RUGGLES & BOHM

ENGINEERING
SURVEYING
LANDSCAPE ARCHITECTURE
GOVERNMENT

TRANSMITTAL MEMO

Date: June 6, 2014

To: Scott Lindebak
City of Wichita

From: Kenneth Lee

Project: Steppes at Ark Valley
Siena Lakes

RB Project No.:

Other Project Reference No.:

Description:
- ☐ Confirmation
- ☒ Transmittal
- ☐ Transmittal under separate cover by

Purpose:
- ☐ Approval
- ☒ Review & comment
- ☐ Use
- ☐ Other :
- ☐ Distribution
- ☐ Information
- ☐ Record

Enclosures/Attachments:
- ☐ Prints
- ☒ Originals
- ☐ Diskettes containing:
- ☐ Other:
- ☐ Change Order
- ☐ Shop Drawings

Copies	Description
1	Drainage Plan for each

Remarks:
See attached plans. I'll be back in town on Wednesday if you have questions but you can email before then.

Copies to:
file

If checked below, please:
- ☐ Acknowledge receipt of enclosures
- ☐ Return enclosures to us.

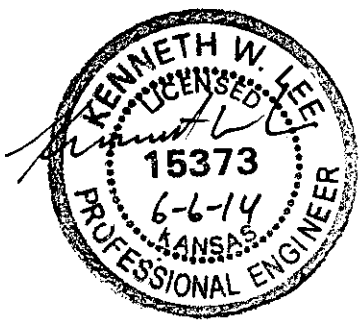
Signed

If Enclosures are not as noted above, please inform us immediately
Phone (316) 264-8008 Fax (316) 264-4621

924 North Main
Wichita, Kansas 67203
Phone 316-264-8008
E-mail info@rbkansas.com
Web www.rbkansas.com

DRAINAGE REPORT
FOR
SIENA LAKES
WICHITA, SEDGWICK COUNTY, KANSAS

June 2014



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924 NORTH MAIN WICHITA, KANSAS 67203 P (316) 264-8008 F (316) 264-4621
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SIENA LAKES
DRAINAGE ANALYSIS
JUNE 2014

INTRODUCTION

This report contains supporting documentation and calculations to provide detention, water quality and channel protection for Siena Lakes. The plat is located to the west of the intersection of 37th Street North and Hoover in Northwest Wichita. The site will be developed with residential single family homes.

EXISTING CONDITIONS

The existing site is currently used for agricultural uses with row crops planted on an annual basis. There are no established waterways on or adjacent to the site. It is approximately 1.5 miles away from the Arkansas River in an area that is prone to sandy soils and relatively shallow groundwater. The onsite soils are 56% Carwile Clay Loam (west and south), 29% Naron Fine Sandy Loam (north and east) and 15% Pratt Loamy Fine Sand (northeast corner). Carwile is a hydrologic soil group D Soil, Naron is a hydrologic soil group C soil and Pratt is hydrologic soil group A soil. There is approximately 67 acres of offsite area to the northwest that has the potential to drain to this site. PEC is developing road plans that will improve the street ditches and further increase the potential for that stormwater to enter the site and has asked that we provide a 24" pipe to 37th Street North to accommodate a portion of that drainage. Ridge Port North 4th was developed adjacent to this site and has backyard basins in the rear yards that have been sized to handle a limited amount of water from this site. In addition, the drainage plan for that addition indicates that approximately 110 cfs of offsite drainage from our site is projected to drain through that addition. A 36" pipe stub was constructed at Lakeway and a 36" SWS is available at the southwest corner of this site to accommodate that drainage. A copy of the drainage plan is included at the back of this report.

DEVELOPED CONDITIONS

The site will be developed with single family homes. As mentioned, a pipe system will be extended north to 37th Street North to provide a route for some of the storm water in that area. Two detention ponds are proposed on site to provide detention, water quality treatment and channel volume protection. Because the constructed ponds will have exposed groundwater, water from roadways will be pretreated through the installation of Snout hoods in specially designed inlets along the roads. Based on soil borings, the expected static pool of the ponds will be approximately 1322. The two pipe systems that will drain the site to the south will be constructed in a manner where the first two feet of storage in the pond will be directed inwardly into the onsite ponds. After the storm water ponds have impounded two feet deep to an elevation of 1324, the system will begin to drain south through those pipe systems. In addition to the ponds draining south through the new pipes, we are expecting the ponds to infiltrate at a rate of 2-6 inches per hour due to the sandy nature of the subsurface soils. To be conservative, we are using a rate of 2" per hour for a base infiltration rate.

HYDROLOGY

The site has been analyzed using HEC-HMS using SCS methodology. The developed areas of the site have a composite curve number of 84 due to the combination of group D soil along the west and south areas of the site and group C and A soils in the other areas. Due to the relatively short drainage paths, a standard Tc of 15 minutes was used for all developed areas of the site. The offsite area to the northwest is very flat with approximately 0.01% slope in some areas but a conservative 60 minute Tc was used for modeling that flow.

The site runoffs are as follows:

	Southwest Exist	Main Dev (From Ponds)	South Exist	Developed Undetained	Existing Site Total	Developed Site Total
2 year	30	9.0	4	6.0	31	15
5 year	51	12	5.4	8.7	52	18
10 year	70	19	6.7	11	71	20
25 year	89	26	8.1	13	90	26
100 year	132	42	11	18	134	43

Note: Site Total includes offsite runoff that is unchanged in both existing and developed

As shown in the table above, our hydrologic model indicates that more water is coming from the site than the original drainage plan for Ridge Port North 4th had shown. However, due to the large size of the groundwater ponds and the relatively small size of the outlet pipe systems, the anticipated runoff is reduced to significantly below both our calculations and those shown in the other drainage plan.

POND ROUTING INFORMATION

As mentioned above, the pond will have two outlet systems for storm water. The first two feet of pond will provide water quality treatment and channel protection volumes, but was not included in the hydrology calculations above to be conservative.

Stage	Area (sq-ft)	Proposed Outlet (cfs)
1322	4.22	9
1323	4.50	9
1324	4.77	9
1325	5.05	20
1326	5.33	46
1327	5.60	56
1328	5.88	60

The 9 cfs noted for release rate from 1322 to 1324 is infiltration into the groundwater due to the sandy nature of the onsite soils. As mentioned in the report above, an infiltration rate of 2 inchers per hour was used to derive that number. The summary of the detention ponds in the 100-yr storm are as follows;

Reserve A Pond
Peak Inflow - 227 cfs
Peak Outflow - 42 cfs
Peak W.S. – 1326.6
Peak Storage – 30.6 ac-ft

Water Quality / Channel Protection Volume

Water quality for the site will be provided in two ways. First, the implementation of Snout water quality treatment hoods in modified inlets at all roadway inlets to pretreat that runoff. Second, the wet ponds will provide the remaining treatment. Channel protection volume for the entire site will be provided by the pond at the north end. The water quality volume for the site was calculated to be 0.85 ac.-ft. (50% reduction due to wet pond). The channel protection volume required for the entire site is 2.88 ac-ft. The water quality volume is nested within the channel protection volume. The site will retain 100% of the site runoff during first flush type rain events and does not release water until the water has impounded 2' above the estimated static pool elevation of 1322. Approximately 8.99 acre-feet of storage is provided between the static pool and the overspill elevation of the pond described above with no release other than infiltration into the ground. See the spreadsheet included in this report for water quality and channel protection calculations.

DRAINAGE MAP

Offsite Basin
67 Acres Total
0.5 acres Impervious
CN = 70

West Basin
2.04 Acres Total
0.0 acres Impervious
CN = 80

Main Basin
33.2 Acres Total
0.1 acres Impervious
CN = 75

Time of Concentration Path
Tc = 40 minutes, L = 1660'
(300' overland, 600' shallow,
760' Concentrated)

Main Basin
1.80 Acres Total
0.1 acres Impervious
CN = 80

NOTES

1. The site is 56% Carwile Clay loam (Hydrologic Soil Group D), 29% Salt Creek and Noron Fine Sandy Loam (Hydrologic Soil Group C) and 15% Pratt Loamy Fine Sand (Hydrologic Soil Group A).
2. Existing Storm Sewer along the west and south perimeters will be used to convey rear yard drainage in those areas. The drainage plan for Ridge Port North 4th Addition was specifically designed for that to occur.
3. The drainage plan for Ridge Port 4th allows for 110 cfs to be discharged from this proposed addition into the existing storm sewer in Lot 13, Block A of Ridge Port 4th Addition. The discharge pipe from the onsite ponds will be sized to limit the outflow below that amount.

