Drainage Letter Date Joint Venture Subdivision Replat of Lots 19 & 20, Block 3, Park Vista Addition (4207 & 4215 Date Street) Colorado Springs, Colorado 80917

Prepared for: Robert Scott General Contractors, Inc. 9850 Highland Glen Place Colorado Springs, Colorado 80920



1604 South 21st Street Colorado Springs, Colorado 80904 (719) 630-7342

Kiowa Project No. 20047 February 8, 2021

Signature Page **Date Joint Venture Subdivision**

Engineer's Statement

This report and plan for the drainage design of Date Joint Venture Subdivision was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Signature (Affix Seal): _____ Colorado P.E. No. 25057

Date

Developer's Statement

Robert Scott General Contractors, Inc. hereby certifies that the drainage facilities for Date Joint Venture Subdivision shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of Date Joint Venture Subdivision, guarantee that final drainage design review will absolve Robert Scott General Contractors, Inc. and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Name of Developer: Robert Scott General Contractors, Inc.

Authorized Signature

Printed Name:

Title:

Address: <u>9850 Highland Glen Place, Colorado Springs, Colorado 80920</u>

City of Colorado Springs Statement:

Filed in accordance with Section 7.7.906 of the code of the City of Colorado Springs, 2001, as amended.

For City Engineer

Date

Conditions:

Date

I. General Property Description

The site is located at what is currently 4207 and 4215 Date Street, Colorado Springs, CO 80917, which are platted as Lots 19 and 20, Block 3, Park Vista Addition in the northeast quarter of Section 26, Township 13 South, Range 66 West of the 6th Principal Meridian, in an unincorporated area of El Paso County. The property is proposed to be annexed into the City of Colorado Springs and platted as Lots 1 and 2, Date Joint Venture Subdivision. The property contains approximately 14,400 square feet (0.331 acres). Figure 1 depicts the general location of the property. Current zoning is El Paso County RM-30 (Residential Multi-Dwelling), which would become City of Colorado Springs R-5 (Multi-Family Residential) after annexation.

II. Drainage Design Criteria

The hydrology for this site was estimated using the methods outlined in the City of Colorado Springs Drainage Criteria Manuals. The topography for the site was compiled using a one-foot contour interval and is presented at a horizontal scale of 1-inch to 50-feet in Figures 2 and 3, which can be found in the Appendix. The hydrologic calculations were made assuming both existing conditions and developed conditions. The existing drainage basins are shown on Figure 2, and the developed drainage basins are shown on Figure 3. Peak flow rates for the drainage basins were estimated by using the Rational Method. Runoff for the 5-year and 100-year recurrence intervals were determined.

The runoff coefficients used for the Rational Method were determined using Table 6-6 of the City of Colorado Springs, Drainage Criteria Manual, Volume 1. The hydrological calculations were performed assuming Hydrologic Soil Group C. The hydrological calculations for both existing and developed conditions are included in the Appendix.

III. General Existing Drainage Characteristics

The property lies entirely within the Templeton Gap drainage basin. Runoff from the north half of the site generally sheet flows, at a slope of approximately 1.9%, towards the northwest onto the Date Street R.O.W. and sheet flows southwest, ultimately draining into the Templeton Gap Floodway approximately 1,000 feet southwest of the site. Runoff from the south half of the site generally sheet flows, at a slope of approximately 3.2%, towards the south, ultimately draining to an existing 12' D-10-R public curb inlet at the northeast corner of Beverly Street and Rosalie Street. From here an existing public storm sewer system conveys runoff southwest to the Templeton Gap Floodway. Existing vegetation consists primarily of native grasses and weeds. Figure 2 depicts existing drainage conditions of the property.

Basin E-1 contains 0.14 acres and existing runoff consists of approximately $Q_5=0.1$ cfs and $Q_{100}=0.5$ cfs. Basin E-2 contains 0.19 acres and existing runoff consists of approximately $Q_5=0.1$ cfs and $Q_{100}=0.6$ cfs. See Appendix for existing hydrologic calculations.

