NCDOT Congestion Management Capacity Analysis Guidelines

Introduction/Purpose

This document provides standard values to ensure consistent traffic analysis. Deviation from these practices requires justification. By reviewing reports, plans, and submittals, the North Carolina Department of Transportation (NCDOT) in no way relieves the analyst of possible claims or additional work resulting from errors or omissions.

Pre-Analysis

Submittal Document Requirements

The submitted traffic analysis document should include, but is not limited to: a summary of the analysis and results, site plans, traffic counts and forecasts, volume generation, any assumptions used in the analysis, and any variations from these guidelines.

TIA	TIP
Summary of Results	Summary of Results
Site Plan	Traffic Forecasts
Traffic Counts and Forecasts	Traffic Breakouts (Existing, No Build, Build
Existing Lane Diagram	Traffic Adjustments and Reroutes)
Existing Traffic Diagram	Analysis (Existing, No Build, Build)
Projected Growth Traffic Diagram	Existing Lane Diagram
Approved Development Traffic Diagram	Recommended Lane Diagram
Projected Background Traffic Diagram	Digital Files (including analysis files)
Unadjusted Trip Generation	
Trip Reductions	
Distribution Chart	
Site Traffic Diagram	
Total Projected Traffic Diagram	
Recommended Lane Diagram	
Assumptions Used in Analysis	
Variations from these Guidelines	
Digital Files (including analysis files)	

For review purposes, a printable digital copy of the submittal is preferable, although NCDOT may require a hard copy. For plan sheets, such as site plans, the digital submittal should be legible and to scale when printed as a 22”x34” sheet. Use of the Portable Document Format (PDF) is preferred.

Project Coordination

On larger developments, the applicant is encouraged to arrange a pre-submittal conference with the District Engineer and local jurisdiction prior to formally submitting an

application for a driveway permit. During this conference the scope of the TIA can be discussed.

TIP Design Year analysis should be performed for the TIA when an impacted TIP project is:

- In the planning phase
- In the design phase
- During construction
- Within 5 years after construction

These impacts may include additional traffic generated by the development not included in the traffic forecasts, and/or a new or modified driveway along the project corridor.

When schools are located near a TIP Project or new development, coordination with the Municipal and School Transportation Assistance Section is required.

All intersections within the study area should be analyzed, unless otherwise justified or explained.

Strategic Highway Corridors

The vision for strategic corridors must be maintained. Interim measures, such as signalized intersections on expressways for identified interchange locations, may be required due to scoping limitations for a specific project.

Access to developments on roadways designated as Strategic Highway Corridors may be restricted. In order to protect the safety, mobility and traffic carrying capacity of this Strategic Highway Corridor, access along the corridor may be closed or relocated if an alternative access is developed in the future or if any safety concerns or other traffic impacts arise. Investigate alternative operational methods to maintain mobility on the corridor.

Median and Control-of-Access Breaks

Changes in Control-of-Access (C/A) will require approval from the Right-of-Way Disposal and Control-of-Access Committee. New or modified median crossovers must be approved by the State Traffic Engineer or designee for existing roadways, the Roadway Design Project Engineer for active TIP projects, and the State Highway Design Engineer for exceptions to the Median Crossover Guidelines on active TIP projects. These requests must be initiated by the District Engineer.

For driveway requests that require a change in C/A, a new median crossover, or both, the benefit to the travelling public should be demonstrated. To provide a basis for comparison, analysis should demonstrate the benefit along the following hierarchy: no-access, right-in/right-out, directional crossover, unconventional intersection designs, and full access.

Interchanges

New and modified interchanges along Interstate routes may require Interchange Justification/Modification Reports for federal approval.

Accesses located near interchanges should provide C/A for a minimum of 1000 feet beyond the ramp terminals. If this is not feasible, full C/A will extend for a minimum of 350 feet and a raised island will be installed to a point a minimum of 1000 feet beyond the ramp terminals.

