



CONNECT4

GA 400 TRANSIT INITIATIVE

Alternatives Analysis

DEFINITION OF ALTERNATIVES REPORT:
Technical Appendix

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1.0 Introduction

This Technical Appendix is intended to provide an inventory of relevant data that supplement and support the findings in the GA 400 Alternatives Analysis (AA) – Definition of Alternatives Report. The appendix includes the analyses of Screen 1 and Screen 2 performances measures, the capital and operating & maintenance costs, and the preliminary operating plans.

1.1.1 Definition of Alternatives Report Background

The Definition of Alternatives Report defines the alternatives considered for evaluation for the GA 400 Corridor. It provides an assessment of the socioeconomic, land use, environmental and travel conditions that potentially support the case for a major transit investment in the study area. This document highlights the key information pertaining to known features, trends, opportunities and constraints that may warrant further analysis as the project advances through the study process. A Technical Appendix is included to provide details on the performance data collected and analyzed to support the findings summarized in this report.

The GA 400 Corridor Alternatives Analysis (AA) addresses the travel market generally extending north along GA 400 from I-285 to the Fulton – Forsyth County boundary, a distance of approximately 15 miles.

1.1.2 Purpose & Goals

The purpose of the project is to provide reliable, convenient, efficient, and sustainable transit service in the GA 400 corridor study area by:

- Providing high capacity transit (bus and/or rail) through the GA 400 corridor study area,
- Improving transit linkages and coverage to communities within the study area, and
- Enhancing mobility and accessibility to and within the study area by providing a more robust transit network that offers an alternative to automobile travel.

The goals and objectives of the GA 400 Corridor AA are:

1. Improve Mobility and Access
2. Support Land Use & Economic Development Planning
3. Provide Cost-Effective Transit Service
4. Minimize Environmental Impacts

1.1.3 Evaluation Process

Evaluation criteria and performance measures were used to evaluate how well the proposed alternatives would meet the project purpose and need, and associated goals and objectives. The measures are both quantitative and qualitative to allow for a comparison of the order of magnitude benefits and detriments of the proposed alternatives. In several cases, one performance measure correlates to multiple project objectives, and certain objectives have been defined by more than one performance measure. It is important to note that care has been taken to include measures that would be effective in demonstrating the relative differences between alternatives.

The following three levels of evaluation were used to define and screen alternatives to identify a Locally Preferred

Alternative (LPA) for the GA 400 corridor:

Fatal Flaw Analysis – to identify Build Alternatives to advance into Screen 1

Screen 1 – to identify Build Alternatives to advance into Screen 2

Screen 2– to identify the LPA

1.1.4 Fatal Flaw Analysis

A screening process was developed for the Fatal Flaw Analysis to assist project participants and decision-makers in identifying and refining alternatives that would address the overall purpose, goals and objectives established for the project. The Fatal Flaw Analysis included a three-step process that: (1) identified potential transit technologies; (2) paired the best transit technology types to nine potential alignments in the GA 400 and SR-9 corridors and (3) applied evaluation criteria to the universe of alternatives from the second step to determine a manageable number of alternatives to advance for further analysis.

Based on the results of the Fatal Flaw Analysis and recommendations from the Technical Advisory Committee (TAC), three transit technology types (bus rapid transit, light rail and heavy rail), and four alternatives were advanced for further evaluation in the Screen 1 phase: GA 400-1, GA 400-3, GA 400-6, and SR 9-2.

2.0 Screen 1 Evaluation of Build Alternatives

Table 2.0-1 shows the alternatives that advanced from the Fatal Flaw Analysis into Screen 1 for further evaluation.

The Screen 1 alternatives are comparatively analyzed and rated across several performance measures that support the four goals for transit in the Georgia 400 Corridor: (1) improve mobility and access; (2) support land use and economic development planning; (3) provide cost-effective transit

services; and (4) minimize environmental impacts.

For each performance measure in Screen 1, alternatives are compared to each other and rated as shown in Table 2.0-2 below. Each alternative is rated either High (2), Medium (1), or Low (0) for each performance measure. The top performing alternative is given a High score, and the other alternatives are rated relative to the highest performing alternative.

Table 2.0-1: Build Alternatives for Screen 1

Corridor	Alignment Name	Alignment Description	Technology
GA 400	GA 400 - 1	North Springs MARTA Station - GA 400 - Windward Parkway with the following design options between Mansell Road and Windward Parkway: <ul style="list-style-type: none"> • A – GA 400 • B – Mansell Road - North Point Parkway – Haynes Bridge Road - GA 400 • C –Mansell Road - North Point Parkway • D – New transit interchange at Encore Parkway 	BRT
			LRT/SC
			HRT
	GA 400 - 3	North Springs MARTA Station - GA 400 - Holcomb Bridge Road - SR 9 - Mansell Road - North Point Parkway - Windward Parkway	BRT
GA 400 - 6	North Springs MARTA Station - GA 400 - Holcomb Bridge Road - SR 9 - Windward Parkway	BRT	
SR 9	SR 9 - 2	Dunwoody MARTA Station (potential tie into Revive 285) - Hammond Drive- SR 9 - Mansell Road - North Point Parkway - Windward Parkway	BRT

Table 2.0-2: Screen 1 Rating System

Rating	Deviation from Highest Performing	Scoring
High	0 to 10%	2
Medium	10 to 20%	1
Low	Greater Than 20%	0

2.1 Goal 1: Improve Mobility and Access

2.1.1 Potential impacts to roadway capacity

Methodology: This performance measure reflects the relative impact of the transit alignment on roadway capacity. Fewer impacts to roadway capacity are associated with an increasing degree of separation between transit facilities and general travel lanes. The analysis is based on various alignment types, including exclusive at-grade, grade separated (tunnel or aerial), or in mixed traffic. Table 2.1.1 below reports the estimated miles of roadway that would be impacted by each alternative. Higher ratings are assigned to those alternatives with longer lengths of grade separated operation or exclusive guideway, and less alignment length in mixed traffic along existing roadways.

Source(s):

- Aerial imagery

Table 2.1-2 provides the cumulative numbers for the total alignment, while Table 2.1-3 provides per station averages.

2.1.3 Major trip generators/activity centers within a 10-minute walk and drive of stations

Methodology: This performance measure identifies uses within a 10-minute walk or drive of proposed stations that generate a high number of vehicular trips. Esri Network Analyst was used to create 10-minute walk and drive travel areas (walksheds and drivesheds) from each proposed station. The ARC's Activity Center point data was then selected within each of those sheds. Table 2.1-3 below reports the number of those activity centers within the respective walk and drive sheds. High ratings are given to alternatives with the highest number of trip generators/activity centers within 10 minutes because the implementation of transit has potential to provide those centers with transit and incite a modal shift away from vehicular traffic trips to transit.

Table 2.1-1: Potential Impacts to Roadway Capacity

Screen 1 Measures	GA400-1A HRT	GA400-1A	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Potential Impacts to Roadway Capacity (in miles)	0	0	2.1	5.7	10.1
Rating	2	2	0	0	0

Summary of Evaluation Findings:

The Georgia 400-1 alignments are rated highest because they are proposed as exclusive guideway systems along their entire lengths, and therefore have no anticipated impacts on roadway capacity. The alignment for alternative SR9-2 is almost entirely along State Route 9, resulting in over 10 miles of potential roadway capacity impacts.

2.1.2 Projected population, household, and employment within a 10-minute walk and drive of stations

Methodology: This measure identifies 2040 estimates for population, households, and employment projections within a 10-minute walk and drive of proposed stations using the Esri Network Analyst tool. This network-based spatial analysis allows users to dynamically model realistic network conditions, including turn restrictions, speed limits and traffic conditions at different times of the day. A 10-minute walk time was chosen as a standard equivalence to walking ½ mile. Drive time calculation takes into consideration congested roadway conditions.

Source(s):

- Atlanta Regional Commission (ARC), Plan 2040
- Esri Network Analyst

Table 2.1-2: Screen 1 – Per Station Measures

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/ BRT	GA400-3	GA400-6	SR9-2
No. of Stations	4	6	7	7	11
Projected population, household, and employment within a 10-minute walk and drive of stations					
Population (drive) Rating	15,784	15,502	14,984	15,590	12,807
Households (drive) Rating	6,437	6,784	6,508	6,818	5,754
Employment (drive) Rating	20,002	17,360	16,306	17,347	15,898
Population (walk) Rating	771	856	894	944	1,000
Households (walk) Rating	312	387	394	419	468
Employment (walk) Rating	1,115	1,097	1,084	1,110	1,307

Summary of Evaluation Findings:

The alternatives with the most stations perform the highest among the cumulative measures. The per station measures show that populations and employment served in each station area vary by alignment. Overall, the SR9-2 alternative performs highest in cumulative measures, but performs lowest in the per station measures for employment/households/population within a 10-minute drive. The other alternatives have an overall similar rating under the per station measures when the individual metrics are totaled.

Source(s):

- ARC, Activity Centers Geographic Information Systems (GIS) data
- Esri Network Analyst

Table 2.1-3: Major Trip Generators & Activity Centers within a 10-Minute Walk 10-Min. Drive

Screen 1 Measures	GA400-1A HRT	GA400-1A	GA400-3	GA400-6	SR9-2
Number of Stations in Alignment	4	6	7	7	11
Major trip generators/activity centers within a 10-minute <i>walk</i> of stations Rating	2 0	2 0	3 0	3 0	4 2
Major trip generators/activity centers within a 10-minute <i>drive</i> of stations Rating	5 0	7 2	7 2	7 2	7 2

Summary of Evaluation Findings:

Alternative SR-9 rated highest for activity centers both within a 10-minute walk or 10-minute drive. The GA-400-1A HRT alternative rates the lowest for both.

2.1.4 Low-income, minority, elderly and zero-car populations/households within a 10-minute walk of stations

Methodology: Low-income, minority, and senior populations, as well as zero-car households have a higher likelihood of being transit-dependent. This performance measure evaluates the aforementioned demographics within a 10-minute walk of the proposed stations for each alignment alternative. Census 2010 tract level data is the source for the minority and senior populations. The data used for the zero-car and low-income analysis is a composite of the surveys between 2006-2010 from the U.S. Census' American Community Survey. Each data source is recalculated based on the land area proportion of each census tract within the 10-minute walkshed, derived using Esri Network Analyst. Higher ratings are scored based on higher transit-dependent populations served in each alignment alternative. The table below (2.1-4) reports per station averages for each measure. Higher ratings are based on the higher per station figures.

Source(s):

- U.S. Census Bureau, Census 2010
- U.S. Census, American Community Survey (2006-2010)
- Esri Network Analyst

Table 2.1-4: Screen1- Per Station Measures

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/ BRT	GA400-3	GA400-6	SR9-2
No. of Stations	4	6	7	7	11
Low-income, minority, & elderly populations, and zero-car households w/in 10-minute walk of stations					
Low-income Rating	74	121	106	118	82
Minority Rating	310	395	379	436	346
Elderly Rating	48	53	53	63	87
Rating	10	15	16	16	23

Summary of Evaluation Findings:

The alternatives were rated according to their per-station averages rather than cumulatively to better evaluate the populations served at each station in the alternative. Alternatives GA400-1A and GA400-6 would service the highest number of low-income and minority residents per station, while SR9-2 would serve a higher number of seniors and zero-car households. GA400-1A with HRT generally rates the lowest overall.

2.1.5 Interface with existing transit and future Concept 3 rapid transit service

Methodology: This measure considers potential access to existing and proposed transit as described in Concept 3, the Atlanta region's long-range transit vision. Esri Network Analyst was used to spatially assess the potential for the alternatives to interface with existing and potential rapid transit envisioned in Concept 3. Furthermore, this analysis also includes the degree to which a proposed transit project can interface with and/or utilize existing transit infrastructure such as park and ride lots (P&R lots), vehicle fleets and maintenance facilities. Higher ratings are assigned qualitatively to those alternatives that provide a higher level of interface with existing and proposed transit. Table 2.1-5 reports the ratings given to each alignment alternative and the summaries below the table provide a synopsis of the potential connections for each alignment.

Source(s):

- ARC, Concept 3

Table 2.1-5: Interface with Existing Transit & Future Concept 3 Rapid Transit Services

Screen 1 Measures	GA400-1A HRT	GA400-1A	GA400-3	GA400-6	SR9-2
Number of Stations in Alignment	4	6	7	7	11
Potential Interfaces	<ul style="list-style-type: none"> -Existing P&R Lots at Windward & Mansell; MARTA Bus 85, 140, 143, 185, GRTA 400; -Seamless connection with existing MARTA Rail. -Use of existing maintenance/storage at Armour Yard. - Concept 3 Express Bus from Windward to Cumming; Suburban Bus Service - Peachtree Corners (State Route 140); Acworth (Crossville Rd); Canton (SR 140). 	<ul style="list-style-type: none"> -Existing P&R Lots at Windward & Mansell; MARTA Bus 85, 140, 143, 185, GRTA 400; -New location for maintenance/storage. - Concept 3 Express Bus from Windward to Cumming; Suburban Bus Service - Peachtree Corners (State Route 140); Acworth (Crossville Rd); Canton (SR 	<ul style="list-style-type: none"> -Existing P&R Lots at Windward & Mansell; MARTA Bus 85, 140, 143, 185, GRTA 400; -New location for maintenance/storage. - Concept 3 Express Bus from Windward to Cumming; SR 120 BRT; Suburban Bus Service - Peachtree Corners (State Route 140); Acworth (Crossville Rd); Canton (SR 	<ul style="list-style-type: none"> -Existing P&R Lots at Windward & Mansell; MARTA Bus 85, 140, 143, 185, GRTA 400; -New location for maintenance/storage. - Concept 3 Express Bus from Windward to Cumming; SR 120 BRT; Suburban Bus Service - Peachtree Corners (State Route 140); Acworth (Crossville Rd); Canton (SR 	<ul style="list-style-type: none"> -Existing P&R Lot at Windward; MARTA Bus 5, 85, 87 140, 143, 150, 185, GRTA 400; -New location for maintenance/storage. - Concept 3 Express Bus from Windward to Cumming; SR 120 BRT; Suburban Bus Service - Peachtree Corners (State Route 140); Acworth (Crossville Rd); Canton (SR
Qualitative Rating	2	1	1	1	1

Summary of Evaluation Findings:

Alternative GA 400-1A HRT has advantages in that it would provide a seamless connection with existing MARTA rail without the need for riders to make a transfer to another transit type. This alternative would also utilize the existing vehicle maintenance and storage facility at Armour Yard, whereas the other alternatives would need a new location for storage and maintenance for non-HRT vehicles. For these advantages GA 400-1A was given a High rating. The other alternatives have a relatively similar number of connections to existing routes and future transit services (planned in Concept 3).

