

DRAINAGE REPORT

FOR

JOHNSON'S NURSERY ADDITION
Wichita, Kansas

APRIL 2008



Public Works, Engineering Division Final Drainage Plan Submittal Checklist

Reviewer: _____	Date: _____
Subdivision Name: _____	Location: _____
Total Land Area Of Ownership: _____ Acres	
Type: _____ Residential _____ Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other	
Applicant: _____	Contact: _____ Phone #: _____
Engineer: _____	Contact: _____ Phone #: _____

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					
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					

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)					
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.					



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					

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)					
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					



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 plat text. (e.g. HOA, Lot Owners Association, or lot)					
W. Off-site drainage easements or agreements required, where necessary					

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

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

Tab 1. Project Narrative

A. Location

The subject property is in the city of Wichita, Sedgwick County, Kansas. The proposed development is located east of North Hoover Road and 25th Street, in the southeast ¼ of the southwest ¼ of Section 2, Township 27 South, Range 1 West. The entire Johnson's Nursery Addition is approximately 13.3 acres. The site is shown on the USGS Map, Figure 1.1.

B. Discussion of Development

A small parking area, product display area, greenhouse and a sales office are proposed for the site. The sales office is an addition to the existing residential structure. The existing septic system will remain in tact and utilized for the expansion, however, two alternatives are presented to provide access to the City's sanitary sewer system. The site currently utilizes well water. The City water line will be extended from the south along the east side of Hoover Road to provide service to the site if desired.

C. Discussion of Offsite

The site is bounded by Hoover Road to the west, agricultural land to the north, a 6.6-acre residential lot to the south and Big River Sand pits to the east.

D. Summary of Runoff

Elevations on site range from 1340 near the existing residence to 1313 at the water's edge of the existing pond. The site drains radially from the high point near the existing residential structure; however, a majority of the site drains east to the existing pond. There are two basins on site, the East Basin drains to the existing pond and the West Basin drains to Hoover Road. Per City standards, the Rational method was used to compute design runoff since the drainage area is less than 320 acres. The existing pond has the capacity to adequately store the 100-year storm event and a detention berm is proposed for the West Basin to reduce post-project flow rates equal to or below pre-project rates. A comparison of pre and post-development flowrates are shown below.

Comparison of Pre and Post-Development Flowrates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Pre-project East Basin	7.7	9.2	10.6	15.0
Post-project East Basin	The East Basin drains to the existing pond which has no outlet structure; however, the pond is able to store the 100-year storm event; runoff from the site will not increase from pre to post project.			
Pre-project West Basin	2.2	2.6	3.0	4.2
Post-project West Basin	1.7	2.1	2.4	3.6

E. Best Management Practices

The site will be seeded or sodded after construction of grading and utilities are complete. During construction, Silt barrier will be utilized to reduce sediment loss from the site.

F. Plat

The plat is included, Figure 1.2.

G. Preliminary Grading Plan

The preliminary lot grading plan is included, Figure 1.3.

H. Professional Engineer Seal

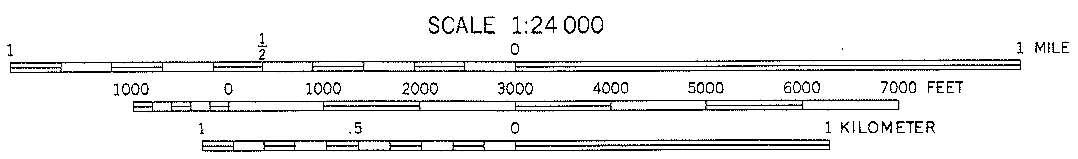
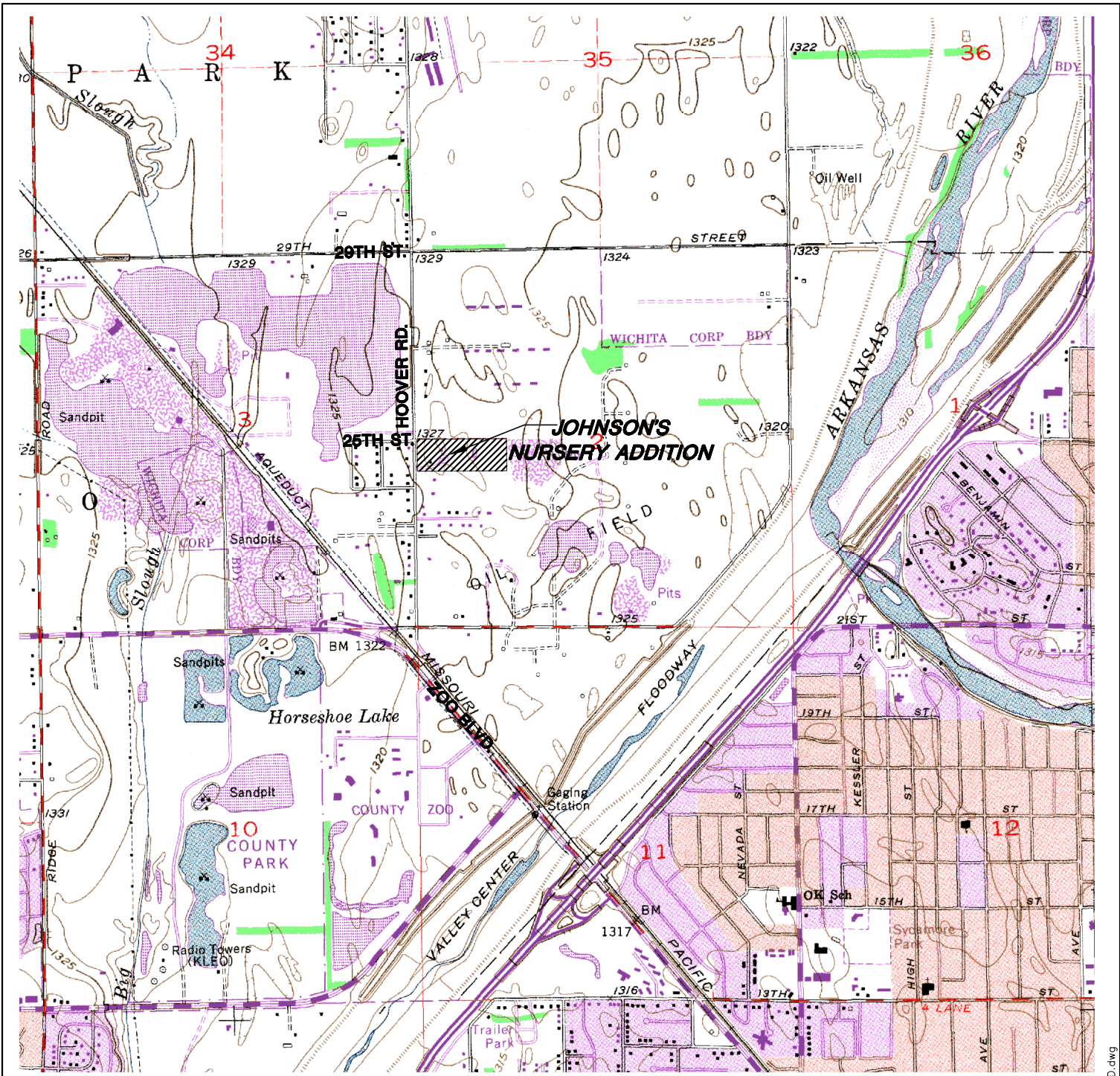
The cover of the report will be signed and dated.

I. CD

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

Figure 1.1

USGS Quadrangle Map



CONTOUR INTERVAL 5 FEET
 NATIONAL GEODETIC VERTICAL DATUM OF 1929



MKEC ENGINEERING CONSULTANTS, INC. 411 N. WEBB ROAD WICHITA, KS. 67206 316 - 684 - 9600	JOHNSON'S NURSERY ADDITION <small>PROJECT NAME</small>		
	WICHITA KS, QUADRANGLE <small>SHEET TITLE</small>		
TMH <small>DESIGN BY:</small>	CMJ <small>DRAWN BY:</small>	TMH <small>CHECKED BY:</small>	
FEBRUARY 2008 <small>DATE</small>	07913 <small>JOB NO.</small>	1 / 1 <small>SHEET/OF</small>	

J:\Civil\07913\dwg\Drwg\07913QUAD.dwg

Figure 1.2

Plat

FINAL PLAT

JOHNSON'S NURSERY ADDITION

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

CERTIFICATE OF SURVEY

I, Gregory J. Allison, a registered land surveyor in Kansas, do hereby certify that I have been in responsible charge of surveying and platting of "JOHNSON'S NURSERY GARDEN ADDITION", an addition to Wichita, Sedgwick County, Kansas, into a Lot, a Block, and a Street, the same being accurately set forth in the accompanying plat and described herein:

The south 225 feet of the north 445 feet of the Northwest Quarter, of the Southwest Quarter, Section 2, Township 27 South, Range 1 West, of the Sixth Principal Meridian, Wichita, Sedgwick County, Kansas; and the North 220.5 feet of the Northwest Quarter of the Southwest Quarter of said Section 2.

All reserves, streets, utility easements, building setbacks, access control, together with, an easement for public utilities recorded on Misc. Book 536, Page 37, all within the above described property are hereby vacated and replatted by virtue of K.S.A. 12-512(b).

I hereby certify that the details of this plat are correct to the best of my knowledge and belief this _____ day of _____, 2008.

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

OWNER'S CERTIFICATE

Know all men by these presents that we the undersigned property owners of the land above set forth in the Registered Land Surveyor's Certificate, have caused the same to be surveyed and platted into a Lot, a Block, and a Street the same to be known as "JOHNSON'S NURSERY ADDITION", an addition to Wichita, Sedgwick County, Kansas.

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

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

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

Jeremy E. Johnson, _____
Kassy A. Johnson, _____

STATE OF KANSAS, SEDGWICK COUNTY) ss:

This instrument was acknowledged before me on _____ day of _____, 2008, by Jeremy E. Johnson and Kassy A. Johnson.

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

Affix Seal

Notary Public: _____, Notary Public
My Term Expires: _____

MORTGAGE CERTIFICATE

We, Bank of the West, holders of a mortgage on the above described property, do hereby consent to the plat of "JOHNSON'S NURSERY ADDITION".

Bank of the West, A California Corporation

_____, Regional Mortgage Manager
Darren Copp, Regional Mortgage Manager

This instrument was acknowledged before me on this _____ day of _____, 2008, by Darren Copp, Bank of the West.

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

Affix Seal

Notary Public: _____, Notary Public
My Term Expires: _____

TRANSFER RECORD

STATE OF KANSAS, SEDGWICK COUNTY) ss:

Entered on transfer record this _____ day of _____, 2008

Don Brace, County Clerk _____, County Clerk

AFFIX SEAL

REGISTER OF DEEDS CERTIFICATE

This is to certify that this instrument was filed for record in the Register of Deeds office this _____ day of _____, 2008, at _____ o'clock _____M, and is duly recorded.

Bill Meek, Register of Deeds _____, Register of Deeds

Attest:

Tonya E. Buckingham, Deputy _____, Deputy

COUNTY SURVEYOR

Reviewed in accordance with K.S.A. 58-2005 on this _____ day of _____, 2008.

