Fort Worth to Laredo High-Speed Transportation Study

Task 4

Alternatives Analysis Memorandum

Prepared for:

North Central Texas Council of Governments

CITY OF WACO KTMPO KILLEEN-TEMPLE metropolitan planning organization CAMPO CAPITAL AREA METROPOLITAN PLANNING ORGANIZATION AAMPO Laredo TEXAS

April 2020

Final

This Page Intentionally Blank.

Contents

List of Tables

List of Figures

1. Fort Worth to Laredo High-Speed Transportation Study Overview

1.1. Background

The purpose of the Fort Worth to Laredo High-Speed Transportation Study is to study high-speed transportation options to connect six metropolitan areas in Texas: Fort Worth, Waco, Killeen/Temple, Austin, San Antonio, and Laredo. The study evaluates technology options and assesses potential corridors for a future National Environmental Policy Act (NEPA) process.

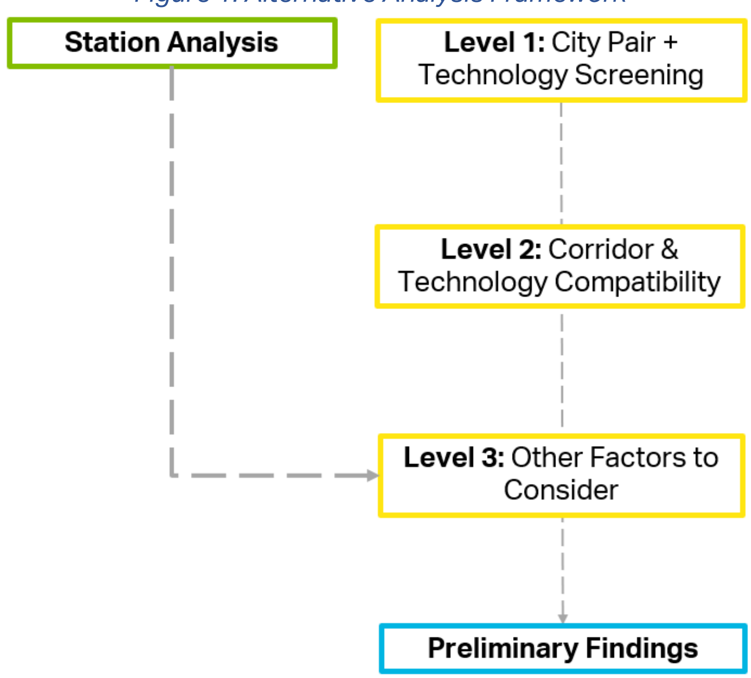
The analysis is being led by the North Central Texas Council of Governments (NCTCOG) in partnership with the Waco Metropolitan Planning Organization (MPO), Killeen-Temple MPO, Capital Area MPO, Alamo Area MPO, and the Laredo MPO.

1.2. Purpose of the Alternatives Analysis and Findings Memorandum

The Task 4 Alternatives Analysis Memorandum built upon and utilized information identified in the Task 2 Technology Review and Design Criteria Memorandum and the Task 3 Previous Studies Review Memorandum to conduct an alternatives analysis evaluating high-speed transportation options broadly along the I-35 corridor. The alternatives analysis evaluated high-speed technology and corridor pairs. Technologies considered included guaranteed transit, conventional passenger rail, higher-speed rail, high-speed rail, superconducting magnetic levitation (maglev), and hyperloop. For more specific information on these technologies, see Task 2 Technology Review and Design Criteria Memorandum.

The analysis was conducted in three levels, beginning by assessing broad aspects of the study area and narrowing to evaluate alternatives against specific criteria. Figure 1 shows the progression of the analysis. The methodology used in each level of alternative analysis is summarized at the beginning of each respective section. Additional details are provided in Appendix A. A station analysis was conducted concurrently and is presented in Appendix B. This memorandum presents the alternative analysis methodology, assessment, and findings.

Figure 1: Alternative Analysis Framework



1.3. Study Area

The study area generally follows the I-35 corridor and includes the metropolitan areas of Fort Worth, Waco, Killeen/Temple, Austin, San Antonio, and Laredo (Figure 2). The I-35 corridor is approximately 455 miles long and connects over 12 million people. The study area was based on the previous Texas-Oklahoma Passenger Rail Study (TOPRS) combined Final Environmental Impact Statement and Record of Decision, where a similar corridor was examined. However, this study does not extend north of Fort Worth or east to Dallas.

Figure 2: Study Area and City Pairs

2. Alternative Analysis Level 1: Screening City Pair and Technology

The objective of the Level 1 analysis was to establish definitions and categories for technology modes and to identify optimal city pair stopping patterns to be utilized later in the analysis when defining end-to-end (Fort Worth to Laredo) alternatives.

2.1. Methodology

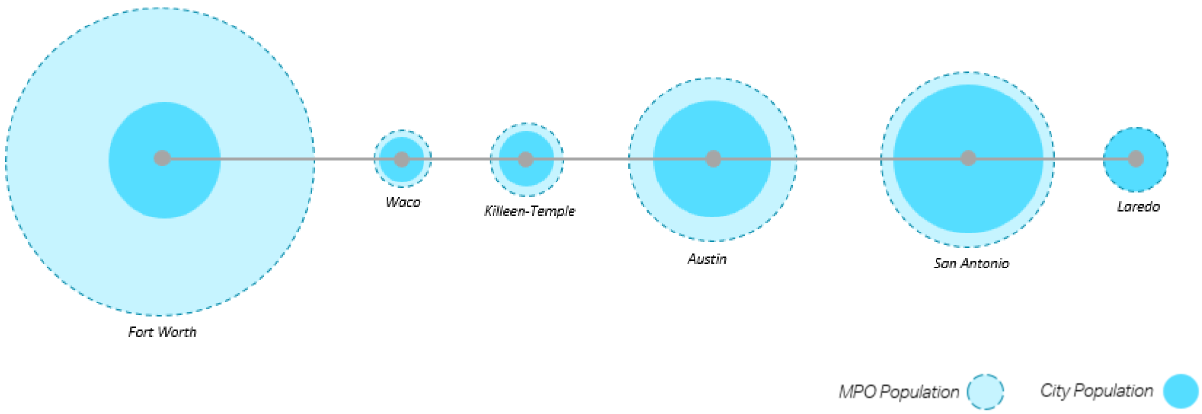
Level 1 of the alternative analysis broadly evaluated cities and technologies. For cities, the evaluation examined items such as population of the metropolitan area. Distances were then assessed between each MPO area and compared to optimal station distances for each technology.

Additionally, technologies were evaluated for operational characteristics and ability to provide optimal travel time savings between cities based on optimal station distances and speed. Technologies were then classified into categories based on those operational characteristics and potential benefits.

2.2. Analysis

Level 1 began with an assessment of the MPO area population and distances between metropolitan areas within the study area. First, cities and MPO planning areas were assessed on population sizes. Table 1 describes each city and MPO in the study area, its relative population, and service area population based the MPO planning area. Fort Worth, Austin, and San Antonio have the highest populations and therefore have the highest opportunity for use, should a high-speed transportation system be developed.

Table 1: Study Area City and MPO Region Population Estimates



City	Fort Worth	Waco	Killeen/Temple	Austin	San Antonio	Laredo
City Population* (2019 rounded)	850,000	140,000	150,000/75,000	975,000	1.5 million	270,000

MPO/Agency	NCTCOG	Waco MPO	KTMPO	CAMPO	AAMPO	Laredo MPO
MPO Population**	7.4 million (2018)	250,000 (2017)	380,000 (2015)	2.2 million (2018)	2.2 million (2015)	275,000 (2017)

Source: *Texas Demographic Center, The University of Texas at San Antonio. *Estimates of the Total Populations of Counties and Places in Texas for July 1, 2019 and January 1, 2019.* October 2019. Accessed March 2020: https://demographics.texas.gov/Resources/TPEPP/Estimates/2018/2018_txpopest_place.pdf
**Task 3 Previous Studies Review Memorandum, AECOM, 2020

Cities were then assessed on the relative distances between metropolitan areas in the study area. For each technology mode, optimal station distance and effective station distance were identified from the Task 2 Technology Review and Design Criteria Memorandum and professional judgement and then applied to the study area. Optimal station distances were based on ideal operating scenarios in which technologies can reach maximum operating speeds. Effective station distances were based on existing and operating transit systems. Existing examples of technology modes, such as maglev and high-speed rail, can vary greatly in the station distances. For hyperloop, there are still many unknowns regarding station distances and operational scenarios utilizing bypass tubes. Table 2 describes optimal and effective station distances for each technology and Table 3 compares the distances between the metropolitan areas in the study area with the optimal station distances.

Table 2: Technology Optimal Station Distances

Technology	Optimal Station Distances	Effective Station Distance	Technology Operational Service Characteristics
Guaranteed Transit	Up to 250 Miles	Approximately 5 miles	Typical interregional bus currently operates throughout the U.S. In Texas, various service providers operate within the study area (Fort Worth, Austin, and San Antonio) and beyond to Laredo. Typical bus travel offers additional flexibility due to a non-dedicated guideway; therefore, station distances can vary greatly depending on the provided route. Guaranteed transit would differ by operating within managed lanes; however, operational characteristics are still unknown.
Conventional Passenger Rail	25 miles	Approximately 5-25 Miles	Most regional passenger rail service in the U.S. is operated by Amtrak, which serves both short- and long-haul routes with intermediary stations. Short-haul routes are typically under 750 miles with long-haul routes reaching up to thousands of miles.
Higher-Speed Rail	100 miles	Approximately 5-30 Miles	Higher-speed trains operating in the U.S. typically share track with freight rail and must abide by regulated speed limits, thereby reducing operational efficiency for long-distance travel.
High-Speed Rail	250 miles	Approximately 10-20 Miles	Internationally, high-speed trains operate over long distances with intermediate stations that can range from 20 miles to 100 miles.
Maglev	100 miles	Approximately 10-20 Miles	Existing maglev systems like the Shanghai Maglev are generally short-distance lines providing service as connectors. However, long-range maglev systems under development would provide more efficient operations with stations at greater distances.
Hyperloop	Up to 500 miles	Approximately 10 Miles	System can be designed as point-to-point with pods that bypass stops without compromising network performance.

Source: AECOM, 2020

Table 3: Optimal Station Distances per Technology

City-Pairs	Distance Between City-Pairs (miles)	Guaranteed Transit	Conventional Passenger Rail	Higher-Speed Trains	High-Speed Trains	Maglev	Hyperloop
Fort Worth to Waco	90	Y	Y	Y	Y	Y	Y
Waco to Killeen/Temple	60	Y	Y	Y	Y	Y	Y
Killeen/Temple to Austin	70	Y	Y	Y	Y	Y	Y
Austin to San Antonio	80	Y	Y	Y	Y	Y	Y
San Antonio to Laredo	160	Y	N	N	Y	N	Y

Y = Within Optimal Station Range
N= Outside of Optimal Station Range
Source: AECOM, 2020

Tables 2 and 3 show that, generally, all reviewed technology modes would be suitable to connect cities and metropolitan areas within the study area. However, the distance between San Antonio and Laredo of approximately 160 miles is longer than the optimal station distance for maglev, higher-speed, and conventional passenger rail trains. While the distance is not outside the total corridor lengths for observed technologies (i.e., total corridor length for the Chuo Shinkansen Superconducting Maglev from Tokyo to Osaka would be approximately 178 miles and the Washington, DC to New York, NY, Acela higher-speed rail corridor is approximately 226 miles), these technologies would typically include intermediate stations between the long-distance destinations, reducing travel time for some passengers and providing passengers with additional destinations. For this study, no intermediate stops would be assessed between any of the identified city-pairs. The optimal station distance exercise shows that reviewed technologies are capable of operating within the city pair distances.

The next step of the Level 1 analysis evaluated travel times between each metropolitan area and the potential savings each technology could provide compared to driving and flying. For each technology, travel time assumptions using acceleration, average operational speed, and deacceleration speed were assessed to develop a potential travel time profile. The speed profiles were developed using information reviewed for existing technologies and researched in the Task 2 Technology Review and Design Criteria Memorandum for maglev and hyperloop. These assumptions were applied to distances between metropolitan areas and calculated to identify travel time. Table 4 displays travel time savings compared to driving a personal vehicle. Vehicle driving times were calculated using Google Maps, excluding traffic, to identify the fastest routes. A 25 percent buffer time was added to drive times to account for potential traffic delay in automobile travel.

Table 4: Travel Time Compared to Driving

City Pairs	Drive Time + 25% Buffer (Minutes)	Guaranteed Transit	Conventional Passenger Rail	Higher-Speed Rail	High-Speed Rail	Maglev	Hyperloop
Fort Worth to Waco	105	70 (33%)	60 (43%)	45 (57%)	30 (71%)	20 (81%)	15 (86%)
Waco to Killeen/Temple	75	50 (33%)	40 (47%)	30 (60%)	25 (67%)	15 (80%)	10 (87%)
Killeen/Temple to Austin	85	55 (35%)	45 (47%)	35 (59%)	25 (71%)	15 (82%)	10 (88%)
Austin to San Antonio	100	65 (35%)	55 (45%)	40 (60%)	30 (70%)	20 (80%)	15 (85%)
San Antonio to Laredo	185	120 (35%)	100 (46%)	75 (59%)	50 (73%)	30 (84%)	20 (89%)

Travel time
(Percent time savings)

Higher Time Savings									Lower Time Savings

Source: AECOM, 2020

Table 4 shows technologies operating at higher speeds provide more travel time savings than lower speed technologies. Compared to driving, higher-speed rail, high-speed rail, maglev, and hyperloop provide travel time savings of over 50 percent for all city pairs. Technologies providing lower than 50 percent travel time savings compared to driving were conventional passenger rail and guaranteed transit. These technologies, generally, have more variability for delay and lower operating speeds. Also, for higher-speed rail, most existing examples operate in shared corridors and are limited in speed, and therefore can be subject to travel time variability.

Table 5 shows the percent time savings for each technology compared to direct flight times. Note that most city pair combinations do not have direct flights available and as such, Table 5 primarily details flights from DFW International Airport and Dallas Love Field to other metropolitan areas along the corridor.

Table 5: Percent Time Savings Compared to Direct Flights

Direct Flights	Flight Time (Minutes)	Guaranteed Transit	Conventional Passenger Rail	Higher-Speed Rail	High-Speed Rail	Maglev	Hyperloop
Fort Worth to Waco	45	-56%	-33%	0%	33%	56%	67%
Killeen/Temple to Fort Worth	60	-108%	-67%	-25%	8%	42%	67%
Austin to Fort Worth	70	-157%	-107%	-57%	-14%	29%	57%
San Antonio to Fort Worth	70	-250%	-186%	-114%	-57%	0%	43%
Laredo to Fort Worth	95	-289%	-216%	-132%	-68%	-5%	37%

Higher Time Savings									Lower Time Savings

Source: AECOM, 2020

Travel time savings compared to flights in the Table 5 assessment is less pronounced due to operational speeds and airline speeds. Overall, the reviewed technologies perform less favorably as travel distance increases. No time savings are observed for guaranteed transit, conventional passenger rail, or higher-speed rail. For high-speed rail, travel time savings would only be observed in the shortest trips. However, hyperloop would provide more than 40 percent time savings for all city pairs.

2.3. Outcomes of Level 1

The objectives of the Level 1 analysis were to establish definitions and categories for technology modes and to identify optimal city pair stopping patterns to be utilized in the Level 2 analysis.

After overlaying the assessment of population, metropolitan area distances, optimal station distances for each technology, and travel time savings, a categorization scheme for technology modes was identified, as shown in Figure 3. The following categories were defined for primary and infill technologies:

- Primary technologies were defined as interregional travel modes with operating speeds above 150 miles per hour (mph), requiring dedicated or closed guideways. For this study, these technologies include high-speed rail, maglev, and hyperloop. In the travel time savings assessment, primary technologies provided at least 50 percent time savings over personal vehicle travel. While, higher-speed rail provides some travel time savings over 50 percent, it does not meet criteria outlined for operating speed and dedicated or closed guideway.
- Infill technologies were defined as potentially both intercity and/or interregional travel modes with operating speeds below 150 mph. Infill technologies can operate in shared corridors or managed highway travel lanes. For this study, these technologies include guaranteed transit, conventional passenger rail, and higher-speed rail. In the travel time savings assessment, infill technologies provided less than 50 percent time savings over personal vehicle travel.

Figure 3: Primary and Infill Technologies

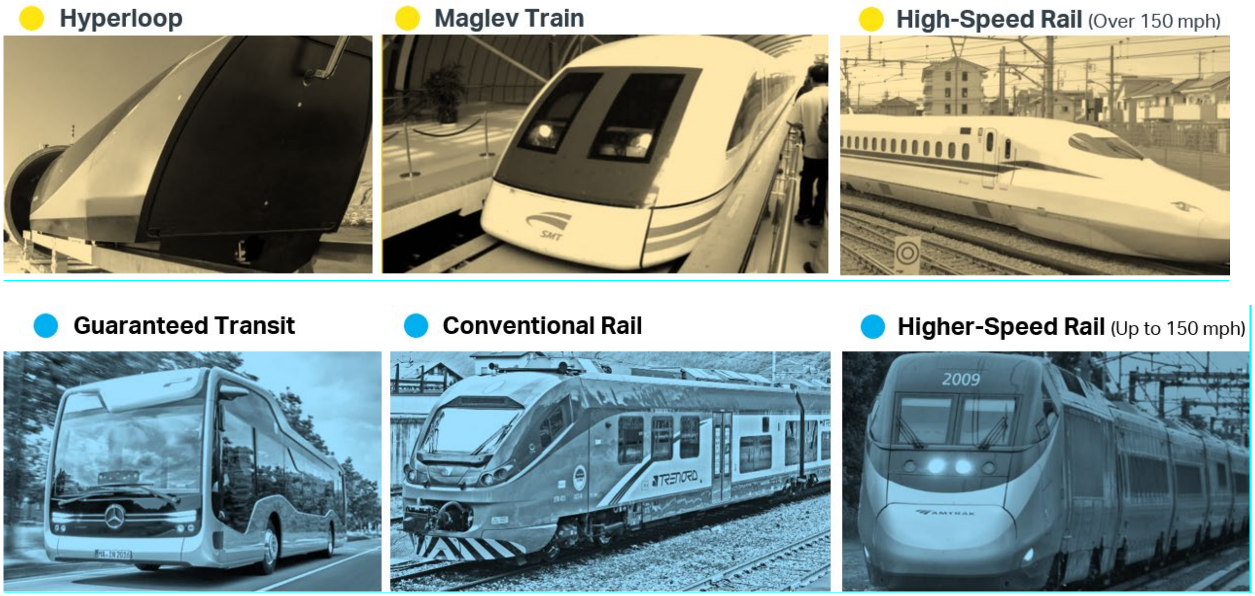
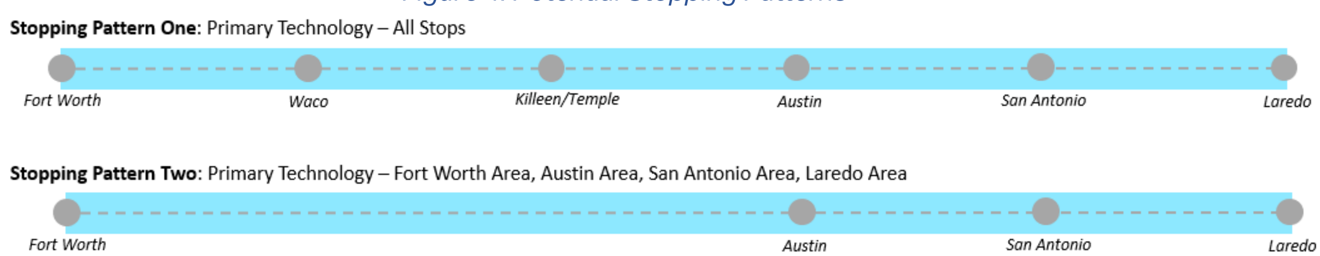


Image sources: Virgin Hyperloop One, Shanghai Maglev, Central Japan Railway Company, Daimler/Mercedes-Benz, Stadler, Amtrak Acela Express

In addition to defining technology categories, Level 1 identified two stopping patterns based on metropolitan area populations, optimal station distances for technologies, and travel time savings. However, additional high-level considerations were made regarding feasibility for infill technology implementation at an interregional level, as discussed in the following paragraphs. Figure 4 shows the two identified stopping patterns.

Figure 4: Potential Stopping Patterns



Source: AECOM, 2020

Stopping Pattern One would utilize a primary technology, with potential stops at all MPO areas within the study area. All primary technologies have been identified to provide efficient travel time savings and could operate within optimal distances between potential station areas within the study area. Stopping Pattern Two would utilize a primary technology to connect the starting location of Fort Worth to travel directly to the Austin area, San Antonio area, and on to the terminal destination of the Laredo area. In this scenario, infill technologies could supplement primary technologies as an intercity connector.

Overall, the Level 1 analysis demonstrated that primary technologies offer the most potential in terms of population sizes served, station distances, and travel time savings for both stopping patterns. Additionally, primary technologies are capable of connecting all potential stops within both stopping patterns. Comparatively, infill technologies offered fewer benefits in terms of population sizes served, operational efficiencies, and in some cases would not provide efficient travel time savings to some city pairs, particularly at an interregional level. Infill technlogies currently exist between Fort Worth and San Antonio as conventional passenger rail operated by Amtrak. However, as discussed in the Task 2 and 3 memoranda, expansion of conventional passenger rail in Texas would be dependent on available funding and potential public-private partnership. Pasesnger rail (conventional or higher-speed) operating in shared freight-rail corridor are subject to constraints limiting speeds, reliability, and travel efficiency. Therefore, conventional passenger rail and higher-speed rail technologies were not considered to be viable alternatives, for all stops, from Fort Worth to Laredo. Guaranteed transit varies from rail infill technlogies by primarily operating in managed highway lanes allowing the service to provide greater travel efficiency compared to buses operating in general purpose highway lanes. However, the presence or lack of managed lanes connecting metropolitan areas in the study area could determine the implementation feasibility of guaranteed transit.

Based on the Level 1 analysis, primary technologies should be evaluated in Level 2 to identify high-scoring corridors for alternatives from Fort Worth to Laredo. Infill technolgies should be assessed for the abilitiy to provide connectivity as supplemental or phased transportation solutions between cities within alternatives from Fort Worth to Laredo utilizing Stopping Pattern Two.

3. Alternative Analysis Level 2: Corridor and Technology Compatibility

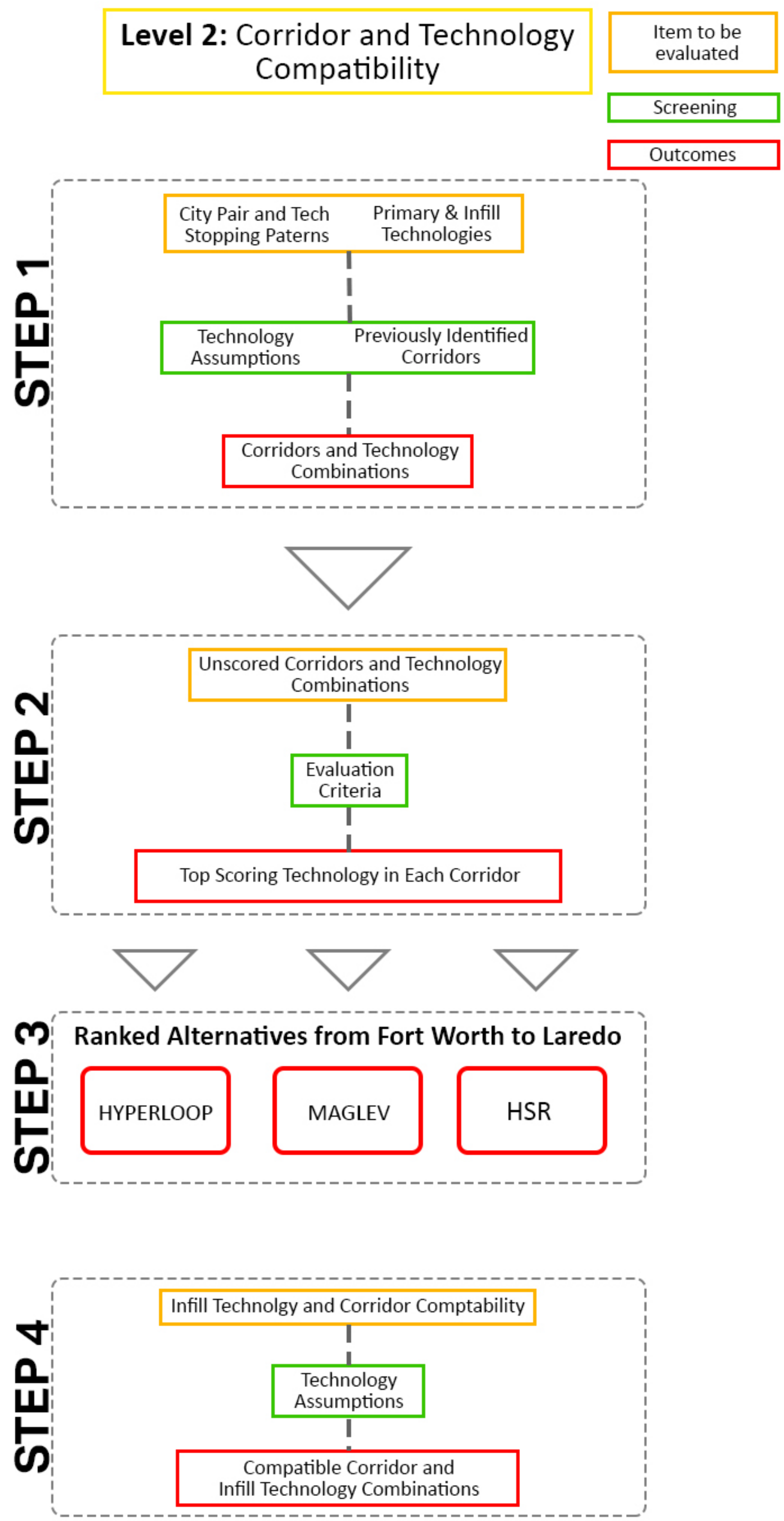
The objective of the Level 2 analysis was to identify and rank end-to-end alternatives for each primary technology (from Fort Worth to Laredo) based on technology and corridor/routings. Level 2 begins by building on the Level 1 analysis outcomes.

3.1. Methodology

Level 2 was conducted in four steps, as shown in Figure 5, details of the analysis can be found in Appendix A:

- **Step 1:** Beginning with the results of Level 1 of the alternatives analysis, Level 2 used technology assumptions and corridors identified from previous studies to perform an initial compatibility analysis.
- **Step 2**: Each corridor and technology combination were evaluated and scored. A detailed list of evaluation criteria can be found in Appendix A, Table 11.
- **Step 3**: The top scoring corridor and technology combinations for each city pair were assembled to create scored alternatives from Fort Worth to Laredo for each primary technology.
- **Step 4:** Similar to Step 1, this step assessed infill technology and corridor compatibility. This analysis assessed infill technology compatibility on the entire set of identified corridors and determined a set of corridors between city pairs that could be suitable for infill technology. Although the Level 1 analysis determined that infill technologies were not feasible for alternatives from Fort Worth to Laredo, assessing the technologies to serve as a phased or supplemental connectivity solution between city pairs was important to determine overall (primary and infill technology) alternatives from Fort Worth to Laredo.

Figure 5: Alternatives Analysis Level 2: Flow Chart



Source: AECOM, 2020

3.2. Outcomes of Level 2

As previously discussed, Level 2 was conducted in four sequential steps. The following paragraphs provide summaries of each step.

Step 1 of the alternative analysis builds off Level 1 outcomes by assessing primary technology compatibility with an identified set of corridors. Corridors, for this study, refer to general geographic routes within the study area assessed in previous plans (see Task 3 Previous Studies Review Memorandum) and studies. These corridors were categorized by type:

- Greenfield (generally undeveloped for transportation infrastructure)
- Shared-highway routes
- Railroad corridors
- Utility corridors (generally following electrical transmission line corridors)

Technology assumptions based on design criteria (see Task 2 Design Criteria and Technology Review Memorandum), the review of previous studies, and professional judgement were developed to assess compatibility. The assessment produced a set of compatible corridor and technology combinations. Appendix A provides details regarding the general geographic location of corridors (see Table 9 and Figure 8), technology assumptions, and compatibility assessment table (see Table 10).

Step 2 of the alternatives analysis developed scored technology and corridor combinations using outcomes from Step 1. A point system based on evaluation criteria was established to score technology and corridor combinations between city pairs. Evaluation criteria included:

- Capital Cost per Mile
- Cost to Construct
- Passenger Capacity
- Reduction in Travel Time
- Land Cover (High Development, Wetlands, Water, Pasture and Cropland)
- National and State Historic Places
- Parks and Open Space

The evaluation produced a set of scored technology and corridor combinations. Appendix A, Table 11 provides the list of evaluation criteria, descriptions, and the Step 2 evaluation criteria table.

Step 3 assembled end-to-end alternatives (from Fort Worth to Laredo) based on scored combinations from Step 2. A total of 38 iterations were possible. Table 5 shows each alternative from Fort Worth to Laredo, corridor types, and total raw score. Total raw score was calculated by summing each corridor score from the Step 2 analysis. Appendix A, Table 13 provides the scored alternatives from Fort Worth to Laredo, including the score for each corridor.

Table 5: Step 3, Scored Alternatives from Fort Worth to Laredo

	Corridor Between Metropolitan Area					
Technology	**Fort Worth to Waco**	**Waco to Killeen/Temple**	**Killeen/Temple to Austin**	**Austin to San Antonio**	**San Antonio to Laredo**	**Total Raw Score**
Hyperloop	I-35	I-35	Greenfield	Utility	I-35	127
Hyperloop	I-35	I-35	Greenfield	Greenfield	I-35	125
Hyperloop	Utility	I-35	Greenfield	Utility	I-35	125
Hyperloop	I-35	Greenfield	Greenfield	Utility	I-35	125

Technology	Corridor Between Metropolitan Area					Total Raw Score
	Fort Worth to Waco	Waco to Killeen/Temple	Killeen/Temple to Austin	Austin to San Antonio	San Antonio to Laredo	
Hyperloop	I-35	I-35	Greenfield	Utility	Greenfield	125
Hyperloop	I-35	I-35	Greenfield	Greenfield/BNSF	I-35	124
Hyperloop	Utility	I-35	Greenfield	Greenfield	I-35	123
Hyperloop	I-35	Greenfield	Greenfield	Utility	Greenfield	123
Hyperloop	I-35	Greenfield	Greenfield	Greenfield	I-35	123
Hyperloop	Utility	Greenfield	Greenfield	Utility	I-35	123
Hyperloop	I-35	I-35	Greenfield	Greenfield	Greenfield	123
Hyperloop	Utility	I-35	Greenfield	Utility	Greenfield	123
Hyperloop	I-35	I-35	Greenfield	Greenfield/BNSF	Greenfield	122
Hyperloop	Utility	I-35	Greenfield	Greenfield/BNSF	I-35	122
Hyperloop	I-35	Greenfield	Greenfield	Greenfield/BNSF	I-35	122
Hyperloop	I-35	Greenfield	Greenfield	Greenfield	Greenfield	121
Hyperloop	Utility	Greenfield	Greenfield	Utility	Greenfield	121
Hyperloop	Utility	Greenfield	Greenfield	Greenfield	I-35	121
Hyperloop	Utility	I-35	Greenfield	Greenfield	Greenfield	121
Hyperloop	I-35	Greenfield	Greenfield	Greenfield/BNSF	Greenfield	120
Hyperloop	Utility	Greenfield	Greenfield	Greenfield/BNSF	I-35	120
Hyperloop	Utility	I-35	Greenfield	Greenfield/BNSF	Greenfield	120
Hyperloop	Utility	Greenfield	Greenfield	Greenfield	Greenfield	119
Hyperloop	Utility	Greenfield	Greenfield	Greenfield/BNSF	Greenfield	118
Maglev	Utility	Greenfield	Greenfield	Utility	Greenfield	113
Maglev	Utility	Greenfield	Greenfield	Greenfield	Greenfield	110
Maglev	Utility	Greenfield	Greenfield	Greenfield/BNSF	Greenfield	108
Hyperloop	I-35	I-35	I-35		I-35	100
High-Speed Rail	Utility	Greenfield	Greenfield	Utility	Greenfield	99
Hyperloop	I-35	Greenfield	I-35		I-35	98
Hyperloop	I-35	I-35	I-35		Greenfield	98
Hyperloop	Utility	I-35	I-35		I-35	98
Hyperloop	I-35	Greenfield	I-35		Greenfield	96
Hyperloop	Utility	Greenfield	I-35		I-35	96
Hyperloop	Utility	I-35	I-35		Greenfield	96
High-Speed Rail	Utility	Greenfield	Greenfield	Greenfield	Greenfield	95
High-Speed Rail	Utility	Greenfield	Greenfield	Greenfield/BNSF	Greenfield	95
Hyperloop	Utility	Greenfield	I-35		Greenfield	94

Source: AECOM 2020

In general, alternatives from Fort Worth to Laredo using hyperloop as primary technology scored higher than alternatives using maglev or high-speed rail. The top 12 scoring alternatives would use hyperloop as the primary technology. The point system established for the Step 3 analysis did not adjust or normalize scores; therefore, high-scoring alternatives reflect strong performance in many different criteria. However, due to its operational speed and capabilities, hyperloop scored highest in reduction in travel time compared to all other primary technologies in all cases.

Step 3 culminated by identifying the highest scoring alternative from Fort Worth to Laredo for each primary technology. Table 6 displays alternatives were made from the best scoring corridors between each city pair.

Table 6: Step 3, Ranked Fort Worth to Laredo Alternatives by Primary Technology

Overall Rank	Technology Mode	Fort Worth to Waco	Waco to Killeen/ Temple	Killeen/Temple to Austin	Austin to San Antonio	San Antonio to Laredo	Raw Score
1	**Hyperloop**	I-35	I-35	Greenfield	Utility	I-35	127
13	**Maglev**	Utility	Greenfield	Greenfield	Utility	Greenfield	113
16	**High-Speed Rail**	Utility	Greenfield	Greenfield	Utility	Greenfield	99

Source: AECOM,2020

Although hyperloop alternatives from Fort Worth to Laredo scored highest in the evaluation, aspects related to design, operation, and cost are unknown or still in development for the technology. Additionally, results of the Level 2 alternatives analysis have shown maglev and high-speed rail to also be viable transportation solutions for the study area.

Step 4 of the Level 2 alternatives analysis assessed infill technology and corridor compatibility by developing high-level technology assumptions. Technology assumptions included:

- No infill technologies were considered along utility or greenfield corridors. Infill technology expansion into utility and greenfield corridors would necessitate new corridor construction. Based on information identified in the Task 2 and 3 memoranda and professional judgement, new construction for infill technologies in utility or greenfield corridors was deemed infeasible due cost, travel efficiency, environmental constraints, and overall benefits.
- Guaranteed transit would primarily operate in managed highway lanes typically within highway corridors; therefore, only corridors along highways were considered.
- Conventional and higher-speed passenger rail could utilize only shared railroad corridors.

Applying the technology assumptions to the corridors identified in Step 1 of the alternatives analysis resulted in three Fort Worth area to Austin area corridor/infill technology combinations, one for each technology type, as shown in Table 7.

Table 7: Step 4, Infill Technology Compatibility

Technology	Fort Worth to Waco	Waco to Killeen/Temple	Killeen/Temple to Austin	Austin to San Antonio
Guaranteed Transit	I-35	I-35	I-35	I-35
Conventional Passenger Rail	UPRR Corridor	UPRR/BNSF	BNSF (Amtrak Texas Eagle)	UPRR Shared Corridor
Higher-Speed Rail	UPRR Corridor	UPRR/BNSF	BNSF (Amtrak Texas Eagle)	UPRR Shared Corridor

Source: AECOM, 2020

Table 7 shows that infill technologies are compatible with corridors identified in the Level 2 alternatives Analysis. Additionally, the assessment showed that infill technologies could provide intercity connectivity in a phased or supplemental role to primary technologies connecting high population metropolitan centers. As discussed in the Level 1 outcomes, infill technology did not provide sufficient benefits as an interregional alternative from Fort Worth to Laredo.