2.1.6 Goal 1 Totals (Improve Mobility and Access)

The GA 400-1A alternatives provide the least potential to impact roadway capacity because their alignments are within the existing GA 400 right-of-way. The other alternatives would have a varying amount of alignment along surface roads (SR 9-2 has the most), and would therefore have more impact to roadway capacity. For the mobility measure GA 400-1A and GA 400-1A rated best.

For the accessibility and connectivity measures, SR-9 provides the greatest potential to serve larger numbers of population and employment within their ½-mile station areas, because this alternative has the most alignment within surface roadways and therefore closer to areas of residential and employment. GA 400-1A has the most potential to interface with existing and planned transit because of its seamless connection to exiting MARTA heavy rail and the ability to utilize the exiting storage and maintenance facility.

Cumulatively, alternatives SR-9, GA 400-6 and GA 400-1A best meet Goal 1 (improving mobility and access). Totals for each objective and overall Goal 1 total is provided in the tables below.

Table 2.1-6: Mobility

Alternative	Rating				
	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Potential Impacts to Roadway Capacity	2	2	0	0	0
Total - Mobility	2	2	0	0	0

Table 2.1-7: Accessibility & Connectivity

Alternative	Rating				
	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Population within a 10-minute Drive of Stations	2	2	2	2	1
Households within a 10- minute Drive of Stations	2	2	2	2	1
Employment within a 10-minute Drive of Stations	2	1	1	1	0
Population within a 10- minute Walk of Stations	0	1	1	2	2
Households within a 10-minute Walk	0	1	1	1	2
Employment within a 10-minute Walk of Stations	1	1	1	1	2
Major Trip Generators within a 10-minute Walk	0	0	0	0	2
Major Trip Generators with a 10-minute Drive	0	2	2	2	2
Low-Income Population within a 10-minute Walk of Stations	0	2	1	2	0
Minority Population within a 10-minute Walk of Stations	0	2	1	2	1
Senior Population within a 10-minute Walk of Stations	0	0	0	0	2
Zero-Car Households within a 10-minute Walk of Stations	0	0	0	0	2
Interface with Existing Transit & Future Concept 3 Transit	2	1	1	1	1
Total - Accessibility & Connectivity	9	15	13	16	18
TOTAL GOAL 1 (Mobility + Access & Connectivity)	11	17	14	17	18

2.2 Goal 2: Support Land Use and Economic Development Planning

2.2.1 Consistency with adopted local and regional plans

Methodology: The degree to which an alternative is consistent with land use policies is evaluated based on a review of the adopted local and regional plans, which include comprehensive land use plans, Livable Centers Initiative (LCI), corridor studies and the Concept 3 regional transit plan. The assessment relies upon a qualitative evaluation comparing the plans with the alternatives. Relevant plans identified in the Existing Conditions and Future Trends Report (May 2012) are reviewed for their support of, opposition to, or exclusion of the following five factors: transit-supportive nodal development, multimodal transportation, general and explicit support of fixed-guideway transit, and accommodation of transit-oriented land uses at specific station areas. Higher ratings are assigned to those alternatives that show greater support of the local and regional plans.

Data Source(s):

- ARC, LCI studies and Concept 3
- Local and regional plans

Table 2.2-1: Consistency with Adopted Local & Regional Plans

Screen 1 Measures	GA400-1A HRT	GA400-1A	GA400-3	GA400-6	SR9-2
Number of Stations in Alignment	4	6	7	7	11
Supports the expansion of transit services?	Y	Y	Y	Y	Y
Improves accessibility & mobility?	Y	Y	Y	Y	Y
Supports mixed use, TOD?	Y	Y*	N	N	N
Supports multi-modal transportation planning?	Y	Y	Y	Y	Y
Promotes/establishes new connectivity?	Y	Y	Y	Y	Y
Number of Criteria Met (out of 5)	5	5	4	4	4
Consistency with Adopted Local & Regional Plans (Rating)	2	2*	1	1	1

*GA400-1A has split rating: LRT = High rating (2), BRT = Medium rating (1)

Summary of Evaluation Findings:

The GA400-1 alternative and GA400-1A alternative (with LRT) support all five of the criteria identified for this performance measure. The other three alternatives, as BRT alternatives, meet four of the five criteria but fail to meet the objective of supporting mixed-use, transit-oriented development or redevelopment.

2.2.2 Transit-supportive future land uses and zoning within ½ mile of stations

This measure is intended to identify the alternatives that serve the areas planned for transit-supportive future land uses. The Esri spatial analysis tool is used to calculate the acreages of transit supportive future land uses within ½ mile of proposed stations. The residential density threshold of 9 units per acre is considered supportive of fixed guideway transit according to frequently cited research by the Transportation Research Board (TRB). Other categories considered to be transit-supportive include office-institutional, commercial and mixed-use, which permit a mixture of high-density residential, office, and retail. Higher ratings are assigned to those alternatives that are in proximity to the greatest acres of transit-supportive land uses.

Source(s):

- Transportation Research Board
- Local zoning and future land use maps

Table 2.2-2: Transit-supportive Future Land Use & Zoning Within ½ Mile of Stations

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations in Alignment	4	6	7	7	11
Acres of transit-supportive future land uses and zoning within ½ mile of stations	1,146	1,690	2,033	1,833	3,083
Per Station Acres	286	282	290	269	280
Rating	2	2	2	2	2

Summary of Evaluation Findings:

The Screen 1 findings show a relatively equivalent amount of transit-supportive land use and zoning within ½ mile of stations among all the alternatives.

2.2.3 Goal 2 Totals (Support Land Use & Economic Development Planning)

All alternatives had a relatively similar amount of acreage of the desired future land use and zoning within ½ mile of their proposed stations. The heavy rail and light rail alternatives

scored higher in the first measure because they would be supportive of mixed use or transit-oriented development (TOD), whereas the bus rapid transit alternatives would be less likely to support TOD development. Alternatives GA 400-1A HRT and GA 400-1A (with LRT) best meet Goal 2 (supporting land use and economic development planning). The table below (2.2-3) shows the cumulative totals for Goal 2.

Table 2.2-3: Goal 2 Totals

Alternative	Rating				
	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Consistency with Adopted Local/Regional Plans	2	2*	1	1	1
Transit-supportive future land use and zoning within ½ mile of stations	2	2	2	2	2
Total Goal 2	4	4	3	3	3

*GA400-1A has split rating: LRT = High rating (2), BRT = Medium rating (1)

2.3 Goal 3: Provide Cost-Effective Transit Service

2.3.1 Annual Operating and Maintenance (O&M) Costs

Methodology: Annual O&M costs are estimated for each alternative and the incremental costs above the No-Build scenario are calculated. Rail service, peak rail cars, annual revenue car-miles, annual revenue train-hours, number of stations, miles of track, and number of rail storage and maintenance facilities are the key service variables used to estimate operating and maintenance costs. The service variables are multiplied by unit costs and productivity ratios (for labor expenses) to calculate the costs for each expense line item. The service variables used to estimate O&M costs for bus service are: peak buses, annual revenue bus-miles, annual revenue bus-hours and number of bus garages. Additionally, the average roadway O&M costs from Georgia Department of Transportation (GDOT) and industry average transit O&M costs are taken into account in the O&M cost estimates of the alternatives.

O&M costs for Screen 1 are based on the operating requirements necessary to meet MARTA service standards, and thus, vehicle operating capacity and potential ridership are not taken into consideration. Higher ratings are assigned to those alternatives with lower annual O&M costs.

Source(s):

- MARTA, Metropolitan Atlanta Rapid Transit Overview Committee (MARTOC) Report, FY2012
- Charlotte Area Transit System (CATS)

Table 2.3-1: Annual O&M Costs

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Annual Operating and Maintenance (O&M) Costs (in millions)	\$15.2	\$15.8	\$7.2	\$6.5	\$7.6
Rating	0	0	2	2	2

Summary of Evaluation Findings:

GA400-1A HRT and GA400-1A had the highest estimated annual operating and maintenance costs (\$15.2 and \$15.8 million), and therefore were rated lower than the other three alternatives.

2.3.2 Construction Capital Costs

Methodology: Project costs for each of the alternative technologies have been developed using the FTA Standard Cost Categories established for New Starts. Specifically, capital costs for Screen 1 were developed based on three methods for estimating unit prices, including:

- Historical bid prices;
- Analysis of production rates, labor, equipment rates, and material costs for each construction activity;
- Parametric unit costs.

These methods have been used individually and in combination. Furthermore, the costing methodology is consistent with FTA guidelines as well as the unit costs associated with the transit projects under the Georgia's Transportation Investment Act of 2010. A range of high and low capital unit costs are applied to obtain a range of potential capital costs for a given alternative. Higher ratings are assigned to those alternatives associated with lower construction capital costs.

Source(s):

- American Public Transportation Association (APTA)
- Georgia Department of Transportation (GDOT)
- Charlotte Area Transit System (CATS)

Table 2.3-2: Construction Capital Costs

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Per mile construction costs (in millions)	\$169.9	\$165.3	\$45.6	\$54.2	\$47.4
Rating	0	0	2	1	2

Summary of Evaluation Findings:

GA400-1A HRT and GA400-1A had significantly higher estimated construction capital costs compared to the other three alternatives, and therefore were rated 'Low', while the other alternatives were rated 'High'.

2.3.3 Goal 3 Totals (Provide Cost-Effective Service)

GA 400-1A and GA 400-1A HRT had the highest annual O&M costs, and highest per-mile construction costs. GA 400-3, GA 400-6 and SR9-2 would each have annual O&M costs that are about half of the GA 400-1A alternatives, and each have much lower construction costs; however, GA 400-6 had a higher per-mile construction cost than GA 400-3 and SR 9-2. GA 400-3 and SR 9-2 provide the lowest construction and ongoing costs; therefore these two alternatives best meet Goal 3. Table 2.3-3 provides the cumulative totals for Goal 3.

Table 2.3-3: Costs

Screen 1 Measures	Rating				
	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Annual Operating and Maintenance Costs	0	0	2	2	2
Per Mile Construction Costs	0	0	2	1	2
Total Goal 3	0	0	4	3	4

2.4 Goal 4: Minimize Environmental Impacts

2.4.1 Acres of potentially impacted wetlands and water bodies within 500 feet of alignments and ½ mile of stations

Methodology: Potentially impacted wetlands and water bodies are identified using the National Wetlands Inventory GIS database and the U.S. Geological Survey's National Hydrography dataset. Wetlands and open water bodies are calculated in land acres within 500 feet of the proposed alignments and within ½ mile surrounding proposed stations. Rivers and streams are calculated by length (linear feet) within 500 ft. of the alignments and ½ mile of stations. Higher ratings are assigned to those alternatives in proximity to smaller amounts (acres, linear feet) of water resources.

Source(s):

- U.S. Fish and Wildlife Service, National Wetlands Inventory
- U.S. Geological Survey, National Hydrography Dataset

Table 2.4-1: Screen1- Cumulative (total alignment) Measures

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
No. of Stations	4	6	7	7	11
Wetland Impacts (Acres w/in 500 ft. of alignments & 1/2 mile of Stations)	45.3	50.5	69.6	8.6	85.4
Rating	0	0	0	2	0
Impacts to Open Water (Acres w/in 500 ft. of alignments & 1/2 mile of Stations)	22.7	23.1	34.7	28.1	30.5
Rating	2	2	0	0	0
Impacts to Rivers/Streams (Linear feet w/in 500 ft. of alignments & 1/2 mile of Stations)	37,073.2	44,960.5	57,419.0	43,426.0	88,417.4
Rating	2	0	0	1	0

Summary of Evaluation Findings:

The half-mile area surrounding the stations has a greater potential impact on water resources than the 500-foot buffer surrounding the alignments. GA400-6 would have a significantly lower impact to wetland resources than the other alignments, while SR 9-2 would have the most. Impacts to open water resources are lowest with the GA 400-1A and GA 400-1A HRT alternatives; and GA 400-1A would have the least impact to rivers and streams. Differences in impacts are due to different alignments and the number and location of stations. GA 400-1A and GA 400-1A HRT generally would have less impact to physical resources because the alignment is along GA 400, and stations are close to existing highway interchanges.

2.4.2 Number of potential impacts to historic resources within 500 feet of alignments and ½ mile of stations

Methodology: The number of historic resources is determined using the GIS layer developed by Historic Preservation Division of Georgia’s Department of Natural Resources, as well as resources from the National Register of Historic Places. This performance measure evaluates potential impacts to historic resources and districts. Resources were evaluated within a buffer of 500 feet from the centerline of the potential alignments and within ½ mile of the potential station areas. Impacts to historic districts are reported in acreage of the districts within the buffer areas, while impacts to historic resources are reported by number of resources within the buffers. Higher ratings are based on lower amounts of historic resources impacted by the alignments and station areas.

Source(s):

- National Register of Historic Places
- Georgia’s Natural, Archaeological and Historic Resources GIS

Table 2.4-2: Screen1- Cumulative (total alignment) Measures

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/ BRT	GA400-3	GA400-6	SR9-2
No. of Stations	4	6	7	7	11
Historic Resources within ½ mile of stations and 500 ft. of alignments	6	12	15	139	88
Rating	2	0	0	0	0
Historic District acreage within ½ mile of stations and 500 ft. of alignments	1.2	1.2	34.5	159.8	590.5
Rating	2	2	0	0	0

Summary of Evaluation Findings:

The GA400-1A HRT has the least number of potentially impact historic resources within ½ mile of the proposed stations or within 500 ft. of its alignment. GA 400-1A and GA 400-1A HRT have the lowest acreage of historic districts within their impact areas. Alternatives SR-9-2 and GA 400-6 would have significantly higher potential impacts to historic resources, due to a greater length of their alignments running along surface streets away from Georgia 400. Differences in impacts between GA 400-1A and GA 400-1A HRT are due to the lower number of stations in the HRT alternative – their impacts within 500 feet of alignment are the same

2.4.3 Estimated community impacts/disruptions and number of displacements

Methodology: Potential impacts (e.g. noise, vibration, visual impacts) on neighborhoods, residences, and businesses located along the alignments or near the proposed stations are assessed by acreage. A count of the parcels, in addition to acres of park lands located within 500 feet of alignments, is used for assessing number of potential displacements. The parcel data is overlaid on the ARC existing land use (LandPro) data to cumulate the affected residential, commercial, and institutional parcels. Higher ratings are given to alternatives with the least impacts or displacements.

