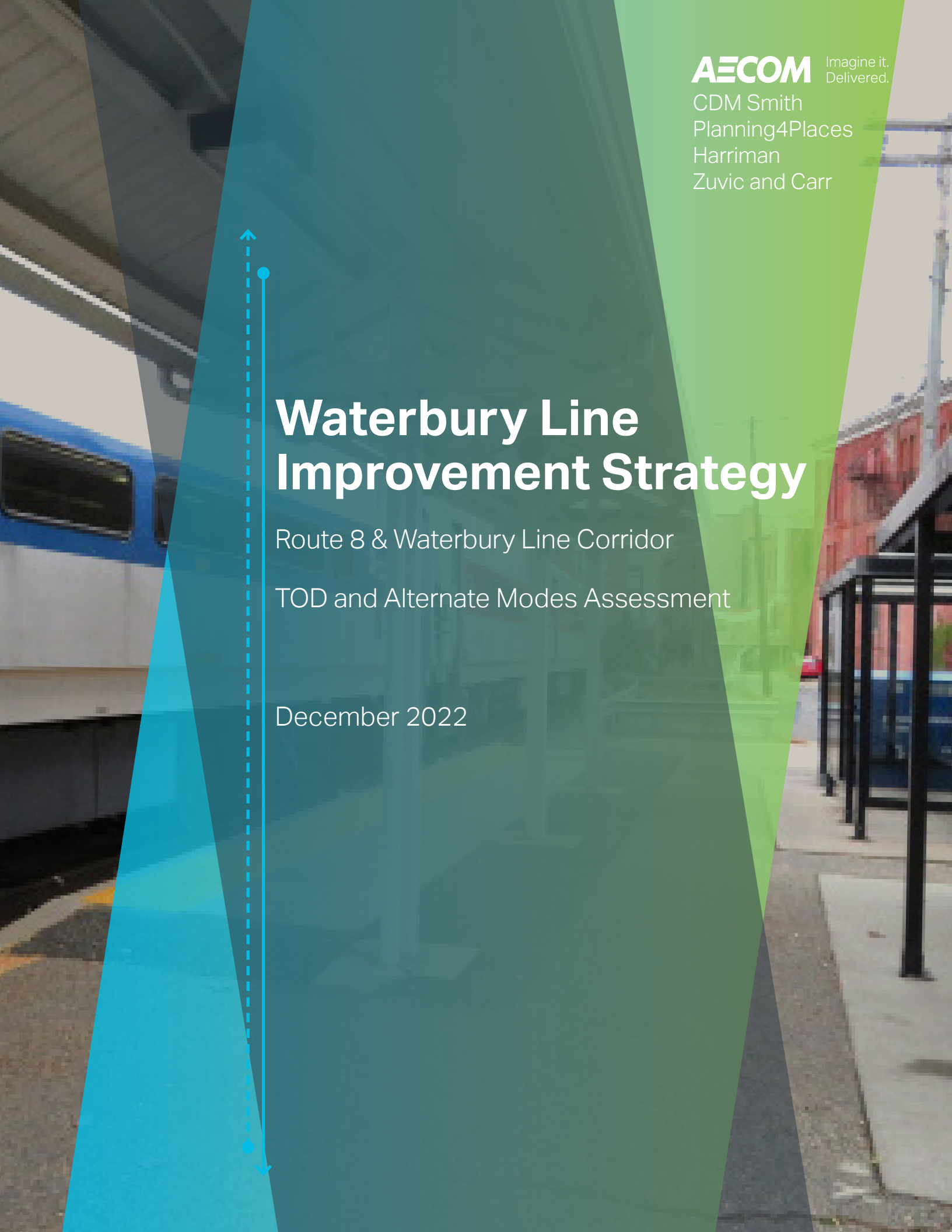

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Waterbury Line Improvement Strategy

Route 8 & Waterbury Line Corridor

TOD and Alternate Modes Assessment

December 2022

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FINAL PHASE OF THE ROUTE 8 & WATERBURY LINE TOD AND ALTERNATE MODES ASSESSMENT

EXECUTIVE SUMMARY

The primary focus of the *Route 8 & Waterbury Line Corridor TOD and Alternate Modes Assessment* project, hereafter referred to as the "*Alt Modes Study*," has been to develop a phased-in improvement strategy for Waterbury Branch Line (WBL) passenger rail service. This focus is based on the finding that enhancing the WBL offers the greatest opportunity to provide an alternative transportation option for commuters and non-commuters traveling along Route 8. This study as well as prior studies of the corridor clearly identified the need to improve rail service in order to effectively attract developers and promote transit-oriented development around each of the line's six rail stations. Problems identified included unreliable equipment, poorly timed connections to the New Haven main line, deteriorating station conditions, slow speeds, lack of high-level boarding platforms and poor ADA access.

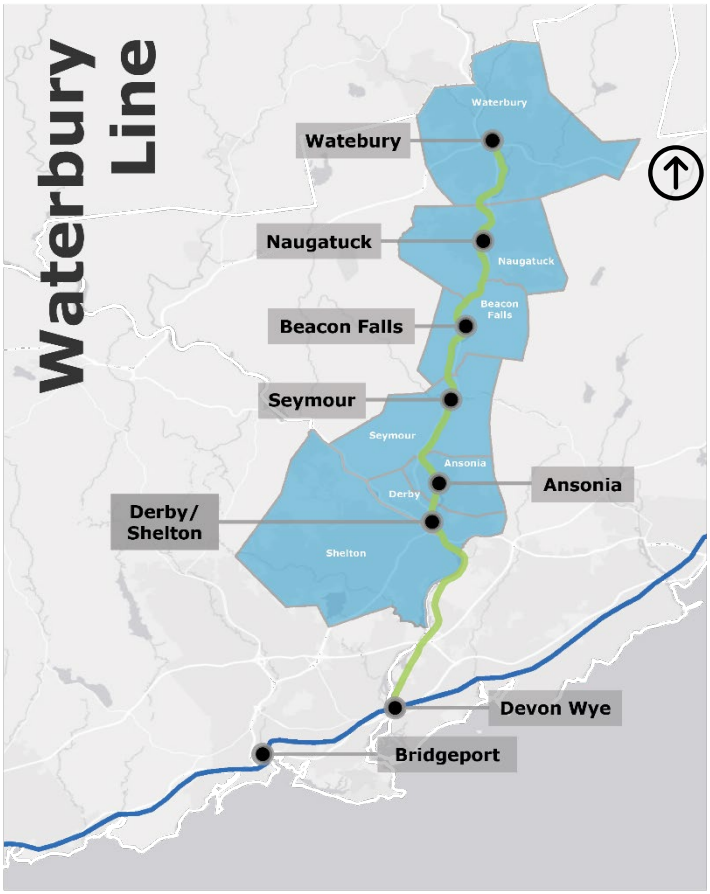

Figure 1. Waterbury Line Communities and Stations

A 2010 study by the Connecticut Department of Transportation (CTDOT) identified a number of improvement options, but nearly a decade passed before any significant or major investments in the line occurred. In 2017, CTDOT invested in the design and installation of a new signal system for the line, implementing Positive Train Control (PTC), improving track infrastructure, and constructing four passing sidings. Plans are now underway for installing new high-level platforms at the five stations that do not have them. (In October 2022 the CTDOT submitted an application to USDOT under the *All Station Accessibility Program* to fund the installation of high-level platforms at three legacy stations – Ansonia, Seymour and Beacon Falls). The resulting new signal system and passing sidings have the capability of handling 10 trains per hour on the line. The CTDOT took advantage of these improvements to add seven new train trips in the summer of 2022. While this level of expanded service substantially enhanced riders access to the main line and provided better connections, it remains less than potential capacity of the line.

