

## **CHAPTER 10.0 - EVALUATION OF ALTERNATIVES CARRIED FORWARD**

This chapter summarizes the evaluation of and the trade-offs among the technology and alignment alternatives considered for the University Corridor based on the information contained in the previous chapters. These alternatives are described in detail in Chapter 2, Alternatives Considered. The effect or impact on the resource discussed would be the same for all alternatives unless otherwise noted. The purpose of this chapter is to evaluate the benefits, costs, and environmental consequences against the project's goals and objectives as presented in Chapter 1.

### **10.1 EVALUATION RELATIVE TO PROJECT GOALS AND OBJECTIVES**

Tables 10-1 through 10-3 present a summary of the environmental consequences for the No Build Alternative, Transportation System Management (TSM)/Baseline Alternative, and Build Alternatives by segment. The environmental consequences for the two Build Alternatives would be the same unless otherwise noted.

**Table 10-1**  
**Segment I (Hillcroft Transit Center to Wesleyan) – Summary of Impacts**

	No Build	TSM Baseline	Richmond/ Westpark (Cummins)		Richmond/ Westpark (Greenway Plaza)		Richmond/ U.S. 59/ Westpark (Kirby)	
<b>Land Use</b>								
Compatible with Local Plans	No	No	Yes		Yes		Yes	
Acres of Land Needed for Right-of-Way	0	0	0.44		0.44		0.47	
<b>Property Acquisition (Number of Parcels)</b>								
Businesses	0	0	3		3		3	
Residential	0	0	0		0		0	
Other (i.e., government, religious, vacant)	0	0	2		2		2	
Total	0	0	5		5		5	
<b>Number of Displacements</b>								
Businesses	0	0	0		0		0	
Residential	0	0	0		0		0	
Other (i.e., government, religious)	0	0	0		0		0	
Total	0	0	0		0		0	
<b>Historic and Archeological Resources</b>								
Historical Sites Adversely Affected	0	0	0		0		0	
Potential Historic Districts/Contributing Structures Adversely Affected	0/0	0/0	0/0		0/0		0/0	
Archeological Sites Adversely Affected	0	0	0		0		0	
<b>Parklands</b>	0	0	0		0		0	
<b>Visual/Aesthetics</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Sensitive Receptor/Assets Impacted	0	0	0	0	0	0	0	0
<b>Safety and Security</b>								
Sites Requiring Mitigation Measures	0	0	0		0		0	
<b>Geology and Soils</b>	None	None	None		None		None	
<b>Water Resources</b>								
Floodplain Crossings	0	0	0		0		0	
Wetlands and Riverine Crossings	0	0	0		0		0	
<b>Biota and Habitat</b>								
Number of Trees Removed	0	0	0		0		0	
<b>Air Quality</b>	Combined See Table 10-3							
<b>Noise</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Residential Impacts	0	0	0	0	0	0	0	0
<b>Vibration</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Residential Impacts	0	0	0	0	0	0	0	0
<b>Hazardous/Regulated Materials</b>								
Potential Contaminated Sites	0	0	32		32		32	
<b>Transportation</b>								
LOS (2030 Traffic), # of Intersections at:								
LOS A-B (a.m./p.m.)	0/1	0/1	2/3		2/3		2/3	
LOS C-D (a.m./p.m.)	0/0	0/0	3/0		3/0		3/0	
LOS E-F (a.m./p.m.)	9/8	9/8	8/10		8/10		8/10	
Parking	0	0	0		0		0	
Freight Movement	0	0	0		0		0	
Bicycle/Pedestrian Movements	0	0	0		0		0	
<b>Construction Impacts</b>	None	Low	Low		Low		Low	
<b>Section 4(f) Properties Impacted</b>	0	0	0		0		0	
<b>Length (miles)</b>	0	Combined	3.6		3.6		3.6	
<b>Total Cost (millions)</b>	\$0	See Table 10-3	Combined with Segment II (see Table 10-2)					

