TRAFFIC FORECASTS FOR THE

TOLL SCENARIOS FOR

TIP PROJECT NO. R-2635, WESTERN WAKE PARKWAY

WAKE COUNTY, NORTH CAROLINA

Prepared for

HNTB

for the

NORTH CAROLINA Turnpike Authority

Prepared by

MARTIN ALEXIOU BRYSON

March, 2007

4000 WestChase Boulevard, Suite 530, Raleigh, North Carolina 27607

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INTRODUCTION

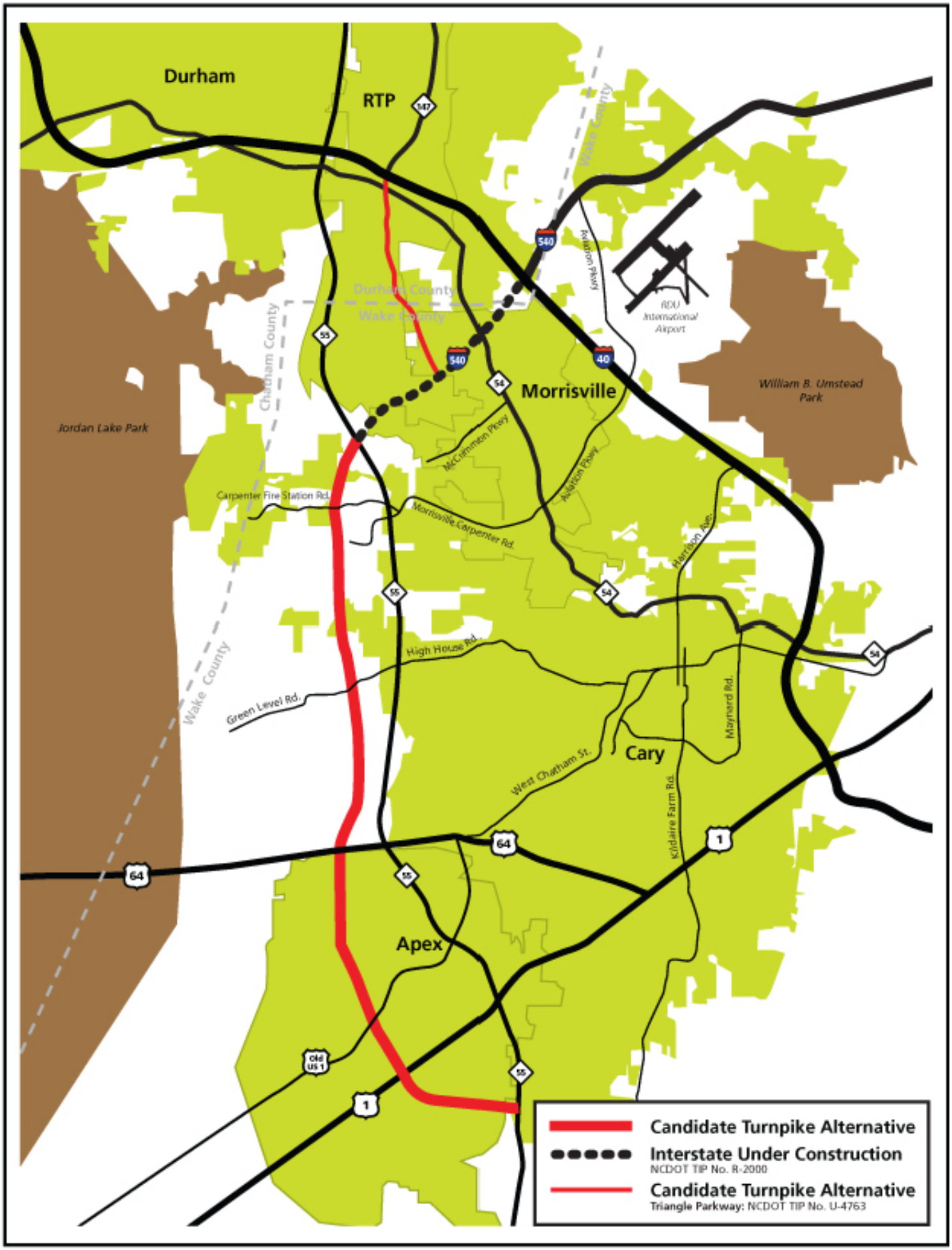
This memorandum details the methodology used to develop the toll forecasts for the Western Wake Parkway Scenarios. This memorandum is accompanied with the documentation detailing the implementation of the tolling methodology by Elizabeth Harper (shown in Appendix A) of the Triangle Regional Model (TRM). The TRM was provided by the Capital Area Metropolitan Planning Organization (CAMPO).

Toll forecasts were developed for the Western Wake Parkway and surrounding intersections for 2011 and 2030. The study area intersections for which traffic forecasts were developed include:

1. Western Wake Parkway at NC 55;
2. NC 55 at Alston Avenue;
3. NC 55 at Good Hope Church Road;
4. NC 55 at Carpenter Fire Station Road;
5. NC 55 at Indian Wells Road and Morrisville-Carpenter Road;
6. NC 55 at Morrisville Parkway Extension;
7. NC 55 at Green Hope School Road;
8. NC 55 at Green Level Road and High House Road;
9. NC 55 at Jenks Road;
10. NC 55 at US 64;
11. NC 55 at Olive Chapel Road;
12. NC 55 at Old US 1;
13. NC 55 at US 1;
14. NC 55 at Old Smithfield Road;
15. Western Wake Parkway at NC 55 Bypass;
16. Western Wake Parkway at US 1;
17. Western Wake Parkway at Old US 1;
18. Western Wake Parkway at US 64 ;
19. US 64 at Kelly Road;
20. Western Wake Parkway at Green Level Road; and
21. Western Wake Parkway at Morrisville Parkway Extension.

The 12.7-mile project—also known as State Transportation Improvement Program Project No. R-2635—is a candidate North Carolina Turnpike Authority facility that extends I-540 from west of NC 55 near Research Triangle Park south to the NC 55 Holly Springs Bypass. The project limits for the Western Wake Parkway are shown in Figure 1.

Figure 1: Western Wake Parkway Project Limits



METHODOLOGY AND FORECAST DEVELOPMENT

Forecast volumes for two main toll alternatives were developed named:

- 2011 Western Wake Parkway Build Toll and
- 2030 Western Wake Parkway Build Toll.

Both of these toll alternatives assumed that Triangle Parkway and Western Wake Parkway were completed in their entirety.

Before the toll alternatives could be completed, base alternatives were developed assuming the Triangle Parkway and Western Wake Parkway as a non-tolled facilities. These alternatives are:

- 2011 Western Wake Parkway Build Non-Toll and
- 2030 Western Wake Parkway Build Non-Toll.

All base and toll alternatives were developed using previous Western Wake Parkway forecasts performed for the NEPA process by the NCDOT.

The design data (i.e., design hourly volume factors [K-Factors], directional distribution factors [D-Factors], and heavy vehicle percentages) for each interchange and roadway segment were adopted from the previous NCDOT forecasts. The factors remained consistent for each of the alternatives.

2011 WESTERN WAKE PARKWAY BUILD NON-TOLL ALTERNATIVE

The 2011 Western Wake Parkway Build Non-Toll Forecasts were derived from the Western Wake Parkway forecasts developed by the NCDOT in July, 2003. Specifically, an interpolation procedure was employed between the 2005 Scenario 1 and the 2025 Scenario 2 to obtain forecast estimates for 2011. These sheets are included in Appendix B.

The 2005 Scenario 1 forecast shows the Western Wake Parkway between NC 55 and the NC 55 Bypass. The 2025 Scenario 2 forecast assumes the Western Wake Parkway extending from NC 55 to beyond the NC 55 Bypass. The 2011 Western Wake Parkway Build Non-Toll Alternative assumes that the Western Wake Parkway ends at the NC 55 Bypass as it does in the 2005 Scenario 1.

Upon completion of the interpolation process, the forecast link and turning movement volumes were balanced for 2011. This final step yielded the 2011 Western Wake Parkway Build Non-Toll Forecasts, which are shown in Diagram 1.

2011 WESTERN WAKE PARKWAY BUILD TOLL ALTERNATIVE

The 2011 Western Wake Parkway Build Toll Forecasts were developed by applying percentages developed from the TRM model runs to the 2011 Western Wake Parkway Build Non-Toll Forecasts. The model percentages were developed from separate runs with Triangle Parkway and Western Wake Parkway as both non-toll and toll facilities. Link and turning movement volume percentages were calculated from the runs. The forecasts were developed using the formula:

$$\textit{2011 Build Toll Forecast Volumes} = \frac{\textit{2011 Build Non-Toll Forecast Volumes} * \textit{2011 Build Toll Model Volume}}{\textit{2011 Build Non Toll Model Volume}}$$

The turning movement volumes were balanced and smoothed through percentages obtained from the toll model run. *TURNSW32,* a turning movement forecasting program, was used to facilitate this process. *TurnsW32* employs techniques described in "National Cooperative Highway Research Program (NCHRP) Report 365: Travel Estimation Techniques for Urban Planning," published by the Transportation Research Board National Research Council.

Figure 2: Western Wake Parkway at US 1 *Input* Turning Movement Volumes *before* Iteration

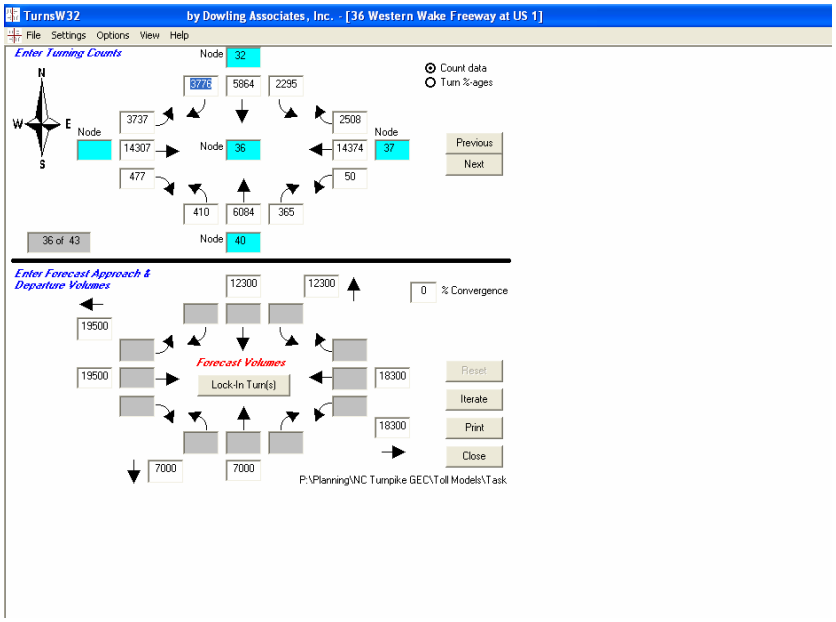
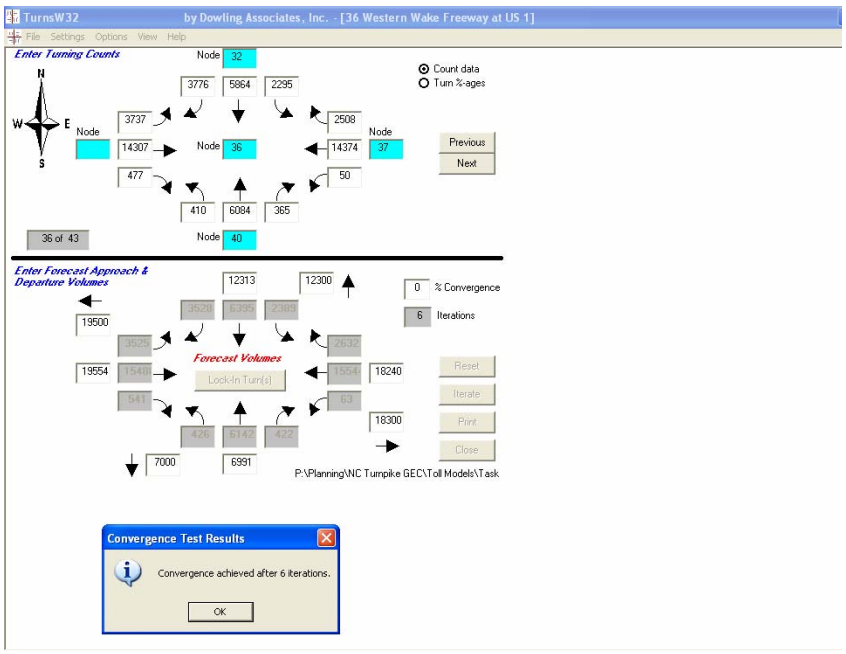


Figure 3: Western Wake Parkway at US 1 *Output* Turning Movement Volumes *after* Iteration



TurnsW32 derives forecast turning movements using an iterative approach that alternately balances the inflows and outflows until the results converge. The results converged within 100 iterations at each location. Simply, the estimated AADT volumes (inflows and outflows) at each intersection were used to estimate the turning movements. Once this process was completed, the turning

movements were manually adjusted to complete the balancing procedure. An example of the inputs and outputs of *TurnsW32* is shown in Figure 2 and Figure 3. Some manual adjustments were required to obtain reasonable estimates at some intersections.

The 2011 Western Wake Parkway Build Toll Forecasts are shown in Diagram 2.

2030 WESTERN WAKE PARKWAY BUILD NON-TOLL ALTERNATIVE

The 2030 Western Wake Parkway Build Non-Toll Forecasts were developed from the NEPA forecast performed for the Western Wake Parkway by the NCDOT in July, 2001. Specifically, an interpolation procedure was employed between the 2005 Scenario 2 and the 2025 Scenario 4. To include the Morrisville Parkway Extension, the percentages obtained from the interpolation process were applied to 2025 Scenario 3 to obtain forecast estimates for the 2030 Western Wake Parkway Build Non-Toll Forecasts. These sheets are included in Appendix B.

Upon completion of the interpolation process, the forecast link and turning movement volumes were balanced for 2030. This final step yielded the 2030 Western Wake Parkway Build Non-Toll Forecasts, which are shown in Diagram 3.

2030 WESTERN WAKE PARKWAY BUILD TOLL ALTERNATIVE

The 2030 Western Wake Parkway Build Toll Forecasts were developed by applying percentages developed from the TRM model runs to the 2030 Western Wake Parkway Build Non-Toll Forecasts. The model percentages were developed from separate runs with Triangle Parkway and Western Wake Parkway as both non-toll and toll facilities. Link and turning movement volume percentages were calculated from the runs. The forecasts were developed using the formula:

$$\textit{2030 Build Toll Forecast Volumes} = \frac{\textit{2030 Build Non-Toll Forecast Volumes} * \textit{2030 Build Toll Model Volume}}{\textit{2030 Build Non Toll Model Volume}}$$

The turning movement volumes were balanced and smoothed through percentages obtained using the *TURNSW32* turning movement forecasting program. Some manual adjustments were required to obtain reasonable estimates at some intersections. The 2030 Western Wake Parkway Build Toll Forecasts are shown in Diagram 4.

