

DRAINAGE PLAN
EASY CREDIT AUTO
2ND ADDITION
TO
WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY



29 JUNE 2010
Revised 06 JULY 2010



DRAINAGE PLAN EASY CREDIT AUTO 2ND ADDITION

FINAL REPORT

Prepared by Baughman Company, P.A.

29 June 2010

Revised 06 July 2010

By Trevor R. Kurth, P.E., CFM
N. Brent Wooten, P.E., L.S.

REPORT CONTENTS

City of Wichita Checklist

- Project Narrative
 - Existing Conditions
 - Proposed Conditions
 - Offsite Conditions

- Existing Conditions Runoff Calculations
 - Drainage Methods & Standards
 - Site Characteristics
 - Existing Conditions Hydrologic Analysis
 - Downstream Drainage Capacity

- Post-Development Hydrologic Analysis
 - Drainage Methods & Standards
 - Detention Facilities
 - Discharge Points Summary
 - Potential Upstream/Downstream Impacts

- Floodplain Submittal
 - Source of Floodplain Information

- Federal, State, & Local Permitting
 - US Army Corps of Engineers
 - Kansas Dept of Agriculture – DWR Permitting
 - FEMA
 - Kansas Dept of Transportation
 - Sedgwick County ROW

- Exhibits
 - Exhibit 1: Site Location Map
 - Exhibit 2: Aerial Photo Exhibit with Hand Topography
 - Exhibit 3: Plat – Half Scale
 - Exhibit 4: Drainage & Grading Plan – Half Scale
 - Exhibit 5: Floodplain Location (FIRM)

- Appendices: Supporting Calculations
 - Appendix A: USGS Soils Survey
 - Appendix B: HydraFlow Hydrographs

- Plan Sheets
 - Drainage & Grading Plan 1: 50 Scale

PROJECT NARRATIVE

EXISTING CONDITIONS

The site is located on the west side of Broadway Avenue just north of 31st Street South, in Wichita, Sedgwick County, Kansas. The entire site is currently paved with asphalt and includes 2 buildings near the northern portion of the site. There are tree rows along the perimeter on all sides except the Broadway frontage. A sanitary sewer and associated easement divides the site into 4 sections. The site is relatively flat, although it appears the site currently sheet flows to the north, south, and west to the surrounding properties and to the Old Lawrence Road ROW. There is a low lying ponding area in the center of the site near the sanitary sewer manhole that appears to hold water. This area is approximately 8" deep and has a 12" PVC pipe that, based on flow line elevation shots, has inverse drainage. The pavement will overspill to the west and south at approximately 8" of depth.

PROPOSED CONDITIONS

The property is expected to remain as existing conditions with no additional grading or improvements. The site is currently used as a storage/car lot and is expected to continue in that aspect. All grades, internal and perimeter, are expected to remain as existing.

If the site is razed and major improvements are constructed in the future, the drainage paths / grading may need to be altered away from surrounding properties and to the Broadway and Old Lawrence ROWs, respectively. Since the property is currently fully paved, future development is not expected to require detention if redeveloped. However, any guidelines or changes in official City of Wichita policy will effect the future development of the site.

For a half-scale copy of the Plat, see Exhibit 3.

OFFSITE CONDITIONS

There does not appear to be any offsite drainage encroaching this property. This property sheet drains to the surrounding properties to the south, north, and west. The surrounding properties are currently developed. There are also open ditch sections along Old Lawrence Road that drain this area. There are low lying areas on the surrounding properties that appear to hold water in the smaller storm events based on lidar topography.

The USGS Quadrangle Sheet can be seen with the site location plotted as Exhibit 1. The Aerial for this area can be viewed as Exhibit 2.

EXISTING CONDITIONS RUNOFF CALCULATIONS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- Ø STORM SERIES
 - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
 - 2-yr Rainfall Depth = 3.5 in
 - 10-yr Rainfall Depth = 5.3 in
 - 100-yr Rainfall Depth = 7.9 in

- Ø FLOW DATA
 - Areas per LIDAR data, USGS Quadrangle Sheet, Aerial Photos, and Site Visits
 - Rational Method used for Existing Flows ('C' = 0.93)
 - Time of Concentration: Lag Method (minimum 15 min)

SITE CHARACTERISTICS

The current site consists of approximately 6.5 acres and is currently a paved car lot or storage area with associated out-buildings. The site is completely paved and is generally flat. It appears the site sheet flows to the surrounding developed areas to the south and north and to the Old Lawrence ROW to the west.

The existing site characteristics can be seen from the aerial exhibit (Exhibit 2).

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

The site was analyzed for pre-development conditions using the hydrograph method for the 2, 10, and 100 year storm events. A rational 'c' coefficient of 0.93 was used for commercial/industrial areas with paved surfaces. The time of concentration was calculated using Lag Method with a minimum time of concentration of 15 minutes.

The lag method was used to calculate the Time of Concentration on this site. Based on a run length of 750 feet and a slope of approximately 0.67%, the Tc was calculated to be 14.6 min. The Tc, based on a recommendation from the City of Wichita, was also calculated using TR-55. When using TR-55, and applying a shallow concentrated flow pattern with a sheet flow pattern, the Tc is approximately 8.8 minutes. Please note, however, that there is no apparent channel or drainage path available on this site to apply the shallow concentrated flow pattern and its calculations. Also, when using a sheet flow value for the entire site –which is what the site appears to do –the Tc is approximately 11 minutes. Based on the numerous Tc calculations, the minimum Tc of 15 minutes was used, along with the Rational Method for calculating site runoff.

The site will produce approximately 45 cfs in the 100-year storm event.

DOWNSTREAM DRAINAGE CAPACITY

The site sheet flows in all directions to the surrounding properties and to the adjacent street ROW to the west. The City of Wichita has expressed concerns of

water ponding issues to the west along Old Lawrence Street. The surrounding areas are mostly paved and have been previously developed.

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- Ø STORM SERIES
 - 24-hour; 2-yr,10-yr,100-yr Storm Events Modeled
 - Rational Method used for proposed flows
 - 'C' factor = 0.93 (Paved Commercial/Industrial Impervious Area)
 - Time of Concentration; Lag Method, minimum Tc = 15min

- Ø GRADING CONSTRAINTS
 - All lot grades matched and existing structures to remain

DETENTION FACILITIES

There is no detention proposed on this site at this time. The site is expected to remain as it is existing and is currently paved. No razing of the site is expected at this time. Currently, the site is completely paved as is the surrounding properties. If redeveloped or re-paved in the future, we do not anticipate any detention needed on the site – based on the current site being of current impervious cover with no real detention value. If, in the future, the City adopts more stringent re-development criteria(s) or water quality rules, then detention or water quality could be needed at that time.

DISCHARGE POINTS SUMMARY

The site sheet flows to the north and south and onto existing developed properties. It appears these areas then eventually drain to the Broadway and 31st St ROWs. There does not appear to be any defined 'discharge point' on these adjoining properties. The site also sheet flows to the west and into existing Old Lawrence Street ROW.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

Due to the site remaining as existing with no grade changes, there are not any potential impacts expected with the platting of this property.

FLOODPLAIN SUBMITTAL

SOURCE OF FLOODPLAIN INFORMATION

The site lies within a FEMA Zone X - Shaded. The location of the property, on FEMA FIRM Panel 365 of 700 for Sedgwick County, Kansas, effective February 2, 2007, is attached as Exhibit 5.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

There does not appear to be any jurisdictional waters of the US on this site.

KANSAS DEPT OF AGRICULTURE –DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time.

FEMA

There is no mapped floodplain located upon the proposed site. Therefore, no FEMA permitting is expected at this time.

KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting needed on the proposed project.

SEDGWICK COUNTY PERMITTING

There does not appear to be any Sedgwick County permitting needed at this time.

EXHIBIT 1: Site Location Map

EXHIBIT 2: Aerial Photo Exhibit with Hand Topography

EXHIBIT 3: Plat –Half Scale

EXHIBIT 4: Drainage & Grading Plan –Half Scale

EXHIBIT 5: Floodplain Location (FIRM)

SITE LOCATION EXHIBIT
EASY CREDIT AUTO 2ND ADDITION
 WICHITA, SEDGWICK COUNTY, KANSAS

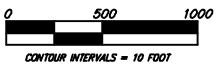
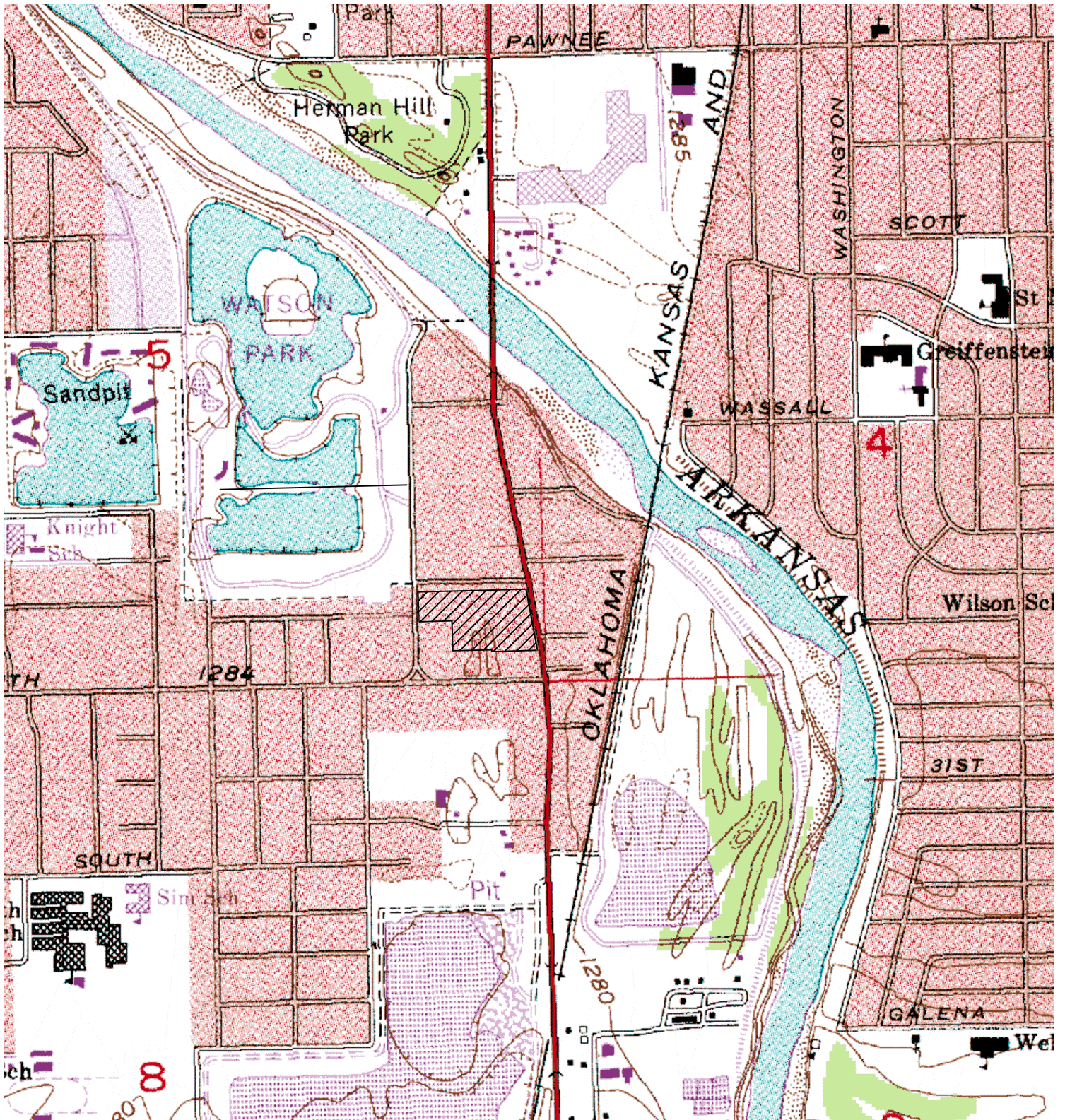


EXHIBIT 1
EASY CREDIT AUTO 2ND ADDITION

29 June 2010


Baughman Company, P.A.
315 E. St. Wichita, KS 67211 P 316.267.7271 F 316.262.0149
ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

AERIAL EXHIBIT
EASY CREDIT AUTO 2ND ADDITION
WICHITA, SEDGWICK COUNTY, KANSAS

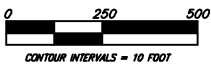


EXHIBIT 3
EASY CREDIT AUTO 2ND ADDITION

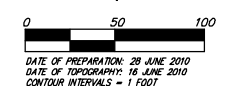
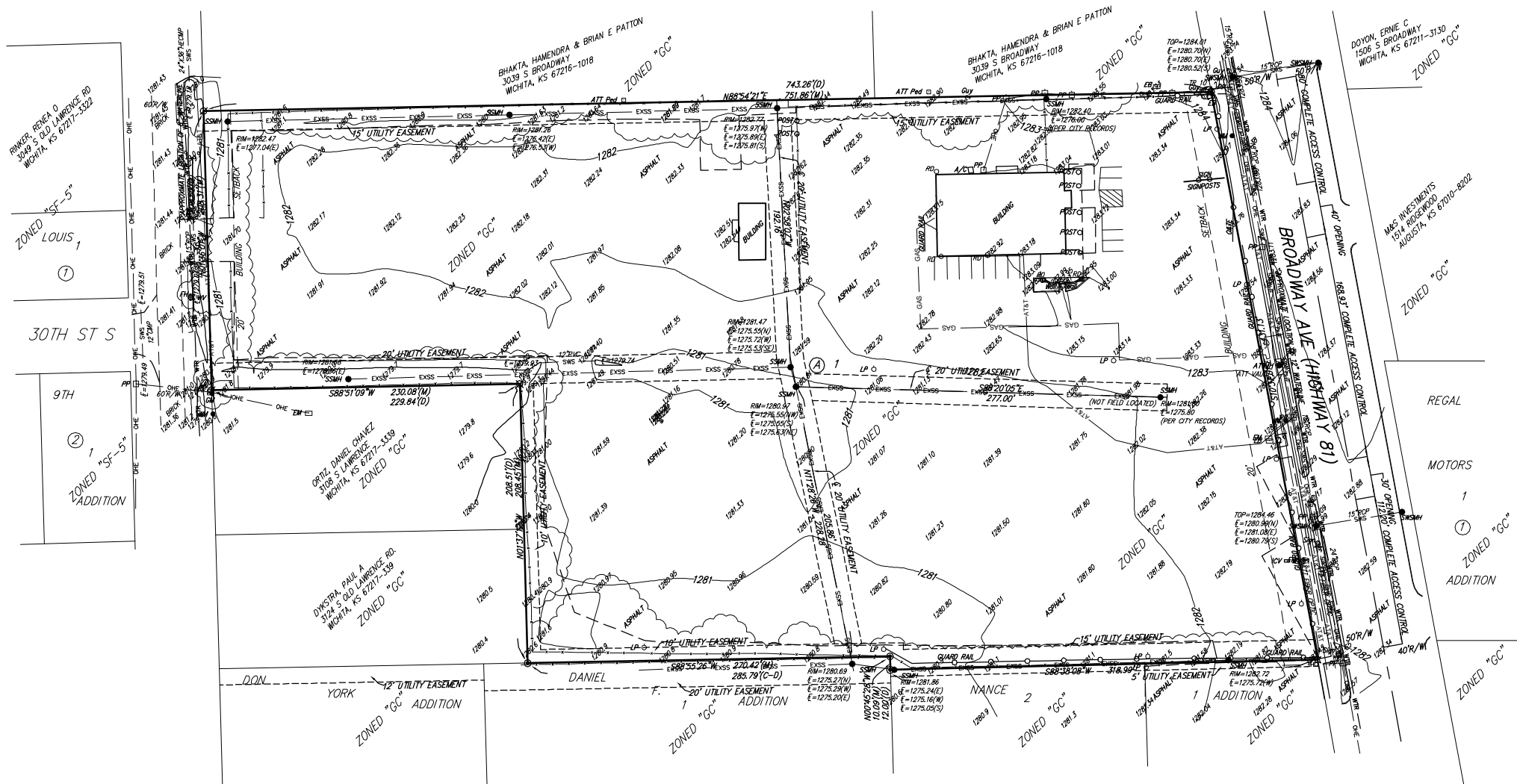
29 June 2010