Source: Carter & Burgess, April 2007

**Table 10-2  
Segment II (Weslayan to Main Street) – Summary of Impacts**

	No Build	TSM Baseline	Richmond/ Westpark (Cummins)		Richmond/ Westpark (Greenway Plaza)		Richmond/ U.S. 59/ Westpark (Kirby)	
<b>Land Use</b>								
Compatible with Local Plans	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Acres of Land Needed for Right-of-Way	0	0	2.54	3.74	3.24			
<b>Property Acquisition (Number of Parcels)</b>								
Businesses	0	0	32	35	26			
Residential	0	0	7	7	4			
Other (i.e., government, religious, vacant)	0	0	4	4	1			
Total	0	0	43	46	31			
<b>Number of Displacements</b>								
Businesses	0	0	12	11	12			
Residential	0	0	13	13	24			
Other (i.e., government, religious)	0	0	0	0	0			
Total	0	0	25	24	36			
<b>Historic and Archeological Resources</b>								
Historical Sites Adversely Affected	0	0	0	0	1			
Potential Historic Districts/Contributing Structures Adversely Affected	0/0	0/0	0/0	0/0	0/0			
Archeological Sites Adversely Affected	0	0	0	0	0			
<b>Parklands</b>	0	0	0	0	0			
<b>Visual/Aesthetics</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Sensitive Receptor/Assets Impacted	0	0	9	3	9	5	9	8
<b>Safety and Security</b>								
Sites Requiring Mitigation Measures	0	0	0	0	0			
<b>Geology and Soils</b>	None	None	None	None	None			
<b>Water Resources</b>								
Floodplain Crossings	0	0	0	0	0			
Wetlands and Riverine Crossings	0	0	0	0	0			
<b>Biota and Habitat</b>								
Number of Trees Removed	0	0	197	153	93			
<b>Air Quality</b>	Combined See Table 10-3							
<b>Noise</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Residential Impacts	0	0	0	0	0	0	5	4
<b>Vibration</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Residential Impacts	0	0	1	0	1	0	1	0
<b>Hazardous/Regulated Materials</b>								
Potential Contaminated Sites	0	0	62	57	36			
<b>Transportation</b>								
LOS (2030 Traffic), # of Intersections at:								
LOS A-B (a.m./p.m.)	4/10	4/10	17/10	13/9	7/1			
LOS C-D (a.m./p.m.)	11/10	11/10	13/12	12/10	10/10			
LOS E-F (a.m./p.m.)	3/8	3/8	5/13	5/11	4/10			
Parking	0	0	0	0	0			
Freight Movement	0	0	0	0	0			
Bicycle/Pedestrian Movements	0	0	0	0	0			
<b>Construction Impacts</b>	None	Low	Medium	Medium	High			
<b>Section 4(f) Properties Impacted</b>	0	0	0	1	1			
<b>Length (miles)</b>	0	Combined	2.9	3.3	3.5			
<b>Total Cost (millions)</b>	\$0	See Table	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
		10-3	\$534	\$303	\$567	\$342	\$617	\$394

Source: Carter & Burgess, April 2007

**Table 10-3**  
**Segment III (Main Street to Eastwood Transit Center) – Summary of Impacts**

	No Build	TSM Baseline	Alabama (U.S. 59/ Alabama/ UH)		Wheeler (Ennis/ Elgin/ Eastwood Transit Center)		Wheeler (Ennis/ Alabama/ UH)	
<b>Land Use</b>								
Compatible with Local Plans	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Acres of Land Needed for Right-of-Way	0	0	1.93	2.70	3.07			
<b>Property Acquisition (Number of Parcels)</b>								
Businesses	0	0	8	16	13			
Residential	0	0	18	24	30			
Other (i.e., government, religious, vacant)	0	0	15	7	17			
Total	0	0	41	47	60			
<b>Number of Displacements</b>								
Businesses	0	0	5	8	8			
Residential	0	0	10	10	14			
Other (i.e., government, religious)	0	0	1	0	1			
Total	0	0	16	18	23			
<b>Historic and Archeological Resources</b>								
Historical Sites Adversely Affected	0	0	0	0	0			
Potential Historic Districts/Contributing Structures Adversely Affected	0	0	1/15	1/19	2/23			
Archeological Sites Adversely Affected	0	0	0	0	0			
<b>Parklands</b>	0	0	0	0	0			
<b>Visual/Aesthetics</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Sensitive Receptor/Assets Impacted	0	0	13	7	15	12	13	10
<b>Safety and Security</b>								
Sites Requiring Mitigation Measures	0	0	0	0	0			
<b>Geology and Soils</b>	None	None	None	None	None			
<b>Water Resources</b>								
Floodplain Crossings	0	0	0	0	0			
Wetlands and Riverine Crossings	0	0	0	0	0			
<b>Biota and Habitat</b>								
Number of Trees Removed	0	0	27	55	12			
<b>Air Quality/2030 Annual Emission</b>			<u>BRT (All Alternatives)</u>		<u>LRT(All Alternatives)</u>			
CO (tons per year)	141,798		141,771		141,764			
NOx (tons per year)	9,217		9,215		9,214			
VOC (tons per year)	9,601		9,599		9,599			
PM10 (tons per year)	1,832		1,832		1,832			
Reduction in CO2 from No Build (tons per million BTUs)	NA		-6,277.7		-7,820.2			
<b>Noise</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Residential Impacts	0	0	133	78	91	46	103	46
<b>Vibration</b>			<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>	<u>LRT</u>	<u>BRT</u>
Residential Impacts	0	0	48	0	9	0	16	0
<b>Hazardous/Regulated Materials</b>								
Potential Contaminated Sites	0	0	10	16	8			

