

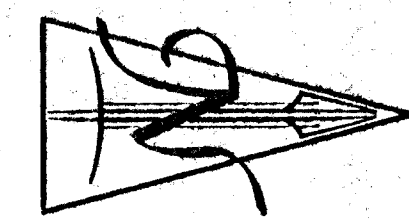
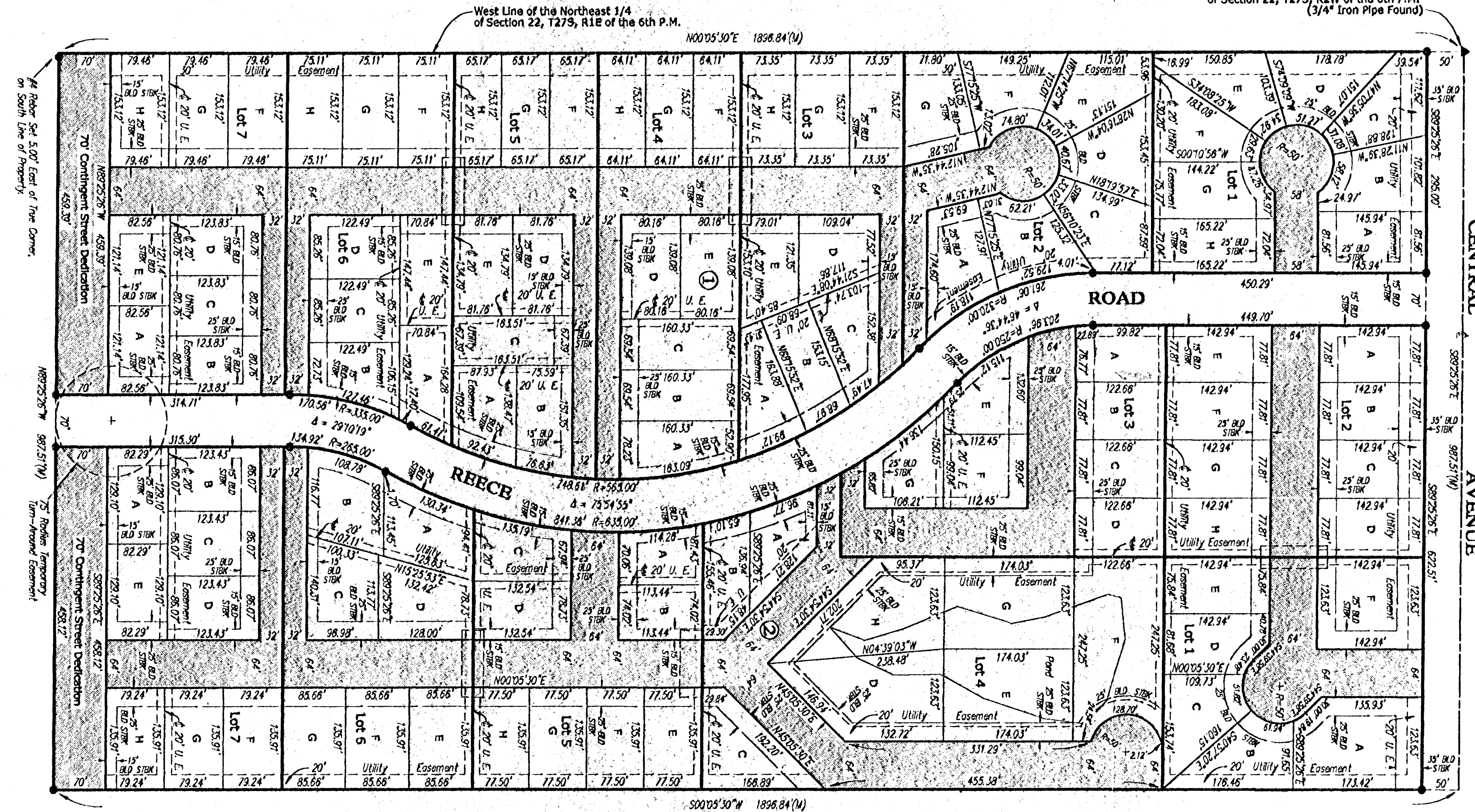
**BUNDLING OVERLAY
FOR PRELIMINARY PLAT OF
"PRAIRIE CROSSING"**
AN ADDITION TO SEDGWICK COUNTY, KANSAS
IN THE NORTHEAST QUARTER OF SECTION 22,
TOWNSHIP 27 SOUTH, RANGE 2 WEST OF THE 6TH P.M.

