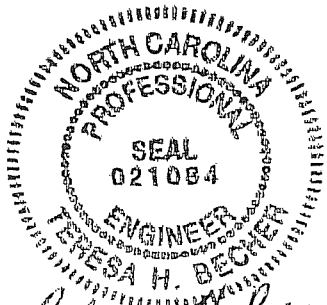
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

February 8, 2005

In reply, refer to
File No. SC-2004-084



Teresa H. Becher
2/8/05

MEMORANDUM

TO: J. L. Picklesimer, P.E., District Engineer
Division 8, District 1

FROM: Teresa H. Becher, P.E., Access Management Engineer
Congestion Management Section

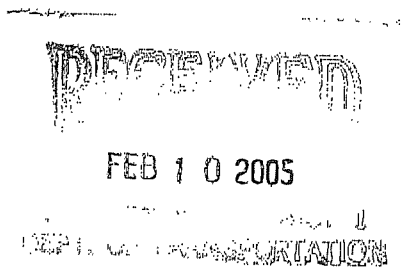
SUBJECT: Proposed Briar Chapel Development on US 15-501 at SR 1532 (Manns Chapel Rd.) and SR 1526/1528 (Andrews Store Rd.) in Chatham County.

Per your request, the Access Management Group of the Traffic Engineering and Safety Systems Branch has completed a review of the subject site. Based on our analysis of the preliminary site plan prepared by John R. McAdams Company, Inc., the Traffic Impact Analysis (TIA) prepared by Kimley-Horn and Associates, Inc. (sealed and dated 6/14/2004) and the TIA Addendum (sealed and dated 9/27/2004), with consideration given to its impacts on the adjacent transportation facilities, we offer the following comments and recommendations for your consideration.

Proposed Development

According to the TIA, the proposed Briar Chapel Development is to be located west of US 15-501 between SR 1532 (Manns Chapel Rd.) and SR 1526/1528 (Andrews Store Rd.). The TIA states the development is to be constructed by 2014 and is to consist of the following:

- 1,877 Single family detached dwelling units
- 432 Residential condominiums/townhouses
- 80 Apartment units
- 270,000 square feet of General office space
- 200,000 square feet of Shopping center
- 52,000 square feet of Specialty retail
- 400 student Charter school
- 900 student Public school
- 141 acre County park



