Marquette Trail Design

Team Members



Project Manager Max Abbott Environmental



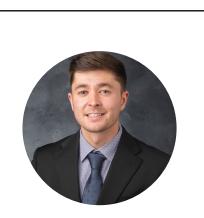
Technology Service

Ben Witzig Transportation Water Resource



Report Graphics Production

Shimin Xu Civil Practice



Report Text Production Mason Welter Civil Practice

Outline

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Project Objective

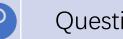
Design Elements

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Project Costs

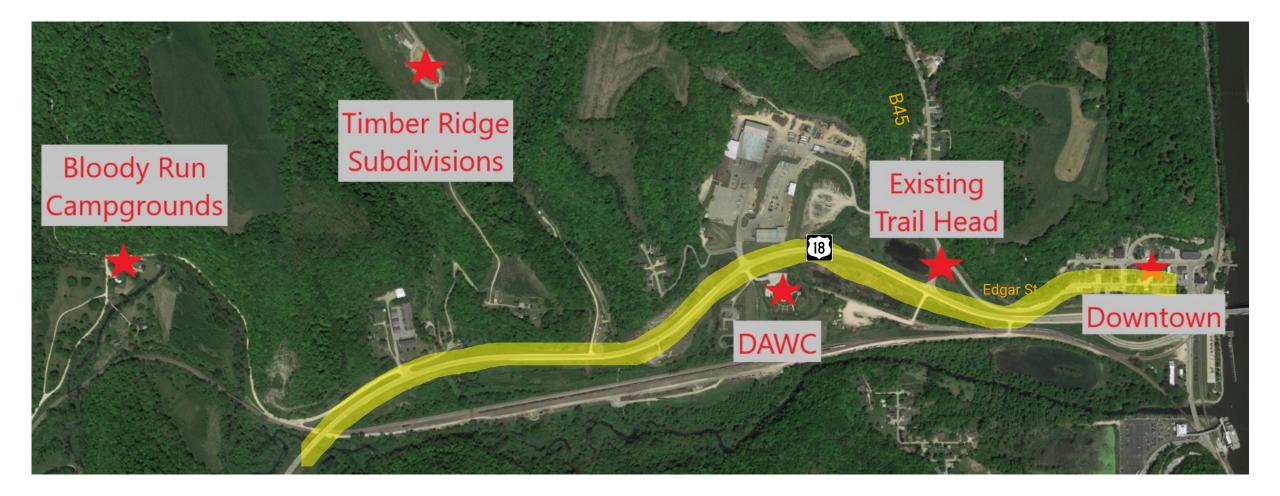


