I-285 STRATEGIC IMPLEMENTATION PLAN

Final Report

Prepared For:

GDOT

Keeping Georgia on the Move

Prepared By:

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In Association With

PB 100 YEARS

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The overall purpose of the I-285 Strategic Implementation Plan study is stated in the established project goal:

> ***Provide an unparalleled, objective technical evaluation to help determine an optimal and compelling case and constituency for investment in and management of the long term viability of I-285.***

In order to achieve this goal, a detail process of data collection, development of the required technical analysis tools, and performing the analysis and evaluation of a series of improvement scenarios was undertaken. Based upon this process, an overall recommended improvement scenario was developed. This recommended improvement scenario then served as the foundation for the development of the phased implementation program for the I-285 Strategic Implementation Plan.

Data Collection

In the development of the I-285 Strategic Implementation Plan and the technical analysis tools required for the detailed analyses and evaluations, a substantial data collection effort was required to establish the characteristics of the existing transportation system. This data collection effort encompassed the assembling of existing data as well as the gathering of new data to establish an overall database for the study effort. The information included in this database was subdivided into broad data categories, including:

- GIS Framework;
- Traffic;
- Accidents;
- Transportation Plans;
- Environment and Land Use;
- Aerial photography:
- I-285 geometry features (horizontal curvature and vertical grades);
- Inventory of signs and ATMS equipment; and
- Travel Speeds.

Traffic counts were conducted throughout the I-285 corridor for this project. These data were combined with of existing Georgia Department of Transportation (GDOT) traffic counts and ATMS data to establish a rich database of traffic count information.

Crash data was obtained from the GDOT's crash database for calendar years 2001, 2002, 2003, and 2004. The locations of accidents were geographically referenced along I-285 in both directions of travel. Accidents were grouped into segments, defined as freeway sections between access points, along I-285. For comparison purposes, I-285's system-wide accident rates were compared with those experienced on comparable facilities from throughout the rest of Georgia. The analysis of existing crash experience went into considerably detail, including accident rates and other patterns at the segment and ramp level-of-detail.

A summary of identified planned projects in the I-285 Corridor was made. A total of 234 projects were identified from the Mobility 2030 Regional Transportation Plan (RTP) and the 2005 – 2010 Transportation Improvement Program (TIP) and the GDOT Construction Work Program (CWP).

Information leading to the identification of possible environmental and land-use constraints that would be considered in developing a strategic plan for I-285 was compiled. Environmental constraints were subdivided into the following categories: environmental resources; social environmental resources; and cultural resources.

Data for average travel speeds observed on the mainline of I-285 were developed. In addition to lane-by-lane travel speed data provided by the GDOT's NaviGator surveillance system, the study team had access to average speed samples obtained from the ARC's 2001 Speed Study. In reviewing all of the traffic, average speed, level-of-service data, and by direction of travel, there was an extremely high level of consistency between the different sources of data

Development of I-285 Strategic Implementation Plan Technical Analysis Tools

The technical analysis tools utilized for the I-285 Strategic Implementation Plan are unique in their development and application. The overall goal of the technical analysis, or modeling, process was the development of a traffic simulation model for the 63-mile I-285 corridor to facilitate the objective operational evaluation of potential improvements in the corridor. The potential problems associated with the development of large scale simulation models were initially researched using the experience of several previously attempted large scale simulation efforts. A symposium was held with the GDOT staff, the I-285 consultant team, and key investigators for five previous large scale simulation efforts. This symposium provided information on the successes, failures, and key findings associated with the development and application of these large scale simulation efforts, including:

- Procedures must be incorporated into the processes that bridge the gap between the regional travel demand model macroscopic process and the microscopic traffic simulation process. The bridge must be composed of two basic elements. First, the detailed temporal distribution of trips within the peak periods must be accounted for in 15 minute time slices to explicate the peak spreading process. Second, the routing of peak period trips must reflect the dynamic nature of traffic routings during the peak periods.

- Aggregation of traffic analysis zones (TAZs) for development and application of dynamic traffic assignment procedures should be avoided. The aggregation of TAZs results in the concentration of trips which are difficult for dynamic traffic assignment procedures to effectively accommodate and accurately load onto the network.

- Development of the microsimulation model networks needs to be based on commercial mapping networks rather than centerline files because of the required network detail. Also the regional travel demand model network needs to be "free" of network errors since detailed routing of trips into, out of, and through the microsimulation area is a critical component of the process.

- Large scale simulation models should be developed in a network expansion process with small portions of the network developed, tested, and calibrated before additional network components are added. Building the entire microsimulation network and attempting a subsequent calibration is extremely time consuming due to the numerous interactions the various model components such as traffic signals, trip patterns (trip origins and destinations), details of intersection configurations, bus operations, and the dynamics of traffic routing. With these numerous interactions it is extremely difficult, if not impossible, to isolate and correct problems during the model calibration process for large simulation networks.

- Extensive data relative to the traffic operations within the microsimulation model study area is required, including: detailed traffic volumes in 15-minute increments (by lane on freeways), vehicle classification volumes (by lane on freeways), vehicle densities by lane on freeways, vehicle headways, vehicle speeds (by lane on freeways), and queue lengths at intersections.

Armed with this knowledge of previous large scale microsimulation model successes and failures, the study team developed an overall structure for the I-285 Strategic Implementation Plan technical analysis process. The I-285 Strategic Implementation Plan technical analysis process has four basic components which address the recommended procedures identified in the previous large scale simulation projects: regional travel demand model, matrix variegation, pseudo dynamic traffic assignment (DTA), and microscopic simulation traffic assignment. The regional travel demand model is connected to the microscopic simulation model with two critical model components:

- The Matrix Variegator which slices the 24-hour trip tables from the ARC regional travel demand model into 15-minute trip tables; and

- The Mesoscopic Model which uses the 15-minute trip tables from the Matrix Variegator in a dynamic traffic assignment process to establish the trip routes that feed into the Microscopic Model.

The final step of the technical analysis process is the application of the Microscopic Model. The output of the Mesoscopic Model, trips and trip routes, serve as the primary inputs to the Microscopic Model. The Microscopic Model provides the detailed corridor operational analysis the existing system and the future scenarios.

It should be clearly understood that the prime objective of the I-285 Strategic Implementation Plan technical analysis process was the development of a procedure that could be applied to future improvement scenarios based upon future development conditions portrayed in the Atlanta Regional Transportation Plan. This prime objective therefore required that the procedures to be used for the model application of future scenarios to replicate the procedures that were used in the development and calibration of the model. To not follow this model development/application paradigm substantially increases the prospect of bias being introduced into the analysis process. The opportunities for potential bias are magnified by the multiplicity and interconnectivity of the various model components.

Existing Conditions Evaluation

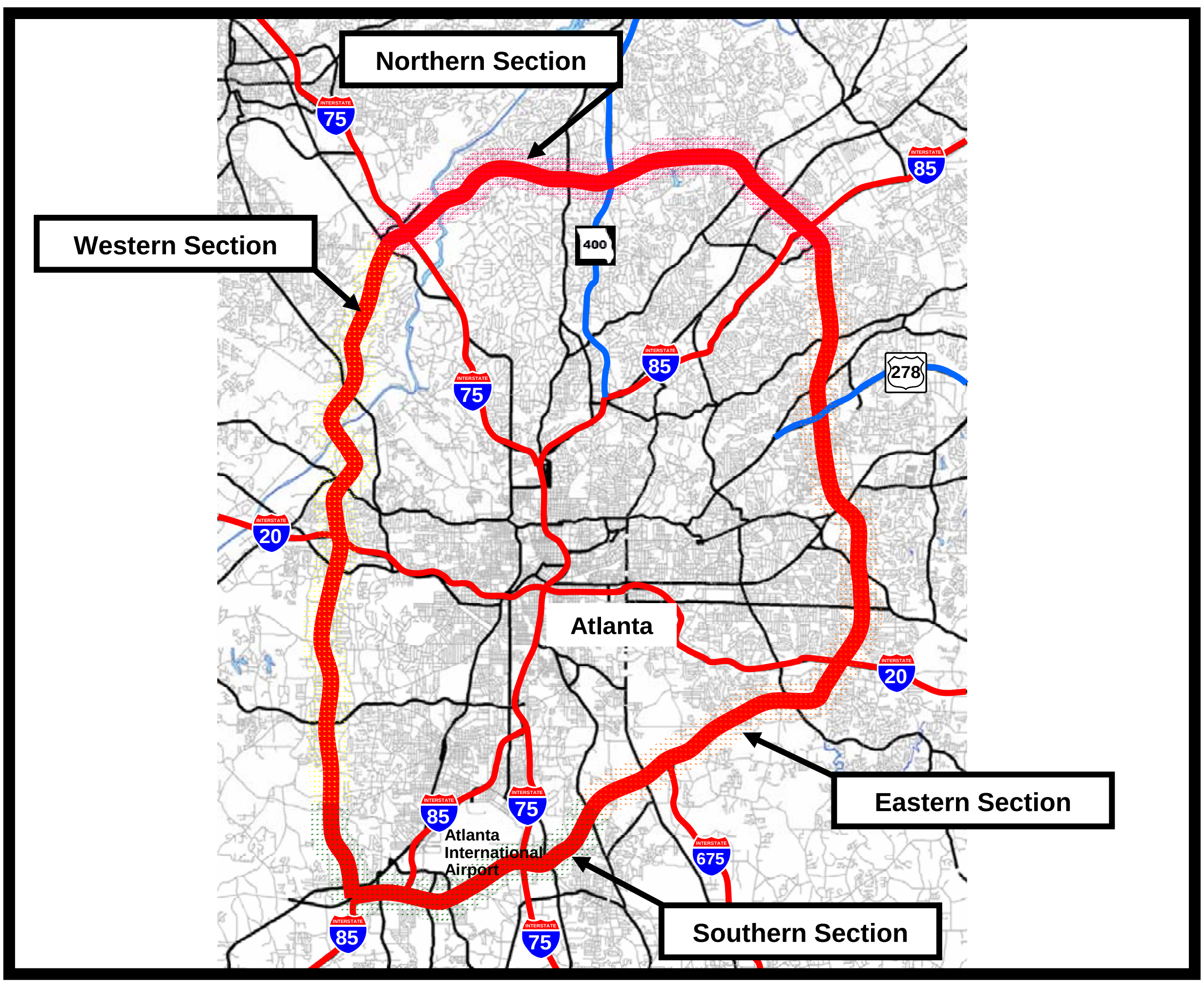
The evaluation of the existing system was undertaken to establish a benchmark for the subsequent analysis and evaluation of the 2030 Regional Transportation Plan (RTP) and alternate improvement scenarios. The existing system evaluation was performed at two levels. The first level of evaluation was the regional level. The measures of effectiveness (MOEs) were developed from the regional travel demand model, Matrix Variegator and Mesoscopic Model components of the I-285 Strategic Implementation Plan technical analysis process. The regional level of evaluation measures of effectiveness (MOEs) included:

- Percent of trips by mode;
- Average system speeds by facility type;
- Percent of trips in peak period;
- Congested vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Free flow vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Vehicle-hours of delay in peak periods by facility type;
- Delay per trip by vehicle type in peak periods;
- Delay cost by vehicle type in peak periods;
- Percent of trips by congested travel time to free flow travel time by vehicle type; and
- Percent of lane-miles operating above capacity by facility type.

The second level of evaluation was the corridor level. The I-285 corridor was divided into four sections: northern, eastern, southern, and western. These sections are shown in Figure 1. The corridor level analysis was carried out using both the Mesoscopic Model and the Microscopic Model components. The Mesoscopic Model MOEs used for the corridor level evaluation included:

- Average peak period speeds by facility type;
- Congested vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Free flow vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Vehicle-hours of delay in peak periods by facility type;
- Delay cost by vehicle type in peak periods; and
- Percent of lane-miles operating above capacity by facility type.

Figure 1
I-285 Corridor Sections



From a regional perspective several key MOEs highlight the overall operation of the existing transportation system in the region. First, the mode of travel indicates the relative importance of the various components of the region's transportation system. Table 1 shows the percent of travel by major transportation market segments for all person trips and for person work trips: automobiles with single person occupancy (SOV); automobiles with multiple person occupancy (HOV), and transit. As can be seen in Table 1, automobiles account for over 97% of the existing total person trips in the region and 94% of the total person work trips.

Table 1
2005 Regional Person Trips by Mode

Mode	Total Person Trips		Work Person Trips	
	Number of Trips	Percent of Total Trips	Number of Trips	Percent of Work Trips
SOV	6,877,558	60.7%	2,061,075	81.5%
HOV	4,161,313	36.8%	315,982	12.5%
Transit	278,337	2.5%	151,999	6.0%
Total	***11,317,208***	***100.0%***	***2,529,056***	***100.0%***

Another key MOE is the estimated cost of delay for motorists traveling on the highway system in the Atlanta region. Table 2 shows the estimated daily cost of delay during the morning (6:00 AM – 10:00 AM) and afternoon (3:00 PM – 7:00 PM) peak periods. Table 2 indicates the estimated cost of delay associated with congestion in 2005 dollars by vehicle type. As can be seen in Table 2, SOVs account for the largest majority of the delay costs in both the AM and PM peak periods. The total regional daily congestion cost during the peak periods is over $1.6 million.

Table 2
2005 Regional Cost of Delay by Vehicle Type

Vehicle Type	AM Peak Period		PM Peak Period		Total	
	Vehicle Hours of Delay	Delay Costs	Vehicle Hours of Delay	Delay Costs	Vehicle Hours of Delay	Delay Costs
SOV[1]	36,631	$503,676	37,603	$517,041	74,234	$1,020,701
HOV[2]	4,462	$153,381	4,433	$152,384	8,895	$305,765
Truck[3]	2,255	$163,826	1,937	$140,723	4,192	$304,549
Total	***43,348***	***$820,883***	***43,973***	***$810,148***	***87,321***	***$1,631,031***

Notes:
[1] Assumes 1 person per vehicle at $13.75 per hour
[2] Assumes 2.5 persons per vehicle at $13.75 per hour
[3] Assumes 1 person per vehicle at $72.65 per hour

Examination of the travel time of trips during the peak periods provides insight into the pervasiveness of congestion during the peak periods. Table 3 shows that over 68% of all the regional trips during both the morning and afternoon peak periods had travel times greater than the uncongested travel times during the off-peak periods, i.e., over two-thirds of all the regional trips during the peak periods are affected by congestion.

Table 3
2005 Regional Cost of Delay by Vehicle Type

Vehicle Type	AM Peak		PM Peak	
	% Trips With Travel Time Equal To Uncongested Travel Time	% Trips With Travel Time Greater Than Uncongested Travel Time	% Trips With Travel Time Equal To Uncongested Travel Time	% Trips With Travel Time Greater Than Uncongested Travel Time
SOV	32.8%	67.2%	32.3%	67.7%
HOV	28.6%	71.4%	27.4%	72.6%
Truck	23.1%	76.9%	21.0%	79.0%
Total	31.9%	68.1%	31.3%	68.7%

The detailed corridor analysis was made using the Mesoscopic and Microscopic components of the I-285. The northern section of I-285 accounts for a significant portion of the delay (62%) and congestion cost (63%) in the corridor. The eastern section has the second highest delay and congestion cost, followed by the western section and the southern section.

The detailed operational examination of the freeway component of the I-285 corridor was made using the Microscopic Model (VISSIM) component of the I-285 Strategic Implementation Plan technical analysis process. The Microscopic Model (VISSIM) component was employed to determine the density in vehicles per lane per mile for three basic types of freeway sections:

- Basic sections;
- Merge/Diverge sections; and
- Weaving sections.

Basic sections are those portions of the freeway that are not influenced by traffic merging or diverging at entrance and exit ramps. Merge sections are the portion of freeway associated with traffic entering the freeway at an entrance ramp. Merge sections are 1,500 feet in length following the gore of the entrance ramp. Diverge sections are the portion of freeway associated with traffic exiting the freeway at an exit ramp. Diverge sections are 1,500 feet in length preceding the gore of the exit ramp. Weaving sections are portions of the freeway between entrance and exit ramps that are within 3,000 feet of each other. Weaving sections are characterized by conflicts between vehicles entering the freeway and vehicles exiting the freeway.

Over 16 percent of the I-285 basic sections heavily congested or severely congested in the AM peak hour and 12 percent in the PM peak hour. The northern section has over 30 percent of its basic sections heavily or severely congested during the AM peak hour and over 23 percent during the PM peak hour. The southern section can be characterized by being the least congested section of I-285.

Over 16 percent of the I-285 merge/diverge sections are heavily or severely congested in the AM peak hour and 15 percent in the PM peak hour. The northern section has over 24 percent of its merge/diverge sections heavily or severely congested and over 33 percent during the PM peak hour. As with the basic freeway section, the southern section can be characterized by being the least congested section of I-285.

Over 22 percent of the I-285 weaving sections are heavily or severely congested in the AM peak hour and over 8 percent in the PM peak hour. The northern section has over 27 percent of its weaving sections heavily or severely congested during the AM peak hour and over 22 percent during the PM peak hour. None of the western section weaving sections are heavily or severely congested in either the AM or PM peak hours.

Figures 2 through 5 graphically depict the congestion levels for the individual sections in the I-285 corridor. This information is presented for each direction (inner loop – clockwise and outer loop – counter clockwise). The radial freeways are also depicted in both the inbound and outbound directions.

Initial Alternates Considered

The development and evaluation of scenarios for the I-285 Strategic Implementation Plan was conducted using a squeal series of alternate improvement concepts. The initial set of improvement scenarios was developed to test a broad range of improvement concepts. Scenarios 1 through 7 represented these initial improvement options. The alternate development process was based upon the following factors:

- Existing system evaluation;
- Evaluation of the 2030 Regional Transportation Plan (RTP);
- Development of a range of alternates so that the impacts of various strategies could be objectively evaluated; and
- Review of other existing plans and programs such as Public Private Initiatives (PPIs).

Figure 2
I-285 Strategic Implementation Plan 2005 Freeway Congestion
AM Peak Hour Inner Loop (Clockwise Direction) Radial Freeways Inbound

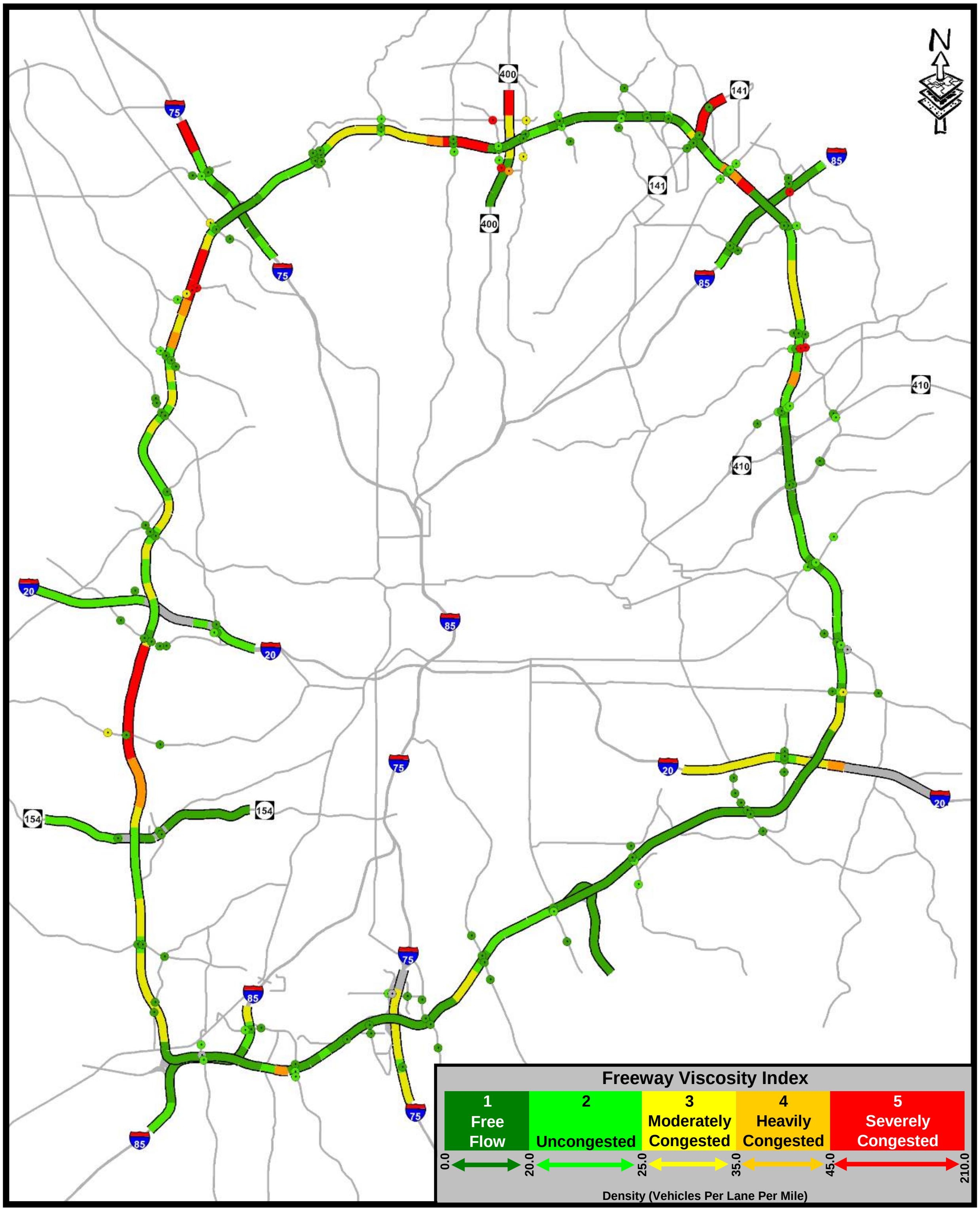


Figure 3
I-285 Strategic Implementation Plan 2005 Freeway Congestion
AM Peak Hour Outer Loop (Counter Clockwise Direction) Radial Freeways Outbound

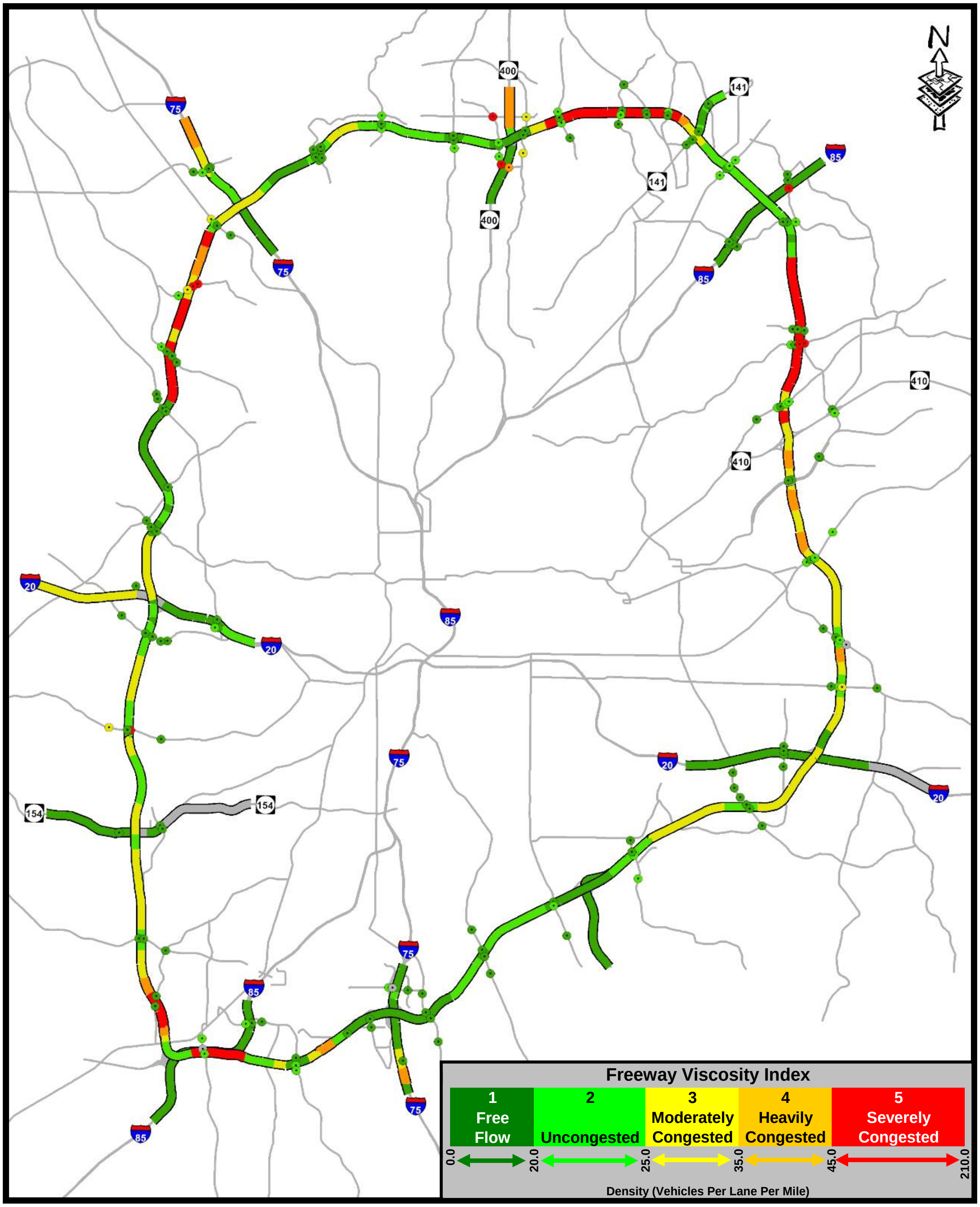


Figure 4
I-285 Strategic Implementation Plan 2005 Freeway Congestion
PM Peak Hour Inner Loop (Clockwise Direction) Radial Freeways Inbound

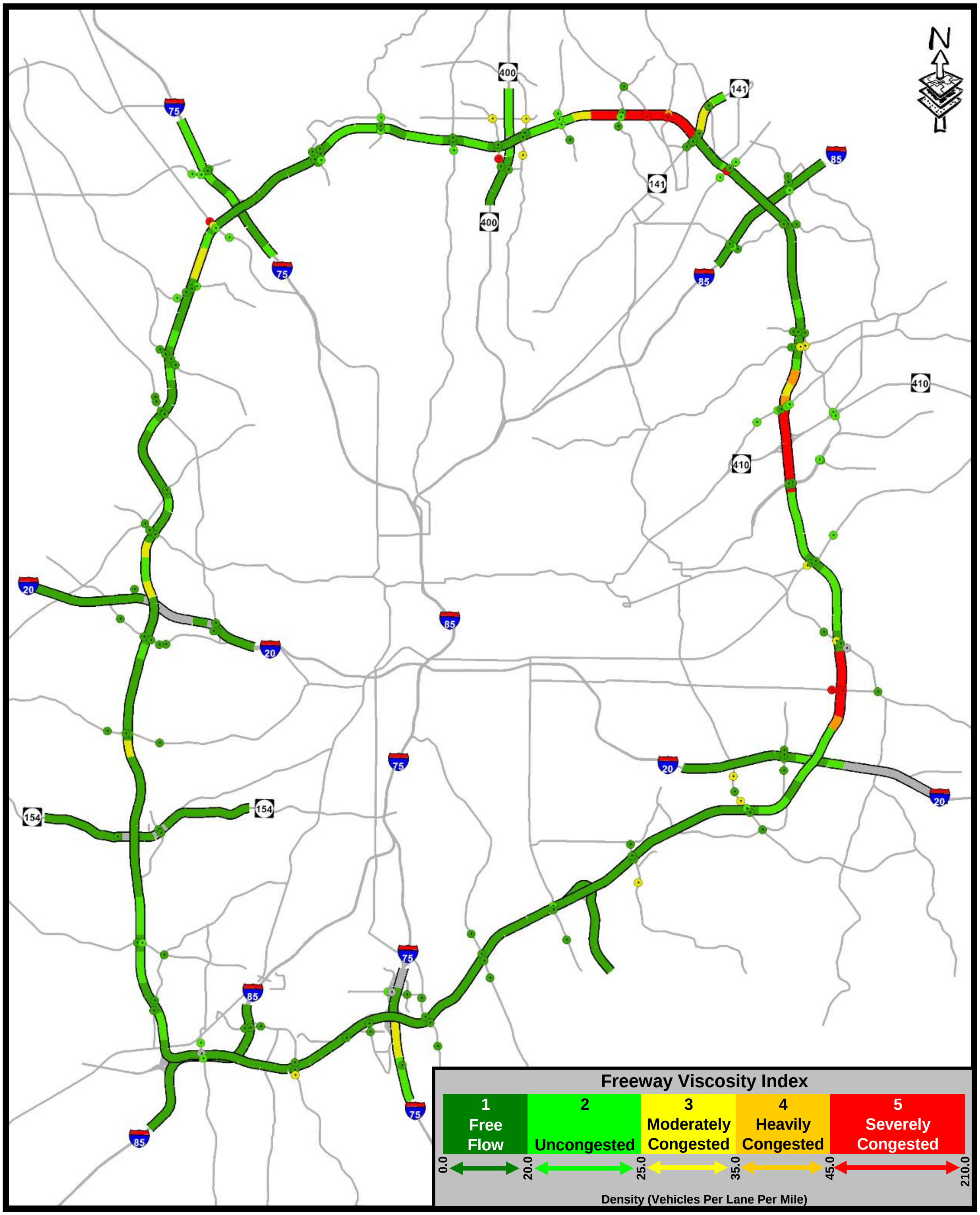
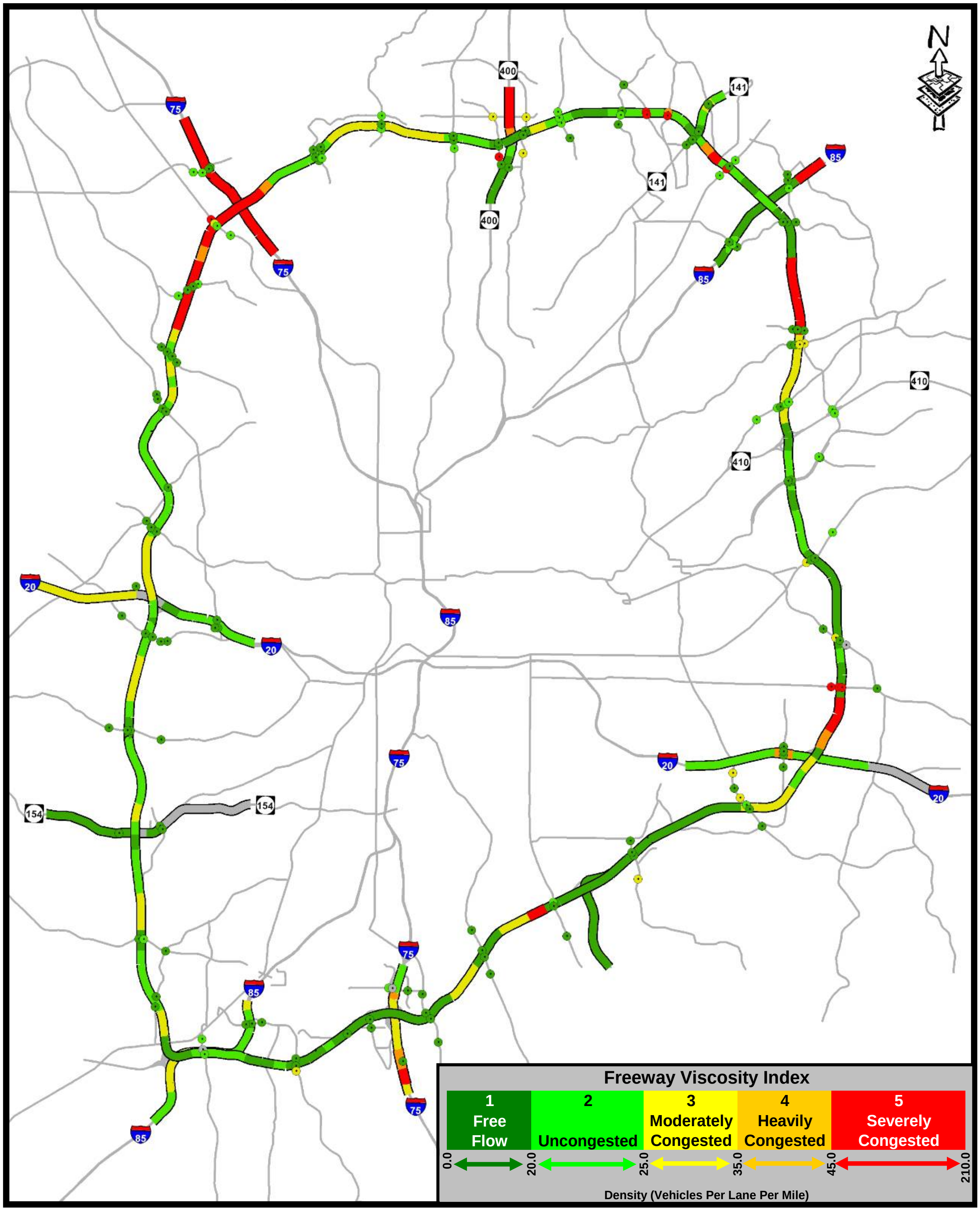


Figure 5
I-285 Strategic Implementation Plan 2005 Freeway Congestion
PM Peak Hour Outer Loop (Counter Clockwise Direction) Radial Freeways Outbound



Based upon these factors, seven initial alternates were identified for evaluation. The improvement concepts evaluated using these seven scenarios included:

- HOV Managed Lanes,
- Truck Managed Lanes, and
- Additional General Purpose (GP) Lanes.