MAILING ADDRESS:
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
1592 MAIL SERVICE CENTER
RALEIGH NC 27699-1592

TELEPHONE: 919-250-4151
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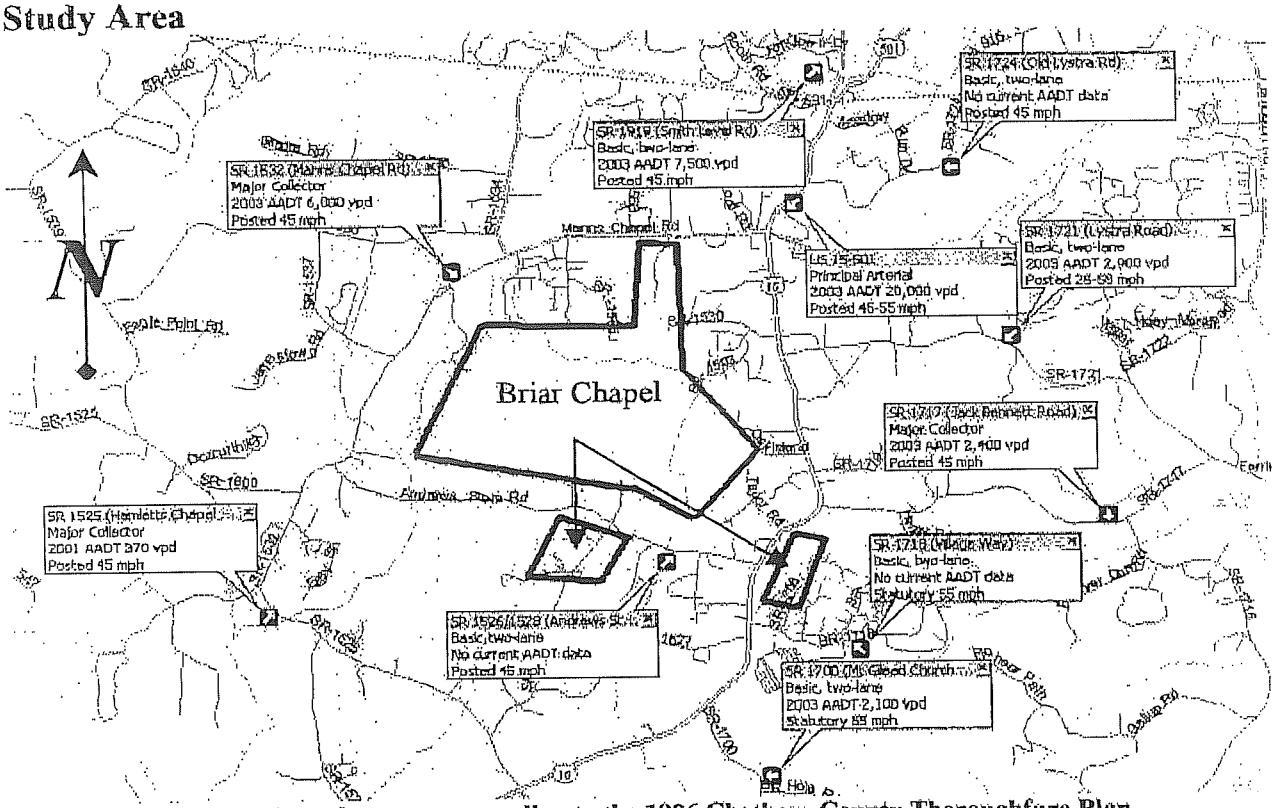
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
1020 BIRCH RIDGE DR.
RALEIGH NC 27610

Access to the development is proposed via two (2) full movement driveways on Andrews Store Road, one (1) full movement driveway on Manns Chapel Road, and three (3) full movement driveways on US 15-501.

Study Area



Note: Route classifications shown are according to the 1996 Chatham County Thoroughfare Plan.

TIP Projects

According to the North Carolina Department of Transportation (NCDOT) *Transportation Improvement Program* (TIP), there is one (1) active TIP project located in the vicinity of the proposed development.

- R-942 proposes to widen US 15-501 to a multi-lane divided roadway from the proposed Pittsboro Bypass (R-2219) north to the Chapel Hill Bypass. This project was let in December 2000 and is expected to be completed in June 2005

Trip Generation

Based on appropriate methodology outlined in the *ITE Trip Generation Manual, (7th Edition)* and the Municipal and School Transportation Assistance (MSTA) School Calculator, the proposed development is projected to generate approximately **41,357** vehicle trips per day. The following table provides the expected unadjusted peak hour volumes during a typical weekday:

Peak Hour	IN	OUT
AM	1,649	1,904
PM	2,309	2,094

Observations/Recommendations

In order to accommodate the site-generated traffic safely and efficiently, while also attempting to protect the functional integrity and operational capacity of the adjacent roadway facilities, we offer the following comments and recommendations for your consideration.

It should be noted that the proposed development includes two (2) proposed schools. NCDOT's Municipal and School Transportation Assistance (MSTA) Group of the Traffic Engineering and Safety Systems Branch should be contacted to provide comments and recommendations concerning the internal traffic circulation pattern of the school.

General TIA Comments

- For proposed signalized intersection analysis, where protected left-turn treatment is warranted, to ensure adequate storage is provided we recommend analyzing left-turn movements as protected only, not protected/permitted.

- Inaccurate signal phasing for intersections along US 15-501. We have concerns related to Dallas phasings coded into the Synchro network.

- In the future, we recommend using 7.0 seconds yellow/all red time (5.0 seconds yellow plus 2.0 seconds all red) to more accurately reflect field conditions.