Conclusion/Recommendations



Questions

Project Objective











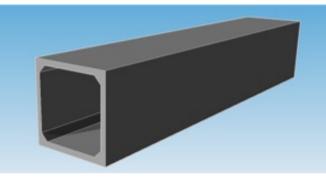




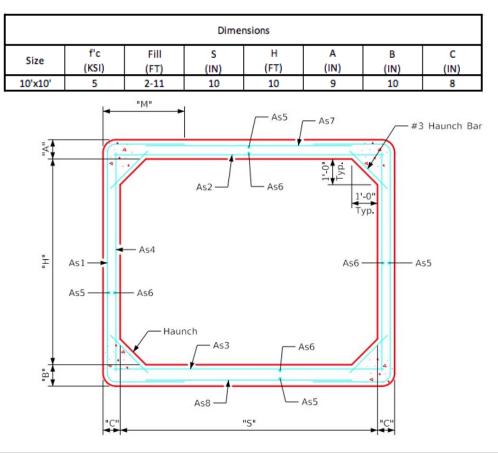


New Underpass Design



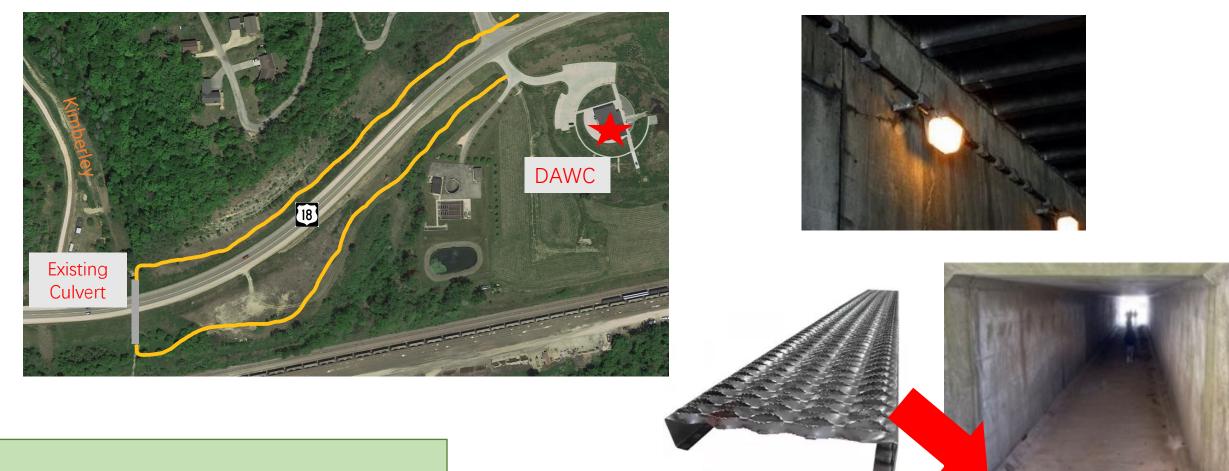


Alternative Cost: \$261,000



Reinforcement Requirements												
As1			A	As2 As3		As4		As5/As6		As7/As8		
Area (IN ² /FT)	Length	м	Area (IN ² /FT)	Length	Area (IN ² /FT)	Length	Area (IN ² /FT)	Length	Area (IN ² /FT)	Length	Area (IN ² /FT)	Length
0.54	16'-7"	2'-10"	1.04	10'-6"	1.13	10'-6"	0.2	10'-6"	0.12	10'	0.24	9'-4"

