



# MONTEZUMA CASTLE NATIONAL MONUMENT

PARKING LOT  
ADDITION AND  
REDESIGN

# PROJECT BACKGROUND

## NOT OPTIMAL FOR VISITOR USAGE

- Parking lot is reaching capacity, pedestrian facilities are poor, larger commercial vehicles do not have adequate infrastructure

## OBJECTIVES

- Design new parking lot and drop off zone to meet the needs of busses and passenger cars
- Improve existing pedestrian facilities by adding sidewalk and designing a picnic area
- Improve existing parking lot by restriping to maximize capacity



Figure 1: Team Selfie  
Photo by: Jacob Robinson



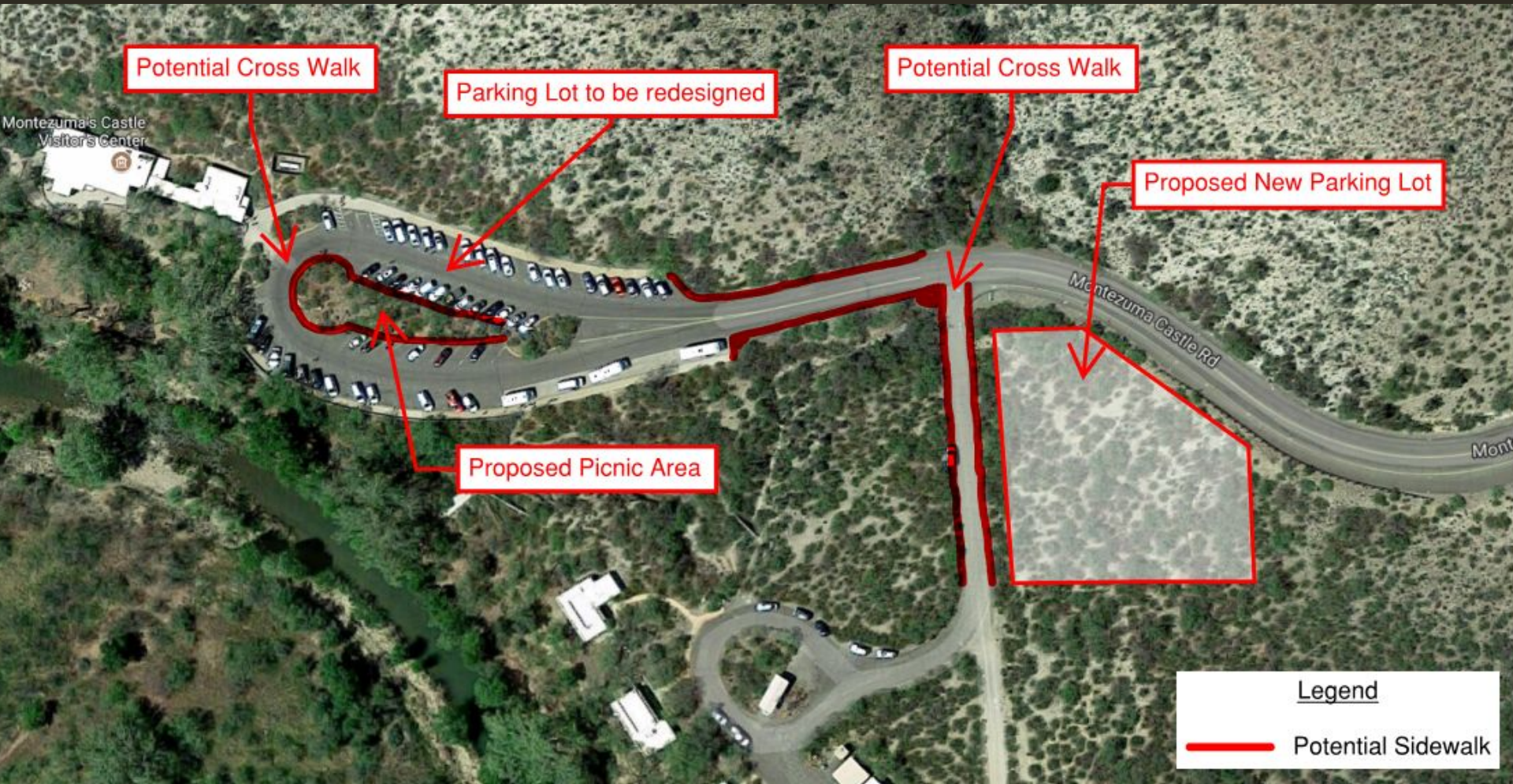


Figure 2: Site Map



# SCHEDULE STATUS

1	Task Name	Duration	Start	Finish
2	<b>Site Investigation</b>	<b>8 days</b>	<b>Fri 1/19/18</b>	<b>Tue 1/30/18</b>
3	<b>1.1 Field Visit and Assessment</b>	<b>1 day</b>	<b>Fri 1/19/18</b>	<b>Fri 1/19/18</b>
4	1.1.1 Assess Drainage Basins	1 day	Fri 1/19/18	Fri 1/19/18
5	1.1.2 Assess Stormwater Systems	1 day	Fri 1/19/18	Fri 1/19/18
6	1.1.3 Assess Traffic Movements/Existing Parking Lot	1 day	Fri 1/19/18	Fri 1/19/18
7	1.2 Field Survey	1 day	Fri 1/19/18	Fri 1/19/18
8	1.3 Process Survey Data	7 days	Mon 1/22/18	Tue 1/30/18
9				
10	<b>Traffic Analysis</b>	<b>4 days</b>	<b>Fri 2/2/18</b>	<b>Wed 2/7/18</b>
11	<b>4.1 Existing Traffic Analysis</b>	<b>2 days</b>	<b>Fri 2/2/18</b>	<b>Mon 2/5/18</b>
12	4.1.1 Estimate Durations for Visitors and Bus Unloading	1 day	Fri 2/2/18	Fri 2/2/18
13	4.1.2 Calculate SSD, Braking & Sight Distance	1 day	Mon 2/5/18	Mon 2/5/18
14	4.1.4 Turning Movements	1 day	Fri 2/2/18	Fri 2/2/18
