



# **Traffic Impact Analysis (TIA) Process and Procedures Manual**

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## **Introduction**

The purpose of this manual is to guide implementation of Article 14, “Traffic Impact Analysis (TIA) Ordinance”, of the Town Of Huntersville Zoning Ordinance. This manual contains processes, procedures, design requirements, and guidelines for the preparation of TIAs. This manual also details the interaction between Town staff, the applicant, traffic consultants, and the requirements for the certification and re-certification of qualified traffic consultants who prepare TIAs, as required, for development proposals in the Town of Huntersville.

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## I. TIA Preparation and Process

The TIA ordinance is administered by the Town of Huntersville Planning Department, in coordination with the Department of Engineering & Public Works. The Town may coordinate with NCDOT or other governmental agencies or Town hired consultants as needed in this process. The TIA prepared is intended to satisfy the requirements of the Town's TIA Ordinance. Additional traffic studies may be required by NCDOT or other governmental agencies. It is recommended that the applicant contact NCDOT, Town of Cornelius, Town of Davidson, or City of Charlotte if the development has a site access that would fall within one of these jurisdictions.

It is recommended that the TIA consultant be present at the TIA scoping meeting, Public Hearing, Planning Board Meeting, Town Board decision meeting should questions about the study arise.

The TIA preparation and review process is outlined below:

### **Step 1. Determination of Need for TIA**

Based upon the proposed land use and development intensity information provided by the applicant, Town staff will determine whether the proposed development is expected to generate enough peak hour trips (100 or more), or daily trips (1000 or more) to require a TIA. The Town will notify the applicant if a TIA will be needed.

The point of contact for coordination of need for a TIA and administration shall be the Town Transportation Engineer. The point of contact on all technical matters related to TIAs shall be the Town's Transportation Engineer.

Additional information regarding TIAs is located in the Town of Huntersville Zoning Ordinance Article 14.

### **Step 2. Applicant Selection and Retaining of TIA Consultant**

Should a TIA be required, the Applicant shall select and retain the services of a qualified TIA consultant. The TIA consultant shall be a licensed professional engineer in the state of North Carolina. The Town shall maintain a list of prequalified traffic consultants that can submit TIAs to the Town. Upon the request of the Applicant, the Town will provide a list of Consultants that are currently prequalified to submit TIA's to the Town. Should the applicant desire to retain a consultant not on the current prequalified list, the applicant's consultant should contact the Town Transportation Engineer regarding qualification requirements/submission package needs. Consultants will need to complete a recertification process at the beginning of each calendar year. The applicant shall notify the Town of the name of the selected TIA consultant, in writing.

### **Step 3. TIA Pre-Scoping Package and Scoping Meeting**

A TIA pre-scoping package and scoping meeting shall be completed prior to the preparation of a draft TIA. The TIA consultant shall contact the Town Transportation Engineer to request a date/time for a TIA scoping meeting.

The TIA consultant shall assemble the following information (pre-scoping package) and submit it to the Town a minimum of 5 business days prior to the scheduled TIA scoping meeting.

- 1) Site Plan (to scale)
- 2) Vicinity map
- 3) Draft trip generation table for the proposed land uses and intensities including internal capture, transit capture (if any), and pass-by calculations
- 4) Draft trip distribution and assignment (separate trip distributions are needed for residential, retail, and office land uses.)
- 5) Proposed historical growth rate
- 6) Proposed build year
- 7) Phasing plan (if phasing of the analysis is desired. This can be added after the full build analysis is completed if desired.)
- 8) List/Map of study area intersections in accordance with Article 14.3 of the TIA Ordinance

The Town shall provide the list of approved developments and any approved but not yet constructed transportation facility projects to be included in the study.

Upon completion of a scoping meeting, Town staff will notify the applicant and TIA consultant in writing if additional information is needed to complete the TIA scoping process or if the TIA scoping process is complete. Town will forward the meeting date, time, and location to NCDOT, should they want to attend.

Once TIA scoping is complete, preparation of the draft TIA can begin. The TIA shall be completed in accordance with this Manual.

### **Step 4. Submission and Review of Draft TIA**

Upon submission of a draft TIA (2 hard copies, 1 electronic (PDF) copy including Synchro files) by the consultant to the Town Transportation Engineer, Town staff will review the TIA within 30 working days of submission. Comments (if any) shall be forwarded to the consultant and the applicant for discussion. If no comments are forwarded by the Town within 30 working days of submission, the TIA is deemed acceptable and consultant shall submit final sealed copies to the Town. Revised draft TIA's may be needed depending on the level of comments submitted by the Town. The Town will notify the consultant if a revised draft TIA will be needed.