 **Baughman Company, P.A.**
318 E. St. Wichita, KS 67211 P 316.263.7271 F 316.262.0149
ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

ONE-STEP FINAL PLAT

EASY CREDIT AUTO 2ND ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS

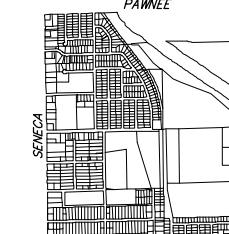


DATE OF PREPARATION: 28 JUNE 2010
 DATE OF TOPOGRAPHY: 16 JUNE 2010
 CONTOUR INTERVALS: 1 FOOT

OWNER:
 EASY CREDIT AUTO SALES, INC.
 333 S. EMPORIA
 WICHITA, KS 67202
 316-393-1360

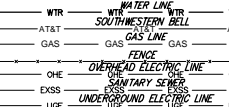
BENCHMARK:
 CROSS CUT ON CONCRETE BASE OF
 LIGHT POLE 152' NORTH AND 3 1/2'
 EAST OF SE CORNER OF THE PLAT.
 ELEVATION = 1284.63 NAVD83

- # = #4 REBAR (FOUND)
- # = #4 REBAR W/ "BAUGHMAN" CAP (SET)
- ⊙ = #4 REBAR (FOUND)
- ⊗ = AXEL (FOUND)
- ⊖ = 5/4" IRON (FOUND)
- II = CROSS (FOUND)
- (M) = MEASURED
- (D) = DESCRIBED
- (P) = PLATTED
- (C) = CALCULATED



VICINITY MAP
 SEC. 5, T28S, R1E

- EB □ = Electric Box
- FH ⊕ = Fire Hydrant
- GM ⊕ = Gas Meter
- Guy ⊕ = Guy Anchor
- ICV ⊕ = Irrigation Control Valve - Valve Box
- LP ⊕ = Light Pole
- PP ⊕ = Power Pole
- Sign ⊕ = Sign
- SSMH ⊕ = Sanitary Sewer Manhole
- ATTMH ⊕ = ATT Manhole
- ATT Ped ⊕ = ATT Pedestal
- SSSMH ⊕ = Stormwater Sewer Manhole
- TR ⊕ = Tree
- WM ⊕ = Water Meter
- WV ⊕ = Water Valve



State of Kansas) SS We, Baughman Company, P.A., Surveyors in
 Sedgwick County) and state do hereby certify that we have surveyed and
 platted "EASY CREDIT AUTO 2ND ADDITION", Wichita, Sedgwick County,
 Kansas and that the accompanying plat is a true and correct exhibit of
 the property surveyed, described as a tract in the Southeast Quarter of
 Section 5, Township 28 South, Range 1 East of the 6th Principal Meridian,
 Sedgwick County, Kansas described as follows: Beginning at a point in the west
 line of New U.S. Highway No. 81, said point being 476.5 feet north and 125.465
 feet west of the southeast corner of said Section 5; thence west parallel with
 the south line of said Section 5, a distance of 350 feet; thence north 208.5
 feet; thence east 314.42 feet to a point in the west line of said Highway No.
 81; thence southeasterly along the west line of said Highway a distance of
 211.51 feet to the point of beginning, together with a tract in the Southeast
 Quarter of Section 5, Township 28 South, Range 1 East of the 6th Principal
 Meridian, Sedgwick County, Kansas described as follows: Beginning 268 feet north
 and 437.885 feet west of the southeast corner of said Southeast Quarter;
 thence west 466.415 feet; thence north 208.5 feet; thence east to a point
 473.465 feet west and 476.5 feet north of the southeast corner of Section 5;
 thence southeasterly 211.51 feet to the place of beginning, EXCEPT the west
 229.835 feet thereof, together with a tract in the Southeast Quarter of Section
 5, Township 28 South, Range 1 East of the 6th Principal Meridian, Sedgwick
 County, Kansas described as follows: Beginning at a point 476.5 feet north and
 404.3 feet west of the southwest corner of Section 4, Township 28 South, Range
 1 East; thence north 208.5 feet; thence east 428.835 feet; thence south
 208.5 feet; thence west to the place of beginning, together with a tract of
 land described as follows: beginning at a point in the west line of the New U.S.
 Highway No. 81, which is 268 feet north and 89.885 feet west of the southeast
 corner of Section 5, Township 28 South, Range 1 East of the 6th Principal
 Meridian, Sedgwick County, Kansas; thence west parallel with the south line
 of said Section 5, a distance of 140 feet; thence northwesterly and parallel with
 the west line of said Highway No. 81, a distance of 211.51 feet; thence east
 140 feet to a point in the west line of said Highway No. 81, said point being
 125.465 feet west and 476.5 feet north of the southeast corner of said Section
 5; thence southeasterly along the west line of said Highway No. 81, a distance
 of 211.51 feet to the point of beginning, together with a tract of land described
 as follows: beginning at a point 268 feet north and 229.885 feet west of the
 southeast corner of Section 5, Township 28 South, Range 1 East of the 6th
 Principal Meridian, Sedgwick County, Kansas; thence west parallel with the
 south line of said Section 5, a distance of 208 feet; thence northwesterly 211.51
 feet to a point 476.5 feet north and 473.465 feet west of the southeast corner
 of said Section 5; thence east parallel to the south line of said Section 5, a
 distance of 208 feet; thence southeasterly 211.51 feet to the point of beginning,
 together with a tract of land described as follows: beginning at a point 256 feet
 north of the southeast corner of Section 5, Township 28 South, Range 1 East of
 the 6th Principal Meridian, Sedgwick County, Kansas; thence west parallel with
 the south line of said Section 5, a distance of 407 feet; thence north parallel
 with the east line of said Section 5, a distance of 12 feet; thence east parallel
 with the south line of said Section 5, a distance of 407 feet; thence south
 along the east line of said Section 5, a distance of 12 feet to the place of
 beginning, EXCEPT that part taken for highway as established in District Court
 Condemnation Case No. 75694.

Existing public easements and dedications
 being vacated by virtue of K.S.A. 12-512(b).
 Baughman Company, P.A.

Michael G. Conrey, Surveyor

Know all men by these presents that we,
 the undersigned, have caused the land in the surveyors certificate to be
 platted into a Lot and a Block, to be known as "EASY CREDIT AUTO 2ND
 ADDITION", Wichita, Sedgwick County, Kansas. The utility easements are
 hereby granted as indicated for the construction and maintenance of all
 public utilities. Access controls shall be as depicted on the face of the
 plat and are hereby granted to the City of Wichita, Kansas. The
 permitted opening locations shall be as determined by the City Engineer
 of the City of Wichita, Kansas.

Easy Credit Auto Sales, Inc., a Kansas corporation

Sam Hudson, President

State of Kansas) SS The foregoing instrument acknowledged before
 Sedgwick County) me, this _____ day of _____, 2010, by Sam Hudson, President of
 Easy Credit Auto Sales, Inc., a Kansas corporation, on behalf of the
 corporation.
 _____ Notary Public

My App't. Exp. _____

This plat of "EASY CREDIT AUTO 2ND
 ADDITION", Wichita, Sedgwick County, Kansas has been submitted to and
 approved by the Wichita-Sedgwick County Metropolitan Area Planning
 Commission, Wichita, Kansas.

Dated this _____ day of _____, 2010.
 Wichita-Sedgwick County Metropolitan Area Planning Commission

_____, Chair
 G. Nelson Van Fleet

_____, Secretary
 John L. Schlegel

This plat approved and all dedications
 shown hereon accepted by the City Council of the City of Wichita,
 Kansas, this _____ day of _____, 2010.

_____, Mayor
 Carl Brewer

_____, City Clerk
 Karen Sublett

Entered on transfer record this _____ day
 of _____, 2010.

_____, County Clerk
 Kelly B. Arnold

State of Kansas) SS This is to certify that this plat has been
 Sedgwick County) filed for record in the office of the Register of Deeds, this _____ day
 of _____, 2010 at _____ o'clock _____ M; and is duly recorded.

_____, Register of Deeds
 Bill Meek

_____, Deputy
 Tonya Buckingham

Reviewed in accordance with K.S.A. 58-2005
 on this _____ day of _____, 2010.

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

NOTE:
 A drainage plan has been developed for this subdivision and is on file with
 the City of Wichita, Kansas. Drainage intent shall remain as depicted or as
 modified with the approval of the City Engineer of the City of Wichita,
 Kansas. No obstructions which impede the flow of this drainage plan shall
 be allowed.

EASY CREDIT AUTO 2ND ADDITION

28 JUNE 2010

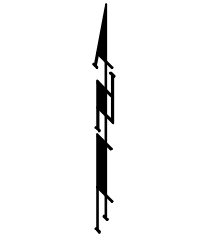
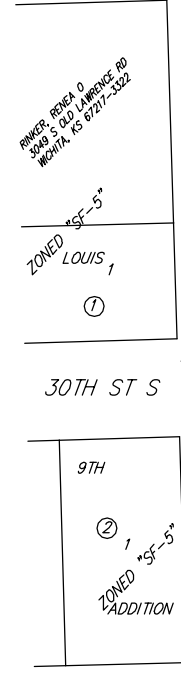
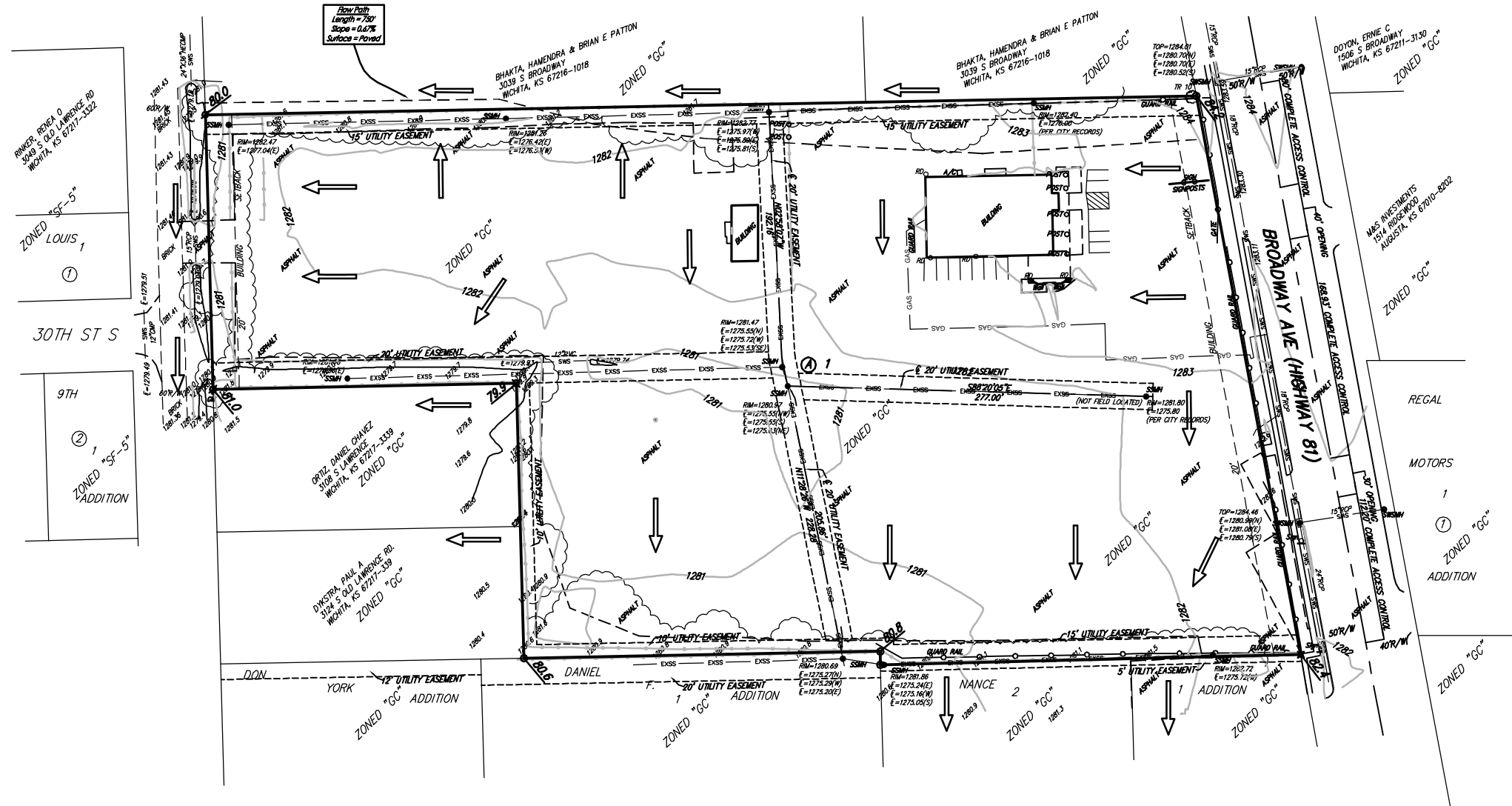
Baughman Company, P.A.
 315 ELLIS ST. WICHITA, KS 67211 P 316-262-7271 F 316-262-0149
 ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE
 E:\PROJECTS\EASYCREDITAUTO2NDADDITION\EASYCREDIT2ND_OSF.DWG:RKR

DRAINAGE & GRADING PLAN

EASY CREDIT AUTO 2ND ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS

Tc Calculations
 Lag Method = 14.6 min
 TR55 Method = 8.8 min
 Due to the COW
 minimum, a Tc of 15 min
 was used.

