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Town of Yarmouth

Cape Cod Rail Trail to Drive-In Parcel Trail Connection – Alternatives Development Report

Direct Local Technical Assistance Program



Prepared by Cape Cod Commission staff

February 2019

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Development's District Local Technical Assistance program through the Cape Cod
Commission

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Introduction/Background

The Town of Yarmouth (Town) requested assistance from the Cape Cod Commission (Commission), through the District Local Technical Assistance (DLTA) program, to identify and analyze options for connecting the “Drive-In” parcel south of Route 28 adjacent to the Parkers River with the Cape Cod Rail Trail (CCRT) using the existing bicycle and facility network and/or creation of new facilities. The Town’s request reflects its interest in improving the economic vitality of the Route 28 commercial corridor. The Town contracted with the Urban Land Institute (ULI) in 2017 for a Technical Assistance Panel (TAP) to devise a strategy for re-invigorating the area and to assess the redevelopment potential of the former drive-in theater site. The TAP identified both the drive-in site and the Cape Cod Rail Trail, with its recent westward extension into Yarmouth and programmed future extension through Yarmouth into Barnstable, as town assets. Providing a bicycle connection between the two could help create a new destination for bicycle tourism as well as improve access to employment opportunities and businesses along the Route 28 corridor. The TAP report noted the contiguous swath of town-owned land between Route 6 and the drive-in parcel as providing a key opportunity for construction of an interconnected bicycle/shared-use path from the CCRT to the drive-in parcel.

GOALS AND OBJECTIVES

Commission staff and Town of Yarmouth staff established following goals and objectives for bicycle route development:

1. Provide a comfortable and enjoyable bicycle route between the Cape Cod Rail Trail and the drive-in parcel for Yarmouth residents and visitors.
 - Create a bikeway that provides a relatively direct route between the two destinations and/or has scenic surroundings and includes points of interest or attraction, including local commercial venues.
 - Minimize motorized/non-motorized vehicle conflict.
2. Maximize use of existing and future assets to connect the two destinations.
 - Minimize right-of-way acquisition.
 - Maximize use of public land, including public rights-of-way.
3. Minimize and/or mitigate adverse impacts to natural and cultural resources.
4. Minimize and/or mitigate impacts to dense residential neighborhoods.



GUIDE TO TERMINOLOGY

The following terms have the following meanings in this report:

Bicycle facility - a new or improved lane, path, or shoulder for use by bicyclists. Bicycle facilities also include associated bicycle accommodations such as bicycle shelters, parking, and bicycle-oriented traffic control devices.

Bicycle path - A right of way, separate from a roadway, designated for bicycle or other non-motorized use. The term bicycle path is used interchangeably with “shared-use path” and “multi-use path” in this report.

Bicycle route - A suggested route for bicycle travel. It may be an on-road route where bicyclists and motor vehicles share the travel way, and it may include stretches of other designated bicycle facilities. In general, a bicycle route designation does not require that the road include any special bicycle facilities.

Full separation – refers to a bicycle facility where the bicycle travel area is separated from the motor vehicle area by a physical barrier such as guard rail, curbing, bollards, etc. A fully separated facility may be located adjacent to the roadway alignment (e.g., protected bike lane) or in a location away from a road (such as the Cape Cod Rail Trail).

Multi-Use Path – See Shared-Use Path. These terms are used interchangeably in this report.

Partial Separation –refers to a bicycle facility (e.g. bike lane) that provides a designated space for bicycling with pavement markings but is located within the roadway footprint without a physical barrier from the motor vehicle area.

“Share the road” program – a public education initiative directed at cyclists and motorists to encourage safe roadway behavior and promote safe travel spaces for all road users. “Share the road” signage and pavement markings are used to inform and direct road users where bicycles and motor vehicles share road space.

Shared Use Path - A path or trail that is physically separated from motor vehicle traffic located either within the road right of-way or within an independent right-of-way. Also referred to as – multiuse pathways, they include bicycle paths, rail-trails or other facilities built for bicycle and pedestrian traffic and allowing other non-motorized travel modes such as skateboards and horses.