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

PLANNING COMMISSION CERTIFICATE

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

Dated this _____ day of _____, 2008

WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

M.S. Mitchell, Chair _____, Chair

Attest: _____, Secretary
John L. Schlegel, Secretary

AFFIX SEAL

GOVERNING BODY CERTIFICATE

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

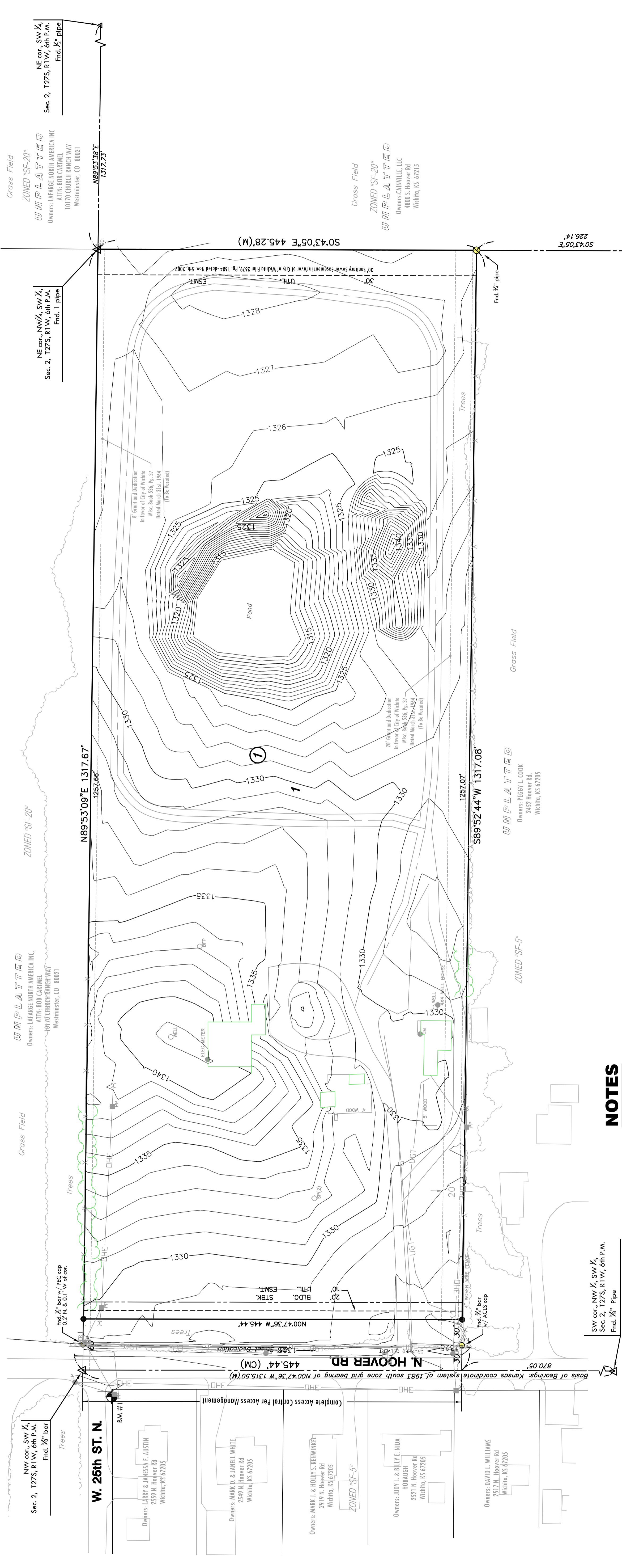
Dated this _____ day of _____, 2008

At the direction of the City Council.

Carl Brewer, Mayor _____, Mayor

Attest: _____, City Clerk
Carol Jones, City Clerk

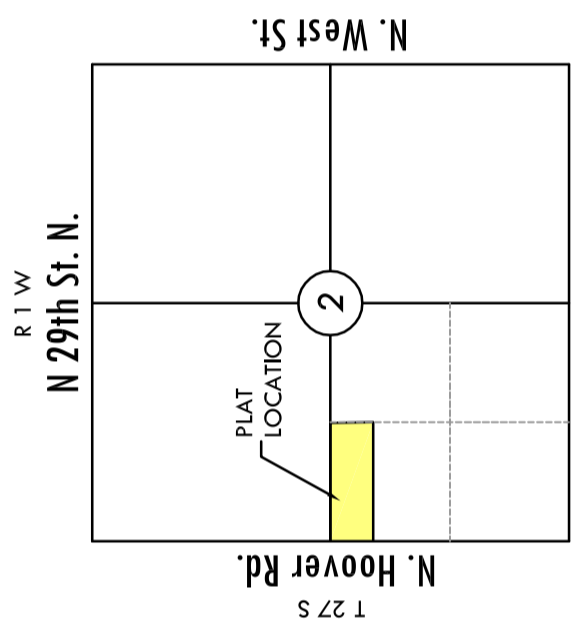
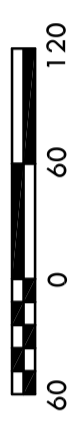
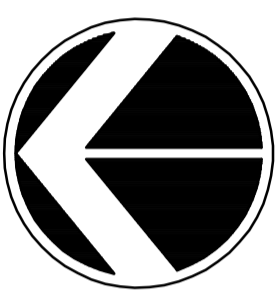
AFFIX SEAL



- LEGEND**
- △ - Sec. Corner
 - S/L - SIGN
 - ⌘ - GATE
 - ⌘ - TREES
 - ⌘ - EDGE OF TREES
 - ⌘ - POLE - POLE
 - ⌘ - POWER POLE/GUY ANCHOR
 - ⌘ - FIRE HYDRANT
 - ⌘ - WATER VALVE
 - ⌘ - WATER METER
 - ⌘ - PIPELINE
 - ⌘ - OVERHEAD ELECTRIC
 - ⌘ - FENCE

NOTES

1. LOT TOTAL - 1
2. ANNEXATION: Incorporated into Wichita
3. EXISTING/PROPOSED USES: Nursery and Garden Center/Residential
4. ZONING: Existing - "LC" Proposed - "LC"
5. PLAT AREA: Gross - 13.16 acres
6. SURVEY DATE: April 2008 (by MKEC)
7. PUBLIC UTILITIES: Municipal water is located on West side of Hoover Rd North of W. 25th St. N.
8. PRIVATE UTILITIES: Two(2) onsite septic systems in use
9. ACCESS CONTROLS: As shown
10. FLOOD: According to FEMA FIRM Community Unit Panel 20173C 0335E, Effective Date February 7th, 2007; within flood zone "X".
11. DRAINAGE: A drainage report shall accompany this plat.



BENCH MARK

B.M. #1
 City of Wichita benchmark disc on southwest corner of 25th Street North and Hoover. 3.5' north of a 4' chain link fence 17' south of center of a gravel road 34.5' South and 31.7' west of the quarter section corner at 25th and Hoover. Elev. = 1327.72 NAVD88

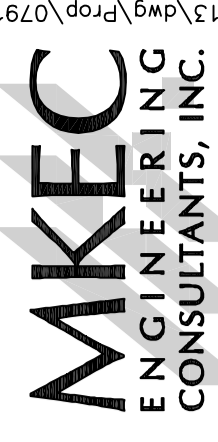
LEGAL DESCRIPTION

The south 225 feet of the north 445 feet of the Northwest Quarter, of the Southwest Quarter, Section 2, Township 27 South, Range 1 West, of the Sixth Principal Meridian, Wichita, Sedgwick County, Kansas; and the North 220.5 feet of the Northwest Quarter of the Southwest Quarter of said Section 2.

PRELIMINARY PLAT
JOHNSON'S NURSERY ADDITION

OWNER / DEVELOPER:
 Jeremy E. Johnson and Kassya A. Johnson 2530 N. Hoover Rd. Wichita, KS 67205 (316) 942-3751

Planning Commission Meeting: May 1st, 2008
 Submitted: April 14th, 2008



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

Figure 1.3

Preliminary Grading Plan

Tab 2. Existing Conditions Runoff Calculations

A. Orthophotograph

The aerial photograph is included, Figure 2.1.

B. Runoff Method

The Rational method in Hydraflow Hydrographs 2007 was used to model the site. The site is divided into two basins, East and West, by a high point near the existing residential structure.

C. Existing Topography

Elevations on the site range from 1340 feet to 1313 feet, there is a high point near the existing residential structure and the water surface of the existing pond is 1313. The existing topography is shown on the Existing Conditions Drawing, Figure 2.2.

D. Site Areas

No offsite areas contribute to runoff from this site. The entire site is 13.3 acres and is currently a rural homestead.

E. Benchmarks

The benchmark used for site is a City of Wichita benchmark disc on the southwest corner of 25th Street North and Hoover Road. 3.5 feet north of a 4-foot chain link fence, 17 feet south of the center of a gravel road, 34.5 feet south and 31.7 feet west of the quarter section corner at Hoover Road and 25th Street, Elevation = 1327.72 NAVD 88.

F. Streams, Creeks, and Waterways

No portion of the site is included in a regulatory floodplain. The site is in Zone X, areas outside the 0.2% annual chance event, as shown on FIRM Panel 0335E of 700, Sedgwick County, Kansas February 2, 2007 in Figure 2.3.

G. Soils

According to the NRCS (SCS) Sedgwick County Soil Survey, Figure 2.4, soils on the site are Pratt Loamy Fine Sand, 1-5% slopes. The Hydraulic Soil Group used to select runoff coefficients and curve numbers is "A".

H. Natural Features

There is an existing pond in the eastern portion of the site. This is a natural feature without a designed outlet structure. The East Basin drains to this pond.

I. Location of Existing Impervious Areas

A majority of the site is undeveloped open land. However, there is an existing residential structure, outbuilding and a paved drive, providing access to the site from Hoover Road. There are three wells on-site.

J. Location of Existing Utilities

The site currently utilizes well water and a septic system. There is an existing City water line south of the site on the east side of Hoover Road and an existing sanitary sewer main southeast of the site. A graphic showing the existing utility lines is in Figure 2.5

K. Location of Existing Conveyance Systems

There are no existing stormwater conveyance systems on-site. There is a crushed culvert under the entrance drive to the site. Runoff overland flows from the site.

L. Flow Paths

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

M. Location and Sizes of Existing Structures

There is an existing crushed culvert under the entrance drive to the site. There are no stormwater structures on site. There are three wells on-site

N. Existing Conditions Hydrologic Analysis

There are no offsite runoff contributions to the 13.3-acre site. The Rational method in Hydraflow Hydrographs 2007 was used to calculate existing runoff rates; output is in Figure 2.6. The resulting pre-project flows are reported in the table below.

Pre-Development Flowrates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Pre-project East Basin	7.7	9.2	10.6	15.0
Pre-project West Basin	2.2	2.6	3.0	4.2

O. Pre-Developed Runoff Curve Numbers

A weighted rational coefficient of 0.23 was used for the East Basin and a rational coefficient of 0.20 was used for the West Basin. Coefficient calculations are in Figure 2.7.