15	4.1.4 Pedestrian Movements (path and Direction)	1 day	Fri 2/2/18	Fri 2/2/18
16	<b>4.2 Proposed Traffic Analysis</b>	<b>3 days</b>	<b>Mon 2/5/18</b>	<b>Wed 2/7/18</b>
17	4.2.1 Estimate Growth Durations for Visitors and Bus Unloading	2 days	Mon 2/5/18	Tue 2/6/18
18	4.2.2 Proposed SSD, Braking & Sight Distance	2 days	Tue 2/6/18	Wed 2/7/18
19	4.2.3 Turning Movements	2 days	Mon 2/5/18	Tue 2/6/18
20	4.2.4 Pedestrian Movements (Path and Duration)	2 days	Mon 2/5/18	Tue 2/6/18
21				

# SCHEDULE STATUS

22	<b>Hydrology</b>	<b>47 days</b>	<b>Mon 1/22/18</b>	<b>Tue 3/27/18</b>
23	2.1 Research Previous Studies	1 day	Mon 1/22/18	Mon 1/22/18
24	2.2 Existing Drainage Basin Mapping	14 days	Wed 1/31/18	Mon 2/19/18
25	2.3 Existing Stormwater Flow	14 days	Wed 1/31/18	Mon 2/19/18
26	2.4 Proposed Drainage Basin	26 days	Tue 2/20/18	Tue 3/27/18
27	2.5 Proposed Stormwater Flow	26 days	Tue 2/20/18	Tue 3/27/18
28				
29	<b>Site Plan</b>	<b>60 days</b>	<b>Mon 1/22/18</b>	<b>Fri 4/13/18</b>
30	3.1 Review As-Builts	1 day	Mon 1/22/18	Mon 1/22/18
31	3.2 Analyze Existing Conditions	2 days	Tue 2/20/18	Wed 2/21/18
32	3.3 Estimate Parking Lot Location and Size	7 days	Wed 2/7/18	Thu 2/15/18
33	3.5 Bus Turning Radii	2 days	Wed 1/31/18	Thu 2/1/18
34	3.6 Sidewalk Placement	3 days	Fri 2/16/18	Tue 2/20/18
35	<b>3.7 Proposed Stormwater</b>	<b>6 days</b>	<b>Wed 3/28/18</b>	<b>Wed 4/4/18</b>
36	3.7.1 Catch Basins (Detention)	6 days	Wed 3/28/18	Wed 4/4/18
37	3.7.2 CSP Culverts	6 days	Wed 3/28/18	Wed 4/4/18
38	3.8 Site Signage	5 days	Mon 4/9/18	Fri 4/13/18
39	3.10 Proposed Picnic Area	6 days	Wed 1/31/18	Wed 2/7/18
40				

