Impacts of Regional Transit Infrastructure Investment on Metropolitan Atlanta:

An Examination Using the Transit Planning Board Concept 3 Vision Plan

December 18, 2008

Table of Contents

Summary

This document is an initial examination of the impact of major investment in regional transit infrastructure on the Atlanta region's transportation network. Concept 3 as authorized by the Transit Planning Board for public comment was used as the transit network. The initial report focuses on expected ridership and the system characteristics of the system combined with some of potential objectives described in the State Transportation Board's Investment in Tomorrow's Transportation Today (IT3) effort in order to illustrate how ongoing work at the different transportation organizations helps support the STB's objectives. Table 1 below reveals how these all fit together.

IT3 Goals & Objectives	Evaluation Criteria (TPB)	Results (TPB)
1. Move Georgians to work, school, and play reliably, affordably, Timely and within an acceptable time frame	1a – Connecting our Employment Centers 1b – Create mobility for commuters, elderly, the disabled, those without cars, those that do not drive and visitors	**1a - All 13 major employment centers connected by a dedicated reliable transit network** **1b – All major hospitals, educational institutions, courthouse and at least 23 major recreational facilities connected by transit**
2. Increase the labor-shed and accessibility of Georgia's Regional Employment Centers	2. Activity Center Accessibility	**2 – More than double the number of workers able to reach their jobs by transit in major suburban activity centers – in North Point and Town Center more than a 10-fold increase**
3. Reduce Congestion Costs below competitors	3a. Surface Roadway network Impact 3b. Safety Impact	**3a – Reduce the Annual travel time per person from projected levels** **3b – Reduce fatalities on the highway system by 14-31 annually**
4. Optimize Through of people and goods in existing network assets	4a – Cost benefit / Effectiveness 4b – Land Use Synergy	**4a – A $4.9 to $10.8 billion annula return on an annual investment of $2.4 billion - a ratio of benefits / costs between 2.0 -4.5 representing between** **4b – Serves 70 Livable Communities Initiative Centers reinforcing existing and planned investments**

Table 1 – Summary of Goals, Objectives, Evaluation and Results of Concept 3 Evaluation

Background

The Transit Planning Board has asked for a comprehensive examination of the impact of regional transit on Atlanta with a specific emphasis on the costs and benefits of transit. This document provides an overview of the impact of major investment in regional transit infrastructure on Atlanta through an examination of model results using the Atlanta Regional Commission Regional Travel Demand Model. Information on potential quantifiable benefits of transit projects are available from sources such as the Texas Transportation Institute's Annual Urban Mobility Report, reports from the Carl Vinson Institute at the University of Georgia and the American Automobile Association, while costs for the various projects were developed by staff using a published methodology.[1]

This report presents an overall rough estimated cost benefit analysis over a 20 year time frame for major investment in regional transit infrastructure through 2030 using Concept 3 with some limitations. These limitations are:

- Quantifiable benefits are confined to the potential congestion, safety, economic, and consumer fuel savings benefits of transit. Other quantitative benefits such as improved air quality through reduction in emissions are not included due to time and resource constraints

- Accessibility to activity centers is used as a proxy for labor market unification benefits. An estimate of this value benefit, reported to be one of the largest benefits of transit investment to the Atlanta region, is provided using historical trends from impact of the MARTA system on the Atlanta region.[2]

- Using the methodologies applied for this analysis for project level examination is cautioned for the following reasons[3]:

    - The current Origin-Destination survey used to calibrate the mode choice assignment for the RTDM was conducted in 2000-2001. This predates the introduction of a large number of new services in the region including much of the express and local bus service expansion in suburban counties

    - The absence of any existing commuter rail or light rail services in the region means that there is no local basis for the calibration of mode choice assignment to commuter rail or light rail projects in future-year scenarios

    - The RTDM treats heavy rail, light rail, and streetcar identically in terms of their perceived characteristics except for average speed

---

[1] "Atlanta Transit Planning Board Project Prioritization Process," Transit Planning Board (August 6, 2007). Pg. 3
[2] Tanner, Thomas C. and Adams Jones. The Economic Impact of the Metropolitan Atlanta Rapid Transit Authority: An analysis of the impact of MARTA Operations on and around the service delivery region. Georgia Economic Modeling System, Carl Vinson Institute of Government, The University of Georgia. Athens, GA. May, 2007.
[3] Most of these challenges will be corrected through completion of the anticipated On-Board Transit Origin-Destination Survey in the 2009-2010 timeframe

Additionally, as part of the ongoing interest by ARC staff in scenario-based modeling, ARC staff used this exercise as an opportunity to test four population and employment scenarios. This was accomplished using the same transportation network – in this case the Concept 3 transit network with E6 roadway network. This allowed development of a range of impacts related to population and employment shifts on the transportation system. This report will focus on the impact of these different population and employment scenarios on the transit network.[4] The population and employment shifting methodology is described in Appendix 1.

This report is structured to show how the stated goals of the TPB in developing Concept 3 fit together with the State Transportation Board's goals and objectives for the state transportation system. The initial development of Concept 3 network focused on delivering a system that provided:

1. Activity Center Focus
2. Regional Mobility and Congestion Mitigation
3. Cost effective and Cost-Benefit worthy
4. A Customer Focused System
5. Land Use Synergy

This focus led to an initial examination primarily on impacts in reduction of transfers between the transit network, increased accessibility to activity centers, the impact on the surface roadway network in terms of travel time and safety, a preliminary ratio of benefits to cost analysis and a system focused on serving specific land uses such as a hospitals, government centers and educational facilities.

During the course of the evaluation, the State Transportation Board (STB) launched the "Investing in Tomorrow's Transportation Today" (IT3) initiative that was designed to help focus and define the State of Georgia's priorities in transportation. Through this process, the STB identified several goals and objectives that were desired to be pursued. The ones particularly relevant for the Atlanta region focused on:

1. Move Georgia's citizens to work, school, and play reliably, affordably, and within an acceptable time frame
2. Increase the laborshed and accessibility of Georgia's regional employment centers
3. Reduce Congestion costs to Georgia's economy below that of competitors
4. Optimize throughput of people and goods in existing network assets

These objectives presented in a straightforward manner many of the concepts already being examined as part of the evaluation of the impact of Concept 3 on metro Atlanta's transportation network. Therefore, it was decided to structure this document to illustrate how the existing work on Concept 3 lines up with the ongoing work of the STB on IT3. The results are presented in this document that is structured in the following format:

[4] This effort was undertaken as an initiative of ARC staff

1. Introduction (this section)
2. A presentation of the overall 2030 ridership estimates of the Concept 3 System
3. Illustrate how the Concept 3 systems moves citizens reliably to work, school and play by:
    a. Creating a Regional Transit Network that connects our employment centers
    b. Creating mobility for commuters, elderly, the disabled, those without cars, those that do not drive, and visitors
4. Illustrated the increase laborshed of metro Atlanta's major employment centers through increases in workers within a 30-minute walk to transit trip
5. Illustrate the reduction in congestion and safety costs through:
    a. Surface Roadway Network Impacts
    b. Safety Impacts
6. Optimizes the Existing Infrastructure through
    a. Cost Benefit / Effectiveness
    b. Land Use Synergy
7. Conclusions

Regional Ridership Estimates

To quantify the impact of regional transit infrastructure investment on the system, both current and future, an estimate of potential regional ridership is needed. The ARC regional travel demand model provides a useful tool for estimating a general range of regional ridership through an estimate of average daily weekday trips. Some of the other measures of transit performance include estimates of annual trips and annual passenger miles. These measures are used in the estimation of the value of the congestion mitigation and safety benefits of regional transit investment. Using the model output of average daily weekday trips annual trips and annual passenger miles are estimated using the following methodology.

Equation 1 is used to estimate annual ridership (trips) to compare trips on both a weekday and annual basis:

Equation 1: $AR_i = Weekday\ Unlinked\ Trips_i * (WK + 1/2Sat + 1/3Sun)$

where:
i = Mode
AR = Annual Ridership Estimate
WK = Number of day with Weekday Service in a normal year
Sat = Number of days with Saturday Service in a normal year[5]
Sun = Number of Days with Sunday service in a normal year[6]

Passenger miles are estimated by using the model output. For bus boardings, passenger miles per route are used. Passenger miles for rail modes are estimated by multiplying the distance between the modeled stations and the number of trips on the link between the stations. This daily estimated is extrapolated to an annual estimate using Equation 1.

Table 2 below provides the potential impact on average daily weekday trips, estimated annual trips, and estimated annual passenger miles for an Atlanta regional transit system using available travel demand model results provided by ARC and the equations above to estimate annual trips and annual passenger miles. The National Transit Database figures for 2005 and the model estimates for 2005 are included to illustrate how the model compares to the actual performance of the existing regional transit system.

---

[5] Saturday service days are assumed to be all regular Saturdays in an average year (52), plus additional days normally scheduled with Saturday service such as the day of Thanksgiving and Christmas Eve day or 54 days per year

[6] Sunday service days are assumed to be all regular Sundays in an average year (52), plus Thanksgiving, the Fourth of July, Memorial Day, Labor Day, and Christmas, or 57 days per year

Measure	Actual 2007[7]	2008 Model Est.	E6 2030 Est.	2030 Concept 3 Est.	Concept 3 10% Pop./ Emp. Shift	Concept 3 20% Pop./ Emp. Shift
Average Daily Weekday Trips	515,400	434,000	714,000	827,000	1,220,000	1,750,000
Est. Annual Trips (1,000,000)	157	129	212	246	362	519
Est. Annual Passenger Miles (1,000,000)	877	758	1,240	1,490	2,200	3,260

Table 2– Estimates of Regional Trips on a Regional Transit System

Table 2 reveals that the regional travel demand model estimate is lower than the actual performance of the system in 2007. This suggests that any estimate of average weekday trips and estimates derived from average weekday trips probably represent a conservative estimate. The regional travel demand model estimates suggest that a network similar to Concept 3 would nearly double or quadruple average daily weekday boardings - depending on the shifts in population and employment. A similar outcome would be expected for annual passenger trips, but annual passenger miles might be expected to show almost a tripling to almost a quintupling of annual passenger miles. This reflects one desired focus of a regional transit system investment on providing alternatives for commuters, particularly those with hour or longer commutes – generally longer trips. These ranges should be considered a lower and extreme upper range for the impact on average weekday trips, annual trips, and annual passenger miles for a regional transit system investment.

In summary, a regional transit system similar to Concept 3 would be expected to increase regional average daily boardings to between about 830,000 to 1,750,000 per day. This range reflects potential shifts in population and employment as people and businesses react to investment in public transit. ..

Move Citizens Reliably to Work, School and Play

In order to move citizens reliably to where they want to go, a regional transit system must provide access to those areas. This section examines how the Concept 3 network connects our major employment centers directly with each other and how the Concept 3 network also provides access to our government centers, educational facilities and recreational areas throughout the region.

[7] Source: NTD 2007 for MARTA, GRTA, CCT, GCT, City of Canton compiled by the Transit Planning Board

Connecting our Employment Centers

A method to measure this characteristic is to examine the number of connections, or transfers, required to reach activity centers within the potential transit network. With thirteen major activity centers identified, there are a total of seventy-eight (78) different combinations of activity center to activity center pairs. Table 6 presents the current number of transfers required to reach each activity center from a specific activity center with the current transit network and the Concept 3 network.

Number of Transfers Required to Travel Between Activity Centers	Existing System	Concept System 3
0	12	40
1	25	34
2	24	4
3	13	0
4	4	0
Total	78	78

Table 3 – Activity Center Transfer Matrix

Table 3 reveals that there are only twelve activity center pairs in the 2008 transit network that can be reached without a transfer and that there are four pairs that require four transfers. Those four are:

1. Fulton Industrial Boulevard to Peachtree Corners
2. Peachtree Corners to North Point
3. Town Center to Fulton Industrial Boulevard
4. Town Center to Peachtree Corners

The network in the Concept 3 vision plan has no activity center pair with more than two transfers. Over half of the travel between activity centers would require no transfer and only four pairs would require two transfers:

1. Fulton Industrial Boulevard to Buckhead
2. Fulton Industrial Boulevard to North Point
3. Peachtree Corners to Fulton Industrial Boulevard
4. Southlake to Fulton Industrial Boulevard

What the pair-to-pair comparison reveals is that Concept 3 provides a fairly dense, interconnected network of services between the thirteen major activities centers that allows for convenient travel between them. In other words, the transit system provides a core backbone through mobility between the most important multi-use regional centers. This enables the workforce to travel effectively and efficiently between employment opportunities.

Create Mobility for commuters, elderly, the disabled, those without cars, those that do not drive, and visitors

This section examines how the Concept 3 network impacts mobility for a variety of markets. The previous sections have focused on accessibility for employment centers which is a primary focus on the commuter market. Therefore this section will focus on how the Concept 3 network impacts the elderly, the disabled, those without cars, and visitors to our region specifically examining how the accessibility of major hospitals, government centers, and regional parks. Tables 4 – 7 provide a list of major hospitals, courthouses, educational institutions, and major regional parks and entertainment venues, respectively, their current transit service and the transit service on the Concept 3 network.

