CHAPTER 5
ENVIRONMENTAL CONSEQUENCES
5. ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the potential impacts on the social, cultural, and natural environment that would result from the construction and operation of the Southeast Corridor fixed-guideway transit system proposed under the Light Rail Transit (LRT), Bus Rapid Transit (BRT) Convertible, and BRT Alternatives in comparison to the No Build Alternative in 2025.¹ ² The specific issues analyzed include those related to: land use; socioeconomics; displacements/relocations; air quality; noise and vibration; visual quality and aesthetics; ecosystems; water resources; historic and archaeological resources; parklands and other Section 4(f) resources; geology and soils; hazardous/regulated materials; safety and security; construction impacts; and secondary and cumulative impacts. Existing conditions in the corridor without the project were discussed under corresponding headings in Chapter 3, Affected Environment.

As described in Section 2.3.2 of Chapter 2, Alternatives Considered, the build alternatives analyzed for potential impacts provide for transit services that extend along an alignment from Bagby in downtown Houston southeast to a terminus on Griggs Road east of Martin Luther King Boulevard. The build alternatives consist of separate alignments for the LRT and BRT alternatives between Bagby and St. Emanuel in downtown and a common alignment extending from St. Emanuel east along Capitol and south along Scott Street to Wheeler Street. In downtown, the LRT alignment would be located on Capitol and the BRT alignment on Capitol and Rusk.

From Wheeler Street to the end of the line, the build alternatives consist of two alignment options: (1) the base alignment on Scott Street and Griggs Road, and (2) the Wheeler-MLK alignment on Wheeler Street and Martin Luther King Boulevard. Both alignment options would terminate on Griggs Road at Beekman Road east of Martin Luther King Boulevard.

The alignment impacts are the same for each build alternative (i.e., LRT, BRT Convertible, and BRT) except where there is a difference in impacts between the alternative. These differences are primarily related to construction impacts.

The potential impacts described in this chapter are based on planning efforts to date and currently available information. These impacts are considered reasonably representative for the purpose of comparing alternatives and selecting a preferred alternative. Changes may result from additional information obtained during preliminary engineering and/or public comments. If significant impacts result from the changes, a supplemental draft environmental impact statement (DEIS) may be required. Otherwise, the environmental impacts of the locally preferred alternative will be defined and presented in the Final Environmental Impact Statement (FEIS). The

¹ This DEIS incorporates by reference all technical information, studies, and other public documents produced for the Southeast-Universities-Hobby Corridor Planning Study Alternatives Analysis (AA) and the METRO Solutions plan that support the DEIS. These documents are considered part of the environmental compliance record and can be requested for review at the METRO offices.

² Acronyms and abbreviations are defined at their first use in each chapter. A complete list of acronyms and abbreviations used in this DEIS is contained in Appendix A.
Federal Transit Administration, in consultation with Metropolitan Transit Authority of Harris County (METRO), will determine whether supplemental National Environmental Policy Act (NEPA) studies and documentation are needed prior to the FEIS.

5.1 Land Use

This section describes the anticipated impacts on existing land use from both the No Build and build alternatives and their compatibility with existing plans, policies and guidelines that may affect future land use in the corridor. Existing land use, plans, policies, and guidelines were previously described in Section 3.1 of Chapter 3.

5.1.1 Regional Land Use and Development

The Houston-Galveston region is expected to grow in population by 63 percent (or 2,917,585 people) between 2000 and 2025. Likewise, employment in the region is expected to grow by 53 percent during the same period (as identified in Chapter 1, Purpose and Need, Table 1-2, Employment and Population Projections).

The No Build Alternative represents the status quo and would not impact regional land use and development as currently planned. The build alternatives are not likely to generate new regional growth, nor is it likely that they would significantly change land use and development patterns at a regional scale. A study of the impact of transit on regional land use and urban form found that urban rail transit rarely creates new growth, but may redistribute growth that would have otherwise taken place (Cervero and Seskin, 1995). Further, the study found that transit investments generally require the leveraging effect of supportive public policies along with the pressures of an expanding regional economy to bring about significant changes in land use and urban form at the regional level. However, the build alternatives, when considered as part of the METRO Solutions plan (METRO, 2003), would play an important role in expanding regional transportation choices and in improving regional quality of life, image, and overall mobility. The extent to which the build alternatives attract new growth or result in a redistribution of projected regional growth will depend on favorable market conditions and supportive public policies. The impact of the build alternatives on corridor-level and station-level development and land use could be more substantial, and is addressed in the following sections.

5.1.2 Corridor Land Use and Development

This section describes the potential impacts of the No Build and build alternatives on land use at the corridor level.

5.1.2.1 No Build Alternative

The No Build Alternative would generally result in a continuation of current development patterns and trends. Land use patterns that exist today in several sections of the corridor, especially those land uses not in proximity to downtown or within a Tax Increment Reinvestment Zone (TIRZ), would be slow to change. The No Build Alternative limits opportunities for intensification, infill, or mixed-use development in portions of the corridor.
Currently, the primary land uses in the Southeast Corridor are single-family residential (25 percent), public and institutional (24 percent), undeveloped land (16 percent), industrial (13 percent), and commercial (other than office) (10 percent) (Harris County Appraisal District, 2004, updated by Knudson & Associates, 2004). The availability of vacant land, together with the planned development or redevelopment of portions of the study area (such as the East Downtown Tax Increment Investment Zone), the increasing emphasis on higher density residential development in areas in and around downtown Houston, the possible expansions of Texas Southern University (TSU) and the University of Houston (UH), and the proximity of the METRORail Red Line on Main Street, all have the potential to affect change in this area.

Much of this area is characterized by a tight grid system of streets, and in some locations it is characterized by older, established neighborhoods where many people are accustomed to walking and using transit, either from personal preference or from necessity. Because the No Build Alternative represents a continuation of past trends, it may hasten the degradation of the walking/transit environment over the long term as auto-oriented uses increase in their dominance.

5.1.2.2 Build Alternatives

The build alternatives, when combined with supportive public policies, plans, and favorable real estate market conditions, could attract transit-supportive development to the corridor, including employment opportunities, higher-density residential development, and new services and amenities. The pattern of development would be affected with a greater focus of activities and intensity of use along the fixed-guideway route. The land use impacts would be felt strongest close to the station locations (for more discussion about potential land use impacts at station locations, see Section 5.1.5). The build alternatives would redistribute growth along the corridor that would likely have otherwise occurred within the region at a less-dense scale.

Experience along the existing METRORail Red Line, such as in downtown Houston and in the Midtown area, suggests that developers in the Houston area are interested in creating transit and pedestrian-oriented mixed-use developments, and that these types of developments can be very successful. The experience in other cities with fixed guideway also supports this idea.

The build alternatives would enhance the potential for intensification of the land use pattern in the corridor by improving transit accessibility and by providing connections with the other parts of the existing and planned transit system, including such modes as bus, LRT, and commuter rail. Accessibility is an important consideration for development decisions for various types of land use including residential, office/retail, health and community services, and recreation facilities. Improved accessibility means that the Southeast Corridor would become more attractive to business and residential opportunities, and that the corridor would experience enhanced connectivity to the central business district (CBD), Midtown, the Museum District, Rice University, the Texas Medical Center (TMC), and the Reliant Park Complex along the METRORail Red Line, and future connections to other activity centers such as Greenway Plaza, Northline Mall, and the Uptown/Galleria area.
5.1.3 Compatibility with Land Use Plans, Policies, and Controls

As identified in Section 3.1.1 of Chapter 3, there are many plans, policies, and guidelines that affect land use in this area. Although the City of Houston does not have a comprehensive plan or land use zoning, it does engage in studies on a citywide scale to address particular needs. The City plans through major infrastructure projects, as well as through area-specific plans and policies. In addition, special districts such as TIRZs have proven to be a successful planning tool for promoting redevelopment in Houston. Each TIRZ has a plan that is approved by City Council.

This section discusses the compatibility of the No Build and build alternatives with the various governmental plans and policies that are in place, as well as plans coordinated by the special districts in the Southeast Corridor and planning efforts at the community level.

5.1.3.1 Government Plans and Policies

The following governmental plans, policies, and guidelines related to land use were evaluated to determine consistency with the No Build and build alternatives.

City of Houston

- **Southern Houston Study** (City of Houston, 2003) – Relevant to the study area, the study recommends encouraging commercial and industrial activities along Mykawa Road. The No Build Alternative does not impact this study. The build alternatives support the recommendation of encouraging development along the Mykawa Road corridor by providing a station less than 2,000 feet to the west of the intersection of Mykawa Road and Griggs Road (the Palm Center Station east of Martin Luther King Boulevard). This proximity of a station could attract development that would benefit from rail transit access to the CBD or other points on the proposed fixed-guideway alignment.

- **Third Ward to Main Street Connectivity Project** (City of Houston, 2003) – This project is a transportation initiative to link the Third Ward to Main Street and the METRORail Red Line via Elgin Street, Blodgett Street, and Old Spanish Trail/Holcombe Boulevard. The No Build Alternative potentially limits the opportunity to fully maximize the transportation linkages provided by the Connectivity Project by not offering a high capacity transit option to support the project. The build alternatives offer a fixed guideway transit option that directly links the Connectivity Project at the Elgin Street, Wheeler Street, and Southeast Transit Center station areas. The build alternatives also make full use of the streetscape improvements of the Connectivity Project, though the scheduling of the construction of the improvements should be coordinated to avoid potential conflicts.

- **Eastside Village Plan** (City of Houston, 1997) – The plan identifies Scott Street as an ideal location for large-scale commercial and higher-density residential uses that are compatible with and accessible to the neighborhood. The plan endorses pedestrian-friendly designs for the neighborhood. The No Build Alternative limits the opportunity to foster pedestrian-friendly designs and to attract large-scale commercial and higher-density residential uses to Scott Street. This option also could lead to degradation of the pedestrian environment in favor
of automobile-centered land use patterns along Scott Street. Conversely, the build alternatives support the plan’s goals of pedestrian-friendly designs and attracting large-scale commercial and higher-density residential uses to Scott Street. The station at Scott Street and Elgin Street would serve Eastside Village and could be a catalyst in realizing the plan’s objectives. However, as Scott Street represents a corridor shared by the Third Ward and the universities, the extent to which the resulting development does not reflect the existing neighborhood could mean that it’s not compatible with the neighborhood.

- **Zion’s Village: A Master Plan** (City of Houston, 1999) – Redevelopment recommendations in the plan include large-scale commercial and higher-density residential uses along Scott Street that are compatible with and accessible to the neighborhood, compatible infill single family and small-scale multi-family housing on vacant lots, and neighborhood-scale commercial, institutional, and multi-family uses along McGowen Street. The No Build Alternative limits the opportunity to attract large-scale commercial and higher-density residential uses to Scott Street, to spur infill housing, and to foster neighborhood-scale redevelopment along McGowen Street. This option also could lead to degradation of the pedestrian environment in favor of automobile-centered land use patterns along Scott Street. The build alternatives support efforts for large-scale commercial and higher-density residential uses along Scott Street that are compatible with and accessible to the neighborhood, compatible infill single-family and small-scale multi-family housing on vacant lots, and neighborhood-scale commercial, institutional, and multi-family uses along McGowen Street. The station at Scott Street and Elgin Street would be located about 1,000 feet south of Zion’s Village.

- **Parks and Recreation Master Plan** (City of Houston, 2001) – There is a planned park adjacent to the alignment in the vicinity of the Palm Center. The park is planned on the strip of land along the east side of the Palm Center. The No Build Alternative would not impact the plan. The improved transit access provided by the introduction of fixed-guideway service under the build alternatives could provide a valuable recreational amenity within reach of transit riders. Coordination of park and transit implementation plans would benefit both projects.

- **William P. Hobby Airport Image Environ Plan** (City of Houston, 2002) – The purpose of the image plan is to create a cohesive identity for the airport and its surrounding area through building and streetscape design elements. The No Build Alternative does not impact the plan. While the image plan’s recommendations are focused on airport-related motorists, the build alternatives provide the opportunity to reflect the plan’s recommendations as the alignment approaches and ultimately connect to Hobby Airport.

- **Major Thoroughfare and Freeway Plan** (City of Houston, 2003) – This plan serves as the guide for improvements to major thoroughfares and highways by the City of Houston, other government agencies and the private sector. The No Build Alternative would not impact the plan, as this represents the status quo. However, the No Build Alternative does represent the continued encroachment of automobile-centered development and infrastructure in neighborhoods with block lengths that are supportive of pedestrian, bicycle, and transit trips. The build alternatives would require coordination between the City of Houston and METRO.
on improvements near the intersections of Scott Street and Polk Street, Scott Street and Blodgett Street, and Griggs Road and Calhoun Road. The fixed-guideway alignment is proposed to primarily follow designated major thoroughfares, with some variation.

**Harris County**

- **Project Brays** – The Harris County Flood Control District (HCFCD) in cooperation with the U.S. Army Corps of Engineers is undertaking the Brays Bayou Flood Damage Reduction Project, also known as Project Brays. The No Build Alternative does not affect this project. The build alternatives require construction within the Project Brays area, including the Scott Street bridge across Brays Bayou. Construction of the build alternatives should be coordinated with the HCFCD to minimize disruptions to the bridge and impacts to planned flood control improvements. The build alternatives could be supportive of Project Brays if it allows for the shared cost of some improvements.

- **Harris County Commuter Rail** – The proposed commuter rail corridor crosses the Southeast Corridor at the intersection of Griggs Road, Long Drive, and Mykawa Road. The No Build Alternative affects future commuter rail studies to the extent that it limits the ability of future commuter rail lines to connect to the METRORail system and to provide service through such connections to the corridor. The build alternatives are supportive of studies of commuter rail in that they provide the opportunity to connect the METRORail system to a future commuter rail line along Mykawa Road, if such a facility is constructed. A connection would improve mobility and transportation options for the study area as well as for the commuter rail corridor.

**Houston-Galveston Area Council (H-GAC)**

- **Pedestrian and Bicycle Special Districts Study** (H-GAC, in progress) – The Greater Third Ward and Downtown Houston are identified in the plan as places where bicycle and pedestrian trips could replace vehicle trips and where safety could be improved. The No Build Alternative would not support improved pedestrian accessibility, as the land use pattern within portions of the corridor could become increasingly auto-oriented. The build alternatives support efforts to replace vehicle trips with pedestrians and bicyclists, and are conducive to developing pedestrian and bicycle activity within station areas. All of the station areas with the exception of the Calhoun Road and the Palm Center Stations are located within street patterns with 250-foot and 200-foot block lengths that are generally considered to be pedestrian-friendly.

- **Goals For Tomorrow** (H-GAC, 1998) – This is a comprehensive regional policy document that is a tool for coordinating planning decisions by H-GAC and local governments, as well as a tool for H-GAC’s review of federal and state grant applications. Goals for the region that are directly related to the Southeast Corridor promote coordinated land use and transportation development. The No Build Alternative would not support the intent of the goals of this document. It would not improve access to and between employment centers, including downtown, nor would it increase transportation choices. Further, the No Build Alternative would not promote the strengthening of downtown Houston and other
major activity centers. The build alternatives are more supportive of the goals of this document by improving mobility of residents and employees within the study area. They are also supportive of current development plans and activities.

- **2025 Regional Transportation Plan (RTP)** (H-GAC, 2005) – This plan identifies projects that would enhance mobility, safety, and the quality of life for residents. The No Build Alternative would not fully support the intent of the goals of this document. It would not improve mobility or complement the development plans within the study area, nor would it improve quality of life for residents within the area since no transportation alternative would be added. The build alternatives would support the 2025 RTP by improving mobility, complementing the development plans of local communities and increasing the quality of life for those who live and work in the area. The build alternatives could ultimately connect to potential commuter rail corridors, which would be beneficial to achieving overall regional mobility goals found in the 2025 RTP, including METRO Solutions (METRO, 2003).

**Texas Department of Transportation (TxDOT)**

- **State Highway (SH) 35 Major Corridor Feasibility Study (MCFS)** (TxDOT, in process) – TxDOT has undertaken an MCFS, expected to conclude in spring 2006, for the SH 35 corridor. The No Build Alternative does not affect this study. Plans for the build alternatives may require coordination with TxDOT and the Harris County Toll Road Authority with regards to the corridors identified in the SH 35 MCFS. TxDOT’s plans could prove to be compatible with the build alternatives if the projects are carefully designed with the other in mind. For example, easy connections from the SH 35 corridors to the Palm Center Station east of Martin Luther King Boulevard, with a park-and-ride lot, would allow drivers from the south and southeast an access point to the METRORail system. If the SH 35 alignments trigger changes in land use, special attention may be required to ensure that the resulting development is supportive of the build alternatives. A lack of coordination between the build alternatives and the SH 35 improvements and subsequent development could result in these plans being incompatible.

**Colleges and Universities**

- **University of Houston Campus Development Plan** (UH, 1998) – The UH campus master plan identifies a vision for the corridor as well as planned development projects. The No Build Alternative does not impact this plan, though it does represent a missed opportunity to serve a university campus with 35,000 students and 8,400 employees with fixed-guideway transit, and to link it with the UH downtown campus and the various major activity centers located along the METRORail Red Line. Both alignment options under the build alternatives support the plan by providing stations at Scott Street and Elgin Street and another at Scott Street and Wheeler Street, the former in the vicinity of proposed additions to athletics facilities and the latter adjacent to proposed student housing. The build alternatives could be a catalyst for efforts to develop a “college strip” along the west side of Scott Street that would meet the needs of the university’s population and the neighboring residents. Further, the build
alternatives would connect the UH main campus and the UH downtown campus, located along the METRORail Red Line.

- **Texas Southern University Campus Master Plan (TSU, 2001)** – The TSU campus master plan recommends the expansion of the university to the east. By 2006, the plan envisions several activities, including development of a ceremonial university entrance, a new School of Public Affairs building, and an athletic and educational complex. The No Build Alternative does not impact this plan, though it does represent the missed opportunity to serve a university campus with 9,000 students and 1,200 employees with fixed guideway transit. The build alternatives support the expansion of TSU towards Scott Street by providing a station at Scott Street and Wheeler Street, along the eastern edge of the expansion area. Proposed academic and athletic facilities adjacent to Scott Street would be served by the Wheeler Station.

### 5.1.3.2 Special Districts

Special districts offer unique opportunities for financing, planning, and implementing public and private improvements and services. Two types of these special districts were considered in this analysis: TIRZs and Municipal Management Districts.

- **Tax Increment Reinvestment Zone Number Three, City of Houston** – This special district is also known as the Market Square TIRZ. The zone includes approximately 100 blocks of the CBD, generally along Main Street and in the Theater District, within the Smith Street and Main Street station areas. The No Build Alternative does not impact the TIRZ plan, though it does represent a missed opportunity to further the goals of the TIRZ plan. The build alternatives support the goals of the TIRZ plan, including the desire to create pedestrian-friendly environments, reinforce pedestrian-attractive retail activities, improve east-west CBD connectivity and transit in general, and to spark redevelopment of vacant or under-used parcels and buildings to create mixed-use developments that add to the vibrancy of the CBD.

- **Tax Increment Reinvestment Zone Number Fifteen, City of Houston** – Also known as the East Downtown TIRZ, this plan proposes a land use concept containing a mix of residential, including townhomes, condos, and multi-family; parks, with a median boulevard park in Bastrop Street; and specialty retail reflective of the zone’s heritage as Old Chinatown. The goal of creating a pedestrian-friendly, mixed-use, mixed-income neighborhood is supported by a strategy of investments in improving the area’s inadequate infrastructure. The No Build Alternative does not impact plans for development of a pedestrian-friendly, mixed-use urban neighborhood within the East Downtown TIRZ, though it does represent a missed opportunity to further the goals of the TIRZ plan. The build alternatives are supportive of the East Downtown TIRZ, and could help to foster the creation of a thriving, pedestrian-friendly community with transit-oriented development. The presence of a substantial transit investment could help to accelerate investment within the TIRZ, and improve the TIRZ’ ability to fund projects from increment generated by the zone.
• Tax Increment Reinvestment Zone Number Seven, City of Houston – The Old Spanish Trail/Alameda TIRZ goals include alleviating blight, addressing obsolete platting, and encouraging growth of residential, commercial, and industrial development within the project area. The No Build Alternative does not impact the TIRZ. The build alternatives provide a vehicle to advance the goals of the TIRZ by potentially encouraging growth within the station areas of the Southeast Transit Center, Calhoun Road, and Martin Luther King Boulevard as well as enhancing the desirability of property in these areas through improved mobility.

• Houston Downtown Management District – The alignment options within the CBD are located within the District. The District’s assessment is being used to fund a variety of programs including the Cotswold Project and Southeast Quadrant Streetscape Improvements. The No Build Alternative does not impact the Houston Downtown Management District projects. The build alternatives take full advantage of the improvements constructed as part of the Cotswold and Southeast Quadrant Streetscape projects. The build alternatives also potentially spur development activity within the station areas in the CBD, which would boost revenues to the district.

• East Downtown Management District – The portion of the Southeast Corridor between US 59 and Interstate Highway 45 (IH-45) is located within the District. The District administers projects related to infrastructure and economic development. The No Build Alternative does not impact the East Downtown Management District. The build alternatives potentially spur economic development activity in the district, and provide a key infrastructure investment around which the district can plan its infrastructure upgrades. To the extent that the build alternatives spur development and redevelopment activity, the district could realize additional revenues through its assessments.

• Greater Southeast Management District – This district includes the alignment between IH-45 and the Palm Center Station at Martin Luther King Boulevard. Amongst the district’s efforts will be economic development and the provision of pedestrian ways, street lighting and landscaping (Texas Local Government Code, Section 376.451 to 376.480, 2001). The No Build Alternative does not impact the Greater Southeast Management District. However, it does represent a missed opportunity to spur economic development in the District. The build alternatives provide the district with a key infrastructure investment that could spark their economic development efforts. The build alternatives also provide an opportunity for the district to improve pedestrian ways, street lighting, and landscaping within the station areas, which could trigger pedestrian activity and further advance economic development objectives.

5.1.3.3 Community Efforts

• Master Plan for Buffalo Bayou and Beyond (Buffalo Bayou Partnership, 2002) – This plan calls for a transformation of the existing Buffalo Bayou environment through the development of park and recreation areas. The No Build Alternative does not impact the plan or proposals to create Festival Place. The build alternatives support the plan by providing a link to Buffalo Bayou and to the site of the proposed Festival Place within the Smith Station area under the LRT
Alternative in downtown Houston and the Louisiana Station are under the BRT Convertible and BRT Alternatives in downtown.

- **Greater Third Ward Community Plan** (Third Ward Development Council, 1995) – This plan recommends a series of strategies related to land use with the objective of stabilizing and preserving residential areas while also promoting investment in the area. The plan identifies several economic revitalization corridors, including Scott Street between IH-45 and Blodgett Street (containing the Elgin Street and Wheeler Street station areas), and between Griggs Road and Old Spanish Trail (within the Southeast Transit Center Station area). The No Build Alternative represents a missed economic development opportunity in the areas identified in the Community Plan. The build alternatives with the base alignment option support efforts in both economic revitalization corridors. However, the this option may be in conflict with efforts to limit commercial development along Scott Street between Blodgett Street and Griggs Road because of the Southmore and Southeast Transit Center Station locations. This option also could support proposals for mid-rise office development and retail along Old Spanish Trail in the Southeast Transit Center Station area.

  The build alternatives would support redevelopment in the portion of the revitalization corridor between IH-45 and Wheeler Street. The build alternatives could trigger infill housing on vacant parcels along Scott Street between IH-45 and Alabama Street, specifically in the Elgin Street station area, as well as infill housing on vacant parcels along Scott Street between Alabama Street and Brays Bayou. The build alternatives could put pressures on existing deed-restricted neighborhoods and could trigger non-single family residential land uses or single family housing that is not compatible with existing housing on vacant parcels in station areas.

  - **Scott Street Coalition** – The Scott Street Coalition is a non-profit group that is organizing a redevelopment plan for Scott Street in the greater Third Ward area. The No Build Alternative does not impact the activities of the Scott Street Coalition but could be a missed opportunity to spark redevelopment along Scott Street. However, until the redevelopment plan of the Scott Street Coalition becomes available, an evaluation of the No Build Alternative’s impact on the plan cannot be conducted. Generally, the build alternatives could be supportive of redevelopment efforts along Scott Street. However, until the redevelopment plan of the Scott Street Coalition becomes available, an evaluation of the build alternatives’ impact on the plan cannot be conducted.

  - **Deed Restrictions** – Many of the residential neighborhoods in the corridor between Wheeler Avenue and Griggs Road along Scott Street are deed-restricted communities. The No Build Alternative does not impact deed restrictions in the Southeast Corridor. The build alternatives could exacerbate or trigger pressures on deed restrictions in neighborhoods, especially in the vicinity of the Southmore Street Station area. Existing deed restrictions could be incompatible with development supportive of fixed-guideway transit.

### 5.1.4 Neighborhood Integrity

This section describes the potential impacts of the No Build and build alternatives on the physical integrity of the immediate surrounding community as well as the social
cohesion of the community, which generally refers to the perceived unity of an area, based on the day-to-day interactions of the area residents.

5.1.4.1 No Build Alternative

The No Build Alternative reflects the status quo, and would not impose additional barriers to the physical boundaries of the residential areas or the functioning of the community. However, as the neighborhoods of the Southeast Corridor begin or continue to experience increasing development and redevelopment pressures, this alternative would not help to guide development along specific corridors. The No Build Alternative would not help with mobility issues or decrease traffic congestion around such activity centers as the CBD, the Toyota Center, Minute Maid Park, the George R. Brown Convention Center, UH, and TSU, or traffic congestion from new development. Without focused development or mitigation strategies, the social cohesion of the community could be disrupted if new development occurs in a patchwork fashion in the neighborhoods.

5.1.4.2 Build Alternatives

The build alternatives could promote the concentration of travel and investment along the proposed alignment. The build alternatives would serve all of the neighborhoods identified in Section 3.2.3.1 to varying degrees. The integrity of the communities along the corridor would not be adversely affected by the proposed build alternatives. The build alternatives, which would be located primarily within existing roadway rights of way, would not have barriers that would prohibit vehicular or pedestrian crossing. All build alternatives would have guideways with semi-exclusive right of way allowing cross street pedestrian and vehicle traffic at signalized intersections only. Pedestrian movements would be directed to signalized intersections and sidewalks in the study area would be improved to enhance pedestrian safety. Except for site-specific displacements (project relocations of occupying owners or tenants), the basic structure of the business and residential communities throughout the project corridor would remain intact. The station areas could become centers of neighborhood activity and investment, and therefore could serve to boost neighborhood social cohesion.

In downtown, the METRORail Red Line along Main Street has proven to be a unifying rather than a dividing physical element, bringing people together along the corridor. The same could hold true for the downtown segment of the proposed Southeast Corridor fixed-guideway alignment. The proposed alignment on Griggs Road is located in a primarily commercial corridor, and therefore would not be a physical neighborhood barrier, but rather would provide centers of neighborhood activity at the station areas.

The build alternatives provide significant public investment in the community and could encourage new social and economic opportunities. Care must be taken however to minimize neighborhood disruption and displacement of existing residents, as well as to ensure that safety issues are adequately addressed.
5.1.5 Station Area Land Use

Because the No Build Alternative represents the status quo, there would be no station vicinity land use impacts. Development patterns would continue to reflect current trends. Portions of the Southeast Corridor, especially outside of the CBD and east downtown areas, could experience difficulty attracting transit-supportive and pedestrian-oriented development and could become increasingly auto-dependent.

This section considers the potential land use impacts within a quarter-mile radius of each station. Direct impacts, such as acquisitions and displacements resulting from construction of the build alternatives, are discussed in Section 5.14. The most substantial development pressure in the corridor would be felt near the proposed stations. Generally, impacts from transit investment are seen within walking distance of stations, generally about a quarter of a mile with the primary impact being immediately adjacent to the station and diminishing with increasing distance. Station locations with proposed parking will experience different kinds of land use impacts than station locations that would be accessed mainly by pedestrians. Impacts within the corridor could also occur to a lesser extent between stations, depending on market conditions. The impacts for each station area are discussed below. The location of station platforms and their relationship to adjacent properties is provided in the conceptual plan drawings in Volume 2 of this DEIS. Detailed maps of land use in each station area are available in the New Starts application package that is available upon request from METRO.

5.1.5.1 Smith Station

The Smith Station at Capitol serves the downtown LRT and westbound BRT alignments. The station serving the eastbound BRT alignment would be located at Smith and Rusk, one block south of Capitol. Land uses in this area are dominated by public, institutional, and office uses. While there are few vacant or under-utilized parcels in the Smith station area, the proposed station could lead to further development of street-level pedestrian-oriented uses in existing buildings, adding to the vibrancy of the area. Also, the proposed station could bolster efforts to expand and complete Bayou Place.

5.1.5.2 Main Street Station

The Main Street Station at Capitol serves the downtown LRT and westbound BRT alignments. The station serving the eastbound BRT alignment would be located at Main and Rusk, one block south of Capitol. The Main Street station area can be characterized as mixed-use, with a combination of office, commercial, and multi-family residential uses, along with vacant parcels typically used as surface parking lots. The presence of the METRORail Red Line on Main Street and supporting investments has sparked redevelopment in the area. The proposed Main Street station would enhance redevelopment activities along Main Street and the surrounding blocks and the intersection between the METRORail Red Line and the Southeast Corridor would likely experience an intensification of land uses and redevelopment of vacant or under-utilized parcels. Redevelopment near the proposed Main Street Station is likely to follow recent trends in the area and be
mixed-use in nature. The proposed Main Street Station would further add to the growing pedestrian-orientation and vibrancy of this portion of the CBD.

5.1.5.3 Crawford Station

The Crawford Station at Capitol serves the downtown LRT and westbound BRT alignments. The station serving the eastbound BRT alignment would be located at Crawford and Rusk, one block south of Capitol. The Crawford station area contains mostly public and institutional, commercial, and vacant land uses (typically in the form of surface parking lots). The proposed Crawford station would trigger redevelopment of vacant parcels and an intensification of land uses. The proximity of Minute Maid Park and the convention center could lead to development oriented towards supporting those land uses and patrons, such as hotels, restaurants, and bars. As land use intensifies and surface parking lots are redeveloped, parking garages with street-level uses may be constructed to fill gaps in parking supply.

5.1.5.4 Dowling Station

This station would be located on Capitol at Dowling. The Dowling station area contains primarily light industrial and vacant parcels, with a growing presence of multi-family residential. The Dowling station area would likely undergo substantial land use change because of its proximity to the CBD, the presence of the East Downtown TIRZ and the East Downtown Management District, and the emerging trend of development and redevelopment activity in the area. Development of multi-family residential loft-style housing is likely in the station area, along with townhouses and supporting pedestrian-oriented uses and services.

5.1.5.5 Leeland Station

This station would be located on Scott Street at Leeland Street. The Leeland Street station area contains a mix of single family residential, industrial, and commercial uses, with vacant parcels scattered throughout. Several commercial properties line Scott Street between Leeland Street and IH-45, including service stations and auto-repair facilities.

Despite a pedestrian-friendly street pattern, many of the land uses in the station area are auto-oriented. Without a TIRZ to focus investment or any emerging development trends in the station area, transition of land uses in the area might be slower than some of the other station locations. Redevelopment at this location might impact existing homes, though vacant parcels are available for potential development.

5.1.5.6 Elgin Station

This station would be located on Scott Street to the north of Elgin Street. Land uses to the north of Elgin Street are primarily single family residential and vacant. This proposed station would likely result in redevelopment of vacant parcels and intensification of land uses, and could spur proposals identified in the University of Houston Campus Development Plan to expand the university northwards on the east side of Scott Street to IH-45. Redevelopment at this location could impact existing homes. However, the absence of a TIRZ to focus investment or any emerging development trends in the area
may result in a slower transition of land uses from private sector forces at the proposed Elgin station than some of the other station locations.

5.1.5.7 **Cleburne Station**

This station would be located on Scott Street to the north of Cleburne Avenue. The Cleburne station area is dominated by public and institutional land uses, with single family residential and commercial uses mixed in. The University of Houston (UH) is located at the northeast corner of Scott Street and Wheeler Street. Development activity at the Cleburne station would strongly influence by institutional plans and investments by UH and Texas Southern University (TSU). The University of Houston Campus Development Plan identified additional student housing to be located in the station area near the northwest corner of Scott and Wheeler Streets. The plan identifies the west side of Scott Street as a location for a “college strip,” and the Wheeler Station could serve as a catalyst for such development to occur. TSU’s planned expansion to Scott Street, with proposed academic and athletic facilities adjacent to Scott Street, will significantly change land use within the expansion zone. Land use changes resulting from the station itself would likely occur on non-public and institutional properties, and are likely to be supportive in nature of the populations of the two universities.

