NORTHRIDGE INDUSTRIAL THIRD ADDITION

DRAINAGE REPORT

POE & ASSOCIATES, INC.
CONSULTING ENGINEERS
8940 E. Central, Suite 200 ■ Wichita, KS 67206-4242
Phone 316/685-4114 ■ FAX 316/685-4444

APRIL 2007

Adopted: February 23, 2007

WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: Timothy R. Austin, P.E. Date: 30 April 2007

Subdivision Name: Northridge Industrial Third Addition Location: W 1/2, NE 1/4, Section 34-T26S-R1E

Total Land Area Of Ownership: 4.7 Acres

Type: ____Residential ____Commercial ✓ Industrial ____Recreation ____Municipal ____Other

Applicant: A-L Enterprises Contact: Leslie G. Rudd, President Phone #: ____

Engineer: Poe & Associates, Inc. Contact: Jason P. Dickman, P.E. Phone # (316) 685-4114

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	✓			✓	
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	✓			✓	
C. Discussion of offsite conditions	✓			✓	
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	✓			✓	
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	✓			✓	
F. Copy of the plat	✓			✓	
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.)	✓			✓	
H. Professional Engineer seal, signature and date on cover of report	✓			✓	
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	✓			✓	

	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)	✓			✓	
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	✓			✓	
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	✓			✓	
D. Total Site Area and Total Impervious Area (acres)	✓			✓	
E. Benchmarks used for site control	✓			✓	
F. Streams, creeks, and waterway labeled	✓			✓	
G. Predominant soils from USDA soil surveys, and/or on site soil borings	✓			✓	
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	✓			✓	
I. Location of existing roads, buildings, parking lots and other impervious areas.	✓			✓	

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J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	✓			✓	
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✓			✓	
L. Flow paths	✓			✓	
M. Location and dimensions of existing channels, bridges or culvert crossings	✓			✓	
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	✓			✓	
O. Assumed pre-developed runoff curve numbers	✓			✓	
P. Existing time of concentrations used in calculations	✓			✓	
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	✓			✓	
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	✓			✓	
S. Cross-section data for open channels	✓			✓	
T. Ground water elevations, if applicable	✓			✓	

	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)	✓			✓	
B. Proposed time of concentrations used in calculations	✓			✓	
C. Assumed post-developed runoff curve numbers	✓			✓	
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)	✓			✓	
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	✓			✓	
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities	✓			✓	
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	✓			✓	
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	✓			✓	
I. Design water surface elevations and normal pool elevation for ponds.	✓			✓	
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.	✓			✓	
K. Proposed limits of clearing and grading	✓			✓	
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	✓			✓	
M. Location of existing and proposed utilities (e.g., water, sewer) and easements	✓			✓	
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✓			✓	
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	✓			✓	

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

	Applicant			Engr	
Tab 4. Floodplain Submittal	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Provide source of flood profile		✓	No changes to floodplain or floodway limits		✓
B. Nearest base flood elevations	✓			✓	
C. Delineation of pre-developed regulatory floodplain/floodway limits	✓			✓	
D. Delineation of post-developed regulatory floodplain and floodway limits		✓	No changes to floodplain or floodway limits		✓
E. Floodplain boundary determination per elevation (project limits shown)		✓	No changes to floodplain or floodway limits		✓
F. Provide source of floodway data table and discharges		✓	No changes to floodplain or floodway limits		✓
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		✓	No changes to floodplain or floodway limits		✓
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		✓	No changes to floodplain or floodway limits		✓
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		✓	No changes to floodplain or floodway limits		✓
J. Flood plains and floodways located within a Reserve, where necessary		✓	Floodplain or floodway limits not on site		✓

	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)		✓	Not Required		✓
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		✓	Not Required		✓
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.		✓	Not Required		✓
D. Kansas Department of Transportation		✓	Not Required		✓
E. Sedgwick County Right-of-way Permit		✓	Not Required		✓

Consulting Engineer Initials JPD

Tab 1. Project Narrative

A. Site location map, using USGS Map

The Northridge Industrial Third Addition is a 4.7-acre tract of land located in the west half of the northeast quarter of Section 34-T26S-R1E in the City Wichita, Sedgwick County, Kansas. The site is bounded on the north by 37th Street North, on the east by Hillside Avenue, on the south by 29th Street North, and on the west by Union Pacific Railroad. See Exhibit 1-1 for USGS Map.

B. Discussion of development, existing conditions, and proposed impacts

The property is currently zoned to allow limited industrial types of use. The site is anticipated on being developed as a limited industrial subdivision, with warehouse facilities proposed on this site. Typically, this type of development will increase the impervious area of the property over the existing land use. Such would be true with this addition. Assumptions for design flows in a limited industrial area include an impervious area of 72% within the proposed development.

Developed conditions will take advantage of the natural grades on the site as the site develops. Detention in the Drainage Area will ensure that developed flows are at or below current flows exiting the site. Proposed parking areas will fulfill the detention requirements for this site. Off-site drainage does not enter this development.

Presently, the site is a made up of vacant land. An un-named tributary connecting to the I-135 Drainage Canal drains northeast to southwest just off-site to the east and south of the site. This site drains from north to south and then off-site to the east through a 12" cross road pipe under Poplar Street. Next, the runoff enters a borrow pit located off-site and then to the un-named tributary mentioned above. The land has natural slopes ranging from less than 1% to roughly 3%. According to the NRCS Soil Survey, the predominant soil type is a Farnum loam series material. See Exhibit 1-2 for NRCS Soil Survey map and information showing existing soil types and descriptions.

The site is not within a FEMA Floodway and no platted reserve encompassing the 100-year Floodway shall be required. Refer to Exhibit 1-3 for proposed plat and Exhibit 1-4 for FIRM Panel 0356E, Wichita, Sedgwick County, Kansas, February 2, 2007. Any impact on storm water shall be addressed in the summary of runoff calculations text. The site does not contain wetland or riparian areas, and thus the intended development has no impact in that regard.

C. Discussion of offsite conditions

Undeveloped and agricultural areas lie to the east, west, and south of the site. Commercial and industrial uses lie to the north. The original, modern land use for the site was a mixture of commercial, industrial, and agricultural uses.

EXIST TOPO IS DIFFERENT

The upstream drainage basin for the un-named tributary contains just about 20 acres. See Exhibit 1-5 for delineation of the entire drainage basin. Land use within the drainage basin varies from agricultural, open space, limited industrial, and commercial in character. Upstream, storm water is directed around the site via overland and natural channel flow. The natural channel conveys storm water around the southwest corner of the property.

D. Summary of runoff calculations

Existing Conditions (24-Hour Storm)							
Site	Area	CN	2-Year	5-Year	10-Year	25-Year	100-Year
Basin	19.57	74.4	15.79	24.90	32.15	42.16	57.82
DA	4.70	56.1	1.34	3.48	5.41	8.28	13.07

Developed Conditions (24-Hour Storm)							
Site	Area	CN	2-Year	5-Year	10-Year	25-Year	100-Year
Basin	19.57	81.2	22.12	32.22	40.16	50.91	67.22
DA	4.70	88.0	12.26	16.77	20.17	24.68	31.42

Using the SCS Method, calculations indicate that the 20-acre upstream drainage basin has a 100-year flow of approximately 57 cfs. The current Q_{100} for the proposed area of development, based on existing conditions, is only about 13 cfs. Developed conditions result in a Q_{100} flow of over 31 cfs from the site. Detention storage will be provided to reduce developed flows to match the existing 13 cfs after the site is fully developed (information shown as Hydrograph Return Period Recap attached herewith as Exhibit 1-6). The site drainage is set up as one area as shown on the attached drainage plan, Exhibit 1-7. Each area was evaluated based on existing and proposed conditions.

Time of concentration for the entire drainage basin is estimated to be approximately 47 minutes based upon the TR-55 method. On-site T_c is estimated to be over 19 minutes for the existing condition and a presumed post-development T_c of 15 minutes. On-site detention is recommended for the area when developed. Therefore, the added 18 cfs from the site will be detained to keep post-developed flows at or below the current flows. It is assumed that immediate downstream capacities are adequate for the current existing flows. The final design of on-site drainage systems shall comply with current City of Wichita design criteria.

E. Narrative description of permanent best management practices

The contractor shall provide stabilized construction entrance prior to any street paving. A buffer of 10 feet of undisturbed native vegetation shall be maintained around perimeter of site where possible. Earthwork stockpiles shall be maintained away from any ponds. Fuel storage and refueling of equipment shall not be allowed around any ponds, drainage channels, or other waterways. Sediment barriers will be placed at storm sewer inlets and rock rip-rap at outlets. Sediment barriers (type determined by owner or contractor) shall be used to prevent sediment from flowing off site. Disturbed earth shall be stabilized where construction activity ceases for at least 21 days with owner's choice of mulch, temporary seed (Rye grass) during the planting season or other suitable BMP device. BMP devices shall be in place until there is a good stand of grass. Disturbed portions of the site where

than 21 days after the last construction activity in that area (during the planting season only). The permanent seed shall consist of fescue or grass chosen by the owner. BMP devices shall be used at back of curb/edge of pavement until vegetation is 75% established.

F. Copy of plat

A copy of the plat is attached as Exhibit 1-3.

G. Preliminary grading plan

A Preliminary grading plan is found on Exhibit 1-8.

H. Professional Engineer Seal

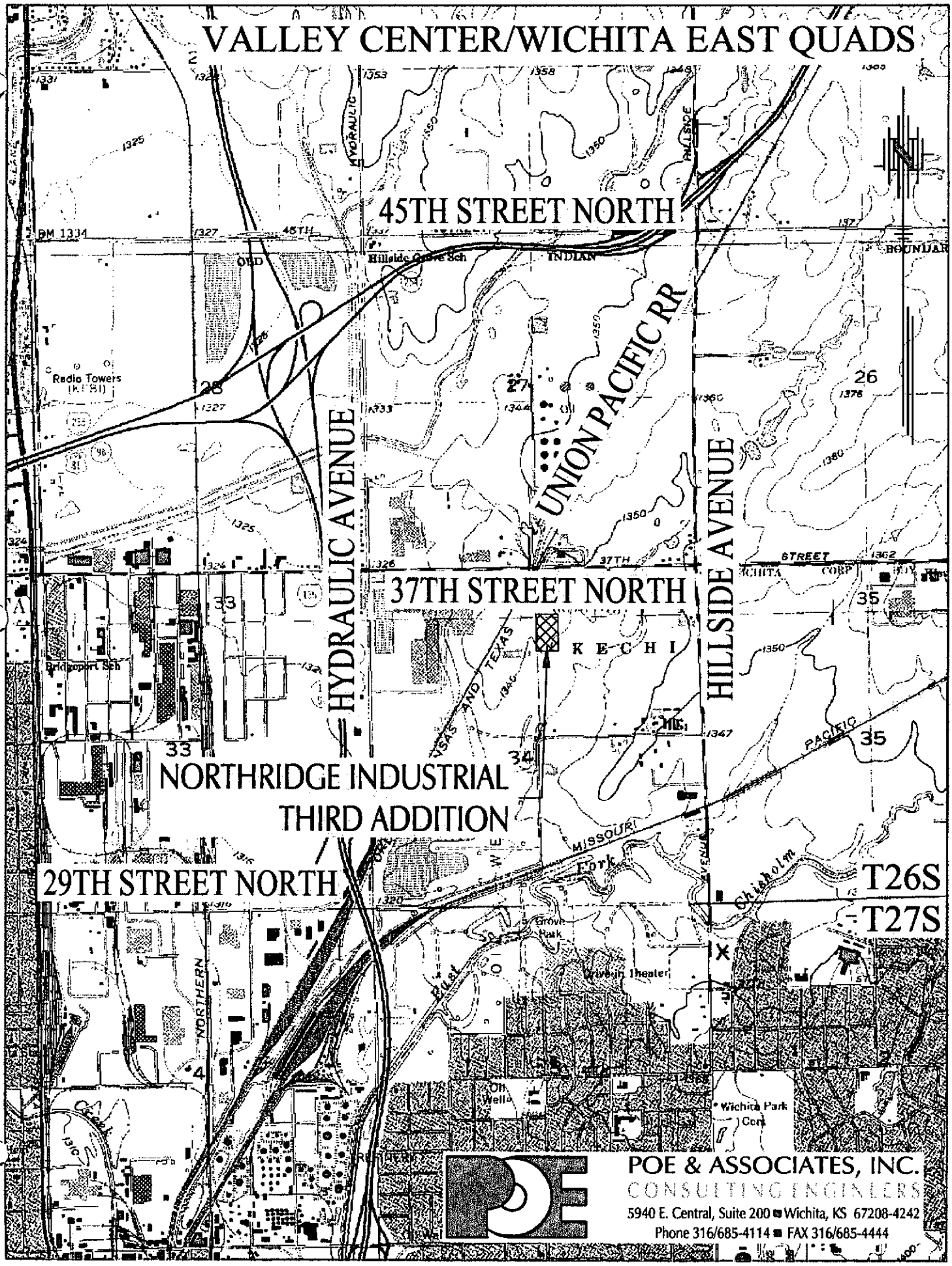
A signed and dated Professional Engineer's seal is located on the cover of this report.

I. CD of drainage plan

A CD of this report in full is attached herewith.

NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-1



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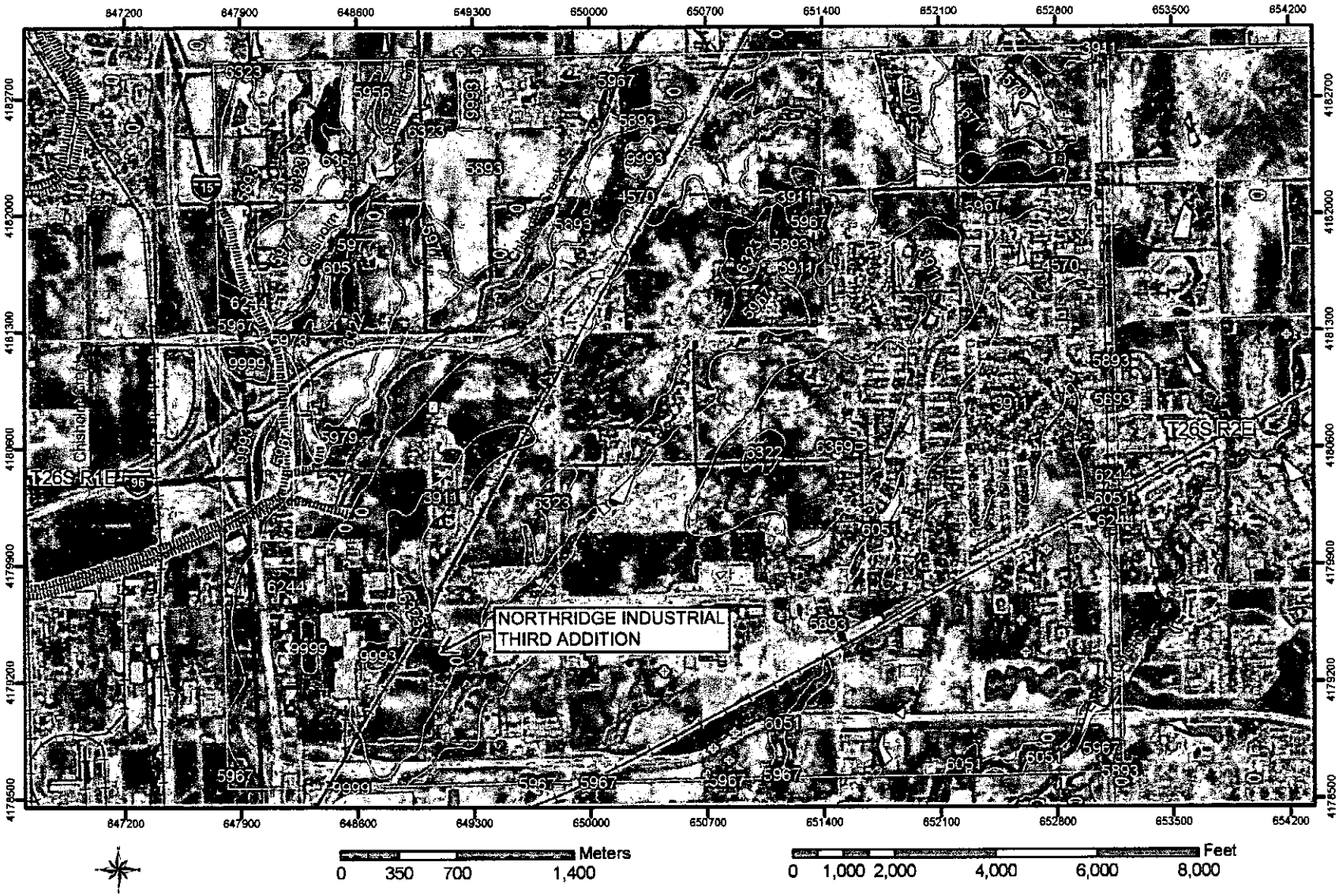
NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-2

SOIL SURVEY OF SEDGWICK COUNTY, KANSAS



MAP LEGEND

- Soil Survey Areas
- Soil Map Units
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans
- Escarpment, bedrock
- Escarpment, non-bedrock
- Gulley
- Levee
- Slope
- Blowout
- Borrow Pit
- Clay Spot
- Depression, closed
- Eroded Spot
- Gravel Pit
- Gravelly Spot
- Gulley
- Lava Flow
- Landfill
- Marsh or Swamp
- Miscellaneous Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Slide or Slip
- Sinkhole
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Perennial Water
- Wet Spot

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 14

Soil Survey Area: Sedgwick County, Kansas
Spatial Version of Data: 1
Soil Map Compilation Scale: 1:24000

Map comprised of aerial images photographed on these dates:
10/1/1991; 3/20/1996

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.

Map Unit Legend Summary

Sedgwick County, Kansas

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3911	Rosehill silty clay, 1 to 3 percent slopes	389.6	6.7
4570	Clime silty clay, 3 to 7 percent slopes	558.4	9.6
4671	Irwin silty clay loam, 1 to 3 percent slopes	64.3	1.1
5893	Farnum loam, 1 to 3 percent slopes	3,027.9	52.2
5956	Shellabarger sandy loam, 1 to 3 percent slopes	8.7	0.2
5967	Tabler silty clay loam, 0 to 1 percent slopes	343.0	5.9
5977	Vanoss silt loam, 1 to 3 percent slopes	90.6	1.6
5978	Vanoss silt loam, 3 to 7 percent slopes	22.0	0.4
5979	Vanoss silt loam, 3 to 7 percent slopes, eroded	13.1	0.2
6051	Elandco silt loam, frequently flooded	75.4	1.3
6244	Elandco silt loam, rarely flooded	546.7	9.4
6322	Blanket silt loam, 0 to 1 percent slopes	109.3	1.9
6323	Blanket silt loam, 1 to 3 percent slopes	190.3	3.3
6364	Milan clay loam, 3 to 6 percent slopes, eroded	12.0	0.2
6369	Milan loam, 1 to 3 percent slopes	225.7	3.9
9993	Pits	99.9	1.7
9999	Water	18.9	0.3

NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-3

State of Kansas)
Sedgwick County) ss

I, the undersigned licensed land surveyor in aforesaid county and state, do hereby certify that, under the supervision of the undersigned, we, Poe and Associates, Inc. have surveyed and platted "NORTHRIDGE INDUSTRIAL THIRD ADDITION", Wichita, Sedgwick County, Kansas and that the accompanying plat is a true and correct exhibit of the property surveyed, described as follows:

Parcel 1:
The West 350 feet of the North Half of the Northeast Quarter of Section 34, Township 26 South, Range 1 East of the Sixth Principal Meridian, Sedgwick County, Kansas, EXCEPT that part platted as Northridge Industrial Park Addition to Wichita, Sedgwick County, Kansas.

Existing public dedications, rights of way, and easements being vacated by virture of K.S.A. 12-512(b).