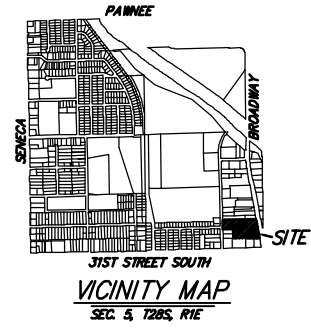


DATE OF PREPARATION: 28 JUNE 2010
 DATE OF TOPOGRAPHY: 16 JUNE 2010
 CONTOUR INTERVALS = 1 FOOT

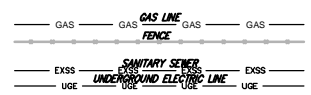
OWNER:
 EASY CREDIT AUTO SALES, INC.
 133 S. EMPORIA
 WICHITA, KS 67202
 316-363-1360

BENCHMARK:
 CROSS CUT ON CONCRETE BASE OF
 LIGHT POLE 152± NORTH AND 3±
 EAST OF SE CORNER OF THE PLAT.
 ELEVATION = 1284.63 NAVD88

- ⊕ = #4 REBAR (FOUND)
- ⊖ = #4 REBAR W/ "BAUGHMAN" CAP (SET)
- ⊙ = #4 REBAR (FOUND)
- ⊗ = AXEL (FOUND)
- ⊚ = 3/4" IRON (FOUND)
- ⊛ = CROSS (FOUND)



- EB □ = Electric Box
- GM ● = Gas Meter
- Sign Δ = Sign
- SSM ● = Sanitary Sewer Manhole
- SSM ● = Stormwater Sewer Manhole
- TR ○ = Tree



Existing = Proposed
Area = 6.5 acres
Tc = 15 min
C' = 0.93
Q ₂ = 24 cfs
Q ₅ = 28 cfs
Q ₁₀ = 32 cfs
Q ₂₅ = 36 cfs
Q ₁₀₀ = 44 cfs

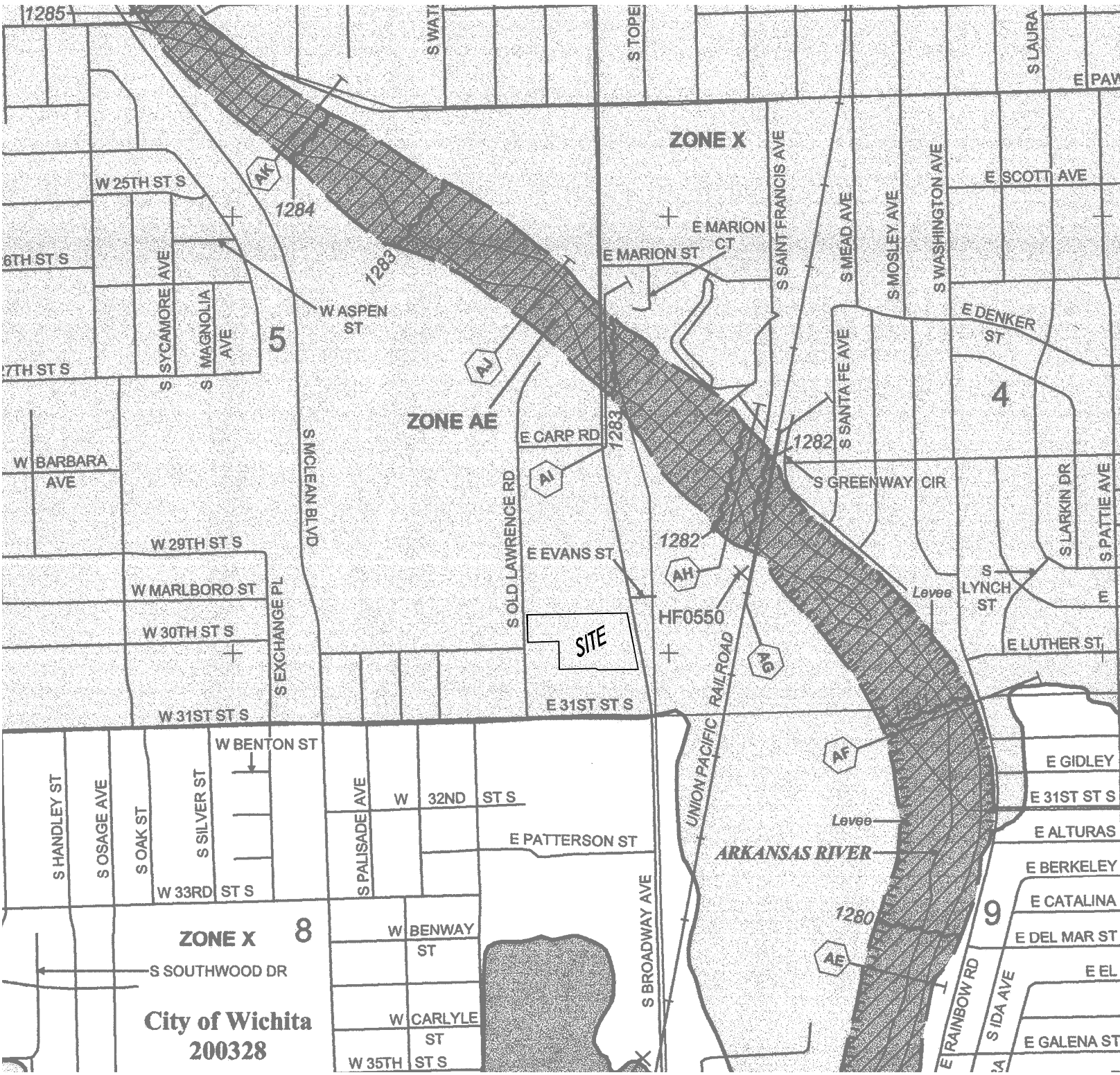
NOTE: The entire site is currently paved (asphalt) with associated buildings and utilities. The existing conditions of this site are expected to remain with this plat and Drainage Plan.

The site lies within Zone X Shaded FEMA SFHA as of this date based on FEMA FIRM Panel 365 or 700 for Sedgwick County, Kansas; effective February 2, 2007.

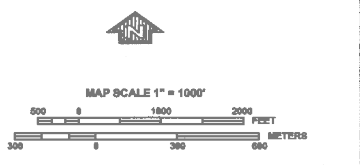
DRAINAGE & GRADING PLAN

EASY CREDIT AUTO

2ND ADDITION



City of Wichita
200328



NFIP PANEL 0365E

FIRM
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY,
KANSAS
AND INCORPORATED AREAS

PANEL 365 OF 700
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0365	E
WICHITA, CITY OF	200328	0365	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
20173C0365E

EFFECTIVE DATE
FEBRUARY 2, 2007

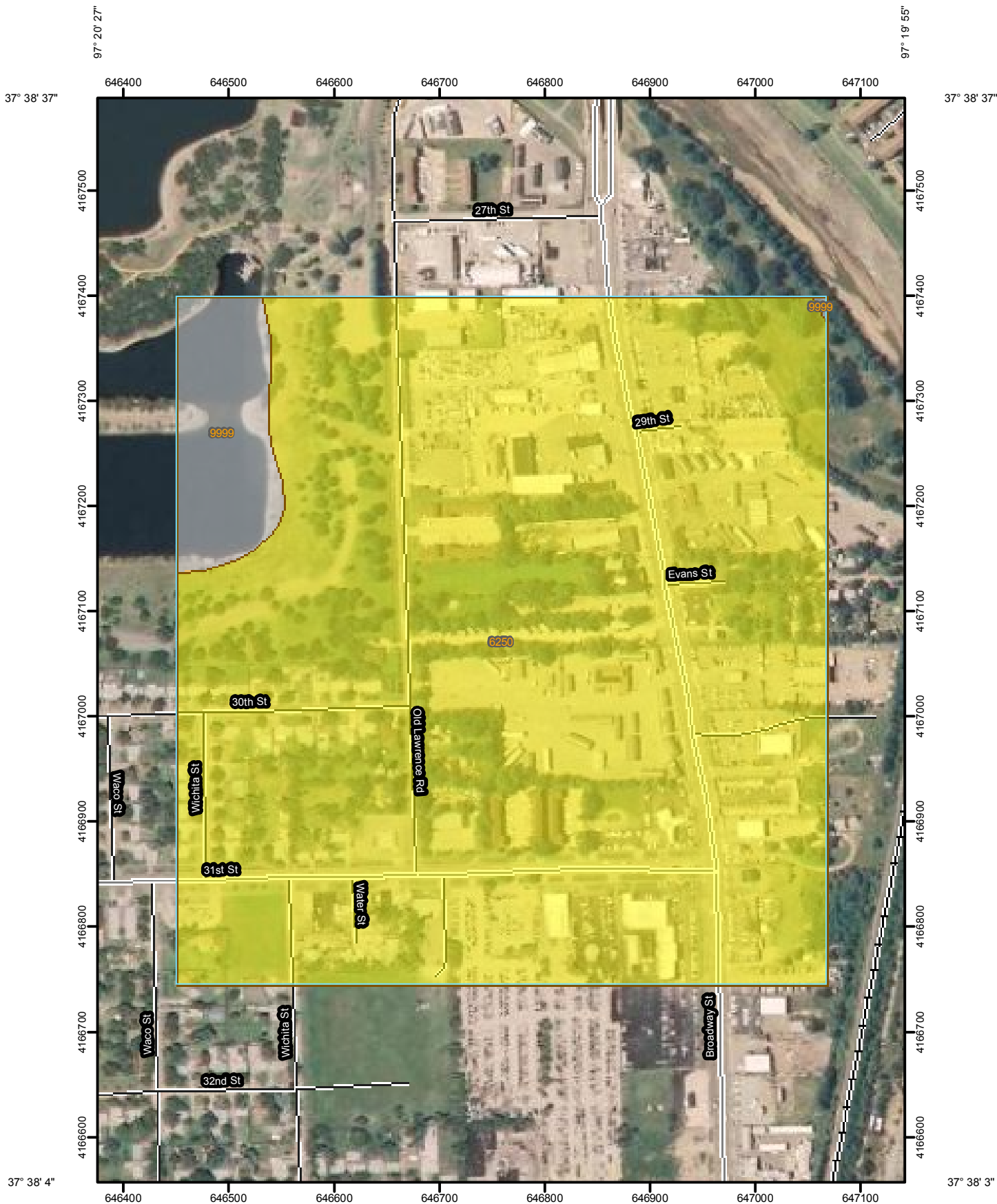
Federal Emergency Management Agency

SUPPORTING CALCULATIONS

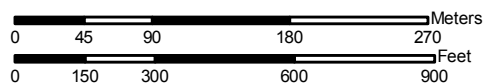
APPENDIX A: USGS Soils Survey

APPENDIX B : HydraFlow Hydrographs
Site Flow and Tc Calculations

USGS Soils Survey




Map Scale: 1:4,920 if printed on A size (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units



Soil Ratings

-  Excessively drained
-  Somewhat excessively drained
-  Well drained
-  Moderately well drained
-  Somewhat poorly drained
-  Poorly drained
-  Very poorly drained
-  Not rated or not available






Political Features

 Cities

Water Features

-  Oceans
-  Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

MAP INFORMATION

Map Scale: 1:4,920 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 14N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sedgwick County, Kansas
Survey Area Data: Version 6, Dec 22, 2009

Date(s) aerial images were photographed: 6/20/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Drainage Class

Drainage Class— Summary by Map Unit — Sedgwick County, Kansas				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6250	Urban land-Canadian complex, 0 to 3 percent slopes	Well drained	94.0	94.3%
9999	Water		5.7	5.7%
Totals for Area of Interest			99.7	100.0%

Description

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

HydraFlow Hydrographs

Site Flow & Tc Calculations

Watershed Model Schematic

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

1 - Site Runoff (SCS)



2 - Site Runoff (Rational)



3 - Site Runoff - 15 min Tc



Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	Site Runoff (SCS)
2	Rational	Site Runoff (Rational)
3	Rational	Site Runoff - 15 min Tc

Hydrograph Return Period Recap

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

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	-----	-----	14.70	-----	22.37	28.95	39.44	46.54	54.46	Site Runoff (SCS)
2	Rational	-----	-----	28.95	-----	34.00	37.75	43.33	47.71	52.07	Site Runoff (Rational)
3	Rational	-----	-----	23.52	-----	28.13	31.49	36.43	40.29	44.13	Site Runoff - 15 min Tc

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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	14.70	2	722	45,383	-----	-----	-----	Site Runoff (SCS)
2	Rational	28.95	1	9	15,634	-----	-----	-----	Site Runoff (Rational)
3	Rational	23.52	1	15	21,164	-----	-----	-----	Site Runoff - 15 min Tc
Site Flow.gpw					Return Period: 2 Year			Tuesday, Jul 6, 2010	

