{3}}} \qquad Q = cIA \qquad Q = \frac{1.49}{n} AR_h^{\frac{2}{3}} S_e^{\frac{1}{2}}$$

Manning's n = 0.013

Area Name	Area (ac)	Cumulative Area (ac)	Land Use	Soil Group	Maximum Elevation	Minimum Elevation	Flow Length	Rational Runoff Coefficient, C				Time of Concentration (min), Tc				Rainfall Intensity (in/hr), I				Flow Rate (cfs), Q				Design Storm	Design Q (cfs)	Pipe Size (in)	Design Slope (%)	Minimum Slope (%)	Velocity (fps)	Capacity of Pipe (cfs)
								2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year							
A	*0.3*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.53	0.68	0.92	1.61	2	0.53	12	0.55	0.02	3.4	2.6
B	*0.6*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	1.06	1.37	1.85	3.23	None						
C	*0.3*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.53	0.68	0.92	1.61	None						
D	*0.3*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.53	0.68	0.92	1.61	2	0.53	12	0.55	0.02	3.4	2.6
D+C		*0.6*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	1.06	1.37	1.85	3.23	2	1.06	12	0.55	0.09	3.4	2.6
A+D+C+B		*1.5*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	2.64	3.42	4.62	8.07	2	2.64	12	0.55	0.55	3.4	2.6
E	*1.9*		*Residential - 1/3 Acre*	*D*	*1335.0*	*1332.0*	*540*	0.46	0.50	0.59	0.73	32.6	30.5	25.9	18.8	2.57	3.24	4.13	6.84	2.25	3.08	4.63	9.49	None						
A+D+C+B+E		*3.4*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	32.6	30.5	25.9	18.8	2.57	3.24	4.13	6.84	4.02	5.51	8.28	16.98	100	16.98	30	0.18	0.17	3.5	17.4
F	*1.9*		*Residential - 1/3 Acre*	*D*	*1335.0*	*1332.0*	*540*	0.46	0.50	0.59	0.73	32.6	30.5	25.9	18.8	2.57	3.24	4.13	6.84	2.25	3.08	4.63	9.49	None						
A+D+C+B+E+F		*5.3*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	32.6	30.5	25.9	18.8	2.57	3.24	4.13	6.84	6.27	8.59	12.91	26.46	100	26.46	36	0.16	0.16	3.8	26.7
G	*0.4*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.70	0.91	1.23	2.15	None						
H	*0.3*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.53	0.68	0.92	1.61	None						
I	*0.4*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.70	0.91	1.23	2.15	2	0.70	12	0.55	0.04	3.4	2.6
I+H		*0.7*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	1.23	1.60	2.16	3.77	2	1.23	12	0.55	0.12	3.4	2.6
A+D+C+B+E+F+I+H+G		*6.4*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	32.6	30.5	25.9	18.8	2.57	3.24	4.13	6.84	7.57	10.37	15.59	31.96	100	31.96	42	0.12	0.10	3.6	34.9
J	*4.6*		*Residential - 1/3 Acre*	*D*	*1336.0*	*1331.5*	*990*	0.46	0.50	0.59	0.73	47.1	44.2	37.6	27.3	2.02	2.61	3.36	5.69	4.27	6.00	9.12	19.11	100	19.11	36	0.12	0.08	3.3	23.1
K	*3.4*		*Residential - 1/3 Acre*	*D*	*1336.0*	*1331.5*	*990*	0.46	0.50	0.59	0.73	47.1	44.2	37.6	27.3	2.02	2.61	3.36	5.69	3.16	4.44	6.74	14.12	None						
J+K		*8.0*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	47.1	44.2	37.6	27.3	2.02	2.61	3.36	5.69	7.43	10.44	15.86	33.23	100	33.23	42	0.12	0.11	3.6	34.9
L	*2.5*		*Residential - 1/3 Acre*	*D*	*1333.5*	*1330.5*	*720*	0.46	0.50	0.59	0.73	41.4	38.8	33.0	23.9	2.21	2.84	3.63	6.13	2.54	3.55	5.35	11.19	100	11.19	24	0.25	0.24	3.6	11.3
M	*2.0*		*Residential - 1/3 Acre*	*D*	*1333.5*	*1330.5*	*720*	0.46	0.50	0.59	0.73	41.4	38.8	33.0	23.9	2.21	2.84	3.63	6.13	2.03	2.84	4.28	8.95	None						
L+M		*4.5*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	41.4	38.8	33.0	23.9	2.21	2.84	3.63	6.13	4.57	6.39	9.64	20.14	100	20.14	36	0.12	0.09	3.3	23.1
N - Inlet to RCB	*15.4*		*Residential - 1/3 Acre*	*D*	*1335.0*	*1331.0*	*850*	0.46	0.50	0.59	0.73	43.2	40.5	34.4	25.0	2.14	2.76	3.51	6.01	15.16	21.25	31.89	67.56	100	67.56					
O - Inlet to RCB	*15.4*		*Residential - 1/3 Acre*	*D*	*1335.0*	*1331.0*	*850*	0.46	0.50	0.59	0.73	43.2	40.5	34.4	25.0	2.14	2.76	3.51	6.01	15.16	21.25	31.89	67.56	100	67.56					
P	*1.2*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	2.11	2.74	3.70	6.46	2	2.11	12	0.55	0.35	3.4	2.6
Q	*0.7*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	1.23	1.60	2.16	3.77	None						
P+Q		*1.9*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	3.35	4.33	5.85	10.22	2	3.35	18	0.32	0.10	3.4	5.9
R	*0.5*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.88	1.14	1.54	2.69	None						
P+Q+R		*2.4*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	4.23	5.47	7.39	12.91	2	4.23	18	0.32	0.16	3.4	5.9
S	*0.6*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	1.06	1.37	1.85	3.23	2	1.06	12	0.55	0.09	3.4	2.6
T	*0.4*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.70	0.91	1.23	2.15	None						
S+T		*1.0*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	1.76	2.28	3.08	5.38	2	1.76	12	0.55	0.24	3.4	2.6
U	*0.5*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.88	1.14	1.54	2.69	None						
S+T+U		*1.5*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	2.64	3.42	4.62	8.07	2	2.64	18	0.32	0.06	3.4	5.9
V	*0.5*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	0.88	1.14	1.54	2.69	None						
S+T+U+V		*2.0*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	3.52	4.56	6.16	10.76	2	3.52	18	0.32	0.11	3.4	5.9
W	*0.9*		*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	1.59	2.05	2.77	4.84	None						
S+T+U+V+W		*2.9*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	15.0	15.0	15.0	15.0	3.83	4.56	5.22	7.37	5.11	6.61	8.93	15.60	2	5.11	18	0.32	0.24	3.4	5.9
X	*2.4*		*Residential - 1/3 Acre*	*D*	*1333.0*	*1330.0*	*620*	0.46	0.50	0.59	0.73	36.5	34.3	29.1	21.1	2.39	3.01	3.83	6.39	2.64	3.61	5.42	11.20	None						
S+T+U+V+W+X		*5.3*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	36.5	34.3	29.1	21.1	2.39	3.01	3.83	6.39	5.83	7.98	11.98	24.72	100	24.72	36	0.15	0.14	3.7	25.8
Y	*2.4*		*Residential - 1/3 Acre*	*D*	*1333.0*	*1330.0*	*620*	0.46	0.50	0.59	0.73	36.5	34.3	29.1	21.1	2.39	3.01	3.83	6.39	2.64	3.61	5.42	11.20	None						
S+T+U+V+W+X+Y		*7.7*	*Residential - 1/3 Acre*	*D*				0.46	0.50	0.59	0.73	36.5	34.3	29.1	21.1	2.39	3.01	3.83	6.39	8.47	11.59	17.40	35.92	100	35.92	42	0.13	0.13	3.8	36.3