Unconventional Intersections

Unconventional intersection designs such as roundabouts and superstreets should be evaluated. Unconventional intersections have demonstrated their ability to move traffic more efficiently, and consideration should be a part of any traffic analysis.

Volumes

Traffic Counts

Traffic counts should reflect normal daily and/or peak hour traffic conditions. The following practices are outlined in the Driveway Manual.

When submitting a traffic analysis document for review, the traffic counts used for capacity analysis purposes should have been taken no more than one year prior to the submittal date of the document. Exceptions to this will need to be approved individually. Heavy vehicles and pedestrians should be included in all traffic counts and used in the traffic analysis.

When using traffic count data to predict future year volumes an appropriate growth rate should be applied. Growth rates should be consistent with historical growth rates in the study area.

Normally, counts should be taken during the following weekdays: Tuesday, Wednesday, or Thursday. In areas with high seasonal traffic variations, counts should be taken during peak seasonal conditions or appropriate seasonal factors should be applied to the traffic count volumes. Counts should not be taken on holidays, when school is not in session, or when a significant weather event or traffic incident occurs.

Traffic Breakouts

Traffic forecasts for TIP projects should be completed or approved by the NCDOT Transportation Planning Branch before performing traffic analysis work. To perform the traffic volume breakouts, traffic forecasts should provide the following information:

- Average annual daily traffic volume (AADT)
- Percent of trucks (duals, TTST) on a facility
- Directional split (D)

- Percent of traffic during the peak hour K (DHV)
- The direction of D during the PM peak hour

Traffic breakout spreadsheets provided by the Transportation Planning Branch are available on the Congestion Management website to convert forecasted AADT to Peak Hour Volumes. If this spreadsheet is not used, justification should be provided for any alternate method chosen.

The Intersection Analysis Utility (IAU) spreadsheet should be used when traffic forecast volumes are displayed with two-way arrows. The Intersection Analysis Utility for Directional Data (IAU_directional) spreadsheet should be used when traffic forecast volumes are displayed with one-way arrows.

Clear documentation should be provided when traffic volumes are converted from the intersection traffic volume layout shown on the forecasts to unconventional intersection layouts.

Interpolations

An interpolation spreadsheet is available on the Congestion Management website to determine intermediate year traffic volumes. This spreadsheet is based on a straight-line calculation method. Please refer to the forecast document for information on how to properly determine intermediate year volumes.

When determining intermediate traffic year volumes, the appropriate traffic breakout spreadsheet should be applied to the Base and Future Year AADT forecasts first, and then the interpolation spreadsheet should be used.

Traffic Adjustments

Provide documentation and methodology for all traffic adjustments and rerouting.

The *NCDOT Alternative Intersection Count Converter* spreadsheet is available to assist in converting a "standard" intersection traffic volume layout to layouts for unconventional intersection designs. (Examples include: superstreets, quadrant designs, etc.)

Trip Generation

Identifying Land Uses

The *ITE TRIP GENERATION MANUAL* describes the key traits of each land use. Some land uses have very similar traits and require attention to ensure the correct land use is used.

Identifying Variables and Trip Calculations

A land use variable describes the size of the land use. Examples include square footage, employees, number of rooms, etc. Most land uses have more than one

variable for trip generation. A trip calculation uses a rate or equation to determine the volume of trips.

The *ITE TRIP GENERATION HANDBOOK* recommends a method to determine the variables and the type of trip calculations. These determinations are summarized in the *Rate vs Equation* spreadsheet on the Congestion Management website.

Trip generation for individual outparcels should be calculated separately from the remainder of the development. If a development includes multiple buildings of the same land use, trip generation should be calculated separately for each building unless otherwise specified in the *ITE Trip Generation Manual*.

Results from Trip Generation software should be confirmed with the *Manual*, for example peak hour type.

Some Lane Uses require additional justification or local studies. For example, the use of Specialty Retail or Gasoline/Service Station with Convenience Market should include definite plans for specific retail that will be in place.