Hydrograph Report

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

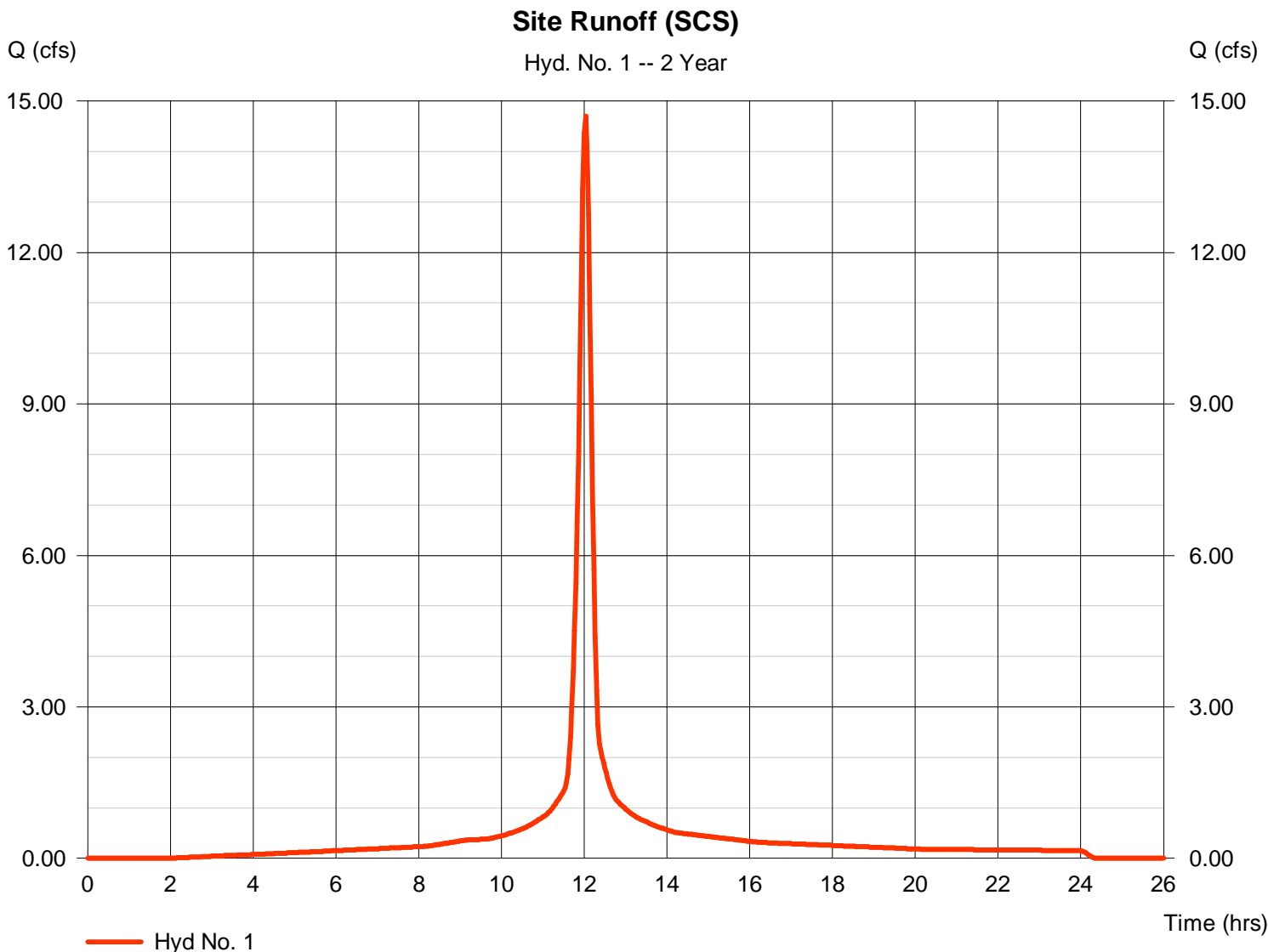
Tuesday, Jul 6, 2010

Hyd. No. 1

Site Runoff (SCS)

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 2 min
 Drainage area = 6.500 ac
 Basin Slope = 0.7 %
 Tc method = LAG
 Total precip. = 2.20 in
 Storm duration = 24 hrs

Peak discharge = 14.70 cfs
 Time to peak = 12.03 hrs
 Hyd. volume = 45,383 cuft
 Curve number = 98
 Hydraulic length = 750 ft
 Time of conc. (Tc) = 14.64 min
 Distribution = Type II
 Shape factor = 484



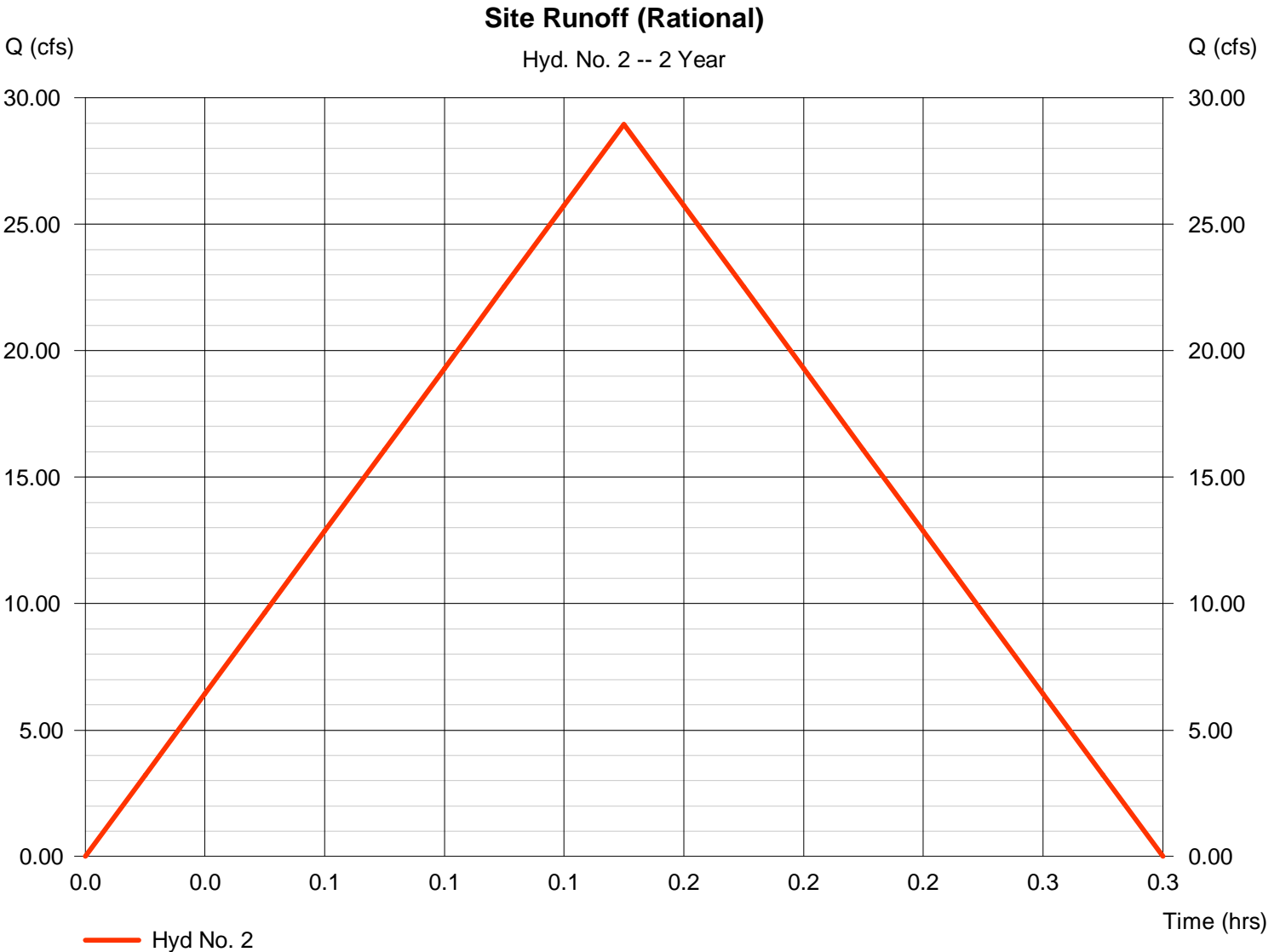
Hydrograph Report

Hyd. No. 2

Site Runoff (Rational)

Hydrograph type = Rational
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 4.789 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 28.95 cfs
Time to peak = 0.15 hrs
Hyd. volume = 15,634 cuft
Runoff coeff. = 0.93
Tc by TR55 = 9.00 min
Asc/Rec limb fact = 1/1



TR55 Tc Worksheet

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

Hyd. No. 2

Site Runoff (Rational)

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>	
Sheet Flow								
Manning's n-value	= 0.011		0.011		0.011			
Flow length (ft)	= 100.0		0.0		0.0			
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00			
Land slope (%)	= 0.67		0.00		0.00			
Travel Time (min)	= 2.26	+	0.00	+	0.00	=	2.26	
Shallow Concentrated Flow								
Flow length (ft)	= 650.00		0.00		0.00			
Watercourse slope (%)	= 0.67		0.00		0.00			
Surface description	= Paved		Paved		Paved			
Average velocity (ft/s)	= 1.66		0.00		0.00			
Travel Time (min)	= 6.51	+	0.00	+	0.00	=	6.51	
Channel Flow								
X sectional flow area (sqft)	= 0.00		0.00		0.00			
Wetted perimeter (ft)	= 0.00		0.00		0.00			
Channel slope (%)	= 0.00		0.00		0.00			
Manning's n-value	= 0.015		0.015		0.015			
Velocity (ft/s)	= 0.00		0.00		0.00			
Flow length (ft)	= 0.0		0.0		0.0			
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00	
Total Travel Time, Tc							=	9.00 min

Hydrograph Report

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

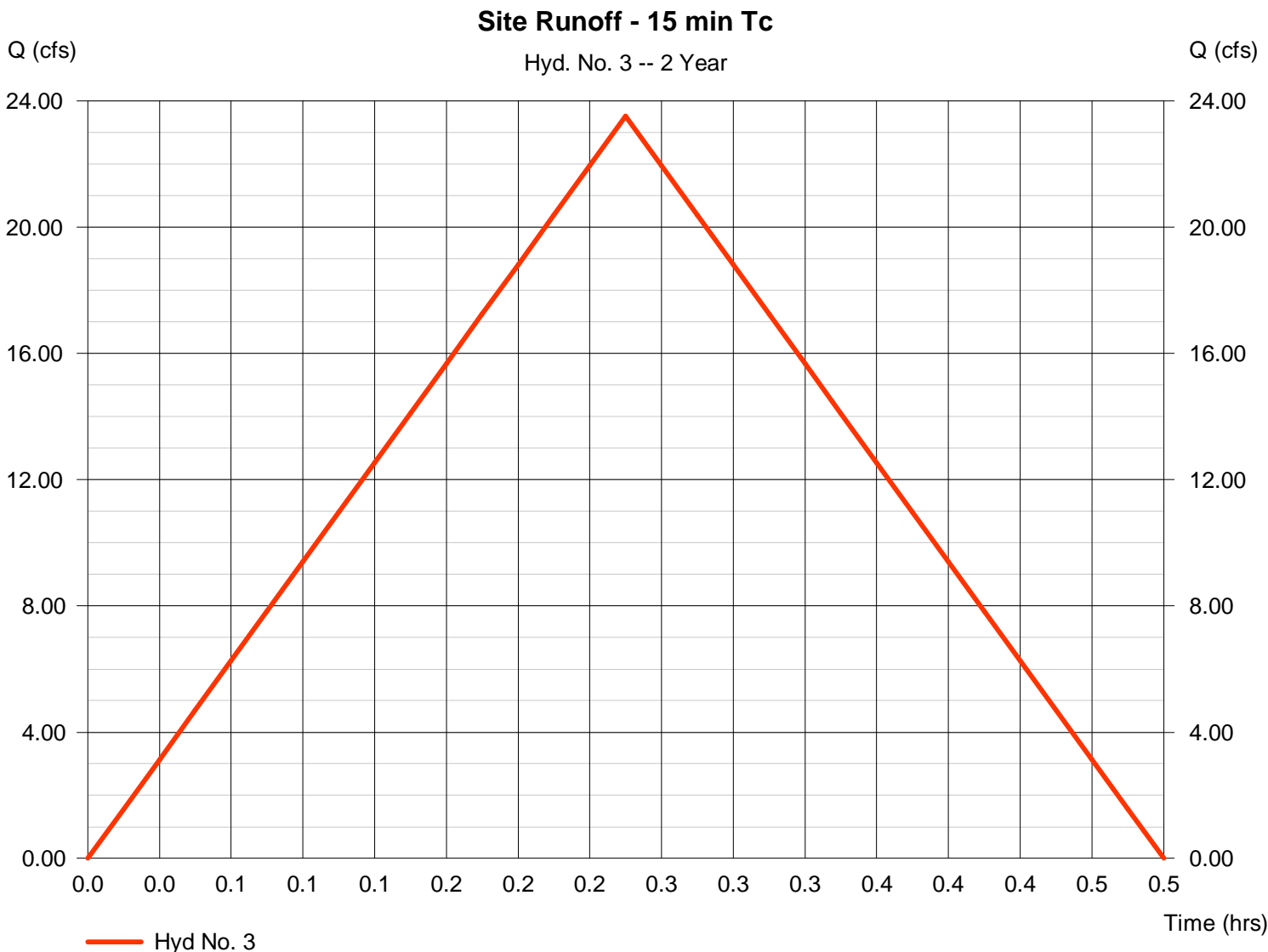
Tuesday, Jul 6, 2010

Hyd. No. 3

Site Runoff - 15 min Tc

Hydrograph type = Rational
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 6.500 ac
 Intensity = 3.890 in/hr
 IDF Curve = wich_IDF.IDF

Peak discharge = 23.52 cfs
 Time to peak = 0.25 hrs
 Hyd. volume = 21,164 cuft
 Runoff coeff. = 0.93
 Tc by User = 15.00 min
 Asc/Rec limb fact = 1/1



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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	22.37	2	722	70,560	-----	-----	-----	Site Runoff (SCS)
2	Rational	34.00	1	9	18,359	-----	-----	-----	Site Runoff (Rational)
3	Rational	28.13	1	15	25,314	-----	-----	-----	Site Runoff - 15 min Tc
Site Flow.gpw					Return Period: 5 Year			Tuesday, Jul 6, 2010	

