DRAINAGE REPORT

FOR

REUSSER ADDITION
SEDGWICK COUNTY, KANSAS

REVISED APRIL 2009

Tab 0. Checklist

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: Sedgwick County/City of Wichita Date: April 30, 2008

Subdivision Name: Reusser Addition Location: Wichita, Kansas

Total Land Area Of Ownership: 39.7 Acres

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

Applicant: L & T Land, L.L.C. Contact: _____ Phone #: (316) 265-1308

Engineer: MKEC Engineering Consultants, Inc. Contact: Kara Anderson Phone # (316) 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, Table 1	☐	☐
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	✔	☐	Tab 2.E	☐	☐
F. Streams, creeks, and waterway labeled	✔	☐	Tab 2.F, Figure 2.3	☐	☐
G. Predominant soils from USDA soil surveys, and/or on site soil borings	✔	☐	Tab 2.G, 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	✔		Tab 2.L, 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, Table 2, Figure 2.5		
O. Assumed pre-developed runoff curve numbers	✔		Tab 2.O		
P. Existing time of concentrations used in calculations	✔		Tab 2.P, Figure 2.6		
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	✔		Tab 2.Q		
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	✔		Tab 2.R		
S. Cross-section data for open channels		✔	N/A		
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, Table 3, Figure 2.5		
B. Proposed time of concentrations used in calculations	✔		Tab 3.B, Figure 2.6		
C. Assumed post-developed runoff curve numbers	✔		Tab 3.C		
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)		✔	Tab 3.D		
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	✔		Tab 3.E, Figure 3.1 & 3.2		
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities		✔	Tab 3.F		
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.	✔		Tab 3.L		
M. Location of existing and proposed utilities (e.g., water, sewer) and easements	✔		Tab 3.M, Figure 3.1		
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✔		Tab 3.N, Figure 3.1		
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		✔			
B. Nearest base flood elevations		✔			
C. Delineation of pre-developed regulatory floodplain/floodway limits		✔			
D. Delineation of post-developed regulatory floodplain and floodway limits		✔			
E. Floodplain boundary determination per elevation (project limits shown)		✔			
F. Provide source of floodway data table and discharges		✔			
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits		✔			
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		✔			
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		✔			
J. Flood plains and floodways located within a Reserve, where necessary		✔			

	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)		✔			
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		✔			
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.		✔			
D. Kansas Department of Transportation		✔			
E. Sedgwick County Right-of-way Permit		✔			

Consulting Engineer Initials _____

Tab 1. Project Narrative

A. Location

The subject property is in Sedgwick County, Kansas. The proposed development is located in the northeast ¼ of the southeast ¼ of Section 34, Township 26 South, Range 2 East. The Reusser Addition consists of 37.9 acres of property west of 127th Street East, between 29th and 37th Street North. Four Oaks Addition is just north of the site. The site is shown on the USGS Map, Figure 1.1.

B. Discussion of Development

The entire site will be developed as single family residential lots, varying in size from, approximately, two to five acres. Water will be provided by Rural Water District Number 5 and a septic system will be constructed for each lot.

C. Discussion of Offsite

The site is bounded by 127th Street on the east, Four Oaks Addition to the North and undeveloped land to the west and south.

D. Summary of Runoff

The site drains in three directions; to the northeast, northwest and south. There is a ridge in the southern third of the property and elevations onsite range from 1405 feet in the southern third of the site to 1380 feet in the northeast. The amount of impervious area increases by approximately ten percent from pre to post-project conditions. In general, the existing drainage patterns will be maintained under post-project conditions; however, the proposed road will be graded to drain northeast. A small portion of the south basin will be graded to the northeast. Since the South basin is slightly smaller, runoff from that basin does not increase even though detention is not provided. There are dry detention ponds proposed in both the northeast and northwest basins to reduce the peak flow rates from the development in each of the design storms. A summary of pre and post-project runoff rates is shown in the table below.

Comparison of Pre and Post-Development Flow rates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Pre-project				
Northeast Basin	16.7	26.1	32.4	56.2
Northwest Basin	26.6	41.5	51.6	89.6
South Basin	14.1	21.8	27.1	46.7
Post-Project				
Northeast Basin	9.8	15.5	21.8	56.0
Northwest Basin	25.5	40.5	50.7	88.9
South Basin	14.1	21.8	27.0	46.3

E. Best Management Practices

The site will be seeded or sodded after construction of grading and utilities are complete.

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

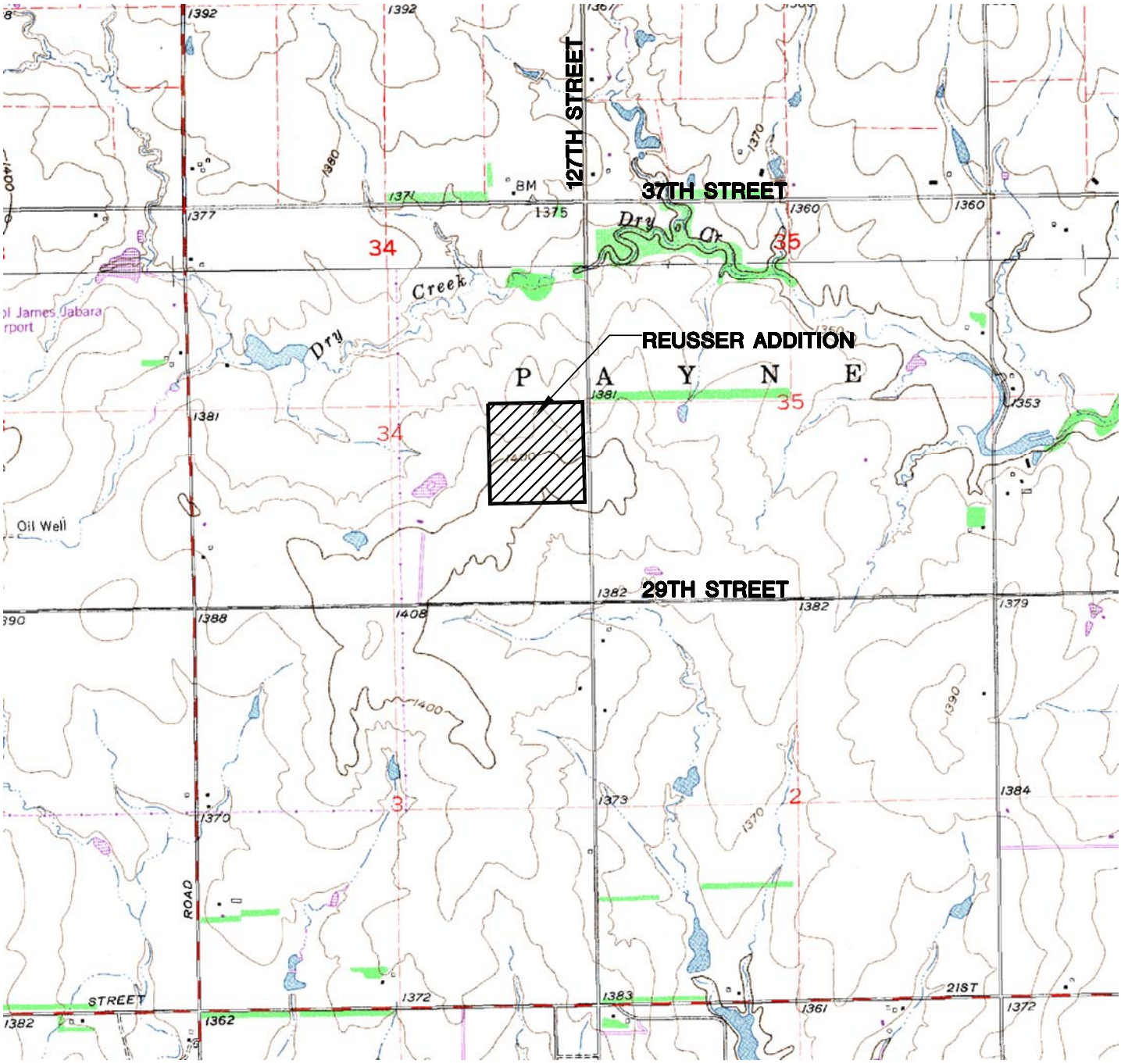
The cover of the report will be signed and dated.

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"=2000'

2000 0 2000 4000

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MKEC ENGINEERING CONSULTANTS, INC.

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

REUSSER ADDITION
PROJECT NAME

QUAD MAP
SHEET TITLE

TMH	CMJ	GJA
DESIGN BY:	DRAWN BY:	CHECKED BY:
SEPTEMBER 2008	07698	1 / 1
DATE	JOB NO.	SHEET/OF

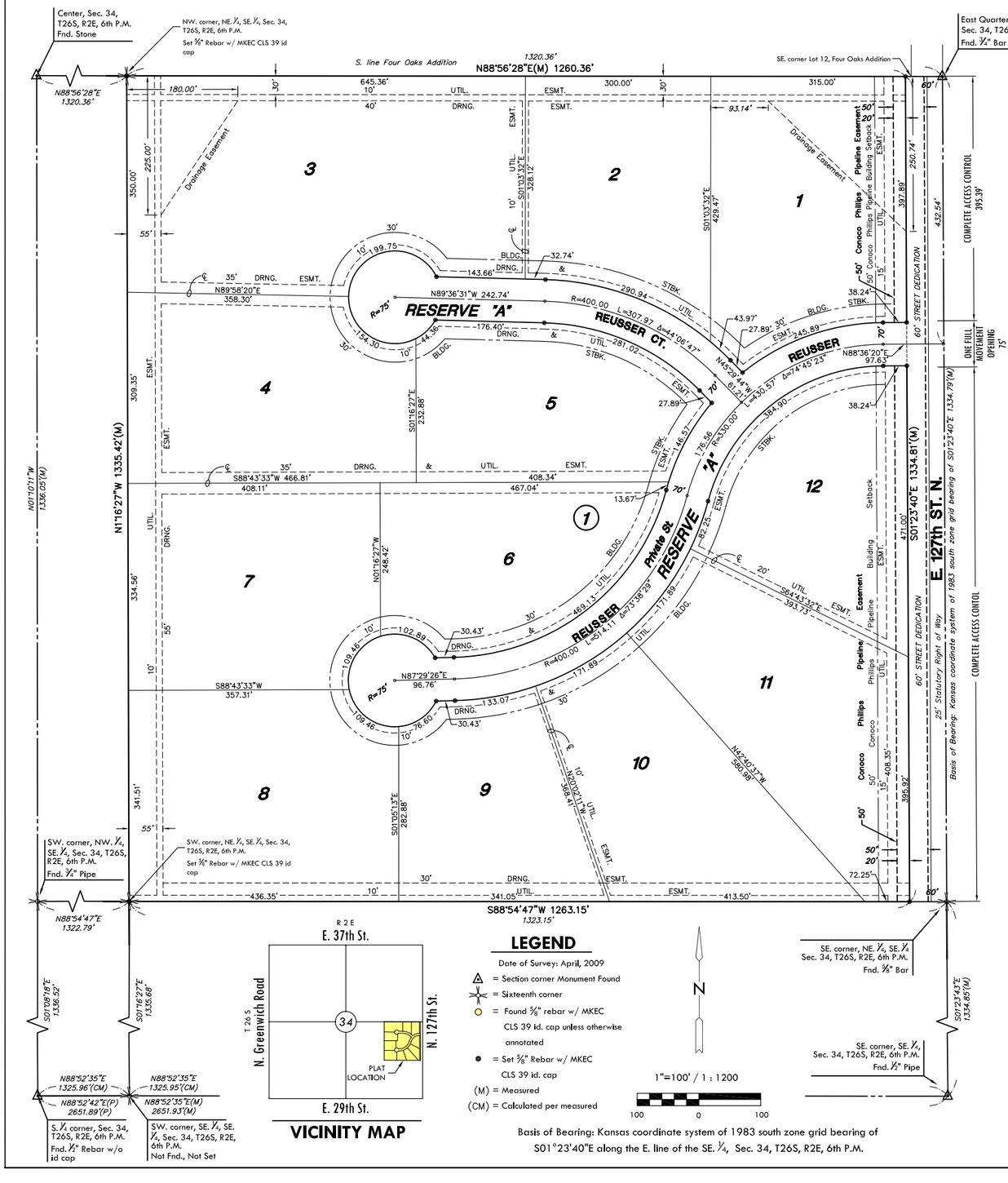
Figure 1.2

Plat

FINAL PLAT

REUSSER ADDITION

AN ADDITION TO SEDGWICK COUNTY, KANSAS



CERTIFICATE OF SURVEY

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

The Northeast Quarter of the Southeast Quarter, Section 34, Township 26 South, Range 2 East of the 6th P.M., Sedgwick County, Kansas.

I hereby certify that the details of this plat are correct to the best of my knowledge and belief, this _____ day of _____ 2009.

GREGORY J. ALLISON LICENSED LS-1257 KANSAS LAND SURVEYOR

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

OWNER'S CERTIFICATE

Know all men by these presents that we the undersigned property owners of the land above set forth in the Registered Land Surveyor's Certificate, have caused the same to be surveyed and platted into Lots, a Block, a Reserve, public and private Streets, the same to be known as "REUSSER ADDITION," an addition to 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 Private Conoco Phillips Pipeline Easement is platted for open space, irrigation, berming and landscaping in accordance with presiding pipeline restrictions of record. The Private Drainage Easement within Lot 1, Block 1, is platted for off-site drainage detension. No buildings are permitted with the said Private Drainage Easement.

The east 60.00 feet (127th Street North) is hereby dedicated to and for the use of the public.

All abutters rights of access to or from North 127th Street, over and across the east line of "REUSSER ADDITION", are hereby granted to the appropriate governing body, provided however, one 75 foot full movement opening as indicated hereon.

Reserve "A" is platted for private streets, utilities, drainage, and access. Reserves "B" and "C" are platted for drainage, utilities confined to easements, landscaping, irrigation, open space and monuments. The Reserves shall be owned and maintained by the developer and or it's successor's, and or a lot or Homeowner Owner's Assodation and is reserved for the stated uses. The owner(s) of the reserves shall bear the cost of any repair or replacement of street improvements within said reserves resulting from street construction, repair and or maintenance.

A drainage plan has been developed for this plat. Drainage easements, rights-of-ways, or reserves shall remain at established grades or as modified with the approval of the applicable City or County Engineer. The lots or homeowner's association shall have authority and responsibility for assuring all drainage easements are maintained and kept free and unobstructed to allow for the control and conveyance of storm water in accordance with the approved plan.

L & T LAND, LLC, a Kansas limited liability company

_____, Member
Layne M. Reusser, Member

_____, Member
Ty M. Reusser, Member

STATE OF KANSAS, SEDGWICK COUNTY} ss:

This instrument was acknowledged before me on this ____ day of _____ , 2009, Layne M. Reusser and Ty M. Reusser, Members, L & T Land, 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.

Affix Seal

_____, Notary Public
Notary Public:

My Term Expires: _____.

MORTGAGE CERTIFICATE

Midland National Bank, holder of a mortgage on the above described property, does hereby consent to the plat of "REUSSER ADDITION."

MIDLAND NATIONAL BANK

_____, President
Ronald R. Lang, President

This instrument was acknowledged before me on ____ day of _____ , 2009, by Ronald R. Lang, President, Midland National Bank.

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

Affix Seal

_____, Notary Public
Notary Public:

My Term Expires: _____.

COUNTY SURVEYOR

Reviewed in accordance with K.S.A. 58-2005 on this ____ day of _____ , 2009.

_____, Deputy County Surveyor
Tricia L. Robello, L.S. #1246
Deputy County Surveyor
Sedgwick County, Kansas

PLANNING COMMISSION CERTIFICATE

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

Dated this ____ day of _____ , 2009

WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

_____, Chair
Darrell Downing, Chair

Attest:

_____, Secretary
John L. Schlegel, Secretary

Affix Seal

GOVERNING BODY CERTIFICATE

This plat of "REUSSER ADDITION", an addition to Sedgwick County, Kansas and all dedications shown hereon has been submitted to and approved by the Board of County Commissioners of Sedgwick County, Kansas, this ____ day of _____ , 2009.

_____, Chairman
Kelly Parks, Chairman

Attest:

_____, County Clerk
Kelly B. Arnold, County Clerk

Affix Seal

THis plat and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this ____ day of _____ , 2009.

_____, Mayor
Carl Brewer, Mayor

Attest:

_____, City Clerk
Karen Sublett, City Clerk

Affix Seal

TRANSFER RECORD

Entered on transfer record this ____ day of _____ , 2009

_____, County Clerk
Kelly B. Arnold, 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 _____ , 2009, at _____ o'clock _M; and is duly recorded.