**Table 10-3 (continued)**  
**Segment III (Main Street to Eastwood Transit Center) – Summary of Impacts**

	No Build	TSM Baseline	Alabama (U.S. 59/ Alabama/ UH)	Wheeler (Ennis/ Elgin/ Eastwood Transit Center)	Wheeler (Ennis/ Alabama/ UH)			
<b>Transportation</b>								
LOS (2030 Traffic), # of Intersections at:								
LOS A-B (a.m./p.m.)	5/6	5/6	12/13	7/10	8/10			
LOS C-D (a.m./p.m.)	9/9	9/9	14/14	13/12	13/11			
LOS E-F (a.m./p.m.)	4/3	4/3	4/3	10/8	3/3			
Parking	0	0	0	0	0			
Freight Movement	0	0	0	0	0			
Bicycle/Pedestrian Movements	0	0	0	0	0			
<b>Construction Impacts</b>	None	Low	Medium	Medium	Medium			
<b>Section 4(f) Properties Impacted</b>	0	0	15	19	23			
<b>Length (miles)</b>	0	9.0	2.3	3.3	2.3			
<b>Total Cost (millions)</b>	\$0	\$24	LRT \$181	BRT \$130	LRT \$219	BRT \$169	LRT \$181	BRT \$137

Source: Carter & Burgess, April 2007

In Chapter 1, Section 1.7, the goals and objectives for the University Corridor were presented. They included the desire to maximize regional transit system connectivity between the University Corridor and major activity centers and destinations through improved transit service to the corridor. A major objective is to increase transit ridership in the University Corridor thereby helping to reduce traffic congestion on corridor freeways and thoroughfares and contribute to the reduction in mobile air source emissions. In accordance with many local plans, another objective of the University Corridor project is to support, by providing a permanent transit investment in the corridor, public and private economic development and neighborhood revitalization efforts. As with all of the other Metropolitan Transit Authority of Harris County, Texas (METRO) Solutions corridors, METRO seeks to develop the transportation solutions for the University Corridor while avoiding as much as possible disruption to neighborhoods, commercial districts, and historic areas in the corridor. Because the implementation of the University Corridor project requires financial partnership with the Federal government, the project must be cost-effective and achievable as defined by the Federal Transit Administration (FTA). And finally, the University Corridor project must serve diverse population concentrations along the University Corridor.

Table 10-4 summarizes the performance of the No Build, Transportation System Management (TSM)/Baseline, and Build Alternatives in achieving the University Corridor goals. The following subsections elaborate on the performance of each of the alternatives.

**Table 10-4**  
**Summary of Achieving Project Goals**

Project Goals	No Build Alternative	TSM/Baseline Alternative	Build Alternatives
Goal 1: Improve Transportation Services	▼	○	▲
Goal 2: Increase Transit Ridership	▼	▲	▲
Goal 3: Support Future Development	▼	▼	▲
Goal 4: Support Environmental Quality	▼	○	▲
Goal 5: Provide Cost-Effective, Achievable Transportation Solutions	▼	▲	▲
Goal 6: Serve Diverse Populations	▼	▲	▲

Rating: ▲ Better ○ Neutral ▼ Worse

Source: Carter & Burgess, April 2007

### 10.1.1 Goals 1 and 2: Improve Transportation Services and Increase Transit Ridership

The No Build Alternative would not improve regional transit system connectivity for the University Corridor. Further it would not increase transit ridership in the University Corridor. The TSM/Baseline Alternative would improve passenger trips over the No Build Alternative but would not maximize regional transit system connectivity for the University Corridor.

The Build Alternatives would maximize regional transit system connectivity between the University Corridor and major activity centers and destinations through improved transit service to the corridor. Transit ridership in the region by alternative is shown in Table 10-5. The Build Alternatives could increase system-wide, unlinked transit trips by as many as 43,000 daily trips as compared to the No Build Alternative and 20,000 daily trips as compared to the TSM/Baseline Alternative.