WILLIAM P. FOX
LICENSED
LS-799
KANSAS
LAND SURVEYOR

_____, Surveyor
William P. Fox, L.S. # 799

State of Kansas)
Sedgwick County) ss

Know all men by these presents that we, the undersigned, have caused the land described in the surveyor's certificate to be platted into a Lot and a Block, to be known as "NORTHRIDGE INDUSTRIAL THIRD ADDITION", Wichita, Sedgwick County, Kansas. The utility easements are hereby granted as indicated for constructing, maintaining, operating, and repairing utilities. The access controls are hereby granted to the appropriate governing body as shown hereon. Reserve A is for drainage and detention. The Reserve shall be owned and maintained by the owner. The governing body shall have the right of access to inspect the improvements, to maintain the improvements if nessecary, and to assess said maintenance costs to the owner.

A drainage plan has been developed for the plat. All drainage easements and/or right-of-ways shall remain at established grades, or as modified with the approval of the applicable public agency, and unobstructed to allow for the conveyance of stormwater.

Signed_____
Leslie G. Rudd

State of Kansas)
Sedgwick County) ss

BE IT REMEMBERED that on this____day of_____, 2007, before me, the undersigned, a notary public in and for the County and State aforesaid came Leslie G. Rudd, to me personally known to be the same person who executed this instrument and such person duly acknowledged the execution of the same.

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

_____
My appointment expires:

_____
Notary Public

_____
Print

N

State
Sedgwi

This p
County
County

Dated
Wichit

Darrel

John L

State
City o

This p
Counci
2007.

Carl B

Karen

Entere

Don B

State
Sedgwi

This is
of Dee
2007,

Bill Me

Tonya

State
Sedgwi

Review

Tricia
Deputy
Sedgwi

SCALE

120 0 120 240

LEGEND

- ▲ Section corner found
- ○ Point found
- ● 5/8" bar w/POE cap set
- (M) Measured distance
- (CM) Calculated from Measured distance
- (D) Deed distance

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NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-4

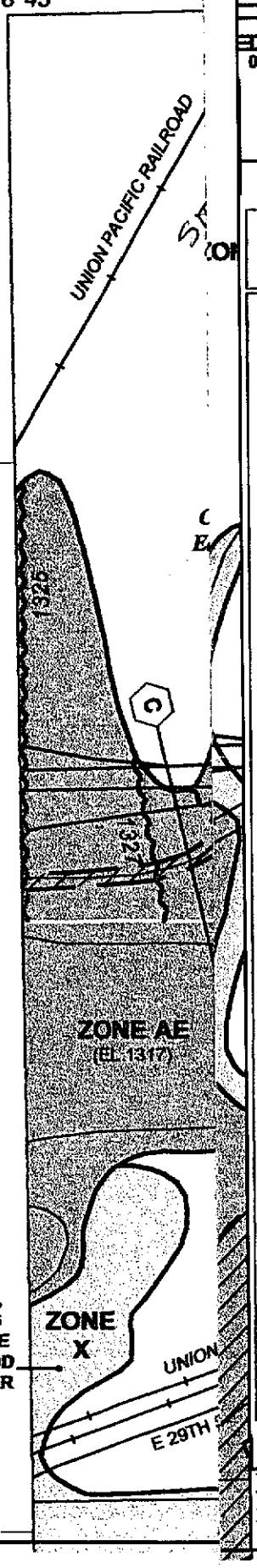
MAP SCALE 1" = 500'

500 1000 FEET

0 150 300 METERS

97° 18' 45"

37° 45' 00"



WARNING! THIS AREA IS SHOWN AS BEING PROTECTED FROM THE 1-PERCENT ANNUAL CHANCE FLOOD HAZARD BY LEVEE, DIKE, OR OTHER STRUCTURE. OVERTOPPING OR FAILURE OF THIS STRUCTURE IS POSSIBLE WHICH COULD RESULT IN DESTRUCTIVE FLOOD ELEVATIONS AND WATER VELOCITIES. PROPER PROTECTION, FLOOD INSURANCE, AND ADHERENCE TO EVACUATION PROCEDURES ARE STRONGLY RECOMMENDED. FOR ADDITIONAL INFORMATION, SEE THE NOTES TO USERS.

PANEL 0356E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
AND INCORPORATED AREAS

PANEL 356 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0356	E
WICHITA, CITY OF	200328	0356	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.

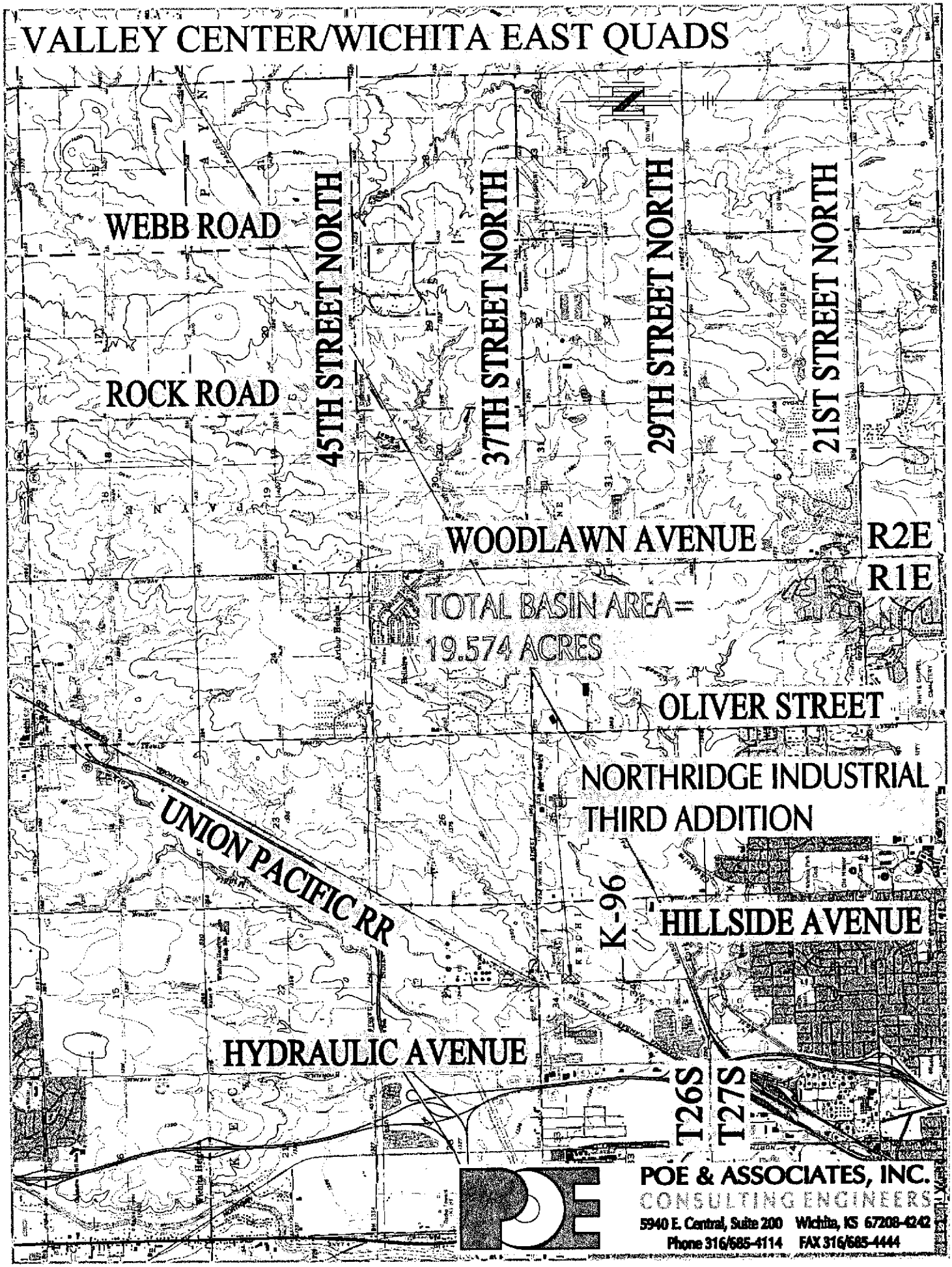
MAP NUMBER
20173C0356E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-5


VALLEY CENTER/WICHITA EAST QUADS
WEBB ROAD
ROCK ROAD
45TH STREET NORTH
37TH STREET NORTH
29TH STREET NORTH
21ST STREET NORTH
WOODLAWN AVENUE
R2E
R1E
TOTAL BASIN AREA =
19.574 ACRES
OLIVER STREET
NORTHRIDGE INDUSTRIAL
THIRD ADDITION
UNION PACIFIC RR
K-96
HILLSIDE AVENUE
HYDRAULIC AVENUE
T26S
T27S
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NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-6

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	------	9.592	15.79	------	24.90	32.15	42.16	49.88	57.82	Basin Existing
2	SCS Runoff	------	14.92	22.12	------	32.22	40.16	50.91	59.05	67.22	Basin Proposed
3	SCS Runoff	------	0.293	1.337	------	3.477	5.411	8.275	10.59	13.07	Site Existing
4	SCS Runoff	------	8.912	12.26	------	16.77	20.17	24.68	28.05	31.42	Site Proposed
5	Reservoir	4	1.028	1.336	------	2.581	3.879	5.732	7.218	8.708	Dry Detention

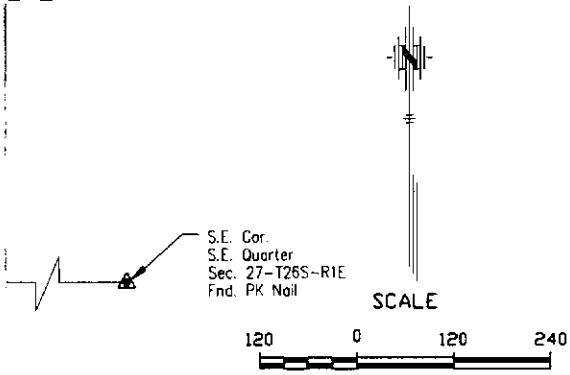
NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-7

NN

LEGAL DESCRIPTION:

Parcel 1:
The West 350 feet of the North Half of the Northeast Quarter of Section 34, Township 26 South, Range 1 East of the Sixth Principal Meridian, Sedgwick County, Kansas, EXCEPT that part platted as Northridge Industrial Park Addition to Wichita, Sedgwick County, Kansas.

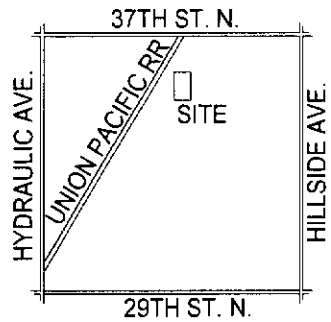


LEGEND

- ▲ Section corner found
- ○ Point found
- ● 5/8" bar w/POE cap set

NOTES:

1. Cross-drainage agreement required for subsequent sub-divisions.
2. Detention shall be provided to reduce developed flows. The detention will be held within parking areas. Minimum storage required in this area shall be 1.05 ac-ft. This will maintain the 100-year high water level at an elevation of 1339.30.
3. Site grading and drainage plans to be designed by a licensed professional engineer.
4. The drainage plan will need to be updated and filed with city engineering at the time of building permit(s).
5. Minimum Pad Elevation = 1341.30 (MSL)
6. If the property is divided into more than one lot when developed, a revised drainage plan for the entire lot must be prepared that indicates how cross lot drainage and required detention will be provided.
7. Storm sewer easements will be provided as needed to allow drainage to discharge across adjacent lots.
8. Off-site drainage will pass around the southwest corner of the site. If the existing drainage pattern is altered to enter the site, a revised drainage plan must be provided and approved, that indicates how the storm water will be directed across this site.
9. The revised drainage plan must be approved by the appropriate governing body prior to building permits being issued.
10. Any storm water detention areas shown will be revised when the final plans for the development are completed but the runoff amounts will be at or below the post development discharge rates.
11. Some of the detention ponding may normally be dry and will be provided in areas used for parking. A detailed plan will be provided at the time of development.



LOCATION MAP
No Scale

CALCULATION NOTES:

1. Determination of Q's was made using the SCS method.
2. Curve Numbers weighted based on hydrologic soil groups.

				Undeveloped			
Area #	Area	CN undeveloped	CN developed	Q_2	Q_5	Q_{10}	Q_{25}
Basin	19.57	74.4	81.2	15.79	24.90	32.15	42.16
DA	4.70	56.1	88.0	1.34	3.48	5.41	8.28

BENCH MARKS

MSL Datum

1. City of Wichita Disc on Concrete traffic signal pole base @ S.E. corner of 37th & Hillside.
   Elev. = 1352.75
2. City of Wichita Disc 2.5' W. of E. end of N. hubguard of 3-RCB under 37th St. W. of centerline of Hillside.
   Elev. = 1345.25
3. "□" cut on median curb @ centerline of Poplar 54' S. of centerline of 37th.
   Elev. = 1351.04
4. "□" cut on N.E. corner concrete pad for electric transformer box W. of yellow building @ 2525 E. 36th St., Suite B.
   Elev. = 1342.20

No.	Date	By	Approved	Revision

NORTHRIDGE INDUSTRIAL THIRD ADDITION
DRAINAGE PLAN
CITY OF WICHITA, KANSAS
JIM ARMOUR P.E.- CITY ENGINEER

POE & ASSOCIATES, INC.
CONSULTING ENGINEERS
5940 E. Central, Suite 200 ■ Wichita, KS 67208-4242
Phone 316/685-4114 ■ FAX 316/685-4444

FINAL

Designed By: J. Dickman
Drawn By: S. Schmidt
Drawing File: P:\822\drainage3rd2007.dwg
Date: 5/4/07

Sheet 1 of 1

NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 1-8

N

SE1/4
S-R1E

SCALE

120 0 120 240

LEGAL DESCRIPTION:

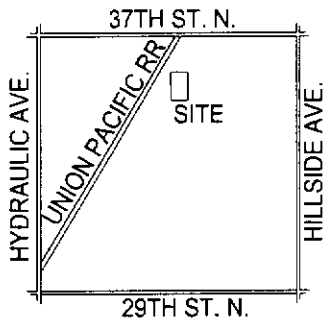
Parcel 1:
The West 350 feet of the North Half of the Northeast Quarter of Section 34, Township 26 South, Range 1 East of the Sixth Principal Meridian, Sedgwick County, Kansas, EXCEPT that part platted as Northridge Industrial Park Addition to Wichita, Sedgwick County, Kansas.

LEGEND

- ▲ Section corner found
- O Point found
- ● 5/8" bar w/POE cap set

NOTES:

1. Detailed site grading plans will be submitted when applying for building permits.
2. Site grading and drainage plans to be designed by a licensed professional engineer.
3. Minimum Pad Elevation = 1341.30 (MSL)



LOCATION MAP
No Scale

BENCH MARKS

MSL Datum

1. City of Wichita Disc on Concrete traffic signal pole base @ S.E. corner of 37th & Hillside.
   Elev. = 1352.75
2. City of Wichita Disc 2.5' W. of E. end of N. hubguard of 3-RCB under 37th St. W. of centerline of Hillside.
   Elev. = 1345.25
3. "□" cut on median curb @ centerline of Poplar 54' S. of centerline of 37th.
   Elev. = 1351.04
4. "□" cut on N.E. corner concrete pad for electric transformer box W. of yellow building @ 2525 E. 36th St., Suite B.
   Elev. = 1342.20

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Tab 2. Existing Conditions
Runoff Calculations

Tab 2. Existing Conditions Runoff Calculations

A. Copy of orthophotograph showing proposed boundaries

See Exhibit 2-1 for aerial photograph showing proposed site boundaries.

B. Runoff method

The runoff method used to determine storm water flows was the SCS hydrograph method. Supporting data and calculation results are shown on Exhibit 2-2.

C. Existing topography

The existing topography is shown on the drainage plan as seen on Exhibit 1-7.

D. Total site area and total impervious area

The total area Northridge Industrial Third Addition encompasses is 4.7 acres. The total impervious area for the developed condition, based on limited industrial land use, is estimated at 72% of the total site area. Therefore, the total impervious area on this site will be nearly 3.4 acres.

E. Benchmarks used for site control

The benchmarks used for site control are listed on the drainage plan, which is Exhibit 1-7.

F. Streams, creeks, and waterways labeled

Exhibit 1-7 shows any water features within the site.

G. Predominate soils from USDA soil surveys

The predominant soil type is a Farnum loam series (5893/Fb) material, which is found in 100% of the drainage area of this site. The overall drainage basin contains mostly Farnum soil and is also made up of about 20% of Blanket silt loam (6323/Bb) soil material. See Exhibit 1-2 for NRCS Soil Survey map and information showing existing soil types and descriptions. The Farnum soil is classified as Hydrologic Group B soils and the Blanket soil is a Hydrologic Group C soil. These Hydrologic Groups are used to select curve numbers for the runoff calculations in both the existing and developed conditions.

H. Location and boundaries of natural features

The existing site does not contain wetlands, lakes, or ponds.

I. Location of existing roads, buildings, parking lots, and other impervious areas

All areas within the platted property are vacant land with good grass cover and various concentrations of trees and brush.

J. Location of existing utilities

The site contains a portion of the gravel/asphalt turn-around at the northeast corner. A monitoring well is located in the southwest quadrant of the site. Also, a sanitary sewer manhole is located on the site in an easement. The easement is located near the center and on the west side of the east line of the property. The top of manhole elevation is approximately 1341.2. The above information is shown on the drainage plan, Exhibit 1-7.

K. Location of existing conveyance systems

Flow across the site is overland flow. This area ultimately drains off-site into the existing culvert located near the southeast corner of the addition.

L. Flow paths

The drainage plan (Exhibit 1-7) shows the general flow paths for the site. Generally, drainage moves from the north to the south. The flow exits the site about 200 feet north of the southeast corner of the property. Then, the flow is routed off-site through the existing culvert and to the east across Poplar Street.

M. Location and dimensions of existing channels, bridges or culvert crossings

Existing channels are not defined within this site. The site drains off-site to a 12" pipe under Poplar Street.

N. Existing conditions hydrologic analysis

The analysis was completed using the SCS Hydrograph method. The 2, 5, 10, 25, & 100 year, 24-hour storm events were evaluated and the information appear in Exhibit 2-2. The results are summarized in the following table.

	24-Hour Storm Flows (cfs)				
Area/Frequency	2-Year	5-Year	10-Year	25-Year	100-Year
Basin	15.79	24.90	32.15	42.16	57.82
DA	1.34	3.48	5.41	8.28	13.07

O. Assumed pre-developed runoff curve numbers

For the existing condition, the curve numbers were weighted based on area of their respective hydrologic soil groups over each site. The results are shown in the table below, to include those for the developed condition as required by Tab 3, Section C.

TOTAL BASIN		Hydrologic	Area		Percent of Areas	CURVE NUMBER	
Soil Information		Group	Square Feet	Acres	Total	Existing	Developed
Farnum loam, 1-3% slopes (Fb)	5893	B	39187.31	0.900	4.60%	61.0	88.0
Farnum loam, 1-3% slopes (Fb)	5893	B	165519.83	3.800	19.41%	55.0	88.0
Farnum loam, 1-3% slopes (Fb)	5893	B	480686.8	11.035	56.38%	81.0	79.5
Blanket silt loam, 1-3% slopes (Bb)	6323	C	167255.28	3.840	19.62%	78.0	78.0
		TOTALS	852649.220	19.574	100.00%	74.4	81.2

SITE DRAINAGE		Hydrologic	Area		Percent of Areas	CURVE NUMBER	
Soil Information		Group	Square Feet	Acres	Total	Existing	Developed
Farnum loam, 1-3% slopes (Fb)	5893	B	39187.31	0.900	19.14%	61.0	88.0
Farnum loam, 1-3% slopes (Fb)	5893	B	165519.83	3.800	80.86%	55.0	88.0
		TOTALS	204707.140	4.699	100.00%	56.1	88.0

P. Existing times of concentration used in calculations

Area	T_c (min)
Basin	47.2
DA	19.2

Q. Evaluation of immediate downstream drainage capacity

The downstream capacity to the east and south of this site shall be considered adequate to accommodate the existing flows from this site. The capacity will not be a concern since post-developed flows are intended to be less than or equal to the existing flow of 13 cfs.

R. Existing structural elevations

The existing 12" pipe under Poplar Street has an upstream flow line of 1338.28 and a downstream flow line of 1338.14 (MSL Datum).

