



TRANSMITTAL

TO:	FROM:
Vicky Huang	Trevor Kurth
COMPANY:	DATE:
City of Wichita	3-5-07
ADDRESS:	PROJECT:
7 th Floor City Hall	I-135 Power Center 2 nd Addition
CITY/ STATE:	PROJECT NUMBER:
Wichita, Kansas	

RE:
I-135 Power Center 2nd Addition Drainage & Grading Plan

VIA: DELIVERY

We are sending you ATTACHED UNDER SEPARATE COVER

PLANS PRINTS SHOP DRAWINGS SAMPLES SPECS
 COPY OF LETTER CHANGE ORDER DISK OTHER

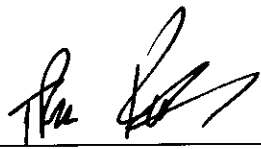
COPIES	DATE	DESCRIPTION
1	3-5-07	I-135 Power Center 2 nd Addition Drainage & Grading Plan

URGENT FOR APPROVAL FOR YOUR INFO FOR REVIEW & COMMENT

APPROVED, AS NOTED REVISE AS NOTED REVISE AND RETURN

AS REQUESTED PLEASE REPLY FOR BIDS DUE

NOTES/ COMMENTS:

SIGNED: 
Trevor R. Kurth, I.E.

Copy: file

ENGINEERING
SURVEYING
PLANNING
LANDSCAPE
ARCHITECTURE

B a u g h m a n
C o m p a n y , P . A .
315 Ellis Street
Wichita, Kansas 67203
P 316.262.7271
F 316.262.0149



DRAINAGE PLAN

I-135 POWER CENTER

2ND ADDITION

TO

WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY



05 MARCH 2007



DRAINAGE PLAN I-135 POWER CENTER 2nd ADDITION

FINAL REPORT

Prepared by Baughman Company, P.A.
05 March 2007

By N. Brent Wooten, P.E.
Trevor R. Kurth, I.E.





**Public Works, Engineering Division
Stormwater Management Subdivision Submittal Checklist**

WICHITA

Reviewer: _____	Date: _____
Subdivision Name: <u>I-135 POWER CENTER 2ND</u>	Location: <u>I-135 & HYDRAULIC AVE</u>
Total Land Area Of Ownership: <u>± 29</u> Acres	
Type: Residential _____ Commercial <u>X</u> Industrial _____ Recreation _____ Municipal _____ Other _____	
Applicant: <u>Cornejo & Sons</u>	Contact: _____ Phone #: _____
Engineer: <u>Baughman Co, PA</u>	Contact: <u>TREVOR KURTH</u> Phone #: <u>262-7271</u>

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

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

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

WICHTER

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

Tab 3. Post-Development Hydrologic Analysis	Applicant			Engr	
	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)	X				
B. Proposed time of concentrations used in calculations	X				
C. Assumed post-developed runoff curve numbers	X				
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)	X				
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	X				
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities	X				
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	X				
H. Dam safety analysis, where necessary		X			
I. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	X				
J. Design water surface elevations and normal pool elevation for ponds.	X				
K. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.	X				
L. Proposed limits of clearing and grading	X				
M. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	X				
N. Location of existing and proposed utilities (e.g., water, sewer) and easements		X	Proposed Ut? on "Utility Plan"		
O. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	X				
P. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	X				



WICHITA

Q. Preliminary selection and location of stormwater controls	<input checked="" type="checkbox"/>				
R. Emergency overflow structure's flow path	<input checked="" type="checkbox"/>				
S. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)	<input checked="" type="checkbox"/>				
T. The 100-year 24-hour HWL delineated on the plan for detention pond	<input checked="" type="checkbox"/>				
U. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds	<input checked="" type="checkbox"/>				
V. Stormwater Management Facilities located within a Reserve	<input checked="" type="checkbox"/>				
W. Maintenance of stormwater management facility specified in the plat as the responsibility of the Homeowner or Business Association	<input checked="" type="checkbox"/>				
X. Off-site drainage easements or agreements required		<input checked="" type="checkbox"/>	None expected		

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

Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	Applicant			Engr	
	I/R	NA	Explanation / Location in Plan	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)		<input checked="" type="checkbox"/>	None expected		
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		<input checked="" type="checkbox"/>			
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) CLOMR shall be included and approved for fill placed in the regulatory floodway		<input checked="" type="checkbox"/>			
D. Kansas Department of Transportation		<input checked="" type="checkbox"/>			
E. Sedgwick County Right-of-way Permit		<input checked="" type="checkbox"/>			

REPORT CONTENTS

Project Narrative

- Existing Conditions
- Proposed Conditions
- Offsite Conditions
- Exhibit 1: Site Location Map
- Exhibit 2: Plat -- Half Scale
- Exhibit 3: Preliminary 4-Lot Corner Grading Plan - Half Scale

Existing Conditions Runoff Calculations

- Drainage Methods & Standards
- Site Characteristics
- Existing Conditions Hydrologic Analysis
- Downstream Drainage Capacity
- Exhibit 4: Aerial Photo Exhibit with Topography

Post-Development Hydrologic Analysis

- Drainage Methods & Standards
- Detention Facilities
- Detention Summary
- Discharge Points Summary
- Potential Upstream/Downstream Impacts
- Exhibit 5: Drainage Plan - Half Scale

Floodplain Submittal

- Source of Floodplain Information
- Exhibit 6: Floodplain Location
- Exhibit 7: Floodway Data Table
- Exhibit 8: Flood Profiles

Federal, State, & Local Permitting

- US Army Corps of Engineers
- Kansas Dept of Agriculture - DWR Permitting
- FEMA
- Kansas Dept of Transportation
- Sedgwick County ROW

Appendices: Supporting Calculations

- Appendix A: USGS Soils Survey
- Appendix B: HydraFlow Hydrographs
- Appendix C: HydraFlow Express

Plan Sheets

- Drainage Plan 1:100 Scale

PROJECT NARRATIVE

EXISTING CONDITIONS

The site is located just northeast of the intersection of I-135 and Hydraulic Avenue. The existing site consists of approximately 28 acres and is currently open space. The space is currently being used as storage for the Cornejo & Sons concrete and asphalt plant. There is a FEMA SFHA to the south of the site due to the Arkansas River. The I-135 roadway separates this site from the FEMA SFHA.

The existing pond will be enlarged and will be included in a drainage easement. The existing pond has no outlet and is not located in an easement or a Reserve. There has been a ditch recently constructed along the south line to convey site runoff, as well as south offsite runoff, to the existing 48" RCP under I-135.

PROPOSED CONDITIONS

The site is proposed to be developed into an asphalt/concrete plant. There will also be 3 commercial lots with frontage to Hydraulic Avenue. The pond will be enlarged to accommodate the site runoff as well as the ditch that will drain to the existing 48" RCP.

The proposed ponds will serve as sedimentation basins as well as storage for storm water runoff. The ponds will be used for drainage purposes only, no recreational purposes are expected. For a half-scale copy of the Plat, see Exhibit 2.

OFFSITE CONDITIONS

The site generally drains to the south east and into an existing 48" RCP. There is also an existing 42" CMP in the I-135 ROW which conveys water to the south.

The 48" RCP headwall is located on the proposed property and drains to the south under I-135. A flapgate has been installed on the outlet of this pipe. The 42" CMP is located near the south corner of the property and is in I-135 ROW. This pipe drains the adjacent south properties as well the majority of the ROW. This pipe also has a flapgate installed on the outlet.

An existing 48" RCP storm sewer system drains properties from the north into the existing pond. This system appears to drain 10+ acres from the north, including street ROW from Industrial Road.

There is a pond adjacent to the site near the northeast corner. This pond appears to be detention for the adjacent properties to the east and west. This pond does not appear to have an outlet and has approximately 10' of freeboard.

There is approximately 4 acres to the north that drains onto this property. The majority of the north property drains to the existing offsite pond.

There is also a 24" HECMP that was installed from the south into the ditch section. The ditch is currently being constructed to help drain this south area which is standing water. This pipe accommodates approximately 3.2 acres of developed property.

There are two (3) locations in which offsite runoff encroaches the property. The following are the points of runoff entry onto the site.

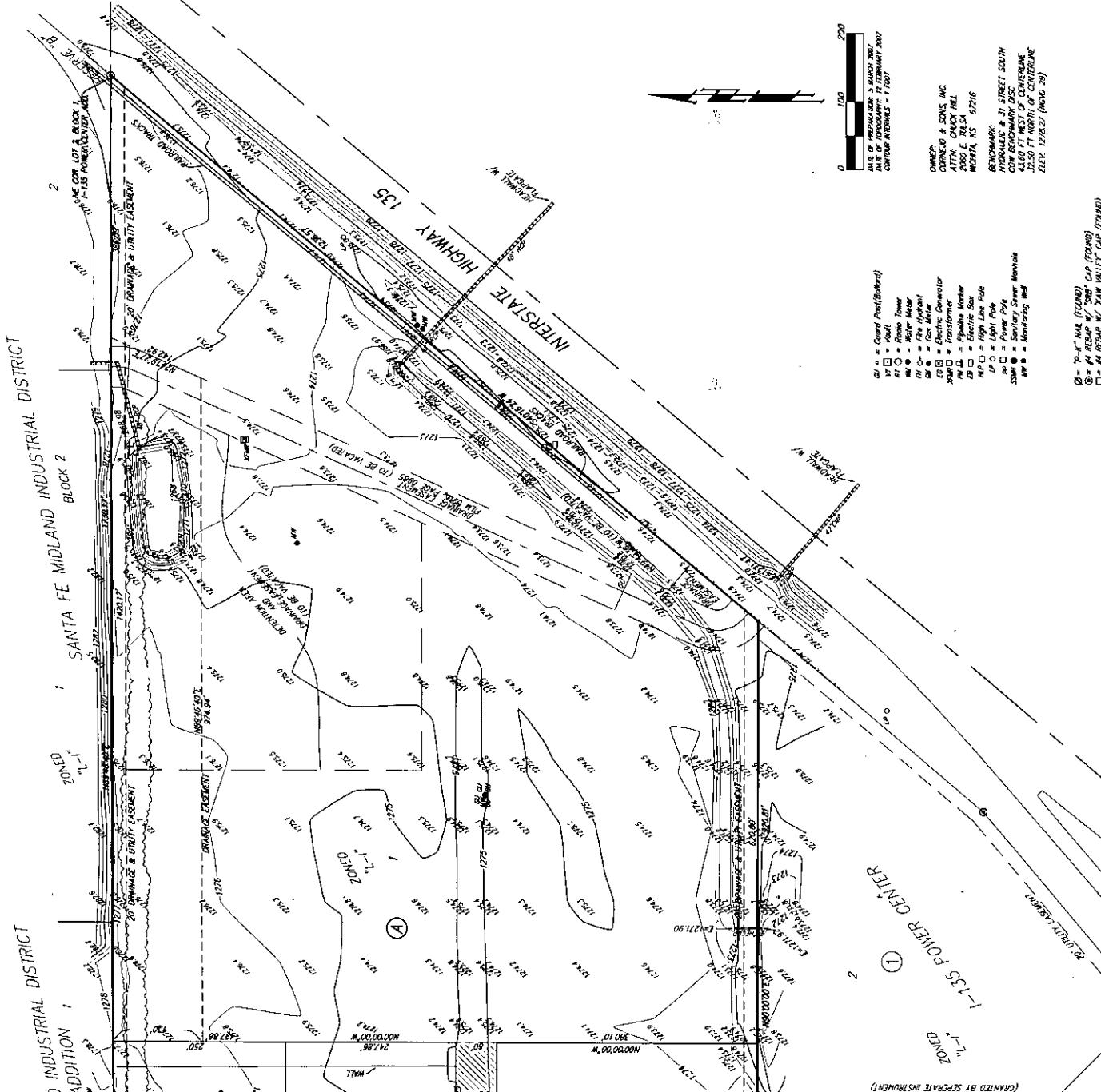
- **North** - There are approximately 4 acres draining onto the north end of the proposed site from the adjacent north property. This runoff is mostly sheet flow.

- **North 48" RCP** – Based on field visits and aerial maps, a true basin delineation was not accomplished for the 48" RCP. Therefore, a maximum capacity was established using 2' of head and the length of the pipe. The 48" drains a large amount of runoff from the north and then discharges into the smaller existing pond.
- **South West** – There are 3.2 acres of offsite runoff that enters the property near the south west corner of the property via a 24" HECMP. This area is accommodated in a recently constructed ditch section and will flow to the existing 48" RCP.

ONE-STEP FINAL PLAT

I-135 POWER CENTER 2ND ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS



State of Kansas) SS We, Baughman Company P.A., Surveyors in Sedgwick County and state do hereby certify that we have surveyed and plotted 7-135 POWER CENTER 2ND ADDITION, Wichita, Sedgwick County, Kansas and that the accompanying plat is a true and correct exhibit of the property surveyed, described as follows: The west 200 feet of Lot 1, Block 1, 1-135 Power Center, an Addition to the City of Wichita, Sedgwick County, Kansas, TOGETHER WITH a portion of Lot 1, in said Block 1 described as beginning at the Southwest corner of said Lot 1; thence N 89° 46' 40" E, along the South line of said Lot 1, 200.00 feet; thence S 00° 00' 00" W, parallel with the West line of said Lot 1, 200.00 feet; thence S 80° 00' 00" W, parallel with the North line of Lot 1, in said Block 1; thence S 80° 00' 00" W, parallel with the North line of said Lot 1, 200.00 feet to a point on the West line of said Lot 2; thence N 00° 00' 00" W, along the West line of said Lot 2, 388.79 feet to the point of beginning. Subject to all utility easements and reservations, if any now of record. TOGETHER WITH Part of Lot 1 and part of Lot 2, Block 1, 1-135 Power Center, an Addition to the City of Wichita, Sedgwick County, Kansas, described as beginning at the Northwest corner of said Lot 1; thence S 89° 46' 40" W, along the North line of said Lots 1 and 2, 1520.17 feet to a point 200 feet east of the Northwest corner of said Lot 1; thence S 00° 00' 00" W, parallel with the West line of said Lots 1 and 2, 937.57 feet to a point 130 feet north of the North line of Lot 1, in the said Block 1; thence N 90° 00' 00" E, 720.81 feet to a point on the Eastern line of said Lot 2; thence N 40° 16' 24" E, 1236.57 feet to the point of beginning. Subject to all easements, restrictions and reservations, if any now of record. Existing public easements and dedications being vacated by virtue of K.S.A. 12-512(b).

Baughman Company P.A.

Michael G. Conroy, Surveyor

This plat of 7-135 POWER CENTER 2ND ADDITION, Wichita, Sedgwick County, Kansas has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas, on this _____ day of _____, 2007. Wichita-Sedgwick County Metropolitan Area Planning Commission

Darrell A. Downing, Chair

John L. Schlegel, Secretary

This plat approved and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this _____ day of _____, 2007.

Carlos Moyens, Mayor

Karen Sublett, City Clerk

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

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

Entered on transfer record this _____ day of _____, 2007.

Don Brace, County Clerk

Know all men by these presents that we, the undersigned, have caused the land in the surveyors certificate to be platted into Lots, Block, and Street, to be known as 7-135 POWER CENTER 2ND ADDITION, Wichita, Sedgwick County, Kansas. The utility easements are hereby granted as indicated for the construction and maintenance of all public utilities. The drainage and utility easements are hereby granted as indicated for drainage purposes and for the construction and maintenance of all public utilities. The drainage easements are hereby granted as indicated for drainage purposes. The street is hereby dedicated to and for the use of the public. Access contracts 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. The Minimum Building Foot Elevations for the lowest opening to the structures shall be as indicated on the face of the plat.

