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

TRANSPORTATION CABINET

Ernie Fletcher
Governor

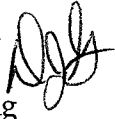Frankfort, Kentucky 40622
www.kentucky.gov

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

TF 07 020

Kentucky
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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

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	30th 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-30th 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

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

Vicinity Map
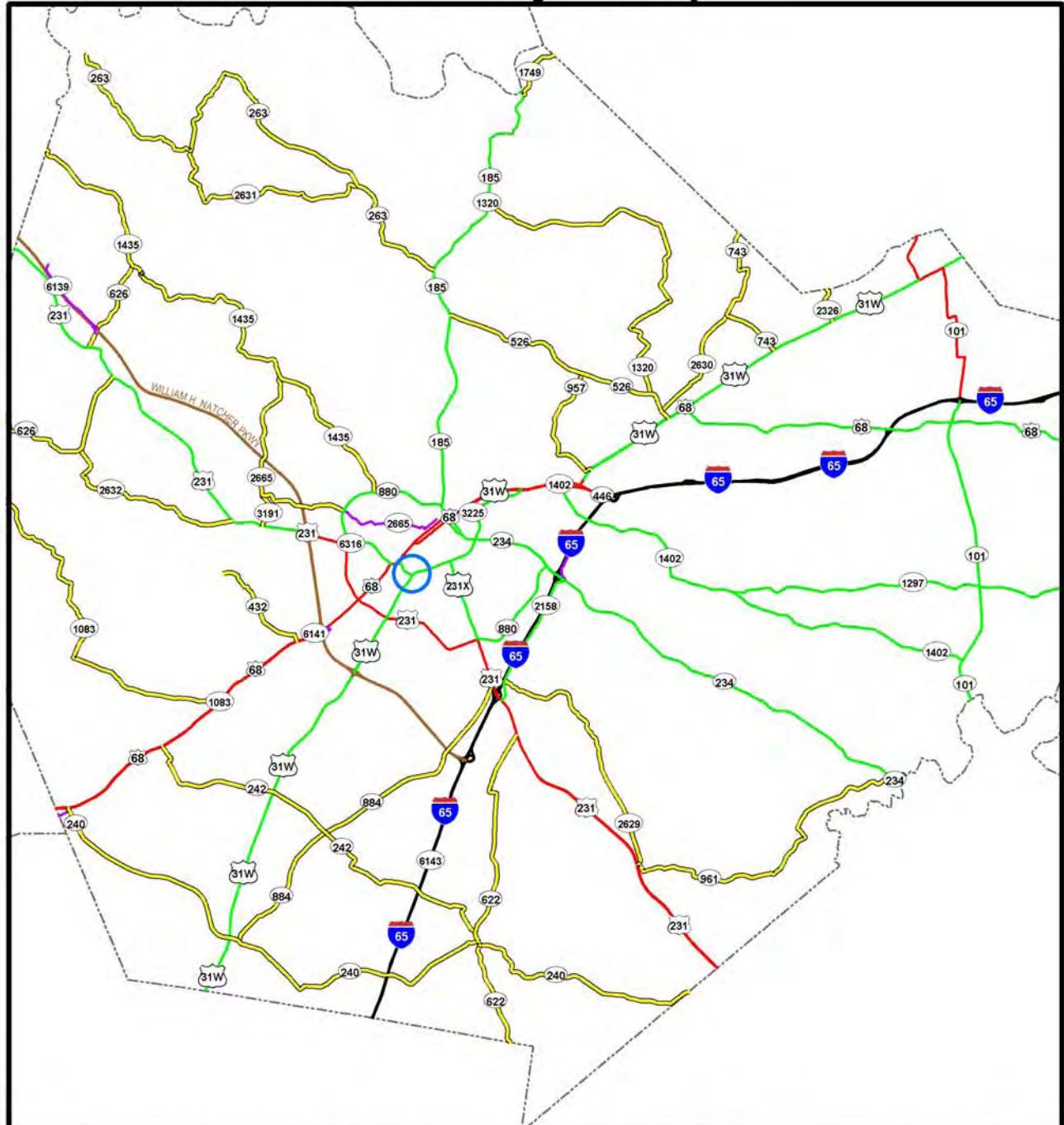
LEGEND

○ Project Site Location

Warren Co. Intersection Improvements at US 31W, US 231X, Chestnut St., and Loving Way Item # 3-131.00

