

**DRAINAGE REPORT FOR
WATER TOWER PLACE
CITY OF MARYSVILLE, KANSAS**

I. SITE DATA

- A. Location.** The proposed property is located in the South Half of the Northwest Quarter of the Northwest Quarter of Section 35, Township 2 South, Range 7 East, Marshall County, Kansas. The property is located on the north side of Prairie Lane in the City of Marysville, KS. (See Exhibit 'A')
- B. Size.** The property has a total area of 3.4 acres and is broken into 11 proposed lots.
- C. Description.** The property currently consists of grass land. The property is located near the top of a hill so a ridge divides the property into three drainage areas. 75% of the property drains south to a 12" CMP culvert under Prairie Lane. The remainder of the property surface rains north from to the adjacent lands. No runoff from adjacent lands enters this property.
- D. Proposed Development.** The property will be developed as multi-family housing consisting of 11 duplex houses. Tower Road will be developed through the property and connect to Prairie Lane on the South side of the property. Drainage area will have minimal to no affect by the development. All driveways will be sloped to provide drainage to the street. All attempts will be made to provide drainage from the roofs towards the street and drainage area 1.

II. HYDROLOGY

Watershed. As described above, this property is divided into three separate drainage areas. Drainage area 1 consists of 2.5 acres. Drainage Area 2 consists of 0.6 acres. Drainage Area 3 consists of 0.3 acres. An additional 0.6 acres of drainage from Prairie Lane and the area west of the development also drains to the culvert on the south side of the property.

- A. Existing.** The three drainage areas were analyzed to determine the peak storm water runoff flows that currently exist. The rational method was used to determine the peak runoff that would occur from the 10 year and 100 year storms. Procedures in the Kansas Department of Transportation Drainage Design Manual" were followed to obtain the Time of Concentration, Rainfall Intensities, Antecedent Precipitation Coefficients, and Runoff Coefficients. Results from each area are located in Exhibit 'B'.
- B. Developed.** The three drainage areas were analyzed to determine the increase in the peak storm water runoff that would be created by the development of the property. All three areas were considered to be fully developed. Increase in impervious areas were considered from the duplex footprint, driveways, and the

proposed street. The rational method was used to determine the peak runoff that would occur from the 10 year and 100 year storms. Procedures in the Kansas Department of Transportation Drainage Design Manual" were followed to obtain the Time of Concentration, Rainfall Intensities, Antecedent Precipitation Coefficients, and Runoff Coefficients. Results from each area are located in Exhibit 'B'.

C. Existing vs Developed.

- i. The development of Area 1 creates an increase in peak runoff rate of 6.2 cfs (102%) for the 10 year storm and 8.5 cfs (82%) for the 100 year storm. All of this runoff will flow south to the ditch on the North side of Prairie Lane where it will flow south through the 12" CMP.
- ii. The development of Area 2 creates an increase in peak runoff rate of 0.9 cfs (53%) for the 10 year storm and 1.4 cfs (50%) for the 100 year storm. This runoff flows northwesterly towards the old Walmart building.
- iii. The development of Area 3 creates an increase in peak runoff rate of 0.3 cfs (33%) for the 10 year storm and 0.4 cfs (27%) for the 100 year storm. This runoff flows east across the field north of the new water tower.
- iv. The total increase in runoff from a fully developed property from all three areas would be 7.4 cfs (85%) for the 10 year storm and 10.3 cfs (70%) for the 100 year storm.

III. HYDRAULICS

The only hydraulic structure associated with the site is the 12" CMP culvert that carries storm water from the north side of Prairie lane to the south side of Prairie Lane. A hydraulic analysis of this structure shows that the culvert can handle a peak flow of 3.6 cfs before water would begin to over top the roadway. This does not take into account the detention storage provided by the ditch. The current layout of the ditch provides 3394 cubic feet of storage before the road is overtopped.

IV. STORMWATER MANAGEMENT

A. Drainage Area 1

The increased runoff from Drainage Area 1 will flow to the 12" CMP culvert described above in Section III. The size of this culvert limits the release of storm water to 3.6 cfs. The ditch on the north side of the road must be able to store the additional runoff created from the development without causing the road to be overtopped. An analysis of the 100 year design storm over the developed Drainage Area 1 shows that the road ditch must be able to store 4,578 cubic feet of water. This ditch can be shaped and widened so that it can provide this storage. If this storage is provided, the additional runoff will be stored in the ditch until it can be evacuated by the culvert.

