

Brentwood South 3rd Addition
Wichita, Sedgwick County, Kansas
Drainage Analysis
November 12, 2007

Brentwood South 3rd Addition is located east of Webb Road on the North side of Pawnee. The plat consists of 5.7 acres. From the online NRCS websoil survey the onsite soils are Tabler silty clay loam, hydrologic soil group D. The site is currently un-maintained grass.

In the pre-developed condition offsite drainage comes from the Sedgwick County maintenance facility to the North and offsite drainage from the East in the Pawnee Avenue ditch. The drainage from the maintenance facility is blocked by a berm and drained by a 24" RCP. For the purposes of this study we considered the drainage from the offsite basins as though it arrived unimpeded. The entire site naturally drains into the Pawnee Avenue ditch. The ditch is drained south under Pawnee by a 54" RCP adjacent to Brentwood South 3rd.

In the developed condition, 14 multi-family units will be constructed on 1 platted lot. There is a dry detention pond in the northwest corner of the lot. Runoff from the maintenance facility will be detained in the pond as well as a small onsite basin. A storm sewer pipe will be employed to drain the street. A small portion of the site will be diverted into an existing Brentwood South 2nd storm sewer system. Swales in drainage easements will be used to convey drainage around the perimeter of the site and then into the road side ditch adjacent to Pawnee Ave. The ditch in Pawnee will be regraded to allow the site to drain.

HEC-HMS 3.0.1 was used for the hydraulic analysis of the site. For all rainstorm events studied, the drainage from the site was reduced in the developed condition.

Storm Return Period	Existing Runoff (cfs)	Developed Runoff (cfs)
2 yr	45.0	42.9
5 yr	62.8	60.8
10 yr	77.1	75.2
25 yr	91.5	88.6
100 yr	114.1	109.3

Table 1: Peak runoff for each studied rainfall event.

Existing Conditions

The existing site consists of 5.7 acres of grassland (0% impervious) with hydrologic group D soil. The time of concentration is 18 minutes for the maintenance facility and 20 minutes for the offsite area to the West. Time of Concentration was found using the velocity method. Considering the soil types and land use a curve number of 83 was used for onsite and 90 was used for the offsite areas. Existing runoff for each return period from Brentwood South 3rd is shown in Table-1. Runoff from the site flows to a single 54" RCP under Pawnee avenue. The RCP is adequately sized for the existing conditions. The rating for the existing culvert can be found in Table-2.

A review of the USGS map, FEMA floodmap and a field visit of the site shows no evidence of floodways, wetland or riparian areas of the subject site.

Offsite Sedgwick County Maintenance Yard:

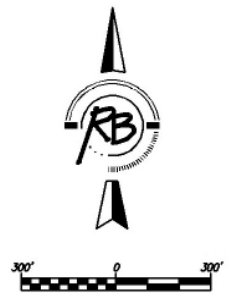
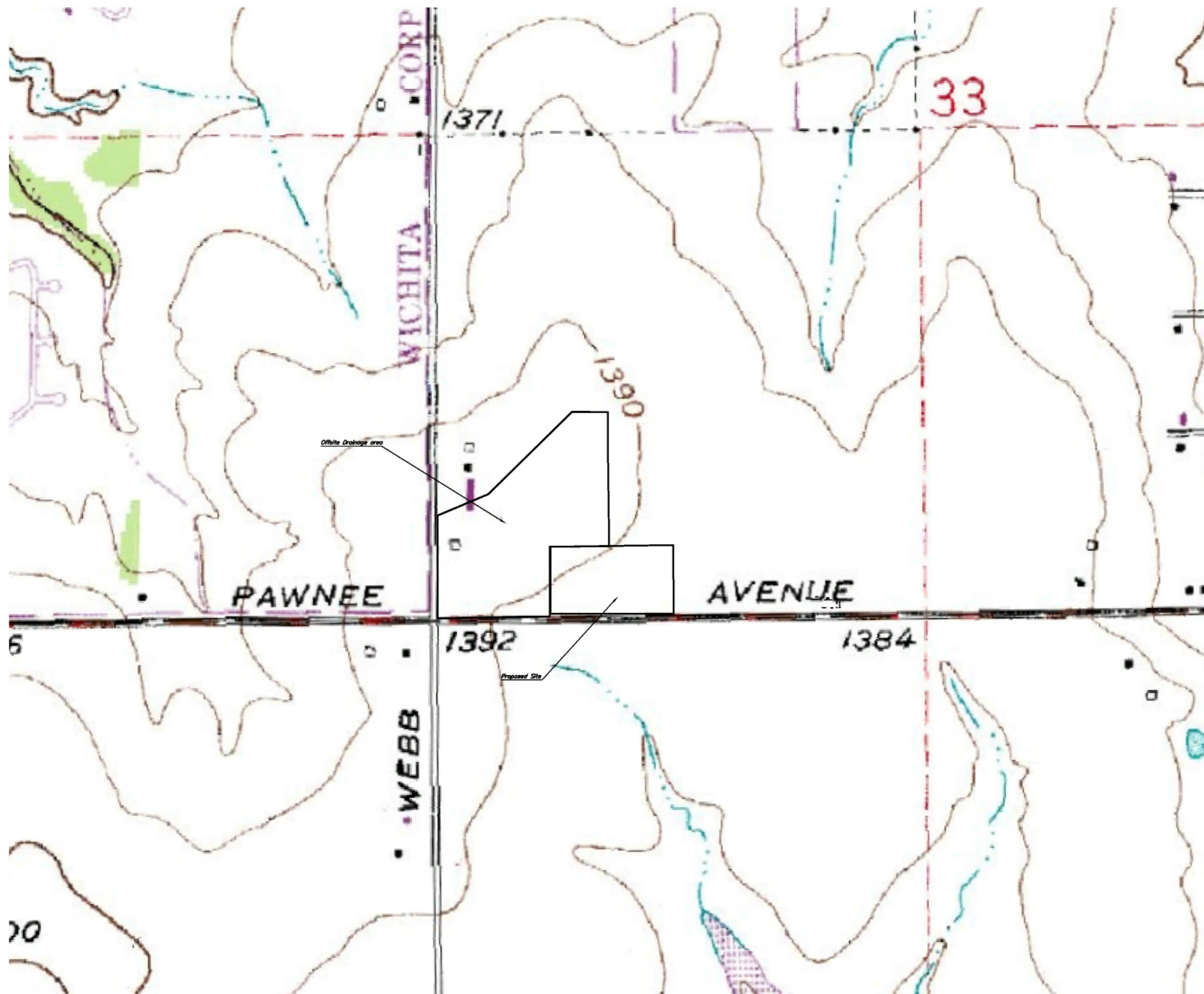
$T_c = 300' / 0.45 \text{ ft/sec (overland flow)} + 300' / 1.5 \text{ ft/sec (sheet flow)} + 550' / 2.5 \text{ ft/sec (channel flow)} = 1087 \text{ sec} = 18.1 \text{ minutes}$


Offsite West:

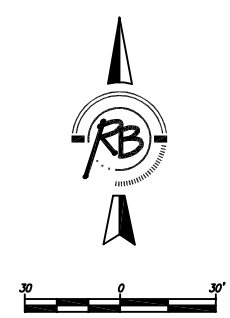
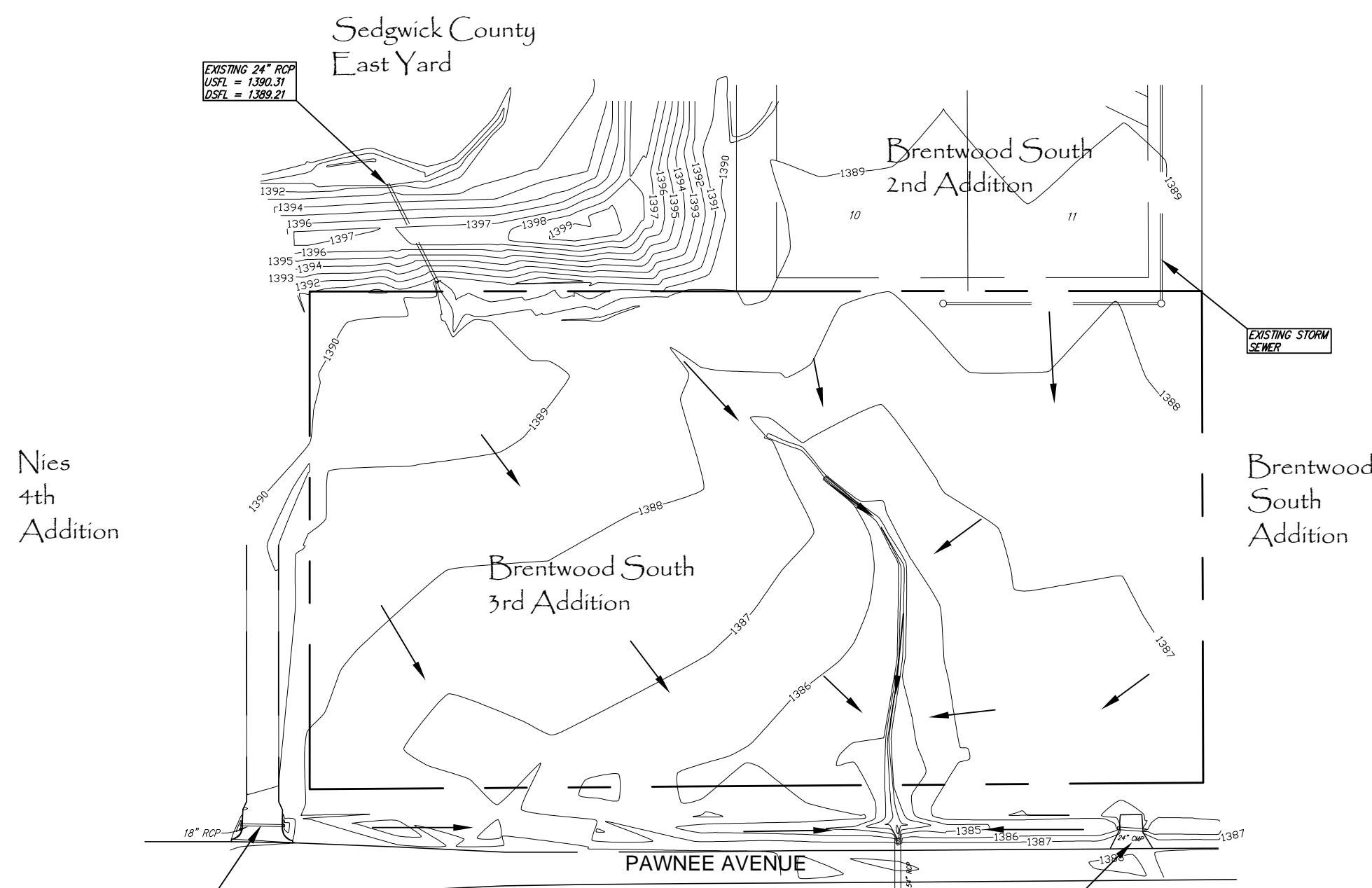
$T_c = 300' / 0.45 \text{ ft/sec (overland flow)} + 300' / 1.5 \text{ ft/sec (sheet flow)} + 840' / 2.5 \text{ ft/sec (channel flow)} = 1087 \text{ sec} = 20.2 \text{ minutes}$

Elevation	Discharge (cfs)
1382.5	0
1383.0	3
1383.5	8
1384.0	17
1384.5	28
1385.0	41
1385.5	54
1386.0	70
1386.5	84
1387.0	100
1387.5	114
1387.8	122

Table-2: Rating for 54" RCP Culvert under Pawnee Ave.

