

4.0 TIER 2 ALTERNATIVES




The Tier 2 Alternatives represent the highest performing Tier 1 Alternatives. The purpose of the Tier 2 Screening was to identify the LPA utilizing a more robust list of evaluation criteria and MOEs. The result of the Tier 1 Screening was a set of feasible transit alignments that would connect activity centers along I-20 East Corridor with central Atlanta and the existing MARTA heavy rail system. The Tier 2 Screening paired these alignments with compatible transit technologies, or modes. As such, all Tier 2 Alternatives were evaluated with all feasible transit technologies. Thus, if a given alignment was compatible with multiple transit technologies, it was analyzed with each technology. The transit technologies identified as suitable for this project included heavy rail transit (HRT), light rail transit (LRT), and bus rapid transit (BRT).

In addition to the Tier 2 Build Alternatives, a No Build Alternative and Baseline/Transportation System Management (TSM) Alternative were developed as required by the FTA's New Starts process. These were evaluated along with the Build Alternatives.

4.1 Transit Technologies Considered

An initial assessment of technologies was performed to determine their appropriateness for the I-20 East Transit Initiative. Based on their vehicle characteristics, station stop characteristics, operating service, and capital and operating costs, the technologies considered in the development of Tier 2 Alternatives included BRT, LRT, and HRT. **Figure 4-1** provides a brief description of the transit technologies.

Figure 4-1: Transit Technologies Considered

<p>Bus Rapid Transit (BRT) offers limited-stop service that relies on technology to help speed up travel. BRT operates in shared or exclusive right-of-way. This service usually has dedicated stations, pre-boarding fare payment, and is separated from normal traffic.</p>	<p>Light Rail Transit (LRT) consists of passenger rail cars powered by overhead catenaries. Operating individually or in short trains, service is usually on fixed rails in exclusive right-of-way. LRT and streetcar service can occasionally operate in shared traffic.</p>	<p>Heavy Rail Transit (HRT) operates on electric railway, and is characterized by high speeds, rapid acceleration of passenger rail cars, high platform loading, and grade separated rights-of-way from which all other vehicular and foot traffic are excluded.</p>
		

4.2 Description of Tier 2 Alternatives

The following are descriptions of all alternatives developed and evaluated in the Tier 2 Screening.

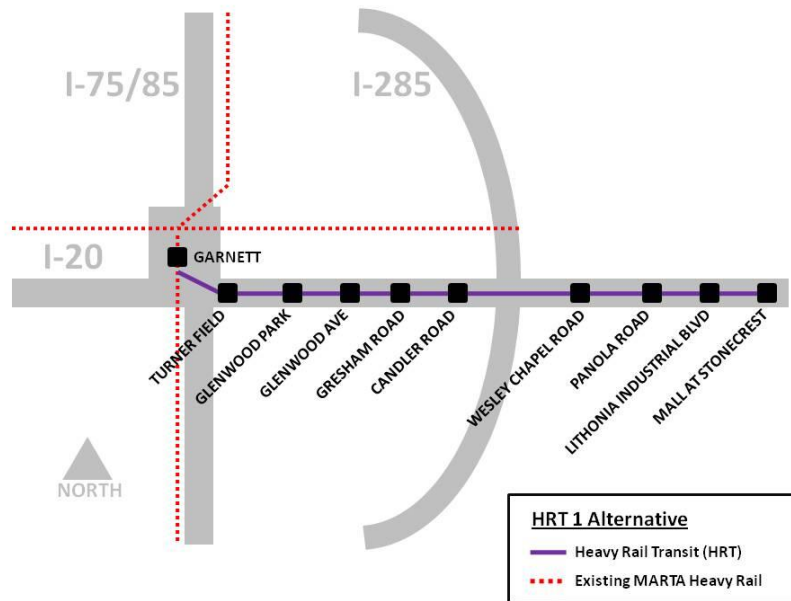
4.2.1 Heavy Rail Transit Alternative 1 (HRT1)

HRT1 would consist of a new HRT line that would spur from the existing MARTA rail network just south of Garnett Station. From there, the alignment would extend south

parallel to Windsor Street, then east along Glenwood Avenue/Fulton Street, before it would enter the I-20 right-of-way at Hill Street. From there, the alignment would extend east, on structure, in the center of the I-20 median. At Glenwood Avenue, the alignment would transition to the side of the interstate and run parallel to I-20 to the Mall at Stonecrest in eastern DeKalb County.

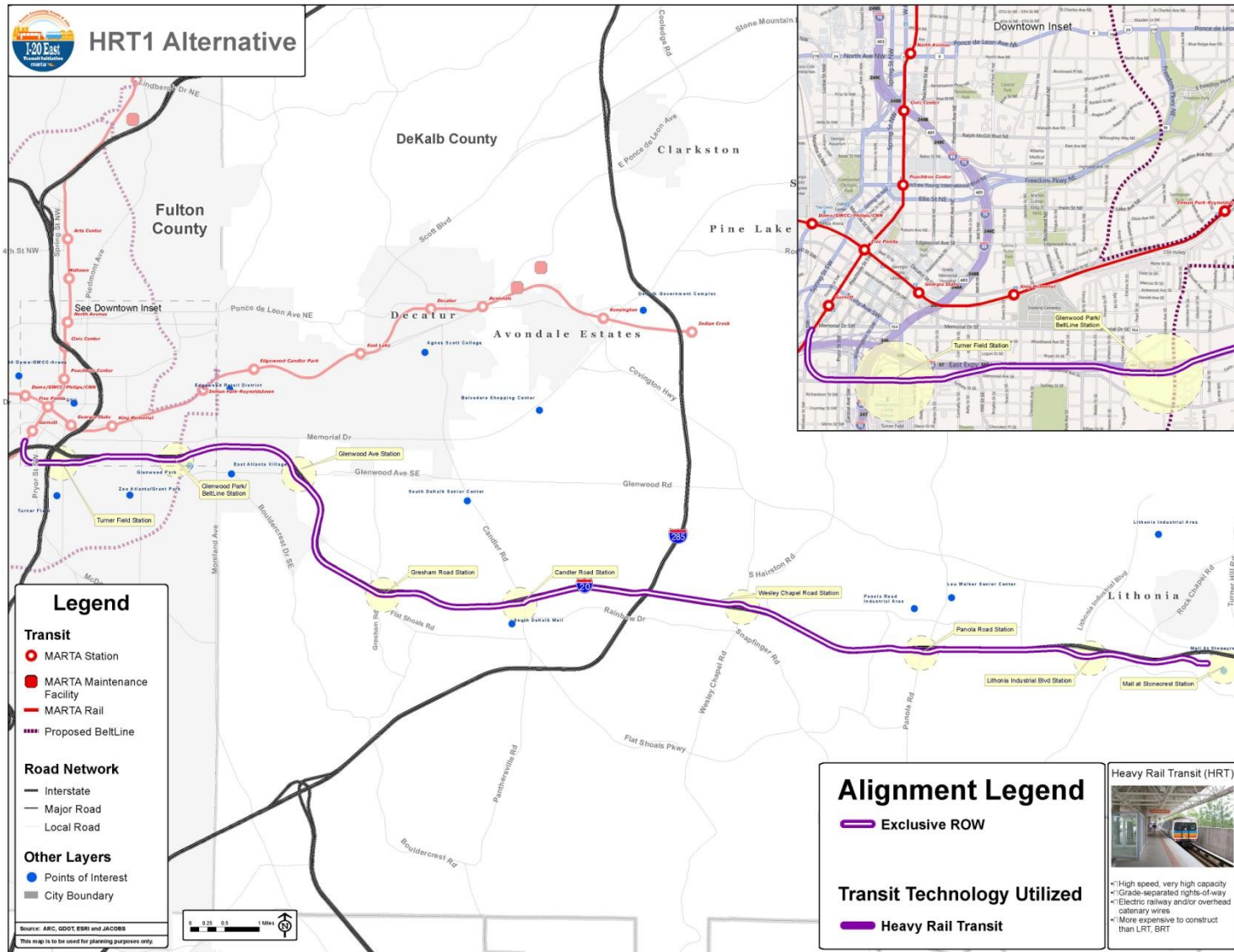
HRT1 would include stations at Turner Field, Glenwood Park, Glenwood Avenue, Gresham Road, Candler Road, Wesley Chapel Road, Panola Road, Lithonia Industrial Blvd., and Mall at Stonecrest. A conceptual map of this alignment is shown in **Figure 4-2**. A map of the HRT1 Alternative is provided in **Figure 4-3**.