Major Hospital	Current Transit Service	Concept 3 Service
Rockdale Hospital	N/A	Commuter Rail, Regional Suburban Bus
Columbia Eastside Medical Center	N/A	Regional Suburban Bus
Gwinnett Medical Center	GCT 40	Commuter Rail, Regional Suburban Bus, Arterial BRT
GHS – Joan Glancy Memorial	N/A	Commuter Rail, Arterial BRT
Crawford Long	MARTA North and Northeast lines, 23	Heavy Rail, Streetcar
Piedmont	MARTA 23	Beltline, Streetcar
North Fulton Regional	MARTA 185	Arterial BRT
Northside	MARTA North Line	Heavy Rail
Scottish Right	MARTA North Line	Heavy Rail
Saint Joseph's	MARTA North Line	Heavy Rail
Georgia Baptist	MARTA 99, 16	Local Bus
Hughes Spalding	MARTA East Line	Heavy Rail, Streetcar
Grady	MARTA East Line	Heavy Rail, Streetcar
South Fulton Medical Center	MARTA 55, 78, 93, 178	Local Bus
Fayette Community Hospital	N/A	Arterial BRT, Regional Suburban Bus
Promina Douglas	N/A	Regional Suburban Bus
Columbia Parkway Medical Center	N/A	Regional Suburban Bus
Emory Dunwoody Medical Center	MARTA 103	Local Bus
Veterans Hospital	MARTA 19	Commuter Rail, LRT
Emory University Hospital	MARTA 6, 245, 36	Commuter Rail, LRT
Wesley Woods Geriatric	MARTA 6, 245, 36	Commuter Rail, LRT
DeKalb Medical Center	MARTA 36, 123, 125	Local Bus
Egleston Children's Hospital	MARTA 6, 245, 36	Commuter Rail, LRT
Wellstar Kennestone Hospital	CCT 40, 45	LRT
Emory Adventist	CCT 20	Local Bus
Wellstar Cobb Hospital	CCT 30, 70	Arterial BRT, Regional Suburban Bus
Southern Regional Medical Center	C-TRAN 503	Regional Suburban Bus
Northside Cherokee Hospital - Canton	CATS 1	Regional Suburban Bus

Table 4 – Major Regional Hospital Transit Access

Major Educational Institutions	Current Transit Service	Concept 3 Service
Reinhardt College – Waleska	N/A	Regional Suburban Bus
Clayton College and State University	C-TRAN 501, 502	Commuter Rail
Kennesaw State University	CCT 40, 45	LRT, Freeway BRT
Southern Polytechnic State University	CCT 10, 101, 10C	LRT
Chattahoochee Tech	CCT 20	Arterial BRT
Life College	CCT 10	LRT
Georgia Perimeter – North	MARTA 132	Local Bus
Georgia Perimeter College South	MARTA 15	Arterial BRT
Georgia Perimeter College – Central	MARTA 121, 122, 125	Arterial BRT
Mercer University	MARTA 126	Local Bus
Oglethorpe University	MARTA 25	Local Bus
Emory University	MARTA 6, 36, 245	Commuter Rail, LRT
DeKalb Tech	MARTA 121, 122, 125	Arterial BRT\
Agnes Scott College	Decatur station	Heavy Rail
Emory University West Campus	MARTA 16	Arterial BRT
DeVry University	MARTA East Line	Heavy Rail
Mercer University – Douglas	N/A	Regional Suburban Bus
Carroll Tech – Douglas	N/A	Freeway BRT
Atlanta Metropolitan College	MARTA 95	Local Bus
Georgia Institute of Technology	MARTA North, Northeast, 113, Tech Trolley	Heavy Rail, LRT/Streetcar
Georgia State University	All MARTA Heavy Rail	Heavy Rail, Commuter Rail, Streetcar
Atlanta University Center	MARTA East, North, Northeast, Local Bus	Heavy Rail
Atlanta Christian College	MARTA 162	Local Bus
Georgia Gwinnett University	N/A	Regional Suburban Bus
Rockdale Center for Higher Education	N/A	Commuter Rail
Griffin Tech	N/A	Commuter Rail
Mercer University – College of Griffin	N/A	Commuter Rail
University of Georgia – Griffin	N/A	Commuter Rail
University of Georgia	Athens Transit	Commuter Rail

Table 5 – Major Regional Hospital Transit Access

Courthouses	Current Transit Service	Concept 3 Service
Cherokee County Courthouse	CATS 1, 2	Regional Suburban Bus
Clayton County Courthouse	C-TRAN 502	Commuter Rail, Arterial BRT, Regional Suburban Bus
Clayton County Justice Center	CTRAN 501, 504, Xpress 440, 441	Arterial BRT, Regional Suburban Bus
Cobb County Courthouse and Probate	CCT 15, 40, 45, 65	Arterial BRT
Cobb County Juvenile Courts	CCT 15	Local Bus
DeKalb County Juvenile Courthouse	MARTA 121	Arterial BRT
DeKalb County Courthouse	MARTA East Line	Heavy Rail
Douglas County Courthouse	N/A	Regional Suburban
Fayette County Juvenile Court	N/A	Arterial BRT, Regional Suburban Bus
Fayette County Courthouse	N/A	Arterial BRT, Regional BRT
Georgia Supreme Court	MARTA Heavy Rail	Heavy Rail, Arterial BRT
Fulton County Juvenile Court	MARTA Heavy Rail	Heavy Rail
Fulton County Probate Court	MARTA Heavy Rail	Heavy Rail
Georgia Court of Appeals	MARTA Heavy Rail	Heavy Rail, Arterial BRT
Fulton County Courthouse	MARTA Heavy Rail	Heavy Rail
Gwinnett County Courthouse	GCT 40	Commuter Rail
Henry County Magistrate	N/A	Freeway BRT, Regional Suburban Bus
Henry County Juvenile Court	N/A	Freeway BRT, Regional Suburban Bus
Henry County Probate Court	N/A	Freeway BRT, Regional Suburban Bus
Henry County Courthouse	N/A	Freeway BRT, Regional Suburban Bus
Rockdale County Courthouse	N/A	Commuter Rail, Regional Suburban Bus
Spalding County Courthouse	N/A	Commuter Rail, Arterial BRT
Spalding County Juvenile Court	N/A	Commuter Rail, Arterial BRT

Table 6 – Courthouse Transit Access

Major Parks / Entertainment Venues	Current Transit Service	Concept 3 Service
Sweetwater Creek Park	N/A	Regional Suburban Bus, Freeway BRT
Stone Mountain Park	MARTA 120, 118	Arterial BRT, Commuter Rail
Kennesaw National Battlefield	CCT 45	LRT
Chattahoochee National Recreational Area	MARTA 12, 85 CCT 10	LRT, Arterial BRT, Regional Suburban Bus
Piedmont Park	MARTA North, Northeast, 27, 26, 45	Heavy Rail, Streetcar, Beltline
Mount Arabia	N/A	Regional Suburban Bus
Panola Mountain Park	N/A	Regional Suburban Bus, Arterial BRT
Cochran Mill Park	N/A	Arterial BRT
Lake Allatoona Water Management Area	N/A	Regional Suburban Bus, Freeway BRT
Gwinnett Arena	GCT 103A, 50	Arterial BRT, LRT
Grant Park	MARTA 32, 97, 397	Beltline
Cobb Energy Center	CCT 10, 10B, 50	LRT
Spivey Hall	C-TRAN 501, 502	Commuter Rail
Memorial Arts Center	MARTA North, Northeast, 23, 36, 110, 110 CCT 10, GCT 412	Heavy Rail, LRT, Streetcar
Fox Theater	MARTA North, Northeast, 2, 27, 99, 110	Heavy Rail, Streetcar
Atlanta Civic Center	MARTA North, Northeast, 16	Heavy Rail
Philips Arena	MARTA West, PC	Heavy Rail, Commuter Rail, LRT, Streetcar
Chastain Park	MARTA 38	Local Bus
Encore (Alpharetta)	MARTA 140	LRT, Arterial BRT
Georgia Dome	MARTA West, PC	Heavy Rail, Commuter Rail, LRT, Streetcar
Alexander Memorial Coliseum	MARTA North, Northeast, 12, 37, 137	Heavy Rail
Ferst Center	MARTA 113, Tech Trolley	LRT
AUC Stadium	MARTA West, PC	Heavy Rail

Table 7 – Major Regional Park and Entertainment Venues Transit Access

Tables 4 – 7 reveal that out of major destinations that the elderly, the disabled, people without cars, and visitors may want or have to travel to such as hospitals, courthouses, educational facilities, or entertainment venues, are reachable by transit with the Concept 3 network.

Increased Laborshed

A key characteristic of Concept 3 is "Activity Center Connectivity" or increasing the laborshed available to our major employment centers. Tthe Georgia Economic Modeling Systems report on the impact of the MARTA system on metro-Atlanta estimates the greatest benefit is in terms of unifying the labor market. This report estimates that the impact of the MARTA system on metropolitan Atlanta ranges between $2 - $2.5 billion annually between 2001 and 2006. For comparison the estimated annual amount needed both to operate our current regional transit system and construct and operate the Concept 3 vision is $2.4 billion in 2007 dollars. This is within the range of the economic impact of the current MARTA system. Since economic impacts of transit system investment are not explicitly captured in the regional travel demand model, one way to estimate the potential impact of the regional transit system on labor market unification is through examination of accessibility to the major employment centers. One of the important conclusions of the Georgia Economic Modeling System's report on the impact of MARTA on the Atlanta region was the value was primarily the result of labor market unification. This means that workers are able to find jobs that met their skills more easily because of MARTA and that employers are able to find employees that meet their needs raising the productivity of the Atlanta region's economy. Table 8 below presents the estimated economic impact of MARTA on the Atlanta region with the capital and operational dollars spent on the regional transit system in Atlanta from 2001 to 2006.

	2001	2002	2003	2004	2005	2006
Estimated Economic Impact of MARTA[8] (Millions $)						
	$1,333	$1,563	$1,571	$1,543	$1,589	$1,630
Total Annual Operating Costs for the Atlanta Regional Transit System (Millions $)						
	$344	$313	$337	$332	$338	$334
Total Annual Capital Costs for the Atlanta Regional Transit System (Millions $)						
	$268	$248	$255	$220	$183	$221
Total Annual Capital and Operating Costs for the Atlanta Regional Transit System (Millions $)						
	$612	$561	$592	$552	$521	$555
Ratio of Estimated Economic Impact and Total Costs						
	2.2	2.9	2.7	2.8	3.0	2.9

Table 8 – Estimated Economic Impact of MARTA and Regional Transit System Costs

[8] Tanner, Thomas C. and Adams Jones. The Economic Impact of the Metropolitan Atlanta Rapid Transit Authority: An analysis of the impact of MARTA Operations on and around the service delivery region. Georgia Economic Modeling System, Carl Vinson Institute of Government, The University of Georgia. Athens, GA. May, 2007.
[9] Source: NTD 2006 for MARTA, GRTA, CCT, GCT, City of Canton compiled by the Transit Planning Board
[10] Source: NTD 2006 for MARTA, GRTA, CCT, GCT, City of Canton compiled by the Transit Planning Board

Table 8 reveals that the estimated economic impact of the MARTA system alone exceeds the amount the Atlanta region spent through local, state, federal, passenger fares, and other revenues to operate and maintain the entire regional transit system by a ratio of between 2.2 to 3.0. As the GEMS report notes, this estimated impact does not include any benefits from safety improvement, air quality improvements or congestion relief and is primarily based upon improvements to the Atlanta region's economic productivity due to labor market unification.

Figures 1 – 8 below provide a visual representation of how the current regional rail network impacts our major employment centers and provides a visual representation of labor market unification. Figures 1 – 4 show the origins of trips to Downtown, Midtown, Buckhead, and Perimeter Center, all employment centers along the existing MARTA heavy rail lines. These figures were taken from the comments submitted by MARTA on Concept 3.[11]

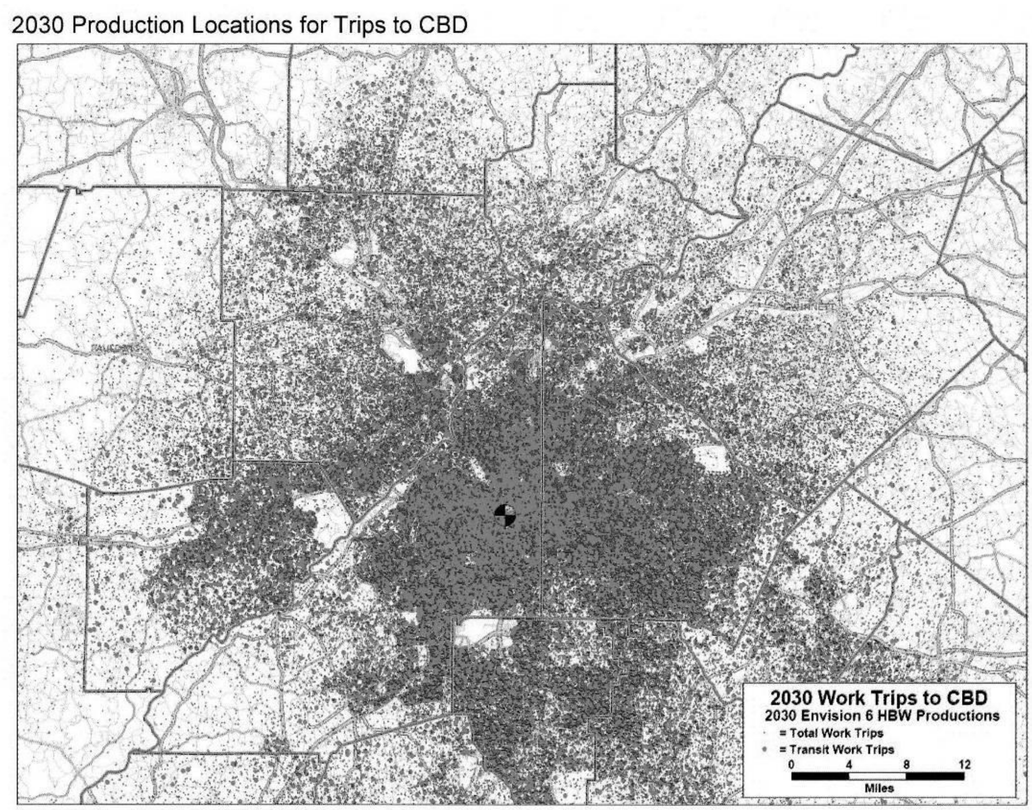

Figure 1 – Origins of Downtown Employment Trips

---

[11] Move the Atlanta Region Now: TPB Concept 3 Review. Metropolitan Atlanta Rapid Transit Authority, June, 2008. Section 3 – Activity Center Trip Patters

