DRAINAGE LETTER

11925 MILAM ROAD

PART S1/2, SECTION 13, T.12S., R.66W. 6TH P.M.
EL PASO COUNTY, COLORADO

PCD File No.: VA-22-003

March 31, 2022

Revised
May 2, 2022

prepared for

Chuck Runge

Oliver E. Watts, Consulting Engineer, Inc.
Colorado Springs, Colorado

OLIVER E. WATTS, PE-LS
OLIVER E. WATTS, CONSULTING ENGINEER, INC.
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COLORADO SPRINGS, COLORADO 80907
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Celebrating over 43 years in business

May 2, 2022

El Paso County Planning and Community Development
2880 International Circle
Colorado Springs, CO 80910

ATTN: *Jennifer Irvine, P.E.*

SUBJECT: Drainage Letter
11925 Milam Road

Gentlemen

Transmitted herewith for your review and approval is the drainage letter for 11925 Milam Road, part of the South Half Section 13, T.12s., R.66W. of the 6th P.M. in El Paso County. This letter is to accompany the development plan for the construction of an additional residence on subject property. It has been revised per the County review comments of 4-18-22.

There will be no significant change in the existing runoff as a result of this additional dwelling. Please contact our office if we may provide any further information.

Oliver E. Watts, Consulting Engineer, Inc.

BY: ___________________________________
Oliver E. Watts, President

Encl:
- Drainage Letter 2 pages
- FEMA Flood Panel 08041C0315 G, December 7, 2018
- Soils Map and Interpretation Sheet
- Computations, 2 sheets
- Backup Information, 5 sheets
- Area Drainage Map
- Drainage Plan, Dwg 22-5785-01

1. ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Oliver E. Watts, Consulting Engineer, Inc.

5-3-22

Oliver E. Watts Colo. PE-LS No. 9853

2. OWNERS / DEVELOPER'S STATEMENT:

I the developer have read and will comply with all of the requirements specified in this drainage report and plan.

Chuck Runge

By: ______________________
5315 Germaine Court
Colorado Springs, CO 80919
(719) 260-0039

3. EL PASO COUNTY:

Filed in accordance with the requirements of the El Paso Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and the Engineering Criteria Manual, as amended.

APPROVED
Engineering Department
05/24/2022 12:55:06 PM
dsdnijkamp
EPC Planning & Community Development Department

Joshua Palmer, PE,
County Engineer / ECM Administrator, interim

Conditions:

4. LOCATION AND DESCRIPTION:
11925 Milam Road is located approximately two miles west of the community of Black Forest in the unplatted South Half of Section 13, Township 12 South, Range 66 West of the 6th P.M., in El Paso County, Colorado. The total size of the parcel is 60.01 Acres, of which approximately 1.93 acres is involved with the existing and proposed dwelling units. An existing residence exists on the property and an additional dwelling unit of 3000 SF of living area will be added as shown on the enclosed drainage plan. The site includes about ¾ mile of Kettle Creek and is in that drainage basin.

5. FLOOD PLAIN STATEMENT:
This subdivision is not within the limits of a designated flood plain or flood hazard area, as identified on FEMA panel no. 08041C0315 G, dated December 7, 2018, a copy of which is enclosed for reference. The portion of the 100-year flood plain is shown on the enclosed drainage plan. The entire flood plain is enclosed within the channel of Kettle Creek, and the building site is not affected by it.

6. DESCRIPTION OF RUNOFF:
As shown on the enclosed drainage plan and area drainage plan, only 8.17 acres of the total 60.01 acre site affects the building site. An offsite 5.16 acre drainage basin (Basin O-1) will discharge 0.9 cfs /7.2 cfs (5-year / 100-year runoffs) into the property in an existing drainage channel. It will combine with the 3.01 acre basin A to create a total runoff of 1.4 cfs / 11.3 cfs at the existing driveway to the dwellings. This runoff is historic in nature and not affected by existing or proposed development. An 18" CMP culvert will be adequate to contain this runoff on minimum slope of four percent, with a minimum of 0.9 feet of headwater. This runoff continues approximately 130 feet in the existing channel to Kettle Creek, and is not affected by development.