SIENA LAKES ADDITION
EXISTING CONDITIONS

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104 NORTH MAIN WICHITA, KANSAS 67203 P (316) 264-8008 F (316) 264-4423
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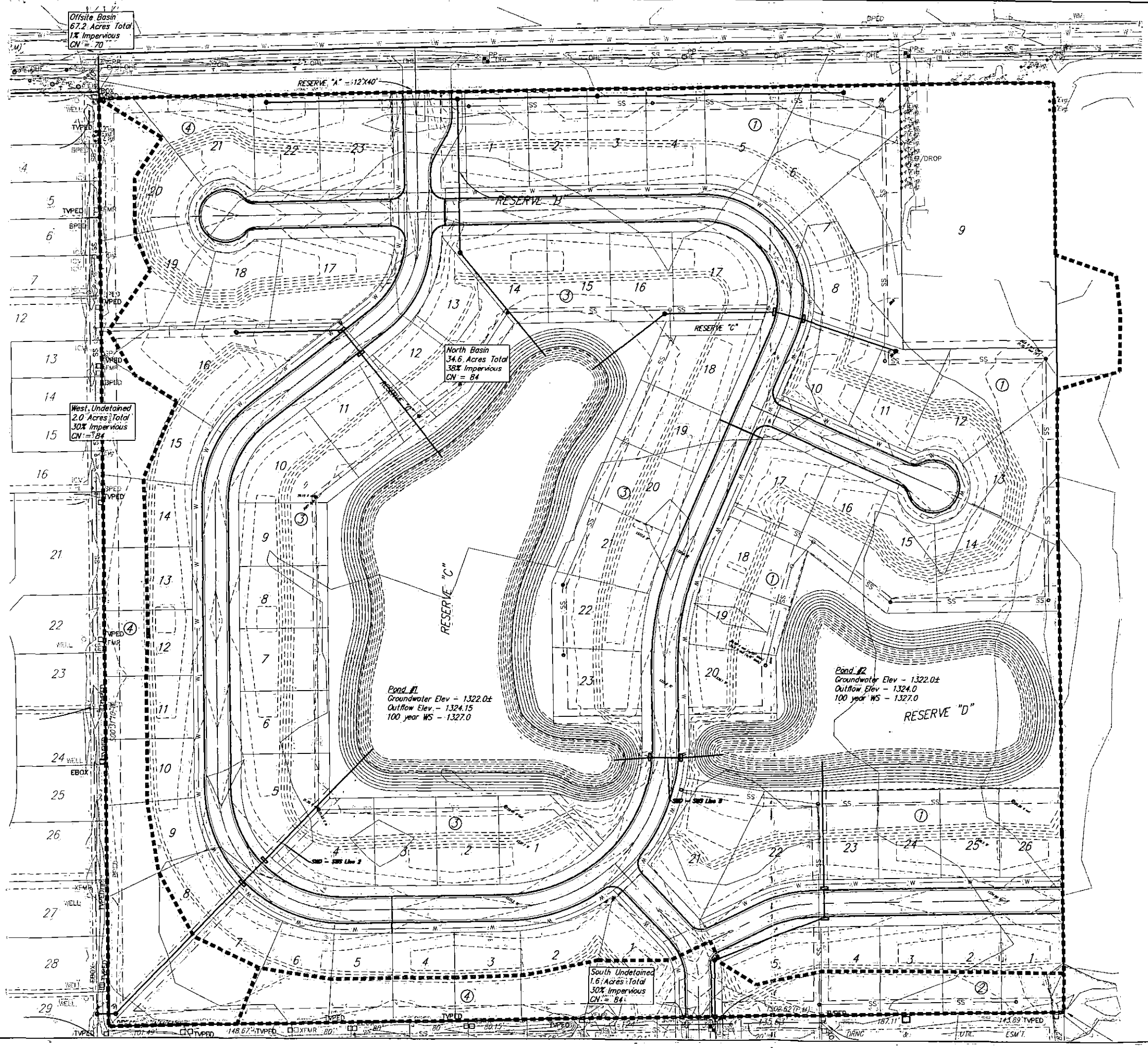
PROJECT NUMBER	RB JOB NO.	DRG. SCALE	SHEET
			1 OF 1

DRAWING FILE:

DATE: May 27, 2014
DESIGN: KWL
DRAWN: KWL
REVIEW:



Water Quality Treatment

Volume Required = 0.85 Ac-Feet
Volume Provided = 8.99 Ac-Feet

Channel Protection Volume
Volume Required = 2.88 Ac-Feet
Volume Provided = 8.99 Ac-Feet

Both Volumes are accommodated below the release elevation of 1324.

NOTES

1. *The site is 56% Carwile Clay loam (Hydrologic Soil Group D), 29% Salt Creek and Naron Fine Sandy Loam (Hydrologic Soil Group C) and 15% Pratt Loamy Fine Sand (Hydrologic Soil Group A).*
2. *Snout Water Quality Treatment Hoods will be installed on all street inlets that drain into onsite ponds. Ponds will provide additional water quality treatment as well.*
3. *On-site Ponds will provide storm water detention/retention as well channel protection volume.*
4. *Existing Storm Sewer along the west and south perimeters will be used to convey rear yard drainage in those areas. The drainage plan for Ridge Port North 4th Addition was specifically designed for that to occur.*
5. *The drainage plan for Ridge Port 4th allows for 110 cfs to be discharged from this proposed addition into the existing storm sewer in Lot 13, Block A of Ridge Port 4th Addition. The discharge pipe from the onsite ponds will be sized to limit the outflow below that amount.*
6. *Pipes from south system (300' and 500' on SWS Basin Sheet) will grade to the interior ponds for the first two feet of pond impoundment. Impoundment past that will result in water being released offsite to Ridge Port North Ponds.*

SIENA LAKES ADDITION
DRAINAGE PLAN

SEAL

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2924 NORTH MAIN WICHITA, KANSAS 67201 P (316) 264-8008 F (316) 264-4222
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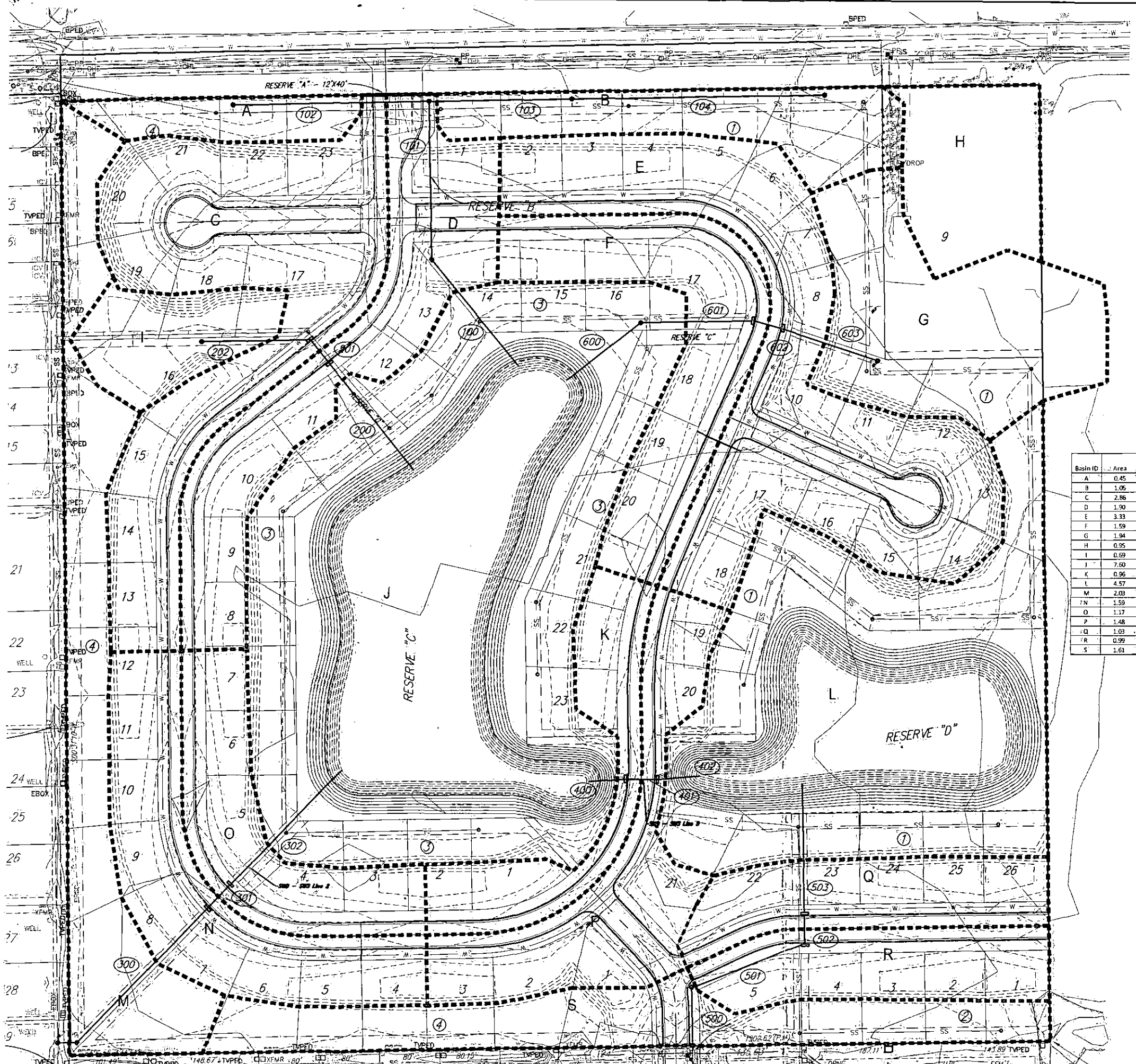
DATE	June 6, 2014
DESIGN	KWL
DRAWN	KWL
REVIEW	-
PROJECT NUMBER	-
RB JOB NO.	-
DWG. SCALE	-
DRAWING FILE	-
SHEET	1
OF	1



