



AARK Stream Restoration, LLC
NAU Capstone

Watershed Delineation

To start analyzing the stream reach at Coyote Springs estate in Flagstaff, Arizona, flow contributing to the reach must be determined. AARK Stream Restoration, LLC decided to follow Coconino County Design Manual to use Coconino County Rational method to determine the runoff flow over the watershed area correspond to Coyote Springs estate. Here are the results:



Figure 1: Aerial photo from Google Maps of Coyote Springs estate showing the channels and culverts on the reach

- The document shows the important results. More in depth discussion of the results can be found in the report.



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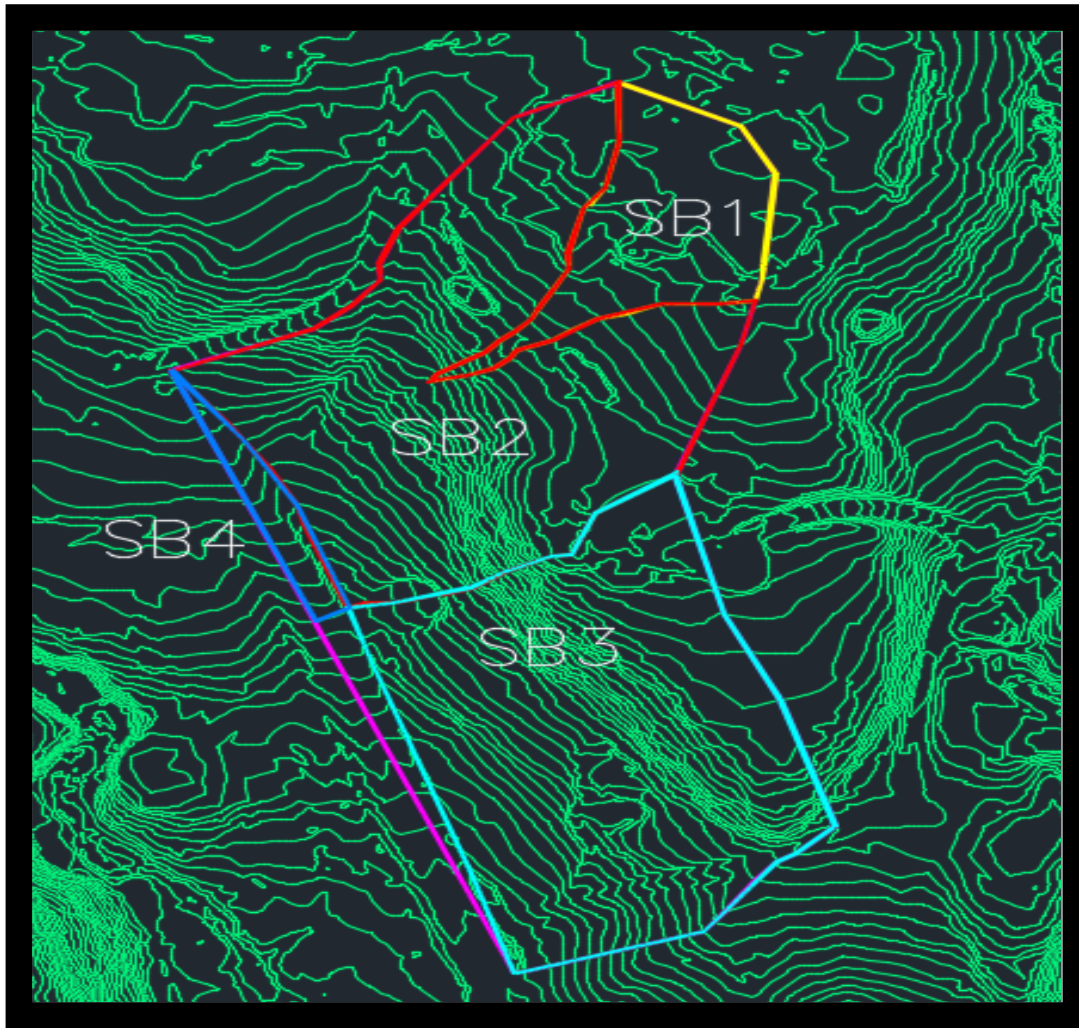


Figure 2: Overview of Sub-Basins at Coyote Springs from AutoCAD Civil 3D

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Flow of the stream:

Stream Flow, Q				
Test No	Time, sec	Distance, Ft	Velocity, ft/s	Q, cfs
1	6.8	3	0.441	0.040
2	5.3	3	0.566	
3	6.8	3	0.441	
		Avg	0.483	
Channel Area, ft²		0.08333		

Coconino County Rational Equation:

$$Q = C_f CIA \quad \text{(Equation 1)}$$

Where:

Q , Rate of runoff, ft^3/s

C_f , Antecedent precipitation factor

C , Runoff coefficient

I , Rainfall intensity, in/hr

A , Drainage area tributary to the design location, acres

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Antecedent Precipitation Factor:

Precipitation Factor, Cf	
Storm Freq.	Factor
25 Year	1.1
50 Year	1.2
100 Year	1.25

Rainfall Intensity, I (in/hr):

Duration (min)	Freq (yrs)		
	25	50	100
5	6.84	7.68	8.52
10	5.34	6	6.66
15	4.4	4.92	5.48
30	2.86	3.22	3.58
60	1.76	1.98	2.21

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Sub-Basin Flow:

Sub Basin	Area (Sf)	Area (Acre)	Runoff Coefficient, C	Q (cfs) 25-yr	Q (cfs) 50-yr	Q (cfs) 100-yr
SB1	126,566	2.91	0.15	2.56	3.14	3.63
SB2	502,116	11.53	0.15	10.16	12.45	14.39
SB3	401,354	9.21	0.10	5.41	6.63	7.67
SB4	30,594	0.70	0.95	3.92	4.80	5.55
Total	1,060,630	24.35		22.05	27.03	31.25

Flow in Channels & Culverts:

Flows Through Channels and Culverts		
Channel/Culvert	Cont. SB	Q, cfs
CH1	1,2	12.72
CU1	1,2	14.43
CH2	1,2,3,4	22.05
CU2	1,2,3,4	22.05
CH3	1,2,3,4	22.05
CU4	1,2,3,4	22.05

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REFERENCES

[1] Az-coconinocounty.civicplus.com, 2015. [Online]. Available: <http://az-coconinocounty.civicplus.com/DocumentCenter/View/1789>.

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