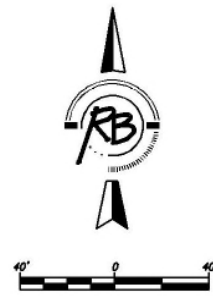


BRENTWOOD SOUTH 3RD ADDITION USGS Map WICHITA, KANSAS			
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BRENTWOOD SOUTH 3RD ADDITION
Existing Contours
WICHITA, KANSAS

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	DRAWING FILE Drainage Exhibits {Existing Cont}		PROJECT NUMBER 		UTILITY DATE Nov. 12, 2007



BRENTWOOD SOUTH 3RD ADDITION Aerial Exhibit WICHITA, KANSAS			
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Developed Conditions

The developed condition for Brentwood South Addition is 1 multifamily lot. The Lot is 5.7 acres. There will be approximately 14 dwellings broken into 38 units all together. There will be a dry detention pond drained by a 24” RCP. The pond will be able to overtop and discharge into a swale within a drainage easement on the west side of the property. The flow will be conveyed to the Pawnee ditch. There will be a swale within a drainage easement along the east side of the addition to convey drainage to the Pawnee ditch. A portion of the Northeast corner of the site will drain to an existing Brentwood South 2nd storm sewer. The Brentwood South 2nd system has the capacity to accommodate the discharge from the Brentwood South 3rd Addition. All discharge except the portion going into the Brentwood 2nd sws will flow to the ditch adjacent to Pawnee avenue and ultimately to a 54” RCP flowing under Pawnee. HEC-HMS 3.0.1 was used to model the developed conditions using the SCS Hydrograph method.

The peak discharge has been reduced in the developed condition from the existing condition for every rainfall return period. There are berms around the Southeast corner of the Sedgwick County Maintenance Facility creating a detention area drained by a 24” RCP. There is an 18” CMP culvert in the Pawnee ditch under the drive entrance for the property directly West of Brentwood South 3rd. In the 100-yr condition, the discharge to this CMP is approximately 33 cfs. This is a far larger amount of flow than an 18” CMP can handle. In our modeling we considered the worse case scenario (for our site) that both of these impediments have been removed and the full discharge is reaching our site. Because of the detention caused by the berms and the undersized CMP, the current peak discharge reaching our site is far less than what we have shown. Should their ever be improvements made to these sites, we’ve shown our development to be able to meet the drainage requirements expected.

Basin	Peak Discharge (cfs)				
	2-year	5-year	10-year	25-year	100-year
Pond Basin	1.04	1.45	1.78	2.12	2.64
Brentwood 2 nd SWS	1.83	2.47	2.97	3.48	4.28
Undetained	10.65	14.38	17.35	20.30	24.96

Table-3: Developed Basin Discharges.

Drainage Basins

Pond Basin (Basin A)

Rear yard drainage to the on-site detention pond.

Area = 0.5 acres

CN = 88

Time of Concentration = 15 minutes

Basin to Brentwood 2nd Storm Sewer (Basin C)

Rear yard drainage to the Brentwood South 2nd storm sewer.

Area = 0.86 acres

CN = 92

Time of Concentration = 15 minutes

Undetained Basin (Basin B, D & E)

Drainage undetained into roadway ditch adjacent to Pawnee Ave.