4. Alternative Analysis Level 3: Other Factors to Consider

The Level 3 analysis scored the qualitative aspects of the primary technology modes.

4.1. Methodology

A set of qualitative criteria was identified using findings from the Task 2 Technology Review and Design Criteria Memorandum and publicly available literature. Relevant findings for each criterion were summarized, and a qualitative score of low, medium, high, or neutral was assigned. Topics included: 1) station location benefits, 2) operational characteristics, 3) interoperability, 4) regulatory factors, 5) convenience, and 6) safety and resilience. These topics were broken down into criteria evaluating additional qualitative aspects. This analysis intended to provide an additional qualitative comparison between technologies.

The qualitative review was based on available information and internet research. High-speed rail has a larger pool of available literature, case studies, and evidence. As noted in the Task 2 Technology Review and Design Criteria Memorandum, there are few maglev systems operating passenger service. Those that do carry passengers are relatively short distances. Literature for maglev came primarily from planning studies, such as the Northeast Corridor Maglev project from Baltimore to Washington, D.C., and the Chuo Shinkansen Superconducting Maglev Project from Tokyo to Nagoya. As hyperloop remains largely unproven and theoretical, research on the technology is ongoing.

4.2. Outcomes of Level 3

Table 8 describes criteria and findings from Level 3. Only primary technologies were reviewed as many of the characteristics of regional bus systems (like guaranteed transit), conventional passenger rail, and higher-speed rail are known or were covered in the Task 2 Technology Review and Design Criteria Memorandum.

Table 8: Other Factors to Consider

Category	Criteria	Hyperloop	Maglev	High-Speed Rail
Station Location Benefits	Urban vs. Suburban Location	Medium	Medium	Medium
	Station Location Benefits (Freight/Passenger-Oriented Uses)	Medium	Medium	Medium
Operational Characteristics	Required Area for Ancillary Facilities	Neutral	Medium	Medium
	Reliability/Technology Maturity	Low	Medium	High
	Operation and Maintenance Costs	Neutral	Neutral	Neutral
Interoperability	Compatibility with Existing Technologies	Low	Low	Low
Regulatory Factors	Regulatory Environment	Low	Low	Medium
	Public and Institutional Plan Consistency	Low	Low	Medium

Category	Criteria	Hyperloop	Maglev	High-Speed Rail
Convenience	Passenger Experience	Neutral	High	High
	Travel Efficiency	Neutral	Medium	High
Safety and Resilience	Vehicle and Track Safety Measures	Low	Medium	High

Source: AECOM, 2020

The qualitative assessment highlighted the variety of unknowns associated with hyperloop particularly related to operational characteristics and convenience. This can be seen in contrast to high-speed rail, that has been in operation for over 50 years throughout the world. Notably, maglev scored mostly medium in the evaluation potentially due the few maglev systems operating passenger service. The Level 3 provided an additional aspect of consideration for future analysis, and it did not impact the quantitative alternative analysis conducted in Level 1 and 2. A summary of relevant supportive evidence from the literature review for each technology, and a full discussion of each category, is included in Appendix C.

5. Findings

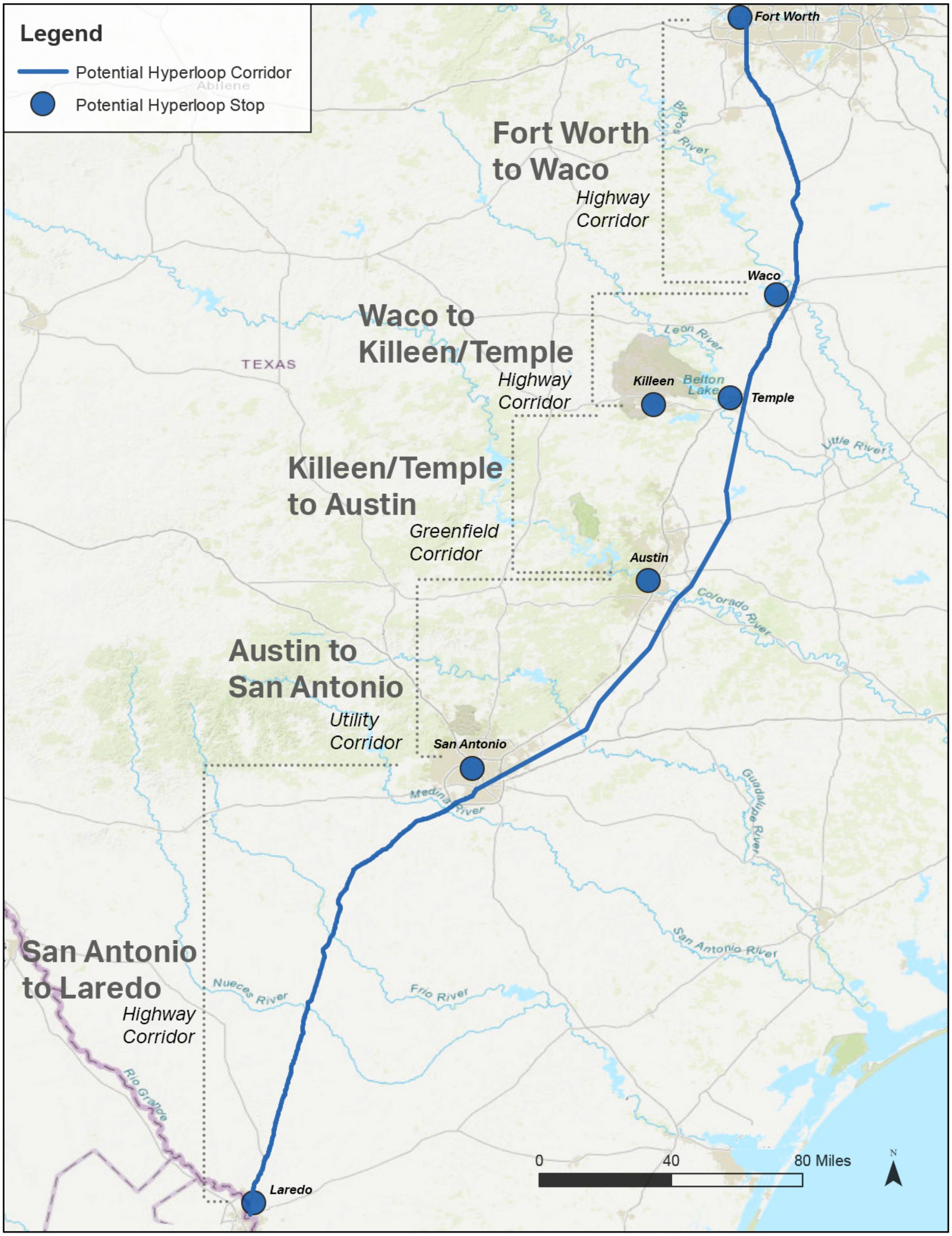
This section outlines preliminary findings of the Task 4 Alternatives Analysis, including top-scoring alternatives, technologies, and infill technologies.

5.1. Top Ranked Alternatives from Fort Worth to Laredo

As discussed in Section 3.2: Outcomes of the Level 2, the highest ranking alternative was identified for each primary technology mode. The following figures and discussion provide an overview of the top three scoring alternatives from Fort Worth to Laredo. All three of the high ranking alternatives would use Stopping Pattern One.

The highest ranking hyperloop alternative from Fort Worth to Laredo would utilize a combination of utility, highway, and greenfield corridors scored in the Level 2 analysis, as shown in Figure 6. The corridor generally follows the I-35 corridor from Fort Worth to Killeen/Temple. South of Killeen/Temple, the corridor continues south towards Austin along a greenfield corridor before transitioning to a utility corridor from Austin to San Antonio. From San Antonio to Laredo, the alternative would generally follow the I-35 corridor.

Figure 6: Highest Ranking Hyperloop Alternative

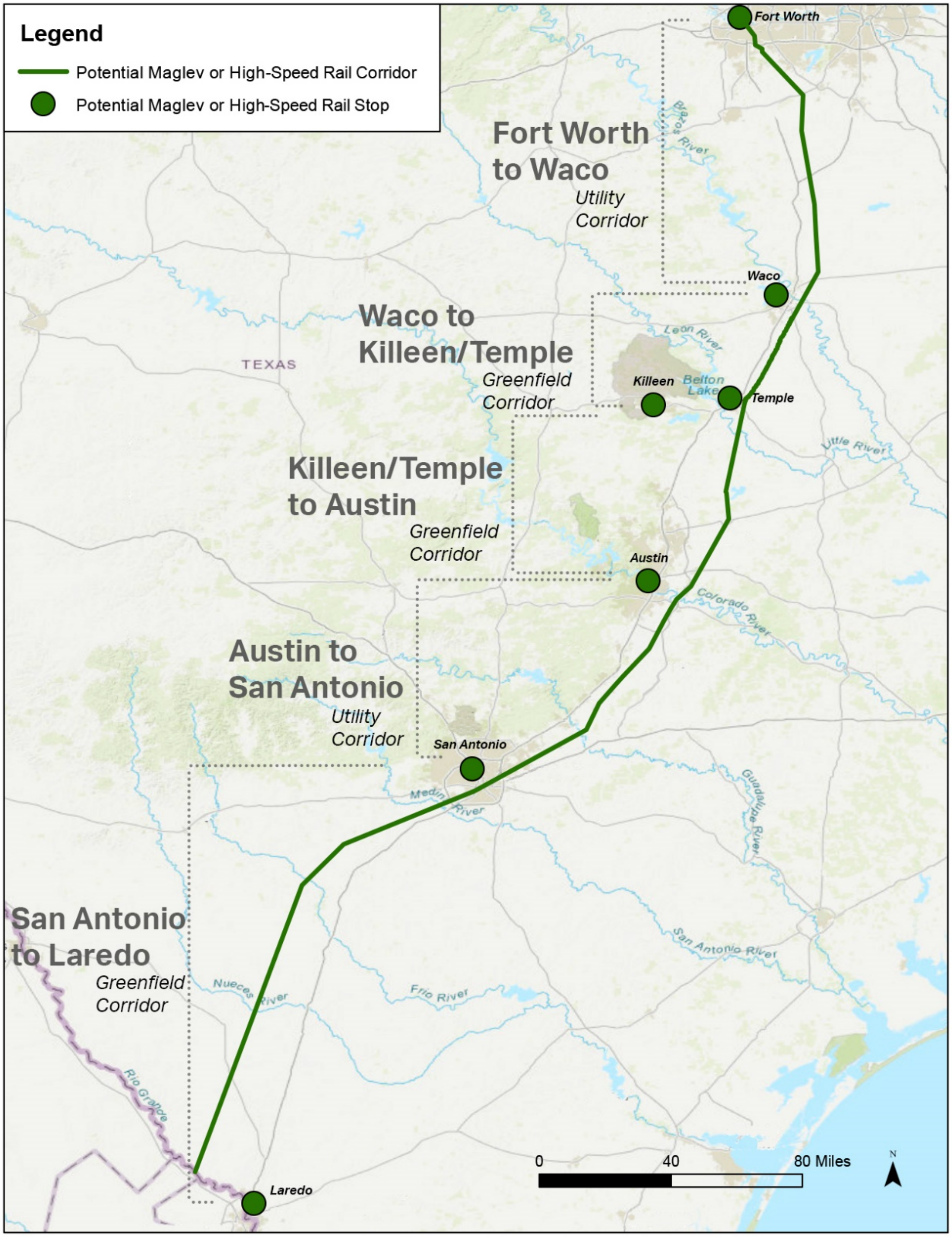


Source: AECOM, 2020

The highest scoring maglev and high-speed rail alternatives from Fort Worth to Laredo would use a combination of utility and greenfield corridors, as shown in Figure 7. Notably, the corridor alternative for maglev and high-speed rail is the same between Waco and San Antonio. From Fort Worth to Waco the corridor would follow utility corridor before transitioning to a greenfield corridor from Waco to Austin. Continuing south from Austin to San Antonio, a utility corridor would be used. Travelling from San Antonio to Laredo a greenfield corridor would be used.

Neither maglev nor high-speed rail alternatives from Fort Worth to Laredo score as well as the top hyperloop alternative. However, as shown in the Level 3: Other Factors to Consider, qualitative assessment, hyperloop is an emerging transportation technology with many operational unknowns. Maglev and high-speed rail offer comparable results in terms of travel time savings but potential significant differences in costs and reliability/technology maturity. As noted in the Task 2 Design Criteria and Technology Review Memorandum, only a few maglev systems are in operation with passenger service in China and South Korea compared to the numerous international examples of high-speed rail systems across Europe and Asia. This study has demonstrated that hyperloop, maglev, or high-speed rail alternatives could be viable transportation solutions and should be considered in any future studies.

Figure 7: Highest Ranking Maglev and High-Speed Rail Alternatives from Fort Worth to Laredo



Source: AECOM, 2020

5.2. Infill Consideration

Levels 1 and 2 of the alternatives analysis determined infill technologies to be best suited for intercity connectivity in a phased or supplemental role to primary technologies. The alternatives analysis demonstrated that corridors compatible with infill technologies are viable for some city pairs in the study area. As noted in the Task 2 Design Criteria and Technology Review Memorandum, existing conventional passenger rail service operates between Fort Worth and San Antonio and a variety of private interregional buses operate between Fort Worth to Laredo. Additional, high-scoring alternatives from Fort Worth to Laredo included hyperloop, maglev, or high-speed rail technology using Stopping Pattern Two (Fort Worth, Austin, San Antonio, Laredo). For these alternatives, infill technologies could provide phased or supplemental connectivity between Waco and Killeen/Temple, or potentially Austin and San Antonio. Similarly, an alternative could utilize existing conventional passenger rail, or be upgraded to a higher-speed rail on shared railroad corridors.

However, the highest scoring alternatives identified in this study utilized a single primary technology stopping at all locations, which would eliminate the need for an infill technology mode.

6. Stakeholder Engagement

The project team worked with the MPOs and councils of governments within the study area to identify key stakeholders in each area, including elected officials, city and county staff, and transportation officials. Once identified, the project team organized two series of meetings in each of the six areas with these key stakeholders.

Series 1 Meeting Summaries

The first series of the stakeholder engagement meetings introduced participating MPOs to the study, its goals, and anticipated outcomes. This engagement included presentation by the project team which shared the purpose and need for the project and other project background information. A review of the five technologies was also included. The project team emphasized that the study was technology neutral to this stage. Station locations for passenger and freight transportation were discussed at a high level. In addition, the project team reviewed the project schedule and scope. Common feedback from this initial series of meetings included the following topics:

- Role this study plays in relation to future feasibility and environmental studies
- Capabilities, design, and feasibility of high-speed transportation technologies, particularly hyperloop technology
- Screening criteria, particularly cost and engineering considerations
- Operational and service details regarding transportation technologies
- Interagency coordination and the role of participating MPOs

Additionally, stakeholders were asked to provide feedback on the following:

- Any additional corridors that should be assessed
- Environmentally sensitive locations the project team should consider in screening
- Potential station locations
- Reasons why a particular technology may not work for each MPO

Series 2 Meeting Summaries

The second series of the stakeholder engagement meetings presented preliminary findings from the alternative analysis along with the analysis methodology. The presentation revealed hyperloop with stops at all identified city pairs ranked highest for technology and alignment. At this stage, common stakeholder questions were related to:

- Specific design and operational impacts such as noise, weather, and disaster related events on the technologies, particularly hyperloop technology
- Environmental impacts, construction costs, and safety and security discussions
- Timeframes for future studies and implementation, costs and funding sources, next steps, and the role the MPOs are expected to carry going forward

Following stakeholder presentations, the project team presented a briefing to each MPO policy board. Summaries for each meeting, documenting attendees, information presented, items discussed, comments/questions, and resulting action items, are provided in Appendix D and E.

7. Study Assumptions and Limitations

The Task 4 Alternatives Analysis relied on publicly available information identified in the Task 2 Technology Review and Design Criteria Memorandum and the Task 3 Previous Studies Review Memorandum to identify corridor and technology compatibility assumptions and design criteria. The project team was able to identify many aspects of all potential technology modes; however, certain aspects of technologies, particularly hyperloop, are unknown or still under development. Also, some aspects of existing technologies, such as maglev, have few operating examples and therefore have unreliable cost ranges. The project team has attempted to mitigate unknowns by conducting thorough research and by valuing analysis criteria equally.

The station area analysis utilized a generalized methodology to assess large areas. The analysis was conducted in this manner intentionally to avoid specifying locations for potential stations. At this planning-level stage of assessment, preferred alignments and specific routing are unknown. Additionally, on approach to any station, all technologies would reduce speed to maneuver into appropriate station locations; therefore, alignments could be more flexible in proximity to stations.

8. Next Steps

The Fort Worth to Laredo High-Speed Transportation Study conducted a planning-level analysis of transportation technologies to evaluate and identify potential corridors. This Task 4 Alternatives Analysis builds upon the previously completed Task 2 and 3 memoranda. The study was developed in collaboration with six MPOs and is intended to serve as a tool to build consensus on the consideration and future study of implementing high-speed transportation technologies from Fort Worth to Laredo.

This study has taken a first step in assessing the feasibility of new and emerging transportation technology throughout Texas. Preliminary findings from the alternatives analysis suggest that an alternative from Fort Worth to Laredo utilizing hyperloop with Stopping Pattern One ranks highest. A hyperloop alternative provides the highest percentage of potential travel time savings, supports the throughput of a significant number of passengers, and scores well or highest in numerous other evaluation criteria. Yet, as shown in the Level 3: Other Factors to Consider, qualitative assessment, hyperloop is an unproven transportation technology with many operational unknowns.

Findings in Section 5 presented the highest ranking viable alternatives from Fort Worth to Laredo using hyperloop, maglev and high-speed rail. While a hyperloop alternative scored highest, all were determined to be feasible. As an alternative from Fort Worth to Laredo progresses into a NEPA process each of the primary technology modes should be considered viable, with the understanding that hyperloop could provide the most benefit.

Appendix A: Alternatives Analysis Level 2 Detailed Methodology and Analysis

Appendix A includes methodology discussion, evalauation criteria, and data tables related to the Level 2 alternatives analysis.

Step 1: Corridor and Technology Compatibility

Step 1 assembled corridors from previous studies and assessed compatibility with the technology modes based on type. During stakeholder meetings, MPOs were asked to provide suggestions for additional corridors to be investigated, but none were provided. A total of 20 corridors were identified. Table 9 displays identified corridors for the Level 2 Alternatives Analysis including a general geographic description.

Table 9: General Corridor Descriptions

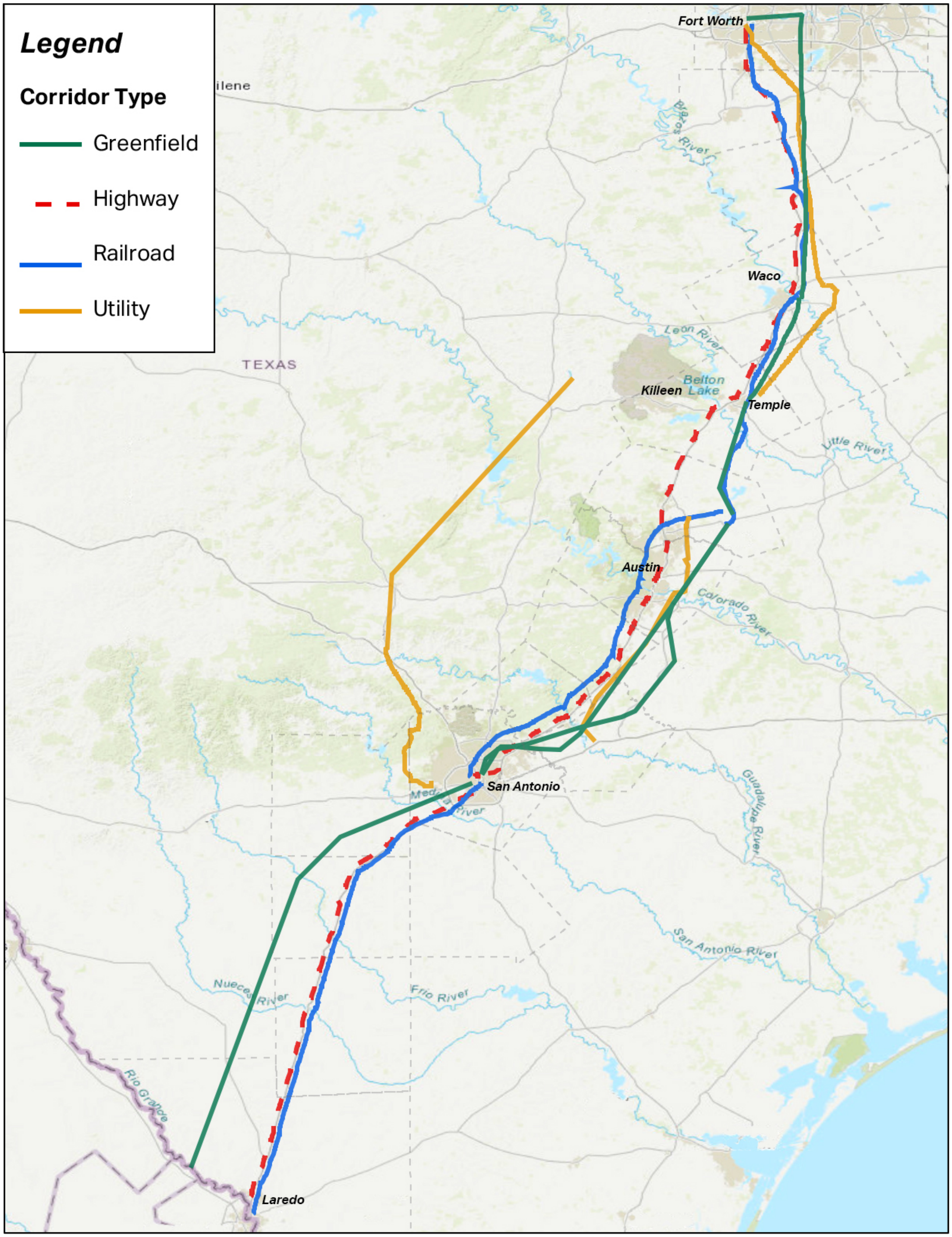
Corridor	Along / Follows	Type	General Route Description
Fort Worth to Waco	BNSF/UPRR	Railroad	Following the Union Pacific Railway south toward Hillsboro
	I-35	Highway	Parallels the I-35 corridor south from Fort Worth
	Electrical Corridor	Utility	Travelling southeast from Fort Worth, generally following the State Highway 287 corridor, and turning south to transition to an electrical corridor travelling southeast toward Mansfield. Southwest of Mansfield the corridor would turn south toward Waco
Fort Worth to Arlington Area to Waco	Greenfield	Greenfield	Generally following I-30 east and turning south near the existing transportation corridors. South of Waxahachie the corridor would enter a new greenfield corridor outside of transportation infrastructure right-of-way continuing toward Hillsboro and Waco
Waco to Killeen/Temple	UPRR	Railroad	Generally following the Union Pacific Railway south from Waco
	Greenfield	Greenfield	Generally parallel to I-35, travelling southeast in a corridor with no existing transportation infrastructure
	I-35	Highway	Parallels the I-35 corridor south from Waco
	Electrical Corridor	Utility	East of Waco, near Trading House Creek Reservoir, the corridor would travel southwest to Killeen/Temple area
Fort Worth Area to Killeen/Temple	BNSF (Amtrak Texas Eagle)	Railroad	Generally following the BNSF Railway south from Fort Worth to Temple
Killeen/Temple to Austin	UPRR (Amtrak Texas Eagle)	Railroad	Following the Union Pacific Railway south from Killeen/Temple area toward the Austin area
	Greenfield	Greenfield	West and generally parallel to the Union Pacific Railway, travelling southwest in an undeveloped corridor toward Austin
Austin to San Antonio	UPRR Shared Corridor	Railroad	West of Austin, generally paralleling the I-35 corridor toward San Antonio
	Greenfield	Greenfield	Generally east of Austin traveling southward toward the Austin Airport and on to San Antonio
	Electrical Corridor	Utility	East of Austin, travelling southwest toward Seguin
	BNSF	Greenfield	East of Austin, near State Highway 130, travelling southwest toward san Antonio in an undeveloped corridor

Corridor	Along / Follows	Type	General Route Description
Killeen/Temple to San Antonio	I-35	Highway	Parallels the I-35 corridor south from Killeen/Temple area
	Electrical Corridor	Utility	West of Killeen, travelling southwest toward Fredericksburg before turning south toward San Antonio
San Antonio to Laredo	Greenfield	Greenfield	Leaving San Antonio travelling Southwest toward Yancey and then turning south toward Laredo in an undeveloped corridor
	UPRR	Railroad	Generally parallel to I-35 toward Laredo
	I-35	Highway	Parallels the I-35 corridor south from San Antonio

*BNSF – Burlington-Northern Santa Fe – Railroad Corridor
*UPRR – Union Pacific Railroad – Railroad corridor
Source: AECOM, 2020

Figure 8 displays the identified corridors by type along the Fort Worth to Laredo study area. Each corridor is displayed on in the figure as a line, however specific footprint and geographic locations were intentionally not defined for this study. As an alternative from Fort Worth to Laredo progresses through a NEPA process, more specific limits of disturbance would be identified through preliminary engineering and environmental assessment.

Figure 8: Identified Corridors by Type



Source: AECOM, 2020

Technology assumptions were used to evaluate corridor and technology compatibility. The technology assumptions were developed based on plans reviewed in the Task 3 Previous Studies Review Memorandum and professional judgement. Assumptions made to evaluate corridors and primary technology combinations were:

- Primary Technology Assumption 1: Primary technologies are not compatible with shared corridors. Overhead catenary systems for electrical high-speed rail vehicles can interfere with freight signals and operations. High-speed transit systems require 100 percent grade separation (closed systems) to achieve high speeds.
- Primary Technology Assumption 2: Maglev and high-speed rail are not compatible along highway routes. Both have more restrictive horizontal and vertical design criteria than highways. To follow an existing highway route, the speed of the technology would have to be greatly reduced. Hyperloop is theorized to be able to generally follow highway routes due to a smaller footprint and enclosed guideway, however, a reduction in speed would be necessary.
- Primary Technology Assumption 3: Primary technologies are not compatible with existing freight railroad corridors. For primary technologies, the entire right-of-way would be fenced and fully grade separated (enclosed systems). Existing freight railroad alignments are neither compatible with the speeds required, nor do they have the required room for separation of freight and high-speed passenger services.

The analysis resulted in 38 corridor and primary technology combinations, which are provided, as shown in Table 10. In general, primary technologies were feasible following utility corridors and favorable in Texas due to geography and long sections of uninterrupted linear paths.

Table 10: Level 2- Step 1: Technology and Corridor Compatibility

City Pair	Along/Follows	Corridor Type	Level 1 - Single Mode Options Applicable: Hyperloop	Maglev	High-Speed Rail	Technology Combo Counts: Hyperloop		Maglev		High-Speed Rail	
Fort Worth to Waco	UPRR	Railroad	N3: Very similar to I-35. I-35 expected to be less impactful as hyperloop would be in right-of-way.	N3	N3 (this is in C4C (NEPA Preferred)	2	4	1	1	1	1
	I-35	Highway	Pass	N2	N2						
	Electrical Corridor	Utility	Pass	Pass	Pass						
Dallas to Waco*	BNSF	Railroad	N1: Outside study area.								
	BNSF	Railroad									
	I-35	Highway									
Fort Worth to Arlington Area to Waco	Greenfield	Greenfield									
Waco to Killeen/Temple	UPRR/BNSF	Railroad	N3: Very similar to I-35. I-35 expected to be less impactful as hyperloop would be in right-of-way.	N3	N3	2		1		1	
	Greenfield near BNSF	Greenfield generally following BNSF	Pass	Pass	Pass						
	I-35	Highway	Pass	N2	N2						
	Electrical Corridor	Utility	N1: Environmental concerns.								
Fort Worth to Killeen/Temple	BNSF (Amtrak Texas Eagle)	Railroad	N3			0	--	0	--	0	--
Killeen/Temple to Austin Area	BNSF (Amtrak Texas Eagle)	Railroad	N3			1	4	1	3	1	3
	Greenfield near BNSF	Greenfield	Pass	Pass	Pass						
Austin to San Antonio	UPRR Shared corridor	Railroad	N3			3		3		3	
	Greenfield	Greenfield	Pass	Pass	Pass						
	Electrical Corridor	Utility	Pass	Pass	Pass						
	Greenfield near BNSF	Greenfield	Pass	Pass	Pass						
Killeen/Temple to San Antonio	I-35	Highway	Pass	N2	N2	1		0		0	
	Electrical Corridor	Utility	N1: Outside of study area.								
San Antonio to Laredo	Greenfield	Greenfield	Pass	Pass	Pass	2	2	1	1	1	1
	UPRR Shared Corridor	Railroad	N3	N3	N3						
	I-35	Highway	Pass	N2	N2						
						Sum	32		3		3
						Total	38				

Notes Technology Assumptions

N1: Rule out corridor (all modes)

N2: No High-Speed Rail, Maglev along highway corridors

N3: No High-Speed Rail, Maglev, or Hyperloop along railroad corridors

*Dallas corridors were initially included to assess southern routes, but were determined to be outside of the study area and excluded.

*BNSF – Burlington-Northern Santa Fe – Railroad Corridor

*UPRR – Union Pacific Railroad – Railroad corridor

Source: AECOM, 2020

Step 2: Scoring of Corridor and Technology Combinations Based on Evaluation Criteria

Corridor and technology combinations, carried over from Step 1, were then scored based on evaluation criteria developed from the Task 2 and 3 memoranda and professional judgement. Table 11 describes criteria used to quantitatively evaluate the corridors and technology combinations.

Table 11: Corridor and Primary Technology Combination Evaluation Criteria

Criteria	Unit of Measure	Criteria Description
Corridor Length	Miles	Mileage calculated with Geographic Information Systems (GIS) software.
Capital Cost Per Mile	Dollars	Guideway capital costs per mile based on estimates and review of existing and planned transportation systems. Capital costs were identified based on publicly available data and did not include information if vehicles were included in costs.
Cost to Construct	Dollars	Total approximate cost per corridor = ([Corridor Length] x [Guideway Capital Costs per Mile])
Passenger Capacity	Number of Passengers	Capacity based on a calculation of the number of passengers per typical trainset multiplied by headway. Typical headways varied by technology mode. (see Task 2 Technology Review and Design Criteria Memorandum)
Reduction in Travel Time	Percent time savings compared to driving	Travel time assumes technology top operating speed unless in a curve, in which case speed is based on acceleration. Maximum acceleration of 0.2 gravitational force (g) for hyperloop and 0.1g for high-speed rail and maglev were used. No passengers are expected to be standing; therefore, a higher acceleration is feasible. The analysis did not consider stopping patterns, or how quickly a vehicle accelerates.
High Development	Acres	Highly developed land cover based on the National Land Cover Database 2016.
Wetlands	Acres	Wetlands land cover based on National Land Cover Database 2016.
Water	Acres	Water land cover based on the National Land Cover database 2016.
Pasture and Crop Lands	Acres	Pasture and crop lands (agriculture) based on National Land Cover Database 2016.
National and State Historic Places	Number of historic sites	Per National Register of Historic Places and data from the Texas Historical Commission.
Parks and Open Space	Number of sites	Texas Parks and Wildlife, Land and Water Resources Conservation and Recreation Plan. Statewide Inventory 2015.

A scoring methodology was established to evaluate corridor and technology combinations. A 1,000 foot buffer was applied to the center of each corridor line creating 2,000 foot buffer. The corridors (including buffers) were then evaluated against measurements defined by each criterion to determine a value. Each primary technology and corridor combination was then scored based on the identified value from one to three. A score of one would represent low performance against the criterion and score of three would represent the highest performance. Total scores were identified by summing all criteria. Table 12 displays the Step 2 evaluation criteria and scored technology and corridor combinations.

When scoring for all criteria, a total possible score of 33 points was possible for each corridor and technology combinations. Overall, Step 2 produced 38 scored alternatives from Fort Worth to Laredo (see Table 5) connecting each identified metropolitan area in the study area.

To assemble the scored alternatives from Fort Worth to Laredo, each corridor score from Table 12 was summed. Table 13 displays each of the 38 alternatives, corridor types between city pairs, scores, and total costs.