**Table 10-5**  
**Build Alternative Transit System Performance Measures**

Alternative Combination	LRT Build Alternative		BRT-Convertible Build Alternative	
	Unlinked Trips	Linked Trips	Unlinked Trips	Linked Trips
No Build	897,380	621,500	897,380	621,500
TSM/Baseline	920,150	625,800	920,150	625,800
Combination #1	932,855	629,030	929,430	627,360
Combination #2	936,630	630,870	932,770	629,140
Combination #3	934,606	630,510	931,310	628,900
Combination #4	936,365	631,875	932,750	630,190
Combination #5	940,490	633,900	936,500	632,050
Combination #6	936,430	632,010	932,980	630,400
Combination #7	930,790	627,500	927,865	626,320
Combination #8	934,200	628,424	931,915	628,375
Combination #9	931,160	627,740	928,120	626,500

Source: METRO, March 2007

The highest transit system ridership would be derived from Combination #5: Richmond/Westpark (Greenway) and Wheeler (Ennis/Elgin/Eastwood Transit Center). The lowest transit ridership would be derived from Combination #7: Richmond/U.S. 59/Westpark (Kirby) and Alabama (U.S. 59/Alabama/UH). Overall the BRT-Convertible Build Alternatives ridership would be approximately 75 percent of the ridership generated by the LRT Build Alternatives.

Average daily boardings (2030) on the fixed guideway component of the Build Alternative alignment combinations are shown in Table 10-6. Combination #2: Richmond/Westpark (Cummins) and Wheeler (Ennis/Elgin/Eastwood Transit Center) would result in the highest daily boardings for either LRT or BRT-Convertible. The three combinations that is a segment of U.S. 59 (Combinations #7, #8, and #9) have significantly lower ridership.

**Table 10-6  
Build Alternative Transit System Performance Measures**

<b>Alternative Combination</b>	<b>LRT Build Alternative</b>	<b>BRT-Convertible Build Alternative</b>
<b>No Build</b>	40,190	30,560
<b>TSM/Baseline</b>	43,590	33,140
<b>Combination #1</b>	40,840	31,170
<b>Combination #2</b>	39,990	30,580
<b>Combination #3</b>	43,390	32,870
<b>Combination #4</b>	40,740	31,220
<b>Combination #5</b>	43,390	32,870
<b>Combination #6</b>	40,740	31,220
<b>Combination #7</b>	27,070	20,460
<b>Combination #8</b>	31,920	23,150
<b>Combination #9</b>	28,000	21,040

Source: METRO, March 2007

**10.1.2 Goal 3: Support Future Development**

The No Build Alternative would maintain the status quo with respect to the transportation system and the development trends in the University Corridor. As such the No Build Alternative would not support public and private economic development and neighborhood revitalization efforts.

Because the TSM/Baseline Alternative does not represent a permanent transit investment in the University Corridor, this alternative would not support public and private economic development and neighborhood revitalization efforts.

The Build Alternatives are consistent with many local plans that call for public and private economic development and neighborhood revitalization efforts. The Build Alternatives represent a permanent transit investment in the corridor that could act as a catalyst in furthering community plans for the study area. The Build Alternatives would improve the transportation system by providing the University Corridor with more travel choices and faster travel times between residential areas, major destinations, and employment centers. In addition to the transportation enhancements, the Build Alternatives would contribute positively to the achievement of the University Corridor economic development goals and their associated benefits.

### **10.1.3 Goal 4: Support Environmental Quality**

Because the No Build Alternative would not be consistent with H-GAC's 2025 RTP and its associated transportation air quality conformity determination, this alternative would continue the dependence on SOV travel, and, thereby, detract from the region's transportation air quality improvement initiatives. However, the No Build Alternative would avoid potential disruption to neighborhoods, commercial districts, and historic areas in the corridor.

The TSM/Baseline Alternative would increase transit ridership in the University Corridor over the No Build Alternative. However, the TSM/Baseline Alternative would not help to reduce traffic congestion on corridor freeways and thoroughfares as well as the Build Alternatives. The resulting reduction in mobile source emissions would not be as good as the Build Alternatives. As with the No Build Alternative, the TSM/Baseline Alternative would avoid potential disruption to neighborhoods, commercial districts, and historic areas in the corridor.

