NC 68 / US 311 INTERCHANGE STUDY

FINAL REPORT

CITY OF HIGH POINT

PREPARED FOR:

City of High Point

PREPARED BY:

HNTB North Carolina, PC
343 East Six Forks Road
Suite 200
Raleigh, NC 27609

March, 2009

CITY OF HIGH POINT, NORTH CAROLINA

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1.0 INTRODUCTION

The City of High Point, North Carolina has identified the need to improve the NC 68/US 311 interchange. The purpose of this report is to assess feasible interchange design concepts and develop planning-level project cost estimates for use by the City of High Point in its transportation planning process. This study is the initial step in the planning process for this project and is not the product of detailed environmental or design analyses. The general location and project study area are shown in **Figure 1**. All figures are located in **Appendix A**.

NC 68 (Eastchester Drive) is a major north-south major arterial connecting High Point with Thomasville to the south and I-40 and the Piedmont Triad Airport to the north. US 311 is a north-south freeway that traverses around the eastern side of High Point and connects I-40 with US 29/US 70/I-85 Business. The extension of US 311 south to I-85 is currently being constructed as part of the North Carolina Department of Transportation (NCDOT) State Transportation Improvement Program (STIP) Project R-0609. NCDOT STIP Project R-2606 will extend US 311 to US 220 (Future I-73) north of Asheboro. In the area of the NC 68/US 311 interchange, US 311 transitions from a four-lane divided freeway west of the interchange to a six-lane divided freeway east of the interchange. US 311 is designated by the Federal Highway Administration as a future Interstate facility (I-74).

This report includes consideration of four (4) potential interchange capacity improvement concepts for the 2035 design year. This study also includes consideration of improvements to surface streets intersecting NC 68 within the study area to improve traffic flow in the area of the interchange. Due to changes in traffic patterns and increased volumes in High Point during the semi-annual International Home Furnishings Market (Market), the evaluation of each design concept was conducted under both Market and Non-Market traffic conditions.

2.0 BACKGROUND

2.1. Study Area Description

The existing NC 68/US 311 interchange was constructed as part of the NCDOT STIP Project R-0609 EA and EB. STIP Project R-0609 is approximately 12.9 miles in length and traverses through Forsyth, Guilford and Randolph Counties. Segments IA and IB of STIP Project R-0609 are planned to extend the US 311 Bypass from US 29/US 70 to SR 1920 (Cedar Square Road) east of I-85 by fiscal year 2011. With the completion of STIP Project R-0609 and the eventual connection to I-85, traffic patterns and volumes are expected to change in the immediate study area and along adjacent roadways around High Point. NCDOT STIP Project R-2606 will extend US 311 to US 220 (Future I-73) north of Asheboro. Segment A of STIP Project R-2606 is under construction. Planning and design for Segment B of STIP Project R-2606 is in progress with right-of-way acquisition scheduled to begin in fiscal year 2009.

The study area consists of the NC 68/US 311 diamond interchange and nearby roadways intersecting NC 68. The minor roadways evaluated in the study area include Gordon Road, Cypress Court, Hilton Court, Timberlake Avenue, and York Avenue. The intersections of NC 68/US 311 northbound ramps, NC 68/US 311 southbound ramps, and NC 68/Gordon Road/Cypress Court are currently signalized. All other intersections are stop-controlled on the minor side-street approaches. **Figure 1** shows the project study area. All figures are located in **Appendix A**.

The High Point area is home to one of the largest trade shows in the world, the International Home Furnishings Market (Market). The furnishings market occurs for one week twice a year, in the Spring and Fall, and this event changes traffic patterns and volumes in High Point and surrounding areas because of the large influx of people and goods. For this reason, two forecasts and analyses were conducted for each interchange design concept: (1) Non-Market traffic conditions and (2) Market traffic conditions.

2.2. Existing Conditions

As High Point's most heavily traveled commuter thoroughfare, NC 68 experiences extended periods of congestion and peak hour gridlock in the vicinity of the US 311 interchange. The City of High Point, in coordination with NCDOT, developed plans to provide dual left-turns lanes from southbound NC 68 to southbound US 311 by re-striping existing NC 68 and the NC 68/US 311 interchange bridge deck. With this re-striping, a third southbound through lane will be developed on NC 68. This additional lane will originate approximately 1,000' north of Hilton Court and will be dropped as the second left-turn lane at the US 311 southbound ramp intersection.

The NC 68 re-striping improvements were constructed during the course of this interchange study. Consequently, the description of existing conditions in the following sections includes discussion of the modified laneage on NC 68 southbound. This configuration will serve as the baseline for improvement analyses contained within this report.

Study Area Roadways

Figure 1 shows the project study area which includes the interchange and adjacent intersections along NC 68. The existing (No-Build) geometrics, intersection traffic control, and speed limits for existing roadways and intersections within the study area are shown schematically in **Figure 2**. For purposes of clarity, the NC 68 re-striping improvements constructed during the course of this study are shown in green on **Figure 2**. The following is a brief description of existing roadways and intersections within the project study area:

- **US 311** is a north-south highway that transitions from a six-lane to a four-lane divided expressway at the interchange with NC 68. Currently, US 311 has a posted speed of 60 miles per hour (mph) and is slated to be converted to a future Interstate facility, I-74. The 2007 Annual Average Daily Traffic (AADT) on US 311 east of the NC 68 interchange was 28,000[1] vehicles per day.

- **NC 68 (Eastchester Drive)** is a five-lane curb and gutter north-south major arterial with a 45 mph posted speed limit in the study area with limited access points. NC 68 serves a mixture of residential, commercial, and residential properties. The 2007 AADT on NC 68 near the US 311 interchange was 42,000[2] vehicles per day.

- **Gordon Road** is a two-lane local collector facility in the study area. Gordon Road serves residential development and connects NC 68 and Deep River Road. The 2007 AADT on Gordon Road was 2,300[3] vehicles per day.

[1] NCDOT Traffic Survey Unit – 2007 High Point Urban AADT Maps
[2] Ibid.
[3] Ibid.

- **Cypress Court** is a two-lane local roadway facility that serves a residential development near Oak Hollow Lake. Cypress Court's only ingress and egress location is its intersection with NC 68 and Gordon Road, approximately 400 feet northeast of the NC 68 and US 311 Northbound Ramps intersection.

- **Hilton Court** is a two-lane local roadway in the study area serving a few residential properties. Hilton Court's only ingress and egress location is its intersection with NC 68 approximately 450 feet northeast of the NC 68 and Gordon Road/Cypress Court intersection.

- **Timberlake Avenue** is a two-lane local roadway facility serving residential areas just to the east of NC 68. It is connected to York Avenue via Merrimon Place.

- **York Avenue** is a two-lane local roadway facility serving residential areas just to the east of NC 68. It is connected to Timberlake Avenue via Merrimon Place.

Facilities for pedestrians and bicycles are not provided on the existing study area roadways. Few side-street intersections provide exclusive turning lanes and/or left and right-turn deceleration lanes.

Study Area Intersections

- **NC 68 and US 311** – NC 68 and US 311 is a grade separated, diamond type interchange. The intersections of US 311 northbound and southbound ramps and NC 68 are serviced by two four-legged, signalized intersections. Current traffic volumes exceed 2025 traffic projections used in the development of the interchange design as part of STIP Project R-0609.

- **NC 68 and Gordon Road/Cypress Court** – The intersection of NC 68 and Gordon Road/Cypress Court is a four-legged, signalized intersection approximately 400 feet northeast of the US 311 northbound ramps intersection. Exclusive left-turn lanes onto Gordon Road and Cypress Court are provided on NC 68 but there are no other exclusive turn lanes at this intersection. The close intersection spacing to US 311 results in signal coordination difficulties and queues extend from this intersection to the US 311 interchange. Field observations prior to the construction of the NC 68 re-striping improvements indicated that queues from the interchange extended far beyond this intersection, blocking vehicles traveling southbound on NC 68.

- **NC 68 and Hilton Court** – The intersection of NC 68 and Hilton Court is a three-legged, unsignalized intersection. The Hilton Court approach is stop-controlled with a shared left and right-turn lane. The northbound NC 68 approach features an exclusive left-turn lane. During peak hour conditions, ingress/egress to Hilton Court can be restricted due to congestion and queuing on NC 68.

- **NC 68 and Timberlake Avenue** – The intersection of NC 68 and Timberlake Avenue is a three-legged, unsignalized intersection. The Timberlake Avenue approach is stop-controlled with a shared left and right-turn lane. Northbound NC 68 features an exclusive left-turn lane. During peak hour conditions, ingress/egress to Timberlake Avenue can be restricted due to congestion and queuing on NC 68.

- NC 68 and York Avenue – The intersection of NC 68 and York Avenue is a three-legged, unsignalized intersection. The York Avenue approach is stop-controlled with a shared left and right-turn lane. Northbound NC 68 features an exclusive left-turn lane.

Existing Land Uses

Existing land uses along NC 68 in the study area vary markedly from residential to retail to business. A considerable amount of the land use in the immediate area of the interchange is residential, including town homes and single family homes. Development in the vicinity of the interchange is limited by Oak Hollow Lake to the west. Decisions regarding future land use within the study area are guided by the Eastchester Drive Corridor Plan Phase II Update (adopted 1994) and the City of High Point Land Use Plan Map (Amended July 20, 2006). These plans designate NC 68/Eastchester Drive as a commercial corridor. Other roadways intersecting NC 68 in the study area provide access to existing and planned residential areas and serve commuter type traffic. These roadways include Gordon Road, Cypress Court, Hilton Court, Timberlake Avenue, and York Avenue.

2.3. Other Planned Transportation Projects

Based on the NCDOT 2009-2015 STIP, there are two projects in the vicinity of the NC 68/US 311 interchange study area. A brief description of these projects is included below:

STIP Project R-0609: US 311 Bypass South of SR 1920 East of Archdale to west of High Pont Reservoir. Four-lane divided facility on new location. Approximately 12.9 miles in length. Partially complete. Sections IA and IB east of I-85 Business are currently under construction.

STIP Project U-3615: Skeet Club Road, US 311 to NC 68 (Eastchester Drive). Widen to multi-lanes. Approximately 6.3 miles in length. Right of way acquisition for Section B is in progress. Construction of Section B is anticipated to begin in Fiscal Year 2010. Right-of-way and constriction of Part A of this project are currently unfunded.

3.0 PRELIMINARY INTERCHANGE DESIGN CONCEPTS

3.1. Description

Based on field observations and recent traffic counts, the NC 68/US 311 interchange currently experiences heavy congestion and queuing during extended AM and PM peak hours of operation. In order to relieve the congested conditions, the City of High Point identified four (4) preliminary interchange design concepts for evaluation as part of this study.

Based on field observations and information provided by the City of High Point, concept plans were prepared for each of the four preliminary interchange design options. The concept plans were prepared at a scale of 1"=200' as overlays on existing orthophotography and GIS information for each of the four design concepts. All design concepts were prepared in accordance with current NCDOT and American Association of State Highway and Transportation Officials (AASHTO) standards for roadway design.

The developed conceptual design plans show the proposed centerline, horizontal curvature, locations of proposed median breaks, estimated limits of construction, anticipated right-of-way limits, and anticipated limits of access control. The concept plans also include a key number for parcels adjacent to the anticipated limits of construction. The concept plans for each design concept are contained in Appendix A. A table matching the key number to the parcel number is also included in Appendix A. Additional discussion regarding each interchange design option is included below.

Planning-level opinions of probable cost were also prepared for each interchange design concept. This information was developed using standard planning-level per-mile costs published by NCDOT in February 2008. Utility relocation costs were considered in the estimates on a per-mile basis. Costs for right-of-way land acquisition were developed using tax assessment data obtained from the City of High Point Geographic Information Services (http://gisweb.high-point.net/, accessed December 2008) and Guilford County (http://gcgis.co.guilford.nc.us/guilford_new/, accessed December 2008) online Geographic Information System (GIS) databases. Industry-standard planning-level contingencies were also applied to the project estimates. Right-of-way acquisition estimates for each design concept were based upon a whole-take parcel assessment. The planning-level opinions of probable cost do not include consideration or potential costs associated with proximity damages, relocation, or access control. Costs for right-of-way land acquisition were provided by the City of High Point.

Partial Cloverleaf (Design Exception) Interchange

This design option would replace the existing interchange configuration with a partial cloverleaf type interchange. By removing left-turns from NC 68 onto the US 311 northbound and southbound ramps, traffic signal phasing could be reduced by one phase at each ramp intersection. This interchange configuration does result in additional ramp junctions along US 311, one northbound and one southbound, to service the proposed loop ramps in the northeast and southwest quadrants.

In order to minimize the impacts to adjacent properties, including lands associated with Oak Hollow Park, the proposed loop ramps would have radii of 150 feet. This would equate to a design speed of 25 miles per hour for the proposed loop ramp[4], possibly requiring a design exception from the Federal Highway Administration. Additionally, modifications would also be required for three of the four existing ramps to accommodate the proposed loop ramps, as well as to provide appropriate capacity for anticipated design year (2035) turning movements onto NC 68.

Based on discussions with City of High Point staff, this concept was also developed to accommodate a six-lane typical section on NC 68 in the area of the interchange. Consequently, the proposed NC 68 bridge over US 311 is an eight-lane structure with a clear roadway width of 102 feet. The outside lanes would be utilized as deceleration lanes for the proposed loop ramps. At the request of the City of High Point, the proposed NC 68 bridge includes a 6-foot wide sidewalk on its west side.

Due to the existing grade of US 311, the maximum proposed widening on the east side of the NC 68 bridge over US 311 is approximately 12 feet. Based on the STIP Project R-0609 design plans, this distance will provide for the required minimum vertical clearance of 16.5 feet over US 311. Consequently, the additional widening of the structure (32.5 feet)

[4] A Policy on Geometric Design of Highways and Streets, AASHTO, 2004

is proposed on the west side of the structure to preserve the required vertical clearances.

The Partial Cloverleaf (Design Exception) Interchange design option also includes modifications to Gordon Road, Cypress Court, and Hilton Court intended to provide better signal spacing in the vicinity of the NC 68/US 311 interchange. The existing signal at Gordon Road/Cypress Court is proposed to be relocated north to Hilton Court. This would increase the intersection spacing from approximately 400 feet to approximately 850 feet. Gordon Road would then be restricted to right-in/right-out access only. The existing Cypress Court access to NC 68 would be closed. Access to NC 68 would be provided via an extension of Cypress Court on new alignment west of NC 68 where it would intersect with Hilton Court. The intersection of NC 68/Hilton Court would operate as a four-legged signalized intersection with Hilton Court extended to Gordon Road as a three-lane section. Based on existing GIS data, the extension of Hilton Court and construction of proposed loop ramps would require two new stream crossings. A roundabout could be constructed at the intersection of Hilton Court Extension and Gordon Road.

Due to its proximity to the existing signalized interchange ramp terminal, Timberlake Drive is also proposed to be restricted to right-in/right-out access. Full movement access to NC 68 would still be available to Timberlake Avenue via a cross-connection on Merrimon Place to York Avenue.

The Partial Cloverleaf (Design Exception) Interchange concept plan is shown in **Figures 3A and 3B**. Based on the design concept plan, it is estimated that construction of this interchange configuration would require approximately 5.5 acres of right-of-way. From existing aerial photography and the anticipated construction limits, it is estimated that two residences would be relocated as a result of constructing this design option; no relocation of existing businesses is anticipated. The Partial Cloverleaf (Design Exception) concept studied did not include retaining walls. However, the use of retaining walls would minimize potential impacts. Other impacts may occur due to splitting of existing parcels or restriction of access.

The planning-level opinion of probable cost for the Partial Cloverleaf (Design Exception) Interchange concept is shown in **Table 1**.

Partial Cloverleaf (No Design Exception) Interchange

A separate design concept plan was developed to evaluate the impact to adjacent properties resulting from increasing the proposed loop ramp radii to 230 feet to meet Interstate design standards. This would equate to a design speed of 30 miles per hour for the proposed loop ramp[5]. Additionally, in order to preserve interchange traffic operations, this design option assumes full control of access on NC 68 between Hilton Court and York Avenue/Ambassador Court. Similar to the Partial Cloverleaf (Design Exception) Interchange option, this design concept proposes an eight-lane NC 68 bridge over US 311 with a clear roadway width of 102 feet. The outside lanes would be utilized as deceleration lanes for the proposed loop ramps. The proposed bridge includes a 6-foot wide sidewalk on its west side.

[5] A Policy on Geometric Design of Highways and Streets, AASHTO, 2004

Table 1 – Partial Cloverleaf (Design Exception) Interchange Option
Planning-Level Opinion of Probable Cost

SECTION	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL COST
1.0 ROADWAY					
1.01	NC 68 Widening (Paving, Earthwork, Drainage, Striping, Signage, Landscaping, and Sidewalk)	0.75	Miles	$ 4,000,000	$ 3,000,000
1.02	US 311 Modification (Paving, Earthwork, Drainage, Striping, Signage, and Landscaping)	0.60	Miles	$ 5,600,000	$ 3,360,000
1.03	3 Lane Roadway (Gordon & Hilton Roads)	0.20	Miles	$ 3,700,000	$ 740,000
1.04	2 Lane Roadway (Cypress Court Realignment)	0.30	Miles	$ 2,800,000	$ 840,000
1.05	Roundabout	1.00	Each	$ 400,000	$ 400,000
1.06	Ramp Improvements	0.90	Miles	$ 2,000,000	$ 1,800,000
1.07	Ramp A Construction	0.28	Miles	$ 4,000,000	$ 1,120,000
1.08	Ramp C Construction	0.28	Miles	$ 2,500,000	$ 700,000
1.09	Ramp D Construction	0.25	Miles	$ 2,000,000	$ 500,000
1.10	Loop Construction	0.35	Miles	$ 1,250,000	$ 437,500
SUBTOTAL ROADWAY					**$12,897,500**
2.0 STRUCTURES					
2.01	NC 68 Bridge Widening (44.5' Additional Width)	11,800	SF	$ 140.00	$ 1,652,000
	Constructed in Intermediate Phase				
SUBTOTAL STRUCTURES					**$1,652,000**
3.0 CONSTRUCTION COST SUMMARY					
	Subtotal Construction				$ 14,549,500
3.01	Engineering Contingency (10%)				$ 1,455,000
3.02	Planning Level Contingency (30%)				$ 4,365,000
3.03	Traffic Control	1	LS	$ 610,000	$ 610,000
SUB-TOTAL FACILITY CONSTRUCTION COST					**$20,979,500**
4.0 ROW and UTILITIES					
4.01	ROW (Land)	5.5	Acres	$ 180,000	$ 990,000
	Residential Relocatees	2	Each	$ 150,000	$ 300,000
	Commercial/Business Relocatees	0	Each	$ 550,000	$ -
	Right of Way Acquisition Contingency (50%)				$ 495,000
4.02	Relocate other Utilities	1.3	Miles	$ 1,000,000	$ 1,300,000
	Utilities Contingency (10%)				$ 130,000
SUBTOTAL ROW and UTILITIES					**$3,215,000**
TOTAL PROJECT COST SUMMARY					
Sub-Total Construction Cost					$ 20,979,500
Sub-Total ROW and Utilities					$ 3,215,000
TOTAL PROJECT COST (2008)					**$24,194,500**

SAY	**$24,200,000**

Notes:
1) The unit costs to construct this facility are based on the unit prices of recently constructed similar facilities and/or the latest average unit prices published by
2) Conceptual horizontal and vertical alignments are developed. Approximate quantities of major roadway and structure elements calculated from conceptual
3) Proposed drainage and utilities elements are not developed and quantities are not calculated individually for this estimate.
4) Approximate right-of-way needs estimated from conceptual design.
5) Unit costs of similar projects are used to calculate construction cost.
6) Contingencies are applied to the construction cost.
7) Environmental mitigation costs are not included.
8) Right-of-way unit costs determined from High Point and Guilford County GIS tax data (accessed December 2008).
9) This estimate does not account for noise barriers.

The Partial Cloverleaf (No Design Exception) Interchange option also includes modifications to Gordon Road, Cypress Court, and Hilton Court intended to provide better signal spacing in the vicinity of the NC 68/US 311 interchange. These proposed modifications would be the same as described in the Partial Cloverleaf (Design Exception) concept. Based on existing GIS data, the extension of Hilton Court, modifications to Cypress court, and construction of the proposed loop ramps would require three new stream crossings. The design concept plan for this interchange option is shown in Figure 4.

Based on the concept design plan, it is estimated that the construction of the Partial Cloverleaf (No Design Exception) Interchange would require approximately 15.0 acres of right-of-way acquisition. Based on the aerial photography and anticipated limits of construction, 11 residences would be relocated as a result of constructing this design option; no business relocations are anticipated. The Partial Cloverleaf (No Design Exception) concept studied did not include retaining walls. However, the use of retaining walls would minimize potential impacts (e.g., residential relocations in Quadrant B). Other impacts may occur due to splitting of existing parcels or restriction of access.

The planning-level opinion of probable cost for the Partial Cloverleaf (No Design Exception) Interchange concept is shown in Table 2.

Single Point Urban Interchange (SPUI)

This design option would replace the existing interchange configuration with a single point urban interchange (SPUI). This configuration replaces the two three-phase signalized interchange ramp intersections on NC 68 with one three-phase intersection and two two-phase signalized intersections which would reduce the delay that drivers encounter in the NC 68/US 311 interchange area. The two two-phase signalized ramp terminal intersections are necessary to allow heavy right-turning traffic volumes on the US 311 off-ramps to access NC 68 and to reduce ramp queues. The SPUI also decreases right-of-way impacts and increases intersection spacing. In general, the SPUI configuration is well suited for conditions where there are closely spaced intersections to the interchange, such as the intersection of NC 68 with Gordon Road/Hilton Court. However, some of these potential benefits are offset by the structure cost associated with this design.

As with the other preliminary design concepts, the implementation of the SPUI concept would require modification to the existing interchange ramps to provide sufficient capacity and storage for design year (2035) turning movements. In order to maintain traffic during construction, the SPUI design concept was developed to widen the existing NC 68 bridge structure. However, in order to do so, approximately 0.4 miles of US 311 would need to be re-aligned by approximately three feet to meet Interstate design standards for vertical clearance (16.5 feet).

Similar to the Partial Cloverleaf Interchange design concepts, the SPUI concept also includes modifications to modifications to Gordon Road, Cypress Court, and Hilton Court intended to provide better signal spacing in the vicinity of the NC 68/US 311 interchange. Based on existing GIS data, the extension of Hilton Court would require construction of a new stream crossing. The design concept plan for the SPUI option can be found in Figure 5.

