

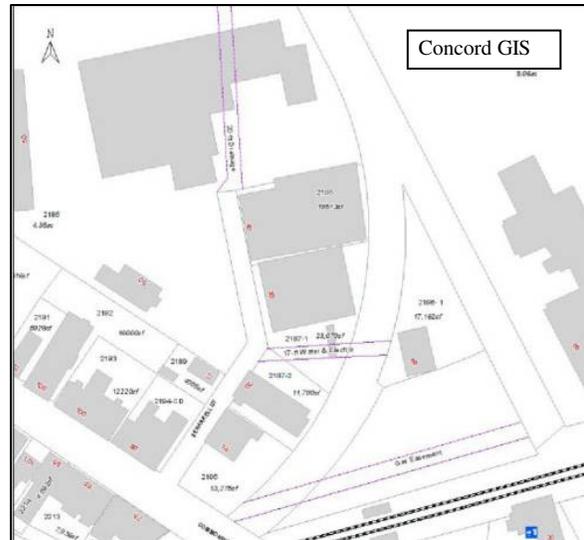
B. CROSSING ALTERNATIVES

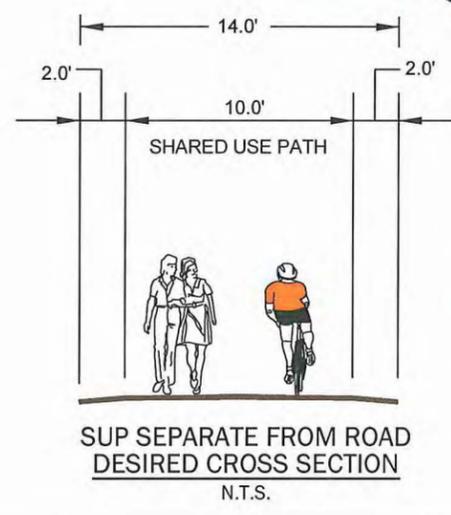
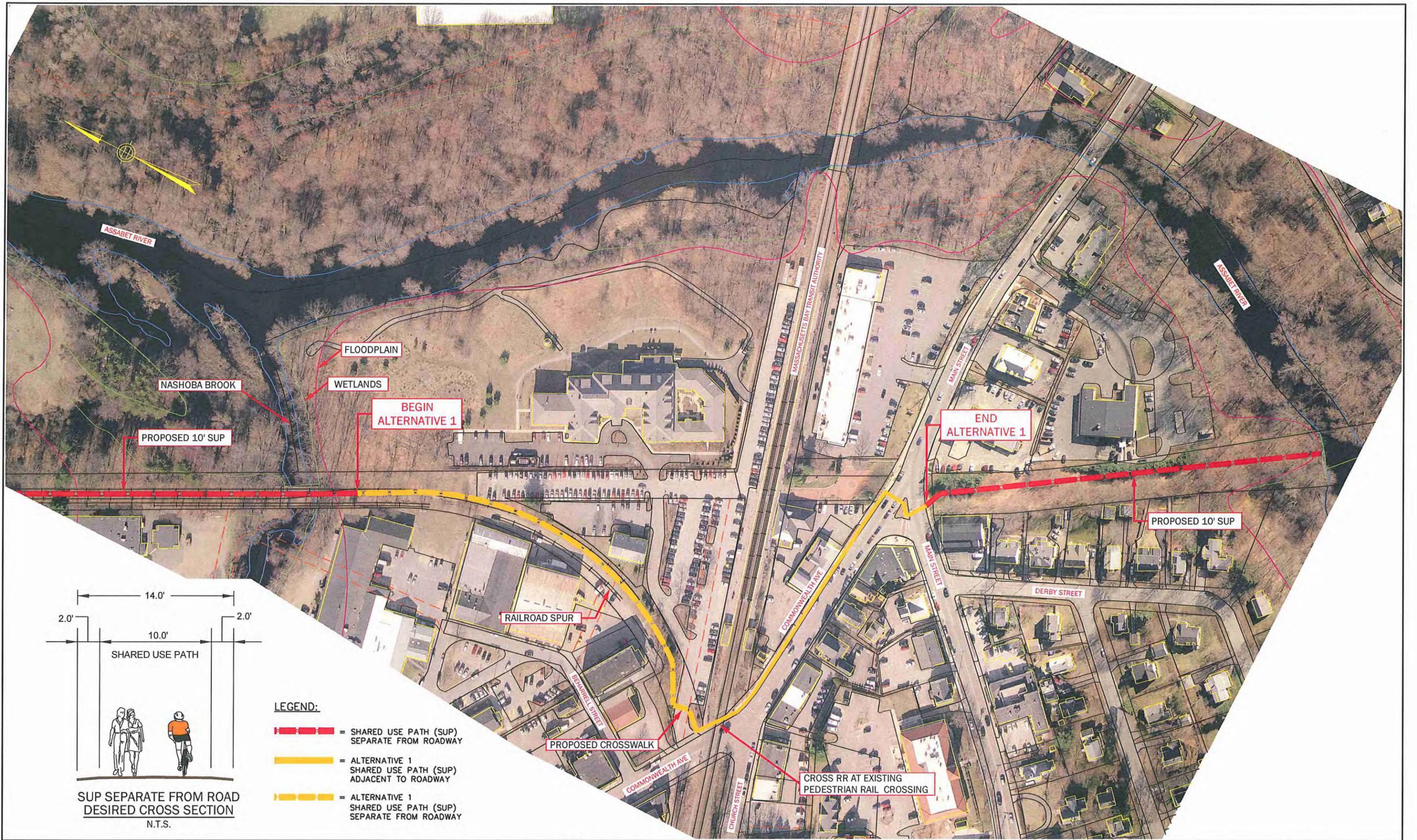
The following section will focus on the five alternatives listed. Following the description of the alternatives is a Score Card for all five alternatives. Various conceptual level alternatives will be discussed and evaluated to assess the feasibility and impacts of construction and how they will help achieve the goals of the study.

Alternative 1 - Railroad Spur to Commonwealth Avenue

This alternative proposes that the BFRT follow the abandoned railroad spur owned by the EOTC in the northern portion of the West Concord commuter railroad station to Commonwealth Avenue. See Figure 1 on the following page. There is an existing vehicle/pedestrian crossing of the active rail line with both vehicular and pedestrian gates on Commonwealth Avenue. Once trail users reach Commonwealth Avenue, there are four options. Alternative 1A would be to instruct trail users to dismount their bikes and walk them along the north side of the street on the existing sidewalk to the existing crossing in front of the 99 Restaurant. After crossing, they could remount their bikes south of Main Street at the existing EOTC owned right-of-way. Alternative 1B would be to allow bicyclists to ride on a specially marked "sharrow" lane to the traffic signal in front of the 99 Restaurant. Alternative 1C would be to provide a wider sidewalk on the north side of Commonwealth Avenue to be shared between pedestrians and trail users. Alternative 1D would be to turn in an easterly direction after crossing the tracks, run parallel to the tracks behind the West Concord Supermarket and meet Main Street in the vicinity of the existing crossing in front of the 99 Restaurant. Both Alternatives 1B and 1C would require elimination of parking on one side of Commonwealth Avenue.