5.1.5.8 **Southmore Station – Base Alignment Option**

This station would be located on Scott Street to the north of Southmore Street. The Southmore Street Station area contains single family residential, public and institutional, and multi-family residential land uses. The preponderance of deed-restricted, stable single-family residential neighborhoods, as well as established institutional land uses (hospital, elementary school) indicates that land use change will be slow in the Southmore Station area. Intensification of land use may occur on commercial parcels at the southwest corner of Scott Street and Southmore Street and to the north of the station on the west side of Scott Street. However, land use change in general is less likely to occur at this station location relative to other station locations.

5.1.5.9 **Southeast Transit Center (Old Spanish Trail) – Base Alignment Option**

This station would be located to the south of Old Spanish Trail at the METRO Southeast Transit Center, east of the intersection with Scottcrest Drive. Land uses in the station area are generally characterized by commercial properties along Old Spanish Trail with single family residential to the south of the commercial strip. A block south of the intersection of Griggs Road and Old Spanish Trail along England Street is MacArthur Elementary School. Vacant, industrial, and single family residential parcels are mixed together to the east of the proposed station. The proposed station would likely trigger redevelopment of vacant and under-utilized commercial and industrial parcels along the north side of Old Spanish Trail within the station area. Opportunities for transit-oriented development exist in this location. Infill opportunities exist to the east of the station. Changes in land use would be slower in the single family residential neighborhood to the south of the station. The development potential of the proposed Southeast Transit Center Station could be enhanced by the Old Spanish Trail/Almeda Corridors TIRZ.
5.1.5.10 **Calhoun Station – Base Alignment Option**

This station would be located on Griggs Road to the east of Calhoun Road. The land uses in the Calhoun Road station area are typically commercial along Griggs Road with single family residential uses generally behind this commercial strip. The Calhoun Road Station area features longer block lengths than most other station areas, with some blocks in excess of 500 feet, which could limit pedestrian-oriented land uses. Development and redevelopment opportunities are available on vacant and under-utilized land within the station area and these properties could become multi-family residential and commercial land uses. Land use changes are less likely in the single family neighborhoods behind the Griggs Road commercial strip. Station area development potential may be enhanced by the Old Spanish Trail/Almeda Corridors TIRZ.

5.1.5.11 **Palm Center Station**

This station would be located on Griggs Road to the west of Beekman Road. Land uses in the station area generally feature commercial, public and institutional, and multi-family residential along Griggs Road with single-family residential neighborhoods behind. On the southeast corner of Griggs Road and Martin Luther King Boulevard is the Palm Center, a multi-service center owned by the City of Houston. A 325-space park-and-ride facility is proposed on the Palm Center site.

The proposed Palm Center Station is likely to attract redevelopment of under-utilized parcels on the north side of Griggs Road in the station area. Multi-family and commercial uses are likely to develop in this location. While the block lengths (in excess of 500 feet) are not particularly supportive of pedestrian-oriented development, opportunities exist to orient redevelopment in a pedestrian-friendly manner while accommodating automobile traffic and parking. Land use changes are less likely in the single-family neighborhoods behind the Griggs Road commercial strip. Station area development potential may be enhanced by the Old Spanish Trail/Almeda Corridors TIRZ.

5.1.5.12 **University Oaks Station – Wheeler-MLK Alignment Option**

This station would be located on Wheeler Street at University Oaks, serving the UH campus. This station is near the Moody Towers Residence Halls, the largest student housing complex on the UH campus, with accommodations for over 1,100 students. The residence halls consist of two 18-story buildings. The Hilton College Building is also nearby and includes offices for student services, undergraduate admissions, graduate programs, and other administrative services. Campus parking lots are located on both the north and south sides of Wheeler Street. While land use changes are not anticipated on the UH campus, the proposed station would enhance mobility for UH students, faculty, and staff, and would encourage pedestrian-friendly development in the surrounding area.

5.1.5.13 **Old Spanish Trail Station – Wheeler-MLK Alignment Option**

This station would be located on Martin Luther King Boulevard at Old Spanish Trail. This station would provide access to MacGregor Park, a large recreation area north of Old Spanish Trail. The station would be constructed in a predominantly commercial
area south of Old Spanish Trail. Residential neighborhoods are present in the blocks to the east and west of Martin Luther King Boulevard in this area. The proposed station is likely to encourage the redevelopment of underutilized parcels south of Old Spanish Trail and to promote pedestrian-oriented land uses and development patterns.

5.1.6 Emerging Trends

Emerging trends in the Southeast Corridor can be identified by considering recent development activity. Table 3-2 in Chapter 3 provides information on building permits issued between 2001 and 2003 along a typically half-mile corridor centered on the proposed build alternative alignments. During that period, the total value of new development and redevelopment in the Southeast Corridor was nearly $486 million.

With the recent interest in redevelopment in the CBD, the area to the east of downtown, and the Old Spanish Trail/Griggs Road intersection, the increasing appeal of loft development and more urban residential experiences in Houston, the presence of special districts to focus investment and enhance development, and the availability of vacant land, the Southeast Corridor can be expected to undergo continued transformation and capitalize on these trends over the up-coming years. The Southeast Corridor will also benefit from the trend of institutional expansion at UH and TSU.

The No Build Alternative would not impact current development trends in the Southeast Corridor. The build alternatives would support continued development and redevelopment activity along the corridor, and that activity could become more intense and focused around stations once the locations are more defined. The build alternatives would help to drive the trends, and redistribute regional growth along the corridor, though it will not likely trigger new regional growth. The build alternatives could also benefit development activity along the METRORail Red Line as they provide more destinations accessible from the station areas.

5.1.7 Mitigation Measures

Some positive development and redevelopment may occur as a result of the proposed fixed-guideway transit. However, neighborhood impacts may also occur. Consideration of potential impacts on land use will continue throughout the study and design of the proposed fixed-guideway alignment, with a view to minimizing negative impacts.

Mitigation measures could include the following:

- Design station locations to be respectful of the primary land use in the surrounding area. For example, in primarily low-density residential areas, stations could be designed to be less obtrusive so that impacts on adjacent land uses are minimized. In areas that are best suited for redevelopment and intensification, stations could be appropriate in scale, and designed in conjunction with adjacent developments.
- Meet with local neighborhood and community groups regarding stations.
- Make safety a priority with the design and operational planning, being especially diligent where there are schools, churches, and senior housing in proximity to the proposed alignment.
- Institute appropriate neighborhood traffic measures to help prevent conflict between cars and the fixed guideway.

- Develop the park-and-ride lot to allow for safe pedestrian access along the streets that the lot abuts.

5.2 Socioeconomic Impacts

This section describes potential socioeconomic impacts of the No Build and build alternatives. Impacts addressed include those related to environmental justice, employment and economic impacts, and impacts on the cohesion of neighborhoods and community facilities and services.

5.2.1 Environmental Justice

This section describes potential impacts to minority and low-income communities. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that the potential for the proposed project to create disproportionately high and adverse impacts on minority and low-income populations with respect to human health and the environment be evaluated. Throughout the development of this project, METRO has met with numerous neighborhood and community groups in the study area and/or their representatives, providing public involvement opportunities that included meaningful access to public information concerning environmental impacts, and input solicited from affected minority and low-income populations in considering alternatives during the planning and development of alternatives and decisions.

Because of the diverse demographic characteristics of the study area and the City of Houston, some low-income and/or minority communities would be affected by the proposed project. Many low-income and/or minority neighborhoods are adjacent to the proposed alignment. This proximity would expose homes and businesses that abut the alignment to potential impacts. The primary potential impacts would be related to increased noise levels, displacement of homes and businesses, and visual changes.

The proposed project would not result in disproportionately adverse impacts on low-income and minority communities and businesses. Although the adverse effects that would occur would be predominantly borne by the minority and low-income populations, these effects are not appreciably more severe or greater in magnitude than adverse effects upon the non-minority population and/or the non-low-income population. As with any major transportation project, it is likely that residents within the project area would endure some impact because of the construction and operation of the proposed transit project. In addition, the build alternatives would provide offsetting benefits and opportunities that would enhance minority and low-income communities, neighborhoods, and individual quality of life. Among the positive effects of the project for all residents in the study area are enhanced mobility options, greater access to local jobs and non-job opportunities such as educational, shopping and entertainment activities, and potential economic development and redevelopment in communities along the project corridor.
5.2.1.1 Environmental Justice Considerations

In assessing compliance of the proposed project with the intent of Executive Order 12898 regarding environmental justice, there are three major considerations:

- Whether the project provides transit service equity;
- Whether any potential adverse impacts would be disproportionately borne by low-income and minority communities; and
- Whether low-income and minority communities have had opportunities to actively participate in the planning of the project.

The environmental justice analysis of minority or low-income populations includes evaluation of the potential for creating:

- Adverse impacts to human health;
- Adverse environmental impacts to natural resources; and
- Impacts that would adversely impact the stability and economic and social functioning of a community or neighborhood.

This analysis must ask whether any disproportionate adverse project impacts would affect minority or low-income areas relative to other areas.

5.2.1.2 Potential for Disproportionate Impacts

The following section addresses potential adverse effects that could result from the fixed guideway transit project that are of interest to the question of environmental justice. The No Build Alternative would not cause adverse impacts related to human health, natural resources, or social and community issues for any community.

Adverse effects under the build alternatives would fall on low-income and minority populations since they constitute the groups that live throughout substantial segments of the transit alignments. However, mitigation measures for impacts discussed in other sections of this chapter will reduce or eliminate the adverse effects. In view of the considerable project benefits and local support for implementing the build alternatives, the adverse effects would not be disproportionate to the improved transit service, increased mobility, and connections with major corridor activity centers, economic gains, and overall improvement in environmental quality that the build alternatives could offer. Community outreach and public involvement programs would continue to involve the traditionally under-represented populations through preliminary engineering, final design, and construction of the project.

Human Health Issues

The build alternatives would not result in disproportionate adverse impacts related to air pollution, noise and vibration, water quality, or exposure to soils contamination. An overview of each issue related to human health is described below.
• Air Pollution – The build alternatives would not cause or exacerbate a violation of the National Ambient Air Quality Standards (NAAQS) in the study area.

• Noise and Vibration – No noise impacts would result from the BRT Alternative. No severe noise impacts are expected to result from implementation of the LRT Alternative. However, under the LRT Alternative, five residential units in or near downtown would experience noise impacts and under the Wheeler-MLK alignment option 32 residential units would experience noise impacts resulting from audible warning devices (bells and whistles) at grade crossings. Vibration impacts could occur at 40 residential units and at Jones Hall and the Incarnate Word Academy. Mitigation measures to minimize noise and vibration impacts are described in Section 5.4.1. Because these impacts can be sufficiently mitigated, no disproportionately high or adverse visual impacts are expected to affect low-income or minority communities.

• Water Quality – Surface waters of Brays Bayou could experience temporary increase in turbidity from erosion and sedimentation during bridge construction. Groundwater could also be exposed to runoff from the project construction site. Water quality, however, would be protected in accordance with best-management practices for storm water management and sediment control. Thus, the proposed project is not expected to adversely affect water quality for this area.

• Contamination – Most of existing contaminated sites in the project area are disbursed throughout the study area and are not concentrated in low-income and minority neighborhoods. A detailed discussion of identified sites is provided in Section 5.12. Known sites along the corridor will be investigated further and appropriate mitigation developed to prevent exposure of workers or adjacent properties to potential contaminants. Federal and state disposal requirements will be applied to all pre-existing contaminants affected by the proposed project. Thus, the proposed project is not expected to expose any communities along the alternative alignments to soil contaminants.

**Destruction of Aesthetic Values**

Minimal visual impacts could result from the introduction of new transit vehicles, transit guideway, stations, and park-and-ride lots and the removal of existing vegetation. Implementation of the LRT Alternative would also introduce overhead power supply lines that could potentially diminish aesthetic value of historic sites, MacGregor Park, and other areas. The guideway throughout the study area would be located within an existing transportation corridor, thus minimizing visual impacts to the surrounding environment. Landscaping would be used to further reduce potential visual impacts. The stations under the build alternatives could also provide an opportunity to enhance the visual quality of the area and reflect the historical character of the Third Ward neighborhoods. A potential visual impact could result from installation of traction power substations if the LRT Alternative is used, but design treatments could be used to make the substations blend into the area. The storage yard and maintenance center would be located within an existing industrial land use area and visual impacts are not anticipated. Specific mitigation measures are described in Section 5.6. No disproportionately high or adverse visual impacts are expected to affect low-income or minority communities.
Diminished Community Cohesion; Reduced Access to Public and Private Facilities and Services; and Exclusion, Isolation, or Separation

The integrity of the communities along the corridor would not be adversely affected by the proposed build alternatives. The build alternatives would not have barriers that would restrict vehicular or pedestrian crossing. Except for site-specific displacements (project relocations of occupying owners or tenants), the basic structure of the business and residential communities throughout the project corridor would remain intact. This basic structure could be enhanced by the transportation benefits of the enhanced transit service. Thus, implementation of the proposed fixed guideway transit project would not adversely affect community cohesion. Access to public and private facilities and services (schools, churches, shopping, and emergency services) would not be adversely affected. The proposed transit project would result in increased accessibility, such that improved access to local services for communities could result.

Diminished Economic Viability and Diminished Employment Opportunities

Employment opportunities for minority and low-income communities would not be negatively affected by the proposed build alternatives. Short-term construction related jobs and long-term employment created by improved access would be a benefit to the entire community. Specific business displacements and relocations would affect individuals, but would not undermine the economic base of these communities.

Improved transportation options would increase access to potential employment. The proposed project would provide new job opportunities and new access to local employment opportunities for all communities within or near the project alignments. The economic and employment disadvantages of the proposed project would not be disproportionate since there would be additional employment access benefits. The project’s business displacements would not inequitably focus on businesses with high minority or low-income employment.

Traffic Congestion and Impairment to Mobility

If the build alternatives were implemented, localized roadway impacts would be expected at non-signalized intersections along Scott Street, Griggs Road, and Martin Luther King Boulevard because guideway in the median of those roadways would physically block left-turn movements as well as cross traffic. Traffic that currently makes these movements would need to divert to adjacent signalized intersections. While this diversion of traffic is not anticipated to be substantial, the diverted traffic volumes would increase traffic at signalized intersections along the proposed alignments. However, the impact is not expected to be disproportionately high or adverse on low-income or minority communities.

Displacements

Table 5-1 identifies the number of estimated housing unit and resident displacements under the build alternatives and the percentage of the displacements that are from minority and low-income communities.
Table 5-1. Displacement Impacts on Minority and Low Income Communities

<table>
<thead>
<tr>
<th>Build Alternatives</th>
<th>Estimated Relocations</th>
<th>Socio-Economic Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Housing Units</td>
<td>Residents</td>
</tr>
<tr>
<td>LRT Alternative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRT with Base Alignment Option</td>
<td>91</td>
<td>204</td>
</tr>
<tr>
<td>LRT with Wheeler-MLK Alignment Option</td>
<td>64</td>
<td>144</td>
</tr>
<tr>
<td>BRT Convertible and BRT Alternatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRT Convertible and BRT with Base Alignment Option</td>
<td>62</td>
<td>139</td>
</tr>
<tr>
<td>BRT Convertible and BRT with Wheeler-MLK Alignment Option</td>
<td>35</td>
<td>79</td>
</tr>
</tbody>
</table>

Source: Parsons Brinckerhoff, 2006.

The LRT Alternative with the base alignment option would result in the relocation of 91 housing units and approximately 204 residents. Of these residents, approximately 92 percent are minorities and 38 percent are low-income. The LRT Alternative with the Wheeler-MLK alignment option would result in the relocation of 64 housing units and approximately 144 residents. Of these, 92 percent of the residents are minorities and 42 percent are low-income.

The BRT Convertible and BRT Alternatives with the base alignment option would result in the relocation of 62 housing units and approximately 139 residents. Of these residents, approximately 93 percent are minorities and 35 percent are low-income. The BRT Convertible and BRT Alternatives with the Wheeler-MLK alignment option would result in the relocation of 35 housing units and approximately 79 residents. Of these residents, approximately 94 percent are minorities and 39 percent are low-income.

These displacements would not adversely affect the stability of the associated low-income or minority neighborhood but would require special attention to ensure that the housing needs of the households displaced are adequately met. Comparable housing should be available. METRO would develop and adopt a Relocation and Assistance Plan in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisitions Act of 1970. METRO will work with displaced households to identify replacement households of comparable size, amenities, and value in their home community. A preliminary assessment of the area identified over 100 properties currently for sale of varying values, sizes, and amenities.

As a secondary impact, the project could result in redevelopment of property in the corridor, particularly around station areas. Increased development potential could result in higher residential property values and taxes, and development of higher-priced housing units. Areas of low-income housing could be affected by gentrification trends, particularly in the Third Ward neighborhood between IH-45 and the UH area.
5.2.1.3 Transit Service Equity

Transit service equity is the extent to which the proposed transit project provides service to various population groups in the area, particularly low-income and minority residents. Persons served by the build alternatives are defined as those living within a one-quarter mile radius of proposed station locations. This section compares the population served by stations under the build alternatives to the total study area population.

Table 5-2 lists the total population, low-income, and minority populations for the areas within one-quarter mile of proposed LRT/BRT stations and the percent of the study area population that this represents, using the available 2000 Census numbers. The proposed LRT and BRT station locations are identical throughout most of the proposed alignments; however, the downtown BRT stations would be located on both Capitol and Rusk Streets.

### Table 5-2. Population Served – Service Equity

<table>
<thead>
<tr>
<th>Build Alternatives</th>
<th>Total Population</th>
<th>Minority</th>
<th>Low-Income&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/4 Mile from Station</td>
<td>Percent of Study Area Total Population</td>
<td>1/4 Mile from Station</td>
</tr>
<tr>
<td>Base Alignment</td>
<td>12,979</td>
<td>11</td>
<td>11,139</td>
</tr>
<tr>
<td>Wheeler-MLK Alignment Option</td>
<td>12,330</td>
<td>10</td>
<td>10,493</td>
</tr>
<tr>
<td>Total Study Area</td>
<td>123,249</td>
<td>100</td>
<td>112,206</td>
</tr>
</tbody>
</table>

Source: 2000 Census
<sup>a</sup> Low-income are persons below poverty level as defined by the U.S. Census Bureau.

Approximately 11 percent of all people residing within the study area live within one-quarter mile of the station locations under the build alternatives with the base alignment option. A slightly lower percentage of residents in the study area would live within one-quarter mile of the stations in the build alternatives with the Wheeler-MLK alignment option (10 percent). Approximately 10 percent of study corridor residents within in the station areas are minorities, with Black or African-American and Hispanic or Latino residents comprising the largest proportions of the population under the build alternatives with the base alignment option. The proportion of minority residents is similar under the Wheeler-MLK alignment option (9 percent).

The population within the build alternatives' station areas is approximately 30 percent low-income, for both the base alignment option and Wheeler-MLK alignment option. This poverty rate is slightly lower than the 33 percent poverty rate for the study area as a whole. These enhanced transportation services would provide increased mobility options and access within the study area as well as to and from low-income and minority communities.
5.2.2 Economic Impacts

Implementation of the build alternatives would provide several direct, indirect, and induced economic benefits related to construction and on-going expenditures for operations and maintenance (O&M) of the system. These effects would be realized to varying degrees throughout the region in terms of increased economic output, employment, and earnings. Other economic impacts relate to impacts on the local property tax base from removal of properties from the tax roles and increases in property taxes from increased development around stations.

5.2.2.1 Impacts of Construction Spending

Economic impacts of construction spending include the number of jobs that would be added to the local economy as a result of building the proposed fixed-guideway alignment. The estimate of construction spending impacts is based on the following typical project assumptions:

- Total costs for the fixed guideway project with the base alignment option would be about $349.6 million for the LRT Alternative, $216.6 million for the BRT Convertible Alternative, and $176.8 for the BRT Alternative. Total costs for the fixed guideway project with the Wheeler-MLK alignment option would be about $318.7 million for the LRT Alternative, $184.9 for BRT Convertible Alternative, and $150.7 for BRT Alternative (METRO, 2006).

- An estimated 65 percent of the total project cost is construction related, and 35 percent is associated with administration, insurance, and engineering services.

- An estimated 40 percent of construction costs fund labor and 60 percent are used for materials and equipment.

- The typical construction wage is approximately $35 per hour.

- Construction of the project would last three to four years (depending on funding availability.)

As shown in Table 5-3, The LRT Alternative with the base alignment option would include approximately $90.9 million in labor costs, which would result in an average of 416 jobs per year for three years. Under the BRT Convertible Alternative, this alignment option would result in approximately 258 jobs per year for three years. Under the BRT Alternative, this alignment option would result in approximately 210 jobs per year for three years. The No Build Alternative would have no impact on construction employment in the corridor.

The LRT Alternative with the Wheeler-MLK alignment option would include approximately $82.9 million labor costs, which would result in an average of 379 jobs per year over three years. Under the BRT Convertible Alternative, this alignment option would result in approximately 220 jobs per year for three years. Under the BRT Alternative, this alignment option would result in approximately 179 jobs per year for three years. The No Build Alternative would have no impact on construction employment in the corridor.
Table 5-3. Employment Impacts of Construction Spending (Millions 2005 Dollars)

<table>
<thead>
<tr>
<th></th>
<th>No Build</th>
<th>Build Alternatives with Base Alignment Option</th>
<th>Build Alternatives with Wheeler-MLK Alignment Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LRT</td>
<td>BRTConvertible</td>
<td>BRT</td>
</tr>
<tr>
<td>Total Costs</td>
<td>$0</td>
<td>$349.60</td>
<td>$216.60</td>
</tr>
<tr>
<td>Construction Costs</td>
<td>$0</td>
<td>$227.24</td>
<td>$140.79</td>
</tr>
<tr>
<td>Labor Costs</td>
<td>$0</td>
<td>$90.90</td>
<td>$56.32</td>
</tr>
<tr>
<td>Jobs</td>
<td>0</td>
<td>416</td>
<td>258</td>
</tr>
</tbody>
</table>


5.2.2.2 Impacts of Operations Spending

Potential impacts of operations spending include additional employment for vehicle operators and maintenance of equipment and station areas. The No Build Alternative would have no impact on operations spending. The build alternatives would have a modest impact on the number of jobs related to operation and maintenance of the transit system. It is estimated that the build alternatives would have approximately 350 more weekday vehicle hours than the No Build Alternative. Meeting this increased level of service would require the addition of about 100 employees. While staff would be needed to operate and maintain the rail system, this impact would be somewhat offset by the reduction in bus service to the corridor and associated staffing needs.

5.2.2.3 Impacts on Property Taxes

The conversion of private property to public right of way would result in a short-term, but relatively minor, decline in the local property tax base, with the removal of the property from the tax rolls. Table 5-4 shows the approximate value of private property that would be acquired for the build alternatives and the corresponding loss of assessed property value that Harris County and the City of Houston would experience in the short term.

Table 5-4. Loss of Assessed Property Value

<table>
<thead>
<tr>
<th>Item</th>
<th>2003 Assessed Property Value in the Study Area</th>
<th>LRT Alternative with Base Alignment</th>
<th>LRT Alternative with Wheeler-MLK Alignment Option</th>
<th>BRT Convertible and BRT Alternatives with Base Alignment</th>
<th>BRT Convertible and BRT Alternatives with Wheeler-MLK Alignment Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>$1,697,574,380</td>
<td>$3,712,670</td>
<td>$853,710</td>
<td>$3,534,480</td>
<td>$675,520</td>
</tr>
<tr>
<td>Commercial</td>
<td>$4,243,321,040</td>
<td>$5,742,330</td>
<td>$4,634,790</td>
<td>$3,346,340</td>
<td>$2,238,800</td>
</tr>
<tr>
<td>Industrial</td>
<td>$426,695,439</td>
<td>$120,140</td>
<td>$111,390</td>
<td>$8,750</td>
<td>$0</td>
</tr>
<tr>
<td>Total Value</td>
<td>$6,367,590,859</td>
<td>$9,575,140</td>
<td>$5,599,890</td>
<td>$6,889,570</td>
<td>$2,914,320</td>
</tr>
<tr>
<td>Share of total revenue from property tax</td>
<td>0.15%</td>
<td>0.09%</td>
<td>0.11%</td>
<td>0.05%</td>
<td>0.05%</td>
</tr>
</tbody>
</table>

The loss of assessed property value was calculated based upon acquisition of whole parcels; therefore, partial acquisitions (which are not known at the conceptual engineering phase) were not directly included as a potential loss to the property tax base.

The value of the property to be acquired was determined through the use of the geographic information system (GIS) database obtained from the City of Houston. Appraised value is based on 2003 property appraisal conducted by Harris County. While these are not inconsequential losses, they must be considered in light of the total assessed value of real estate within the study area. For 2003, the County appraised real property at a value of $6,367,590,859 in the study area. The amount of property tax base that would be lost under the LRT Alternative with the base alignment would be about 0.15 percent of the County’s 2003 assessed property value within the study area. Property acquisitions under the LRT Alternative with the Wheeler-MLK alignment option would result in the loss of about 0.09 percent of assessed property within the study area. Under the BRT Convertible and BRT Alternatives with the base alignment, property acquisitions would result in the loss of approximately 0.11 percent of assessed property within the study area. Under the BRT Convertible and BRT Alternatives with the Wheeler-MLK alignment option, property acquisitions would result in the loss of approximately 0.05 percent of assessed property within the study area.

The initial loss to the tax base would begin in the first year of project construction. Possible increases in property tax revenues as a result of increased development activity around rail stations or higher property values along the rail line would not be expected to occur until near, or after the completion of the construction phase. This is expected to more than offset the property value loss from the acquisition of properties for public use.

5.2.3 Neighborhoods, Community Facilities and Services

This section discusses anticipated impacts on neighborhood and community facilities from the No Build Alternative and build alternatives.

5.2.3.1 Community Facilities

Community facilities and services include educational facilities; places of worship; health care facilities; public safety facilities (i.e. police, fire, and rescue); cultural facilities (i.e. libraries, museums, or theaters); park/recreation areas; and government agency buildings. As discussed in Section 3.2.3, many of these facilities are located throughout the study area and contribute to the social welfare of the local communities. Impacts to parks are evaluated in Section 5.10, Parklands and Other Section 4(f) Properties. Impacts to police and fire stations are discussed in Section 5.13, Safety and Security.

The No Build Alternative would not change existing conditions at community facilities in the study area.

The build alternatives would provide increased accessibility to community facilities within the study area, while resulting in few anticipated negative impacts. The build
alternatives would require additional right of way along Scott Street near the intersection of Ruth Street. This acquisition would result in a partial displacement of parking and front yard area for the William A. Lawson Christian Life Center, which offers meeting space and educational training for members of Wheeler Avenue Baptist Church, and as well as front yard space for Wheeler Avenue Baptist Church Community Life Center, which offers medical services and meeting spaces. The build alternatives would require additional right of way along Griggs Road near the intersection of Martin Luther King Boulevard. This acquisition would remove parking spaces adjacent to Griggs Road in the Palm Center community center, which also includes the Young Public Library. The removal of these parking spaces would have a minimal effect on the Palm Center and the Young Public Library because of the large size of the parking lot.

5.2.3.2 Neighborhoods

The No Build Alternative would not change the existing character of neighborhoods and communities in the project area; therefore, no impacts to the study area’s neighborhoods would be anticipated as a result of the No Build Alternative. The build alternatives have the potential to create additional barriers in some locations; although throughout much of the study area the build alternatives are within or adjacent to major streets that currently serve as edges of existing neighborhood areas.

As discussed in Section 3.2.3.1, and shown in Figure 3-4 in Chapter 3, there are eight Super Neighborhoods identified in the study area. This section describes the potential impacts to these 11 Super Neighborhoods under the build alternatives. Relocation of businesses and residents are discussed in Section 5.3, Acquisitions and Displacements/Relocations.

- Downtown – Downtown is the primary commercial center of Houston, although an increasing number of residences are being built or developed through the adaptive reuse of older structures, in addition to large-scale redevelopment efforts. The proposed (LRT or BRT) alignment would be within existing right of way along Capitol and Rusk; therefore, no displacement or relocations within this neighborhood would occur. There are three proposed stations within the downtown neighborhood. The build alternatives would encourage additional growth of the existing street-level retail uses. This new accessibility could also act as a catalyst for the utilization of underused space in the upper floors of commercial buildings. Although the proposed project runs through the heart of the area, no physical division or isolation would occur since the line would be built within existing right of way and the building elevation of the surrounding structures would overshadow any potential barrier effect. Greater access and mobility provided by the build alternatives are anticipated to support the existing business activity within the existing community without significantly changing the overall neighborhood.

- Second Ward – Although this neighborhood is located in the study area for the project, the proposed fixed-guideway service would not extend into the Second Ward neighborhood. Rather, the proposed service runs adjacent to the Second Ward as it crosses from downtown southward into the Greater Eastwood/Lawndale neighborhood. The sections of Second Ward closest to the
build alternatives are mostly utilized as industrial space, with residential uses toward the interior of the neighborhood. Greater access and mobility provided by the proposed transit service is anticipated to support the land uses within the existing community without significantly changing the overall neighborhood.

- **Greater Eastwood/Lawndale** – Within the Greater Eastwood/Lawndale neighborhood, the areas adjacent to the proposed fixed-guideway corridor are utilized by predominately industrial uses with a few residences. The build alternatives would not use existing roadway and would require right of way and property acquisition starting at the intersection of Nagle and Capitol extending southward to the intersection of Polk Street and Scott Street. The barrier effect from the alignment would be minimal because of the nature of industrial land uses and the fact that the LRT storage and maintenance facility would be adjacent to the Burlington Northern Santa Fe Railway (BNSF) tracks, while the social interactions among residents and pedestrians in the remainder of the neighborhood would not be adversely affected by the project. Greater access and mobility provided by the build alternatives are anticipated to support the land uses within the existing community, without substantially changing the overall neighborhood.

- **Greater Third Ward** – The Greater Third Ward contains TSU and Riverside Hospital, in addition to many small frame and “shotgun” style residences throughout the neighborhood. The two stations proposed to serve the Greater Third Ward neighborhood would improve general accessibility for the neighborhood residents as well as the commercial uses and community facilities within the area. As a result of right of way acquisition, several residences and retail uses would be relocated. The relocation of these retail services, though important to owners, employees, and patrons, would not substantially alter the overall character of the neighborhood. Greater access and mobility provided by the build alternatives are anticipated to support these existing neighborhood functions without changing the overall neighborhood.

- **Gulfgate Riverview/Pine Valley** – Although this neighborhood is located in the study area for the project, the proposed light rail service would not extend into the Gulfgate Riverview/Pine Valley neighborhood. The sections of Gulfgate Riverview/Pine Valley closest to the build alternatives are mostly as single family residential uses, separated by older highways. Greater access and mobility provided by the proposed transit service is anticipated to support the land uses within the existing community without changing the overall neighborhood.

- **MacGregor** – The MacGregor neighborhood is dominated by residential uses with some commercial and multi-family housing interspersed within the area. As a result of right of way acquisition, several residences and retail uses would be relocated. The proposed stations would provide greater access and mobility to the residents in this area, and could encourage commercial redevelopment. Overall, the build alternatives are anticipated to support these existing neighborhood functions without basically changing the overall neighborhood.

- **Old Spanish Trail/South Union** – The Old Spanish Trail/South Union neighborhood includes both residential and commercial uses. Within the Old Spanish Trail/South Union neighborhood, the build alternatives would use existing roadway right of way and would require very little right of way and property acquisition, which would result in minimal impact to overall neighborhood cohesion. There are two stations...
proposed within this neighborhood. Greater access and mobility provided by the build alternatives are anticipated to support the land uses within the existing community without changing the overall neighborhood.

- **Golfcrest/Belfort/Reveille** – Although this neighborhood is located in the study area for the project, the proposed light rail service would not extend into the Golfcrest/Belfort/Reveille neighborhood. The sections of Golfcrest/Belfort/Reveille closest to the build alternatives include suburban neighborhoods as well as industrial sites. Greater access and mobility provided by the proposed METRO service is anticipated to support the land uses within the existing community without changing the overall neighborhood.

### 5.2.3.3 Mitigation Measures

The impacts on community facilities and neighborhood cohesion from the build alternatives are anticipated to be minimal. Educational awareness programs would alert residents to the presence of fixed-guideway service and vehicles.