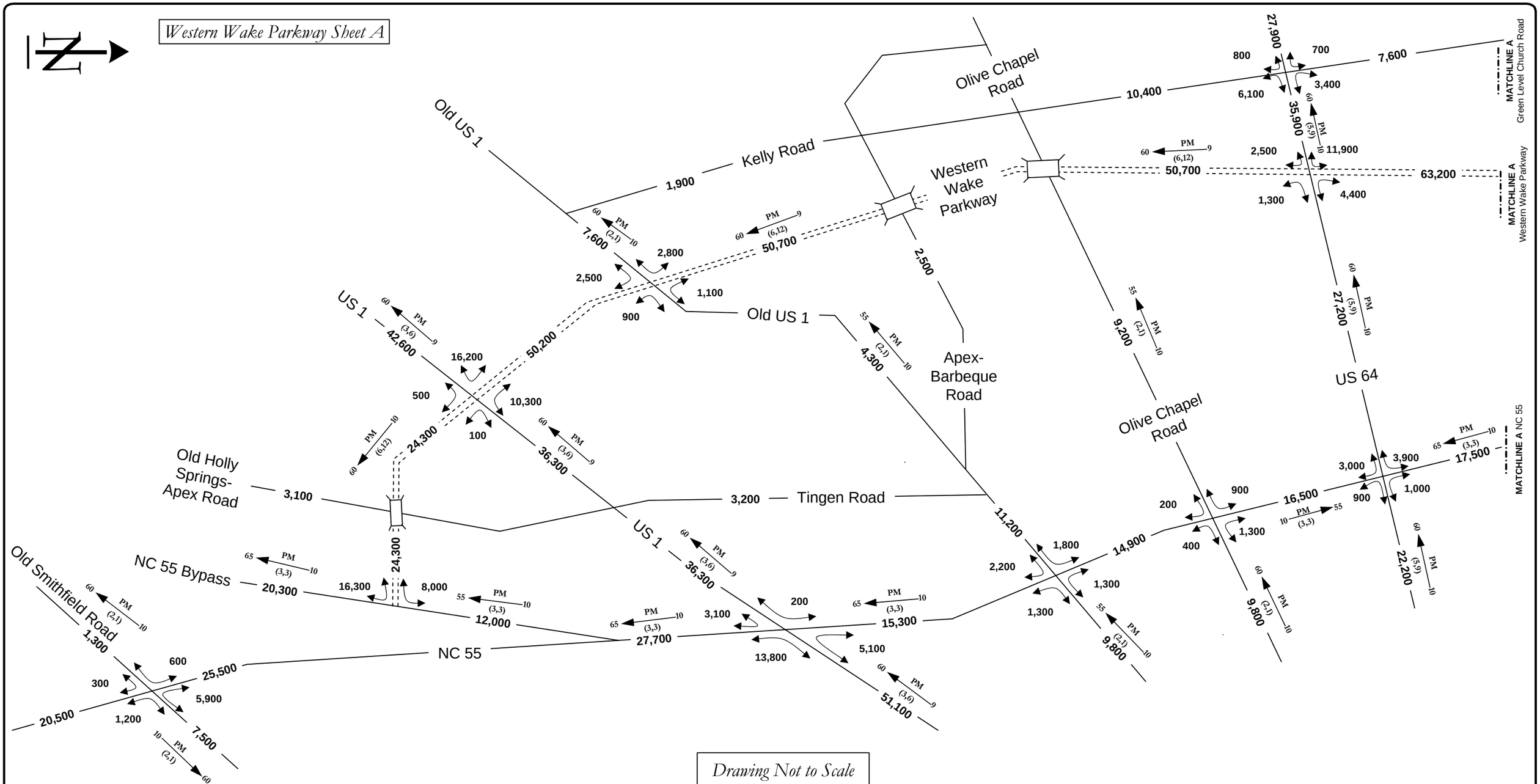


Diagram 1
2011 BUILD Non-Toll ALTERNATIVE
DAILY FORECAST VOLUMES

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LEGEND

DHV —PM (d, t)→ D

DHV = DESIGN HOURLY VOLUME (%) = K30

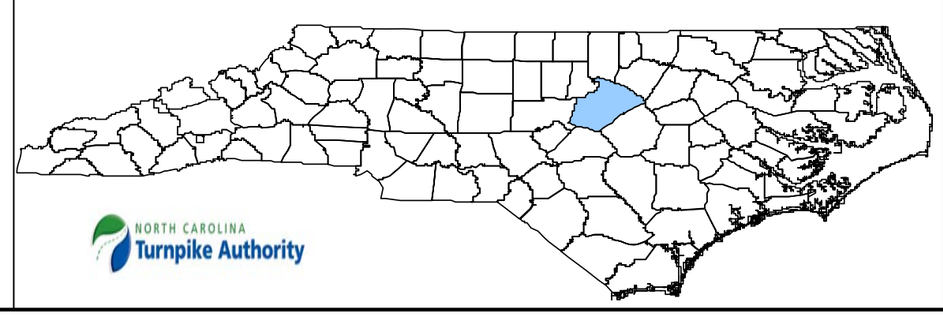
K30 = 30th HIGHEST HOURLY VOLUME

PM = PM PEAK PERIOD

D = DIRECTIONAL SPLIT (%)

→ INDICATES DIRECTION OF D
REVERSE FOR AM PEAK

(d,t) DUALS, TT-ST'S (%)



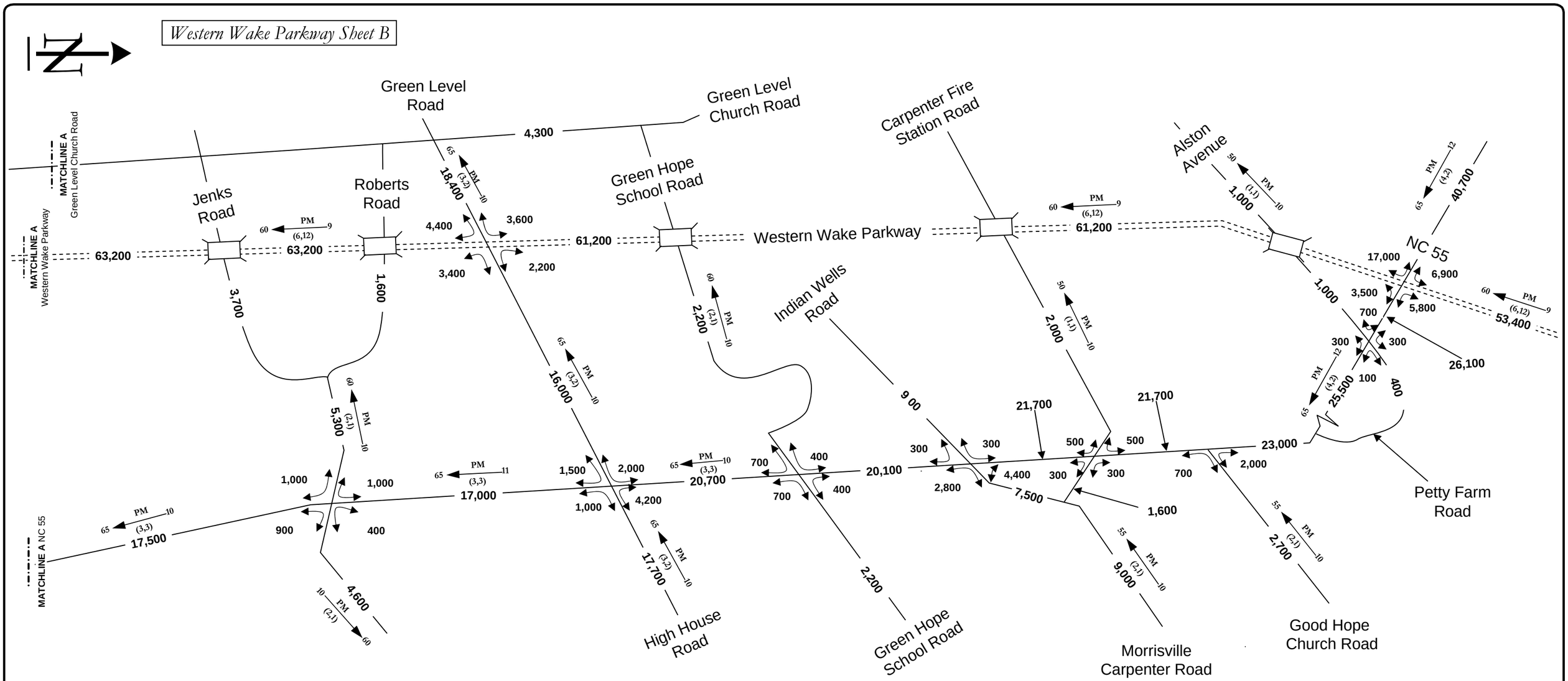
LOCATION: Western Wake Parkway—From NC 55 Bypass to NC 55 near Alston Avenue

PROJECT: Western Wake Parkway

COUNTY: WAKE

DIVISION: 5 **DATE: March, 2007**

TIP Project No. R-2635



Drawing Not to Scale

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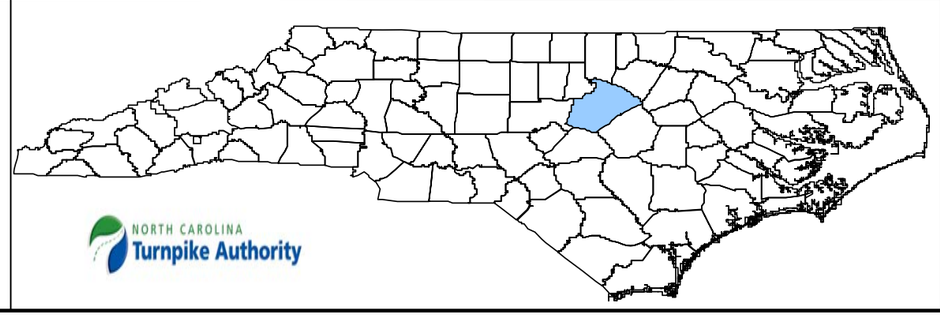

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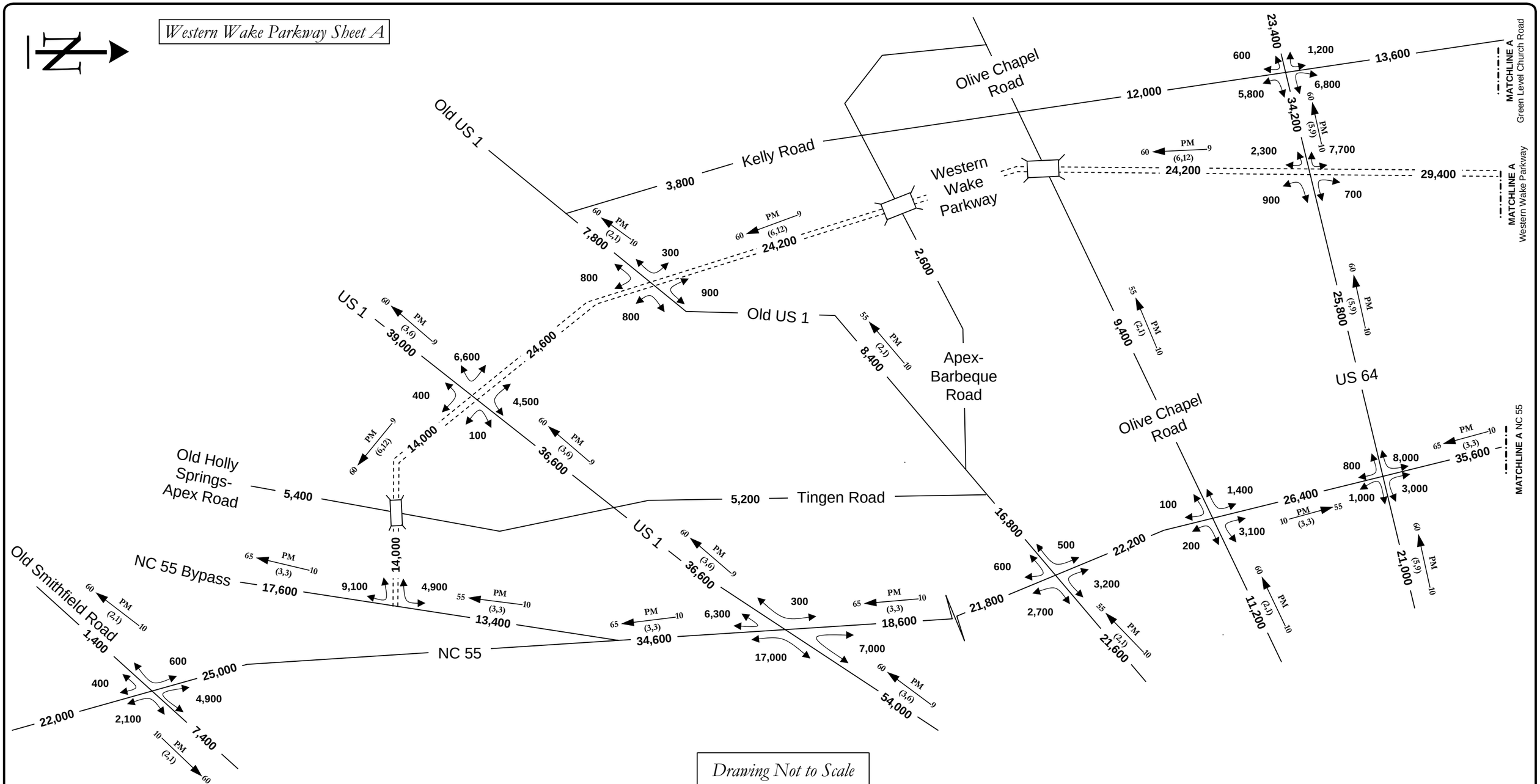

Drawing Not to Scale

Diagram 2
2011 BUILD Toll ALTERNATIVE
DAILY FORECAST VOLUMES

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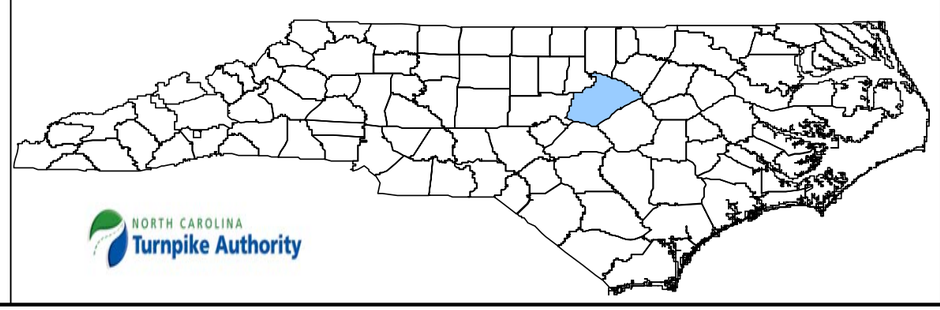

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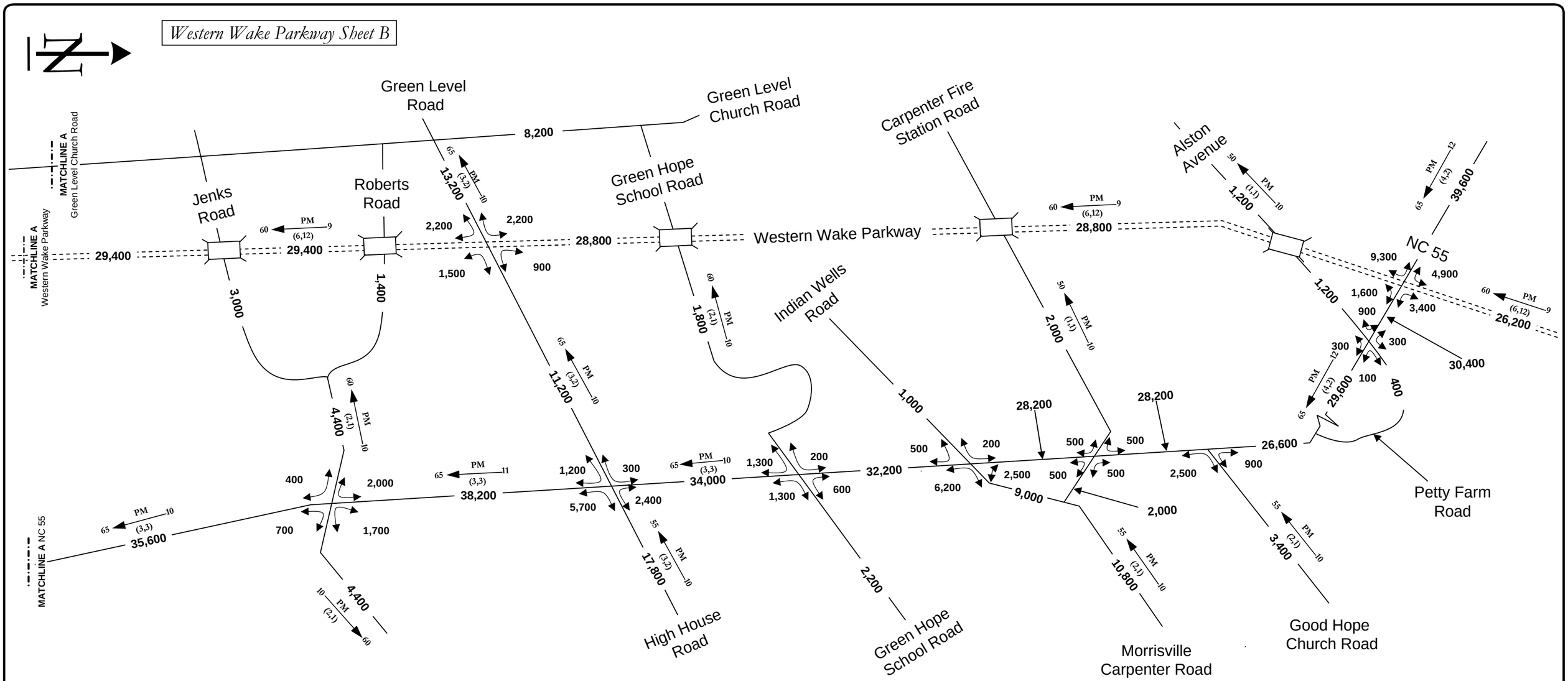

