

Traffic Impact Analysis Supplemental Guidelines

The **NCDOT Congestion Management Section's Capacity Analysis Guidelines Standards & Best Practices** shall be the basis for the development of all TIA reports. This Supplement provides a submittal framework for TIAs, as well as direction on certain items within the *Standards & Best Practices*. Any deviations from the any of these documents must be approved prior to preparation of the TIA.

Submittal Framework for TIAs (3 Step process)

Step 1: Scoping Document – A scope approval will be provided no later than 10 business days from receipt of the complete scoping document. Incomplete scoping documents will not be accepted for review and approval. The documents to include for review and approval are:

1. Site Plan/Vicinity Map and a plan overlay on an aerial map
2. Proposed Land Uses and Trip Generation, including Pass-by and Internal Capture
3. Proposed Study Intersections and Types of Accesses
4. Proposed Annual Growth Rate with justification
5. Proposed Build Out Year(s)
6. Study Method for Capacity Analysis – peak periods and conditions
7. Approved Adjacent Developments
8. Committed Improvements

IMPORTANT

If the proposed development is phased, then land uses, trip generation estimates, build out years, roadway improvements and analysis must reflect the proposed phasing. The phase schedule must be submitted for approval prior to use in the TIA.

Step 1.A: Pre-Completeness Check – Documents for Input Verification prior to full TIA submittal – This step is **recommended**, as these will be the first items checked at Step 2. If the applicant chooses to submit for input verification, then comments or approval will be provided no later than 20 business days from receipt of the documents. This step will result in the reduced likelihood of issues discovered in the Completeness Review and Final Review.

All or any portion of these items can be submitted for review/approval:

1. Trip Distribution – Traffic counts must be performed prior to submittal of proposed distributions.
2. Proposed Volume Balancing
3. All diagrams – Existing Traffic Volumes, Future No Build Volumes, and Future Build Volumes
4. Synchro / Sidra Network Model Framework – Submit the framework for the Future No Build analysis. This Synchro / Sidra model can be modified for Existing analysis.

Step 2: Completeness Review – TIA Report – A digital submittal of the completed document is to be submitted for Preliminary Review. This review will be conducted to determine the completeness of the TIA report, and comments or approval will be provided no later than 20 business days from receipt of the TIA.

Step 3: Final Sealed TIA Report - After preliminary approval has been provided, a digital and/or hard copy (as requested) of the sealed TIA report is to be submitted. Final review comments or approval will be provided no later than 20 business days from receipt of the TIA.

Supplemental Direction for the Capacity Analysis *Standards & Best Practices*

Background Traffic Assumptions, Site Trip Generation, and Site Trip Distribution

1. Peak Hour Determination – In order to establish an accurate peak hour for analysis, the controlling study intersection shall be determined. Once determined, the controlling intersection’s peak hour timeframe shall be used for all other study intersections:
 - a) Analyze all study intersection volumes and determine the controlling intersection (intersection with highest total volume).
 - b) Identify the relevant peak hours for the controlling intersection (e.g. 7:45-8:45 AM; 4:45-5:45 PM).
 - c) Use the volumes from the same peak hour at all other intersections in the study.
 - d) Do not use volume balancing without prior approval. Use of the same time period at all intersections will typically reduce the need to perform volume balancing.

2. Site Trip Generation:
 - a) Unadjusted Trips – Use the appropriate Land Use Code in the *ITE Trip Generation Manual* (currently the 11th Edition). The *NCDOT Congestion Management Rate vs Equation Spreadsheet* recommends the variable, peak hour type, and type of trip calculation method to use for specific land uses.

 - b) Internal Capture - The *Standards* state to limit reductions for internal capture to the “land use categories and time periods in the current *HANDBOOK*.” The current *ITE Trip Generation Handbook* is the 3rd Edition. The *Standards* also state to estimate internal capture rates “using the *NCHRP 684 spreadsheet* referenced in the current *HANDBOOK*.” The *Standards* give guidance on using the spreadsheet:

“Do not use transit or non-motorized splits in spreadsheet.
Vehicle occupancy “1.1” (NC averages).
Use Walking Distance between land uses of 4000’ or the calculated maximum distance between a given pair of land use categories in the proposed site.”

To determine the internal capture entering and exiting per Land Use, use the percentages in *Table 6-P: Internal Capture Percentages by Land Use* with the “Estimated Vehicle-Trips” in *Table 1-P: Base Vehicle-Trip Generation Estimates* (Tables found in the *NCHRP 684 Internal Trip Capture Estimation Tool*).