The evaluation of these initial seven scenarios was based upon a regional and corridor level of analysis. Detailed operational analysis was not undertaken for these initial seven scenarios. The overall result of the testing and evaluation of this initial set of seven improvement strategies indicated that there was not a single improvement strategy that would provide the overall best option for improving the operations on I-285. Rather, a combination of improvement options unified into an overall strategy would be required. This evaluation also provided insights as to the improvement options that would be best suited for each of the major segments of I-285 (north, east, south, and west). Figures 6 through 12 illustrate these first seven alternates.

Figure 6
Scenario 1 General Concept

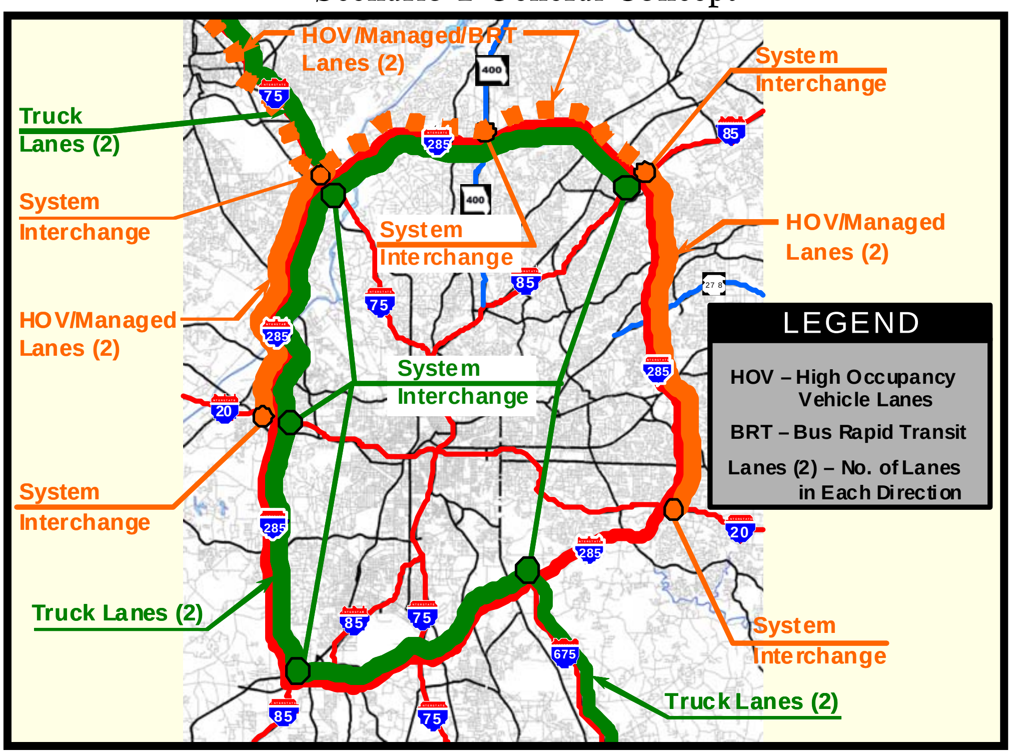


Figure 7
Scenario 2 General Concept

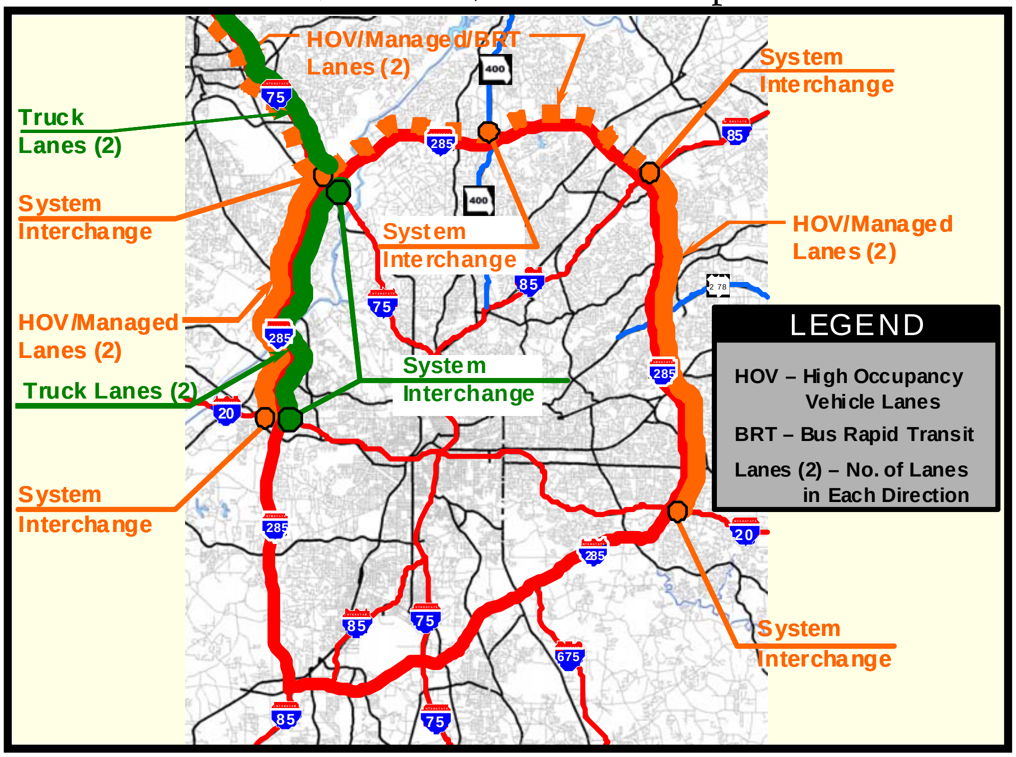


Figure 8
Scenario 3 General Concept

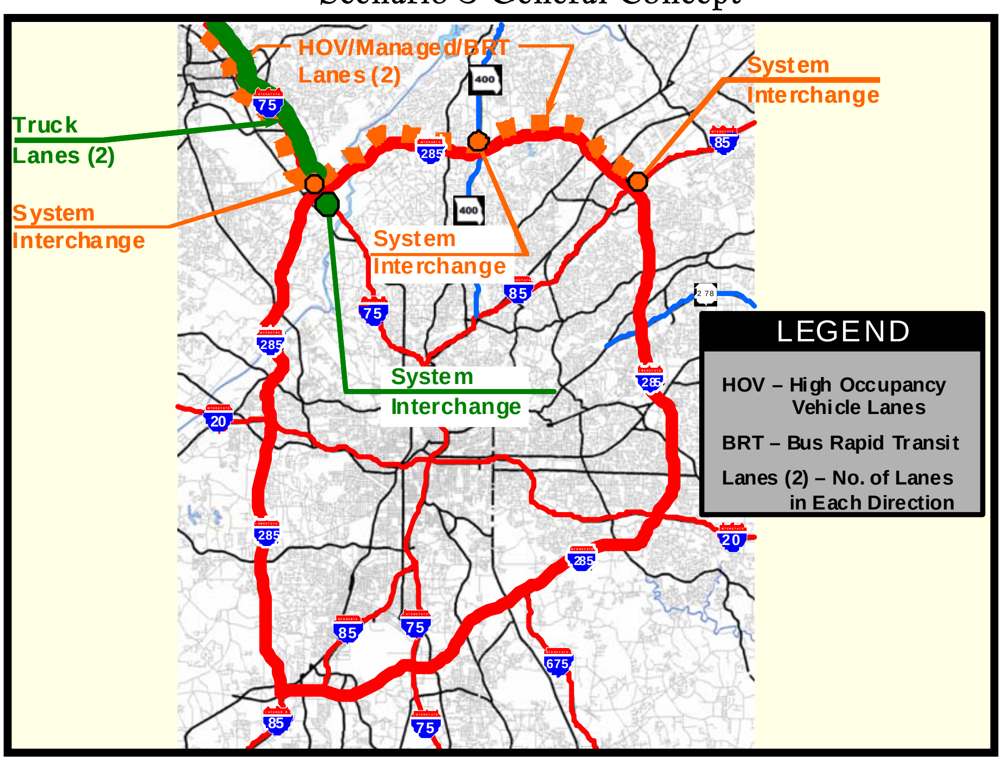


Figure 9
Scenario 4 General Concept

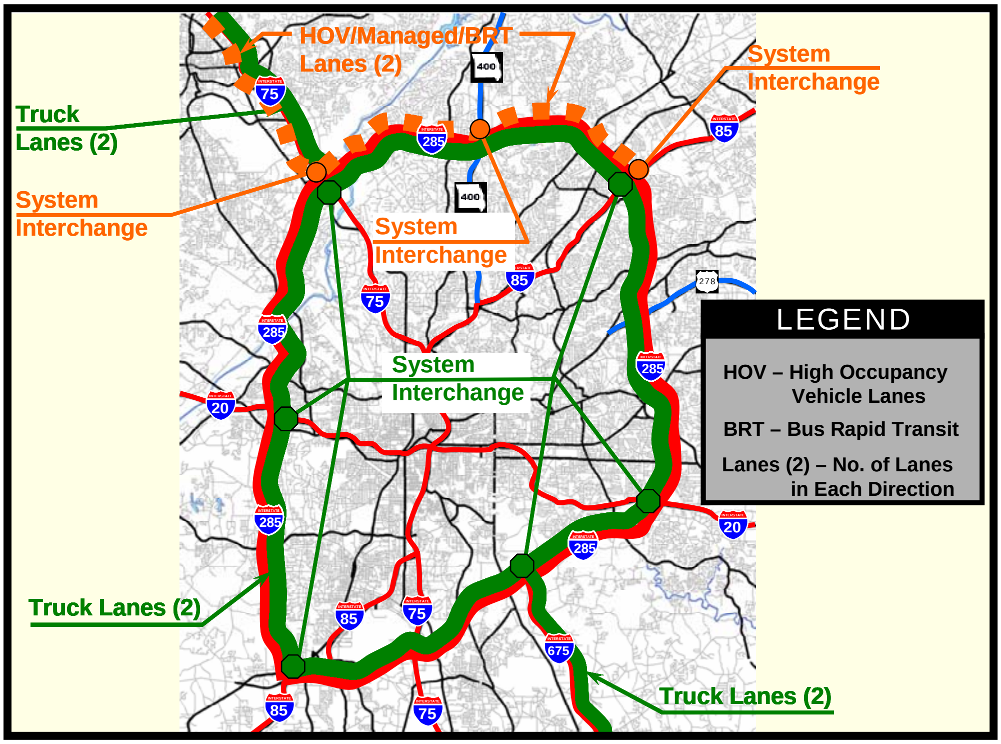


Figure 10
Scenario 5 General Concept

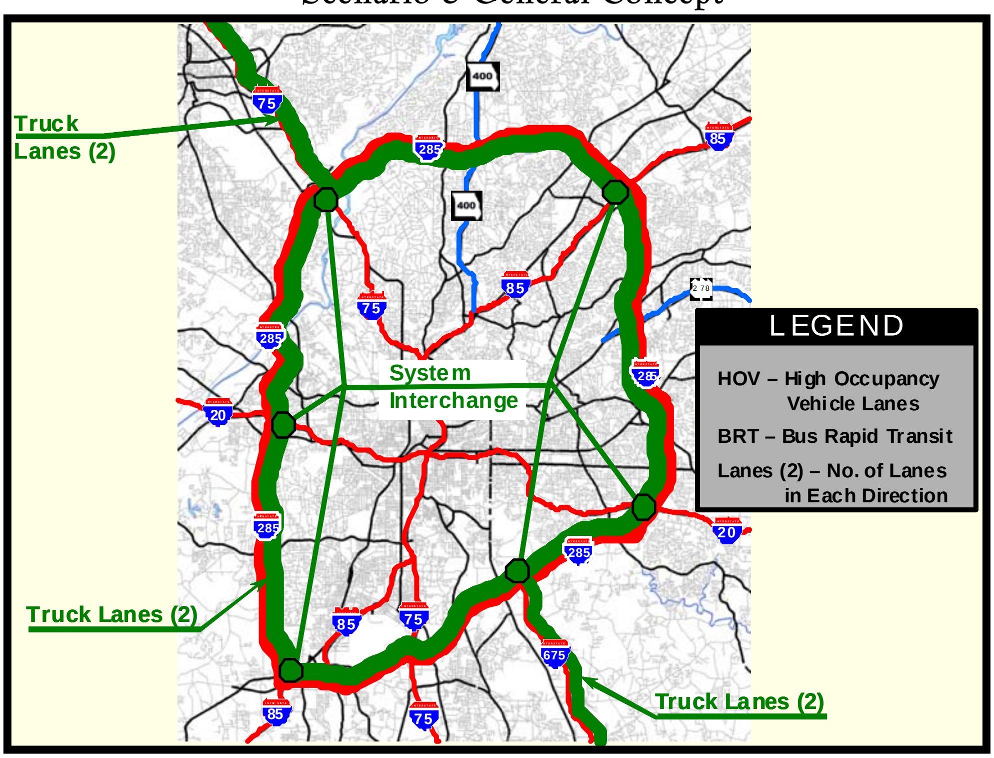


Figure 11
Scenario 6 General Concept

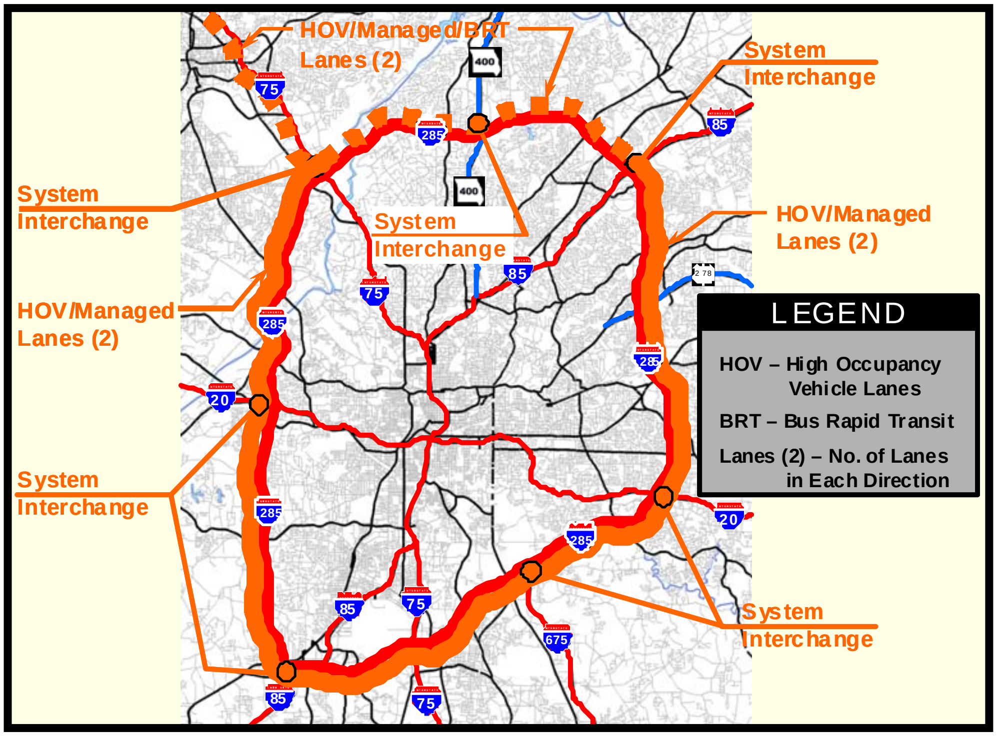
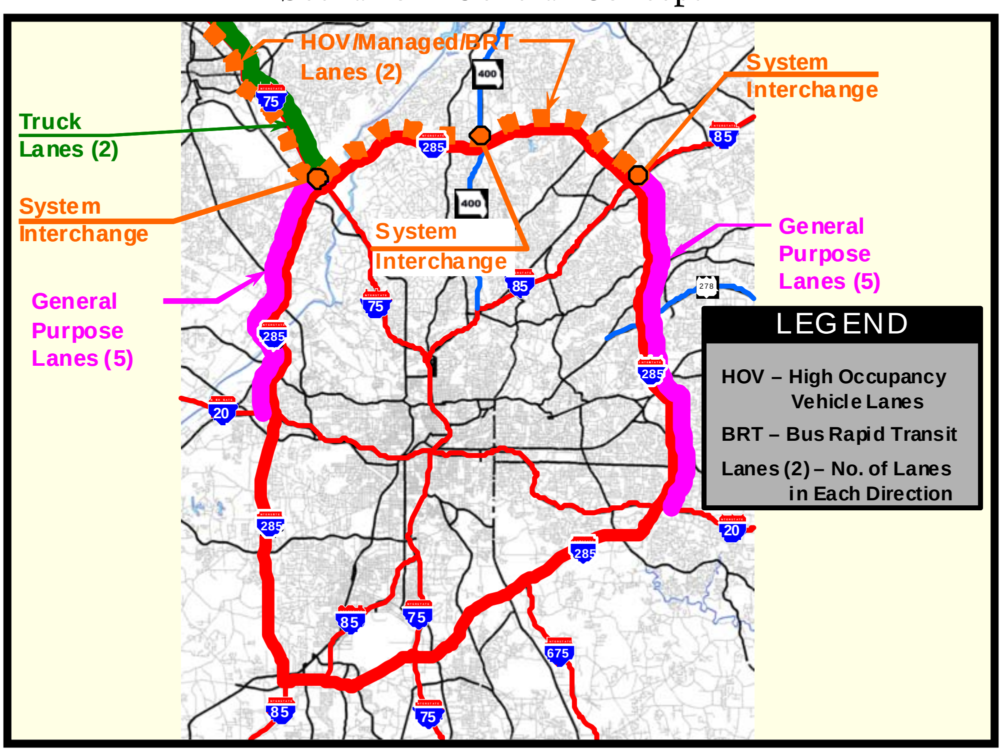


Figure 12
Scenario 7 General Concept



The evaluation measures used for the regional and corridor level of analysis were:

- Speeds,
- Delay costs,
- Percent of lane-miles of roadway greater than capacity,
- Percent of trips that have a travel time equal to the uncongested travel time, and
- Air quality.

The individual scenarios were compared with each other based upon which scenario performed the best for each of the individual evaluation measures for the regional and corridor levels. The scenario that was identified as best for an individual evaluation measure was given a score of 1. All other scenarios were given a score of 0 for that particular evaluation measure. If two (or more) scenarios were judged as equal, then each of the scenarios identified as best was given a score of 1 with the other scenarios being given a score of 0 for that particular evaluation measure. There were a total of 303 regional and corridor evaluation measures. Based upon these evaluation measures, Scenario 7 was identified as the best of the initial seven scenarios with a rating of 68.

Alternate Refinement

Using the insights gained in the testing and evaluation of initial seven scenarios, a second series of scenarios was investigated. This second series of scenarios also included the evaluation of improvement concepts that incorporated high occupancy toll (HOT) and truck only toll (TOT) managed lane concepts. Scenario 7 was also included in this second series of scenario testing and evaluation since it was identified as the "best" scenario in the initial round of scenario evaluation. This second round of scenario testing and evaluation also incorporated a detailed analysis of the operational characteristics of these scenarios using operational traffic simulation models to account for the actual traffic operations during morning and afternoon peak hour periods.

The second round of scenario testing and evaluation resulted in the investigation of five improvement concepts, Scenarios 8, 9R, 10, 11, and 12. These concepts were combinations of managed lanes (with and without tolls) for various sections of I-285. Scenarios 11 and 12 included the concept of mandatory truck use of managed (toll) lanes. These scenarios are illustrated in Figures 13 through 17. It is important to note that the tolls on the managed lanes, where tolls were included, were set to ensure that the managed lanes operated at a Level of Service C or better.

Estimated construction and rights-of-way costs were developed for Scenarios 7, 8, 9R, 10, and 11. These estimated costs were planning level cost estimates based upon 2007 construction and rights-of-way costs.

The analysis and evaluation of the five scenarios provided the following insights:

- No improvement scenario provided complete relief of the future (2030) congestion in the general purpose (GP) lanes on I-285 during the AM and PM peak periods for the northern, eastern, and western sections, i.e., there will continue to be significant congestion on I-285 during the AM and PM peak periods;

Figure 13
Scenario 8 General Concept

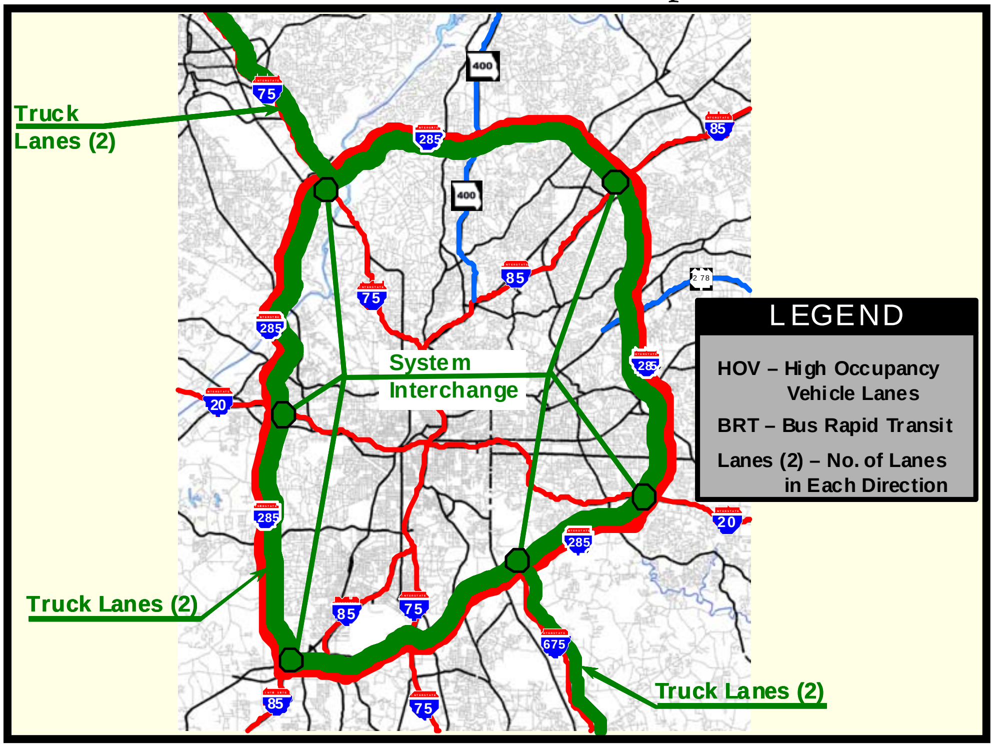


Figure 14
Scenario 9R General Concept

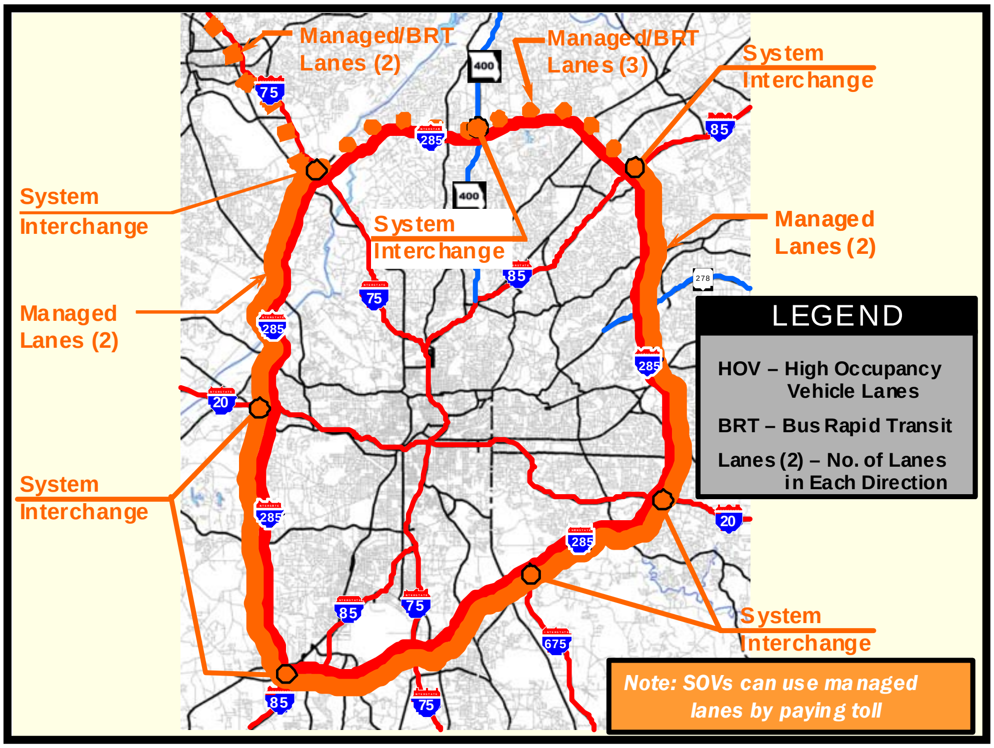


Figure 15
Scenario 10 General Concept

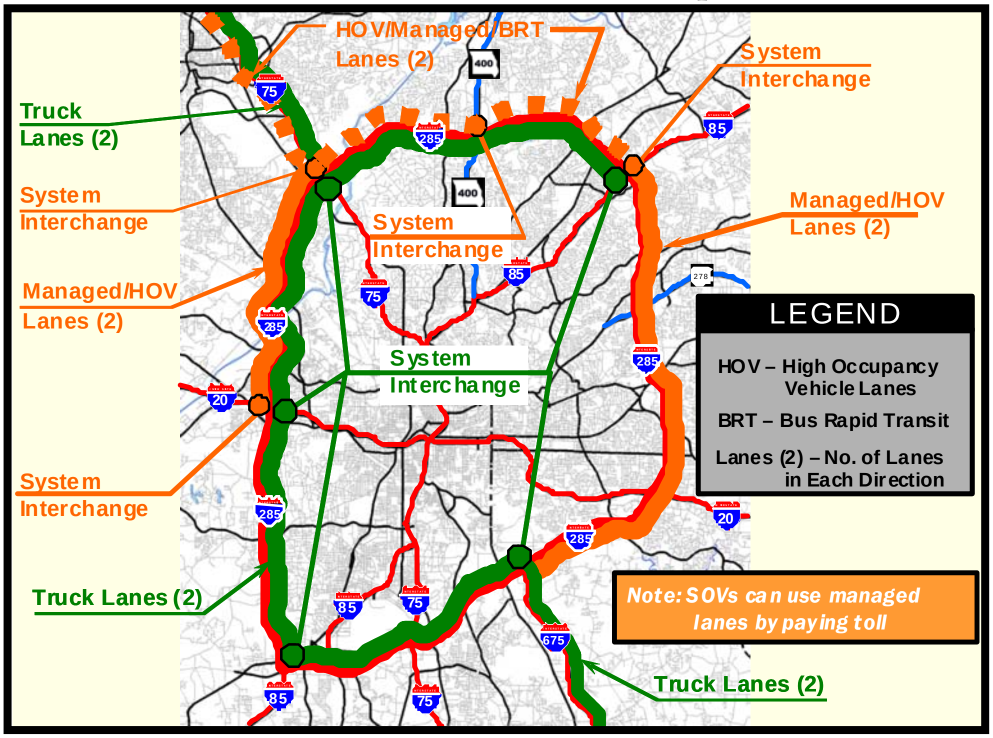


Figure 16
Scenario 11 General Concept

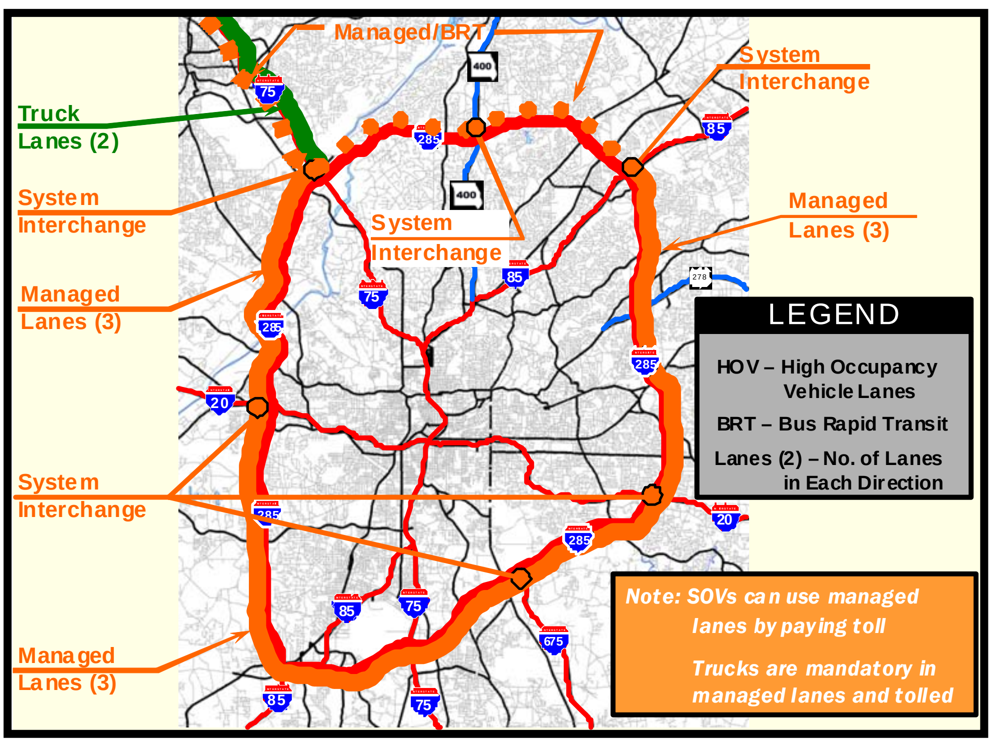
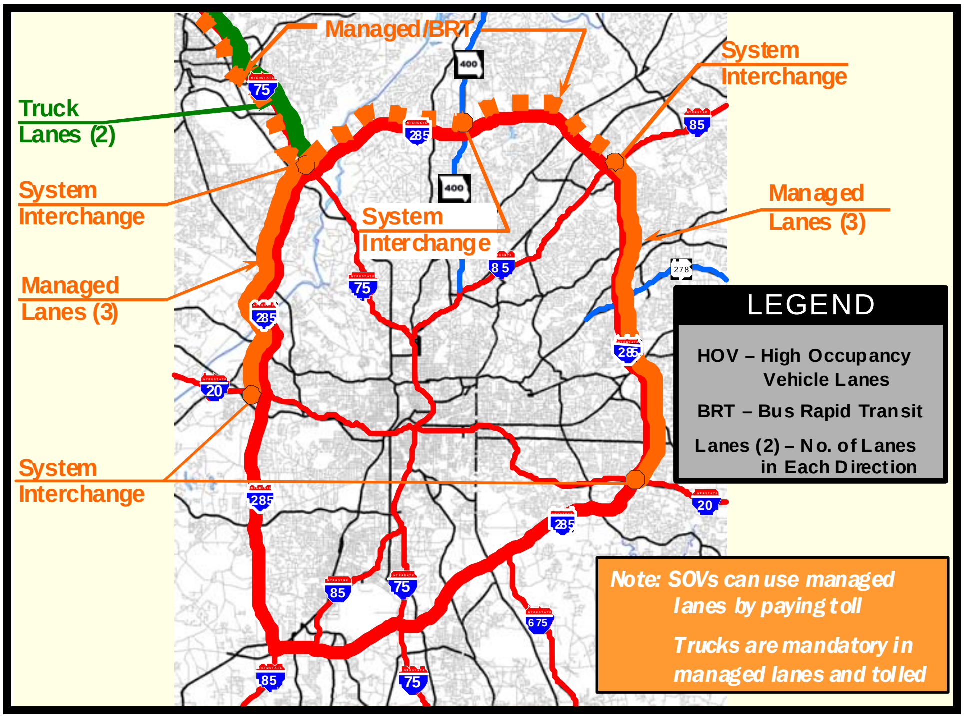


Figure 17
Scenario 12 General Concept



- Scenario 7 with the addition of general purpose lanes on the eastern and western sections was the only scenario with a positive benefit-to-cost ratio greater than 1.0. The managed lanes were assumed to be barrier separated with separate interchanges from the current GP lane interchanges. (Benefits were based upon user time cost savings and costs were estimated construction and right-of-way costs);
- Scenario 11 has the highest rating when all the evaluation factors are considered in an un-weighted analysis. Since there are more regional evaluation factors than there are operational evaluation factors (almost twice as many) this places a significant bias on the overall scenario evaluation toward the regional factors;
- When the regional and operational evaluation measures are equally weighted Scenarios 7 and 11 rank equally best with Scenario 8 being second best by a small margin; and
- Scenario 12 did not perform as well as Scenario 11 and subsequent detailed operational analysis for Scenario 12 was not undertaken.