Yarmouth Bicycle and Pedestrian Trail Network

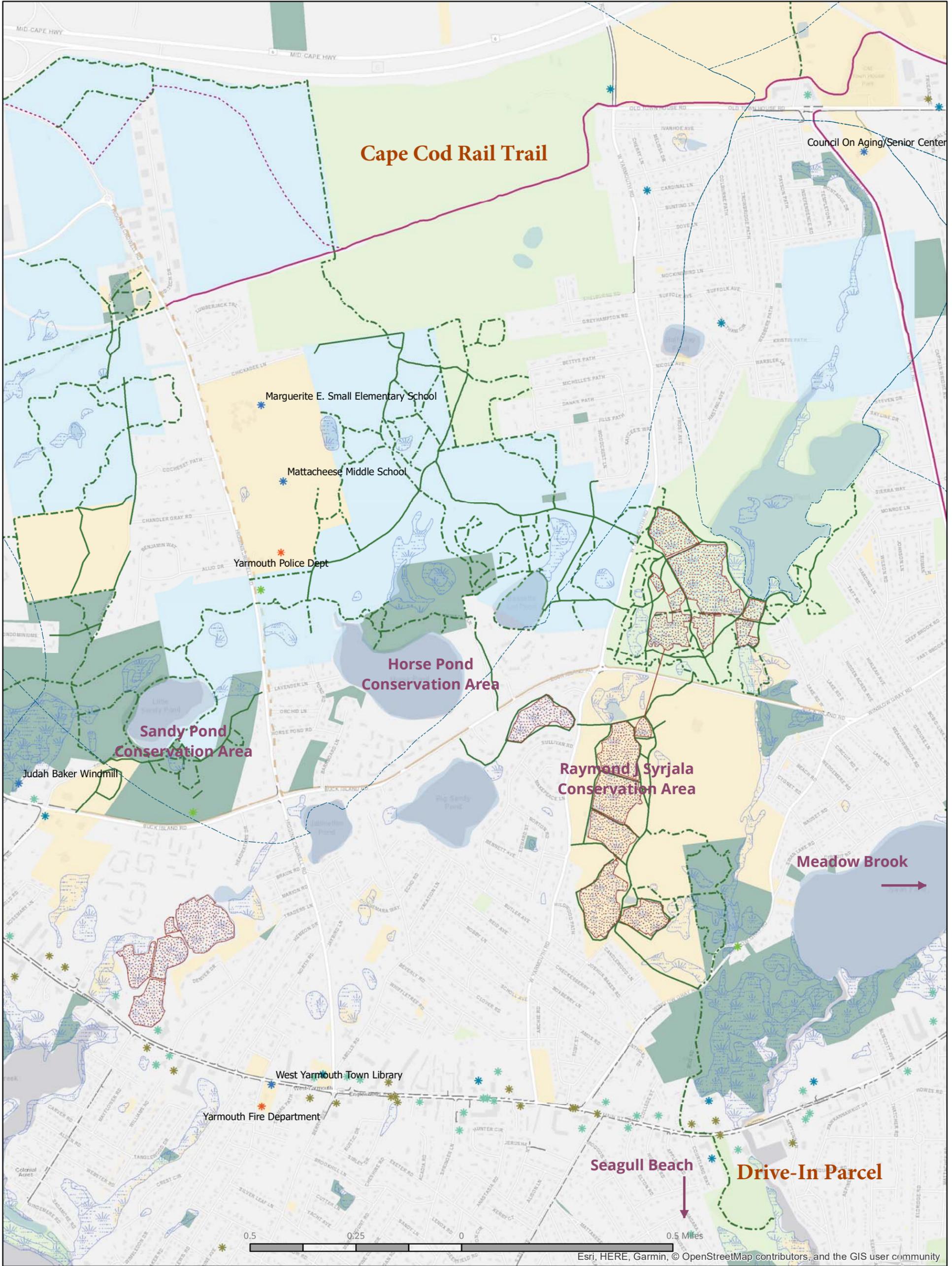
EXISTING AND PROPOSED

The Cape Cod Rail Trail (CCRT) travels through the towns of Wellfleet, Eastham, Orleans, Brewster, Harwich, Chatham, Dennis, and Yarmouth. A westward extension to Barnstable is programmed for 2020, and an extension through the Outer Cape towns of Truro and Provincetown as proposed in the Outer Cape Bicycle and Pedestrian Master Plan also is underway. The Yarmouth portion of the CCRT follows the railroad right-of-way from Dennis into Yarmouth, with bridges across the Bass River and Station Avenue, to Peter Homer Park. The CCRT connects with the town-owned Old Town House Road bike path and continues westward through Bayberry Hills golf course to Higgins Crowell Road. The Town-owned path will be upgraded and integrated into the CCRT Phase 3 construction, which will extend the path through Yarmouth Water Department land, across Willow Street with a new bridge, and continue through Yarmouth into Barnstable.

A bike path on Forest Avenue runs from the Old Town House Road intersection to Route 28. It begins across Old Town House Road from Peter Homer Park and the CCRT but does not directly connect with the CCRT. A wide/expanded sidewalk that functions as a bike path runs along Buck Island Road but does not connect to the CCRT network.

An extensive unpaved and off-road trail network, including unpaved footpaths, fire roads and cranberry bog service roads, is located throughout Yarmouth's town-owned open space areas, including conservation areas and Water Department land. The trails extend through woodlands, active cranberry bogs, meadows, and other scenic areas and provide opportunities for hiking, dog-walking, and exploring nature. Mountain bicyclists also use the trails.

Yarmouth Existing Trail Inventory/ 2018 Cape Cod Rail Trail Drive-In Parcel Bike Route Study



Shared Use Pathways (SUP) Points of Interest		Pedestrian Accommodations		Town Owned Land		Cranberry Bogs	
Path	Accommodation and Food Services	Wide Sidewalk (width greater than 5')	Municipal Conservation	Cranberry Bogs	Wetlands	Municipal Recreation	Wellhead Protection Areas
proposed path	Arts, Entertainment, and Recreation	Sidewalk (width less than 5')	Municipal Other	Water District			
Unpaved Trails		Proposed Sidewalk					
Wide trail/Fire Road	Retail Trade						
Narrow Trail	Municipal Buildings						
	Community Site						
	Trailheads						

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OTHER FUTURE PATHS/TRAILS

The town (through a consultant) prepared engineered plans for the installation of a sidewalk/shared-use path along most of Higgins Crowell Road. A bicycle/pedestrian facility in this location would provide a key north-south connection between the CCRT and Route 28. In addition, a shared-use path is proposed on the south side of Route 28 in the current designs for the future Bass River bridge upgrade/improvements and Route 28/Main Street/Old Main Street intersection through to Mill Lane.

Cape Cod Rail Trail to Drive-In Routes

ROUTE DEVELOPMENT

Using the project's goals and objectives as the guiding principles for route development, Commission staff reviewed maps of the existing trail network between the CCRT and the drive-in parcel and conducted site visits to evaluate trail conditions and connections. Most of the road network between the two destinations lacks bicycle accommodations, requiring bicyclists to share space with motorists on busy roads. The existing trail network through town-owned land provides opportunities to travel between the CCRT and the drive-in parcel without using the road network. The trails are unpaved and are unsuitable for bicycling (other than off-road/mountain bikes) without additional clearing and grading. Some trails are narrow footpaths between 4-6 feet in width. Others are wider fire- and cranberry bog service roads approximately 10 feet wide.

The project team identified two off-road CCRT to drive-in route alternatives that follow inter-connected existing trails and bog roads through town-owned land in the western part of town. The team also developed route alternatives that follow existing roads and connect from the east. The alternatives along the roads would need to incorporate sidewalk expansion or protected bike lanes to provide full separation from motor vehicles.

Following guidance from town staff, the project team focused its analysis for this study on the off-road route alternatives through town-owned property. Town staff suggested identifying the other routes as potential opportunities for improving bicycling connectivity in the future. (See Appendix - "Future Connectivity Considerations" section for a description and maps of the other considered routes.)

Working with town staff, the project team refined the off-road trail alternatives and created a "Main Route Option" as the primary alternative for consideration. The Main Route Option includes alternative segment options in areas with natural resource issues or land use conflicts. The team also developed additional route options for consideration south of Buck Island Road, based on suggestions from town staff. These are labelled as "Other Route Options."



OPPORTUNITIES AND CHALLENGES

The contiguous nature of Town owned land between the CCRT and the drive-in parcel presents a significant opportunity for creating an interconnected off-road bicycle facility through scenic land with gentle topography. Locating the route on town-owned land reduces the need for and cost of right-of-way acquisition. The contiguity allows for the creation of an off-road route that is fully separated from motor vehicles. The flat and scenic nature of the land adds to its appeal for bicycling. Challenges for bike path construction through this land include potential impacts to (and/or mitigation for) environmental resources such as wetlands; potential conflicts with existing uses, including cranberry bog operations, water department operations, hunting activity, conservation area uses, and road crossing locations. The project team considered these factors in its route development process. Discussion of these issues is provided in the Routes Analysis section

MAIN ROUTE OPTION

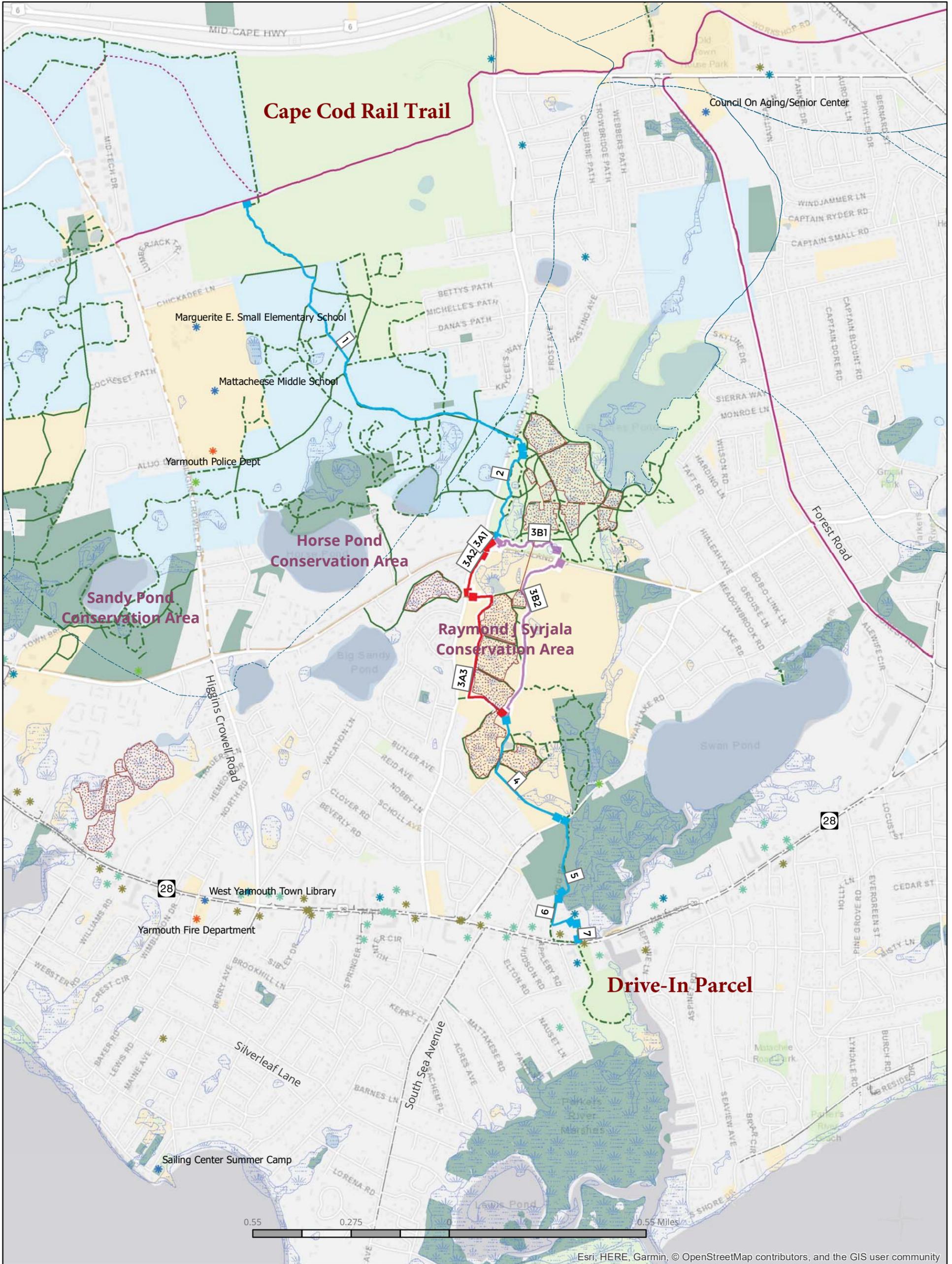
The project team mapped the “Main Route” option and labeled route segments for identification purposes. A description of the route and segments follows below. See Figure 2.