B. Drainage Area 2

The increased runoff from Drainage Area 2 will flow northwesterly across the open lots towards the northwest corner of the development. All of the increased runoff is due to the roofs from the proposed duplexes. Runoff from the roofs will be slowed by the gutter system contained by the duplexes. Due to the small amount of drainage in this area and the low runoff rates, storm water management can be obtained by planting a thick vegetative buffer along the outside boundary of the property which will slow down the runoff before it leaves the property. This should prove to be more effective than attempting to collect the storm water in one location and evacuating through a detention structure.

C. Drainage Area 3

The increased runoff from Drainage Area 3 will flow easterly across the open lots towards the east side of the development. All of the increased runoff is due to the roofs from the proposed duplexes. Runoff from the roofs will be slowed by the gutter system contained by the duplexes. Due to the small amount of drainage in this area and the low runoff rates, storm water management can be obtained by planting a thick vegetative buffer along the east boundary of the property which will slow down the runoff before it leaves the property. This should prove to be more effective than attempting to collect the storm water in one location and evacuating through a detention structure.

V. CONCLUSION

If the Storm water is handled as described in Section IV above, increased runoff from the proposed site will be adequately handled and no adjacent areas will be adversely affected by Stormwater runoff from the development.

Drainage Report Conducted by:

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EXHIBIT 'A'