Data Source(s):

- DeKalb County and Fulton County parcel data
- ARC, LandPro dataset
- Screening Survey

Table 2.4-3: Community Impacts and Number of Displacements

Screen 1 Measures	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
No. of Stations	4	6	7	7	11
Impacts (acreage)	601	601	696	900	1,042
Rating	2	2	2	0	0
Displacements (no. of parcels)	343	343	379	422	449
Rating	2	2	1	0	0

Summary of Evaluation Findings:

GA400-1A HRT, GA400-1A, and GA400-3 have the least potential community impacts and disruptions because much of the 500-foot buffer is occupied by the existing GA400 right-of-way. GA400-6 and SR9-2 have greater portions of their alignments outside of the GA400 right-of-way, and therefore would affect a greater number of parcels within 500 feet.

2.4.4 Goal 4 Totals (Minimize Environmental Impacts)

GA 400-1A HRT would have the least potential impact to environmental and cultural resources (as shown in table 2.4-4) and potential community impacts (table 2.4-5). This is due mainly to the location of its alignment within the existing Georgia 400 right-of-way and proposed station locations at or near existing highway interchanges. This is also true of GA 400-1A, but this alternative has more stations and therefore more potential impacts to natural/historic resources. GA 400-1A HRT best meets the objectives for Goal 4.

2.4.5 Screen 1 Results

Cumulatively, alternatives GA400-1A LRT/BRT and GA400-1A HRT were the two highest rated alternatives in the Screen 1 analysis, followed by GA400-6, SR9-2, and GA400-3, respectively. Scoring for the each of the four project goals and total Screen 1 scoring are provided below in Table 2.2.

- Alternatives SR9-2, GA400-1A LRT/BRT and GA400-6 best meet Goal 1 (improve mobility and access) because of the higher per-station population and employment served by those alternatives.
- Alternatives GA 400-1A LRT/BRT and GA 400-1A HRT best met Goal 2 (land use/development) because they were the most consistent with local and regional plans and provided the greatest potential for transit-oriented development around their station areas.
- SR9-2 and GA400-3 best met Goal 3 (providing cost-effective service) because they had the lowest annual operating and maintenance costs, and lowest capital construction costs (per mile).
- GA 400-1A (HRT/LRT/BRT) best met Goal 4 (minimize environmental impacts) because they impacted less natural resources, and they had far less impact to historic resources because the alignments would be entirely within the GA 400 right-of-way.

Advancement to Screen 2

GA 400-6 and SR9-2 were eliminated after Screen 1 because of the high potential to impact surrounding communities due to the length that of the alignments that would be within surface streets, particularly along State Route 9. GA 400-3 was eliminated because of the additional travel time added by detouring from Georgia 400 to run along Holcomb Bridge Road and Mansell Road, as well as the potential traffic impacts along those roads. Additionally, public input indicated that alternatives GA 400-3, GA400-6 and SR9-2 were the least appropriate alternatives for transit in the Georgia 400 corridor, while indicating a preference for GA 400-1A with heavy rail transit. Based on Screen 1 analysis and public input, GA 400-1A and GA 400-1A HRT were advanced to Screen 2 for further analysis.

Table 2.4-4: Environmental Quality

Alternative	Rating				
	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Potentially Impacted Wetlands (acreage)	0	0	0	2	0
Potentially Impacted Open Water (acreage)	2	2	0	0	0
Potentially Impacted Rivers/Streams (length)	2	0	0	1	0
Historic Resources (count)	2	0	0	0	0
Historic Districts (acreage)	2	2	0	0	0
Total – Environmental Quality	8	4	0	3	0

Table 2.4-5: Community Impacts

Alternative	Rating				
	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Number of Stations	4	6	7	7	11
Community Impacts	2	2	1	0	0
Potential Displacements	2	2	1	0	0
Total – Community Impact	4	4	2	0	0
TOTAL GOAL 4 (Environmental Quality + Community Impact)	12	8	2	3	0

Table 2.4-6: Total Scores

Alternative	Rating				
	GA400-1A HRT	GA400-1A LRT/BRT	GA400-3	GA400-6	SR9-2
Total Goal 1	11	17	14	17	18
Total Goal 2	4	4	3	3	3
Total Goal 3	0	0	4	3	4
Total Goal 4	12	8	2	3	0
Cumulative Total	27	29	23	26	25

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3.0 Screen 2 Evaluation of Build Alternative Alignments

This section provides an evaluation of alternatives that advanced from Screen 1 into Screen 2. Each alternative is evaluated for performance under Screen 2 performance measures, which includes a greater a number of measures than was applied in the Screen 1 evaluation.

The alternatives below advanced from Screen 1 for further analysis in Screen 2.

GA 400-1

GA 400-1 is heavy rail transit (HRT) from the existing North Springs MARTA station extending north within the Georgia 400 right-of-way to Windward Parkway. Five proposed stations are included in the analysis: Northridge Drive, Holcomb Bridge Road, Mansell Road, North Point Mall, and Windward Parkway.

GA 400-1A

GA 400-1A is the same alignment as GA-400-1, but with bus rapid transit (BRT) or light rail transit (LRT). A total of six stations are proposed for this alternative – the five evaluated under GA-400-1, plus a proposed station at Old Milton Parkway. All six stations are evaluated for this alternative regardless of the transit type (BRT or LRT). In each section, BRT and LRT options are both included in the GA-400-1A alternative and they have identical performance measures, unless each transit technology is separately identified in the table.

Table 3.0-1: Screen 2 Alternatives

Alternative	Transit Type	Number of Stations	Proposed Stations
GA 400-1	Heavy Rail (HRT)	5	Northridge, Holcomb Bridge, Mansell, North Point, Windward
GA 400-1A	Light Rail (LRT), or Bus Rapid Transit (BRT)	6	Northridge, Holcomb Bridge, Mansell, North Point, Old Milton, Windward

3.0.1 Screen 2 Evaluation

Screen 2 includes all performance measures from Screen 1, plus additional measures. Screen 1 performance measures were reevaluated and re-rated in the Screen 2 analysis to capture differences due to further refinements to the alignments, as well as the addition of Northridge Station and removal of Pitts Road Station.

The rating system for Screen 2 is consistent with Screen 1. Alternatives are rated High (2), Medium (1), or Low (0) for each performance measure. The top performing alternative is given a High score, and the other alternatives are rated relative to the High score as shown below.

Table 3.0-2: Screen 2 Scoring System

Rating	Deviation from Highest Performing	Scoring
High	0 to 10%	2
Medium	10 to 20%	1
Low	Greater Than 20%	0

3.1 Goal 1: Improve Mobility and Access

3.1.1 Total daily projected transit boardings

Methodology: This performance measure provides the sum of the number of daily boardings or riders on the potential alternatives using the ARC TDM, based on the future year 2040 Regional Transportation Plan. Higher ratings are assigned to alternatives with the higher number of projected transit boardings. The projected transit boardings and ratings for each alternative are reported in Table 3.1-1.

Data Source(s):

- ARC, Travel Demand Model
- ARC, 2040 Regional Transportation Plan

Table 3.1-1: Daily Projected Transit Boardings, 2040

Station	GA 400-1A (BRT)	GA 400-1A (LRT)	GA 400-1 (HRT)
Windward	2,150	2,560	3,640
Old Milton	1,130	1,500	-
North Point	1,360	1,670	2,840
Mansell	930	1,180	1,440
Holcomb Bridge	1,930	2,410	3,690
Northridge	1,030	1,300	2,250
North Springs (existing)	4,740	5,130	-
To/From Existing MARTA Rail	-	-	9,840
Total	13,270	15,750	23,700
Rating	0	0	2

provides projections to show the additional transit boardings for MARTA bus routes resulting from the implementation of each build alternative. In the table, the projected transit boardings from Table 3.1-1 are added to the projected bus boardings for a total number of boardings (transit build alternatives plus new and existing bus routes) in the Georgia 400 corridor.

Table 3.1-2: GA 400 Corridor Transit Route Boardings

TRANSIT ROUTES	Year 2040 (by Alternative)			
	No Build	GA 400-1A (BRT)	GA 400-1A (LRT)	GA 400-1 (HRT)
Existing Bus Routes	17,500	9,200	9,400	10,400
New Feeder Routes	0	10,200	10,800	12,000
Bus Total	17,500	19,400	20,200	22,400
MARTA Red Line*	19,700	21,300	21,400	16,200
Build Alternative	-	13,300	15,800	23,700
CORRIDOR TOTAL	37,200	54,000	57,400	62,300
Rating		1	2	2

Summary of Evaluation Findings:

Alternative GA 400-1 (HRT) provides the highest number of project boardings, both in terms of transit boardings for the build options, but also for the total boardings for the build alternatives plus bus boardings. GA 400-1A with BRT transit provides the least benefit in terms of projected boardings.

3.1.2 New transit riders

Methodology: This measure reflects the relative performance of the alternatives in attracting new riders to the transit system. The term transit rider refers to a linked trip between origin and destination, regardless of the number of transfers. Higher ratings are assigned to those alternatives with a higher number of projected new riders.

Data Source(s):

- ARC, Travel Demand Model
- ARC, 2040 Regional Transportation Plan

Table 3.1-3: Projected Total Trips and New Transit Riders, 2040

Screen 2 Measure		GA 400-1A (BRT)		GA 400-1A (LRT)		GA 400-1 (HRT)	
Access Mode	2040 No Build	2040 Trips	2040 New Riders	2040 Trips	2040 New Riders	2040 Trips	2040 New Riders
Walk to local	94,800	98,900	4,100	98,600	3,800	98,800	4,000
Walk to premium	198,300	201,000	2,700	202,000	3,700	203,700	5,400
Drive to local	20,600	19,800	-800	19,800	-800	19,800	-800
Drive to premium	169,000	168,400	-600	169,300	300	171,300	2,300
Total	482,700	488,100	5,400	489,700	7,000	493,600	10,900
Rating		0		0		2	

Summary of Evaluation Findings:

Alternative GA 400-1 (HRT) provides the highest number of projected new riders by year 2040, and was therefore a high rating and score of 2. The BRT and LRT alternatives were projected to produce over 20% less new riders than Heavy Rail, and therefore were rated Low with a score of 0.

3.1.3 Number of transfers per linked trip

Methodology: This performance measure reflects the directness and convenience of travel as expressed by the average number of transfers required per trip. An entire journey, from origin to destination is a “linked” trip; this includes all aspects such as walk, car bus, or other mode between the origin and the ultimate destination. The measure is computed by contrasting the number of boardings to the number of linked trips to yield the number of transfers. Higher ratings are assigned to those alternatives with the least number of transfers.

Source(s):

- ARC, Travel Demand Model
- ARC, 2040 Regional Transportation Plan

Table 3.1-4: Transfers Per Linked Trip

Screen 2 Measure	GA 400-1	GA 400-1A
Regional Transfers per Linked Trip	0.61	0.63
Rating	2	2

Summary of Evaluation Findings:

The number of transfers per linked trip are consistent between the alternatives, with no significant difference. All three alternatives are rated equally.

3.1.4 Potential impacts to roadway capacity

Methodology: This performance measure reflects the relative impact of the transit alignment on roadway capacity. Fewer impacts to roadway capacity are associated with an increasing degree of separation between transit facilities and general travel lanes. The analysis is based on various alignment types, including exclusive at-grade, grade separated (tunnel or aerial), or in mixed traffic. Table 3.1-5 below reports the estimated miles of roadway that would be impacted by each alternative. As such, higher ratings are assigned to those alternatives with longer lengths of grade separated operation or exclusive guideway, and less potential operation impacts on the existing roadways as a result of implementing transit.

Source(s):

- Aerial imagery

Table 3.1-5: Potential Impacts to Roadway Capacity

Screen 2 Measure	GA 400-1	GA 400-1A
Potential Impacts to Roadway Capacity (in miles)	0.0	0.0
Rating	2	2

Summary of Evaluation Findings:

All three alternatives are proposed within the Georgia 400 right-of-way and would operate on exclusive guideways; therefore, no impact to roadway capacity would result from any of the Screen 2 alternatives.

3.1.5 Annual corridor crash reductions

Methodology: Transportation safety statistics have consistently shown that transit is safer than driving based on collisions per passenger mile. In order to address safety concerns in the corridor, this measure evaluates the effective reduction in crashes, which can be used as an indicator of how well a transit alternative mitigates roadway congestion resulting from crashes.

This measure provides a comparative assessment of the potential safety benefits resulting from each transit alternative. Data required to compute the estimated reduction in crashes are: daily passenger miles computed from the travel demand model, average crash rates for private vehicle travel and average crash rates for transit travel. To calculate the number of incidents, average crash rates based on travel mode are multiplied by the changes in passenger miles traveled to determine the net change in incidents. For private vehicles, the change in passenger miles considers the travel distance matrix for both single-occupancy vehicle (SOV) and high-occupancy vehicle (HOV) trips. To calculate incident reductions resulting from public transportation use, the transit assignment output passenger miles are summarized by mode for the baseline scenario and alternative scenarios; these are then used to compute the difference.

The proposed crash rates are derived from the ARC Plan 2040 methodology for transit incident congestion. A positive value represents a reduction in net crashes and a negative value represents an increase in net crashes resulting from the project. As such, higher ratings are assigned to those alternatives that yield higher reductions in net crashes.

Source(s):

- ARC, Plan 2040
- ARC, Travel Demand Model

Table 3.1-6: Annual Corridor Crash Reductions

Screen 2 Measure	GA 400-1	GA 400-1A (LRT)	GA 400-1A (BRT)
Annual Crash Reductions	44	14	9
Rating	2	0	0

Summary of Evaluation Findings:

Alternative GA-4001 (HRT) provides the greatest potential crash reductions per year (44), which is significantly higher than those projected for GA 400-1A LRT (14) and BRT (9).