IV. General Proposed Drainage Characteristics

After development, runoff from the northern portion of the site (Basin D-1) will generally sheet flow, at a slope of approximately 3.7%, towards the northwest into the proposed south Date Street curb and gutter. From here runoff sheet flows southwest, ultimately draining into the Templeton Gap Floodway approximately 1,000 feet southwest of the site. Runoff from the southern portion of the site (Basin D-2) will generally sheet flow, at a slope at approximately 7.0% towards the south, ultimately draining to the existing 12' D-10-R public curb inlet at the northeast corner of Beverly Street and Rosalie Street. From here an existing public storm sewer system conveys runoff southwest to the Templeton Gap Floodway. Proposed development consists of two multi-family residential duplexes, sidewalks, driveways, and new curb and gutter in the Date Street Right-of-Way. Figure 3 depicts developed drainage conditions of the property.

Basin D-1 contains 0.14 acres and developed runoff consists of approximately $Q_5=0.3$ cfs and $Q_{100}=0.8$ cfs. Basin D-2 contains 0.19 acres and developed runoff consists of approximately $Q_5=0.3$ cfs and $Q_{100}=0.9$ cfs. See Appendix for developed hydrologic calculations.

There are no proposed drainage improvements, drainage facilities or water quality features associated with the development of the property. After development, Effective imperviousness will increase by 46.2%. There are no significant changes to existing drainage patterns from those shown in the previously approved Templeton Gap Drainage Basin Study and the Master Development Drainage Plan for Park Vista Subdivision.

V. Water Quality

While this site is less than an acre, it is considered a part of a larger development and is required to address water quality. Based upon the proposed conditions which includes the addition of a duplex building, a runoff reduction analysis using the MHFD UD-BMP (Version 3.07) of the plat area has been prepared and is included in the Appendix as Exhibit 1. The analysis shows that 77% of the WQCV infiltrates into the pervious portions of the site.

VI. Drainage and Bridge Fees

The Date Joint Venture Subdivision lies wholly within the Park Vista (MDDP) drainage basin. Drainage fees have been established for the Park Vista (MDDP) Area for assessment against platted land within the watershed. There are no public facilities proposed with the development of Date Joint Venture Subdivision. The 2021 fees for the Park Vista drainage basin are as follows:

Drainage Fee: \$18,444 per acre	
Bridge Fee:	None
Pond Land Fee:	None
Pond Facility Fee:	None
Surcharge:	None
Total Fee	\$18,444 / acre

Drainage Fee: 0.331 acres × \$18,444/acre=**\$6,104.96** are due for this development.

VII. Summary and Conclusion

This report along with its findings are in general conformance with the Templeton Gap Drainage Basin Study and the Master Development Drainage Plan for Park Vista Subdivision, and associated drainage studies in the area. Runoff from the proposed Date Joint Venture Subdivision will not have adverse impacts on existing downstream drainage facilities or surrounding developments.

APPENDIX

Hydrologic Calculations

Runoff Coefficient Calculations -

Time of Concentration -

Runoff Calculations -

Exhibit 1

Figures

Date Joint Venture Subdivision Runoff Coeficient and Percent Impervious Calculation **Existing Conditions**

_					DR	Area 1	l Land	Use	RO	Area 2	Land	Use	LA	Area 3	Land	Use	HI	Area 4	l Land	Use			
Pag	in	Basin or D	P Area	Γype	ıperv	l Use ea	rea	Land 6 Imp	perv	l Use ea	rea	Land 6 Imp	perv	l Use ea	rea	Land 6 Imp	ıperv	l Use ea	rea	Land 6 Imp	n % erv	Basin I Coefi	Runoff cient
Das		basin	is)	Soil	% Im	Land Ar	% A	Comp Use %	% Im	Land Ar	% A	Comp Use %	% Im	Land Ar	% A	Comp Use %	% Im	Land Ar	% A	Comp Use %	Basi Imp	C ₅	C ₁₀₀
E -3	1	6,252 sf	0.14ac	С	100%	0.00ac	0%	0%	90%	0.00ac	0%	0%	0%	0.00ac	0%	0%	2%	0.14ac	100%	2%	2.0%	0.16	0.51
E-3	2	8,148 sf	0.19ac	С	100%	0.00ac	0%	0%	90%	0.00ac	0%	0%	0%	0.00ac	0%	0%	2%	0.19ac	100%	2%	2.0%	0.16	0.51