The recently completed infrastructure improvements and implemented service enhancements form the baseline condition from which four improvement options were developed. These recommended actions are based on the previous studies, updated analyses, and input from NVCOG, CTDOT and Metro-North Railroad.

During the course of this planning project, the scope and purpose of the *Alt Modes* study has evolved. The intent was to develop a short list of preferred recommendations to improve the Waterbury Branch Line, promote transit-oriented developments around the train stations, and provide alternative transportation options for commuters and noncommuters travelling along Route 8. Because of the importance of the Waterbury Branch Line to the economic

revitalization of the Naugatuck Valley, an action plan to upgrade the rail line was presented before the completion of the study and the state accelerated plans to take advantage of infrastructure improvements being completed.

Figure 2: Waterbury Rail Working Group, January 13, 2020, Conference

At regional level, the Waterbury Rail Working Group was established. It is comprised of the mayors and first selectmen serving the municipalities of the Naugatuck Valley planning region. Mayor O'Leary of Waterbury and Mayor Hess of Naugatuck serve as the co-chairs of the group. Two rail summits have been held: December 19, 201 and January 13, 2020. These summits served as a way to draw attention to the current condition of the Waterbury branch line service and present strategic actions to upgrade and modernize the rail equipment. The Working Group, acting in coordination with the region's state representatives, advocated enhancement of service and equipment and drafted and submitted testimony in support of legislation to fund improvements to the WBL. The recommendations included the following:

1. Immediately institute new morning and evening peak period trips and provide 30-minute headway service during peak periods and 60-minute headway service during off-peak periods by 2025.
2. Provide funds to develop specifications dual-powered locomotives and modern rail coaches to operate on the Waterbury branch line.
3. Commit funds to identify a location for a new rail storage yard and maintenance facility along the Waterbury branch line.
4. Develop a Waterbury branch line improvement master plan that identifies strategic projects and actions necessary to expand service and improve infrastructure.

The Working Group also endorsed several mid-term and long-term actions to transform the rail line. While the state is working on designing and installing high level platforms at the WBL stations, the project does not address the need to renovate the station areas to provide comfortable passenger waiting areas, modern amenities and enhance connections to the nearby downtown areas. The capacity of the New Haven main line is also a concern of the Working Group. The improvements that have been implemented would permit increased service, but the level of service that can be provided is limited because of the constrained capacity on the main line. To provide frequent service on the Waterbury branch line may require altering how the line function. Instead of all trains accessing the main line, the concept of creating a transfer station between the branch and main lines and operating service on the WBL more like a shuttle needs to be considered.

This report presents a phased implementation plan to transform travel within the Route 8 and Waterbury Branch Line corridors. The baseline condition includes the already completed, ongoing and planned improvements. In addition, near-term, mid-term and longer-term improvement options were also identified. For each option a ridership forecast was prepared to determine overall impacts of each improvement cumulatively over 20 years.

These options include:

1. **Program 1—Baseline Scenario**: Includes ongoing and planned improvements in WBL infrastructure, service, and facilities: new central traffic control signal system, passing sidings at four locations and integration into the signal system, and seven new trips per day.
   Ridership: if no other improvements are implemented to the baseline conditions, 2041 ridership on the WBL would be 105,310 a 24% increase above the 2019 ridership.

2. **Program 2—Increased Service and Upgrades (Near-Term)**: Addition of new rail equipment (dual-powered locomotives and coaches), increased frequency of WBL Service and Infrastructure/Facility Upgrades. This includes half hour service in the AM/PM peak periods, addition of direct, one-seat trains to Grand Central Terminal and new or renovated rail stations at Derby-Shelton, Ansonia, Seymour, Beacon Falls and Naugatuck. (Note: new stations at Seymour and Naugatuck may involve relocations).
   Ridership: The increased frequency of service in the Near-Term option of improvements would bring about a 55% increase in 2041 over the 2019 numbers.
3. **Program 3—Frequent Rail Shuttle Service (Mid-Term):** Institute frequent rail shuttle service with well-timed connections to New Haven Main Line trains. It is recommended that a temporary Devon Transfer station be started early in this phase. The longer-term option would include construction of a permanent Devon Wye transfer station and limited parking facilities**.** (Note: the intent of the Devon Wye station is to function as a way for passengers to transfer directly between the Waterbury branch line and the New Haven main line and not to serve as a new stop on the main line. Therefore, on-site parking will be limited to a supply needed to support transfers, including a short-term drop-off and pick-up zone).
   Ridership: Institution of frequent rail shuttle service would lead to a significant 178% increase over 2019 ridership by 2041.
4. **Program 4—Bus Rapid Transit (Long-Term):** Addition of new Bus Rapid Transit (BRT) service along a portion of the Route 8 right of way, in addition to construction of the Devon Wye, to better connect Derby-Shelton rail station with Shelton corporate office parks and provide service along the Bridgeport Avenue Corridor. This would complement the improved rail services and facilities and provide high frequency transit service in a segment of the corridor currently without it.
   Ridership: Ridership forecast for this option includes only the total BRT users, which is estimated at 400 riders per weekday.