3.1.6 Transit travel time savings

Methodology: Transit travel time savings are used to evaluate the impact the Build Alternatives would have on transit travel

time. This measure compiles travel time spent on transit, whether on a transit vehicle, time spent transferring from one transit technology to another, and wait times associated with the given trip. Travel time savings are estimated for both existing riders and forecast new transit riders. Trip tables from the modal choice model and transit travel times are used in this calculation. Higher ratings are assigned to those alternatives with a higher level of travel time savings.

Source(s):

- ARC, Travel Demand Model
- ARC, Plan 2040
- Federal Transit Administration, SUMMIT Model

Table 3.1-7: Transit Travel Time Savings

Screen 2 Measure	GA 400-1	GA 400-1A (LRT)	GA 400-1A (BRT)
Daily Travel Time Savings(hours of user benefits)	9,300	6,200	4,500
Rating	2	0	0

Summary of Evaluation Findings:

Alternative GA-4001 (HRT) provides an estimated daily time savings in hours spent by users of 9,300 hours, which is significantly higher than that of the other transit alternatives (6,200 and 4,500 hours).

3.1.7 Differences in Transit and Auto Travel Times Between Origins & Destinations

Methodology: This measure shows the differences in transit travel time and automobile travel time for various origins and destinations in the study area. A number of origins and destinations are selected and the average travel times by mode are determined. This measure gauges the overall competitiveness of transit compared to automobile travel and a no-build transit scenario. Higher ratings are assigned to those alternatives with the greater travel savings over auto travel and no-build.

Three points of origination and destination were chosen – Windward Avenue at the northern terminus of all three build scenarios; North Point MARTA station, which is the current northern terminus of MARTA and the future connecting point for the three build scenarios, and the Perimeter (GA 400 at I-285). Each of these three points was evaluated to and from eight origins/destinations in the Atlanta Metropolitan Area during the A.M. peak period. The table below reports the average travel time savings to and from all origins and destinations.

Times reported include: time spent waiting for the first train/bus, time spent waiting for and walking to transfer, if applicable; and time spent on board a bus/train. The travel times do not include walk access/egress time.

Source(s):

- ARC, Travel Demand Model
- ARC, Plan 2040

Table 3.1-8: Difference in Travel Times vs. No-Build and Auto Travel (A.M. Peak)

Screen 2 Measure	GA 400-1	GA 400-1A (LRT)	GA 400-1A (BRT)
Average Time Savings Versus No-Build Transit Travel	20.6 min.	14.9 min.	13.7 min.
Rating	2	0	0
Average Time Savings Versus Auto Travel	3.9 min.	-1.8 min.	-3.0 min.
Rating	2	0	0

Summary of Evaluation Findings:

Heavy Rail provides the greatest travel savings benefit versus auto travel and transit travel without implementation of a dedicated transit system. A minimal savings is shown for HRT in comparison to auto travel, and no savings between LRT/BRT and auto travel. This is primarily due to reverse commutes (e.g., northbound trips on GA 400 during A.M. rush). The averages are not weighted according to the number of commuters in each trip.

3.1.8 Projected population, household, and employment within a 10-minute walk and drive of stations

Population

Methodology: Table 3.1-9 reports projected 2040 population and population density within a 10-minute walk and drive of proposed stations. The ARC’s Plan 2040 dataset provides census tract level projections for population in the Atlanta region. Ten minute walk and drive areas were generated using Esri Network Analyst. The land area of each census tract within the walksheds was calculated and used as a multiplier to determine a proportional share of the tract’s total population within the walkshed. Total population is given for each alignment alternative in the table below.

Higher ratings are based on higher population figures per station.

Source(s):

- ARC, Plan 2040 data, U.S. Census Tract level

Table 3.1-9: Projected 2040 Population within a 10-Minute Walk and Drive of Stations

Screen 2 Measure	GA 400-1		GA 400-1A	
	2040 Population	Population Per Station	2040 Population	Population Per Station
Population w/ in 10-minute walk	4,224	844.8	5,138	856.3
Rating		2		2
Population Within 10-minute drive	74,113	14,822.6	77,889	12,981.5
Rating		2		1

Summary of Evaluation Findings:

The alternatives do not differ in rating for the population served within a 10-minute walk of stations; however, GA-400-1 (HRT) would serve a greater population within a 10-minute drive of stations on a per station basis.

Households

Methodology: Table 3.1-10 reports projected 2040 households and household density within a 10-minute walk and drive of proposed stations. The ARC’s Plan 2040 dataset provides census tract level projections for households in the Atlanta Region. Ten minute walk and drive areas were generated using Esri Network Analyst. The land area of each census tract within the walksheds was calculated and used as a multiplier to determine a proportional share of the tract’s total number of households within the walkshed. Total number of households is given for each alignment alternative in the table below. Higher ratings are based on higher number of households per station.

Source(s):

- ARC, Plan 2040 data, U.S. Census Tract level

Table 3.1-10: Projected 2040 Households with a 10-Minute Walk of Stations

Screen 2 Measure	GA 400-1		GA 400-1A	
	2040 Households	Households per Station	2040 Households	Households per Station
Households w/in 10-minute walk	1,839	367.8	2,210	368.3
Rating		2		2
Households Within 10-minute drive	32,360	6,742.0	33,948	5,658.0
Rating		2		1

Summary of Evaluation Findings:

Alternative GA 400-1A would serve a greater number of households (per station) within a walking distance of the proposed stations, and was therefore a High rating. GA400-1A was also given a High rating because the projected number of households within a 10-minute walk is not significantly lower. Within a 10-minute driving distance, GA 400-1 serves a significantly higher number of households per station than GA 400-1A.

Employment

Methodology: Table 3.1-11 reports projected 2040 employment and employment density within a 10-minute walk and drive of proposed stations. The ARC's Plan 2040 dataset provides census tract level projections for employment in the Atlanta Region. Ten-minute walk and drive areas were generated using Esri Network Analyst. The land area of each census tract within the walksheds was calculated and used as a multiplier to determine a proportional share of the tract's total employment within the walkshed. Total employment is given for each alignment alternative in the table below. Higher ratings are based on higher employment numbers per station.

Source(s):

- ARC, Plan 2040 data, U.S. Census Tract level

Table 3.1-11: Projected 2040 Employment with a 10-Minute Walk of Stations

Screen 2 Measure	GA 400-1		GA 400-1A	
	2040 Households	Households per Station	2040 Households	Households per Station
Households w/in 10-minute walk	1,839	367.8	2,210	368.3
Rating		2		2
Households Within 10-minute drive	32,360	6,742.0	33,948	5,658.0
Rating		2		1

Summary of Evaluation Findings:

Alternative GA 400-1 would serve a greater number of employees (per station) within a 10-minute driving distance of the proposed stations, and was therefore a High rating. GA400-1A was given a Medium rating because it serves less employment per station by a difference of greater than 10%. There is not a significant difference in the employment served per station within a 10-minute walk.

3.1.9 Major trip generators/activity centers within a 10-minute walk and drive of stations

Methodology: GIS was used to identify activity centers and trip generators within a 10-minute walk or drive of proposed stations. Under this performance measure, Major Activity Centers (i.e., a regional mall, or university) are evaluated within the walk and drive areas, using ARC’s dataset for activity centers. Esri Network Analyst was used to determine 10-minute walk and drive areas. Higher ratings are assigned to those alternatives that serve the most major activity centers.

Source(s):

- ARC, Activity Centers GIS layer
- Esri Network Analyst

Table 3.1-12: Major Activity Centers with a 10-Minute Walk and Drive of Stations

Screen 2 Measure	GA 400-1	GA 400-1A
Major Activity Centers w/in a 10-Minute Walk of Stations	2	2
Rating	2	2
Major Activity Centers w/in a 10-minute Drive of Stations	5	5
Rating	2	2

Summary of Evaluation Findings:

Alternatives GA 400-1 and GA 400-1A have an equal number of major activity centers (2) within a 10-minute walk of proposed stations (2); and also have an equal number of major activity centers within a 10-minute drive of proposed stations (5). Each alternative is rated with a score of two.

In the Screen 1 analysis, it was reported that there were 7 activity centers within a 10-minute drive of the GA-400-1A BRT/LRT alternative; however, at that time a Pitts Road station was proposed for BRT/LRT, which had two additional activity centers within a 10-minute drive service area. That station was moved further north to Northridge Road, as a result of public input, and is now beyond the drivesheds of the two activity centers.

3.1.10 Low-income, minority, elderly and zero-car populations/households within a 10-minute walk of stations

Methodology: This measure evaluates the degree to which alternatives provide access to transit-dependent populations, which are defined as low-income, minority and elderly populations, and zero-car households. This measure captures the potential benefits to these populations. Using Census 2010 data for senior and minority populations, and American

Community Survey data 2006-2010 for low-income and zero-car households (this data is not provided in the general census), Esri Network Analyst is used to calculate these populations within a 10-minute walking distance of each station, based on land area proportion of the census tracts within each 10-minute walk distance.

A 10-minute drive is not considered in this measure since many of these populations may not own vehicles. Higher ratings are assigned to those alternatives that provide access to the greatest number of transit-dependent populations/households per station.

Source(s):

- U.S. Census Bureau, Census 2010 census tract data
- American Community Survey, composite of 2006-2010 data
- Esri Network Analyst

Table 3.1-13: Minority Population within a 10-Minute Walk of Stations

Screen 2 Measure	GA 400-1		GA 400-1A	
	Minority Population	Minority pop. per Station	Minority Population	Minority pop. per Station
Minority population w/in a 10-minute walk of stations	2,675	535.0	3,026	504.3
Rating		2		2

Summary of Evaluation Findings:

As reported in Table 3.1-13, alternative GA 400-1 has a slightly higher concentration of minorities served within a 10-minute walk, with approximately 535 minorities per station. GA 400-1 is given a High rating because it is the highest performing alternative. Alternative GA 400-1A would serve approximately 504 minorities per station, which is slightly but not significantly lower than GA 400-1. This alternative is also given a High rating.

Table 3.1-14: Senior Population (65+) Within a 10-Minute Walk of Stations

Screen 2 Measure	GA 400-1		GA 400-1A	
	Senior Population	Senior pop. per Station	Senior Population	Senior pop. per Station
Senior population w/in a 10-minute walk of stations	282	56.4	324	54.0
Rating		2		2

Summary of Evaluation Findings:

As reported in Table 3.1-14, alternative GA 400-1 has a slightly higher population of persons 65 and older served within a 10-minute walk, with approximately 56 seniors per station. Because it is the highest performing alternative, GA 400-1 is given a High rating. Alternative GA 400-1A would serve approximately 54 seniors per station, which is slightly but not significantly lower than GA 400-1. This alternative is also given a High rating.

Table 3.1-15: Population Below Poverty Level within 10-Minute Walk of Stations

Screen 2 Measure	GA 400-1		GA 400-1A	
	Low-Income Population	Low-income pop. per Station	Low-Income Population	Low-income pop. per Station
Low-income (below poverty) population w/in a 10-minute walk of stations	666	133.2	706	117.6
Rating		2		1

Summary of Evaluation Findings:

As reported in Table 3.1-15, alternative GA 400-1 has a slightly higher number of persons below poverty level served within a 10-minute walk, with approximately 133 low-income residents per station. GA 400-1 is the highest performing alternative and is given a High rating. Alternative GA 400-1A would serve approximately 117 low income residents per station, which is greater than a 10% difference from the GA-400-1 alternative; therefore GA-400-1A is rated Medium.

Table 3.1-16: Zero-Car Households within a 10-Minute Walk of Station

Screen 2 Measure	GA 400-1		GA 400-1A	
	Zero-car Households	Zero-car HH per Station	Zero-car Households	Zero-car HH per Station
Households with no car available w/ in 10-minute walk of stations	96	19.2	108	18.0
Rating		2		2

Summary of Evaluation Findings:

Alternative GA 400-1 has a slightly higher number of zero-car households within a 10-minute walk, with approximately 19 zero-car households per station. GA 400-1 is the highest performing alternative, and is given a High rating. Alternative GA 400-1A would serve approximately 18 zero-car households per station, which is slightly but not significantly lower than GA 400-1. This alternative is also given a High rating.

3.1.11 Interface with existing transit and future Concept 3 Rapid Transit Service

Methodology: This measure considers potential access to existing and proposed transit as described in Concept 3, the Atlanta region’s transit vision. GIS was used to spatially assess the potential for the alternatives to interface with existing and potential rapid transit envisioned in Concept 3. Furthermore, this analysis also includes the degree to which a proposed transit project can interface with and/or utilize existing transit infrastructure such as park and ride lots, vehicle fleets and maintenance facilities. Higher ratings are assigned to those alternatives which that provide a higher level of interface with existing and proposed transit.

Table 3.1-17 reports the ratings given to each alignment alternative, and the summaries below the table provide a synopsis of the potential connections for each alignment.

3.1.12 Maximize walking and bicycling accessibility to stations

Methodology: This measure considers the accessibility of proposed stations for pedestrians and bicyclists based on the surrounding transportation network. Improved pedestrian and bicycle access allows short-distance trips to access a greater number of potential destinations. The roadway networks within a 10-minute walking and bicycling distance are quantified according to typical distance for a 10-minute walk and average bicycling speed. A half-mile distance

from proposed stations was used for a 10-minute walking distance along existing roadways and trails. An average speed of 10 miles per hour was used for bicycling distances, which gives an estimated travel distance of 1.66 miles for a 10-minute bike ride from proposed stations. After the 10-minute biking and walking area was created, the mileage of existing roadway was quantified for a general measure of the street grid network within each alternative’s proposed station locations. Table 3.1-18 reports roadway miles within the walking distance of each alternative’s station locations (walkshed), while Table 3.1-19 reports the same for the 10-minute bicycling distance, or (bikeshed).