Scenario 12 did not perform as well as the other scenarios and therefore detailed operational analysis for this scenario was not undertaken. Based upon this regional and corridor analysis Scenario 11 performed the "best".

Detailed operational analysis and evaluation was carried out for Scenarios 7, 8, 9R, 10, and 11 using the microsimulation component of the I-285 Strategic Implementation Plan model. This evaluation included a number of measures:

- Speeds,
- Lane densities,
- Lost time (delay),
- Intersection queue length and approach delay, and
- Viscosity Index (surrogate for Level of Service).

The results of this operational evaluation showed that Scenario 8 was identified as the "best" with Scenario 7 being the second best. The combined regional, corridor, and operational evaluation of Scenarios 7, 6, 9R, 10, and 11showed that Scenario 11 was the "best" and Scenario 7 was second best when all evaluation measures (regional, corridor, and operational) are taken into consideration.

The previous analyses and evaluations considered equal weighting for all factors. However, in reviewing the evaluation measures it is evident that more weight was being given to the regional and corridor evaluation measures than the operational measures, i.e., of the total of 455 evaluation measures 303 were regional and corridor with only 152 being operational measures. Since the operational aspects were considered to equally as important as the regional and corridor aspects of any proposed improvement plan for I-285, the evaluation measures were adjusted to provide for equal weighting of both sets of evaluation measures. The results of this weighting showed that both Scenario 7 and Scenario 11 were equal as being identified as the "best".

Other Considerations

In development of the I-285 Strategic Implementation Plan it is important to incorporate a number of factors that are not explicitly taken into account through the technical analysis and evaluation process previously described. Two primary factors needed to be incorporated into the overall process.

First, in the development of a managed lane system for the Atlanta metropolitan area, of which I-285 would be a major component, several key factors must be considered:

- The managed lane system cannot be composed of isolated segments, i.e., there must be an overall managed lane system throughout the region's transportation network in order to ensure viability and utility;
- The managed lane system must connect major regional origins and destinations, i.e., because of I-285's unique service characteristics it is major component of the region's transportation system linking major activity centers;
- The improvement plan for I-285 must provide for flexibility as conditions change over the planning horizon and beyond; and

- As part of the regional system to improve regional mobility, I-285 must be a part of the system of improvements that has a goal of providing a high level of travel time certainty for the region's trip makers.

Second, the implementation of any major transportation system improvements on I-285 must consider the funding resources available, including:

- Current funding constraints would not permit massive system improvements; and
- Tolls associated with managed lanes can provide a potential source of revenue to assist in making system improvements.

These considerations together with the technical analysis and evaluation previously described were combined to develop the overall I-285 Strategic Implementation Plan.

Recommended I-285 Strategic Implementation Plan

The recommended I-285 Strategic Implementation Plan has Scenario 11 as its basic framework. The basic plan has the following major components:

- Three managed lanes in each direction along all sections of I-285;
- The manages lanes would serve HOV, bus transit/BRT, SOV (tolled), and trucks (tolled); and
- The I-285 managed lane system would be connected to the managed lane systems on I-75, I-85, and I-20 with system-to-system interchanges.

In addition to this overall system improvement concept, a number of major operational improvements along I-285 would be implemented to improve the traffic operations and safety. These operational and safety improvements (see Figure 18) include:

1) Riverside Drive Interchange Improvements,
2) Roswell Road/Glenridge Drive/GA 400 Interchange Improvements,
3) Peachtree-Dunwoody Road/Ashford-Dunwoody Road Interchange Improvements,
4) North Shallowford Road/Peachtree Industrial Boulevard Interchange Improvements[1],
5) Stone Mountain Freeway Interchange Improvements[1],
6) I-20 West Interchange Improvements,
7) South Atlanta Road Interchange Improvements,
8) South Cobb Drive Interchange Improvements,
9) I-75 South Interchange Improvements,
10) Jonesboro Road Interchange Improvements, and
11) I-20 East Interchange Improvements.

[1] Improvement not in current Regional Transportation Plan (RTP)

I-285 Strategic Implementation Plan Phasing

One of the major objectives of the I-285 Strategic Implementation Plan was to determine the implementation phasing of the projects on the I-285 corridor to ensure that the most efficient project sequencing was identified. It was recognized that the sequencing of project implementation is critical to maintaining maximum operational efficiency within the corridor. Without the proper project sequencing, the operational efficiency within the corridor could be compromised. In other words, without proper project phasing the current operational problems in the corridor could be accentuated and even possibly exacerbated. Thus, the project implementation phasing was identified to improve and enhance the traffic operations and safety throughout the corridor. The analysis and evaluation has identified the critical elements of the implementation project phasing for the I-285 corridor. The I-285 Strategic Implementation Plan phasing is depicted in Table 3 and illustrated in Figure 18.

I-285 Strategic Implementation Plan Phase 1

The analysis and evaluation of the I-285 corridor identified the major congestion, both existing and in the future, would be associated with those sections of I-285 north of I-20. These problems were associated with insufficient capacity in several areas along I-285 and other connecting facilities:

- I-285 between I-85 north and I-20 east, generally referred to as the east wall,
- I-285 between I-75 north and I-20 west, generally referred to as the west wall,
- I-75 north of I-285, and
- I-85 north of I-285.

The analysis clearly demonstrated that the majority of the observed congestion on the northern section of I-285, from I-75 north to I-85 north, is associated with these capacity limitations outside the northern section. In general, it was determined that the northern section has sufficient capacity to accommodate the observed traffic volumes. Thus, before any consideration is given to the enhancement of the capacity of the northern section, capacity enhancements to those facilities outside the northern section (listed above) must be implemented. In other words, simply adding capacity to the northern section will not address the identified existing and future congestion problems on the northern section of I-285.

Therefore, Phase 1 of the I-285 Strategic Implementation Plan is divided into two elements. The first element, Phase 1a, includes the development of detailed plans for implementing the overall managed lane concept on I-285 north of I-20. These plans would provide the overall framework within which detailed operational improvements can be designed and implemented. This process is currently underway for the northern section (I-75 north to I-85 north) with the ***revive I-285*** **Top End** project. Similar efforts need to be initiated on the eastern (I-85 north to I-20 east) and western (I-75 north to I-20 west) sections of I-285. Within the overall framework of these managed lane improvement concepts the individual operational and safety improvements can be designed and implemented.

The second element of Phase 1, Phase 1b, would be the implementation of the managed lane elements on the eastern (I-85 north to I-20 east) and western (I-75 north to I-20 west) sections. It is assumed that the managed lane improvements to I-85 north and I-75 north will also be implemented during this timeframe.

It is critical to overall operations of I-285 that all the elements in Phase 1, north of I-20, be completed before beginning the implementation of Phase 2. These Phase 1 improvements provide the foundation for the Phase 2 improvements. Implementation of Phase 2 before Phase 1 is complete will only increase the levels of congestion on I-285 in the northern section (I-75 north to I-85 north).

I-285 Strategic Implementation Plan Phase 2

Phase 1 provides the foundation for the implementation of Phase 2. Without the completion of the Phase 1 projects north of I-20, the implementation of Phase 2 projects will significantly increase the levels of congestion on the northern section of I-285 (I-75 north to I-85 north).

I-285 Strategic Implementation Plan Phase 3

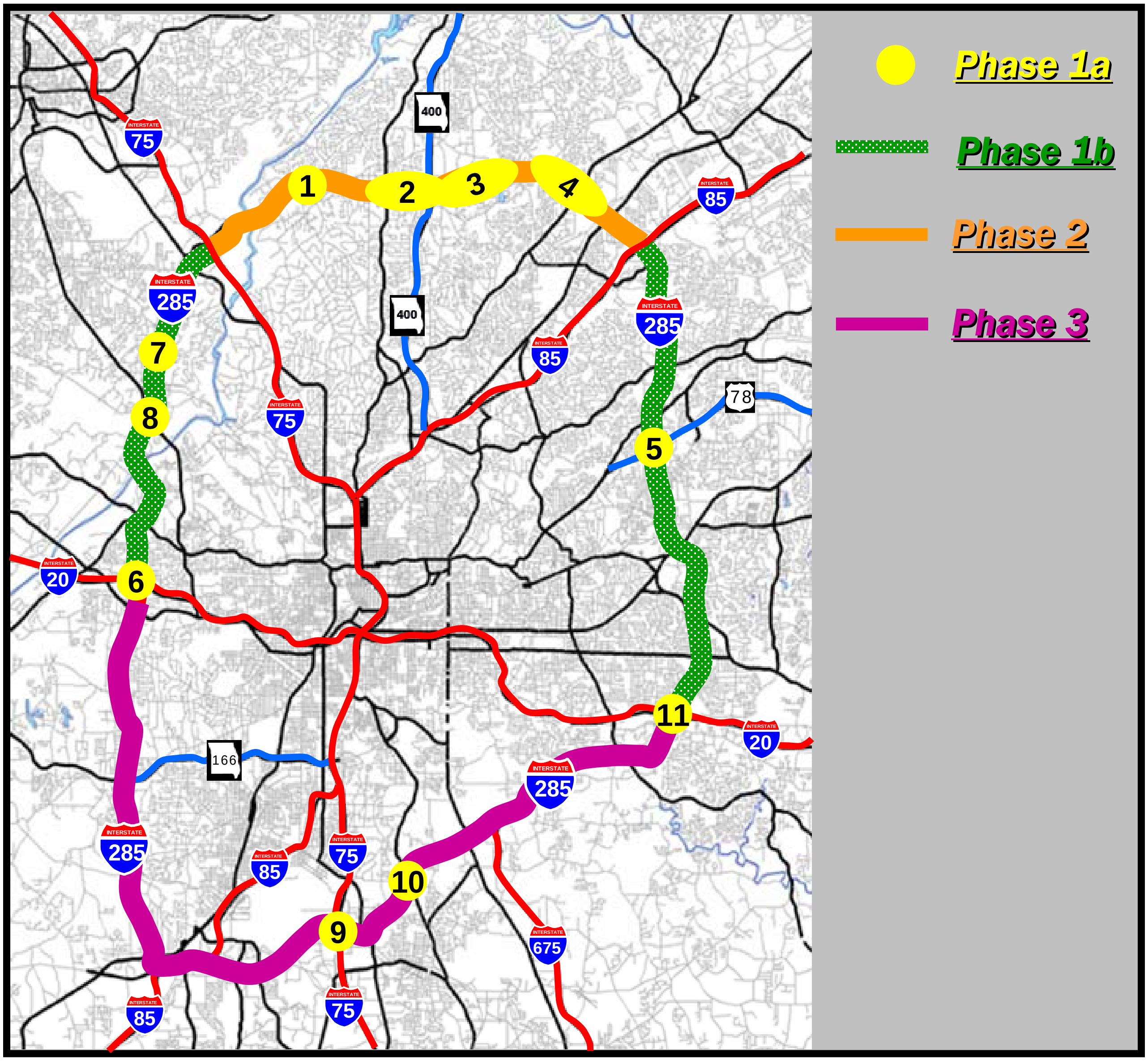
Phase 3 provides for the completion of the managed lane system on I-285. With the completion of Phase 3, all elements of the I-285 Strategic Implementation Plan will be complete providing for a system of managed lanes achieving the goal of providing a high level of travel time certainty for the region's trip makers in the I-285 corridor.

Table 3
I-285 Strategic Implementation Plan Improvement Phasing

Phase	Project
1a	Detailed Planning Studies for Managed Lanes I-85 North to I-20 East
	Detailed Planning Studies for Managed Lanes I-75 North to I-20 West
	Completion of the Detailed Planning Study for Northern Section (***revive I-285* Top End**)
	Riverside Drive Interchange Improvements
	Roswell Road/Glenridge Drive/GA 400 Interchange Improvements
	Peachtree-Dunwoody Road/Ashford-Dunwoody Road Interchange Improvements
	North Shallowford Road/Peachtree Industrial Boulevard Interchange Improvements[2]
	Stone Mountain Freeway Interchange Improvements[2]
	I-20 West Interchange Improvements
	South Atlanta Road Interchange Improvements
	South Cobb Drive Interchange Improvements
	I-75 South Interchange Improvements
	Jonesboro Road Interchange Improvements
	I-20 East Interchange Improvements
1b	Managed Lanes on I-285 from I-85 North to I-20 East
	Managed Lanes on I-285 from I-75 North to I-20 West
	Managed Lanes on I-75 North[1]
	Managed Lanes on I-85 North[1]
2	Managed Lanes on I-285 from I-75 North to I-85 North
3	Managed Lanes on I-285 from I-20 East to I-75 South
	Managed Lanes on I-285 from I-75 South to I-85 South
	Managed Lanes on I-285 from I-20 West to I-85 South

Note:
[1] Not part of the I-285 Strategic Implementation Plan
[2] Not part of the current Regional Transportation Plan (RTP)

Figure 18
Location of I-285 Strategic Implementation Plan Recommended Phasing



1.0 Study Background and Purpose

The overall purpose of the I-285 Strategic Implementation Plan study is stated in the established project goal:

> ***Provide an unparalleled, objective technical evaluation to help determine an optimal and compelling case and constituency for investment in and management of the long term viability of I-285.***

In order to meet this goal several project objectives were identified:

- Objective, detailed evaluation of planned projects and programs in the I-285 corridor;
- Development and evaluation of alternate improvement projects, programs and/or strategies;
- Development of a comprehensive, implementable improvement program for the entire I-285 corridor through the horizon year 2030; and
- Development of implementation program for 2010, 2020, 2030, and beyond 2030.

In order to achieve this goal and the objectives, a detail process of data collection, development of the required technical analysis tools, and performing the analysis and evaluation of a series of improvement scenarios was undertaken. Based upon this process, an overall recommended improvement scenario was developed. This recommended improvement scenario then served as the foundation for the development of the phased implementation program for the I-285 Strategic Implementation Plan.

The following sections of this report outline the procedures used in the development of the I-285 Strategic Implementation Plan and phased implementation program. The extensive data collection program is summarized and the use of these data in the development of the technical analysis tools and subsequent evaluation of the existing system are described. These discussions are followed by a discussion of the various improvement scenarios investigated and the selection of the recommended overall improvement concept. The final section of this report details the recommended improvement program and its implementation phasing. As described in this final section, the implementation phasing is a critical element of the overall plan to ensure that the current operational problems in the I-285 corridor would not be accentuated and even possibly exacerbated.

2.0 Data Collection

For the development of the I-285 Strategic Implementation Plan and the technical analysis tools required for the detailed analyses and evaluations, a substantial data collection effort was necessary to establish the characteristics of the existing transportation system. This data collection effort encompassed the assembling of existing data as well as the gathering of new data to establish an overall database for the study effort. This extensive data collection is documented in ***Data Collection Technical Memorandum***, May, 2006.

The information included in this database was subdivided into broad data categories. These include:

- GIS Framework;
- Traffic;
- Accidents;
- Transportation Plans;
- Environment and Land Use;
- Aerial photography:
- I-285 geometry features (horizontal curvature and vertical grades);
- Inventory of signs and ATMS equipment; and
- Travel Speeds.

Figures 2.0.1, 2.0.2, 2.0.3, 2.0.4, and 2.0.5 illustrate the locations where traffic counts were compiled for this project. This compilation was a combination of existing Georgia Department of Transportation (GDOT) traffic counts and traffic counts obtained specifically by the study team. These data are presented in the ***I-285 Strategic Implementation Plan Data Collection Technical Memorandum***, May, 2006.

Crash data was obtained from the GDOT's crash database for calendar years 2001, 2002, 2003, and 2004. The locations of accidents were geographically referenced along I-285 in both directions of travel. Accidents were grouped into segments, defined as freeway sections between access points, along I-285. For comparison purposes, I-285's system-wide accident rates were compared with those statewide accident rates on facilities of the same functional class. The analysis of existing crash experience went into considerable detail, including accident rates and other patterns at the segment and ramp level-of-detail. These analyses are presented in the ***I-285 Strategic Implementation Plan Data Collection Technical Memorandum***, May, 2006.

A summary of identified planned projects in the I-285 Corridor was made. A total of 234 projects were identified from the Mobility 2030 Regional Transportation Plan (RTP) and the 2005 – 2010 Transportation Improvement Program (TIP) and the GDOT Construction Work Program (CWP). Table 2.0.1 summarizes these projects by major section of the I-285 corridor.

Figure 2.0.1
GDOT Ramp Count Locations

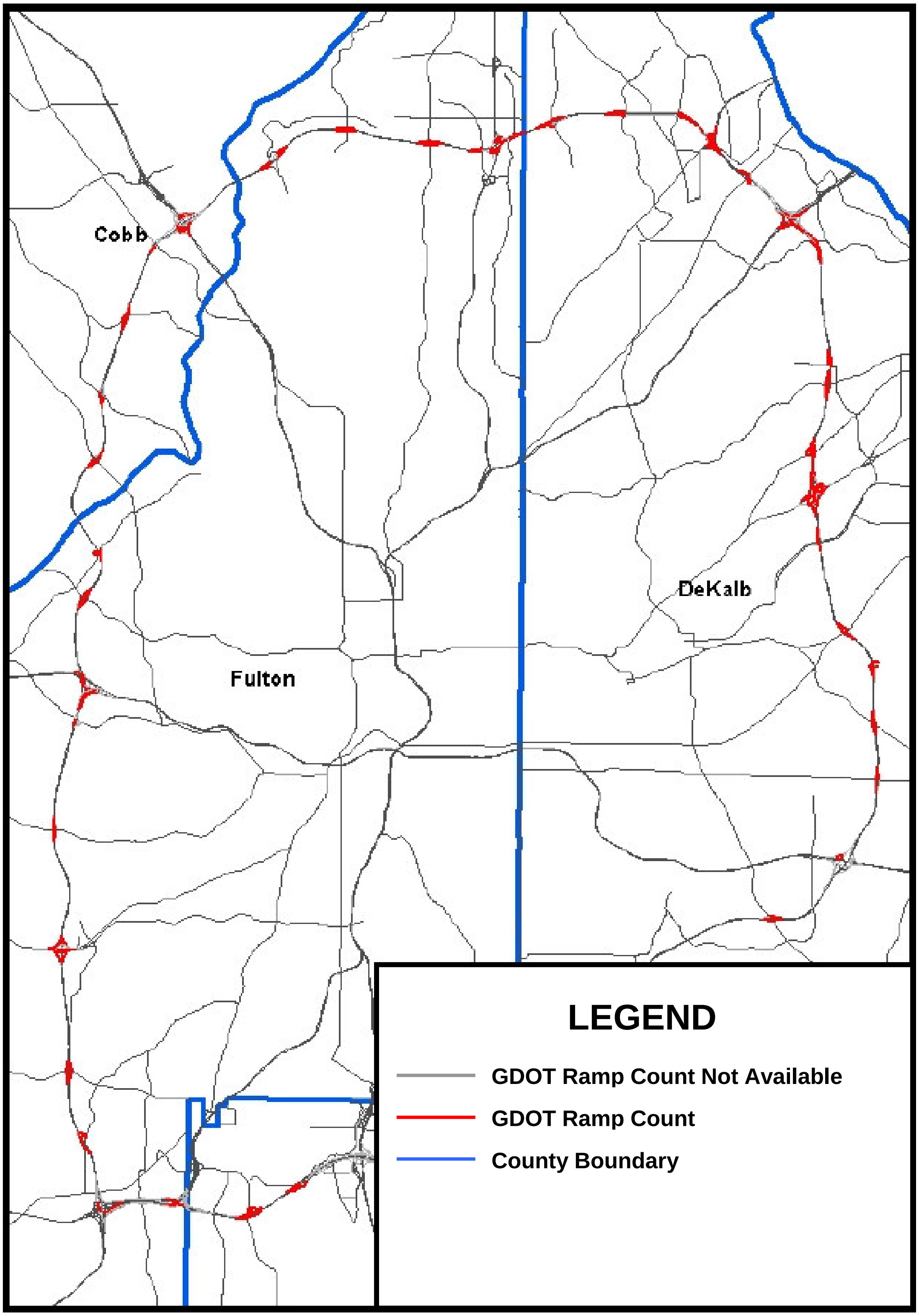


Figure 2.0.2
GDOT NaviGator Data Locations

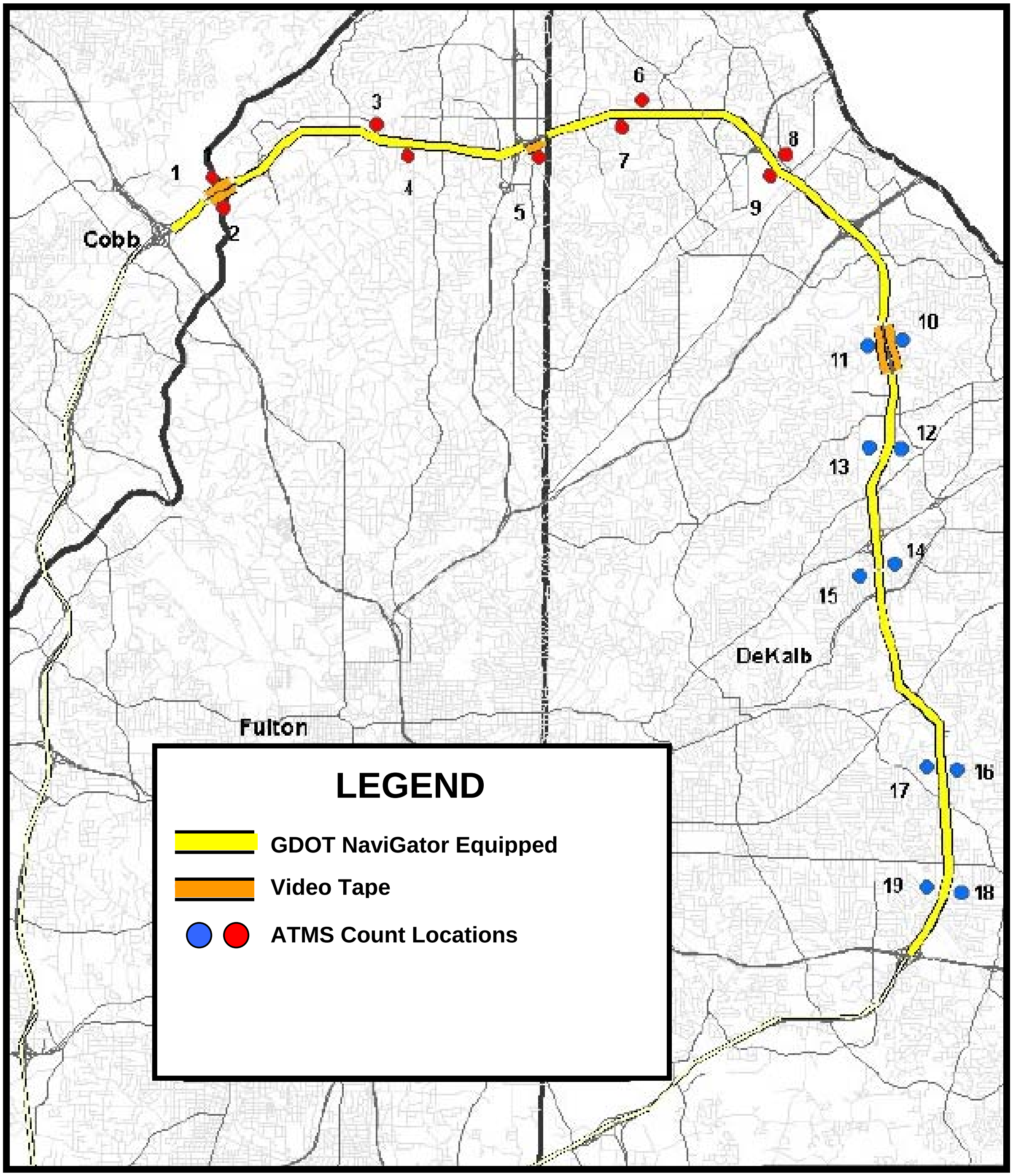


Figure 2.0.3
Study Team Vehicle Classification Count Locations

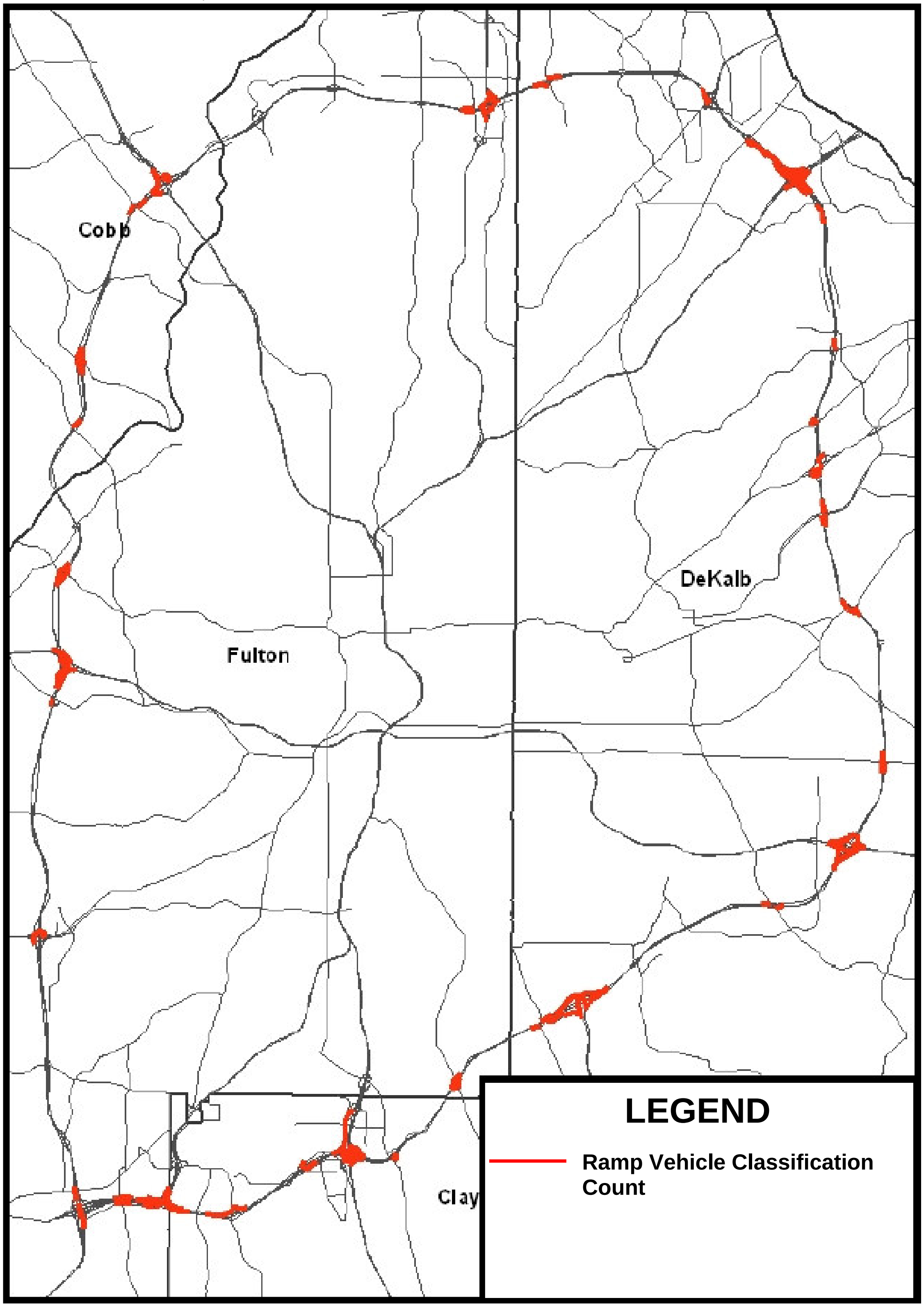


Figure 2.0.4
Study Team Intersection Turning Movement Count Locations

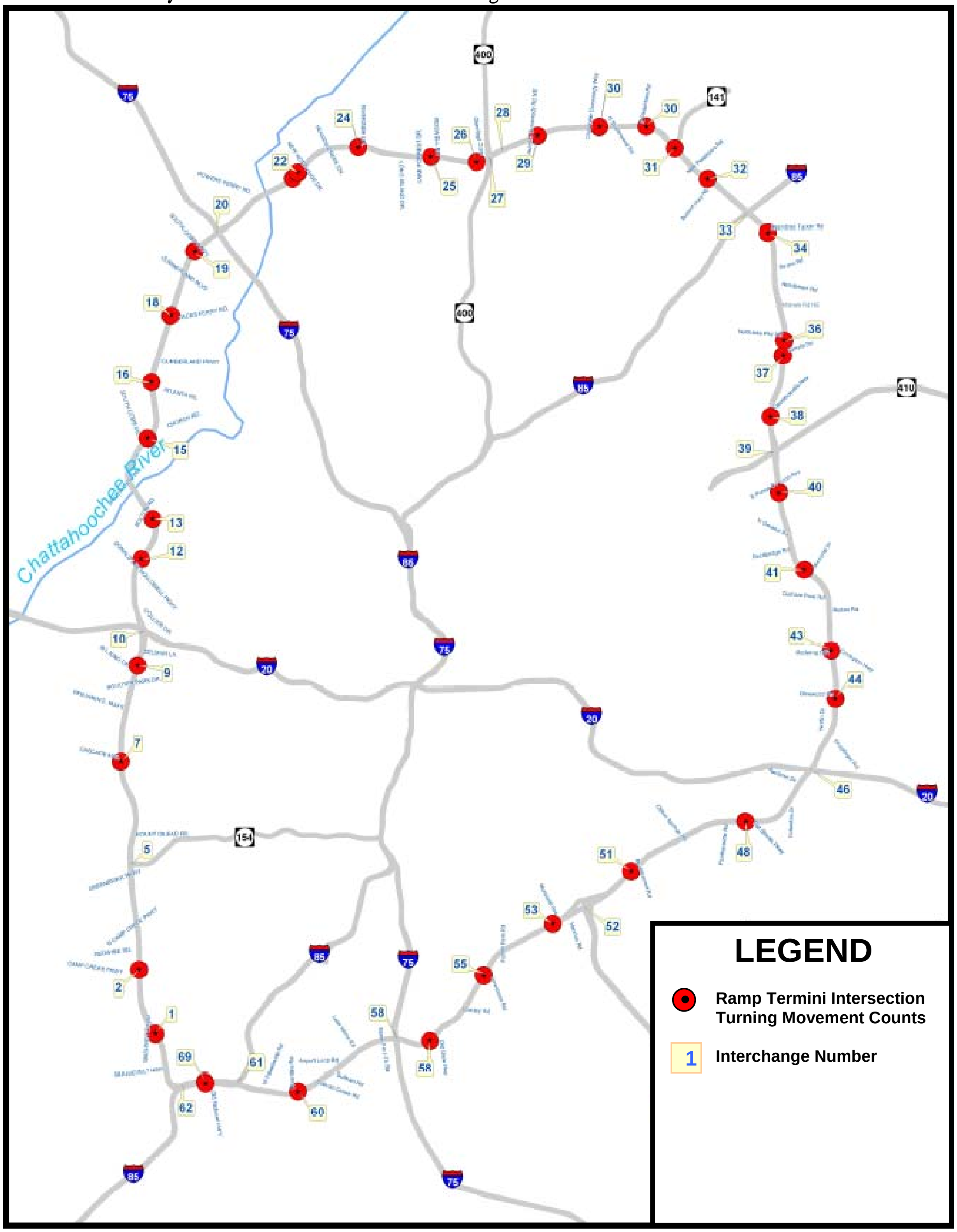


Figure 2.0.5
Cross Street Traffic Count Locations

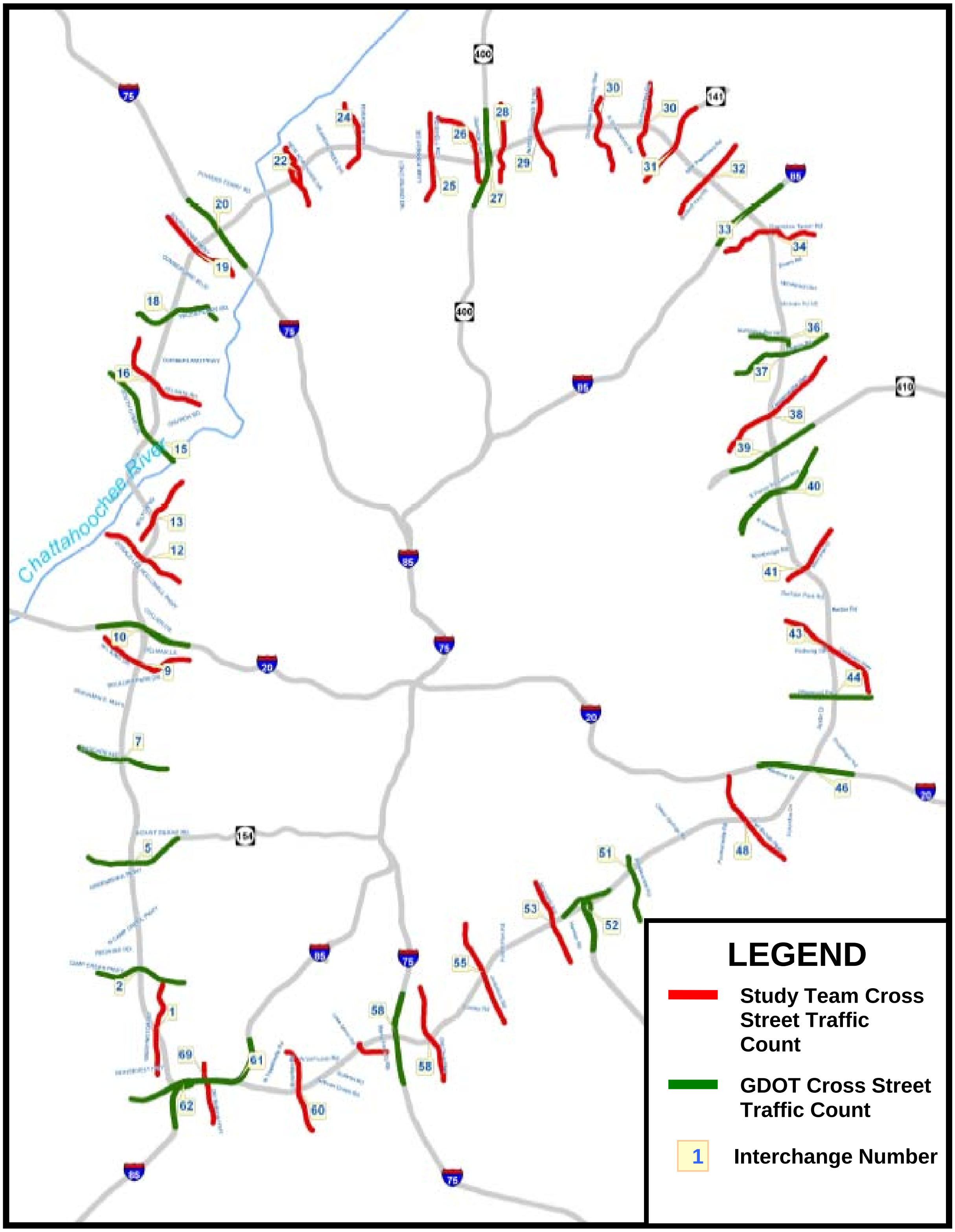


Table 2.0.1
Identified Planned Projects in I-285 Corridor

Section	Number of Projects	Percent of Total Projects
Northern	96	41%
Eastern	53	23%
Southern	52	22%
Western	33	14%
Total	**234**	**100%**

Information leading to the identification of possible environmental and land-use constraints that would be considered in developing a strategic plan for I-285 was compiled. Environmental constraints were subdivided into the following categories: environmental resources; social environmental resources; and cultural resources. These data are summarized in the ***I-285 Strategic Implementation Plan Data Collection Technical Memorandum***, May, 2006.