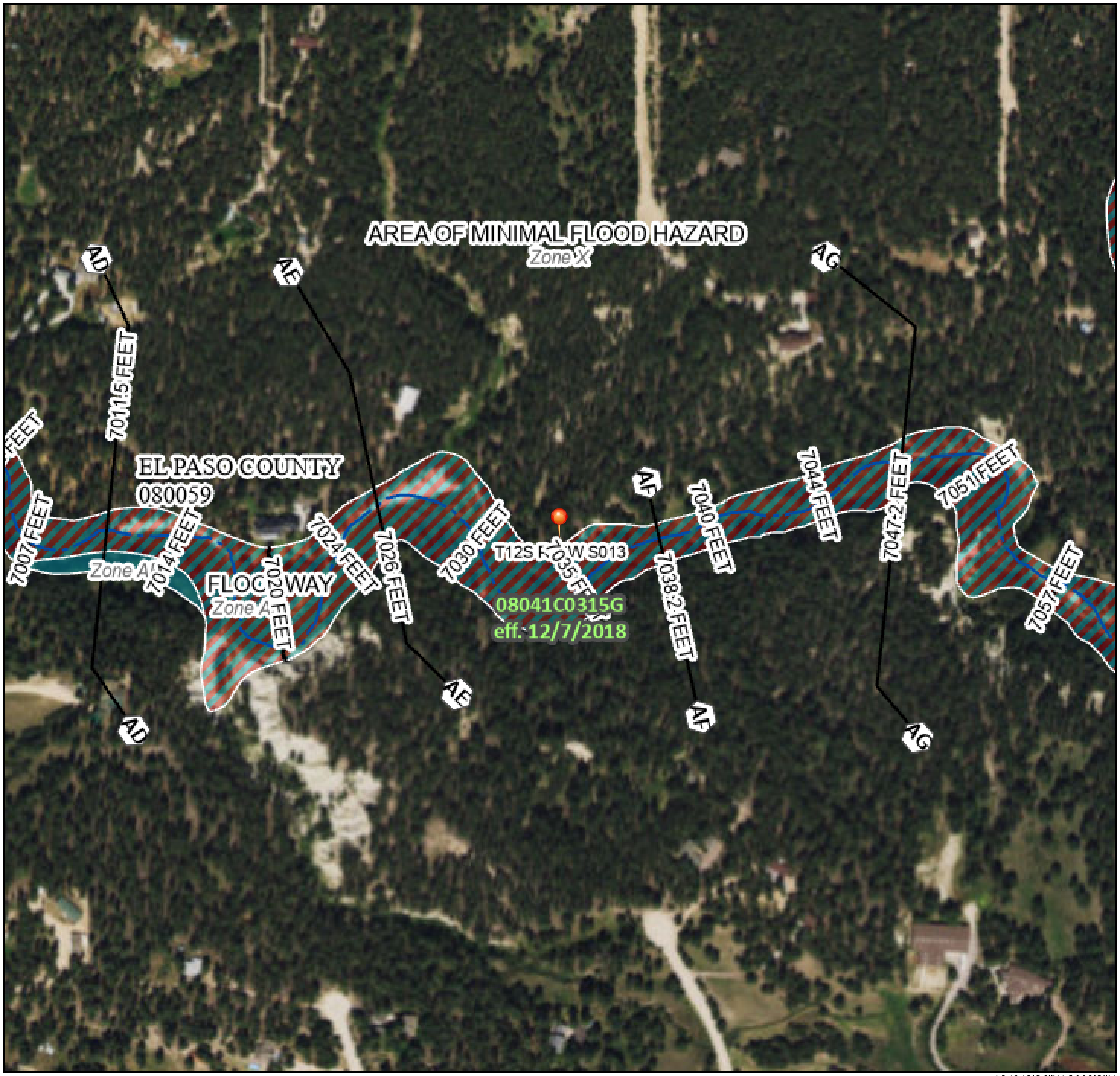
The total building site consists of 1.93 acres along the north side of Kettle Creek, and is approximately 30% impervious due to the residential construction. The total runoff from the site is 2.5 cfs / 8.0 cfs, which can be easily accommodated by standard grading practices on the residential site.

