

Treeline Subdivision
Leavenworth County Kansas
Drainage Report
January 26, 2022



Parcel Information - The 22.26-acre (+/-) parcel is located on the east side of Mt. Calvary Road in Leavenworth County KS. The property is zoned RR 2.5.

Existing Conditions – There is a house, driveway, and outbuildings on the property. The parcel can be divided into two drainage areas as shown on exhibit #1. Drainage calculations are only prepared for drainage area #1. This drainage area is where the new driveway and home are assumed to be constructed. No changes are anticipated in the other drainage area.

A composite c value was calculated for each drainage area as shown in the table below. The composite c value is based on the soil type, slopes, and existing land use, see Exhibits #2 and #3.

Existing	c value	Acres in each Drainage Area			
		DA #1			
Wooded	0.35	2.00			
Pasture	0.36	17.07			
Impervious	0.90	0.26			
Composite c		0.37			

$$\text{composite c} = \frac{(\text{Pasture Acres} * 0.36 + \text{Wooded Acres} * 0.35 + \text{Impervious Acres} * 0.90)}{\text{Total Acres}}$$

Developed Conditions – The proposed development will create two residential building lots. Lot #1 has an existing house, driveway, and outbuildings. The new home is assumed to be located as shown on exhibit #1. A composite c value was calculated for the drainage area as shown in the table below. The composite c value is based on the soil type, slopes, and land use, see Exhibits #2 and #3. The developed storm water runoff calculations include 10,000 sq ft of impervious area for the house and driveway on Lot #2. It is assumed that two acres around the new home will be maintained as a grass lawn and the remainder will not be changed from existing.

Developed	c value	Acres in each Drainage Area			
		DA #1			
Wooded	0.35	2.00			
Pasture	0.36	14.74			
Impervious	0.90	0.49			
Grass	0.30	2.00			
Composite c		0.37			

$$\text{composite c} = \frac{(\text{Pasture Acres} * 0.36 + \text{Wooded Acres} * 0.35 + \text{Impervious Acres} * 0.90 + \text{Grass Acres} * 0.30)}{\text{Total Acres}}$$

The storm water runoff for existing and developed conditions is summarized in the following table. Calculations for the storm water runoff are included with the report.

	DA #1	
	Q10 cfs	Q100 cfs
Existing	40.1	71.0
Developed	40.1	71.0
Change	0%	0%

Conclusion – The change in land use for this parcel of ground results in no change to the storm water runoff from the site.

TREELINE SUBDIVISION
 A Three Subdivision in the Southeast Quarter of Section 134, Township 9 South,
 Range 22 East of the 6th E.M., Lawrence County, Kansas.
PRELIMINARY PLAT

PREPARED BY: [Name]
 DATE: [Date]
 SHEET NO. [Number]