PIPE FLOW INFORMATION

PIPE ID	FLOW (CFS)	SIZE	SLOPE	NOTES
100	31	30"	0.50%	Includes 25 cfs from offsite
101	31	30"	0.50%	
102	2.1	15"	0.50%	
103	3.4	15"	0.50%	
104	1.7	15"	0.50%	
200	29	24"	1.00%	Pressure Flow
201	19	24"	1.00%	
202	3.2	15"	0.50%	
300	52	36"	0.50%	Drains South to offsite after ponds have filled from 1322 to 1324
301	52	36"	0.50%	Drains North into Pond 1
302	52	36"	0.50%	Drains North into Pond 1
400	50	36"	0.00%	Flat Connecting Pipe Between Ponds
401	45	36"	0.00%	
402	36	36"	0.00%	
500	36	36"	0.50%	Drains South to offsite after ponds have filled from 1322 to 1324
501	36	30"	0.50%	Drains South to offsite after ponds have filled from 1322 to 1324
502	30	30"	0.50%	
503	24	30"	0.50%	
600	33	24"	1.00%	
601	33	24"	1.00%	
602	24	24"	0.50%	
603	6.3	15"	0.50%	

BASIN RUNOFF CALCULATIONS

Basin ID	Area	Runoff Coefficients 2-yr	5-yr	10-yr	100-yr	Rainfall Intensity (in/hr) 2-yr	5-yr	10-yr	100-yr	Peak Runoff 2-yr	5-yr	10-yr	100-yr	Notes
A	0.45	0.40	0.43	0.50	0.63	3.80	4.62	5.21	7.40	0.7	0.9	1.2	2.1	Rear Yard Drain
B	1.05	0.30	0.31	0.35	0.44	3.80	4.62	5.21	7.40	1.2	1.5	1.9	3.4	Rear Yard Drain
C	2.86	0.55	0.58	0.64	0.73	3.80	4.62	5.21	7.40	6.0	7.7	9.5	15.4	Triple Inlet
D	1.90	0.55	0.58	0.64	0.73	3.80	4.62	5.21	7.40	4.0	5.1	6.3	10.3	Double Inlet
E	3.33	0.55	0.58	0.64	0.73	3.80	4.62	5.21	7.40	7.0	8.9	11.1	18.0	Triple Inlet
F	1.59	0.55	0.58	0.64	0.73	3.80	4.62	5.21	7.40	4.3	5.3	8.6	Double Inlet	
G	1.94	0.30	0.31	0.35	0.44	3.80	4.62	5.21	7.40	2.2	2.8	3.5	6.3	Rear Yard Drain (Double)
H	0.95	0.30	0.31	0.35	0.44	3.80	4.62	5.21	7.40	1.1	1.4	1.7	3.1	
I	0.69	0.40	0.43	0.50	0.63	3.80	4.62	5.21	7.40	1.0	1.4	1.8	3.2	
J	7.60	0.42	0.48	0.56	0.72	3.80	4.62	5.21	7.40	12.1	16.9	22.2	40.5	Lake
K	0.96	0.57	0.61	0.65	0.79	3.80	4.62	5.21	7.40	2.1	2.7	3.3	5.6	
L	4.57	0.42	0.48	0.56	0.72	3.80	4.62	5.21	7.40	7.3	10.1	13.3	24.3	Lake
M	2.08	0.42	0.48	0.56	0.72	3.80	4.62	5.21	7.40	3.2	4.5	5.9	10.8	Double Inlet
N	1.59	0.57	0.61	0.65	0.79	3.80	4.62	5.21	7.40	3.4	4.5	5.5	9.3	Double Inlet
O	1.17	0.57	0.61	0.65	0.79	3.80	4.62	5.21	7.40	2.5	3.3	4.0	6.8	
P	1.48	0.57	0.61	0.66	0.79	3.80	4.62	5.21	7.40	3.2	4.2	5.1	8.7	Double Inlet
Q	1.03	0.57	0.61	0.65	0.79	3.80	4.62	5.21	7.40	2.2	2.9	3.5	6.0	
R	0.99	0.57	0.61	0.66	0.79	3.80	4.62	5.21	7.40	2.1	2.8	3.4	5.8	
S	1.61	0.42	0.48	0.56	0.72	3.80	4.62	5.21	7.40	2.6	3.6	4.7	8.6	

NOTES

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SIENA LAKES ADDITION

SWS Basins

RUGGLES & BOHM

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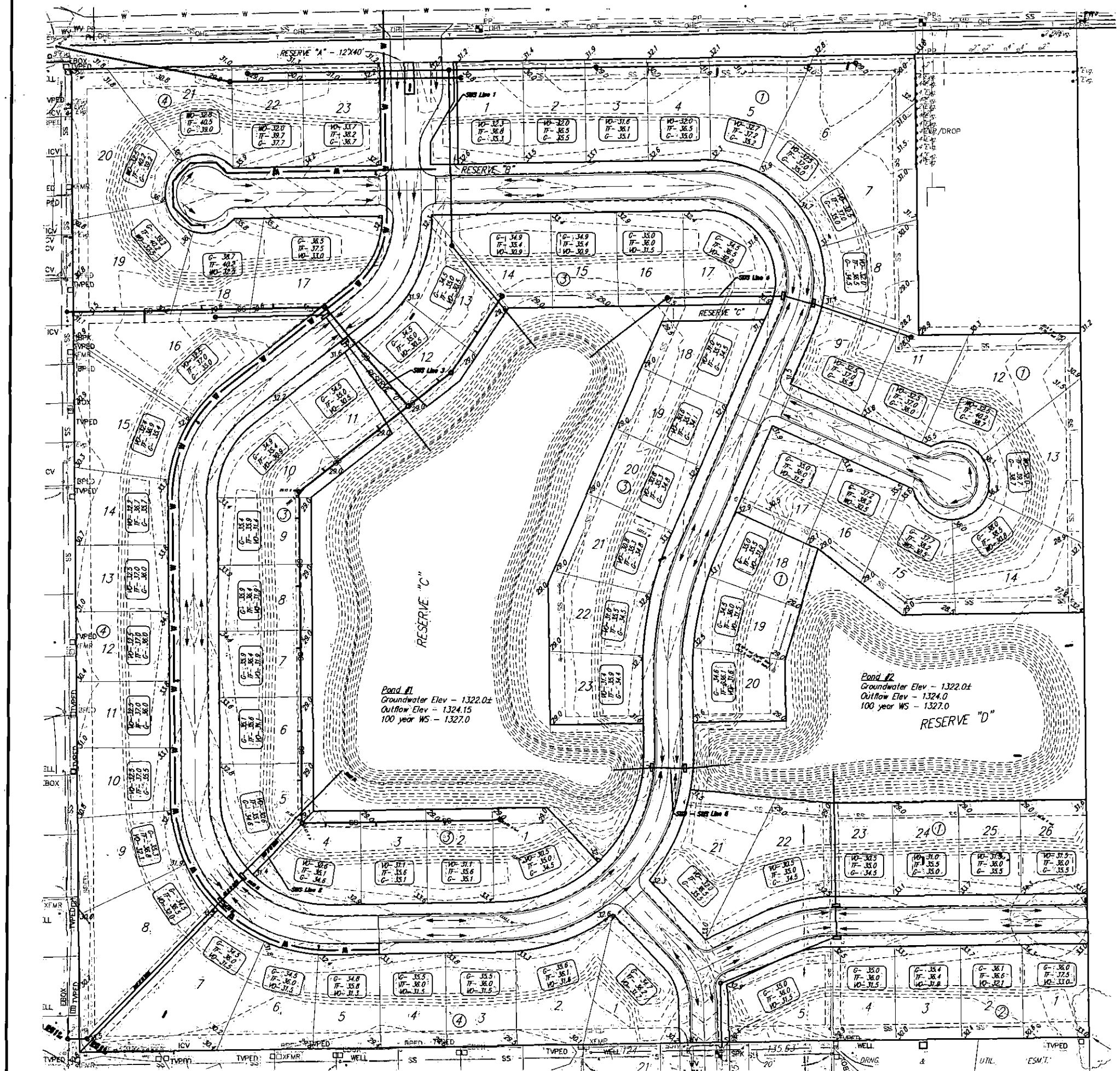
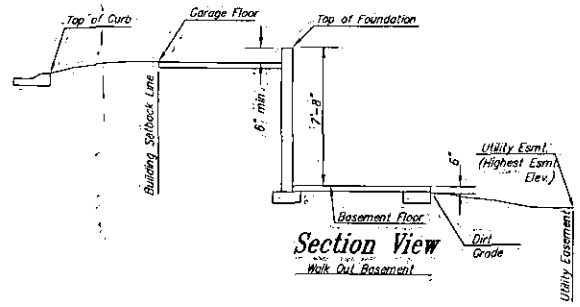
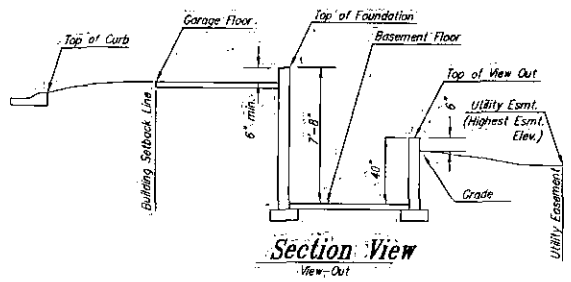
DATE: June 6, 2014
DESIGN: KWL
DRAWN: KWL
REVISION:
PROJECT NUMBER:
RB JOB NO.:
DRG. SCALE:
SHEET: 1 of 1
DRAWING FILE:







MINIMUM BUILDING PAD ELEVATION FOR LOWEST OPENING INTO STRUCTURES

BLOCK	LOT NO.	ELEVATION (NAVD88)
1	14 - 26	1329.0
3	1 - 23	1329.0

BENCHMARKS

BENCHMARK #1: CHISELED SQUARE AT THE END OF THE TOP OF CURB AT THE SOUTHEAST CORNER OF RIDGE PORT AND 37TH ST. N.; ELEVATION = 1333.05 (NAVD88)

BENCHMARK #2: RAILROAD SPIKE IN THE NORTH FACE OF THE 6TH POWER POLE WEST OF HOOVER, 2066' W & 18' S OF 37TH ST. N. AND HOOVER; ELEVATION = 1332.89 (NAVD88)

BENCHMARK #3: RAILROAD SPIKE IN THE NORTH FACE OF THE 4TH POWER POLE WEST OF HOOVER; ON THE WEST SIDE OF THE DRIVE ENTRANCE TO HOUSE #6007 1494' W & 20' S OF 37TH ST. N AND HOOVER; ELEVATION = 1334.74 (NAVD88)

BENCHMARK #4: CHISELED SQUARE ON THE SOUTH SIDE OF CURB INLET, ON THE EAST SIDE OF LAKEWAY ST., 8.5' NORTH OF THE NORTH FACE OF HOUSE #3514 LAKEWAY ST. ELEVATION = 1329.58 (NAVD88)

60' 0' 60'

SIENA LAKES ADDITION
PRELIMINARY GRADING PLAN

RUGGLES & BOHM
ENGINEERING | SURVEYING | LANDSCAPE ARCHITECTURE | GOVERNMENT
534 NORTH MAIN | WICHITA, KANSAS 67203 | P (316) 264-6006 | F (316) 264-4423
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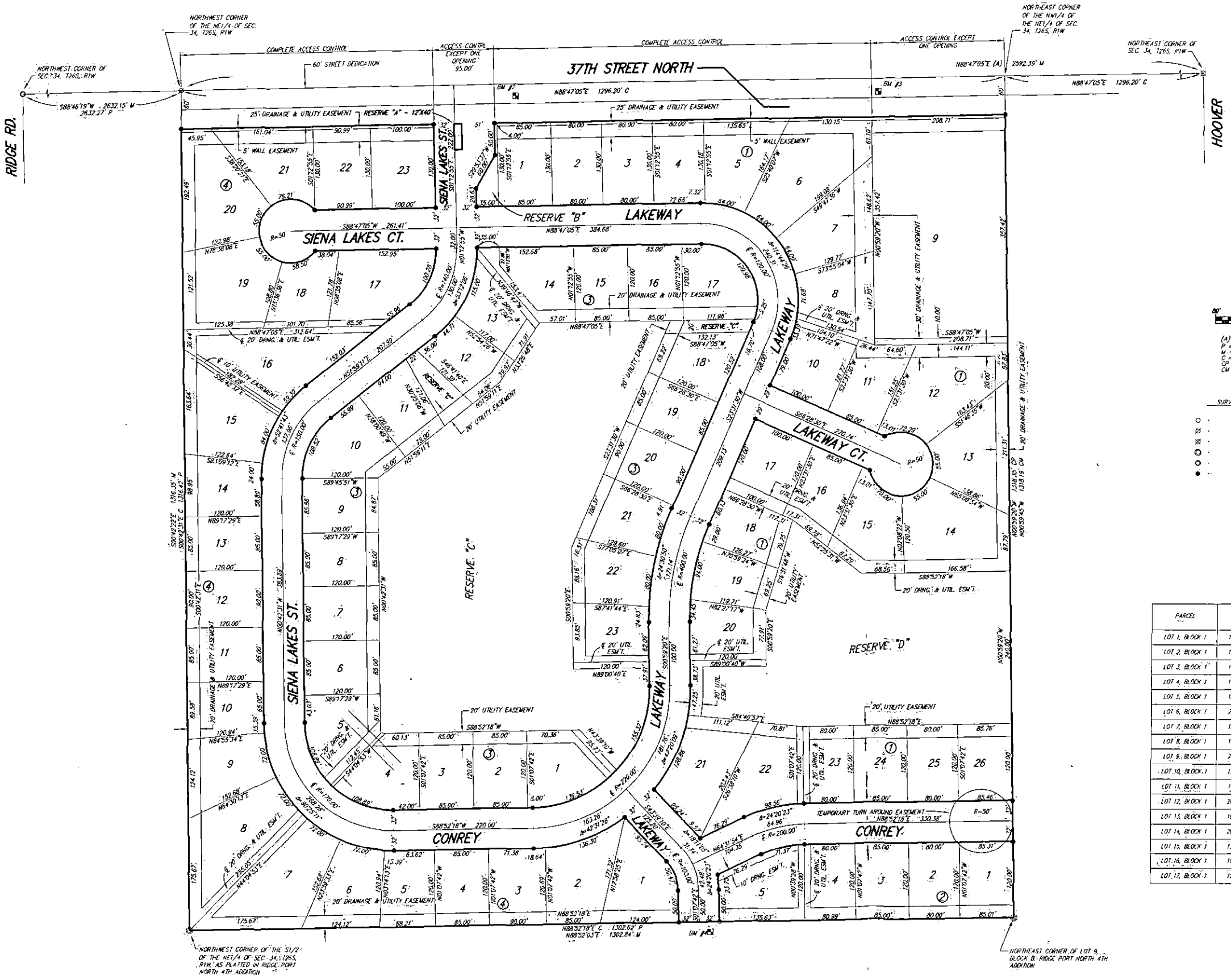
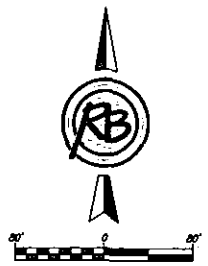
DATE: June 6, 2014
DESIGN: KWL
DRAWN: KWL
REVIEW: -
PROJECT NUMBER: "1"
RB JOB NO: -
DWG. SCALE: -
DRAWING FILE: -
SHEET: 1 OF 1

SIENA LAKES

Wichita, Sedgwick County, Kansas





(A) = Assumed Kansas Zone South Grid Bearing
P = Platted (Ridge Port North 4th Addition)
M = Measured
C = Calculated
[P] = Calculated from Platted
CM = Calculated from Measured

SURVEY MARKER LEGEND

- ○ - 1/2" REBAR W/BAUGHMAN CAP (FOUND – ORIGIN UNKNOWN)
- ⊠ - 1/2" REBAR (FOUND – ORIGIN UNKNOWN)
- ⊠ - 5/8" REBAR W/CAP (FOUND – ORIGIN UNKNOWN)
- ○ - 1/2" IRON PIPE (FOUND) – ORIGIN UNKNOWN)
- ○ - MAG NAIL (FOUND – ORIGIN UNKNOWN)
- ● - 5/8" REBAR W/RUGGLES & BOHM CAP (SET)

BENCHMARKS

BENCHMARK #1: CHISELED SQUARE AT THE END OF THE TOP OF CURB AT THE SOUTHEAST CORNER OF RIDGE PORT AND 37TH ST. N., ELEVATION = 1333.05 (NAVD88)

BENCHMARK #2: RAILROAD SPIKE IN THE NORTH FACE OF THE 6TH POWER POLE WEST OF HOOVER, 2065' W. & 18' S. OF 37TH ST. N. AND HOOVER. ELEVATION = 1332.89 (NAVD88)

BENCHMARK #3: RAILROAD SPIKE IN THE NORTH FACE OF THE 4TH POWER POLE WEST OF HOOVER, ON THE WEST SIDE OF THE DRIVE ENTRANCE TO HOUSE #6007, 1494' W. & 20' S. OF 37TH ST. N. AND HOOVER. ELEVATION = 1334.74 (NAVD88)

BENCHMARK #4: CHISELED SQUARE ON THE SOUTH SIDE OF CURB INLET ON THE EAST SIDE OF LAKEWAY ST., 8.5' NORTH OF THE NORTH FACE OF HOUSE #3514 LAKEWAY ST. ELEVATION = 1329.58 (NAVD88)

MINIMUM BUILDING PAD ELEVATION FOR LOWEST OPENING INTO STRUCTURES		
BLOCK	LOT NO.	ELEVATION (NAVD88)
1	1, 2, 3, 4, 5, 6, 7,	1300.0
2	10, 11, 12	1300.0
3	1, 2, 3, 4, 5, 6, 7, 8, 9	1300.0
4	1, 2, 3, 4, 5	1300.0

