Exhibit A

Project Scope of Work and Budget

Introduction

The following scope of work is presented as the proposed work plan for the TRM Service Bureau and Model Team for the budget year July 1, 2013 – June 30, 2014. The primary efforts outlined in this scope are intended to focus the efforts of the Service Bureau and Model Team on continuing development of a v6 model for the Triangle region with various enhancements. During this budget year work will continue on investigations for developing a future v7 model. Refer to Appendix A for an overall vision for v6 and v7 models.

Several assumptions are made within the context of this scope.

1. Each signatory agency's one half FTE contribution may include staff time from people other than their TRM Team member, but the TRM Team member will play a key role and other staff must be adequately trained to meet the needs of the TRM Team.
2. All TRM staff representing the signatory agencies will, as needed, work on site at ITRE, including any third person who is providing services in the name of a signatory agency. This enables the Team to work together on issues that require the input of multiple team members and reduces the tendency for team members to be reassigned to other tasks in their home offices.
3. The TRM Program Manager will assign tasks with associated deliverables and target dates. TRM Team members will agree to take responsibility for specific tasks and will be held accountable for completion of those tasks. The responsible team member (stakeholder and TRM Service Bureau) will be responsible for **monthly** reporting on progress via an email attachment including 1) status, 2) changes in anticipated completion dates, 3) reasons for change, and 4) hours spent on model development work for the month reported.
4. Signatory agencies will commit one half FTE per agency to the completion of the list of tasks outlined in this work plan. The TRM Program Manager will assume responsibility for providing adequate work to meet this obligation by specifying the task description, deliverables, and person hours required. This information will be provided at least quarterly and will be sufficient to fully incorporate the one half FTE required of each agency.
5. All intermediate and final products of this work program belong to the four stakeholders (NCDOT, CAMPO, DCHC, and Triangle Transit) and these will be delivered to the stakeholders in a form and via media acceptable to each stakeholder at the end of the contract year or before. The products include: model files including input files; scripts and program source code; all technical memoranda; estimation data file inputs and outputs; technical reports and user guides.

Note on model version names: the following version names will be used in this scope of work consistent with model team recommendations (for detailed TRM name history, please refer to Appendix B "TRM History" section).

- **TRM v5:** Based on structure of v4-2008 with revisions to model specifications and using 2006 household survey and 2006 on board transit survey data for estimating model components with an expanded study area [v5 TAZ system]. The enhancements requested by the stakeholders have been included. (see Appendix B "TRM History" for detailed list of enhancements) This version will be used for the Alternatives Analysis and Air Quality Conformity Analysis for the 2040 Long Range Transportation Plans.
- **TRM v6:** Updated and enhanced trip based model based on the v5 model. TRM v6 will be delivered in December, 2014 and will be used for the Alternatives

Analysis and Air Quality Conformity Analysis for the 2045 Long Range Transportation Plan.

- **TRM v7:** New tour based or activity based model designed to address policy testing needs not sufficiently addressed by TRM v6. TRM v7 will be delivered in December, 2018 and will be used for the Alternatives Analysis and Air Quality Conformity Analysis for the 2050 Long Range Transportation Plan.

Overall Work Program Summary Task Table (including stakeholder work hours)

Task Number	Task Title	Task Hours	% of Total
1.1	Advice and management of parking beh. data collection	152	1.5%
1.4	Gather locally collected data	430	4.3%
2.1	Maintain and update hwy. & transit networks, SE data	0	0%
2.2	Modify Net Manager to work with v6 model networks	248	2.5%
2.3	Zone geography	24	0.2%
2.4	Develop highway network procedures	0	0%
2.5	Transit networks	0	0%
2.6	Zonal data & models	0	0%
2.7	Develop an improved parking constraint model	1,632	16.3%
2.8	Data systems	0	0%
3.1	Re-estimation and/or re-calibration of trip production models	0	0%
4.1	Peak spreading model	216	2.2%
5.1	Develop an improved destination choice model	1,394	13.9%
6.1	Estimation and calibration of non-motorized models	732	7.3%
7.1	Calibration of mode choice models	568	5.7%
8.1	Develop improved commercial vehicle model (CVM)	944	9.4%
8.2	University student model	896	8.9%
8.3	Land use models	0	0%
8.4	External travel models	0	0%
8.5	Links to MOVES air quality models	0	0%
8.6	Sub-area and corridor analysis procedures	0	0%
9.1	Investigate improving hwy assignment	0	0%

Task Number	Task Title	Task Hours	% of Total
9.2	TRM v6 model assignment & overall model calibration	224	2.2%
10.1	Assist with MTP model application	0	0%
10.2	Assistance with TRM model application	168	1.6%
10.3	Action items	600	6%
11.1	Oversight and reporting	1,560	15.5%
11.2	Training	276	2.6%

1 Data collection

1.1 *Advice and management of parking behavior data collection*

Parking related behavior data will be collected for later use in developing the models designed in FY 13.

Deliverables:

A. By survey consulting firm:
   1) Survey designs (sample plan, instrument etc.)
   2) Pilot survey report on details and issues
   3) Full survey report (usual survey contents)
   4) Complete final cleaned/Geo-coded full survey and pilot survey data, fully expanded/weighted, ready to use; with complete data dictionary
   5) Working data used (including but not limited to recruitment data, expansion/weighting source data and working files)
   6) Training session for stakeholders

B. By TRM team:

Technical memoranda on

   1) Stakeholders review and approve survey sampling plan including parking facilities in each PASA to be surveyed, because the survey is not expected to be a simple random sample
   2) Pilot survey procedure/instrument and data QA/QC issues and suggested resolution
   3) Pilot survey data analysis result
   4) Full survey data QAQC issues and resolutions

Est. Est. start date: 7/1/2013

Est. end date: 10/25/2013

ID	Task Description	Person Days
1.1	**Parking behavior data collection management**	**19**
b)	Design and review data collection procedure	1
c)	Design and review sample plan including team member review	3
d)	Design and review survey instruments	2
e)	Review preliminary design for stakeholders approval	1
f)	Management of pilot data collection [including but not limited to signing contract, overseeing survey consulting firm process, communication, issue resolving, budget/time control]	1
g)	QAQC and analyze pilot data; provide feedback to survey consultant and document	4
h)	Advice for management of full data collection [including but not limited to overseeing survey consulting firm process, communication, issue resolving, budget/time control; final training]	2
i)	QAQC full survey data; provide feedback to survey consultant and document	5

** Note: This effort estimate assumes a one for one matching effort will be provided by the stakeholder that contracts for survey data collection*

1.2 *Household survey data collection*

A household survey is anticipated to be conducted by the region to support future model development efforts. A full sample of households for the region is expected to be surveyed during 2016. This task will develop a recommended survey approach, provide a basis for developing a request for proposals document, and manage survey data collection by a contractor.

Placeholder for future work

1.3 *Transit on-board survey data collection*

A transit on-board survey of passengers is anticipated to be conducted by the region during 2016 to support model development.

Placeholder for future work

1.4 *Gather locally collected data*

Stakeholders and local governments routinely collect many types of data that could be used for developing the TRM, such as traffic counts, turning movement counts, and transit passenger counts. In order to use the locally collected data for developing the TRM, it needs to be gathered from the agencies that collect it, to organize it for use, and to document it. This task

will contact local agencies and compile a catalog of locally collected data including contact information and information about when and how often data is collected. A set of file folders will be created to organize the data, and to make it easy for team members to find it. Finally documentation will be prepared for the data gathered.

Deliverable:

Locally collected data gathered, organized, stored, and documented

Est. start date: 7/1/2013

Est. end date: 6/30/2014

ID	Task Description	Person Days
1.4	**Gather locally collected data**	**50**
a)	Identify data collected by stakeholders and local governments	5
b)	Contact agencies that collect data and arrange for transfer	10
c)	Organize storage for data	10
d)	Load data collected into storage	20
e)	Prepare documentation	5

2 Model inputs

2.1 *Maintain and update networks, and zonal data*

Maintain and update highway and transit networks, and zonal data whenever new data (such as school enrollment or zonal path density and average block size) are available, new attributes (such as on-street parking, truck prohibited links and lanes indicator) are needed in the model, new projects are completed, or errors are discovered. A new 2013 base year network and SE data will be created as well.

2.1.1 Develop a tool to facilitate external review of highway and transit networks

Highway and transit networks ideally should be reviewed by local planning staff and be updated annually. This task will develop a tool to make TRM networks with attributes available to local planning staff for review and comment perhaps similarly to the employment geo-coder tool. The task includes specifying the review to be done by the planners, designing a way to accomplish the review, and implementing the design.

Placeholder for future work

2.1.2 Develop 2013 base year highway and transit network and SE data

The region has determined that in order to have a new base year for developing the next Metropolitan Transportation Plan (MTP), a base year of 2013 will need to be developed. This task will use information provided by the stakeholders to prepare and check highway and transit networks for 2013. New SE data tables for 2013 will be developed. These model inputs will be tested to make sure they work in the TRM v6 model.

Placeholder for future work

2.2 *Modify Net Manager to work with v6 model networks*

Work performed during FY 2013 focused on improvements to Net Manager for use with TRM v5 and support during development of the 2040 MTP alternatives networks. This addressed an immediate need, and in any case TRM v6 networks were not available. This meant the task to modify Net Manager to work with a TRM v6 network is still to be done. The task has been adjusted to reflect work already completed and adds a sub-task to improve the usability of the highway project creation tool.

a) Edit Net Manager script to work with v6 highway and transit networks
b) Fully improve usability of highway project creation tool
c) Continue improving the highway network scenario revision tool
d) Improve the tool based on comments/feedback from users (including debugging)
e) Prepare revised documentation
f) Provide Net Manager-related technical support to the stakeholder agencies

Deliverable:

Revised Net Manager script ready for use preparing v6 scenario networks and revised documentation.