The existing right-of-way along the spur varies between fifty and sixty feet and would accommodate a ten (10) foot shared use path with two (2) foot graded shoulders on either side. Heading south along the right-of-way, there are five abutting property owners along the west side of right-of-way. They include: 50 Beharrell LLC, 40 Beharrell Street LLC, 30 Beharrell Street LLC, Steinmann Realty LLC and Hollis R. and Caroline V. Holden. There are two abutting property owners along the east side of the right-of-way. They include Russell S. Beede and the Town of Concord. There are two existing utility easements along the spur. One is a seventeen (17) foot wide water and electric easement and the second is a gas easement crossing the spur right-of-way.





- LEGEND:**
- - - = SHARED USE PATH (SUP) SEPARATE FROM ROADWAY
 - = ALTERNATIVE 1 SHARED USE PATH (SUP) ADJACENT TO ROADWAY
 - - - = ALTERNATIVE 1 SHARED USE PATH (SUP) SEPARATE FROM ROADWAY

ALTERNATIVE 1 - CONCEPTUAL PLAN
RR SPUR TO COMMONWEALTH AVENUE
CONCORD, MA

FIGURE 1

SCALE: 1" = 80'

FINAL REPORT

Proposed Bruce Freeman Rail Trail/MBTA Commuter Rail Crossing Alternative Analysis

The existing spur right of way meets the existing entrance to the commuter parking area prior to intersecting Commonwealth Avenue. Therefore, in order to remain within the right-of-way, trail users would need to cross the parking lot to reach Commonwealth Avenue. It would be GPI's recommendation to cross at a 90° angle set back from the entrance a short distance and follow the curb line to Commonwealth Avenue (see illustration on the following page). With a short setback from the entrance, vehicles entering the parking area from the street will have more time to react to trail users crossing the driveway. A 90° crossing provides the shortest crossing distance for trail users thereby minimizing the potential for vehicle/trail user conflict.



Although a standard painted crosswalk could be used to channel trail users at this location, it would be our recommendation to use a raised crosswalk, a textured crosswalk, a colored crosswalk or a combination to provide a safer crossing for trail users. Raised crosswalks are crosswalks that are raised to act simultaneously as a speed hump to slow motor vehicles and increase driver awareness of a crossing. Textured and colored crosswalks provide a different material emphasizing the crossing to oncoming vehicles and textured crosswalks also provide an uneven surface for vehicles to traverse slowing their speed. Textured crosswalks can be brick, stamped pavement or even cobble stones among other materials. There are several different options as illustrated below.



Utilization of a raised crosswalk could potentially make snow removal more difficult if the snow plow driver was unaware of the crosswalk or was unable to see it. In areas with a considerable amount of snow, bollards are often placed on either side of the crosswalk to alert snow plow drivers to the presence of the cross walk.



Once trail users cross the driveway, they would follow the curb line to the existing rail gates on Commonwealth Avenue. At this point users would be instructed to walk their bikes. The sidewalk begins on the southern side of the tracks. There would be a short stretch approaching the tracks where striping could be proposed on Commonwealth Avenue to separate trail users from motor vehicles. It appears that the existing pavement width and right-of-way is sufficient for the proposed markings. Once users cross the tracks, the sidewalk begins.



Alternative 1A - Dismount Bicycles at Commonwealth Avenue

This alternative proposes that trail users utilize the existing sidewalk on Commonwealth Avenue and walk their bicycles. See Figure 2 on the following page. The sidewalk on Commonwealth Avenue begins on the southern corner of the track crossing. Signs would be proposed on Commonwealth Avenue instructing trail users to dismount their bikes and walk them along the sidewalk. While some riders may comply with the signing, it is likely that many more experienced riders will ignore the signing and ride with vehicle traffic on Commonwealth Avenue or try and ride along the sidewalk.

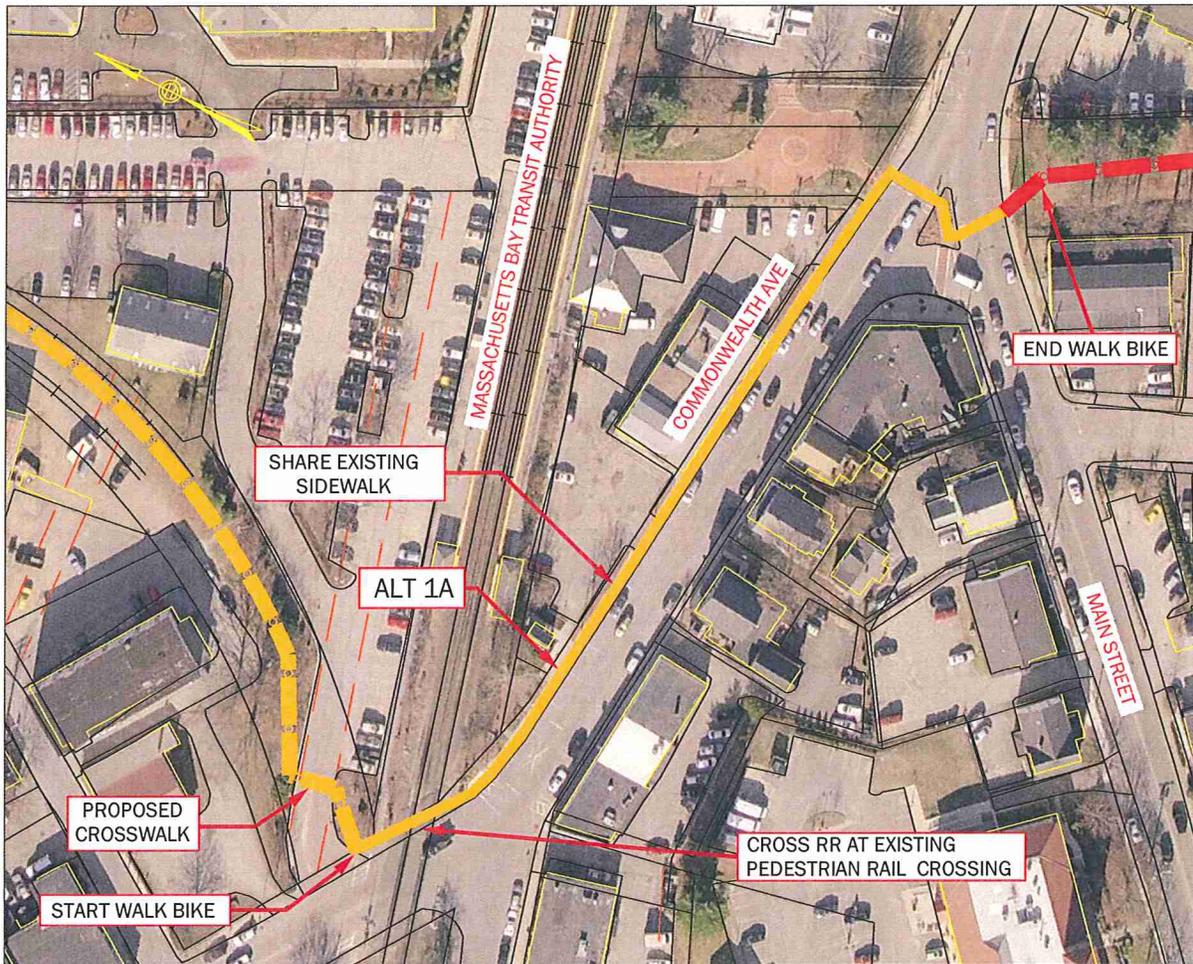
Although the existing sidewalk is between seven (7) and eight (8) feet, the parking meters and light poles decrease the usable width. The West Concord Supermarket is located on Commonwealth Avenue and anyone visiting the Supermarket utilizes the sidewalk. There are two entrance drives for the West Concord Supermarket parking area along the sidewalk, one on either side of the store. A parking lane also abuts the sidewalk along Commonwealth Avenue.