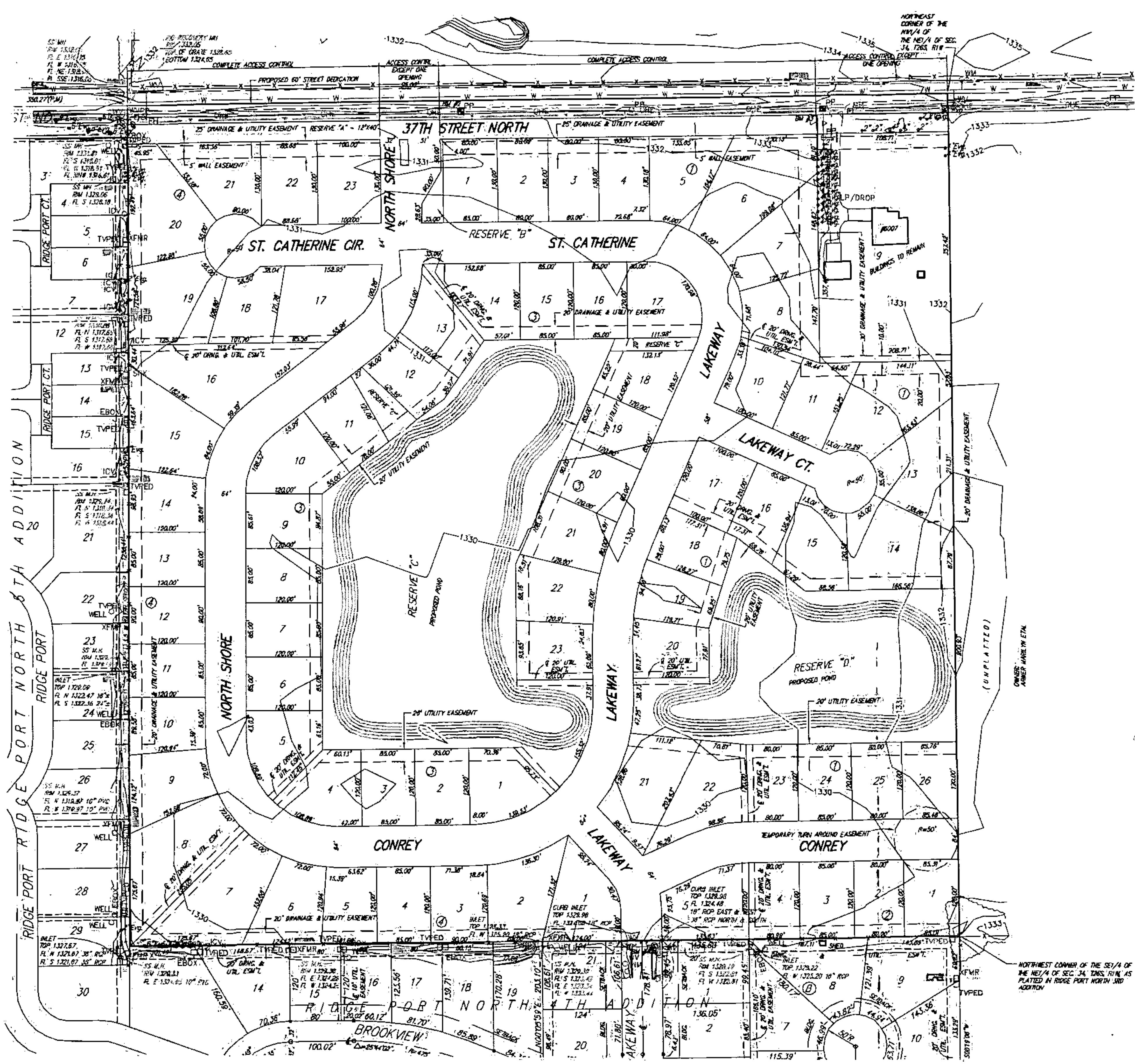
PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.
LOT 1, BLOCK 1	11050.00	LOT 18, BLOCK 1	10296.19	LOT 4, BLOCK 3	12350.24	LOT 21, BLOCK 3	11849.27	LOT 15, BLOCK 4	17866.03
LOT 2, BLOCK 1	10400.00	LOT 19, BLOCK 1	10152.14	LOT 5, BLOCK 3	12513.23	LOT 22, BLOCK 3	11609.57	LOT 16, BLOCK 4	22375.98
LOT 3, BLOCK 1	10400.00	LOT 20, BLOCK 1	10410.41	LOT 6, BLOCK 3	10200.00	LOT 23, BLOCK 3	10853.79	LOT 17, BLOCK 4	16767.28
LOT 4, BLOCK 1	10400.43	LOT 21, BLOCK 1	16000.70	LOT 7, BLOCK 3	10200.00	LOT 1, BLOCK 4	13362.94	LOT 18, BLOCK 4	10577.10
LOT 5, BLOCK 1	13786.37	LOT 22, BLOCK 1	15489.76	LOT 8, BLOCK 3	10200.00	LOT 2, BLOCK 4	13884.39	LOT 19, BLOCK 4	18493.77
LOT 6, BLOCK 1	21796.35	LOT 23, BLOCK 1	9600.00	LOT 9, BLOCK 3	10244.08	LOT 3, BLOCK 4	10804.28	LOT 20, BLOCK 4	18708.41
LOT 7, BLOCK 1	15348.62	LOT 24, BLOCK 1	10200.00	LOT 10, BLOCK 3	13179.28	LOT 4, BLOCK 4	10700.00	LOT 21, BLOCK 4	13937.08
LOT 8, BLOCK 1	13383.39	LOT 25, BLOCK 1	9600.00	LOT 11, BLOCK 3	10320.00	LOT 5, BLOCK 4	10038.02	LOT 22, BLOCK 4	11527.79
LOT 9, BLOCK 1	24596.45	LOT 26, BLOCK 1	10213.02	LOT 12, BLOCK 3	10451.22	LOT 6, BLOCK 4	12711.26	LOT 23, BLOCK 4	13000.00
LOT 10, BLOCK 1	11752.34	LOT 1, BLOCK 2	10219.28	LOT 13, BLOCK 3	10800.01	LOT 7, BLOCK 4	21010.30	RESERVE "A"	480.00
LOT 11, BLOCK 1	11319.27	LOT 2, BLOCK 2	9600.00	LOT 14, BLOCK 3	12581.51	LOT 8, BLOCK 4	21010.38	RESERVE "B"	22013.25
LOT 12, BLOCK 1	20400.07	LOT 3, BLOCK 2	10200.00	LOT 15, BLOCK 3	10200.00	LOT 9, BLOCK 4	12711.26	RESERVE "C"	211944.42
LOT 13, BLOCK 1	16586.57	LOT 4, BLOCK 2	9659.13	LOT 16, BLOCK 3	10200.00	LOT 10, BLOCK 4	10203.04	RESERVE "D"	109200.80
LOT 14, BLOCK 1	20285.63	LOT 5, BLOCK 2	13981.66	LOT 17, BLOCK 3	12434.22	LOT 11, BLOCK 4	10200.00		
LOT 15, BLOCK 1	13438.40	LOT 1, BLOCK 3	11955.65	LOT 18, BLOCK 3	11144.15	LOT 12, BLOCK 4	10800.00		
LOT 16, BLOCK 1	10773.36	LOT 2, BLOCK 3	10200.00	LOT 19, BLOCK 3	10200.00	LOT 13, BLOCK 4	10200.00		
LOT 17, BLOCK 1	12000.00	LOT 3, BLOCK 3	10200.00	LOT 20, BLOCK 3	10800.00	LOT 14, BLOCK 4	10951.56		

DWG FILE: SURVEY BASE
PROJECT NO. 4,518
JUNE 3, 2014

RUGGLES BOHM

ENGINEERING | SURVEYING | LANDSCAPE ARCHITECTURE | GOVERNMENT

924 NORTH MAIN | WICHITA, KANSAS 67203 | P (316) 264-8008 | F (316) 264-4621
WWW.RBKANSAS.COM



Preliminary Plat

ST. CATHERINE'S LAKES

Wichita, Sedgwick County, Kansas

LEGAL DESCRIPTION:
The NW1/4 of the NE1/4 of Section 34, T26S, R1W of the 6th P.M., Sedgwick County, Kansas.

OWNERS:
Dean W. Nicholson and Pauline Nicholson, Trustees under the Dean W. and Pauline Nicholson Living Trust, dated April 23, 1997
4106 N. Ridge Road
Wichita, KS 67205

Robert W. and Janet S. Kingsley
6007 W. 37th St. N.
Wichita, KS 67205

Agent:
Randy Ketzner
5120 N. Ridge Road
Wichita, KS 67205

Ph. (316) 293-7700

SURVEYOR & ENGINEER:
Ruggles & Bohm P.A.
Attn: Will Clevenger
wclevenger@rbkansas.com

PROPOSED ZONING:
SF-5

EXISTING ZONING:
Properties to the east and south are zoned SF-5. Subject property and the rest of the surrounding property is zoned SF-20. Existing use is agricultural

FLOOD ZONE:
According to the FEMA/FIRM Map No.s 20173C0195E and 20173C0335E, effective February 2, 2007, the property shown hereon is located in Zone X.