Table 12: Level 2, Step 2 Evaluation Criteria Table

Red = 1 point
Orange = 2 points
Green = 3 points

		Fort Worth to Waco Corridors							Waco to Killeen/Temple			
		Utility			I-35	Greenfield			Greenfield			I-35
	Primary Technology	Hyperloop	Maglev	High-Speed Rail	Hyperloop	Hyperloop	Maglev	High-Speed Rail	Hyperloop	Maglev	High-Speed Rail	Hyperloop
Alignment Criteria	**Measure**											
Length of Route	Length of Route in Miles		78		86		84			33		37
Business Feasibility Criteria	**Measure**											
Capital Cost per Mile	$Million / mile	54	265	72	54	54	265	72	54	265	72	54
Cost to Construct Alternative	Total Capital Cost for Alternative ($Billion in 2019 USD)	4.2	20.7	5.6	4.6	4.5	22.3	6.0	1.8	8.7	2.4	2.
	Points											
Required Right-of-Way	Approximate right-of-way needed with Typical Section Width (acres)	660	810	950	730	710	880	1020	280	340	400	310
	Points											
Passenger Capacity	Passengers per Train/Vehicle	1680	2400	1200	1680	1680	2400	1200	1680	2400	1200	1680
	Points											
Reduction in Travel Time	Percent Time Savings Compared to Auto (time saved/car time)	87%	79%	69%	75%	88%	81%	70%	88%	82%	72%	46%
	Points											
Natural Resources Sensitivity	**Measure**											
Corridor Buffer	Study Area Total Acres		1891		2092		2032			812		810
High Development	Highly Developed Land Cover Acres within Study Area		1		388		28			1		119
	Points											
Wetlands	Wooded and Emergent Herbaceous Wetland Land Cover Acres within Study Area		20		0		20			24		2
	Points											
Water	Water Land Cover Acres within Study Area		8		0		6			4		0
	Points											
Pasture and Crop Lands	Pasture and Crops Land Cover Acres within Study Area		613		26		604			286		4
	Points											
National and State Historic Places	Number of Historic Sites in Study Area		0		0		0			0		0
	Points											
Parks and Open Space	Number of Parks and Open Spaces in Study Area		0		0		0			0		0
	Points											
	Score (out of 10*3 = 30 max points)	23	20	18	25	23	20	18	23	22	19	25
	Overall				top score							top score
	Hyperloop				top score							top score
	Maglev		top score				top score			top score		
	HSR			top score				top score			top score	

Table 12: Level 2, Step 2 Evaluation Criteria Table -continued

	Red = 1 point Orange = 2 points Green = 3 points	Killeen/Temple to Austin			Austin to San Antonio Route Corridors									Killeen/Temple to San Antonio	San Antonio to Laredo			
		Greenfield			Greenfield			Utility			Greenfield/BNSF			I-35	Greenfield			I-35
	Primary Technology	Hyperloop	Maglev	High-Speed Rail	Hyperloop	Maglev	High-Speed Rail	Hyperloop	Maglev	High-Speed Rail	Hyperloop	Maglev	High-Speed Rail	Hyperloop	Hyperloop	Maglev	High-Speed Rail	Hyperloop
Alignment Criteria	**Measure**																	
Length of Route	Length of Route in Miles		37			145			114			149		137		147		157
Business Feasibility Criteria	**Measure**																	
Capital Cost per Mile	$Million / mile	54	265	72	54	265	72	54	265	72	54	265	72	54	54	265	72	54
Cost to Construct Alternative	Total Capital Cost for Alternative ($Billion in 2019 USD)	2.0	9.8	2.7	7.8	38.4	10.4	6.2	30.2	8.2	8.0	39.5	10.7	7.4	7.9	39.0	10.6	8.5
	Points																	
Required right-of-way	Approximate right-of-way needed with Typical Section Width (acres)	310	390	450	1230	1510	1760	970	1190	1380	1260	1550	1810	1160	1250	1530	1780	1330
	Points																	
Passenger Capacity	Passengers per Train/Vehicle	1680	2400	1200	1680	2400	1200	1680	2400	1200	1680	2400	1200	1680	1680	2400	1200	1680
	Points																	
Reduction in Travel Time	Percent Time Savings Compared to Auto (time saved/car time)	89%	83%	73%	89%	83%	72%	91%	86%	78%	84%	75%	67%	72%	75%	64%	55%	75%
	Points																	
Natural Resources Sensitivity	**Measure**																	
Corridor Buffer	Study Area Total Acres		896			3516			2767			3604		3321		3553		3797
High Development	Highly Developed Land Cover Acres within Study Area		7			79			24			77		1083		10		338
	Points																	
Wetlands	Wooded and Emergent Herbaceous Wetland Land Cover Acres within Study Area		27			84			103			100		0		102		2
	Points																	
Water	Water Land Cover Acres within Study Area		6			63			20			81		0		6		0
	Points																	
Pasture and Crop Lands	Pasture and Crops Land Cover Acres within Study Area		583			1447			1417			1556		10		247		103
	Points																	
National and State Historic Places	Number of Historic Sites in Study Area		2			3			3			4		0		0		1
	Points																	
Parks and Open Space	Number of Parks and Open Spaces in Study Area		0			0			0			0		0		0		0
	Points																	
	Score (out of 10*3 = 30 max points)	29	30	26	21	19	16	23	22	20	20	17	16	25	23	19	16	25
	Overall		top score					top score										top score
	Hyperloop	top score						top score										top score
	Maglev		top score						top score							top score		
	HSR			top score						top score							top score	

Source: AECOM, 2020

Table 13: Alternatives from Fort Worth to Laredo by Corridor and Score

Technology	**Corridor Between Metropolitan Area**					**Total Raw Score**	**Potential Total Cost** ($ Billions rounded)
	Fort Worth to Waco (*score*)	**Waco to Killeen/Temple** (*score*)	**Killeen/Temple to Austin** (*score*)	**Austin to San Antonio** (*score*)	**San Antonio to Laredo** (*score*)		
Hyperloop	I-35 (*25*)	I-35 (*25*)	Greenfield (*29*)	Utility (*23*)	I-35 (*25*)	127	23
Hyperloop	I-35 (*25*)	I-35 (*25*)	Greenfield (*29*)	Greenfield (*21*)	I-35 (*25*)	125	25
Hyperloop	Utility (*23*)	I-35 (*25*)	Greenfield (*29*)	Utility (*23*)	I-35 (*25*)	125	23
Hyperloop	I-35 (*25*)	Greenfield (*23*)	Greenfield (*29*)	Utility (*23*)	I-35 (*25*)	125	23
Hyperloop	I-35 (*25*)	I-35 (*25*)	Greenfield (*29*)	Utility (*23*)	Greenfield (*23*)	125	23
Hyperloop	I-35 (*25*)	I-35 (*25*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	I-35 (*25*)	124	25
Hyperloop	Utility (*23*)	I-35 (*25*)	Greenfield (*29*)	Greenfield (*21*)	I-35 (*25*)	123	25
Hyperloop	I-35 (*25*)	Greenfield (*23*)	Greenfield (*29*)	Utility (*23*)	Greenfield (*23*)	123	23
Hyperloop	I-35 (*25*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield (*21*)	I-35 (*25*)	123	25
Hyperloop	Utility (*23*)	Greenfield (*23*)	Greenfield (*29*)	Utility (*23*)	I-35 (*25*)	123	23
Hyperloop	I-35 (*25*)	I-35 (*25*)	Greenfield (*29*)	Greenfield (*21*)	Greenfield (*23*)	123	24
Hyperloop	Utility (*23*)	I-35 (*25*)	Greenfield (*29*)	Utility (*23*)	Greenfield (*23*)	123	22
Hyperloop	I-35 (*25*)	I-35 (*25*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	Greenfield (*23*)	122	25
Hyperloop	Utility (*23*)	I-35 (*25*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	I-35 (*25*)	122	25
Hyperloop	I-35 (*25*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	I-35 (*25*)	122	25
Hyperloop	I-35 (*25*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield (*21*)	Greenfield (*23*)	121	24
Hyperloop	Utility (*23*)	Greenfield (*23*)	Greenfield (*29*)	Utility (*23*)	Greenfield (*23*)	121	22
Hyperloop	Utility (*23*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield (*21*)	I-35 (*25*)	121	24
Hyperloop	Utility (*23*)	I-35 (*25*)	Greenfield (*29*)	Greenfield (*21*)	Greenfield (*23*)	121	24
Hyperloop	I-35 (*25*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	Greenfield (*23*)	120	24
Hyperloop	Utility (*23*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	I-35 (*25*)	120	25
Hyperloop	Utility (*23*)	I-35 (*25*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	Greenfield (*23*)	120	24
Hyperloop	Utility (*23*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield (*21*)	Greenfield (*23*)	119	24
Hyperloop	Utility (*23*)	Greenfield (*23*)	Greenfield (*29*)	Greenfield/BNSF (*20*)	Greenfield (*23*)	118	24
Maglev	Utility (*20*)	Greenfield (*22*)	Greenfield (*30*)	Utility (*22*)	Greenfield (*19*)	113	108
Maglev	Utility (*20*)	Greenfield (*22*)	Greenfield (*30*)	Greenfield (*19*)	Greenfield (*19*)	110	117
Maglev	Utility (*20*)	Greenfield (*22*)	Greenfield (*30*)	Greenfield/BNSF (*17*)	Greenfield (*19*)	108	118

Technology	Fort Worth to Waco (*score*)	Waco to Killeen/Temple (*score*)	Killeen/Temple to Austin (*score*)	Austin to San Antonio (*score*)	San Antonio to Laredo (*score*)	Total Raw Score	Potential Total Cost ($ Billions rounded)
	Corridor Between Metropolitan Area						
Hyperloop	I-35 (*25*)	I-35 (*25*)	I-35 (*25*)		I-35 (*25*)	100	25
High-Speed Rail	Utility (*18*)	Greenfield (*19*)	Greenfield (26)	Utility (*20*)	Greenfield (*16*)	99	32
Hyperloop	I-35 (*25*)	Greenfield (*23*)	I-35 (*25*)		I-35 (*25*)	98	24
Hyperloop	I-35 (*25*)	I-35 (*25*)	I-35 (*25*)		Greenfield (*23*)	98	24
Hyperloop	Utility (*23*)	I-35 (*25*)	I-35 (*25*)		I-35 (*25*)	98	24
Hyperloop	I-35 (*25*)	Greenfield (*23*)	I-35 (*25*)		Greenfield (*23*)	96	24
Hyperloop	Utility (*23*)	Greenfield (*23*)	I-35 (*25*)		I-35 (*25*)	96	24
Hyperloop	Utility (*23*)	I-35 (*25*)	I-35 (*25*)		Greenfield (*23*)	96	24
High-Speed Rail	Utility (*18*)	Greenfield (*19*)	Greenfield (*26*)	Greenfield (*16*)	Greenfield (*19*)	95	32
High-Speed Rail	Utility (*18*)	Greenfield (*19*)	Greenfield (*26*)	Greenfield/BNSF (*16*)	Greenfield (*19*)	95	32
Hyperloop	Utility (*23*)	Greenfield (*23*)	I-35 (*25*)		Greenfield (*23*)	94	23

Source: AECOM, 2020

Step 3: Preliminary Findings: Ranked Fort Worth to Laredo Alternatives for Each Primary Technology

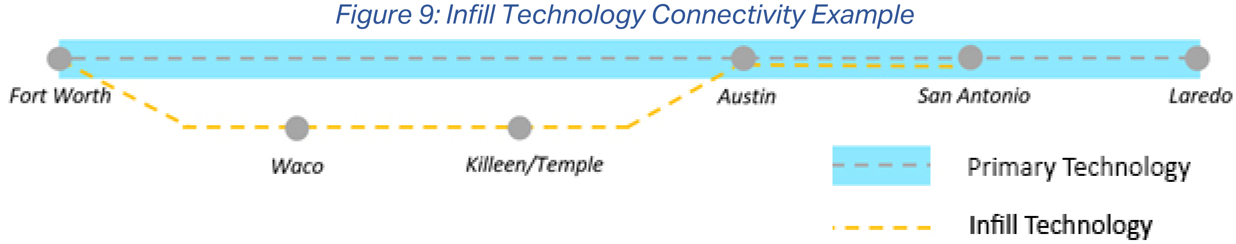
Full length (Fort Worth to Laredo) alternatives were assembled from corridor and technology combinations scored in the Step 2. After screening, the highest rank end-to-end alternative was selected as a preliminary finding for each primary technology mode (see Table 6).

As no specific alignment or route were to be chosen the evaluation was intended to generally score each corridor and technology based on a high-level assessment of publicly available data.

Step 4: Infill Technology Considerations

Levels 1 and 2 of the alternatives analysis determined infill technologies to be best suited for intercity connectivity in a phased or supplemental role to primary technologies. Figure 9 shows how an infill technology could potentially supplement a primary technology alternative.

Figure 9: Infill Technology Connectivity Example



Source: AECOM, 2020

Existing conventional passenger rail service operates with similar city pair connectivity, as shown in Figure 9. However, infill technologies are constrained in performance and reliability due to operating in shared corridors. Step 4 of the alternatives analysis conducted a compatibility assessment of identified corridors and technologies. Outcomes of the assessment produced viable infill technology and corridor combinations that could connect city pairs in the study area. Table 14 shows the infill technology and corridor compatibility analysis.

Table 14: Level 2, Step 4 Infill Technology and Corridor Compatibility Analysis

			Level 1 - Single Mode Options Applicable			Technology Combination Counts					
Segment	**Along/Follows**	**Corridor Type**	**Guaranteed Transit**	**Conventional Passenger Rail**	**Higher-Speed Rail**	**Guaranteed Transit**		**Conventional Passenger Rail**		**Higher-Speed Rail**	
Fort Worth to Waco	UPRR	Railroad	N5	Pass	Pass						
	I-35	Highway route	Pass	N3	N3	1		1		1	
	Electrical Corridor	Utility	N4	N4	N4						
Fort Worth Area to Waco	Greenfield	Greenfield	N4	N4	N4		1		1		1
Waco to Temple	UPRR/BNSF	Railroad	N5	Pass	Pass						
	Greenfield/BNSF	Greenfield/BNSF	N4	N4	N4	1		1		1	
	I-35	Highway	Pass	N3	N3						
Killeen/Temple to Austin	BNSF (Amtrak Texas Eagle)	Railroad	N5	Pass	Pass	0		1		1	
	Greenfield/BNSF	Greenfield	N4	N4	N4						
Austin to San Antonio	UPRR/Lonestar Shared corridor	Railroad	N2	Pass	Pass						
	Greenfield	Greenfield	N4	N4	N4	0	1	1	1	1	1
	Electrical Corridor	Utility	N4	N4	N4						
	Greenfield/BNSF	Greenfield	N4	N4	N4						
Killeen/Temple to San Antonio	I-35	Highway	Pass	N3	N3	1		0		0	
	Electrical Corridor	Utility	N4	N4	N4						
							1		1		1
			With Stopping Patterns			1	1	1	1	1	1
							3				

Notes: Infill Technology Assumptions
N1: Rule Out Corridor
N2: No Guaranteed Transit in shared corridors
N3: Only Guaranteed Transit along highway routes
N4: No Infill Tech along greenfield or utility corridors
N5: No Guaranteed Transit along railroad routes

Source: AECOM, 2020

Appendix B: Station Analysis

A station analysis was conducted concurrent with the alternative analysis. The goal of the analysis was to identify suitable station locations in proximity to cities identified in Level 1 of this assessment. Fort Worth was excluded from the analysis because the city recently completed a separate study identifying preferred station locations for a high-speed rail station near downtown.

Methodology

U.S. Census Bureau block groups were used as a geographic unit for this assessment. Available land use, demographic, transportation infrastructure, and environmental consideration data were assembled and scored to identify high-scoring block groups in the study area. Data was sourced primarily from participating MPOs and state and federal agencies where applicable. Tabular analysis and desktop research were used to overlay datasets within the identified block groups and evaluate a score based on a set of criteria.

This analysis sought to identify block groups with the highest suitability for developing a station based on analysis of the selected criteria. The analysis intentionally did not identify specific locations and/or parcels in which a station should be located. Results were mapped with Geographic Information Systems (GIS) software and displayed graphically.

Scoring criteria were selected to show multi-modal connectivity to a station, employment and population density, environmental considerations, existing and future land use, and land availability. A brief description of these criteria is provided in Table 15.

Table 15: Station Analysis Scoring Criteria

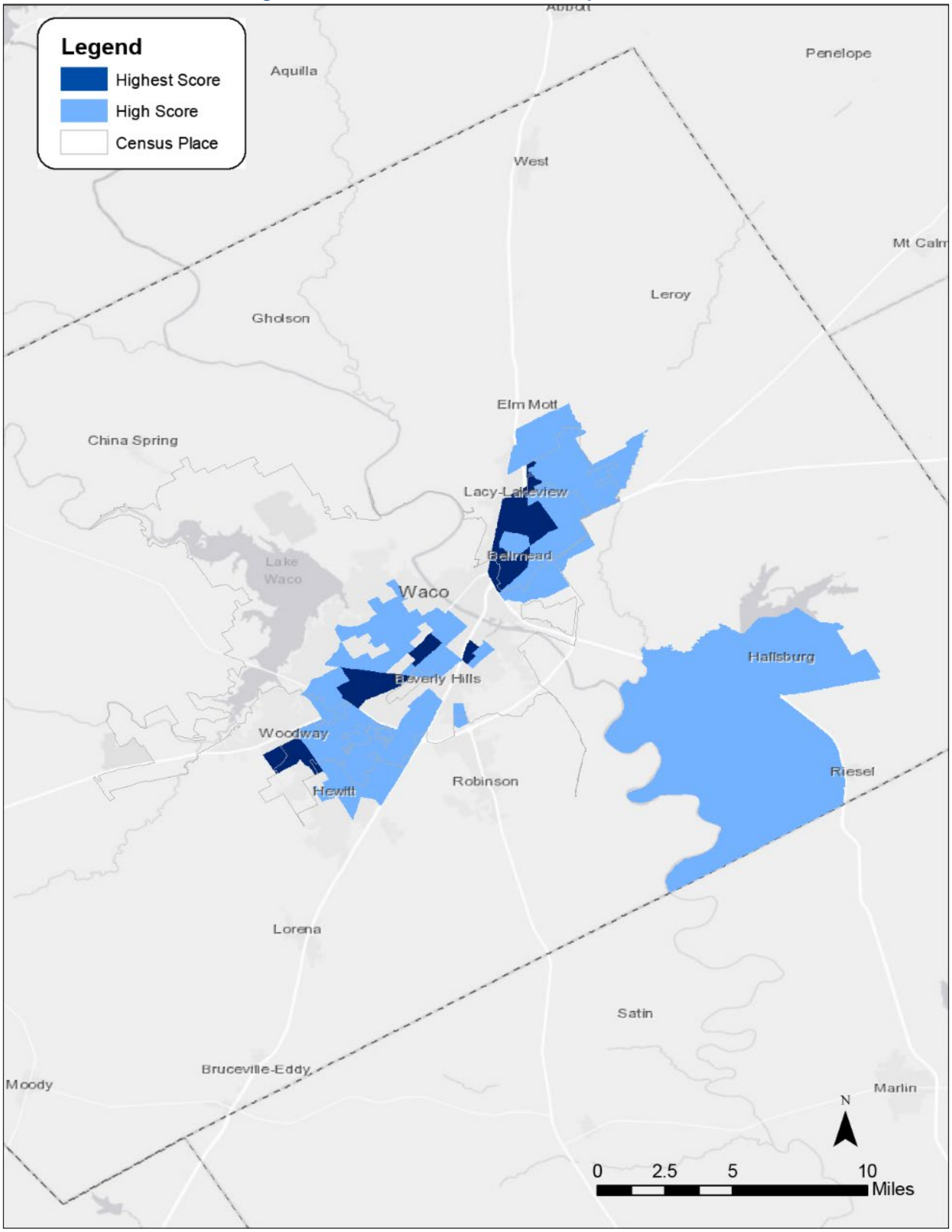
Criteria	Definition	Scoring	Scoring Details
Multimodal Connectivity	- Number of transit stops - Type of transit service (flag stop/fixed route) - Freight rail infrastructure – presence of transit hub or park-and-ride	0 to 3 0 or 1 0 or 1	(Low to High) (Present/Not Present) (Present/Not Present)
Employment and Population Density	Modal suitability (combination of population and employment numbers to identify an index that is calculated per mile)	0 or 1	(Low or High)
Environmental Considerations	Using GIS data from the Federal Emergency Management Agency, Texas Natural Resources Information System, Texas Department of Transportation, and other sources, this measure indicates the percentage of environmental features found within a block group that pose barriers to station development. Block groups with higher percentages of environmental features received lower scores, while block groups with lower percentages of environmental features received higher scores.	0 to 3	Percentage of block group covered by environmental features: 0 = >51% 1 = 26% - 50% 2 = 11% - 25% 3 = <10%
Existing and Future Land Use/Land Use Availability	Potential sites where existing or planned land uses are suitable for station locations were identified. Where land uses were found to be compatible, available land or open space for station locations was assessed. To assess the transit-oriented development/redevelopment potential, locations that are prime for those opportunities based on connectivity and availability of developable land were identified.	0 to 2	0 = Not Conducive to station development (industrial, landfills, single-family housing,) 1 = Moderately Supportive (apartments/condos, offices/retail, etc.) 2 = Highly Supportive (mixed-use, high-density residential)
	Total Possible Score	11	

Analysis

Station areas presented are generalized locations that do not identify specific sites or parcel selections. Each MPO area was evaluated for highly suitable block groups based on the criteria described in Table 15. The following discussion includes a brief summary and high-scoring block group map identified through the analysis.

In the Waco area, block groups rank highly near the central business district where employment and population density are highest. High-scoring block groups were also present north of the Brazos River, where numerous freight rail lines, a freight rail yard, and industrial land uses converge. South of the river, block groups rank highly due to favorable land uses and bus connectivity, as shown in Figure 10.

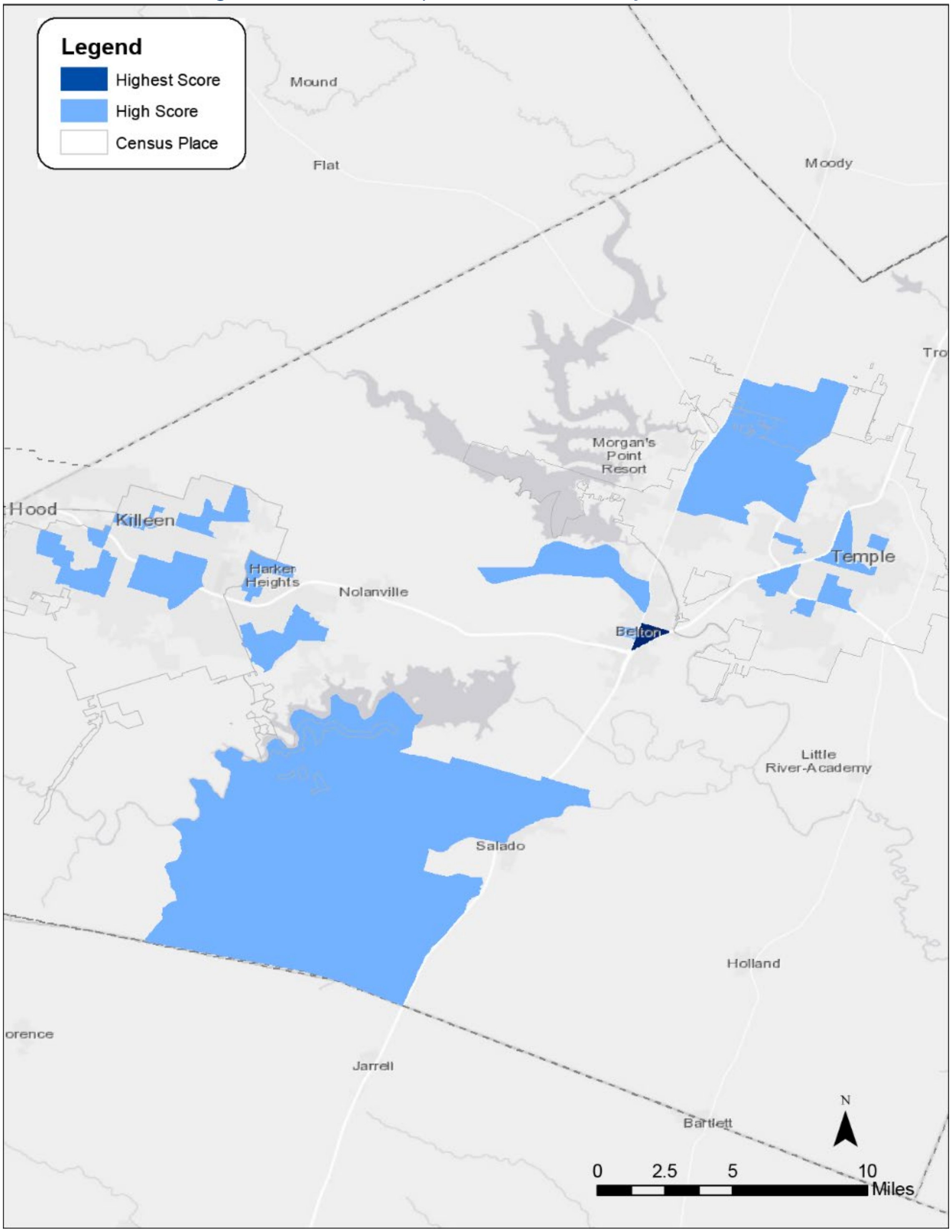
Figure 10: Waco Area Station Analysis Results



Source: AECOM, 2020

In the Killeen/Temple area, block groups generally score highly in areas of favorable land uses. Airports northwest of Temple and southwest of Killeen, at Fort Hood, add to block group scoring. The highest-scoring block group was centrally located and generally had mostly commercial uses with higher employment density, as shown in Figure 11.

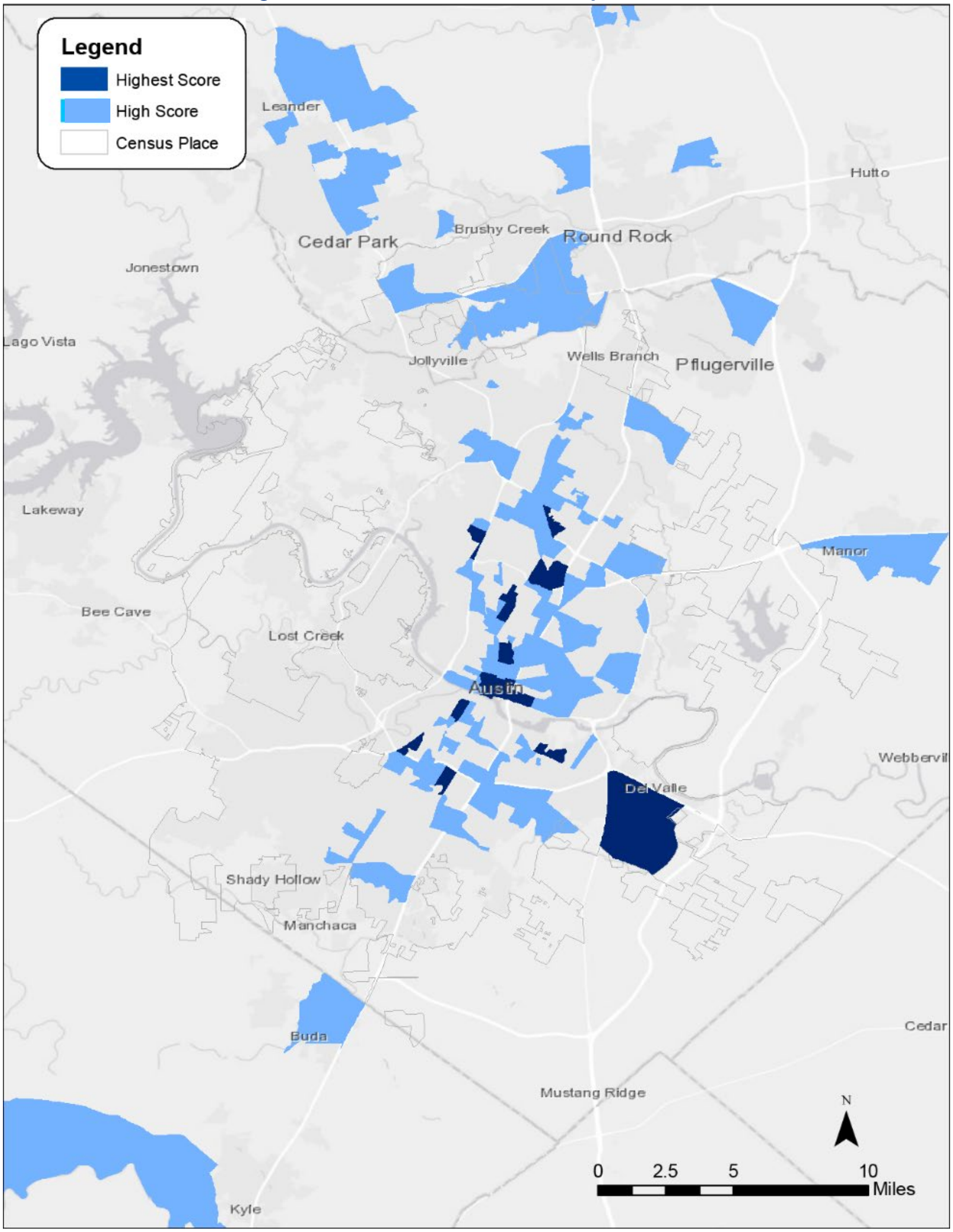
Figure 11: Killeen/Temple Area Station Analysis Results



Source: AECOM, 2020

The Austin area had the most high-scoring block groups spread out across the region and in the central business district. High-scoring block groups also occurred southeast of downtown at the Austin-Bergstrom International Airport. Favorable land uses account for many high-scoring block groups north of Austin, as shown in Figure 12.

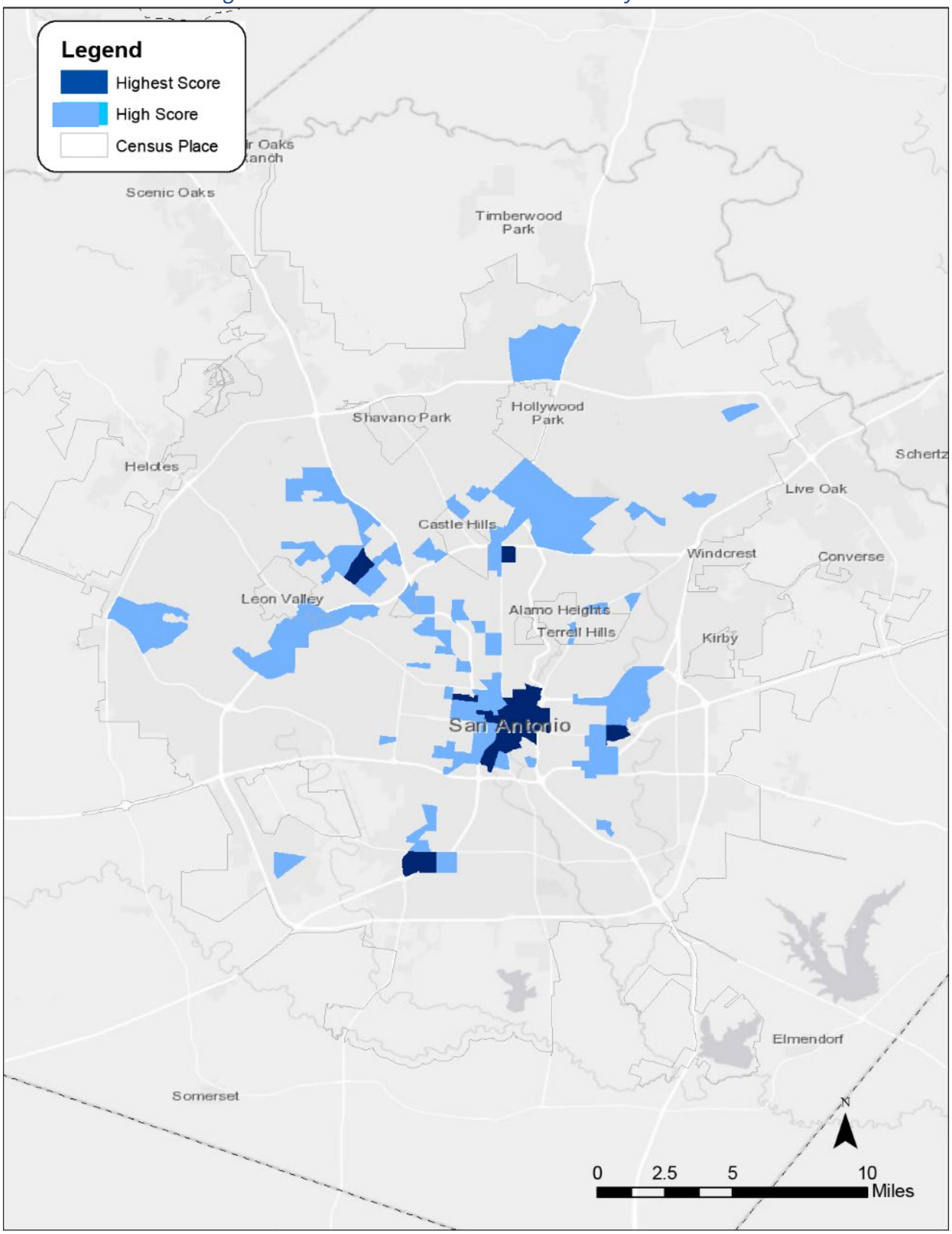
Figure 12: Austin Area Station Analysis Results



Source: AECOM, 2020

In the San Antonio area, population and employment density generally provided high scores to block groups around the downtown area. There were additional high-scoring block groups near San Antonio International Airport where connectivity and commercial and industrial land uses provided a favorable score. Block groups near Joint Base San Antonio also scored highly due to connectivity and favorable land uses, as shown in Figure 13.

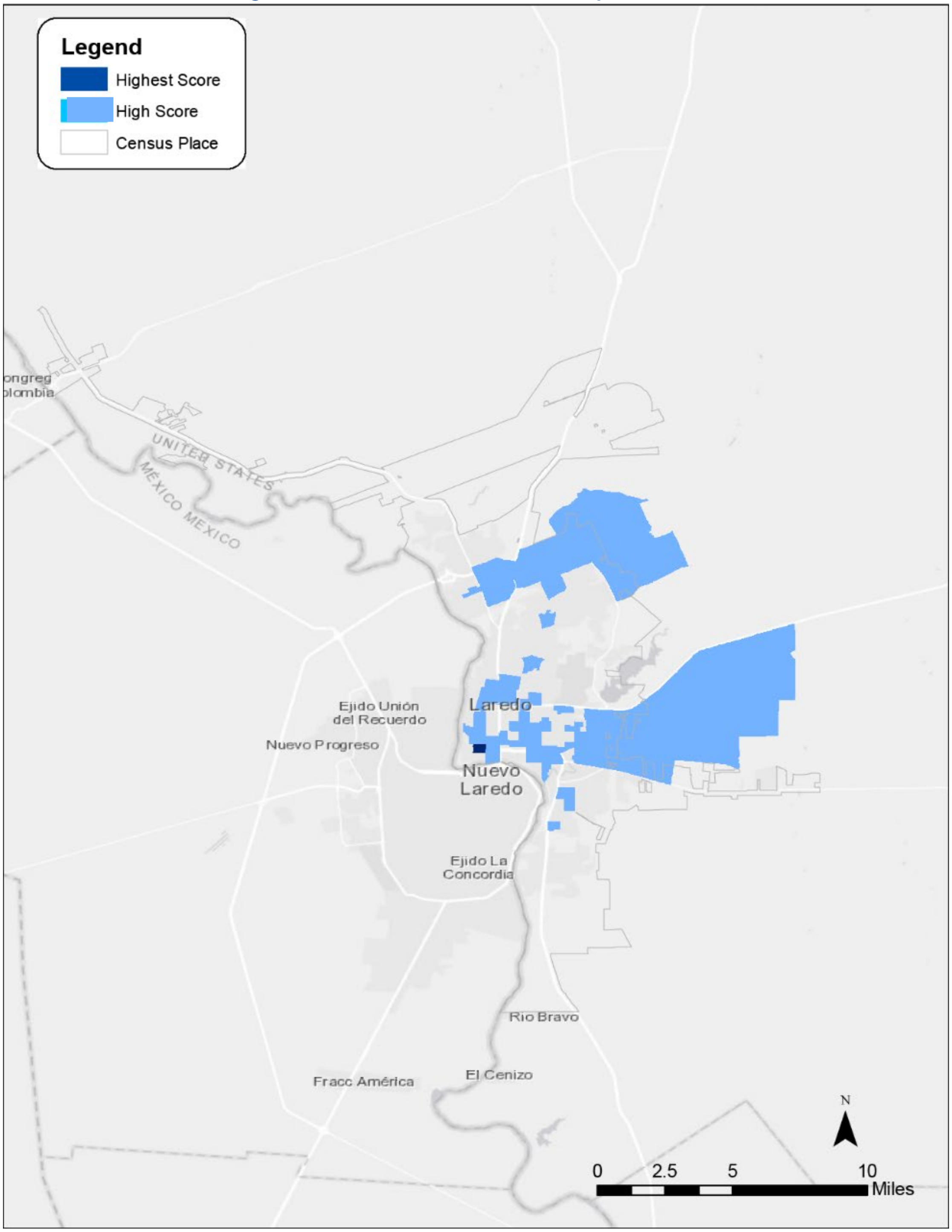
Figure 13: San Antonio Area Station Analysis Results



Source: AECOM, 2020

Block groups in the Laredo area are generally larger, due to smaller population numbers than some of the more urban cities evaluated. Again, high-scoring block groups were generally centered near the central business district. The highest-scoring block group was near a large area of commercial and industrial uses with high population and employment density. Freight rail connectivity also added to the score, as shown in Figure 14.

Figure 14: Laredo Area Station Analysis Results



Source: AECOM, 2020

Outcomes

In all locations analyzed, connectivity, favorable land uses, and employment and population density contributed to high-scoring block groups. These factors tend to converge in locations near city centers. Additional high-scoring block groups tended to be in locations adjacent to or within airports. Existing airports are nodes for transportation modes and are generally trip generators; therefore, adding high-speed transportation options to these nodes scored highly in the station analysis. Overall, additional study would be required to more specifically align station areas with specific routing to be utilized in the selected transportation technology mode.

Stations were analyzed independent of corridors and end-to-end alternatives. This choice was made because no specific routing or alignments were identified in the course of the Task 4 Alternatives Analysis. As the program for implementing a high-speed ground transportation option within the study area progresses through the project life cycle and into a NEPA process, project alignments and footprints will become more refined, with specific impacts identified.

Station Analysis Summary Data Table

Table 16 summaries highest and high scoring block groups depicted in the previous series of maps.

