

SCOPING STUDY REPORT

US 31W at University Blvd. / Chestnut St.

Study of Proposed Intersection Improvements

Warren County, Kentucky

Item No.: 3-131.00

Prepared for:

**KENTUCKY TRANSPORTATION CABINET
DISTRICT #3**

Prepared by:



December 03, 2008



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1.0 INTRODUCTION

1.1 Background

This project is located on US 31W, at the intersections of University Boulevard and Chestnut Street, in Bowling Green, Kentucky (see *Attachment 1*). The Kentucky Transportation Cabinet (KYTC) retained Qk4, Inc. to conduct the engineering and analysis for this project through our Statewide Design Contract. A Project Scoping/Pre-Design Meeting was held on July 17, 2007 at the District 3 office in Bowling Green, which was followed by a site visit. Minutes of this meeting are included as *Attachment 2* and photographs of the study area are provided in *Attachment 3*.

1.2 Purpose and Methodology of the Study

The purpose of this study is to analyze the performance of these two intersections, compare different mechanisms for improvement (e.g. adding a right turn lane, relocating and/or signalizing Chestnut, roundabouts, pedestrian facilities, etc.) and to recommend a preferred configuration that optimizes performance while controlling costs. Qk4 performed traffic simulations and analysis utilizing VISSIM software. VISSIM is a microscopic simulation program for multi-modal traffic flow modeling.

2.0 EXISTING CONDITIONS

2.1 Existing Intersections

The existing intersections of US 31W at University Boulevard / Loving Way and US 31W at Chestnut Street are separated by approximately 400 feet. The former is a four-way signalized intersection and is located at the southern gateway and landmark sign for Western Kentucky University (WKU) and the latter is an un-signalized intersection just to the north.

2.2 Current and Future Traffic Volumes

The KYTC provided Qk4 with the traffic forecast and turning movements for these intersections. The Traffic Forecast Report, dated September 14, 2007 can be found in *Attachment 4*. The traffic data from this report was used in the development of the VISSIM simulation models.

3.0 CONSIDERED ALTERNATIVES

The following alternative improvement options were developed to address the deficiencies of the subject intersections. A two-phased alternative screening process was used. The first phase included the identification and analysis of a broad range of alternatives. The second phase included a more in depth analysis of a short list of alternatives.

3.1 Initial Alternatives

At the Project Scoping Meeting, KYTC staff indicated the key goals to be 1) improving the left-turn movement from Chestnut Street to US 31W, 2) reducing congestion at University Boulevard and US 31W, 3) the integration of pedestrian facilities and 4) identifying a cost effective recommendation. Qk4 focused this initial study on the following improvement concepts to help alleviate these issues:

- Existing Configuration (2007).
- No-Build (2027).
- Alternative 1 (2027) – Add exclusive right turn lane on US 31W SB to University WB and include an additional through lane on US 31W SB with a merge area south of the intersection with University.
- Alternative 2 (2027) – Relocate Chestnut approximately 300 feet to the north to gain more separation with the University intersection (Chestnut would remain un-signalized).
- Alternative 3 (2027) – Relocate Chestnut to the north (Chestnut would remain un-signalized) in addition to the improvements described in Alternative 1.
- Alternative 4 (2027) – Alternative 2 (Signalize the Chestnut and US 31W intersection and synchronize with the University intersection).
- Alternative 5 (2027) – Dual roundabouts at University and Chestnut.
- Alternative 6 (2027) – Single roundabout at Chestnut.

Once the conceptual designs and initial VISSIM simulations and analysis were complete, a Project Team Meeting was held on November 2, 2007 to screen these alternatives. The summary of the delay analysis for AM and PM peak hours for the above eight configurations is shown in *Attachment 5*. The minutes of this meeting are included as *Attachment 6*. The result of this meeting was the Project Team recommending further development and investigation of Alternatives 1, 3, and 5.

3.2 Short-List Alternatives

The short-list of alternatives, resulting from the Project Team Meeting on November 2, 2007, was additionally developed and presented to the Bowling Green/Warren County Metropolitan Planning Organization on December 17, 2007. The summary of the delay analysis for these more defined alternatives is provided in *Attachment 6A*. The feedback received from local city and WKU officials lead to the development of an additional alternative, Alternative 7 (detailed below). On April 23, 2008, the Project Team decided to extend the added through lane southbound on US 31W to Lansdale Avenue where it would serve as a right turn lane and an extended merge area. This added lane, from University Boulevard to Lansdale Avenue, will affect Alternatives 1, 3, and 7.

The following describes the four alternatives that were advanced and further analyzed:

- Alternative 1:** Exclusive right turn lane from US 31W SB to University WB with an additional through lane on US 31W SB approximately 1300' to Lansdale Avenue where it ends as a right turn lane. This allows for commuters turning right from Chestnut onto US 31W SB to turn into a through lane, where as currently they turn into the right turn lane for University and then must merge to the left to go straight (*Attachment 7A-1, 7A-2*). No changes to the Chestnut intersection are proposed with this alternative.
- Alternative 3:** Relocate Chestnut over 300' to the north to gain separation with University in addition to the improvements in Alternative 1. This would allow for longer queue lengths at University and ease of left turn movement at Chestnut (Chestnut will be analyzed as an un-signalized and signalized intersection) (*Attachment 7B-1, 7B-2*).
- Alternative 5:** Dual roundabouts at University and Chestnut. The roundabout at University is a 4-way dual lane with Loving Way having a single approach. The Chestnut roundabout is 3-Way with dual lane approaches and a single lane exit at Chestnut Street (*Attachment 7C-1*).
- Alternative 7:** In addition to improvements in alternatives 1 & 3, a through lane is added to US 31W NB beginning south of University and continuing through the relocated Chestnut intersection. The inside NB lane thus serves as a left turn lane at University Boulevard and Chestnut Street. This provides two continuous through lanes through both intersections (Chestnut will be analyzed as an un-signalized and signalized intersection) (*Attachment 7D-1, 7D-2*).

4.0 VISSIM DELAY ANALYSIS

Traffic flow simulations were conducted using VISSIM software to model the AM and PM delay for the four short-list alternatives. A summary of this information is included in *Attachment 8*. All of the build alternatives offer similar levels of operational improvement in the design year 2027. CDs containing VISSIM input data and movie files for simulations of each alternative can be found inside the back cover of this report.

5.0 COST ESTIMATES

Construction cost estimates for Alternatives 1, 3, 5 and 7 are included in *Attachment 9*. Right of way and utility estimates were provided via email by the KYTC District 3 office on May 28, 2008. The right of way, utilities, and construction costs for the alternatives are summarized as follows:

Alternative	Right of Way	Utilities	Construction	Total
Alternative 1	\$185,000	\$610,000	\$442,000	\$1,237,000
Alternative 3	\$300,000	\$785,000	\$1,066,000	\$2,151,000
Alternative 5	\$500,000	\$1,550,000	\$1,572,000	\$3,622,000
Alternative 7	\$400,000	\$1,985,000	\$1,390,000	\$3,775,000

The following are included in the current State Highway Plan. State funds are allocated for the year 2010 for right of way and utility work and 2011 for construction.

2008 Highway Plan

Right of Way	Utilities	Construction	Total
\$470,000	\$760,000	\$1,130,000	\$2,360,000

6.0 COMPARISON OF ALTERNATIVES

The four short-list alternatives provide similar levels of delay reduction over the no-build alternative. One exception is Alternative 5 (the roundabouts), where the US 31W southbound PM Peak Hour delays do not exhibit as significant a reduction as with the other alternatives. The Project Team also noted that Alternative 5, with two very closely placed dual-lane roundabouts, may be confusing to the travelling public. On July 9, 2008 the Cabinet issued Project Development Memorandum No. 1-2008. This memo states that "roundabouts are no longer to be pursued or considered as an alternative solution for intersection design." For these reasons Alternative 5 was eliminated from consideration.

The remaining alternatives (1, 3 & 7) are essentially staged construction packages beginning with Alternative 1 and ending with the full improvement build-out of Alternative 7. As seen on Attachment 8, the PM Peak Hour delays exhibit the highest congestion; therefore, our comparisons of the alternatives will be addressing the PM Peak Hour delays. Reviewing these PM delays reveals that signaling Chestnut for either Alternative 3 or Alternative 7 increases the delays for the through movements on US 31W, therefore the signalization of Chestnut should be eliminated from consideration.

As a way to compare the performance of the remaining three alternatives the Overall Average Delay was calculated. The Overall Average Delay for each alternative was calculated by multiplying the number of vehicles for each movement by the average delay for that movement. These values were added together and then divided by the total number of vehicles in the network. The results are contained in Table 1.

**TABLE 1
SUMMARY OF PM PEAK HOUR DELAYS (2027)
(Seconds)**

From	To	No Build	Alt 1	Alt 3	Alt 7
Northbound US 31	Eastbound Loving	55	51	36	15
Northbound US 31	Northbound US 31	56	55	42	24
Northbound US 31	Northbound Chestnut	86	94	54	40
Northbound US 31	Westbound University	136	135	121	115
Westbound Loving	Northbound US 31	41	32	16	4
Westbound Loving	Northbound Chestnut	38	52	6	25
Westbound Loving	Westbound University	29	23	28	32
Westbound Loving	Southbound US 31	19	17	30	15
Southbound US 31	Northbound Chestnut	218	5	1	3
Southbound US 31	Westbound University	294	16	1	7
Southbound US 31	Southbound US 31	275	47	29	29
Southbound US 31	Eastbound Loving	269	63	32	16
Southbound Chestnut	Westbound University	672	61	38	44
Southbound Chestnut	Southbound US 31	619	94	62	50
Southbound Chestnut	Eastbound Loving	425	99	62	32
Southbound Chestnut	Northbound US 31	356	34	24	27
Eastbound University	Southbound US 31	32	37	30	31
Eastbound University	Eastbound Loving	37	38	32	33
Eastbound University	Northbound US 31	144	136	126	123
Eastbound University	Northbound Chestnut	156	142	116	121
Overall Average Delay		190	70	55	52
Percent Reduction from the No-Build			63%	71%	73%

Reviewing Table 1 reveals that Alternative 1 provides for a 63% reduction in PM Peak Hour delays in the design year as compared with the No Build. This significant result produced by Alternative 1 becomes only an incremental decrease for Alternatives 3 and 7. Alternative 3 produces a 71% decrease while Alternative 7 exhibits a 73% decrease as compared with the No Build.

With the Cabinet's initiative on Practical Solutions launched in 2008, maximizing project value is emphasized. In an attempt to quantify the value or cost-benefit for each alternative, the cost per second of reduction in delay achieved was calculated for each alternative and is shown in Table 2.

TABLE 2

Cost per Second of Reduction in Delay

	Reduction in Delay (sec)	Total Alternative Cost	Cost per Second of Delay Reduction
Alternative 1	120	\$1,237,000	\$10,000
Alternative 3	135	\$2,151,000	\$16,000
Alternative 7	138	\$3,775,000	\$27,000

Based on this analysis Alternative 1 produces the most value for reducing the congestion and improving the operation of these two intersections.

This is an important goal of this project but other factors come into consideration when recommending a preferred alternative such as improved pedestrian facilities or increasing the separation between the University Boulevard and Chestnut Street intersections along US 31W.

7.0 RECOMMENDATIONS

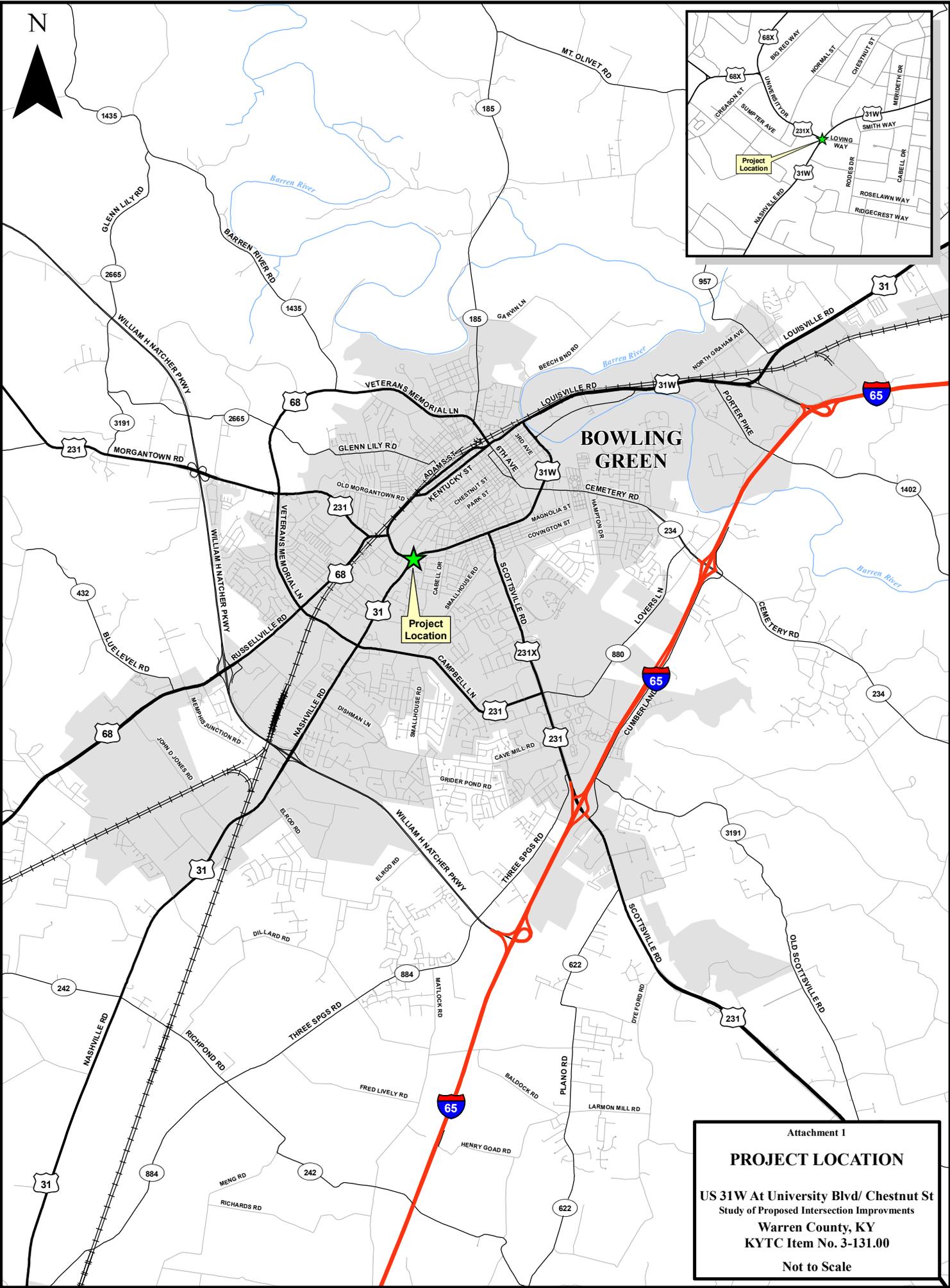
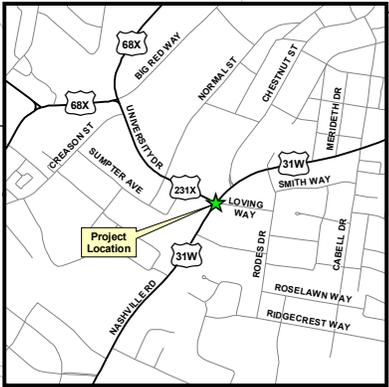
Because Alternative 1 is the least expensive and most cost effective solution to meet the primary goal of reducing congestion, it is the most “practical design” and therefore the preferred alternative.

Although Alternative 1 would not include the reconstruction of Chestnut at US 31W (with or without a signal) nor would it include the integration of new pedestrian facilities, it would also not exclude them from being constructed in the future. As stated above, the three short-listed alternatives (1, 3 and 7) are essentially staged construction packages beginning with Alternative 1 and ending with the full improvement build-out of Alternative 7. After implementation of Alternative 1, it is recommended that both a traffic analysis and pedestrian needs assessment be reconsidered for Alternatives 3 and 7 as long term solutions.

Due to low volumes and alternate accessibility, the District 3 office further recommends that the left-turn movement from Southbound US 31W to Loving Way be eliminated upon construction of this project.

ATTACHMENT 1
Project Location Map

N



Attachment 1

PROJECT LOCATION

US 31W At University Blvd/ Chestnut St
 Study of Proposed Intersection Improvements
 Warren County, KY
 KYTC Item No. 3-131.00
 Not to Scale

ATTACHMENT 2
Scoping / Pre-Design Conference
Minutes (7-17-07)

ATTACHMENT 2

PRE-DESIGN CONFERENCE MINUTES July 17, 2007

Warren County Intersection Improvements

US31W/University Blvd./Loving Way and US31W/Chestnut Street

Item No. 3-131.00

Participants:

- | | | |
|--------------------|---------------------|------------------------|
| 1. James Simpson | KYTC Central Office | Jim.Simpson@ky.gov |
| 2. Steve James | KYTC District 3 | Steve.James@ky.gov |
| 3. Jim Hudson | KYTC District 3 | Jim.Hudson@ky.gov |
| 4. Deneatra Hack | KYTC District 3 | Deneatra.Hack@ky.gov |
| 5. Scott Pedigo | KYTC District 3 | Scott.Pedigo@ky.gov |
| 6. Renee Slaughter | KYTC District 3 | Renee.Slaughter@ky.gov |
| 7. Jeremy Lukat | Qk4, Inc. | jluckat@qk4.com |
| 8. Bob Gustafson | Qk4, Inc. | gustafson@qk4.com |

The consultant is to provide engineering and related services for this project for the following items (check all that applies):

- Pre-design scoping study
- Phase I Design
- Phase II Design

Scoping Studies

The type and extent of studies necessary for any given project will be defined at the Pre-design conference. The Department reserves the right to solicit other firms to complete the actual design of the project after the studies are completed. The project may be split into design sections or may require the selection of another consultant to perform activities specifically identified during the study phase.

Design Related Services

The following design related services shall be performed as checked below:

	N/A	Department	Consultant
Photogrammetry: *	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Surveying:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Geotechnical:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
R/W & Utility Estimates:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Traffic Analysis:	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pavement Design:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Structure Plans:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Signing Plans:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Signal Plans:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lighting Plans:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landscaping Plans:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utility Design:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**** The project area will not be flown. Qk4 or District 3 will acquire digital ortho-photos, mapping and 3-D models (if available) from the City of Bowling Green.***

Unless otherwise specified in the Pre-design Conference Minutes, the Department shall provide:

- (1) All existing and projected traffic counts, including intersection turning movements. Anticipate receipt from the KYTC by September 7, 2007
- (2) ~~The project's photogrammetry will be provided in DGN format, in English units. Additionally, the mass point and breakline files will be provided to aid the Consultant in creating a digital terrain model. Ortho-rectified aerial photographs will also be provided.~~
- (3) Copies of any available record plans of existing roads and construction plans of any proposed road projects in the project corridor.
- (4) Copies of any previous pertinent studies, reports or project documentation.