Figure 4-2: HRT1 Alternative Concept



As shown above, this alternative would tie into the existing MARTA heavy rail system just south of the Garnett Station. This new service would continue north along the Red/Gold line serving all stations in downtown and Midtown Atlanta. The service would continue to the Lenox station where it would utilize a pocket track for a turn around without disruption to existing service. This alternative would serve as a new MARTA heavy rail line.

Figure 4-3: HRT1 Alternative Map

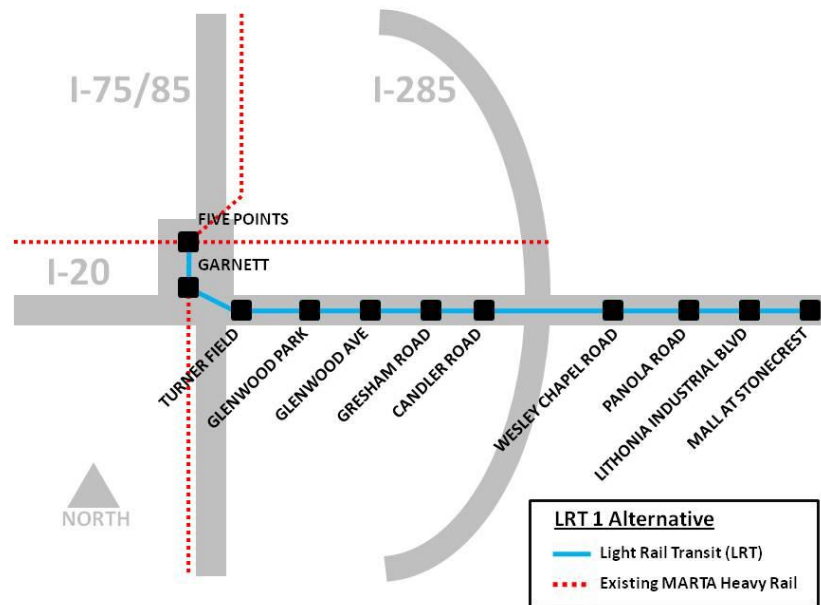


4.2.2 Light Rail Transit Alternative 1 (LRT1)

The LRT1 Alternative would be an LRT service that would operate along the same alignment as HRT1. It would extend at grade along Broad Street from Five Points Station to Garnett Station. Then it would operate in an exclusive guideway south of Garnett Station and extend south parallel to Windsor Street, then east along Glenwood Avenue/Fulton Street. It would enter the I-20 right-of-way at Hill Street. From there, the alignment would extend east, on structure, in the I-20 median. At Glenwood Avenue, the alignment would transition to the side of the interstate and run parallel to I-20 to the Mall at Stonecrest in eastern DeKalb County. This alternative would require the construction of a new vehicle maintenance facility.

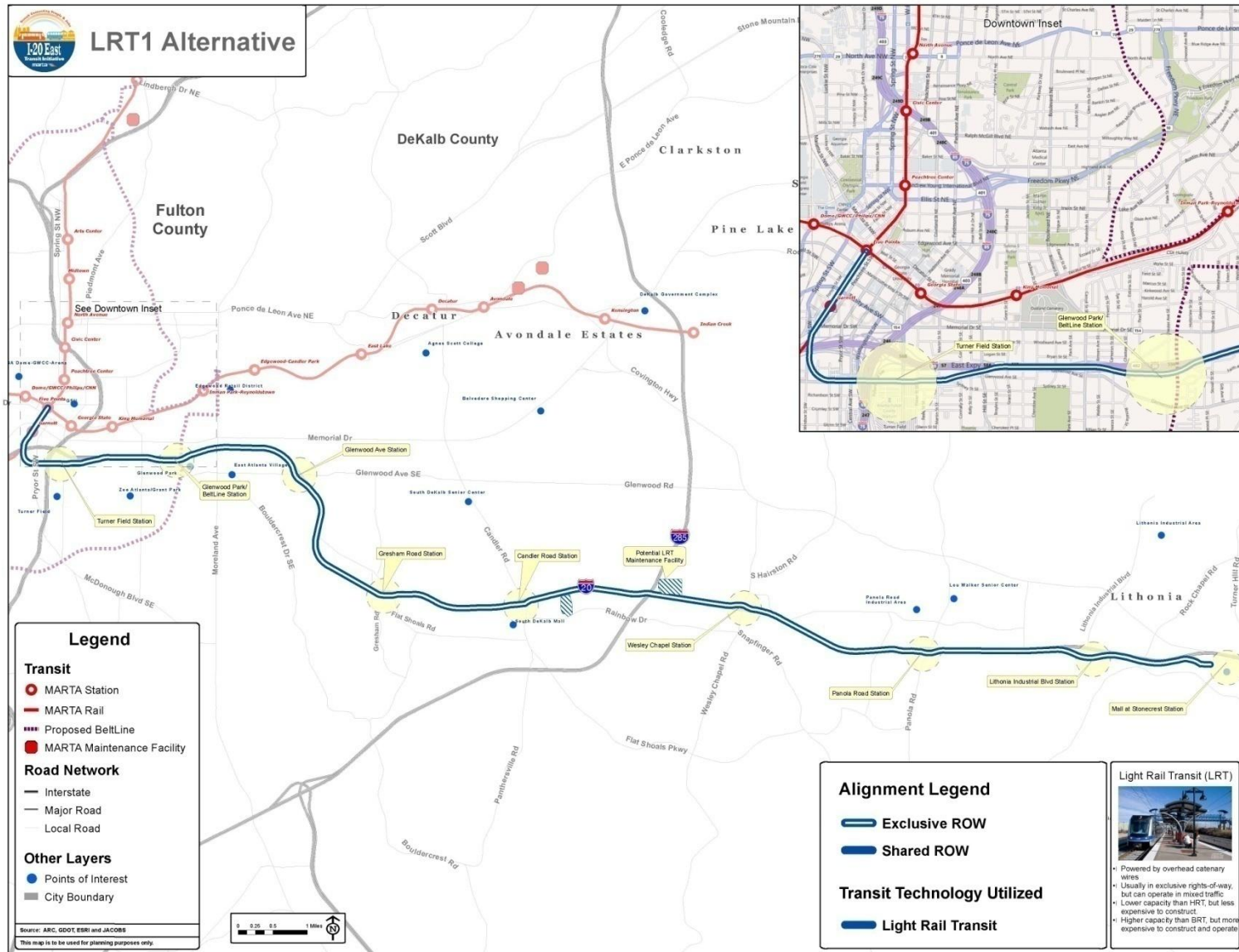
This alternative would include stations at Five Points, Garnett, Turner Field, Glenwood Park, Glenwood Avenue, Gresham Road, Candler Road, Wesley Chapel Road, Panola Road, Lithonia Industrial Blvd., and Mall at Stonecrest. A conceptual map of this alternative is shown in **Figure 4-4**. A map of the LRT1 Alternative is provided in **Figure 4-5**.