Table 2 – Partial Cloverleaf (No Design Exception) Interchange Option
Planning-Level Opinion of Probable Cost

SECTION	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL COST
1.0 ROADWAY					
1.01	NC 68 Widening (Paving, Earthwork, Drainage, Striping, Signage, Landscaping, and Sidewalk)	0.75	Miles	$ 4,000,000	$ 3,000,000
1.02	US 311 Modification (Paving, Earthwork, Drainage, Striping, Signage, and Landscaping)	0.60	Miles	$ 5,600,000	$ 3,360,000
1.03	3 Lane Roadway (Gordon & Hilton Roads)	0.20	Miles	$ 3,700,000	$ 740,000
1.04	2 Lane Roadway (Cypress Court Realignment)	0.40	Miles	$ 2,800,000	$ 1,120,000
1.05	Roundabout	1.00	Each	$ 400,000	$ 400,000
1.06	Ramp Improvements	0.90	Miles	$ 2,000,000	$ 1,800,000
1.07	Ramp A Construction	0.30	Miles	$ 4,000,000	$ 1,200,000
1.08	Ramp B Construction	0.30	Miles	$ 2,000,000	$ 600,000
1.09	Ramp C Construction	0.32	Miles	$ 2,500,000	$ 800,000
1.10	Ramp D Construction	0.23	Miles	$ 2,000,000	$ 460,000
1.11	Loop Construction	0.53	Miles	$ 1,250,000	$ 662,500
SUBTOTAL ROADWAY					**$14,142,500**
2.0 STRUCTURES					
2.01	NC 68 Bridge Widening (44.5' Additional Width)	11,800	SF	$ 140.00	$ 1,652,000
	Constructed in Intermediate Phase				
SUBTOTAL STRUCTURES					**$1,652,000**
3.0 CONSTRUCTION COST SUMMARY					
	Subtotal Construction				$15,794,500
3.01	Engineering Contingency (10%)				$ 1,579,500
3.02	Planning Level Contingency (30%)				$ 4,739,000
3.03	Traffic Control	1	LS	$ 788,000	$ 788,000
SUB-TOTAL FACILITY CONSTRUCTION COST					**$22,901,000**
4.0 ROW and UTILITIES					
4.01	ROW (Land)	15.0	Acres	$ 180,000	$ 2,700,000
	Residential Relocatees	19	Each	$ 150,000	$ 2,850,000
	Commercial/Business Relocatees	0	Each	$ 550,000	$ -
	Right of Way Acquisition Contingency (50%)				$ 1,350,000
4.02	Relocate other Utilities	1.4	Miles	$ 1,000,000	$ 1,400,000
	Utilities Contingency (10%)				$ 140,000
SUBTOTAL ROW and UTILITIES					**$8,440,000**
TOTAL PROJECT COST SUMMARY					
Sub-Total Construction Cost					$ 22,901,000
Sub-Total ROW and Utilities					$ 8,440,000
TOTAL PROJECT COST (2008)					**$31,341,000**

SAY	**$31,400,000**

Notes:
1) The unit costs to construct this facility are based on the unit prices of recently constructed similar facilities and/or the latest average unit prices published by
2) Conceptual horizontal and vertical alignments are developed. Approximate quantities of major roadway and structure elements calculated from conceptual
3) Proposed drainage and utilities elements are not developed and quantities are not calculated individually for this estimate.
4) Approximate right-of-way needs estimated from conceptual design.
5) Unit costs of similar projects are used to calculate construction cost.
6) Contingencies are applied to the construction cost.
7) Environmental mitigation costs are not included.
8) Right-of-way unit costs determined from High Point and Guilford County GIS tax data (accessed December 2008).
9) This estimate does not account for noise barriers.

The construction of the SPUI interchange concept would require acquisition of approximately 5 acres of right-of-way. Based on existing aerial photography and the anticipated construction limits, it is estimated that two residences would require relocation as a result of constructing this option; no business relocations are anticipated. The SPUI concept studied in this report does not consider use of retaining walls. However, the use of retaining walls would minimize potential impacts. Other impacts may occur due to splitting of existing parcels or restriction of access.

The planning-level opinion of probable cost for the SPUI Interchange concept can be found in Table 3.

Full Cloverleaf Interchange

A separate concept plan was developed to evaluate cost and impacts to adjacent properties resulting from the reconstruction of the NC 68/US 311 interchange to a full cloverleaf configuration. This configuration would eliminate all left-turns from NC 68 onto US 311 through construction of loop ramps in all four interchange quadrants. In order to preserve freeway traffic operations, barrier separated collector-distributor (CD) roads would be required on both sides of US 311 to specifically serve traffic weaving between the proposed loop ramps. In contrast to the Partial Cloverleaf and SPUI design concepts, this option would also require construction of a completely new NC 68 bridge over US 311 to accommodate the required CD roads.

The Full Cloverleaf Interchange concept includes proposed modifications to Gordon Road, Cypress Court, and Hilton Court intended to provide better signal spacing in the area of the NC 68/US 311 interchange. US 311 off-ramp traffic can not operate efficiently under free-flow conditions onto the NC 68 arterial in the peak hour periods because of heavy volumes along NC 68, proximity of adjacent signalized intersections, and the widening limitation along NC 68. Therefore, two two-phase signalized ramp terminal intersections are proposed with this design to allow heavy right-turning traffic volumes on the US 311 off-ramps to access NC 68 and to reduce ramp queues. The extension of Hilton Court and modifications to Cypress Court would require construction of four new stream crossings.

In order to preserve interchange traffic operations, the Full Cloverleaf Interchange option includes full control of access on NC 68 between Hilton Court and York Avenue/Ambassador Court.

The design concept plan associated with the Full Cloverleaf can be found in Figure 6. Based on the design concept plan, it is estimated that construction of this interchange configuration would require approximately 25 acres of right-of-way. Based on the aerial photography and anticipated limits of construction, 37 residences and 2 businesses would require relocation as a result of constructing this option. The Full Cloverleaf design concept studied in this report does not consider use of retaining walls. However, the use of retaining walls would minimize potential impacts. Other impacts may occur due to splitting of existing parcels or restriction of access.

The planning-level opinion of probable cost for the Full Cloverleaf Interchange concept can be found in Table 4.

Table 3 – Single Point Urban Interchange (SPUI) Option
Planning-Level Opinion of Probable Cost

SECTION	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL COST
1.0 ROADWAY					
1.01	NC 68 Widening (Paving, Earthwork, Drainage, Striping, Signage, Landscaping, and Sidewalk)	0.85	Miles	$ 4,000,000	$ 3,400,000
1.02	US 311 Re-alignment (Paving, Earthwork, Drainage, Striping, Signage, and Landscaping)	0.40	Miles	$ 8,400,000	$ 3,360,000
1.03	3 Lane Roadway (Gordon & Hilton Roads)	0.20	Miles	$ 3,700,000	$ 740,000
1.04	2 Lane Roadway (Cypress Court Realignment)	0.30	Miles	$ 2,800,000	$ 840,000
1.05	Roundabout	1.00	Each	$ 400,000	$ 400,000
1.06	Ramp A Construction	0.26	Miles	$ 4,000,000	$ 1,040,000
1.07	Ramp AY Construction	0.11	Miles	$ 4,000,000	$ 440,000
1.08	Ramp B Construction	0.24	Miles	$ 2,000,000	$ 480,000
1.09	Ramp BY Construction	0.09	Miles	$ 4,000,000	$ 360,000
1.10	Ramp C Construction	0.27	Miles	$ 2,500,000	$ 675,000
1.11	Ramp CY Construction	0.11	Miles	$ 5,000,000	$ 550,000
1.12	Ramp D Construction	0.21	Miles	$ 2,000,000	$ 420,000
1.13	Ramp DY Construction	0.09	Miles	$ 4,000,000	$ 360,000
SUBTOTAL ROADWAY					**$13,065,000**
2.0 STRUCTURES					
2.01	NC 68 Bridge Widening (Additional Width Varies)	43,025	SF	$ 140.00	$ 6,023,500
SUBTOTAL STRUCTURES					**$6,023,500**
3.0 CONSTRUCTION COST SUMMARY					
	Subtotal Construction				$ 19,088,500
3.01	Engineering Contingency (10%)				$ 1,908,900
3.02	Planning Level Contingency (30%)				$ 5,727,000
3.03	Traffic Control	1	LS	$ 573,000	$ 573,000
SUB-TOTAL FACILITY CONSTRUCTION COST					**$27,297,400**
4.0 ROW and UTILITIES					
4.01	ROW (Land)	5.0	Acres	$ 180,000	$ 900,000
	Residential Relocatees	2	Each	$ 150,000	$ 300,000
	Commercial/Business Relocatees	0	Each	$ 550,000	$ -
	Right of Way Acquisition Contingency (50%)				$ 450,000
4.02	Relocate other Utilities	1.8	Miles	$ 1,000,000	$ 1,800,000
	Utilities Contingency (10%)				$ 180,000
SUBTOTAL ROW and UTILITIES					**$3,630,000**
TOTAL PROJECT COST SUMMARY					
Sub-Total Construction Cost					$ 27,297,400
Sub-Total ROW and Utilities					$ 3,630,000
TOTAL PROJECT COST (2008)					**$30,927,400**

SAY	**$31,000,000**

Notes:
1) The unit costs to construct this facility are based on the unit prices of recently constructed similar facilities and/or the latest average unit prices published by
2) Conceptual horizontal and vertical alignments are developed. Approximate quantities of major roadway and structure elements calculated from conceptual
3) Proposed drainage and utilities elements are not developed and quantities are not calculated individually for this estimate.
4) Approximate right-of-way needs estimated from conceptual design.
5) Unit costs of similar projects are used to calculate construction cost.
6) Contingencies are applied to the construction cost.
7) Environmental mitigation costs are not included.
8) Right-of-way unit costs determined from High Point and Guilford County GIS tax data (accessed December 2008).
9) This estimate does not account for noise barriers.

Table 4 – Full Cloverleaf Interchange Option
Planning-Level Opinion of Probable Cost

SECTION	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL COST
1.0 ROADWAY					
1.01	NC 68 Widening (Paving, Earthwork, Drainage, Striping, Signage, Landscaping, and Sidewalk)	0.75	Miles	$ 4,000,000	$ 3,000,000
1.02	US 311 Modification (Paving, Earthwork, Drainage, Striping, Signage, and Landscaping)	1.00	Miles	$ 5,600,000	$ 5,600,000
1.03	3 Lane Roadway (Gordon & Hilton Roads)	0.20	Miles	$ 3,700,000	$ 740,000
1.04	2 Lane Roadway (Cypress Court Realignment)	0.20	Miles	$ 2,800,000	$ 560,000
1.05	Roundabout	1.00	Each	$ 400,000	$ 400,000
1.06	Ramp Improvements	0.90	Miles	$ 2,000,000	$ 1,800,000
1.07	Ramp A Construction	0.30	Miles	$ 4,000,000	$ 1,200,000
1.08	Ramp B Construction	0.28	Miles	$ 2,000,000	$ 560,000
1.09	Ramp C Construction	0.34	Miles	$ 2,500,000	$ 850,000
1.10	Ramp D Construction	0.30	Miles	$ 2,000,000	$ 600,000
1.11	Loop Construction	1.00	Miles	$ 1,250,000	$ 1,250,000
SUBTOTAL ROADWAY					**$16,560,000**
2.0 STRUCTURES					
2.01	New NC 68 Bridge	38,230	SF	$ 120.00	$ 4,587,600
2.02	Widen Oak Hollow Bridge (Add. Width Varies)	46,000	SF	$ 140.00	$ 6,440,000
2.03	Remove Existing NC 68 Bridge	17,595	SF	$ 25.00	$ 439,875
SUBTOTAL STRUCTURES					**$11,467,475**
3.0 CONSTRUCTION COST SUMMARY					
	Subtotal Construction				$ 28,027,475.00
3.01	Engineering Contingency (10%)				$ 2,802,800.00
3.02	Planning Level Contingency (30%)				$ 8,409,000.00
3.03	Traffic Control	1	LS	$ 1,120,000	$ 1,120,000
SUB-TOTAL FACILITY CONSTRUCTION COST					**$40,359,275**
4.0 ROW and UTILITIES					
4.01	ROW (Land)	25.0	Acres	$ 180,000	$ 4,500,000.00
	Residential Relocatees	37	Each	$ 150,000	$ 5,550,000
	Commercial/Business Relocatees	2	Each	$ 550,000	$ 1,100,000
	Right of Way Acquisition Contingency (50%)				$ 2,250,000.00
4.02	Relocate other Utilities	2.5	Miles	$ 1,000,000	$ 2,500,000.00
	Utilities Contingency (10%)				$ 250,000.00
SUBTOTAL ROW and UTILITIES					**$16,150,000**
TOTAL PROJECT COST SUMMARY					
Sub-Total Construction Cost					$ 40,359,300
Sub-Total ROW and Utilities					$ 16,150,000
TOTAL PROJECT COST (2008)					**$56,509,300**

SAY	**$56,600,000**

Notes:
1) The unit costs to construct this facility are based on the unit prices of recently constructed similar facilities and/or the latest average unit prices published by
2) Conceptual horizontal and vertical alignments are developed. Approximate quantities of major roadway and structure elements calculated from conceptual
3) Proposed drainage and utilities elements are not developed and quantities are not calculated individually for this estimate.
4) Approximate right-of-way needs estimated from conceptual design.
5) Unit costs of similar projects are used to calculate construction cost.
6) Contingencies are applied to the construction cost.
7) Environmental mitigation costs are not included.
8) Right-of-way unit costs determined from High Point and Guilford County GIS tax data (accessed December 2008).
9) This estimate does not account for noise barriers.

3.2. Preliminary Interchange Design Concept Screening

Table 5 includes a comparative summary of the preliminary interchange design concepts.

Table 5 – Comparison of Preliminary Interchange Design Options

Interchange Design Option	Estimated Business Relocations	Estimated Residential Relocations	Estimated ROW Acquisition (Acres)	Design Exception	Planning-Level Opinion of Probable Cost (2008 $)
Partial Cloverleaf (Design Exception)	0	2	5.5	Yes	$24,200,000
Partial Cloverleaf (No Design Exception)	0	19	15.0	No	$31,400,000
SPUI	0	2	5.0	No	$31,000,000
Full Cloverleaf (No Design Exception)	2	37	25.0	No	$56,600,000

Based on Table 5, implementation of the Partial Cloverleaf (No Design Exception) Interchange and Full Cloverleaf Interchange design options would result in greater impacts to the adjacent properties. These two design options would also require construction of more new location stream crossings. Consequently, these design concepts were eliminated from further consideration. The Partial Cloverleaf (Design Exception) and SPUI have the fewest estimated residential relocations and require the least amount of right-of-way acquisition. Due to their reduced impact to adjacent properties, the Partial Cloverleaf (Design Exception) Interchange and SPUI were selected for more detailed analysis. This additional analysis included development of design year (2035) traffic projections, traffic capacity analyses, and a GIS-based environmental screening. The results of these additional analyses are discussed in Section 4 through Section 7 of this report.

4.0 TRAFFIC FORECASTS

4.1 Current Traffic Patterns and Volumes

The study area is characterized by heavy peak traffic flows. Although it does not have intense commercial development within the study area, NC 68 experiences heavy traffic throughout the day. Current directional peak flows along NC 68 during Non-Market periods are heavier in the southbound direction in the PM peak (with a 55/45 percent split) based on existing traffic data. For Market traffic conditions, directional peak flows alter along NC 68 and are heavier in the northbound direction in the PM peak with a 55/45 percent split.

Along US 311, the directional peak flows are heavier in the eastbound direction in the AM peak with a 60/40 percent split for both Non-Market and Market conditions. Generally, this distribution suggests that peak hour work trips in the study area are oriented towards Greensboro and the I-85 corridor in the AM peak and are reversed in the PM peak. Based on existing traffic count and forecast data, peak hour trips represent approximately 9 to 10 percent of the daily trip total.

In the study area, heavy vehicle percentages are highest along the NC 68 and US 311 corridors. Based on historic traffic counts provided by the City of High Point (2004 and 2005) and NCDOT (1986 through 2005) along NC 68, heavy vehicle percentages of 3 percent for dual-tired vehicles (duals) and 2 percent for trucks, trailers, and semi-trailers was used for this corridor. Based on 2025 traffic projections developed for the design of the US 311 project (STIP Project R-0609), heavy vehicle percentages of 8 percent for dual-tired vehicles and 7 percent for trucks, trailers, and semi-trailers were used for the US 311 corridor. For other minor streets, minimum values of 2 percent and 1 percent were used to forecast traffic for dual-tired vehicles and trucks, trailers, and semi-trailers, respectively.

4.2. Historic Traffic Trends

In order to develop traffic projections for the study area, various background data was compiled and analyzed to observe historic trends. This information included historic traffic counts from the North Carolina Department of Transportation (NCDOT), twelve hour traffic counts from the City of High Point, traffic forecasts for previous transportation projects in the area, and the current approved Triad Regional Travel Demand Model. This data, along with conversations with NCDOT Transportation Planning Branch and City of High Point, was used to develop the traffic forecasts discussed below. A more detailed description of this process can be found in the *US 311 / NC 68 Interchange Analysis Final Traffic Forecast Technical Memorandum* prepared by HNTB and dated May 19, 2008.

4.3. 2008 Traffic Forecast

The 2008 traffic forecasts for Non-Market and Market conditions are shown on **Figures 7 and 8**, respectively. Year 2008 base/calibration peak traffic count estimates were determined by growing 2005 peak counts by four (4) percent annually to 2008. The four percent annual growth was determined from historical annual average daily traffic (AADT) counts along NC 68. AADT turning movement volumes were determined from percentages of peak hour turns from the 2005 traffic counts. Along US 311, an approximate 2.5 percent annual growth rate was determined. Per discussions with High Point staff, portable variable message signs (VMS) are implemented along US 311 during the International Furnishings Market to direct Market traffic towards park-and-ride lots outside the downtown area. These VMS signs help to reduce traffic volumes at the NC 68 interchange by directing US 311 traffic towards the Kivett Drive and Johnson Street interchanges. These traffic pattern variations are consistent with Non-Market and Market traffic forecast volumes presented in the traffic forecast data developed for this project. This holds true for all forecasted years.

4.4. 2035 Traffic Forecast

The 2035 traffic forecasts for Non-Market and Market conditions are shown on **Figures 9 and 10**, respectively. Based upon the background information, including additional discussions with the City of High Point and NCDOT Transportation Planning Branch, it was determined that traffic volumes along NC 68 north of US 311 would generally grow 2.5 percent annually to 2035. The background information also indicated that traffic volumes on NC 68 south of US 311 would grow closer to 2.0 percent annually to 2035. Traffic volumes along NC 68 north of US 311 and the side-streets were grown 2.53 percent annually. Traffic volumes on NC 68 south of US 311 were grown 2.21 percent annually. These applied growth percentages were based on growth rates in the area and providing a balanced network. Traffic volumes were grown at same growth rate for both

the Market and Non-Market traffic scenarios. In general, Non-Market traffic forecasts are predicted to have higher quadrant turning movements at the NC 68/US 311 interchange and along US 311 to the east in comparison to Market conditions. Market traffic forecasts are expected to have slightly higher volumes along NC 68 and US 311 to the west than Non-Market conditions.

5.0 TRAFFIC CAPACITY ANALYSIS

Evaluating traffic operations on suburban arterials is generally done by the determination of level of service (LOS) criteria. The level of service correlates qualitative aspects of traffic flow to quantitative terms. This enables transportation professionals to take the qualitative issues, such as congestion and substandard geometrics, and translate them into measurable quantities, such as operating speeds and vehicular delays. The *2000 Highway Capacity Manual (HCM 2000)* characterizes level of service by letter designations A through F. Level of service A represents ideal low-volume traffic operations, and level of service F represents over-saturated, high-volume traffic operations. Level of service for intersections is determined by average delay per vehicle. Level of service letter designations and criteria for arterial intersections are determined by the delay per vehicle (sec.). Level of service for freeway facilities are determined by average density in passenger cars per mile per lane (pc/mi/ln).

Using the aforementioned traffic forecasts to derive peak hour traffic volumes, level of service (LOS) traffic analyses were then conducted to evaluate existing (2008) and design year (2035) conditions. Due to the previously discussed traffic pattern and volume changes during the semiannual International Home Furnishings Market (Market), traffic analyses were conducted for each scenario under both Market and Non-Market traffic conditions.

Detailed discussion and complete tabular data associated with the traffic analyses can be found in the *City of High Point: US 311 / NC 68 Interchange Analysis – Final Traffic Analysis Technical Memorandum* developed by HNTB and dated December 23, 2008.

The following section provides information on the traffic capacity analysis results. Schematic laneage configurations and computed levels of service for the analyzed scenarios are shown in **Figures 11 through 18**.

5.1. 2035 No-Build Scenario

The City of High Point, in coordination with NCDOT, developed plans to provide dual left-turn lanes from southbound NC 68 to southbound US 311 by re-striping existing NC 68 and the NC 68/US 311 interchange bridge deck. With this re-striping, a third southbound through lane will be developed on NC 68 approximately 1,000' north of Hilton Court. This additional lane will be dropped as the second left-turn lane at the US 311 southbound ramp intersection.

Since the NC 68 re-striping improvements were implemented during the course of this study, they were utilized as the basis of comparison for all design year build scenarios. **Figure 2** schematically shows the 2008 existing roadway geometrics and intersection traffic control evaluated for the 2035 No-Build scenario.

For the 2035 No Build scenario, all signalized and unsignalized intersections operate at LOS F with excessive queues and delays for both Non-Market and Market traffic conditions in the AM and PM peak hours. All signalized and unsignalized intersections operate well over capacity with the existing laneage and traffic can not be adequately processed due to the lack of additional capacity and laneage along NC 68, the US 311 ramp terminals, and at Gordon Road. Heavy volumes of NC 68 north-south through traffic, heavy volumes of NC 68 traffic from the north accessing US 311, and the close signal spacing (approximately 400') of NC 68/Gordon Road to the interchange intersections also contribute to the poor level of service operations. In the 2035 No-Build scenario, US 311 ramp junctions remain the same as existing conditions and the ramps along US 311 northwest of NC 68 are expected to operate at LOS F while all junctions southeast are predicted to operate at LOS D or better. This difference in traffic operations performance is attributed to the fact that US 311 is a six-lane section southeast of the NC 68/US 311 interchange.

Figures 11 and 12 show 2035 No-Build Non-Market and Market level of service, respectively. **Tables 6 and 7** present the intersection and freeway capacity analysis results the 2035 No-Build traffic analyses, respectively.

5.2. 2035 Build Scenarios

Two potential interchange improvement configurations were evaluated under 2035 traffic conditions as part of the 2035 Build scenarios. The interchange improvement options are further described below.

Partial Cloverleaf (Design Exception) Interchange (PCDE)

This scenario proposes a partial cloverleaf interchange with loop ramps in the northeast and southwest quadrants, which remove left-turns from NC 68 to US 311. **Figure 13** schematically shows the laneage analyzed for the 2035 Build PCDE scenario.

Required improvements include the provision of triple right-turns from US 311 northbound to NC 68 northbound and triple left-turns from US 311 southbound to NC 68 northbound. An additional NC 68 northbound through lane is provided from south of the interchange, near York Avenue, to approximately 1,000 feet north of Hilton Court. This additional northbound through lane is necessary to receive triple turn lanes and to help progress traffic through the interchange and adjacent signalized intersections. Because there are no planned capacity improvements to NC 68, the traffic analysis for this scenario was completed with the assumption that NC 68 would remain a four-lane typical section in 2035. This provided a worse case evaluation of design year traffic operations.

Even with the improvements proposed under this scenario, the interchange ramp intersections are expected to operate at or above capacity in the design year. The operations of the ramps are further hindered by the closely spaced signalized intersection of realigned Gordon Road and Hilton Court. The intersection of NC 68/Hilton Court is expected to operate at LOS F in 2035 and negatively impact the operations of the adjacent interchange intersections. Based up the simulation runs, traffic queues on the extension of Hilton Court are expected to extend into adjacent intersections on Gordon Road, which could result in gridlock.

Figures 14 and 15 show the Partial Cloverleaf (Design Exception) interchange concept (PCCE) Non-Market and Market level of service results, respectively. **Tables 6 and 7**

present the intersection and freeway capacity analysis results for the PCDE traffic analyses, respectively.

Single Point Urban Interchange (SPUI)

This scenario evaluates the potential of replacing the existing interchange configuration with a single point urban interchange (SPUI).

Figure 16 schematically shows the laneage analyzed for the 2035 Build SPUI scenario.