The Build Alternatives would introduce changes to the University Corridor. These changes would result in benefits that could not be achieved without the associated impacts to the environment in comparison to the No Build and TSM/Baseline Alternatives. Build Alternatives benefits include increased transit ridership, enhanced mobility, and positive influence on economic development for the corridor. Overall the benefits derived from the Build Alternatives outweigh the potential adverse environmental impacts.

#### **10.1.3.1 LRT and BRT-Convertible Build Alternatives**

The environmental consequences of the two Build Alternative technologies are very similar. The LRT Build Alternatives would have greater noise and vibration impacts than the BRT-Convertible Alternative. Additionally, the LRT Build Alternatives would have more visual impacts than the BRT-Convertible Alternative because of the overhead power system required for the LRT.

#### **10.1.3.2 Alternative Alignments**

In Segment I, there is only one alignment alternative in this segment that runs along the METRO-owned Westpark right-of-way. This alignment is compatible with local plans. It would require up to 0.47 acres and impact five properties with no displacements. This alignment would have no impacts on parklands, historic [Section 4(f)] properties, or sensitive visual receptors. In addition, there would be no noise or vibration impacts in this segment. Traffic impacts include a decrease in level-of-service (LOS) at one intersection in the a.m. peak and an increase in LOS at two intersections in the p.m. peak as compared to the No Build and TSM/ Baseline Alternatives. Construction impacts would be low.

There are three alignment alternatives in Segment II: Richmond/Westpark (Cummins), Richmond/Westpark (Greenway Plaza), and Richmond/U.S. 59/Westpark (Kirby). All three alignments are compatible with local plans. Right-of-way requirements vary from a low of 2.54 acres for the Richmond/Westpark (Cummins) alignment to a high of 3.74 acres for the Richmond/Westpark (Greenway Plaza) alignment. Properties impacted range from a low of 31 for the Richmond/U.S. 59/Westpark (Kirby) alignment to a high of 46 for the Richmond/Westpark (Greenway Plaza) alignment. Displacements associated with right-of-way acquisition are the reverse of properties impacted with the Richmond/U.S. 59/ Westpark (Kirby) alignment having the highest displacements (36) and the Richmond/Westpark (Greenway Plaza) alignment having the lowest displacements (24).

Both the Richmond/Westpark (Cummins) and the Richmond/Westpark (Greenway Plaza) alignments would impact one Section 4(f) property. No parkland property would be impacted in this segment. Each of the three of the LRT alignments would have visual impacts to nine sensitive receptors. With the BRT-Convertible Build Alternative, the Richmond/Westpark (Cummins) alignment would have the lowest number of visual impacts (three) and the Richmond/U.S. 59/Westpark (Kirby) alignment would have the highest (eight). Although METRO intends to preserve as many trees as possible with the University Corridor project, the maximum number of trees that could be lost would be with the Richmond/Westpark (Cummins) alignment (197). The maximum number of trees that could be lost would be with the Richmond/Westpark (Greenway Plaza) alignment would be 153. For the Richmond/U.S. 59/ Westpark (Kirby) alignment the maximum number of trees that could be lost would be 93.

Only the Richmond/U.S. 59/Westpark (Kirby) alignment would have noise impacts on sensitive receptors with five properties impacted for the LRT Build Alternative and four for the BRT-Convertible Build Alternative. Vibration impacts for the LRT Build Alternative are the same for all three alignments in this segment (one). No vibration impacts are anticipated for the BRT-Convertible Build Alternative. During the a.m. peak hour the number of intersections operating at an unacceptable LOS (E or F) are the same for the No Build and the Richmond/U.S. 50/Westpark (Kirby) alternative with the Richmond/Westpark (Cummins) and Richmond/Westpark (Greenway Plaza) Alternatives increasing by one intersection. During the PM peak hour the number of intersections operating at an unacceptable LOS (E or F) increase over the No Build Alternative by five for the Richmond/Westpark (Cummins) Alternative; by three for the Richmond/Westpark (Greenway Plaza) alternative; and by two for the Richmond/U.S. 50/Westpark (Kirby) Alternative. The construction impacts for the Richmond/Westpark (Cummins) and the Richmond/Westpark (Greenway Plaza) alignments are anticipated to be medium with the construction impacts for the Richmond/U.S. 59/ Westpark (Kirby) alignment anticipated to be high. The construction impacts are expected to be high for the Richmond/U.S. 59/ Westpark (Kirby) alignment primarily because of the impacts to U.S. 59.