### 5.3 Acquisitions and Displacements/Relocations

Displacement/relocation results from right of way acquisition that requires permanent removal and relocation of existing land uses, and addresses both owners and tenants at the time of acquisition. The No Build Alternative would not require the acquisition of additional right of way and therefore would not require the relocation of any commercial, residential, or other uses. The build alternatives are expected to require the acquisition of private property. In some cases, the project would require only a partial acquisition and in other cases, the project would require acquisition of the entire parcel. As a result of the whole parcel property acquisitions, the build alternatives and associated alignment options are expected to displace residences and businesses along the alignment. The information described in this section is preliminary and subject to refinement during preliminary engineering and design. If significant impacts result from the changes, a supplemental draft DEIS may be required. The Federal Transit Administration (FTA), in consultation with METRO, will determine whether supplemental NEPA studies and documentation are needed prior to the FEIS.

#### 5.3.1 Property Acquisitions and Relocations

Table 5-5 identifies the estimated number of parcels that would be acquired under the build alternatives with the base alignment (i.e., Scott Street and Griggs Road) and Wheeler-MLK alignment options. The table also identifies the estimated number of residential, business, and other units that would be relocated as a result of acquiring the parcels for each alignment segment. Aerial photography, field surveys of the project area, City of Houston land use data, and 2000 U.S. Census data were used to identify the location and potential number of relocations. The conceptual plan drawings (see Volume 2 of the DEIS) showing existing and proposed right-of-way lines and property boundaries were used to determine parcel acquisitions for the build alternatives. During the preliminary engineering design of the project, efforts will be made to minimize impacts to individual parcels and the need for some of the relocations. Figure 5-1 and Figure 5-2 show the location of displacements along the proposed alignments from downtown to Wheeler Street and from Wheeler Street to Beekman Road under the build alternatives.
Locations of Displacements from Downtown to Wheeler Street

Figure 5-1. Location of Displacements from Downtown to Wheeler Street

Source: Parsons Brinckerhoff, 2006.
Locations of Displacements from Wheeler Street to Beekman Road

Figure 5-2

Source: Parsons Brinckerhoff, 2006.
As identified in Table 5-5, the LRT Alternative with the base alignment would require the acquisition of a total of 127 whole parcels and 138 partial parcels. Of the whole parcels, 59 are classified as residential, 64 are commercial, and four are publicly owned. Approximately 91 residential units and 78 businesses would be relocated. The LRT Alternative with the Wheeler-MLK alignment option would require the acquisition of 93 whole parcels and 110 partial parcels. Of the whole parcels, 41 are classified as residential, 49 are commercial, and three are publicly owned (City of Houston GIS, 2005). Approximately 64 residential units and 35 businesses would be relocated.

Under the BRT Convertible and BRT Alternatives with the base alignment, 84 whole parcels and 136 partial parcels would be acquired. Of the whole parcels, 47 are residential, 34 are commercial, and three are publicly owned. Approximately 62 residential units and 62 businesses would be relocated. The BRT Convertible and BRT Alternatives with the Wheeler-MLK alignment option would require the acquisition of 50 whole parcels and 108 partial parcels. Of the whole parcels, 29 are residential, 19 are commercial, and two are publicly owned. Approximately 35 residential and 19 commercial relocations would occur (City of Houston GIS, 2005).

5.3.2 Relocations by Segment

No relocations would occur in the downtown segment of the build alternatives. As shown in Table 5-5, several business and residential relocations would occur at the site of the proposed train storage yard and maintenance center east of downtown under the LRT Alternative. The proposed location is generally bounded by Capitol, McKinney, Nagel, and BNSF railroad and is in a primarily industrial area, although this area is experiencing residential redevelopment. Types of businesses that would be impacted include warehouses, distribution centers, transportation services, and industrial uses. Two blocks in this area contain residential parcels. These timber-frame residential structures are small and isolated within the industrial area. There is new residential construction along Capitol between Live Oak and Nagle; however, estimated residential units to be relocated are still unknown at this stage in development in construction. Under the LRT Alternative, a traction power substation (TPSS) would be located northeast of the intersection of Paige and Walker. All of the proposed TPSS substations have been sited to minimize impacts to surrounding properties. However, these locations are subject to change during preliminary engineering and final design. If significant impacts result from the changes, a supplemental draft DEIS may be required. The FTA, in consultation with METRO, will determine whether supplemental NEPA studies and documentation are needed prior to the FEIS.

As the build alternatives continue southeastward across McKinney Street, three additional commercial/industrial and 13 residential units would be relocated. Two businesses and nine residential units would be relocated between Polk Street and IH-45, in addition to some partial acquisitions. The primary land uses along Scott Street between IH-45 and Elgin Avenue include single-family and multi-family residences, and neighborhood service and commercial uses. Examples of types of business that would be impacted include convenience stores and retail stores serving the local neighborhood. There are multiple vacant lots and buildings in the
### Table 5-5. Estimated Potential Property Acquisitions and Relocations

<table>
<thead>
<tr>
<th>Build Alternatives</th>
<th>Number of Whole Parcels</th>
<th>Number of Relocations</th>
<th>Number of Partial Parcels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Residential</td>
<td>Commercial</td>
<td>Other</td>
</tr>
<tr>
<td>LRT Alternative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRT with Base Alignment</td>
<td>59</td>
<td>64</td>
<td>4</td>
</tr>
<tr>
<td>LRT with Wheeler-MLK Alignment Option</td>
<td>41</td>
<td>49</td>
<td>3</td>
</tr>
<tr>
<td>BRT Convertible and BRT Alternatives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRT Convertible and BRT with Base Alignment</td>
<td>47</td>
<td>34</td>
<td>3</td>
</tr>
<tr>
<td>BRT Convertible and BRT with Wheeler-MLK Alignment Option</td>
<td>29</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>Alignment Segments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRT Storage Yard and Maintenance Facility</td>
<td>12</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>Paige St to Wheeler St.</td>
<td>26</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Wheeler St. to Beekman Rd. under Base Alignment</td>
<td>21</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>Wheeler St. to Beekman Rd. under Wheeler - MLK Alignment Option</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: 2003 aerial photographs; City of Houston GIS Land Use Data, 2005; 2000 U.S. Census; METRO; Parsons Brinckerhoff, 2006.
segment of Scott Street between IH-45 and the UH campus. Under the LRT Alternative, a TPSS would be located northeast of the intersection of Scott Street and Hadley Street and east of Scott Street at Cleburne Avenue.

Multiple single-family, duplex, and apartment units along Scott Street and along Griggs Road would be displaced under the base alignment option. Neighborhood businesses including salons, restaurants, and other local services would be displaced. Approximately 35 residences (30 single-family and five multi-family) and 46 businesses would be relocated in this segment of the alignment. Under the LRT Alternative, a TPSS would be located southeast of the intersection of Scott Street and Old Spanish Trail and south of Griggs Road between Calhoun Road and Wayland Road.

The Wheeler-MLK alignment option would result in the relocation of three businesses as well as eight residential (seven single-family and one multi-family).

5.3.3 Mitigation Measures

Mitigation for property acquisition and relocations would be in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. Property acquisition would occur after receipt of the Record of Decision. Property owners would be paid fair market value for property acquired. Right-of-way needs would be refined during the design process and would not be finalized until design is complete.

The Uniform Relocation Assistance and Real Property Acquisition Policies Act requires that relocation and advisory assistance be provided to all eligible individuals and businesses displaced by a proposed transportation project in accordance with the provisions of the act. Comparable housing that is decent, safe, and sanitary must be available for displaced persons. The act requires non-discriminatory policies and actions with regard to appraisals and acquisitions of properties.

Relocations could be accomplished either by providing compensation for moving residences or businesses back from the proposed right of way on the currently occupied properties (where possible), or by providing assistance to locate and acquire available housing or business properties elsewhere.

5.4 Air Quality

This section describes the analysis completed to compare potential impacts of the No Build and build alternatives on regional air quality and at specific locations within the study area.

5.4.1 Methodology

5.4.1.1 Pollutants for Analysis

Pollutants that can be traced principally to motor vehicles and transit systems are relevant to the evaluation of the project impacts; these pollutants include carbon monoxide (CO), hydrocarbon (HC), nitrogen oxide (NOₓ), ozone (O₃), particulate matter (PM₁₀), PM₂.₅, and the six priority mobile source air toxics (MSAT) discussed.
Transportation sources account for a small percentage of regional emissions of sulfur oxide (SO\textsubscript{x}) and lead (Pb); thus, a detailed analysis is not required. The operation of the LRT or BRT vehicles may produce incremental emission increases under the build alternatives but these increases should be offset by the emission reductions because of the project. While the US Environmental Protection Agency (EPA) has indicated that PM\textsubscript{10} and PM\textsubscript{2.5} are pollutants of concern for mobile-source projects, EPA has not released modeling guidance on how to perform quantitative PM\textsubscript{10} and PM\textsubscript{2.5} hot-spot analysis. Quantitative analysis is not currently required. As the area is in attainment for PM\textsubscript{10} and PM\textsubscript{2.5}, and given the project is predicted to reduce regional vehicle miles traveled (VMT), the project is not expected to cause or exacerbate a violation of the PM\textsubscript{10} or PM\textsubscript{2.5} standard.

HC, volatile organic compounds (VOC), and NO\textsubscript{x} emissions from automotive sources are a concern primarily because they are precursors in the formation of ozone. Ozone is formed through a series of reactions which occur in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels often are found many miles from sources of the precursor pollutants. Therefore, the effects of HC and NO\textsubscript{x} emissions generally are examined on a regional or "mesoscale" basis.

CO impacts are generally localized. Even under the worst meteorological conditions and most congested traffic conditions, high concentrations are limited within a relatively short distance (300 – 600 feet) of heavily traveled roadways. Vehicle emissions are the major sources of CO. The proposed project could change traffic patterns within the study area. Consequently, it is appropriate to predict concentrations of CO on both a regional and a localized or "microscale" basis.

Through the issuance of EPA’s Final Rule regarding emission control of Hazardous Air Pollutants from Mobile Sources (66FR17229), it was determined that many existing and newly promulgated mobile source emission control programs would result in a reduction of MSAT. Federal Highway Administration (FHWA) projects that even with a 64 percent increase in VMT, the programs will reduced on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent. As a result, EPA has concluded that no further motor vehicle emission standards or fuel standards were necessary to further control MSATs. Since the project is predicted to reduce overall VMT in the study area and MSATs emissions are predicted to decrease in future years, a qualitative discussion of the project’s impact on MSAT levels, following FHWA’s February 3, 2006 guidance is presented in this section.

5.4.1.2 Regional Emissions Analysis

The regional or mesoscale analysis of a project determines a project's overall impact on regional air quality levels. The regional analysis utilizing VMT and vehicle hours traveled (VHT) within the region, with corresponding emission factors for VOC, NO\textsubscript{x}, CO and PM\textsubscript{10} from EPA's latest emission factor program, currently MOBILE6.2 to determine daily “pollutant burden” levels.
5.4.1.3 Mobile Source Air Toxics Analysis

On February 3, 2006, FHWA issued Interim Guidance regarding MSAT analysis for NEPA documents. Given the emerging state of the science and of project-level analysis techniques regarding MSAT, there are no established criteria for determining when MSAT emissions should be considered a significant issue. FHWA has suggested a tiered approached in determining potential project induced MSAT impacts. The three tiers are:

- Tier 1 – No analysis for projects with no potential for meaningful MSAT effects;
- Tier 2 – Qualitative analysis for projects with low potential MSAT effects; and
- Tier 3 – Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

FHWA has developed this approach because currently available technical tools do not have the ability to predict project-specific health impacts of the emission changes associated with the No Build and build alternatives.

5.4.1.4 Microscale Air Quality Analysis

Microscale air quality modeling was performed using the most recent version of the EPA mobile source emission factor model (MOBILE6.2) and the CAL3QHC version 2 air quality dispersion model to estimate existing and future CO levels under the No Build and build alternatives at selected locations in the study area.

Site Selection and Receptor Locations

The analysis sites for the CO analysis were selected using a screening analysis based on overall intersection volume, changes in intersection volume, and changes in level of service (LOS). Intersections which demonstrate a LOS of A, B, or C pass the screening test. That is, they are not expected to cause a violation of the NAAQS. Intersections which operate at a LOS of D or worse have the potential to cause a violation of the NAAQS, and thus fail the screening analysis. The LOS analysis of the intersections found to operate at LOS D or worse is presented in Table 5-6.

The intersections found to be operating at LOS D or below are:

- Capitol and Louisiana – The LOS for this site deteriorates from an A to a D in the p.m. peak period.
- Gulf Freeway South Service Road and Scott Street – The LOS for this site deteriorates from a C to a D in the a.m. peak period.
- North MacGregor Road and Scott Street – The LOS for this site deteriorates from a C to a D from the a.m. peak period.
- Cullen Road and Wheeler Street – While the LOS for the intersection is D for all scenarios, the average delay increases under the build alternatives in both the a.m. and p.m. periods.
Table 5-6. Air Quality Screening Analysis

<table>
<thead>
<tr>
<th>Intersection</th>
<th>No Build Alternative</th>
<th>LRT Alternative</th>
<th>BRT Convertible and BRT Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Delay (se/veh)</td>
<td>LOS Volume</td>
<td>Average Delay (se/veh)</td>
</tr>
<tr>
<td>AM Peak Hour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capitol at Louisiana</td>
<td>7.6</td>
<td>A 2,129</td>
<td>8.1</td>
</tr>
<tr>
<td>Gulf Fwy S SR at Scott</td>
<td>26.6</td>
<td>C 2,410</td>
<td>38.0</td>
</tr>
<tr>
<td>N. McGregor at Scott</td>
<td>32.6</td>
<td>C 3,565</td>
<td>39.7</td>
</tr>
<tr>
<td>Cullen at Wheeler</td>
<td>33.4</td>
<td>D 1,865</td>
<td>36.5</td>
</tr>
<tr>
<td>Wheeler at Calhoun/MLK</td>
<td>35.7</td>
<td>D 1,689</td>
<td>41.5</td>
</tr>
<tr>
<td>Griggs at MLK</td>
<td>32.5</td>
<td>C 3,224</td>
<td>34.0</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capitol at Louisiana</td>
<td>10.9</td>
<td>B 2,571</td>
<td>11.5</td>
</tr>
<tr>
<td>Gulf Fwy S SR at Scott</td>
<td>23.1</td>
<td>C 2,529</td>
<td>19.6</td>
</tr>
<tr>
<td>N. MacGregor at Scott</td>
<td>26.1</td>
<td>C 3,656</td>
<td>27.6</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cullen at Wheeler</td>
<td>46.9</td>
<td>D 2,473</td>
<td>48.3</td>
</tr>
<tr>
<td>Wheeler at Calhoun/MLK</td>
<td>41.3</td>
<td>D 1,943</td>
<td>49.0</td>
</tr>
<tr>
<td>Griggs at MLK</td>
<td>36.7</td>
<td>D 3,551</td>
<td>44.0</td>
</tr>
</tbody>
</table>

Source: Parsons Brinckerhoff, 2006.

- Wheeler Street and Calhoun Road/Martin Luther King Boulevard – While the LOS for the intersection is D for all build alternatives and alignment options, the average delay increases under the build alternatives in both the a.m. and p.m. periods.

- Griggs Road and Martin Luther King Boulevard – This intersection was selected because of deteriorating delay in the build alternatives and community concerns.

The analysis sites are shown in Figure 5-3. Receptors were chosen at each site in accordance with the guidelines found in the EPA’s Guideline for Modeling Carbon Monoxide from Roadway Intersections (EPA-454/R-92-005).

Dispersion Model

Mobile source models are the basic analytical tools used to estimate CO concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that comprise the various models attempt to describe an extremely complex physical phenomenon as closely as possible.

Vehicular Emissions

Vehicular emission factors were provided by TxDOT and H-GAC. The emissions were estimated using the EPA MOBILE6 vehicular emission factor model. (User’s Guide to MOBILE6.2, Mobile Source Emission Factor Model, Ann Arbor, Michigan, EPA420-R-02-028, October 2002).
MOBILE6.2 is a mobile source emission estimate program that provides current and future estimates of emissions from highway motor vehicles. The latest in the MOBILE series, dating back to 1978, MOBILE6.2, was designed by the EPA to address a wide variety of air pollution modeling needs. MOBILE6.2 incorporates updated information on basic emission rates, more realistic driving patterns, separation of start and running emissions, improved correction factors, and changing
fleet composition. It also includes impacts of new regulations promulgated since the models previous version, MOBILE5b.

**Meteorological Conditions**

The transport and concentration of pollutants emitted from motor vehicles are influenced by three principal meteorological factors: wind direction, wind speed, and the atmosphere's profile. The values for these parameters were chosen to establish a conservative, worst-case situation.

- **Wind Direction** – Maximum CO concentrations normally are found when the wind is assumed to blow parallel to a roadway adjacent to the receptor location. At complex intersections, it is difficult to predict which wind angle would result in maximum concentrations. Therefore, the approximate wind angle that would result in maximum pollutant concentrations at each receptor location was used in the analysis. All wind angles from 0° to 360° (in 5° increments) were considered.

- **Wind Speed** – CO concentrations are greatest at low wind speeds. A conservative wind speed of one meter per second (2.2 miles per hour) was used to predict CO concentrations during peak traffic periods.

- **Profile of the Atmosphere** – A "mixing" height (the height in the atmosphere to which pollutants rise) of 1000 meters, and neutral atmospheric stability (stability class D) conditions were used in estimating microscale CO concentrations. The selection of these meteorological parameters was based on recommendations from the TxDOT Air Quality Guidelines. This data was found to be the most representative of the conditions existing along the project area.

The CO levels estimated by the model are the maximum concentrations which could be expected to occur at each air quality receptor site analyzed, given the assumed simultaneous occurrence of a number of worst-case conditions: peak-hour traffic conditions, conservative vehicular operating conditions, low wind speed, low atmospheric temperature, neutral atmospheric conditions, and wind direction.

**5.4.1.5 Persistence Factor**

Peak eight-hour concentrations of CO were obtained by multiplying the highest peak hour CO estimates by a persistence factor. The persistence factor accounts for the fact that:

- More than eight hours (as distinct from a single hour) of vehicle volumes will fluctuate downward from the peak;
- Vehicle speeds might vary; and
- Meteorological conditions including wind speed and wind direction will vary compared to the conservative assumptions used for the single hour

TxDOT recommends the use of a persistence factor of 0.4. This factor represents a meteorological persistence factor of 0.60 multiplied by a traffic persistence factor of 0.67. EPA recommends a persistence factor of 0.7. For worst-case emission
estimates, the EPA persistence factor of 0.7 was applied to the one-hour concentrations to obtain eight-hour concentrations.

**Analysis Years**

The existing year (2006) and the project’s design year (2025) were analyzed to determine the project’s air quality effects. The existing year results are used in conjunction with the results of the future year without the project to illustrate the predicted air quality trends at the study locations without the project.

**Background Concentrations**

Microscale modeling is used to predict CO concentrations resulting from emissions from motor vehicles using roadways immediately adjacent to the locations at which predictions are being made. A CO background level must be added to this value to account for CO entering the area from other sources upwind of the receptors.

A one-hour CO background level of 4.5 particles per million (ppm) and an eight-hour background level of 2.8 ppm were added to each analysis site. These values are recommended for use by TxDOT.

**Traffic Data**

Traffic data for the air quality analysis was derived from traffic counts and other information developed as part of an overall traffic analysis for the project using methodology accepted by TxDOT. The microscale CO analysis was performed based on data from this analysis for the a.m. and p.m. peak hours of traffic. These are the hours when maximum traffic volumes occur on local streets and when the greatest traffic and air quality impacts of the proposed project are expected.

**5.4.2 Impact Analysis**

**5.4.2.1 Regional Emission Analysis**

Regional emission estimates were conducted for the project through Federal Transit Administration’s (FTA’s) New Starts analysis procedure. The results of this analysis indicate that the build alternatives are expected to reduce overall pollutant levels by approximately 0.02 percent for 2025, as compared to the No Build Alternative. This decline in overall regional transportation emissions will help to offset any addition emissions produced as a result of the project.

**5.4.2.2 Mobile Source Air Toxics Analysis**

Based on the recommended tiering approach, the proposed Southeast Corridor fixed-guideway project falls within the Tier 2 approach. The amount of MSATs emitted would be proportional to the VMT assuming the vehicle mix does not change. The project is predicted to reduce overall VMT thus the project generally would produce no meaningful MSAT effects.

Because of the specific characteristics of the build alternatives and associated alignment options, particularly the BRT Alternative, there may be localized areas
where VMT would increase, and other areas where VMT would decrease. Therefore it is possible that localized increases and decreases in MSAT emissions may occur. These localized increases would most likely occur near station locations. The diesel powered BRT vehicles would contribute to the potential increases in MSAT at station locations and at vehicle maintenance and storage yards. The electrically powered LRT vehicles would not directly increase MSAT levels, but potential increases in VMT around station locations by other vehicles dropping off and picking up passengers, could increase local VMT and thus local MSAT levels. However, even if these increases do occur, they too would be substantially reduced with implementation of EPA’s vehicle and fuel regulations.

In summary, in 2025 under the build alternatives, it is expected there would be reduced MSAT emissions in the study area, relative to the No Build Alternative, because of the reduced VMT associated with the build alternatives and because of EPA’s MSAT reduction program. However, in comparison to the No Build Alternative, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify them. On a regional basis, EPA’s vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

5.4.2.3 Microscale Local Analysis

As explained previously, quantitative analysis of PM$_{10}$ is not currently required. As the area is in attainment for PM$_{10}$ and the project is predicted to reduce regional bus VMT, the project is not expected to cause or exacerbate a violation of the PM$_{10}$ NAAQS.

Maximum one-hour and eight-hour CO levels predicted at the six analysis sites within the study area are shown in Table 5-7 and Table 5-8, respectively. As shown in these tables, the build alternatives are not predicted to cause or exacerbate a violation of the CO NAAQS.

Table 5-7. Predicted Worst-Case One-Hour Carbon Monoxide Concentrations (ppm)

<table>
<thead>
<tr>
<th>Site #</th>
<th>Analysis Site</th>
<th>2006 Existing</th>
<th>2025 No Build</th>
<th>2025 Build BRT</th>
<th>2025 Build LRT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td>1</td>
<td>Capitol at Louisiana</td>
<td>6.2</td>
<td>6.4</td>
<td>5.4</td>
<td>5.7</td>
</tr>
<tr>
<td>2</td>
<td>Gulf Fwy. South Service Rd. at Scott</td>
<td>6.8</td>
<td>7.4</td>
<td>6.1</td>
<td>6.7</td>
</tr>
<tr>
<td>3</td>
<td>N. MacGregor at Scott</td>
<td>5.8</td>
<td>5.8</td>
<td>5.7</td>
<td>5.3</td>
</tr>
<tr>
<td>4</td>
<td>Cullen at Wheeler</td>
<td>6.0</td>
<td>6.5</td>
<td>5.5</td>
<td>5.8</td>
</tr>
<tr>
<td>5</td>
<td>Wheeler at Calhoun/MLK</td>
<td>5.7</td>
<td>5.8</td>
<td>5.1</td>
<td>5.3</td>
</tr>
<tr>
<td>6</td>
<td>MLK at Griggs</td>
<td>6.0</td>
<td>6.0</td>
<td>5.4</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Source: Parsons Brinckerhoff, 2006.

CO One-hour NAAQS = 35 ppm
CO One-hour background = 4.5 ppm
Southeast Corridor

July 2006

Table 5-8. Predicted Worst-Case Eight-Hour Carbon Monoxide Concentrations (ppm)

<table>
<thead>
<tr>
<th>Site #</th>
<th>Analysis Site</th>
<th>2006 Existing</th>
<th>2025 No Build</th>
<th>2025 Build BRT</th>
<th>2025 Build LRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capitol at Louisiana</td>
<td>4.1</td>
<td>3.6</td>
<td>3.8</td>
<td>3.5</td>
</tr>
<tr>
<td>2</td>
<td>Gulf Fwy. South Service Rd. at Scott</td>
<td>4.8</td>
<td>4.3</td>
<td>4.2</td>
<td>4.2</td>
</tr>
<tr>
<td>3</td>
<td>N. MacGregor at Scott</td>
<td>3.7</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>4</td>
<td>Cullen at Wheeler</td>
<td>4.2</td>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
</tr>
<tr>
<td>5</td>
<td>Wheeler at Calhoun/MLK</td>
<td>3.7</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>6</td>
<td>MLK at Griggs</td>
<td>3.9</td>
<td>3.4</td>
<td>3.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Source: Parsons Brinckerhoff, 2006.
CO Eight-hour NAAQS = 9 ppm
CO Eight-hour background = 2.8 ppm

5.4.3 Mitigation Measures

The build alternatives are not predicted to cause or exacerbate a violation of the NAAQS; however, transportation air quality conformity rules apply to this project. METRO Solutions is included in the 2025 RTP, adopted June 2004 and the corresponding air quality conformity finding adopted in June 2005. As a METRO Solutions project, the Southeast Corridor project is included in all current conforming regional transportation plans. In December 2005, H-GAC, in concert with the statewide air quality partners, conducted an analysis of BRT as an interim technology replacement in the year 2015. The results of this analysis were consistent with the original conformity findings adopted in June 2005. H-GAC held public meetings on December 13, 2005, to inform the public of proposed administrative amendments to the RTP and air quality conformity determination to include BRT as an interim technology for the North, Southeast, and Harrisburg corridors. In a letter dated December 30, 2005, FHWA accepted H-GAC’s assessment that the BRT was characteristically identical to the LRT in the plan and therefore did not require an updated conformity analysis. The letter also cited that the FTA and EPA confirmed their agreement with the interagency decision that the RTP changes were not significant in e-mails dated December 28, 2005, and December 29, 2005, respectively. The Southeast Corridor project is also listed in the current TIP.

To demonstrate conformity of the project with the SIP, and to allow the regional air quality effects of the project alternatives to be compared pursuant to NEPA, emissions inventories were prepared for the project. The project is not predicted to increase regional emissions. Based on this finding, the build alternatives would conform with the SIP and the goals set forth in the Clean Air Act Amendments (CAAA) and the Final Conformity Rule.

5.5 Noise and Vibration

This section describes the analysis completed to compare potential noise and vibration impacts of the No Build and build alternatives and discusses mitigation measures to minimize adverse impacts.
5.5.1 Methodology

5.5.1.1 Noise Methodology

Noise levels under the build alternatives were projected based on the methodology for detailed analysis in the guidance manual, *Transit Noise and Vibration Impact Assessment* (FTA, April 1995). The primary inputs to the FTA model include: the noise source level of the vehicles, number of vehicles operating during each hour of the day, location of the alignments, location of the noise-sensitive land use, and the speeds of the transit vehicles along the corridor. The sources used for the model inputs are listed below:

- Source levels for the model are based on noise measurements of the Houston METRO LRT vehicles and representative Irisbus Civis hybrid buses for BRT.
- Numbers and speeds of vehicles are based on the proposed operating plan for the build alternatives.
- Alignments and proximity of routes to noise-sensitive land uses are based on GIS mapping developed as part of the project.

The primary assumptions made in determining potential noise impacts of LRT and BRT operations under the build alternatives are as follows:

**LRT Alternative**

- Based on the LRT vehicle noise measurements, the predictions assume that a one-car 95-foot long articulated LRT vehicle operating at 30 miles per hour (mph) on ballasted track with continuous welded rail generates a maximum noise level of 79 decibels (A-weighting) (dBA) at a distance of 50 feet from the track centerline. The corresponding maximum noise level for the LRT vehicle on embedded track is 76 dBA.
- The projections near grade crossings include noise from train whistles and crossing bells. The projections are based on noise measurements made on similar light rail systems around the country. The noise projections assume that the whistles generate a noise level of 78 dBA at 50 feet from the track for a five-second period as trains approach each crossing. The bells are estimated to generate a noise level of 72 dBA at 50 feet for ten seconds prior to and five seconds following each train.
- A new vehicle storage and maintenance center would be located south of the LRT alignment east of Nagel. Noise projections are based on the number of trains per hour accessing the facility from the operations plan.
- A park-and-ride lot is proposed south of Griggs Road east and west of Beekman Road. Noise from this lot was assessed using standard FTA reference levels. Volume adjustments were made for the expected number of vehicles generated by the lot.
BRT Alternative

- Based on noise measurements of the Irisbus Civis hybrid bus in revenue service in Las Vegas, Nevada, the predictions for BRT Convertible and BRT and assume that a 61-foot long articulated bus operating at 30 mph generates a maximum noise level of 75 dBA at a distance of 50 feet.
- For noise-sensitive land-use near intersections, it is assumed that buses would idle at the intersection for 30 seconds and would then accelerate away from the intersection. The prediction model for intersections therefore includes a combination of stationary source (idling) and moving source (accelerating) characteristics.
- Bus storage and maintenance are planned to occur at existing facilities and no new facilities are planned as part of the BRT Convertible and BRT Alternative.
- A park-and-ride lot is proposed south of Griggs Road east and west of Beekman Road. Noise from this lot was assessed the same as under the LRT Alternative.

Operations Assumptions

Operating assumptions are based on the operating plan described in Section 2.3.2, of Chapter 2, Alternatives Considered, and are summarized below.

- Service will be provided by single vehicles at all times.
- The operating schedule for the Southeast Corridor fixed-guideway line would be between 4:30 a.m. and 1:00 a.m., Monday through Saturday. Sunday and holiday service will be between 5:30 a.m. and 1:00 a.m. Peak period headways will be 6 minutes (7:00 a.m. to 9:30 a.m. and 3:00 p.m. to 7:00 p.m.), off-peak period headways will be 10 minutes (9:30 a.m. to 3:00 p.m. and 7:00 p.m. to 9:00 p.m.) and early morning and late night period headways will be 15 minutes (5:00 a.m. to 7:00 a.m. and 9:00 p.m. to 1:00 a.m.).
- Vehicle operating speeds are based on the operations plan. The speed limits range from 20 mph to 35 mph along the corridor.

5.5.1.2 Vibration Methodology

The potential vibration impact from transit operations was assessed based on the methodology in the FTA guidance manual, including the criteria identified in Section 3.5 of Chapter 3. The following assumptions were made in determining potential vibration impacts under the build alternatives:

- Vibration source levels for the LRT vehicle are based on measurements conducted at the ballasted test track near the maintenance facility and an embedded track section in the Museum District.
- Vibration source levels for the BRT vehicle are based on generic rubber-tired vehicle levels from the general assessment method described in the FTA guidance manual.
- Ground-borne vibration propagation was determined by the FTA testing procedure conducted at a location near UH. The FTA test procedure measures
the response of the ground to an input force. The results of the test are combined with the vibration source level measurements to provide projections of vibration levels from LRT vehicles operating in the Southeast Corridor.

- Vehicle operating speeds are based on the operations plan. The speed limits range from 20 mph to 35 mph along the corridor.

### 5.5.2 Noise Impact Assessment

Table 5-9 presents the results of the analysis of existing and future noise levels for the Category 2 receptors along the proposed alignment with both daytime and nighttime sensitivity to noise (e.g. residences, hotels, and hospitals). The table identifies for each receptor or receptor group the location of the receptor to the LRT trackway, distance to the near track, LRT train speed, existing noise level, projected noise level from LRT operations, and impact criteria. No adverse noise impacts were identified for the BRT Convertible and BRT Alternatives.

Based on a comparison of the predicted project noise level with the impact criteria, the impact category is listed, along with the predicted total noise level and projected noise increase from the introduction of LRT service. Also included is an estimate of the total number of impacts and severe impacts at each sensitive receptor location. These impacts are considered preliminary because of the conceptual nature of the engineering and operating plans for the project. As the proposed project is advanced to preliminary engineering and final design, the noise impacts will be refined, and may result in different impacts than identified. If significant impacts result from the changes, a supplemental draft DEIS may be required. The FTA, in consultation with METRO, will determine whether supplemental NEPA studies and documentation are needed prior to the FEIS.

Following is a description of noise impacts to Category 2 land uses under the build alternatives, which are also shown in Figure 5-4:

- **Inn at the Ballpark (north side of Capitol between La Branch and Crawford)** – This hotel is projected to be exposed to noise impact because of the proximity of the building to the tracks and the audible warning devices (bells and whistles) at the grade crossings with La Branch and Crawford. Noise impact has been assessed for this building at ground-floor outdoor receptors. Not all of the 208 rooms would be exposed, but as more detailed information regarding the acoustic properties of windows and doors in the building becomes available, a re-assessment of the interior noise impact will be conducted.