Northwest Corner of the Northeast Quarter
of Section 22, T27S, R2W of the 6th P.M.
(3/4" Iron Pipe Found)

LOT 1, BLOCK 1 2.5 Acres Gross		LOT 2, BLOCK 1 2.5 Acres Gross		LOT 3, BLOCK 1 2.5 Acres Gross		LOT 4, BLOCK 1 2.5 Acres Gross		LOT 5, BLOCK 1 2.5 Acres Gross	
PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.
A	11,902	A	12,500	A	10,842	A	11,149	A	11,019
B	11,902	B	12,500	B	10,842	B	11,149	B	11,019
C	11,902	C	12,500	C	10,842	C	11,149	C	11,019
D	11,902	D	12,500	D	10,842	D	11,149	D	11,019
E	11,902	E	12,500	E	10,842	E	11,149	E	11,019
F	11,902	F	12,500	F	11,231	F	9,816	F	9,978
G	11,902	G	12,500	G	11,231	G	9,816	G	9,978
H	11,902	H	12,500	H	11,231	H	9,816	H	9,978
TOTAL	95,216	TOTAL	87,500	TOTAL	87,903	TOTAL	85,193	TOTAL	85,029
	(2.19 Acres Net)		(2.01 Acres Net)		(2.02 Acres Net)		(1.96 Acres Net)		(1.95 Acres Net)

LOT 6, BLOCK 1 2.5 Acres Gross		LOT 7, BLOCK 1 3.3 Acres Gross		LOT 1, BLOCK 2 2.5 Acres Gross		LOT 2, BLOCK 2 2.5 Acres Gross	
PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.
A	10,444	A	10,000	A	20,768	A	11,122
B	10,444	B	10,000	B	11,505	B	11,122
C	10,444	C	10,000	C	11,660	C	11,122
D	10,444	D	10,000	D	10,893	D	11,122
E	10,444	E	10,000	E	10,840	E	11,122
F	11,500	F	12,167	F	17,671	F	11,122
G	11,500	G	12,167	G	83,337	G	11,122
H	11,500	H	12,167	H	(1.91 Acres Net)	H	11,122
TOTAL	86,720	TOTAL	86,501	TOTAL	88,976	TOTAL	(2.04 Acres Net)
	(1.99 Acres Net)		(1.99 Acres Net)				

LOT 3, BLOCK 2 2.5 Acres Gross		LOT 4, BLOCK 2 4.8 Acres Gross		LOT 5, BLOCK 2 2.5 Acres Gross		LOT 6, BLOCK 2 2.5 Acres Gross		LOT 7, BLOCK 2 3.2 Acres Gross	
PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.	PARCEL	SQ. FT.
A	9,536	A	9,681	A	8,397	A	12,319	A	10,623
B	9,544	B	9,681	B	8,397	B	12,319	B	10,623
C	9,544	C	13,368	C	10,435	C	12,319	C	10,623
D	9,544	D	21,575	D	10,435	D	12,319	D	10,623
E	11,136	E	21,514	E	10,532	E	11,641	E	10,623
F	11,136	F	27,782	F	10,532	F	11,641	F	10,769
G	11,136	G	21,514	G	10,532	G	11,641	G	10,769
H	11,136	H	21,514	H	10,532	H	11,641	H	10,769
TOTAL	71,576	TOTAL	146,631	TOTAL	79,792	TOTAL	84,199	TOTAL	85,422
	(1.64 Acres Net)		(3.37 Acres Net)		(1.83 Acres Net)		(1.93 Acres Net)		(1.96 Acres Net)



SCALE: 1" = 100'

- Number of Lots: 14
- Number of Parcels: 107
- See Sheet 1 of 2 For Additional Easement Information.
- = 90' x 30' Temporary Hammerhead Turnaround Easement
- = Building Setback
- = Utility Easement
- = Building Setback
- = Utility Easement



**FINAL DRAINAGE REPORT
PRAIRIE CROSSING ADDITION**

**SEDGWICK COUNTY, KANSAS
NOVEMBER 22, 2002**

Ruggles & Bohm P.A.