VICINITY MAP

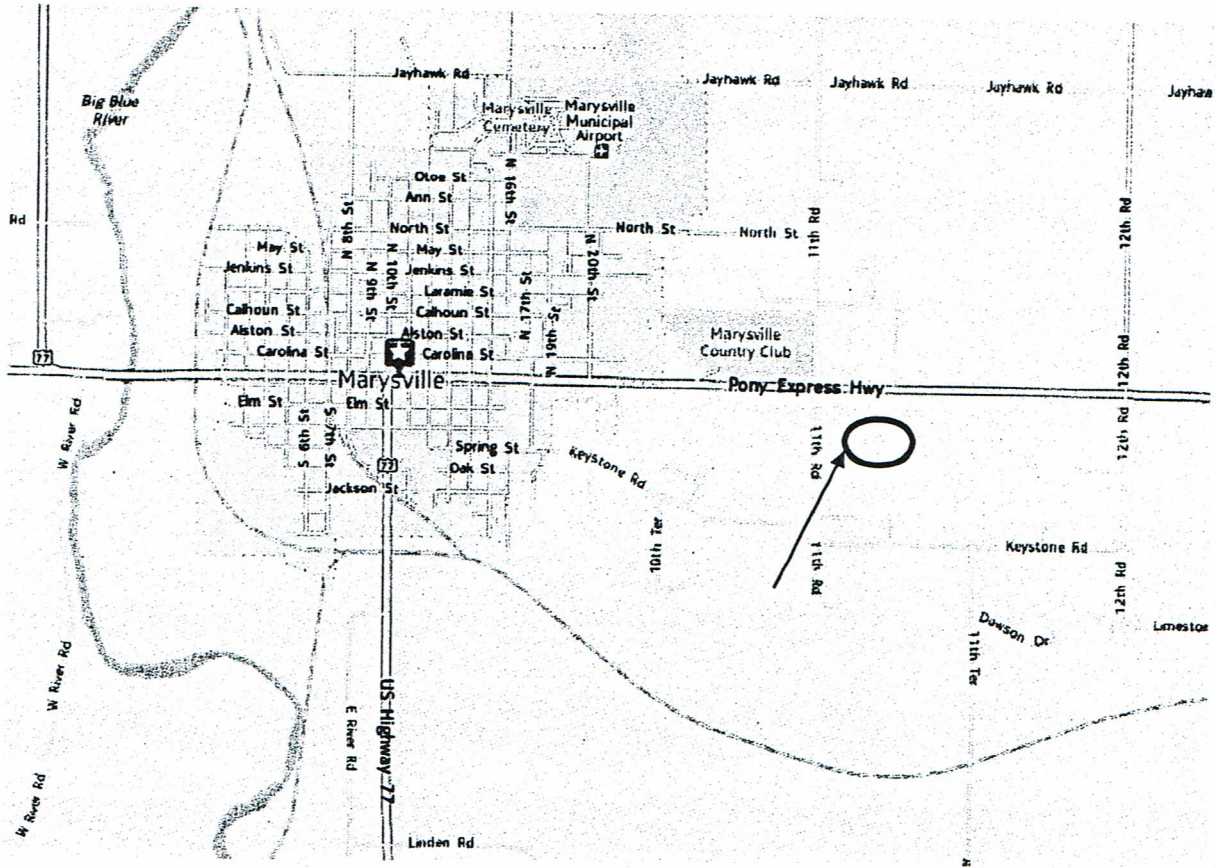


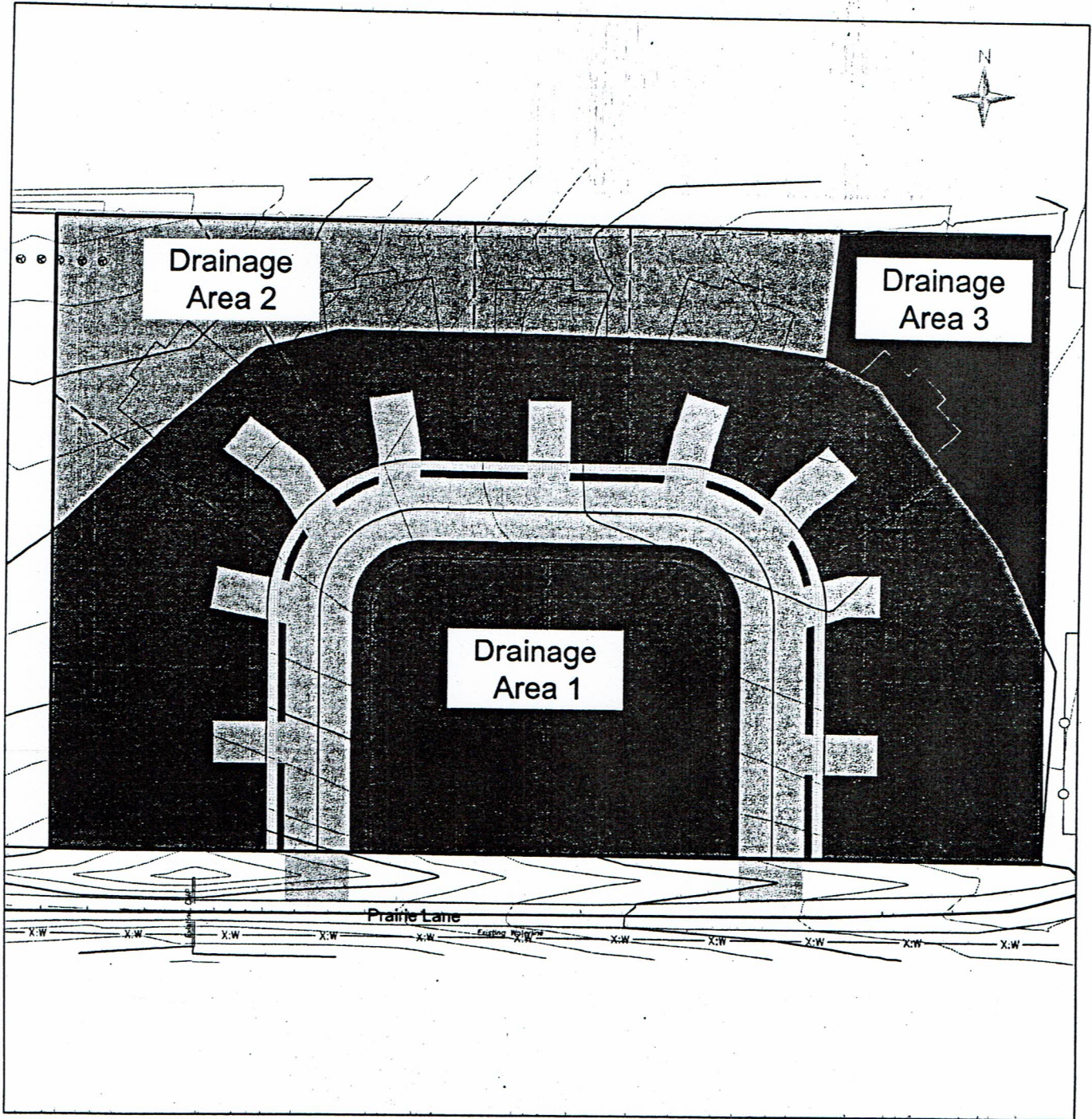
EXHIBIT 'B'

HYDROLOGY ANALYSIS

- 1. Design Areas Overview**
- 2. Drainage Area 1**
- 3. Drainage Area 2**
- 4. Drainage Area 3**