As with the PCDE scenario, triple right-turns from US 311 northbound to NC 68 northbound and triple left-turns from US 311 southbound to NC 68 northbound are recommended as well as dual left-turn lanes from NC 68 northbound and southbound to US 311. An additional northbound through lane is provided from south of the interchange to approximately 1,000 feet north of the Hilton Court intersection to receive these triple turn lanes and help to progress traffic through the interchange area and signalized intersections. Because there are no planned capacity improvements to NC 68, the traffic analysis for this scenario was completed with the assumption that NC 68 would remain a four-lane typical section in 2035. This provided a worse case evaluation of design year traffic operations.

Even with the improvements proposed under this analysis scenario, the center three-phase single point ramp intersection is expected to operate at LOS F in the design year. The operations of the ramps are further hindered by the closely spaced signalized intersection of realigned Gordon Road and Hilton Court, but this is improved from the 2035 Build PCDE scenario. The intersection of NC 68/Hilton Court is expected to operate at LOS F in 2035 and negatively impact the operations of the adjacent interchange intersections. Even though, as part of the scenario, this intersection is relocated further away from the interchange, its poor operations result in spillback queues onto the interchange intersections. This poor intersection operation also results in considerable queuing in the northbound direction, which results in US 311 ramp queues extending to the US 311 northbound and southbound mainline by the design year and northbound queues along NC 68 extending beyond York Avenue.

Figures 17 and 18 show SPUI Non-Market and Market level of service, respectively. Tables 6 and 7 present the intersection and freeway capacity analysis results for the SPUI traffic analyses, respectively.

Table 6 – 2035 Scenarios Intersection LOS and Delay Summary

Intersections	Time Period	2035 No-Build Non-Market		2035 No-Build Market		2035 Build PCDE Non-Market		2035 Build PCDE Market		2035 Build SPUI Non-Market		2035 Build SPUI Market	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
US 311 NB Ramp / NC 68	AM	***405.6***	***F***	***255.8***	***F***	***61.6***	***E***	***56.4***	***E***	49.0	D	16.7	B
	PM	***355.8***	***F***	***410.3***	***F***	***101.8***	***F***	***89.4***	***F***	15.1	B	***65.6***	***E***
US 311 NB and SB Ramps / NC 68	AM									***135.7***	***F***	***239.1***	***F***
	PM									***109.6***	***F***	***113.4***	***F***
US 311 SB Ramp / NC 68	AM	***269.8***	***F***	***268.6***	***F***	41.3	D	***109.6***	***F***	7.5	A	***86.5***	***F***
	PM	***165.5***	***F***	***208.9***	***F***	***66.0***	***E***	44.1	D	42.9	D	13.6	B
NC 68 / Gordon Road / Cypress Court	AM	***302.6***	***F***	***282.2***	***F***								
	PM	***238.3***	***F***	***287.1***	***F***								
WB RT	AM					16.9	C	19.7	C	16.7	C	16.7	C
	PM					11.6	B	16.7	C	11.7	B	18.4	C
NC 68 / Hilton Court	AM					***132.1***	***F***	***63.9***	***E***	***97.7***	***F***	42.2	D
	PM					***142.5***	***F***	***80.6***	***E***	***72.6***	***E***	49.5	D
NB LT	AM	***87.4***	***F***	***96.2***	***F***								
	PM	***306.4***	***F***	***52.0***	***F***								
EB LT	AM	***720.1***	***F***	#	***F***								
	PM	#	***F***	***435.8***	***F***								
NC 68 / Timberlake Avenue													
NB LT	AM	***104.9***	***F***	#	***F***	***95.0***	***F***	***275.4***	***F***	***116.6***	***F***	#	***F***
	PM	***5159.0***	***F***	***761.9***	***F***	***3805.0***	***F***	***479.0***	***F***	#	***F***	***1363.4***	***F***
EB LT	AM	***441.3***	***F***	#	***F***	***397.6***	***F***	#	***F***	***418.3***	***F***	#	***F***
	PM	#	***F***	#	***F***	#	***F***	#	***F***	#	***F***	#	***F***
NC 68 / York Avenue													
NB LT	AM	***107.7***	***F***	#	***F***	***97.5***	***F***	***5049.0***	***F***	***122.3***	***F***	#	***F***
	PM	***4892.0***	***F***	***882.6***	***F***	***3751.9***	***F***	***579.0***	***F***	#	***F***	***1495.3***	***F***
EB LT	AM	***466.8***	***F***	#	***F***	***438.1***	***F***	#	***F***	***484.1***	***F***	#	***F***
	PM	#	***F***	#	***F***	#	***F***	#	***F***	#	***F***	#	***F***

# => No movement capacity predicted by HCM Methodology. Delay theoretically infinite.
PCDE = Partial Cloverleaf (Design Exception) Interchange
SPUI = Single Point Urban Interchange Design

Table 7 – 2035 Scenarios Freeway LOS and Delay Summary

Segment (limits)	Analysis Type	Period	2035 No-Build / Build SPUI Non-Market		2035 No-Build / Build SPUI Market		2035 Build PCDE Non-Market		2035 Build PCDE Market	
			LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
US 311 NB - South of NC 68	Freeway	AM	C	19.8	B	17.6	C	19.8	B	17.6
		PM	D	29.2	D	26.9	D	29.2	D	26.9
NC 68 NB Ramp	Ramp	AM	N/A	UNDER	N/A	UNDER	N/A	UNDER	N/A	UNDER
		PM	N/A	UNDER	N/A	UNDER	N/A	UNDER	N/A	UNDER
US 311 NB - Between NC 68 Ramps	Freeway	AM	C	19.8	C	20.1	C	19.8	C	20.1
		PM	D	32.0	D	32.2	D	32.0	D	32.2
US 311 NB - From NC 68 NB Loop Ramp	Merge	AM					B	19.1	B	19.4
		PM					D	30.2	D	31.0
US 311 NB - From NC 68 Ramp	Merge	AM	C	20.9	C	21.5	C	21.0	C	21.7
		PM	***F***	*	***F***	*	***F***	*	***F***	*
US 311 NB - North of NC 68	Freeway	AM	D	27.9	D	28.6	D	27.9	D	28.6
		PM	***F***	***N/A***	***F***	***N/A***	***F***	***N/A***	***F***	***N/A***
US 311 SB - North of NC 68	Freeway	AM	***F***	***N/A***	***F***	***N/A***	***F***	***N/A***	***F***	***N/A***
		PM	D	27.9	D	28.6	D	27.9	D	28.6
US 311 SB - To NC 68	Diverge	AM	***F***	***45.1***	***F***	***44.6***	***F***	***45.1***	***F***	***44.6***
		PM	D	30.3	D	31.0	D	30.3	D	31.0
US 311 SB - From NC 68 SB Loop Ramp	Merge	AM					***F***	*	D	34.4
		PM					C	24.0	C	21.9
US 311 SB - From NC 68	Merge	AM	C	26.4	C	23.4	C	23.7	C	21.2
		PM	B	17.8	B	14.8	B	15.4	B	13.2
US 311 SB - South of NC 68	Freeway	AM	D	29.2	D	26.9	D	29.2	D	26.9
		PM	C	19.8	B	17.6	C	19.8	B	17.6

N/A => Not Applicable, i.e. movement is non-existent or no improvements made
UNDER => Ramp operates under capacity
PCDE = Partial Cloverleaf (Design Exception) Interchange
SPUI = Single Point Urban Interchange Design

SimTraffic simulation runs were used to supplement the intersection analysis for the two interchange improvement concepts. As shown in Table 8, considerable improvements in the network total delay, delay per vehicle, average speed, and vehicles entered/exited are expected between the 2035 No-Build and the 2035 Build scenarios. Generally, the PCDE and SPUI Non-Market scenarios are expected to reduce network total delay by approximately 46 and 44 percent, reduce network delay per vehicle by approximately 59 and 58 percent and both allow approximately 33 percent more vehicles to traverse (enter and exit) the network during peak hours, respectively, while improving network travel speeds. As indicated, the PCDE and SPUI analysis scenarios have similar results in terms of traffic operations.

Table 8 – 2035 Scenarios SimTraffic Measure of Effectiveness Summary

Measure of Effectiveness	2035 No-Build Non-Market		2035 No-Build Market		2035 Build PCDE Non-Market		2035 Build PCDE Market		2035 Build SPUI Non-Market		2035 Build SPUI Market	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Network Total Delay (hrs)	2667.3	2205.7	2133.3	2391.9	1435.1	1212.7	1118.4	921.6	1525.0	1182.9	1186.8	894.5
Network Delay / Vehicle (sec)	1767.7	1304.9	1211.0	1490.5	690.7	563.2	461.8	407.5	751.8	542.6	537.7	379.0
Network Average Speed (mph)	7	9	8	8	9	11	10	11	8	12	10	11
NB NC 68 Speed (mph)	9	7	10	9	6	10	13	9	6	15	12	11
SB NC 68 Speed (mph)	8	20	16	14	23	23	11	17	14	24	12	19
Vehicles Entered	5515	6160	6448	5875	7584	7881	8832	8242	7439	7927	8057	8586
Vehicles Exited	5346	6018	6237	5680	7372	7619	8604	8040	7167	7773	7832	8404

PCDE = Partial Cloverleaf (Design Exception) Interchange
SPUI = Single Point Urban Interchange Design

5.3. Traffic Analysis Results

The traffic analysis results show that both 2035 Build scenarios provide considerable operational benefits to the study area above 2008 existing roadway geometrics. Based on the 2035 analysis, the Partial Cloverleaf (Design Exception) interchange (PCDE) and Single Point Urban Interchange (SPUI) scenarios operate very similarly under future projected traffic volumes. In 2035, both scenarios have signalized intersections that are expected to operate at or above capacity with similar queues along NC 68 and the US 311 northbound and southbound ramps. The operations of the ramps are further hindered by the closely spaced signalized intersection of realigned Gordon Road and Hilton Court in both scenarios.

Although the traffic analyses show that the PCDE and SPUI scenarios operate similarly, the Partial Cloverleaf (Design Exception) design option requires the introduction of two additional merge conflict points along US 311. These additional merge ramps would require a shift the US 311 mainline to the median to accommodate the ramps. However, both interchange configurations work well with appropriate signage and pavement marking.

US 311

Based on the traffic capacity analysis, US 311 northwest of NC 68 is expected to operate over capacity as a four-lane section in 2035. Therefore, US 311 northwest of NC 68 and the US 311 bridges over Oak Hollow Lake would require widening to a six-lane divided highway facility to operate under capacity in 2035. Because it is outside of the scope of this interchange study, no traffic analysis was completed for the recommended six-lane section on US 311.

NC 68

The North Carolina Level of Service (NCLOS) planning-level roadway capacity software, which is based on field data collected from North Carolina roadways, indicates that a four-lane suburban principal arterial with auxiliary lanes, such as existing NC 68 within the study area, is expected to operate with a maximum AADT of 41,500 before reaching LOS E and 44,400 before reaching LOS F. Based on the traffic projections developed for this study, NC 68 currently operates with approximately 50,000 Annual Average Daily Traffic (AADT) north of US 311 and 40,000 AADT south of US 311. The existing poor intersection LOS and delay results along the NC 68 corridor show that peak hour intersection capacities are currently being reached along the corridor.

NC 68 is projected to have approximately 85,000 AADT north of US 311 and 65,000 AADT south of US 311 in 2035. With these projected 2035 daily traffic volumes, NC 68 will operate well over capacity as a four-lane section. NCLOS and intersection capacity analyses show a need to upgrade NC 68 to a six-lane section by year 2035 to provide additional capacity along the network corridor. If NC 68 is widened to a six-lane section, consideration should be given to widening existing bridge structures along NC 68, such as the bridge at the base of the Oak Hollow Lake Dam north of US 311, and beginning the bridge widening process to accommodate the roadway cross-section.

Based on existing and future intersection traffic operations along NC 68, Timberlake Avenue should be considered for restriction to right-in/right-out only operation and York Avenue should be considered for signalization. In the 2035 analysis, the intersection of NC 68 and Timberlake Avenue was analyzed as a full-movement unsignalized T-intersection. With this provision, Timberlake Avenue operates at LOS F with considerable turning movement delays. Since this intersection is located in close proximity to the interchange, this intersection should be considered for restricted right-in/right-out access to improve intersection and corridor operations. Full-movement access to NC 68 would still be available to Timberlake Avenue residences through a cross-connection to York Avenue, a full-movement intersection, via Merrimon Place. Although York Avenue may meet the peak hour signal warrant analysis at or before year 2035 (with or without restricting Timberlake Avenue) this intersection should be monitored for future signalization and a full signal warrant study should be conducted before determination of signal installation. Installation of a signal at York Avenue would provide approximately 1,000 foot spacing from the existing signalized US 311 southbound ramp terminal. The existing York Avenue cross-section appears to have sufficient width to be re-striped to provide an exclusive left-turn and an exclusive right-turn lane with signalization.

6.0 COMMUNITY ISSUES

There is one municipal fire station (Fire Station #13) located immediately adjacent to the NC 68/US 311 interchange study area (see **Figure 19**). This facility is located on the south side of Ambassador Court. There are no schools located within the study area.

There is one park (Oak Hollow Park) within the study area. Based on the National Park Service's online database (http://www.nps.gov/ncrc/programs/lwcf/, accessed December 2008), portions of this facility were constructed with funds from the Land and Water Conservation Fund (LWCF). Section 6(f) of the Land and Water Conservation Act requires that any recreation lands that have received LWCF money and are converted to non-recreational purposes must be replaced with land of equal or greater value, location, and

usefulness. Land conversions for this purpose must be approved by the US Department of the Interior – National Park Service. In North Carolina, the LWCF program is administered by the NC Department of Environment and Natural Resources Division of Parks and Recreation. Based on the interchange design concept plans developed as part of this study, it is anticipated that no land from Oak Hollow Park would be required to construct the proposed interchange improvements.

A cursory review of 2000 U.S. Census Data (see **Table 9**) indicates that there is a higher concentration of African American population in the eastern portion of the study area.

Table 9 – Study Area Characteristics

Area	Total Population (2000)	% African American (2000)	% Hispanic (2000)	% Below Poverty (2000)	Median Income (1999)	Median Age (2000)
Census Tract 144.02, Block Group 1	4,408	12.8%	4.5%	7.8%	$40,191	34.8
Census Tract 144.05, Block Group 2	4,238	42.1%	3.8%	3.3%	$46,367	33.9
Guilford County	421,048	29.0%	3.8%	10.6%	$42,618	34.9
North Carolina	8,049,313	21.4%	4.7%	12.3%	$39,184	35.3

Source: US Census Bureau, Summary File 1, Tables P1, P8, P13 & Summary File 3, Table P53, P87 (2000)

7.0 NATURAL ENVIRONMENT ISSUES

As part of the study, a review of existing GIS data (www.nconemap.com, accessed June 2008) and existing regulatory agency databases was completed to identify environmental issues within the project study area. This review is preliminary in nature and is not intended to substitute for the project planning/environmental documentation process. Consequently, no natural systems field investigations were completed as part of this task. The purpose of this screening is to identify potential environmental issues early. The results of the GIS-based environmental screening are shown on **Figure 19**.

Floodplains

Guilford County is a participant in the National Flood Insurance Program. According to GIS floodplain information provided the City of High Point, the proposed project corridor will cross the 100-year floodplain of Oak Hollow Lake. The location of this floodplain crossing is shown in **Figure 19**. No determination was made as to whether the proposed project will result in a modification to the existing Federal Emergency Management Agency (FEMA) floodplain.

Stream Classification

The proposed project is located in the Cape Fear River Basin. There are two Water Supply IV (WS-IV) Watersheds within the project study area: West Fork Deep River and East Fork Deep River. Waters within WS-IV watersheds are used as sources of water supply for drinking, culinary, or food processing purposes for those users where a WS-I, WS-II, or WS-III classification is not feasible. WS-IV waters are generally located within moderately to highly developed watersheds.

The proposed improvements to roadways intersecting NC 68 under both the Partial Cloverleaf (Design Exception) and SPUI scenarios will require construction of one new stream crossing of an Unnamed Tributary to West Fork Deep River.

Wetlands

National Wetland Inventory (NWI) GIS mapping was reviewed to determine whether the proposed improvements may impact wetlands. No delineation of jurisdictional resources or agency coordination was conducted as part of this study. Based on the NWI GIS mapping (see Figure 19), there are some wetland areas immediately adjacent to Oak Hollow Lake. These areas are located on the fringes of the study area and outside the anticipated construction limits. Therefore, no impacts to NWI wetlands are anticipated.

Historic Properties and Archaeological Sites

As part of the environmental screening process, existing GIS data was reviewed for the presence of any known historic properties and archaeological sites within the study area. This information did not manifest any properties or structures within the study area that were listed on the National Register of Historic Places or state study lists. For the purposes of this screening, a field visit was also conducted to identify structures that had the potential to be greater than 50 years in age. Based on the field observations, no additional structures were identified as potentially eligible for inclusion on the National Register based on the age criteria.

Threatened and Endangered Species

The North Carolina Natural Heritage Program (NCNHP) database was queried to determine the presence of protected species within the study corridor. Table 10 summarizes the results of the NCNHP database query.

Table 10 – Potential State and Federally-Protected Species

Common Name	Scientific Name	Federal Status	State Status	USGS Quad Map
Vascular Plant:				
Appalachian Golden-banner	*Thermopsis mollis*	N/A	Significantly Rare – Peripheral	Guilford
American Barberry	*Berberis canadensis*	N/A	Significantly Rare – Threatened	High Point East
Piedmont Horsebalm	*Collinsonia tuberosa*	N/A	Significantly Rare – Peripheral	High Point East
Schweinitz's Sunflower	*Helianthus schweinitzii*	Endangered	Endangered	High Point East
Vertebrate Animal:				
Loggerhead Shrike	*Lanius ludovicianus*	N/A	Special Concern	Guilford
Crustacean:				
Greensboro Burrowing Crayfish	*Cambarus catagius*	N/A	Special Concern	Guilford High Point East
Natural Community:				
N/A	*Upland depression swamp forest*	N/A	N/A	High Point East

Source: North Carolina Natural Heritage Program; Guilford and High Point East USGS topographic quadrangles, http://www.ncnhp.org (accessed December 2008).

Air Quality

The study area is located entirely within Guilford County. The US Environmental Protection Agency (USEPA) has classified Guilford County as a maintenance area under the 1-hour ozone standard. USEPA also classifies Guilford County as nonattainment for fine particulate matter ($PM_{2.5}$). High Point's Long Range Transportation Plan conforms to the State Implementation Plan for these three pollutants.

As part of this study, an analysis of emission outputs produced by SimTraffic microsimluation software was also conducted. This analysis is not intended to take the place of a project-level air quality analysis; however, the emissions data provided by SimTraffic can be used to estimate the relative projected air quality effect associated with implementation of the two design options. As shown in **Tables 11 and 12**, the 2035 No-Build, 2035 Build Partial Cloverleaf (Design Exception) Interchange option (PCDE), and 2035 Build Single Point Urban Interchange (SPUI) were analyzed for the AM and PM peak time periods for both Non-Market and Market conditions.

Table 11–SimTraffic Emissions Data for Partial Cloverleaf (Design Exception) Option

Parameter	Non-Market						Market					
	2035 No-Build AM	2035 Build PCDE AM	% Change	2035 No-Build PM	2035 Build PCDE PM	% Change	2035 No-Build AM	2035 Build PCDE AM	% Change	2035 No-Build PM	2035 Build PCDE PM	% Change
Fuel Used (Gal)	756.8	538.8	-28.8 %	674.9	494.2	-26.8 %	661.7	472.4	-28.6 %	703.4	428.0	-39.2 %
HC Emissions (kg)	5.60	5.05	-9.8 %	5.24	4.87	-7.1 %	5.16	4.74	-8.1 %	5.05	4.52	-10.5 %
CO Emissions (kg)	143.26	146.13	2.0 %	148.28	146.29	-1.3 %	142.32	136.36	-4.2 %	140.66	133.27	-5.3 %
NOx Emissions (kg)	11.47	13.94	21.5. %	12.45	13.97	12.2 %	12.46	13.08	5.0 %	11.44	13.06	14.2 %

PCDE = Partial Cloverleaf (Design Exception) Interchange

Table 12–SimTraffic Emissions Data for Single Point Urban Interchange (SPUI) Option

Parameter	Non-Market						Market					
	2035 No-Build AM	2035 Build SPUI AM	% Change	2035 No-Build PM	2035 Build SPUI PM	% Change	2035 No-Build AM	2035 Build SPUI AM	% Change	2035 No-Build PM	2035 Build SPUI PM	% Change
Fuel Used (Gal)	756.8	553.5	-26.9%	674.9	489.4	-27.5%	661.7	512.5	-22.5%	703.4	447.0	-36.5%
HC Emissions (kg)	5.60	5.48	-2.1%	5.24	5.36	2.3%	5.16	5.31	2.9%	5.05	4.75	-5.9%
CO Emissions (kg)	143.26	150.58	5.1%	148.28	158.77	7.1%	142.32	145.54	2.3%	140.66	139.53	-0.8%
NOx Emissions (kg)	11.47	14.04	22.4%	12.45	15.11	21.4%	12.46	13.75	10.4%	11.44	13.32	16.4%

SPUI = Single Point Urban Interchange

Based on the information contained in **Tables 11 and 12**, both 2035 Build scenarios show an overall decline in total network fuel consumption. This decrease in fuel consumption could be attributed to the lack of idle time experienced by drivers in the 2035 Build conditions. Although total fuel consumption will decrease by at least 22 percent in each of the 2035 Build peak hour periods, the Partial Cloverleaf (Design Exception) interchange (PCDE) option results in a greater reduction of total network fuel consumption.

Hydrocarbons (HC) are a precursor to ground-level ozone, a serious air pollutant in cities across the United States. Hydrocarbon emissions result from incomplete fuel combustion and from fuel evaporation[6]. The HC emissions for the PCDE design option will be reduced by at least 7 percent for each peak hour period. In contrast, the HC emissions for the SPUI design option will increase in one peak hour period of both the Non-Market and Market conditions.

Carbon monoxide (CO) is a colorless, odorless and poisonous gas that forms when carbon in fuel doesn't burn completely (incomplete combustion). The main source of carbon monoxide in the atmosphere is vehicle emissions[7]. Based on the SimTraffic results, the CO emission levels for the PCDE design option decreased in all but one peak period (2035 Non-Market AM peak). On the other hand, the CO emission levels for the SPUI design option increased in all but one peak hour period (2035 Market PM peak).

Nitrogen oxides (NOx) form when fuel burns at high temperatures, such as in motor vehicle engines. Mobile sources are responsible for more than half of all nitrogen oxide emissions in the United States. Both on-road and nonroad mobile sources are major nitrogen oxide polluters[8]. In the 2035 Build scenarios, more vehicles can be processed through the study area roadway network. As a result, NOx emission levels are expected to increase overall for each design option. Based on the SimTraffic data, the SPUI design option will result in higher NOx emissions than the PCDE design option. However, it is important to note that NOx emissions per vehicle are expected to decrease for all 2035 Build scenarios.

Hazardous Materials

GIS databases (www.nconemap.com, accessed June 2008) were reviewed because of the liability associated with purchasing properties containing hazardous materials. Based on the existing databases, there are no sites within the study area that were determined to contain potential hazardous materials.

8.0 PREFERRED CONCEPT

The NC 68/US 311 interchange is a priority focus of the City's efforts to improve areas of localized congestion. Based on the analyses completed as part of this study, the construction of measures to enhance the traffic carrying capacity of the interchange are feasible from an engineering and environmental perspective. **Table 13** summarizes the details of the two interchange design options evaluated in further detail as part of this study.