Hydrograph Report

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

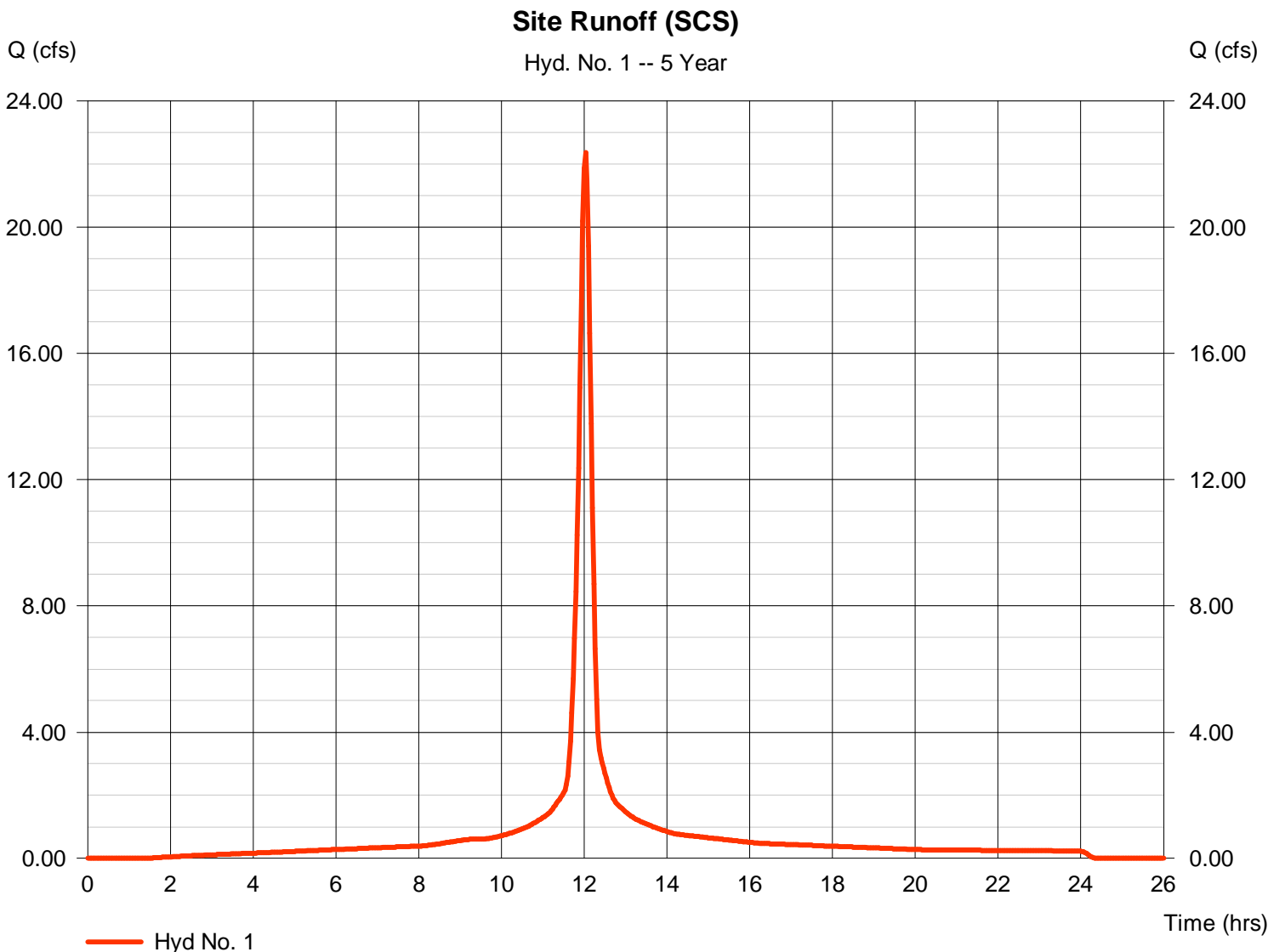
Tuesday, Jul 6, 2010

Hyd. No. 1

Site Runoff (SCS)

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 6.500 ac
 Basin Slope = 0.7 %
 Tc method = LAG
 Total precip. = 3.30 in
 Storm duration = 24 hrs

Peak discharge = 22.37 cfs
 Time to peak = 12.03 hrs
 Hyd. volume = 70,560 cuft
 Curve number = 98
 Hydraulic length = 750 ft
 Time of conc. (Tc) = 14.64 min
 Distribution = Type II
 Shape factor = 484

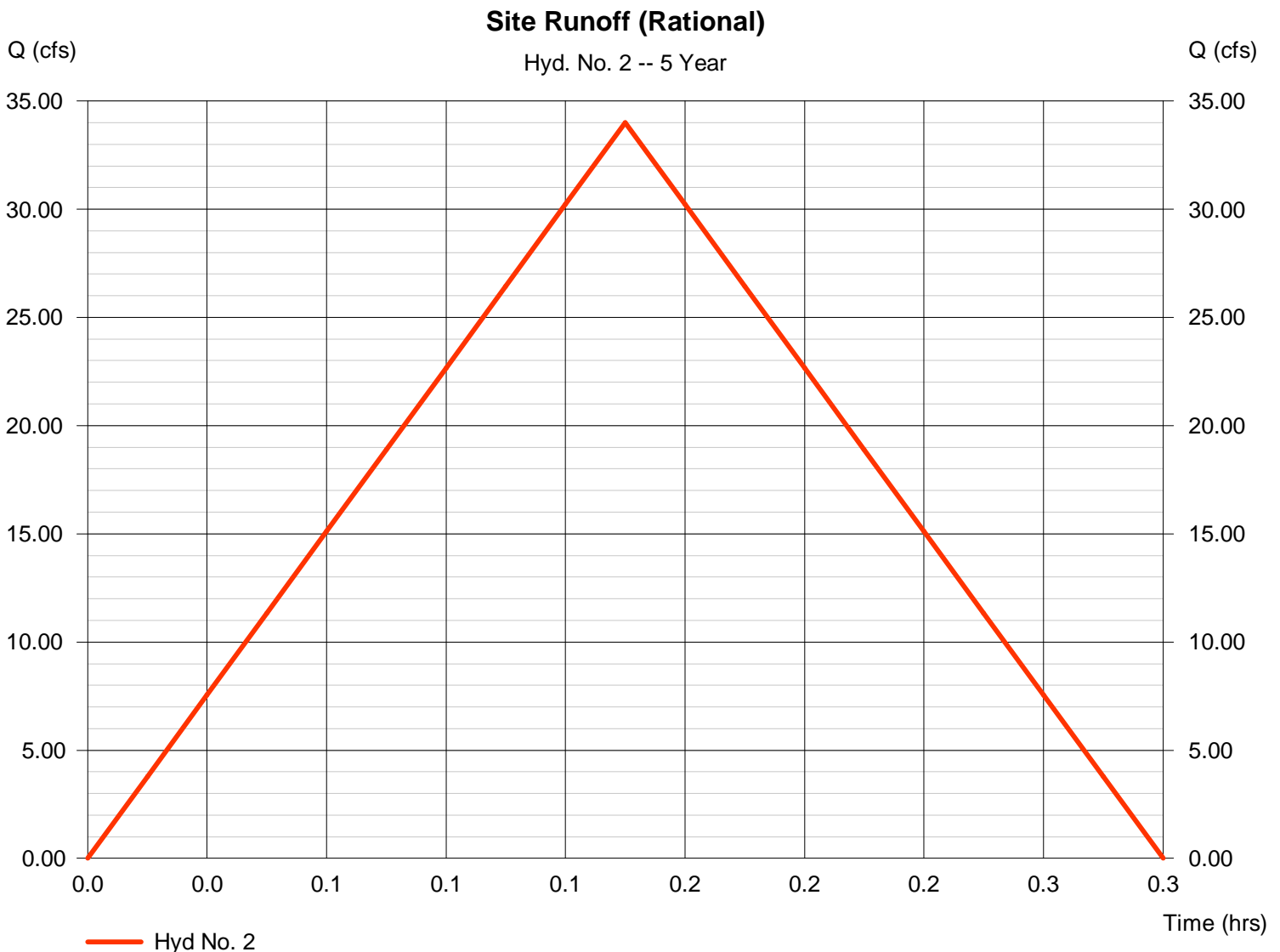


Hyd. No. 2

Site Runoff (Rational)

Hydrograph type = Rational
Storm frequency = 5 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 5.624 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 34.00 cfs
Time to peak = 0.15 hrs
Hyd. volume = 18,359 cuft
Runoff coeff. = 0.93
Tc by TR55 = 9.00 min
Asc/Rec limb fact = 1/1



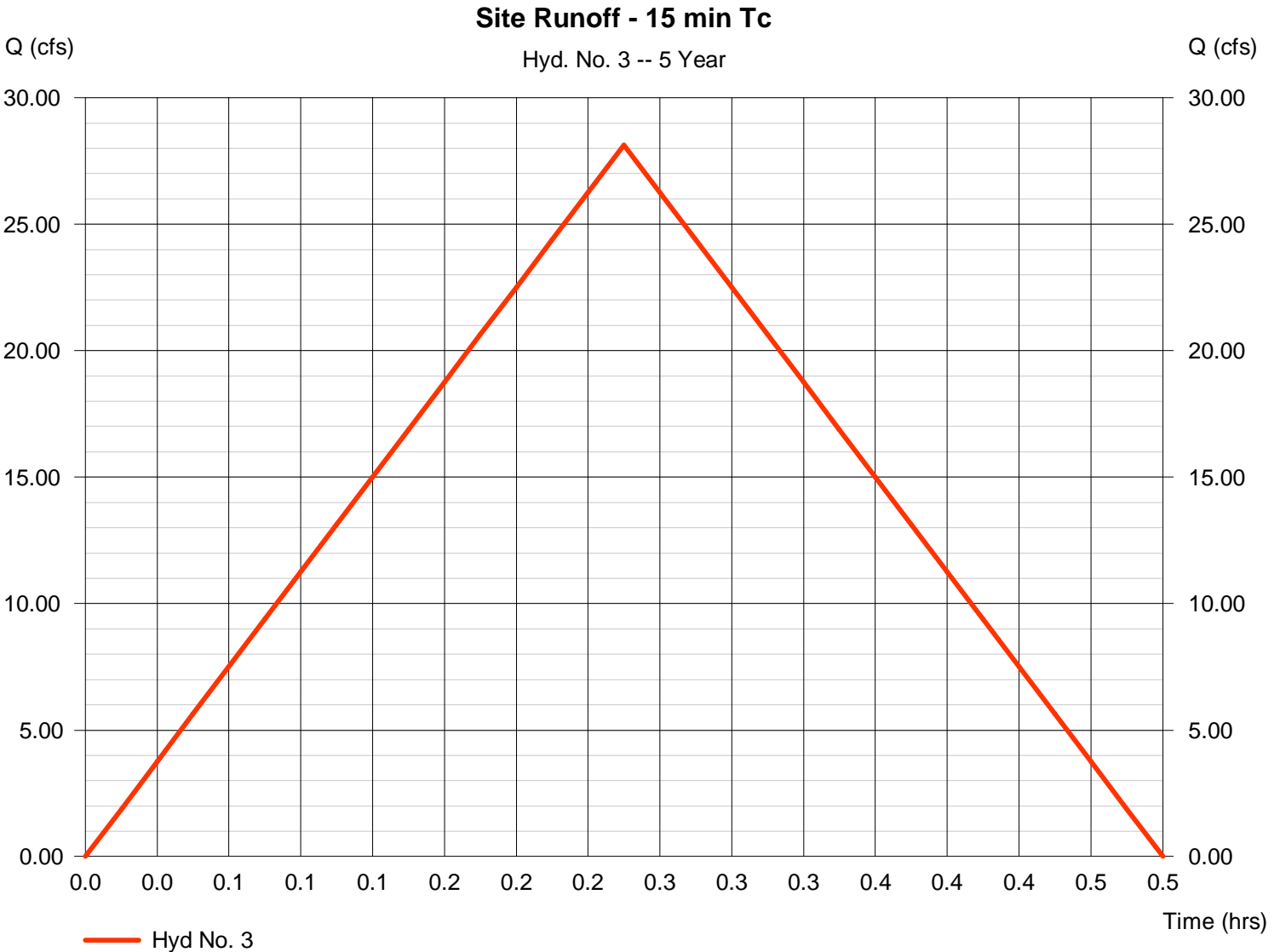
Hydrograph Report

Hyd. No. 3

Site Runoff - 15 min Tc

Hydrograph type = Rational
Storm frequency = 5 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 4.653 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 28.13 cfs
Time to peak = 0.25 hrs
Hyd. volume = 25,314 cuft
Runoff coeff. = 0.93
Tc by User = 15.00 min
Asc/Rec limb fact = 1/1



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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	28.95	2	722	92,355	-----	-----	-----	Site Runoff (SCS)	
2	Rational	37.75	1	9	20,386	-----	-----	-----	Site Runoff (Rational)	
3	Rational	31.49	1	15	28,341	-----	-----	-----	Site Runoff - 15 min Tc	
Site Flow.gpw					Return Period: 10 Year			Tuesday, Jul 6, 2010		

Hydrograph Report

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

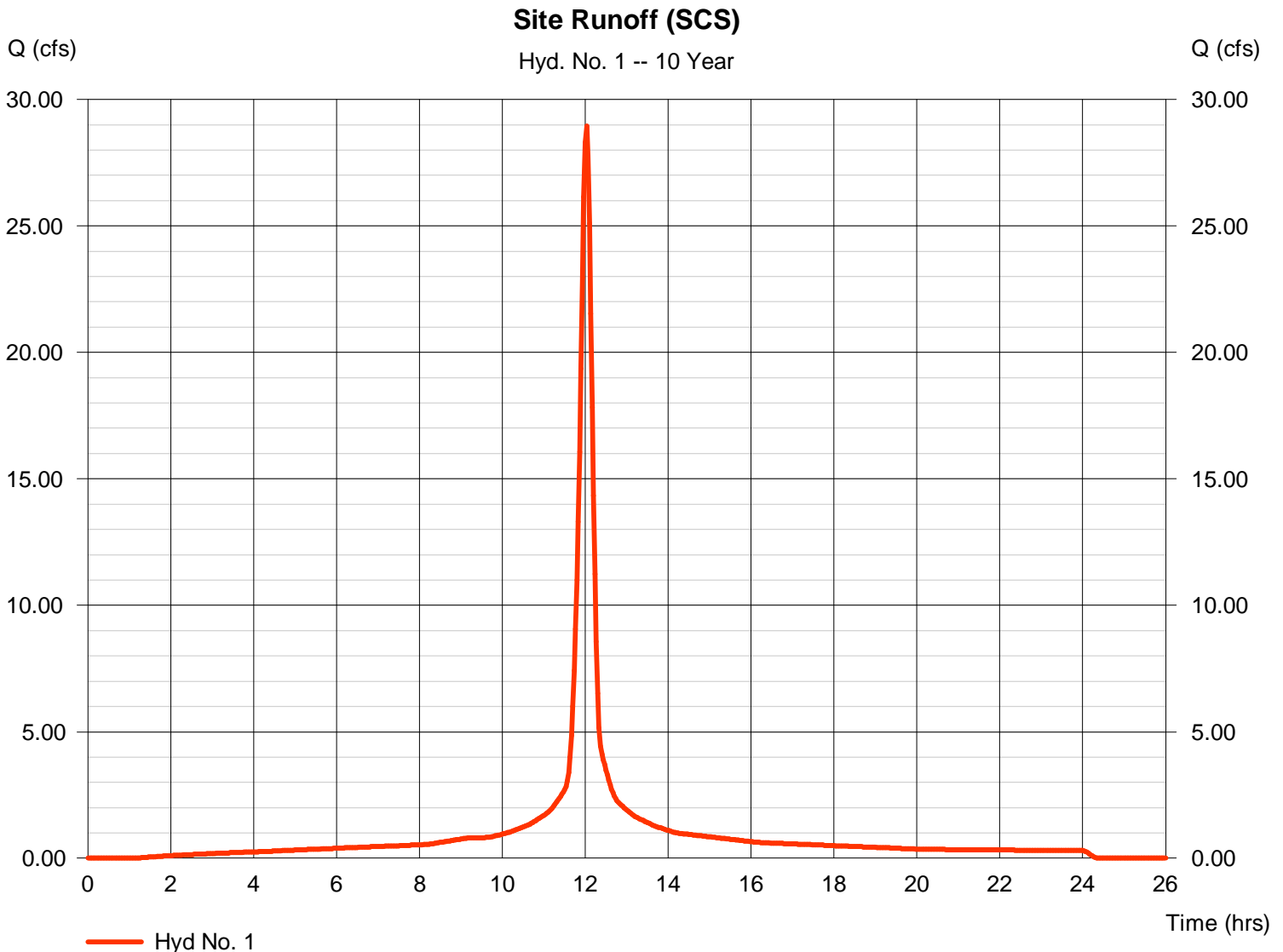
Tuesday, Jul 6, 2010

Hyd. No. 1

Site Runoff (SCS)