Data for average travel speeds observed on the mainline of I-285 were developed. In addition to lane-by-lane travel speed data provided by the GDOT's NaviGator surveillance system, the study team had access to average speed samples obtained from the ARC's 2001 Speed Study. In reviewing all of the traffic, average speed, level-of-service data, and by direction of travel, there was an extremely high level of consistency between the different sources of data. Comparison of these data for the AM and PM peak hours is shown in Tables 2.0.2 and 2.0.3.

Table 2.0.2
AM Peak Hour (7:00 AM – 8:00 AM) Speeds and Level of Service Comparisons

Location	Clockwise Direction			Counter Clockwise Direction		
	NaviGator 2005[1]	ARC 2001[2]	Skycomp 2001[3]	NaviGator 2005[1]	ARC 2001[2]	Skycomp 2001[3]
Between I-75 and New Northside Dr.	30	N/A	F	62	65	B
Between Riverside Dr. and Roswell Rd.	40	N/A	E	60	65	C
Between Ashford-Dunwoody Rd and Chamblee-Dunwoody Rd.	65	65	B	47	37	E
Between Peachtree Industrial Blvd. and Buford Highway	60	53	C	30	37	F
Between Chamblee-Tucker Rd. and Northlake Pkwy.	58	65	C	53	53	D
Between LaVista Rd. and Lawrenceville Hwy.	60	65	C	45	37	F
Between Stone Mt. Freeway and Ponce de Leon Ave.	50	53	C	25	25	F
Between Glenwood Rd. and I-20	65	65	B	75	75	B

Notes:
[1] Using surveillance cameras from GDOT's NaviGator system
[2] ARC's 2001 Travel Time and Speed Study
[3] From Skycomp's 2001 Photo Survey – Speed Data Not Available

Table 2.0.3
PM Peak Hour (5:00 PM – 6:00 PM) Speeds and Level of Service Comparisons

Location	Clockwise Direction			Counter Clockwise Direction		
	NaviGator 2005[1]	ARC 2001[2]	Skycomp 2001[3]	NaviGator 2005[1]	ARC 2001[2]	Skycomp 2001[3]
Between I-75 and New Northside Dr.	60	65	B	25	N/A	F
Between Riverside Dr. and Roswell Rd.	55	65	B	40	N/A	F
Between Ashford-Dunwoody Rd and Chamblee-Dunwoody Rd.	25	65	F	70	N/A	C
Between Peachtree Industrial Blvd. and Buford Highway	20	20	F	40	53	D
Between Chamblee-Tucker Rd. and Northlake Pkwy.	25	25	F	53	65	C
Between LaVista Rd. and Lawrenceville Hwy.	25	25	F	56	65	C
Between Stone Mt. Freeway and Ponce de Leon Ave.	25	37	E	57	65	C
Between Glenwood Rd. and I-20	66	65	C	75	65	C

Notes:
[1] Using surveillance cameras from GDOT's NaviGator system
[2] ARC's 2001 Travel Time and Speed Study
[3] From Skycomp's 2001 Photo Survey – Speed Data Not Available

3.0 Development of I-285 Strategic Implementation Plan Technical Analysis Tools

The technical analysis tools utilized for the I-285 Strategic Implementation Plan are unique in their development and application. The overall goal of the technical analysis, or modeling, process was the development of a traffic simulation model for the 63-mile I-285 corridor to facilitate the objective operational evaluation of potential improvements in the corridor.

The potential problems associated with the development of large scale simulation models were initially researched using the experience of several previously attempted large scale simulation efforts:

- Portland, Oregon – TRANSIMS,
- Northern Ring and State of Hessen (Germany) – VISUM and VISSIM,
- I-80 Corridor Study, New Jersey – VISTA,
- Salt Lake City – Integration, and
- Long Island – Integration.

A symposium was held with the GDOT staff, the I-285 consultant team, and key investigators for each of these previous study efforts. This symposium provided information on the successes, failures, and key findings associated with the development and application of these large scale simulation efforts, including:

- Procedures must be incorporated into the processes that bridge the gap between the regional travel demand model macroscopic process and the microscopic traffic simulation process. The bridge must be composed of two basic elements. First, the detailed temporal distribution of trips within the peak periods must be accounted for in 15 minute time slices to explicate the peak spreading process. Second, the routing of peak period trips must reflect the dynamic nature of traffic routings during the peak periods.

- Aggregation of traffic analysis zones (TAZs) for development and application of dynamic traffic assignment procedures should be avoided. The aggregation of TAZs results in the concentration of trips which are difficult for dynamic traffic assignment procedures to effectively accommodate and accurately load onto the network.

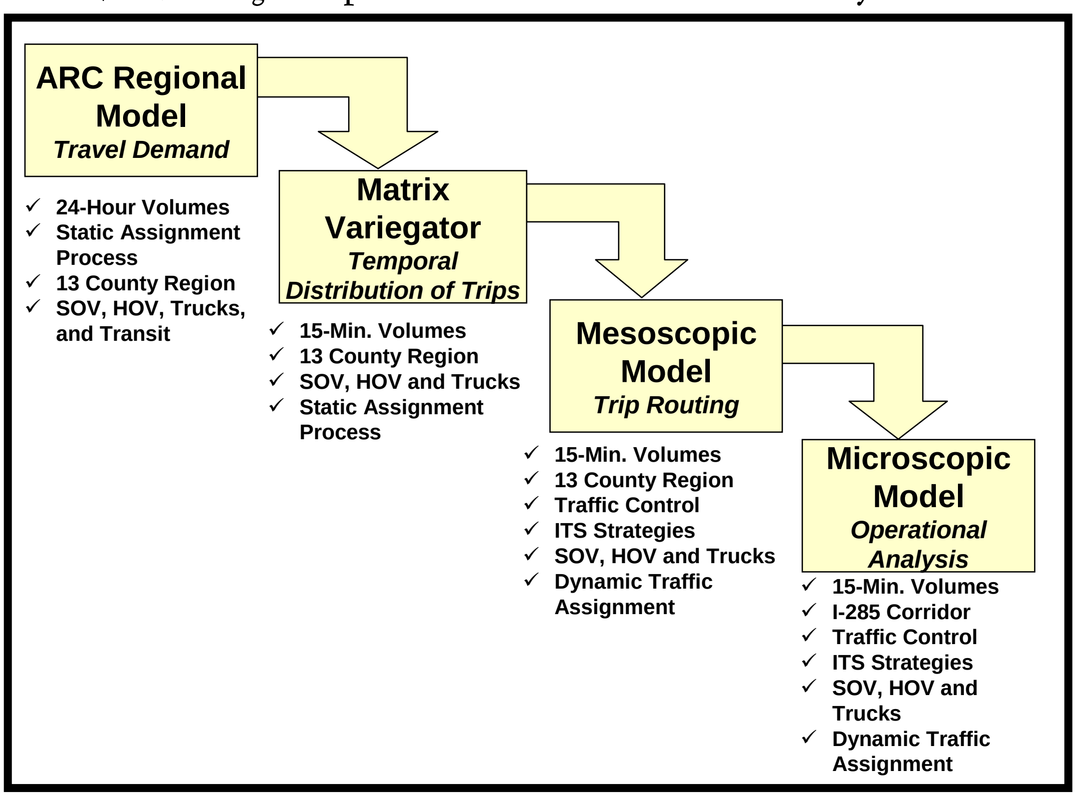
- Development of the microsimulation model networks needs to be based on commercial mapping networks rather than centerline files because of the required network detail. Also the regional travel demand model network needs to be "free" of network errors since detailed routing of trips into, out of, and through the microsimulation area is a critical component of the process.

- Large scale simulation models should be developed in a network expansion process with small portions of the network developed, tested, and calibrated before additional network components are added. Building the entire microsimulation network and attempting a subsequent calibration is extremely time consuming due to the numerous interactions the various model components such as traffic signals, trip patterns (trip origins and destinations), details of intersection configurations, bus operations, and the dynamics of traffic routing. With these numerous interactions it is extremely difficult, if not impossible, to isolate and correct problems during the model calibration process for large simulation networks.

- Extensive data relative to the traffic operations within the microsimulation model study area is required, including: detailed traffic volumes in 15-minute increments (by lane on freeways), vehicle classification volumes (by lane on freeways), vehicle densities by lane on freeways, vehicle headways, vehicle speeds (by lane on freeways), and queue lengths at intersections.

Armed with this knowledge of previous large scale microsimulation model successes and failures, the study team developed an overall structure for the I-285 Strategic Implementation Plan technical analysis process which is shown in Figure 3.0.1.

Figure 3.0.1
I-285 Strategic Implementation Plan Technical Analysis Process



As can be seen in Figure 3.0.1 the I-285 Strategic Implementation Plan technical analysis process has four basic components which address the recommended procedures identified in the previous large scale simulation projects. The regional travel demand model is connected to the microscopic simulation model with two critical model components:

- The Matrix Variegator which slices the 24-hour trip tables from the ARC regional travel demand model into 15-minute trip tables; and

- The Mesoscopic Model which uses the 15-minute trip tables from the Matrix Variegator in a dynamic traffic assignment process to establish the trip routes that feed into the Microscopic Model.

A mesoscopic traffic model is one that bridges the gap between microscopic and macroscopic in representational detail of traffic flow, geographic scope, and temporal detail. Where a macroscopic assignment model uses static network equilibrium to model traffic flow, a mesoscopic approach uses dynamic network equilibrium, or dynamic traffic assignment, for modeling traffic flow. The terminology dynamic traffic assignment (DTA) is commonly used to refer to the traffic assignment process used to determine traffic flows on a network with variation in route choice by relatively small time periods (15 minutes or less). The DTA process provides for a more realistic representation of traffic flows and trip routing in peak period congested flow conditions. In addition, DTA provides more realistic traffic propagation by employing either simplified car following procedures or cell transmission models of traffic flow. These procedures also consider the effects of traffic control on traffic propagation and consequently on route choices over a large geographical area.

A review of potential software products for solving the DTA problem was performed early in this project, in conjunction with reviews of microscopic simulation products. In short, the DTA products available at the time of the evaluation had one or more of the following flaws:

- The geographic scale permitted was not sufficient for the scope of the I-285 project;
- The software was not fully deployed; or
- Required unreasonable aggregation of the network and zonal structure.

One of the products not fully deployed was promising enough to explore the feasibility of its use. This product is called VISTA, developed by the VISTA Transport Group, in conjunction with Northwestern University. The VISTA software and development philosophy seemed most appropriate for the I-285 project. The software was developed in such a way as to allow it to scale easier to more powerful computing systems that were becoming available than other products. The software was tested on networks as large as Atlanta and proven to work under those rather controlled conditions which will be elaborated on in subsequent paragraphs. Finally, the software was developed with straightforward interfaces that facilitated integration with the microscopic model and other analysis procedures. For these reasons, the VISTA DTA software was selected, and the 13-County Atlanta Regional model was implemented in VISTA.

The solution of dynamic equilibrium in DTA for the problem size of the I-285 project requires a great deal of computation time. A solution of the problem for an individual scenario requires several iterations of a search process; each iteration of a search requires as many as a dozen function evaluations; and each function evaluation can require as little as 45 minutes, but as long as 3-4 hours, depending on the state of the current solution. A dynamic user equilibrium solution (DUE), therefore could take from 24 hours to 10 days. After a solution is found, typically some adjustment to input data like corrections of network anomalies or revised traffic signal settings would require an entirely new run. At some point in the solution process, when the solution was of sufficient quality, a new path generation sequence is run, and the entire process restarted. The base year validation runs, not withstanding all the problem discovery and resolution, took months of computational time just for a single model run. Thus, it was concluded that the VISTA platform was not viable for implementation for the I-285 Strategic Implementation Plan modeling process.

Thus, an alternate approach to the mesoscopic process had to be developed. The goal of this process would be to approximate the DTA methodology using commonly available and proven static assignment methods. It was hoped that this could be accomplished through successively assigning the demand originating in each 15 minute period, provided by the matrix variegator. While conceptually simple, this process had one formidable hurdle to overcome when used to assign such short periods of demand. The mean trip length in the Atlanta region is longer than the 15 minutes of assignment. As is true almost everywhere else, the distribution of travel times is skewed left, meaning that the median trip length is probably shorter but that the presence of a significant number of very long trips influences the location of the mean. The practical upshot of this is that a large number of trips will still be in motion at the end of each 15 minute period, which will in turn influence the travel times in the following 15 minute assignment. The observed mean travel time for the A.M. peak period is 28 minutes, meaning that each trip would at best be able to travel only halfway through the network at the end of a 15 minute assignment. Ignoring their effect on network congestion in the following 15 minute period would result in substantial errors in link cost calculations, resulting in illogical or suboptimal paths.

In the investigation of the procedures to apply the 15-minute time step assignment process using the CUBE/VOYAGER software a little used feature known as volume sets was identified. These volume sets are associated with each link in the traffic assignment network, and they can be used to accumulate assignment volumes during the traffic assignment process. Utilization of these volume sets for tracking the flows of trips through the network in 15-minute increments was identified as a mechanism to potentially effectuate a pseudo DTA process. The trips would be assigned in 15-minute increments using the Matrix Variegator trip tables. Based upon the length of the trip along the path between the origin and destination, the volumes would be accumulated in the appropriate volume set for each individual link. For each successive time period assignment, the trips in the appropriate volume sets would be pre-loaded onto the network before the trips for the current 15-minute time period were assigned on the network. In effect, the paths for the current 15-minute assignment were developed based upon the network congestion resulting from the traffic flows and volumes from the previous time periods. The hypothesis was that the congestion on the network at the beginning of each 15-minute resulting from the pre-loaded volumes would better reflect the path decision process observed in the real world as drivers made route choices in a highly congested network framework.

The Pseudo DTA process was tested and the results indicated a realistic estimate of the travel paths and volumes during the A.M. and P.M. peak periods. Figures 3.0.2 and 3.0.3 illustrate the results from the final calibration of the Pseudo DTA process.

Figure 3.0.2
Pseudo DTA Correlation Results for AM Peak Period

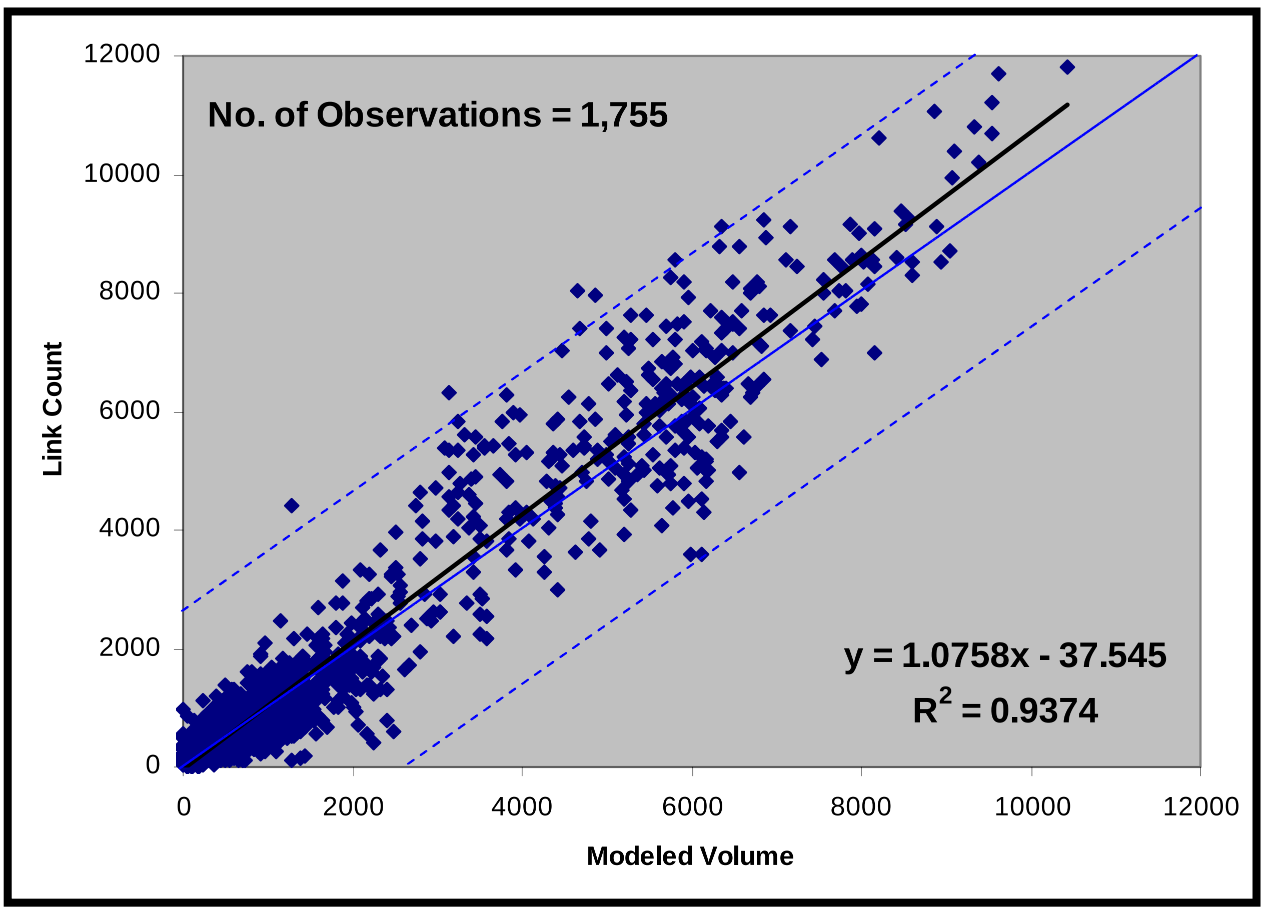
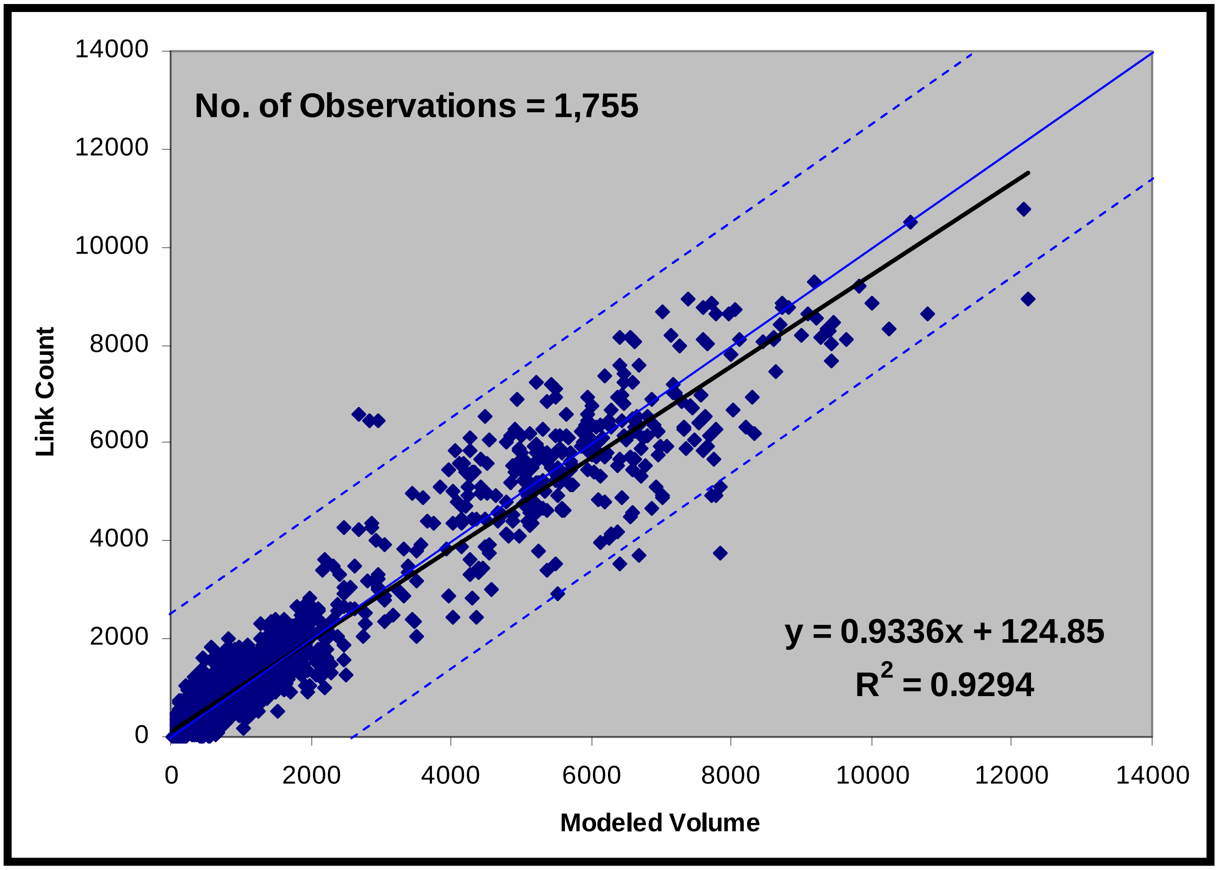


Figure 3.0.2
Pseudo DTA Correlation Results for PM Peak Period



The final step of the technical analysis process is the application of the Microscopic Model. The output of the Mesoscopic Model, trips and trip routes, serve as the primary inputs to the Microscopic Model. The Microscopic Model provides the detailed corridor operational analysis of the existing system and the future scenarios.

It should be clearly understood that the prime objective of the I-285 Strategic Implementation Plan technical analysis process was the development of a procedure that could be applied to future improvement scenarios based upon future development conditions portrayed in the Atlanta Regional Transportation Plan. This prime objective thus required that the procedures to be used for the model application of future scenarios must replicate the procedures that were used in the development and calibration of the model. To not follow this model development/application paradigm substantially increases the prospect of bias being introduced into the analysis process. The opportunities for potential bias are magnified by the multiplicity and interconnectivity of the various model components. Consequently, the procedures for determining traffic signal timings were established recognizing that traffic signal timings would not be available for future years and scenarios and thus would have to be developed as part of the analysis process. With this recognition, procedures were developed to estimate traffic signal timings for the base year as well as for the future years.

The development of the modeling process for the I-285 Strategic Implementation Plan is documented in the technical memorandum ***I-285 Strategic Implementation Plan Model Documentation***, May, 2007. This document includes a detailed description of the model development process including the calibration/validation of the individual components and the model application procedures.

4.0 Existing Conditions Evaluation

The evaluation of the existing system was undertaken to establish a benchmark for the subsequent analysis and evaluation of the 2030 Regional Transportation Plan (RTP) and alternate improvement scenarios. The existing system evaluation was performed at two levels. The first level of evaluation was the regional level. The measures of effectiveness (MOEs) were developed from the regional travel demand model, Matrix Variegator and Mesoscopic Model components of the I-285 Strategic Implementation Plan technical analysis process. The regional level of evaluation measures of effectiveness (MOEs) included:

- Percent of trips by mode;
- Average system speeds by facility type;
- Percent of trips in peak period;
- Congested vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Free flow vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Vehicle-hours of delay in peak periods by facility type;
- Delay per trip by vehicle type in peak periods;
- Delay cost by vehicle type in peak periods;
- Percent of trips by congested travel time to free flow travel time by vehicle type; and
- Percent of lane-miles operating above capacity by facility type.

The second level of evaluation was the corridor level. The I-285 corridor was divided into four sections: northern, eastern, southern, and western. These sections are shown in Figure 4.0.1. The corridor level analysis was carried out using both the Mesoscopic Model and the Microscopic Model components. The Mesoscopic Model MOEs used for the corridor level evaluation included:

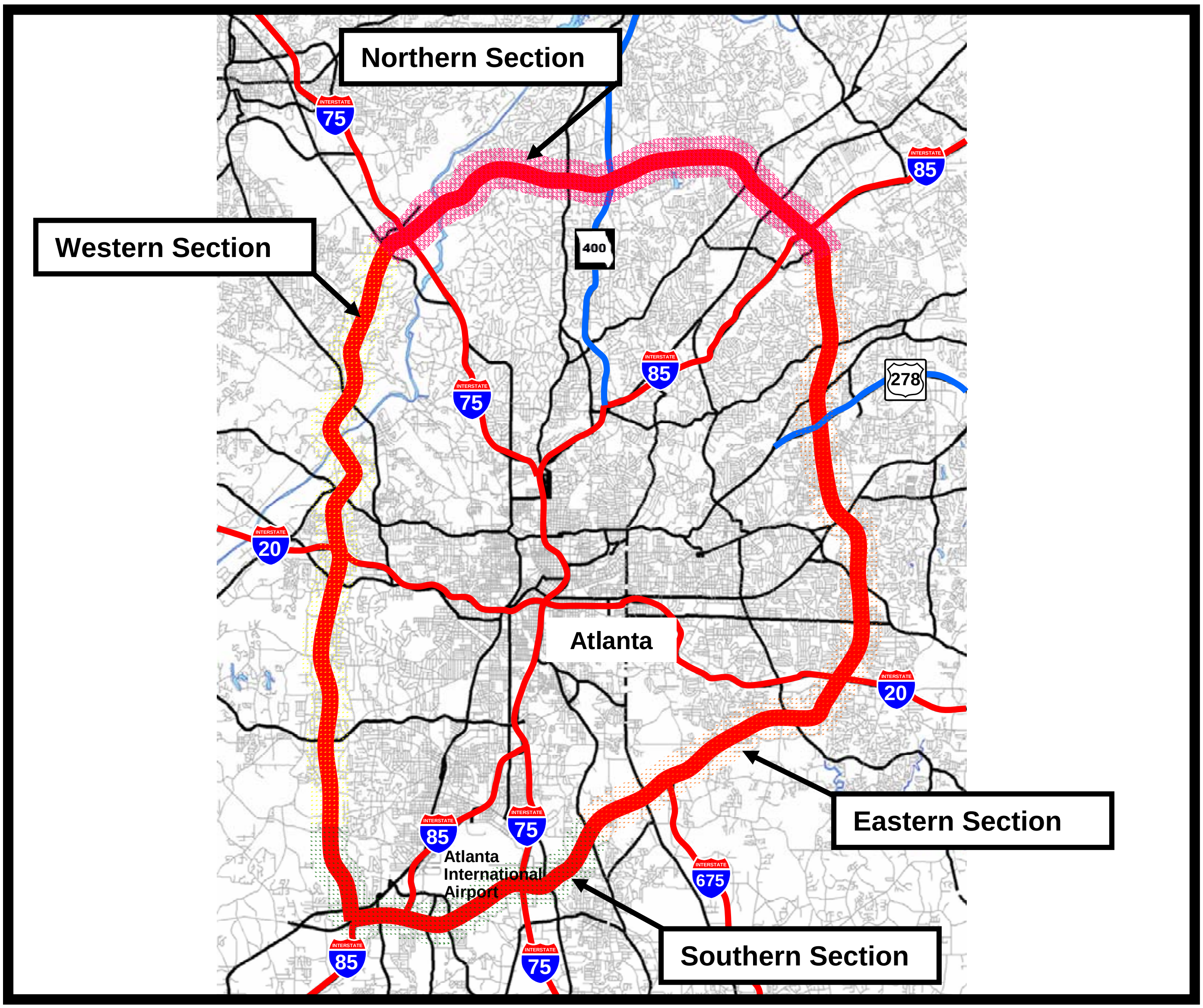
- Average peak period speeds by facility type;
- Congested vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Free flow vehicle-miles and vehicle-hours of travel in peak periods by facility type;
- Vehicle-hours of delay in peak periods by facility type;
- Delay cost by vehicle type in peak periods; and
- Percent of lane-miles operating above capacity by facility type.

The Microscopic Model measures of effectiveness (MOEs) used for the corridor level of evaluation included:

- Peak hour speeds
- Peak hour percent lost time;

- Number of intersections with queue length over 300 feet in peak hour;
- Number of freeway basic sections with a viscosity index (vehicle density) over 32.0 vehicles per lane per mile;
- Number of merge/diverge sections with a viscosity index over 35.0 vehicles per lane per mile; and
- Number of weaving sections with viscosity index over 35.0 vehicles per lane per mile.

Figure 4.0.1
I-285 Corridor Sections



From a regional perspective several key MOEs highlight the overall operation of the existing transportation system in the region. First, the mode of travel indicates the relative importance of the various components of the region's transportation system. Table 4.0.1 shows the percent of travel by major transportation market segments for all person trips and for person work trips: automobiles with single person occupancy (SOV); automobiles with multiple person occupancy (HOV), and transit. As can be seen in Table 4.0.1, automobiles account for over 97% of the existing total person trips in the region and 94% of the total person work trips.

Table 4.0.1
2005 Regional Person Trips by Mode

Mode	Total Person Trips		Work Person Trips	
	Number of Trips	Percent of Total Trips	Number of Trips	Percent of Work Trips
SOV	6,877,558	60.7%	2,061,075	81.5%
HOV	4,161,313	36.8%	315,982	12.5%
Transit	278,337	2.5%	151,999	6.0%
Total	***11,317,208***	***100.0%***	***2,529,056***	***100.0%***

Another key MOE is the estimated cost of delay for motorists traveling on the highway system in the Atlanta region. Table 4.0.2 shows the estimated daily cost of delay during the morning (6:00 AM – 10:00 AM) and afternoon (3:00 PM – 7:00 PM) peak periods. Table 4.0.2 indicates the estimated cost of delay associated with congestion in 2005 dollars by vehicle type. As can be seen in Table 4.0.2, SOVs account for the largest majority of the delay costs in both the AM and PM peak periods. The total regional daily congestion cost during the peak periods is over $1.6 million.

Table 4.0.2
2005 Regional Cost of Delay by Vehicle Type

Vehicle Type	AM Peak Period		PM Peak Period		Total	
	Vehicle Hours of Delay	Delay Costs	Vehicle Hours of Delay	Delay Costs	Vehicle Hours of Delay	Delay Costs
SOV[1]	36,631	$503,676	37,603	$517,041	74,234	$1,020,701
HOV[2]	4,462	$153,381	4,433	$152,384	8,895	$305,765
Truck[3]	2,255	$163,826	1,937	$140,723	4,192	$304,549
Total	***43,348***	***$820,883***	***43,973***	***$810,148***	***87,321***	***$1,631,031***

Notes:

1 Assumes 1 person per vehicle at $13.75 per hour
2 Assumes 2.5 persons per vehicle at $13.75 per hour per person
3 Assumes 1 person per vehicle at $72.65 per hour

Table 4.0.3 shows the percent of total travel occurring in the AM (6:00 AM – 10:00 AM) and PM (3:00 PM – 7:00 PM) peak periods. As can be seen in Table 4.0.3 over one-half (52.1%) of all trips occur in the peak periods.