Basin Runoff Coefficient i	s a weigh	ted aver	age						ſ
Runoff Coefficients and	Percents	5 Imperv	vious <mark>(</mark> (City DCM	Table	6-6)			
Hydrologic Soil Type:	С			Runof	f Coef	Calc Me	ethod	Weighte	d
Land Use	Abb	%	C ₂	C ₅	C ₁₀	C ₂₅	C ₅₀	C ₁₀₀	Weig
Business: Commercial	BD	95%	0.80	0.82	0.84	0.87	0.88	0.89	%lr
Business: Neighborhood	BS	70%	0.49	0.53	0.57	0.62	0.65	0.68	
Drives and Walks	DR	100%	0.89	0.90	0.92	0.94	0.95	0.96	A
Streets - Gravel (Packed)	GR	80%	0.60	0.63	0.66	0.70	0.72	0.74	Е
Historic Flow Analysis	HI	2%	0.05	0.16	0.26	0.38	0.45	0.51	C
Lawns	LA	0%	0.04	0.15	0.25	0.37	0.44	0.50	D
Off-site flow-Undeveloped	OF	45%	0.31	0.37	0.44	0.51	0.55	0.59	
Park	PA	7%	0.09	0.19	0.29	0.40	0.46	0.52	
Streets - Paved	PV	100%	0.89	0.90	0.92	0.94	0.95	0.96	
Roofs	RO	90%	0.73	0.75	0.77	0.80	0.82	0.83	
User Input 1 - Residential	US1	65%	0.41	0.45	0.49	0.54	0.57	0.59	

Equation: $C_c=(C_1A_1+C_2A_2+C_3A_3+...C_i+A_i) / A_t$

(City of Colorado Springs DCM Equation 6-6) Where: C_c = composite runoff coefficient for total area

C_i = runoff coefficient for subarea (surface type or land use)

A_i = area of surface type corresponding to C_i

 A_t = total area of all sub areas

i = number of surface types in the drainage area

Date Joint Venture Subdivision Time of Concentration Calculation Existing Conditions

	Sub-Basin D	ata						Time of	Concen	tratio	on Es	timate			t _c (1st D	P in Urban	
	Contributing				Initial/0	Overland	Time (t _i)			Trave	el Tir	ne (t _t)		Comp.	Catcl	nments)	Final t.
Basin	Basins	Area	C ₅	i	Longth	Slope	t.	Longth	Slone	Land	ĸ	Velocity	+	+	Total t _c		
	Dusins				Length	Slope	ι	Length	Slope	Туре	к	Velocity	ч	ι _c	Length	(1st DP)	
E-1	E-1	0.14ac	0.16	2.0%	40lf	2.5%	8.0 min.	40lf	1.3%	SP	7	0.8 ft/sec	0.9 min.	8.9 min.	80lf	18.5 min.	8.9 min.
E-2	E-2	0.19ac	0.16	2.0%	61lf	2.5%	9.9 min.	50lf	4.0%	SP	7	1.4 ft/sec	0.6 min.	10.5 min.	111lf	18.5 min.	10.5 min.

Equations:

 t_i (Overland) = 0.395(1.1-C₅)L^{0.5} S^{-0.333}

(DCM Equation 6-8) Where:

 C_5 = Runoff coefficient for 5-year

L = Length of overland flow (ft)

S = Average basin slope (ft/ft)

 t_c (1st DP) = (18-15i) + L_t / (60 (24i+12)S^{0.5}) Where:

t_c (1st DP) = First DP Time of Concentration in urban catchments

Lt = Length of Flow Path

i = imperviousness (expressed as a decimal)

 $t_t = L_t / 60KS^{0.5}$ Where:

 t_t = Channelized flow time (travel time)(min.)

L_t = Waterway length (ft)

K = Conveyance Factor (see DCM Table 6-7)

S = Watercourse slope (ft/ft)

City DCM Table 6-7

Type of Land Surface	Land Type	Cv
Grassed Waterway	GW	15
Heavy Meadow	HM	2.5
Nearly Bare Ground	NBG	10
Paved Area	PV	20
Riprap (Not Buried)	RR	6.5
Short Pasture/Lawns	SP	7
Tillage/Fields	TF	5

20047 Drainage Calcs Existing Tc Date Prepared: 2/2/2021

Date Joint Venture Subdivision Runoff Calculation Existing Conditions

Pacin	Contributing Pacing	Drainage			Time of	Rainfall	Intensity	Ru	noff	Pacin
Dasiii	Contributing Dasins	Area	C ₅	C ₁₀₀	Concentration	i ₅	i ₁₀₀	Q_5	Q ₁₀₀	Dasin
E-1	E-1	0.14 ac	0.16	0.51	8.9 min.	4.3 in/hr	7.2 in/hr	0.1 cfs	0.5 cfs	E-1
E-2	E-2	0.19 ac	0.16	0.51	10.5 min.	4.1 in/hr	6.8 in/hr	0.1 cfs	0.6 cfs	E-2