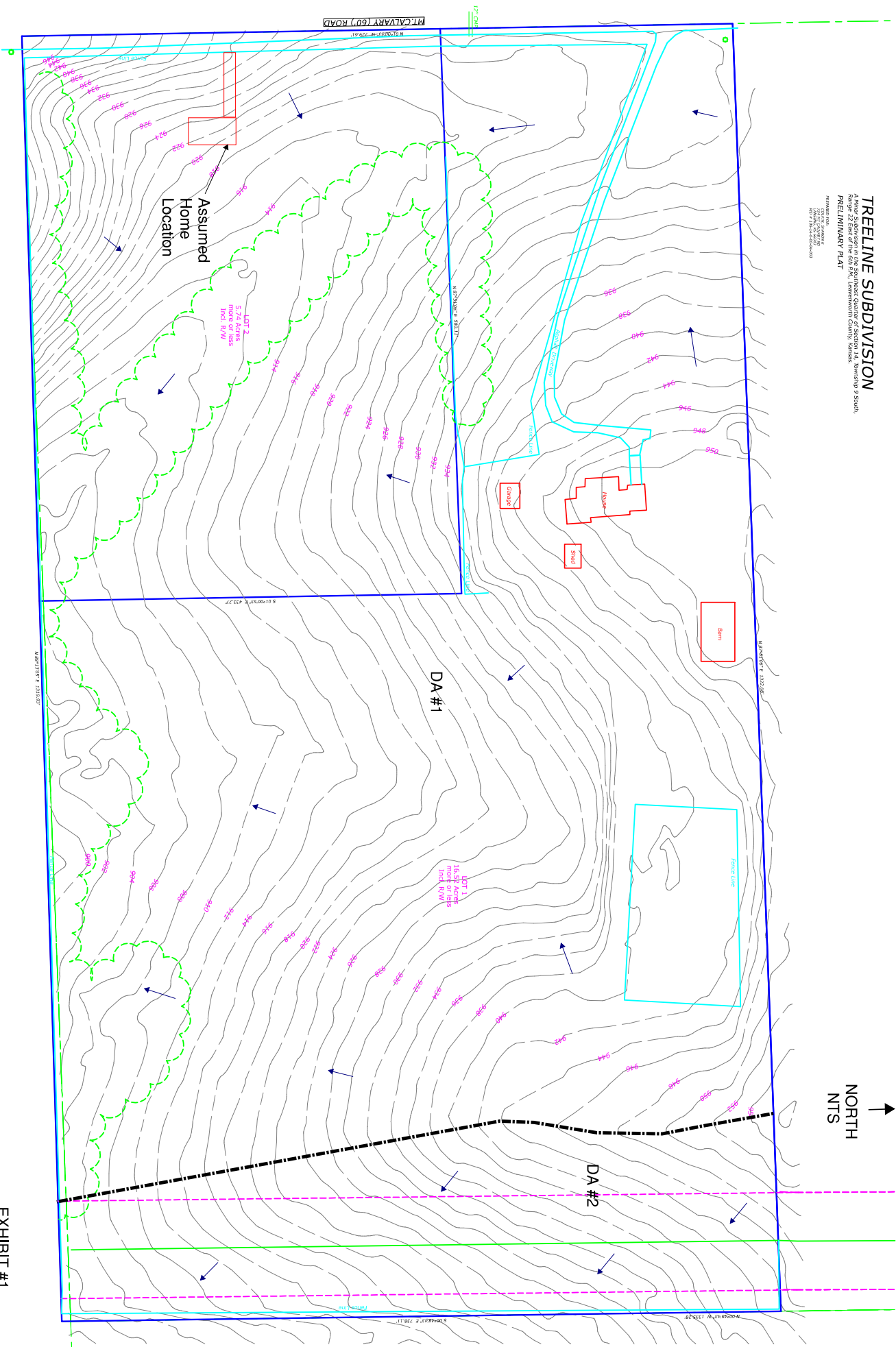


EXHIBIT #1



Map Scale: 1:2,360 if printed on A landscape (11" x 8.5") sheet.



Map Unit Symbol	Map Unit Name
7542	Sharpsburg silty clay loam, 4 to 8 percent slopes, eroded
7589	Shelby loam, 3 to 7 percent slopes
7659	Vinland-Sibleyville complex, 5 to 12 percent slopes

TABLE 1 Values of Runoff Coefficient C

URBAN AREAS:	
Type of drainage area	Runoff coefficient C
Lawns:	0.05 - 0.10
Sandy soil, flat 2%	0.10 - 0.15
Sandy soil, average, 2 - 7%	0.15 - 0.20
Sandy soil, steep, 7%	0.13-0.17
Heavy soil, flat, 2%	0.18 - 0.22
Heavy soil, average, 2 - 7%	0.25 - 0.35
Heavy soil, steep, 7%	
Business:	0.70 - 0.95
Downtown areas Neighborhood areas	0.50.0.70
Residential:	0.30 - 0.50
Single-family areas	0.40 - 0.60
Multi units, detached Multi units,	0.60 - 0.75
attached Suburban	0.25 - 0.40
Apartment dwelling areas	0.50 - 0.70
Industrial:	
Light areas	0.50 - 0.80
Heavy areas	0.60 - 0.90
Parks, cemeteries	0.10 - 0.25
Playgrounds	0.20 - 0.35
Railroad yard areas	0.20 - 0.40
Unimproved areas	0.10 - 0.30
Streets:	0.70 - 0.95
Asphaltic	0.80 - 0.95
Concrete	0.70 - 0.85
Brick	
Drives and walks	0.75 - 0.85
Roofs	0.75 - 0.95