Scope of Work

Scoping study for operational/capacity/safety improvements to the US31W@Universty Blvd./Loving Way and US31W@Chestnut Street intersections in Bowling Green. Approximately 400 feet separates these intersections and Chestnut Street intersects US31W at a severe skew. The KYTC staff indicated the main issues to address are the left turning movement from Chestnut to US31W, congestion at University @ US31W and the integration of pedestrian facilities. The following tasks will be included in the scope of work:

- 1) Data Collection and Review
- 2) Geometric Review and Concept Development
 - Turning Lane Improvements
 - Relocation of Chestnut intersection +/- 350 feet north
 - Roundabout at Chestnut
 - Roundabouts at Chestnut and University
 - Other concepts
 - Pedestrian Facilities
- 3) Traffic Analysis – Traffic analysis using VISSIM software for capacity and simulations for existing conditions plus all considered alternatives.
- 4) Preparation of schematics of each alternative for review by the project team and presentation to City and WKU officials.
- 5) Construction Cost Estimates – Estimates of probable construction costs will be developed for all of the alternatives produced under Task 2.
- 6) Report – Qk4 will prepare a brief report which describes and summarizes the study results. Supporting traffic analysis and simulations will be included in this report.
- 7) Management and Meetings – This work effort includes the management and coordination for accomplishment of the work for this study. The meetings required during the timeframe for this study are also included in this task.

Surveying

The consultant's responsibility for surveys shall include:

Preliminary Design

~~The consultant shall be responsible for all studies and construction cost estimates necessary to make a determination of a recommended alignment. Said studies should generally include the following items:~~

~~Preliminary hydraulic studies, including stream sections, stream profile, and necessary channel changes. Consideration of avoidance and minimization of effects on blue line streams must be included in accordance with Section 404 and 401 of the Clean Water Act. The consultant shall be responsible for obtaining all floodway studies and other pertinent drainage information to be utilized in his design.~~

Environmental

All environmental work will be performed by the department. *An Environmental Overview will be prepared.*

Public Involvement

If necessary, public meetings or hearings will be held as discussed at the pre-design conference. The consultant will be responsible for providing all necessary exhibits and to attend any public meetings or hearings that may be held.

- (1) Informational meeting will be held to present the project to City of Bowling Green and Western Kentucky University officials.

Final Design

~~The consultant shall be responsible for the development of all final details necessary for the complete design of Grade, Drain, and Surfacing Plans suitable for the letting to contract of the project. Plan scales for this project are as follows:—————~~

- | | |
|---|----------------------------------|
| 1) Plan and Profile | ————— 1" = 50' |
| 2) Cross Sections | ————— 1" = 10' |
| 3) Cross Section Spacing | ————— 50' |
| 4) Pipe Sections | ————— 1" = 10' |
| 5) Right of Way Strip Maps | ————— 1" = 200' |
| 6) Soil Profile Sheets | ————— Provided by KTC |
| 7) Coordinate Control Sheets | ————— 1" = 100' |
| 8) Erosion Control Sheets | ————— 1" = 50' |

~~Detail sheets shall be provided as required or as otherwise specified in the Pre-design Conference Minutes.~~

~~An Advance Folders will be required for the Box Culvert Extension.~~

~~The consultant is responsible for providing an acceptable plan for the maintenance of traffic. This plan shall include, as necessary:~~

- ~~(1) A written description of all required phases and notes to adequately explain the activities required of the contractor during construction to address maintenance of traffic.~~
- ~~(2) Plan and profile views of runarounds, part-width construction or other necessary maintenance of traffic items.~~
- ~~(3) Cross sections to depict the location of traffic in various phases.~~

~~A Final Plans In Hand Inspection will be held when the right of way limits, plan construction notes and drainage items are shown on the plans. A detailed maintenance of traffic scheme shall also be available. An updated cost estimate based on all established bid items will be required. Details of Avoidance, Minimization and Mitigation Alternatives for blue line streams shall be presented. A Drainage Inspection will also be held, frequently concurrent with the Final Inspection. Finalization of plans shall not occur until the approvals of the Final and Drainage Inspection Reports are given by the Department.~~

~~A separate Right of Way Inspection may be held, in order to expedite the Right of Way phase. The Project Manager will make the determination if adequate details have been developed and included within the plans to hold an inspection. Upon approval of the inspection report and incorporation of inspection recommendations into the plans, Right of Way review prints will be submitted.~~

~~The Right of Way Plans submittal will consist of mylar prints, 1/2 size prints with cross sections, project CD, deeds on CD and hard copy of all source deeds.~~

~~It shall be the Consultant's responsibility to see that all comments addressed in all inspection reports have been resolved before submission of Final Plans. Any item that may affect right of way should be resolved prior to the submission of Final Right of Way Plans.~~

~~Approximately 6 months prior to the letting date, a complete set of full-size prints of the final plans will be submitted to the Project Manager, to be forwarded to the Plan Processing Section in the Central Office. The Plan Processing Section shall review the plans and return the plans with comments, corrections and revisions necessary to be made to the original plans. The Consultant, prior to submittal of the original mylars of the final construction plans, will perform the required changes to the final plans. With the submittal of the final plans, all electronic plans, terrain models, geometric files, etc. shall be submitted on compact disk (CD), as directed by the Project Manager.~~

General

- (1) The consultant shall be represented at all inspections and meetings. Any plans or exhibits required shall be the responsibility of the consultant.
- (2) Any subconsultants utilized must have approval of the Department prior to their performance of any work.

- (3) The consultant is responsible for having obtained and being knowledgeable of all Department Manuals including, but not limited to, Design, Drainage, Standard Drawings and Bridges. All work shall be performed in accordance with those manuals or other memos issued subsequent to the publication of those manuals unless otherwise explicitly stated.
- (4) The Consultant shall submit the Production-Hour Worksheet, listing only the involved units of work, including supporting documentation of units obtained to the Project Manager to be reviewed. Upon agreement of the Production-Hour units, the Consultant shall submit his fee proposal with detailed production-hours on the Department's standard Production-Hour Worksheet to the Director of Professional Services. The Department's Project Manager shall also submit the Department's detailed Production-Hours
- (5) Change orders to this project will not be permitted except in such cases that:
 - the project limits have been substantially revised from those initially indicated in the Pre-design Minutes.
 - a change of scope has occurred.
 - the Consultant is requested to revise the plans as a result of a direction change by the Department.
- (6) The consultant is responsible, at all times, for correction of any errors or omissions that he may have made in the preparation of the plans. The consultant shall immediately notify the Project Manager of any item that he feels requires extra work. He shall not proceed with that item of work until such time that the matter of extra work has been resolved.
- (7) All original submissions, including pay estimates and consultant monthly reports, shall be sent to the Project Manager. The pay estimate and monthly report may be electronically submitted to the Project Manager. The consultant monthly report shall be submitted even if a pay estimate is not being submitted. All correspondences pertinent to this project shall have the County, Item No. and Project Description noted.
- (8) Sets of plans shall be provided for inspections and meetings, as requested by the Project Manager.
- (9) The Consultant will be responsible for preparation of all minutes of meetings, including this Pre-design Conference.
- (10) Periodic progress meetings will be held with the District as discussed during the Pre-design Conference.
- (11) All design work and development of plans, preliminary and final shall be prepared in MicroStation DGN format in accordance with current KTC CADD Standards
- (12) The Departments Project Manager assigned to this project is ***Jim Hudson***.

(13) The current schedule for this project, as described in the 2006 Six Year Plan is as follows:

<u>Phase</u>	<u>FY</u>
Final Design	2007
Right of Way	2008
Utilities	2008
Construction	2008

Milestones

The consultant shall provide milestone dates for the following activities:

1) Scoping Study

- a) Progress Meeting, Review Alternatives - October 15, 2007
- b) Informational Meeting (City Bowling Green, WKU) - November 1, 2007
- c) Submit Scoping Study Report - November 30, 2007

Milestone dates are based on receiving Notice to Proceed and/or letter agreement by August 15, 2007.

ATTACHMENT 3
Photographs of Study Area

ATTACHMENT 3



Looking NB on US31W from University



Looking EB on University Dr from US31W

ATTACHMENT 3



Looking SB on US31W from University



Looking SB on US31W between Chestnut and University

ATTACHMENT 3



Looking SB on US31W from Chestnut Street



Looking NEB on US31W from Chestnut

ATTACHMENT 3



Looking NB on Chestnut from US31W



Looking NB on Chestnut

ATTACHMENT 3



Sinkhole East of Chestnut Street



Looking NB on US31W South of University

ATTACHMENT 3



Looking NB on US31W near Oaklawn Way



Looking NB on US31W from Lansdale Avenue

ATTACHMENT 4
KYTC Traffic Forecast, Turning
Movements (9-14-07)



TRANSPORTATION CABINET

Frankfort, Kentucky 40622
www.kentucky.gov

Ernie Fletcher
Governor

Bill Nighbert
Secretary

Marc Williams
Commissioner of Highways

INTRA-DEPARTMENTAL MEMO

TO: Marc Williams, P.E.
Acting Chief District Engineer
District 3 – Bowling Green

ATTN: Jim Hudson

FROM: Daryl J. Greer, P.E. 
Director
Division of Planning

DATE: September 14, 2007

SUBJECT: Warren County Traffic Forecast
Two intersection improvements, one at US 31W and Chestnut Street, and the other
at US 31W, US 231X, and Loving Way
Item No. 3-131.00

In response to your March 21, 2007 request, we are providing the following forecasts on the attached maps and worksheets:

- 2007 and 2027 Average Daily Traffic
- 2007 and 2027 Daily and Design Hour Turning Movements
- 2007 and 2027 Truck Percentages and 20 year ESALs

If you have any questions, please contact Scott Thomson of this Division at (502) 564-7183.

DJG/DH/BC

Attachments

c/att: Jim Simpson
Steve James
W. Jeff Moore
Dan Hite
Barry House

Executive Summary

**Traffic Forecast Report
Warren County
Intersection Improvements at US 31W, US 231X,
Chestnut St., and Loving Way
Item No. 3-131.00**

Prepared for:



Prepared by:
Daniel Hulker
Division of Planning
Kentucky Transportation Cabinet
September 17, 2007

ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

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Commonly Used Abbreviations and their Descriptions

ADT	Average Daily Traffic	Without any adjustment
DHV	Design Hour Volume	30 th highest hour of a <u>year</u>
ESAL	Estimated Single Axle Load	A measure of traffic's impact on a roadway
%T	Truck Percentage	The percentage of trucks to total volume
FC	Functional Class	Refers to a road's importance
GR	Growth Rate	A value normally compounded annually
PHF	Peak Hour Factor	Considers a 15 minute spike in an hourly count
K-Factor	K-30 th hour Factor	DHV divided by ADT (DHV/ADT)
D-Factor	Directional Factor	Percentage of dominant flow to total
MP	Mile Point	Miles increase easterly and northerly
ATR	Automatic Traffic Recorder	A permanent & continuous recording station
KYSTM	Kentucky Statewide Model	A computerized representation of KY roads

ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

Traffic Forecast Executive Summary

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way

Item No. 3-131.00

FORECAST SUMMARY

The purpose of this project was to provide a basis for future work to be conducted at two intersections on US 31W. The forecast included the 4-way intersection where US 231X and Loving Way (CS 1004) meets US 31W at MP 11.8, as well as the 3-way intersection where Chestnut Street (CS 1323) meets US 31W at MP 11.87.

FORECAST TYPE

The following types of forecasts were developed:

- 2007 and 2027 ADT and DHV values
- 2007 and 2027 Daily and Design Hour Turn Movements
- 2007 and 2027 Truck Percentages
- 20-year ESALs

CURRENT-YEAR VOLUMES

Current year traffic volumes were calculated from existing traffic stations on the roads in question. Warren County traffic stations A22 (2006 ADT of 20400), C31 (2006 ADT of 17600), B43 (2004 ADT of 21700), A58 (2006 ADT of 18700), A31 (2006 ADT of 22100), A01 (2003 ADT of 4100), and B95 (2004 ADT of 9100) were used to calculate current year volumes. Each station was factored up to the current year to get current year volumes. Loving Way did not have a traffic station available so turn movement counts that were conducted in 2005 were used to calculate the traffic volume.

DESIGN YEAR/GROWTH FACTORS

Future year traffic volumes were based on current year volumes in the previous section. Each traffic station's history suggested an annual growth rate from 0 to 2 percent. Western Kentucky University personnel indicated a series of changes in the road configuration on campus. These changes included closing part of one road, changing the direction of traffic flow on another, as well as plans for expansion of the campus. After consideration, the proposed changes do not appear to alter significantly the traffic patterns through the intersections in question. The roads that make up the intersections are forecasted to grow at a rate of 1 percent per year.

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

DESIGN HOUR FACTORS

The design hour volume was based on hourly counts from the previously mentioned traffic stations. K-factors were based on ATR traffic stations of similar functional class roads. Due to rounding, peak hour traffic volumes displayed on the turn movements may not correspond exactly to the K-factors displayed on the ESAL sheets.

TRUCK PERCENTAGE

US 31W and US 231X truck percentages were based on traffic stations A15 (2002 Truck Volume of 1100), A33 (2005 truck volume of 900), 008 (2006 truck volume of 500), 281 (2006 truck volume of 1000), and A13 (2006 Truck volume of 1300). Functional class averages were used for Chestnut St. and Loving Way. Truck percentages were forecasted to grow at a rate of 2.5 percent per year, based on ATR station data for similar functional class roads.

ESALs

Functional class averages and previously mentioned traffic stations were used along with ADT projections of each road to calculate ESAL values. The functional class average growth rates used to help grow the ESAL calculation variables come from the 2006 aggregated ESAL report generated by the Kentucky Transportation Center in collaboration with the Transportation Cabinet. For more information see the attached ESAL sheets.

TURN MOVEMENTS

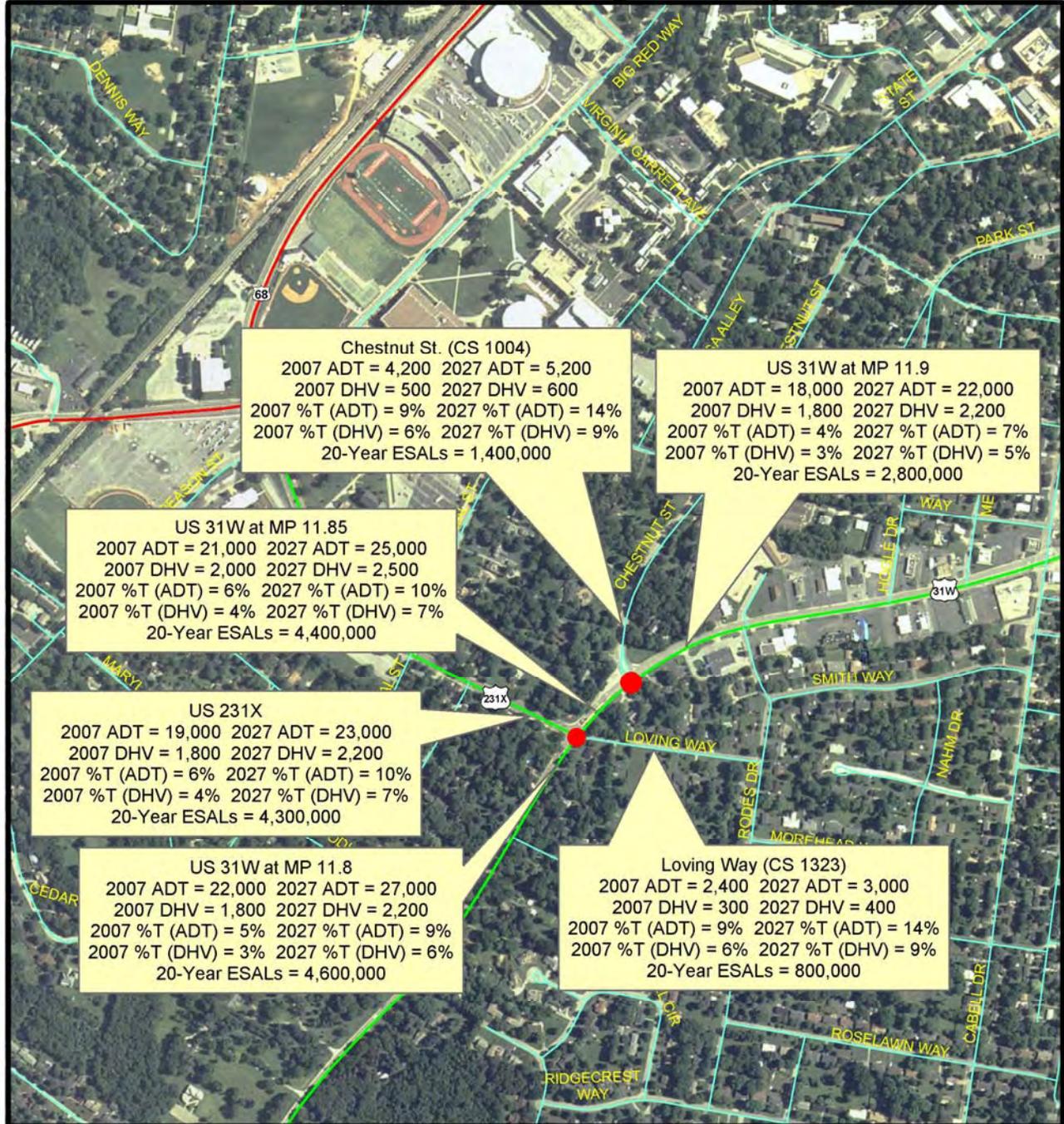
Turn movements taken in 2005 at the two forecasted intersections were used to develop current and future year scenarios. Four hours of 15-minute turn movements were analyzed to develop the highest hourly rates for each movement. This process was used to determine the AM and PM peak hours at the daily estimates. Traffic spikes in a 15-minute period determined the peak hour factors. Turn movement numbers were used to estimate ADT values for Loving Way.