P. Existing Time of Concentration

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

Existing Time of Concentration and Rational Coefficient

Basin	T_c	Rational Coefficient
	minutes	
East	19.6	0.23
West	20.7	0.20

Q. Downstream Drainage Capacity

The runoff from the existing site does not adversely affect any downstream properties.

R. Existing Structural Elevations

There is an existing residential structure on-site with an elevation of 1333.84. There is an existing outbuilding with a structural elevation of 1330.28

S. Open Channels

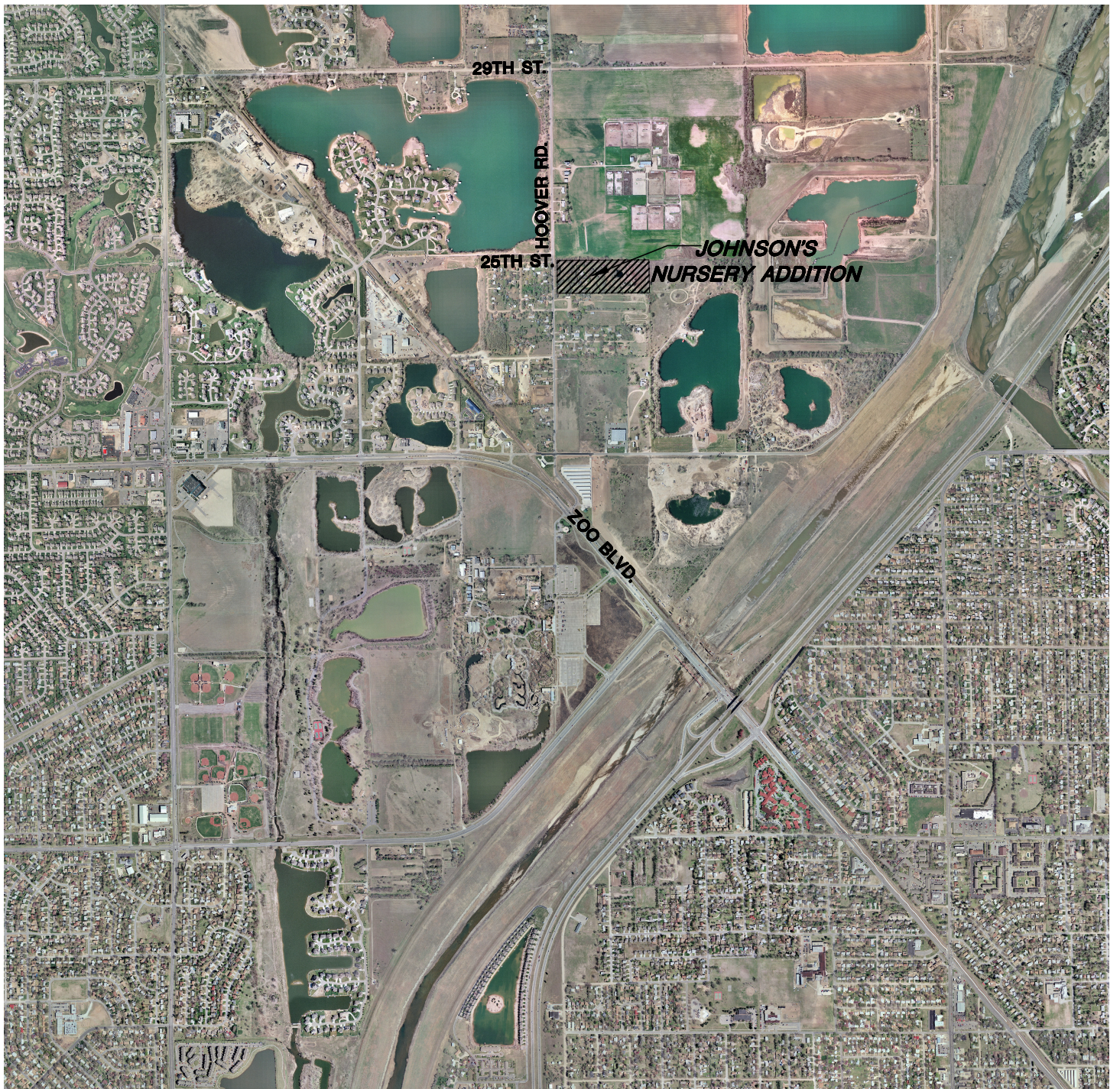
There are no open channels on-site.

T. Groundwater Elevations

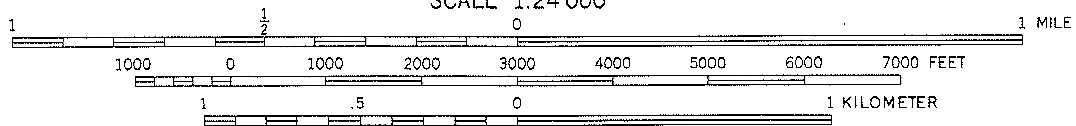
According to a Hydrogeologic Map of Sedgwick County, Kansas, the groundwater elevations on and near the site are around 1315 (NGVD 29), Figure 2.8.

Reference: (<http://www.kgs.ku.edu/General/Geology/Sedgwick/gifs/plate1.pdf>)

Figure 2.1
Orthophotograph



SCALE 1:24 000



CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



MKEC
ENGINEERING
CONSULTANTS, INC.

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

JOHNSON'S NURSERY ADDITION
PROJECT NAME

AERIAL MAP
SHEET TITLE

TMH
DESIGN BY:

CMJ
DRAWN BY:

TMH
CHECKED BY:

FEBRUARY 2008
DATE

07913
JOB NO.

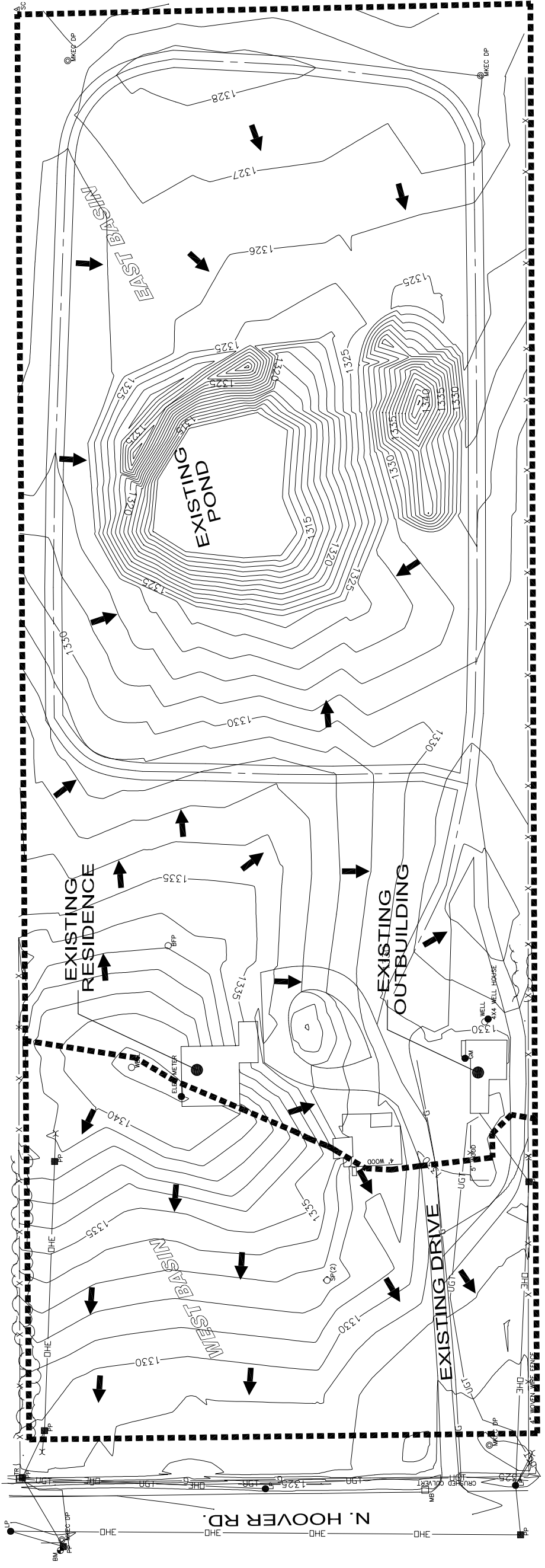
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Figure 2.2

Existing Conditions Drawing

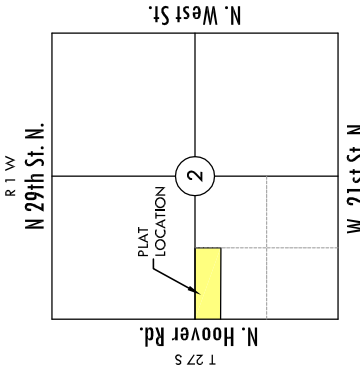
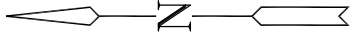
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LEGEND

- CONIFEROUS TREE
- DECIDUOUS TREE
- SIGN
- POWER POLE
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SECTION CORNER
- BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- TELEPHONE LINE
- UNDERGROUND ELEC.
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- DRAINAGE SUB BASIN
- DRAINAGE BASIN
- FLOW ARROW
- AREA FOR SWS SIZING