AGRICULTURAL AREAS:

Topography and Vegetation	Runoff Coefficient C Soil Texture		
	Soil Texture		
	Open Sandy Loam	Clay and Silt Loam	Tight Clay
Woodland			
Flat 0 - 5% Slope	0.10	0.30	0.40
Rolling 5 - 10% Slope	0.25	0.35	0.50
Hilly 10 - 30% Slope	0.30	0.50	0.60
Pasture			
Flat	0.10	0.30	0.40
Rolling	0.16	0.36	0.55
Hilly	0.22	0.42	0.60
Cultivated			
Flat	0.30	0.50	0.60
Rolling	0.40	0.60	0.70
Hilly	0.52	0.72	0.82

Source - Natural Resources Conservation Service (NRCS) US Department of Agriculture (USDA) Peak Discharge Course
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1083019.pdf

EXHIBIT #3

Drainage Area #1- 10 year

Existing Conditions

Area = 19.33 acres
 C= 0.37
 L= 815
 S= 9.6
 K= 1

$$T_i = 1.8(1.1-C)L^{.5}/S^{1/3}$$

L max = 300

$$i_{10} = 175/(T_c + 18.8)$$

5 < T_c < 15

$$T_i = 10.8$$

$$i_{10} = 214/(T_c + 26.7)$$

15 < T_c < 60

$$T_t = 1.36$$

$$T_c = 12.1$$

$$i_{10} = 5.66$$

Q=KCIA

$$Q = 40.1 \text{ cfs}$$

Developed Conditions

Area = 19.33 acres
 C= 0.37
 L= 815
 S= 9.6
 K= 1

$$T_i = 1.8(1.1-C)L^{.5}/S^{1/3}$$

L max = 300

$$i_{10} = 175/(T_c + 18.8)$$

5 < T_c < 15

$$T_i = 10.8$$

$$i_{10} = 214/(T_c + 26.7)$$

15 < T_c < 60

$$T_t = 1.36$$

$$T_c = 12.1$$

$$i_{10} = 5.66$$

Q=KCIA

$$Q = 40.1 \text{ cfs}$$

Drainage Area #1 - 100 year

Existing Conditions

Area = 19.33 acres
 C= 0.37
 L= 815
 S= 9.6
 K= 1.25

$$T_i = 1.8(1.1-C)L^{.5}/S^{.1/3}$$

$$L_{max} = 300$$

$$i_{100} = 256/(T_c + 19.8)$$

$$5 < T_c < 15$$

$$T_i = 10.8$$

$$i_{100} = 331/(T_c + 30)$$

$$15 < T_c < 60$$

$$T_t = 1.36$$

$$T_c = 12.1$$

$$i_{100} = 8.02$$

$$Q = KCiA$$

$$Q = 71.0 \text{ cfs}$$

Developed Conditions

Area = 19.33 acres
 C= 0.37
 L= 815
 S= 9.6
 K= 1.25

$$T_i = 1.8(1.1-C)L^{.5}/S^{.1/3}$$

$$L_{max} = 300$$

$$i_{100} = 256/(T_c + 19.8)$$

$$5 < T_c < 15$$

$$T_i = 10.8$$

$$i_{100} = 331/(T_c + 30)$$

$$15 < T_c < 60$$

$$T_t = 1.36$$

$$T_c = 12.1$$

$$i_{100} = 8.02$$

$$Q = KCiA$$

$$Q = 71.0 \text{ cfs}$$