Figure 4-4: LRT1 Alternative Concept



As shown above, this alternative would connect to the existing MARTA heavy rail system at Five Points Station and Garnett Station. LRT1 would serve as a new light rail service in the I-20 East Corridor.

Figure 4-5: LRT1 Alternative Map



4.2.3 Bus Rapid Transit Alternative 1 (BRT1)

The BRT1 Alternative is a BRT line that would follow the same alignment as HRT1 and LRT1. It would operate in mixed traffic along Broad Street from Five Points Station to Garnett Station. It would then operate in an exclusive guideway south of Garnett Station and extend south parallel to Windsor Street, then east along Glenwood Avenue/Fulton Street, before it would enter the I-20 right-of-way at Hill Street. From there, the alignment would extend east, on structure, in the center of the I-20 median. At Glenwood Avenue, the alignment would transition to the side of the interstate and run parallel to I-20 to the Mall at Stonecrest in eastern DeKalb County.

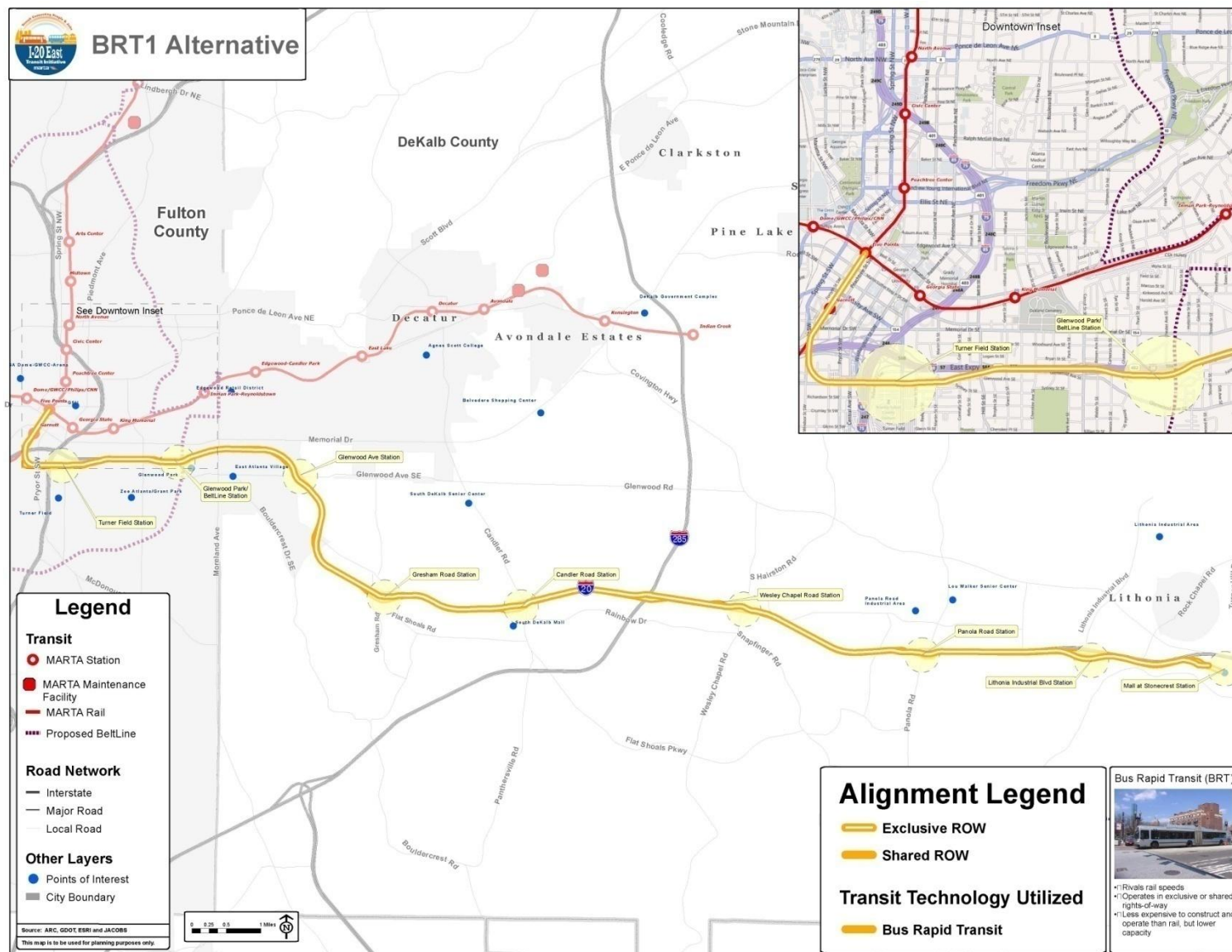
This alternative would include stations at Five Points, Garnett, Turner Field, Glenwood Park, Glenwood Avenue, Gresham Road, Candler Road, Wesley Chapel Road, Panola Road, Lithonia Industrial Blvd., and Mall at Stonecrest. This alignment would be identical and include the same station areas as the LRT1 and HRT1 alternatives. A concept of the BRT1 Alternative is shown in **Figure 4-6**. A map of the BRT1 Alternative is provided in **Figure 4-7**.

Figure 4-6: BRT1 Alternative Concept



As shown above, this alternative would connect to the existing MARTA heavy rail system at Five Points Station and Garnett Station. BRT1 would serve as a new bus rapid transit service in the I-20 East Corridor.