Engineering, Surveying, Land Planning

Prairie Crossing Addition Drainage Plan
CMB – (10-28-2002 through 11-15-2002)

Summary of Drainage Plan – Prairie Crossing Addition, Sedgwick County, Kansas

This drainage plan consists of two parts, each of which is based on a particular configuration of the Prairie Crossing Addition. In its initial condition, the lots will be sold as 2.5-acre parcels of ground, with Reece Road being constructed as an open ditch roadway. The corresponding drainage plan will utilize the existing and an additional detention pond to limit runoff from the property. Some initial street grades are indicated on the plan, and shall be refined at the time of roadway design.

In the secondary condition, the individual lots actually platted would be sold as building sites, the roadway demolished, existing utility lines relocated, and the existing homes in the addition would revert to a single lot ownership. In concert with these changes, sanitary sewer, water, paving, and storm water sewer improvements would be made to the area. The urban scale lot drainage plan takes this scenario into consideration, and also makes use of the existing and a future detention facility for the site. Again, a rough site-grading plan for the addition is provided, and shall be refined at the time of actual implementation.

Existing soil types: On site soils are Vb, Vd, and Bb. The Bb is dominant at approximately 70 percent of the site, and is a type C hydrological group soil. For this analysis, use a Curve Number (CN) of 78, type C soil, contoured and terraced ground, small grain crops in good condition.

Drainage to existing pond located near the northeast corner of the property:

From the topographic survey, and additional mapping indicated on the USGS quadrangle sheet for the area, the total drainage area to the existing pond is 41 acres. The elevation difference of the basin is 36 feet, with a travel length of 3500 feet. From this, a time of concentration may be calculated as follows:

$$\text{Kerby-Hathaway } T_c = 0.8262L n^{0.47} s^{-0.235}$$

N = 0.60 for good condition, moderately dense ground cover

L = 3500 feet

S = 0.01 (average of 1 percent basin slope)

Solving for $T_c = 88$ minutes, or an average velocity along the channel of 0.67 f/s

Try SCS T_c method:

$$T_c = (11.9L^3/h)^{0.385}$$

$$L = 3500/5280 = 0.66 \text{ miles}$$

H = 36 feet

Solving for $T_c = 0.41$ hours = 25 minutes, or an average velocity of 2.3 f/s

The average of both methods results in a T_c of 56 minutes, or an average velocity of 1.0 f/s, which seems appropriate. This 56 minute T_c will be used for the calculations.

The existing pond will spill to the west around the dam at an elevation of 1403. The crest of the dam is at an elevation of 1405. These calculations will ignore the detention effects of the existing pond. To determine the effects of the 100 year storm, the basin information is routed through HEC-1 (U.S. Army Corps of Engineers Hydraulic Program) to determine the runoff from the basin. The basin area includes the downstream north of the pond up to the existing dual 36" RCP pipes under Central.
Existing Pond Runoff Data:

BA (basin area) = 41 acres = 0.0641 square miles
SCS Lag = $0.6T_c = 0.6(56 \text{ minutes}) / (60 \text{ min/hour}) = 0.56$ hours
CN = 78

$Q_{100} = 115$ cfs from HEC1 program

The spillway on the west edge of the dam allows water to pass at an elevation of 1403, and a width of 40 feet. To approximate the flow depth at 115 cfs, consider that $Q = V \cdot A$, Therefore $115 \text{ cfs} = 3.0 \text{ f/s (assumed)} \cdot 40y$, where y = depth of flow. Solving for y results in 0.96 feet, or about a foot of depth of flow, and a maximum water surface elevation of approximately 1404.