2030 Production Locations for Trips to Midtown

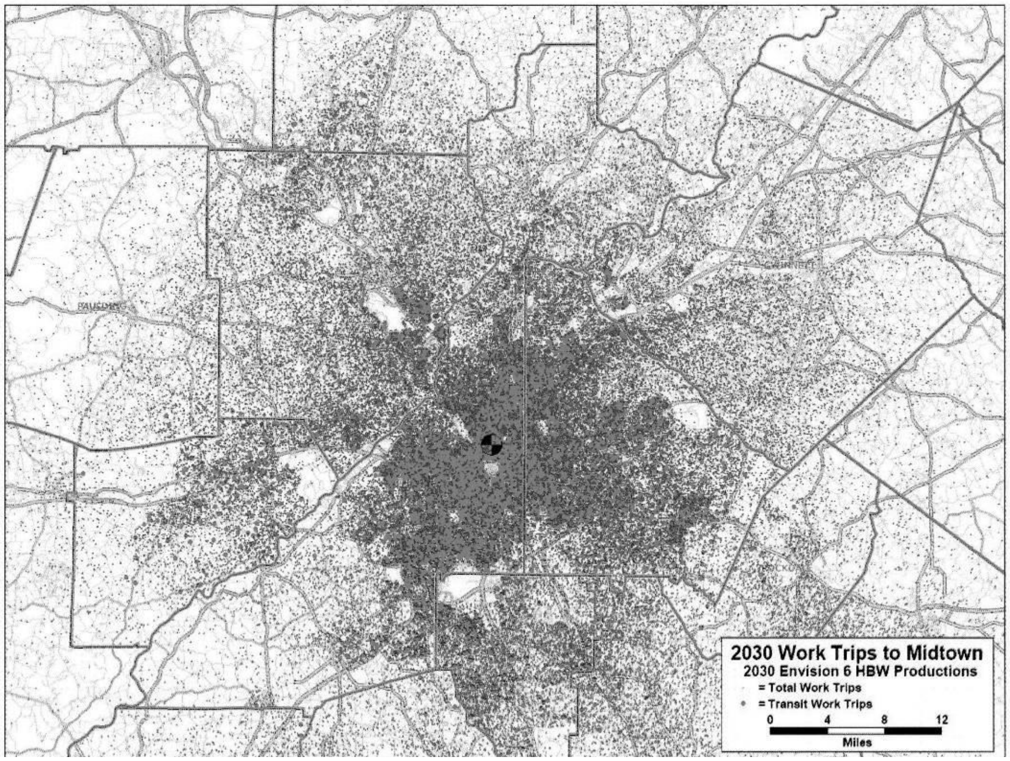

Figure 2 – Origins of Midtown Employment Trips

2030 Production Locations for Trips to Buckhead

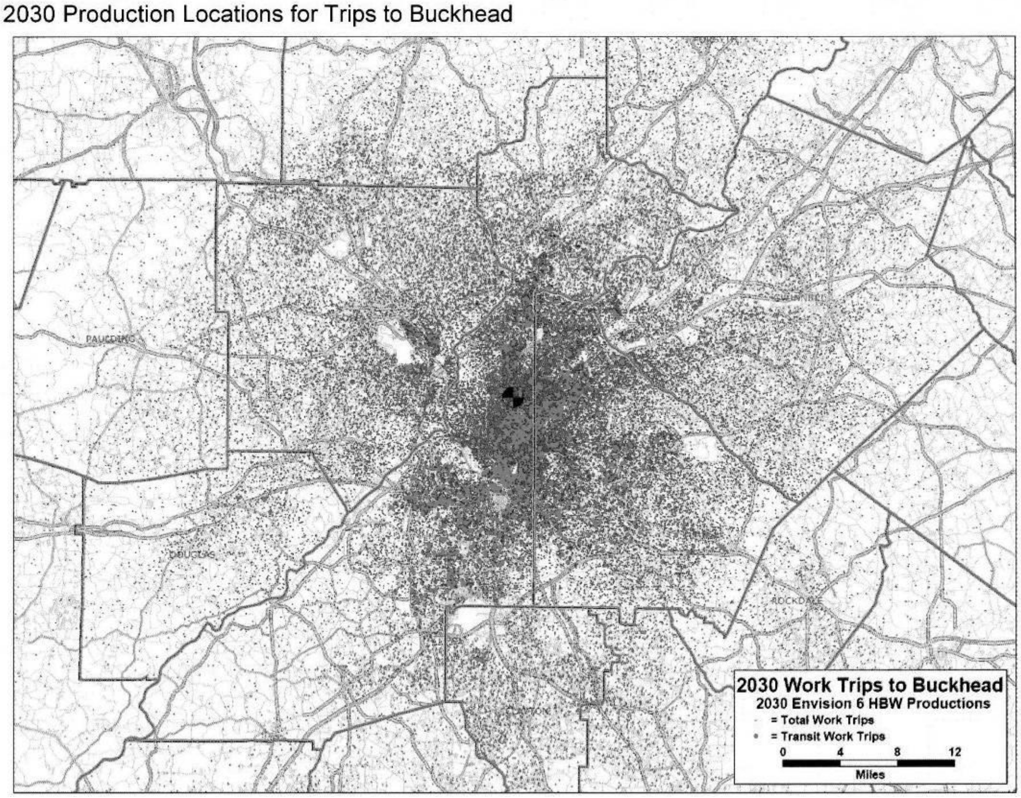

Figure 3 – Origins of Buckhead Employment Trips

2030 Production Locations for Trips to Perimeter

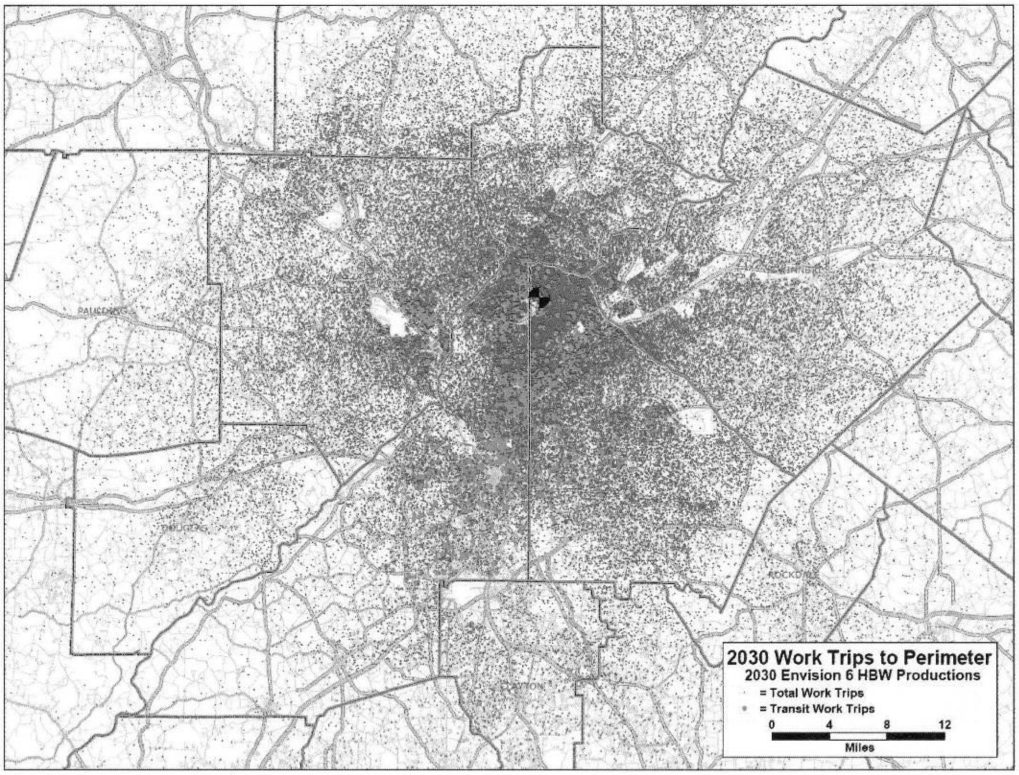

Figure 4 – Origins of Perimeter Center Employment Trips

Each of these employment centers has a nexus of strong employment trip origins centered around their main core. Additionally, noticeable on the Perimeter and Buckhead figures, are additional pockets of origins in central DeKalb, central Fulton and west Atlanta – all located along the existing MARTA rail lines. In general, these figures show that in addition to drawing strongly from the immediate area, these employment centers also draw employees from the areas of the region with strong transit access, expanding their potential employment base.

Figures 5 – 8 illustrate the work trip origins for four additional employment centers not currently connected to the regional fixed guideway system – Cumberland, Gwinnett Place, Peachtree Corners and Southlake.