1. The Main Route option travels on existing unpaved trails off the Bayberry Hills bike path south through Town of Yarmouth Water Department land to West Yarmouth Road (Segment 1).
2. It crosses West Yarmouth Road and proceeds south on new trail that runs parallel to the road, between the adjacent woodlands and the cranberry bogs, to approximately 200’ north of the intersection of West Yarmouth Road and Buck Island Road (Segment 2).
3. From there, route options are either to:
 - A. Proceed south on a new trail approximately 200’ to the West Yarmouth Road and Buck Island Road intersection (Segment 3a1); cross, and continue on a new trail approximately 700’ into the Raymond Syrjala Conservation Area (Segment 3a2) to the junction with an existing bog road between West Yarmouth Road and the west side of the bogs (Segment 3a3) that turns to the southeast and intersects with an existing north-south trail (Segment 3b2) on the east side of the bogs); or
 - B. Follow existing trails approximately a quarter-mile east to a Buck Island Road trailhead across from Water Department driveway (Segment 3b1); cross Buck Island Road and continue into the Raymond Syrjala Conservation Area on an existing bog road on the east side of the bogs (Segment 3b2) for approximately a half-mile to the junction with Segment 3a3, between the bogs.
4. Following either A or B alternative into the southern half of the bog area, the route continues through the bogs on existing trails adjacent to wetlands to Winslow Gray Road (Segment 4).
5. After crossing Winslow Gray Road, the route continues through town-owned land on Bog Road until the Whydah (private) property line (Segment 5).



6. From the Whydah property line the route would travel through the Whydah parking area (Segment 6);
7. It then turns south across the adjacent “Captain Parker (private) property and driveway for approximately 320’ (Segment 7) to Route 28 across from the drive-in parcel.
8. A road crossing would be needed across Route 28 to gain access to the drive-in parcel.

2018 Cape Cod Rail Trail Drive-In Parcel: Main Route Option



Shared Use Pathways (SUP)	Points of Interest	Main Route Option	Town Owned Land	Cranberry Bogs
Path	Accommodation and Food Services	Blue: Main Route	Municipal Conservation	Cranberry Bogs
proposed path	Arts, Entertainment, and Recreation	Red: Option A	Municipal Recreation	Wetlands
Unpaved Trails	Retail Trade	Purple: Option B	Municipal Other	Wellhead Protection Areas
Wide trail/Fire Road	Municipal Buildings	Pedestrian Accommodations	Water District	
Narrow Trail	Community Site	Wide Sidewalk (width greater than 5')		
	Trailheads	Sidewalk (width less than 5')		
		Proposed Sidewalk		



Wide trail (fire road) through water department land (left); and West Yarmouth road trail entrance to the bogs (Main Option, Segment 1).



Main Route Option Segment 2 view from West Yarmouth Road bogs (left) south; and trail head near Winslow Gray Road (Segment 4)



View from drive-in parcel north across Route 28 towards the Whydah property and adjacent restaurant parking lot (Segment 7)

OTHER ROUTE OPTIONS - ADDITIONAL OPTIONS SOUTH OF BUCK ISLAND ROAD

Following the project team's presentation of the Main Route Option, town staff identified additional alternative route segments south of Buck Island Road for consideration. These "Other Route Options" consist of several possible route segments on new trails, as described below and shown in Figure 3.

