DRAFT EXECUTIVE SUMMARY OF PHASE 1 REPORT:

Existing Conditions and Evaluation of the Greater New Haven Bus System

AUGUST 2017
Contents

ES. 1 INTRODUCTION ........................................................................................................... 2
ES.2 PURPOSE AND NEED .................................................................................................. 2
ES.3 REPORT STRUCTURE .................................................................................................. 2
ES.4 SYSTEM DESCRIPTION ............................................................................................... 3
ES.5 SUMMARY OF SYSTEM INFRASTRUCTURE ............................................................... 8
ES.6 SUMMARY OF SYSTEM PERFORMANCE ................................................................. 9
ES.7 SUMMARY OF MARKET ANALYSIS ......................................................................... 10
ES.8 PHASE 1 CONCLUSION ............................................................................................. 13
ES.1 Introduction

Through a partnership between the City of New Haven, the Connecticut Department of Transportation (CTDOT), the Greater New Haven Transit District (GNHTD), the South Central Regional Council of Governments (SCRCOG), and the Federal Transit Administration (FTA), this two phase Move New Haven Transit Mobility Study is being conducted to evaluate and recommend improvements to CTtransit New Haven’s system. Study goals include enhancing access to jobs and educational institutions, increasing CTtransit New Haven customer service, and upgrading service quality and operating efficiency.

The evaluation of the productivity and effectiveness of the current CTtransit New Haven system is a foundational task for the two-phase Move New Haven Study. The existing conditions and evaluation of the system (Phase 1) will inform the development of an implementable and staged transit plan for the region which will improve the system’s effectiveness at the least possible cost or subsidy (Phase 2).

ES.2 Purpose and Need

The purpose of the Move New Haven Transit Mobility Study is to provide Greater New Haven with the building blocks that will help implement transit improvements in a phased and thoughtful manner, considering the timing of potential funding sources and alternative constructability. Given the analyses and conclusions of this Phase 1 technical report, a purpose and need statement is provided that will guide the development of system improvements in Phase 2. Not only will Phase 2 expand upon the effectiveness of the system’s major routes, but will also recommend adjustments for poor performing routes. The result will position the system to be better-balanced from a service and fiscal perspective, to deliver improved customer experiences, to become better coordinated with other modes, and to advance the system to be more consistent with other modern bus systems where possible. These transit improvement recommendations will consider the travel needs of the Greater New Haven community for both the short and long term.

ES.3 Report Structure

This technical report concludes the Move New Haven Transit Mobility Study’s first phase with documentation of the system’s existing conditions, results of a route performance evaluation, a review of previous studies, market analysis, and outreach, as outlined below:

- **System description** of the existing CTtransit New Haven service including service coverage, ridership, bus stops, and CTtransit fare and revenue information.
● **Bus supportive infrastructure and fleet** describes the bus supportive transportation infrastructure, commuter park and ride lots, multi-modal connectivity, and shuttle network.

● **Bus performance evaluation** of the CTtransit New Haven system at a route level which applies the bus service guidelines developed for the 2017 Connecticut Statewide Bus Study to the routes in the CTtransit New Haven system. The evaluation identifies areas of strength and areas of concern and informs the development of route-specific recommendations for capital investment and future system planning.

● **Complementary planning efforts** were reviewed, including previous bus service planning studies within the Greater New Haven region that have been developed leading up to this Study. The Regional Transit Development Strategies (2005), Implementation of the Regional Transit Study (2008), Connecticut Statewide Bus Study (2017), and Route 1 Bus Rapid Transit Feasibility Study (2017) provide valuable information for Phase 2 of this Study.

● **Market analysis** provides an understanding of the underlying demand for transit and why support for transit is important to Greater New Haven’s communities.

● **Study Outreach** informed the public about the importance of transit within Greater New Haven and gained user and non-user feedback on the CTtransit New Haven system. Feedback from public and stakeholder engagement, survey outreach, and peer agency interviews that supports findings from the data collection portion of this Phase 1 report are provided.

● **Summary of Phase 1 analysis** which will guide the development of system improvements in Phase 2 of this Study.

● **Purpose and Need statement** that clearly defines the goals and objectives of this Study to be applied in Phase 2 of the Study.

This report provides the information needed to support the development of recommendations for improved CTtransit New Haven service in Phase 2 of the Move New Haven Transit Mobility Study.

