Table of Contents

1. Executive Summary ................................................................. 1
   1.1 Introduction ........................................................................ 1
   1.2 Public Involvement .......................................................... 2
   1.3 Detailed Alternatives ....................................................... 2
   1.4 Evaluation Results .......................................................... 5
   1.5 Franklin Two-Way Conversion vs Franklin/Washington Couplet 7
   1.6 RTC and Optimized Local Bus Service ............................ 8
   1.7 Next Steps ........................................................................ 10

Figures

Figure 1: Initial Conceptual Realignment of Waco Transit Fixed Route System .......... 1
Figure 2: RTC Draft Alignment Alternatives ................................................. 4
Figure 3: Recommended RTC Alignment .................................................... 6
Figure 4 Potential (Optimized) WTS Network with RTC Service .................... 9

Tables

Table 1: Detailed RTC Alternative Alignments ........................................... 3
Table 2: Waco RTC Detailed Evaluation Criteria ........................................ 5
Table 3: Draft Alignment Alternative Evaluation Results ............................ 5
Table 4: Draft Franklin / Washington Evaluation Results ............................ 7
Table 5: RTC Alignment #2 and Optimized WTS System Ridership ............... 8
This page intentionally left blank
1. Executive Summary

1.1 Introduction

Waco Transit Systems (WTS) and the Waco Metropolitan Planning Organization (MPO) are conducting a study to analyze the feasibility of developing a rapid transit corridor and subsequent implementing bus service enhancements for the Waco Metropolitan Area. The current WTS network operates 10 fixed route bus lines with (average) 60-minute frequency in a traditional hub-and-spoke format. All local buses operate on long routes that wind their way into various neighborhoods and activity centers before looping back to the Downtown Transit Center, where most transfers occur. This operating system causes long 1-way travel times on each route and limits the opportunity for passengers to connect to other routes in order to get to their final destination. The result is a long and inefficient trip for most users, making transit the mobility option of last-resort for those who have little or no other choice.

The purpose for implementing a rapid transit corridor is to offer residents enhanced mobility and to provide improved access to jobs, medical and social services, and educational facilities. The proposed Rapid Transit Corridor (RTC) spans the north-south length of the City of Waco and connects to suburban communities on both ends of the corridor. The proposed RTC travels from the northern limits in the Bellmead community, through downtown Waco, generally following Elm Ave / Taylor Ave south to the Brazos River. Once south of the river, the corridor follows the alignment of Franklin Avenue and US Highway 84 (US 84) to the southern limits in the communities of Woodway and Hewitt, near the intersection of Hewitt Dr (FM 1695).
The RTC would connect a diverse range of communities and regional activity centers and destinations such as Downtown Waco, area schools and universities, health services, as well as significant commercial centers and industrial parks.

The RTC study is following a three-step method to evaluate the rapid transit mode and alignment options to identify a preferred alternative.

1. **Assess Existing Conditions**: determine where people are coming from and where they are going, determine the primary travel corridors that are used, and understand how a RTC would support existing bus transit services.

2. **Develop Potential Solutions and Evaluation Metrics**: determine the right infrastructure, technology, and service components; determine the effects on riders, stakeholders, and transportation providers; and determine capital and operating costs.

3. **Select a Locally Preferred Alternative (LPA)**: Determine the solution that fits best with the community and determine how to pay for the improvements.

Alternatives considered for implementation within the RTC were defined such that they may meet application requirements for the Federal Transit Administration (FTA) Capital Improvement Grant (CIG) Program. (see Final Interim Policy Guidance Federal Transit Administration Capital Investment Grant Program – June 2016)

1.2 **Public Involvement**

The project team launched a rigorous public involvement process to bring the community into the conversation when developing draft alternatives, as well as discussion of evaluation results and recommendations. An RTC Steering Committee was formed to meet quarterly as guiding body for vetting of the study alternatives, analysis approach, evaluation results and recommendations. All Final technical documents and materials used in public presentations were uploaded to the Project website (http://www.aecomconnect.com/WacoRTC/).

The engagement process opened with a public charrette workshop (June 15, 2017) to introduce the project to the community, preliminary vehicle (mode) technology recommendations and ask for feedback regarding potential RTC alignment, the types of destinations connected by the service, and station amenity options. The project team used the community responses (over 200) to identify three potential alignment alternatives for detailed evaluation as well as the preferred station amenities and important destinations served by transit.