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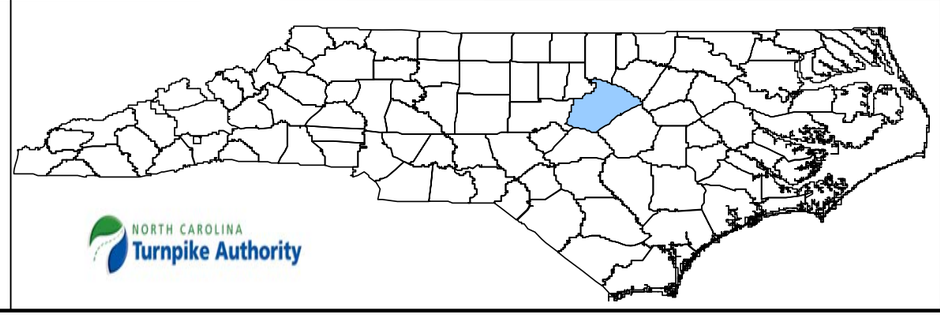

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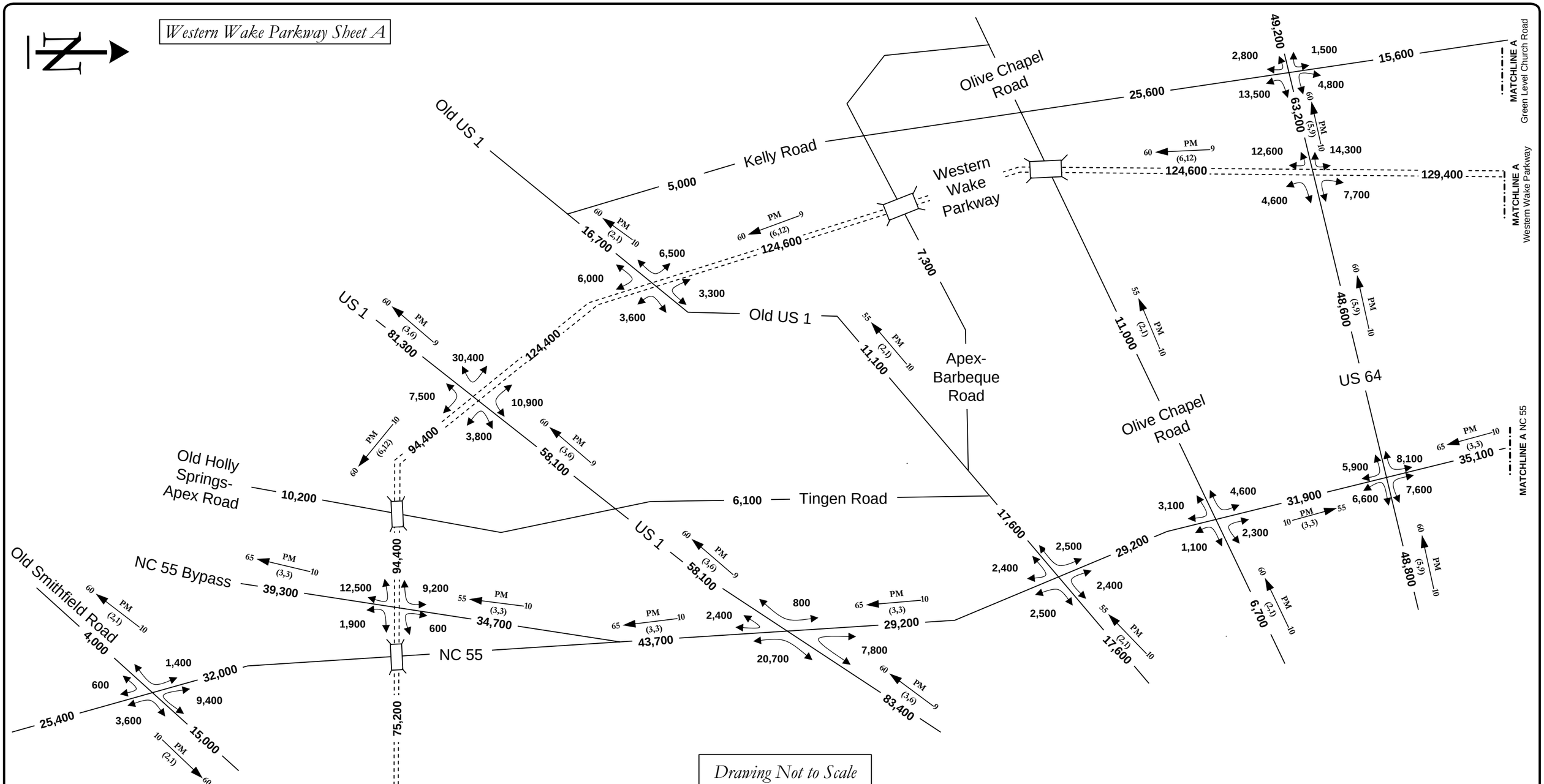

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Diagram 3
2030 BUILD Non-Toll ALTERNATIVE
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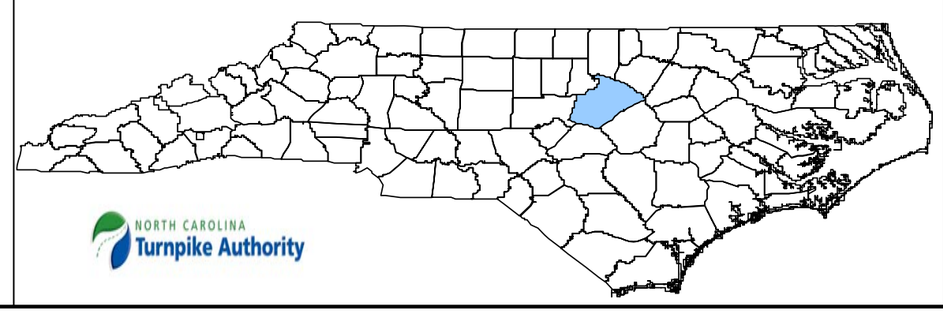

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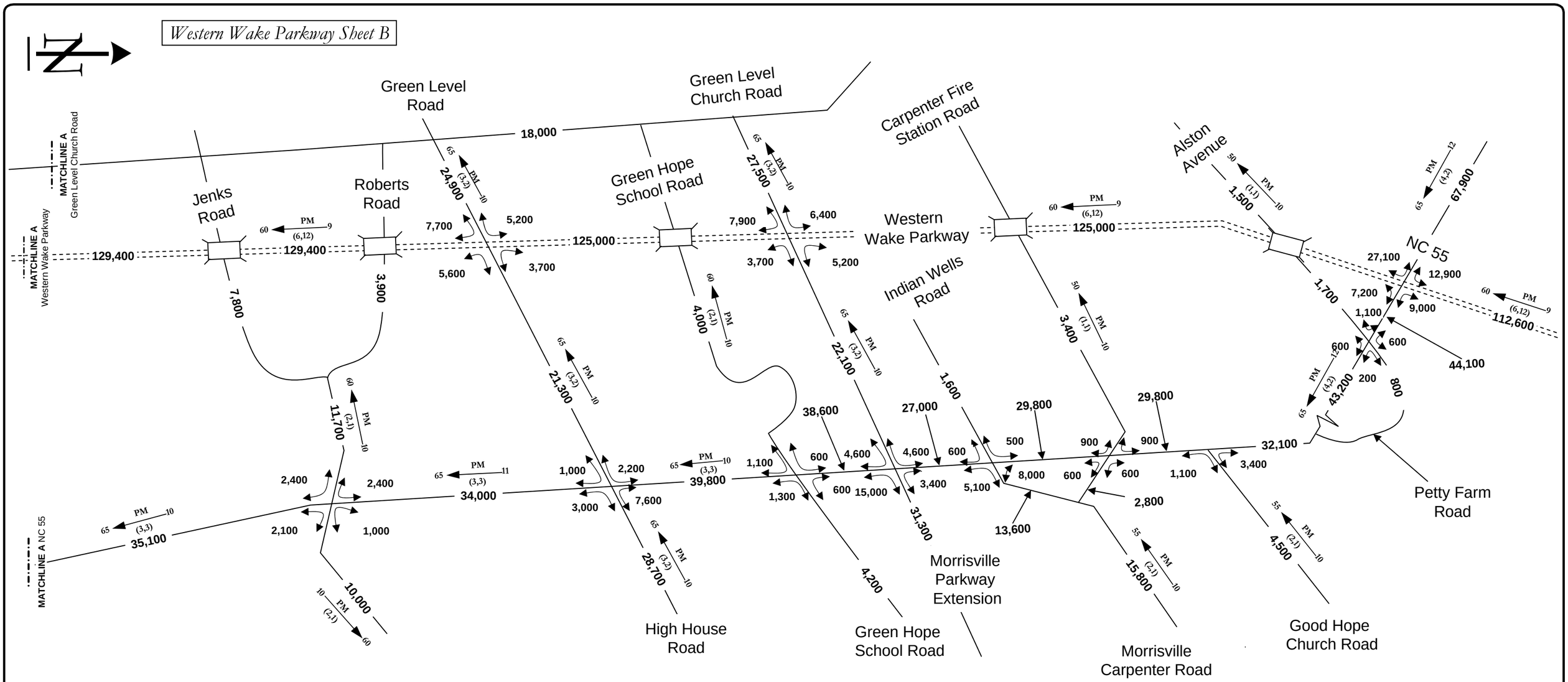

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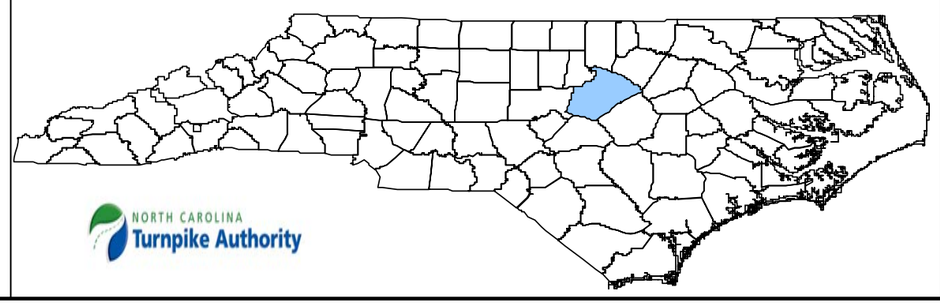

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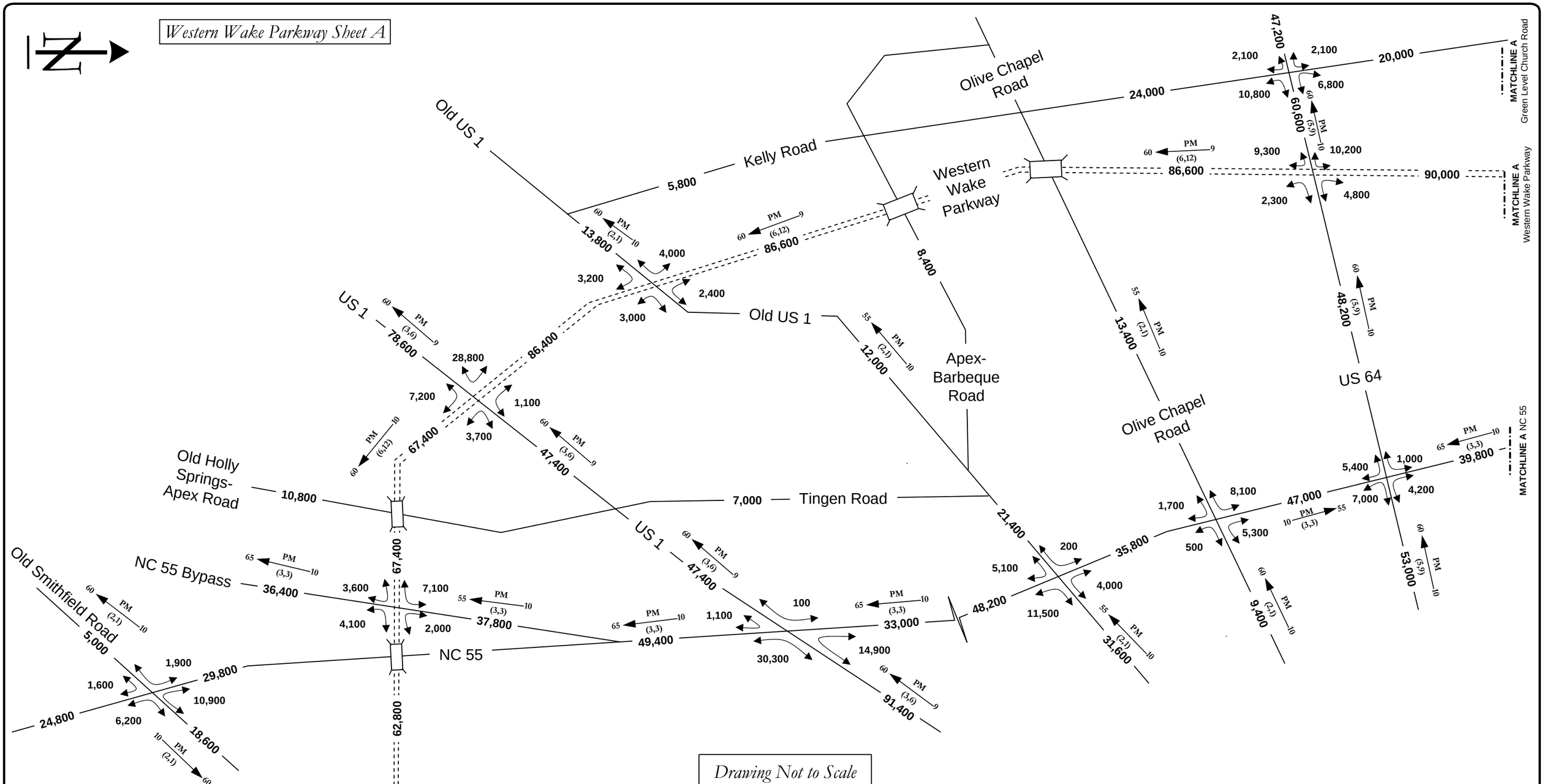

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Diagram 4
2030 BUILD Toll ALTERNATIVE
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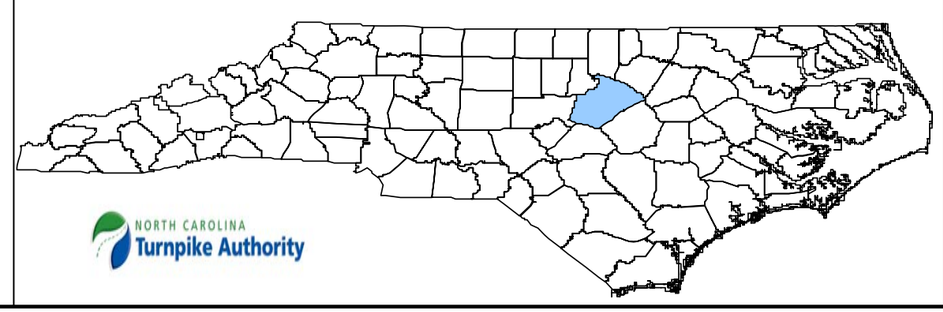