# SCHEDULE STATUS

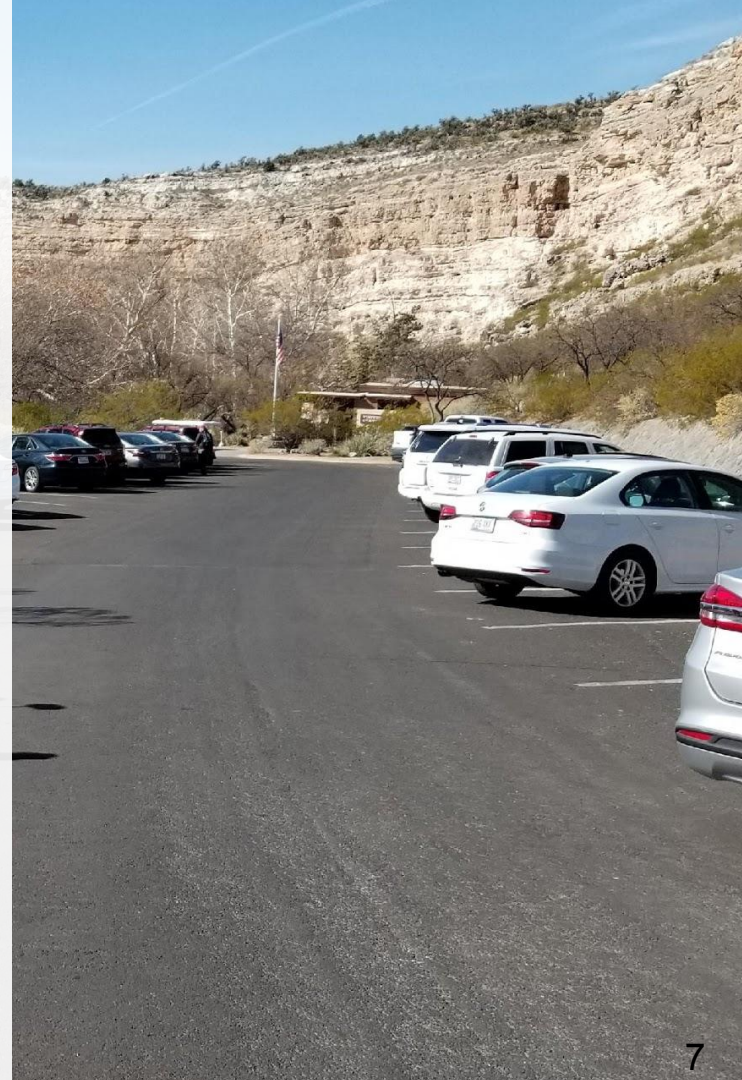
41	<b>Impacts</b>	<b>46 days</b>	<b>Fri 2/16/18</b>	<b>Fri 4/20/18</b>
42	5.1 Hydrology	5 days	Wed 3/28/18	Tue 4/3/18
43	<b>5.2 Physical</b>	<b>46 days</b>	<b>Fri 2/16/18</b>	<b>Fri 4/20/18</b>
44	5.2.1 Traffic Control/Movements	5 days	Fri 2/16/18	Thu 2/22/18
45	5.2.2 Aesthetics	5 days	Mon 4/9/18	Fri 4/13/18
46	5.2.3 Pedestrian Movement	5 days	Mon 4/16/18	Fri 4/20/18
47				
48	<b>Construction Plans</b>	<b>63 days</b>	<b>Wed 1/31/18</b>	<b>Fri 4/27/18</b>
49	6.1 Cover	14 days	Wed 1/31/18	Mon 2/19/18
50	6.2 Codes or Applicable Codes	30 days	Wed 1/31/18	Tue 3/13/18
51	6.3 Existing & Proposed Site Plan	24 days	Mon 2/5/18	Thu 3/8/18
52	6.4 Demo Sheet	16 days	Thu 4/5/18	Thu 4/26/18
53	6.5 Grading and Drainage Sheet Including Plan and Profile	16 days	Thu 4/5/18	Thu 4/26/18
54	6.7 Necessary Details	7 days	Thu 4/5/18	Fri 4/13/18
55	6.8 SWPPP/Safety/Risk Plan	9 days	Fri 3/9/18	Wed 3/21/18
56	50% Construction Drawings	0 days	Fri 3/16/18	Fri 3/16/18
57	100% Construction Drawings	0 days	Fri 4/27/18	Fri 4/27/18
58				