Table 16: Station Analysis Data Table

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
WMPO	G483090004004	3	3	1	1	0	0	8
WMPO	G483090037072	3	3	1	1	0	0	8
WMPO	G483090033002	3	3	0	1	0	1	8
WMPO	G483090023022	2	3	1	1	0	1	8
WMPO	G483090023021	3	3	1	1	0	0	8
WMPO	G483090016001	1	3	2	1	0	1	8
WMPO	G483090037075	1	3	1	1	0	1	7
WMPO	G483090004002	3	2	1	1	0	0	7
WMPO	G483090023023	2	3	1	1	0	0	7
WMPO	G483090007001	2	3	0	1	0	1	7
WMPO	G483090016004	0	3	2	1	0	1	7
WMPO	G483090016005	1	3	2	1	0	0	7
WMPO	G483090017002	1	3	1	1	0	1	7
WMPO	G483090016003	2	3	0	1	0	0	6
WMPO	G483090037073	1	3	0	1	0	1	6
WMPO	G483090004003	3	1	1	1	0	0	6
WMPO	G483090005982	1	3	0	1	0	1	6
WMPO	G483090027001	2	3	0	1	0	0	6
WMPO	G483090001002	3	1	0	1	0	1	6
WMPO	G483090011005	2	3	0	1	0	0	6
WMPO	G483090009002	2	3	0	1	0	0	6
WMPO	G483090026001	2	3	0	1	0	0	6

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
WMPO	G483090026003	2	3	0	1	0	0	6
WMPO	G483090033001	0	3	2	1	0	0	6
WMPO	G483090037061	0	3	1	1	0	1	6
WMPO	G483090024983	2	3	0	1	0	0	6
WMPO	G483090025011	2	3	0	1	0	0	6
WMPO	G483090025013	2	3	0	1	0	0	6
WMPO	G483090025032	2	3	0	1	0	0	6
WMPO	G483090013002	2	3	0	1	0	0	6
WMPO	G483090032001	0	3	1	1	0	1	6
WMPO	G483090019001	2	2	1	1	0	0	6
WMPO	G483090005984	2	3	0	1	0	0	6
WMPO	G483090036021	0	3	1	1	0	1	6
WMPO	G483090024982	2	3	0	1	0	0	6
WMPO	G483090005983	1	3	0	1	0	1	6
WMPO	G483090007003	2	3	0	1	0	0	6
WMPO	G483090008001	2	3	0	1	0	0	6
WMPO	G483090008002	2	3	0	1	0	0	6
WMPO	G483090009001	2	3	0	1	0	0	6
WMPO	G483090009003	2	3	0	1	0	0	6
WMPO	G483090009004	2	3	0	1	0	0	6
WMPO	G483090010003	2	3	0	1	0	0	6
WMPO	G483090011004	2	3	0	1	0	0	6
WMPO	G483090012001	2	3	0	1	0	0	6
WMPO	G483090016002	1	3	0	1	0	1	6
WMPO	G483090017001	0	3	1	1	0	1	6
WMPO	G483090017003	0	3	1	1	0	1	6
WMPO	G483090017004	0	3	1	1	0	1	6
WMPO	G483090018001	0	3	1	1	0	1	6
WMPO	G483090021004	2	3	0	1	0	0	6
WMPO	G483090043004	1	3	1	1	0	0	6
WMPO	G483090027003	2	3	0	1	0	0	6
WMPO	G483090037081	2	3	0	0	0	1	6
WMPO	G483090010002	2	3	0	1	0	0	6
WMPO	G483090010001	2	3	0	1	0	0	6
KTMPO	G480270216012	3	3	2	1	0	1	10
KTMPO	G480270224051	3	3	1	1	0	0	8
KTMPO	G480270221043	3	3	1	1	0	0	8
KTMPO	G480270220004	2	3	2	1	0	0	8

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
KTMPO	G480990108043	2	3	1	1	0	1	8
KTMPO	G480990108041	2	3	1	1	0	1	8
KTMPO	G480270234032	3	2	2	0	0	1	8
KTMPO	G480270213033	3	3	1	1	0	0	8
KTMPO	G480270203001	3	3	1	0	0	1	8
KTMPO	G480270219033	3	3	0	1	0	0	7
KTMPO	G480270219041	2	3	1	1	0	0	7
KTMPO	G480270219014	2	3	0	1	0	1	7
KTMPO	G480270222002	1	3	1	1	0	1	7
KTMPO	G480270221051	3	3	0	1	0	0	7
KTMPO	G480270231081	0	3	2	1	0	1	7
KTMPO	G480270231084	2	3	0	1	0	1	7
KTMPO	G480270231073	1	3	1	1	0	1	7
KTMPO	G480270231071	2	3	1	1	0	0	7
KTMPO	G480270224052	2	3	1	1	0	0	7
KTMPO	G480270221041	1	3	2	1	0	0	7
KTMPO	G480270207022	3	3	0	1	0	0	7
KTMPO	G480270231042	2	3	1	1	0	0	7
KTMPO	G480270216013	2	3	1	1	0	0	7
KTMPO	G480270220003	2	3	1	1	0	0	7
KTMPO	G480270221012	0	3	2	1	0	1	7
KTMPO	G480270224012	2	3	1	1	0	0	7
KTMPO	G480270225014	2	3	1	1	0	0	7
KTMPO	G480270225023	2	3	1	1	0	0	7
KTMPO	G480270226004	2	3	0	1	0	1	7
KTMPO	G480270229001	2	3	1	1	0	0	7
KTMPO	G480270231072	3	3	0	1	0	0	7
KTMPO	G480270231032	3	3	0	1	0	0	7
KTMPO	G480990106011	2	3	0	1	0	1	7
KTMPO	G480990106031	1	3	1	1	0	1	7
KTMPO	G480990107011	3	3	0	1	0	0	7
KTMPO	G480990107012	2	3	0	1	0	1	7
KTMPO	G480990107013	2	3	1	1	0	0	7
KTMPO	G480990105011	3	3	1	0	0	0	7
KTMPO	G480270207021	2	3	0	1	0	1	7
KTMPO	G480270211004	2	3	1	1	0	0	7
KTMPO	G480270217001	3	3	0	1	0	0	7
KTMPO	G480270212032	2	3	1	1	0	0	7

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
KTMPO	G480270221042	3	3	0	1	0	0	7
KTMPO	G480270234042	3	3	1	0	0	0	7
KTMPO	G482819503022	3	3	0	0	0	1	7
KTMPO	G480270205003	2	3	0	1	0	1	7
KTMPO	G480270210004	3	3	0	1	0	0	7
KTMPO	G480270210005	2	3	0	1	0	1	7
KTMPO	G480270210001	2	3	1	1	0	0	7
KTMPO	G480270212022	2	3	0	1	0	1	7
CAMPO	G484530002031	3	3	0	2	1	0	9
CAMPO	G484530009024	2	3	0	3	0	1	9
CAMPO	G484530020041	2	3	1	2	0	0	8
CAMPO	G484530013032	2	3	1	1	0	1	8
CAMPO	G484530018051	1	3	1	2	1	0	8
CAMPO	G484530020032	1	3	0	2	1	1	8
CAMPO	G484530017181	2	3	1	1	0	1	8
CAMPO	G484530015033	2	3	0	2	0	1	8
CAMPO	G484530015034	2	3	1	2	0	0	8
CAMPO	G484530023181	2	3	1	2	0	0	8
CAMPO	G484530011001	3	1	0	3	0	1	8
CAMPO	G484530006012	2	3	0	3	0	0	8
CAMPO	G484530002063	2	3	1	1	0	0	7
CAMPO	G484530017521	2	3	1	0	0	1	7
CAMPO	G484530018201	2	3	0	2	0	0	7
CAMPO	G484530018202	2	3	0	1	0	1	7
CAMPO	G484530015031	2	3	0	1	0	1	7
CAMPO	G484530018172	2	3	1	1	0	0	7
CAMPO	G484530017531	1	3	1	1	0	1	7
CAMPO	G484530003061	1	3	0	3	0	0	7
CAMPO	G484530017523	3	3	1	0	0	0	7
CAMPO	G484530018494	2	3	0	1	0	1	7
CAMPO	G484530017222	2	3	1	1	0	0	7
CAMPO	G484530018121	2	3	1	1	0	0	7
CAMPO	G484530006035	3	3	1	0	0	0	7
CAMPO	G484530002041	2	3	0	2	0	0	7
CAMPO	G484530022091	0	3	2	0	1	1	7
CAMPO	G484530008011	0	3	0	3	0	1	7
CAMPO	G484530008023	1	3	0	2	0	1	7
CAMPO	G484530012002	3	1	0	2	0	1	7

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
CAMPO	G484530020021	1	3	0	2	0	1	7
CAMPO	G484530020052	1	3	1	1	0	1	7
CAMPO	G484530021052	2	3	1	1	0	0	7
CAMPO	G484910203111	0	3	0	2	1	1	7
CAMPO	G484530024024	1	3	1	2	0	0	7
CAMPO	G484530024111	1	3	0	2	0	1	7
CAMPO	G484530018192	2	3	1	1	0	0	7
CAMPO	G484530018213	1	3	0	2	0	1	7
CAMPO	G484530021082	1	3	2	1	0	0	7
CAMPO	G484530021101	0	3	0	3	0	1	7
CAMPO	G484530018503	2	3	1	1	0	0	7
CAMPO	G484530023152	2	3	1	1	0	0	7
CAMPO	G484530001013	1	3	0	2	0	1	7
CAMPO	G484530003024	2	3	0	1	0	1	7
CAMPO	G484530004011	1	3	0	2	0	1	7
CAMPO	G484530009021	1	3	0	2	0	1	7
CAMPO	G484530009022	1	3	0	2	0	1	7
CAMPO	G484530006033	3	3	1	0	0	0	7
CAMPO	G484530006043	3	3	1	0	0	0	7
CAMPO	G484530013054	1	3	0	2	0	1	7
CAMPO	G484530002043	3	2	0	2	0	0	7
CAMPO	G484910203123	2	3	2	0	0	0	7
AAMPO	G480291106003	2	3	2	2	0	1	10
AAMPO	G480291101003	3	2	2	3	0	0	10
AAMPO	G480291814021	3	3	1	3	0	0	10
AAMPO	G480291101002	3	1	2	3	0	0	9
AAMPO	G480291308002	1	3	2	2	0	1	9
AAMPO	G480291109001	1	3	2	2	0	1	9
AAMPO	G480291501004	1	3	2	2	0	1	9
AAMPO	G480291921001	2	1	2	3	0	1	9
AAMPO	G480291108001	2	3	2	2	0	0	9
AAMPO	G480291512002	1	3	1	3	0	1	9
AAMPO	G480291909012	2	3	2	2	0	0	9
AAMPO	G480291101001	2	2	2	3	0	0	9
AAMPO	G480291701012	1	3	2	2	0	1	9
AAMPO	G480291919001	1	3	2	2	0	1	9
AAMPO	G480299800041	3	2	2	1	0	0	8
AAMPO	G480291813032	3	3	0	2	0	0	8

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
AAMPO	G480291105001	1	3	1	2	0	1	8
AAMPO	G480291601004	1	3	0	3	0	1	8
AAMPO	G480291912022	2	3	1	2	0	0	8
AAMPO	G480291815063	3	3	0	2	0	0	8
AAMPO	G480291701011	1	3	2	1	0	1	8
AAMPO	G480291210001	2	3	0	2	0	1	8
AAMPO	G480291212065	1	3	2	1	0	1	8
AAMPO	G480291513011	1	3	1	2	0	1	8
AAMPO	G480291802013	2	3	1	2	0	0	8
AAMPO	G480291901002	2	3	0	2	0	1	8
AAMPO	G480291605011	2	3	1	1	0	1	8
AAMPO	G480291701023	1	3	2	2	0	0	8
AAMPO	G480291913042	2	3	1	2	0	0	8
AAMPO	G480291809011	2	3	1	1	0	0	7
AAMPO	G480291106002	1	3	0	2	0	1	7
AAMPO	G480291818152	2	3	0	2	0	0	7
AAMPO	G480291106001	1	3	0	2	0	1	7
AAMPO	G480291218121	2	3	0	1	0	1	7
AAMPO	G480291801021	1	3	1	2	0	0	7
AAMPO	G480291810011	1	3	0	2	0	1	7
AAMPO	G480291913031	1	3	1	2	0	0	7
AAMPO	G480291107001	1	3	0	2	0	1	7
AAMPO	G480291308001	0	3	0	3	0	1	7
AAMPO	G480291923001	1	3	1	2	0	0	7
AAMPO	G480291918171	1	3	1	2	0	0	7
AAMPO	G480291810042	2	3	0	2	0	0	7
AAMPO	G480291815032	2	3	0	2	0	0	7
AAMPO	G480291818183	1	3	1	2	0	0	7
AAMPO	G480291807012	1	3	1	2	0	0	7
AAMPO	G480291210004	1	3	1	1	0	1	7
AAMPO	G480291818162	1	3	1	2	0	0	7
AAMPO	G480291401001	1	3	0	2	0	1	7
AAMPO	G480291914103	2	3	1	1	0	0	7
AAMPO	G480291304021	0	3	1	2	0	1	7
AAMPO	G480291815042	2	3	0	2	0	0	7
AAMPO	G480291203003	2	3	0	2	0	0	7
AAMPO	G480291914081	2	3	1	1	0	0	7
AAMPO	G480291802014	1	3	1	2	0	0	7

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
AAMPO	G480291806031	2	3	1	1	0	0	7
AAMPO	G480291906032	1	3	0	2	0	1	7
AAMPO	G480291808001	1	3	1	2	0	0	7
AAMPO	G480291704013	2	3	1	1	0	0	7
AAMPO	G480291814022	1	3	1	2	0	0	7
AAMPO	G480291205012	2	3	1	1	0	0	7
AAMPO	G480291615042	1	3	0	2	0	1	7
AAMPO	G480291816011	1	3	1	2	0	0	7
AAMPO	G480291816012	1	3	1	2	0	0	7
AAMPO	G480291816021	1	3	1	2	0	0	7
AAMPO	G480291914092	1	3	1	2	0	0	7
AAMPO	G480291206003	1	3	1	2	0	0	7
AAMPO	G480291511007	1	3	1	1	0	1	7
AAMPO	G480291601002	2	3	0	1	0	1	7
AAMPO	G480291304012	1	3	1	1	0	1	7
AAMPO	G480291701022	1	3	2	1	0	0	7
AAMPO	G480291405001	1	3	0	2	0	1	7
AAMPO	G480291817053	1	3	1	2	0	0	7
AAMPO	G480291817251	1	3	1	2	0	0	7
AAMPO	G480291710003	2	3	1	1	0	0	7
AAMPO	G480291412003	1	3	1	2	0	0	7
AAMPO	G480291501001	1	2	2	1	0	1	7
AAMPO	G480291901001	2	3	0	2	0	0	7
AAMPO	G480291801013	1	3	1	2	0	0	7
AAMPO	G480291905013	1	3	1	2	0	0	7
AAMPO	G480291905033	2	3	0	1	0	1	7
AAMPO	G480291906042	1	3	0	2	0	1	7
AAMPO	G480291701021	1	3	2	1	0	0	7
AAMPO	G480291802022	2	3	1	1	0	0	7
AAMPO	G480291304022	1	3	1	1	0	1	7
AAMPO	G480291304013	1	3	1	2	0	0	7
AAMPO	G480291909011	1	3	1	2	0	0	7
AAMPO	G480291305003	0	3	1	2	0	1	7
AAMPO	G480291307001	1	3	0	2	0	1	7
AAMPO	G480291806043	2	3	1	1	0	0	7
AAMPO	G480291910062	1	3	0	2	0	1	7
AAMPO	G480291910064	1	3	0	2	0	1	7
AAMPO	G480291212045	2	3	1	0	0	1	7

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
AAMPO	G480291719121	1	3	1	2	0	0	7
AAMPO	G480291609013	0	3	1	2	0	1	7
LMPO	G484790019001	3	3	1	1	0	1	9
LMPO	G484790001013	2	3	1	1	0	1	8
LMPO	G484790002002	2	3	1	1	0	1	8
LMPO	G484790007001	2	3	1	1	0	1	8
LMPO	G484790006012	2	3	1	1	0	1	8
LMPO	G484790010041	2	3	1	1	0	1	8
LMPO	G484790015012	2	3	1	1	0	1	8
LMPO	G484790014012	2	3	1	1	0	1	8
LMPO	G484790010012	2	3	1	1	0	1	8
LMPO	G484790001012	1	3	1	1	0	1	7
LMPO	G484790011041	2	3	1	1	0	0	7
LMPO	G484790017122	0	3	2	1	0	1	7
LMPO	G484790018162	0	3	2	1	0	1	7
LMPO	G484790006022	1	3	1	1	0	1	7
LMPO	G484790008003	2	3	1	1	0	0	7
LMPO	G484790009012	2	3	1	1	0	0	7
LMPO	G484790009013	2	3	1	1	0	0	7
LMPO	G484790006013	1	3	1	1	0	1	7
LMPO	G484790011011	2	3	1	1	0	0	7
LMPO	G484790013003	1	3	1	1	0	1	7
LMPO	G484790014013	2	3	1	1	0	0	7
LMPO	G484790009042	2	3	1	1	0	0	7
LMPO	G484790017192	2	3	1	1	0	0	7
LMPO	G484790015011	1	3	1	1	0	1	7
LMPO	G484790015022	2	3	1	1	0	0	7
LMPO	G484790009032	2	3	1	1	0	0	7
LMPO	G484790017064	2	3	1	1	0	0	7
LMPO	G484790012021	2	3	1	1	0	0	7
LMPO	G484790018161	0	3	2	1	0	1	7
LMPO	G484790009014	2	3	1	1	0	0	7
LMPO	G484790008002	1	3	1	1	0	1	7
LMPO	G484790019003	2	2	1	1	0	1	7
LMPO	G484790006011	1	3	1	1	0	1	7
LMPO	G484790009043	2	3	1	1	0	0	7
LMPO	G484790015021	2	3	1	1	0	0	7
LMPO	G484790011031	2	3	1	1	0	0	7

MPO	Block Group GIS ID	Employment and Population Density Score	Environmental Considerations Score	Land Use Score	Transit Stops Score	Transit Type Score	Freight Rail Infrastructure Score	Total Score
LMPO	G484790002001	2	3	1	1	0	0	7
LMPO	G484790014011	1	3	1	1	0	1	7
LMPO	G484790017063	2	3	1	1	0	0	7
LMPO	G484790017062	2	3	1	1	0	0	7
LMPO	G484790017211	3	3	0	1	0	0	7
LMPO	G484790001011	2	3	1	1	0	0	7
LMPO	G484790001091	2	3	1	1	0	0	7
LMPO	G484790001063	2	3	1	1	0	0	7
LMPO	G484790001071	2	3	1	1	0	0	7
LMPO	G484790017132	0	3	2	1	0	1	7
LMPO	G484790009041	2	3	1	1	0	0	7
LMPO	G484790010031	1	2	2	1	0	1	7
LMPO	G484790018141	0	3	2	1	0	1	7
LMPO	G484790009031	2	3	1	1	0	0	7
LMPO	G484790001061	2	3	1	1	0	0	7
LMPO	G484790017152	0	3	2	1	0	1	7
LMPO	G484790011052	1	3	2	1	0	0	7

Appendix C: Level 3 Other Factors to Consider

Methodology

The Level 3 analysis provided an opportunity to score qualitative measures following the Level 2 technical analysis. This provides another screening process in the alternative analysis. Findings from the Task 2 Technology Review and Design Criteria Memorandum as well as existing literature on the subject were analyzed and utilized to create qualitative scores for the chosen criteria. Relevant findings for each criterion were summarized and a qualitative score of low, medium, high, or neutral was assigned. Topics included 1) station location benefits, 2) operations factors, 3) interoperability, 4) regulatory factors, 5) convenience, and 6) safety and resilience. These topics were broken down into criteria evaluating qualitative aspects intended provide additional comparison between technologies.

It is important to note of the three primary technologies, high-speed rail has the largest pool of research literature, case studies and empirical evidence whereas literature for maglev and hyperloop is sparse. Maglev literature consist primarily of real-world case studies. As hyperloop remains largely unproven and theoretical, research on the technology is ongoing.

Analysis

The final step of the alternatives analysis sought to assess qualitative aspects of the primary technologies. These topics did not factor into the quantified scores assessed in Level 2 of the analysis; however, the goal of Level 3 was to provide an additional lens of evaluation. Relevant findings for each criterion was summarized through a robust literature review and a qualitative score of neutral, low, medium, or high was assigned to each technology. Table 8 summarizes the Level 3 analysis.

Station Location Benefits

Urban vs. Suburban Location

- Urban centers have more transit and modal connectivity compared to suburban locations. Peripheral stations can suffer from lesser integration to the public networks of the urban areas served. The more complete the public transport supply to the station, the more this supply is used to reach the station. However, for suburban centers, connections by shuttles can help mitigate remoteness. On the other hand, land is typically more available in suburban areas and is less expensive. The high-speed transit service speed would also be compromised when navigating from the suburban areas to the urban core.[1] Because both urban and suburban locations have advantages and disadvantages when compared, this criterion was scored *medium* across all technologies.

Freight Co-Benefit of Station Location

Opportunity for co-locating stations with passenger-oriented uses or freight-oriented use.

- Hyperloop - This criterion scored as *medium* due to the following key findings: hyperloop technology can be designed to accommodate both passenger and freight transportation by sharing cost and operating within the same network. In Dubai, a collaboration between Virgin Hyperloop One and DP World has formed to create DP World Cargospeed, which aims to transport freight from Dubai to surrounding locations. Due to a decrease in travel time, DP World Cargospeed believes cost will be

[1]Facchinetti-Mannone, V. (2009, June). Location of high-speed rail stations in French medium-size city and mobility and territorial implications.

five-times cheaper than existing air freight.[2] Regarding details on freight capacity, literature does not provide exact detail. Early proposals have included pods at roughly 40-feet to mimic standard shipping containers (the tonnage limit will be a deciding factor when realized).[3] Regardless of freight type, Virgin Hyperloop One believes that hyperloop will be critical for the movement of time sensitive freight moving, impacting perceived freight sensitivity to time.[4] Further, hyperloop freight is most similar to air freight, but an expansive network to be necessary to match the air freight hub and spoke system.[5]

- Maglev - This criterion was scored as m*edium* due to the following key findings: Maglev systems have the capability to move freight as well as passengers. Research shows maglev systems to be internally configured to accommodate standardized air freight or express shipping containers. For example, a full length Transrapid (20-sections) can hold roughly 19 U.S. tons per section (386 U.S. tons of air cargo). However, there is limited literature discussion on freight movement, and most of this is theoretical analysis.[6]
- High-Speed Rail - This criterion scored as *medium* due to the following key findings: The use of high-speed rail for freight is a growing practice. The Italian state-owned rail operator FS Italiane is currently leading the way by running light industry freight between Caserta and Bologna. Branded 'Mercitalia Fast,'[7] this includes time sensitive materials from express couriers (e.g., FedEx) and logistics operators.[8] Interporto Servizi Cargo plans to provide similar services between Florence and Bologna, as well as between Verona and Pomezia. Both entities plan to use the same high-speed rail infrastructure at night. Mercitalia will use 12 trainsets equivalent to the capacity of 18 freight trucks.

Operational Characteristics

Required Area for Ancillary Facilities

- Hyperloop – Hyperloop is still an evolving technology and depending on the company a variety of propulsion systems are being evaluated for freight and passenger movement. However, several systems would be necessary for operations. These facilities could include electrical power substations necessary to supply power to propulsion systems. Additionally, hyperloop is being designed as a net positive energy system, and many designs are incorporating the addition of solar energy production through paneling above the tube guideways or in solar farms along the right-of-way. Vacuum stations would be necessary along the alignment to maintain the low-pressure environment. Maintenance facilities would also be required as a rolling stock depot for maintenance, inspection and repair of vehicles. An operations and control center would also be needed. With ongoing design changes and relative unknowns, additional area for ancillary facilities regarding

---

[2] Page, T. (2018, May). *Hyperloop for Cargo Aims to Deliver at Over 600 mph.* Retrieved from https://www.cnn.com/2018/05/04/tech/hyperloop-dp-world-cargospeed-announcement/index.html

[3] Taylor, C.L., Hyde, D.J., Barr, L.C. (2016, July). *Hyperloop Commercial Analysis: High Level Overview.* U.S. Department of Transportation (U.S. DOT), John A. Volpe National Transportation Systems Center.

[4] Zhang, D. (2017, June). *Hyperloop One's Transport Economist Makes the Freight Case.* Retrieved from https://hyperloop-one.com/blog/hyperloop-ones-transport-economist-makes-freight-case

[5] Taylor, C.L., Hyde, D.J., Barr, L.C. (2016, July). *Hyperloop Commercial Analysis: High Level Overview.* USDOT, John A. Volpe National Transportation Systems Center

[6] Blow, L.E. (2010). *Dispelling the Top Ten Myths of Maglev*

[7] U.S. High-Speed Rail Association (USHSR). (2019). *High-Speed Rail Light Freight.* Retrieved from http://www.ushsr.com/hsr/highspeedfreight.html

[8] Railway Technology. (January, 2019). *Mercitalia Fast: the world's first high-speed rail freight service.* Retrieved from https://www.railway-technology.com/features/mercitalia-fast-service/

hyperloop has been scored as *neutral*. The *neutral* score was given due to hyperloop due to relative unknowns regarding land requirements for facilities.

- **Maglev –** Maglev technology would require typical rail facilities such as a rolling stock depot for maintenance, inspection and repair of vehicles, a rail/operations and control center, maintenance of-way-facilities, and general storage facilities. Additionally, for tunneled sections of guideway, ventilation buildings would be necessary. Electrical substations would be necessary to supply power to propulsion systems. This criterion was rated *medium* for additional property and systems that would be required for operation.
- **High-Speed Rail –** High-speed rail requires the three key ancillary facilities positioned at locations along the rail right-of-way. These facilities are maintenance yards, maintenance-of-way facilities, and traction power substations. Maintenance yards are the largest of the facilities and generally are located near large station areas. Maintenance-of-way facilities are located along portions of the rail mainline and generally consist of additional parallel tracks used for maintenance vehicles and equipment. Traction power substations would be positioned approximately over 25 miles along the rail alignment to supply power to overhead catenary used to provide energy to the train propulsion systems.[9] Additionally, an operations and control center would also be needed. This criterion was rated *medium*.

Reliability / Technology Maturity

- **Hyperloop –** No existing hyperloop systems are in operation. Reliability of the system is anticipated to be high with highly sophisticated vehicle and dispatch systems. Additionally, vehicle frequency at stations is anticipated to be rapid with less two minutes. However, this criterion is scored as *low*, as no existing systems are in operation.
- **Maglev –** Existing maglev trains in operation in Shanghai have been operating since 2002, providing safe and reliable transportation.[10] However, as no other maglev systems are currently operating revenue service, some question remains about technology reliability and economic feasibility; therefore, the reliability criterion is scored *medium*.
- **High-Speed Rail –** High-speed rail has been in operation in Japan, China, and throughout Europe for over 50 years and is known for safe, fast, and reliable, on-time, service.[11] This criterion is rated *high*.

Operation and Maintenance Costs

- **Hyperloop –** Initial studies and available information regarding operation and maintenance costing of hyperloops has generally been produced by hyperloop companies, and thus must be considered critically. Additionally, operating and maintenance costs seem to vary between companies. A recently completed feasibility study anticipated total operating costs in 2030 for one particular system could be approximately $435 million (approximately $1.4 million per mile) annually.[12] Comparatively, another hyperloop company anticipated operating cost to be two-thirds that of high-speed rail.[13] Due to the uncertainty of this category the criterion has been scored as *neutral*.

---

[9] Federal Rail Administration, *Dallas to Houston High-Speed Rail Draft Environmental Impact Statement (DEIS) Appendix F: Final Draft Conceptual Engineering Report – FDCEv7. Retrieved from* https://railroads.dot.gov/sites/fra.dot.gov/files/fra_net/17677/31%20Dallas%20to%20Houston%20High%20Speed%20Rail%20DEIS%20Appendix%20F_TCRR%20FDCE%20v7%20REPORT.pdf
[10] Shanghai Maglev Transportation Development Co., *Ltd. About Maglev.* Retrieved from http://www.smtdc.com/en/gycf2.html
[11] Japan Railway Company. *About the Shinkansen.* Retrieved from https://global.jr-central.co.jp/en/company/about_shinkansen/
[12] Northeast Ohio Areawide Coordinating Agency. *Great Lakes Hyperloop Feasibility Study, December 2019.* Retrieved from https://www.glhyperloopoutreach.com/feasibility-study
[13] Virgin Hyperloop One. *Facts & Frequently Asked Questions.* Retrieved from https://hyperloop-one.com/facts-frequently-asked-questions

- **Maglev –** Publicly available information regarding the operations and maintenance costs of maglev systems are sparse. Additionally, only one maglev system is currently operating passenger service, the Shanghai Maglev. Maglev systems in the U.S. are currently in planning stages and no publicly available operation and maintenance costing could be identified. Due to a lack of available information, this criterion has been scored as *neutral*.
- **High-Speed Rail –** An operation and maintenance and lifecycle cost model was developed in 2018 for the California High-Speed Rail Authority for the Phase 1 system and Silicon Valley to Central Valley Line. The assessment included a risk assessment that evaluated ridership, fare recovery, system reliability and more. Based on the model, estimated operation and maintenance costs varied depending on each modeled year, early estimates ranged from approximately $240 to $280 million (approximately $900,000 per mile) annually, adjusted for 2017 dollars. Overall, the analysis showed an estimated 79 percent probability of farebox recovery necessary for breakeven.[14] However, in the U.S., there is no high-speed rail in passenger service. Therefore, no reliable or historical data exists in which to accurately assess lifecycle costs of the technology. Thus, this criterion is scored as *neutral*.

Interoperability

Compatibility of technologies in shared corridors.

- All evaluated primary technologies would require enclosed systems with proprietary guideways. Therefore, shared infrastructure with existing technologies would be incompatible. Potential interoperability with additional modes of transportation would occur at station locations where mode transfers could be made. All technology modes, at stations, would be designed to incorporate modal connectivity to local bus, airplane terminal, passenger rail, or personal vehicle. However, due to dedicated guideways, interoperability is scored as *low*.

Regulatory Factors

Assessment of applicable state and federal statutes/regulations that could allow delivery of the technology.

- **Hyperloop -** This criterion scored as *low* due to the following key findings: at the federal level, hyperloop companies are gaining bipartisan support and public officials understand the need for regulations to permit the implementation of the technology. For example, current U.S. Secretary of Transportation, Elaine Chao, has announced a new council to support hyperloop technology with the aim to explore regulations and permitting.[15] Virgin Hyperloop One recently unveiled its XP-1 test pod on Capitol Hill in Washington D.C. as part of its national roadshow and has gained support form Representatives of the House Committee on Transportation.[16] At the state level, the Texas Rail Plan (2019) lists several projects examining hyperloop alternatives in the state such as the Dallas-Fort

---

[14] California High-Speed Rail Authority. *2018 California High-Speed Rail Business Plan: Ridership and Revenue Risk Analysis.* Retrieved from https://www.hsr.ca.gov/docs/about/business_plans/2018_BusinessPlan.pdf

[15] Virgin Hyperloop (2019). U.S. Secretary of Transportation Elaine Chao Announces New Council to Support Hyperloop Commercialization. Retrieved from https://hyperloop-one.com/us-secretary-transportation-elaine-chao-announces-new-council-support-hyperloop-commercialization

[16] Virgin Hyperloop one. (2019). For First Time, Federal Lawmakers Gather in Support of Hyperloop Technology on Capitol Hill. doi: https://hyperloop-one.com/first-time-federal-lawmakers-gather-support-hyperloop-technology-capitol-hill

Worth Core Express Service Project Tier 2 Environmental Impact Statement and the Fort Worth to Laredo Transportation Study.[17]

- Maglev - This criterion scored as *low* due to the following key findings: although the technology has been tested and successfully deployed in other parts of the world, literature shows that, regulatory standards have not yet caught up to the technology in the U.S. At the federal level, the technology has been researched by the U.S. Department of Transportation since the 1990's, resulting in several corridors being identified across the country that might benefit from high-speed maglev trains.[18] However, maglev technology has largely stagnated in the United States, with no real revenue deployments. At the state level, the Texas Rail Plan (2019) lists one project examining maglev alternatives and this is the Fort Worth to Laredo Transportation Study.[12]
- High-Speed Rail - This criterion scored as *medium* due to the following key findings: to date, the country has no clear-cut policy on high-speed rail development. Current efforts are ad hoc at both the federal and state levels and lack clearly defined goals. Literature suggests that a more structured and long-term policy framework with clearly defined goals and a stable source of funding is needed. Through the High-Speed Intercity Passenger Rail Program, the Federal Railroad Administration has supported nearly 150 projects in 35 states and the District of Columbia. It has strategically invested in five mega-regions (Seattle-Portland, San Francisco-Los Angeles, Charlotte-Raleigh-DC, Midwest hub, and Northeast Corridor).[19]

  Since the 1960's, government policies such as the High-Speed Ground Transportation Act, the Passenger Rail Service Act, and Intermodal Surface Transportation Efficiency Act set aside funding for the development and demonstration of high-speed rail technologies, the creation of the Amtrak passenger rail, mandating a national rail plan, and designation of 11 high-speed rail corridors. These acts, however, did not appropriate any funds for constructing high-speed rail lines along these corridors.[20, 21]

  At the state level, budgetary policies of the Texas Senate currently prevent the use of state funds to build high-speed rail lines[22] and may in the future even extend to barring the Texas Department of Transportation from helping coordinate access to rights-of-way on state highways for the high-speed rail project until there is a final unappealable court ruling on the eminent domain authority for the project.

Public and Institutional Plan Consistency

Assessment of federal/state/local planning documents that provide input on high-speed transportation in the study area.

---

[17] Texas Department of Transportation (2019). 2019 Texas Rail Plan. Retrieved from http://ftp.dot.state.tx.us/pub/txdot-info/rail/texas-rail-plan-2019-draft-chapters.pdf

[18] Lever, James H. Technical assessment of maglev system concepts. Final report. No. AD-A-358293/XAB; CRREL-SR-98-12. Cold Regions Research and Engineering Lab., Hanover, NH (United States), 1998.

[19] Texas Department of Transportation (2020). High-Speed Intercity Passenger Rail (HSIPR). Retrieved 22 January 2020, from https://www.txdot.gov/inside-txdot/division/rail/high-speed.html

[20] Intermodal Surface Transportation Efficiency Act of 1991 Information - Legislation - Archive - Public Involvement - Planning - FHWA. (2020). Retrieved 22 January 2020, from https://www.fhwa.dot.gov/planning/public_involvement/archive/legislation/istea.cfm

[21] High-Speed Rail Timeline | FRA. (2020). Retrieved 22 January 2020, from https://cms8.fra.dot.gov/passenger-rail/high-speed-rail/high-speed-rail-timeline

[22] The Texas Tribune (2019). Texas high-speed rail developer doesn't want state money. But the Senate's state budget could still delay the project. Retrieved 22 January 2020, from https://www.texastribune.org/topics/high-speed-rail/

- Hyperloop - This criterion scored as *low* due to the following key findings: many potential hyperloop projects are not identified by institutional plans. Hyperloop is not mentioned in the current 2040 State of Texas Transportation Plan. The Texas Rail Plan (2019) lists only two projects in Texas considering hyperloop alternatives.[23] These are the Dallas-Fort Worth Core Express Service Project Tier 2 Environmental Impact Statement and Fort Worth to Laredo study. The NCTCOG metropolitan transportation plan known as Mobility 2045 (2018) mentions that additional high-speed modes of travel, such as hyperloop, are being explored with public and private funding.[24] Potential routes include one from Dallas to Laredo through Fort Worth, which was identified through a private, internationally competitive assessment on potential routes.[25]
- Maglev - This criterion scored as *low* due to the following key findings: Many potential maglev projects are not identified by institutional plans. Maglev is not mentioned in the current 2040 State of Texas Transportation Plan. The Texas Rail Plan (2019) lists the Fort Worth to Laredo study as the only project in Texas considering maglev alternatives.[26] The NCTCOG Mobility 2045 (2018) mentions that additional high-speed modes of travel, such as maglev, are being explored with public and private funding.[20]
- High-Speed Rail - This criterion scored as *medium* due to the following key findings: At the federal level, the national High-Speed Rail Strategic Plan (2009) Federal Railroad Administration provides a list of 11 federally-designated corridors. The South-Central High-Speed Rail Corridor encompasses the study area.[27]

  The Texas Rail Plan (2019) lists five projects examining high-speed rail alternatives. These are the TRE Valley View Double Track, TOPRS Corridor, Dallas to Houston High-Speed Rail Project, Texas Department of Transportation passenger route alternative studies, and the Dallas-Fort Worth Core Express Service.[20] The Texas Statewide Long-Range Transportation Plan 2035 supports high-speed intercity passenger rail to complement the long-term mobility strategy for the state.[28] It references the Texas Rail Plan for identifying the needed studies to determine the location and or improvement of existing routes.