A meeting between Town staff, the applicant, and the TIA consultant may be needed or requested by the applicant to discuss the draft TIA.

### **Step 5. Final TIA**

Once all comments by the Town have been addressed by the consultant and applicant, copies of the final sealed TIA (2 hard copies and 1 electronic (PDF) copy) shall be submitted to the Town. Based on the final TIA, a list of required transportation mitigation improvements shall be prepared and included as part of any approved development plans.

## **II. TIA Analysis Guidelines and Standards**

### **Analysis Methodology**

The TIA shall be completed using the latest Intersection Capacity Utilization (ICU) Methodology.

### **Trip Generation**

- The trip generation for the site shall utilize the equation for the land use if available unless otherwise approved by the Town Transportation Engineer.
- The trip generation for individual outparcels is to be calculated separately from the remainder of the development. If a development includes multiple buildings of the same land use, the trip generation is to be calculated separately for each building.
- Internal capture trip reductions should be limited to mixed use sites. Mixed use sites contain two of the following land use types (residential, office, retail)
- Internal capture trip reductions shall be applied before the pass-by trip reduction is taken.
- Pass-by percentages should only be applied to land uses with an ITE land use code in the 800's or 900's
- Pass-by trip reductions will be limited to 10 percent of the adjacent street traffic unless otherwise approved by the Town Transportation Engineer.
- Pass-by percentages should come from the ITE Trip Generation Handbook.
- Use of the NCDOT MSTA School Calculator is required for all proposed school sites. The number of faculty/staff recommended by the spreadsheet is to be utilized unless the school intends to have an amount above that number. Student drivers will be limited to the number of spaces approved on the site plan and restricted to grades 11 or 12 if offered at the school. Where multiple bell schedules are proposed on the same school campus or shared access, only bell schedules separated by 1 hour or more can be analyzed as separate peak hours in the TIA.

**Signalized Intersections**

Coordinated signals

- If the signal plan or Town Transportation Engineer indicates that the traffic signal is coordinated, the traffic analysis shall utilize coordinated signal timings.
- Cycle lengths for coordinated signals should be equal with justification needed for half or double cycle lengths.

Signal timing/phasing

- If protected only left turn phasing is indicated on the signal plan or exists in the field, protected only phasing should be used. Use protected only left turn lane phasing when dual left-turn lanes are present or when left turn lanes are crossing 3 or more opposing through lanes of traffic.
- When analyzing future improvements, it is recommended that protected only phasing be utilized with the addition of a new exclusive left-turn lane.
- When analyzing existing signalized intersections, only use leading left-turn phasing for protective/permitted phasing.
- Total lost time should equal 5.0 seconds. Use of longer lost times may be needed at large intersections or single point urban interchanges (SPUI).
- If existing signal timings cannot be obtained from field measurements or signal plans, utilize 4 seconds of yellow time and 2 seconds of red time for existing conditions and 5 seconds of yellow and 2 seconds of all red for all future conditions. Clearance times utilizing the criteria in the North Carolina Department of Transportation (NCDOT) Traffic Management & Signal Systems Unit Design Manual may also be utilized. If clearance times are calculated, the calculations shall be included in the Appendix of the TIA.
- The minimum initial green time for side street through and major street left-turn movements should be 7 seconds.
- The minimum initial green time for major street through movements should be based on the speed limit. If the speed limit is 35 mph or less use 10 seconds; for 36-45 mph use 12 seconds; for greater than 45 mph use 14 seconds.
- All cycle lengths should be in increments of 5 seconds.
- For future background and future build conditions, cycle lengths and splits may be optimized. See below table for recommended minimum cycle lengths by phase for guidance in minimum cycle lengths.
- Phasing shall remain constant for all time periods for each intersection. Leading/lagging left-turn phasing is allowable for protected only left-turn movements.
- The table below provides recommendations for minimum cycle length by phases.

<b>Recommended Minimum Cycle Lengths by Phase</b>	
Number of Phases	Minimum Recommended (seconds)
2	60
3	90
4 or more	120
<b>Note:</b> Maximum recommended cycle length is 180.	

### **Turn Lane Storage Lengths**

- A 60 minute (four consecutive 15 minute intervals) shall be modeled for future year conditions for determination of exclusive turn lane storage lengths.
- Determination of turn lane storage lengths for signalized intersections shall be based on the Synchro 95<sup>th</sup> percentile queue lengths and maximum queue lengths from the Simulation.
- Determination of turn lane storage lengths for unsignalized intersections shall be based on the Warrant for Left and Right-Turn lanes graph published by the North Carolina Department of Transportation (graph attached).
- Recommended storage lengths should be rounded to the nearest 25 feet with a minimum of 100 feet for a right- or left-turn lane.

