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MEMORANDUM

DATE: January 20, 2012

TO: Joe Mehaffey, P.E. (retired)
Citizen

FROM: Scott Ritchie, P.E., President, Roundabout Specialist
Roundabouts & Traffic Engineering (RTE)

SUBJECT: Cursory Review of Smith/Lumpkin SLR Citizen Analyses

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Thank you for taking the time to contact RTE and be a participating citizen in your local community's roundabout projects. Per your request, I have performed a very brief / cursory review of the materials you provided of the subject single lane roundabout at A.C. Smith Road/Lumpkin Campground (Hopewell Rd) in Forsyth County, GA. The intent of this phase of your inquiry is to briefly review the comments you provided to determine if your information is relatively accurate, if you are "on the right track" with your assessments, and provide additional roundabout information relative to your local project.

Please note RTE is not aware of the site constraints such as right-of-way availability, budget limits, required design vehicles, or traffic volumes at the subject intersection to accurately assess the roundabout's situation in its entirety. Without the proper design information and electronic design files to review, a substantiated assessment of the roundabout cannot be performed. However, general roundabout information and a few safety observations can be provided. It is understood RTE cannot redesign the roundabout without an adequate budget or information from the jurisdictions involved. Furthermore, it is not RTE's intent to degrade your assessment, the design team, or the jurisdictions involved in the project, rather to increase general roundabout awareness, public education, and assist in the implementation of properly designed roundabouts in the future.

With this letter report, RTE has prepared a brief list of comments regarding your comment analyses and the current roundabout with respect to general roundabout information and safety observations. RTE has identified a few major issues / deficiencies in the comments and apparent roundabout design parameters in this short technical memorandum to assist your initial efforts towards better roundabout guidance in your community in the future. A teleconference is encouraged to be set up at a later date to discuss any questions or comments with you and the jurisdictions involved.

Your "Examination of the Roundabout" information provided discusses three main categories: (1) general roundabout information and features, (2) comparisons of subject intersection to roundabout design guidelines and (3) proposed modifications to the subject roundabout. With respect to part (1), your information and comments are correct and derived from sound resources and personal experience. However, with respect to part (2), design guides are excellent resources for general guidance wherein they attempt to address common roundabout parameters at typical roundabout intersections. Although this information is extremely useful and often used as a basis of measurement, these guidelines do not apply well to complex sites, awkward constraints, skewed intersections, unique designs, or an expert in the field who can achieve proper roundabout design principles in unconventional ways. So long as safety can be maintained and the integrity of the roundabout design remains sound with good design principles, roundabout design parameters and guidelines may be adjusted for a specific site. Please read the ***Foreward*** section of the FHWA Roundabout Guide (2000) you reference as it clarifies the use of guidelines (versus standards) very clearly as not a rulebook. In addition, I encourage you to listen to the following short presentation on *Roundabout Design Guides in Practice* at the following link:

Rbt Guides 2008: http://teachamerica.com/RAB08/RAB08S4ARitchie/index.htm

With respect to your proposed modifications or part (3), there are numerous alternatives from slight modifications to complete redesign which can occur at a roundabout wherein mostly budgetary constraints dictate these implementations. In the case of this roundabout and its application, most of your analysis comments are sound wherein I would recommend redesign of the intersection for both capacity and safety purposes. The current design has enough potential safety issues to warrant restoration. However, some of your redesign suggestions are of high suspect without actually verifying the design parameters, speeds, and truck movements carefully. For example, although you may be correct the circulatory roadway is too narrow, simply cutting back the truck apron may increase fastest path speeds unsafely.

ALL roundabout designs, should be performed, assisted by, or at least reviewed by a qualified roundabout design specialist as it directly relates to public safety, intersection

capacity, and public acceptance of a roundabout. Even those roundabouts completed by local engineers who may have designed a few roundabout projects in the past should at least have design assistance or a peer review conducted by a recognized and qualified roundabout specialist to ensure proper design and implementation for not only general public safety, but also for the future use of roundabouts within the jurisdiction's area. Please listen to the following short presentation on the *Effectiveness of Roundabout Peer Review* at the link below:

Peer Review 2008: http://teachamerica.com/RAB08/RAB08S9BSanders/index.htm

GDOT has recently recognized the need and effectiveness of roundabout design experts and peer review and has commenced with the development of their guidelines and pre-approved list of qualified designers/reviewers to improve roundabout designs in the future.

With the above discussion provided and duly noted, below is a short list of comments on this project:

(1) Your discussion of the radii of the roundabout are appropriate. Tight entry and exit geometry are not only inappropriate for the operational safety of a roundabout, but also significantly reduce capacity and truck capabilities. Although the subject roundabout design does have a few excessively tight radii, it is actually the design method utilized (radial), the size of the roundabout, and the application of the geometry which creates the awkward operations. Admittedly, this roundabout has design flaws wherein it appears the designer's goal was to avoid any right-of-way impacts / takes whilst utilizing a "coffee can" placement to a roundabout design. This resulted in a poor holistic design (feels tight and uncomfortable), unsound application or misplaced design principles of the roundabout's geometry, and inadequate execution of the design layout.