Trip Reductions

Internal Capture

Internal capture calculations should be used cautiously. The internal capture calculation should utilize the percentages from the *ITE Trip Generation Handbook* to estimate the internal capture reduction percentage. Use of internal capture requires justification and approval on a case by case basis.

Reductions for internal capture should be limited to the land use categories and time periods included in the current *Handbook*. Internal Capture is only applicable to sites or subdivisions of sites that are accessible without using or crossing public streets.

Internal Capture rates may be estimated using the NCHRP 684 spreadsheet procedure referenced in the current *Handbook.* When using this spreadsheet, transit or non-motorized splits should not be used unless otherwise justified and approved. Vehicle occupancy should be “1.1” in accordance with North Carolina averages. The Walking Distances between land uses should be 4000’ or the calculated maximum distance between a given pair of land use categories in the proposed site.

The internal capture reduction should be applied before the pass-by trips are calculated.

Pass-by

Pass-by percentages should be obtained from the *ITE TRIP GENERATION HANDBOOK.* The percentages are summarized in the *Rate vs Equation* spreadsheet on the Congestion Management website.

Pass-by percentages should only be applied to land uses numbered in the 800s and 900s.

For multi-use developments, pass-by percentages should be applied to the retail component only. Total pass-by trips (sum of entering and exiting) should not exceed 10% of the volume on the adjacent street.

Diverted Trips

Diverted trips should only be estimated in a TIA if reliable data reporting the percentage distribution of the three types of trips (primary, pass-by, and diverted trips) are available for the land use being considered and the travel routes for diverted trips can be clearly established. If these conditions cannot be met, the analyst should treat all non-pass-by trips as primary trips.

Volume Balancing

All efforts should be made to ensure that upstream and downstream traffic volumes along corridors balance and maintain continuity. If balanced volumes are not attainable, explanation should be provided.

Documentation regarding the balancing methodology should be provided.

General Analysis

Analysis Scenarios

Analysis should normally be submitted for the following scenarios:

Scenario	TIA	TIP
Existing Base Year	When Specified in Scope	Yes
No-Build Design Year	Yes	Yes
Design Year Build without Improvements	Yes	N/A
Intermediate Years Build with Improvements for all Alternatives	When Specified in Scope	When Specified in Scope
Design Year Build with Improvements for all Alternatives	Yes	Yes
Ultimate Build*	When LOS concerns exist	N/A

* For TIAs, Unfunded Improvements may only be identified in Ultimate Build Analysis.

AM and PM Peak Hour analysis should be performed for all reports; explanation should be provided for alternate time periods or to not perform an analysis for the AM or PM peak. Laneage should be identical for all time periods within the same scenario. The requirement to review other key analysis periods, such as a seasonal peak, lunch peak,

or weekend peak, should be discussed with NCDOT prior to completion of the traffic analysis.

Signal phasing should remain consistent for all time periods. As an example, if split phasing is used for the AM peak, it must be used for the PM peak. Changing the phasing sequence such as altering left-turn phasing from leading left to lagging left is dependent on the traffic signal controller equipment.

Default Values

The Base Saturation Flow Rate should be used in accordance with the *Highway Capacity Manual* (HCM).

Lane Utilization Factors should be used in accordance with the HCM .

A Peak Hour Factor (PHF) of 0.90 should be used, which is a median value between 0.88 for Rural and 0.92 for Urban conditions listed in the HCM. If traffic counts have been acquired, the resulting PHF may only be used for existing conditions. For projected conditions, the PHF should be 0.90. Where schools are present, coordination with the MSTA group is necessary due to the possible differences in the acceptable PHF.

A total flow period of 60 minutes and a peak flow period of 15 minutes should be used.

If known actual conditions differ from analysis, the model should be calibrated to match actual conditions.

Signal Recommendations

Monitoring for Signalization should be recommended when Peak Hour Warrants are met. Poor LOS on a side street does not always result in a recommendation for signalization if v/c ratios and queuing are acceptable.