S. Cross-section data for open channels

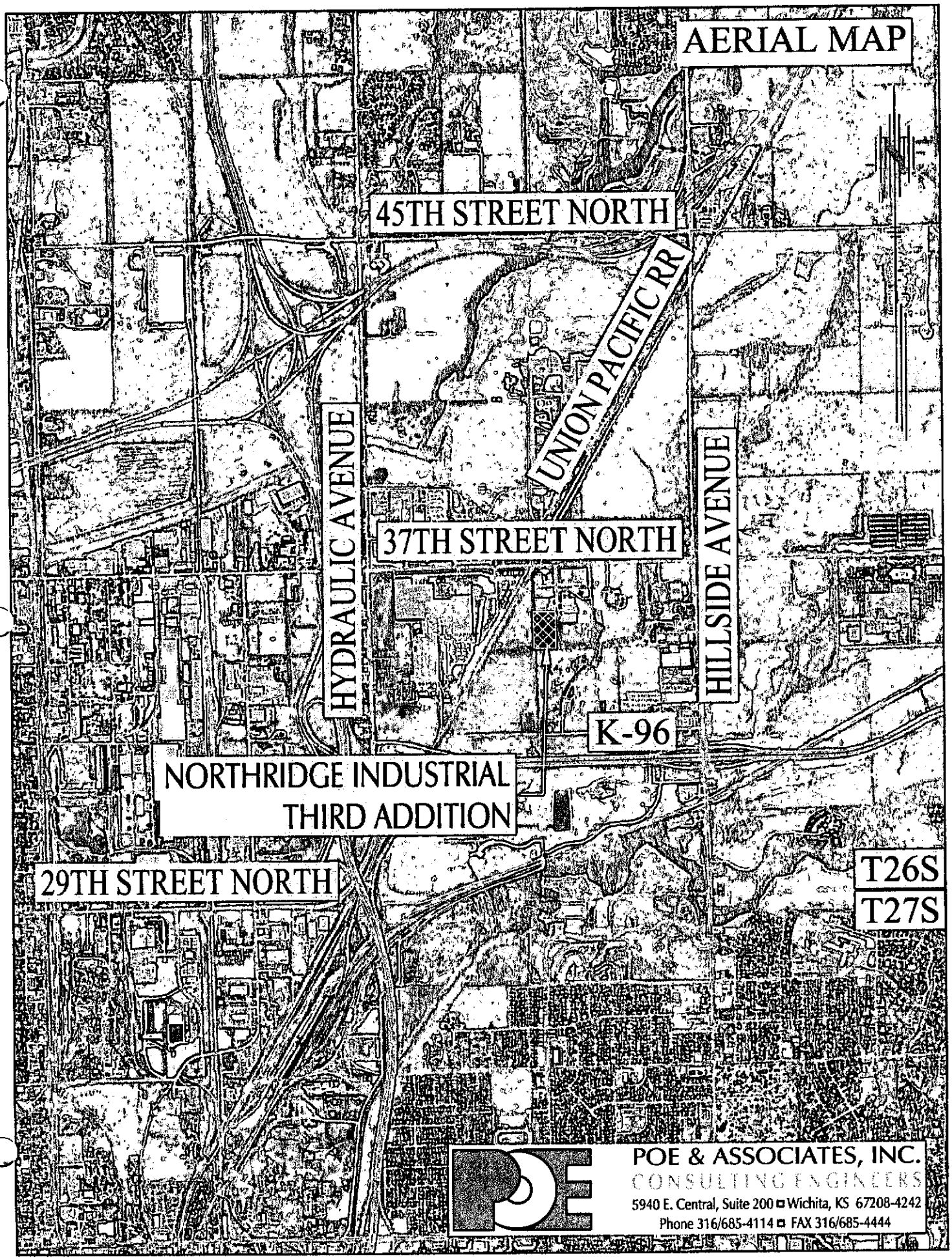
No open channels appear within this site.

T. Ground water elevations

The ground water elevation is not a concern for this area.

NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 2-1



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Phone 316/685-4114 ◘ FAX 316/685-4444

NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 2-2

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	15.79	6	744	2.123	----	------	------	Basin Existing
2	SCS Runoff	1.337	6	726	0.154	----	------	------	Site Existing
3	SCS Runoff	22.12	6	744	2.870	----	------	------	Basin Proposed
4	SCS Runoff	12.26	6	720	0.866	----	------	------	Site Proposed
5	Reservoir	1.336	6	762	0.866	4	1338.99	0.434	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

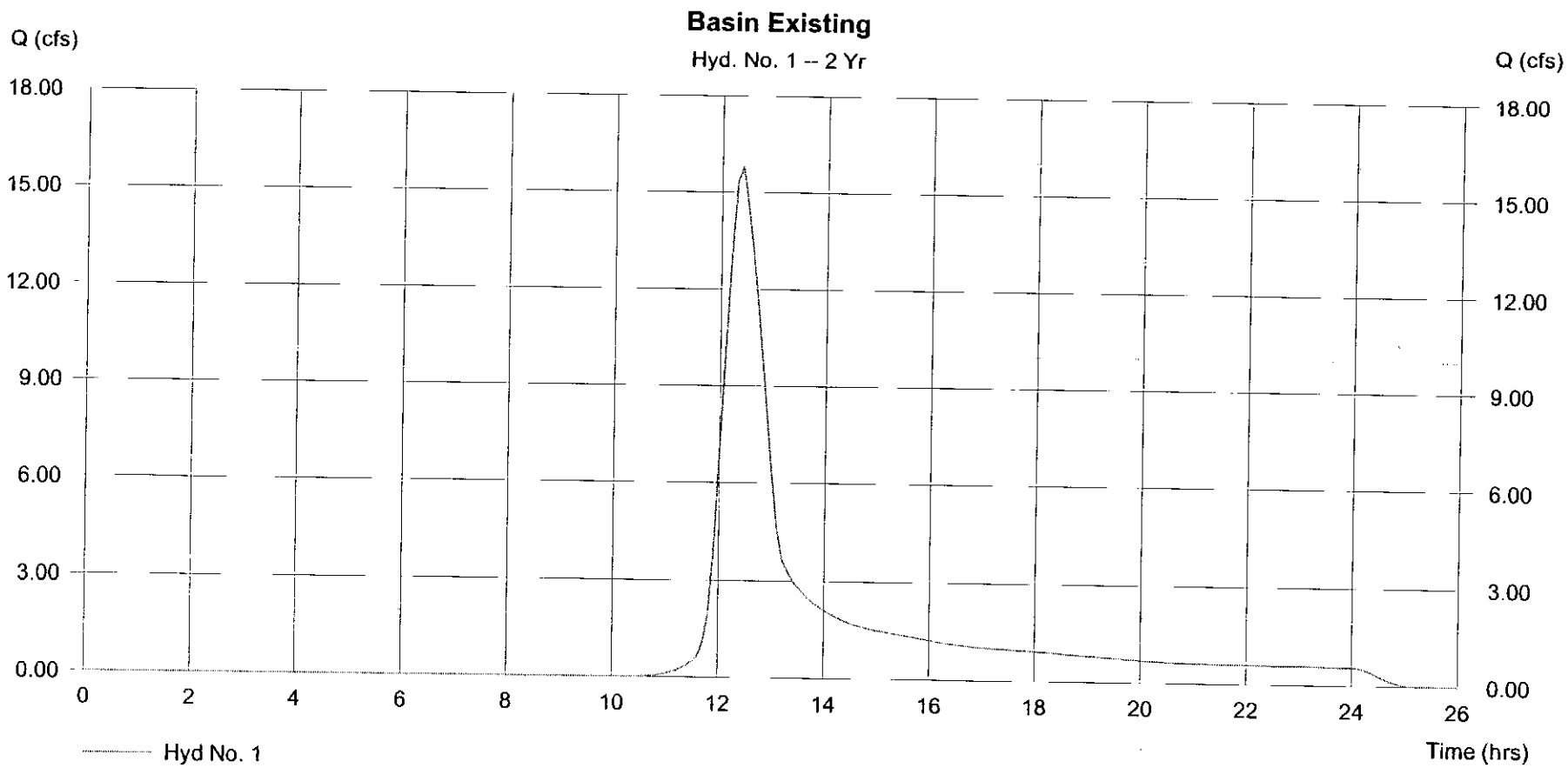
Monday, May 7 2007, 11:29 AM

Hyd. No. 1

Basin Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 15.79 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 74.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2.123 acft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Basin Existing

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.60		0.00		0.00		
Land slope (%)	= 0.53		0.00		0.00		
Travel Time (min)	**= 13.14**	**+**	**0.00**	**+**	**0.00**	**=**	**13.14**
Shallow Concentrated Flow							
Flow length (ft)	= 487.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 1.61		0.00		0.00		
Travel Time (min)	**= 5.03**	**+**	**0.00**	**+**	**0.00**	**=**	**5.03**
Channel Flow							
X sectional flow area (sqft)	= 30.00		0.00		0.00		
Wetted perimeter (ft)	= 64.85		0.00		0.00		
Channel slope (%)	= 1.00		0.00		0.00		
Manning's n-value	= 0.100		0.015		0.015		
Velocity (ft/s)	= 0.89		0.00		0.00		
Flow length (ft)	= 1550.0		0.0		0.0		
Travel Time (min)	**= 29.06**	**+**	**0.00**	**+**	**0.00**	**=**	**29.06**

Total Travel Time, Tc ..... **47.20 min**

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

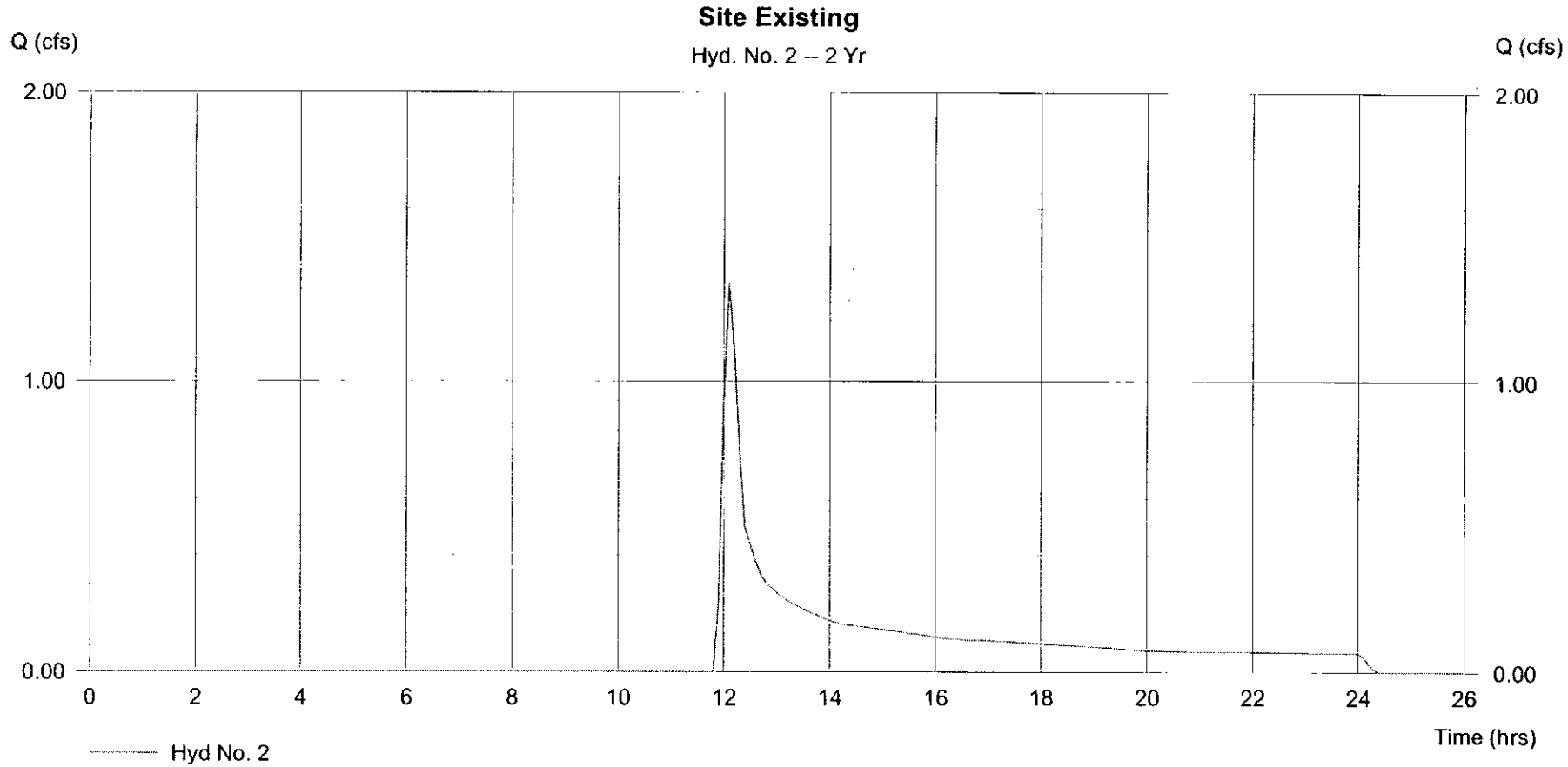
Monday, May 7 2007, 11:29 AM

Hyd. No. 2

Site Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 1.337 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 56.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.20 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 0.154 acft



TR55 Tc Worksheet

Hyd. No. 2

Site Existing

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 75.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.60		0.00		0.00		
Land slope (%)	= 1.33		0.00		0.00		
Travel Time (min)	**= 12.57**	**+**	**0.00**	**+**	**0.00**	**=**	**12.57**
Shallow Concentrated Flow							
Flow length (ft)	= 300.00		0.00		0.00		
Watercourse slope (%)	= 1.10		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 1.69		0.00		0.00		
Travel Time (min)	**= 2.95**	**+**	**0.00**	**+**	**0.00**	**=**	**2.95**
Channel Flow							
X sectional flow area (sqft)	= 30.00		0.00		0.00		
Wetted perimeter (ft)	= 63.85		0.00		0.00		
Channel slope (%)	= 1.00		0.00		0.00		
Manning's n-value	= 0.100		0.015		0.015		
Velocity (ft/s)	= 0.90		0.00		0.00		
Flow length (ft)	= 200.0		0.0		0.0		
Travel Time (min)	**= 3.71**	**+**	**0.00**	**+**	**0.00**	**=**	**3.71**

Total Travel Time, Tc ..... **19.20 min**

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	24.90	6	744	3.260	----	------	------	Basin Existing
2	SCS Runoff	3.477	6	726	0.304	----	------	------	Site Existing
3	SCS Runoff	32.22	6	744	4.163	----	------	------	Basin Proposed
4	SCS Runoff	16.77	6	720	1.194	----	------	------	Site Proposed
5	Reservoir	2.581	6	744	1.194	4	1339.08	0.586	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

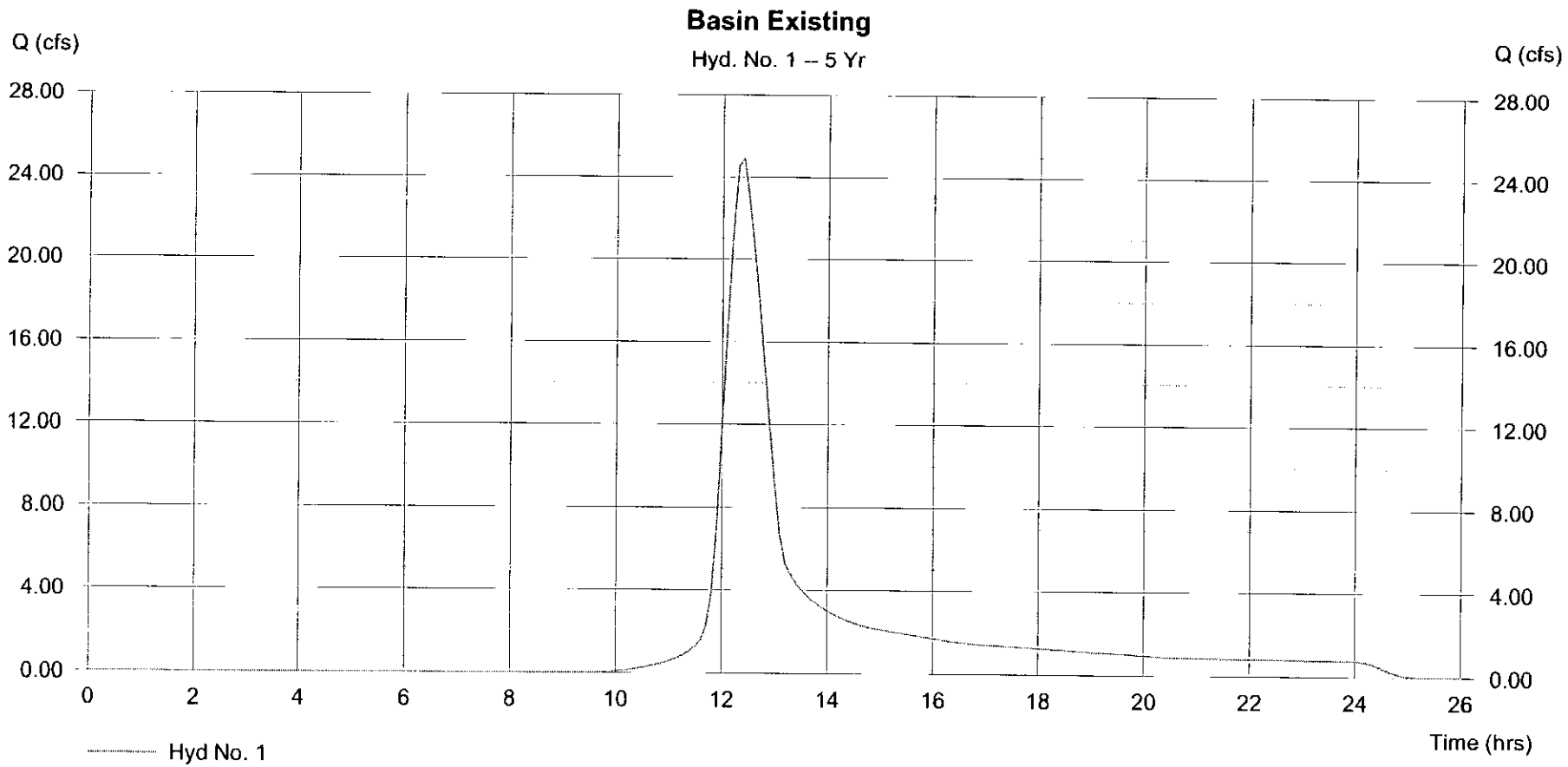
Monday, May 7 2007, 11:30 AM

Hyd. No. 1

Basin Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 24.90 cfs
Storm frequency	= 5 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 74.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 4.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3.260 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