- For mainline approaches at signalized intersections, we recommend using the following minimum initial green times: for 35 mph or less, use 10 seconds; for 36-45 mph use 12 seconds, for 46 mph or higher use 14 seconds. For side street approaches, a minimum initial green time of 7.0 seconds is recommended.

- The report states that Level-of-Service (LOS) D was assumed to be the minimum standard for operations. However, it should be noted that even if an intersection operates at LOS D overall, it is not acceptable to have a major movement operating at LOS E or LOS F. A single movement experiencing extensive queuing can cause back-ups extending to adjacent intersections. Review the analysis for such cases to account for potential queuing and recommend appropriate improvements.

- In the future, please provide recommended storage lengths for all exclusive turn-lanes.

- We have some concerns with the cycle lengths utilized in the signalized capacity analysis. We generally use a 60 second minimum cycle length for two-phase signals, a 90 second minimum cycle length for three-phase signals, a 110 second minimum cycle length for four- or five-phase signals, and a 140 second minimum cycle length for six- or eight-phase signals.

- Right turns on red were used in the analysis. As a standard, we do not analyze right turns on red at any proposed intersection approaches to ensure adequate storage is provided.

- We have some concerns with the distribution percentages provided and the assignment of site trips based on the submitted trip distribution figures submitted with the TIA.

- Existing and proposed traffic volumes do not consistently balance in the TIA.

- Unfortunately, no analysis was provided in the TIA for the intersection of SR 1534 (Poythress Road) and SR 1939 (Damascus Church Road). As a result, we are unable to make specific geometric recommendation about these intersections at this time.

- Please provide a queue analysis and recommended storage lane lengths for all exclusive turn lanes. Synchro queue analysis or calculation based on the Red Time Formula (unless permitted left-turn phasing is allowed) is acceptable only if the intersection is operating below capacity.

- A SimTraffic "Queuing and Blocking Report" would be helpful to quantify overall queuing through the network of signals.

Future needs for US 15-501
Due to traffic volumes associated with this development, currently approved developments, and future developments along US 15-501, there may be a need for further widening along US 15-501 to increase capacity near the Orange County/Chatham County line. The need for future widening may not be the direct responsibility of a sole development, rather it is mostly attributable to the collective growth of this region. Without further widening of US 15-501 in northern Chatham County, queuing and delays may increase, compromising safety and leading to decreases in LOS along US 15-501.

US 15-501 and SR 1919 (Smith Level Road) Intersection
Due to the anticipated impacts that the additional traffic volumes associated with this development will have on the adjacent traffic facilities and with various other geometric improvements that may occur, this intersection may require signal modifications to accommodate this additional traffic volume.

Eastbound (Smith Level Road)

- We recommend extending the existing storage length for the outside right-turn lane to 500 feet (minimum) of full storage and appropriate deceleration taper.

US 15-501 and SR 1724 (Old Lystra Road) Intersection
Due to the anticipated impacts that the additional traffic volumes associated with this development will have on the adjacent traffic facilities and with various other geometric improvements that may occur, this intersection may require signal modifications to accommodate this additional traffic volume.

US 15-501 and SR 1532 (Manns Chapel Road) Intersection
We recommend providing one (1) additional northbound and southbound through lane along US 15-501 at this intersection. The additional through lanes should commence a minimum of 1,000 feet prior to Manns Chapel Road and terminate a minimum of 1,200 feet beyond Manns Chapel Road.

Due to the anticipated impacts that the additional traffic volumes associated with this development will have on the adjacent traffic facilities and with various other geometric improvements that may occur, this intersection may require signal modifications to accommodate this additional traffic volume.

Eastbound (Manns Chapel Road)

- We recommend providing triple left-turn lanes with a minimum of 350 feet of full storage and appropriate transitional taper.
- We recommend extending the storage length for the exclusive right-turn lane to 200 feet (minimum) of full storage and appropriate deceleration taper.