_____, Register of Deeds
Bill Meek, Register of Deeds

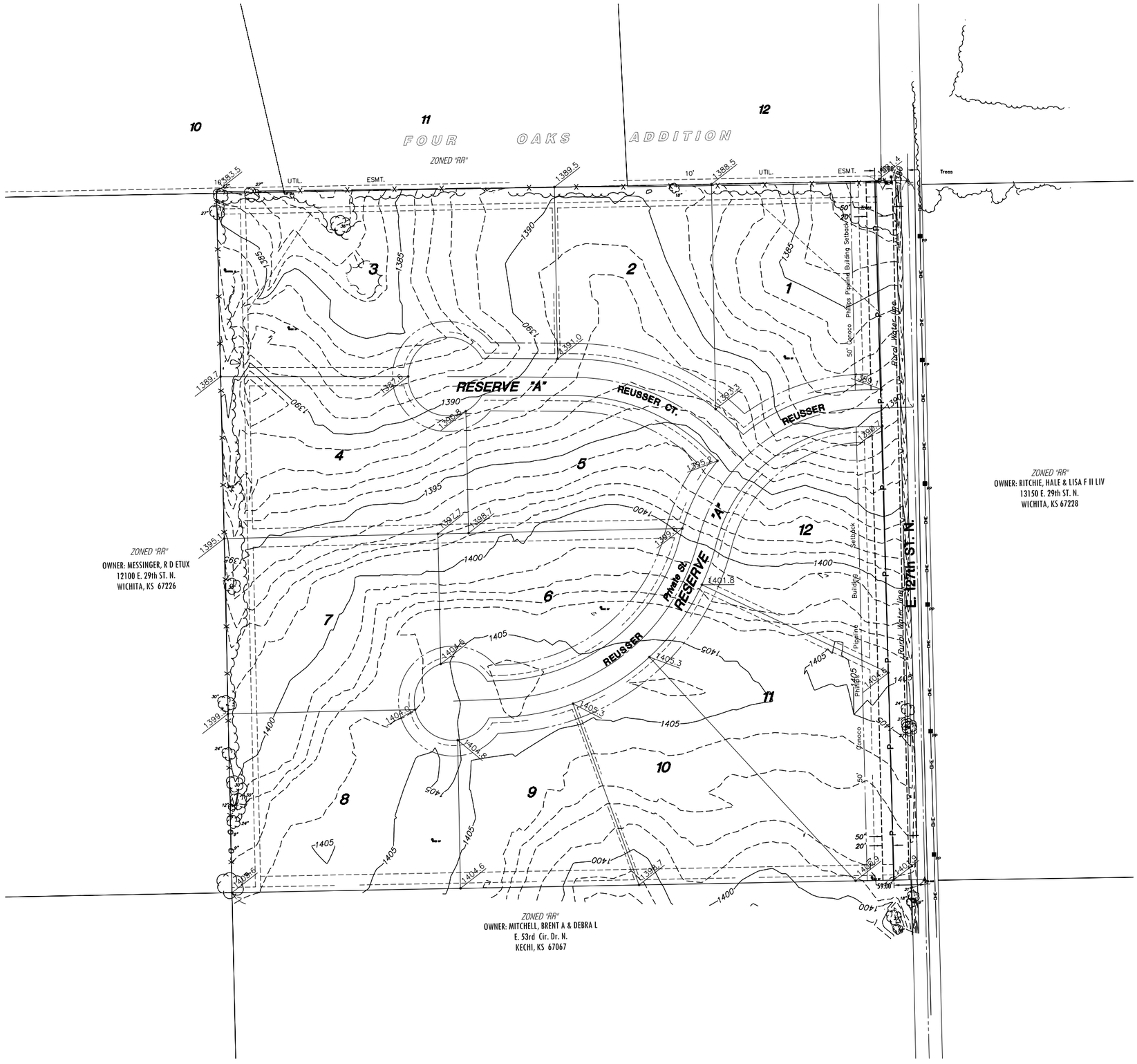
Attest:

_____, Deputy
Tonya E. Buckingham, Deputy

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

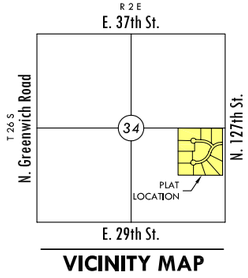
Figure 1.3

Preliminary Grading Plan

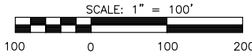


LEGEND

- 6IN - CONIFEROUS TREE
- 3IN - DECIDUOUS TREE
- SN - SIGN
- PP - POWER POLE
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SECTION CORNER
- BM - BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELEC.
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- 1XXX.0 - SPOT ELEVATION



VICINITY MAP



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

REUSSER ADDITION

REUSSER'S ADDITION
WICHITA, KANSAS

PRELIMINARY LOT GRADING PLAN

DATE: SEPTEMBER 2008
REVISED:

DESIGN BY: TMH
DRAWN BY: CMJ
CHECKED BY: GJA

SHEET NUMBER: 1

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Tab 2. Existing Conditions Runoff Calculations

A. Orthophotograph

The aerial photograph is included, Figure 2.1.

B. Runoff Method

The SCS method in Hydraflow Hydrographs 2009 was used to determine pre and post-project runoff rates.

C. Existing Topography

Elevations on the site range from 1405 feet in the south to 1380 feet, in the northeast. The existing topography is shown on the Existing Conditions Drawing, Figure 2.2.

D. Site Areas

The site is undeveloped, agricultural pasture land.

E. Benchmarks

Benchmark 1: Center, Sec 34, T26S, R2E, 6th P.M., Fnd Stone; Elevation = 1320.36' (NGVD29)

Benchmark 2: SE corner, SE ¼ Sec 34, T26S, R2E, 6th P.M. Fnd. ½" pipe; Elevation = 1334.85 (NGVD29)

Both benchmarks are shown on Figure 1.2. NGVD 29 datum is used in this report.

F. Streams, Creeks, and Waterways

No portion of the site is included in a regulatory floodplain. The site is in Zone X, areas outside the 0.2% annual chance event, as shown on FIRM Panel 0377E of 700, Sedgwick County, Kansas February 2, 2007 in Figure 2.3. The closest floodplain is approximately 1,500 feet north of the site.

G. Soils

According to the NRCS (SCS) Sedgwick County Soil Survey, Figure 2.4, soils on the site are Goessel silty clay 1 to 3 percent slopes, (Ga – HSG "D") and Irwin silty clay loam 1 to 3 percent slopes, (Ia, - HSG "D), Clime silty clay 3 to 7 percent slopes (Ce – HSG "C") and Rosehill silty clay 1 to 3 percent slopes (Rd – HSG "D"). The Hydraulic Soil Group used to select runoff coefficients and curve numbers is "D".

H. Natural Features

There are no natural ponds or channels onsite.

I. Location of Existing Impervious Areas

There is no impervious area onsite.

J. Location of Existing Utilities

There is an existing 4-inch waterline on the west side of 127th Street. There is an existing Conoco Phillips pipeline along the east edge of the property. This pipeline is currently not in service.

K. Location of Existing Conveyance Systems

There are no existing man-made conveyance systems onsite.

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 drainage structures on site.

N. Existing Conditions Hydrologic Analysis

Hydraflow Hydrographs 2009 was used to calculate pre-project runoff rates. The SCS method was used to determine runoff rates. There are three drainage basins onsite, the Northeast, Northwest and South basins. These basins drain as they are named. The pre-project drainage basins are shown on the Existing Conditions drawing, Figure 2.2. The pre-development runoff rates are shown in the table below, calculations are in Figure 2.5.

Pre-Development Flow rates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Northeast Basin	16.7	26.1	32.4	56.2
Northwest Basin	26.6	41.5	51.6	89.6
South Basin	14.1	21.8	27.1	46.7

O. Pre-Developed Runoff Curve Numbers

The entire site is agricultural pasture area; a curve number of 80 was used to represent existing conditions.

P. Existing Time of Concentration

The FAA method was used to calculate the time of concentration. The times of concentration and rational coefficients for pre-development conditions are shown in the following table. Time of concentration calculations are in Figure 2.6.

Existing Time of Concentration and Rational Coefficient

Basin	T_c minutes	Rational Coefficient
Northeast	32.9	0.47
Northwest	35.0	0.47
South	18.8	0.47

Q. Downstream Drainage Capacity

The existing ditch west of 127th Street North was modeled using Hydraflow Express. The ditch has a capacity of 42.6 cfs. This ditch will convey a 25-year storm without overtopping.

R. Existing Structural Elevations

There are no existing structures onsite.

S. Open Channels

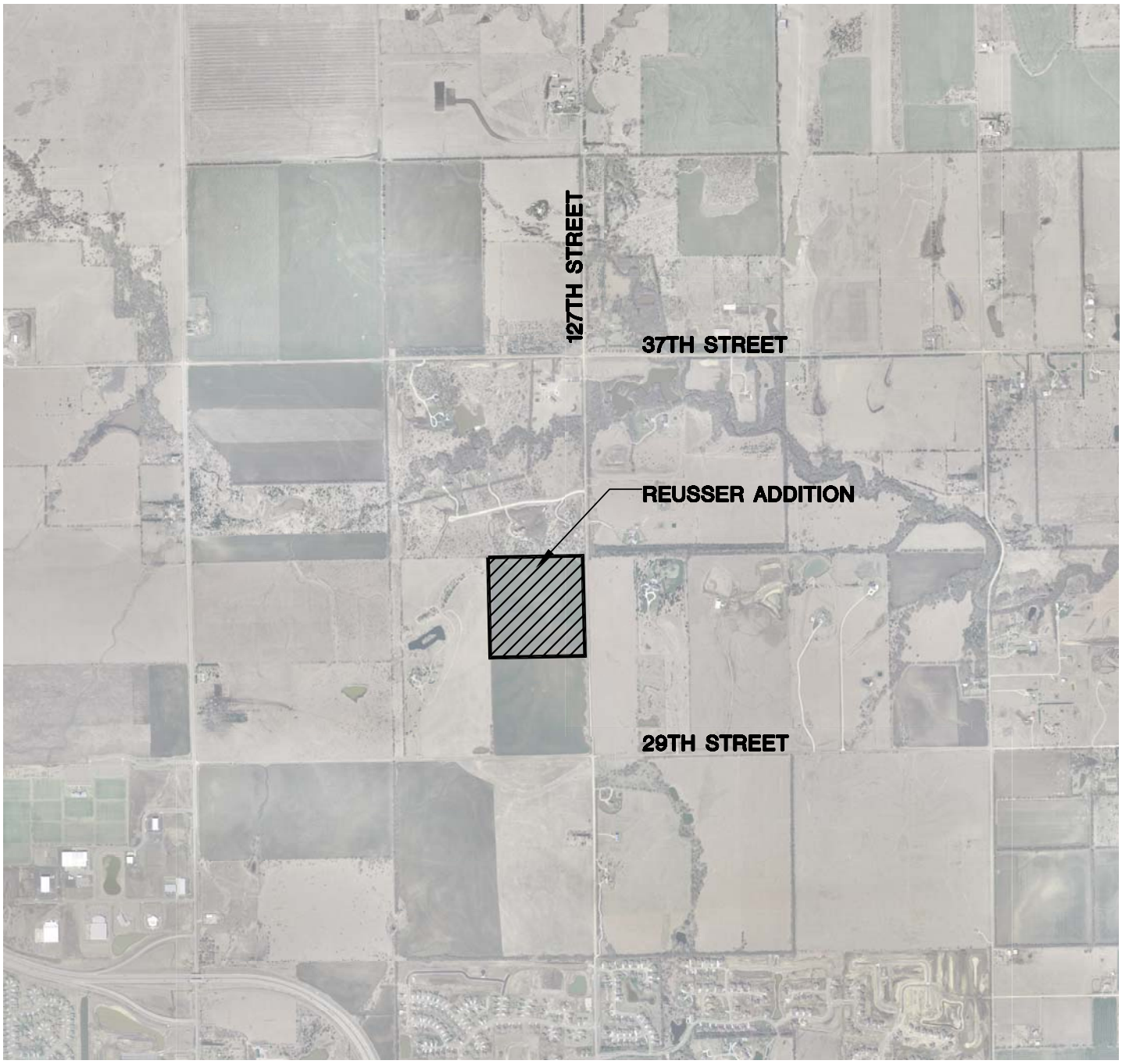
There are no open channels onsite.

T. Groundwater Elevations

Groundwater elevations are not applicable for this project.

Figure 2.1

Orthophotograph



SCALE: 1"=2000'

2000 0 2000 4000

N

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

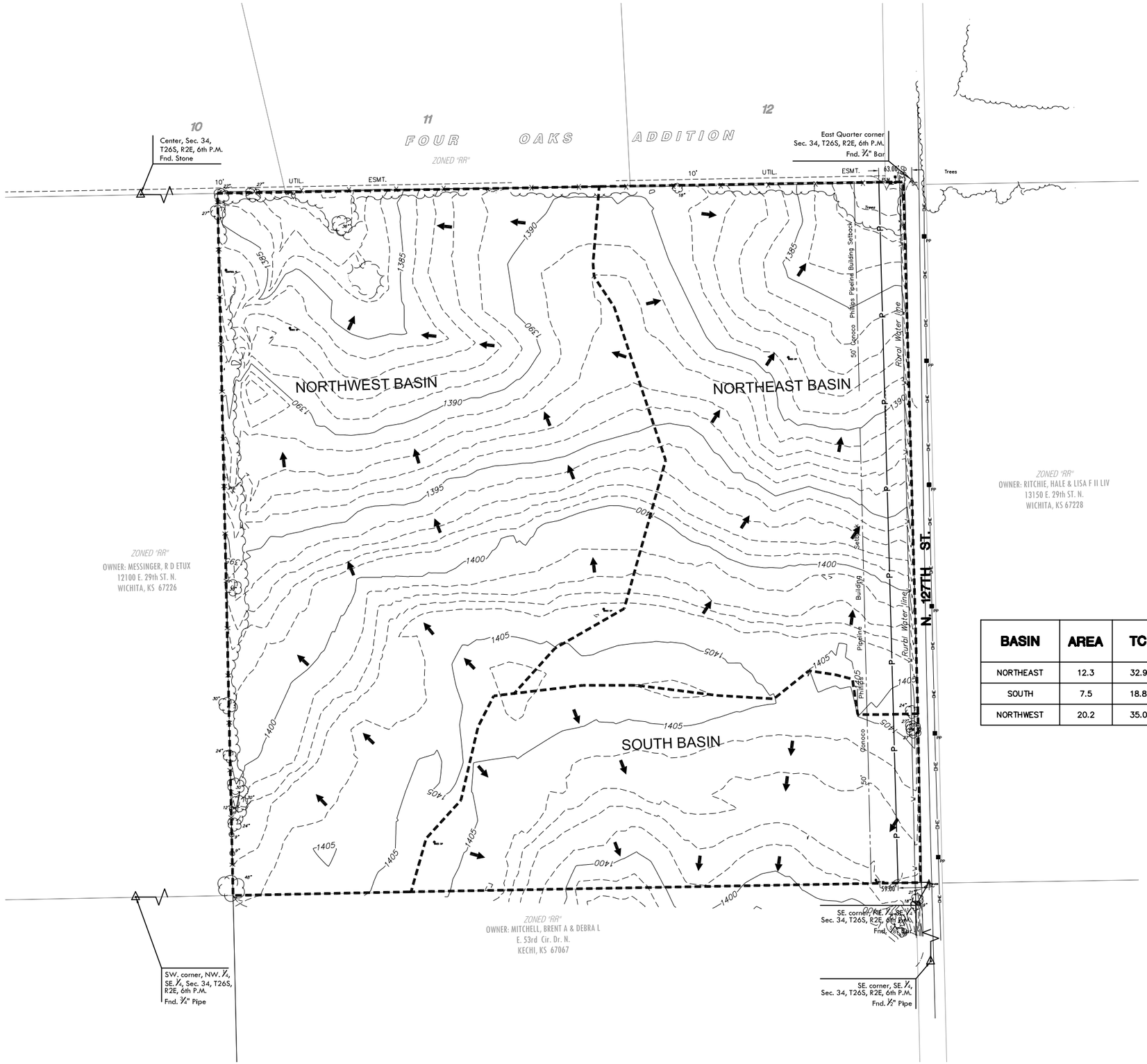
REUSSER ADDITION
PROJECT NAME

AERIAL MAP
SHEET TITLE

TMH	CMJ	GJA
DESIGN BY:	DRAWN BY:	CHECKED BY:
SEPTEMBER 2008	07698	1 / 1
DATE	JOB NO.	SHEET/OF

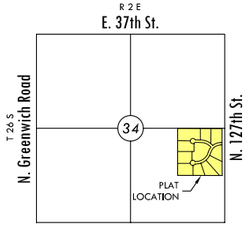
Figure 2.2

Existing Conditions Drawing



LEGEND

- CIN - CONIFEROUS TREE
- DIN - DECIDUOUS TREE
- SN - SIGN
- PP - POWER POLE
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SECTION CORNER
- BM - BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UGE - UNDERGROUND ELEC.
- OHE - OVERHEAD ELECTRIC
- FOC - FIBER OPTIC CABLE
- DRAINAGE BASIN
- FLOW ARROW



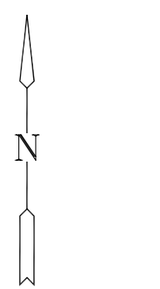
VICINITY MAP

BENCHMARKS

Date of Survey: April, 2008

- △ = Section corner Monument Found
- ○ = Found ⅝" rebar w/ MKEC CLS 39 id. cap unless otherwise annotated
- ● = Set ⅝" Rebar w/ MKEC CLS 39 id. cap
- (M) = Measured
- (CM) = Calculated from measured

BASIN	AREA	TC	CN	DESIGN STORM					
				2	5	10	25	50	100
NORTHEAST	12.3	32.9	80	16.7	26.1	32.4	42.2	49.6	56.2
SOUTH	7.5	18.8	80	14.1	21.8	27.1	35.1	41.3	46.7
NORTHWEST	20.2	35.0	80	26.6	41.5	51.6	67.2	79.1	89.6



SCALE: 1" = 100'

