DRAINAGE LETTER

ROLLING THUNDER BUSINESS PARK FILING NO. 2

A REPLAT OF LOTS 2 AND 3, ROLLING THUNDER BUSINESS PARK
County File No.s: SF 209 and PRP2010

January 22, 2020

Revised
July 24, 2020

Revised
November 16, 2020

prepared for

Jessie and Sherrie Tix.

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

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Celebrating over 41 years in business

November 16, 2020

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

ATTN: *Jennifer Irvine, P.E.*

SUBJECT: Drainage Letter
Rolling Thunder Business Park, Filing No. 2

Gentlemen

Transmitted herewith for your review and approval is the drainage letter for the Rolling Thunder Business Park, Filing No. 2, which is a replat of Lots 2 and 3, Rolling Thunder Business Park. It has been revised per the reviews by Mr. Daniel Torres, 5-11-20 and 9-17-20.

There will be no change in the approved runoff as a result of this subdivision. 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
- Computations, 1 sheet
- FEMA Flood Panel 08041C0752 G, December 7, 2018
- Soils Map and Interpretation Sheet
- Backup Information, 4 pages
- Rolling Thunder Drainage Plan and Computations, 2 pages
- Peak Gymnastics Drainage Plan
- Drainage Plan, Dwg No. 19-5348-07

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.

____

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

2. OWNERS / DEVELOPER'S STATEMENT:

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

2C Construction and Consulting, Inc.

By: ______________________________________
3430 Sloan Peak Heights
Colorado Springs, CO 80922
499-2377

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.

______________________________________ ______________

Jennifer Irvine, P.E., date
County Engineer / ECM Administrator

Conditions:

4. LOCATION AND DESCRIPTION:

The Rolling Thunder Business Park, Filing No. 2 is located on the South side of Woodmen Road just east of Falcon Meadows Boulevard, as shown on the enclosed drainage plan. It is a replat of Lot 2 and 3, Rolling Thunder Business Park and lies in the NE1/4 of Section 11, Township 13 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The total size of the subdivision is 1.02 acres. The purpose of the subdivision is to combine the two existing lots and construct a commercial building as shown on the enclosed drainage plan.

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. 08041C0535 G, dated December 7, 2018, a copy of which is enclosed for reference.

6. CRITERIA:

Runoff is computed as prescribed by the City/County Drainage Criteria Manual, using the rational method for areas the size of this subdivision. Computations are enclosed for reference and review.

The area has bee mapped by the USDA/SCS, and soils type in this are is the Blakeland Series, having hydrologic group "A". A soils map and interpretation sheet are enclosed for reference.

7. DESCRIPTION OF RUNOFF:

As stated above, this Site was previously platted as the Rolling Thunder Business Park. At that time a drainage report, prepared by Springs Engineering, Charlene Sammons, PE 36727, was submitted and approved by El Paso County, Colorado on 10-16-08. A copy of the approved drainage plan and the pertinent computations are enclosed. This lot has been zoned for industrial or commercial uses since that time, and runoff was computed on that basis. The subdivision lays South of Woodmen on the North side of Maltese Drive. Runoff is divided by a high point in the existing curb and gutter where shown on the drainage plan.

Basins O-1 and O-2 are the inflows to the subdivision from adjacent Woodmen Road, south of the centerline of the pavement. 0.5 cfs / 0.9 cfs (5-year / 100-year runoffs) will flow into the subdivision in each basin. This will combine with the runoff from each half of the development and exit to the West and East long the north curb line of Maltese Drive, as dictated by the grades shown on the drainage plan. The combined runoff exiting the subdivision is 1.6/3.3 cfs westerly and 1.9/4.0 cfs easterly, well within the capacity of the roadway. These runoffs are less than those previously approved as described below. The westerly runoff will flow to the existing detention pond lying South of the Cul-de-sac as described and shown on the enclosed Rolling Thunder drainage report and the subsequent Peak Gymnastics Drainage Report, also enclosed. The easterly portion will run to the easterly cul-de-sac on Maltese Point and then into the Southeast detention pond shown on the enclosed Rolling Thunder drainage plan. This routing exists and according to the approved plans, and approved facilities are more than adequate, as discussed in the four step process below. The runoff is unchanged from that developed by the existing zoning at the time of the original subdivision, and no harm will be incurred to downstream facilities.