  NCTCOG Mobility 2045 (2018) includes plans for high-speed rail service that will connect North Central Texas to other regions. Plans include a high-speed rail system connecting City of Arlington activity centers (the University of Texas at Arlington, downtown, and entertainment district) with the Dallas-Fort Worth International Airport, Trinity Railway Express corridors, proposed redevelopment areas near the airport, and downtown Fort Worth and Dallas. Recommendations for Mobility 2045 include at-grade and grade-separated high-speed passenger rail service within the region. [21]

  Federal and state plans indicate a need for high-speed passenger rail service to, though, and within the North Central Texas region. Corridors traveling through the region include proposed high-speed

---

[23] Texas Department of Transportation (2019). 2019 Texas Rail Plan. Retrieved from http://ftp.dot.state.tx.us/pub/txdot-info/rail/texas-rail-plan-2019-draft-chapters.pdf
[24] NCTCOG (2018), Mobility 2045. Retrieved from https://www.nctcog.org/trans/plan/mtp/2045
[25] KUT, M., KUT, S., Hart, A., & KUT, N. (2020). It May Be More Hype Than Loop, But Texas' Hyperloop Proposal Is A Finalist. Retrieved 22 January 2020, from https://www.kut.org/post/it-may-be-more-hype-loop-texas-hyperloop-proposal-finalist

[27] Federal Railroad Administration (2009), High-Speed Rail Strategic Plan. Retrieved from: https://cms8.fra.dot.gov/elibrary/high-speed-rail-strategic-plan
[28] Texas Department of Transportation (2010). Texas Statewide Long-Range Transportation Plan 2035. Retrieved from: https://www.txdot.gov/government/reports/statewide-plan/slrtp-2035-report.html

rail service to Oklahoma City, Austin, San Antonio, Houston, Shreveport, and Little Rock Arkansas. Four proposed corridors would provide service from Oklahoma City to South Texas, Fort Worth to Shreveport, Fort Worth to Dallas, and Dallas to Houston.[25]

Convenience

Passenger Experience

General assessment of vehicle and station amenities and accessibility.

- Hyperloop - This criterion scored as *neutral* due to the following key findings: hyperloop technology is still under development hence no real-world case studies were analyzed. However, conceptual designs and prototypes developed by major investors, developers, and through design competitions of this technology were analyzed.

  The Serge Roux Hyperloop Station Design Prototype is proposed to include solar panels, shops, restaurants, storage and maintenance systems, ticketing machines, escalators, elevators, and security screening areas. The passenger capsule is assumed to carry 28 passengers with comfortable seating and luggage storage. The station concept is a looped track to create an efficient and continuous stream of capsules that people can embark and disembark from in three parallel flows of traffic in a self-sufficient building with a reduced footprint. [29]

  The Hyperloop Transportation Technologies concept proposes capsules with augmented windows for enhanced experience and fusion of comfort and entertainment. Capsules would be designed to carry 28 to 40 passengers with a system designed for departures every 40 seconds at a maximum speed of 759 mph (capable of moving 164,000 passengers a day on one line, or 3,600 passengers per hour). The capsules are proposed to be silent, emission-free, with customized interior for user-based experiences. [30,31]

  The UNStudio modular station concept could be easily expanded as needed to adjust for local conditions and demand. Stations would be flexibly designed to accommodate the needs of the community, including luggage and bike storage, daycare, ticket counters, information center, shopping, lounge, hotel, offices, and urban farming.[32]
- Maglev - This criterion scored as *high* due to the following key findings: moderate speeds generate less noise/vibration than wheeled systems. Also, speeds exceeding 155 mph can create uncomfortable riding scenarios for users. Literature suggests train separation from the guideway causes less friction, enhancing passenger comfort. Existing maglev (specifically the German Transrapid) contains an interior that is nearly one meter wider than conventional rail cars.[33]

  The Baltimore-Washington Superconducting Maglev Environmental Impact Statement considered

---

[29] Hyperloop Passenger Station – Serge Roux | Design your life. (2020). Retrieved 22 January 2020, from http://dev.sergeroux.com/portfolio/hyperloop-passenger-station/
[30] HyperloopTT | The First Transportation Breakthrough in a Century. (2020). Retrieved 22 January 2020, from https://www.hyperlooptt.com/technology
[31] Walker, R. (2018, June). *Hyperloop: Cutting Through the Hype.* TRL.
[32] Ravenscroft, T. (2020). UNStudio unveils modular concept station for European hyperloop. Retrieved 22 January 2020, from https://www.dezeen.com/2018/09/17/unstudio-hyperloop-concept-station-european-transport-architecture/
[33]Connor, P. (N/D). *High-Speed Railway Capacity: Understanding the Factors Affecting Capacity Limits for a High-Speed Railway.* Retrieved from http://www.railway-technical.com/books-papers--articles/high-speed-railway-capacity.pdf

both above ground and underground stations in preliminary planning. Stations would include: Head House, Ticking Concourse, Mezzanine, and Platforms. The Head House would be the structure that interfaced with the surrounding community, highly visible and architecturally significant. Ticketing would include passenger circulation areas. The Mezzanine would include large open space dedicated to passenger circulation, waiting areas, restrooms retail and other features. The platforms would be where a trainset arrives for passenger boarding and alighting.

- High-Speed Rail - This criterion scored as *high* due to the following key findings: high-speed rail provides ample empirical evidence of passenger experience and comfort as the technology is widely deployed across the world. Current service includes different passenger/comfort classes, restrooms, an understanding of lateral and vertical acceleration to maximize passenger comfort. Some systems even include entertainment/internet, sleeping cars, dining cars, etc. Several existing high-speed rail examples provide substantially more room than commercial airplanes. One way to compare comfort between the two modes is to calculate floor area per passenger. A standard Boeing 737 provides roughly five to six square feet per passenger, whereas an E5 series Shinkansen has 731 seats, is roughly 8,000 square feet, and 12 feet high, generating an average of 12 square feet per person. The Amtrak Acela Express, which runs along the Northeast corridor from Washington, D.C., to Boston, Massachusetts, provides passengers with 18 square feet per person, as well as first class, business class, sleeping, and café cars. [34, 35]

  Station areas for high-speed rail, include ticketing, passenger amenity and circulation areas, and platforms for boarding and alighting trains. Amenities could include information kiosks, bars, restaurants, coffee shops and additional retail or commercial space.

Travel efficiency

General assessment of technology frequency, boarding, and convenience.

- Hyperloop – This criterion scored as *neutral* due to the following key findings: hyperloop technology is currently under development. Hence, no real-world examples can be analyzed. For this technology, conceptual design of prototypes and theoretical research was assessed. Elon Musk's SpaceX Hyperloop Alpha concept proposes sealed capsules carrying 28 passengers each that travel along the interior of the tube departing on average every two minutes (up to 30 seconds during peak usage hours).[36] Due to short travel times envisioned, there would be a continual flow of passengers through stations designed with simpler and efficient layouts that would streamline security checks, wait times, ticketing, and baggage handling.[37]

  The Serge Roux Hyperloop Station Design Prototype details a station design that includes a continuous six-step looped loading/unloading sequence based on single compression and decompression airlocks, and the simultaneous management of three capsules during embarking and disembarking. The ground floor of the station includes the entrances/exits, ticketing machines, security check, amenities, and escalators to the second story arrival/departure terminals. The track

[34] JR East E5 series shinkansen pre-series train]. Tetsudō Daiya Jōhō. Japan: Kotsu Shimbun. 38 (304): 68–69. August 2009.

[35] "Acela Express." *Trainweb.org*. February 2001. Retrieved June 18, 2012.

[36] Spacex. (2013, August). *Hyperloop Alpha.* Retrieved from https://www.spacex.com/sites/spacex/files/hyperloop_alpha.pdf

[37] Spacex. (2013, August). *Hyperloop Alpha.* Retrieved from https://www.spacex.com/sites/spacex/files/hyperloop_alpha.pdf

loops host three docking platforms on both sides, allowing for passengers from three capsules to embark and disembark simultaneously.[38]

- **Maglev -** This criterion scored as *medium* due to the following key findings: literature and case studies of currently operating systems shows that frequencies, number of transfers, and lower operating speeds compared to other technologies like high-speed rail contribute to the scoring assigned. For the Shanghai Maglev Train, frequency is every 15 to 20 minutes. The line connects Shanghai Pudong International Airport and Longyang Road Station (in the outskirts of central Pudong), where passengers can interchange to the Shanghai Metro and continue on to the city center. At full speed, the journey takes seven minutes and 20 seconds to complete the distance of 18.6 miles. Times can take slightly longer in the morning. The line has been operating at less than 20 percent capacity and reaches the highest speed of 267 mph.[39]

  Transrapid studies show 10-section, four across seating layouts with a five-minute headway assumption with seating capacity of 644 riders to generate an hourly capacity (one direction) as high as 7,728 passengers.[40]

  The Chuo Shinkansen superconducting maglev is anticipated to have similar capacities of the Central Japan Railway Company Shinkansen high-speed rail. Passenger capacities can range from 400 to 1300 passengers per trainset depending on configuration.

- **High-Speed Rail -** This criterion scored as *high* due to the following key findings: literature and case studies of currently operating systems shows that frequencies, number of transfers, and operating speeds compared are optimal for this technology. The Tokyo-Osaka Shinkansen departs every 30 minutes at a 175 mph operating speed. It connects the four largest cities in Japan: Tokyo, Yokohama, Nagoya, and Osaka, with 420,000 people per day daily ridership (2014). To ride, you can either buy a prepaid Japan Rail Pass for seven-day intervals (up to 21 days) or buy from the Shinkansen and Japan Rail Line station. Passengers can make a seat reservation and wait on the platform for the train to come. Japan is in testing for the ALFA-X version of the Shinkansen train, which could run at speeds of up to 224 mph by 2030, making it the fastest bullet train in the world.[41]

  Trainset configuration and the number of tracks available determine a potential passenger capacity for the high-speed rail systems. The Shinkansen N700 trainset can carry 400-1300 passengers depending on configuration. Headways for trains can vary depending on demand from every three minutes to 30 minutes.

Safety & Resilience

Vehicle and Track Safety Measures

Assessment of safety measures implemented per technology for various threats (vehicle, natural hazards, criminal activity).

- **Hyperloop -** This criterion scored as *low* due to the following key findings: the test track built by Virgin Hyperloop One in Nevada is the only example of the technology being tested in the country. Many

---

[38] Hyperloop Passenger Station – Serge Roux | Design your life. (2020). Retrieved 22 January 2020, from http://dev.sergeroux.com/portfolio/hyperloop-passenger-station/
[39] Shanghai Maglev Official Website. (2020). Retrieved 22 January 2020, from http://www.smtdc.com/en/jszl1_4.html
[40] Vuchic, V.R., Casello, J.M. (2002). An Evaluation of Maglev Technology and Its Comparison with High-Speed Rail. Transrapid
[41] SCMAGLEV (2020). Retrieved 22 January 2020, from https://global.jr-central.co.jp/en/

safety issues have not been addressed, including whether it is possible to maintain the partial vacuum within the tubes over long distances and if airlocks can quickly and fully seal off the tubes when passengers exit a pod to prevent air leaks. Passenger safety and need to provide self-containing life support systems within the capsule are also concerns. Hyperloop creates an enclosure that is theoretically immune to weather, disturbance from outside events, and concerns about crossing traffic and wildlife. The technology can also be designed for digital control and communication to allow instantaneous reporting of capsule position, speed, and status. However, these theories have not yet been confirmed with full testing and optimization. Virgin and other companies like Hyperloop Transportation Technologies and Elon Musk's Boring Company have plans to begin testing full-sized hyperloop systems and conduct feasibility studies for implementation in the United Arab Emirates, India, Europe, South Korea, and in North America, but these studies have not yet been conducted. The private sector is beginning to show investment interest and has given over $400 million to Virgin Hyperloop One for example. As more test systems are developed, it is possible for scores to improve in this category.[42]

- Maglev - This criterion scored as *medium* due to the following key findings: technology has been in operation since the 1960's with many test tracks built. The design of the powered guideway ensures that trains are safe from derailment, as magnetic force is exerted the further the train gets from its normal position, pushing it back into place. Crashes are unlikely as two trains traveling the same route cannot catch up and crash into one another because they are all being powered to move at the same speed. Vehicles are unmanned, eliminated driver error and allowing for more efficient routing and scheduling.[43]
- High-Speed Rail - This criterion scored as *high* due to the following key findings: literature shows that high-speed rail is the safest form of transportation in the world proven by decades of safe operations. For example, Japan was the first nation to build high-speed rail in 1964 and has since transported over ten billion passengers without a single fatality. France has a similar record with 30 years of high-speed rail operations. Technological innovations have allowed for integrated approaches for electrification, communications, traction power and substations, as well as signaling and communications, supporting safe and efficient operation. Advanced safety systems (i.e., automatic braking), extensive maintenance, improvements in the design of German trains, and a review of best practices in design and operations have contributed to safety.[44]

[42] The New York Times (2019). A Real Tube Carrying Dreams of 600-M.P.H. Transit. Retrieved from: https://www.nytimes.com/2019/02/18/technology/hyperloop-virgin-vacuum-tubes.html
[43] Johnson, L. R., Rote, D. M., Hull, J. R., Coffey, H. T., Daley, J. G., & Giese, R. F. (1989). Maglev vehicles and superconductor technology: Integration of high-speed ground transportation into the air travel system (No. ANL/CNSV-67). Argonne National Lab., IL (U.S.).
[44] Environmental and Energy Study Institute (2018). Fact Sheet: High-Speed Rail Development Worldwide. Retrieved from: https://www.eesi.org/papers/view/fact-sheet-high-speed-rail-development-worldwide

Appendix D: Stakeholder Engagement

The following section includes:

- Meeting Schedules
- Meeting Agendas
- Meeting Summaries
- Meeting Attendance

Engagement Approach

The project team worked with the metropolitan planning organizations and councils of governments along the corridor to identify key stakeholders in each area, including elected officials, city and county staff and transportation officials. Once identified, the project team organized one meeting in each of the six areas with these key stakeholders designed to allow the project team to share information about the project via a presentation and ask for feedback on key decision points. A follow-up presentation was scheduled in each area near the end of the study to share analysis results. A third and final presentation was scheduled for select areas so the project team could share study results with the policy boards in areas where they had not previoulsy presented.

Engagement Goals

Each series of engagement had different goals.

The first series of stakeholder engagement was designed to:

- Provide a review of potential technology options and modes of travel for the corridor.
- Solicit feedback on community visions, previously adopted relevant plans, technology options, corridors, and station opportunities.
- Identify needs and priorities in evaluating high-speed transit technologies and its impacts within the community.

The second series of engagement (including one or two presentations, depending on the area) updated stakeholders on the findings of the Alternative Analysis task, including screening results for technology and modes of travel, corridor recommendations and station locations. Stakeholders were also asked to review draft recommendations and provide comment.

Meeting Notifications

The project team notified stakeholders of presentations in different ways, based on the preferences of the local COG/MPO. Some presentations were provided via established recurring meetings and did not require special notifications, and some were stand-alone events which required email notifications and calendar invitations.

Series One Meeting Schedule

Meeting Name	Meeting Location	Meeting Date	Meeting Time	Attendees	Page Reference
NCTCOG MPO Stakeholder Workshop	Burleson Public Library 248 SW Johnson Avenue Burleson, TX 76026	June 20, 2019	2 p.m.	14	64
Waco MPO Workshop	WebEx meeting	May 9, 2019	2 p.m.	14	68
Central Texas COG Policy Board Meeting	Central Texas Council of Governments 2180 N. Main Street Belton, TX 76513	May 15, 2019	10 a.m.	13	71
CAMPO Stakeholder Meeting	CAMPO Office 3300 N. Interstate 35 Austin, TX 78705	May 16, 2019	8:30 a.m.	9	78
Alamo Area MPO TAC Workshop	TxDOT San Antonio District Office 4615 NW Loop 410 San Antonio, TX 78229	May 10, 2019	9:30 a.m.	19	81
Laredo MPO TAC Workshop	WebEx meeting	July 11, 2019	2 p.m.	8	86
Laredo Urban Transportation Study Technical Committee Meeting and Laredo MPO Policy Committee Meeting	Laredo City Hall 1110 Houston Street Laredo, TX 78040	July 15, 2019	1:30 p.m.	19	86

North Central Texas Council of Governments – Series 1 Meeting Agenda

Fort Worth/Waco/Temple-Killeen/Austin/San Antonio/Laredo High Speed Transportation Study

North Central Texas Council of Governments
Stakeholder Workshop Series #1
Burleson Public Library
June 20, 2019 2:00pm – 4:00pm

AGENDA

Welcome & Introductions	Michael Morris, P.E. Director of Transportation NCTCOG
Presentation	Steven Duong, AICP Project Manager AECOM
Input Session, Questions & Answers	All

North Central Texas Council of Governments – Series 1 Meeting Summary

North Central Texas Council of Governments
Stakeholder Workshop Series #1
Burleson Public Library
June 20, 20192:00pm – 4:00pm

Summary

The project team presented the project outline, scope, schedule and an overview the five high speed technologies being considered. After this, the team took questions from the stakeholders to further clarify any questions they had. Finally, the team posed a series of questions and gathered input. This is summarized below.

Questions & Answers

Following the PowerPoint presentation, the following questions and answers were discussed.

Will you be looking at potential cost? Fair cost is difficult to forecast. Fare is less important right now than the actual cost to develop.

STEVEN DOUNG– We will be looking at very high-level costs, insofar to determine whether or not the technology is viable as a solution. Our study is focused on passenger movement (instead of freight).

What are your thoughts of how HSR plans were stopped in the past by Love, etc.?

MICHAEL MORRIS – The goods movement part will be very high end. This will focus on people not goods.

STEVEN DOUNG– For the freight piece, you would use this for high value, immediate, 2 hour-delivery.

Is this cutting into Amazon?

MICHAEL MORRIS – The whole logistics of how people and freight move will change over the next 20 years. This technology will not draw a Burlington Northern, but it may draw an Amazon. It will be interesting to see how we entice people to join the parade. But we need the support of community leaders for what we are doing. We may draw a big critic, but the question is do we draw enough support. Is there is enough support like there is HST between Dallas and Houston.

The Japanese have a particular technology. Michael, we always talk about a system. We have Japan and we have a system in Texas. Are we going to tie into the Japanese system?

MICHAEL MORRIS – Our perfect situation is one technology for all purposes because you minimize the trouble to the passenger.

The folks from Dallas to Houston initially said they were not interested in going west. We cannot always predict what others are going to do, but I am more than comfortable with the great things that will come out of it.

The purpose of the core express service is for the service to go over to Fort Worth from the central station. That station is positioned for the south movement to happen.

These are different technologies with different ROW needs.

STEVEN DOUNG– We are not really looking at this during this initial scoring process.

Range of heights is also important.

Does this create jobs for the community? Would there be job training?

MICHAEL MORRIS – We can pull transformative tables for what is going from Dallas to Houston. We can go to try to find that and prorate it to get an idea, but maglev will be different from HSR and others, etc.

AECOM – Most the jobs will likely deal with construction and maintenance.

MICHAEL MORRIS – Government in other countries builds the HSR. Other countries found alignments, but our country did not do that. So, it is not fair to blame private companies from doing that in the U.S.

What about having a group among all the MPOs?

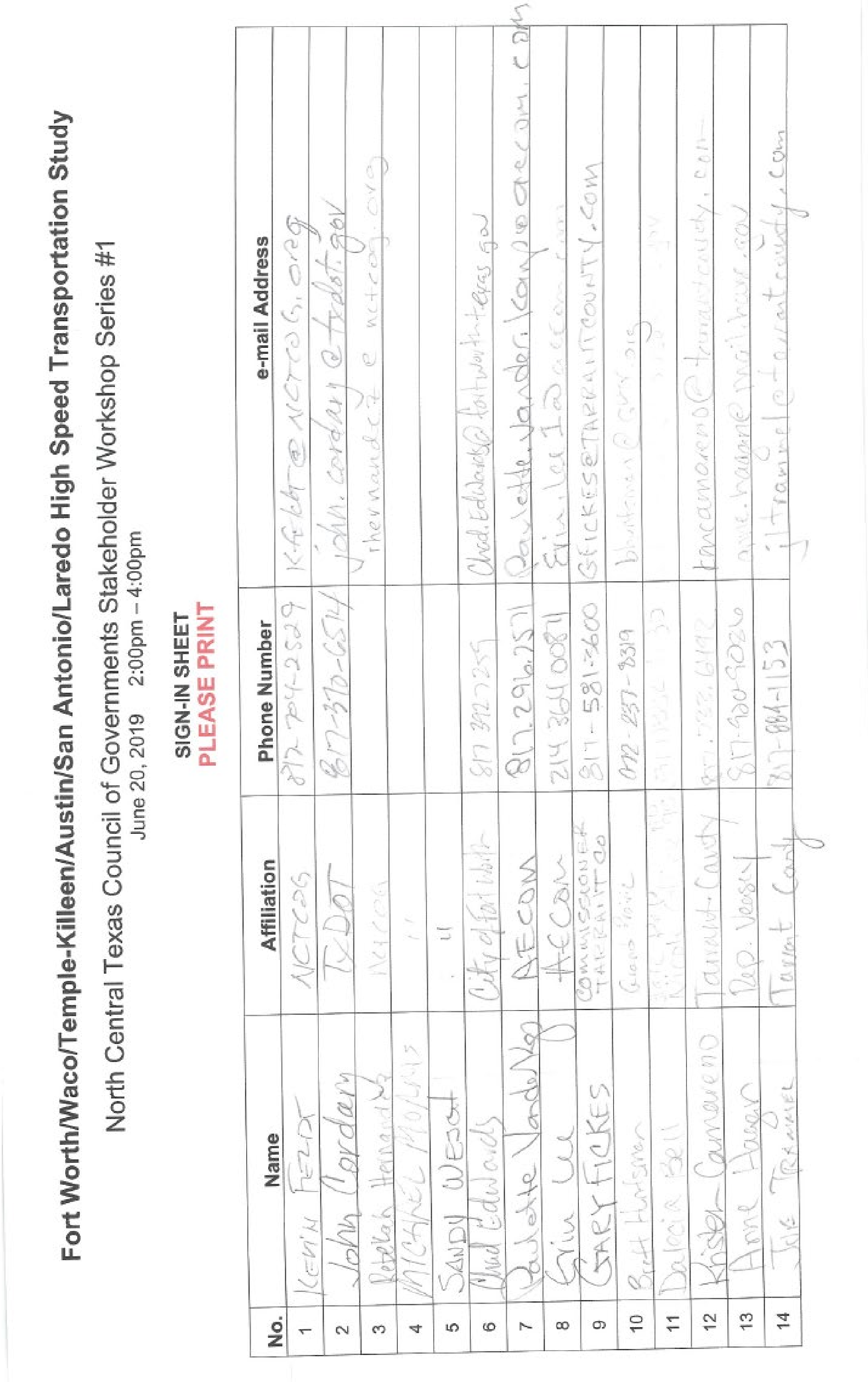
MICHAEL MORRIS – Our boundaries cannot do the Tier 2. We have to go to the state for that.

MICHAEL MORRIS – You could, in theory, have Hyperloop in a tube and Hyperloop not in a tube.

STEVEN DOUNG– There is not a lot of information on the open-air concept for those out of the tube.

MICHAEL MORRIS – Our official position is that we are funding this and would like to see these opportunities explored.

North Central Texas Council of Governments – Series 1 Sign-in Sheet



Fort Worth/Waco/Temple-Killeen/Austin/San Antonio/Laredo High Speed Transportation Study

North Central Texas Council of Governments Stakeholder Workshop Series #1
June 20, 2019 2:00pm – 4:00pm

SIGN-IN SHEET
PLEASE PRINT

No.	Name	Affiliation	Phone Number	e-mail Address
1	Kevin Feldt	NCTCOG	817-704-2529	KFeldt@NCTCOG.org
2	John Cordary	TxDOT	817-370-6514	john.cordary@txdot.gov
3	Rebekah Hernandez	NCTCOG		rhernandez@nctcog.org
4	Michael Morris	"		
5	Sandy Wesch	"		
6	Chad Edwards	City of Fort Worth	817 392 7259	Chad.Edwards@fortworthtexas.gov
7	Paulette Vander Kamp	AECOM	817.296.7571	Paulette.Vander.Kamp@aecom.com
8	Erin Lee	AECOM	214 364 0081	Erin.Lee1@aecom.com
9	Gary Fickes	Commissioner Tarrant Co	817-581-3600	GFICKES@TARRANTCOUNTY.com
10	Brett Huntsman	Grand Prairie	972-237-8319	bhuntsman@gptx.org
11	Daleccia Bell	[illegible]	[illegible]	[illegible]
12	Kristen Camareno	Tarrant County	817.[illegible].6192	kmcamareno@tarrantcounty.com
13	Anne Hagen	Rep. Veasey	817-920-9026	anne.hagen@mail.house.gov
14	Jole Trammel	Tarrant County	817-884-1153	jltrammel@tarrantcounty.com

North Central Texas Council of Governments – Series 1 Notice

Fort Worth to Laredo High Speed Transportation Study
Stakeholder Meetings Round #1

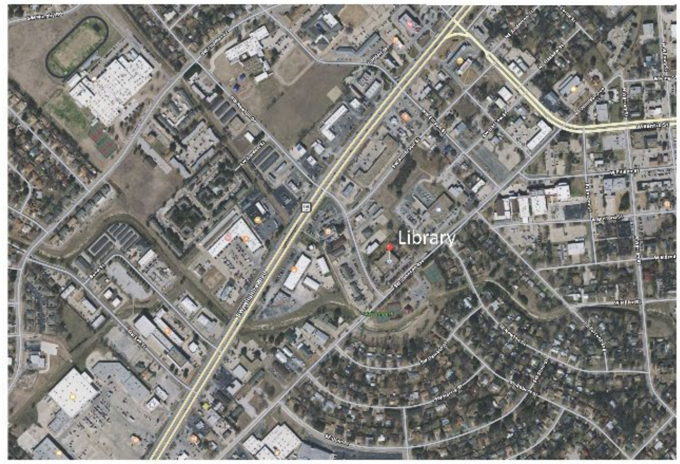
North Central Texas Council of Governments

2 pm – 4 pm
Thursday, June 20, 2019

Burleson Public Library

248 SW Johnson Avenue
Burleson, TX 76028-4296

Library Phone: 817-426-9210



For questions about the meeting, or to RSVP by June 14, please contact:

Leigh Hornsby
leigh@piacommunications.com
214-551-5401

Waco MPO – Series 1 Meeting Agenda

N/A

Waco MPO – Series 1 Meeting Summary

Meeting Minutes- Waco Metropolitan Planning Organization (MPO)
May 9th, 2019.

Summary

The project team presented the project outline, scope, schedule, and an overview the five high speed technologies being considered. After this, the team took questions from the stakeholders to further clarify any questions they had. Finally, the team posed a series of questions and gathered input. This is summarized below.

Questions & Answers

Which of these technologies do you think will not work for your MPO? Are there any you think should be considered?

- Hyperloop is a high-end technology. It will not be feasible for this corridor unless it is connected to a larger regional network. For instance, a DFW, Denver and Chicago network. Guaranteed transit and conventional train are not convenient modes of connectivity from Waco to San Antonio. High Speed Rail and Maglev may be better technologies to consider.
- Maglev preferred over High Speed Rail because it is electric and produces less noise.

- For Waco, the challenge is in getting to larger cities such as Dallas, Houston and San Antonio. It is particularly challenging to get to downtown of these cities and not just the airports.

Where do you think the stations can be possibly located?

- Waco is already a destination and will benefit from having a high-speed transportation station. There are approximately 2.6 million visitors each year.
- For Waco, it is ideal if the station is in the downtown area and not in the outskirts of the city. Right- of-Way is a major concern. Ideally the route should have minimum impact to the existing urban core.
- Any new infrastructure should not physically divide the community. It is ideal if the tracks are elevated or underground.
- Waco airport could be a possible location. Right now, because parking is inconvenient at DFW airport, people prefer to fly from Waco to DFW instead. Having a convenient and high-speed alternate to air travel will be competitive.
- Currently, only one airline services Waco airport and has a monopoly of it. Complimentary train travel can potentially increase market and draw more competition.
- Right of Way- There is an existing freight line that runs through the downtown area and connects tourist destination and transit hubs. This right of way can potentially be repurposed to become a high-speed rail or Maglev corridor.
- Locations around Baylor University may not be ideal for station location because majority of the students drive to places. Because there is a significant international student population, connectivity to international airports may be well received.

Are there any environmental sensitive areas that need to be avoided?

- The MPO has a consolidated list and will share this with the team.

Which destinations should be considered as priority?

- DFW, Austin, San Antonio, Houston and College Station are the cities to which most trips are generated.

What distance will you be comfortable driving? When will you consider an alternative?

- Around 1.5 hours is a comfortable drive time.
- It is a question of time and convenience. For instance, people would rather fly to DFW than drive because parking is an inconvenience.
- If a high-speed rail service connects to Houston or Austin airport, people are likely to use it as a means for easier air travel.
- The time to reach the destination plays an important factor in deciding the mode of travel. It takes approximately 1.5 hours to reach Austin. But this is easily doubled if there is an accident. This unpredictability may encourage people to consider other reliable options.
- It is also currently cheaper to drive than take other modes of transit.

- Choosing alternate mode of transportation is also dependent on destination. People are more likely to take a train to the airport vs a train to game. If there is no set time, people are likely to drive for the convenience of it.
- People are likely to take a train if their purpose of visit is located in an urban core where connectivity to other activities is easy.
- If people can work on commute, they may prefer alternate modes to driving.
- Culturally, people are comfortable with driving long distances.

What are some of the potential screening criteria while considering each technology?

- Reliability, safety, comfort, and estimate ridership.

Any other thoughts?

- If any mode of transportation can guarantee reliable and convenient trips to Dallas within 30 minutes, this will have substantial economic benefit to Waco. Families can live within Waco and commute to Dallas for work.
- Selection of appropriate technology is important so that the investments made today do not became obsolete 20 years down the line.
- Appropriate technology is required to maximize speed based on destination. Traveling from Waco to Dallas or Houston it would be hard to reach speeds of 150-200mph because of the shorter distance.

Waco MPO – Series 1 Attendance

Name	Position/Organization
Chris Evilia	Director, Waco MPO
Barbara Maley	Environmental Planning Coordinator, FHWA
Sara Garza	MPO Coordinator, TxDOT
Amy Burlarley-Hyland	Asst. Director of Public Works, City of Waco
Henry 'Reggie' Richardson	Plan Commission, City of Waco
Christi Bonham	Transportation Planning Administrator, TxDOT Waco
John Deaver	Representative, Waco Business League
Annette Shepherd	Planner, Waco MPO
Allen Hunter	General Manager, Waco Transit System, Inc.
Ashley Nystrom	Executive Coordinator, Waco City Manager's Office
Janet Sheguit	Engineer, BSP Engineers
Liz Bullock	Portfolio Manager, TP&D, TxDOT, Waco District
Dustin Chapman	Administrator, McLennan County
Sarina Stevenson	Asst. General Manager, Waco Transit System, Inc.

Killeen Temple MPO – Series 1 Meeting Agenda

KTMP
KILLEEN-TEMPLE
metropolitan planning organization

KILLEEN-TEMPLE METROPOLITAN PLANNING ORGANIZATION (KTMPO)
TRANSPORTATION PLANNING POLICY BOARD (TPPB)

Wednesday, May 15, 2019
9:30 AM

Central Texas Council of Governments (CTCOG)
2180 North Main Street
Belton, TX 76513

Policy Board Voting Members Present

Chair Tim Davis – City of Temple
Vice Chair Mayor Jose Segarra—City of Killeen
Sam Listi for Marion Grayson—City of Belton
Joseph Molis for Spencer Smith—City of Harker Heights
Councilmember Susan Long—City of Temple
David Blackburn – Bell County
Ryan Haverlah for Dan Yancey—City of Copperas Cove
Carole Warlick—Hill Country Transit District (HCTD)
Butch Menking – City of Killeen

Policy Board Non-Voting Members Present

Brian Dosa—Ft. Hood

Others Present

Caesar Arizpe—City of Killeen
Solomon Thomas—TxDOT Bell County Area Engineer
Jason Deckman—City of Temple
Brynn Myers – City of Temple
Keith Sledd -- HOTDA
Darrell Burtner – HCTD
Terry Reeves – HCTD
Christi Bonham – TxDOT Waco District
Uryan Nelson – KTMPO
Kendra Coufal—KTMPO
James McGill - KTMPO

Meeting Minutes:

1. Call to Order: Tim Davis called the meeting to order at 9:32 a.m.

2. Opportunity for Public Comment: No comments were made by the public.

3. Staff Update: Advisory Committees; Air Quality.

Kendra Coufal introduced James McGill, a new staff member with KTMPO, to the group. Mrs. Coufal also told the group that there will be no June TAC or TPPB meetings. Meetings will resume in July, with TAC on the 10th and TPPB on the 17th. Mrs. Coufal also told the group that the next Planner's Roundtable meeting will be May 21, 2019. Air quality readings for the Month of April were 67 ppb at the Temple station and 60 ppb at the Killeen station.

4. Action Item: Approve minutes from April 17, 2019 meeting.

Butch Menking made a motion to approve April 17, 2019 meeting minutes, seconded by Jose Segarra; the motion passed unanimously.

5. Discussion and Action Item: Approve amendments to the 2040 Metropolitan Transportation Plan (MTP) and FY19-22 Transportation Improvement Program (TIP) regarding TxDOT's Advanced Traffic Management System (ATMS) Project, W45-01.

Kendra Coufal informed the group that after the Policy Board approval, project W45-01 underwent a 15-day public comment period with one public meeting during which no comments were received. The amendment revises the original limits to the new limits from Coryell County line to FM 3423.

Carole Warlick made a motion to recommend the approval for MTP and TIP amendments for project W45-01, seconded by David Blackburn; the motion passed unanimously.

6. Discussion and Action Item: Approve the 2045 MTP through Resolution 2019-04

Kendra Coufal informed the group that the draft 2045 MTP, which has been developed over the past year with public workshops, a project call, and project scoring, and ranking has been compiled into a final copy. The final copy of the 2045 MTP underwent a 30-day public comment period and public forum during which no comments were received. Mrs. Coufal also stated that the final 2045 MTP has also been kept up to date on the KTMPO website and is there for review and comment.

Susan Long made a motion to recommend approval of the 2045 MTP through Resolution 2019-04, seconded by Jose Segarra; the motion passed unanimously.

7. Discussion Item: Review of draft FY20-21 Unified Planning Work Program (UPWP).

Kendra Coufal informed the board that the draft FY20-21 UPWP was brought before the TAC at their May 1st meeting for their review. Mrs. Coufal also informed the group that comments are being taken through May 17th and that on June 1st the document will be submitted to TxDOT for their preliminary review. The draft will be brought back one more time before the TAC and TPPB at their July meetings for final approval before the official submission of the document to TxDOT on August 1st and then for FTA/FHWA approval.

Mrs. Coufal referred the board to look at the screen for an overview of the draft task totals for planning funds. The total budget summary for the two years combined is just over $2 million dollars with a breakdown of that left in the meeting packet.

No comments were made.

8. Discussion Item: Update on KTMPO 2018 Federal Highway Administration (FHWA)/Federal Transit Administration (FTA) Federal Certification Review.

Kendra Coufal informed the group that the KTMPO received a letter from the FHWA/FTA submitting their full summary report. According to the report there were no findings and no corrective actions, only a couple of recommendations and plenty of commendations. Mrs. Coufal stated that it was overall a good review and that KTMPO is certified to continue moving forward.

No comments were made.

9. Discussion Item: Fort Worth – Laredo High Speed Transportation Study.

Uryan Nelson informed the group that KTMPO is working with 5 other MPOs in from the Fort Worth to Laredo corridor on a High-Speed Transportation study. Mr. Nelson also informed the group that an informational session on the study was being held following the meeting at 10 AM.

No comments were made.

10. Discussion Item: Public input received through April 30, 2019.

Public input received through April 30, 2019 were presented to the TPPB.

11. Member Comments:

Kendra Coufal reminded the group that May is National Bike Month and that the City of Belton passed a resolution to recognize the month as National Bike Month. Mrs. Coufal also stated that this week is National Bike to Work Week and Friday is National Bike to Work Day and KTMPO's appreciation of cities in the region recognizing the importance of alternative modes of transportation.

12. Adjourn: The meeting adjourned at 9:43 a.m.

These meeting minutes were approved by the TPPB members at their meeting on July 17, 2019.