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 6.500 ac
 Basin Slope = 0.7 %
 Tc method = LAG
 Total precip. = 4.25 in
 Storm duration = 24 hrs

Peak discharge = 28.95 cfs
 Time to peak = 12.03 hrs
 Hyd. volume = 92,355 cuft
 Curve number = 98
 Hydraulic length = 750 ft
 Time of conc. (Tc) = 14.64 min
 Distribution = Type II
 Shape factor = 484



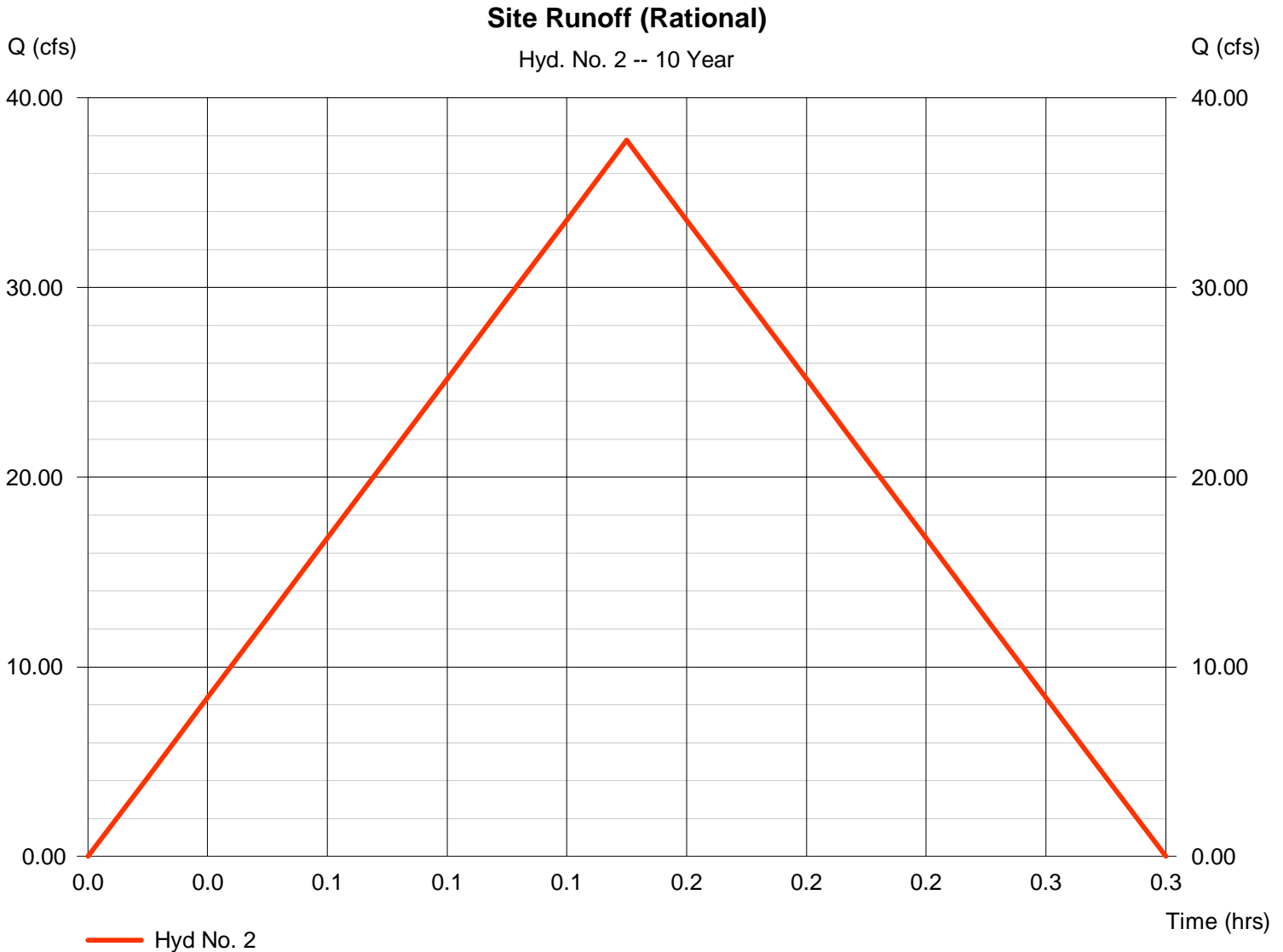
Hydrograph Report

Hyd. No. 2

Site Runoff (Rational)

Hydrograph type = Rational
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 6.245 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 37.75 cfs
Time to peak = 0.15 hrs
Hyd. volume = 20,386 cuft
Runoff coeff. = 0.93
Tc by TR55 = 9.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

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

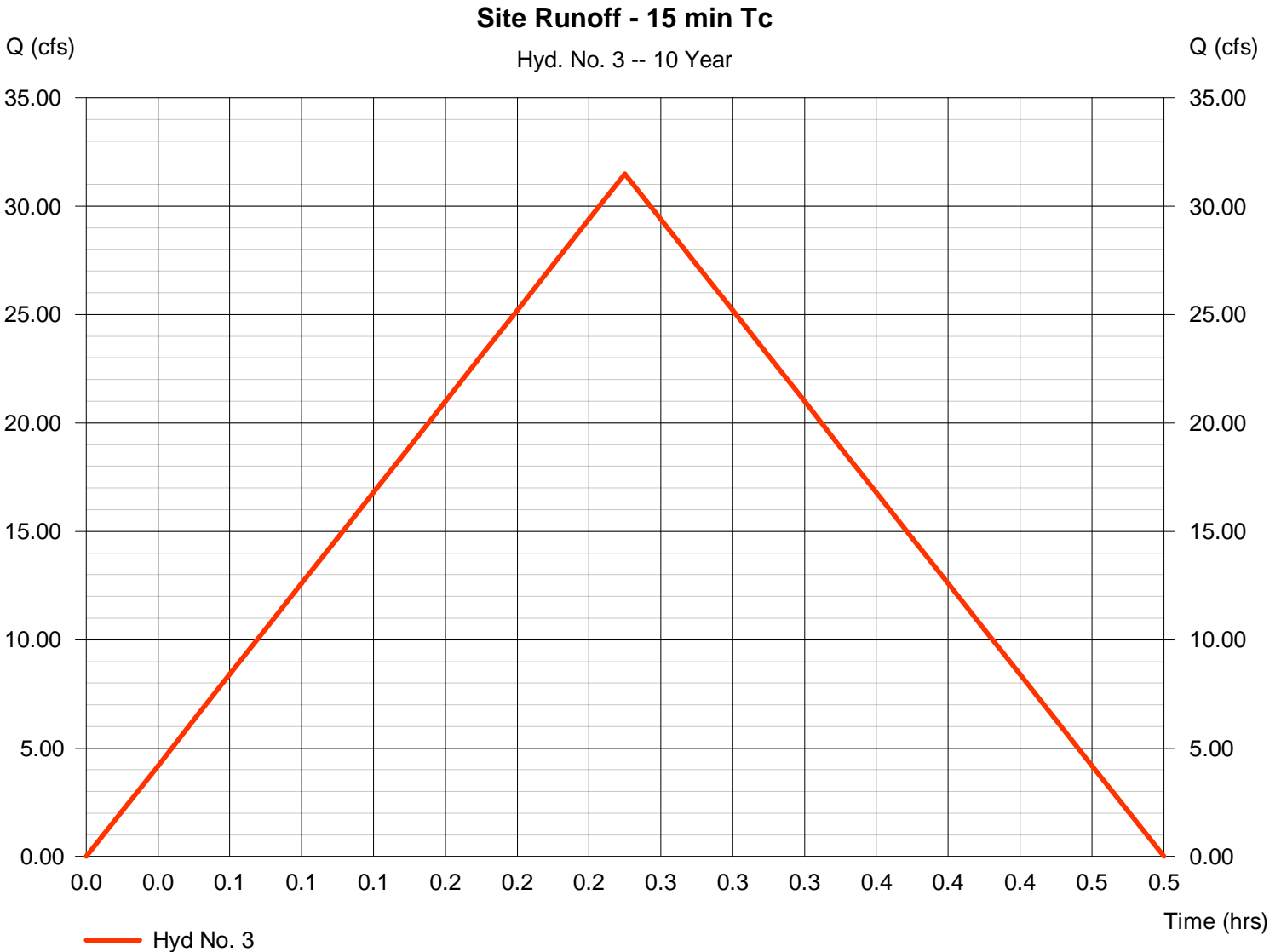
Tuesday, Jul 6, 2010

Hyd. No. 3

Site Runoff - 15 min Tc

Hydrograph type = Rational
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 5.209 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 31.49 cfs
Time to peak = 0.25 hrs
Hyd. volume = 28,341 cuft
Runoff coeff. = 0.93
Tc by User = 15.00 min
Asc/Rec limb fact = 1/1



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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	39.44	2	722	127,267	-----	-----	-----	Site Runoff (SCS)	
2	Rational	43.33	1	9	23,400	-----	-----	-----	Site Runoff (Rational)	
3	Rational	36.43	1	15	32,783	-----	-----	-----	Site Runoff - 15 min Tc	
Site Flow.gpw					Return Period: 25 Year			Tuesday, Jul 6, 2010		

Hydrograph Report

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

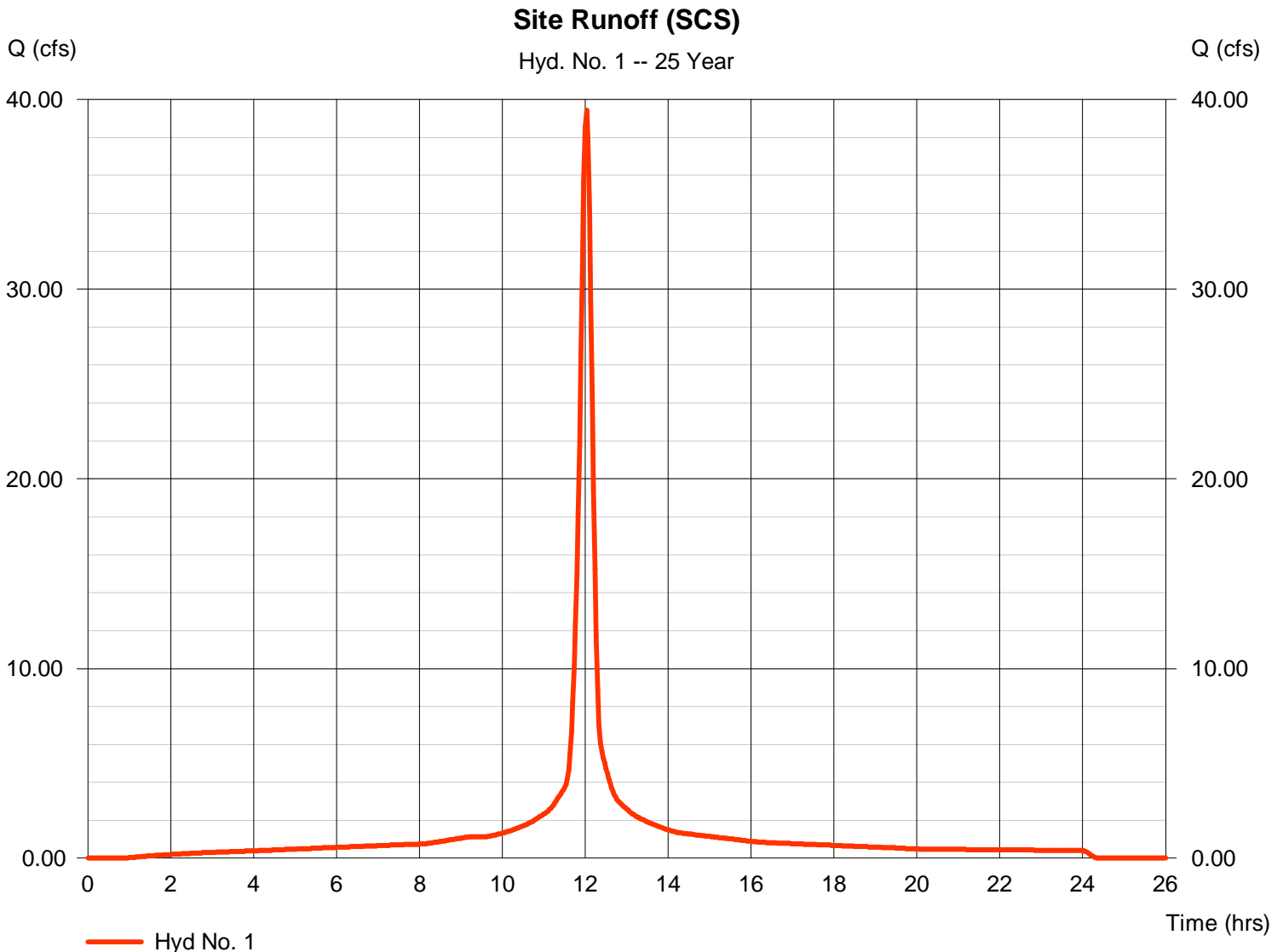
Tuesday, Jul 6, 2010

Hyd. No. 1

Site Runoff (SCS)

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 2 min
Drainage area = 6.500 ac
Basin Slope = 0.7 %
Tc method = LAG
Total precip. = 5.77 in
Storm duration = 24 hrs