- **Scott Street and Hadley Street** – There are four single-family residences west of Scott Street and south of Hadley Street that would be exposed to noise impact. These noise impacts are predominantly from the audible warning devices (bells and whistles) at the grade crossing with Hadley Street.

- **Martin Luther King Boulevard between Stuyvesant Lane and Cortelyou Lane** – There are two single-family residences east of Martin Luther King Boulevard that would be exposed to noise impact. The noise impact would predominantly result from the speed of the train at this location. The impact was assessed based on the
### Table 5-9. Noise Impacts for Category 2 Land Uses

<table>
<thead>
<tr>
<th>Location</th>
<th>Side of Track</th>
<th>Distance To Nearest Track (ft)</th>
<th>Speed (mph)</th>
<th>Exist. Noise Level</th>
<th>Project Noise Level&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Impact Criteria</th>
<th>Impact Category</th>
<th>Total Noise Level&lt;sup&gt;a,c&lt;/sup&gt;</th>
<th>Noise Level Increase&lt;sup&gt;a,c&lt;/sup&gt;</th>
<th>Number of Residential Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LRT Alternative with Base Alignment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inn at the Ballpark</td>
<td>East</td>
<td>29</td>
<td>20</td>
<td>63</td>
<td>62</td>
<td>60</td>
<td>Impact</td>
<td>66</td>
<td>2.4</td>
<td>208</td>
</tr>
<tr>
<td>Scott and Hadley</td>
<td>East</td>
<td>37</td>
<td>21</td>
<td>73</td>
<td>66</td>
<td>66</td>
<td>Impact</td>
<td>74</td>
<td>0.8</td>
<td>4</td>
</tr>
<tr>
<td><strong>LRT Alternative with and Wheeler-MLK Alignment Option</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inn at the Ballpark</td>
<td>East</td>
<td>29</td>
<td>20</td>
<td>63</td>
<td>62</td>
<td>60</td>
<td>Impact</td>
<td>66</td>
<td>2.4</td>
<td>208</td>
</tr>
<tr>
<td>Scott and Hadley</td>
<td>East</td>
<td>37</td>
<td>21</td>
<td>73</td>
<td>66</td>
<td>66</td>
<td>Impact</td>
<td>74</td>
<td>0.8</td>
<td>4</td>
</tr>
<tr>
<td>MLK between Stuyvesant Ln. and Cortelyou Ln.</td>
<td>East</td>
<td>61</td>
<td>35</td>
<td>61</td>
<td>59</td>
<td>59</td>
<td>Impact</td>
<td>63</td>
<td>2.2</td>
<td>2</td>
</tr>
<tr>
<td>PAOCC Missionary Training Institute</td>
<td>West</td>
<td>46</td>
<td>35</td>
<td>61</td>
<td>61</td>
<td>59</td>
<td>Impact</td>
<td>64</td>
<td>2.6</td>
<td>30</td>
</tr>
<tr>
<td><strong>BRT Convertible and BRT Alternative</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Noise levels are based on L<sub>eq</sub> and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.

<sup>b</sup> Predicted levels include a 5dBA penalty applied to audible signal noise, where applicable.

<sup>c</sup> The reported noise levels represent the highest noise levels for each grouping of receivers.

Source: Parsons Brinckerhoff and Harris Miller Miller Hanson, 2004, 2006.
posted speed limits along Martin Luther King Boulevard and Wheeler Street. As more detailed information regarding the speed profile of the train along this option is available, a reassessment of the noise impact will be conducted for the project.

- Shrine of the Black Madonna Pan African Orthodox Christian Church Missionary Training Institute (PAOCC) – There are three multi-family buildings containing approximately 30 residences west of Martin Luther King Boulevard that are exposed to noise impact. These noise impacts are predominantly a result of the speed of the train at this location. The impacts were assessed using the posted speed limits along Wheeler Street and Martin Luther King Boulevard. As more detailed information regarding the speed profile of the train along this option becomes available, a reassessment of the noise impact will be made.

An assessment of noise impacts for Category 3 receptors, consisting of institutional sites that are not sensitive to noise at night (e.g. schools, churches, parks, and medical offices), was also conducted. This assessment was based on a comparison
of the existing ambient noise level with the predicted project noise levels in terms of
the peak transit hour day-night sound level \( L_{eq} \). No noise impacts for any
institutional receptors are projected for the build alternatives.

5.5.2.1 Noise Mitigation Measures

A large number of noise impacts would result from the LRT alternative. These are
primarily due to horn and whistle blowing at grade crossings. Potential mitigation
measures for reducing noise impacts from LRT operations under the build
alternatives are described below.

- **Use of Horns at Grade Crossings** – The Texas Department of Transportation is
  charged with the responsibility of administering the installation and maintenance
  of active warning devices at grade crossings. Some of the current highway-rail
  grade crossing warning devices may allow the reduction or elimination of
  horn/whistle blowing. Crossing horns are mounted on a signal mast at grade
  crossings with the warning sound directed along the roadway and toward
  vehicular traffic. These devices permit the train to not sound its horn and may
  reduce noise levels in certain communities near a grade crossing. Four-quadrant
  gates or median barriers can provide a sealed corridor in which no vehicular
  traffic can intrude upon a crossing during train operations. With these types of
  warning devices, trains may not be required to sound horns or whistles. To
  satisfy regulatory requirements for permitting trains to not sound horns or
  whistles, the public agency must work closely with the community and a
demonstration is needed showing that public safety would not be compromised.

- **Building Sound Insulation** – Sound insulation of residences and institutional
  buildings to improve the outdoor-to-indoor noise reduction has been widely
  applied around airports and has seen limited application for transit projects.
  Although this approach has no effect on noise in exterior areas, it may be the
  best choice for sites where noise barriers are not feasible or desirable, and for
  buildings where indoor sensitivity is of most concern. Substantial improvements
  in building sound insulation (on the order of 5 to 10 dBA) can often be achieved
  by adding an extra layer of glazing to the windows, by sealing any holes in
  exterior surfaces that act as sound leaks, and by providing forced ventilation and
  air-conditioning so that windows do not need to be opened.

As discussed in Section 3.5 of Chapter 3, Affected Environment, FTA states that in
implementing noise impact criteria, severe impacts should be mitigated unless there
are no practical means to do so. At the moderate impact level, other project-specific
factors should be included in the consideration of mitigation. These other factors can
include the predicted increase over existing noise levels, the types and number of
noise-sensitive land uses affected, existing outdoor-to-indoor sound insulation, and
the cost-effectiveness of mitigating noise to more acceptable levels.

5.5.3 Vibration Impact Assessment

Potential vibration impacts of the build alternatives were analyzed for both Category
2 and Category 3 land uses in accordance with the FTA guidance. The estimated
root mean square (RMS) velocity levels \( \text{VdB re 1 micro-in./sec.} \) for vibration
sensitive receptors at representative distances are provided in Table 5-10 for Category 2 land uses and Table 5-11 for Category 3 land uses. These tables summarize the results of the analysis in terms of number of anticipated exceedances of the FTA criteria for "frequent events" (defined as more than 70 events per day). The criteria are defined in Section 3.5 of Chapter 3.

As a rubber-tired vehicle, ground vibration levels from BRT vehicles would be minimal, and would not exceed the FTA criteria of 72 VdB for residential buildings and other structures where people normally sleep (Category 2). This analysis therefore focuses on impacts of LRT operations at receptor locations along the proposed fixed-guideway alignment. For each location, the location of the receptor to the LRT trackway, distance to the near track, LRT speed, the predicted project vibration level, and the impact criterion level are identified along with the number of impacts projected for each receptor or receptor group.

Again these impacts are considered preliminary because of the conceptual nature of the engineering and operating plans for the project. As the project is advanced to preliminary engineering and final design, the vibration impacts will be refined, and may result in different impacts than identified.

Following is a description of vibration impacts to Category 2 land uses under the build alternatives:

- Scott Street at IH-45: There are three single-family residences located east of Scott Street and north of IH-45 that would be exposed to vibration impacts. The vibration impacts are a result of the proximity of the residences to the proposed fixed-guideway alignment at this location.
- Scott Street at McKinney Street: There are three single-family residences located east of Scott Street and south of McKinney Street that would be exposed to vibration impacts. The vibration impacts are a result of the proximity of the near track, which would be less than 25 feet away.
- Scott Street at Dennis Street: There are two single-family residences located north of Dennis Street and east of Scott Street that would be exposed to vibration impacts and five single-family residences east of Scott Street and south of Dennis Street that would also be exposed. The vibration impacts are predominately a result of the proximity of the residences to the proposed alignment.
- Scott Street at Tuam Street: There are ten single-family residences located east of Scott Street and north of Tuam Street and seven single-family residences east of Scott Street and south of Tuam Street that would be exposed to vibration impacts. The impacts are predominately a result of the proximity of the residences to the alignment.
Table 5-10. Vibration Impacts for Category 2 Land Uses

<table>
<thead>
<tr>
<th>Location</th>
<th>Side of Track</th>
<th>Distance to Near Track (ft)</th>
<th>Speed (mph)</th>
<th>Project Vibration Level</th>
<th>Vibration Impact Criterion</th>
<th>Number of Residential Impacts</th>
<th>Project GBN Level</th>
<th>GBN Impact Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scott at IH-45</td>
<td>East</td>
<td>28</td>
<td>21</td>
<td>75</td>
<td>72</td>
<td>3</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scott at McKinney</td>
<td>East</td>
<td>18</td>
<td>21</td>
<td>85</td>
<td>72</td>
<td>3</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scott at Dennis</td>
<td>East</td>
<td>27</td>
<td>21</td>
<td>76</td>
<td>72</td>
<td>7</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scott at Tuam</td>
<td>East</td>
<td>20</td>
<td>21</td>
<td>82</td>
<td>72</td>
<td>17</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scott at Holman</td>
<td>West</td>
<td>50</td>
<td>20</td>
<td>75</td>
<td>72</td>
<td>3</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scott at Holman</td>
<td>West</td>
<td>47</td>
<td>20</td>
<td>75</td>
<td>72</td>
<td>1</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scott at Holman</td>
<td>West</td>
<td>49</td>
<td>20</td>
<td>75</td>
<td>72</td>
<td>6</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

* a Vibration levels are measured in VdB referenced to 1 \( \mu \text{in/sec} \).
* b Ground-borne noise levels are measured in dBA.
* c Ground-borne noise is generally not assessed for buildings other than concert halls, TV studios, auditoriums or theatres since air-borne noise is expected to dominate the noise environment inside buildings with typical construction.

Source: Parsons Brinckerhoff and Harris Miller Miller Hanson, 2004, 2006.

Table 5-11. Vibration Impacts for Category 3 Land Uses

<table>
<thead>
<tr>
<th>Location</th>
<th>Side of Track</th>
<th>Dist To Near Track (ft)</th>
<th>Speed (mph)</th>
<th>Project Vibration Level</th>
<th>Vibration Impact Criterion</th>
<th>Vibration Impact</th>
<th>Project GBN Level</th>
<th>GBN Impact Criterion</th>
<th>GBN Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayou Place</td>
<td>East</td>
<td>29</td>
<td>20</td>
<td>69</td>
<td>72</td>
<td>None</td>
<td>51</td>
<td>35</td>
<td>Impact</td>
</tr>
<tr>
<td>Jones Hall</td>
<td>East</td>
<td>29</td>
<td>20</td>
<td>79</td>
<td>65</td>
<td>Impact</td>
<td>51</td>
<td>25</td>
<td>Impact</td>
</tr>
<tr>
<td>Incarnate Word Academy</td>
<td>East</td>
<td>29</td>
<td>20</td>
<td>75</td>
<td>Impact</td>
<td>--</td>
<td>--</td>
<td>N/A(^c)</td>
<td></td>
</tr>
</tbody>
</table>

* a Vibration levels are measured in VdB referenced to 1 \( \mu \text{in/sec} \).
* b Ground-borne noise levels are measured in dBA.
* c Ground-borne noise is generally not assessed for buildings other than concert halls, TV studios, auditoriums or theatres since air-borne noise is expected to dominate the noise environment inside buildings with typical construction.

Source: Parsons Brinckerhoff and Harris Miller Miller Hanson, 2004, 2006.
Scott Street at Holman Street – There are three single-family residences and one multi-family residence located west of Scott Street and south of Holman Street and six single-family residences located west of Scott Street and one block south of Holman Street that would be exposed to vibration impacts. The impacts are predominately a result of the proximity of a crossover in the tracks.

Following is a description of vibration impacts to Category 3 land uses under the build alternatives:

- Bayou Place (northwest corner of Capitol and Bagby) – This theater would be exposed to ground-borne noise impact. The impact is predominately a result of the proximity of the building to the proposed alignment.
- Jones Hall – This concert hall located in the northeast corner of Capitol and Louisiana would be exposed to vibration and ground-borne noise impacts. The impacts are a result of the proximity of the concert hall to the alignment and a crossover located directly in front of Jones Hall.
- Incarnate Word Academy – This school located in the northeast corner of Capitol and Crawford would be exposed to vibration impact. The vibration impact is predominately a result of the proximity of the building to the alignment.

5.5.3.1 Vibration Mitigation Measures

Vibration impacts that exceed FTA criteria are considered to be significant and to warrant mitigation, if reasonable and feasible. The assessment of vibration impacts assumes that the LRT vehicle wheels and track are maintained in good condition with regular wheel truing and rail grinding. Beyond this, there are several approaches to reduce ground-borne vibration from LRT operations, as described below.

- Resilient Rail Fasteners – Vibration isolation between the rail and the track support system can be provided by special fasteners with rubber elements on ties, or with rubber boots in embedded track.
- Ballast Mats – A ballast mat consists of a pad made of rubber or rubber-like material placed on an asphalt or concrete base with the normal ballast, ties and rail on top. The reduction in ground-borne vibration provided by a ballast mat is strongly dependent on the frequency content of the vibration and design and support of the mat.
- Relocation of Crossovers or Special Trackwork – Because the impacts of wheels over rail gaps at track crossover locations increases vibration by about 10 dBA, crossovers are a major source of vibration impact when they are located in sensitive areas. If crossovers cannot be relocated away from residential and other sensitive areas, another approach is to use spring-rail or moveable point frogs in place of standard rigid frogs at turnouts. These devices allow the flangeway gap to remain closed in the main traffic direction for revenue service trains.
5.6 Visual/Aesthetics

The visual impact of the proposed build alternatives on the surrounding area is dependent upon its alignment and associated structural elements that could potentially obstruct a view or create new views within neighboring community areas.

An assessment of two perspectives determines the type of visual affect a project would have on a community and surrounding areas. These include an evaluation of the:

- Visual environment experienced by those who utilize the proposed transit facility;
- and,
- Visual elements the proposed project introduces into the surrounding environment.

Visual impacts rated as minimal indicate that the visual change would be minor and that transportation facilities are already a part of the visual environment. A substantial impact identifies a major change in the existing visual character of the environment.

The No Build Alternative includes existing and planned transportation services, facilities and infrastructure that will be in place by 2025. The level of visual impact that would result from this alternative would be minimal. Any introduction of additional transportation infrastructure or transit vehicles would not be visually degrading or intrusive since these types of physical elements already exist within the local view shed and neighboring areas of development.

5.6.1 Visual Impact of Project Physical and Structural Elements

The build alternatives would result in a varying level of visual impact on the surrounding environment and viewer groups which include pedestrians, commuters, patrons of restaurants, and customers of commercial, retail and service oriented development as well as users of transportation facilities. The physical and structural elements proposed by the build alternatives include transit vehicles, fixed-guideway infrastructure, and station design. If the LRT Alternative is used, an electrification and distribution system as well as maintenance shop and storage yard would also be constructed.

The level of visual impact for the proposed alignments is dependent upon specific location, type of infrastructure, planned design, and the existing visual environment of the surrounding area. The following discussion describes the potential level of visual impact from each of the physical and structural elements of the proposed project and how they affect the surrounding environment.

5.6.1.1 Vehicle Design

One of the most visible aspects of the build alternatives is the transit vehicle as it travels along the guideway. The two vehicle options are light rail vehicles (LRV) and BRT vehicles. It is anticipated that the vehicles would be of a modern design. A typical electrically powered LRV is approximately the height (11 feet) and width (8 feet) of a METRO bus and about 96 feet in length. The proposed line would be designed to operate three-car trains which would have a length of approximately 290 feet. BRT vehicles can be designed with a sleek railcar-like appearance. For example, the BRT vehicles currently used by the Regional Transportation
Commission (RTC) of Southern Nevada are 61 foot long articulated buses that are 11 feet high and 8.5 feet wide (RTC of Southern Nevada, 2005).

Any level of visual impact that may occur would primarily be attributed to the introduction of a vehicle that is currently not commonly observed within the local view shed.

5.6.1.2 Fixed-Guideway Alignment

The fixed-guideway transit alignment would operate largely at-grade. LRT would operate on trackway located in exclusive lanes either on the side or the center of the street or within new rights-of-way. Where located within existing or widened street rights-of-way, the lanes would be separated from general traffic by curbing or raised buttons.

BRT vehicles would operate in reserved lanes adjacent to the curb in downtown between Bagby and St. Emanuel. Outside of downtown, vehicles would operate in exclusive lanes located either in the center or side of the street and separated from general traffic by vertical curb or raised buttons or within new rights-of-way. The BRT Convertible Alternative would consist of BRT that could be modified for LRT use in the future. It would include imbedded rail. Exclusive lanes outside of downtown would be constructed with imbedded track for conversion to LRT in the future.

The level of visual impact of the guideway would be minimal and primarily result from the introduction of an at-grade guideway in areas where this infrastructure is not part of the local streetscape. The removal of grass and vegetation from existing median areas or curbsides could result in a visual impact since these areas generally provide aesthetic value to the surrounding environment.

5.6.1.3 Stations

The build alternatives include up to 11 stations. Stations are at-grade and directly adjacent to the planned right of way. Each station would include common structural elements and amenities to facilitate passenger convenience and to enhance the visibility and permanence of a station area. These structural elements include lighting, benches, ticket vending machines, artwork, information kiosks, trash cans, alarms with intercoms, public and emergency telephones, and other amenities as needed. All stations will include an overhead canopy to provide weather protection. The specific design and physical dimension of each station area will be determined during the station area planning process and final design phase of project development.

The stations along the downtown LRT alignment would use center platforms for passenger loading. The center platform type design has two platforms located within the dual tracks that would be staggered, with one platform on each side of an adjacent intersection, similar to most stations of the existing METRORail Red Line. The stations along the downtown BRT alignment would use shelters within the sidewalk.

Many of the new fixed-guideway stations located outside the downtown area would have center platforms for passenger loading. Where turning traffic or spatial requirements warrant it, a side platform type design would be used.
The planned physical elements for station areas are not anticipated to be visually intrusive. The station area elements could enhance the local visual environment through design and artwork that would reflect a community’s history, culture, and character. The station areas could include landscaping to obscure views from neighboring residential development.

One park-and-ride lot would also be constructed. The proposed park-and-ride lot at the Palm Center Station would consist of a point of ingress and egress to an at-grade paved parking lot with painted parking stripes. The park-and-ride lot would present a low level of visual impact and could be landscaped to reduce potential visual impact on neighboring areas.

5.6.1.4 LRT Electrification and Distribution System

LRT vehicles would be electrically powered and require the use of overhead power supply lines (overhead contact system) along the entire length of the proposed LRT alignment. The overhead contact system (OCS) consists of support poles, cantilever brackets and overhead wires. Another component of the electrical power system is the TPSS. This is a self-contained unit that is typically placed at specific locations about 1 mile apart along the alignment to ensure that an adequate power load is continuously delivered throughout the LRT system to prevent service disruption.

Overhead Contact System

Electric power for the proposed LRT guideway would be delivered through a contact wire that is supported on cantilever brackets attached to a support pole. The OCS would run the entire length of the track alignment. The design of the contact wires along the LRT alignment would vary according to the track alignment. Support poles would be approximately 25 feet tall and installed every 90 feet to 170 feet depending on the track location.

A fixed tensioned low-profile (or simple wire) contact system would be considered during preliminary engineering and final design. Such a system would provide a single contact wire as opposed to the multiple-wire, automatically tensioned contact system, and would have a less cluttered appearance. Since the proposed alignment is relatively straight with gradual turning curves, the OCS would primarily include a single wire for each direction of track supported by a cantilever bracket and pole. However, in some locations along the alignment additional support would be necessary for the OCS requiring the placement of supportive overhead cross wires. This could result in a network of wires creating a more cluttered appearance and produce a minimal level of visual impact.

The installation of the OCS could have varying levels of visual impact within several segments of the proposed LRT alignment. The following is a discussion of the impacts on the surrounding environment by corridor segment.

- **Downtown LRT Alignment** – Throughout downtown, utility lines are located underground and infrastructure includes street lights and existing structural elements of METRO transit stops. The introduction of contact wires and support poles could have a minimal visual impact since these physical elements are not commonly viewed within the existing downtown view shed. Also, open areas that do not have
the presence of shade trees or landscaping to obscure views will allow the OCS to be visibly apparent. Landscaping as well as affixing cantilever support brackets to existing street light poles would minimize any level of visual impact.

- **Scott Street and Griggs Road** – Numerous utility poles and wires currently align both Scott Street and Griggs Road. The introduction of the OCS within this segment would have a minimal visual impact on neighboring development. The acquisition of land necessary for this alignment would provide an opportunity for landscaping to minimize the level of visual impact that could enhance the local view shed through additional tree plantings and other vegetation.

- **Wheeler Street and Martin Luther King Boulevard** – Numerous utility poles and wires currently align portions of Wheeler Street and Martin Luther King Boulevard. However, in MacGregor Park and through the UH campus, the introduction of contact wires and support poles could have a minimal visual impact since these physical elements are not currently viewed within the existing view shed. Landscaping would minimize any level of visual impact.

**Traction Power Substations**

A TPSS, a common component of an electrically powered LRT system, is placed along every mile of track to minimize and prevent service disruptions. The LRT Alternative would require the placement of six TPSS units along the entire project alignment. The specific locations of the six TPSS units would be finalized during the next phase of project development. The conceptual locations for these facilities occur at: the storage and maintenance facility; park-and-ride lot; and, three locations that are adjacent to the planned track alignment (as shown on the conceptual engineering plans). At each of these sites, the specific location of a TPSS unit as well as additional landscaping could keep them as inconspicuous as possible within the existing local environment.

A potential visual impact would exist and depends on the final design and site location, however, TPSS units can be installed to blend into an area's streetscape or surroundings through various design treatments to obscure their location.

**5.6.1.5 LRT Storage and Maintenance Facility**

The LRT Alternative would require the construction of a vehicle storage and maintenance facility to ensure LRT service with a well-maintained vehicle fleet. Sufficient storage space as well as maintenance and repair facilities for LRVs would be provided at this location. In addition, track maintenance vehicles, maintenance shops, storage buildings, and administration offices would occupy the storage and maintenance site. A lead track that connects to the main line operation and circulation tracks would also be constructed. The tracks would be at-grade throughout the entire facility and typically are raised rail or ballast type track. The storage and maintenance facility would require operations 24 hours a day and need to be lit at night, which may create a potential visual impact on the surrounding environment.

The proposed location is a site north of McKinney Street and south of Capitol Street. This location would require an acquisition of approximately 25 acres of land to accommodate the facility’s site plan. The site is located within an industrial land use...
area adjacent to a railroad and the El Expresso International Bus Service vehicle storage and maintenance facility, as shown in the photograph in Figure 5-5. Typical for the Houston downtown urban environment, one vacant lot on the southern end of the identified site has three newly constructed residential townhomes. These townhomes are inconsistent with the surrounding operating industrial land uses. The type of activity that will occur at this facility is consistent with the neighboring industrial and transportation land uses and activities currently present in the area. As a result, any visual impact is anticipated to be minor.

Figure 5-5. El Expresso Bus Service Facility


5.6.2 Impacts on Visually Sensitive Resources

The build alternatives traverse the Third Ward North, Third Ward East, and Third Ward West neighborhoods which are considered the City of Houston’s oldest areas and are eligible National Register of Historic Places (NRHP) districts. These districts have maintained their historical character as based on the architectural integrity of historic buildings from the early twentieth century as well as their historical association with the area’s growth and development within the local African-American community.

The proposed alignment under the build alternatives is also adjacent to the UH Robertson stadium. Built in 1941, the stadium maintains its original Art Deco-influenced façade and is identified as an NRHP-eligible historic resource.

The proposed alignment would be adjacent to multiple historic resources and would traverse MacGregor Park. The guideway would be located at grade within an existing transportation corridor, thus minimizing visual impact on the surrounding environment. Most of the visual impact from this project would be attributed to the introduction of structural elements that do not currently exist along the proposed alignment.

The construction of fixed-guideway elements could also provide an opportunity to design various structural elements (i.e., station stops and street lights) to enhance the visual
quality of the area and reflect the historical character of the Third Ward neighborhoods and Robertson Stadium.

A low-level of visual impact is anticipated on the parks and recreational areas adjacent to the planned alignment since the proposed system would operate within the existing roadway right of way.

5.6.3 Mitigation Measures

The introduction of a visual element that results in a significant impact on a surrounding area requires the implementation of preventative or corrective measures to reduce the severity of an impact. Specific mitigation measures to address significant visual elements will continue to be developed throughout project design.

Mitigation that would further minimize the level of visual impact for the build alternatives include the following measures for the different physical and structural components of the proposed fixed guideway for the Southeast Corridor.

- **Fixed-Guideway Alignment** – The addition of landscaping along an alignment can replace any lost vegetation and enhance the existing visual environment.
- **LRT Electrification and Distribution System** – The OCS poles under the LRT Alternative can be fabricated to provide a variety of designs. The OCS poles can also be used to support streetlights and signage and in many cases provide an improved visual image with fewer poles that have a consistent style. Also, existing utility poles and/or street light poles could be utilized to affix the support brackets and contact wire for the LRT system. The use of landscaping along the alignment’s line of OCS poles could partially obscure the OCS and soften any visual impact.
- **Station Locations** – Design station locations to be respectful of the primary land use in the surrounding area. For example, in primarily low-density residential areas, stations could be designed to be less obtrusive so that impacts on adjacent land uses are minimized. In areas that are best suited for redevelopment and intensification, stations could be appropriate in scale, and designed in conjunction with adjacent developments.
- **Vehicle Storage Yard and Maintenance Facility** – Mitigation for the storage and maintenance facility under the LRT Alternative could be accomplished with the selection of an appropriate site. The facility could be located in an industrial area where other uses are consistent with that of the proposed facility. Mitigation could include the use of landscaped berms, fencing, and walls where necessary to screen the facility from the surrounding area.

5.7 Ecosystems

Ecosystems and natural resources include vegetation, wildlife, and threatened, endangered, or otherwise sensitive species. Impacts to threatened and endangered species are regulated under the Federal Endangered Species Act of 1973, as amended (16 United States Code (USC) 1531 et seq.), which provides for the conservation of endangered and threatened species of fish, wildlife, plants, and the critical habitats where they live.
No impacts to ecosystems would occur as a result of the No Build Alternative. Because the study area is an urbanized environment, only minimal impacts to ecosystems are expected to occur as a result of the build alternatives. Few sparsely wooded lots exist within the study area, providing marginal wildlife habitat for common species adapted to urban environments. As most of the proposed construction would include the installation of tracks and platforms within landscaped areas, developed areas, and existing rights-of-way, impacts to adjacent habitats would be minimized or avoided.

Under the LRT Alternative, the proposed vehicle storage and maintenance facility would impact one wooded lot with approximately 50 percent canopy cover and several other partially developed lots, including areas adjacent to the railroad, with some vegetative cover (primarily grass with some scattered trees and shrubs). A storage yard and maintenance center would not be required for the BRT Convertible and BRT Alternatives.

The Wheeler-MLK alignment option would pass through MacGregor Park and may require removal of young, recently landscaped vegetation within the median of Martin Luther King Boulevard and potentially several trees adjacent to the roadway. These trees, primarily post oak and loblolly pine, are not unique to the area and would be avoided to the maximum extent practicable.

5.7.1 Threatened and Endangered Wildlife

The federal and state list of wildlife species that have the potential to occur in Harris County, along with habitat requirements, have been reviewed and identified in Table 3-20 in Chapter 3.

No state or federally-listed threatened or endangered wildlife species or their potential habitat were identified during July 2004 and January 2006 field surveys of the corridor. Furthermore, no federally designated critical habitat is present for the listed species within the study area. No active bird nests were observed during site reconnaissance activities. Therefore, the build alternatives would have no effect on state or federally-listed threatened or endangered wildlife species. Because the build alternatives would have no effect on federally-listed species, coordination with the U.S. Fish and Wildlife Service (USFWS) is not required.

Because of the urbanized setting of the study area, along with the lack of appropriate foraging and nesting habitat, the build alternatives would have no effect on the following listed avian species: Arctic peregrine falcon, Attwater’s greater prairie-chicken, bald eagle, brown pelican, piping plover, reddish egret, swallow-tailed kite, white-faced ibis, white-tailed hawk, whooping crane, and wood stork.

No creeks, rivers, lakes, springs, bays, estuaries, or other aquatic habitats would be impacted by the build alternatives; therefore, the build alternatives would have no effect on the following listed aquatic species: creek chubsucker, alligator snapping turtle, Atlantic hawksbill sea turtle, green sea turtle, Kemp’s Ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle.

Because of the lack of woodlands, grasslands, and other native plant communities in the study area, the build alternatives would have no effect on the following listed...
terrestrial or semi-aquatic species: Houston toad, black bear, Louisiana black bear, Rafinesque’s big-eared bat, smooth green snake, Texas horned lizard, and timber/canebrake rattlesnake.

5.7.2 Threatened and Endangered Vegetation

State and federally-listed plant species that have the potential to occur in Harris County, along with habitat requirements, are identified in Table 3-20 in Chapter 3. The only listed species that may occur in Harris County is the Texas prairie dawn. No sightings of this species were documented on the field survey of the project corridor. Furthermore, because of the lack of suitable habitat and federally designated critical habitat within the study area, it has been determined that the build alternatives would have no effect on the Texas prairie dawn.

5.7.3 Mitigation Measures

Impacts to vegetation and wildlife as a result of the build alternatives could potentially occur in a few sparsely wooded lots and where landscaping is proposed to be eliminated (e.g., along street segments lined by residential lots). Potential mitigation measures could include minimizing clearing, cutting, and pruning of trees where possible along the proposed alignments. Because of the lack of potentially impacted natural vegetation communities, no other formal mitigation is proposed for this project. In accordance with the Migratory Bird Treaty Act of 1918, which prohibits the take of migratory birds, their nests or their young, no nesting, feeding or breeding areas would be affected. Any necessary right-of-way clearing would preferably be conducted outside the general bird nesting season.

5.8 Water Resources

The impact of the build alternatives on surface waters, groundwater, floodplains, and waters of the US are described in this section. No impacts to water resources would occur as a result of the No Build Alternative.

5.8.1 Surface Waters

Long-term effects to surface water quality may occur as a result of pollutants emitted from passing vehicles, which would be carried by sheet flow to surface waters. Although Sims Bayou and Buffalo Bayou border the study area, their surface waters are not likely to be affected by construction of the build alternatives.

The proposed alignments under the build alternatives follow the existing roadway pavement. There would be a minimal increase in impervious surfaces; therefore, an increase in storm water runoff is not expected to be substantial. The proposed construction of fixed-guideway alignment and stations under the build alternatives is anticipated to include modifications to the existing storm sewer systems. In addition, the vehicle maintenance and storage facility under the LRT Alternative is expected to include modifications to the existing storm sewer systems. Detailed analysis of the affected storm sewers would be conducted during the design phase to ensure no flooding impacts to adjacent properties as a result of construction of the Stormwater management ponds may be required at the vehicle and maintenance facility site.
under the LRT Alternative and at the Palm Center Station park-and-ride lot under all build alternatives. The stormwater management ponds will be sized during preliminary engineering per the City of Houston stormwater management criteria. However, stormwater management mitigation could be accommodated by increasing storm sewer infrastructure. Accommodations for the stormwater management ponds are a standard assumption for the footprint of these facilities if ground cover characteristics are altered. Stormwater management pond locations would be subject to change during preliminary engineering and final design. If the stormwater management system that satisfies Federal, State of Texas, and local governmental requirements cannot be accommodated on the property identified for these facilities in this DEIS, a supplemental environmental document, as determined appropriate by FTA in concert with METRO, would be prepared.