Figure 4-7: BRT1 Alternative Map

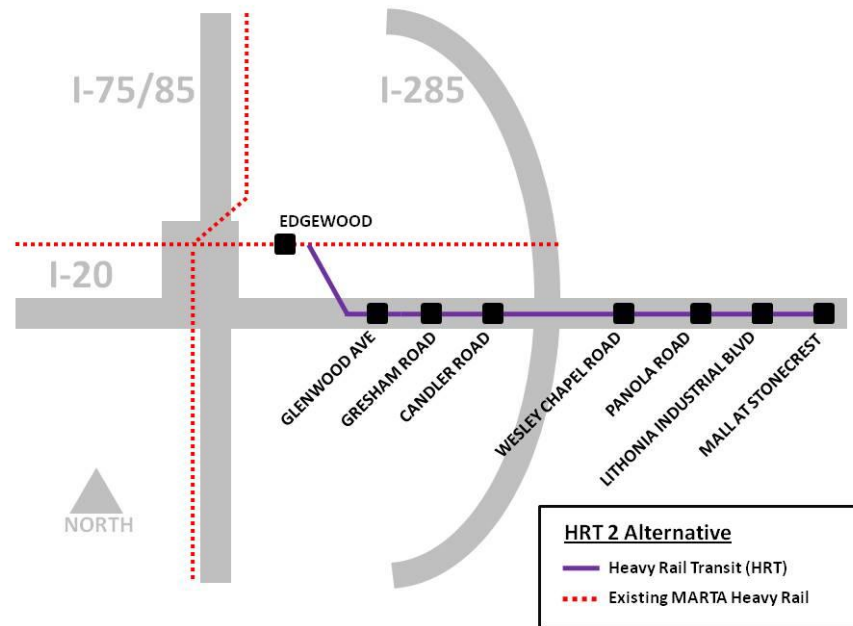


4.2.4 Heavy Rail Transit Alternative 2 (HRT2)

HRT2 would be a new HRT line that would spur from the existing MARTA rail network between the Edgewood/Candler Park Station and the East Lake Station. This alternative would utilize the existing tunnel portal constructed with the east-west line that was originally intended for the proposed Tucker – North DeKalb line. This tunnel portal would allow the HRT2 line to enter a tunnel alignment before leaving the MARTA right-of-way. This is necessary to ensure that this alternative does not adversely affect the surrounding historic neighborhoods. The tunnel alignment would extend south to I-20 where it would surface and run parallel to I-20 to the Mall at Stonecrest in eastern DeKalb County.

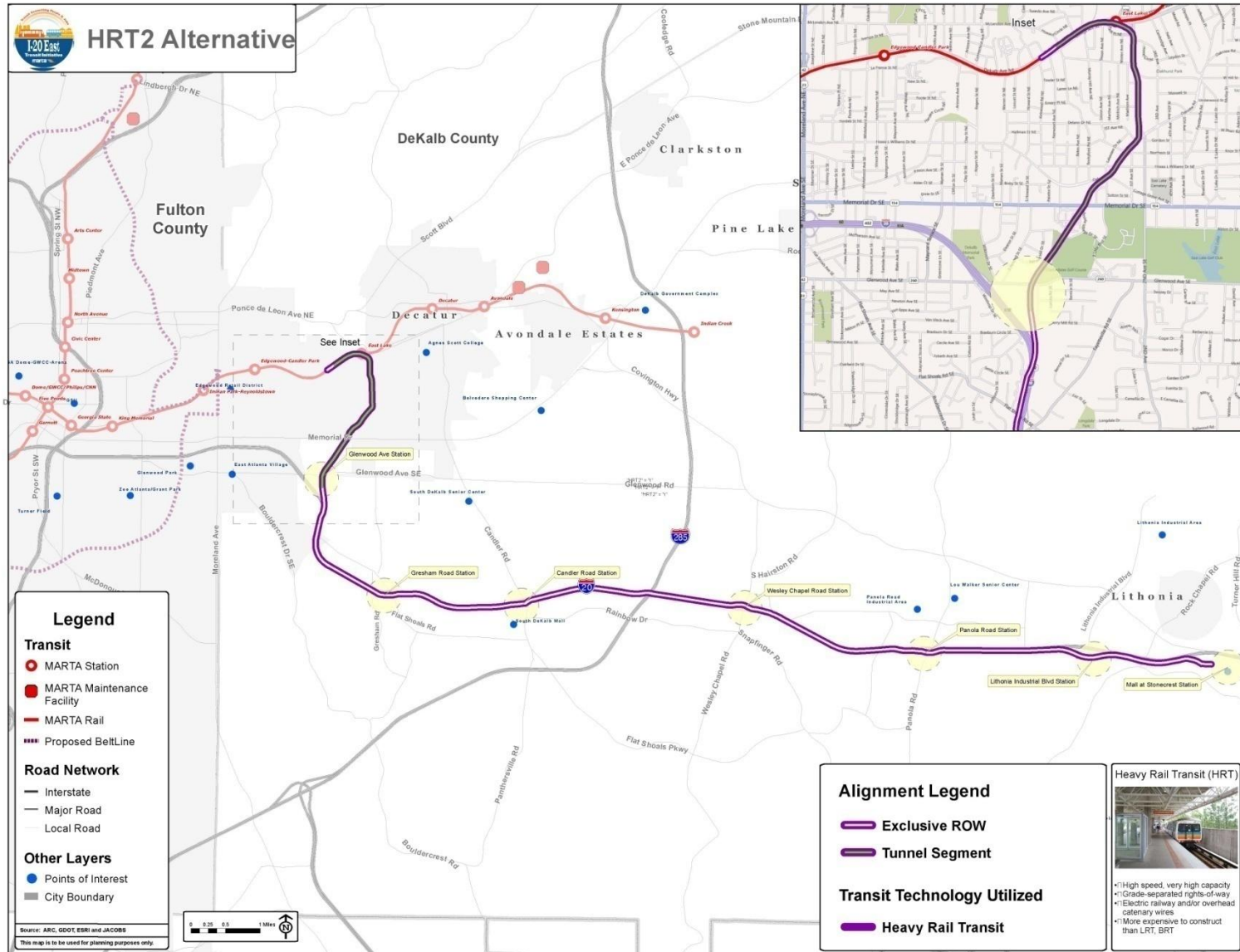
This alternative includes stations at Glenwood Avenue, Gresham Road, Candler Road, Wesley Chapel Road, Panola Road, Lithonia Industrial Blvd., and the Mall at Stonecrest. A conceptual map of this alternative is provided in **Figure 4-8**. A map of the HRT2 Alternative is provided in **Figure 4-9**.

Figure 4-8: HRT2 Alternative Concept



This alternative would tie into the existing MARTA heavy rail system between the Edgewood/Candler Park Station and the East Lake Station. Rather than add a third HRT service along the east-west line, this alternative would extend the MARTA Green Line from its current eastern terminus at Edgewood Candler Park Station to the Mall at Stonecrest. The Blue Line service would be unchanged.