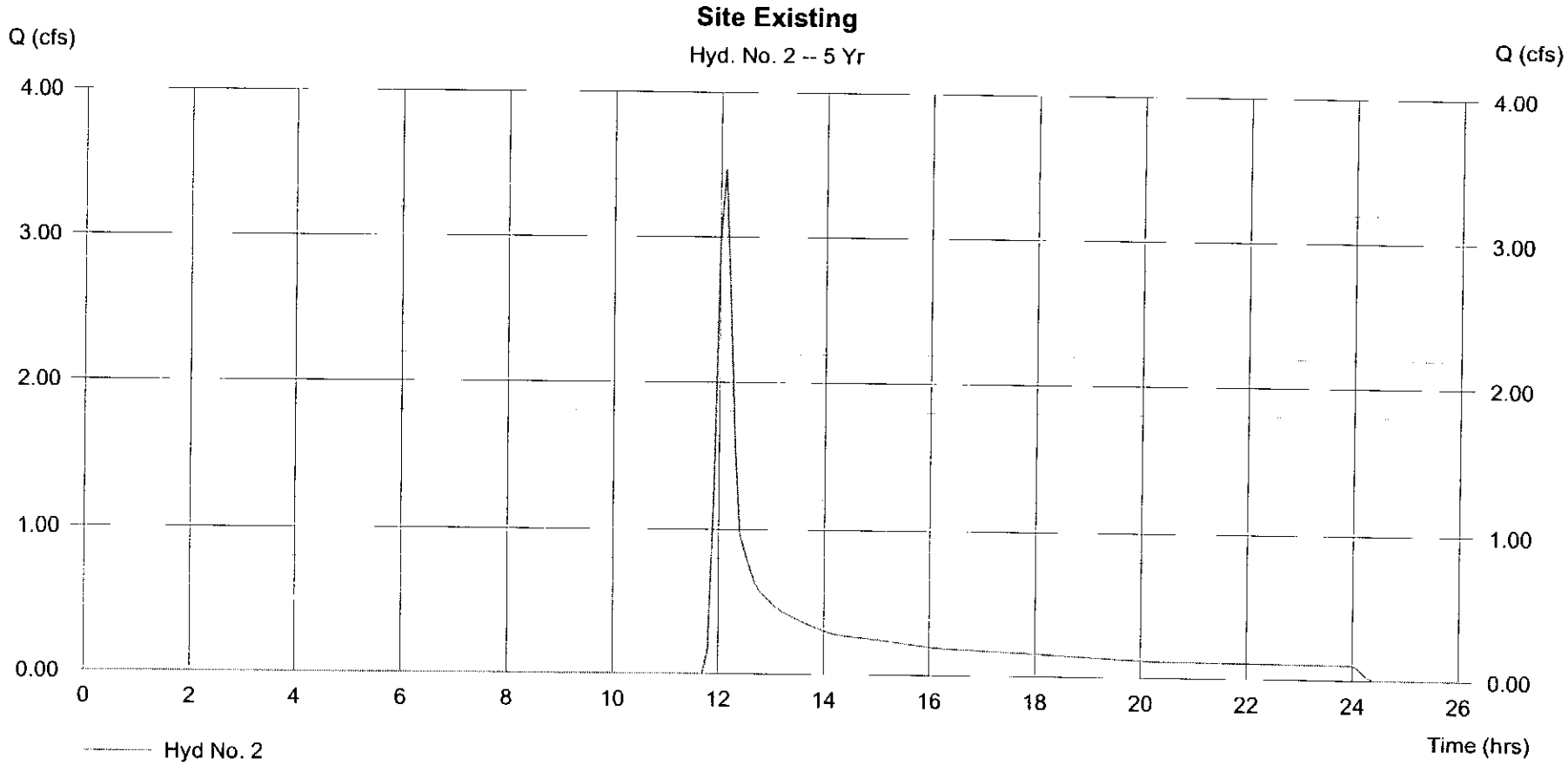
Monday, May 7 2007, 11:30 AM

Hyd. No. 2

Site Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 3.477 cfs
Storm frequency	= 5 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 56.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.20 min
Total precip.	= 4.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 0.304 acft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	32.15	6	744	4.175	----	------	------	Basin Existing
2	SCS Runoff	5.411	6	726	0.439	----	------	------	Site Existing
3	SCS Runoff	40.16	6	738	5.174	----	------	------	Basin Proposed
4	SCS Runoff	20.17	6	720	1.445	----	------	------	Site Proposed
5	Reservoir	3.879	6	744	1.444	4	1339.14	0.695	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

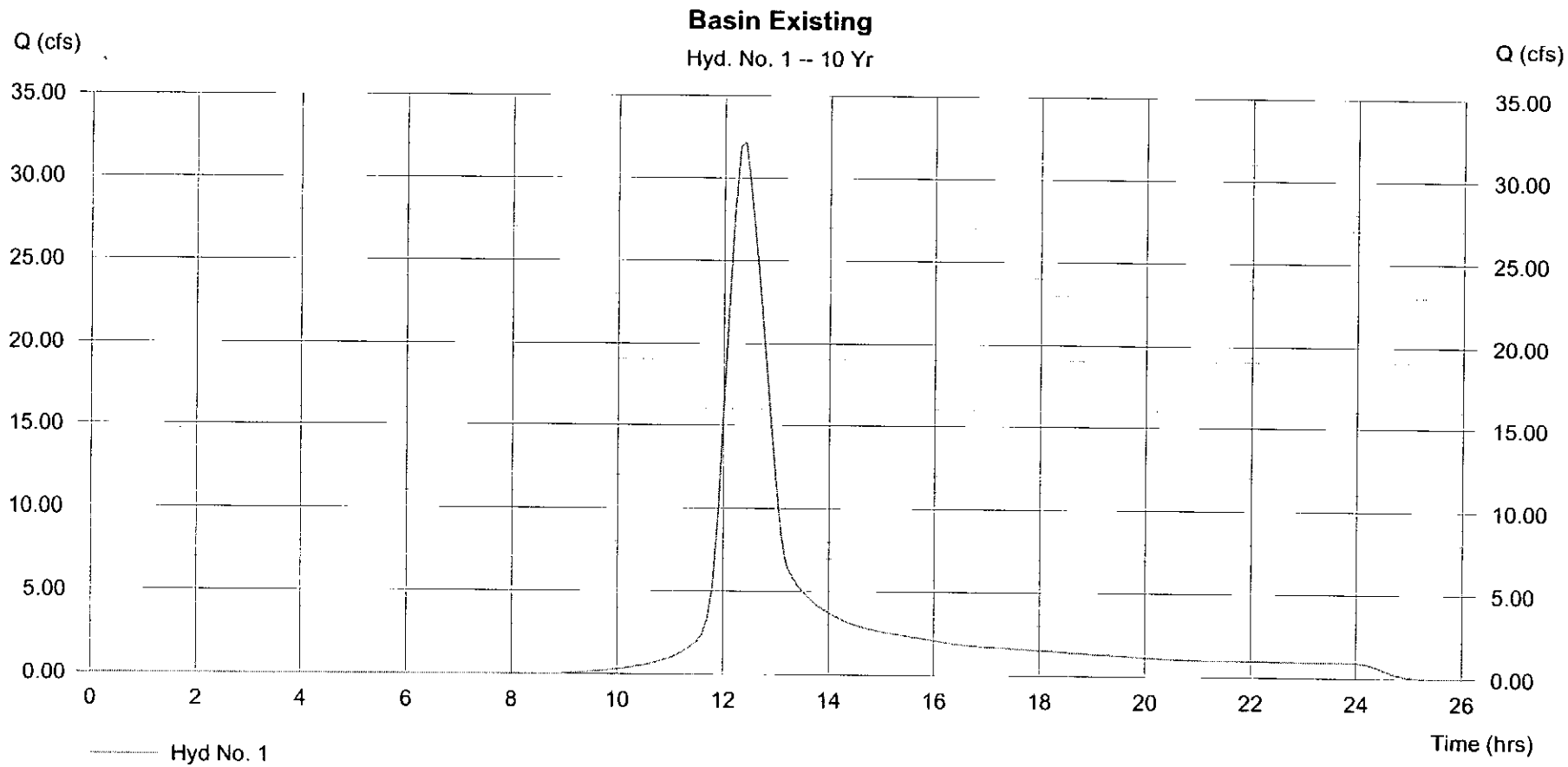
Monday, May 7 2007, 11:31 AM

Hyd. No. 1

Basin Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 32.15 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 74.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4.175 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

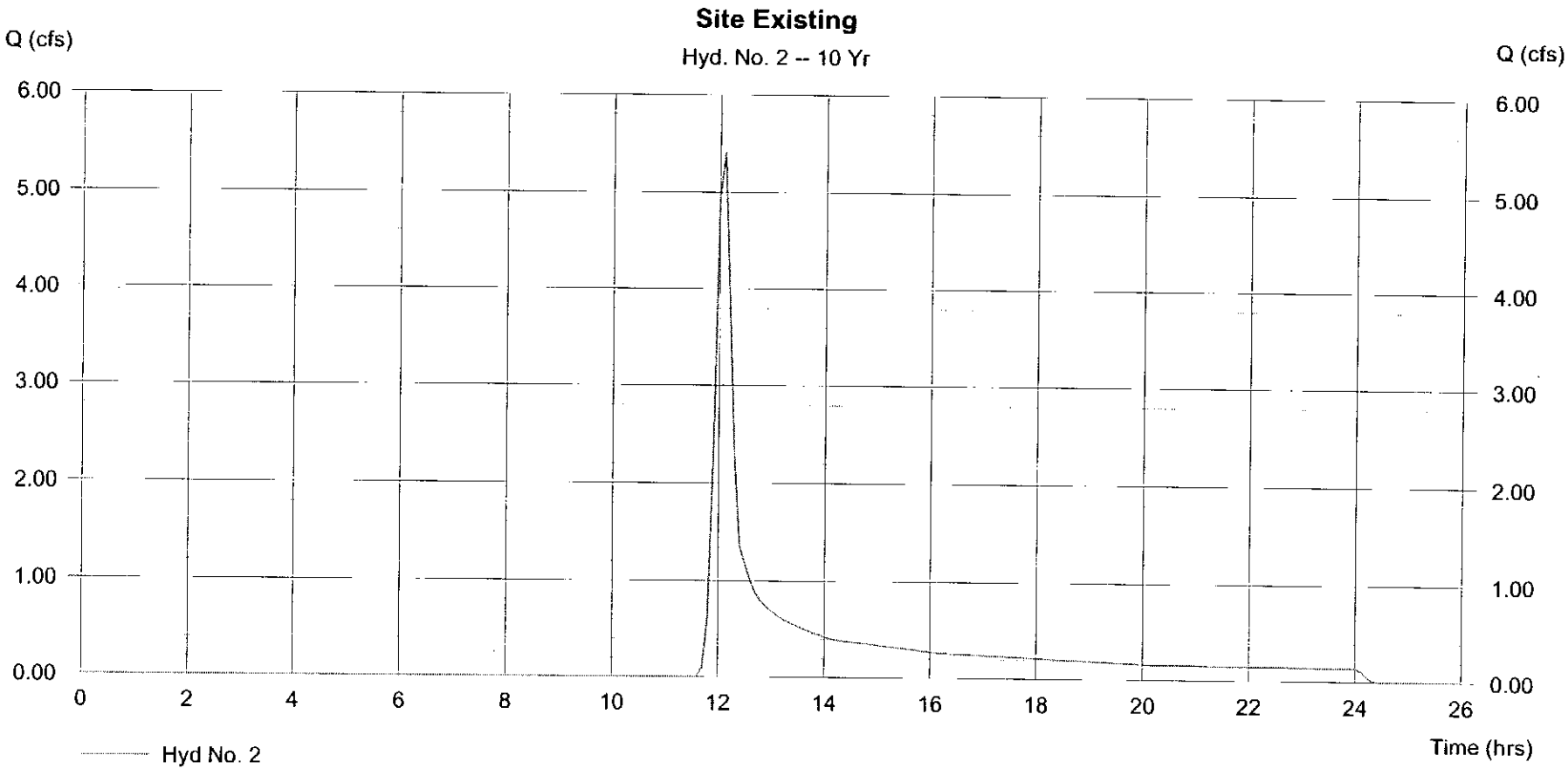
Monday, May 7 2007, 11:31 AM

Hyd. No. 2

Site Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 5.411 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 56.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.20 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 0.439 acft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	42.16	6	744	5.451	----	------	------	Basin Existing
2	SCS Runoff	8.275	6	726	0.642	----	------	------	Site Existing
3	SCS Runoff	50.91	6	738	6.559	----	------	------	Basin Proposed
4	SCS Runoff	24.68	6	720	1.783	----	------	------	Site Proposed
5	Reservoir	5.732	6	738	1.783	4	1339.20	0.836	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

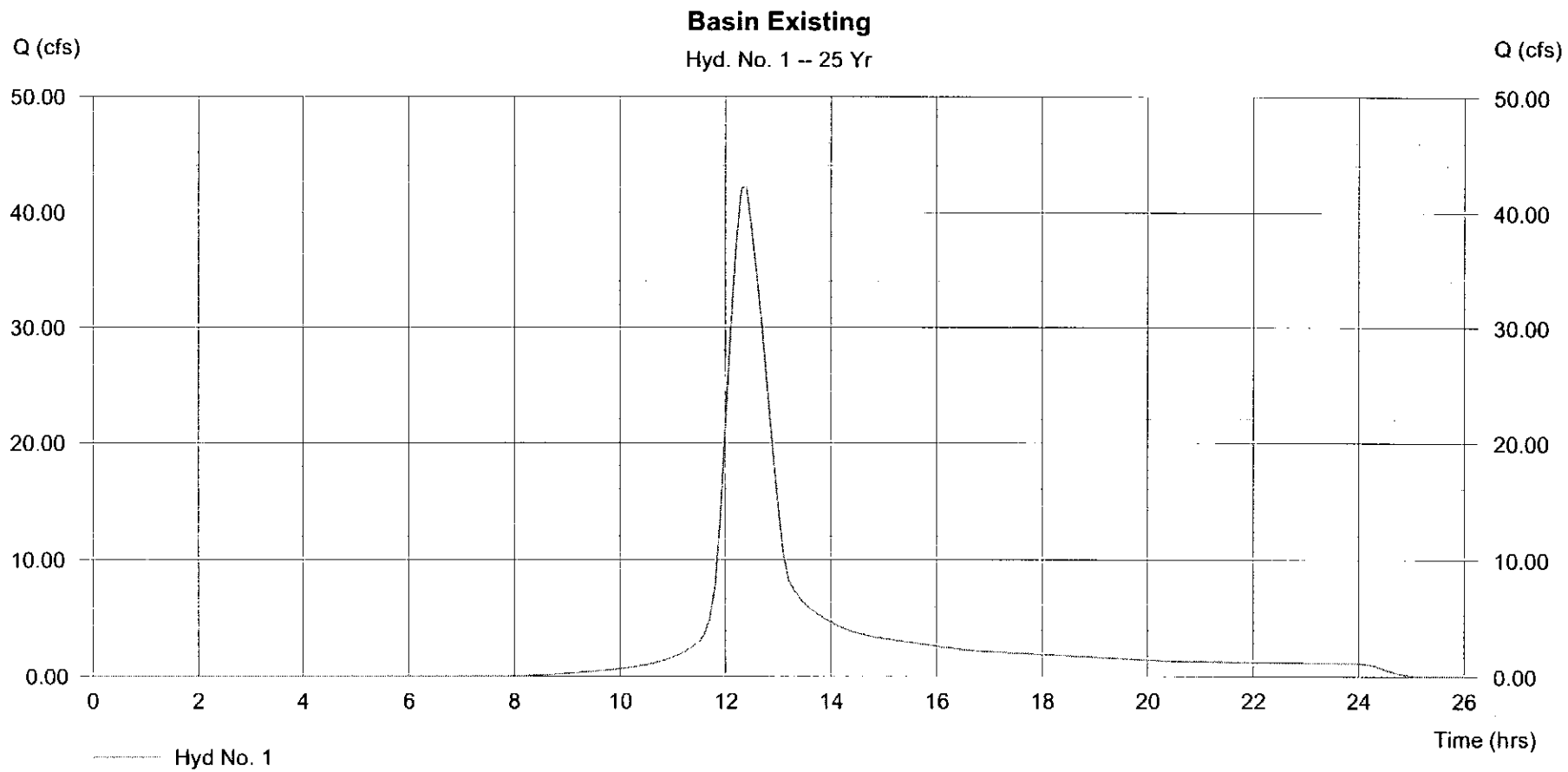
Monday, May 7 2007, 11:31 AM

Hyd. No. 1

Basin Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 42.16 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 74.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 6.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5.451 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

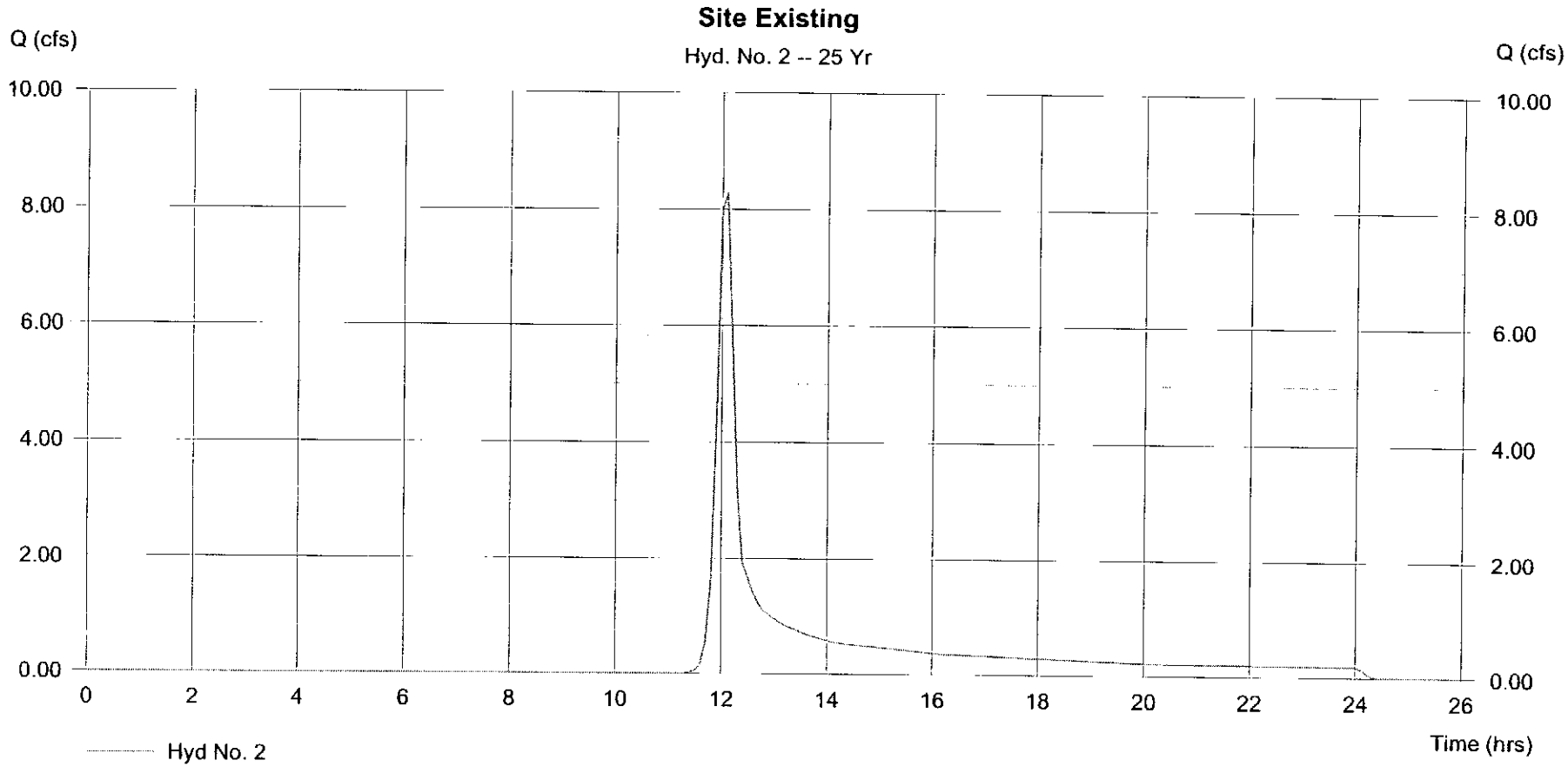
Monday, May 7 2007, 11:31 AM

Hyd. No. 2

Site Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 8.275 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 56.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.20 min
Total precip.	= 6.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 0.642 acft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	57.82	6	738	7.452	----	------	------	Basin Existing
2	SCS Runoff	13.07	6	720	0.985	----	------	------	Site Existing
3	SCS Runoff	67.22	6	738	8.690	----	------	------	Basin Proposed
4	SCS Runoff	31.42	6	720	2.297	----	------	------	Site Proposed
5	Reservoir	8.708	6	738	2.296	4	1339.29	1.046	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

