



HISTORIC
FRANKLIN
TENNESSEE

ITEM #16
WRK S 01/12/10

MEMORANDUM

December 29, 2009

TO: Board of Mayor and Aldermen

FROM: David Parker, City Engineer/CIP Executive
Eric Stuckey, City Administrator

SUBJECT: **Goose Creek Bypass/I-65 Interchange
Single Point Urban Interchange (SPUI)**

Purpose

The purpose of this memorandum is to provide the Board of Mayor and Aldermen (BOMA) with information regarding options for interchange design at the Goose Creek Bypass and I-65.

Background

At the last (December 10, 2009) Capital Investment (CIP) Committee meeting there was a discussion concerning the City continuing with the Agreement (PIN No. 111070.00, dated October 24, 2008) with the Tennessee Department of Transportation (TDOT) for funding of the proposed single point urban interchange (SPUI). Through this memo we will provide some additional information to assist you in your discussions and consideration of continuing with the City's proposed funding of a portion of the construction cost of the Goose Creek Bypass/I-65 Interchange Modifications/Improvements.

The City of Franklin entered into the Agreement (PIN No. 111070.00) to fund \$4,800,000 of the construction cost of the proposed SPUI. The City did this because TDOT was planning to construct the interchange as an urban diamond (generally referred to as a Tight Urban Diamond Interchange, or TUDI) and the City wanted the interchange constructed as a SPUI. The \$4.8 million is the construction cost difference in the two types of interchanges. All design to this point for the interchange project has been done based on this Agreement, or for the construction to be a SPUI.

The main question being asked concerning Franklin's expenditure of \$4.8 million towards the construction of a SPUI versus a TUDI is; "What benefit does Franklin gain from this expenditure?" At the time the City entered into the Agreement with TDOT, the answer to this question was simply that a SPUI would provide greater traffic capacity in a safer manner. The analogy was that the City did not want to create another SR 96 (Murfreesboro Road) Interchange, typical TUDI, with its congestion and safety issues.

What we are attempting to do with this memo is provide answers to questions such as: "What is the percentage increase of capacity of a SPUI versus a TUDI?" and "What are the safety advantages that are talked about?" In order to answer these questions we have conducted a literature (reports and studies) review of the two types of interchanges and offer the following for your consideration.

Traffic Capacity

The following are recommendations/comments from a Research Development and Technology report for the Missouri Department of Transportation (MoDOT) and a report from Applied Technology and



Traffic Analysis Program (ATTAP). The MoDOT report was formulated after reviewing questions sent out via the AASHTO Research Advisory Committee listserve with fourteen states responding.

1. When the crossroad volume is between 15,000 and 30,000 AADT (Average Annual Daily Traffic), SPUIs are a superior option to Diamond interchanges. SPUIs are considered to have more capacity than Diamond interchanges. So SPUIs are usually used in high volume conditions. When Volumes are between 20,000 and 35,000 AADT for major roads, a SPUI should be used instead of a Diamond Interchange.

Based on the traffic counts and projections for use in the Major Thoroughfare Plan Update using the Metropolitan Planning Organization's (MPO) traffic model, the 2008 AADT for the Goose Creek Bypass (crossroad) is 12,215 (count station is west of I-65) with the projected 2035 AADT at 18,602. This 2035 projected AADT exceeds the volume stated as when a SPUI is a superior option and we feel that this projection is low. The reason we feel the projection is low is because it doesn't appear that the Berry Farms Development approved concept plan(s) have been taken into account in predicting population and employment numbers for the various Traffic Analysis Zones (TAZs) that cover this development. For instance, the TAZ covering the Reams-Fleming Section of the Berry Farms Development lists a population of zero (0) and employment of zero (0) when the approved concept plan indicates 400 residential units and 2,212,700 SF of commercial/office. We have forwarded this information to our consultant doing the Major Thoroughfare Plan Update for correction in the model. Just as the TAZ for the Reams-Fleming area appears to need correction, the other two TAZs covering the remaining sections of the Berry Farms Development need to be corrected and these corrections will indicate an increase in the predicted traffic to use the Goose Creek Interchange.

The major road (I-65) has a 2008 AADT count of 56,638 and a projected 2035 AADT of 121,474. The 2008 AADT count already exceeds the volume of traffic for the major roads stated above when a SPUI "should" be used.

2. It is easier to coordinate the SPUI's one signal with other signalized intersections compared to the Diamond interchanges's two signals. Thus the SPUI is preferred when arterial coordination is required. A typical SPUI has a three-phase signal verses a four-phase controller.