Figure 4-9: HRT2 Alternative Map

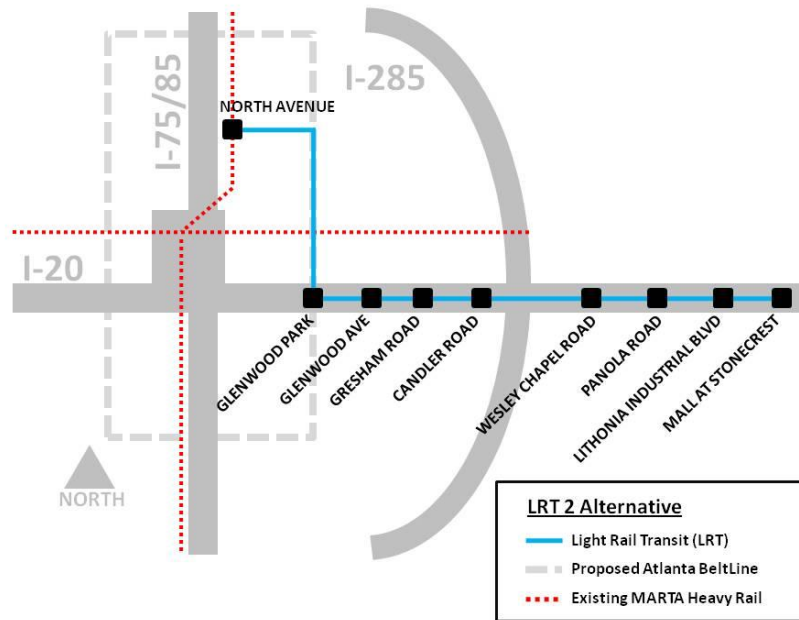


4.2.5 Light Rail Alternative 2 (LRT2)

LRT2 is proposed as new LRT line that would originate at the North Avenue Station and operate in mixed traffic along North Avenue east to the proposed BeltLine alignment. It would follow the BeltLine alignment south to I-20. It would then extend east in an exclusive guideway, on structure, in the center of the I-20 median. At Glenwood Avenue, the alignment would transition to the side of the interstate and run parallel to I-20 to the Mall at Stonecrest in eastern DeKalb County. This alternative would require the construction of a new vehicle maintenance facility.

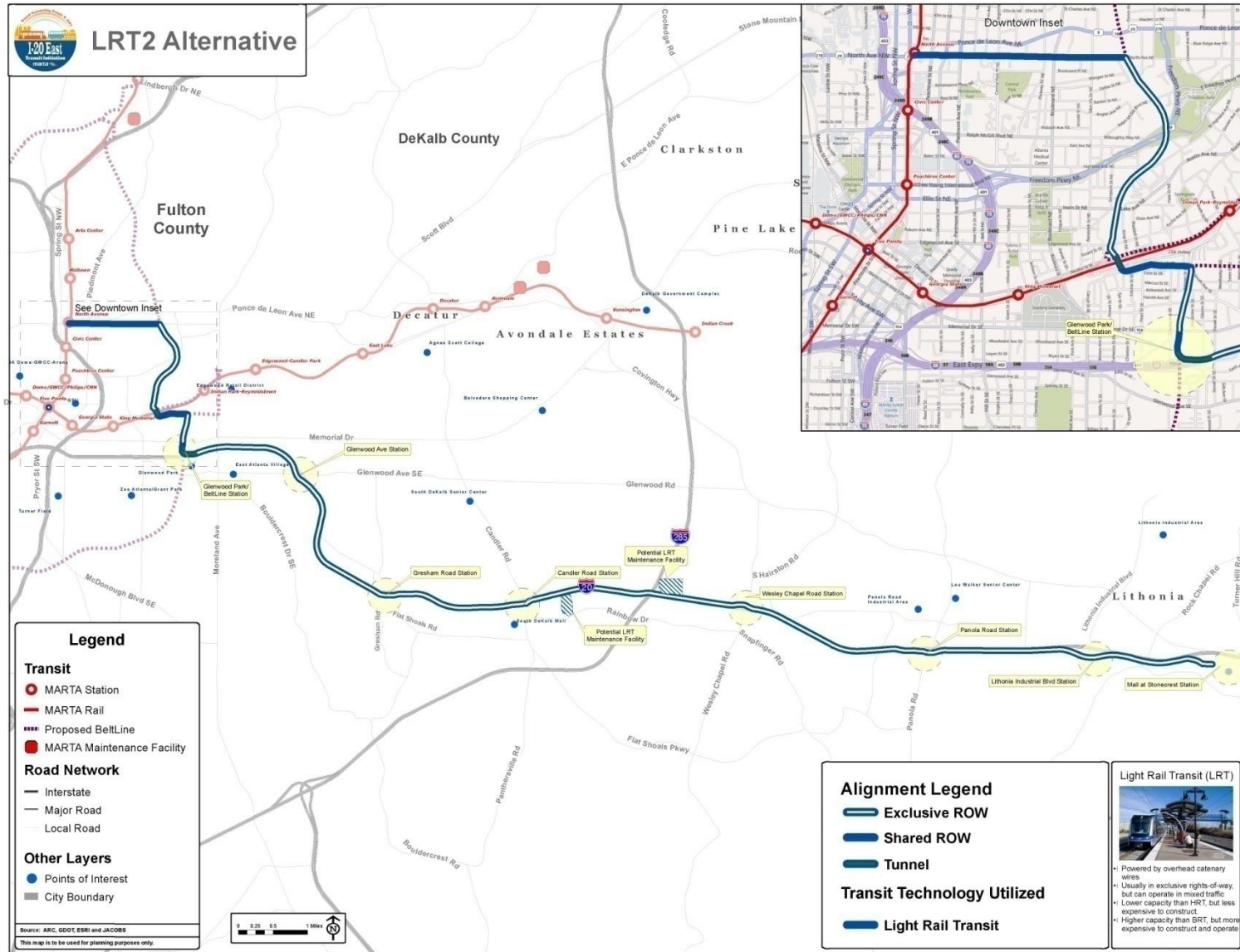
This alternative would include stops along the BeltLine alignment then stations along I-20 at Glenwood Park, Glenwood Avenue, Gresham Road, Candler Road, Wesley Chapel Road, Panola Road, Lithonia Industrial Blvd., and the Mall at Stonecrest. A conceptual map is provided in **Figure 4-10**. A map of the LRT2 Alternative is provided in **Figure 4-11**.

Figure 4-10: LRT2 Alternative Concept



As shown above, this alternative would utilize the BeltLine alignment to access Midtown Atlanta and the MARTA heavy rail system. LRT2 would serve as a new light rail service in the I-20 East Corridor.