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Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

Summary Map



<p>N</p>	<p>LEGEND</p> <p>● Intersections</p>	<p>Warren Co. Intersection Improvements at US 31W, US 231X, Chestnut St., and Loving Way Item # 3-131.00</p>	<p>0 0.05 0.1 0.2 Miles</p>
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ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS (20-year)

ROUTE ID:

County	Warren
Road Name	Chestnut Street
Functional Class	17 - Urban Collector
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way
Scenario	Build
Segment Description	Chestnut St. (CS 1004)

Date	09/12/07
Forecaster	Daniel Hulker
MARS No.	80500 01 D
Item No.	3-131.00
Route No.	CS 1004
Beg. MP	0
End MP	0.1
T.F. No.	TF07_020
No. of Lanes	2
1 or 2 way	2

REFERENCES:

Previous Forecasts	none
Traffic Volume Milepoint	A01 0.1
Truck Percent Milepoint	Functional Class Average 0.1
ESAL Information	2006 Aggregated ESALS
Growth Rate	1%

K- Factor Value	11.9%
K-Factor Source	A01
PHF	0.85

TRAFFIC PARAMETERS:

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2007		2007	2017	2027
Volume (AADT)	4200	1%	4200	4700	5200
Percent Trucks (%T)	9%	2.5%	9%	11%	14%
Number of Trucks	400		400	500	700
Percent Trucks Hauling Coal (%CT)	0%	0%	0%	0%	0%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.010	1.3%	3.010	3.425	3.897
ESALs/Axle (ESAL/A)	0.152	2.0%	0.152	0.185	0.228
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	0	0%	0.000	0.000	0.000
ESALs/Axle (ESAL/CA)	0	0%	0.000	0.000	0.000

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 1,400,000

General Comments:

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

Chestnut St. (CS 1004)

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AXT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2007	4,200	91.4%	8.6%	3839	361	0.00%	3.01	0.15	0	0	0.500	33,662
2008	4,245	91.2%	8.8%	3871	374	0.00%	3.05	0.16	0	0	0.500	35,817
2009	4,291	91.0%	9.0%	3903	388	0.00%	3.09	0.16	0	0	0.500	38,121
2010	4,337	90.7%	9.3%	3935	402	0.00%	3.13	0.16	0	0	0.500	40,585
2011	4,383	90.5%	9.5%	3967	416	0.00%	3.17	0.16	0	0	0.500	43,221
2012	4,430	90.3%	9.7%	3999	431	0.00%	3.21	0.17	0	0	0.500	46,041
2013	4,478	90.0%	10.0%	4031	447	0.00%	3.25	0.17	0	0	0.500	49,057
2014	4,526	89.8%	10.2%	4063	463	0.00%	3.29	0.17	0	0	0.500	52,283
2015	4,575	89.5%	10.5%	4095	479	0.00%	3.34	0.18	0	0	0.500	55,735
2016	4,624	89.3%	10.7%	4127	497	0.00%	3.38	0.18	0	0	0.500	59,428
2017	4,673	89.0%	11.0%	4159	514	0.00%	3.43	0.19	0	0	0.500	63,379
2018	4,724	88.7%	11.3%	4191	533	0.00%	3.47	0.19	0	0	0.500	67,607
2019	4,774	88.4%	11.6%	4222	552	0.00%	3.51	0.19	0	0	0.500	72,130
2020	4,825	88.1%	11.9%	4253	572	0.00%	3.56	0.20	0	0	0.500	76,969
2021	4,877	87.8%	12.2%	4285	593	0.00%	3.61	0.20	0	0	0.500	82,148
2022	4,930	87.5%	12.5%	4316	614	0.00%	3.65	0.20	0	0	0.500	87,689
2023	4,983	87.2%	12.8%	4346	636	0.00%	3.70	0.21	0	0	0.500	93,618
2024	5,036	86.9%	13.1%	4377	659	0.00%	3.75	0.21	0	0	0.500	99,963
2025	5,090	86.6%	13.4%	4407	683	0.00%	3.80	0.22	0	0	0.500	106,753
2026	5,145	86.3%	13.7%	4437	707	0.00%	3.85	0.22	0	0	0.500	114,019
2027	5,200	85.9%	14.1%	4467	733	0.00%	3.90	0.23	0	0	0.500	121,795

5-yr ESALS
200,000

10-yr ESALS
500,000

15-yr ESALS
900,000

20-yr ESALS
1,400,000

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS (20-year)

ROUTE ID:

County	Warren
Road Name	US 31 W
Functional Class	16 - Urban Minor Arterial
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way
Scenario	Build
Segment Description	US 31 W at MP 11.9

Date	09/12/07
Forecaster	Daniel Hulker
MARS No.	80500 01 D
Item No.	3-131.00
Route No.	US 31 W
Beg. MP	11.876
End MP	11.9
T.F. No.	TF07_020
No. of Lanes	4
1 or 2 way	2

REFERENCES:

Previous Forecasts	None
Traffic Volume Milepoint	C31 12.3
Truck Percent Milepoint	A33 14.3
ESAL Information	2006 Aggregated ESALS
Growth Rate	1%

K- Factor Value	8.8%
K-Factor Source	C31
PHF	0.92

TRAFFIC PARAMETERS:

		Present Year	Growth Rate	Construction Year	Median Year	Design Year
		2007		2007	2017	2027
Volume	(AADT)	18000	1%	18000	20000	22000
Percent Trucks	(%T)	4%	2.5%	4%	5%	7%
Number of Trucks		700		700	1000	1500
Percent Trucks Hauling Coal	(%CT)	0%	0%	0%	0%	0%
<i>Non-Coal Trucks:</i>						
Axles/Truck	(A/T)	3.010	1.3%	3.010	3.425	3.897
ESALs/Axle	(ESAL/A)	0.152	2.0%	0.152	0.185	0.226
<i>Coal Trucks:</i>						
Axles/Truck	(A/CT)	0	0%	0.000	0.000	0.000
ESALs/Axle	(ESAL/CA)	0	0%	0.000	0.000	0.000

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 2,800,000

General Comments:

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

US 31 W at MP 11.9

Year	ADT	Cat %	Truck %	Cars	Trucks	CT%	AXT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2007	18,000	95.9%	4.1%	17262	738	0.00%	3.01	0.15	0	0	0.459	70,983
2008	18,180	95.8%	4.2%	17416	764	0.00%	3.05	0.16	0	0	0.459	75,051
2009	18,362	95.7%	4.3%	17571	791	0.00%	3.09	0.16	0	0	0.459	79,395
2010	18,545	95.6%	4.4%	17727	819	0.00%	3.13	0.16	0	0	0.459	84,033
2011	18,731	95.5%	4.5%	17883	848	0.00%	3.17	0.16	0	0	0.459	88,985
2012	18,918	95.4%	4.6%	18041	878	0.00%	3.21	0.17	0	0	0.459	94,275
2013	19,107	95.2%	4.8%	18199	909	0.00%	3.25	0.17	0	0	0.459	99,924
2014	19,298	95.1%	4.9%	18358	941	0.00%	3.29	0.17	0	0	0.459	105,958
2015	19,491	95.0%	5.0%	18518	974	0.00%	3.34	0.18	0	0	0.459	112,405
2016	19,686	94.9%	5.1%	18678	1008	0.00%	3.38	0.18	0	0	0.459	119,292
2017	19,883	94.8%	5.2%	18840	1044	0.00%	3.43	0.19	0	0	0.459	126,650
2018	20,082	94.6%	5.4%	19002	1080	0.00%	3.47	0.19	0	0	0.459	134,511
2019	20,283	94.5%	5.5%	19164	1118	0.00%	3.51	0.19	0	0	0.459	142,912
2020	20,486	94.3%	5.7%	19328	1158	0.00%	3.56	0.20	0	0	0.459	151,890
2021	20,691	94.2%	5.8%	19492	1199	0.00%	3.61	0.20	0	0	0.459	161,484
2022	20,897	94.1%	5.9%	19657	1241	0.00%	3.65	0.20	0	0	0.459	171,737
2023	21,106	93.9%	6.1%	19822	1285	0.00%	3.70	0.21	0	0	0.459	182,696
2024	21,317	93.8%	6.2%	19988	1330	0.00%	3.75	0.21	0	0	0.459	194,409
2025	21,531	93.6%	6.4%	20154	1377	0.00%	3.80	0.22	0	0	0.459	206,929
2026	21,746	93.4%	6.6%	20321	1425	0.00%	3.85	0.22	0	0	0.459	220,312
2027	21,963	93.3%	6.7%	20488	1476	0.00%	3.90	0.23	0	0	0.459	234,619

5-yr ESALs
400,000

10-yr ESALs
1,000,000

15-yr ESALs
1,700,000

20-yr ESALs
2,800,000

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS (20-year)

ROUTE ID:

County	Warren
Road Name	US 31W
Functional Class	16 - Urban Minor Arterial
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way
Scenario	Build
Segment Description	US 31W at MP 11.85

Date	09/12/07
Forecaster	Daniel Hulker
MARS No.	80500 01 D
Item No.	3-131.00
Route No.	US 31W
Beg. MP	11.85
End MP	11.85
T.F. No.	TF07_020
No. of Lanes	4
1 or 2 way	2

REFERENCES:

Previous Forecasts	none
Traffic Volume	B43
Milepoint	10.2
Truck Percent	B43
Milepoint	10.2
ESAL Information	2006 Aggregated ESALS
Growth Rate	1%

K- Factor Value	9.0%
K-Factor Source	B43
PHF	0.92

TRAFFIC PARAMETERS:

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2007		2007	2017	2027
Volume (AADT)	21000	1%	21000	23000	25000
Percent Trucks (%T)	6%	2.5%	6%	8%	10%
Number of Trucks	1300		1300	1800	2500
Percent Trucks Hauling Coal (%CT)	0%	0%	0%	0%	0%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.010	1.3%	3.010	3.425	3.897
ESALs/Axle (ESAL/A)	0.152	2.0%	0.152	0.185	0.226
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	0	0%	0.000	0.000	0.000
ESALs/Axle (ESAL/CA)	0	0%	0.000	0.000	0.000

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 4,400,000

General Comments:

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

US 31W at MP 11.85

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AXT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2007	21,000	94.0%	6.0%	19740	1260	0.00%	3.01	0.15	0	0	0.452	111,433
2008	21,184	93.9%	6.2%	19881	1303	0.00%	3.05	0.16	0	0	0.452	118,054
2009	21,369	93.7%	6.3%	20022	1347	0.00%	3.09	0.16	0	0	0.452	125,119
2010	21,556	93.5%	6.5%	20164	1393	0.00%	3.13	0.16	0	0	0.452	132,660
2011	21,745	93.4%	6.6%	20305	1440	0.00%	3.17	0.16	0	0	0.452	140,708
2012	21,936	93.2%	6.8%	20447	1489	0.00%	3.21	0.17	0	0	0.452	149,299
2013	22,128	93.0%	7.0%	20588	1540	0.00%	3.25	0.17	0	0	0.452	158,469
2014	22,321	92.9%	7.1%	20729	1592	0.00%	3.29	0.17	0	0	0.452	168,258
2015	22,517	92.7%	7.3%	20871	1646	0.00%	3.34	0.18	0	0	0.452	178,708
2016	22,714	92.5%	7.5%	21012	1702	0.00%	3.38	0.18	0	0	0.452	189,865
2017	22,913	92.3%	7.7%	21153	1760	0.00%	3.43	0.19	0	0	0.452	201,776
2018	23,113	92.1%	7.9%	21294	1820	0.00%	3.47	0.19	0	0	0.452	214,493
2019	23,316	91.9%	8.1%	21434	1881	0.00%	3.51	0.19	0	0	0.452	228,071
2020	23,520	91.7%	8.3%	21575	1945	0.00%	3.56	0.20	0	0	0.452	242,570
2021	23,726	91.5%	8.5%	21715	2011	0.00%	3.61	0.20	0	0	0.452	258,051
2022	23,934	91.3%	8.7%	21854	2080	0.00%	3.65	0.20	0	0	0.452	274,583
2023	24,143	91.1%	8.9%	21993	2150	0.00%	3.70	0.21	0	0	0.452	292,236
2024	24,355	90.9%	9.1%	22131	2224	0.00%	3.75	0.21	0	0	0.452	311,088
2025	24,568	90.6%	9.4%	22269	2299	0.00%	3.80	0.22	0	0	0.452	331,221
2026	24,783	90.4%	9.6%	22406	2377	0.00%	3.85	0.22	0	0	0.452	352,721
2027	25,000	90.2%	9.8%	22542	2458	0.00%	3.90	0.23	0	0	0.452	375,683

5-yr ESALs
700,000

10-yr ESALs
1,600,000

15-yr ESALs
2,800,000

20-yr ESALs
4,400,000

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS (20-year)

ROUTE ID:

County	Warren
Road Name	Loving Way
Functional Class	19 - Urban Local
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way
Scenario	Build
Segment Description	Loving Way (CS 1323)

Date	09/12/07
Forecaster	Daniel Hulker
MARS No.	80500 01 D
Item No.	3-131.00
Route No.	CS 1323
Beg. MP	0
End MP	0.1
T.F. No.	TF07_020
No. of Lanes	2
1 or 2 way	2

REFERENCES:

Previous Forecasts	None
Traffic Volume Milepoint	Turn Movement Factoring N/A
Truck Percent Milepoint	Functional Class Average N/A
ESAL Information	2006 Aggregated ESALS
Growth Rate	1%

K- Factor Value	11.2%
K-Factor Source	TM Factoring
PHF	0.85

TRAFFIC PARAMETERS:

		Present	Growth	Construction	Median	Design
		Year	Rate	Year	Year	Year
		2007		2007	2017	2027
Volume	(AADT)	2400	1%	2400	2600	3000
Percent Trucks	(%T)	9%	2.5%	9%	11%	14%
Number of Trucks		200		200	300	400
Percent Trucks Hauling Coal	(%CT)	0%	0%	0%	0%	0%
<i>Non-Coal Trucks:</i>						
Axles/Truck	(A/T)	3.010	1.3%	3.010	3.425	3.897
ESALs/Axle	(ESAL/A)	0.152	2.0%	0.152	0.185	0.226
<i>Coal Trucks:</i>						
Axles/Truck	(A/CT)	0	0%	0	0	0
ESALs/Axle	(ESAL/CA)	0	0%	0	0	0

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 800,000

General Comments:

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Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

Loving Way (CS 1323)

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AXT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2007	2,400	91.4%	8.6%	2,194	206	0.00%	3.01	0.15	0	0	0.500	19,236
2008	2,423	91.2%	8.8%	2,209	214	0.00%	3.05	0.16	0	0	0.500	20,442
2009	2,446	91.0%	9.0%	2,225	221	0.00%	3.09	0.16	0	0	0.500	21,730
2010	2,469	90.7%	9.3%	2,240	229	0.00%	3.13	0.16	0	0	0.500	23,107
2011	2,493	90.5%	9.5%	2,256	237	0.00%	3.17	0.16	0	0	0.500	24,578
2012	2,516	90.3%	9.7%	2,271	245	0.00%	3.21	0.17	0	0	0.500	26,149
2013	2,540	90.0%	10.0%	2,287	253	0.00%	3.25	0.17	0	0	0.500	27,829
2014	2,564	89.8%	10.2%	2,302	262	0.00%	3.29	0.17	0	0	0.500	29,623
2015	2,589	89.5%	10.5%	2,317	271	0.00%	3.34	0.18	0	0	0.500	31,540
2016	2,613	89.3%	10.7%	2,333	281	0.00%	3.38	0.18	0	0	0.500	33,589
2017	2,638	89.0%	11.0%	2,348	290	0.00%	3.43	0.19	0	0	0.500	35,779
2018	2,663	88.7%	11.3%	2,363	301	0.00%	3.47	0.19	0	0	0.500	38,119
2019	2,689	88.4%	11.6%	2,378	311	0.00%	3.51	0.19	0	0	0.500	40,620
2020	2,714	88.1%	11.9%	2,392	322	0.00%	3.56	0.20	0	0	0.500	43,292
2021	2,740	87.8%	12.2%	2,407	333	0.00%	3.61	0.20	0	0	0.500	46,149
2022	2,766	87.5%	12.5%	2,421	345	0.00%	3.65	0.20	0	0	0.500	49,202
2023	2,792	87.2%	12.8%	2,436	356	0.00%	3.70	0.21	0	0	0.500	52,465
2024	2,819	86.9%	13.1%	2,450	369	0.00%	3.75	0.21	0	0	0.500	55,952
2025	2,846	86.6%	13.4%	2,464	382	0.00%	3.80	0.22	0	0	0.500	59,680
2026	2,873	86.3%	13.7%	2,478	395	0.00%	3.85	0.22	0	0	0.500	63,665
2027	2,900	85.9%	14.1%	2,491	409	0.00%	3.90	0.23	0	0	0.500	67,924

5-yr ESALS
100,000

10-yr ESALS
300,000

15-yr ESALS
500,000

20-yr ESALS
800,000

ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS (20-year)

ROUTE ID:

County	Warren
Road Name	US 231X
Functional Class	16 - Urban Minor Arterial
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way
Scenario	Build
Segment Description	US 231X

Date	09/12/07
Forecaster	Daniel Hulker

MARS No.	80500 01 D
Item No.	3-131.00
Route No.	US 231 X
Beg. MP	2.1
End MP	2
T.F. No.	TF07_020
No. of Lanes	4
1 or 2 way	2

REFERENCES:

Previous Forecasts	None
Traffic Volume Milepoint	A58 2.1
Truck Percent Milepoint	A58 2.1
ESAL Information	2006 Aggregated ESALS
Growth Rate	1%

K- Factor Value	9.4%
K-Factor Source	A58
PHF	0.92

TRAFFIC PARAMETERS:

		Present Year	Growth Rate	Construction Year	Median Year	Design Year
		2007		2007	2017	2027
Volume	(AADT)	19000	1%	19000	21000	23000
Percent Trucks	(%T)	6%	2.5%	6%	8%	10%
Number of Trucks		1200		1200	1700	2400
Percent Trucks Hauling Coal	(%CT)	0%	0%	0%	0%	0%
<i>Non-Coal Trucks:</i>						
Axles/Truck	(A/T)	3.010	1.3%	3.010	3.425	3.897
ESALs/Axle	(ESAL/A)	0.152	2.0%	0.152	0.185	0.226
<i>Coal Trucks:</i>						
Axles/Truck	(A/CT)	0	0%	0.000	0.000	0.000
ESALs/Axle	(ESAL/CA)	0	0%	0.000	0.000	0.000

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 4,300,000

General Comments:

ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

US 231X

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AXT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2007	19,000	93.7%	6.3%	17803	1197	0.00%	3.01	0.15	0	0	0.456	105,956
2008	19,190	93.5%	6.5%	17951	1239	0.00%	3.05	0.16	0	0	0.456	112,430
2009	19,382	93.4%	6.6%	18099	1283	0.00%	3.09	0.16	0	0	0.456	119,347
2010	19,576	93.2%	6.8%	18248	1328	0.00%	3.13	0.16	0	0	0.456	126,738
2011	19,771	93.0%	7.0%	18397	1375	0.00%	3.17	0.16	0	0	0.456	134,635
2012	19,969	92.9%	7.1%	18546	1423	0.00%	3.21	0.17	0	0	0.456	143,074
2013	20,169	92.7%	7.3%	18695	1474	0.00%	3.25	0.17	0	0	0.456	152,093
2014	20,371	92.5%	7.5%	18845	1525	0.00%	3.29	0.17	0	0	0.456	161,732
2015	20,574	92.3%	7.7%	18995	1579	0.00%	3.34	0.18	0	0	0.456	172,034
2016	20,780	92.1%	7.9%	19145	1635	0.00%	3.38	0.18	0	0	0.456	183,045
2017	20,988	91.9%	8.1%	19295	1693	0.00%	3.43	0.19	0	0	0.456	194,815
2018	21,198	91.7%	8.3%	19445	1752	0.00%	3.47	0.19	0	0	0.456	207,396
2019	21,410	91.5%	8.5%	19596	1814	0.00%	3.51	0.19	0	0	0.456	220,846
2020	21,624	91.3%	8.7%	19746	1878	0.00%	3.56	0.20	0	0	0.456	235,223
2021	21,840	91.1%	8.9%	19896	1944	0.00%	3.61	0.20	0	0	0.456	250,594
2022	22,058	90.9%	9.1%	20046	2013	0.00%	3.65	0.20	0	0	0.456	267,027
2023	22,279	90.6%	9.4%	20195	2084	0.00%	3.70	0.21	0	0	0.456	284,597
2024	22,502	90.4%	9.6%	20345	2157	0.00%	3.75	0.21	0	0	0.456	303,381
2025	22,727	90.2%	9.8%	20494	2233	0.00%	3.80	0.22	0	0	0.456	323,466
2026	22,954	89.9%	10.1%	20642	2312	0.00%	3.85	0.22	0	0	0.456	344,941
2027	23,184	89.7%	10.3%	20790	2393	0.00%	3.90	0.23	0	0	0.456	367,904