**ES.4 System Description**

CTtransit New Haven provides bus service to the Greater New Haven region serving about 10 million annual passenger trips with 15 fixed-route, one intercity express, and two shuttle services. No limited-stop or priority service is provided in the system. The fixed-routes radiate from the system’s hub at the downtown New Haven Green throughout New Haven and to 19 additional municipalities. In addition to New Haven, the municipalities of Hamden, West Haven, East Haven, and North Haven
represent the core service area of the regional system. The fixed routes operate with multiple variations that include different stopping patterns, extended coverage, differing headways, and differing spans of service. Overall, 14 of the 15 fixed-routes in the system operate with over 90 variations.

The bus system provides connections to 10 train stations including provision of a free shuttle service between New Haven’s downtown and Union Station. A commuter shuttle service within New Haven’s downtown is also operated that provides service to Union Station in the PM peak. Aside from the dedicated shuttles however, this intermodal connectivity is coincidental with the bus system’s purpose as a regional transit system. Private shuttle buses, including the expansive Yale Shuttle Bus system, replicate a significant portion of the CTtransit New Haven system in the core study area, siphoning potential public system riders with free service and other amenities.

**CTtransit New Haven Routes**

CTtransit New Haven is a division of CTtransit that is owned by the Connecticut Department of Transportation (CTDOT), operated by HNS Management, and managed by First Transit. The service area covers an estimated 500 square miles in size with a 2014 population of about 531,314. The division serves the City of New Haven and 19 surrounding municipalities including:

- Ansonia
- Branford
- Cheshire
- Derby
- East Haven
- Guilford
- Hamden
- Madison
- Meriden
- Milford
- North Branford
- North Haven
- Orange
- Seymour
- Shelton
- Wallingford
- Waterbury
- West Haven
- Woodbridge

For the purposes of this Study, a core service area has been delineated from the overall service area. In addition to New Haven, municipalities listed in bold (above) are the core municipalities that border New Haven. The overwhelming majority of existing ridership, bus stops and service hours are in the core service area. **Figure ES-1** provides an overview of
CT\textit{transit} New Haven’s overall system coverage, followed by a more detailed map of the core service area in \textbf{Figure ES-2}. Routes are designated by letters and route deviations are designated by numbers.

\textit{CTtransit} New Haven’s fixed and express routes connect with bus service provided by other \textit{CTtransit} divisions, including Meriden Transit District, Greater Waterbury Transit District, Wallingford Transit District, Valley Transit District, and Milford Transit District, as well as rail service connections with Amtrak, New Haven Line, and Shore Line East. In addition to \textit{CTtransit} New Haven, the Greater New Haven Transit District (GNHTD) provides paratransit service within a $\frac{3}{4}$ mile perimeter of \textit{CTtransit} fixed route service.

An overview of individual route span of service, headways, ridership, and bus stops is provided in this Phase 1 technical report. Four of the 15 routes, the B-Congress Ave, B-Whalley Ave, D-Dixwell Ave, and D-Grand Ave, have frequent headways for extended periods of the day and the highest ridership. These four routes, as well as eight additional \textit{CTtransit} New Haven routes radiate from the only transfer hub within the system at the downtown New Haven Green. The remaining routes have longer and variable headways (more than 50\% of the routes have 40 minute or longer headways) and more limited spans of service. In some areas, routes overlap service areas to compensate for system span and headway limitations.

New Haven has the highest percentage of \textit{CTtransit} New Haven boardings. Only 27\% of \textit{CTtransit} New Haven’s boardings are outside of New Haven. West Haven and Hamden have the second and third highest boardings but at a significantly lower level than New Haven. Nine of the 20 municipalities served by \textit{CTtransit} New Haven each have less than 1\% of the total system-wide boardings.

All 10 of the highest ridership bus stops in the \textit{CTtransit} New Haven system are in New Haven. Eight of the 10 highest average weekday bus stop boardings and alightings within the \textit{CTtransit} New Haven system are at the New Haven Green. This is not surprising since all fixed-route, express and shuttle services traverse the downtown New Haven Green at Elm Street, Chapel Street, Temple Street, and/or Church Street. Only two of the 10 highest ridership bus stops are outside of the downtown New Haven Green at Union Station and the intersection of Grand Ave and Ferry St.
Figure ES-1: CTtransit New Haven Service Coverage

- Train Station
- Whalley Ave/Congress Ave
- North Haven
- Grand Ave/Dixwell Ave
- East Haven/West Chapel St.
- Shelton Ave/East Chapel St.
- Whitney Ave/Kimberly Ave
- North Branford
- Washington Ave/State St.
- Route 1/Winchester Ave
- State St./Edgewood Ave
- Madison via Route 1
- Goffe St./Sargent Dr.
- CT Post Flyer
- Core Service Area
- Service Area