[6] US Environmental Protection Agency, http://www.epa.gov/OMS/invntory/overview/pollutants/, accessed January 2009.
[7] Ibid.
[8] Ibid.

Although the Partial Cloverleaf (Design Exception) and SPUI provide similar benefits in terms of traffic operations, there is a cost savings (approximately 28%) associated with the implementation of the Partial Cloverleaf (Design Exception) Interchange design option. The anticipated impact to adjacent properties is relatively similar between the two design options. However, the Partial Cloverleaf (Design Exception) option does not require re-alignment of US 311 to meet Interstate design standards for vertical clearance associated with a widened NC 68 bridge. Additionally, based on the SimTraffic emission outputs, the Partial Cloverleaf (Design Exception) option offers a slight advantage in terms of relative air quality effects. Consequently, the Partial Cloverleaf (Design Exception) interchange option was identified as the preferred concept to address the traffic operational deficiencies in the area of NC 68/US 311 interchange.

Table 13 – Comparison of Detailed Study Interchange Design Options

Evaluation Category	Interchange Design Option	
	Partial Cloverleaf (Design Exception)	SPUI
Estimated Business Relocations	0	0
Estimated Residential Relocations	2	2
Estimated ROW Acquisition (Acres)	5.5	5.0
Design Exception	Yes	No
Re-alignment of US 311	No	Yes
Federally-Protected Species Present in USGS Quadrangle	Yes	Yes
Potential Wetland and Stream Impacts	Yes	Yes
Potential Effects to National Register Properties	No	No
Hazardous Materials Site Encroachment	No	No
Section 6(f) Resource Encroachment	No	No
2035 Total Fuel Used* (Gal)		
Non-Market (Market)	1,213.7 (1,134.1)	1,228.4 (1,215.9)
2035 Total HC Emissions* (kg)		
Non-Market (Market)	10.29 (9.79)	10.72 (10.36)
2035 Total CO Emissions* (kg)		
Non-Market (Market)	294.41 (277.02)	298.86 (286.20)
2035 Total NOx Emissions* (kg)		
Non-Market (Market)	26.39 (23.90)	26.49 (25.19)
Planning-Level Opinion of Probable Costs (2008 $)	$24,200,000	$31,000,000

* - Total of AM and PM peak hour periods
Note: Table based on conceptual design plans, existing GIS data, SimTraffic emission data, and existing regulatory agency databases.

9.0 CONSTRUCTABILITY OF PREFERRED CONCEPT

In order to minimize impacts to adjacent properties, including lands associated with Oak Hollow Park, the proposed loop ramps associated with the Partial Cloverleaf (Design Exception) option would have proposed radii of 150 feet. This may also require a design exception from the Federal Highway Administration (FHWA). Additionally, due to the geometrics of the existing ramps and US 311, the proposed loop ramps would have acceleration lane lengths of approximately 1,000 feet. This may require a design exception from FHWA. However, the 1,000 feet of acceleration lane is the maximum distance that can be implemented for the loop ramp to US 311 northbound without having to modify the existing ramp terminal and widen the existing bridges over Oak Hollow Lake. Although this acceleration length is less than indicated in the AASHTO design guidelines, the traffic analysis indicates that the loop ramp to US 311 northbound is anticipated to operate at LOS D in the worse case peak hour. The loop ramp to US 311 southbound is also anticipated to operate at LOS F in the worse case peak hour. However, it is believed that the poor operations of the southbound loop ramp can be attributed to the limited mainline capacity of US 311 rather than the length of the acceleration lane.

Bridge widening concept plans were also developed to further evaluate the feasibility of widening the existing NC 68 bridge over US 311 to accommodate the Partial Cloverleaf (Design Exception) interchange design option. The NC 68 bridge widening concept plans can be found in **Appendix B**. Based on the concept plans, the proposed widening of the NC 68 bridge is structurally feasible. The design concept proposes widening of the existing NC 68 bridge to accommodate an eight-lane section with a clear roadway width of 102 feet. In order to preserve required minimum vertical clearances, the NC 68 bridge would be widened approximately 12 feet to the east side and 32.5 feet to the west side. The proposed bridge would also include a 6-foot wide sidewalk on its west side. Assuming extension of the existing normal crown slopes on the bridge and the existing super-elevated section on US 311, the minimum vertical clearance of 16.5 feet would occur over northbound US 311. The vertical clearance over US 311 southbound would be 17.5 feet.

The widening of the NC 68 bridge superstructure to both sides cannot occur concurrently while maintaining existing traffic. Therefore, the construction schedule will be lengthened to allow for phased construction. One additional column will be required for the widening of the NC 68 bridge to the east side at each interior bent. Two additional columns would be required for widening of the NC 68 bridge to the west side at each interior bent. Foundations of the proposed bridge widening would likely be consistent with the existing pile and spread footings. Temporary barrier rail would be required at all bent construction and shoring may be required at Bent #1 and Bent #3 to protect traffic on US 311.

The traffic analysis completed as part of this interchange study also indicated a need to provide additional capacity on US 311 northwest of the NC 68/US 311 interchange by the design year of 2035. Consequently, a cursory assessment of the existing US 311 bridges over Oak Hollow Lake was also completed to determine if these structures could be widened to accommodate capacity improvements to US 311. The widening of the existing US 311 bridges over Oak Hollow Lake to the outside is structurally feasible. However, the existing span arrangement and superstructure type are not anticipated to be suitable for top-down construction. Therefore, a temporary work bridge would be required to facilitate the widening of the bridges. Once a design concept is developed, the structure elevations

should be checked against the design high water elevation to ensure that sufficient vertical clearance is provided. If capacity improvements are implemented on US 311 northwest of the NC 68 interchange, consideration should also be given to ensure sufficient distances are provided for traffic merging onto US 311 from NC 68.

10.0 PHASING OF PREFERRED CONCEPT

Should it be determined that funding is limited, the opportunity exists to phase construct the Partial Cloverleaf (Design Exception) Interchange option. Using this approach, modifications to the minor roadways intersecting NC 68 in the study area (i.e., Hilton Court, Cypress Court, and Gordon Road) and the widening of the NC 68 bridge to an eight-lane structure would be constructed first as a separate project. A plan for the intermediate widening concept can be found in Figure 20. The proposed loop ramps in the northeast and southwest interchange quadrants would then be constructed under a later project and as shown in Figures 3A and 3B.

In order to assist the City in considering options for phased construction of the capacity improvements to the NC 68/US 311 interchange, the opinion of probable costs for the Partial Cloverleaf (Design Exception) Interchange option was further broken down into two phases:

- Phase 1 – Intermediate Widening – includes modifications to Cypress Court, Hilton Court, Gordon Road and widening of NC 68; and
- Phase 2 – Partial Cloverleaf (Design Exception) Ramps – includes construction of loop ramps, modifications to existing ramps and US 311, and minor widening of NC 68 in the area of the interchange.

The opinions of probable cost for these two project phases are provided in Tables 14 and 15.

Table 14 – Planning-Level Opinion of Probable Cost for Phased Project – Phase 1 – Intermediate Widening

SECTION	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL COST
1.0 ROADWAY					
1.01	NC 68 Widening (Paving, Earthwork, Drainage, Striping, Signage, Landscaping, and Sidewalk)	0.55	Miles	$ 4,000,000	$ 2,200,000
1.02	3 Lane Roadway (Gordon & Hilton Roads)	0.20	Miles	$ 3,700,000	$ 740,000
1.03	2 Lane Roadway (Cypress Court Realignment)	0.30	Miles	$ 2,800,000	$ 840,000
1.04	Roundabout	1.00	Each	$ 400,000	$ 400,000
1.05	Ramp Improvements	0.90	Miles	$ 2,000,000	$ 1,800,000
SUBTOTAL ROADWAY					**$5,980,000**
2.0 STRUCTURES					
2.01	NC 68 Bridge Widening (44.5' Additional Width)	11,800	SF	$ 140.00	$ 1,652,000
SUBTOTAL STRUCTURES					**$1,652,000**
3.0 CONSTRUCTION COST SUMMARY					
	Subtotal Construction				$ 7,632,000.00
3.01	Engineering Contingency (10%)				$ 763,200
3.02	Planning Level Contingency (30%)				$ 2,290,000
3.03	Traffic Control	1	LS	$ 190,000	$ 190,000
SUB-TOTAL FACILITY CONSTRUCTION COST					**$10,875,200**
4.0 ROW and UTILITIES					
4.01	ROW (Land)	3.5	Acres	$ 180,000	$ 630,000
	Residential Relocatees	0	Each	$ 150,000	$ -
	Commercial/Business Relocatees	0	Each	$ 550,000	$ -
	Right of Way Acquisition Contingency (50%)				$ 315,000
4.02	Relocate other Utilities	1.1	Miles	$ 1,000,000	$ 1,100,000
	Utilities Contingency (10%)				$ 110,000
SUBTOTAL ROW and UTILITIES					**$2,155,000**
TOTAL PROJECT COST SUMMARY					
Sub-Total Construction Cost					$ 10,875,200
Sub-Total ROW and Utilities					$ 2,155,000
TOTAL PROJECT COST (2008)					**$13,030,200**

SAY	**$13,100,000**

Notes:

1) The unit costs to construct this facility are based on the unit prices of recently constructed similar facilities and/or the latest average unit prices published by NCDOT dated February, 2008.

2) Conceptual horizontal and vertical alignments are developed. Approximate quantities of major roadway and structure elements calculated from conceptual design.

3) Proposed drainage and utilities elements are not developed and quantities are not calculated individually for this estimate.

4) Approximate right-of-way needs estimated from conceptual design.

5) Unit costs of similar projects are used to calculate construction cost.

6) Contingencies are applied to the construction cost.

7) Environmental mitigation costs are not included.

8) Right-of-way unit costs determined from High Point and Guilford County GIS tax data (accessed December 2008).

9) This estimate does not account for noise barriers.

Table 15 – Planning-Level Opinion of Probable Cost for Phased Project – Phase 2 - Partial Cloverleaf (Design Exception) Interchange Ramps

SECTION	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL COST
1.0 ROADWAY					
1.01	NC 68 Widening (Paving, Earthwork, Drainage, Striping, Signage, Landscaping, and Sidewalk)	0.20	Miles	$ 4,000,000	$ 800,000
1.02	US 311 Modification (Paving, Earthwork, Drainage, Striping, Signage, and Landscaping)	0.60	Miles	$ 5,600,000	$ 3,360,000
1.06	Ramp A Construction	0.28	Miles	$ 4,000,000	$ 1,120,000
1.07	Ramp C Construction	0.28	Miles	$ 2,500,000	$ 700,000
1.08	Ramp D Construction	0.25	Miles	$ 2,000,000	$ 500,000
1.10	Loop Construction	0.35	Miles	$ 1,250,000	$ 437,500
SUBTOTAL ROADWAY					**$6,917,500**
2.0 STRUCTURES					
2.01	NC 68 Bridge Widening (44.5' Additional Width)	0	SF	$ 140.00	$ -
	Constructed in Intermediate Phase				
SUBTOTAL STRUCTURES					**$0**
3.0 CONSTRUCTION COST SUMMARY					
	Subtotal Construction				$ 6,917,500
3.01	Engineering Contingency (10%)				$ 691,800
3.02	Planning Level Contingency (30%)				$ 2,076,000
3.03	Traffic Control	1	LS	$ 416,000	$ 416,000
SUB-TOTAL FACILITY CONSTRUCTION COST					**$10,101,300**
4.0 ROW and UTILITIES					
4.01	ROW (Land)	2.0	Acres	$ 180,000	$ 360,000
	Residential Relocatees	2	Each	$ 150,000	$ 300,000
	Commercial/Business Relocatees	0	Each	$ 550,000	$ -
	Right of Way Acquisition Contingency (50%)				$ 180,000
4.02	Relocate other Utilities	0.2	Miles	$ 1,000,000	$ 200,000
	Utilities Contingency (10%)				$ 20,000
SUBTOTAL ROW and UTILITIES					**$1,060,000**
TOTAL PROJECT COST SUMMARY					
Sub-Total Construction Cost					$ 10,101,300
Sub-Total ROW and Utilities					$ 1,060,000
TOTAL PROJECT COST (2008)					**$11,161,300**

SAY	**$11,200,000**

Notes:

1) The unit costs to construct this facility are based on the unit prices of recently constructed similar facilities and/or the latest average unit prices published by NCDOT dated February, 2008.

2) Conceptual horizontal and vertical alignments are developed. Approximate quantities of major roadway and structure elements calculated from conceptual design.

3) Proposed drainage and utilities elements are not developed and quantities are not calculated individually for this estimate.

4) Approximate right-of-way needs estimated from conceptual design.

5) Unit costs of similar projects are used to calculate construction cost.

6) Contingencies are applied to the construction cost.

7) Environmental mitigation costs are not included.

8) Right-of-way unit costs determined from High Point and Guilford County GIS tax data (accessed December 2008).

9) This estimate assumes that modifications to Hilton Court, Cypress Court, Gordon Road and NC 68 bridge are constructed under a separate project.

10) This estimate does not account for noise barriers.

In order to provide the City with a general understanding of inflationary pressures on anticipated construction costs, a trend line analysis of historic construction cost index data was also completed as part of this study. Based on this data, it is believed that an approximate 6.0% annual increase in construction costs can be expected. Using this trend analysis data, the planning-level costs for the total project were projected out to assess construction costs for the five year (2013) and twelve year (2020) planning horizon. The projected preliminary opinions of cost for the phased implementation of the Partial Cloverleaf (Design Exception) Interchange option are included in Table 16.

Table 16 – Year of Expenditure (YOE) Planning-Level Opinion of Probable Costs for Phased Implementation of Partial Cloverleaf (Design Exception) Interchange Option

Construction Phase	Planning-Level Opinion of Probable Cost (2008 $)	Planning-Level Opinion of Probable Cost (2013 $)	Planning-Level Opinion of Probable Cost (2020 $)
Phase 1 – Intermediate Widening	$13,100,000	$17,600,000*	$26,400,000*
Phase 2 - Partial Cloverleaf (Design Exception) Ramps	$11,200,000	$15,000,000*	$22,600,000*
TOTAL	**$24,300,000**	**$32,600,000**	**$49,000,000**

* Base year (2008) planning-level costs inflated at 6.0% interest compounded annually.

Note: Planning-level opinion or probable costs provided in table do not consider specific items (i.e. mobilization, demobilization, etc.) associated with phased project implementation which may increase total project cost.

Due to rounding, total costs for Year 2008 differ slightly from those presented in Table 5.

REFERENCES

American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highway and Streets*, 2004.

City of High Point, North Carolina, Eastchester *Drive Corridor Plan Phase II Update*, October 1994.

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HNTB North Carolina, P.C., *US 311 / NC 68 Interchange Analysis – Final Traffic Analysis Technical Memorandum,* December 23, 2008.

National Park Service, www.nps.gov, accessed December 2008.

North Carolina Natural Heritage Program, www.ncnhp.org, accessed December 2008.

North Carolina Department of Transportation, *2009-2015 State Transportation Improvement Program*, www.ncdot.org/planning/development/, accessed December 2008.

North Carolina Department of Transportation, *2007 High Point Urban AADT Maps*, www.ncdot.org/it/img/DataDistribution/TrafficSurveyMaps/, accessed February 2009.

NC OneMap, www.nconemap.com, accessed June 2008.

US Census Bureau, www.census.gov, 2000 data, accessed June 2008.

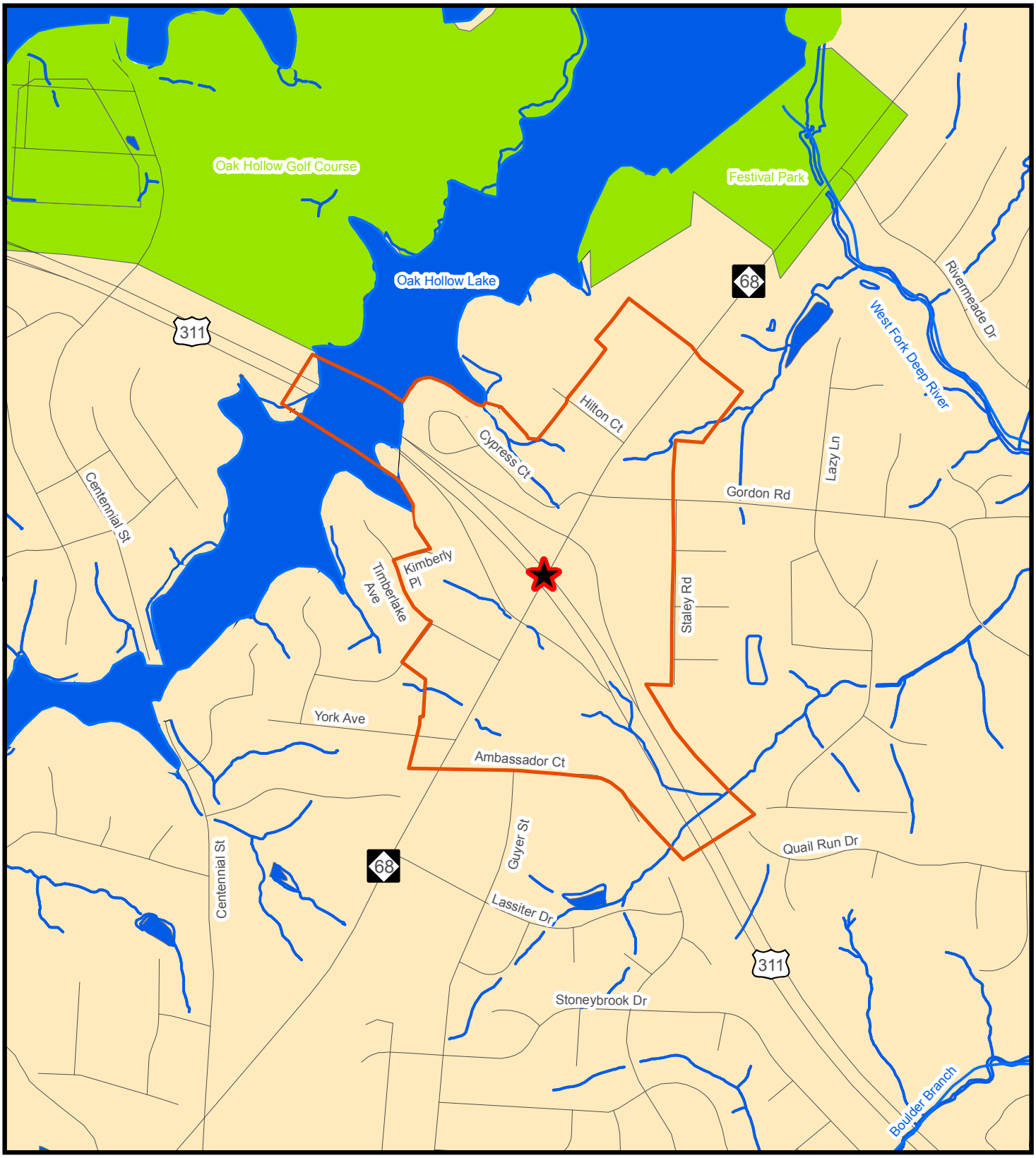
US Environmental Protection Agency, http://www.epa.gov/OMS/invntory/overview/pollutants/, accessed January 2009.

Guilford County GIS Data, http://gcgis.co.guilford.nc.us/guilford_new/, accessed December 2008.

APPENDIX A

FIGURES 1-20

PARCEL KEY NUMBER TABLE



P:\41253_High_Point_On_Call\US 311 and NC 68\GIS\study area.mxd

Figure 1: Project Study Area

LEGEND:

- Study Area
- US 311 @ NC 68 Interchange
- US Highway
- State Highway
- Streams
- Lakes
- High Point

March 2009

N W E S

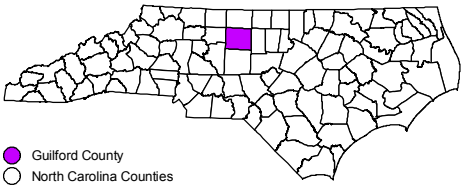
0 250 500 1,000 1,500 Feet

MAP SOURCES:

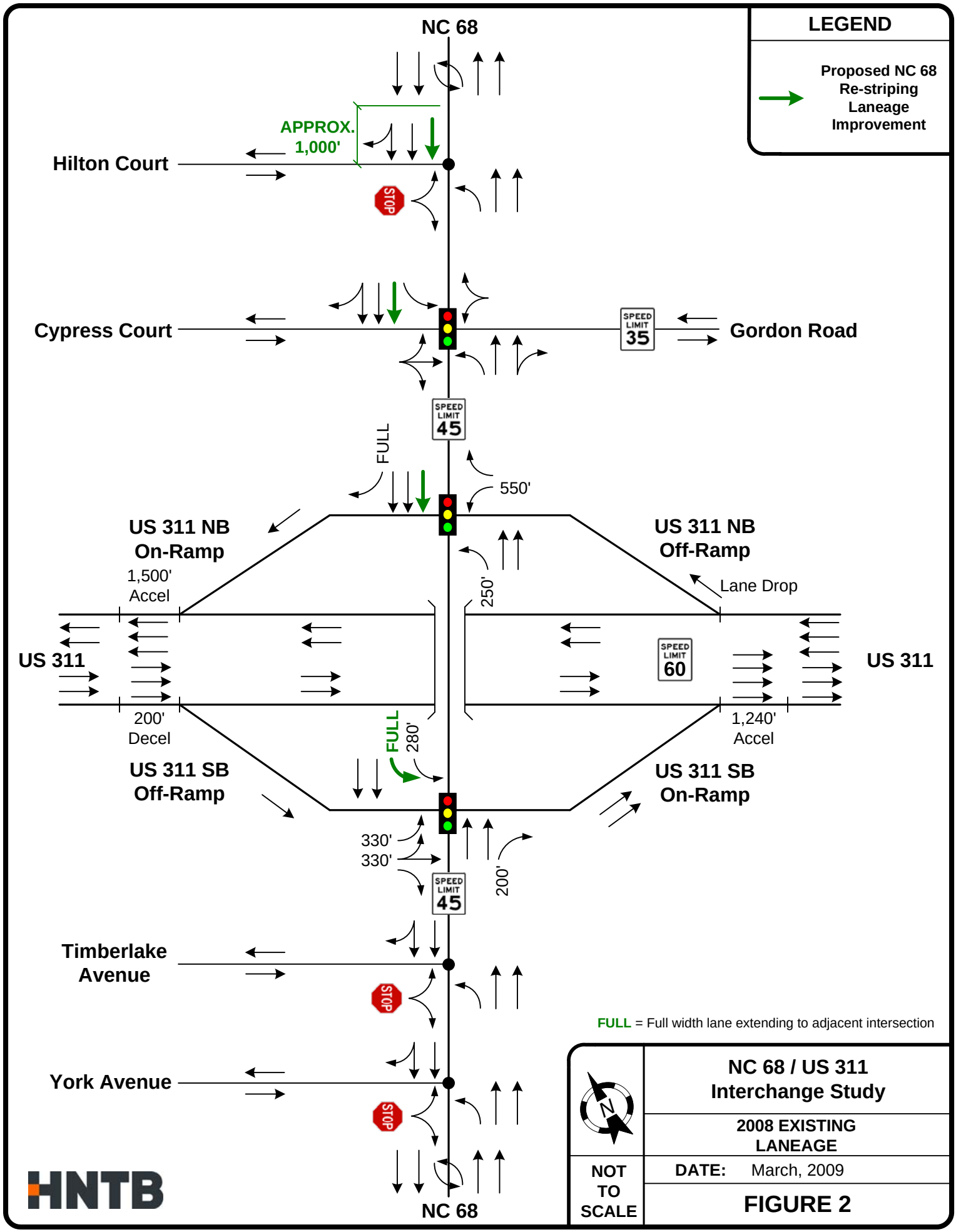
North Carolina OneMap: http://nconemap.com
North Carolina DOT: http://www.ncdot.org/it/gis
City of High Point: http://gisweb.high-point.net