Figure 4-11: LRT2 Alternative Map



4.2.6 Heavy Rail Transit Alternative 3 (HRT3)

HRT3 would extend the existing MARTA east-west heavy rail line 12 miles from the Indian Creek Station, south parallel to I-285, then east parallel to I-20 to the Mall at Stonecrest in eastern DeKalb County. This alternative would also include BRT service operating on I-20 between the Five Points Station and Wesley Chapel. This would be a premium BRT service which could potentially operate on surface streets, in High Occupancy Vehicle (HOV) lanes, High Occupancy Toll (HOT) lanes, dedicated lanes or in the shoulder of the interstate, which will be determined as part of subsequent environmental and engineering studies to provide the best possible transit solution within existing physical and environmental constraints.

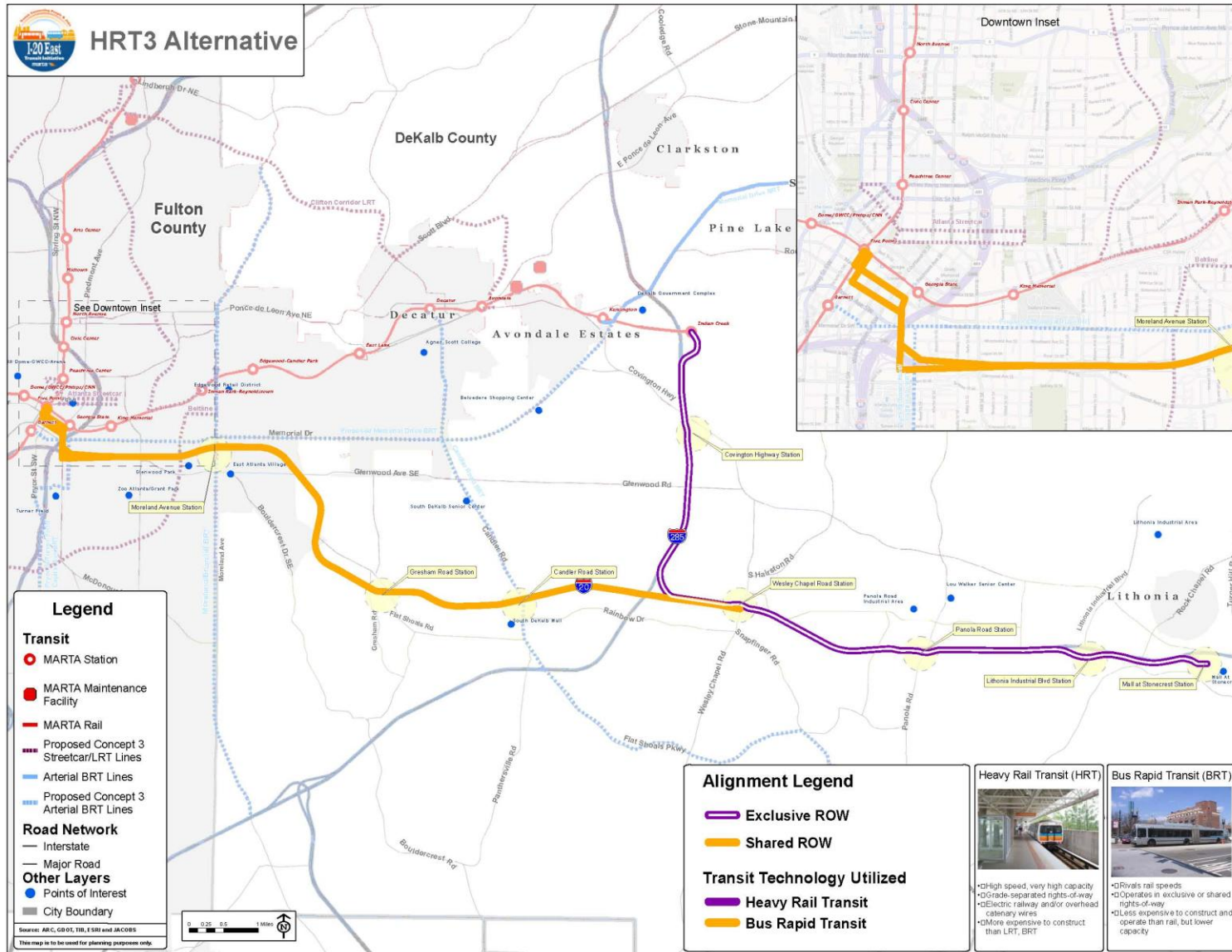
Stations along the HRT portion of this alternative would be located at Covington Highway, Wesley Chapel Road, Panola Road, Lithonia Industrial Boulevard, and Mall at Stonecrest. Stations for the BRT portion of the alternative would be located at Moreland Avenue, Glenwood Avenue, Gresham Road, Candler Road, and Wesley Chapel Road. A conceptual map of this alternative is provided in **Figure 4-12**. A map of the HRT3 Alternative is provided in **Figure 4-13**.

Figure 4-12: HRT3 Alternative Concept



HRT3 would extend MARTA's existing Green Line to provide new service in the I-20 Corridor. The extended Green Line would serve all new heavy rail stations as shown in the figure above, and then operate as an express service along the existing east line, serving only select stations in order to minimize travel times between Mall at Stonecrest and the Five Points Station. The Blue Line service would remain unchanged, providing local service to all existing stations between Indian Creek and Five Points Station.

Figure 4-13: HRT3 Alternative Map



4.2.7 Baseline/TSM Alternative

The Baseline/TSM Alternative is intended to be the best that can be done to improve mobility without making a major capital investment in fixed guideway infrastructure. This alternative is generally considered to be a low cost approach to addressing transportation problems in the study corridor. As such, the improvements associated with the Baseline/TSM Alternative are developed to respond to and satisfy the defined purpose and need associated with enhancing mobility in the study area. These improvements typically consist of a variety of actions to improve existing transportation services including modifications to existing bus routes, additions to existing park-and-ride facilities, and minor roadway signal improvements. The FTA guidance designates the Baseline/TSM Alternative to serve as the benchmark against which the Build Alternatives are evaluated in the New Starts program. To this end, the Baseline/TSM Alternative is utilized during the Tier 2 Screening as the basis for calculating incremental costs and benefits of a fixed guideway facility.

The I-20 East Baseline/TSM strategy focuses on developing a set of new express routes that provide linkages to downtown markets via connections to the existing MARTA heavy rail stations at Five Points or Indian Creek. The key objective of the Baseline/TSM strategy is to facilitate convenient transit access and connectivity by increasing service frequency, reducing transit travel times, and creating convenient opportunities for transfers to occur. To accomplish these objectives, new park and ride facilities, improvements to existing transit services and additional express services are proposed as part of the Baseline/TSM Alternative. More detail on the development and operational characteristics can be referenced in the *Baseline/Transportation System Management Alternative Report*.