Existing Drainage – West Swale (Area 4)

Other existing drainage patterns for the site include the drainage area to the existing sump along the west side of the property, roughly between Lots 4 and 5, Block 1 (Large Lot Layout). This drainage area (on-site) = 3.0 acres. In large runoff events, the terraces which direct the runoff away from the sump may overflow, however, the dynamics of this event would be difficult to predict, and will be ignored for this report. Given the length of the basin (short), the minimum T_c of 15 minutes will be used for drainage calculations. Since no pond will be routed for this reach, the Rational Method will suffice for calculation of storm water runoff. Given the type C soils, with contoured row crops, use a C factor of 0.53 (100 year) and 0.26 (2 year) (City of Wichita Attachment A, Drainage Policy Manual, 1979). The rainfall intensity I is 3.83 in/hour for the two year storm, and is 7.37 in/hr for the 100 year storm. Using the rational formula:

$Q_2 = 0.26 \cdot 2.84 \cdot 3.0 = 2.2$ cfs
 $Q_{100} = 0.53 \cdot 5.69 \cdot 3.0 = 9.1$ cfs

Since the 2.5 Acre lot configuration will not increase the drainage basin size or runoff values, the runoff from this area will remain generally the same in the pre and post development conditions.

Site development: 2.5-acre tracts:

The initial development on the Prairie Crossing site will be as 2.5 acre lots. At issue is the difference in storm water runoff from the site between the undeveloped and developed condition. Looking at the U.S. Soil Conservation Service runoff curve numbers for type C hydrological group soils, and at the proposed land use, we see the following:

Pre-development: Small grain crops, contoured and terraced, good condition, CN = 78

Post-development (2.5 acre lots): Some yard area will likely be a fescue type grass cover, with outlying areas being a pasture type grass such as brome or bluestem. Most of the shape of the ground would remain, with the exception of the area adjacent to the new home. This configuration favorably compares to Pasture or Range, Type C soils, contoured, good condition, the CN for which is 70. Given the fact that some of the lot will now be impervious (house, driveway), it can be approximated that a weighted curve number could be:

House = 3000 square feet, driveway = 200 feet long x 20 feet wide = 4000 square feet:
Total impervious = 3000 + 4000 = 7000 s.f., to be conservative, use 10,000 square feet of impervious area in the developed condition for a standard lot. Assume a CN of 95 for the impervious area.

Weighted CN: $10,000 \text{ s.f} \times 95 = 950,000$
 $2.5 \text{ ac.}(43560 \text{ sf/ac}) - 10,000 \text{ sf} = 98,900 \text{ sf} (70) = 6,923,000$

$$\text{Weighted CN} = 950,000 + 6,923,000 / 2.5(43560) = 72.3$$

Based on this calculation, it does not appear that development of the site in 2.5 acres lots will have any net positive affect on the existing runoff from the site. The drainage plan will, however, take into account any drainage that may be re-directed by the new roadway alignment.

2.5 Acre Configuration Drainage Calculations:

South Basin to Cross Pipe at Station 11+00 (Area 1 and Off 1)

This basin contains 13.2 acres of on-site and 4.5 acres of off-site drainage, totaling 17.7 acres. Travel distance measures 2200 feet, so at 1.0 f/s velocity, $T_c = 36$ minutes. C values are as above, $I_2 = 2.39 \text{ in/hr}$, $I_{100} = 4.93 \text{ in/hr}$. Solving for runoff:

$$Q_2 = 0.26 \times 2.39 \times 17.7 = 11.0 \text{ cfs}$$

$$Q_{100} = 0.53 \times 4.93 \times 17.7 = 46.3 \text{ cfs}$$

The runoff from this basin will be directed to the existing pond basin, actually into the existing pond. Adding the areas, 17.7 acres + 41 acres (Area 2 and Off 2) = 58.7 acres. $T_c = 56$ minutes (pond basin governs). Using the Rational Method:

$$Q_2 = 0.26 \times 1.79 \times 58.7 = 27.4 \text{ cfs}$$

$$Q_{100} = 0.53 \times 3.88 \times 58.7 = 120.7 \text{ cfs}$$

Check basin with HEC-1, 100yr-24 hour storm: Q100 = 164 cfs

Check existing 2 – 36" RCP pipes under Central for Capacity:

Flow pipes = 1391.3; Edge of shoulder of Central = 1395.5

HW = 4.2', HW/D = 4.2'/3' = 1.4

From Hydraulic Charts for the Selection of Highway Culverts (FHA), For inlet control, each pipe can handle 52 cfs for a combined total of 104 cfs.