The following list indicates when signals are less desirable:

- Strategic Highway Corridors
- In close proximity to other signals
- When the signal creates operational and queuing problems greater than it solves

When signals are warranted, every option to reduce phasing should be analyzed, especially on a Strategic Highway Corridor.

Lane Recommendations

Lane continuity should be verified and should logically flow through the network of intersections.

Recommended storage lane lengths should be provided for all exclusive turn lanes. The 95th percentile queue from analysis or the maximum observed queue from a simulation (whichever is larger) should be used to determine the storage lane length. Queuing should not exceed the storage capacity of the approach. Full storage for queue lengths should be rounded up to the nearest 25 feet with a minimum of 100 feet for both right-turn and left-turn lanes. A default taper length of 100 feet should be modeled for all added lanes unless specific taper lengths are known.

Recommendations where improvements are identified "by others" should clarify which parties are to provide the additional improvements.

Dual Left Turns should be used cautiously due to:

- Turn Conflicts requiring split phasing
- Protected Phasing (see signal plans)
- Driveways in close proximity to the intersection on the receiving lanes can lead to erratic movements
- Merges on the receiving lanes can create false capacity in the analysis

Dual Right Turns sharing a Through movement perform poorly in overlap and Right-Turn-On-Red conditions.

Through Movements on highway ramps should not be combined with right turns for three phase signals or standard diamond configurations. The through movement should be shared with the left-turn lanes.

If an improvement is in place to demonstrate the impact of traffic, it is expected that the improvement will be in place at construction. Mitigation dependent on unfunded or uncommitted improvements provided by others are not acceptable.

Measures of Effectiveness

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.

All poor levels of service and/or excessive queuing in the analyses should be addressed. Additional measures of effectiveness beyond level of service should be reported for near or over capacity conditions.

Intersection Details

Signalized Intersections

New Signals

If an intersection is not anticipated to be signalized but may warrant signalization within five years of construction, both signalized and unsignalized analyses should be

performed to ensure adequate lanes and storage are provided for both signalized and unsignalized operations in the future. The recommended storage lane lengths should reflect the maximum queue from both analyses.

Left-Turn Treatment

For analysis of future operations, use protected-only phasing not protected/permitted phasing. This analysis will identify the required storage in the event that protected-only phasing is necessary. In the design of the traffic signal, the use of protected/permitted phasing may be allowed and is encouraged.

Intersections with combination through/left-turn lanes should have either permitted-only left-turn treatment or split phase left-turn treatment for that approach. This is not a recommended geometric configuration and should be avoided when possible.

Lane configuration for opposing side streets should match when possible to avoid driver confusion (for example: avoid a combination through/left-turn and right-turn lane on one approach opposite a combination through-right-turn and left-turn lane on the opposite approach).

For analysis, generally use protected left-turn treatment instead of permitted when:

- Dual left-turn lanes are present
- Hourly volume exceeds 240 cars
- Left-turn lanes are crossing 3 or more opposing through lanes of traffic
- When a condition is satisfied in the table below:

Number of Opposing Lanes (Through and Right)	Condition
1	**Left-Turn Volume * Opposing Volume > 50,000**
2	**Left-Turn Volume * Opposing Volume > 90,000**
3 or more	**Left-Turn Volume * Opposing Volume > 110,000**

Right-Turn Treatment

For analysis of future operations, Right-Turn-On-Red (RTOR) operation should not be included. To provide for a proper comparison, do not use RTOR for existing conditions. In the design of the traffic signal RTOR may be allowed.

Use overlapping right-turn phasing where appropriate. Use of a shared through-right turn lane limits the effectiveness of the right-turn overlap, especially where volumes require dual right turns.

Coordinated Signal Systems

Multiple signalized intersections should be analyzed as a coordinated signal system.

The coordinated phase should be the main street through movement (typically phases 2+6) unless special circumstances dictate otherwise. For coordinated signals under recall, the usual condition will specify none for minor streets or movements.