### **Other Guidelines**

- Traffic counts, used for capacity analysis purposes, are to be completed no more than 1 year prior to the date the first draft of the study is submitted. If road network changes (new roadway links or additional through lanes added) have occurred in the vicinity of the site since the date of the counts but prior to the submission of the TIA, the counts are to be retaken to account for the network change.
- Peak Hour factors from the traffic counts are to be used for all analysis scenarios unless approved by the Town Transportation Engineer.
- When analyzing school traffic, a peak hour factor of 0.50 shall be used on intersection approaches where 50 percent or more of the traffic on the approach is attributable to school traffic.
- It is recommended that peak hour factors be calculated by approach. For intersection approaches where 50 percent or more of the traffic on the approach is attributable to school traffic, peak hour factors should be applied per movement.
- Ideal saturation flow rate shall equal 1900 vphpl.
- Traffic volumes along corridors should be balanced up to account for variations in the counts. Balancing should be balanced with no loss of volume between intersections which have no driveways between them and within 5 percent where a sufficient number/type of driveways exist between the study intersections.



- The AM Peak (6-9) and the PM Peak (4-7) periods will be included for all studies unless otherwise specified by the Town Transportation Engineer. Count times for school developments will be based on the proposed school hours.
- Traffic analysis should be completed using Synchro 10 software. Roundabout analysis should be completed using aaSidra software.
- The network for the traffic simulation shall include enough link length beyond the last node to prevent queuing off of the analysis network. The simulation should be seeded long enough so that traffic can traverse through the entire network (a minimum of 10 minutes is recommended). The simulation should record for an entire 60 minute period.
- Existing lane widths shall be noted in the field notes and included in the traffic analysis.
- New lanes proposed should be analyzed using 11 foot wide lanes unless required otherwise by the site plan or as directed by the Town Transportation Engineer.
- Preparation of a signal warrant analysis will be needed for all proposed signalized intersections.
- Recommendation of turn lanes (new or for analysis of the existing turn lanes) at unsignalized intersections shall be based on the thresholds depicted in the Warrant for Left and Right-Turn lanes graph published by the North Carolina Department of Transportation (graph attached).
- For school sites, the latest version of the MSTA School Calculations spreadsheet is to be used to evaluate both AM and PM Peak Hour anticipated queuing. A 30% high demand factor is to be added to the worst average (either AM or PM) queue length for the minimum required on-site storage length. If the school does not plan to open the doors to accept students 1 hour prior to the start of school, 100% of the worst peak hour parent volume is to be accommodated on site.

Analysis of New Intersections (new site access drive or new public street)

- The baseline for unsignalized intersection ICU at build-out shall be the same as the baseline for the zoning district as listed in section 14.4.1.
- Unsignalized Access locations at project build-out shall be mitigated (if needed) to obtain the baseline for the zoning district as listed in section 14.4.1. If the proposed access intersection fails with the addition of a right-turn lane, a left-turn lane, and a through lane in each direction, a review of restriction of access shall be completed.
- Recommendation of turn lanes at unsignalized intersections shall be based on the thresholds depicted in the Warrant for Left and Right-Turn lanes graph published by the North Carolina Department of Transportation (graph attached).
- Preparation of a signal warrant analysis will be needed for all proposed signalized intersections.

### III. TIA Report Requirements

#### Report Content

- The Synchro Lanes, Volumes, Timings reports shall be provided for all analysis scenarios for all intersections.
- All figures shall be numbered.
- Existing laneage and Recommended laneage figures shall:
  - o Show a separate arrow for each exclusive lane
  - o Existing laneage shall be shown as a different arrow type than proposed lanes
  - o Show the distance between existing and proposed intersections
  - o Show existing and/or proposed storage lengths
  - o Un-signalized intersections shall indicate which approaches are stop or yield controlled
  - o Signalized intersections shall be indicated
  - o Identify all streets by name. Also include a route number if street is a US or NC route.
  - o Include a north arrow
  - o Include a legend
  - o The site location shall be generally indicated
- The following traffic volume figures shall be included at a minimum:
  - o Existing traffic volumes: AM(PM)
  - o Future Background AM traffic volumes: existing AM(historical growth){approved development volumes}[AM Total]
  - o Future Background PM traffic volumes: existing PM(historical growth traffic){approved development volumes}[PM total]
  - o Future Build-out AM traffic volumes: background AM total(net new site traffic){pass-by}[AM total]
  - o Future Build-out PM traffic volumes: background PM total(net new site traffic){pass-by}[PM total]
- Figures depicting each of the approved developments site trip assignment shall be included in the Appendix.
- Field notes shall be included in the Appendix.
- Study scoping documents shall be included in the Appendix.
- Synchro reports shall be organized in the Appendix by analysis scenario then by peak period. For Example the 2021 Background AM Peak analysis for all intersections should be grouped separate from the 2021 Background PM Peak analysis.
- Signal timing plans (if available) should be included in the Appendix.