Est. start date: 7/1/2013

Est. end date: 8/20/2013

ID	Task Description	Person Days
2.2	**Modify Net Manager to work with v6 model networks**	**36**
a)	Edit Net Manager script to work with v6 highway and transit networks	10
b)	Fully improve usability of highway project creation tool	10
c)	Continue improving highway network scenario revision tool	3
d)	Improve the tool based on comments/feedback from users (including debugging)	5
e)	Prepare revised documentation	3
f)	Provide Net Manager-related technical support to the stakeholder agencies	5

2.3 *Zone geography*

Objectives:

To make script and inputs work with new TAZ geography for TRM v6

Previous work:

TAZ geography was updated by the MPO partners during FY 2012. This included modifications to the highway network to make it consistent with the updated TAZ geography.

2.3.1 Script and input file modifications

These were completed during FY 2013.

2.3.2 Review district definitions

This task will perform a review of the district definitions using the TRN v6 TAZ geography and will make any needed adjustments to accommodate the revised TAZs.

Deliverable:

Revised district definitions, and short description of changes made.

Est. start date: 7/3/2013

Est. end date: 7/11/2013

ID	Task Description	Person Days
2.3.1	**Review district definitions**	**3**
a)	Review district definitions for TRM v6 TAZs	2
b)	Prepare brief documentation	1

2.4 *Develop highway network procedures*

These tasks were completed during FY 13 and no further work is proposed during FY 14.

2.5 *Transit networks*

2.5.1 Develop improved transit model procedures

Task completed during FY 2013.

2.5.2 Develop transit select link analysis tool

It has been suggested that a tool be created to allow users to perform select link analysis on transit model output (a postprocessor). While tools to perform this analysis are available in TransCAD, it is desired to make the process available directly from the TRM user interface, and to make it easier to use by scripting it.

Placeholder for future work

2.6 *Zonal data & models*

2.6.1 Population synthesizer

Task completed during FY 2013

2.6.2 Employment synthesizer: investigation of employee type at place of work

Task completed during FY 2013

2.6.3 Employment synthesizer

Task completed during FY 2013

2.6.4 Long-term decision models

It is possible to distinguish between decisions people make at long intervals (new home location, new employment location, school location, auto purchase), and decisions that are made at short intervals or even every day (shopping, recreation). Models of the decisions made at long intervals are developed early in model development, so later models can be conditional on the long interval decisions. The auto ownership model is proposed to be prepared first.

2.6.4.1 Auto ownership model

Auto ownership plays a role in travel choices throughout the TRM. An important difference between aggregate trip based models and activity-based models is that in trip based models the auto ownership model usually comes before trip generation, whereas with activity-based models it usually comes after the models of usual workplace, and school locations. This reflects that if the work location is farther away, a household is more likely to purchase more cars (both for the worker(s) and for other non-worker(s). For the approach to add new components to the trip based model, it may make sense to develop an auto ownership model before trip generation, but it is very likely that it will be re-estimated for a later tour or activity-based model.

2.6.4.1.1 Investigation

The investigation of auto ownership models was completed during FY 13

2.6.4.1.2 Estimation of an Auto Ownership Model for TRM v7

Placeholder for future work

2.6.4.2 Usual workplace location model

Placeholder for future work

2.6.4.3 Usual school location model

Placeholder for future work

2.7 *Develop an improved parking constraint model*

Purpose: Improve parking constraint model to better address regional policy issues with sub-area analysis within a PASA.

Objective: Finalize improved parking cost and capacity constraint model specifications; review parking analysis sub-area (PASA); design parking behavior data collection plan and instrument; collect, process and analyze data; prepare parking behavior data for model development; collect, process and analyze parking inventory data (facility location, capacity by use type, parking rate, and usage); prepare parking inventory data for model development; and develop and implement improved parking constraint models in TRM v6.

Previous work:

In FY 2012 TRM SB staff reviewed and evaluated other regions parking constraint model practice and associated parking data collection approach. In FY 2013 the Model Team approved the initial design of new parking constraint models for TRM v6.

FY 2014 main tasks:

1) Review and revise parking analysis sub-area (PASA)
2) Collect and review parking model related data including inventory of parking facilities/pricing/occupancy rate
3) Prepare parking inventory data (facility location, capacity, rate and usage for model estimation

4) Collect parking behavior data. A survey consultant will be hired by a stakeholder partner to conduct the survey, while TRM SB will provide advice, including pilot and final survey data QA/QC (see task 1.1 above)
5) Process and analyze parking behavior data for model development use
6) Develop improved parking models [estimation, calibration and validation]
7) Implement improved parking models in TRM v6 model stream (updating TransCAD script, FORTRAN program and so on)
8) Document the TRM v6 improved parking model development

Effort estimated for the sub-tasks is based on the assumption that all three of the proposed parking choice models will be developed, while time needed for each model is given separately.

2.7.1 Design TRM v6 parking constraint models

Task completed in FY 2013

2.7.2 Review Parking Analysis Sub-Area (PASA)

Deliverables:

1) Technical memorandum summarizing PASA development process
2) TRM v6 PASA boundary geo-files

Est. start date: 7/1/2013

Est. end date: 7/10/2013

ID	Task Description	Person Days
2.7.2	**Review Parking Analysis Sub-Area (PASA)**	**8**
a)	Prepare PASA boundary materials for stakeholder review	2
b)	Review and finalize stakeholder suggested PASA boundary and sub-area within each PASA	4
c)	Documentation	2

2.7.3 Collect, process and analyze parking inventory data

Deliverables:

1) Technical memorandum summarizing parking inventory data collection and process
2) Technical memorandum summarizing parking inventory data preparation for model development
3) Parking inventory data ready to use

Est. start date: 7/11/2013

Est. end date: 8/23/2013

ID	Task Description	Person Days
2.7.3	**Collect, process and analyze parking inventory data**	**31**
a)	Prepare lists of parking inventory data needed for each PASA	1
b)	Collect parking inventory data for year 2013	5
c)	Review, QA/QC, and process 2013 parking inventory data	10
d)	Process and analyze parking inventory data for model development	10
e)	Documentation	5

2.7.4 Analyze parking behavior survey data and prepare estimation data

Deliverables:

1) Technical memorandum summarizing parking behavior survey data analysis
2) Technical memorandum on parking behavior survey data process and preparation
3) Model estimation data files ready to use

Est. start date: 10/28/2013

Est. end date: 12/19/2013

ID	Task Description	Person Days
2.7.4	**Analyze parking behavior survey data and prepare estimation data**	**37**
a)	Parking Location Choice Model: Analyze parking behavior survey data (on relations to be used in v6 model estimation)	19
b)	Parking Reserved Space Choice Model: Analyze parking behavior survey data (on relations to be used in v6 estimation	9
c)	Parking Monetary Subsidy Choice Model: Process and prepare parking behavior survey data (on relations to be used in v6 model estimation)	9

2.7.5 Develop implementation specification in TRM stream

Deliverables:

1) Input files (in addition to the parking behavior data files) ready to use
2) TransCAD script/FORTRAN program and model input/output structure ready to use

Est. start date: 12/20/2013

Est. end date: 2/7/2014

ID	Task Description	Person Days
2.7.5	**Develop implementation specification into TRM stream**	**29**
a)	Parking Location Choice Model	17
b)	Parking Reserved Space Choice Model	6
c)	Parking Monetary Subsidy Choice Model	6

2.7.6 Estimate TRM v6 parking constraint models

Est. start date: 2/10/2014

Est. end date: 3/20/2014

ID	Task Description	Person Days
2.7.6	**Estimate TRM v6 parking constraint model**	**29**
a)	Parking Location Choice Model	17
b)	Parking Reserved Space Choice Model	6
c)	Parking Monetary Subsidy Choice Model	6

2.7.7 Calibrate TRM v6 parking constraint models

Deliverables:

1) Technical memorandum documents v6 parking model estimation and calibration process, with statistical test results; and model performance
2) Calibrated model (parameters, any input files))

Est. start date: 3/21/2014

Est. end date: 5/2/2014

ID	Task Description	Person Days
2.7.7	**Calibrate model**	**31**
a)	Parking Location Choice Model	21
b)	Parking Reserved Space Choice Model	5
c)	Parking Monetary Subsidy Choice Model	5

2.7.8 Validate TRM v6 parking constraint models and final adjustment

Deliverables:

1) Technical memorandum document on TRM v6 parking model validation process
2) Finalized model specification and parameters (and input files)

Est. start date: 5/5/2014

Est. end date: 6/12/2014

ID	Task Description	Person Days
2.7.8	**Validate model and final adjustment**	**29**
a)	Parking Location Choice Model	15
b)	Parking Reserved Space Choice Model	7
c)	Parking Monetary Subsidy Choice Model	7

2.7.9 *Final documentation*

Deliverables:

1) Technical memorandum on entire Task 2.7 TRM v6 Parking cost/capacity constraint model development
2) Ready to use model components (TransCAD script, FORTRAN program, parameters, model structure, input files)

Est. start date: 6/13/2014

Est. end date: 6/26/2014

ID	Task Description	Person Days
2.7.9	**Final documentation**	**10**

2.8 *Data systems*

It is expected that more advanced models will require new approaches to storing and processing data, and this suggests that design of data systems should be undertaken early in the development of the new model. Since an incremental approach to developing the new model is proposed, it will also be good to consider how components developed as additions to the trip based model will be modified to work in a new model system.

