

**Appendix G**  
**Round 3 - Safety Analysis**

## No-Build Alternative

### Safety Performance Calculations

**No-Build Alternative**

**Intersection Analysis  
Willow Road at IL Route 43**

**Alternative: No-Build**  
**Intersection: Willow Road at Waukegan Road**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Waukegan Road
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	42,000
AADT <sub>minor</sub> (veh/day)		--	34,000
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			11
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	5

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF<sub>COMB</sub></i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	0.96	0.88	1.00	1.00	1.01	0.57

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs (7) from Worksheet 2B	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	16.452	1.000	16.452	0.57	1.00	9.334
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	5.568	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.349	5.734	0.57	1.00	3.253
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	10.407	$(5)_{TOTAL}-(5)_{FI}$ 0.651	10.718	0.57	1.00	6.081

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	3.253	1.000	6.081	9.334
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	1.464	0.483	2.937	4.401
Head-on collision	0.049	0.159	0.030	0.182	0.342
Angle collision	0.347	1.129	0.244	1.484	2.613
Sideswipe	0.099	0.322	0.032	0.195	0.517
Other multiple-vehicle collision	0.055	0.179	0.211	1.283	1.462

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs (7) from Worksheet 2B	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.857	1.000	0.857	0.57	1.00	0.486
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.193	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.228	0.196	0.57	1.00	0.111
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.652	$(5)_{TOTAL}-(5)_{FI}$ 0.772	0.662	0.57	1.00	0.375

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.111	1.000	0.375	0.486
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.083	0.870	0.327	0.409
Collision with other object	0.072	0.008	0.070	0.026	0.034
Other single-vehicle collision	0.040	0.004	0.023	0.009	0.013
Single-vehicle noncollision	0.141	0.016	0.034	0.013	0.028

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.12	1.12

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub> (4)*(5)*(6)
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.023	1.12	1.00	0.026
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.026

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	9.334	0.486	9.821	0.015	1.00	0.147
Fatal and injury (FI)	--	--	--	--	1.00	0.147

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	1.464	2.937	4.401
Head-on collisions (from Worksheet 2D)	0.159	0.182	0.342
Angle collisions (from Worksheet 2D)	1.129	1.484	2.613
Sideswipe (from Worksheet 2D)	0.322	0.195	0.517
Other multiple-vehicle collision (from Worksheet 2D)	0.179	1.283	1.462
Subtotal	3.253	6.081	9.334
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.083	0.327	0.409
Collision with other object (from Worksheet 2F)	0.008	0.026	0.034
Other single-vehicle collision (from Worksheet 2F)	0.004	0.009	0.013
Single-vehicle noncollision (from Worksheet 2F)	0.016	0.013	0.028
Collision with pedestrian (from Worksheet 2G or 2I)	0.026	0.000	0.026
Collision with bicycle (from Worksheet 2J)	0.147	0.000	0.147
Subtotal	0.284	0.375	0.660
Total	3.538	6.456	9.994

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	10.0
Fatal and injury (FI)	3.5
Property damage only (PDO)	6.5

## No-Build Alternative

Segment Analysis  
Willow Road – IL Route 43 to  
Three Lakes/ Fox Meadow Drive

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Waukegan Rd to Three Lakes
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.22
AADT (veh/day)		--	37,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Not Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	18
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	18
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.00	1.00	1.00	1.00	1.00

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3 a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-12.34	1.36	1.32	1.570	1.000	1.570	1.00	1.00	1.575
Fatal and Injury (FI)	-12.76	1.28	1.31	0.445	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.422	1.00	1.00	0.423
Property Damage Only (PDO)	-12.81	1.38	1.34	1.211	$(5)_{TOTAL} - (5)_{FI}$ 0.731	1.149	1.00	1.00	1.152

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.423	1.000	1.152	1.575
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.352	0.662	0.763	1.115
Head-on collision	0.020	0.008	0.007	0.008	0.017
Angle collision	0.040	0.017	0.036	0.041	0.058
Sideswipe, same direction	0.050	0.021	0.223	0.257	0.278
Sideswipe, opposite direction	0.010	0.004	0.001	0.001	0.005
Other multiple-vehicle collision	0.048	0.020	0.071	0.082	0.102

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.198	1.000	0.198	1.00	1.00	0.198
Fatal and Injury (FI)	-8.71	0.66	0.28	0.038	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.188	0.037	1.00	1.00	0.037
Property Damage Only (PDO)	-5.04	0.45	1.06	0.162	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.812	0.161	1.00	1.00	0.161

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.037	1.000	0.161	0.198
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.010	0.010
Collision with fixed object	0.500	0.019	0.813	0.131	0.150
Collision with other object	0.028	0.001	0.016	0.003	0.004
Other single-vehicle collision	0.471	0.018	0.108	0.017	0.035

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.000	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdvw}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	1.00	1.00	0.000
Fatal and injury (FI)	--	0.284	0.000	1.00	1.00	0.000
Property damage only (PDO)	--	0.716	0.000	1.00	1.00	0.000

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	1.575	0.198	0.000	1.774	0.019	1.00	0.034
Fatal and injury (FI)	--	--	--	--	--	1.00	0.034

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	1.575	0.198	0.000	1.774	0.005	1.00	0.009
Fatal and injury (FI)	--	--	--	--	--	1.00	0.009

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.352	0.763	1.115
Head-on collisions (from Worksheet 1D)	0.008	0.008	0.017
Angle collisions (from Worksheet 1D)	0.017	0.041	0.058
Sideswipe, same direction (from Worksheet 1D)	0.021	0.257	0.278
Sideswipe, opposite direction (from Worksheet 1D)	0.004	0.001	0.005
Driveway-related collisions (from Worksheet 1H)	0.000	0.000	0.000
Other multiple-vehicle collision (from Worksheet 1D)	0.020	0.082	0.102
Subtotal	0.423	1.152	1.575
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.010	0.010
Collision with fixed object (from Worksheet 1F)	0.019	0.131	0.150
Collision with other object (from Worksheet 1F)	0.001	0.003	0.004
Other single-vehicle collision (from Worksheet 1F)	0.018	0.017	0.035
Collision with pedestrian (from Worksheet 1I)	0.034	0.000	0.034
Collision with bicycle (from Worksheet 1J)	0.009	0.000	0.009
Subtotal	0.080	0.161	0.241
Total	0.503	1.313	1.816

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.8	0.22	8.3
Fatal and injury (FI)	0.5	0.22	2.3
Property damage only (PDO)	1.3	0.22	6.0

**No-Build Alternative**

**Intersection Analysis**

**Willow Road at Three Lakes/ Fox Meadow Drive**

**Alternative: No-Build**  
**Intersection: Willow Road at Three Lakes**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Three Lakes
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	37,000
AADT <sub>minor</sub> (veh/day)		--	2,000
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	2
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			17
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF<sub>COMB</sub></i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.73	0.98	0.92	1.00	1.00	1.00	0.66

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	7.487	1.000	7.487	0.66	1.00	4.937
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	2.571	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.357	2.672	0.66	1.00	1.762
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	4.633	$(5)_{TOTAL}-(5)_{FI}$ 0.643	4.815	0.66	1.00	3.175

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.762	1.000	3.175	4.937
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	0.793	0.483	1.534	2.326
Head-on collision	0.049	0.086	0.030	0.095	0.182
Angle collision	0.347	0.611	0.244	0.775	1.386
Sideswipe	0.099	0.174	0.032	0.102	0.276
Other multiple-vehicle collision	0.055	0.097	0.211	0.670	0.767

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.366	1.000	0.366	0.66	1.00	0.241
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.080	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.216	0.079	0.66	1.00	0.052
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.291	$(5)_{TOTAL}-(5)_{FI}$ 0.784	0.287	0.66	1.00	0.189

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.052	1.000	0.189	0.241
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.000
Collision with fixed object	0.744	0.039	0.870	0.165	0.203
Collision with other object	0.072	0.004	0.070	0.013	0.017
Other single-vehicle collision	0.040	0.002	0.023	0.004	0.006
Single-vehicle noncollision	0.141	0.007	0.034	0.006	0.014

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub> (4)*(5)*(6)
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.011	1.00	1.00	0.011
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.011

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	4.937	0.241	5.178	0.015	1.00	0.078
Fatal and injury (FI)	--	--	--	--	1.00	0.078

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.793	1.534	2.326
Head-on collisions (from Worksheet 2D)	0.086	0.095	0.182
Angle collisions (from Worksheet 2D)	0.611	0.775	1.386
Sideswipe (from Worksheet 2D)	0.174	0.102	0.276
Other multiple-vehicle collision (from Worksheet 2D)	0.097	0.670	0.767
Subtotal	1.762	3.175	4.937
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 2F)	0.039	0.165	0.203
Collision with other object (from Worksheet 2F)	0.004	0.013	0.017
Other single-vehicle collision (from Worksheet 2F)	0.002	0.004	0.006
Single-vehicle noncollision (from Worksheet 2F)	0.007	0.006	0.014
Collision with pedestrian (from Worksheet 2G or 2I)	0.011	0.000	0.011
Collision with bicycle (from Worksheet 2J)	0.078	0.000	0.078
Subtotal	0.140	0.189	0.330
Total	1.902	3.364	5.267

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	5.3
Fatal and injury (FI)	1.9
Property damage only (PDO)	3.4

## No-Build Alternative

### Segment Analysis

Willow Road – Three Lakes/ Fox Meadow Drive to  
35mph Zone

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Three Lakes to Speed Zone Change
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.1
AADT (veh/day)		--	37,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Not Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	40
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	8
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.11	1.00	1.00	1.00	1.11

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-12.34	1.36	1.32	0.714	1.000	0.714	1.11	1.00	0.790
Fatal and Injury (FI)	-12.76	1.28	1.31	0.202	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.192	1.11	1.00	0.212
Property Damage Only (PDO)	-12.81	1.38	1.34	0.551	$(5)_{TOTAL} - (5)_{FI}$ 0.731	0.522	1.11	1.00	0.578

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.212	1.000	0.578	0.790
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.177	0.662	0.383	0.559
Head-on collision	0.020	0.004	0.007	0.004	0.008
Angle collision	0.040	0.008	0.036	0.021	0.029
Sideswipe, same direction	0.050	0.011	0.223	0.129	0.140
Sideswipe, opposite direction	0.010	0.002	0.001	0.001	0.003
Other multiple-vehicle collision	0.048	0.010	0.071	0.041	0.051

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.090	1.000	0.090	1.11	1.00	0.100
Fatal and Injury (FI)	-8.71	0.66	0.28	0.017	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.188	0.017	1.11	1.00	0.019
Property Damage Only (PDO)	-5.04	0.45	1.06	0.074	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.812	0.073	1.11	1.00	0.081

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.019	1.000	0.081	0.100
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.005	0.005
Collision with fixed object	0.500	0.009	0.813	0.066	0.075
Collision with other object	0.028	0.001	0.016	0.001	0.002
Other single-vehicle collision	0.471	0.009	0.108	0.009	0.018

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.000	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdvw}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	1.11	1.00	0.000
Fatal and injury (FI)	--	0.284	0.000	1.11	1.00	0.000
Property damage only (PDO)	--	0.716	0.000	1.11	1.00	0.000

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.790	0.100	0.000	0.890	0.019	1.00	0.017
Fatal and injury (FI)	--	--	--	--	--	1.00	0.017

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.790	0.100	0.000	0.890	0.005	1.00	0.004
Fatal and injury (FI)	--	--	--	--	--	1.00	0.004

Alternative: No-Build  
Segment: Three Lakes to 35mph Zone

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.177	0.383	0.559
Head-on collisions (from Worksheet 1D)	0.004	0.004	0.008
Angle collisions (from Worksheet 1D)	0.008	0.021	0.029
Sideswipe, same direction (from Worksheet 1D)	0.011	0.129	0.140
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.001	0.003
Driveway-related collisions (from Worksheet 1H)	0.000	0.000	0.000
Other multiple-vehicle collision (from Worksheet 1D)	0.010	0.041	0.051
Subtotal	0.212	0.578	0.790
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.009	0.066	0.075
Collision with other object (from Worksheet 1F)	0.001	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.009	0.009	0.018
Collision with pedestrian (from Worksheet 1I)	0.017	0.000	0.017
Collision with bicycle (from Worksheet 1J)	0.004	0.000	0.004
Subtotal	0.040	0.081	0.121
Total	0.252	0.659	0.911

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	0.9	0.10	9.1
Fatal and injury (FI)	0.3	0.10	2.5
Property damage only (PDO)	0.7	0.10	6.6

## No-Build Alternative

### Segment Analysis

Willow Road – 35mph Zone to Sunset Ridge Road

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Speed Zone Change to Sunset Ridge
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.13
AADT (veh/day)		--	37,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Not Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	1
Minor industrial / institutional driveways (number)		--	1
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	92
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	12
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.22	1.00	1.00	1.00	1.22

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3 a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-12.34	1.36	1.32	0.928	1.000	0.928	1.22	1.00	1.133
Fatal and Injury (FI)	-12.76	1.28	1.31	0.263	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.249	1.22	1.00	0.304
Property Damage Only (PDO)	-12.81	1.38	1.34	0.716	$(5)_{TOTAL} - (5)_{FI}$ 0.731	0.679	1.22	1.00	0.829

**Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.304	1.000	0.829	1.133
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.253	0.662	0.549	0.802
Head-on collision	0.020	0.006	0.007	0.006	0.012
Angle collision	0.040	0.012	0.036	0.030	0.042
Sideswipe, same direction	0.050	0.015	0.223	0.185	0.200
Sideswipe, opposite direction	0.010	0.003	0.001	0.001	0.004
Other multiple-vehicle collision	0.048	0.015	0.071	0.059	0.073

**Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.117	1.000	0.117	1.22	1.00	0.143
Fatal and Injury (FI)	-8.71	0.66	0.28	0.022	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.188	0.022	1.22	1.00	0.027
Property Damage Only (PDO)	-5.04	0.45	1.06	0.096	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.812	0.095	1.22	1.00	0.116

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.027	1.000	0.116	0.143
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.007	0.007
Collision with fixed object	0.500	0.013	0.813	0.094	0.108
Collision with other object	0.028	0.001	0.016	0.002	0.003
Other single-vehicle collision	0.471	0.013	0.108	0.013	0.025

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	1	0.036	1.106	0.098	
Minor industrial/institutional	1	0.005	1.106	0.014	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.111	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.111	1.000	0.111	1.22	1.00	0.136
Fatal and injury (FI)	--	0.284	0.032	1.22	1.00	0.039
Property damage only (PDO)	--	0.716	0.080	1.22	1.00	0.097

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	1.133	0.143	0.136	1.411	0.019	1.00	0.027
Fatal and injury (FI)	--	--	--	--	--	1.00	0.027

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	1.133	0.143	0.136	1.411	0.005	1.00	0.007
Fatal and injury (FI)	--	--	--	--	--	1.00	0.007

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.253	0.549	0.802
Head-on collisions (from Worksheet 1D)	0.006	0.006	0.012
Angle collisions (from Worksheet 1D)	0.012	0.030	0.042
Sideswipe, same direction (from Worksheet 1D)	0.015	0.185	0.200
Sideswipe, opposite direction (from Worksheet 1D)	0.003	0.001	0.004
Driveway-related collisions (from Worksheet 1H)	0.039	0.097	0.136
Other multiple-vehicle collision (from Worksheet 1D)	0.015	0.059	0.073
Subtotal	0.343	0.926	1.269
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.007	0.007
Collision with fixed object (from Worksheet 1F)	0.013	0.094	0.108
Collision with other object (from Worksheet 1F)	0.001	0.002	0.003
Other single-vehicle collision (from Worksheet 1F)	0.013	0.013	0.025
Collision with pedestrian (from Worksheet 1I)	0.027	0.000	0.027
Collision with bicycle (from Worksheet 1J)	0.007	0.000	0.007
Subtotal	0.061	0.116	0.177
Total	0.404	1.042	1.445

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.4	0.13	11.1
Fatal and injury (FI)	0.4	0.13	3.1
Property damage only (PDO)	1.0	0.13	8.0

**No-Build Alternative**

**Intersection Analysis  
Willow Road at Sunset Ridge Road**

**Alternative: No-Build**  
**Intersection: Willow Road at Sunset Ridge**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Sunset Ridge
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	37,000
AADT <sub>minor</sub> (veh/day)		--	12,000
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	0
Type of left-turn signal phasing for Leg #1		Permissive	Permissive
Type of left-turn signal phasing for Leg #2		--	Permissive
Type of left-turn signal phasing for Leg #3		--	Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	1
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			110
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	3
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF<sub>COMB</sub></i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	1.00	0.96	0.98	1.00	1.00	0.62

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	11.306	1.000	11.306	0.62	1.00	7.020
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.813	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.349	3.942	0.62	1.00	2.448
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.123	$(5)_{TOTAL}-(5)_{FI}$ 0.651	7.364	0.62	1.00	4.572

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	2.448	1.000	4.572	7.020
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	1.101	0.483	2.208	3.310
Head-on collision	0.049	0.120	0.030	0.137	0.257
Angle collision	0.347	0.849	0.244	1.116	1.965
Sideswipe	0.099	0.242	0.032	0.146	0.389
Other multiple-vehicle collision	0.055	0.135	0.211	0.965	1.099

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.594	1.000	0.594	0.62	1.00	0.369
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.135	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.229	0.136	0.62	1.00	0.084
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.455	$(5)_{TOTAL}-(5)_{FI}$ 0.771	0.458	0.62	1.00	0.284

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.084	1.000	0.284	0.369
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.063	0.870	0.247	0.310
Collision with other object	0.072	0.006	0.070	0.020	0.026
Other single-vehicle collision	0.040	0.003	0.023	0.007	0.010
Single-vehicle noncollision	0.141	0.012	0.034	0.010	0.022

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.35	1.00	3.75

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub> (4)*(5)*(6)
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.038	3.75	1.00	0.143
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.143

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	7.020	0.369	7.389	0.015	1.00	0.111
Fatal and injury (FI)	--	--	--	--	1.00	0.111

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	1.101	2.208	3.310
Head-on collisions (from Worksheet 2D)	0.120	0.137	0.257
Angle collisions (from Worksheet 2D)	0.849	1.116	1.965
Sideswipe (from Worksheet 2D)	0.242	0.146	0.389
Other multiple-vehicle collision (from Worksheet 2D)	0.135	0.965	1.099
Subtotal	2.448	4.572	7.020
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.063	0.247	0.310
Collision with other object (from Worksheet 2F)	0.006	0.020	0.026
Other single-vehicle collision (from Worksheet 2F)	0.003	0.007	0.010
Single-vehicle noncollision (from Worksheet 2F)	0.012	0.010	0.022
Collision with pedestrian (from Worksheet 2G or 2I)	0.143	0.000	0.143
Collision with bicycle (from Worksheet 2J)	0.111	0.000	0.111
Subtotal	0.338	0.284	0.622
Total	2.786	4.857	7.642

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	7.6
Fatal and injury (FI)	2.8
Property damage only (PDO)	4.9

## No-Build Alternative

### Segment Analysis

Willow Road – Sunset Ridge Road to Old Willow Road

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Sunset Ridge to Old Willow Rd
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	2U
Length of segment, L (mi)		--	0.18
AADT (veh/day)		--	32,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	Not Present
Lighting (present / not present)		Not Present	Not Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	1
Major industrial / institutional driveways (number)		--	1
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	5
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	50
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	19
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.11	1.00	1.00	1.00	1.11

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3 a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-15.22	1.68	0.84	1.637	1.000	1.637	1.11	1.00	1.822
Fatal and Injury (FI)	-16.22	1.66	0.65	0.489	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.287	0.469	1.11	1.00	0.523
Property Damage Only (PDO)	-15.62	1.69	0.87	1.217	$(5)_{TOTAL} - (5)_{FI}$ 0.713	1.167	1.11	1.00	1.300

**Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.523	1.000	1.300	1.822
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.730	0.381	0.778	1.011	1.393
Head-on collision	0.068	0.036	0.004	0.005	0.041
Angle collision	0.085	0.044	0.079	0.103	0.147
Sideswipe, same direction	0.015	0.008	0.031	0.040	0.048
Sideswipe, opposite direction	0.073	0.038	0.055	0.071	0.110
Other multiple-vehicle collision	0.029	0.015	0.053	0.069	0.084

**Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.47	0.56	0.81	0.253	1.000	0.253	1.11	1.00	0.281
Fatal and Injury (FI)	-3.96	0.23	0.50	0.037	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.154	0.039	1.11	1.00	0.043
Property Damage Only (PDO)	-6.51	0.64	0.87	0.205	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.846	0.214	1.11	1.00	0.238