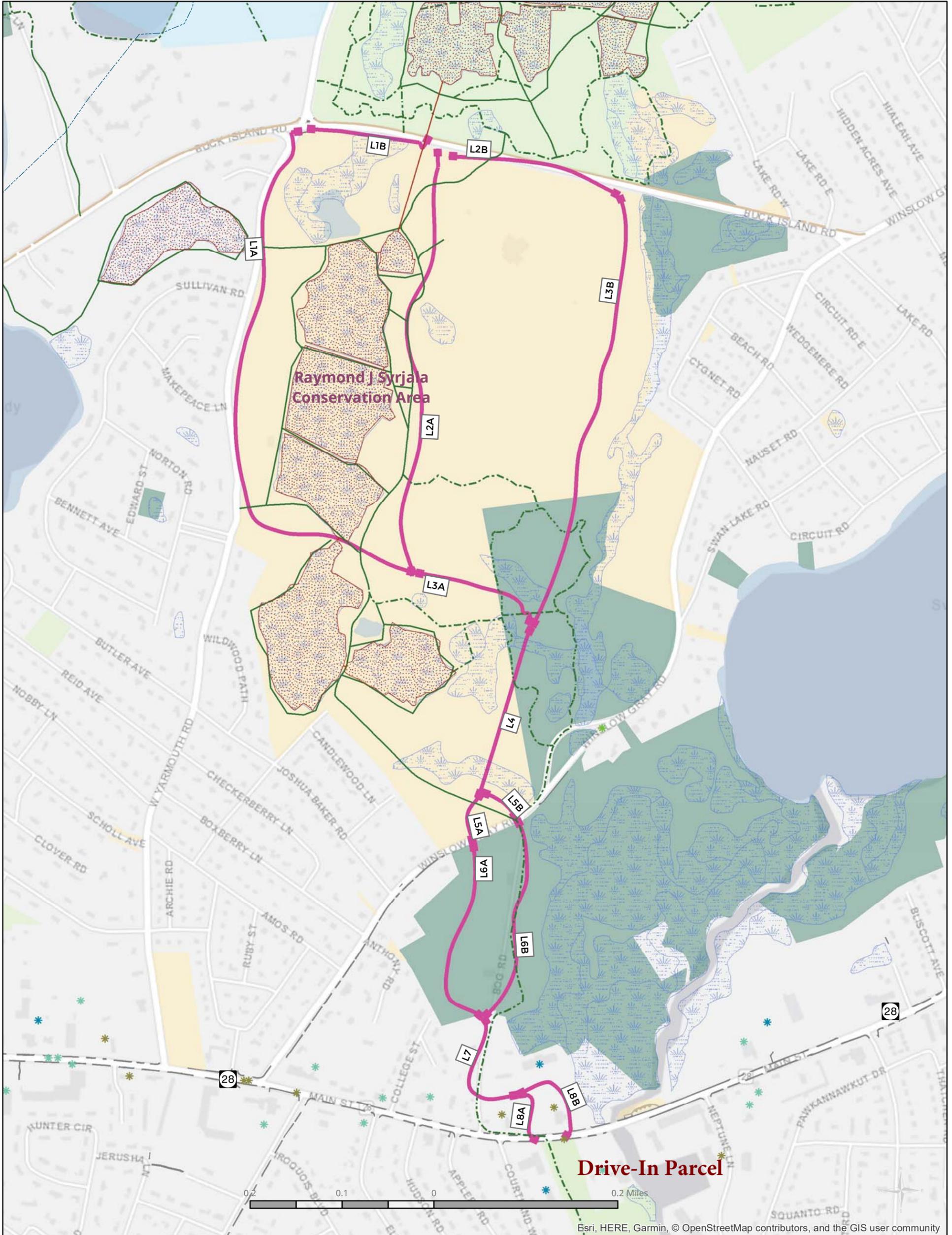
1. Buck Island Road to Winslow Gray Road options:
 - A. West side of bogs route: Continue south on a new trail (Segment L1A) east of the West Yarmouth Road right of way and west of the existing bog road/trail that turns eastward just south of a West Yarmouth Road trail head and overlaps with an existing bog road located between the bogs and continues east past the junction of the southern end of Segment L2A, to a wetland trail junction in the conservation area east of Syrjala land boundary (Segment L3a); or
 - B. Center of bogs route: Travel east on the Buck Island Road wide sidewalk approximately 700' (Segment L1B), with a crossing at the existing trailhead. After crossing Buck Island Road, a new north-south trail through the center of the bogs (Segment L2A) an adjacent bog road would continue south to the junction with Segment L1A (and L3A).
 - C. East of the bogs route: An alternative to Segment L1B's orientation towards the center of the bogs is to follow the Buck Island sidewalk approximately two-tenths mile farther east (Segment L2B), cross Buck Island Road, and travel south through the bog area on a new north-south trail east of the wastewater treatment facility, adjacent to the Plashes



Brook wetland system, through the eastern part of the Syrjala Conservation Area (Segment L3B).

2. Segment 4 continues south through streams and wetland areas on a new trail to the south eastern edge of the Syrjala Conservation Area.
3. Two route options could connect from here to Winslow Gray Road and points south.
 - A. One option travels southwest on an existing trail to Winslow Gray Road (Segment L5A). After crossing Winslow Gray Road, it proceeds on a new trail south (Segment L6A) that travels to the west of the town's storage building compound to the southern boundary of town land and the Whydah property on Bog Road.
 - B. The second option travels southeast on an existing trail to a trail head at Winslow Gray Road opposite a Town of Yarmouth municipal building driveway. After crossing Winslow Gray Road, it follows a new trail (Segment L6B) along the east of the town storage compound parallel to Bog Road, ending at the southern boundary of town land and the Whydah property on Bog Road.
4. Segment 7 travels through the Whydah parking lot, with two options from there to Route 28/drive-in.
 - A. One option is to proceed from the Whydah parking area on Segment L8A through Captain Parker property to the Route 28 driveway directly across from the drive-in parcel.
 - B. The other option is to proceed farther east through the Whydah parking lot to its entrance drive on Route 28, slightly east of the drive-in parcel (Segment L8B).
5. A crossing of Route 28 would be needed to reach the drive-in parcel.

2018 Cape Cod Rail Trail Drive-In Parcel: Other Route Option: South of Buck Island Road



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<p>Shared Use Pathways (SUP)</p> <ul style="list-style-type: none"> — Path — proposed path — Unpaved Trails — Wide trail/Fire Road — Narrow Trail 	<p>Points of Interest</p> <ul style="list-style-type: none"> ★ Accommodation and Food Services ★ Arts, Entertainment, and Recreation ★ Retail Trade ★ Municipal Buildings ★ Community Site ★ Trailheads 	<p>Other Route Option</p> <ul style="list-style-type: none"> — Other Route Option <p>Pedestrian Accommodations</p> <ul style="list-style-type: none"> — Wide Sidewalk (width greater than 5') — Sidewalk (width less than 5') — Proposed Sidewalk 	<p>Town Owned Land</p> <ul style="list-style-type: none"> ■ Municipal Conservation ■ Municipal Recreation ■ Municipal Other ■ Water District 	<ul style="list-style-type: none"> ■ Cranberry Bogs ■ Wetlands ■ Wellhead Protection Areas
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Alternatives Analysis

ROUTE CHARACTERISTICS

The project team used a web mapping application it created for the project to analyze the route alternatives. The mapping application allows users to see selected data layers such as wetlands, wetland buffer areas, mapped habitat, etc., and their locations relative to the trail alternatives. The project team used the mapping application to measure segment lengths and resource areas. The measurements are estimates and not precise, given the coarseness of the measuring tool but they are useful for comparing segment alternatives and understanding relative impacts.

The Route Characteristics Table shown on Page 16 provides information on features of the Main Route Option segments and the Other Route Options South of Buck Island Road segments. For the sake of comparison between the Main Route Option and the Other Route Options South of Buck Island Road, the table includes three “sample” routes comprised of Other Route Options segments. A list and description of the table columns are provided below, followed by a summary of characteristics.

Segment ID: Number/letter to identify each route segment.

Segment Condition: Indicates whether the segment is located on one of the following:

- Existing Trail (Narrow =5', Wide=10', Mix = both narrow and wide trail pieces in segment);
- Existing Sidewalk; or,
- No trail exists in the location, shown as a blank - no entry in column cell. The segment would be a new trail.

Location: Describes where the segment is located. The direction of travel is oriented from the Cape Cod Rail Trail to the Drive-In parcel.

Segment Length: Length of segment in miles.

Suggested Accommodation: Type of facility for segment:

- Multi-Use Path = 10' path with 2' shoulders each side;
- Share the Road: Bicycles and motor vehicles share the road. Pavement markings and signage for guidance and safety.
- Sidewalk

Property Owner: Indicates whether the segment is located on Public (Town of Yarmouth or MassDOT) or private property.

Area of New Disturbance: Approximate area of clearing for accommodation.



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Wetland Buffer: Approximate length of segment within mapped DEP 100' wetland buffer area.

Impact to Wetland Buffer: Approximate area of segment in wetland buffer area.

Wetlands: Length of segment in mapped wetland.

Cost of Accommodation: Estimated cost of construction. Does not include design, permitting, environmental mitigation costs, etc.

Note: The initial route characteristics analysis included review of Massachusetts Natural Heritage and Endangered Species Program (NHESP) mapped Priority Habitat for rare species. No route segments are located within Priority Habitat areas, so this field was not included in the table.