0 2 4 Miles

KYTC Division of Planning

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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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

Chestnut St. (CS 1004)
2007 ADT = 4,200   2027 ADT = 5,200
2007 DHV = 500   2027 DHV = 600
2007 %T (ADT) = 9%   2027 %T (ADT) = 14%
2007 %T (DHV) = 6%   2027 %T (DHV) = 9%
20-Year ESALs = 1,400,000

US 31W at MP 11.9
2007 ADT = 18,000   2027 ADT = 22,000
2007 DHV = 1,800   2027 DHV = 2,200
2007 %T (ADT) = 4%   2027 %T (ADT) = 7%
2007 %T (DHV) = 3%   2027 %T (DHV) = 5%
20-Year ESALs = 2,800,000

US 31W at MP 11.85
2007 ADT = 21,000   2027 ADT = 25,000
2007 DHV = 2,000   2027 DHV = 2,500
2007 %T (ADT) = 6%   2027 %T (ADT) = 10%
2007 %T (DHV) = 4%   2027 %T (DHV) = 7%
20-Year ESALs = 4,400,000

US 231X
2007 ADT = 19,000   2027 ADT = 23,000
2007 DHV = 1,800   2027 DHV = 2,200
2007 %T (ADT) = 6%   2027 %T (ADT) = 10%
2007 %T (DHV) = 4%   2027 %T (DHV) = 7%
20-Year ESALs = 4,300,000

US 31W at MP 11.8
2007 ADT = 22,000   2027 ADT = 27,000
2007 DHV = 1,800   2027 DHV = 2,200
2007 %T (ADT) = 5%   2027 %T (ADT) = 9%
2007 %T (DHV) = 3%   2027 %T (DHV) = 6%
20-Year ESALs = 4,600,000

Loving Way (CS 1323)
2007 ADT = 2,400   2027 ADT = 3,000
2007 DHV = 300   2027 DHV = 400
2007 %T (ADT) = 9%   2027 %T (ADT) = 14%
2007 %T (DHV) = 6%   2027 %T (DHV) = 9%
20-Year ESALs = 800,000

N	LEGEND	Warren Co.Intersection Improvements at US 31W, US 231X, Chestnut St., and Loving Way Item # 3-131.00	Kentucky UNBRIDLED SPIRIT
	● Intersections		0 0.05 0.1 0.2 Miles

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	Date: 09/12/07
		Forecaster: Daniel Hulker
Road Name	Chestnut Street	
		MARS No. 80500 01 D
Functional Class	17 - Urban Collector	Item No. 3-131.00
		Route No. CS 1004
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way	Beg. MP 0
		End MP 0.1
Scenario	Build	T.F. No. TF07_020
Segment Description	Chestnut St. (CS 1004)	No. of Lanes 2
		1 or 2 way 2

REFERENCES:

Previous Forecasts	none	K- Factor Value 11.9%
		K-Factor Source A01
Traffic Volume	A01	PHF 0.85
Milepoint	0.1	
Truck Percent	Functional Class Average	
Milepoint	0.1	
ESAL Information	2006 Aggregated ESALS	
Growth Rate	1%	

TRAFFIC PARAMETERS:

		Present Year 2007	Growth Rate	Construction Year 2007	Median Year 2017	Design Year 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%
Non-Coal Trucks:						
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
Coal Trucks:						
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:

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%	AX/T	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	5-yr ESALs 200,000
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	10-yr ESALs 500,000
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	15-yr ESALs 900,000
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	20-yr ESALs 1,400,000
2027	5,200	85.9%	14.1%	4467	733	0.00%	3.90	0.23	0	0	0.500	121,795	