- Internal capture calculations shall be included in the Appendix.
- Traffic count data shall be included in the Appendix of the report and provided in electronic Excel format.
- Photos of the intersections from the site visit may be included.
- A table of contents, list of figures, and list of tables shall be included in the front of the report.
- The name of the development shall be included in the header or footer of each page of the report.
- Existing study intersections shall be called out in the report as signalized or unsignalized.
- Analysis results (ICU% with corresponding LOS grade) shall be summarized in table format by intersection. Level-of-Service results for existing, future background, future build-out, and future build-out mitigated (if needed) shall be included in one table. A summary table listing all intersections may be included as well.

## **Report Outline**

1. Executive Summary
  - o Site location
  - o Development description
  - o Recommendations
2. Introduction
  - o Site location
  - o Development description
  - o Type of studies undertaken (impacts, signal warrant, sight distance, etc.)
3. Existing Conditions
  - o Study area intersections
  - o Description of roads
  - o Traffic counts including location, date, and time of counts (including figure)
  - o Existing land uses for site and adjacent area
  - o Site location figure and vicinity map figure
4. Future Conditions
  - o Historical growth rate
  - o Description of proposed public projects (figure may be needed)
  - o Description of proposed private development and associated improvements (figure may be needed)
  - o Future background traffic volumes (including figures)
5. Proposed Site
  - o Description of development
  - o Site plan figure

- Trip generation discussion including table
- Trip distribution and assignment discussion (including figure)
- Proposed site access
- Phasing (if applicable)
- Future build-out traffic volumes

**6. Capacity Analysis**

- Methodology discussion including
  - Listing of Town level-of-service (LOS) and intersection capacity utilization (ICU) guidelines for determination of mitigation thresholds.
  - Discussion of storage length determination methodology.
- Analysis results by intersection
  - Table of results are to show the LOS and ICU for each study intersection for all scenarios. For example, the 2019 existing, 2024 background, 2024 build-out, and 2024 build-out improved (if needed) would all be in the same table.
  - Listing and/or discussion of the recommended improvements including storage lengths.

**7. Recommendations**

- List of recommended improvements
- Recommended laneage figure

**IV. Consultant Pre-qualification and Re-qualification Process**

**Pre-qualification Process**

The following is a list of qualifications needed for a consultant that is not pre-qualified or has let their re-qualification lapse to submit a TIA to the Town of Huntersville for review. A lapse in re-qualification is defined as one who has not submitted their re-qualification information between January 1 and February 15 of each calendar year.

- TIA consultant needs to be a licensed professional engineer in the state of North Carolina.
- TIA consultant needs to submit the following:
  - A statement of qualifications listing experience including recent or past TIAs or traffic studies completed.
  - A list of staff to be utilized/available for TIA preparation including their previous TIA experience. Should the lead licensed professional engineer (sealer of the TIA) change, the consultant shall notify the Town in writing. If the licensed professional engineer is not on the prequalified list, the licensed professional engineer will need to submit qualifications to the Town.
  - Staff/office location

- 2 recently prepared/supervised TIAs or TIAs in which the consultant was extensively involved.

Additional information may be requested by the Town Transportation Engineer if consultant has not prepared a TIA in North Carolina or South Carolina or if the experience in TIA preparation is less than 2 years.

#### Re-qualification Process

A consultant who is currently pre-qualified who desires to remain qualified needs to submit the following information between January 1 and February 15 to remain pre-qualified to submit TIAs to the Town of Huntersville:

- An update of qualifications listing experience and recent or past studies completed. Updates to these qualifications statements should include only that information which has changed since the last submission. If there have been no changes to the information contained in the most recently submitted TIA qualifications statement, a statement attesting to this shall be submitted to the Town Transportation Engineer.
- A list of staff to be utilized/available for TIA preparation including their previous TIA experience. Should the lead licensed professional engineer (sealer of the TIA) change, the consultant shall notify the Town Transportation Engineer in writing. If the licensed professional engineer is not on the prequalified list, the licensed professional engineer will need to submit qualifications to the Town.