Existing Culvert



Alternative Cost: \$53,000

© Metals Depot

Pedestrian Surface Crossing



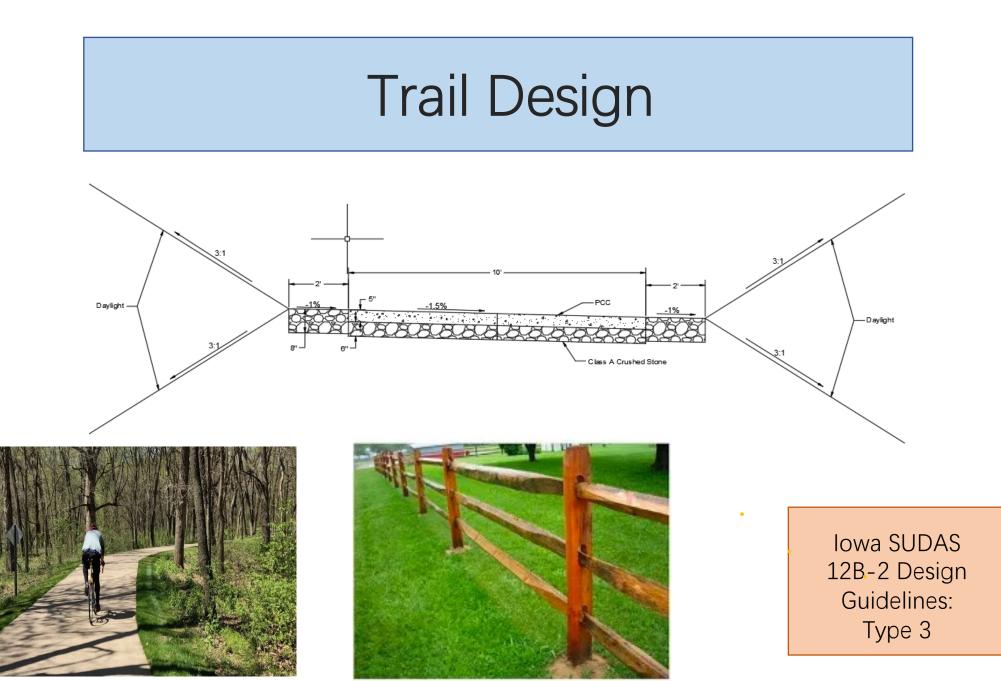






Alternative Cost: \$15,000

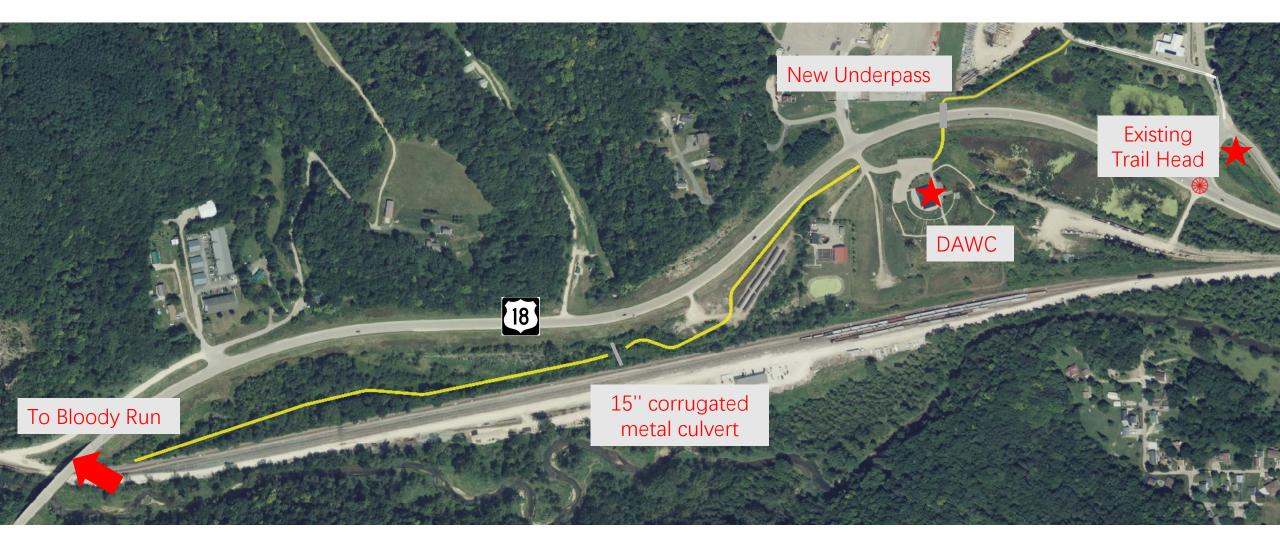




Trail Design



Recommendations



Project Cost

Recommended Route Cost

Design Element	Cost
Trail and Trail Elements	\$370,000
New Underpass	\$261,000
Total Project Cost	\$631,000
Total Project Cost (20% Contingency)	\$757,000

Costs Include/Factor:

- Material
- Labor
- Equipment
- Overhead
- Profit
- Inflation

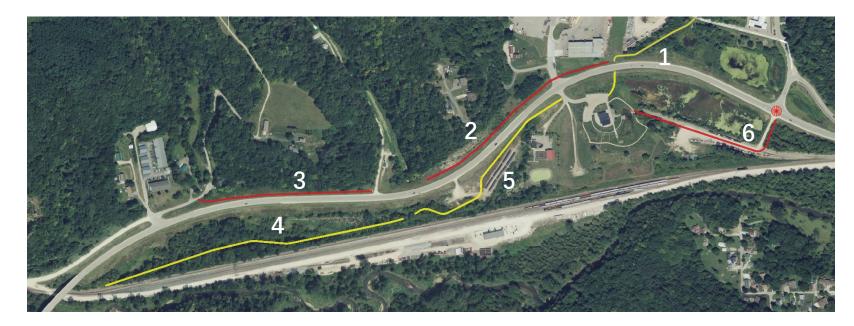
Cost Sources:

- DOT Bid Tabs
- lowa City Example Cost Estimation
- Online Vendors

Conclusion

Trail Segment	Cost
1	\$71,000
2	\$128,000
3	\$85,000
4	\$166,000
5	\$132,000
6	\$51,000

Crossing Alternative	Cost			
New Underpass	\$261,000			
Existing Underpass	\$53,000			
Crosswalk	\$15,000			



Detailed Cost Estimations

Item Clearing and Grubbing Excavation - class 12	556.18	ft			
	Quantity	Unit	Unit Price	Total	
Excavation - class 12	0.3	5 ACRE	\$4,531	\$1,575	
Cut/fill	626.9		\$48	\$30,070	
soil compaction	20.6	0 CY	\$1	\$22	
Pavement					
5" PCC	617.9		\$42	\$25,881	
6" class A crushed stone		3 Ton	\$32	\$8,675	
Pavement Marking	384.5	2 STA	\$12	\$4,614	
				\$70,837	Subtota
North Central Trail Segment	1599.1	ft			
Item	Quantity	Unit	Unit Price	Total	
Clearing and Grubbing	0.6	7 ACRE	\$4,531	\$3,045	
Excavation - class 12					
Cut/fill	527.5		\$48	\$25,300	
soil compaction	59.2	3 CY	\$1	\$63	
Pavement					
5" PCC	1776.7		\$42	\$74,411	
6" class A crushed stone	783.5	6 Ton	\$32	\$24,941	
				\$127,761	Subtotal
Northwest Trail Segment	1234.09	ft			
Item	Quantity	Unit	Unit Price	Total	
Clearing and Grubbing	0.6	6 ACRE	\$4,531	\$3,000	
Excavation - class 12					
Cut/fill	101.7		\$48	\$4,879	
soil compaction	45.7	1 СҮ	\$1	\$49	
Pavement					
5" PCC	1371.2		\$42	\$57,426	
6" class A crushed stone	604.704	1 Ton	\$32	\$19,248	
				\$84,603	Subtotal
Southwest Trail Segment	2173.2	ft			
Item	Quantity	Unit	Unit Price	Total	
Clearing and Grubbing	0.8	8 ACRE	\$4,531	\$4,003	
Excavation - class 12					
Cut/fill	568.1	S CY	\$48	\$27,248	
soil compaction	80.4	9 CY	\$1	\$86	
Pavement					
5" PCC	2414.6	7 SY	\$42	\$101,126	
6" class A crushed stone	1064.86	8 Ton	\$32	\$33,895	
				\$166,358	Subtotal
South Central Trail Segment	1454.43	ft			
Item	Quantity	Unit	Unit Price	Total	
Clearing and Grubbing	0.81	ACRE	\$4,531	\$3,689	
Excavation - class 12					
Cut/fill	738.94	CY	\$48	\$35,440	
soil compaction	53.87	CY	\$1	\$58	
Pavement					
5" PCC	1616.03	SY	\$42	\$67,679	
	712.6707	Ton			
		19911	\$22	\$22.684	
6" class A crushed stone Post fence (wood)		÷	\$32	\$22,684	
Post fence (wood)	261.66	ft	\$32 \$8	\$2,093	
Post fence (wood)	261.66				
Post fence (wood) Total width	261.66 14	ft		\$2,093	
Post fence (wood)	261.66			\$2,093	
Post fence (wood) Total width Pavement Width	261.66 14	ft		\$2,093	
Post fence (wood) Total width Pavement Width Soll compaction	261.66 14 10	ft ft		\$2,093	
Post fence (wood) Total width Pavement Width Soil compaction Base depth	261.66 14 10 0.5	ft ft ft		\$2,093	
Post fence (wood) Total width Pavement Width Soil compaction Base depth Clear zone width	261.66 14 10 0.5 2	ft ft ft ft		\$2,093	
Post fence (wood) Total width Pavement Width Soil compaction Base depth	261.66 14 10 0.5 2	ft ft ft		\$2,093	
Post fence (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area	261.66 14 10 0.5 2	ft ft ft ft		\$2,093	
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone	261.66 14 10 0.5 2	ft ft ft ft 1 sq. ft.		\$2,093	
Post fonce (wood) Total width Pavement Width Soll compaction Base dopth Clear zone width Cross Area G ^e class A crushed stone Depth	261.66 14 10 0.5 2	ft ft ft ft 1 sq. ft.		\$2,093	
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Density	261.66 14 10 0.5 2	ft ft ft ft 1 sq. ft. 5 ft 00 lb/ft^3		\$2,093	