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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	C31
Milepoint	12.3
Truck Percent	A33
Milepoint	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%
Non-Coal Trucks:						
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
Coal Trucks:						
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:

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	Car %	Truck %	Cars	Trucks	CT%	AX/T	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	5-yr ESALs 400,000
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	10-yr ESALs 1,000,000
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	15-yr ESALs 1,700,000
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	20-yr ESALs 2,800,000
2027	21,963	93.3%	6.7%	20488	1476	0.00%	3.90	0.23	0	0	0.459	234,619	

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

ROUTE ID:

County	Warren	Date: 09/12/07
		Forecaster: Daniel Hulker
Road Name	US 31W	
		MARS No. 80500 01 D
Functional Class	16 - Urban Minor Arterial	Item No. 3-131.00
		Route No. US 31W
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way	Beg. MP 11.85
		End MP 11.85
Scenario	Build	T.F. No. TF07_020
Segment Description	US 31W at MP 11.85	No. of Lanes 4
		1 or 2 way 2

REFERENCES:

Previous Forecasts	none	K- Factor Value 9.0%
		K-Factor Source B43
Traffic Volume	B43	PHF 0.92
Milepoint	10.2	
Truck Percent	B43	
Milepoint	10.2	
ESAL Information	2006 Aggregated ESALS	
Growth Rate	1%	

TRAFFIC PARAMETERS:

		Present Year 2007	Growth Rate	Construction Year 2007	Median Year 2017	Design Year 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%
Non-Coal Trucks:						
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
Coal Trucks:						
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: [ ]

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%	AX/T	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

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	Turn Movement Factoring
Milepoint	N/A
Truck Percent	Functional Class Average
Milepoint	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 Year	Growth Rate	Construction Year	Median Year	Design 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%
Non-Coal Trucks:						
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
Coal Trucks:						
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:

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%	AX/T	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALs
2007	2,400	91.4%	8.6%	2194	206	0.00%	3.01	0.15	0	0	0.500	19,236
2008	2,423	91.2%	8.8%	2209	214	0.00%	3.05	0.16	0	0	0.500	20,442
2009	2,446	91.0%	9.0%	2225	221	0.00%	3.09	0.16	0	0	0.500	21,730
2010	2,469	90.7%	9.3%	2240	229	0.00%	3.13	0.16	0	0	0.500	23,107
2011	2,493	90.5%	9.5%	2256	237	0.00%	3.17	0.16	0	0	0.500	24,578
2012	2,516	90.3%	9.7%	2271	245	0.00%	3.21	0.17	0	0	0.500	26,149
2013	2,540	90.0%	10.0%	2287	253	0.00%	3.25	0.17	0	0	0.500	27,829
2014	2,564	89.8%	10.2%	2302	262	0.00%	3.29	0.17	0	0	0.500	29,623
2015	2,589	89.5%	10.5%	2317	271	0.00%	3.34	0.18	0	0	0.500	31,540
2016	2,613	89.3%	10.7%	2333	281	0.00%	3.38	0.18	0	0	0.500	33,589
2017	2,638	89.0%	11.0%	2348	290	0.00%	3.43	0.19	0	0	0.500	35,779
2018	2,663	88.7%	11.3%	2363	301	0.00%	3.47	0.19	0	0	0.500	38,119
2019	2,689	88.4%	11.6%	2378	311	0.00%	3.51	0.19	0	0	0.500	40,620
2020	2,714	88.1%	11.9%	2392	322	0.00%	3.56	0.20	0	0	0.500	43,292
2021	2,740	87.8%	12.2%	2407	333	0.00%	3.61	0.20	0	0	0.500	46,149
2022	2,766	87.5%	12.5%	2421	345	0.00%	3.65	0.20	0	0	0.500	49,202
2023	2,792	87.2%	12.8%	2436	356	0.00%	3.70	0.21	0	0	0.500	52,465
2024	2,819	86.9%	13.1%	2450	369	0.00%	3.75	0.21	0	0	0.500	55,952
2025	2,846	86.6%	13.4%	2464	382	0.00%	3.80	0.22	0	0	0.500	59,680
2026	2,873	86.3%	13.7%	2478	395	0.00%	3.85	0.22	0	0	0.500	63,665
2027	2,900	85.9%	14.1%	2491	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