HIGH POINT North Carolina's Furniture City

HNTB



Guilford County
North Carolina Counties


LEGEND
Proposed NC 68 Re-striping Laneage Improvement
NC 68
APPROX. 1,000'
Hilton Court
STOP
Cypress Court
SPEED LIMIT 35
Gordon Road
SPEED LIMIT 45
FULL
550'
US 311 NB On-Ramp
1,500' Accel
US 311 NB Off-Ramp
Lane Drop
250'
US 311
SPEED LIMIT 60
US 311
200' Decel
1,240' Accel
FULL
280'
US 311 SB Off-Ramp
US 311 SB On-Ramp
330'
330'
200'
SPEED LIMIT 45
Timberlake Avenue
STOP
York Avenue
STOP
NC 68
FULL = Full width lane extending to adjacent intersection
N
NC 68 / US 311 Interchange Study
2008 EXISTING LANEAGE
NOT TO SCALE
DATE: March, 2009
FIGURE 2
HNTB

LEGEND

LIMITS OF CONSTRUCTION	PROPOSED APPROX. ALIGNMENT
EXISTING EDGE OF PAVEMENT	PROPOSED EDGE OF PAVEMENT
EXISTING BUILDING	PROPOSED CONCRETE BARRIER
EXISTING CURB & GUTTER / ISLAND	PROPOSED CURB & GUTTER/ ISLAND/ SIDEWALK
EXISTING PROPERTY BOUNDARIES	PROPOSED BRIDGE CONSTRUCTION
APPROX. RIGHT OF WAY IMPACT	PARCEL NUMBER (A1)
STREAMS / CREEKS	PROPOSED CONTROL OF ACCESS

GRAPHIC SCALE
50 0 50 100 200
(IN FEET)

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

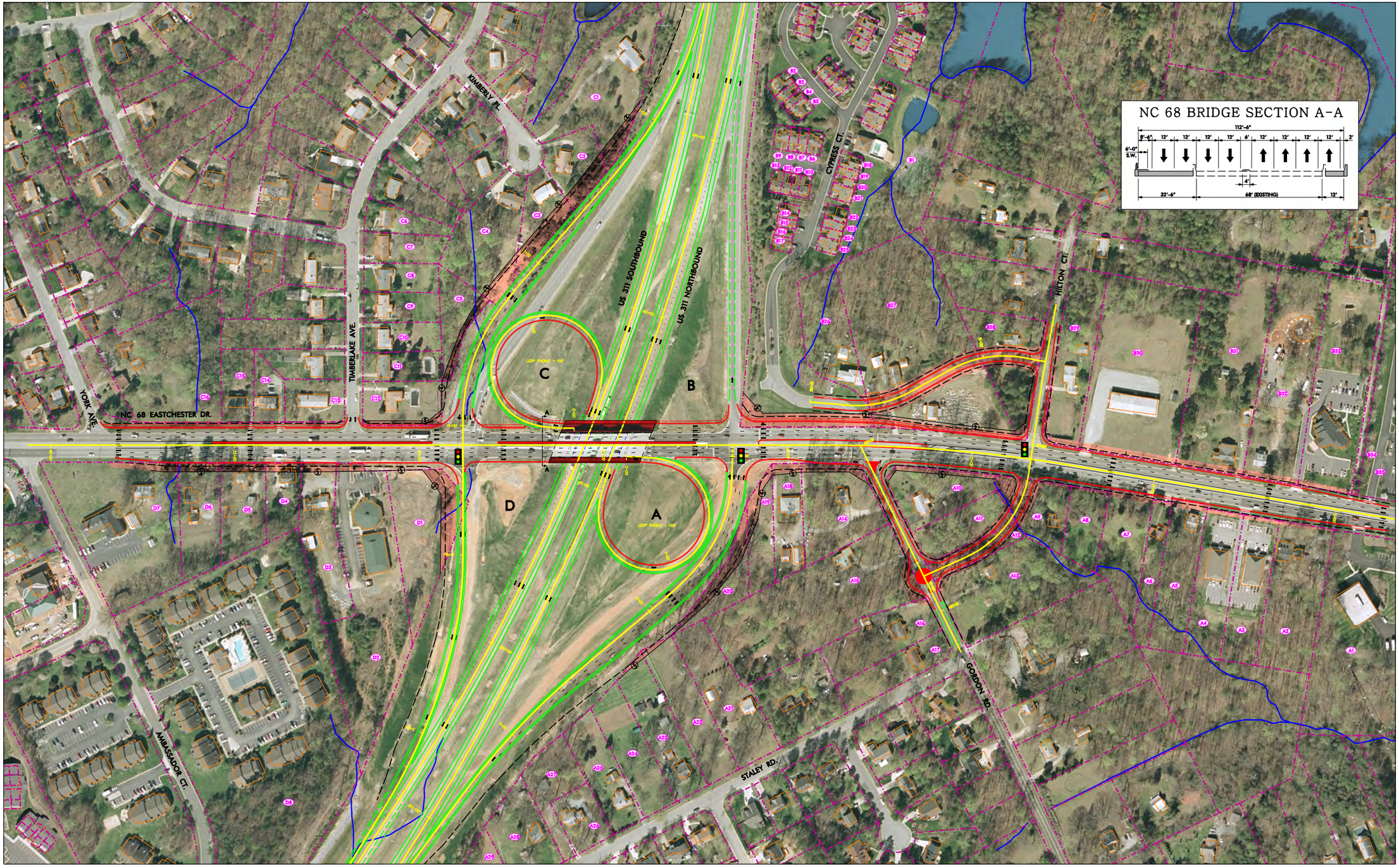
NC 68 / US 311 INTERCHANGE STUDY

FIGURE 3A - PARTIAL CLOVERLEAF (DESIGN EXCEPTION)
INTERCHANGE CONCEPT
CITY OF HIGH POINT, NC
MARCH 2009

SOURCES: GUILFORD COUNTY
CITY OF HIGH POINT
NC ONEMAP

HIGH POINT
NORTH CAROLINA'S INTERNATIONAL CITY

HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 300
Raleigh, North Carolina 27609



LEGEND

LIMITS OF CONSTRUCTION	PROPOSED APPROX. ALIGNMENT
EXISTING EDGE OF PAVEMENT	PROPOSED EDGE OF PAVEMENT
EXISTING BUILDING	PROPOSED CONCRETE BARRIER
EXISTING CURB & GUTTER / ISLAND	PROPOSED CURB & GUTTER/ ISLAND/ SIDEWALK
EXISTING PROPERTY BOUNDARIES	PROPOSED BRIDGE CONSTRUCTION
APPROX. RIGHT OF WAY IMPACT	PARCEL NUMBER (A1)
STREAMS / CREEKS	PROPOSED CONTROL OF ACCESS

GRAPHIC SCALE
50 0 50 100 200
(IN FEET)

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

NC 68 / US 311 INTERCHANGE STUDY

FIGURE 3B - PARTIAL CLOVERLEAF (DESIGN EXCEPTION)
INTERCHANGE CONCEPT
CITY OF HIGH POINT, NC
MARCH 2009

SOURCES: GUILFORD COUNTY
CITY OF HIGH POINT
NC ONEMAP

HIGH POINT
NORTH CAROLINA'S INTERNATIONAL CITY

HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609

LEGEND

LIMITS OF CONSTRUCTION	PROPOSED APPROX. ALIGNMENT
EXISTING EDGE OF PAVEMENT	PROPOSED EDGE OF PAVEMENT
EXISTING BUILDING	PROPOSED CONCRETE BARRIER
EXISTING CURB & GUTTER / ISLAND	PROPOSED CURB & GUTTER/ ISLAND/ SIDEWALK
EXISTING PROPERTY BOUNDARIES	PROPOSED BRIDGE CONSTRUCTION
APPROX. RIGHT OF WAY IMPACT	PARCEL NUMBER (A1)
STREAMS / CREEKS	PROPOSED CONTROL OF ACCESS

GRAPHIC SCALE
50 0 50 100 200
(IN FEET)

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

NC 68 / US 311 INTERCHANGE STUDY

FIGURE 4 - PARTIAL CLOVERLEAF (NO DESIGN EXCEPTION)
INTERCHANGE CONCEPT
CITY OF HIGH POINT, NC
MARCH 2009

SOURCES: GUILFORD COUNTY
CITY OF HIGH POINT
NC ONEMAP

HIGH POINT
NORTH CAROLINA'S INTERNATIONAL CITY

HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609

LEGEND

LIMITS OF CONSTRUCTION	PROPOSED APPROX. ALIGNMENT
EXISTING EDGE OF PAVEMENT	PROPOSED EDGE OF PAVEMENT
EXISTING BUILDING	PROPOSED CONCRETE BARRIER
EXISTING CURB & GUTTER / ISLAND	PROPOSED CURB & GUTTER/ ISLAND/ SIDEWALK
EXISTING PROPERTY BOUNDARIES	PROPOSED BRIDGE CONSTRUCTION
APPROX. RIGHT OF WAY IMPACT	PARCEL NUMBER (A1)
STREAMS / CREEKS	PROPOSED CONTROL OF ACCESS

GRAPHIC SCALE
50 0 50 100 200
(IN FEET)

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

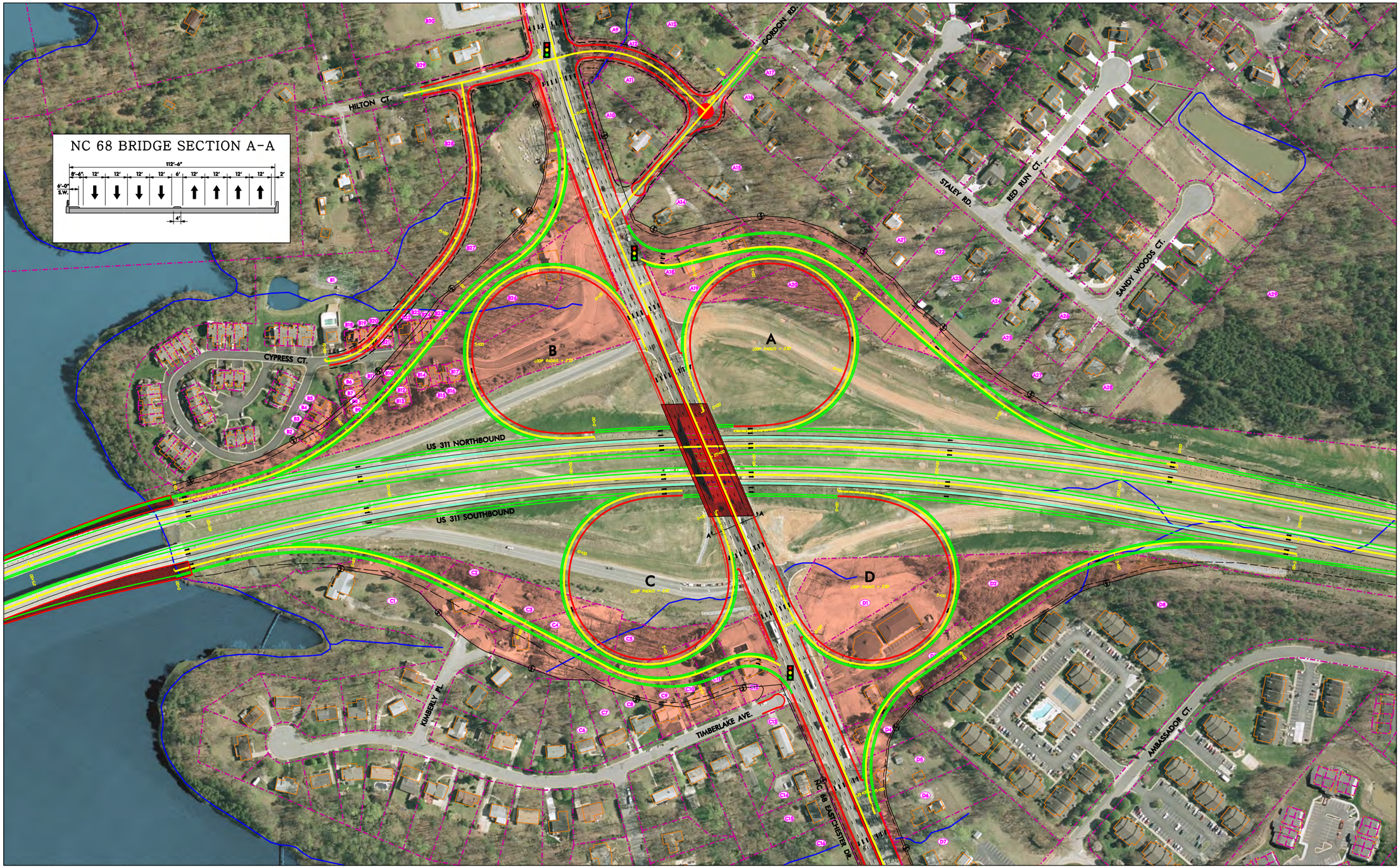
NC 68 / US 311 INTERCHANGE STUDY

FIGURE 5 - SINGLE POINT URBAN INTERCHANGE (SPUI) CONCEPT
CITY OF HIGH POINT, NC
MARCH 2009

SOURCES: GUILFORD COUNTY
CITY OF HIGH POINT
NC ONEMAP

HIGH POINT
NORTH CAROLINA'S INTERNATIONAL CITY

HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609



LEGEND

LIMITS OF CONSTRUCTION	PROPOSED APPROX. ALIGNMENT
EXISTING EDGE OF PAVEMENT	PROPOSED EDGE OF PAVEMENT
EXISTING BUILDING	PROPOSED CONCRETE BARRIER
EXISTING CURB & GUTTER / ISLAND	PROPOSED CURB & GUTTER/ ISLAND/ SIDEWALK
EXISTING PROPERTY BOUNDARIES	PROPOSED BRIDGE CONSTRUCTION
APPROX. RIGHT OF WAY IMPACT	PARCEL NUMBER (A1)
STREAMS / CREEKS	PROPOSED CONTROL OF ACCESS

GRAPHIC SCALE
50 0 50 100 200
(IN FEET)

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

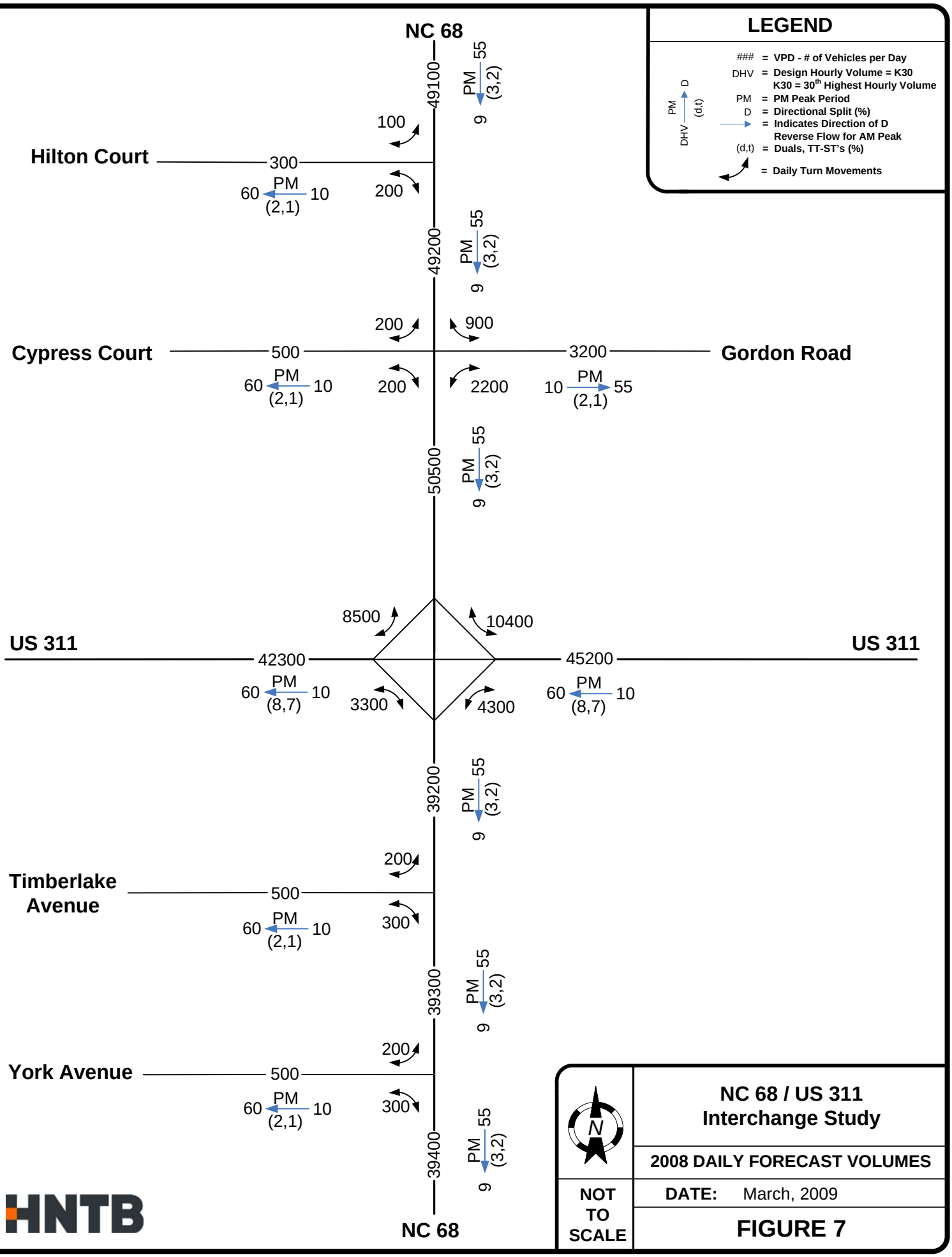
NC 68 / US 311 INTERCHANGE STUDY

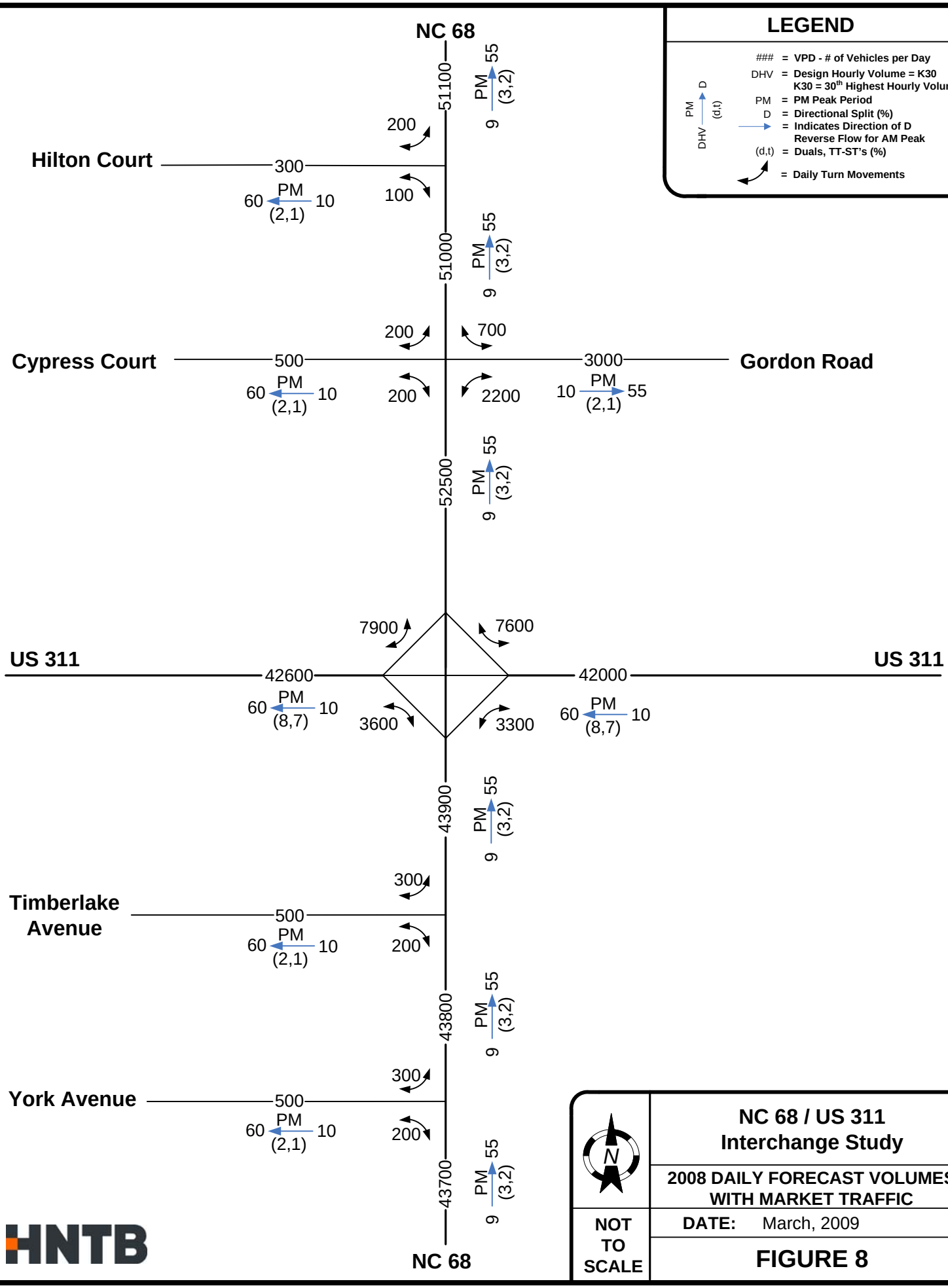
FIGURE 6 - FULL CLOVERLEAF (NO DESIGN EXCEPTION)
INTERCHANGE CONCEPT
CITY OF HIGH POINT, NC
MARCH 2009