Northbound (US 15-501)

- To accommodate the anticipated site-generated traffic volumes on this approach, we recommend providing dual left-turn lanes by constructing an additional left-turn lane. The full storage length should be equal to the storage provided by the TIP.
- Due to the additional left-turn lane for this approach, dual receiving lanes are necessary on the eastbound approach. We recommend providing 1,200 of receiving lane on the eastbound approach leg.
- We recommend maintaining an exclusive right-turn lane as provided by TIP Project R-942B.

Southbound (US 15-501)

- To accommodate the anticipated site-generated traffic volumes on this approach, we recommend providing dual left-turn lanes by constructing an additional left-turn lane. The full storage length should be equal to the storage provided by the TIP.

US 15-501 and SR 1721 (Lystra Road) Intersection

Due to the anticipated impacts that the additional traffic volumes associated with this development will have on the adjacent traffic facilities and with various other geometric improvements that may occur, this intersection may require signal modifications to accommodate this additional traffic volume.

US 15-501 and SR 1719 (Vickers Road)/Herbert Herndon Road (Proposed East Access Road) Intersection

Due to the anticipated impacts that the additional site-generated traffic is to have on this intersection, this intersection may require signal implementation to accommodate this additional volume.

Eastbound (East Access Road)

- We recommend providing a three (3) lane cross-section consisting of one (1) ingress and two (2) egress lanes with 200 feet (minimum) of internal protected storage before crossing maneuvers and parking should be allowed. The egress lanes should consist of an exclusive left-turn lane and a combination through/right-turn lane.

Southbound (US 15-501)

- We recommend extending the storage length for the exclusive right-turn lane to 150 feet (minimum) of full storage and appropriate deceleration taper.

US 15-501 and SR 1717 (Jack Bennett Road) Intersection

Westbound (Jack Bennett Road)

- To accommodate the anticipated site-generated traffic volumes on this approach, we recommend providing dual left-turn lanes by constructing an additional left-turn lane. The full storage length should be equal to the storage provided by the TIP.

US 15-501 and SR 1529 (Taylor Road)/Proposed North Commercial Entrance Intersection

Due to the anticipated impacts that the additional site-generated traffic is to have on this intersection, this intersection may require signal implementation to accommodate this additional volume.

Eastbound (Taylor Road)

- We concur with the TIA recommendation of providing dual left-turn lanes; however, we recommend providing a minimum of 300 feet of storage and appropriate transitional taper.
- We recommend providing an exclusive right-turn lane with 300 feet (minimum) of full storage and appropriate deceleration taper.
- We recommend providing a concrete, monolithic island westward along Taylor Road for a minimum of 300 feet to provide protected storage.

Westbound (North Commercial Entrance)

- We concur with the TIA recommendation of providing a three (3) lane cross-section consisting of one (1) ingress and two (2) egress lanes; however, we recommend providing 150 feet (minimum) of internal protected storage before crossing maneuvers and parking should be allowed. The egress lanes should consist of an exclusive left-turn lane and a combination through/right-turn lane.

Northbound (US 15-501)

- To accommodate the anticipated site-generated traffic volumes on this approach, we recommend providing dual left-turn lanes by constructing an additional left-turn lane. The full storage length should be equal to the storage provided by the TIP.
- Due to the additional left-turn lane for this approach, dual receiving lanes are necessary on the eastbound approach. We recommend providing 1,200 of receiving lane on the eastbound approach leg.
- We concur with the TIA addendum recommendation of providing an exclusive right-turn lane with 100 feet (minimum) of full storage and appropriate deceleration taper.

US 15-501 and SR 1526/1528 (Andrews Store Road)/South Commercial Entrance Intersection

Due to the anticipated impacts that the additional site-generated traffic is to have on this intersection, this intersection may require signal implementation to accommodate this additional volume.

Eastbound (Andrews Store Road)

- We recommend providing dual left-turn lanes with a minimum of 300 feet of storage and appropriate transitional taper.
- We recommend providing an exclusive right-turn lane with 300 feet (minimum) of full storage and appropriate deceleration taper.