2.8.1 *Investigation*

Placeholder for future work

3 Trip generation

3.1 *Re-estimation and/or re-calibration of trip production models*

Task completed in FY 2013

4 Time of day and peak spreading model

The current TRM v5 model uses fixed time-of-day factors to slice a daily trip matrix into multiple time periods of a day and estimates traffic conditions for each time period by assigning the sliced trip matrices onto the highway network. This is a typical time-of-day modeling approach widely used in the US. However, since time-of-day factors are most commonly specified as exogenous values derived from the household survey data or traffic count data, they are fixed and independent of congestion levels. Even when congestion gets more severe, the model still assumes the percentage of travelers that start their trips in the peak period will keep unchanged, which is not realistic and can over estimate traffic congestion for the peak period. It

has been observed from travel surveys that the peak spreads when congestion gets more severe. A more sophisticated congestion-level-dependent time-of-day (or called peak spreading) modeling method should be employed in the TRM to better simulate traffic conditions.

4.1 *Peak spreading model*

A peak spreading model was developed in FY12-13 using travel time from v5. This model needs to be brought into v6. The following tasks will be carried out.

1) Model re-estimation using v6 data.

2) Model recalibration. Parameters, thresholds, and/or factors estimated in the previous step will be adjusted until model estimates agrees reasonably well with the traffic count data by period.

3) Implementing the Model in TRM v6. A GISDK module will be developed and integrated with the main TRM script.

4) Investigating the Impact on Model Output Stability. Since the approach we chose to use makes adjustments to trip matrices directly, as an extra to the MSA process executed immediately after the highway assignment step, the stability impact of peak spreading adjustments on model output should be examined and any major changes should be investigated and explained.

5) Update Documentation.

Est. start date: 12/10/2013

Est. end date: 1/24/2014

ID	Task Description	Person Days
4.1	**Peak spreading model**	**27**
1)	Model re-estimation	10
2)	Model re-calibration	5
3)	Implementation (including input data preparation)	5
4)	Investigating the impact on model output stability	5
5)	Update documentation	2

4.2 *Prepare time of day factors*

Task completed in FY 2013

5 Trip distribution

5.1 *Develop improved destination choice model*

Objective:

The purpose of this task is to improve the TRM v5 destination choice model. The objective is for v6 to better model trip distribution for each trip purpose by household strata, by employee type (including employer business type and employee earning levels for HBW, and business type for other trip purposes); focusing more on individual person types; to improve the accuracy of trip attraction allocation by purpose to appropriate destinations for each of the five household strata and/or employee types used in TRM v6. This task will include finalizing a model specification.

In FY 2013:

Stakeholders reviewed and approved the TRM SB initial design specification for the improved destination choice models.

FY 2014 main tasks:

1) Identify sources of model estimation data
2) Script modifications to include destination choice model in TRM v6 model stream, including creating input/control files for model parameters (replacing the existing hard-coded coefficients in the FORTRAN program)
3) Possibly replacing the current FORTRAN program with TransCAD GISDK script
4) Prepare model estimation file from re-expanded/weighted 2006 Household Travel Survey and other data sources (e.g., traffic skims, and SESyn output of employment types for HBW, and other trip purposes respectively)
5) Finalize model specification
6) Develop improved destination choice model (estimation, calibration and validation)
7) Document the model development process

Final product will be a technical memorandum that documents the entire process above, model performance; and a completely updated ready-to-use destination choice model (including TransCAD scripts, FORTRAN programs, input data files and finalized parameters).

5.1.1 Review TRM v5 destination choice – attraction share model

Task completed during FY 2013.

5.1.2 Design TRM v6 destination choice model specifications

Task completed during FY 2013.

5.1.3 Script modifications for application of destination choice in TRM v6

A new destination choice model will require changes to the model script and the application programs. A first step will be to design the overall flow of the model application including input variables, computations, and output of model results. The next step will be to make modifications to script and program code. Finally the model implementation will need to be tested and debugged.

Deliverables:

1) Technical memorandum documenting all script and FORTRAN program modifications
2) Final model script and application program ready for application

Est. start date: 7/1/2013

Est. end date: 8/15/2013

ID	Task Description	Person Days
5.1.3	**Script modifications for application of destination choice in TRM v6**	**33**
a)	Design model application approach	5
b)	Modify model script and FORTRAN program: update TransCAD script/Fortran program (and control files), other needed input and parameter files	20
c)	Test and finalize model implementation	5
d)	Document all script and program modifications	3

5.1.4 Prepare v6 destination choice model estimation files

This set of tasks will include developing and estimating new attraction share models that will be used to develop weights to be used during destination choice sampling of TAZs (sub-task b below).

Est. start date: 7/1/2013

Est. end date: 8/20/2013

ID	Task Description	Person Days
5.1.4	**Prepare TRM v6 destination choice model estimation data files**	**36**
a)	Prepare explanatory variables (such as logsum, and congested travel times) in TRMv6	5
b)	Develop and estimate new attraction share models for use in sampling TAZs in task c below	20
c)	Prepare the model estimation files, which includes sampling 20 possible destination TAZs for each trip record in the 2006 Household Survey, and calculating all candidate explanatory variables for each possible destination TAZ	10
d)	Prepare a short tech memo	1

5.1.5 Estimate model using new specification

Est. start date: 8/21/2013

Est. end date: 10/18/2013

ID	Task Description	Person Days
5.1.5	**Estimate TRM v6 destination choice model with new specification**	**42**
a)	Estimate model (HBW by 6 employee types, and 5 trip purposes by 5 strata for other purposes)	36
b)	Documentation	6

5.1.6 Calibrate model

Deliverables:

1) Technical memorandum documents estimation and calibration process, with statistical test results; and distribution results performance
2) Calibrated model (parameters, any input files)

Est. start date: 10/21/2013

Est. end date: 12/6/2013

ID	Task Description	Person Days
5.1.6	**Calibrate TRM v6 destination choice model**	**33**
a)	Identify and prepare calibration target data [mostly likely 2006HIS], including observed target trip tables, county level and district level flow	5
b)	Review model performance result vs. survey based target [trip length/distance, county-to-county flow and district-to-district flow]	10
c)	Calibrate model specification (adjust parameters, and/or even function forms when necessary)	15
d)	Document calibration process	3

5.1.7 Validate model

Deliverables:

1) Technical memorandum summarizes validation process and results.

Est. start date: 12/9/2013

Est. end date: 1/13/2014

ID	Task Description	Person Days
5.1.7	**Validate TRM v6 destination choice model**	**19**
a)	Identify validation data source not used for estimation [e.g., CTPP and other data sources]	1
b)	Prepare validation data [depends upon availability]	2
c)	Develop validation approach	1
d)	Validate model including: Duke University, Durham & Raleigh downtowns, RTP, NCSU, and UNC	10
e)	Document validation result	5

5.1.8 Final adjustment

Est. start date: 1/14/2014

Est. end date: 1/20/2014

ID	Task Description	Person Days
5.1.8	**Final adjustment**	**5**

5.1.9 Documentation

Deliverables:

1) Technical memorandum on entire Task 5.1 TRM v6 destination choice model
2) Ready to use model components (TransCAD script, FORTRAN program, parameters, input files)

Est. start date: 1/21/2014

Est. end date: 1/28/2014

ID	Task Description	Person Days
5.1.9	**Final documentation for the TRM v6 destination choice model**	**6**

6 Non-motorized

6.1 *Estimation and calibration of non-motorized models*

a) Adjust the non-motorized model script to fit the TRMv6 TAZ system.

This sub-task includes:

- Compare new time-of-day factors to those used in TRM v5 and document the difference
- Prepare non-motorized model specific zonal input data such as average block length, non-motorized path density with new zonal data
- Run initial non-motorized models with the newly developed time-of-day factors and zonal data
- Prepare the observed non-motorized target data from re-expanded/weighted household survey data
- Evaluate model results versus the observed target
- Determine whether the models need to be re-estimated and re-calibrated

If they do, then:

b) Prepare the model estimation files, which includes calculating household characteristics, TAZ attributes, and inter-TAZ travel impedance

c) Re-estimate and calibrate for non-motorized models by time period and strata

d) Implement re-calibrated non-motorized model in model stream (updating model script and parameter files

e) Document the work on re-estimation and re-calibration of Non-motorized Models including calibration results.

Deliverable:

New parameters for Non-motorized Models, technical memorandum on observed time of day factors, and technical memorandum on the re-estimation and re-calibration of Non-motorized Models, and model parameter files and updated model script

Est. start date: 1/29/2014

Est. end date: 4/3/2014

ID	Task Description	Person Days
6.1	**Calibration and/or estimation of non-motorized models**	**79**
a)	Adjust non-motorized script to fit v6 TAZ system	1
a1)	Prepare non-motorized model specific zonal input data	3
a2)	Prepare observed non-motorized target data from re-expanded/weighted survey data	3
a3)	Evaluate model run results against observed targets	5
a4)	Determine whether the models need to be re-estimated and re-calibrated	2
b)	Prepare model estimation files	10
c)	Re-estimate and re-calibrate non-motorized models by time period and strata	40
d)	Implement re-estimated/calibrated non-motorized model in model stream	5
e)	Documentation	10

7 Mode choice

7.1 *Re-calibration of mode choice models*

a) Adjust the mode choice model script and FORTRAN program and control files to fit the TRMv6 TAZ system

b) Prepare the mode choice calibration targets from the re-expanded/weighted 2006 Household Survey and 2006 Transit On-board Survey

c) Investigate mode choice estimation and make recommendation to team

d) If feasible and recommended, estimate mode choice models

e) Re-calibrate Mode Choice Model alternative specific constants

f) Implement re-calibrated mode choice models in model stream by updating TransCAD script, FORTRAN program and control files when necessary

g) Document the work on calibration of Mode Choice Models.