It is anticipated that the trail will draw a large volume of users including bicycles, joggers, walkers, roller bladers and skateboarders particularly on weekends. Although this option does minimize the potential for trail user/motor vehicle conflict, it will increase the potential for trail user/pedestrian conflicts since people are entering and exiting the Supermarket while it is open. During times of very high trail usage, this simple function could be delayed and if people are not paying full attention to trail users traveling along the sidewalk, this option increases the potential for pedestrian/trail user conflict.

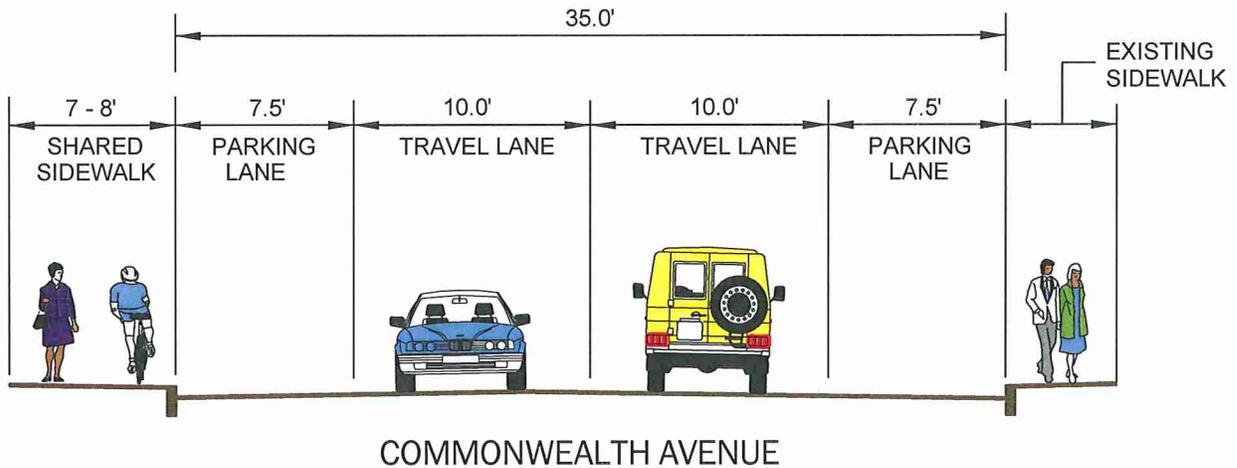


Motor vehicle passenger doors open up into the usable sidewalk area as well as into the travel lane of Commonwealth Avenue. With limited right-of-way, this option does not allow for the inclusion of a door zone buffer. A door zone is the space spanning approximately four (4) feet on either side of a parked car. It is hazardous to ride a bicycle in a door zone because if the door opens suddenly, the cyclist must either crash into it or swerve to avoid it which could cause serious injury or death. Although most areas do have laws that require car users to check for bicyclists and pedestrians before opening the door of their vehicle, there have still been countless injuries and



LEGEND:

- = SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY
- = ALTERNATIVE 1A – ADJACENT TO ROADWAY
- = ALTERNATIVE 1 – SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY



**ALTERNATIVE 1A
DISMOUNT BICYCLES AT COMMONWEALTH AVENUE
CONCORD, MA**

FIGURE 2

NOT TO SCALE

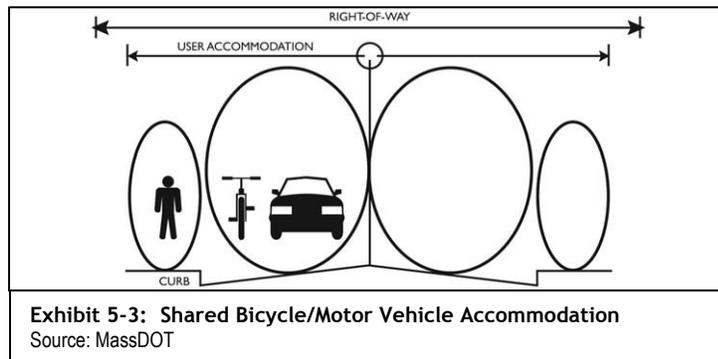
deaths caused by cyclists riding in door zones when a car door is carelessly opened. Therefore, if people are not paying full attention to trail users traveling along the sidewalk, opening car doors could create a hazardous situation for trail users since not everyone will dismount their bikes or get off their skateboards. Roller bladers could be traveling at a faster speed also. It should also be noted that since the sidewalk does not provide a uniform surface, roller bladers may have a more difficult time trying to traverse the sidewalk and opt to travel in the roadway.

Once trail users have traversed the sidewalk, they would cross the road at the existing crosswalk in front of the 99 Restaurant to the existing island at the intersection of Main Street and Commonwealth Avenue and then cross the existing crosswalk from the island to the EOTC owned right of way and remount their bikes to continue along the BFRT. The existing island has a pedestrian path which bends to allow for perpendicular crossings of both roadways. Depending on the volume of traffic and the volume of trail users, this two crosswalk movement could cause delays. It would be GPI's recommendation to consider intersection modifications to minimize crossing distances and times. GPI would investigate reconfiguring the intersection to a more traditional "T" intersection with a single crossing of Main Street.