7. FEES:
The site is not be being platted / replatted so no drainage fees are due at this time

National Flood Hazard Layer FIRMette

FEMA

104°44'13"W 39°0'30"N



104°43'36"W 39°0'2"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

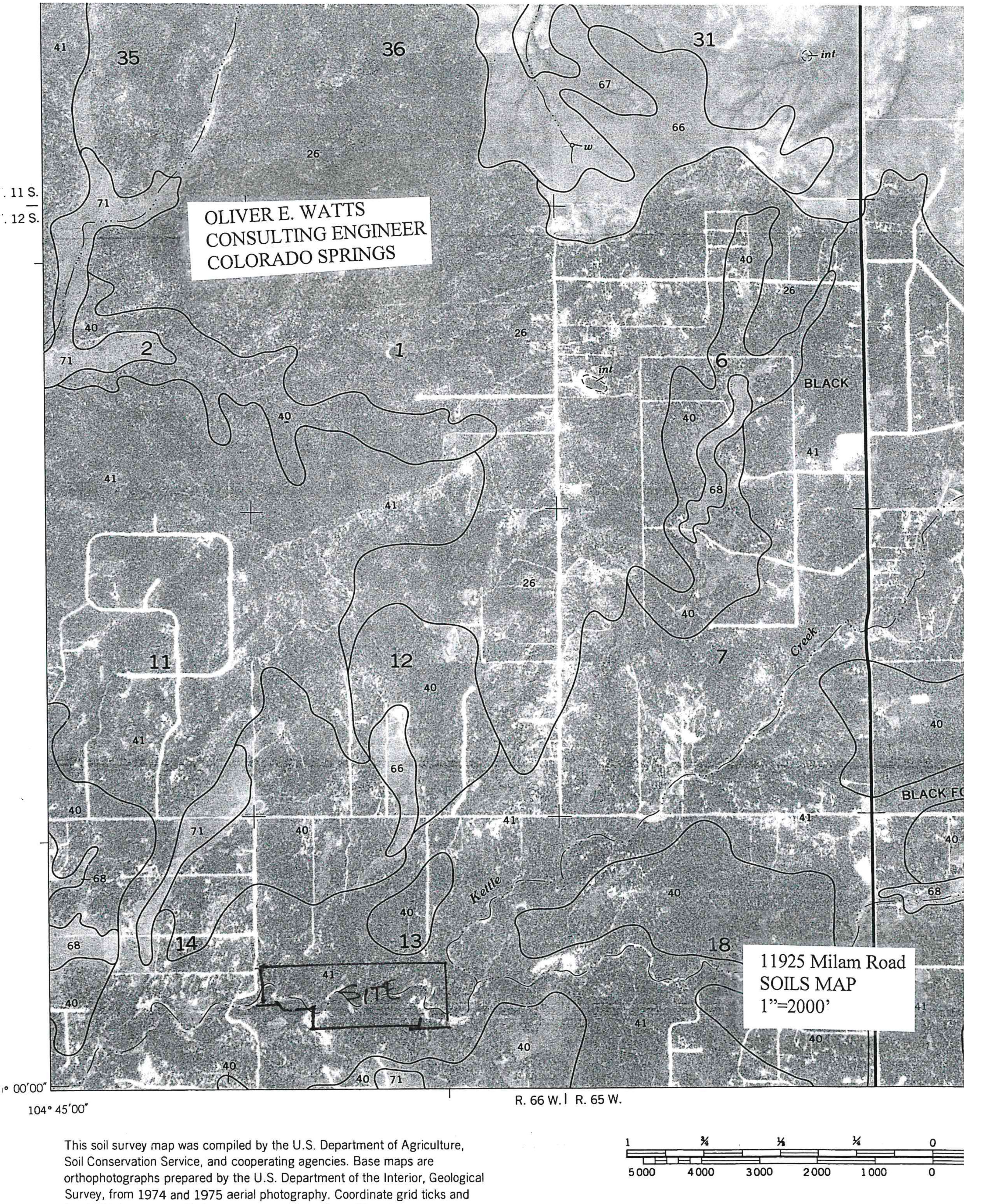
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/28/2022 at 11:24 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Elbeth:							
Pring part-----	B	None----------	---	---	>60	---	Moderate.
Ellicott:							
28---------------	A	Frequent------	Brief---------	Mar-Jun	>60	---	Low.
Fluvaquentic Haplaquolls:							
29---------------	B/D	Frequent------	Brief---------	Mar-Jul	>60	---	High.
Fort Collins:							
30, 31-----------	B	None to rare	---	---	>60	---	Moderate.
Fortwingate:							
[1]32:							
Fortwingate part----------	C	None----------	---	---	20-40	Hard	Low.
Rock outcrop part----------	D	---	---	---	---	---	---
Heldt:							
33---------------	C	None----------	---	---	>60	---	Moderate.
Holderness:							
34, 35, 36-------	C	None----------	---	---	>60	---	Moderate.
Jarre:							
37---------------	B	None----------	---	---	>60	---	Moderate.
[1]38:							
Jarre part-----	B	None----------	---	---	>60	---	Moderate.
Tecolote part--	B	None----------	---	---	>60	---	Moderate.
Keith:							
39---------------	B	None----------	---	---	>60	---	High.
Kettle:							
40, 41-----------	B	None----------	---	---	>60	---	Moderate.
[1]42:							
Kettle part----	B	None----------	---	---	>60	---	Moderate.
Rock outcrop part----------	D	---	---	---	---	---	---
Kim:							
43---------------	B	None----------	---	---	>60	---	Moderate.
Kutch:							
44, 45-----------	C	None----------	---	---	20-40	Rippable	Moderate.
Kutler:							
[1]46:							
Kutler part----	C	None----------	---	---	20-40	Rippable	Low.
Broadmoor part-	C	None----------	---	---	20-40	Rippable	Low.
Rock outcrop part----------	D	---	---	---	---	---	---
Limon:							
47---------------	C	Occasional----	Brief---------	May-Sep	>60	---	Moderate.
Louviers:							
48---------------	D	None----------	---	---	10-20	Rippable	Moderate.
49---------------	D	None----------	---	---	10-20	Rippable	Low.