3.1.13 Goal 1 Totals (Improve Mobility & Access)

GA 400-1 HRT scored highest in all three objectives under Goal 1:

- It provides better mobility through higher project transit boardings, and has the most potential to reduce GA 400 corridor crashes by taking more vehicles off the roadway;
- It provides the greatest savings in travel times; and,
- It improves accessibility by providing service to larger population and employment bases per station; provides service to more low-income residents per-station; and has a better interface with existing transit services, because it would provide a continuous mode of transit with MARTA heavy rail and take advantage of MARTA’s existing vehicle storage and maintenance facility

Cumulatively GA 400-1 is the alternative that best meets Goal 1 (Improve Mobility and Access). The summary of scoring is provided in Tables 3.1-20, 3.1-21, and 3.1-22. The total Goal score is provided in Table 3.1-22.

Source(s):

- ARC, regional GIS street data
- Custom walksheds, modified from Esri Network Analyst

Table 3.1-17: Interface with Existing Transit & Future Concept 3 Rapid Transit Services

Screen 2 Measure	GA400-1	GA400-1A
Potential Interfaces with Existing Transit and Concept 3 Transit Services	-Connectivity to existing MARTA rail without mode change. -Existing P&R Lots at Windward & Mansell; MARTA Bus 85, 140, 143, 185, GRTA 400; -Use of existing maintenance/storage at Armour Yard -Concept 3 Express Bus from Windward to Cumming; Suburban Bus Service - Peachtree Corners (SR 140); Acworth (Crossville Rd); Canton (SR 140)	-Existing P&R Lots at Windward & Mansell; MARTA Bus 85, 140, 143, 185, GRTA 400; -New location for maintenance/storage -Concept 3 Express Bus from Windward to Cumming; Suburban Bus Service - Peachtree Corners (SR 140); Acworth (Crossville Rd); Canton (SR 140)
Rating	2	1

Summary of Evaluation Findings:

Alternative GA 400-1 provides a couple advantages for connectivity/interface with current/future transit, including extension of existing MARTA heavy rail without transit mode change. This alternative also allows use of MARTA's existing maintenance/storage at Armour Yard, whereas the other alternatives would require a new facility. Because of these advantages, GA 400-1 was given a High rating. Although GA 400-1A does not share the same advantages, it would still provide interfaces with existing and planned transit service routes; therefore GA 400-1A was given a Medium rating.

Table 3.1-18: Road Miles Within 10-Minute Walkshed

Screen 2 Measure	GA 400-1		GA 400-1A	
	Length of roadways	Per station average	Length of roadways	Per station average
Road miles within 10-minute walkshed	18.12	3.62	21.79	3.63
Rating		2		2

Table 3.1-19: Road Miles Within 10-Minute Bikeshed

Screen 2 Measure	GA 400-1		GA 400-1A	
	Length of roadways	Per station average	Length of roadways	Per station average
Road miles within 10-minute bike-shed	220.98	44.19	242.89	40.48
Rating		2		2

Summary of Evaluation Findings:

There is overlap of the bikeshed areas due to the greater distances covered; overlap areas are not double-counted. Therefore, only the area exclusive to the Old Milton bikeshed was subtracted for the HRT (GA 400-1) total, which does not include Old Milton as a proposed station.

There is little difference between the two alternatives in terms of the average grid network per station. GA 400-1 performs slightly lower than GA400-1A for the grid within walking distance, but performs slightly better for the grid network within biking distance.

Table 3.1-20: Mobility

Screen 2 Measure	Rating (Score)		
	GA400-1A HRT	GA400-1A LRT	GA400-1A BRT
Daily Projected Transit Boardings	2	0	0
Transit Route Boardings	2	1	1
New Transit Riders	2	0	0
Transfers Per Linked Trip	2	2	2
Potential Impacts to Roadway Capacity	2	2	2
Annual Corridor Crash Reductions	2	0	0
Total – Mobility	12	5	5

Table 3.1-21: Travel Times

Screen 2 Measure	Rating (Score)		
	GA400-1A HRT	GA400-1A LRT	GA400-1A BRT
Transit Travel Time Savings	2	0	0
Travel Time Savings vs. Auto Travel (Origins/Destinations)	2	0	0
Travel Time Savings vs. No-Build Transit (Origins/Destinations)	2	0	0
Total – Travel Times	6	0	0

Table 3.1-22: Accessibility & Connectivity

Screen 2 Measure	Rating (Score)		
	GA400-1A HRT	GA400-1A LRT	GA400-1A BRT
Projected Population/Households Within 10-minute Walk	2	2	2
Projected Population/Households Within 10-minute Drive	2	1	1
Projected Employment Within 10-minute Walk	2	2	2
Projected Employment Within 10-minute Drive	2	1	1
Major Trip Generators Within 10-minute Walk	2	2	2
Major Trip Generators Within 10-minute Drive	2	2	2
Minority Population Within 10-minute Walk	2	2	2
Senior Population Within a 10-minute Walk	2	2	2
Population Below Poverty Level Within 10-minute Walk of Stations	2	1	1
Zero-Car Households Within a 10-minute Walk of Stations	2	2	2
Interface with Existing Transit & Future Concept 3 Rapid Transit Services	2	1	1
Maximization of Walking Accessibility	2	2	2
Maximization of Bicycling Accessibility	2	2	2
Total – Accessibility & Connectivity	26	22	22
TOTAL GOAL 1 (Mobility + Travel Times + Accessibility & Connectivity)	44	27	27

3.2 Goal 2: Support Land Use and Economic Development Planning

3.2.1 Consistency with adopted local and regional plans

Methodology: The degree to which an alternative is consistent with land use policies is evaluated based on a review of the adopted local and regional plans, which include: comprehensive land use plans, Livable Centers Initiative (LCI), corridor studies and the Concept 3 regional transit plan. The assessment relies upon a qualitative evaluation comparing the plans with the alternatives. Relevant plans identified in the Existing Conditions and Future Trends Report (May 2012) are reviewed for their support of, opposition to, or exclusion of the following five factors: transit-supportive nodal development, multimodal transportation, general and explicit support of fixed-guideway transit, and accommodation of transit-oriented land uses at specific station areas. Higher ratings are assigned to those alternatives that show greater support of the local and regional plans.

Data Source(s):

- ARC, LCI studies
- ARC, Concept 3
- Local and regional plans

Table 3.2-1: Consistency with Adopted Local & Regional Plans

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A (LRT)	GA 400-1A (BRT)
Supports expansion of transit services	Y	Y	Y
Improves access & mobility	Y	Y	Y
Would support mixed-use and TOD	Y	Y	N
Supports multi-modal transportation planning	Y	Y	Y
Promotes/establishes new connectivity	Y	Y	Y
Number of Criteria Met (out of 5)	5	5	4
Rating	2	2	1

Summary of Evaluation Findings:

The GA400-1 alternative and GA400-1A alternative (with LRT) were found to support all five of the criteria identified for this performance measure. The GA400-1A alternative with BRT transit meets four of the five criteria. Although there are some examples of BRT-based transit-oriented developments (TOD), bus transit services (including BRT) are generally less impactful than rail at achieving higher density development. Therefore, the BRT alternative was given a Medium rating, while HRT and LRT are given a High rating.

3.2.2 Acres of land with economic development incentives within ½ mile of stations

Methodology: Inducement for development was measured in terms of the number of economic incentives within 1/2 mile of the proposed transit stations. Tax Allocation Districts, Opportunity Zones, and HUBZones were evaluated for each transit station area as potential incentives.

No Tax Allocation Districts (TADs) are located within the half-mile radius of any of the proposed station locations; however, the Alpharetta City Center TAD is located approximately one mile from the proposed North Point station.

Georgia Opportunity Zones give local governments flexibility to relax fees, provide local incentives and relax local regulatory requirements within the zone to encourage redevelopment. There are three Opportunity Zones with land area inside the half-mile radius of the proposed station locations, and one that lies just outside of the half-mile radius of Windward station.

Two Opportunity Zones are located within a half mile of the Holcomb Bridge station. There is a small amount of land area (1.89 acres) of an opportunity zone that lies within the Mansell station area. Holcomb Bridge is the only proposed station area with a significant amount of development incentives, with 86.5% of the total land area within a half-mile radius that is within Georgia Opportunity Zones.

The Historically Underutilized Business Zones (HUBZone) program is administered by the U.S. Small Business Administration. It encourages economic development in historically underutilized business zones by incentivizing small businesses within the zone, or small businesses that hire residents that live within a HUB Zone. Census Tract 114.20, which comprises approximately 77 acres northeast of the Holcomb Bridge interchange at GA-400, is an eligible tract for HUBZone. This tract has land area within the Holcomb Bridge and Mansell ½-mile station areas.

Data Source(s):

- Georgia Department of Community Affairs
- U.S. Small Business Administration
- U.S. Census Bureau, Census Tract layer files

Table 3.2-2: Economic Incentives within ½ Mile of Proposed Stations

Screen 2 Measure	GA 400-1	GA 400-1A
Opportunity Zone acres within ½ mile of stations	436.56	436.56
HUBZone acres within ½ mile of stations	118.70	118.70
Total acreage of incentive areas	555.26	555.26
Incentive area acreage per station	111.1	92.5
Rating	2	1

Summary of Evaluation Findings:

The GA400-1 has a higher total and per station acreage of incentivized areas within a ½ mile radius of its proposed stations, and is rated High. GA 400-1A has less incentivized areas with greater than 10% difference in per station average from GA 400-1; therefore, a Medium rating was given.

It should be noted that other incentivized areas are located outside of the half-mile station areas but in proximity to the corridor. These areas were not included in the evaluation.

- Alpharetta City Center Tax Allocation District (TAD) is located approximately 1.25 miles from the proposed Old Milton station in downtown Alpharetta
- Opportunity Zone located just outside the half mile radius for Windward station, within ¾ of a mile.

3.2.3 Projected population, households, and employment within ½ mile of stations

Population

Methodology: This measure considers the total population served within the proposed station areas based on the projected 2040 population within one-half of a mile of each station. The half-mile area serves as the basis for calculating the population within a 10-minute walk of each station. The projected population data was provided by ARC’s forecasts for 2040 census tract level data. This data was then recalculated based on the proportional land area of each census tract within the ½-mile station radius. Table 3.2-3 below shows the total projected population for the year 2040 within each of the station areas.

Data Source(s):

- ARC, Plan 2040

Table 3.2-3: 2040 Projected Population Within ½ Mile of Stations

Screen 2 Measure	GA 400-1	GA 400-1A
2040 projected population within ½ mile of stations	11,117	13,361
2040 population per station	2,235.4	2,226.8
Rating	2	2

Summary of Evaluation Findings:

Alternative GA 400-1 has a slightly higher projected population served within a ½-mile radius of its proposed stations, with approximately 2,235 residents per station. The highest performing alternative, GA 400-1, is given a High rating. Alternative GA 400-1A would serve approximately 2,227 persons per station in 2040, which is slightly but not significantly lower than GA 400-1. This alternative is also given a High rating.

Households

This measure considers the number of households served within the proposed station areas based on the projected 2040 population within one-half of a mile of each station. The half-mile area serves as the basis for calculating households within a 10-minute walk of each station. The projected housing data was provided by ARC’s forecasts for 2040 census tract level data. This data was then recalculated based on the proportional land area of each census tract within the ½-mile station radius. Table 3.2-4 below shows the total projected housing for the year 2040 within each of the station areas.

Data Source(s):

- ARC, Plan 2040

Table 3.2-4: 2040 Projected Households Within ½ Mile of Stations

Screen 2 Measure	GA 400-1	GA 400-1A
2040 projected households within ½ mile of stations	4,806	5,961
2040 households per station	961.2	948.5
Rating	2	2

Summary of Evaluation Findings:

Alternative GA 400-1 has a slightly higher projected number of households served within a ½-mile radius of its proposed stations with approximately 961 households per station. The highest performing alternative, GA 400-1, is given a High rating. Alternative GA 400-1A would serve approximately 949 households per station in 2040, which is slightly but not significantly lower than GA 400-1. This alternative is also given a High rating.

Employment

This measure considers the employment served within the proposed station areas based on the projected 2040 employment data within one-half of a mile of each station. The half-mile area serves as the basis for calculating the employment within a 10-minute walk of each station. The projected employment data was provided by ARC’s forecasts for 2040 census tract level data; this data was then recalculated based on the proportional land area of each census tract within the ½-mile station radius. Table 3.2-5 below shows the total projected employment for year 2040 within each of the station areas.

Data Source(s):

- ARC, Plan 2040

Table 3.2-5: 2040 Projected Employment Within ½ Mile of Stations

Screen 2 Measure	GA 400-1	GA 400-1A
2040 projected employment within ½ mile of stations	14,730	18,757
2040 employment per station	2,946.0	3,126.2
Rating	2	2

Summary of Evaluation Findings:

Alternative GA 400-1A has a slightly higher projected number of employees served within a ½-mile radius of its proposed stations, with approximately 3,126 employees per station. The highest performing alternative, GA 400-1, is given a High rating. Alternative GA 400-1 would serve approximately 2,946 employees per station in 2040, which is slightly but not significantly lower than GA 400-1A. This alternative is also given a High rating.

3.2.4 Transit-supportive future land uses and zoning within ½ mile of stations

Future Land Use & Zoning

Zoning and officially-designated future land uses of property can also be effective tools for incentivizing development. The land use plans and zoning maps for each municipality were examined to find any future land use designations or zoning districts specifically geared for redevelopment areas or transit supportive densities.

- City of Roswell: No zoning districts or overlays that are supportive of TOD were found within the Holcomb Bridge station area, although the City of Roswell is currently revising its zoning ordinance. Revisions may provide greater incentives for development by allowing mixed use and higher development intensities in the Holcomb Bridge Station Area.
- City of Sandy Springs: The Northridge Road station area is entirely within the City of Sandy Springs. Sandy Springs has a mixed-use zoning category, as well as Living-Working future land-use categories that encourage compact, pedestrian-oriented development with a horizontal and vertical mix of land uses. A total of approximately 74 acres of land within the Northridge half-mile station area is either already zoned for mixed-use, or within a future land use node that designates mixed-use for new development or redevelopment.
- City of Alpharetta: The City of Alpharetta does not designate any future land use categories that are specifically geared towards generating densities

supportive of transit. There are two land areas currently zoned for Mixed Use – one within the Old Milton station area, one within the North Point station area. While no specific densities are regulated within the zoning district (must be approved by site-specific development plan), these areas would typically allow a concentration of multiple land uses mixed into one master planned site, and with higher than conventional densities.