The I-20 East Baseline/TSM strategy is a low cost approach to solving transportation needs in the corridor and includes the following:

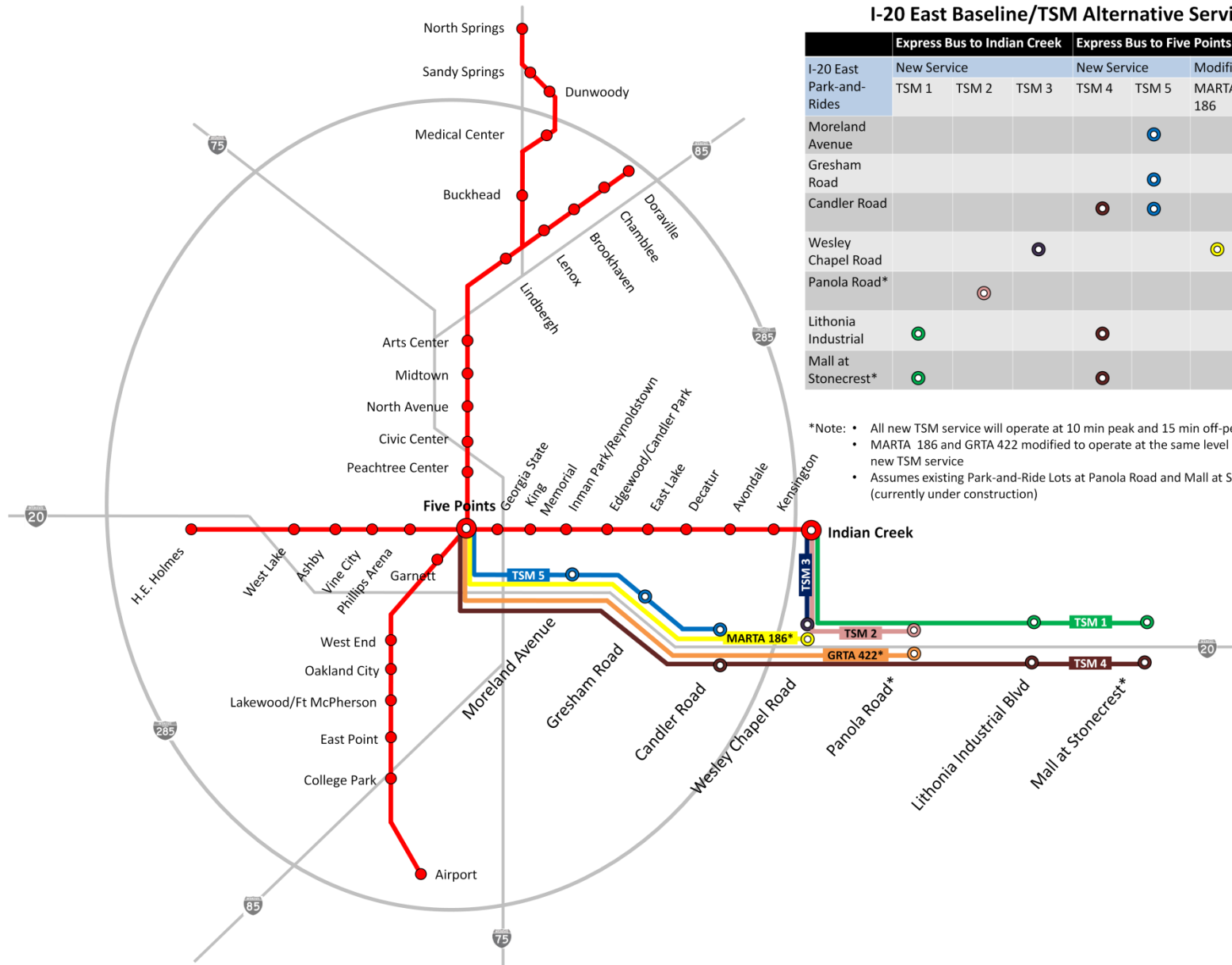
- Provide new park and ride facilities to expand opportunities to access transit.
- Enhance existing transit services to provide greater transit connectivity and accessibility within the corridor and the existing rail network; and
- Provide new limited stop express service with competitive travel times and destinations served by the Build Alternatives.

Figure 4-14 presents a map of the proposed Baseline/TSM Alternative, which includes the new and improved express routes and identification of new park-and-ride lots.

4.2.8 No Build Alternative

The No Build Alternative represents future transportation conditions if no investments are made beyond transportation projects that are already planned and committed in Atlanta region's fiscally constrained long-range transportation plan. The programmed projects included in the TSM can be found in the *Baseline/Transportation System Management Alternative Report*. As such, it serves as the base case against which each of the Build Alternatives is compared.

Figure 4-14: Baseline/TSM Alternative



I-20 East Baseline/TSM Alternative Service Plan

	Express Bus to Indian Creek			Express Bus to Five Points			
I-20 East Park-and-Rides	New Service TSM 1	New Service TSM 2	New Service TSM 3	New Service TSM 4	New Service TSM 5	Modified Service* MARTA 186	Modified Service* GRTA 422
Moreland Avenue					●		
Gresham Road					●		
Candler Road				●	●		
Wesley Chapel Road			●			●	
Panola Road*		●					●
Lithonia Industrial	●			●			
Mall at Stonecrest*	●			●			

*Note: • All new TSM service will operate at 10 min peak and 15 min off-peak headways
 • MARTA 186 and GRTA 422 modified to operate at the same level of service as new TSM service
 • Assumes existing Park-and-Ride Lots at Panola Road and Mall at Stonecrest (currently under construction)

4.2.9 Cost Estimates for Tier 2 Build Alternatives

Cost estimates for the Tier 2 Alternatives were completed through a refinement of the Tier 1 cost estimates and the integration of factors specifically related to the chosen technology for each alignment advancing from Tier 1. More specifically, this included:

- Matching appropriate technologies for the alignments advancing from Tier 1 Screening;
- Operational characteristics of a given technology with respect to the existing and planned transit infrastructure; and
- Right-of-way availability to accommodate a specific technology.

As such, the documents utilized to refine the initial Tier 1 estimates and develop cost estimates for Tier 2 Alternatives were as follows:

- *Station Cost Estimating Methodology* - This memorandum provided preliminary costs for HRT, LRT, and BRT technologies based on a comparison of similar projects throughout the US and was utilized to refine the Tier 1 cost estimates to include capital costs for stations based on their location and type.
- *Conceptual Right-of-Way Cost Estimating Methodology* – This memorandum documented the development of right-of-way costs for each alternative. Right-of-way estimates were developed through the assumption of an 80' footprint for each alternative and applying land values based on Tax Assessor Office information from Fulton and DeKalb Counties. An 80' wide ROW footprint was assumed to provide initial order-of-magnitude costs. These initial estimates were then inflated to reflect market values, scheduling, and administrative and court costs.

Table 4-1 presents the concept level cost estimates for the Tier 2 Build Alternatives. Please refer to the *I-20 East AA/DEIS Cost Estimating Methodology* and *Conceptual Right-of-Way Cost Estimating Methodology* memoranda for more detail on the methodology employed to develop these estimates.