The runoff coefficients used in this report are taken from the enclosed criteria. We are submitting separately the detailed coordinate geometry computations for the percent impervious value of the subdivision, which is 73.4%. A value of 75% was conservatively used for the enclosed computations. The original subdivision computations are enclosed, which shows that the "C" values used were 0.90 and 0.95 for the 5 and 100- year storms, respectively. These extremely high values would not represent the presence of any landscaping or native grasses that would remain the site.

FOUR STEP PROCESS

Step1 Employ Runoff Reduction Practices – Runoff from the portion of the building rooftop in Basin A will be directed to the west and Maltese Point. Runoff will then travel west, down Maltese. Runoff from the building rooftop in Basin B will be directed to the east and into Maltese Point. Runoff will join with the west half runoff then travel east, down Maltese. Due to the proposed improvements in relation to the size of the property, provides little to no opportunity for runoff reduction practice. Curb outlets will be provided as shown on the drainage plan to traverse intervening traffic islands.

Step 2 Stabilize Drainageways –The development of this project does not anticipate having any negative effects on downstream drainageways.

Step 3 Provide Water Quality Capture Volume – The existing Storm Water Quality Facilities were previous designed by Springs Engineering. Due to the configuration of the proposed lots north of the pond, and already existing changes to the pond geometry due to erosion, the existing Storm Water Quality Facility was reshaped with 3:1 side slopes for the development of Lots 9 and 10 for the Peak Gymnastics facility, by M & S Civil Consultants per their drainage report, prepared by Virgil Sanchez PE 37160 and approved by the County 1-17-19. Their proposed reshaping is minor in nature and increase the capacity from 0.17 Acre feet to 0.21 Acre feet. This reshaping did not have any negative effects on the performance of the existing Storm Water Quality Facility. The Easterly Tank water quality pond is shown on the Rolling Thunder drainage plan. Both ponds appear to be sized in accordance with the approved plans, and are in adequate condition.

Step4 Consider Need for Industrial and Commercial BMP's – This submittal provides a final grading and erosion control plans with BMPs in place. The proposed project will use silt fence, a vehicle tracking control pad, and concrete washout area, reseeding/landscaping to mitigate the potential for erosion across the site.

7. FEES:

This Site has been previously platted; therefore fees are not due at this time. The above analysis with the existing approved subdivision report indicates that the impervious ratios proposed are far less than those previously used. The fees collected for the subdivision are far greater than required for the proposed development.

8. CONCLUSIONS:

This subdivision represents the development of Lots 2 and 3 of the Rolling Thunder Business Park into one lot for the construction of a commercial building as shown on the enclosed drainage plan. This drainage plan is in compliance with the provisions of the previously approved plans and reports and is in full compliance with current County drainage criteria. The above described storm water detention ponds appear to adequately constructed in accordance with their approved designs and fully adequate for containing the discharge proposed by this construction. This development will have no adverse affect on downstream or adjacent properties or improvements.

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc MIN	I		SOIL GRP	DEV. TYPE	C		FLOW		RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-		in./hr.						qp -CFS-	qp -CFS-		
FALCON	O-1	COGO	0.098	38	1	0.8			A	A/C	0.90	0.96			5	100
		30%	0.030	+10	3	+0.1				R/L	0.09	0.36				
			0.128			0.87	5.1	9.0		MIX	0.710	0.819	0.5	0.9		
	A		0.112	25	5	3.0				L/S						
	V=2.72	1.86%	0.338	+215	4	+2.7				IMP						
			0.450			5.7	5.0	8.5		75%	0.554	0.672	1.2	2.6		
	O-1 + A		0.578			6.6	4.8	8.1		MIX	0.588	0.705	1.6	3.3		
	O-2		0.098	38	1	0.8			A	A/C	0.90	0.96				
			0.030							R/L	0.096	0.36				
			0.128			0.9	5.1	9.0		MIX	0.710	0.819	0.5	0.9		
	B		0.151	25	5	3.0				L/S						
	V=2.64	1.74%	0.414	+235	4	+1.5				IMP						
			0.565			4.5				73%	0.528	0.651	1.5	3.3		
	O-2 + B		0.693			5.4	5.0	8.5		MIX	0.561	0.682	1.9	4.0		

HYDROLOGICAL COMPUTATION – BASIC DATA
PROJ: ROLLING THUNDER BUS PK F#2 BY: O.E. WATTS
RATIONAL METHOD DATE: 1/22/20

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

National Flood Hazard Layer FIRMette

FEMA

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
	Coastal Transect
	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 1/22/2020 at 12:00:29 PM 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.