Following the evaluation of alignment alternatives, the project team held multiple open houses community meetings, and a second public survey between November 2017 and January 2018.

1.3 **Detailed Alternatives**

Based on community feedback on preferred roadways for rapid transit service, the Project Team identified three (3) potential alignment alternatives for comparison (see Table 1 and Figure 2).

The detailed Alternatives developed and compared during Step 2 of the Waco RTC study were combinations of right-sized service vehicles, stations, operating profiles and guideway assumptions.
Table 1: Detailed RTC Alternative Alignments

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Length (mi)</th>
<th>Alignment Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment 1</td>
<td>14.1</td>
<td>US 84 → New Rd → Franklin → Taylor / Hillsboro → Bus 77 to Crest (TSTC)</td>
</tr>
<tr>
<td>Alignment 2</td>
<td>13.3</td>
<td>US 84 → New Rd → Franklin → Taylor / Hillsboro → US 84 to Loop 340</td>
</tr>
<tr>
<td>Alignment 3</td>
<td>14.6</td>
<td>US 84 → Waco Dr → Taylor / Hillsboro → B 77 to Crest (TSTC)</td>
</tr>
</tbody>
</table>

Alternatives 2 and 3 also contain a routing option through downtown Waco along the 1-way pair of Franklin Ave / Washington Ave, or converting Franklin Ave to 2-way operations to run transit bi-directionally. This operating option was evaluated independently within the RTC study.

Service Operations

The service operating profile determines the amount of time vehicles are operating (span of service), how often vehicles stop at any given station (frequency) during different times of the day and the typical distance (spacing) between stations. When developing detailed service assumptions for each corridor, the existing conditions and challenges were also considered.

RTC Team Recommendation: The overwhelming feedback from public involvement participants and Waco Transit Systems staff identified needs for greater frequency, evening and weekend service. RTC corridor alternatives will be defined to operate until 8pm Monday through Wednesday and 10pm Thursday through Saturday, with a minimum 15-minute frequency for at least 14 hours on weekdays. Sunday RTC service will also be provided until 7pm. To compliment the RTC service, local bus routes may be subject to extended hours or days of service as well as realignment to improve overall transit system efficiency.

Infrastructure

The most visible element of the RTC will be branded station areas and vehicles. Stations and amenities must be designed and built to provide senses of comfort, security, accessibility, and connectivity for users. High capacity guideways are dedicated spaces in which the transit operates. The guideway may use space within an existing roadway, railroad right-of-way (property), or new right-of-way (property).

RTC Team Recommendation: Community feedback identified preferred station shelter types as well as priority safety and placemaking amenities that were included in conceptual station areas (see Section 2.2 of the main report). Alternatives assume pursuing a dedicated transit guideway (reserved lanes) where achievable to allow for the most efficient transit trip time possible. However, roadways under the jurisdiction of the Texas Department of Transportation will require significant coordination to support conversion of existing traffic lanes or right-of-way to dedicated transit guideway. The study identified potential
locations where the greatest benefit can be realized from the investment to dedicate space for transit.

**Technology**

Transit ‘Modes’ are defined by the types of vehicles in operation and the propulsion (engine) technology that they use. They are typically some type of bus or rail vehicle. Different vehicle types can have a wide range of person-carrying capacity, but may also have different limitations on how much space is needed, operating speed or the type of guideway required. Additional technologies may be deployed to improve operating efficiency or user experience.

**RTC Team Recommendation:** Bus Rapid Transit is the preferred transit technology for higher-capacity transit in Waco (see the *Waco RTC Technology Assessment Executive Summary - August 2017* for further information). The recommendation also includes priority treatment at traffic signals to improve transit trip times, and at station areas to help inform passengers with real-time arrival signage or improve the off-board ticketing and fare collection process.

---

**Figure 2: RTC Draft Alignment Alternatives**
The detailed Alternatives were evaluated against the criteria shown in Table 2. These criteria are linked back to the project goals and objectives.