Timothy A Davis

Mayor Tim Davis, Chair

Jim Reed, KTMPO Director

Killeen Temple MPO – Series 1 Summary

Meeting Minutes- Central Texas Council of Governments (CTCOG)
May 15th, 2019.

Summary

The project team presented the project outline, scope, schedule and an overview the five high speed technologies being considered. After this, the team took questions from the stakeholders to further clarify any questions they had. Finally, the team posed a series of questions and gathered input. This is summarized below.

Questions & Answers

Project scope

- This project is funded by NCTCOG.
- The deliverables of this study include identification of appropriate technologies between city pair potential corridors and station locations. The final report will consist of a summary of the recommendations.
- The scope of this project is to look at passenger travel; however, freight will also be accounted for.

For Hyperloop

- Will the tubes be completely enclosed? In some of the newer design concepts, there are windows every several hundred feet. The design is still under development.
- What power source will it utilize? Because the technology utilizes a passive linear induction motor, it will be fully electric. The aim is to potentially incorporate solar panels on the elevated tube.
- What are some of the limitations of maintaining a vacuum over a long distance? The tube requires near vacuum, which is easier to create and maintain compared to complete vacuum.
- What kind of life safety systems will be incorporated? This is still under development. Companies are working with the federal government to engineer appropriate safety systems.
- What will be the system capacity? It is envisaged to be a high-volume low capacity system. Approximately 20 to 30 people per pod with a high frequency headway.
- The system will be designed to a 0.2G, which is comparable to an airliner.
- Will this system contribute to noise pollution? It will not because the movement is contained within the tube.
- Has the system been tested with people? No, the system is still under development.
- Can passengers move around during the journey? Theoretically, yes, they can. But the journeys are very short, hence it may not be required.

Maglev and High-Speed Rail

- Neither technology can reach their optimal speed if there are several stops. An optimal station distance must be considered.
- Journey on Maglev trains are very smooth and comfortable.

Guaranteed Transit-

- Is guaranteed transit similar to light rail? It serves a similar market, but guaranteed transit will not require a guide way. Its operation is also different. The system is prone to the same setbacks as any highway travel. If there is an accident, there will be a delay.

Screening criteria

- The study will look at relative capital cost per mile. It will not account for operation cost.
- Consider flexibility in adding or subtracting stops as a criterion.
- A ridership forecast will be modeled.

Areas to avoid

- Stillhouse Hollow Lake
- Belton Lake
- Ft Hood

Other

- Houston will not be a part of this study. However, other companies are studying its corridor potential.

Killeen Temp – Series 1 Sign-in Sheet

Fort Worth/Waco/Temple-Killeen/Austin/San Antonio/Laredo High Speed Transportation Study

Central Texas Council of Governments Stakeholder Workshop Round #1
May 15, 2019 10:00am – 12:00pm

SIGN-IN SHEET
PLEASE PRINT

No.	Name	Affiliation	Address	Home or Business Phone Number	E-mail Address
1	Abby Tomlinson	AECOM	419 Amberglen, Austin	512-419-6871	abby.tomlinson@aecom.com
2	Caesar Arizpe	CITY OF KILLEEN	3201A S WS YOUNG DR KILLEEN TEX 76523	254-616-3175	carizpe@killeentexas.gov
3	DAVID OLSON	CITY OF TEMPLE	2 N MAIN ST. TEMPLE, TX 76501	254.298.5600	dolson@templetx.gov
4	DAVID BLACKBURN	BELL COUNTY	101 E. CENTRAL AVE. BELTON, TX 76513	254.933.5105	david.blackburn@bellcounty.texas.gov
5	Kendra Coufal	CTCOG	2180 N. Main Belton 76513 TX	254.770.2363	kendra.coufal@ctcog.org
6	URYAN NELSON	CTCOG/KTMPO	2180 N MAIN ST BELTON, TX	254-770-2373	uryan.nelson@ctcog.org
7	Ryan Haverlah	City of Copperas Cove	914 S. Main St Copperas Cove, TX	254-547-4221	rhaverlah@copperascovetx.gov
8	Joseph Molis	Harker Heights	305 Millers Crossing Harker Heights, TX 76548	254-953-5600	jmolis@ci.harker-heights.tx.us
9	Cheryl Maxwell	City of Belton	333 Water Street Belton, TX 76513	254-933-5816	cmaxwell@beltontexas.gov
10	Jason Deckman	City of Temple	2 N. Main St. Temple TX 76501	254-298-5668	jdeckman@templetx.gov
11	Solomon Thomas	TxDOT	410 W Loop 121 Belton, TX 76513	254-939-3778	solomon.thomas@txdot.gov
12	Ken Cox	Workforce Solu	300 Cheyenne Dr Killeen, TX 76542	254-258-8027	Kendallc@workforcelink.com

Fort Worth/Waco/Temple-Killeen/Austin/San Antonio/Laredo High Speed Transportation Study

Central Texas Council of Governments Stakeholder Workshop Round #1

May 15, 2019 10:00am – 12:00pm

SIGN-IN SHEET
PLEASE PRINT

No.	Name	Affiliation	Address	Home or Business Phone Number	E-mail Address
13	Keith Skedd	HOTDA	2916 Illinois AVE Killeen TX 76543	254 702 8045	Keith.skedd@hotda.org
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Capital Area MPO – Series 1 Meeting Agenda

N/A

Capital Area MPO – Series 1 Meeting Summary

Meeting Minutes- Capital Area Metropolitan Planning Organization (CAMPO)
May 16th, 2019.

Summary

The project team presented the project outline, scope, schedule and an overview the five high speed technologies being considered. After this, the team took questions from the stakeholders to further clarify any questions they had. Finally, the team posed a series of questions and gathered input. This is summarized below.

Questions & Answers

Project scope

- The project will analyze different time frames. This study will not propose a phasing plan but will evaluate how each technology and guideway are inoperable or operable. It will not recommend one option but several appropriate alternatives. Any further decision will be made by the MPO. This study only looks to better inform the tier 2 analysis.
- The scope of this study is to look at passenger travel, but freight will also be considered.
- The study will be noting and scoring appropriate technologies between city pairs. It will not provide an exact alignment but only a possible corridor and suitable station locations.

For Hyperloop

- Systems for safety are still under development.
- Currently the pylons are being tested for seismic activity.
- Additional elements such as safety access and service frontage roads may be required.
- Height of pylon will be tailored to site conditions. On average it is expected to be between 30 to 40 feet.
- The infrastructure is prone to minor vandalism and graffiti since it is above grade.
- The tube can withstand minor damages and punctures as only a close to vacuum environment needs to be maintained. However, like any other infrastructure, it cannot withstand large damages.
- Will flashing lights trigger epilepsy attacks? No, these lights are simply a means to validate speed.
- The estimated trip time between Dallas to Austin is 19 minutes.

Conventional rail

- The technology is still improving and very much relevant even today.

Maglev

- It causes considerable noise pollution.
- Unable to operate if there is considerable debris on the guideway.

Screening criteria

- Some suggested screening criteria include population density, right of way requirements, eminent domain/ parcel acquisition, passenger experience, safety and environmental risk.

- Price point per trip will not be calculated. Only relative cost per mile will be estimated. This will be used to inform benefits of speed compared to cost per mile.

Possible routes

- Potential route is east of I-35. There are considerable environmental challenges west of I-35. The topography is also more suitable on the east.
- Highway 130 can potentially accommodate high speed rail or maglev.
- A guaranteed transit line can be considered along 290.
- Possible station location- airport.

Areas to avoid

- West of I-35
- Flood plains

Other-

- Using existing right of way is challenging. Union pacific will not allow other operators (other than Amtrak).
- The soft, clay soil in Austin may make it difficult to engineer hyperloop or high-speed rail.

Capital Area MPO – Series 1 Meeting Attendance

Attendees from CAMPO:

- Cathy Stephens- Travis County
- Peter Espy- TxDOT
- Chad Coburn- TxDOT
- Mark Werner- TxDOT
- Ryan Collins- CAMPO
- Todd Gibson- CAMPO
- Doise Miers- CAMPO
- Shirley Nichols- TxDOT

Capital Area MPO – Series 1 Sign-in Sheet

Fort Worth/Waco/Temple-Killeen/Austin/San Antonio/Laredo High Speed Transportation Study

Capital Area Metropolitan Planning Organization Stakeholder Workshop Round #1
May 16, 2019 9:30am – 11:30am

SIGN-IN SHEET
PLEASE PRINT

No.	Name	Affiliation	Address	Home or Business Phone Number	E-mail Address
1	Cathy Stephens	Travis County	700 Lavaca Austin 78701	512-854-7664	cathy.stephens@traviscountytx.gov
2	PETER ESPY	TxDOT	118 E RIVERSIDE AUSTIN 78704	512-416-2056	peter.espy@txdot.gov
3	Chad Coburn	TxDOT	"	512 486 5815	chad.coburn@txdot.gov
4	Mark Werner	TxDOT	118 E Riverside Austin	512 486-5137	mark.werner@txdot.gov
5	Ryan Collins	CAMPO	3300 N Interstate Suite 630, Austin TX	512-215-2541	ryan.collins@campotexas.org
6	Todd Gibson	CAMPO	3300 N Interstate 35 Suite 630 Austin TX	512-215-9481	todd.gibson@campotexas.org
7	Doise Miers	CAMPO	"	512 215 9411	doise.miers@campotexas.org
8	SHIRLEY NICHOLS	TXDOT-AUS DIS	AUSTIN DISTRICT 7901 N IH 35, 78753	512-832-7168	Shirley.Nichols@txdot.gov
9	Abby Tomlinson	AECOM	1401 Amberglen	512-419-6871	abby.tomlinson@aecom.com
10					
11					

Alamo Area MPO – Series 1 Agenda

Memorandum
May 6, 2019

This agenda is subject to revision up to 72 hours prior to the meeting.

To: All Members, Technical Advisory Committee
From: Jeanne Geiger, Deputy Director
Subject: Workshop Notice and Agenda

*A special workshop of the **Technical Advisory Committee** is scheduled for Friday, May 10, 2019 at 9:30 a.m. at the TxDOT District Office, Building 2, Hearing Room located at 4615 NW Loop 410, San Antonio, Texas, 78229*

Agenda:

1. Introductions

2. Part I: Technology presentations
   - Next Generation Levitation (Hyperloop) (10-20 mins)
   - Magnetic Levitation (Maglev) (5 mins)
   - High Speed and Higher Speed Technology (5 mins)
   - Conventional Passenger Rail (5 mins)
   - Guaranteed Transit (5 mins)
   - Technology Matrix Comparison (5 mins)

3. Part II: Q & A

4. Part III: Stakeholder discussion
   a. Visual preference survey (online poll)
      i. Transit Oriented Development (TOD) typology preference review
   b. Identifying fatal flaws for potential station locations/Corridors
      i. Gather fatal flaws for potential station areas and corridors
      ii. Mark up PDF or Google Earth Local/Regional Maps for opportunity areas

5. Adjourn

MPO meetings are accessible to persons with disabilities. To arrange for special assistance or an interpreter, please call 210-227-8651 or TDD 1-800-735-2989 (Relay Texas) at least five working days in advance.
Las reuniones son accesibles a personas con discapacidad. Si usted necesita asistencia especial o un intérprete, llame al (210) 227-8651 o al TDD 1-800-662-4954 (Relay Texas) con cinco días hábiles de anticipación.

825 South St. Mary's Street – San Antonio, Texas 78205 – (210) 227-8651
TDD 1 (800) 735-2989 - Fax (210) 227-9321
www.alamoareampo.org

Alamo Area MPO – Series 1 Meeting Summaries

Meeting Minutes- Alamo Area Metropolitan Planning Organization (AAMPO)
May 10th, 2019.

<u>Summary</u>
The project team presented the project outline, scope, schedule and an overview the 5 high speed technologies being considered. After this, the team took questions from the stakeholders to further clarify any questions they had. Finally, the team posed a series of questions and gathered input. This is summarized below.

Q&A - Questions:

Darcie – Have we looked at ROW needs of different technologies?

Art – Question about track widths— will you be accounting for past studies with Lone Star Rail?

Clay – Key components horizontal of the geometric could be a challenge— could be difficult to traverse some of the existing ROW, also include radius requirements.

Kammy – Where did the name "Guaranteed Transit" come from?

Clay – Size of stations needed, and criteria needs (infrastructural needs to support the technologies).

Allie – Cost to the consumer?

Art – Will there be a cost/benefit analysis?

Group Discussion

Findings from Capital-Alamo Connections Study. Group asked for insight from attendees.

Sid – We were just looking at Austin/San Antonio – consultant did not go into detail the way AECOM just did – that's why commuter rail ranked higher (most likely).

What technologies would work in San Antonio?

Art – Looking at San Antonio to Monterrey – high speed transit center identified near Texas A&M San Antonio – to get to SH 130 ROW – need to look at a combination of modes.

What current transit route from the airport?

- VIA – Route 5 – looking at longer term – North-central corridor to connect to north (Stone Oak) down 281 to South
- North-east corridor from Rolling Oaks Mall to Broadway
- Clay – can send Vision 2040 Map to AECOM Team

Are there specific areas that are sensitive from an environmental perspective?

- Did team look at Lone Star Rail and environmental studies? Lone Star Rail wanted to use existing UP lines.
- VIA – closer to downtown are cultural and historic resources.

- Clay – west of I-35 and north of 410 – karst environmental east of I-35 – heritage farms, TxDOT through Trans Texas Corridors looked at many rural areas – might look at this documentation, west of 35 – Edwards Aquifer

Are there any technologies we should rule out?

- No keep all options on the table.

Where are visitors coming from?

- Convention and Visitors Bureau has this data.
- Would you want this data broken out by travel mode?

From your perspective, what's the comfort level of the longest length of drive time?

- Four to five hours – in Texas, we all drive.
- Clay – over time, flying to Dallas was the preference, but now cue times in terminals is so long, you might as well drive
- Jonathan – it's a cost/benefit analysis for each person

Any other questions/comments?

- Are you engaging our military members (JBSA)? Potential security issues. Recommend for team to consider bases and missions.
- **Clay** – do you have a website to watch status of the study? No, we do not
- **Jeanne** – will you be making the presentation available? Yes – will send to Lena for dissemination.
- **Jeanne** – what's the purpose and need of this project? What problem are we trying to solve? Josh – we are looking at connecting triangle – very high-level study Recommend looking at population/needs based – potentially consider New Braunfels
- **Josh** – responding to white paper – very early planning to look at technologies and identify potential technologies that are feasible as an alternative to car/air travel.
- **Art** – alternatives to air travel. This study is very broad— for example, guaranteed transit does not appear to fit with the other technologies that we are studying.
- We are trying to be at the forefront in evaluating technologies from a neutral perspective.

Alamo Area MPO – Series 1 Sign-in Sheet

Alamo Area Metropolitan Planning Organization

We Plan to Keep You Moving!

High Speed Transportation Workshop
TxDOT District Office
Friday, May 10, 2019

Members	Alternate Members	Affiliation
Clay Smith, P.E.	Timothy Mulry	Advanced Transportation District
Stella Garcia	Sean Scott	Alamo Area Council of Governments
Christopher Treviño, P.E.	Reggie Fountain, P.E.	Alamo Reg. Mobility Authority
David Wegmann, P.E.	Jesse Garcia, P.E.	Bexar County
Garry Ford, P.E., PTOE**	Vacant	City of New Braunfels
Marc Jacobson, P.E.	Jillian Harris	City of San Antonio
Bianca Thorpe, P.E.	Vacant	City of San Antonio
Christina DeLaCruz, P.E.	Greg Reininger	City of San Antonio
David Rabago, P.E.	Ismael Segovia	City of Seguin
Tom Hornseth, P.E.	David Vollbrecht, P.E.	Comal County
David Dimaline (LV)	Rick Schroder (Helotes)	Greater Bexar County Council of Cities
Allen Dunn, P.E.	Scott Larson (Schertz)	Guadalupe County
Tobin Maples (FOR)	Ron Emmons, P.E. (FOR)	Kendall County Area
Ylda Capriccioso	Lydia Kelly	MPO Bicycle Mobility Advisory Comm
Robert Hanley, AIA	Brian Crowell	MPO Pedestrian Mobility Advisory Comm
Blake Partridge (UC)	Joel Hicks (Cibolo)	Northeast Partnership
Nicholas Wingerter	Vacant	Private Transportation Providers
Jonathan Bean, P.E.*	Mark Mosley, P.E.	Texas Department of Transportation
Manjiri Akalkotkar	Arturo Herrera	VIA Metropolitan Transit

*Chair ** Vice Chair

MPO Staff

Sid Martinez	Jeanne Geiger	Lori Stewart
Zack Graham	Linda Alvarado-Vela	Travis Nedrich
Allison Blazosky	Lily Lowder	Joey Pawlik

6

High Speed Transportation Workshop
TxDOT District Office
Friday, May 10, 2019

Visitors: Please sign in:

Name	Agency	E-mail Address
Darcie Schipull	TxDOT	darcie.schipull@txdot.go
Greg Reininger	COSA	gregory.reininger@sanantonio.gov
KAMMY Horne	VIA	Kammy.Horne@viainfo.net
ART REINHARDT	COSA TCI	ART.REINHARDT@SANANTONIO.GOV
CLAYTON RIPPS	TxDOT	CLAYTON.RIPPS@TXDOT.GOV

7

Laredo MPO TAC Workshop July, 2019 – Series 1 Meeting

This meeting occurred via WebEX, the project team introduced and presented the study as part of a larger TAC workshop meeting. After presentation, no additional discussion was noted.

Laredo MPO Laredo Urban Transportation Study Technical Committee Meeting and Laredo MPO Policy Committee Meeting – July 15, 2019 – Series 1 Meeting Agenda

Laredo Urban Transportation Study

Metropolitan Planning Organization Policy Committee

Notice of Public Meeting

City of Laredo City Hall
City Council Chambers
1110 Houston Street
Laredo, Texas
July 15th, 2019
1:30 p.m.

MEETING AGENDA

I. CHAIRPERSON TO CALL MEETING TO ORDER

II. CHAIRPERSON TO CALL ROLL

JUL 12 '19 AM8:16
REC'D CITY SEC OFF

III. CITIZEN COMMENTS

Speakers are required to fill out witness cards, which must be submitted to MPO Staff no later than 15 minutes after the start of the meeting. Speakers shall identify themselves at the microphone. Comments are limited to three (3) minutes per speaker. No more than three (3) persons will be allowed to speak on any side of an issue. Should there be more than three (3) people who wish to speak on a specific issue, they should select not more than three (3) representatives to speak on their behalf. The presiding officer may further limit public on the interest of order or time. Speakers may not transfer their minutes to any other speaker. Comments should be relevant to City business and delivered in a professional manner. No derogatory remarks shall be permitted.

IV. ITEMS REQUIRING POLICY COMMITTEE ACTION

A. Approval of the minutes for the meeting held on May 20, 2019, June 17, 2019, and June 24, 2019.

B. Receive public testimony and initiate a ten-day public review and comment period for the following proposed amendment(s) of the 2019-2022 Transportation Improvement Program (TIP):

1. ***Revision*** of project CSJ 0018-06-183 for the construction of interchange direct connector 5, located from 0.50 miles south of US 59 to 0.50 miles east of IH 35. ***Purpose*** of amendment is to revise the estimated letting date from fiscal year (FY) 2019 to FY 2020.

2. ***Revision*** of project CSJ 0018-06-136 for the widening of main lanes and the construction of a railroad grade separation, from Shiloh Drive to 0.25 miles north of US 59/IH 69W. ***Purpose*** of amendment is to revise the estimated letting date from fiscal year (FY) FY 2021 to FY 2020.

C. Receive public testimony and initiate a ten-day public review and comment period for the following proposed amendment(s) of the 2015-2040 Metropolitan Transportation Plan (MTP):

1. Amending Table 12-10, entitled Roadway and Bicycle/Pedestrian Project Summary,

a) ***Revision*** of project CSJ 0018-06-183 for the construction of interchange direct connector 5, located from 0.50 miles south of US 59 to 0.50 miles east of IH 35. ***Purpose*** of amendment is to revise the estimated letting date from fiscal year (FY) 2019 to FY 2020.
b) ***Revision*** of project CSJ 0018-06-136 for the widening of main lanes and the construction of a railroad grade separation, from Shiloh Drive to 0.25 miles north of US 59/IH 69W. ***Purpose*** of amendment is to revise the estimated letting date from fiscal year (FY) 2021 to FY 2020.

D. Receive public testimony and initiate a 20 day public review and comment period for the draft 2020 Unified Planning Work Program (UPWP).

		Amount
1.1	Regional Planning & Administration	$420,000.00
1.2	Travel, training, equipment, & supplies	$80,000.00
2.1-2.5	Management of data, GIS, & website	$100,000.00
3.1-3.2	Short Range Planning	$90,000.00
4.1-4.2	Long Range Planning	$125,000.00
Total		**$900,000.00**

E. Discussion with possible action on the River Road Project.

F. Discussion with possible action on Hachar-Reuthinger.

V. REPORT(S) AND PRESENTATIONS (No action required).

A. Presentation by CDM Smith, on the 2020-2045 Metropolitan Transportation Plan (MTP).

B. Presentation by Steven Duong, AICP, with AECOM, on the Fort Worth to Laredo High Speed Rail Study.

C. Status report by Abrazo Partners on the City of Laredo's Boulevard of the America's Project.

D. Status report by TxDOT on the Outer Loop Alignment Study.

E. Status report by TxDOT on ongoing projects.

F. Status report by the Regional Mobility Authority (RMA).

VI. ADJOURNMENT

THIS NOTICE WAS POSTED AT THE MUNICIPAL GOVERNMENT OFFICES, 1110 HOUSTON STREET, LAREDO, TEXAS, AT A PLACE CONVENIENT AND READILY ACCESSIBLE TO THE PUBLIC AT ALL TIMES. SAID NOTICE WAS POSTED BY JULY 12TH, 2019, BY 1:30 P.M.

All meetings of the MPO Committee are open to the public. Persons who plan to attend this meeting and who may need auxiliary aid or services such as: interpreters for persons who are deaf or hearing impaired, readers of large print or Braille, or a translator for the Spanish language are requested to contact Ms. Vanessa Guerra, City Planning, 1120 San Bernardo Ave. at 956-794-1613, vguerra@ci.laredo.tx.us, at least five working days prior to the meeting so that appropriate arrangements can be made. Materials in Spanish may also be provided upon request.

Disability Access Statement-This meeting is wheelchair accessible. The accessible entrances are located at 1110 Victoria and 910 Flores. Accessible parking spaces are located at City Hall, 1110 Victoria.

Ayuda o Servicios Auxiliares: Todas las reunions del Comité del MPO están abiertas al público. Personas que planean asistir a esta reunion y que pueden necesitar ayuda o servicios auxiliaries como: interpretes para personas con discapacidad auditiva, lectores de letra grande o en Braille, o un traductor para el idioma español deben comunicarse con la Sra. Vanessa Guerra, en el Departmento del Planificacion de la Ciudad, 1120 San Bernardo Ave. al (956) 794-1613, vguerra@ci.laredo.tx.us, al menos cinco dias habiles antes de la reunion para que los arreglos apropriados se pueden hacer. Materiales en español se proveerán a petición.

Declaración de Acceso a la Discapacidad: Esta reunion es accesible para sillas de ruedas. Las entradas accesibles estan ubicadas en 1110 Victoria y 900 Flores. Las plazas de aparcamiento accesibles se encuentran en el Ayuntamiento, 1110 Victoria.

Información en Español: Si usted desea esta información en español o si desea explicación sobre el contenido, por favor llámenos al teléfono (956) 794-1613 o comunicarse con nosotros mediante correo electronico a vguerra@ci.laredo.tx.us.

CITY OF LAREDO REPRESENTATIVES:

Honorable Pete Saenz, Mayor and LUTS Chairperson
Honorable Norma "Nelly" Vielma, City Councilmember, District V
Honorable Dr. Marte Martinez, City Councilmember, District VI
Honorable George Altgelt, City Councilmember, District VII

LAREDO MASS TRANSIT BOARD REPRESENTATIVE:

Vacant (yet to be appointed)

COUNTY OF WEBB REPRESENTATIVES:

Honorable Tano E. Tijerina, Webb County Judge
Honorable Jesse Gonzalez, Webb County Commissioner, Pct. 1
Honorable John Galo, Webb County Commissioner, Pct. 3

STATE REPRESENTATIVES:

Mr. David M. Salazar, Jr. P.E., District Engineer

*****EX-OFFICIO*****

Honorable Judith Zaffirini, State Senator, District 21
Honorable Richard Raymond, State Representative, District 42
Honorable Tracy O. King, State Representative, District 80

J. Kirby Snideman, AICP
MPO Director

For: José A. Valdez, Jr.
City Secretary

Laredo MPO – Series 1 Meeting Summary and Attendance

2019 HST Laredo MPO Policy Committee Meeting
July 15, 2019, 1:30 p.m.
Laredo City Hall, 1110 Houston St, Laredo, TX 78040
Committee Meeting Notes

Attendees:

Name	Representing
Honorable Pete Saenz, Mayor and LUTS Chairperson	City of Laredo
Honorable Dr. Marte Martinez, City Councilmember, District VI	City of Laredo
Honorable Tano. E. Tijerina, Judge	Webb County
Honorable Jesse Gonzalez, Commissioner, Pct. 1	Webb County
Honorable John Galo, Commissioner, Pct. 3	Webb County
David M. Salazar, P.E.	TxDOT District Engineer
James Kirby Snideman	Laredo Planning/MPO Director
Steven Duong	AECOM (Study Team)
Kari Anne Sutton	Poznecki-Camarillo, Inc. (Study Team)

The Laredo MPO Policy Committee Meeting was recorded on video. The agenda is attached and the link to the full meeting and presentation are provided below.

Full Meeting Video - http://laredotx.swagit.com/play/07152019-593

Item VB – Steven Duong Presentation (25 min) - http://laredotx.swagit.com/play/07152019-593/#10

Mr. Duong introduced the Fort Worth to Laredo High Speed Transportation Study that is funded by the NCTCOG. He described the purpose as the review of technologies and station locations for passenger and freight transportation. He explained the multiple technologies and was clear that the study is technology neutral. Technologies described included the Hyperloop One Global Challenge, Maglev Technology, High Speed Rail, Conventional Passenger Rail, and Guaranteed Transit. He reviewed the schedule outlining the current status and future milestones. Engaging the Policy Committee, Mr. Duong requested continuous feedback and stated that the Study Team planned to engage in October for a second round of engagement followed by a briefing to the Policy Committee when the study was complete late Fall 2019 or January 2020.

The Policy Committee engaged throughout the presentation. At the end of the slide deck, Mr. Duong asked the Committee the following questions to engage additional discussion and questions:

1. Are you interested in the technology?
2. How would you like to see this deployed in your community?

Steven Duong (AECOM) presenting to the Laredo MPO Policy Committee.

A general summary of the questions and answers/discussion follows.

Q1: Mayor Saenz – Will this study area include transportation into Mexico?

A1: Steven Duong (AECOM) – Technically the study area goes from Fort Worth to Laredo. However, the larger Texas Oklahoma Passenger Rail Study project does consider Mexico. We are studying all options for both passenger and freight in such a way that does not preclude going into Mexico. The goal is to be able to utilize this information for other future studies/projects.

Statement: Judge Tijerina – He recalls meeting with other parties in San Antonio approximately 3 years ago when the decision was being addressed to terminate in Laredo or in the Valley.

Q2: Mayor Saenz – Who is paying you to be here (public or private sector)?

A2: Steven Duong (AECOM) – The North Central Texas Council of Governments is paying for this study.

Q3: Commissioner Galo – What about autonomous vehicles regarding Guaranteed Transit?

A3: Steven Duong (AECOM) – Yes, Phase 1 is the traditional bus, and overtime would transition to a fleet of autonomous vehicles/buses platooning down the corridor.

Q4:* Commissioner Galo – *Are we really looking at Rick Perry's corridors?

A4: Steven Duong (AECOM) – This does have references to this idea but is not formally a spinoff. Part of the evaluation will be to look at what technologies work best in these areas.

Q5: *Mayor Saenz* – Are we contemplating using the I-35 Corridor as much as possible?

A5: Steven Duong (AECOM) – We aren't saying whether you should or should not use the I-35 corridor, but are looking at it in general to see if the I-35 corridor makes sense from an engineering perspective for these technologies considering speed, turn radius, and horizontal and vertical clearance. If the I-35 corridor does not make sense, we will look at other utility corridors.

Q6: Mayor Saenz – Are these technologies deployed in other places currently?

A6: Steven Duong (AECOM) – All the technologies exist in some form except for hyperloop which does exist technically, however only on a test track in Nevada right now built by Virgin 500-meter test track in which the system is currently operating at about 230 miles an hour. They are currently considering Texas, Missouri, and the Midwest for a five-mile certification test track so that it can certify the technology for deployment. There is also a test track in construction outside of Paris, France. High speed rail and maglev operate everywhere in the world. China has probably likely the most expansive system and Japan is the producer of that technology. Amtrak and regional rail occur everywhere.

Statement: Mayor Saenz – We would be interested in all technologies.

Q7:* Commissioner Galo – *Why wouldn't high speed rail be used for freight?

A7: Steven Duong (AECOM) – There are a couple of different reasons. Maglev technology for example would be impacted by load bearing weight from cargo. It could possibly be used for "just in time" or "high value time deliveries", but traditional cargo would be too heavy. Traditional high-speed rail also requires an exclusive track, closed loop ROW, and does not do well in a true multi-modal ROW. Could it be done? Yes, but has not been done yet.

***Statement: Commissioner Dr. Martinez** – I think as we go through this process and you start to eliminate areas or technologies that are not viable, that would be a much better time for us to speak on what technologies we would like to see. Obviously, we want to see all of the results, but if you are going to take four of these away because they don't work in that I-35 corridor then that's a little premature for us to be telling you what we would prefer. I would say that anything that would allow connectivity between our area and the rest of Texas and Oklahoma into Mexico we would welcome. This would help open our borders up and increase commerce, and we would love to see that our constituents could be able to travel throughout Texas, Oklahoma, Arizona, and all the way to Canada, quickly. We would welcome any one of these technologies.*

Q8: Steven Duong (AECOM) – At this time, you could help shape our study by discussing a few preferences. For example, do you have a specific preference, depending on the technology, for an urban core station or a core station on the periphery? These items potentially change the way that we score some technologies as being viable.

A8: Commissioner Dr. Martinez – We are a tale of two cities. We have so many options with quick travel for commuters, but we're also trade. When you talk about trade, that would probably be on the periphery some where the station wouldn't interfere with our traffic patterns, but we're talking about commuter trains and I think some area densely populated would do it with travel to park and then use that rail for whatever vacations or whatever we wanted probably be appropriate. We must consider passenger and freight options because we have both. anybody else has any

Series Two Meeting Schedule

Meeting Name	Meeting Location	Meeting Date	Meeting Time	Attendees	Reference Page
NCTCOG MPO Meeting	Burleson City Hall 141 W. Renfro Street Burleson, TX 76028	October 29, 2019	10 a.m.	*4*	*94*
Waco MPO Policy Board and Technical Committee Meeting	South Waco Community Center 2815 Speight Avenue Waco, TX 76711	November 21, 2019	2 p.m.	*	97
Central Texas COG Policy Board Meeting	Central Texas Council of Governments 2180 N. Main Street Belton, TX 76513	November 20, 2019	9:30 a.m.	*13*	102
CAMPO Stakeholder Meeting	CAMPO Office 3300 N. Interstate 35 Austin, TX 78705	November 19, 2019	9 a.m.	7	106
CAMPO Transportation Policy Board Presentation	University of Texas Thompson Center, 2405 Robert Dedman Drive Austin, TX	December 9, 2019	6:00 p.m.	7	106
Alamo Area MPO TAC Workshop	WebEx meeting	November 8, 2019	1:30 p.m.	19	107
Alamo Area MPO Transportation Policy Board Meeting	Via Metro Center 1021 San Pedro San Antonio, TX 78212	December 9, 2019	1:30 p.m.	19	107
Laredo Urban Transportation Study Technical Committee Meeting and Laredo MPO Policy Committee Meeting	Laredo City Hall 1110 Houston Street Laredo, TX 78040	December 10, 2019	2:30 p.m.	11	112

*Attendee numbers were not recorded for this meeting.

North Central Texas Council of Governments – Series 2 Meeting Agenda

N/A

North Central Texas Council of Governments – Series 2 Meeting Summary

Meeting Minutes- North Central Texas Council of Governments (NCTCOG)
October 29, 2019.

Summary

Welcome & Introductions: Kevin Feldt, AICP, Program Manager, NCTCOG

Study purpose—taking what TxDOT initially did and expanding on the analysis,
Hyperloop technology was not available when TxDOT did the study.

Published RFP on Oct. 18 for FW to Arlington to Dallas. Study Phase 1 completion is expected in May, 2020. Study recommendations will be presented to the Texas Transportation Commission for consideration.

The FW-to-Laredo route roughly parallels IH 35. Laredo is a pathway to Mexico (Monterey). Ridership virtually doubles by going into Mexico.

More background information is available at www.nctcog.org/hsr.

Hyperloop has the ability to have much smaller vehicles where you can stop at various points. The fare structure and available features would be similar to an airline, i.e., first class, coach, etc. Hyperloop would take an estimated 48 minutes to travel from Dallas to Laredo vs 9 hours to drive.

Hyperloop's small pods hold 35 people, where trains have to stop at each station, making hyperloop flexible, faster, and available on demand. At a DFW event in August, the hyperloop vehicle was on display.

Presentation: Steven Duong, AICP, Project Manager, AECOM

Methodology: TOPRS recommended high speed rail along a set group of corridors.
Screening was conducted for city pairs and technology, using factors such as compatibility, performance, maturity of technology, passenger experience, etc.

Preliminary Findings: Chart in presentation comparing travel times of the various technologies (Hyperloop, Maglev, HSR) to driving and flying.

Kevin said the Hyperloop might offer more possibilities for stations in smaller communities rather than the limited stations that optimize maglev and HSR.

There is no requirement for TSA at this time. There may be similar security to getting on a Greyhound bus. A bill is in the works to require more security, possibly metal detectors or TSA screening.

Aaron Russel of Burleson asked how the dwell time is reduced if security is the same. Kevin responded that no luggage check would reduce dwell time. Colleen Zwiebel added that dwell time will be reduced by the facilities being built for the required level of security rather than being retrofitted.

Older studies assumed HSR— this study applied different technology to old assumptions. Possibility of using highway corridors, freight corridors, and utility corridors.

Hyperloop is the only one compatible with highway routes, but a lower speed would be required. None of the technologies could use existing railroad tracks. All could feasibly follow utility corridors. Hyperloop scored highest for all stops, followed by maglev. All scored highest on the utility corridor.

Technology maturity--Hyperloop is new/unproven system. There is a test track in Las Vegas. The upside is substantial. Hyperloop is the only mode that offers a co-benefit for the freight industry.

Findings: Hyperloop with potential stops at FW, Waco, Killeen/Temple, Austin, SA, Laredo, following utility corridor from FW to Waco, IH-35 from Temple to SA, greenfield from SA to Laredo.

The study supplements the TOPRS recommendations with new corridors and new technology.

<u>Questions & Answers</u>

Kevin said the technologies operate differently. Running freight could lessen cost for passengers. Hyperloop could allow more station opportunities rather than just having access in larger cities.

Aaron Russell pointed out the challenge of making it quicker than driving when you consider travel to station, parking, etc. Steven responded that hyperloop travels direct to your station. It is always point-to-point.

All-private sector development is anticipated for Hyperloop. Richard Branson (Virgin Air) has put money into a test facility. There is a question of how much local participation we would have.

Infrastructure would also need to be provided by private sector. It might be like a tollway.

There is a new council on emergent technologies. TxDOT appointed a commission to oversee but not spend money. It has not met in 5 years.

The team is trying to identify a local government corporation for construction between Dallas and FW, then someone else to operate it.

There is also the possibility of foreign investors.

This should be a state-level project. If the commission does not approve it, the MPOs affected will have to move it forward.

Dallas/FW ridership does not justify HSR/hyperloop between the cities, but a connector is needed to the new system.

Southwest Airlines and American Airlines are not opposed to this technology because short flights are not their main focus anymore. There was resistance from them in the 80s and 90s.