Equations (taken from Fig 6-5, City of Colorado Springs DCM):

$$\begin{split} i_2 &=\! -1.19 \ln(T_c) + 6.035 \\ i_5 &=\! -1.50 \ln(T_c) + 7.583 \\ i_{10} &=\! -1.75 \ln(T_c) + 8.847 \\ i_{100} &=\! -2.52 \ln(T_c) + 12.738 \end{split}$$

Q = CiA

Q = Peak Runoff Rate (cubic feet/second)

C = Runoff coef representing a ration of peak runoff rate to ave rainfall intensity for a duration equal to the runoff time of concentration.

i = average rainfall intensity in inches per hour

A = Drainage area in acres

Date Joint Venture Subdivision Runoff Coeficient and Percent Impervious Calculation **Developed Conditions**

					DR	Area	1 Land	Use	RO	Area 2	Land	Use	LA	Area 3	Land	Use	HI	Area 4	Land	Use			
	Pacin	Basin or D	P Area	Γype	tperv	l Use ea	rea	Land 6 Imp	perv	l Use ea	rea	Land 6 Imp	perv	l Use ea	rea	Land 6 Imp	ıperv	l Use ea	rea	Land 6 Imp	n % erv	Basin Coefi	Runoff cient
	Dasin	basin	is)	Soil	% Im	Land Ar	% A	Comp Use %	% Im	Land Ar	% A	Comp Use %	m1 %	Land Ar	% A	Comp Use %	% Im	Land Ar	% A	Comp Use %	Basi Imp	C ₅	C ₁₀₀
Γ	D-1	6,252 sf	0.14ac	С	100%	0.05ac	37%	37%	90%	0.05ac	35%	31%	0%	0.04ac	28%	0%	2%	0.00ac	0%	0%	68.6%	0.64	0.79
	D-2	8,148 sf	0.19ac	С	100%	0.01ac	4%	4%	90%	0.06ac	32%	29%	0%	0.12ac	64%	0%	2%	0.00ac	0%	0%	32.6%	0.37	0.62

Basin Runoff Coefficient i	s a weigh	ted aver	age						ſ
Runoff Coefficients and	Percents	5 Imperv	vious <mark>(</mark>	City DCM	Table	6-6)			[
Hydrologic Soil Type:	С			Runof	f Coef	Calc Me	ethod	Weighte	d
Land Use	Abb	%	C ₂	C ₅	C ₁₀	C ₂₅	C ₅₀	C ₁₀₀	Weig
Business: Commercial	BD	95%	0.80	0.82	0.84	0.87	0.88	0.89	%1
Business: Neighborhood	BS	70%	0.49	0.53	0.57	0.62	0.65	0.68	
Drives and Walks	DR	100%	0.89	0.90	0.92	0.94	0.95	0.96	A
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Lawns	LA	0%	0.04	0.15	0.25	0.37	0.44	0.50	C
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Date Joint Venture Subdivision Time of Concentration Calculation Developed Conditions

	Sub-Basin D	ata						Time of	Concen	tratio	on Es	timate			t _c (1st D	P in Urban	
	Contributing				Initial/0	Overland	Time (t _i)			Trave	el Tir	ne (t _t)		Comp.	Catcl	nments)	Final t.
Basin	Basins	Area	C ₅	i	Longth	Slope	t.	Longth	Slope	Land	ĸ	Velocity	t	t	Total	t _c	
	Dusinis				Length	Slope	Ľ	Length	Slope	Туре	ĸ	Velocity	Ľ	L _C	Length	(1st DP)	
D-1	D-1	0.14ac	0.64	68.6%	30lf	23.3%	1.6 min.	48lf	3.7%	SP	7	1.3 ft/sec	0.6 min.	5.0 min.	78lf	7.8 min.	5.0 min.
D-2	D-2	0.19ac	0.37	32.6%	25lf	28.5%	2.2 min.	52lf	7.0%	SP	7	1.9 ft/sec	0.5 min.	5.0 min.	77lf	13.3 min.	5.0 min.