Deliverable:

New parameters for Mode Choice Models and input files, and technical memorandum on the calibration of Mode Choice Models

Est. start date: 4/3/2014

Est. end date: 6/26/2014

ID	Task Description	Person Days
7.1	**Re-calibration of mode choice models**	**71**
a)	Adjust mode choice model control files FORTRAN program or script to fit v6 TAZ system	3
b1)	Prepare mode choice calibration targets from re-expanded/weighted 2006 survey data	5
b2)	Run initial TRMv6 mode choice model	1
b3)	Evaluate initial model run result using the above observed targets	3
b4)	Determine which mode choice model(s) need to be re-calibrated	1
c)	Investigate mode choice estimation & make recommendation	5
d)	Estimate mode choice models if recommended	20
e)	Re-calibrate mode choice models for 6 trip purposes by 2 time periods	20
f)	Implement re-calibrated mode choice models into model stream	5
g)	Documentation	8

8 Special models

8.1 *Develop an improved commercial vehicle model (CVM)*

The following sub-sections detail the steps and related tasks required to complete the CVM and in particular to prepare it for use with v6 model inputs.

8.1.1 Model estimation and calibration with v6 input data

a) Trip generation model:

1) Investigate and improve CV trip generation model for TRM v6

2) Update model script and documentation

b) Trip distribution model:

1) Generate new highway travel time and travel distance skim matrices from TRM v6. Both AM peak and PM peak travel times are needed to distribute the trips by time of day.
2) Update model estimation datasets
3) Re-estimate destination choice models based on new SE data and new skim data
4) Derive new trip length frequency distributions based on the improved TAZs and new highway travel times
5) Calibrate destination choice models to align model estimated average trip lengths with observed trip lengths
6) Update the GISDK macro to implement destination choice model in v6

Deliverables:

Updated technical memoranda documenting development/update of the models, calibration efforts made, and model performance.

Est. start date: 8/14/2013

Est. end date: 9/25/2013

ID	Task Description	Person Days
8.1.1	**Model estimation and calibration with v6 input data**	**30**
8.1.1.a	Trip generation model	12
1)	Investigate and improve CV trip generation model for TRM v6	10
2)	Update model script and documentation	2
8.1.1.b	Trip distribution model	18
1)	Generate new highway travel time and distance skims	1
2)	Update model estimation datasets	2
3)	Re-estimate destination choice models (6 models)	8
4)	Derive new trip length frequency distributions (one for each model) using v6 travel time data	2
5)	Calibrate destination choice models (6 models)	3
6)	Update the GISDK macro	2

8.1.2 Interfacing with NC Statewide Model for CV IE-EI and E-E Trips

a) Develop a correspondence between NCSTM and TRM zones and between NCSTM and

TRM employment types

The NCSTM created its zone structure for the Triangle Region based on the TRM v5 zones. Since the new v6 zones are a bit different from those in TRM v5, a more complicated correspondence table will need to be developed between the NCSTM zones and the TRM v6 zones.

The correspondence table will contain estimated percentages to allocate population, households, and employment by type in each of the NCSTM zones to TRM zones that have been geographically over laid. Since NCSTM uses a different employment categorization scheme from the TRM, conciliation between the schemes is anticipated using another correspondence table.

b) Conduct sub-area analysis using NCSTM

A subarea analysis will need to be conducted in NCSTM to identify the pairs of ODs that have trips passing through TRM external stations and produce initial I-E/E-I and E-E trip tables. It will be necessary to get familiar with the NCSTM and to set up the model correctly on a local computer before conducting the sub-area analysis.

c) Allocate internal trip ends to TRM internal zones

With allocated socioeconomic data, the internal trip ends of I-E and E-I trips will need to be allocated from the NCSTM to the TRM. Since NCSTM and TRM have different trip generation models and employment classifications, reconciliation between the two models is anticipated in order to successfully integrate them. Comparison between model estimates using the two models along with some adjustments may be needed to find the best solution for internal trip end allocation. Further adjustments are anticipated in the model validation stage where modeled VMT or volumes are compared with observed VMT or counts in the region.

d) Allocate external trip ends to TRM external stations

Allocating external trip ends (relative to the TRM model boundary) reasonably to TRM external stations is critical. However, unlike the TRM, many of the local roads and even some collectors are not included in the NCSTM making this task a bit challenging. Based on the results from step b), certain percentages of trips will have to be assumed and be allocated from the major roads to adjacent roads that are present in the TRM but not in the NCSTM. Both I-E/E-I and E-E trips will need to be included in the analysis.

e) Adjust disaggregated NCSTM estimates to align estimated volumes with counts at external stations

Truck trip ends (or called traffic volumes) at each TRM external station as estimated in the previous step will be compared with actual ground truck counts for the base year. One ratio will be developed and be applied where necessary as a factor to align the estimated volumes with the counts at each external station. The other end of those impacted trips will be factored too, to remain consistent.

f) Re-balance disaggregated E-E trip tables

After disaggregation and factoring, it is necessary to re-balance the disaggregated E-E trip tables so that at each external station the numbers of inbound and outbound trips are close (ideally equal) and the to and from flows between any pair of external stations are close (ideally equal).

g) Implement the interfacing approach in GISDK and integrate it with the other parts of the model

Deliverables:

Updated technical memoranda documenting development/update of this interfacing model

Est. start date: 9/26/2013

Est. end date: 11/18/2013

ID	Task Description	Person Days
8.1.2	**Interfacing with NC Statewide Model for CV I-E/E-I and E-E Trips**	**38**
a)	Develop a correspondence between NCSTM and TRM zones and between NCSTM and TRM employment types	6
b)	Conduct sub-area analysis using NCSTM (including getting familiar with NCSTM and setting up the model on a local computer)	5
c)	Allocate internal trip ends to TRM internal zones	8
d)	Allocate external trip ends to TRM external stations	7
e)	Adjust disaggregated NCSTM estimates to align estimated volumes with counts at external stations	3
f)	Re-balance disaggregated E-E trip tables	3
g)	Implement the interfacing approach in GISDK and integrate it with the other parts of the model	6

8.1.3 Develop truck-prohibited link and lane function in v6

a) Identify the truck-prohibited links and lanes in v6 highway network

b) Implement truck-prohibited links and lanes in TRM v6. It is anticipated that script modifications will be made at many places in the v6 model because change of network is a fundamental change and impacts anywhere the network is used in the model, such as the steps of Create Network, Trip Distribution, and Highway Assignment. Full testing of the entire model is needed to make sure all the pieces impacted still work correctly.

Deliverable:

Technical memorandum documenting development of this function

Est. start date: 11/19/2013

Est. end date: 12/5/2013

ID	Task Description	Person Days
8.1.3	**Develop truck-prohibited link and lane function in v6**	**11**
a)	Identify the truck-prohibited links and lanes in v6 network	1
b)	Implementations and full test	10

8.1.4 Script modifications for time of day traffic assignment

a) Implement time-of-day CV traffic assignment in v6. Since the v6 model is going to implement 4 time periods of day, additional scripting will be needed.

Est. start date: 12/6/2013

Est. end date: 12/9/2013

ID	Task Description	Person Days
8.1.4	**Implement Time of Day Traffic Assignment**	**2**
a)	Update CV model assignment script for 4 time periods of day	2

8.1.5 Validate model using 2010 classification traffic counts and VMT data

a) Develop validation data including classification counts and VMT data

b) Compare model performance to validation data and adjust the model to improve its performance

Deliverable:

Validated model with v6 networks and input data and technical memorandum describing development of model validation data, comparisons of model performance to validation data, and any adjustments made to improve model performance

Est. start date: 5/9/2014

Est. end date: 6/19/2014

ID	Task Description	Person Days
8.1.5	**Validate model**	**30**
a)	Develop validation data: classification counts and VMT data	5
b)	Compare model performance to validation data and adjust the model	25

8.1.6 Update overall model documentation for commercial vehicle model

a) Model documentation prepared in FY 2012 based on the v5 data will be updated fully to reflect the modeling efforts made and results achieved using the v6 data.

Deliverable:

Commercial vehicle model documentation section of v6 model documentation

Est. start date: 6/20/2014

Est. end date: 6/30/2014

ID	Task Description	Person Days
8.1.6	**Update model documentation**	**7**
a)	Update model documentation	7

8.2 *University student model*

The TRMv5 included university students with other adults as workers and non-workers with and without autos. Trips from home to the three main campuses were modeled as a separate trip purpose (Home Based University or HBU). While this approach improved on earlier models, it left room for improvement, in particular for non-home based travel between Duke University east and west campuses and NCSU main and Centennial campuses. An improved university student model will be developed to better represent travel choices made by students.

8.2.1 Investigation of university student models

This task was completed during FY 2013.

8.2.2 Prepare available university student data for analysis

This task was completed during FY 2013.

8.2.3 Trip/activity generation model estimation

This task was completed during FY 2013.

8.2.4 Destination choice model estimation

This task was completed during FY 2013.

8.2.5 Non-motorized model estimation

The current TRM v5 model includes a step to separate trips into non-motorized and motorized modes after destination choice. If this structure is recommended for the university student model, then non-motorized models will be estimated for trips or tours/stops on tours.

a) Develop model estimation files based on the 2001 NCSU student survey

b) Re-estimate non-motorized models by 4 trip purposes, 2 time periods and 2 strata (on-campus and off-campus students)

c) Documentation

Deliverable:

Technical memorandum describing development of the non-motorized model

Est. start date: 7/1/2013

Est. end date: 7/23/2013

8.2.5	**Non-motorized model estimation**	**16**
a)	Develop model estimation files based on the 2001 NCSU student survey	5
b)	Re-estimate non-motorized models by 4 trip purposes, 2 time periods and 2 strata (on-campus and off-campus students)	10
c)	Documentation	1

8.2.6 Prepare models for application

It is anticipated that the university student models will require new model scripts to be written. This is expected to be a substantial effort that will include the design of inputs and outputs, script flow, coding, and execution testing. Due to the special model structures of the student models (e.g., the trip purposes are different), the script for the general public may not be easily adapted for the university students.

a) Prepare the destination choice model script to implement the university student destination choice model

b) Prepare the non-motorized model script to implement the university student non-motorized model

c) Prepare the mode choice model script to implement the university student mode choice model.