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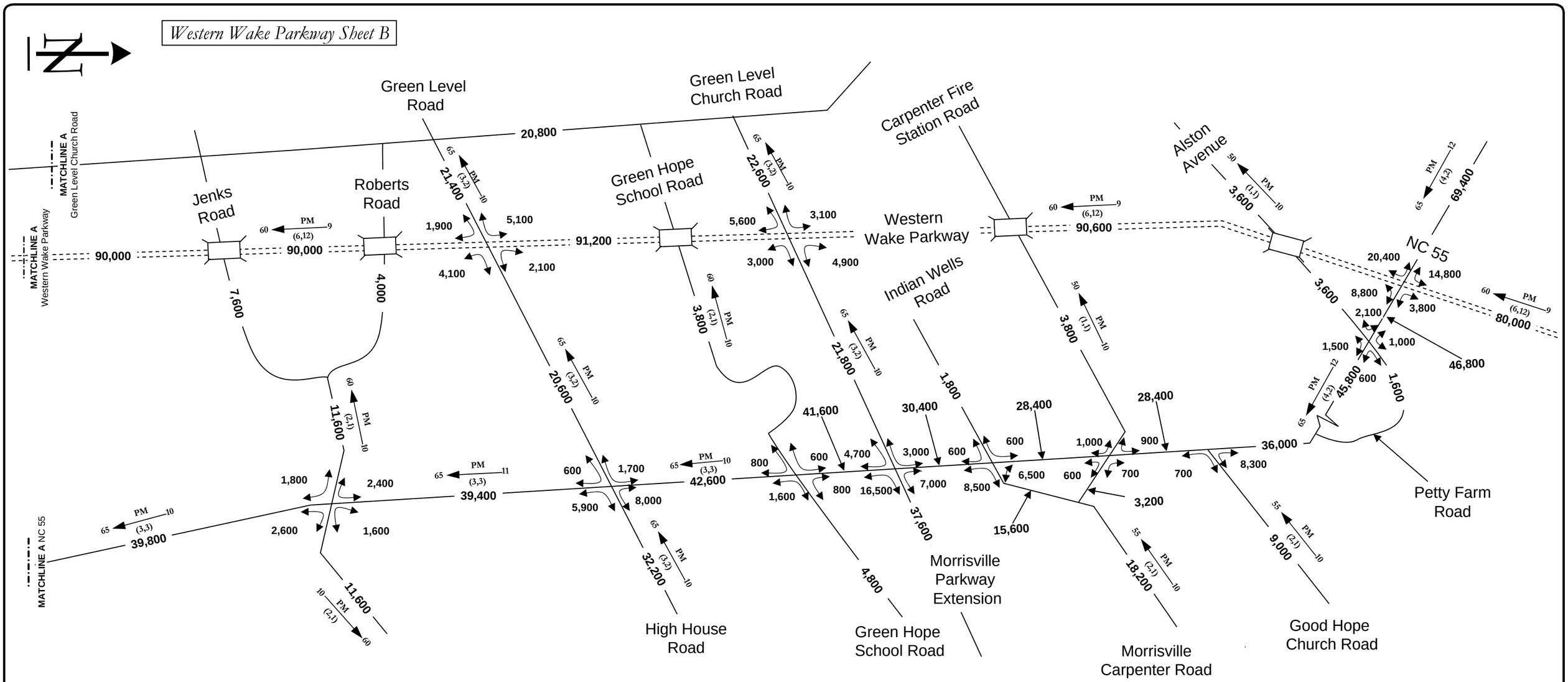

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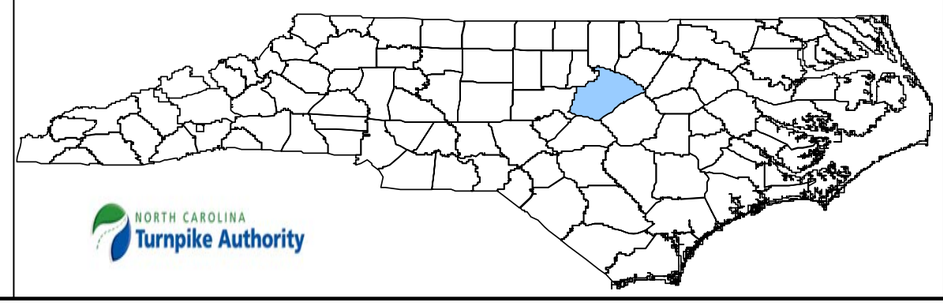

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APPENDICES

APPENDIX A: TRM TOLLING METHODOLOGY

Elizabeth A. Harper

Memorandum

To: Bill Martin, Martin/Alexiou/Bryson, Inc.
Taruna Tayal, Martin/Alexiou/Bryson, Inc.

From: Elizabeth A. Harper

Date: December 4, 2006

Re: Triangle Regional Model Tolling Application

This memo provides documentation of the implementation of the a tolling methodology within the Triangle Regional Model (TRM) for purposes of evaluation of the effect of tolling the Western Wake Parkway (WWP) and the Triangle Parkway (TP) on regional travel demand in 2030 and 2011. It is accompanied by a set of three CDs containing the official models as delivered by the Capital Area Metropolitan Planning Organization (CAMPO) and the model files used for the initial forecasts. The CD containing the model files used for the initial forecasts contains a workbook entitled 'Files on this CD.xls' describing the files required to run the various toll scenario analyses.

Installation and Verification of the TRM

The current official approved TRM for 2030 and for 2010 were provided by CAMPO via FTP, were installed at Martin/Alexiou/Bryson offices, and were tested to verify that the project installation produced the same results as those produced by CAMPO. Total vehicle miles traveled (VMT) for both the 2030 and the 2010 models were identical to that reported by CAMPO.

Modifications to the TRM for the Base Case (Non-toll)

The official TRM model was executed using version 9.1 of TranPlan. Subsequent testing has shown that some auto through trips may fail to be assigned using version 9.1 and that problems with the gravity model may also effect the vehicle loads. To assure the most accurate analysis of diversions due to tolls the consulting team choose to evaluate the use of version 9.2 of TranPlan. Tests showed a minor difference in total VMT and average speeds due to the use of TranPlan version 9.2 (see Table 1 below). Version 9.2 was chosen for this analysis.

Table 1: Changes in VMT and Speeds - V9.1 to V9.2*

	v9.1	*v9.2*	*Difference*
VMT	74,132,275	74,062,390	-0.09%
VHT	2,287,146	2,278,572	-0.37%
Speed	32.4	32.5	0.28%

*autos only, no trucks, commercial vehicles or through trips

Methodology for Modeling Tolls

There is little consensus in the travel demand modeling community on the appropriate methods for modeling travel demand under tolling conditions. The proceedings of an *Expert Forum on Road*

Pricing and Travel Demand Modeling[1] provides a good summary of the technical options evidenced in the current state of the practice, the benefits and drawbacks of each, and the directions in which the state of the art and current research are leading. A summary of the three[2] state of the practice approaches discussed at the Forum are listed and summarized relative to the TRM and this tolling analysis project in Table 2 on page 3.

Priorities for this analysis are for a capability to analyze tolls with minimum changes to the existing, approved TRM model structure and model stream. Time constraints prohibit data collection, model estimation and calibration. After testing and evaluation, the diversion model, using the default parameters provided in the TranPlan software[3], was selected for the following reasons:

1. Estimation of a new mode choice model with a tolling capability is an extensive effort; and is beyond the scope and time constraints of this project.

2. The trip assignment approach provided erratic results due to highly congested facilities, short trip length frequencies, and undocumented but commonly recognized problems with the TRM distribution model. Building the trip assignment approach into the larger TRM model stream with full feedback might ameliorate this erratic behavior but would require a major change to the overall approved TRM model, and would not ameliorate potential issues related to the distribution model.

3. There is considerable precedence in the travel demand forecasting community for making use of calibrated model parameters from other regions where no local data exists for model estimation and calibration.

4. Making use of the diversion model allows the consulting team to remain as close as possible to the original, approved, TRM model structure.

5. Estimation of a single value of time for the entire region is difficult to defend and document but would not be necessary with the diversion model.

6. The toll diversion model can be easily implemented in a timely manner.

For more documentation on the algorithms and parameters of the TranPlan implementation of the toll diversion model please see the TranPlan Users' Guide.

Other Considerations

1. Because of the generous capacities coded on ramps in the 2030 TRM networks there are many locations in the corridor where traffic finds a shorter path by exiting and re-entering the expressway at an interchange, by-passing the mainline between the ramp gores. The consulting team coded turn prohibitors at the base of every interchange on the WWP and the TP to prohibit this unlikely movement from an exit ramp directly onto the subsequent entrance ramp. The locations where these turn prohibitors are added can be identified in the file included in the model setups and named "turnproh.prn"."
2. Some ramps are incorrectly coded as two-way ramps and are receiving zero assigned volumes in the official TRM. However, these ramps became acceptable paths for some traffic being diverted by the tolls. These ramps were disabled with a combination of zero capacities and turn prohibitors. Ramps that are disabled can be seen in the file included in the model setups and named "disable.prn".

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[1] Expert Forum on Road Pricing and Travel Demand Modeling Proceedings; November 14- 15, 2005; Hilton Alexandria Old Town; Sponsored the Office of Transportation Policy, U.S. Department of Transportation.

[2] A fourth approach, the Facilities Model, is documented in the TranPlan Users Guide, but is rarely used in current practice since GPS, video imagery, and electronic data capture technologies are making toll booths obsolete for future forecasts.

[3] These parameters were developed for the Florida Department of Transportation based on considerable observed toll data.

Table 2: Approaches for Travel Demand Forecasting for Toll Facilities

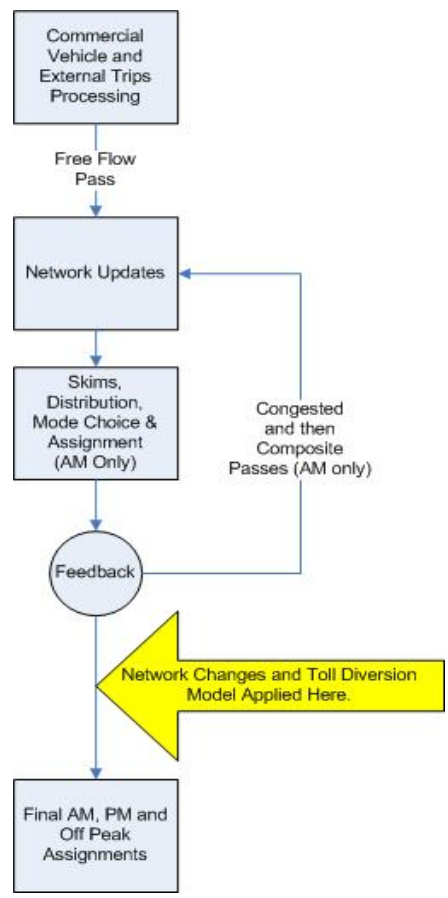
Approach	*Pros*	*Cons*
Mode Choice Analysis – Selection of a route that includes a toll is treated as a sub-mode choice in the auto nest of a nested-logit mode choice model. Variables that effect the choice may include cost, travel time savings, average income, purpose of trip, auto ownership, etc. Only those auto person trips that are identified as likely to choose the toll route are allowed to be assigned to the toll facility.	Use of 'generalized cost' functions in identifying toll choices resulting in a more realistic representation of choices made by drivers. Most defensible technically.	Requires full model feedback (mode choice through assignment) iteratively until convergence is reached – substantial change in TRM model structure. Requires estimation and calibration of a nested mode choice model and re-validation of the entire model stream – substantial level of effort.
Trip Assignment – the cost of tolls are converted to an equivalent measure of time and added to the travel times on toll roads to compute a generalized time for calculating impedances and shortest paths. The choice to use a toll road or not is based on minimum generalized travel times only.	Provides ability to evaluate directly the influence of traffic congestion on demand for the toll facility. Easiest to implement.	Requires estimation of a single value of time for the entire population of the region (or complex multi class trip assignment with trip matrix stratification) Elimination of effect of other contributing factors such as income, trip purposes, and time of day. Should be applied within the full model feedback to account for changes in trip distribution – Requires major change to TRM model structure. Without incorporation into full model stream, results can be unpredictable in heavily congested networks with short trip length frequencies.
Diversion Models – A probability that a vehicle will use the toll facility route rather than a free route is calculated for each origin-destination pair based on observed behavior, differences in travel times, and costs of the tolls.	Can be applied without modifying or recalibrating the existing four-step travel demand model structure.	Requires the estimation and calibration of model parameters based on observed data.

3. The ramps on the TP between Hopson Road and Davis Drive are to be combined with a collector-distributor type configuration rather than the ramp coding currently included in the official TRM. Changes to the TRM network to implement this revised configuration can be seen in the file included with the model setups and named "addramp.prn".
4. It is assumed that electronic tolling capabilities will be sufficient by 2030 to effectively eliminate the need to model delays at service plazas.
5. Approximately eight percent of the total regional 2030 trips are represented by the trucks, external commercial vehicles, and through trips and are assigned separately from the autos and other internal trips in an all or nothing (AON) assignment. These trips load primarily on the freeways and constitute over 30% of freeway traffic volumes. They are not included in the impedance calculations for the auto and other internal trips assignment or for the toll probability calculations. This model structure was not modified because to do so would represent a major change in the adopted TRM, and would require re-validation of the highway model.

Toll Model Implementation

To minimize the changes between the official approved TRM and the Toll Model the consulting team choose to add the toll model changes to the end of the model stream after all congestion redistribution and skimming feedback loops. The toll model references output trip tables and networks generated by a run of the TRM, modifies the final networks to accommodate changes noted above, and then runs the final assignments with the toll diversion model implemented. (See Figure 1).

Figure 1: Changes to the TRM Model Structure



Traffic volumes on the WWP and the TP have already been estimated during long range planning efforts and early toll feasibility studies. The intention of this modeling exercise is to determine the extent of traffic diversion from these facilities due to the introduction of tolls. The strategy for implementing tolls, including locations of toll collection and price of the tolls, were initially determined by the Toll Authority and are documented under separate cover. A final determination of locations and amounts of tolls was still under consideration at the time of this analysis. To isolate the effects of the toll amounts from later decisions about locations of toll collections, this toll model applies a flat toll amount per mile to each link in the toll system. Toll amounts per mile are calculated based on an assumed $2.00 toll on the Triangle Parkway and a $4.00 toll on the Western Wake Parkway in 2030. All cost related parameters in the TRM are assumed to be 2002 dollars. A deflation factor of 0.44 (0.11/0.25) was documented in the *Preliminary Traffic and Revenue Study*[4] and is used to derive the link level per mile toll rates as shown in Table 3.

[4] "Proposed Western and Southern Wake Parkways Preliminary Traffic and Revenue Study Final Report", North Carolina Turnpike Authority, June 16, 2006.

Table 3: Calculation of Per Mile Toll Rates

Total Tolls	*Cost*	*Miles*	*Cost/mi (in 2030 $)*	*Cost/mi (in 2002 $)*
TP	2.00	3.69	0.5424	0.24
WWP	4.00	14.63	0.2734	0.12

Validation

The objective of this memo is to provide documentation of the methodology, but not to document the final toll scenario forecasts. However, to obtain a level of confidence that the toll modeling methodology is producing reasonable results a comparison of toll and non-toll baseline runs was prepared. All the changes described above were made to a base version of the model but with the tolling capability disabled. This created a base against which to compare the results from toll scenarios.

A comparison of screen-lines with and without tolls enabled shows insignificant differences (see Table 4). Table 5 shows the vehicle kilometers traveled (VKT) comparison by facility type and Table 6 shows the VKT comparison by volume-capacity ratio groupings. Shifts in VKT are consistent with what might be expected from the implementation of tolls.

Table 4: Comparison of Screenlines

Screenline	*No Toll*	*Toll*	*Percent Change*
Parallel to Fayetteville St., Durham	299,588	305,180	1.9%
Inside US-70 and I-85	74,345	675,387	0.2%
North of I-85	475,803	476,925	0.2%
Southeast of I-540	479,770	480,035	0.1%
External Cordon on West	72,057	72,364	0.4%
West of I-40	2,192,240	2,204,189	0.5%
North of I-440	613,492	621,126	1.2%
Between I-440 and I-540 cutting North-South	824,477	829,299	0.6%
South of US-64 west of I-440	683,574	680,355	-0.5%
Northeast-Southwest, South of Triangle Pkwy	1,211,518	1,205,374	-0.5%
Northeast of I-540 North	243,279	244,089	0.3%
Parallel to US-70 between I-540 and Miami Blvd	383,644	392,742	2.4%

Table 5: Comparison of VMTs by Facility Type

Assignment Group	*No Toll*	*Toll*	*Difference*	*Percent Change*
Access Controlled	51,016,416	49,614,738	(1,401,678)	-2.7%
Arterial Class 1	17,565,676	17,978,983	413,307	2.4%
Arterial Class 2	23,185,702	23,891,471	705,769	3.0%
Arterial Class 3	3,375,282	3,398,959	23,677	0.7%
Collector	16,180,853	16,662,827	481,974	3.0%
Local	10,242,292	10,620,983	378,692	3.7%
HOV Facility	1,090,590	1,163,296	72,706	6.7%
TOTAL	122,656,811	123,331,256	674,445	0.5%

Table 6: Comparison of VMTs by Volume Capacity Ratio Groupings

V/C Ratio	*No Toll*	*Toll*	*Difference*	*Percent Change*
0.2	8,823	7,842	(981)	-11.1%
0.4	40,844	42,253	1,409	3.4%
0.6	74,809	69,911	(4,899)	-6.5%
0.8	126,077	118,771	(7,306)	-5.8%
1.0	171,784	158,229	(13,555)	-7.9%
1.2	161,111	174,193	13,081	8.1%
>=1.4	122,073,362	122,760,057	686,696	0.6%
TOTAL	122,656,811	123,331,256	674,445	0.5%

Opening Year Model (2011)

For this analysis the opening year of 2011 was modeled by combining the official 2010 TRM model with a 2011 network. No changes were made to the socio-economic data. The 2011 network was provided by CAMPO. The consulting team added the coding for the WWP and TP as CAMPO had coded it in the 2017 network. The 2011 network coding is implemented outside the toll model stream and is provided in the accompanying CDs under the “RUN11\NETWORK EDITS” subdirectory.

