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|------------------------|------------------------|---|---|-----------------------------|
| Project Location | Certified Vernal Pool* | Alternate Route 1 | NHESP Priority Habitats of Rare Species | Regulatory Floodway |
| Potential Vernal Pool* | Alternate Route 2 | NHESP Estimated Habitats of Rare Wildlife | 100-year Floodplain, with BFE | 100-year Floodplain, no BFE |
| Alternate Route 3 | Challenge Areas | | 500-year Floodplain | |

Bruce Freeman Rail Trail | Sudbury, Massachusetts

Figure 1 - Alternative Routes & Environmental Constraints

Source Info: Bing Maps, NHESP, FEMA, VHB

* Based on 2015 Vernal Pool Investigation*

Bruce Freeman Rail Trail
Sudbury, MA
Off-Trail Alternatives

Alternative Ranking Matrix

2/13/2017

Impact Criteria	Alternative 1 – Union Avenue ¹	Rank	Alternative 2 – Concord Road ²	Rank	Alternative 3 – Union Avenue Hybrid ³	Rank
1. Farmland Impacts	0 parcels	3	3 parcels	1	0 parcels	3
2. Relocation Impacts and ROW Acquisition	22 parcels impacted, 5 with commercial parking	1	19 parcels residential	2	10 parcels, 5 with commercial parking	3
3. Considerations Relating to Pedestrians and Bicyclists	Provides SUP for pedestrians in business area	2	Provides SUP for pedestrians to school/recreation facilities	3	Provides SUP for pedestrians in business area	2
4. Air Quality Impacts	Temp minor during construction	2	Temp minor during construction	2	Temp minor during construction	2
5. Noise Impacts	Temp minor during construction	2	Temp minor during construction	2	Temp minor during construction	2
6. Bridges/Culverts	Widen culvert/bridge Hop Brook	1	Lengthen culvert Pantry Brook	2	Widen culvert Hop Brook	1
7. Regulatory Floodway	350 LF	2	100 LF	1	450 LF	3
8. 100-year Floodplain w/BFE	1,250 LF	3	1,300 LF	3	1,900 LF	2
9. 100-year Floodplain no BFE	0	3	1,300 LF	1	0	3
10. 500-year Floodplain	350 LF	2	200 LF	3	350 LF	2
11. Certified Vernal Pool	0	3	0	3	0	3
12. Potential Vernal Pool	0	3	0	3	1	2
13. NHESP Priority Habitat Rare Species	0	3	625 LF	1	0	3
14. NHES Estimated Habitat Rare Wildlife	0	3	625 LF	1	0	3
15. Construction Impacts	Traffic delays on Union	2	Traffic delays Morse, Concord, Pantry & Haynes	1	Traffic delay on Union	3
16. Visual Impacts	Path along businesses	2	Path along residential lots	1	Path along business frontage	2
17. Public Utilities	Guy pole impacts	3	Utility pole and guy relocations	1	Guy pole relocations	3
18. Conservation Land/Sce Road Impacts	None	3	Scenic road impact	3	Conservation Land impact	3
19. Maintenance and Operations	Plowing path along roadway	2	Plowing path along roadway	1	Plowing path along roadway	3
Final Score		45		35		48
Cost ⁴	(1.0322 mi) \$2.064 million		(1.7667 mi) \$3.533 million		(0.6387 mi along road, 0.1527 mi off-road) \$1.506 million	

- 1

Path on west side Union Avenue
- 2

Path on east side Concord Avenue
- 3

Path on west side Union Avenue
- 4

Estimated \$2 million per mile for SUP adjacent to roadway, \$1.5 million per mile for off-road path