Deliverable:

Modified script to implement the university student destination choice, non-motorized and mode choice models

Est. start date: 7/24/2013

Est. end date: 10/2/2013

8.2.6	**Prepare models for application**	**50**
a)	Prepare the destination choice model script to implement the university student destination choice model	20
b)	Prepare the non-motorized model script to implement the university student non-motorized model	15
c)	Prepare the mode choice model script to implement the university student mode choice model	15

8.2.7 Calibration of the university destination choice model

The university trip distribution model needs to be calibrated to match the average trip length and the trip length distribution observed from the 2001 NCSU survey.

a) Prepare calibration target data from the 2001 NCSU student survey

b) Calibrate the model

c) Document calibration process.

Deliverables:

Technical memorandum documenting calibration process

Est. start date: 10/3/2013

Est. end date: 10/18/2013

8.2.7	**Calibration of the university destination choice model**	**12**
a)	Prepare calibration target data from the 2001 NCSU student survey	3
b)	Calibrate the model	8
c)	Document calibration process	1

8.2.8 Calibration of the university non-motorized model

The university non-motorized model needs to be calibrated to match the share of the non-motorized trips observed from the 2001 NCSU survey.

a) Prepare calibration target data from the 2001 NCSU student survey

b) Calibrate the model

c) Document calibration process

Deliverables:

Technical memorandum documenting calibration process

Est. start date: 10/21/2013

Est. end date: 10/31/2013

8.2.8	**Calibration of the university non-motorized model**	**9**
a)	Prepare calibration target data from the 2001 NCSU student survey	3
b)	Calibrate the model	5
c)	Document calibration process	1

8.2.9 Calibration of the university mode choice model

Mode choice models will be estimated for university student trips. University students account for 61% of the transit trips and 57% of the transit ridership in the Triangle area. It is important to make sure the mode choice models for the general public (5 household strata) and for the university students are consistent so that the total number of transit trips meet the target.

a) Prepare the calibration targets from the 2001 NCSU student survey and the 2006 transit on-board survey

b) Calibrate the model

c) Document calibration process

Deliverables:

Technical memorandum documenting calibration process

Est. start date: 11/6/2013

Est. end date: 12/18/2013

8.2.9	**Calibration of the university mode choice model**	**12**
a)	Prepare the calibration targets from the 2001 NCSU student survey and the 2006 transit on-board survey	5
b)	Calibrate the model	5
c)	Document calibration process	2

8.2.10 Model validation and final documentation

Validation data will be prepared depending on availability. The university student models will be validated and documented

Deliverables:

Final technical memorandum documenting the university models

Est. start date: 12/19/2013

Est. end date: 1/15/2014

8.2.10	**Model validation and final documentation**	**13**
a)	Prepare the validation data	5
b)	Validate the model	5
c)	Document the university student models	3

8.3 Land use models

Other regions have included the integration of a regional land use model with their advanced travel demand models. The Triangle region has experience with the UrbanSim land use model. It is suggested that the region consider whether to integrate a land use model with the TRM.

8.3.1 Investigation

This task was completed during FY 2013

8.4 Update external travel models (I-E, E-I, and EE)

External travel models need to be updated for TRM v6 to accommodate changes in TAZs.

8.4.1 Update external travel models

The work will include script updates and updates of input files including external transit trip inputs. This task will also include an investigation of using alternative sources of external travel data to update external travel models.

Placeholder for future work

8.5 Links to MOVES air quality models

MOVES is now required for performing air quality analysis for long range transportation plan conformity determinations. It is desired to create procedures within the TRM to prepare output data for MOVES analysis and perhaps to call the MOVES programs. This task will identify the best approach to integrate MOVES analysis in the TRM and prepare scripting to implement it.

8.5.1 Develop module to link MOVES air quality models with TRM

A module will be designed based on approaches used by other regions to link MOVES air quality models with aggregate trip based models.

Placeholder for future work

8.6 Sub-area and corridor analysis procedures

When applying a regional model to a sub-area or corridor level of analysis, special procedures are needed. This task will investigate approaches used in other regions and recommend an approach to apply to the TRM. Depending on the approach that is recommended, subsequent tasks will design and implement the recommended procedure in the TRM.

8.6.1 Procedures for performing sub-area and corridor analysis - investigation

Procedures for performing sub-area and corridor analyses will be investigated. Practice at other MPOs will be described. A recommendation will be made for procedures to implement in the TRM.

Placeholder for future work

9 Trip assignment, calibration & validation

The v6 model while similar to the v5 model will have many improved components that will affect the results of highway and transit assignment. One major improvement is the new highway network procedure. This new procedure might have a large impact on the highway and transit assignments because, a) intersection delays are considered in the v6 model but not in the v5 model, therefore speeds on interrupted facilities in the v6 model will generally be lower than those in the v5 model; b) the facility types and corresponding free-flow speeds and capacities used in the v6 model are different from those in the v5 model. It is still unclear how large the impacts are. All the model estimations and calibrations before highway assignments will use the network skims based on the congested speeds from assigning the v5 model output on the v6 network. When the initial highway assignments are completed in the v6 model, it might be necessary to re-estimate and/or re-calibrate all the previous models.

This task will apply the model with 2010 model inputs and the resulting highway and transit assignments will be compared to calibration targets. Data for observed speeds will be compared to model speeds. Comparisons will be made for peak periods as well as for the whole day.

9.1 Investigate improving highway assignment

9.1.1 Dynamic traffic assignment

Dynamic traffic assignment is being considered for both pricing and safety planning applications, and tools are being developed that may be appropriate for application in the Triangle region. These include DTALite being developed under an FHWA research project, and the SHRP 2 C10 project combining an activity based model with Dynus T.

An investigation of dynamic traffic assignment was conducted during FY 2013. This task remains as a placeholder for possible future work with dynamic traffic assignment in the TRM.

9.2 *V6 model assignment and overall model calibration*

9.2.1 Highway assignment

a) Prepare new time of day factors for the off-peak period to include new mid-day and night periods
b) Review screen line and cut line definitions for TRM v6 and make any needed corrections
c) Apply model script for highway assignment and confirm that script works correctly and if not make revisions
d) Perform assignment and perform reasonableness checks including: centroid connectors with zero volumes, highway links with zero volumes, highway links with speed less than five and ten miles per hour
e) Identify and make any needed model improvements in order to improve assignment such as connecting unconnected links, adding links if missing, and correcting any errors in attribute coding.

Est. start date: 5/21/2014
Est. end date: 6/30/2014

ID	Task Description	Person Days
9.2.1	**Highway assignment**	**28**
a)	Prepare new off peak factors for mid-day and night periods	10
b)	Review screen line and cut line definitions in TRM v6	3
b)	Apply model script for highway assignment	5
c)	Perform assignment and apply reasonableness checks	5
d)	Identify and make any needed model improvements	5

9.2.2 Transit assignment

Placeholder for future work

9.2.3 Model chain calibration/validation

Placeholder for future work

10 Technical Assistance

10.1 *Assistance with model application for developing the Metropolitan Transportation Plan*

Placeholder for future work

10.2 *Technical assistance with TRM model application on as needed basis*

Objective:

To enable stakeholders (including stakeholder contractors) to apply the model as needed

TRM Service Bureau staff will provide technical assistance for stakeholder partners on an as needed basis when they are applying the TRM. This will include providing model files and documentation to contractors working on the behalf of stakeholder partners. It will also include answering questions and providing assistance when problems arise.

10.3 *Action items*

Objective:

To address issues identified by stakeholders as Action Items.

From time to time the stakeholders may determine that there are work tasks not covered elsewhere in the work program that nonetheless must be done. During FY2013 such action items were requested by stakeholders. The action item work program element sets aside time for conducting work on tasks as determined by the stakeholders. These tasks will result in a work product, such as a technical memorandum that will document the work done and the completion of the task. Unused time can be allocated to other work tasks after the end of the second quarter.

11 Oversight, reporting, and training

Objective:

To enable efficient and effective team communication and project management.

This task includes necessary administrative tasks and meetings needed for project oversight and communication with stakeholders such as Executive Committee, Model Team, and internal TRM Service Bureau meetings. Periodically team members meet both internally and with stakeholders to review task progress and approaches, solve problems, and keep stakeholders informed of work taking place on the project. The project also requires developing an annual work program, task assignments, and monthly team reporting.

11.1 *Oversight & reporting*

TRM Team Meetings will be held monthly on the 3rd Thursday of each month unless there are no items to discuss. Model Team members may convene a technical team meeting to review task approaches in detail and develop recommendations for tasks on an as needed basis. Task includes preparation of all presentation materials for meetings.

Executive Committee meetings will be held every other month on Tuesday afternoons, or as designated by executive committee members.

Quarterly progress reports will be prepared in October, January, April, and July. Monthly status reports will be prepared.

A web site for team collaboration will be maintained to allow the team to share data, analysis, calendar, and documentation to improve collaboration and efficiency.

TRM Service Bureau team members will attend up to a total of four stakeholder project team meetings or one meeting per team member in the course of the project year.