APPENDIX B: PREVIOUS NCDOT FORECASTS

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

July 21, 2003

MEMORANDUM TO: Brenda Moore, P.E.
Roadway Design Unit

FROM: Alena R. Cook, P.E.
Statewide Planning Branch

SUBJECT: Traffic Forecast for TIP Project R-2635
Project 6.408006T, I-540 (Western Wake Freeway) from
South of SR 1615 (Green Level Road) to NC 55

In response to your request dated June 9, 2003, attached is an update of the July 2001 traffic forecast for the aforementioned project. As you requested, this update revises Scenario 1 of the original forecast to change the grade separation at Kelly Road and US 64 to a full movement interchange. If you have any questions or need additional information, please contact me at (919) 733-4705 or arcook@dot.state.nc.us.

Attachment
cc: Jay A. Bennett, P.E., Roadway Design
Nathan K. Phillips, P.E., Traffic Engineering
Jennifer Harris, P.E., PDEA
Laura Cove, P.E., Statewide Planning
Scott Walston, P.E., Statewide Planning
Joe Springer, Statewide Planning
Hardee Cox, Statewide Planning

for 2011 base → Revised 2005 Scenario 1 + 2025 Scenario 2 (interpolate) to 2011

for 2030 base → 2005 Scenario 2 + 2025 Scenario 4 (interpolate), then pivot onto 2025 Scenario 3 → extrapolate to 2030

*

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING
1554 MAIL SERVICE CENTER
RALEIGH NC 27699-1554

TELEPHONE: 919-733-4705
FAX: 919-733-2417

WEBSITE: WWW.NCDOT.ORG

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH NC

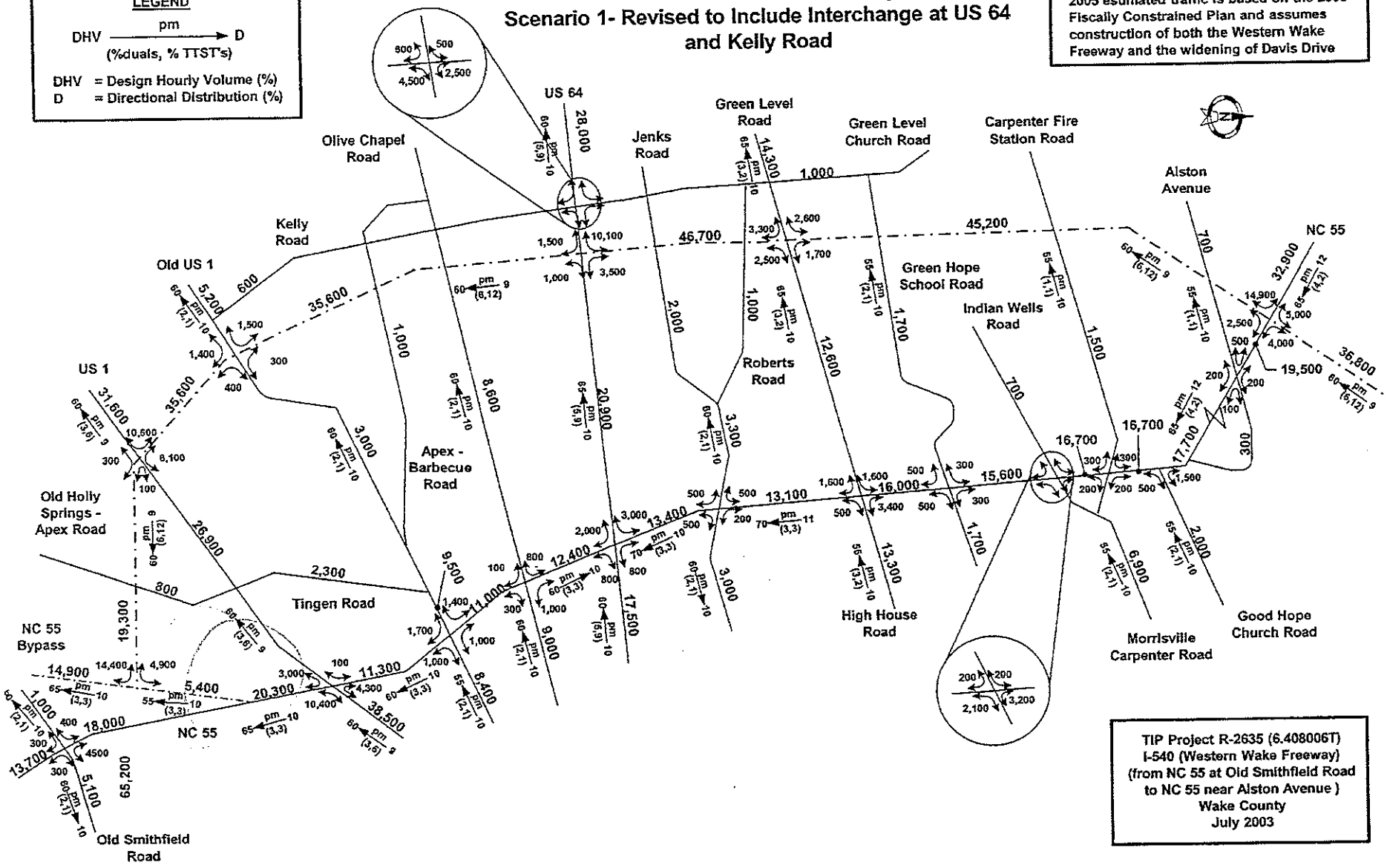
2005 Western Wake Freeway
Scenario 1- Revised to Include Interchange at US 64 and Kelly Road

LEGEND

DHV —pm→ D
(%duals, % TTST's)

DHV = Design Hourly Volume (%)
D = Directional Distribution (%)

NOTE:
2005 estimated traffic is based on the 2005 Fiscally Constrained Plan and assumes construction of both the Western Wake Freeway and the widening of Davis Drive



TIP Project R-2635 (6.408006T)
I-540 (Western Wake Freeway)
(from NC 55 at Old Smithfield Road to NC 55 near Alston Avenue)
Wake County
July 2003

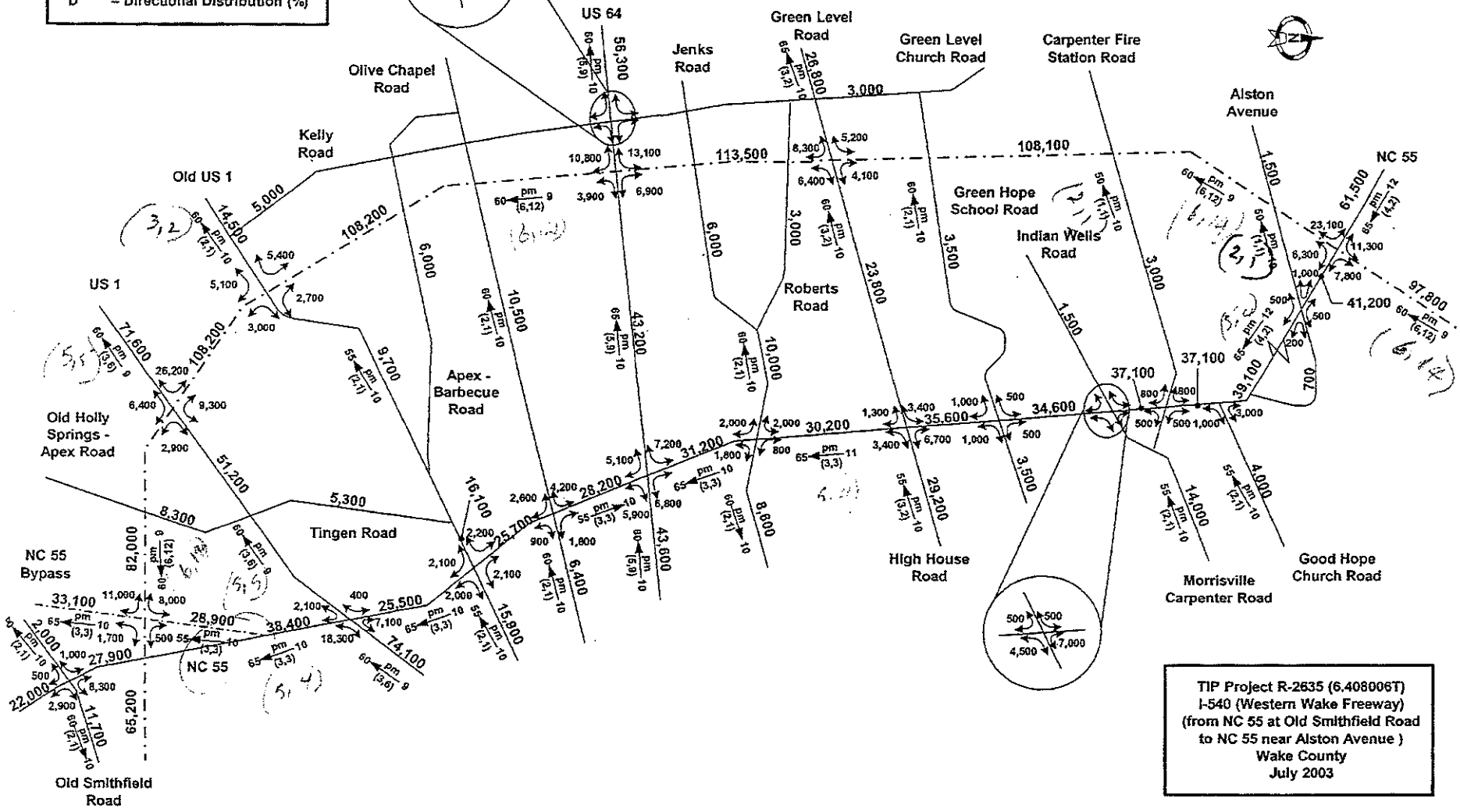
2025 Western Wake Freeway
Scenario 1- Revised to Include Interchange at US 64 and Kelly Road

LEGEND

DHV —pm→ D
(%duals, % TTST's)

DHV = Design Hourly Volume (%)
D = Directional Distribution (%)

NOTE:
2025 estimated traffic is based on the 2025 Fiscally Constrained Plan and assumes construction of the widening of Davis Drive



TIP Project R-2635 (6.408006T)
I-540 (Western Wake Freeway)
(from NC 55 at Old Smithfield Road
to NC 55 near Alston Avenue)
Wake County
July 2003

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

LYNDO TIPPETT
SECRETARY

July 13, 2001

MEMORANDUM TO: Jennifer Harrison
Project Development and Environmental Analysis Branch

FROM: Anna E. Hayes Brigman, P.E. AEHB
Statewide Planning Branch

SUBJECT: TIP R-2635 Wake County
State Project 6.408006T
I-540 (Western Wake Freeway)

I have completed the traffic forecast for TIP Project R-2635. The forecast assumes construction of all projects included in the Capital Area Metropolitan Planning Organization (CAMPO) 2025 Long Range Transportation Plan's (LRTP) 2005 and 2025 horizon years except as indicated in the descriptions below and in the attached list of assumptions. A list of projects for the 2005 and 2025 horizon years is attached.

The daily traffic volumes shown on the attached figures were projected based on the Triangle Regional Model version 5-2001 and include coordination with previous forecasts in the region. As requested six scenarios are provided. The following describes each scenario.

2005 Western Wake Freeway Scenario 1: Includes all 2005 Long Range Transportation Plan (LRTP) projects, the widening of Davis Drive, and TIP Project R-2635.

2005 Western Wake Freeway Scenario 2: Includes all 2005 LRTP projects, the widening of Davis Drive, TIP Project R-2635, and the proposed extension of Morrisville Parkway to Green Level Church Road with an interchange at I-540.

2025 Western Wake Freeway Scenario 1: Includes all 2025 LRTP projects and the widening of Davis Drive.

2025 Western Wake Freeway Scenario 2: Is based on the 2025 Long Range Transportation Plan excluding TIP projects R-2828, R-2829, and R-2721 (the 2025 portions of I-540) and includes the widening of Davis Drive. ***(Note: This scenario is included for straight-line***

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WEBSITE: WWW.DOT.STATE.NC.US

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH, NC

interpolation purposes. All 2025 traffic should be reported based on either 2025 Western Wake Freeway Scenario 1 or 3.)

2025 Western Wake Freeway Scenario 3: Includes all 2025 LRTP projects, the widening of Davis Drive, and the proposed extension of Morrisville Parkway to Green Level Church Road with an interchange at I-540.

2025 Western Wake Freeway Scenario 4: Is based on the 2025 Long Range Transportation Plan excluding TIP projects R-2828, R-2829, and R-2721 (the 2025 portions of I-540). This scenario includes the widening of Davis Drive and the proposed extension of Morrisville Parkway to Green Level Church Road with an interchange at I-540. ***(Note: This scenario is included for straight-line interpolation purposes. All 2025 traffic should be reported based on either 2025 Western Wake Freeway Scenario 1 or 3.)***

Directional distribution, DHV factor, % Duals, and % TTST's are provided as requested. Directional distribution, DHV factors, % Duals, and %TTST's are based on the peak period models, previous forecasts, and on existing and projected functional classification.

If you have any questions or need additional information, please contact me by phone at (919) 733-4705 or by email at a*brigman@dot.state.nc.us*.