3 – Most Preferred

1 – Least Preferred

Considerations for Various Trail Treatments along the Rail Road Alignment

		10' Paved Width with 3:1 slopes		Rank	Boardwalk (14')		Rank	Reduced Width – 8' paved; 3:1 slopes		Rank	10' Paved Width with Walls/ Rip-rap		Rank	8' Paved Width with Walls		Rank
Permanent Wetland Impacts Sta. 167+50 – 174+00	<i>South of Hudson Road (Rt. 27) Through the majority of this section, one side of embankment is bank and the other side is BVW.</i>	1,840± sf	2,740sf	5	At footings 12± sf	112 sf	1	940± sf	1,840 sf	4	630± sf	1,390 sf	3	290± sf	950 sf	2
Temporary Wetland Impacts Sta. 167+50 – 174+00		900± sf		4	100± sf		1	900± sf		5	760± sf		3	660± sf		2
Permanent Bank Impacts – Sta. 167+50 – 174+00		875± ft		3	At footings 75± ft		1	850± ft		4	850± ft		4	835± ft		2
Temporary Bank Impacts – Sta. 167+50 – 174+00		775± ft		4	650± ft		5	745± ft		1	815± ft		2	85± ft		3
Permanent Wetland Impacts Sta. 292+00-304+00	<i>South of North Road (Rt. 117) and North of Haynes Road Through the majority of this section, both sides of the embankment are BVW. The limited bank is on both sides of a culvert.</i>	10,800± sf	16,380 sf	5	At footings 200± sf	12,300 sf	1	5870± sf	10,215 sf	4	1575± sf	4,425 sf	3	1065± sf	2,950sf	2
Temporary Wetland Impacts Sta. 292+00-304+00		5,580± sf		4	12,100± sf		5	4345± sf		3	2850± sf		2	1885± sf		1
Permanent Bank Impacts – Sta. 292+00-304+00		27± ft		3	n/a	n/a	1	18± ft		2	n/a	n/a	1	n/a	n/a	1
Temporary Bank Impacts – Sta. 292+00-304+00		10± ft		3	n/a		1	8 ft		2	n/a		1	n/a		1
Floodplain Impacts		None		1	none		1	none		1	none		1	None		1
Pedestrian/Bicycle Conflicts		AASHTO minimum		1	AASHTO minimum		3	Will reduce width for passing		4	AASHTO minimum		2	Will reduce width for passing		5
Design Waiver		Not required		1	Not required		1	Will require MassDOT approval		5	Not required		2	Will require MassDOT approval		5
Vegetation Removal				5			3			2			4			1
Emergency Response Time		--		1	would be reduced Boardwalk would be designed to meet H10 loading		3	would be reduced		4	--		2	would be reduced		5
Law Enforcement Response time		--		1	would be reduced Boardwalk would be designed to meet H10 loading			would be reduced		4	--		2	would be reduced		5
Construction Costs				3	\$215/sf		5	-		1	\$75/sf		4			2
Maintenance Costs		--		2	--		5	--		1	--		2	--		1

Rank: 1= least impactful, 5= most impactful

(Wetland Resource Impact Estimates are preliminary and provided for Identified Challenge Areas)

Considerations for Various Trail Treatments along the Rail Road Alignment

To Meet a Goal of Avoiding a Variance of the Wetlands Protection Act the Following Three Options Are Under Consideration

(Based on Preliminary Wetland Resource Impact Estimates and only quantified for Identified Challenge Areas)

		<div><div></div><div>14'</div><div></div></div>		<div><div></div><div>2+' 10' 2+' </div><div></div></div>		<div><div></div><div>2+' 8' 2+' </div><div></div></div>	
OPTION 1 = 3,062+ sf		Boardwalk (14') 14' of decking- railing to railing		10' Paved Width with Walls/ Rip-rap and railings		8' Paved Width with Walls and railings	
Permanent Wetland Impacts Sta. 167+50 – 174+00	South of Hudson Road (Rt. 27) - 650 ft Through the majority of this section, one side of embankment is bank and the other side is BVW.	At footings 12+ sf	112 sf				
Temporary Wetland Impacts Sta. 167+50 – 174+00		100+ sf					
Permanent Wetland Impacts Sta. 292+00-304+00	South of North Road (Rt. 117) and North of Haynes Road – 1200 ft Through the majority of this section, both sides of the embankment are BVW. The limited bank is on both sides of a culvert.					1065+ sf	2,950sf
Temporary Wetland Impacts Sta. 292+00-304+00						1885+ sf	

OPTION 2 = 3,900+ sf		Boardwalk (14')		10' Paved Width with Walls/ Rip-rap		8' Paved Width with Walls	
Permanent Wetland Impacts Sta. 167+50 – 174+00	South of Hudson Road (Rt. 27) - 650 ft Through the majority of this section, one side of embankment is bank and the other side is BVW.					290+ sf	950 sf
Temporary Wetland Impacts Sta. 167+50 – 174+00						660+ sf	
Permanent Wetland Impacts Sta. 292+00-304+00	South of North Road (Rt. 117) 1200 ft Through the majority of this section, both sides of the embankment are BVW. The limited bank is on both sides of a culvert.					1065+ sf	2,950sf
Temporary Wetland Impacts Sta. 292+00-304+00						1885+ sf	

OPTION 3 = 4,537+ sf		Boardwalk (14')		10' Paved Width with Walls/ Rip-rap		8' Paved Width with Walls	
Permanent Wetland Impacts Sta. 167+50 – 174+00	South of Hudson Road (Rt. 27) - 650 feet Through the majority of this section, one side of embankment is bank and the other side is BVW.	At footings 12+ sf	112 sf				
Temporary Wetland Impacts Sta. 167+50 – 174+00		100+ sf					
Permanent Wetland Impacts Sta. 292+00-304+00	South of North Road (Rt. 117) - 1200 feet Through the majority of this section, both sides of the embankment are BVW. The limited bank is on both sides of a culvert.			1575+ sf	4,425 sf		
Temporary Wetland Impacts Sta. 292+00-304+00				2850+ sf			