See footnote at end of table.

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW 5-ry	FLOW 100-yr	RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-								qp -CFS-	qp -CFS-		
KETTLE CREEK	O-1	225 k	5.16	300	60	29			B	FOREST	0.08	0.35			5	100
			V=5.8	+200	30	+0.6										
						29.6	2.2	4.0					0.9	7.2	5	100
	+A	COGO	3.01	+250	12	+1.3										
	TOTAL		8.17	V=3.3		30.5	2.1 7	3.9 6	B	FIREST	0.08	0.35	1.4	11.3	5	100
	B	COGO	1.93			MIN	5.2	8.8	B	30%	0.25	0.47	2.5	8.0	5	100

HYDROLOGICAL COMPUTATION – BASIC DATA
PROJ: 11925 MILAM ROAD BY: O.E. WATTS
RATIONAL METHOD DATE: 3-30-22

OLIVER E. WATTS, CONSULTING ENGINEER, INC.
614 ELKTON DRIVE COLORADO SPRINGS, CO 80907

STREET AND STORM SEWER CALCULATIONS

STREET	LOCATION	DISTANCE -ft.-	ELEVATION & SLOPE	TOTAL RUNOFF -cfs- 5-yr./100-yr	STREET FLOW / CAPACITY -cfs- 5-yr./100-yr	PIPE FLOW -cfs-	TYPE PIPE, CATCH BASIN & SLOPE %
DRIVEWAY	BASIN A			1.4/11.3		11.3	18” CMP S=4% MIN hi=0.9’ MIN.

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

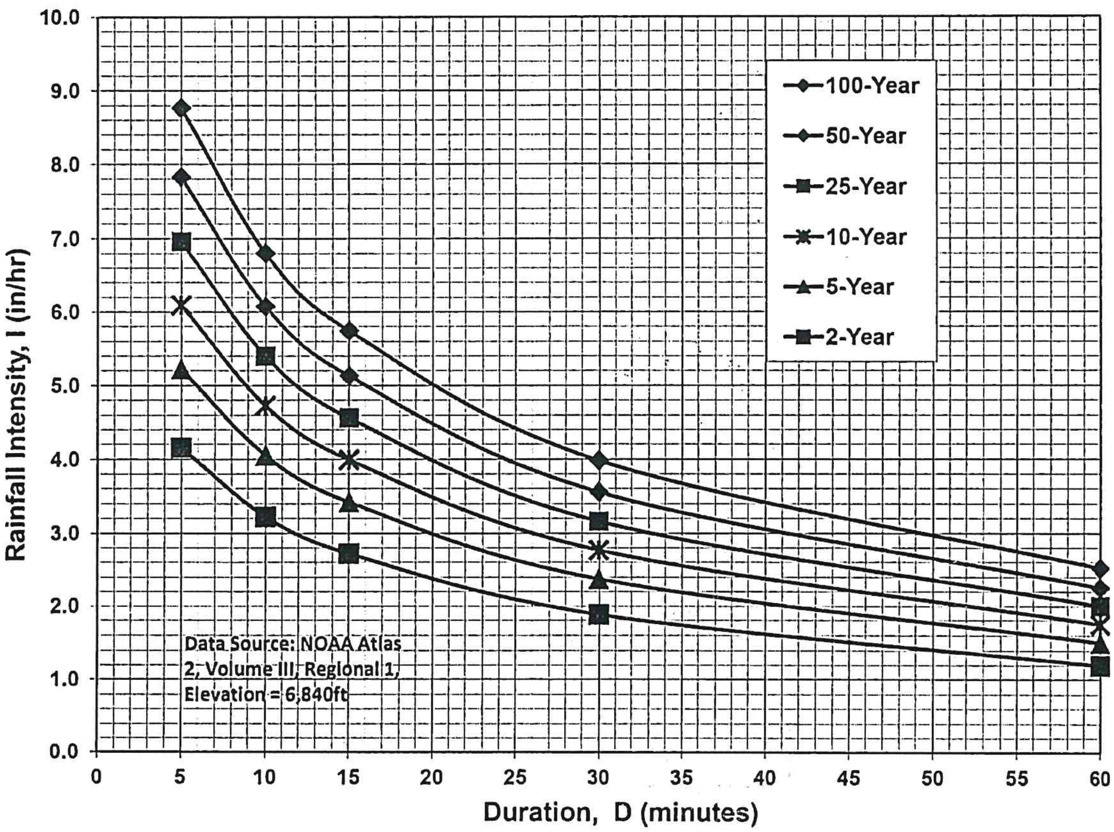
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

