



Transportation Impact Analysis (TIA) Process and Procedures Manual (2021)

Introduction

The Town is committed to establishing an interconnected, multimodal transportation system that improves mobility, safety, connectivity, health, and quality of life for its residents and businesses. The Transportation Impact Analysis (TIA) is an important component of this, and the Town is sensitive to the needs of developers to have clear and concise explanations of requirements as it pertains to the TIA, as well as predictability of the process.

A TIA varies in detail and complexity depending on various factors such as development size, type, location, scope, Town-adopted area plans and vision statements, and other project-specific considerations. The cost for development-related TIAs is borne by the developer. The Town will choose an independent third-party firm to scope and review the TIA; the developer is also responsible for the cost for the third-party firm.

The purpose of this manual is to guide the implementation of Transportation Impact Analysis (TIA) in the Town of Matthews. It outlines the thresholds that require a TIA, procedures for the TIA process, and requirements for completing the TIA.

TIA Preparation and Process

Step 1.

By authority of the Town of Matthews UDO 155.701.C.9, the Town staff shall determine whether a TIA is required as part of the development review and approval process. A TIA shall be required to accompany a site-specific concept plan when any of the following are met:

- 50 residential units are proposed
- Expected gross trip generation is 500 trips or more (entering/exiting combined) in a 24-hour period
- 150 trips or more (entering/exiting combined) during either the adjacent road's peak hour(s) or the development's peak hour(s).
- Town staff reserves the right to require a TIA if operational or safety concerns exist. Some additional factors for determination may include any nonresidential use meeting one or more of the following:
 - covering more than two (2) acres;
 - including more than three (3) building lots;
 - providing an assembly area for more than four hundred (400) persons;
 - involving office or sales floor area over twenty thousand (20,000) square feet;
 - within one hundred fifty (150) lineal feet of any intersection of two (2) designated thoroughfares;

- within five hundred (500) lineal feet of any public road intersection currently operating as a Level of Service D, E or F;
- and/or involving service or delivery vehicles in excess of one (1) ton.

The NCDOT TIA Screening Checklist shall be submitted to the Town Engineer and Planning staff using the Institute of Transportation Engineers (ITE) Trip Generation Rates, latest edition, as described in the Contents and Methodology section of this manual. In general, trip generation shall be measured as the total new base trips generated by the proposed use as compared to trips generated by the current, active use(s) on the site within the most recent six months. ITE Trip Generation rates for age-targeted and/or age-restricted housing developments (or communities) will assume single-family (detached) or multi-family (attached) land use codes when estimating site vehicular trips, not senior adult housing land use codes, unless otherwise approved by Town Staff and/or NCDOT.

Notwithstanding the threshold values above, a Transportation Technical Memo (TTM) shall be required for a site-specific concept plan if Town staff determines that one or more of the following conditions exist:

1. Traffic generated from a non-residential development will significantly impact adjacent residential neighborhoods.
2. Traffic operation problems for current and/or future years on nearby streets are expected to be substantially aggravated by traffic generated by the proposed new development.
3. Traffic safety issues exist at intersections or streets that would serve the proposed new development.
4. The proposed land use differs significantly from that contemplated in the adopted Comprehensive Land Use Plan.
5. The internal street or access system is not anticipated to accommodate the expected traffic generation.
6. The proposed site plan includes a building with a drive-through window, fast-food or other drive-through window uses (e.g. pharmacy or bank).
7. The amount or character of traffic (existing or proposed) is significantly different from an earlier approved study and more than 24 months have passed since completion of the previous transportation study.

Step 2.

When required, the TIA must be prepared for the applicant by a duly qualified and registered professional engineer in the State of North Carolina chosen from the Town's list of prequalified transportation consultants. The Town may, at its discretion, refer to the NCDOT prequalified consultants list for prequalified transportation consultants. In that case, a firm will be considered prequalified if it (or its subconsultant as appropriate) is prequalified for Traffic Data Collection, Capacity Analysis, and Traffic Impact Studies.