Figure 3.5

Flowmaster Calculations

Worksheet for Moorings 10th Channel to East

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00200	ft/ft
Left Side Slope	3.50	ft/ft (H:V)
Right Side Slope	3.50	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	600.00	ft^3/s

Results

Normal Depth	4.90	ft
Flow Area	132.86	ft^2
Wetted Perimeter	45.64	ft
Top Width	44.27	ft
Critical Depth	3.32	ft
Critical Slope	0.01052	ft/ft
Velocity	4.52	ft/s
Velocity Head	0.32	ft
Specific Energy	5.21	ft
Froude Number	0.46	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.90	ft
Critical Depth	3.32	ft
Channel Slope	0.00200	ft/ft
Critical Slope	0.01052	ft/ft

Tab 4. Floodplain Submittal

Not applicable to Moorings 10th Addition.

Tab 5. Permits

A. US Army Corps of Engineers

Not applicable to Moorings 10th Addition.

B. Kansas Department of Agriculture

Not applicable to Moorings 10th Addition.

C. Federal Emergency Agency (FEMA)

Not applicable to Moorings 10th Addition.

D. Kansas Department of Transportation

Not applicable to Moorings 10th Addition.

E. Sedgwick County Right-of-way Permit

Not applicable to Moorings 10th Addition.