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Density South East Trail Segment	261.66 14 10 0.5 2 0. 14	ft ft ft 1 sq. ft. 5 ft 10 lb/ft*3 ft	\$8	\$2,093 \$131,643	
Post fonce (wood) Total width Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Density South East Trail Segment Item	261.66 14 10 0.5 2 2 14 0.14 0.14	ft ft ft ft ft ft ft ft ft ft ft ft Unit	\$8 Unit Price	\$2,093 \$131,643 Total	Subtotal
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing	261.66 14 10 0.5 2 0. 14	ft ft ft 1 sq. ft. 5 ft 10 lb/ft*3 ft	\$8	\$2,093 \$131,643	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear sone width Cross Area 6* class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Execution class 12	261.66 14 10 0.5 2 0. 14 Quantity 0.14	ft ft ft ft ft ft ft ft ft ft l sq.ft. S ft Ub/ft^3 ft Unit ACRE	\$8 Unit Price \$4,531	\$2,093 \$131,643 Total \$653	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Depth Density South East Trail Segment Item Clearing and Grubbing Excavation class 12 Cut/Hil	261.66 14 10 0.5 2 2 14 0.14 0.14	ft f	\$8 Unit Price \$4,531 \$48	\$2,093 \$131,643 Total \$653 \$11,846	Subtotal
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Depth Density South East Trail Segment Item Clearing and Grubbing Excavation class 12 Cut/fill soil Compaction	261.66 14 10 0.5 2 0. 14 Quantity 0.14	ft ft ft ft ft ft ft ft ft ft l sq.ft. S ft Ub/ft^3 ft Unit ACRE	\$8 Unit Price \$4,531	\$2,093 \$131,643 Total \$653	Subtotal
Post fonce (wood) Total width Total width Soli compaction Base depth Clear zone width Cross Area 6" class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Exervation class 12 Cut/hil soli compaction Pavement	261.66 14 10 0.5 2 2 14 Quantity 0.14 247.00	ft ft ft ft ft ft ft ft ft ft ft ft ft f	\$8 Unit Price \$4,531 \$48 \$1	\$2,093 \$131,643 Total \$653 \$11,846 \$0	Subtotal
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6" class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Excavation class 12 Cur/hill soil compaction Pavement 5" PGC	261.66 14 10 0.5 2 0.14 Quantity 0.14 247.00 441.00	ft ft ft 1 sq. ft. 5 ft 0 lb/ft*3 ft Unit ACRE CY CY SY	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469	Subtotal
Post fonce (wood) Total width Total width Soli compaction Base depth Clear zone width Cross Area 6" class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Exervation class 12 Cut/hil soli compaction Pavement	261.66 14 10 0.5 2 2 14 Quantity 0.14 247.00	ft ft ft ft ft ft ft ft ft ft ft ft ft f	\$8 Unit Price \$4,531 \$48 \$1	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area E' class A crushed stone Depth Denthy Denthy South East Trail Segment Item Clearing and Grubbling Excavation class 12 Cut/fill Soll compaction Pavement 5" PCC E' class A crushed stone	261.66 14 10 0.5 2 0 14 Quantity 0.14 247.00 441.00 618	ft ft ft ft ft ft ft ft ft ft ft ft ft f	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Excavation Clearing and Grubbing Excavation Soil compaction Pavement 5° PRCC 6° class A crushed stone Total width	261.66 14 10 0.5 2 0. 