5.8.2 Groundwater

No long-term impacts on groundwater are anticipated as a result of the proposed project.

5.8.3 Floodplains

The study area in the vicinity of Brays Bayou is highly urbanized and the bayou is concrete-lined. Even though both 100-year and 500-year floodplains of Brays Bayou occur within the study area, the project’s encroachments into the floodplain would be minimal. Therefore, the proposed project would not increase risks of property loss or hazards to natural and beneficial floodplain values.

There would be crossings of Brays Bayou under both the base and Wheeler-MLK alignment options. Both bridge crossings would be constructed to match the profiles of the existing bridges; therefore, no fill would be required. Construction plans and hydraulic analysis for bridge crossings of Brays Bayou would be submitted to HCFCD for review prior to construction.

5.8.4 Wetlands and Riverine Systems

The study area for the proposed project is located within an urbanized portion of the City of Houston, and the build alternatives are located largely within existing street rights-of-way. Waters of the US that were identified in the study area include Brays Bayou and several wetland areas, as indicated by 1979 USFWS National Wetland Inventory (NWI) maps. Field investigations reveal that no wetlands would be impacted by the build alternatives. Brays Bayou would be crossed by the proposed fixed-guideway alignment under the build alternatives; however, the bayou would be bridged to accommodate the alignment, resulting in no impact to the channel. The build alternatives would not result in any adverse impacts to waters of the US.

5.8.5 Potential Permit Requirements Related to Water Resources

Potential permit requirements related to water resources are described in Section 5.14 Construction Impacts.
5.8.6 Mitigation Measures

No long-term impacts on water resources are anticipated. Mitigation for construction impacts is discussed in Section 5.14 Construction Impacts.

5.9 Historic and Archaeological Resources

Section 106 of the National Historic Preservation Act (NHPA) requires that a Federal agency head with jurisdiction over a federal, federally-assisted, or federally-licensed undertaking take into account the effect of the agency’s undertaking on properties listed in or eligible for listing in the NRHP.

The Section 106 regulations and criteria used for assessing effects are outlined in 36 Code of Federal Regulations (CFR) 800, Protection of Historic Properties. The regulations stipulate that a determination of effect must be made to NRHP-listed or eligible resources within a project’s Area of Potential Effects (APE). The APE for this project and the NRHP- listed or eligible resources within the project APE are described in Section 3.9 of Chapter 3.

5.9.1 Section 106 Criteria of Adverse Effect

As defined in 36 CFR 800.16(i), “effect” means “alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.” A determination of effect was made for NRHP-listed or eligible resources in the project APE. For those identified as potentially affected, the Section 106 Criteria of Adverse Effect were then applied. Under 36 CFR 800.5, an “Adverse Effect” is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the resource for inclusion in the NRHP in a manner that diminishes the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Examples of adverse effects provided in the Section 106 Regulations include the following:

- Physical destruction/damage to all or part of the property;
- Alteration of a property that is not consistent with the Secretary of Interior’s Standards for Treatment of Historic Properties;
- Removal of the property from its historic location;
- Change of the character of the property’s use or of physical features within the property’s setting that contribute to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property’s significant historic features;
- Neglect of the property that causes its deterioration; and
- Transfer, sale or lease of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property’s historic significance.

The historic resources’ locations in proximity to the project, the properties’ settings, noise and vibration impacts, visual impacts and other impacts to the properties, such as secondary and cumulative impacts, were taken into account in the adverse effects
analysis. If the project’s effects did not meet the adverse effect criteria, or if the project has been modified to avoid adverse effects, then a finding of no adverse effect has been put forth.

5.9.2 Assessment of Effect to Historic Resources

The No Build Alternative, as described in Chapter 2 – Alternatives Considered, involves using existing transportation services and facilities plus METRO enhancements to transit service/facilities and the regional roadway/highway system. Based on existing information, the No Build Alternative would have no effect on any of the NRHP-listed or eligible resources identified within the APE for this project.

The build alternatives have the potential for Section 106 adverse effects. The alternatives provide for introduction of new fixed-guideway services along an alignment extending from Bagby in downtown Houston to a terminus on Griggs Road east of Martin Luther King Boulevard. The LRT Alternative would introduce into the setting of historic resources along the alignment: LRT vehicles, stations, trackwork, the overhead contact system (i.e., single contact wire and support poles), traction power substations, and a vehicle maintenance and storage facility. Warning horns and whistles would also be introduced at various locations along the proposed route. The trackwork would be located in an exclusive lane that is either paved or ballasted and separated from general-purpose traffic by curbing or raised buttons.

The BRT Convertible and BRT Alternatives would introduce BRT vehicles that are similar in appearance to the LRT vehicles and stations. The BRT vehicles would operate in reserved lanes within downtown Houston and in paved exclusive lanes outside downtown. Under the BRT Convertible Alternative, the lanes would be constructed with embedded trackwork for conversion to LRT in the future. The stations under both BRT Alternatives would be the same as the LRT stations except in downtown, where the BRT Alternatives would have bus stop shelters located on the sidewalk instead of stations. Also unlike the LRT Alternative; the BRT Alternatives would not have the OCS, power substations, or the vehicle maintenance and storage facility.

Available studies and field information on visual, noise, vibration, and traffic impacts, as well as secondary and cumulative effects were considered in the effects determinations. It is important to note that the effects assessments presented in this section are preliminary, because of the conceptual design of the project. Some of the effects identified as “adverse” could be minimized to a finding of “No Adverse Effect” under Section 106 through alignment/design modifications, mitigation or enhancements.

The Section 106 Criteria of Adverse Effect, as applied to the NRHP-listed or eligible resources in the project APE, are summarized in Table 5-12 and described below. The locations of the resources are shown in Figures 3-17 and 3-18 in Chapter 3. The resources with potential adverse effects are shown by location in Figure 5-6.
Table 5-12. Summary of Section 106 Effects to NRHP-Listed or Eligible Historic Resources

<table>
<thead>
<tr>
<th>General Location/Resource Name</th>
<th>Street Location</th>
<th>Alternative</th>
<th>Section 106 Effect Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Downtown from Bagby to St. Emanuel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kress Building</td>
<td>Main Street</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>U.S. Post Office/Customhouse</td>
<td>San Jacinto</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Annunciation Catholic Church</td>
<td>Texas</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Incarnate Word Academy* Eligible as part of Annunciation Catholic Church Complex</td>
<td>Capitol</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Annunciation Catholic Church Rectory* Eligible as part of Annunciation Catholic Church Complex</td>
<td>Texas</td>
<td>Build Alternatives</td>
<td>Potential Adverse Effect—Vibration, but mitigation has been recommended</td>
</tr>
<tr>
<td>Arthur B. Cohen House</td>
<td>Avenida De Las Americas</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>William Lee Foley House*</td>
<td>Avenida De Las Americas</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Gulf Building</td>
<td>Main Street</td>
<td>BRT Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Gulf Building Annex*</td>
<td>Travis</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Texas State Hotel*</td>
<td>Fannin</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Texas Company Building</td>
<td>San Jacinto</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Niels Esperson Building*</td>
<td>Travis</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td><strong>Capitol and Scott St. from St. Emanuel to Wheeler St.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Houston Coca-Cola Bottling Plant*</td>
<td>Capitol</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Third Ward North Historic District*</td>
<td>Along and west of Scott St., north of IH-45</td>
<td>Build Alternatives</td>
<td>Potential Adverse Effect, physical, visual</td>
</tr>
<tr>
<td>Third Ward East Historic District*</td>
<td>Along and east of Scott St., south of IH-45</td>
<td>Build Alternatives</td>
<td>Potential Adverse Effect, physical, visual, noise</td>
</tr>
<tr>
<td>Third Ward West Historic District*</td>
<td>Along and west of Scott St., south of IH-45</td>
<td>Build Alternatives</td>
<td>Potential Adverse Effect, physical, visual</td>
</tr>
<tr>
<td>Dahl Gren Building*</td>
<td>Polk Street</td>
<td>Build Alternatives</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>Robertson Stadium, The University of Houston*</td>
<td>Block bounded by Calhoun, Scott, Wheeler and Cullen</td>
<td>Build Alternatives with Wheeler-MLK alignment option</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td><strong>Scott St. from Wheeler St. to Griggs Rd.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3807 South McGregor Wy.*</td>
<td>MacGregor Way</td>
<td>Build Alternatives with base alignment on Scott/Griggs</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td><strong>Wheeler St. and Martin Luther King Blvd.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MLK Place Shopping Center*</td>
<td>Martin Luther King Blvd. at Old Spanish Trail</td>
<td>Build Alternatives with Wheeler-MLK alignment option</td>
<td>No Adverse Effect</td>
</tr>
<tr>
<td>University of Houston Residence Hall Quadrangle Historic District*</td>
<td>Wheeler St., east of Cullen Blvd.</td>
<td>Build Alternatives with Wheeler-MLK alignment option</td>
<td>No Adverse Effect</td>
</tr>
</tbody>
</table>

* All properties marked with an asterisk have been determined NRHP-eligible in consultation with the SHPO for purposes of planning for this project; other properties are NRHP-listed.

5.9.2.1 Impacts to Historic Resources in Capitol APE

Capitol in downtown Houston is a one-way street in the center of Houston’s business district. On Capitol (and throughout downtown), utility lines are located underground, but existing infrastructure includes street lights and the existing structural elements of METRO transit stops. Capitol contains a mixture of historic and new skyscrapers and other multi-story buildings, as well as surface parking lots on the sites of razed buildings.

Under the LRT Alternative, the introduction of contact wires and support poles would have a minimal visual impact on the setting of downtown because these physical elements are not currently present and are being introduced into the existing downtown setting. The LRT stations would have a greater impact; however, because of the loss of historic character downtown. The introduction of the stations into the settings of the dispersed historic buildings would not negatively impact the historic
characteristics of the actual buildings. The BRT Alternatives would have less impact because the only physical improvements to Capitol would be bus stop shelters.

The results of the noise assessment of the build alternatives found that none of the buildings along Capitol would incur noise impacts, and because of the highly developed nature of the area, no adverse secondary or cumulative impacts have been identified. The historic resources on Capitol may incur impacts through construction noise and disruption under the LRT Alternative, but these are temporary and short-term in nature, and are not considered adverse under Section 106.

Potential Section 106 impacts to the NRHP-listed or eligible buildings in the Capitol APE under the build alternatives are described below.

**Kress Building**

The NRHP-listed Kress Building, today’s St. Germain Lofts, is significant in the areas of commerce and architecture. The building fronts on Main Street, but its north side elevation abuts Capitol. No right of way would be acquired from this property. The LRT alignment along Capitol and the construction of an LRT station adjacent to the resource would introduce a new element into the property’s setting, constituting a minor visual effect, but as previously stated, the building’s historic downtown setting no longer exists and none of the property’s historic characteristics would be negatively impacted. Because of the minor level of impacts, the project would have No Adverse Effect to the Kress Building.

**U.S. Post Office/Customhouse**

This NRHP-listed building, significant in the area of architecture, occupies the block bounded on the north by Capitol, the south by Rusk, and on the east and west, respectively, by San Jacinto and Caroline. No land would be acquired from within the NRHP-listed boundary, and the setting of this historic building has modern buildings and parking lots and is not historic. While the LRT Alternative would introduce a new element into the property’s setting, the project would have No Adverse Effect to the property’s historic characteristics.

**Annunciation Catholic Church Complex**

This NRHP-listed building is significant in the areas of Religion, Education and Social History and Architecture. The building fronts on Crawford. Two other buildings adjacent to the Church and historically connected to it have been determined NRHP-eligible. The three historic buildings of the complex are considered eligible as a group – the Church, the Rectory and the Incarnate Word Academy. The Rectory abuts the north side of Capitol. No property would be acquired from the church complex. Within the complex, but outside the area recommended as eligible, and next to the Rectory, is a multi-story modern building that is out of character with the historic properties. The setting outside the complex is comprised of parking and vacant lots, and non-historic buildings, including the massive Minute Maid Stadium. The introduction of either the LRT alignment or the station adjacent to the Rectory would not negatively impact the historic characteristics or significance of the church complex. Studies have revealed, however, that the Rectory, the only building in the
complex on Capitol, may incur vibration impacts from the operation of the LRT line. These impacts were determined not to be significant. Because of the potential for vibration impacts, the Annunciation Catholic Church Complex may be adversely affected by the LRT Alternative. However, mitigation measures to reduce ground borne vibrations have been recommended for the Rectory, and could reduce the finding to No Adverse Effect.

**Arthur B. Cohen House and William Lee Foley House**

These architecturally and historically significant NRHP-listed and eligible buildings are located on the new roadway, Avenida De Las Americas, which runs in front of the convention center and leads to the Minute Maid Stadium one block away. The buildings fall within the APE on Capitol (and also the APE on Rusk). The buildings are one-half block from the Capitol alignment, with a large, vacant lot between them and the project. The setting does not contribute to these resources because the houses were relocated to this site from their original locations. In addition, their setting already includes downtown, convention center and stadium traffic; and parking lots, as well as overgrown vacant lots. The setting is not historic and is not historically associated with the moved buildings. Because no physical or other impacts are anticipated, the project would have No Adverse Effect to the Arthur B. Cohn House and the William Lee Foley House.

**5.9.2.2 Impacts to Historic Resources in Rusk APE**

The environment along Rusk is similar to Capitol. The area is highly developed and the historic character of the area has been lost over time. In addition, no noise, vibration, or adverse secondary or cumulative impacts have been identified. The historic resources may incur impacts though construction noise and disruption, but these are temporary and short-term in nature, and are not considered adverse under Section 106.

Potential Section 106 impacts to the NRHP-listed or eligible buildings in the APE along Rusk under the BRT Alternatives are described below.

**Gulf Building**

This NRHP-listed resource is known today as the Chase Bank Building. It is significant in the areas of economics and architecture. This high-rise fronts Main, but its north side faces Capitol. No right of way would be acquired from the historic property. The BRT vehicles would operate on Rusk along the side of the building. However, none of the property’s historic characteristics would be negatively impacted. Because no physical or other impacts are anticipated, the project would have No Adverse Effect to the Gulf Building.

**Gulf Building Annex**

This building is immediately west of the Gulf Building and possesses significance for its architecture and its historic association with the Gulf Building. The effects to this resource are the same as those discussed above for the Gulf Building. Therefore, the project would have No Adverse Effect to the NRHP-eligible Gulf Building Annex.
Texas State Hotel

The Texas State Hotel, NRHP-eligible for its architectural significance, fronts on Fannin and abuts the north side of Rusk. The bus stop shelters for the BRT alignment would be located on the south side of the Rusk. No right of way would be acquired from this property. Therefore, no adverse impacts to the property’s significant historic characteristics would occur as a result of the project. Consequently, the project would have No Adverse Effect to this resource.

Texas Company Building

This building, which is also known as the Texaco Building, is significant in the areas of commerce and architecture. The building’s main façade faces San Jacinto. There would be no adverse visual or aesthetic effects or any other effects to the historic resource and no adverse impacts to the property’s significant historic characteristics would occur. Consequently, the project would have No Adverse Effect to the NRHP-listed Texas Company Building.

Niels Esperson Building

This building is considered NRHP-eligible for its architectural significance. It fronts on Travis and abuts Rusk. The views to and from the front and north side of the building would not be affected by the proposed project. Therefore, there would be no adverse visual or aesthetic effects or any other effects to the historic resource, and no adverse impacts to the property’s significant historic characteristics would occur. Consequently, the project would have No Adverse Effect to the Niels Esperson Building.

Arthur B. Cohn House and William Lee Foley House

The setting of the two houses is not historic and is not historically associated with the moved buildings. Because no physical or other impacts are anticipated, and no adverse impacts to the property’s significant historic characteristics would occur, the project would have No Adverse Effect to the Arthur B. Cohn House and the William Lee Foley House.

5.9.2.3 Impacts to Historic Resources in APE from St. Emanuel to Wheeler Street

The APE in this segment of the proposed fixed guideway along Capitol and Scott Street from St. Emanuel to Wheeler Street is primarily industrial on the north; mixed use in the central portion, and institutional at Wheeler Street on the south. Scott Street encompasses the majority of the APE as the alignment leaves the industrial area at the east end of Capitol and proceeds diagonally across several blocks to Scott Street. Scott Street is a four-lane roadway, with a grassed median at many locations and left-turn lanes in the median. IH-45 crosses Scott Street in the central portion of the corridor.

Scott Street was widened in the past and a row of houses on the east side of Scott were removed. Modern commercial uses and vacant lots are interspersed with older residential uses along the street. Located at the south end of this segment are a university bookstore and shopping center and the UH Robertson Stadium. While the
historic integrity of the neighborhoods is low along Scott Street, the areas of the Third Ward off Scott Street retain a higher level of integrity.

The proposed fixed-guideway alignment would be located at grade in the median on Scott Street. Because the median is not wide enough to accommodate the guideway (i.e., double-track for the LRT Alternative and two lanes for the BRT Alternatives), Scott Street would have to be widened throughout the entire length of this segment. Stations would be located alongside the guideway in the median. The station platforms would be approximately 290 feet in length. Each station would include common structural elements and amenities to facilitate passenger convenience and to enhance the visibility and permanence of a station area. These structural elements include low-level lighting, benches, fare vending machines, information kiosks, trash receptacles, and public telephones. All stations would include an overhead canopy to provide weather protection. The specific design and physical dimension of each station area would be determined during the station area planning process and final design phase of project development.

The proposed fixed-guideway alignment on Scott Street would be located adjacent to historic resources identified as NRHP-eligible. Because the guideway would be located at-grade within an existing transportation corridor, the visual impact from the build alternatives on the surrounding environment, which has already been negatively affected by new construction and building demolition, would be minimal. Most of the visual impact would be attributed to the introduction of structural elements that do not currently exist on Scott Street. The construction of the project could also provide an opportunity to design various structural elements (i.e., OCS support poles, station stops and street lights) to enhance the visual quality of the area and reflect the historical character of the Third Ward neighborhoods and Robertson Stadium.

Visual impacts through other project improvements, however, have the potential for more substantial visual and physical impacts. The build alternatives would require acquisition of additional right of way along Scott Street between Elgin and Wheeler Streets. The right of way would be acquired from one side of the street, typically the side that has the most vacant land or the side that would minimize impacts on cultural resources or other important structures. Another project improvement that could also involve visual and physical impacts would be the lowering of Scott Street at IH-45. The bridge clearance at the interchange would not be able accommodate trucks turning underneath the OCS for the LRT vehicles. The street would not have to be lowered with BRT because no OCS would be required for operation of the vehicles.

Potential Section 106 impacts to the NRHP-listed or eligible resources in the APE along Capitol and Scott Street from St. Emanuel to Wheeler Street are described below:

**Houston Coca-Cola Bottling Company Plumbing Supply Company, Inc.**

This industrial building is NRHP-eligible for its architectural and historical significance. The build alternatives would not acquire right of way from this property and the improvements would be constructed at-grade. This building is in an industrial setting and the introduction of the elements of the fixed-guideway project would not negatively affect its setting, or its significant qualities. Consequently, the build alternatives would have No Adverse Effect to the Houston Coca-Cola Bottling Company.
Third Ward North Historic District

The Third Ward North, a small district on the west side of Scott Street and north of IH-45, is considered NRHP-eligible for its association with local African American history and its examples of early twentieth-century architecture. The build alternatives would provide for a fixed-guideway transit line in the median of Scott Street adjacent to the district’s eastern boundary. Because the median is not currently wide enough to accommodate the fixed-guideway alignment, additional right of way would be needed along Scott Street, potentially from properties within the district. However, where reasonable, the additional right of way would be acquired from the opposite side of the street to avoid or minimize impacts to the district.

In addition to the potential for right of way acquisition, there is the potential for visual effect to the district by the introduction of project elements adjacent to the district’s eastern boundary. However, the effect is not considered adverse because the district’s historic setting has already been altered by the widening of Scott Street and removal of houses on the east side of Scott Street across from the district.

Under the LRT Alternative, the potential lowering of Scott Street at IH-45 would be within the viewshed of the district, although the construction of the interchange has already negatively affected the viewshed and historic character of the area.

In summary, if Scott Street can not be widened on the side of Scott Street opposite the district, the build alternatives have the potential to have an Adverse Effect to the Third Ward North Historic District because of its potential physical and visual effects.

Third Ward East Historic District

The Third Ward East, a large, NRHP-eligible historic district, is on the east side of Scott Street, just south of IH-45. It is considered NRHP-eligible for its association with local African American history and its examples of early twentieth-century architecture. The proposed NRHP-eligible boundary of the district is irregular with no buildings facing Scott Street.

Under the build alternatives, a fixed-guideway transit line would be constructed in the median of Scott Street adjacent to the district’s western boundary and additional right of way would be required to accommodate the fixed-guideway alignment. Where reasonable, the additional right of way would be acquired from the opposite side of the street to avoid or minimize impacts to the district. However, if land from the district is required for the Scott Street widening (as the Third Ward West Historic District is across the street), the potential exists for the build alternatives to have a physical and visual adverse effect to the district.

The introduction of fixed-guideway stations and other project elements (e.g. OCS poles) adjacent to the district’s eastern boundary also has the potential for visual effect, but the effect is not adverse because this area has already been visually intruded upon by new construction and because its historic setting has already been altered by the widening of Scott Street, which resulted in the demolition of the buildings in the neighborhood that fronted on Scott Street.
The potential lowering of Scott Street at IH-45 under the LRT Alternative also has the potential for an adverse physical effect and possible visual effects to the district, although the construction of the interchange has already negatively affected the viewshed and historic character of the area.

As proposed, the build alternatives would result in the displacement of two contributing structures in the district, which would be an Adverse Effect. These properties are located on the southeast corner of Scott and Drew Streets, on the southeast corner of Scott and Tuam Streets, and at the northeast corner of Scott and McGowen Streets. A station is proposed at Elgin Street outside the southwest district boundaries and in an area that already contains a busy, modern shopping center, other businesses and an electric substation; no adverse effects from this station to the district are foreseeable.

In summary, the build alternatives have the potential for an Adverse Effect to the Third Ward East Historic District. If Scott Street is lowered at IH-45, the LRT Alternative may have greater adverse effects than the BRT Convertible and BRT Alternatives.

**Third Ward West Historic District**

The Third Ward West, an NRHP-eligible historic district, is immediately south of IH-45 on the west side of Scott Street. It is considered NRHP-eligible for its association with local African American history and its examples of early twentieth-century architecture. Scott Street, between Pease Street and Alabama Street, forms the district's easternmost boundary. The recommended NRHP-eligible boundary is irregular and includes a small number of resources that front on or abut Scott Street; but many others along Scott are excluded from the boundary.

The build alternatives would provide for a fixed-guideway transit line in the median of Scott Street adjacent to the district's eastern boundary. Additional right of way would be required along Scott Street and, where reasonable, land would be acquired from outside the district's boundaries.

If land from the district is required for the Scott Street widening (as the Third Ward West Historic District is across the street), the potential exists for the LRT and BRT alternatives to have an physical and visual adverse effect. The potential lowering of Scott Street at IH-45 under the LRT Alternative also has the potential for an adverse physical effect and possible visual effects to the district, although the construction of the interchange has already negatively affected the viewshed and historic character of the area.

In summary, the build alternatives have the potential for an Adverse Effect to the Third Ward West Historic District. If Scott Street is lowered at IH-45, the LRT Alternative may have greater adverse effects than the BRT Convertible and BRT Alternatives.

**Dahl Gren Building/Latino American Learning Center**

This historic building is significant for its architecture and possibly also for its association with ethnic history. It fronts Polk Street at a busy five-legged intersection at Scott, Polk, and Sampson Streets. A parking lot encompasses the land at the corner of Scott and Polk Streets, and the side of the building is about 40 feet from Scott Street, the location...
of the proposed fixed-guideway alignment. The building faces a long, warehouse structure across Polk Street. The guideway would be built at-grade, part on new location and part along Scott Street in the vicinity of the building. The project would introduce a new element into the setting of the resource, but the setting does not contribute to the architectural or historical significance of this resource, as its historic context is no longer extant. No physical impacts or other impacts to the building have been identified. For these reasons, the build alternatives would have No Adverse Effect to this resource.

Robertson Stadium

The University of Houston’s Robertson Stadium is on the east side of Scott Street, between Elgin and Wheeler Streets. A large parking lot buffers the stadium from Scott Street. The stadium structure is architecturally significant and also historically significant for its association with the university and with the Works Progress Administration (WPA). The fixed-guideway alignment under the build alternatives would be constructed at-grade on Scott Street, which is currently a local arterial with four travel lanes. If right of way is acquired, it would likely result in the acquisition of a small portion of the stadium’s parking lot, a feature that is not included in the recommended NRHP-eligible boundary for the stadium. The build alternatives may result in the introduction of a new visual element in the vicinity of the stadium. The stadium, however, is presently surrounded by expansive parking and Scott Street. The project will have no adverse effect to the Stadium’s significant historic characteristics. In summary, the build alternatives would have No Adverse Effect to this resource. (Impacts from the Wheeler-MLK alignment option to the stadium are described below.)

5.9.2.4 Impacts to Historic Resources in APE for Base Alignment Option

There is one NRHP-eligible resource in the APE for the build alternatives with the base alignment option on Scott Street and Griggs Road. The resource is located at 3807 South MacGregor Way. This residence is NRHP-eligible for its architectural significance as an example of modern architecture. It is set back from Scott Street, and the main façade faces onto MacGregor Way. Behind the house is deteriorated multi-unit housing. No right of way would be acquired from this property and no noise impacts have been identified. Because the main façade faces onto South MacGregor Way rather than Scott Street (approximately 100 feet to its east) and the proposed fixed guideway would be constructed at grade on Scott Street, the views to and from the building would not be notably affected by the proposed guideway alignment. While the project would introduce a new element into the property’s setting, the effects would be minor and the setting adjacent to the resource does not contribute to its significance. Consequently, the build alternatives with the base alignment would have No Adverse Effect to this residence.

5.9.2.5 Impacts to Historic Resources in APE for Wheeler-MLK Alignment Option

Following is a discussion of the application of the Criteria of Adverse Effect to the two NRHP-eligible resources in the APE for the Wheeler-MLK alignment option.
University of Houston Residential Hall Quadrangle Historic District

This five-building student residential complex is on the north side of Wheeler Street. The proposed fixed-guideway alignment under this option to the build alternatives would be located in a new median on Wheeler Street and the street would be widened on the north side. The rear of one of the buildings in the complex and the sides of two other buildings abut the sidewalk and Wheeler Street. These buildings are eligible for their architecture and for their historic association with the Post-World War II campus expansion.

Although Wheeler Street would be widened on the campus side adjacent to the buildings, the widening would not physically affect the buildings and no land would be taken from the eligible boundaries, which along Wheeler Street are the south building faces of Law, Settegast and Oberholtzer Halls. The setting outside the boundaries is dominated by a large parking lot across Wheeler Street and a busy street that carries local and campus traffic. While the project elements are considered out of character with the historic property, the property’s setting does not contribute to the property, particularly as the focus of the quadrangle buildings inward to the planned greenspace and circulation system. Because the build alternatives with Wheeler-MLK alignment option would not physically affect the district and would not affect the significant characteristics of the resource, this alignment option would have No Adverse Effect on the property.

MLK Place Shopping Center

This shopping center is eligible for its significance as an example of modern commercial architecture. It is located on the corner of Martin Luther King Boulevard and Old Spanish Trail. This resource has a modern gas station and a circa 1970s shopping center in its viewshed and both Old Spanish Trail and Martin Luther King Boulevard have been widened since the center was built in 1947. The eligible boundaries are the footprint of the building. The parking lot and non-historic sign are not included in the boundary. This Wheeler-MLK alignment option would not take the building and its parking area would remain, because the fixed-guideway alignment would be constructed in the center of Martin Luther King Boulevard. While the proposed project is considered out of character with the historic property, the property’s setting does not contribute to the property. Because the build alternatives with the Wheeler-MLK alignment option would not physically affect the MLK Place Shopping Center and would not affect the significant characteristics of the historic property, the build alternatives with this alignment option would have No Adverse Effect on the property.

5.9.2.6 Impacts to Historic Resources, Storage Yard and Maintenance Center APE

The APE for the proposed maintenance and storage facility for the LRT Alternative contains no NRHP-listed or eligible resources. Consequently, construction of this proposed facility would not affect any historic resources under Section 106.
5.9.3 Assessment of Effect to Archaeological Resources

No known locally designated or NRHP-eligible or listed archaeological sites were identified within the project APE. In addition, research has found that little potential for encountering archaeological sites exists in the project impact area, due primarily to prior disturbance that has occurred for construction of the project area’s roadways. Therefore, it appears unlikely that any significant archaeological sites would be impacted by the proposed alignments.

5.9.4 Section 106 Coordination

Section 106 coordination with the staff of the State Historic Preservation Office (SHPO) has been on-going. The SHPO staff has provided guidance on the development of the APE, the survey methodology and the survey findings in regard to NRHP eligibility and Section 106 effects. The Advisory Council on Historic Preservation will be notified of any Adverse Effect finding.

Both public and agency scoping meetings were held in 2002. While no comments were received from the public regarding historic or archaeological resources, historic resources was an issue of special concern identified at the agency scoping meeting by the Texas Historical Commission (the Texas SHPO).

Pursuant to the public involvement requirements of Section 106 of the National Historic Preservation Act, the project will be coordinated with local officials and attempts will be made to identify consulting or interested parties with a desire to participate in the resolution of any adverse effects identified.

METRO will first attempt to avoid adverse impacts to NRHP-listed or eligible resources. Should the project be unable to avoid such impacts, the Section 106 process will likely culminate in a Memorandum of Agreement (MOA) between the FTA, METRO, and the SHPO. The MOA will contain measures agreed upon to minimize or mitigate the project’s adverse effects. The FTA, METRO, and the SHPO will involve any Section 106 Consulting Parties identified in the development of the measures for the MOA.

5.10 Parklands and Other Section 4(f) Properties

Section 4(f) of the Department of Transportation Act of 1966, as amended (49 USC 303), states that the U.S. Department of Transportation may not approve the use of land from a significant publicly owned public park, recreation area, wildlife or wildfowl refuge, or a significant historic site unless a determination is made that:

- There is no feasible and prudent alternative to the use of land from the property; and
- The action includes all possible planning to minimize harm to the property resulting from such use.

This section describes impacts to parks and recreational facilities and potential Section 4(f) involvement with parks and recreation facilities and historic resources under the
build alternatives. It also describes Section 6(f) involvement with one recreational resource. Impacts associated with projects in the No Build Alternative would be identified and addressed by the responsible agencies prior to implementation. Additional information is available in the Section 4(f) report in Appendix F.

5.10.1 Methodology

Impacts on Section 4(f) resources are categorized as impacts involving a “use” or “constructive use” of such resources. A Section 4(f) use, as defined in 23 CFR 771.135(p), occurs when land is permanently incorporated into a transportation facility, or there is temporary occupancy of land that is adverse in terms of the statute’s preservationist purposes. Adverse “temporary occupancy” could occur when the capability to perform any of the site’s substantial functions is substantially impaired. The recently-issued Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) states that the requirements of Section 4(f) will be considered satisfied with respect to a Section 4(f) resource if it is determined that a transportation project will have only a “de minimus impact” on the Section 4(f) resource. The provision allows avoidance, minimization, mitigation, and enhancement measures to be considered in making the de minimus determination. The agencies with jurisdiction must concur in writing with the determination. For historic properties, the de minimus criteria are defined as “no adverse affect” or no "historic properties affected" under Section 106 of the National Historic Preservation Act. The de minimus criteria for parks, recreation areas, and wildlife and waterfowl refuges were not clearly defined in the law, but are generally minor impacts not adversely affecting the activities, features, or attributes of the Section 4(f) resource.

A Section 4(f) “constructive use” occurs when the transportation project does not incorporate land from the resource, but the project’s proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired. For example, a constructive use can occur when one or more of the following conditions apply:

- The projected noise level increase attributable to the project substantially interfered with the use and enjoyment of a noise-sensitive resource protected by Section 4(f).
- The proximity of the proposed project substantially impairs aesthetic features or attributes of a resource protected by Section 4(f) where such features or attributes are considered important contributing elements to the value of the resource. An example of such an effect would be the location of a proposed transportation facility in such proximity that it obstructs or eliminates the primary views of an architecturally significant historic building, or substantially detracts from the setting of a park or historic site which derives its value in substantial part from its setting, and/or,
- The project results in a restriction on access that substantially diminishes the utility of a significant publicly owned park, recreation area, or historic site.