5-yr ESALs
600,000

10-yr ESALs
1,500,000

15-yr ESALs
2,700,000

20-yr ESALs
4,300,000

ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS (20-year)

ROUTE ID:

County	Warren
Road Name	US 31W
Functional Class	16 - Urban Minor Arterial
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way
Scenario	Build
Segment Description	US 31W at MP 11.8

Date	09/12/07
Forecaster	Daniel Hulker
MARS No.	80500 01 D
Item No.	3-131.00
Route No.	US 31W
Beg. MP	11.8
End MP	11.805
T.F. No.	TF07_020
No. of Lanes	2
1 or 2 way	2

REFERENCES:

Previous Forecasts	none
Traffic Volume	B43
Milepoint	11.1
Truck Percent	A15
Milepoint	10.2
ESAL Information	2006 Aggregated ESALS
Growth Rate	1%

K- Factor Value	9.0%
K-Factor Source	B43
PHF	0.92

TRAFFIC PARAMETERS:

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2007		2007	2017	2027
Volume (AADT)	22000	1%	22000	24000	27000
Percent Trucks (%T)	5%	2.5%	5%	7%	9%
Number of Trucks	1100		1100	1600	2300
Percent Trucks Hauling Coal (%CT)	0%	0%	0%	0%	0%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.010	1.3%	3.010	3.425	3.897
ESALs/Axle (ESAL/A)	0.152	2.0%	0.152	0.185	0.228
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	0	0%	0.000	0.000	0.000
ESALs/Axle (ESAL/CA)	0	0%	0.000	0.000	0.000

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 4,600,000

General Comments:

ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

US 31W at MP 11.8

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AXT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2007	22,000	94.8%	5.2%	20856	1144	0.00%	3.01	0.15	0	0	0.500	114,552
2008	22,220	94.7%	5.3%	21036	1184	0.00%	3.05	0.16	0	0	0.500	121,372
2009	22,442	94.5%	5.5%	21216	1226	0.00%	3.09	0.16	0	0	0.500	128,657
2010	22,667	94.4%	5.6%	21397	1269	0.00%	3.13	0.16	0	0	0.500	136,438
2011	22,893	94.3%	5.7%	21579	1314	0.00%	3.17	0.16	0	0	0.500	144,751
2012	23,122	94.1%	5.9%	21762	1360	0.00%	3.21	0.17	0	0	0.500	153,632
2013	23,353	94.0%	6.0%	21945	1408	0.00%	3.25	0.17	0	0	0.500	163,121
2014	23,587	93.8%	6.2%	22129	1458	0.00%	3.29	0.17	0	0	0.500	173,260
2015	23,823	93.7%	6.3%	22314	1509	0.00%	3.34	0.18	0	0	0.500	184,095
2016	24,061	93.5%	6.5%	22499	1563	0.00%	3.38	0.18	0	0	0.500	195,673
2017	24,302	93.3%	6.7%	22684	1618	0.00%	3.43	0.19	0	0	0.500	208,047
2018	24,545	93.2%	6.8%	22870	1675	0.00%	3.47	0.19	0	0	0.500	221,271
2019	24,790	93.0%	7.0%	23056	1734	0.00%	3.51	0.19	0	0	0.500	235,406
2020	25,038	92.8%	7.2%	23243	1795	0.00%	3.56	0.20	0	0	0.500	250,514
2021	25,288	92.7%	7.3%	23430	1858	0.00%	3.61	0.20	0	0	0.500	266,663
2022	25,541	92.5%	7.5%	23618	1924	0.00%	3.65	0.20	0	0	0.500	283,926
2023	25,797	92.3%	7.7%	23805	1991	0.00%	3.70	0.21	0	0	0.500	302,380
2024	26,055	92.1%	7.9%	23993	2062	0.00%	3.75	0.21	0	0	0.500	322,108
2025	26,315	91.9%	8.1%	24181	2134	0.00%	3.80	0.22	0	0	0.500	343,199
2026	26,578	91.7%	8.3%	24369	2209	0.00%	3.85	0.22	0	0	0.500	365,748
2027	26,844	91.5%	8.5%	24557	2287	0.00%	3.90	0.23	0	0	0.500	389,856

5-yr ESALS
700,000

10-yr ESALS
1,600,000

15-yr ESALS
2,900,000

20-yr ESALS
4,600,000

ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2007 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

	Peak Hour Factors			Thru			Right			Left		
	AM	PM		AM	PM		AM	PM		AM	PM	
Southbound	0.82	0.96	N/A	0.79	0.81	0.50	0.83					
Westbound	0.96	0.97	0.98	0.87	0.83	N/A	N/A					
Eastbound	0.94	0.97	0.94	0.94	0.94	N/A	N/A	0.85	0.80			

* Arrows indicate approach direction, PHF given by approach and approach movement

PROJECT: Intersection Improvements on US 31W

ITEM NUMBER: 3-131.00

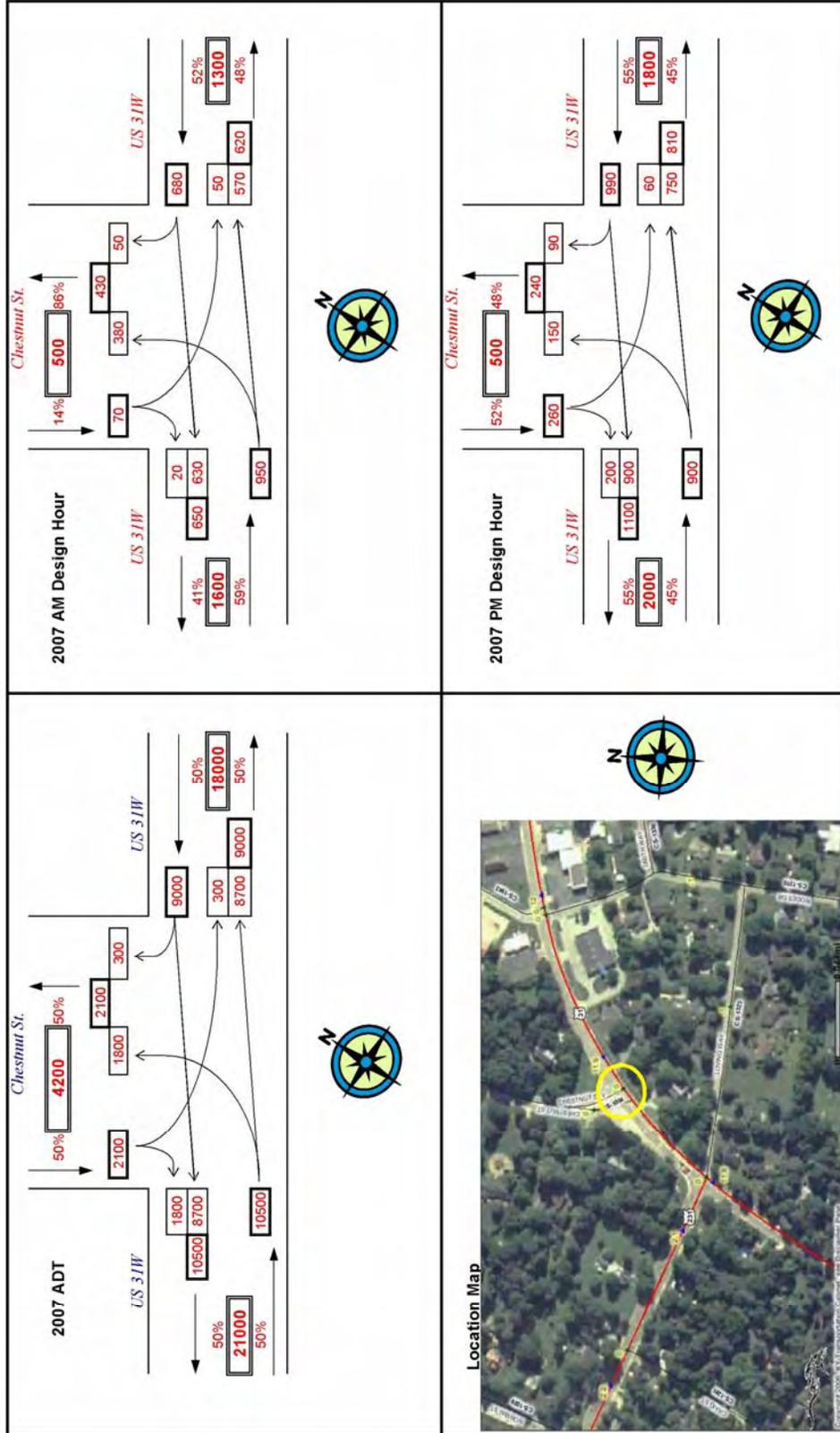
MARS NUMBER: 80500 01 D

REQUEST DATE: 3/21/2007

ANALYST: D. Hulker

SCENARIO: 2007 Current ADT and Design Hour Volume:

INTERSECTION: US 31W and Chestnut Street



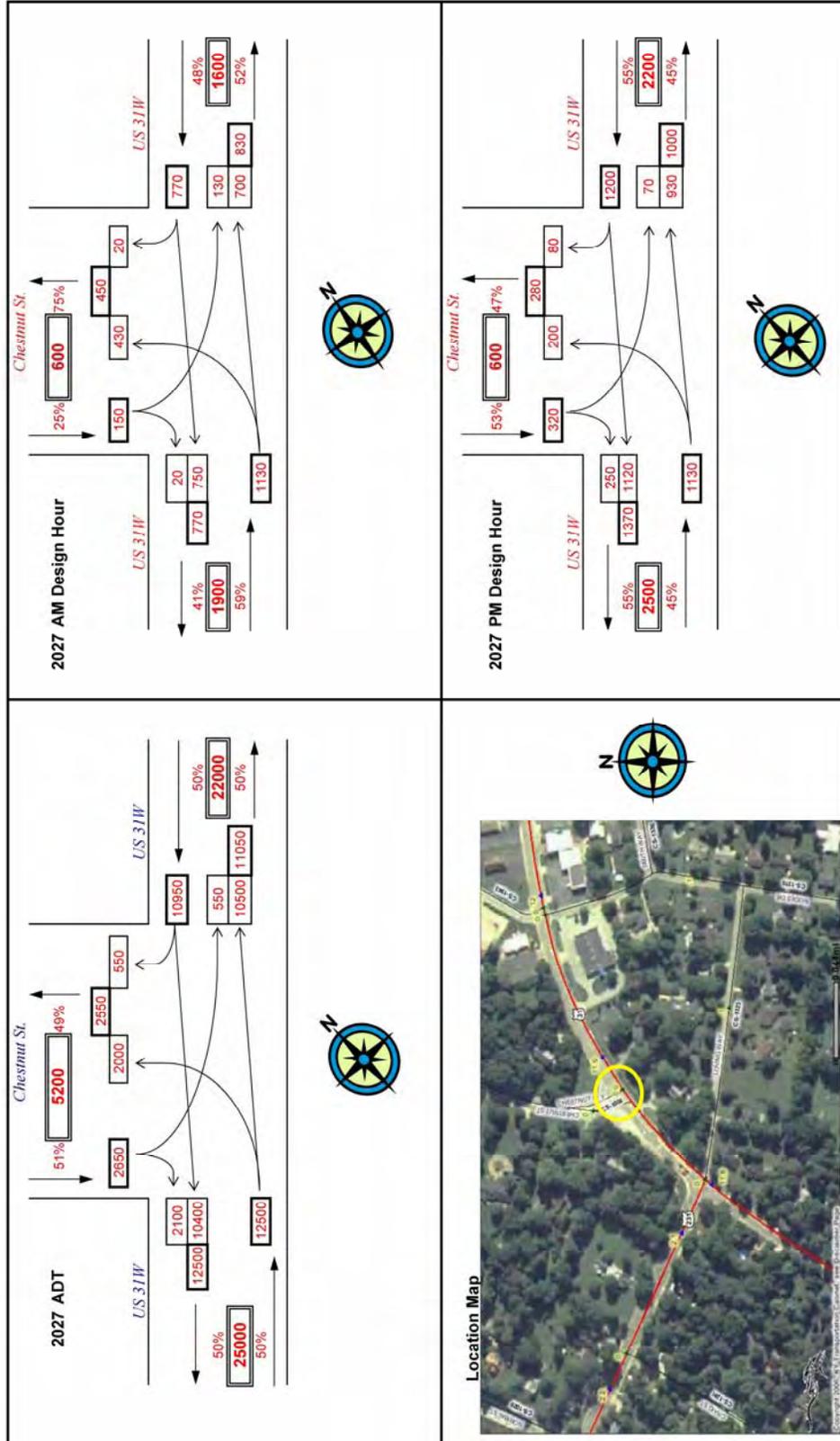
ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2007 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: Intersection Improvements on US 31W
 ITEM NUMBER: 3-131.00
 MARS NUMBER: 80500.01 D
 REQUEST DATE: 3/21/2007
 ANALYST: D. Hulker
 SCENARIO: 2027 Future ADT and Design Hour Volumes
 INTERSECTION: US 31W and Chestnut Street



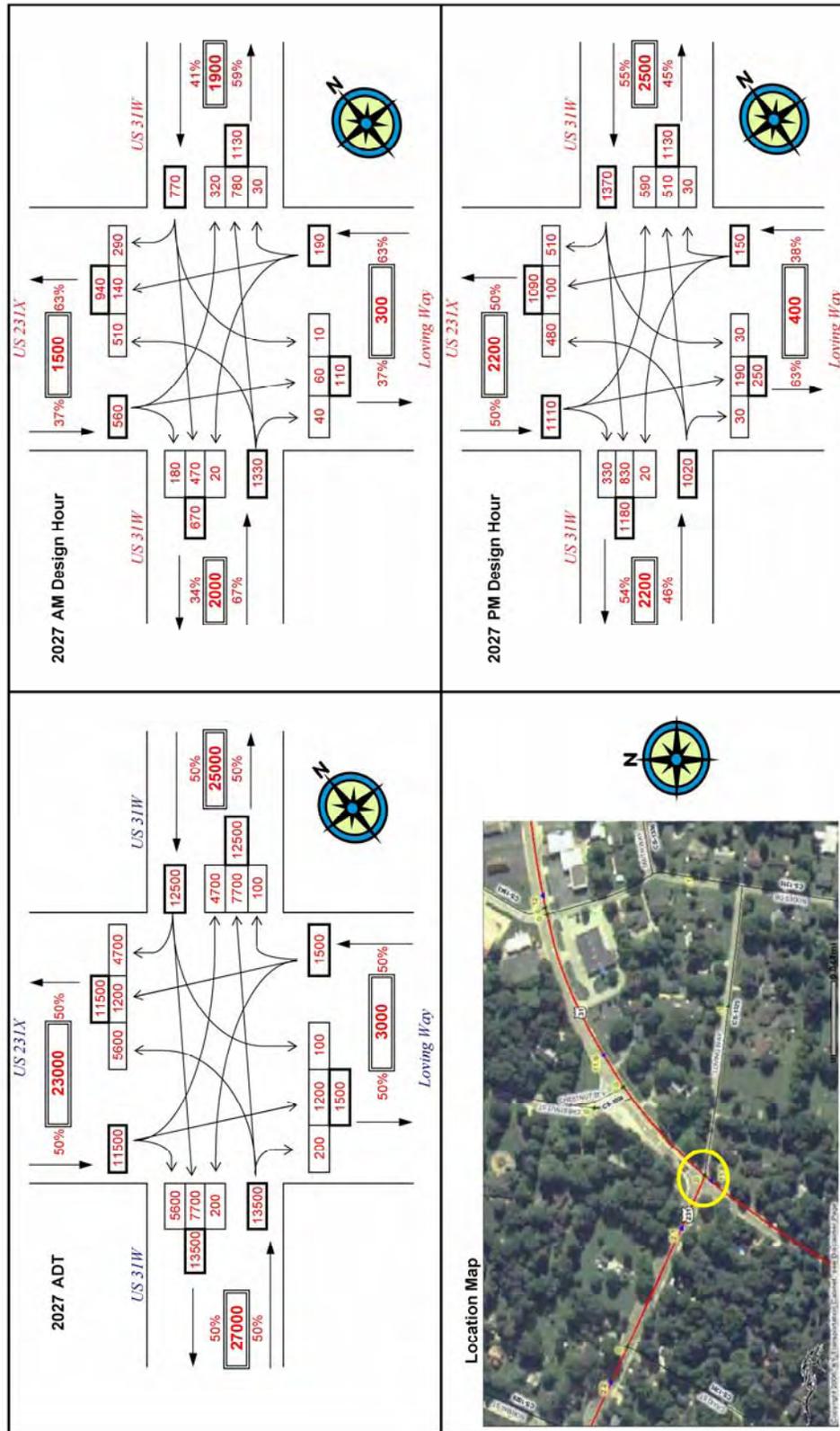
ATTACHMENT 4

Traffic Forecast Technical Report

Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving Way. Item No. 3-131.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2007 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: Intersection Improvements on US 31W
 ITEM NUMBER: 3-131.00
 MARS NUMBER: 80500 01 D
 REQUEST DATE: 3/21/2007
 ANALYST: D. Hulker
 SCENARIO: 2027 Current ADT and Design Hour Volumes
 INTERSECTION: US 31W, US 231X, and Loving Way



ATTACHMENT 5
VISSIM Delay Analysis of Initial
Alternatives (11-02-07)

SUMMARY OF VISSIM ANALYSIS

WARREN COUNTY US 31 - UNIVERSITY DR – CHESTNUT ST INTERSECTION ANALYSIS

Item No. 3-131.00

November 2007

Prepared for:

**Commonwealth of Kentucky
Transportation Cabinet**

Prepared by:



Architecture Engineering Construction

815 West Market Street, Suite 300
Louisville, Kentucky 40202
Phone: 502-585-2222 • Fax: 502-566-3058

ATTACHMENT 5

COMPARISON OF ALTERNATIVES

SUMMARY OF AM PEAK HOUR DELAYS

From	To	Existing	No Build	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Northbound US 31	Eastbound Loving	6	12	17	20	13	155	22	17
Northbound US 31	Northbound US 31	10	18	18	21	17	154	22	17
Northbound US 31	Northbound Chestnut	21	33	35	24	19	181	64	12
Northbound US 31	Westbound University	24	49	38	57	53	88	63	51
Westbound Loving	Northbound US 31	13	19	21	26	11	26	29	29
Westbound Loving	Northbound Chestnut	36	37	29	32	37	86	54	15
Westbound Loving	Westbound University	19	21	20	23	21	27	48	23
Westbound Loving	Southbound US 31	7	16	17	17	16	12	38	8
Southbound US 31	Northbound Chestnut	1	1	1	1	2	45	6	1
Southbound US 31	Westbound University	7	8	7	8	10	67	10	26
Southbound US 31	Southbound US 31	20	30	21	25	22	100	42	52
Southbound US 31	Eastbound Loving	20	24	34	38	31	101	21	88
Southbound Chestnut	Westbound University	14	18	13	15	12	105	8	18
Southbound Chestnut	Southbound US 31	22	37	18	40	15	115	11	19
Southbound Chestnut	Eastbound Loving	15	23	17	22	31	65	20	23
Southbound Chestnut	Northbound US 31	15	19	19	12	12	205	5	4
Eastbound University	Southbound US 31	15	22	20	22	21	25	1	24
Eastbound University	Eastbound Loving	26	27	18	22	33	22	1	24
Eastbound University	Southbound US 31	24	33	32	32	41	37	3	44
Eastbound University	Northbound Chestnut	32	41	45	36	52	64	6	35

SUMMARY OF PM PEAK HOUR DELAYS

From	To	Existing	No Build	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Northbound US 31	Eastbound Loving	21	53	31	36	14	149	103	44
Northbound US 31	Northbound US 31	16	54	30	36	12	150	168	37
Northbound US 31	Northbound Chestnut	39	86	48	52	19	158	240	39
Northbound US 31	Westbound University	47	142	109	120	59	71	111	123
Westbound Loving	Northbound US 31	16	36	25	19	8	18	4	30
Westbound Loving	Northbound Chestnut	58	66	28	20	6	36	12	35
Westbound Loving	Westbound University	22	29	21	23	16	17	11	28
Westbound Loving	Southbound US 31	11	21	5	6	4	10	9	11
Southbound US 31	Northbound Chestnut	97	210	5	170	1	619	9	149
Southbound US 31	Westbound University	165	302	41	273	31	687	24	189
Southbound US 31	Southbound US 31	160	272	20	257	53	764	18	268
Southbound US 31	Eastbound Loving	160	244	64	246	35	824	18	267
Southbound Chestnut	Westbound University	243	428	184	161	61	142	60	57
Southbound Chestnut	Southbound US 31	233	416	175	160	36	245	66	250
Southbound Chestnut	Eastbound Loving	231	360	186	138	63	290	52	227
Southbound Chestnut	Northbound US 31	58	204	26	15	20	24	18	215
Eastbound University	Southbound US 31	65	131	5	136	12	120	16	132
Eastbound University	Eastbound Loving	61	148	136	143	121	129	17	134
Eastbound University	Northbound US 31	83	174	157	161	153	178	40	155
Eastbound University	Northbound Chestnut	103	198	164	182	132	177	64	166

ATTACHMENT 5

**EXISTING ROADWAY NETWORK
EXISTING TRAFFIC**



Existing Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	6	21
Northbound US 31	Northbound US 31	10	16
Northbound US 31	Northbound Chestnut	21	39
Northbound US 31	Westbound University	24	47
Westbound Loving	Northbound US 31	13	16
Westbound Loving	Northbound Chestnut	36	58
Westbound Loving	Westbound University	19	22
Westbound Loving	Southbound US 31	7	11
Southbound US 31	Northbound Chestnut	1	97
Southbound US 31	Westbound University	7	165
Southbound US 31	Southbound US 31	20	160
Southbound US 31	Eastbound Loving	20	160
Southbound Chestnut	Westbound University	14	243
Southbound Chestnut	Southbound US 31	22	233
Southbound Chestnut	Eastbound Loving	15	231
Southbound Chestnut	Northbound US 31	15	58
Eastbound University	Southbound US 31	15	65
Eastbound University	Eastbound Loving	26	61
Eastbound University	Northbound US 31	24	83
Eastbound University	Northbound Chestnut	32	103

EXISTING ROADWAY NETWORK FUTURE YEAR TRAFFIC



No-Build Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	12	53
Northbound US 31	Northbound US 31	18	54
Northbound US 31	Northbound Chestnut	33	86
Northbound US 31	Westbound University	49	142
Westbound Loving	Northbound US 31	19	36
Westbound Loving	Northbound Chestnut	37	66
Westbound Loving	Westbound University	21	29
Westbound Loving	Southbound US 31	16	21
Southbound US 31	Northbound Chestnut	1	210
Southbound US 31	Westbound University	8	302
Southbound US 31	Southbound US 31	30	272
Southbound US 31	Eastbound Loving	24	244
Southbound Chestnut	Westbound University	18	428
Southbound Chestnut	Southbound US 31	37	416
Southbound Chestnut	Eastbound Loving	23	360
Southbound Chestnut	Northbound US 31	19	204
Eastbound University	Southbound US 31	22	131
Eastbound University	Eastbound Loving	27	148
Eastbound University	Northbound US 31	33	174
Eastbound University	Northbound Chestnut	41	198

ALTERNATIVE 1 FUTURE YEAR TRAFFIC

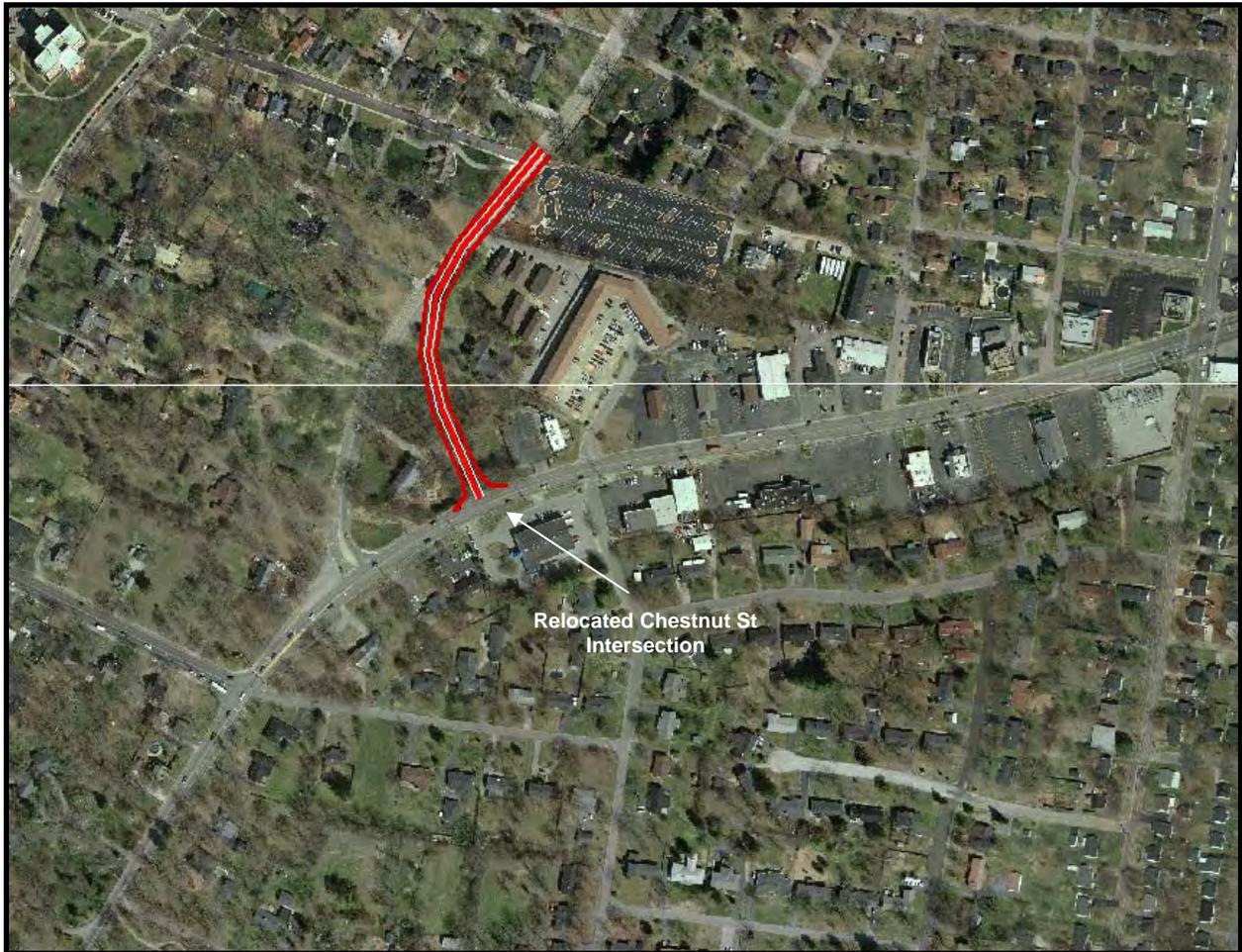


Alternative 1 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	17	31
Northbound US 31	Northbound US 31	18	30
Northbound US 31	Northbound Chestnut	35	48
Northbound US 31	Westbound University	38	109
Westbound Loving	Northbound US 31	21	25
Westbound Loving	Northbound Chestnut	29	28
Westbound Loving	Westbound University	20	21
Westbound Loving	Southbound US 31	17	5
Southbound US 31	Northbound Chestnut	1	5
Southbound US 31	Westbound University	7	41
Southbound US 31	Southbound US 31	21	20
Southbound US 31	Eastbound Loving	34	64
Southbound Chestnut	Westbound University	13	184
Southbound Chestnut	Southbound US 31	18	175
Southbound Chestnut	Eastbound Loving	17	186
Southbound Chestnut	Northbound US 31	19	26
Eastbound University	Southbound US 31	20	5
Eastbound University	Eastbound Loving	18	136
Eastbound University	Northbound US 31	32	157
Eastbound University	Northbound Chestnut	45	164

ATTACHMENT 5

ALTERNATIVE 2 FUTURE YEAR TRAFFIC



Alternative 2 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	20	36
Northbound US 31	Northbound US 31	21	36
Northbound US 31	Northbound Chestnut	24	52
Northbound US 31	Westbound University	57	120
Westbound Loving	Northbound US 31	26	19
Westbound Loving	Northbound Chestnut	32	20
Westbound Loving	Westbound University	23	23
Westbound Loving	Southbound US 31	17	6
Southbound US 31	Northbound Chestnut	1	170
Southbound US 31	Westbound University	8	273
Southbound US 31	Southbound US 31	25	257
Southbound US 31	Eastbound Loving	38	246
Southbound Chestnut	Westbound University	15	161
Southbound Chestnut	Southbound US 31	40	160
Southbound Chestnut	Eastbound Loving	22	138
Southbound Chestnut	Northbound US 31	12	15
Eastbound University	Southbound US 31	22	136
Eastbound University	Eastbound Loving	22	143
Eastbound University	Northbound US 31	32	161
Eastbound University	Northbound Chestnut	36	182

ALTERNATIVE 3 FUTURE YEAR TRAFFIC



Alternative 3 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	13	14
Northbound US 31	Northbound US 31	17	12
Northbound US 31	Northbound Chestnut	19	19
Northbound US 31	Westbound University	53	59
Westbound Loving	Northbound US 31	11	8
Westbound Loving	Northbound Chestnut	37	6
Westbound Loving	Westbound University	21	16
Westbound Loving	Southbound US 31	16	4
Southbound US 31	Northbound Chestnut	2	1
Southbound US 31	Westbound University	10	31
Southbound US 31	Southbound US 31	22	53
Southbound US 31	Eastbound Loving	31	35
Southbound Chestnut	Westbound University	12	61
Southbound Chestnut	Southbound US 31	15	36
Southbound Chestnut	Eastbound Loving	31	63
Southbound Chestnut	Northbound US 31	12	20
Eastbound University	Southbound US 31	21	12
Eastbound University	Eastbound Loving	33	121
Eastbound University	Northbound US 31	41	153
Eastbound University	Northbound Chestnut	52	132

ALTERNATIVE 4 FUTURE YEAR TRAFFIC



Alternative 4 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	155	149
Northbound US 31	Northbound US 31	154	150
Northbound US 31	Northbound Chestnut	181	158
Northbound US 31	Westbound University	88	71
Westbound Loving	Northbound US 31	26	18
Westbound Loving	Northbound Chestnut	86	36
Westbound Loving	Westbound University	27	17
Westbound Loving	Southbound US 31	12	10
Southbound US 31	Northbound Chestnut	45	619
Southbound US 31	Westbound University	67	687
Southbound US 31	Southbound US 31	100	764
Southbound US 31	Eastbound Loving	101	824
Southbound Chestnut	Westbound University	105	142
Southbound Chestnut	Southbound US 31	115	245
Southbound Chestnut	Eastbound Loving	65	290
Southbound Chestnut	Northbound US 31	205	24
Eastbound University	Southbound US 31	25	120
Eastbound University	Eastbound Loving	22	129
Eastbound University	Northbound US 31	37	178
Eastbound University	Northbound Chestnut	64	177

ATTACHMENT 5

ALTERNATIVE 5 FUTURE YEAR TRAFFIC



Alternative 5 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	22	103
Northbound US 31	Northbound US 31	22	168
Northbound US 31	Northbound Chestnut	64	240
Northbound US 31	Westbound University	63	111
Westbound Loving	Northbound US 31	29	4
Westbound Loving	Northbound Chestnut	54	12
Westbound Loving	Westbound University	48	11
Westbound Loving	Southbound US 31	38	9
Southbound US 31	Northbound Chestnut	6	9
Southbound US 31	Westbound University	10	24
Southbound US 31	Southbound US 31	42	18
Southbound US 31	Eastbound Loving	21	18
Southbound Chestnut	Westbound University	8	60
Southbound Chestnut	Southbound US 31	11	66
Southbound Chestnut	Eastbound Loving	20	52
Southbound Chestnut	Northbound US 31	5	18
Eastbound University	Southbound US 31	1	16
Eastbound University	Eastbound Loving	1	17
Eastbound University	Northbound US 31	3	40
Eastbound University	Northbound Chestnut	6	64

ATTACHMENT 5

ALTERNATIVE 6 FUTURE YEAR TRAFFIC



Alternative 6 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	17	44
Northbound US 31	Northbound US 31	17	37
Northbound US 31	Northbound Chestnut	12	39
Northbound US 31	Westbound University	51	123
Westbound Loving	Northbound US 31	29	30
Westbound Loving	Northbound Chestnut	15	35
Westbound Loving	Westbound University	23	28
Westbound Loving	Southbound US 31	8	11
Southbound US 31	Northbound Chestnut	1	149
Southbound US 31	Westbound University	26	189
Southbound US 31	Southbound US 31	52	268
Southbound US 31	Eastbound Loving	88	267
Southbound Chestnut	Westbound University	18	57
Southbound Chestnut	Southbound US 31	19	250
Southbound Chestnut	Eastbound Loving	23	227
Southbound Chestnut	Northbound US 31	4	215
Eastbound University	Southbound US 31	24	132
Eastbound University	Eastbound Loving	24	134
Eastbound University	Northbound US 31	44	155
Eastbound University	Northbound Chestnut	35	166

ATTACHMENT 6
Project Team Meeting Minutes (11-02-07)



Architecture

Engineering

Construction

MEETING MINUTES

Project: US31 – University/Chestnut Intersections, Item No. 3-131.00
(Statewide Roadway Design)

Purpose: Project Team Meeting, Review VISSIM Analysis/Simulations

Place: KYTC, District 3, Bowling Green, Kentucky

Meeting Date: November 2, 2007

Prepared By: Bob Gustafson

In Attendance:

Steve James	KYTC, D-3
Jim Hudson	KYTC, D-3
Jeff Moore	KYTC, D-3
Scott Pedigo	KYTC, D-3
Keirsten Jagers	KYTC, D-3
Jeremy Lukat	Qk4
Andy Gilley	Qk4
Bob Gustafson	Qk4

This meeting was scheduled to provide the project team the opportunity to review the VISSIM simulations and delay analysis for the considered alternatives prior to meeting with local officials and completion of this study. Qk4 presented the simulations and provided the delay analysis for the following:

1. Existing Configuration (2007)
2. No-Build (2027)
3. Alternate 1 (2027) – Add Exclusive Right Turn Lane (US31 SB to University WB) and include an additional thru lanes on US31 SB with merge area south of the intersection with University
4. Alternate 2 (2027) – Relocate Chestnut to the north to gain more separation with the University Intersection (Chestnut non-signalized)
5. Alternate 3 (2027) – Relocate Chestnut to the north (Chestnut non-signalized) plus improvements described in Alternative 1
6. Alternate 4 (2027) – Alternative 3 (Signalized)
7. Alternate 5 (2027) – Dual Roundabouts at University and Chestnut
8. Alternate 6 (2027) – Single Roundabout at Chestnut

ATTACHMENT 6

Project Team Meeting

November 2, 2007

Page 2

After review of the simulations and delay analysis the project team had the following comments (Delay Analysis included as Attachment 1):

- Alternative 1 provides a significant reduction in delays as compared to No-Build. This alternative should be fairly inexpensive and could be implemented as an interim improvement if a more extensive Alternative is ultimately recommended. This alternative will be carried forward.
- Alternative 2 was deemed ineffective by the project team and will be removed from further consideration.
- Alternative 3 provides a significant reduction in delay as compared to Alternative 1 alone. The project team recommended Alternative 3 be carried forward and for the consultant to add an alternative, Alternative 3A, that would investigate moving relocated Chestnut slightly south to avoid the sinkhole. This may involve the taking of a residence. Both of these alternatives will be analyzed with and without signals at Chestnut.
- Alternative 4 was recommended to be removed from further consideration.
- Alternative 5, while deemed confusing and undesirable by the project team, will be carried forward since this alternative was thought to be a viable alternative by local officials.
- Alternative 6 was deemed ineffective by the project team and to be removed from further consideration.

Qk4 will now advance the investigation of Alternative 1, Alternative 3, Alternative 3A and Alternative 5. The following will be prepared for presentation to the MPO in December 2007:

- Refined VISSIM simulations and analysis for each alternative
- Construction cost estimates
- Approximate property lines and owners from tax maps
- Right of Way impacts
- Graphics on boards for each alternative

Other items discussed by the Project Team:

- Investigate poor sight lines at US 31 - University/Loving Intersection
- Evaluate coordination with existing pedestrian facilities
- Qk4 will contact Jeff Lashlee at the City to see if they have any information on the sinkhole that is located north of Chestnut and west of US 31W.

ATTACHMENT 6

Project Team Meeting
November 2, 2007
Page 3

After the Project Team Meeting, Qk4 staff visited the project site. The two photos below are of the sinkhole near the project location. As you can see there has been a structure constructed over the sinkhole which does not exhibit an open throat.