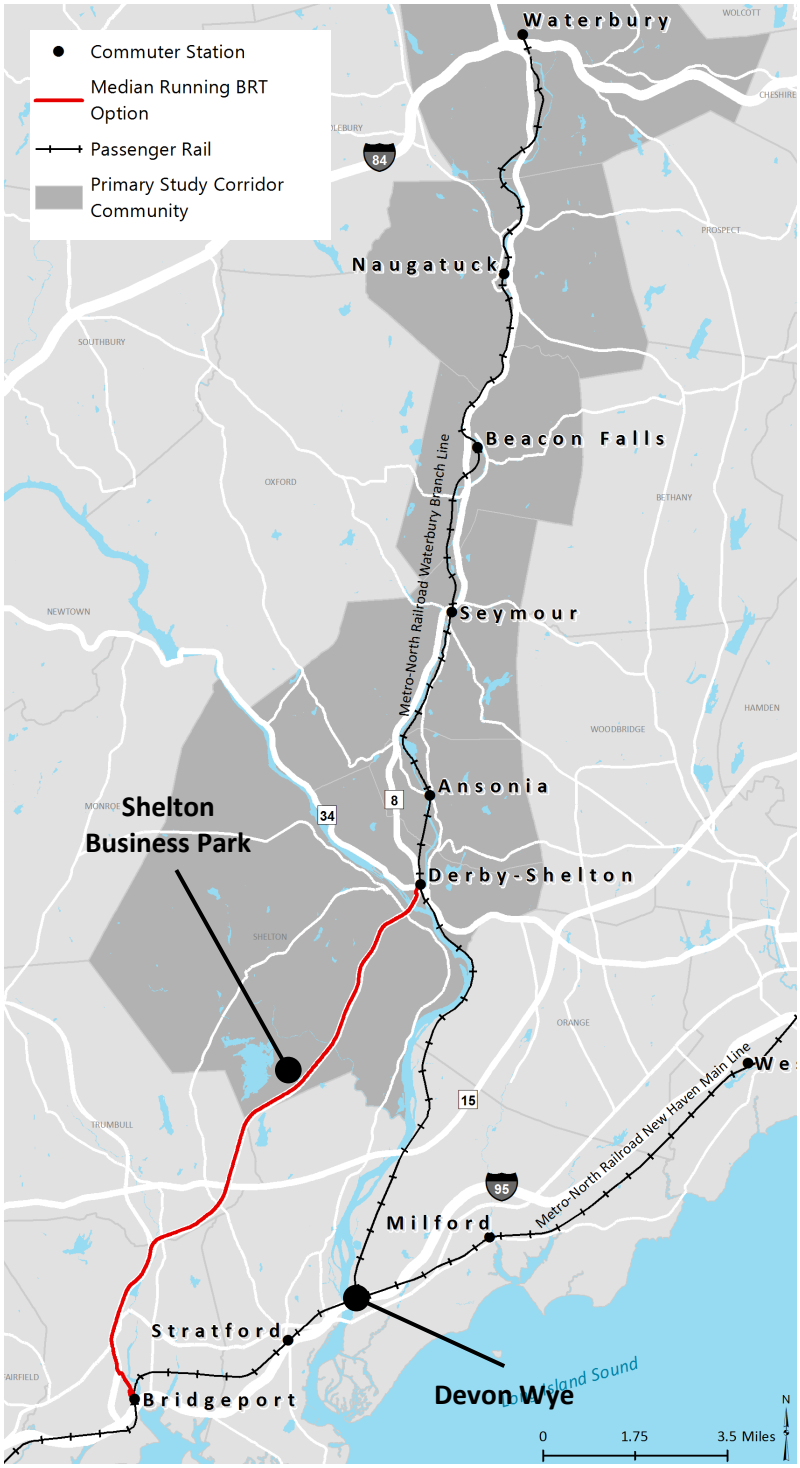

Figure 3. Route 8 Median Running Bus Rapid Transit

1 IMPROVEMENT STRATEGY PROCESS

This section summarizes the process for analyzing the four programs developed for the study. For a full analysis please see Appendix A. Waterbury Line ridership estimates were developed for four programs, as presented in Figure 3. The model is a "sketch-level" method to estimate mode shifts based on various independent variables and approximate the behavioral changes and potential demand reductions for the various improvement and TOD assumptions. Table 1 provides an overview of the major model inputs and process.

Table 1: Improvement and Transit-Oriented Development Assumptions for the Study Alternatives

Improvement and Transit-Oriented Development Assumptions for the Study Alternatives

Program	*Principal Transit Improvement Assumptions*	*Transit-Oriented Development (TOD) Build-Out Assumptions*
Program 1: Baseline Scenario	• Full traffic signal system and Positive Train Control (PTC); • Passing sidings in Devon, Derby, Beacon Falls and Waterbury; • One additional AM and PM train; and • One train providing one-seat ride to Grand Central Terminal.	• No TOD
Program 2: Increased Service and Upgrades	• All assumptions from the Baseline Scenario; • Reduced headways, 2-3 additional train sets, and increased one-seat rides to Stamford and Bridgeport; • Traffic control signalization and PTC; and • Station area upgrades at all stations and relocation of theNaugatuck and Seymour Stations.	• Mixed use developments in Naugatuck and Derby (South of Main Street) • 20% TOD Build-out
Program 3: Frequent Rail Shuttle Service	• All assumptions from the Baseline and Program 2; • Construction of a new transfer station at Devon; • One-seat ride service to Bridgeport and Stamford; • New rail equipment with increased passenger amenities; and • Complete station rehabilitation and replacement program.	• Mixed use developments in Naugatuck and Derby (South of Main Street) • 100% TOD Build-out
Program 4: Bus Rapid Transit (BRT)	• All assumptions from the Baseline, and Programs 2 and 3; • Route 8 Corridor BRT between the Derby-Shelton Station andDowntown Bridgeport with a stop at Shelton Corporate Park; • Headways: 15-min. peak periods / 35-40-min. off-peak; and • First- and Last-mile bus connections.	• Mixed use developments in Naugatuck and Derby (South of Main Street) • 75% TOD Build-out

To convert travel times, headways, and other time-based inputs into a cost, the model incorporated travelers' perceived Value of Time (VOT), which is typically linked to income. The VOT estimates were developed using town-level household income and hours-worked data (U.S. Census) and averaged $0.31 per minute. In addition to VOT, 2019-level gasoline costs were estimated at $0.202 per mile for drive alone trips. Transit factors, such as walkability, station amenities, first/last-mile services and emergency ride home options, were incorporated into the model as perceived time costs.

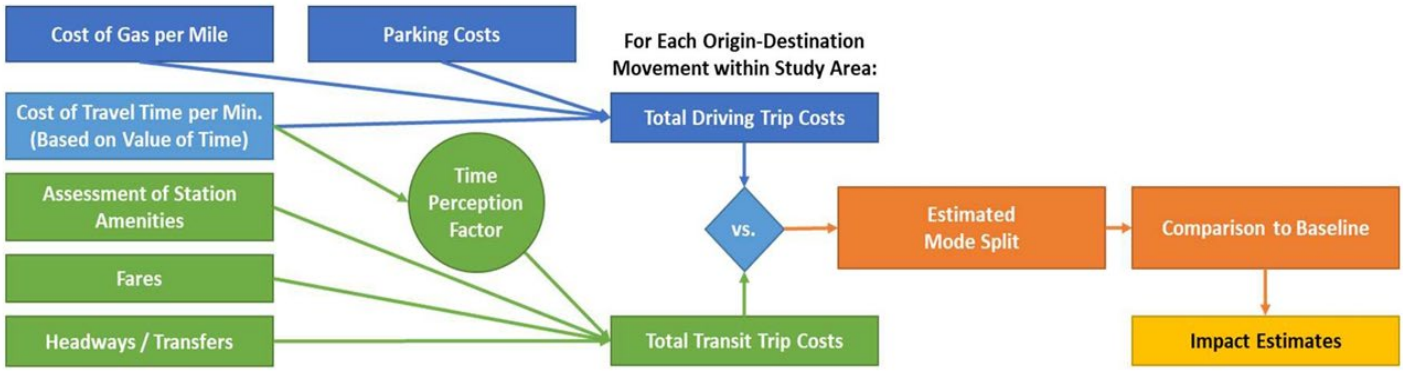

Figure 4. Overview of Modelling Process

To estimate future conditions (2041), trips were increased at a rate of 1 percent annually, for a total increase of 24.5 percent between 2019 and 2041. Travel times for Drive Alone trips were also inflated by 20 percent to approximate future congestion levels. An annual inflation rate of two percent was also assumed for all costs, based on historical trends. No COVID-19-related adjustments were applied to the future year estimates, as it was assumed that the study area would be fully recovered by 2041.