2030 Production Locations for Trips to Cumberland

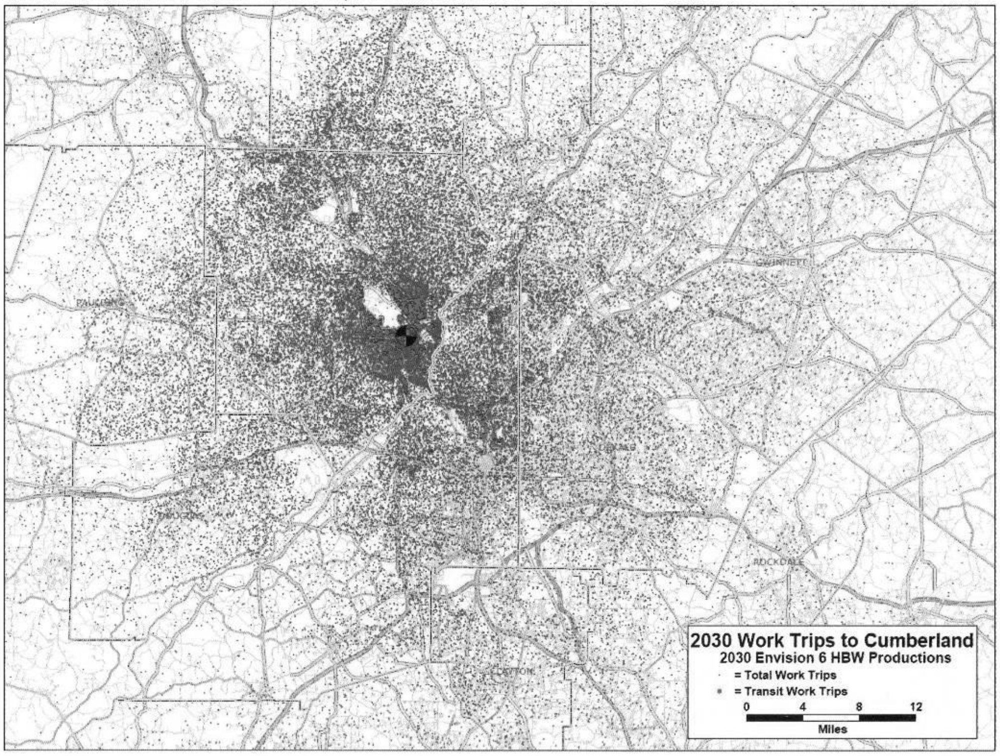

Figure 5 – Trip Origins for Cumberland

2030 Production Locations for Trips to Gwinnett Place

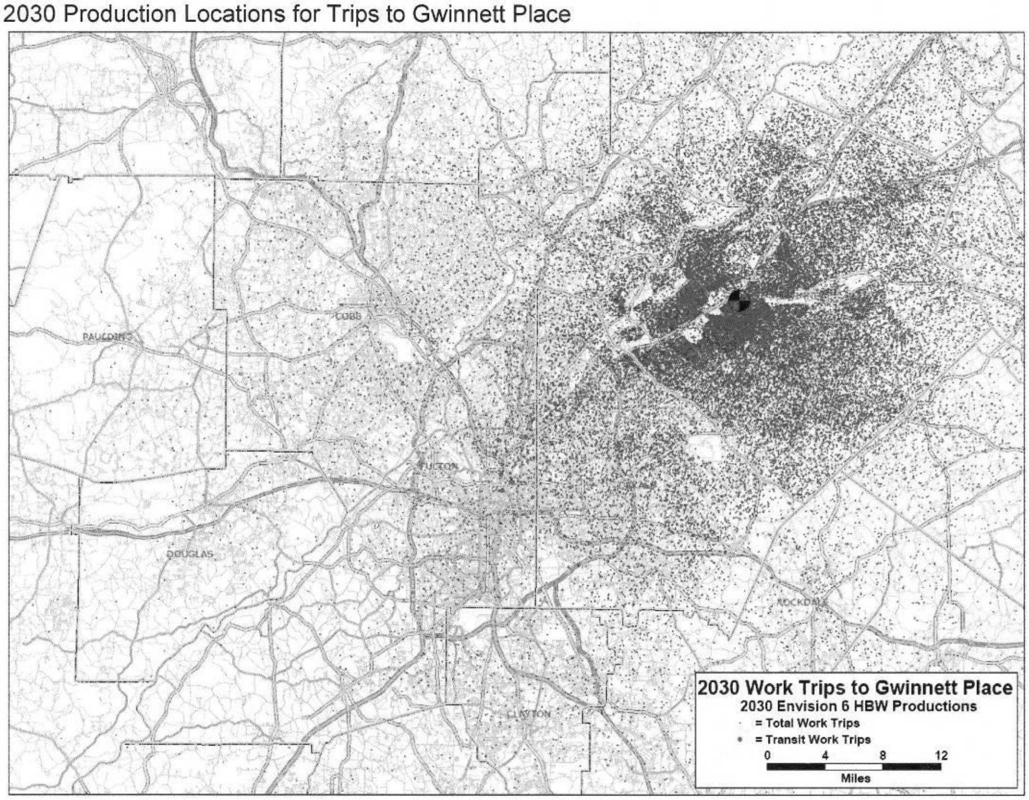

Figure 6 – Trip Origins for Gwinnett Place

2030 Production Locations for Trips to Norcross/Peachtree Corners

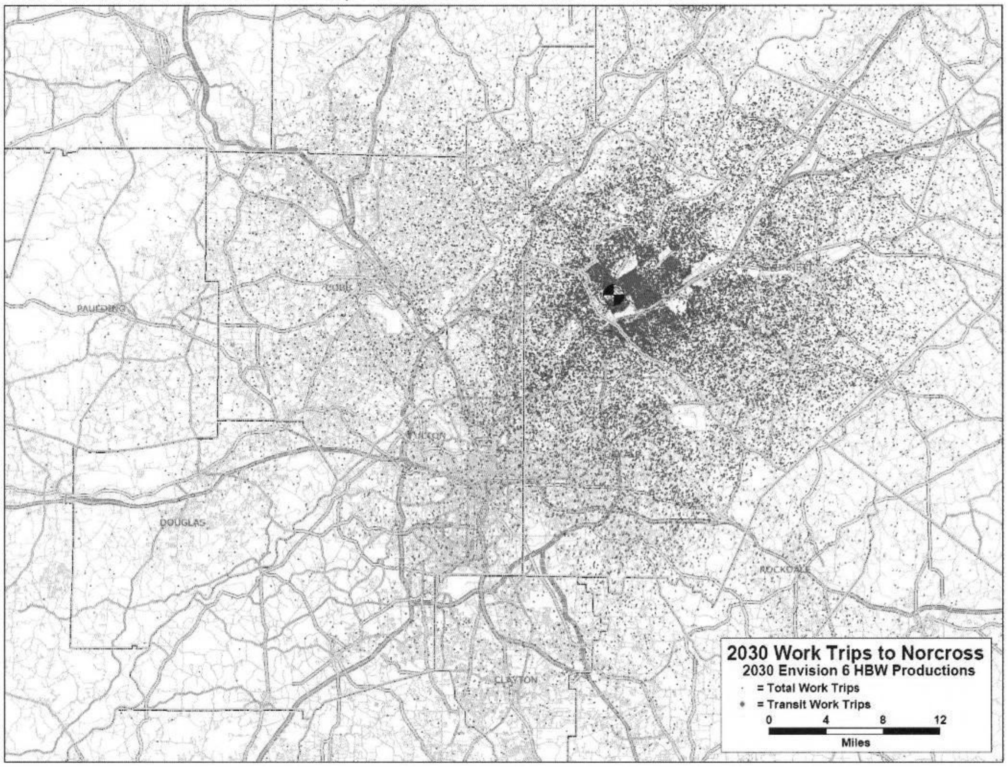

Figure 7 – Trip Origins for Peachtree Corners

2030 Production Locations for Trips to Southlake

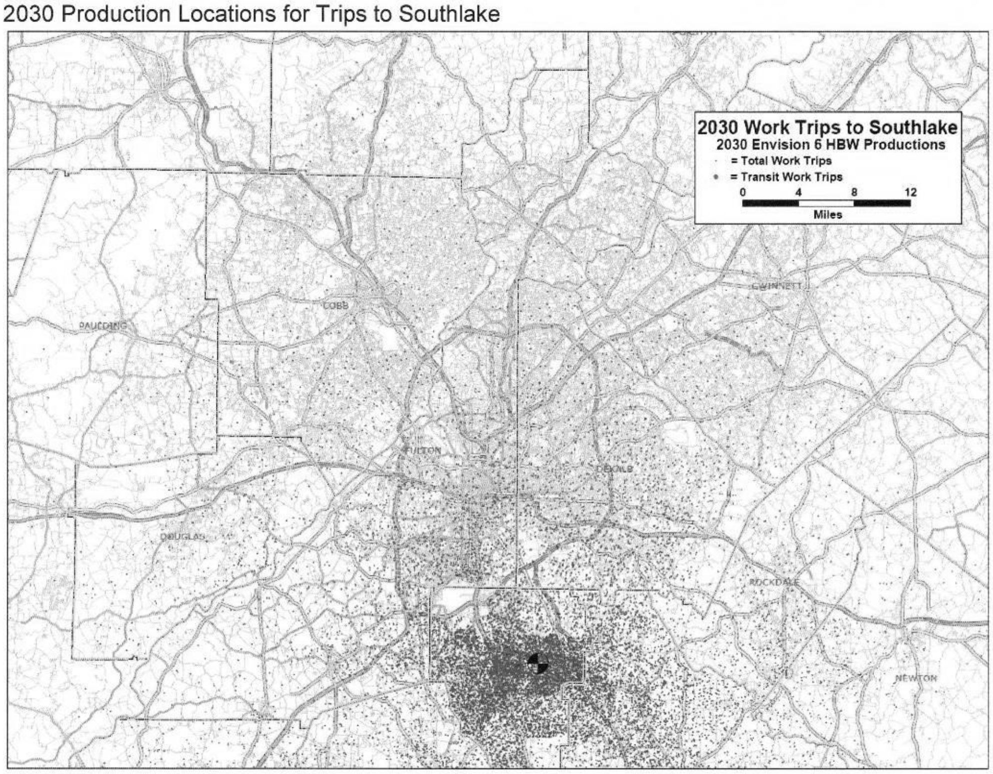

Figure 8 – Trip Origins for Southlake

In contrast the previous figures, Figures 5 – 8 shows that trip origins are only concentrated in the areas around these employment centers. This means that these major employment centers only draw the vast majority of their employees from their immediate area and are not drawing significantly from the broader region. One potential suggestion from these figures is that the regional heavy rail system allows the employment centers with direct access to draw from both their immediate surrounding area as well as areas along the heavy rail system for large number of employees, while major employment centers not connected to the heavy rail system only draw employees from their immediate surroundings.

While the regional travel demand model does not explicitly include estimates of the economic impact of transportation investments on the labor market of the region, it does provide information on household accessibility to major activity and employment centers. Using this accessibility as a proxy for labor market impact, since increased accessibility should improve labor market productivity by providing more potential employees for available jobs, it is possible to judge whether transportation investments might have a strong impact on the regional labor market. Initial results have focused on the major activity centers of Downtown, Midtown, Buckhead, Perimeter Center, and Cumberland. Table 9 below presents the estimated number of households within 30 minutes of walk to transit in these different activity centers for the existing system, the 2030 E6, and base 2030 Concept 3 along with the different population and employment shift scenarios as prepared by ARC.

Measure	2008 Model Estimates	2030 E6	2030 Concept 3 Base	Concept 3 10% Pop./ Emp. Shift	Concept 3 20% Pop./ Emp. Shift
Downtown	228,000	325,000	345,000	419,000	471,000
Midtown	177,000	256,000	289,000	339,000	377,000
Buckhead	133,000	221,000	293,000	356,000	362,000
Cumberland	37,000	91,000	133,000	159,000	170,000
Perimeter Center	62,000	103,000	140,000	169,000	208,000
Airport	76,000	96,000	106,000	128,000	156,000
Town Center	1,500	37,000	30,000	37,000	43,000
Gwinnett Place	18,000	31,000	53,000	62,000	73,000
Peachtree Corners	14,000	17,000	61,000	74,000	88,000
Southlake	3,100	7,200	12,000	16,000	18,000
Fulton Industrial Boulevard	30,000	50,000	59,000	65,000	122,000
North Point	2,200	2,500	36,000	43,000	54,000

Table 9 – Estimated Workers within 30 minutes by transit for activity centers according to the regional Travel Demand Model

Table 9 reveals that according to the regional travel demand model, with one exception, there is an increase in accessibility for all activity centers in terms of potential employees within a 30 minute walk to transit. Figure 9 below shows ratio of employees to workers within a 30-minute walk to transit trip for the major activity centers in 2008 and 2030 with and without a population and employment shift. The following figure 10, shows the estimated absolute change in number of potential employees within a 30-minute walk to transit trip for the major activity centers between 2008 and 2030.

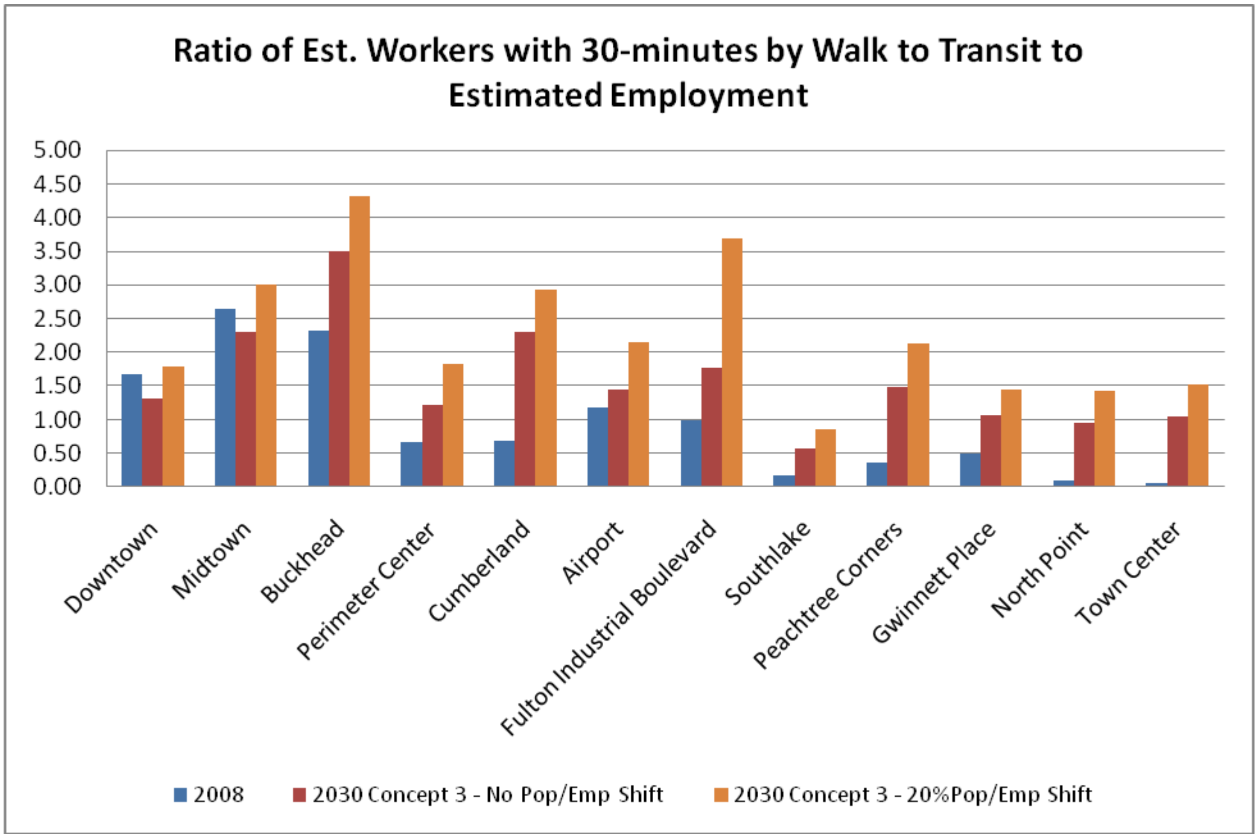

Figure 9 - Ratio of employees to workers within a 30-minute walk to transit trip for major activity centers

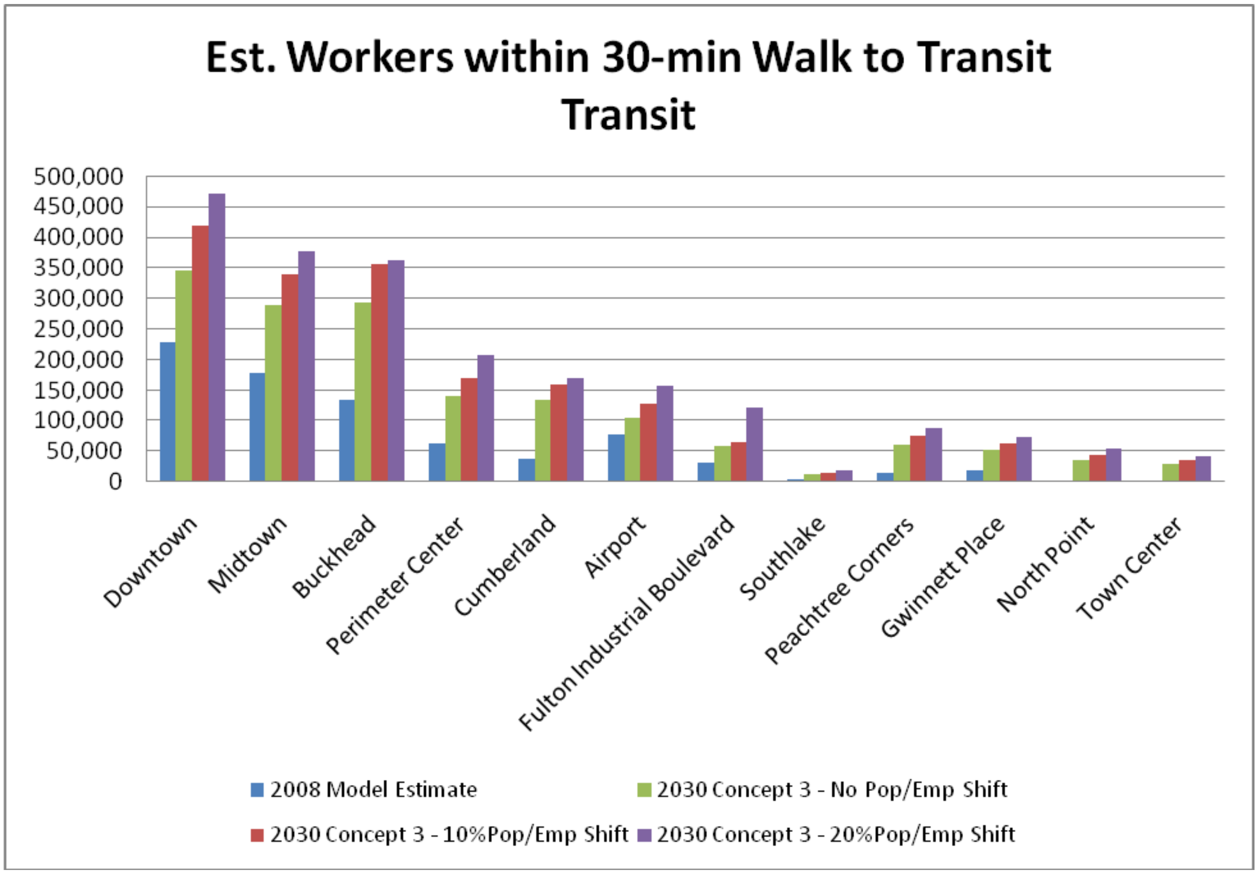

Figure 10 - Estimated Workers within a 30-minute Walk to Transit Trip for Major Activity Centers

These two figures reveal several important points. First, Downtown, Midtown, and Buckhead continue to have the largest number of potential workers within a 30-minute walk to transit trips. Secondly, the greatest increases in accessibility occur outside of these areas particularly in Cumberland, Peachtree Corners, North Point, and Town Center. In Finally Town Center and North Point see an increase from of over 1,000% of the number of workers within a 30-minute walk to transit trip.