Attachments

cc: Brian Yamamoto, Project Development and Environmental Analysis Branch
Art McMillan, P.E., Roadway Design Unit
Gary Lovering, Roadway Design Unit (with Attachments)
Nathan Phillips, P.E., Traffic Engineering (with Attachments)
Laura Cove, P.E., Statewide Planning Branch (with Attachments)
Deborah Hutchings, P.E., Statewide Planning Branch
Joe Springer, Statewide Planning Branch (with Attachments)
L.C. Smith, Statewide Planning Branch (with Attachments)

Western Wake Freeway (R-2635) Forecast Assumptions

Official Model: TRM v5-2001

2005 Unloaded Networks: **Wstwk05.net:** Includes the Western Wake Freeway, as well as all, all projects in the 2005 LRTP financially constrained network
MorExt05.net: Includes an extension of Morrisville Parkway to Green Level Church Road with an interchange at I-540, as well as, all projects in the Wstwk05.net network

2025 Unloaded Networks: **TriInt25.net:** Includes all projects in the 2025 LRTP financially constrained network
NoSL25.net: Includes all projects in the 2025 LRTP financially constrained network except TIP projects R-2828 (Southern Wake Freeway), R-2829 (Southern Wake Freeway), and R-2721 (Eastern Wake Freeway)
MorExt25.net: Includes an extension of Morrisville Parkway to Green Level Church Road with an interchange at I-540, as well as, all projects in the TriInt25.net network
MENoSL25.net: Includes an extension of Morrisville Parkway to Green Level Church Road with an interchange at I-540, as well as, the projects as outlined in the NoSL25.net network

2005 and 2025 Model Runs

- NC 55 LG 1 coding changed from 59 (45mph) to 26 (55mph) to allow facility to compete against Davis Drive which is coded at 55mph. Note: NC 55 is coded as LG 1 = 26 in base year network (1995)
- Davis Drive coded as LG 1 = 31 (4-lanes)

LEGEND

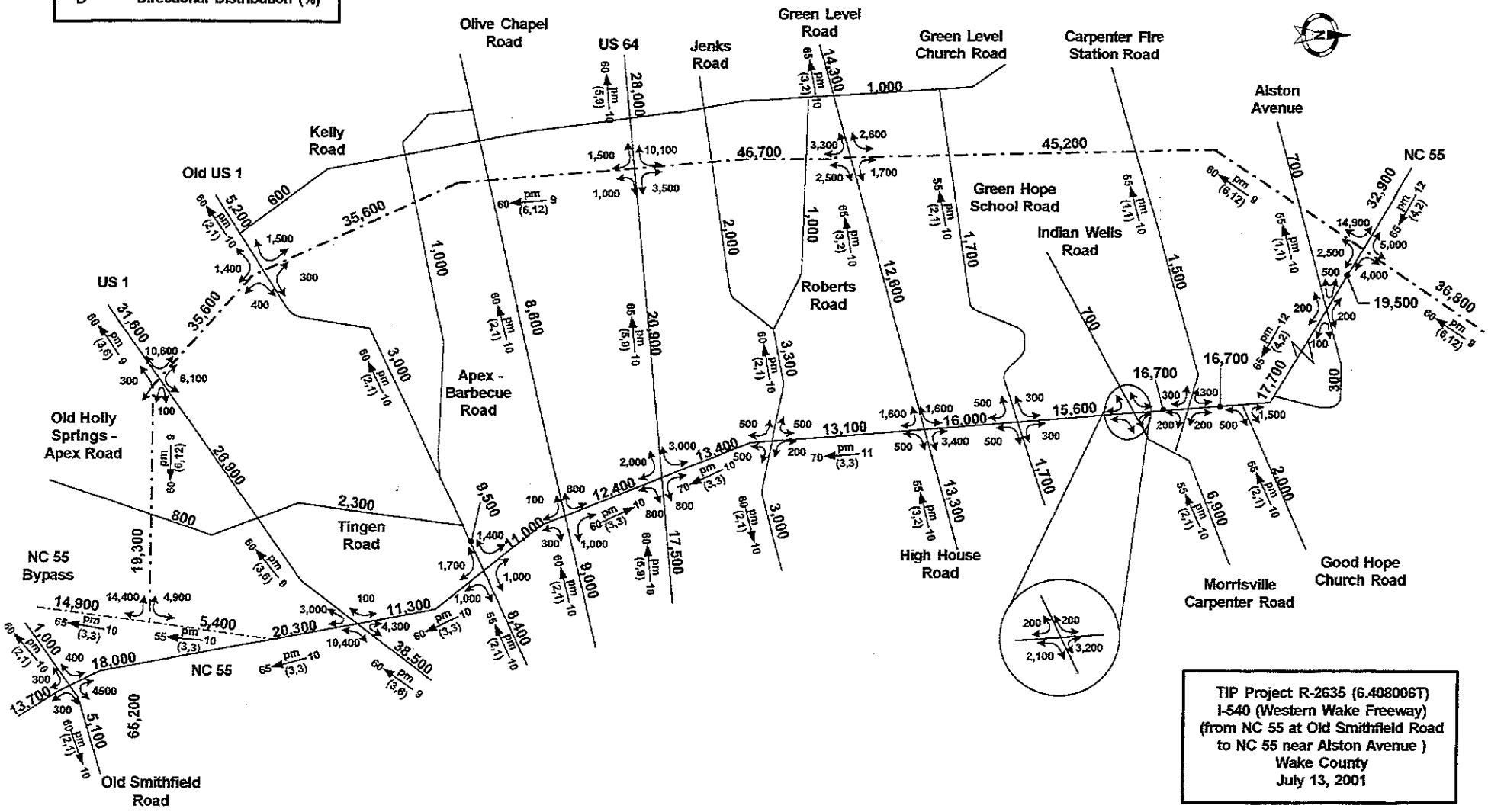
DHV —pm→ D

(%duals, % TTST's)

DHV = Design Hourly Volume (%)
D = Directional Distribution (%)

2005 Western Wake Freeway
Scenario 1

NOTE:
2005 estimated traffic is based on the 2005 Fiscally Constrained Plan and assumes construction of both the Western Wake Freeway and the widening of Davis Drive



TIP Project R-2635 (6.408006T)
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Wake County
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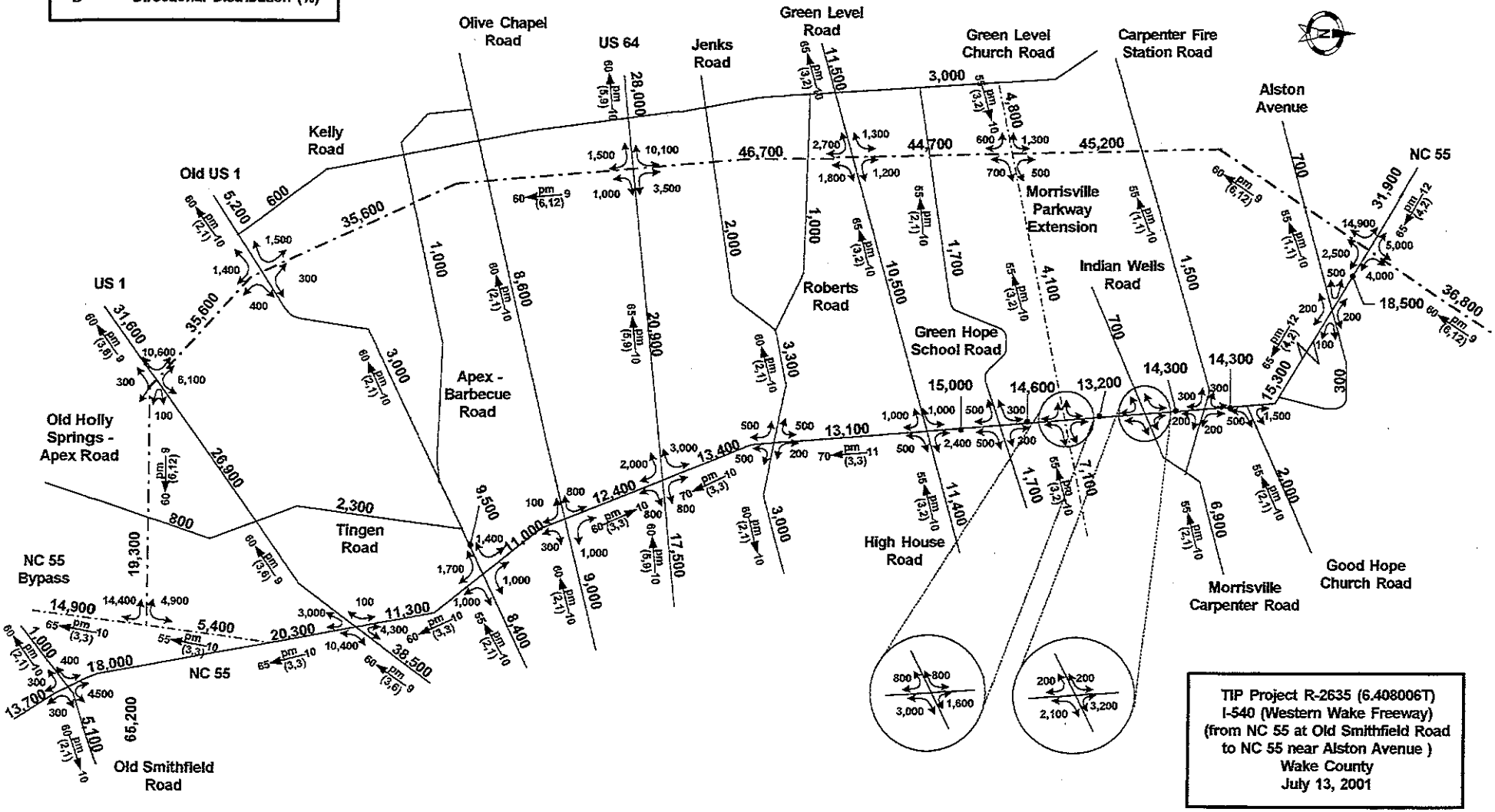
2005 Western Wake Freeway
Scenario 2

LEGEND

DHV —pm→ D
(%duals, % TTST's)

DHV = Design Hourly Volume (%)
D = Directional Distribution (%)

NOTE:
2005 estimated traffic is based on the 2005 Fiscally Constrained Plan and assumes construction of the Western Wake Freeway, the widening of Davis Drive, and the extension of Morrisville Parkway



TIP Project R-2635 (6.408006T)
I-540 (Western Wake Freeway)
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Wake County
July 13, 2001

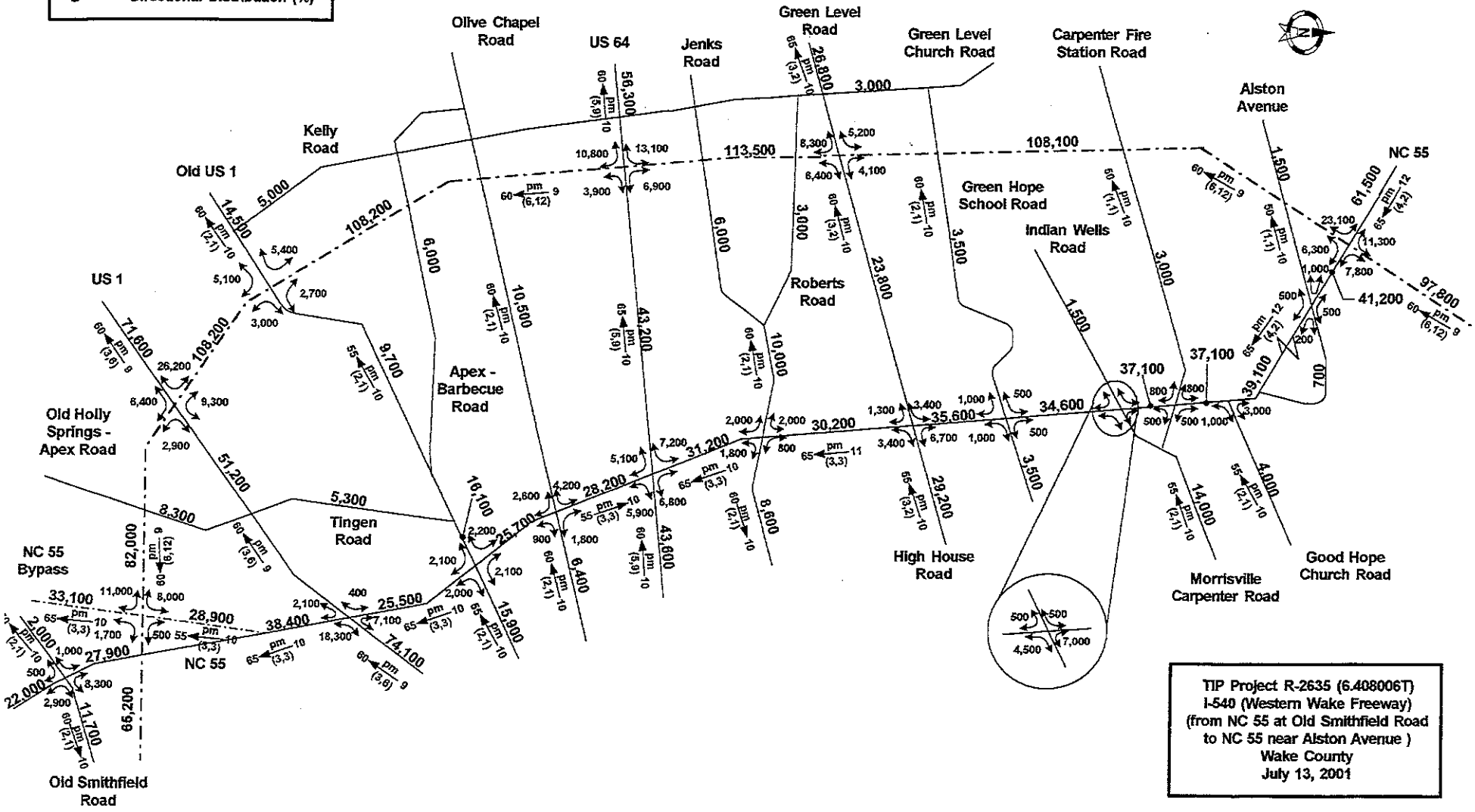
2025 Western Wake Freeway
Scenario 1

LEGEND

DHV —pm→ D
(%duals, % TTST's)

DHV = Design Hourly Volume (%)
D = Directional Distribution (%)

NOTE:
2025 estimated traffic is based on the 2025 Fiscally Constrained Plan and assumes construction of the widening of Davis Drive



TIP Project R-2635 (6.408006T)
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Wake County
July 13, 2001

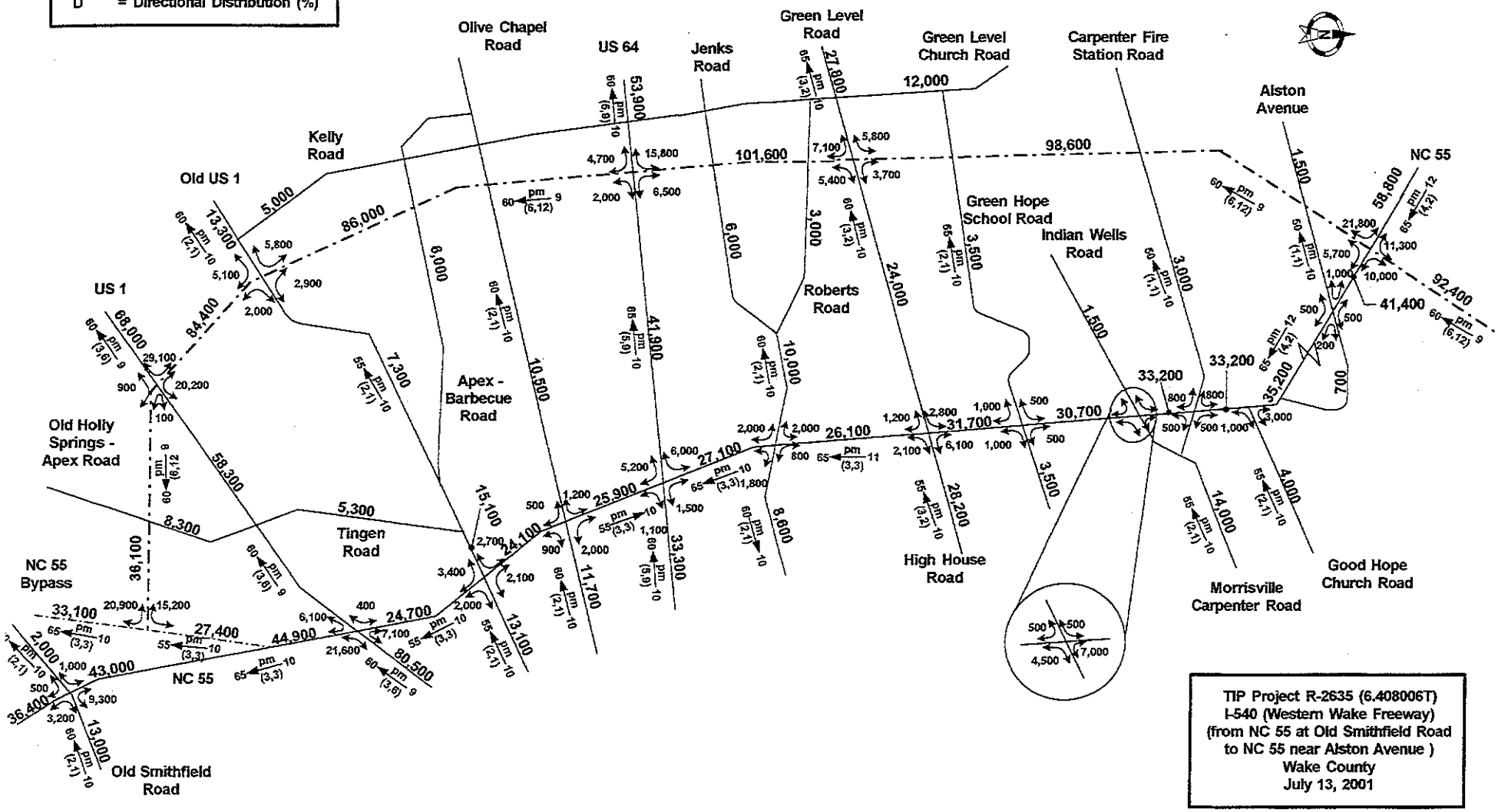
2025 Western Wake Freeway
Scenario 2

LEGEND

DHV —pm→ D
(%duals, % TTST's)