Section 6(f) of the Land and Water Conservation Fund (L&WCF) Act of 1965 (36 CFR 59) contains provisions to protect the federal investment and the quality of
resources developed with L&WCF assistance. Section 6(f) protects grant-assisted areas from conversions to other uses, and states that:

No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and reasonably equivalent usefulness and location.

The pertinence of Section 6(f) to transportation projects is that if a project proposes to take land from a recreational resource that has been wholly or partially developed with an L&WCF grant, the project must be coordinated with the administrator of the fund in Texas, the Texas Parks and Wildlife Department Grants Branch.

Preliminary determinations have been made based on conceptual engineering regarding Section 4(f) “direct” uses, de minimus findings, and constructive uses, as well as involvement with Section 6(f). The parklands and historic resources with potential Section 4(f) uses are shown by location in Figure 5-7. The results of the preliminary determinations are discussed in the following sections.

Section 5.10.4 describes measures that would be studied during the FEIS phase to avoid, minimize or mitigate Section 4(f) uses. The potential for additional Section 4(f) involvement may be identified during the FEIS phase. If this occurs, a Section 4(f) evaluation would be undertaken for each newly identified use.

5.10.2 Parkland and Recreational Resource Impacts and Section 4(f) Use

Section 3.10 in Chapter 3 identifies 37 parks and recreational facilities in the study area. Of this total, only the following five resources are located immediately adjacent to the proposed build alternatives:

- Tranquility Park
- Hermann Square
- MacGregor Parkway Linear Park and Brays Bayou Hike and Bike Trail
- MacGregor Park
- Proposed Beekman Road Park at Palm Center

Potential Section 4(f) impacts to these resources under the build alternatives are described below.

5.10.2.1 Tranquility Park

This park is a relatively small, 4.3-acre special use city park in downtown Houston, on a block bounded by Brazos on the east, Bagby on the west, Rusk on the south, and Capitol on the north. The focus of the small park is a fountain, but it also
contains monuments, sculptures, and concessions. The setting of the park is a greenspace in a sea of high-rise buildings with arterial streets on the north and south sides of the park.

The westernmost point of the proposed fixed-guideway alignment in downtown would be adjacent to the park. The project would use no land from the park, but the Smith station would be constructed within the viewshed of the park. As previously stated, this viewshed already is populated with high-rises and the elevated IH-45 is in its viewshed. Because of the noisy, busy setting of the park, the build alternatives would not impact the park or park user. The park may experience temporary noise, vibration, or access impacts during construction of the alignment and station, but these impacts are short-term and none of the impacts are physical. Because the
project would not use land from this property and other impacts are either short-term or relatively minor, no Section 4(f) use would occur.

5.10.2.2 Hermann Square

This small HPD special use park encompasses 1.43 acres in downtown Houston, between Rusk, Walker, Smith, and Brazos Streets. The park contains a fountain and surrounding greenspace. The setting of the park is a small greenspace surrounded by high rise buildings that cast shadows upon the park.

The BRT alignment along Rusk would pass by the side of this park. This proposed alternative specifies no use of land from this property and because it is in a busy, urban setting, no long-term impacts are anticipated. The park may incur construction impacts, but any construction impacts, e.g., vibration, noise or access impacts, would be short term. Because the project would not use land from this property and other impacts are either short-term or relatively minor, no Section 4(f) use would occur.

5.10.2.3 MacGregor Parkway Linear Park and Brays Bayou Hike and Bike Trail

MacGregor Parkway Park is a City of Houston linear park along Brays Bayou that essentially connects the city’s Hermann Park with MacGregor Park. Within this linear park is Harris County’s Brays Bayou Hike and Bike Trail, which extends outside MacGregor Parkway Park on both ends. At some locations in the segment between the two city parks, the Brays Bayou trail is on both sides of the river, while on others, it is only on one side. The City of Houston maintains the greenspace from the curbs of North and South MacGregor Way to a distance ten feet from the trail when the trail is present and to the Bayou when it is not. The U.S. Army Corps of Engineers maintains the Bayou for flood control. Section 6(f) funds were utilized in the development of the Brays Bayou trail system.

The proposed base alignment under the build alternatives would cross above the MacGregor Linear Park and the Brays Bayou Hike/Bike Trail at the existing Scott Street crossing of Brays Bayou. On the east side of the Scott Street bridge, trails are located on both sides of the river, but on the west side, trails are only on the south side. The project proposes to widen the existing Scott Street bridge over the bayou to accommodate the fixed-guideway alignment. The existing trail on both sides of the bridge connects at street level. Trail users can cross at the traffic signal at North MacGregor Way and Scott Street, or at the non-signaled, striped pedestrian crosswalk south of the intersection that connects the trail segments on the south side of the bayou. The widening of the bridge would not impact the trail user or the user’s experience in the long term, as the bridge already exists at this location and the crosswalks at the intersection and south of it would remain. Based on conceptual engineering, it is not anticipated that piers for the widened bridge would be placed within the linear park or adjacent to the trails. Therefore, no use of this property would occur.

The Wheeler-MLK alignment option would avoid MacGregor Parkway and so there would be no impact to this property. This alignment would involve either renovating the existing bridge on Martin Luther King Boulevard over the Bray’s Bayou Trail or building a new bridge to accommodate the fixed-guideway. Today, the completed
portion of the Brays Bayou Hike and Bike Trail terminates at the bridge. It is not anticipated that a Section 4(f) use of the trail would occur by this bridge project, although there may be temporary construction impacts. The bridge construction would take into account the need for trail user safety and trail continuity, as the county plans to extend the trail eastward from Martin Luther King Boulevard along the bayou. No impact to this resource is anticipated.

5.10.2.4 MacGregor Park

MacGregor Park is a city park located on the west side of Martin Luther King Boulevard between Brays Bayou and Old Spanish Trail. The former parkland on the east side of the roadway has reverted back to the original owners. The Wheeler-MLK alignment option under the build alternatives would locate the fixed-guideway alignment in the existing grassy median of Martin Luther King Boulevard which runs along the east side of the park. This would comprise a use of the property as the Martin Luther King Boulevard median is within the park boundary. There would also be acquisition of small amounts of park property to provide turning lanes and a new signalized intersection at Martin Luther King Boulevard and to improve the intersection at Old Spanish Trail. These uses would not have a negative affect on the park’s activities or appearance and would not impair the recreational uses of the park. These impacts are considered de minimis under Section 4(f). The City of Houston Parks and Recreation Department indicated agreement with this finding at a meeting with METRO on June 14, 2006. The City is currently preparing a written concurrence with the de minimis finding.

5.10.2.5 Proposed Beekman Road Park at Palm Center

The City of Houston has proposed to construct a park at the intersection of Griggs Road and Beekman Road, adjacent to the Palm Center. The park is planned for land at the intersection’s southeast quadrant, across Beekman Road from the existing Palm Center parking lot and abutting an apartment complex. The project at this location would feature a transit station and a park-and-ride lot on land currently occupied by the Palm Center. No land would be acquired from the proposed park for this project and no significant impacts to the park’s proposed activities are anticipated from the operation of fixed-guideway transit on Griggs Road or from the proposed station and park-and-ride lot, as the area already functions as a shopping center parking lot. METRO would work with the City of Houston Parks and Recreation Department to coordinate development of the project in the vicinity of the park area to avoid or minimize potential impacts to the extent feasible.

5.10.3 Section 4(f) Use of Historic Resources

The preliminary Section 106 analysis of effects to historic resources, as discussed in Section 5.9 and summarized in Table 5-12, was used as a basis for the Section 4(f) historic resources analysis. In accordance with Section 4(f), the effects on the NRHP-listed or eligible resources were reviewed to determine if the build alternatives’ effects are considered Section 4(f) uses.
5.10.3.1 Historic Resources with No Potential Section 4(f) Use

Two of the identified historic resources in the corridor would involve either a Section 106 adverse effect (Annunciation Catholic Church Complex) or a minor use of land from a property outside the property’s NRHP eligible boundary (Robertson Stadium), but would not involve a Section 4(f) use:

- Annunciation Catholic Church Complex – The build alternatives would adversely impact one historic resource, the Annunciation Catholic Church Complex, which includes the NRHP-listed church and the NRHP-eligible Incarnate Word Academy and Church Rectory, but these impacts would not constitute a Section 4(f) use. The results of the studies have projected potential vibration impacts to the Rectory as a result of LRT operations along Capitol, but these impacts are not significant and are proposed to be mitigated. And, since no land would be used and the impacts are not considered significant, the project would not involve a Section 4(f) use from the Annunciation Church Complex.

- University of Houston Robertson Stadium – The NRHP-eligible Robertson Stadium is on the east side of Scott Street under the build alternatives and on the north side of Wheeler Street under the Wheeler-MLK alignment option. As presently proposed, the project would likely acquire land from the parking lot of the stadium, but the parking lot is outside the NRHP-eligible boundary, which is the footprint of the stadium. The land acquired from the parking lot for the project would be minor and no significant impact to the stadium would result. For these reasons, the project would not involve a Section 4(f) use from the University of Houston Robertson Stadium.

5.10.3.2 Historic Resources with a Potential Section 4(f) Use

A potential Section 4(f) use under the build alternatives was determined for the three NRHP-eligible districts along Scott Street. A more detailed description of impacts to these three districts is presented in Section 5.9.2.3 and in the Section 4(f) Evaluation in the Appendix of this DEIS. It was determined that these districts may be adversely affected under Section 106. The potential Section 4(f) use from these districts is described below:

- Third Ward North – A minimal amount of right of way would be acquired from two parcels between Pease Avenue and Jefferson Avenue. No structures would be affected. Impacts to the Third Ward North Historic District have been minimized by moving the proposed platform at Leland Station to the area in the median between the northbound and southbound guideway. Moving the platform location reduces the need for right of way acquisition and would result in no adverse impacts to the district.

- Third Ward East – Impacts to the Third Ward East Historic District include acquisition of approximately 10 feet of right of way from all the properties adjacent to Scott Street. This would result in the acquisition of a contributing property within the district on the southeast corner of Scott and Drew Streets. One additional contributing building within the Third Ward East Historic District at
the Scott/McGowan Street intersection would be acquired for the realignment of this intersection for safety improvements.

- Third Ward West – Impacts to the Third Ward West Historic District are limited to acquisition of a small amount of right of way along the west side of Scott Street between Holman and Alabama Avenues. This acquisition would affect four parcels, one of which contains a house that is a contributing element to the district. The house would not be affected.

5.10.4 Avoidance, Minimization, and Mitigation

The discussion of avoidance alternatives focuses on the three Third Ward Historic Districts where impacts have been identified. No impacts to MacGregor Parkway or the Brays Bayou Trail were identified. The impacts to MacGregor Park have been identified as de minimis impacts and therefore do not require discussion of avoidance alternatives.

Avoidance alternatives include those that avoid Section 4(f) resources with a new alignment location and those that avoid impacts through design modifications.

5.10.4.1 Location Alternatives

Development of alternatives for the Southeast Corridor followed established FTA procedures for New Starts projects. A full range of alternatives for the Southeast Corridor were considered as part of the Alternatives Analysis (AA), completed in 2004. The AA identified and evaluated alternatives through a two-step process. The first step consisted of the identification and mapping of all potential rights-of-way conceivable for fixed-guideway transit, including arterial streets and active or abandoned railroad rights of way. In the initial step, alignment segments having “fatal flaws” that made them clearly inferior for further consideration were eliminated.

The second step involved the development of full-length corridor alternatives from the list of remaining alignment segments. The corridor alternatives were then subjected to more detailed evaluation of the benefits and the environmental, transportation, and economic impacts against the stated goals and objectives for the project as set forth in the purpose and need.

The AA also screened a long list of transit technologies capable of providing high capacity transit, narrowing to the consideration of LRT and BRT with input from the Community Involvement Committee and general public. The technologies of LRT and BRT were selected for detailed evaluation with the corridor alignment alternatives.

Because the Third Ward Historic Districts comprise a large geographical area between the Downtown and UH, there were not a large number of alignment alternatives that completely avoided all three districts. However, two alternatives, in addition to the No Build Alternative, that avoid the use of these Section 4(f) resources.
properties were developed during the AA. These alternatives and the reasons for their elimination are described below.

**Houston Belt & Terminal Railway and BNSF Railway**

Route segments utilizing the Houston Belt & Terminal (HBT) Railway and BNSF Railway were considered in the initial identification and screening of potential route segments in the AA. These segments were not advanced for further consideration in the AA because of their lack of consistency with the project purpose and need, low ridership, and high costs. For these reasons they are not considered prudent alternatives. Railroad alignments are more appropriate for commuter rail which serves longer distance peak period trips. These types of trips are currently served by METRO using express buses operating in high occupancy vehicle (HOV)/bus lanes on IH-45. The need is for improved transit to serve shorter non-work and work trips not served by the peak oriented commuter service. The railroad alignments also would not serve the university areas of TSU and UH. The HBT Railway alignment also conflicts with a future hike and bike trail planned by Harris County in the abandoned railroad right of way from Brays Bayou to Polk Street.

**Alternative SL-3**

Alternative SL-3 was one of four complete alternatives developed from the viable route segments. Alternative SL-3 avoided the three documented Third Ward historic districts but would have the same de minimis impacts to MacGregor Park as the base alignment. Alternative SL-3 was not advanced for consideration in the DEIS because it would not directly serve the Downtown area and hence the potential to generate ridership would be substantially diminished. The Downtown area is the single largest activity and employment center served by the alternatives and the largest single destination for trips in the corridor. Alternative SL-3 also showed relatively low potential for attracting new transit riders, primarily due to the lesser travel time savings offered by this alternative. Overall, Alternative SL-3 would not meet the purpose and need for the project in terms of improving mobility, making regional connections, and providing economic development opportunity and was not considered a prudent alternative. Alternative SL-3 also traverses a portion of the Third Ward neighborhood and while it does not affect the identified historic districts, there is potential for additional historic properties within the SL-3 alignment.

**No Build Alternative**

The No Build Alternative is retained throughout the New Starts and NEPA process as a potential alternative as well as a baseline against which the other alternatives can be compared. The No Build Alternative would avoid the use of any Section 4(f) properties. However, the No Build alternative does not meet the project purpose and need as stated in Chapter 1 of the DEIS and therefore is not considered prudent. The No Build Alternative would not provide the transit investment in the Southeast Corridor needed to support the development/redevelopment included in local land use plans. The No Build Alternative would not effectively meet the projected travel demand in the corridor – congestion would likely continue to worsen, and the transit system would not successfully attract a significant portion of this demand. The No Build Alternative would not contribute to improved air quality in the region, nor would
it contribute to neighborhood revitalization and economic development of the area. Mobility of the area’s residents, many of whom are low-income and dependent upon public transit, would not be improved.

5.10.4.2 Design Alternatives

Design alternatives that avoid the use of the three Third Ward Historic Districts were also considered. These design alternatives include minor alignment shifts and a reduced facility.

Minor Shifts in Alignment

Currently the MOS alignment is roughly centered on Scott Street with small right-of-way acquisitions on both sides. Because the two impacted historic districts are located on both sides of Scott Street, shifting the alignment east or west would not avoid impacts to these Section 4(f) resources. Shifting to avoid one historic district could result in more severe impacts to another district, including potentially additional structure acquisitions. The net impact to the two districts is less by maintaining the alignment in the center of Scott Street.

The station platform at Leland Station was moved from the west side of Scott Street to the center of Scott Street (between the northbound and southbound tracks) to minimize the right-of-way acquisition along Scott Street in this area. This shift minimized impacts to the Third Ward North Historic District.

Reduced Facility

Eliminating a travel lane on Scott Street would provide sufficient right-of-way for the proposed LRT/BRT alignment without impacting the Section 4(f) properties. However, Scott Street is currently a 4-lane facility that provides direct access to IH-45. Existing and future demand on this facility precludes the removal of any traffic capacity. Any capacity reduction would result in severe congestion and would impact access to the Third Ward neighborhood as well as to the interstate. Reducing the number of lanes on Scott Street is not considered a prudent alternative.

The existing 5-foot sidewalks would be expanded to 12 feet under the Build Alternatives. A reduction of planned sidewalk width would reduce the amount of right of way required for the proposed facility.

5.10.4.3 Measures to Minimize Harm

Impacts have been identified under the Build Alternatives and alignment options to the Third Ward East and Third Ward West Historic Districts. Every effort will be made in final design to avoid these impacts with further design options. Additional measures to minimize harm to historic properties will be developed in consultation with the SHPO. A MOA will be executed between FTA, METRO, and the SHPO to document adverse effects on historic properties and measures to resolve those effects. These measures could include detailed documentation (e.g. Historic American Building Survey documentation) of any adversely affected historic buildings. This would include the contributing buildings in the Third Ward East
Historic District to be acquired, and potentially other buildings adversely affected by encroachment of Scott Street and the proposed improvements. Other measures to minimize and mitigate impacts could include reducing the proposed 12-foot sidewalk width at some locations and using additional landscaping. Coordination with the SHPO on mitigation measures is ongoing.

De minimis impacts were also identified to MacGregor Park under the Wheeler-MLK alignment. However, these impacts will not impair the recreational uses or activities at the park and so no additional mitigation measures are warranted.

5.10.4.4 Coordination

The Texas SHPO and the City of Houston Parks and Recreation Department have been consulted regarding impacts to historic and park properties as a result of the project. The SHPO was involved in the identification of the project Area of Potential Effect for historic properties, and has reviewed the historic inventory and eligibility recommendations completed by METRO completed in November 2004 and supplemented in February 2006. The SHPO will continue to be involved in the determination of effect for the project.

METRO has also coordinated with the City of Houston Parks and Recreation Department regarding impacts to MacGregor Park. On June 14, 2006, METRO and the City met to discuss the impacts of placing the fixed guideway in the median of Martin Luther King Boulevard, as well as right-of-way acquisition required for intersection improvements within the park. The City agreed that these impacts would be minor and would not substantially impair the recreational values of the park or any of the park’s significant features or activities. Written concurrence from the City on the de minimis finding is forthcoming.

5.11 Geology and Soils

Issues of concern related to geology and soils include study area geology and groundwater, existing underground conditions such as tunnels and utilities, and construction methods. As described in Section 3.11, geologic conditions have been established using published geologic mapping, and information from other projects in the vicinity of the build alternatives.

5.11.1 Geology

No geologic impacts are anticipated to result from the No Build Alternative. The build alternatives would be constructed at grade and would have minimal impact on geologic conditions. Additional geotechnical investigations may be required for track bed foundation design for the LRT and BRT Convertible Alternatives.

5.11.2 Soil

No impacts to soils are anticipated to result from the No Build Alternative. The build alternatives would be constructed at grade and would have minimal impact on soil conditions. The project is in an urban area where surface soils along the alignment
have generally been disturbed. While no soil borings have been placed for this study, it is likely that some fill materials of varying placement conditions exist in some locations. These may be from road construction, placement of utilities or other existing underground structures. Surface soils are expected to exhibit shrink-swell characteristics of the Beaumont formation.

5.11.3 Mitigation Measures

Foundations for structures would be designed to accommodate the shrink-swell properties of project area soils through methods such as removal and replacement of expansive layers or soil improvement such as cement stabilization.

5.12 Hazardous Materials

The early identification of hazardous materials sites, which could adversely affect the subsurface conditions of the proposed project, provides valuable information for the alternatives evaluation, design, right-of-way acquisition, and construction phases. Hazardous materials sites are considered throughout project development to address compliance with NEPA and other federal, state, and local laws and regulations. The identification of hazardous materials sites and their potential to adversely affect the subsurface conditions of the project help to:

- Protect the health and safety of the contractors and general public during construction of the project and agency personnel during operation of the facility.
- Avoid or minimize encounters and/or releases of hazardous materials during construction.
- Avoid or minimize liability for environmental remedial action.

The findings presented in this assessment are based on preliminary information and are not intended to replace more detailed studies such as individual site assessments and subsurface soil and groundwater investigations. Rather, this assessment is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions in connection with the proposed project. Other technical studies may be required to determine the existence of site contamination prior to right-of-way acquisition, utility relocation, or other construction activity. No environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions. Potential contamination sites may extend beyond those identified in this report because of limited historical and regulatory information, illegal dumping practices, and a lack of compliance with storage tank registration and hazardous waste generator programs. Furthermore, the identification of a site does not necessarily indicate that the site contains contamination, but only that there is the potential for contamination to occur.

5.12.1 Potential Impacts

The No Build Alternative would have no impact to hazardous material sites because there would not be any construction activities associated with this alternative.
Table 5-13 shows the database search results for the build alternatives with the base
alignment option via Scott Street and Griggs Road, and Table 5-14 shows the
database search results for the build alternatives with the Wheeler-MLK alignment
option. The search distances for the “type of site” generally follow the guidelines listed
in American Society of Testing Materials (ASTM) E1527-00: Standard Practice for
Environmental Site Assessments: Phase I Environmental Site Assessment Process.

**Table 5-13. Regulatory Database Search Results for Build Alternatives
with Base Alignment Option**

<table>
<thead>
<tr>
<th>Type of Site</th>
<th>Adjacent to Centerline</th>
<th>Adjacent to Centerline to 1/8 mile</th>
<th>1/8 mile to 1/4 mile</th>
<th>1/4 mile to 1/2 mile</th>
<th>1/2 mile to 1 mile</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superfund Sites - National Priorities List (NPL) Sites</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Sites</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>CERCLIS No Further Removal Action Plan (NFRAP) Sites</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>N/A</td>
<td>6</td>
</tr>
<tr>
<td>Resource Conservation and Recovery Act (RCRA) - Corrective Actions (CORRACTS) Sites</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>RCRA - Treatment, Storage, and Disposal (TSD) Sites</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>RCRA - Generator/Handler Sites</td>
<td>17</td>
<td>33</td>
<td>38</td>
<td>N/A</td>
<td>N/A</td>
<td>88</td>
</tr>
<tr>
<td>Emergency Response Notification System (ERNS) Sites</td>
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<td>5</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
<td>8</td>
</tr>
<tr>
<td>Texas Superfund (TXSF) Sites</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Municipal Solid Waste Landfill (MSWLF) Sites</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Voluntary Cleanup Program (VCP) Sites</td>
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<td>6</td>
<td>10</td>
<td>6</td>
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<td>25</td>
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<tr>
<td>Leaking Petroleum Storage Tank (LPST) Sites</td>
<td>21</td>
<td>22</td>
<td>32</td>
<td>44</td>
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<td>Petroleum Storage Tanks (PST) Sites</td>
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<td>62</td>
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<td>N/A</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>90</strong></td>
<td><strong>128</strong></td>
<td><strong>152</strong></td>
<td><strong>54</strong></td>
<td><strong>5</strong></td>
<td><strong>429</strong></td>
</tr>
</tbody>
</table>

Source: Parsons Brinckerhoff and GeoSearch, 2006.
Table 5-14. Regulatory Database Search Results for Build Alternatives with Wheeler-MLK Alignment Option

<table>
<thead>
<tr>
<th>Type of Site</th>
<th>Adjacent to Centerline</th>
<th>Adjacent to Centerline to 1/8 mile</th>
<th>1/8 mile To 1/4 mile</th>
<th>1/4 mile to 1/2 mile</th>
<th>1/2 mile to 1 mile</th>
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<tr>
<td>Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Sites</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>CERCLIS No Further Removal Action Plan (NFRAP) Sites</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>N/A</td>
<td>3</td>
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<tr>
<td>Resource Conservation and Recovery Act (RCRA) - Corrective Actions (CORRACTS) Sites</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>RCRA - Treatment, Storage, and Disposal (TSD) Sites</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>RCRA - Generator/Handler Sites</td>
<td>13</td>
<td>34</td>
<td>35</td>
<td>N/A</td>
<td>N/A</td>
<td>82</td>
</tr>
<tr>
<td>Emergency Response Notification System (ERNS) Sites</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
<td>8</td>
</tr>
<tr>
<td>Texas Superfund (TXSF) Sites</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Municipal Solid Waste Landfill (MSWLF) Sites</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Voluntary Cleanup Program (VCP) Sites</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>0</td>
<td>N/A</td>
<td>18</td>
</tr>
<tr>
<td>Leaking Petroleum Storage Tank (LPST) Sites</td>
<td>20</td>
<td>31</td>
<td>25</td>
<td>42</td>
<td>N/A</td>
<td>118</td>
</tr>
<tr>
<td>Petroleum Storage Tanks (PST) Site</td>
<td>35</td>
<td>69</td>
<td>54</td>
<td>N/A</td>
<td>N/A</td>
<td>158</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>72</strong></td>
<td><strong>145</strong></td>
<td><strong>127</strong></td>
<td><strong>45</strong></td>
<td><strong>4</strong></td>
<td><strong>394</strong></td>
</tr>
</tbody>
</table>

Source: Parsons Brinckerhoff and GeoSearch, 2006.

Table 5-15 lists the sites which are considered “high-risk” to the construction of the build alternatives with the base alignment option and the Wheeler-MLK alignment option. The table lists the high risk sites by map location, site name and address, and database type. A description of each site is available in Appendix G. The build alternatives with the base alignment option encompass 65 high-risk hazardous materials sites, while the alternative with the Wheeler-MLK alignment option encompasses 52 high-risk sites.

5.12.2 Mitigation Measures

Construction of the proposed project under the build alternatives may require removal of potentially hazardous materials from the right of way. These include underground petroleum storage tanks (active, inactive, leaking), contaminated soils and groundwater, other containers holding petroleum products or hazardous materials (e.g. 55-gallon drums), automotive or train parts, and other potentially hazardous materials that may need to be removed because of construction activities. Prior to the FEIS,
### Table 5-15. Regulatory Database Search Results: High Risk Sites

<table>
<thead>
<tr>
<th>ID</th>
<th>Site Name and Address</th>
<th>Database Type(s)</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Texaco Inc. Garage 700 N. San Jacinto</td>
<td>PST (ID 34200)</td>
<td>Build Alternatives</td>
</tr>
<tr>
<td>2</td>
<td>Harris County Jail 701 N. San Jacinto</td>
<td>PST (ID 49670)</td>
<td>Build Alternatives</td>
</tr>
<tr>
<td>2</td>
<td>Jeffy’s Mobil 2/ Exxon 66953, 3506 Elgin St.</td>
<td>PST (ID 26683) LPST (ID 111299) LPST (ID 115100)</td>
<td>Build Alternatives</td>
</tr>
<tr>
<td>3</td>
<td>PC Motor Cars 5503 Griggs Rd.</td>
<td>PST (ID 31673)</td>
<td>Build Alternatives</td>
</tr>
<tr>
<td>4</td>
<td>PC Motor Cars 5423 Griggs Rd.</td>
<td>PST (ID 31675)</td>
<td>Build Alternatives</td>
</tr>
<tr>
<td>5</td>
<td>Morrison Supply Co. 2420 Rusk</td>
<td>PST (ID 41263)</td>
<td>Build Alternatives</td>
</tr>
<tr>
<td>6</td>
<td>York Warehouse 1018 York St.</td>
<td>PST (ID 43639) LPST (ID 103218)</td>
<td>Build Alternatives</td>
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### Table 5-15. Regulatory Database Search Results: High Risk Sites (continued)

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<td>International Mailing Systems/Brandt &amp; Lawson Printing 815 Live Oak</td>
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<td>Blocks 97 and 129 Austin, McKinney, LaBranch, Rusk</td>
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<td>Vacant Warehouse 2601 Rusk St.</td>
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Table 5-15. Regulatory Database Search Results: High Risk Sites (continued)

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<td>68</td>
<td>UPRR Rail and Rail Yard</td>
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PST = Petroleum Storage Tanks Sites; VCP = Voluntary Cleanup Program Sites; LPST = Leaking Petroleum Storage Tank Sites
Source: Parsons Brinckerhoff and GeoSearch, 2006.

METRO will perform a formal phase 1 site assessment and, when recommended as a result of the phase 1, a phase 2 site assessments on every parcel of land on which construction will occur and which is listed in one of these regulatory databases. Unless the recommended action is the simple, straightforward removal of a petroleum storage tank, METRO will coordinate with the affected community adjacent to the site and with the Texas Commission of Environmental Quality (TCEQ) to determine a safe, effective means of removing the contamination from the site, or encapsulating the contamination, in a manner that will not pose a health risk to the community. METRO will perform the recommended actions in accordance with the recommendations of the State of Texas and, to the extent feasible, of the community. If remediation that eliminates all potentially significant impacts on the community cannot be found and implemented, supplemental environmental documentation will be required by FTA prior to the FEIS.

5.13 Safety and Security

This section discusses anticipated impacts of the project on emergency medical, police and fire and emergency services. In general, the No Build Alternative would have no effect on the delivery of safety related services.
5.13.1 Emergency Medical Services

The build alternatives would not adversely affect emergency medical services in the study area. None of the stations or guideways would block intersections or driveways, nor would there be physical restrictions on left turns into emergency facilities. Transit vehicle operators would be directed to yield intersection right of way to emergency vehicles.

5.13.2 Police Services

Implementation of the build alternatives would not result in a delay in delivery of police protection. METRO’s Department of Police and Traffic Management would provide primary police protection with additional assistance provided by the City of Houston Police Department. As an integral component of Houston TranStar, the regional transportation and emergency management center for the greater Houston area, METRO Police would continue to coordinate with state and local authorities on public safety and traffic within the corridor. Additionally, the fixed-guideway stations would be equipped with adequate lighting in waiting and transfer areas and parking lots. Emergency communication would be handled by METRO’s radio system, and all fixed-guideway vehicles would be equipped with two-way radios for normal dispatching messages and emergency communications (such as medical emergencies, accidents or crime). The incidence of crime occurring in and around transit properties would not be expected to change with the implementation of build alternatives.

5.13.3 Fire and Emergency Services

Implementation of the build alternatives is not expected to adversely affect the delivery of fire and emergency services in the study area. Emergencies occurring along the alignments would be handled by the nearest of the six fire stations located within the corridor. Fire Station 25 at 3902 Scott Street is the only station adjacent to the alignment. The fixed-guideway alignment would not affect access to and from this station.

5.14 Construction Impacts

Implementation of the build alternatives would require construction of new fixed-guideway transit facilities within the study area. Construction would be completed by a Facility Provider, who would be responsible for final design and construction. The Facility Provider will seek to construct the entire line on an accelerated schedule. Overall, construction may take about two years. However, the durations of construction in any one segment of the alignment may be shorter. Typical construction sequencing and methods are described in this section. However, it should be noted that variations and innovative approaches may be used to achieve schedule and budget goals.

The construction activity associated with the project would inconvenience or disturb the residents, businesses, and business customers adjacent to the construction areas. The construction impacts would be of a relatively short duration, lasting only until construction is completed. This section describes the construction impacts that
may occur during the construction of the project. Where potential negative impacts are identified, potential measures to lessen the impact are also discussed.

All construction would be conducted in accordance with plans and specifications prepared by a Facility Provider engaged by METRO. The providers would prepare contract documents (plans and specifications) to guide the construction work. The specifics of how the project is constructed, commonly called the facility provider’s “means and methods,” would be left to the discretion of the facility providers, but must be within the framework of the project design as specified in the construction contract documents. Those documents, and more specifically the special conditions portion of the contract specifications, would identify any specific restrictions on the facility providers’ means and methods necessary to assure compliance with the requirements of the FEIS.

5.14.1 Construction Methods

This section provides an overview of typical methods, sequencing, and equipment that would be used in construction of the build alternatives. Every effort would be made to protect the safety and welfare of the public and to minimize the effects of construction on the daily lives of the public. Implementation of the fixed guideway would involve a considerable amount of conventional at-grade construction, similar to typical roadway and utility work currently occurring in the Houston region. More specifically, these construction activities would resemble those employed during the construction of the METRORail Red Line.

All of the visible construction of the build alternatives would occur at street grade. Traffic and pedestrian control and coordination of construction would follow procedures identified in the construction contract documents. Those procedures would include construction requirements that are imposed on the project by the City of Houston, TxDOT, other Texas state regulatory agencies, and federal regulatory agencies.

5.14.1.1 Construction Sequencing

LRT and BRT Convertible

The typical sequence of construction for projects similar to the LRT and BRT Convertible Alternatives would include:

- Where necessary, purchase of new right of way and the relocation of existing businesses, residential, and other uses in accordance with federal regulations.
- Utilities that unavoidably conflict with the project’s infrastructure would be relocated to non-conflicting locations.
- The guideway (i.e., the area that would be occupied by the LRT tracks or BRT lanes, poles, overhead wires, and station platforms) would be cleared of existing infrastructure and landscaping. In cases where the guideway would be constructed within the travel lanes of streets, this would include excavation and removal of existing pavement and underlying materials. Where existing traffic signals and street lighting must be removed, they would be replaced with temporary lights.
• Construction of the below grade portions of the LRT and BRT Convertible infrastructure. This may include track bed, concrete-encased electrical conduits that would be used for traction power cables and communications cables, and the foundations for poles and stations.