Should the applicant desire to retain a consultant not on the current prequalified list, the applicant's consultant should contact Planning staff regarding qualification requirements/submission package needs at least three months prior to anticipated submittal date. 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. The cost for the TIA consultant is the responsibility of the applicant.

The Town will contract with an independent third-party reviewer for scoping and review of the TIA. The cost of the TIA review shall be borne by the applicant. An agreement must be signed between the Developer and the Town prior to any work on the TIA, or payment shall be received for the third-party review fees.

Should questions about the study arise, it is recommended that the TIA consultant be present at the Public Hearing, Planning Board Meeting, and Town Board decision meeting. Attendance for the TIA consultant at the TIA scoping meeting is required. The Town's TIA review consultant will also be in attendance.

Step 3.

A TIA pre-scoping package and scoping meeting shall be completed prior to the preparation of a draft TIA. The pre-scoping package shall contain the same form and package information that the NCDOT uses. The TIA consultant shall contact the Town Engineer and Senior Planner to request a date/time for a TIA scoping meeting and shall also coordinate the attendance of NCDOT representatives and adjacent municipalities, if applicable.

The TIA consultant shall assemble the following information (pre-scoping package) and submit it to the Town when requesting the TIA scoping meeting. Every effort shall be made to schedule the scoping meeting within 10 business days of request, depending on NCDOT availability.

1. Vicinity map
2. Site Plan, to scale, showing at a minimum: proposed buildings, internal circulation, connections to adjacent properties, and site access.
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, unless to be determined upon traffic data collection; separate trip distributions are needed for residential, retail, and office land uses
5. Historical growth rate, and source
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. Map of study area intersections within 1/4-mile buffer from the project's parcel boundaries as well as additional intersections in accordance with NCDOT criteria.
9. List/Map of multimodal origins/destinations for analysis including transit stops/stations, 1/4-mile walk-shed for pedestrians and 1-mile bike-shed for bicyclists.
10. A copy of any previous transportation studies prepared for the site.
11. NCDOT Scoping checklist (even for TIAs not required by NCDOT)

Once TIA scoping is complete, the scoping package is modified by the TIA consultant to incorporate information from the meeting. Once the scope is approved by the Town and NCDOT, the preparation of the draft TIA can begin.

Step 4.

The TIA consultant shall submit the TIA in electronic (PDF) format including Synchro files to the Town Planning Department, and NCDOT as applicable. The Town has 20 business days (approximately four weeks) for completeness review; upon written approval of completeness, two hard copies shall be submitted to the Town for the mitigation review. An additional 20 business days (approximately four weeks) are allocated for mitigation review.

Comments from the TIA review shall be forwarded by Planning staff to the consultant and the applicant for discussion. Revised draft TIA's may be needed depending on the level of comments submitted by the Town and NCDOT.

Step 5.

Upon written approval from the Town and NCDOT Division 10 District 2 office, the consultant shall develop a list of required improvements from the TIA to be included in the applicant's zoning package. The applicant will not receive final approval until the TIA process is completed and mitigation measures are included in the notes. Any ongoing or additional considerations for the development as it moves forward shall be described in the plan notes for projects going through the rezoning process. Any deviation from the development features as described in the final TIA, including but not limited to land uses, densities and site access or requirements by the NCDOT, must be submitted to the Town Staff in writing who will then determine if a TIA revision will be required.

TIA Contents and Procedures

1. Cover/Signature page – Includes the project name, location, name of the applicant, contact information for the applicant, and date of the study. The name, contact information, registration number, signature, and seal of a duly qualified and registered professional engineer in the State of North Carolina are also required to appear on this page.
2. Table of Contents – Includes a list of all section headings, figures, tables, and appendices included in the TIA report. Page numbers shall denote the location of all information, excluding appendices, in the TIA report.
3. Executive Summary – Includes a description of the study findings, a general description of the project scope, study horizon years, probable transportation impacts of the project, and mitigation measure recommendations. Technical publications, calculations, documentation, data reporting, and detailed design should not be included in this section.
4. Project Description – Includes a detailed description of the development, including the size of the parcel, development size, existing and proposed uses for the site, anticipated

completion dates (including phasing). Should also include the square footage of each use and/or the number and size of dwelling units proposed, and should also include a map and copy of the site plan provided by the applicant(s).