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.043	1.000	0.238	0.281
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.026	0.001	0.066	0.016	0.017
Collision with fixed object	0.723	0.031	0.759	0.181	0.212
Collision with other object	0.010	0.000	0.013	0.003	0.004
Other single-vehicle collision	0.241	0.010	0.162	0.039	0.049

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_i * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.158	1.000	0.000	--
Minor commercial	1	0.050	1.000	0.107	
Major industrial/institutional	1	0.172	1.000	0.367	
Minor industrial/institutional	0	0.023	1.000	0.000	
Major residential	0	0.083	1.000	0.000	
Minor residential	5	0.016	1.000	0.171	
Other	0	0.025	1.000	0.000	
Total	--	--	--	0.644	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdvw}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.644	1.000	0.644	1.11	1.00	0.717
Fatal and injury (FI)	--	0.323	0.208	1.11	1.00	0.232
Property damage only (PDO)	--	0.677	0.436	1.11	1.00	0.486

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	1.822	0.281	0.717	2.821	0.005	1.00	0.014
Fatal and injury (FI)	--	--	--	--	--	1.00	0.014

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	1.822	0.281	0.717	2.821	0.004	1.00	0.011
Fatal and injury (FI)	--	--	--	--	--	1.00	0.011

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.381	1.011	1.393
Head-on collisions (from Worksheet 1D)	0.036	0.005	0.041
Angle collisions (from Worksheet 1D)	0.044	0.103	0.147
Sideswipe, same direction (from Worksheet 1D)	0.008	0.040	0.048
Sideswipe, opposite direction (from Worksheet 1D)	0.038	0.071	0.110
Driveway-related collisions (from Worksheet 1H)	0.232	0.486	0.717
Other multiple-vehicle collision (from Worksheet 1D)	0.015	0.069	0.084
Subtotal	0.754	1.786	2.540
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.001	0.016	0.017
Collision with fixed object (from Worksheet 1F)	0.031	0.181	0.212
Collision with other object (from Worksheet 1F)	0.000	0.003	0.004
Other single-vehicle collision (from Worksheet 1F)	0.010	0.039	0.049
Collision with pedestrian (from Worksheet 1I)	0.014	0.000	0.014
Collision with bicycle (from Worksheet 1J)	0.011	0.000	0.011
Subtotal	0.069	0.238	0.307
Total	0.823	2.024	2.847

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	2.8	0.18	15.8
Fatal and injury (FI)	0.8	0.18	4.6
Property damage only (PDO)	2.0	0.18	11.2

**No-Build Alternative**

**Intersection Analysis  
Willow Road at Old Willow Road**

**Alternative: No-Build**  
**Intersection: Willow Road at Old Willow**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Old Willow
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	3ST
AADT <sub>major</sub> (veh/day)		--	32,000
AADT <sub>minor</sub> (veh/day)		--	3,000
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	0
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	0
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	0
Type of left-turn signal phasing for Leg #1		Permissive	Not Applicable
Type of left-turn signal phasing for Leg #2		--	Not Applicable
Type of left-turn signal phasing for Leg #3		--	Not Applicable
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Not Applicable
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			1
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	0
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF<sub>COMB</sub></i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
1.00	1.00	1.00	1.00	1.00	1.00	1.00

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-13.36	1.11	0.41	0.80	4.209	1.000	4.209	1.00	1.00	4.209
Fatal and Injury (FI)	-14.01	1.16	0.30	0.69	1.530	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.326	1.372	1.00	1.00	1.372
Property Damage Only (PDO)	-15.38	1.20	0.51	0.77	3.163	$(5)_{TOTAL}-(5)_{FI}$ 0.674	2.837	1.00	1.00	2.837

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.372	1.000	2.837	4.209
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.421	0.578	0.440	1.248	1.826
Head-on collision	0.045	0.062	0.023	0.065	0.127
Angle collision	0.343	0.471	0.262	0.743	1.214
Sideswipe	0.126	0.173	0.040	0.113	0.286
Other multiple-vehicle collision	0.065	0.089	0.235	0.667	0.756

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-6.81	0.16	0.51	1.14	0.344	1.000	0.344	1.00	1.00	0.344
Fatal and Injury (FI)	--	--	--	--	0.107	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.294	0.101	1.00	1.00	0.101
Property Damage Only (PDO)	-8.36	0.25	0.55	1.29	0.256	$(5)_{TOTAL}-(5)_{FI}$ 0.706	0.243	1.00	1.00	0.243

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.101	1.000	0.243	0.344
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.003	0.001	0.001
Collision with animal	0.003	0.000	0.018	0.004	0.005
Collision with fixed object	0.762	0.077	0.834	0.203	0.280
Collision with other object	0.090	0.009	0.092	0.022	0.031
Other single-vehicle collision	0.039	0.004	0.023	0.006	0.010
Single-vehicle noncollision	0.105	0.011	0.030	0.007	0.018

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	4.209	0.344	4.553	0.021	1.00	0.096
Fatal and injury (FI)	--	--	--	--	1.00	0.096

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
--	--	--	--

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									
	a	b	c	d	e					
Total	--	--	--	--	--	--	--	--	1.00	--
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	--

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	4.209	0.344	4.553	0.016	1.00	0.073
Fatal and injury (FI)	--	--	--	--	1.00	0.073

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.578	1.248	1.826
Head-on collisions (from Worksheet 2D)	0.062	0.065	0.127
Angle collisions (from Worksheet 2D)	0.471	0.743	1.214
Sideswipe (from Worksheet 2D)	0.173	0.113	0.286
Other multiple-vehicle collision (from Worksheet 2D)	0.089	0.667	0.756
Subtotal	1.372	2.837	4.209
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.001	0.001
Collision with animal (from Worksheet 2F)	0.000	0.004	0.005
Collision with fixed object (from Worksheet 2F)	0.077	0.203	0.280
Collision with other object (from Worksheet 2F)	0.009	0.022	0.031
Other single-vehicle collision (from Worksheet 2F)	0.004	0.006	0.010
Single-vehicle noncollision (from Worksheet 2F)	0.011	0.007	0.018
Collision with pedestrian (from Worksheet 2G or 2I)	0.096	0.000	0.096
Collision with bicycle (from Worksheet 2J)	0.073	0.000	0.073
Subtotal	0.270	0.243	0.513
Total	1.642	3.080	4.721

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	4.7
Fatal and injury (FI)	1.6
Property damage only (PDO)	3.1

## **No-Build Alternative**

### **Segment Analysis**

**Willow Road – Old Willow Road to Wagner Road**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Old Willow Rd. to Wagner
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	2U
Length of segment, L (mi)		--	0.42
AADT (veh/day)		--	30,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	Not Present
Lighting (present / not present)		Not Present	Not Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	12
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	45
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	22
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.08	1.00	1.00	1.00	1.08

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-15.22	1.68	0.84	3.427	1.000	3.427	1.08	1.00	3.711
Fatal and Injury (FI)	-16.22	1.66	0.65	1.026	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.287	0.984	1.08	1.00	1.065
Property Damage Only (PDO)	-15.62	1.69	0.87	2.546	$(5)_{TOTAL} - (5)_{FI}$ 0.713	2.443	1.08	1.00	2.645

**Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	1.065	1.000	2.645	3.711
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.730	0.778	0.778	2.058	2.836
Head-on collision	0.068	0.072	0.004	0.011	0.083
Angle collision	0.085	0.091	0.079	0.209	0.300
Sideswipe, same direction	0.015	0.016	0.031	0.082	0.098
Sideswipe, opposite direction	0.073	0.078	0.055	0.145	0.223
Other multiple-vehicle collision	0.029	0.031	0.053	0.140	0.171

**Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.47	0.56	0.81	0.569	1.000	0.569	1.08	1.00	0.616
Fatal and Injury (FI)	-3.96	0.23	0.50	0.086	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.158	0.090	1.08	1.00	0.097
Property Damage Only (PDO)	-6.51	0.64	0.87	0.459	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.842	0.479	1.08	1.00	0.519

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.097	1.000	0.519	0.616
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.026	0.003	0.066	0.034	0.037
Collision with fixed object	0.723	0.070	0.759	0.394	0.464
Collision with other object	0.010	0.001	0.013	0.007	0.008
Other single-vehicle collision	0.241	0.023	0.162	0.084	0.107

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.158	1.000	0.000	--
Minor commercial	0	0.050	1.000	0.000	
Major industrial/institutional	0	0.172	1.000	0.000	
Minor industrial/institutional	0	0.023	1.000	0.000	
Major residential	0	0.083	1.000	0.000	
Minor residential	12	0.016	1.000	0.384	
Other	0	0.025	1.000	0.000	
Total	--	--	--	0.384	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.384	1.000	0.384	1.08	1.00	0.416
Fatal and injury (FI)	--	0.323	0.124	1.08	1.00	0.134
Property damage only (PDO)	--	0.677	0.260	1.08	1.00	0.282

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	3.711	0.616	0.416	4.742	0.005	1.00	0.024
Fatal and injury (FI)	--	--	--	--	--	1.00	0.024

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	3.711	0.616	0.416	4.742	0.004	1.00	0.019
Fatal and injury (FI)	--	--	--	--	--	1.00	0.019

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.778	2.058	2.836
Head-on collisions (from Worksheet 1D)	0.072	0.011	0.083
Angle collisions (from Worksheet 1D)	0.091	0.209	0.300
Sideswipe, same direction (from Worksheet 1D)	0.016	0.082	0.098
Sideswipe, opposite direction (from Worksheet 1D)	0.078	0.145	0.223
Driveway-related collisions (from Worksheet 1H)	0.134	0.282	0.416
Other multiple-vehicle collision (from Worksheet 1D)	0.031	0.140	0.171
Subtotal	1.200	2.927	4.126
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.003	0.034	0.037
Collision with fixed object (from Worksheet 1F)	0.070	0.394	0.464
Collision with other object (from Worksheet 1F)	0.001	0.007	0.008
Other single-vehicle collision (from Worksheet 1F)	0.023	0.084	0.107
Collision with pedestrian (from Worksheet 1I)	0.024	0.000	0.024
Collision with bicycle (from Worksheet 1J)	0.019	0.000	0.019
Subtotal	0.140	0.519	0.658
Total	1.339	3.445	4.785

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	4.8	0.42	11.4
Fatal and injury (FI)	1.3	0.42	3.2
Property damage only (PDO)	3.4	0.42	8.2

**No-Build Alternative**

**Intersection Analysis  
Willow Road at Wagner Road**

**Alternative: No-Build**  
**Intersection: Willow Road at Wagner**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Wagner
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	30,000
AADT <sub>minor</sub> (veh/day)		--	6,000
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	0
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	0
Type of left-turn signal phasing for Leg #1		Permissive	Permissive
Type of left-turn signal phasing for Leg #2		--	Permissive
Type of left-turn signal phasing for Leg #3		--	Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	2
Intersection red light cameras (present/not present)		Not Present	Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			213
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	3
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF<sub>COMB</sub></i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	1.00	1.00	0.96	1.00	1.01	0.64

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	7.702	1.000	7.702	0.64	1.00	4.939
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	2.556	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.344	2.651	0.64	1.00	1.700
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	4.870	$(5)_{TOTAL}-(5)_{FI}$ 0.656	5.051	0.64	1.00	3.239

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.700	1.000	3.239	4.939
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	0.765	0.483	1.564	2.329
Head-on collision	0.049	0.083	0.030	0.097	0.180
Angle collision	0.347	0.590	0.244	0.790	1.380
Sideswipe	0.099	0.168	0.032	0.104	0.272
Other multiple-vehicle collision	0.055	0.093	0.211	0.683	0.777

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.427	1.000	0.427	0.64	1.00	0.274
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.101	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.237	0.101	0.64	1.00	0.065
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.325	$(5)_{TOTAL}-(5)_{FI}$ 0.763	0.326	0.64	1.00	0.209

**Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.065	1.000	0.209	0.274
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.001
Collision with fixed object	0.744	0.048	0.870	0.182	0.230
Collision with other object	0.072	0.005	0.070	0.015	0.019
Other single-vehicle collision	0.040	0.003	0.023	0.005	0.007
Single-vehicle noncollision	0.141	0.009	0.034	0.007	0.016

**Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections**

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

**Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections**

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.35	1.00	3.75

**Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections**

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub> (4)*(5)*(6)
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.040	3.75	1.00	0.150
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.150

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	4.939	0.274	5.212	0.015	1.00	0.078
Fatal and injury (FI)	--	--	--	--	1.00	0.078

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.765	1.564	2.329
Head-on collisions (from Worksheet 2D)	0.083	0.097	0.180
Angle collisions (from Worksheet 2D)	0.590	0.790	1.380
Sideswipe (from Worksheet 2D)	0.168	0.104	0.272
Other multiple-vehicle collision (from Worksheet 2D)	0.093	0.683	0.777
Subtotal	1.700	3.239	4.939
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.001
Collision with fixed object (from Worksheet 2F)	0.048	0.182	0.230
Collision with other object (from Worksheet 2F)	0.005	0.015	0.019
Other single-vehicle collision (from Worksheet 2F)	0.003	0.005	0.007
Single-vehicle noncollision (from Worksheet 2F)	0.009	0.007	0.016
Collision with pedestrian (from Worksheet 2G or 2I)	0.150	0.000	0.150
Collision with bicycle (from Worksheet 2J)	0.078	0.000	0.078
Subtotal	0.293	0.209	0.502
Total	1.993	3.448	5.441

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	5.4
Fatal and injury (FI)	2.0
Property damage only (PDO)	3.4

**No-Build Alternative**

**Segment Analysis**

**Willow Road – Wagner Road to 4-Lane Section**

Alternative: No-Build  
Segment: Wagner to 4-Lane Section

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Wagner to 4-lane section taper
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	2U
Length of segment, L (mi)		--	0.29
AADT (veh/day)		--	30,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	Not Present
Lighting (present / not present)		Not Present	Not Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	1
Minor residential driveways (number)		--	8
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	45
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	16
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.11	1.00	1.00	1.00	1.11

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-15.22	1.68	0.84	2.366	1.000	2.366	1.11	1.00	2.635
Fatal and Injury (FI)	-16.22	1.66	0.65	0.708	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.287	0.679	1.11	1.00	0.757
Property Damage Only (PDO)	-15.62	1.69	0.87	1.758	$(5)_{TOTAL} - (5)_{FI}$ 0.713	1.687	1.11	1.00	1.878

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.757	1.000	1.878	2.635
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.730	0.552	0.778	1.461	2.013
Head-on collision	0.068	0.051	0.004	0.008	0.059
Angle collision	0.085	0.064	0.079	0.148	0.213
Sideswipe, same direction	0.015	0.011	0.031	0.058	0.070
Sideswipe, opposite direction	0.073	0.055	0.055	0.103	0.159
Other multiple-vehicle collision	0.029	0.022	0.053	0.100	0.121

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.47	0.56	0.81	0.393	1.000	0.393	1.11	1.00	0.437
Fatal and Injury (FI)	-3.96	0.23	0.50	0.059	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.158	0.062	1.11	1.00	0.069
Property Damage Only (PDO)	-6.51	0.64	0.87	0.317	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.842	0.331	1.11	1.00	0.368

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.069	1.000	0.368	0.437
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.026	0.002	0.066	0.024	0.026
Collision with fixed object	0.723	0.050	0.759	0.280	0.329
Collision with other object	0.010	0.001	0.013	0.005	0.005
Other single-vehicle collision	0.241	0.017	0.162	0.060	0.076

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.158	1.000	0.000	--
Minor commercial	0	0.050	1.000	0.000	
Major industrial/institutional	0	0.172	1.000	0.000	
Minor industrial/institutional	0	0.023	1.000	0.000	
Major residential	1	0.083	1.000	0.166	
Minor residential	8	0.016	1.000	0.256	
Other	0	0.025	1.000	0.000	
Total	--	--	--	0.422	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.422	1.000	0.422	1.11	1.00	0.470
Fatal and injury (FI)	--	0.323	0.136	1.11	1.00	0.152
Property damage only (PDO)	--	0.677	0.286	1.11	1.00	0.318

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	2.635	0.437	0.470	3.542	0.005	1.00	0.018
Fatal and injury (FI)	--	--	--	--	--	1.00	0.018

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	2.635	0.437	0.470	3.542	0.004	1.00	0.014
Fatal and injury (FI)	--	--	--	--	--	1.00	0.014

Alternative: No-Build  
Segment: Wagner to 4-Lane Section

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.552	1.461	2.013
Head-on collisions (from Worksheet 1D)	0.051	0.008	0.059
Angle collisions (from Worksheet 1D)	0.064	0.148	0.213
Sideswipe, same direction (from Worksheet 1D)	0.011	0.058	0.070
Sideswipe, opposite direction (from Worksheet 1D)	0.055	0.103	0.159
Driveway-related collisions (from Worksheet 1H)	0.152	0.318	0.470
Other multiple-vehicle collision (from Worksheet 1D)	0.022	0.100	0.121
Subtotal	0.908	2.196	3.104
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.002	0.024	0.026
Collision with fixed object (from Worksheet 1F)	0.050	0.280	0.329
Collision with other object (from Worksheet 1F)	0.001	0.005	0.005
Other single-vehicle collision (from Worksheet 1F)	0.017	0.060	0.076
Collision with pedestrian (from Worksheet 1I)	0.018	0.000	0.018
Collision with bicycle (from Worksheet 1J)	0.014	0.000	0.014
Subtotal	0.101	0.368	0.469
Total	1.009	2.565	3.574

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	3.6	0.29	12.3
Fatal and injury (FI)	1.0	0.29	3.5
Property damage only (PDO)	2.6	0.29	8.8

## **No-Build Alternative**

### **Segment Analysis Willow Road – 4-Lane Section to Old Willow Road/ Northfield Road**

Alternative: No-Build

Segment: 4-Lane Section to Old Willow/Northfield

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	4-Lane to Old Willow/Northfield
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	5T
Length of segment, L (mi)		--	0.12
AADT (veh/day)		--	30,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	Not Present
Lighting (present / not present)		Not Present	Not Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	5
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	1
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	125
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	9
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.17	1.00	1.00	1.00	1.17

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3 a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-9.70	1.17	0.81	1.273	1.000	1.273	1.17	1.00	1.488
Fatal and Injury (FI)	-10.47	1.12	0.62	0.352	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.266	0.338	1.17	1.00	0.396
Property Damage Only (PDO)	-9.97	1.17	0.88	0.972	$(5)_{TOTAL} - (5)_{FI}$ 0.734	0.934	1.17	1.00	1.092

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.396	1.000	1.092	1.488
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.846	0.335	0.651	0.711	1.046
Head-on collision	0.021	0.008	0.004	0.004	0.013
Angle collision	0.050	0.020	0.059	0.064	0.084
Sideswipe, same direction	0.061	0.024	0.248	0.271	0.295
Sideswipe, opposite direction	0.004	0.002	0.009	0.010	0.011
Other multiple-vehicle collision	0.018	0.007	0.029	0.032	0.039

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-4.82	0.54	0.52	0.253	1.000	0.253	1.17	1.00	0.296
Fatal and Injury (FI)	-4.43	0.35	0.36	0.053	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.217	0.055	1.17	1.00	0.064
Property Damage Only (PDO)	-5.83	0.61	0.55	0.190	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.783	0.198	1.17	1.00	0.232

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.064	1.000	0.232	0.296
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.016	0.001	0.049	0.011	0.012
Collision with fixed object	0.398	0.026	0.768	0.178	0.204
Collision with other object	0.005	0.000	0.061	0.014	0.014
Other single-vehicle collision	0.581	0.037	0.122	0.028	0.066

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.165	1.172	0.000	--
Minor commercial	5	0.053	1.172	0.597	
Major industrial/institutional	0	0.181	1.172	0.000	
Minor industrial/institutional	0	0.024	1.172	0.000	
Major residential	0	0.087	1.172	0.000	
Minor residential	1	0.016	1.172	0.036	
Other	0	0.027	1.172	0.000	
Total	--	--	--	0.633	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.633	1.000	0.633	1.17	1.00	0.740
Fatal and injury (FI)	--	0.269	0.170	1.17	1.00	0.199
Property damage only (PDO)	--	0.731	0.463	1.17	1.00	0.541

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	1.488	0.296	0.740	2.524	0.023	1.00	0.058
Fatal and injury (FI)	--	--	--	--	--	1.00	0.058