Of the 15,390 new residents and 17,516 new employees that could result from TOD, it was assumed that 40 and 90 percent, respectively, would travel within the study corridor. These trips were distributed along the Waterbury Branch Line at twice the transit share of the existing trips for each program.

Total perceived one-way travel costs for a Metro-North trip were compared to those of a drive alone trip for each potential trip movement. The resulting cost ratio was then used to estimate the mode split for each movement based on observed 2019 conditions. In this way, the mode shift model was used to develop high-level 2041 ridership estimates for each program by changing the relevant input variables or factors and comparing the model output against the 2041 Baseline.

2 WATERBURY LINE IMPROVEMENT STRATEGY

This section summarizes each of the phased-in improvement options for the WBL. It is based on the input received from the NVCOG, the Study Advisory Committee, input from CTDOT, Metro-North Railroad (MNR), elected officials from the six municipalities along the line, and prior studies. It provides a description of each, outlines any constraints, describes operating requirements, discusses infrastructure needs and presents the pros and cons.

Prior to this study, a number of alternatives (23) were initially identified, studied, and evaluated in detail as part of the *Waterbury and New Canaan Branch Lines Needs and Feasibility Study* in 2010. These 23 alternatives were evaluated based on environmental constraints, engineering and operational complexity, station area land use, cost efficiency and how well they met the goals and objectives of the study. These 23 options were shortened to 10 viable options plus "No build" (Figure 1).

Table 2: WBL Viable Alternatives from *2010 Waterbury and New Canaan Branch Lines Needs and Feasibility Study*

Waterbury Line Short List of Improvements (2010)		
W-1	Increased Train Length with High-Level Platforms	Planned
W-3	Full Signalization	In Progress
W-10	Beacon Falls Passing Siding	In Progress
W-11	Four Passing Sidings	In Progress
W-13	New Station at Devon	Long Term Vision
W-15	Derby-Shelton Multi-Modal Station	Planned
W-18	Waterbury Multi-Modal Station	Planned
W-19	Relocated Naugatuck Platform	In Progress
W-22	Express Bus	Planned
TSM/W-23	Shuttle Bus	Planned

Alternatives were not mutually exclusive and were combined to create several packages of options as viable alternatives for further consideration.

Each of these options were reviewed as a starting point for this project. Several of the options shown in Figure 1 have been or are in the process of being implemented, and the signalization, Positive Train Control (PTC), and construction of four passing sidings have been completed. However, much of the Line remains as it was a decade ago, with no high-level platforms, no significant station upgrades, and no increased train capacity (number of coaches per train set). While additional service has been instituted, to date there has been no improvement in the equipment operated on the WBL and service is provided using older, outdated equipment that is viewed as in poor condition by riders and does not provide amenities that commuters desire.

Working with the NVCOG leadership and senior planning team, Metro-North operations, and capital planning staff, CTDOT Office of Rail staff, Route 8 Corridor chief elected officials and NVCOG Board members, a comprehensive Waterbury Rail Line Capital Improvement Plan was developed. It consists of immediate actions, short-term actions, mid-term actions, mid-to-long term actions, and a long-term vision. These improvement options have been promoted by the Waterbury Rail Working Group and supported by the Waterbury Rail Line Caucus, a bipartisan group of legislators representing various parts of the corridor. The recommended action plan was presented at the Waterbury Rail Summit held in January 2020. It was submitted to CTDOT for consideration and is currently being developed as part of CTDOT's Waterbury Line Master Plan study, which is anticipated to be complete by fall 2023.

From this action plan, an updated short list of four options for a program of continuous rail improvements.

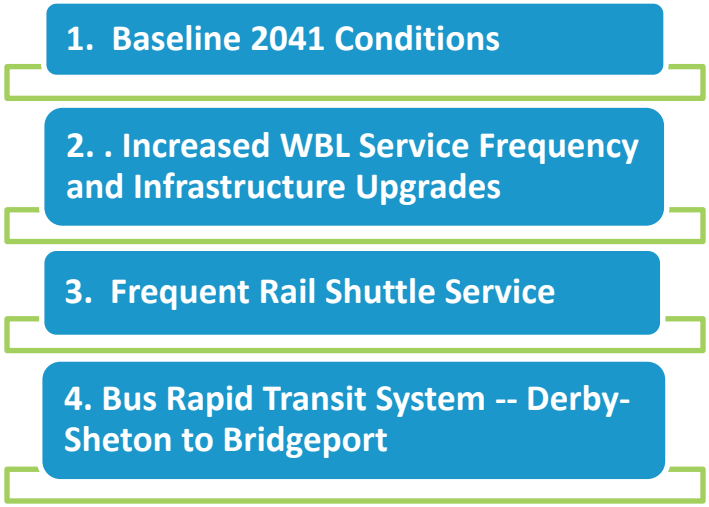

Figure 5. Rail Improvement Programs

1. Baseline 2041 Conditions

The Baseline 2041 scenario is based on what would happen if no action were taken to improve or change the Waterbury Branch Line going forward, with the exception of what is already planned, funded and underway. If that is the case, the following are the results:

The installation of a new signal system and four new passing sidings was originally cited in the *2010 Needs and Feasibility Study* and subsequently supported by CTDOT. The improvements became operational in early 2022. Without the signal system, only one train was able operate on the tracks in either direction at any time. The signalization of the line and new passing sidings substantially increases the capacity of the WBL, up to 10 trains per hour. Despite these improvements, the limiting factor of the capacity remains the frequency of service that is provided and the condition of the equipment operated on the line. Installation of the new signal system without any new equipment (new locomotives and coaches) will not improve on-time performance or travel times. Further, the improvements that have been completed will not cause a significant increase in ridership, about 24% over 2019 levels.

In 2020, there were only three train sets available for use on the Waterbury Line – two deadheaded from Stamford, and one shared with the Danbury Branch. All trains are diesel push-pull equipment with typically a three-car set. Only one train set remains on the WBL for approximately 16 hours per day. Improved reliability of the service will only be fully realized if new equipment is acquired and placed into service on the WBL. The current equipment has had a demonstrated record of unreliability and will continue to cause reliability issues even with all the infrastructure upgrades that have become operational over the past year. Additionally, the lack of equipment impedes the ability to enhance service frequency despite having the traffic control signal system and sidings in place.

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Economic Development impacts: Without perceived or actual service enhancements the impact on economic development has been negligible; however, the upgrade and modernization of the WBL is considered by the mayors and first selectmen of the municipalities along the line as the catalyst needed to spark the economic revitalization of the Naugatuck Valley. Expanded service will make the adjacent downtown areas more attractive as a TOD site. As was demonstrated in the extensive outreach that was conducted at five of the communities along the WBL related to TOD opportunities, one of the key drivers for new development is improvements to the WBL. Points of emphasis:

- Service frequency
- New equipment
- Upgraded stations
- Improved connectivity

In Derby, a 14-acre redevelopment site is receiving interest from several prospective developers. The site located on the south side of Main Street (Route 34) and opposite the access road to the Derby-Shelton train station. Preliminary conceptual site plans illustrate the potential for adding 325 apartments and 60,000 square feet of retail/commercial space to the site. Opportunity sites for higher density development near the rail stations were identified and evaluated as part of the *TOD Scenarios Assessment* (https://nvcogct.gov/wp-content/uploads/2019/05/Route-8-TOD-Analysis-Report-Draft-04-18-19.pdf).