Carneg & Sons, Inc., a Kansas Corporation

Ronald J. Carneg, President

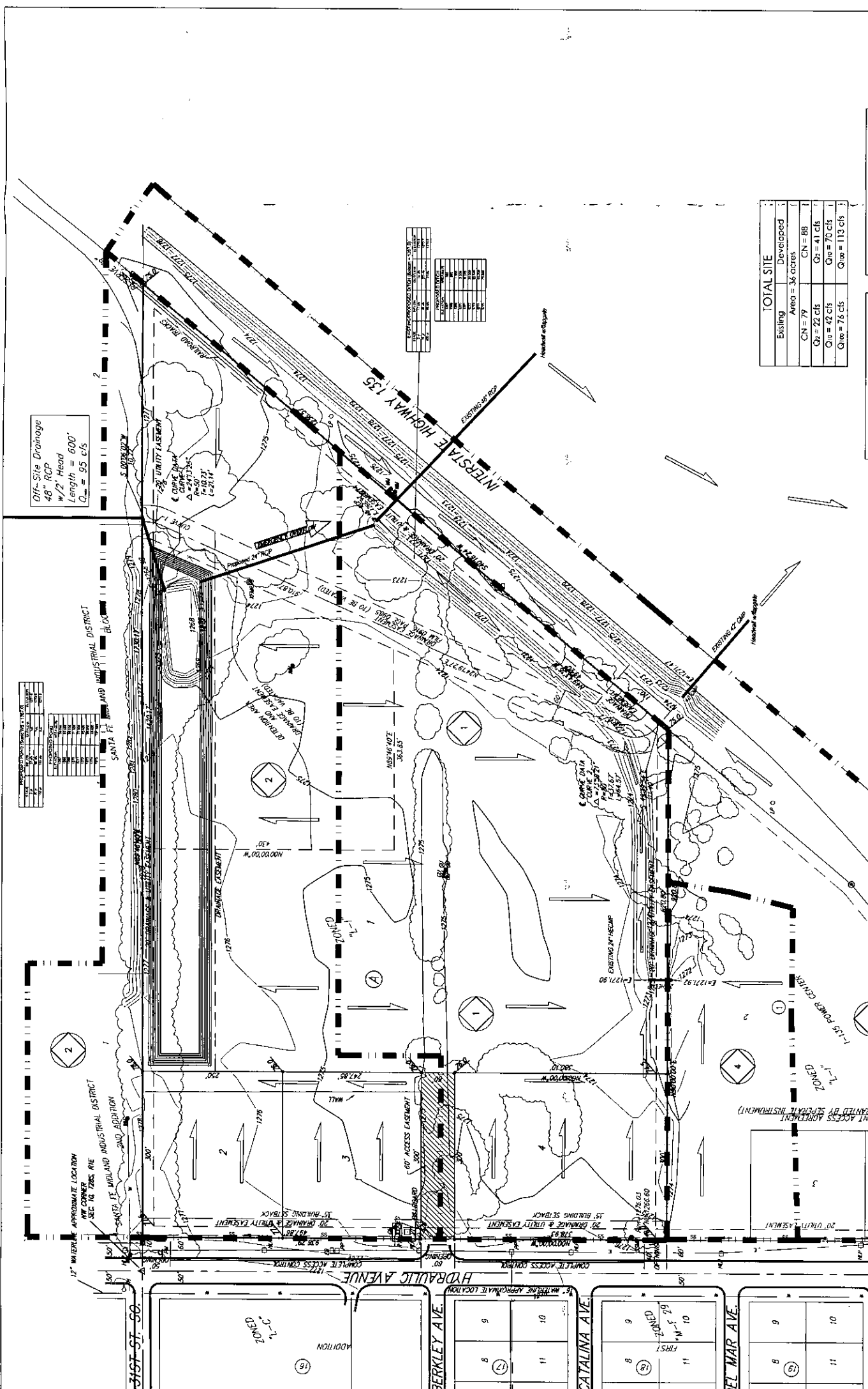
- GP = Guard Post (Bulb-head)
- RT = Right-of-Way
- ET = Easement
- MT = Meter
- HT = Hydrant
- CS = Gas Meter
- CSB = Gas Meter
- FR = Fire Hydrant
- EB = Electric Box
- EP = Electric Pole
- LP = Light Pole
- SP = Sewer Pole
- SW = Sewer Manhole
- MM = Manhole

7-135 POWER CENTER 2ND ADDITION, WICHITA, SEDGWICK COUNTY, KANSAS

GRADING & DRAINAGE PLANS

I-135 POWER CENTER 2ND ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS



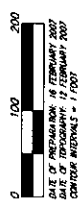
PROPOSED ELEVATIONS AT 10' INTERVALS

GRID	100	110	120	130	140	150
1	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
2	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
3	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
4	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
5	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
6	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
7	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
8	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
9	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
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14	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
15	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
16	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00

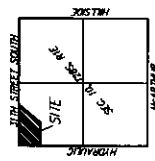
Off-Site Drainage
 48" RCP
 w/2' Head
 Length = 600'
 Q_{max} = 95 cfs

EXISTING ELEVATIONS AT 10' INTERVALS

GRID	100	110	120	130	140	150
1	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
2	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
3	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
4	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
5	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
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13	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
14	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
15	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00
16	1278.00	1278.00	1278.00	1278.00	1278.00	1278.00



BENCHMARK: 21 STREET SOUTH
 CORNER
 DATE OF PREPARATION: 18 FEBRUARY 2007
 DATE OF INSPECTION: 12 FEBRUARY 2007
 CHECKED: [Signature]
 CONTRACT NUMBER: 11007



ANNUAL DRAINAGE AND DEFERRING FOR
 CLOSURE PERMITTED TO THE STATE

LOT	AREA	ELEVATION	NO.
1	2.2	4	0000
2	2.2	4	0000

TOTAL SITE

Existing	Developed
Area = 36 acres	
CN = 79	CN = 88
Q ₂ = 22 cfs	Q ₂ = 41 cfs
Q ₁₀ = 42 cfs	Q ₁₀ = 70 cfs
Q ₁₀₀ = 76 cfs	Q ₁₀₀ = 113 cfs

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.

- **STORM SERIES**
 - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Modeled
 - 2-yr Rainfall Depth = 3.5 in
 - 5-yr Rainfall Depth = 4.5 in
 - 10-yr Rainfall Depth = 5.3 in
 - 25-yr Rainfall Depth = 6.1 in
 - 50-yr Rainfall Depth = 7.0 in
 - 100-yr Rainfall Depth = 7.8 in

- **OFFSITE FLOW**
 - Areas per existing topography and site visits
 - HydraFlow Hydrographs software for existing flows (SCS Unit Hydrograph Method)
 - Time of Concentration using City of Wichita minimum 15 min

SITE CHARACTERISTICS

The proposed site is currently open space with pasture characteristics. There is an existing pond in the northeast portion of the site which stores offsite runoff from the north. A ditch is being constructed, at the time of this report, to accommodate runoff from the south.

The Arkansas River is to the south of the property, separated by I-135. The relatively high tailwater of the river required the sites 2 outlet pipes to have flapgates. The predominant soils on the site consist of Type B soils. The site generally drains to the south.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

There are three (3) locations in which offsite runoff encroaches the property. The following are the points of runoff entry and the flow onto the site. All offsite Tc's were assumed to be the 15 minute minimum. A Curve Number of 88 was used for offsite flows for developed conditions. A curve number of 79 was used for undeveloped conditions.

- **North** - There are approximately 4 acres draining onto the north end of the proposed site from the adjacent north property. Since this runoff was sheet flow, its area was calculated into Basin 2. This basin includes some of the existing site and has a time of concentration of 24 minutes.

- **North 48" RCP** - The basin for the 48" SWS system was not delineated due to north offsite access. Therefore, the capacity of the system was calculated using HydraFlow with a 2' headwater over the inlet. There did not appear to be any overland relief due to overtopping of the pipe. This pipe, with the 2' headwater, will produce approximately 100 cfs in the 100-yr storm event. The time of concentration was calculated using the adjacent street draining to

the inlets. This street, assuming a minimum grade of 0.5% and a run length of 1300 feet, produces a Tc of 42 minutes. This gives the peak runoff a value of 65 cfs. The pipe discharges into the onsite existing pond.

- **South West**– There is approximately 3.2 acres of runoff that is conveyed onto the site via a 24" HECMP. This area produces approximately 24 cfs of runoff. The pipe appears to handle this runoff. Once on the property, the runoff flows in a newly constructed ditch to the existing 48" RCP.

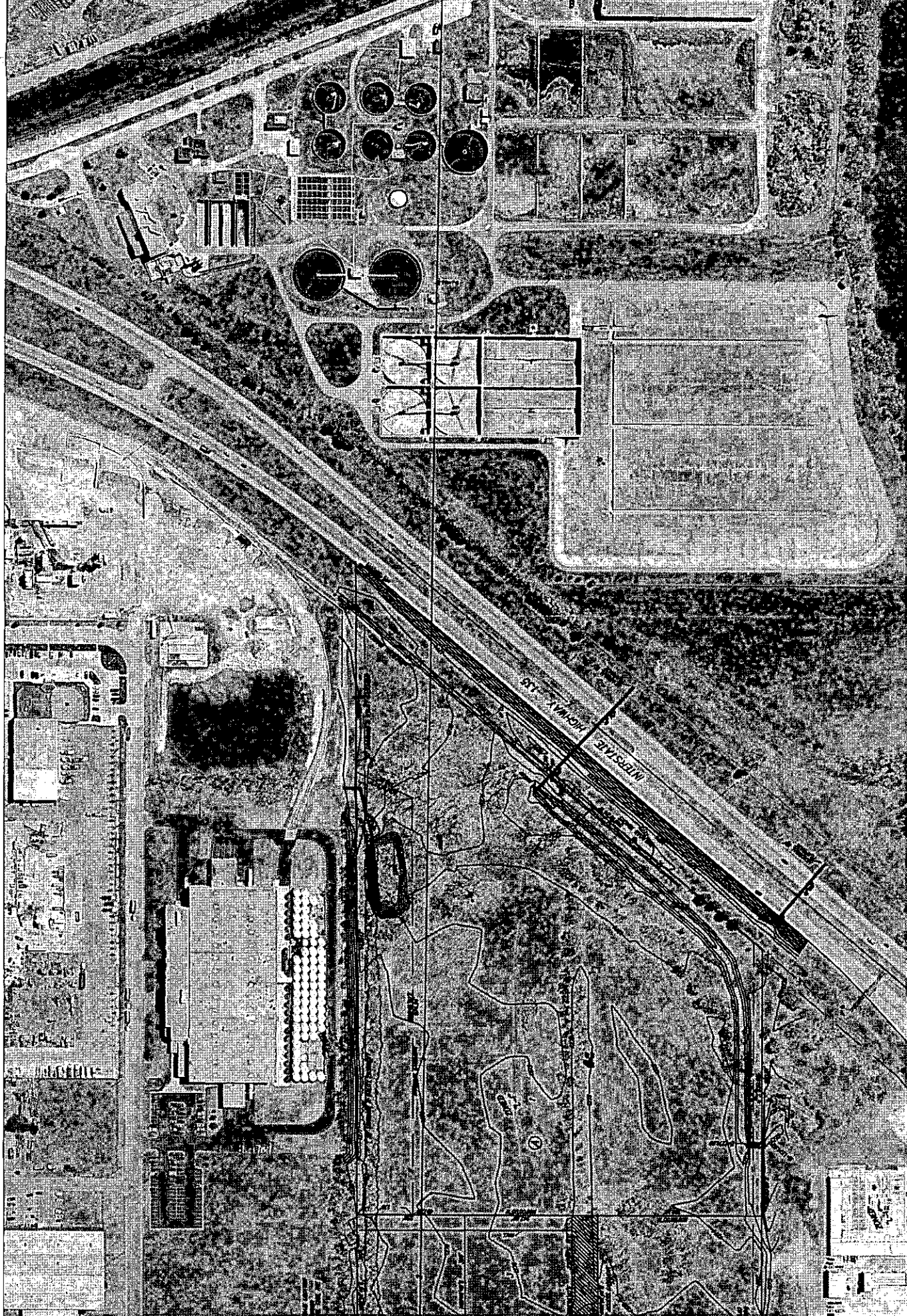
DOWNSTREAM DRAINAGE CAPACITY

The two structures which drain the property are a 48" RCP and a 42" HECMP. These structures will convey approximately 100 cfs and 75 cfs normally. However, the two pipes have flapgates on them due to the tailwater of the Arkansas River. The 100-yr tailwater elevation of 1274.0 NAVD (1273.5 NGVD) will not allow either of these pipes to discharge at their full capacities. The flowlines of the pipes are approximately 1270 to 1271.0. The 48" RCP outfall for the ditch section was modeled with a tailwater of 1273.5.

AERIAL EXHIBIT

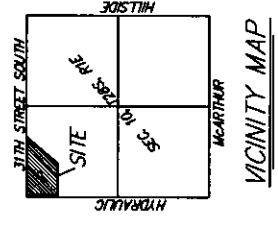
I-135 POWER CENTER 2ND ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS



0 150 300
 DATE OF PREPARATION: 05 MARCH 1957
 DATE OF PHOTOGRAPHY: 12 FEBRUARY 1957
 CONTOUR INTERVALS = 1 FOOT

BENCHMARK: HYDRAULIC & 31 STREET SOUTH
 COW BENCHMARK 41.60 FT WEST OF CENTERLINE
 32.50 FT NORTH OF CENTERLINE
 ELEV: 1278.27 (MCH 29)



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.

- **STORM SERIES**
 - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Modeled
 - 2-yr Rainfall Depth = 3.5 in
 - 5-yr Rainfall Depth = 4.5 in
 - 10-yr Rainfall Depth = 5.3 in
 - 25-yr Rainfall Depth = 6.1 in
 - 50-yr Rainfall Depth = 7.0 in
 - 100-yr Rainfall Depth = 7.8 in

- **STORM WATER SEWER PIPES**
 - Calculated in HydraFlow Hydrographs
 - Soil Type = B & D
 - Developed CN = 88 (Industrial)
 - Minimum Tc = 15 min

- **GRADING CONSTRAINTS**
 - Minimum 1% Cross-lot Rear Yard Grades
 - Minimum 4:1 Ditch Side Slopes
 - Minimum 0.5% Ditch Longitudinal Slope

- **POND ROUTING / GRADING**
 - HydraFlow software utilized for modeling (Hydrograph Method)
 - Minimum 1' Freeboard from 100-yr Water Surface Elevations to adjacent lot corners (except where noted below)
 - Minimum 2' between BFE and lowest opening elevation
 - Minimum 3:1 Side Slopes above water surface for Pond Banks
 - Minimum 4:1 Side Slopes on ditch sections

DETENTION FACILITIES

There are two (2) ponds proposed on this site, including the storage capacity of the dry ditch section. These ponds and ditch will detain offsite runoff as well as developed runoff. These ponds can be seen on the half-scale drainage plan in Exhibit 5. The pond systems are described below in further detail.

➤ **NORTH POND**

This pond is located near the north east corner of the property and accepts offsite runoff from the north and onsite runoff. This pond will be expanded from its current state and include an outlet (24" RCP) to the south into the ditch section. This pond is expected to be dry and have a bottom of 1267.0. No tailwater was applied to this pond in the modeling.

➤ **DITCH SECTION**

The current ditch section was modeled for its storage and water surface due to its size as well as its outlet. The ditch directly discharges into the Arkansas River via a 48" RCP. This pipe contains a flapgate, and due to the 100-yr BFE, will limit its discharge. The ditch will have a bottom of 1267.0 and run along the south line of the property.

A 24" HECMP will convey runoff from the south properties into this ditch.

NOTE: The BFE of the Arkansas River is the same during the 10, 25, 50, and 100-yr storm events.

DETENTION SUMMARY

Detention will be provided on the proposed site to limit the developed runoff to less than or equal to the existing conditions. The pond and ditch was modeled in an interconnected system due to utilizing the same outlet. The following tables represent the pond systems inflow and outflow for the 24-hour, 100-yr storm event.

POND & DITCH SYSTEM

POND	INFLOW	OUTFLOW	100-yr WSE	OUTLET
Pond	155 cfs	27 cfs	1274.8	24" RCP
Ditch	47 cfs	37 cfs	1274.0	48" RCP

DISCHARGE POINTS SUMMARY

There is 1 main discharge points that this site utilizes. This point is summarized below. All flows are the 24-hour, 100-yr storm events with no tailwater applied. The capacity of the structures was calculated using HydraFlowExpress (Appendix D) using existing flowlines and overtopping elevations of the roadways.

LOCATION	STRUCTURE	CAPACITY
Under I-135	48" RCP	95 cfs

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

No potential upstream impacts are expected with this development. The site will accept all offsite runoff in ditch sections and the pond. Where needed, drop structures and ditch checks will be constructed.

Due to detention on the proposed site, there are no downstream impacts expected.

FLOODPLAIN SUBMITTAL

SOURCE OF FLOODPLAIN INFORMATION

No FEMA SFHA exists on this property. However, due to the Arkansas River directly south and downstream of this project, the flood map and profiles are attached. The BFE of the river directly impacts the sites discharge.

The actual FEMA FIRM Panel can be viewed as Exhibit 6.