Westbound (South Commercial Entrance)

- We concur with the TIA recommendation of providing a three (3) lane cross-section consisting of one (1) ingress and two (2) egress lanes; however, we recommend providing 200 feet (minimum) of internal protected storage before crossing maneuvers and parking should be allowed. The egress lanes should consist of an exclusive left-turn lane and a combination through/right-turn lane.

Northbound (US 15-501)

- To accommodate the anticipated site-generated traffic volumes on this approach, we recommend providing dual left-turn lanes by constructing an additional left-turn lane. The full storage length should be equal to the storage provided by the TIP.
- Due to the additional left-turn lane for this approach, dual receiving lanes are necessary on the eastbound approach. We recommend providing 1,200 of receiving lane on the eastbound approach leg.
- We concur with the TIA addendum recommendation of providing an exclusive right-turn lane with 100 feet (minimum) of full storage and appropriate deceleration taper.

US 15-501 and SR 1718 (Village Way)/SR 1527 (Morris Road) Intersection

Due to the anticipated impacts that the additional traffic volumes associated with this development will have on the adjacent traffic facilities and with various other geometric improvements that may occur, this intersection may require signal modifications to accommodate this additional traffic volume.

Westbound (Village Way)

- We recommend restriping the approach lanes to accommodate an exclusive right-turn lane and a combination through/left-turn lane. This configuration may require a realignment of this approach to align the through/left-turn lane with the opposing receiving lane on Morris Road.

US 15-501 and SR 1700 (Mount Gilead Church Road) Intersection

Based on the anticipated traffic volumes, it appears that this intersection may meet signal warrants during or at full build out of the site; therefore, this intersection should be monitored for signalization.

SR 1532 (Manns Chapel Road) and Proposed North Access Road Intersection

Due to the anticipated impacts that the additional site-generated traffic is to have on this intersection, this intersection may require signal implementation to accommodate this additional volume.

Eastbound (Manns Chapel Road)

- We recommend providing an exclusive right-turn lane with 150 feet (minimum) of full storage and appropriate deceleration taper.

Westbound (Manns Chapel Road)

- We recommend providing dual left-turn lanes with a minimum of 250 feet of storage and appropriate transitional taper.

Northbound (North Access Road)

- We recommend providing a four (4) lane cross-section consisting of two (2) ingress and two (2) egress lanes with 300 feet (minimum) of internal protected storage before crossing maneuvers and parking should be allowed. The egress lanes should consist of a combination through/left-turn lane and an exclusive right-turn lane.

SR 1526/1528 (Andrews Store Road) and Proposed South Access Road Intersection

Based on the anticipated traffic volumes, it appears that this intersection may meet signal warrants during or at full build out of the site; therefore, this intersection should be monitored for signalization.

Eastbound (Andrews Store Road)

- We concur with the TIA recommendation of providing an exclusive left-turn lane; however, we recommend providing 125 feet (minimum) of full storage and appropriate transitional taper.

Westbound (Andrews Store Road)

- Due to the addition of an opposing left-turn lane on the eastbound approach and in an effort to provide sufficient site distances for the eastbound left-turn vehicles, we recommend providing an exclusive left-turn lane with 100 feet (minimum) of full storage and appropriate transitional taper.
- We recommend providing an exclusive right-turn lane with 150 feet (minimum) of full storage and appropriate deceleration taper.

Southbound (South Access Road)

- We concur with the TIA recommendation of providing a three (3) lane cross-section consisting of one (1) ingress and two (2) egress lanes; however, we recommend providing 200 feet (minimum) of internal protected storage before crossing maneuvers and parking should be allowed. The egress lanes should consist of an exclusive left-turn lane and a combination through/right-turn lane.

SR 1526/1528 (Andrews Store Road) and Proposed Second South Access Road Intersection

Eastbound (Andrews Store Road)

- We concur with the TIA recommendation of providing an exclusive left-turn lane; however, we recommend providing 100 feet (minimum) of full storage and appropriate transitional taper.