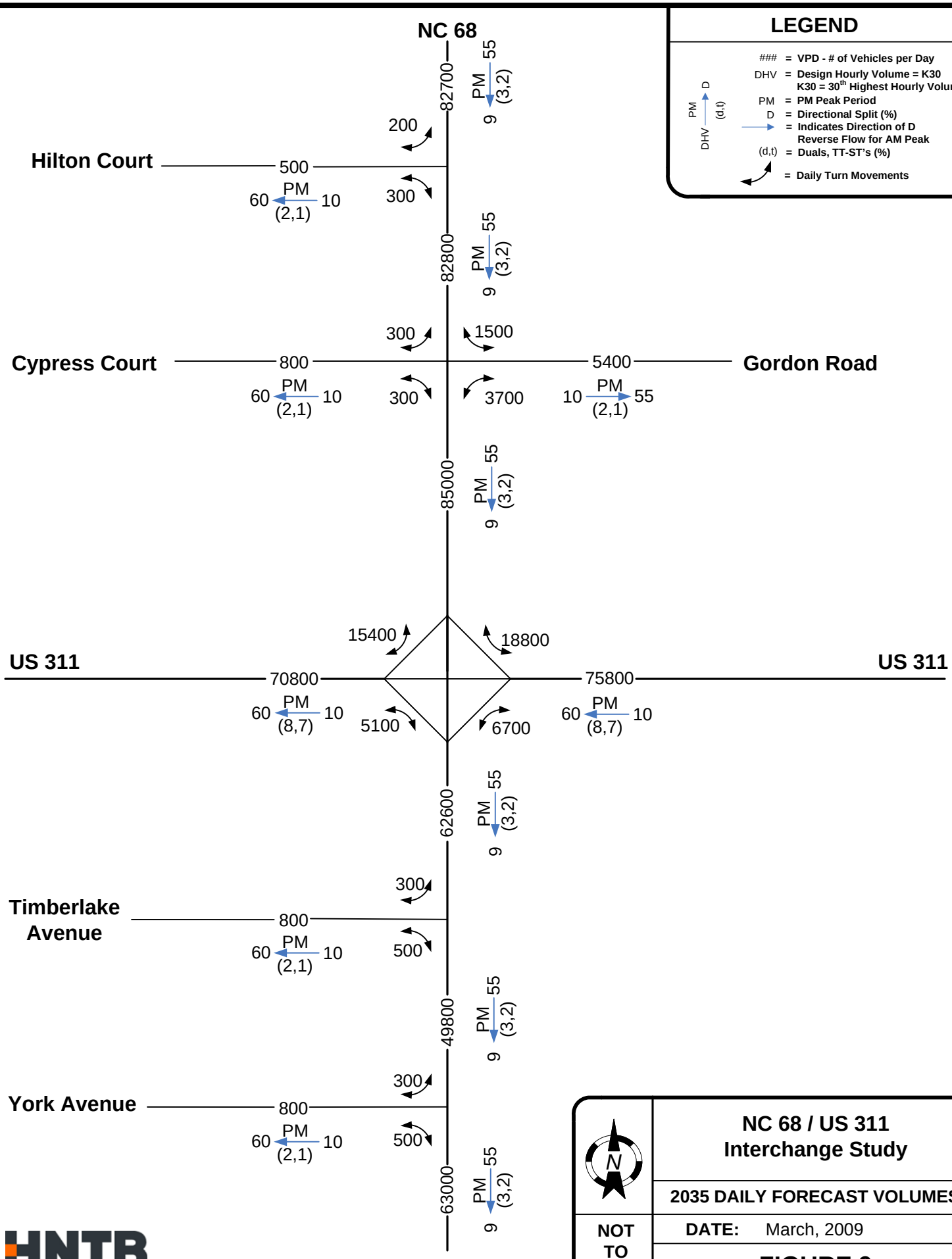
SOURCES: GUILFORD COUNTY
CITY OF HIGH POINT
NC ONEMAP

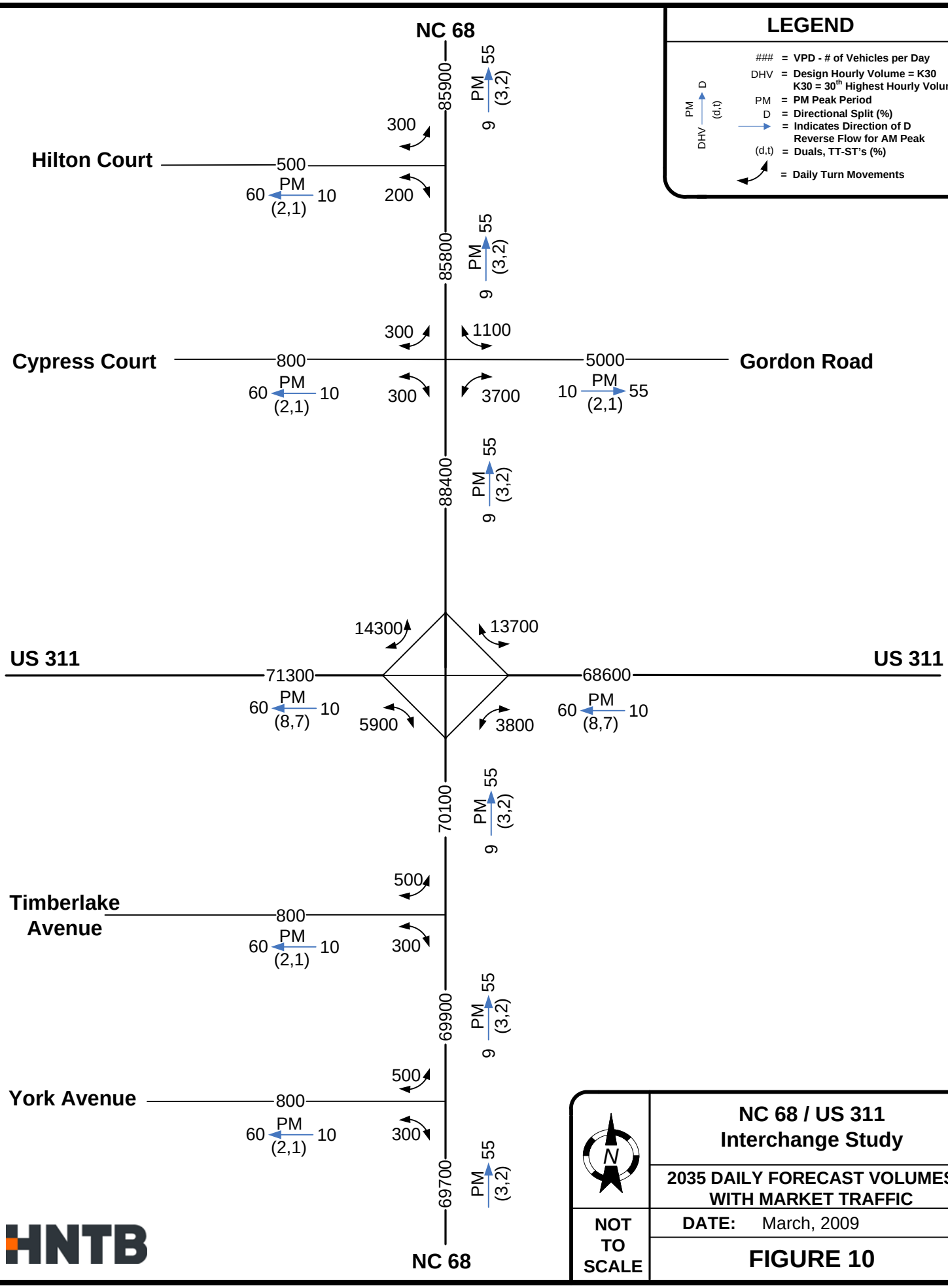
HIGH POINT
NORTH CAROLINA'S INTERNATIONAL CITY

HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609


LEGEND
= VPD - # of Vehicles per Day
DHV = Design Hourly Volume = K30
K30 = 30th Highest Hourly Volume
PM = PM Peak Period
D = Directional Split (%)
= Indicates Direction of D
Reverse Flow for AM Peak
(d,t) = Duals, TT-ST's (%)
= Daily Turn Movements
NC 68
49100
55
PM
(3,2)
9
100
Hilton Court
300
60
PM
(2,1)
10
200
49200
55
PM
(3,2)
9
200
900
Cypress Court
500
3200
Gordon Road
60
PM
(2,1)
10
200
2200
10
PM
(2,1)
55
50500
55
PM
(3,2)
9
8500
10400
US 311
42300
45200
US 311
60
PM
(8,7)
10
3300
4300
60
PM
(8,7)
10
39200
55
PM
(3,2)
9
200
Timberlake Avenue
500
60
PM
(2,1)
10
300
39300
55
PM
(3,2)
9
200
York Avenue
500
60
PM
(2,1)
10
300
39400
55
PM
(3,2)
9
NC 68
N
NC 68 / US 311
Interchange Study
2008 DAILY FORECAST VOLUMES
NOT TO SCALE
DATE: March, 2009
FIGURE 7
HNTB


LEGEND
= VPD - # of Vehicles per Day
DHV = Design Hourly Volume = K30
K30 = 30th Highest Hourly Volume
PM = PM Peak Period
D = Directional Split (%)
= Indicates Direction of D
Reverse Flow for AM Peak
(d,t) = Duals, TT-ST's (%)
= Daily Turn Movements
NC 68
51100
PM 55 (3,2) 9
200
Hilton Court
300
60 PM (2,1) 10
100
51000
PM 55 (3,2) 9
200
700
Cypress Court
500
60 PM (2,1) 10
200
2200
3000
10 PM (2,1) 55
Gordon Road
52500
PM 55 (3,2) 9
7900
7600
US 311
42600
60 PM (8,7) 10
3600
3300
42000
60 PM (8,7) 10
US 311
43900
PM 55 (3,2) 9
300
Timberlake Avenue
500
60 PM (2,1) 10
200
43800
PM 55 (3,2) 9
300
York Avenue
500
60 PM (2,1) 10
200
43700
PM 55 (3,2) 9
NC 68
N
NC 68 / US 311
Interchange Study
2008 DAILY FORECAST VOLUMES
WITH MARKET TRAFFIC
NOT TO SCALE
DATE: March, 2009
FIGURE 8
HNTB


LEGEND
= VPD - # of Vehicles per Day
DHV = Design Hourly Volume = K30
K30 = 30th Highest Hourly Volume
PM = PM Peak Period
D = Directional Split (%)
= Indicates Direction of D
Reverse Flow for AM Peak
(d,t) = Duals, TT-ST's (%)
= Daily Turn Movements
NC 68
82700
55
PM
(3,2)
9
200
Hilton Court
500
60
PM
(2,1)
10
300
82800
55
PM
(3,2)
9
300
1500
Cypress Court
800
60
PM
(2,1)
10
300
3700
5400
10
PM
(2,1)
55
Gordon Road
85000
55
PM
(3,2)
9
15400
18800
US 311
70800
60
PM
(8,7)
10
5100
6700
75800
60
PM
(8,7)
10
US 311
62600
55
PM
(3,2)
9
300
Timberlake Avenue
800
60
PM
(2,1)
10
500
49800
55
PM
(3,2)
9
300
York Avenue
800
60
PM
(2,1)
10
500
63000
55
PM
(3,2)
9
NC 68
N
NOT TO SCALE
NC 68 / US 311
Interchange Study
2035 DAILY FORECAST VOLUMES
DATE: March, 2009
FIGURE 9
HNTB



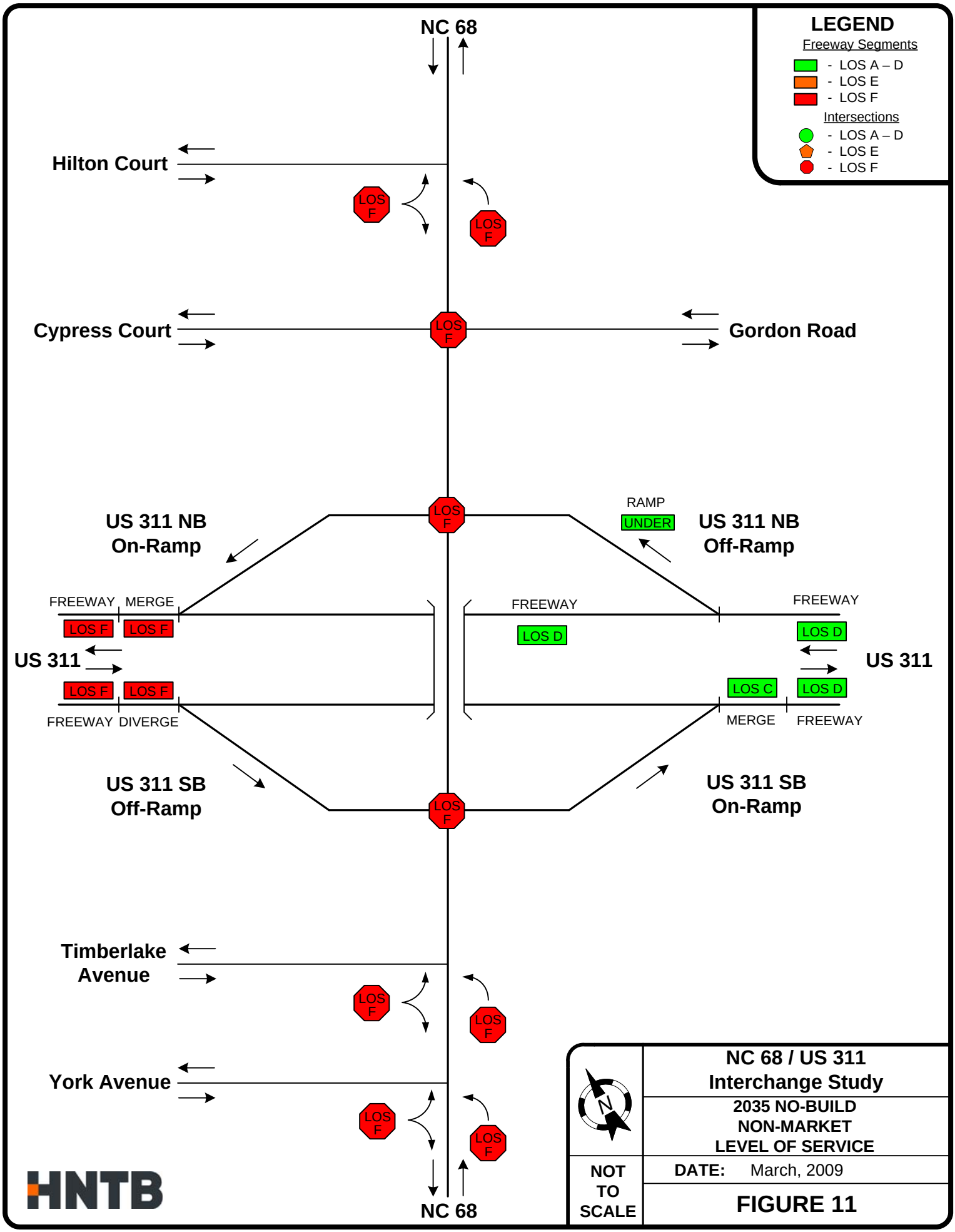
NC 68 / US 311 Interchange Study

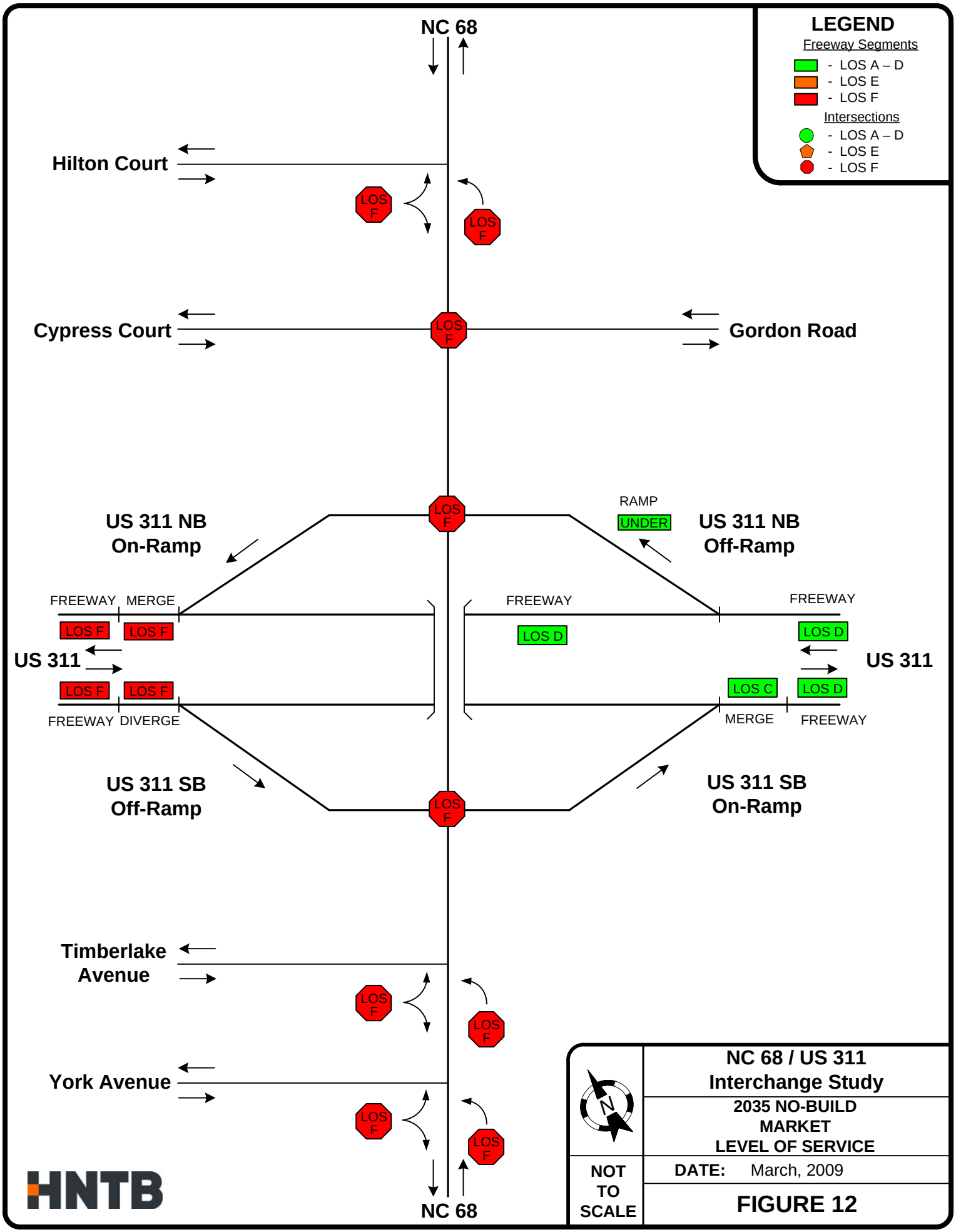
2035 DAILY FORECAST VOLUMES WITH MARKET TRAFFIC