ROLLING THUDER BUSINESS PARK
FILING NO. 2
SOILS MAP
1"=2000'

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

Soil name and map symbol	Hydro- logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Alamosa:							
1	C	Frequent	Brief	May-Jun	>60	---	High.
Ascalon:							
2, 3	B	None	---	---	>60	---	Moderate.
Badland:							
4	D	---	---	---	---	---	---
Bijou:							
5, 6, 7	B	None	---	---	>60	---	Low.
Blakeland:							
8	A	None	---	---	>60	---	Low.
[1]9:							
Blakeland part	A	None	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part	D	Common	Very brief	Mar-Aug	>60	---	High.
Blendon:							
10	B	None	---	---	>60	---	Moderate.
Bresser:							
11, 12, 13	B	None	---	---	>60	---	Low.
Brussett:							
14, 15	B	None	---	---	>60	---	Moderate.
Chaseville:							
16, 17	A	None	---	---	>60	---	Low.
[1]18:							
Chaseville part	A	None	---	---	>60	---	Low.
Midway part	D	None	---	---	10-20	Rippable	Moderate.
Columbine:							
19	A	None to rare	---	---	>60	---	Low.
Connerton:							
[1]20:							
Connerton part	B	None	---	---	>60	---	High.
Rock outcrop part	D	---	---	---	---	---	---
Cruckton:							
21	B	None	---	---	>60	---	Moderate.
Cushman:							
22, 23	C	None	---	---	20-40	Rippable	Moderate.
[1]24:							
Cushman part	C	None	---	---	20-40	Rippable	Moderate.
Kutch part	C	None	---	---	20-40	Rippable	Moderate.
Elbeth:							
25, 26	B	None	---	---	>60	---	Moderate.
[1]27:							
Elbeth part	B	None	---	---	>60	---	Moderate.

See footnote at end of table.

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.

$$t_c = t_i + t_t$$ (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.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$ (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).

$$V = C_v S_w^{0.5}$$ (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.