NOTE: VERTICAL DATUM IS NAVD 88



VICINITY MAP

Figure 2.3

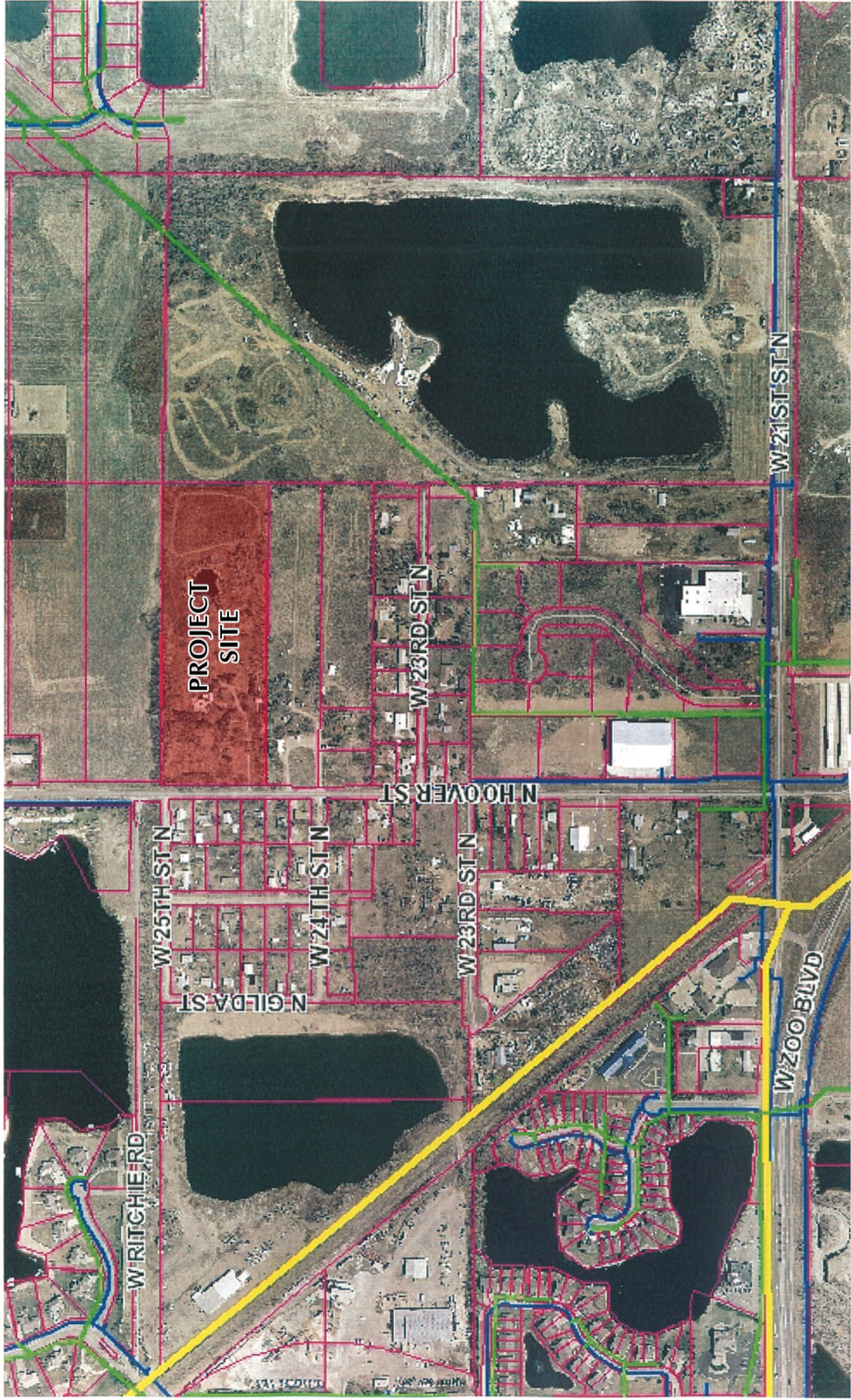
FIRM

Figure 2.4
Soil Survey

Figure 2.5

Sanitary Sewer and Water Line Graphic

JOHNSON NURSERY ADDITION



— = Existing Water Line

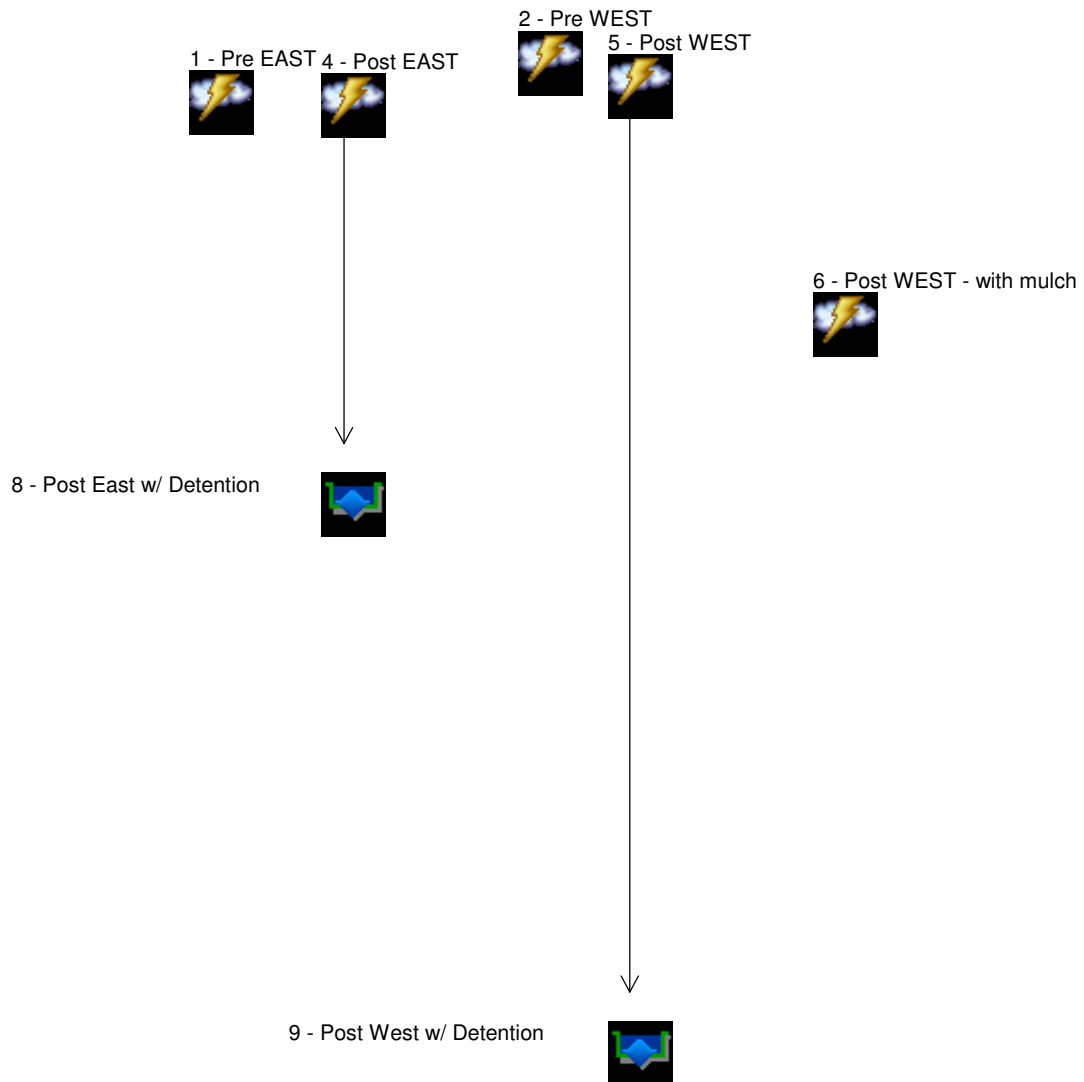
— = Existing Sanitary Sewer Line

Figure 2.6

Hydraflow Hydrographs

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.23



Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	Rational	Pre EAST
2	Rational	Pre WEST
4	Rational	Post EAST
5	Rational	Post WEST
6	Rational	Post WEST - with mulch
8	Reservoir	Post East w/ Detention
9	Reservoir	Post West w/ Detention

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.23

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	Rational	-----	-----	7.700	-----	9.179	10.58	12.30	13.80	15.02	Pre EAST
2	Rational	-----	-----	2.154	-----	2.572	2.967	3.450	3.873	4.218	Pre WEST
4	Rational	-----	-----	9.623	-----	11.45	13.19	15.32	17.18	18.70	Post EAST
5	Rational	-----	-----	2.431	-----	2.897	3.339	3.881	4.355	4.741	Post WEST
6	Rational	-----	-----	2.154	-----	2.572	2.967	3.450	3.873	4.218	Post WEST - with mulch
8	Reservoir	4	-----	0.000	-----	0.000	0.000	0.000	0.000	0.000	Post East w/ Detention
9	Reservoir	5	-----	2.029	-----	2.446	2.856	3.348	3.785	4.139	Post West w/ Detention

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description	
1	Rational	7.700	1	20	0.212	----	-----	-----	Pre EAST	
2	Rational	2.154	1	21	0.062	----	-----	-----	Pre WEST	
4	Rational	9.623	1	19	0.252	----	-----	-----	Post EAST	
5	Rational	2.431	1	20	0.067	----	-----	-----	Post WEST	
6	Rational	2.154	1	21	0.062	----	-----	-----	Post WEST - with mulch	
8	Reservoir	0.000	1	n/a	0.000	4	1313.82	0.252	Post East w/ Detention	
9	Reservoir	2.029	1	23	0.067	5	1328.34	0.017	Post West w/ Detention	
07913Runoff.gpw					Return Period: 2 Year			Thursday, Apr 17, 2008		

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	Rational	9.179	1	20	0.253	----	-----	-----	Pre EAST
2	Rational	2.572	1	21	0.074	----	-----	-----	Pre WEST
4	Rational	11.45	1	19	0.300	----	-----	-----	Post EAST
5	Rational	2.897	1	20	0.080	----	-----	-----	Post WEST
6	Rational	2.572	1	21	0.074	----	-----	-----	Post WEST - with mulch
8	Reservoir	0.000	1	n/a	0.000	4	1313.98	0.300	Post East w/ Detention
9	Reservoir	2.446	1	23	0.080	5	1328.39	0.020	Post West w/ Detention
07913Runoff.gpw					Return Period: 5 Year			Thursday, Apr 17, 2008	

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	Rational	10.58	1	20	0.291	----	-----	-----	Pre EAST
2	Rational	2.967	1	21	0.086	----	-----	-----	Pre WEST
4	Rational	13.19	1	19	0.345	----	-----	-----	Post EAST
5	Rational	3.339	1	20	0.092	----	-----	-----	Post WEST
6	Rational	2.967	1	21	0.086	----	-----	-----	Post WEST - with mulch
8	Reservoir	0.000	1	n/a	0.000	4	1314.12	0.345	Post East w/ Detention
9	Reservoir	2.856	1	23	0.092	5	1328.43	0.022	Post West w/ Detention
07913Runoff.gpw					Return Period: 10 Year			Thursday, Apr 17, 2008	

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Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	Rational	15.02	1	20	0.414	----	-----	-----	Pre EAST
2	Rational	4.218	1	21	0.122	----	-----	-----	Pre WEST
4	Rational	18.70	1	19	0.489	----	-----	-----	Post EAST
5	Rational	4.741	1	20	0.131	----	-----	-----	Post WEST
6	Rational	4.218	1	21	0.122	----	-----	-----	Post WEST - with mulch
8	Reservoir	0.000	1	n/a	0.000	4	1314.53	0.489	Post East w/ Detention
9	Reservoir	4.139	1	23	0.131	5	1328.56	0.028	Post West w/ Detention
07913Runoff.gpw					Return Period: 100 Year			Thursday, Apr 17, 2008	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