Westbound (Andrews Store Road)

- We concur with the TIA recommendation of providing an exclusive right-turn lane; however, we recommend providing 100 feet (minimum) of full storage and appropriate deceleration taper.

Southbound (Second South Access Road)

- We concur with the TIA recommendation of providing a three (3) lane cross-section consisting of one (1) ingress and two (2) egress lanes; however, we recommend providing 200 feet (minimum) of internal protected storage before crossing maneuvers and parking should be allowed. The egress lanes should consist of an exclusive left-turn lane and an exclusive right-turn lane.

SR 1526/1528 (Andrews Store Road) and SR 1532 (Manns Chapel Road) Intersection

Westbound (Andrews Store Road)

- We recommend providing an exclusive right-turn lane with 100 feet (minimum) of full storage and appropriate deceleration taper.

Northbound (Manns Chapel Road)

- We concur with the TIA recommendation to extend the exclusive right-turn lane storage to provide 150 feet of full storage and appropriate deceleration taper.

SR 1525 (Hamletts Chapel Road) and SR 1532 (Manns Chapel Road)/SR 1532 (River Forest Road) Intersection

The TIA recommends converting traffic control for this intersection to four-way stop control upon the completion of the approved development in the area. Final signing plans should be submitted to the Division Traffic Engineer for approval prior to the installation of any signs.

Southbound (Manns Chapel Road)

- We recommend providing an exclusive right-turn lane with 125 feet (minimum) of full storage and appropriate deceleration taper.

SR 1532 (Manns Chapel Road) and SR 1534 (Poythress Road) Intersection

No future improvements are necessary at this intersection at this time to mitigate site-generated traffic.

SR 1942 (Jones Ferry Road) and SR 1940 (Damascus Church Road) Intersection

No future improvements are necessary at this intersection at this time to mitigate site-generated traffic.

SR 1721 (Lystra Road) and SR 1717 (Jack Bennett Road) Intersection

Based on the anticipated traffic volumes, it appears that this intersection may meet signal warrants during or at full build out of the site; therefore, this intersection should be monitored for signalization.

Northbound (Jack Bennett Road)

- We recommend providing an exclusive right-turn lane with 100 feet (minimum) of full storage and appropriate deceleration taper.

SR 1721 (Lystra Road) and SR 1008 (Farrington Road) Intersection

Due to the anticipated impacts that the additional traffic volumes associated with this development will have on the adjacent traffic facilities and with various other geometric improvements that may occur, this intersection may require signal modifications to accommodate this additional traffic volume.

Eastbound (Lystra Road)

- We recommend extending the existing storage length for the exclusive left-turn lane to 200 feet (minimum) of full storage and appropriate transitional taper.

Southbound (Farrington Road)

- We recommend providing an exclusive right-turn lane with 200 feet (minimum) of full storage and appropriate deceleration taper.

General

Cross-access to adjacent properties is strongly encouraged to reduce repetitive trips and provide future alternative routes of ingress/egress.

Due to, but not limited to, the comments and recommendations from this review of the proposed development, changes in the internal circulation may be necessary to ensure that driver confusion is minimized to the maximum extent possible.

Any signal revisions, modifications, or additions necessitated by the development should be coordinated with the Regional Traffic Engineer, the Division Traffic Engineer, and the Signals and Geometrics Section.

Any pavement marking revisions/modifications necessitated by the development should be the responsibility of the developer and coordinated with the Division Traffic Engineer.

Any roadway modifications or improvements necessitated by the development should be the responsibility of the developer unless otherwise noted.

Reference should also be made to the information included in the "General Recommendations Attachment."

Once the driveway permit has been approved and issued, a copy of the final driveway permit requirements should be forwarded to this office. If we can provide further assistance, please contact me or David H. Spencer at (919) 250-4151.