Alternative 1B - Sharrow Lane on Commonwealth Avenue

This alternative proposes sharrow lanes on Commonwealth Avenue. Sharrows are shared lane



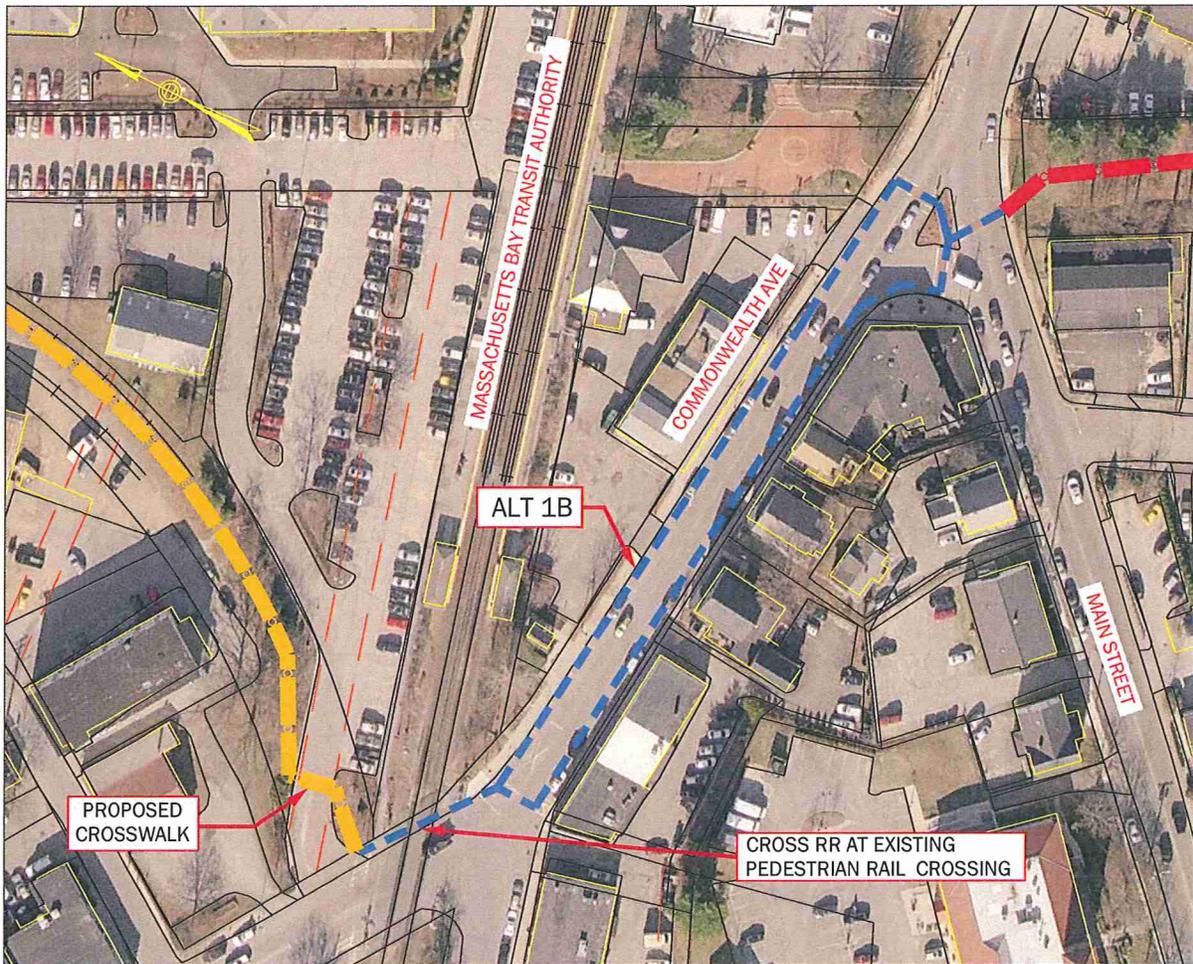
pavement markings clarifying where cyclists are expected to ride and reminding motorists to expect cyclists on the road. Sharrows are used when there is not enough room on the street for bicycle lanes. See Figure 3 on the following page. The **Guide** requires a minimum of fourteen (14) feet for shared bicycle/motor vehicle accommodation. Pedestrians would

still utilize the existing sidewalk which would remain separated from the roadway by a raised curb.

The pavement width on Commonwealth Avenue is approximately thirty-five (35) feet in width. The roadway includes one travel lane in each direction and parking on both sides against vertical curbing. The existing parking lanes are between seven (7) and eight (8) feet in width indicating that the existing travel lanes are approximately ten (10) feet in width. Commonwealth Avenue is classified as an urban collector. There is an existing crosswalk on Commonwealth Avenue just east of its intersection with Church Street.

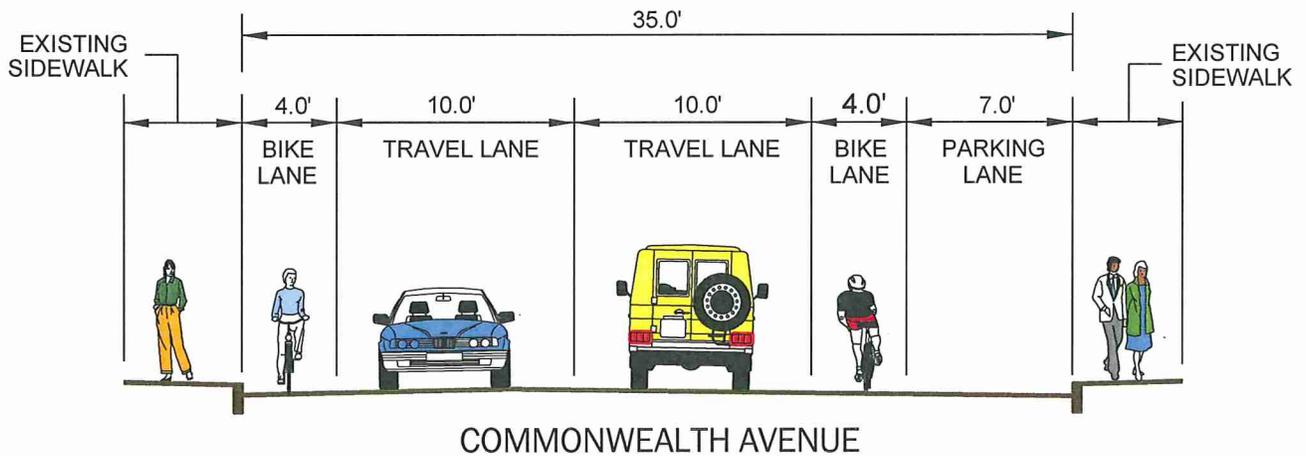


In order to accommodate two - fourteen (14) foot travel lanes, parking would need to be eliminated along one side of Commonwealth Avenue. Since only the West Concord Supermarket is on the north side of Commonwealth Avenue and they have parking facilities, GPI would recom-



LEGEND:

- - - - - = SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY
- - - - - = ALTERNATIVE 1B – SHARROW LANES ON ROADWAY
- - - - - = ALTERNATIVE 1 – SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY

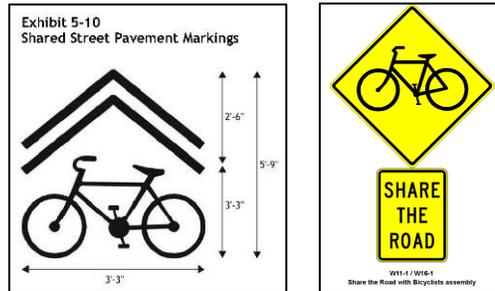


ALTERNATIVE 1B
SHARROW LANE ON COMMONWEALTH AVENUE
 CONCORD, MA

FIGURE 3

NOT TO SCALE

mend removal of the parking lane on the northern side of Commonwealth Avenue resulting in the loss of fifteen (15) parking spaces. Removal of this parking lane would improve site distance for trail users crossing Commonwealth Avenue who are heading south along the BFRT. If it was not removed, the combination of the parked cars and the slight curve in the roadway make it difficult to see oncoming traffic. The parked cars make it more difficult to see oncoming traffic. The proposed section would include one seven foot parking lane and two fourteen foot travel lanes. GPI would recommend Share the Road pavement markings and signing.