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Route Characteristics Table
Cape Cod Rail Trail to Drive-In Parcel

Segment ID	Segment Condition	Location	Segment Length (Miles)	Suggested Accommodation	Property Owner	Area of new disturbance (sq.ft)	Wetland Buffer (ft)	Impact to wetland buffer (ft2)	Wetlands (ft)	Cost of Accomodation1 (\$1,000)
MAIN ROUTE (w/ Option A)										
1	Existing Trail (mix)	Bayberry Hills Bike path @ Blue Barrell trail to West Yarmouth Road	1.20	Multi-use path; Crossing	Town	47,520				\$ 1,951
2	Existing Trail (mix)	West Yarmouth Road to point NE of Buck Island Road	0.35	Multi-use path	Town	13,860	475	3,563		\$ 569
3a1		Point NE of Buck Island/West Yarmouth Roads to Buck Island Road at West Yarmouth Road.	0.04	Multi-use path; Crossing	Town	2,957				\$ 65
3a2		Buck Island Road at West Yarmouth Road to bog access road off of West Yarmouth Road.	0.14	Multi-use path	Town	10,349	365	5,110		\$ 228
3a3	Existing Trail (Wide)	Bog access road off of West Yarmouth Road (3a2) to trail junction with 3b2.	0.50	Multi-use path	Town	13,200	2,240	8,960		\$ 813
4	Existing Trail (mix)	Junction of 3a3 and 3b2 to Winslow Gray Road at Bog Road	0.40	Multi-use path; Crossing	Town	15,840	1,703	12,773	59	\$ 650
5	Existing Trail (Wide)	Winslow Gray at Bog Road to property boundary of TOY and Whydah property	0.25	Multi-use path	Town	5,280	351	1,404		\$ 407
6	Whydah driveway & parking lot	TOY/Whydah property boundary to restaurant parking lot	0.15	Share the road	Private		120			\$ 2
7	Parking lot	Restaurant parking lo to Route 28	0.07	Share the road	Private					\$ 1
Trail Totals w/Option A			3.10			109,006	5,254	31,809	59	\$ 4,767
Option B										
3b1	Existing Trail (narrow)	Point NE of Buck Island/West Yarmouth Roads to Buck Island Road - Water Dept driveway	0.25	Multi-use path	Town	11,880	416	3,744	215	\$ 407
3b2	Existing Trail (wide)	Water Dept driveway to junction with 3a3.	0.5	Multi-use path	Town	10,560	1,325	7,950		\$ 813
Trail Totals w/Option B			3.17			104,940	4,390	29,433	274	\$ 4,881
OTHER ROUTE OPTIONS SOUTH OF BUCK ISLAND ROAD										
L1a		Buck Island Road/West Yarmouth Road intersection to a point east of the junction of existing bog roads.	0.65	Multi-use Path (small section of share the road)	Town	48,048	600	8,400		\$ 1,057
L2a		East of Buck Island/West Yarmouth Road to east of the junction of the bog roads.	0.5	Multi-use path	Town	36,960				\$ 813
L3a		East of bog roads junction to junction of L3b and L4.	0.15	Multi-use path	Town	11,088	260	3,640		\$ 244
L1b	Expanded sidewalk	Buck Island Road/West Yarmouth Road intersection to point east of bog roads junction	0.13	Existing Sidewalk	Town		530			\$ 1
L2b	Expanded sidewalk	Buck Island Road sidewalk from junction with L1b eastern edge of Raymond Syrjala area, east of bogs	0.2	Existing Sidewalk	Town		200			\$ 1
L3b		Buck Island Road crossing to junction with Segment L3a and Segment 4.	0.5	Multi-use path	Town	36,960	344	15,824		\$ 813
L4		Junction of L3a and L3b to intersection of existing trails west of Winslow Gray parking area trail head.	0.2	Multi-use path	Town	14,784	400	5,600	190	\$ 325
L5a		Existing trail (wide) west of Winslow Gray trailhead to Winslow Gray Road west of trail entrance at Bog Road.	0.08	Multi-use path	Town	5,914				\$ 130
L5b		Existing trail (narrow) west of Winslow Gray trailhead to Winslow Gray Road trail entrance at Bog Road.	0.06	Multi-use path	Town	4,435	275	3,850		\$ 98
L6a		Winslow Gray Road to border of Town/Whydah property	0.21	Multi-use path	Town	15,523				\$ 342
L6b		Winslow Gray Road to border of Town/Whydah property	0.24	Multi-use path	Town	17,741	275	3,850		\$ 390
L7		Town/Whydah property to Whydah Parking lot.	0.35	Share the road	Private	25,872				\$ 5
L8a		Whydah parking lot to Route 28 driveway across from drive in parcel.	0.06	Share the road	Private					\$ 1
L8b		Whydah parking lot to eastern site entrance at Route 28.	0.11	Share the road	Private		132	1,848		\$ 2
Trail Totals including 1, 2, 3a1, L1A, L3A, L4, L5A, L6A, L7, L8A			3.29			185,566	1,735	21,203	190	\$ 4,770
Trail Totals including 1, 2, 3a1, L1B, L2B, L3B, L4, L5B, L6B, L7, L8B			3.38			164,129	2,631	34,535	190	\$ 4,301
Trail Totals including 1, 2, 3a1, L1B, L2A, L3A, L4, L5A, L6A, L7, L8B			3.32			174,478	1,797	14,651	190	\$ 4,527

Notes

1. Assumes 4 updated or new crosswalks with associated warning devices, signage, striping.
2. All considered routes are outside of Priority Habitats



ROUTE CHARACTERISTICS TABLE SUMMARY

EXISTING CONDITION

The Main Route Option is located on existing trails for the entire route except for approximately 0.18 miles with Alternative A (Segments 3a1 and 3a2) that would be located where no trail currently exists i.e. new trails. All of the Other Route Options segments are located outside of existing trails and would all be new trails, except for 0.15 miles on the Buck Island Road sidewalk (Segments L1b and L2b). All alternatives also travel through a portion of existing parking lots between Bog Road and Route 28.

ROUTE LENGTH

The alternatives are all similar in length. The Main Route Option is approximately 3.10 miles with the “A” segments and approximately 3.17 miles with the “B” segments. The “Other Route Options” based on the three sample routes range from approximately 3.29 miles to 3.38 miles in length. (The differences are negligible given the coarseness of the measurement tool and conceptual nature of the trail lines.)

SUGGESTED ACCOMMODATION

A multi-use path is the suggested accommodation for all segments of the Main Route option except for Segments 6 and 7, where Share the Road signage and pavement markings are suggested as the treatment through an existing parking lot. The same is true for the Other Route Options, except for 0.15 miles on Buck Island Road (Segments L1b and L2b) where the existing (wide) sidewalk is the suggested accommodation. Crossing accommodations are recommended at all road crossings. The type of crossing accommodation would vary depending on the traffic speed and volume of the road.

PROPERTY OWNER

All route segments on the Main Route Option and the Other Route Option are located on public (Town of Yarmouth-owned) land except for segments between the town-owned portion of Bog Road and Route 28. Main Route Option Segments 6 and 7 travel through Whydah and Captain Parker’s parking lots. Other Route Option Segments L7 and L8a also cross through the Whydah parking lot and site driveway. Segment L8b travels on Whydah property only.

AREA OF NEW DISTURBANCE

The Main Route Option requires less new land disturbance than the “Other Route Options” because of its use of existing trails rather than creation of new trails. Other Options Segments L1b and L2b require no new disturbance because they use the existing Buck Island Road sidewalk.



WETLAND BUFFER

Work inside the wetland buffer area would trigger review from the Yarmouth Conservation Commission. The Main Route Option has the greatest length of travel within the wetland buffer area (approximately 5,254 feet using A segments and 4,390 feet using B segments). The Other Route Options length inside the wetland buffer area ranges from 1,735 feet to 2,631 feet.

IMPACT TO WETLAND BUFFER

The Main Route Option, both the A segments and the B segments, would impact more wetland buffer area (39,899 square feet and 33,145 square feet, respectively) than the Other Route Options (which range from 14,651 square feet to 34,535 square feet impact area for the three sample routes).