THB:dhs

cc: C. S. Houser, P.E. (Attention: D. Scheffel)
T. Johnson, P.E. (Attention: W. C. Garner, P.E.)
T. M. Hopkins, P.E. (Attention: A. D. Wyatt, P.E.)
A. L. Grandy
G. A. Fuller, P.E. (Attention: R. E. Mullinax, P.E.)
L. L. Cove, P.E. (Attention: J. H. Dunlop, P.E.)
N. K. Phillips, P.E.

GENERAL RECOMMENDATIONS ATTACHMENT

(For SC-2004-084 / Briar Chapel--Large Mixed Use Development)

Adequate horizontal and vertical sight distances should be reserved at all proposed entrances. Foliage that interferes with sight distance should be cut back to protect lines of sight. The District Engineer should determine if all drainage facilities are adequate. Curb cuts and curb ramps should be constructed in conformance with the Guidelines for Curb Cuts and Curb Ramps for Handicapped Persons, if applicable.

The developer may be required to obtain an approved encroachment agreement covering proposed work within the state right-of-way. If this is the case, the encroachment should be cross-referenced to this review.

All street and driveway entrances onto state system roadways should be controlled with appropriate traffic control devices, including but not limited to, stop, yield, directional, regulatory, and advisory signs and pavement markings. All traffic control devices shall conform to the requirements set forth in the Manual on Uniform Traffic Control Devices. Final pavement marking and signing plans should be submitted to the Division Traffic Engineer for approval prior to the installation of any signs and/or pavement markings.

Unless otherwise noted, a recommended width of 40 feet (curb face to curb face) should be used at each drive. It is also recommended that 40 foot (minimum) radii should be used at each drive to accommodate any service type vehicles or truck traffic that may visit the site.

If the developer anticipates adding or petitioning for addition to the state system, all roads/streets should be designed and constructed in conformance with the current North Carolina Department of Transportation design and construction guidelines.

All "outparcels" or "excluded areas" should be served internally with no additional access onto abutting roadways. The developer should convey this condition in any lease or sell agreements.

As required by the *"Policy on Street and Driveway Access to North Carolina Highways,"* dated July 2003, the applicant is responsible for identifying all right-of-way and/or control-of-access limits and for including this information on all submittals. Failure to accurately disclose R/W and C/A limits could result in the denial or closure of access points.

Adequate Right-Of-Way for widening and Sight Distance triangles should be reserved. Consideration should be given to the possible future need for signalization and the associated span poles, controller and pad, and guy wires at the intersections along US 15-501, Manns Chapel Road, and Andrews Store Road.

Any additional development, either within this site or adjacent to this site, that intends on using this development's access will require an updated driveway permit and re-evaluation of geometric and traffic control needs.