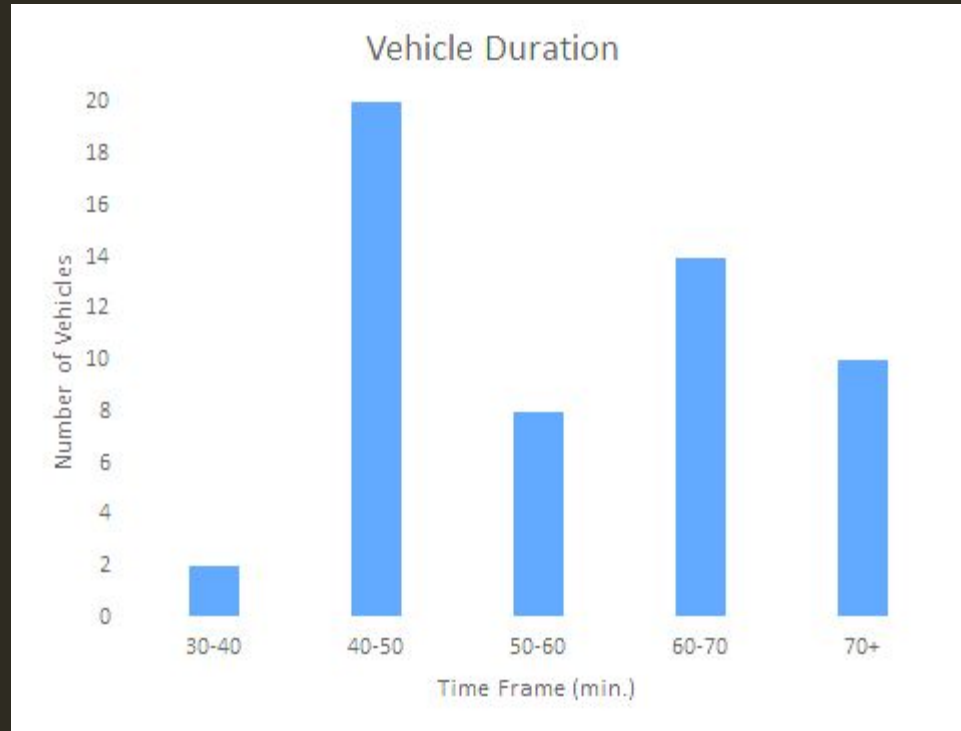
# WORK COMPLETED

- Existing and Proposed Traffic Analysis
- 100% Existing Hydrology Mapping and Runoff Analysis

Figure 3: Parking Lot  
Photo by: Jacob Robinson



# Traffic Analysis



*Figure 4: Vehicle duration count during the traffic analysis site visit during a period of 2 hours.*



# Traffic Analysis

Figure 5: The types of vehicles that were counted in the traffic study and the projected count in a day based on the findings as well as the pedestrian movements.

Vehicle Type	Vehicles in study period	Projected Vehicles in Business Day (8am-5pm)
Passenger Car	85	383
Bus	2	9
Recreational Vehicle	1	5
Motorcycle	1	5
Pedestrian Movement	Pedestrians in study period	Projected Pedestrians in Business Day (8am-5pm)
Sidewalk	121	545
Asphalt	303	1364
Total Pedestrians (Total x0.7)	297	1336
	Pedestrians in study period	Projected Pedestrians in Business Day (8am-5pm)
Bus Visitors	16	72

Figure 6: A growth factor and peak hour factor were applied to the projected vehicle totals to calculate the spaces that will need to be accommodated in the new parking lot.

	Current Daily	Daily w/ Growth	Peak (Design)
		Current Daily x 1.25	Daily w/ Growth x 0.2
Passenger Cars	383	479	96
Large Vehicles	14	18	4
Motorcycles	5	6	1
	Passenger Ca	Large Vehicles	Motorcycles
Existing	64	0	0
Needed Spaces	32	4	1