Mike Mann (Cleburne) pointed out that the ability to add a freight option would speed up the construction process. Kevin said that freight could even go before passengers because of lower security required. Freight would also reduce the cost to passenger.

Aaron Russell said getting freight off of 35 would be a huge benefit.

Mike Mann said there are still questions about funding and right of way. Not all would benefit, and access is not available to all.

The meeting concluded at 11:30.

North Central Texas Council of Governments – Series 2 Meeting Attendance

Attendees:

- Jeremy Hutt-City of Cleburne
- Mike Mann-City of Cleburne
- Aaron Russell-City of Burleson
- Lorri Kennedy

Waco MPO – Series 2 Meeting Agenda

Waco Metropolitan Planning Organization

THE STATE OF TEXAS
COUNTY OF McLENNAN

This is to certify that the Notice of a Meeting, a copy of which is attached hereto, was posted on the official bulletin board at the Courthouse, as required by Article 62.52-17 V. T. C. S.

Executed on 11-12, 2019

J. A. "Andy" Harwell, County Clerk
McLennan County, Texas

By ______ Deputy

NOTICE OF PUBLIC MEETING

POLICY BOARD OF THE WACO METROPOLITAN PLANNING ORGANIZATION, TECHNICAL COMMITTEE OF THE WACO METROPOLITAN PLANNING ORGANIZATION, AND THE CITY COUNCIL OF THE CITY OF WACO, TEXAS

2:00 P.M. Thursday, November 21, 2019

South Waco Community Center
2815 Speight Ave
Waco, Texas

AGENDA

In accordance with requirements identified in Section 551.007 of the Texas Government Code, the public is permitted to address the Policy Board regarding any action or discussion item identified on this agenda.

I. **Call to Order, Proof of Posting.**

II. **Approval** of the September 19, 2019 meeting minutes.

III. **Presentation** to the Waco MPO Policy Board the 2019 National Award for Outstanding Overall Achievement for a Non Transportation Management Area by the Association of Metropolitan Planning Organizations.

IV. **Review and Discussion** regarding the draft of Connections 2045: The Waco Metropolitan Transportation Plan.

V. **Presentation and Discussion** regarding draft consultant recommendations for the Fort Worth to Laredo High Speed Transportation Study.

VI. **Discussion and Updates** from the Texas Department of Transportation regarding significant highway construction within the Waco Metropolitan Area.

P.O. Box 2570, Waco, TX 76702-2570
(254) 750-5650
www.waco-texas.com/cms-mpo
mpo@wacotx.gov

VII. **Directors Report**

A. **Request** for agenda items to be considered for future meetings.

   A. Next Meeting January 17, 2020
   B. Adoption of Connections 2045: The Waco Metropolitan Transportation Plan

VIII. **Public Hearing** of visitors regarding any item of MPO business*

IX. **Adjournment.**

*The Policy Board cannot respond to comments received during the public hearing regarding items of business not specifically identified on this agenda.

Persons with disabilities who plan to attend this meeting and who may need auxiliary aids or services should contact the MPO at (254) 750-5650 at least twenty-four (24) hours before this meeting so that appropriate arrangements can be made.

I hereby certify that this agenda was posted on the bulletin board at the McLennan County Courthouse, Waco, Texas on the 12th day of November, 2019 at 12:15pm.

Christopher Evilia, AICP
Director

Si gustaría abordar al comité representativo de la Organización de Planeación Metropolitana en una reunión publica y necesita un intérprete, sírvase llamar a Diane Cano por lo menos 24 horas de antemano de la reunión anunciada al número telefónico 254-750-5650.

Si necesita información adicional o una traducción de este documento, dirija su solicitud por correo a la Organización de Planeación Metropolitana a este numero telefónico: 254-750-5650, o por correo esta dirección: P.O. Box 2570 Waco, Texas 76702.

Waco MPO – Series 2 Meeting Summary

Excerpts from Waco MPO—November 21, 2019 Meeting Notes:

Background:

- The Waco MPO, along with 5 other MPOs along the IH-35 corridor, jointly agreed to conduct a study of potential high speed transportation options from Fort Worth to Laredo. AECOM was selected for consultant assistance.
- The intent of the study is to provide recommendations regarding the following:
  - Potential service corridors within each MPO area
  - Potential station locations within each MPO area
  - Identify the feasibility of different service technologies including Hyperloop
- After receiving input from each region earlier this year, AECOM completed a set of draft recommendations and is in the process of presenting those to each MPO Policy Board that is participating in the study.

Presentation:

- Mr. Steven Duong, Urban Planner from study consultant, AECOM, summarized the consultant's analysis and preliminary findings.
  - Hyperloop technology stopping at all identified cities ranked as the highest technology and alignment combination along the IH-35 Corridor.
    - Potentials stops: Fort Worth, Waco, Killeen/Temple, Austin, San Antonio, and Laredo
  - Recommended alignment generally follows:
    - Traveling south from Fort Worth to Waco generally following a Utility Corridor
    - From Temple to San Antonio, generally following IH-35
    - From San Antonio to Laredo in a greenfield corridor

Discussion was concentrated on the following topics:

- Hyperloop technology and operation - Methodology behind speeds, dwell times, and security clearance periods used in analysis for Hyperloop technology, competition for location of 6-mile Hyperloop test facility in the US, and expected timeframe for results from test facilities already being constructed in other countries.
- How chosen technology gets funded – No way to determine yet but can look to the privately funded Texas Central rail project between Dallas and Houston, and Maglev and High Speed Rail (HSR) projects in other states.

Waco MPO – Series 2 Meeting Attendance

MPO Policy Board
Thursday, November 21, 2019
South Waco Community Center
Large Conference Room, 2:00 p.m.
2815 Speight Avenue, Waco, Texas

Waco Metropolitan Planning Organization

Summary Notes DRAFT

Policy Board Members Present:

Mr. Jacob Bell, P.E.	Citizen Representative, City of Waco
Mr. Keith Bond	City Manager, City of Lacy Lakeview
Hon. Kyle Deaver	Mayor, City of Waco
Hon. Bert Echterling	Mayor, City of Robinson
Mr. Kevin Evans	City Manager, City of McGregor
Hon. Jim Holmes	Council Member, City of Waco
Hon. Jim Jaska	Mayor, City of Ross
Hon. Dillon Meek, Proxy for Hon. John Kinnaird	Council Member, City of Waco
Ms. Barbara Maley, Ex-Officio Member	Transportation Planning Coordinator/Air Quality Specialist Federal Highway Administration – Texas Division
Hon. Dillon Meek	Council Member, City of Waco
Dr. Shawn Oubre	City Manager, City of Woodway
Mr. Hector Sabido	Council Member, City of Waco
Mr. Stan Swiatek, P.E.,	District Engineer, Texas Dept. of Transportation, Waco District
Mr. Everett "Bo" Thomas	City Manager, City of Hewitt

Policy Board Members Absent:

Hon. Scott Felton	County Judge, McLennan County
Mr. Bradley Ford	Assistant City Manager, City of Waco
Hon. Travis Gibson	Council Member, City of Bellmead
Hon. Will Jones	County Commissioner, Pct. 3, McLennan County
Mr. Joseph R. Pace	City Manager, City of Lorena
(Vacant)	Plan Commission, City of Waco

Technical Committee Members Present:

Ms. Christi Bonham	Planner, Texas Dept. of Transportation, Waco District
Ms. Amy Burlarley-Hyland	Interim Director, Public Works, City of Waco
Mr. Thomas Dahl	City Engineer, City of Waco
Mr. Mitch Davison	City Engineer, City of Woodway
Chief Tom Dickson	Chief of Police, City of Lorena
Mr. Zane Dunnam	County Engineer, McLennan County
Mr. Joseph Dvorsky	Director, Service Development, City of Waco, Waco Transit Systems, Inc.

Ms. Brigida Gonzales	Planner, Regional Planning & Programming, Transportation Planning and Programming Division, Texas Dept. of Transportation
Mr. Jeff Jackson	Assistant Area Engineer, Texas Dept. of Transportation, Waco Area Office
Mr. Francisco Leos	Citizen Representative, City of McGregor
Mr. Clayton Zacha	Area Engineer, Texas Dept. of Transportation, Waco Area Office

Technical Committee Members Absent:

Mr. Anthony Beach	Consultant / President, BSP Engineers, Inc., City of Bellmead Representative
Ms. Leola Davis	Transportation Director, Meals on Wheels
Mr. Victor Goebel	Director, Transportation Planning and Programming Division, Texas Dept. of Transportation, Waco District
Hon. David Gonzalez	Mayor, City of Beverly Hills
Mr. Joel Martinez	Airport Manager, City of Waco
Mr. Karl McNair	Associate Vice President, Real Estate Operations & Campus Services, Baylor University
Mr. Matt Meadors	President / CEO, Greater Waco Chamber of Commerce
Mr. Clint Peters	Director, Planning Services, City of Waco
Ms. Serena Stevenson	Assistant General Manager, City of Waco, Waco Transit Systems, Inc.
Ms. Debbie Tahiri	Public Transportation Coordinator, Texas Dept. of Transportation, Waco District

Staff Present:

Mr. Christopher Evilia, AICP	Director, Waco MPO
Ms. Chelsea Phlegar, AICP	Planner, Waco MPO
Ms. Annette Shepherd	Planner, Waco MPO

Others Present:

Ms. Jessica Attas	Vice President, Public Policy, Greater Waco Chamber of Commerce
Mr. Lenny Caballero	Assistant City Manager, City of Woodway
Mr. Jack Compton	Waco Area Resident
Mr. Mike Copeland	Business Editor, Waco Tribune-Herald
Mr. John Deaver	Waco Business League
Mr. Steven Duong	Urban Planner, AECOM
Mr. Bill Frawley	Texas Transportation Institute, Texas A&M University
Ms. Brittney Gick	Texas Transportation Institute, Texas A&M University
Ms. Leigh Hornsby	Principal Partner, Public Information Associates
Mr. Brenton Lane	Planning & Programming Engineer, Texas Dept. of Transportation, Waco District
Mr. Ken Roberts	Public Information Officer, Texas Dept. of Transportation, Waco District

Killeen Temple MPO – Series 2 Meeting Agenda and Summary

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Killeen-Temple Metropolitan Planning Organization
Transportation Planning Policy Board (TPPB)
Wednesday, November 20, 2019
Central Texas Council of Governments Building
2180 North Main Street, Belton, Texas 76513

Regular Meeting: 9:30 A.M.
AGENDA

1. Call to Order.
2. Opportunity for Public Comment.
3. Staff Update: Advisory Committees; Air Quality.
4. **Action Item**: Regarding approval of minutes from October 23, 2019 meeting.
5. **Action Item**: Approve Resolution 2020-01 supporting Complete Streets in the KTMPO region.
6. **Discussion Item:** Update on the Fort Worth-Laredo High Speed Transit Study.
7. **Discussion Item:** Update on FY19 Special Studies.
8. **Action Item**: Approve proposed FY20 Special Studies.
9. **Discussion Item:** Regarding public input received through October 31, 2019.
10. Member comments.
11. Adjourn.

Workshop - To Follow Regular Scheduled Meeting if Needed
AGENDA

1. Call to order.
2. Discussion on any of the following topics (if needed):
   a. Current or past KTMPO documents and plans to include Unified Planning Work Program, Transportation Improvement Program, By-Laws, Public Participation Plan, Regional Thoroughfare/Bicycle Pedestrian Plan, Metropolitan Transportation Plan, Congestion Management Process, Annual Performance Expenditure Report, Annual Project Listing, Texas Urban Mobility Plan, Unified Transportation Plan, Federal Certification Process; b. Past or Future KTMPO Meeting processes or happenings; c. KTMPO Current, Past or Future MPO Boundary Studies; d. KTMPO Past or Future Annual Meetings; e. Current, Past or Future KTMPO Budgets and funding conditions; f. Rural Planning Organizations and/or Regional Mobility Authorities; g. Special Funding for Projects; h. Legislative Changes; i. Status of MPO Projects; j. Staff, TxDOT, Consultant, Guest presentations relating to transportation; k. Meetings pertaining to any transportation related items/topics.
3. Adjourn.

A8: Mayor Saenz – Our interest would be heightened if Mexico is incorporated somehow because we do business both ways.

A8: Commissioner Dr. Martinez – We recognize the limit of your study is here, but we are international city and so we have to think about everything given Mexico.

Statement: Steven (AECOM) – From this discussion, we will try and place a special emphasis on a scoring criterion that talks about the ability of flexibility the system to continue south of the border regardless of where in Laredo the station is located.

***Statement: Commissioner Dr. Martinez* – We also have potential security issues and need to incorporate Transportation, Security, Border Patrol, and everybody else just to make sure that as people are traveling internationally, security is incorporated, potentially like an airport. We are very unique and different than other areas that you will be studying.**

Statement: Mayor Saenz – As this is opened to investors, Mexico has an inherent interest in participating.

Q9 Steven Duong (AECOM): In some of these potential locations, would you want some of these stations collocated (passenger and freight)?

A9: Commissioner Galo – It needs to be separate due to some of the public's frustration with current transportation issues.

A9: Commissioner Dr. Martinez – I do believe that you're talking about two separate things. The separate stations could potentially come back to one corridor. We have different viable economies there one is that the economy of people and the other is the economy of people. These need to be separated out because it will take a long time to process freight versus passengers.

A9: Commissioner Galo – You could separate these out like airport traffic where the public and freight come in on different sides.

A9: Mayor Saenz – We need to consider pre- and post-clearance items.

A9 Commissioner Dr. Martinez – Laredo also has dual customs with the ability to have pre-clearance for the rest of the United States. There are a lot of reasons why I think Laredo should be the choice just so you're aware.

***Committee Discussion** – We have two different economies here: transportation of people that are visiting both into Mexico and into the States. There is a lot of tourism, but then there's also freight, so it would be difficult to be able to have a lot of 18 wheelers dropping off freight inside a suburban area. I think it would be a planning nightmare for Mr. Snideman on how to get trucks in and out of this area without having problems.*

Mr. Duong thanked the Policy Committee for the opportunity to present and that we'll be keeping them informed as we go throughout the process. He asked for feedback to incorporate as early as possible to help shape our analysis.

Killeen Temple MPO – Series 2 Sign-in Sheet

KTMP
KILLEEN-TEMPLE
metropolitan planning organization

Please Sign In

Policy Board Meeting
November 20, 2019
9:30 a.m.

Policy Board Members

Voting Members		(Please Initial)	Alternates	(Please Initial)
Cities				
Belton:	Mayor Marion Grayson	YMG	Sam Listi Cheryl Maxwell	Cm
Copperas Cove:	Mayor Bradi Diaz		Ryan Haverlah Dan Yancey	
Harker Heights:	Mayor Spencer Smith		David Mitchell Joseph Molis	
Killeen:	Mayor Jose Segarra		Councilmember Jim Kilpatrick	
	Councilmember Butch Menking		None	
	Councilmember Gregory Johnson		Councilmember Shirley Fleming	
Temple:	Chair Tim Davis		Lynn Barrett Brynn Myers Brian Chandler Jason Deckman Erin Smith	
	Councilmember Susan Long		Erin Smith Brynn Myers Jason Deckman	
Hill Country Transit:	General Manager Carole Warlick		Darrell Burtner	DWB
Counties				
Bell:	Judge David Blackburn		Commissioner Bobby Whitson	
Coryell:	Judge Roger Miller	RAM	None	
Lampasas:	Commissioner Mark Rainwater		Robert Carroll	
TxDOT				
Waco District:	Stan Swiatek, PE		Victor Goebel, PE Liz Bullock	
Brownwood District	Elias Rmeili, PE		Jason Scantling, PE	
Non-Voting Members				
Fort Hood:	Brian Dosa	BLD		
FHWA—TX Division:	Justin P. Morgan			

KTMPO KILLEEN-TEMPLE metropolitan planning organization

Please Sign In

Policy Board Meeting
November 20, 2019
9:30 a.m.

Additional Attendees

	Name	Organization	E-mail or Telephone
1.	Steven Duong	AECOM	steven.duong@aecom.com
2.	Brigida Gonzalez	TXDOT	brigida.gonzalez@txdot.g
3.	Bobby Lewis	Copperas Cove	rlewis@copperascovetx.gov
4.	Christi Barham	Waco District TxDOT	Christi.Barham@TxDot.gc
5.	Brenton Lane	TXDOT	brenton.lane@txdot.gc
6.	Keith Sledd	HOTDA	keith.sledd@hotda.org
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			

Capital Area MPO – Series 2 Meeting Agenda

N/A

Capital Area MPO – Series 2 Meeting Summary

No meeting summary. Project presentation was part of a larger agenda and discussion was limited.

Capital Area MPO – Series 2 Meeting Attendance

Attendees:

- Chad Coburn (TxDOT)
- Mark Werner (TxDOT)
- Doise Miers (CAMPO)
- Shirley Nichols (TxDOT)
- Ashby Johnson (CAMPO)
- Chad McKeown (CAMPO)
- Anna Lan (Williamson County)

Alamo Area MPO TAC WORKSHOP – Series 2 Meeting

This meeting occurred via WebEX, the project team introduced and presented the study as part of a larger TAC workshop meeting. After presentation, no additional discussion occurred.

Alamo Area MPO Transportation Policy Board Meeting – Series 2 Meeting Agenda

N/A

Alamo Area MPO – Series 2 Meeting Summary

2019 HST Alamo Area MPO Transportation Policy Board Meeting
VIA Metro Center – Community Room
1021 San Pedro Avenue, San Antonio, Texas
December 9, 2019
1:30 p.m.
Meeting Notes
HST Presentation (attached)
Sign in Sheet (attached)

Information was presented by Steven Duong, AECOM. Notes were taken by Kari Anne Sutton, Poznecki-Camarillo, Inc.

The presentation provided is attached.

The meeting was recorded on video. The agenda is attached and the link to the full meeting and presentation are provided below.

Full agenda and meeting package:
http://www.alamoareampo.org/Committees/TPB/docs/TPB_Package.pdf

Full video link: http://alamoareampo.swagit.com/play/12092019-801

Item 6 (Presentation) link: http://alamoareampo.swagit.com/play/12092019-801

Mr. Sid Martinez, Director of AAMPO, introduced Steven Duong (AECOM). Mr. Martinez explained that this study is a follow up to the TOPRS study that resulted in no activity following. Mr. Martinez said that other technologies are being studied by this study led by NCTCOG (with input from six COGS up and down the corridor) to see what technologies are feasible as well as stakeholder interest along the corridor. Mr. Duong reviewed the agenda, purpose, background, overall technologies, what question is trying to be answered, and preliminary findings and evaluations. He explained that this study is a bridging study to help fill the gap since the TOPRS study and review other technologies.

Technology examined for that study was high speed rail. This study provides additional research on high speed transportation technologies. He reviewed the scheduled stating that the final report will be available in early 2020. He described the methodology and three methods of screening analysis including city pairings, technology, and offering opinions for how these technologies may play out real world. Travel savings compared to driving and flying were also presented. Travel time savings compared to driving and flying include platform dwell times (30 min). The study found similar savings for travel, except for flying from Laredo to Fort Worth may not have as much savings compared to conventional travel methods. Primary technology modes provide at least 50% savings in time compared to driving time. He finished the presentation by summarizing with the recommendation that should the state of Texas continue with this study, adding technology to the study would be beneficial since there is a large benefit with higher speed transportation technologies to the traveling public.

Mr. Duong offered to answer any questions and thanked the Board for the time to present information.

Question: Who funded the study?

Answer: North Central Texas Council of Governments

Mr. Sid Martinez stated that the AAMPO may contribute funds to the study in the amount of approximately $200,00.

Question: Did the study look into financial needs and how the Dallas to High Speed Rail compares to this?

Answer: Financial analysis was not reviewed in detail. The study team looked at expected performance on a per mile per value basis. The cost cannot be predicted due to the technologies not being built out yet. The team looked at the best industry numbers available.

Question: Did the study look at Mexico into Monterrey?

Answer: We stop at the border, but we held the perspective of a statewide system and the benefit into traveling into Mexico. The transportation would be freight and passenger for hyperloop which would be important for the relationship between Mexico and the U.S.

Question: Have you presented to other MPOs?

Answer: Yes, and we have a few more presentations to make. Our ask is level of interest and which technology are you most interested in.

Question: How do we connect the study to reality?

The first step and the scope of this study is to look at the recommendations out of TOPRS and determine if initial technologies should be added.

Question: How do we provide information on technologies that don't exist? Will funds be raised?

Answer: There are discussions with technology companies about funding.

Question: How do you describe the technology to the public? It's not like a Disneyland ride that is already built that you can ride.

Answer: The feeling is more like an airplane flying w/out wings. Additionally, many cities are trying to win the chance for the building of a 6- mile test track.

Comment of concern about the I-35 corridor.

Comment to be cautious about funding a study for something that may never happen.

Question: How many are in operation internationally?

Answer: Most extensive system is in China which has a goal of trying to connect cities at least 2 hours apart. Japan and France also have high speed rail.

Comment: Maglev has design criteria that fits corridors better. Time savings benefit and electrification build the score. Maglev can have more stops. The scores for Maglev and High-Speed Rail were very close. Part of the study was the infill technologies that may help with low scores between some cities.

Question: Is dwell time considered at each stop?

Answer: Yes, but best-case dwell time is used, which is similar to Amtrak times now. The Hyperloop is good because of there is an Express Tube/Pod or Train that goes from point A to point B with no in between stops.

Comment: Much discussion surrounded cost and the need for parametric costing and being cautious about funding something where no cost estimate is provided.

Mr. Duong stated that the study has very high-level cost estimates, however there is still no real cost as the technology has not yet been built in the US.

Comment: The process to decide if the TPB would assist with funding the study was discussed. Mr. Martinez said that the contribution to the study has passed the Executive Committee.

Questions were asked within the TPB if a steering committee was in place for the study. Mr. Martinez-explained that AAMPO helped with consultant choice and have had two presentations to the TAC.

Comment: There is pause about eliminating 3 technologies that could actually be used here to connect cities with real costs.

Mr. Duong clarified the statement and said that no technologies had been eliminated and that the study investigates all technologies, but this is a high-speed transportation study.

Comment: This is important for real estate and there is a cost for not planning on doing anything. Other countries are moving fast and we need to innovate. We can't do nothing. This is much cheaper than flying and has been proven in many studies.

Comment: Costs will be very important and need to be understood going forward or this is not very useful.

Closing remarks by the Chair of the TPB were to look at two things: 1) Look at ROW regardless of type is a cost that can be estimated, 2) There must be a way to get an average cost per mile per technology. These two items are very important and as officials we need to have costs to help focus us as policy advisors and how we want to spend money moving forward.

Alamo Area MPO – Series 2 Meeting Attendance

Alamo Area MPO
Roll Call Attendance

Meeting Date: 12/09/19

TPB Members	Agency	In attendance Yes	In attendance No
Ms. Jordana Matthews (Mayor Louis Cooper)	Advanced Transportation District		✓
Mr. Michael J. Lynd, Jr.	Alamo Regional Mobility Authority	✓	
Commissioner Tommy Calvert	Bexar County		✓
Ms. Renee Green, P.E.	Bexar County		✓
Commissioner Sergio "Chico" Rodriguez	Bexar County		✓
Commissioner Kevin A. Wolff (Chair)	Bexar County	✓	
Mayor Pro Tem Wayne Peters (Councilmember Justin Mead	City of New Braunfels	✓	
Councilwoman Melissa Cabello Havrda	City of San Antonio	✓	
Councilwoman Shirley Gonzales	City of San Antonio		✓
Councilman Clayton Perry	City of San Antonio	✓	
Councilwoman Ana E. Sandoval	City of San Antonio	✓	
Mr. Arthur Reinhardt, P.E., CFM (Mr. Razzi Hosseini, P.E., R	City of San Antonio	✓	
Ms. Bridgett White (Mr. Rudy Niño)	City of San Antonio	✓	
Mayor Don Keil (Ms. Betty Ann Matthies)	City of Seguin	✓	
Commissioner Kevin Webb, Vice Chair (Commissioner Scot	Comal County	✓	
Mayor Chris Riley (Ms. Cheryl Landman)	GBCCC	✓	
Judge Kyle Kutscher (Commissioner Jim Wolverton)	Guadalupe County	✓	
Commissioner Christina Bergmann (Mr. Jeff Haberstroh)	Kendall County Geographic Area	✓	
Councilman Kevin Hadas (Mayor Mary Dennis)	Northeast Partnership	✓	
Mr. Mario Jorge, P.E. (Mr. Rick Castañeda)	TxDOT	✓	
Mr. Ezra Johnson (Ms. Kristi Villanueva)	VIA Metropolitan Transit	✓	
Non-voting members in attendance:			
Ms. Diane Rath	Alamo Area Council of Governments	✓	
Mr. Kirk Fauver	Federal Highway Administration		✓
Mr. Tony Ogboli	Federal Transit Administration		✓
Mr. Vic Boyer	San Antonio Mobility Coalition	✓	
Mr. Nick Page	Texas Department of Transportation		✓
Mr. Jeff Arndt	VIA Metropolitan Transit	✓	

Chair we have/do not have a quorum
(need 11/21)

Laredo MPO – Series 2 Meeting Agenda and Summary

2019 HST Laredo MPO Technical Committee Meeting
December 10, 2019, 2:30 p.m.
Laredo City Hall, 1110 Houston St, Laredo, TX 78040
Microsoft Teams Meeting/Web Conference
Committee Meeting Notes

Attendees: see attached sign-in sheet

Information was presented by Steven Duong, AECOM. Notes were taken by Kari Anne Sutton, Poznecki-Camarillo, Inc.

The presentation provided is attached.

Mr. Duong discussed his previous presentation of the Fort Worth to Laredo High Speed Transportation Study to the Policy Committee earlier in the year. Most attendees were familiar with that presentation. He reminded the group that this a bridging study building on the prior EIS done on TOPRS completed in 2017. Technology examined for that study was high speed rail. This study provides additional research on high speed transportation technologies. He described the methodology and three methods of screening analysis including city pairings, technology, and offering opinions for how these technologies may play out real world. Travel savings compared to driving and flying were also presented. Travel time savings compared to driving and flying include platform dwell times (30 min). The study found similar savings for travel, except for flying from Laredo to Fort Worth may not have as much savings compared to conventional travel methods. Primary technology modes provide at least 50% savings in time compared to driving time.

Mr. Snideman asked about security check timeframes compared to flying. Mr. Duong said that the study expects that security is a light screening compared to airport screening when looking internationally. Security would most likely be regulated under transportation rules, not FAA.

Mr. Duong continued the discussion after a short break in the call due to a loss of communication. He finished the presentation by summarizing with the recommendation that should the state of Texas continue with this study, adding technology to the study would be beneficial since there is a large benefit with higher speed transportation technologies to the traveling public.

Engaging the Technical Committee, Mr. Duong offered to answer any questions and thanked the Committee for the time to present information. He reviewed the scheduled stating that the final report will be available in early 2020. No questions were asked.

Laredo MPO – Series 2 Sign-in Sheet

Laredo Urban Transportation Study

LAREDO, TEXAS 1755

MPO Technical Committee Meeting
December 10th, 2019
City Hall 1st Floor Conference Room
2:30 p.m.

	Name	Title/Organization	Address	Email	Phone
1.	VANESSA GUERRA	MPO/COL	1110 SAN BERNARDO	vguerra@ci.laredo.tx.us	956-794-1604
2.	Angie Quijano	MPO	1120 San Bernardo	aquijano@ci.laredo.tx.us	794-1613
3.	Sara R Garza	TXDOT	1817 Bob Bullock Loop	sara.garza@txdot.gov	712-7780
4.	Omar Castilla	TXDOT	1817 Bob Bullock Loop	Omar.Castilla@txdot.gov	(956) 712-7726
5.	ROBERTO RODRIGUEZ	TXDOT	1817 Bob Bullock Loop	roberto.rodriguez@txdot.gov	956-712-7735
6.	Danny Magee	COL Traffic [redacted]	5512 Thomas	dmagee@ci.laredo.tx.us	(956) 795-2580
7.	Rosa Soto	El METRO	401 Scott	rsoto@ci.laredo.tx.us	956 7952250 ex 110
8.	Gloria P Saavedra	COL Eng	1110 Houston St	gsaavedra@ci.laredotx.us	956-791-7351
9.	LUIS PEREZ GARCIA	WEBB COUNTY	1620 Santa Ursula	lperezgarcia@webbcountytx.gov	956 523-4055
10.	Carlos D Garcia	UISD Planning	201 Lindenwood	cdgarcia@uisd.net	956 473-7974
11.	Claudia San Miguel	GM/EL METRO	1301 Farragut	cstmike675@gmail.com	(956) 286-0167
12.					

Appendix E: Stakeholder Presentation Content

This section provides the presentations given at stakeholder meetings.

4/22/2020

1

MEETING AGENDA

- Welcome and Introductions
- Project Background and Purpose
- Overview of Technologies
- Q & A
- Engagement Exercise

2

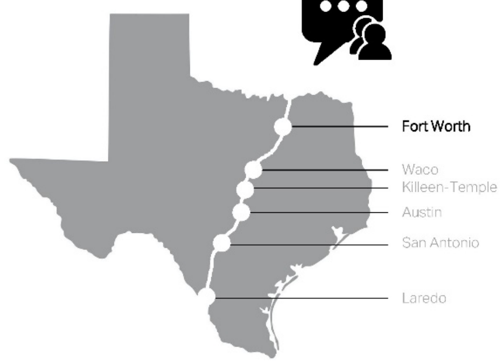
2

1

4/22/2020

MEETING PURPOSE

- **Follow up on the review of previous studies** and the **early assessment of technology.**
- Early assessment of **station spacing recommendations**
- Prioritize similarly and geographically scaled **perspectives**
- Target discussions geared toward **identifying opportunities and challenges** associated with a project of this scope.



3

3

WELCOME AND INTRODUCTIONS

North Central Texas Council of Governments
AAMPO
CITY OF WACO
CAMPO Capital Area Metropolitan Planning Organization Central Texas
CTCOG central texas council of governments
Laredo Texas

AECOM ARUP PIA ATG Alliance Transportation Group Poznecki Camarillo Inc Michael Baker International Continuum Industries

4

4

2

4/22/2020

IT'S ALL
ABOUT THE
NUMBERS

5

5

5/8

TOP **5** OF THE **8** FASTEST GROWING
CITIES IN THE UNITED STATES

US Census Bureau

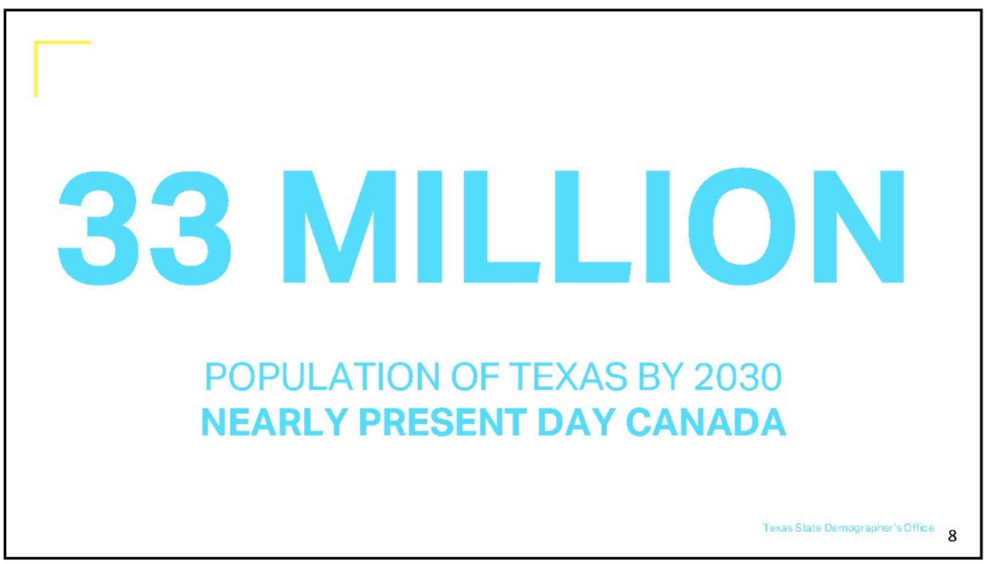
6

3

6

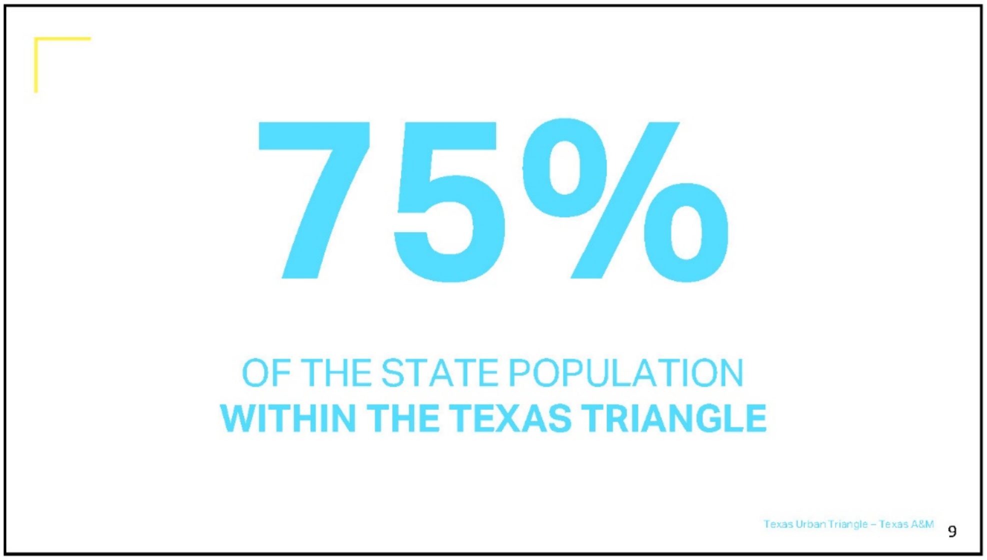

1,100
PEOPLE MOVE TO TEXAS **EVERY DAY**
www.sacurrent.com/the-daily/archives/2016/12/20/more-people-moved-to-texas-in-2016-than-any-other-state
7

7


33 MILLION
POPULATION OF TEXAS BY 2030
NEARLY PRESENT DAY CANADA
Texas State Demographer's Office
8

4

8


75%
OF THE STATE POPULATION
WITHIN THE TEXAS TRIANGLE
Texas Urban Triangle – Texas A&M
9

9


10th
LARGEST ECONOMY IN THE WORLD
$1.6 TRILLION GDP, LARGER THAN RUSSIA
Texas Governor Abbott, 2016
10

10

4/22/2020

PROJECT BACKGROUND

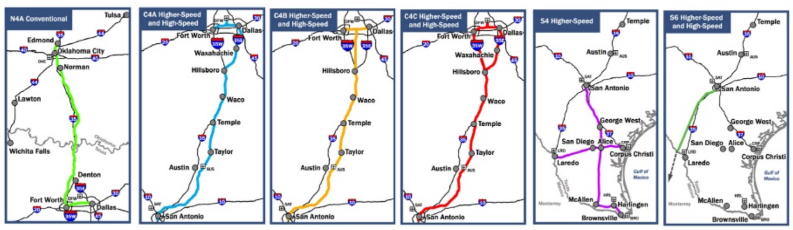
2017 — FRA publishes ROD and Tier 1 TOPRS FEIS

2019 — Current Study; Bridge to Tier 2 NEPA Study

2020

Future — Corridors to be evaluated further in Tier 2 NEPA Study

Tier 1 FEIS Corridors

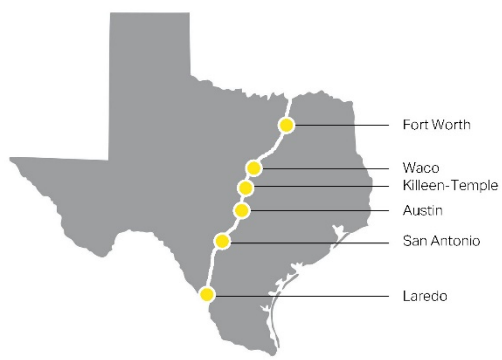


11

11

PROJECT PURPOSE

- The project purpose is to **conduct a High-Speed Transportation (HST) study** that connects Fort Worth, Waco, Killeen-Temple, Austin, San Antonio, and Laredo.
- It will **evaluate various technology options** and modes of travel.
  - Technology Neutral
- It will **recommend corridors** and potential station locations to include in future NEPA documents.