CTtransit New Haven Routes

Municipalities served by CTtransit New Haven
Figure ES-2: CTtransit New Haven Core Service Area

- Whalley Ave/Congress Ave
- East Haven/West Chapel St.
- Shelton Ave/East Chapel St.
- Whitney Ave/Kimberly Ave
- North Branford
- Washington Ave/State St.
- Route 1/Winchester Ave
- State St/Edgewood Ave
- Madison via Route 1
- Goffe St./Sargent Dr.
- CT Post Flyer

Legend:
- B: Whalley Ave/Congress Ave
- C: North Haven
- D: Grand Ave/Dixwell Ave
- F: East Haven/West Chapel St.
- G: Shelton Ave/East Chapel St.
- J: Whitney Ave/Kimberly Ave
- L: North Branford
- M: Washington Ave/State St.
- O: Route 1/Winchester Ave
- Q: State St/Edgewood Ave
- S: Madison via Route 1
- Z: Goffe St./Sargent Dr.
ES.5 Summary of System Infrastructure

The CTtransit New Haven system operates on the regional and local roadway network with buses operating in mixed traffic. The buses also operate without traffic signal priority and thus must wait in queues at downtown intersections, which extend bus travel times and could result in the reliability issues reported by some system riders.

With a single downtown hub at the New Haven Green, bus riders are forced to transfer to complete cross-town trips and riders are forced downtown even if their travel does not require a downtown visit. While the hub is effective in allowing for connections the concentration of buses and pedestrians accessing stops makes it even more difficult to traverse for buses.

Without any data available to measure on-time performance, reliability issues are only known through information reported through community outreach. However, some facts such as the age of the system fleet and the incidence of bus breakdowns, support the public dialogue of system failures and reliability issues.

These infrastructure conditions are typical of older urban systems that have organically expanded without a specified plan. Modern systems such as those researched in the peer review for this study include bus priority measures, multiple transfer hubs or direct routings, and state-of-the-industry fleets (in addition to diversified service offerings such as local, limited and express routes).

Modern systems also include new technologies to improve customer service and system perception such as the provision of real-time bus arrival information and smart-phone fare payment and other expedited fare/boarding systems.

While the City of New Haven is planning for new infrastructure in their downtown, new buses will soon be delivered to improve the reliability of the CTtransit New Haven fleet, and new technologies have been recently introduced to the system to improve the customer experience, a coordinated plan is necessary to make best use of these investments and to plan for additional bus-supportive infrastructure.

As discussed in this Phase 1 technical report, the CTtransit New Haven system is not intended to provide feeder connections (except for the Union Station Shuttle and Commuter Connection route) to other transit systems or modes. The ability to do so today is only coincidental. However, modern systems embrace multi-modal connections to improve usage of all systems and the CTtransit system should consider opportunities to improve connectivity. This includes improved
connectivity to non-transit systems such as bicycle and pedestrian networks and even coordination with private shuttles.

**ES.6 Summary of System Performance**

The performance analysis conducted as part of this Study details a system that has few well performing routes. Despite being afflicted by multiple route variations (in a system where 15 routes have 90 variations), inconsistent spans of service, and inconsistent headways, there are two routes that are the effective work-horses of the system: the D route (comprised of D-Dixwell Ave and D-Grand Ave) and the B route (comprised of B-Whalley Ave and B-Congress Ave). These two routes attract 62% of the system’s ridership, with the remaining ridership (38%) distributed across thirteen additional routes and two public shuttles.

What sets these routes apart are their long operating periods (18+ hours) with short headways (as short as a bus every 5 minutes). When compared with other system routes that extend as far as Waterbury; the B and D routes are compact; operating primarily within the core service area. These factors enable users of these routes to reliably complete round trips with short total trip times.

Accordingly, the B and D routes perform at the top of the system for all performance metrics (including costs per rider) except for two metrics (bus stop spacing and peak/off-peak loading). For bus stop spacing, the routes exceed the metric of 4 bus stops per mile with some segments exceeding 9 stops per mile. This is not surprising since virtually every route in the system exceeds this metric. Numerous bus stops on high ridership routes slow the bus travel time for all users and only nominally expand accessibility. Additionally, the B and D routes have periods of passenger crowding with as many as 1.71 riders per seat in the peak (vs. the metric of 1.3) and 1.11 riders in the off-peak (vs. the metric of 1.0). Bus crowding not only impacts passenger comfort it also affects bus boarding and alighting, which extends bus stop dwell time and lengthens overall travel time.