# Existing Hydrology Map

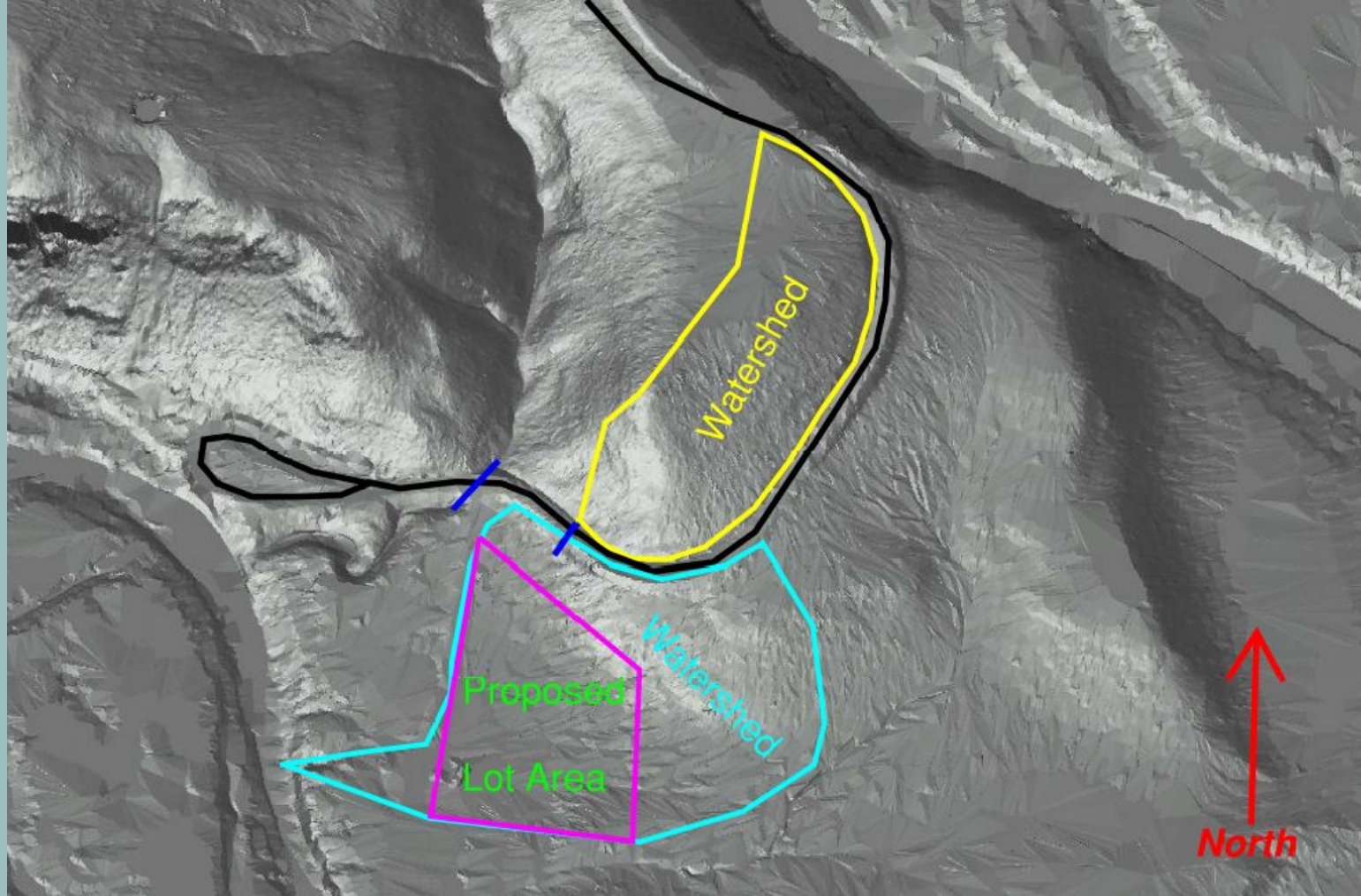


Figure 7: Existing Hydrology Map



# Results from Yellow Watershed

$Q = (CIA)/K_u$		Weighted C	0.373	/
		I_10Y30M	2.21	in/hr
		I_25Y30M	2.78	
		I_50Y30M	3.26	
		I_100Y30M	3.78	
		Area	5.51	acres
		K_u	1	Unit adjustment
Q_10Y30M	4.544	CFS		
Q_25Y30M	5.716	CFS		
Q_50Y30M	6.703	CFS		
Q_100Y30M	7.772	CFS		

Figure 8: Results of Rational Method given 10 Year to 100 Year Storm with a 30 Minute Duration

Culvert Analysis Report				
Culvert under Montezuma Castle Road (Into Proposed Parking Lot)				
Analysis Component				
Storm Event	Design	Discharge	7.80 cfs	
Peak Discharge Method: User-Specified				
Design Discharge	7.80 cfs	Check Discharge	6.70 cfs	
Tailwater Conditions: Constant Tailwater				
Tailwater Elevation	N/A ft			
Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-15 inch Circular	7.80 cfs	3,223.44 ft	13.31 ft/s
Weir	Not Considered	N/A	N/A	N/A