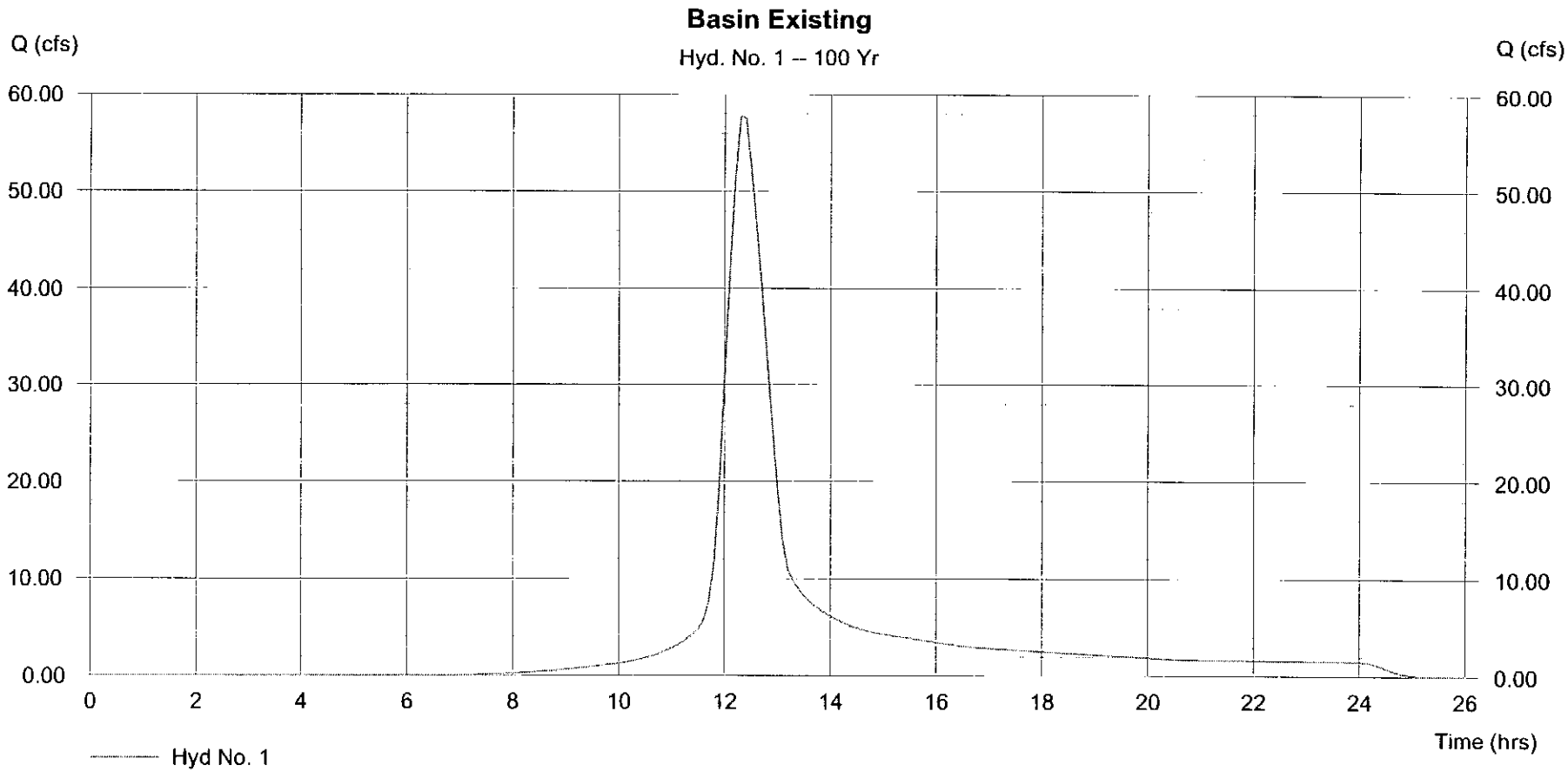
Monday, May 7 2007, 11:32 AM

Hyd. No. 1

Basin Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 57.82 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 74.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 7.68 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 7.452 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

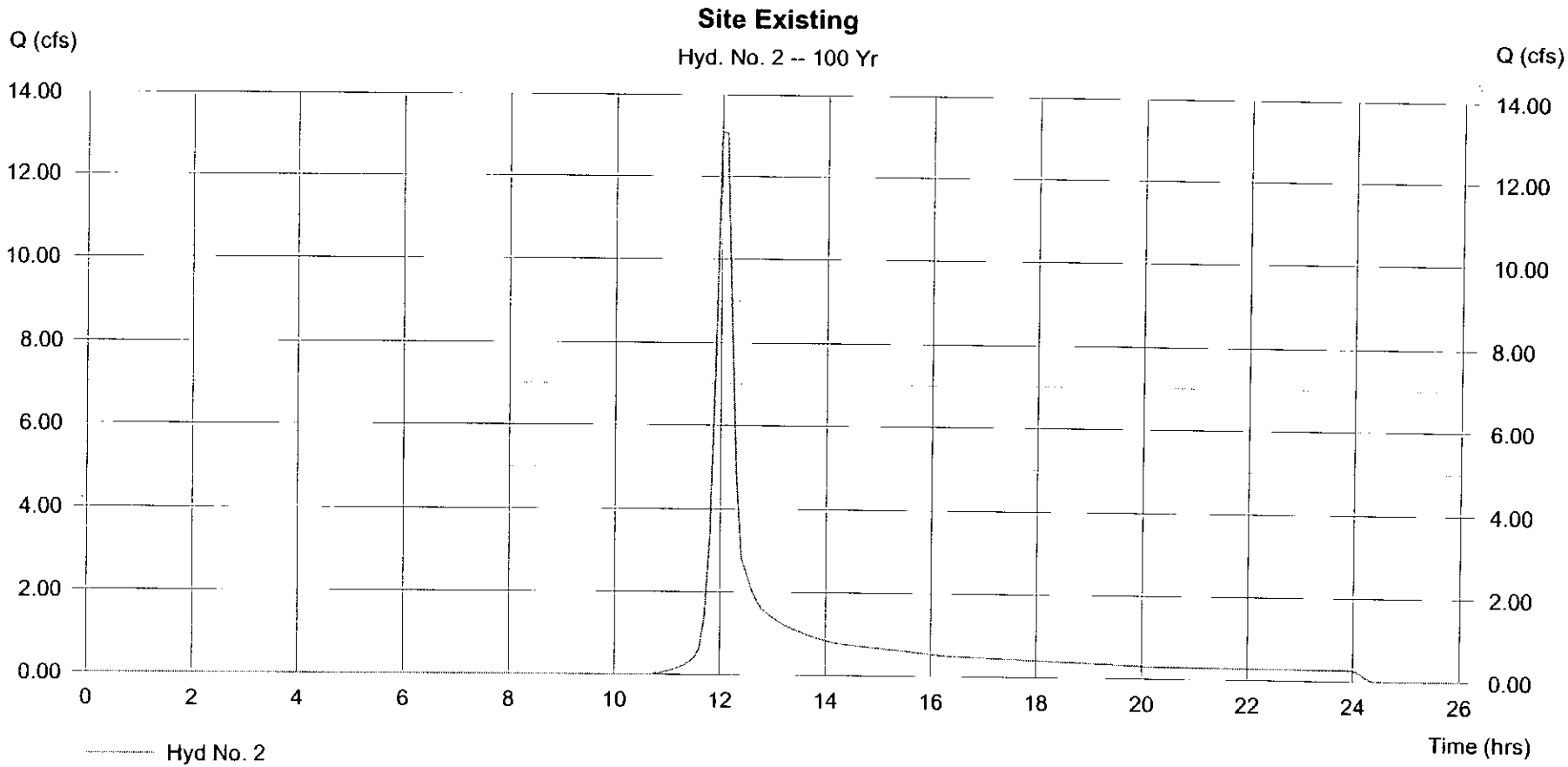
Monday, May 7 2007, 11:32 AM

Hyd. No. 2

Site Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 13.07 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 56.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.20 min
Total precip.	= 7.68 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 0.985 acft



Tab 3. Post-Development Hydrologic Analysis

A. Proposed conditions hydrologic and hydraulic analysis

The analysis was completed using the SCS Hydrograph method. The 2, 5, 10, 25, & 100 year, 24-hour storm events were evaluated. The information appears in Exhibit 3-1. The results are summarized in the following table.

	24-Hour Storm Flows (cfs)				
Area/Frequency	2-Year	5-Year	10-Year	25-Year	100-Year
Basin	22.12	32.22	40.16	50.91	67.22
DA	12.26	16.77	20.17	24.68	31.42

B. Proposed times of concentration used in calculations

Area	T_c (min)
Basin	47.2
DA	15.0

C. Assumed post-developed runoff curve numbers

See table shown in Tab 2, Section O for proposed curve numbers.

D. Proposed contours for detention facilities

Proposed detention areas are shown on the grading plan, Exhibit 1-7. NOT FOUND

E. Preliminary sizing calculations for storm water controls

Sizing for all storm water controls is shown in Exhibit 3-1.

F. Stage-storage-discharge curve and inflow/outflow hydrographs for storage facilities

Storage facility calculations and results are found in Exhibit 3-1.

G. Final analysis of potential upstream/downstream impacts

No relevant impacts are noted from this analysis. Off-site flows do not enter the site. The proposed flows will be less than or equal to the existing flows leaving the site.

H. Existing and proposed structural elevations

No existing structures present on the site. Specific storm sewer networks are outside the scope of this report. However, any future storm sewer designs shall comply with the latest City of Wichita design criteria to convey added site runoff to any proposed on-site detention

areas and through control structures with discharge rates at or below those existing prior to any development. The detention pond design will be modeled as a curbed parking lot with discharge through a 1' wide curb cut (rectangular weir) at an elevation of 1338.45. The proposed minimum pad elevations on the site shall be set at least two feet above the 100-year design water surface elevation of detention facilities for any given drainage area unless a higher base flood elevation exists within the same site. The detention area is shown on the drainage plan, Exhibit 1-7.

I. Design water surface elevations and normal pool elevations for ponds

The detention area shall be designed as dry detention, that being controlled by a one-foot wide rectangular weir at an elevation of 1338.45. Running the 100-year design storm through the outlet weir gives a design-water surface of 1339.29.

J. Typical details for structures

The rectangular weir will be an open curb cut at the lowest curb flow line. The Cipoletti weir will be graded with compacted earth behind the open curb cut and riprap will be placed at the bottom to prevent erosion. Slopes on the side of the Cipoletti weir to existing ground will be a maximum of 4:1 with permanent grass seeding.

K. Proposed limits of clearing and grading

Clearing and grading shall be done throughout the site and will be established upon submittal for building construction.

L. Location of existing and proposed impervious areas

Existing impervious areas are shown on the drainage plan. The proposed areas will be delineated with final construction plans, but will not exceed 72% of the total site area as per design calculations.

M. Location of existing and proposed utilities and easements.

The drainage plan shows the location of existing utilities as stated in Tab 2, Section J. The plat (Exhibit 1-3) shows proposed easements, which will be the location for any future utilities.

N. Location of existing and proposed conveyance systems

Existing conveyance systems are discussed in Tab 2, Section K. Again, specific storm sewer networks are outside the scope of this report. Any future storm sewer designs shall comply with the latest City of Wichita design criteria to convey added site runoff to any proposed on-site detention areas and through control structures with discharge rates at or below those existing rates prior to any development.

O. Preliminary location and dimensions of proposed channel modifications

This development will not require/include any channel modifications.

P. Preliminary selection and location of storm water controls

Storm water controls will include appropriate curb/drop inlets and pipe networks at locations to be determined as part of the construction plans. When these networks are needed, they will convey the five-year storm event and be routed to detention facilities designed as part of this drainage plan. Other controls will include any pond control structures as discussed above in sections H through J.

Q. Emergency overflow structure's flow path

The emergency overflow for the detention area will route any flows, beyond the 100-year rates, to the proposed Cipoletti weir and is shown on the drainage plan, Exhibit 1-7.

R. Detention facility freeboard

All detention facilities will have a minimum of one foot of freeboard above the design-water surface elevation.

S. The 100-year, 24-hour High Water Line

The HWL for the east detention pond is 1339.29.

T. Lowest opening elevation table

The lowest opening elevation table is shown on the plat, Exhibit 1-3.

U. Storm water management facilities located within a reserve

This site contains no platted reserves.

V. Maintenance responsibility of storm water management facilities

The maintenance of storm water management facilities shall be the responsibility of the owner and shall be transferred to new owner upon the sale of any part thereof.

W. Off-site drainage easements or agreements

No off-site drainage easements or agreements will be required for this development.

NORTHRIDGE INDUSTRIAL THIRD ADDITION

EXHIBIT 3-1

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	15.79	6	744	2.123	----	------	------	Basin Existing
2	SCS Runoff	1.337	6	726	0.154	----	------	------	Site Existing
3	SCS Runoff	22.12	6	744	2.870	----	------	------	Basin Proposed
4	SCS Runoff	12.26	6	720	0.866	----	------	------	Site Proposed
5	Reservoir	1.336	6	762	0.866	4	1338.99	0.434	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

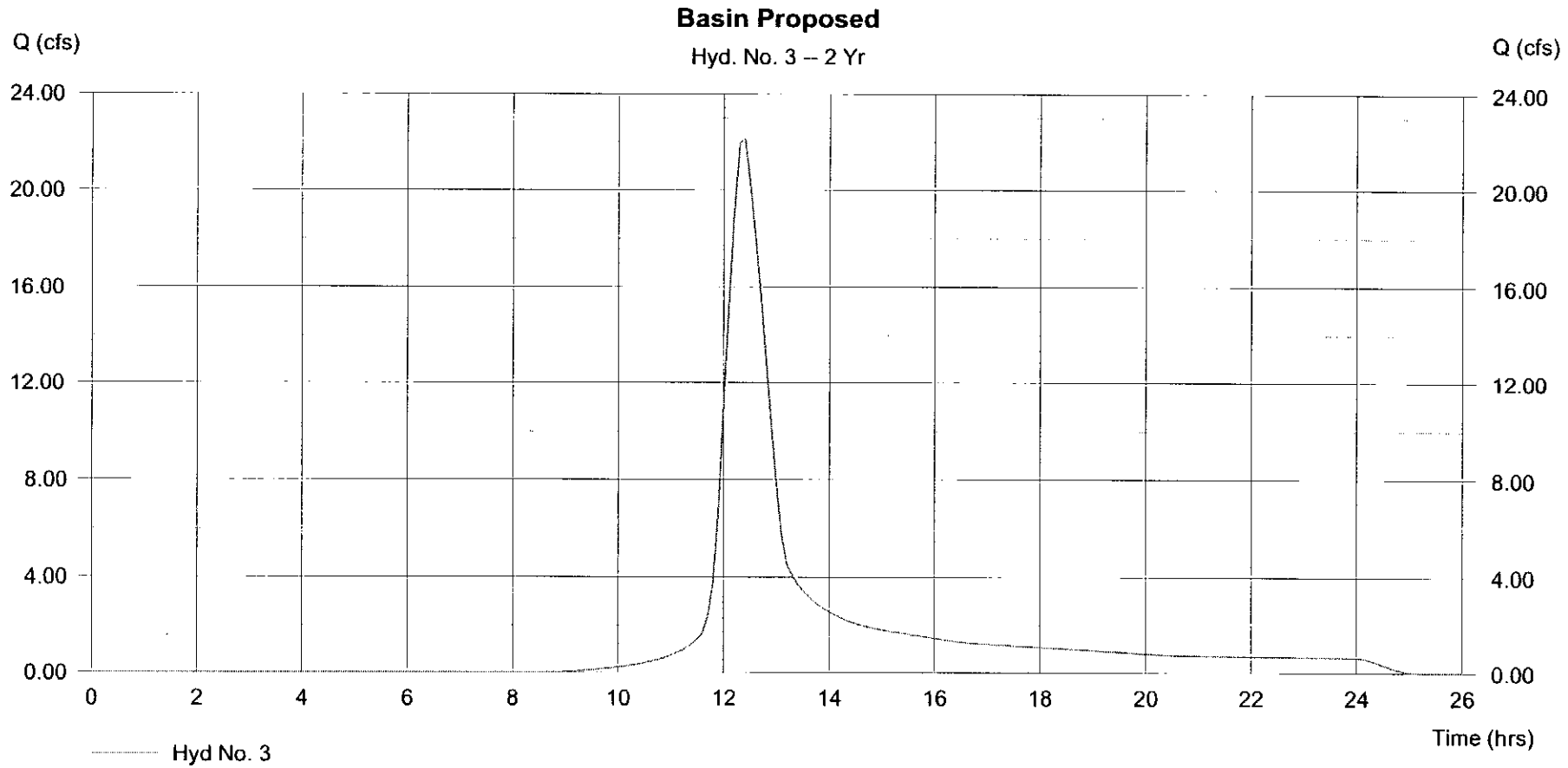
Monday, May 7 2007, 11:36 AM

Hyd. No. 3

Basin Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 22.12 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 81.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2.870 acft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

Basin Proposed

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.60		0.00		0.00		
Land slope (%)	= 0.53		0.00		0.00		
Travel Time (min)	**= 13.14**	**+**	**0.00**	**+**	**0.00**	**=**	**13.14**
Shallow Concentrated Flow							
Flow length (ft)	= 487.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 1.61		0.00		0.00		
Travel Time (min)	**= 5.03**	**+**	**0.00**	**+**	**0.00**	**=**	**5.03**
Channel Flow							
X sectional flow area (sqft)	= 30.00		0.00		0.00		
Wetted perimeter (ft)	= 64.85		0.00		0.00		
Channel slope (%)	= 1.00		0.00		0.00		
Manning's n-value	= 0.100		0.015		0.015		
Velocity (ft/s)	= 0.89		0.00		0.00		
Flow length (ft)	= 1550.0		0.0		0.0		
Travel Time (min)	**= 29.06**	**+**	**0.00**	**+**	**0.00**	**=**	**29.06**

Total Travel Time, Tc ..... **47.20 min**

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

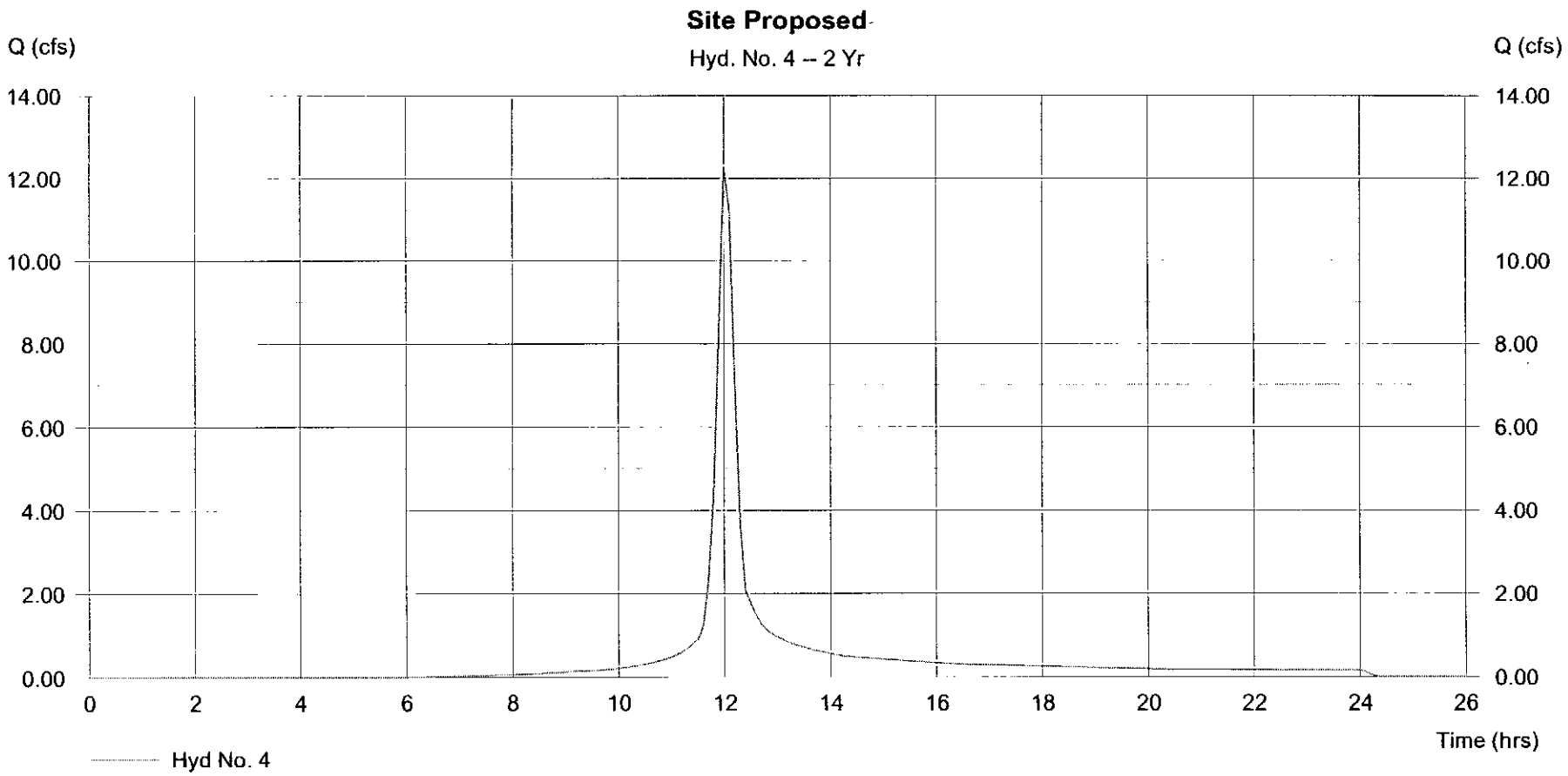
Monday, May 7 2007, 11:36 AM

Hyd. No. 4

Site Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 12.26 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 0.866 acft