Upon completion of development in the Goose Creek Interchange area, there must be signal coordination along the Goose Creek Bypass/Peytonsville Road corridor. This corridor is listed as a major arterial in Franklin's Major Thoroughfare Plan. Between Lewisburg Pike and I-65, the Berry Farms Development has three (3) major access points approved on Goose Creek Bypass. If a TUDI was constructed, there would be a potential to have six (6) signalized intersections from Lewisburg Pike to I-65 (signal at Lewisburg and two at I-65 included) within a distance of approximately 0.9 miles. This compares to seven (7) signalized intersections on SR 96 (Murfreesboro Road) from Mack Hatcher Parkway to I-65, a distance of approximately 1.25 Miles.



3. Left-turn paths are flatter for a SPUI and can be made at higher speeds, thus increasing saturation flow rates and intersection capacity.

Safety

We have been unable to find any study indicating a major difference in the number of accidents with use of the two different types of interchanges (SPUI vs TUDI). From an ATTAP report we have found that SPUIs seem to have an increased number of side-swipe accidents compared to the TUDI, but a smaller number of angle accidents. Typically, angle accidents are more severe than side-swipe accidents, thus more injuries. In a SPUI design there is only one conflict point, as compared to the two for a TUDI.

From a study conducted through the Federal Highway Administration, Turner-Fairbank Highway Research Center, titled "Crash Comparison of Single Point and tight Diamond Interchanges" we have learned that, that the safety comparison did not reveal a significant difference between the two types of interchanges for total crash. However, the SPUIs were found to be safer than the comparable TUDI for injury and fatality frequencies.

The answer to the original question of what benefit does the City get from the construction of a SPUI, is reduced congestion, improved capacity and increased safety. It is impossible, however, to quantify the exact percentage of these benefits. Studies simply have not been accomplished that provides that data.

Financial Impact

The City has already agreed to fund \$4.8 million towards the construction of a SPUI at Goose Creek/I-65. According to TDOT staff this funding is not expected to be needed until FY 2014. This funding and timing was incorporated into the Board-approved Capital Investment Funding Plan.

If the City decides to not fund the increased cost of the SPUI (rescind, or terminate, the Agreement), then TDOT will fund the entire cost of the Goose Creek Interchange and it will be constructed as a TUDI. It is our understanding that there will be some delay in the project being ready for construction if TDOT has to change the design of the interchange from a SPUI to a TUDI. Also, in accordance with Section IX of the Agreement, the City is obligated to reimburse TDOT for any expenditure(s) they have or have obligated towards the project as a SPUI. We do not know the magnitude of expense incurred by TDOT to date on this design.

Options

1. Do nothing and continue with the approved Agreement (Pin No. 111070.00) with TDOT.
2. Rescind/terminate the Agreement (PIN No. 111070.00) with TDOT with the expectation to reimburse TDOT for costs to date. Reprogramming the \$4.8 million of approved capital investment funding.

Recommendation

From a technical traffic engineering standpoint, the review of literature concerning the differences between a SPUI and a TDUI indicates that for future circumstance (traffic volumes) the SPUI will better



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serve the citizens of Franklin. The policy question for the Board then appears to be: "Is this the best use of \$4.8 million to benefit the City and its citizens?" Board direction related to this expenditure relative to our various capital needs will be needed.



December 3, 2009

TO: Board of Mayor and Aldermen

FROM: Eric Stuckey, City Administrator - *ESS*
David Parker, City Engineer/CIP Executive

SUBJECT: **Professional Services Agreement with
Wilbur Smith Associates for
Goose Creek Area Sub Area Traffic Analysis
COF Contract No. 2009-0094**

Purpose

The purpose of this memorandum is to present information to the Board of Mayor and Aldermen (BOMA) to consider a professional services agreement with Wilbur Smith Associates for a traffic analysis of the Goose Creek area.

Background

As a part of the plans review for the proposed I-65 widening and the reconstruction of the I-65/Goose Creek Bypass Interchange it was discovered that there would potentially be some closures of the Interchange in order to complete the reconstruction. At this time it is not known the exact extent of any closures, but in order to be proactive staff has announced the possible required closures and need to investigate alternatives to provide some short and long term traffic mitigation for the anticipated problems that will result from any closures of this interchange. At the joint workshop of the Franklin Municipal Planning Commission (FMPC) and the Board of Mayor and Aldermen (BOMA) there was also mention of studying the area to seek some possible traffic mitigation during the reconstruction of the Interchange. Staff has, therefore, requested a proposal from Wilbur Smith Associates (WSA) for additional services to their Major Thoroughfare Plan Update Contract. The proposed work is as described in the attached letter (Scope of Services) from WSA. Staff is proposing to treat this work as a separate contract from the Major Thoroughfare Plan to facilitate better tracking of the two projects.