Trail users heading south along the BFRT would utilize the existing crosswalk at the Commonwealth Avenue/Church Street intersection to enter the shared roadway. They would follow the shared roadway until Commonwealth Avenue intersects with Main Street. There are two existing crosswalks at this location. One crosswalk would bring trail users to the existing island and the second would bring trail users from the existing island to the EOTC owned right-of-way. Trail users heading north along the BFRT would cross Main Street (Route 62) at the existing crosswalk from the EOTC right-of-way to the existing island and then from the existing island to the proposed shared roadway.



The existing signal at Main Street and Commonwealth Avenue currently provides exclusive pedestrian phasing resulting in all traffic stopping when the crossing phase is activated. GPI recently evaluated operations of the signal as part of a Townwide Traffic Signal Inventory. The intersection operates fairly well with delays typical of a signal in a downtown area. During peak commuting periods, queues are regularly experienced along the Main Street approaches. With the addition of trail users, the exclusive "WALK" or pedestrian phase may be called more frequently resulting in increases in delays and longer queues for motorists. Intersection modifications to minimize crossing distances and times should be examined, including reconfiguring the intersection to a more traditional "T" intersection with a single crossing of Main Street.



With one parking lane remaining on the south side of Commonwealth Avenue, the width provided for trail users headed in a southerly direction still puts them at risk from opening car doors.

Alternative 1C - Wider Sidewalk on Commonwealth Avenue



This alternative proposes a wider sidewalk on Commonwealth Avenue. See Figure 4 on the following page. The existing sidewalk on Commonwealth Avenue varies between seven (7) and eight (8) feet in width. The usable sidewalk space is reduced with the light poles, parking meters and street furniture. Therefore, in order to accommodate BFRT traffic with the existing sidewalk traffic and reduce the potential for significant congestion, this option would again eliminate the parking on the north side of Commonwealth Avenue and increase the width of the sidewalk.

As an urban collector, MassDOT requires ten (10) foot travel lanes and four (4) foot shoulders. The minimum acceptable parking lane must be seven (7) feet. In order to implement this alternative, GPI would propose to shift the curbing on the north side of Commonwealth Avenue five (5) feet in a southerly direction leaving both travel lanes and the parking lane on the south side of Commonwealth Avenue as they exist today. By shifting the curb line, approximately twelve (12) feet would be provided on the north side of Commonwealth Avenue between the center line of the roadway and the vertical curb. It should be noted though that with only twelve (12) feet, MassDOT would require the filing of a Design Exception Report for the sub-standard shoulder width.

This would provide a sidewalk in excess of twelve (12) feet to be utilized by pedestrians and trail users. GPI would still propose signing that would request trail users to dismount their bicycles and walk them. Although many riders may not dismount their bikes, the wider sidewalk should lessen the potential for pedestrian / bicycle collision.



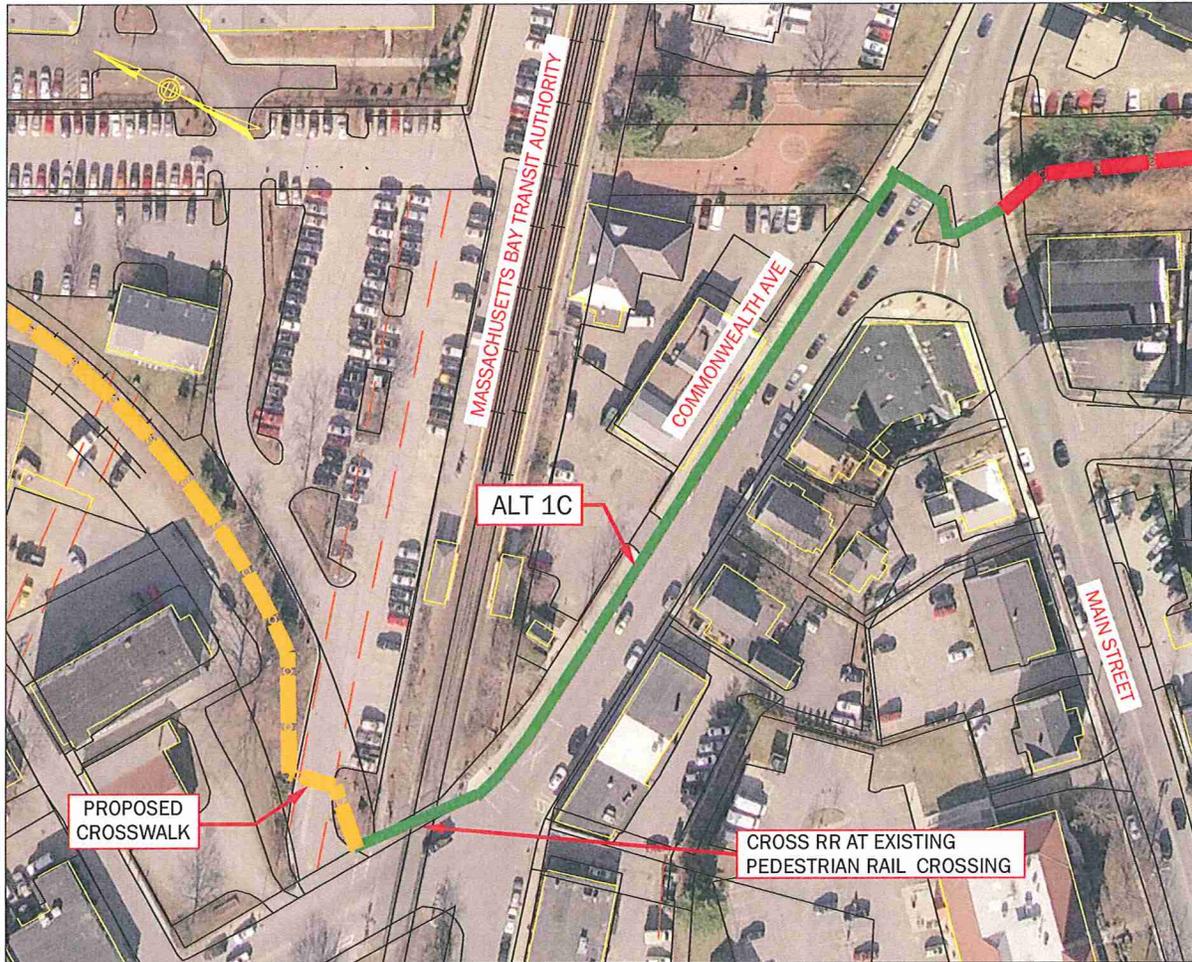
Another consideration would be to provide some separation between the required five (5) foot sidewalk for pedestrians and the portion being utilized by the trail. This separation could be as simple as a paint stripe or a paver stripe. The trail side of the sidewalk could also be denoted by a different color such as the Ride-A-Way coating which would define the section dedicated for trail users. This separation would provide additional guidance to keep pedestrians and trail users apart. Signing would be proposed indicating which portion of the wider sidewalk was

intended for trail users. Although it would be difficult to prevent crossover, the increased width should make it less necessary.