In Segment III, there are three alignment alternatives: Alabama (U.S. 59/Alabama/UH), Wheeler (Ennis/Elgin/Eastwood Transit Center), and Wheeler (Ennis/Alabama/UH). All three alignments are compatible with local plans. Right-of-way requirements vary from a low of 1.93 acres for the Alabama (U.S. 59/Alabama/UH) alignment to a high of 3.07 acres for the Wheeler (Ennis/Alabama/UH) alignment. Properties impacted range from a low of 41 for the Alabama (U.S. 59/Alabama/UH) alignment to a high of 60 for the Wheeler (Ennis/Alabama/UH) alignment. Displacements would mirror the properties impacted with the Wheeler (Ennis/Alabama/UH) alignment having the highest displacements (25) and the Alabama (U.S. 59/Alabama/UH) alignment having the lowest displacements (16).

Both the Alabama (U.S. 59/Alabama/UH) and the Wheeler (Ennis/Elgin/Eastwood Transit Center) alignments would impact one historic district while the Wheeler (Ennis/Alabama/UH) alignment would impact two. Potential impacts to Section 4(f) properties varies from a low of 15 for the Alabama (U.S. 59/Alabama/UH) alignment to a high of 23 for the Wheeler (Ennis/Alabama/UH) alignment. No parkland property would be impacted in this segment. Potential visual impacts to sensitive receptors from the LRT Build Alternative varies from a low of 13 for the Alabama (U.S. 59/Alabama/UH) and Wheeler (Ennis/Alabama/UH) alignments to a high of 15 for the Wheeler (Ennis/Elgin/Eastwood Transit Center) alignment. Potential visual impacts to sensitive receptors from the BRT-Convertible Build Alternatives varies from a low of seven for the Alabama (U.S. 59/Alabama/UH) alignment to a high of 12

for the Wheeler (Ennis/Elgin/Eastwood Transit Center) alignment. Although METRO intends to preserve as many trees as possible with the University Corridor project, the maximum number of trees that could be lost would be with the Wheeler (Ennis/Elgin/ Eastwood Transit Center) alignment (55). The maximum number of trees that could be lost would be 27 with the Alabama (U.S. 59/Alabama/UH) alignment. For the Wheeler (Ennis/Alabama/UH) alignment the maximum number of trees that could be lost would be 12.

The Alabama (U.S. 59/Alabama/UH) alignment would have noise impacts on 133 sensitive receptors for the LRT Build Alternative and 78 for the BRT-Convertible Build Alternative. The Wheeler (Ennis/Elgin/Eastwood Transit Center) alignment would have noise impacts on 91 sensitive receptors for the LRT Build Alternative and 46 for the BRT-Convertible Build Alternative. The Wheeler (Ennis/Alabama/UH) alignment would have noise impacts on 103 sensitive receptors for the LRT Build Alternative and 46 for the BRT-Convertible Build Alternative. Vibration impacts for the LRT Build Alternative vary in this segment from a high of 48 for the Alabama (U.S. 59/Alabama/UH) alignment to a low of nine for the Wheeler (Ennis/Elgin/ Eastwood Transit Center) alignment. During the a.m. peak hour the number of intersections operating at an unacceptable LOS (E or F) increase over the No Build Alternative by six for the Wheeler (Ennis/Elgin/Eastwood Transit Center) Alternative; remain the same as the No Build Alternative for Alabama (U.S. 59/Alabama/UH) Alternative; and decrease by one for the Wheeler (Ennis/Alabama/UH) Alternative. During the PM peak hour the number of intersections operating at an unacceptable LOS (E or F) increase over the No Build Alternative by five for the Wheeler (Ennis/Elgin/Eastwood Transit Center) Alternative and remain the same for the Alabama (U.S. 59/Alabama/UH) and Wheeler (Ennis/Alabama/UH) Alternatives. The construction impacts for all three alignments in this segment are anticipated to be medium.

#### **10.1.4 Goal 5: Provide Cost-Effective, Achievable Transportation Solutions**

The No Build Alternative does not include new transit facilities in the University Corridor. Therefore, there would be no new capital costs associated with this alternative. The No Build Alternative would introduce very little new transit service in the corridor. Therefore, transit service in the corridor would remain near current levels. As traffic congestion increases in the corridor, existing bus speeds could decrease resulting in a negative impact on transit ridership. Therefore the No Build Alternative does not represent a cost effective transportation solution for the University Corridor.