Figure 6: Downtown Derby Redevelopment Plan near Derby-Shelton Train Station

In downtown Ansonia, several redevelopment projects are underway that will add residential units within walking distance of the train station. The city is also working remediating and redeveloping the former Ansonia Copper and Brass property. Plans are also underway in Naugatuck to market and redevelop vacant parcels in the downtown area near the WBL as higher density TOD sites. Efforts have been enhanced by the increase in service on the WBL and state plans to relocate the Naugatuck station closer to the parcels.

2. Increased Service Frequency and Infrastructure Upgrades

The second option listed above will be the next step in transforming the Waterbury line into a modern, state-of-the-art passenger rail line. While it includes many of the original recommended alternatives from the 2010 WBL Needs and Feasibility Study, it expands on those improvement options to take full advantage of the opportunities created by the new signal system, passing sidings and additional investments in infrastructure/facility improvements.

Plans to increase service on the WBL were developed by CTDOT and implemented in the Summer of 2022. This action consisted of adding seven new daily train trips in both the AM and PM peak, as well as during off-peak times. This new service required additional equipment and is currently being provided without the purchase of new coaches and locomotives. To meet the service needs, the CTDOT reallocated equipment from other rail lines, mainly from the Shore Line East line. This was possible because the CTDOT began operating electric, M8 equipment on the SLE by extending the use of the M8s to serve the SLE instead of terminating at the end of the New Haven main line. However, this reallocation is unlikely to meet the longer-term prospect of maintaining this additional service, let alone the proposed increase in service beyond the initial seven train trips. Ultimately new equipment will be acquired to maintain this option.

More importantly, increasing the number trains is only a part of what is needed to enhance the WBL. Survey comments have consistently expressed criticism of the condition of the current equipment. Poor condition, unclean coaches, frequent breakdowns, uncleanliness, and lack of amenities are typical criticisms from riders. While increasing the number of trains operated on the line is a critical and important action, it needs to be considered only a first step and the WBL will not realize its full potential without CTDOT addressing the condition of the equipment.

More importantly, increasing the number of trains is only a part of what is needed to enhance the WBL. Survey comments have consistently expressed criticism of the condition of the current equipment. Specifical complaints include cleanliness and lack of amenities.

Figure 7. Conceptual Re-Design of Derby-Shelton Station

To achieve this envisioned transformation, the following improvements are recommended:

- Acquire new rail equipment, including dual-powered locomotives and coaches to replace and expand the existing fleet – at least three sets for replacements and five new sets to expand service will be needed.
- To accommodate this new equipment, construction of a new Waterbury Rail Line storage yard and maintenance of equipment facility is necessary to store, fuel, clean and maintain the WBL's line rolling stock. The location for this facility is being evaluated as part of CTDOT's Waterbury Line Master Plan.
- Rail Station improvements at all locations including construction of high-level platforms, weather-protected waiting areas, updating to meet new ADA requirements, improved station facilities and amenities, landscaping, and parking.
- Improved station access from nearby downtown areas with combined bicycle and pedestrian improvements will support improved connectivity to the stations.

The CTDOT is working on various elements of these recommendation. Specifications for new rail coaches are being developed but there has not been a commitment to allocate any of the new equipment for operation on the WBL. For the WBL service to be attractive, the age and condition of the equipment needs to be addressed.

Currently, only the Waterbury rail station has high level platform access to trains. At all other stations, only low-level or mid-level platforms are provided, requiring passengers to use on-board steps to access trains. These

platforms also require passengers to board at one set of doors, which slows boarding and alighting and increases dwell times. The CTDOT is developing plans to install high level platforms at the stations that currently lack them. An application has been submitted to the USDOT under the discretionary *All Stations Accessibility Program (ASAP)* to fund the installation and construction of new platforms at three legacy stations – Ansonia, Seymour and Beacon Falls. High level platforms will be installed, and the station rehabilitated at the Derby-Shelton station will be completed as part of the FY 2021 RAISE program project. When the Naugatuck station is relocated, the new station will provide high-level platforms and will be fully ADA accessible.

Figure 8. Typical Low-Level Platform

High level platforms would improve and facilitate boarding and alighting, reducing dwell times. High level platforms will also improve access to the trains for people with mobility impairments. While the installation of high-level platforms is an important action and demonstrates a commitment by CTDOT to improve the WBL, the project must be implemented in conjunction with other station improvements, such as new weather-protected waiting areas, landscaping, parking and pedestrian and bicycle connections to the adjacent downtown areas. In addition, the project to install high level platforms needs to recognize and consider the potential closure of the stations at Beacon Falls and Seymour and consolidation of the two stops at a new location associated with a planned TOD development in Seymour north of the downtown area.

To improve operations along the WBL and implement service and schedules to attract riders, the service must be fast, reliable, and frequent. Service currently continues to Bridgeport for transfers, with infrequent service leaving gaps in the schedule. However, adding more trains to the New Haven main line between the Devon Wye, where trains leave the branch line, and Bridgeport is not always possible. Capacity constraints on the main line limit the number of additional trains that can run on the line. It becomes a balancing act to add new service into the available time slots.

The addition of new dual powered locomotives and state-of-the-art push-pull coaches for the WBL is necessary to allow for increased service frequency and optimize operations with the new signal system and passing sidings. The dual-powered locomotives would also allow WBL trains to operate more seamlessly on the mainline and possibly continue through to Grand Central Terminal (GCT), creating a one seat ride option for passengers travelling from Waterbury to GCT. New coaches will also address the current poor condition of the rail cars and provide a more comfortable and attractive experience for passengers.

Figure 9. Example of Dual-Powered Locomotive

The existing station areas are defined by non-descript boarding areas that provide little or no protection from the elements. To attract more riders, stations need to provide passenger amenities, protection from the weather and a more distinctive design and style. The station area and buildings would be significantly improved. New station buildings would be constructed at Naugatuck, Beacon Falls, Ansonia, and Seymour. In addition to high level platforms, the new buildings would provide protection from the weather, platform canopies, ticketing kiosks, real-time passenger information systems, and full ADA accessibility.

The areas around the stations would be landscaped and beautification elements added. Better accessibility and connections to the nearby downtowns would be provided.

To take advantage of TOD opportunities, the stations at Naugatuck (planned) and Seymour (proposed) would be relocated to prime development sites.

At Naugatuck, the plan is to move the station south of its current location to an area adjacent to three vacant parcels. A new commuter parking lot will be constructed, and enhanced pedestrian connections would be created to the downtown area.