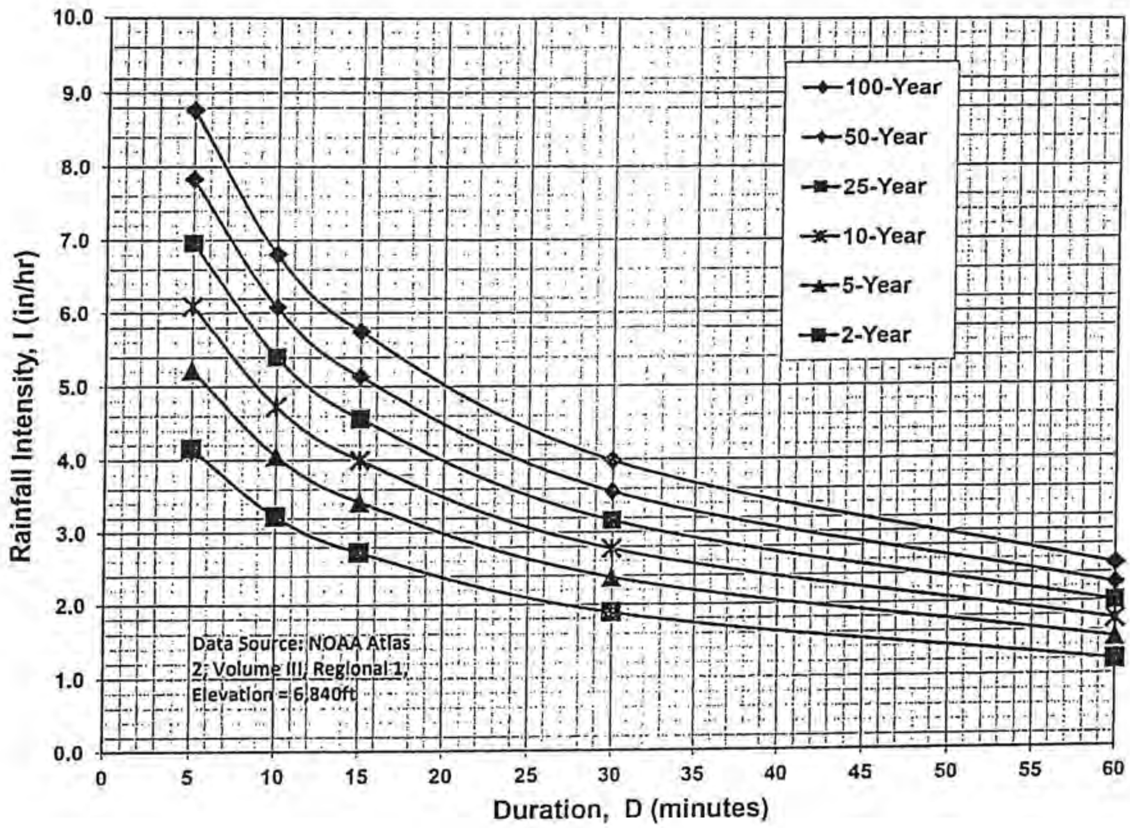
3.2.4 Minimum Time of Concentration

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

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

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

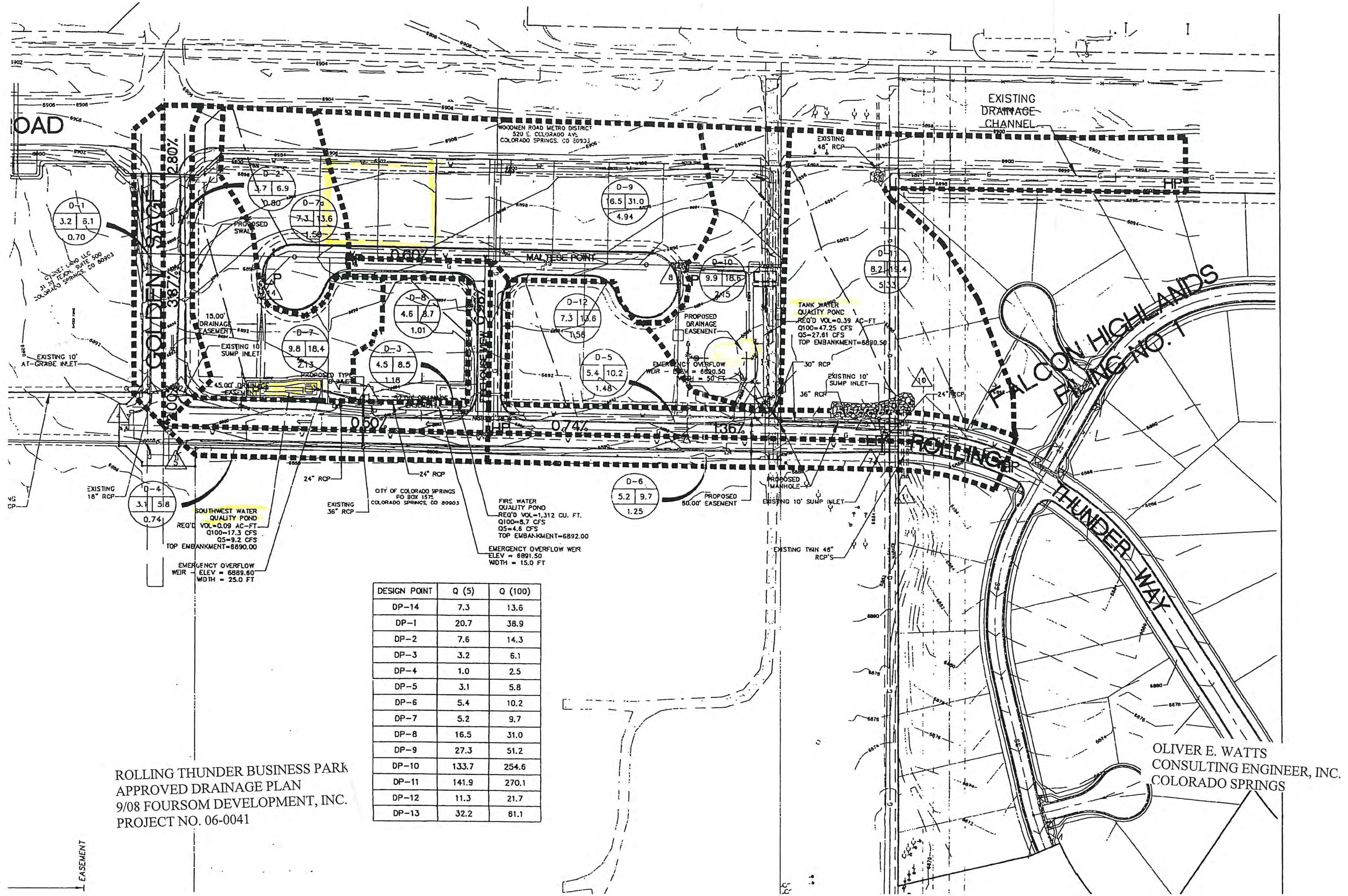
$I_{25} = -2.00 \ln(D) + 10.111$

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

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

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

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



DESIGN POINT	Q (5)	Q (100)
DP-14	7.3	13.6
DP-1	20.7	38.9
DP-2	7.6	14.3
DP-3	3.2	6.1
DP-4	1.0	2.5
DP-5	3.1	5.8
DP-6	5.4	10.2
DP-7	5.2	9.7
DP-8	16.5	31.0
DP-9	27.3	51.2
DP-10	133.7	254.6
DP-11	141.9	270.1
DP-12	11.3	21.7
DP-13	32.2	61.1

ROLLING THUNDER BUSINESS PARK
APPROVED DRAINAGE PLAN
9/08 FOURSOM DEVELOPMENT, INC.
PROJECT NO. 06-0041

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

ROLLING THUNDER BUSINESS PARK - FDR - DEVELOPED CONDITIONS
(RATIONAL METHOD Q=CIA)