- City of Milton, Forsyth County, City of Dunwoody – No FLU or zoning categories within station areas that target station area development or redevelopment.

Table 3.2-6 below summarizes the acres within each station area with development incentives, including Opportunity Zones, HUB Zones, and Zoning Incentives. A rating is given for each station area based on the amount of acreage with potential incentives.

Data Source(s):

- Cities of Dunwoody, Sandy Springs, Roswell, Alpharetta, Milton, and Forsyth County: locally adopted future land use maps and comprehensive plans; official zoning maps.

Table 3.2-6: Transit-Supportive Land Use and Zoning within ½ Mile of Stations

Screen 2 Measure	GA 400-1	GA 400-1A
Zoning/Future land use incentive areas (in acres)*	121.49	198.43
Average incentive areas (acres) per station	24.3	33.1
Rating	2	1

*Total does not double-count acreage for overlapping incentive areas

Summary of Evaluation Findings:

Alternative GA 400-1A has a higher amount of land area (total and per station) that is supportive of transit, and is given a High rating. GA 400-1A has less land area per station that is within transit-supportive zoning districts or designated future land use categories. The per station difference between the alternatives is greater than 10%; therefore GA 400-1 is given a Medium rating.

3.2.5 Acres of vacant or underutilized land within ½ mile of stations

Methodology: Available land for development or redevelopment was quantified in terms of acres of vacant or underutilized land within ½ mile of proposed stations. The selection of these properties was determined through the use of parcel based tax assessors' data from Fulton and DeKalb Counties, as well as aerial imagery.

Vacant parcels were selected by first using tax parcel records, selecting those parcels with only land value and no improvement value. These were then verified as vacant by using aerial imagery. Small HOA outparcels were not selected.

Underutilized property was selected through tax records using a ratio of improved value to overall appraised value. Properties with less than 40% improvement value to total appraised value, because this indicates a high likelihood of redevelopment or reinvestment. Aerial imagery was then used to manually select parcels with only surface parking and no buildings.

The vacant and underutilized acreage within each proposed station's half-mile radius are totaled below in Table 3.2-7. It should be noted that there may be additional properties with high redevelopment potential, especially those with high proportions of undeveloped land or surface parking area, such as strip commercial, individual commercial pad sites, and office buildings with a low floor-area ratio.

Higher ratings are assigned to alternatives with proximity to greater acres of vacant or underutilized land.

Data Source(s):

- DeKalb County and Fulton County tax assessors' parcel data
- Aerial imagery

Table 3.2-7: Vacant/Underutilized Land with in ½ Mile of Stations

Screen 2 Measure	GA 400-1	GA 400-1A
Vacant land area within ½ mile of stations (in acres)	490.42	725.73
Underutilized land within ½ mile of stations (in acres)	215.11	230.02
Vacant land + underutilized land	705.53	955.75
Vacant/underutilized land per station	141.11	159.29
Rating	1	2

Summary of Evaluation Findings:

Because Old Milton Station has the highest percentage of vacant land within a ½ mile of all the proposed station areas in the GA400-1A alignment, the GA 400-1 alternative (which does not include Old Milton) has a lower amount of vacant/underutilized land available on a per station basis. The percentage difference between the two alignments is greater than 10%; therefore GA-400-1A is rated High and GA-400-1 is rated Medium.

3.2.6 Goal 2 Totals (Support Land Use & Economic Development Planning)

GA 400-1 (HRT) would provide more economic incentives per half-mile station areas than GA 400-1A (LRT/BRT). Heavy rail and light rail transit are more consistent with local/regional planning than bus rapid transit, because most cases of BRT have not generated transit-oriented development (TOD) as compared to other transit types.

Table 3.2-8: Land Use & Development

Screen 2 Measure	Rating (Score)		
	GA400-1A HRT	GA400-1A (LRT)	GA400-1A (BRT)
Consistency With Adopted Local/Regional Plans	2	2	1
Economic Incentives Within ½ Mile of Stations	2	1	1
Total – Land Use & Development	4	3	2

Table 3.2-9: Potential for Transit Oriented Development (TOD)

Screen 2 Measure	Rating (Score)		
	GA400-1A HRT	GA400-1A (LRT)	GA400-1A (BRT)
Population/Households Density Within ½ Mile of Stations	2	2	2
Employment Density Within ½ Mile of Stations	2	2	2
Transit-Supportive Land Use & Zoning Within ½ Mile of Stations	1	2	2
Acres of Vacant/Underutilized Land Within ½ Mile of Stations	1	2	2
Total – Potential for TOD	6	8	8
TOTAL GOAL 2 (Land Use/Development + Potential for TOD)	10	11	10

GA 400-1A rated higher for transit-supportive land use/zoning and vacant/underutilized land areas within ½ mile of its stations. The inclusion of Old Milton station provides the difference, because Old Milton station area has a significant amount of vacant and underutilized land area, and it has more areas with mixed-use zoning in place.

Cumulatively GA 400-1 all three alternatives rated a similar level of support for Goal 2 (Support Land Use/Economic Development), with GA 400-1A (LRT) scoring slightly higher. The summary of scoring is provided below in Tables 3.2-8 and 3.2-9. The total Goal 2 scoring is provided in Table 3.2-9. Measures in blue indicate distinguishing measures (measures where the alternatives rated differently).

3.3 Goal 3: Provide Cost-Effective Transit Service

3.3.1 Annual Operating and Maintenance (O&M) Costs

Methodology: Annual O&M costs are estimated for each alternative and the incremental costs above the No-Build scenario are calculated. For rail service, peak rail cars, annual revenue car-miles, annual revenue train-hours, number of stations, miles of track, and number of rail storage and maintenance facilities are the key service variables used to estimate operating and maintenance costs. The service variables are multiplied by unit costs and productivity ratios (for labor expenses) to calculate the costs for each expense line item. For bus service: peak buses, annual revenue bus-miles, annual revenue bus-hours and number of bus garages are the service variables used to estimate operating and maintenance cost. Additionally, the average roadway O&M costs from GDOT and industry average transit O&M costs are taken into account in the O&M cost estimates of the alternatives.

O&M costs for Screen 2 builds on vehicle requirements calculated in Screen 1 relative to modeled ridership demand, and also considers vehicle operating capacity and potential ridership figures. Higher ratings are assigned to those alternatives associated with lower annual O&M costs.

Source(s):

- MARTA, Metropolitan Atlanta Rapid Transit Overview Committee (MARTOC) report, FY2012
- Charlotte Area Transit System (CATS), Operations & Maintenance Quantities and Costs Report for LRT

Table 3.3-1: Annual Operating and Maintenance (O&M) Costs

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A (LRT)	GA 400-1A (BRT)
Annual Estimated O&M Costs (in 2013 Dollars)	\$19 Million	\$20 Million	\$10 million
Rating	0	0	2

Summary of Evaluation Findings:

Annual O&M costs for the GA 400-1A alternative with BRT is the best performing alternative with a significantly lower annual cost of \$10 million, compared with \$19 million for Heavy Rail and \$20 million for Light Rail. BRT is rated High because it is the best performing alternative; HRT and LRT are rated Low because both have significantly higher estimated annual O&M costs.

3.3.2 Construction Capital Cost

Methodology: Project costs for each alternative technologies have been developed using the FTA Standard Cost Categories established for New Starts. Specifically, capital costs for Screen 1 were developed based on three methods for estimating unit prices, including:

- Historical bid prices;
- Analysis of production rates, labor, equipment rates, and material costs for each construction activity;
- Parametric unit costs.

These methods have been used individually and in combination. Furthermore, the costing methodology is consistent with FTA guidelines as well as the unit costs associated with the transit projects under the Georgia's Transportation Investment Act of 2010. A range of high and low capital unit costs are applied to obtain a range of potential capital costs for a given alternative. Capital costs are refined during Screen 2 as detailed cost worksheets associated with conceptual engineering are developed. Higher ratings are assigned to those alternatives associated with lower construction capital costs.

Source(s):

- American Public Transportation Association (APTA), U.S. Average New Vehicle Costs for 2010 & 2011 Vehicles by Type Report
- Georgia Department of Transportation (GDOT), Item Mean Summary List
- Charlotte Area Transit System (CATS), Operations & Maintenance Quantities and Costs Report for LRT

Table 3.3-2: Construction Capital Costs

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A (LRT)	GA 400-1A (BRT)
Total Project Cost (in millions)	\$2,438	\$1,841	\$631
Cost per Mile (in millions)	\$200	\$151	\$52
Rating	0	0	2

Summary of Evaluation Findings:

Capital costs per mile for the GA 400-1A alternative with BRT is the best performing alternative with a significantly lower estimated capital construction cost of approximately \$52 million per mile, compared with \$200 million for Heavy Rail and \$151 million for Light Rail. Bus rapid transit has substantially less capital costs because rail infrastructure is not needed, stations are typically much smaller (and less expensive) than rail stations, and transit vehicles (buses) are less costly than train cars. BRT rated High because it is the best performing alternative; HRT and LRT were rated Low because both have significantly higher estimated capital costs.

3.3.3 Right of Way costs

Methodology: A preliminary estimate of right of way acquisition costs is prepared by estimating the total areas required for alignment and station construction, then applying average land values determined from general land use types and parcel-level tax data. The cost estimates for right-of-way along the project corridor have been estimated at \$25 per square foot or \$1 million per acre. Higher ratings are assigned to those alternatives associated with lower right of way costs.

Source(s):

- DeKalb & Fulton County parcel tax data

Table 3.3-3: Right of Way Costs

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A (LRT)	GA 400-1A (BRT)
Right of Way Costs	\$48.1	\$48.1	\$48.1
Rating	2	2	2

Summary of Evaluation Findings:

The alignment is same for all alternatives, with an equal amount of potential land and right-of-way acquisition. Therefore, all alternatives are given the High rating.

3.3.4 Cost Effectiveness

Methodology: Cost effectiveness is the annual capital and operating cost per trip on the project. The number of trips is a sum of the estimated number of linked transit trips on the project taken by non-transit dependent persons, and the number of linked transit trips taken by transit-dependent persons multiplied by a factor of two (otherwise known as project boardings).

Source(s):

- Federal Transit Administration (FTA), New Starts Cost-Effectiveness Measure
- FTA, SUMMIT Model
- ARC, Travel Demand Model

Table 3.3-4: Cost Effectiveness

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A (LRT)	GA 400-1A (BRT)
Horizon Year Annual Project Trips	9,415,000	6,545,000	5,624,000
Horizon Year Annualized Cost Per Trip	\$11.61	\$21.04	\$11.61
Rating	0	0	2

Summary of Evaluation Findings:

The GA 400-1A alternative with BRT has lowest annualized cost per trip, indicating that it has the least amount of annualized capital and O&M costs per estimated transit trip. The cost per trip of \$11.61 is significantly lower than the other two transit alternatives; therefore, BRT is rated High while the other two alternatives are rated Low.

3.3.5 Goal 3 Totals (Provide Cost-Effective Transit Service)

GA 400-1A with BRT transit has significantly lower estimated capital construction costs and annual operating and maintenance costs. Bus rapid transit has a much lower capital cost associated because it does not include the addition of rail infrastructure, has much smaller transit stops/stations, and cheaper vehicles (buses) than rail systems. Less infrastructure and less expensive vehicles also translates to a lower cost to operate and maintain the transit system – therefore BRT was estimated to also have much lower annual O&M costs.

Table 3.3-5: Costs

Alternative	Rating (Score)		
	GA400-1A HRT	GA400-1A (LRT)	GA400-1A (BRT)
Annual Operating & Maintenance Costs	0	0	2
Construction Capital Costs	0	0	2
Right-of-Way Costs	2	2	2
Total - Costs	2	2	6

Table 3.3-6: Cost Effectiveness

Alternative	Rating (Score)		
	GA400-1A HRT	GA400-1A (LRT)	GA400-1A (BRT)
Cost-Effectiveness Index	0	0	2
Incremental Cost Per Rider	0	0	2
Total – Cost Effectiveness	0	0	4
TOTAL GOAL 3 (Costs + Cost Effectiveness)	2	2	10

Although BRT has less projected ridership, the cost figures are low enough that cost-effectiveness measures (costs per rider) still substantially better than LRT or HRT for the GA 400 Corridor.

Cumulatively GA 400-1A (with BRT transit) rated highest in support of Goal 3 (Provide Cost-Effective Transit). The summary of scoring is provided below in Tables 3.3-5 and 3.3-6. The total Goal 3 scoring is provided in Table 3.3-6. Measures in blue indicate distinguishing measures (measures where the alternatives rated differently).

3.4 Goal 4: Minimize Environmental Impacts

3.4.1 Acres of potentially impacted wetlands and water bodies within 500 feet of alignments and ½ mile of stations

Methodology: Acres of wetlands and water bodies are calculated using the National Wetlands Inventory (NWI) GIS database, and GDOT’s DLG-F Polygonal Hierarchy and/or linear feet of ARC’s Rivers and Streams GIS database. Higher ratings are assigned to those alternatives with proximity to smaller acres of potentially impacted wetlands and water bodies.

Source(s):

- U.S. Fish & Wildlife Service, National Wetlands Inventory
- U.S. Geological Survey, National Hydrography Dataset

Table 3.4-1: Potentially Impacted Wetlands, Water Bodies and Streams

Screen 2 Measure	GA 400-1-HRT	GA 400-1A
Total Wetlands (acres within 500 ft. of alignment and ½ mile of stations)	45.29	45.58
Rating	2	2
Total Open Water (acres within 500 ft. of alignment and ½ mile of stations)	32.18	35.81
Rating	2	1
Total Rivers/Streams (linear feet within 500 ft. of alignment and ½ mile of stations)	40,740.80	45,911.03
Rating	2	1
Total Rivers/Stream buffers (acres within 500 ft. of alignment and ½ mile of stations)	49.00	54.50
Rating	2	1

Summary of Evaluation Findings:

GA400-1 provides a lesser potential impact on open water bodies, streams and stream buffers, due primarily to having less stations. The impact on wetland resources between alternatives is not significantly different. GA 400-1 rated High for all four measures, while GA 400-1 rated High in one measure and Medium in the other three.