5. **Site Description** – Includes a description of the project location within the Town and region, existing zoning and use (and proposed use if applicable), and key physical characteristics of the site, including general terrain and environmentally sensitive or protected areas.
6. **Site Access** – Includes a complete description of the ingress/egress of the site should be explained and depicted. It should include number of driveways, their locations, distances between driveways and intersections, access control (full-movement, leftover, right-in/right-out, etc.) types of driveways (two-way, one-way, etc.), traffic controls, etc. Public and private internal streets (lanes, flow, and queuing), parking lots, sidewalks and bicycle lanes, and designated loading/unloading areas should also be described. Similar information for adjacent properties, including topographic grade relationship, should be provided to evaluate opportunities for internal connections. The design, number, and location of access points to collector and arterial roadways immediately adjacent to the site must be fully analyzed. The number of access points should be kept to a minimum and designed to be consistent with the type of roadway facility. Driveways serving the site from state roads should be designed in accordance with the NCDOT's Policy on Street and Driveway Access, and/or the Town's standards and ordinances, as applicable. Driveway type selection shall be from the Mecklenburg County Land Development Standards.
7. **Study Area** – A map showing the study area shall be included, showing the 1/4-mile and 1-mile radius from the parcel boundaries as well as the study intersections agreed upon in the scoping document. A narrative describing the study area should identify the location of the proposed project in relation to the existing transportation system and list the specific study intersections and/or segments. Any unique transportation plans or policies applicable to the area (e.g., CATS bus service and future plans) should be mentioned. The study area map shall also identify natural features, major and minor roadways within the study area, study intersections, and a boundary of the site under consideration.
8. **Existing Conditions** – Shall include a narrative and map that represents AM and PM peak hour turning movement volumes for all intersections within the study area. Traffic volumes shall be 15-minute interval weekday turning movement counts (Tuesday through Thursday) and be no more than twelve months old; with the exception of studies for MSTA analysis which shall be as per MSTA requirements such as 5-minute intervals. The required count timeframes are from 7:00-9:00 a.m. and 4:00-6:00 p.m. conducted on a Tuesday, Wednesday or Thursday when area schools are in session; however, the TIA scoping meeting may have identified additional or different traffic counting hours and/or days depending on the development program and location within the Town. Planning staff and the Town's Engineer will determine if additional peak hours or weekend analyses shall be included in the TIA at the mandatory scoping meeting. The source of existing traffic volume information should be explicitly stated (e.g., Town counts, new counts collected by the

applicant, NCDOT counts, etc.). If previous counts were obtained, only counts collected within the one year of the Scoping Meeting will be deemed acceptable. Any historic intersection counts used for the study will be equated to current year baseline volumes. Summary sheets for turning movement counts should be included in the appendix of the TIA report. A separate narrative and map shall be prepared to describe the characteristics of study intersection roadways, including functional classification, number of lanes, posted speed limit, existing average daily traffic volumes, typical cross section, intersection control, and lineal distance of any existing turn lanes.