The TSM/Baseline Alternative includes low capital cost investments in the University Corridor with corresponding modest improvements in transportation system performance. Although cost-effective, the TSM/Baseline Alternative does not maximize transportation solutions for the University Corridor. The capital cost (in 2007 dollars) for the TSM/Baseline Alternative is \$24 million.

The Build Alternatives introduce new transit service in the corridor. The result would be increased transit ridership and mobility benefits as compared to the No Build and TSM/Baseline Alternatives. The Build Alternatives would reduce transit travel times and provides additional connections to the regional transit system, thereby, enhancing mobility as compared to the No Build and TSM/Baseline Alternatives. The Build Alternatives are superior to the No Build and TSM/Baseline Alternatives in increasing transit ridership and improving mobility.

The No Build Alternative is clearly the least costly of the alternatives under consideration. The Build Alternatives would include a new fixed guideway transit project in the corridor.

The capital cost (in 2007 dollars) for the Build Alternatives range from a low of \$338 million for the BRT-Convertible Alternative, Combination #1: Richmond/Westpark (Cummins) and Alabama (U.S. 59/Alabama/UH) to a high of \$836 million for the LRT Alternative, Combination #8: Richmond/U.S. 59/Westpark (Kirby) and Wheeler (Ennis/Elgin/ Eastwood Transit Center).

A project is judged to be cost-effective when the benefits are commensurate with the costs. Some components of the benefits, such as system-wide and corridor ridership, are easily quantifiable. Other benefits, such as improvements in mobility and the full range of economic benefits are not so easily quantified.

Costs are generally defined as the initial capital cost to build the system and the long-term stream of costs required to operate and maintain the system over its useful life. Adverse environmental impacts are a non-quantifiable cost.

The most cost-effective projects are those that produce the greatest benefits for the least cost. While not a comprehensive evaluation of cost-effectiveness, it can be stated that the Build Alternatives produce a wide range of benefits to the corridor and region as compared to the No Build and TSM/Baseline Alternatives. There is a cost to achieve corridor and regional benefits. Additionally, while the capital costs of the LRT Alternatives are higher than those for the BRT-Convertible Alternatives, they also produce the highest ridership. It is also clear that the alternatives that use a portion of the U.S. 59 right-of-way have the highest capital costs and produce the lowest ridership.

The financial analysis presented in Chapter 8 confirms the ability of METRO to fund the capital, operating, and maintenance costs of any of the alternatives. The Build Alternatives, which would have a higher capital cost, would consume more of METRO's financial resources. However, the financial analysis has confirmed that METRO can afford the most costly of the Build Alternatives and still have the financial resources to expand bus services and implement new fixed guideway in the corridors defined in METRO Solutions Phase 2 Implementation Plan.

### **10.1.5 Goal 6: Serve Diverse Populations**

Because the No Build Alternative would retain bus operations in mixed flow traffic with a limited number of routes using the U.S. 59 HOV lane for portions of the trip, this alternative would not improve transit service or connections to the diverse communities that make up the University Corridor.

The TSM/Baseline Alternative would improve transit service and connections to the diverse communities that make up the University Corridor compared to the No Build Alternative; however this alternative would not maximize the transit service and connectivity for the University Corridor.

The Build Alternatives would provide an in-street running and exclusive guideway with some grade separated sections. The Build Alternatives would connect to the existing METRO Rail Red Line to provide access from the study corridor to Downtown Houston, Midtown, Museum District, Hermann Park, the Texas Medical Center, and Reliant Stadium complex. The Build Alternatives would also connect to the planned Southeast and Uptown GRT lines that would provide access to the Uptown/Galleria area and southeast Houston. As a consequence, the Build Alternatives would maximize transit service and connections to the diverse communities that make up the University Corridor.

## **10.2 NEW STARTS CRITERIA**

The Section 5309 “New Starts” program is the Federal government’s primary program for providing financial support to locally-planned, implemented, and operated fixed guideway transit major capital investments. The New Starts evaluation process is used in conjunction with the evaluation process under the National Environmental Policy Act (NEPA), for which this DEIS is being prepared. This section describes the New Starts process and the associated methods that FTA uses to evaluate and rate fixed guideway transit projects seeking Federal funding, and describes the current criteria ratings for the University Corridor.

Each year FTA submits its *Annual Report Funding on Recommendations* to Congress as a companion document to the annual budget submitted by the President. The report provides recommendations for the allocation of New Starts funds under Section 5309 of Title 49 of the United States Code. As required by SAFETEA-LU, FTA uses the following project justification criteria to evaluate New Starts projects: mobility improvements; environmental benefits; cost effectiveness; operating efficiencies; transit-supportive existing land use, policies, and future patterns; and other factors. FTA must also consider the local financial commitment for the proposed project.