GROSS AREA:
1,711,790.7 Sq. Ft.±
39.30 Acres±

DATE OF TOPOGRAPHY:
APRIL 8, 2014

80' 0 80'

LEGEND

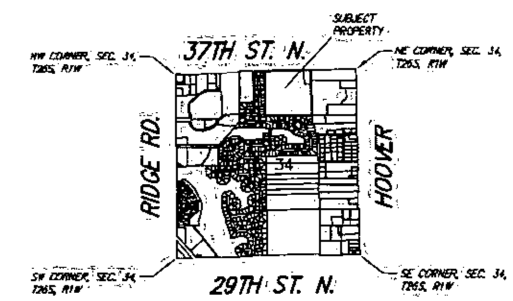
Symbol	Description
SS	SANITARY SEWER (CITY OF WICHITA)
SWS	STORM WATER SEWER (CITY OF WICHITA)
OHE	OVERHEAD ELECTRIC (WESTAR)
T	UNDERGROUND TELEPHONE (AT&T)
G	GAS LINE (BLACK HILLS ENERGY)
W	WATER MAIN (CITY OF WICHITA)
GV	GAS VALVE
FH	FIRE HYDRANT
WV	WATER VALVE BOX
WM	WATER METER
ICV	IRRIGATION CONTROL VALVE
	SIGN
	TELEPHONE PEDESTAL
TVPed.	CABLE TV PEDESTAL
A.C.	AIR CONDITIONER
EBOX	ELECTRIC BOX
Xfmr.	TRANSFORMER
LP	LIGHT POLE
PP	POWER POLE (WESTAR)
	GUY ANCHOR
SS MH	SANITARY SEWER MANHOLE (CITY OF WICHITA)
CO	CLEAN OUT
	LOCATION OF SPOT ELEVATION
	DECIDUOUS TREE (CALIPER INDICATED)
	CONIFEROUS TREE (CALIPER INDICATED)
	BENCHMARK

BENCHMARKS
BENCHMARK #1: CHISELED SQUARE AT THE END OF THE TOP OF CURB AT THE SOUTHEAST CORNER OF RIDGE PORT AND 37TH ST. N. ELEVATION = 1333.05 (NAVD88)

BENCHMARK #2: RAILROAD SPIKE IN THE NORTH FACE OF THE 6TH POWER POLE WEST OF HOOVER, 2066' W. & 18' S. OF 37TH ST. N. AND HOOVER. ELEVATION = 1332.89 (NAVD88)

BENCHMARK #3: RAILROAD SPIKE IN THE NORTH FACE OF THE 4TH POWER POLE WEST OF HOOVER, ON THE WEST SIDE OF THE DRIVE ENTRANCE TO HOUSE #6007, 1494' W. & 20' S. OF 37TH ST. N. AND HOOVER. ELEVATION = 1334.74 (NAVD88)

BENCHMARK #4: CHISELED SQUARE ON THE SOUTH SIDE OF CURB INLET ON THE EAST SIDE OF LAKEWAY ST., 8.5' NORTH OF THE NORTH FACE OF HOUSE #3514 LAKEWAY ST. ELEVATION = 1329.58 (NAVD88)

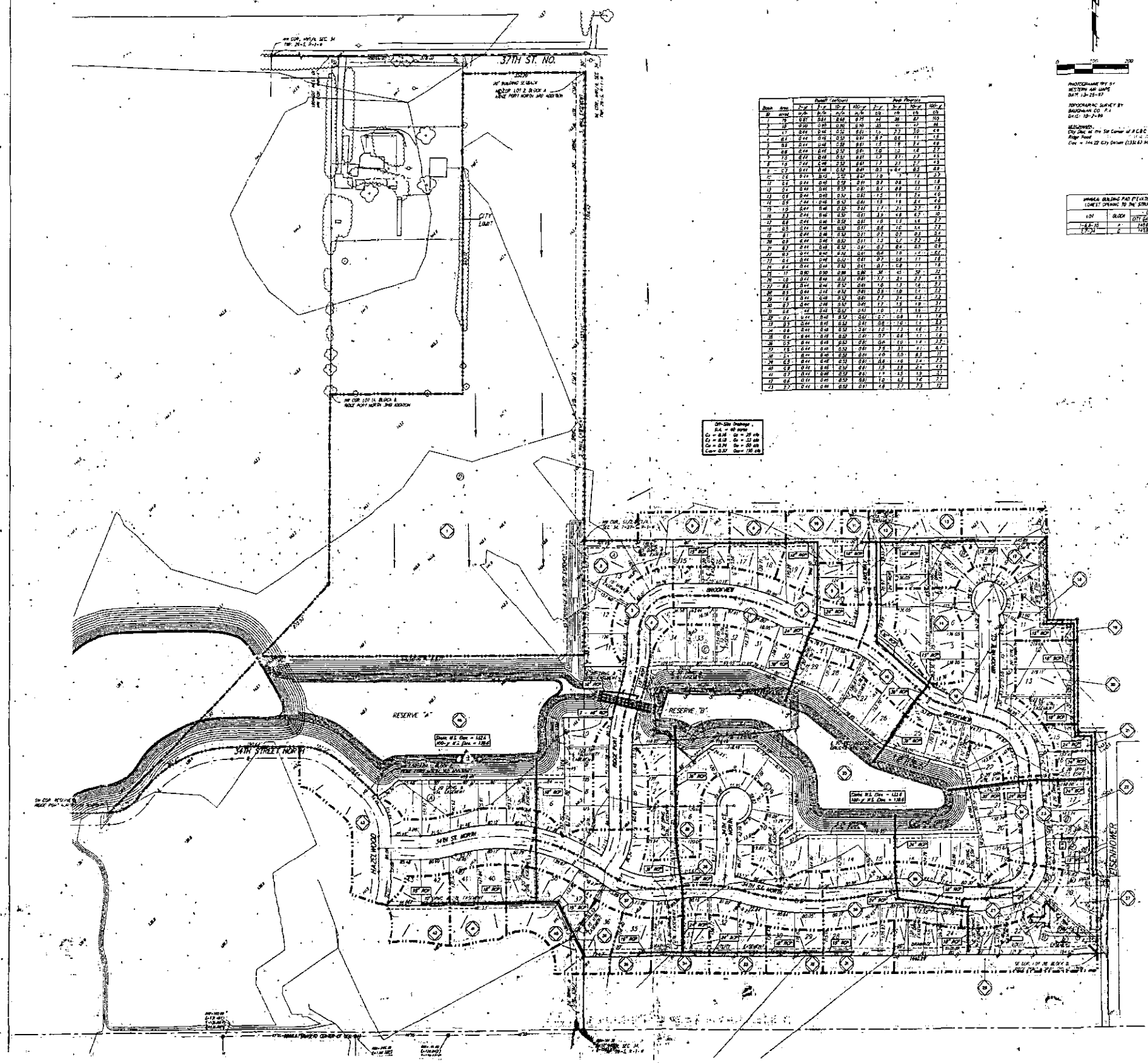


VICINITY MAP
NOT TO SCALE

DWG FILE: SURVEY BASE
PROJECT NO. 4318P
MAY 9, 2014

RUGGLES & BOHM
ENGINEERING | SURVEYING | LANDSCAPE ARCHITECTURE | GOVERNMENT
524 NORTH MAIN WICHITA, KANSAS 67203 P (316) 264-8008 F (316) 264-4621
WWW.RBKANSAS.COM