9. Future Year Conditions – The number of phases will determine the build out scenario of a particular development. Unless otherwise approved by the Planning staff and the Town Engineer, future year conditions for a single-phase development shall be analyzed for the year the development is expected to be at full occupancy (Build Year) and five years after the build year (Build + 5). For multiple phases, future year conditions for each phase must be analyzed in addition to the Build Year and Build +5. The phased scenarios shall be completed in order, with any improvements specified by development included in the phased build scenarios. Specific analysis periods to include in the study shall depend on proposed project phasing plan and significant ongoing construction of the adjacent transportation system. The development and transportation projects to be included in the base conditions or Build Year conditions for the transportation system within the study area shall be determined during the scoping meeting and included in the appendix of the TIA report. These transportation improvements include those that, at the time of application, are currently under construction by the Town, NCDOT, or another development with improvements within the study area. Only projects approved at the scoping meeting may be included in the analysis as future existing infrastructure. Those improvements built by other projects must be clearly identified in the report as approved offsite development road improvements. Unfunded, planned infrastructure projects may be mentioned but the description should specifically identify that these projects are not included in the base condition. Future year background traffic volumes shall be forecasted using historical growth rate information, regional models, and the Matthews Subarea Model. A narrative and map shall be prepared that presents turning movement volumes for each peak hour for all intersections identified within the study area. Developments within the study area that are currently under construction can be included in the background trips for the current application using the TIAs that were performed for the developments if not accounted for in the growth rate. Future year background volumes, other development volumes, and site traffic volumes should be clearly indicated the map, as well as a combined total at all intersections/legs.
10. Trip Generation – Base trip generation for the proposed land use(s) should be calculated using data published in the latest version of the Institute of Transportation Engineers (ITE) Trip Generation Manual. The NCDOT Congestion Management Rate vs Equation Spreadsheet should be referenced in preparation of trip generation.
(<https://connect.ncdot.gov/resources/safety/Congestion%20Mngmt%20and%20Signing/Con%20gestion%20Management/NCDOT%20Rate%20vs%20Equation-Eff07012018.pdf>). Data

limitations, data age, choice of peak hour or adjacent street traffic, choice of independent variable, and choice of average rate versus equation shall be discussed at the mandatory scoping meeting. Local trip generation rates may be acceptable if appropriate validation is provided by the applicant to support them. Any deviation from ITE trip generation rates shall be discussed in the mandatory scoping meeting and documented if approved by Planning staff, the Town Engineer, and NCDOT. Developments within the study area that are currently under construction can be included in the trip generation for background traffic using the TIAs that were performed for the developments, or by using ITE trip generation if the developments do not have TIAs. The NCDOT Municipal School Transportation Assistance (MSTA) calculator should be used to calculate projected trip generations for school sites.

11. Internal Capture – Base trip generation may be reduced by rate of internal capture when two or more land uses are proposed using methodology recommended in the most current Trip Generation Handbook published by the Institute of Transportation Engineers. Pass by trips shall be limited to 10% of the no-build volume, unless otherwise accepted by Town Planning staff, the Town Engineer and NCDOT. The internal capture reduction should be applied before pass-by trips are calculated. Submit internal capture estimates by using NCHRP 684 Internal Capture Tool, where possible.
12. Pass-by Trips – Pass-by trips are those made as intermediate trips between an origin and primary destination. However, pass-by trips are not diverted from another roadway. Base trip generation may be reduced by rate of pass-by capture using methodology recommended in the most current Trip Generation Handbook published by the Institute of Transportation Engineers. Pass-by trips associated with the development program may not exceed 10% of the existing volume reported for the adjacent public street network. This network shall include the streets that provide primary access to/from the site. For example, a site access drive that connects to a low-volume local street, whose primary access is to a major collector road, the traffic on the major collector shall be used as the adjacent street for pass-by calculation purposes. Evaluation of diverted trips may apply depending on the specifics of each site. A trip generation table shall summarize all trip generation calculations for the project. Submit pass by trip estimates by using pass by percentage rates as shown on the NCDOT Trip Generation Rate Equation Recommendations (<https://connect.ncdot.gov/resources/safety/Congestion%20Mngmt%20and%20Signing/Congestion%20Management/NCDOT%20Rate%20vs%20Equation-Eff07012018.pdf>).
13. Trip Distribution– Trip distribution percentages proposed for the surrounding transportation network are agreed upon in the scoping document approved by Planning staff, the Town Engineer, and NCDOT before proceeding with the transportation analysis. A map showing the percentage of site traffic on each street included in the study area shall be included in the TIA. Separate trip distributions are needed for residential, retail, and office land uses.
14. Trip Assignment – Project traffic shall be distributed to the surrounding transportation system based on the site's trip generation estimates and trip distribution percentages.