14 Quantity 0.14 247.00 618 14	ft ft ft 1 sq. ft. 0 lb/ft*3 ft Unit ACRE CY CY CY CY Ton ft	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area E' class A crushed stone Depth Denthy Denthy South East Trail Segment Item Clearing and Grubbling Excavation class 12 Cut/fill Soll compaction Pavement 5" PCC E' class A crushed stone	261.66 14 10 0.5 2 0 14 Quantity 0.14 247.00 441.00 618	ft ft ft ft ft ft ft ft ft ft ft ft ft f	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area 6" class A crushed stone Depth Denth Denth Denth Clearing and Grubbing Excavation class 12 Cur/hil soll compaction Pavement 5" PCC 6" class A crushed stone Total width Pavement Width	261.66 14 10 0.5 2 0. 14 Quantity 0.14 247.00 618 14	ft ft ft 1 sq. ft. 0 lb/ft*3 ft Unit ACRE CY CY CY CY Ton ft	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soil compaction Base depth Clear zone width Cross Area 6° class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Excavation Clearing and Grubbing Excavation Soil compaction Pavement 5° PRCC 6° class A crushed stone Total width	261.66 14 10 0.5 2 0. 14 Quantity 0.14 247.00 618 14	ft ft ft 1 sq. ft. 0 lb/ft*3 ft Unit ACRE CY CY CY CY Ton ft	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area 6" class A crushed stone Depth Denth Denth Denth Clearing and Grubbing Excavation class 12 Cur/hil soll compaction Pavement 5" PCC 6" class A crushed stone Total width Pavement Width	261.66 14 10 0.5 2 0. 14 Quantity 0.14 247.00 618 14	ft ft ft 1 sq. ft. 0 lb/ft*3 ft Unit ACRE CY CY CY CY Ton ft	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area Gross A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Execution Cleas 12 Cut/fill Soll Compaction Total width Pavement Width Soll compaction	261.66 14 10 0.5 2 .14 Quantity 0.14 247.00 441.00 618 14 10	ft f	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area 6* Class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Excavation class 12 Cut/fill Soll compaction Pavement 5* PCC 6* class A crushed stone Total width Soll compaction Base depth	261.66 14 10 0.5 2 0. 14 Quantity 0.14 247.00 441.00 618 14 10 5 2 2	ft ft ft ft ft ft ft ft ft ft ft ft ft f	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area 6* Class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Execution Clearing and Grubbing Pavement 5* PCC For Lass A crushed stone For Clear zone width Soll compaction Base depth Clear zone width	261.66 14 10 0.5 2 0. 14 Quantity 0.14 247.00 441.00 618 14 10 5 2 2	ft f	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area 6° class A crushed stone Denth Denth Denth Denth South East Trail Segment Item Clearing and Grubbing Excavation class 12 Cur/fill Soil compaction Pavement Width Soil compaction Base depth Clear zone width Cross Area	261.66 14 10 0.5 2 0. 14 Quantity 0.14 247.00 441.00 618 14 10 5 2 2	ft f	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal
Post fonce (wood) Total width Pavement Width Soll compaction Base depth Clear zone width Cross Area 6* Class A crushed stone Depth Density South East Trail Segment Item Clearing and Grubbing Execution Clearing and Grubbing Pavement 5* PCC For Lass A crushed stone For Clear zone width Soll compaction Base depth Clear zone width	261.66 14 10 0.5 2 	ft f	\$8 Unit Price \$4,531 \$48 \$1 \$42	\$2,093 \$131,643 Total \$653 \$11,846 \$0 \$18,469 \$19,671	Subtotal