Route flows through detention pond system to provide adequate storage for the 100 year storm: To HEC-1 (Hudson2.hc1, Hudson2.out)

Existing Pond Location: Enlarged and controlled with 5.0' Notched Weir

Elevation (MSL)	Head (feet)	Area (acres)	Outflow (cfs)
1401	0	1.13	-
1402	1	1.26	15
1403	2	1.40	42.4
1404	3	1.54	77.9
1405	4	1.69	120

* Weir rating with the equation $Q = CLH^{**1.5}$, where $C = 3.0$, $L = 3.5'$ and $H =$ head in feet.

The new, downstream pond to be constructed consists of the following:

New Lower Pond with 2-36" RCP pipes controlling discharge

Elevation (MSL)	Head (feet)	Area (acres)	Discharge 2-36" RCP*
1394	0	0.65	-
1395	1	0.74	4
1396	2	0.84	38
1397	3	0.95	74
1398	4	1.06	100
1399	5	1.17	140

* Selection of Highway Culverts, FHA Hydraulic Circular No. 5

Results of this routing are indicated in the output:

RUNOFF SUMMARY

OPERATION	STATION	FLOW IN CUBIC FEET PER SECOND TIME IN HOURS, AREA IN SQUARE MILES					BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
		PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD					
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	BASINA	115.	12.42	29.	9.	9.	0.06		
HYDROGRAPH AT	BASINB	63.	12.17	12.	4.	4.	0.03		
2 COMBINED AT	COMBINE	169.	12.33	41.	13.	13.	0.09		

ROUTED TO	POND	120.	12.67	40.	12.	12.	0.09	1405.01	12.67
HYDROGRAPH AT	PONDAREA	14.	12.00	2.	1.	1.	0.00		
2 COMBINED AT	COMB2	123.	12.67	43.	13.	13.	0.10		
ROUTED TO	NEWPOND	106.	13.00	42.	13.	13.	0.10	1398.14	13.00

*** NORMAL END OF HEC-1 ***

The outflow from the new, lower pond is limited to 106 cfs, which is consistent with the target flows of 104 cfs (existing pipe capacity) and 115 cfs (target original flow from natural drainage area).

The new detention pond and modifications to the existing detention ponds are required modifications to the site with an open ditch roadway along Reese Road.

West Culvert Pipe Under Central

Runoff reaching the existing culvert pipe under Central near the northwest corner of the property consists of 11.9 acres (Area 3), with a time of concentration of 15 minutes:

$$Q_2 = 0.26 * 3.83 * 11.9 = 12.0 \text{ cfs}$$

$Q_{100} = 0.53 * 7.37 * 11.9 = 46.5 \text{ cfs}$ (note: this compares to 33.7 cfs from the Baughman Company Drainage plan for Woodland Hills Addition). Drainage from this basin passes through a 20"x28" CMPA under Central, with a flowline elevation of 1395.00 and a top of roadway elevation of 1396.6, allowing a headwater depth of 1.6 feet (pipe is mathematically at the surface of the road). This pipe will pass approximately 15 cfs in its current configuration. It appears that the pipe was sized for the two-year storm, and the roadway is allowed to overtop in larger storms. The new, 2.5 acre lot configuration will not increase the drainage area for the basin discharging to this 20"x28" CMPA. Since the roadway has recently been surfaced, and it would require approximately two additional pipes to attempt to pass the 100 year runoff from this swale, it is recommended that the existing pipe be allowed to service the area until such time that the roadway is improved.

Site development in urban scale lot configuration:

Of first concern with a developed site condition will be the need for detention of storm water from the improved site. Attached with this report is a first draft, subdivision grading plan for the addition. From this grading plan, the major drainage basins can be identified and routed to the existing pond situated on the site. The limiting discharge from this area is the 115 cfs for the dual 36" RCP pipes under Central which are located east of Reece Road.