100 0 100 200

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

REUSSER ADDITION

REUSSER'S ADDITION
WICHITA, KANSAS

EXISTING CONDITIONS

DATE: SEPTEMBER 2008
REVISED:
DESIGN BY: TMH
DRAWN BY: CMJ
CHECKED BY: GJA
SHEET NUMBER: 1

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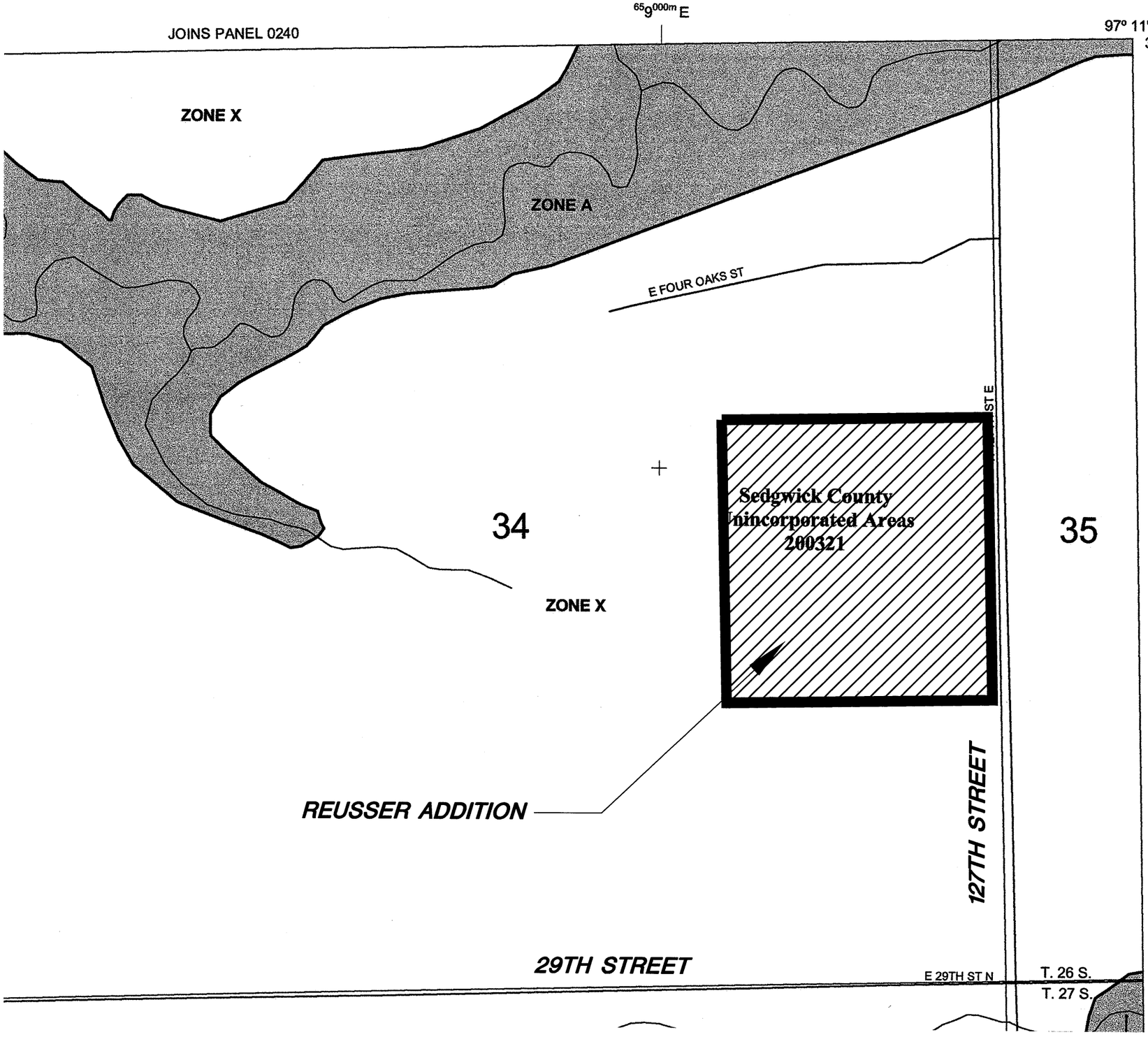
Figure 2.3

FIRM



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0377E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 377 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0377	E
WICHITA, CITY OF	200328	0377	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
20173C0377E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

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

REUSSER ADDITION

REUSSER'S ADDITION
WICHITA, KANSAS

FIRM MAP

DATE
SEPTEMBER 2008

REVISED

DESIGN BY
TMH

DRAWN BY
CMJ

CHECKED BY
GJA

SHEET NUMBER
1

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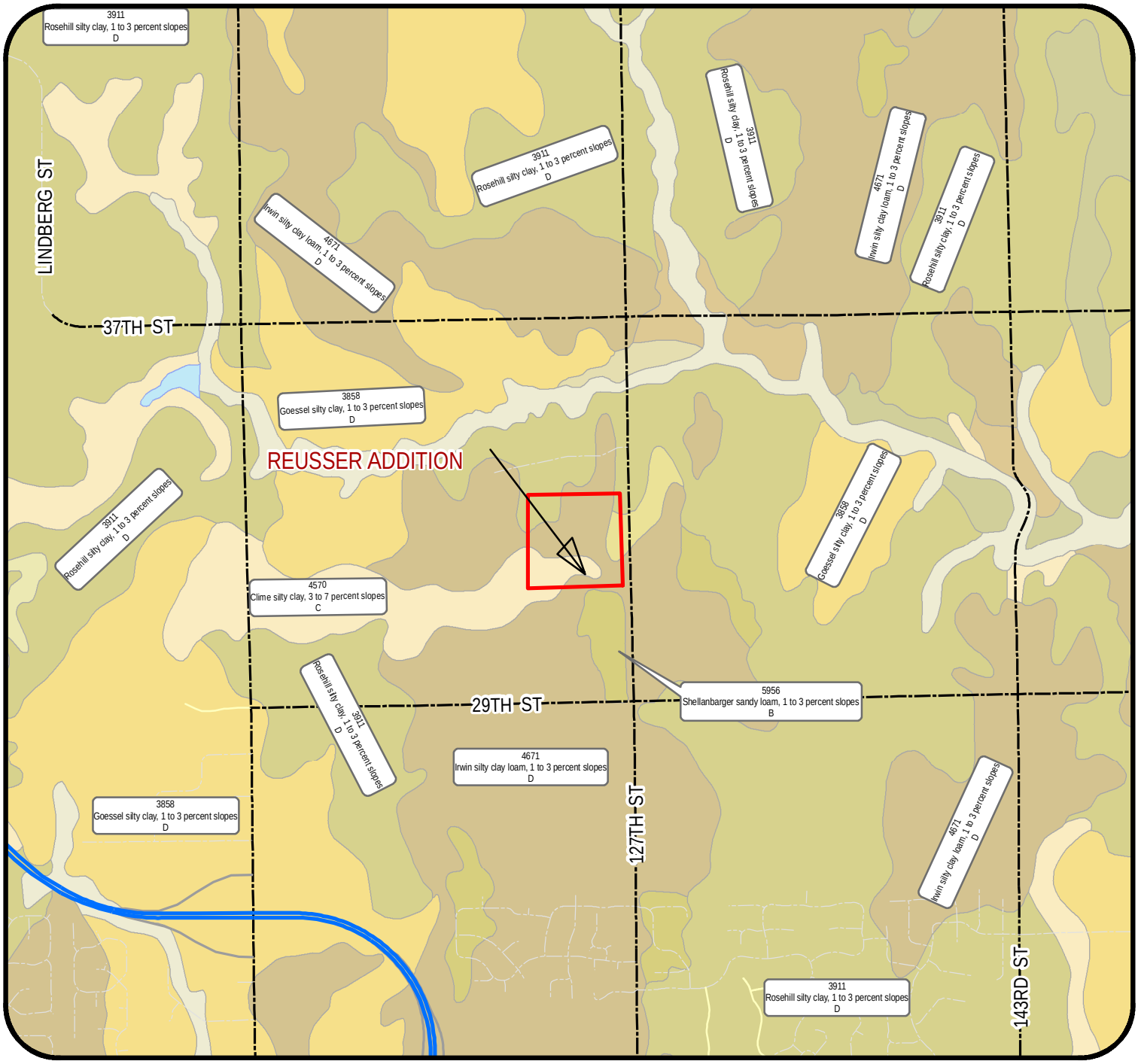
Figure 2.4

Soil Survey



J:\Civil\07698\dwg\DRNG\nrcs-soil.mxd

REUSSER ADDITION

Project Name:

Soil Survey - Sedgwick County, KS

Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

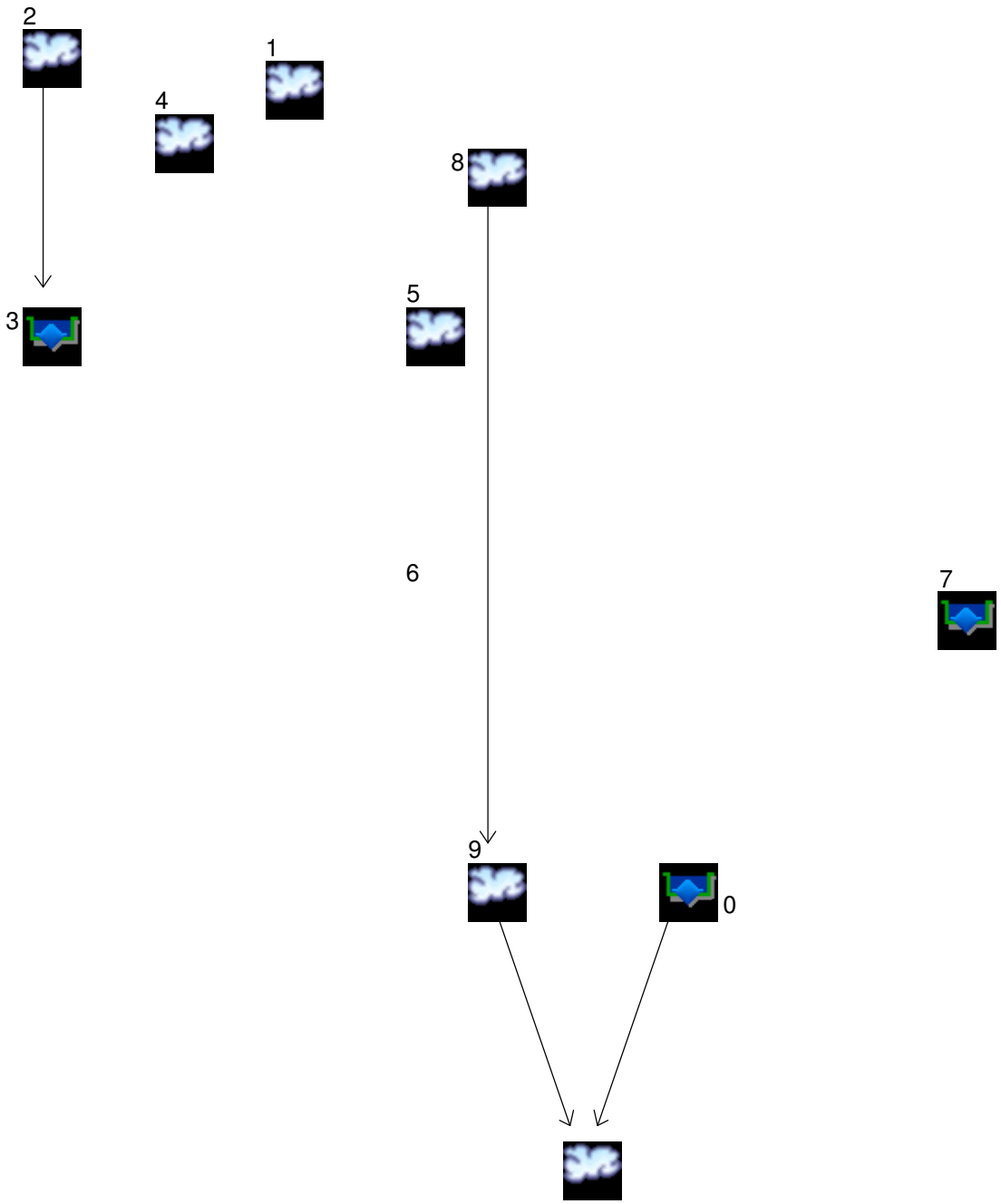
CMJ	Sept. 2008
Drawn By:	Date:
TMH / KLA	07698
Design / Review:	Job No.:

Figure 2.5

Hydraflow Hydrographs

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre-Project Northwest
2	SCS Runoff	Post-Project Northwest
3	Reservoir	Post-Project NW Detain
4	SCS Runoff	Pre-Project South
5	SCS Runoff	Post-Project South
6	SCS Runoff	Pre-Project Northeast
7	SCS Runoff	Post- Northeast to Detention
8	Reservoir	Northeast Detention
9	SCS Runoff	Post-Project Northeast Undetained
10	Combine	Post-Project Northeast

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	------	-------	26.55	-------	41.48	51.64	67.15	79.09	89.59	Pre-Project Northwest
2	SCS Runoff	------	-------	28.29	-------	43.97	54.60	70.81	83.28	94.22	Post-Project Northwest
3	Reservoir	2	-------	25.53	-------	40.51	50.70	66.27	78.35	88.89	Post-Project NW Detain
4	SCS Runoff	------	-------	14.05	-------	21.83	27.10	35.13	41.29	46.71	Pre-Project South
5	SCS Runoff	------	-------	14.14	-------	21.84	27.04	34.94	41.00	46.32	Post-Project South
6	SCS Runoff	------	-------	16.68	-------	26.05	32.42	42.15	49.64	56.21	Pre-Project Northeast
7	SCS Runoff	------	-------	11.69	-------	18.15	22.53	29.19	34.32	38.82	Post- Northeast to Detention
8	Reservoir	7	-------	2.335	-------	6.090	11.67	19.89	26.01	31.20	Northeast Detention
9	SCS Runoff	------	-------	8.611	-------	13.38	16.60	21.51	25.29	28.60	Post-Project Northeast Undetained
10	Combine	8, 9	-------	9.791	-------	15.54	21.84	36.21	46.97	56.01	Post-Project Northeast

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	26.55	1	735	2.728	------	------	------	Pre-Project Northwest
2	SCS Runoff	28.29	1	733	2.725	------	------	------	Post-Project Northwest
3	Reservoir	25.53	1	739	2.725	2	1382.84	0.305	Post-Project NW Detain
4	SCS Runoff	14.05	1	725	1.013	------	------	------	Pre-Project South
5	SCS Runoff	14.14	1	724	0.965	------	------	------	Post-Project South
6	SCS Runoff	16.68	1	734	1.651	------	------	------	Pre-Project Northeast
7	SCS Runoff	11.69	1	730	1.037	------	------	------	Post- Northeast to Detention
8	Reservoir	2.335	1	761	1.023	7	1384.12	0.473	Northeast Detention
9	SCS Runoff	8.611	1	730	0.764	------	------	------	Post-Project Northeast Undetained
10	Combine	9.791	1	731	1.787	8, 9	------	------	Post-Project Northeast

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	41.48	1	734	4.215	------	------	------	Pre-Project Northwest
2	SCS Runoff	43.97	1	732	4.195	------	------	------	Post-Project Northwest
3	Reservoir	40.51	1	737	4.195	2	1383.14	0.423	Post-Project NW Detain
4	SCS Runoff	21.83	1	725	1.565	------	------	------	Pre-Project South
5	SCS Runoff	21.84	1	724	1.485	------	------	------	Post-Project South
6	SCS Runoff	26.05	1	733	2.551	------	------	------	Pre-Project Northeast
7	SCS Runoff	18.15	1	730	1.596	------	------	------	Post- Northeast to Detention
8	Reservoir	6.090	1	753	1.582	7	1384.66	0.709	Northeast Detention
9	SCS Runoff	13.38	1	730	1.176	------	------	------	Post-Project Northeast Undetained
10	Combine	15.54	1	732	2.758	8, 9	------	------	Post-Project Northeast

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	51.64	1	734	5.239	------	------	------	Pre-Project Northwest
2	SCS Runoff	54.60	1	732	5.205	------	------	------	Post-Project Northwest
3	Reservoir	50.70	1	737	5.205	2	1383.32	0.498	Post-Project NW Detain
4	SCS Runoff	27.10	1	725	1.945	------	------	------	Pre-Project South
5	SCS Runoff	27.04	1	724	1.843	------	------	------	Post-Project South
6	SCS Runoff	32.42	1	733	3.170	------	------	------	Pre-Project Northeast
7	SCS Runoff	22.53	1	730	1.980	------	------	------	Post- Northeast to Detention
8	Reservoir	11.67	1	747	1.966	7	1384.84	0.792	Northeast Detention
9	SCS Runoff	16.60	1	730	1.459	------	------	------	Post-Project Northeast Undetained
10	Combine	21.84	1	741	3.425	8, 9	------	------	Post-Project Northeast

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	67.15	1	734	6.823	------	------	------	Pre-Project Northwest
2	SCS Runoff	70.81	1	732	6.767	------	------	------	Post-Project Northwest
3	Reservoir	66.27	1	737	6.767	2	1383.58	0.605	Post-Project NW Detain
4	SCS Runoff	35.13	1	725	2.533	------	------	------	Pre-Project South
5	SCS Runoff	34.94	1	724	2.395	------	------	------	Post-Project South
6	SCS Runoff	42.15	1	733	4.128	------	------	------	Pre-Project Northeast
7	SCS Runoff	29.19	1	730	2.574	------	------	------	Post- Northeast to Detention
8	Reservoir	19.89	1	742	2.560	7	1385.04	0.887	Northeast Detention
9	SCS Runoff	21.51	1	730	1.897	------	------	------	Post-Project Northeast Undetained
10	Combine	36.21	1	737	4.457	8, 9	------	------	Post-Project Northeast

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	79.09	1	734	8.058	------	------	------	Pre-Project Northwest
2	SCS Runoff	83.28	1	732	7.984	------	------	------	Post-Project Northwest
3	Reservoir	78.35	1	736	7.983	2	1383.77	0.684	Post-Project NW Detain
4	SCS Runoff	41.29	1	725	2.992	------	------	------	Pre-Project South
5	SCS Runoff	41.00	1	724	2.826	------	------	------	Post-Project South
6	SCS Runoff	49.64	1	733	4.876	------	------	------	Pre-Project Northeast
7	SCS Runoff	34.32	1	730	3.037	------	------	------	Post- Northeast to Detention
8	Reservoir	26.01	1	739	3.023	7	1385.17	0.949	Northeast Detention
9	SCS Runoff	25.29	1	730	2.238	------	------	------	Post-Project Northeast Undetained
10	Combine	46.97	1	736	5.261	8, 9	------	------	Post-Project Northeast

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	89.59	1	734	9.154	------	------	------	Pre-Project Northwest
2	SCS Runoff	94.22	1	732	9.062	------	------	------	Post-Project Northwest
3	Reservoir	88.89	1	736	9.062	2	1383.93	0.752	Post-Project NW Detain
4	SCS Runoff	46.71	1	725	3.399	------	------	------	Pre-Project South
5	SCS Runoff	46.32	1	724	3.208	------	------	------	Post-Project South
6	SCS Runoff	56.21	1	733	5.539	------	------	------	Pre-Project Northeast
7	SCS Runoff	38.82	1	730	3.448	------	------	------	Post- Northeast to Detention
8	Reservoir	31.20	1	738	3.433	7	1385.27	0.998	Northeast Detention
9	SCS Runoff	28.60	1	730	2.540	------	------	------	Post-Project Northeast Undetained
10	Combine	56.01	1	735	5.973	8, 9	------	------	Post-Project Northeast