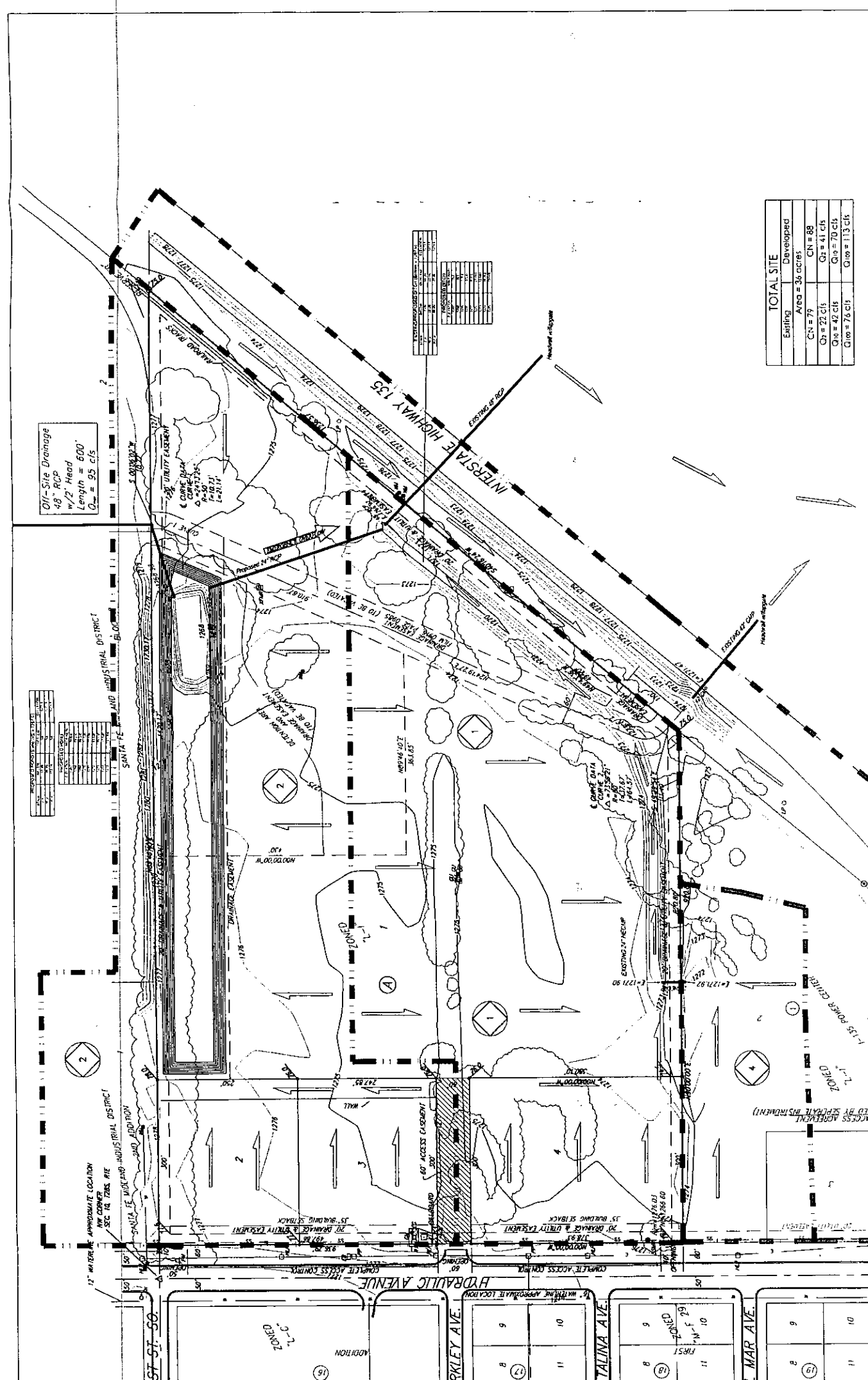
The Floodway data table, as provided by the National Flood Insurance Program, can be seen in Exhibit 7. The corresponding Flood Profiles are attached as Exhibit 8.

Note: The elevations shown on the plan sheets are in NGVD. The elevations on the FEMA FIRM Panels are in NAVD. To convert NAVD to NGVD, subtract 0.4.

GRADING & DRAINAGE PLANS

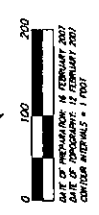
I-135 POWER CENTER 2ND ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS

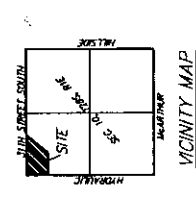


Off-Site Drainage
 48" RCP
 w/2' Head
 Length = 600'
 Q₁₀ = 93 cfs

NO.	DESCRIPTION	DATE
1	PREPARED FOR PERMIT	1/15/07
2	REVISED PER COMMENTS	1/22/07
3	REVISED PER COMMENTS	1/29/07
4	REVISED PER COMMENTS	2/5/07
5	REVISED PER COMMENTS	2/12/07
6	REVISED PER COMMENTS	2/19/07
7	REVISED PER COMMENTS	2/26/07
8	REVISED PER COMMENTS	3/5/07
9	REVISED PER COMMENTS	3/12/07
10	REVISED PER COMMENTS	3/19/07
11	REVISED PER COMMENTS	3/26/07
12	REVISED PER COMMENTS	4/2/07
13	REVISED PER COMMENTS	4/9/07
14	REVISED PER COMMENTS	4/16/07
15	REVISED PER COMMENTS	4/23/07
16	REVISED PER COMMENTS	4/30/07
17	REVISED PER COMMENTS	5/7/07
18	REVISED PER COMMENTS	5/14/07
19	REVISED PER COMMENTS	5/21/07
20	REVISED PER COMMENTS	5/28/07
21	REVISED PER COMMENTS	6/4/07
22	REVISED PER COMMENTS	6/11/07
23	REVISED PER COMMENTS	6/18/07
24	REVISED PER COMMENTS	6/25/07
25	REVISED PER COMMENTS	7/2/07
26	REVISED PER COMMENTS	7/9/07
27	REVISED PER COMMENTS	7/16/07
28	REVISED PER COMMENTS	7/23/07
29	REVISED PER COMMENTS	7/30/07
30	REVISED PER COMMENTS	8/6/07
31	REVISED PER COMMENTS	8/13/07
32	REVISED PER COMMENTS	8/20/07
33	REVISED PER COMMENTS	8/27/07
34	REVISED PER COMMENTS	9/3/07
35	REVISED PER COMMENTS	9/10/07
36	REVISED PER COMMENTS	9/17/07
37	REVISED PER COMMENTS	9/24/07
38	REVISED PER COMMENTS	10/1/07
39	REVISED PER COMMENTS	10/8/07
40	REVISED PER COMMENTS	10/15/07
41	REVISED PER COMMENTS	10/22/07
42	REVISED PER COMMENTS	10/29/07
43	REVISED PER COMMENTS	11/5/07
44	REVISED PER COMMENTS	11/12/07
45	REVISED PER COMMENTS	11/19/07
46	REVISED PER COMMENTS	11/26/07
47	REVISED PER COMMENTS	12/3/07
48	REVISED PER COMMENTS	12/10/07
49	REVISED PER COMMENTS	12/17/07
50	REVISED PER COMMENTS	12/24/07



BENCHMARK
 1/4" BLACK 3/4" STREET SOUTH
 CORNER MARK
 4.68 FT WEST OF CENTERLINE
 31.50 FT NORTH OF CENTERLINE
 ELEV. 1298.37 (NGVD 29)



NO.	DESCRIPTION	DATE
1	PREPARED FOR PERMIT	1/15/07
2	REVISED PER COMMENTS	1/22/07
3	REVISED PER COMMENTS	1/29/07
4	REVISED PER COMMENTS	2/5/07
5	REVISED PER COMMENTS	2/12/07
6	REVISED PER COMMENTS	2/19/07
7	REVISED PER COMMENTS	2/26/07
8	REVISED PER COMMENTS	3/5/07
9	REVISED PER COMMENTS	3/12/07
10	REVISED PER COMMENTS	3/19/07
11	REVISED PER COMMENTS	3/26/07
12	REVISED PER COMMENTS	4/2/07
13	REVISED PER COMMENTS	4/9/07
14	REVISED PER COMMENTS	4/16/07
15	REVISED PER COMMENTS	4/23/07
16	REVISED PER COMMENTS	4/30/07
17	REVISED PER COMMENTS	5/7/07
18	REVISED PER COMMENTS	5/14/07
19	REVISED PER COMMENTS	5/21/07
20	REVISED PER COMMENTS	5/28/07
21	REVISED PER COMMENTS	6/4/07
22	REVISED PER COMMENTS	6/11/07
23	REVISED PER COMMENTS	6/18/07
24	REVISED PER COMMENTS	6/25/07
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31	REVISED PER COMMENTS	8/13/07
32	REVISED PER COMMENTS	8/20/07
33	REVISED PER COMMENTS	8/27/07
34	REVISED PER COMMENTS	9/3/07
35	REVISED PER COMMENTS	9/10/07
36	REVISED PER COMMENTS	9/17/07
37	REVISED PER COMMENTS	9/24/07
38	REVISED PER COMMENTS	10/1/07
39	REVISED PER COMMENTS	10/8/07
40	REVISED PER COMMENTS	10/15/07
41	REVISED PER COMMENTS	10/22/07
42	REVISED PER COMMENTS	10/29/07
43	REVISED PER COMMENTS	11/5/07
44	REVISED PER COMMENTS	11/12/07
45	REVISED PER COMMENTS	11/19/07
46	REVISED PER COMMENTS	11/26/07
47	REVISED PER COMMENTS	12/3/07
48	REVISED PER COMMENTS	12/10/07
49	REVISED PER COMMENTS	12/17/07
50	REVISED PER COMMENTS	12/24/07

TOTAL SITE	
Existing	Developed
Area = 36 acres	Area = 88
CN = 79	CN = 88
Q ₂ = 22 cfs	Q ₂ = 41 cfs
Q ₁₀ = 42 cfs	Q ₁₀ = 70 cfs
Q ₁₀₀ = 74 cfs	Q ₁₀₀ = 113 cfs

BASIN 1

BASIN 2

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY FLOODWAY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ARKANSAS RIVER (CONTINUED)								
S	753.490	920	6,550	4.8	1,260.9	1,260.9	1,261.4	0.5
T	754.990	817	6,144	5.1	1,268.4	1,268.4	1,268.7	0.3
U	755.200	713	5,384	5.9	1,269.0	1,269.0	1,269.2	0.2
V	755.600	722	7,720	4.1	1,270.0	1,270.0	1,270.2	0.2
W	755.940	395	3,688	8.0	1,270.2	1,270.2	1,270.5	0.3
X	756.180	512	5,138	6.1	1,272.4	1,272.4	1,272.5	0.1
Y	756.500	387	6,327	5.0	1,273.6	1,273.6	1,274.2	0.6
Z	757.000	415	4,468	5.7	1,274.2	1,274.2	1,274.8	0.6
AA	757.500	600	4,642	5.5	1,275.7	1,275.7	1,276.2	0.5
AB	757.600	583	5,377	4.7	1,276.2	1,276.2	1,276.2	0.0
AC	758.000	575	3,163	8.1	1,277.3	1,277.3	1,277.3	0.0
AD	758.300	720	4,697	5.4	1,279.0	1,279.0	1,279.0	0.0
AE	758.600	511	4,319	5.9	1,279.8	1,279.8	1,279.8	0.0
AF	759.000	695	4,752	5.4	1,281.0	1,281.0	1,281.0	0.0
AG	759.400	699	4,843	5.3	1,281.9	1,281.9	1,281.9	0.0
AH	759.500	823	3,752	6.8	1,282.0	1,282.0	1,282.0	0.0
AI	759.800	598	6,934	3.7	1,283.1	1,283.1	1,283.1	0.0
AJ	759.900	493	5,162	4.9	1,283.2	1,283.2	1,283.2	0.0

¹Miles above confluence with Mississippi River

FEDERAL EMERGENCY MANAGEMENT AGENCY

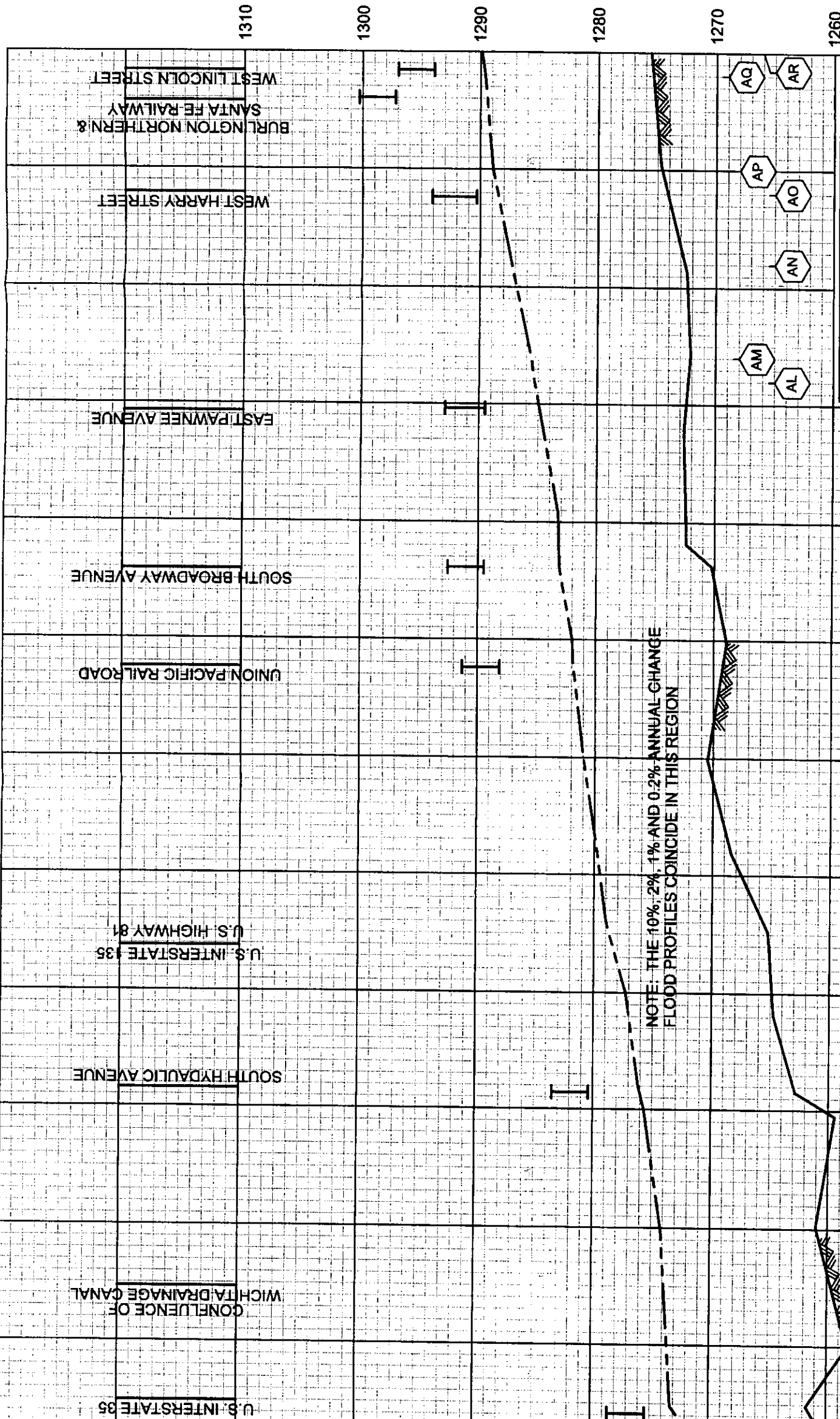
**SEDGWICK COUNTY, KS
AND INCORPORATED AREAS**

FLOODWAY DATA

ARKANSAS RIVER

TABLE 9

FLOOD PROFILES
 ARKANSAS RIVER



NOTE: THE 10%, 2%, 1% AND 0.2% ANNUAL-CHANGE
 FLOOD PROFILES COINCIDE IN THIS REGION

LEGEND

- AQ
- AR
- AP
- AN
- AM
- AL

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

There does not appear to be any US Army Corps of Engineers jurisdiction on this property.

KANSAS DEPT OF AGRICULTURE - DWR PERMITTING

There is not 240+ acres draining onto this site, therefore no DWR permit is expected.

FEMA

No FEMA SFHA exists on this property.

KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting needed on the proposed project. The 48" RCP, which this site utilizes, is on the proposed property, not in the ROW.

SEDGWICK COUNTY ROW

There does not appear to be any water discharging to the Sedgwick County ROW.