WETLANDS

The Main Route option travels approximately 59' through a wetland (Segment 4 between the cranberry bog area and Winslow Gray trailhead). The Other Route Options travel through approximately 60' of wetland between the wastewater facility and Plashes Brook (Segment L3b) and 190' of wetland between the cranberry bog area and Winslow Gray Road (similar to Main Option Segment 4).

COSTS

Cost estimates for Main Option alternatives range from \$4,767,000 (with A Option) and \$4,881,000 (with B Option). Other Route Options estimates are similar, ranging from \$4,301,000 to 4,770,000 for the sample routes.

ROUTE EVALUATION

The following tables present a summary evaluation of route segment options. The evaluation factors are based on the project/route development goals and objectives. Since route segments are located outside of residential areas, this factor is not included in the evaluation. In addition, construction of a multi-use path may create visual impacts from clearing and grading and paving, but the project team did not evaluate the route segments for visual impacts.

The Summary Evaluation tables are organized as follows:

1. Table 2: "Main Route Option" segments between Cape Cod Rail Trail and north of Buck Island Road. (No "Other Route Options" exist for this area.)
2. Table 3: Main Route Option segments between north of Buck Island Road and Winslow Gray Road.
3. Table 4: Other Route Options segments between north of Buck Island Road and Winslow Gray Road.
4. Table 5: Main Route Option segments between Winslow Gray Road and Route 28.
5. Table 6: Other Route Options segments between Winslow Gray Road and Route 28.



CAPE COD RAIL TRAIL TO NORTH OF BUCK ISLAND ROAD

Table 2 - Summary Evaluation: Main Route Option CCRT to North of Buck Island Road Segments

	Route Segment
Evaluation Factor	1 and 2
Comfort/Travel Experience	All off-road. Pleasant scenery.
Environmental Impacts	Segment 2 is partially located within wetland buffer area west of bogs on an existing trail; widening/clearing in the buffer area.
Land Use Conflicts	Segment 1 is on Water Department land. Potential conflicts with operations/access. Hunting may occur in the area. Route near prescribed burn area.
Existing Assets	All town-owned land, existing trails.
Additional Cost	Would require new crossing at West Yarmouth Road.
Ease of Implementation	Feasible. No significant permitting issues.

NORTH OF BUCK ISLAND ROAD TO WINSLOW GRAY ROAD

Table 3 - Summary Evaluation: Main Route Option Buck Island Road to Winslow Gray Road

	Route Segment		
Route Evaluation Factor	A Segments	B Segments	Segment 4
Route Comfort/Travel Experience	All off road. Pleasant scenery, cranberry bog views.	All off road. Pleasant scenery cranberry bog views.	All off road. Pleasant scenery. cranberry bog views.
Environmental Resource Impacts	New trail in wetland buffer.	Existing trail widening, clearing in wetland buffer and through wetland area.	Existing trail widening, clearing in wetland buffer and through wetland.
Land Use Conflicts	Use of bog access road could conflict with bog operation. Hunting. May conflict with Syrjala Conservation Area uses/restrictions.	Use of bog access road could conflict with bog operation. Crossing at Water Department drive – potential conflict with trucks. Hunting. May conflict with Syrjala Conservation Area uses/restrictions.	Use of bog access road and proximity to bogs could conflict with bog operation. Hunting. May conflict with Syrjala Conservation Area uses/restrictions.
Use of Existing Assets	Town-owned land. Uses existing signal/crossing at Buck Island Road/West Yarmouth Road.	Town-owned land.	Town-owned land. Winslow Gray crossing aligns with Bog Road.



Additional Costs	Buck Island Road/West Yarmouth Road crossing and signal upgrade.	New Buck Island Road crossing. Wetland crossing may need boardwalk or bridge	Wetland crossing.
Implementation/Feasibility	Feasible if no conflicts with cranberry bog operations and allowed on conservation land.	Feasible if no conflicts with cranberry bog operations and allowed on conservation land.	Proximity to cranberry bogs may make segment location infeasible.

Table 4 - Summary Evaluation: Other Route Options Buck Island Road to Winslow Gray Road

Route Evaluation Factor	Route Segment		
	LA Segments	LB Segments	L4
Route Comfort/Travel Experience	All off road. Pleasant scenery, cranberry bog views.	All off road. Pleasant scenery cranberry bog views. Wastewater treatment facility could be visible from L3b.	All off road. Pleasant scenery.
Environmental Resource Impacts	Adjacent to but appear to be outside of wetland resource areas, except part of L1a and are L3a inside buffer area.	Adjacent to but appear to be outside of wetland resource areas except part of L3b.	Travels through wetland and streams.
Land Use Conflicts	A small part of L1a shares bog road – potential conflict. May conflict with Syrjala Conservation Area uses/restrictions. Hunting.	May conflict with Syrjala Conservation Area uses/restrictions. Hunting.	May conflict with Syrjala Conservation Area uses/restrictions. Hunting.
Existing Assets	Town-owned land. Uses existing signal/crossing at Buck Island Road/West Yarmouth Road (but upgrades needed).	Town-owned land. Uses existing Buck Island Road sidewalk. Winslow Gray crossing from bog area aligns with Bog Road.	Town-owned land.
Additional Costs	Buck Island Road/West Yarmouth Road crossing and signal upgrade.	New Buck Island Road crossing at Water Department drive.	Wetland crossing may need boardwalk or bridge



Implementation/Feasibility	Feasible if compatible with bog operations and conservation land.	Feasible if allowed on conservation land.	Feasible – if allowed on conservation land. Wetland crossing, permitting.
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WINSLOW GRAY ROAD TO ROUTE 28

Table 5 - Summary Evaluation: Main Route Option Winslow Gray Road to Route 28

Route Evaluation Factor	Segment 5	Segment 6	Segment 7
Route Comfort/Travel Experience	Pleasant scenery. All off road.	Part through woodland and approximately 500' through paved parking lot	Through paved parking lot.
Environmental Resource Impacts	Existing wide trail with portion inside wetland buffer.	Within wetland buffer	
Land Use Conflicts	Potential security/vandalism of town storage buildings.	Potential conflict with uses on Whydah property and motor vehicles	Potential conflict with motor vehicles.
Use of Existing Assets	Town-owned land, existing wide trail/road.	Shares parking lot with commercial destination/attraction.	Town-owned land, parking lot aligns with drive-in.
Additional Costs	Security fencing for storage building.	Security fencing for storage building. Easement for use/travel through private property.	Easement for use/travel through private property.
Implementation/Feasibility	Feasible.	Feasible if private property use allowed.	Feasible if private property use allowed.



Table 6 - Summary Evaluation: Other Route Options Winslow Gray Road to Route 28

Route Evaluation Factor	Route Segment		
	LA Segments	LB Segments	L7
Route Comfort/Travel Experience	Pleasant scenery. All off road except short final segment through parking lot.	All off road. Pleasant scenery. All off road except final segment through parking lot and site drive.	All off road. Pleasant scenery.
Environmental Resource Impacts		Portion of L6b in wetland buffer area.	
Land Use Conflicts	Potential conflict with motor vehicles in Whydah and restaurant parking lot/site drive	Potential conflict with motor vehicles in Whydah and restaurant parking lot/site drive	Potential conflict with existing uses on Whydah property
Use of Existing Assets	Town-owned land. Shares parking lot with commercial destination/attraction. Parking lot aligns with drive-in parcel	Town-owned land. Shares parking lot with commercial destination/attraction.	Town-owned land
Additional Costs	Easement for use/travel through private property.	Security fencing for storage building. Easement for use/travel through private property.	Easement for use/travel through private property.
Implementation/Feasibility	Feasible if private property use allowed.	Feasible if private property use allowed.	Feasible if private property use allowed.