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	A58
Milepoint	2.1
Truck Percent	A58
Milepoint	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%
Non-Coal Trucks:						
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
Coal Trucks:						
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:

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%	AX/T	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	5-yr ESALs 600,000
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	10-yr ESALs 1,500,000
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	15-yr ESALs 2,700,000
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	20-yr ESALs 4,300,000
2027	23,184	89.7%	10.3%	20790	2393	0.00%	3.90	0.23	0	0	0.456	367,904	

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	Date	09/12/07
		Forecaster	Daniel Hulker
Road Name	US 31W		
		MARS No.	80500 01 D
Functional Class	16 - Urban Minor Arterial	Item No.	3-131.00
		Route No.	US 31W
Project Description	Improvements at intersections with US 231X, US 31W, Chestnut St, and Loving Way	Beg. MP	11.8
		End MP	11.805
Scenario	Build	T.F. No.	TF07_020
Segment Description	US 31W at MP 11.8	No. of Lanes	2
		1 or 2 way	2

REFERENCES:

Previous Forecasts	none	K- Factor Value	9.0%
		K-Factor Source	B43
Traffic Volume	B43	PHF	0.92
Milepoint	11.1		
Truck Percent	A15		
Milepoint	10.2		
ESAL Information	2006 Aggregated ESALS		
Growth Rate	1%		

TRAFFIC PARAMETERS:

		Present Year 2007	Growth Rate	Construction Year 2007	Median Year 2017	Design Year 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%
Non-Coal Trucks:						
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
Coal Trucks:						
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:

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%	AX/T	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	5-yr ESALs 700,000
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	10-yr ESALs 1,600,000
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	15-yr ESALs 2,900,000
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	20-yr ESALs 4,600,000
2027	26,844	91.5%	8.5%	24557	2287	0.00%	3.90	0.23	0	0	0.500	389,856	