DRAINAGE PLAN
RIDGE PORT NORTH 4TH ADDITION
WICHITA, SEDGWICK COUNTY, KANSAS



Basin	Area	Runoff (without pond)				Pond Routing			
ID	acres	T_c yr	T_c yr	Q_{100} yr	Q_{50} yr	T_c yr	Q_{100} yr	Q_{50} yr	Q_{10} yr
1	7.5	0.22	0.31	0.46	0.29	24	26	19	10
2	28	0.20	0.30	0.70	0.35	30	41	32	16
3	17	0.44	0.46	0.52	0.33	15	23	18	9.3
4	6.1	0.44	0.46	0.53	0.33	8.7	0.5	11	5.8
5	9.3	0.44	0.46	0.58	0.33	9.1	13	9.8	5.1
6	9.8	0.44	0.46	0.59	0.33	9.0	13	9.8	5.1
7	7.5	0.44	0.46	0.52	0.33	7.5	11	8.2	4.3
8	7.2	0.44	0.46	0.50	0.33	7.3	10	7.7	4.0
9 — OS	0.7	0.11	0.18	0.32	0.09	0.5	0.6	0.5	0.3
OS	0.5	0.11	0.18	0.32	0.09	0.5	0.6	0.5	0.3
10	5.9	0.44	0.46	0.59	0.33	8.3	12	8.8	4.6
11	5.4	0.44	0.46	0.59	0.33	8.2	12	8.8	4.6
12	4.5	0.44	0.46	0.54	0.33	7.5	11	8.4	4.6
13	5.9	0.44	0.46	0.52	0.33	7.5	11	8.4	4.6
14	5.9	0.44	0.46	0.52	0.33	7.5	11	8.4	4.6
15	1.9	0.44	0.46	0.52	0.33	7.7	11	8.4	4.6
16	3.3	0.44	0.46	0.52	0.33	3.9	5.8	4.3	2.4
17	4.8	0.44	0.46	0.52	0.33	4.8	7.1	5.3	2.9
18	8.5	0.44	0.46	0.52	0.33	8.5	12	9.4	5.2
19	8.1	0.44	0.46	0.52	0.33	8.3	12	9.2	5.1
20	6.9	0.44	0.46	0.52	0.33	7.2	10	7.9	4.4
21	6.2	0.44	0.46	0.50	0.32	6.2	8.9	6.5	3.9
22	9.3	0.44	0.46	0.52	0.33	8.8	13	9.6	5.2
23	6.6	0.44	0.46	0.52	0.33	9.7	0.9	11	5.8
24	6.4	0.44	0.46	0.52	0.33	9.7	0.9	11	5.8
25	11	0.30	0.39	0.58	0.30	14	20	16	8.2
26	10	0.31	0.44	0.52	0.31	9.7	14	11	5.7
27	9.5	0.44	0.46	0.52	0.33	9.5	14	10	5.7
28	8.5	0.44	0.46	0.52	0.33	8.3	12	9.2	5.1
29	7.4	0.44	0.46	0.52	0.33	7.3	10	7.9	4.4
30	8.7	0.44	0.46	0.52	0.33	7.2	10	7.9	4.4
31	5.8	0.43	0.46	0.52	0.33	7.1	10	7.7	4.3
32	0.4	0.11	0.18	0.32	0.09	0.5	0.6	0.5	0.3
33	8.1	0.44	0.46	0.52	0.33	8.1	12	8.8	4.9
34	6.6	0.44	0.46	0.52	0.33	7.5	11	8.2	4.6
35	6.4	0.44	0.46	0.52	0.33	7.3	10	7.9	4.4
36	5.9	0.44	0.46	0.52	0.33	6.8	9.9	7.4	4.1
37	7.5	0.44	0.46	0.52	0.33	7.5	11	8.2	4.7
38	3.1	0.44	0.46	0.52	0.33	3.9	5.5	4.1	2.2
39	6.3	0.44	0.46	0.52	0.33	6.8	9.9	7.4	4.1
40	6.7	0.44	0.46	0.52	0.33	7.3	10	7.9	4.4
41	6.7	0.44	0.46	0.52	0.33	7.3	10	7.9	4.4
42	6.6	0.44	0.46	0.52	0.33	7.2	10	7.9	4.4
43	7.2	0.44	0.46	0.52	0.33	7.8	11	8.4	4.7

PHOTOGRAMMETRY BY
WESTERN AIR MAPS
DATE: 3-25-97

TOPOGRAPHIC SURVEY BY
BAUGHMAN CO. P.A.
DATE: 10-2-98

BENCHMARK:
City Disc. at the SW Corner of A.C.B.C. Sq. Sta. # 18
Ridge Road
Elev. = 1414.22 (City Datum (1310.60 MSL))

SPRINKLER BUILDING PAD ELEVATIONS FOR LOWEST SPRINKLING TO FIRE STRUCTURES			
LOT	BLOCK	ELEVATION	
		CITY DATUM	MSL
1 & 2, 15	2	1419.5	1309.3
3 & 14	2	1419.5	1309.3

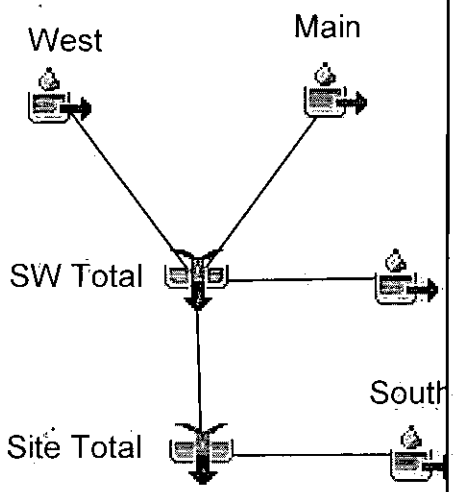
HYDROLOGIC OUTPUT

HEC-HMS

Project : sienalakes

Basin Model : Existing

Jun 05 19:34:20 CDT 2014



Project: sienalakes Simulation Run: Existing 002 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Existing
End of Run: 02Jun2014, 00:03 Meteorologic Model: 002 year
Compute Time: 04Jun2014, 17:08:03 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	17.2	01Jun2014, 13:36	0.96
Main	0.052	21.3	01Jun2014, 12:36	1.28
West	0.003	3.8	01Jun2014, 12:09	2.01
SW Total	0.160	30.1	01Jun2014, 12:45	1.08
South	0.003	3.8	01Jun2014, 12:09	2.01
Site Total	0.163	30.8	01Jun2014, 12:45	1.10

Project: sienalakes Simulation Run: Existing 005 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Existing
End of Run: 02Jun2014, 00:03 Meteorologic Model: 005 year
Compute Time: 04Jun2014, 17:08:06 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	30.3	01Jun2014, 13:33	1.60
Main	0.052	34.8	01Jun2014, 12:33	2.02
West	0.003	5.4	01Jun2014, 12:09	2.90
SW Total	0.160	51.1	01Jun2014, 12:45	1.76
South	0.003	5.4	01Jun2014, 12:09	2.90
Site Total	0.163	52.1	01Jun2014, 12:45	1.78

Project: sienalakes Simulation Run: Existing 010 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Existing
End of Run: 02Jun2014, 00:03 Meteorologic Model: 010 year
Compute Time: 04Jun2014, 17:08:09 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	42.0	01Jun2014, 13:30	2.17
Main	0.052	46.3	01Jun2014, 12:33	2.65
West	0.003	6.7	01Jun2014, 12:09	3.63
SW Total	0.160	69.6	01Jun2014, 12:45	2.36
South	0.003	6.7	01Jun2014, 12:09	3.63
Site Total	0.163	70.8	01Jun2014, 12:45	2.38

Project: sienalakes Simulation Run: Existing 025 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Existing
End of Run: 02Jun2014, 00:03 Meteorologic Model: 025 Year
Compute Time: 04Jun2014, 17:08:11 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	54.4	01Jun2014, 13:30	2.78
Main	0.052	58.3	01Jun2014, 12:33	3.32
West	0.003	8.1	01Jun2014, 12:06	4.38
SW Total	0.160	89.0	01Jun2014, 12:45	2.98
South	0.003	8.1	01Jun2014, 12:06	4.38
Site Total	0.163	90.4	01Jun2014, 12:45	3.01

Project: sienalakes Simulation Run: Existing 100 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Existing
End of Run: 02Jun2014, 00:03 Meteorologic Model: 100 year
Compute Time: 04Jun2014, 17:08:14 Control Specifications: Control 1

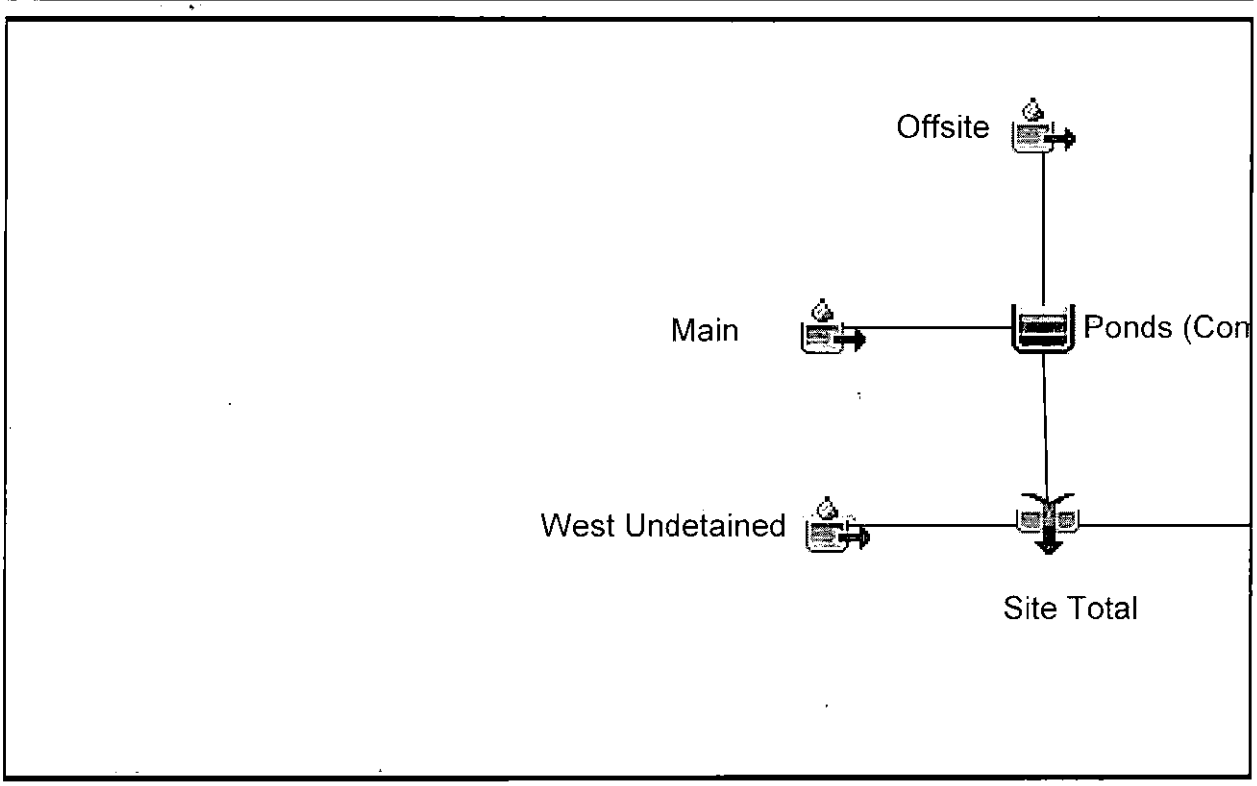
Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	82.2	01Jun2014, 13:27	4.15
Main	0.052	84.5	01Jun2014, 12:33	4.80
West	0.003	10.9	01Jun2014, 12:06	6.00
SW Total	0.160	132.4	01Jun2014, 12:45	4.39
South	0.003	10.9	01Jun2014, 12:06	6.00
Site Total	0.163	134.3	01Jun2014, 12:45	4.42