Cycle lengths for individual intersections in coordinated systems should be equal. Double or half cycles can be used if the minimum cycle lengths are accommodated.

It should not be the intent at the planning stage of a project to fully design and optimize a coordinated traffic signal system.

Signal Phasing and Timing

Recommended Timing Settings*	
Timing Setting	**Time (seconds)**
Minimum Initial Green Time, Protected Left Turns and All Side Street Movements	7
Minimum Initial Green Time, Major Street Through Movements ≤ 35 mph	10
Minimum Initial Green Time, Major Street Through Movements 36-45 mph	12
Minimum Initial Green Time, Major Street Through Movements > 45 mph	14
Yellow Time*	5
All-Red Time*	2
Lost Time Adjustment (Synchro)	-2
Total Lost Time*	5
Minimum Split	Minimum Initial Green Time (or Pedestrian Walk + Clearance) + Yellow Time + All-Red Time

* Increase clearance and lost time as needed for large cross sections such as single point urban interchanges (SPUI).

Recommended Minimum Cycle Lengths by Phase	
Number of Phases	**Minimum Recommended (seconds)****
2	60
3	90
4 or more*	120
Maximum recommended cycle length is 180, but circumstances may warrant cycle lengths up to 240 seconds.	

* Traffic Signal Timing Manual (FHWA) for planning level analysis.

** All cycle lengths should be rounded to the nearest 5 seconds.

Pedestrians should be considered and accommodated as appropriate. This can include, but is not limited to: pedestrian phases, adequate pedestrian clearance, and potential conflicts with phasing, such as overlapping phases.

Unsignalized Intersections

Based on the HCM LOS for unsignalized intersections is not defined as a whole, and should only be reported for individual stop-controlled or yield movements.

Roundabouts

The design of a roundabout should be based on projected traffic 20 years after the completion of construction. A flow-scale analysis determining the expected failure year of the proposed roundabout based on a maximum v/c (degree of saturation) of 0.85 should be provided. A peak hour v/c greater than 0.85 in the future design year does not absolutely remove a roundabout from consideration as a solution. Synchro should not be used for analysis of roundabouts. SIDRA, HCS, or Vissim are currently the only acceptable analysis tools for roundabouts in North Carolina.

If a dual-lane roundabout is needed for the design year, consider construction as a single-lane roundabout designed for simple expansion to a dual-lane design.

The interaction between the proposed roundabout and adjacent intersections should be considered. Roundabouts should not be constructed where queues from adjacent intersections restrict the flow of vehicles leaving the roundabout.

For single-lane roundabout analysis, use a minimum 120 feet for the roundabout diameter, with 16 foot lanes, and an 88 foot inside diameter. The speed of the roundabout should be restricted to a maximum of 25 mph.

Superstreets

The main street should be analyzed as parallel one-way streets, rather than a single facility, because each two-phase signal impacts only one direction of traffic on the main street.

Median U-turn crossovers should be located approximately 800-1000 feet from the side-street. Spacing may also be determined by the U-turn queuing.

Alternate Intersections

Consider alternate intersections as a possible solution when applicable, such as:

- Quadrant Left
- Continuous Flow Intersection

Analysis Software

For software to be acceptable it must be based on HCM methods.

System analysis software should be used for arterials and networks of multiple signalized and/or stop/yield-controlled intersections. Simulation software should be utilized to aid in determining storage lengths, verifying geometry and lane continuity, and to identify overall network operations. Analysis procedures utilizing gap acceptance methodology should be used for roundabout analysis.

Preferred Software*	
Item for Analysis	**Useful Software**
Multiple Intersections	Synchro
Isolated Signalized Intersections	Synchro
Isolated Unsignalized Intersections	Synchro, HCS
Simulation	SimTraffic, VISSIM, CORSIM
Roundabouts	SIDRA, VISSIM
Roadway Segment	HCS
Merge, Diverge, and Weave	HCS

* Use of alternate analysis software must be approved by NCDOT, however the above software is not specifically endorsed by NCDOT.