Table 4.0.3
2005 Percent of Daily Trips in Peak Periods

Percent of Daily Trips in AM Peak Period (6:00 AM – 10:00 AM)	24.1%
Percent of Daily Trips in PM Peak Period (3:00 PM – 7:00 PM)	28.0%
Total	***52.1%***

Examination of the travel time of trips during the peak periods provides insight into the pervasiveness of congestion during the peak periods. Table 4.0.4 shows that over 68% of all the regional trips during both the morning and afternoon peak periods had travel times greater than the uncongested travel times during the off-peak periods, i.e., over two-thirds of all the regional trips during the peak periods are affected by congestion.

Table 4.0.4
2005 Regional Cost of Delay by Vehicle Type

Vehicle Type	AM Peak		PM Peak	
	% Trips With Travel Time Equal To Uncongested Travel Time	% Trips With Travel Time Greater Than Uncongested Travel Time	% Trips With Travel Time Equal To Uncongested Travel Time	% Trips With Travel Time Greater Than Uncongested Travel Time
SOV	32.8%	67.2%	32.3%	67.7%
HOV	28.6%	71.4%	27.4%	72.6%
Truck	23.1%	76.9%	21.0%	79.0%
Total	31.9%	68.1%	31.3%	68.7%

The detailed corridor analysis using the Mesoscopic and Microscopic components of the I-285 Strategic Implementation Plan model provided insights into the existing operations in the corridor. Table 4.0.5 shows the estimated existing (2005) vehicle hours of delay and the delay costs for the morning and afternoon peak periods. As can be seen in Table 4.0.5, the northern section of I-285 accounts for a significant portion of the delay (62%) and congestion cost (63%) in the corridor. The eastern section has the second highest delay and congestion cost, followed by the western section and the southern section.

The detailed operational examination of the freeway component of the I-285 corridor was made using the Microscopic Model (VISSIM) component of the I-285 Strategic Implementation Plan technical analysis process. The Microscopic Model (VISSIM) component was employed to determine the density in vehicles per lane per mile for three basic types of freeway sections:

- Basic sections;
- Merge/Diverge sections; and
- Weaving sections.

Table 4.0.5
2005 I-285 Corridor Delay and Delay Cost by Vehicle Type

Corridor	Vehicle Type	AM Peak Period		PM Peak Period		Total	
		Vehicle Hours of Delay	Delay Costs	Vehicle Hours of Delay	Delay Costs	Vehicle Hours of Delay	Delay Costs
Northern	SOV[1]	6,207	$85,345	7,120	$97,900	13,327	$183,245
	HOV[2]	700	$24,063	771	$26,503	1,471	$50,566
	Truck[3]	847	$61,535	485	$35,235	1,332	$96,770
	Total	***7,754***	***$170,943***	***8,374***	***$159,638***	***16,130***	***$330,581***
Eastern	SOV[1]	1,609	$22,124	1,793	$24,654	3,402	$46,778
	HOV[2]	179	$6,153	195	$6,703	374	$12,856
	Truck[3]	193	$14,021	109	$7,919	302	$21,940
	Total	***1,981***	***$42,298***	***2,097***	***$39,276***	***4,078***	***$81,574***
Southern	SOV[1]	756	$10,395	761	$10,464	1,517	$20,859
	HOV[2]	74	$2,544	62	$2,131	136	$4,675
	Truck[3]	82	$5,957	58	$4,214	140	$10,171
	Total	***912***	***$18,896***	***881***	***$16,089***	***1,793***	***$35,705***
Western	SOV[1]	1,533	$21,079	1,707	$23,471	3,240	$44,550
	HOV[2]	138	$4,744	148	$5,088	286	$9,832
	Truck[3]	155	$11,261	168	$12,205	323	$23,466
	Total	***1,826***	***$37,084***	***2,023***	***$40,764***	***3,849***	***$77,848***
Total	SOV[1]	10,105	$138,943	11,381	$156,489	21,486	$295,432
	HOV[2]	1,086	$37,504	1,176	$40,425	2,262	$77,929
	Truck[3]	1,277	$92,774	820	$59,573	2,097	$152,347
	Total	***12,468***	***$269,221***	***13,377***	***$256,487***	***25,845***	***$525,708***

Notes:
[1] Assumes 1 person per vehicle at $13.75 per hour
[2] Assumes 2.5 persons per vehicle at $13.75 per hour per person
[3] Assumes 1 person per vehicle at $72.65 per hour

Basic sections are those portions of the freeway that are not influenced by traffic merging or diverging at entrance and exit ramps. Merge sections are the portion of freeway associated with traffic entering the freeway at an entrance ramp. Merge sections are 1,500 feet in length following the gore of the entrance ramp. Diverge sections are the portion of freeway associated with traffic exiting the freeway at an exit ramp. Diverge sections are 1,500 feet in length preceding the gore of the exit ramp. Weaving sections are portions of the freeway between entrance and exit ramps that are within 3,000 feet of each other. Weaving sections are characterized by conflicts between vehicles entering the freeway and vehicles exiting the freeway.

Table 4.0.6 shows the number of 2005 basic freeway sections that have a density over 35 vehicles per lane per mile which would be a viscosity index of 4, i.e., heavily congested. Figure 4.0.2 shows the criteria for the viscosity index which ranges between 1 and 5 with 1 being no congestion and 5 being severe congestion. As can be seen in Table 4.0.6, over 16 percent of the I-285 basic sections have a viscosity index of 4 or greater in the AM peak hour and 12 percent in the PM peak hour. The northern section has over 30 percent of its basic sections with a viscosity index of 4 or greater during the AM peak hour and over 23 percent during the PM peak hour. The southern section can be characterized by being the least congested section of I-285.

Table 4.0.6
I-285 Basic Freeway Sections with 2005 Density over 35 Vehicles per Lane per Mile

I-285 Section	Total Number of Sections	AM Peak Hour		PM Peak Hour	
		Number Of Sections	Percent Of Total Sections	Number Of Sections	Percent Of Total Sections
North	78	24	30.8%	18	23.1%
East	46	1	2.2%	6	13.0%
South	47	3	6.4%	0	0.0%
West	38	6	15.8%	1	2.6%
Total	***209***	***34***	***16.3%***	***25***	***12.0%***

Figure 4.0.2
I-285 Strategic Implementation Plan Freeway Viscosity Index

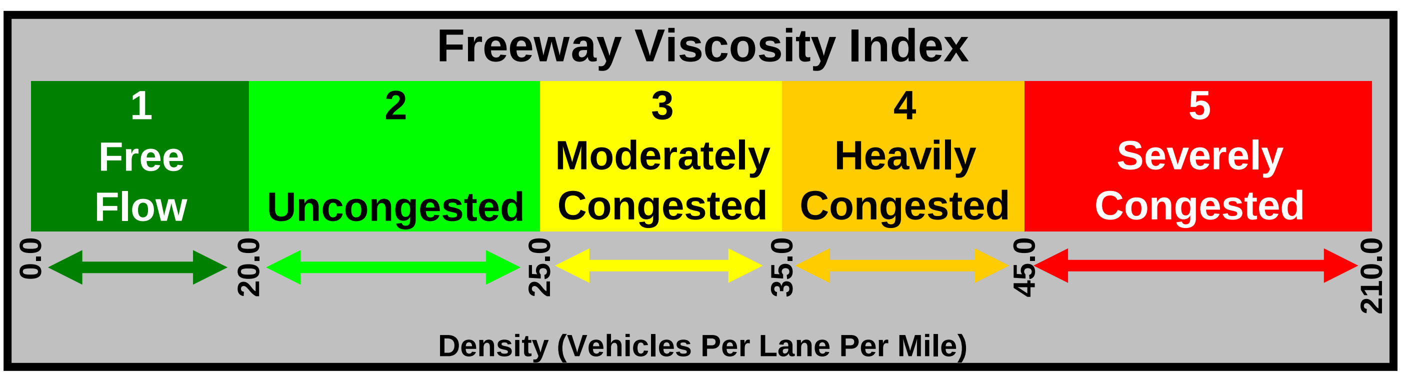


Table 4.0.7 shows the number of 2005 merge/diverge sections that have a density over 35 vehicles per lane per mile which would be a viscosity index of 4, i.e., heavily congested. As can be seen in

Table 4.0.7, over 16 percent of the I-285 merge/diverge sections have a viscosity index of 4 or greater in the AM peak hour and 15 percent in the PM peak hour. The northern section has over 24 percent of its merge/diverge sections with a viscosity index of 4 or greater during the AM peak hour and over 33 percent during the PM peak hour. As with the basic freeway section, the southern section can be characterized by being the least congested section of I-285.

Table 4.0.7
I-285 Merge/Diverge Sections with 2005 Density over 35 Vehicles per Lane per Mile

I-285 Section	Total Number of Sections	AM Peak Hour		PM Peak Hour	
		Number Of Sections	Percent Of Total Sections	Number Of Sections	Percent Of Total Sections
North	62	15	24.2%	21	33.9%
East	52	8	15.4%	9	17.3%
South	47	3	6.4%	0	0.0%
West	36	6	16.7%	0	0.0%
Total	***197***	***32***	***16.2%***	***30***	***15.2%***

Table 4.0.8 shows the number of weaving sections that have a density over 35 vehicles per lane per mile which would be a viscosity index of 4, heavily congested. As can be seen in Table 4.0.8, over 22 percent of the I-285 weaving sections have a viscosity index of 4 or greater in the AM peak hour and over 8 percent in the PM peak hour. The northern section has over 27 percent of its weaving sections with a viscosity index of 4 or greater during the AM peak hour and over 22 percent during the PM peak hour. None of the western section weaving sections has a viscosity index of 4 or greater in either the AM or PM peak hours.

Table 4.0.8
I-285 Weaving Sections with 2005 Density over 35 Vehicles per Lane per Mile

I-285 Section	Total Number of Sections	AM Peak Hour		PM Peak Hour	
		Number Of Sections	Percent Of Total Sections	Number Of Sections	Percent Of Total Sections
North	18	5	27.8%	4	22.2%
East	7	1	14.3%	1	14.3%
South	58	13	22.4%	2	3.4%
West	2	0	0.0%	0	0.0%
Total	***85***	***19***	***22.4%***	***7***	***8.2%***

Figures 4.0.3 through 4.0.6 graphically depict the viscosity index for the individual sections in the I-285 corridor. This information is presented for each direction (inner loop – clockwise and outer loop – counter clockwise). The radial freeways are also depicted in both the inbound and outbound directions. These figures summarize the data shown in Tables 4.0.6, 4.0.7, and 4.0.8.

Figure 4.0.3
I-285 Strategic Implementation Plan 2005 Freeway Viscosity Index
AM Peak Hour Inner Loop (Clockwise Direction) Radial Freeways Inbound

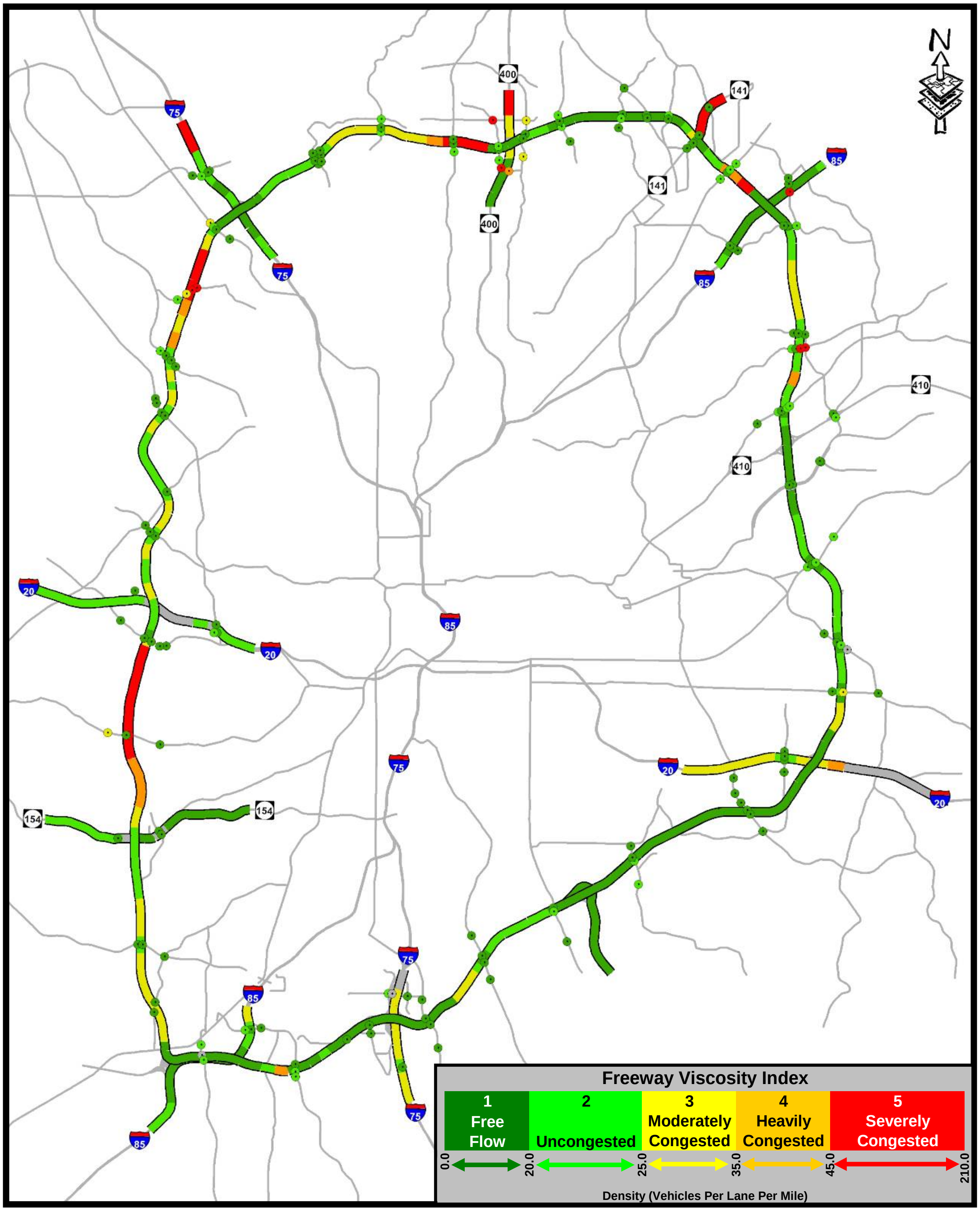


Figure 4.0.4
I-285 Strategic Implementation Plan 2005 Freeway Viscosity Index
AM Peak Hour Outer Loop (Counter Clockwise Direction) Radial Freeways Outbound

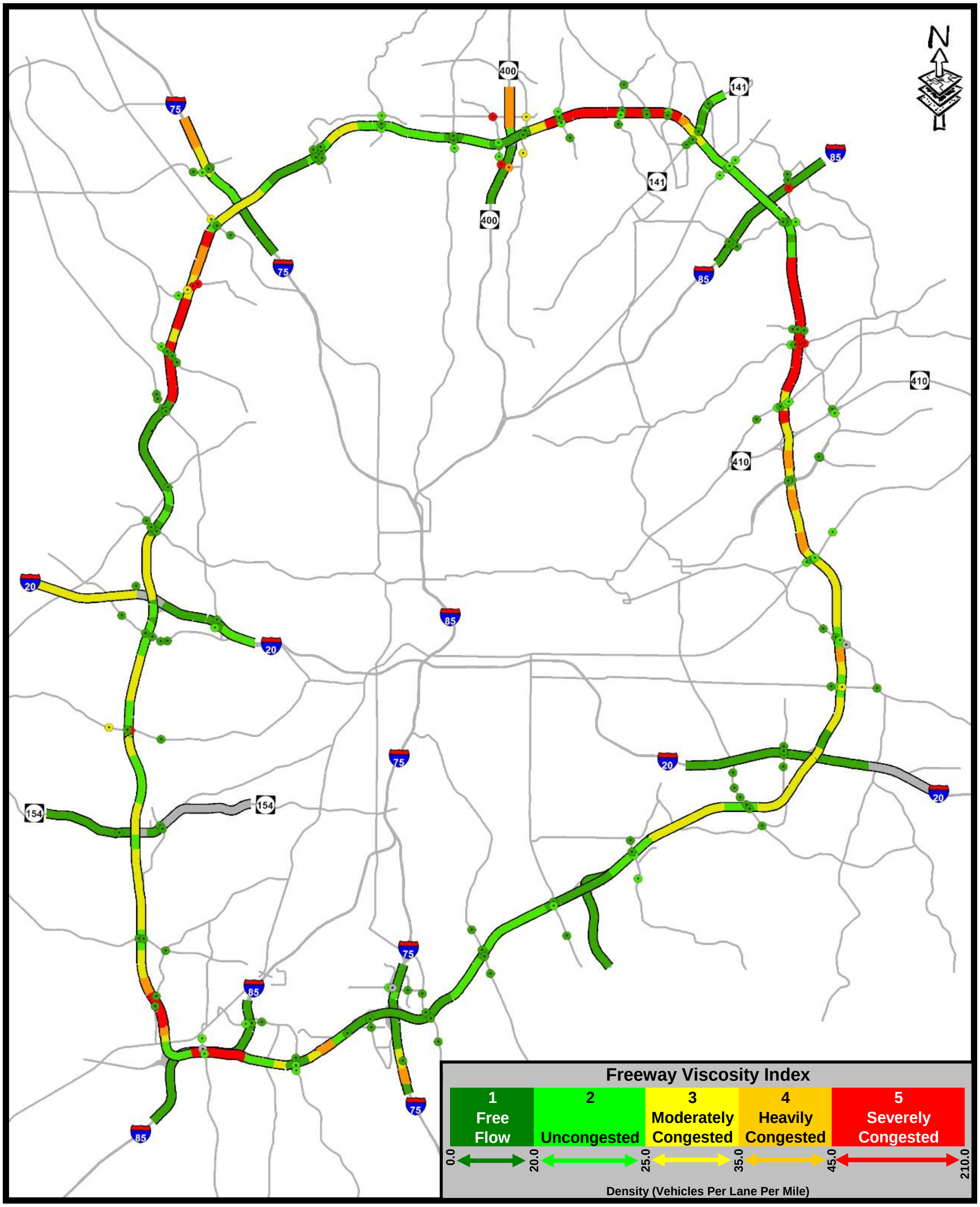


Figure 4.0.5
I-285 Strategic Implementation Plan 2005 Freeway Viscosity Index
PM Peak Hour Inner Loop (Clockwise Direction) Radial Freeways Inbound

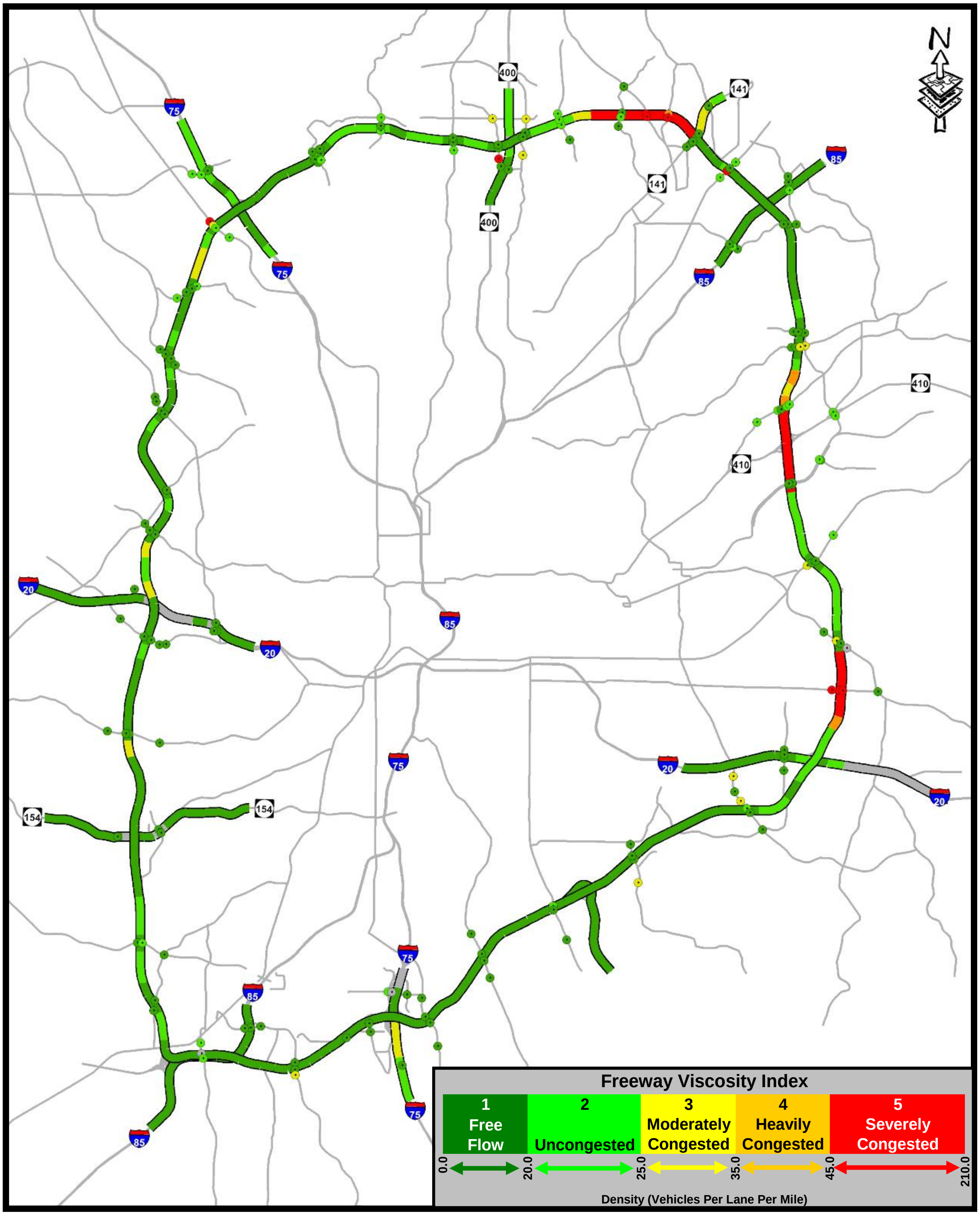
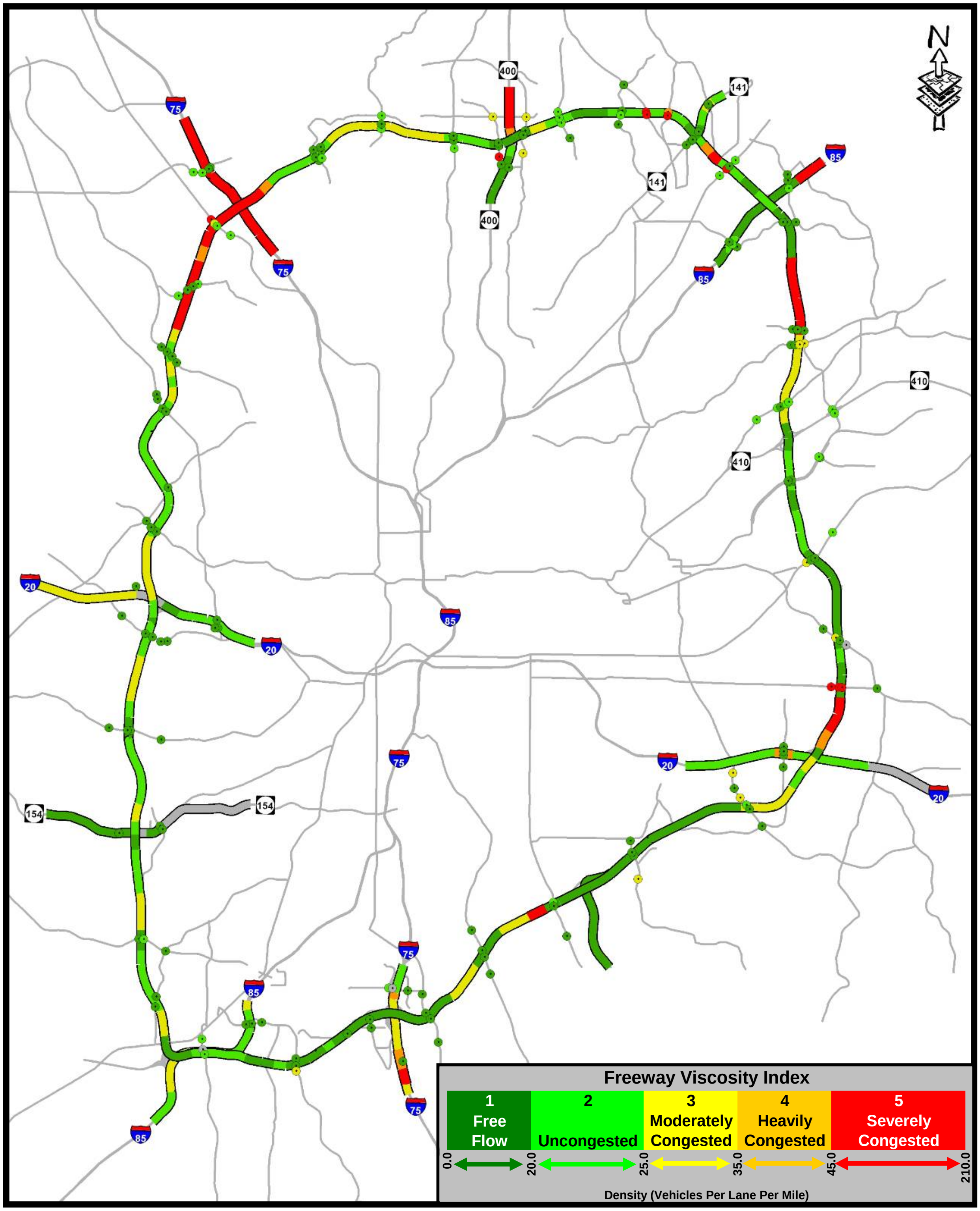


Figure 4.0.6
I-285 Strategic Implementation Plan 2005 Freeway Viscosity Index
PM Peak Hour Outer Loop (Counter Clockwise Direction) Radial Freeways Outbound



5.0 Initial Alternates Considered

The development and evaluation of scenarios for the I-285 Strategic Implementation Plan was conducted using a sequel series of alternate improvement concepts. The initial set of improvement scenarios was developed to test a broad range of improvement concepts. Scenarios 1 through 7 represented these initial improvement options. The alternate development process was based upon the following factors:

- Existing system evaluation;
- Evaluation of the 2030 Regional Transportation Plan (RTP);
- Development of a range of alternates so that the impacts of various strategies could be objectively evaluated; and
- Review of other existing plans and programs such as Public Private Initiatives (PPIs).

Based upon these factors, seven initial alternates were identified for evaluation. The improvement concepts evaluated using these seven scenarios included:

- HOV Managed Lanes,
- Truck Managed Lanes, and
- Additional General Purpose (GP) Lanes.

The evaluation of these initial seven scenarios was based upon a regional and corridor level of analysis. Detailed operational analysis was not undertaken for these initial seven scenarios. The detailed evaluation measures used in the evaluation are shown in Appendix A. The overall result of the testing and evaluation of this initial set of seven improvement strategies indicated that there was not a single improvement strategy that would provide the overall best option for improving the operations on I-285. Rather, a combination of improvement options unified into an overall strategy would be required. This evaluation also provided insights as to the improvement options that would be best suited for each of the major segments of I-285 (north, east, south, and west). Figures 5.0.1 through 5.0.7 illustrate these first seven alternates.

The evaluation measures used for the regional and corridor level of analysis were:

- Speeds,
- Delay costs,
- Percent of lane-miles of roadway greater than capacity,
- Percent of trips that have a travel time equal to the uncongested travel time, and
- Air quality.