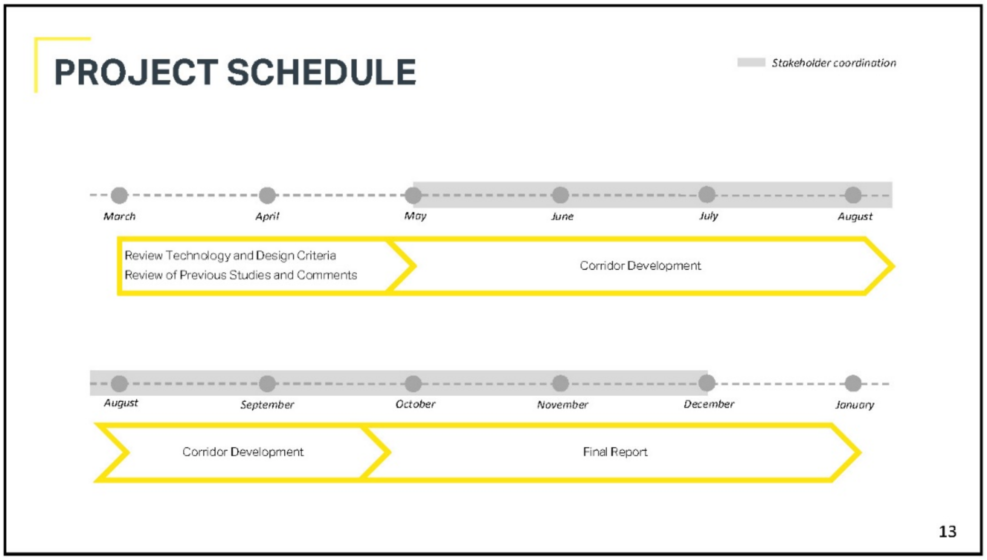


12

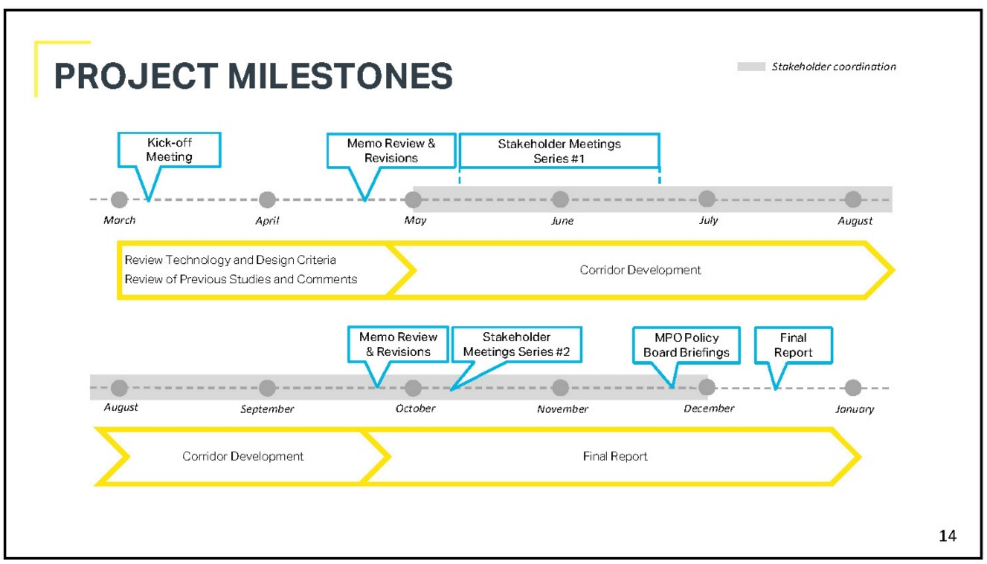
6

12

4/22/2020

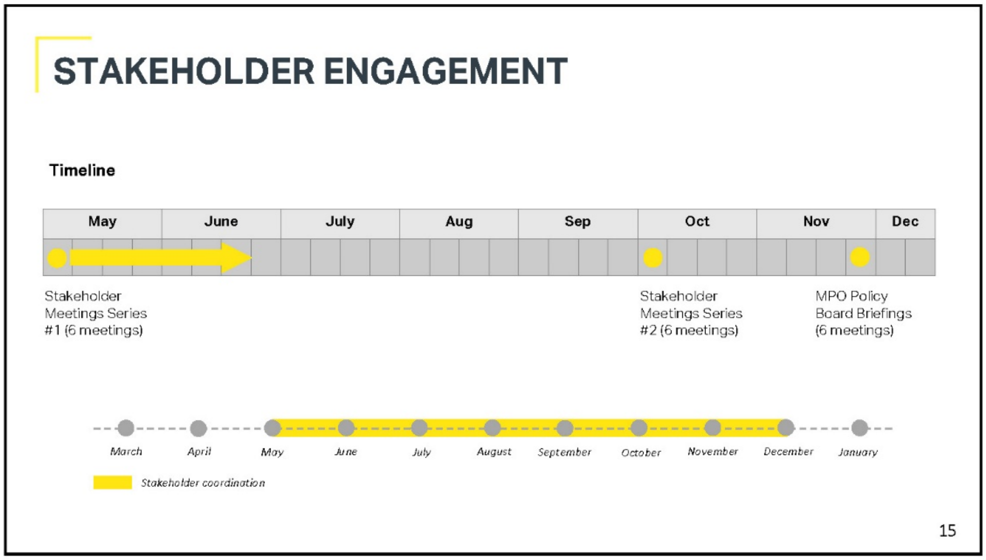


13

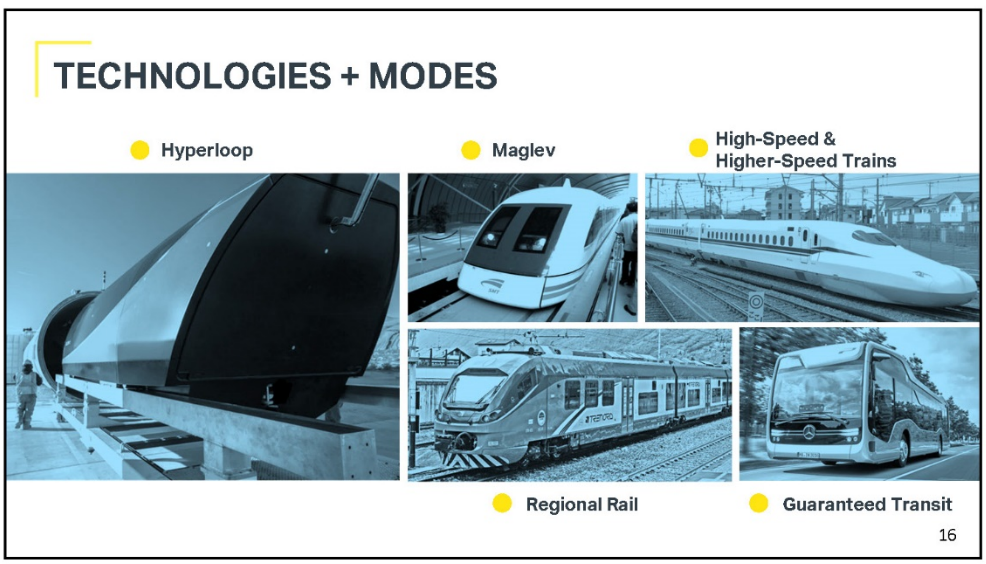


14

7


STAKEHOLDER ENGAGEMENT
Timeline
May
June
July
Aug
Sep
Oct
Nov
Dec
Stakeholder Meetings Series #1 (6 meetings)
Stakeholder Meetings Series #2 (6 meetings)
MPO Policy Board Briefings (6 meetings)
March
April
May
June
July
August
September
October
November
December
January
Stakeholder coordination
15

15


TECHNOLOGIES + MODES
Hyperloop
Maglev
High-Speed & Higher-Speed Trains
Regional Rail
Guaranteed Transit
16

16

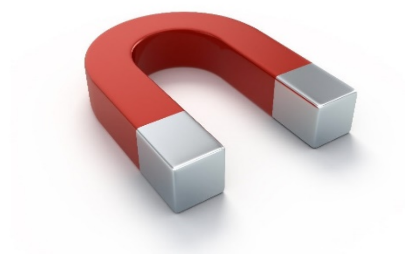
8

4/22/2020

17

9

18



19

19

RIDING HYPERLOOP

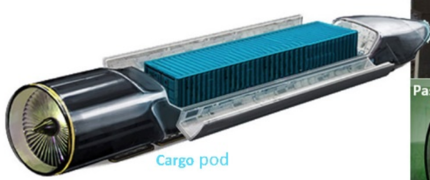
10

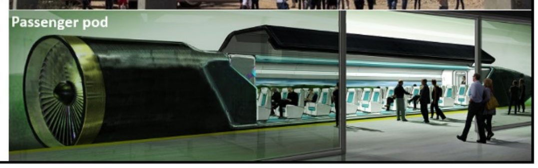
20

20

WHAT IS HYPERLOOP?

- New mode of transportation consisting of **moving** passenger or cargo vehicles through a **near-vacuum tube** using **electric propulsion**
- Autonomous pod levitates above the track and glides at **700 mph+ over long distances**





21

Sourced by: Virgin HyperloopOne

22

Sourced by: Virgin HyperloopOne

23

HOW DOES IT WORK?

Sourced by: Virgin HyperloopOne

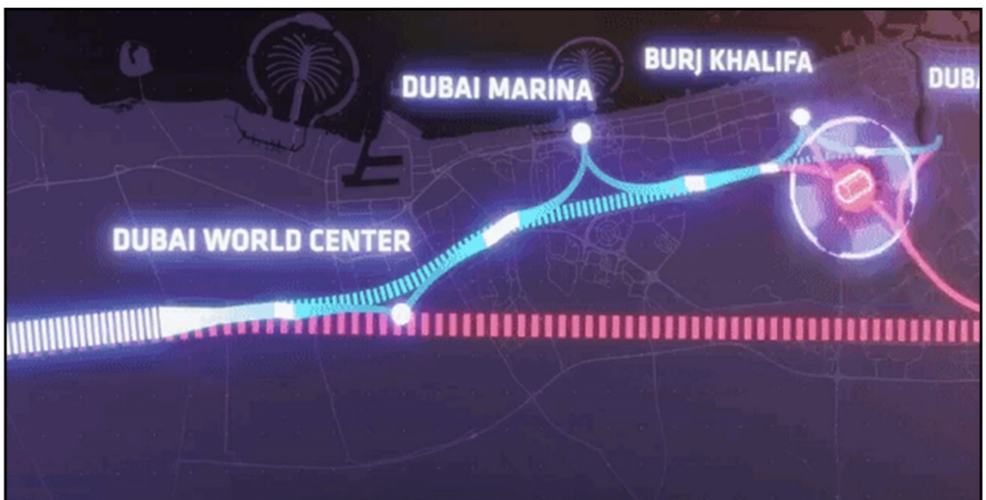
24

24

12

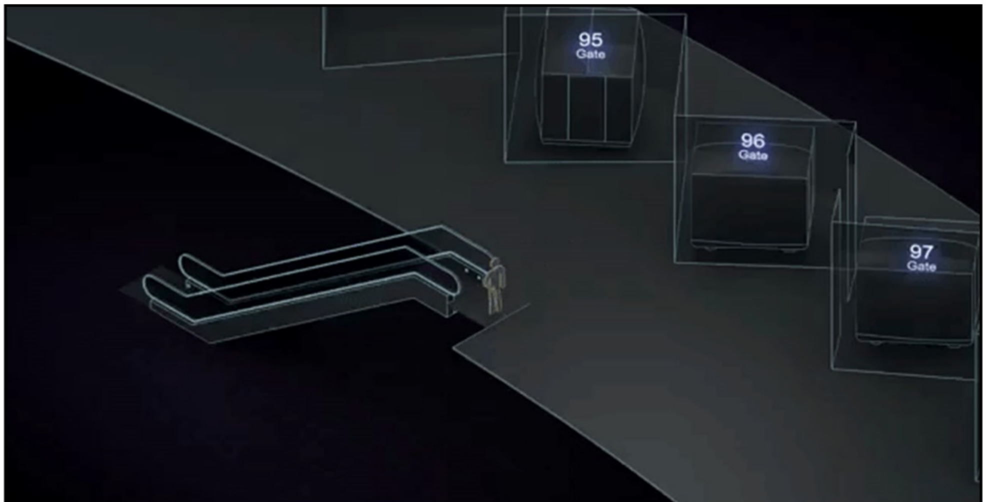
Sourced by: Virgin HyperloopOne

25



Sourced by: Virgin HyperloopOne

26



Sourced by: Virgin HyperloopOne

27

Sourced by: Virgin HyperloopOne

28

14

4/22/2020

10 Routes | 3 Continents | 5 Countries
53 urban centers | 6,000+ km | 148+ million people connected

Sourced by: Virgin HyperloopOne

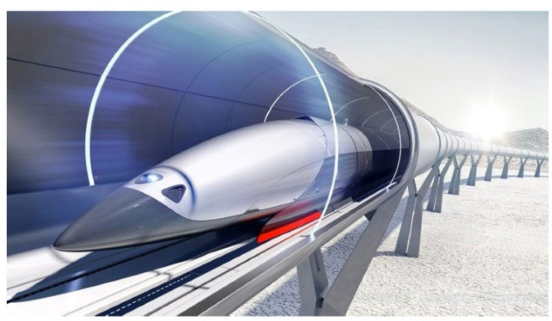
29

HYPERLOOP

<700mph
Speed

2mins
Headway

> 250
Miles
Station
Distance



30

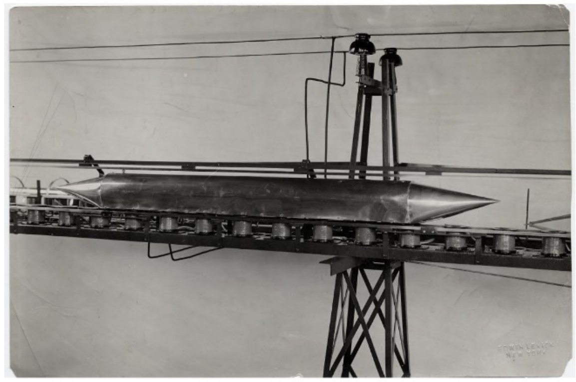
30

15

4/22/2020

MAGLEV

- Maglev technology has been **developing** since the early **19th century**.
- **No current operating** maglev systems in the United States.
- Technical and commercial **viability** has been **proven in overseas deployments**, most notably in Japan and China.



Photograph of Bachelet's working model of Maglev , New York (1910).

31

31

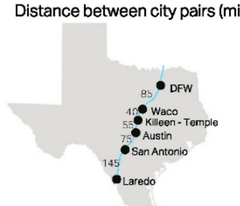
MAGLEV

< 435mph
Speed

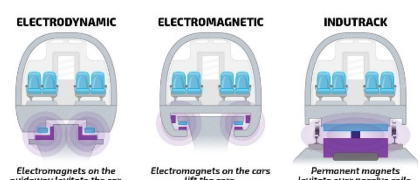
5mins
Headway

> 150 miles
Station Distance

Distance between city pairs (miles)



Longyang Road maglev station, China



32

32

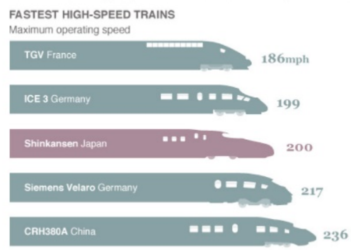
16

4/22/2020

HIGH-SPEED & HIGHER SPEED RAIL

- In **1964,** Japan National Railways (JNR) started operation on the Tokaido Shinkansen between Tokyo and Osaka, **the world's first electrified, intercity High-Speed Rail (HSR) system**.
- At the time, **operating speed** for the 0-Series Shinkansen was **130mph**. The train was introduced as a new transport system incorporating the latest modern technology.
- The success of the Shinkansen in Japan spurred technological innovation in both Japan and Europe that continues today.

A 1964 photo taken at a ceremony to mark the launch of the Shinkansen High-Speed train between Tokyo and Osaka.



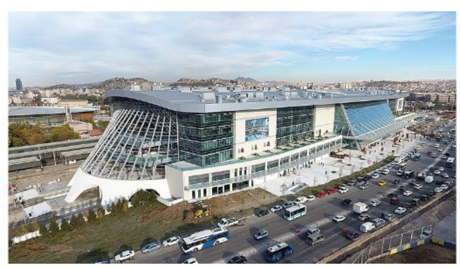
33

33

HIGH-SPEED & HIGHER-SPEED RAIL

Higher-Speed Rail	High-Speed Rail
> 90 mph Speed	>150 mph Speed
3 - 33 mins Headway	Varies Headway
20miles Station Distance	240 miles Station Distance

Distance between city pairs (miles)



Ankara High-Speed Train Station, Turkey.

17

34

34

4/22/2020

CONVENTIONAL INTERCITY PASSENGER RAIL

- In the United States (U.S.), **wooden railroads** were built during the late **1700s and early 1800s.**
- The number of passenger trains in the United States **dropped 45%** between 1929 and 1945, and **85%** between 1929 and 1965 .
- The **decline in intercity rail ridership** coincided with the **rise of automobile ownership** following World War II and **air jet travel.**
- **Amtrak** currently serves **45 states.**

Great Smoky mountains railroad

35

35

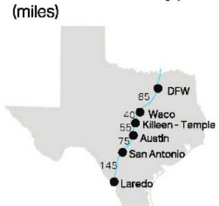
CONVENTIONAL INTERCITY PASSENGER RAIL

< 90mph Speed

5 - 120 mins Headway

>20 miles Station Distance

Distance between city pairs (miles)



18

36

36

GUARANTEED TRANSIT

- New type of commuter concept providing bus service combined with a guaranteed arrival time
- Operational Configurations
  - Managed Lane
  - Dedicated ROW
- Few examples:
  - LA Metro operates the Orange Line in exclusive, bus-only facility
  - Several Texas transit agencies operate a BRT-type service along managed lanes

37

37

GUARANTEED TRANSIT

< 75 mph
Speed

Varies
Headway

Varies
Station Distance

Distance between city pairs (miles)

38

38

19

4/22/2020

COMPARISON MATRIX

	Guaranteed Transit	Conventional Intercity Passenger Rail	Higher-Speed Trains	High-Speed Trains	Maglev	Hyperloop
Speed	Up to 76 mph	Up to 90 mph	HrSR: Up to 150 mph	HSR: Up to 220 mph	Up to 435 mph	Up to 760 mph
Technology maturity	Operational	Operational	Operational	Operational	Operational	In development
ROW requirements	Managed Lane or Exclusive ROW	Existing network	Exclusive ROW	Exclusive ROW	Exclusive ROW	Exclusive ROW
Headway	5 minutes in peak periods Varies during non-peak	5 to 20 mins during peak 90 to 120 mins during non-peak	HrSR: 3 to 33 mins	HSR: Varies	Average 5 mins	Every 2 minutes on average and every 30 seconds during peak periods
Seating capacity	12 to 60 per bus	80 to 150 per train	65 to 100 per train	65 to 100 per train	52 to 110 per train	27 to 40 per pod
Optimal intercity distance between stations	Varies	3 to 5 miles apart	HrSR stations: 20 miles	HSR stations: 40 to 50 miles	150 to 500 miles	250 to 500 miles
Relative cost	Low	Medium	Medium	High	High	High

39

39

Feedback

20

40

40

Questions & Answers

THANK YOU

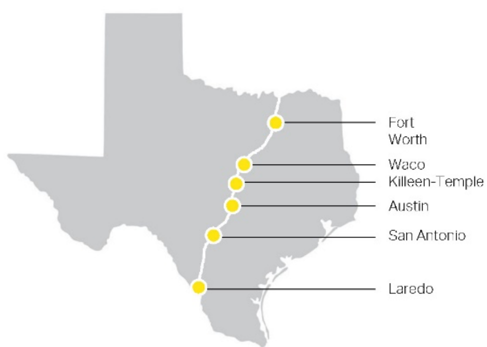
41

41

1

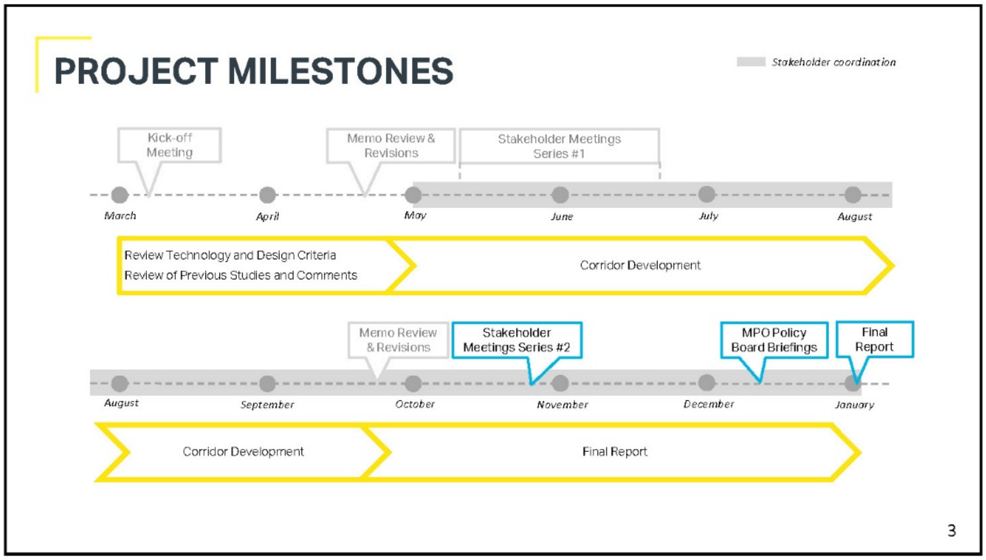
PROJECT PURPOSE

- The project purpose is to **conduct a High-Speed Transportation (HST) study** that connects Fort Worth, Waco, Killeen-Temple, Austin, San Antonio, and Laredo.
- It will **evaluate various technology options** and modes of travel for fatal flaws, benefits, and drawbacks.
- It will **recommend options for corridors** and **potential station locations** to include in future NEPA documents.

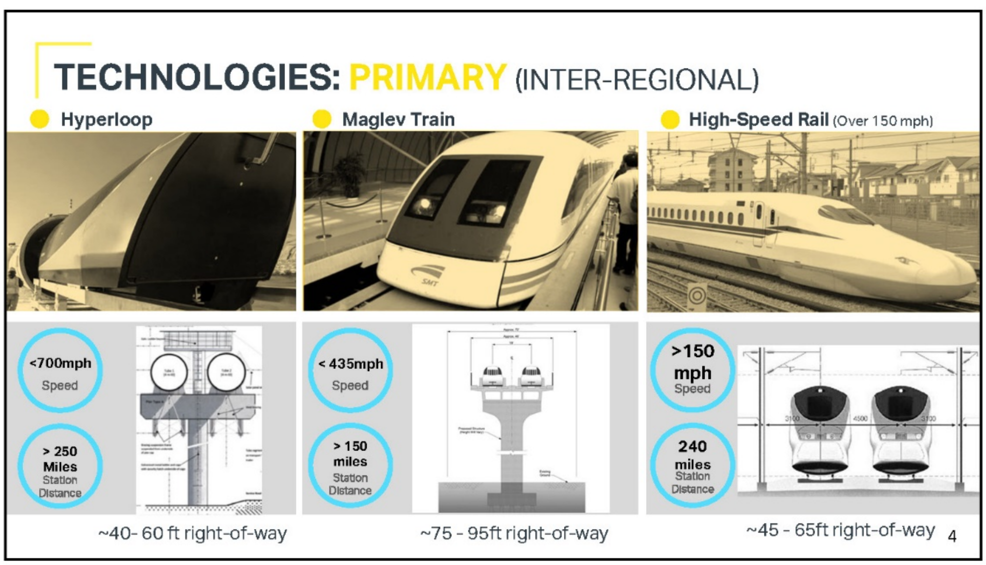


2

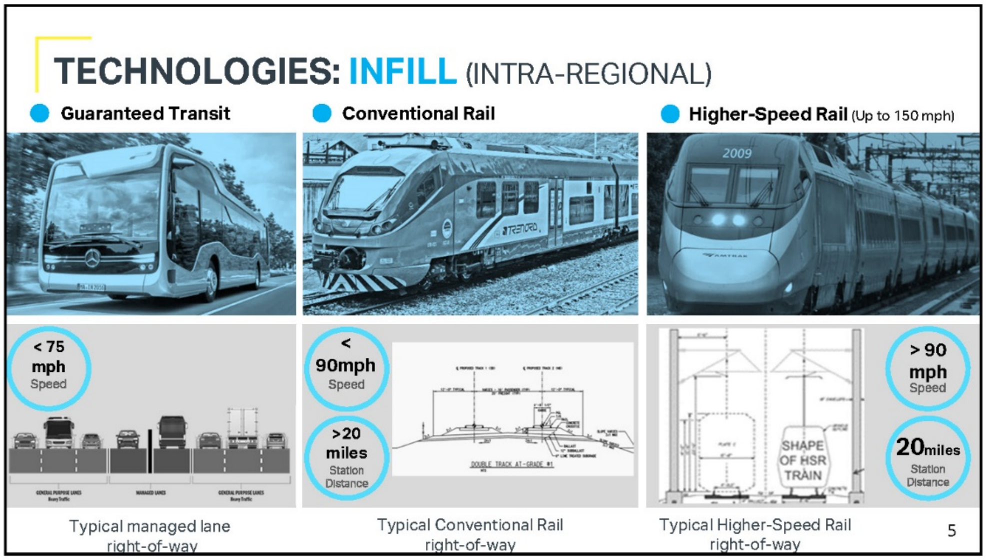
2


PROJECT MILESTONES
Stakeholder coordination
Kick-off Meeting
Memo Review & Revisions
Stakeholder Meetings Series #1
March
April
May
June
July
August
Review Technology and Design Criteria
Review of Previous Studies and Comments
Corridor Development
Memo Review & Revisions
Stakeholder Meetings Series #2
MPO Policy Board Briefings
Final Report
August
September
October
November
December
January
Corridor Development
Final Report
3

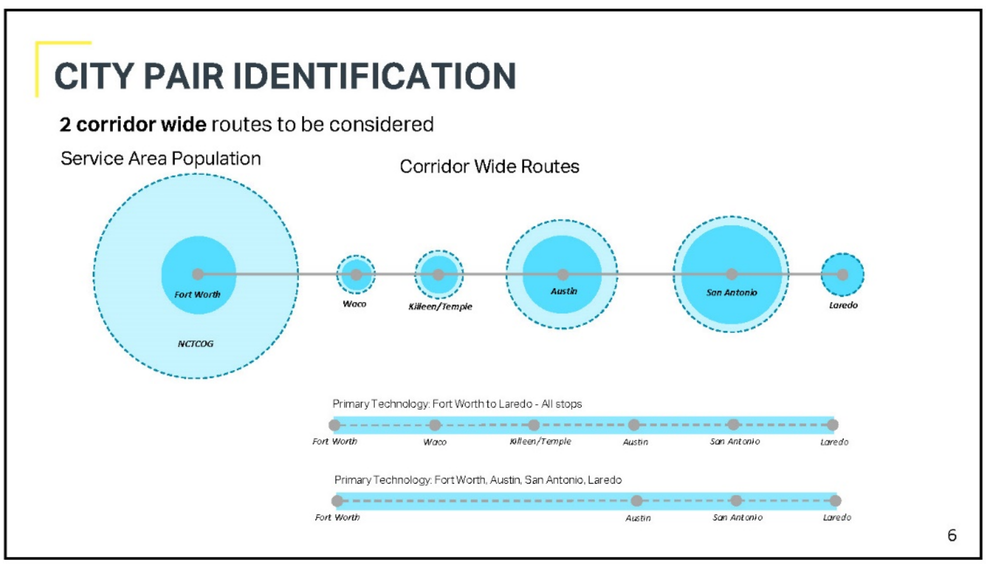
3


TECHNOLOGIES: PRIMARY (INTER-REGIONAL)
Hyperloop
Maglev Train
High-Speed Rail (Over 150 mph)
<700mph Speed
> 250 Miles Station Distance
< 435mph Speed
> 150 miles Station Distance
>150 mph Speed
240 miles Station Distance
~40- 60 ft right-of-way
~75 - 95ft right-of-way
~45 - 65ft right-of-way
4

4


TECHNOLOGIES: INFILL (INTRA-REGIONAL)
Guaranteed Transit
Conventional Rail
Higher-Speed Rail (Up to 150 mph)
2009
< 75 mph Speed
< 90mph Speed
>20 miles Station Distance
> 90 mph Speed
20miles Station Distance
SHAPE OF HSR TRAIN
Typical managed lane right-of-way
Typical Conventional Rail right-of-way
Typical Higher-Speed Rail right-of-way
5

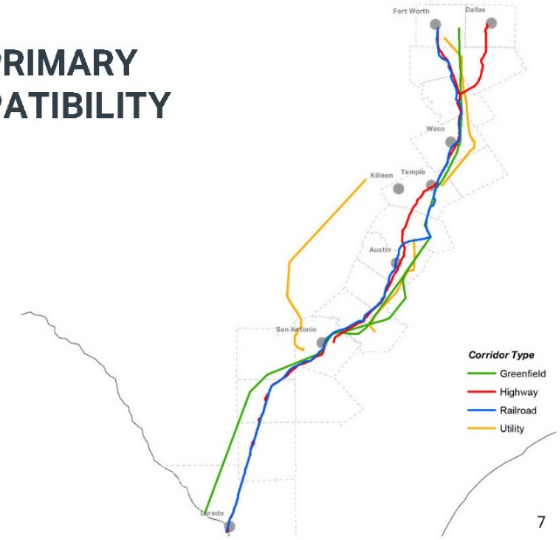
5


CITY PAIR IDENTIFICATION
2 corridor wide routes to be considered
Service Area Population
Corridor Wide Routes
Fort Worth
NCTCOG
Waco
Killeen/Temple
Austin
San Antonio
Laredo
Primary Technology: Fort Worth to Laredo - All stops
Fort Worth
Waco
Killeen/Temple
Austin
San Antonio
Laredo
Primary Technology: Fort Worth, Austin, San Antonio, Laredo
Fort Worth
Austin
San Antonio
Laredo
6

6

TOPRS SEGMENT & PRIMARY TECHNOLOGY COMPATIBILITY

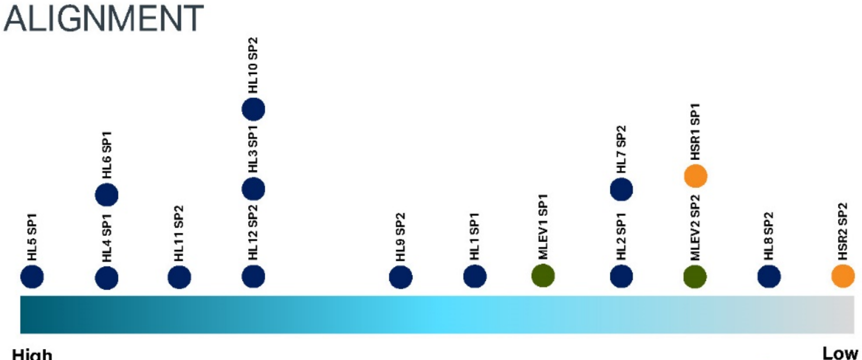
- Applied **high-level criteria** to **narrow down feasible segments** from TOPRS
- A total of **23 city-to-city** segments evaluated.
- Corridor types included:
  - Greenfield (new location)
  - Existing highway corridors
  - Existing railroad corridors
  - Existing utility corridors



7

7

HIGHEST SCORING TECHNOLOGY AND ALIGNMENT



HL– Hyperloop
MLEV- Maglev
HSR- High Speed Rail

SP1-Stopping Pattern 1 - All (6) Stops
SP2-Stopping Pattern 2 – Fort Worth- Austin- San Antonio- Laredo (4) Stops

Hyperloop
Maglev
HSR

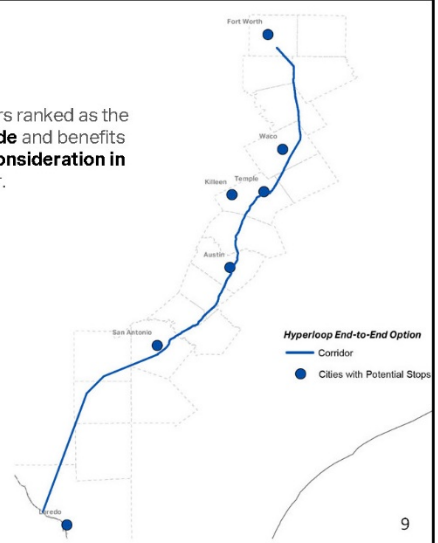
8

8

PRELIMINARY FINDINGS

After screening, Hyperloop stopping at all identified city pairs ranked as the technology and corridor combination with the **highest upside** and benefits related to a high-speed technology system and **warrants consideration in future studies as a technology option** for the I-35 Corridor.

- **Hyperloop potential stops:**
  - Fort Worth
  - Waco
  - Killeen/Temple
  - Austin
  - San Antonio
  - Laredo
- **Alignment generally follows:**
  - Traveling south from Fort Worth to Waco generally following a Utility Corridor.
  - From Temple to San Antonio, generally following IH-35.
  - From San Antonio to Laredo in a greenfield corridor.



9

9

OTHER MPO MEETINGS

Meeting Date	Meeting Name	Meeting Location	Meeting Time	Attendees
May 9, 2019	Waco MPO Workshop	WebEx meeting	2 p.m.	14
May 10, 2019	Alamo Area MPO TAC Workshop	TxDOT San Antonio District Office 4615 NW Loop 410 San Antonio, TX 78229	9:30 a.m.	19
May 15, 2019	Central Texas COG Policy Board Meeting	Central Texas Council of Governments 2180 N. Main Street Belton, TX 76513	10 a.m.	13
May 16, 2019	CAMPO Stakeholder Meeting	CAMPO Office 3300 N. Interstate 35 Austin, TX 78705	8:30 a.m.	9
June 20, 2019	NTCOG MPO Stakeholder Workshop	Burleson Public Library 248 SW Johnson Avenue Burleson, TX 76026	2 p.m.	14
July 11, 2019	Laredo MPO TAC Workshop	WebEx meeting	2 p.m.	8
July 15, 2019	Laredo Urban Transportation Study Technical Committee Meeting and Laredo MPO Policy Committee Meeting	Laredo City Hall 1110 Houston Street Laredo, TX 78040	1:30 p.m.	19

10

10

Meeting Date	Meeting Name	Meeting Location	Meeting Time	Attendees
October 29, 2019	NCTCOG MPO Meeting	Burleson City Hall 141 W. Renfro Street Burleson, TX 76028	10 a.m.	4
November 8, 2019	Alamo Area MPO TAC Workshop	TxDOT San Antonio District Office 4615 NW Loop 410 San Antonio, TX 78229	1:30 p.m.	19
November 19, 2019	CAMPO Stakeholder Meeting	CAMPO Office 3300 N. Interstate 35 Austin, TX 78705	9 a.m.	7
November 20, 2019	Central Texas COG Policy Board Meeting	Central Texas Council of Governments 2180 N. Main Street Belton, TX 76513	9:30 a.m.	13
November 21, 2019	Waco MPO Policy Board and Technical Committee Meeting	South Waco Community Center 2815 Speight Avenue Waco, TX 76711	2 p.m.	30+
December 9, 2019	Alamo Area MPO Transportation Policy Board Meeting	Via Metro Center 1021 San Pedro San Antonio, TX 78212	1:30 p.m.	19
December 9, 2019	CAMPO Transportation Policy Board Presentation	University of Texas Thompson Center, 2405 Robert Dedman Drive Austin, TX	6:00 p.m.	7
December 10, 2019	Laredo Urban Transportation Study Technical Committee Meeting and Laredo MPO Policy Committee Meeting	Laredo City Hall 1110 Houston Street Laredo, TX 78040	2:30 p.m.	11

11

11

Questions & Answers

Thank you

12

12