Developed curve number:

Using an SCS curve number of 90 (Type C soil, hard surfaces) for the developed lots, a weighted curve number can be determined for the entire basin:

$$CN = ((9.2 \text{ ac})(78) + (31.8 \text{ ac})(90))/41 = 87 \text{ composite curve number}$$

Pond routing of developed area will allow several basins to combine runoff in the existing detention pond, and in the open drainage swale north of the existing pond. Routing will include the following:

To existing pond: 26.2 acres of offsite area + 8.7 acres of developed lot area + 4.3 acres of existing pond and surrounding drainage area, for a total of 39.2 acres (0.0613 sq. miles). The composite curve number for this area is $((26.2 \text{ ac})(78) + (13\text{ac})(90))/39.2 = 82$. For time of concentration, use 40 minutes, which takes into account the reduced travel time for water traveling through the developed subdivision.

The previous hydrograph will be routed through the existing pond. Assuming a static pool of 1401 and modifications to the pond to allow more storage, and utilizing a 3.5 foot wide broad crested weir for discharge, the following values can be tabulated:

Existing Pond Location: Enlarged and controlled with 3.5' Wide Notched Weir

Elevation (MSL)	Head (feet)	Area (acres)	Discharge 3.5' Notched Weir
1401	0	1.13	-
1402	1	1.26	10.5
1403	2	1.40	29.7
1404	3	1.54	54.5
1405	4	1.69	84

* Weir rating with the equation $Q = CLH^{1.5}$, where $C = 3.0$, $L = 3.5'$ and $H = \text{head in feet}$.

Added to the outflow hydrograph from this pond will be the discharge from the second on-site basin, consisting of the westerly portion of the plat (14.5 acres) + half of the drainage reserve area = 4.3 acres, + half of the offsite area south of the plat (totaling 18.8 acres or 0.0294 square miles. Since this area will be almost entirely developed, the CN of 90 will be used for the calculation of runoff.

For the upper basin, an SCS Lag time of 0.40 hours will be used for the developed condition. This is reduced from the original 0.56 hours due to the decreased travel time for storm water drainage due to development.

The resultant flow is routed through the new, lower pond, which will utilize 2-36" RCP Pipes (Inlet Control) as control. A summary of this pond is as follows:

New Lower Pond with 2-36" RCP pipes controlling discharge

Elevation (MSL)	Head (feet)	Area (acres)	Discharge 2-36" RCP*
1394	0	0.65	-
1395	1	0.74	4
1396	2	0.84	38
1397	3	0.95	74
1398	4	1.06	100
1399	5	1.17	140

* Selection of Highway Culverts, FHA Hydraulic Circular No. 5

Running the HEC-1 program with the basin configuration indicated above yields the following results: (Hudson.hc1, Hudson.out)

RUNOFF SUMMARY

OPERATION	STATION	FLOW IN CUBIC FEET PER SECOND TIME IN HOURS, AREA IN SQUARE MILES					BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
		PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD					
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	BASINA	142.	12.25	30.	9.	9.	0.06		
ROUTED TO	POND	81.	12.58	29.	9.	9.	0.06	1404.89 12.58	
HYDROGRAPH AT	BASINB	87.	12.08	16.	5.	5.	0.03		
2 COMBINED AT	COMBINE	135.	12.25	44.	14.	14.	0.09		
ROUTED TO	NEWPOND	110.	12.67	44.	14.	14.	0.09	1398.25 12.67	

*** NORMAL END OF HEC-1 ***

As the results indicate the enlarged, existing pond utilizing a 3.5' wide notched weir will detain runoff at an elevation of 1404.89. The outflow hydrograph of this pond, combined with the runoff from the adjacent basin results in a peak flow of 135 cfs, which is then routed through the bottom pond. This pond utilizes 2-36" RCP Pipes to control the outflow, which is limited to 110 cfs at an elevation of 1398.25.

Modifications of this design could be implemented at the time of design to utilize other structures, or different pond configurations.

Urban Standard Storm Water Sewer System:

The attached drainage plan for the urban standard development is attached. Drainage basins and control grades are indicated on the drawing, as well as a tabulation of runoff generated from each area.

The Methodology used for the drainage plan is the Rational Formula, with the following assumptions:

Runoff coefficients and rainfall intensity values are taken from the Attachment A and D, City of Wichita Interim Drainage Policy. Given the soil types, C2 = 0.48 and C100 = 0.68. A 15 minute time of concentration will be used for all basins. Storm water sewer pipes sized for this configuration are done only with the Mannings Equation, as outlined in Design Data 4 – Concrete Pipe Association. If the development was transformed from the 2.5 acre lot configuration to the urban lot configuration, a full hydraulic analysis of the storm water sewer would be required at the time of storm water sewer design.