SUPPORTING CALCULATIONS

APPENDIX A: USGS Soils Survey

APPENDIX B: HydraFlow Hydrographs
- Existing Conditions
- Pond System

APPENDIX C: HydraFlow Express
- 48" Storm System
- 24" HECMP
- 48" RCP Outlet
- Channel Section

USGS Soils Survey

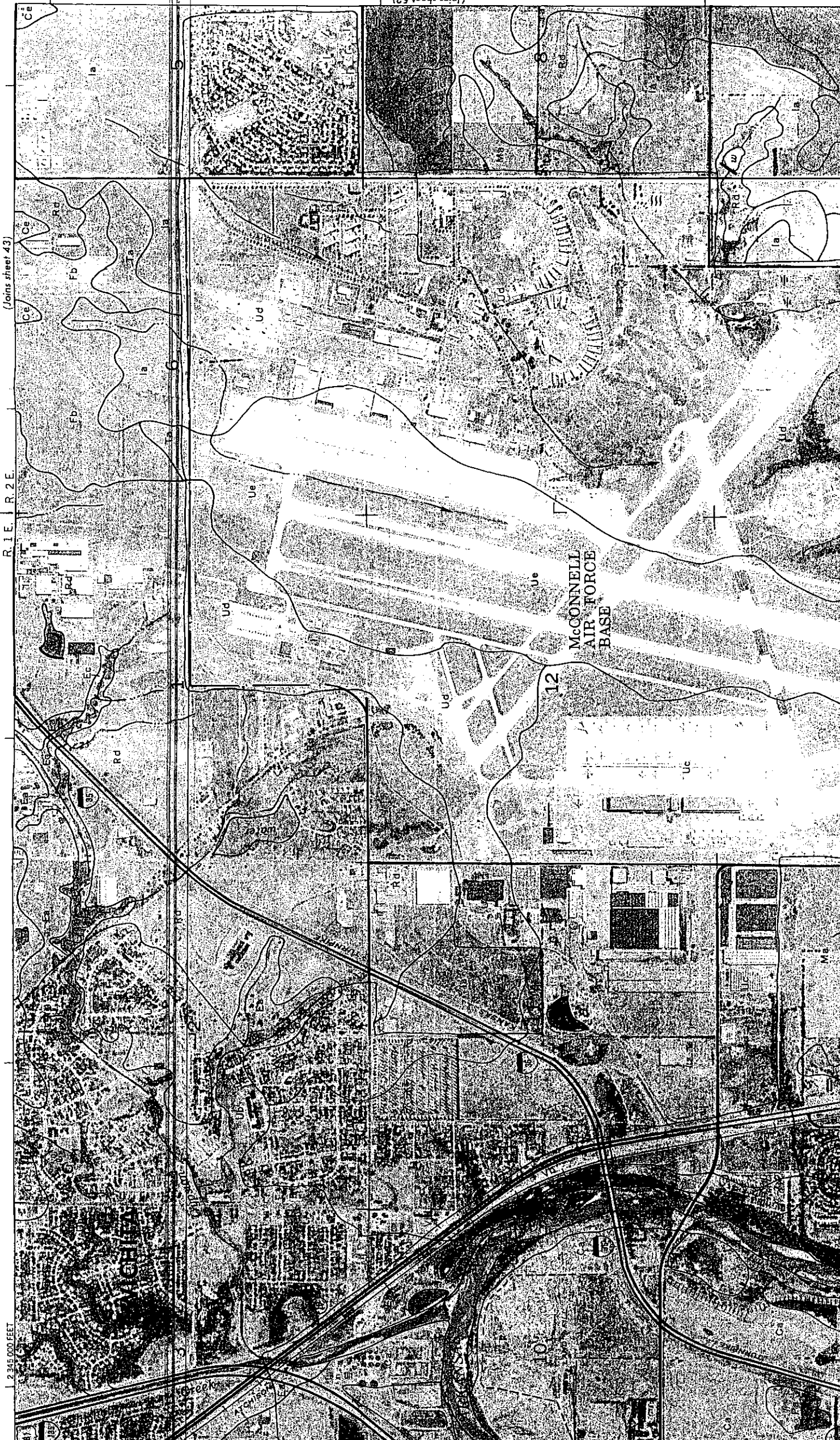
SEDGWICK COUNTY, KANSAS - SHEET NUMBER 51

1:2345 000 FEET

R. 1 E. | R. 2 E.

(Joins sheet 43)

(Joins sheet 52)



HydraFlow Hydrographs

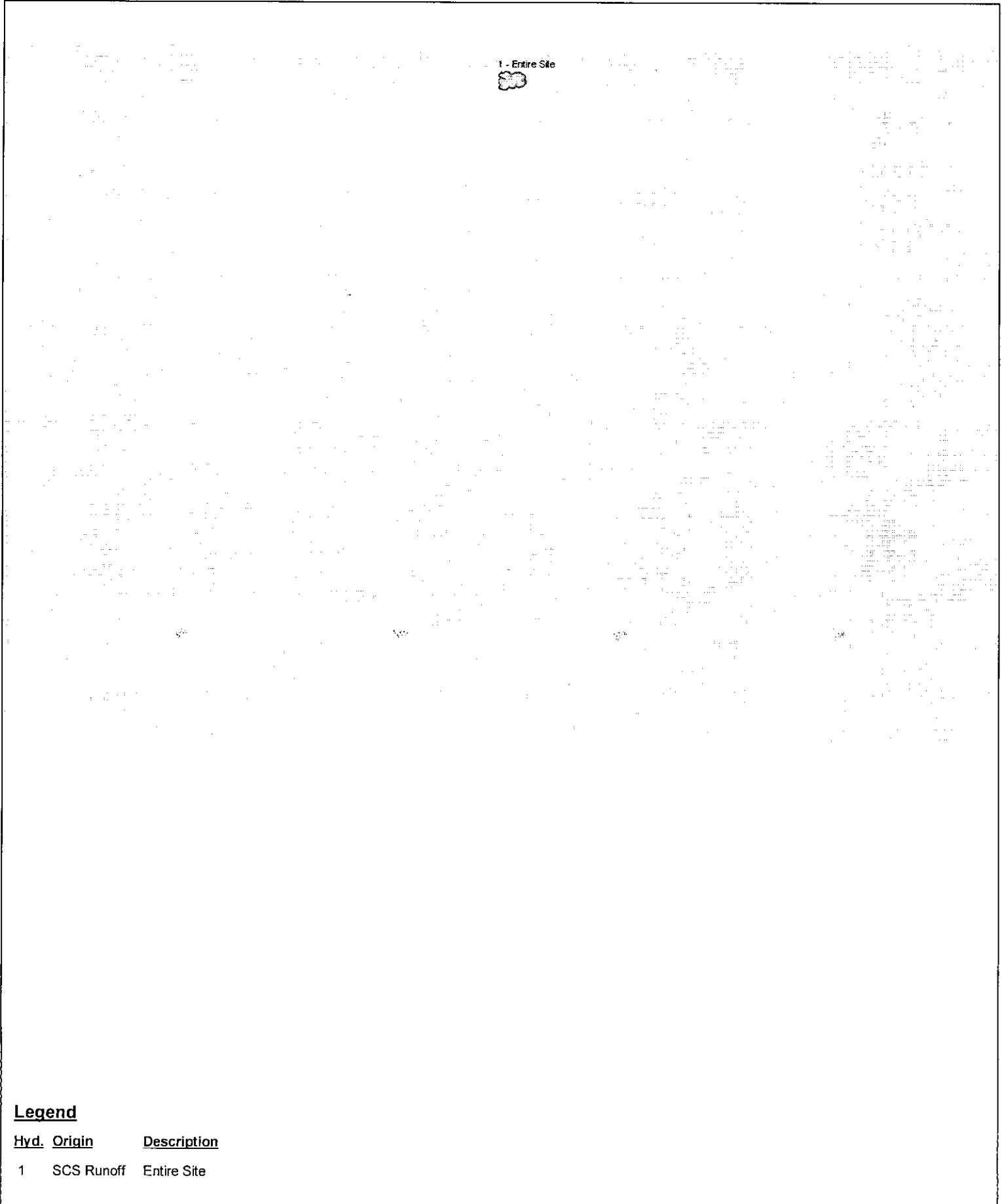
**Existing Conditions
Pond System**

Hydraflow Table of Contents

Watershed Model Schematic	1
Hydrograph Return Period Recap	2
2 - Year	
Summary Report	3
Hydrograph Reports	4
Hydrograph No. 1, SCS Runoff, Entire Site	4
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Hydrograph No. 1, SCS Runoff, Entire Site	6
100 - Year	
Summary Report	7
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Hydrograph No. 1, SCS Runoff, Entire Site	8
IDF Report	9

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.02



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff Entire Site

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.02

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	-----	-----	41.11	-----	-----	69.33	-----	-----	112.55	Entire Site

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	41.11	2	756	296,470	----	-----	-----	Entire Site

Hydrograph Report

Hydraflow Hydrographs by Intellisolve v9.02

Monday, Mar 5, 2007

Hyd. No. 1

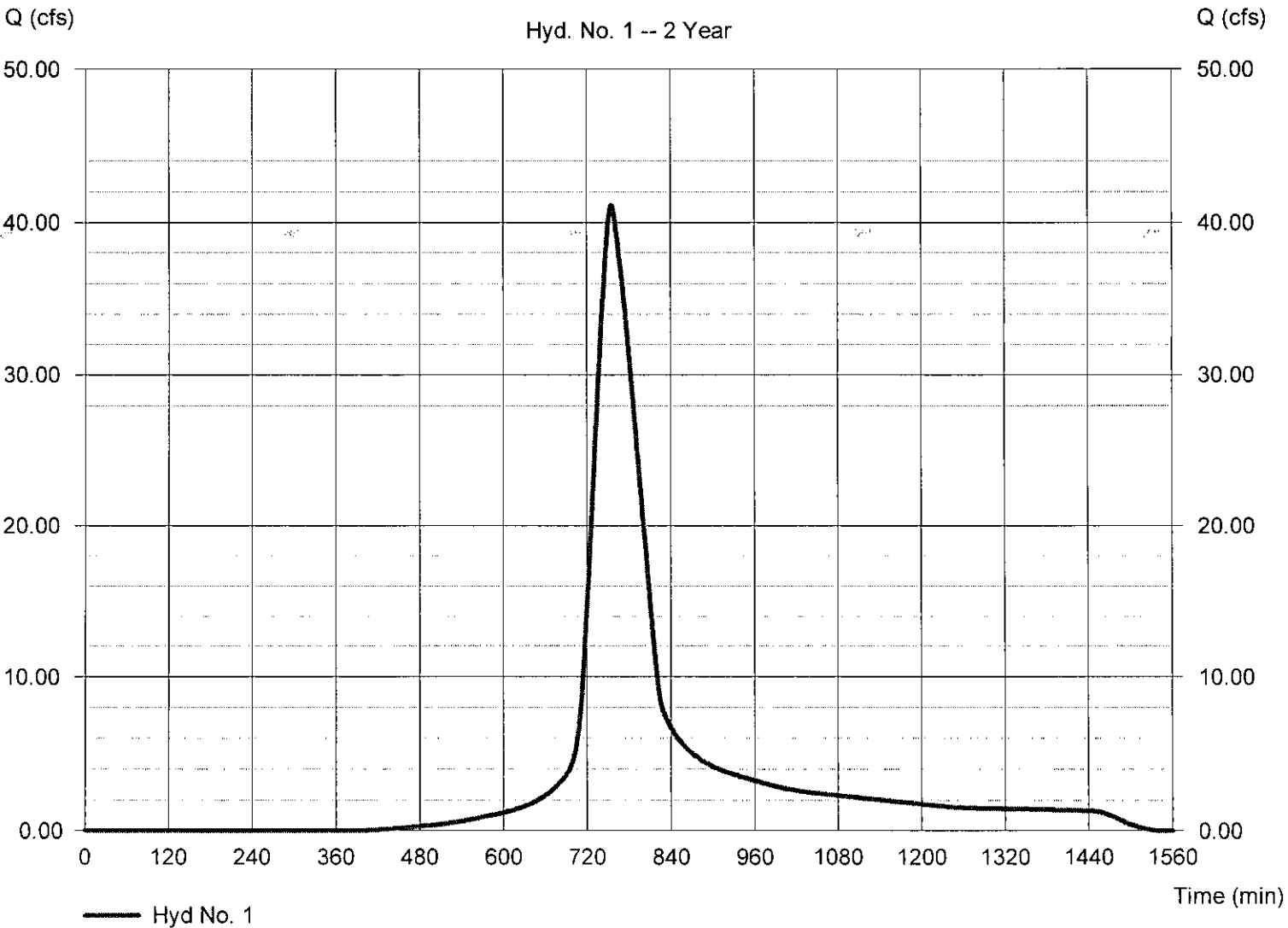
Entire Site

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 36.000 ac
Basin Slope = 0.2 %
Tc method = LAG
Total precip. = 3.50 in
Storm duration = 24 hrs

Peak discharge = 41.11 cfs
Time to peak = 756 min
Hyd. volume = 296,470 cuft
Curve number = 88
Hydraulic length = 1400 ft
Time of conc. (Tc) = 70.80 min
Distribution = Type II
Shape factor = 484

Entire Site

Hyd. No. 1 -- 2 Year



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	69.33	2	754	504,323	---	-----	-----	Entire Site

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Hyd. No. 1

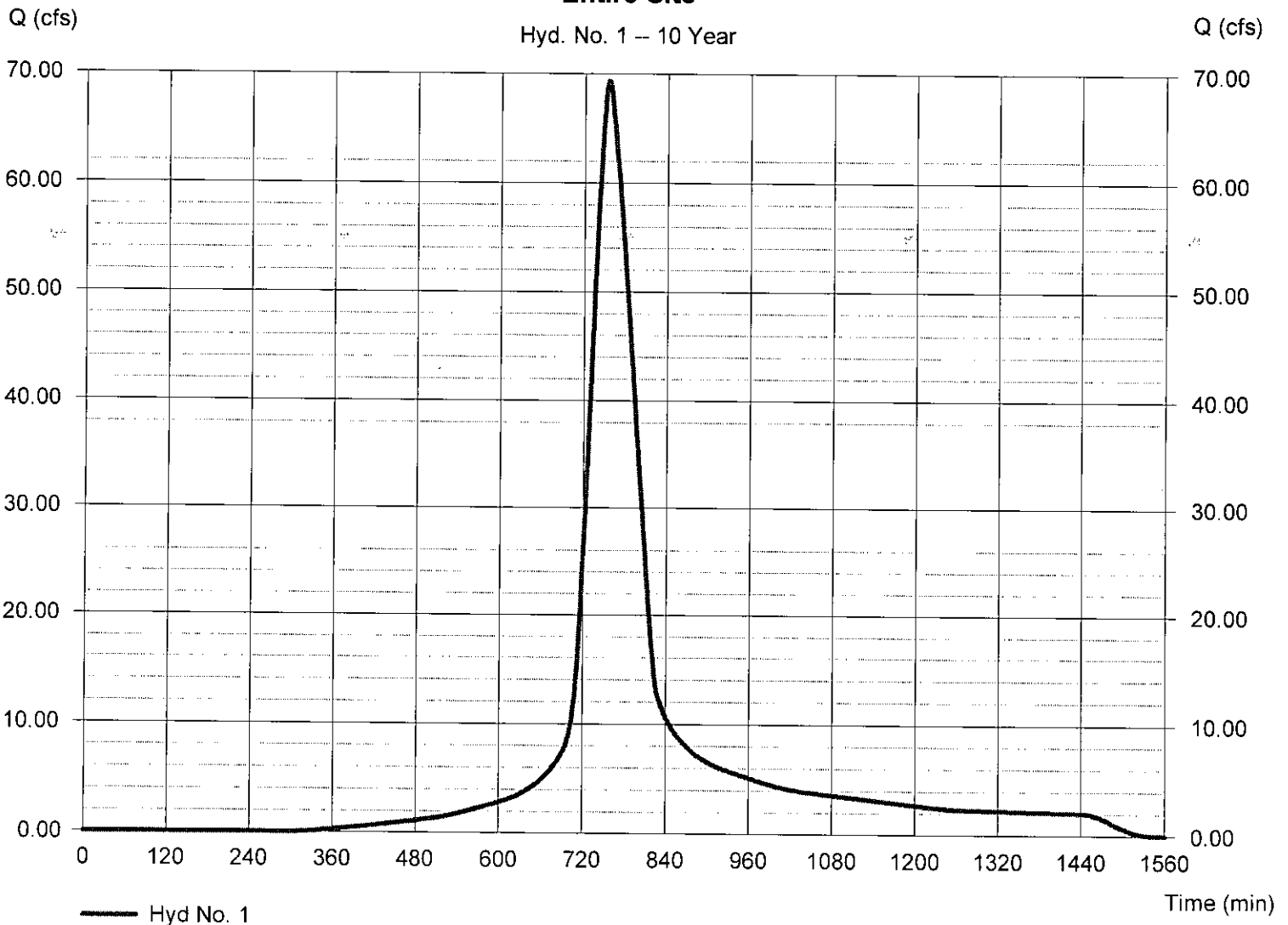
Entire Site

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 36.000 ac
Basin Slope = 0.2 %
Tc method = LAG
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 69.33 cfs
Time to peak = 754 min
Hyd. volume = 504,323 cuft
Curve number = 88
Hydraulic length = 1400 ft
Time of conc. (Tc) = 70.80 min
Distribution = Type II
Shape factor = 484

Entire Site

Hyd. No. 1 -- 10 Year



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	112.55	2	754	832,795	---	----	-----	Entire Site
existingconditions.gpw					Return Period: 100 Year			Monday, Mar 5, 2007	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Hyd. No. 1