11.2 *Training*

11.2.1 TRM training

Training modules will be developed for stakeholder staff, model users, and consultants. These three groups will be briefly surveyed regarding their needs for training in the use of the TRM. Based on the survey results it is anticipated that three training modules will be developed with each tailored to the needs of each group. Each of the three modules will be given once during the year, and evaluation forms will be distributed to participants. The evaluations will be used to make adjustments to the training modules for future sessions.

ID	Task Description	Person Days
11.2.1	**TRM training**	**12.5**
a)	Conduct survey of stakeholders, model users, and consultants	1
b)	Develop stakeholder training module	5
c)	Develop model users module	3
d)	Develop consultant module	2
e)	Provide ½ day training for each of three groups	1.5

11.2.2 Staff training

The highly technical nature of the work on the Triangle Regional Model requires that team members update their skills by attending training sessions, using on-line training opportunities, watching Travel Model Improvement Program webinars, and attending model user group meetings. This task will help ensure that up to date skills are applied when performing TRM work.

Appendix A

Vision for Developing the v6 and v7 Models

Policy Testing Needs Identified by Stakeholder Partners

Policy Testing Needs Identified by EC 10/20/2009	Part of Model?
1. Dynamic Tolls	Part of model
2. Greenhouse gas – land use change (Urban Sim)	Part of model
3. Peak spreading (a result)	Part of model
4. Parking constraint in CBD and elsewhere	Part of model
5. Environmental Justice (EJ) impacts (a result)	Analysis done outside model
6. Change mix of land uses within TAZs & consider design of land uses	Part of model
7. TDM policies	Analysis done outside model
8. ITS	Analysis done outside model
9. Making decisions on modal investments	Analysis done outside model

Suggested Elements of New Models or Work Programs

Suggested Elements (FY 2012 list)	In v6	In v7	Invest.	Notes
1. Improved Commercial Vehicle Model	X			DCHC #1
2. Improved Transit Assignment		X		DCHC #2
3a. Static Traffic Assignment Improvements	X		X	DCHC #3
3b. Dynamic Traffic Assignment		X		DCHC #3
4. Area Type Sub-model		X		DCHC #4
5. Population Synthesizer		X		DCHC #5

Suggested Elements (FY 2012 list)	In v6	In v7	Invest.	Notes
6. Trip Attraction and Destination Choice Sub-model	X			DCHC #6
7. University Student Trip Model		X		DCHC #7
8. Walk Access - Transit Link		X		DCHC #8
9. Employment Category and Special Trip Generators		X		DCHC #9
10. System Optimization	X			DCHC #10
11. Time of Day Model		X		DCHC #11
12. Parking Survey and/or Behavior Study		X	X	DCHC #12 Tri. Tran. req.
13a. Link Capacity Calculation			X	DCHC #13 CAMPO req.
13b. Intersection Delay			X	DCHC #13
14. HBW Journey or Tour Based Model		X		
15. Strategic data collection plan			X	MPO req.
16. TAZ review			X	

Suggested Elements (FY 2013 list)	In v6	In v7	Invest.	Notes
1. University student trip model	X			DCHC #1
2. Validation on person and CV trip rate	X			DCHC #2
3. Attraction share and destination choice improvement	X			DCHC #3
4. Mode choice estimation/calibration	X		X	DCHC #4
5. Transit model [updates]	X			DCHC #5
6. Time of day	X			DCHC #6
7. Disaggregated population synthesizer	X			DCHC #7

Suggested Elements (FY 2013 list)	In v6	In v7	Invest.	Notes
8. Auto ownership model	X			DCHC #8
9. Meso-scopic dynamic traffic assignment			X	DCHC #9
10. Action items				CAMPO
12. Parking Survey and/or Behavior Study	X			Tri. Tran.

Suggested Elements (FY 2014 list)	In v6	In v7	Invest.	Notes
1. Transit select link analysis tool	X			CAMPO
2. TRM training for stakeholders, model users, & consultants				CAMPO
3. Attend stakeholder project meetings				CAMPO

V6 Model

The v6 model will continue to be an aggregate trip based model based on the v5 model. It is expected the v6 model will be used for the 2045 Metropolitan Transportation Plan (MTP) development starting in 2015. The focus for this model will be on further enhancement of the aggregate trip based model.

Fiscal Year	TRM v6 Development	Notes
Year 1 July 1, 2011 - June 30, 2012	Design new commercial vehicle model Optimize model run time performance TAZ modifications Modifications of SE data and SE models Develop improved transit network procedures Investigate and specify enhancements below: 1) definition of facility types 2) link capacity calculation 3) update link free flow speeds 4) intersection delay 5) develop GIS approach to changing future road characteristics 6) improve highway traffic assignment 7) employment categories and special generator definitions 8) investigate and implement improvements to area type calculations	
Year 2 July 1, 2012 - June 30, 2013	Design improved destination choice – attraction share model Develop and implement enhancements below: 1) reviewed & revised employment types for v6, developed and implemented SESyn to estimate population types, HH types, and employee by type at both residence and establishment locations 2) recommended changes to the trip attraction/destination choice sub model using new employment types 3) intersection delay & link capacity calculation implementation including data collection and input 4) designed improved parking constraint models specification and data collection. 5) develop peak spreading model 6) develop university student model Trip generation will be re-estimated using existing survey data.	
Year 3 July 1, 2013 - June 30, 2014	Complete the following enhancements: 1) commercial vehicle model, 2) develop new parking constraint models, 3) develop new university student travel models All remaining model components will be re-estimated using existing survey data. Highway assignment will be QA/QC'd.	[See detailed task list in the scope for more information on individual tasks]
Year 4 July 1, 2014 - June 30, 2015	Model calibration and validation. Work tasks will include calibrating and validating model components and overall model performance. A 2013 base year model will be prepared. Sensitivity tests will be conducted for a forecast year.	

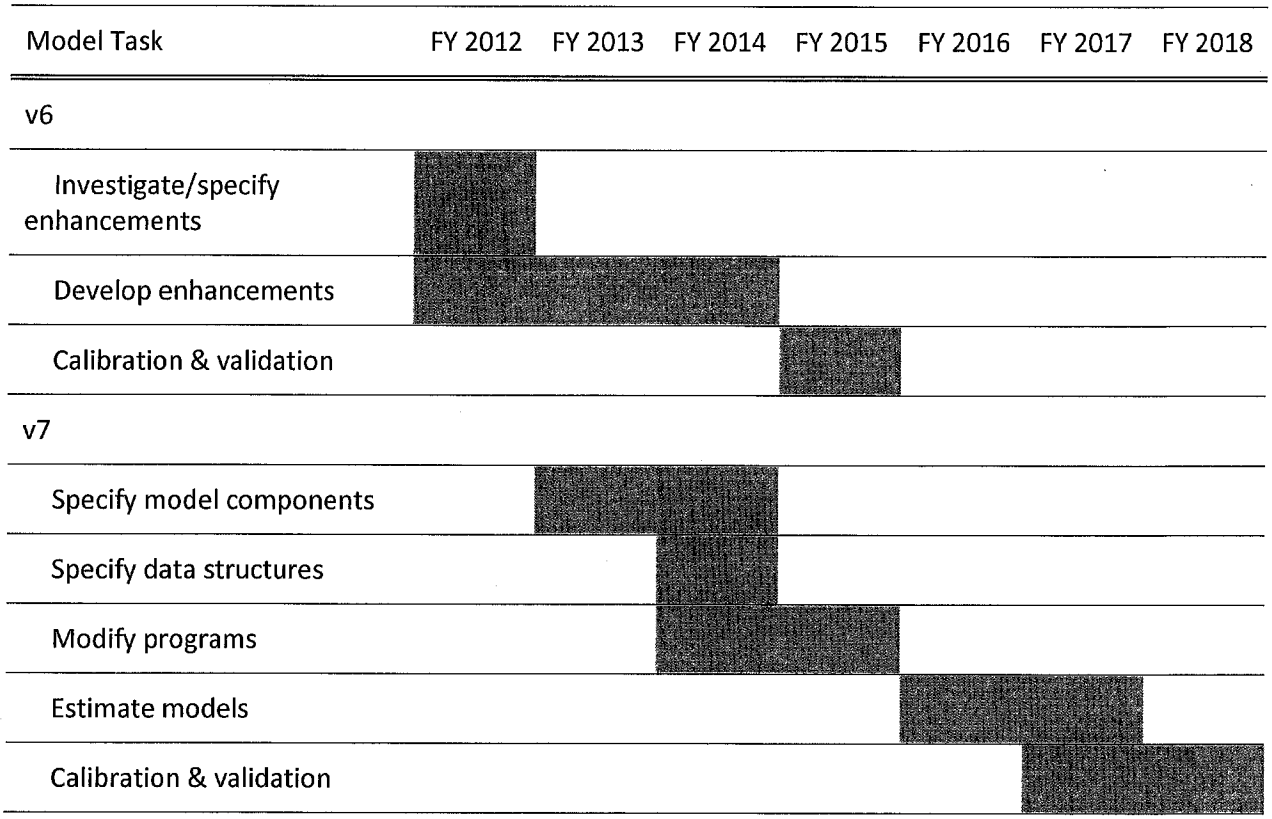
V7 Model

The v7 model will be either a tour based or activity based model depending on stakeholder direction. It is expected the v7 model will be used for 2050 MTP development starting in 2018. This will address policy testing needs that require consideration of how travelers change their daily schedules in response to policies intended to reduce peak congestion.