TR55 Tc Worksheet

Hyd. No. 4

Site Proposed

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.090		0.011		0.011		
Flow length (ft)	= 200.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.60		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 10.69**	**+**	**0.00**	**+**	**0.00**	**=**	**10.69**
Shallow Concentrated Flow							
Flow length (ft)	= 581.00		0.00		0.00		
Watercourse slope (%)	= 2.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 2.87		0.00		0.00		
Travel Time (min)	**= 3.37**	**+**	**0.00**	**+**	**0.00**	**=**	**3.37**
Channel Flow							
X sectional flow area (sqft)	= 30.00		0.00		0.00		
Wetted perimeter (ft)	= 64.85		0.00		0.00		
Channel slope (%)	= 1.00		0.00		0.00		
Manning's n-value	= 0.100		0.015		0.015		
Velocity (ft/s)	= 0.89		0.00		0.00		
Flow length (ft)	= 50.0		0.0		0.0		
Travel Time (min)	**= 0.94**	**+**	**0.00**	**+**	**0.00**	**=**	**0.94**

Total Travel Time, Tc ..... **15.00 min**

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2007, 11:36 AM

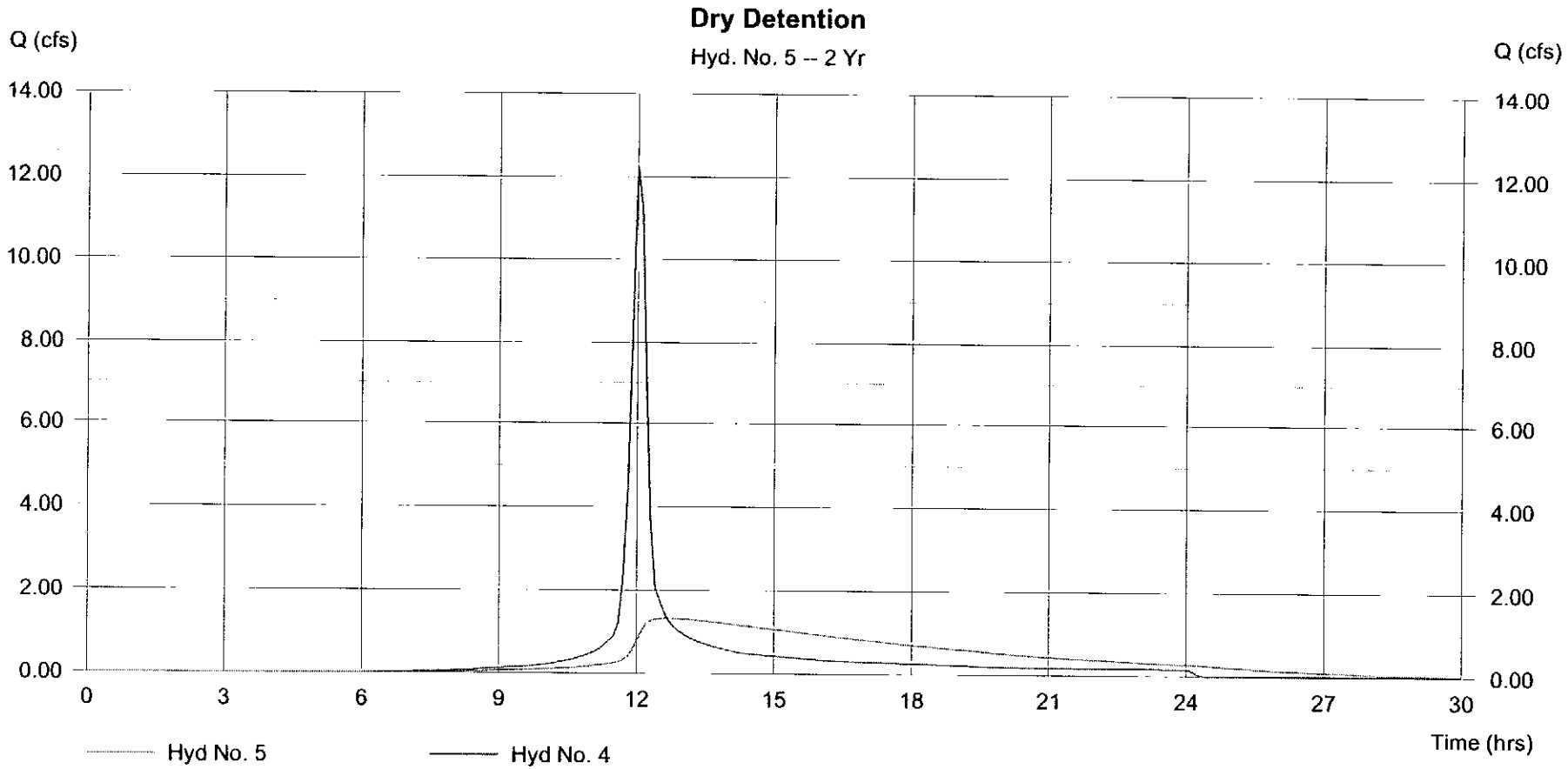
Hyd. No. 5

Dry Detention

Hydrograph type	= Reservoir	Peak discharge	= 1.336 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 4	Max. Elevation	= 1338.99 ft
Reservoir name	= DRY DETENTION	Max. Storage	= 0.434 acft

Storage Indication method used.

Hydrograph Volume = 0.866 acft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	24.90	6	744	3.260	----	------	------	Basin Existing
2	SCS Runoff	3.477	6	726	0.304	----	------	------	Site Existing
3	SCS Runoff	32.22	6	744	4.163	----	------	------	Basin Proposed
4	SCS Runoff	16.77	6	720	1.194	----	------	------	Site Proposed
5	Reservoir	2.581	6	744	1.194	4	1339.08	0.586	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

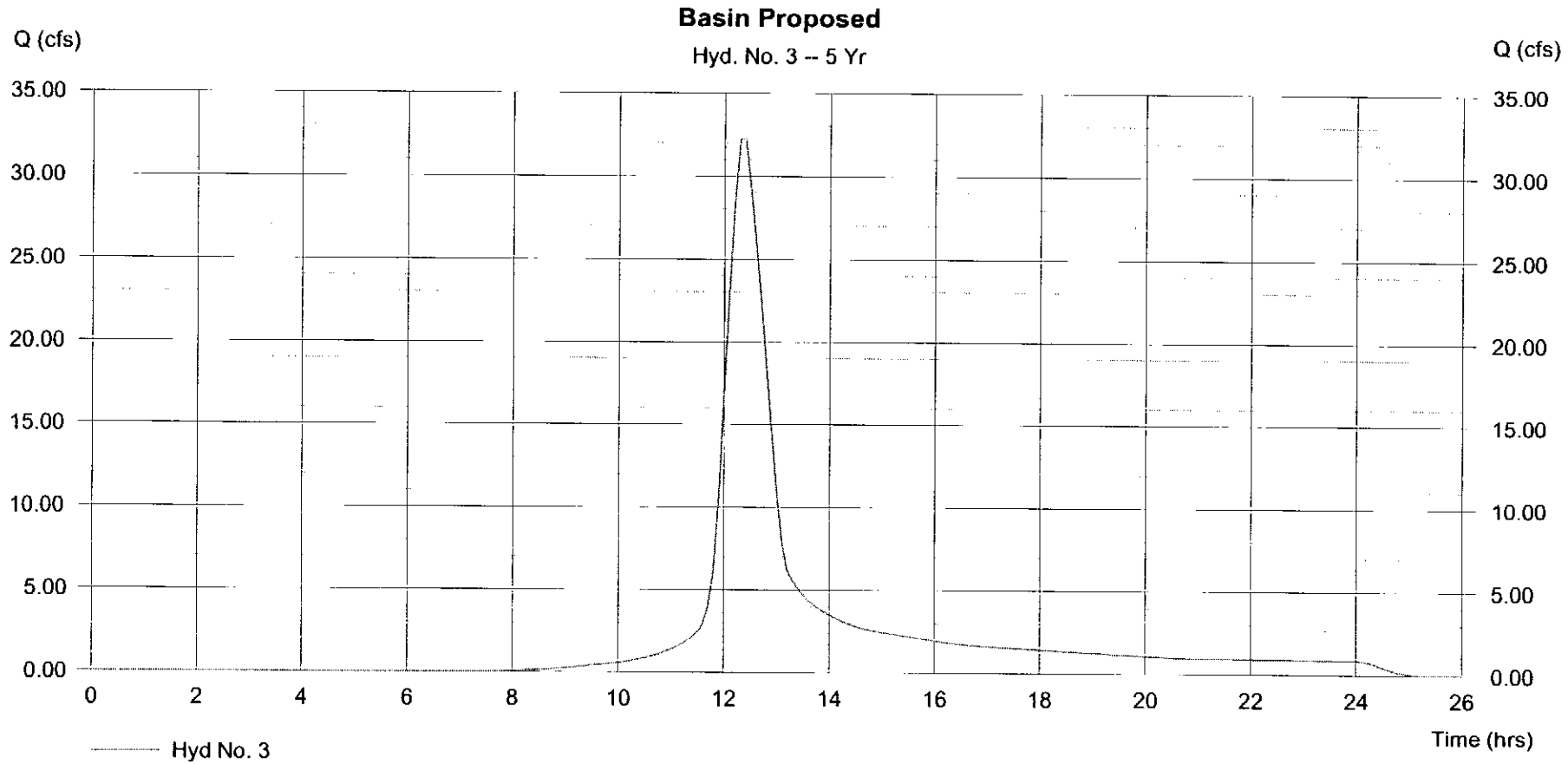
Monday, May 7 2007, 11:37 AM

Hyd. No. 3

Basin Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 32.22 cfs
Storm frequency	= 5 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 81.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 4.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4.163 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

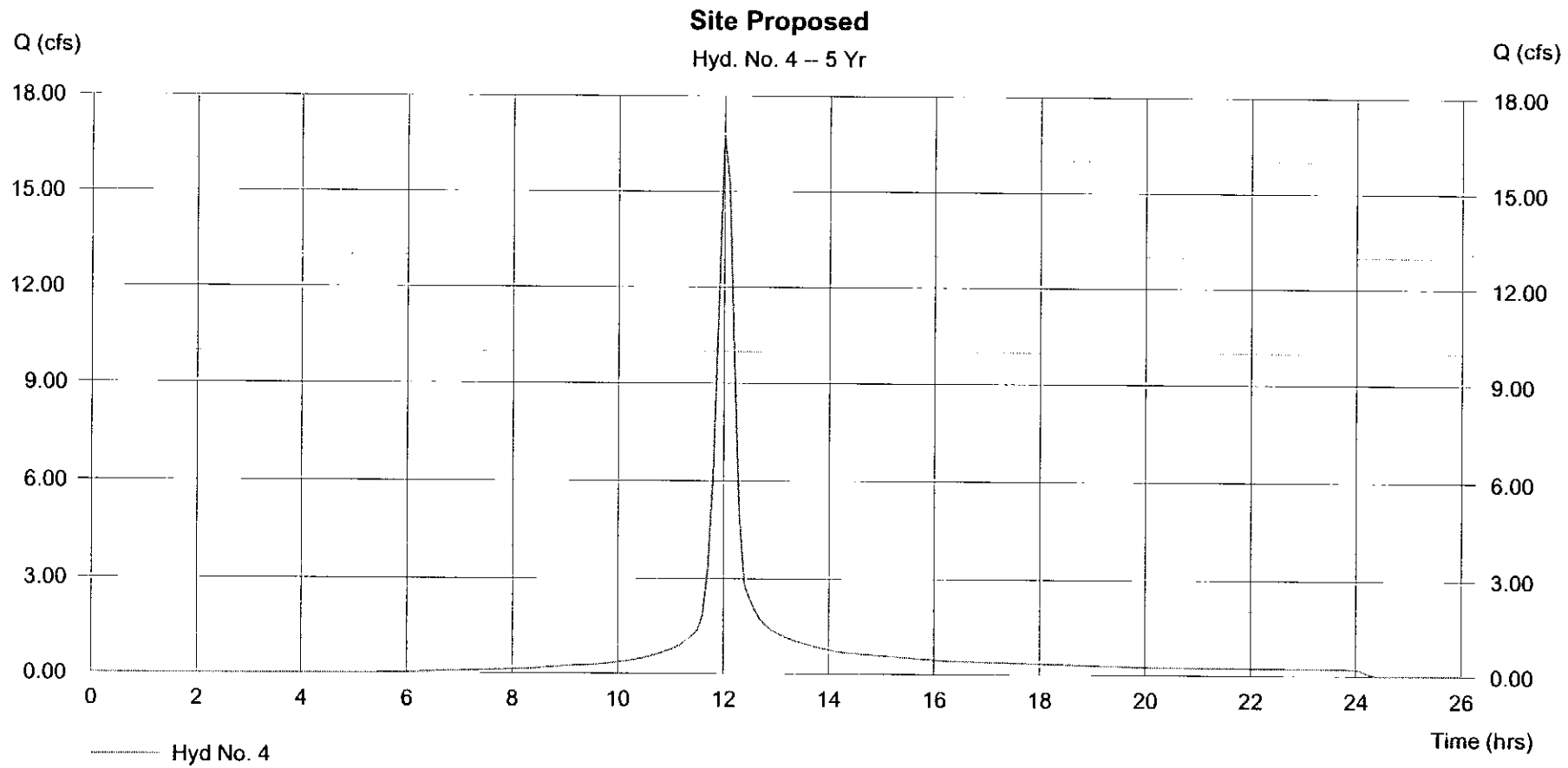
Monday, May 7 2007, 11:37 AM

Hyd. No. 4

Site Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 16.77 cfs
Storm frequency	= 5 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1.194 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2007, 11:37 AM

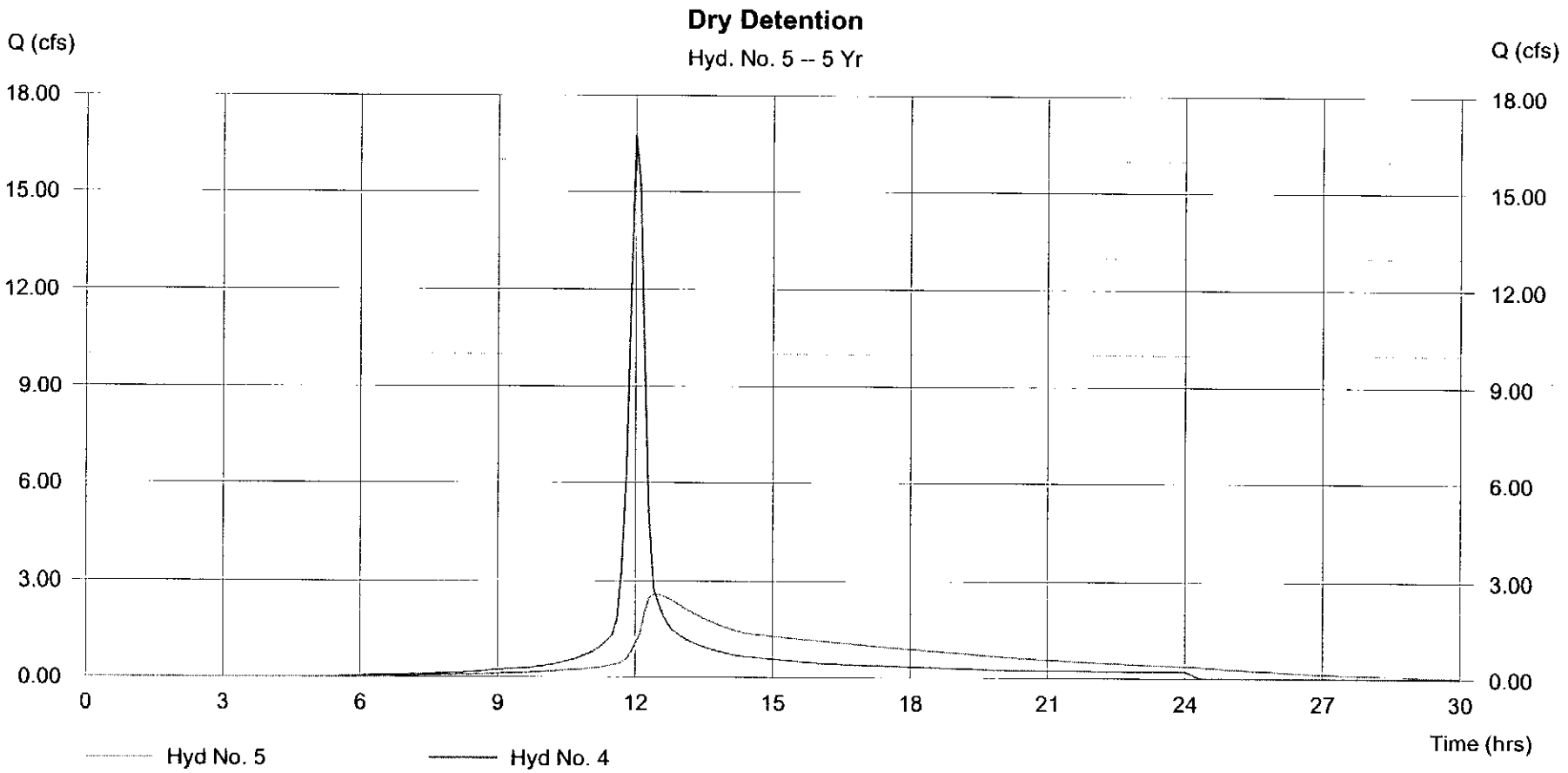
Hyd. No. 5

Dry Detention

Hydrograph type	= Reservoir	Peak discharge	= 2.581 cfs
Storm frequency	= 5 yrs	Time interval	= 6 min
Inflow hyd. No.	= 4	Max. Elevation	= 1339.08 ft
Reservoir name	= DRY DETENTION	Max. Storage	= 0.586 acft

Storage Indication method used.