Peak discharge = 39.44 cfs
Time to peak = 12.03 hrs
Hyd. volume = 127,267 cuft
Curve number = 98
Hydraulic length = 750 ft
Time of conc. (Tc) = 14.64 min
Distribution = Type II
Shape factor = 484



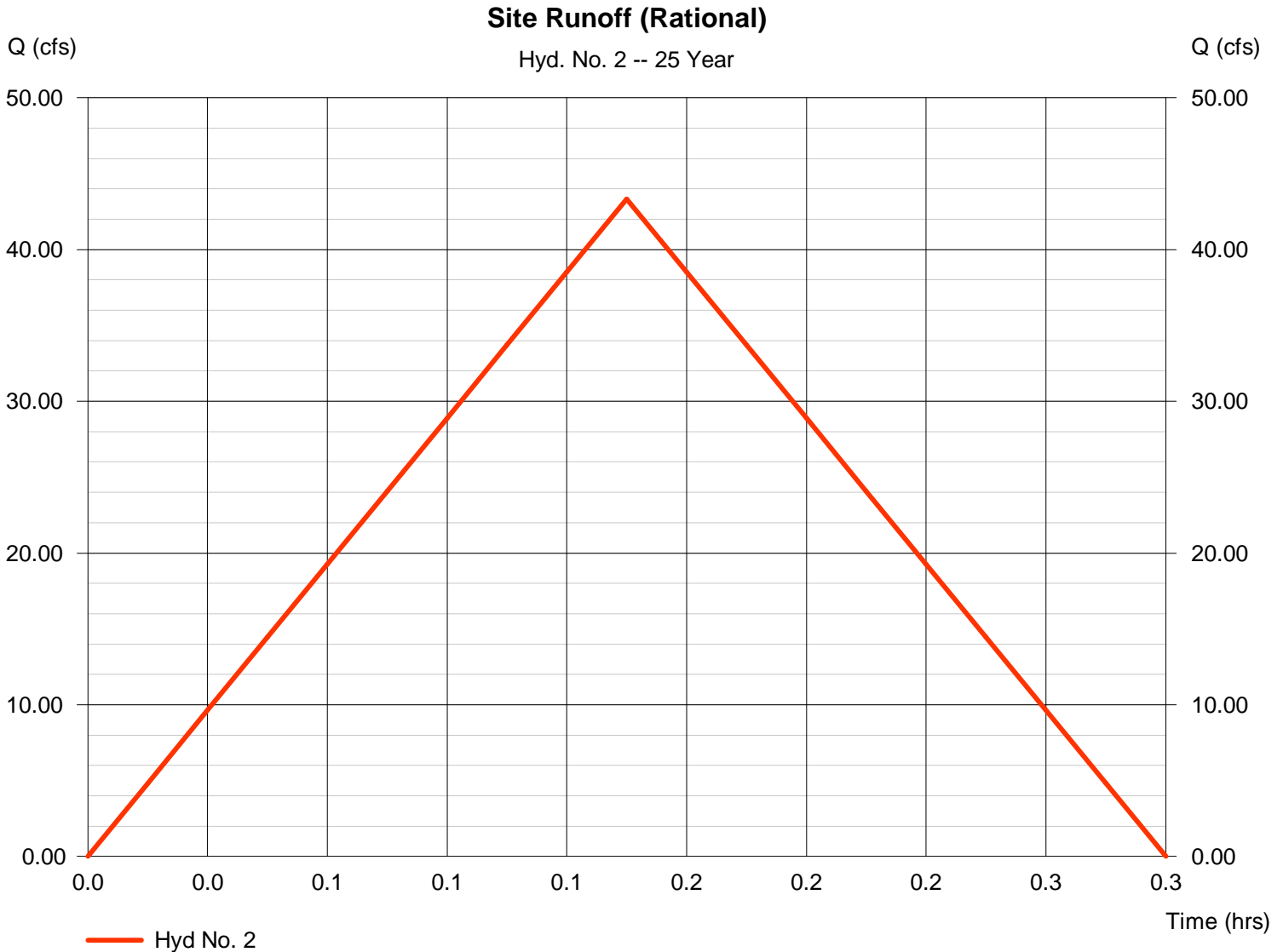
Hydrograph Report

Hyd. No. 2

Site Runoff (Rational)

Hydrograph type = Rational
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 7.168 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 43.33 cfs
Time to peak = 0.15 hrs
Hyd. volume = 23,400 cuft
Runoff coeff. = 0.93
Tc by TR55 = 9.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

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

Tuesday, Jul 6, 2010

Hyd. No. 3

Site Runoff - 15 min Tc

Hydrograph type = Rational
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 6.026 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 36.43 cfs
Time to peak = 0.25 hrs
Hyd. volume = 32,783 cuft
Runoff coeff. = 0.93
Tc by User = 15.00 min
Asc/Rec limb fact = 1/1



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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	46.54	2	722	150,938	-----	-----	-----	Site Runoff (SCS)
2	Rational	47.71	1	9	25,763	-----	-----	-----	Site Runoff (Rational)
3	Rational	40.29	1	15	36,260	-----	-----	-----	Site Runoff - 15 min Tc
Site Flow.gpw					Return Period: 50 Year			Tuesday, Jul 6, 2010	

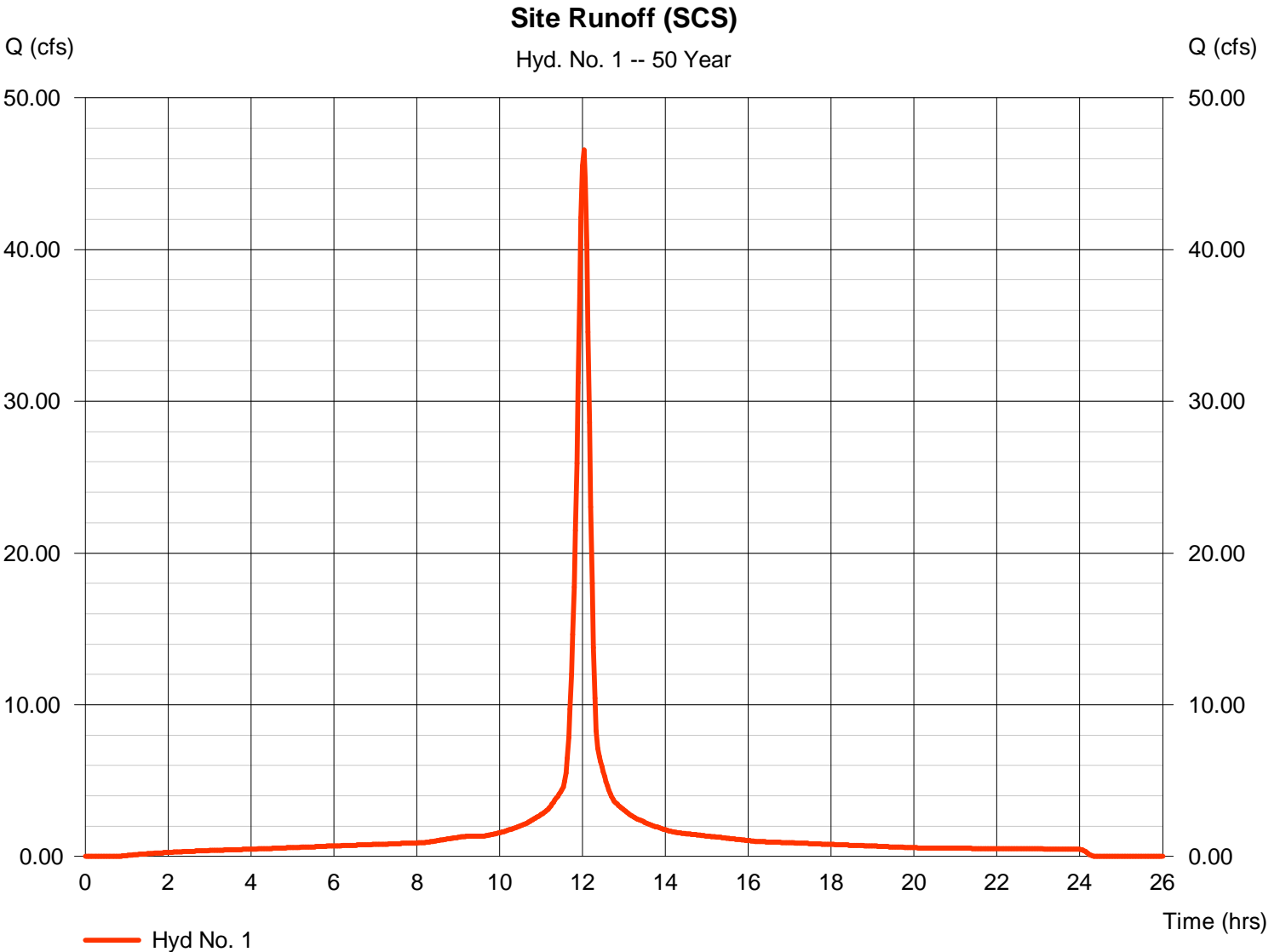
Hydrograph Report

Hyd. No. 1

Site Runoff (SCS)

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 2 min
Drainage area = 6.500 ac
Basin Slope = 0.7 %
Tc method = LAG
Total precip. = 6.80 in
Storm duration = 24 hrs

Peak discharge = 46.54 cfs
Time to peak = 12.03 hrs
Hyd. volume = 150,938 cuft
Curve number = 98
Hydraulic length = 750 ft
Time of conc. (Tc) = 14.64 min
Distribution = Type II
Shape factor = 484



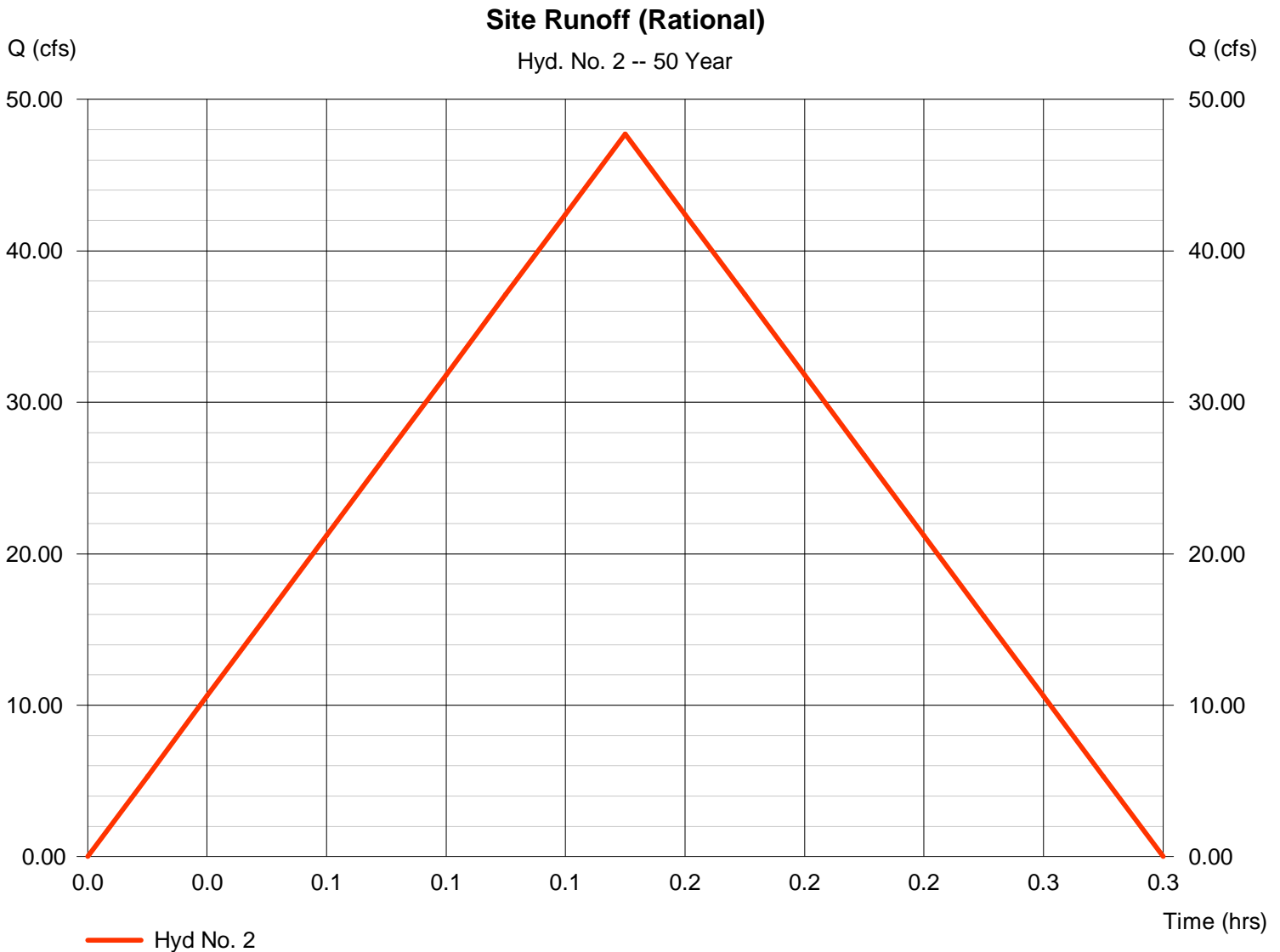
Hydrograph Report

Hyd. No. 2

Site Runoff (Rational)

Hydrograph type = Rational
Storm frequency = 50 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 7.892 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 47.71 cfs
Time to peak = 0.15 hrs
Hyd. volume = 25,763 cuft
Runoff coeff. = 0.93
Tc by TR55 = 9.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

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

Tuesday, Jul 6, 2010

Hyd. No. 3

Site Runoff - 15 min Tc

Hydrograph type = Rational
Storm frequency = 50 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 6.665 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 40.29 cfs
Time to peak = 0.25 hrs
Hyd. volume = 36,260 cuft
Runoff coeff. = 0.93
Tc by User = 15.00 min
Asc/Rec limb fact = 1/1



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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	54.46	2	722	177,375	-----	-----	-----	Site Runoff (SCS)
2	Rational	52.07	1	9	28,119	-----	-----	-----	Site Runoff (Rational)
3	Rational	44.13	1	15	39,721	-----	-----	-----	Site Runoff - 15 min Tc
Site Flow.gpw					Return Period: 100 Year			Tuesday, Jul 6, 2010	