ATTACHMENT 6

Project Team Meeting
November 2, 2007
Page 4



END OF MINUTES

REG/cw

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**ATTACHMENT 6A
VISSIM Delay Analysis for MPO
Meeting (12-17-07)**

SUMMARY OF VISSIM ANALYSIS

WARREN COUNTY US 31 - UNIVERSITY DR – CHESTNUT ST INTERSECTION ANALYSIS

Item No. 3-130.00

December 2007

Prepared for:

**Commonwealth of Kentucky
Transportation Cabinet**

Prepared by:



Architecture Engineering Construction

815 West Market Street, Suite 300
Louisville, Kentucky 40202
Phone: 502-585-2222 • Fax: 502-566-3058

ATTACHMENT 6A

COMPARISON OF ALTERNATIVES

SUMMARY OF AM PEAK HOUR DELAYS

From	To	Existing	No Build	Alt 1	Alt 3	Alt 3A	Alt 5
Northbound US 31	Eastbound Loving	13	30	26	13	15	24
Northbound US 31	Northbound US 31	20	32	25	17	13	44
Northbound US 31	Northbound Chestnut	32	48	42	19	19	54
Northbound US 31	Westbound University	26	68	47	53	32	55
Westbound Loving	Northbound US 31	21	34	34	11	9	6
Westbound Loving	Northbound Chestnut	37	42	35	37	12	9
Westbound Loving	Westbound University	20	22	22	21	17	19
Westbound Loving	Southbound US 31	22	26	17	16	15	28
Southbound US 31	Northbound Chestnut	1	1	1	2	1	7
Southbound US 31	Westbound University	10	9	7	10	1	14
Southbound US 31	Southbound US 31	28	34	21	22	35	18
Southbound US 31	Eastbound Loving	62	44	39	31	21	16
Southbound Chestnut	Westbound University	16	17	16	12	8	5
Southbound Chestnut	Southbound US 31	24	33	18	15	14	7
Southbound Chestnut	Eastbound Loving	15	16	17	31	16	18
Southbound Chestnut	Northbound US 31	19	23	23	12	18	4
Eastbound University	Southbound US 31	24	23	20	21	19	1
Eastbound University	Eastbound Loving	19	23	19	33	20	4
Eastbound University	Northbound US 31	27	28	35	41	26	9
Eastbound University	Northbound Chestnut	41	52	51	52	32	9

SUMMARY OF PM PEAK HOUR DELAYS

From	To	Existing	No Build	Alt 1	Alt 3	Alt 3A	Alt 5
Northbound US 31	Eastbound Loving	18	55	51	40	52	7
Northbound US 31	Northbound US 31	24	56	54	39	46	7
Northbound US 31	Northbound Chestnut	43	86	87	58	63	66
Northbound US 31	Westbound University	53	136	130	116	83	49
Westbound Loving	Northbound US 31	28	41	28	19	30	14
Westbound Loving	Northbound Chestnut	44	38	52	25	70	3
Westbound Loving	Westbound University	26	29	22	31	29	18
Westbound Loving	Southbound US 31	14	19	15	6	22	21
Southbound US 31	Northbound Chestnut	120	218	3	1	15	95
Southbound US 31	Westbound University	196	294	15	1	27	135
Southbound US 31	Southbound US 31	186	275	45	52	59	216
Southbound US 31	Eastbound Loving	198	269	50	30	69	221
Southbound Chestnut	Westbound University	280	672	63	46	52	47
Southbound Chestnut	Southbound US 31	302	619	56	30	89	60
Southbound Chestnut	Eastbound Loving	236	425	71	66	99	49
Southbound Chestnut	Northbound US 31	46	356	27	23	34	39
Eastbound University	Southbound US 31	36	32	42	10	50	6
Eastbound University	Eastbound Loving	36	37	39	75	46	95
Eastbound University	Northbound US 31	75	144	133	133	80	118
Eastbound University	Northbound Chestnut	73	156	146	114	107	125

ATTACHMENT 6A

**EXISTING ROADWAY NETWORK
EXISTING TRAFFIC**



Existing Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	13	18
Northbound US 31	Northbound US 31	20	24
Northbound US 31	Northbound Chestnut	32	43
Northbound US 31	Westbound University	26	53
Westbound Loving	Northbound US 31	21	28
Westbound Loving	Northbound Chestnut	37	44
Westbound Loving	Westbound University	20	26
Westbound Loving	Southbound US 31	22	14
Southbound US 31	Northbound Chestnut	1	120
Southbound US 31	Westbound University	10	196
Southbound US 31	Southbound US 31	28	186
Southbound US 31	Eastbound Loving	62	198
Southbound Chestnut	Westbound University	16	280
Southbound Chestnut	Southbound US 31	24	302
Southbound Chestnut	Eastbound Loving	15	236
Southbound Chestnut	Northbound US 31	19	46
Eastbound University	Southbound US 31	24	36
Eastbound University	Eastbound Loving	19	36
Eastbound University	Northbound US 31	27	75
Eastbound University	Northbound Chestnut	41	73

ATTACHMENT 6A

**EXISTING ROADWAY NETWORK
FUTURE YEAR TRAFFIC**



No-Build Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	30	55
Northbound US 31	Northbound US 31	32	56
Northbound US 31	Northbound Chestnut	48	86
Northbound US 31	Westbound University	68	136
Westbound Loving	Northbound US 31	34	41
Westbound Loving	Northbound Chestnut	42	38
Westbound Loving	Westbound University	22	29
Westbound Loving	Southbound US 31	26	19
Southbound US 31	Northbound Chestnut	1	218
Southbound US 31	Westbound University	9	294
Southbound US 31	Southbound US 31	34	275
Southbound US 31	Eastbound Loving	44	269
Southbound Chestnut	Westbound University	17	672
Southbound Chestnut	Southbound US 31	33	619
Southbound Chestnut	Eastbound Loving	16	425
Southbound Chestnut	Northbound US 31	23	356
Eastbound University	Southbound US 31	23	32
Eastbound University	Eastbound Loving	23	37
Eastbound University	Northbound US 31	28	144
Eastbound University	Northbound Chestnut	52	156

ATTACHMENT 6A

ALTERNATIVE 1 FUTURE YEAR TRAFFIC



Alternative 1 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	26	51
Northbound US 31	Northbound US 31	25	54
Northbound US 31	Northbound Chestnut	42	87
Northbound US 31	Westbound University	47	130
Westbound Loving	Northbound US 31	34	28
Westbound Loving	Northbound Chestnut	35	52
Westbound Loving	Westbound University	22	22
Westbound Loving	Southbound US 31	17	15
Southbound US 31	Northbound Chestnut	1	3
Southbound US 31	Westbound University	7	15
Southbound US 31	Southbound US 31	21	45
Southbound US 31	Eastbound Loving	39	50
Southbound Chestnut	Westbound University	16	63
Southbound Chestnut	Southbound US 31	18	56
Southbound Chestnut	Eastbound Loving	17	71
Southbound Chestnut	Northbound US 31	23	27
Eastbound University	Southbound US 31	20	42
Eastbound University	Eastbound Loving	19	39
Eastbound University	Northbound US 31	35	133
Eastbound University	Northbound Chestnut	51	146

ATTACHMENT 6A

**ALTERNATIVE 3
FUTURE YEAR TRAFFIC**



Alternative 3 Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	13	40
Northbound US 31	Northbound US 31	17	39
Northbound US 31	Northbound Chestnut	19	58
Northbound US 31	Westbound University	53	116
Westbound Loving	Northbound US 31	11	19
Westbound Loving	Northbound Chestnut	37	25
Westbound Loving	Westbound University	21	31
Westbound Loving	Southbound US 31	16	6
Southbound US 31	Northbound Chestnut	2	1
Southbound US 31	Westbound University	10	1
Southbound US 31	Southbound US 31	22	52
Southbound US 31	Eastbound Loving	31	30
Southbound Chestnut	Westbound University	12	46
Southbound Chestnut	Southbound US 31	15	30
Southbound Chestnut	Eastbound Loving	31	66
Southbound Chestnut	Northbound US 31	12	23
Eastbound University	Southbound US 31	21	10
Eastbound University	Eastbound Loving	33	75
Eastbound University	Northbound US 31	41	133
Eastbound University	Northbound Chestnut	52	114

ATTACHMENT 6A

**ALTERNATIVE 3A
FUTURE YEAR TRAFFIC**

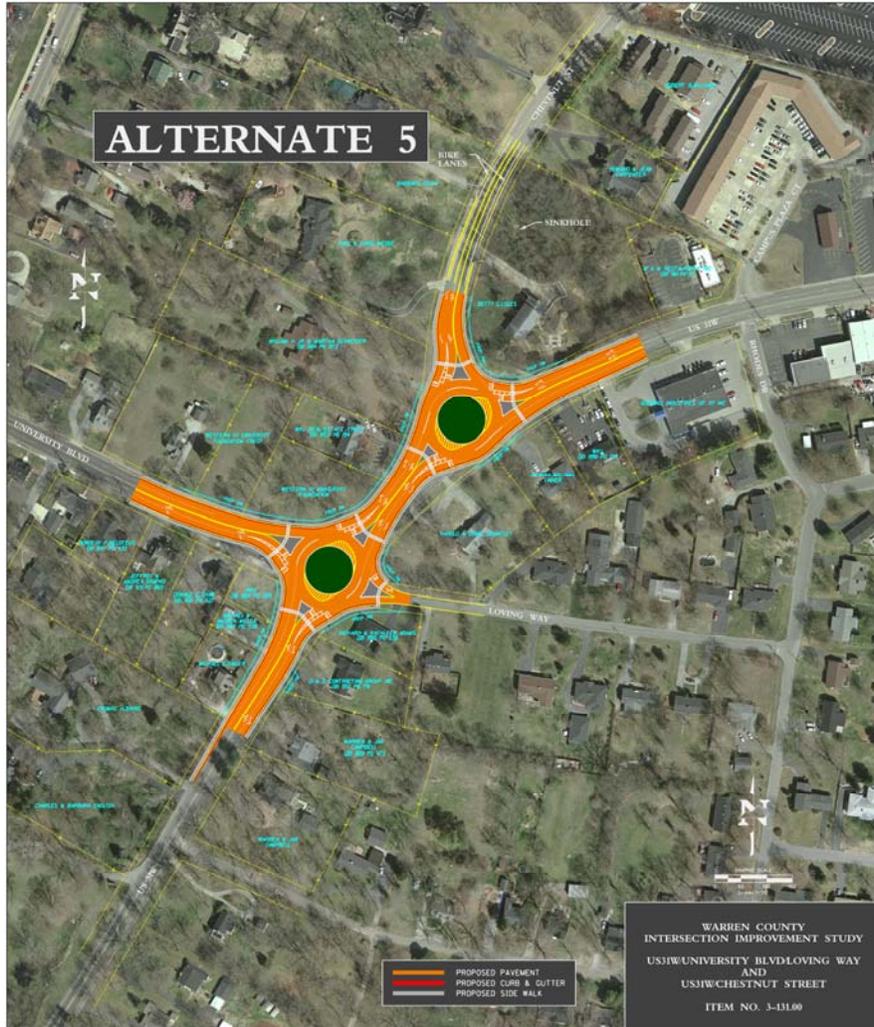


Alternative 3A Summary of Delays

From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	15	52
Northbound US 31	Northbound US 31	13	46
Northbound US 31	Northbound Chestnut	19	63
Northbound US 31	Westbound University	32	83
Westbound Loving	Northbound US 31	9	30
Westbound Loving	Northbound Chestnut	12	70
Westbound Loving	Westbound University	17	29
Westbound Loving	Southbound US 31	15	22
Southbound US 31	Northbound Chestnut	1	15
Southbound US 31	Westbound University	1	27
Southbound US 31	Southbound US 31	35	59
Southbound US 31	Eastbound Loving	21	69
Southbound Chestnut	Westbound University	8	52
Southbound Chestnut	Southbound US 31	14	89
Southbound Chestnut	Eastbound Loving	16	99
Southbound Chestnut	Northbound US 31	18	34
Eastbound University	Southbound US 31	19	50
Eastbound University	Eastbound Loving	20	46
Eastbound University	Northbound US 31	26	80
Eastbound University	Northbound Chestnut	32	107

ATTACHMENT 6A

ALTERNATIVE 5 FUTURE YEAR TRAFFIC

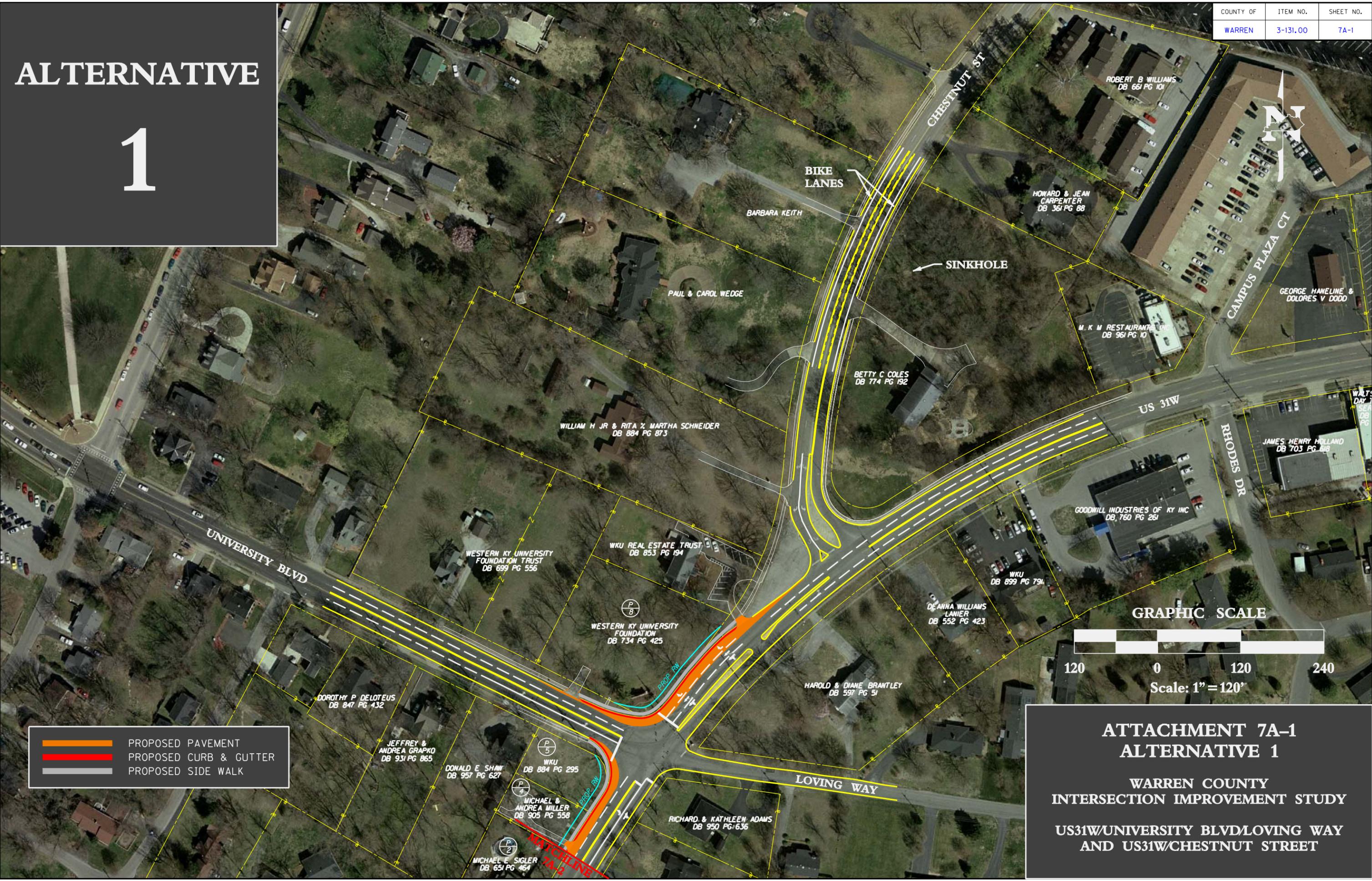


Alternative 5 Summary of Delays

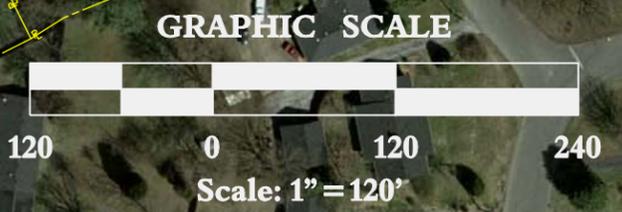
From	To	AM Peak	PM Peak
Northbound US 31	Eastbound Loving	24	7
Northbound US 31	Northbound US 31	44	7
Northbound US 31	Northbound Chestnut	54	66
Northbound US 31	Westbound University	55	49
Westbound Loving	Northbound US 31	6	14
Westbound Loving	Northbound Chestnut	9	3
Westbound Loving	Westbound University	19	18
Westbound Loving	Southbound US 31	28	21
Southbound US 31	Northbound Chestnut	7	95
Southbound US 31	Westbound University	14	135
Southbound US 31	Southbound US 31	18	216
Southbound US 31	Eastbound Loving	16	221
Southbound Chestnut	Westbound University	5	47
Southbound Chestnut	Southbound US 31	7	60
Southbound Chestnut	Eastbound Loving	18	49
Southbound Chestnut	Northbound US 31	4	39
Eastbound University	Southbound US 31	1	6
Eastbound University	Eastbound Loving	4	95
Eastbound University	Northbound US 31	9	118
Eastbound University	Northbound Chestnut	9	125