WATER TOWER PLACE
DRAINAGE STUDY

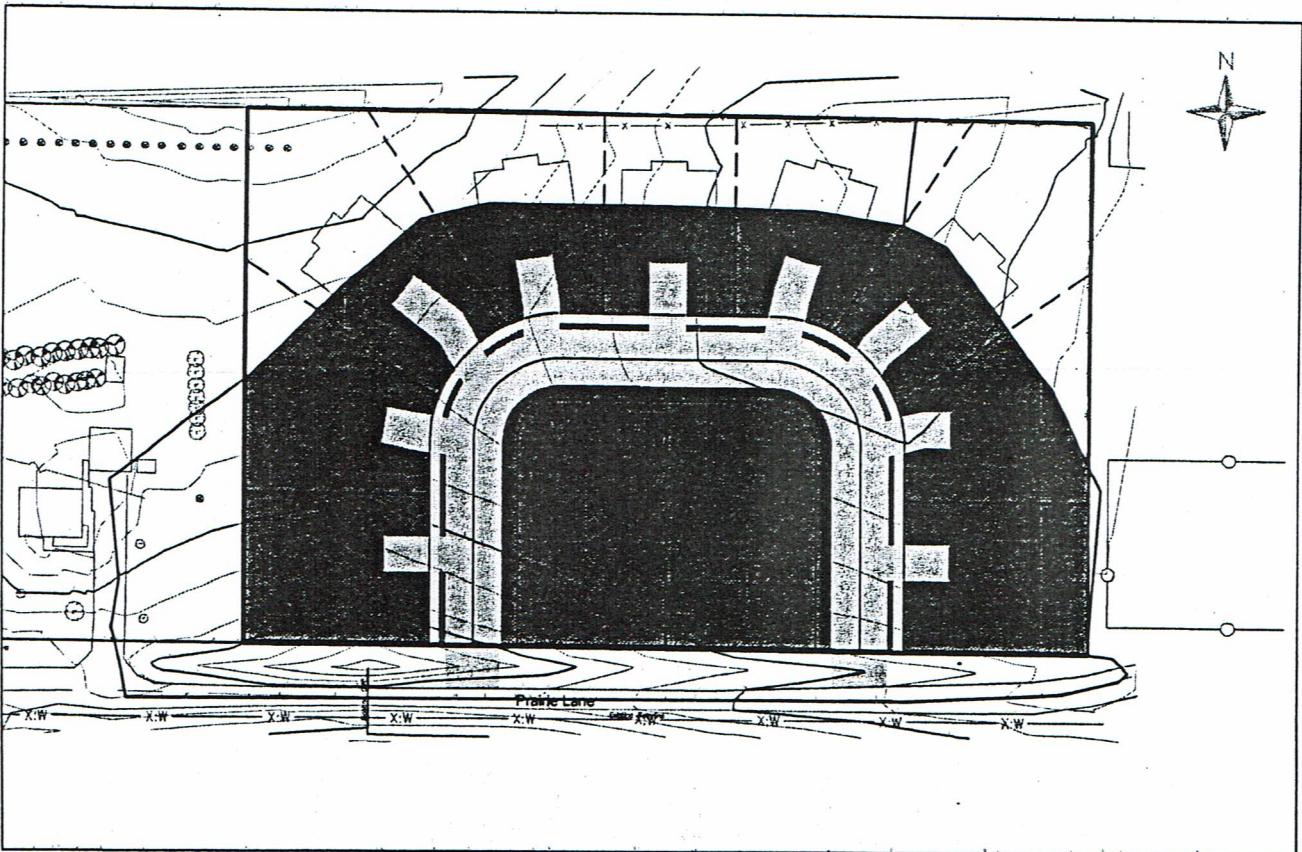
DRAINAGE AREA MAP



WATER TOWER PLACE
DRAINAGE STUDY

DRAINAGE AREA 1

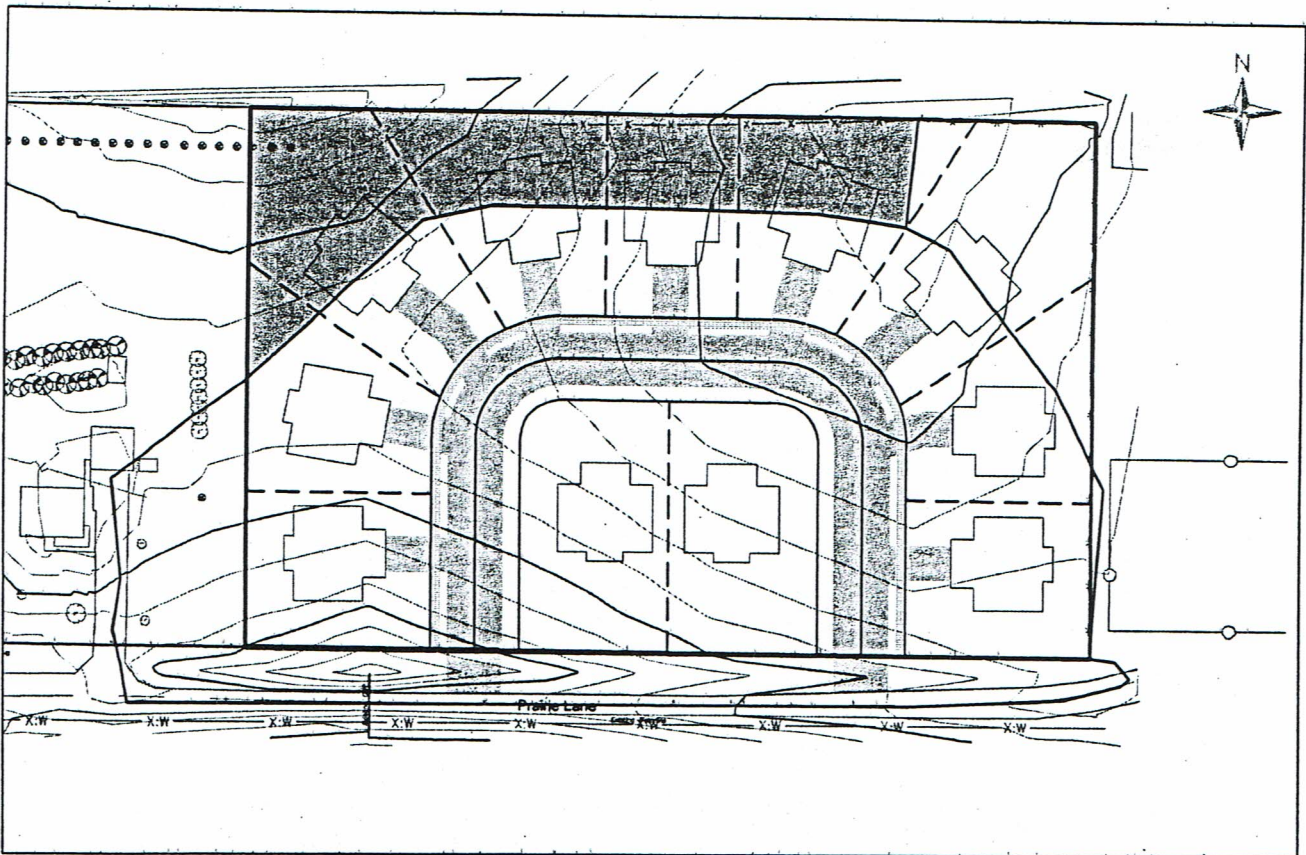
HYDROLOGY RESULTS								
CONDITION	AREA	C10	C100	Tc	I10	Q10	I100	Q100
	(acres)			(min.)	(in/hr)	(cfs)	(in/hr)	(cfs)
DEVELOPMENT - EXISTING	2.5	0.40	0.48	11	6.11	6.1	8.64	10.4
DEVELOPMENT - DEVELOPED	2.5	0.68	0.74	5	7.26	12.3	10.20	18.9



WATER TOWER PLACE
DRAINAGE STUDY

DRAINAGE AREA 2

HYDROLOGY RESULTS								
CONDITION	AREA (acres)	C10	C100	Tc (min.)	I10 (in/hr)	Q10 (cfs)	I100 (in/hr)	Q100 (cfs)
DEVELOPMENT - EXISTING	0.6	0.40	0.48	6	7.03	1.7	9.84	2.8
DEVELOPMENT - DEVELOPED	0.6	0.60	0.68	5	7.26	2.6	10.20	4.2



WATER TOWER PLACE
DRAINAGE STUDY

DRAINAGE AREA 3

HYDROLOGY RESULTS								
CONDITION	AREA (acres)	C10	C100	Tc (min.)	I10 (in/hr)	Q10 (cfs)	I100 (in/hr)	Q100 (cfs)
DEVELOPMENT - EXISTING	0.3	0.40	0.48	5	7.26	0.9	10.20	1.5
DEVELOPMENT - DEVELOPED	0.3	0.53	0.62	5	7.26	1.2	10.20	1.9