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	1.488	0.296	0.740	2.524	0.012	1.00	0.030
Fatal and injury (FI)	--	--	--	--	--	1.00	0.030

Alternative: No-Build  
Segment: 4-Lane Section to Old Willow/Northfield

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.335	0.711	1.046
Head-on collisions (from Worksheet 1D)	0.008	0.004	0.013
Angle collisions (from Worksheet 1D)	0.020	0.064	0.084
Sideswipe, same direction (from Worksheet 1D)	0.024	0.271	0.295
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.010	0.011
Driveway-related collisions (from Worksheet 1H)	0.199	0.541	0.740
Other multiple-vehicle collision (from Worksheet 1D)	0.007	0.032	0.039
Subtotal	0.595	1.633	2.228
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.001	0.011	0.012
Collision with fixed object (from Worksheet 1F)	0.026	0.178	0.204
Collision with other object (from Worksheet 1F)	0.000	0.014	0.014
Other single-vehicle collision (from Worksheet 1F)	0.037	0.028	0.066
Collision with pedestrian (from Worksheet 1I)	0.058	0.000	0.058
Collision with bicycle (from Worksheet 1J)	0.030	0.000	0.030
Subtotal	0.153	0.232	0.384
Total	0.748	1.865	2.613

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	2.6	0.12	21.8
Fatal and injury (FI)	0.7	0.12	6.2
Property damage only (PDO)	1.9	0.12	15.5

**No-Build Alternative**

**Intersection Analysis**

**Willow Road at Old Willow Road/ Northfield Road**

**Alternative: No-Build**

**Intersection: Willow Road at Old Willow/Northfield Road**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Old Willow/Northfield Rd.
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	35,000
AADT <sub>minor</sub> (veh/day)		--	7,000
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	2
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			105
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	7
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	5

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF<sub>COMB</sub></i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	0.98	0.96	1.00	1.00	1.00	0.62

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs (7) from Worksheet 2B	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	9.411	1.000	9.411	0.62	1.00	5.844
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.172	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.349	3.285	0.62	1.00	2.040
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	5.914	$(5)_{TOTAL}-(5)_{FI}$ 0.651	6.125	0.62	1.00	3.804

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	2.040	1.000	3.804	5.844
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	0.918	0.483	1.837	2.755
Head-on collision	0.049	0.100	0.030	0.114	0.214
Angle collision	0.347	0.708	0.244	0.928	1.636
Sideswipe	0.099	0.202	0.032	0.122	0.324
Other multiple-vehicle collision	0.055	0.112	0.211	0.803	0.915

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs (7) from Worksheet 2B	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.494	1.000	0.494	0.62	1.00	0.307
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.113	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.228	0.113	0.62	1.00	0.070
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.381	$(5)_{TOTAL}-(5)_{FI}$ 0.772	0.381	0.62	1.00	0.237

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.070	1.000	0.237	0.307
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.001
Collision with fixed object	0.744	0.052	0.870	0.206	0.258
Collision with other object	0.072	0.005	0.070	0.017	0.022
Other single-vehicle collision	0.040	0.003	0.023	0.005	0.008
Single-vehicle noncollision	0.141	0.010	0.034	0.008	0.018

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.12	1.12

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub> (4)*(5)*(6)
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.036	1.12	1.00	0.041
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.041

Alternative: No-Build

Intersection: Willow Road at Old Willow/Northfield Road

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	5.844	0.307	6.151	0.015	1.00	0.092
Fatal and injury (FI)	--	--	--	--	1.00	0.092

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.918	1.837	2.755
Head-on collisions (from Worksheet 2D)	0.100	0.114	0.214
Angle collisions (from Worksheet 2D)	0.708	0.928	1.636
Sideswipe (from Worksheet 2D)	0.202	0.122	0.324
Other multiple-vehicle collision (from Worksheet 2D)	0.112	0.803	0.915
Subtotal	2.040	3.804	5.844
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.001
Collision with fixed object (from Worksheet 2F)	0.052	0.206	0.258
Collision with other object (from Worksheet 2F)	0.005	0.017	0.022
Other single-vehicle collision (from Worksheet 2F)	0.003	0.005	0.008
Single-vehicle noncollision (from Worksheet 2F)	0.010	0.008	0.018
Collision with pedestrian (from Worksheet 2G or 2I)	0.041	0.000	0.041
Collision with bicycle (from Worksheet 2J)	0.092	0.000	0.092
Subtotal	0.203	0.237	0.440
Total	2.243	4.041	6.284

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	6.3
Fatal and injury (FI)	2.2
Property damage only (PDO)	4.0

## No-Build Alternative

### Segment Analysis

Willow Road – Old Willow Road/ Northfield Road to  
Central Avenue/ Happ Road

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Old Willow/Northfield to Central/Happ
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.09
AADT (veh/day)		--	35,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	20
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	1
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	100
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	8
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.32	0.99	0.91	1.00	1.20

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3 a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-12.34	1.36	1.32	0.596	1.000	0.596	1.20	1.00	0.712
Fatal and Injury (FI)	-12.76	1.28	1.31	0.169	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.270	0.161	1.20	1.00	0.192
Property Damage Only (PDO)	-12.81	1.38	1.34	0.459	$(5)_{TOTAL} - (5)_{FI}$ 0.730	0.435	1.20	1.00	0.520

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.192	1.000	0.520	0.712
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.160	0.662	0.344	0.504
Head-on collision	0.020	0.004	0.007	0.004	0.007
Angle collision	0.040	0.008	0.036	0.019	0.026
Sideswipe, same direction	0.050	0.010	0.223	0.116	0.126
Sideswipe, opposite direction	0.010	0.002	0.001	0.001	0.002
Other multiple-vehicle collision	0.048	0.009	0.071	0.037	0.046

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.079	1.000	0.079	1.20	1.00	0.094
Fatal and Injury (FI)	-8.71	0.66	0.28	0.015	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.187	0.015	1.20	1.00	0.018
Property Damage Only (PDO)	-5.04	0.45	1.06	0.065	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.813	0.064	1.20	1.00	0.077

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.018	1.000	0.077	0.094
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.005	0.005
Collision with fixed object	0.500	0.009	0.813	0.062	0.071
Collision with other object	0.028	0.000	0.016	0.001	0.002
Other single-vehicle collision	0.471	0.008	0.108	0.008	0.017

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	1	0.033	1.106	0.084	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.084	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.084	1.000	0.084	1.20	1.00	0.101
Fatal and injury (FI)	--	0.284	0.024	1.20	1.00	0.029
Property damage only (PDO)	--	0.716	0.060	1.20	1.00	0.072

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.712	0.094	0.101	0.908	0.019	1.00	0.017
Fatal and injury (FI)	--	--	--	--	--	1.00	0.017

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.712	0.094	0.101	0.908	0.005	1.00	0.005
Fatal and injury (FI)	--	--	--	--	--	1.00	0.005

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.160	0.344	0.504
Head-on collisions (from Worksheet 1D)	0.004	0.004	0.007
Angle collisions (from Worksheet 1D)	0.008	0.019	0.026
Sideswipe, same direction (from Worksheet 1D)	0.010	0.116	0.126
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.001	0.002
Driveway-related collisions (from Worksheet 1H)	0.029	0.072	0.101
Other multiple-vehicle collision (from Worksheet 1D)	0.009	0.037	0.046
Subtotal	0.221	0.592	0.813
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.009	0.062	0.071
Collision with other object (from Worksheet 1F)	0.000	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.008	0.008	0.017
Collision with pedestrian (from Worksheet 1I)	0.017	0.000	0.017
Collision with bicycle (from Worksheet 1J)	0.005	0.000	0.005
Subtotal	0.039	0.077	0.116
Total	0.260	0.669	0.929

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	0.9	0.09	10.3
Fatal and injury (FI)	0.3	0.09	2.9
Property damage only (PDO)	0.7	0.09	7.4

**No-Build Alternative**

**Intersection Analysis  
Willow Road at Central Avenue/ Happ Road**

**Alternative: No-Build**  
**Intersection: Willow Road at Central/Happ**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Central/Happ
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	35,000
AADT <sub>minor</sub> (veh/day)		--	19,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			133
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	6

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF<sub>COMB</sub></i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	0.96	0.92	1.00	0.91	1.00	0.53

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	11.840	1.000	11.840	0.53	1.00	6.300
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.951	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.345	4.080	0.53	1.00	2.171
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.515	$(5)_{TOTAL}-(5)_{FI}$ 0.655	7.760	0.53	1.00	4.129

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	2.171	1.000	4.129	6.300
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	0.977	0.483	1.995	2.971
Head-on collision	0.049	0.106	0.030	0.124	0.230
Angle collision	0.347	0.753	0.244	1.008	1.761
Sideswipe	0.099	0.215	0.032	0.132	0.347
Other multiple-vehicle collision	0.055	0.119	0.211	0.871	0.991

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.647	1.000	0.647	0.53	1.00	0.344
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.151	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.235	0.152	0.53	1.00	0.081
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.489	$(5)_{TOTAL}-(5)_{FI}$ 0.765	0.495	0.53	1.00	0.263

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.081	1.000	0.263	0.344
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.060	0.870	0.229	0.289
Collision with other object	0.072	0.006	0.070	0.018	0.024
Other single-vehicle collision	0.040	0.003	0.023	0.006	0.009
Single-vehicle noncollision	0.141	0.011	0.034	0.009	0.020

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.00	1.12	3.11

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub> (4)*(5)*(6)
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.056	3.11	1.00	0.173
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.173

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	6.300	0.344	6.645	0.015	1.00	0.100
Fatal and injury (FI)	--	--	--	--	1.00	0.100

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.977	1.995	2.971
Head-on collisions (from Worksheet 2D)	0.106	0.124	0.230
Angle collisions (from Worksheet 2D)	0.753	1.008	1.761
Sideswipe (from Worksheet 2D)	0.215	0.132	0.347
Other multiple-vehicle collision (from Worksheet 2D)	0.119	0.871	0.991
Subtotal	2.171	4.129	6.300
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.060	0.229	0.289
Collision with other object (from Worksheet 2F)	0.006	0.018	0.024
Other single-vehicle collision (from Worksheet 2F)	0.003	0.006	0.009
Single-vehicle noncollision (from Worksheet 2F)	0.011	0.009	0.020
Collision with pedestrian (from Worksheet 2G or 2I)	0.173	0.000	0.173
Collision with bicycle (from Worksheet 2J)	0.100	0.000	0.100
Subtotal	0.354	0.263	0.617
Total	2.525	4.393	6.918

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	6.9
Fatal and injury (FI)	2.5
Property damage only (PDO)	4.4

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**  
**Safety Performance Calculations**

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Intersection Analysis**  
**Willow Road at IL Route 43**

**Alternative: 2 (Barrier Median)**  
**Intersection: Willow Road at Waukegan Road**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Waukegan Road
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	42,000
AADT <sub>minor</sub> (veh/day)		--	34,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected
Type of left-turn signal phasing for Leg #2		--	Protected
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	2
Intersection red light cameras (present/not present)		Not Present	Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			11
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	5

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.78	0.85	0.96	0.91	1.01	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.38

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs (8) from Worksheet 2B	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	16.452	1.000	16.452	0.38	1.00	6.268
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	5.568	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.349	5.734	0.38	1.00	2.185
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	10.407	$(5)_{TOTAL}-(5)_{FI}$ 0.651	10.718	0.38	1.00	4.083

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	2.185	1.000	4.083	6.268
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	0.983	0.483	1.972	2.955
Head-on collision	0.049	0.107	0.030	0.123	0.230
Angle collision	0.347	0.758	0.244	0.996	1.754
Sideswipe	0.099	0.216	0.032	0.131	0.347
Other multiple-vehicle collision	0.055	0.120	0.211	0.862	0.982

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs (7) from Worksheet 2B	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.857	1.000	0.857	0.38	1.00	0.327
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.193	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.228	0.196	0.38	1.00	0.075
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.652	$(5)_{TOTAL}-(5)_{FI}$ 0.772	0.662	0.38	1.00	0.252

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.075	1.000	0.252	0.327
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.055	0.870	0.219	0.275
Collision with other object	0.072	0.005	0.070	0.018	0.023
Other single-vehicle collision	0.040	0.003	0.023	0.006	0.009
Single-vehicle noncollision	0.141	0.011	0.034	0.009	0.019

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections				
(1)	(2)	(3)	(4)	(5)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	CMF for Replace W/DW Ped Signals with Countdown Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmfclearinghouse.org	
1.00	1.00	1.12	0.75	(1)*(2)*(3)*(4) 0.84

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									from Equation 12-29
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.023	0.84	1.00	0.019
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.019

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	6.268	0.327	6.595	0.015	1.00	0.099
Fatal and injury (FI)	--	--	--	--	1.00	0.099

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.983	1.972	2.955
Head-on collisions (from Worksheet 2D)	0.107	0.123	0.230
Angle collisions (from Worksheet 2D)	0.758	0.996	1.754
Sideswipe (from Worksheet 2D)	0.216	0.131	0.347
Other multiple-vehicle collision (from Worksheet 2D)	0.120	0.862	0.982
Subtotal	2.185	4.083	6.268
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.055	0.219	0.275
Collision with other object (from Worksheet 2F)	0.005	0.018	0.023
Other single-vehicle collision (from Worksheet 2F)	0.003	0.006	0.009
Single-vehicle noncollision (from Worksheet 2F)	0.011	0.009	0.019
Collision with pedestrian (from Worksheet 2G or 2I)	0.019	0.000	0.019
Collision with bicycle (from Worksheet 2J)	0.099	0.000	0.099
Subtotal	0.193	0.252	0.445
Total	2.378	4.336	6.713

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	6.7
Fatal and injury (FI)	2.4
Property damage only (PDO)	4.3

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – IL Route 43 to**  
**Three Lakes/ Fox Meadow Drive**

Alternative: 2 (Barrier Median)  
Segment: Waukegan to Three Lakes

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Waukegan Rd to Three Lakes
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data	Base Conditions	Site Conditions	
Roadway type (2U, 3T, 4U, 4D, ST)	--	4D	
Length of segment, L (mi)	--	0.22	
AADT (veh/day)	--	37,000	
Type of on-street parking (none/parallel/angle)	None	None	
Proportion of curb length with on-street parking	--	0	
Median width (ft) - for divided only	15	15	
Lighting (present / not present)	Not Present	Present	
Auto speed enforcement (present / not present)	Not Present	Not Present	
Major commercial driveways (number)	--	0	
Minor commercial driveways (number)	--	0	
Major industrial / institutional driveways (number)	--	0	
Minor industrial / institutional driveways (number)	--	0	
Major residential driveways (number)	--	0	
Minor residential driveways (number)	--	0	
Other driveways (number)	--	0	
Speed Category	--	Posted Speed Greater than 30 mph	
Roadside fixed object density (fixed objects / mi)	0	18	
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	30	18	
Calibration Factor, Cr	1.00	1.00	

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.00	1.00	0.91	1.00	0.92

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brmv}$	Proportion of Total Crashes	Adjusted $N_{brmv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brmv}$
	from Table 12-3								
	a	b							
Total	-12.34	1.36	1.32	1.570	1.000	1.570	0.92	1.00	1.440
Fatal and Injury (FI)	-12.76	1.28	1.31	0.445	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.422	0.92	1.00	0.387
Property Damage Only (PDO)	-12.81	1.38	1.34	1.211	$(5)_{TOTAL} - (5)_{FI}$ 0.731	1.149	0.92	1.00	1.053

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brmv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brmv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.387	1.000	1.053	1.440
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.322	0.662	0.697	1.019
Head-on collision	0.020	0.008	0.007	0.007	0.015
Angle collision	0.040	0.015	0.036	0.038	0.053
Sideswipe, same direction	0.050	0.019	0.223	0.235	0.254
Sideswipe, opposite direction	0.010	0.004	0.001	0.001	0.005
Other multiple-vehicle collision	0.048	0.019	0.071	0.075	0.093

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1) Crash Severity Level	(2) SPF Coefficients		(3) Overdispersion Parameter, k	(4) Initial N <sub>brsv</sub>	(5) Proportion of Total Crashes	(6) Adjusted N <sub>brsv</sub>	(7) Combined CMFs	(8) Calibration Factor, Cr	(9) Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13	1.000	(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	1.00	(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.198	0.198	0.92	1.00	0.181	
Fatal and Injury (FI)	-8.71	0.66	0.28	0.038	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.188	0.037	0.92	1.00	0.034
Property Damage Only (PDO)	-5.04	0.45	1.06	0.162	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.812	0.161	0.92	1.00	0.147

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brsv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brsv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.034	1.000	0.147	0.181
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.009	0.009
Collision with fixed object	0.500	0.017	0.813	0.120	0.137
Collision with other object	0.028	0.001	0.016	0.002	0.003
Other single-vehicle collision	0.471	0.016	0.108	0.016	0.032

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_i * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.000	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	0.92	1.00	0.000
Fatal and injury (FI)	--	0.284	0.000	0.92	1.00	0.000
Property damage only (PDO)	--	0.716	0.000	0.92	1.00	0.000

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	1.440	0.181	0.000	1.621	0.019	0.23	1.00	0.007
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.007

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	1.440	0.181	0.000	1.621	0.005	0.23	1.00	0.002
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.002

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.322	0.697	1.019
Head-on collisions (from Worksheet 1D)	0.008	0.007	0.015
Angle collisions (from Worksheet 1D)	0.015	0.038	0.053
Sideswipe, same direction (from Worksheet 1D)	0.019	0.235	0.254
Sideswipe, opposite direction (from Worksheet 1D)	0.004	0.001	0.005
Driveway-related collisions (from Worksheet 1H)	0.000	0.000	0.000
Other multiple-vehicle collision (from Worksheet 1D)	0.019	0.075	0.093
Subtotal	0.387	1.053	1.440
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.009	0.009
Collision with fixed object (from Worksheet 1F)	0.017	0.120	0.137
Collision with other object (from Worksheet 1F)	0.001	0.002	0.003
Other single-vehicle collision (from Worksheet 1F)	0.016	0.016	0.032
Collision with pedestrian (from Worksheet 1I)	0.007	0.000	0.007
Collision with bicycle (from Worksheet 1J)	0.002	0.000	0.002
Subtotal	0.043	0.147	0.190
Total	0.430	1.200	1.630

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, N predicted rs (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.6	0.22	7.4
Fatal and injury (FI)	0.4	0.22	2.0
Property damage only (PDO)	1.2	0.22	5.5

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Intersection Analysis**  
**Willow Road at Three Lakes/ Fox Meadow Drive**

**Alternative: 2 (Barrier Median)**  
**Intersection: Willow Road at Three Lakes**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Three Lakes
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	37,000
AADT <sub>minor</sub> (veh/day)		--	2,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	2
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			17
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.73	0.98	0.92	1.00	0.91	1.00	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.59

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	7.487	1.000	7.487	0.59	1.00	4.424
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	2.571	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.357	2.672	0.59	1.00	1.579
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	4.633	$(5)_{TOTAL}-(5)_{FI}$ 0.643	4.815	0.59	1.00	2.845

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Total	1.000	1.579	1.000	2.845	4.424
Rear-end collision	0.450	0.710	0.483	1.374	2.085
Head-on collision	0.049	0.077	0.030	0.085	0.163
Angle collision	0.347	0.548	0.244	0.694	1.242
Sideswipe	0.099	0.156	0.032	0.091	0.247
Other multiple-vehicle collision	0.055	0.087	0.211	0.600	0.687

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.366	1.000	0.366	0.59	1.00	0.216
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.080	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.216	0.079	0.59	1.00	0.047
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.291	$(5)_{TOTAL}-(5)_{FI}$ 0.784	0.287	0.59	1.00	0.170

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.047	1.000	0.170	0.216
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.000
Collision with fixed object	0.744	0.035	0.870	0.147	0.182
Collision with other object	0.072	0.003	0.070	0.012	0.015
Other single-vehicle collision	0.040	0.002	0.023	0.004	0.006
Single-vehicle noncollision	0.141	0.007	0.034	0.006	0.012

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections				
(1)	(2)	(3)	(4)	(5)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Replace W/DW Ped Signals with	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmclearinghouse.org	(1)*(2)*(3)*(4)
1.00	1.00	1.00	0.75	0.75

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections												
(1)	(2)					(3)	(4)	(5)	(6)	(7)		
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>		
	from Table 12-14									from Equation 12-29	(4) from Worksheet 2H	(4)*(5)*(6)
	a	b	c	d	e							
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.011	0.75	1.00	0.008		
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.008		