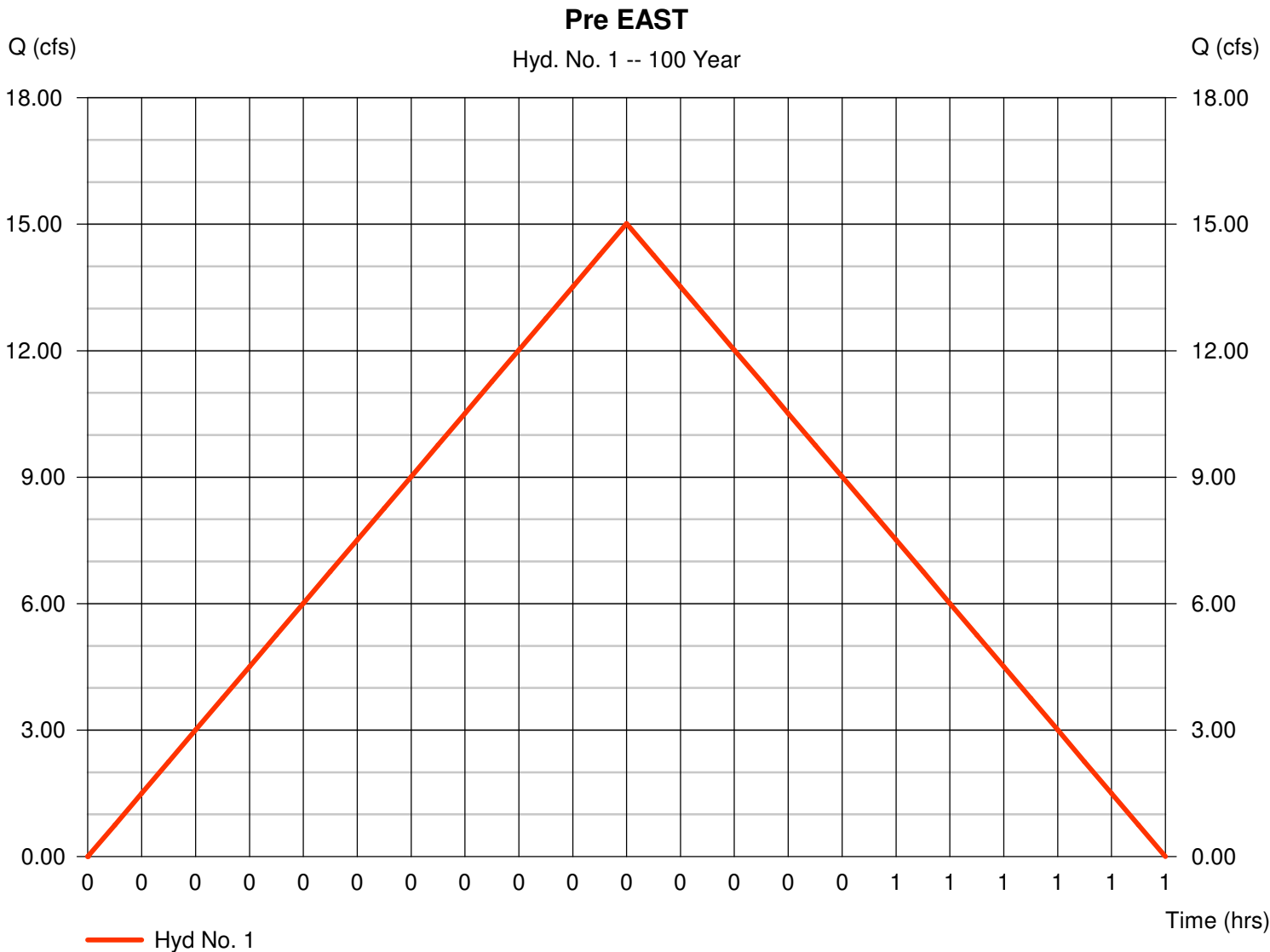
Thursday, Apr 17, 2008

Hyd. No. 1

Pre EAST

Hydrograph type = Rational
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 10.000 ac
 Intensity = 6.530 in/hr
 IDF Curve = SedgwickCoKS.IDF

Peak discharge = 15.02 cfs
 Time to peak = 0.33 hrs
 Hyd. volume = 0.414 acft
 Runoff coeff. = 0.23
 Tc by User = 20.00 min
 Asc/Rec limb fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

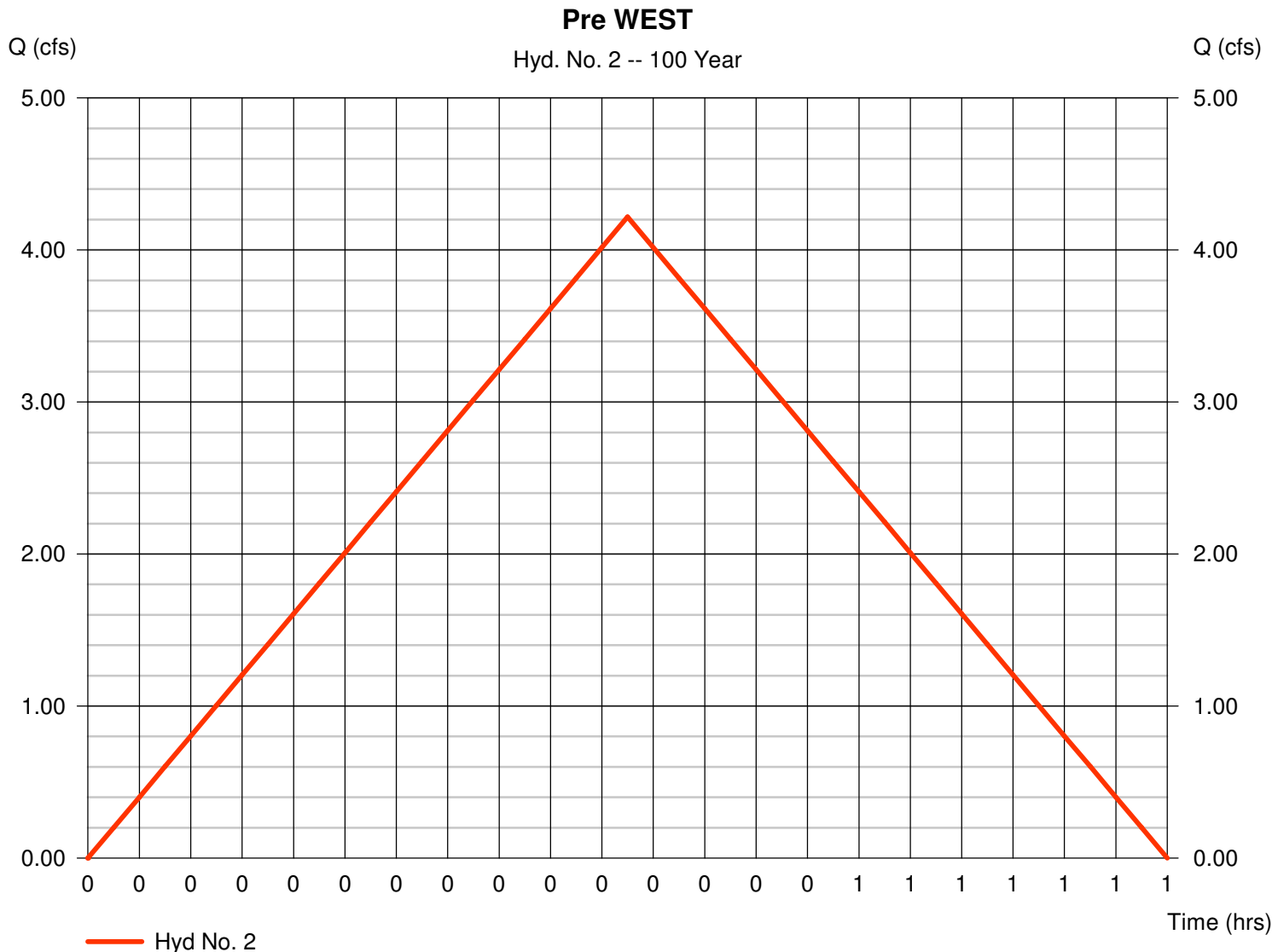
Thursday, Apr 17, 2008

Hyd. No. 2

Pre WEST

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 3.300 ac
Intensity = 6.390 in/hr
IDF Curve = SedgwickCoKS.IDF

Peak discharge = 4.218 cfs
Time to peak = 0.35 hrs
Hyd. volume = 0.122 acft
Runoff coeff. = 0.2
Tc by User = 21.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

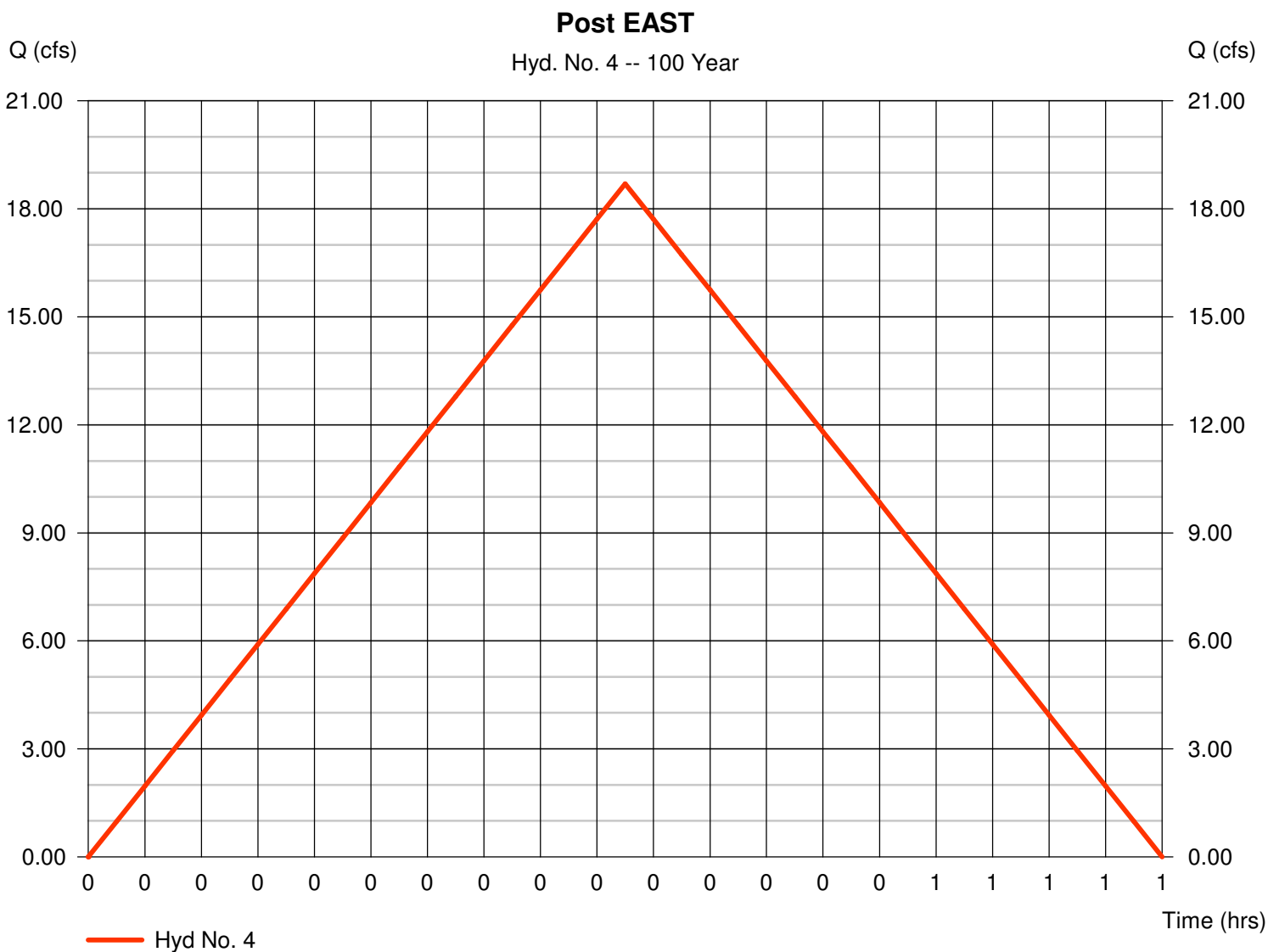
Thursday, Apr 17, 2008

Hyd. No. 4

Post EAST

Hydrograph type = Rational
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 10.000 ac
 Intensity = 6.678 in/hr
 IDF Curve = SedgwickCoKS.IDF