As a proxy for a more unified labor market, the initial analysis indicates that Concept 3 would have a net positive impact on the Atlanta region through improvements in accessibility to employment opportunities by providing reliable transportation to and between the major employment centers. This change is most pronounced and important for those current activity centers not having direct access to the rapid transit network – specifically:

- Cumberland
- Fulton Industrial Boulevard
- Southlake
- Peachtree Corners
- Gwinnett Place
- North Point
- Town Center

Regional Mobility and Congestion Mitigation

This section examines at a system level, the impact of the Concept 3 network on the surface transportation system of the metro Atlanta region focusing on the surface roadway network under congested conditions and safety impacts.

Surface Roadway Network

Modeling of the Concept 3 network produced some interesting results on the surface freeway and arterial network. Figures 11 – 14 provide an overview of the congestion on the surface freeway and arterial road networks all day and during the PM peak for the urban, suburban, and exurban sections of the system.

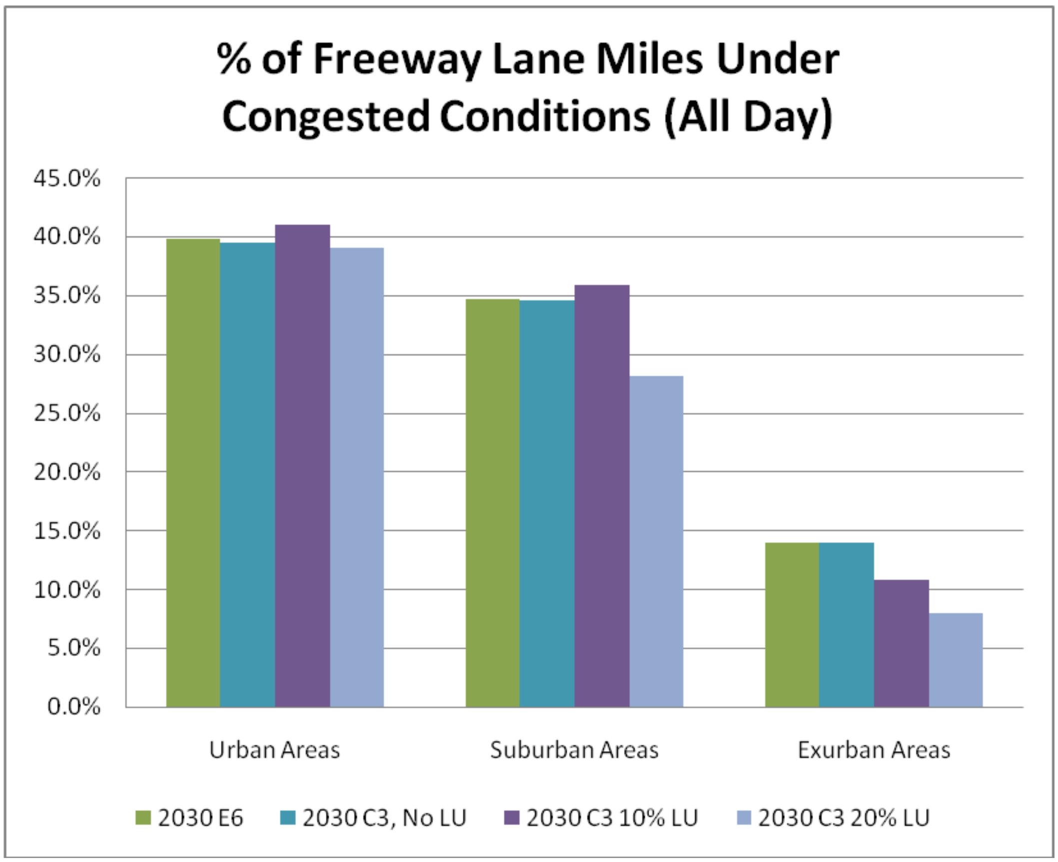

Figure 11 - % of Freeway Lane Miles Under Congestion throughout the Day

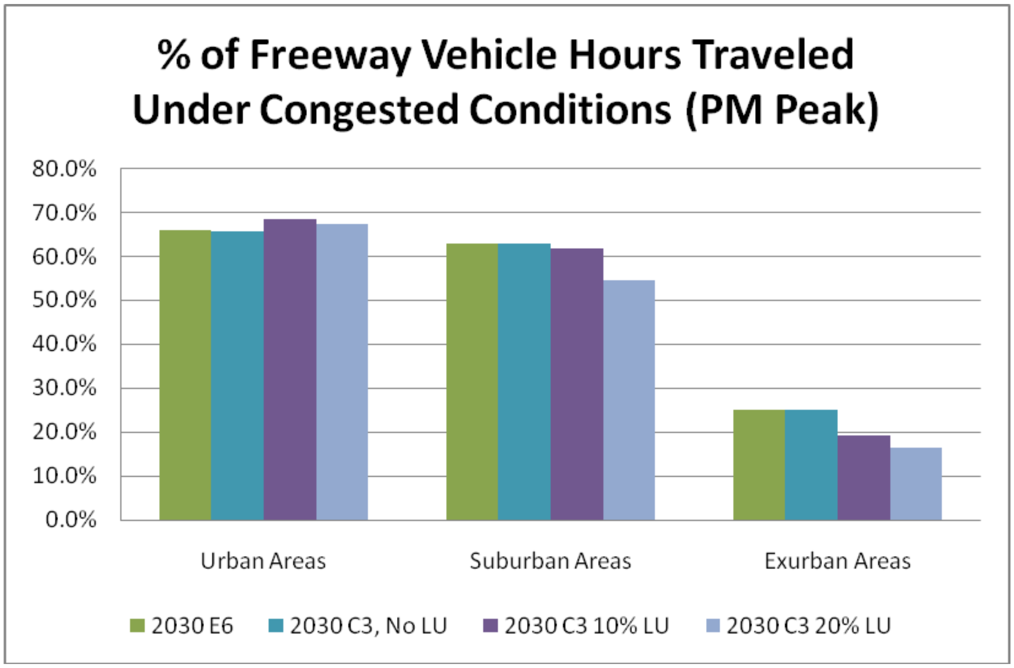

Figure 12 – Percentage of Vehicle Hours Traveled Under Congested Conditions during the PM Peak Period

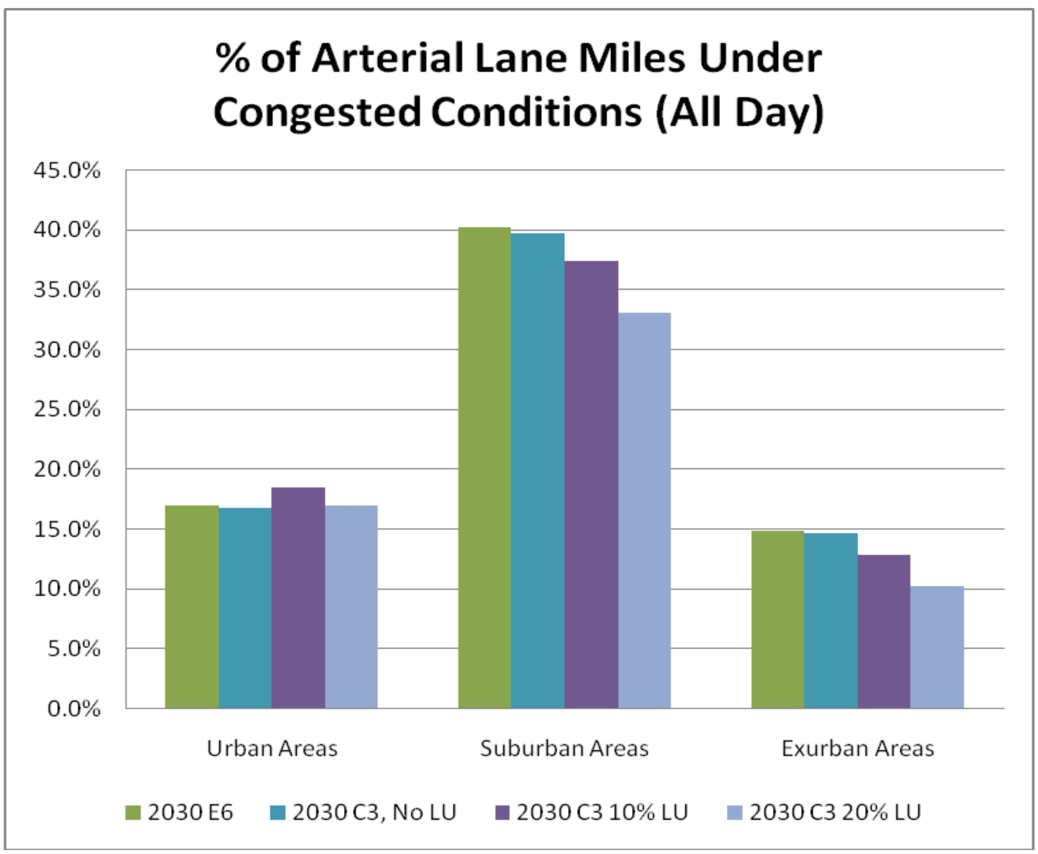

Figure 13– Percentage of Arterial Lane Miles Under Congested Conditions

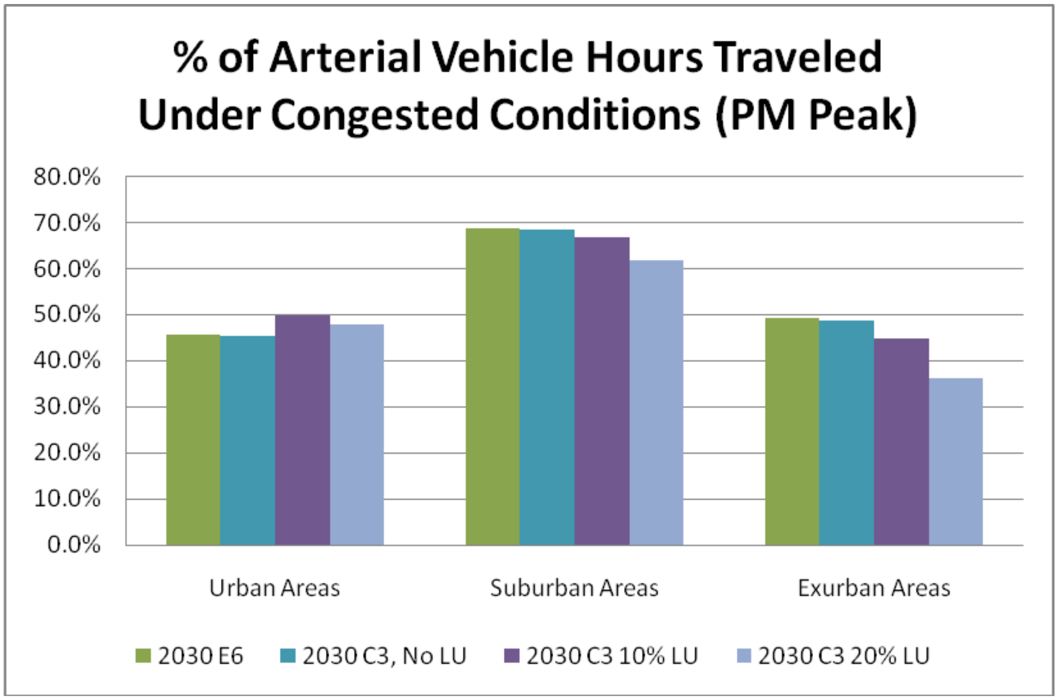

Figure 14 – Percentage of Arterial Vehicle Hours Traveled Under Congested Conditions during the PM Peak

Figures 11-14 reveal that while congestion may increase slightly within the urban parts of the roadway network, the percentage of time in congestion decreases on the suburban and exurban roadway network, particularly for the arterial network. What is also interesting to note is that suburban arterials have consistently higher congestion levels than either urban or exurban arterials. Indeed, suburban arterials spend as much time under congested conditions (as a percentage of vehicle hours traveled) as urban freeways.