Should the I-65/Goose Creek Bypass Interchange be closed for even a short period of time to facilitate its reconstruction, there will be major traffic problems created in the southern portions of the City. The traffic that would normally use the Interchange would be diverted to the existing streets such as Lewisburg Pike (SR 106, US 431), Arno Road (County Road), and Columbia Avenue (SR 6, US 31) in order to travel north. This diversion will also affect several of the other streets, which is why the Scope of Services covers such a wide area. These streets are not adequate at the present time to handle this increase in traffic without major congestion. This inadequacy is evidenced during periods of traffic crashes on I-65 that create traffic backups and some of the traffic diverts to the other listed streets. In addition to creating traffic problems, the closure of the Interchange will create major obstacles of access to businesses, residences and event facilities (Ag Center) in the immediate area. The results of the analysis should provide some short term mitigation solutions for the times the Interchange would be closed as well as long term solutions for traffic mitigation in the general area.



Financial Impact

The cost for the work as proposed is a lump sum fee of \$52,500. This cost covers the Scope of Services as outlined in the WSA letter and appears to be appropriate for the amount of work required. Presently this cost is not included in any budgeted item and discussion will be needed on how the cost will be funded. Options for funding are;

1. Add this cost to the bond issue recently approved;
2. Amend the FY 2010 Budget to include this cost;
3. Add this project to the Small Projects group that is to be funded as approved in the Capital Funding Plan;
4. Budget the cost of the project in FY 2011 Budget;
5. Not do the project.

Recommendation

Staff recommends that this project be approved and carried forward with an amendment to the FY 2010 Budget to fund the cost. The reason for this recommendation is that if the project is to be done, then work on determining what mitigation can and should be done needs to start as soon as possible to allow ample time to actually implement any future approved traffic mitigation measures.

December 1, 2009

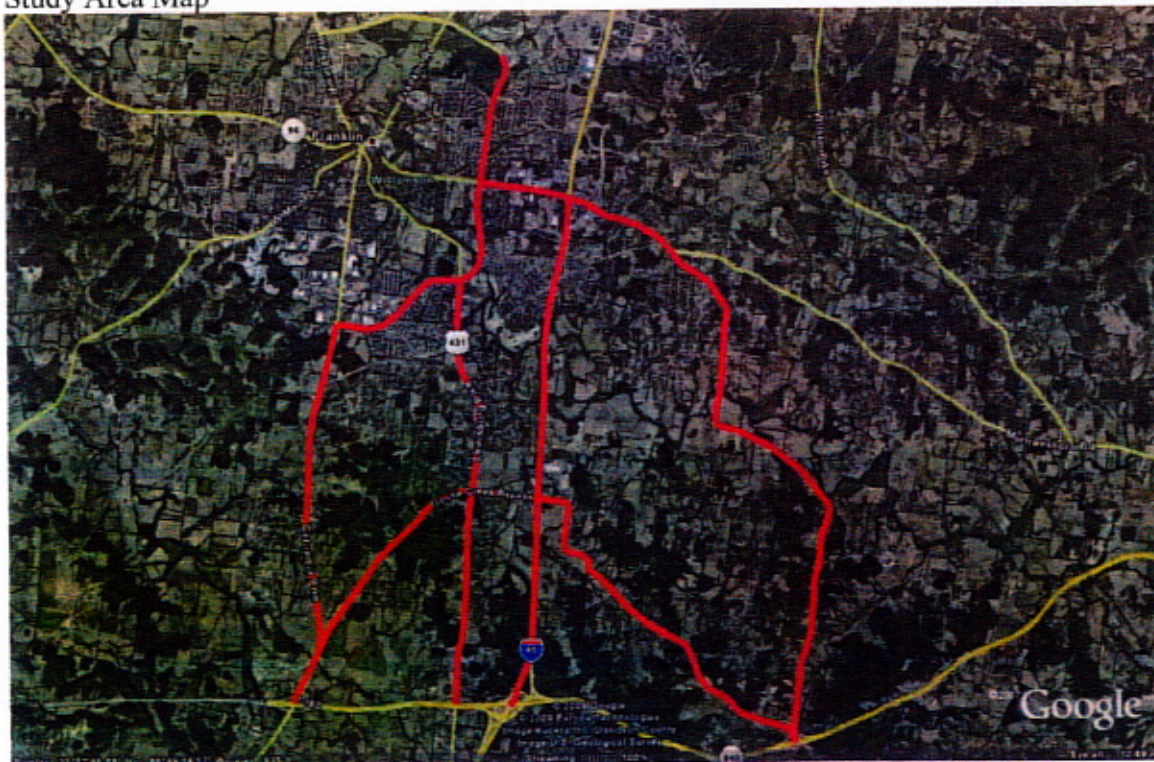
Mr. David Parker
City of Franklin
109 3rd Avenue South
P.O. Box 305
Franklin, TN 37065

Subject: City of Franklin Major Thoroughfare Plan Additional Services

Dear David,

In response to your request for a proposed scope of services and associated fee for additional services related to the Major Thoroughfare Plan and analysis of the Interstate 65 and Goose Creek Interchange widening and reconstruction project, below is a scope for conducting a sub area analysis of the potential traffic pattern changes when the above mentioned construction project takes place.