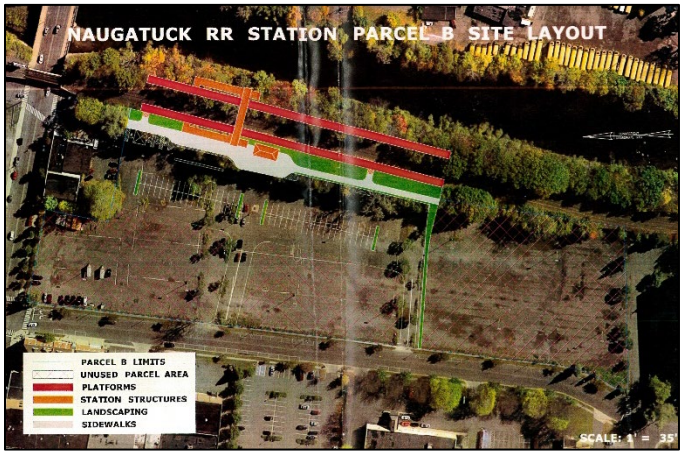

Figure 10: Naugatuck Station Relocated to Parcel B

The relocation of the Seymour station would be to a development site just north of the downtown area. This new site would offer the opportunity for the station to be adjacent to a sizeable mixed-use development that is planned by a local development company. The new location would provide an expanded and dedicated commuter parking area from what is currently available at the downtown site. Parking for rail commuters is limited and not well defined, currently. The relocation of the Seymour station also has the potential to reduce travel times by affording the potential consolidation of the Beacon Falls station with the new station, thereby, reducing the number of stops along the line.

At the Waterbury and Derby-Shelton stations, there are former station buildings that would be rehabilitated and reopened as passenger waiting areas. Plans (not part of this study) are being completed to renovate the former baggage room at the Waterbury station into an in-door passenger waiting area. The Derby-Shelton station was built in 1890 and needs substantial renovation. The CTDOT applied under the USDOT RAISE program to rehabilitate the building and transform the area into a multi-modal transfer station. The grant was awarded in 2021 and the project was initiated in 2022. The same passenger amenities and station features described above would be install at these stations.

At both Derby-Shelton and Waterbury stations, opportunities exist to convert these facilities into true multi-modal stations, where local fixed route and express bus services connect the stations to other parts of their respective host cities as well as the greater region. At Waterbury, the station is served by several bus routes operated by the CT*transit* Waterbury Division, which provide access throughout the city and adjacent municipalities. Express bus services operate from the station to New Britain, Hartford via connections to CT*fastrak* and Meriden. At the Derby-Shelton station, local bus routes provide connections to Bridgeport via Greater Bridgeport Transit (GBT) buses and New Haven, via CT*transit* New Haven Division service.

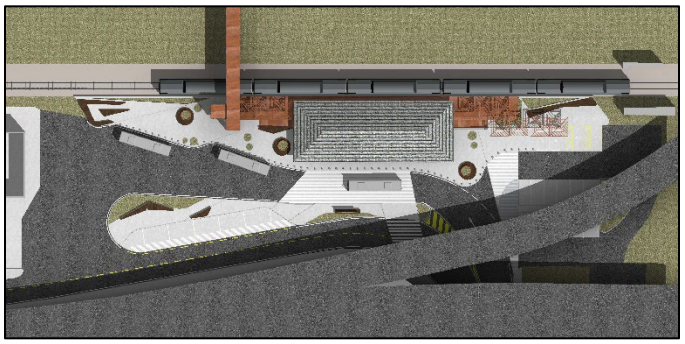

Figure 11: Enhanced Station Area Concept for Derby-Shelton Station

Currently trains deadhead from Stamford each morning to begin service. By constructing a storage yard, this train movement can be eliminated which could result in longer service spans and more equipment available for WBL operations. The facility would be equipped with maintenance bays to allow for the FRA required vehicle inspections each day, a fueling station and service station (for the train crews) to eliminate the dependency on the Stamford Yard. This new facility would also ease capacity constraints systemwide and support the acquisition of new rail coaches and locomotives dedicated to the WBL.

To prepare for a substantial increase in the frequency of service along the WBL (refer to Section 3 below) and addition of trains traveling along the WBL, the concept of creating a point at which WBL trains can seamlessly connect with the New Haven main line (NHML) needs to be

assessed. A possible location for a transfer station, as identified in the 2012 branch line study, is at the Devon wye. This study investigated the feasibility of constructing a permanent transfer station at the Devon wye. However, this assessment was at a relatively high level because of the physical constraints of the site. A more in-depth engineering assessment is required.

The Devon wye is the point at which the WBL connects with the NHML. The wye consists of two, single track connectors that join NHML Track 1. The west leg is currently used by WBL trains to access the mainline and travel in the inbound direction. The other track connector on the east side of the wye is currently out-of-service but had permitted WBL trains to travel east towards New Haven. Planning for a permanent transfer station, including the feasibility of locating it within the Devon wye, needs to begin in this phase. While the creation of a permanent transfer station and operation of shuttle rail service from Waterbury is considered a longer-term vision for the line, planning of this project needs to be initiated early to integrate it into ongoing and more immediate projects. Specifically, the CTDOT is expected to initiate the design of the replacement of the movable railroad bridge over the Housatonic River at Devon in the near term. This project is located adjacent to the Devon Wye, a preferred site of the transfer station, and will require the replacement or relocation of the bridge carrying Naugatuck Avenue over the main line. As this project advances, the opportunity of integrating the needed cross-track connection for a Devon transfer station into the new Naugatuck Avenue bridge must be considered. This study investigated the feasibility of constructing a permanent transfer station at the Devon wye. However, this assessment was at a relatively high level because of the physical constraints of the site. One hindrance to creation of the Devon wye is the lack of a fourth track for a considerable portion on the line between New Haven and Bridgeport. A more in-depth engineering assessment is required.

Figure 12 Conceptual Re-Design of Derby/Shelton Station

3. Frequent Rail Shuttle Service

The most critical finding of this study is that to attract riders to the Waterbury Branch Line and spur economic development, the service must be fast, reliable, and frequent, and the equipment must be modern and provide passenger amenities. The substantial investment that the state has made to improve the line to date is not sufficient by itself to attract and retain passengers. To realize a maximum return on this investment more frequent service needs to be implemented. CTDOT added seven new trips during the morning (inbound) and evening (outbound) peak periods is an important first step in efforts to better meet the needs of commuters and provide them with greater confidence that they can meet connections.

With the infrastructure, station, equipment, storage facilities and station improvements discussed above, WBL service can be expanded to provide at least 30-minute headways during the peak periods and 60-minutes in the off-peak. The increased service needs to be timed to accommodate transfers to and from main line trains. The expanded service would provide greater travel options, improve confidence in being able to make connections, and reduce stress and anxiety of using the WBL. When commuters view the service as a modern, convenient, reliable, and state-of-the-art system, it will attract riders and serve as a catalyst for economic development around

each of the rail stations while helping reduce congestion on Route 8.

Waterbury Branch line service currently merges onto the New Haven main line at Devon and continues to Bridgeport and Stamford (one trip per day). More WBL riders transfer to a main line train than use a WBL train to their destination. Therefore, passengers are accustomed to having to transfer to another train and are less reliant on "one" seat rides. Because of capacity constraints on the main line, adding more service to the main line from the branch line is problematic. Even if new rail equipment is acquired, as recommended, and more frequent service is instituted, it may not be possible for these trains to operate on the line as there are not enough slots to accommodate the service.