Marquette Trail Cost Estimate - 4/23 **Underpass Alternative Costs**

Alt. 1 - Existing Culvert						
Item	Quantity	Unit	ι	Unit Price		Total
Underpass Lighting	1	LS	\$	9,450.00	\$	9,450.00
24" wide x 2 x 12GA Galvanized Steel Safety Grate / Grip Strut	70	EACH	\$	622.00	¢.	43,540.00
Total	70	LACIT	Ŷ	022.00	\$	52,990
lotai					Ŷ	52,550
Alt. 2 New Underpass						
Item	Quantity	Unit	ι	Unit Price		Total
Precast Concrete Box Culvert, 10 FT. X 10 FT.	60	LF	\$	2,200.00	\$1	32,000.00
Precast Concrete Box Culvert Straight End Section, 10 FT. X 10 FT.	2	Each	\$	31,500.00	\$	63,000.00
Lighting	1	LS	\$	9,450.00	\$	9,450.00
Excavation	250	CY	\$	35.00	\$	8,750.00
Temporary Shoring	1	LS	\$:	20,000.00	\$	20,000.00
Anti-Graffiti Coating	300	SY	\$	25.00	\$	7,500.00
Steel Guardrail	200	LF	\$	100.00	\$:	20,000.00
					\$2	60,700.00
Alt. 3 Surface Pedestrian						
Item	Quantity	Unit	ι	Jnit Price		Total
Rectangular Rapid Flash Beacon	2	Each	\$	3,680.00	\$	7,360.00
Lighting Poles	2	Each	\$	3,685.00	\$	7,370.00
Paint	1	Sta	\$	250.00	\$	250.00

Pr	oject Recommend	ation	Cost Esti	mate	
Trail	Total Trail Length = 4183.81	ft			
Item	Quantity	Unit	Unit Price	Total	
Clearing and Grubbing	2.04	ACRE	\$4,531.41	\$9,267	
Excavation - class 12					
Cut/fill	1934.07	CY	\$47.96	\$92,758	
soil compaction	154.96	CY	\$1.07	\$166	
Pavement					
5" PCC	4648.68	SY	\$41.88	\$194,687	
6" class A crushed stone	2050.07	Ton	\$31.83	\$65,254	
Pavement Marking	384.521	STA	\$12.00	\$4,614	
Post fence (wood)	261.6635	ft	\$8.00	\$2,093	
				\$368,838	Subtotal
Small Culverts					
Item	Quantity	Unit	Unit Price	Total	
CULVERT, CORRUGATED					
METAL ENTRANCE PIPE,					
15 IN. DIA.	28	LF	\$40.00	\$1,120	
				\$1,120	Subtotal
Box Culvert (Underpass)					
Item	Quantity	Unit	Unit Price	Total	
Precast Concrete Box Cul	60	LF	\$ 2,200.00	\$132,000	
Culvert Straight End					
Section, 10 FT. X 10 FT.		Each	\$31,500.00	\$63,000	
Underpass Lighting		LS	\$9,450.00		
Excavation - class 12	250		\$ 35.00	\$8,750	
Temporary Shoring		LS	\$20,000.00	\$20,000	
Anti-Graffitti Coating	300		\$25.00	\$7,500	
Steel Gaurdrail	200	UF	\$100.00	\$20,000	
				\$260,700	Subtotal
			Construction		
			Subtotal	\$630,658	
			Contingencies (10%)	\$126,132	
			Total Project		
			Cost	\$756,790	