Peak discharge = 18.70 cfs
 Time to peak = 0.32 hrs
 Hyd. volume = 0.489 acft
 Runoff coeff. = 0.28
 Tc by User = 19.00 min
 Asc/Rec limb fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

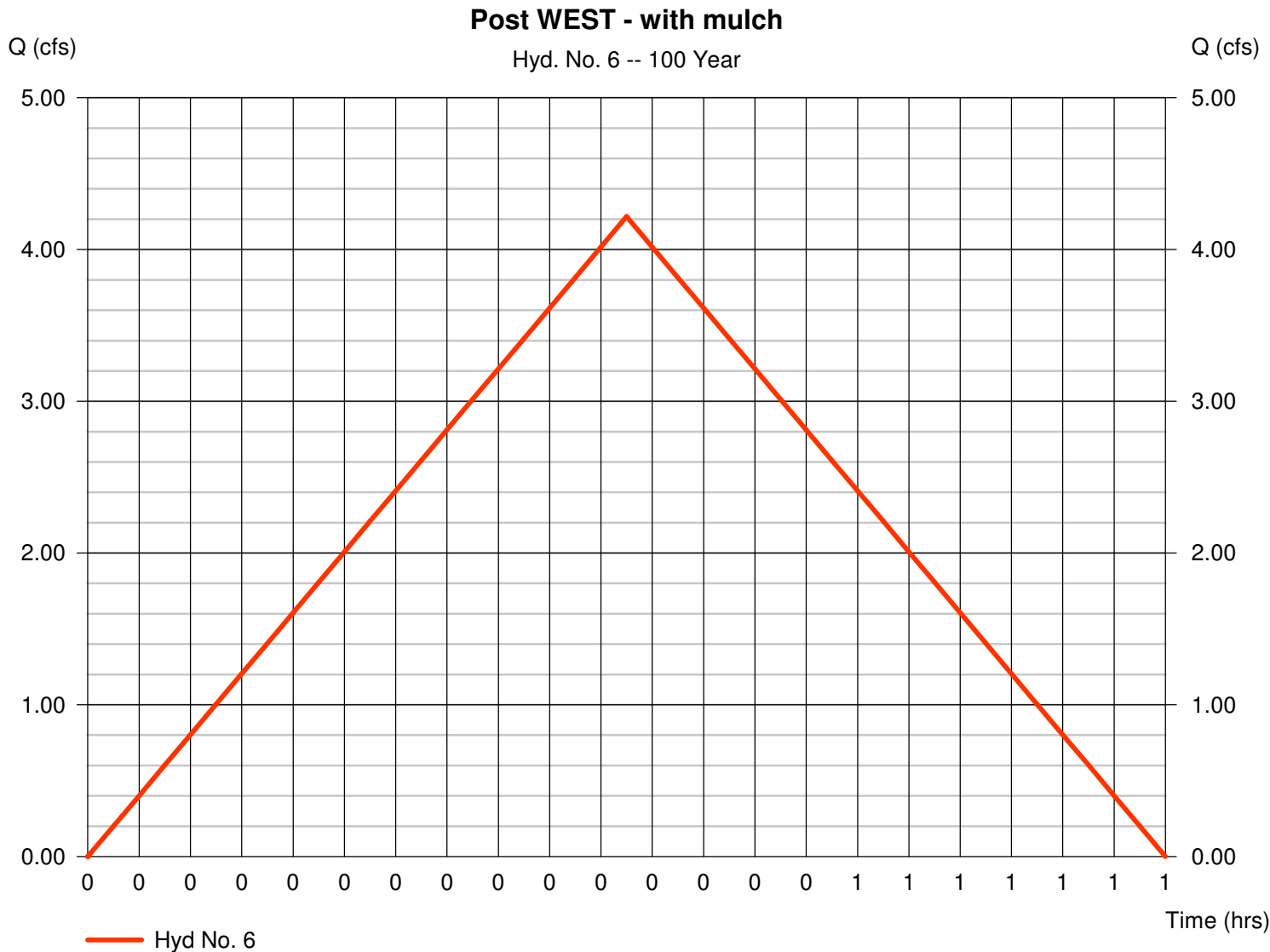
Thursday, Apr 17, 2008

Hyd. No. 6

Post WEST - with mulch

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 3.300 ac
Intensity = 6.390 in/hr
IDF Curve = SedgwickCoKS.IDF

Peak discharge = 4.218 cfs
Time to peak = 0.35 hrs
Hyd. volume = 0.122 acft
Runoff coeff. = 0.2
Tc by User = 21.00 min
Asc/Rec limb fact = 1/1



Pond No. 1 - Existing Pond - add outlet strux

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1313.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1313.00	12,505	0.000	0.000
1.00	1314.00	14,136	0.306	0.306
2.00	1315.00	15,842	0.344	0.649
3.00	1316.00	17,791	0.386	1.035
4.00	1317.00	19,768	0.431	1.466
5.00	1318.00	21,844	0.477	1.944
6.00	1319.00	24,179	0.528	2.472
7.00	1320.00	26,809	0.585	3.056

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 1313.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1313.00	---	---	---	---	0.00	---	---	---	---	---	0.000
1.00	0.306	1314.00	---	---	---	---	0.00	---	---	---	---	---	0.000
2.00	0.649	1315.00	---	---	---	---	0.00	---	---	---	---	---	0.000
3.00	1.035	1316.00	---	---	---	---	0.00	---	---	---	---	---	0.000
4.00	1.466	1317.00	---	---	---	---	0.00	---	---	---	---	---	0.000
5.00	1.944	1318.00	---	---	---	---	0.00	---	---	---	---	---	0.000
6.00	2.472	1319.00	---	---	---	---	0.00	---	---	---	---	---	0.000
7.00	3.056	1320.00	---	---	---	---	0.00	---	---	---	---	---	0.000

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

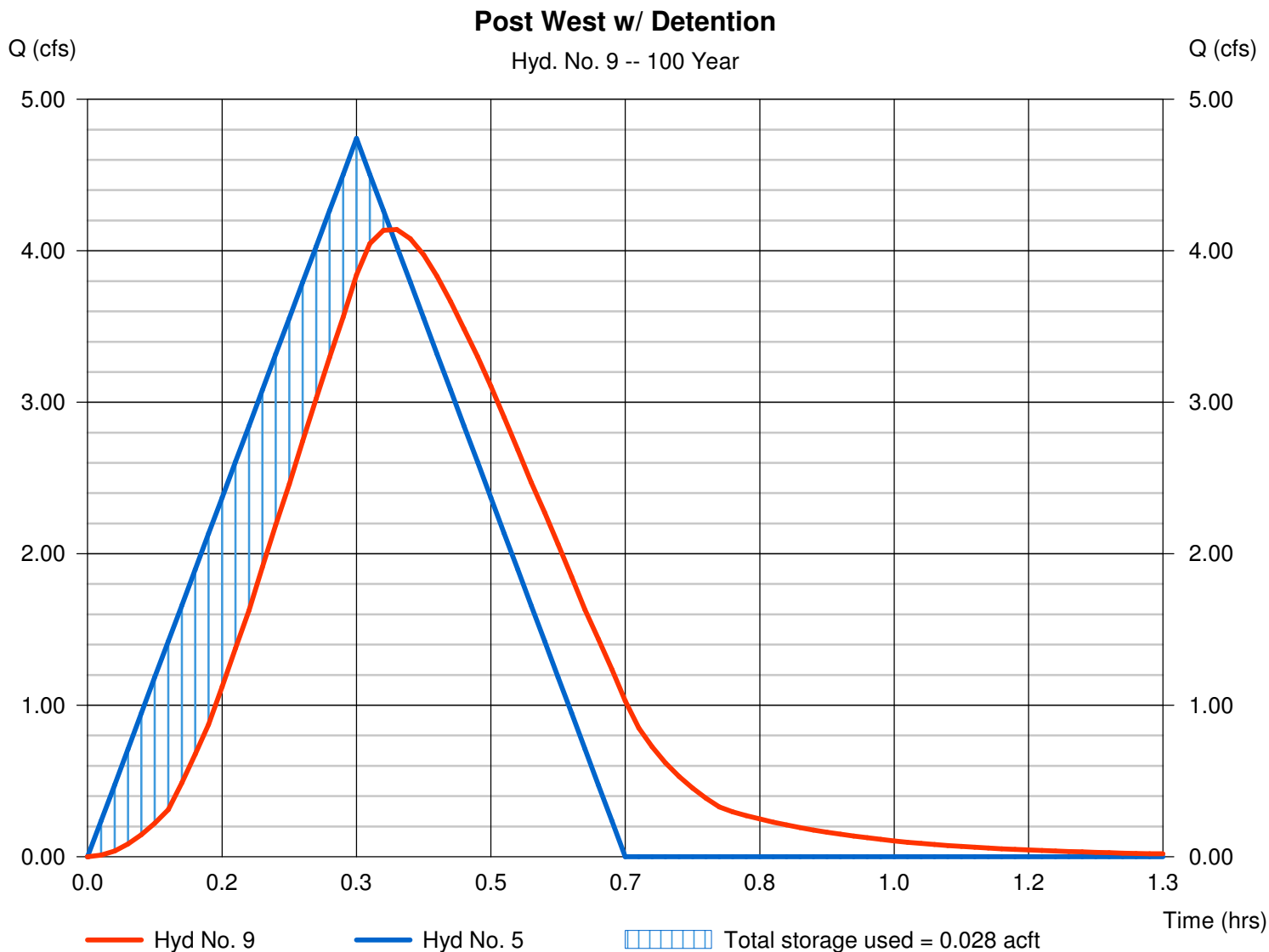
Thursday, Apr 17, 2008

Hyd. No. 9

Post West w/ Detention

Hydrograph type	= Reservoir	Peak discharge	= 4.139 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.38 hrs
Time interval	= 1 min	Hyd. volume	= 0.131 acft
Inflow hyd. No.	= 5 - Post WEST	Max. Elevation	= 1328.56 ft
Reservoir name	= West Basin Berm	Max. Storage	= 0.028 acft

Storage Indication method used.



Hydraflow Rainfall Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Apr 17, 2008

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

File name: SedgwickCoKS.IDF

$$\text{Intensity} = B / (T_c + D)^E$$

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

T_c = time in minutes. Values may exceed 60.