**Table 2: Waco RTC Detailed Evaluation Criteria**

<table>
<thead>
<tr>
<th>Project Goals</th>
<th>Evaluation Criteria</th>
</tr>
</thead>
</table>
| Increase the efficiency of WTS operations and decrease overall transit travel times | • Minimize conflicts with pedestrian, bicycle and auto facilities  
• 1-way RTC travel time |
| Increase access to employment opportunities and critical services | • Projected ridership  
• Maximize connectivity with pedestrian and bicycle facilities, as well as local bus routes  
• Minimize safety impacts for bicycles and pedestrians |
| Leverage available local, state and Federal funding opportunities | • Economic development potential  
• Capital and operating & maintenance (O&M) costs  
• Community support |

**1.4 Evaluation Results**

All three alternatives were analyzed independently and evaluated to compare the potential benefits and impacts among them. Several of the criteria identified in Table 3 have multiple sub-categories that were analyzed individually and aggregated into the High/Medium/Low ratings shown. Alternative alignments may perform better or worse in the various sub-categories, but may not distinguish themselves as the clear best performer among the three options based on the aggregation of results (See Section 3 through Section 6 and Appendix A for further information).

**Table 3: Draft Alignment Alternative Evaluation Results**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Alignment 1</th>
<th>Alignment 2</th>
<th>Alignment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimodal Connections and Network Compatibility</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>1-way Travel Time</td>
<td>60 min</td>
<td>65 min (NB)</td>
<td>45 min</td>
</tr>
<tr>
<td>‘System / RTC’ Ridership (year)*</td>
<td>4,030 / 870 (2023) / 4,690 / 980 (2040)</td>
<td>3,990 / 900 (2023) / 4,630 / 980 (2040)</td>
<td>4,080 / 900 (2023) / 4,730 / 1,000 (2040)</td>
</tr>
<tr>
<td>Economic Development</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Safety</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>(Conceptual) Capital Cost</td>
<td>$20.1 M – $20.8 M</td>
<td>$18.3 M – $19.4 M</td>
<td>$17.4 M – $18.5 M</td>
</tr>
<tr>
<td>Overall Rating</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>

* WTS fixed route bus service not optimized for RTC operations
All three alternatives are similar in length and operate as parallel alignments in providing rapid transit service to the Waco community. As a result, all three performed similarly in terms of potential Ridership, Mobility Impacts and Capital Cost. Criteria proving to be differentiators were Economic Development Potential and Safety. Alignments 1 and 2 would operate on the primarily commercial corridor of Franklin Ave / Washington Ave, while Alignment 3 is located on a residential corridor of Waco Dr. The higher speed limit and lack of pedestrian crossing protection near station locations on Waco Dr. also presented potential safety risks for prospective transit users. The lower posted speeds and urban development along Franklin Ave / Washington Ave provide a more pedestrian friendly environment, as well as a greater concentration of existing transit destinations and under utilized land suitable for development or reinvestment. The potential operating & maintenance (O&M) cost of each of the Alignment Alternatives is estimated at approximately $3.5 to $4.5 million, annually.

Ultimately, Alignment 2 was identified as the Recommended Alternative which includes 13 initial stations and 2 potential additional stations as ridership and future development may justify. It should also be noted that the draft ridership projections shown in Table 3 assumes existing local bus service, overlaid by RTC service and is not optimized for efficiency.
1.5 Franklin Two-Way Conversion vs Franklin/Washington Couplet

RTC Alignments 1 and 2 include an operational consideration to run along an existing pair of 1-way Northbound (Franklin Ave) / Southbound (Washington Ave) streets through downtown Waco. The City of Waco is currently evaluating conversion of Franklin Ave to a bi-directional arterial to improve traffic operations in the area. The RTC study considered the potential benefits and impacts of operating BRT service through downtown Waco using the existing 1-way couplet versus bi-directionally on Franklin only. Similar to the evaluation of alignment alternatives, the evaluation of 1-way vs 2-way operations through downtown may perform better or worse in the various sub-categories, but may not distinguish themselves as the clear best performer based on the aggregation of results.

Table 4: Draft Franklin / Washington Evaluation Results

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Franklin 2-way</th>
<th>Franklin / Washington Couplet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility Impacts</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Economic Development</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Safety</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Cost</td>
<td>$$$</td>
<td>$$</td>
</tr>
<tr>
<td>Overall Rating</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Converting Franklin Avenue to two-way traffic operations was identified as the preferred option to support RTC operations on Alignment 2.

- **Capacity on parallel streets**: 2-way conversion may impact more auto and parking lanes along the converted street, but may improve pedestrian safety with better crossing protection and induced traffic calming. Concentrating transit on a single street may also allow parallel streets to be designated for bike, pedestrian or auto focused uses.