GENERAL RECOMMENDATIONS ATTACHMENT

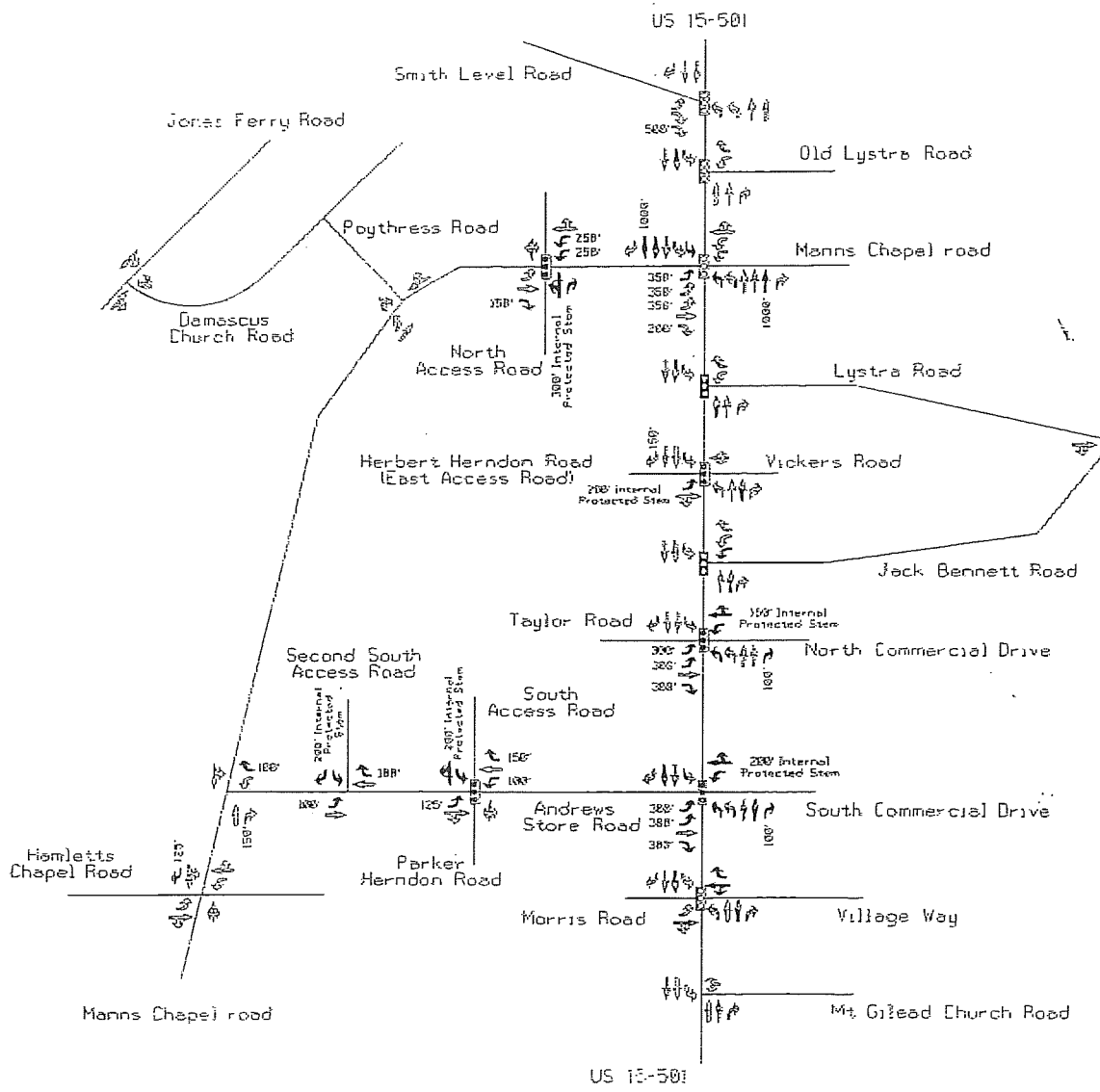
(For SC-2004-084 / Briar Chapel--Large Mixed Use Development; continued)

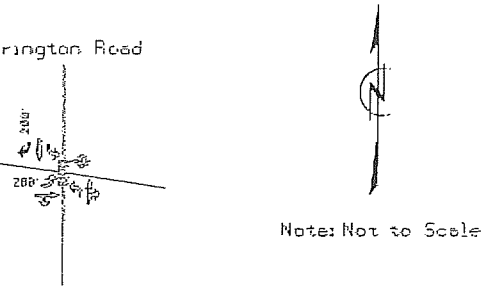
All widening should include appropriate transitional and deceleration tapers. Recommended turn lane and transitional treatments are shown on pages 78 and 79 of the "*Policy on Street and Driveway Access to North Carolina Highways,*" dated July 2003.

Where possible, opposite side driveways should be aligned to prevent the operational and safety problems caused by offset driveways.

This development's formal access request should be coordinated with the ongoing TIP Project R-942. Roadway Design should be advised of any approvals and associated geometric revisions associated with this development. Right-of-way that is identified as necessary to accommodate R-942 should be dedicated.

Recommended Lanes and Storage Lengths for Briar Chapel





Note: Not to Scale

Existing Lane

Lane Provided by R-942

Recommended Lane

XXX' Recommended Storage Length

Existing Signal

Signal Provided by R-942

Recommended Signal