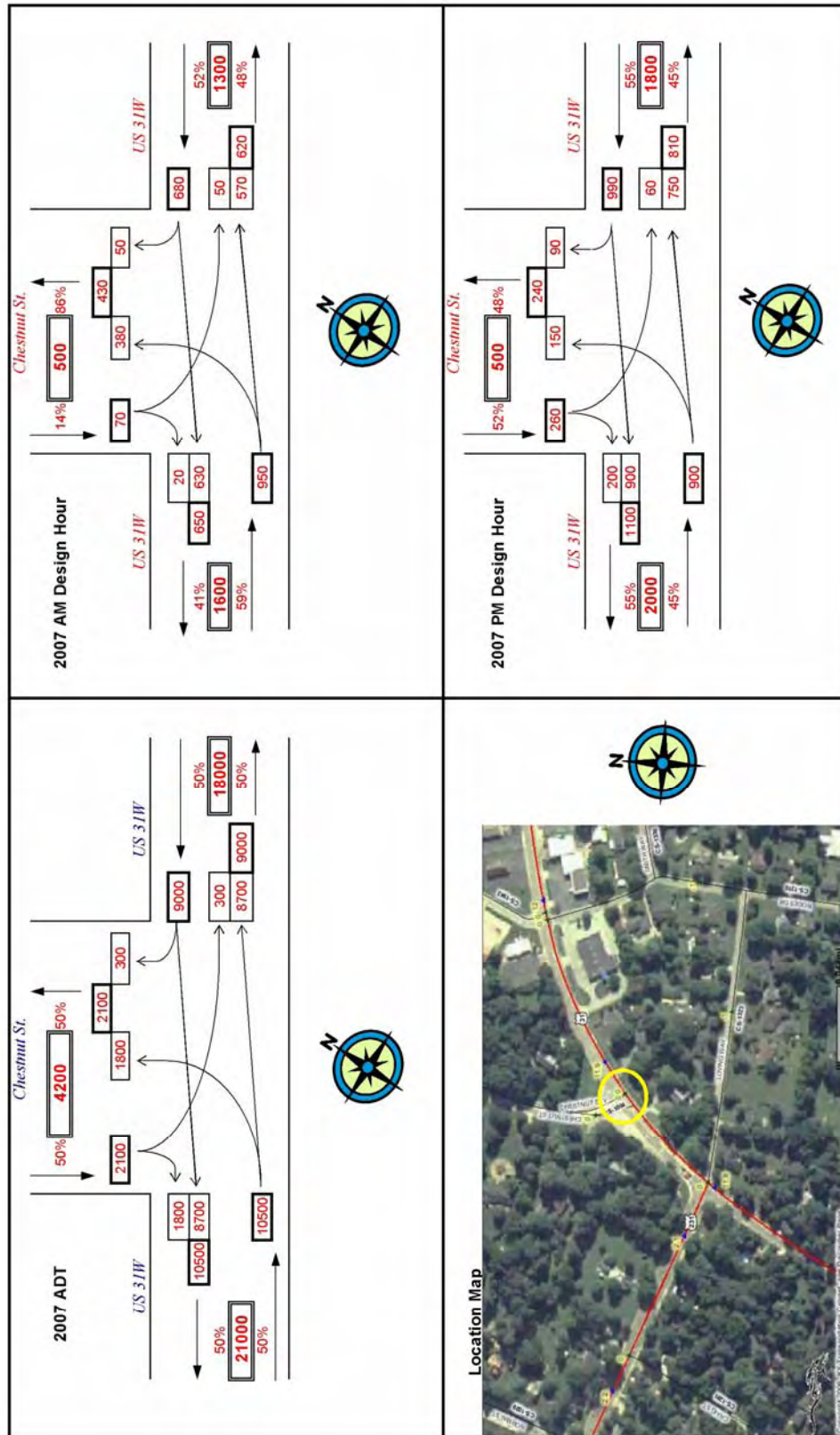*Traffic Forecast Technical Report*
Warren County: Intersection Improvements at US 31W, US 231X, Chestnut St. and Loving
Way. Item No. 3-131.00