In addition, WBL trains cannot travel directly to New Haven, located east of the Devon wye. Any passenger wanting to travel to New Haven is required to travel to Bridgeport, the opposite direction from New Haven, and transfer to an outbound main line train. This substantially increases the travel time and causes passengers to backtrack their trip. Currently, if someone were to use the WBL to travel to New Haven via a transfer at Bridgeport, the trip would take about 35 minutes, not including time waiting for the NHL outbound train. Since there currently is not any schedule coordination between WBL trains and main line outbound service, this wait time could be substantial.

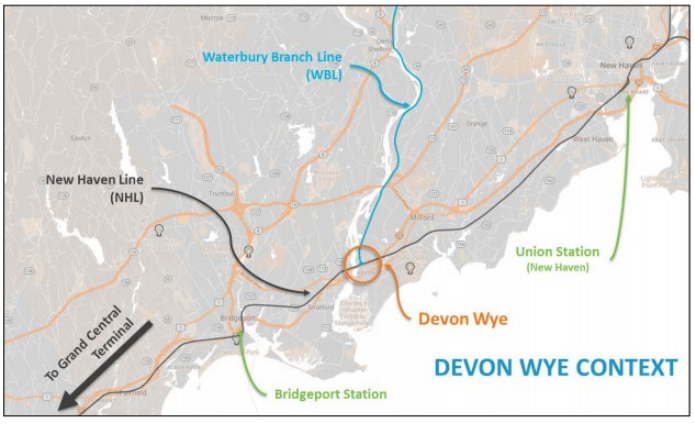

Figure 14 Devon Wye Context

A reasonable alternative to trying to add more WBL trains to the NHML is to create a dedicated transfer point at which WBL passengers can have easily and convenient access to NHML service.

As a longer-term improvement, the construction of a new, permanent transfer station at the Devon junction to increase the frequency of service on the WBL and expand potential transfers and connections with NHML trains is recommended. The transfer station would be located within the Devon wye between the WBL track and the interlocking with track 3 of the NHML. This would allow the WBL line to act as a true shuttle service, providing connecting service to the NHML without occupying schedule slots on the NHML.

The proposed transfer station would provide the ability to significantly increase service to the mainline with the potential of WBL trains to meet most NHML trains. In

Passengers would be able to connect to the inbound and outbound local tracks on the NHL. The platforms would be connected to provide seamless transfers via an elevated up-and-over walkway. There would be a designated drop off and pick up area and available vehicle parking would be provided.

Figure 13. Conceptual Design of Devon Wye Transfer Station

addition, it would create a new option for those traveling to New Haven from the Naugatuck Valley region. The transfer station would provide access to outbound trains, as well as inbound service, and commuters would be able to access New Haven bound trains directly without having to travel to and transfer at Bridgeport. A direct transfer at Devon would reduce the travel time for those heading towards New Haven to about 16 minutes.

Passengers would be able to connect to the inbound and outbound local tracks on the NHML via crossline platforms and an elevated up-and-over walkway that would provide seamless transfers. The connection will require the installation of elevators on both NHML platforms to ensure it is fully accessible. There would be a designated drop off and pick up area and available vehicle parking would be provided. One option is to evaluate the feasibility of constructing a parking lot under the I-95 Moses Wheeler Bridge with access from Naugatuck Avenue. While commuter parking may be beneficial, it is not a critical element of the concept of creating a permanent transfer station at Devon. The proposal is not intended to create a new rail stop to serve the Devon area, rather the purpose of the project is to facilitate passenger transfers between the two rail lines.

The schedule and frequency of the "shuttle-service" would be set based on NHML schedules. Service would be designed so that it meets most trains in each direction during both weekday peak periods with reduced connections during off-peak and weekend schedule periods. If timed correctly southbound WBL trains would arrive at Devon several minutes before a New Haven main line train is due to arrive. Inbound service and stop for NHML trains would be designated to pick-up passengers only while the outbound service would be primarily to discharge passengers. The goal of the shuttle service is to minimize dwell times for main line trains.

While this concept is intended to greatly increase access to the main line and improve connectivity, it is important to maintain several through WBL trains to Bridgeport and Stamford during the peak hours. In addition, the CTDOT is exploring the possibility of creating one-seat through trips between Waterbury and Grand Central Terminal. This study supports the concept but recommends the focus of travel enhancements on the Waterbury branch be on intra-state travel. Previous survey results indicate that less than 20% of all riders using a WBL train travel to GCT and about 70% of the passengers use the line to travel within Connecticut. These data suggest that enhancements to intra-state travel would benefit substantially more riders than a one-seat ride for those going to New York City.

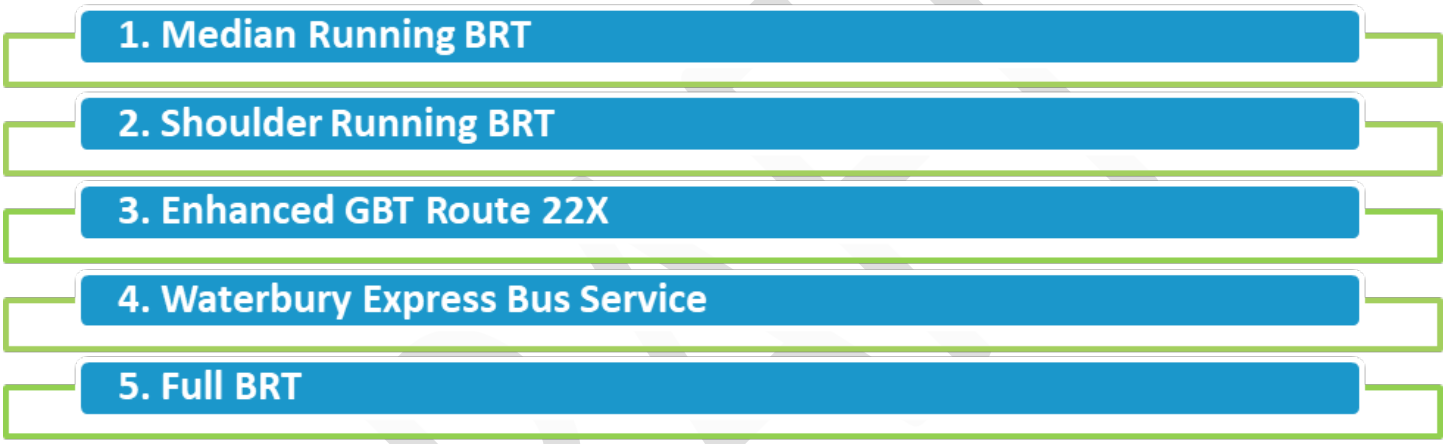

Figure 15: Bus Rapid Transit (BRT) Alternatives

4. Route 8 Bus Rapid Transit System – Derby-Shelton Station to Bridgeport

To help improve connectivity between the Derby-Shelton train station and downtown Bridgeport, as well as provide a more expansive "transit" connection to the corporate office, retail, and residential districts along the Bridgeport Avenue corridor in Shelton, as well as in Stratford, Trumbull, and the east side of Bridgeport, the feasibility of a new Bus Rapid Transit (BRT) route was assessed.