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	4.424	0.216	4.640	0.015	1.00	0.070
Fatal and injury (FI)	--	--	--	--	1.00	0.070

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.710	1.374	2.085
Head-on collisions (from Worksheet 2D)	0.077	0.085	0.163
Angle collisions (from Worksheet 2D)	0.548	0.694	1.242
Sideswipe (from Worksheet 2D)	0.156	0.091	0.247
Other multiple-vehicle collision (from Worksheet 2D)	0.087	0.600	0.687
Subtotal	1.579	2.845	4.424
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 2F)	0.035	0.147	0.182
Collision with other object (from Worksheet 2F)	0.003	0.012	0.015
Other single-vehicle collision (from Worksheet 2F)	0.002	0.004	0.006
Single-vehicle noncollision (from Worksheet 2F)	0.007	0.006	0.012
Collision with pedestrian (from Worksheet 2G or 2I)	0.008	0.000	0.008
Collision with bicycle (from Worksheet 2J)	0.070	0.000	0.070
Subtotal	0.124	0.170	0.294
Total	1.703	3.015	4.718

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	4.7
Fatal and injury (FI)	1.7
Property damage only (PDO)	3.0

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – Three Lakes/ Fox Meadow Drive to**  
**35mph Zone**

**Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments**

General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Three Lakes to Speed Zone Change
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.1
AADT (veh/day)		--	37,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	40
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	8
Calibration Factor, Cr		1.00	1.00

**Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.11	1.00	0.91	1.00	1.01

**Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3 a	b							
Total	-12.34	1.36	1.32	0.714	1.000	0.714	1.01	1.00	0.722
Fatal and Injury (FI)	-12.76	1.28	1.31	0.202	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.192	1.01	1.00	0.194
Property Damage Only (PDO)	-12.81	1.38	1.34	0.551	$(5)_{TOTAL} - (5)_{FI}$ 0.731	0.522	1.01	1.00	0.528

**Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brmv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brmv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.194	1.000	0.528	0.722
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.161	0.662	0.350	0.511
Head-on collision	0.020	0.004	0.007	0.004	0.008
Angle collision	0.040	0.008	0.036	0.019	0.027
Sideswipe, same direction	0.050	0.010	0.223	0.118	0.128
Sideswipe, opposite direction	0.010	0.002	0.001	0.001	0.002
Other multiple-vehicle collision	0.048	0.009	0.071	0.038	0.047

**Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1) Crash Severity Level	(2) SPF Coefficients		(3) Overdispersion Parameter, k	(4) Initial N <sub>brsv</sub>	(5) Proportion of Total Crashes	(6) Adjusted N <sub>brsv</sub>	(7) Combined CMFs	(8) Calibration Factor, Cr	(9) Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.090	1.000	0.090	1.01	1.00	0.091
Fatal and Injury (FI)	-8.71	0.66	0.28	0.017	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.188	0.017	1.01	1.00	0.017
Property Damage Only (PDO)	-5.04	0.45	1.06	0.074	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.812	0.073	1.01	1.00	0.074

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brsv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brsv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.017	1.000	0.074	0.091
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.005	0.005
Collision with fixed object	0.500	0.009	0.813	0.060	0.069
Collision with other object	0.028	0.000	0.016	0.001	0.002
Other single-vehicle collision	0.471	0.008	0.108	0.008	0.016

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_j$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.000	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	1.01	1.00	0.000
Fatal and injury (FI)	--	0.284	0.000	1.01	1.00	0.000
Property damage only (PDO)	--	0.716	0.000	1.01	1.00	0.000

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	0.722	0.091	0.000	0.813	0.019	0.23	1.00	0.004
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.004

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	0.722	0.091	0.000	0.813	0.005	0.23	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.001

Alternative: 2 (Barrier Median)  
 Segment: Three Lakes to 35mph Zone

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.161	0.350	0.511
Head-on collisions (from Worksheet 1D)	0.004	0.004	0.008
Angle collisions (from Worksheet 1D)	0.008	0.019	0.027
Sideswipe, same direction (from Worksheet 1D)	0.010	0.118	0.128
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.001	0.002
Driveway-related collisions (from Worksheet 1H)	0.000	0.000	0.000
Other multiple-vehicle collision (from Worksheet 1D)	0.009	0.038	0.047
Subtotal	0.194	0.528	0.722
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.009	0.060	0.069
Collision with other object (from Worksheet 1F)	0.000	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.008	0.008	0.016
Collision with pedestrian (from Worksheet 1I)	0.004	0.000	0.004
Collision with bicycle (from Worksheet 1J)	0.001	0.000	0.001
Subtotal	0.022	0.074	0.095
Total	0.216	0.602	0.818

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, N <sub>predicted rs</sub> (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	0.8	0.10	8.2
Fatal and injury (FI)	0.2	0.10	2.2
Property damage only (PDO)	0.6	0.10	6.0

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – 35mph Zone to Sunset Ridge Road**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Speed Zone Change to Sunset Ridge
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.13
AADT (veh/day)		--	37,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	1
Minor industrial / institutional driveways (number)		--	1
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	16
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	$(1)*(2)*(3)*(4)*(5)$
1.00	1.03	1.00	0.91	1.00	0.94

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brmv}$	Proportion of Total Crashes	Adjusted $N_{brmv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brmv}$
	from Table 12-3								
	a	b							
Total	-12.34	1.36	1.32	0.928	1.000	0.928	0.94	1.00	0.870
Fatal and Injury (FI)	-12.76	1.28	1.31	0.263	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.249	0.94	1.00	0.234
Property Damage Only (PDO)	-12.81	1.38	1.34	0.716	$(5)_{TOTAL} - (5)_{FI}$ 0.731	0.679	0.94	1.00	0.636

**Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brmv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brmv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.234	1.000	0.636	0.870
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.194	0.662	0.421	0.616
Head-on collision	0.020	0.005	0.007	0.004	0.009
Angle collision	0.040	0.009	0.036	0.023	0.032
Sideswipe, same direction	0.050	0.012	0.223	0.142	0.154
Sideswipe, opposite direction	0.010	0.002	0.001	0.001	0.003
Other multiple-vehicle collision	0.048	0.011	0.071	0.045	0.056

**Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1) Crash Severity Level	(2) SPF Coefficients		(3) Overdispersion Parameter, k	(4) Initial N <sub>brsv</sub>	(5) Proportion of Total Crashes	(6) Adjusted N <sub>brsv</sub>	(7) Combined CMFs	(8) Calibration Factor, Cr	(9) Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13	1.000	(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	1.00	(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.117	0.117	0.94	1.00	0.110	
Fatal and Injury (FI)	-8.71	0.66	0.28	0.022	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.188	0.022	0.94	1.00	0.021
Property Damage Only (PDO)	-5.04	0.45	1.06	0.096	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.812	0.095	0.94	1.00	0.089

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brsv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brsv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.021	1.000	0.089	0.110
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.006	0.006
Collision with fixed object	0.500	0.010	0.813	0.072	0.083
Collision with other object	0.028	0.001	0.016	0.001	0.002
Other single-vehicle collision	0.471	0.010	0.108	0.010	0.019

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_i * (AADT/15,000)^t$	
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	1	0.036	1.106	0.098	
Minor industrial/institutional	1	0.005	1.106	0.014	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.111	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.111	1.000	0.111	0.94	1.00	0.104
Fatal and injury (FI)	--	0.284	0.032	0.94	1.00	0.030
Property damage only (PDO)	--	0.716	0.080	0.94	1.00	0.075

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	0.870	0.110	0.104	1.084	0.019	0.23	1.00	0.005
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.005

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	0.870	0.110	0.104	1.084	0.005	0.23	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.001

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.194	0.421	0.616
Head-on collisions (from Worksheet 1D)	0.005	0.004	0.009
Angle collisions (from Worksheet 1D)	0.009	0.023	0.032
Sideswipe, same direction (from Worksheet 1D)	0.012	0.142	0.154
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.001	0.003
Driveway-related collisions (from Worksheet 1H)	0.030	0.075	0.104
Other multiple-vehicle collision (from Worksheet 1D)	0.011	0.045	0.056
Subtotal	0.263	0.711	0.975
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.006	0.006
Collision with fixed object (from Worksheet 1F)	0.010	0.072	0.083
Collision with other object (from Worksheet 1F)	0.001	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.010	0.010	0.019
Collision with pedestrian (from Worksheet 1I)	0.005	0.000	0.005
Collision with bicycle (from Worksheet 1J)	0.001	0.000	0.001
Subtotal	0.027	0.089	0.116
Total	0.290	0.800	1.090

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, N predicted rs (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.1	0.13	8.4
Fatal and injury (FI)	0.3	0.13	2.2
Property damage only (PDO)	0.8	0.13	6.2

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Intersection Analysis**  
**Willow Road at Sunset Ridge Road**

Alternative: 2 (Barrier Median)  
 Intersection: Willow Road at Sunset Ridge Road

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Sunset Ridge Road
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	37,000
AADT <sub>minor</sub> (veh/day)		--	12,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:			
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:			
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	1
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			110
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	3
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmclearinghouse.org
0.66	0.96	0.92	0.98	0.91	1.00	0.98
(8)						(9)
Interconnect/Coordinate Traffic Signals; Optimization						Combined CMF
<i>CMF 8i</i>						<i>CMF<sub>COMB</sub></i>
ITE Toolbox						1)*(2)*(3)*(4)*(5)*(6)*(7)*(8)
0.84						0.43

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1) Crash Severity Level	(2) SPF Coefficients			(3) Overdispersion Parameter, k	(4) Initial N <sub>bimv</sub> from Equation	(5) Proportion of Total Crashes	(6) Adjusted N <sub>bimv</sub> (4) <sub>TOTAL</sub> *(5)	(7) Combined (7) from Worksh	(8) Calibration Factor, C <sub>i</sub>	(9) Predicted N <sub>bimv</sub> (6)*(7)*(8)
	from Table 12-10									
	a	b	c							
Total	-10.99	1.07	0.23	0.39	11.306	1.000	11.306	0.43	1.00	4.873
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.813	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.349	3.942	0.43	1.00	1.699
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.123	$(5)_{TOTAL} - (5)_{FI}$ 0.651	7.364	0.43	1.00	3.174

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections										
(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>bimv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type (PDO)	(5) Predicted N <sub>bimv (PDO)</sub> (crashes/yea	(6) Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)					
						from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.699	1.000	3.174	4.873					
		$(2) * (3)_{FI}$		$(4) * (5)_{PDO}$	$(3) + (5)$					
Rear-end collision	0.450	0.765	0.483	1.533	2.298					
Head-on collision	0.049	0.083	0.030	0.095	0.178					
Angle collision	0.347	0.590	0.244	0.774	1.364					
Sideswipe	0.099	0.168	0.032	0.102	0.270					
Other multiple-vehicle collision	0.055	0.093	0.211	0.670	0.763					

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1) Crash Severity Level	(2) SPF Coefficients			(3) Overdispersion Parameter, k	(4) Initial N <sub>bisv</sub> from Eqn. 12-24; (FI) from Eqn.	(5) Proportion of Total Crashes	(6) Adjusted N <sub>bimv</sub> (4) <sub>TOTAL</sub> *(5)	(7) Combined (7) from Worksh	(8) Calibration Factor, C <sub>i</sub>	(9) Predicted N <sub>bisv</sub> (6)*(7)*(8)
	from Table 12-12									
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.594	1.000	0.594	0.43	1.00	0.256
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.135	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.229	0.136	0.43	1.00	0.059
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.455	$(5)_{TOTAL} - (5)_{FI}$ 0.771	0.458	0.43	1.00	0.197

Alternative: 2 (Barrier Median)  
 Intersection: Willow Road at Sunset Ridge Road

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sup>(FI)</sup>	Predicted N <sup>bisv (FI)</sup> (crashes/year)	Proportion of Collision Type <sup>(PDO)</sup>	Predicted N <sup>bisv (PDO)</sup> (crashes/yea	Predicted N <sup>bisv (TOTAL)</sup> (crashes/year)
	from Table 12-13	(9) <sup>FI</sup> from Worksheet 2E	from Table 12-13	(9) <sup>PDO</sup> from Worksheet	(9) <sup>PDO</sup> from Worksheet 2E
Total	1.000	0.059	1.000	0.197	0.256
		(2) <sup>*</sup> (3) <sup>FI</sup>		(4) <sup>*</sup> (5) <sup>PDO</sup>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.001
Collision with fixed object	0.744	0.044	0.870	0.172	0.215
Collision with other object	0.072	0.004	0.070	0.014	0.018
Other single-vehicle collision	0.040	0.002	0.023	0.005	0.007
Single-vehicle noncollision	0.141	0.008	0.034	0.007	0.015

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sup>bimv</sup>	Predicted N <sup>bisv</sup>	Predicted N <sup>hi</sup>	f <sup>pedi</sup>	Calibration factor, C <sub>i</sub>	Predicted N <sup>pedi</sup>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4) <sup>*</sup> (5) <sup>*</sup> (6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	CMF for Install Refuge Island	CMF for Replace W/DW Ped Signals with Countdown Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmclearinghouse.org	cmclearinghouse.org	(1) <sup>*</sup> (2) <sup>*</sup> (3) <sup>*</sup> (4) <sup>*</sup> (5) <sup>*</sup> (6)
2.78	1.35	1.00	0.44	0.75	1.24

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter r, k	N <sup>pedbase</sup> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sup>pedi</sup> (4) <sup>*</sup> (5) <sup>*</sup> (6)
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.038	1.24	1.00	0.047
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.047

Alternative: 2 (Barrier Median)  
 Intersection: Willow Road at Sunset Ridge Road

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bike}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	4.873	0.256	5.129	0.015	1.00	0.077
Fatal and injury (FI)	--	--	--	--	1.00	0.077

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.765	1.533	2.298
Head-on collisions (from Worksheet 2D)	0.083	0.095	0.178
Angle collisions (from Worksheet 2D)	0.590	0.774	1.364
Sideswipe (from Worksheet 2D)	0.168	0.102	0.270
Other multiple-vehicle collision (from Worksheet 2D)	0.093	0.670	0.763
Subtotal	1.699	3.174	4.873
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.001
Collision with fixed object (from Worksheet 2F)	0.044	0.172	0.215
Collision with other object (from Worksheet 2F)	0.004	0.014	0.018
Other single-vehicle collision (from Worksheet 2F)	0.002	0.005	0.007
Single-vehicle noncollision (from Worksheet 2F)	0.008	0.007	0.015
Collision with pedestrian (from Worksheet 2G or 2I)	0.047	0.000	0.047
Collision with bicycle (from Worksheet 2J)	0.077	0.000	0.077
Subtotal	0.183	0.197	0.380
Total	1.882	3.371	5.253

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted}$ <i>int</i> (crashes/year)
	(Total) from Worksheet 2K
Total	5.3
Fatal and injury (FI)	1.9
Property damage only (PDO)	3.4

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – Sunset Ridge Road to Old Willow Road**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Sunset Ridge to Old Willow Rd
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	3T
Length of segment, L (mi)		--	0.18
AADT (veh/day)		--	31,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	Not Present
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	1
Major industrial / institutional driveways (number)		--	1
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	4
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	11
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

Worksheet 1B1 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Fatality/Injury Crashes (FI)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	CMF for Provide a Median
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF 6r</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	from Table 13-10
1.00	1.01	1.00	0.93	1.00	0.78
					(7)
					Combined CMF
					<i>CMF comb</i>
					(1)*(2)*(3)*(4)*(5)*(6)
					0.73

Worksheet 1B2 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Property Damage Only Crashes (PDO)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	CMF for Provide a Median
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF 6r</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	from Table 13-11
1.00	1.01	1.00	0.93	1.00	1.09
					(7)
					Combined CMF
					<i>CMF comb</i>
					(1)*(2)*(3)*(4)*(5)*(6)
					1.02

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brmv}$	Proportion of Total Crashes	Adjusted $N_{brmv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brmv}$
	from Table 12-3		from Table 12-3	from Equation 12-10		$(4)_{TOTAL} * (5)$	(6) from Worksheet 1B		$(6) * (7) * (8)$
	a	b							
Total	-12.40	1.41	0.66	1.595	1.000	1.595	0.93	1.00	1.488
Fatal and Injury (FI)	-16.45	1.69	0.59	0.503	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.315	0.502	0.73	1.00	0.368
Property Damage Only (PDO)	-11.95	1.33	0.59	1.094	$(5)_{TOTAL} - (5)_{FI}$ 0.685	1.093	1.02	1.00	1.120

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{brmv (FI)}$ (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{brmv (PDO)}$ (crashes/year)	Predicted $N_{brmv (TOTAL)}$ (crashes/year)
	from Table 12-4	$(9)_{FI}$ from Worksheet 1C	from Table 12-4	$(9)_{PDO}$ from Worksheet 1C	$(9)_{TOTAL}$ from Worksheet 1C
Total	1.000	0.368	1.000	1.120	1.488
		$(2) * (3)_{FI}$		$(4) * (5)_{PDO}$	$(3) + (5)$
Rear-end collision	0.845	0.311	0.842	0.943	1.254
Head-on collision	0.034	0.013	0.020	0.022	0.035
Angle collision	0.069	0.025	0.020	0.022	0.048
Sideswipe, same direction	0.001	0.000	0.078	0.087	0.088
Sideswipe, opposite direction	0.017	0.006	0.020	0.022	0.029
Other multiple-vehicle collision	0.034	0.013	0.020	0.022	0.035

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brsv}$	Proportion of Total Crashes	Adjusted $N_{brsv}$	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted $N_{brsv}$
	from Table 12-5								
	a	b				(4) <sub>TOTAL</sub> *(5)	(6)*(7)*(8)		
Total	-5.74	0.54	1.37	0.154	1.000	0.154	0.95	1.00	0.146
Fatal and Injury (FI)	-6.37	0.47	1.06	0.040	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$	0.041	0.73	1.00	0.030
Property Damage Only (PDO)	-6.29	0.56	1.93	0.109	$(5)_{TOTAL}-(5)_{FI}$	0.113	1.02	1.00	0.116
					0.267				
					0.733				

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{brsv (FI)}$ (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{brsv (PDO)}$ (crashes/year)	Predicted $N_{brsv (TOTAL)}$ (crashes/year)
	from Table 12-6	$(9)_{FI}$ from Worksheet 1E	from Table 12-6	$(9)_{PDO}$ from Worksheet 1E	$(9)_{TOTAL}$ from Worksheet 1E
Total	1.000	0.030	1.000	0.116	0.146
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Collision with animal	0.001	0.000	0.001	0.000	0.000
Collision with fixed object	0.688	0.021	0.963	0.111	0.132
Collision with other object	0.001	0.000	0.001	0.000	0.000
Other single-vehicle collision	0.310	0.009	0.035	0.004	0.013

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, t	Initial $N_{brdwy}$	Overdispersion parameter, k
		from Table 12-7		from Table 12-7	
					$n_i * N_i * (AADT/15,000)^t$
Major commercial	0	0.033	1.000	0.000	--
Minor commercial	1	0.011	1.000	0.023	
Major industrial/institutional	1	0.036	1.000	0.074	
Minor industrial/institutional	0	0.005	1.000	0.000	
Major residential	0	0.018	1.000	0.000	
Minor residential	4	0.003	1.000	0.025	
Other	0	0.005	1.000	0.000	
Total	--	--	--	0.122	

Changed lookup function to pull data for 4D values from Table 12-7 instead, since this alternative would behave similar to 4D rather than 3T.