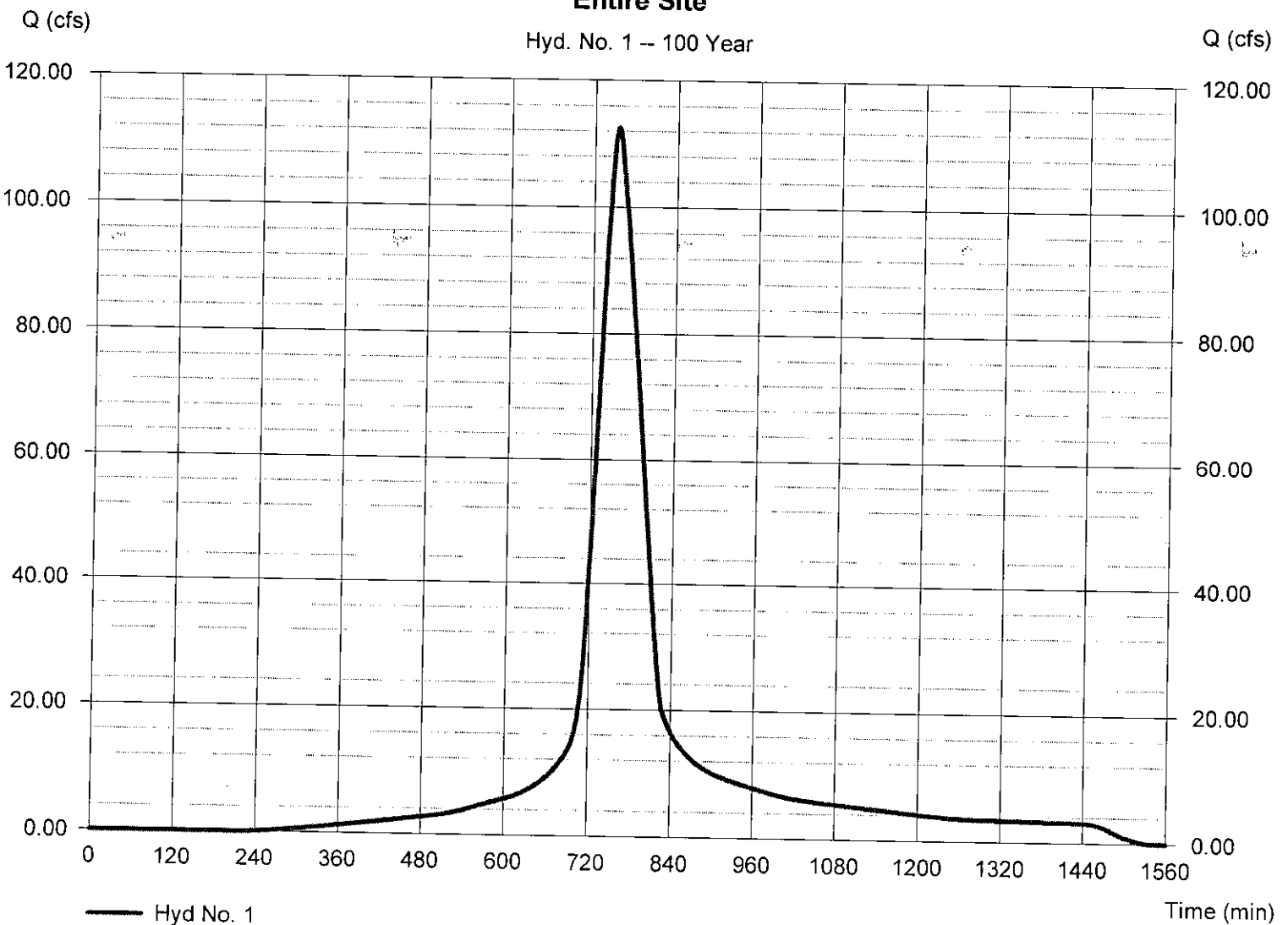
Entire Site

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 36.000 ac
Basin Slope = 0.2 %
Tc method = LAG
Total precip. = 7.80 in
Storm duration = 24 hrs

Peak discharge = 112.55 cfs
Time to peak = 754 min
Hyd. volume = 832,795 cuft
Curve number = 88
Hydraulic length = 1400 ft
Time of conc. (Tc) = 70.80 min
Distribution = Type II
Shape factor = 484

Entire Site

Hyd. No. 1 -- 100 Year



Hydraflow Rainfall Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	69.8703	13.1000	0.8658	-----
3	0.0000	0.0000	0.0000	-----
5	79.2597	14.6000	0.8369	-----
10	88.2351	15.5000	0.8279	-----
25	102.6072	16.5000	0.8217	-----
50	114.8193	17.2000	0.8199	-----
100	127.1596	17.8000	0.8186	-----

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: SCS_24HR.pcp

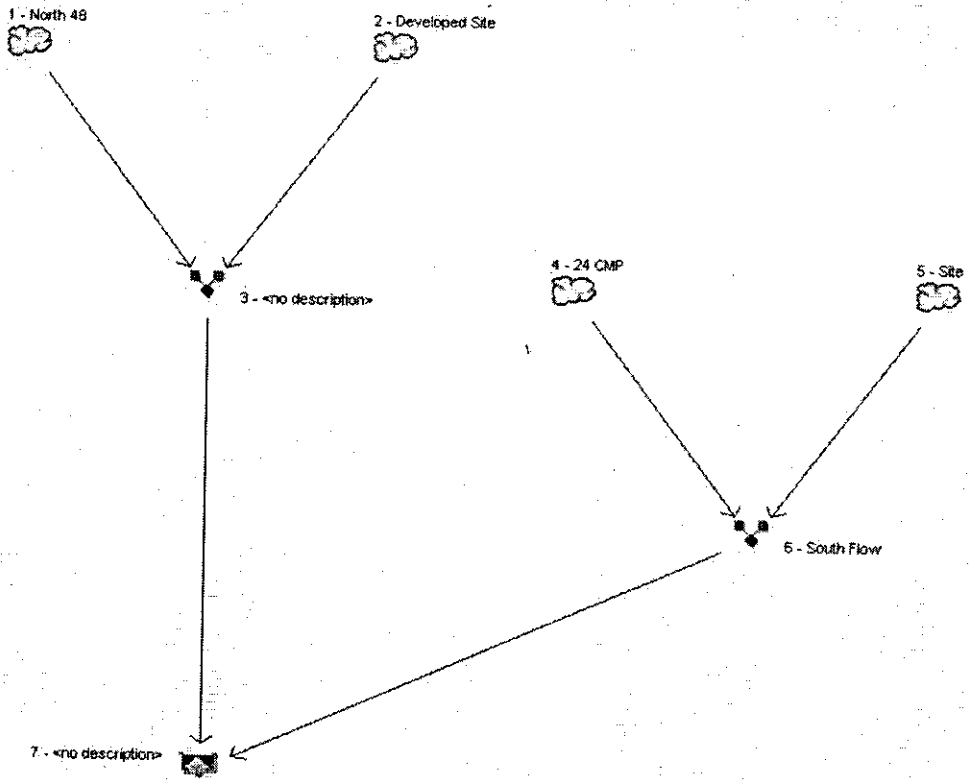
Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.50	0.00	3.30	5.20	5.77	6.80	7.80
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

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Summary Report	7
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Hydrograph No. 7, Reservoir, <no description>	8
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Watershed Model Schematic

Hydraflow Hydrographs by Intellisolve v9.02



Legend

Hyd. Origin	Description
1	SCS Runoff North 48
2	SCS Runoff Developed Site
3	Combine <no description>
4	SCS Runoff 24 CMP
5	SCS Runoff Site
6	Combine South Flow
7	Reservoir(i) <no description>

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.02

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	----	-----	20.94	-----	-----	35.24	-----	-----	57.07	North 48
2	SCS Runoff	----	-----	39.66	-----	-----	66.44	-----	-----	107.26	Developed Site
3	Combine	1, 2	-----	57.14	-----	-----	96.02	-----	-----	155.34	<no description>
4	SCS Runoff	-----	-----	9.943	-----	-----	16.57	-----	-----	26.65	24 CMP
5	SCS Runoff	-----	-----	13.28	-----	-----	22.37	-----	-----	36.28	Site
6	Combine	4, 5	-----	16.77	-----	-----	28.44	-----	-----	46.31	South Flow
7	Reservoir(i)	3, 6	-----	13.15	-----	-----	21.73	-----	-----	36.97	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	20.94	2	738	108,088	---	----	----	North 48	
2	SCS Runoff	39.66	2	728	145,919	---	----	----	Developed Site	
3	Combine	57.14	2	730	254,007	1, 2	----	----	<no description>	
4	SCS Runoff	9.943	2	722	28,103	---	----	----	24 CMP	
5	SCS Runoff	13.28	2	746	81,747	---	----	----	Site	
6	Combine	16.77	2	724	109,850	4, 5	----	----	South Flow	
7	Reservoir(i)	13.15	2	762	62,477	3, 6	1273.58	304,794	<no description>	
System.gpw					Return Period: 2 Year			Monday, Mar 5, 2007		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Hyd. No. 7

<no description>

Hydrograph type = Reservoir (Interconnected)
 Storm frequency = 2 yrs
 Time interval = 2 min

Peak discharge = 13.15 cfs
 Time to peak = 762 min
 Hyd. volume = 62,477 cuft

Upper Pond

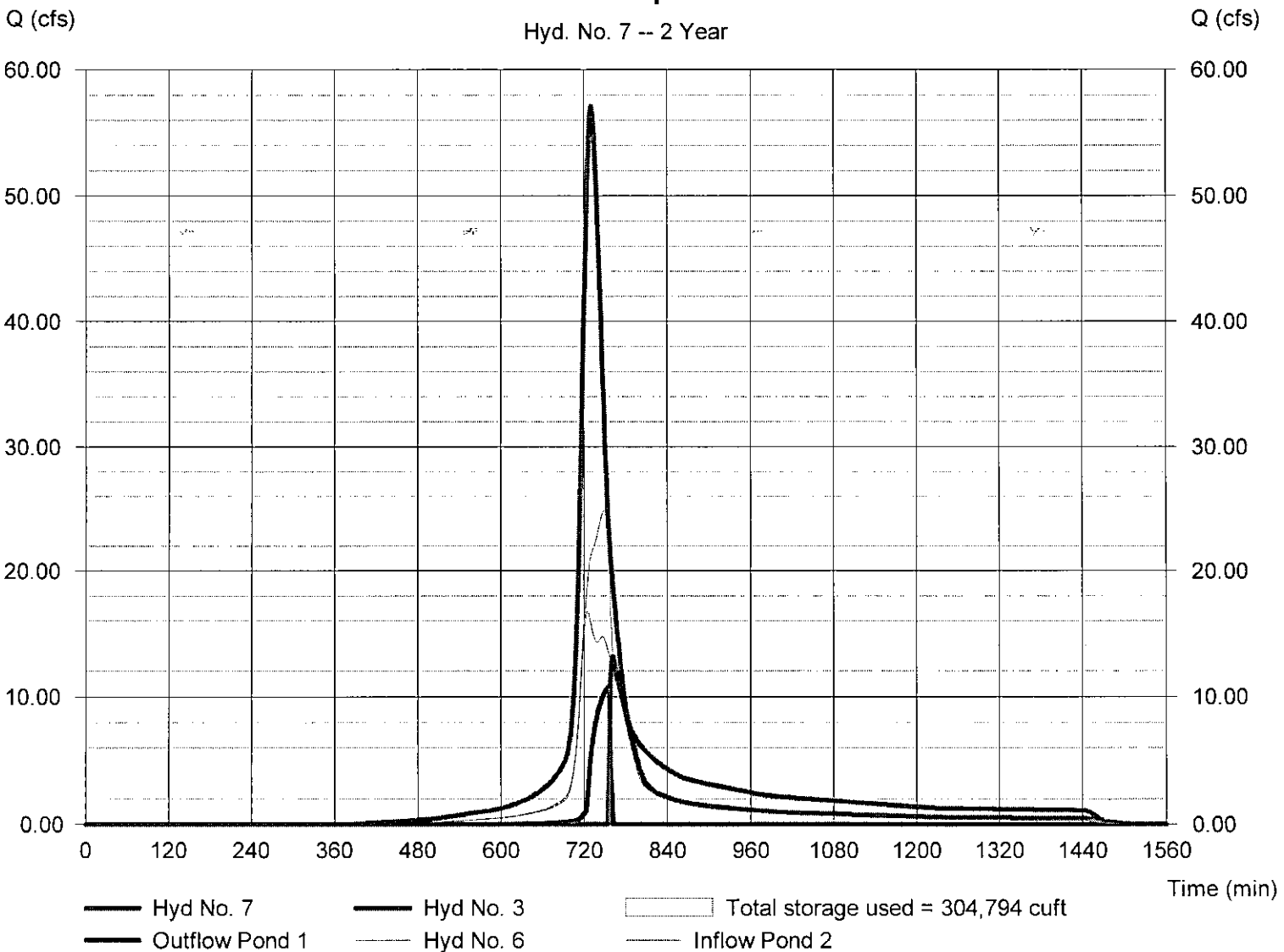
Pond name = Proposed Pond
 Inflow hyd. = 3 - <no description>
 Max. Elevation = 1271.59 ft
 Max. Storage = 235,881 cuft

Lower Pond

Pond name = Ditch
 Other Inflow hyd. = 6 - South Flow
 Max. Elevation = 1273.58 ft
 Max. Storage = 68,913 cuft

Interconnected Pond Routing. Storage Indication method used.

<no description>
 Hyd. No. 7 -- 2 Year



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Pond No. 1 - Proposed Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1267.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1267.00	59,000	0	0
1.00	1269.00	62,000	60,488	60,488
2.00	1270.00	66,000	63,983	124,471
3.00	1271.00	71,000	68,478	192,949
4.00	1272.00	77,000	73,972	266,921
5.00	1273.00	83,000	79,973	346,894
6.00	1274.00	88,900	85,925	432,819
7.00	1275.00	95,000	91,924	524,743
8.00	1275.00	101,000	97,975	622,718

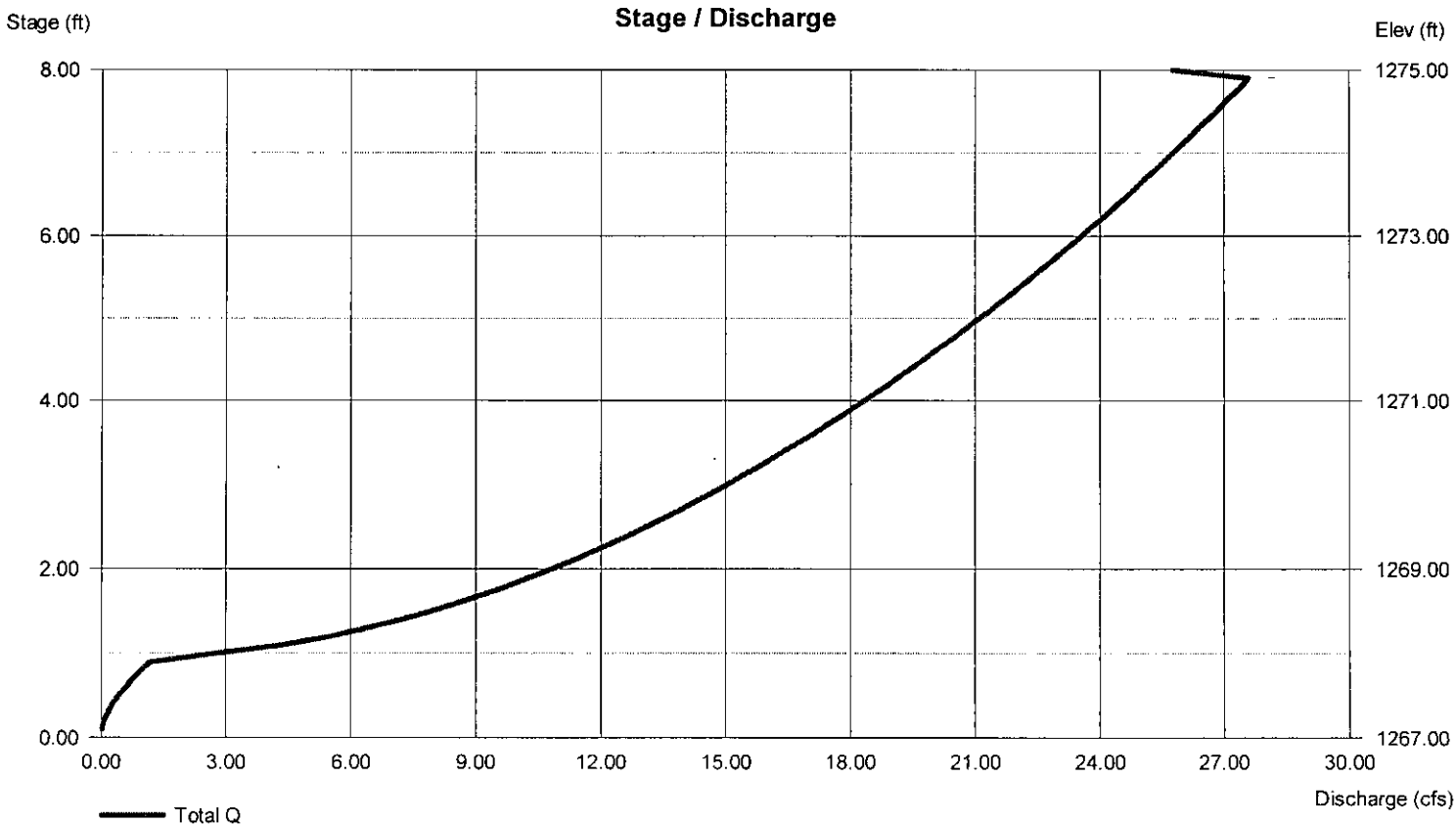
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1267.00	0.00	0.00	0.00
Length (ft)	= 350.00	0.00	0.00	0.00
Slope (%)	= 0.02	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	0.00	0.00	0.00
Crest El. (ft)	= 1277.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil. (in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Pond No. 2 - Ditch

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1267.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1267.00	200	0	0
1.00	1269.00	1,000	549	549
2.00	1270.00	3,000	1,910	2,460
3.00	1271.00	6,315	4,555	7,015
4.00	1272.00	20,000	12,517	19,531
5.00	1273.00	32,640	26,061	45,592
6.00	1274.00	48,000	40,070	85,662
7.00	1275.00	70,000	58,649	144,311
8.00	1276.00	500,000	252,336	396,647