3.4.2 Number of potentially impacts historic resources within 500 feet of alignments and ½ mile of stations

Methodology: The number of historic resources is calculated using the GIS layer developed by Historic Preservation Division of Georgia Department of Natural Resources. Higher ratings are assigned to those alternatives with proximity to a lower number of potentially impacted historic resources.

Source(s):

- National Register of Historic Places
- Georgia’s Natural, Archaeological, and Historic Resources GIS

Table 3.4-2: Potentially Impacted Historic Resources and Archaeological Sites

Screen 2 Measure	GA 400-1-HRT	GA 400-1A
Historic Resources within 500 ft. of alignment and ½ mile of stations	11	11
Rating	2	2
Historic Districts (acres within 500 ft. of alignment and ½ mile of stations)	1.17	1.88
Rating	2	0
Archeological Sites within 500 ft. of alignment and ½ mile of stations	30	30
Rating	2	2

Summary of Evaluation Findings:

The same number of historic resources were found to be within each alternative. GA400-1A has a higher amount of land area within historic districts than that of GA400-1. Only one potential archaeological site was found within 500 ft. of the proposed alignments. A much greater amount of potential sites is within ½ mile of proposed stations; however an equal amount between the alternatives. All alternatives rated High for these measures.

3.4.3 Acres of noise sensitive land uses within 700 (HRT), 350 (LRT), or 200 (BRT) feet of alignments

Methodology: Using FTA guidance on transit noise

assessment, this analysis considers the potential impacts of noise associated with the project alternatives. Construction and operation of new transit facilities poses a potential noise problem for residents and businesses near an alignment. Noise-sensitive land uses are defined as single- and multi-family residential, low-density commercial and institutional uses (e.g., schools and churches). This measure requires application of GIS to identify and calculate the acres of the noise-sensitive land uses within 700 feet of heavy rail, 350 feet of light rail and within 200 feet of BRT alternatives. Higher ratings are assigned to those alternatives with proximity to smaller acres of noise sensitive land uses.

Source(s):

- FTA Administration, Transit Noise and Vibration Impact Assessment guidance manual

Table 3.4-3: Acres of Noise Sensitive Land Uses

Acres of noise sensitive land uses	GA400-1-HRT (within 700')	GA400-1A LRT (within 350')	GA400-1A BRT (within 200')
Residential	553.67	156.04	43.85
Rating	0	0	2
Low-Density Commercial	235.79	70.64	21.70
Rating	0	0	2
Institutional	71.72	23.76	7.20
Rating	0	0	2

Summary of Evaluation Findings:

Bus rapid transit (BRT) has the smallest area of impact for noise-related issues, and therefore affects the least acreage of residential, commercial and institutional uses. BRT was given a High rating for all three measures and the other alternatives given Low ratings for all three.

3.4.4 Vibration-sensitive locations within 500 feet of alignments and 1/2 mile of stations

Methodology: Vibration sensitive locations were identified based upon the guidelines in the FTA's Transit Noise and Vibration Impact Assessment manual dated May 2006 (FTA-VA-90-1003-06). Vibration sensitive locations are divided into three categories of sensitivity:

- Vibration Category 1 – High Sensitivity – buildings such as vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, university research operations, and other buildings where vibration would interfere with operations, including levels that may be well below those associated with human annoyance;

- Vibration Category 2 – Residential – all residential land uses and any buildings where people sleep, such as hotels and hospitals; and,
- Vibration Category 3 – Institutional – includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

Vibration sensitive locations were identified by analyzing ARC's Land Use mapping and by conducting desktop research to identify specific facilities and institutions that would be classified in each of these three categories. For the purposes of this screening, special-use facilities such as concert halls, TV studios, recording studios, auditoriums, and theaters were included in Category 1. The number of sensitive locations was based upon the number of parcels within the buffer in each category.

Source(s):

- FTA Administration, Transit Noise and Vibration Impact Assessment guidance manual

Table 3.4-4: Acres of Noise Sensitive Land Uses

Vibration-sensitive locations w/in 500 ft. of alignments & 1/2 mile of stations Screen 2 Measure	GA 400-1	GA 400-1A
Category 1 (High Sensitivity)	1	1
Rating	2	2
Category 2 (Residential)	2,538	2,545
Rating	2	2
Category 3 (Institutional)	135	180
Rating	2	0

Summary of Evaluation Findings:

There is not a significant difference between alternatives for high-sensitivity locations (Category 1) and residential uses (Category 2); however, there is a greater amount of institutional properties (Category 3) within the vibration-sensitive area surrounding the GA400-1A alignment and stations. GA400-1 is rated High; GA400-1A has a 33.3% higher number of Category 3 locations, and so it is rated Low.

3.4.5 Number of contaminated and hazardous material sites within 1/4 mile of stations

Methodology: The EPA's Geospatial Data Access Project GIS shapefile and the Multisystem Envirofacts Query Form are used to identify the number of contaminated hazardous material sites within 1/4 mile of alignments. This buffer area would capture all direct physical impacts and allow for a broader view of potential effects. Higher ratings are assigned

to those alternatives in proximity to smaller number of contaminated and hazardous material sites.

Source(s):

- Environmental Protection Agency, Multisystem query form

Table 3.4-5: Number of Contaminated/HAZMAT Sites within ½ Mile of Stations

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A
Number of HAZMAT sites within 1/2 mile of alignment	0	0
Number of HAZMAT sites within ½ mile of stations	8	8
Total HAZMAT sites	8	8
Rating	2	2

Summary of Evaluation Findings:

An equal number of hazardous material sites are located within a ¼ mile of alignments and ½ mile radius of stations. All alternatives were given a High rating.

3.4.6 Change in Vehicle Miles Traveled (VMT)

Methodology: This measure is intended to show the potential for a reduction in the total VMT for all corridor trips from the various alternatives. The estimated change in VMT resulting from mode shift is considered in accordance with the Notice of Proposed Rule Making for FTA's New Starts and Small Starts Program. The TDM performs separate highway assignments by four time periods. These time periods are split into AM (6AM to 10AM), Midday (10AM to 3PM), PM (3PM to 7PM), and Night (7PM to 6AM). The total VMT calculation for each scenario is a summation of these four time periods. Higher ratings are assigned to those alternatives with higher reductions in VMT.

Source(s):

- ARC, Transportation Demand Model

Table 3.4-6: Change in Vehicle Miles Traveled (VMT)

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A (LRT)	GA 400-1A (BRT)
Change in vehicle miles traveled (VMT)	-48,000	-24,000	-16,000
Rating	2	0	0

Summary of Evaluation Findings:

GA400-1 (HRT) provides a significantly higher estimated change in vehicle miles traveled, with a reduction of 48,000 VMT- twice the reduction amount of LRT and three times as much as BRT. GA 400-1 (HRT) was given a High rating, while the other two alternatives rated Low.

3.4.7 Change in daily emissions of air quality pollutants

Methodology: This measure takes into account the importance of air quality benefits of transit by estimating the change in mobile emissions associated with each alternative. The emission factors specific for the Atlanta region are calculated using the EPA model MOBILE6.1. These factors are used in conjunction with output of the highway assignment (calculated from the previous VMT measure) to generate daily emissions of air quality pollutants. Higher ratings are assigned to those alternatives with higher reductions in pollutants.

Source(s):

- Environmental Protections Agency, MOBILE 6.1 model

Table 3.4-7: Change (Reduction) in Daily Emissions of Air Quality Pollutants

Screen 2 Measure	GA 400-1 (HRT)	GA 400-1A (LRT)	GA 400-1A (BRT)
Change in daily emissions of air quality pollutants (CO, NOx, PM2.5, PM10)	Most	Intermediate	Lowest
Rating	2	1	0

Summary of Evaluation Findings:

For screening level assessment of impacts to air quality between the HRT, LRT, and BRT, a qualitative approach was employed, based on the difference in Vehicle Miles Traveled (VMT) between the No Build Alternative and each of the Build Alternatives. A quantitative analysis can be applied during the detailed analysis in the NEPA Environmental Impact Statement. The Alternative resulting in the greatest reduction in VMT from the No Build Alternative can be assumed to result in the greatest benefit to air quality, as fewer miles traveled generally results in less emission of vehicle-generated pollutants such as carbon monoxide and particulate matter. Based on these assumptions, the HRT Alternative would have the least impact to air quality, followed by the LRT Alternative, and lastly the BRT.

3.4.8 Low-income, elderly, and zero-car population/ households within 500 feet of alignments

Methodology: The following measures consider potential negative impacts on transit-dependent populations located in proximity to proposed alignments. Transit-dependent populations are defined as those who are low-income, minority, elderly or do not own a vehicle. GIS spatial analysis is used to evaluate the project’s impact areas by identifying the census tracts within 500 feet and applying a land area proportion of each census area within the 500’ buffer to the census data. Census 2010 data is used for minority and senior populations. American Community Survey data is used for low-income populations and zero-car households. Tables 3.4-8 reports the findings for each measure and associated rating.

Source(s):

- U.S. Census Bureau, Census 2010 census tract data
- U.S. Census Bureau, American Community Survey, composite of 2006-2010 census tract level data

Table 3.4-8: 2010 Transit-dependent populations within 500 feet of Proposed Alignment

Screen 2 Measure	GA 400-1	GA 400-1A
Minority population within 500 ft. of alignment	3,734	3,734
Rating	2	2
Senior population within 500 ft. of alignment	453	453
Rating	2	2
Population below poverty level within 500 ft. of alignment	740	740
Rating	2	2
Zero-car households within 500 ft. of alignment	175	175
Rating	2	2

3.4.9 Estimated community impacts/disruptions and number of displacements

Methodology: Potential impacts on neighborhoods, residences, and businesses located along the alignments or near the proposed stations are assessed for this performance measure. A count of the parcels in addition to acres of park lands located within 500 feet of alignments is used for comparison in Screen 1. The parcel data is overlaid on the ARC existing land use (LandPro) data to cumulate the affected residential, commercial, and institutional parcels.

During Screen 2, a preliminary assessment of potential acquisitions is conducted using aerial photography and

field surveys. This supplements the parcel-level analysis. An offset distance consistent with the design criteria for each technology may be applied to estimate the number of potential acquisitions.

Data Source(s):

- DeKalb County and Fulton County tax assessors’ parcel data
- Screening Survey

Table 3.4-9: Community Impacts/ Disruptions and Displacements – Final Alignment

Community Impacts/disruptions within 500 ft. of alignments and ½ mile of stations	GA 400-1	GA 400-1A
Acres of Parks	219.95	219.95
Rating	2	2
Parcel Count of Parks (#)	39	39
Rating	2	2
Neighborhood Impacts (#)	66	71
Rating	2	2

3.4.10 Goal 4 Totals (Minimize Environmental Impacts)

GA 400-1 (HRT) and GA 400-1A (BRT) have the least potential impact to natural resources, while GA 400-1A (LRT) had the most potential impact. Light rail and heavy rail have the most noise impacts, while the absence of Old Milton station for HRT reduced the GA 400-1 (HRT) alternative’s impact to water resources, historic districts and institutional uses (through vibration impacts).

GA 400-1 (HRT) has the most potential to reduce vehicle miles traveled (VMT) in the corridor, which in turn provides the greatest potential to also reduce emissions of pollutants from automobiles.

Community impacts were equivalent among all alternatives due to all having the same alignment.

Cumulatively GA 400-1 (HRT) rated highest in support of Goal 4 (Minimize Environmental Impacts). The summary of scoring is provided below in Tables 3.4-10 , 3.4-11, and 3.4-12. The total Goal 3 scoring is provided in Table 3.3-6. Measures in blue indicate distinguishing measures (measures where the alternatives rated differently).

Table 3.4-10: Environmental Quality

Alternative	Rating (Score)		
	GA400-1A HRT	GA400-1A (LRT)	GA400-1A (BRT)
Potentially impacted wetlands	2	2	2
Potentially impacted open water	2	1	1
Potentially impacted streams/ivers	2	1	1
Potentially impacted stream buffers	2	1	1
Potentially impacted historic resources	2	2	2
Potentially impacted historic districts	2	0	0
Potentially impacted archaeological sites	2	2	2
Acres of Noise-Sensitive Land Uses (Residential)	0	0	2
Acres of Noise-Sensitive Land Uses (Commercial)	0	0	2
Acres of Noise-Sensitive Land Uses (Institutional)	0	0	2
Vibration Sensitive locations – Category 1	2	2	2
Vibration Sensitive locations – Category 2	2	2	2
Vibration Sensitive locations – Category 3	2	0	0
Hazardous material sites	2	2	2
Total – Environmental Quality	22	15	21

Table 3.4-11: Air Quality

Alternative	Rating (Score)		
	GA400-1A HRT	GA400-1A (LRT)	GA400-1A (BRT)
Change in Vehicle Miles Traveled (VMT)	2	0	0
Change in Daily Emissions of Air Quality Pollutants	2	1	0
Total – Air Quality	4	1	0

Table 3.4-12: Community Impact

Alternative	Rating (Score)		
	GA400-1A HRT	GA400-1A (LRT)	GA400-1A (BRT)
Minority Population Within 500 ft. of Proposed Alignment	2	2	2
Senior Population Within 500 ft. of Proposed Alignment	2	2	2
Low Income Population Within 500 ft. of Proposed Alignment	2	2	2
Zero-Car Households Within 500 ft. of Proposed Alignment	2	2	2
Acres of Parks potentially impacted	2	2	2
Parkland Parcels potentially impacted	2	2	2
Neighborhood impacts	2	2	2
Total- Community Impact	14	14	14
TOTAL GOAL 4 (Environmental Quality + Air Quality + Community Impact)	40	30	35

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4.0 Operations Plan

Introduction

The purpose of this section is to describe the transit operations plans serving in the GA 400 corridor. Transit operating plans define the transit routes and service levels for the alternatives being considered. The operating plans are considered for No Build and Build alternatives. Operating plans for each alternative form the basis of operating, maintenance and capital cost estimates. The No-Build Alternative will include the region's current and planned roadway and transit projects. The build alternatives are new corridor major investments that will be reflected with heavy rail transit (HRT), light rail transit (LRT) or bus rapid transit (BRT) technologies. The alternatives will include bus routes serving the corridor as well as potential feeder service that will provide additional transit access within the study corridor. Bus plans include route alignments modified to provide connections to the proposed station locations.