ATTACHMENT 7
Plan Layouts of Short-List Alternatives

ALTERNATIVE 1

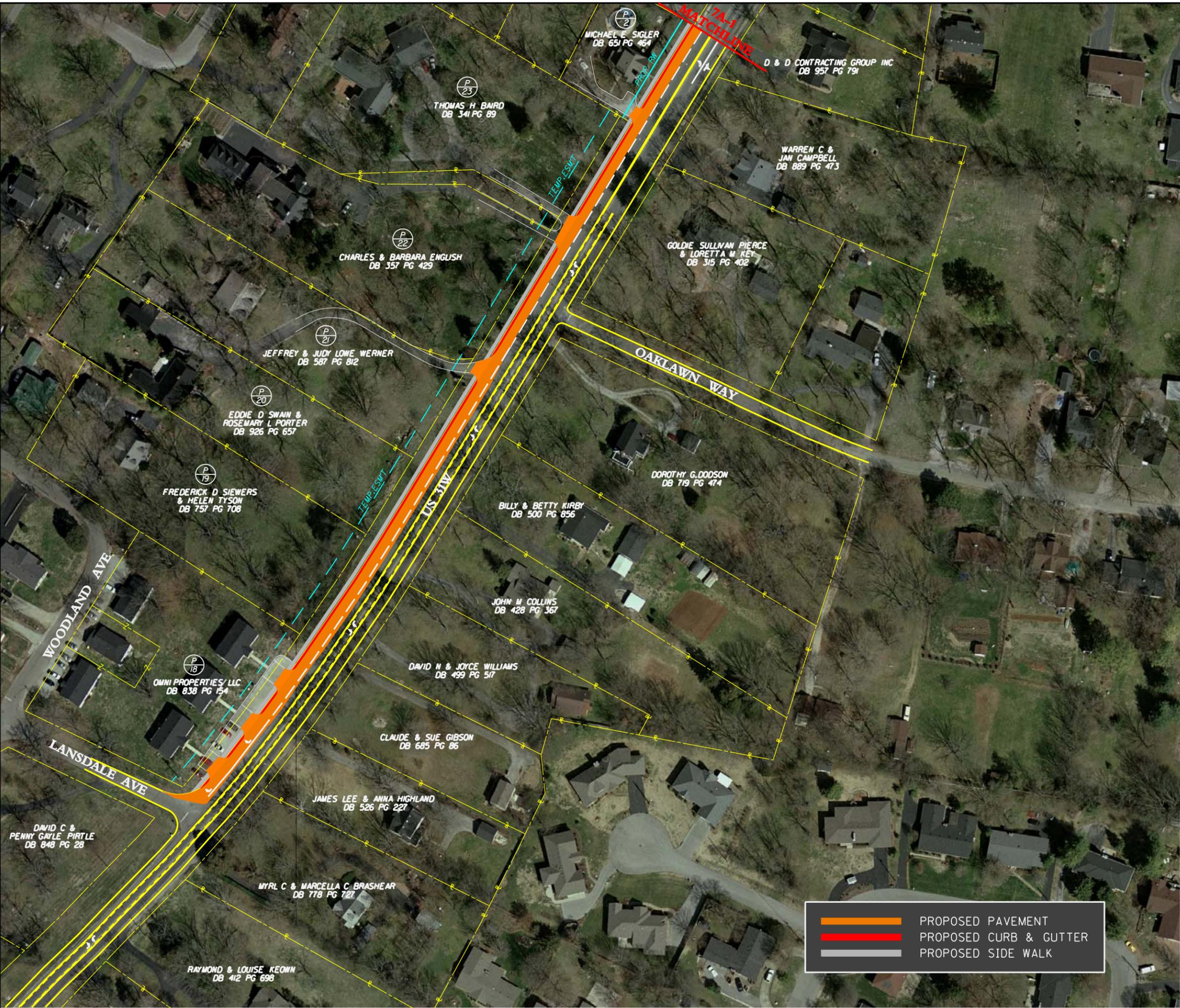


PROPOSED PAVEMENT
 PROPOSED CURB & GUTTER
 PROPOSED SIDE WALK

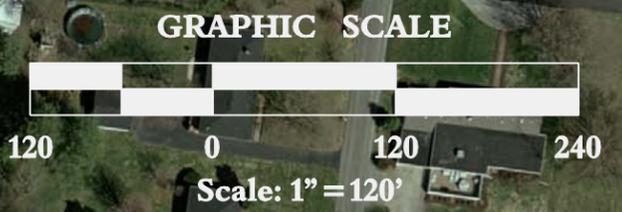


ATTACHMENT 7A-1
ALTERNATIVE 1
 WARREN COUNTY
 INTERSECTION IMPROVEMENT STUDY
 US31W/UNIVERSITY BLVD/LOVING WAY
 AND US31W/CHESTNUT STREET

MATCHLINE TO 7A-2



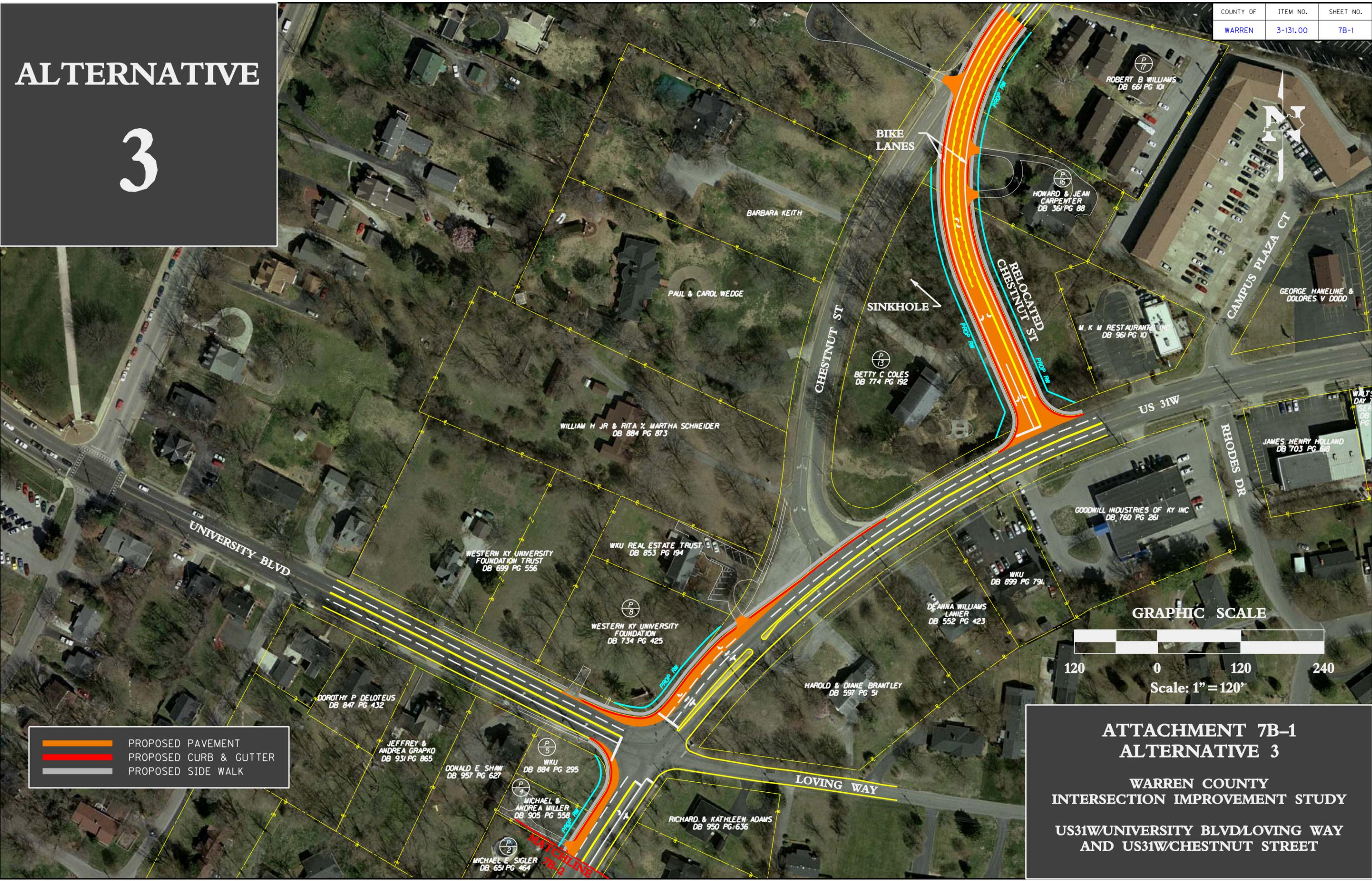
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 THOMAS H BAIRD DB 341 PG 89
 CHARLES & BARBARA ENGLISH DB 357 PG 429
 JEFFREY & JUDY LOWE WERNER DB 587 PG 812
 EDDIE D SWAIN & ROSEMARY L PORTER DB 926 PG 657
 FREDERICK D SIEWERS & HELEN TYSON DB 757 PG 708
 OMNI PROPERTIES/LLC DB 838 PG 154
 DAVID C & PENNY GAYLE PIRTLE DB 848 PG 28
 MYRL C & MARCELLA C BRASHEAR DB 778 PG 727
 RAYMOND & LOUISE KEOWN DB 412 PG 698
 D & D CONTRACTING GROUP INC DB 957 PG 791
 WARREN C & JAN CAMPBELL DB 889 PG 473
 GOLDIE SULLMAN PIERCE & LORETTA M KEY DB 315 PG 402
 DOROTHY G. DOODSON DB 719 PG 474
 BILLY & BETTY KIRBY DB 500 PG 856
 JOHN M COLLINS DB 428 PG 367
 DAVID N & JOYCE WILLIAMS DB 499 PG 517
 CLAUDE & SUE GIBSON DB 685 PG 86
 JAMES LEE & ANNA HIGHLAND DB 526 PG 227



- PROPOSED PAVEMENT
- PROPOSED CURB & GUTTER
- PROPOSED SIDE WALK

ATTACHMENT 7A-2
ALTERNATIVE 1
 WARREN COUNTY
 INTERSECTION IMPROVEMENT STUDY
 US31W/UNIVERSITY BLVD/LOVING WAY
 AND US31W/CHESTNUT STREET

ALTERNATIVE 3

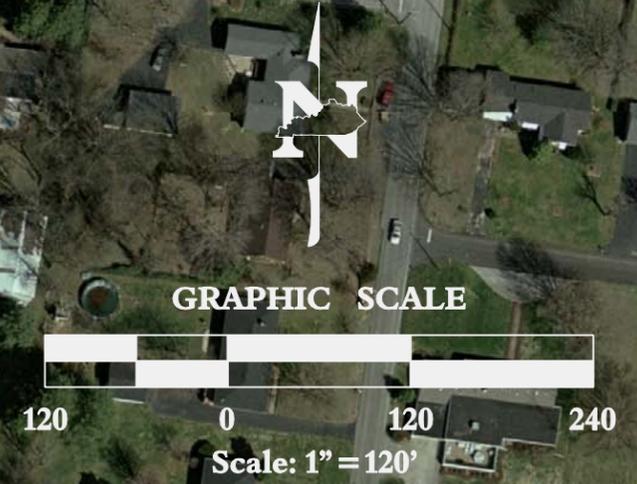


PROPOSED PAVEMENT
 PROPOSED CURB & GUTTER
 PROPOSED SIDE WALK

ATTACHMENT 7B-1
ALTERNATIVE 3
 WARREN COUNTY
 INTERSECTION IMPROVEMENT STUDY
 US31W/UNIVERSITY BLVD/LOVING WAY
 AND US31W/CHESTNUT STREET



MICHAEL E SIGLER
 DB 651 PG 464
 P 2
 THOMAS H BAIRD
 DB 341 PG 89
 P 23
 CHARLES & BARBARA ENGLISH
 DB 357 PG 429
 P 22
 JEFFREY & JUDY LOWE WERNER
 DB 587 PG 812
 P 21
 EDDIE D SWAIN &
 ROSEMARY L PORTER
 DB 926 PG 657
 P 20
 FREDERICK D SIEWERS
 & HELEN TYSON
 DB 757 PG 708
 P 19
 OMNI PROPERTIES, LLC
 DB 838 PG 154
 P 18
 DAVID C &
 PENNY GAYLE PIRTLE
 DB 848 PG 28
 DAVID N & JOYCE WILLIAMS
 DB 499 PG 517
 CLAUDE & SUE GIBSON
 DB 685 PG 86
 JAMES LEE & ANNA HIGHLAND
 DB 526 PG 227
 MYRL C & MARCELLA C BRASHEAR
 DB 778 PG 727
 RAYMOND & LOUISE KEOWN
 DB 412 PG 698
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 DB 957 PG 791
 WARREN C &
 JAN CAMPBELL
 DB 889 PG 473
 GOLDIE SULLMAN PIERCE
 & LORETTA M KEY
 DB 315 PG 402
 DOROTHY G. DOODSON
 DB 719 PG 474
 BILLY & BETTY KIRBY
 DB 500 PG 856
 JOHN M COLLINS
 DB 428 PG 367



- PROPOSED PAVEMENT
- PROPOSED CURB & GUTTER
- PROPOSED SIDE WALK

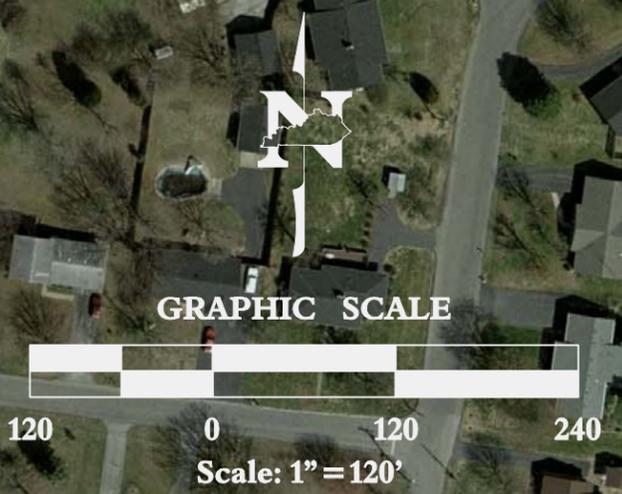
ATTACHMENT 7B-2
ALTERNATIVE 3
 WARREN COUNTY
 INTERSECTION IMPROVEMENT STUDY
 US31W/UNIVERSITY BLVD/LOVING WAY
 AND US31W/CHESTNUT STREET

COUNTY OF	ITEM NO.	SHEET NO.
WARREN	3-131.00	7C-1

ALTERNATIVE 5



- PROPOSED PAVEMENT
- PROPOSED CURB & GUTTER
- PROPOSED SIDE WALK



**ATTACHMENT 7C-1
ALTERNATIVE 5**

**WARREN COUNTY
INTERSECTION IMPROVEMENT STUDY**

**US31W/UNIVERSITY BLVD/LOVING WAY
AND US31W/CHESTNUT STREET**

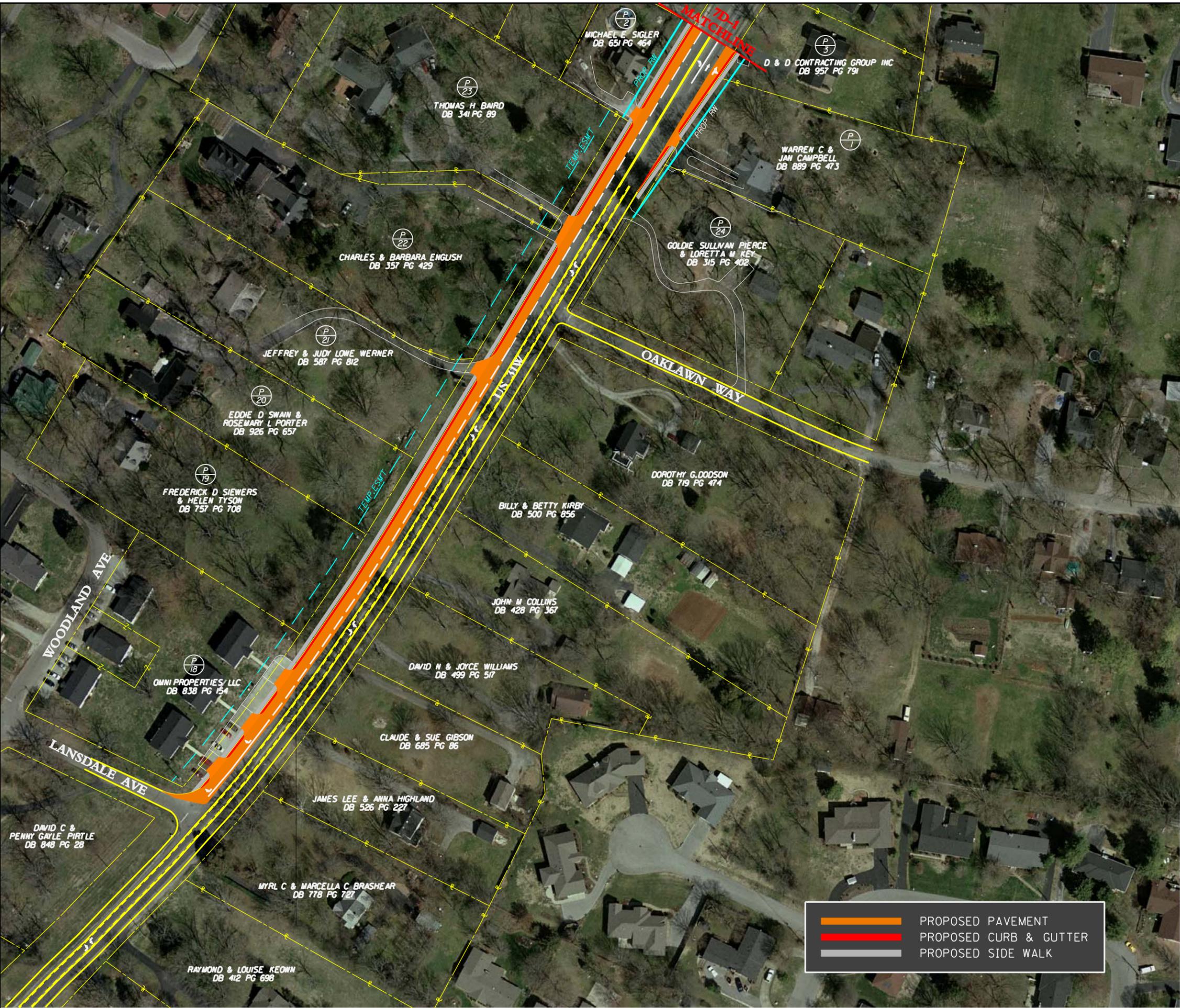
ALTERNATIVE 7



PROPOSED PAVEMENT
 PROPOSED CURB & GUTTER
 PROPOSED SIDE WALK

GRAPHIC SCALE
 120 0 120 240
 Scale: 1" = 120'

**ATTACHMENT 7D-1
ALTERNATIVE 7**
 WARREN COUNTY
 INTERSECTION IMPROVEMENT STUDY
 US31W/UNIVERSITY BLVD/LOVING WAY
 AND US31W/CHESTNUT STREET