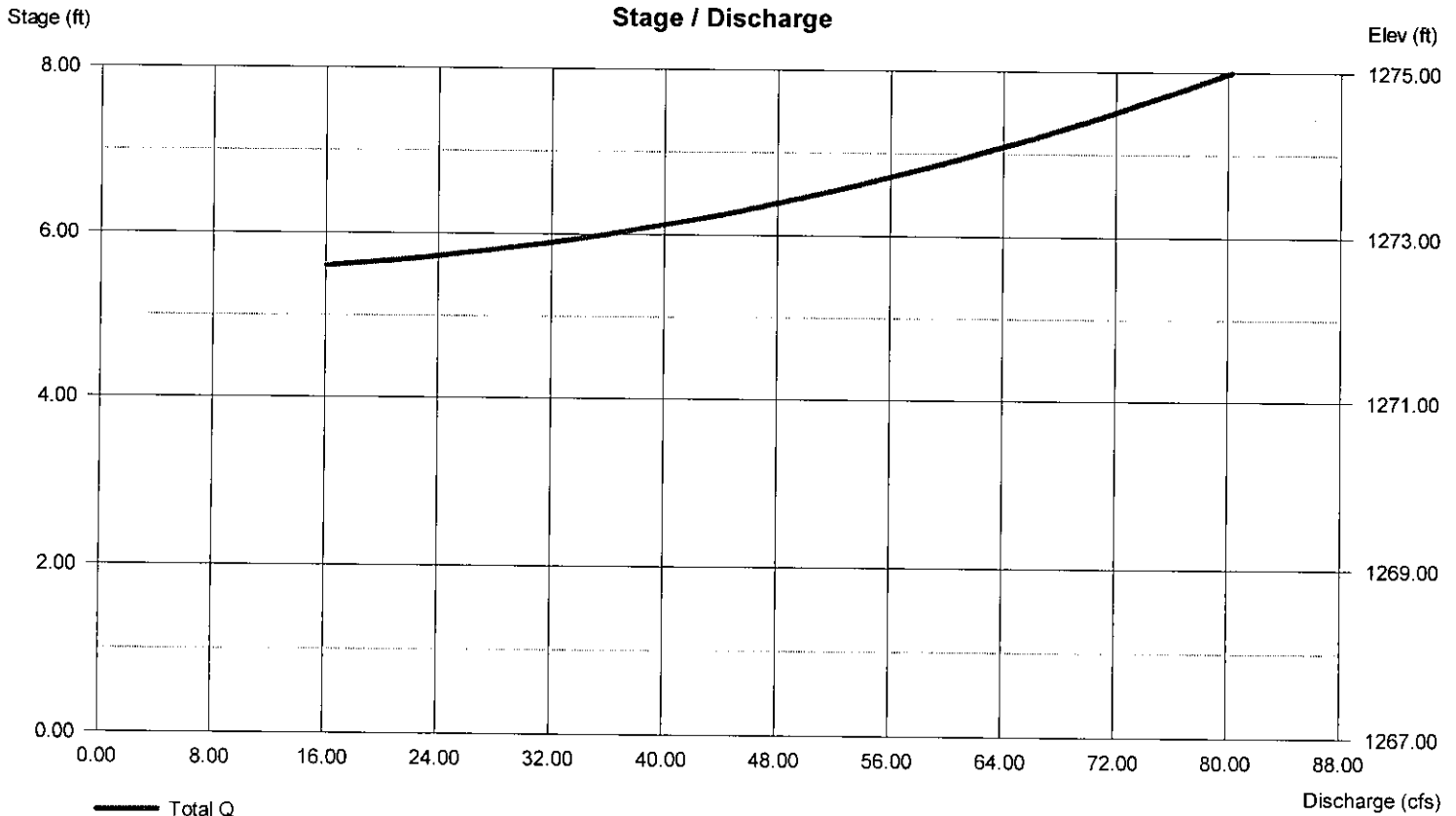
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1268.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= --	--	--	--
Multi-Stage	= No	No	No	No
Exfil. (in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 1273.50			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	35.24	2	738	183,868	---	----	----	North 48	
2	SCS Runoff	66.44	2	728	248,222	---	----	----	Developed Site	
3	Combine	96.02	2	730	432,089	1, 2	----	----	<no description>	
4	SCS Runoff	16.57	2	722	47,806	---	----	----	24 CMP	
5	SCS Runoff	22.37	2	746	139,060	---	----	----	Site	
6	Combine	28.44	2	724	186,865	4, 5	----	----	South Flow	
7	Reservoir(i)	21.73	2	756	163,468	3, 6	1273.69	469,034	<no description>	
System.gpw					Return Period: 10 Year			Monday, Mar 5, 2007		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Hyd. No. 7

<no description>

Hydrograph type = Reservoir (Interconnected)
 Storm frequency = 10 yrs
 Time interval = 2 min

Peak discharge = 21.73 cfs
 Time to peak = 756 min
 Hyd. volume = 163,468 cuft

Upper Pond

Pond name = Proposed Pond
 Inflow hyd. = 3 - <no description>
 Max. Elevation = 1273.57 ft
 Max. Storage = 395,961 cuft

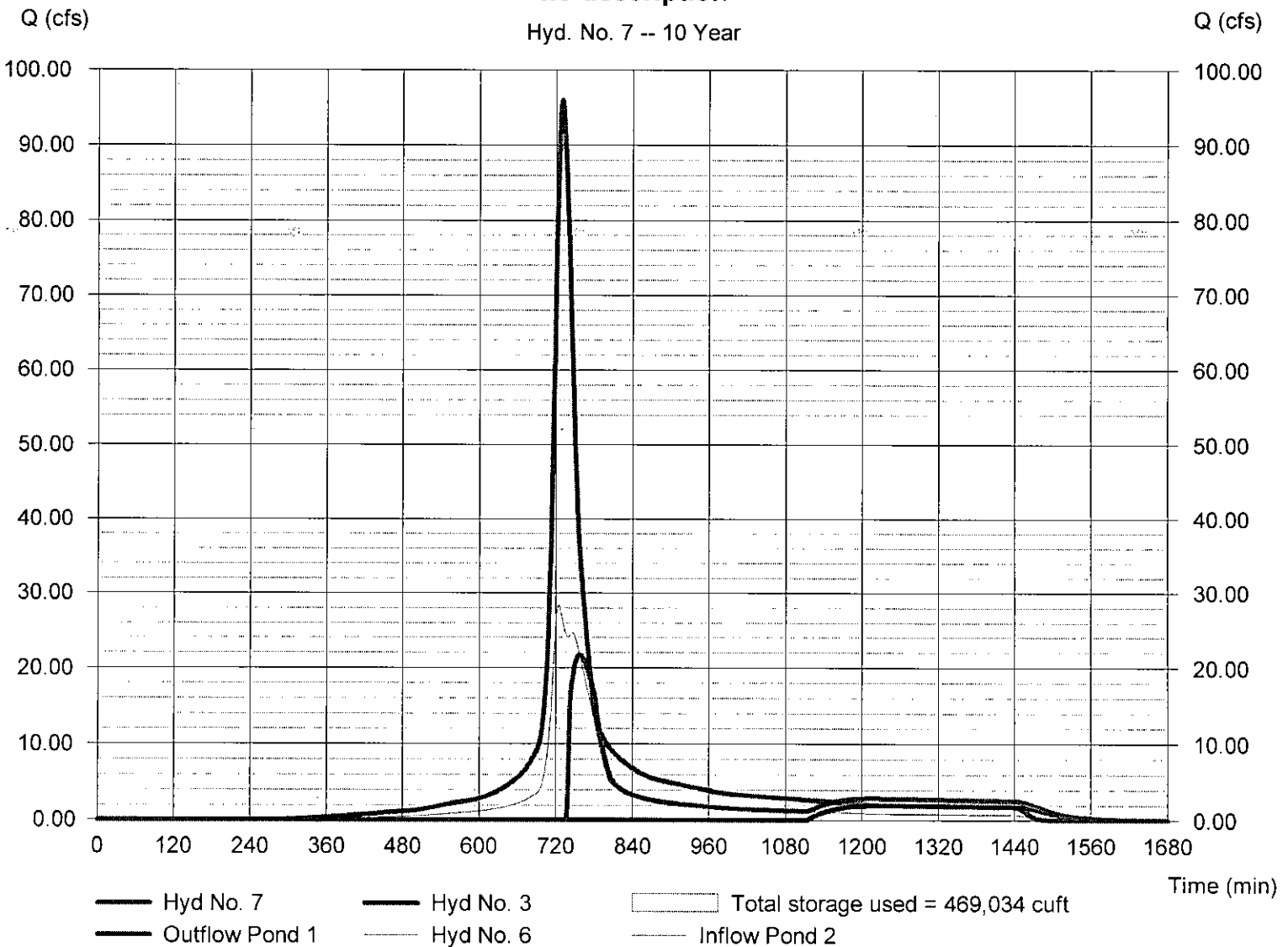
Lower Pond

Pond name = Ditch
 Other Inflow hyd. = 6 - South Flow
 Max. Elevation = 1273.69 ft
 Max. Storage = 73,073 cuft

Interconnected Pond Routing. Storage Indication method used.

<no description>

Hyd. No. 7 -- 10 Year



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Pond No. 1 - Proposed Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1267.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1267.00	59,000	0	0
1.00	1269.00	62,000	60,488	60,488
2.00	1270.00	66,000	63,983	124,471
3.00	1271.00	71,000	68,478	192,949
4.00	1272.00	77,000	73,972	266,921
5.00	1273.00	83,000	79,973	346,894
6.00	1274.00	88,900	85,925	432,819
7.00	1275.00	95,000	91,924	524,743
8.00	1275.00	101,000	97,975	622,718

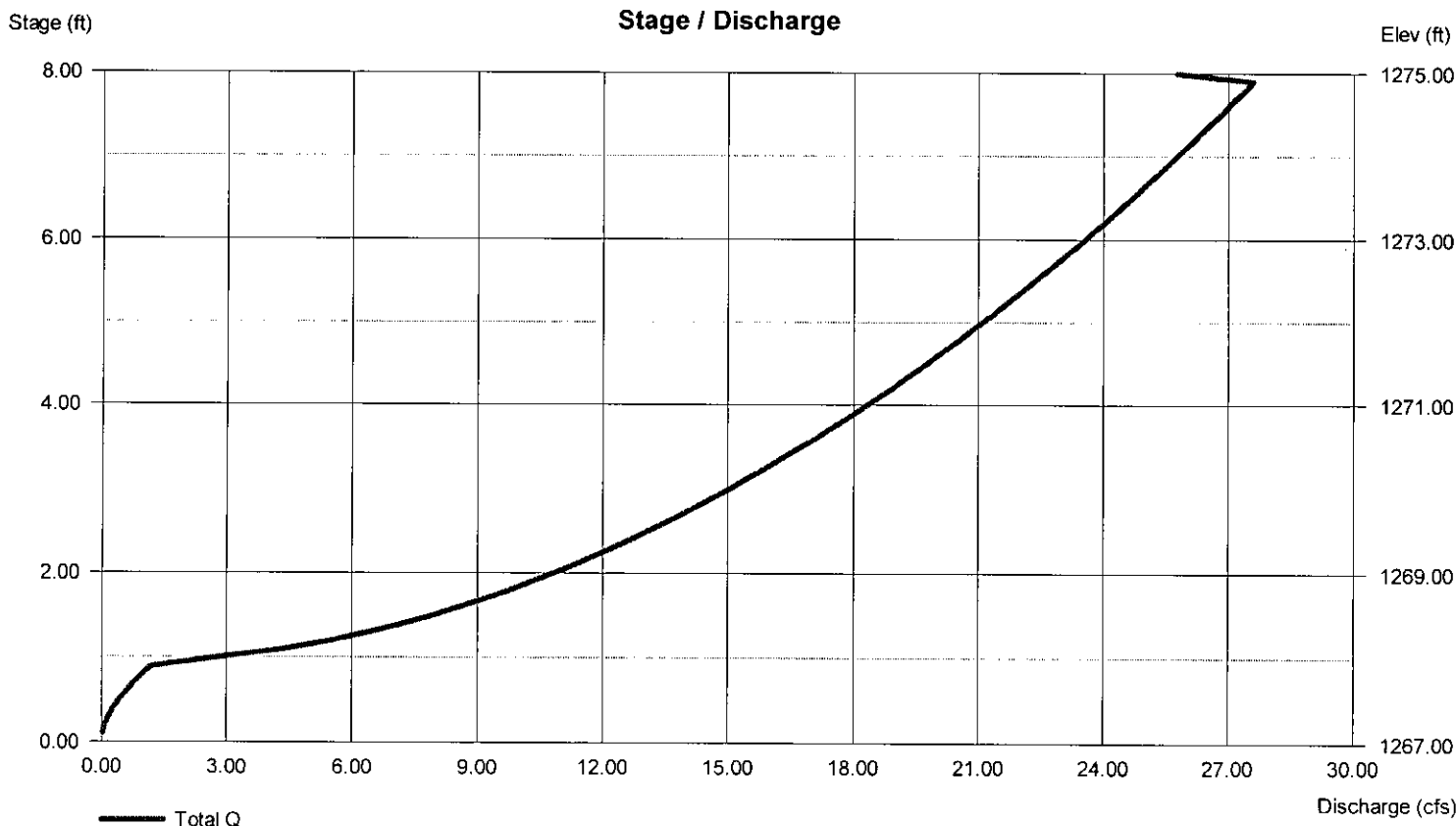
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1267.00	0.00	0.00	0.00
Length (ft)	= 350.00	0.00	0.00	0.00
Slope (%)	= 0.02	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	0.00	0.00	0.00
Crest El. (ft)	= 1277.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil. (in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Monday, Mar 5, 2007

Pond No. 2 - Ditch

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1267.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1267.00	200	0	0
1.00	1269.00	1,000	549	549
2.00	1270.00	3,000	1,910	2,460
3.00	1271.00	6,315	4,555	7,015
4.00	1272.00	20,000	12,517	19,531
5.00	1273.00	32,640	26,061	45,592
6.00	1274.00	48,000	40,070	85,662
7.00	1275.00	70,000	58,649	144,311
8.00	1276.00	500,000	252,336	396,647

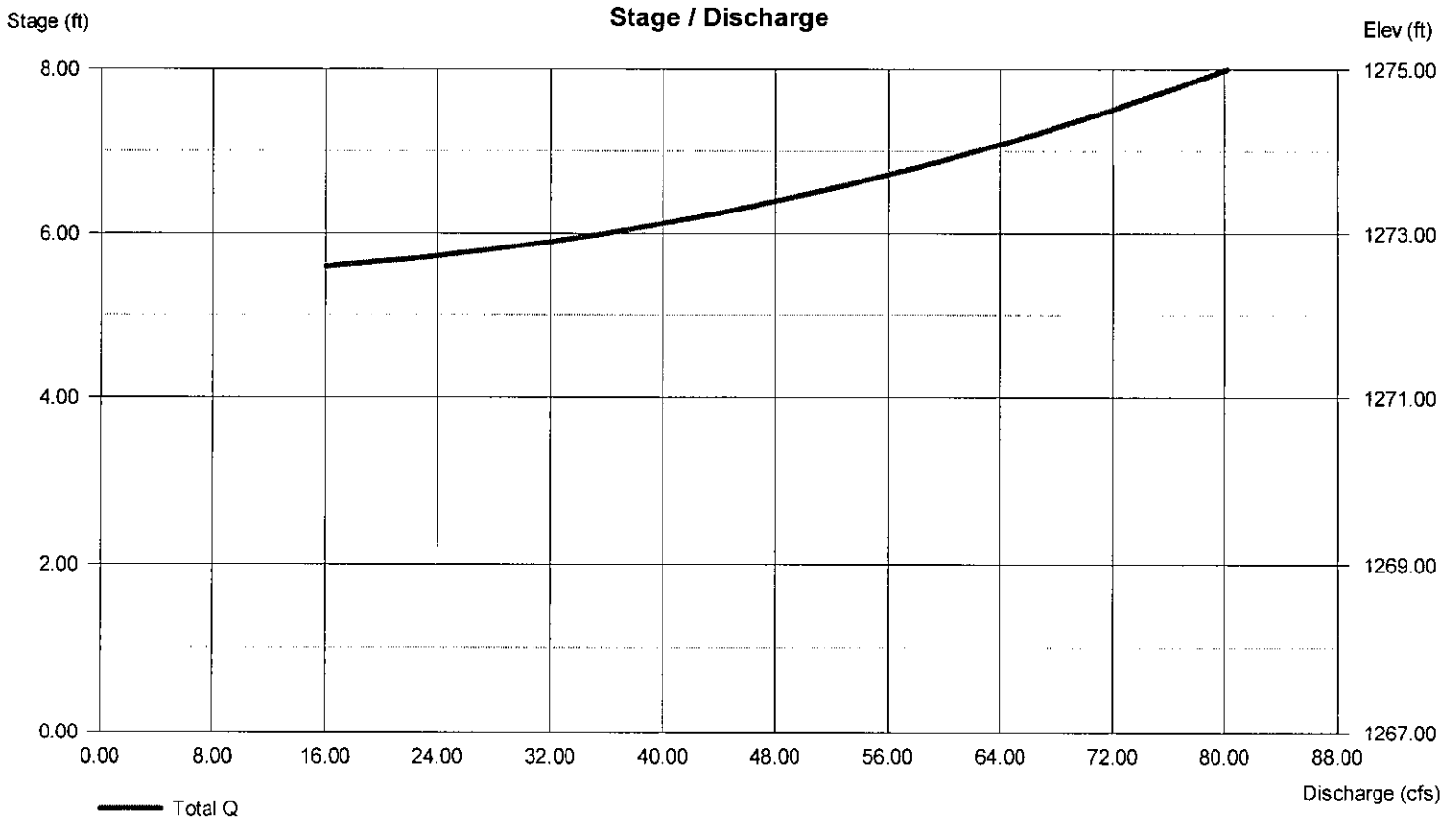
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1268.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= --	--	--	--
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 1273.50			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	57.07	2	738	303,623	---	----	-----	North 48	
2	SCS Runoff	107.26	2	728	409,891	---	----	-----	Developed Site	
3	Combine	155.34	2	730	713,514	1, 2	----	-----	<no description>	
4	SCS Runoff	26.65	2	722	78,942	---	----	-----	24 CMP	
5	SCS Runoff	36.28	2	746	229,631	---	----	-----	Site	
6	Combine	46.31	2	724	308,573	4, 5	----	-----	South Flow	
7	Reservoir(i)	36.97	2	760	566,576	3, 6	1274.75	588,964	<no description>	
System.gpw					Return Period: 100 Year			Monday, Mar 5, 2007		