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.122	1.000	0.122	0.95	1.00	0.116
Fatal and injury (FI)	--	0.243	0.030	0.73	1.00	0.022
Property damage only (PDO)	--	0.757	0.092	1.02	1.00	0.095

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	1.488	0.146	0.116	1.750	0.013	1.00	0.023
Fatal and injury (FI)	--	--	--	--	--	1.00	0.023

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path from Ped & Safety Toolbox	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9			(5)*(6)*(7)*(8)
Total	1.488	0.146	0.116	1.750	0.007	0.23	1.00	0.003
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.003

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.311	0.943	1.254
Head-on collisions (from Worksheet 1D)	0.013	0.022	0.035
Angle collisions (from Worksheet 1D)	0.025	0.022	0.048
Sideswipe, same direction (from Worksheet 1D)	0.000	0.087	0.088
Sideswipe, opposite direction (from Worksheet 1D)	0.006	0.022	0.029
Driveway-related collisions (from Worksheet 1H)	0.022	0.095	0.116
Other multiple-vehicle collision (from Worksheet 1D)	0.013	0.022	0.035
Subtotal	0.390	1.214	1.604
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 1F)	0.021	0.111	0.132
Collision with other object (from Worksheet 1F)	0.000	0.000	0.000
Other single-vehicle collision (from Worksheet 1F)	0.009	0.004	0.013
Collision with pedestrian (from Worksheet 1I)	0.023	0.000	0.023
Collision with bicycle (from Worksheet 1J)	0.003	0.000	0.003
Subtotal	0.056	0.116	0.171
Total	0.446	1.330	1.776

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.8	0.18	9.9
Fatal and injury (FI)	0.4	0.18	2.5
Property damage only (PDO)	1.3	0.18	7.4

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – Old Willow Road to Wagner Road**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Old Willow Rd. to Wagner
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data	Base Conditions	Site Conditions	
Roadway type (2U, 3T, 4U, 4D, ST)	--	3T	
Length of segment, L (mi)	--	0.42	
AADT (veh/day)	--	31,000	
Type of on-street parking (none/parallel/angle)	None	None	
Proportion of curb length with on-street parking	--	0	
Median width (ft) - for divided only	15	Not Present	
Lighting (present / not present)	Not Present	Present	
Auto speed enforcement (present / not present)	Not Present	Not Present	
Major commercial driveways (number)	--	0	
Minor commercial driveways (number)	--	0	
Major industrial / institutional driveways (number)	--	0	
Minor industrial / institutional driveways (number)	--	0	
Major residential driveways (number)	--	0	
Minor residential driveways (number)	--	12	
Other driveways (number)	--	0	
Speed Category	--	Posted Speed Greater than 30 mph	
Roadside fixed object density (fixed objects / mi)	0	5	
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	30	7	
Calibration Factor, Cr	1.00	1.00	

Worksheet 1B1 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Fatality/Injury Crashes (FI)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	CMF for Provide a Median
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF 6r</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	from Table 13-10
1.00	1.00	1.00	0.93	1.00	0.78
					(7)
					Combined CMF
					<i>CMF comb</i>
					(1)*(2)*(3)*(4)*(5)*(6)
					0.73

Worksheet 1B2 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Property Damage Only Crashes (PDO)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	CMF for Provide a Median
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF 6r</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	from Table 13-11
1.00	1.00	1.00	0.93	1.00	1.09
					(7) Combined CMF
					<i>CMF comb</i>
					(1)*(2)*(3)*(4)*(5)*(6) 1.02

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1) Crash Severity Level	(2) SPF Coefficients		(3) Overdispersion Parameter, k	(4) Initial $N_{brmv}$	(5) Proportion of Total Crashes	(6) Adjusted $N_{brmv}$	(7) Combined CMFs	(8) Calibration Factor, Cr	(9) Predicted $N_{brmv}$
	from Table 12-3		from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-12.40	1.41	0.66	3.722	1.000	3.722	0.93	1.00	3.450
Fatal and Injury (FI)	-16.45	1.69	0.59	1.174	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.315	1.172	0.73	1.00	0.854
Property Damage Only (PDO)	-11.95	1.33	0.59	2.552	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.685	2.550	1.02	1.00	2.596

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted $N_{brmv}$ (FI) (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted $N_{brmv}$ (PDO) (crashes/year)	(6) Predicted $N_{brmv}$ (TOTAL) (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.854	1.000	2.596	3.450
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.845	0.722	0.842	2.186	2.907
Head-on collision	0.034	0.029	0.020	0.052	0.081
Angle collision	0.069	0.059	0.020	0.052	0.111
Sideswipe, same direction	0.001	0.001	0.078	0.202	0.203
Sideswipe, opposite direction	0.017	0.015	0.020	0.052	0.066
Other multiple-vehicle collision	0.034	0.029	0.020	0.052	0.081

**Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brsv}$	Proportion of Total Crashes	Adjusted $N_{brsv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brsv}$
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> * (5)	(6) from Worksheet 1B		(6) * (7) * (8)
	a	b							
Total	-5.74	0.54	1.37	0.360	1.000	0.360	0.94	1.00	0.338
Fatal and Injury (FI)	-6.37	0.47	1.06	0.093	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.267	0.096	0.73	1.00	0.070
Property Damage Only (PDO)	-6.29	0.56	1.93	0.255	$(5)_{TOTAL} - (5)_{FI}$ 0.733	0.264	1.02	1.00	0.268

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{brsv}$ (FI) (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{brsv}$ (PDO) (crashes/year)	Predicted $N_{brsv}$ (TOTAL) (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.070	1.000	0.268	0.338
		$(2) * (3)_{FI}$		$(4) * (5)_{PDO}$	$(3) + (5)$
Collision with animal	0.001	0.000	0.001	0.000	0.000
Collision with fixed object	0.688	0.048	0.963	0.258	0.307
Collision with other object	0.001	0.000	0.001	0.000	0.000
Other single-vehicle collision	0.310	0.022	0.035	0.009	0.031

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$	
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$		
Major commercial	0	0.033	1.000	0.000	--	
Minor commercial	0	0.011	1.000	0.000		
Major industrial/institutional	0	0.036	1.000	0.000		
Minor industrial/institutional	0	0.005	1.000	0.000		
Major residential	0	0.018	1.000	0.000		
Minor residential	12	0.003	1.000	0.074		
Other	0	0.005	1.000	0.000		
Total	--	--	--	0.074		1.10

Changed lookup function to pull data for 4D values from Table 12-7 instead, since this alternative would behave similar to 4D rather than 3T.

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.074	1.000	0.074	0.95	1.00	0.071
Fatal and injury (FI)	--	0.243	0.018	0.73	1.00	0.013
Property damage only (PDO)	--	0.757	0.056	1.02	1.00	0.057

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Multi-Use	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-	from Ped & Safety		(5)*(6)*(7)*(8)
Total	3.450	0.338	0.071	3.859	0.013	0.23	1.00	0.012
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.012

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Multi-Use	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-	from Ped & Safety		(5)*(6)*(7)*(8)
Total	3.450	0.338	0.071	3.859	0.007	0.23	1.00	0.006
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.006

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.722	2.186	2.907
Head-on collisions (from Worksheet 1D)	0.029	0.052	0.081
Angle collisions (from Worksheet 1D)	0.059	0.052	0.111
Sideswipe, same direction (from Worksheet 1D)	0.001	0.202	0.203
Sideswipe, opposite direction (from Worksheet 1D)	0.015	0.052	0.066
Driveway-related collisions (from Worksheet 1H)	0.013	0.057	0.071
Other multiple-vehicle collision (from Worksheet 1D)	0.029	0.052	0.081
Subtotal	0.867	2.653	3.521
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 1F)	0.048	0.258	0.307
Collision with other object (from Worksheet 1F)	0.000	0.000	0.000
Other single-vehicle collision (from Worksheet 1F)	0.022	0.009	0.031
Collision with pedestrian (from Worksheet 1I)	0.012	0.000	0.012
Collision with bicycle (from Worksheet 1J)	0.006	0.000	0.006
Subtotal	0.088	0.268	0.356
Total	0.955	2.922	3.877

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	3.9	0.42	9.2
Fatal and injury (FI)	1.0	0.42	2.3
Property damage only (PDO)	2.9	0.42	7.0

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Intersection Analysis**  
**Willow Road at Wagner Road**

Alternative: 2 (Barrier Median)  
 Intersection: Willow Road at Wagner

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Wagner
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	31,000
AADT <sub>minor</sub> (veh/day)		--	6,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	2
Intersection red light cameras (present/not present)		Not Present	Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			213
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	3
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.96	0.96	0.96	0.91	1.01	0.98
(8)						(9)
Interconnect/Coordinate Traffic Signals; Optimization						Combined CMF
<i>CMF 8i</i>						<i>CMF<sub>COMB</sub></i>
ITE Toolbox						1)*(2)*(3)*(4)*(5)*(6)*(7)*(8)
0.84						0.45

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	7.977	1.000	7.977	0.45	1.00	3.550
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	2.657	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.345	2.755	0.45	1.00	1.226
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	5.035	$(5)_{TOTAL}-(5)_{FI}$ 0.655	5.222	0.45	1.00	2.324

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.226	1.000	2.324	3.550
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	0.552	0.483	1.123	1.674
Head-on collision	0.049	0.060	0.030	0.070	0.130
Angle collision	0.347	0.426	0.244	0.567	0.993
Sideswipe	0.099	0.121	0.032	0.074	0.196
Other multiple-vehicle collision	0.055	0.067	0.211	0.490	0.558

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.437	1.000	0.437	0.45	1.00	0.194
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.102	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.235	0.102	0.45	1.00	0.046
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.333	$(5)_{TOTAL}-(5)_{FI}$ 0.765	0.334	0.45	1.00	0.149

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.046	1.000	0.149	0.194
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.000
Collision with fixed object	0.744	0.034	0.870	0.129	0.163
Collision with other object	0.072	0.003	0.070	0.010	0.014
Other single-vehicle collision	0.040	0.002	0.023	0.003	0.005
Single-vehicle noncollision	0.141	0.006	0.034	0.005	0.011

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Install Refuge Island	CMF for Replace W/DW Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmclearinghouse.org	cmclearinghouse.org	(1)*(2)*(3)*(4)*(5)
2.78	1.35	1.00	0.44	0.75	1.24

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									from Equation 12-29
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.040	1.24	1.00	0.050
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.050

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bike}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	3.550	0.194	3.745	0.015	1.00	0.056
Fatal and injury (FI)	--	--	--	--	1.00	0.056

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.552	1.123	1.674
Head-on collisions (from Worksheet 2D)	0.060	0.070	0.130
Angle collisions (from Worksheet 2D)	0.426	0.567	0.993
Sideswipe (from Worksheet 2D)	0.121	0.074	0.196
Other multiple-vehicle collision (from Worksheet 2D)	0.067	0.490	0.558
Subtotal	1.226	2.324	3.550
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 2F)	0.034	0.129	0.163
Collision with other object (from Worksheet 2F)	0.003	0.010	0.014
Other single-vehicle collision (from Worksheet 2F)	0.002	0.003	0.005
Single-vehicle noncollision (from Worksheet 2F)	0.006	0.005	0.011
Collision with pedestrian (from Worksheet 2G or 2I)	0.050	0.000	0.050
Collision with bicycle (from Worksheet 2J)	0.056	0.000	0.056
Subtotal	0.151	0.149	0.300
Total	1.378	2.473	3.851

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	3.9
Fatal and injury (FI)	1.4
Property damage only (PDO)	2.5

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – Wagner Road to 4-Lane Section**

Alternative: 2 (Barrier Median)  
Segment: Wagner to 4-Lane Section

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Wagner to 4-lane section taper
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	3T
Length of segment, L (mi)		--	0.29
AADT (veh/day)		--	31,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	Not Present
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	1
Minor residential driveways (number)		--	8
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	7
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

Worksheet 1B1 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Fatality/Injury Crashes (FI)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	CMF for Provide a Median
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF 6r</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	from Table 13-11
1.00	1.00	1.00	0.93	1.00	0.78
(7)					(8)
CMF for Install Changeable Speed Warning Signs for					Combined CMF
<i>CMF 6r</i>					<i>CMF comb</i>
from Table 13-33					(1)*(2)*(3)*(4)*(5)*(6)*(7)
0.54					0.39

Worksheet 1B2 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Property Damage Only Crashes (PDO)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	CMF for Provide a Median
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF 6r</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	from Table 13-11
1.00	1.00	1.00	0.93	1.00	1.09
(7)					(8)
CMF for Install Changeable Speed Warning Signs for					Combined CMF
<i>CMF 6r</i>					<i>CMF comb</i>
from Table 13-33					(1)*(2)*(3)*(4)*(5)*(6)*(7)
0.54					0.55

Worksheet 1C -- Multiple-Vehicle Nondrivable Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1) Crash Severity Level	(2) SPF Coefficients		(3) Overdispersion Parameter, k	(4) Initial N <sub>brmv</sub>	(5) Proportion of Total Crashes	(6) Adjusted N <sub>brmv</sub>	(7) Combined CMFs	(8) Calibration Factor, Cr	(9) Predicted N <sub>brmv</sub>
	from Table 12-3		from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	(8)	(6)*(7)*(8)
	a	b							
Total	-12.40	1.41	0.66	2.570	1.000	2.570	0.50	1.00	1.286
Fatal and Injury (FI)	-16.45	1.69	0.59	0.810	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.315	0.810	0.39	1.00	0.318
Property Damage Only (PDO)	-11.95	1.33	0.59	1.762	$(5)_{TOTAL}-(5)_{FI}$ 0.685	1.761	0.55	1.00	0.968

Worksheet 1D -- Multiple-Vehicle Nondrivable Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brmv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brmv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.318	1.000	0.968	1.286
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Rear-end collision	0.845	0.269	0.842	0.815	1.084
Head-on collision	0.034	0.011	0.020	0.019	0.030
Angle collision	0.069	0.022	0.020	0.019	0.041
Sideswipe, same direction	0.001	0.000	0.078	0.075	0.076
Sideswipe, opposite direction	0.017	0.005	0.020	0.019	0.025
Other multiple-vehicle collision	0.034	0.011	0.020	0.019	0.030

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1) Crash Severity Level	(2) SPF Coefficients		(3) Overdispersion Parameter, k	(4) Initial N <sub>brsv</sub>	(5) Proportion of Total Crashes	(6) Adjusted N <sub>brsv</sub>	(7) Combined CMFs	(8) Calibration Factor, Cr	(9) Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	(8)	(6)*(7)*(8)
	a	b							
Total	-5.74	0.54	1.37	0.248	1.000	0.248	0.51	1.00	0.126
Fatal and Injury (FI)	-6.37	0.47	1.06	0.064	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.267	0.066	0.39	1.00	0.026
Property Damage Only (PDO)	-6.29	0.56	1.93	0.176	$(5)_{TOTAL}-(5)_{FI}$ 0.733	0.182	0.55	1.00	0.100

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted N <sub>brsv (FI)</sub> (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted N <sub>brsv (PDO)</sub> (crashes/year)	(6) Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.026	1.000	0.100	0.126
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Collision with animal	0.001	0.000	0.001	0.000	0.000
Collision with fixed object	0.688	0.018	0.963	0.096	0.114
Collision with other object	0.001	0.000	0.001	0.000	0.000
Other single-vehicle collision	0.310	0.008	0.035	0.004	0.012

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_i$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_i * (AADT/15,000)^t$	
Major commercial	0	0.033	1.000	0.000	--
Minor commercial	0	0.011	1.000	0.000	
Major industrial/institutional	0	0.036	1.000	0.000	
Minor industrial/institutional	0	0.005	1.000	0.000	
Major residential	1	0.018	1.000	0.037	
Minor residential	8	0.003	1.000	0.050	
Other	0	0.016	1.000	0.000	
Total	--	--	--	0.087	

Changed lookup function to pull data for 4D values from Table 12-7 instead, since this alternative would behave similar to 4D rather than 3T.

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{brwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.087	1.000	0.087	0.51	1.00	0.044
Fatal and injury (FI)	--	0.243	0.021	0.39	1.00	0.008
Property damage only (PDO)	--	0.757	0.066	0.55	1.00	0.036

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	CMF for Multi-Use Bike Path	CMF for HAWK Signal	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8	from Ped & Safety Toolbox	cmclearinghouse.org		(5)*(6)*(7)*(8)*(9)
Total	1.286	0.126	0.044	1.457	0.013	0.23	0.398	1.00	0.002
Fatal and injury (FI)	--	--	--	--	--	--	--	1.00	0.002

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	1.286	0.126	0.044	1.457	0.007	0.23	1.00	0.002
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.002

Alternative: 2 (Barrier Median)  
 Segment: Wagner to 4-Lane Section

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.269	0.815	1.084
Head-on collisions (from Worksheet 1D)	0.011	0.019	0.030
Angle collisions (from Worksheet 1D)	0.022	0.019	0.041
Sideswipe, same direction (from Worksheet 1D)	0.000	0.075	0.076
Sideswipe, opposite direction (from Worksheet 1D)	0.005	0.019	0.025
Driveway-related collisions (from Worksheet 1H)	0.008	0.036	0.044
Other multiple-vehicle collision (from Worksheet 1D)	0.011	0.019	0.030
Subtotal	0.327	1.004	1.331
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 1F)	0.018	0.096	0.114
Collision with other object (from Worksheet 1F)	0.000	0.000	0.000
Other single-vehicle collision (from Worksheet 1F)	0.008	0.004	0.012
Collision with pedestrian (from Worksheet 1I)	0.002	0.000	0.002
Collision with bicycle (from Worksheet 1J)	0.002	0.000	0.002
Subtotal	0.030	0.100	0.130
Total	0.357	1.104	1.461

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, N <sub>predicted rs</sub> (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.5	0.29	5.0
Fatal and injury (FI)	0.4	0.29	1.2
Property damage only (PDO)	1.1	0.29	3.8

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – 4-Lane Section to**  
**Old Willow Road/ Northfield Road**

Alternative: 2 (Barrier Median)  
 Segment: 4-Lane Section to Old Willow/Northfield

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	4-Lane to Old Willow/Northfield
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.12
AADT (veh/day)		--	31,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	5
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	1
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	17
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

Worksheet 1B1 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Fatality/Injury Crashes (FI)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.03	1.00	0.91	1.00	0.94

Worksheet 1B2 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Property Damage Only Crashes (PDO)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.03	1.00	0.91	1.00	0.94

**Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brmv}$	Proportion of Total Crashes	Adjusted $N_{brmv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brmv}$
	from Table 12-3								
	a	b				(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	(6)*(7)*(8)	
Total	-12.34	1.36	1.32	0.673	1.000	0.673	0.94	1.00	0.634
Fatal and Injury (FI)	-12.76	1.28	1.31	0.193	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.272	0.183	0.94	1.00	0.172
Property Damage Only (PDO)	-12.81	1.38	1.34	0.518	$(5)_{TOTAL}-(5)_{FI}$ 0.728	0.490	0.94	1.00	0.461

**Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{brmv}$ (FI) (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{brmv}$ (PDO) (crashes/year)	Predicted $N_{brmv}$ (TOTAL) (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.172	1.000	0.461	0.634
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Rear-end collision	0.832	0.143	0.662	0.305	0.449
Head-on collision	0.020	0.003	0.007	0.003	0.007
Angle collision	0.040	0.007	0.036	0.017	0.024
Sideswipe, same direction	0.050	0.009	0.223	0.103	0.112
Sideswipe, opposite direction	0.010	0.002	0.001	0.000	0.002
Other multiple-vehicle collision	0.048	0.008	0.071	0.033	0.041

**Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brsv}$	Proportion of Total Crashes	Adjusted $N_{brsv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brsv}$
	from Table 12-5								
	a	b				(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	(6)*(7)*(8)	
Total	-5.05	0.47	0.86	0.099	1.000	0.099	0.94	1.00	0.093
Fatal and Injury (FI)	-8.71	0.66	0.28	0.018	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.183	0.018	0.94	1.00	0.017
Property Damage Only (PDO)	-5.04	0.45	1.06	0.082	$(5)_{TOTAL}-(5)_{FI}$ 0.817	0.081	0.94	1.00	0.076

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.017	1.000	0.076	0.093
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.005	0.005
Collision with fixed object	0.500	0.009	0.813	0.062	0.071
Collision with other object	0.028	0.000	0.016	0.001	0.002
Other single-vehicle collision	0.471	0.008	0.108	0.008	0.016

**Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, n <sub>j</sub>	Crashes per driveway per year, N <sub>i</sub>	Coefficient for traffic adjustment, t	Initial N <sub>brdwy</sub>	Overdispersion parameter, k
		from Table 12-7	from Table 12-7	Equation 12-16 n <sub>i</sub> * N <sub>j</sub> * (AADT/15,000) <sup>t</sup>	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	5	0.011	1.106	0.123	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	1	0.003	1.106	0.007	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.129	

**Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial N <sub>brdwy</sub>	Proportion of total crashes (f <sub>dwy</sub> )	Adjusted N <sub>brdwy</sub>	Combined CMFs	Calibration factor, C <sub>r</sub>	Predicted N <sub>brdwy</sub>
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.129	1.000	0.129	0.94	1.00	0.122
Fatal and injury (FI)	--	0.284	0.037	0.94	1.00	0.035
Property damage only (PDO)	--	0.716	0.093	0.94	1.00	0.087

**Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N <sub>brmv</sub>	Predicted N <sub>brsv</sub>	Predicted N <sub>brdwy</sub>	Predicted N <sub>br</sub>	f <sub>pedr</sub>	Calibration factor, C <sub>r</sub>	Predicted N <sub>pedr</sub>
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.634	0.093	0.122	0.849	0.019	1.00	0.016
Fatal and injury (FI)	--	--	--	--	--	1.00	0.016

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$ from Table 12-9	CMF for Multi-Use Bike Path from Ped & Safety Toolbox	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)				(5)*(6)*(7)*(8)
Total	0.634	0.093	0.122	0.849	0.005	0.23	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.001

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI) (3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	Property damage only (PDO) (5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	Total (6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.143	0.305	0.449
Head-on collisions (from Worksheet 1D)	0.003	0.003	0.007
Angle collisions (from Worksheet 1D)	0.007	0.017	0.024
Sideswipe, same direction (from Worksheet 1D)	0.009	0.103	0.112
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.000	0.002
Driveway-related collisions (from Worksheet 1H)	0.035	0.087	0.122
Other multiple-vehicle collision (from Worksheet 1D)	0.008	0.033	0.041
Subtotal	0.207	0.549	0.756
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.009	0.062	0.071
Collision with other object (from Worksheet 1F)	0.000	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.008	0.008	0.016
Collision with pedestrian (from Worksheet 1I)	0.016	0.000	0.016
Collision with bicycle (from Worksheet 1J)	0.001	0.000	0.001
Subtotal	0.034	0.076	0.111
Total	0.241	0.625	0.866

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{predicted\ rs}$ (crashes/year) (Total) from Worksheet 1K	Roadway segment length, L (mi)	Crash rate (crashes/mi/year) (2) / (3)
Total	0.9	0.12	7.2
Fatal and injury (FI)	0.2	0.12	2.0
Property damage only (PDO)	0.6	0.12	5.2

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Intersection Analysis**  
**Willow Road at Old Willow Road/ Northfield Road**

Alternative: 2 (Barrier Median)

Intersection: Willow Road at Old Willow/Northfield Road

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Old Willow/Northfield Rd.
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data	Base Conditions	Site Conditions	
Intersection type (3ST, 3SG, 4ST, 4SG)	--	4SG	
AADT <sub>major</sub> (veh/day)	--	34,000	
AADT <sub>minor</sub> (veh/day)	--	6,000	
Intersection lighting (present/not present)	Not Present	Present	
Calibration factor, C <sub>i</sub>	1.00	1.00	
Data for unsignalized intersections only:	--	--	
Number of major-road approaches with left-turn lanes (0,1,2)	0	0	
Number of major-road approaches with right-turn lanes (0,1,2)	0	0	
Data for signalized intersections only:	--	--	
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]	0	4	
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]	0	1	
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]	--	4	
Type of left-turn signal phasing for Leg #1	Permissive	Protected / Permissive	
Type of left-turn signal phasing for Leg #2	--	Protected / Permissive	
Type of left-turn signal phasing for Leg #3	--	Protected / Permissive	
Type of left-turn signal phasing for Leg #4 (if applicable)	--	Protected / Permissive	
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]	0	0	
Intersection red light cameras (present/not present)	Not Present	Not Present	
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only		105	
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )	--	7	
Number of bus stops within 300 m (1,000 ft) of the intersection	0	0	
Schools within 300 m (1,000 ft) of the intersection (present/not present)	Not Present	Not Present	
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection	0	5	

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.96	0.96	1.00	0.91	1.00	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.55

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	8.806	1.000	8.806	0.55	1.00	4.803
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	2.963	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.349	3.071	0.55	1.00	1.675
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	5.533	$(5)_{TOTAL}-(5)_{FI}$ 0.651	5.735	0.55	1.00	3.128

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.675	1.000	3.128	4.803
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.450	0.754	0.483	1.511	2.264
Head-on collision	0.049	0.082	0.030	0.094	0.176
Angle collision	0.347	0.581	0.244	0.763	1.344
Sideswipe	0.099	0.166	0.032	0.100	0.266
Other multiple-vehicle collision	0.055	0.092	0.211	0.660	0.752

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.465	1.000	0.465	0.55	1.00	0.254
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.106	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.229	0.106	0.55	1.00	0.058
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.358	$(5)_{TOTAL}-(5)_{FI}$ 0.771	0.358	0.55	1.00	0.195

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.058	1.000	0.195	0.254
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.001
Collision with fixed object	0.744	0.043	0.870	0.170	0.213
Collision with other object	0.072	0.004	0.070	0.014	0.018
Other single-vehicle collision	0.040	0.002	0.023	0.004	0.007
Single-vehicle noncollision	0.141	0.008	0.034	0.007	0.015

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Install Refuge Island	CMF for Replace W/DW Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmclearinghouse.org	cmclearinghouse.org	(1)*(2)*(3)*(4)*(5)
1.00	1.00	1.12	0.44	0.75	0.37

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections												
(1)	(2)					(3)	(4)	(5)	(6)	(7)		
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>		
	from Table 12-14									from Equation 12-29	(4) from Worksheet 2H	(4)*(5)*(6)
	a	b	c	d	e							
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.034	0.37	1.00	0.013		
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.013		

Alternative: 2 (Barrier Median)

Intersection: Willow Road at Old Willow/Northfield Road

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	4.803	0.254	5.056	0.015	1.00	0.076
Fatal and injury (FI)	--	--	--	--	1.00	0.076

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.754	1.511	2.264
Head-on collisions (from Worksheet 2D)	0.082	0.094	0.176
Angle collisions (from Worksheet 2D)	0.581	0.763	1.344
Sideswipe (from Worksheet 2D)	0.166	0.100	0.266
Other multiple-vehicle collision (from Worksheet 2D)	0.092	0.660	0.752
Subtotal	1.675	3.128	4.803
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.001
Collision with fixed object (from Worksheet 2F)	0.043	0.170	0.213
Collision with other object (from Worksheet 2F)	0.004	0.014	0.018
Other single-vehicle collision (from Worksheet 2F)	0.002	0.004	0.007
Single-vehicle noncollision (from Worksheet 2F)	0.008	0.007	0.015
Collision with pedestrian (from Worksheet 2G or 2I)	0.013	0.000	0.013
Collision with bicycle (from Worksheet 2J)	0.076	0.000	0.076
Subtotal	0.147	0.195	0.342
Total	1.822	3.323	5.145

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	5.1
Fatal and injury (FI)	1.8
Property damage only (PDO)	3.3

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Segment Analysis**  
**Willow Road – Old Willow Road/ Northfield Road to**  
**Central Avenue/ Happ Road**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Old Willow/Northfield to Central/Happ
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.09
AADT (veh/day)		--	34,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	20
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	1
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	100
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	9
Calibration Factor, Cr		1.00	1.00

Worksheet 1B1 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Fatality/Injury Crashes (FI)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.30	0.99	0.91	1.00	1.17

Worksheet 1B2 -- Crash Modification Factors for Urban and Suburban Roadway Segments - Property Damage Only Crashes (PDO)					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.30	0.99	0.91	1.00	1.17

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brmv}$	Proportion of Total Crashes	Adjusted $N_{brmv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brmv}$
	from Table 12-3								
	a	b				(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	(6)*(7)*(8)	
Total	-12.34	1.36	1.32	0.573	1.000	0.573	1.17	1.00	0.672
Fatal and Injury (FI)	-12.76	1.28	1.31	0.163	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.270	0.155	1.17	1.00	0.182
Property Damage Only (PDO)	-12.81	1.38	1.34	0.441	$(5)_{TOTAL}-(5)_{FI}$ 0.730	0.418	1.17	1.00	0.490

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{brmv}$ (FI) (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{brmv}$ (PDO) (crashes/year)	Predicted $N_{brmv}$ (TOTAL) (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.182	1.000	0.490	0.672
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Rear-end collision	0.832	0.151	0.662	0.325	0.476
Head-on collision	0.020	0.004	0.007	0.003	0.007
Angle collision	0.040	0.007	0.036	0.018	0.025
Sideswipe, same direction	0.050	0.009	0.223	0.109	0.118
Sideswipe, opposite direction	0.010	0.002	0.001	0.000	0.002
Other multiple-vehicle collision	0.048	0.009	0.071	0.035	0.044

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brsv}$	Proportion of Total Crashes	Adjusted $N_{brsv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brsv}$
	from Table 12-5								
	a	b				(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	(6)*(7)*(8)	
Total	-5.05	0.47	0.86	0.078	1.000	0.078	1.17	1.00	0.091
Fatal and Injury (FI)	-8.71	0.66	0.28	0.015	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.186	0.014	1.17	1.00	0.017
Property Damage Only (PDO)	-5.04	0.45	1.06	0.064	$(5)_{TOTAL}-(5)_{FI}$ 0.814	0.063	1.17	1.00	0.074

**Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.017	1.000	0.074	0.091
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.005	0.005
Collision with fixed object	0.500	0.008	0.813	0.060	0.069
Collision with other object	0.028	0.000	0.016	0.001	0.002
Other single-vehicle collision	0.471	0.008	0.108	0.008	0.016

**Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, n <sub>j</sub>	Crashes per driveway per year, N <sub>i</sub>	Coefficient for traffic adjustment, t	Initial N <sub>brdwy</sub>	Overdispersion parameter, k
		from Table 12-7	from Table 12-7	Equation 12-16 n <sub>i</sub> * N <sub>j</sub> * (AADT/15,000) <sup>t</sup>	from Table 12-7
Major commercial	1	0.033	1.106	0.082	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.082	

**Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial N <sub>brdwy</sub>	Proportion of total crashes (f <sub>dwy</sub> )	Adjusted N <sub>brdwy</sub>	Combined CMFs	Calibration factor, C <sub>r</sub>	Predicted N <sub>brdwy</sub>
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.082	1.000	0.082	1.17	1.00	0.096
Fatal and injury (FI)	--	0.284	0.023	1.17	1.00	0.027
Property damage only (PDO)	--	0.716	0.058	1.17	1.00	0.069

**Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N <sub>brmv</sub>	Predicted N <sub>brsv</sub>	Predicted N <sub>brdwy</sub>	Predicted N <sub>br</sub>	f <sub>pedr</sub>	Calibration factor, C <sub>r</sub>	Predicted N <sub>pedr</sub>
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.672	0.091	0.096	0.859	0.019	1.00	0.016
Fatal and injury (FI)	--	--	--	--	--	1.00	0.016

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	0.672	0.091	0.096	0.859	0.005	0.23	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.001

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.151	0.325	0.476
Head-on collisions (from Worksheet 1D)	0.004	0.003	0.007
Angle collisions (from Worksheet 1D)	0.007	0.018	0.025
Sideswipe, same direction (from Worksheet 1D)	0.009	0.109	0.118
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.000	0.002
Driveway-related collisions (from Worksheet 1H)	0.027	0.069	0.096
Other multiple-vehicle collision (from Worksheet 1D)	0.009	0.035	0.044
Subtotal	0.209	0.559	0.768
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.008	0.060	0.069
Collision with other object (from Worksheet 1F)	0.000	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.008	0.008	0.016
Collision with pedestrian (from Worksheet 1I)	0.016	0.000	0.016
Collision with bicycle (from Worksheet 1J)	0.001	0.000	0.001
Subtotal	0.034	0.074	0.109
Total	0.243	0.633	0.876

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{predicted\ rs}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	0.9	0.09	9.7
Fatal and injury (FI)	0.2	0.09	2.7
Property damage only (PDO)	0.6	0.09	7.0

**Alternative #2**  
**Willow Road 2-Lane with Curbed Median**

**Intersection Analysis**  
**Willow Road at Central Avenue/ Happ Road**

**Alternative: 2 (Barrier Median)**  
**Intersection: Willow Road at Central/Happ**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Central/Happ
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	35,000
AADT <sub>minor</sub> (veh/day)		--	19,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			133
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	6

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.96	0.92	1.00	0.91	1.00	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.52

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1) Crash Severity Level	(2) SPF Coefficients			(3) Overdispersion Parameter, k	(4) Initial $N_{bimv}$	(5) Proportion of Total Crashes	(6) Adjusted $N_{bimv}$	(7) Combined CMFs	(8) Calibration Factor, $C_i$	(9) Predicted $N_{bimv}$
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL} * (5)$	(7) from Worksheet 2B		$(6) * (7) * (8)$
	a	b	c							
Total	-10.99	1.07	0.23	0.39	11.840	1.000	11.840	0.52	1.00	6.200
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.951	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.345	4.080	0.52	1.00	2.136
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.515	$(5)_{TOTAL} - (5)_{FI}$ 0.655	7.760	0.52	1.00	4.063

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1) Collision Type	(2)	(3)	(4)	(5)	(6)
	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{bimv (FI)}$ (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{bimv (PDO)}$ (crashes/year)	Predicted $N_{bimv (TOTAL)}$ (crashes/year)
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	2.136	1.000	4.063	6.200
		$(2) * (3)_{FI}$		$(4) * (5)_{PDO}$	$(3) + (5)$
Rear-end collision	0.450	0.961	0.483	1.963	2.924
Head-on collision	0.049	0.105	0.030	0.122	0.227
Angle collision	0.347	0.741	0.244	0.991	1.733
Sideswipe	0.099	0.211	0.032	0.130	0.342
Other multiple-vehicle collision	0.055	0.117	0.211	0.857	0.975

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1) Crash Severity Level	(2) SPF Coefficients			(3) Overdispersion Parameter, k	(4) Initial $N_{bisv}$	(5) Proportion of Total Crashes	(6) Adjusted $N_{bisv}$	(7) Combined CMFs	(8) Calibration Factor, $C_i$	(9) Predicted $N_{bisv}$
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL} * (5)$	(7) from Worksheet 2B		$(6) * (7) * (8)$
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.647	1.000	0.647	0.52	1.00	0.339
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.151	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.235	0.152	0.52	1.00	0.080
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.489	$(5)_{TOTAL} - (5)_{FI}$ 0.765	0.495	0.52	1.00	0.259

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.080	1.000	0.259	0.339
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.059	0.870	0.225	0.285
Collision with other object	0.072	0.006	0.070	0.018	0.024
Other single-vehicle collision	0.040	0.003	0.023	0.006	0.009
Single-vehicle noncollision	0.141	0.011	0.034	0.009	0.020

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Install Refuge Island	CMF for Replace W/DW Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmfclearinghouse.org	cmfclearinghouse.org	(1)*(2)*(3)*(4)*(5)
2.78	1.00	1.12	0.44	0.75	1.03

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections													
(1)	(2)					(3)	(4)	(5)	(6)	(7)			
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>			
	from Table 12-14										from Equation 12-29	(4) from Worksheet 2H	(4)*(5)*(6)
	a	b	c	d	e								
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.056	1.03	1.00	0.057			
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.057			

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bike}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	6.200	0.339	6.539	0.015	1.00	0.098
Fatal and injury (FI)	--	--	--	--	1.00	0.098

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.961	1.963	2.924
Head-on collisions (from Worksheet 2D)	0.105	0.122	0.227
Angle collisions (from Worksheet 2D)	0.741	0.991	1.733
Sideswipe (from Worksheet 2D)	0.211	0.130	0.342
Other multiple-vehicle collision (from Worksheet 2D)	0.117	0.857	0.975
Subtotal	2.136	4.063	6.200
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.059	0.225	0.285
Collision with other object (from Worksheet 2F)	0.006	0.018	0.024
Other single-vehicle collision (from Worksheet 2F)	0.003	0.006	0.009
Single-vehicle noncollision (from Worksheet 2F)	0.011	0.009	0.020
Collision with pedestrian (from Worksheet 2G or 2I)	0.057	0.000	0.057
Collision with bicycle (from Worksheet 2J)	0.098	0.000	0.098
Subtotal	0.235	0.259	0.494
Total	2.371	4.322	6.694

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	6.7
Fatal and injury (FI)	2.4
Property damage only (PDO)	4.3

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**  
**Safety Performance Calculations**

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Intersection Analysis**  
**Willow Road at IL Route 43**

**Alternative: 3 (Modified)**  
**Intersection: Willow Road at Waukegan Road**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Waukegan Road
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	44,000
AADT <sub>minor</sub> (veh/day)		--	34,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected
Type of left-turn signal phasing for Leg #2		--	Protected
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	2
Intersection red light cameras (present/not present)		Not Present	Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			11
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	5

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.78	0.85	0.96	0.91	1.01	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.38

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bimv}$	Proportion of Total Crashes	Adjusted $N_{bimv}$	Combined CMFs (7) from Worksheet 2B	Calibration Factor, $C_i$	Predicted $N_{bimv}$
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	17.292	1.000	17.292	0.38	1.00	6.588
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	5.883	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.350	6.056	0.38	1.00	2.307
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	10.913	$(5)_{TOTAL}-(5)_{FI}$ 0.650	11.235	0.38	1.00	4.281

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{bimv (FI)}$ (crashes/year)	Proportion of Collision Type (PDO)	Predicted $N_{bimv (PDO)}$ (crashes/year)	Predicted $N_{bimv (TOTAL)}$ (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	2.307	1.000	4.281	6.588
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Rear-end collision	0.450	1.038	0.483	2.067	3.106
Head-on collision	0.049	0.113	0.030	0.128	0.241
Angle collision	0.347	0.801	0.244	1.044	1.845
Sideswipe	0.099	0.228	0.032	0.137	0.365
Other multiple-vehicle collision	0.055	0.127	0.211	0.903	1.030

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bisv}$	Proportion of Total Crashes	Adjusted $N_{bisv}$	Combined CMFs (7) from Worksheet 2B	Calibration Factor, $C_i$	Predicted $N_{bisv}$
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.885	1.000	0.885	0.38	1.00	0.337
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.197	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.225	0.199	0.38	1.00	0.076
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.676	$(5)_{TOTAL}-(5)_{FI}$ 0.775	0.686	0.38	1.00	0.261

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.076	1.000	0.261	0.337
		(2)* <sub>(3)FI</sub>		(4)* <sub>(5)PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.057	0.870	0.227	0.284
Collision with other object	0.072	0.005	0.070	0.018	0.024
Other single-vehicle collision	0.040	0.003	0.023	0.006	0.009
Single-vehicle noncollision	0.141	0.011	0.034	0.009	0.020

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections				
(1)	(2)	(3)	(4)	(5)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	CMF for Replace W/DW Ped Signals with Countdown Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmfclearinghouse.org	(1)*(2)*(3)*(4)
1.00	1.00	1.12	0.75	0.84

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.023	0.84	1.00	0.019
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.019

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	6.588	0.337	6.925	0.015	1.00	0.104
Fatal and injury (FI)	--	--	--	--	1.00	0.104

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	1.038	2.067	3.106
Head-on collisions (from Worksheet 2D)	0.113	0.128	0.241
Angle collisions (from Worksheet 2D)	0.801	1.044	1.845
Sideswipe (from Worksheet 2D)	0.228	0.137	0.365
Other multiple-vehicle collision (from Worksheet 2D)	0.127	0.903	1.030
Subtotal	2.307	4.281	6.588
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.057	0.227	0.284
Collision with other object (from Worksheet 2F)	0.005	0.018	0.024
Other single-vehicle collision (from Worksheet 2F)	0.003	0.006	0.009
Single-vehicle noncollision (from Worksheet 2F)	0.011	0.009	0.020
Collision with pedestrian (from Worksheet 2G or 2I)	0.019	0.000	0.019
Collision with bicycle (from Worksheet 2J)	0.104	0.000	0.104
Subtotal	0.199	0.261	0.460
Total	2.507	4.542	7.048

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	7.0
Fatal and injury (FI)	2.5
Property damage only (PDO)	4.5

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – IL Route 43 to**  
**Three Lakes/ Fox Meadow Drive**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Waukegan Rd to Three Lakes
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.22
AADT (veh/day)		--	42,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	18
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	18
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.00	1.00	0.91	1.00	0.92

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3		from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-12.34	1.36	1.32	1.866	1.000	1.866	0.92	1.00	1.710
Fatal and Injury (FI)	-12.76	1.28	1.31	0.523	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.266	0.496	0.92	1.00	0.455
Property Damage Only (PDO)	-12.81	1.38	1.34	1.443	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.734	1.369	0.92	1.00	1.255

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.455	1.000	1.255	1.710
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.379	0.662	0.831	1.210
Head-on collision	0.020	0.009	0.007	0.009	0.018
Angle collision	0.040	0.018	0.036	0.045	0.063
Sideswipe, same direction	0.050	0.023	0.223	0.280	0.303
Sideswipe, opposite direction	0.010	0.005	0.001	0.001	0.006
Other multiple-vehicle collision	0.048	0.022	0.071	0.089	0.111