Figure 5.0.1
Scenario 1 General Concept

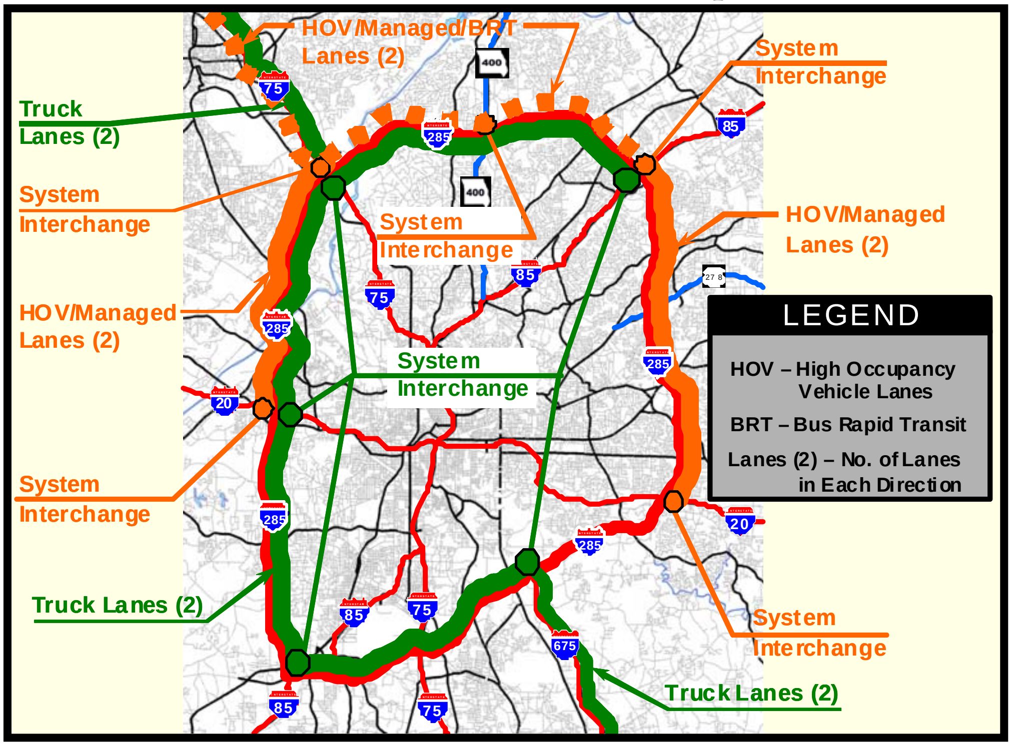


Figure 5.0.2
Scenario 2 General Concept

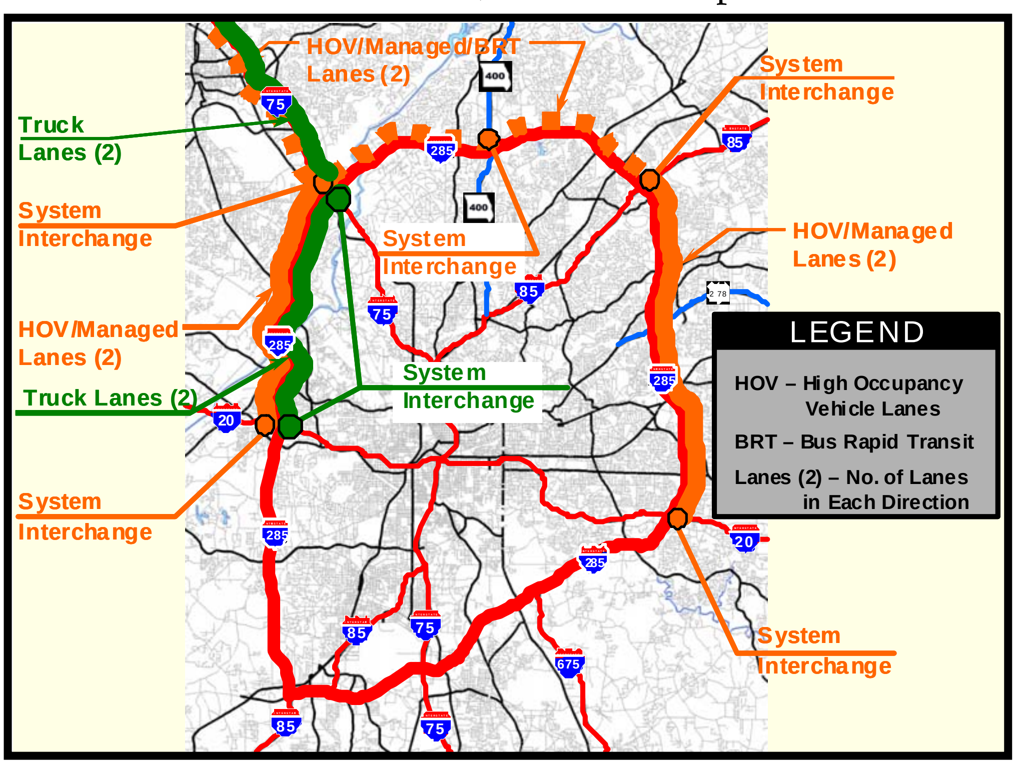


Figure 5.0.3
Scenario 3 General Concept

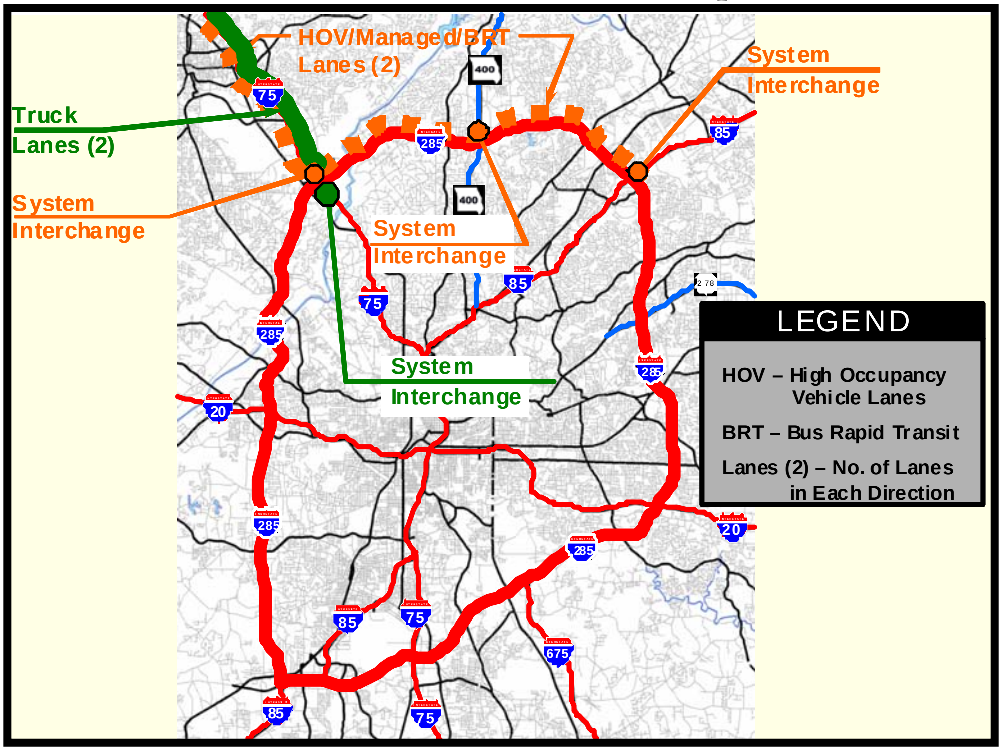


Figure 5.0.4
Scenario 4 General Concept

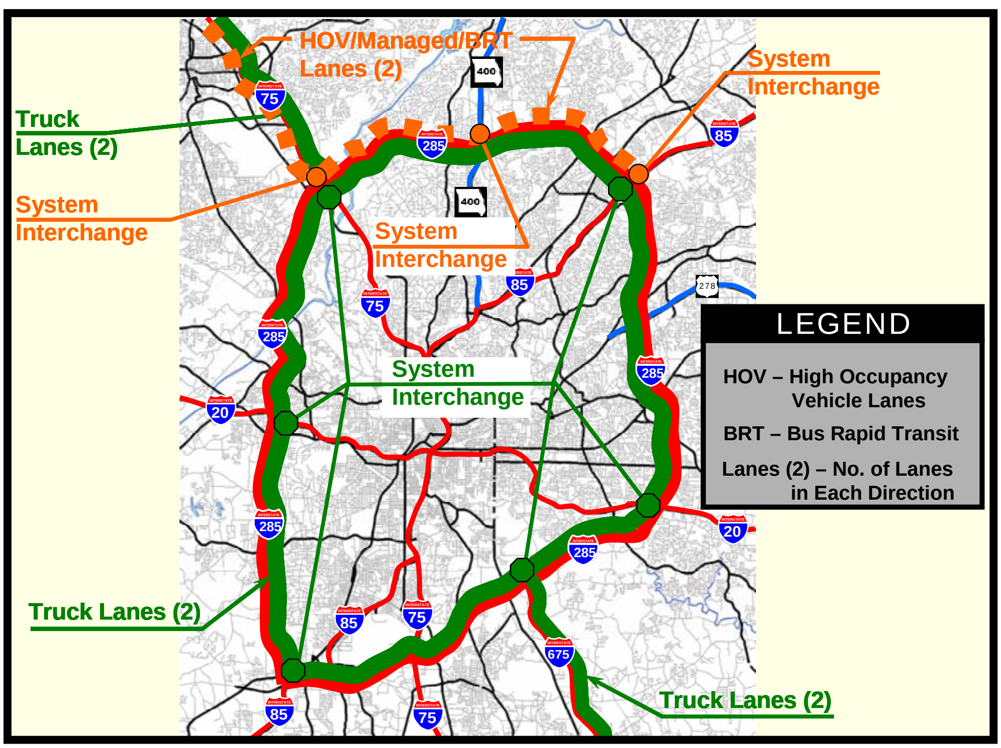


Figure 5.0.5
Scenario 5 General Concept

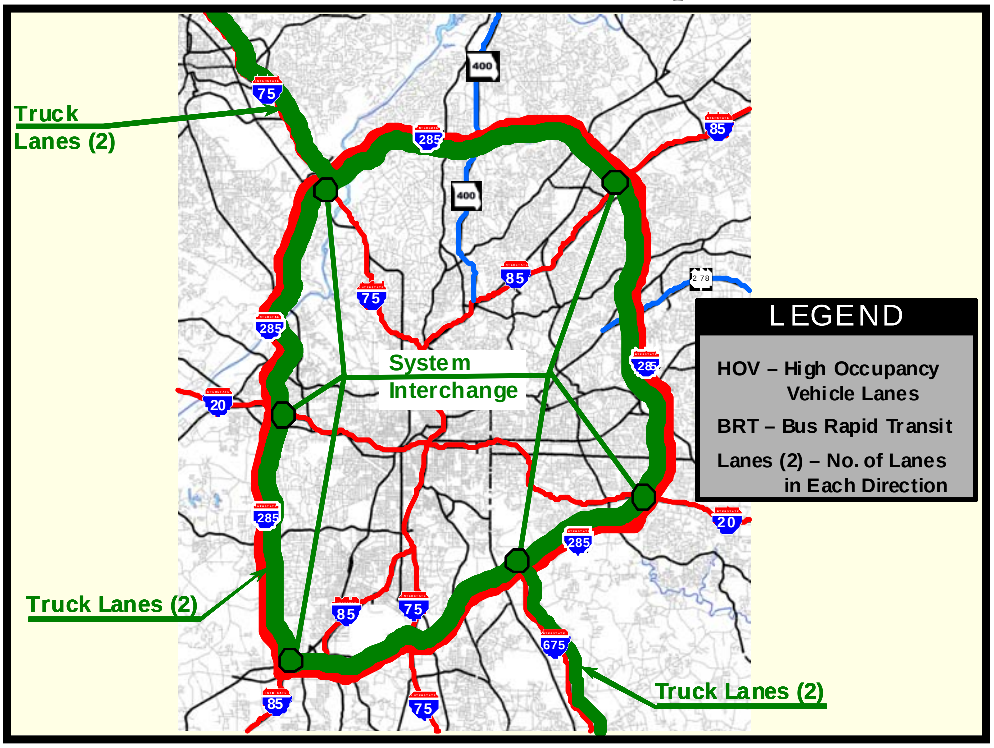


Figure 5.0.6
Scenario 6 General Concept

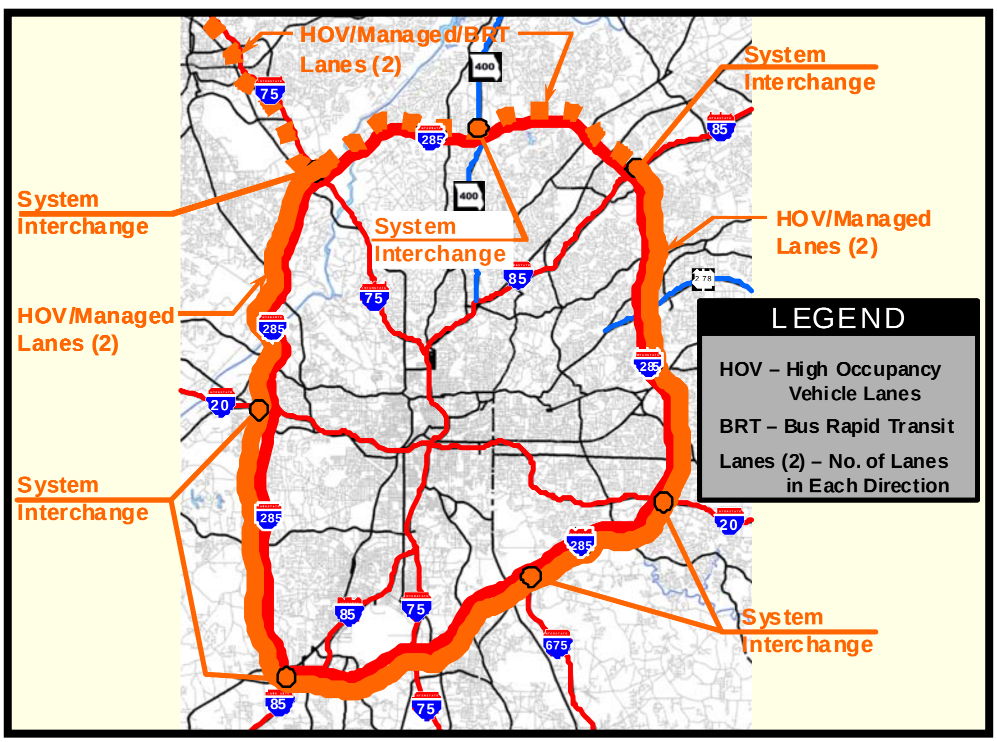
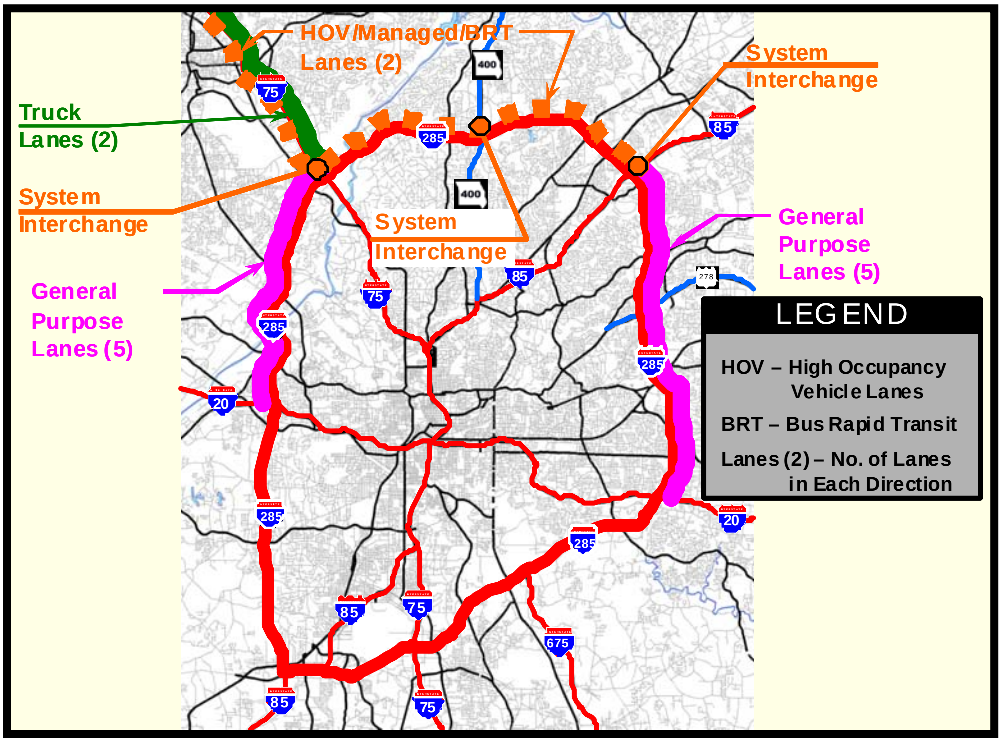


Figure 5.0.7
Scenario 7 General Concept



The individual scenarios were compared with each other based upon which scenario performed the best for each of the individual evaluation measures for the regional and corridor levels. The scenario that was identified as best for an individual evaluation measure was given a score of 1. All other scenarios were given a score of 0 for that particular evaluation measure. If two (or more) scenarios were judged as equal, then each of the scenarios identified as best was given a score of 1 with the other scenarios being given a score of 0 for that particular evaluation measure. Table 5.0.1 shows the result of the evaluation of the initial seven scenarios. There were a total of 303 regional and corridor evaluation measures. Based upon these evaluation measures, Scenario 7 was identified as the best of the initial seven scenarios with a rating of 68. The detail evaluation of these scenarios is presented in the ***I-285 Strategic Implementation Plan Scenario Evaluation Technical Memorandum***, April, 2008.

Table 5.0.1
Initial Seven Scenario Evaluation

Category	Section	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Regional Speeds	Region	2	0	0	1	1	2	6
	Northern	1	2	0	0	2	0	5
	Eastern	2	0	0	0	0	1	7
	Southern	4	1	1	3	1	0	6
	Western	2	3	0	0	1	0	6
	Subtotal	***11***	***6***	***1***	***4***	***5***	***3***	***30***
Delay Costs	Region	0	0	0	1	1	0	6
	Northern	3	0	0	2	0	0	3
	Eastern	0	0	0	1	1	2	4
	Southern	3	0	0	1	0	1	3
	Western	6	0	0	0	0	1	2
	Subtotal	***12***	***0***	***0***	***5***	***2***	***4***	***18***
% Lane-Miles Greater Than Capacity	Region	2	2	2	2	2	2	6
	Northern	2	2	1	0	2	1	3
	Eastern	1	1	1	2	2	1	1
	Southern	3	0	0	1	2	3	0
	Western	3	1	1	3	4	0	1
	Subtotal	***11***	***6***	***5***	***8***	***12***	***7***	***11***
% Trips With Trip Time Equal to Free Flow Travel Time	Region	0	0	0	0	0	0	8
Air Quality	Region	0	0	0	0	0	0	1
Grand Total		***34***	***12***	***6***	***17***	***19***	***14***	***68***
Regional Total		***4***	***2***	***2***	***4***	***4***	***4***	***27***

Scenario identified as best for the evaluation measure

6.0 Alternate Refinement

Using the insights gained in the testing and evaluation of Scenarios 1 through 7, a second series of scenarios was investigated (Scenarios 8, 9R, 10, 11 and 12). This second series of scenarios also included the evaluation of improvement concepts that incorporated high occupancy toll (HOT) and truck only toll (TOT) managed lane concepts. Initially, Scenario 9 was developed consisting of two tolled managed lanes (HOV vehicles with 2 or more persons plus SOV vehicles paying a toll) on the northern section of I-285 (I-75 north to I-85 north). The preliminary analysis indicated that the two tolled managed lanes in each direction did not provide sufficient capacity to provide adequate additional capacity for both HOV vehicles (vehicles with 2 or more persons) and SOV tolled vehicles. To address this issue Scenario 9R provided for 3 tolled managed lanes in each direction on the northern section of I-285 (I-75 north to I-85 north). Scenario 9R was used in all subsequent scenario testing and evaluation. Scenario 7 was also included in this second series of scenario testing and evaluation since it was identified as the "best" scenario in the initial round of scenario evaluation. This second round of scenario testing and evaluation also incorporated a detailed analysis of the operational characteristics of these scenarios using the operational traffic simulation models to account for the actual traffic operations during morning and afternoon peak hour periods. Operational analysis was not performed on Scenario 12 because the regional and corridor evaluation of Scenario 12 indicated that its performance was lower than the other scenarios.

The second round of scenario testing and evaluation resulted in the investigation of six improvement concepts. These concepts were combinations of managed lanes (with and without tolls) for various sections of I-285. Scenarios 11 and 12 included the concept of mandatory truck use of managed (toll) lanes. These scenarios are illustrated in Figures 6.0.1 through 6.0.5. It is important to note that the tolls on the managed lanes, where tolls were included, were set to ensure that the managed lanes operated at a Level of Service C or better.

Estimated construction and rights-of-way costs were developed for Scenarios 7, 8, 9R, 10, and 11. These estimated costs were planning level cost estimates based upon 2007 construction and rights-of-way costs.

The analysis and evaluation of the six scenarios provided the following insights:

- No improvement scenario provided complete relief of the future (2030) congestion in the general purpose (GP) lanes on I-285 during the AM and PM peak periods for the northern, eastern, and western sections, i.e., there will continue to be significant congestion on I-285 during the AM and PM peak periods;
- Scenario 7 with the addition of general purpose lanes on the eastern and western sections was the only scenario with a positive benefit-to-cost ratio greater than 1.0. The managed lanes were assumed to be barrier separated with separate interchanges from the current GP lane

interchanges. (Benefits were based upon user time cost savings and costs were estimated construction and right-of-way costs);

- Scenario 11 has the highest rating when all the evaluation factors are considered in an un-weighted analysis. Since there are more regional evaluation factors than there are operational evaluation factors (almost twice as many) this places a significant bias in the overall scenario evaluation toward the regional factors;
- When the regional and operational evaluation measures are equally weighted Scenarios 7 and 11 rank equally best with Scenario 8 being second best by a small margin; and
- Scenario 12 did not perform as well as Scenario 11 and subsequent detailed operational analysis for Scenario 12 was not undertaken.

Table 6.0.1 shows the results of the regional and corridor levels of evaluation for Scenarios 7, 8, 9R, 10, 11 and 12. As can be seen in Table 6.0.1, Scenario 12 did not perform as well as the other scenarios and therefore detailed operational analysis for this scenario was not undertaken. Based upon this regional and corridor analysis Scenario 11 performed the "best". Table 6.0.2 shows the results of the regional and corridor level of evaluation for Scenarios 7, 8, 9R, 10, and 11 with Scenario 12 removed from consideration. The evaluations used in Table 6.0.2 were used in subsequent evaluations.

Detailed operational analysis and evaluation was carried out for Scenarios 7, 8, 9R, 10, and 11 using the microsimulation component of the I-285 Strategic Implementation Plan model. This evaluation included a number of measures:

- Speeds,
- Lane densities,
- Lost time (delay),
- Intersection queue length and approach delay, and
- Viscosity Index (surrogate for Level of Service).

Table 6.0.3 shows the results of this operational evaluation. As can be seen in Table 6.0.3, Scenario 8 was identified as the "best" with Scenario 7 being the second best. Table 6.0.3 shows the combined regional, corridor, and operational evaluation of Scenarios 7, 6, 9R, 10, and 11. As can be seen in Table 6.0.4, Scenario 11 was identified as the "best" and Scenario 7 was second best when all evaluation measures (regional, corridor, and operational) are taken into consideration.

The previous analyses and evaluations considered equal weighting for all factors. However, in reviewing the evaluation measures it is evident that more weight was being given to the regional and corridor evaluation measures than the operational measures. Table 6.0.5 illustrates this phenomenon with 303 of the total 455 evaluation measures being regional and corridor versus only 152 measures being operational measures. Since the operational aspects were considered to equally as important as the regional and corridor aspects of any proposed improvement plan for I-285, the evaluation measures were adjusted to provide for equal weighting of both sets of evaluation measures. Table 6.0.6 shows the results of this weighting with both Scenario 7 and Scenario 11 being identified as the "best".

The detail evaluation of these final five scenarios is presented in the ***I-285 Strategic Implementation Plan Scenario Evaluation Technical Memorandum***, April, 2008.

Figure 6.0.1
Scenario 8 General Concept

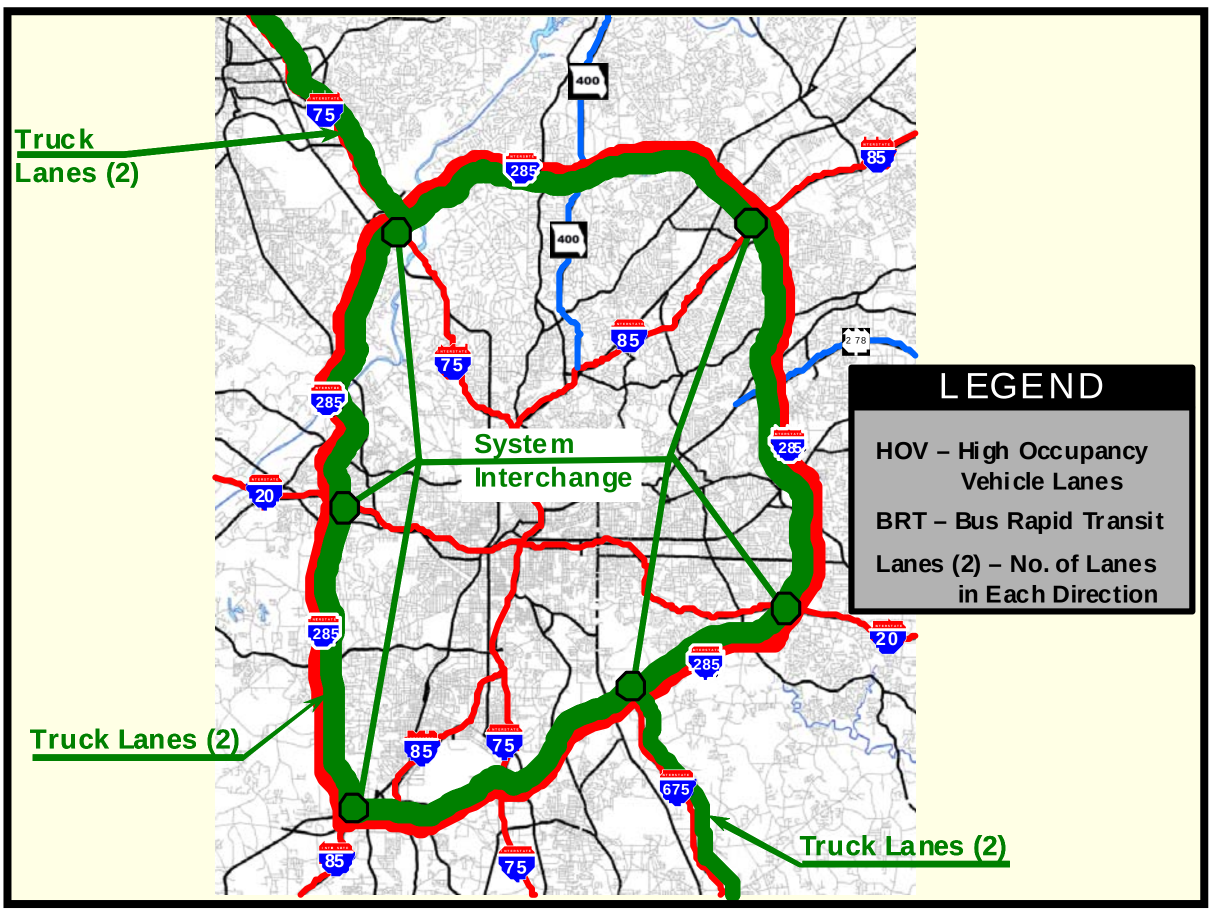


Figure 6.0.2
Scenario 9R General Concept

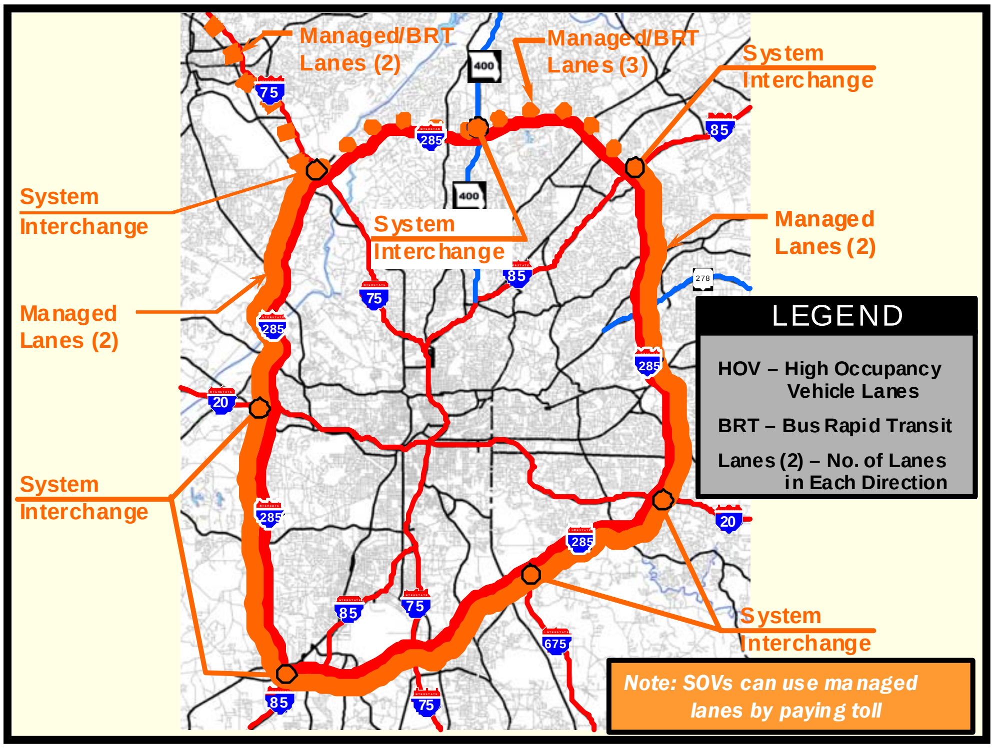


Figure 6.0.3
Scenario 10 General Concept

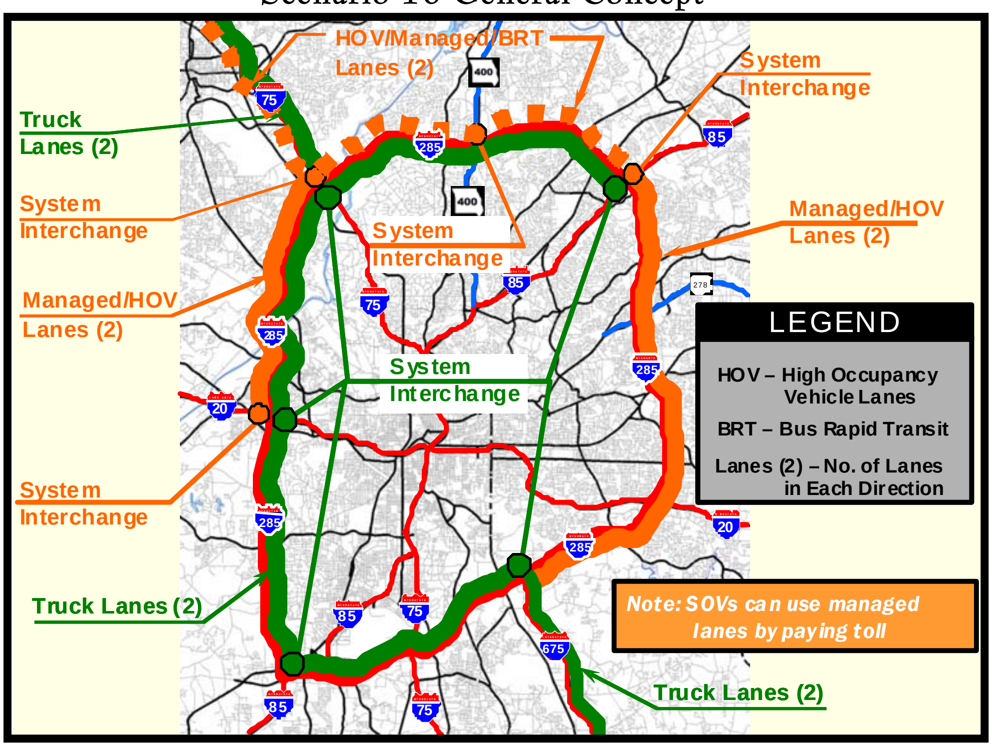


Figure 6.0.4
Scenario 11 General Concept

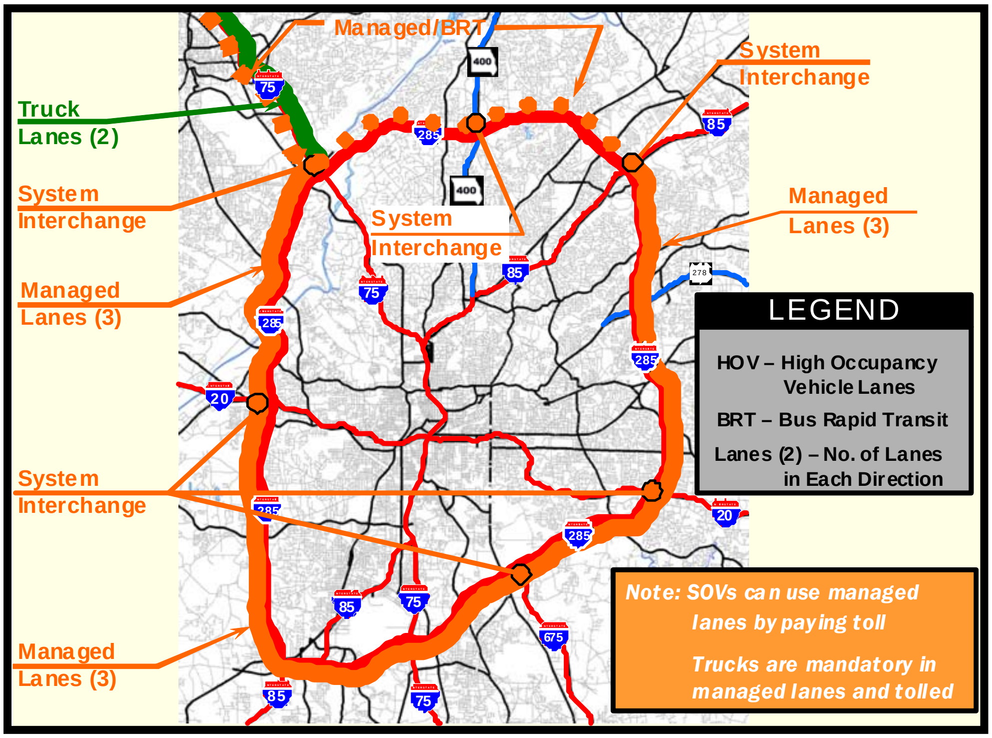


Figure 6.0.5
Scenario 12 General Concept

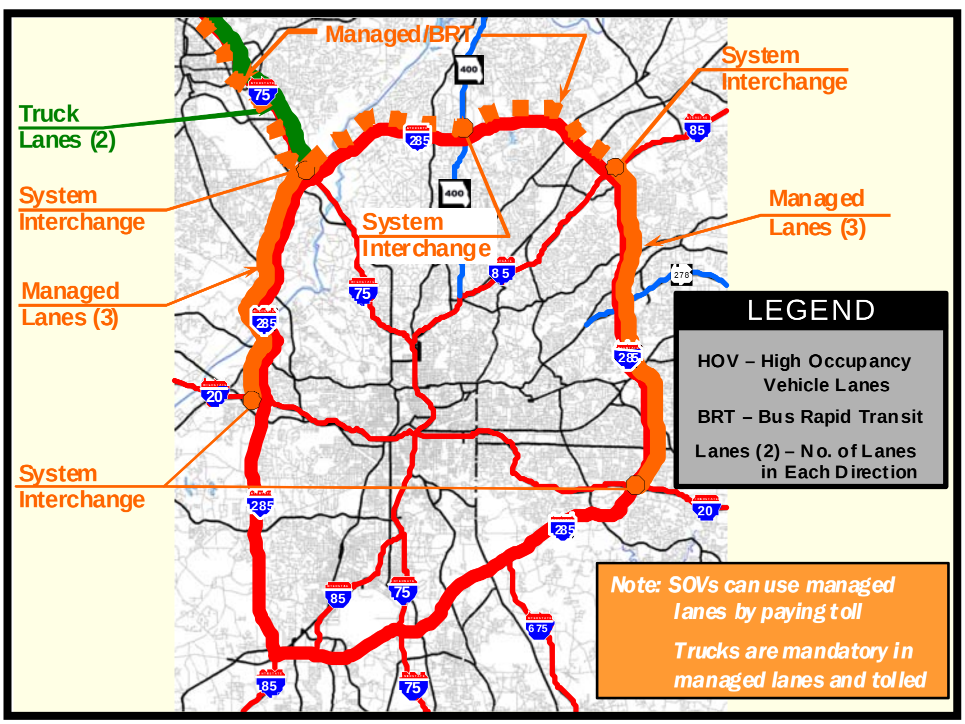


Table 6.0.1
Scenarios 7 -12 Regional and Corridor Evaluation

Category	Section	Scenario 7	Scenario 8	Scenario 9R	Scenario 10	Scenario 11	Scenario 12
Regional Speeds	Region	4	4	0	1	1	0
	Northern	2	1	0	1	2	4
	Eastern	1	1	0	1	6	1
	Southern	2	0	2	1	4	1
	Western	2	3	0	0	4	1
	Subtotal	***11***	***9***	***2***	***4***	***17***	***7***
Delay Costs	Region	4	2	0	0	2	0
	Northern	0	2	0	0	6	0
	Eastern	0	2	0	0	6	0
	Southern	0	2	0	0	6	0
	Western	0	2	1	0	5	0
	Subtotal	***4***	***10***	***1***	***0***	***25***	***0***
% Lane-Miles Greater Than Capacity	Region	5	0	5	4	4	0
	Northern	0	0	0	2	2	0
	Eastern	0	0	0	2	2	4
	Southern	0	0	0	3	3	2
	Western	2	0	2	1	1	2
	Subtotal	***7***	***0***	***7***	***12***	***12***	***8***
Delay	Region	8	1	1	2	3	0
	Northern	1	2	0	4	5	0
	Eastern	2	2	0	1	7	1
	Southern	1	1	3	1	6	0
	Western	2	1	0	1	8	1
	Subtotal	***14***	***7***	***4***	***9***	***29***	***2***
% Trips With Trip Time Equal to Free Flow Travel Time	Region	5	0	5	0	0	0
Air Quality	Region	2	0	0	0	0	0
Vehilce Hours of Delay Per 1,000 Vehicle Miles of Travel	Region	6	0	6	3	0	0
	Northern	2	0	2	0	0	0
	Eastern	1	0	2	2	0	2
	Southern	1	0	3	1	2	0
	Western	4	0	4	3	0	1
	Subtotal	***14***	***0***	***17***	***9***	***2***	***3***
Benefit-to-Cost Ratio	***Region***	1	***0***	***0***	***0***	***0***	***0***
Grand Total		**58**	***26***	***36***	***34***	**85**	***20***
Regional Total		**35**	***7***	***17***	***10***	***10***	***0***