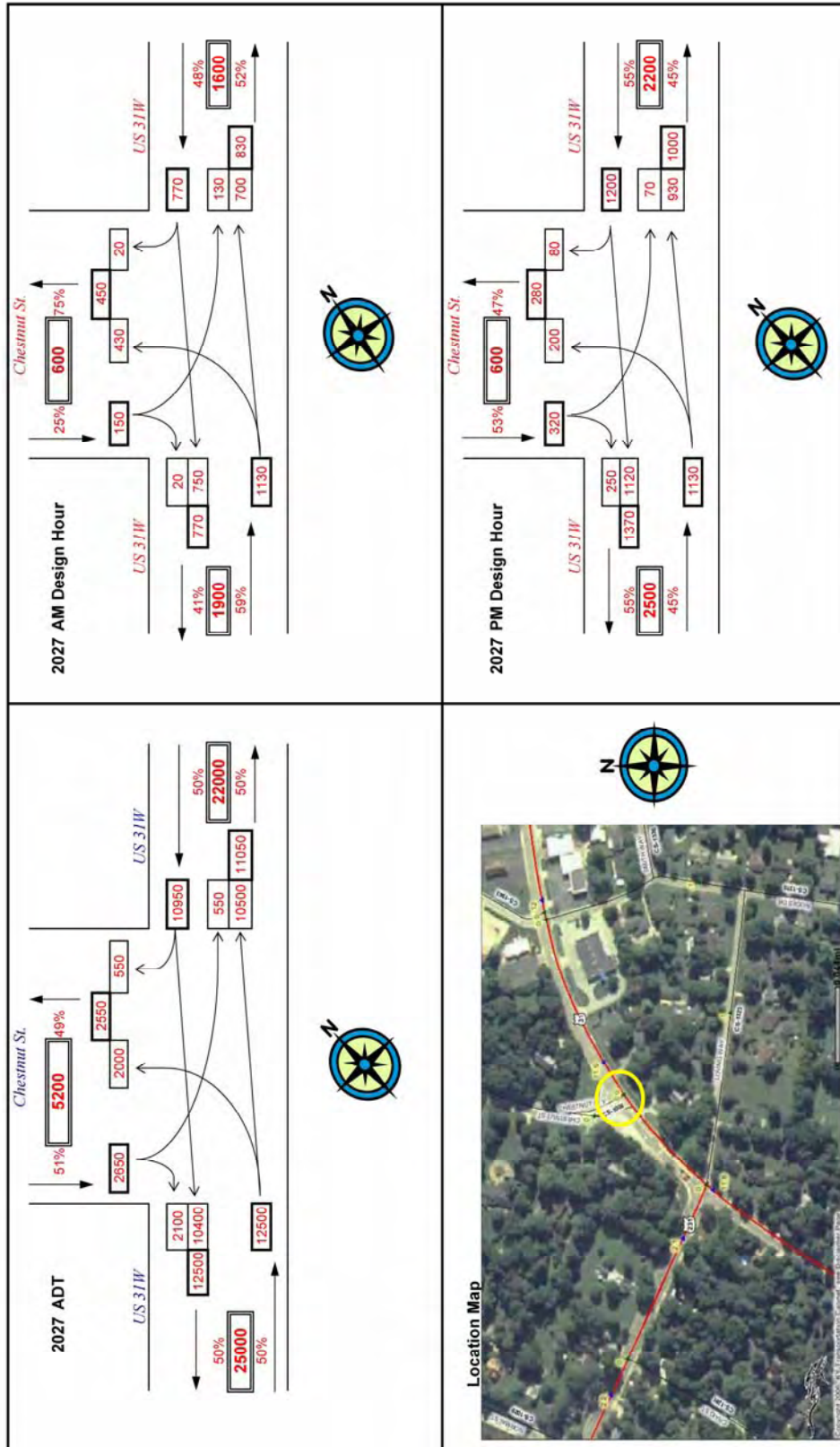PROJECT: Intersection Improvements on US 31W
ITEM NUMBER: 3-131.00
MARS NUMBER: 80500 01 D
REQUEST DATE: 3/21/2007
ANALYST: D. Hulker
SCENARIO: **2007 Current ADT and Design Hour Volume**
INTERSECTION: US 31W and Chestnut Street

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	AM	PM	Thru AM	Thru PM	Right AM	Right PM	Left AM	Left PM
Southbound	0.82	0.96	N/A	N/A	0.79	0.81	0.50	0.83
Westbound	0.96	0.97	0.98	0.87	0.70	0.83	N/A	N/A
Eastbound	0.94	0.97	0.94	0.94	N/A	N/A	0.85	0.80

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

2007 ADT

2007 AM Design Hour

2007 PM Design Hour

Location Map

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

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 Volumes**
INTERSECTION: US 31W, US 231X, and Loving Way

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	
Southbound	0.78	0.93	0.65	0.91	0.63	0.89	0.75	0.87
Northbound	0.58	0.84	0.52	0.73	0.67	0.58	0.45	0.33
Westbound	0.81	0.94	0.76	0.89	0.83	0.87	0.25	0.40
Eastbound	0.81	0.94	0.81	0.92	0.42	0.45	0.76	0.72