Figure 9: Results of Culvert Velocity given a 100 Year Storm Flow

# Results from Blue Watershed

$Q = (CIA)/K_u$		Weighted C	0.31	/
		I_10Y120M	0.777	in/hr
		I_25Y120M	0.972	
		I_50Y120M	1.13	
		I_100Y120M	1.31	
		Area	12.98	acres
K_u	1	Unit adjustment		
Q_10Y120M	3.157	CFS		
Q_25Y120M	3.949	CFS		
Q_50Y120M	4.591	CFS		
Q_100Y120M	5.322	CFS		

Figure 10: Results of Rational Method given 10 Year to 100 Year Storm with a 120 Minute Duration



Draft of  
Proposed  
Parking Lot

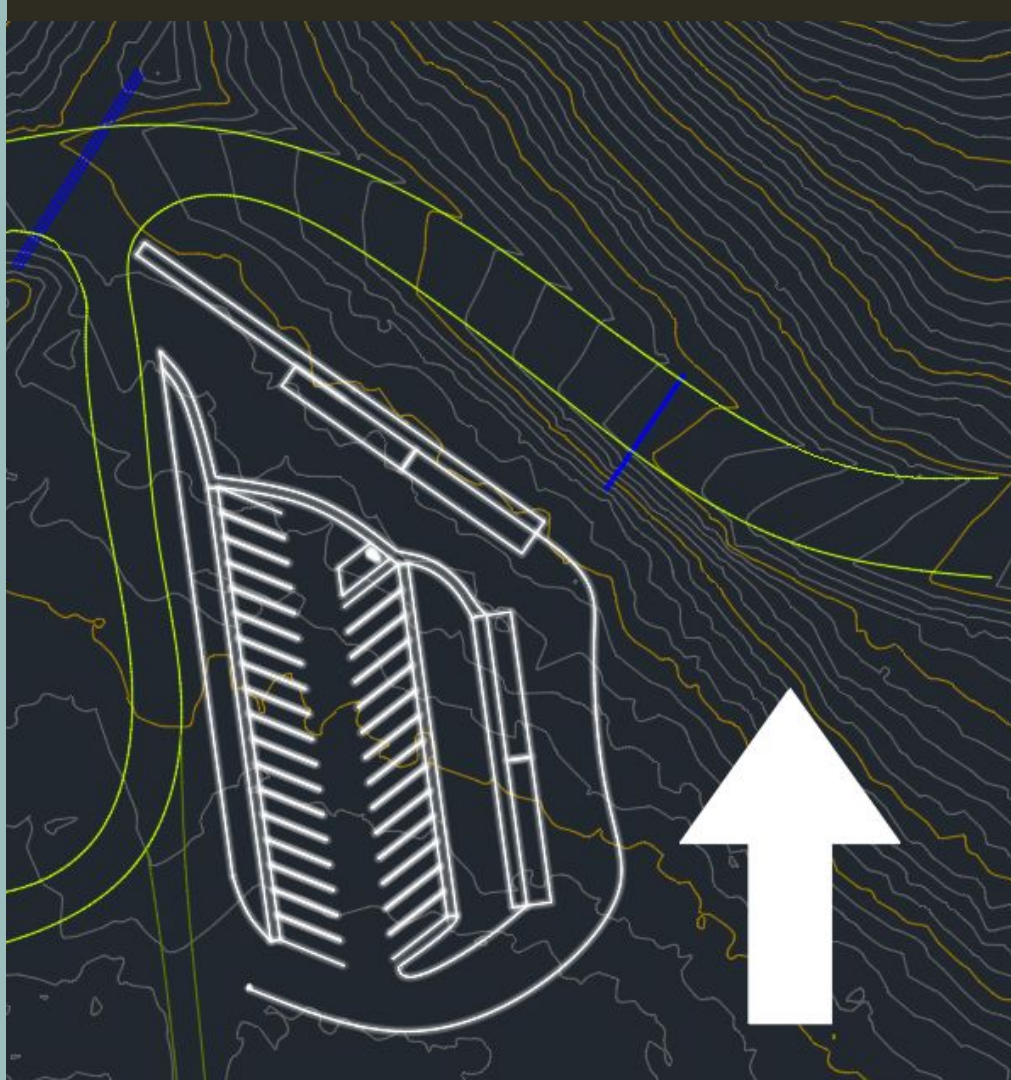


Figure 11: Proposed Parking Lot  
Draft Selected Feb. 20, 2018.



Questions?