Future year build traffic forecasts (i.e., future year background traffic plus project traffic) shall be presented in both tabular and graphic formats for AM and PM peak hour conditions, as well as any additional analysis periods (i.e. mid-day or weekend) at all intersections included in the study area. If the project will be built in phases, traffic assignments shall be reported for each phase. Pass-by traffic shall be included at the driveways for evaluating driveway volumes. Multiple assignment analyses may be required if the traffic control at the access drives varies (i.e., right-in/right-out vs. stop controlled vs. signalized).

15. Capacity Analysis – Level of Service (LOS) and delay are the primary measurement for impacts to the transportation system, and is defined by the most current edition of the Highway Capacity Manual. Unless otherwise noted, Synchro LOS and delay shall be reported for signalized intersections and approaches. Unsignalized minor street approach and major street exclusive turn lanes LOS and delay shall be reported according to HCM analysis, as reported by Synchro. LOS for existing signalized intersections shall be determined using existing signal timing plans provided by either the Town or NCDOT. Existing signal timing plans should be included in the appendix of the TIA report. If no other signals that are a part of the coordinated system are required to be analyzed within the study area, cycle lengths and splits should match timing plans. Other standard practices and default input values for evaluating signalized intersections should be consistent with the most recent guidelines published by the NCDOT, Traffic Engineering and Safety Systems Branch, Congestion Management Unit (“Capacity Analysis Guidelines”). Planning staff and the Town Engineer may also require safety, traffic simulation, gap and/or other analyses appropriate for evaluating a development application, as agreed upon in the scoping meeting. Additional analyses and/or traffic capacity or simulation tools (such as Vissim) required for the TIA shall be identified during the scoping meeting. Capacity analyses shall be conducted to determine levels of service in each peak hour and any additional analysis periods for all intersections, and their approaches, identified for study using methodologies contained in the most current edition of the Highway Capacity Manual. Capacity calculations should be included for the existing and all future year scenarios. Impacts from the proposed project shall be measured by comparing the Future-Year-Build and the Future-Year-No-Build conditions, without improvements by others unless those improvements are under construction at the time of the TIA. Mitigation shall be required for any intersection or approach with LOS F, for any intersection with a total average delay increase of 25% or greater, or an approach that results in a delay increase of 25% or greater. Another analysis with improvements by others in the future years is allowed, but may not be considered in the proposed mitigations. All TIA reports submitted to the Town shall use Synchro, SimTraffic or Vissim software, for signalized and unsignalized intersections, or Sidra Software, for roundabouts, consistent with policies released by the NCDOT. A narrative, table, and map shall be prepared that summarizes the methodology and measured conditions at the intersections reported in level of service LOS A – F, intersection and approach signal delay for signalized intersections, approach delay for unsignalized intersections, and 95th percentile queue lengths for all movements including SimTraffic max queue lengths. Capacity analysis worksheets and auxiliary turn lane warrants for unsignalized intersections should be included in the appendix of the TIA report. For multi-phase developments, the

capacity analyses scenarios shall address the phasing of improvements for each phase of development.