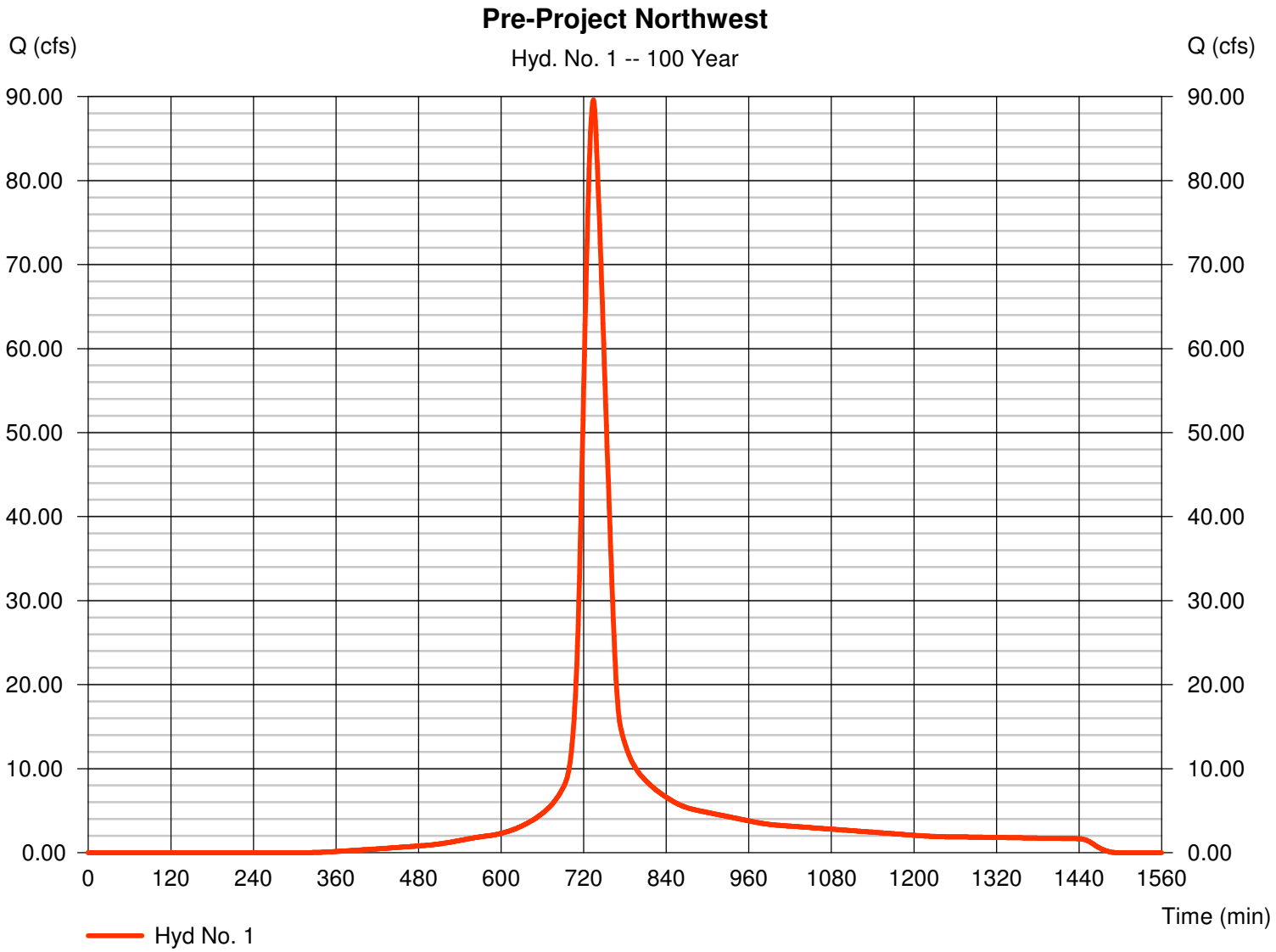
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 1

Pre-Project Northwest

Hydrograph type	=	SCS Runoff	Peak discharge	=	89.59 cfs
Storm frequency	=	100 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	9.154 acft
Drainage area	=	20.200 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	35.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



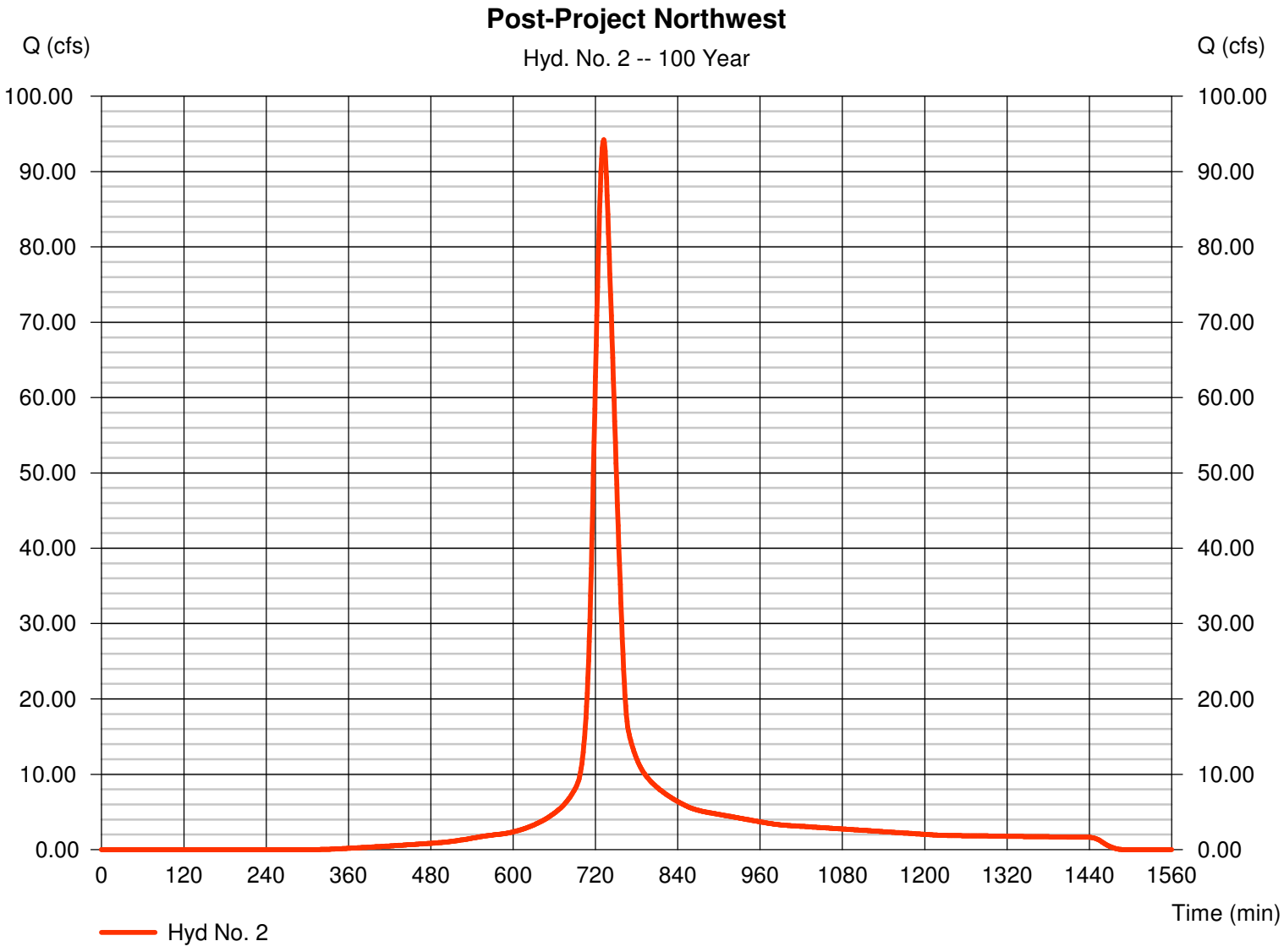
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 2

Post-Project Northwest

Hydrograph type	=	SCS Runoff	Peak discharge	=	94.22 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	9.062 acft
Drainage area	=	19.700 ac	Curve number	=	80.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	31.50 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

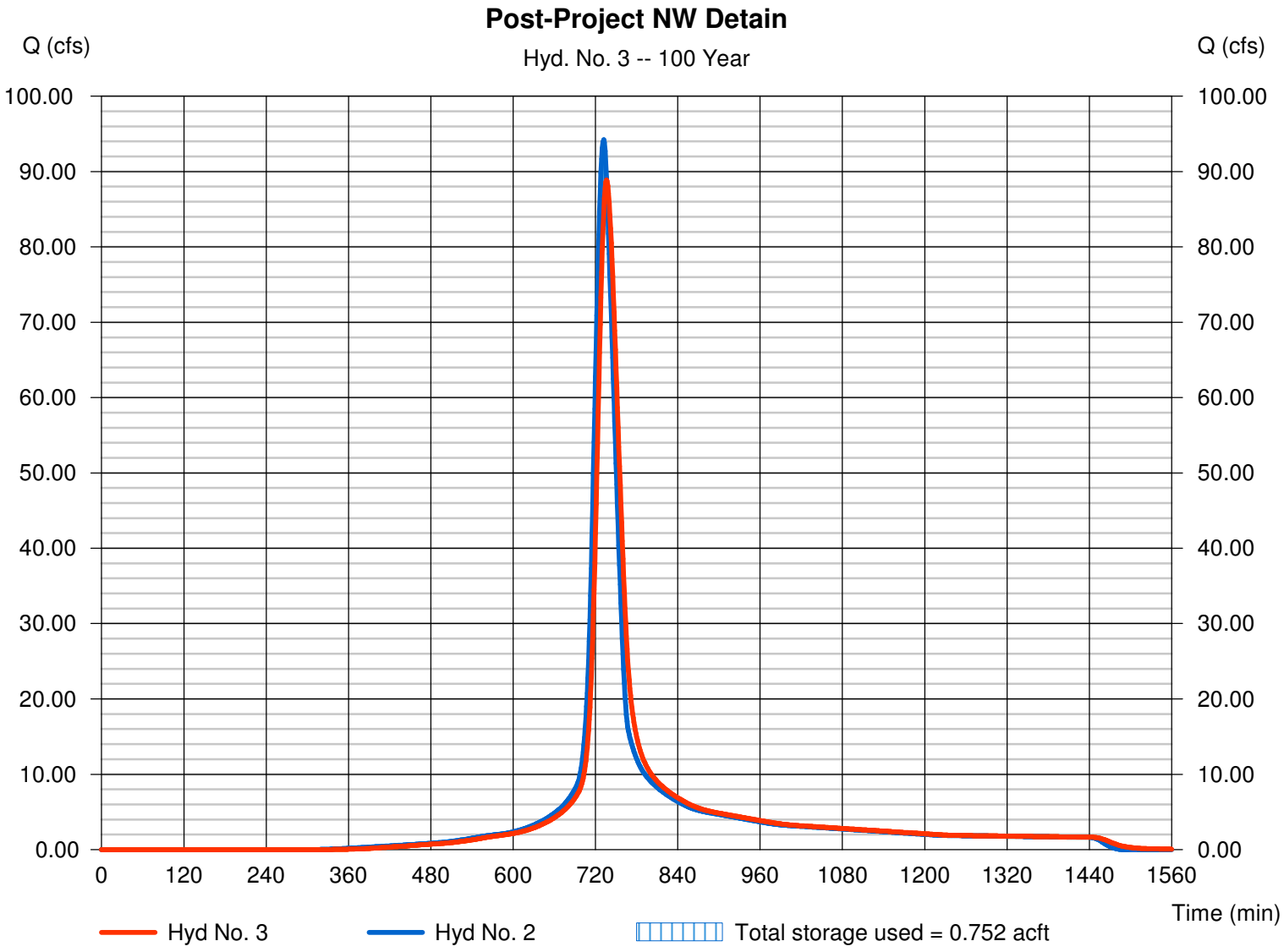
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 3

Post-Project NW Detain

Hydrograph type	=	Reservoir	Peak discharge	=	88.89 cfs
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	1 min	Hyd. volume	=	9.062 acft
Inflow hyd. No.	=	2 - Post-Project Northwest	Max. Elevation	=	1383.93 ft
Reservoir name	=	Northwest Detention	Max. Storage	=	0.752 acft

Storage Indication method used.



Pond Report

Pond No. 1 - Northwest Detention

Pond Data

Trapezoid - Bottom L x W = 150.0 x 100.0 ft, Side slope = 4.00:1, Bottom elev. = 1382.00 ft, Depth = 3.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1382.00	15,000	0.000	0.000
0.30	1382.30	15,606	0.105	0.105
0.60	1382.60	16,223	0.110	0.215
0.90	1382.90	16,852	0.114	0.329
1.20	1383.20	17,492	0.118	0.447
1.50	1383.50	18,144	0.123	0.570
1.80	1383.80	18,807	0.127	0.697
2.10	1384.10	19,482	0.132	0.829
2.40	1384.40	20,169	0.137	0.965
2.70	1384.70	20,867	0.141	1.107
3.00	1385.00	21,576	0.146	1.253

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 1382.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1382.00	---	---	---	---	0.00	---	---	---	---	---	0.000
0.03	0.011	1382.03	---	---	---	---	0.17	---	---	---	---	---	0.173
0.06	0.021	1382.06	---	---	---	---	0.49	---	---	---	---	---	0.490
0.09	0.032	1382.09	---	---	---	---	0.90	---	---	---	---	---	0.900
0.12	0.042	1382.12	---	---	---	---	1.39	---	---	---	---	---	1.386
0.15	0.053	1382.15	---	---	---	---	1.94	---	---	---	---	---	1.937
0.18	0.063	1382.18	---	---	---	---	2.55	---	---	---	---	---	2.547
0.21	0.074	1382.21	---	---	---	---	3.21	---	---	---	---	---	3.209
0.24	0.084	1382.24	---	---	---	---	3.92	---	---	---	---	---	3.921
0.27	0.095	1382.27	---	---	---	---	4.68	---	---	---	---	---	4.679
0.30	0.105	1382.30	---	---	---	---	5.47	---	---	---	---	---	5.473
0.33	0.116	1382.33	---	---	---	---	6.31	---	---	---	---	---	6.315
0.36	0.127	1382.36	---	---	---	---	7.20	---	---	---	---	---	7.196
0.39	0.138	1382.39	---	---	---	---	8.11	---	---	---	---	---	8.115
0.42	0.149	1382.42	---	---	---	---	9.07	---	---	---	---	---	9.069
0.45	0.160	1382.45	---	---	---	---	10.06	---	---	---	---	---	10.06
0.48	0.171	1382.48	---	---	---	---	11.08	---	---	---	---	---	11.08
0.51	0.182	1382.51	---	---	---	---	12.14	---	---	---	---	---	12.14
0.54	0.193	1382.54	---	---	---	---	13.22	---	---	---	---	---	13.22
0.57	0.204	1382.57	---	---	---	---	14.34	---	---	---	---	---	14.34
0.60	0.215	1382.60	---	---	---	---	15.48	---	---	---	---	---	15.48
0.63	0.226	1382.63	---	---	---	---	16.65	---	---	---	---	---	16.65
0.66	0.238	1382.66	---	---	---	---	17.86	---	---	---	---	---	17.86
0.69	0.249	1382.69	---	---	---	---	19.09	---	---	---	---	---	19.09
0.72	0.261	1382.72	---	---	---	---	20.35	---	---	---	---	---	20.35
0.75	0.272	1382.75	---	---	---	---	21.63	---	---	---	---	---	21.63
0.78	0.283	1382.78	---	---	---	---	22.95	---	---	---	---	---	22.95
0.81	0.295	1382.81	---	---	---	---	24.28	---	---	---	---	---	24.28
0.84	0.306	1382.84	---	---	---	---	25.65	---	---	---	---	---	25.65
0.87	0.317	1382.87	---	---	---	---	27.03	---	---	---	---	---	27.03
0.90	0.329	1382.90	---	---	---	---	28.43	---	---	---	---	---	28.43
0.93	0.341	1382.93	---	---	---	---	29.87	---	---	---	---	---	29.87
0.96	0.353	1382.96	---	---	---	---	31.33	---	---	---	---	---	31.33

Continues on next page...