The street and lot corner grades indicated on the drainage plan are approximate, and are subject to change in the event that the urban scale layout is developed.

West Side Storm Water Sewer System:

Drainage reaching the main conduit of this system is calculated as 1/2 of area A-Off + Area A, resulting in a 100 year flow of 74.9 cfs. The remaining 1/2 of area A-Off is assumed to make its way into the swale along the west side of the subject property, and will drain through the existing off-site swale.

The resulting main conduit is a 42" RCP. 100-year overflow shall be allowed as indicated on the drainage plan.

East Storm Water Sewer System (Into existing pond):

In its ultimate configuration, this system will drain Area B and 1/2 with B-Off. Again, 1/2 of the offsite drainage is assumed to make its way to the swale along the east property line of the subject property. This results in a 100 year flow of 64.4 cfs. 100 year overflow is available at the sump location.

Please see the following HEC-1 models for details pertaining to the detention storage on the site.

**ATTACHMENT A – HEC1 MODEL
2.5 ACRE CONFIGURATION
DETENTION STORAGE RUN**

HUDSON2.HC1 – HUDSON2.OUT

HEC-1 INPUT

LINE	ID	1	2	3	4	5	6	7	8	9	10
*** FREE ***											
1	ID	Rural Development, Praire Crossing Addition									
2	ID	Roadway sump at 11+00 with diverted flow to modified pond									
3	IT	5									
4	IN	30									
5	IO	4									
6	KK	BASINA									
7	BA	0.0641									
8	PC	0	0.04	0.08	.12	.17	.22	.27	.32	.37	.43
9	PC	.49	.56	.62	.69	.77	.85	.94	1.04	1.15	1.27
10	PC	1.41	1.59	1.83	2.21	5.17	5.73	6.02	6.23	6.40	6.54
11	PC	6.65	6.76	6.86	6.95	7.02	7.09	7.16	7.23	7.29	7.36
12	PC	7.43	7.49	7.54	7.59	7.63	7.68	7.72	7.76	7.80	
13	UD	0.56									
14	LS	0	78								
15	KK	BASINB									
16	BA	0.0277									
17	UD	0.36									
18	LS	0	78								
19	KK	COMBINE									
20	HC	2									
21	KK	POND									
22	RS	1	ELEV	1401							
23	SQ	.1	5.3	15	27.5	42.4	59.3	77.9	98.2	120	
24	SE	1401	1401.5	1402	1402.5	1403	1403.5	1404	1404.5	1405	
25	SA	1.13	1.26	1.40	1.54	1.69					
26	SE	1401	1402	1403	1404	1405					
27	KK	PONDAREA									
28	BA	0.0039									
29	UD	0.20									
30	LS	0	95								
31	KK	COMB2									
32	HC	2									
33	KK	NEWPOND									
34	RS	1	ELEV	1394							
35	SQ	.1	4	38	74	100	140				
36	SE	1394	1395	1396	1397	1398	1399				
37	SA	0.65	0.74	0.84	0.95	1.06	1.17				
38	SE	1394	1395	1396	1397	1398	1399				
39	ZZ										

29 UD SCS DIMENSIONLESS UNITGRAPH
 TLAG 0.20 LAG

 UNIT HYDROGRAPH
 14 END-OF-PERIOD ORDINATES
 2. 6. 8. 6. 1. 0. 0.
 0. 0. 0. 0. 3. 2. 1.