Area = 4.32 acres

CN = 92

Time of Concentration = 15 minutes

Pond Ratings

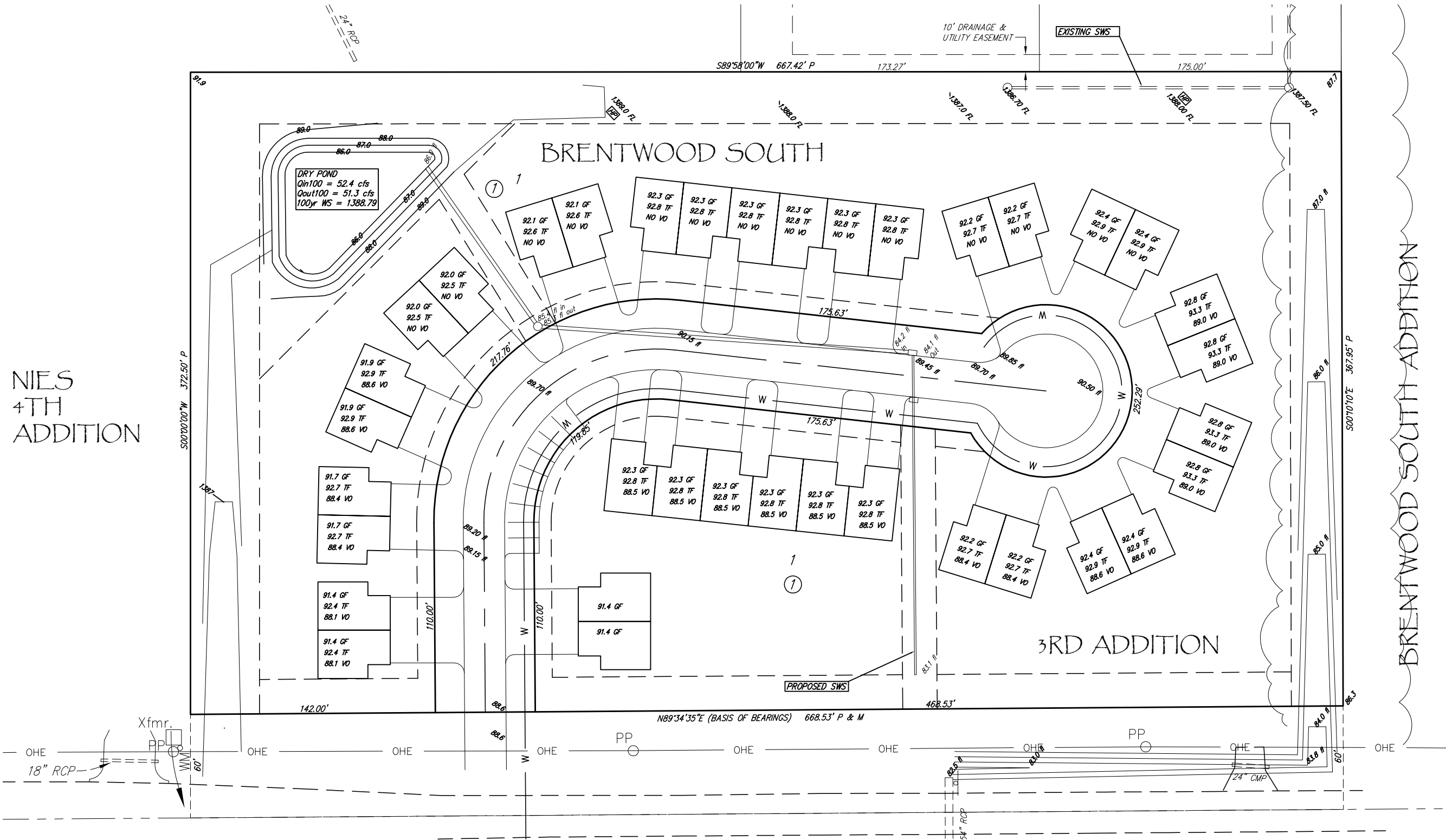
The following tables represent the data associated with the proposed dry detention pond.

Elevation	Area (ac)	Discharge (cfs)	Storage
1386.0	0.09	0	0
1386.5	0.10	1	0.05
1387.0	0.11	4.5	0.10
1387.5	0.13	8.5	0.17
1388.0	0.14	11.5	0.23
1388.5	0.19	30.4	0.25
1389.0	0.23	67.0	0.48

Table-4: Pond ratings: Area; Discharge & Storage.