Northwest Detention

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.99	0.364	1382.99	---	---	---	---	32.81	---	---	---	---	---	32.81
1.02	0.376	1383.02	---	---	---	---	34.31	---	---	---	---	---	34.31
1.05	0.388	1383.05	---	---	---	---	35.84	---	---	---	---	---	35.84
1.08	0.400	1383.08	---	---	---	---	37.39	---	---	---	---	---	37.39
1.11	0.412	1383.11	---	---	---	---	38.96	---	---	---	---	---	38.96
1.14	0.423	1383.14	---	---	---	---	40.55	---	---	---	---	---	40.55
1.17	0.435	1383.17	---	---	---	---	42.16	---	---	---	---	---	42.16
1.20	0.447	1383.20	---	---	---	---	43.77	---	---	---	---	---	43.77
1.23	0.459	1383.23	---	---	---	---	45.42	---	---	---	---	---	45.42
1.26	0.472	1383.26	---	---	---	---	47.10	---	---	---	---	---	47.10
1.29	0.484	1383.29	---	---	---	---	48.79	---	---	---	---	---	48.79
1.32	0.496	1383.32	---	---	---	---	50.51	---	---	---	---	---	50.51
1.35	0.508	1383.35	---	---	---	---	52.24	---	---	---	---	---	52.24
1.38	0.521	1383.38	---	---	---	---	53.99	---	---	---	---	---	53.99
1.41	0.533	1383.41	---	---	---	---	55.76	---	---	---	---	---	55.76
1.44	0.545	1383.44	---	---	---	---	57.55	---	---	---	---	---	57.55
1.47	0.558	1383.47	---	---	---	---	59.36	---	---	---	---	---	59.36
1.50	0.570	1383.50	---	---	---	---	61.18	---	---	---	---	---	61.18
1.53	0.583	1383.53	---	---	---	---	63.02	---	---	---	---	---	63.02
1.56	0.595	1383.56	---	---	---	---	64.89	---	---	---	---	---	64.89
1.59	0.608	1383.59	---	---	---	---	66.77	---	---	---	---	---	66.77
1.62	0.621	1383.62	---	---	---	---	68.67	---	---	---	---	---	68.67
1.65	0.633	1383.65	---	---	---	---	70.59	---	---	---	---	---	70.59
1.68	0.646	1383.68	---	---	---	---	72.52	---	---	---	---	---	72.52
1.71	0.659	1383.71	---	---	---	---	74.48	---	---	---	---	---	74.48
1.74	0.672	1383.74	---	---	---	---	76.45	---	---	---	---	---	76.45
1.77	0.684	1383.77	---	---	---	---	78.43	---	---	---	---	---	78.43
1.80	0.697	1383.80	---	---	---	---	80.42	---	---	---	---	---	80.42
1.83	0.710	1383.83	---	---	---	---	82.44	---	---	---	---	---	82.44
1.86	0.723	1383.86	---	---	---	---	84.48	---	---	---	---	---	84.48
1.89	0.737	1383.89	---	---	---	---	86.53	---	---	---	---	---	86.53
1.92	0.750	1383.92	---	---	---	---	88.60	---	---	---	---	---	88.60
1.95	0.763	1383.95	---	---	---	---	90.69	---	---	---	---	---	90.69
1.98	0.776	1383.98	---	---	---	---	92.79	---	---	---	---	---	92.79
2.01	0.789	1384.01	---	---	---	---	94.91	---	---	---	---	---	94.91
2.04	0.803	1384.04	---	---	---	---	97.05	---	---	---	---	---	97.05
2.07	0.816	1384.07	---	---	---	---	99.20	---	---	---	---	---	99.20
2.10	0.829	1384.10	---	---	---	---	101.34	---	---	---	---	---	101.34
2.13	0.843	1384.13	---	---	---	---	103.52	---	---	---	---	---	103.52
2.16	0.856	1384.16	---	---	---	---	105.71	---	---	---	---	---	105.71
2.19	0.870	1384.19	---	---	---	---	107.93	---	---	---	---	---	107.93
2.22	0.884	1384.22	---	---	---	---	110.15	---	---	---	---	---	110.15
2.25	0.897	1384.25	---	---	---	---	112.40	---	---	---	---	---	112.40
2.28	0.911	1384.28	---	---	---	---	114.65	---	---	---	---	---	114.65
2.31	0.924	1384.31	---	---	---	---	116.93	---	---	---	---	---	116.93
2.34	0.938	1384.34	---	---	---	---	119.21	---	---	---	---	---	119.21
2.37	0.952	1384.37	---	---	---	---	121.52	---	---	---	---	---	121.52
2.40	0.965	1384.40	---	---	---	---	123.81	---	---	---	---	---	123.81
2.43	0.980	1384.43	---	---	---	---	126.14	---	---	---	---	---	126.14
2.46	0.994	1384.46	---	---	---	---	128.49	---	---	---	---	---	128.49
2.49	1.008	1384.49	---	---	---	---	130.85	---	---	---	---	---	130.85
2.52	1.022	1384.52	---	---	---	---	133.22	---	---	---	---	---	133.22
2.55	1.036	1384.55	---	---	---	---	135.61	---	---	---	---	---	135.61
2.58	1.050	1384.58	---	---	---	---	138.01	---	---	---	---	---	138.01
2.61	1.064	1384.61	---	---	---	---	140.43	---	---	---	---	---	140.43
2.64	1.078	1384.64	---	---	---	---	142.86	---	---	---	---	---	142.86
2.67	1.093	1384.67	---	---	---	---	145.31	---	---	---	---	---	145.31
2.70	1.107	1384.70	---	---	---	---	147.73	---	---	---	---	---	147.73
2.73	1.121	1384.73	---	---	---	---	150.20	---	---	---	---	---	150.20
2.76	1.136	1384.76	---	---	---	---	152.69	---	---	---	---	---	152.69
2.79	1.151	1384.79	---	---	---	---	155.19	---	---	---	---	---	155.19
2.82	1.165	1384.82	---	---	---	---	157.70	---	---	---	---	---	157.70
2.85	1.180	1384.85	---	---	---	---	160.23	---	---	---	---	---	160.23
2.88	1.194	1384.88	---	---	---	---	162.77	---	---	---	---	---	162.77
2.91	1.209	1384.91	---	---	---	---	165.32	---	---	---	---	---	165.32
2.94	1.224	1384.94	---	---	---	---	167.88	---	---	---	---	---	167.88
2.97	1.238	1384.97	---	---	---	---	170.46	---	---	---	---	---	170.46
3.00	1.253	1385.00	---	---	---	---	173.03	---	---	---	---	---	173.03

...End

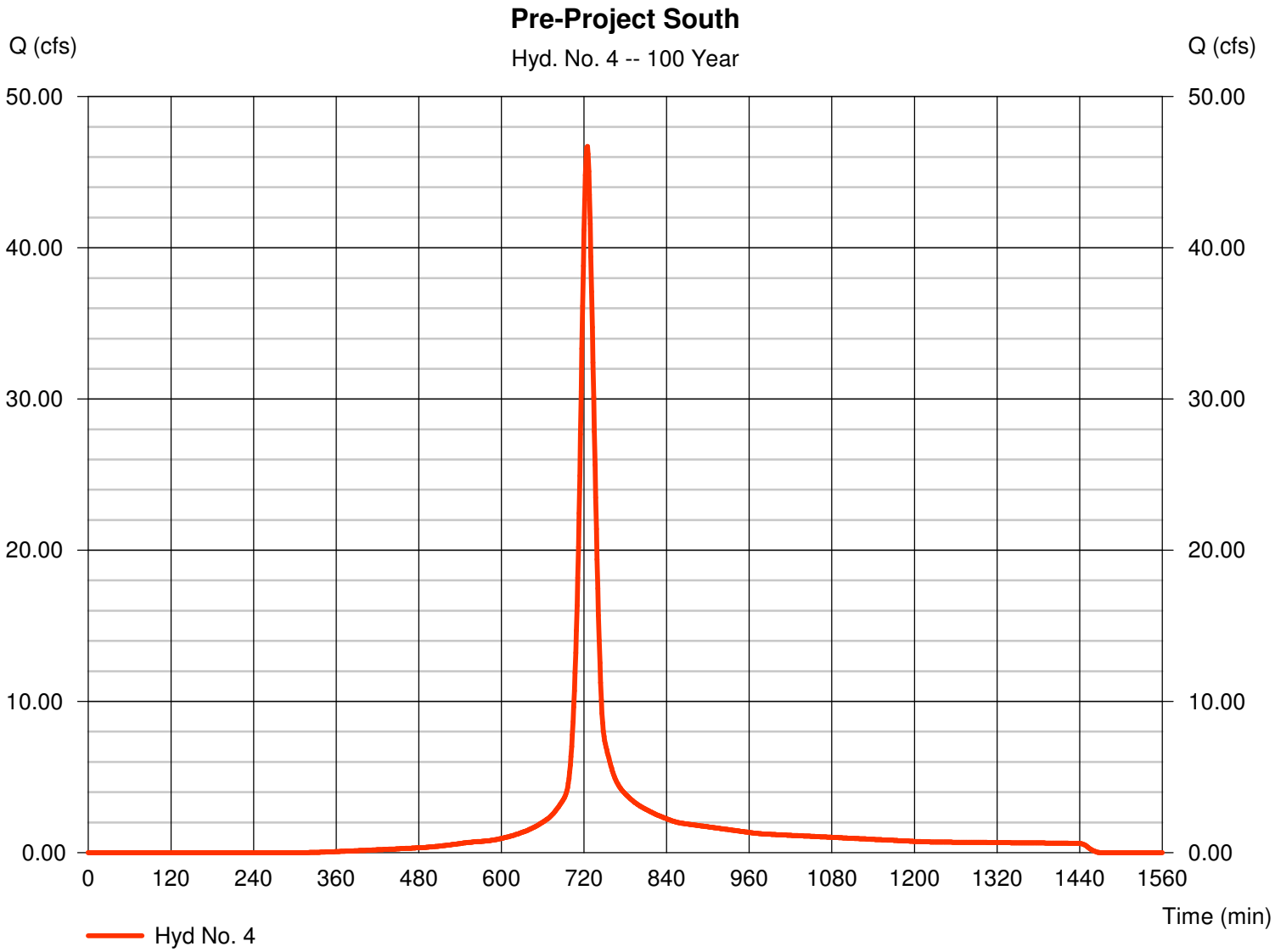
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 4

Pre-Project South

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.71 cfs
Storm frequency	=	100 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	3.399 acft
Drainage area	=	7.500 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	18.80 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



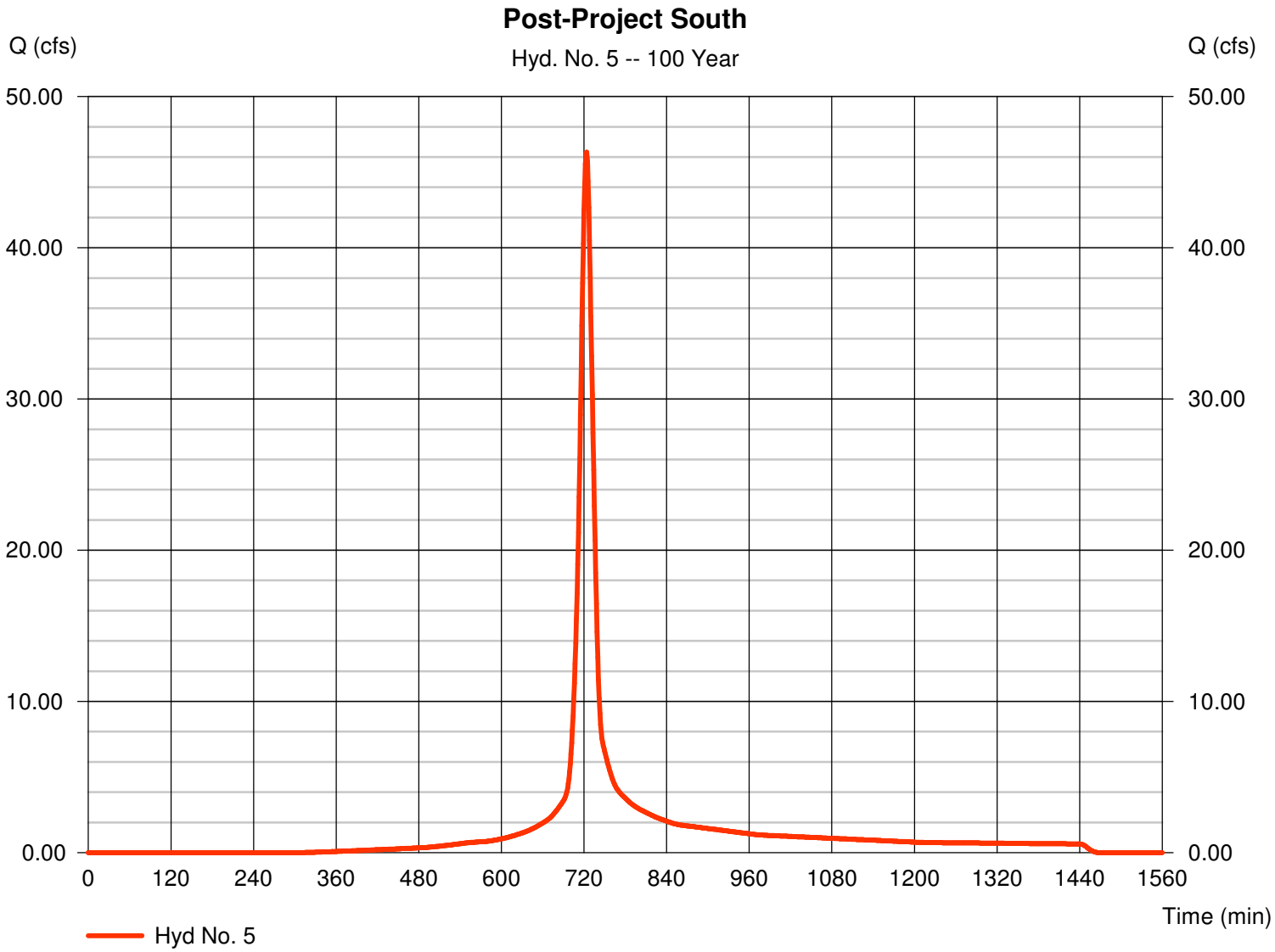
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 5

Post-Project South

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.32 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	3.208 acft
Drainage area	=	7.100 ac	Curve number	=	80.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	17.60 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



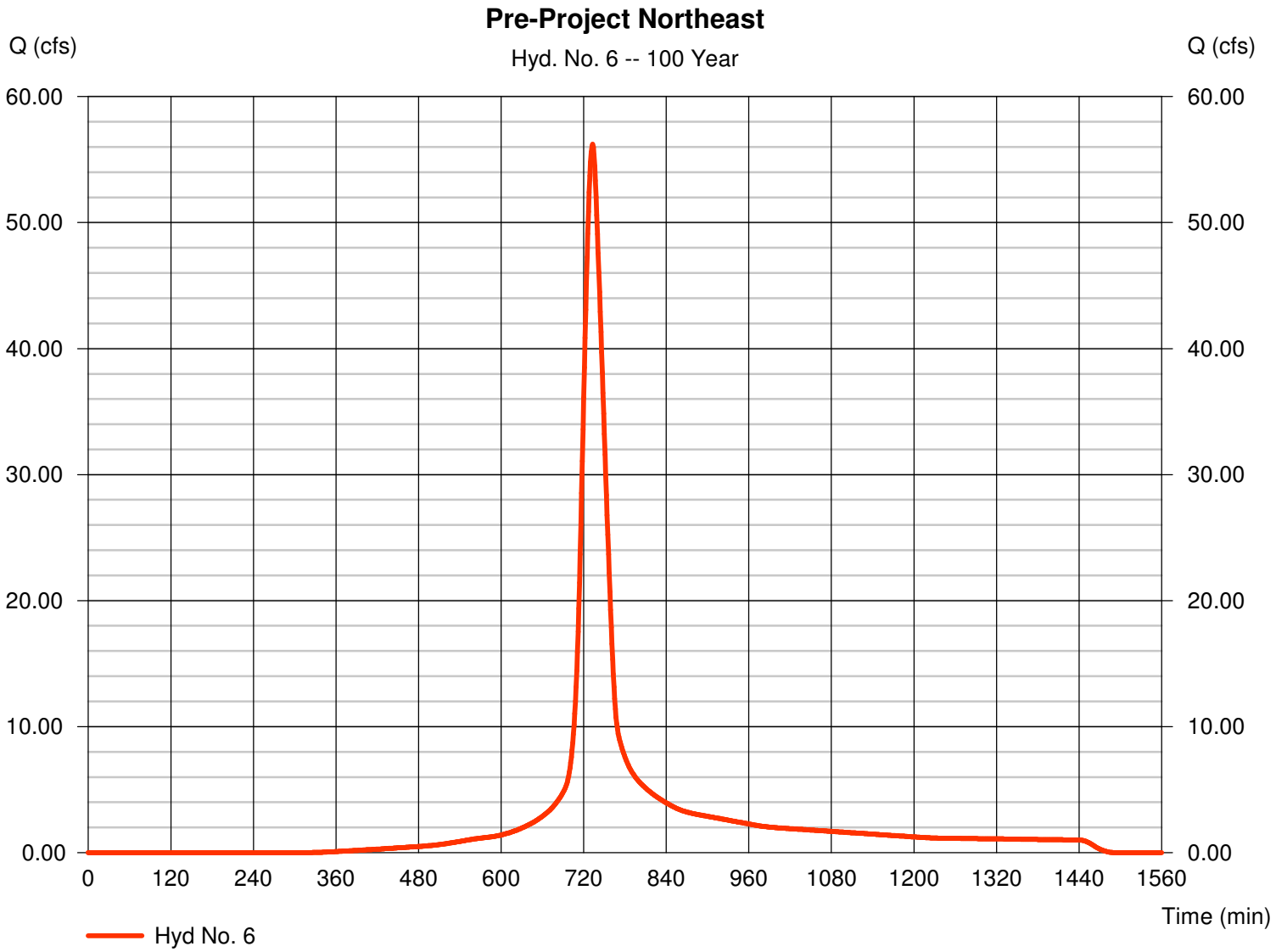
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 6

Pre-Project Northeast

Hydrograph type	=	SCS Runoff	Peak discharge	=	56.21 cfs
Storm frequency	=	100 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	5.539 acft
Drainage area	=	12.300 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	32.90 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