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

2007 AM Design Hour

2007 PM Design Hour

2007 ADT

Location Map

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

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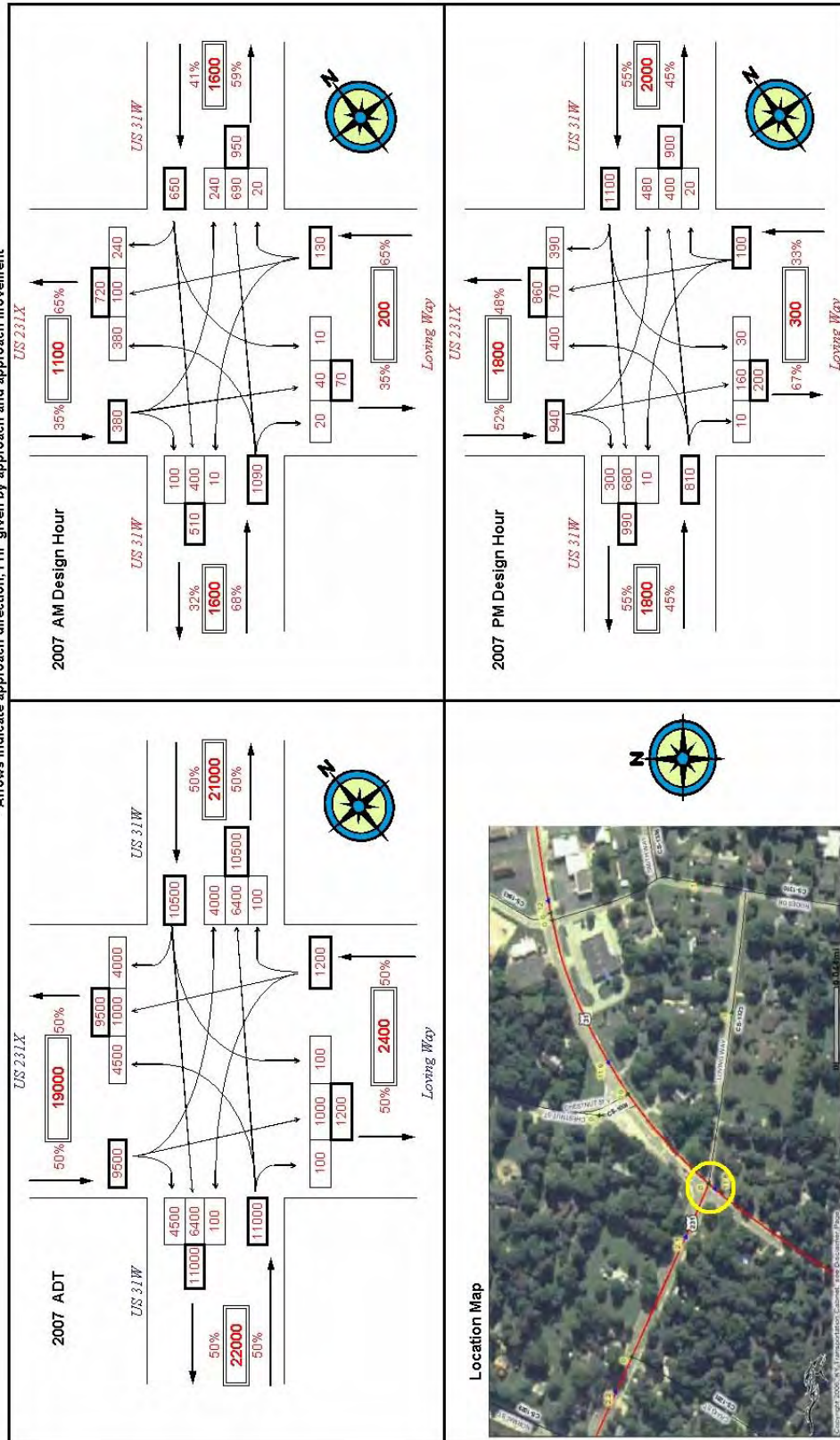SCENARIO: 2027   Current ADT and Design Hour Volumes
INTERSECTION: US 31W, US 231X, and Loving Way

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.