BICYCLE FACILITY DESIGN

The selected route would be served by a shared use path that provides for safe and comfortable bicycle travel between the Cape Cod Rail Trail and the Drive-In parcel. Design considerations are discussed in the following sections.

DESIGN STANDARDS

The Massachusetts Department of Transportation's Design Guide provides minimum and preferred dimensions for shared use paths as shown in Figure 4. Minimum path widths of 12 feet are preferred but 10 feet is allowable. In cases of critical features or constraints such as historic features, segments of 8 feet can be considered. A 2-foot graded shoulder adjacent to each side of the path is required; this width is included in the required 3 feet "shy" distance (lateral clearance from vertical features such as sign poles or trees).

Shared Use Path Dimensions

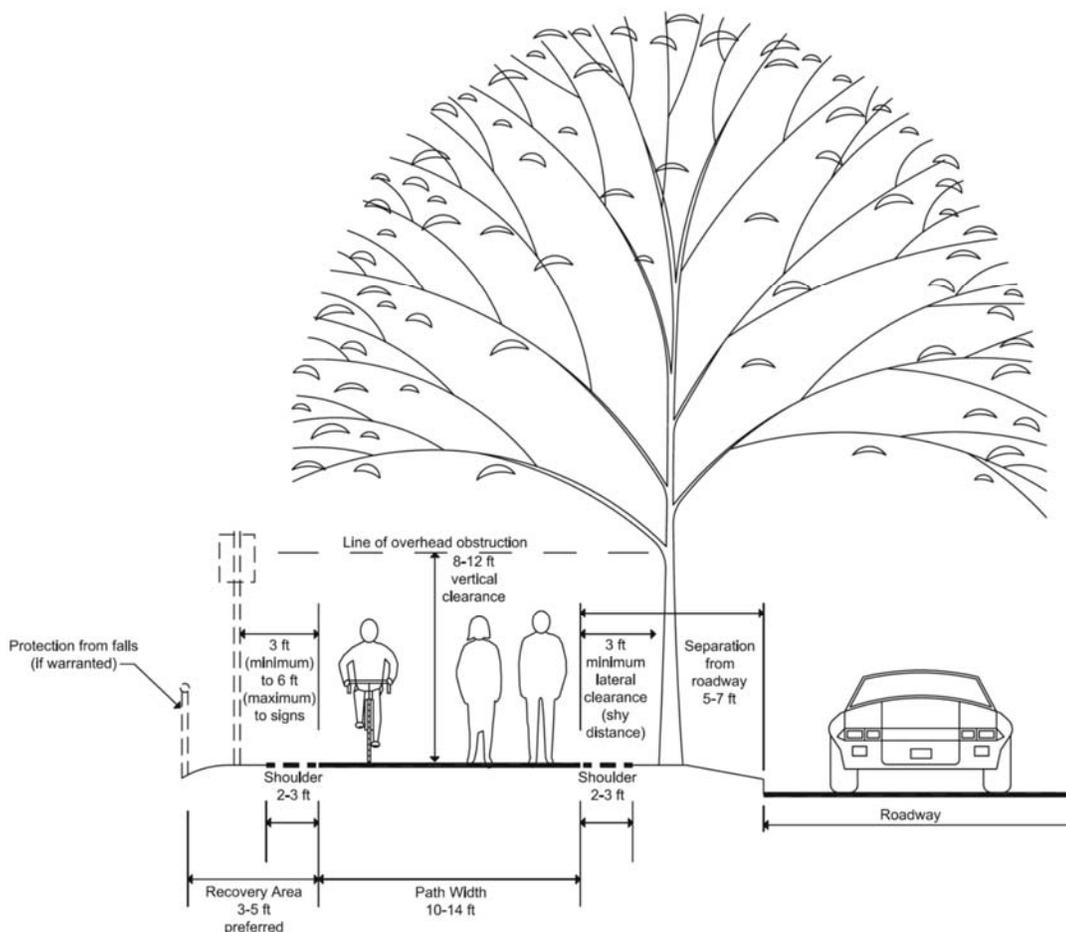


Figure 4- MassDOT Shared Use Path Dimensions. (Source: MassHighway Design Guide.)



SURFACE TREATMENT

The surface treatment for a standard multi-use path is asphalt. A hardened non-asphalt surface treatment may be desirable for trails in areas with sensitive resources or habitat or with rural character associated with tree canopy or vegetation. Unpaved surface treatments may also be preferred by trail users who want to retain “quiet” character of the walking trails. Unpaved surfaces, often compacted stone (decomposed granite) are used successfully on bicycle and multi-use trails throughout the country, including areas with similar weather conditions to Cape Cod, such as the Erie Canal bike path in New York state and, closer to Cape Cod, the Battle Road at Minuteman National Park in Lexington, Massachusetts. Crushed stone/stone dust trails can accommodate most users except for in-line skaters. Initial installation for stone dust may be cheaper than asphalt, as it requires less excavation depth. Annual maintenance costs tend to be less too, provided the path has proper drainage and is not located in a flood prone area which could cause erosion damage.

Costs

Cost estimates were developed for each segment and entered into the Routes Characteristics Table. The cost estimates are useful comparing the different alternatives’ costs. Design details have not been developed, so the project team used several recent multi-use path and bicycle accommodation projects to estimate the unit cost of providing different accommodations. The cost estimates in the Route Characteristics Table are based on the following averages:

Adding signage to existing sidewalk	\$1 per linear foot
Share-the-Road markings and signage:	\$2 per linear foot
Expanded sidewalk (over 5’):	\$100 per linear foot
Multi-use path (10’):	\$220 per linear foot
Upgraded or new crosswalk	\$20,000 per installation

As noted in the preceding surface treatments discussion, construction of an unpaved trail surface is cheaper than constructing an asphalt path. The figures below (from the 2017 *Outer Cape Bicycle and Pedestrian Master Plan*) reflect average unit costs for constructing an unpaved trail along existing railroad bed:

Hardened surface, unpaved	\$75 per linear foot
Hardened surface, unpaved with structural base	\$125 per linear foot

Permitting Considerations

Construction of a share-use path may require permits or need to undergo a review process from several different entities:



Environmental issues

- Massachusetts Environmental Protection Act (MEPA) review would be required if a project triggers MEPA threshold in accordance with 301 CMR 11.03.
- Rare Species Habitat: Massachusetts Natural Heritage and Endangered Species Program. (Note all alternatives discussed in this study are located outside mapped rare species habitat.)
- Wetlands: Yarmouth Conservation Commission
- Other: possible MassDEP review

Bikeway/Access on Private Land:

- Actions by Board of Selectmen and Town Meeting to secure easements

Bikeway on Article 97 Land (e.g., protected/preserved public land dedicated to a specific use such as a conservation):

- Permission from controlling authority i.e. state legislature; may require further study, alternatives development, and mitigation

Road Crossings and bikeways along roadways:

- Town roads: Yarmouth DPW requirements
- Route 28: MassDOT Access Permit

Bikeway may be considered a “road”