Equations:

 t_i (Overland) = 0.395(1.1-C₅)L^{0.5} S^{-0.333}

(DCM Equation 6-8) Where:

 C_5 = Runoff coefficient for 5-year

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Lt = Length of Flow Path

i = imperviousness (expressed as a decimal)

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L_t = Waterway length (ft)

K = Conveyance Factor (see DCM Table 6-7)

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Short Pasture/Lawns	SP	7
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Date Joint Venture Subdivision Runoff Calculation Developed Conditions

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Dasiii	Contributing Dasins	Area	C ₅	C ₁₀₀	Concentration	i ₅	i ₁₀₀	Q_5	Q ₁₀₀	Dasin
D-1	D-1	0.14 ac	0.64	0.79	5.0 min.	5.2 in/hr	8.7 in/hr	0.5 cfs	1.0 cfs	D-1
D-2	D-2	0.19 ac	0.37	0.62	5.0 min.	5.2 in/hr	8.7 in/hr	0.4 cfs	1.0 cfs	D-2

Equations (taken from Fig 6-5, City of Colorado Springs DCM):

$$\begin{split} i_2 &=\! -1.19 \ln(T_c) + 6.035 \\ i_5 &=\! -1.50 \ln(T_c) + 7.583 \\ i_{10} &=\! -1.75 \ln(T_c) + 8.847 \\ i_{100} &=\! -2.52 \ln(T_c) + 12.738 \end{split}$$

Q = CiA

Q = Peak Runoff Rate (cubic feet/second)

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i = average rainfall intensity in inches per hour

A = Drainage area in acres

UD-BMP (Variors) 3/7, Mark 2011; Sheet 1 of 1 Company: Kine Engineering Corporation	Design Procedure Form: Runoff Reduction														
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	Designer:	NRK										-			
	Company:	Kiowa Engine	eering Corpora	ation								-			
	Date:	February 3, 2	021									-			
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Area Type UNKEPA DOI: Image: Control of the second sec	Depth of Average Ru	Depth of Average Runoff Producing Storm, $d_6 = 0.43$ inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)													
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HSG B (%) Ch Image of the origon of the	SPA (ft ⁻) HSG & (%)	0%											┠────┤ │		
HSG CDC rol DOX	HSG B (%)	0%			1	1							├┤ │		
Average Slope of RPA (ftm) 0.054 - <th< td=""><td>HSG C/D (%)</td><td>100%</td><td></td><td></td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td> </td></th<>	HSG C/D (%)	100%			1	1									
URAPRA Interface Width (th) 322.00	Average Slope of RPA (ft/ft)	0.054			1										
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Area (P) 1 2 Image: Constraint of the second of the se															
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UKUPA Mation UKUPA Mation<	Alea ID	12 650													
UIA / Area 0.4602 -	L/W Ratio	0.12													
Rundf (in) 0.00 0.50 Image: constraint of the second s	UIA / Area	0.4602					1			1					
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CALCULATED WOCK RESULTS Area ID 1 2 Image: Control of the con	Runoff Reduction (ft ³)	243	0												
OLCUPATE OF NEADLYS Area ID WQCV (th) 243 73 Image: Colspan="2">Image: Colspan="2" Image:		COLULTO													
Note of bit 1 2 1 1 2 WQCV (ft) 243 0 1		1	2				r		r	r			<u>г</u>		
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WQCV Reduction (%) 100% 0% Image: constraint of the second se	WQCV Reduction (ft ³)	243	0												
Untreated WQCV (tr ³) 0 73 Image: Constraint of the same const	WQCV Reduction (%)	100%	0%												
CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID DOWNSTREAM DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID DECIA (ft ²) OCALCULATED SITE RESULTS (sums results from all columns in worksheet) <td>Untreated WQCV (ft³)</td> <td>0</td> <td>73</td> <td></td>	Untreated WQCV (ft ³)	0	73												
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Vice v Reduction (%) 100% 0% 0 </td <td>WQCV Reduction (ft³)</td> <td>243</td> <td>0</td> <td></td> <td></td> <td>+</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>┝───┤│</td>	WQCV Reduction (ft ³)	243	0			+							┝───┤│		
CALCULATED SITE RESULTS (sums results from all columns in worksheet) Total Area (ft ²) 14,400 Total Impervious Area (ft ²) 7,571 WQCV (ft ³) 315 WQCV Reduction (ft ³) 243 WQCV Reduction (%) 77% Untreated WQCV (ft ³) 73	WQCV Reduction (%)	100%	U%										┠────┤ │		
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VVQCV Reduction (%) //% Untreated WQCV (ft ³) 73	WQCV Reduction (ft ³)	243													
	WQCV Reduction (%)	//%													
	Untreated WQCV (ft°)	13	1												





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