Fiscal Year	TRM v7 Development	Notes
Year 1 July 1, 2011 - June 30, 2012	Stakeholders agree on concept for v7 1) Convene expert panel 2) Develop work plan for v7 model development	
Year 2 July 1, 2012 - June 30, 2013	Investigation/specification of model structure and components: 1) population synthesizer, 2) land use models. 3) auto ownership model	
Year 3 July 1, 2013 - June 30, 2014		
Year 4 July 1, 2014 - June 30, 2015	Investigation/specification of model structure and components: 1) tour/activity scheduler, 2) router. Investigate/specify and develop data structures. Determine best data structures for storing, processing and updating model elements. Approaches will be sought that maximize analyst productivity and model runtime performance. Available data will be prepared in the chosen data structure.	
Year 5 July 1, 2015 - June 30, 2016	Modify programs as needed to implement the chosen model specification including: 1) population synthesizer, 2) tour/activity scheduler, 3) router. Model component programs may be borrowed and adapted for use in the Triangle region.	

Fiscal Year	TRM v7 Development	Notes
	Estimate models and implement. Recent survey data will be used to estimate model components specified during years one to three [population synthesizer, tour/activity scheduler, router].	
Year 6 July 1, 2016 - June 30, 2017	Continue to estimate models and implement. Recent survey data will be used to estimate model components specified during year one [population synthesizer, tour/activity scheduler, router]. Other model components (commercial vehicles, external models) will be incorporated in overall model structure.	
Year 7 July 1, 2017 - June 30, 2018	Model calibration and validation. Initial model will be applied and any problems will be noted and addressed. This process will be iterated until all problems discovered have been addressed. The model will then be validated to observed conditions.	

Conceptual Schedule for Model Development



Appendix B

TRM History

Version - Release Year [Delivered Time]	Key Features Enhancements vs. Previous Version	Base Year	Use
v.1 - 2006 [Not to Stakeholder]	TTA New Start model converted to the TransCad platform with a 2002 base year as delivered by the contractor [Parsons Brinckerhoff] in Fall of 2006	2002	
v.2- 2006 [delivered 12/2006]	Revised and calibrated/validated to 2005 base year highway data only	2005	
v.3 - 2007 [β test version delivered 4/2007]	1. Updated mode choice ASC calibration using 2006 Household Interview Survey and 2006 Transit On Board Survey data 2. Repaired trip generation program and 3. Revised **2005** Socio Economic data provided by the MPOs.	**2005**	**1)** Transit Infrastructure Blueprint, **2)** the Chapel Hill Long Range Transit Plan, **3)** the Orange County Greenhouse Gas project and **4)** the Deficiency and Needs Analysis for the 2035 Long Range Transportation Plans.
v.4 - 2008 [Delivered 1/2008; approved spring; adopted 8/2008]	Improved v3-2007 ready for application and including HOV/HOT and toll capabilities.	**2005**	**1)** Alternatives Analysis and **2)** Air Quality Conformity Analysis for the 2035 Long Range Transportation Plans.

Version - Release Year [Delivered Time]	**Key Features Enhancements vs. Previous Version**	**Base Year**	**Use**
v.5 - 2011 Delivered 6/2011	**New:** 1. Parking capacity constraint 2. Airport trip making model 3. Bicycle and pedestrian travel submodels through trip distribution. 4. External station forecasts methodology. 5. Hourly capacity and traffic assignment 6. Use of Logsum in destination choice 7. Stratified utility coefficients by income in mode choice: 8. Summit analysis for FTA New Start analysis. [planned] 9. An off model GIS approach to forecast changes in road characteristics over time as rural areas become more urbanized [planned] 10. Travel by people from outside the region on transit. [planned] **Improved:** 1. Parking cost model improved; New: capacity constraint components added 2. Bus speed model: adjusted and validated vs. 2006 bus schedules. 3. Revise Federal Functional Class. Federal Functional Class has been updated in the 2010 v5 model to be consistent with NCDOT updates. **Investigated:** Cost of Auto Travel [e.g. gas price component]	2005, 2010	**1)** Alternatives Analysis and **2)** Air Quality Conformity Analysis for the 2040 Long Range Transportation Plans.

Appendix C

TRM Calibration and Validation Statistics

Triangle Regional Model components will be calibrated and validated to the following targets. These tests based on local and national targets will be used to evaluate the quality of model components.

Calibration/validation Statistics

Model Inputs

Model demographic data inputs will be checked against benchmarks at a regional level for persons/household, employment/population ratio, and autos/household. Plots of persons per household and household income by zone (TAZ) will be compared to census values. A report will document all findings.

Model highway and transit networks will be checked for reasonableness and the results will be reported. Maps of various network characteristics (area types, lanes, speeds, counts, screenlines, and transit routes by company) will be plotted to aid in the checks and to document the process used. The transit on board survey data will be assigned by access mode to the transit network and comparisons of transfer rates and assignments by transit line and company will be made to determine if problems exist. The results will be reported.

Model output from the household and person model (workers, non-workers, and children), and by household strata will be compared to census and other data for the region and sub region levels as appropriate (county and district) depending on the availability of data. This comparison will be documented in a report.

Trip Generation

Work trips per worker match survey work trips per worker

Ratio of region wide trip productions to trip attractions by trip purpose +/- 10%

Summaries comparing observed and model estimated trips by trip purpose will be prepared

Daily trips by trip purpose will be compared to determine if proportions of daily travel by purpose match survey data and proportions from other areas (benchmarks)

Overall trip rates by trip purpose will be compared to those reported for other areas

Trip productions per household and per capita will be compared to standard reasonable ranges

Summary comparisons will be made at the region, county, and district levels

Work trip attractions will be compared to total employment, K-12 school trips will be compared to total school enrollments, and shopping trips will be compared to total retail employment

Trip Distribution

Percent Deviation of Average Trip Length (minutes) for all trip purposes +/- 5%

District to district comparisons will be made of observed and model estimated trips. Trip length frequency distributions by time and distance will be prepared by trip purpose by strata. Coincidence ratios will be prepared for the trip length frequency distributions with a target of >70% coincidence.

Percent intra zonal trips by purpose will be compared to benchmarks.

Mode Choice

All trip purposes will match observed mode shares for auto and transit modes (+/- 2%), though not for transit by access mode to avoid over calibrating

Summaries by trip purpose will be prepared comparing observed mode shares to model estimated mode shares. Work trip mode shares will be compared to census (CTPP) mode share data. District summaries will be prepared. Auto occupancies will be compared to survey auto occupancies. Mean transit trip lengths will be compared to observed and these will be expected to fall within +/- 5%. Parameters will be compared to acceptable ranges.

Validation Statistics*

Vehicle Miles Traveled (VMT) by Federal Functional Class (based on links with counts)

Functional Class	Target % Deviation
Freeway	7%
Principal Arterial	10%
Minor Arterial	10%
Collector	15%
Local	15%
Total	5%

Screenline Comparison

Screenline Name	Target % Deviation
I-85	10%
I-40	10%
Wake/Durham County Line	10%

* All traffic counts used for validation will be factored in a consistent way

Cutline Comparison

Cutline Name	Target % Deviation
SW Durham	15%
Durham	15%
Johnston County	15%
Chatham County	15%
North Raleigh	15%
Eastern Wake	15%
US 1 South	15%
North Wake	15%
US 70	15%

* If unable to match this best practice target, then a secondary check will be performed based on the overall volume of the cutline

Percent Difference of Total Traffic Count Volume and Total Model Assigned Volumes by County and Area Type

Summary Level	% Difference Target (+/-)
County	
Durham	10%
Orange	10%
Wake	10%
Chatham	10%
Harnett	10%
Johnston	10%
Nash	10%
Franklin	10%

Granville	10%
Person	10%
Area Type	
Urban	10%
Suburban	10%
Rural	10%

Percent Difference of Model Estimated Daily Traffic Volumes by Federal Functional Class

Federal Functional Class	FHWA Target (+/-)	TRM Target (+/-)
Freeway	7%	5%
Principal Arterial	10%	8%
Minor Arterial	15%	10%
Collector	25%	15%
Local	25%	15%

Percent Difference of Model Estimated Daily Traffic Volumes by Volume Group

Volume Group	Target % Deviation
1 -1000	55%
1001 – 2500	50%
2501 – 5000	30%
5001 – 10000	25%
10001 – 25000	20%
25001 – 50000	15%
>= 50001	10%
Total	5%

R-Square for Region wide Estimated Volumes vs. Traffic Counts
Target R^2 >= 0.88

Root Mean Square Error (RMSE) of Estimated Traffic Volumes
Target RMSE <= 35%

Evaluation of Peak Period Assignments for AM and PM Peak Periods

Screenline Comparison AM and PM Peak

Screenline Name	Target % Deviation
I-85	10%
I-40	10%
Wake/Durham County Line	10%

Cutline Comparison AM and PM Peak

Cutline Name	Target % Deviation
SW Durham	15%
Durham	15%
Johnston County	15%
Chatham County	15%
North Raleigh	15%
Eastern Wake	15%
US 1 South	15%
North Wake	15%
US 70	15%

* If unable to match this best practice target, then a secondary check will be performed based on the overall volume of the cutline

AM and PM Peak Period Percent Difference of Total Traffic Count Volume and Total Model Assigned Volumes by County and Area Type Based on Links with Hourly Traffic Counts

Summary Level	% Difference Target (+/-)
County	
Durham	10%
Orange	10%
Wake	10%
Chatham	10%
Harnett	10%
Johnston	10%
Nash	10%
Franklin	10%
Granville	10%
Person	10%
Area Type	
Urban	10%
Suburban	10%
Rural	10%

Overall average speeds will be reported for AM peak, PM peak and off peak periods.

Transit Ridership Assigned

Total transit riders target +/- 5%

Target for individual companies +/- 10%

Triangle Regional Model Service Bureau

Justification for Supplies and Materials

Plotter supplies are needed to support project plotting requirements.