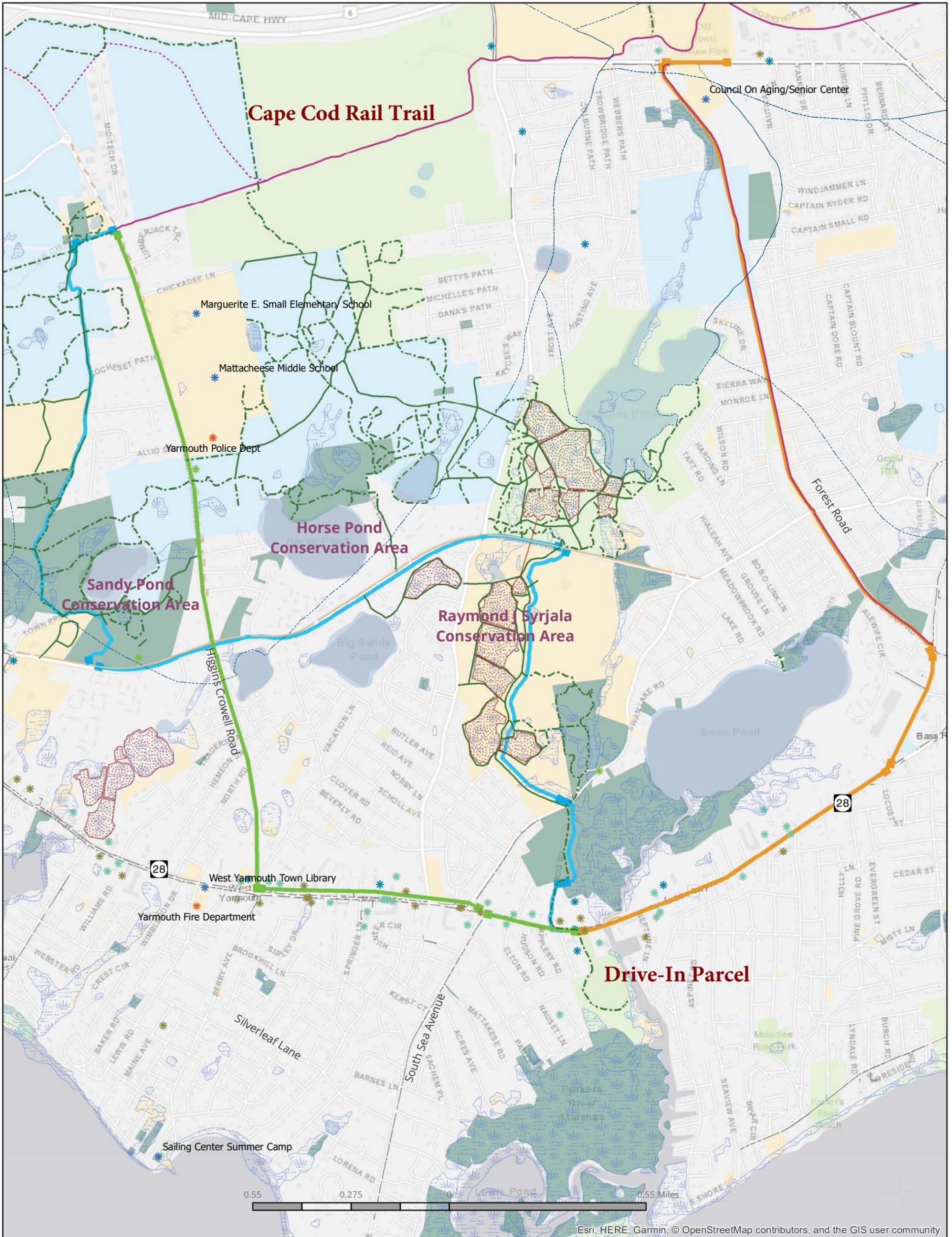
- Roadway layout approval from Yarmouth Planning Board

Next Steps

This report provides an overview of preliminary route development for the Town’s consideration as it considers options for providing a bicycle connection between the Cape Cod Rail Trail and the drive-in parcel. Challenges and opportunities accompany each alternative. Following presentation and discussion of the report at a public meeting, the project team will compile a final Alternatives Report that includes input received from the Town officials and public, refined analysis, and recommendations.

Appendix: Future Connectivity Considerations

2018 Cape Cod Rail Trail Drive-In Parcel Bike Route Study: Other Bike Ped Connections



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Shared Use Pathways (SUP)	Points of Interest	Alternatives	Town Owned Land	Cranberry Bogs
Path	Accommodation and Food Services	Alternative C	Municipal Conservation	Cranberry Bogs
proposed path	Arts, Entertainment, and Recreation	Alternative D	Municipal Recreation	Wetlands
Unpaved Trails	Retail Trade	Alternative E: Sandy Pond	Municipal Other	Wellhead Protection Area
Wide trail/Fire Road	Municipal Buildings	Pedestrian Accommodations	Water District	
Narrow Trail	Community Site	Wide Sidewalk (width greater than 5')		
	Trailheads	Sidewalk (width less than 5')		
		Proposed Sidewalk		

FUTURE BICYCLE CONNECTIVITY CONSIDERATIONS

ROADS/EXISTING PATHS ROUTES

The following routes provide additional connections between the CCRT and the drive-in parcel but were dismissed as alternatives for this project because they include road segments without adequate accommodations for inexperienced bicyclists. Portions of the routes use existing bike paths that could become key connectors for future expansion of the towns bicycle facility network and help more people get around town on bicycle.

Higgins Crowell Connection – Alternative C

Higgins Crowell Road could provide a key bicycle/pedestrian connection between the CCRT and Route 28.

Eastern Route – Alternative D

Alternative D provides a direct route connection from the CCRT at Peter Homer Park parking lot to the drive-In parcel from the east, using existing paths. The route provides bicyclists separate space from motor vehicles but widening the sidewalks on Route 28 and Long Pond Road (or providing bike lanes) would be needed to provide full separation between bicycles and motor vehicles.

Segment ID	Length	Location	Notes
D1	0.2	Peter Homer park, east end parking lot/existing path to Forest Road bike path	Uses existing crosswalk to cross Old Townhouse Road. Follows existing sidewalk – which could be expanded.
D3	1.8	Forest Road @ Forest Road bike path to Long Pond Drive	Uses Forest Road bike path
D4	0.3	Long Pond Road to Route 28	Existing sidewalk on Long Pond Road. (Consider expanding to accommodate bicycles. Expansion could impact 4-5 residential properties)
D5	0.9	Route 28 to Drive In parcel	Existing sidewalk on Route 28. (Route 28 sidewalk expansion would be needed to accommodate bicycles.)

SANDY POND ROUTE

The project team considered a CCRT to drive-in route connection that links to the Sandy Pond Conservation Area. It fell from consideration for this study as an alternative because it is not direct and for its proximity to sensitive cultural resources that would require more extensive analysis. As the town expands its bicycle/pedestrian facility network, a Sandy Pond connection may become desirable in the future. See map on page A4.

The Sandy Pond Alternative travels from the bike path at Higgins Crowell Road along an unpaved trail to Old Industrial Road. The route then heads south through Water Department land following an unpaved trail to Old Mill Lane, where it continues adjacent to cemetery and then follows an existing trail to the Sandy Pond Recreation Area. From there the route follows Buck Island Road to the east for 1.4 miles using the existing wide sidewalk to the Water Department driveway. From here, it could connect with any of the alternative segments discussed in this report.

Segment ID	Length	Location	Notes
E1	0.13	Bike Path @Higgins Crowell Road to Industrial Park Road	Follows unpaved trail adjacent to power line easement.
E2	1.4	Industrial Park Road to Buck Island Road	Follows unpaved trail to Water Department buildings, across driveway onto Mill Lane, past cemetery, through Sandy Pond Rec Area parking lot. Old Mill Lane id paved near cemetery. Consider share the road here. Sandy Pond area mapped for rare species.
E3	1.4	Sandy Pond Recreation Area to Water Department driveway on Buck Island Road.	Uses existing wide sidewalk on Buck Island Road.

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