DHV = Design Hourly Volume (%)
D = Directional Distribution (%)

NOTE:
2025 estimated traffic is based on the 2025 Fiscally Constrained Plan ***excluding construction of TIP Projects R-2828, R-2829, and R-2721*** and assumes construction of the widening of Davis Drive



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July 13, 2001

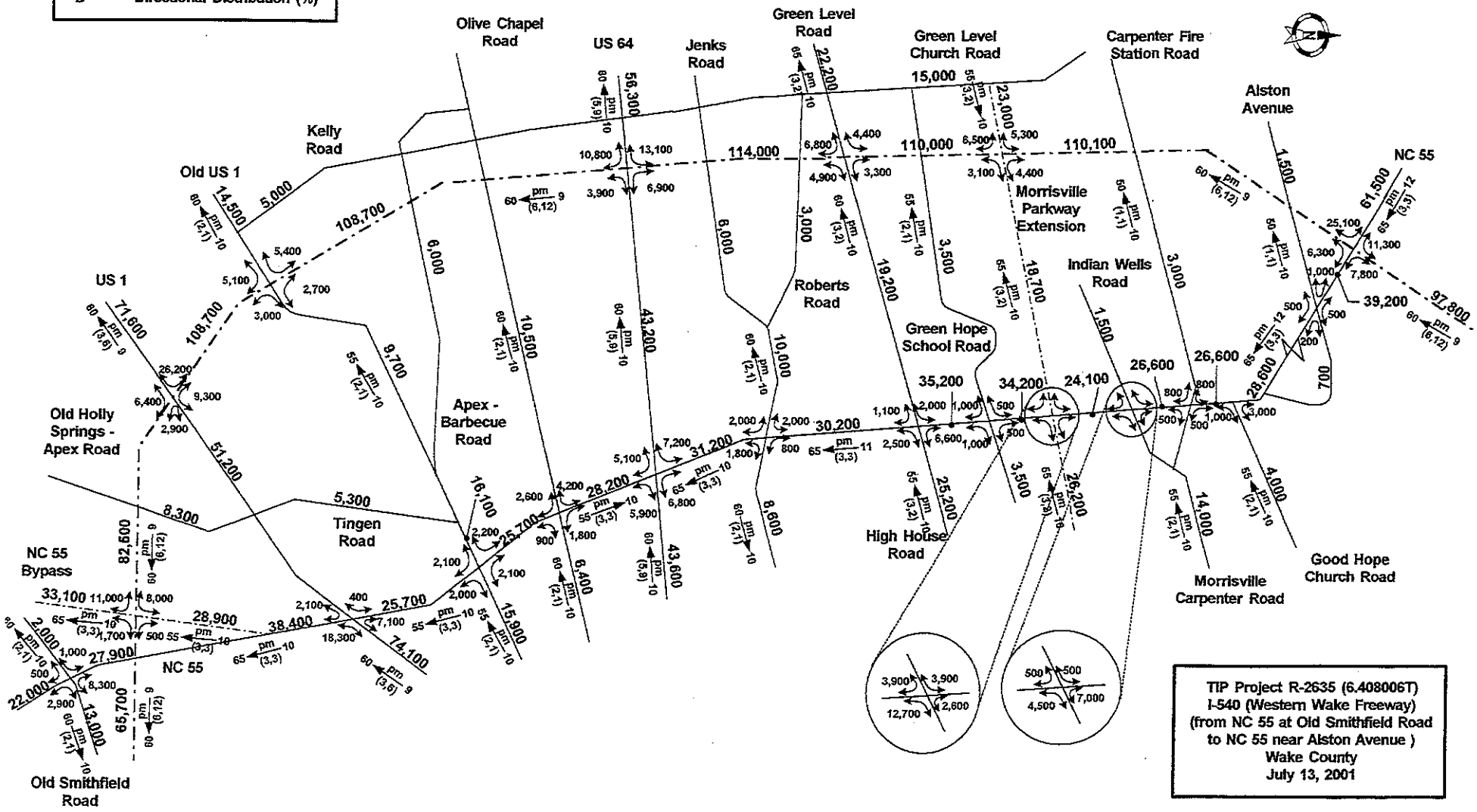
2025 Western Wake Freeway
Scenario 3

LEGEND

DHV —pm→ D
(%duals, % TTST's)

DHV = Design Hourly Volume (%)
D = Directional Distribution (%)

NOTE:
2025 estimated traffic is based on the 2025 Fiscally Constrained Plan assumes construction of the widening of Davis Drive and the extension of Morrisville Parkway



TIP Project R-2635 (6.408006T)
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2025 Western Wake Freeway
Scenario 4

LEGEND

DHV —pm→ D
(%duals, % TTST's)

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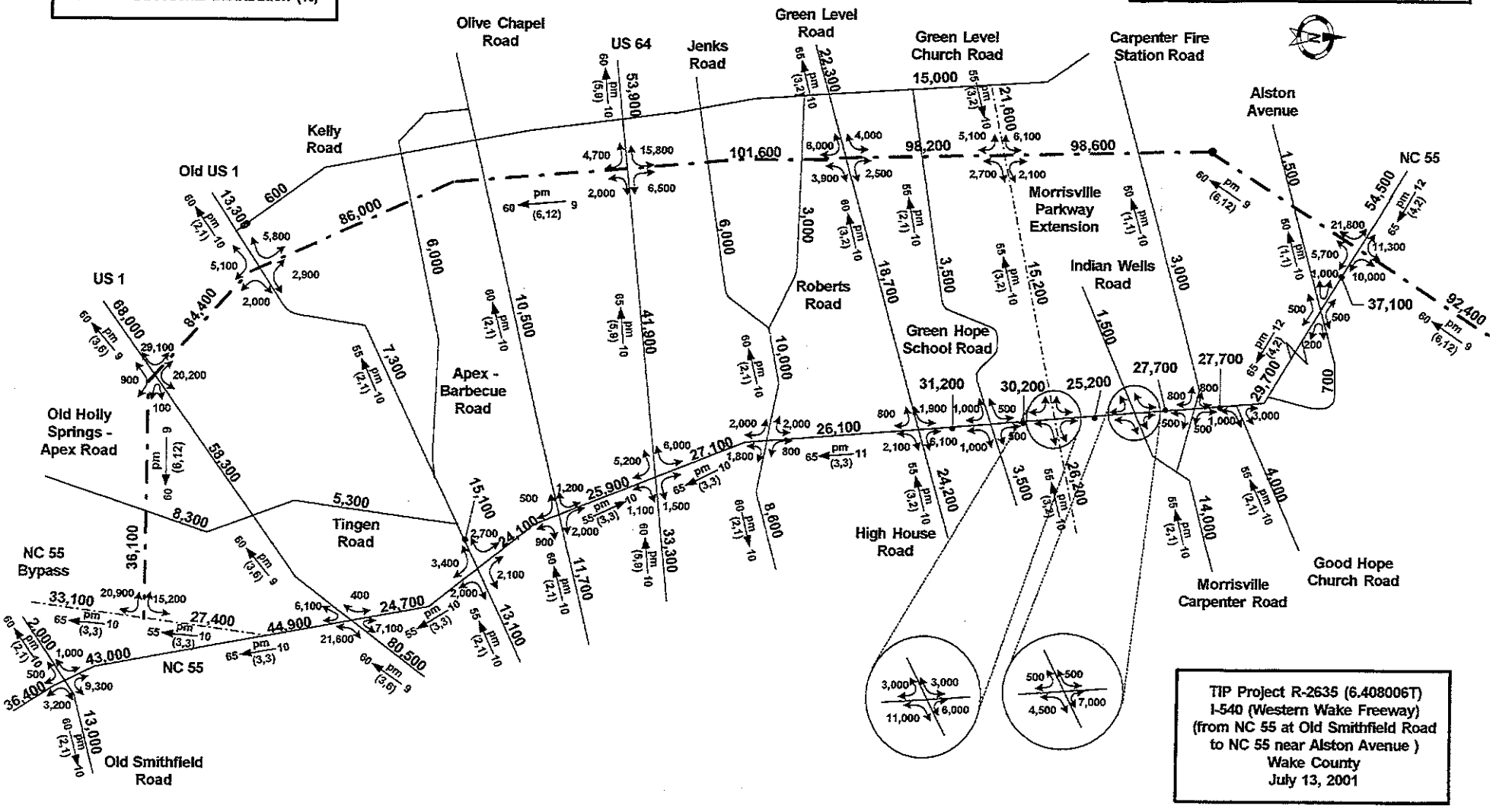
NOTE:
2025 estimated traffic is based on the 2025 Fiscally Constrained Plan *excluding construction of TIP Projects R-2828, R-2829, and R-2721* and assumes construction of the widening of Davis Drive and the extension of Morrisville Parkway