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.210	1.000	0.210	0.92	1.00	0.192
Fatal and Injury (FI)	-8.71	0.66	0.28	0.041	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> )	0.040	0.92	1.00	0.037
					0.192				
Property Damage Only (PDO)	-5.04	0.45	1.06	0.171	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub>	0.170	0.92	1.00	0.155
					0.808				

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.037	1.000	0.155	0.192
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.010	0.010
Collision with fixed object	0.500	0.019	0.813	0.126	0.145
Collision with other object	0.028	0.001	0.016	0.002	0.004
Other single-vehicle collision	0.471	0.017	0.108	0.017	0.034

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_i * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.000	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{drwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	0.92	1.00	0.000
Fatal and injury (FI)	--	0.284	0.000	0.92	1.00	0.000
Property damage only (PDO)	--	0.716	0.000	0.92	1.00	0.000

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-	from Ped & Safety		(5)*(6)*(7)*(8)
Total	1.710	0.192	0.000	1.903	0.019	0.23	1.00	0.008
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.008

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-	from Ped & Safety		(5)*(6)*(7)*(8)
Total	1.710	0.192	0.000	1.903	0.005	0.23	1.00	0.002
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.002

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.379	0.831	1.210
Head-on collisions (from Worksheet 1D)	0.009	0.009	0.018
Angle collisions (from Worksheet 1D)	0.018	0.045	0.063
Sideswipe, same direction (from Worksheet 1D)	0.023	0.280	0.303
Sideswipe, opposite direction (from Worksheet 1D)	0.005	0.001	0.006
Driveway-related collisions (from Worksheet 1H)	0.000	0.000	0.000
Other multiple-vehicle collision (from Worksheet 1D)	0.022	0.089	0.111
Subtotal	0.455	1.255	1.710
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.010	0.010
Collision with fixed object (from Worksheet 1F)	0.019	0.126	0.145
Collision with other object (from Worksheet 1F)	0.001	0.002	0.004
Other single-vehicle collision (from Worksheet 1F)	0.017	0.017	0.034
Collision with pedestrian (from Worksheet 1I)	0.008	0.000	0.008
Collision with bicycle (from Worksheet 1J)	0.002	0.000	0.002
Subtotal	0.048	0.155	0.203
Total	0.503	1.411	1.913

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, N <sub>predicted rs</sub> (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.9	0.22	8.7
Fatal and injury (FI)	0.5	0.22	2.3
Property damage only (PDO)	1.4	0.22	6.4

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Intersection Analysis**  
**Willow Road at Three Lakes/ Fox Meadow Drive**

**Alternative: 3 (Modified)**  
**Intersection: Willow Road at Three Lakes**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Three Lakes
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	42,000
AADT <sub>minor</sub> (veh/day)		--	2,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	2
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			17
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.73	0.98	0.92	1.00	0.91	1.00	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.59

**Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bimv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bimv</sub>
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> * (5)	(7) from Worksheet 2B		(6) * (7) * (8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	8.575	1.000	8.575	0.59	1.00	5.067
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	2.986	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.362	3.100	0.59	1.00	1.832
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	5.273	$(5)_{TOTAL} - (5)_{FI}$ 0.638	5.475	0.59	1.00	3.235

**Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections**

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bimv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bimv (PDO)</sub> (crashes/year)	Predicted N <sub>bimv (TOTAL)</sub> (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.832	1.000	3.235	5.067
		(2) * (3) <sub>FI</sub>		(4) * (5) <sub>PDO</sub>	(3) + (5)
Rear-end collision	0.450	0.824	0.483	1.562	2.387
Head-on collision	0.049	0.090	0.030	0.097	0.187
Angle collision	0.347	0.636	0.244	0.789	1.425
Sideswipe	0.099	0.181	0.032	0.104	0.285
Other multiple-vehicle collision	0.055	0.101	0.211	0.683	0.783

**Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections**

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial N <sub>bisv</sub>	Proportion of Total Crashes	Adjusted N <sub>bimv</sub>	Combined CMFs	Calibration Factor, C <sub>i</sub>	Predicted N <sub>bisv</sub>
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> * (5)	(7) from Worksheet 2B		(6) * (7) * (8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.399	1.000	0.399	0.59	1.00	0.236
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.085	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.209	0.083	0.59	1.00	0.049
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.321	$(5)_{TOTAL} - (5)_{FI}$ 0.791	0.316	0.59	1.00	0.187

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.049	1.000	0.187	0.236
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.000
Collision with fixed object	0.744	0.037	0.870	0.162	0.199
Collision with other object	0.072	0.004	0.070	0.013	0.017
Other single-vehicle collision	0.040	0.002	0.023	0.004	0.006
Single-vehicle noncollision	0.141	0.007	0.034	0.006	0.013

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections				
(1)	(2)	(3)	(4)	(5)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Replace W/DW Ped Signals with	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmclearinghouse.org	(1)*(2)*(3)*(4)
1.00	1.00	1.00	0.75	0.75

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.011	0.75	1.00	0.008
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.008

Alternative: 3 (Modified)  
 Intersection: Willow Road at Three Lakes

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	5.067	0.236	5.302	0.015	1.00	0.080
Fatal and injury (FI)	--	--	--	--	1.00	0.080

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.824	1.562	2.387
Head-on collisions (from Worksheet 2D)	0.090	0.097	0.187
Angle collisions (from Worksheet 2D)	0.636	0.789	1.425
Sideswipe (from Worksheet 2D)	0.181	0.104	0.285
Other multiple-vehicle collision (from Worksheet 2D)	0.101	0.683	0.783
Subtotal	1.832	3.235	5.067
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 2F)	0.037	0.162	0.199
Collision with other object (from Worksheet 2F)	0.004	0.013	0.017
Other single-vehicle collision (from Worksheet 2F)	0.002	0.004	0.006
Single-vehicle noncollision (from Worksheet 2F)	0.007	0.006	0.013
Collision with pedestrian (from Worksheet 2G or 2I)	0.008	0.000	0.008
Collision with bicycle (from Worksheet 2J)	0.080	0.000	0.080
Subtotal	0.137	0.187	0.323
Total	1.969	3.421	5.390

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	5.4
Fatal and injury (FI)	2.0
Property damage only (PDO)	3.4

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – Three Lakes/ Fox Meadow Drive to**  
**35mph Zone**

Alternative: 3 (Modified)  
Segment: Three Lakes to 35mph Zone

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Three Lakes to Speed Zone Change
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.1
AADT (veh/day)		--	42,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	40
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	8
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.11	1.00	0.91	1.00	1.01

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brmv}$	Proportion of Total Crashes	Adjusted $N_{brmv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brmv}$
	a	b							
Total	-12.34	1.36	1.32	0.848	1.000	0.848	1.01	1.00	0.858
Fatal and Injury (FI)	-12.76	1.28	1.31	0.238	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.266	0.226	1.01	1.00	0.228
Property Damage Only (PDO)	-12.81	1.38	1.34	0.656	$(5)_{TOTAL} - (5)_{FI}$ 0.734	0.622	1.01	1.00	0.630

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments						
(1)	(2)		(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>		Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4		(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000		0.228	1.000	0.630	0.858
			(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832		0.190	0.662	0.417	0.607
Head-on collision	0.020		0.005	0.007	0.004	0.009
Angle collision	0.040		0.009	0.036	0.023	0.032
Sideswipe, same direction	0.050		0.011	0.223	0.140	0.152
Sideswipe, opposite direction	0.010		0.002	0.001	0.001	0.003
Other multiple-vehicle collision	0.048		0.011	0.071	0.045	0.056

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.095	1.000	0.095	1.01	1.00	0.097
Fatal and Injury (FI)	-8.71	0.66	0.28	0.019	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.192	0.018	1.01	1.00	0.019
Property Damage Only (PDO)	-5.04	0.45	1.06	0.078	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.808	0.077	1.01	1.00	0.078

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments						
(1)	(2)		(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>		Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6		(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000		0.019	1.000	0.078	0.097
			(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001		0.000	0.063	0.005	0.005
Collision with fixed object	0.500		0.009	0.813	0.063	0.073
Collision with other object	0.028		0.001	0.016	0.001	0.002
Other single-vehicle collision	0.471		0.009	0.108	0.008	0.017

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.000	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	1.01	1.00	0.000
Fatal and injury (FI)	--	0.284	0.000	1.01	1.00	0.000
Property damage only (PDO)	--	0.716	0.000	1.01	1.00	0.000

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Multi-Use from Ped & Safety	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-			(5)*(6)*(7)*(8)
Total	0.858	0.097	0.000	0.955	0.019	0.23	1.00	0.004
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.004

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Multi-Use from Ped & Safety	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-			(5)*(6)*(7)*(8)
Total	0.858	0.097	0.000	0.955	0.005	0.23	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.001

Alternative: 3 (Modified)  
 Segment: Three Lakes to 35mph Zone

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.190	0.417	0.607
Head-on collisions (from Worksheet 1D)	0.005	0.004	0.009
Angle collisions (from Worksheet 1D)	0.009	0.023	0.032
Sideswipe, same direction (from Worksheet 1D)	0.011	0.140	0.152
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.001	0.003
Driveway-related collisions (from Worksheet 1H)	0.000	0.000	0.000
Other multiple-vehicle collision (from Worksheet 1D)	0.011	0.045	0.056
Subtotal	0.228	0.630	0.858
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.009	0.063	0.073
Collision with other object (from Worksheet 1F)	0.001	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.009	0.008	0.017
Collision with pedestrian (from Worksheet 1I)	0.004	0.000	0.004
Collision with bicycle (from Worksheet 1J)	0.001	0.000	0.001
Subtotal	0.024	0.078	0.102
Total	0.252	0.708	0.960

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.0	0.10	9.6
Fatal and injury (FI)	0.3	0.10	2.5
Property damage only (PDO)	0.7	0.10	7.1

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – 35mph Zone to Sunset Ridge Road**

**Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments**

General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Speed Zone Change to Sunset Ridge
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.13
AADT (veh/day)		--	42,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	1
Minor industrial / institutional driveways (number)		--	1
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed 30 mph or Lower
Roadside fixed object density (fixed objects / mi)		0	16
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

**Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments**

(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.03	1.00	0.91	1.00	0.94

**Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments**

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3								
	a	b	from Table 12-3	from Equation 12-10	(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B	(6)*(7)*(8)		
Total	-12.34	1.36	1.32	1.102	1.000	1.102	0.94	1.00	1.034
Fatal and Injury (FI)	-12.76	1.28	1.31	0.309	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.266	0.293	0.94	1.00	0.275
Property Damage Only (PDO)	-12.81	1.38	1.34	0.853	$(5)_{TOTAL} - (5)_{FI}$ 0.734	0.809	0.94	1.00	0.759

Worksheet 1D -- Multiple-Vehicle Nondrivable Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.275	1.000	0.759	1.034
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.229	0.662	0.502	0.731
Head-on collision	0.020	0.006	0.007	0.005	0.011
Angle collision	0.040	0.011	0.036	0.027	0.038
Sideswipe, same direction	0.050	0.014	0.223	0.169	0.183
Sideswipe, opposite direction	0.010	0.003	0.001	0.001	0.004
Other multiple-vehicle collision	0.048	0.013	0.071	0.054	0.067

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.124	1.000	0.124	0.94	1.00	0.116
Fatal and Injury (FI)	-8.71	0.66	0.28	0.024	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.192	0.024	0.94	1.00	0.022
Property Damage Only (PDO)	-5.04	0.45	1.06	0.101	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.808	0.100	0.94	1.00	0.094

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.022	1.000	0.094	0.116
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.006	0.006
Collision with fixed object	0.500	0.011	0.813	0.076	0.088
Collision with other object	0.028	0.001	0.016	0.002	0.002
Other single-vehicle collision	0.471	0.011	0.108	0.010	0.021

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	1	0.036	1.106	0.112	
Minor industrial/institutional	1	0.005	1.106	0.016	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.128	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.128	1.000	0.128	0.94	1.00	0.120
Fatal and injury (FI)	--	0.284	0.036	0.94	1.00	0.034
Property damage only (PDO)	--	0.716	0.092	0.94	1.00	0.086

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Multi-Use from Ped & Safety	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-			(5)*(6)*(7)*(8)
Total	1.034	0.116	0.120	1.270	0.067	0.23	1.00	0.020
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.020

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	Multi-Use from Ped & Safety	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-			(5)*(6)*(7)*(8)
Total	1.034	0.116	0.120	1.270	0.013	0.23	1.00	0.004
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.004

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.229	0.502	0.731
Head-on collisions (from Worksheet 1D)	0.006	0.005	0.011
Angle collisions (from Worksheet 1D)	0.011	0.027	0.038
Sideswipe, same direction (from Worksheet 1D)	0.014	0.169	0.183
Sideswipe, opposite direction (from Worksheet 1D)	0.003	0.001	0.004
Driveway-related collisions (from Worksheet 1H)	0.034	0.086	0.120
Other multiple-vehicle collision (from Worksheet 1D)	0.013	0.054	0.067
Subtotal	0.309	0.845	1.154
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.006	0.006
Collision with fixed object (from Worksheet 1F)	0.011	0.076	0.088
Collision with other object (from Worksheet 1F)	0.001	0.002	0.002
Other single-vehicle collision (from Worksheet 1F)	0.011	0.010	0.021
Collision with pedestrian (from Worksheet 1I)	0.020	0.000	0.020
Collision with bicycle (from Worksheet 1J)	0.004	0.000	0.004
Subtotal	0.046	0.094	0.140
Total	0.355	0.939	1.294

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.3	0.13	10.0
Fatal and injury (FI)	0.4	0.13	2.7
Property damage only (PDO)	0.9	0.13	7.2

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Intersection Analysis**  
**Willow Road at Sunset Ridge Road**

**Alternative: 3 (Modified)**  
**Intersection: Willow Road at Sunset Ridge Road**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Sunset Ridge Road
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	42,000
AADT <sub>minor</sub> (veh/day)		--	12,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:			
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:			
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	1
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			110
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	3
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.96	0.96	0.98	0.91	1.00	0.98
(8)						(9)
Interconnect/Coordinate Traffic Signals; Optimization						Combined CMF
<i>CMF 8i</i>						<i>CMF<sub>COMB</sub></i>
ITE Toolbox						(1)*(2)*(3)*(4)*(5)*(6)*(7)*(8)
0.84						0.45

Alternative: 3 (Modified)  
 Intersection: Willow Road at Sunset Ridge Road

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bimv}$ from Equation	Proportion of Total Crashes	Adjusted $N_{bimv}$ (4) <sub>TOTAL</sub> *(5)	Combined (7) from Worksh	Calibration Factor, $C_i$	Predicted $N_{bimv}$ (6)*(7)*(8)
	from Table 12-10									
	a	b	c							
Total	-10.99	1.07	0.23	0.39	12.948	1.000	12.948	0.45	1.00	5.813
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	4.428	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.353	4.574	0.45	1.00	2.054
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	8.106	$(5)_{TOTAL}-(5)_{FI}$ 0.647	8.373	0.45	1.00	3.759

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{bimv (FI)}$ (crashes/year)	Proportion of Collision Type (PDO)	Predicted $N_{bimv (PDO)}$ (crashes/yea	Predicted $N_{bimv (TOTAL)}$ (crashes/year)
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	2.054	1.000	3.759	5.813
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Rear-end collision	0.450	0.924	0.483	1.816	2.740
Head-on collision	0.049	0.101	0.030	0.113	0.213
Angle collision	0.347	0.713	0.244	0.917	1.630
Sideswipe	0.099	0.203	0.032	0.120	0.324
Other multiple-vehicle collision	0.055	0.113	0.211	0.793	0.906

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bisv}$ from Eqn. 12-24; (FI) from Eqn.	Proportion of Total Crashes	Adjusted $N_{bisv}$ (4) <sub>TOTAL</sub> *(5)	Combined (7) from Worksh	Calibration Factor, $C_i$	Predicted $N_{bisv}$ (6)*(7)*(8)
	from Table 12-12									
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.647	1.000	0.647	0.45	1.00	0.291
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.142	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.221	0.143	0.45	1.00	0.064
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.502	$(5)_{TOTAL}-(5)_{FI}$ 0.779	0.504	0.45	1.00	0.226

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type (PDO)	Predicted N <sub>bisv (PDO)</sub> (crashes/yea	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.064	1.000	0.226	0.291
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.001
Collision with fixed object	0.744	0.048	0.870	0.197	0.245
Collision with other object	0.072	0.005	0.070	0.016	0.020
Other single-vehicle collision	0.040	0.003	0.023	0.005	0.008
Single-vehicle noncollision	0.141	0.009	0.034	0.008	0.017

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	CMF for Install Refuge Island	W/DW Ped Signals with Countdown Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmfclearinghouse.org	cmfclearinghouse.org	(1)*(2)*(3)*(4)*(5)
2.78	1.35	1.00	0.44	0.75	1.24

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter r, k	N <sub>pedbase</sub> from Equation 12-29	Combined CMF (4) from Worksheet 2H	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.038	1.24	1.00	0.047
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.047

Alternative: 3 (Modified)  
 Intersection: Willow Road at Sunset Ridge Road

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bike}$	Calibration factor, $C_i$	Predicted $N_{ped}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	5.813	0.291	6.104	0.015	1.00	0.092
Fatal and injury (FI)	--	--	--	--	1.00	0.092

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.924	1.816	2.740
Head-on collisions (from Worksheet 2D)	0.101	0.113	0.213
Angle collisions (from Worksheet 2D)	0.713	0.917	1.630
Sideswipe (from Worksheet 2D)	0.203	0.120	0.324
Other multiple-vehicle collision (from Worksheet 2D)	0.113	0.793	0.906
Subtotal	2.054	3.759	5.813
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.001
Collision with fixed object (from Worksheet 2F)	0.048	0.197	0.245
Collision with other object (from Worksheet 2F)	0.005	0.016	0.020
Other single-vehicle collision (from Worksheet 2F)	0.003	0.005	0.008
Single-vehicle noncollision (from Worksheet 2F)	0.009	0.008	0.017
Collision with pedestrian (from Worksheet 2G or 2I)	0.047	0.000	0.047
Collision with bicycle (from Worksheet 2J)	0.092	0.000	0.092
Subtotal	0.203	0.226	0.430
Total	2.257	3.986	6.243

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted}$ <i>int</i> (crashes/year)
	(Total) from Worksheet 2K
Total	6.2
Fatal and injury (FI)	2.3
Property damage only (PDO)	4.0

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – Sunset Ridge Road to Old Willow Road**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Sunset Ridge to Old Willow Rd
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.18
AADT (veh/day)		--	36,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	10
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	1
Major industrial / institutional driveways (number)		--	1
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	4
Other driveways (number)		--	0
Speed Category		--	Posted Speed 30 mph or Lower
Roadside fixed object density (fixed objects / mi)		0	11
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.01	1.01	0.91	1.00	0.93

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-12.34	1.36	1.32	1.238	1.000	1.238	0.93	1.00	1.150
Fatal and Injury (FI)	-12.76	1.28	1.31	0.351	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.333	0.93	1.00	0.310
Property Damage Only (PDO)	-12.81	1.38	1.34	0.954	$(5)_{TOTAL} - (5)_{FI}$ 0.731	0.905	0.93	1.00	0.841

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.310	1.000	0.841	1.150
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.258	0.662	0.557	0.814
Head-on collision	0.020	0.006	0.007	0.006	0.012
Angle collision	0.040	0.012	0.036	0.030	0.043
Sideswipe, same direction	0.050	0.015	0.223	0.187	0.203
Sideswipe, opposite direction	0.010	0.003	0.001	0.001	0.004
Other multiple-vehicle collision	0.048	0.015	0.071	0.060	0.075

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.160	1.000	0.160	0.93	1.00	0.148
Fatal and Injury (FI)	-8.71	0.66	0.28	0.030	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.187	0.030	0.93	1.00	0.028
Property Damage Only (PDO)	-5.04	0.45	1.06	0.131	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.813	0.130	0.93	1.00	0.121

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.028	1.000	0.121	0.148
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.008	0.008
Collision with fixed object	0.500	0.014	0.813	0.098	0.112
Collision with other object	0.028	0.001	0.016	0.002	0.003
Other single-vehicle collision	0.471	0.013	0.108	0.013	0.026