Hydrograph Volume = 1.194 acft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	32.15	6	744	4.175	----	------	------	Basin Existing
2	SCS Runoff	5.411	6	726	0.439	----	------	------	Site Existing
3	SCS Runoff	40.16	6	738	5.174	----	------	------	Basin Proposed
4	SCS Runoff	20.17	6	720	1.445	----	------	------	Site Proposed
5	Reservoir	3.879	6	744	1.444	4	1339.14	0.695	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

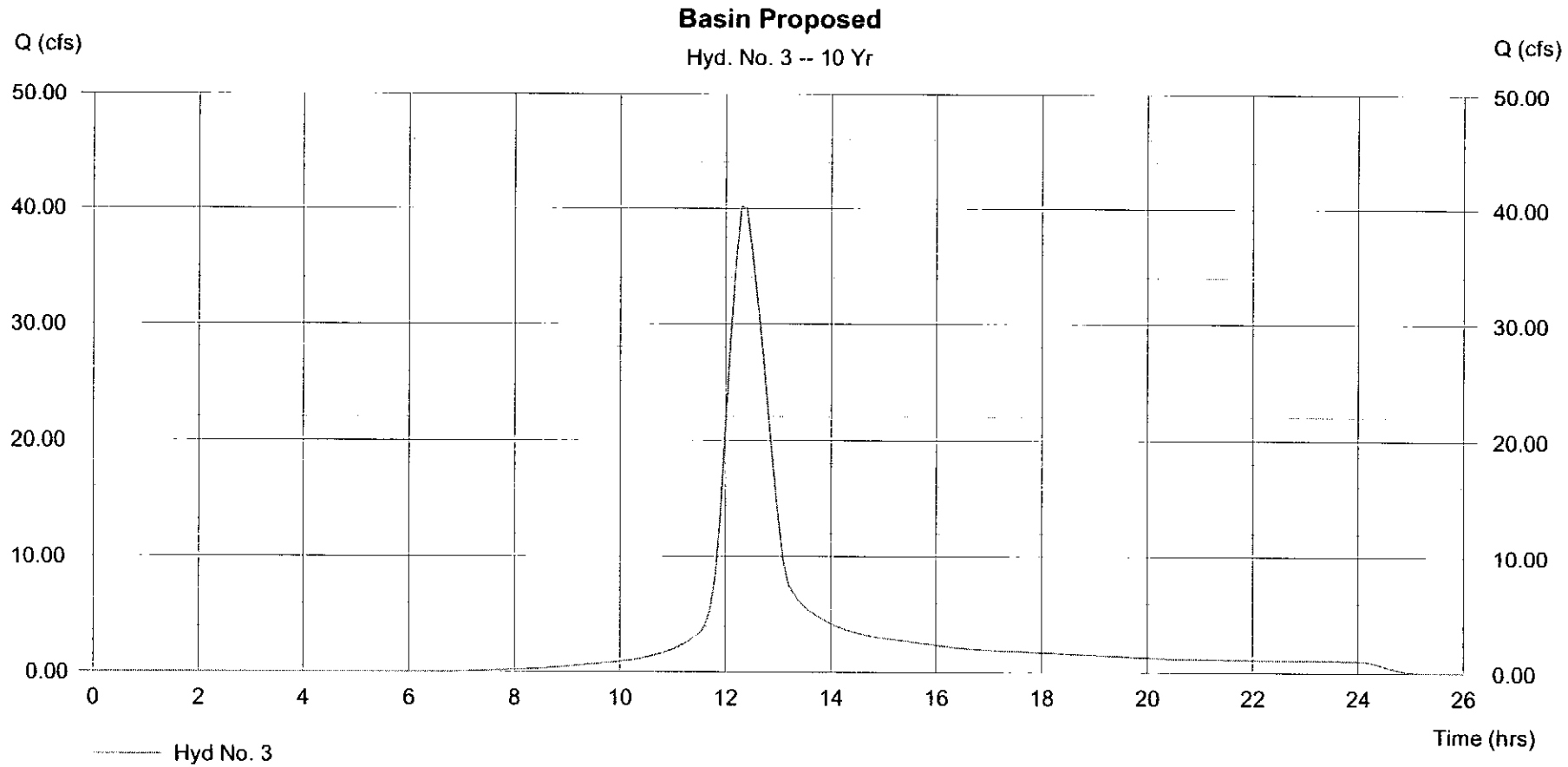
Monday, May 7 2007, 11:38 AM

Hyd. No. 3

Basin Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 40.16 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 81.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5.174 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

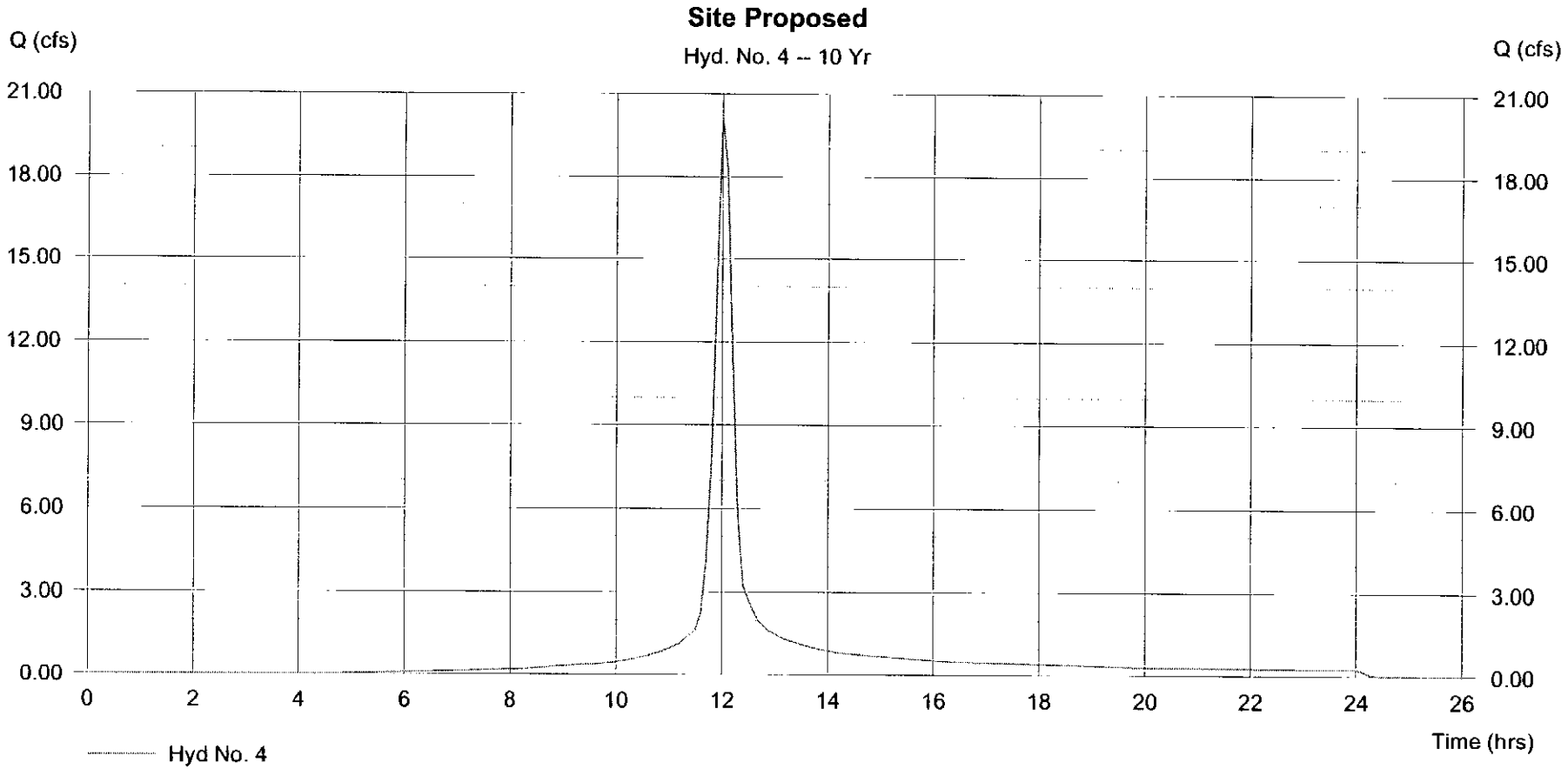
Monday, May 7 2007, 11:38 AM

Hyd. No. 4

Site Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 20.17 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1.445 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2007, 11:38 AM

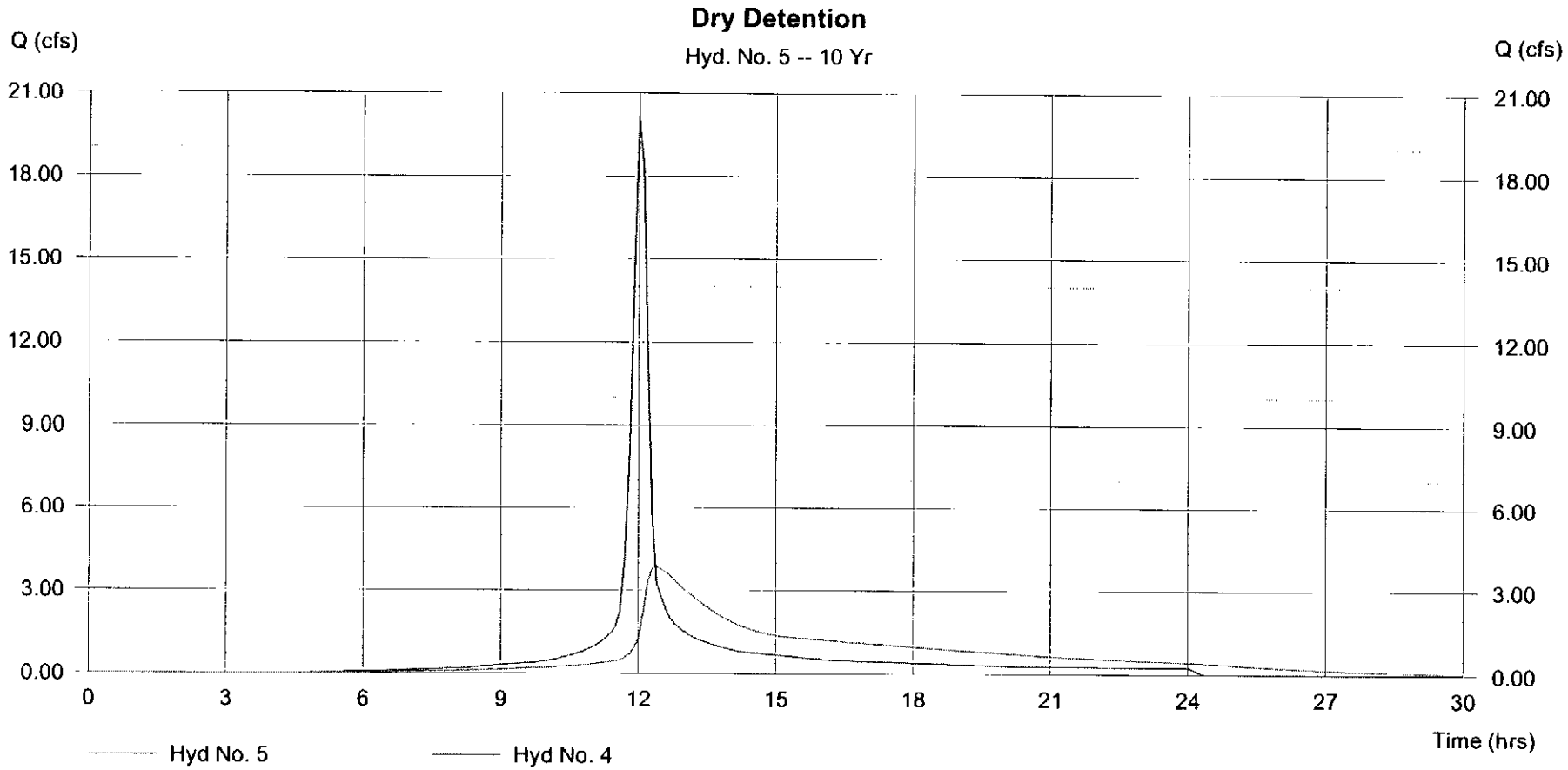
Hyd. No. 5

Dry Detention

Hydrograph type	= Reservoir	Peak discharge	= 3.879 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 4	Max. Elevation	= 1339.14 ft
Reservoir name	= DRY DETENTION	Max. Storage	= 0.695 acft

Storage Indication method used.

Hydrograph Volume = 1.444 acft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	42.16	6	744	5.451	----	------	------	Basin Existing
2	SCS Runoff	8.275	6	726	0.642	----	------	------	Site Existing
3	SCS Runoff	50.91	6	738	6.559	----	------	------	Basin Proposed
4	SCS Runoff	24.68	6	720	1.783	----	------	------	Site Proposed
5	Reservoir	5.732	6	738	1.783	4	1339.20	0.836	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

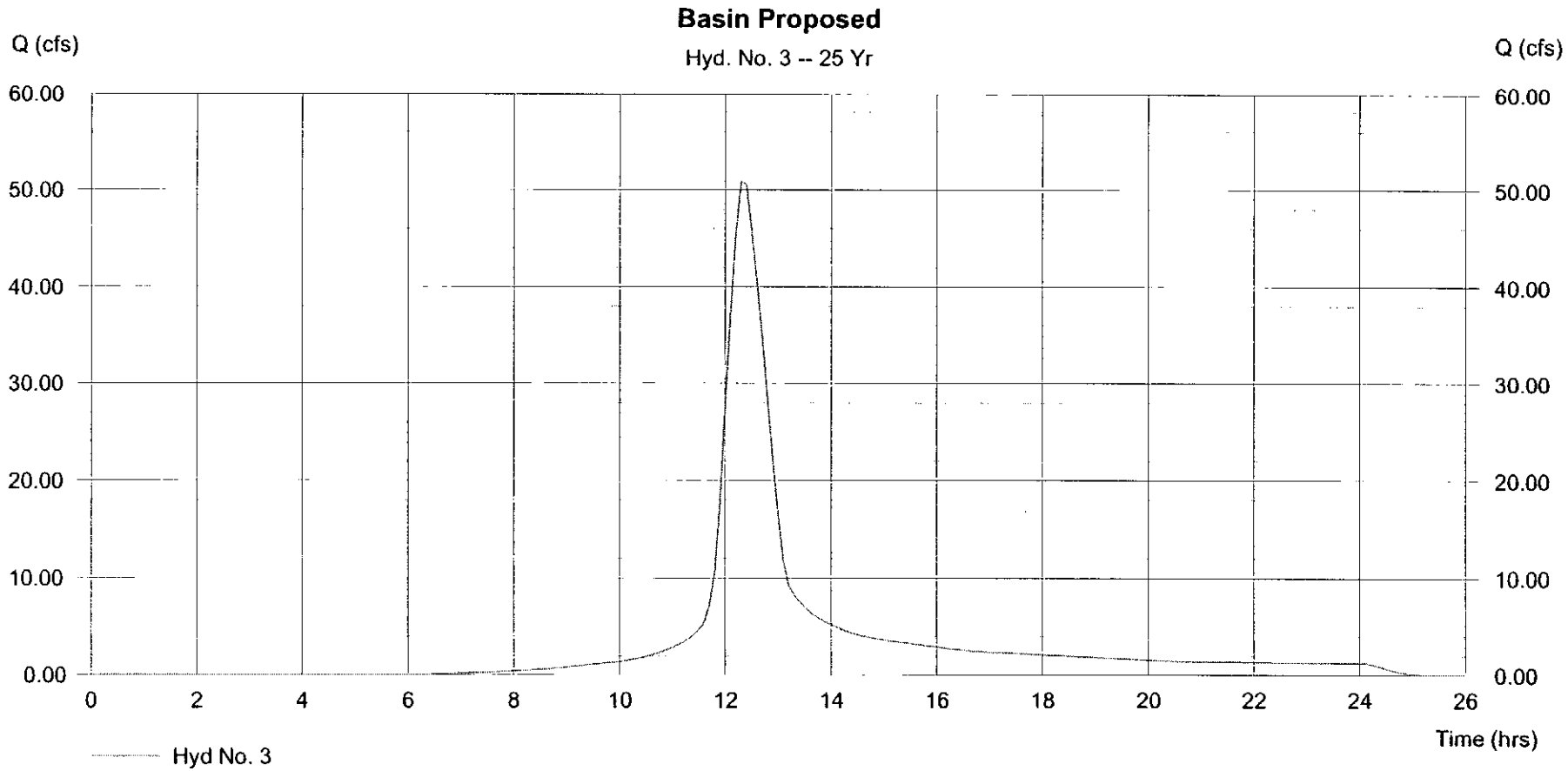
Monday, May 7 2007, 11:39 AM

Hyd. No. 3

Basin Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 50.91 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 81.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 6.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6.559 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

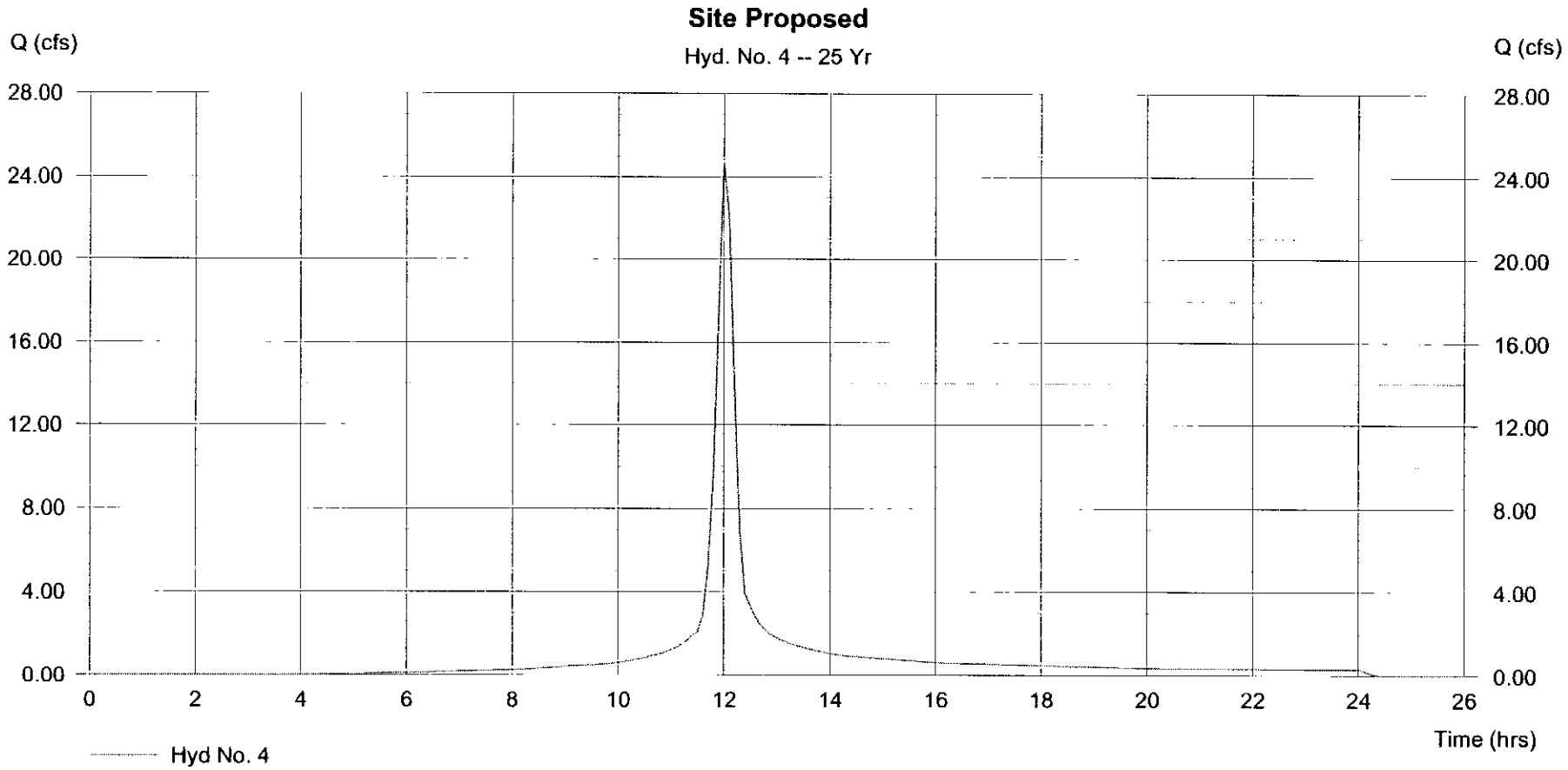
Monday, May 7 2007, 11:39 AM

Hyd. No. 4

Site Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 24.68 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1.783 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2007, 11:39 AM