BASIN	TOTAL FLOWS			CA(equiv.)			AREA TOTAL	WEIGHTED		OVERLAND				CHANNEL				Tc TOTAL	INTENSITY		
	Q2 (c.f.s.)	Q5 (c.f.s.)	Q100 (c.f.s.)	2 YR	5 YR	100 YR	(Ac)	C5	C100	C5	Length (ft)	Slope (ft)	Tco (min)	Length (ft)	Slope (%)	Velocity (fps)	Tcc (min)	(min)	I2 (in/hr)	I5 (in/hr)	I100 (in/hr)
D-1	2.3	3.2	6.1	0.6	0.63	0.67	0.70	0.90	0.95	0.90	5	2.0%	0.7	500	3.5%	3.7	2.2	5.0	3.7	5.1	9.1
D-2	2.7	3.7	6.9	0.7	0.72	0.76	0.80	0.90	0.95	0.90	5	2.0%	0.7	500	3.5%	3.7	2.2	5.0	3.7	5.1	9.1
D-3	3.3	4.5	8.5	1.1	1.06	1.12	1.18	0.90	0.95	0.90	40	2.0%	1.9	715	0.7%	1.7	7.1	9.0	3.1	4.3	7.6
D-4	2.2	3.1	5.8	0.7	0.67	0.71	0.74	0.90	0.95	0.90	5	2.0%	0.7	560	0.5%	1.4	6.6	7.3	3.3	4.6	8.2
D-5	3.9	5.4	10.2	1.3	1.33	1.41	1.48	0.90	0.95	0.90	40	2.0%	1.9	1,000	1.0%	2.0	8.3	10.2	3.0	4.1	7.2
D-6	3.8	5.2	9.7	1.1	1.12	1.19	1.25	0.90	0.95	0.90	5	2.0%	0.7	775	1.0%	2.0	6.5	7.1	3.4	4.6	8.2
D-7	7.1	9.8	18.4	1.9	1.92	2.02	2.13	0.90	0.95	0.90	40	2.0%	1.9	515	3.1%	3.5	2.4	5.0	3.7	5.1	9.1
D-7a	5.3	7.3	13.6	1.4	1.42	1.50	1.58	0.90	0.95	0.90	40	2.0%	1.9	285	4.3%	4.1	1.2	5.0	3.7	5.1	9.1
D-8	3.4	4.6	8.7	0.9	0.91	0.96	1.01	0.90	0.95	0.90	5	2.0%	0.7	245	1.2%	2.2	1.8	5.0	3.7	5.1	9.1
D-9	12.0	16.5	31.0	4.4	4.45	4.69	4.94	0.90	0.95	0.90	300	2.0%	5.2	715	0.6%	1.5	7.7	12.8	2.7	3.7	6.6
D-10	7.2	9.9	18.6	1.9	1.94	2.04	2.15	0.90	0.95	0.90	60	2.0%	2.3	300	2.0%	2.8	1.8	5.0	3.7	5.1	9.1
D-11	5.9	8.2	19.4	1.6	1.60	2.13	5.33	0.30	0.40	0.90	60	2.0%	2.3	500	2.8%	3.3	2.5	5.0	3.7	5.1	9.1
D-12	5.3	7.3	13.6	1.4	1.42	1.50	1.58	0.90	0.95	0.90	10	2.0%	0.9	250	1.6%	2.5	1.6	5.0	3.7	5.1	9.1
Offsite	68.8	94.7	194.5	32.5	32.50	37.50	50.00	0.65	0.75	0.35	100	2.0%	11.2	1,500	1.5%	2.4	10.2	21.4	2.1	2.9	5.2
Formula:		C*I*A	C*I*A		Q/I	Q/I							*1			*2	*3	Tco+Tcc	*4	*5	*6
							86.95									20			1.09	1.5	2.67

1* $T_{co} = 1.87*(1.1-C5)*(L\hat{}0.5)*((S*100)\hat{}-0.33)$ (DCM page 5-11)

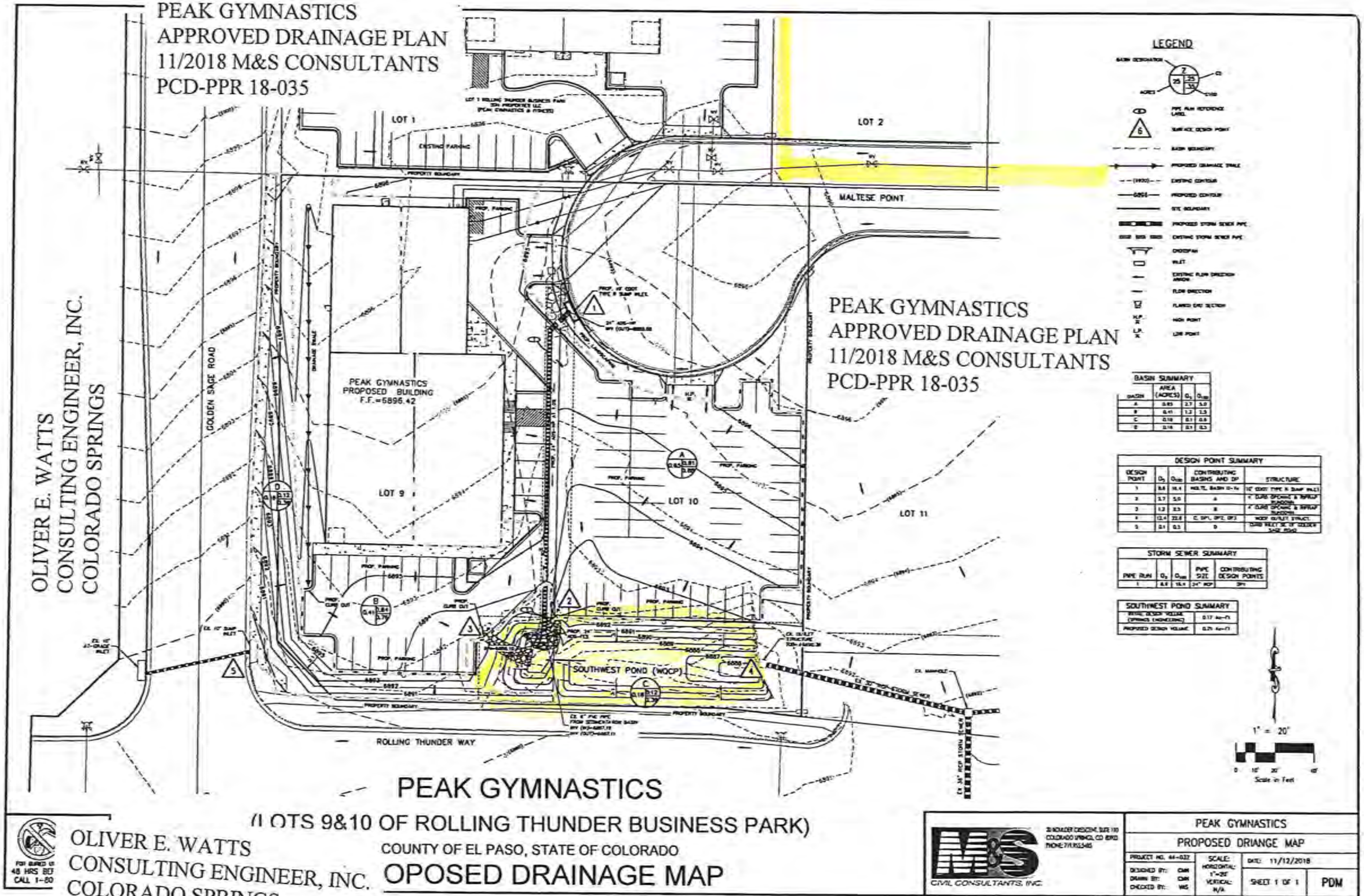
2* $V_c = 20*S\hat{}0.5$ (USDCM RO-4)