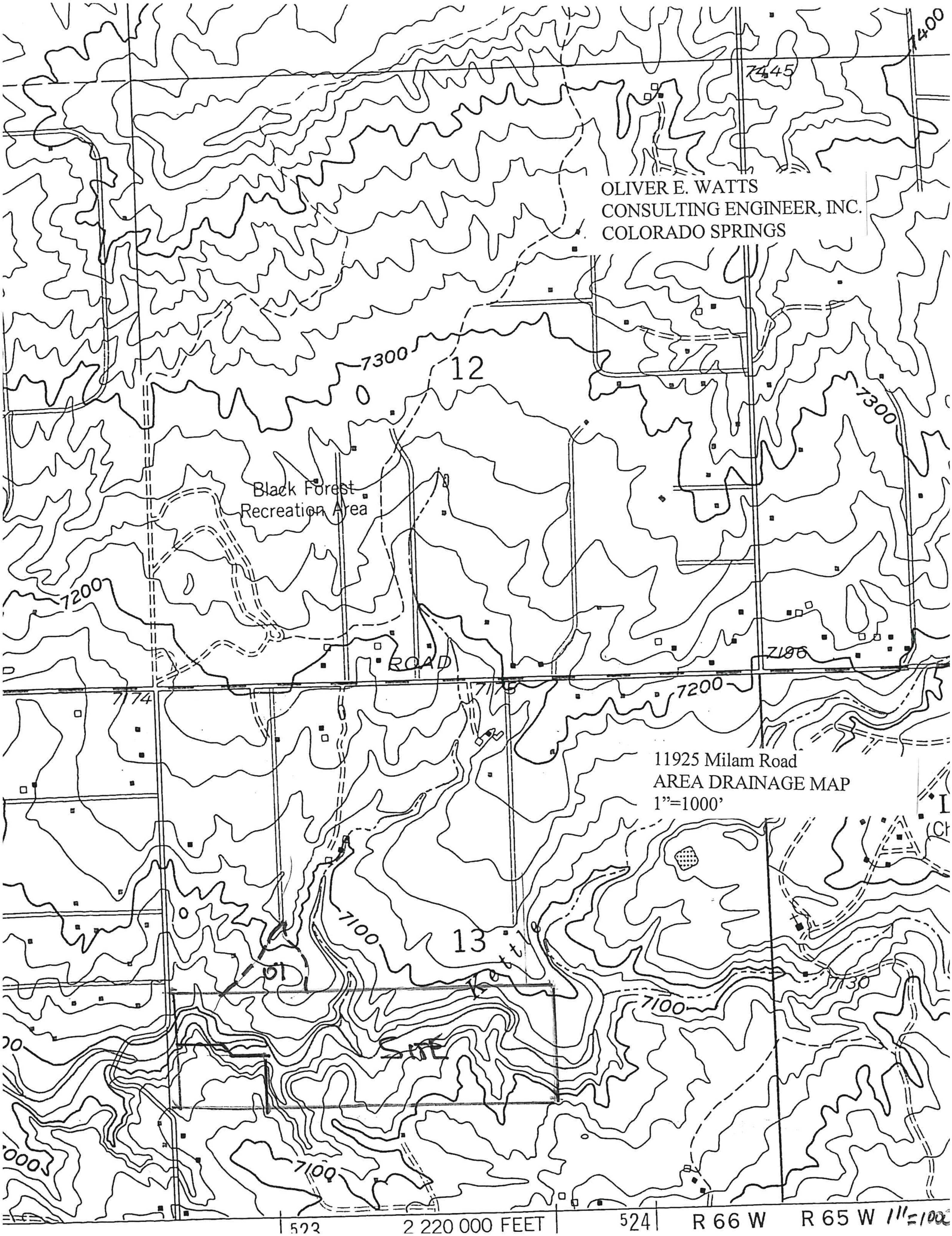
Note: Values calculated by equations may not precisely duplicate values read from figure.