Hydrograph Report

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

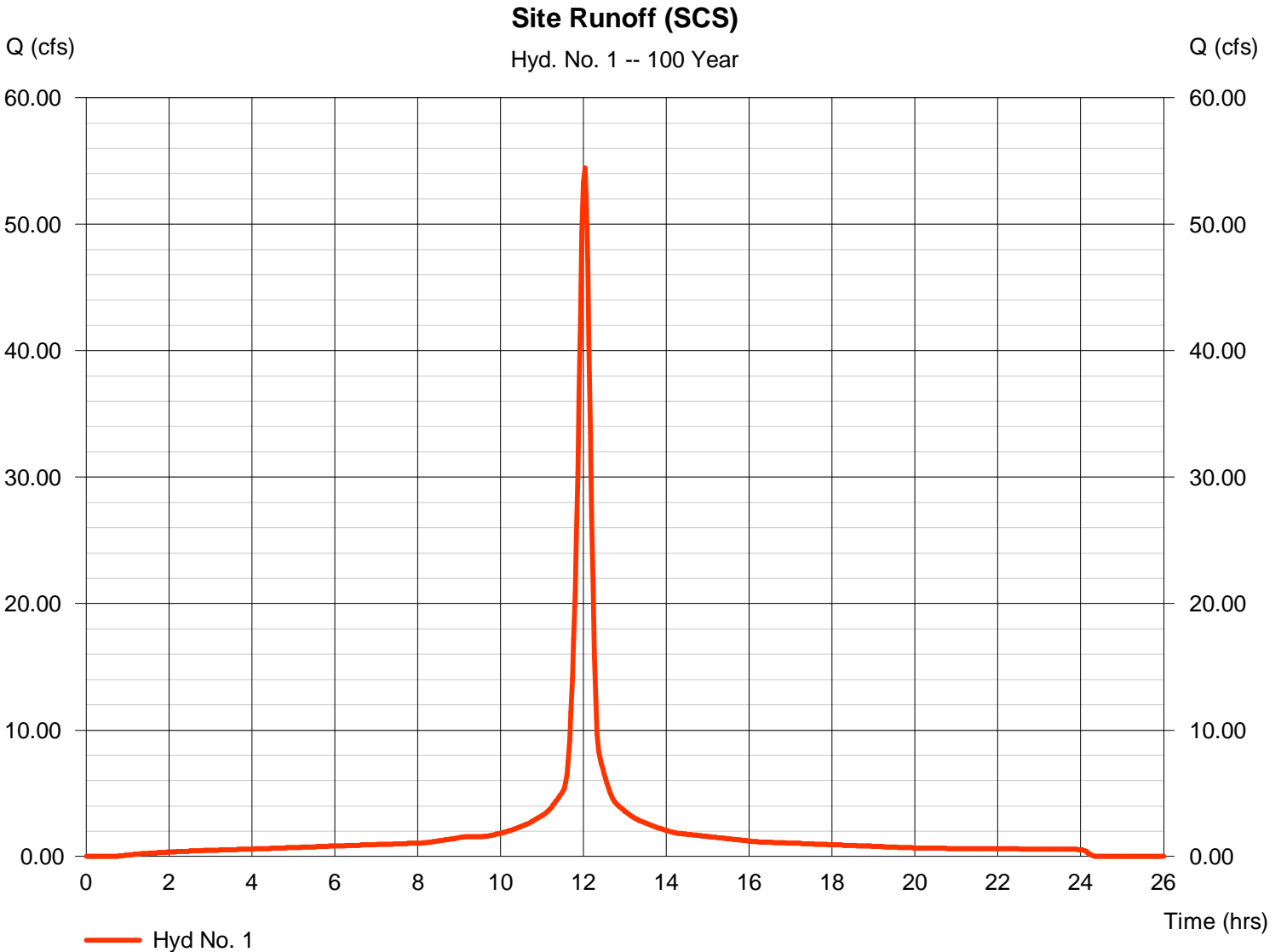
Tuesday, Jul 6, 2010

Hyd. No. 1

Site Runoff (SCS)

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 6.500 ac
Basin Slope = 0.7 %
Tc method = LAG
Total precip. = 7.95 in
Storm duration = 24 hrs

Peak discharge = 54.46 cfs
Time to peak = 12.03 hrs
Hyd. volume = 177,375 cuft
Curve number = 98
Hydraulic length = 750 ft
Time of conc. (Tc) = 14.64 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

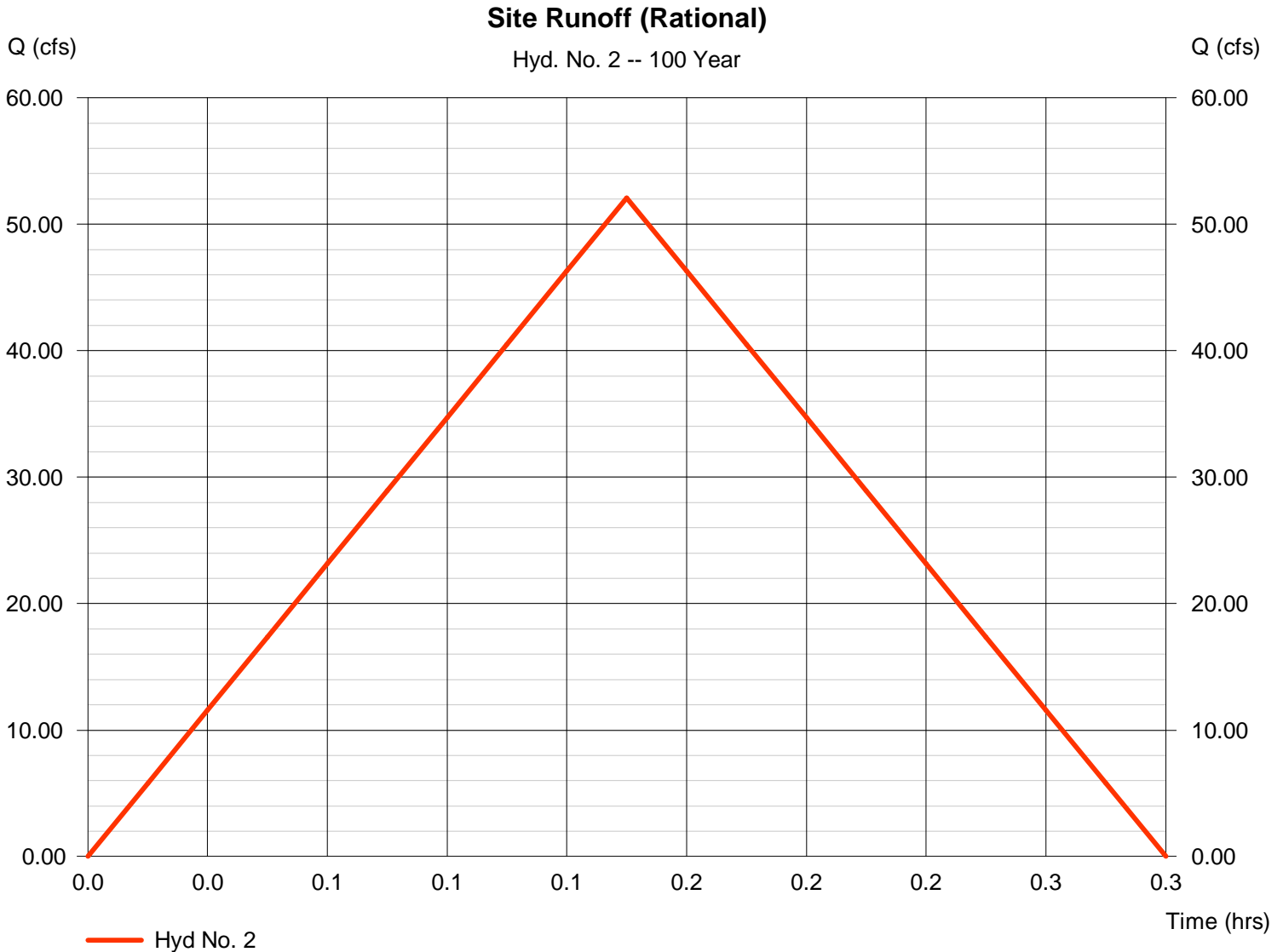
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Tuesday, Jul 6, 2010

Hyd. No. 2

Site Runoff (Rational)

Hydrograph type	= Rational	Peak discharge	= 52.07 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.15 hrs
Time interval	= 1 min	Hyd. volume	= 28,119 cuft
Drainage area	= 6.500 ac	Runoff coeff.	= 0.93
Intensity	= 8.614 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= wich_IDF.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

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

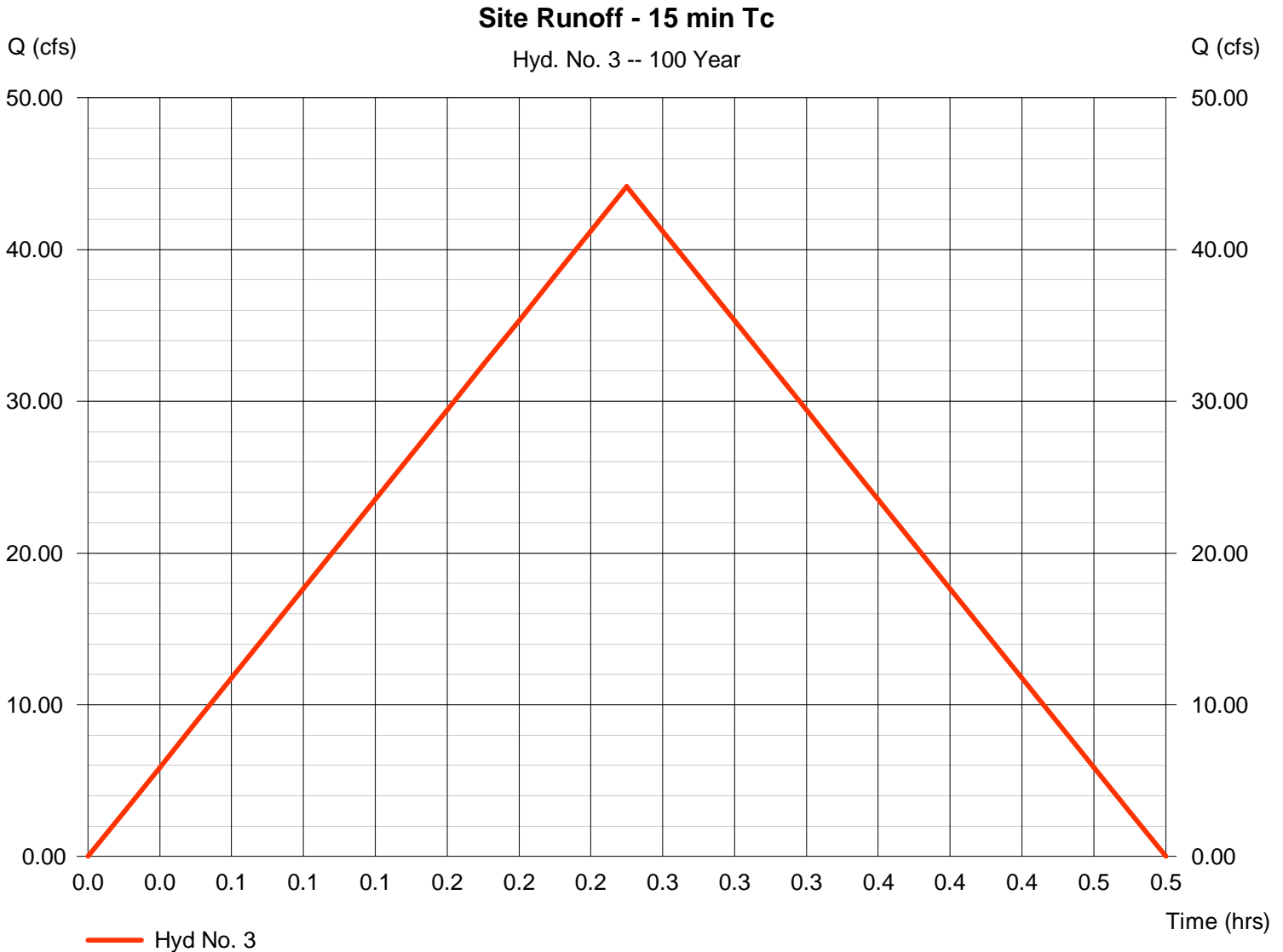
Tuesday, Jul 6, 2010

Hyd. No. 3

Site Runoff - 15 min Tc

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 6.500 ac
Intensity = 7.301 in/hr
IDF Curve = wich_IDF.IDF

Peak discharge = 44.13 cfs
Time to peak = 0.25 hrs
Hyd. volume = 39,721 cuft
Runoff coeff. = 0.93
Tc by User = 15.00 min
Asc/Rec limb fact = 1/1



Watershed Model Schematic	1
Hydrograph Return Period Recap	2
2 - Year	
Summary Report	3
Hydrograph Reports	4
Hydrograph No. 1, SCS Runoff, Site Runoff (SCS)	4
Hydrograph No. 2, Rational, Site Runoff (Rational)	5
TR-55 Tc Worksheet	6
Hydrograph No. 3, Rational, Site Runoff - 15 min Tc	7
5 - Year	
Summary Report	8
Hydrograph Reports	9
Hydrograph No. 1, SCS Runoff, Site Runoff (SCS)	9
Hydrograph No. 2, Rational, Site Runoff (Rational)	10
Hydrograph No. 3, Rational, Site Runoff - 15 min Tc	11
10 - Year	
Summary Report	12
Hydrograph Reports	13
Hydrograph No. 1, SCS Runoff, Site Runoff (SCS)	13
Hydrograph No. 2, Rational, Site Runoff (Rational)	14
Hydrograph No. 3, Rational, Site Runoff - 15 min Tc	15
25 - Year	
Summary Report	16
Hydrograph Reports	17
Hydrograph No. 1, SCS Runoff, Site Runoff (SCS)	17
Hydrograph No. 2, Rational, Site Runoff (Rational)	18
Hydrograph No. 3, Rational, Site Runoff - 15 min Tc	19
50 - Year	
Summary Report	20
Hydrograph Reports	21
Hydrograph No. 1, SCS Runoff, Site Runoff (SCS)	21
Hydrograph No. 2, Rational, Site Runoff (Rational)	22
Hydrograph No. 3, Rational, Site Runoff - 15 min Tc	23
100 - Year	
Summary Report	24
Hydrograph Reports	25
Hydrograph No. 1, SCS Runoff, Site Runoff (SCS)	25
Hydrograph No. 2, Rational, Site Runoff (Rational)	26
Hydrograph No. 3, Rational, Site Runoff - 15 min Tc	27