Turn lane storage lengths and node distances should be appropriately coded into the analysis files. Incorrect storage lengths or node/link distances may impact intersection operations during simulation.

Synchro (version 7)

Any approaches or movements whose 95th percentile queue lengths are flagged with "#" or "m" should be reviewed for improvements given there may be serious delay and queuing problems for this approach or in the vicinity. These problems will need to be addressed in order for the intersection to operate properly. In these cases, the Synchro output should be compared to the SimTraffic output and/or other analysis tools such as CORSIM, VISSIM, or the Red Time Formula. The Red Time Formula should only be used for protected phasing when operations are under capacity.

Intersection approaches should only be coded by cardinal directions (north, south, east, and west) as other approach directions (northeast, southeast, northwest, and southwest) may prevent Synchro from discerning turn movements from through movements resulting in inaccurate capacity and queuing results.

The analysis period "T" in Synchro should remain at the default of 15 minutes.

The absence of traffic volumes on some movements that are allowed at one or more intersections may cause Synchro to incorrectly calculate one or more movements as

being prohibited. We recommend changing zero volume movements to four vehicles per hour.

The link speed used in the analysis should represent the posted or proposed speed limit of the actual roadway.

All link termini should extend a reasonable distance beyond the last node (typically 1000 feet) to ensure adequate queuing can be calculated in SimTraffic.

The "Coding Error Check" should be run in Synchro before finalizing the analysis, and any errors or warnings should be justified or corrected prior to activating SimTraffic.

When analyzing superstreets Left- or U-turning movements that do not cross each other should be modeled on separate links. On these short turn-only median links, the "Simulation Left Turn Speed" entering the link and the link speed should be 10 mph below the speed limit.

Nodes should be numbered in a logical order along the main route to facilitate review of the results.

SimTraffic

Overall network operations should be reviewed during the simulation, and any significant queuing, starvation, spillback, or gridlock should be addressed.

A SimTraffic "Queuing and Blocking Report" for the network should be included for review.

All instances where the SimTraffic Maximum Queue length (maximum observed queue) exceeds the Storage Bay Distance should be addressed. The SimTraffic Maximum Queue or Synchro 95th Percentile Queue, whichever is higher, should be used in determining recommended storage lane lengths. Excessive queuing indicated in SimTraffic should be reviewed for appropriateness and possible unrealistic lane blockages. The 95th percentile queue from SimTraffic should not be used.

Networks should be seeded for a period long enough to traverse the two most distant points of the network including stops prior to recording. The suggested default seed time is 10 minutes. The seeding time should also be longer than the maximum cycle length used in the network. The recording interval duration used in SimTraffic should be 60 minutes unless otherwise justified.

It is unacceptable to retain a coded U-turn and Right-turn overlap conflict in Synchro.

Multiple simulation runs may be necessary. If multiple runs are performed the set of seeding values should be consistent in all scenarios.

HCS

Default Values

Operational analysis should be used to obtain levels of service.

Enter driver population factor f_P = 1.00, unless in a tourist area, then use 0.95.

Appropriate terrain should be used depending on location. In absence of local data, typical average grades can be approximated by the terrain shown:

	Freeway Grades**	Non-Freeway Grades**
Level	2% or less	3% or less
Rolling	Between 2% and 6%	Between 3% and 7%
Mountainous	6% or more *	7% or more *

* Mountainous terrain should be considered where heavy vehicles operate at crawl speeds

** Average grade for the entire facility should be used.

All truck/bus and RV equivalents (E_T or E_R) and similar calculated adjustments should remain at HCM defaults.

The percentage of trucks should be based on where the traffic flow is heading towards (e.g. ramps and weaving analyses).

If demand exceeds available capacity for any segment or junction analysis, LOS F results for that segment or junction, but these oversaturated conditions could further cause poor network operations for adjacent segments or junctions.