Figure 16: Elements of BRT

As part of this project, five alternative BRT options were investigated and are described in detail in the BRT assessment report (https://nvcogct.gov/wp-content/uploads/2019/05/NVCOG_BRT-Alternatives_04182019.pdf).

The BRT options ranged from an enhanced express bus service operating along Route 8 to a full BRT system operating within the median of the Route 8 Expressway along a dedicated busway.

While enhancing the existing Express Bus route operated by the Greater Bridgeport Transit (GBT) is viewed as a feasible short-term/immediate action, the long-term recommendation is to develop and launch a median running BRT system operated on a dedicated busway within Route 8. The median-running BRT route essentially serves the same travel corridor as the WBL; however, the BRT is intended to complement rail service, not replace it, and provide a transit option for high activity areas that are currently underserved by transit

The concept features a high frequency BRT system with a connector to the Derby-Shelton multimodal center, connection to a new Transportation Hub in Shelton, and would provide a continuous BRT route along Route 8 with 30-minute service to Bridgeport. The Transportation Hub would be strategically located in proximity to Bridgeport Avenue and be developed to serve as the main transfer point to feeder service to connect with the corporate office parks. The BRT connections at the Derby-Shelton multimodal center would be timed to meet all WBL trains.

Figure 17: Transit Hub Concept

While the initial service would be targeted at providing frequent, high-speed and convenient transit connections between the WBL and the corporate office areas along Bridgeport Avenue in Shelton, future connections would include stops at the Trumbull Corporate Park, Lake Success Business Park in Stratford and Bridgeport, and the proposed commuter rail station on the East Side of Bridgeport (potential new PT Barnum station) that would be built adjacent to a prime industrial, office and residential redevelopment area.

improvement programs. While overall trips increase by an

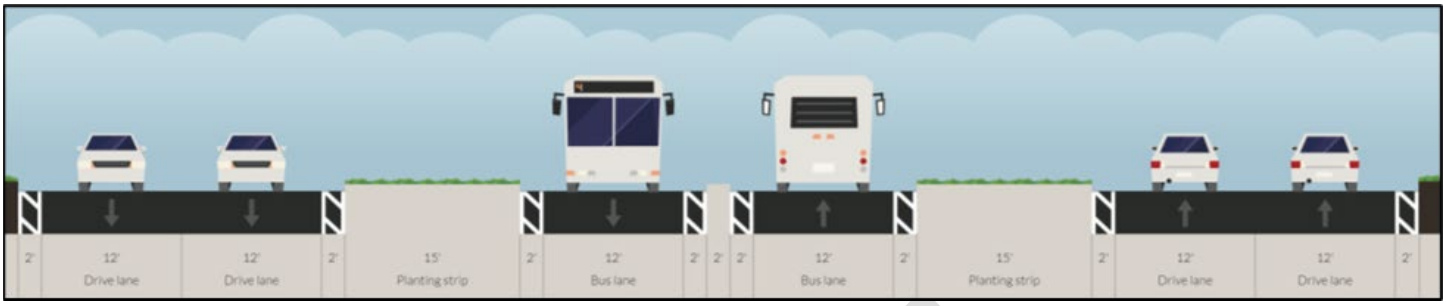

Figure 18: Median-running Bus Rapid Transit (BRT) Alternative

3 RIDERSHIP

Ridership estimates were developed using origin-destination data from *StreetLight* as well as Metro-North ridership data. A model incorporating factors such as travel time, travel distance, fares, station amenities and other factors was developed. Details on the methodology and full results of the forecasting efforts are found in Appendix A.

For the baseline forecast model, the ridership analysis is based on pre-COVID conditions (2019) and the assumption that ridership would return to 2019 level by 2023. The baseline scenario includes the WBL infrastructure and service improvements completed by the CTDOT.

Table 3 presents the change in Weekday AM Peak Period, Peak Direction trips between 2019 and 2041 under the four average of 1.0 percent annually based on the normal growth assumptions, Metro-North trips are estimated to increase by an average rate of 1.9 percent. Additionally, trips boarding at Derby-Shelton and Seymour are estimated to increase at annual average rates of 3.2 percent. The higher growth in Metro-North ridership, relative to drive alone trips is due to the increased congestion and travel times assumed for cars, as well as the assumed transit improvements. This has the effect of increasing Waterbury Line ridership by 100 trips, or 52.6 percent, over the study period. Within the study corridor, the estimated 2019 to 2041 growth increases the current (2019) mode split from 1.3 percent to 1.6 percent by 2041.

Table 3: 2041 Ridership Forecasts by Program

Program	Trip Type	Origin Stations						Total
		Derby-Shelton	Ansonia	Seymour	Beacon Falls	Naugatuck	Waterbury	
Existing Conditions	**WBL**	**100**	**100**	**60**	**60**	**100**	**480**	**900**
	Transit Share	0.4%	0.8%	0.3%	2.7%	0.8%	4.3%	1.1%
Program 1: 2041 Baseline	**WBL**	**180**	**140**	**100**	**60**	**140**	**700**	**1,320**
	Transit Share	0.5%	0.9%	0.4%	2.2%	0.9%	5.1%	1.3%
Program 2: Increased Service Frequency and Infrastructure Upgrades	**WBL**	**260**	**360**	**140**	**60**	**220**	**920**	**1,960**
	Transit Share	0.7%	1.3%	0.5%	1.6%	1.1%	6.0%	1.5%
	% Transit Increase	44.4%	157.1%	40.0%	0.0%	57.1%	31.4%	48.5%
Program 3: Frequent Rail Shuttle Service	**WBL**	**960**	**1,460**	**480**	**180**	**800**	**2,560**	**6,440**
	Transit Share	1.8%	2.0%	1.1%	2.2%	2.2%	11.7%	2.7%
	% Transit Increase	433.3%	942.9%	380.0%	200.0%	471.4%	265.7%	387.9%
Program 4: Bus Rapid Transit System - Derby-Shelton to Bridgeport	**WBL**	**740**	**1,060**	**400**	**140**	**620**	**2,060**	**5,020**
	BRT	**100**	**100**	**20**	**20**	**100**	**60**	**400**
	Transit Share	1.8%	2.0%	1.1%	2.3%	2.3%	10.7%	2.7%
	% Transit Increase	311.1%	657.1%	300.0%	133.3%	342.9%	194.3%	280.3%

4 SUMMARY

All the programs considered represent significant increases in Waterbury Line ridership and transit mode share when compared to the Baseline Scenario. The greatest benefits are projected to come from additional TOD trips. However, TOD will likely only be effective when supported with a complementary increase in Waterbury Line service and station improvements.

This modeling further highlights the significant potential for the corridor if the proper investments are made to address the line's existing and persistent deficiencies. Renewed investment, which targets both the service and infrastructure of the line, as well as the user experience, would produce growth in ridership and increased economic development opportunities within the corridor.