Please listen to the *Thinking Through Roundabout Design* presentation made at the International Roundabout Conference in 2008 (link below) which discusses the balance between design guidelines and design principles as well as shows a number of examples to illustrate creative design solutions which function significantly better than a conventional roundabout:

Thinking 2008: http://teachamerica.com/RAB08/RAB08S3BRitchie/index.htm

(2) There are three basic design techniques to completing a generic roundabout layout (other advanced techniques or combinations thereof also exist) to establish self-enforcing geometry (slowing approaching vehicles) at a modern roundabout. These are (a) radial design, (b) offset left design, and (c) curvilinear design. The

subject roundabout is a radial design. Most roundabout specialists and roundabout savvy jurisdictions do not allow radial design methods as they have been proven to be less safe and create operational problems with existing roadway speeds higher than 35 mph. Radial designs do not encourage traffic to reduce speeds within the entry, can create abrupt or sudden speed changes with higher roadway speeds, and are typically reserved for low speed urban environments with extreme ROW constraints. Below 35 mph, radial designs or mini roundabouts in urban or suburban areas can function well if designed properly and at appropriate locations. Please refer to the presentation on *Mini Roundabouts* below as they definitely have their place in our engineering toolbox at intersections who qualify.

Minis 2011: http://teachamerica.com/RAB11/RAB1123Ritchie/player.html

(3) We (including you and your county commissioner) should not contend small roundabouts are unsafe as the facts, statistics, and proper applications of small roundabouts prove positive safety and capacity results. A well designed small roundabout (even smaller than guidelines suggest) can function very well with positive public acceptance, truck operations, and speeds if designed properly. Since your information states roadway speeds are posted at 50 mph, this presents a whole new category of design criteria wherein a radial design or a small roundabout without proper approach treatments are not good design practices (mostly for safety purposes) unless additional design treatments are applied. The Smith/Lumpkin roundabout is classified as a rural high speed roundabout wherein it does not have proper treatments for the speeds on the roadway or the unconventionally small size implemented. However, it could be corrected despite the desire for a small shape/size/diameter. Significant design considerations should have been taken into account for appropriate approach and circulating speeds (fastest path design speeds) to ensure operational safety. The current design clearly does not take into account the high speed approaches and does not promote safe entry design or appropriate design speeds (too slow). I refer you to the *High Speed Approaches at Roundabouts* publication at the following links) to address this primary issue with this project:

High Speed Approaches at Roundabouts:
2008: http://teachamerica.com/RAB08/RAB08S8BSanders/index.htm
2005: http://teachamerica.com/Roundabouts/RA052A_ppt_Ritchie.pdf
2004: http://teachamerica.com/Roundabouts/RA052A_ppr_Ritchie.pdf

(4) I agree the size / diameter of the roundabout does not fall within the recommended guidelines. If right-of-way (ROW) was not a constraint, a single lane roundabout diameter of 120 to 140 feet (inscribed circular diameter – ICD –

outermost circle size) would be the most appropriate. However, if a larger ICD was not possible such as ROW could not be taken, an entirely different solution would have been much more appropriate for this location while still effectively addressing the principles of a roundabout design. At the end of this document is an example of a project design sketch wherein the initial circular roundabout design was only capable of "fitting" about a 90-foot diameter circle (similar to this project). However, with a creative design solution, the elliptical design allows trucks and all design principles to be properly executed.

(5) As in most states, all roundabout designs should be required to have "proof of design" operational information which includes the six basic critical geometric design parameters (entry angle - PHI, diameter/size - D, entry widths - E, entry radii - R, flare lengths – L', and half widths of the roadway - V), fastest path design speeds based on a spiral / spline measurement, design vehicle / truck tracking capabilities, and sight distances. This information is most likely available to you and reviewable through the jurisdiction's public works department or the design team. If this primary and essential *proof of design* information was not submitted or conducted, it should be performed now to verify design operations and identify potential operational problems which may occur in the future. The process of roundabout designs is slightly different than that of a conventional signalized intersection. Please see the presentation below to better help you understand the process (*Defining the Stages of Roundabout Plan Detail*):

Design Stages: http://teachamerica.com/RAB08/RAB08S7CSanders/index.htm

(6) If a peer review had been performed on this design, comments would have been provided to address many of the design's issues described herein as well as the acute angle in the NE quadrant, the straight-in or abrupt entry designs, the unnecessary reverse curvature in the SE quadrant, verification of truck movements and truck apron size, deficient splitter island dimensions, and the like.

Conclusion:

As you may have observed in the provided presentations and example, roundabouts can be very flexible in their design and implementation (if the designer knows how). Most of the comments, comparisons, and analysis you provided are appropriate and should be discussed further with the design team. On the other hand, your comments about the insufficient size/diameter are worth noting when comparing to a typical roundabout or roundabout guidelines, but a proper solution and design can still be achieved while not adhering to guidelines or typical practices (again, if you know what you're doing in roundabout design). Unfortunately, the design you provided would

significantly benefit from substantial improvements to create more comfortable operations (public rejection is inevitable and obvious to occur in the future), more appropriate entry speeds (approaches are very abrupt/sudden to the driver), better address the skewed angle/roadway, and allow for what appears to me to be unacceptable truck accommodations and critical design parameters. With respect to roundabout approach speeds, most roundabout benefits can be achieved with approximately a 25 mph speed within entry (circulating speeds depend on diameter/shape of roundabout). Extremely fast approaches (≥30mph) or excessively slow (≤20mph as it appears in this case) are dangerous and unacceptable roundabout designs especially in a high speed classification/environment (locations ≥45mph). In addition, if the six basic geometric parameters were measured, I'm confident most will not fall within acceptable safety ranges (such as the entry angle phi being much too obtuse and some entry radii much too small). I applaud the designer's efforts to fit such a small circle at this location, but I unfortunately believe this was not the right solution or a safe execution of roundabout design principles. If possible, a more thorough review of the design materials and constraints would be appropriate.

Example of small SLR with an elliptical shape designed to fit within ROW constraints where a circular roundabout would not function well for proper speed control or large truck movements (N and E legs designated local truck route).

(Note: Animated image below is rotated)