Alternative 1D - Trail behind the West Concord Supermarket

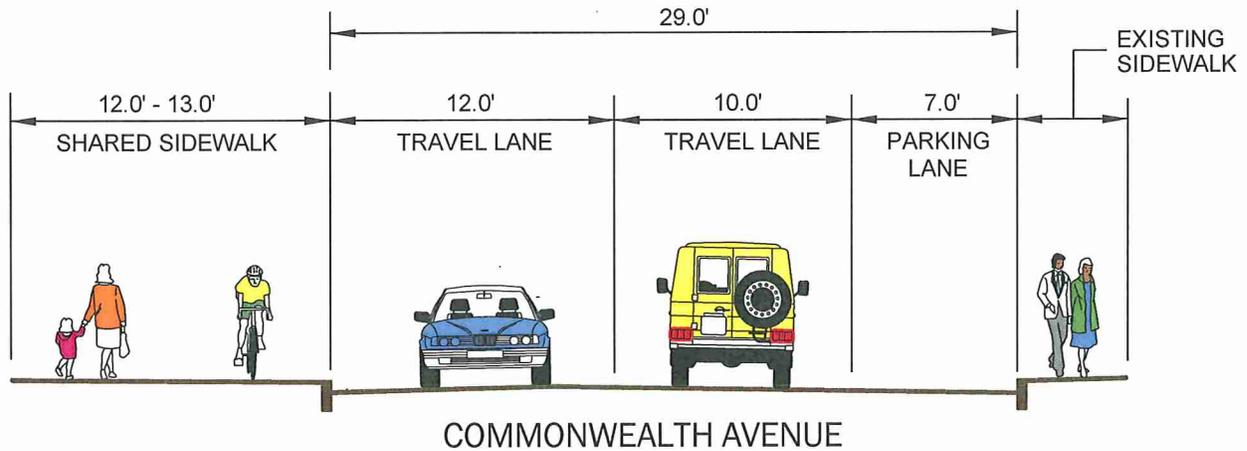
Alternative 1D proposes a trail behind the West Concord Supermarket that would cross the tracks at the existing gated crossing on Commonwealth Avenue, run parallel to and south of the tracks and then bend around Union Station to the existing Main Street crossing in front of the 99 Restaurant. See Figure 5 on page 20. The Town of Concord owns a small portion of the right of way at the westernmost portion of the area between the tracks and Commonwealth Avenue. Mandrioli Real Estate Trust and the MBTA own the remaining portion of the right-of-way in this area. In





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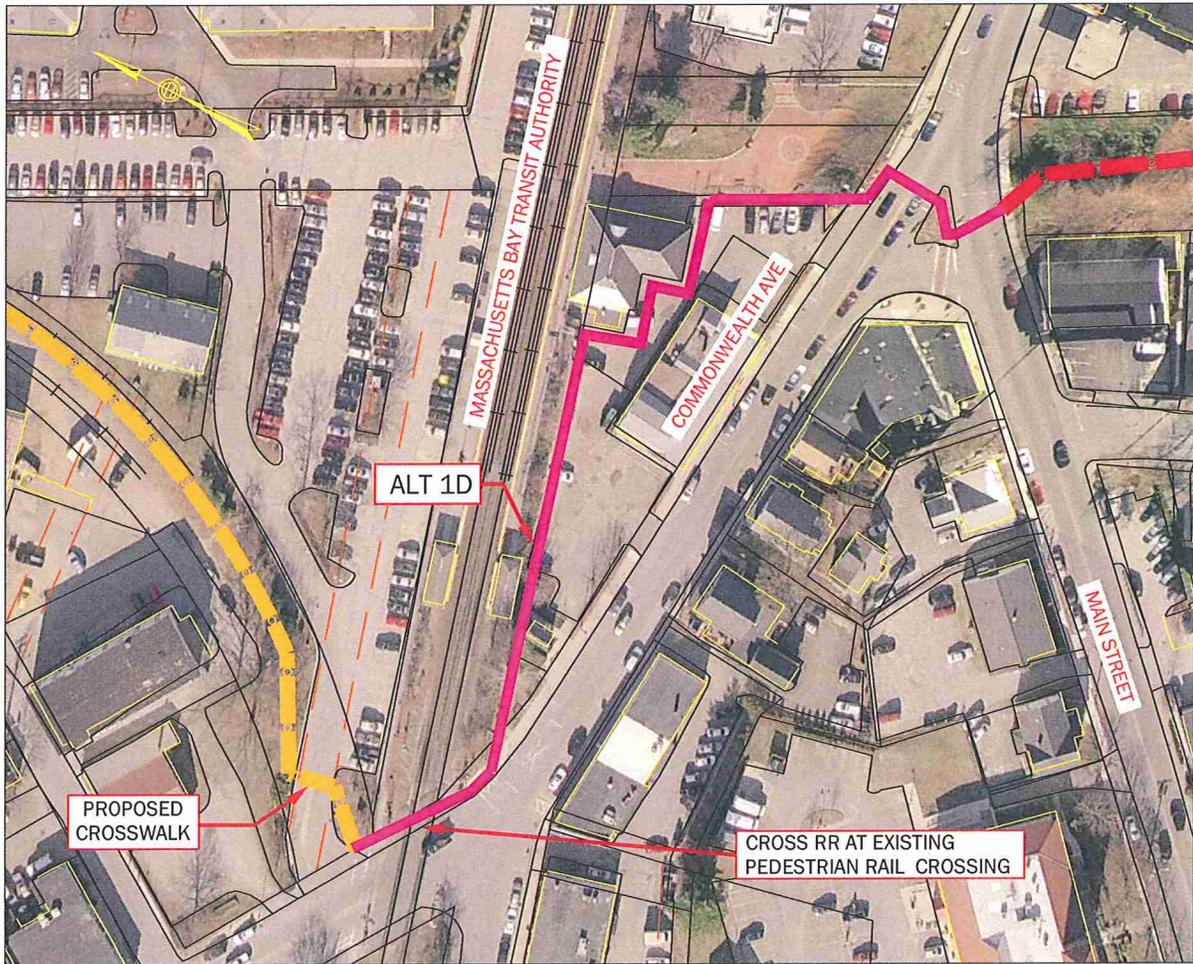
-  = SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY
-  = ALTERNATIVE 1C – ADJACENT TO ROADWAY
-  = ALTERNATIVE 1 – SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY



ALTERNATIVE 1C
WIDER SIDEWALK ON COMMONWEALTH AVENUE
 CONCORD, MA

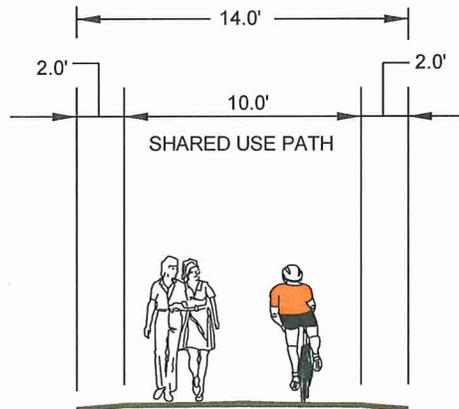
FIGURE 4

NOT TO SCALE



LEGEND:

-  = SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY
-  = ALTERNATIVE 1D – TRAIL BEHIND THE WEST CONCORD SUPERMARKET
-  = ALTERNATIVE 1 – SHARED USE PATH (SUP) – SEPARATE FROM ROADWAY



SUP SEPARATE FROM ROAD DESIRED CROSS SECTION

ALTERNATIVE 1D
TRAIL BEHIND THE WEST CONCORD SUPERMARKET
CONCORD, MA

FIGURE 5

NOT TO SCALE

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Proposed Bruce Freeman Rail Trail/MBTA Commuter Rail Crossing Alternative Analysis

addition to the West Concord Supermarket, Union Station is located on this property. Union Station currently functions as the MBTA Commuter Rail Station and is listed on both the State and National Register of Historic Places. It was constructed in 1893 at the former junction of the Boston-Fitchburg and Framingham-Lowell railroad lines and is the only remaining building associated with the railroad in West Concord still intact and located on its original site. This area is currently utilized as a parking lot and as a loading zone.



The edge of the existing parking lot parallel to the tracks is lined with wheel stops and is the approximate location of the MBTA Fitchburg Line property line. Currently there is a fence set approximately ten feet from the MBTA Fitchburg Line property line and edge of the existing parking lot. This area is landscaped with trees, bushes and various plantings.



There are also some wheel stops and granite bollards at the rear of Union Station. These are proposed to protect those entering or exiting the rear door of Union Station. There is reserved parking along the easternmost portion of the parking lot abutting Concord Junction Depot Park.



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The existing landscaped area between the MBTA fence and the parking lot is approximately ten feet in width which is insufficient to provide a trail meeting MassDOT and AASHTO Standards. At a minimum an eight foot trail with two foot shoulders on either side would be required. Therefore, in order to accommodate the trail, right-of-way would be necessary from both Mandrioli Real Estate Trust and the MBTA impacting the existing parking and flow of traffic through the area. An effort would be made to rearrange the existing parking lot to accommodate the trail through this area. However, parking spaces would likely be lost. It would also be GPI's recommendation to provide fencing or a suitable barrier between the parking lot and the proposed trail. If fencing was proposed, the wheel stops should remain.

It is our understanding that previous discussions with West Concord Supermarket indicated that they did not want to lose any parking spaces. In order to minimize the potential loss of parking, a sidewalk rather than a trail could be provided in the landscaped area. Trail users would be required to dismount their bikes and walk them.

Once the trail reached Union Station, it would need to follow the outline of Union Station and stay as close to the building as possible since the area is also utilized as a loading zone and



people utilize this area to enter and exit the parking area. In order to accomplish this, the trail would not meet the minimum radius requirements as defined in the *Guide* and would essentially serve as a sidewalk since space is limited. There is a distance of approximately fifteen feet between Union Station and West Concord Supermarket where they are closest to each other. With a distance of only fifteen feet, trail users would need to share this space with vehicles. Trail users would be required to dismount their bikes through this area due to the width of the sidewalk and the

turns necessary to get around Union Station. This presents an issue with people entering and exiting the rear doors of the Union Station building also.

In order for the sidewalk/trail to reach Main Street, it would follow the curbline along Concord Junction Depot Park. As a result, the parking spaces along the easternmost portion of the MBTA property in this area would be lost and with the limited space most likely could not be replaced.

Incorporating the trail in front of the MBTA platforms was discussed in the field but not investigated further. With only ten feet between the front of Union Station and the tracks, there is insufficient space in front of the platforms and Union Station to safely incorporate a trail enabling bikers, walkers, skateboarders, roller bladers and runners to traverse the area while people are entering and exiting the train.



Alternative 1 Summary**EVALUATION CRITERIA****Effectiveness**

Routing the trail along the abandoned railroad spur has both pros and cons. Since human nature is to find the most direct route from Point A to Point B, users may try and find a more direct route, i.e. through the MBTA parking lot and across the tracks. It would be GPI's recommendation to install fencing at the existing MBTA parking lot and along the spur to prevent trail users from taking that route.

Although signing can be proposed requiring bicyclists to dismount their bikes and walk them, it will be extremely difficult to enforce without constant monitoring, warnings and possibly enforcement such as police warnings, tickets and fines. If Alternative 1A or 1C were chosen and there is a lot of pedestrian traffic on the sidewalk, trail users may opt to travel on the street. Avid trail users may opt to travel on the street regardless of the sidewalk traffic. Conversely, if Alternative 1B is chosen, families with small children may opt to have the children travel on the sidewalk and avoid the street. If Alternative 1D were chosen, trail users may avoid the proposed path on the outskirts of the parking lot and cut through the parking lot or they may continue along Commonwealth Avenue to Main Street.

From the *AASHTO Guide for the Development of Bicycle Facilities*, "In general, the designated use of sidewalks (as a signed shared facility) for bicycle travel is unsatisfactory". Sidewalks are typically designed for pedestrian speeds and maneuverability and are not safe for higher speed bicycle use. This option presents conflicts between pedestrians and bicyclists as well as bicyclists and parking meters, light poles, sign posts and parked cars. Walkers, joggers, skateboarders and roller skaters can and often change their speed and direction almost instantaneously leaving bicyclists insufficient reaction time to avoid collisions. Pedestrians have a difficult time predicting the direction of oncoming bicyclists. Although a wider sidewalk does provide more space, it does not necessarily add to the safety of sidewalk bicycle travel since wider sidewalks might encourage higher speed bicycle use. AASHTO however does note that sidewalk bikeways should only be considered under certain limited circumstances such as to provide bikeway continuity along heavily traveled roadways having inadequate space for bicyclists.

Short-term and Long-term Reliability

Although not direct, Alternative 1 does provide a continuous path for the BFRT. However, it will not be reliable as far as compliance. It will be extremely difficult to force trail users to dismount and walk their bikes. It may also not be reliable as far as use. Trail users may opt to travel on a more direct or less congested route.

Short-term and Long-term Maintenance Costs

The maintenance costs described earlier in this report apply. The annual maintenance cost for a trail is approximately \$1,500/mile. The long-term paving cost would be approximately \$80,000/mile the first time and \$130,000/mile the second time.

Difficulty in Implementing

Alternatives 1A, 1B and 1C only require an easement from EOTC. No additional right-of-way would be required. The Town would need to work with the abutters along the spur as far as their unauthorized use of the right-of-way and screening mechanisms.

Alternative 1D would require an easement from the EOTC, Mandrioli Real Estate Trust and the MBTA. This alternative would likely result in the loss of parking, make loading and unloading more difficult and inconvenience people using the rear entrances of Union Station.