TIP Project R-2635 (6.408006T)
I-540 (Western Wake Freeway)
(from NC 55 at Old Smithfield Road
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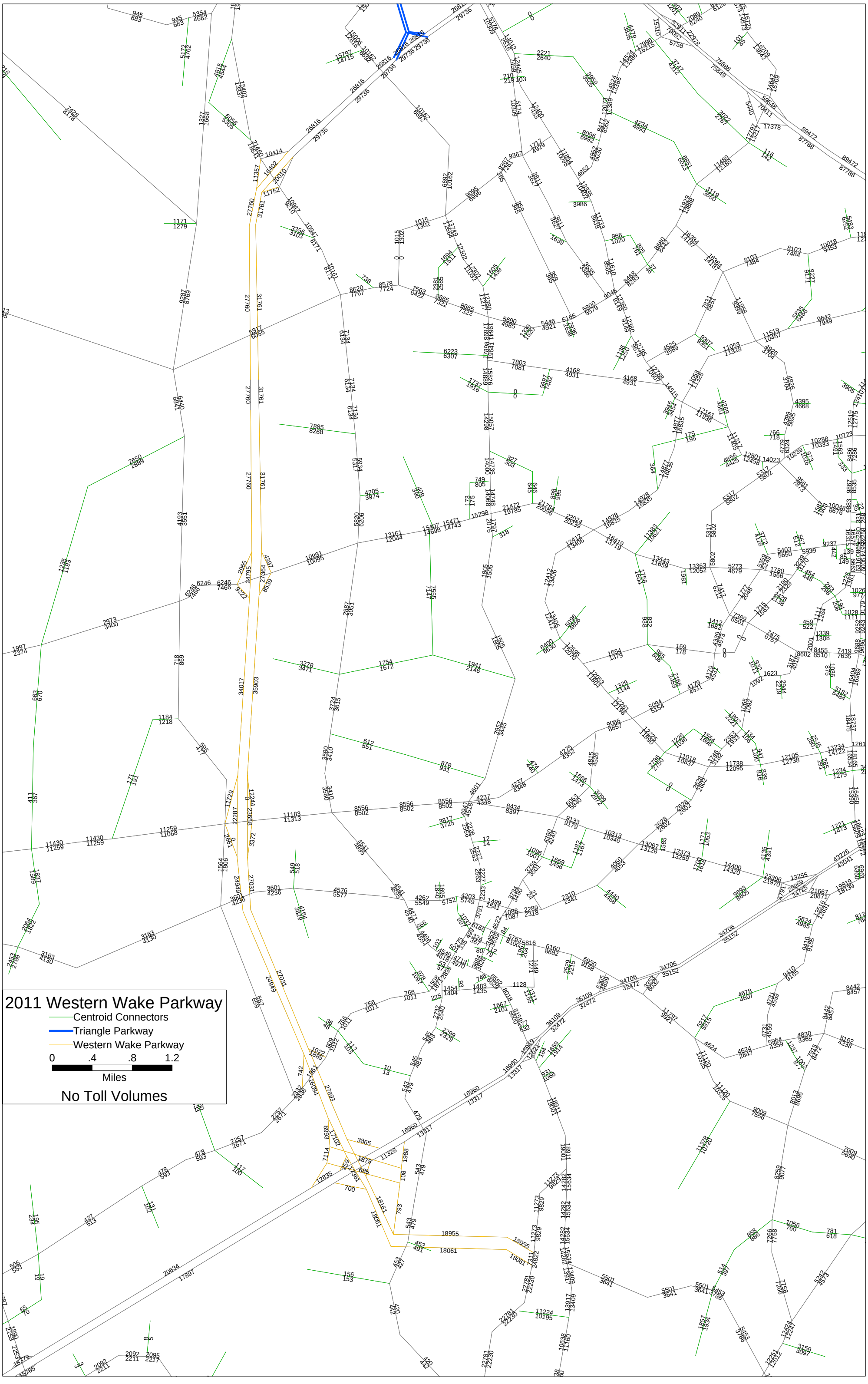
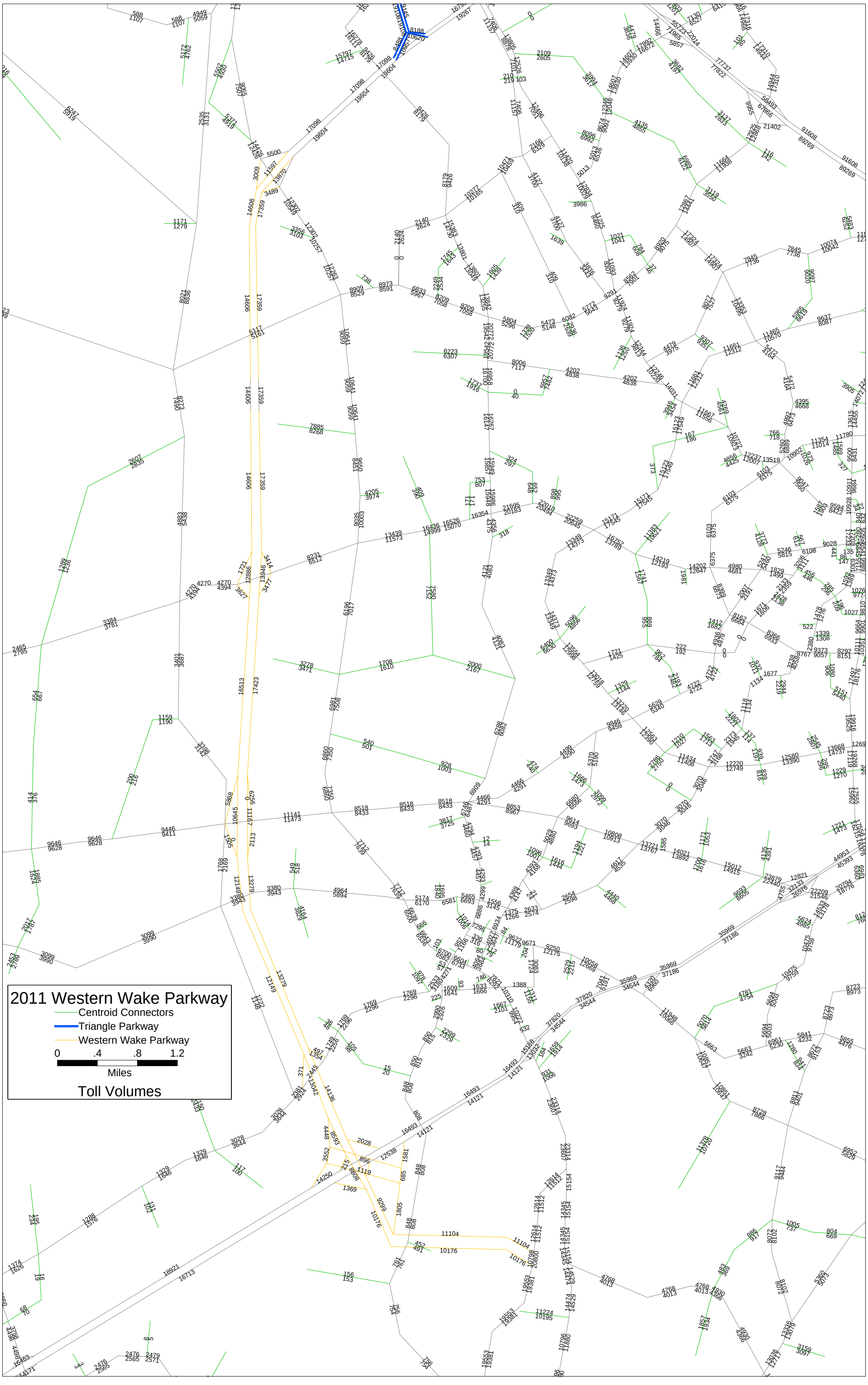
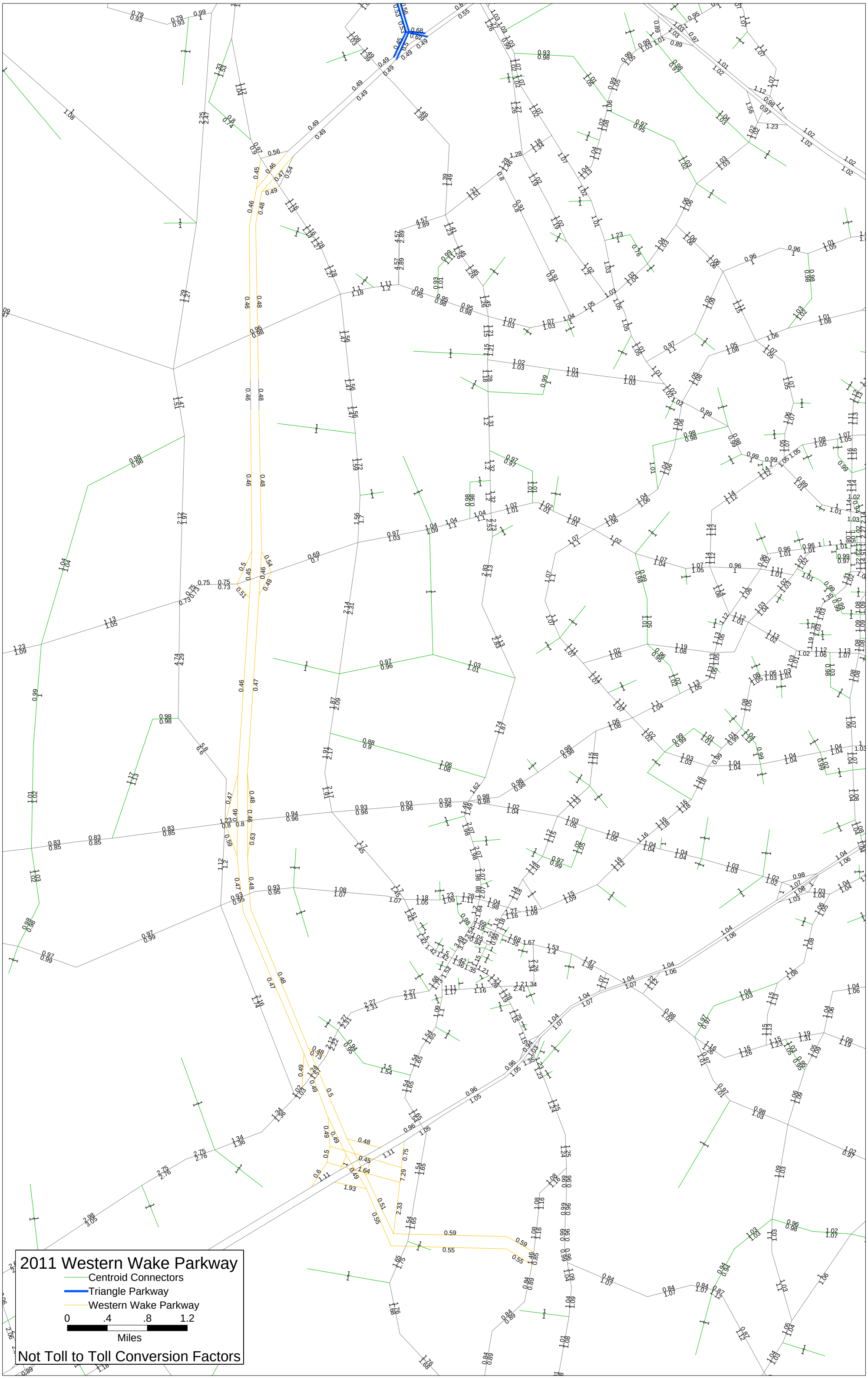
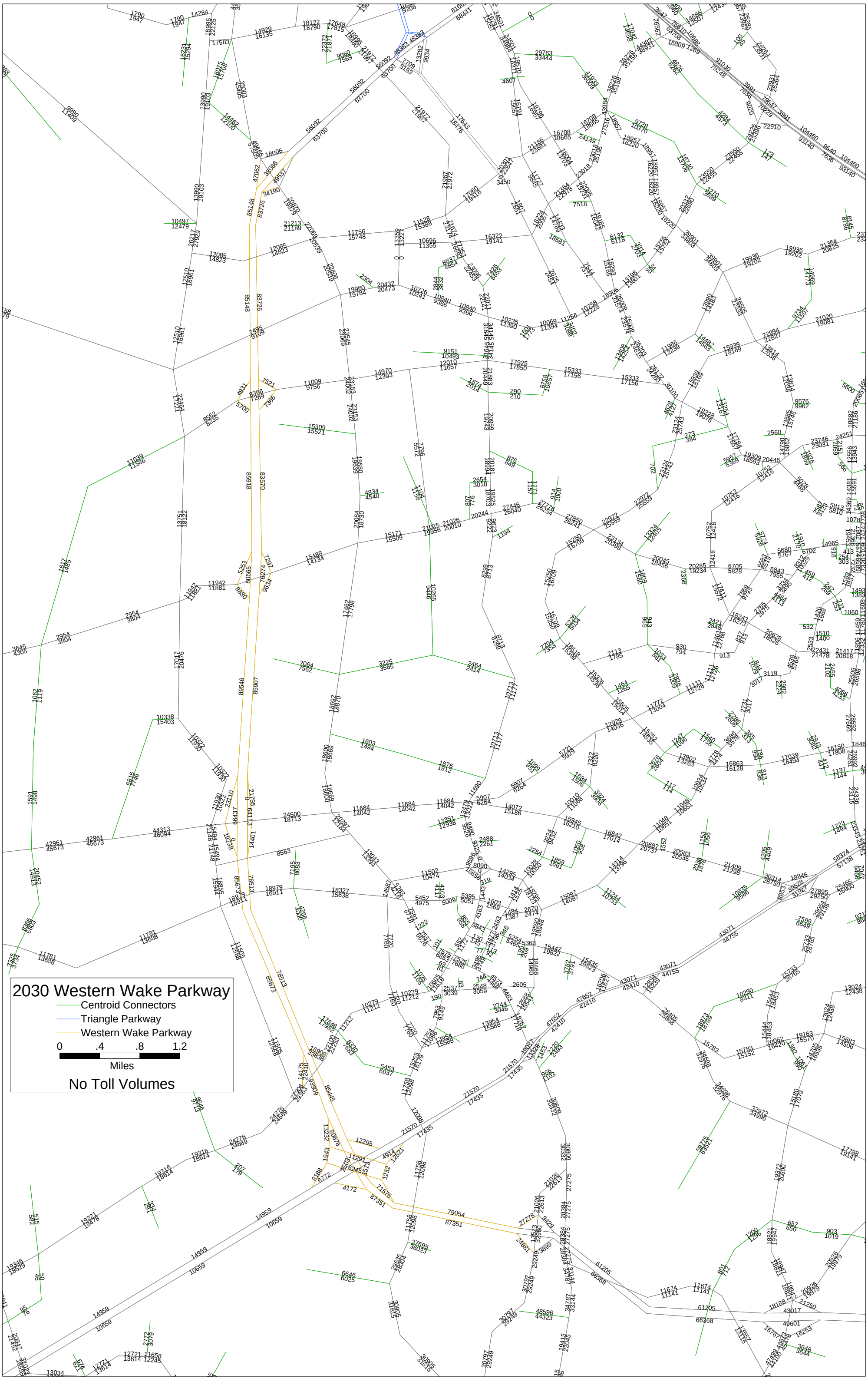
Wake County
July 13, 2001

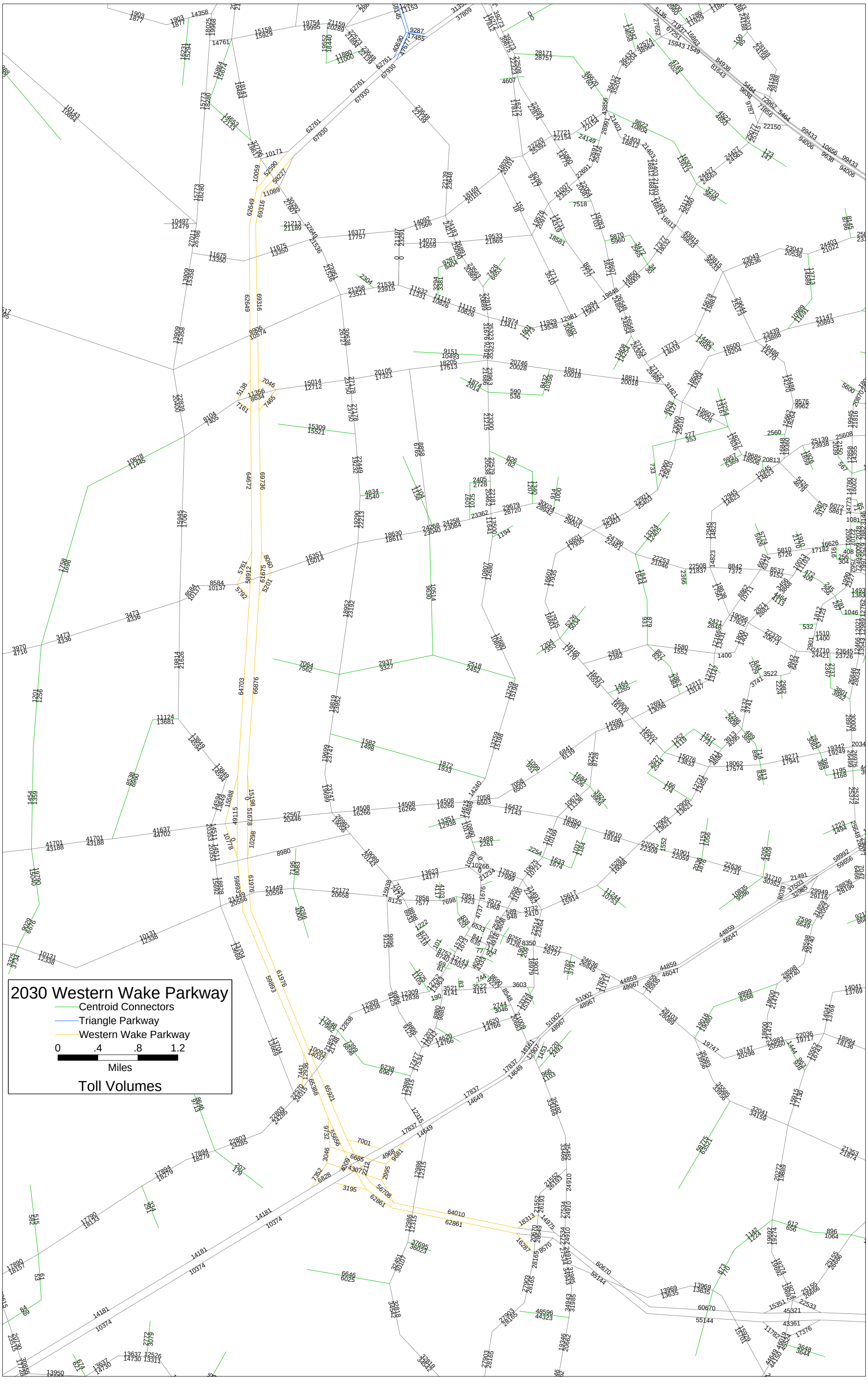
APPENDIX C: TRIANGLE REGIONAL MODEL FACTORS AND VOLUMES

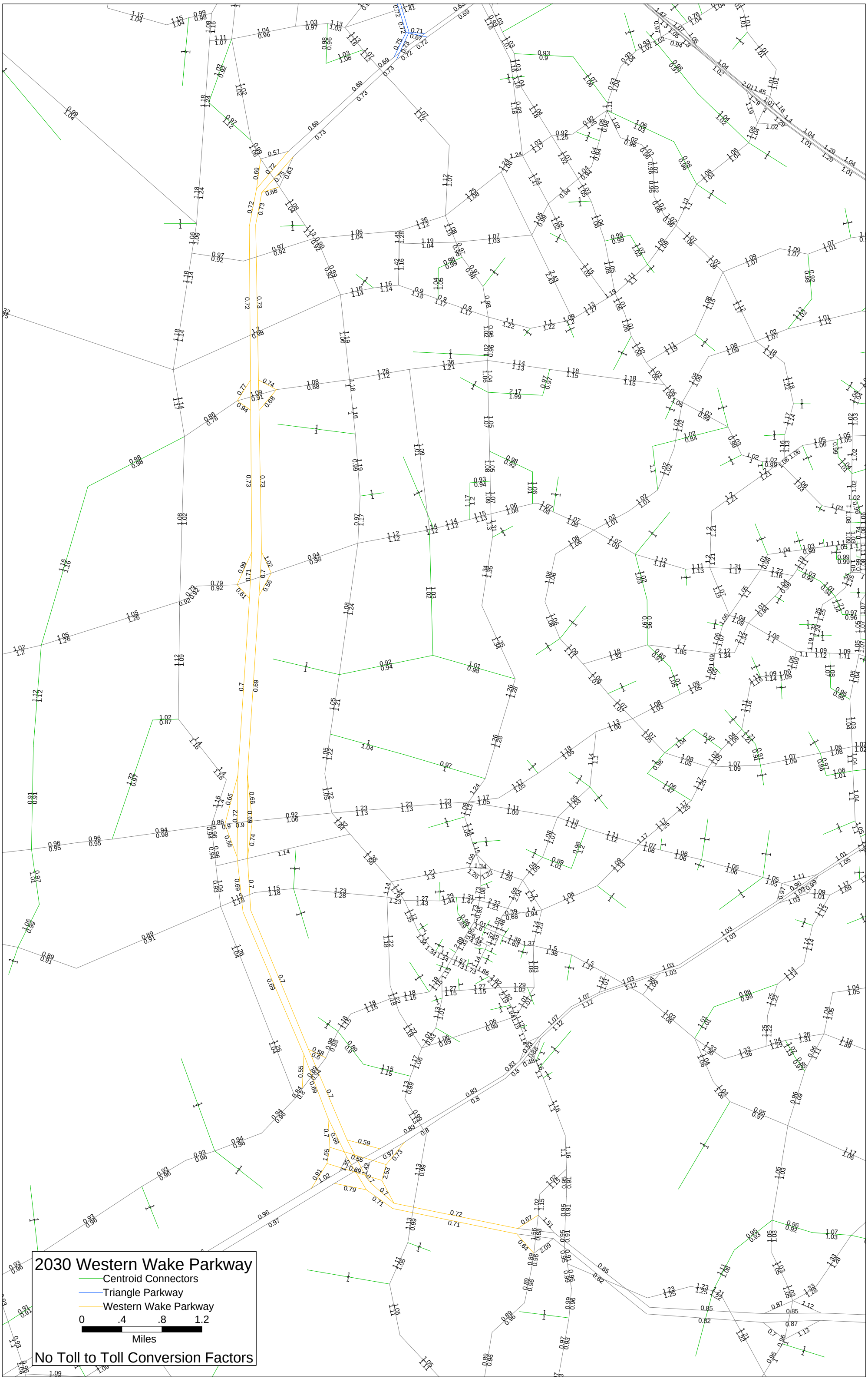

2011 Western Wake Parkway
Centroid Connectors
Triangle Parkway
Western Wake Parkway
0 .4 .8 1.2
Miles
No Toll Volumes


2011 Western Wake Parkway
Centroid Connectors
Triangle Parkway
Western Wake Parkway
0 .4 .8 1.2
Miles
Toll Volumes


2011 Western Wake Parkway
Centroid Connectors
Triangle Parkway
Western Wake Parkway
0 .4 .8 1.2
Miles
Not Toll to Toll Conversion Factors


2030 Western Wake Parkway
Centroid Connectors
Triangle Parkway
Western Wake Parkway
0
.4
.8
1.2
Miles
No Toll Volumes


2030 Western Wake Parkway
Centroid Connectors
Triangle Parkway
Western Wake Parkway
0 .4 .8 1.2
Miles
Toll Volumes


2030 Western Wake Parkway
Centroid Connectors
Triangle Parkway
Western Wake Parkway
0 .4 .8 1.2
Miles
No Toll to Toll Conversion Factors