 - c) Pass-by – The *Standards* state “to limit pass-by percentages to retail land uses in [the *HANDBOOK*.” The current *ITE Trip Generation Handbook* is the 3rd Edition. The calculation of the trips should be based on the total peak hour trips with a 50/50 entering/exiting split; they are pass-by trips which means they enter and exit along the same path, in the same direction, within the same hour. *The pass-by will be capped at 10% of the adjacent street traffic.*

3. Site Trip Distribution –

Determined based on collected traffic count data. Both site trip distribution and pass-by trip distribution should be submitted for approval prior to use in the TIA.

Synchro Signalized Intersection Setup

1. For existing signals, the size and position of the detector loops and the timing chart settings must match the existing signal plans, with exception of:
 - a) Yellow Time = 5 sec
 - b) Red Time = 2 sec
 - c) Specific timing settings provided by the signal timing agency
2. For proposed signals, size and place the detector loops according to Part 1, Section 4 of the *NCDOT Signal Design Manual*.
3. Contact signal timing agency for existing peak hour timings and other operational mode information. Request specific analysis periods to ensure proper information is provided.
4. Existing signal timings shall be “locked” for all scenarios unless signal phasing changes are necessary in the “Future Build with Improvements” scenario.
5. Recall Mode:
 - a) If simulating ‘free run’ operation (Actuated-Uncoordinated), use Min Recall on main street phases.
 - b) If simulating ‘Coordinated Mode’ (Actuated-Coordinate), use C-Max on the coordinated phases.
6. Right-Turn-On-Red (RTOR) shall not be used in existing or future conditions without prior approval. In some circumstances, RTOR may be necessary to minimize Synchro conflict errors.
7. All signalized left turns with a dedicated signal phase will be protected-only movements in all future conditions. Protected-only left turn phasing in future conditions will identify required vehicle storage needs in the event that protected-only phasing is necessary in the future.
8. Permissive-only left-turn phasing should remain permissive in future conditions, except where protected-only phasing is being analyzed as an improvement to the intersection in the Future Build with Improvement condition.

Synchro Analysis and Data Reports

1. Any “Field Condition” analysis that the engineer wishes to include can be provided in a separate supplemental analysis file.
2. The “Future No-Build” and “Future Build” analysis conditions should only include improvements that are a requirement of approved developments or a State/Municipal project to be constructed in the build year for the proposed development. Any other capacity gained from lane improvements shown in the analysis is assumed to be proposed by the developer and should only be included in the “Future Build + Improvements” analysis condition.
3. The TIA shall include a chart that shows the “Level of Service” and “Delay” for each movement, approach, and overall intersection, for every access alternative and build scenario.
4. A SimTraffic “Queuing and Blocking Report” for the network shall be included.
5. A comparison chart listing the Synchro 95th Percentile Queues and the SimTraffic Maximum Queues shall be provided for all exclusive turn lanes. This chart shall include the existing turn lane length for comparison to the reported Queue lengths. A sample chart is included on the last page.

Recommendations of the TIA Report

1. The *NCDOT Policy On Street And Driveway Access to North Carolina Highways* (p. 21-22) states, “The applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:
 - a) The total average delay at an intersection or individual approach increases by 25% or greater, while maintaining the same Level of Service,
 - b) The Level of Service degrades by at least one level, or
 - c) Level of Service is “F.”
2. In the event that approved developments do not move forward, a revised scenario reflecting the future conditions will be required as directed by the reviewing agencies to reflect the changes in the underlying assumptions of the analysis.
3. The *Best Practices* state, “When performing analyses, providing an adequate overall intersection LOS alone is not sufficient. Items such as queuing, individual movement level of service, and volume-to-capacity ratio should be evaluated and addressed.” The information in the charts listed under “Synchro Analysis and Data Reports” in the previous section, should be used when determining the improvements to address the impacts of site-generated traffic.
4. Recommended storage lane lengths shall be provided for all exclusive turn lanes and based on the Synchro 95th Percentile Queue or the SimTraffic Maximum Queue, whichever is larger.
5. If phase changes are recommended as an improvement, then a Synchro analysis for “Future Build + Improvements” shall be included in the TIA.
6. Signal timing adjustments and/or Signal Optimization in Synchro (i.e. “Optimize Splits”) shall not be used unless phase changes are recommended as an improvement. Signal timing adjustment and/or Signal Optimization as a sole “improvement” to mitigate the impacts of site-generated traffic will not be permitted.
7. Use the *Manual on Uniform Traffic Control Devices* for proposed full-movement signals to conduct signal warrant analysis based upon a 13-hour turning movement count.
8. Use the *Guidelines for Signalization of Intersections with Two or Three Approaches* (ITRE report dated December 31, 2017) where applicable, to determine possible signalization.