Study Area Map



Scope of Services

Utilizing the travel demand model developed for the ongoing Major Thoroughfare Plan and supplementing it with additional data collection and traffic engineering analysis, WSA proposes to determine the anticipated impacts to Interstate 65, U.S. 431/Lewisburg Pike, U.S. 31, Goose Creek Bypass, Peytonsville Road, State Route 96 interchange, Mack Hatcher Parkway, and Arno Road from State Route 840 to State Route 96.

Task 1: Sub Area Travel Demand Model

- a) Review the Travel Demand Model to determine refinements necessary for the sub area analysis. This would include traffic analysis zone refinement and potentially adding roads to the model network.
- b) Perform minor validation adjustments to the model within the study area including adjusting demographic data, adjusting centroid connector placements, and roadway attributes to improve traffic loading within the study area.
- c) Adjust the model to capture intersection volumes.
- d) Run the model to identify origin and destination patterns and capture turning movements for both the base year (2008) and a determined future year (likely 2014).
- e) Run the model with an improved transportation network that includes the improvements to the supporting roadway network to determine impacts to the sub area network.

Task 2: Traffic Engineering

- a) Obtain all available traffic count data from TDOT on I-65 and U.S. 431 from Mack Hatcher Parkway to SR 840, Mack Hatcher Parkway from U.S. 31 to Cool Springs Boulevard, U.S. 31 from Goose Creek Bypass to Mack Hatcher Parkway, Arno Road from Peytonsville-Trinity Road to State Route 96, State Route 96 from Mack Hatcher Parkway to Arno Road, and Peytonsville Road/Goose Creek Bypass.
- b) Gather field data including intersection geometry and traffic signal splits and offsets.

c) Augment existing data with manual turning movement counts at the existing interchanges and key intersections within the primary study area. It is assumed that all AM and PM peak hour interchange ramp and freeway link volumes are available from TDOT. Furthermore, it is assumed that all 15 at-grade intersections will need updated counts, and that a 7:00 to 9:00 AM and 4:00 to 6:00 PM timeframe will be adequate.

d) Develop a Synchro traffic network of the 15 principal at-grade intersections in the primary study area.

e) Conduct an AM and PM peak hour capacity analysis at all 15 principal at-grade intersections. Using the Highway Capacity Manual methodology and HCS software, merge, diverge, and weave analysis will be conducted for the AM and PM peak hours at the following interchanges:

- I-65 at State Route 96 / Murfreesboro Road
- I-65 at State Route 248 / Peytonsville Road
- SR 840 at Peytonsville Trinity Road
- SR 840 at U.S. 431 / Lewisburg Pike
- SR 840 at I-65 (only the key impacted ramps will be analyzed)

f) Using the travel demand model results, project future AM and PM peak hour traffic volumes with the I-65 and Goose Creek Bypass interchange closed. The projected peak hour volumes will be determined based on the current peak hour percentage. The TDM will generate ADT traffic on the study area road network, so the ADT will be converted to peak hour at the intersections.

g) Re-run the Synchro and interchange analysis with the projected future volumes assuming the interchange is closed.

h) Based on the LOS and capacity results of the Synchro analysis, identify poorly functioning intersections and roadways.

Task 3: Study Documentation and Recommendations

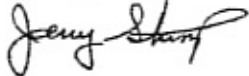
a) Develop short term mitigation for anticipated problems. This might include traffic signal timing and phasing, temporary turn lanes, or other temporary traffic control devices. We will also be mindful of potential permanent improvements that could mitigate short term traffic, but could also help with long term traffic needs.

b) Document the result of the study with a report that includes a summary of our results and recommendations.

c) Attend coordination meetings with the various agencies involved in the interchange reconstruction project (TDOT, Williamson County, City of Franklin, etc.) to discuss the findings and conclusions.

We propose to provide these additional services for a lump sum fee of \$52,500 through an amendment to our existing contract. If you have any questions or would like to discuss further, feel free to contact me.

Best regards,



Jerry Stump
Chief Operating Officer

c: Bob Polk, Brad Thompson