$Q=\frac{0.463}{n} D^{8/3} S^{\frac{1}{2}}$

$Q=KS^{\frac{1}{2}}$

IAMETER -IN.-	AREA -FT2-	D 8/3 -FT-	K			
			N=0.010	N=0.013	N=0.024	N=0.026
2	0.02182	0.008413	0.3895	---	---	---
4	0.08727	0.053420	2.4733	---	---	---
6	0.19630	0.157500	7.2922	5.609	---	---
8	0.34910	0.339200	15.7050	12.081	---	---
10	0.54540	0.615000	28.4745	21.903	---	---
12	0.78540	1.000000	46.3000	35.615	---	---
15	1.22720	1.813100	83.9465	64.574	---	---
18	1.76710	2.948300	136.5100	105.000	56.88	52.50
21	2.40530	4.447400	205.9100	158.400	85.80	79.20
24	3.14160	6.349600	293.9900	226.140	122.49	113.07
27	3.97610	8.692700	402.4700	309.590	167.70	154.79
30	4.90870	11.512600	533.0300	410.030	222.10	205.02
33	5.93960	14.844100	---	528.680	---	---
36	7.06860	18.720800	866.7700	666.700	361.20	333.30
39	8.29580	23.175100	---	825.400	---	---
42	9.62110	28.238900	---	1005.000	544.80	502.50
48	12.56640	40.317500	---	1436.000	777.80	718.00
54	15.90430	55.195000	---	1966.000	1065.00	983.00
60	19.63500	73.100400	---	2604.000	1410.00	1302.00
66	23.75830	94.254200	---	3357.000	1818.00	1678.00
72	28.27430	118.869400	---	4234.000	2293.00	2117.00
78	33.18310	147.152900	---	5241.000	2839.00	2620.00
84	38.48450	179.306000	---	6386.000	3459.00	3193.00
90	44.17860	215.524500	---	7676.000	4158.00	3838.00
96	50.26550	256.000000	---	9118.000	4939.00	4559.00
108	63.61730	350.466600	---	12480.000	6761.00	6140.00
120	78.53980	464.158900	---	16530.000	8954.00	8265.00

Oliver E. Watts
Consulting Engineer
Colorado Springs


OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS
11925 Milam Road
AREA DRAINAGE MAP
1"=1000'
7445
7400
7300
12
7300
Black Forest
Recreation Area
7200
ROAD
7196
7174
7200
7100
13
7100
7130
7100
Site
7100
523
2 220 000 FEET
524
R 66 W
R 65 W

LEGEND:

- DIRECTION OF RUNOFF
- 10.5/20.4 — RUNOFF IN CFS 5-YEAR/100-YEAR
- A — LIMIT OF DRAINAGE BASIN AND DESIGNATION
- PROPOSED STORM SEWER AS LABELED
- 𝔅 — LIMIT OF SOILS TYPE AND GROUP
- 7011.5 — LIMIT OF FLOOD PLAN AND ELEVATION

N

100 0 100 200 300

Scale 1" = 100'

DRAINAGE BASIN SUMMARY

BASIN	AREA -AC.-	RUNOFF IN CFS 5-YEAR	RUNOFF IN CFS 100-YEAR
OS-1	5.16	0.9	7.2
OS-1 + A	8.17	1.4	11.3
B	1.53	2.5	8.0

DRAWN BY: O.E. WATTS	APPROVED BY:	REVISIONS
DATE: 3-30-22	PROJ. NO.	
DWG. NO.: 22-5785-01	DWG.	
BASE PLAN BY: CHUCK RUNGE		

OLIVER E. WATTS
CONSULTING ENGINEER
COLORADO SPRINGS

PROJECT
11925 MILAM ROAD
PART S1/2 SEC. 13., T.12S., R.66W., 6TH P.M.
EL PASO COUNTY

SHT. NAME
PROPOSED DRAINAGE PLAN

SHT. NO. 1 OF 1