16. **Queuing Analysis** – 95th percentile and maximum queue length simulation analysis of future year queues shall be consistent with NCDOT's Traffic Engineering and Safety Systems Branch, Congestion Management Unit current practices and published Capacity Analysis Guidelines. Turn lanes for unsignalized driveways serving the site shall be identified using volume thresholds published in the NCDOT's Policy on Street and Driveway Access to North Carolina Highways. Recommendations for left turn lanes serving the site shall be designed to meet future year capacity needs identified in the TIA report. For projects that include drive-through facilities, pick-up/drop-off areas or entrance gates, a queuing analysis is required to ensure that vehicle stacking will not adversely impact the public transportation system. The queuing analysis must be performed using accepted transportation engineering procedures approved by the Town, including the NCDOT Policy on Street and Driveway Access (p32). If a TIA is required for a new school site, the consultant must model the internal circulation and ingress/egress of the site using a "dummy signal" in the SYNCHRO software as prescribed by NCDOT Municipal School Transportation Assistance (MSTA) department. A new school is required to provide stacking for 125% of the queue on-site.
17. **Collision Analysis** – A summary of crash data (type, number, and severity) for all modes for the most recent 5-year period at each study location is required. Crash data shall be obtained by the TIA consultant from NCDOT, the Town, and any other available sources. For locations with prevalent crash types and/or frequency, a discussion shall be included describing factors that may be contributing to the incidents as well as measures that could be taken to eliminate or mitigate collisions. It is understood that any increase in traffic to these intersections will contribute to collisions. If contributing factors are identified, recommendations to eliminate or mitigate these features shall be included. Mitigation for high crash sites, such as a high severity index (>8.4), or crash rates greater than the critical or statewide crash rates, is required. Such mitigation shall be described in the TIA.
18. **Multimodal Analysis** - Pedestrian, bicycle and transit connectivity shall be analyzed in the TIA document. The TIA consultant shall examine origins and destinations within ¼-mile for pedestrian and transit analyses and within 1-mile for bicycle analysis. These distances are measured as a buffer from the site's parcel boundaries. Origins and destinations are agreed upon in the scoping meeting. Any gaps in bicycle and pedestrian connectivity shall be identified and mitigation proposed. A map showing existing pedestrian and bicycle network as well as proposed improvements shall be included in the TIA document. Improvements not along site frontage may be deemed necessary. Transit analysis area shall be within a 1/4-mile buffer of the parcel boundary and shall include potential new bus stops, access to existing bus stops or transit stations, and enhancements of existing bus/transit stops, such as bicycle racks, seats/benches, mid-block crossings, waiting pads, or canopies. Proposed improvements to the transit system shall be identified by the TIA consultant in coordination with Charlotte Area Transit System. A map of the existing transit routes and stops/stations,

and proposed changes to the system shall be included in the TIA document. Consideration of transit reduction rates may be discussed in the scoping meeting.

19. Traffic Signal Warrants – Town staff and NCDOT may consider potential signal locations at the scoping meeting. However, traffic flow progression is of paramount importance when considering a new traffic signal location. A new traffic signal should not cause an undesirable delay to the surrounding transportation system. Installation of a traffic signal at a new location shall be based on the application of warrants criteria contained in the most current edition of the Manual on Uniform Traffic Control Devices (MUTCD) and engineering judgment. Traffic signal warrants should be included in the appendix of the TIA report. Additionally, spacing of traffic signals within the Town must adhere to NCDOT requirements. Pedestrian and bicycle movements must be considered in the evaluation and adequate pedestrian and bicycle clearance provided in the signal cycle split assumptions. If a signal warrant analysis is recommended in the TIA, the Town and/or NCDOT may decide to defer a signal warrant analysis until after the development has opened in order to use actual turning movement counts at an intersection. The TIA recommendations must clearly state that this analysis shall occur at a specified date following the opening of the development. The applicant must issue a bond or letter of credit in the name of the Town for the estimated cost plus 25% of the signal warrant analysis and construction of mast arm signals plus needed right-of-way and utility relocations prior to final approval of the TIA. The cost shall be established based on an engineer's estimate provided by the engineer of record for the applicant, however final approval of the dollar amount rests with the Town.
20. Mitigation Measure Recommendations – This section shall provide a description of the study's findings regarding impacts of the proposed project on the existing and proposed transportation system. This section shall describe the location, nature, and extent of all mitigation measures recommended to the applicant to improve the delay at the intersection or approach, through phasing and full build of the project. This mitigation will be based on the project phasing and Build Year scenario; the Build +5 scenario is used for reference and potential mitigation. A narrative, map, and table shall be prepared that describes and illustrates recommended mitigations, by phase if necessary, for maintaining the integrity of the transportation system. The applicant is required to mitigate transportation deficiencies for their development and as identified in the five analysis types listed above (content items 15-19); the narrative and map shall address all five analyses. Right-turn lanes are not acceptable mitigation measures except in extreme situations, and therefore require additional explanation/justification as well as mitigation of impacts to pedestrians and cyclists.
21. Compliance with Adopted Transportation Plans – All TIA reports must include a statement of compliance with plans, programs, and policies adopted by the Town for maintaining a safe and efficient multi-modal transportation system.