Measures	E6	2030 C3, No LU	2030 C3, 10% LU	2030 C3, 20% LU
Annual Travel Time (hours) / person	374.70	372.70	368.30	336.80
% of Travel Time Spent in Congestion	40.10%	39.90%	41.90%	40.90%
Annual Travel Time in Congestion (hours)	150.25	148.71	154.32	137.75

Table 10 – Per-capita Travel Time Measures

Table 10 reveals an interesting point – overall the Concept 3 network and the population / employment shift scenarios reveal that metro-Atlantans would spend less time traveling, but may experience a greater percentage of that time in congestion.

Overall, these measures show that there would be a reduction in travel time and in congested conditions for some parts of the freeway and arterial network in the outer lying areas. This suggests that a transit investment decision makers need to consider the tradeoff between less congestion in the exurban and suburban network and more congestion on the urban surface transportation network.

Safety

As part of the process for evaluating *Envision6*, the currently adopted Regional Transportation Plan, the Atlanta Regional Commission created a methodology for determining the impact of future transit projects on roadway congestion.[12] The rationale for examining the safety impacts of a regional transit system investment is that there are significant differences in fatality and injury rates between modes. Table 8 below provides an overview of the different injury and fatality rates for different modes.

Mode	Crashes/ 100 million Passenger Miles[13]	Fatalities / 100 million Passenger Miles[14, 4]	Injuries / 100 million Passenger Miles [15], [16]
Private Vehicle	289.8	1.5	91
Bus	48.2	0.5	66
Heavy Rail	0.5	0.22	5
Light Rail	39.0	0.96	27
Commuter Rail	0.9	0.45	14

Table 11 – Crash, Fatality and Injury Rates by mode per 100,000,000 passenger miles

Table 11 reveals that transit modes have significantly lower crash, fatality, and injury rates than travel by private vehicle. This suggests that there are significant safety benefits in shifting travel from private vehicle to transit. A recent report commissioned by the Automobile Association of America estimates that the average cost of a fatality is $3,246,192 and the average cost of an injury is $68,170 in 2005 dollars.[17]

As part of the requested analysis of the costs and benefits of regional transit investment, the TPB staff will quantify a range of the safety benefits to the region as a result of modal shifts due to Concept 3.

Methodology

The Atlanta Regional Commission staff undertook an effort to model Concept 3. This was a base model update, which only changed the transit network for the year 2030 and held all population, employment,

---

[12] Envision6, "Appendix G: *Envision6* Project Prioritization Technical Analysis" (Atlanta Regional Commission, Atlanta, GA 2008). Pg. G-22 – G25.

[13] Envision6, "Appendix G: *Envision6* Project Prioritization Technical Analysis" (Atlanta Regional Commission, Atlanta, GA 2008). Pg. G-24.

[14] Transit Safety & Security Statistics & Analysis 2003 Annual Report Federal Transit Administration. December, 2006. Pg. 78

[15] Report on Injuries in America. "Selected Measures of Unintentional Injuries, U.S., 2001-2005" (National Safety Council, Washington, D.C.) (www.nsc.org/library/report_table_2.htm) Last Accessed: December 27, 2007

[16] Transit Safety & Security Statistics & Analysis 2003 Annual Report Federal Transit Administration. December, 2006. Pg. 80

[17] Cambridge Systematics, Inc and Michael D. Meyer, Crashes vs. Congestion – What's the Cost to Society (Bethseda, MD, March 5, 2008).

and roadway networks the same as the adopted 2030 Envision6 model. This allowed a direct comparison of changes to travel behavior solely as a result of transit infrastructure improvements. To provide a range of the benefits from safety improvements, two approaches were used. One approach was similar to the ARC E6 approach in examining the reduction of total crashes that were forecast. The other approach examined only the forecast reduction in fatalities and injuries from the modal shift to transit. The basic approach for each method is the same.

To forecast the number of potential crashes, fatalities, or injuries by mode using the rates from table 2, the Equation 3 was used:

Equation 3: $CT_{ij} = PM_i * CR_j$

where:

i = Mode

j = Crash type (crash only, injury or fatality)

PM = Estimated Annual Passenger Mikes

CR = Crash rate / 100,000,000 passenger miles

CT = Total number of crashes for mode and type

Since the crash rates are specific to each travel mode, total crashes / fatalities or injuries from transit travel were estimated by summing the modal specific results using Equation 4:

Equation 4: $TTCj = \sum CT_{ij}$

where:

i = Mode

j = Crash type (crash only, injury or fatality)

CT = Total number of crashes for mode and type

TTC = Total for of crashes all modes

In order to compare the difference between estimated crashes, fatalities, or injuries resulting from a modal shift to transit, it was necessary to estimate the number of crashes, fatalities, or injuries that would have occurred if these trips used another mode. Several assumptions to estimate vehicle miles are used. First it was assumed that trips that utilize one of the transit modes would take place regardless of what mode they utilized since the model choice split in the ARC model takes place after the trip assignment process. Second each of these trips would take place using a motorized mode since the shortest average trip length by mode used to estimated transit passenger miles was 4.03 miles. Third, each of the replaced transit trips would be replaced with a trip in a private auto, either SOV, HOV2, HOV3+, etc. All passenger miles taken by transit trips could be estimated as taking place in private vehicles if there was no transit system. Estimated crashes, injuries or fatalities if all transit trips were shifted to the private auto are calculated with the Equations 5 and 6:

Equation 5: $EVM = (\sum PM_i) * VO$

where:

EVM = Estimated vehicle miles traveled

PM = Estimated annual passenger Miles

VO = Vehicle Occupancy Rate

i = Mode

Equation 6: $TC_{auto\ j} = EVM * CR_j$

where:

j = Crash type (crash only, injury or fatality)

EVM = Estimated Annual Vehicle Miles

CR = Crash rate / 100,000,000 vehicle miles

TC = Estimated number of crashes if trips switched to auto

In order to estimate the number of avoided crashes, fatalities, or injuries Equation 7 is used:

Equation 7: $AC_j = TC_{auto\ j} - TTC_j$

where:

AC_j = Estimated avoided crashes

TC_{auto} = Estimated number of crashes if trips switch to auto

TTC = Total estimated number of transit crashes

Equation 8 is used to estimate the value of avoided crashes, fatalities, or injuries:

Equation 8: $Value = AC_j * V_j$

where:

AC_j = Estimated avoided crashes

Vj= Estimated value of crash, fatality or injury

Value = Estimated value of all avoided crashes, fatalities, or injuries by mode shift to transit

The Automobile Association of America estimates that the average cost of a fatality is $3,246,192 and the average cost of an injury is $68,170 in 2005 dollars.[18]

[18] Cambridge Systematics, Inc and Michael D. Meyer, Crashes vs. Congestion – What's the Cost to Society (Bethseda, MD, March 5, 2008).

Table 12 below shows the results of applying this methodology to actual passenger miles traveled in the Atlanta region from 2000 – 2006.

Year	2000	2001	2002	2003	2004	2005	2006
Estimated Avoided Fatalities							
	9	10	10	10	10	10	11
Estimated Avoided Injuries							
	643	709	678	579	550	521	532
Estimated Value of Avoided Fatalities (Millions $)							
	$26.9	$30.4	$30.4	$28.9	$30.2	$31.7	$35.7
Estimated Value of Avoided Injuries (Millions $)							
	$38.5	$44.0	$42.5	$37.1	$36.3	$35.5	$37.3
Total Estimated Value of Avoided Injuries and Fatalities (Millions $)							
	$65.4	$74.4	$72.9	$66.0	$66.5	$67.2	$73.0

Table 12 – Historic Estimates of Value of Fatality and Injury Reduction by Existing Regional Transit System

Table 13 provides the estimated number of fatality and injury reduction by the Concept 3 regional transit system from the Regional Travel Demand Model results. The value of these potential reductions is presented in a following section.

	E6	Concept 3 – No Pop/ Emp. Shift	Concept 3 – 10% Pop/ Emp. Shift	Concept 3 – 20% Pop/ Emp. Shift
Estimated Avoided Fatalities				
	13	14	21	31
Estimated Avoided Injuries				
	670	930	1,410	2,140

Table 13 – Estimates of Value of Fatality and Injury Reduction by Regional Transit System

Table 13 reveals that a regional transit system similar to Concept 3 could potentially reduce fatalities and injuries on the Atlanta surface transportation network between 14 – 31 fatalities and reduce injuries between 930 and 2,140 annually based on a modal shift from roads to transit.

Cost Benefit and Effectiveness

This section presents efforts to quantify four major benefit areas and compare the benefits with the estimated cost of constructing, operating, and maintaining our existing transit system and Concept 3 network. The four areas of benefit are congestion cost, safety through reduction in fatalities and injuries, economic benefits through labor mobility, and potential consumer savings through fuel purchase avoidance.

Congestion Cost

Every year the Texas Transportation Institute publishes an annual report on urban mobility. The Atlanta region frequently focuses on the report's ranking of congestion cost and Travel Time Index. The Atlanta region has even adopted a goal of congestion tied to TTI targets. One frequently overlooked part of the report is the calculation of the travel time savings of the public transit system. Table 14 below provides the figures for the savings in terms of avoided congestion costs provided by the Atlanta region's transit network

Year	2000	2001	2002	2003	2004	2005	Total (2000 - 2005)
Estimated Value of Congestion Relief Provided by the Atlanta Regional Transit System[19]							
	$174,200,000	$202,100,000	$207,600,000	$214,300,000	$237,100,000	$245,200,000	$1,280,500,000
Total Transit Trips[20]							
	169,831,503	166,845,466	167,176,274	147,949,556	142,411,530	149,671,070	943,885,399
Average Congestion Benefit / Transit Trip							
	$1.03	$1.21	$1.24	$1.45	$1.66	$1.64	$1.37

Table 14 – Estimated Value of Congestion Relief Provided by the Regional Atlanta Transit System

Table 14 reveals that transit provides a significant amount of congestion relief to the Atlanta region. There are several potential methods for estimating the future benefit of congestion relief to the Atlanta region. This analysis uses the historic average value of congestion relief per trip provided to estimate the future benefits of congestion relief to the Atlanta Region. Between 2000 and 2005, the average congestion benefit is $1.37 / passenger trip. Using this average and assuming that this average holds for the future, it is possible to provide a rough estimate of the congestion benefits that occur with a regional transit system investment. Table 16 below provides an estimate using this method for the Atlanta region in 2030 with the E6 network and the Concept 3 network with the various population and employment shifts by the Atlanta Regional Commission.

---

[19] "Performance Measures Summary for Atlanta," 2007 Urban Mobility Report (College Station, TX). http://mobility.tamu.edu/ums/congestion_data/tables/atlanta.pdf (last accessed: May 15, 2008)

[20] "Update on Atlanta Regional Transit System Performance," Transit Planning Board (April 2, 2008) http://www.tpb.ga.gov/Documents/PM/040208%20-%20Update%20Existing%20Conditions%20Presentation.pdf (Last Accessed: June 17, 2008)

E6	Concept 3 – No Pop/ Emp. Shift	Concept 3 – 10% Pop/ Emp. Shift	Concept 3 – 20% Pop/ Emp. Shift
Estimated Annual Passenger Trips (Millions of Trips)			
213	246	362	519
Estimated Potential Annual Value of Congestion Relief (Millions $2005)			
$290	$340	$495	$710

Table 15 – Initial Estimate of Potential Range of Annual Value of Congestion Relief

Using the information provided by the regional travel demand model and the historic average value of congestion relief for Atlanta region, Table 15 shows that Concept 3 could provide an annual value of $340 - $710 million annually in 2005 dollars in 2030. This range is dependent on shifts in land use patterns.

Safety

Table 10 provided the estimated number of fatality and injury reduction by the Concept 3 regional transit system from the Regional Travel Demand Model results. Table 16 below presents the value of those fatality and injury reductions based upon an anticipated cost of fatalities and injuries.

E6	Concept 3 – No Pop/ Emp. Shift	Concept 3 – 10% Pop/ Emp. Shift	Concept 3 – 20% Pop/ Emp. Shift
Estimated Avoided Fatalities			
14	15	22	33
Estimated Avoided Injuries			
670	955	1,440	2,180
Estimated Value of Avoided Fatalities (Millions $)			
$44.9	$48.1	$71.1	$106
Estimated Value of Avoided Injuries (Millions $)			
$45.6	$65.1	$98.1	$148
Total Estimated Value of Avoided Injuries and Fatalities (Millions $)			
$90.5	$110	$170	$250

Table 16 – Estimates of Value of Fatality and Injury Reduction by Regional Transit System

Table 16 reveals that a regional transit system similar to Concept 3 could be expect to provide annual savings of between $110-250 million annually in 2030 in 2008 dollars due to reductions in fatalities and injuries due to the modal shift.

Economic Benefit

As noted, the Georgia Economic Modeling Systems report on the impact of the MARTA system on metro-Atlanta, the greatest benefit of the regional transit system is the unification of the labor market. This report estimates that the impact of the MARTA system on metropolitan Atlanta ranges between $2 - $2.5 billion annually between 2001 and 2006. To estimate a potential future benefit due to labor market unification. Table 17 below illustrates the average economic benefit per transit passenger mile from 2001 to 2006 in the Atlanta region.[21]

	2001	2002	2003	2004	2005	2006
Estimated Economic Impact of MARTA[22] (Millions $)						
	$1,333	$1,563	$1,571	$1,543	$1,589	$1,630
Total Annual Passenger Miles [23]						
	874,432,746	878,117,600	779,722,651	802,528,299	811,487,324	889,136,973
Estimated Economic Impact / Passenger Mile						
	$2.29	$2.73	$3.11	$2.90	$3.07	$2.88

Table 17 – Historic Estimated Economic Impact per Passenger Mile

Table 17 reveals that the range of the estimated economic impact per passenger mile of the regional transit system is between $2.29 and $3.11 with an average of $2.83 per passenger mile. Table 18 below reveals the estimate economic impact of the Concept 3 transit network using equation 2 to estimate passenger miles.