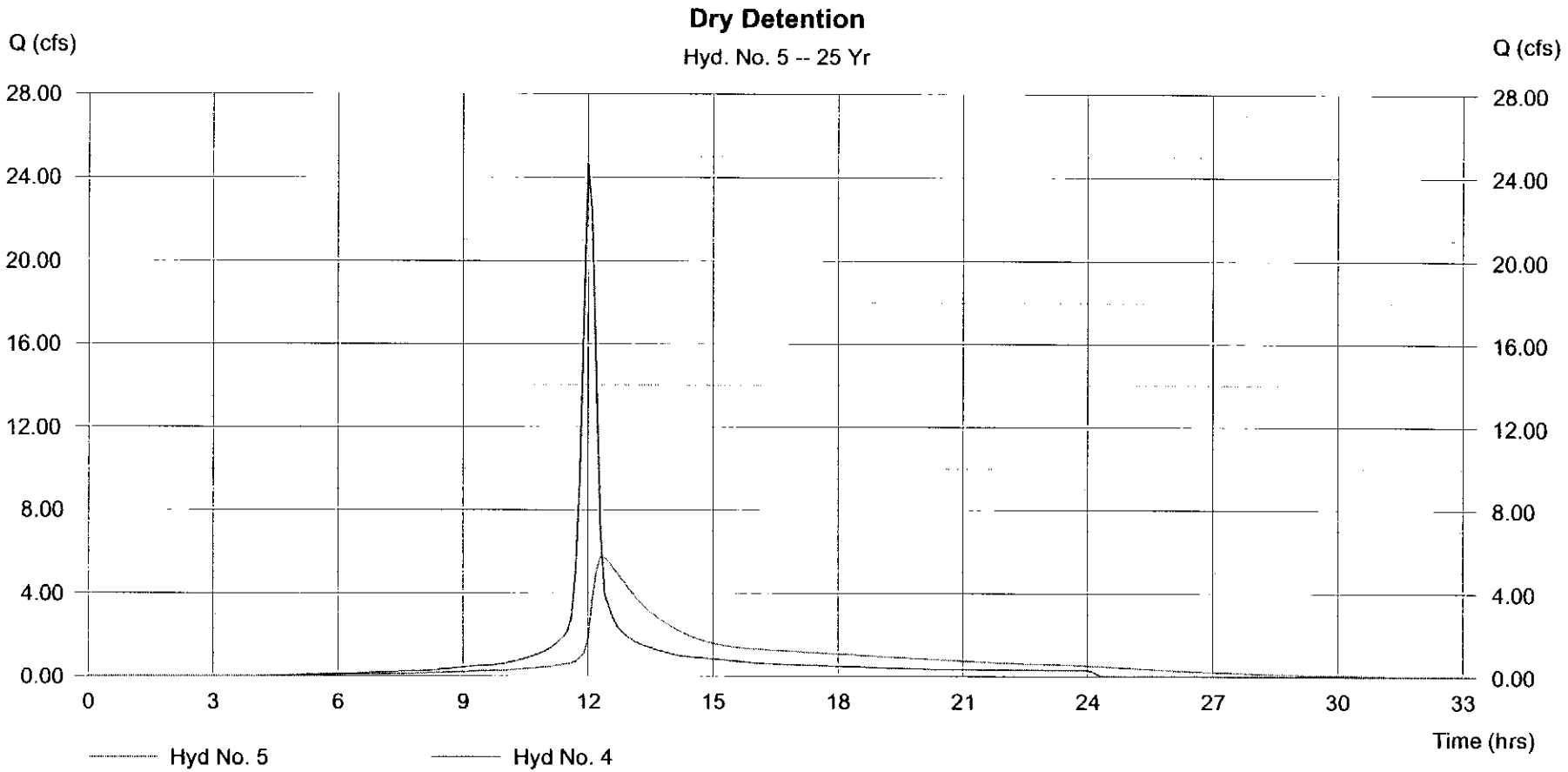
Hyd. No. 5

Dry Detention

Hydrograph type	= Reservoir	Peak discharge	= 5.732 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Inflow hyd. No.	= 4	Max. Elevation	= 1339.20 ft
Reservoir name	= DRY DETENTION	Max. Storage	= 0.836 acft

Storage Indication method used.

Hydrograph Volume = 1.783 acft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	57.82	6	738	7.452	----	------	------	Basin Existing
2	SCS Runoff	13.07	6	720	0.985	----	------	------	Site Existing
3	SCS Runoff	67.22	6	738	8.690	----	------	------	Basin Proposed
4	SCS Runoff	31.42	6	720	2.297	----	------	------	Site Proposed
5	Reservoir	8.708	6	738	2.296	4	1339.29	1.046	Dry Detention

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

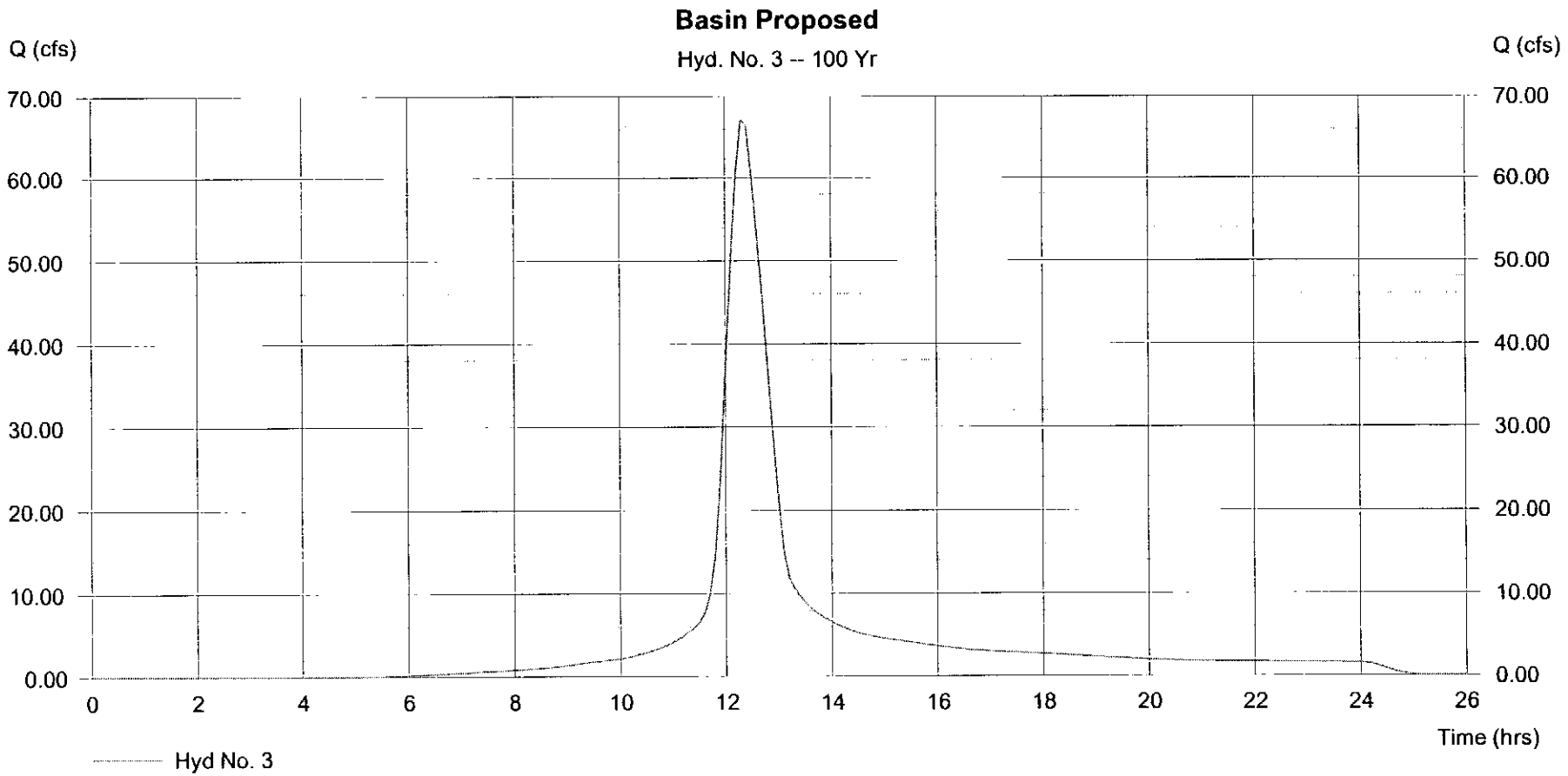
Monday, May 7 2007, 11:39 AM

Hyd. No. 3

Basin Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 67.22 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 19.574 ac	Curve number	= 81.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 47.20 min
Total precip.	= 7.68 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8.690 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

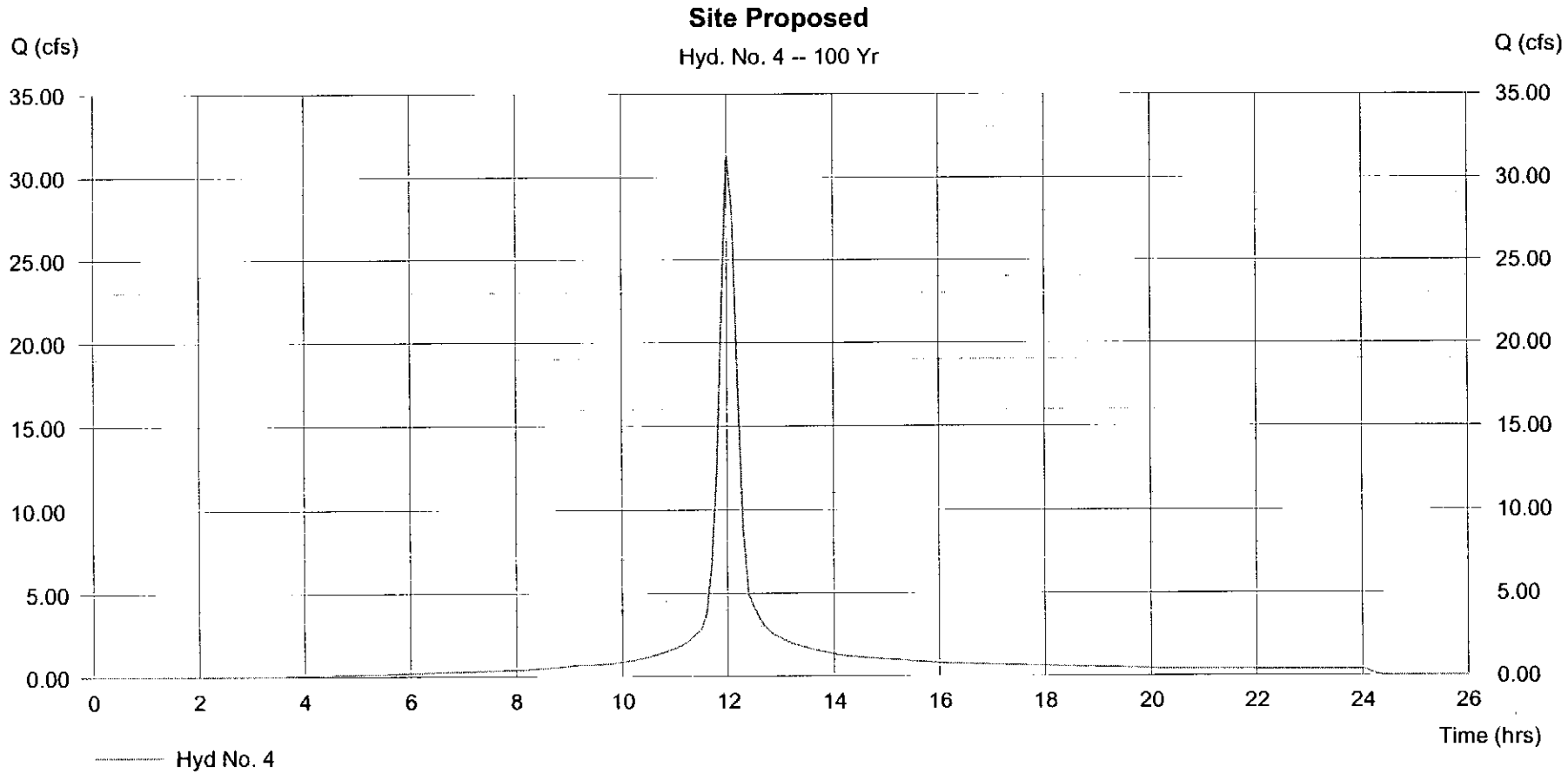
Monday, May 7 2007, 11:39 AM

Hyd. No. 4

Site Proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 31.42 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 4.699 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.68 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2.297 acft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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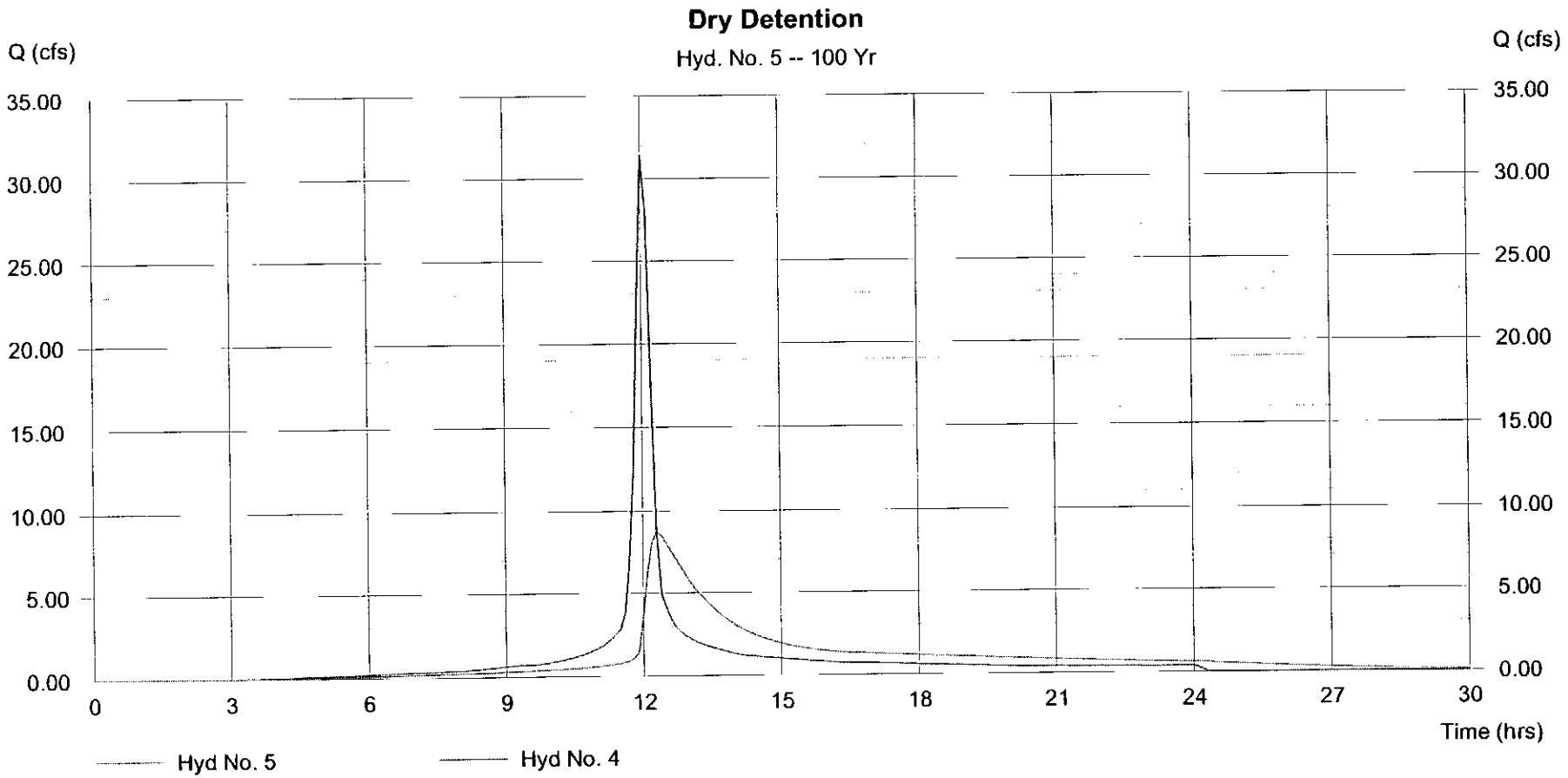
Hyd. No. 5

Dry Detention

Hydrograph type	= Reservoir	Peak discharge	= 8.708 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 4	Max. Elevation	= 1339.29 ft
Reservoir name	= DRY DETENTION	Max. Storage	= 1.046 acft

Storage Indication method used.

Hydrograph Volume = 2.296 acft



Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2007, 11:43 AM

Pond No. 1 - DRY DETENTION

Pond Data

Bottom LxW = 1240.0 x 0.0 ft = 1.55 ft

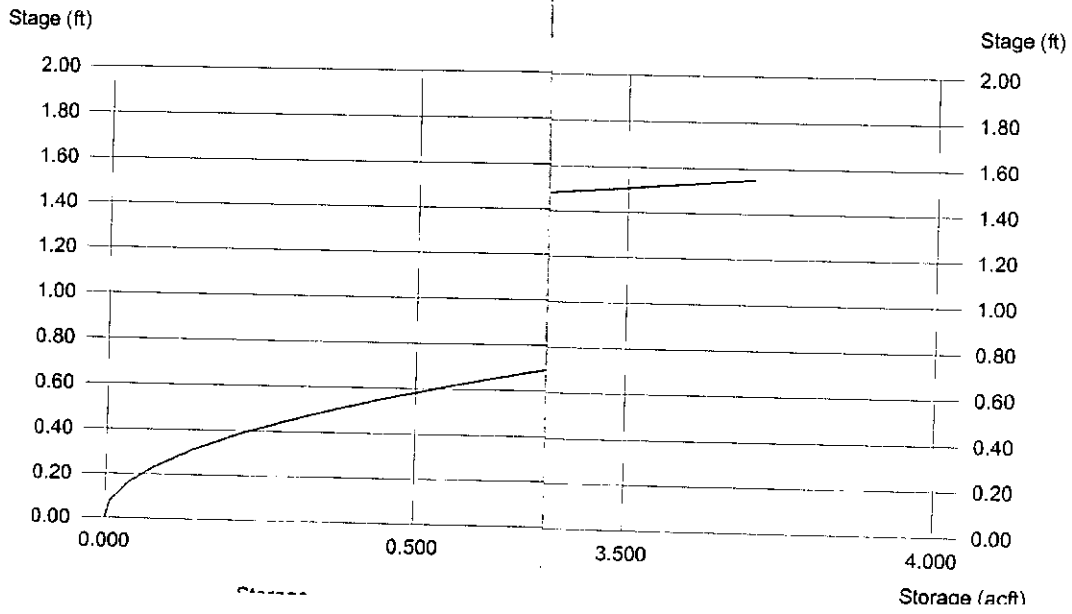
Stage / Storage Table

Stage (ft)	Elevation (ft)
0.00	1338.45
0.08	1338.53
0.16	1338.61
0.23	1338.68
0.31	1338.76
0.39	1338.84
0.47	1338.92
0.54	1338.99
0.62	1339.07
0.70	1339.15
0.77	1339.23
0.85	1339.30
0.93	1339.38
1.01	1339.46
1.09	1339.54
1.16	1339.61
1.24	1339.69
1.32	1339.77
1.40	1339.85
1.47	1339.92
1.55	1340.00

Culvert / Orifice Structures

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

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



Tab 4. Floodplain Submittal

Tab 4. Floodplain Submittal

A. Source of flood profile

The flood profile is not applicable to this development.

B. Nearest base flood elevations

The base flood elevations are show off-site on the drainage plan, Exhibit 1-7.

C. Delineation of pre-developed regulatory floodplain/floodway limits

Limits of pre-developed floodplain/floodway limits are shown off-site on the drainage plan, Exhibit 1-7.

D. Delineation of post-developed regulatory floodplain/floodway limits

The limits of post-developed floodplain/floodway limits are not applicable to this development. The existing regulatory limits will not be changed.

E. Floodplain boundary determination per elevation

Not applicable to this development.

F. Provide source of floodway data table and discharges

Not applicable to this development.

G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies

Not applicable to this development.

H. Provide regulatory floodway and four natural profile models (10, 50, 100, & 500-yr) for existing and future watershed conditions

Not applicable to this development.

I. Location of floodplain/floodway limits and relationship of site to upstream/ downstream properties

Not applicable to this development.

J. Floodplains and floodways located within a Reserve

Not applicable to this development.

Tab 5. Federal, State, and Local Permits

A. US Army Corps of Engineers – Regulatory Program Permits

Not applicable to this development.

B. Kansas Department of Agriculture – Division of Water Resources Permits

Not applicable to this development.

C. Federal Emergency Management Agency (FEMA) Letter of Map Changes

Not applicable to this development.

D. Kansas Department of Transportation

Not applicable to this development.

E. Sedgwick County Right-of-Way Permit

Not applicable to this development.