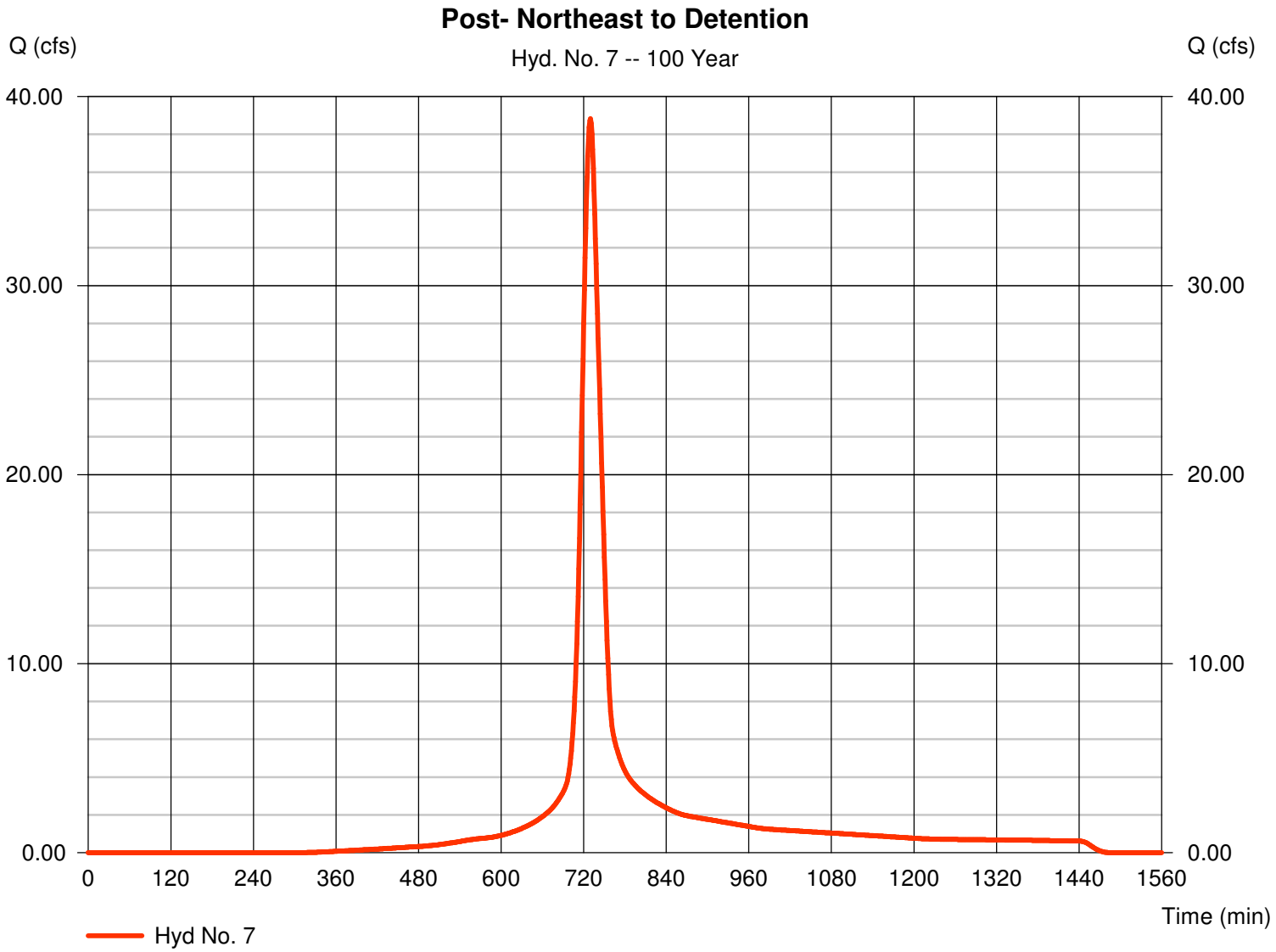
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 7

Post- Northeast to Detention

Hydrograph type	=	SCS Runoff	Peak discharge	=	38.82 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	3.448 acft
Drainage area	=	7.600 ac	Curve number	=	80.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	27.70 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

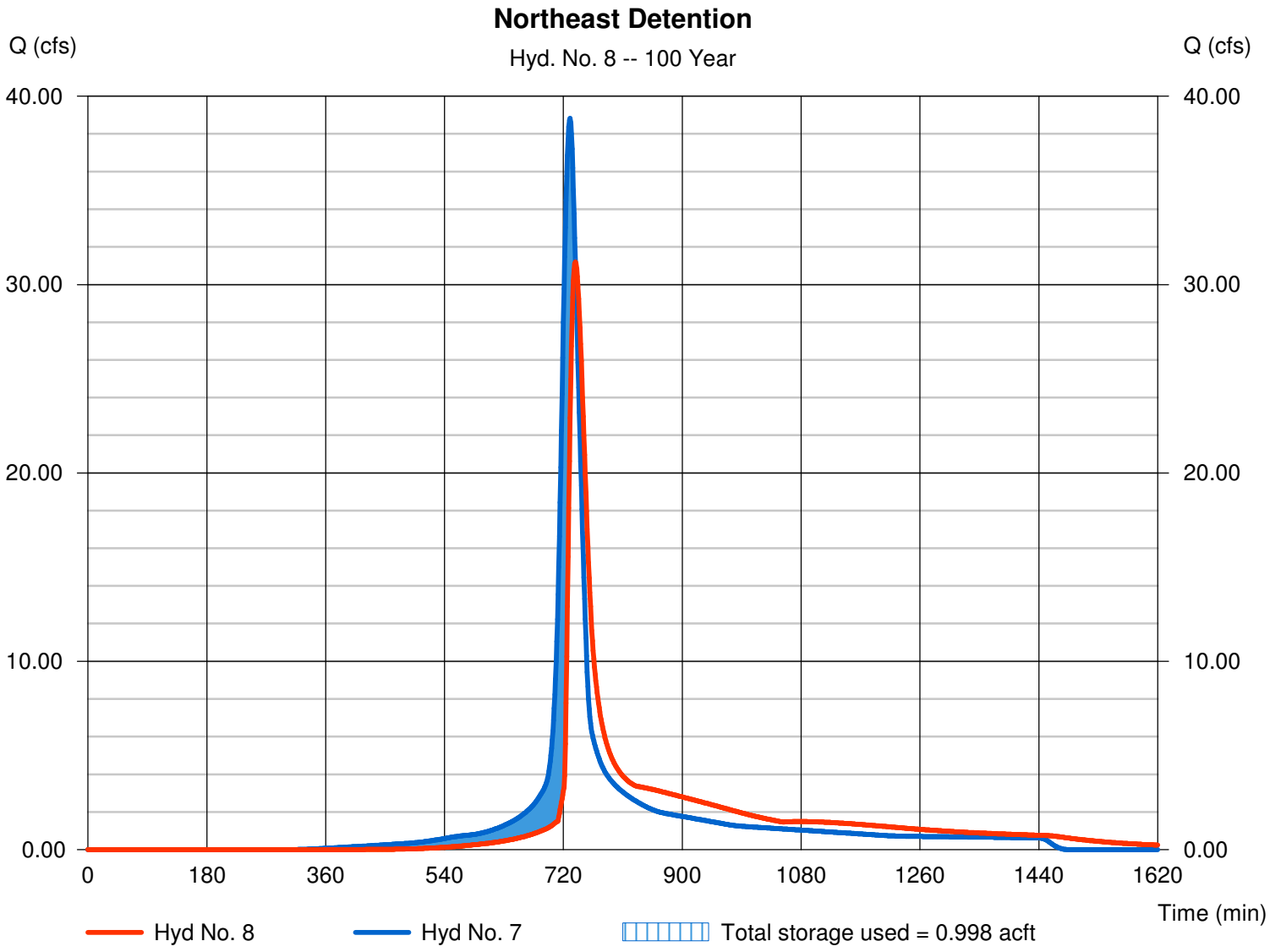
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 8

Northeast Detention

Hydrograph type	=	Reservoir	Peak discharge	=	31.20 cfs
Storm frequency	=	100 yrs	Time to peak	=	738 min
Time interval	=	1 min	Hyd. volume	=	3.433 acft
Inflow hyd. No.	=	7 - Post- Northeast to Detention	Max. Elevation	=	1385.27 ft
Reservoir name	=	Northeast Detention	Max. Storage	=	0.998 acft

Storage Indication method used.



Pond Report

Pond No. 2 - Northeast Detention

Pond Data

Trapezoid - Bottom L x W = 195.0 x 80.0 ft, Side slope = 4.00:1, Bottom elev. = 1382.90 ft, Depth = 2.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1382.90	15,600	0.000	0.000
0.25	1383.15	16,154	0.091	0.091
0.50	1383.40	16,716	0.094	0.185
0.75	1383.65	17,286	0.098	0.283
1.00	1383.90	17,864	0.101	0.384
1.25	1384.15	18,450	0.104	0.488
1.50	1384.40	19,044	0.108	0.596
1.75	1384.65	19,646	0.111	0.707
2.00	1384.90	20,256	0.114	0.821
2.25	1385.15	20,874	0.118	0.939
2.50	1385.40	21,500	0.122	1.061

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1382.90	0.00	0.00	0.00
Length (ft)	= 35.00	0.00	0.00	0.00
Slope (%)	= 0.40	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.00	0.00	0.00	0.00
Crest El. (ft)	= 1384.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1382.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.03	0.009	1382.93	0.00 oc	---	---	---	0.00	---	---	---	---	---	0.002
0.05	0.018	1382.95	0.01 oc	---	---	---	0.00	---	---	---	---	---	0.011
0.08	0.027	1382.98	0.02 oc	---	---	---	0.00	---	---	---	---	---	0.024
0.10	0.036	1383.00	0.04 oc	---	---	---	0.00	---	---	---	---	---	0.043
0.13	0.046	1383.03	0.07 oc	---	---	---	0.00	---	---	---	---	---	0.067
0.15	0.055	1383.05	0.09 oc	---	---	---	0.00	---	---	---	---	---	0.095
0.18	0.064	1383.08	0.13 oc	---	---	---	0.00	---	---	---	---	---	0.126
0.20	0.073	1383.10	0.16 oc	---	---	---	0.00	---	---	---	---	---	0.161
0.23	0.082	1383.13	0.20 oc	---	---	---	0.00	---	---	---	---	---	0.200
0.25	0.091	1383.15	0.24 oc	---	---	---	0.00	---	---	---	---	---	0.240
0.28	0.101	1383.18	0.28 oc	---	---	---	0.00	---	---	---	---	---	0.283
0.30	0.110	1383.20	0.33 oc	---	---	---	0.00	---	---	---	---	---	0.329
0.33	0.119	1383.23	0.38 oc	---	---	---	0.00	---	---	---	---	---	0.375
0.35	0.129	1383.25	0.42 oc	---	---	---	0.00	---	---	---	---	---	0.424
0.38	0.138	1383.28	0.47 oc	---	---	---	0.00	---	---	---	---	---	0.474
0.40	0.148	1383.30	0.53 oc	---	---	---	0.00	---	---	---	---	---	0.525
0.43	0.157	1383.33	0.58 oc	---	---	---	0.00	---	---	---	---	---	0.577
0.45	0.167	1383.35	0.63 oc	---	---	---	0.00	---	---	---	---	---	0.629
0.48	0.176	1383.38	0.68 oc	---	---	---	0.00	---	---	---	---	---	0.682
0.50	0.185	1383.40	0.74 oc	---	---	---	0.00	---	---	---	---	---	0.735
0.53	0.195	1383.43	0.79 oc	---	---	---	0.00	---	---	---	---	---	0.787
0.55	0.205	1383.45	0.84 oc	---	---	---	0.00	---	---	---	---	---	0.840
0.57	0.215	1383.48	0.89 oc	---	---	---	0.00	---	---	---	---	---	0.893
0.60	0.224	1383.50	0.95 oc	---	---	---	0.00	---	---	---	---	---	0.947
0.62	0.234	1383.53	1.00 oc	---	---	---	0.00	---	---	---	---	---	0.999
0.65	0.244	1383.55	1.05 oc	---	---	---	0.00	---	---	---	---	---	1.050
0.67	0.254	1383.58	1.10 oc	---	---	---	0.00	---	---	---	---	---	1.098
0.70	0.263	1383.60	1.15 oc	---	---	---	0.00	---	---	---	---	---	1.148
0.72	0.273	1383.63	1.19 oc	---	---	---	0.00	---	---	---	---	---	1.195
0.75	0.283	1383.65	1.24 oc	---	---	---	0.00	---	---	---	---	---	1.240
0.78	0.293	1383.68	1.28 oc	---	---	---	0.00	---	---	---	---	---	1.283
0.80	0.303	1383.70	1.32 oc	---	---	---	0.00	---	---	---	---	---	1.324

Continues on next page...

Northeast Detention

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.82	0.313	1383.73	1.36 oc	---	---	---	0.00	---	---	---	---	---	1.362
0.85	0.323	1383.75	1.40 oc	---	---	---	0.00	---	---	---	---	---	1.397
0.87	0.333	1383.78	1.43 oc	---	---	---	0.00	---	---	---	---	---	1.429
0.90	0.344	1383.80	1.46 oc	---	---	---	0.00	---	---	---	---	---	1.456
0.92	0.354	1383.83	1.48 oc	---	---	---	0.00	---	---	---	---	---	1.478
0.95	0.364	1383.85	1.49 oc	---	---	---	0.00	---	---	---	---	---	1.493
0.97	0.374	1383.88	1.50 oc	---	---	---	0.00	---	---	---	---	---	1.497
1.00	0.384	1383.90	1.47 oc	---	---	---	0.00	---	---	---	---	---	1.467
1.03	0.394	1383.93	1.59 oc	---	---	---	0.00	---	---	---	---	---	1.593
1.05	0.405	1383.95	1.71 oc	---	---	---	0.00	---	---	---	---	---	1.709
1.08	0.415	1383.98	1.82 oc	---	---	---	0.00	---	---	---	---	---	1.818
1.10	0.426	1384.00	1.92 oc	---	---	---	0.00	---	---	---	---	---	1.921
1.13	0.436	1384.03	2.02 oc	---	---	---	0.00	---	---	---	---	---	2.019
1.15	0.446	1384.05	2.11 oc	---	---	---	0.00	---	---	---	---	---	2.112
1.18	0.457	1384.08	2.20 oc	---	---	---	0.00	---	---	---	---	---	2.201
1.20	0.467	1384.10	2.29 oc	---	---	---	0.00	---	---	---	---	---	2.287
1.23	0.478	1384.13	2.37 oc	---	---	---	0.00	---	---	---	---	---	2.369
1.25	0.488	1384.15	2.45 oc	---	---	---	0.00	---	---	---	---	---	2.448
1.28	0.499	1384.18	2.53 oc	---	---	---	0.00	---	---	---	---	---	2.526
1.30	0.510	1384.20	2.60 oc	---	---	---	0.00	---	---	---	---	---	2.601
1.33	0.520	1384.23	2.67 oc	---	---	---	0.00	---	---	---	---	---	2.673
1.35	0.531	1384.25	2.74 oc	---	---	---	0.00	---	---	---	---	---	2.744
1.38	0.542	1384.28	2.81 oc	---	---	---	0.00	---	---	---	---	---	2.814
1.40	0.553	1384.30	2.88 oc	---	---	---	0.00	---	---	---	---	---	2.881
1.43	0.563	1384.33	2.95 oc	---	---	---	0.00	---	---	---	---	---	2.947
1.45	0.574	1384.35	3.01 oc	---	---	---	0.00	---	---	---	---	---	3.012
1.48	0.585	1384.38	3.07 oc	---	---	---	0.00	---	---	---	---	---	3.075
1.50	0.596	1384.40	3.14 oc	---	---	---	0.00	---	---	---	---	---	3.136
1.53	0.607	1384.43	3.20 oc	---	---	---	0.00	---	---	---	---	---	3.197
1.55	0.618	1384.45	3.26 oc	---	---	---	0.00	---	---	---	---	---	3.256
1.58	0.629	1384.48	3.32 oc	---	---	---	0.00	---	---	---	---	---	3.315
1.60	0.640	1384.50	3.37 oc	---	---	---	0.00	---	---	---	---	---	3.373
1.63	0.651	1384.53	3.43 oc	---	---	---	0.16	---	---	---	---	---	3.585
1.65	0.662	1384.55	3.48 oc	---	---	---	0.44	---	---	---	---	---	3.923
1.68	0.673	1384.58	3.54 oc	---	---	---	0.80	---	---	---	---	---	4.344
1.70	0.684	1384.60	3.59 oc	---	---	---	1.24	---	---	---	---	---	4.831
1.73	0.696	1384.63	3.65 oc	---	---	---	1.73	---	---	---	---	---	5.375
1.75	0.707	1384.65	3.70 oc	---	---	---	2.27	---	---	---	---	---	5.965
1.78	0.718	1384.68	3.75 oc	---	---	---	2.86	---	---	---	---	---	6.606
1.80	0.730	1384.70	3.80 oc	---	---	---	3.49	---	---	---	---	---	7.291
1.83	0.741	1384.73	3.85 oc	---	---	---	4.17	---	---	---	---	---	8.016
1.85	0.752	1384.75	3.90 oc	---	---	---	4.88	---	---	---	---	---	8.779
1.88	0.764	1384.78	3.95 oc	---	---	---	5.63	---	---	---	---	---	9.578
1.90	0.775	1384.80	4.00 oc	---	---	---	6.41	---	---	---	---	---	10.41
1.93	0.787	1384.83	4.05 oc	---	---	---	7.23	---	---	---	---	---	11.28
1.95	0.798	1384.85	4.09 oc	---	---	---	8.08	---	---	---	---	---	12.18
1.98	0.810	1384.88	4.14 oc	---	---	---	8.96	---	---	---	---	---	13.10
2.00	0.821	1384.90	4.19 oc	---	---	---	9.87	---	---	---	---	---	14.05
2.03	0.833	1384.93	4.23 oc	---	---	---	10.81	---	---	---	---	---	15.04
2.05	0.845	1384.95	4.28 oc	---	---	---	11.78	---	---	---	---	---	16.05
2.08	0.857	1384.98	4.32 oc	---	---	---	12.77	---	---	---	---	---	17.09
2.10	0.868	1385.00	4.37 oc	---	---	---	13.79	---	---	---	---	---	18.16
2.13	0.880	1385.03	4.41 oc	---	---	---	14.84	---	---	---	---	---	19.25
2.15	0.892	1385.05	4.45 oc	---	---	---	15.92	---	---	---	---	---	20.37
2.18	0.904	1385.08	4.50 oc	---	---	---	17.01	---	---	---	---	---	21.51
2.20	0.916	1385.10	4.54 oc	---	---	---	18.14	---	---	---	---	---	22.67
2.23	0.927	1385.13	4.58 oc	---	---	---	19.28	---	---	---	---	---	23.86
2.25	0.939	1385.15	4.62 oc	---	---	---	20.44	---	---	---	---	---	25.06
2.28	0.951	1385.18	4.66 oc	---	---	---	21.63	---	---	---	---	---	26.29
2.30	0.964	1385.20	4.70 oc	---	---	---	22.84	---	---	---	---	---	27.55
2.33	0.976	1385.23	4.74 oc	---	---	---	24.08	---	---	---	---	---	28.83
2.35	0.988	1385.25	4.79 oc	---	---	---	25.34	---	---	---	---	---	30.12
2.38	1.000	1385.28	4.83 oc	---	---	---	26.62	---	---	---	---	---	31.44
2.40	1.012	1385.30	4.87 oc	---	---	---	27.92	---	---	---	---	---	32.78
2.43	1.024	1385.33	4.90 oc	---	---	---	29.23	---	---	---	---	---	34.14
2.45	1.036	1385.35	4.94 oc	---	---	---	30.57	---	---	---	---	---	35.52
2.48	1.049	1385.38	4.98 oc	---	---	---	31.93	---	---	---	---	---	36.92
2.50	1.061	1385.40	5.02 oc	---	---	---	33.30	---	---	---	---	---	38.32