3* $T_{cc} = 1/V*L/60$

4* $I_2 = (26.65*1.09)/(10+T_c)\hat{}0.76$ (City Letter of 1/7/2003)

5* $I_5 = (26.65*1.50)/(10+T_c)\hat{}0.76$ (City Letter of 1/7/2003)

6* $I_{100} = (26.65*2.67)/(10+T_c)\hat{}0.76$ (City Letter of 1/7/2003)



BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A	0.85	2.7	5.0
B	0.41	1.2	2.5
C	0.10	0.1	0.6
D	0.16	0.1	0.5

DESIGN POINT SUMMARY				
DESIGN POINT	Q_5	Q_{100}	CONTRIBUTING BASINS AND DP	STRUCTURE
1	8.8	16.4	MULTI. BASIN [illegible]	10' CDOT TYPE R SUMP INLET
2	2.7	5.0	A	4' CURB OPENING & RIPRAP RUNDOWN
3	1.2	2.5	B	4' CURB OPENING & RIPRAP RUNDOWN
4	12.4	22.8	C, DP1, DP2, DP3	WQCP OUTLET STRUCT.
5	0.1	0.5	D	CURB INLET SE OF GOLDEN SAGE ROAD

STORM SEWER SUMMARY				
PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING DESIGN POINTS
1	8.8	16.4	24" RCP	DP1

SOUTHWEST POND SUMMARY	
INITIAL DESIGN VOLUME (SPRINGS ENGINEERING)	0.17 Ac-Ft
PROPOSED DESIGN VOLUME	0.2[illegible] Ac-Ft

DRAWN BY: O.E. WATTS DATE: 1-21-20 DWG. NO.: 19-5348-07 SURVEYED BY: OEW, ESW, 6-26-19	APPROVED BY: PROJ. NO. DWG.	REVISIONS	OLIVER E. WATTS CONSULTING ENGINEER COLORADO SPRINGS	PROJECT 10634 & 10658 MALTESE POINT LOTS 2 & 3, ROLLING THUNDER BUSINESS PARK EL PASO COUNTY	SHT. NAME DRAINAGE PLAN	SHT. NO. 1 OF 1