For the remaining routes, most exhibit sufficient performance. However, there are a few routes whose performance fails multiple standards. These include:

- C-North Haven
- J-Whitney Ave
- L-North Branford
- S-Madison
- 55x CT Flyer
- Commuter Connection Shuttle
Some of these routes are plagued by short spans of service (12 hours or less), multiple variations (C-North Haven has 9), long headways (as long as a bus every 2 hours on the S-Madison) and long routings (C-North Haven and L-Branford). The operating costs per rider are especially high for these routes with the L-North Branford costing more than 6 times as much per rider as the most cost-effective route (D-Dixwell). Additionally, poor loading per revenue mile plagues these routes with some routes going long distances without a single boarding. Accordingly, ridership on these routes is low.

**Table ES-1** highlights data results from the Bus Performance Evaluation, supplemented by metrics from the Existing Conditions and Market Analysis sections of this Phase 1 technical report.

Route and schedule design, supplemented by infrastructure improvements, are critical to unlocking the key to a balanced system of well performing routes. Routes with high performance require additional investment to maintain or even further improve their effectiveness. Poor performing routes require adjustments to either improve effectiveness or to seek consensus amongst the system’s stakeholders about the purpose or need for routes that may not be focused on performance but rather regional coverage.

**ES.7 Summary of Market Analysis**

The Greater New Haven region that is served by the CTtransit system is expected to have growth in population and employment by 2025. The region is home to several major employers including institutions, businesses and significant retailers. In the core market area there are a significant number of households with no vehicles, high population density, and high job density. These factors combine to indicate that the core area and areas around most existing routes have a high propensity to support transit. Overall, the existing transit system is serving these areas well, providing good coverage (but not necessarily good service) where it is needed today and in the future (as evidenced by the proximity of bus routes to planned development). However, because the bus system is expansive, it traverses many areas that have low population and employment densities which result in large swaths of revenue miles with very low productivity.
### Table ES-1: CTtransit New Haven System Evaluation