4.1 Operations Plan

GA 400 is the primary facility that carries a substantial number of trips to and from employment centers, major activity centers and residential communities in north Fulton County. The scenario for the GA 400 corridor will consider all three transit technologies. The HRT alignment extends from North Springs Station to Windward Parkway with stations at Northridge Rd., Holcomb Bridge Rd, Mansell Rd., and North Point Mall. The BRT and LRT alignments begin at the North Springs station with stops at Northridge Rd., Holcomb Bridge Rd., Mansell Rd., North Point Mall, Old Milton Rd. to the terminus at Windward Parkway. MARTA's existing Red Line terminates at North Springs Station south of the study area. This section will concentrate on the service characteristics, operating assumptions and feeder service for this scenario. Table 4.1-1 lists the service characteristics and operating

**Table 4.1-1: Service Characteristics/
Operating Assumptions**

Service Span	Weekday AM Peak PM Peak Weekend	05:00-01:00 05:00-0900 15:00-19:00 06:00-24:00
Service Frequency (minutes)	Weekday Peak/Off-Peak – HRT Weekday Peak/Off-Peak – BRT & LRT Weekend	15/20 15/20 20
Operating Days	Weekdays Saturdays Sundays	259 52 54
Number of Trains	Weekday Peak/Off-Peak – HRT Weekday Peak/Off-Peak –LRT Weekday Peak/Off-Peak –BRT	4/3 4/3 n/a
Number of Vehicles required	Weekday Peak/Off-Peak – HRT Weekday Peak/Off-Peak –LRT Weekday Peak/Off-Peak - BRT	24/18 16/12 4/3
Service hours (annual)	HRT LRT BRT	20,420 23,336 20,420
Service miles (annual)	HRT LRT BRT	508,866 car-miles 569,398 car-miles 498,248 bus-miles

Table 4.1-2 shows the operations and maintenance (O & M) costs basis by mode. The BRT and HRT are based on MARTA costs and the LRT costs are developed from peer LRT systems.

Table 4.1-2: Hourly O&M Cost Basis by Mode

Mode	Hourly Costs
BRT	\$96.28 / vehicle-hour
LRT	\$179.66 / train-hour plus \$2.57 / car-mile plus \$155,489 / mile of railway
HRT	\$596 / train-hour (\$99.33 / car-hour) for new service \$208.42 / train-hour (\$34.74 / car-hour) for existing service

assumptions for both scenarios by transit technology.

4.1.1 Feeder Service

The GA 400 study corridor consists of several existing MARTA routes that will be realigned and fed into the proposed stations on the GA 400 corridor alignment. However, this corridor has significant east-west travel patterns and additional routes were developed to capture these destinations within the study area. Seven additional routes were added to complement the feeder services for this corridor (see table 4.1.C). Major roads for the east-west feeder service are:

- Holcomb Bridge
- Old Milton
- Haynes Bridge
- Mansell
- Mount Vernon

Additionally, six existing MARTA routes and two GRTA routes will be realigned to feed into the proposed stations where applicable and included in Table 4.1-3. The existing feeder route 143 Windward P/R will be eliminated to avoid duplication of service.

Routes that serve stations but do not terminate at the station have an assumed dwell time at each station of one minute to reflect time required for boarding/de-boarding and acceleration/deceleration. This dwell time is included in the route's running time.. At each end point, layover times vary dependent upon the difference of running times and cycle times that can range between 10 and as much as 20%. The dwell time at stations is included in the running times. Routes that have a different routing between the HRT and the LRT/BRT alternatives are identified in bold, in all others the routing does not vary. Service spans are allocated similar to existing services already in the study corridor. Table 4.1-4 outlines the service characteristics for the new feeder for the GA 400 corridor.

4.1.2 Load Standards

Operating assumptions for the load standards will be MARTA Service Standards. Service standards are required by the MARTA Act and are a federal requirement to recipients receiving federal monies. The service standards are revised and adopted by the Board of Directors within 120 days of each new fiscal year. Load standards impact not only the quality of service but safety for passengers. Load standards vary between rail and bus due to the ratio of passengers on a bus or train to the amount of seats available on the vehicles. The rail load factors for all hours of service shall not exceed 150% or 1.50 except between Peachtree Center and Five Points where 170% or 1.7 is the maximum acceptable load permitted. The seated capacity for a single rail car is 64. The GA400 study corridor is beyond this point and the load factor shall not exceed 150% or 1.5. An example of train capacity is a 4-car consist that will have a seated load of 256 but the maximum acceptable load is 384. While there are several sizes for buses this will focus on the standard 40-foot bus. The load factors for a standard 40-foot bus are 125% or 1.25 of seated capacity not to exceed 150% or 1.5. For example, a 40-seat bus with 50 passengers is acceptable, but 60 or more exceeds the maximum limit. In addition, for a bus route operating more than 10 miles per trip on limited access highway, the load factor shall not exceed 100% or 1.0 of seated capacity. The feeder service for the GA400 corridor shall not exceed 150% or 1.5.

4.1.3 Fares

The MARTA current adopted fare policy is assumed in this plan. Table 4.1-7 outlines the current MARTA fare structure.

Table 4.1-3: Feeder Bus Service

Route	Name	Routing
East/West Connections		BRT/LRT/HRT Options
EW1	Holcomb Bridge	From Holcomb Center, continue Holcomb Bridge Rd. west to Holcomb Bridge Station, continue west to Holcomb Bridge/Crossville and loop at Hardscrabble
E2	Old Milton	From John's Creek at State Bridge/Medlock continue west to Old Milton to North Point Pkwy to North Point Station
W2	Old Milton	From North Point Station continue Haynes Bridge to Old Milton continue Rucker to Houze/Crabapple
*E2	Old Milton	From John's Creek at State Bridge/Medlock continue west to Old Milton to Old Milton Station
*W2	Old Milton	From Old Milton Station continue Old Milton to Rucker to Houze/Crabapple
EW3	Milton	From Arnold Mill at county line to Houze to Holcomb Bridge to Holcomb Bridge Station
EW4	Haynes Bridge	From Haynes Bridge/Old Alabama continue Haynes Bridge to North Point to North Point Station continue North Point Pkwy to Windward Station
EW5	Mt Vernon	From Mt Vernon/Spalding, continue Mt Vernon to Sandy Springs Station, continue Mt Vernon to Hammond & Lake Forest
EW6	Milton/Alpharetta	From Cumming Hwy @ county line, continue Cumming Hwy to Windward Pkwy to Windward Station
Existing Routes		
MARTA 85	Roswell Road	Existing routing but terminate in Mansell Station
MARTA 85	Roswell Road	Existing routing but route will serve Northridge Station and terminate in Mansell Station
MARTA 87	Roswell/Morgan Falls	Existing Routing
MARTA 87	Revised	Existing Routing and route will terminate at Northridge Station.
MARTA 140	North Point/Mansell	From Holcomb Bridge Station continue Holcomb Bridge to Alpharetta, Haynes Bridge to North Point, North Point Station, North Point Pkwy to Windward Pkwy to Windward Station
MARTA 150	Perimeter Center	Existing Routing
MARTA 150	Perimeter Center	Existing Routing to Dunwoody Village but route will continue via Roberts Rd to terminate at Northridge Station
MARTA 185	Alpharetta/Holcomb Bridge	From Holcomb Bridge Station existing routing to Windward Pkwy to Windward Station
GRTA 400	Cumming/Downtown	Existing routing but terminate at Windward Station
GRTA 401	Cumming/North Springs	Existing routing but terminate at Windward Station

*Bold text for new feeder routes represent BRT/LRT routing only.

Table 4.1-4: Bus Service Characteristics (New Feeder Routes)

Route	Name	Headways Pk./Off-Pk.	Span of service	Running Time Pk./Off-Pk.	Cycle Time Pk./Off-Pk.	No. of Buses required Pk./Off-Pk.
EW1	Holcomb Bridge	15/20	5:00 am-11:00 pm	120/120	135/140	9/7
E2	HRT Old Milton	15/30	6:00 am- 12:00 am	48/48	60/60	4/2
W2	HRT Old Milton	15/30	6:00 am- 12:00 am	34/34	45/60	3/2
E2	LRT/BRT Old Milton	15/30	6:00 am- 12:00 am	42/42	60/60	4/2
W2	LRT/BRT Old Milton	15/30	6:00 am- 12:00 am	34/34	60/60	3/2
EW3	Milton	15/30	5:00 am – 11:00 pm	106/106	120/120	8/4
EW4	Haynes Bridge	30/30	5:00 am- 1:00 am	104/104	120/120	4/4
EW5	Mount Vernon	15/20	5:00 am-11:00 pm	92/92	105/120	7/6
EW6	Milton/Alpharetta	15/20	5:00 am – 11:00 pm	34/34	45/60	2/2

Table 4.1-5 shows operating statistics of peak vehicles, vehicle miles and hours for the alternatives. The peak vehicle numbers shown is needed to operate the seven new feeder routes and are in addition to the existing fleet. The number of buses assumes a 20% spare ratio.

Table 4.1-5: New Feeder Routes Operating Statistics

	Peak Vehicles including Spares	Vehicle Miles (annual)	Vehicle Hours (annual)
HRT	46	932,260	78,736
BRT/LRT	47	946,764	80,808

Table 4.1-6 outlines the service characteristics for the existing routes operating in the GA 400 corridor.

Table 4.1-6: Bus Service Characteristics (Existing Service)

Route	Name	Headways Pk./Off-Pk.	Span of service	Running Time	Cycle Time	No. of Buses required
85	Roswell/Mansell	30/30	5:00am – 12:00 am	77/77	90/90	3/3
87	Roswell/Morgan Falls (existing)	20/30	5:00 am – 1:00 am	80/90	100/120	5/3
	Roswell/Morgan Falls (Northridge)	20/40		80/80	100/120	5/3
140	North Point/Mansell	15/30	6:00 am – 12:00 am	70/70	90/90	6/3
150	Perimeter Center/Dunwoody (existing)	30/50	6:00 am – 10:30 am	40/50	60/60	2/1
	Perimeter Center/Dunwoody (Northridge)	30/50		30/40	60/60	2/1
185	Alpharetta/Holcomb Bridge	30/30	5:00 am – 12:00 am	100/100	120/120	4/4
GRTA 400	Cummings/North Springs/Downtown Atlanta	60	Peak Period Only	n/a	n/a	n/a
GRTA 401	Cumming/North Springs	30	Peak Period Only	n/a	n/a	n/a

Of the existing routes, Routes 87 and 150 will be realigned to feed both scenarios serving the Pitts Road or the Northridge Stations. Table 4.1-7 shows operating statistics of peak vehicles, vehicle miles and hours for the six MARTA routes that currently operate within the study corridor. The number of buses assumes a 20% spare ratio.

Table 4.1-7: Existing Routes Operating Statistics

	Peak Vehicles including Spares	Vehicle Miles (annual)	Vehicle Hours (annual)
HRT	24	369,659	41,440
BRT/LRT	24	369,659	41,440

Table 4.1-8: Fares

Fare Type	Price	Multi-Day Visitor Pass (1-4 Days) (unlimited rides)	Price	Special Fare Programs	Price
Cash	2.50	1 Day Pass	9.00	Visitor's Pass Program	Discounted
Breeze Card (with purchase of additional fare loaded on card)	1.00	2 Day Pass	14.00	Partnership Program (Employers)	Discounted
Single Trip	2.50	3 Day Pass	16.00	University U-Pass Program	Students: 68.50 Faculty/Staff: 83.50
Round Trip	5.00	4 Day Pass	19.00	Student Pass Program (K-12) in MARTA service area only	14.40
Ten (10) Trips	25.00	n/a	n/a	Reduced Fare Program (Seniors, Disabled riders & Medicare recipients)	0.95
Twenty (20) Trips	42.50	n/a	n/a	Shuttles	Regular fare with free transfer
7-Day Pass (Unlimited for 7 consecutive days beginning first time use)	23.75	n/a	n/a	n/a	n/a
30-Day Pass (Unlimited for 30 consecutive days beginning 1st time use)	95.00	n/a	n/a	n/a	n/a

LIST OF ACRONYMS

A		MARTA	Metropolitan Atlanta Rapid Transit Authority
AA	Alternatives Analysis		
ARC	Atlanta Regional Commission	MARTOC	Metropolitan Atlanta Rapid Transit Authority Overview Committee
APTA	American Public Transportation Association		
B		N	
BRT	Bus Rapid Transit	NAHRGIS	Natural Archaeological Historical Resources Geographical Information System
C			
CATS	Charlotte Area Transit System	NEPA	National Environmental Policy Act
CBD	Central Business District	NRHP	National Register of Historic Places
CID	Community Improvement District	NWI	National Wetlands Inventory
CTP	Comprehensive Transportation Plan	O	
D		O&M	Operating & Maintenance
DCA	Department of Community Affairs	P	
DRI	Development of Regional Impact	PCID	Perimeter CID
E		P&R	Park and Ride
EPA	U.S. Environmental Protection Agency	R	
F		RTP	Regional Transportation Plan
FEMA	Federal Emergency Management Agency	ROW	Right-of-way
FTA	Federal Transit Administration	S	
G		SLUP	Special Land Use Permits
GA 400	Georgia State Route 400	SSTP	Statewide Strategic Transportation Plan
GADNR	Georgia Department of Natural Resources	SR	State Route
GDOT	Georgia Department of Transportation	T	
GEPD	Georgia Environmental Protection Division	TAD	Tax Allocation District
GIS	Geographic Information Systems	TDM	Travel Demand Model
GRTA	Georgia Regional Transportation Authority	TIA	Transportation Investment Act (of 2010)
H		TIP	Transportation Improvement Program
HUBZone	Historically Underutilized Business Zone	TOD	Transit-Oriented Development
HBW	Home Based Work	TPB	Transit Planning Board
HD	Historic District	TRB	Transportation Research Board
HRT	Heavy Rail Transit	U	
L		UGPM	Unified Growth Policy Map
LCI	Livable Centers Initiative		USFWS U.S. Fish & Wildlife Service
LOS	Level of Service	V	
LPA	Locally Preferred Alternative	V/C	Volume-to-Capacity Ratio
LRT	Light Rail Transit	VMT	Vehicle Miles Traveled
M			