...End

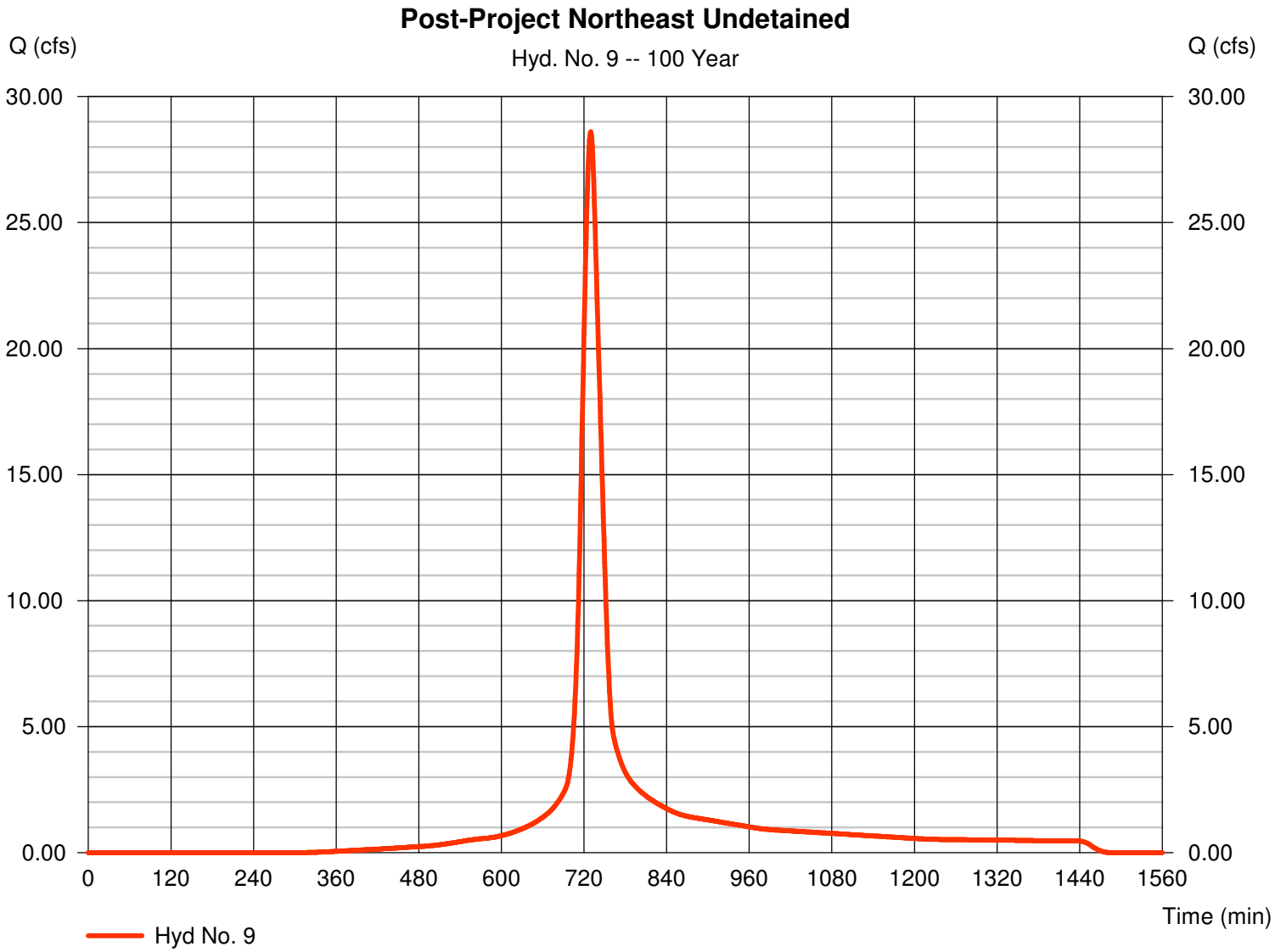
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 9

Post-Project Northeast Undetained

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.60 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	2.540 acft
Drainage area	=	5.600 ac	Curve number	=	80.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	28.50 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



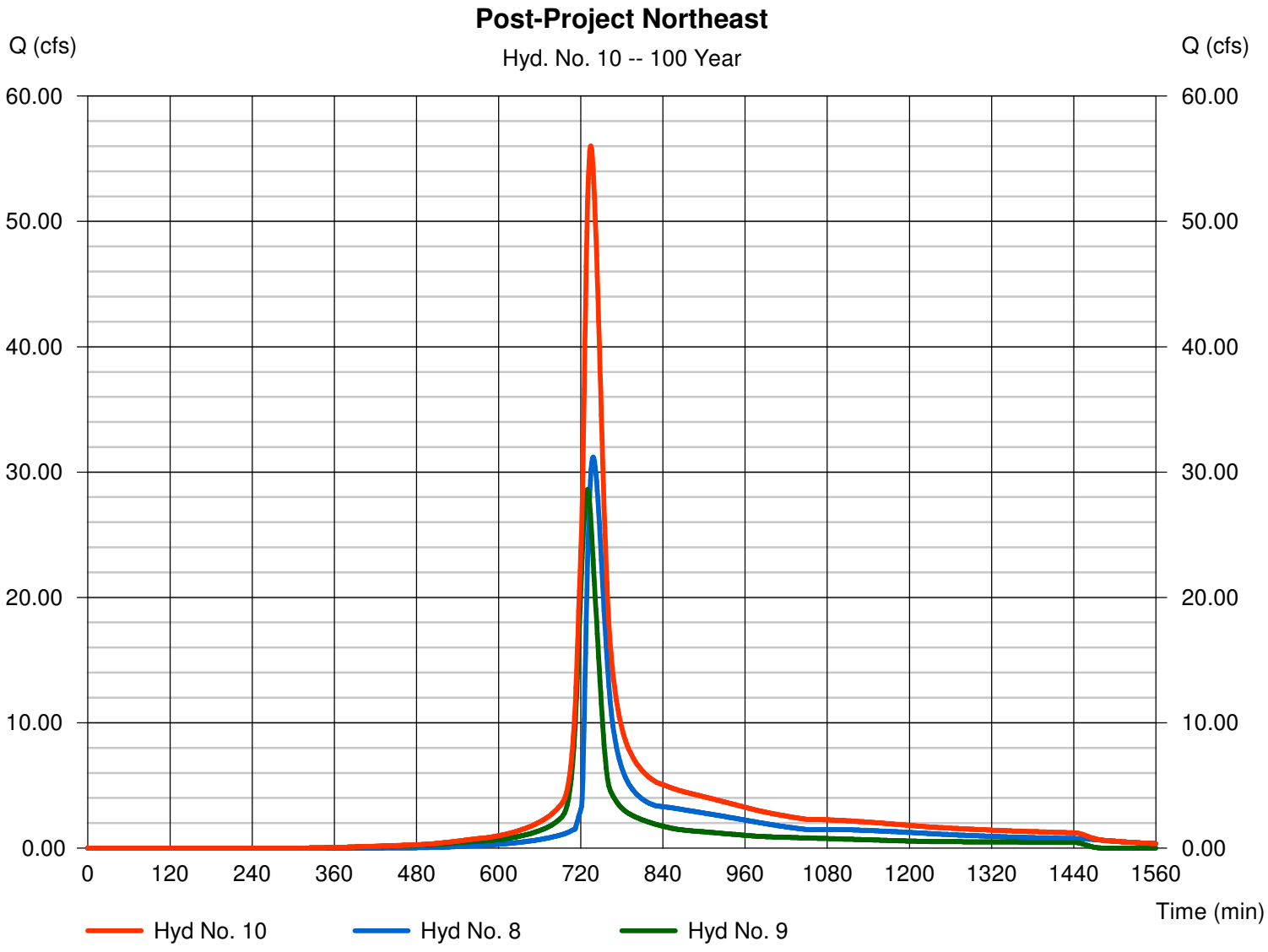
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Apr 29, 2009

Hyd. No. 10

Post-Project Northeast

Hydrograph type	= Combine	Peak discharge	= 56.01 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 1 min	Hyd. volume	= 5.973 acft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 5.600 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	76.3137	14.3000	0.8844	--------
3	0.0000	0.0000	0.0000	--------
5	52.6224	11.2000	0.7497	--------
10	55.1841	11.1000	0.7229	--------
25	60.7012	11.1000	0.7068	--------
50	66.9222	11.3000	0.7004	--------
100	62.2794	10.1000	0.6624	--------

File name: SedgwickCoKS.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.80	1.69
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.27	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.67	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	3.14	2.98
50	9.47	7.86	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.55	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.66	4.37	4.13	3.92	3.73

Tc = time in minutes. Values may exceed 60.

Precip. file name: SedgwickCoKS.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.48	0.00	4.55	5.25	6.30	7.10	7.80
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Custom	0.00	2.50	0.00	0.00	0.00	4.60	5.20	5.90

Figure 2.6

Time of Concentration Calculations

Time of Concentration Calculations by the FAA method

Reusser Addition

Project Number 07698

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

Area Name	Land Use	Soil Group	Maximum Elevation	Minimum Elevation	Flow Length (L)	Rational Runoff Coefficient, C				Time of Concentration (min), T_c				Time of Concentration (hr), T_c			
						2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year
Pre-project																	
Northeast	*Agricultural - Pasture - Slopes 1-4%*	*D*	*1406.0*	*1381.0*	*1300*	0.32	0.37	0.47	0.67	40.7	38.1	32.9	22.4	0.6785	0.6350	0.5480	0.3740
Northwest	*Agricultural - Pasture - Slopes 1-4%*	*D*	*1406.0*	*1381.0*	*1400*	0.32	0.37	0.47	0.67	43.3	40.5	35.0	23.9	0.7217	0.6754	0.5829	0.3979
South	*Agricultural - Pasture - Slopes 1-4%*	*D*	*1406.0*	*1399.0*	*400*	0.32	0.37	0.47	0.67	23.3	21.8	18.8	15.0	0.3884	0.3635	0.3137	0.2500
*Post-project**																	
Northeast	*Residential - 1 Acre*	*D*	*1405.0*	*1381.0*	*1200*	0.41	0.45	0.54	0.71	34.1	32.2	27.7	19.3	0.5692	0.5362	0.4619	0.3217
Northeast Undetained	*Residential - 1 Acre*	*D*	*1405.0*	*1391.0*	*1000*	0.41	0.45	0.54	0.71	35.1	33.1	28.5	19.8	0.5851	0.5512	0.4749	0.3307
Northwest	*Residential - 1 Acre*	*D*	*1405.0*	*1381.0*	*1400*	0.41	0.45	0.54	0.71	38.8	36.6	31.5	21.9	0.6472	0.6096	0.5252	0.3658
South	*Residential - 1 Acre*	*D*	*1405.0*	*1399.0*	*400*	0.41	0.45	0.54	0.71	21.7	20.4	17.6	15.0	0.3617	0.3407	0.2935	0.2500

*The post-project site will be approximately 10% impervious, therefore a weighted coefficient and curve number was utilized

Project Name: Reusser Property
Project Number: 07698
Basin: Pre-project

Total Area = 39.7 Acres
Total Area = 0.0620 sq. mi.
Composite Curve Number = 80.00

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	39.7 80
Meadow - good condition	0	30	58	71	78
Wood or Forest land - thin stand, poor cover, no mulch	0	45	66	77	83
Wood or Forest land - good cover	0	25	55	70	77
Open spaces - good condition - grass cover on 75% or more of area	0	39	61	74	80
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residential - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84
Paved Parking lots, roofs, driveways, etc.	0	1400	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - dirt	0	72	82	87	89
Lake/Pond	100	100	100	100	100

Project Name: Reusser Property
Project Number: 07698
Basin: Post-project

Total Area = 39.7 Acres
Total Area = 0.0620 sq. mi.
Composite Curve Number = 80.40

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 35.73
Open spaces - fair condition - grass cover on 50-75% of area	0	49	69	79	84
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential - 1/8 acre or less	65	77	85	90	92
Residential - 1/4 acre	38	61	75	83	87
Residential - 1/3 acre	30	57	72	81	86
Residential - 1/2 acre	25	54	70	80	85
Residential - 1 acre	20	51	68	79	84 3.97
Paved Parking lots, roofs, driveways, etc.	1381	98	98	98	98
Streets and roads - paved with curbs and storm sewers	-	98	98	98	98
Streets and roads - dirt	1381	72	82	87	89
Lake/Pond	100	100	100	100	100

Figure 2.7

Hydraflow Express – 127th Street Ditch

Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Wednesday, Apr 29 2009

127th Street Ditch

User-defined

Invert Elev (ft)	= 1381.21
Slope (%)	= 1.38
N-Value	= Composite

Calculations

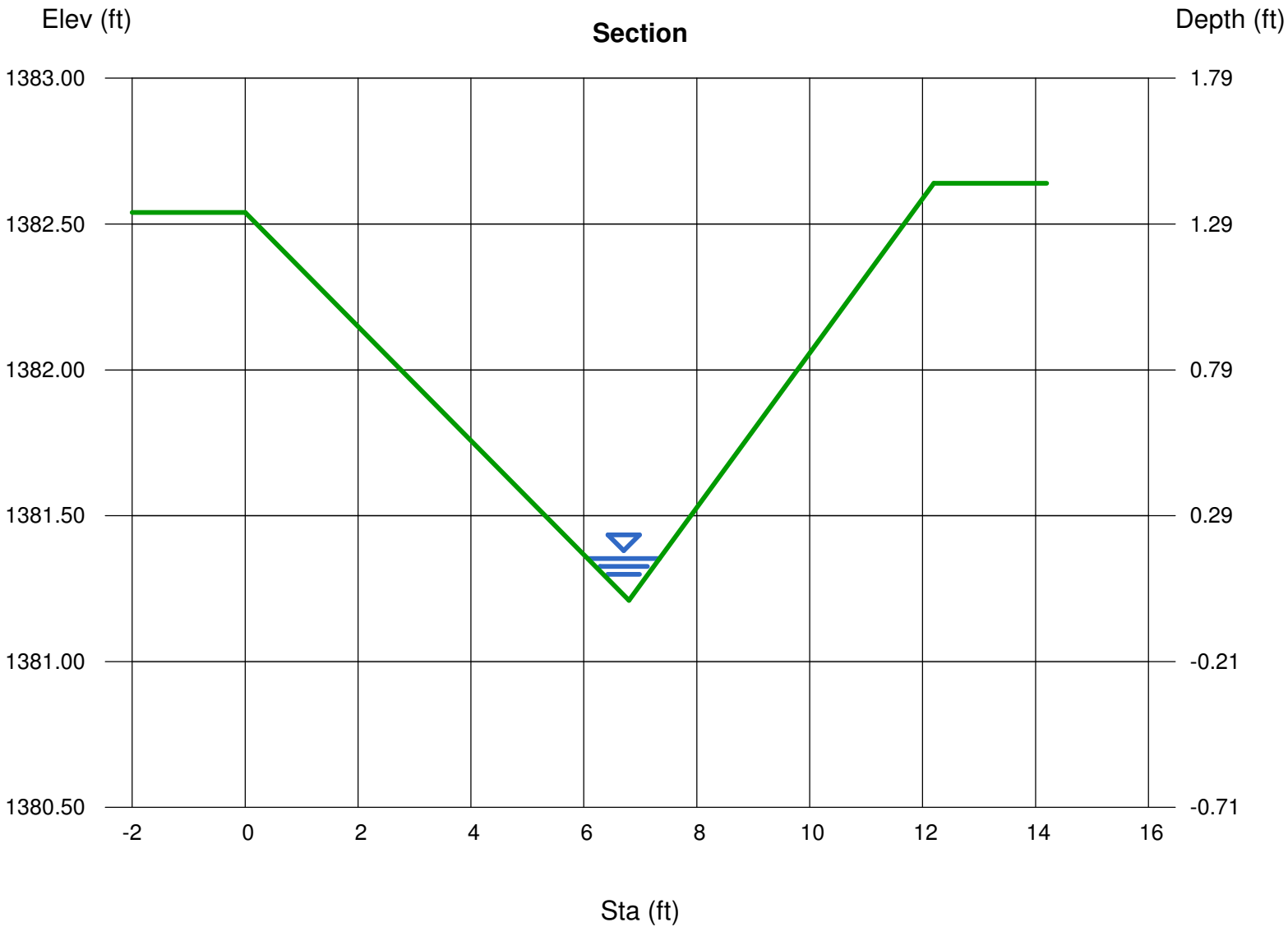
Compute by:	Q vs Depth
No. Increments	= 10

(Sta, El, n)-(Sta, El, n)...

(0.00, 1382.54)-(6.80, 1381.21, 0.030)-(12.20, 1382.64, 0.030)

Highlighted

Depth (ft)	= 0.14
Q (cfs)	= 0.090
Area (sqft)	= 0.09
Velocity (ft/s)	= 0.99
Wetted Perim (ft)	= 1.30
Crit Depth, Yc (ft)	= 0.01
Top Width (ft)	= 1.27
EGL (ft)	= 0.16



Depth	Q	Area	Veloc	Wp	Yc
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)
0.14	0.090	0.091	0.99	1.30	0.01
0.29	0.569	0.364	1.57	2.61	0.13
0.43	1.679	0.818	2.05	3.91	0.26
0.57	3.617	1.454	2.49	5.21	0.39
0.72	6.560	2.273	2.89	6.52	0.53
0.86	10.66	3.272	3.26	7.82	0.68
1.00	16.09	4.453	3.61	9.12	0.82
1.14	22.97	5.817	3.95	10.43	0.96
1.29	31.45	7.363	4.27	11.73	1.11
1.43	42.60	9.063	4.70	12.52	1.26

TopWidth	Energy
(ft)	(ft)
1.27	0.16
2.54	0.32
3.81	0.49
5.08	0.67
6.36	0.84
7.63	1.02
8.90	1.20
10.17	1.39
11.44	1.57
12.20	1.77

Tab 3. Post-Development Hydrologic Analysis

A. Proposed Conditions Hydrologic and Hydraulic Analysis

The post-project drainage boundaries are shown on the Drainage and Utility plan Figure 3.1 The SCS method in Hydraflow Hydrographs 2007 was used to determine the post-development flow rates. These flows are shown below; calculations are in Figure 2.5.