[red box] Scenario identified as best for the evaluation measure

Table 6.0.2
Scenarios 7 -11 Regional and Corridor Evaluation

Category	Section	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11
Regional Speeds	Region	4	4	0	1	1
	Northern	4	1	0	1	4
	Eastern	2	1	0	1	6
	Southern	2	1	2	1	4
	Western	2	3	0	0	5
	Subtotal	***14***	***10***	***2***	***4***	***20***
Delay Costs	Region	4	2	0	0	2
	Northern	0	2	0	0	6
	Eastern	0	2	0	0	6
	Southern	0	2	0	0	6
	Western	0	2	1	0	5
	Subtotal	***4***	***10***	***1***	***0***	***25***
% Lane-Miles Greater Than Capacity	Region	5	0	5	4	4
	Northern	0	0	0	2	2
	Eastern	0	0	0	2	2
	Southern	0	0	0	3	3
	Western	2	0	2	1	1
	Subtotal	***7***	***0***	***7***	***12***	***12***
Delay	Region	8	1	1	2	3
	Northern	1	2	0	4	5
	Eastern	2	2	0	1	7
	Southern	1	1	3	1	6
	Western	2	1	0	1	8
	Subtotal	***14***	***7***	***4***	***9***	***29***
% Trips With Trip Time Equal to Free Flow Travel Time	Region	5	0	0	0	3
Air Quality	Region	2	0	0	0	0
Vehilce Hours of Delay Per 1,000 Vehicle Miles of Travel	Region	6	3	0	2	1
	Northern	2	0	0	2	8
	Eastern	2	2	0	0	8
	Southern	3	1	2	2	4
	Western	4	3	0	1	4
	Subtotal	***17***	***9***	***2***	***7***	***25***
Benefit-to-Cost Ratio	Region	1	*0*	*0*	*0*	*0*
Corridor Total		***29***	***26***	***10***	***23***	***100***
Regional Total		***35***	***10***	***6***	***9***	***14***
Grand Total		***64***	***36***	***16***	***32***	***114***

[red box] Scenario identified as best for the evaluation measure

Table 6.0.3
Scenarios 7 -11 Operational Evaluation

Category	Section	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11
Speeds	Northern	6	6	3	**7**	2
	Eastern	2	**5**	3	1	2
	Southern	**3**	**3**	0	**3**	**3**
	Western	2	**7**	3	1	4
	Subtotal	***13***	**21**	***9***	***12***	***11***
Densities	Northern	**3**	1	0	**3**	1
	Eastern	0	**5**	2	1	1
	Southern	1	2	**3**	2	1
	Western	1	***4***	3	1	1
	Subtotal	***5***	***12***	***8***	***7***	***4***
Lost Time	Northern	**6**	2	0	5	1
	Eastern	0	**6**	3	0	1
	Southern	**5**	**5**	2	2	1
	Western	2	**7**	3	2	4
	Subtotal	***13***	**20**	***8***	***9***	***7***
Queue Length & Approach Delay	Northern	**4**	2	0	0	0
	Eastern	**3**	0	1	0	0
	Southern	**4**	0	0	0	0
	Western	0	1	0	0	**3**
	Subtotal	**11**	***3***	***1***	***0***	***3***
Viscosity Index	Northern	**3**	0	0	0	0
	Eastern	0	**4**	1	0	0
	Southern	**2**	0	1	0	0
	Western	**3**	**3**	1	0	0
	Subtotal	***8***	**7**	***3***	***0***	***0***
Operational Evaluation Total		***50***	***63***	***29***	***28***	***25***

[Red] Scenario identified as best for the evaluation measure

Table 6.0.4
Scenarios 7 -11 Overall Regional, Corridor, and Operational Evaluation

Category	Area	Scenario 7	Scenario 8	Scenario 9R	Scenario 10	Scenario 11
Regional Analysis	Regional	**35**	10	6	9	14
	Sections	29	26	10	23	**100**
	Subtotal	64	36	16	32	**114**
Operational Analysis	Sections	50	**63**	29	28	25
Grand Total		***114***	***99***	***45***	***60***	***139***

Scenario identified as best for the evaluation measure (red)

Table 6.0.5
Number of Regional, Corridor, and Operational Evaluation Measures

Category	Area	Maximum Score
Regional Analysis	**Regional**	63
	Sections	240
	Subtotal	***303***
Operational Analysis	**Sections**	***152***
Grand Total		***455***

Table 6.0.6

Scenarios 7 -11 Weighted Overall Regional, Corridor, and Operational Evaluation

Category	Area	Scenario 7	Scenario 8	Scenario 9R	Scenario 10	Scenario 11
Regional Analysis	Regional	**35**	10	6	9	14
	Sections	29	26	10	23	**100**
	Subtotal	64	36	16	32	**114**
Operational Analysis	Sections	100	**126**	58	56	50
Grand Total		***164***	***162***	***74***	***88***	***164***

Scenario identified as best for the evaluation measure

7.0 Other Considerations

In development of the I-285 Strategic Implementation Plan it is important to incorporate a number of factors that are not explicitly taken into account through the technical analysis and evaluation process previously described. Two primary factors needed to be incorporated into the overall process.

First, in the development of a managed lane system for the Atlanta metropolitan area, of which I-285 would be a major component, several key factors must be considered:

- The managed lane system cannot be composed of isolated segments, i.e., there must be an overall managed lane system throughout the region's transportation network in order to ensure viability and utility;
- The managed lane system must connect major regional origins and destinations, i.e., because of I-285's unique service characteristics it is major component of the region's transportation system linking major activity centers;
- The improvement plan for I-285 must provide for flexibility as conditions change over the planning horizon and beyond; and
- As part of the regional system to improve regional mobility, I-285 must be a part of the system of improvements that has a goal of providing a high level of travel time certainty for the region's trip makers.

Second, the implementation of any major transportation system improvements on I-285 must consider the funding resources available, including:

- Current funding constraints would not permit massive system improvements; and
- Tolls associated with managed lanes can provide a potential source of revenue to assist in making system improvements.

These considerations together with the technical analysis and evaluation previously described were combined to develop the overall I-285 Strategic Implementation Plan.

8.0 Recommended I-285 Strategic Implementation Plan

The recommended I-285 Strategic Implementation Plan has Scenario 11 as its basic framework. The basic plan has the following major components:

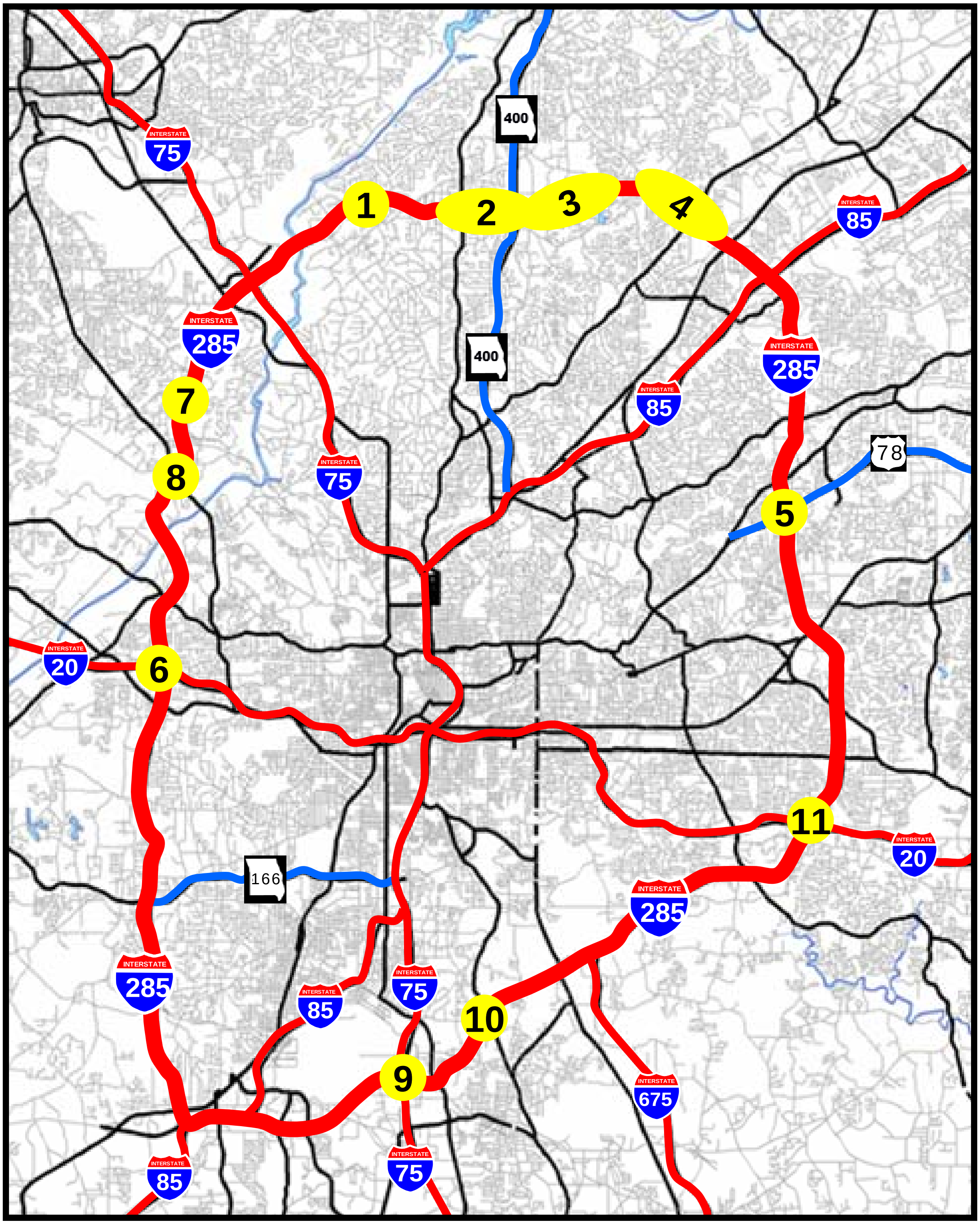
- Three managed lanes in each direction along all sections of I-285;
- The manages lanes would serve HOV, bus transit/BRT, SOV (tolled), and trucks (tolled); and
- The I-285 managed lane system would be connected to the managed lane systems on I-75, I-85, and I-20 with system-to-system interchanges.

In addition to this overall system improvement concept, a number of major operational improvements along I-285 would be implemented to improve the traffic operations and safety. These operational and safety improvements include:

1) Riverside Drive Interchange Improvements (turn lanes and traffic signalization), See Appendix B, Figure B-1,
2) Roswell Road/Glenridge Drive/GA 400 Interchange Improvements (turn lanes, ramp improvements, ramp braids, and collector-distributor roadways, and interchange modifications), See Appendix B, Figure B-2,
3) Peachtree-Dunwoody Road/Ashford-Dunwoody Road Interchange Improvements (turn lanes, ramp improvements, ramp braids, and collector-distributor roadways, and interchange modifications), See Appendix B, Figure B-3,
4) North Shallowford Road/Peachtree Industrial Boulevard Interchange (PIB) Improvements[1] (eastbound auxiliary lane extension to PIB northbound loop ramp), See Appendix B, Figure B-4,
5) Stone Mountain Freeway Interchange Improvements[1] (interchange modifications), See Appendix B, Figure B-5,
6) I-20 West Interchange Improvements (interchange modifications), See Appendix B, Figure B-6,
7) South Atlanta Road Interchange Improvements (interchange modification and auxiliary lanes between South Atlanta Road and Paces Ferry Road), See Appendix B, Figure B-7,
8) South Cobb Drive Interchange Improvements (turn lanes, traffic signalization, and ramp modifications), See Appendix B, Figure B-8
9) I-75 South Interchange Improvements (interchange modifications), See Appendix B, Figure B-9
10) Jonesboro Road Interchange Improvements (ramp modifications, turn lanes and traffic signalization), See Appendix B, Figure B-10, and
11) I-20 East Interchange Improvements (interchange modifications), See Appendix B, Figure B-11.

[1] Improvement not in 2030 Regional Transportation Plan (RTP)

Figure 8.0.1
Location of I-285 Strategic Implementation Plan Operations and Safety Improvements



The locations of these operational and safety improvements are illustrated in Figure 8.0.1. It is important to note that the improvements identified above represent the major improvement projects identified as part of this study. There were a over 200 projects identified in the I-285 corridor study area in the Regional Transportation Plan (RTP), Transportation Improvement Program (TIP), and the construction work program (CWP). Lack of inclusion of any these projects in the listing of identified improvements for this study does not indicate a need for the deletion of these projects from the program or the need to change the scope or priority of these other projects.

8.1 I-285 Strategic Implementation Plan Phasing

One of the major objectives of the I-285 Strategic Implementation Plan was to determine the implementation phasing of the projects on the I-285 corridor to ensure that the most efficient project sequencing was identified. It was recognized that the sequencing of project implementation is critical to maintaining maximum operational efficiency within the corridor. Without the proper project sequencing, the operational efficiency within the corridor could be compromised. In other words, without proper project phasing the current operational problems in the corridor could be accentuated and even possibly exacerbated. Thus, the project implementation phasing was identified to improve and enhance the traffic operations and safety throughout the corridor. The analysis and evaluation has identified the critical elements of the implementation project phasing for the I-285 corridor.

8.2 I-285 Strategic Implementation Plan Phase 1

The analysis and evaluation of the I-285 corridor identified the major congestion, both existing and in the future, that would be associated with those sections of I-285 north of I-20. These problems were associated with insufficient capacity in several areas along I-285 and other connecting facilities:

- I-285 between I-85 north and I-20 east, generally referred to as the east wall,
- I-285 between I-75 north and I-20 west, generally referred to as the west wall,
- I-75 north of I-285, and
- I-85 north of I-285.

The analysis clearly demonstrated that the majority of the observed congestion on the northern section of I-285, from I-75 north to I-85 north, is associated with these capacity limitations outside the northern section. In general, it was determined that the northern section has sufficient capacity to accommodate the observed traffic volumes. Thus, before any consideration is given to the enhancement of the capacity of the northern section, capacity enhancements to those facilities outside the northern section (listed above) must be implemented. In other words, simply adding capacity to the northern section will not address the identified existing and future congestion problems on the northern section of I-285.

Therefore, Phase 1 of the I-285 Strategic Implementation Plan is divided into two elements. The first element, Phase 1a, includes the development of detailed plans for implementing the overall managed lane concept on I-285 north of I-20. These plans would provide the overall framework within which detailed operational improvements can be designed and implemented. This process is currently underway for the northern section (I-75 north to I-85 north) with the ***revive I-285* Top End** project. Similar efforts need to be initiated on the eastern (I-85 north to I-20 east) and western (I-75 north to I-20 west) sections of I-285. Within the overall framework of these managed lane improvement concepts, the individual operational and safety improvements identified in Figure 8.1 can be designed and implemented.

The second element of Phase 1, Phase 1b, would be the implementation of the managed lane elements on the eastern (I-85 north to I-20 east) and western (I-75 north to I-20 west) sections of I-285. It is assumed that the managed lane improvements to I-85 north and I-75 north will also be implemented during this timeframe.

It is critical to overall operations of I-285 that all the elements in Phase 1, north of I-20, be completed before beginning the implementation of Phase 2. These Phase 1 improvements provide the foundation of the Phase 2 improvements. Implementation of Phase 2 before Phase 1 is complete will only increase the levels of congestion on I-285 in the northern section (I-75 north to I-85 north). Table 8.2.1 summaries the Phase 1 program.

Table 8.2.1
I-285 Strategic Implementation Plan Phase 1 Improvements

Phase	Project	GDOT PI Number
1a	Detailed Planning Studies for Managed Lanes I-85 North to I-20 East	0003432
	Detailed Planning Studies for Managed Lanes I-75 North to I-20 West	0003433
	Completion of the Detailed Planning Study for Northern Section (***revive I-285* Top End**)	0001758
	Riverside Drive Interchange Improvements	713230
	Roswell Road/Glenridge Drive/GA 400 Interchange Improvements	0009159 0009160 0000247
	Peachtree-Dunwoody Road/Ashford-Dunwoody Road Interchange Improvements	714000 0000784
	North Shallowford Road/Peachtree Industrial Boulevard Interchange Improvements[1]	N/A
	Stone Mountain Freeway Interchange Improvements[1]	N/A
	I-20 West Interchange Improvements	0000379
	South Atlanta Road Interchange Improvements	752300
	South Cobb Drive Interchange Improvements	0006048
	I-75 South Interchange Improvements	0001759 0007271 713210
	Jonesboro Road Interchange Improvements	713310
	I-20 East Interchange Improvements	0000378

Note:
[1] Improvement not in 2030 Regional Transportation Plan (RTP)

Table 8.2.1 (Continued)
I-285 Strategic Implementation Plan Phase 1 Improvements

Phase	Project	GDOT PI Number
1b	Managed Lanes on I-285 from I-85 North to I-20 East	0003432
	Managed Lanes on I-285 from I-75 North to I-20 West	0003433
	Managed Lanes on I-75 North	0008256
	Managed Lanes on I-85 North	0009295 0009296

8.3 I-285 Strategic Implementation Plan Phase 2

Phase 1 provides the foundation for the implementation of Phase 2. Without the completion of the Phase 1 projects north of I-20, the implementation of Phase 2 projects will significantly increase the levels of congestion on the northern section of I-285 (I-75 north to I-85 north). Table 8.3.1 summaries the Phase 2 program.

Table 8.3.1
I-285 Strategic Implementation Plan Phase 2 Improvements

Phase	Project	GDOT PI Number
2	Managed Lanes on I-285 from I-75 North to I-85 North	0001758

8.4 I-285 Strategic Implementation Plan Phase 3

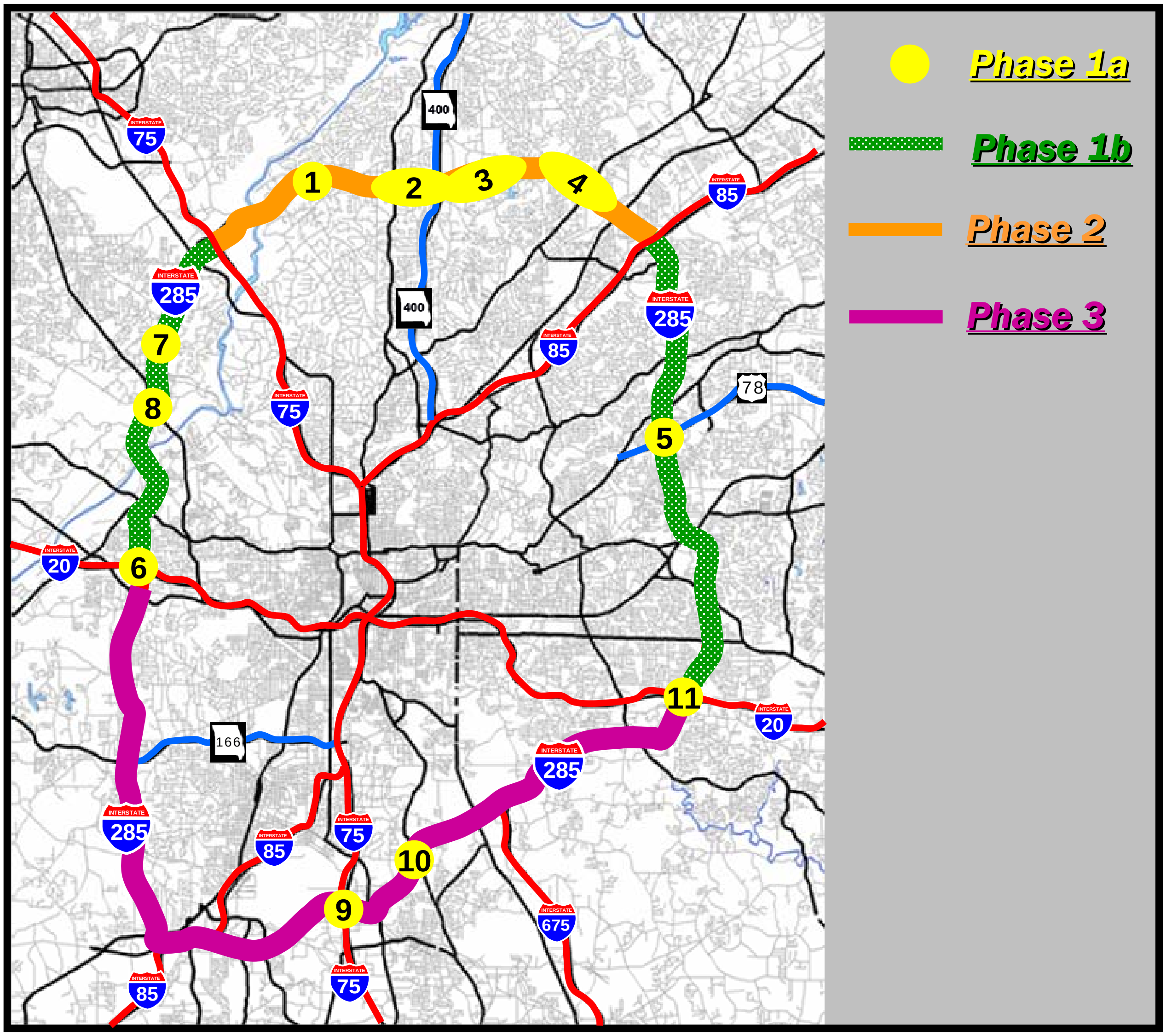
Phase 3 provides for the completion of the managed lane system on I-285. With the completion of Phase 3, all elements of the I-285 Strategic Implementation Plan will be complete providing for a system of managed lanes achieving the goal of providing a high level of travel time certainty for the region's trip makers in the I-285 corridor. Table 8.4.1 summaries the Phase 3 program.

Table 8.4.1
I-285 Strategic Implementation Plan Phase 3 Improvements

Phase	Project	GDOT PI Number
3	Managed Lanes on I-285 from I-20 East to I-75 South	N/A
	Managed Lanes on I-285 from I-75 South to I-85 South	N/A
	Managed Lanes on I-285 from I-20 West to I-85 South	N/A

Figure 8.4.1 graphically illustrates the I-285 Strategic Implementation Plan recommended phasing.

Figure 8.4.1
I-285 Strategic Implementation Plan Recommended Phasing



APPENDIX A
Scenario Evaluation Measures

Figure A.1
Scenario Regional Evaluation Measures

I-285 Strategic Implementation Plan
Scenario Evaluation

Scenario:

Mode of Travel

Mode	Total Person Trips	Percent	Person Work Trips	Percent
SOV				
HOV				
Transit				
Total				

System-Wide Average Speeds

	Period							
	AM Peak				PM Peak			
Facility	6:00	7:00	8:00	Total	4:00	5:00	6:00	Total
Freeways								
GP Lanes								
HOV Lanes								
Truck Lanes								
Arterials								

Trips In Peak Period

Percent of Daily Trips in AM Peak Period (6:00 AM - 10:00 AM):	
Percent of Daily Trips in PM Peak Period (3:00 PM - 7:00 PM):	
Total Percent of Daily Trips in Peak Periods	

System-Wide Congested Vehicle Miles and Vehicle Hours of Travel

	Vehicle Miles of Travel				Vehicle Hours of Travel			
	AM Peak Period		PM Peak Period		AM Peak Period		PM Peak Period	
Facility	VMT	Percent	VMT	Percent	VHT	Percent	VHT	Percent
Freeways								
GP Lanes								
HOV Lanes								
Truck Lanes								
Arterials								
Total								

System-Wide Free Flow Vehicle Miles and Vehicle Hours of Travel

	Vehicle Miles of Travel				Vehicle Hours of Travel			
	AM Peak Period		PM Peak Period		AM Peak Period		PM Peak Period	
Facility	VMT	Percent	VMT	Percent	VHT	Percent	VHT	Percent
Freeways								
GP Lanes								
HOV Lanes								
Truck Lanes								
Arterials								
Total								

System-Wide Delay (Vehicle-Hours)

	Vehicle Hours of Travel			
	AM Peak Period		PM Peak Period	
Facility	VHT	Percent	VHT	Percent
Freeways				
GP Lanes				
HOV Lanes				
Truck Lanes				
Arterials				
Total				

Figure A.1 (Continued)
Scenario Regional Evaluation Measures

I-285 Strategic Implementation Plan
Scenario Evaluation

Scenario:

System-Wide Delay Per Trip

Type Trip	AM Peak Total Trips	AM Peak Free Flow VHT	AM Peak Congested VHT	AM Peak Delay Per Trip (Min.)	PM Peak Total Trips	PM Peak Free Flow VHT	PM Peak Congested VHT	PM Peak Delay Per Trip (Min.)
SOV								
HOV								
Truck								
Total								

System-Wide Delay Time Cost

Type Trip	AM Peak Free Flow VHT	AM Peak Congested VHT	AM Peak Total Delay (Hours)	AM Peak Delay Cost[1,2,3]	PM Peak Free Flow VHT	PM Peak Congested VHT	PM Peak Total Delay (Hours)	PM Peak Delay Cost[1,2,3]
SOV								
HOV								
Truck								
Total								

NOTES:
[1] Assumes 1.0 Persons Per Vehicle at $13.75 Per Hour
[2] Assumes 2.5 Persons Per Vehicle at $13.75 Per Hour
[3] Assumes 1.1 Persons Per Vehicle at $72.65 Per Hour

System-Wide Average Trip Length

Type Trip	AM Average Trip Length Miles	AM Average Trip Length Minutes	PM Average Trip Length Miles	PM Average Trip Length Minutes
SOV				
HOV				
Truck				

Percent of AM Peak Period Trips by Ratio of Congested Travel Time to Free Flow Travel Time

Type Trip	AM Peak (Ratio Congested Time to Free Flow Time)					
	= 1.00	1.01 - 1.25	1.26 - 1.50	1.51 - 1.75	1.75 - 2.00	>2.00
SOV						
HOV						
Truck						
Total						

Percent of PM Peak Period Trips by Ratio of Congested Travel Time to Free Flow Travel Time

Type Trip	PM Peak (Ratio Congested Time to Free Flow Time)					
	= 1.00	1.01 - 1.25	1.26 - 1.50	1.51 - 1.75	1.75 - 2.00	>2.00
SOV						
HOV						
Truck						
Total						

Percent of Lane-Miles Operating at Capacity

Type Lane	Total Lane-Miles	AM Peak Period Lane-Miles at Capacity	AM Peak Period % Lane-Miles at Capacity	PM Peak Period Lane-Miles at Capacity	PM Peak Period % Lane-Miles at Capacity
SOV					
HOV					
Truck					
Arterial					

Figure A.2
Scenario Corridor Evaluation Measures

I-285 Strategic Implementation Plan
Scenario Evaluation

Scenario:

Section Average Speeds

Section	Facility	Period							
		AM Peak				PM Peak			
		6:00	7:00	8:00	Total	4:00	5:00	6:00	Total
North	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
East	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
South	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
West	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								

Section Congested Vehicle Miles and Vehicle Hours of Travel

Section	Facility	Vehicle Miles of Travel				Vehicle Hours of Travel			
		AM Peak Period		PM Peak Period		AM Peak Period		PM Peak Period	
		VMT	Percent	VMT	Percent	VHT	Percent	VHT	Percent
North	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								
East	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								
South	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								
West	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								

Section Free Flow Vehicle Miles and Vehicle Hours of Travel

Section	Facility	Vehicle Miles of Travel				Vehicle Hours of Travel			
		AM Peak Period		PM Peak Period		AM Peak Period		PM Peak Period	
		VMT	Percent	VMT	Percent	VHT	Percent	VHT	Percent
North	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								
East	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								
South	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								
West	Freeways								
	GP Lanes								
	HOV Lanes								
	Truck Lanes								
	Arterials								
	Total								

Figure A.2 (Continued)
Scenario Corridor Evaluation Measures

I-285 Strategic Implementation Plan
Scenario Evaluation

Scenario:

Section Average Speeds

Section Delay (Vehicle Hours)

Section	Facility	Vehicle Hours of Travel			
		AM Peak Period		PM Peak Period	
		VMT	Percent	VMT	Percent
North	Freeways				
	GP Lanes				
	HOV Lanes				
	Truck Lanes				
	Arterials				
	Total				
East	Freeways				
	GP Lanes				
	HOV Lanes				
	Truck Lanes				
	Arterials				
	Total				
South	Freeways				
	GP Lanes				
	HOV Lanes				
	Truck Lanes				
	Arterials				
	Total				
West	Freeways				
	GP Lanes				
	HOV Lanes				
	Truck Lanes				
	Arterials				
	Total				

Section Delay Time Cost

Section	Type Trip	AM Peak				PM Peak			
		Free Flow VHT	Congested VHT	Total Delay (Hours)	Delay Cost[1,2,3]	Free Flow VHT	Congested VHT	Total Delay (Hours)	Delay Cost[1,2,3]
North	SOV								
	HOV								
	Truck								
	Total								
East	SOV								
	HOV								
	Truck								
	Total								
South	SOV								
	HOV								
	Truck								
	Total								
West	SOV								
	HOV								
	Truck								
	Total								

NOTES:

[1] Assumes 1.0 Persons Per Vehicle at $13.75 Per Hour

[2] Assumes 2.5 Persons Per Vehicle at $13.75 Per Hour

[3] Assumes 1.1 Persons Per Vehicle at $72.65 Per Hour

Percent of Lane-Miles Operating at Capacity

Section	Type Lane	Total Lane-Miles	AM Peak Period		PM Peak Period	
			Lane-Miles at Capacity	% Lane-Miles at Capacity	Lane-Miles at Capacity	% Lane-Miles at Capacity
North	Gen Purp					
	HOV					
	Truck					
	Arterial					
East	Gen Purp					
	HOV					
	Truck					
	Arterial					
South	Gen Purp					
	HOV					
	Truck					
	Arterial					
West	Gen Purp					
	HOV					
	Truck					
	Arterial					

Figure A.3
Scenario Operational Evaluation Measures by Section

I-285 Strategic Implementation Plan
Scenario Evaluation

Scenario:

Northern Section Peak Hour Speeds

Facility	Peak Hour	
	AM Peak Hour	PM Peak Hour
Freeways		
GP Lanes		
HOV Lanes		
Truck Lanes		
Ramps		
Arterials		

Northern Section Peak Hour Densities

Facility	Peak Hour	
	AM Peak Hour	PM Peak Hour
Freeways		
GP Lanes		
HOV Lanes		
Truck Lanes		
Ramps		

Northern Section Peak Hour Percent Lost Time

Facility	Peak Hour	
	AM Peak Hour	PM Peak Hour
Freeways		
GP Lanes		
HOV Lanes		
Truck Lanes		
Ramps		
Arterials		

Figure A.3 (Continued)
Scenario Operational Evaluation Measures by Section

I-285 Strategic Implementation Plan
Scenario Evaluation

Scenario:

Northern Section Peak Hour
Number of Intersection Approaches With Queue Length > 300 Feet

	Total Number of Intersections Approaches	AM Peak Hour		PM Peak Hour	
		Number Of Approaches	Percent Of Total Approaches	Number Of Approaches	Percent Of Total Approaches
Number of Intersection Approaches					

Northern Section Peak Hour
Number of Intersection Approaches With Approach Delay > 35.0 Seconds

	Total Number of Intersections Approaches	AM Peak Hour		PM Peak Hour	
		Number Of Approaches	Percent Of Total Approaches	Number Of Approaches	Percent Of Total Approaches
Number of Intersection Approaches					

Northern Section Peak Hour
Number of Freeway Basic Sections With Viscosity Index > 32.0

	Total Number of Intersections Sections	AM Peak Hour		PM Peak Hour	
		Number Of Sections	Percent Of Total Sections	Number Of Sections	Percent Of Total Sections
Number of Freeway Sections					

Northern Section Peak Hour
Number of Freeway Merge/Diverge Sections With Viscosity Index > 35.0

	Total Number of Intersections Sections	AM Peak Hour		PM Peak Hour	
		Number Of Sections	Percent Of Total Sections	Number Of Sections	Percent Of Total Sections
Number of Freeway Sections					

Northern Section Peak Hour
Number of Freeway Weaving Sections With Viscosity Index > 35.0

	Total Number of Intersections Sections	AM Peak Hour		PM Peak Hour	
		Number Of Sections	Percent Of Total Sections	Number Of Sections	Percent Of Total Sections
Number of Freeway Sections					