• The tracks would be constructed, commencing with the placement of coarse aggregate stone to provide a solid base and the placement and welding of rails. The rails would be wrapped in a rubber “boot” to provide electrical and vibration isolation and the rail and boot assembly would be fastened to steel crossties. This “skeleton” track next would be carefully aligned to proper position prior to the placement of encasing concrete.

• For LRT, poles would be erected on the previously installed foundations, and overhead wiring installed. Cables would be pulled through the previously installed duct banks and connected to the overhead wiring where required. Permanent street lighting and traffic signal installations would be made at this time.

• Station platforms would be built and canopies erected at those locations that receive them.

• Landscaping elements would be installed, including topsoil, grass, and trees.

**BRT**

The general sequence of construction for a project similar to the BRT Alternative would include:

• Where necessary, purchase of new right of way and the relocation of existing businesses, residential, and other uses in accordance with federal regulations.

• Utilities that unavoidably conflict with the BRT infrastructure would be relocated to non-conflicting locations.

• The guideway (i.e., the area that would be occupied by the BRT lanes and station platforms) would be cleared of existing infrastructure and landscaping. In cases where the guideway would be constructed within the travel lanes of streets, this would include excavation and removal of existing pavement and underlying materials. Where existing traffic signals and street lighting must be removed, they would be replaced with temporary lights.

• Construction of the below grade portions which would be the foundations for the stations.

• The guideway would be constructed.

• Station platforms would be built and canopies erected at those locations that receive them.

• Landscaping elements would be installed, including topsoil, grass, and trees.

**Utility Reconstruction and Relocation Work**

The most extensive construction activities would be those associated with utility relocation and construction. Because of the urban character of the area surrounding the fixed guideway, numerous utility lines presently occupy the streets in and along which
the fixed-guideway components would be built. These include not only overhead electric and communications poles and lines, but also below grade lines such as water, sewers, and fiber optic communications. In most cases, utility reconstruction would occur within the width of the streets occupied by the project.

**Fixed-Guideway Construction**

Once utility relocation work was complete, construction activity would be largely limited to the guideway with some ancillary activities in adjacent roadway lanes. At various times, the construction could require temporary closures of intersecting streets.

### 5.14.2 Access and Circulation

#### 5.14.2.1 Probable Effects

Potential access and circulation impacts from construction activity may result from temporary lane closures or the narrowing of lanes, causing traffic to detour around or slow down near a construction site. Slow moving construction vehicles on the roadway near a construction site may also affect levels of service on the roadway. Construction of transit stations and associated facilities also could affect local roads and modify traffic patterns, but these impacts would be temporary and short-term.

Where the fixed guideway would be constructed in existing traffic lanes, the impacts on vehicular traffic would be more severe than where the fixed guideway would be on new location, since the facility provider would not be able to keep all lanes open throughout the construction process. It also may be necessary to either close or encroach into adjoining lanes during the work for secondary construction activities such as temporary storage of materials and equipment being used in the construction and incidental construction work such as the reconstruction of curbs and matching street pavement, plus the provision of a safety buffer zone between construction workers and moving traffic only a few feet away. In addition to traffic movement, parking and loading areas would be a concern.

#### 5.14.2.2 Mitigation Measures

Maintenance of traffic and sequence of construction would be planned and scheduled by the Facility Provider. These plans would be updated as warranted throughout the project. Access to all businesses and residences would be maintained.

### 5.14.3 Existing Businesses and Residences

#### 5.14.3.1 Probable Effects

During the construction of the proposed project, which can have a duration of about two years (i.e., perhaps less in some segments depending upon the construction approach) for surface guideway construction, unavoidable short-term, local restrictions such as limits on parking and loading areas, blockages of driveways, and sidewalk and/or lane closures or constrictions could occur. These restrictions would affect local businesses and other users adjacent to the construction area. Economic effects may occur when existing businesses along the construction route experience short-term disruptions of
commercial activity as a result of altered access (or the perception of an impediment) and the diversion of vehicular or pedestrian traffic when lanes and/or sidewalks are closed. Some businesses near the project may suffer little or no adverse impacts while others may experience a noticeable decline in sales or an increase in costs and/or decrease in efficiency. The extent of the impacts on the individual businesses is related to the proximity of the construction activity to the business, the length of time that the construction occurs in that location, and the type of business. Small retail businesses that depend upon walk-up customers and impulse buying, such as clothing stores, card and gift shops, restaurants, and convenience markets, may be more susceptible to disruptions in trade as a result of customers being discouraged by construction activity.

5.14.3.2 Mitigation Measures

The facility provider would be required to maintain continuous access to active businesses and other buildings near the construction activity. The construction facility provider would be required to orchestrate his activities so that access or utility disruptions are anticipated, scheduled in advance, and as brief as reasonably possible. In addition, advanced notification of such disruptions would be provided to affected property owners and businesses. Deliveries of construction materials would be controlled to minimize disruptions to surrounding areas.

Mitigation for adverse impacts during construction would also include coordinating with business owners and managers during construction. A public information and notification program would advise area residents of traffic detours.

5.14.4 Utilities

5.14.4.1 Probable Effects

Utility pipes, conduits, cables, lines, and poles would be impacted by the fixed guideway. Construction of the guideway, stations, and other facilities would require relocating, abandoning, or otherwise avoiding some of this infrastructure.

Some of the impacts may potentially be substantial because of added costs, disruption of service, or temporary loss of access. These include relocation of utility poles supporting overhead lines and street lights; relocation of underground utilities from the track zone/BRT lanes, station areas, and the LRT maintenance facility site; and inspection, repairs, and encasement of underground utilities at track crossings. In cases where utilities that occupy the right of way pose a safety hazard or conflict with construction activities, lines may be relocated before construction.

The approximate locations of subsurface and overhead utility lines would be identified as part of preliminary engineering. Utilities include facilities belonging to government agencies, public utility corporations, and privately owned companies for the provision of sewer, water, storm drain, gas, electrical, telephone, telegraph, cable television, street lighting, pipelines, alarm systems, and parking meters. The relationship between the fixed guideway alignment and the utility lines would be identified.

Discussions would be held with affected utility operators in order to identify how best to relocate affected utilities and maintain them in place during construction.
Relocation methods and timing would take into account the need to minimize disruption in utility service.

5.14.4.2 Mitigation Measures

Impacts because of temporary utility service interruptions during construction would be minimized by carefully scheduling the occasional interruptions and notifying affected properties prior to service interruptions.

5.14.5 Air Quality

5.14.5.1 Probable Effects

Construction-related impacts of the build alternatives would be limited to short-term increased fugitive dust and mobile source emissions from construction sites and mobile source emissions from trucks and construction equipment. Some general air quality effects are described below.

Fugitive Dust Emissions

Fugitive dust is airborne particulate matter, generally of a relatively large particulate size. Construction-related fugitive dust would be generated by haul trucks, concrete trucks, delivery trucks, and other earth moving vehicles operating around the construction sites. This would be due primarily to particulate matter re-suspended (“kicked up”) by vehicle movement over paved and unpaved roads, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks.

Generally, the distance that particles drift from their source depends on their size, emission height, and wind speed. Small particles (30 to 100 micron range) can travel several hundred feet before settling to the ground, depending on wind speed. Most fugitive dust, however, is made up of relatively large particles (i.e., particles greater than 100 microns in diameter). These particles are responsible for the reduced visibility often associated with this type of construction. Given their relatively large size, these particles tend to settle within 20 to 30 feet of their source.

Mobile Source Emissions

Since emissions of CO from motor vehicles increase with decreasing vehicle speed, disruption of traffic during construction (such as the temporary reduction of roadway capacity and the increased queue lengths) could result in short-term elevated concentrations of CO.

5.14.5.2 Mitigation Measures

In order to minimize the amount of construction dust generated, the following preventative and mitigation measures could be considered by the Facility Provider to minimize potential particulate emissions:
Site Preparation

- Minimize land disturbance;
- Use watering trucks to minimize dust;
- Cover trucks when hauling dirt;
- Stabilize the surface of dirt piles if not removed immediately;
- Use windbreaks to prevent any accidental dust pollution; and
- Limit vehicular paths and stabilize these temporary roads.

Construction

- Cover trucks when transferring materials;
- Use dust suppressants on traveled paths which are not paved;
- Minimize unnecessary vehicular and machinery activities; and
- Minimize dirt track-out by washing or cleaning trucks before leaving the construction site.

Post Construction

- Revegetate any disturbed land not used;
- Remove unused material;
- Remove dirt piles; and
- Revegetate all vehicular paths created during construction to avoid future off-road vehicular activities.

5.14.6 Noise and Vibration

Project construction activities would have short-term noise and vibration effects on receptors in the immediate vicinity of the construction site. Effects on community noise and vibration levels during construction include: noise and vibration from construction equipment and noise from construction vehicles and delivery vehicles traveling to and from the site.

The level of effect of these noise and vibration sources depends upon the noise characteristics of the equipment and activities (e.g., pile driving) involved, the construction schedule, and the distance from sensitive receptors. Noise and vibration levels at a given receptor location are dependent on the type and number of pieces of construction equipment being operated, as well as the distance from the construction site.

Table 5-16 identifies typical noise levels and Table 5-17 identifies typical vibration levels of construction equipment expected to be employed during the construction phase. Noise and vibration levels from construction activities can vary widely depending on the phase of construction, which includes land clearing and
Table 5-16. Construction Equipment Noise Emission Levels

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Typical Noise Level (dBA) 50 ft from Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Compressor</td>
<td>81</td>
</tr>
<tr>
<td>Backhoe</td>
<td>80</td>
</tr>
<tr>
<td>Ballast Equalizer</td>
<td>82</td>
</tr>
<tr>
<td>Ballast Tamper</td>
<td>83</td>
</tr>
<tr>
<td>Compactor</td>
<td>82</td>
</tr>
<tr>
<td>Concrete Mixer</td>
<td>85</td>
</tr>
<tr>
<td>Concrete Pump</td>
<td>82</td>
</tr>
<tr>
<td>Concrete Vibrator</td>
<td>76</td>
</tr>
<tr>
<td>Crane, Derrick</td>
<td>88</td>
</tr>
<tr>
<td>Crane, Mobile</td>
<td>83</td>
</tr>
<tr>
<td>Dozer</td>
<td>85</td>
</tr>
<tr>
<td>Generator</td>
<td>81</td>
</tr>
<tr>
<td>Grader</td>
<td>85</td>
</tr>
<tr>
<td>Impact Wrench</td>
<td>85</td>
</tr>
<tr>
<td>Jack Hammer</td>
<td>88</td>
</tr>
<tr>
<td>Loader</td>
<td>85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Typical Noise Level (dBA) 50 ft from Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paver</td>
<td>89</td>
</tr>
<tr>
<td>Pile Driver (Impact)</td>
<td>101</td>
</tr>
<tr>
<td>Sonic</td>
<td>96</td>
</tr>
<tr>
<td>Pneumatic Tool</td>
<td>85</td>
</tr>
<tr>
<td>Pump</td>
<td>76</td>
</tr>
<tr>
<td>Rail Saw</td>
<td>90</td>
</tr>
<tr>
<td>Rock Drill</td>
<td>98</td>
</tr>
<tr>
<td>Roller</td>
<td>74</td>
</tr>
<tr>
<td>Saw</td>
<td>76</td>
</tr>
<tr>
<td>Scarifier</td>
<td>83</td>
</tr>
<tr>
<td>Scraper</td>
<td>89</td>
</tr>
<tr>
<td>Shovel</td>
<td>82</td>
</tr>
<tr>
<td>Spike Driver</td>
<td>77</td>
</tr>
<tr>
<td>Tie Cutter</td>
<td>84</td>
</tr>
<tr>
<td>Tie Handler</td>
<td>80</td>
</tr>
<tr>
<td>Tie Inserter</td>
<td>85</td>
</tr>
<tr>
<td>Truck</td>
<td>88</td>
</tr>
</tbody>
</table>


Table 5-17. Construction Equipment Vibration Levels

<table>
<thead>
<tr>
<th>Equipment</th>
<th>PPV&lt;sup&gt;a&lt;/sup&gt; at 25 ft (in/sec)</th>
<th>Approximate L&lt;sub&gt;V&lt;/sub&gt; at 25 ft&lt;sup&gt;b&lt;/sup&gt; (VdB re 10&lt;sup&gt;-6&lt;/sup&gt; in/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pile Driver (impact, upper range)</td>
<td>1.518</td>
<td>112</td>
</tr>
<tr>
<td>Pile Driver (impact, typical)</td>
<td>0.644</td>
<td>104</td>
</tr>
<tr>
<td>Pile Driver (sonic, upper range)</td>
<td>0.734</td>
<td>105</td>
</tr>
<tr>
<td>Pile Driver (sonic, typical)</td>
<td>0.170</td>
<td>93</td>
</tr>
<tr>
<td>Clam Shovel Drop (slurry wall)</td>
<td>0.202</td>
<td>94</td>
</tr>
<tr>
<td>Large Bulldozer</td>
<td>0.089</td>
<td>87</td>
</tr>
<tr>
<td>Caisson Drilling</td>
<td>0.089</td>
<td>87</td>
</tr>
<tr>
<td>Loaded Trucks</td>
<td>0.076</td>
<td>86</td>
</tr>
<tr>
<td>Jackhammer</td>
<td>0.035</td>
<td>79</td>
</tr>
<tr>
<td>Small Bulldozer</td>
<td>0.003</td>
<td>58</td>
</tr>
</tbody>
</table>

<sup>a</sup> Peak Particle Velocity.
<sup>b</sup> RMS velocity in decibels (VdB) re 1 microinch per second.


excavation, construction of new tracks, and construction of retaining walls. At a typical receptor, the noise levels would be highest during the early phases of construction, when excavation and heavy daily truck traffic would occur. These early phase of construction would be relatively short (three to six months).
Average noise levels for typical construction equipment measured at 50 feet from the construction site range from 76 dBA for pumps to 89 dBA for pavers and scrapers to 101 dBA for impact pile drivers. The total hourly energy average dBA noise level, $L_{eq}$ (1 hour), at a distance of 50 feet from the construction site boundary, usually is on the order of 85 to 90 dBA. Noise levels at receptors located at known distances from the construction site boundary can be estimated by assuming a 6-dBA drop-off for every doubling of distance from the site boundary. The construction equipment noise emission levels in Table 5-16 are representative of a distance of 50 feet from the source.

5.14.6.1 Probable Effects

A quantitative assessment of noise impacts from construction activities involves computation of noise at each noise-sensitive receiver and comparing with noise impact criteria developed by FTA. The noise is computed from scenarios of equipment operations developed during final design. At the DEIS stage, however, a qualitative description of probable noise and vibration effects is provided for informational purposes.

Noise impacts during the construction phase would be temporary and closely related to the various types and phases of construction required for the alternatives. In addition, multiple portions of the construction may be taking place simultaneously. Careful coordination of the activities would help to minimize the potential for noise impacts.

Noise impacts would include noise from equipment and trucks as well as noise resulting from construction. Construction noise and hours of construction would be limited by the City of Houston’s ordinances. Increases in noise levels from operation of delivery trucks and other construction vehicles would not be significant. Small increases in noise levels are expected near a few defined truck routes and in the immediate vicinity of the project site.

Vibration impacts during the construction of tracks would be temporary and closely related to the type and phase of construction involved. Activities associated with construction of new tracks are high vibration generators.

Construction noise and vibration impacts at the sensitive sites would be dependent on the proposed construction technique (pile driving, slurry wall, etc.), types, and number of equipment that would be used on the site, noise associated with construction related traffic, duration of construction activity, time period of construction (daytime or nighttime), and several other factors. Use of alternative construction methods could reduce construction noise and vibration impacts at specific areas of concern, if necessary.

5.14.6.2 Noise Mitigation Measures

Construction noise is regulated by local ordinances and by EPA and General Service Administration (GSA) emission standards for some construction equipment. The FTA guidelines contain construction noise limits that have been established to protect sensitive receptors from excessive construction noise levels. The recommended FTA limits at residential land uses is an 8-hour $L_{eq}$ of 80 dBA during the daytime and an 8-hour $L_{eq}$ of 70 dBA at the nighttime. The limits are higher for commercial and industrial land uses. The local and federal requirements mandate
that certain classifications of construction equipment and motor vehicles meet specified noise emission standards and that construction material be handled and transported in such a manner as not to create unnecessary noise.

5.14.6.3 Vibration Mitigation Measures

Construction vibration impacts are assessed by comparing peak vibration levels against the FTA criteria. A detailed vibration assessment incorporating the likely construction scenarios will be performed during final design.

The construction contract specifications could require the Facility Provider to:

- Limit the hours of activities;
- Use pre-bored piles, if technically feasible for the soils involved;
- Provide specific truck routes to each construction site to avoid or minimize the use of residential streets; and
- Provide a careful maintenance and lubrication program for heavy equipment.

5.14.7 Visual

5.14.7.1 Probable Effects

Short-term visual impacts are expected to occur as a result of construction activities and equipment in any of the options and would vary in intensity, duration, and scope.

The type of impacts would include:

- Presence of equipment, and materials;
- Airborne dust and possible mud on cars, outside furniture, and windows; and
- Removal of or damage to vegetation (e.g., trees, shrubs, grass).

These are temporary conditions and should pose no substantial problem in the long term.

5.14.7.2 Mitigation Measures

To reduce the potential for visual impacts, construction activities would be contained within as minimal an area as practical.

Throughout the length of the project, some existing streetscape and landscaping features that are within the existing or proposed right of way may have to be removed. Because the duration of construction, existing trees, shrubbery and other vegetation cannot be stored and restored upon completion of construction. Instead, new landscaping features would be provided near the end of construction. Some streetscape elements could be removed, rehabilitated, if required, and restored to their original or nearby locations.
5.14.8 Excavations, Fill Material, Debris, and Spoil

5.14.8.1 Probable Effects

The preliminary contamination study indicated a number of contamination sites adjacent to the proposed alignments. Typically contamination cleanup would be completed before the construction begins; however when additional contamination is encountered during construction, project impacts would include delay in construction activity and associated financial consequences from delays.

5.14.8.2 Mitigation Measures

During preliminary engineering and final design, detailed investigations would be conducted to provide a basis for determining specific construction health and safety specifications, and appropriate contaminated soil management procedures for construction of proposed project. The design and preparation of a Remedial Action Work Plan would be coordinated with and approved by the TCEQ and local regulatory authorities.

The facility provider would be required to develop an Emergency Response Plan as part of the overall Health and Safety Plan for the project. The Plan would establish response procedures to be implemented should hazardous materials conditions be encountered or should a spill of hazardous materials occur during construction. The design and preparation of the Emergency Response Plan would be coordinated with TCEQ and other appropriate agencies (e.g., fire, police, and rescue). Upon the discovery of potentially hazardous material(s), construction activities would be stopped and the substance identified. If the presence of hazardous material(s) is verified, TCEQ would be contacted, and an appropriate response would be implemented. Any handling, treatment, and disposal of hazardous materials would occur in full compliance with all federal, state, and local requirements.

The disposal of soil is regulated at the federal and state level by the Federal Resource Conservation and Recovery Act (RCRA), based on the Hazardous and Solid Waste Amendments (HSWA). Sampling of soil slated for disposal would be conducted in accordance with the applicable federal and state protocols, to determine the proper location and method of off-site disposal. For known contaminated soils, the facility provider would be required to develop a Hazardous Materials Management Plan for construction activities that would be prepared by a Certified Hazardous Materials Specialist. This plan would address the proper methods for excavation, handling and disposal of contaminated materials, as well as the storage, handling, and use of hazardous materials required during construction.

For any contaminated groundwater identified, the following options are available for the handling of discharge water, with the approval of the TCEQ and local authorities:

- Containment and off-site treatment and disposal at a permitted facility;
- Discharge to a surface water body, with or without pretreatment under a National Pollutant Discharge Elimination System Permit (NPDES); and
• The applicability of these options would be determined after a more thorough investigation of specific sites.

5.14.9 Water Quality and Runoff

5.14.9.1 Permit Requirements Related to Water Quality

Effective March 5, 2003, the TCEQ issued a new Texas Pollutant Discharge Elimination System (TPDES) general permit for storm water discharges from construction activities (General Permit No. TXR150000) under the terms of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code (TCEQ, 2003).

The state permit replaces the federal construction general storm water permit and includes permit requirements for both small and large construction sites. Operators of construction sites that will disturb five or more acres or that are part of a common plan of development or sale that will disturb five or more acres (large construction sites) must submit a TCEQ Notice of Intent (NOI) form to the TCEQ. Operators of construction sites that will disturb one or more acres but less than five acres or that are part of a common plan of development or sale that will disturb one or more acres but less than five acres (small construction sites) must post a Construction Site Notice (CSN). Copies of NOIs and CSNs must also be submitted to the operator of the Municipal Separate Storm Sewer System (MS4) (Storm Water Management Joint Task Force, 2003) receiving the storm water discharges. For projects discharging to the city, county, HCFCDC or TxDOT MS4, the NOIs and CSNs should be sent to the appropriate agency's permitting office. For projects discharging to the County or HCFCDC MS4, the project must be reviewed by the Permit Office of the Harris County Public Infrastructure Department, Engineering Division.

Section 404

Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands, and other special aquatic sites. CWA Section 404(b)(1) (40 CFR 230) presents the guidelines, established by US EPA, that constitute the substantive environmental criteria used in evaluating activities regulated under Section 404 of the Clean Water Act. Discharges of dredge and fill material into waters of the US can be authorized by individual or general permits under Section 404. Disturbance from dredge and fill of up to one half acre at any single water or the US crossing may potentially be covered by Section 404 Nationwide Permit (NWP) 14 (Linear Transportation Projects) if it meets the general conditions of the permit. NWP 14 requires that a preconstruction notification (PCN) be sent to the US Army Corps of Engineers (USACE) if the project results in the permanent loss of more than one-tenth of an acre of waters of the U.S., or any amount of wetlands or other special aquatic sites. Disturbance of any special aquatic site, wetland, or other water of the US in excess of one-half acre may require an Individual Section 404 Permit.

No wetlands or other waters of the US would be impacted by the build alternatives; therefore, a Section 404 permit would not be required and further coordination with the USACE would not be necessary.
Section 401 and Coastal Permits

General Condition nine of the Nationwide Permit Program requires applicants using NWP 14 to comply with Section 401 of the Clean Water Act. Compliance with Section 401 requires the use of best management practices (BMPs) to manage water quality on construction sites. In Texas, the TCEQ enforces state water quality standards, and conducts 401 certification reviews of Section 404 permit applications.

The TCEQ does not issue separate permits for coastal projects in the State of Texas. Instead, applications for projects that require Section 404 permits are subject to review for consistency with the Texas Coastal Management Plan (TCMP). In Texas, the Railroad Commission determines if a proposed activity is consistent with the TCMP.

The proposed project will not require a Section 404 permit; therefore, a Section 401 Water Quality Certification and a coastal permit will not be required.

5.14.9.2 Probable Effects

Construction impacts to water quality could vary from moderate to none. Qualitative short-term construction impacts to water quality by the proposed improvements are listed below. None of the impacts listed would be permanent and they would be kept to a minimum using BMPs, consistent with state standards.

Direct effects on water quality would include the impacts caused during the construction of the project or as a result of project implementation. Pollution from existing contaminated facilities and spills or discharges during construction are the primary concerns regarding this issue. However, BMPs and proper planning should prevent such occurrences. Water quality degradation as a result of stormwater runoff is expected to be minimal as stormwater management rules and regulations are strict and compensation for this type of impact would be provided.

5.14.9.3 Mitigation Measures

BMPs would be implemented to satisfy permit requirements and to minimize secondary effects of turbidity, greases, and oils. Effects on water quality resulting from sedimentation are proposed for the construction areas to:

- Limit the amount of exposed soil area and the length of time exposed;
- Mechanically retard runoff erosion and sediment in runoff water; and
- Provide effective accommodations for increased runoff caused by changed soil and surface conditions during construction.

The removal of structures and debris would be in accordance with local and state regulatory agencies permitting this project. The facility providers would be required to store fuels and other petroleum products in leakproof containers at secured sites. The facility providers would have equipment available to initiate collection and containment of a fuel spill that may occur during construction. Any spill over 25 gallons would be reported to the TCEQ in accordance with established procedures. Spoil sites for disposal of excavated materials would not be located in or adjacent to
any wetlands. Spoil sites would be self-contained upland sites with erosion and runoff controls. Stockpiling would be temporary and should pose no substantial long-term adverse effects.

5.14.10 Historic Resources

Construction activities have the potential to generate short-term visual and noise impacts to historic resources. In addition, subsurface archeological resources may be encountered during construction.

5.14.10.1 Mitigation Measures

Construction activities should minimize impacts to historic resources. Potential mitigation measures could include a worker education program and work stoppage and notification of SHPO if archeological resources are encountered.

5.14.11 Construction Staging Areas

5.14.11.1 Probable Effects

Staging areas would be required for the storage of equipment and materials that would be used for the construction of the build alternatives. The location and size of these areas will be defined as engineering progresses. Preliminary sites for the staging areas are the existing METRO properties located at the proposed inter-modal facility, which is to the north of the study area, and the Southeast Transit Center.

Construction equipment has the potential to leak fluids and spillage is a potential during the fueling process. Additionally, construction equipment and materials have the potential to release chemicals when exposed to weather. The effect on the staging area ground may result in the disturbance of soil and could kill or prevent the growth of groundcover, which causes the soil to be susceptible to wind and water erosion.

5.14.11.2 Mitigation Measures

All equipment and materials would be stored at staging areas in conformance with applicable local regulations. Non-project materials and equipment would not be allowed to use the staging area as a storage site. Materials would not be stored on private property without written authorization from the property owner.

A Storm Water Pollution Prevention Plan will be developed that would incorporate the best management practices to prevent storm water runoff from construction equipment and materials. Finally, after the construction is complete, vegetative features would be restored to prevent air and water erosion.

5.15 Secondary and Cumulative Impacts

This secondary and cumulative effects assessment was conducted to comply with NEPA and the Council on Environmental Quality (CEQ) guidelines. The CEQ guidelines for implementing NEPA define both secondary and cumulative impacts:
Secondary, or indirect effects are defined as “effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water or other natural systems, including ecosystems (40 CFR 1508.8(b)).”

Cumulative effects are defined as the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7).” These impacts are less defined than secondary effects. The cumulative effects of an action may be undetectable when viewed in the individual context of direct and even secondary impacts, but nonetheless can add to other disturbances and eventually lead to a measurable environmental change.

The build alternatives have the potential for producing secondary and cumulative effects. Secondary effects would most likely occur in the areas around the fixed-guideway stations because of the improved access provided by the fixed-guideway service and the increased pedestrian traffic in and around the station areas. Cumulative effects could occur through the combination of the project’s direct and secondary impacts, combined with other development in the corridor that is not directly dependent on the project.

5.15.1 Methodology

This assessment of secondary and cumulative effects has been conducted using guidance from the Position Paper on Secondary and Cumulative Impact Assessment in the Highway Project Development Process (FHWA, April 1992). The FTA has no specific guidance on this issue. In addition to the FHWA guidance, a number of the state departments of transportation have produced guidance on secondary and cumulative effect assessments, which have also been consulted.

For secondary effects, the assessment focuses on changes in both land use and the level of development that could occur as a result of the build alternatives. The cumulative effects assessment also identifies other development that is expected to occur regardless of whether the build alternatives are constructed. Impacts to resources from the secondary effects of the build alternatives and other actions, including past, present, and future, have been identified and added to the direct impacts of the project to arrive at the total cumulative impact.

No secondary and cumulative impacts on water resources, water quality, wetlands, vegetation, wildlife habitat, or endangered and threatened species are expected to occur under the build alternatives. Areas where redevelopment would most likely occur are already developed or disturbed; therefore, no substantial changes in stormwater runoff are expected that could degrade surface water or groundwater quality. Consequently, no creeks, rivers, lakes, springs, bays, estuaries, or other aquatic habitats would be expected to incur secondary or cumulative impacts from the build alternatives.
Specifically, because of the urbanized setting of the study area, minimal secondary and cumulative impacts to ecosystems are expected to occur as a result of the build alternatives. The few sparsely wooded lots that exist within the study area provide marginal wildlife habitat for common species adapted to urban environments. The only listed threatened or endangered plant species that may occur in Harris County, the Texas prairie dawn, has not been sighted or documented in the field survey of the project corridor. Furthermore, because of the lack of suitable habitat and federally designated critical habitat within the study area, the build alternatives would have no secondary or cumulative effect on this plant. Additionally, because of the urbanized setting, lack of appropriate foraging and nesting habitat, and lack of woodlands, grasslands, and other native plant communities in the study area, no secondary or cumulative effects on threatened or endangered wildlife species from the build alternatives are anticipated.

A total of 65 hazardous materials sites of concern were identified in the vicinity of the proposed build alternatives with the base alignment option and 52 sites were identified in the vicinity of the build alternatives with the Wheeler-MLK alignment option. Potential redevelopment near stations occurring as a secondary or cumulative effect of the build alternatives could result in encountering contaminated soils or groundwater during the construction of those prospective redevelopment projects. It would be the responsibility of the parties involved in those projects to address hazardous materials impacts resulting directly from those actions or as otherwise prescribed by the applicable federal or state laws.

Secondary development at the station level has been analyzed for each of the proposed stations along the fixed guideway under the Build Alternative alignment options. The analysis distinguishes between development which would have occurred in the station areas because of proximity to downtown or major educational institutions and development which can be attributed to the construction of the build alternatives and the individual stations.

The H-GAC has recently released preliminary 2035 population and employment projections based on the assumptions contained in the RTP. These projections are available at a small scale using 1,000 foot by 1,000 foot grid cells covering the Houston region making them an ideal tool to use as an alternative method of examining the future development potential for each station area. Comparing the base population and employment with the projections for 2025 and 2035 for the grid cells covering each station area provides a measure of the development anticipated in these areas. The RTP includes a new fixed guideway alignment in this general corridor. The RTP does not include a specific alignment or station locations for the fixed guideway alignment, therefore, the 2035 H-GAC projections do not factor this in specifically for the grid cells around the stations analyzed in this section.

Each station area is discussed in detail within this section. The size of the area of analysis for each station area is based on a quarter-mile radius, with the exception of the Palm Center Station where a park-and-ride lot is proposed. In this case, the area of analysis is a half-mile radius. The proximity of the three stations within the downtown area allows them to be analyzed as a group.
5.15.2 Secondary Effects

The No Build Alternative would not impact regional land use and development. The No Build Alternative would generally result in a continuation of current development patterns and trends. Land use patterns that exist today in several sections of the corridor, especially those land uses not in proximity to downtown or within a TIRZ, would be slow to change.

Much of the study area is characterized by a tight grid system of streets, and in some locations it is characterized by older, established neighborhoods where many people are accustomed to walking and using transit, either from personal preference or from necessity. Because the No Build Alternative represents a continuation of past trends, it runs the risk of continued degradation of the walking/transit environment over the long term as automobile-oriented land uses increase in number.

The build alternatives are not likely to generate new regional growth, nor is it likely that it would substantially change land use and development patterns at a regional scale. At the corridor level, the build alternatives combined with supportive public policies, plans, and favorable real estate market conditions, could attract transit-supportive development to the corridor, including employment opportunities, higher-density residential development, and new services and amenities. The pattern of land development could be affected through a greater concentration and intensity of land use activities along the proposed fixed guideway transit. The land use impacts would be most notable close to stations. Experience gained from the existing METRORail Red Line, such as in downtown Houston and in the Midtown area, suggests that developers in the Houston area are interested in creating transit- and pedestrian-oriented mixed-use developments, and that these types of developments can be very successful. The experience in other cities with high capacity fixed guideway transit also supports this idea. As stated above, however, policies supportive of the desired type of development must usually be in place.

Even with no change in public policies, some changes in land use could occur as a result of the project. As previously stated, the downtown and some outlying neighborhoods are organized in a tight grid system of streets. The blocks within the grid of the downtown and in older, established neighborhoods, such as the Third Ward neighborhoods, are generally densely developed. The fixed-guideway stations could attract transit-supportive land uses to these areas. Such uses could be developed in existing storefronts or in new buildings on vacant lots close to the stations. The build alternatives could enhance the attractiveness of the corridor for living or conducting business by improving transit accessibility for people desiring to come to destinations in the project area and for area residents or others bound for the downtown or other locations.