Justification for Travel

Travel includes fees to cover project related training beneficial to the development of staff on the project.

Justification for Current Services

Current services covers the cost of long distance telephone communication.

Justification for Contracted Services

On-call technical assistance provides a way for the Service Bureau to obtain advice from technical experts in the field of travel forecasting. This enables the Service Bureau to learn how to appropriately implement new procedures consistent with national practice and experience.

Justification for Other Fixed Charges

The maintenance of TransCAD software requires a $1,800 per year maintenance fee per license (including remote access). The Intel FORTRAN compiler license and technical support maintenance annual fee is $800 for two academic licenses.

DCHC STAKEHOLDER BUDGET
TRIANGLE REGIONAL MODEL SERVICE BUREAU
BUDGET FOR YEAR 11: July 1, 2013 to June 30, 2014

Budget Items	Description of Level of Effort	Budget FY 2013-14
Salaries and Wages (Personnel) *		
ITRE Director	1.25 % effort for 12 mo	$ 1,538
Director	25 % effort for 12 mo	$ 24,188
Senior Research Associate	25 % effort for 12 mo	$ 19,914
Senior Research Associate	25 % effort for 12 mo	$ 19,730
Senior Research Associate	12.5 % effort for 12 mo	$ 7,635
Graduate Intern	50 % /sem; 100 % summer	$ 1,722
SUBTOTAL PERSONNEL		$ 74,727
Staff Benefits		
Staff (30%)		$ 21,902
Graduate Intern1 (21%)		$ 362
SUBTOTAL STAFF BENEFITS		$ 22,264
TOTAL PERSONNEL & BENEFITS		**$ 96,991**
Supplies and Materials		
(Supplies, plotter paper, plotter ink)		$ 50
		$ -
Travel		
In State		$ 138
Out of State		$ -
Training		$ 750
Current Services		
Communications (long distance)		$ 37
Printing and Binding		$ -
Contracted Services		
On-call technical assistance		$ 5,000
Fixed Charges		
Rental of Equipment/State Vehicles		$ 75
Other Fixed Charges (software maintenance fees, $1,800/yr/key)		$ 2,450
Student Aid / Tuition Remission		
In State		$ -
Subcontract		
		$ -
TOTAL OTHER DIRECT COSTS		**$ 8,500**
Facilities & Administrative Costs		
20% of MTDC **		**$ 21,098**
TOTAL BUDGET		**$ 126,589**

* Uses a 3% growth factor/yr
** 20% based on one contract through the Master Agreement between NCSU-ITRE and NCDC

Exhibit A.2
Schedule Effort by Task, Subtask and Timeline

Schedule

Task	FY 2013/2014 July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
1.1 Advice on parking behavior data collection	■	■	■	■	■							
1.4 Gather locally collected data	■	■	■	■	■	■	■	■	■	■	■	■
2.1 Maintain & update highway & transit networks, SE data												
2.2 Modify Net Manager to work with v6 networks	■	■										
2.3 Zone geography	■											
2.4 Develop highway network procedures												
2.5 Transit networks												
2.6 Zonal data and models												
2.7 Develop an improved parking constraint model	■	■	■	■	■	■	■	■	■	■	■	■
3.1 Estimation and/or calibration of trip production models												
4.1 Peak spreading models						■	■					
4.2 Prepare time of day factors												
5.1 Develop improved destination choice model	■	■	■	■	■	■	■					
6.1 Calibration and/or estimation of non-motorized models								■	■	■		
7.1 Re-calibration of mode choice models											■	■
8.1 Develop improved commercial vehicle model		■	■	■	■	■					■	■
8.2 University student model	■	■	■	■	■	■	■					
8.3 Land use models												
9.1 Investigate improving highway assignment												
9.2 Highway assignment											■	■
10.1 Assist with LRTP model application	As needed											
10.2 Assistance with TRM model application	As needed											
10.3 Action items	As needed											
11 Oversight, reporting & training	■	■	■	■	■	■	■	■	■	■	■	■

Exhibit A.2
Schedule Effort by Task, Subtask and Timeline

Exhibit B

Federal Regulatory and Programmatic Requirements For Federal Flow-through Funding

Known State Funding Agency: NC Department of Transportation
Catalog of Federal Domestic Assistance (CFDA) Number: 20.205-5

By signing this Public Service / Development Work Order, the University Official certifies that to the best of his/her knowledge, University is in compliance with the applicable regulatory requirements listed below. University agrees to immediately report to Sponsor any change in its compliance status. University agrees to flow these requirements down to Subrecipients at any tier as appropriate.

1. Nondiscrimination statues on the basis of race, color, national origin, sex, blindness, handicap or age.
2. Common Federal Policy for the Protection of Human Subjects (45 CFR Parts 46 & 690).
3. USDA Rules that implement the Laboratory Animal Welfare Act of 1966 (9 CFR Parts 1-4).
4. Regulations for the Clean Air Act, 42 USC 7606, 40 CFR 6 & 32.
5. Regulations for the Clean Water Act 33 USC 1368, as implemented by E.O. 11738.
6. National Scenic Rivers Act of 1968, 16 USC1271, 40 CFR 6.
7. For NSF & DHHS awards only, internal conflict of interest policy.
8. E.O. 11246, & E.O. 11375 "Equal Employment Opportunity," per 41 CFR part 60.
9. OMB Circular A-129 and 40 CFR 30.73, the parties are not delinquent on any Federal debt.
10. The parties are in compliance with the Drug-Free Workplace Act of 1988, Public Law 100-690, 41 USC 701, 40 CFR 32 or equivalent.
11. HIPPA Patient Privacy Rule, 45 CFR 160 & 164.
12. Coastal Barriers Resource Act, 40 CFR 6.
13. The Anti-Kickback Act of 1986, Pub. L. 99-634, amending 18 U.S.C. 874, 29 C.F.R. Part 3
14. The Safe Drinking Water Act, 42 U.S.C. 300h-3(e)
15. Davis-Bacon Act, 40 U.S.C. 276a to 276a-7, 29 C.F.R. Part 5
16. Contract Work Hours and Safety Standards Act, 40 U.S.C. 327 – 330, 29 C.F.R. Part 5
17. Environmental Protection Agency Regulations, 40 C.F.R. Parts 1 through 49
18. Mandatory Standards & Policies contained in the State Energy Conservation Plan issued in compliance with the Energy Policy and Conservation Act, Pub. L. 94-163, 89 Stat. 871
19. "Debarment and Suspension" Regulations under E.O. 12549 & 12689, 7 CFR 3017, 10 CFR 606 & 40 CFR 32, or equivalent.
20. Prohibitions against lobbying as set forth in 7 CFR 3018, 31 USC 1352 and 18 USC 1913.
21. The Hatch Act (5 U.S.C. s 1501-1508 and 7324-7328) which limits the political activities of employees whose principal employment activities in whole or in part supported by Federal Funds.
22. Comply with environmental regulations that may be issued pursuant to:
    a. Institution of environmental quality control measures under NEPA (PL 91-190 & EO11514.
    b. Notification of violating facilities EO 11738
    c. Protection of wetlands EO 11990
    d. Evaluation of flood hazards in floodplains EO 11988
    e. Assure project consistency under Costal Zone Management Act of 1972 16 USC 1451
    f. Endangered Species Act of 1973, as amended PL 93-205
    g. National Historic Preservation Act of 1966, 16 USC470, EO11593
    h. Lead-Based Paint Poisoning Prevention Act 42 USC 4801
    i. Requirements governing the applicable Grant Program

(Abbreviations: CFR = "Code of Federal Regulations," USC = "United States Code," E.O. = "Executive Order,"
OMB = "Office of Management and Budget")

OP ID: KK

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 09/19/2012

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER NC Assoc. of Ins. Agents, Inc. P. O. Box 1165 Cary, NC 27512 Karen A. Kerr, AAI, CISR, CPIW	919-828-4371 919-821-3172
INSURED State of North Carolina Attn: Joe Rippard 1202 Mail Service Center Raleigh, NC 27699-1202	CONTACT NAME: PHONE (A/C, No, Ext): FAX (A/C, No): E-MAIL ADDRESS: PRODUCER CUSTOMER ID #: AUTOR-1

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A: Travelers Property Casualty	
INSURER B:	
INSURER C:	
INSURER D:	
INSURER E:	
INSURER F:	

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$
	COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
	CLAIMS-MADE OCCUR						MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$
	POLICY PRO-JECT LOC						PRODUCTS - COMP/OP AGG	$
								$
A	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	X ANY AUTO			TRJCAP104T6800-TIL-11	07/01/11	07/01/12	BODILY INJURY (Per person)	$
	ALL OWNED AUTOS						BODILY INJURY (Per accident)	$
	SCHEDULED AUTOS						PROPERTY DAMAGE (Per accident)	$
	HIRED AUTOS						BI/PDper person	$ 1,000,000
	NON-OWNED AUTOS						BI/PD per acc.	$ 10,000,000
	UMBRELLA LIAB OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$
	DEDUCTIBLE							$
	RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						WC STATU-TORY LIMITS OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N (Mandatory in NH)	N/A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$
A	Hired Physical Damage			TRJCAP449J9525TIL-11	07/01/11	07/01/12		

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
Effective 9/1/11 Hired Physical Damage Limits have been amended to $30,000 Limit applies except; $50,000 Limit applies to vehicles with GVW >10,000 LBS.

CERTIFICATE HOLDER

NCDEPTO

NC Dept. of Insurance
Attn: Joe Rippard
1202 Mail Service Center
Raleigh, NC 27699-1202

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Karen A. Kerr

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