E6	Concept 3 – No Pop/ Emp. Shift	Concept 3 – 10% Pop/ Emp. Shift	Concept 3 – 20% Pop/ Emp. Shift
Estimated Passenger Miles (millions of miles)			
1,340	1,490	2,190	3,250
Estimated Value of Economic Impact (Millions $)			
$3,790	$4,200	$6,200	$9,200

Table 18 – Estimated Economic Impact per Passenger Mile

Table 18 reveals that the estimate economic impact of a regional transit network could be extremely significant ranging from $4.2 to $9.2 billion for the Atlanta region.

Potential Consumer Fuel Savings

---

[21] Passenger miles were selected since the main impact of the benefit is from labor market unification meaning that that value of the distance traveled has a relationship with the benefit. For example, using a per trip basis would value a trip between the CBD and Midtown equally with a trip between the CBD and Douglasville, while a per passenger mile basis would capture the variation that the trip from Douglasville has more of an effect on incorporating Douglasville into the CBD's labor market pool.

[22] Tanner, Thomas C. and Adams Jones. The Economic Impact of the Metropolitan Atlanta Rapid Transit Authority: An analysis of the impact of MARTA Operations on and around the service delivery region. Georgia Economic Modeling System, Carl Vinson Institute of Government, The University of Georgia. Athens, GA. May, 2007.

[23] Source: NTD 2006 for MARTA, GRTA, CCT, GCT, City of Canton compiled by the Transit Planning Board

With the recent increase in fuel prices there is increased interest in fuel savings. Using the estimated passenger miles with information regarding fleet fuel efficiencies, fuel prices, and average vehicle occupancy, it is possible to roughly estimate potential consumer fuel savings. Equation 9 presents the equation used to estimate potential consumer fuel savings[24].

Equation 9: *Value of Potential Consumer Fuel Savings = ((PM * VOR) / AFF) * PPG*
where:
PM = Estimated passenger miles
VOR = Vehicle Occupancy Rate
AFF = Average Fleet Efficiencies
PPG = Price per Gallon of Fuel

Table 19 presents the potential consumer fuel savings from a major transit investment.

	E6	Concept 3 – No Pop/ Emp. Shift	Concept 3 – 10% Pop/ Emp. Shift	Concept 3 – 20% Pop/ Emp. Shift
Estimated Passenger Miles (million of miles)				
	1,340	1,480	2,190	3,250
Estimated Vehicle Miles Traveled (millions of miles)[25]				
	1,100	1,220	1,800	2,660
Estimated Gallons of Fuel Saved (millions)[26]				
	65	72	106	157
Estimated Value of Potential Fuel Savings (millions $)[27]				
	$261	$290	$428	$634

Table 19 – Estimated Consumer Fuel Savings

Table 19 reveals that, potentially, consumer fuel savings could be in the range of $290 to $634 million annually from an investment in transit infrastructure.

Incorporation of Cost Benefit Information

The Board has indicated that an analysis of cost/benefit information is of interest. Additional focus in the region has been placed on estimating congestion relief benefit and nationally on the incorporation of safety benefits. Additionally, other research has revealed that a significant benefit of transit is the unification of the labor market in Atlanta and there has been growing interest in fuel savings as a result

[24] This equation assumes that all trips not taken by transit would still be taken and that they would be taken by private vehicle. The ARC model does not currently have modal choice values for pedestrian or bicycles and therefore, removing transit modes from the model would shift personal transit trips to vehicle trips. Further work would need to be done to estimate the number of trips that would not be taken as a result of removing transit mode choices.
[25] Estimated Atlanta Vehicle Occupancy Rate = 1.22 passengers / vehicle. Gilbert, Richard. "Greater Toronto Area Comparisons." Toronto, ON. May 30, 2003.
[26] Average Atlanta Fleet Efficiency = 17 miles/gallon. Atlanta Regional Commission. Transportation Spotlight. Atlanta, GA. June 2, 2008.
[27] Average Atlanta Fuel Price = $4.048. "Atlanta gas prices hit record high," Atlanta Journal Constitution. July 5, 2008. (http://www.ajc.com/metro/content/metro/stories/2008/07/05/gas_0706.html Last accessed: July 17, 2008).

of recent price increases. Therefore, benefits quantified as part of this assessment of Concept 3 network on Atlanta's transportation infrastructure include estimates of congestion savings, safety savings, economic, and consumer fuel savings. Table 20 below projects these results out into the future using the results of the regional Travel Demand Model and compares these benefits with the estimated annual cost of Concept 3. An annual number in the horizon year of 2030 is used since a phasing plan for Concept 3 was not assumed at this time.

E6	Concept 3 – No Pop/ Emp. Shift	Concept 3 – 10% Pop/ Emp. Shift	Concept 3 – 20% Pop/ Emp. Shift
Total Estimated Value of Avoided Injuries and Fatalities (Millions $)			
$90.5	$110	$170	$250
Estimated Potential Annual Value of Congestion Relief (Millions $)			
$290	$340	$495	$710
Estimated Economic Benefit (Millions $)			
$3,790	$4,205	$6,200	$9,200
Estimate Consumer Benefits from Fuel Savings (Millions $)			
$260	$290	$430	$630
Total Estimated Value of Benefits (Millions $)			
$4,430	**$4,950**	**$7,290**	**$10,800**

Table 20– Estimates of Value of Fatality and Injury Reduction by Regional Transit System

Table 20 reveals that direct congestion and safety benefits from a regional transit system similar to Concept 3 could range from $4,950 to $10,800 million annually depending upon shifts in population and employment patterns. Previous work estimated that the Concept 3 network, including operation and maintenance of the existing transit network, would cost approximately $2.4 billion annually meaning that in 2030 the ratio of annual benefits to cost could be estimated at between 2.1 to 4.5.

Effectiveness:

In an effort to examine whether the proposed projects were within the national norms of effective systems, the different components of the Heavy Rail and Light Rail extensions were compared on a boardings per mile basis with recent new start systems in the U.S. Figure 15 presents different segments of the Concept 3 systems compared with national systems.

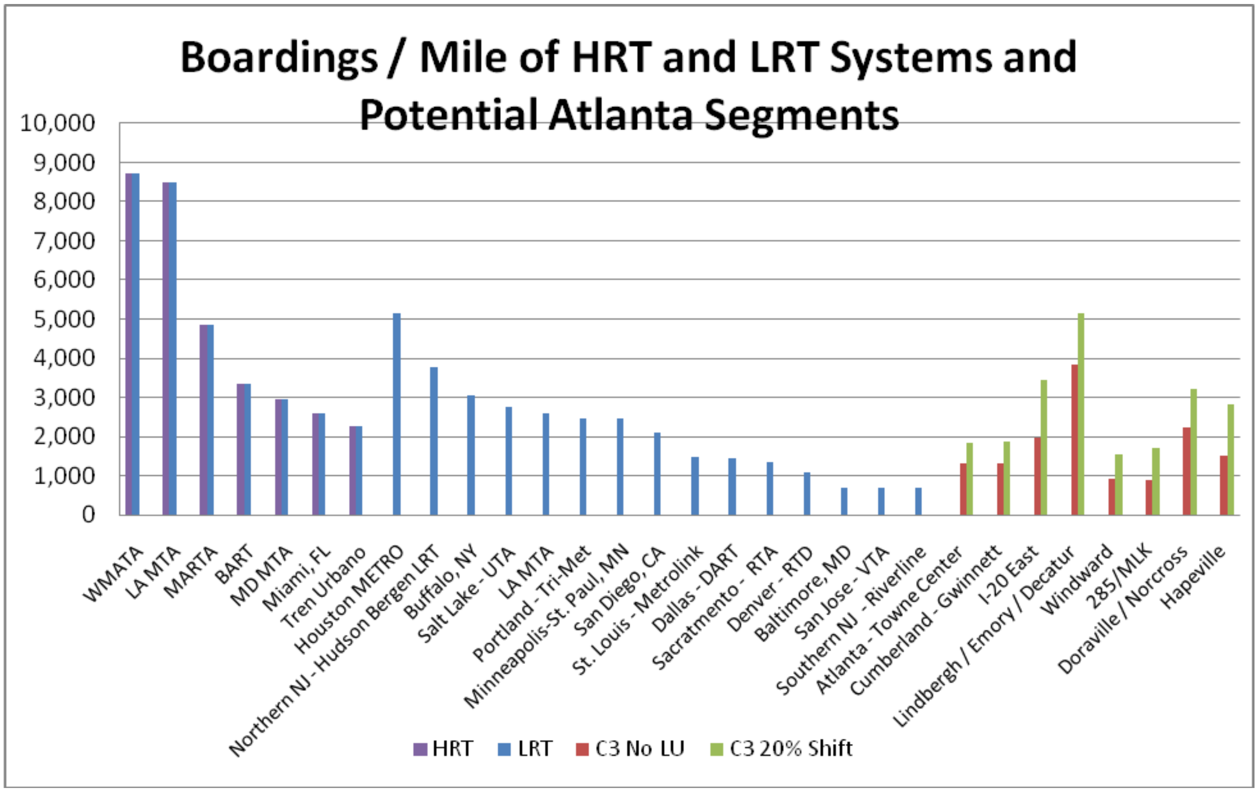

Figure 15 – Concept 3 HRT and LRT Segments compared with New U.S. Systems

Figure 15 reveals the different segments of the LRT/Streetcar network on the Concept 3 network generally fall within the range of new U.S. LRT systems. Additionally, the I-20 East busway boardings per mile number also falls within the range of the new LRT systems. The HRT extensions fall within the range of LRT systems, but generally below the range of new HRT systems in the U.S. since the opening of BART in San Francisco.

This examination suggests that some shift in technology on some of the potential extensions. These potential changes are discussed in the associated report "Initial Report on Proposed Changes to the Concept Network" produced for the July 24, 2008 TPB Committee meetings.

Land Use Synergies

Livable Centers Initiative Area	Current Transit Service	Concept 3 Service
Acworth	Express Bus	Freeway BRT, Regional Suburban Bus
Austell	N/A	Commuter Rail
Avondale	Heavy Rail, Local Bus	Heavy Rail, Commuter Rail
Bankhead Station	Heavy Rail, Local Bus	Heavy Rail
Bolton – Moores Mill	Local Bus	Streetcar
Brookhaven MARTA Station	Heavy Rail, Local Bus	Heavy Rail
Buckhead	Heavy Rail, Local Bus	Heavy Rail, Commuter Rail
Buford	Local Bus, Express Bus	Commuter Rail, Regional Suburban Bus
Canton	Local Bus, Express Bus	Regional Suburban Bus, Regional Rail
Chamblee	Heavy Rail, Local Bus	Heavy Rail
Chattahoochee Hill Country	N/A	Regional Suburban Bus
City Center	Heavy Rail, Local Bus, Express Bus	Heavy Rail, Commuter Rail, Streetcar
Clarkston	Local Bus	Local Bus
Conyers	Express Bus	Commuter Rail, Regional Suburban Bus
Cumberland	Local Bus	Regional Rail, Express Bus, Regional Suburban Bus
Decatur	Heavy Rail, Local Bus	Heavy Rail
Dell Road TOD	Local Bus	Regional Rail
Doraville	Heavy Rail, Local Bus	Heavy Rail, Freeway BRT
Douglasville	Express Bus	Commuter Rail, Regional Suburban Bus
Duluth	Express Bus, Local Bus	Commuter Rail, Arterial BRT, Regional Suburban Bus
East Point	Heavy Rail, Local Bus	Heavy Rail, Commuter Rail
Emory Village	Local Bus	Commuter Rail, Regional Rail
Fayetteville	N/A	Arterial BRT, Regional Suburban Bus
Forest Park	Local Bus	Commuter Rail
Greenbriar	Local Bus	Arterial BRT
Griffin	N/A	Commuter Rail, Arterial BRT
Gwinnett Place	Local Bus	Regional Rail, Arterial BRT
H.E. Holmes	Heavy Rail, Local Bus	Heavy Rail, Arterial BRT
Hapeville	Local Bus	Heavy Rail
Hapeville / Virginia Avenue	Local Bus	Heavy Rail
Highway 278	N/A	Commuter Rail
Holly Springs	N/A	Regional Suburban Bus
Hwy 78	Express Bus	Arterial BRT
Indian Trail – Lilburn	Local Bus	Commuter Rail
Jonesboro	Local Bus, Express Bus	Commuter Rail, Arterial BRT, Regional Suburban Bus

JSA-McGill	Heavy Rail, Local Bus, Express Bus	Heavy Rail
Kennesaw	Local Bus, Express Bus	Regional Rail, Express Bus
Kensington MARTA Station	Heavy Rail, Local Bus	Heavy Rail, Arterial BRT
Lilburn	N/A	Commuter Rail
Lithonia	Local Bus, Express Bus	Commuter Rail, Regional Rail
Mableton	Local Bus, Express Bus	Commuter Rail
Marietta	Local Bus, Express Bus	Regional Rail, Arterial BRT
McDonough	Express Bus	Freeway BRT, Regional Suburban Bus
Memorial Drive – MLK Station	Heavy Rail	Heavy Rail, Arterial BRT
Midtown	Heavy Rail, Local Bus, Express Bus	Heavy Rail, Regional Rail, Streetcar
Morrow	Local Bus	Commuter Rail
Norcross	Local Bus	Commuter Rail, Regional Rail, Heavy Rail, Regional Suburban Bus
Northlake	Local Bus	Freeway BRT
Northwest Clayton	N/A	Regional Suburban Bus
Oakland City –Lakewood	Heavy Rail, Local Bus	Heavy Rail
Old National Highway	Local Bus	Commuter Rail
Peachtree City	N/A	Commuter Rail, Arterial BRT
Perimeter Center	Heavy Rail, Local Bus, Express Bus	Heavy Rail, Regional Rail
Powder Springs	Express Bus	Regional Suburban Bus
Riverdale Town Center	Local Bus	Arterial BRT, Regional Suburban Bus
Roswell	Local Bus	Arterial BRT
Sandtown	N/A	Arterial BRT, Regional Suburban Bus
Sandy Springs	Local Bus	Regional Rail, Arterial BRT
Smyrna	Local Bus	Regional Rail
Snellville	Express Bus	Regional Suburban Bus
Stockbridge	Express Bus	Freeway BRT, Regional Suburban Bus
Stone Mountain	Local Bus	Commuter Rail, Arterial BRT
Suwannee	N/A	Commuter Rail
Town Center Area	Local Bus, Express Bus	LRT, Regional Suburban Bus
Tucker	Local Bus	Commuter Rail, Regional Suburban Bus
Union City	Local Bus, Express Bus	Commuter Rail
Upper Westside	Local Bus	Streetcar
West End	Heavy Rail, Local Bus	Heavy Rail, Streetcar
West Lake MARTA Station	Heavy Rail, Local Bus	Heavy Rail, Streetcar
Woodstock	Express Bus	Regional Suburban Bus

Table 22 – LCI Study Areas and Transit Access

Table 22 reveals that there are several different LCI areas that have either no transit service or only peak hour service but that the Concept 3 network would provide these areas with transit service. Since one of the goals of many of the LCI initiatives is to support pedestrian environments and infrastructure, providing transit services to areas investing pedestrian infrastructure should enable the transit service to attract more riders as well as reinforcing the investments by local governments in pedestrian infrastructure.