Use measured speeds if available. The Free Flow Speed (FFS) can be estimated when measured field data is unavailable. Use the HCM methods for estimating FFS.

Freeway Weaving

Ramp-to-ramp volume (V_{B-D}) assumptions should be provided.

Truck and bus percentages should be based on the freeway/mainline value. Use the higher percentage.

Check “Limitations on Weaving Segments” to ensure that none of the limitations specified are exceeded. Where any limits are exceeded, consult the appropriate notes near the bottom of the output. These situations should be eliminated where feasible and addressed in the included report. HCS may provide values that are too short.

If V_{FO} V_F or V_R = LOS F, the resultant density does not apply.

Ramps and Ramp Junctions

Freeway Analysis should be performed for high speed ramp segments with two or more lanes that begin/end as merge/diverge segments.

Typical Free Flow Speed for Ramps = 45 mph, and for Loops = 25 mph. These can be adjusted as needed based upon designs if that information is available.

Freeway truck and bus percentages should be based on freeway/mainline values, and ramp truck and bus percentages should be based on minor/crossing street values, unless specific information is available.

If V_{12} or VR_{12} exceed the available capacity indicated, but the other capacity checks are under capacity, the computed density and LOS A-E applies. If other or multiple capacity checks are over capacity, LOS F results and any density values should not be indicated in the results.

If a ramp section exceeds two lanes, assumptions for the analysis volume of the two inside ramp lanes should be documented.

For circumstances where HCS Ramp and Ramp Junction analysis cannot be performed, ramp operations should be evaluated based on volume-to-capacity ratios.

Multilane Highways

This methodology does not address highways that have one of the following categories: Signal spacing of 2.0 miles or less, significant presence of on-street parking, heavily used bus stops, or significant pedestrian activity. Facilities falling under one or more of these categories may be analyzed and evaluated with the methodology of Urban Streets (Synchro Arterials or HCS Arterials).

If the access point density is known, only access points that influence traffic flow should be included; access points unnoticed by the driver or with little activity should not be included. If no information is available for access points per mile use the following table. If there is potential for a rural section to become suburban by the design year, use the appropriate suburban value. This includes right-side only access points. For a one-way roadway it is appropriate to include intersections and driveways on both sides of the roadway. Existing and proposed driveways and intersections may be used where known for specific conditions.

Section Description	Density (access points per mile)
Rural	8
Low Density Suburban	16
High Density Suburban	25

Two-lane Highways

This methodology does not address two-lane highways with signalized intersections. Two-lane highways in urban and suburban areas with multiple signalized intersections

at spacings of 2.0 miles or less can be evaluated with the methodology of Urban Streets (HCS Arterials or Synchro Arterials).

Class I highways are primary US/NC highways, primary arterials, or daily commuter routes that serve long-distance trips where mobility is critical. Class II highways are access routes to Class I highways, local roads, or scenic routes that serve relatively short trips where mobility is less critical. Use caution when analyzing Class I highways with low speed limits as low levels of service may result solely based on lower travel speeds.

Enter 100% no passing zones unless the presence of passing zones is known.

Sidra

Sidra roundabout analysis submittals should include the Movement Summary table in addition to the digital data file. A flow scale estimate should be used to project the failure year of a roundabout.

Links

Congestion Management Section
https://connect.ncdot.gov/resources/safety/Pages/Congestion-Management.aspx

Municipal and School Transportation Assistance Section
https://connect.ncdot.gov/municipalities/School/Pages/default.aspx

Strategic Highway Corridors
https://connect.ncdot.gov/projects/planning/pages/NCTransportationNetwork.aspx

TIP Projects
https://connect.ncdot.gov/projects/planning/Pages/default.aspx

Traffic Volume Maps (AADT)
http://www.ncdot.gov/travel/statemapping/trafficvolumemaps/default.html

Comprehensive Transportation Plans
https://connect.ncdot.gov/projects/planning/pages/comprehensive-transportation-plans.aspx

Please note that links may change.