Precip. file name: SedgwickCoKS.pcp

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

Figure 2.7

Rational Coefficient and Time of Concentration Calculations

Time of Concentration Calculations by the FAA method
 Johnson's Nursery Addition

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

Area Name	Area acres	% of Impervious Area	Land Use	Soil Group	Maximum Elevation	Minimum Elevation	Flow Length (L)	Rational Runoff Coefficient, C			Time of Concentration (min), T _c							
								2-Year	5-Year	10-Year	2-Year	5-Year	10-Year	100-Year				
PRE-DEVELOPED																		
East Basin	10.0																	
*	0.6		Drive, Parking Lots & Walks	A					0.87	0.87	0.88							
	9.4		Agricultural - Pasture - Slopes 1-4%	A					0.14	0.15	0.19							
					1340.0	1313.0	489		0.18	0.19	0.23				20.6	20.4	19.6	17.4
West Basin	3.3																	
	0.1		Drive, Parking Lots & Walks	A					0.87	0.87	0.88							
	3.2		Agricultural - Pasture - Slopes 1-4%	A					0.14	0.15	0.19							
					1340.0	1329.0	351		0.15	0.16	0.20				21.8	21.6	20.7	18.4
Site		5.0%																
POST-DEVELOPED																		
East Basin	10.0																	
*	1.2		Drive, Parking Lots & Walks	A					0.87	0.87	0.88							
	0.8		Streets - Gravel	A					0.24	0.26	0.33							
	6.6		Agricultural - Pasture - Slopes 1-4%	A					0.14	0.15	0.19							
**	1.4		Urban Lawn - Slopes <1%	A					0.08	0.09	0.13							
					1340.0	1313.0	489		0.23	0.24	0.28				19.7	19.4	18.6	16.5
West Basin	3.3																	
	0.2		Drive, Parking Lots & Walks	A					0.87	0.87	0.88							
	2.6		Agricultural - Pasture - Slopes 1-4%	A					0.14	0.15	0.19							
**	0.5		Urban Lawn - Slopes <1%	A					0.08	0.09	0.13							
With Mulch Storage					1340.0	1329.0	351		0.17	0.16	0.20				21.5	21.6	20.9	19.0
Without Mulch Storage					1340.0	1329.0	351		0.18	0.19	0.22				21.3	21.1	20.2	18.0
Site		10.3%																

*Includes 0.27 acres of impervious area from existing pond

**Mulch characteristics are similar to this land use

Figure 2.8

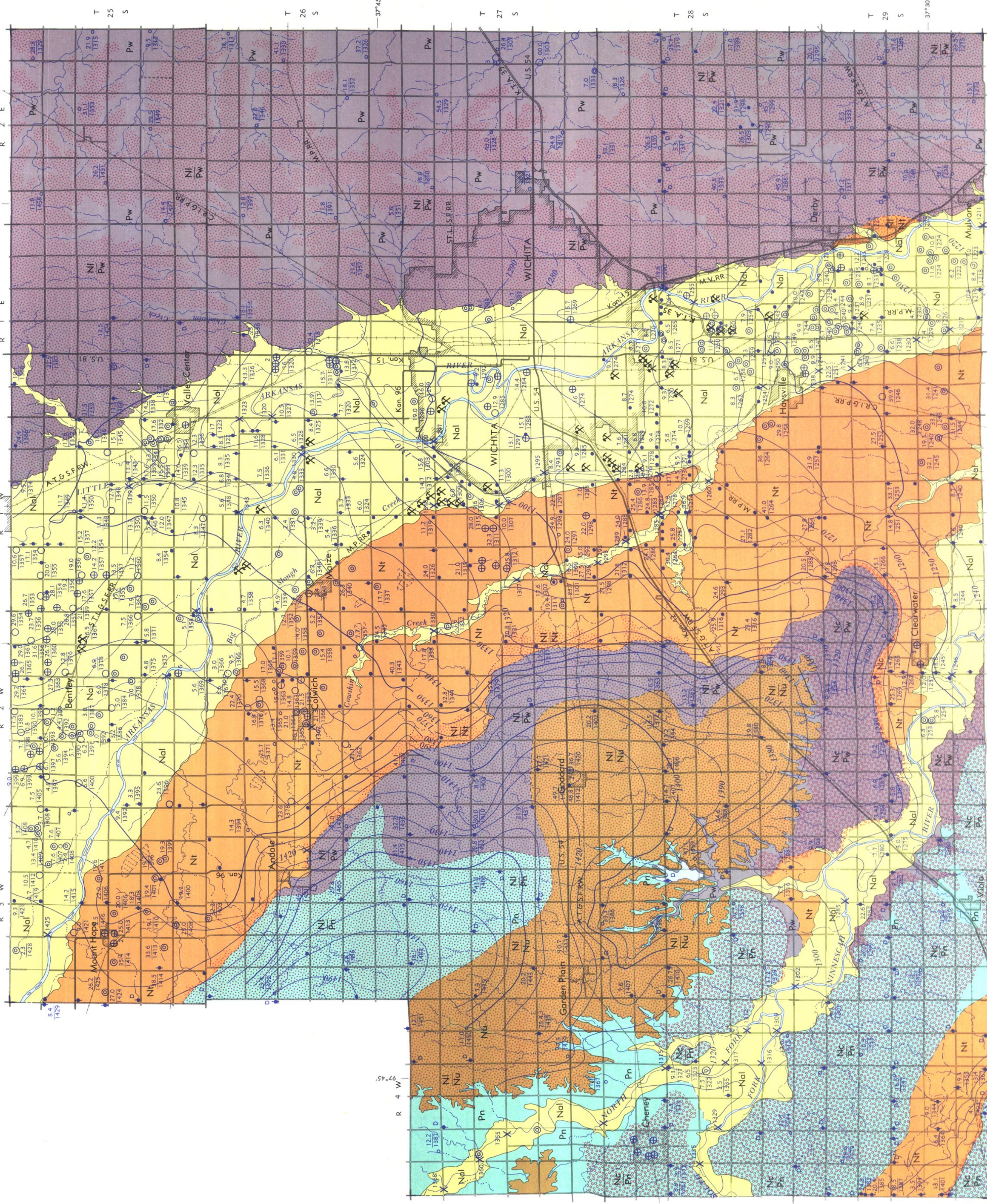
Hydrogeological Map

HYDROGEOLOGIC MAP OF SEDGWICK COUNTY, KANSAS

By Charles W. Lane and Don E. Miller
1965

State Geological Survey
of Kansas

Bulletin
Plate
176



EXPLANATION

Nal
Alluvium and terrace deposits (Wisconsin to Recent)
Chiefly fine to coarse sand and fine to coarse arkosic gravel with coarse silt in upper part. Yields large quantities of water.

Ni
Leess (Illinoian to Recent)
Tan to pinkish-tan calcareous silt; contains pieces of caliche nodules and some sandy zones. Overlies Permian or Pleistocene deposits in most upland areas of the County. Generally lies above water table, but locally basal part is saturated and may yield small quantities of water.

Nc
Colluvium (Illinoian to Recent)
Heterogeneous mixture of silt, clay, sand, gravel, and bedrock fragments. Generally lies above water table, but locally basal part is saturated and may yield small quantities of water from sandy zones.

Nt
Terrace deposits (Illinoian)
Chiefly fine to coarse sand and fine to coarse arkosic gravel with sandy silt in upper part. Sand and gravel beds locally contain silt and clay lenses. Yields large quantities of water.

Nu
Undifferentiated deposits (Nebraskan and Kansan)
Light tan to gray, sandy silt and clay, fine to coarse sand, and fine to coarse arkosic gravel. Locally contains lenticular bed of volcanic ash in upper part. Yields small to moderate quantities of water where in upland position and large quantities in Arkansas Valley.

Pn
Minnesab Shale
Composed chiefly of beds of brownish to silty shale and siltstone. Contains thin beds of argillite, green shale, dolomite, and fine-grained sandstone. Yields small quantities of hard water.

Pw
Wellington Formation
Chiefly gray and blue shale. Contains small thin beds of maroon shale, impure limestone, gypsum, and anhydrite. Thick salt beds present in subsurface. Yields small to moderately large quantities of very hard water.

Upper Pleistocene Subseries

Nal

Lower Pleistocene Subseries

Ni

Pleistocene Series

Nc

Lower Permian Series

Nt

Lower Permian Series

Pn

Lower Permian Series

Pw

- X Gravel pit
 - Augered test hole
 - Domestic or stock well
 - Observation well
 - Municipal well
 - Industrial well
 - Irrigation well
 - Spring
 - Indicates dry hole
- Flood-routing system
- Concave contact
- Approximate contact
- Altitude of stream level
- Number of wells at this location included in Table 14
- Contours on water table dashed where approximate; contour interval, 10 feet
- Upper number, depth to water below land surface, in feet
- Lower number, depth to water table above mean sea level, in feet
- Scale in miles
- 0 1 2 3 4 5 6

Base compiled from maps prepared by the Soil Conservation Service. Aerial geology mapped in 1958 by Charles W. Lane and Don E. Miller.

Tab 3. Post-Development Hydrologic Analysis

A. Proposed Conditions Hydrologic and Hydraulic Analysis

The post-project drainage boundaries are shown in Figure 3.1. The Rational method in Hydraflow Hydrographs 2007 was used to calculate runoff from the post-project site, calculations are in Figure 2.6. The table below shows the resulting post-development flowrates. If 0.5 acres of the West Basin is utilized as a mulch storage area, the increase in pervious area will bring post-project flowrates to pre-project values; however if a mulch storage area is not implemented a small detention area will be required for the West Basin.

Post-Development Flowrates

Description	Design Storm Flows (cfs)			
	2-Yr	5-Yr	10-Yr	100-Yr
Post-project East Basin	The East Basin drains to the existing pond which has no outlet structure; however, the pond is able to store the 100-year storm event; runoff from the site will not increase from pre to post project.			
Post-project West Basin w/ Detention Berm	2.0	2.4	2.9	4.1
Post-project West Basin w/ Mulch Storage Area	2.2	2.6	3.0	4.2

B. Proposed Time of Concentration

A post-project time of concentration of 18.6 and 20.2 minutes was calculated for the East and West Basin, respectively. Time of concentration calculations are in Figure 2.7.

C. Assumed Post-Developed Curve Numbers

A weighted rational coefficient was calculated for the West and East Basin. The table below shows the resulting coefficients; the West Basin values assume mulch storage is not utilized. Rational coefficient calculations are in Figure 2.7.

Proposed Time of Concentration and Rational Coefficient

Basin	T _c	Rational Coefficient
	minutes	
East	18.6	0.28
West	20.2	0.20

D. Proposed Contours for Detention

The proposed detention area will be designed as a landscape berm and will provide 0.03 ac-ft of detention. The outlet control will be a 3-foot wide opening at a flowline of 1328.0. The 100-year water surface elevation is 1328.6.

E. Preliminary SWS Sizing Calculations

All stormwater will be directed overland; no stormsewer is proposed for the site.

F. Stage-Storage-Discharge

The stage-storage-discharge for the detention berm is located in Figure 2.6. The existing pond is able to contain the 100-year event without overtopping and still provide a 1-foot freeboard. These calculations are in Figure 2.6 as well.

G. Analysis of upstream/downstream impact

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

H. Existing and Proposed Structural Elevations

Minimum pads will be set to follow existing grade.