Table 4-1: Cost Estimates for Tier 2 Alternatives

Alternative #	Alternative Name	Right-of-Way Cost	Capital, Professional, Finance, & Contingency Costs	Total Cost	Annual O&M Costs
HRT1	Heavy Rail Transit 1	\$233.7M	\$3,048M	\$3,281M	\$35.2M
LRT1	Light Rail Transit 1	\$233.7M	\$2,467M	\$2,700M	\$10.4M
BRT1	Bus Rapid Transit 1	\$233.7M	\$1,862M	\$2,111M	\$6.4M
HRT2	Heavy Rail Transit 2	\$116.7M	\$2,612M	\$2,729M	\$23.8M
LRT2	Light Rail Transit 1	\$112.7M	\$1,987M	\$2,115M	\$10.4M
HRT3	Heavy Rail Transit 2	\$107.4M	\$1,718M	\$1,840M	\$18.0M
TSM/Baseline	TSM/Baseline	\$41.9M	\$29M	\$70.9M	\$24.2M

4.3 Assumptions and Design Criteria

Table 4-2 presents the major assumptions considered during the development and evaluation of alternatives. These include design, cost estimating, transit service, forecasting, and right-of-way cost estimating assumptions.

Table 4-2: Major Assumptions

Design Assumptions	<ul style="list-style-type: none"> • All new HRT stations would be smaller, simpler stations that will cost less than traditional MARTA HRT stations. • No surface street operation or at-grade rail crossings for LRT alternatives with exception of BeltLine alignment for LRT2. • Sufficient capacity at existing rail maintenance facilities to maintain HRT vehicles. • Sufficient capacity at existing bus maintenance facilities to maintain BRT vehicles. Some additional equipment may be necessary. • A new storage and maintenance facility in the I-20 corridor would be required for LRT alternatives.
Capital Cost Estimates	<ul style="list-style-type: none"> • All cost estimates are reported in 2011 dollars. • Storage and maintenance facilities were only deemed necessary for LRT alternatives. Assumed that HRT and BRT vehicles would be stored and maintained at existing MARTA facilities.
Service Assumptions	<ul style="list-style-type: none"> • 10-minute peak and 20 minute off-peak headways. • Six car consists for HRT service. • Four car consists for LRT service.
Forecasting Assumptions	<ul style="list-style-type: none"> • No HOV or managed lanes along I-20 east of I-285 in year 2030. • GRTA express bus service would no longer serve the Panola Road park and ride lot.
Right-of-Way Cost Estimates	<ul style="list-style-type: none"> • 80' required right-of-way assumed for corridor. • Property costs based on current assessed value plus escalations factors. • Right-of-way requirements on publicly owned property assumed to have no cost.

Engineering Design Criteria

Each transit technology has its own set of design standards. Those standards are developed in conjunction with vehicle dimensions and operating characteristics. The different design criteria for the three transit technologies are found in **Table 4-3**. Design criteria were established utilizing technology standards for LRT, BRT, and HRT.

Table 4-3: Design Criteria

I-20 East Design Criteria		
<p>Light Rail Transit</p> <p>Minimum Horizontal Curve Radii:</p> <ul style="list-style-type: none"> • Minimum • * <math>35\text{mph} = 500\text{ ft radius}</math> • * <math>35\text{mph} = 700\text{ ft radius}</math> • Absolute minimum on embedded track • * <math>5\text{mph} = 82\text{ ft radius}</math> <p>Grades</p> <ul style="list-style-type: none"> • Preferred grade = 4% max sustained • Maximum grade = 6% up to 2,500 feet • Absolute maximum = 7% up to 500 feet <p>Vertical Bridge Clearance Requirements</p> <ul style="list-style-type: none"> • 23 ft between railroad and roadway overpass • 18 ft between roadway and railroad overpass <p>Station Platforms</p> <ul style="list-style-type: none"> • Absolute minimum length = 330 ft • Maximum grade = 1% <p>Vehicle Design Speed</p> <ul style="list-style-type: none"> • Desirable = 55 mph • Minimum = 25 mph <p>Passenger Capacity (per vehicle)</p> <ul style="list-style-type: none"> • Seated = 69 (approx) • Max density = 4 people/m² <p>Vehicle Lengths</p> <ul style="list-style-type: none"> • LRT vehicle = 90 ft <p>Minimum Tangent Length Between Curves</p> <ul style="list-style-type: none"> • Desirable = 200 ft • Minimum = 100 ft 	<p>Heavy Rail Transit</p> <p>Minimum Horizontal Curve Radii:</p> <ul style="list-style-type: none"> • 60mph = 1,425 ft radius • 50mph = 1,000 ft radius • 37mph = 750 ft radius • 25mph = 750 ft radius <p>Grades</p> <ul style="list-style-type: none"> • Preferred maximum grade = 3% • Maximum grade = 4% • Minimum grade for underground and aerial structures = 0-3% <p>Vertical Bridge Clearance Requirements</p> <ul style="list-style-type: none"> • 23 ft between railroad and roadway overpass • 18 ft between roadway and railroad overpass <p>Station Platforms</p> <ul style="list-style-type: none"> • Absolute minimum length = 600 ft • Maximum grade = 1% <p>Vehicle Design Speed</p> <ul style="list-style-type: none"> • Desirable = 70 mph • Minimum = 25mph <p>Passenger Capacity (per vehicle)</p> <ul style="list-style-type: none"> • Seated = 64-68 • Full = 130-140 • Max = 235-250 (crush) <p>Minimum Tangent length between curves</p> <ul style="list-style-type: none"> • The greater of 3 x speed (in mph) or 100 ft <p>Vehicle Lengths</p> <ul style="list-style-type: none"> • HRT vehicle = 75 ft in locked pairs 	<p>Bus Rapid Transit</p> <p>Minimum Horizontal Curve Radii:</p> <ul style="list-style-type: none"> • 35 mph at 4% superelevation = 420 ft radius • 35 mph at normal crown (2%) = 460 ft radius <p>Grades</p> <ul style="list-style-type: none"> • Maximum grade = 8% <p>Vertical Bridge Clearance Requirements</p> <ul style="list-style-type: none"> • 23 ft between busway and roadway overpass • 18 ft between roadway and busway overpass <p>Station Platforms</p> <ul style="list-style-type: none"> • Absolute Minimum Length = 80 ft <p>Vehicle Design Speed</p> <ul style="list-style-type: none"> • Desirable = 65 mph • Minimum = 25 mph <p>Passenger Capacity (per vehicle)</p> <ul style="list-style-type: none"> • Standard Bus = 39 seated, 60 max • Articulated BRT Bus = 60 seated, 90 max <p>Vehicle Lengths</p> <ul style="list-style-type: none"> • Standard Bus = varies • Articulated BRT Bus = 60 ft <p>Minimum tangent length between curves</p> <ul style="list-style-type: none"> • Dependent on radii, superelevation rate & roadway width <p>Superelevation</p> <ul style="list-style-type: none"> • Urban curbed @ 35 mph = 4% max <p>All intersections within the BRT Alternatives would have Signal Priority or Signal Preemption</p>
<p>The minimums are listed, however, the design is completed with a factor of safety and best solution practices.</p>		