FTA reviews the project justification and local financial commitment criteria for each candidate project and assigns a rating for each criterion. For some of the project justification criteria, the proposed project is compared against a “Baseline Alternative.” The TSM/Baseline Alternative for purposes of the New Starts program consists of improvements to the transit system that are relatively low in cost and the “best that can be done” to improve transit without major capital investment for new infrastructure. A candidate project is given an overall rating of “high,” “medium-high,” “medium,” “medium-low,” or “low” based on ratings assigned by FTA to each of the project justification and local financial commitment criteria described previously.

Because a preferred alternative has not been selected, New Starts criteria information has not been developed for the University Corridor. This information will be included in the Final EIS when it becomes available. FTA’s evaluation and rating process occurs annually in support of budget recommendations presented in the *Annual Report Funding on Recommendations* and when projects request FTA approval to enter into preliminary engineering or final design. Consequently, as proposed New Starts projects proceed through the project development process, information concerning costs, benefits, and impacts is refined and the ratings updated to reflect new information.

## **10.3 BRT CONVERSION TO LRT**

The BRT-Convertible Alternative would be designed in a manner that would not preclude future implementation of LRT. The basic LRT infrastructure would be in place from commencement of BRT service. It would then be converted with minimum disruption to LRT as ridership grows and land use develops to warrant additional transit capacity within the University Corridor. FTA would not participate in any elements of the LPA that are needed solely for the future conversion from BRT to LRT. Although METRO has designated the LPA to be BRT-Convertible-to-LRT, FTA would require another NEPA review if, at some time in the future, FTA funds are sought for the conversion of the BRT system to LRT. FTA considers the conversion to LRT to be a separate project from the construction of BRT.

The basic infrastructure would be augmented at a later date with minimum disruption to the running BRT service over a period preceding the implementation of LRT. The final step would be to replace the BRT vehicles with LRT vehicles. As proposed, some LRT Infrastructure could be included with the initial construction of the BRT-Convertible alternative. The design could include:

- BRT guideway configured in accordance with LRT grade, curvature and clearance requirements.
- Track embedded in the BRT guideway (special trackwork would be built later).
- Stations built to not preclude future conversion to LRT.
- Utility relocations from beneath the BRT roadways to permit reasonable mutual exclusivity between LRT service and in-street utility work.
- Ductbanks to accommodate future LRT signal and communications system.
- Traction electrification and Overhead Catenary System (OCS) foundations.
- Land acquisition, where required, for future LRT components [such as substations, maintenance facility, yard, OCC (Operational Control Center) and parking facilities].
- Corrosion control features.
- Non-revenue track connections to the existing LRT main line.

As ridership demand increases, the BRT would be converted to LRT. This work would most likely take place over several months given the long lead times associated with procurement of LRT components. The majority of the construction work in proximity to the BRT guideway envelopes could be performed and not impact BRT service. Some work would be performed off-site, such as:

- Design and construct of the LRT maintenance facility, or design/construct expansion of existing LRT maintenance facility, as necessary.
- Specify, procure and test new light rail vehicles (could be completed while BRT remains in operation because vehicles could be tested on existing test track).

In coordination with on-going BRT service, the specific work that may be performed on site within or near the BRT guideways to convert the BRT operations to LRT could consist of the following major activities:

- Install OCS.
- Install the power cables from the OCS.
- Install special trackwork.
- Pull required conductors.
- Install final configurations of the communication and signal systems.
- Perform LRT subsystem and integrated system test and start-up.
- Complete trackway installation.
- Perform any necessary station modifications.
- Complete ductbank system.

## **10.4 UNRESOLVED ISSUES**

Copies of the Draft Environmental Impact Statement (DEIS) will be distributed to appropriate local, regional, state, and Federal agencies as well as the public for their review and comment. Public comment will play a role in the final decision by the METRO Board of Directors on the alignment and technology alternative. Throughout the planning and

environmental process, local elected officials were kept apprised of project status through public and stakeholder meetings and individual briefings. These elected officials will have the opportunity to provide input to the decision-making process as unresolved issues are addressed.

The major key unresolved issues that will be addressed prior to the Final EIS (FEIS) include:

- Selection of a preferred alternative.
- Selection of a preferred alignment, if a Build Alternative is selected.