Hydrograph Report

Monday, Mar 5, 2007

Hydraflow Hydrographs by Intelisolve v9.02

Hyd. No. 7

<no description>

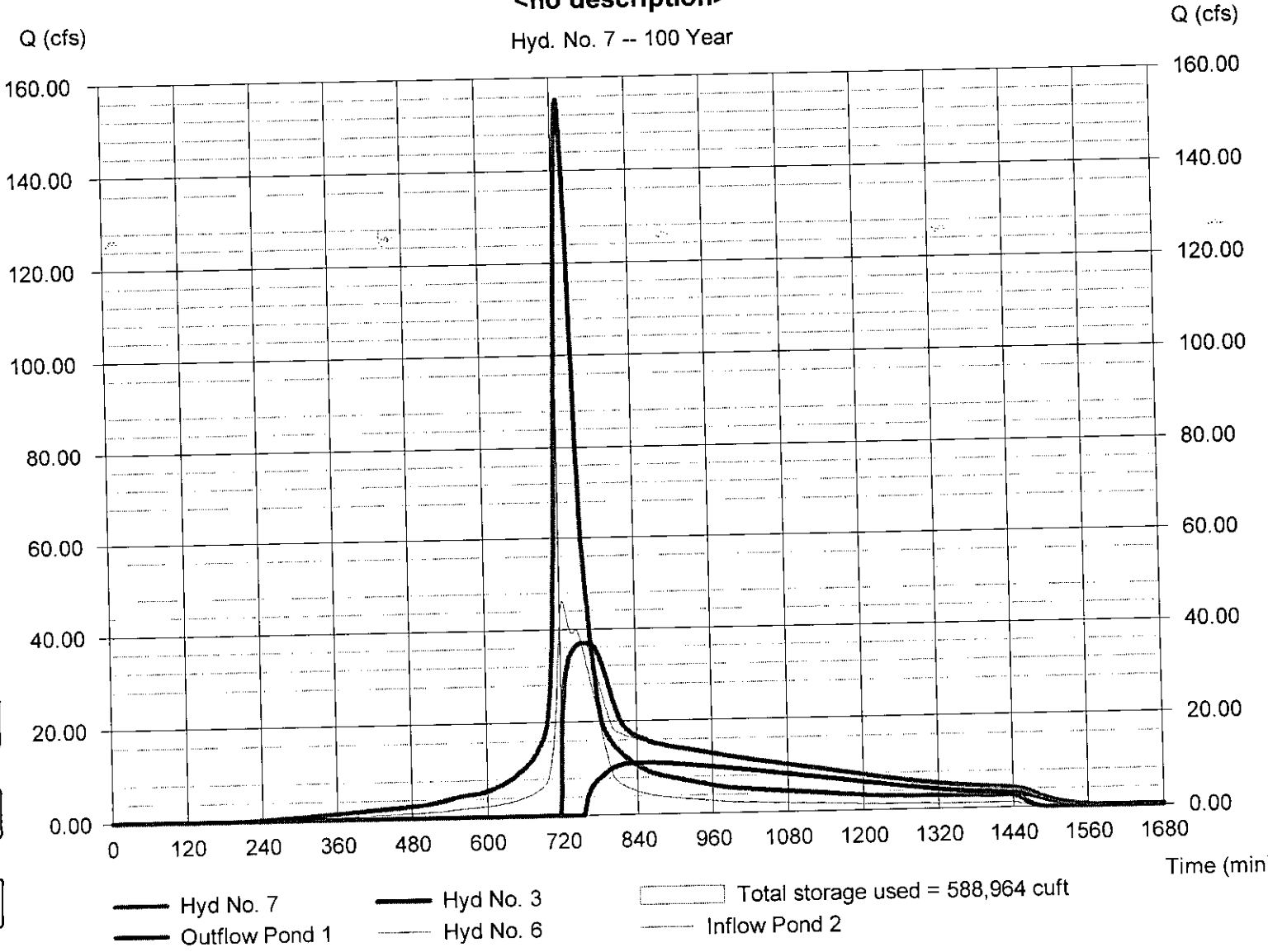
Hydrograph type = Reservoir (Interconnected)
 Storm frequency = 100 yrs
 Time interval = 2 min
Upper Pond
 Pond name = Proposed Pond
 Inflow hyd. = 3 - <no description>
 Max. Elevation = 1274.75 ft
 Max. Storage = 501,415 cuft

Peak discharge = 36.97 cfs
 Time to peak = 760 min
 Hyd. volume = 566,576 cuft
Lower Pond
 Pond name = Ditch
 Other Inflow hyd. = 6 - South Flow
 Max. Elevation = 1274.03 ft
 Max. Storage = 87,548 cuft

Interconnected Pond Routing. Storage Indication method used.

<no description>

Hyd. No. 7 -- 100 Year



Pond Report

Monday, Mar 5, 2007

Hydraflow Hydrographs by Intelisolve v9.02

Pond No. 1 - Proposed Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1267.00 ft

Stage / Storage Table

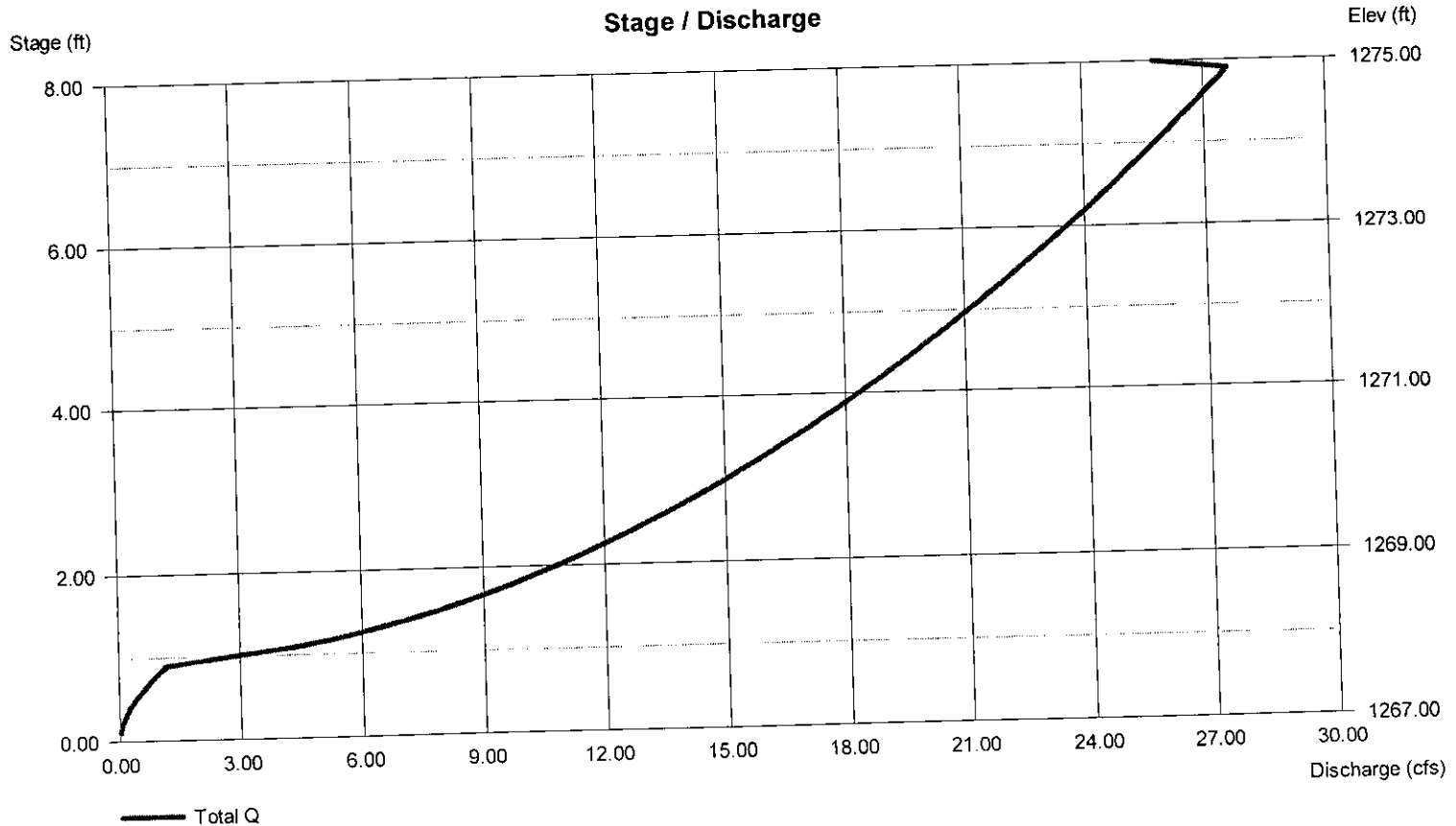
Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1267.00	59,000	0	0
1.00	1269.00	62,000	60,488	60,488
2.00	1270.00	66,000	63,983	124,471
3.00	1271.00	71,000	68,478	192,949
4.00	1272.00	77,000	73,972	266,921
5.00	1273.00	83,000	79,973	346,894
6.00	1274.00	88,900	85,925	432,819
7.00	1275.00	95,000	91,924	524,743
8.00	1275.00	101,000	97,975	622,718

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 24.00	0.00	0.00	0.00	Crest Len (ft)	= 20.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00	Crest El. (ft)	= 1277.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0	Weir Coeff.	= 2.60	3.33	3.33	3.33
Invert El. (ft)	= 1267.00	0.00	0.00	0.00	Weir Type	= Rect	---	---	---
Length (ft)	= 350.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.02	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a	Exfil.(in/hr)	= 0.000 (by Contour)			
Orifice Coeff.	= 0.60	0.60	0.60	0.60	TW Elev. (ft)	= 0.00			
Multi-Stage	= n/a	No	No	No					

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Pond Report

Monday, Mar 5, 2007

Hydraflow Hydrographs by Intelisolve v9.02

Pond No. 2 - Ditch

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1267.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1267.00	200	0	0
1.00	1269.00	1,000	549	549
2.00	1270.00	3,000	1,910	2,460
3.00	1271.00	6,315	4,555	7,015
4.00	1272.00	20,000	12,517	19,531
5.00	1273.00	32,640	26,061	45,592
6.00	1274.00	48,000	40,070	85,662
7.00	1275.00	70,000	58,649	144,311
8.00	1276.00	500,000	252,336	396,647

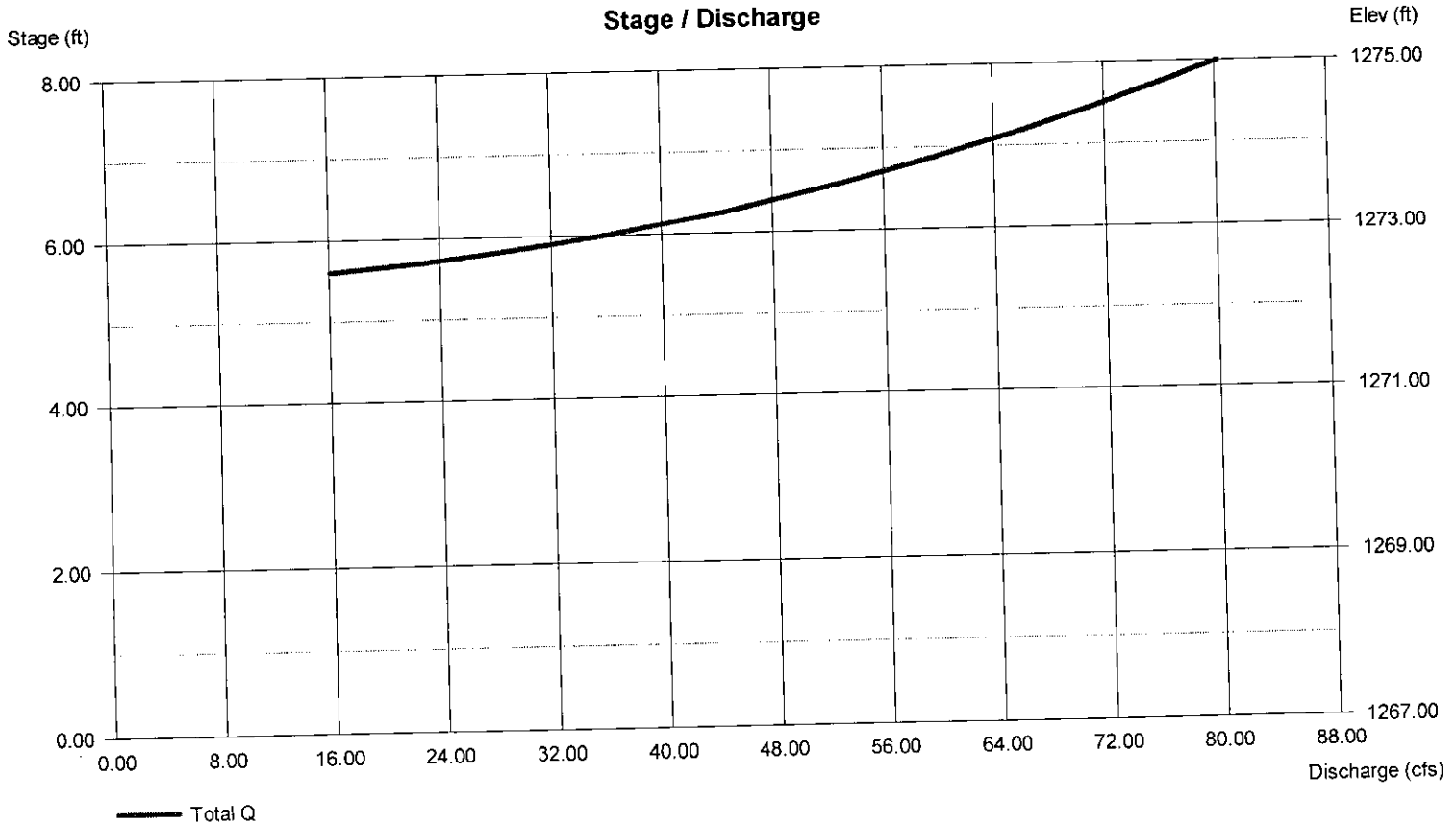
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1268.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 1273.50			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydraflow Rainfall Report

Monday, Mar 5, 2007

Hydraflow Hydrographs by Intelisolve v9.02

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	69.8703	13.1000	0.8658	-----
3	0.0000	0.0000	0.0000	-----
5	79.2597	14.6000	0.8369	-----
10	88.2351	15.5000	0.8279	-----
25	102.6072	16.5000	0.8217	-----
50	114.8193	17.2000	0.8199	-----
100	127.1596	17.8000	0.8186	-----

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: SCS_24HR.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.50	0.00	4.50	5.20	6.00	7.00	7.80
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

HydraFlow

**48" Storm System
24" HECMP
48" RCP Outlet
Channel Section**

Culvert Report

Monday, Mar 5 2007

Hydraflow Express by Intelisolve

Cir Culvert

Invert Elev Dn (ft) = 1268.98
 Pipe Length (ft) = 600.00
 Slope (%) = 0.08
 Invert Elev Up (ft) = 1269.46
 Rise (in) = 48.0
 Shape = Cir
 Span (in) = 48.0
 No. Barrels = 1
 n-Value = 0.013
 Inlet Edge = Sq Edge
 Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