- **Cost savings**: With fewer intersections required for the RTC to traverse (as buses would be focused only on Franklin Avenue), infrastructure costs would be less. A qualitative assessment was conducted, since detailed costs of 2-way conversion were not produced during this study and are the responsibility of others.

- **Efficient transit operations and passenger wayfinding**: Focusing rapid transit service on a two-way street is more efficient for the operation, as well as being easier for passengers to understand and navigate.

- **All day traffic vs peak only**: The two-way conversion would provide for an all-day traffic pattern rather than a peak period only pattern for buses operating in 1-way couplets. The development potential of properties along a 1-way pair may be negatively impacted by having less visibility during peak travel times of the day, when the travel flows are concentrated in a single direction.
1.6 RTC and Optimized Local Bus Service

The future ‘No Build’ condition (no RTC service) assumes a heightened level of investment in the local bus service to improve the average frequency from 60 minutes to 30 minutes. As previously mentioned, the potential daily ridership on the RTC Alignment Alternatives and WTS network was projected based on the existing hub-and-spoke local bus service, overlaid by the rapid transit service.

However, the frequency and speed of the RTC service provides an opportunity for WTS to re-route the local buses into a more efficient system of local collector routes, connecting transit trip points of origin and destination to the RTC. The RTC is able to travel across town faster than the local bus routes and the robust RTC stations can function as transfer points to easily interline with connector routes that get passengers to their final destination instead of relying on making all transfers at the Downtown Transit Center. The reconfigured transit network proposed in support of RTC service is shown in Figure 4.

This reconfigured fixed-route system is meant to provide a more optimized future transit network where the RTC serves as the spine of the transit system with which fixed-routes are intended to integrate. The outcome is a transit system that provides improved access and more efficient travel for future system users. Special care was given to ensure that the reconfigured-system maintained coverage that exists today, improved coverage and maximize connectivity to key destinations and the recommended RTC alignment.

The benefits of the Optimized fixed-route network are illustrated by the improved RTC and system ridership in Table 5.

<table>
<thead>
<tr>
<th>Ridership Projections</th>
<th>No Build System</th>
<th>Optimized System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2023</td>
<td>2040</td>
</tr>
<tr>
<td>Total RTC Ridership*</td>
<td>900</td>
<td>980</td>
</tr>
<tr>
<td>Total System-wide Ridership**</td>
<td>3,990</td>
<td>4,630</td>
</tr>
</tbody>
</table>

*Table 4.03 – STOPs Model Output; **Table 10.01 – STOPs Model Output;

Optimized service changes include, but are not limited to (see section 9 of the main report for additional details):

- High frequency service consistent with the No Build option (average of 30 minutes)
- Shorter local bus routes (target 30-minute round trips or less), mitigating the need for additional vehicle purchases
- Rerouting local buses to maintain connectivity to activity centers (while allowing easy transfers to RTC spine)
- Extending hours of service to compliment RTC service
Figure 4 Potential (Optimized) WTS Network with RTC Service
1.7 Next Steps

The RTC study recommendation (Alignment #2) and optimized network configuration was presented to the RTC Steering Committee on March 20, 2018 and received a favorable recommendation. These recommendations will be presented to the appropriate approval bodies of WTS, Waco MPO and the City of Waco during the months of April and May, 2018. Upon adoption, the proposed BRT project may be submitted to the Federal Transit Administration for potential entry into the CIG Project Development process to compete for federal funding for construction. The RTC study also recommends further coordination with the City of Waco to develop a long-term funding and financing strategy for sustained operations.

While the Optimized fixed-route network presented within this study was developed with input from WTS operations staff, the proposed changes to fixed route frequency and span of service are not final. WTS will undergo a significant community engagement process when developing any potential changes to the fixed-route network to make sure that transit access for residents and employers is maintained, as well as compliance with Federal requirements and guidelines. The City of Waco and WTS may also continue to develop RTC solutions and fixed route optimization through additional planning studies or preliminary engineering activities.
About AECOM

AECOM (NYSE: ACM) is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries.

As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges.

From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM companies had revenue of approximately US$19 billion during the 12 months ended June 30, 2015.

See how we deliver what others can only imagine at aecom.com and @AECOM.

Contact
Andrew Ittigson
Project Manager
T +01 (214) 672-2858
E andrew.ittigson@aecom.com

aecom.com