I. Pond Design Elevations

The detention berm is designed to regulate flow from the West Basin. The flowline of the 3-foot opening is 1328.0 and the 100-year water surface elevation is 1328.6. The existing pond is able to store the 100-year storm event. Calculations for the existing pond and detention berm are in Figure 2.6.

J. Structure Details

The existing residence will be expanded and two more outbuilding are proposed.

K. Limits of Clearing and Grading

Portions of the site will be graded to accommodate the proposed building development; current drainage patterns will be maintained.

L. Location of Impervious Areas

Roads, parking areas and buildings will be located as shown on the Drainage and Utility Plan, Figure 3.1.

M. Location of Utilities

The site currently utilizes well water and a septic system. Improvements will be made to the existing water and sanitary sewer line to provide City services to the site. Proposed utilities are shown on the Drainage and Utility Plan, Figure 3.1.

N. Location of Conveyance Systems

Overland flow will convey water to the existing pond and detention berm, Figure 3.1.

O. Location of Channel Modifications

Channel modifications are not applicable to the Johnson Nursery Addition.

P. Selection and Location of Stormwater Controls

Stormwater controls consist of grading, when necessary, to direct stormwater to the existing pond and detention berm.

Q. Emergency Overflow

The existing pond emergency overflows, mainly, to the east; however, this pond is significantly deep and overtopping is unlikely.

R. Freeboard

The existing detention pond has a 1-foot freeboard for added safety.

S. 100-Year High Water Line

The 100-year water surface elevation for the existing pond is 1314.5. The 100-year water surface elevation for the detention berm is 1328.6.

T. Lowest Openings

The lowest opening for the proposed improvements and additions will match into the existing structures.

U. Stormwater Management Facilities

Not applicable to the Johnson Nursery Addition.

V. Maintenance Responsibility

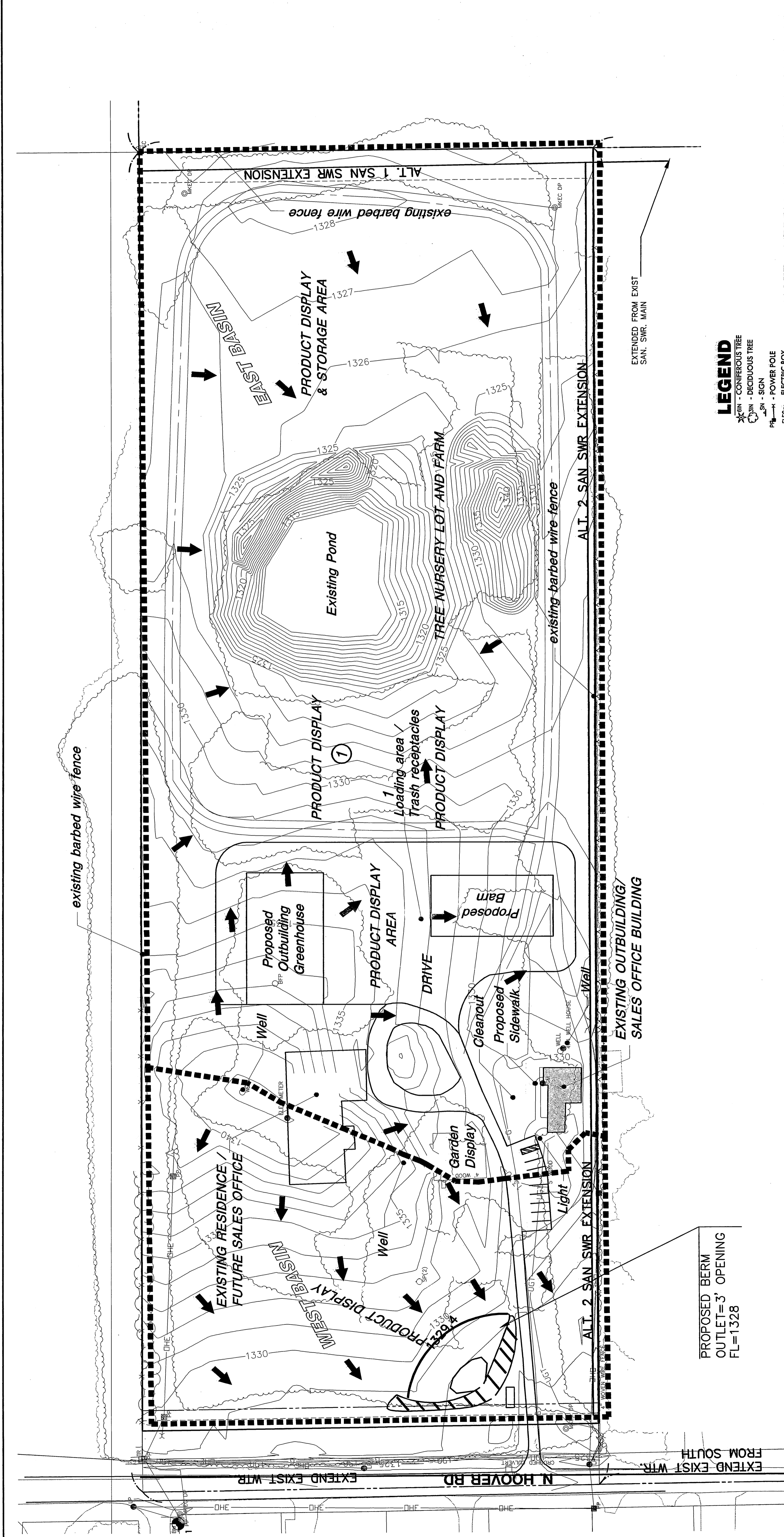
The maintenance of the site will be the responsibility of the owner.

W. Offsite-Drainage Easements

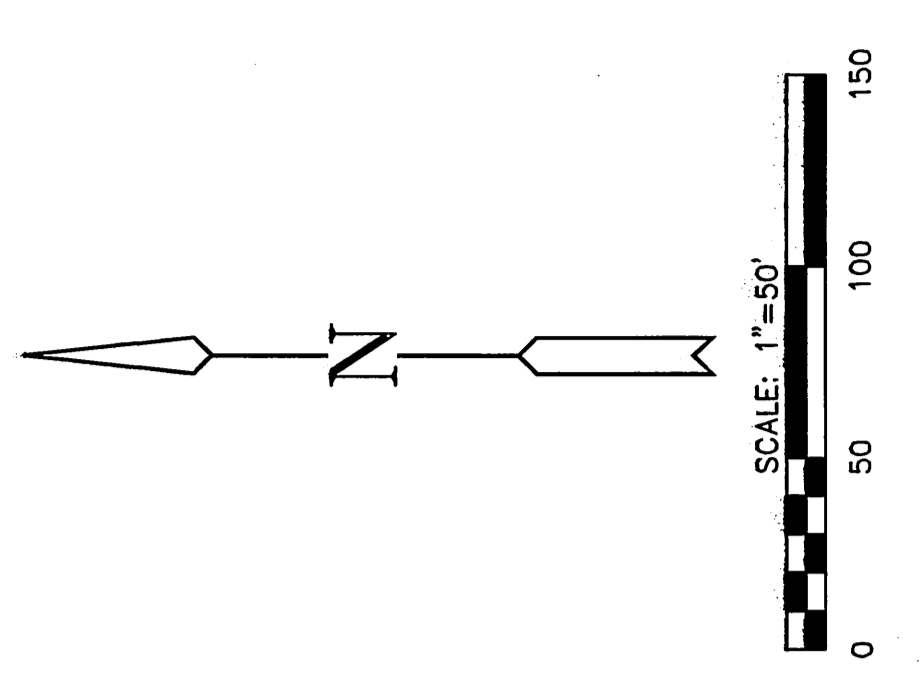
Not applicable to Johnson Nursery Addition.

Figure 3.1

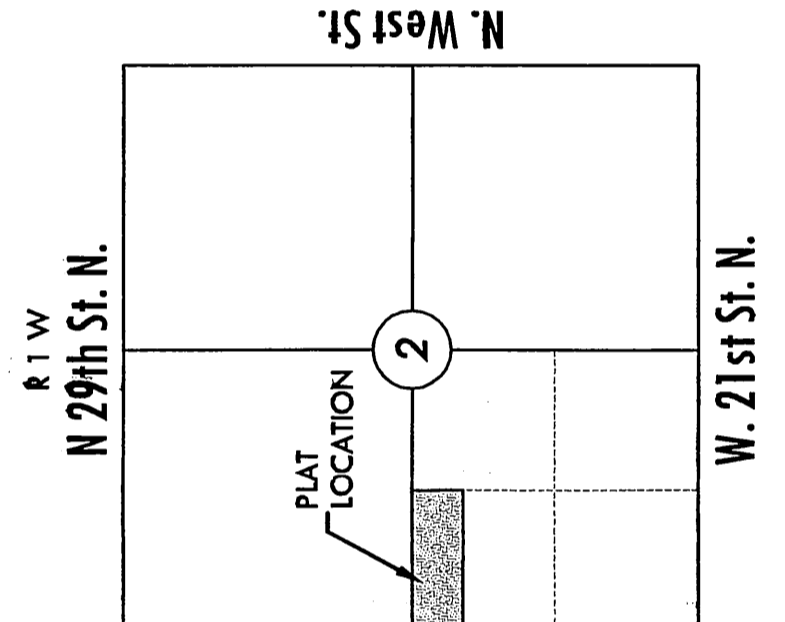
Drainage and Utility Plan



NOTE: VERTICAL DATUM IS NAVD 88



- LEGEND**
- CONIFEROUS TREE
 - DECIDUOUS TREE
 - SIGN
 - POWER POLE
 - ELECTRIC BOX
 - LIGHT POLE
 - FIRE HYDRANT
 - WATER VALVE
 - WATER METER
 - BENCHMARK
 - SECTION CORNER
 - EASEMENT
 - BUILDING SETBACK
 - FENCE
 - STORM SEWER PIPE
 - WATER LINE
 - SANITARY SEWER LINE
 - GAS LINE
 - GAS PIPELINE
 - TELEPHONE LINE
 - UNDERGROUND ELEC.
 - OVERHEAD ELECTRIC
 - FIBER OPTIC CABLE
 - DRAINAGE SUB BASIN
 - DRAINAGE BASIN
 - FLOW ARROW
 - AREA FOR SWS SIZING



BENCHMARK

BM #1
City of Wichita benchmark disc on southwest corner of 25th Street North and Hoover
3.5' north of a 4' chain link fence
17' south of center of a gravel road
34.5' South and 31.7' west of the quarter section corner at 25th and Hoover
Elev. = 1327.72 NAVD88

PROPOSED BERM
OUTLET=3' OPENING
FL=1328

Tab 4. Floodplain Submittal

Not applicable to Johnson Nursery Addition.

Tab 5. Permits

A. *US Army Corps of Engineers*

Not applicable to Johnson Nursery Addition.

B. *Kansas Department of Agriculture*

Not applicable to Johnson Nursery Addition.

C. *Federal Emergency Agency (FEMA)*

Not applicable to Johnson Nursery Addition.

D. *Kansas Department of Transportation*

Not applicable to Johnson Nursery Addition.

E. *Sedgwick County Right-of-way Permit*

Not applicable to Johnson Nursery Addition.