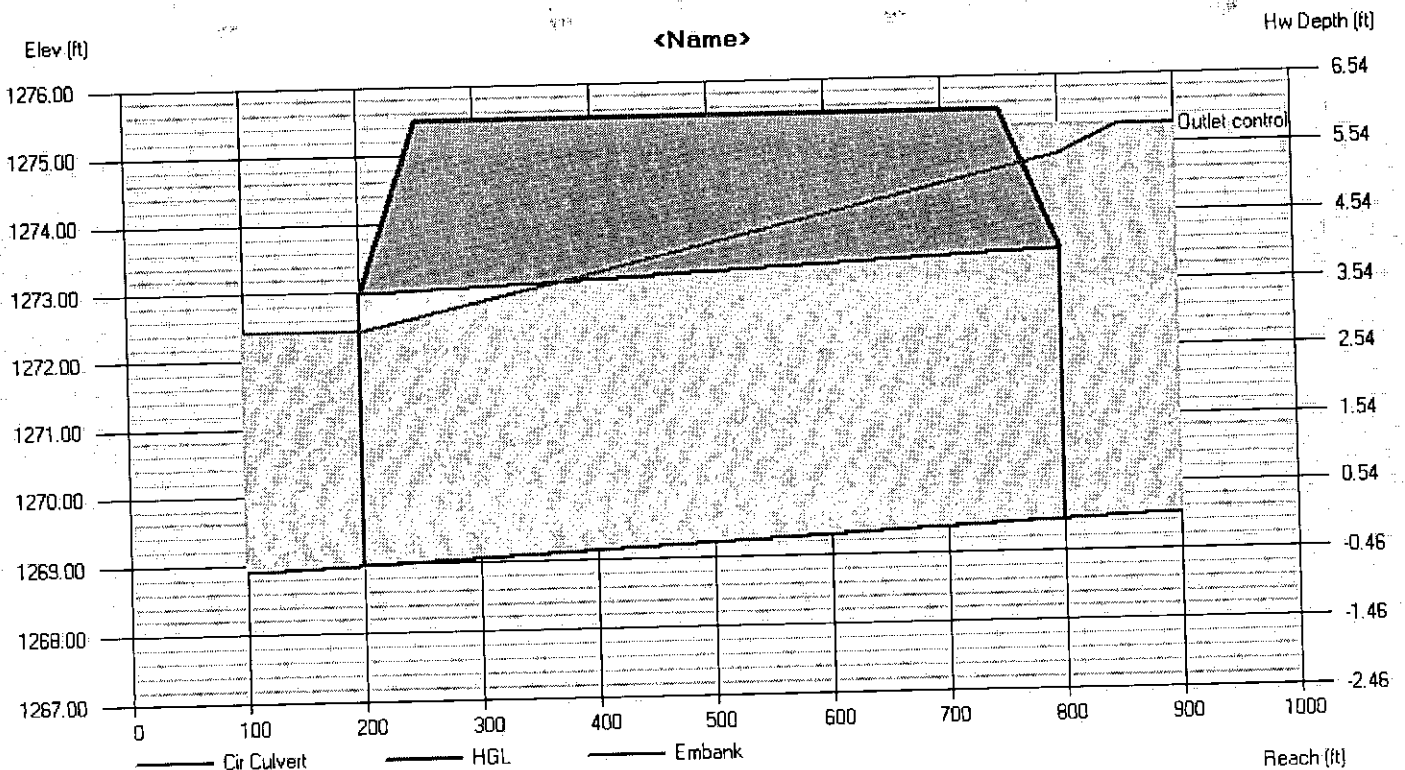
Top Elevation (ft) = 1275.50
 Top Width (ft) = 500.00
 Crest Width (ft) = 10.00

Calculations

Qmin (cfs) = 10.00
 Qmax (cfs) = 150.00
 Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 90.00
 Qpipe (cfs) = 90.00
 Qovertop (cfs) = 0.00
 Veloc Dn (ft/s) = 7.82
 Veloc Up (ft/s) = 7.16
 HGL Dn (ft) = 1272.42
 HGL Up (ft) = 1274.84
 Hw Elev (ft) = 1275.24
 Hw/D (ft) = 1.45
 Flow Regime = Outlet Control



Culvert Report

Monday, Mar 5 2007

Hydraflow Express by Intelisolve

EII Culvert

Invert Elev Dn (ft) = 1271.90
 Pipe Length (ft) = 45.00
 Slope (%) = 0.04
 Invert Elev Up (ft) = 1271.92
 Rise (in) = 24.0
 Shape = EII
 Span (in) = 38.0
 No. Barrels = 1
 n-Value = 0.024
 Inlet Edge = Projecting
 Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

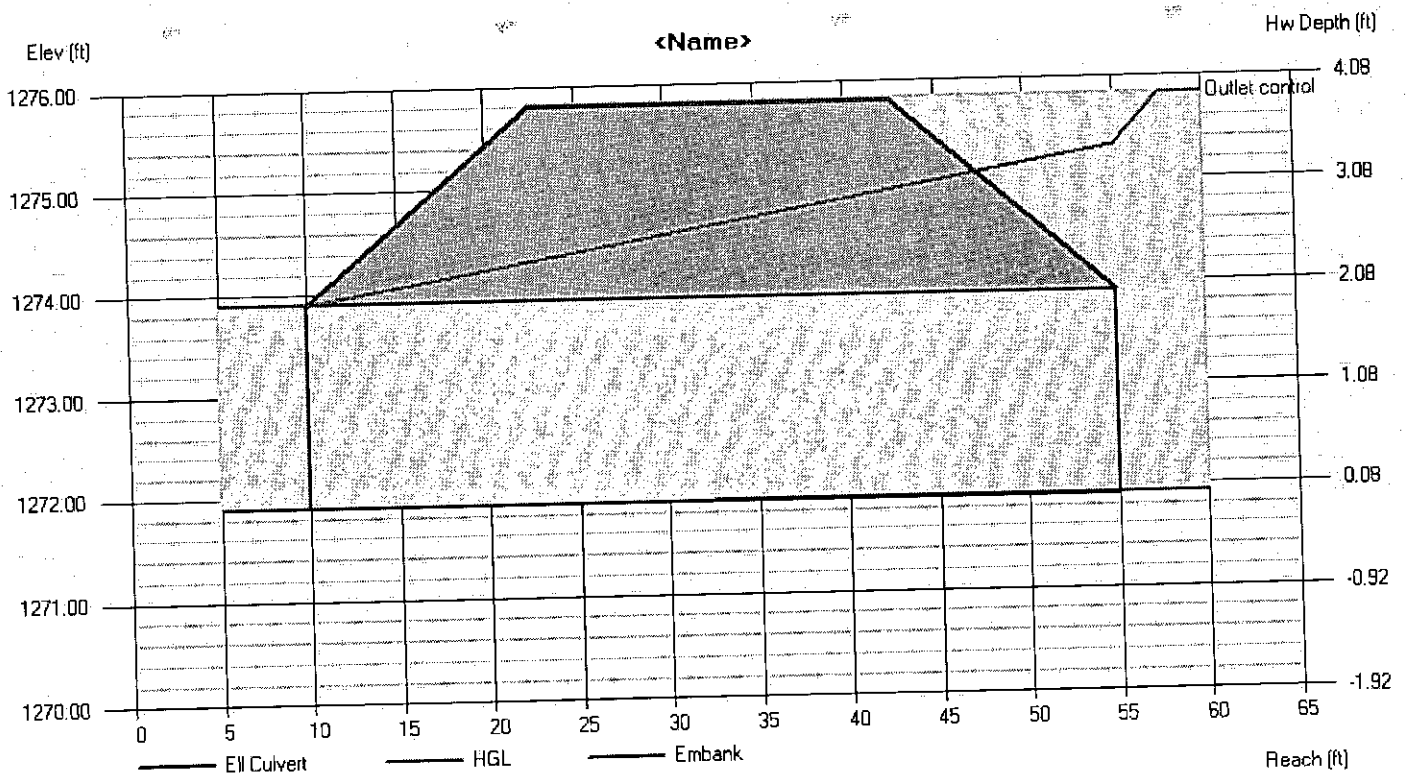
Top Elevation (ft) = 1275.80
 Top Width (ft) = 20.00
 Crest Width (ft) = 40.00

Calculations

Qmin (cfs) = 5.00
 Qmax (cfs) = 40.00
 Tailwater Elev (ft) = $(dc+D)/2$

Highlighted

Qtotal (cfs) = 40.00
 Qpipe (cfs) = 39.66
 Qovertop (cfs) = 0.34
 Veloc Dn (ft/s) = 7.97
 Veloc Up (ft/s) = 7.97
 HGL Dn (ft) = 1273.90
 HGL Up (ft) = 1275.33
 Hw Elev (ft) = 1275.83
 Hw/D (ft) = 1.95
 Flow Regime = Outlet Control



Culvert Report

Monday, Mar 5 2007

Hydraflow Express by Intelisolve

Cir Culvert

Invert Elev Dn (ft) = 1266.97
 Pipe Length (ft) = 400.00
 Slope (%) = 0.08
 Invert Elev Up (ft) = 1267.29
 Rise (in) = 48.0
 Shape = Cir
 Span (in) = 48.0
 No. Barrels = 1
 n-Value = 0.013
 Inlet Edge = Mitered
 Coeff. K,M,c,Y,k = 0.021, 1.33, 0.0463, 0.75, 0.7

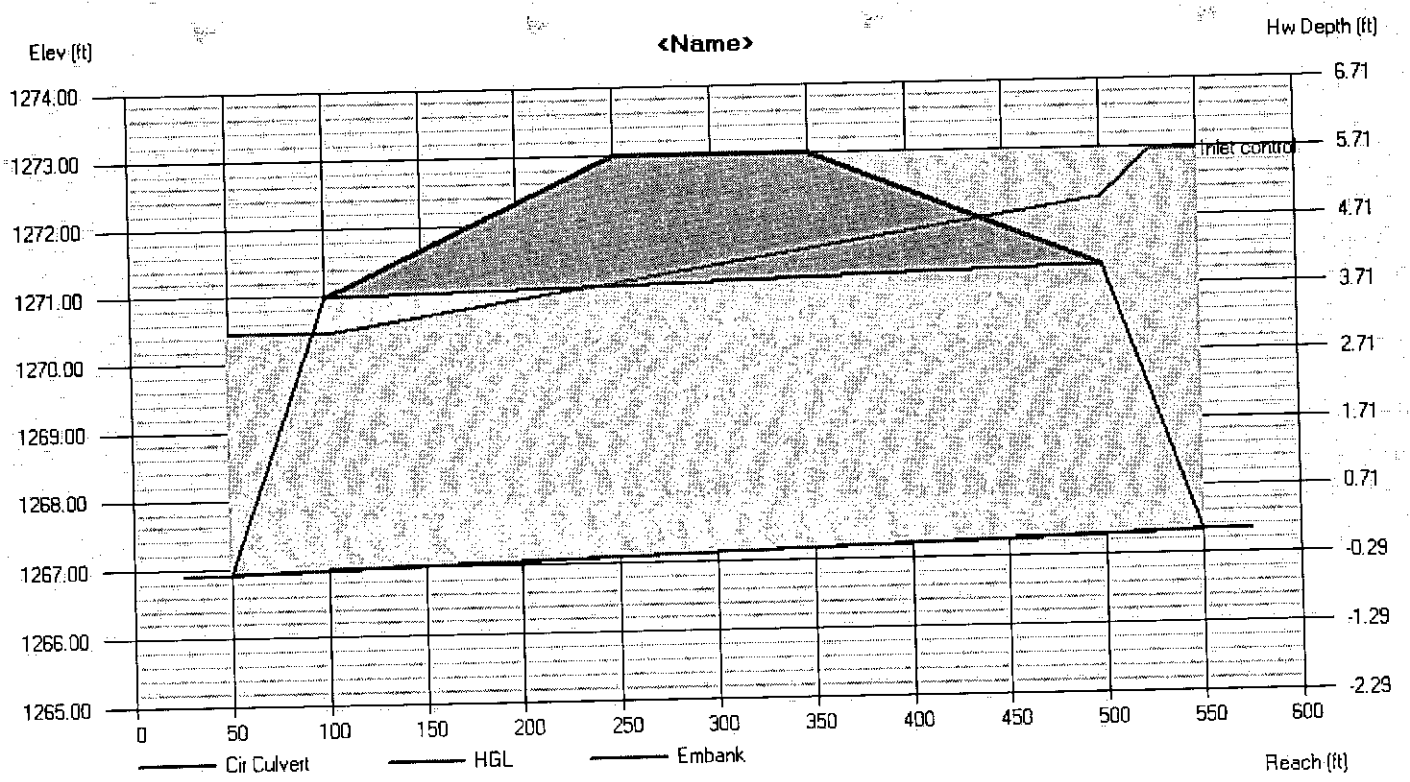
Embankment
 Top Elevation (ft) = 1273.00
 Top Width (ft) = 100.00
 Crest Width (ft) = 10.00

Calculations

Qmin (cfs) = 10.00
 Qmax (cfs) = 150.00
 Tailwater Elev (ft) = $(dc+D)/2$

Highlighted

Qtotal (cfs) = 95.00
 Qpipe (cfs) = 95.00
 Qovertop (cfs) = 0.00
 Veloc Dn (ft/s) = 8.18
 Veloc Up (ft/s) = 7.56
 HGL Dn (ft) = 1270.45
 HGL Up (ft) = 1272.28
 Hw Elev (ft) = 1272.94
 Hw/D (ft) = 1.41
 Flow Regime = Inlet Control



Channel Report

Hydraflow Express by Intelisolve

Monday, Mar 5 2007

<Name>

Trapezoidal

Bottom Width (ft) = 15.00
Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 3.00
Invert Elev (ft) = 1271.30
Slope (%) = 0.40
N-Value = 0.030

Highlighted

Depth (ft) = 3.00
Q (cfs) = 408.03
Area (sqft) = 81.00
Velocity (ft/s) = 5.04
Wetted Perim (ft) = 39.74
Crit Depth, Y_c (ft) = 2.05
Top Width (ft) = 39.00
EGL (ft) = 3.39

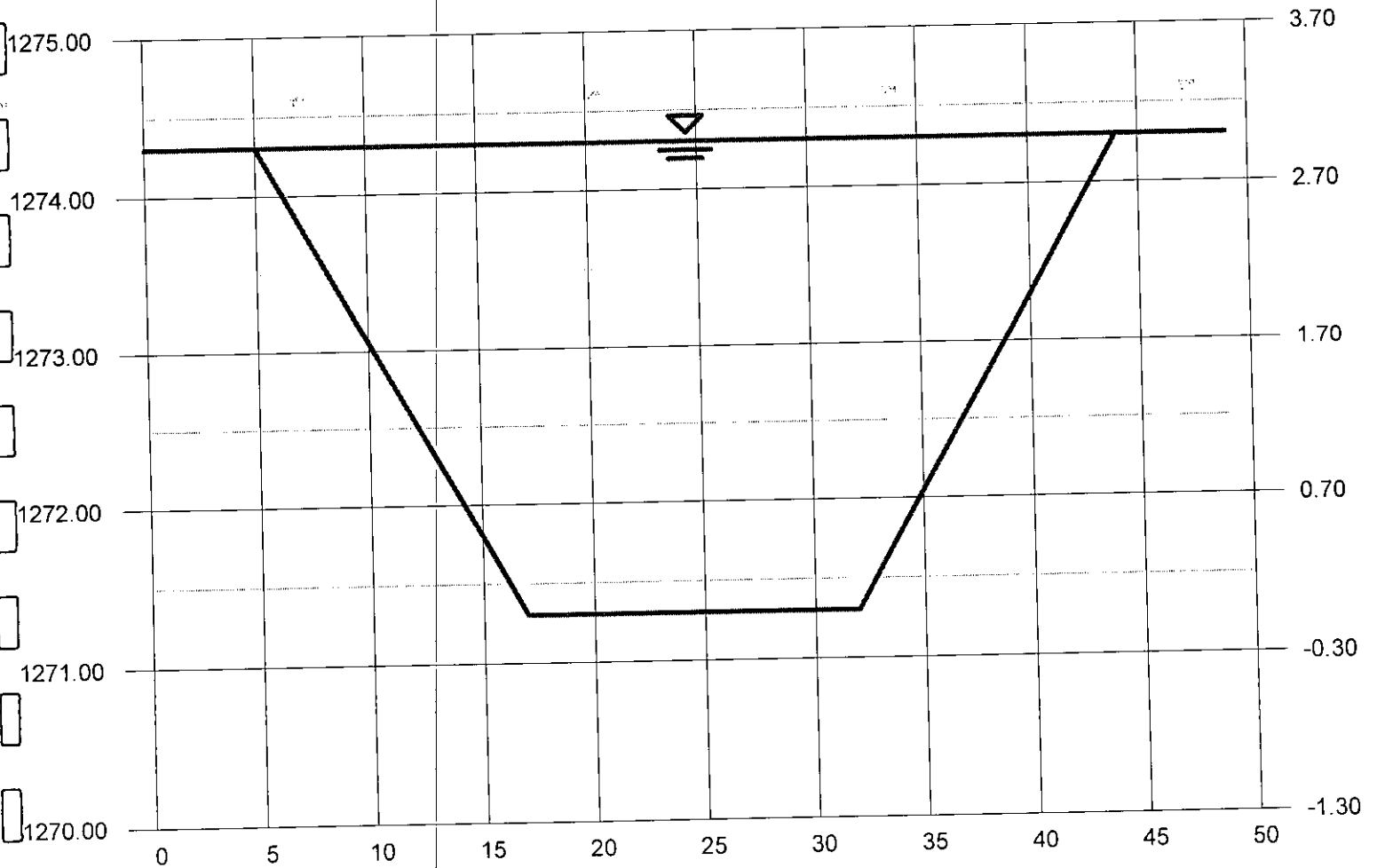
Calculations

Compute by: Q vs Depth
No. Increments = 10

Elev (ft)

Section

Depth (ft)



Reach (ft)

PLAN SHEETS

DRAINAGE PLAN

Scale 1:100