SEDGWICK COUNTY EAST YARD ADDITION

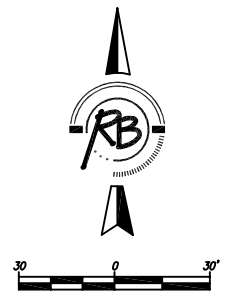
BRENTWOOD SOUTH 2ND ADDITION



NIES
4TH
ADDITION

BRENTWOOD SOUTH ADDITION

3RD ADDITION

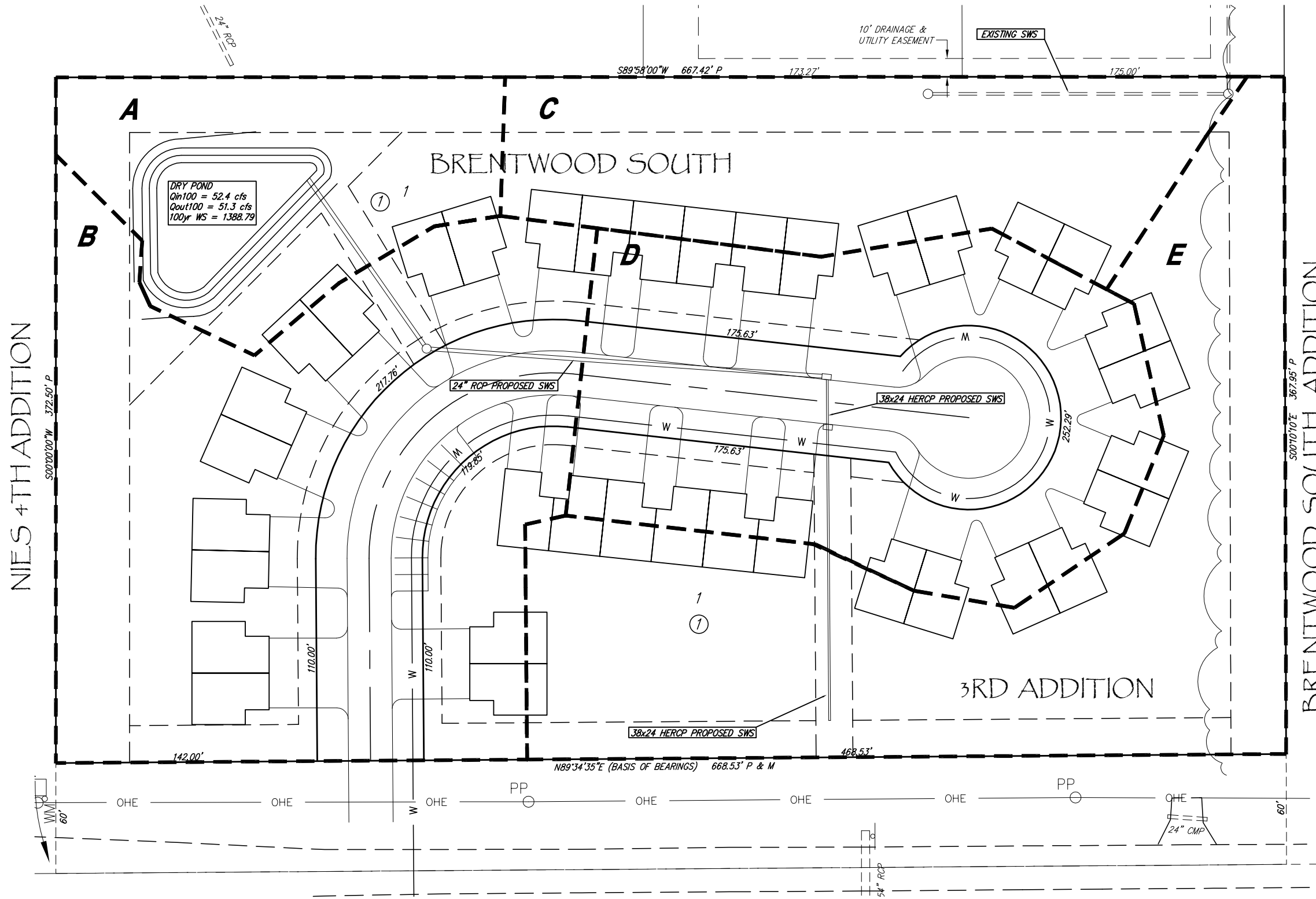


BRENTWOOD SOUTH 3RD ADDITION
4 Corner Lot Grading
WICHITA, KANSAS

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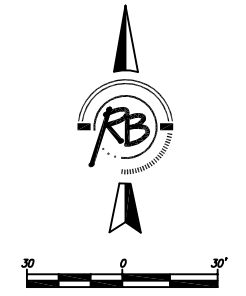
SEDGWICK COUNTY EAST YARD ADDITION

BRENTWOOD SOUTH 2ND ADDITION



DRY POND
 $Q_{in100} = 52.4 \text{ cfs}$
 $Q_{out100} = 51.3 \text{ cfs}$
 $100\text{yr WS} = 1388.79$

BASIN	AREA	CN
A	0.5 ac	88
B	1.7 ac	92
C	0.9 ac	92
D	1.2 ac	92
E	1.6 ac	88



BRENTWOOD SOUTH 3RD ADDITION
4 Corner Lot Grading
 WICHITA, KANSAS

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