The Town should also work with the business owners along Commonwealth Avenue to ensure that they are in support of the selected alternative. The political ramifications of removing a lane of parking or parking spaces could present a major road block for the project.

Alternatives 1A (substandard width for bicycle accommodations), 1C (substandard shoulder width) and 1D (substandard width for bicycle accommodations, sight distance and minimum radius requirements) would likely require design exceptions since they do not meet the design standards required. This would entail the preparation of a design exception report and approval by the Design Exceptions Committee. These alternatives would require discussion and/or meetings with both the AAB/ADA Coordinator and the Bicycle/Pedestrian Accommodation Engineer at Mass DOT. At this time, it is unknown whether or not any of the options would be approved by MassDOT. In discussions with MassDOT regarding this report, they had indicated that they would need a formal submission in order to evaluate any alternative and make any decisions.

It should be noted however, that the MBTA would approve of Alternatives 1A, 1B and 1C. Alternative 1D would require further review by the MBTA.

With federal funds being allocated towards the construction of the BFRT, a Categorical Exclusion (CE) Checklist would be required. Since work will be proposed within the Riverfront Area of Nashoba Brook, a Notice of Intent must be filed with the Concord Natural Resources Commission. It is possible that an Environmental Notification Form (ENF) would also be required assuming that this would be constructed as part of the Concord BFRT and not independently. It should be noted that these permits will be required regardless of this alternative. None of these alternatives trigger additional permitting.

Cost to Design and Implement

The projected design costs assume that the design is being completed as part of the design of the Concord BFRT and not just the section that this report is evaluating. The costs will increase if the design of this alternative is removed from the design of the Concord BFRT and done independently. All costs in this report assume that the project is being designed and constructed as part of the BFRT Phase 2C.

The construction of one (1) mile of bikepath without any structures is approximately \$1.5 million/mile.

The design cost for incorporating Alternative 1 into the BFRT Phase 2C would be approximately \$70,000.00. Construction of this alternative would be approximately \$500,000.00.

Risk to Public Safety

Alternatives 1A and 1C eliminate potential trail user/moving motor vehicle conflict except at the MBTA parking lot entrance on Commonwealth Avenue and the crossing at the existing crosswalk in front of the 99 Restaurant which are concerns for all alternatives. They do however increase the potential for trail user/pedestrian conflict as trail users try and make their way along the sidewalk. If the volume of trail users is high, it could potentially have an impact on business at the West Concord Supermarket. It will make it more difficult for vehicles to enter the parking lot and for patrons to enter and exit the store. Alternative 1B does place trail users closer to

moving motor vehicles since they will be sharing a lane with them. Alternative 1D also places trail users closer to moving vehicles in the area between Union Station and West Concord Supermarket. This alternative also increases the potential for trail user/pedestrian conflict as people try and enter or exit the rear of the Union Station Building and also increases the potential for collision for trail users since sight distance will be limited in areas.

All variations of this alternative except Alternative 1D create a potential conflict with trail users and opening car doors since right-of-way does not allow for a door zone.

Bicycle crash statistics from the Pedestrian and Bicycling Information Center's website (<http://www.bicyclinginfo.org/> and <http://www.walkinginfo.org/>) at intersections indicate that bicyclists are not safer on the sidewalk because they become almost invisible to the motorist. When a driver turns, either left or right, or into a driveway or alley, they are simply not looking for, or expecting to encounter, a bicyclist. If they do look and see a bicyclist they may still underestimate the speed a rider is traveling on the sidewalk - because it will likely be much faster than a pedestrian. Although there is not a specific crash statistic attributed to bicyclists riding on sidewalks, the fact that the bicyclist was riding on the sidewalk contributed to the crash as can be seen below.

Motorist turns left in front of cyclist	42% of bicyclists are on the sidewalk
Motorist turns left into oncoming cyclist	15% of bicyclists are on the sidewalk
Motorist turns right into bicyclist	31% of bicyclists are on the sidewalk
Motorist drives out of alley/driveway	48% of bicyclists are on the sidewalk
Motorist drives through intersection	15% of bicyclists are on the sidewalk
Bicyclist rode out intersection with signal	24% of bicyclists are on the sidewalk

Furthermore, the quality of the riding surface on most sidewalks is far inferior to the parallel roadway. The vast majority of bicycle crashes that end up with the bicyclist seeking medical attention do not involve a motor vehicle and happen because a rider either falls after hitting an obstacle, slides on gravel or leaves, or loses control. Riding on the sidewalk is fraught with the kind of dangers and obstacles that may increase the chances of that happening.

The 1992 report, *Risk Factors for Bicycle-Motor Vehicle Collisions at Intersections* authored by Alan Wachtel and Diana Lewiston concludes that *"Bicyclists on a sidewalk or bicycle path incur greater risk than those on the roadway (on average 1.8 times as great), most likely because of blind conflicts at intersections. Wrong-way sidewalk bicyclists are at even greater risk, and sidewalk bicycling appears to increase the incidence of wrong-way travel"*

Vehicular Impacts

Alternatives 1B and 1C eliminate one lane of parking along Commonwealth Avenue. Alternative 1B does propose that trail users and vehicles will be sharing the roadway. Alternative 1D will likely result in the loss of parking and could potentially make loading/unloading activities more difficult. Alternatives 1A, 1B and 1C propose potential conflict with trail users and opening car doors. With the trail routed along Commonwealth Avenue, turning into and out of the West Concord Supermarket parking lot may be more difficult. Alternative 1D may make loading, unloading, entering and exiting the parking area behind the West Concord Supermarket.

Benefits to the Community

This alternative provides a continuous route along the BFRT. This also directs trail users to the businesses along Commonwealth Avenue and the MBTA Commuter Rail Station.

Timeliness to Implement

This option requires the elimination of one lane of parking or parking spaces in addition to eliminating unauthorized use of the right-of-way along the spur so the public process may delay the design process. Each alternative requires right-of-way. If the Main Street/Commonwealth Avenue intersection is reconfigured and reconstructed, the design will take between one (1) and two (2) years.

If a design exception is determined necessary and approved and the abutters are amenable, none of the options presented under Alternative 1 propose any special or time consuming design features so assuming this would be incorporated into the BFRT Phase 2C design and construction, the design could be completed in approximately 24 months and the construction could be completed in an additional 24 months.

Context-sensitive Aesthetics

A solid fence to prevent trail users from entering the MBTA Commuter Rail parking area could negatively impact the visual character and aesthetics of the area.

Inclusion of context-sensitive aesthetics such as pavers, colors and plantings could be included in the design of any option under Alternative 1. Alternative 1A does not propose any changes to Commonwealth Avenue other than some signing. Alternatives 1B and 1C do propose changes to Commonwealth Avenue but these changes could be implemented with minimal disruption to the historic context of the area. Alternative 1D does not propose changes along Commonwealth Avenue however does propose changes in the vicinity of Union Station which is listed on the National and State Registers of Historic Places.

Alternative 1 does have both positive and negative impacts on the businesses, particularly the West Concord Supermarket. Although trail users will be directed to the businesses, one lane of parking and/or parking spaces will be lost and sidewalk congestion and trail traffic could negatively affect the business.