WOODLAND AVE
 LANSDALE AVE

MICHAEL E SIGLER
DB 651 PG 464

THOMAS H BAIRD
DB 341 PG 89

CHARLES & BARBARA ENGLISH
DB 357 PG 429

JEFFREY & JUDY LOWE WERNER
DB 587 PG 812

EDDIE D SWAIN &
ROSEMARY L PORTER
DB 926 PG 657

FREDERICK D SIEWERS
& HELEN TYSON
DB 757 PG 708

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DB 838 PG 154

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DB 499 PG 517

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DB 526 PG 227

MYRL C & MARCELLA C BRASHEAR
DB 778 PG 727

RAYMOND & LOUISE KEOWN
DB 412 PG 698

D & D CONTRACTING GROUP INC
DB 957 PG 791

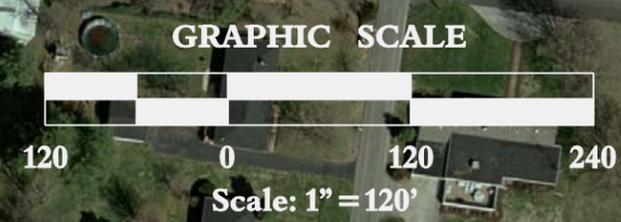
WARREN C &
JAN CAMPBELL
DB 889 PG 473

GOLDIE SULLMAN PIERCE
& LORETTA M KEY
DB 315 PG 402

DOROTHY G. DOODSON
DB 719 PG 474

BILLY & BETTY KIRBY
DB 500 PG 856

JOHN M COLLINS
DB 428 PG 367



- PROPOSED PAVEMENT
- PROPOSED CURB & GUTTER
- PROPOSED SIDE WALK

ATTACHMENT 7D-2
ALTERNATIVE 7

WARREN COUNTY
 INTERSECTION IMPROVEMENT STUDY

US31W/UNIVERSITY BLVD/LOVING WAY
 AND US31W/CHESTNUT STREET

ATTACHMENT 8
VISSIM Delay Analysis Summary of
Short-List Alternatives

ATTACHMENT 8

COMPARISON OF SHORT-LIST ALTERNATIVES

SUMMARY OF AM PEAK HOUR DELAYS

		(Seconds)							
From	To	Existing	No Build	Alt 1	Alt 3	Alt 3-S	Alt 5	Alt 7	Alt 7-S
Northbound US 31	Eastbound Loving	13	30	24	16	31	24	17	27
Northbound US 31	Northbound US 31	20	32	29	15	26	44	14	20
Northbound US 31	Northbound Chestnut	32	48	45	20	72	54	19	64
Northbound US 31	Westbound University	26	68	48	36	87	55	32	30
Westbound Loving	Northbound US 31	21	34	36	14	27	6	16	11
Westbound Loving	Northbound Chestnut	37	42	44	10	64	9	15	57
Westbound Loving	Westbound University	20	22	22	20	24	19	16	13
Westbound Loving	Southbound US 31	22	26	16	33	23	28	25	20
Southbound US 31	Northbound Chestnut	1	1	2	1	9	7	1	12
Southbound US 31	Westbound University	10	9	7	1	15	14	1	17
Southbound US 31	Southbound US 31	28	34	26	25	27	18	23	25
Southbound US 31	Eastbound Loving	62	44	47	26	27	16	21	30
Southbound Chestnut	Westbound University	16	17	15	10	36	5	8	32
Southbound Chestnut	Southbound US 31	24	33	29	22	79	7	22	43
Southbound Chestnut	Eastbound Loving	15	16	32	45	26	18	12	29
Southbound Chestnut	Northbound US 31	19	23	24	18	39	4	16	51
Eastbound University	Southbound US 31	24	23	31	20	29	1	28	13
Eastbound University	Eastbound Loving	19	23	21	19	25	4	18	17
Eastbound University	Northbound US 31	27	28	36	28	39	9	28	34
Eastbound University	Northbound Chestnut	41	52	56	31	92	9	31	72

S - Signalized Chestnut

SUMMARY OF PM PEAK HOUR DELAYS

		(Seconds)							
From	To	Existing	No Build	Alt 1	Alt 3	Alt 3-S	Alt 5	Alt 7	Alt 7-S
Northbound US 31	Eastbound Loving	18	55	51	36	131	7	15	22
Northbound US 31	Northbound US 31	24	56	55	42	131	7	24	24
Northbound US 31	Northbound Chestnut	43	86	94	54	159	66	40	67
Northbound US 31	Westbound University	53	136	135	121	83	49	115	135
Westbound Loving	Northbound US 31	28	41	32	16	30	14	4	13
Westbound Loving	Northbound Chestnut	44	38	52	6	71	3	25	47
Westbound Loving	Westbound University	26	29	23	28	29	18	32	25
Westbound Loving	Southbound US 31	14	19	17	30	22	21	15	11
Southbound US 31	Northbound Chestnut	120	218	5	1	22	95	3	25
Southbound US 31	Westbound University	196	294	16	1	27	135	7	19
Southbound US 31	Southbound US 31	186	275	47	29	58	216	29	44
Southbound US 31	Eastbound Loving	198	269	63	32	69	221	16	39
Southbound Chestnut	Westbound University	280	672	61	38	52	47	44	71
Southbound Chestnut	Southbound US 31	302	619	94	62	89	60	50	90
Southbound Chestnut	Eastbound Loving	236	425	99	62	99	49	32	58
Southbound Chestnut	Northbound US 31	46	356	34	24	34	39	27	28
Eastbound University	Southbound US 31	36	32	37	30	50	6	31	46
Eastbound University	Eastbound Loving	36	37	38	32	33	95	33	37
Eastbound University	Northbound US 31	75	144	136	126	80	118	123	131
Eastbound University	Northbound Chestnut	73	156	142	116	107	125	121	112

S - Signalized Chestnut

ATTACHMENT 9
Construction Cost Estimates

ATTACHMENT 9
DEPARTMENT OF TRANSPORTATION
Bureau of Highways
ESTIMATE SHEET

Alternative 1

County: Warren Item No. 3-131.00
 UPN Fed No.: _____ Total Length: _____
 Road Name: Intersections of US31/University Blvd/Loving Way and US31/Chestnut Street
 From: _____
 To: _____
 Net Length, _____ Type of Construction: Grade, Drain, & Surfacing Class of Road: _____

Item	Item	Quantity	Unit	Unit Price	Amount
	Clearing and Grubbing	1	LP SUM	\$ 2,100	\$ 2,100
	Seeding and Protection	3,300	SQ YD	\$ 0.35	\$ 1,155
	Sodding	815	SQ YD	\$ 4.00	\$ 3,260
	Topdressing Fertilizer	1	TON	\$ 500.00	\$ 500
	Temp. Seeding and Protection	3,300	SQ YD	\$ 0.20	\$ 660
	Roadway Excavation	1,300	CU YD	\$ 14.00	\$ 18,200
	Pave. Striping - Temp. Paint 4 In	9,200	LIN. FT	\$ 0.20	\$ 1,840
	Pave. Striping - Permanent Paint - 4 In	9,200	LIN FT	\$ 0.25	\$ 2,300
	Pave Marking - Thermo Stop Bar - 24 In	98	LIN FT	\$ 7.00	\$ 686
	Pave Marking - Pre Therm Curve Arrow	4	EACH	\$ 85.00	\$ 340
	Pave Marking - Pre Therm Straight Arrow	2	EACH	\$ 90.00	\$ 180
	Silt Trap Type C	8	EACH	\$ 250.00	\$ 2,000
	Clean Silt Trap Type C	8	EACH	\$ 43.00	\$ 344
	Temporary Silt Fence	1,440	LIN FT	\$ 2.00	\$ 2,880
	Clean Temporary Silt Fence	2,880	LIN FT	\$ 0.35	\$ 1,008
	Staking	1	LP SUM	\$ 5,000.00	\$ 5,000
	Maintain and Control Traffic	1	LP SUM	\$ 10,000.00	\$ 10,000
	R/W Marker Rural Type 1	5	EACH	\$ 75.00	\$ 375
	Storm Sewer Pipe - 18 In	1,440	LIN FT	\$ 50.00	\$ 72,015
	Curb Box Inlet Type A	8	EACH	\$ 3,250.00	\$ 26,000
	Standard Curb and Gutter	1,440	LIN FT	\$ 15.00	\$ 21,600
	Sidewalk	646	SQ YD	\$ 32.00	\$ 20,677
	Class 2 Asphalt Base	1,049	TON	\$ 65.00	\$ 68,185
	Class 2 Asphalt Surface	772	TON	\$ 75.00	\$ 57,900
	DGA Base	1,646	TON	\$ 16.50	\$ 27,159
	Lighting (Poles)	2	EACH	\$ 8,000.00	\$ 16,000
	Subtotal Grade, Drain & Surfacing				\$ 362,364
	Mobilization (3%)	-	LP SUM		\$ -
	Demobilization (1 1/2%)	1	LP SUM		\$ 5,435
	Grade & Drain		Subtotal		\$ 367,799
Cost per mile	G. & D. & Surf.		+ 20% Engr. & Contg.		\$ 73,560
			Grand Total		\$ 441,359

Estimated by: WAG Date: 8/20/2008
 Checked by: REG Date: 8/20/2008

ATTACHMENT 9
DEPARTMENT OF TRANSPORTATION
Bureau of Highways
ESTIMATE SHEET

Alternative 3

County: Warren Item No. 3-131.00
 UPN Fed No.: _____ Total Length: _____
 Road Name: Intersections of US31/University Blvd/Loving Way and US31/Chestnut Street
 From: _____
 To: _____
 Net Length, _____ Type of Construction: Grade, Drain, & Surfacing Class of Road: _____

Item	Item	Quantity	Unit	Unit Price	Amount
	Clearing and Grubbing	1	LP SUM	\$ 7,100	\$ 7,100
	Seeding and Protection	6,200	SQ YD	\$ 0.35	\$ 2,170
	Sodding	1,200	SQ YD	\$ 4.00	\$ 4,800
	Topdressing Fertilizer	1	TON	\$ 500.00	\$ 500
	Temp. Seeding and Protection	6,200	SQ YD	\$ 0.20	\$ 1,240
	Embankment in Place	10,000	CU YD	\$ 14.00	\$ 140,000
	Pave. Striping - Temp. Paint 4 In	13,900	LIN. FT	\$ 0.20	\$ 2,780
	Pave. Striping - Permanent Paint - 4 In	13,900	LIN FT	\$ 0.25	\$ 3,475
	Pave Marking - Thermo Stop Bar - 24 In	150	LIN FT	\$ 7.00	\$ 1,051
	Pave Marking - Pre Therm Curve Arrow	20	EACH	\$ 85.00	\$ 1,700
	Pave Marking - Pre Therm Straight Arrow	6	EACH	\$ 90.00	\$ 540
	Remove Pavement	4,000	SQ YD	\$ 16.00	\$ 64,000
	Scarify Pavement	4,000	SQ YD	\$ 3.00	\$ 12,000
	Silt Trap Type B	1	EACH	\$ 225.00	\$ 225
	Silt Trap Type C	12	EACH	\$ 250.00	\$ 3,000
	Temporary Mulch	6,200	SQ YD	\$ 0.20	\$ 1,240
	Clean Silt Trap Type B	1	EACH	\$ 43.00	\$ 43
	Clean Silt Trap Type C	12	EACH	\$ 43.00	\$ 516
	Temporary Silt Fence	2,982	LIN FT	\$ 2.00	\$ 5,964
	Clean Temporary Silt Fence	5,964	LIN FT	\$ 0.35	\$ 2,087
	Erosion Control Blanket	450	SQ YD	\$ 1.50	\$ 675
	Staking	1	LP SUM	\$ 8,000.00	\$ 8,000
	Maintain and Control Traffic	1	LP SUM	\$ 15,000.00	\$ 15,000
	R/W Marker Rural Type 1	10	EACH	\$ 75.00	\$ 750
	Storm Sewer Pipe - 18 In	2,982	LIN FT	\$ 50.00	\$ 149,095
	Curb Box Inlet Type A	14	EACH	\$ 3,250.00	\$ 45,500
	Standard Curb and Cutter	2,982	LIN FT	\$ 15.00	\$ 44,729
	Signs	600	SQ FT	\$ 8.00	\$ 4,800
	Sidewalk	1,318	SQ YD	\$ 32.00	\$ 42,190
	Class 2 Asphalt Base	2,228	TON	\$ 65.00	\$ 144,820
	Class 2 Asphalt Surface	1,003	TON	\$ 75.00	\$ 75,225
	DGA Base	3,494	TON	\$ 16.50	\$ 57,651
	Lighting (Poles)	4	EACH	\$ 8,000.00	\$ 32,000
	Subtotal Grade, Drain & Surfacing				\$ 874,866
	Mobilization (3%)	-	LP SUM		\$ -
	Demobilization (1 1/2%)	1	LP SUM		\$ 13,123
	Grade & Drain		Subtotal		\$ 887,989
Cost per mile	G. & D. & Surf.		+ 20% Engr. & Contg.		\$ 177,598
			Grand Total		\$ 1,065,587

Estimated by: WAG Date: 8/20/2008
 Checked by: REG Date: 8/20/2008

ATTACHMENT 9
DEPARTMENT OF TRANSPORTATION
Bureau of Highways
ESTIMATE SHEET

Alternative 5

County: Warren Item No. 3-131.00
 UPN Fed No.: _____ Total Length: _____
 Road Name: Intersections of US31/University Blvd/Loving Way and US31/Chestnut Street
 From: _____
 To: _____
 Net Length, _____ Type of Construction: Grade, Drain, & Surfacing Class of Road: _____

Item	Item	Quantity	Unit	Unit Price	Amount
	Clearing and Grubbing	1	LP SUM	\$ 7,000	\$ 7,000
	Sodding	2,700	SQ YD	\$ 4.00	\$ 10,800
	Roadway Excavation	8,000	CU YD	\$ 14.00	\$ 112,000
	Pave. Striping - Temp. Paint 4 In	11,000	LIN. FT	\$ 0.20	\$ 2,200
	Pave. Striping - Permanent Paint - 4 In	11,000	LIN FT	\$ 0.25	\$ 2,750
	Pave Marking - Pre Therm Curve Arrow	2	EACH	\$ 85.00	\$ 170
	Pave Marking - Pre Therm (Misc.)	20	EACH	\$ 150.00	\$ 3,000
	Pave Marking - Pre Therm Combo Arrow	23	EACH	\$ 150.00	\$ 3,450
	Pave Marking - Thermo X-Walk - 12 In	1,500	LIN FT	\$ 4.00	\$ 6,000
	Silt Trap Type C	14	EACH	\$ 250.00	\$ 3,500
	Clean Silt Trap Type C	14	EACH	\$ 43.00	\$ 602
	Temporary Silt Fence	3,250	LIN FT	\$ 2.00	\$ 6,500
	Clean Temporary Silt Fence	6,500	LIN FT	\$ 0.35	\$ 2,275
	Staking	1	LP SUM	\$ 12,000.00	\$ 12,000
	Maintain and Control Traffic	1	LP SUM	\$ 18,000.00	\$ 18,000
	R/W Marker Rural Type 1	15	EACH	\$ 75.00	\$ 1,125
	Storm Sewer Pipe - 18 In	3,250	LIN FT	\$ 50.00	\$ 162,500
	Curb Box Inlet Type A	14	EACH	\$ 3,250.00	\$ 45,500
	Standard Curb and Gutter	3,255	LIN FT	\$ 15.00	\$ 48,825
	Island Curb and Gutter	600	LIN FT	\$ 52.00	\$ 31,200
	Signs	800	SQ FT	\$ 8.00	\$ 6,400
	Sidewalk	1,760	SQ YD	\$ 32.00	\$ 56,320
	Median Treatments	211	SQ YD	\$ 40.00	\$ 8,444
	Landscaping	1	LP SUM	\$ 25,000.00	\$ 25,000
	Diversions	1	LP SUM	\$ 60,000.00	\$ 60,000
	Class 2 Asphalt Base	5,018	TON	\$ 65.00	\$ 326,170
	Class 2 Asphalt Surface	941	TON	\$ 75.00	\$ 70,575
	DGA Base	7,870	TON	\$ 16.50	\$ 129,855
	Lighting (Poles)	16	EACH	\$ 8,000.00	\$ 128,000
	Subtotal Grade, Drain & Surfacing				\$ 1,290,161
	Mobilization (3%)	-	LP SUM		\$ -
	Demobilization (1 1/2%)	1	LP SUM		\$ 19,352
	Grade & Drain		Subtotal		\$ 1,309,513
Cost per mile	G. & D. & Surf.		+ 20% Engr. & Contg.		\$ 261,903
			Grand Total		\$ 1,571,416

Estimated by: WAG Date: 8/20/2008
 Checked by: REG Date: 8/20/2008

ATTACHMENT 9
DEPARTMENT OF TRANSPORTATION
Bureau of Highways
ESTIMATE SHEET

Alternative 7

County: Warren Item No. 3-131.00
 UPN Fed No.: _____ Total Length: _____
 Road Name: Intersections of US31/University Blvd/Loving Way and US31/Chestnut Street
 From: _____
 To: _____
 Net Length, _____ Type of Construction: Grade, Drain, & Surfacing Class of Road: _____

Item	Item	Quantity	Unit	Unit Price	Amount
	Clearing and Grubbing	1	LP SUM	\$ 8,000	\$ 8,000
	Seeding and Protection	7,200	SQ YD	\$ 0.35	\$ 2,520
	Sodding	1,800	SQ YD	\$ 4.00	\$ 7,200
	Topdressing Fertilizer	1	TON	\$ 500.00	\$ 500
	Temp. Seeding and Protection	7,200	SQ YD	\$ 0.20	\$ 1,440
	Embankment in Place	10,000	CU YD	\$ 14.00	\$ 140,000
	Pave. Striping - Temp. Paint 4 In	20,800	LIN. FT	\$ 0.20	\$ 4,160
	Pave. Striping - Permanent Paint - 4 In	20,800	LIN FT	\$ 0.25	\$ 5,200
	Pave Marking - Thermo Stop Bar - 24 In	150	LIN FT	\$ 7.00	\$ 1,050
	Pave Marking - Pre Therm Curve Arrow	22	EACH	\$ 85.00	\$ 1,870
	Pave Marking - Pre Therm Straight Arrow	8	EACH	\$ 90.00	\$ 720
	Remove Pavement	4,000	SQ YD	\$ 16.00	\$ 64,000
	Scarify Pavement	4,000	SQ YD	\$ 3.00	\$ 12,000
	Silt Trap Type B	1	EACH	\$ 225.00	\$ 225
	Silt Trap Type C	16	EACH	\$ 250.00	\$ 4,000
	Temporary Mulch	7,200	SQ YD	\$ 0.20	\$ 1,440
	Clean Silt Trap Type B	1	EACH	\$ 43.00	\$ 43
	Clean Silt Trap Type C	16	EACH	\$ 43.00	\$ 688
	Temporary Silt Fence	4,420	LIN FT	\$ 2.00	\$ 8,840
	Clean Temporary Silt Fence	8,800	LIN FT	\$ 0.35	\$ 3,080
	Erosion Control Blanket	450	SQ YD	\$ 1.50	\$ 675
	Staking	1	LP SUM	\$ 10,000.00	\$ 10,000
	Maintain and Control Traffic	1	LP SUM	\$ 17,000.00	\$ 17,000
	R/W Marker Rural Type 1	15	EACH	\$ 75.00	\$ 1,125
	Storm Sewer Pipe - 18 In	4,420	LIN FT	\$ 50.00	\$ 220,990
	Curb Box Inlet Type A	22	EACH	\$ 3,250.00	\$ 71,500
	Standard Curb and Cutter	4,420	LIN FT	\$ 15.00	\$ 66,297
	Signs	800	SQ FT	\$ 8.00	\$ 6,400
	Sidewalk	1,866	SQ YD	\$ 32.00	\$ 59,713
	Class 2 Asphalt Base	2,852	TON	\$ 65.00	\$ 185,380
	Class 2 Asphalt Surface	1,502	TON	\$ 75.00	\$ 112,650
	DGA Base	4,472	TON	\$ 16.50	\$ 73,788
	Lighting (Poles)	6	EACH	\$ 8,000.00	\$ 48,000
	Subtotal Grade, Drain & Surfacing				\$ 1,140,494
	Mobilization (3%)	-	LP SUM		\$ -
	Demobilization (1 1/2%)	1	LP SUM		\$ 17,107
	Grade & Drain		Subtotal		\$ 1,157,601
Cost per mile	G. & D. & Surf.		+ 20% Engr. & Contg.		\$ 231,520
			Grand Total		\$ 1,389,121

Estimated by: WAG Date: 8/20/2008
 Checked by: REG Date: 8/20/2008