<table>
<thead>
<tr>
<th>Service Standard</th>
<th>Criteria</th>
<th>Purpose</th>
<th>Evaluation of Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transit Mobility Study</strong></td>
<td><strong>Transit propensity</strong> <em>(see Chapter 7)</em></td>
<td>Assess existing bus route service coverage and identify areas where new bus service may be warranted.</td>
<td>CTtransit New Haven has good ½ mile service coverage inclusion of census block groups with high density of population, employment, and zero car households. In addition, key shopping centers and grocers within Greater New Haven are all within a ½ mile of transit service. All educational institutions that employ more than 500 employees are within a 1/2 mile of bus service as well.</td>
</tr>
<tr>
<td><strong>Route Design</strong></td>
<td><strong>Bus stop spacing</strong> <em>(see Chapter 5)</em></td>
<td>Used in siting of new bus stops and evaluation of existing bus stop spacing.</td>
<td>About ½ of the CTtransit New Haven routes have more than the benchmark performance metric of 4 bus stops per mile.</td>
</tr>
<tr>
<td></td>
<td><strong>Route Variations</strong> <em>(see Chapter 3)</em></td>
<td>Assess resource allocation within the transit system, including impact on headways, span of service, and the dominant full-time route pattern.</td>
<td>The B-Route, D-Route, and J-Route have the highest number of route variations. Each of these 3 routes, have 14 to 15 route variations for inbound and outbound.</td>
</tr>
<tr>
<td></td>
<td><strong>Transit Hubs</strong> <em>(see Chapter 3)</em></td>
<td>Used for service convenience, reduced operating costs, and increased visibility of the system.</td>
<td>The downtown New Haven Green is the only hub in the CTtransit New Haven system. High ridership bus stops outside of the New Haven Green that are serviced by multiple routes suggests additional transit hubs would benefit the system. The 2005 and 2008 regional transit studies recommended locations for additional hubs.</td>
</tr>
<tr>
<td><strong>Schedule Design</strong></td>
<td><strong>Load factors &amp; headways</strong> <em>(see Chapter 5)</em></td>
<td>Used in determining service levels based on ridership demand and whether shorter headways are needed</td>
<td>Overcrowding is occurring predominately during the non-peak AM and PM periods on nine of the CTtransit New Haven routes. Buses that come more often can reduce overcrowding. The B and D routes are overcrowded in the peak.</td>
</tr>
<tr>
<td>Service Standard</td>
<td>Criteria</td>
<td>Purpose</td>
<td>Evaluation of Criteria</td>
</tr>
<tr>
<td>------------------</td>
<td>----------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Schedule Design</strong></td>
<td><strong>Span of service</strong> <em>(see Chapter 5)</em></td>
<td>Used in determining hours of service, based on ridership during the first and last hours of service on the route.</td>
<td>Data analysis shows that none of the routes have load factors for the first and last runs of the day that exceed the benchmark performance metric of 1.0 (non-peak hour) or 1.3 (peak hour) passengers for every seat on the bus. However, public feedback during the engagement process has consistently cited the need for increased spans of service.</td>
</tr>
<tr>
<td><strong>Route Productivity</strong></td>
<td><strong>Passenger trips per revenue mile</strong> <em>(see Chapter 5)</em></td>
<td>Used in evaluating efficiency of routes based on revenue miles (a useful counterpart to passenger trips per revenue hour.)</td>
<td>J-Whitney Ave, C-North Haven, S-Madison, L-North Branford, and Commuter Connection Shuttle routes have less than the benchmark performance metric of less than 2 passenger trips per revenue mile and should be considered for service improvements.</td>
</tr>
<tr>
<td></td>
<td><strong>Passenger trips per revenue hour</strong> <em>(see Chapter 5)</em></td>
<td>Used in evaluating efficiency of route based on revenue hours (a useful counterpart to passenger trips per revenue mile).</td>
<td>Commuter Connection Shuttle and L-North Branford routes have less than the benchmark performance metric of less than 20 passenger trips per revenue hour and should be considered for service improvements.</td>
</tr>
<tr>
<td></td>
<td><strong>Operating cost per rider</strong> <em>(see Chapter 5)</em></td>
<td>Helps quantify the benefits and costs of a transit system when adding additional variables such as the number of passengers that ride each route.</td>
<td>The S-Madison, 55x CT Post Flyer, L-North Branford and Commuter Connection Shuttle routes have the highest cost per rider of the routes in the system. These routes have costs per rider more than 2.5 times that of the best financially performing route (B-Whalley Ave).</td>
</tr>
<tr>
<td></td>
<td><strong>Estimated fare box recovery</strong> <em>(see Chapter 5)</em></td>
<td>Used in evaluating how much fare revenue covers the cost of providing service.</td>
<td>C-North Haven, S-Madison, Commuter Connection Shuttle, 55x, L-North Branford, and the Union Station Shuttle have fare box recovery ratios in the bottom 60th percentile of the agency’s average.</td>
</tr>
</tbody>
</table>
### Service Standard Criteria

<table>
<thead>
<tr>
<th>Service Standard</th>
<th>Criteria</th>
<th>Purpose</th>
<th>Evaluation of Criteria</th>
</tr>
</thead>
</table>
| Route Productivity | Ratio of revenue miles to non-revenue miles (see Chapter 5) | Used in evaluating efficiency of scheduled service based on amount of non-revenue mileage. | Almost all the routes, except for G-East Chapel St., O-Route 1, F-West Chapel St., and Q Edgewood Ave, have a ratio of revenue miles to non-revenue miles above 5%.
| Service Delivery | Average distance between failures (see Chapter 5) | Used in evaluating overall fleet availability for revenue service. | CTtransit New Haven’s system-wide average distance between failures falls below the statewide average. Although, it is assumed that the addition of 87 new 40 foot buses in 2017 and 2018 will reduce failures. |
|                  | Fleet average age (see Chapter 5) | Used in evaluating overall fleet performance and its availability for revenue service. | CTtransit New Haven will receive 87 new 40 foot buses in 2017 and 2018. |

### ES.8 Phase 1 Conclusion

The Greater New Haven region is served by a transit system that needs revitalization to effectively serve the region’s population and employment and to effectively utilize the funds invested in its operation. As evidenced by the existing and future market analysis, the region needs (and will continue to need) the transit system and regional demographics support a continued investment in transit.

While the system has shown recent incremental improvement, an overall plan is needed to guide the system to deliver the improved reliability, customer service and productivity that are the hallmarks of a modern transit system. These objectives can be met through the careful re-programming of the system’s service and the funds used to sustain it, as well as the implementation of infrastructure and fleet improvements that can be delivered in a phased fashion when funding becomes available. Phase 2 of the MOVE New Haven study will explore system improvements and will recommend changes to the system, with public and stakeholder participation, to deliver a phased and implementable transit plan for the Greater New Haven region.