APPENDIX B
Improvement Concepts

Figure B-1
I-285/Riverside Drive Interchange Improvement Concept

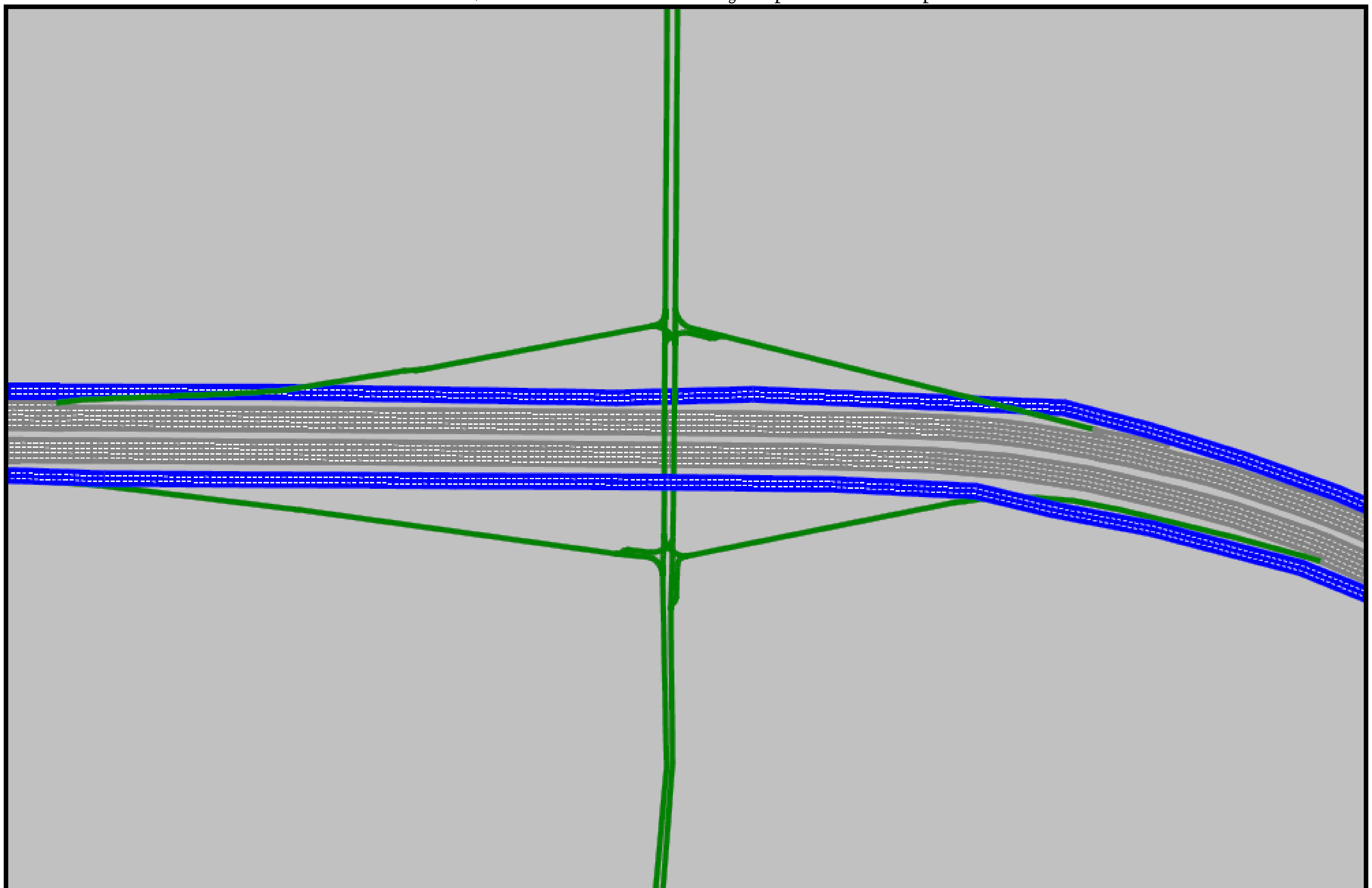


Figure B-2
I-285/Roswell Road/Glenridge Drive/GA 400 Interchange Improvement Concept

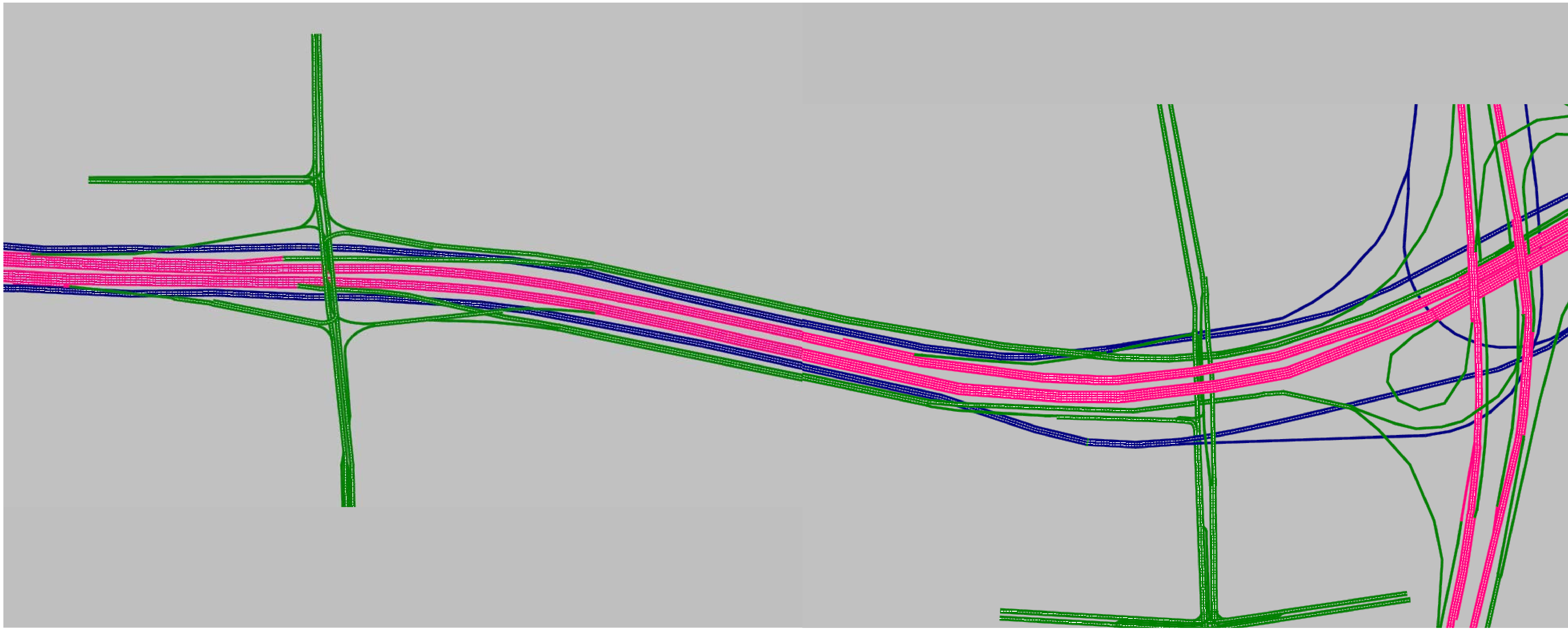


Figure B-3
I-285/Peachtree-Dunwoody Road/Ashford-Dunwoody Road Interchange Improvement Concept

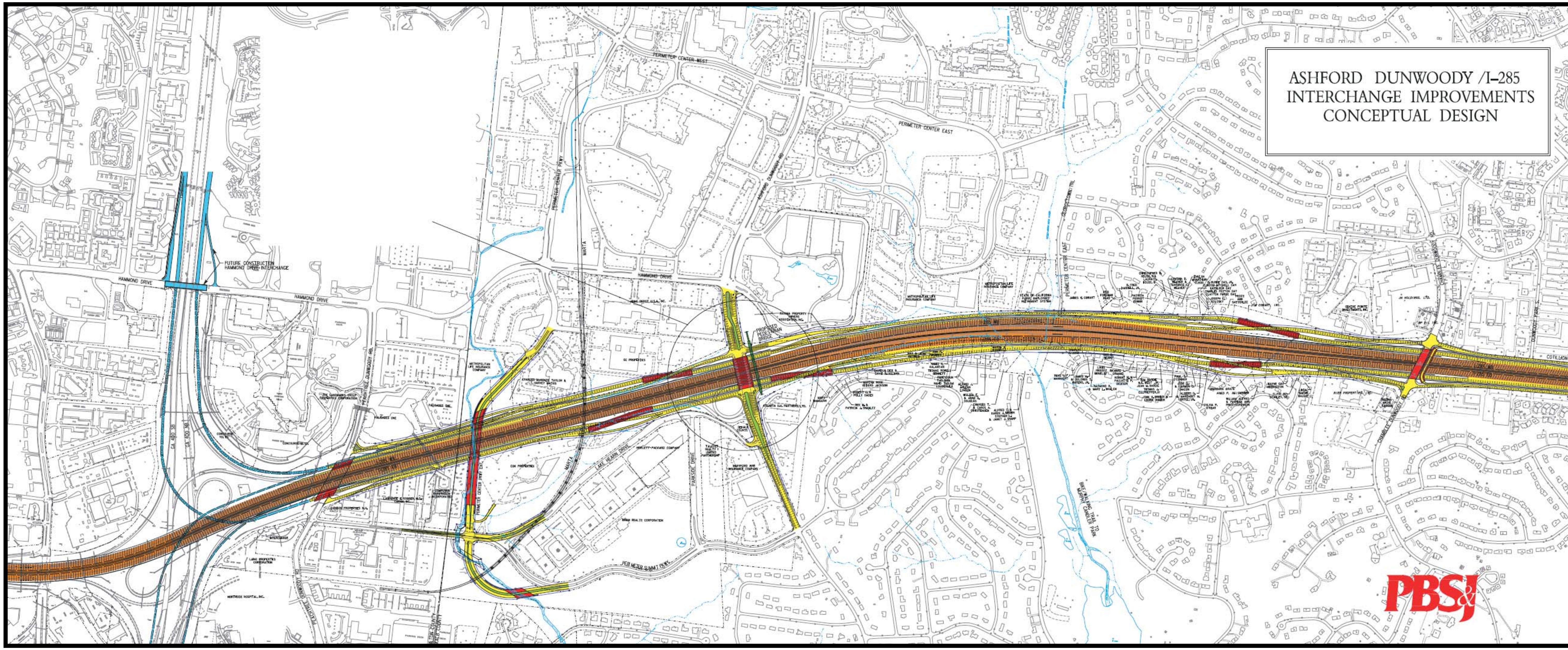


Figure B-4
I-285/North Shallowford Road/New Peachtree Road/Peachtree Industrial Boulevard Interchange Improvement Concept

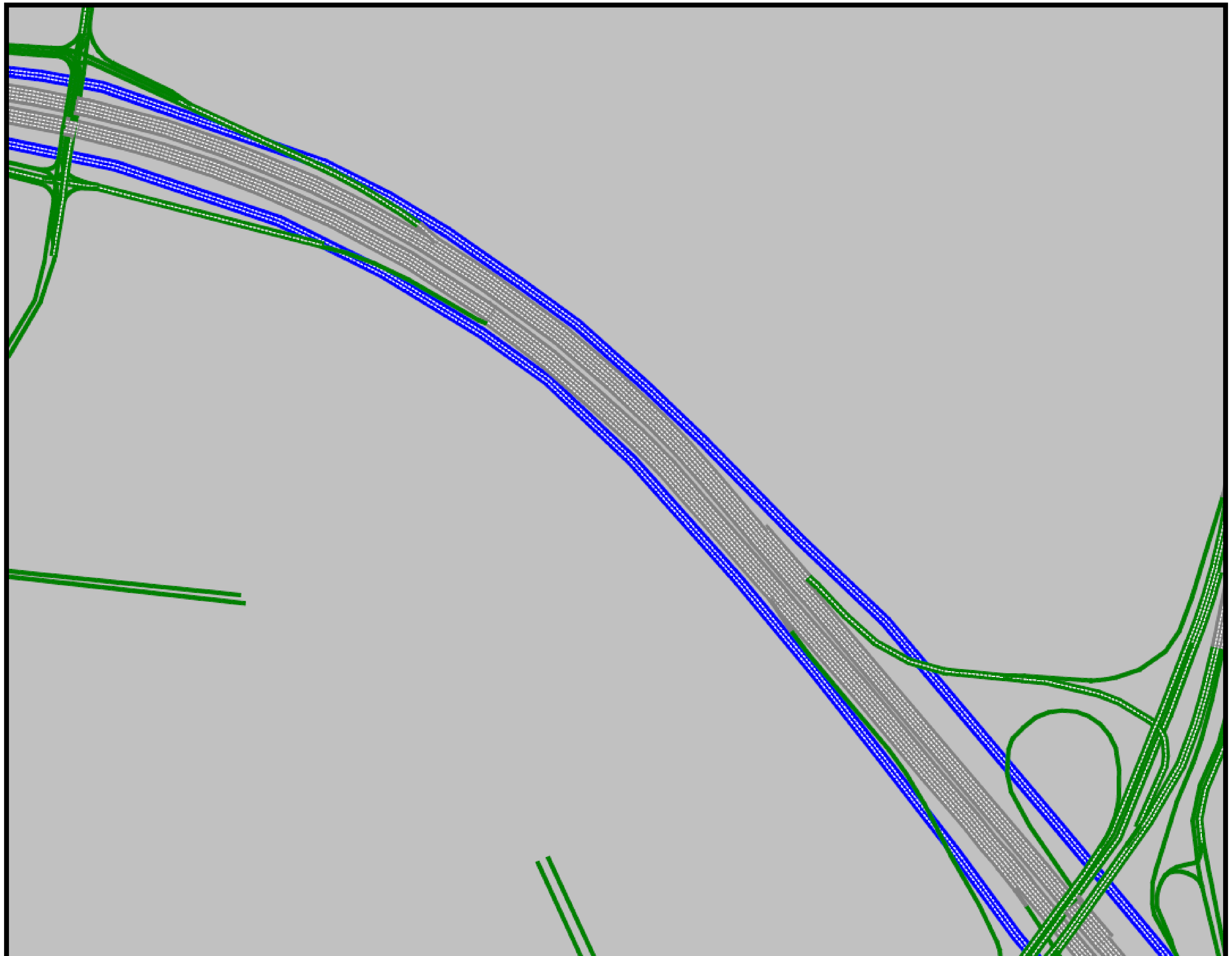
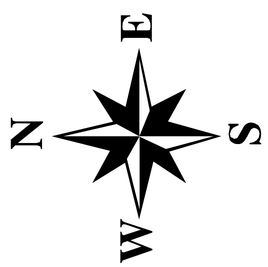


Figure B-5
I-285/Stone Mountain Freeway Interchange Improvement Concept



GP Lanes
C/D Lanes
Ramp
Alternate Ramp Configuration

PBSJ

Figure B-6
I-285/I-20 West Interchange Improvement Concept

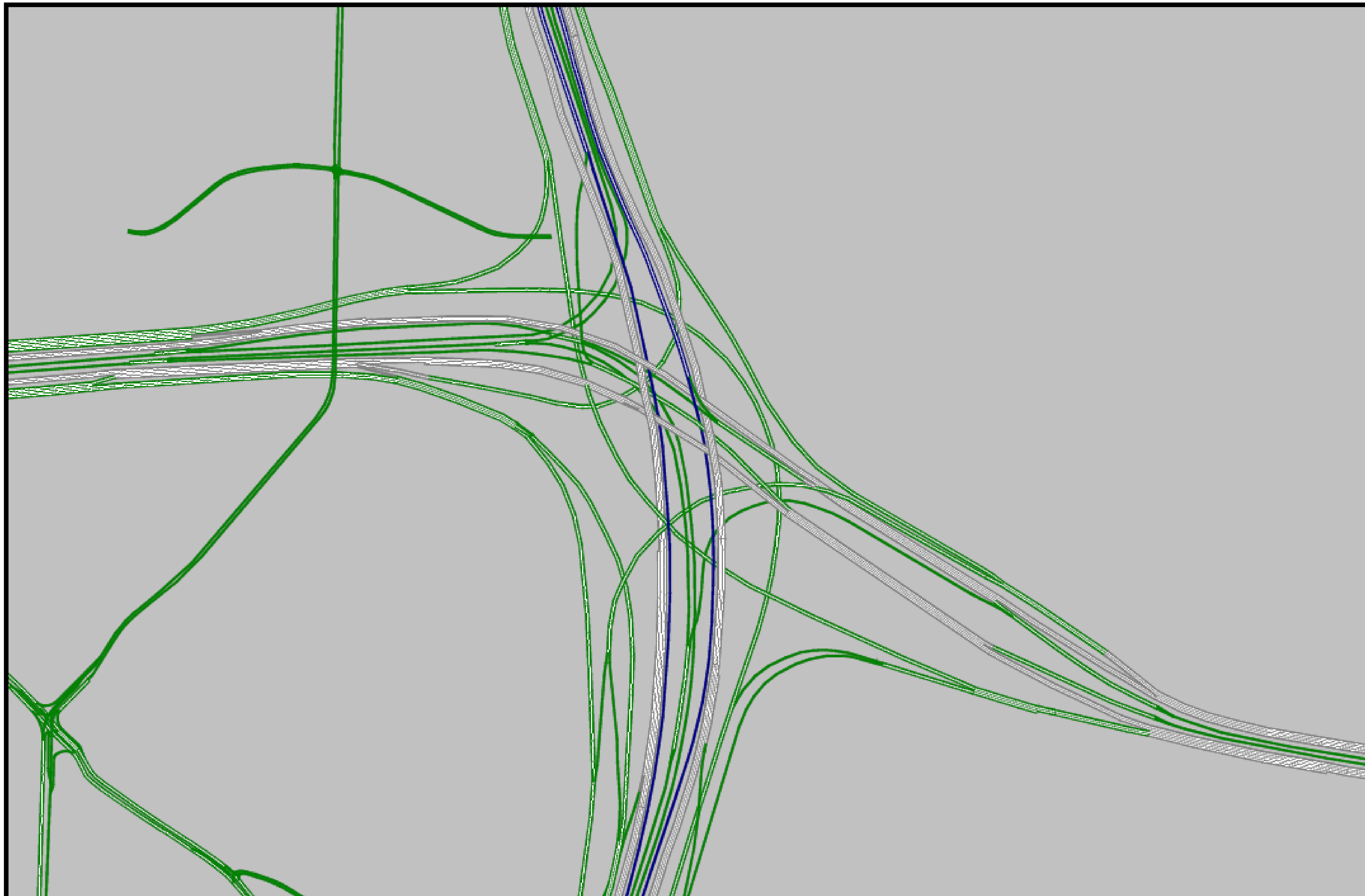


Figure B-7
I-285/South Atlanta Road Interchange Improvements

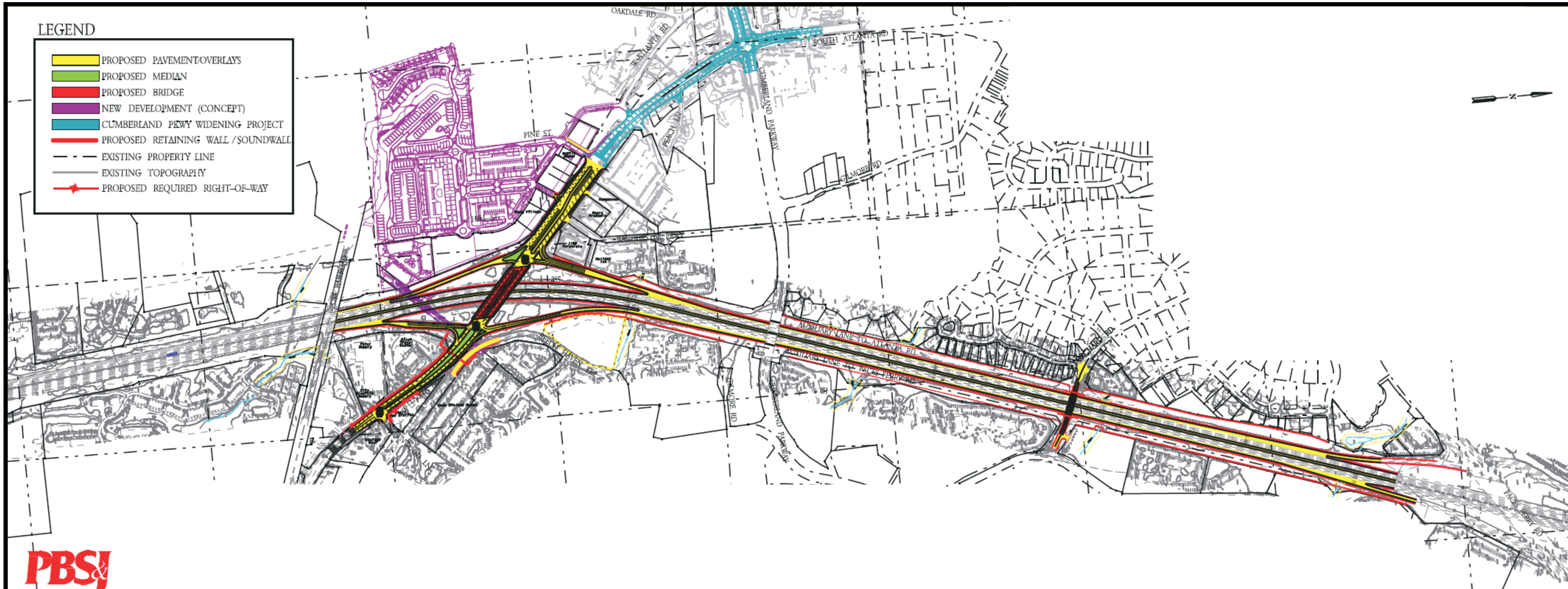


Figure B-8
I-285/South Cobb Drive Interchange Improvement Concept

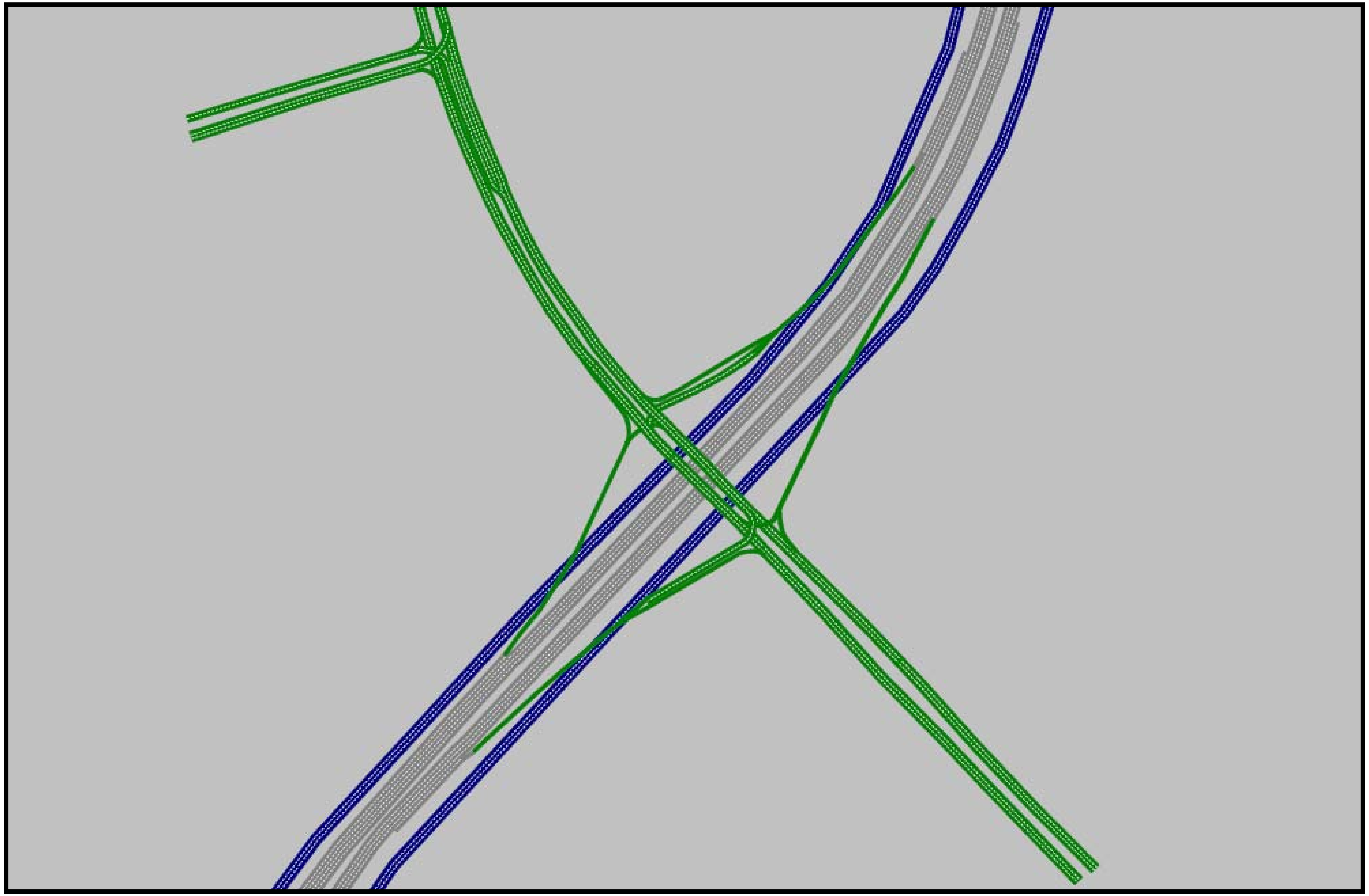
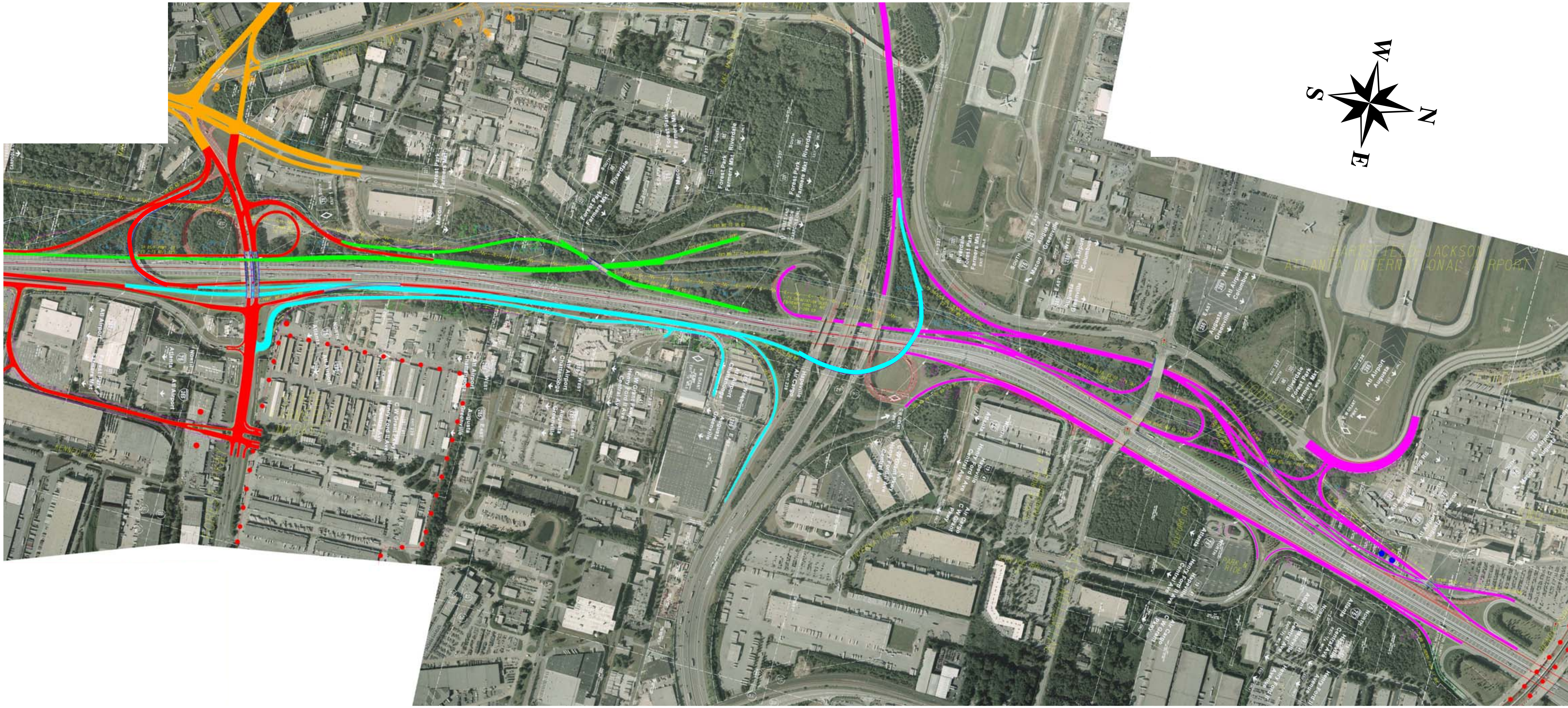


Figure B-9
I-285/I-75 South Interchange Improvement Concept



PBSJ

Figure B-10
I-285/Jonesboro Road Interchange Improvement Concept

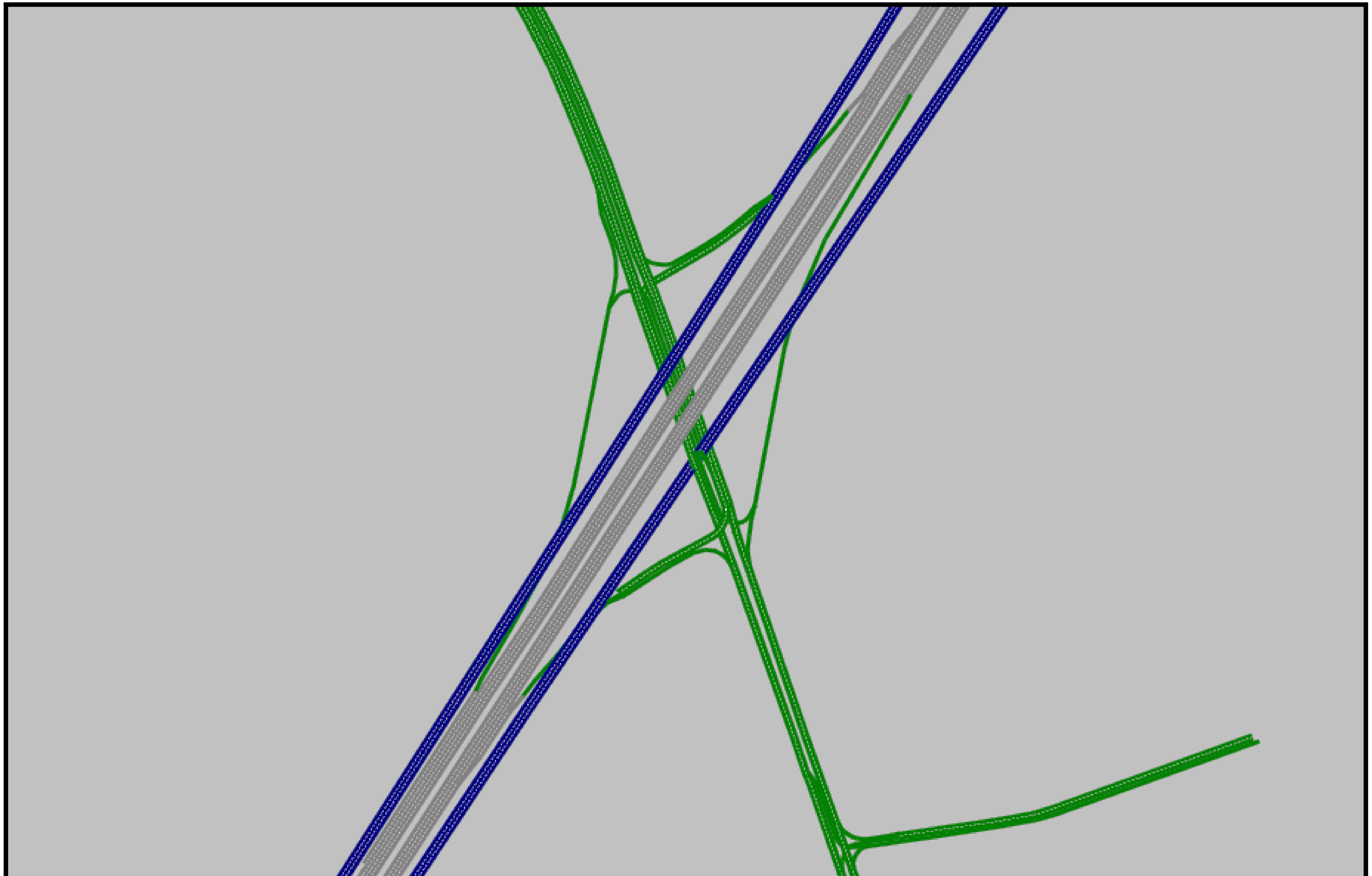


Figure B-11
I-285/I-20 East Improvement Concept