Employment opportunities may increase in the study area, and these opportunities would be enhanced by the build alternatives. The proposed project could provide new job opportunities and new access to local employment opportunities for all communities within or near the project corridor. Improved transportation options would increase access to existing and any new jobs in the corridor. Short-term construction-
related jobs created by the project and long-term employment opportunities created by the improved access would be a benefit to the entire community.

Under the build alternatives, the indirect impacts on neighborhoods would generally be positive. Station areas could become centers of neighborhood activity and investment, and therefore could serve to boost neighborhood social cohesion and improve economic conditions for the commercial buildings within the corridor and in particular, those adjacent to stations. In downtown, the METRORail Red Line along Main Street has proven to be a unifying physical element along the corridor. The same could hold true for the build alternatives. The proposed line could encourage additional growth of existing street-level retail uses in downtown. This new accessibility could also act as a catalyst for the utilization of underused space in commercial buildings.

Business displacements would likely be minimal and would not undermine the economic base of these communities. Commercial properties near stations have reasonable potential to increase in value – a possible secondary impact.

A low potential exists for the build alternatives to cause secondary adverse impacts to historic properties. This could occur through redevelopment at or near station areas that are adjacent to historic properties/districts. Such development could introduce new buildings of a scale and appearance that is out of character with the historic properties, or could result in the demolition of historic buildings to accommodate the new development. On the other hand, underutilized historic buildings in the corridor could be indirectly impacted by the project through an increase in desirability of these resources because of their proximity to the project. This could be considered a beneficial secondary impact if the development is undertaken with the goal of complimenting the historic setting of the resources/district.

### 5.15.2.1 Downtown Stations

While the construction of the fixed-guideway system in downtown Houston under the build alternatives can be expected to have some effect on business locations because of the change in arrival and departure patterns of transit riders, it is unlikely to significantly alter development plans within the downtown area. Land prices, access to existing business activities or public facilities and the presence of vacant land or underused structures will continue to be the predominant development factors in this area.

The 2025 and 2035 H-GAC projections for the proposed Smith and Main Stations show very little change in population and employment, reflecting the highly developed conditions found in the vicinity of these stations. The projections for the proposed Crawford Station, located in a part of the downtown area with abundant vacant land, reflect the availability of this land, and show growth of population and employment far in excess of what might be attributed to access to the fixed-guideway system.

### 5.15.2.2 Dowling Station

Proximity to the downtown area and recent major improvements such as the expansion of the George R. Brown Convention Center and the construction of Minute
Maid Park baseball stadium has increased development activity in the area of the proposed Dowling Station. Residences have been introduced into the station area in recent years with the construction of luxury rental and condominium buildings. This has been a major change in an area previously characterized as industrial. The conversion of warehouse and industrial buildings in this area has also occurred.

Under the No Build Alternative the trend for conversion of industrial buildings into condominiums or rental apartments should continue. The construction of new condominiums and rental apartments should also continue, especially on the abundant vacant land in the station area.

Convenient and faster transit access to downtown and the METRORail Red Line provided by the build alternatives could accelerate this trend. Commercial development could also be expected to increase as a result of the station. The fixed-guideway line would provide improved access for mid-day trips. Services for both downtown workers and the new residential population could also be expected to locate near the station to take advantage of the access it provides to downtown. In many cases the trend for adaptive reuse of obsolete industrial, warehouse, and office structures as residences will help to preserve many vacant structures in the station area, which otherwise would be allowed to continue to deteriorate.

Projections for 2025 and 2035 by H-GAC show rapid growth in population and employment in this station area throughout the 30-year period. The most likely secondary impact of this station location would be the possible acceleration of the already anticipated growth.

5.15.2.3 Leland Station

This station area is a mix of housing and older industrial facilities. Much of the housing is in Third Ward North, an area identified as eligible for inclusion in the NRHP. These structures date from the first quarter of the twentieth century, and are generally wood frame construction.

Industries and distributors still active in the region have tended to relocate to less densely developed areas where new facilities can be built at a lower cost as existing facilities become obsolete. The development of an extensive freeway system has reduced the location advantages formerly provided by a central city location. New housing would likely be developed in the area because of its proximity to employment centers to the west and south, but more likely more slowly than in surrounding areas, which have the advantage of more vacant land and being closer to existing employers.

Under the build alternatives, the access to downtown and the universities area provided by the fixed-guideway system would encourage the redevelopment of land in the station area. Industrial structures can be expected to be replaced by residential development, or commercial development intended to serve new residents or the populations found in downtown or the universities area. The build alternatives would accelerate and could intensify this process.
While some interest in the historic nature of some of the residential structures in the station area may result in renovation and preservation efforts, secondary development pressures could result in the demolition or removal of some of the existing housing in the station area.

The 2025 and 2035 H-GAC projections of population and employment from H-GAC anticipate rapid growth in both population and employment in this station area in the first 20 years. The projections then show slow employment growth from 2025 to 2035, and a slight decline in population during that period. This station location would support this rapid population and employment growth, and possibly accelerate it during the first part of the projection period.

5.15.2.4 Elgin Station

Flanking the site of the proposed Elgin Station are the Third Ward East and Third Ward West neighborhoods, both of which have been identified as eligible for inclusion in the NRHP. Much like Third Ward North, these neighborhoods are a mix of older, low cost and frequently deteriorated housing. Two local churches have formed Community Development Corporations in efforts to build new affordable housing in the Third Ward West neighborhood. These projects, Zion's Village and Eastside Village, cover all of the station area north of Elgin Street and west of Scott Street and have resulted in some new single-family homes. The plans for the areas around the two churches would maintain the existing scale of development in the western part of the station area, and reduce the tendency for redevelopment to result in gentrification of what is generally a low income neighborhood. But their plans do little to preserve the historic characteristics of the area.

The Third Ward East neighborhood has been identified in the University of Houston Campus Development Plan as an area for expansion of the adjacent campus. The eastern section of Third Ward East is identified for acquisition and clearing to serve as surface parking lots for UH. The remainder of the neighborhood, including all of the land east of Scott Street in the station area is identified for acquisition, although no specific use has been identified for most of the land. These plans are not dependent on the construction of the build alternatives or the location of this station, and so should not be regarded as secondary impacts.

Under the No Build Alternative the continuing erosion of existing housing stock and its partial replacement by affordable housing can be expected. The acquisition of significant portions of the area by UH and the demolition of housing and commercial structures on that land is also expected to continue. Some new construction of commercial buildings to serve the area may occur on the major thoroughfares.

The build alternatives should reinforce the development of additional commercial property in the station area. Much of the property fronting Scott and Elgin Streets in the station area is vacant or under-utilized. The northeast corner of the intersection of these two major thoroughfares is the site of a recently-constructed shopping center. Businesses in this center are oriented to serving students and employees of the nearby universities. The land available for commercial development on the west side of Scott and on Elgin Streets west of Scott Street would be possible locations for commercial development to serve this population, as well as future residents of new
housing which is planned in Zion’s Village and Eastside Village. The proposed station would assist this trend in the station area by concentrating transit riders and attracting new riders.

The H-GAC projections for this station area show a modest population growth by 2025, followed by a slight decline in population. The employment projections show a moderate growth in jobs for the area by 2025, followed by an accelerated increase in employment by 2035. Considering the large portion of the station area which UH plans to clear of population, even a modest population increase would require significant construction of new housing in the remaining portion of the station area. The pattern of predicted employment growth would be consistent with a long term conversion of much of the station area to various university functions, especially in the 2025-2035 period. The projections are consistent with the analysis which suggests that station area may be bolstered by the station location, but unlikely to produce significant secondary development.

### 5.15.2.5 Cleburne Station

Much of the area surrounding the proposed Cleburne Station is in institutional use. A large percentage of the land in the station area is already owned by UH and TSU. Other institutional uses include a public school, Jack Yates High School, a recently renovated City of Houston public library, and the expanding campus of Wheeler Avenue Baptist Church. Wheeler Avenue Baptist Church has purchased and removed numerous homes on Ruth Street in the southern part of the station area for their school, the Walipp Academy. The Texas Southern University Campus Master Plan calls for the acquisition of additional private property within the station area, including most of the western side of Scott Street and all of the 60-lot College Oaks subdivision. Current plans for use of land in the station area by the two universities include additional housing and additional athletic facilities.

Under the No Build Alternative, the implementation of existing plans for expansion of institutions in this area at the expense of existing single family residences would be expected to continue.

The build alternatives should be complementary to existing plans by TSU, UH, and the Wheeler Avenue Baptist Church. The location of the proposed station would be compatible with these plans, but they are not dependent on its construction. No increase in scale or acceleration of projects is anticipated.

The H-GAC projections for the station area show population growing modestly during the first twenty years, with a small decline between 2025 and 2035. Employment is forecast to grow significantly by 2025, but level off with only marginal increases in jobs by 2035. Although the expansion plans of TSU will remove most of the remaining single family homes from this station area, the construction of new student housing by TSU and UH will more than make up for this population loss. Both campus master plans project land use in the station area which may include some additional employment, consistent with the H-GAC projections. The H-GAC projections are consistent with a lack of secondary impacts in this station area.
5.15.2.6 Southmore Station – Build Alternatives with Base Alignment Option

The area around the proposed Southmore Station is a mix of single family residential and higher density multi-family housing. The east side of Southmore Boulevard remains a middle class neighborhood of single family homes with a high percentage of home ownership. The only commercial uses are found at the intersection of Southmore Boulevard and North MacGregor Street. Several large garden apartment complexes are found in the western part of the station area. The largest has been renovated and is the location for a Houston Police Department store front operation. Wheeler Avenue Baptist Church has recently built a high rise facility for the elderly, Walipp Senior Residence, on the west side of Scott Street just north of Southmore Boulevard. The far western edge of the station area is the location of a Harris County Hospital District facility, the Quentin Mease Community Hospital. On the northwest edge is the location of a public school, Lockhart Elementary. The station area extends across Brays Bayou. The small amount of land south of the bayou includes a small, apartment complex.

Under the No Build Alternative conditions could be expected to remain largely as they are now. Some additional vacant land may be used for commercial or residential purposes, but no strong development trend is currently in place in this location.

For the build alternatives, the potential for secondary development in this station area is found west of Southmore Boulevard and south of Brays Bayou. The access that the station would provide could justify renovation of existing apartment complexes, or their replacement with new rental housing if renovation is not economical. Vacant property and under-utilized commercial property in the western part of the station area are potential locations for new retail or residential development to serve the local population and transit riders.

H-GAC projects strong population and employment growth in this station area. Most of the population growth is projected to occur by 2025, and employment growth is shown increasingly strongly by 2025, with more moderate growth in the subsequent ten year period. The projections suggest that transit or pedestrian-oriented development would probably have occurred even without the development of the build alternatives in this alignment.

5.15.2.7 Southeast Transit Center – Build Alternatives with Base Alignment Option

The existing Southeast Transit Center has helped to stimulate a significant revival of retail activity in this station area. The south end of the station area includes modest tract homes built after World War II.

The eastern edge of the station area is a mix of older industrial buildings vacant land and some single family residences. The potential exists for the construction new housing on the vacant parcels and to replace industrial facilities.

The western edge of the station area is anchored by St. Peter the Apostle Catholic Church, which also houses a parochial school. Some potential redevelopment of garden apartments adjacent to the church is possible, as efforts have been made to do so in the past.
The northern edge of the station area includes a small part of the Riverside Terrace neighborhood, a deed-restricted neighborhood of large homes. Existing development along Griggs Road south of Riverside Terrace is very mixed, with new and historical homes adjacent to vacant land and commercial property of varying ages and levels of maintenance. The Spanish Village cooperative apartment complex is found in this part of the station area. The far northeast corner of the station study area includes a small portion of the West MacGregor Estates subdivision. Vacant land that was recently developed for large luxury homes, this subdivision is indicative of the desirability of the Riverside Terrace area for residential use. Considerable vacant land is located in this part of the station area, especially along Old Spanish Trail and Griggs Road.

Under the build alternatives the slow development of new retail buildings in the vicinity of the existing transit center could be expected to continue. Some affordable apartment complexes have been built in the general area, and proximity to a station would make such a development more attractive for tenants. In addition, renovation of existing housing in the station area is more likely because of the increased access to transit. Any increase in transit riders at a station in this location would be beneficial to retail businesses, and could accelerate such development.

The H-GAC 2025 and 2035 support the idea that this station area will experience rapid growth in employment and population, especially by 2025. Multiple apartment complexes would have to be built to meet the projection of more than doubling the population by that time. Employment is projected to nearly double by 2025, with a modest rise in the final ten years of the projection. These projections may be influenced by the excellent transit service that the Southeast Transit Center provides this area.

5.15.2.8 Calhoun Station – Build Alternatives with Base Alignment Option

The northeastern and southwestern portions of the quarter-mile radius around this proposed station include single family tract homes developed after World War II. These neighborhoods are characterized by varying degrees of maintenance of existing housing, and have a low potential for significant secondary redevelopment. Commercial property lining Griggs Road is a mix of well-maintained and thriving retail buildings with older, deteriorated commercial and industrial buildings. Significant vacant or under-used land is located in these commercial areas.

Under the No Build Alternative the weak demand for new housing or commercial property in this area can be expected to continue. Additional affordable housing may be built because of the presence of vacant tracts in the area, but little demand for new market-rate housing would exist.

Some elements necessary for secondary impacts under the build alternatives exist, but may be countered by other characteristics of the area. Considerable vacant land is found in this area, and much of the industrial property is vacant or under-used. The far northern end of the expanded station area includes part of the prestigious Riverside Terrace residential area, and most of the new West MacGregor Estates subdivision of large, luxury homes. The success of this new subdivision demonstrates the strength of housing demand in this particular neighborhood.
The H-GAC projections indicate less skepticism over the potential redevelopment of vacant or underused land in this station area. The thirty year projection includes a near doubling of population and an increase in employment well in excess of 100 percent. Most of the growth in population and employment would occur in the first twenty years of the projection period. Such projections would indicate that the station location may accelerate development in this area, but would not increase development above levels already anticipated.

### 5.15.2.9 Palm Center Station

Palm Center is located at the center of the station area. Palm Center was Houston’s first shopping mall when it opened in 1953. Smaller than subsequent malls, it and the surrounding retail development made the intersection of Griggs and South Park (now Martin Luther King Boulevard) a major retail center for this part of southeast Houston. The decline of incomes in the surrounding neighborhoods during the 1960s and 1970s produced a similar decline in the retail center’s fortunes. By the time of the severe local recession in the 1980s Palm Center was largely vacant, as was the nearby Montgomery Ward. Efforts to revive Palm Center as a community and educational center began at that time, and eventually created a facility with significant resources for the surrounding community, including a public library, a post office, and a police store front location.

Inclusion of a park-and-ride lot at the proposed Palm Center Station extends the potential secondary impacts to a half mile circle surrounding the station. The impacts within the quarter mile circle surrounding the station are described first, then the impacts for the larger area.

Within the quarter-mile station area the land use outside of Palm Center itself is a mix of underused retail buildings, light industrial uses, and older housing. The far eastern edge of the immediate station area includes a portion of a new, affordable apartment complex. Using modular construction, the complex offers higher levels of amenities in the units than are normally found at this rental rate. The northern edge of the immediate station area includes a small portion of the MacGregor Place subdivision.

South of Palm Center the station area within the quarter-mile radius includes parts of the MacGregor Palms and MacGregor Terrace neighborhoods. All three of these subdivisions were developed in the 1950s. The existing housing in these subdivisions is wood frame construction and conditions vary.

Secondary development potential in this station area exists primarily in the commercial property along Griggs Road and Martin Luther King Boulevard. The low level of commercial activity in almost all of these properties may represent a significant opportunity for redevelopment once access to downtown and the TSU/UH area is improved.

The station area within the half-mile radius represents an expansion of the same sorts of land uses found in the immediate station area. The southeastern and eastern edge of the half mile circle is largely industrial, and much of it is isolated from the station by a major freight rail line. This portion of the extended station area also includes a successful retail center, which is unlikely to be significantly affected by the
station development. The industrial areas closest to Palm Center have the potential for redevelopment as a secondary impact of the station, especially the site currently used for material storage, a reflection of its low market value at this time.

The single-family residential areas found in the extended area are parts of the neighborhoods previously described as well as another subdivision, MacGregor Park Estates. The homes in this additional subdivision are larger than those found in the quarter mile circle around the station, and generally in better condition. These residential areas do not offer significant opportunities for secondary development impacts, although improvements in the commercial areas around Palm Center could encourage investment in the existing housing stock. Much of the property along Martin Luther King Boulevard north of the proposed station is owned by the Shrine of the Black Madonna, a church and cultural center. Because the church uses are unaffected by the station location, there is very little potential for secondary impacts in this part of the extended station area.

The 2025 projections by H-GAC show a steady growth of station area population and employment for twenty years. Then population is projected to decline slightly by 2035, but employment is expected to continue to rise. Growth is projected to be considerably less than in the adjacent Calhoun Station area. Given the superior location of vacant or underused land in this station area, the H-GAC projections support the idea that the location of the fixed guideway station at this site could produce some secondary development.

5.15.2.10 University Oaks Station – Wheeler-MLK Alignment Option

This is the first station on the alignment option as it diverges from Scott Street at Wheeler Street, and proceeds down Wheeler Street and Martin Luther King Boulevard to the Palm Center. A majority of the land around the station between University Oaks Street and Calhoun Street is owned by the UH. The University of Houston Campus Master Plan proposes the use of this land for residences and educational buildings. These land uses are unlikely to change as a result of the construction of this station.

The southwestern portion of the station area is the University Oaks subdivision. The single family homes in this subdivision are generally large and well-maintained. Some new construction of homes has taken place within the neighborhood, a good indication of its desirability. The subdivision is deed-restricted, and represents a very limited potential for secondary impacts. The UH plan proposes the acquisition of a row of homes facing Wheeler Street on the north edge of University Oaks. The future use of this property may be affected by the construction of the fixed guideway and station development.

Under either the No Build Alternative or the build alternatives, no changes in future development are expected. The continued existence of the University Oaks subdivision and the development plans of the UH are not expected to be altered by the development of the build alternatives. The continued expansion of facilities on the UH campus will be unaffected in scale by the station location, although those facilities may be oriented to take advantage of access to the fixed guideway system.
The H-GAC 2025 and 2035 projections show a rapid population growth by 2025, with a small decline from 2025 to 2035. This population growth is consistent with the nearby location of existing campus housing and UH plans for additional student housing in the area. The employment projection shows relatively small growth in employment in percentage in the first twenty years of the projection, and none from 2025 to 2035. Most of this employment is university-based, and will depend on university operations, not access to transit.

5.15.2.11 Martin Luther King Station – Wheeler-MLK Alignment Option

A high percentage of this station area is owned by state and local governments. The northern part of the station area, located north of Old Spanish Trail, is MacGregor Park, a major City of Houston facility. The park includes a recreation center, swimming pool, baseball diamond, and tennis courts.

The eastern edge of the station area includes right of way acquired by the State of Texas decades ago for the extension of the SH 35. This acquisition removed a large number of single family homes in the MacGregor Place subdivision. The remaining homes are modest, with varying degrees of maintenance. The homes are separated from the station by a public school, Peck Elementary, and an older, but fully-occupied, retail center.

The neighborhood to the west and southwest is a part of the Riverside Terrace subdivision. The homes in this part of Riverside Terrace are generally smaller and less well maintained than those located in the more prestigious areas closer to South MacGregor Way, but more substantial and better maintained than those found in other portions of the station area. Homes facing Old Spanish Trail on the northern edge of the subdivision are generally in varying conditions, and many have been converted to commercial use, or replaced by commercial buildings. The shopping center located north of the station at the southwest corner of Martin Luther King Boulevard and Old Spanish Trail is fully occupied, although the retail mix suggests that rents are low.

Under the No Build Alternative current conditions could be expected to continue. Commercial property would continue to be under-used and residential property would vary in condition.

Under the build alternatives, the commercial property in this station area represents an opportunity for secondary development. Such development would likely take the form of renovation rather than replacement of the existing structures, unless those structures cannot be economically renovated. The residential areas do not offer major opportunities for secondary development in the foreseeable future, with the exception of residential property adjacent to Old Spanish Trail.

Projections of population and employment for 2025 by H-GAC reflect slow growth for the station area. That growth is projected to pick up from 2025 to 2035. The location of the station on this site could be expected to accelerate that growth. The relatively modest growth in employment projections is an indication that the station location may have secondary development potential for commercial activity.
5.15.3 Cumulative Effects

The level of the expansion of METRO's fixed-guideway system would be less under the No Build Alternative than that proposed under the build alternatives. Less extensive improvements in transportation choice, quality of life, and mobility, however, would still occur. In addition, the same overall regional market conditions and public policies would be expected under either alternative.

The No Build Alternative would not directly change the existing character of neighborhoods and communities in the project area. As the neighborhoods of the Southeast Corridor begin or continue to experience increased development and redevelopment pressures over time, this alternative would not help to attract or guide development within the corridor. The No Build Alternative would not help with mobility issues or decrease traffic congestion around such activity centers as downtown, the Toyota Center, Minute Maid Park, the George R. Brown Convention Center, UH, and TSU, or traffic congestion generated by new development. Without focused development or mitigation strategies, the social cohesion of the community could be disrupted if new development occurs in a patchwork fashion in the neighborhoods.

The build alternatives, when considered as part of METRO's expanding fixed guideway system, would play an important role in expanding regional transportation choices and in improving regional quality of life, image, and overall mobility. The extent to which the build alternatives attract new growth or results in a redistribution of projected regional growth will depend on favorable market conditions and supportive public policies.

The project would also provide connections with other components of the existing and planned transit systems. This would cumulatively benefit transit users by increasing accessibility and also through possibly increasing the desirability of the project area for redevelopment. Accessibility is an important consideration in development decisions for various types of land use, including residential, office/retail, health and community services, and recreation facilities. Improved accessibility means that the Southeast Corridor would become more attractive to business and residential investment, and that the corridor would experience enhanced connectivity along the METRORail Red Line to downtown, Midtown, Museum District, Rice University, TMC, and the Reliant Park Complex, and future connections to other activity centers such as Greenway Plaza, Northline Mall, and the Uptown/Galleria area.

Within the corridor, the availability of vacant land, together with the planned development/redevelopment of portions of the study area (such as the East Downtown TIRZ) and the Palm Center, the increasing emphasis on higher density residential development in areas in and around downtown Houston, the possible expansions of TSU and UH, and the proximity of the METRORail Red Line on Main Street, all have the potential to effect generally positive change in this area.

Overall, the greater access and mobility provided by the proposed METRO service is anticipated to support the existing land use and business activity within the existing community without significantly changing neighborhoods. The build alternatives provide significant public investment in the community and could encourage new social and economic opportunities for neighborhoods.
Gentrification is a process by which low-income and working class neighborhoods in the inner city are refurbished by an influx of private capital and middle-class homebuyers and renters. It is not a direct effect, but is instead a cumulative effect that results from a combination of past, present, and future actions of developers, individuals, and sometimes, governmental agencies. Gentrification can change the social make up of the community, its property values and could also result in the loss of housing stock in the study area’s three NRHP-eligible historic districts. On the other hand, it can improve aesthetics and the value of properties. Gentrification is often perceived by long-time area residents as a negative impact to their sense of community, while others may view the property improvements, densification, and increases in the tax base as positive.

On the Main Street segment of the METRORail Red Line, gentrification has occurred in some neighborhoods. However, this trend was already in place prior to the initiation of planning for the METRORail Red line. The possibility exists that gentrification could also occur along the proposed Southeast Corridor build alternatives. When the proposed fixed guideway is combined with the existing and future real estate market and the existence of two universities in the area, this could result in gentrification of the corridor neighborhoods, including the Third Ward neighborhoods. Even without the line, the corridor is experiencing some present-day gentrification primarily related to the area’s proximity to downtown and societal trends of people moving back in to the city to reduce travel times. Developers have already expressed an interest in assembling property for multi-unit housing in the Third Ward area. This housing could accommodate students at UH and TSU, but also could be attractive to people who would like to live closer to downtown and/or feel that the adjacent transit line is an attractive amenity.

The potential cumulative impacts of the build alternatives and the associated stations, combined with other public projects, shown in Table 5-18, or private development trends for each station area are discussed below.

Table 5-18. Public Projects Contributing to Cumulative Impacts

<table>
<thead>
<tr>
<th>Project #</th>
<th>Agency</th>
<th>Facility and improvement</th>
<th>Cost</th>
<th>Letting Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>10552</td>
<td>TxDOT</td>
<td>Griggs to Wayside 8 lane freeway, 4 lane frontage</td>
<td>$40,000,000</td>
<td>9/1/2005</td>
</tr>
<tr>
<td>202</td>
<td>TxDOT</td>
<td>SH 35, IH-45 to Griggs 8 lane freeway</td>
<td>$38,000,000</td>
<td>9/1/2009</td>
</tr>
<tr>
<td>10567</td>
<td>TxDOT</td>
<td>SH 35, O.S.T. to SH 99 4 lane toll road</td>
<td>$154,000,000</td>
<td>9/1/2010</td>
</tr>
<tr>
<td>12524</td>
<td>TBD</td>
<td>Elgin, Scott to IH-45 Widen to 6 lanes</td>
<td>$2,409,840</td>
<td>1/1/2023</td>
</tr>
</tbody>
</table>

Note: Project Numbers are from the H-GAC RTP.
HCTRA - Harris County Toll Road Authority
5.15.3.1 Downtown Stations

While the build alternatives are only one line of the METRO Solutions plan which will serve the downtown area, these alternative would contribute to the overall improvement in access to the area. Combined with economic and development trends, and other public projects, the build alternatives would reinforce the attractiveness of downtown as a business, residential, and entertainment center. Increased transit ridership will reduce the demand for parking, or reduce the growth in the demand for parking. This will have the effect of reducing the need to build more parking garages or tie up valuable land in surface parking as an interim land use. Any reduction in the need to provide parking will improve the downtown’s competitive position because suburban locations can generally provide parking at a lower cost. Although a small part of the total effect, the build alternatives would contribute to a trend for new private investment in the downtown in commercial, residential, and entertainment facilities.

5.15.3.2 Dowling Station

The combination of rapid and frequent access to the downtown with existing development trends in this station area should reinforce those development trends and contribute to the rapid conversion of this area from industrial and distribution facilities to high density residential and entertainment facilities.

5.15.3.3 Leland Station

Although this station area has not yet seen any new residential development, it is located just to the east of an area with significant construction of row houses and townhouses. It is also just west of an area experiencing significant renovation of existing homes and a rapid escalation in home prices. These trends, when combined with the introduction of rapid and frequent transit access to downtown and the universities located to the south, will likely result in the significant new housing development as well as some renovation and adaptive reuse of existing structures.

5.15.3.4 Elgin Station

The change envisioned in the University of Houston Campus Master Plan may not be substantially affected by the development of the fixed guideway and this station location. The UH property is used for playing fields, and so has no direct interaction with transit. The proposal to acquire all of the residential land east of Scott Street and north of Elgin Street contained in the master plan does not include its proposed future use and the effect of the station location can not be measured in this case. The development of the build alternatives and the proposed station location should help reinforce and even accelerate plans to develop affordable housing west of Scott Street. The H-GAC RTP includes a widening of Elgin Street from Scott Street eastward to IH-45 from four to six lanes (Project 12524). This improvement is programmed for letting in 2023, and would not be expected to significantly alter the development patterns within the station area.
5.15.3.5 **Cleburne Station**

Since most of the land located within the station area is either owned by public agencies or non-profit institutions, or is planned to be, the location of this proposed station is unlikely to significantly alter future development. The specific location may lead the universities to orient facilities in such a way as to recognize that large numbers of workers and students are arriving and departing at this point, but this may not represent any more than a rearrangement of future facilities within the station area. The location of the station here should be of assistance to Wheeler Avenue Baptist Church and its many activities, but would not appear to alter its future development plans, unless the church determined that it has reduced parking needs and can more intensively develop its campus. This could reduce its need to acquire property in the single family neighborhood to its south.

5.15.3.6 **Southmore Station**

The recent construction of a high rise residence for the elderly by a non-profit associated with the nearby Wheeler Avenue Baptist Church does not constitute a development trend by itself. The strengthening of the local housing market has resulted in some renovation of multi-family properties in the station area, and the location of the fixed guideway station at this site will reinforce this tendency. But the general demand for housing in this area has not grown enough to justify construction of high rise residences except in specialized cases, such as the Wheeler Avenue Baptist Church facility.

5.15.3.7 **Southeast Transit Center**

The location of the fixed guideway station at this site should reinforce redevelopment trends already existing in this station area. The plans of the Almeda Old Spanish trail TIRZ should be assisted by the development of this station.

5.15.3.8 **Calhoun Station**

This station is located within the boundaries of the Almeda Old Spanish Trail TIRZ. Its inclusion should be beneficial to the zone's redevelopment plans.

5.15.3.9 **Palm Center Station**

The development of public facilities at Palm Center and the construction of affordable housing in the station area should be assisted by the location of the transit station at this location. It is possible that the station may increase the desirability of locating such public facilities in the station area because it increases accessibility for transit users and can interact with previously developed public facilities.

A significant set of projects for this station area involve the construction of the SH 35 freeway through the eastern edge of the half mile circle around the station site. Project 202 in the RTP would extend eight freeway lanes from IH-45 south to Griggs Road, along the eastern side of the station area, with a contract letting by the TxDOT scheduled for September 1, 2009. In addition, Project 10552 is also in the RTP for letting by TxDOT September 1, 2005. This project would build an eight-lane freeway.
with four lanes of frontage roads from Griggs Road to Wayside Drive, extending the
freeway southward past IH-610. Finally, Project 10567, a joint project of TxDOT and the
Harris County Toll Road Authority is scheduled for letting September 1, 2010. It would
construct a four-lane toll road from Old Spanish Trail to the future extension of SH 99 in
Brazoria County. The effect of these projects is to bring a major route for commuters
through the eastern part of the station area. The access that these projects will provide
the station area to the city center and to suburban locations will significantly increase the
desirability of this location for residences and businesses, and likely increase the
number of transit riders that use the transit at this proposed station.

5.15.3.10 University Oaks Station

The location of a station at this site should have minimal cumulative effects. The
nearby residential area is not a low income area, and therefore not a candidate for
gentrification. The plans of the UH for its portion of the station area are unlikely to be
significantly altered because of the fixed-guideway line or the proposed station.

5.15.3.11 Martin Luther King Station

Several highway projects involving the construction of the SH 35 freeway on the eastern
edge of the station area, combined with the location of a transit station may increase
redevelopment pressure on the MacGregor Place subdivision. Right of way acquisition
has already removed a significant number of homes in that subdivision. Project 202 in
the RTP would extend eight freeway lanes from IH 45 south to Griggs Road, along the
eastern side of the station area, with a contract letting by the TxDOT scheduled for
September 1, 2009. In addition, Project 10552 is also in the RTP for letting by TxDOT
September 1, 2005. This project would build an eight lane freeway with four lanes of
frontage roads from Griggs Road to Wayside Drive, extending the freeway southward
past IH-610. Finally, Project 10567, a joint project of TxDOT and the Harris County Toll
Road Authority is scheduled for letting September 1, 2010. It would construct a four-
lane toll road from Old Spanish Trail to the future extension of SH 99 in Brazoria County.
The effect of these projects is to bring a major route for commuters through the eastern
part of the station area. The freeway construction may result in the conversion of some
or all of the remaining homes in the MacGregor Place subdivision to commercial use.
Access to the fixed guideway may affect this by encouraging redevelopment of the
neighborhood, or by providing an entry point for commuters into the transit system.

In most cases, the cumulative impacts described are the interaction of the proposed
fixed guideway and station locations with private investment and development. Because of this, the cumulative impact and its timing are hard to predict. The
identified cumulative impacts are descriptions of the potential for the fixed guideway
and stations to combine with observed tendencies in the station areas or nearby
areas. There is no guarantee that private property owners in the various areas will
choose to use their property in the same way that has been previously observed, or
in a way that would meet the desires and expectations of others.
5.15.4 Mitigation Measures

Specific tools that could be adopted for station areas to encourage positive development include:

- Design guidelines that emphasize a pedestrian-friendly and human-scale environment, as well as blending in with historic resources in areas where such resources are present.
- Strategic selection of station areas that take full advantage of land availability, development and redevelopment potential, and local demand.