31 KK

 * COMB2 *

32 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

33 KK

 * NEWPOND *

HYDROGRAPH ROUTING DATA

34 RS STORAGE ROUTING
 NSTPS 1 NUMBER OF SUBREACHES
 ITYP ELEV TYPE OF INITIAL CONDITION
 RSVRIC 1394.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

37 SA	AREA	0.6	0.7	0.8	0.9	1.1	1.2
38 SE	ELEVATION	1394.00	1395.00	1396.00	1397.00	1398.00	1399.00
35 SD	DISCHARGE	0.	4.	38.	74.	100.	140.
36 SE	ELEVATION	1394.00	1395.00	1396.00	1397.00	1398.00	1399.00

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	0.69	1.48	2.38	3.38	4.50
ELEVATION	1394.00	1395.00	1396.00	1397.00	1398.00	1399.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.69	1.48	2.38	3.38	4.50
OUTFLOW	0.10	4.00	38.00	74.00	100.00	140.00
ELEVATION	1394.00	1395.00	1396.00	1397.00	1398.00	1399.00

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	BASINA	115.	12.42	29.	9.	9.	0.06		
HYDROGRAPH AT	BASINB	63.	12.17	12.	4.	4.	0.03		
2 COMBINED AT	COMBINE	169.	12.33	41.	13.	13.	0.09		
ROUTED TO	POND	120.	12.67	40.	12.	12.	0.09	1405.01	12.67
HYDROGRAPH AT	PONDAREA	14.	12.00	2.	1.	1.	0.00		
2 COMBINED AT	COMB2	123.	12.67	43.	13.	13.	0.10		
ROUTED TO	NEWPOND	106.	13.00	42.	13.	13.	0.10	1398.14	13.00

*** NORMAL END OF HEC-1 ***

**ATTACHMENT B – HEC1 MODEL
URBAN SCALE DEVELOPMENT
DETENTION STORAGE RUN**

HUDSON.HC1 – HUDSON.OUT

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*****  
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *  
* MAY 1991 *  
* VERSION 4.0.1E *  
* RUN DATE 10/29/2002 TIME 11:05:39 *  
*****
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*****  
* U.S. ARMY CORPS OF ENGINEERS *  
* HYDROLOGIC ENGINEERING CENTER *  
* 609 SECOND STREET *  
* DAVIS, CALIFORNIA 95616 *  
* (916) 756-1104 *  
*****
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X X XXXXXXX XXXX X  
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::: Full Microcomputer Implementation :::  
::: by :::  
::: Haestad Methods, Inc. :::  
::: :::  
.....  
.....
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

25 LS SCS LOSS RATE
 STRTL 0.22 INITIAL ABSTRACTION
 CRVNB 90.00 CURVE NUMBER
 RTIMP 0.00 PERCENT IMPERVIOUS AREA

24 UD SCS DIMENSIONLESS UNITGRAPH
 TLAG 0.30 LAG

UNIT HYDROGRAPH
 20 END-OF-PERIOD ORDINATES

6.	19.	36.	42.	38.	30.	19.	13.	9.	6.
4.	3.	2.	1.	1.	1.	0.	0.	0.	0.

26 KK
 * COMBINE *
 * *
 * *

27 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

28 KK
 * NEWPOND *
 * *
 * *

HYDROGRAPH ROUTING DATA

29 RS STORAGE ROUTING
 NSTPS 1 NUMBER OF SUBREACHES
 ITYP ELEV TYPE OF INITIAL CONDITION
 RSVRIC 1394.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

32 SA AREA 0.6 0.7 0.8 0.9 1.1 1.2

33 SE ELEVATION 1394.00 1395.00 1396.00 1397.00 1398.00 1399.00

30 SQ DISCHARGE 0. 4. 38. 74. 100. 140.

31 SE ELEVATION 1394.00 1395.00 1396.00 1397.00 1398.00 1399.00

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	0.69	1.48	2.38	3.38	4.50
ELEVATION	1394.00	1395.00	1396.00	1397.00	1398.00	1399.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.69	1.48	2.38	3.38	4.50
OUTFLOW	0.10	4.00	38.00	74.00	100.00	140.00
ELEVATION	1394.00	1395.00	1396.00	1397.00	1398.00	1399.00

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	BASINA	142.	12.25	30.	9.	9.	0.06		
ROUTED TO	POND	81.	12.58	29.	9.	9.	0.06	1404.89	12.58
HYDROGRAPH AT	BASINB	87.	12.08	16.	5.	5.	0.03		
2 COMBINED AT	COMBINE	135.	12.25	44.	14.	14.	0.09		
ROUTED TO	NEWPOND	110.	12.67	44.	14.	14.	0.09	1398.25	12.67

*** NORMAL END OF HEC-1 ***