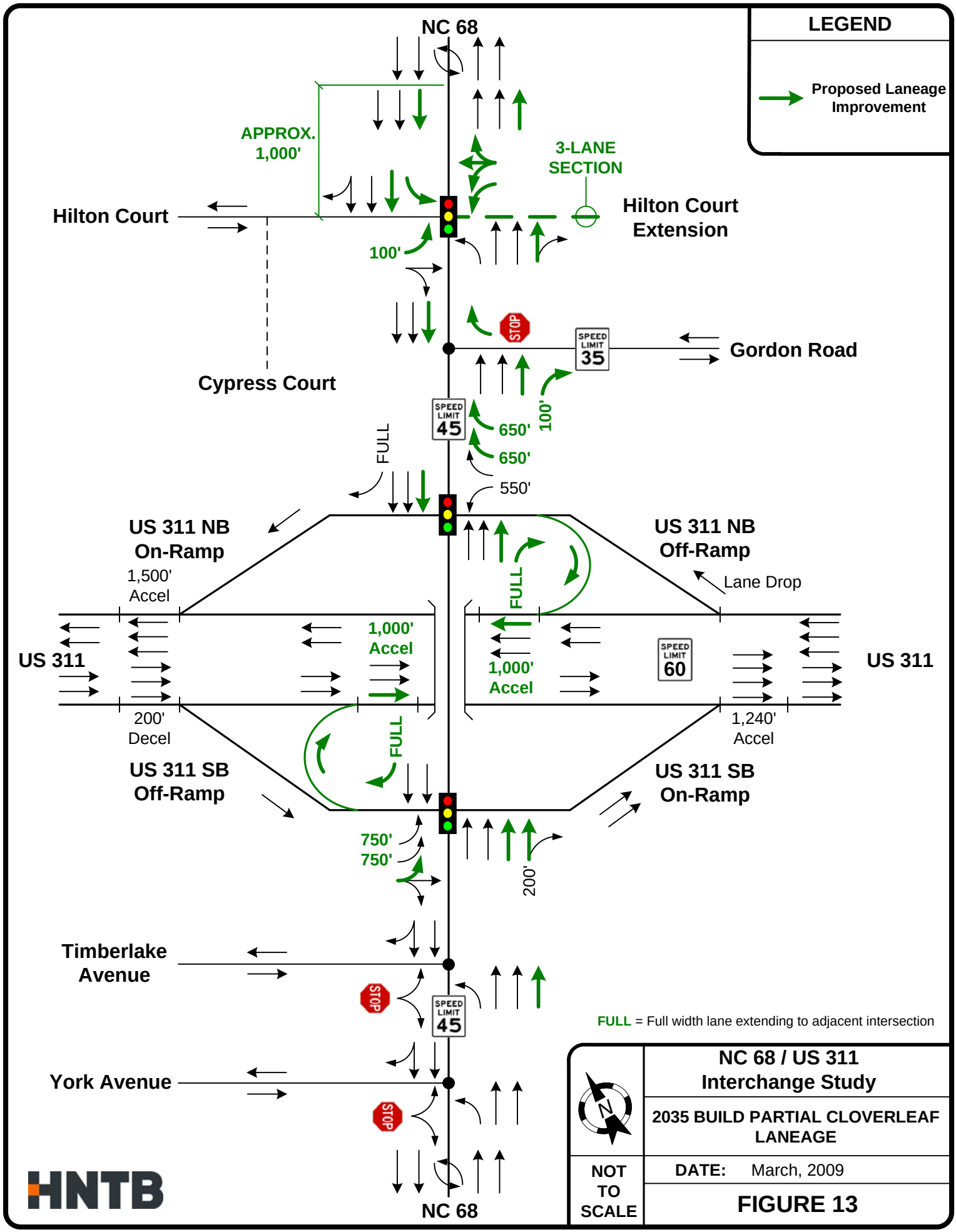
DATE: March, 2009

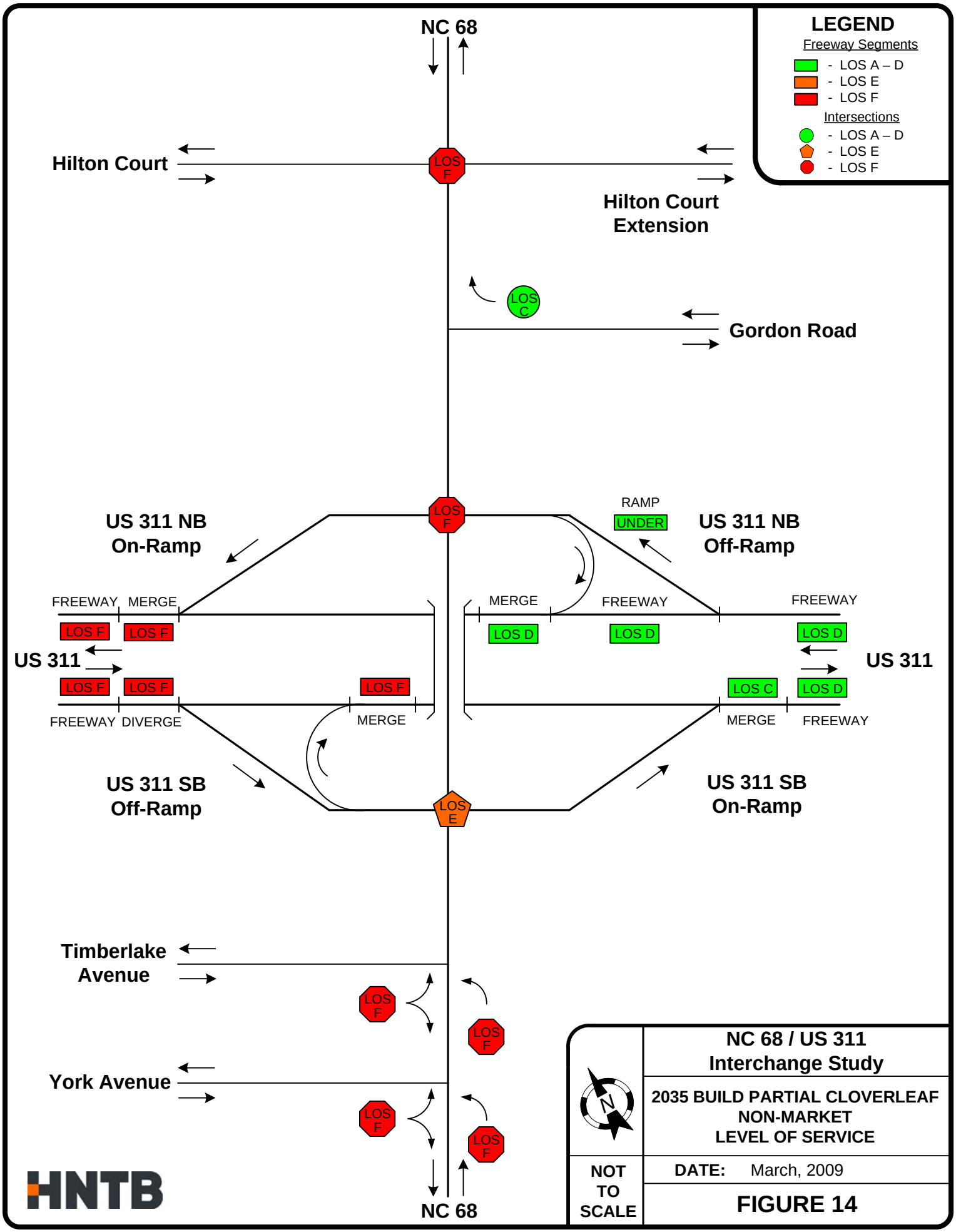
FIGURE 10

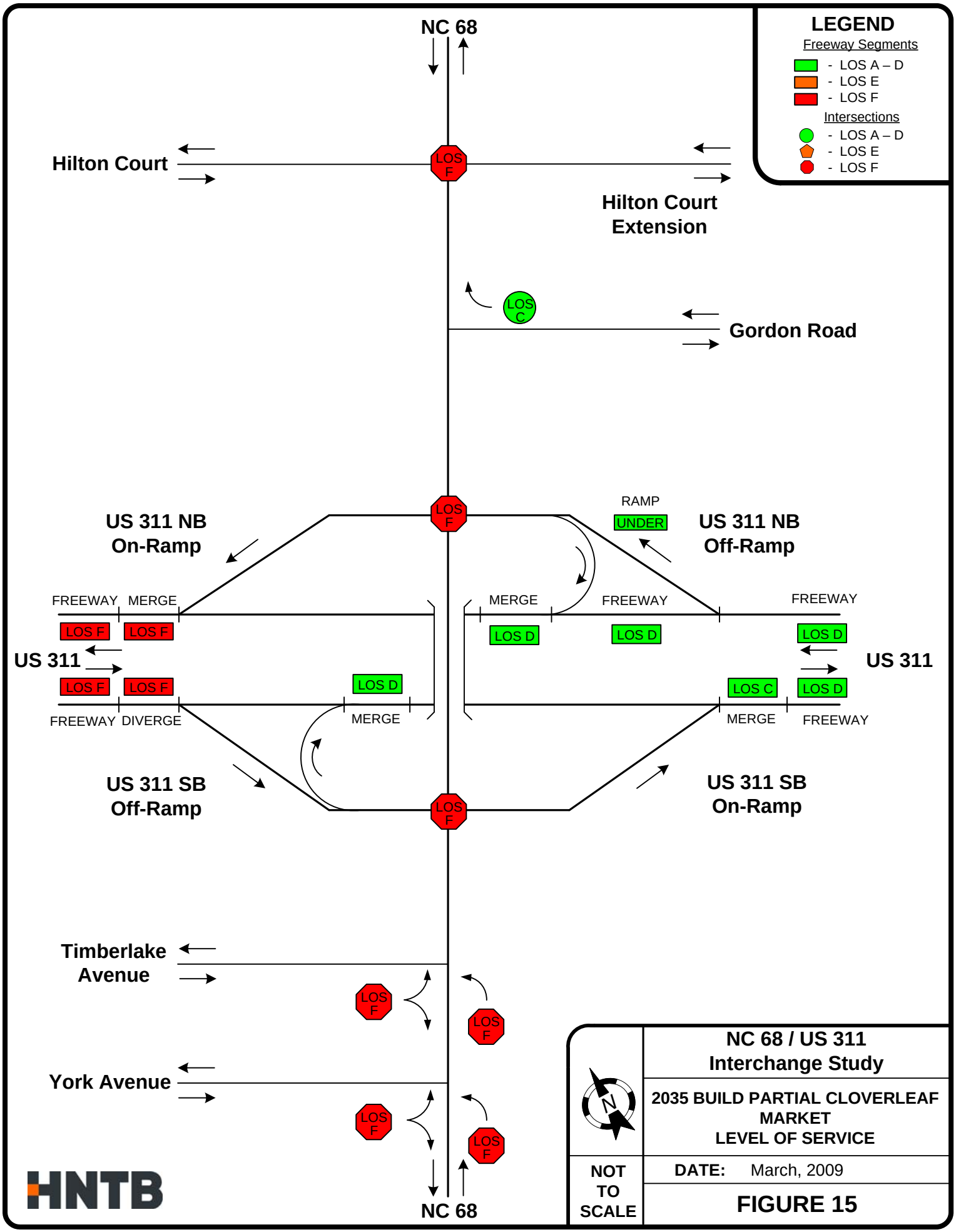
HNTB

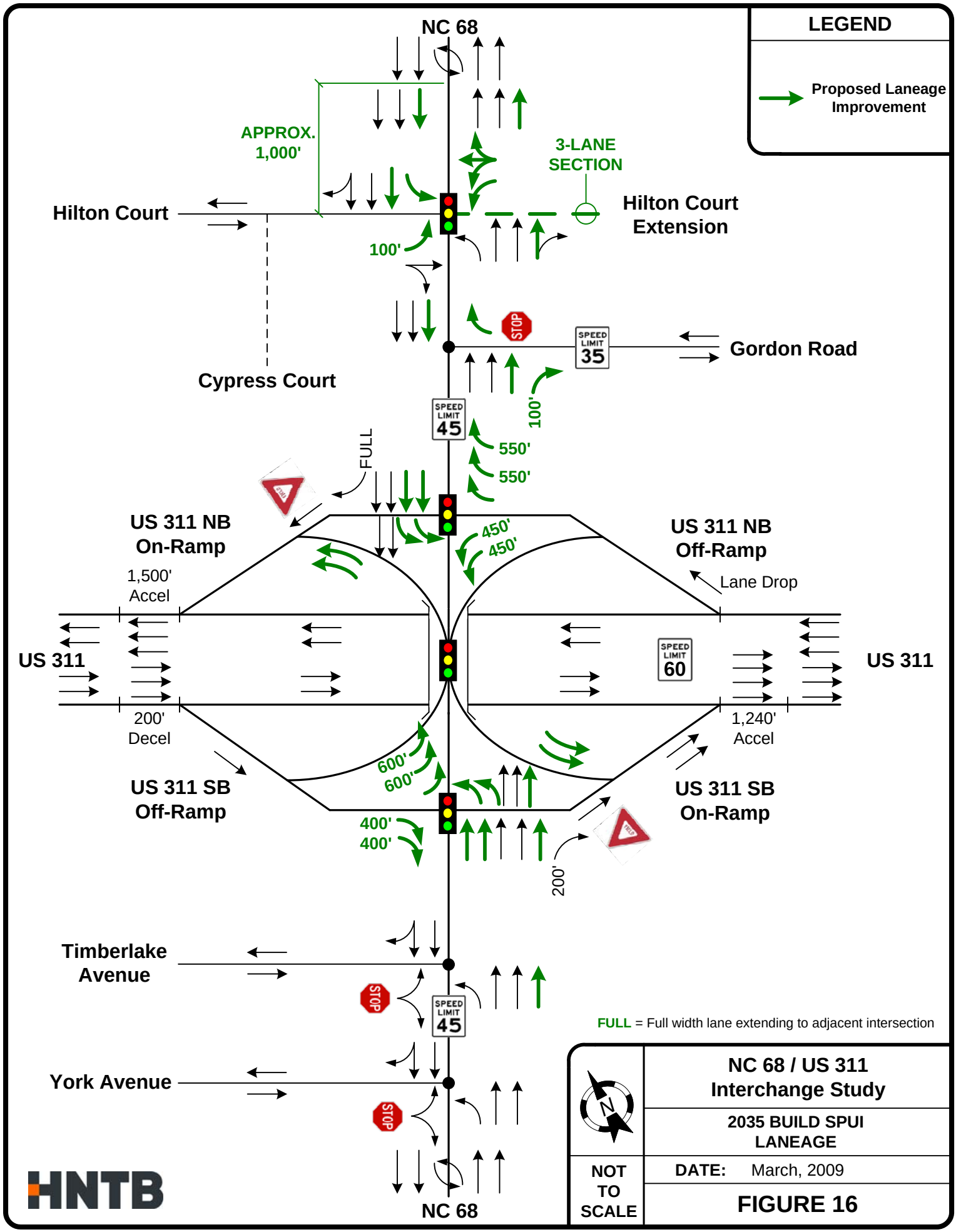

LEGEND
Freeway Segments
- LOS A – D
- LOS E
- LOS F
Intersections
- LOS A – D
- LOS E
- LOS F
NC 68
Hilton Court
LOS F
LOS F
Cypress Court
LOS F
Gordon Road
LOS F
RAMP
UNDER
US 311 NB On-Ramp
US 311 NB Off-Ramp
FREEWAY
MERGE
LOS F
LOS F
FREEWAY
LOS D
FREEWAY
LOS D
US 311
US 311
LOS F
LOS F
LOS C
LOS D
FREEWAY
DIVERGE
MERGE
FREEWAY
US 311 SB Off-Ramp
US 311 SB On-Ramp
LOS F
Timberlake Avenue
LOS F
LOS F
York Avenue
LOS F
LOS F
NC 68
HNTB
NC 68 / US 311
Interchange Study
2035 NO-BUILD
NON-MARKET
LEVEL OF SERVICE
NOT TO SCALE
DATE: March, 2009
FIGURE 11

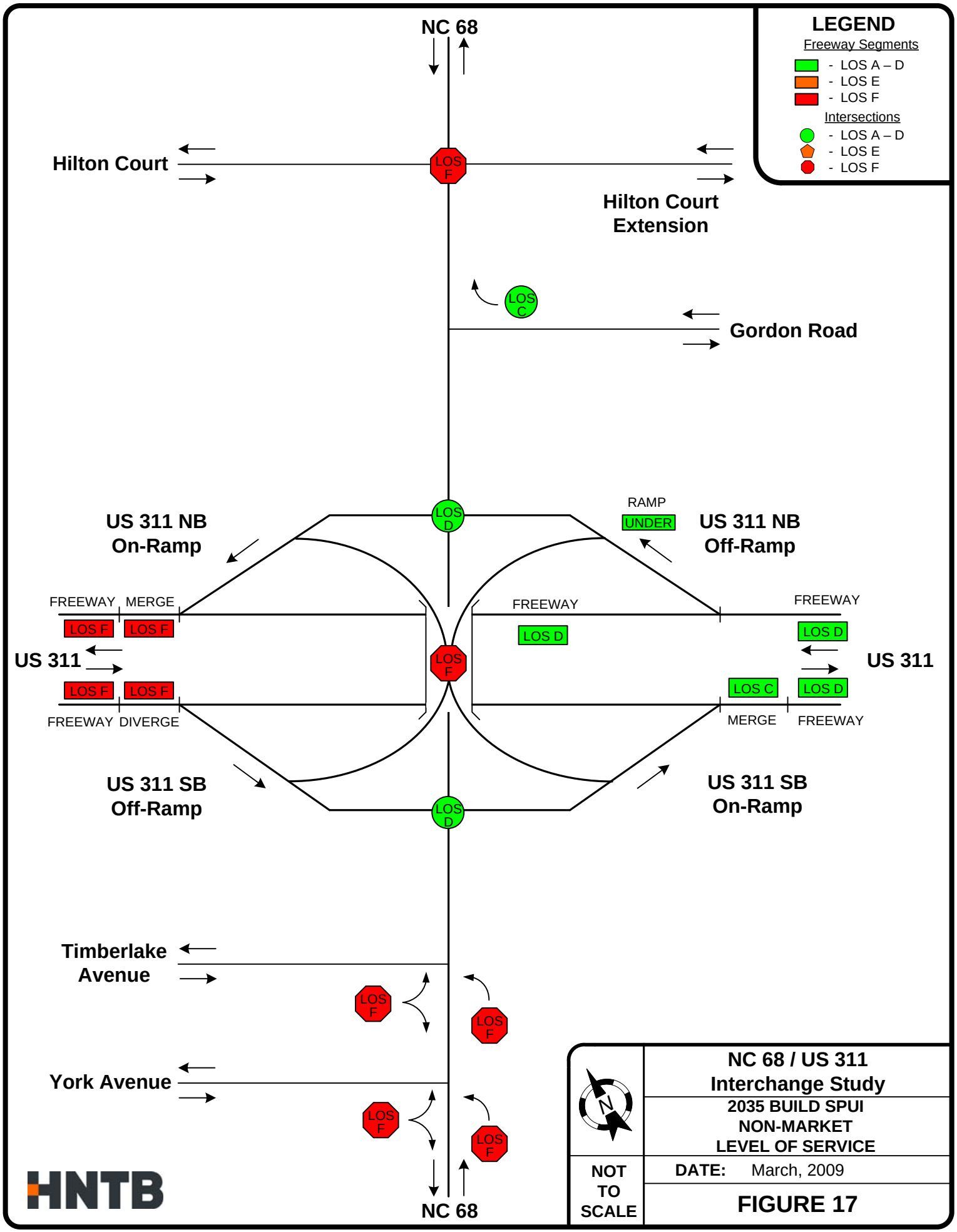

LEGEND
Freeway Segments
- LOS A – D
- LOS E
- LOS F
Intersections
- LOS A – D
- LOS E
- LOS F
NC 68
Hilton Court
LOS F
LOS F
Cypress Court
LOS F
Gordon Road
LOS F
RAMP
UNDER
US 311 NB On-Ramp
US 311 NB Off-Ramp
FREEWAY
MERGE
FREEWAY
FREEWAY
LOS F
LOS F
LOS D
LOS D
US 311
US 311
LOS F
LOS F
LOS C
LOS D
FREEWAY
DIVERGE
MERGE
FREEWAY
US 311 SB Off-Ramp
US 311 SB On-Ramp
LOS F
Timberlake Avenue
LOS F
LOS F
York Avenue
LOS F
LOS F
NC 68
N
NC 68 / US 311 Interchange Study
2035 NO-BUILD MARKET LEVEL OF SERVICE
NOT TO SCALE
DATE: March, 2009
FIGURE 12
HNTB

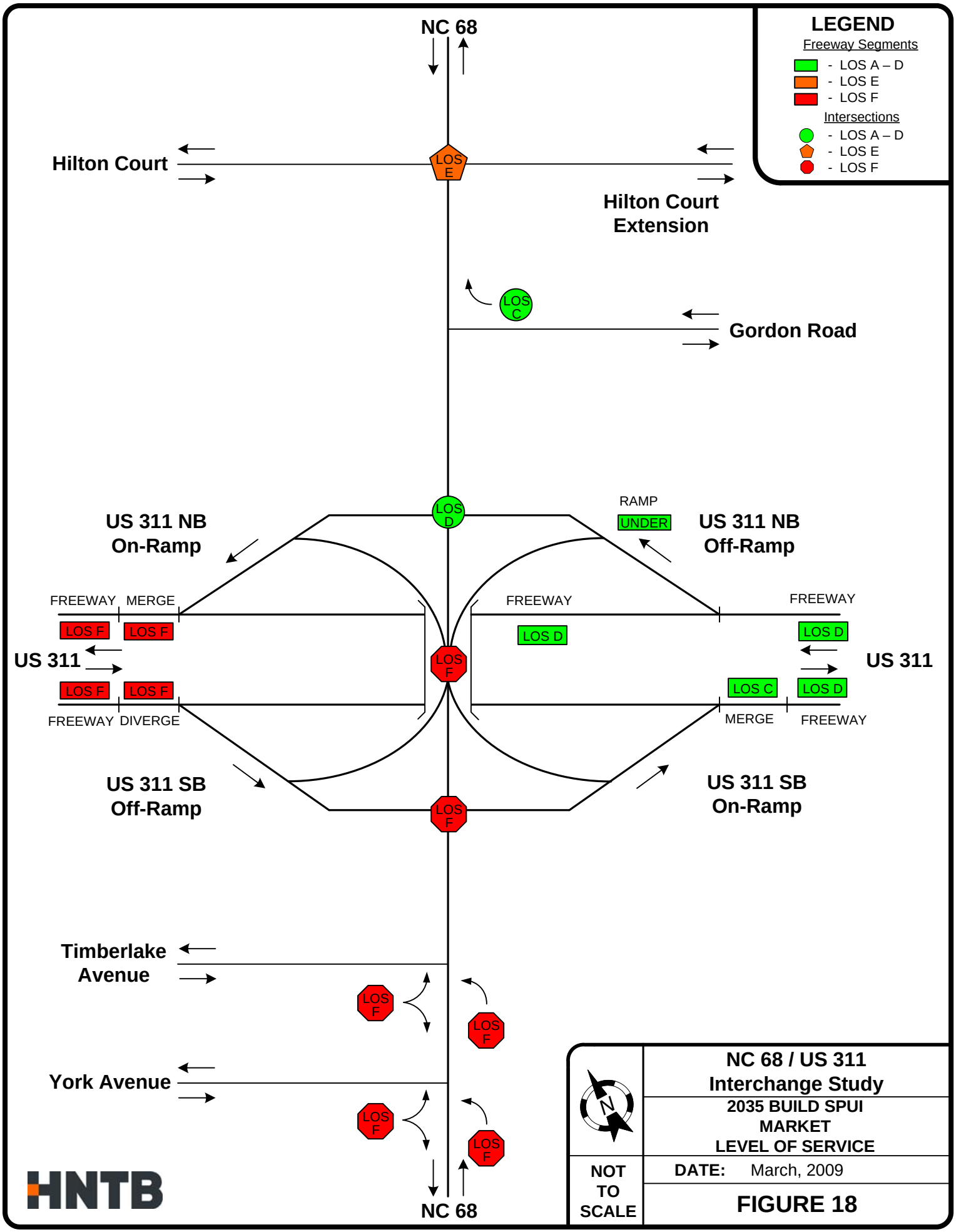

LEGEND
Proposed Laneage Improvement
NC 68
APPROX. 1,000'
3-LANE SECTION
Hilton Court
Hilton Court Extension
100'
STOP
SPEED LIMIT 35
Gordon Road
Cypress Court
SPEED LIMIT 45
650'
650'
100'
FULL
550'
US 311 NB On-Ramp
1,500' Accel
US 311 NB Off-Ramp
Lane Drop
FULL
1,000' Accel
1,000' Accel
SPEED LIMIT 60
US 311
US 311
200' Decel
1,240' Accel
FULL
US 311 SB Off-Ramp
US 311 SB On-Ramp
750'
750'
200'
Timberlake Avenue
STOP
SPEED LIMIT 45
FULL = Full width lane extending to adjacent intersection
York Avenue
STOP
NC 68
HNTB
NC 68 / US 311 Interchange Study
2035 BUILD PARTIAL CLOVERLEAF LANEAGE
NOT TO SCALE
DATE: March, 2009
FIGURE 13

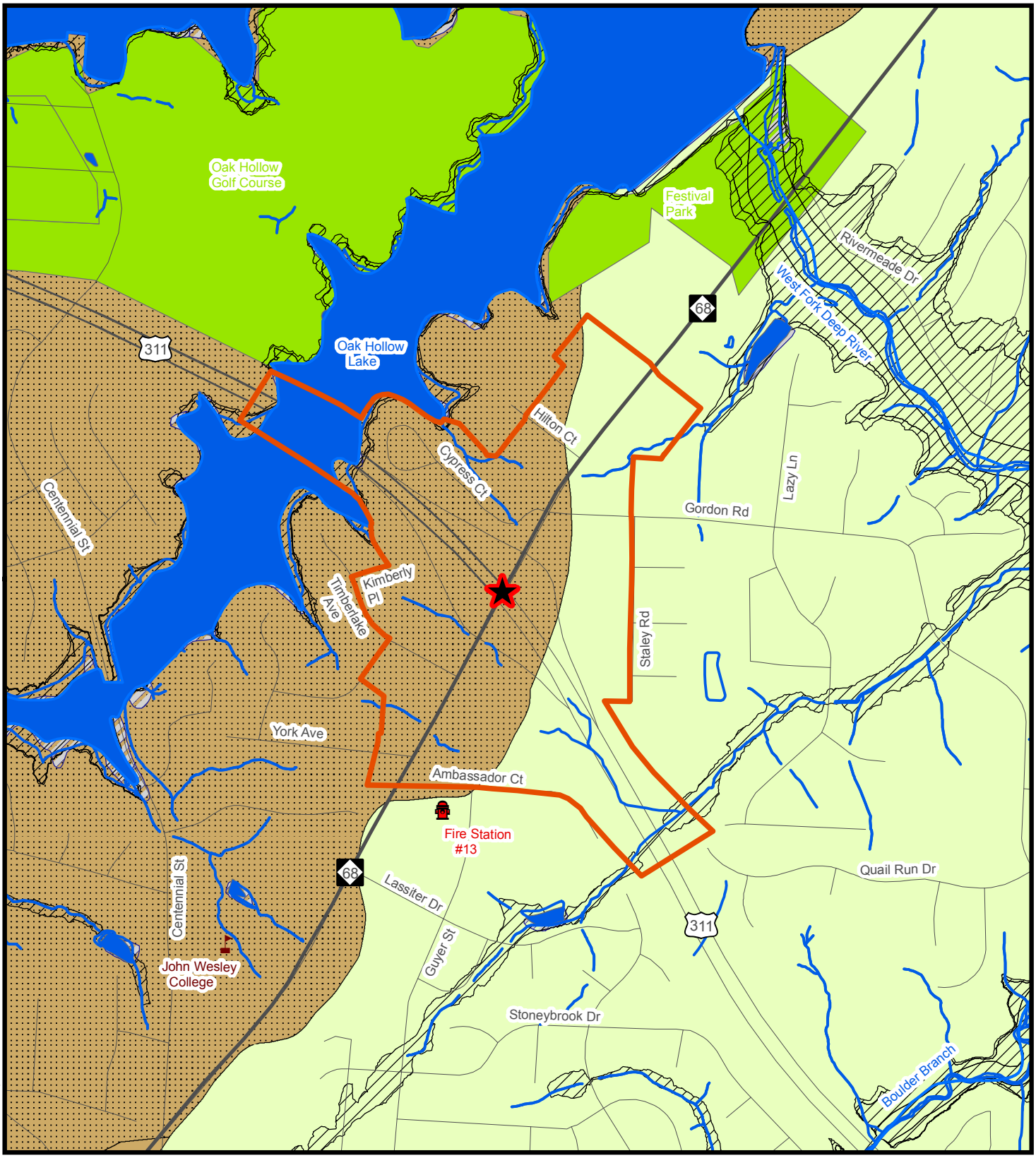

LEGEND
Freeway Segments
- LOS A – D
- LOS E
- LOS F
Intersections
- LOS A – D
- LOS E
- LOS F
NC 68
Hilton Court
LOS F
Hilton Court Extension
LOS C
Gordon Road
LOS F
RAMP
UNDER
US 311 NB On-Ramp
US 311 NB Off-Ramp
FREEWAY
MERGE
LOS F
LOS F
MERGE
FREEWAY
FREEWAY
LOS D
LOS D
LOS D
US 311
US 311
LOS F
LOS F
LOS F
LOS C
LOS D
FREEWAY
DIVERGE
MERGE
MERGE
FREEWAY
US 311 SB Off-Ramp
LOS E
US 311 SB On-Ramp
Timberlake Avenue
LOS F
LOS F
York Avenue
LOS F
LOS F
NC 68
HNTB
NC 68 / US 311
Interchange Study
2035 BUILD PARTIAL CLOVERLEAF
NON-MARKET
LEVEL OF SERVICE
N
NOT TO SCALE
DATE: March, 2009
FIGURE 14