Conclusions

This document is an initial examination of the impact of major investment in regional transit infrastructure on the Atlanta region's transportation network. Concept 3 as authorized by the Transit Planning Board for public comment was used as the transit network. The initial report focuses on expected ridership and the system characteristics of the system combined with some of potential objectives described in the State Transportation Board's Investment in Tomorrow's Transportation Today (IT3) effort in order to illustrate how ongoing work at the different transportation organizations helps support the STB's objectives. Table 23 below reveals how these all fit together.

IT3 Goals & Objectives	Evaluation Criteria (TPB)	Results (TPB)
5. Move Georgians to work, school, and play reliably, affordably, Timely and within an acceptable time frame	1a – Connecting our Employment Centers 1b – Create mobility for commuters, elderly, the disabled, those without cars, those that do not drive and visitors	**1a - All 13 major employment centers connected by a dedicated reliable transit network** **1b – All major hospitals, educational institutions, courthouse and at least 23 major recreational facilities connected by transit**
6. Increase the labor-shed and accessibility of Georgia's Regional Employment Centers	2. Activity Center Accessibility	**2 – More than double the number of workers able to reach their jobs by transit in major suburban activity centers – in North Point and Town Center more than a 10-fold increase**
7. Reduce Congestion Costs below competitors	3a. Surface Roadway network Impact 3b. Safety Impact	**3a – Reduce the Annual travel time per person from projected levels** **3b – Reduce fatalities on the highway system by 14-31 annually**
8. Optimize Through of people and goods in existing network assets	4a – Cost benefit / Effectiveness 4b – Land Use Synergy	**4a – A \$4.9 to \$10.8 billion annula return on an annual investment of \$2.4 billion - a ratio of benefits / costs between 2.0 -4.5 representing between** **4b – Serves 70 Livable Communities Initiative Centers reinforcing existing and planned investments**

Table 23 – Summary of Goals, Objectives, Evaluation and Results of Concept 3 Evaluation

The bottom line is that a regional transit network in Atlanta can help the region maintain its economic competiveness and quality of life by providing a cost effective, reliable, and safe mobility option.

Appendix 1: Changes to the ARC Envision6 Model

This appendix provides an overview of the travel demand modeling work that serves as an important component of the technical analysis completed for Concept 3. This work includes a scenario-based modeling exercise devised specifically for the Concept 3 analysis, in which significant changes were made to the underlying socioeconomic data to allow for more transit-intensive land use scenarios.

ARC Travel Demand Model Background

The Atlanta Regional Commission travel demand model is designed to, at a minimum; represent the state of the practice in travel demand modeling and to meet all modeling requirements in the US EPA Transportation Conformity Rule. All elements of the travel demand model are designed to support all technical and policy decisions that are required in developing a comprehensive, multimodal transportation plan and program.

Several data inputs are essential to the effectiveness of the model. In addition to the transportation network itself, a key input for the travel demand modeling process is detailed zone-level socioeconomic data for the 20-county Atlanta region, traditionally produced for future years with the use of a DRAM/EMPAL land use forecast model. Two files, a households file and land use / employment file, are used throughout the modeling process.

The households file quantifies the number of households in each traffic analysis zone (TAZ). To allow for a more robust trip generation process, the household data is broken down by two factors, household income and household size. Specifically, household data in the ARC model is broken down into four income groups, and within each group households are broken down into six size groups (i.e. each household has between one and six people). These subdivisions are all quantified to the TAZ level.

The land use file provides detailed information, also quantified to the TAZ level, on land use patterns within each zone, focusing specifically on employment activity. Like the household data, the land use data is also categorized to allow for more advanced trip generation and distribution. Specifically, the following activities are all quantified at the TAZ level:

- Construction Employment
- Manufacturing Employment
- TCU (Transportation, Communication, Utilities) Employment
- Wholesale Employment
- Retail Employment
- FIRE (Finance Insurance, and Real Estate) Employment
- Service Employment
- Government Employment
- University Enrollment

Initial Concept 3 Modeling Activities

The first application of the travel demand model to Concept 3 consisted of replacing the 2030 Envision6 transit network with the much more extensive Concept 3 network, while retaining the 2030 forecasts for zone-level population and employment data. While this “baseline” run showed significant increases in transit ridership as a result of the expanded network, the fact that the Envision6 socioeconomic data does not take into account the modified transit network inherently limits the degree of ridership growth estimated by the model.

Following the initial Concept 3 model run based on Envision 6 socioeconomic forecasts, it became evident that an opportunity exists to create a series of new socioeconomic inputs for the 2030 horizon year based on a geographic shift of households and jobs toward greater concentration around the expanded Concept 3 transit system. This realization led to a comprehensive scenario-based modeling effort that became an important component of the Concept 3 technical analysis.

Before reviewing the methods employed to model these hypothetical shifts, it must be emphasized that the results from any modifications to population and employment distribution reflect potential *scenarios*, but cannot be considered true *forecasts* since their development does not involve the level of statistical sophistication that is seen in the development of the original 2030 Envision forecast (based on DRAM/EMPAL and other complex forecasting tools). Still, the data do provide a useful, albeit simplified, look at how modified land use patterns can impact transit ridership and other relevant performance measures at the regional level.

Population/Employment Shift Methodology

A standardized process was developed to modify the existing socioeconomic data such that the goal of a geographic shift of population and/or employment toward a more transit-oriented pattern (while not affecting total regional population and employment levels) is achieved. This process can be broken down into the following steps:

1. Identify the donor and recipient zones

The first step is to analyze the existing TAZ's, classifying each into one of the following two categories:

- "Recipient" zones – TAZ's that will gain households and/or jobs in the horizon year (2030) relative to the Envision6 forecast. These are the zones that are best served by transit in under Concept 3.
- "Donor" zones – TAZ's that will lose households and/or jobs relative to 2030 Envision6 forecast (though they typically still gain households/jobs in relation to the 2005 baseline, but at a more modest growth rate).

For the Concept 3 scenario-based modeling exercise, separate techniques were devised to identify the donor and recipient zones for the household and employment shifts.

For households, zones whose geographic center lies within two miles of a Concept 3 service point are classified as a recipient zone. These service points include all existing and proposed rail stations as well as major bus transfer centers and park-and-ride lots. All remaining zones are classified as donor zones.

For the employment shift, a more limited recipient area is used, based on the activity centers defined in ARC's Unified Growth Policy Map (UGPM). Specifically, four categories of places defined in the UGPM are the focus of the employment shift: the center city (Downtown and Midtown Atlanta), regional centers (areas such as Buckhead, the airport, etc.), town centers (e.g. downtown Marietta), and station communities (e.g. Lindbergh Center – note that many higher-activity stations are already located in one of the other three place types). Any TAZ whose geographic center lies within the boundaries of a UGPM place is classified as a recipient zone, and all other areas are classified as donor zones.

2. Determine the shift factors for population and/or employment

The next step is to determine a percentage that represents the portion of total regional households/employment to be shifted from the "donor" zones to the "recipient" zones.

As a hypothetical example, suppose a region has a forecast horizon year population of 1,000,000 households. If a household shift factor of 10 percent is chosen, then household-shift scenario would consist of the region's donor area losing 100,000 households, with the region's recipient area gaining 100,000 residents. The total population of the region would remain unchanged at 1,000,000 households. A similar pattern would also be observed with an employment shift.

While it is possible to have different population and employment shift factors within a single scenario, for the purposes of the Concept 3 analysis exercise, the same shift factor was always applied to both population and employment within each scenario. Specifically, four separate scenarios were analyzed, with varying population/employment shifts of 5, 10, 15 and 20 percent.

3. Reduce household / employment totals in the donor zones

This step consists of calculating the total population of the donor zones and determining the overall decrease in population across all donor zones as a result of the shift. Then, the totals for each of these individual zones are reduced by this percentage.

Returning to the previous example of a 1,000,000-household region, suppose that the identified household donor zones (as selected in step 1) collectively comprise 400,000 residents. Since the chosen 10 percent shift involves moving 100,000 residents from the donor to the recipient zones, the end result is decrease of 25 percent (100,000 households shifted from the original 400,000) within the donor area. Therefore, to perform the donor side of the shift, the household total for each identified donor zone is individually reduced by 25 percent.

4. Distribute the households / employment to the recipient zones.

Finally, the households and jobs that were removed from the donor zones are redistributed to the recipient zones. In the case of both the household and employment shifts, the changes are applied such that the regional totals for the various categories of households (income group and household size) and jobs (economic sectors) remain constant. However, the specific method for the distribution differs between the population and employment shifts.

For the employment shift, the donor recipient zones represent a more limited area as defined be the UGPM place types (see Step 1). In the interest of reinforcing existing major employment centers, rather than distributing the shifted jobs equally to all TAZs, the distribution was instead weighted to favor the more intensive UGPM place categories (regional centers and city centers). Specifically, 40 percent of the shifted jobs were sent to regional center TAZs, 30 percent to the center city, 20 percent to town centers, and 10 percent to the comparatively small category of station communities.

For the population redistribution, households are distributed to the recipient zones without preference for any area of the region. Instead, the overall percentage increase for the recipient area is applied individually to each zone, similar to the reduction procedure in step 3.

It should finally be noted that some variation is seen in the final regional totals of population and, to a lesser extent, employment after the shifts are completed. This error is due to the nature of the fine-grained breakdown by zone, household size, income group, and employment type, resulting in many cases where the proportional adjustments result in the rounding of fractional amounts to the nearest integer value. Collectively, this rounding can have a noticeable effect on the resulting regional totals, but because this variation is generally within 1 to 2 percent of the original total it is considered tolerable for the purposes of this exercise.

Visualization of the Population and Employment Shift

Figures 1 and 2, below, illustrate the results of the population and employment changes for the 20 percent shift, the most dramatic change considered. The darker-shaded TAZ's represent greater concentrations of households (Figure 1) or jobs (Figure 2). The yellow points in Figure 1 represent the locations of stations under the full Concept 3 buildout, while the yellow outlines in Figure 2 represent the boundaries of the UGPM activity centers.

Figure 1 – Illustration of 20 Percent Population Shift

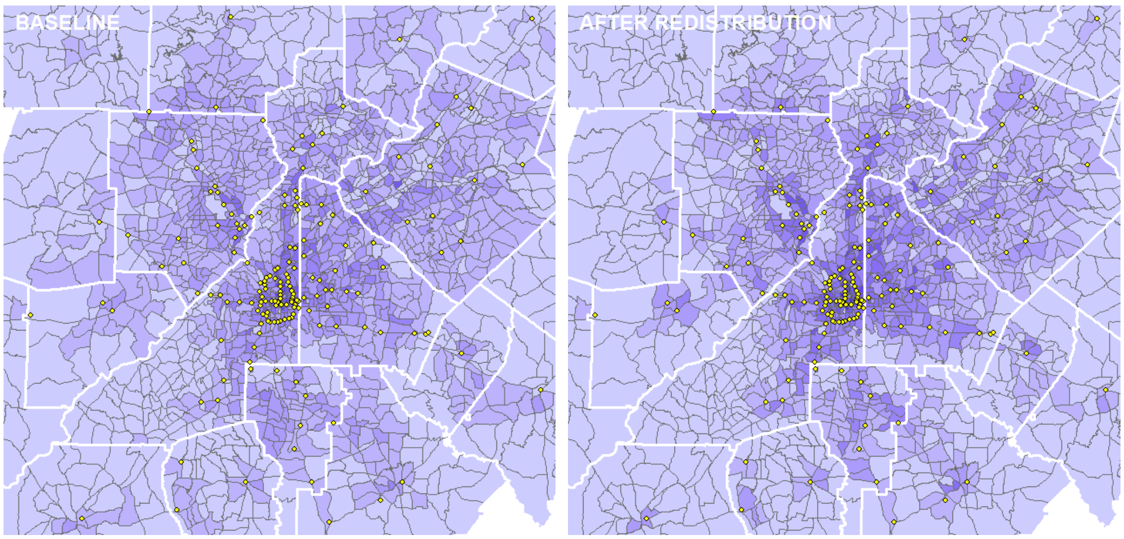

Figure 2 – Illustration of 20 Percent Employment Shift

Appendix 2: ARC Model Output Summary Tables

Appendix 3: Project Segment Cost / Benefit Summary

Appendix 4: Individual Rail Station Boarding Estimates

Appendix 5: Passenger Mile Estimates

Appendix 6: Capital Cost Estimates