HEC-HMS

Project : sienalakes

Basin Model : Developed

Jun 05 19:34:15 CDT 2014



Project: sienalakes Simulation Run: Developed 002 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Developed
End of Run: 02Jun2014, 00:03 Meteorologic Model: 002 year
Compute Time: 04Jun2014, 17:07:51 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	23.2	01Jun2014, 13:00	0.98
Main	0.054	65.1	01Jun2014, 12:09	1.93
Ponds (Composite)	0.159	9.0	01Jun2014, 00:00	2.11
West Undetained	0.003	3.6	01Jun2014, 12:09	1.93
South undetained	0.002	2.4	01Jun2014, 12:09	1.93
Site Total	0.164	15.0	01Jun2014, 12:09	2.10

Project: sienalakes Simulation Run: Developed 005 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Developed
End of Run: 02Jun2014, 00:03 Meteorologic Model: 005 year
Compute Time: 04Jun2014, 17:07:53 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	41.1	01Jun2014, 12:57	1.63
Main	0.054	94.4	01Jun2014, 12:09	2.80
Ponds (Composite)	0.159	11.5	01Jun2014, 15:39	2.20
West Undetained	0.003	5.2	01Jun2014, 12:09	2.80
South undetained	0.002	3.5	01Jun2014, 12:09	2.80
Site Total	0.164	17.7	01Jun2014, 12:09	2.22

Project: sienalakes Simulation Run: Developed 010 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Developed
End of Run: 02Jun2014, 00:03 Meteorologic Model: 010 year
Compute Time: 04Jun2014, 17:07:56 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	57.0	01Jun2014, 12:57	2.20
Main	0.054	118.2	01Jun2014, 12:09	3.53
Ponds (Composite)	0.159	18.6	01Jun2014, 15:03	2.66
West Undetained	0.003	6.6	01Jun2014, 12:09	3.53
South undetained	0.002	4.4	01Jun2014, 12:09	3.53
Site Total	0.164	19.9	01Jun2014, 12:09	2.69

Project: sienalakes Simulation Run: Developed 025 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Developed
End of Run: 02Jun2014, 00:03 Meteorologic Model: 025 Year
Compute Time: 04Jun2014, 17:07:59 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	73.9	01Jun2014, 12:57	2.82
Main	0.054	142.2	01Jun2014, 12:06	4.27
Ponds (Composite)	0.159	25.8	01Jun2014, 14:45	3.20
West Undetained	0.003	7.9	01Jun2014, 12:06	4.27
South undetained	0.002	5.3	01Jun2014, 12:06	4.27
Site Total	0.164	26.4	01Jun2014, 14:45	3.24

Project: sienalakes Simulation Run: Developed 100 Year

Start of Run: 01Jun2014, 00:00 Basin Model: Developed
End of Run: 02Jun2014, 00:03 Meteorologic Model: 100 year
Compute Time: 04Jun2014, 17:08:01 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.105	111.5	01Jun2014, 12:54	4.20
Main	0.054	193.7	01Jun2014, 12:06	5.88
Ponds (Composite)	0.159	41.8	01Jun2014, 14:30	4.41
West Undetained	0.003	10.8	01Jun2014, 12:06	5.88
South undetained	0.002	7.2	01Jun2014, 12:06	5.88
Site Total	0.164	42.7	01Jun2014, 14:27	4.46

Project: sienalakes

Simulation Run: Developed 100 Year Reservoir: Ponds (Composite)

Start of Run:	01Jun2014, 00:00	Basin Model:	Developed
End of Run:	02Jun2014, 00:03	Meteorologic Model:	100 year
Compute Time:	04Jun2014, 17:08:01	Control Specifications:	Control 1

Volume Units: IN

Computed Results

Peak Inflow :	226.9 (CFS)	Date/Time of Peak Inflow :	01Jun2014, 12:09
Peak Outflow :	41.8 (CFS)	Date/Time of Peak Outflow :	01Jun2014, 14:30
Total Inflow :	4.77 (IN)	Peak Storage :	30.6 (AC-FT)
Total Outflow :	4.41 (IN)	Peak Elevation :	1326.6 (FT)

Area (Ac)	37.5
R_{vu}	0.04 table 4-13
R_{vd}	0.22 table 4-13
R_{vi}	0.95 table 4-13
I	0.64 percent of impervious area /100
U	0 percent of wooded area /100

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group A	B	C	D
Undisturbed Woods, Meadow or Ag. Land (R_{vu})	0.02	0.03	0.04	0.05
Turf or Disturbed Soils (R_{vd})	0.15	0.20	0.22	0.25
Impervious Cover (R_{vi})	0.95	0.95	0.95	0.95

Table 4-4 Average Imperviousness per Land Use (Source NRCS, TR-55)

Land Use	Average % Impervious
Urban Districts:	
Commercial and business	85%
Industrial	72%
Residential districts by average lot size:	
1/8 acre or less (town house)	65%
1/4 acre	38%
1/3 acre	30%
1/2 acre	25%
1 acre	20%
2 acres	12%

R_{vu}	0.04
U	0
R_{vd}	0.22
D	0.68
R_{vi}	0.95
I	0.32

$R_v = R_{vu}U + R_{vd}D + R_{vi}I$ *volumetric runoff coefficient*

R_v = 0.4536

$WQ_v = \frac{PR_vA}{12}$ *water quality protection volume (acre-feet)*

P	1.2 *water quality rainfall depth (1.2 inches for Sedgwick County)*
R_v	see above
A	see above

WQ_v = 1.7010 ac-ft (Use 1/2 this volume when a permanent wet pond is used for detention)

$Q_{WV} = PR_v$ *water quality protection volume (inches)*

P	1.2 *water quality rainfall depth (1.2 inches for Sedgwick County)*
R_v	see above

Q_{WV} = 0.5443 inches

$CN = \frac{1000}{10 + 5P + 10Q_{WV} - 10(Q_{WV}^2 + 1.25Q_{WV}P)^{0.5}}$

CN = 91.79 *curve number*

$S = (1000/CN) - 10$

S = 0.89 *inch*

$I_a = 0.2S$

I_a = 0.179 *inch*

$\frac{I_a}{P}$ = 0.1491

q_u = 750 from figure 4-6 using 15 min Tc

$Q_{WQ} = q_u * A * Q_{WV}$

Q_{eq} = 23.92 (cfs) *water quality peak flow*

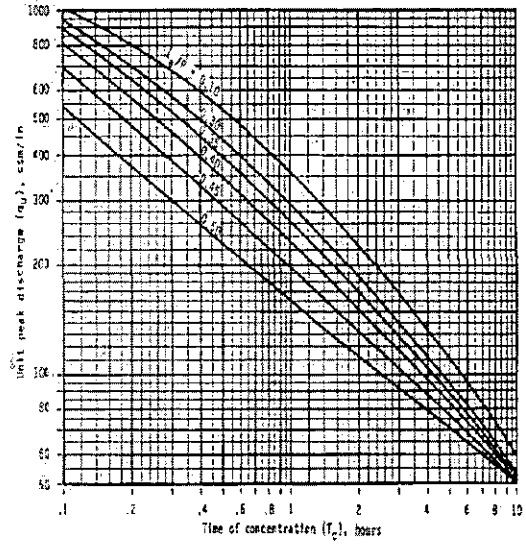


Figure 4-6 SCS Type II Unit Peak Discharge Graph

$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$ *rainfall excess for 1 year, 24 hour rainfall*

P	2.8 inch *2.8 inches (the 1 year, 24 hour rainfall)*
CN	see above
S	2.2 inch
I_a	see above
T_c	15 min
A	see above

Q = 1.43 *inch*

q_o/q_i 0.025 from figure 4-17 using T=24 hr - (this is going to be very close to the same value for every situation)

$V_s/V_r = 0.682 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 0.804(q_o/q_i)^3$

V_s/V_r = 0.647

$V_s = \frac{(V_s/V_r)QA}{12}$ *required storage volume acre-feet*

CP$_v$ for Q = (see above) inches

V_s = 2.88 *acre-feet*