Post-Development Flow rates

Basin	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Northeast	9.8	15.5	21.8	56.0
Northwest	25.5	40.5	50.7	88.9
South	14.1	21.8	27.0	46.3

B. Proposed Time of Concentration

The FAA method was used to calculate post-project times of concentration. The Northeast basin time of concentration increases from pre to post-project because the proposed grading extends the flow path for this basin. The times of concentration and rational coefficients for post-development conditions are shown in the following table. Calculations are in Figure 2.6.

Proposed Time of Concentration and Rational Coefficient

Basin	T_c	Rational Coefficient
	minutes	
Northeast	27.7	0.48
Northeast Undetained	28.3	0.48
Northwest	31.5	0.48
South	17.6	0.48

C. Assumed Post-Developed Curve Numbers

A curve number of 80.4 was used to represent post-project conditions.

D. Proposed Contours for Detention

Contours are shown on the drainage and utility plan.

E. Preliminary SWS Sizing Calculations

Because of the rural nature of this site, storm sewer is not proposed onsite. Drainage will be conveyed via overland flow and ditches. An 30" culvert is proposed under the entrance drive to maintain current flow patterns in the ditch west of 127th Street.

F. Stage-Storage-Discharge

The stage storage discharge curves for each pond are included in the Hydraflow Hydrographs output.

G. Analysis of upstream/downstream impact

Flow rates for all design storms were decreased from pre-project to post-project development. The existing ditch west of 127th Street North was modeled using Hydraflow Express. The ditch has a capacity of 42.6 cfs. This ditch will convey a 25-year storm without overtopping.

H. Existing and Proposed Structural Elevations

Proposed drainage structures will be set according to the elevations shown on the drainage and utility plan.

I. Pond Design Elevations

The Northwest pond will have a bottom elevation of 1382.0 and a 100-year elevation of 1383.9. The Northeast pond will have a bottom elevation of 1382.9 and 100-year of 1385.3.

J. Structure Details

The Northwest pond will detain a volume of 0.8 acre-feet. The outlet structure will be an earthen and rip-rap weir with an opening 10' wide at 1382.0. The Northeast pond will have a 12" storm sewer pipe at an elevation of 1382.9 and a rip-rap weir with an opening 15' wide at 1384.5.

K. Limits of Clearing and Grading

Portions of the site will be cleared and graded in order to accommodate building and road construction; a majority of the site will be left in its natural state or allowed to return to its existing condition.

L. Location of Impervious Areas

Gravel roads will be located as shown on the Drainage and Utility Plan, Figure 3.1. Houses with driveways will be constructed on each lot.

M. Location of Utilities

Proposed utilities are shown on the Drainage and Utility Plan, Figure 3.1. Septic systems are proposed for each lot.

N. Location of Conveyance Systems

Natural drainage patterns will be closely maintained; proposed grading and ditches will direct runoff from the site as shown on the Drainage and Utility Plan, Figure 3.1. A 30" culvert is proposed under the entrance drive. Detention will be provided in the northeast and northwest corners of the site.

O. Location of Channel Modifications

Channel modifications are not applicable to the Reusser Addition.

P. Selection and Location of Stormwater Controls

Dry detention ponds will be constructed in the northeast and northwest corners of the site. A storm water sewer pipe will convey the ditch flow under Reusser drive. Channels will be constructed in drainage easements to convey runoff from the north west basin to the west and north.

Q. Emergency Overflow

Each of the detention ponds will have rip-rap weirs for the emergency outflow and outflow of large events.

R. Freeboard

The detention ponds will be constructed with 1' of freeboard. The top of the Northwest Detention will be 1384.9 and the Northeast Detention will be 1386.3.

S. 100-Year High Water Line

The Northwest Detention pond will have a 100-Year high water line of 1383.9 and the Northeast Detention pond will have a 100-year high water line of 1385.3.

T. Lowest Openings

Lowest openings for the house on Lot 1 will be 1388.3 and the lowest opening on Lot 3 will be 1386.9.

U. Stormwater Management Facilities

Drainage ditches are in easements.

V. Maintenance Responsibility

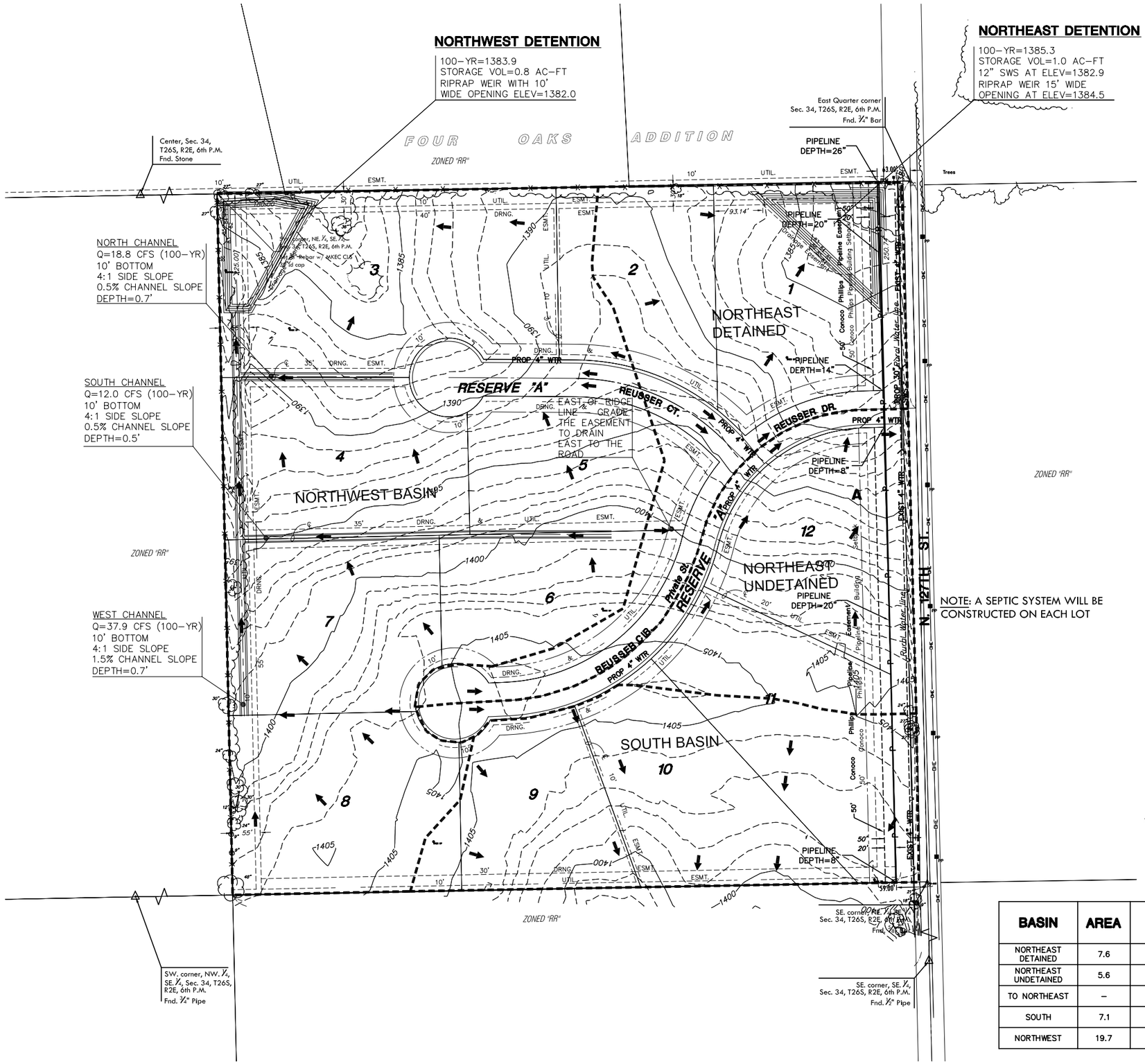
The maintenance of the reserves will be the lot owners association.

W. Offsite-Drainage Easements

An off-site easement will be obtained for the runoff from the northwest corner of Lot 3 that will drain to an existing pond in the Four Oaks Addition.

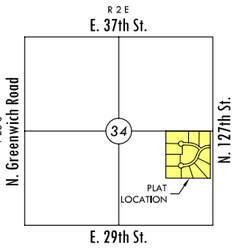
Figure 3.1

Drainage and Utility Plan



LEGEND

- 6IN - CONIFEROUS TREE
- 3IN - DECIDUOUS TREE
- SN - SIGN
- PP-H - POWER POLE
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SECTION CORNER
- BM - BENCHMARK
- - EASEMENT
- - BUILDING SETBACK
- - FENCE
- - STORM SEWER PIPE
- - WATER LINE
- - SANITARY SEWER LINE
- - GAS LINE
- - GAS PIPELINE
- - TELEPHONE LINE
- - UNDERGROUND ELEC.
- - OVERHEAD ELECTRIC
- - FIBER OPTIC CABLE
- - DRAINAGE BASIN
- - SWS DRAINAGE AREA
- - FLOW ARROW
- A17 - AREA FOR SWS SIZING



VICINITY MAP

BENCHMARKS

Date of Survey: April, 2008

- △ = Section corner Monument Found
- ○ = Found ⅝" rebar w/ MKEC CLS 39 id. cap unless otherwise annotated
- ● = Set ⅝" Rebar w/ MKEC CLS 39 id. cap
- (M) = Measured
- (CM) = Calculated from measured

BASIN	AREA	TC	CN	DESIGN STORM					
				2	5	10	25	50	100
NORTHEAST DETAINED	7.6	27.7	80.4	11.7	18.2	22.5	29.2	34.3	38.8
NORTHEAST UNDETAINED	5.6	28.3	80.4	8.6	13.4	16.6	21.5	25.3	28.6
TO NORTHEAST	–	–	–	9.8	15.5	21.8	36.2	47.0	56.0
SOUTH	7.1	17.6	80.4	14.1	21.8	27.0	34.9	41.0	46.3
NORTHWEST	19.7	31.5	80.4	25.5	40.5	50.7	66.3	78.4	88.9

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

REUSSER ADDITION

REUSSER'S ADDITION
WICHITA, KANSAS

DRAINAGE AND UTILITY PLAN

DATE
SEPTEMBER 2008

REVISED
SEPTEMBER 18 2008
OCTOBER 2008
APRIL 2009

DESIGN BY
TMH

DRAWN BY
CMJ

CHECKED BY
GJA

SHEET NUMBER
1

J: \Civil \07698_ReusserBros \dwg \Drng \07698_dup.dwg

Figure 3.2

Hydraflow Express – Reusser Drive Culvert

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Wednesday, Apr 29 2009

Reusser Drive Culvert

Invert Elev Dn (ft)	=	1389.00
Pipe Length (ft)	=	150.00
Slope (%)	=	0.40
Invert Elev Up (ft)	=	1389.60
Rise (in)	=	30.0
Shape	=	Cir
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.013
Inlet Edge	=	Projecting
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.5

Embankment

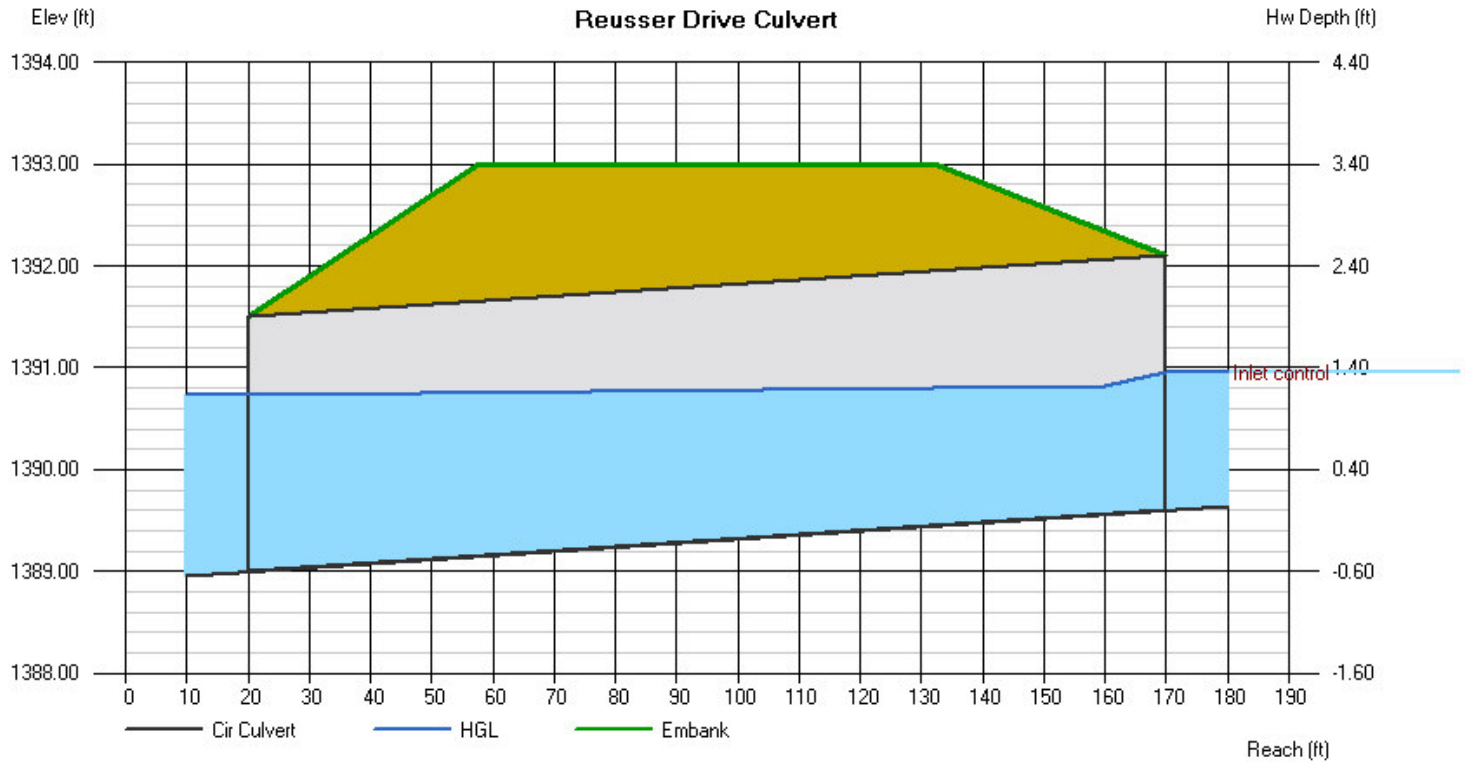
Top Elevation (ft)	=	1393.00
Top Width (ft)	=	75.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	8.60
Qmax (cfs)	=	28.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	8.60
Qpipe (cfs)	=	8.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.36
Veloc Up (ft/s)	=	3.62
HGL Dn (ft)	=	1390.74
HGL Up (ft)	=	1390.82
Hw Elev (ft)	=	1390.96
Hw/D (ft)	=	0.54
Flow Regime	=	Inlet Control



Q			Veloc		Depth		HGL	
Total	Pipe	Over	Dn	Up	Dn	Up	Dn	Up
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)
8.60	8.60	0.00	2.36	3.62	20.89	14.61	1390.74	1390.82
9.60	9.60	0.00	2.59	3.89	21.23	15.06	1390.77	1390.86
10.60	10.60	0.00	2.81	4.11	21.56	15.59	1390.80	1390.90
11.60	11.60	0.00	3.02	4.32	21.90	16.11	1390.83	1390.94
12.60	12.60	0.00	3.24	4.51	22.19	16.63	1390.85	1390.99
13.60	13.60	0.00	3.44	4.69	22.49	17.16	1390.88	1391.03
14.60	14.60	0.00	3.65	4.85	22.76	17.67	1390.90	1391.07
15.60	15.60	0.00	3.85	4.99	23.06	18.26	1390.92	1391.12
16.60	16.60	0.00	4.05	5.14	23.32	18.77	1390.94	1391.16
17.60	17.60	0.00	4.26	5.26	23.54	19.35	1390.96	1391.21
18.60	18.60	0.00	4.45	5.37	23.80	19.92	1390.98	1391.26
19.60	19.60	0.00	4.65	5.47	24.06	20.55	1391.01	1391.31
20.60	20.60	0.00	4.84	5.56	24.28	21.17	1391.02	1391.37
21.60	21.60	0.00	5.03	5.64	24.53	21.85	1391.04	1391.42
22.60	22.60	0.00	5.22	5.72	24.75	22.51	1391.06	1391.48
23.60	23.60	0.00	5.41	5.79	24.96	23.21	1391.08	1391.53
24.60	24.60	0.00	5.59	5.86	25.17	23.95	1391.10	1391.60
25.60	25.60	0.00	5.78	5.93	25.38	24.65	1391.12	1391.66
26.60	26.60	0.00	5.96	5.99	25.59	25.43	1391.13	1391.72
27.60	27.60	0.00	6.15	6.06	25.79	26.26	1391.15	1391.79
28.60	28.60	0.00	6.33	6.13	25.99	27.11	1391.17	1391.86

HGL	
Hw	Hw/D
(ft)	
1390.96	0.54
1391.04	0.58
1391.12	0.61
1391.21	0.64
1391.28	0.67
1391.36	0.70
1391.44	0.74
1391.51	0.77
1391.59	0.79
1391.66	0.82
1391.73	0.85
1391.80	0.88
1391.88	0.91
1391.95	0.94
1392.02	0.97
1392.09	0.99
1392.16	1.02
1392.23	1.05
1392.30	1.08
1392.37	1.11
1392.44	1.14

Tab 4. Floodplain Submittal

Not applicable to Reusser Addition.

Tab 5. Permits

A. US Army Corps of Engineers

Not applicable to Reusser Addition.

B. Kansas Department of Agriculture

Not applicable to Reusser Addition.

C. Federal Emergency Agency (FEMA)

Not applicable to Reusser Addition.

D. Kansas Department of Transportation

Not applicable to Reusser Addition.

E. Sedgwick County Right-of-way Permit

A Sedgwick County Right-of-way permit will be required before the construction of the culvert under Reusser Drive and for ditch work in the 127th Street right-of way.