LEGEND
Freeway Segments
- LOS A – D
- LOS E
- LOS F
Intersections
- LOS A – D
- LOS E
- LOS F
NC 68
Hilton Court
LOS F
Hilton Court Extension
LOS C
Gordon Road
LOS F
RAMP
UNDER
US 311 NB On-Ramp
US 311 NB Off-Ramp
FREEWAY
MERGE
MERGE
FREEWAY
FREEWAY
LOS F
LOS F
LOS D
LOS D
LOS D
US 311
US 311
LOS F
LOS F
LOS D
LOS C
LOS D
FREEWAY
DIVERGE
MERGE
MERGE
FREEWAY
US 311 SB Off-Ramp
US 311 SB On-Ramp
LOS F
Timberlake Avenue
LOS F
LOS F
York Avenue
LOS F
LOS F
NC 68
HNTB
NC 68 / US 311 Interchange Study
2035 BUILD PARTIAL CLOVERLEAF MARKET LEVEL OF SERVICE
NOT TO SCALE
DATE: March, 2009
FIGURE 15


LEGEND
Proposed Laneage Improvement
NC 68
APPROX. 1,000'
3-LANE SECTION
Hilton Court
Hilton Court Extension
100'
STOP
SPEED LIMIT 35
Gordon Road
Cypress Court
SPEED LIMIT 45
100'
550'
550'
FULL
US 311 NB On-Ramp
450'
450'
US 311 NB Off-Ramp
1,500' Accel
Lane Drop
US 311
SPEED LIMIT 60
US 311
200' Decel
1,240' Accel
600'
600'
US 311 SB Off-Ramp
US 311 SB On-Ramp
400'
400'
200'
Timberlake Avenue
STOP
SPEED LIMIT 45
FULL = Full width lane extending to adjacent intersection
York Avenue
STOP
NC 68
HNTB
NC 68 / US 311 Interchange Study
2035 BUILD SPUI LANEAGE
NOT TO SCALE
DATE: March, 2009
FIGURE 16


LEGEND
Freeway Segments
- LOS A – D
- LOS E
- LOS F
Intersections
- LOS A – D
- LOS E
- LOS F
NC 68
Hilton Court
LOS F
Hilton Court Extension
LOS C
Gordon Road
LOS D
RAMP
UNDER
US 311 NB On-Ramp
US 311 NB Off-Ramp
FREEWAY
MERGE
LOS F
LOS F
FREEWAY
LOS D
FREEWAY
LOS D
US 311
LOS F
US 311
LOS F
LOS F
LOS C
LOS D
FREEWAY
DIVERGE
MERGE
FREEWAY
US 311 SB Off-Ramp
US 311 SB On-Ramp
LOS D
Timberlake Avenue
LOS F
LOS F
York Avenue
LOS F
LOS F
NC 68
HNTB
N
NC 68 / US 311 Interchange Study
2035 BUILD SPUI
NON-MARKET
LEVEL OF SERVICE
NOT TO SCALE
DATE: March, 2009
FIGURE 17


LEGEND
Freeway Segments
- LOS A – D
- LOS E
- LOS F
Intersections
- LOS A – D
- LOS E
- LOS F
NC 68
Hilton Court
LOS E
Hilton Court Extension
LOS C
Gordon Road
LOS D
RAMP
UNDER
US 311 NB On-Ramp
US 311 NB Off-Ramp
FREEWAY
MERGE
LOS F
LOS F
FREEWAY
LOS D
FREEWAY
LOS D
US 311
LOS F
US 311
LOS F
LOS F
LOS C
LOS D
FREEWAY
DIVERGE
MERGE
FREEWAY
US 311 SB Off-Ramp
US 311 SB On-Ramp
LOS F
Timberlake Avenue
LOS F
LOS F
York Avenue
LOS F
LOS F
NC 68
HNTB
NC 68 / US 311 Interchange Study
2035 BUILD SPUI MARKET LEVEL OF SERVICE
NOT TO SCALE
DATE: March, 2009
FIGURE 18



P:\41253_High_Point_On_Call\US 311 and NC 68\GIS\environmental constraints.mxd

Figure 19: Constraints Map

LEGEND:

- Study Area
- US 311 @ NC 68 Interchange
- US Highway
- State Highway
- Streams
- Lakes
- East Fork Deep River Water Supply Watershed (Class WS-IV)
- West Fork Deep River Water Supply Watershed (Class WS-IV)
- WS-IV Critical Area
- Wetlands
- FEMA Floodplains
- Parks / Recreational Facilities
- Schools
- Fire Station

March 2009

N W E S

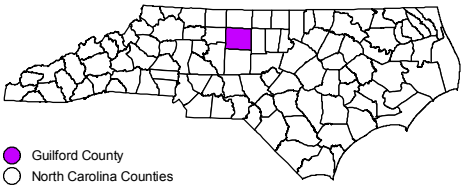
0 500 1,000 1,500 Feet

MAP SOURCES:

North Carolina OneMap: http://nconemap.com
North Carolina DOT: http://www.ncdot.org/it/gis
City of High Point: http://gisweb.high-point.net

HIGH POINT

HNTB



Guilford County
North Carolina Counties

LEGEND

LIMITS OF CONSTRUCTION	PROPOSED APPROX. ALIGNMENT
EXISTING EDGE OF PAVEMENT	PROPOSED EDGE OF PAVEMENT
EXISTING BUILDING	PROPOSED CONCRETE BARRIER
EXISTING CURB & GUTTER / ISLAND	PROPOSED CURB & GUTTER/ ISLAND/ SIDEWALK
EXISTING PROPERTY BOUNDARIES	PROPOSED BRIDGE CONSTRUCTION
APPROX. RIGHT OF WAY IMPACT	PARCEL NUMBER (A1)
STREAMS / CREEKS	

GRAPHIC SCALE
50 0 50 100 200
(IN FEET)

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

NC 68 / US 311 INTERCHANGE STUDY

FIGURE 20 - INTERMEDIATE WIDENING INTERCHANGE CONCEPT
CITY OF HIGH POINT, NC
MARCH 2009

SOURCES: GUILFORD COUNTY
CITY OF HIGH POINT
NC ONEMAP

HIGH POINT
NORTH CAROLINA'S INTERNATIONAL CITY

HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609

City of High Point, North Carolina
NC 68/US 311 Interchange Feasibility Study
Adjacent Parcel Data from Design Concept Plans

Concept Map Key Number	Parcel Number
	Ex. XX-XX-XXXX-X-XXXX-XX-XXX
A1	18-00-0339-0-0001-00-006
A2	18-00-0339-0-0001-00-010
A3	18-00-0339-0-0001-00-011
A4	18-00-0339-0-0001-00-012
A5	18-00-0339-0-0001-00-013
A6	18-00-0339-0-0001-00-014
A7	18-00-0339-0-0001-00-015
A8	18-00-0339-0-0001-00-016
A9	18-00-0339-0-0001-00-017
A10	18-00-0339-0-0001-00-018
A11	18-00-0339-0-0001-00-019
A12	18-00-0339-0-0001-00-020
A13	18-00-0339-0-0001-00-021
A14	18-00-0340-0-0001-00-001
A15	18-00-0338-0-0002-00-011
A16	18-00-0338-0-0002-00-010
A17	18-00-0338-0-0002-00-009
A18	18-00-0340-0-0000-00-002
A19	18-00-0340-0-0000-00-003
A20	18-00-0340-0-0000-00-004
A21	18-00-0338-0-0000-00-007
A22	18-00-0338-0-0000-00-006
A23	18-00-0338-0-0000-00-005
A24	18-00-0338-0-0000-00-004
A25	18-00-0338-0-0000-00-003
A26	18-00-0338-0-0000-00-002
A27	18-00-0338-0-0000-00-012
A28	18-00-0338-0-0000-00-001
A29	18-00-0334-0-0000-00-009
B1	18-00-0402-0-0000-00-083
B2	18-00-0402-0-0000-00-016
B3	18-00-0402-0-0000-00-015
B4	18-00-0402-0-0000-00-014
B5	18-00-0402-0-0000-00-013
B6	18-00-0402-0-0000-00-012
B7	18-00-0402-0-0000-00-011
B8	18-00-0402-0-0000-00-010
B9	18-00-0402-0-0000-00-009
B10	18-00-0402-0-0000-00-005
B11	18-00-0402-0-0000-00-006
B12	18-00-0402-0-0000-00-007
B13	18-00-0402-0-0000-00-008
B14	18-00-0402-0-0000-00-004
B15	18-00-0402-0-0000-00-003
B16	18-00-0402-0-0000-00-002

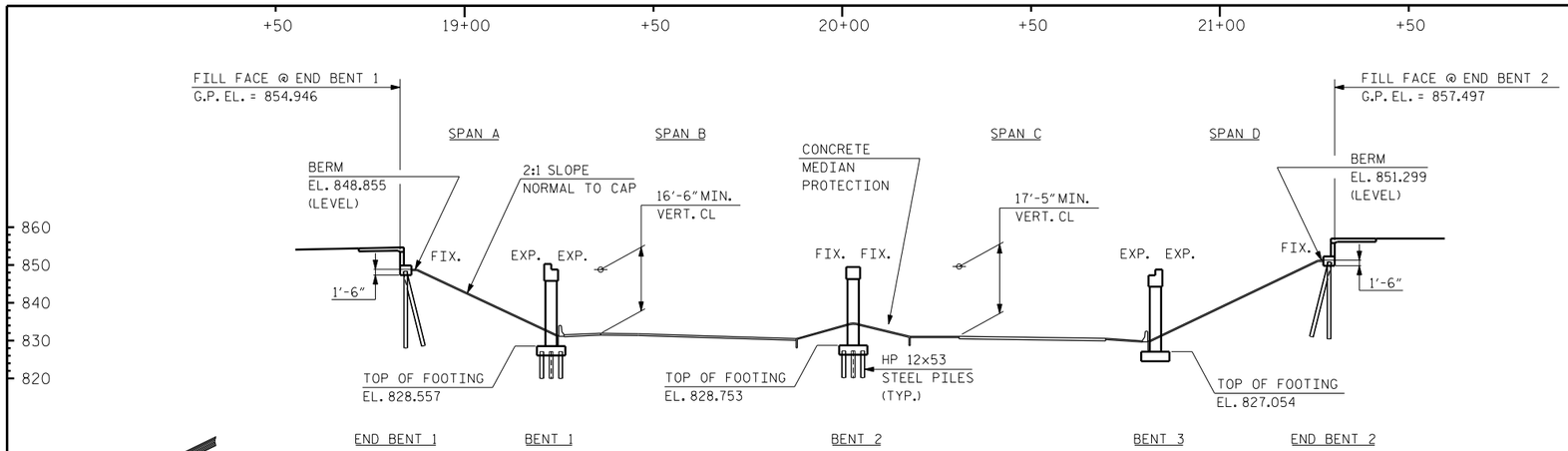
City of High Point, North Carolina
NC 68/US 311 Interchange Feasibility Study
Adjacent Parcel Data from Design Concept Plans

Concept Map Key Number	Parcel Number
B17	18-00-0402-0-0000-00-001
B18	18-00-0402-0-0000-00-055
B19	18-00-0402-0-0000-00-056
B20	18-00-0402-0-0000-00-057
B21	18-00-0402-0-0000-00-058
B22	18-00-0402-0-0000-00-059
B23	18-00-0402-0-0000-00-060
B24	18-00-0402-0-0000-00-061
B25	18-00-0402-0-0000-00-062
B26	18-00-0340-0-0000-00-002
B27	18-00-0340-0-0000-00-003
B28	18-00-0340-0-0000-00-005
B29	18-00-0340-0-0000-00-013
B30	18-00-0340-0-0000-00-014
B31	18-00-0340-0-0000-00-015
B32	18-00-0340-0-0000-00-016
B33	18-00-0340-0-0000-00-017
B34	18-00-0340-0-0000-00-010
B35	18-00-0340-0-0000-00-018
C1	18-00-0168-0-0000-00-017
C2	18-00-0168-0-0000-00-016
C3	18-00-0168-0-0000-00-015
C4	18-00-0168-0-0000-00-014
C5	18-00-0999-0-0000-00-999
C6	18-00-0168-0-0000-00-007
C7	18-00-0168-0-0000-00-006
C8	18-00-0168-0-0000-00-005
C9	18-00-0168-0-0000-00-004
C10	18-00-0168-0-0000-00-003
C11	18-00-0168-0-0000-00-002
C12	18-00-0168-0-0000-00-001
C13	18-00-0168-0-0000-00-024
C14	18-00-0168-0-0000-00-023
C15	18-00-0168-0-0000-00-022
C16	18-00-0168-0-0000-00-021
D1	18-00-0334-0-0000-00-011
D2	18-00-0334-0-0000-00-010
D3	18-00-0334-0-0000-00-003
D4	18-00-0334-0-0000-00-004
D5	18-00-0334-0-0000-00-005
D6	18-00-0334-0-0000-00-006
D7	18-00-0334-0-0000-00-007
D8	18-00-0334-0-0000-00-012

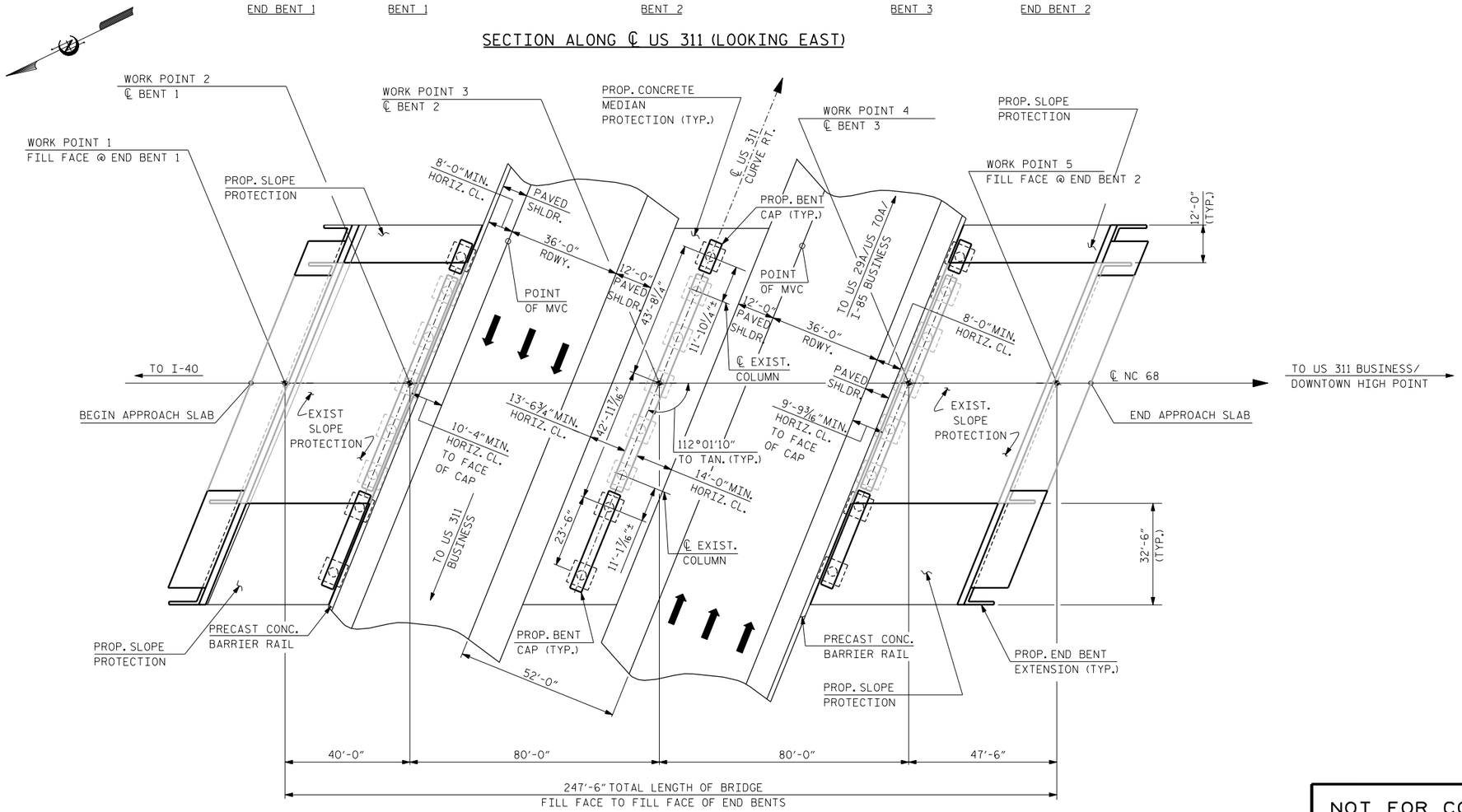
Source: Guilford County GIS Data, http://gcgis.co.guilford.nc.us/guilford_new/, accessed December 2008.

APPENDIX B

NC 68 BRIDGE WIDENING CONCEPT PLANS



SECTION ALONG ℄ US 311 (LOOKING EAST)



PLAN

NOTES:

EXISTING STRUCTURE INFORMATION SHOWN IS FROM AVAILABLE EXISTING STIP PROJECT R-609 PLAN DATA.

TEMPORARY SHORING MAY BE REQUIRED FOR PLACEMENT OF END BENT EXTENSION AND PROPOSED BENT FOOTINGS.

MVC = MINIMUM VERTICAL CLEARANCE

GUILFORD COUNTY

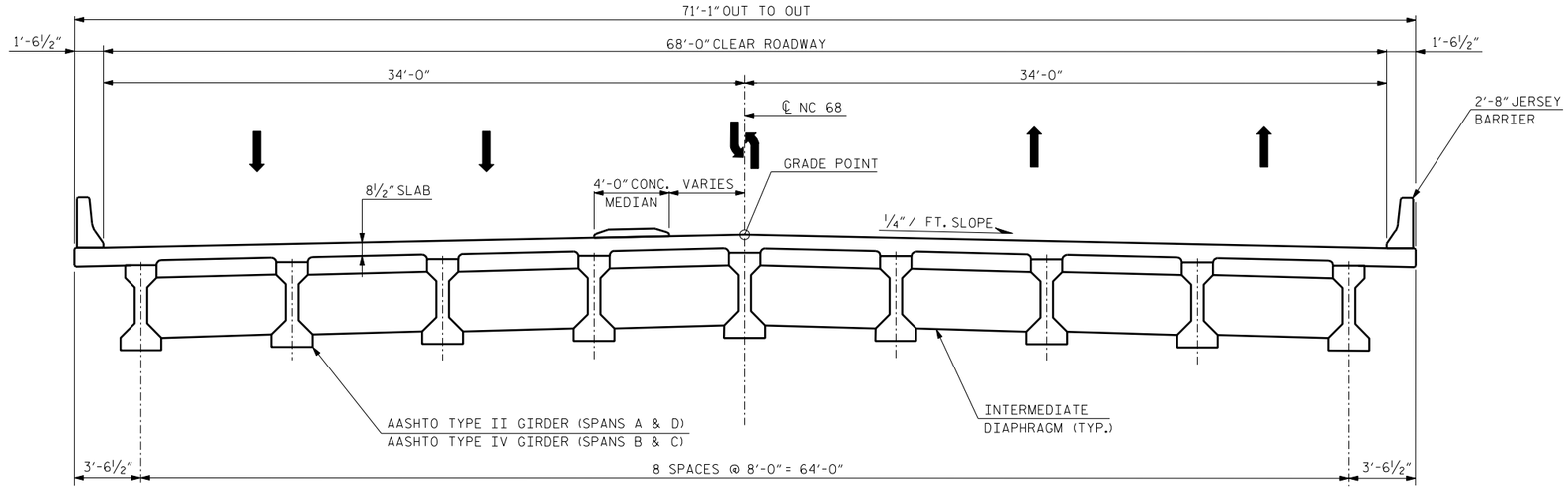
NOT FOR CONSTRUCTION

CONCEPT DRAWING
FOR WIDENING OF BRIDGE ON
NC 68 (EASTCHESTER DR.) OVER
US 311 BYPASS

HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

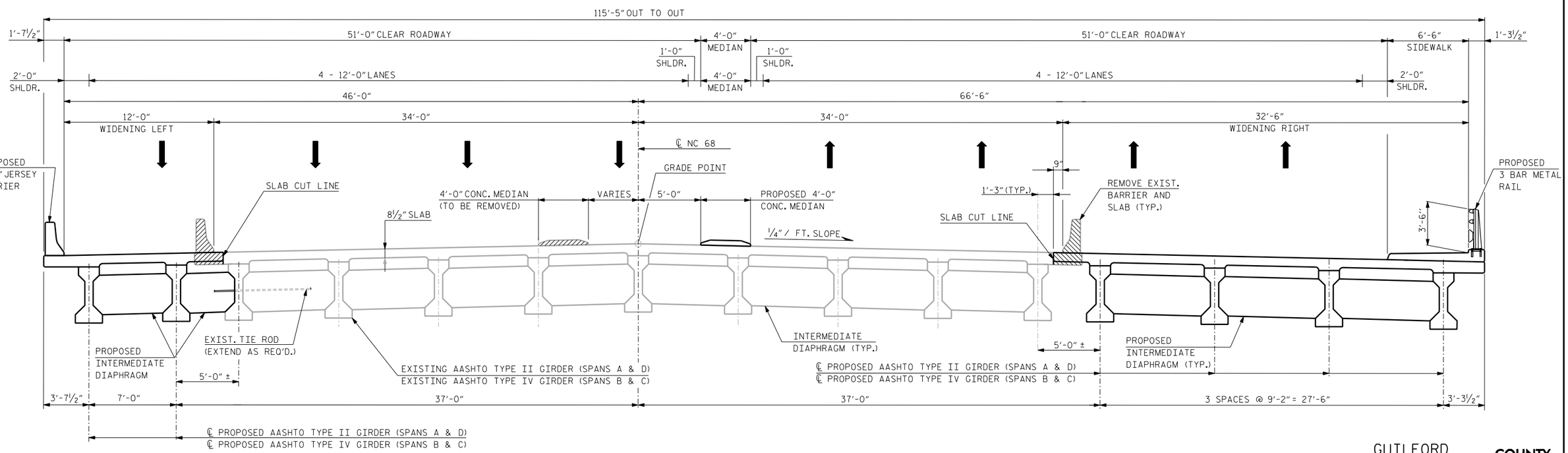
DRAWN BY J. BAYNE DATE 12/08
CHECKED BY D. HAWKINS DATE 12/08
DWG. NO. 1

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			TOTAL SHEETS
2			4			



EXISTING TYPICAL SECTION - NC 68 BRIDGE OVER US 311 (LOOKING SOUTH)

(SHOWING INTERMEDIATE DIAPHRAGM)



PROPOSED TYPICAL SECTION - NC 68 BRIDGE OVER US 311 (LOOKING SOUTH)

(SHOWING INTERMEDIATE DIAPHRAGM)

NOTES:

CONSTRUCTION STAGING REQUIRED FOR PROPOSED WIDENING TO MAINTAIN EXISTING TRAFFIC CONDITION

GUILFORD COUNTY

NOT FOR CONSTRUCTION

CONCEPT DRAWING

NC 68 BRIDGE
TYPICAL SECTION

HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY J. BAYNE DATE 12/08
CHECKED BY D. HAWKINS DATE 12/08

DWG. NO. 2

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			TOTAL SHEETS
2			4			