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$ from Table 12-7	Coefficient for traffic adjustment, $t$ from Table 12-7	Initial $N_{brdwy}$	Overdispersion parameter, $k$ from Table 12-7
				Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	1	0.011	1.106	0.029	
Major industrial/institutional	1	0.036	1.106	0.095	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	4	0.003	1.106	0.032	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.155	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ ) from Table 12-7	Adjusted $N_{brdwy}$ (2) <sub>TOTAL</sub> * (3)	Combined CMFs (6) from Worksheet 1B	Calibration factor, $C_r$	Predicted $N_{brdwy}$ (4)*(5)*(6)
	(5) <sub>TOTAL</sub> from Worksheet 1G					
Total	0.155	1.000	0.155	0.93	1.00	0.144
Fatal and injury (FI)	--	0.284	0.044	0.93	1.00	0.041
Property damage only (PDO)	--	0.716	0.111	0.93	1.00	0.103

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$ from Table 12-8	Calibration factor, $C_r$	Predicted $N_{pedr}$ (5)*(6)*(7)
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)			
Total	1.150	0.148	0.144	1.443	0.067	1.00	0.097
Fatal and injury (FI)	--	--	--	--	--	1.00	0.097

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$ from Table 12-9	CMF for Multi-Use Bike Path from Ped & Safety Toolbox	Calibration factor, $C_r$	Predicted $N_{biker}$ (5)*(6)*(7)*(8)
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)				
Total	1.150	0.148	0.144	1.443	0.013	0.23	1.00	0.004
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.004

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.258	0.557	0.814
Head-on collisions (from Worksheet 1D)	0.006	0.006	0.012
Angle collisions (from Worksheet 1D)	0.012	0.030	0.043
Sideswipe, same direction (from Worksheet 1D)	0.015	0.187	0.203
Sideswipe, opposite direction (from Worksheet 1D)	0.003	0.001	0.004
Driveway-related collisions (from Worksheet 1H)	0.041	0.103	0.144
Other multiple-vehicle collision (from Worksheet 1D)	0.015	0.060	0.075
Subtotal	0.351	0.944	1.295
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.008	0.008
Collision with fixed object (from Worksheet 1F)	0.014	0.098	0.112
Collision with other object (from Worksheet 1F)	0.001	0.002	0.003
Other single-vehicle collision (from Worksheet 1F)	0.013	0.013	0.026
Collision with pedestrian (from Worksheet 1I)	0.097	0.000	0.097
Collision with bicycle (from Worksheet 1J)	0.004	0.000	0.004
Subtotal	0.129	0.121	0.249
Total	0.479	1.065	1.544

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, N <sub>predicted rs</sub> (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.5	0.18	8.6
Fatal and injury (FI)	0.5	0.18	2.7
Property damage only (PDO)	1.1	0.18	5.9

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – Old Willow Road to Wagner Road**

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Old Willow Rd. to Wagner
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data	Base Conditions	Site Conditions	
Roadway type (2U, 3T, 4U, 4D, ST)	--	4D	
Length of segment, L (mi)	--	0.42	
AADT (veh/day)	--	36,000	
Type of on-street parking (none/parallel/angle)	None	None	
Proportion of curb length with on-street parking	--	0	
Median width (ft) - for divided only	15	10	
Lighting (present / not present)	Not Present	Present	
Auto speed enforcement (present / not present)	Not Present	Not Present	
Major commercial driveways (number)	--	0	
Minor commercial driveways (number)	--	0	
Major industrial / institutional driveways (number)	--	0	
Minor industrial / institutional driveways (number)	--	0	
Major residential driveways (number)	--	0	
Minor residential driveways (number)	--	12	
Other driveways (number)	--	0	
Speed Category	--	Posted Speed 30 mph or Lower	
Roadside fixed object density (fixed objects / mi)	0	5	
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	30	7	
Calibration Factor, Cr	1.00	1.00	

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	$(1)*(2)*(3)*(4)*(5)$
1.00	1.00	1.01	0.91	1.00	0.92

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial $N_{brmv}$	Proportion of Total Crashes	Adjusted $N_{brmv}$	Combined CMFs	Calibration Factor, Cr	Predicted $N_{brmv}$
	from Table 12-3								
	a	b							
Total	-12.34	1.36	1.32	2.888	1.000	2.888	0.92	1.00	2.666
Fatal and Injury (FI)	-12.76	1.28	1.31	0.820	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.777	0.92	1.00	0.717
Property Damage Only (PDO)	-12.81	1.38	1.34	2.227	$(5)_{TOTAL} - (5)_{FI}$ 0.731	2.111	0.92	1.00	1.948

Worksheet 1D -- Multiple-Vehicle Nondrivable Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.717	1.000	1.948	2.666
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.597	0.662	1.290	1.887
Head-on collision	0.020	0.014	0.007	0.014	0.028
Angle collision	0.040	0.029	0.036	0.070	0.099
Sideswipe, same direction	0.050	0.036	0.223	0.435	0.470
Sideswipe, opposite direction	0.010	0.007	0.001	0.002	0.009
Other multiple-vehicle collision	0.048	0.034	0.071	0.138	0.173

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.373	1.000	0.373	0.92	1.00	0.344
Fatal and Injury (FI)	-8.71	0.66	0.28	0.070	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> )	0.070	0.92	1.00	0.065
Property Damage Only (PDO)	-5.04	0.45	1.06	0.305	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub>	0.303	0.92	1.00	0.280
					0.813				

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.065	1.000	0.280	0.344
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.018	0.018
Collision with fixed object	0.500	0.032	0.813	0.227	0.260
Collision with other object	0.028	0.002	0.016	0.004	0.006
Other single-vehicle collision	0.471	0.030	0.108	0.030	0.061

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_i * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	12	0.003	1.106	0.095	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.095	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.095	1.000	0.095	0.92	1.00	0.088
Fatal and injury (FI)	--	0.284	0.027	0.92	1.00	0.025
Property damage only (PDO)	--	0.716	0.068	0.92	1.00	0.063

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	2.666	0.344	0.088	3.098	0.067	0.23	1.00	0.048
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.048

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	2.666	0.344	0.088	3.098	0.013	0.23	1.00	0.009
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.009

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.597	1.290	1.887
Head-on collisions (from Worksheet 1D)	0.014	0.014	0.028
Angle collisions (from Worksheet 1D)	0.029	0.070	0.099
Sideswipe, same direction (from Worksheet 1D)	0.036	0.435	0.470
Sideswipe, opposite direction (from Worksheet 1D)	0.007	0.002	0.009
Driveway-related collisions (from Worksheet 1H)	0.025	0.063	0.088
Other multiple-vehicle collision (from Worksheet 1D)	0.034	0.138	0.173
Subtotal	0.742	2.011	2.753
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.018	0.018
Collision with fixed object (from Worksheet 1F)	0.032	0.227	0.260
Collision with other object (from Worksheet 1F)	0.002	0.004	0.006
Other single-vehicle collision (from Worksheet 1F)	0.030	0.030	0.061
Collision with pedestrian (from Worksheet 1I)	0.048	0.000	0.048
Collision with bicycle (from Worksheet 1J)	0.009	0.000	0.009
Subtotal	0.121	0.280	0.401
Total	0.864	2.291	3.155

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, N predicted rs (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	3.2	0.42	7.5
Fatal and injury (FI)	0.9	0.42	2.1
Property damage only (PDO)	2.3	0.42	5.5

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Intersection Analysis**  
**Willow Road at Wagner Road**

**Alternative: 3 (Modified)**  
**Intersection: Willow Road at Wagner**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Wagner
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data	Base Conditions	Site Conditions	
Intersection type (3ST, 3SG, 4ST, 4SG)	--	4SG	
AADT <sub>major</sub> (veh/day)	--	36,000	
AADT <sub>minor</sub> (veh/day)	--	7,000	
Intersection lighting (present/not present)	Not Present	Present	
Calibration factor, C <sub>i</sub>	1.00	1.00	
Data for unsignalized intersections only:	--	--	
Number of major-road approaches with left-turn lanes (0,1,2)	0	0	
Number of major-road approaches with right-turn lanes (0,1,2)	0	0	
Data for signalized intersections only:	--	--	
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]	0	4	
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]	0	0	
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]	--	4	
Type of left-turn signal phasing for Leg #1	Permissive	Protected / Permissive	
Type of left-turn signal phasing for Leg #2	--	Protected / Permissive	
Type of left-turn signal phasing for Leg #3	--	Protected / Permissive	
Type of left-turn signal phasing for Leg #4 (if applicable)	--	Protected / Permissive	
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]	0	2	
Intersection red light cameras (present/not present)	Not Present	Present	
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only		213	
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )	--	3	
Number of bus stops within 300 m (1,000 ft) of the intersection	0	1	
Schools within 300 m (1,000 ft) of the intersection (present/not present)	Not Present	Present	
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection	0	0	

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.96	1.00	0.96	0.91	1.01	0.98
(8)						(9)
Interconnect/Coordinate Traffic Signals; Optimization						Combined CMF
<i>CMF 8i</i>						<i>CMF<sub>COMB</sub></i>
ITE Toolbox						(1)*(2)*(3)*(4)*(5)*(6)*(7)*(8)
0.84						0.46

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1) Crash Severity Level	(2) SPF Coefficients			(3) Overdispersion Parameter, k	(4) Initial $N_{bimv}$	(5) Proportion of Total Crashes	(6) Adjusted $N_{bimv}$	(7) Combined CMFs	(8) Calibration Factor, $C_i$	(9) Predicted $N_{bimv}$
	from Table 12-10			from Table 12-10	from Equation 12-21		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B	1.00	(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	9.699	1.000	9.699	0.46	1.00	4.496
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.279	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.350	3.396	0.46	1.00	1.574
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	6.086	$(5)_{TOTAL}-(5)_{FI}$ 0.650	6.303	0.46	1.00	2.922

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1) Collision Type	(2) Proportion of Collision Type <sub>(FI)</sub>	(3) Predicted $N_{bimv (FI)}$ (crashes/year)	(4) Proportion of Collision Type <sub>(PDO)</sub>	(5) Predicted $N_{bimv (PDO)}$ (crashes/year)	(6) Predicted $N_{bimv (TOTAL)}$ (crashes/year)
	from Table 12-11	(9) <sub>FI</sub> from Worksheet 2C	from Table 12-11	(9) <sub>PDO</sub> from Worksheet 2C	(9) <sub>PDO</sub> from Worksheet 2C
Total	1.000	1.574	1.000	2.922	4.496
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	$(3)+(5)$
Rear-end collision	0.450	0.708	0.483	1.411	2.120
Head-on collision	0.049	0.077	0.030	0.088	0.165
Angle collision	0.347	0.546	0.244	0.713	1.259
Sideswipe	0.099	0.156	0.032	0.094	0.249
Other multiple-vehicle collision	0.055	0.087	0.211	0.617	0.703

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1) Crash Severity Level	(2) SPF Coefficients			(3) Overdispersion Parameter, k	(4) Initial $N_{bisv}$	(5) Proportion of Total Crashes	(6) Adjusted $N_{bisv}$	(7) Combined CMFs	(8) Calibration Factor, $C_i$	(9) Predicted $N_{bisv}$
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		(4) <sub>TOTAL</sub> *(5)	(7) from Worksheet 2B	1.00	(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.504	1.000	0.504	0.46	1.00	0.234
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.114	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.227	0.114	0.46	1.00	0.053
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.389	$(5)_{TOTAL}-(5)_{FI}$ 0.773	0.390	0.46	1.00	0.181

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sup>(FI)</sup>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sup>(PDO)</sup>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sup>FI</sup> from Worksheet 2E	from Table 12-13	(9) <sup>PDO</sup> from Worksheet 2E	(9) <sup>PDO</sup> from Worksheet 2E
Total	1.000	0.053	1.000	0.181	0.234
		(2) <sup>FI</sup> (3) <sup>FI</sup>		(4) <sup>PDO</sup> (5) <sup>PDO</sup>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.000
Collision with fixed object	0.744	0.039	0.870	0.157	0.197
Collision with other object	0.072	0.004	0.070	0.013	0.016
Other single-vehicle collision	0.040	0.002	0.023	0.004	0.006
Single-vehicle noncollision	0.141	0.007	0.034	0.006	0.014

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4) <sup>FI</sup> (5) <sup>FI</sup> (6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Install Refuge Island	CMF for Replace W/DW Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmfclearinghouse.org	cmfclearinghouse.org	(1)*(2)*(3)*(4)*(5)
2.78	1.35	1.00	0.44	0.75	1.24

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.043	1.24	1.00	0.053
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.053

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	4.496	0.234	4.730	0.015	1.00	0.071
Fatal and injury (FI)	--	--	--	--	1.00	0.071

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.708	1.411	2.120
Head-on collisions (from Worksheet 2D)	0.077	0.088	0.165
Angle collisions (from Worksheet 2D)	0.546	0.713	1.259
Sideswipe (from Worksheet 2D)	0.156	0.094	0.249
Other multiple-vehicle collision (from Worksheet 2D)	0.087	0.617	0.703
Subtotal	1.574	2.922	4.496
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.000
Collision with fixed object (from Worksheet 2F)	0.039	0.157	0.197
Collision with other object (from Worksheet 2F)	0.004	0.013	0.016
Other single-vehicle collision (from Worksheet 2F)	0.002	0.004	0.006
Single-vehicle noncollision (from Worksheet 2F)	0.007	0.006	0.014
Collision with pedestrian (from Worksheet 2G or 2I)	0.053	0.000	0.053
Collision with bicycle (from Worksheet 2J)	0.071	0.000	0.071
Subtotal	0.177	0.181	0.357
Total	1.751	3.103	4.854

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	4.9
Fatal and injury (FI)	1.8
Property damage only (PDO)	3.1

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – Wagner Road to 4-Lane Section**

Alternative: 3 (Modified)  
Segment: Wagner to 4-Lane Section

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Wagner to 4-lane section taper
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.29
AADT (veh/day)		--	35,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	1
Minor residential driveways (number)		--	8
Other driveways (number)		--	0
Speed Category		--	Posted Speed 30 mph or Lower
Roadside fixed object density (fixed objects / mi)		0	7
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	CMF for Install Changeable Speed Warning Signs for Individual Drivers
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF 6r</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	from Table 13-33
1.00	1.00	1.00	0.91	1.00	0.54
					(7)
					Combined CMF
					<i>CMF<sub>COMB</sub></i>
					(1)*(2)*(3)*(4)*(5)*(6)
					0.49

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	a	b							
Total	-12.34	1.36	1.32	1.919	1.000	1.919	0.49	1.00	0.947
Fatal and Injury (FI)	-12.76	1.28	1.31	0.546	$\frac{(4)_{FI}}{((4)_{FI}+(4)_{PDO})}$ 0.270	0.518	0.49	1.00	0.255
Property Damage Only (PDO)	-12.81	1.38	1.34	1.479	$\frac{(5)_{TOTAL}-(5)_{FI}}{0.730}$	1.402	0.49	1.00	0.692

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.255	1.000	0.692	0.947
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.213	0.662	0.458	0.670
Head-on collision	0.020	0.005	0.007	0.005	0.010
Angle collision	0.040	0.010	0.036	0.025	0.035
Sideswipe, same direction	0.050	0.013	0.223	0.154	0.167
Sideswipe, opposite direction	0.010	0.003	0.001	0.001	0.003
Other multiple-vehicle collision	0.048	0.012	0.071	0.049	0.061

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5 a	b							
Total	-5.05	0.47	0.86	0.254	1.000	0.254	0.49	1.00	0.125
Fatal and Injury (FI)	-8.71	0.66	0.28	0.048	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.187	0.047	0.49	1.00	0.023
Property Damage Only (PDO)	-5.04	0.45	1.06	0.208	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.813	0.207	0.49	1.00	0.102

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.023	1.000	0.102	0.125
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.006	0.006
Collision with fixed object	0.500	0.012	0.813	0.083	0.095
Collision with other object	0.028	0.001	0.016	0.002	0.002
Other single-vehicle collision	0.471	0.011	0.108	0.011	0.022

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	
Driveway Type	Number of driveways, $n_i$	Crashes per driveway per year, $N_i$	Coefficient for traffic adjustment, $t$	Initial $N_{brdwy}$	Overdispersion parameter, $k$	
		from Table 12-7	from Table 12-7	Equation 12-16 $n_i * N_i * (AADT/15,000)^t$	from Table 12-7	
Major commercial	0	0.033	1.106	0.000	--	
Minor commercial	0	0.011	1.106	0.000		
Major industrial/institutional	0	0.036	1.106	0.000		
Minor industrial/institutional	0	0.005	1.106	0.000		
Major residential	1	0.018	1.106	0.046		
Minor residential	8	0.003	1.106	0.061		
Other	0	0.005	1.106	0.000		
Total	--	--	--	0.107		1.39

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{drwy}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sup>TOTAL</sup> from Worksheet 1G	from Table 12-7	(2) <sup>TOTAL</sup> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.107	1.000	0.107	0.49	1.00	0.053
Fatal and injury (FI)	--	0.284	0.030	0.49	1.00	0.015
Property damage only (PDO)	--	0.716	0.077	0.49	1.00	0.038

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	CMF for Multi-Use Bike Path	CMF for HAWK Signal	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8	from Ped & Safety Toolbox	cmfclearinghouse.org		(5)*(6)*(7)*(8)*(9)
Total	0.947	0.125	0.053	1.125	0.067	0.23	0.398	1.00	0.007
Fatal and injury (FI)	--	--	--	--	--	--	--	1.00	0.007

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Crash Severity	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$	
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)	
Total	0.947	0.125	0.053	1.125	0.013	0.23	1.00	0.003	
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.003	

Alternative: 3 (Modified)  
 Segment: Wagner to 4-Lane Section

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.213	0.458	0.670
Head-on collisions (from Worksheet 1D)	0.005	0.005	0.010
Angle collisions (from Worksheet 1D)	0.010	0.025	0.035
Sideswipe, same direction (from Worksheet 1D)	0.013	0.154	0.167
Sideswipe, opposite direction (from Worksheet 1D)	0.003	0.001	0.003
Driveway-related collisions (from Worksheet 1H)	0.015	0.038	0.053
Other multiple-vehicle collision (from Worksheet 1D)	0.012	0.049	0.061
Subtotal	0.270	0.730	1.000
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.006	0.006
Collision with fixed object (from Worksheet 1F)	0.012	0.083	0.095
Collision with other object (from Worksheet 1F)	0.001	0.002	0.002
Other single-vehicle collision (from Worksheet 1F)	0.011	0.011	0.022
Collision with pedestrian (from Worksheet 1I)	0.007	0.000	0.007
Collision with bicycle (from Worksheet 1J)	0.003	0.000	0.003
Subtotal	0.034	0.102	0.136
Total	0.304	0.832	1.136

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	1.1	0.29	3.9
Fatal and injury (FI)	0.3	0.29	1.0
Property damage only (PDO)	0.8	0.29	2.9

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – 4-Lane Section to**  
**Old Willow Road/ Northfield Road**

Alternative: 3 (Modified)

Segment: 4-Lane Section to Old Willow/Northfield

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	4-Lane to Old Willow/Northfield
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.12
AADT (veh/day)		--	35,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	15
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	0
Minor commercial driveways (number)		--	5
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	1
Other driveways (number)		--	0
Speed Category		--	Posted Speed 30 mph or Lower
Roadside fixed object density (fixed objects / mi)		0	17
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	7
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.03	1.00	0.91	1.00	0.94

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	from Table 12-3 a	b	from Table 12-3	from Equation 12-10		(4) <sub>TOTAL</sub> *(5)	(6) from Worksheet 1B		(6)*(7)*(8)
Total	-12.34	1.36	1.32	0.794	1.000	0.794	0.94	1.00	0.748
Fatal and Injury (FI)	-12.76	1.28	1.31	0.226	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.270	0.214	0.94	1.00	0.202
Property Damage Only (PDO)	-12.81	1.38	1.34	0.612	$(5)_{TOTAL} - (5)_{FI}$ 0.730	0.580	0.94	1.00	0.546

Worksheet 1D -- Multiple-Vehicle Nondriveway Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4	(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000	0.202	1.000	0.546	0.748
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832	0.168	0.662	0.361	0.529
Head-on collision	0.020	0.004	0.007	0.004	0.008
Angle collision	0.040	0.008	0.036	0.020	0.028
Sideswipe, same direction	0.050	0.010	0.223	0.122	0.132
Sideswipe, opposite direction	0.010	0.002	0.001	0.001	0.003
Other multiple-vehicle collision	0.048	0.010	0.071	0.039	0.048

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.105	1.000	0.105	0.94	1.00	0.099
Fatal and Injury (FI)	-8.71	0.66	0.28	0.020	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.187	0.020	0.94	1.00	0.018
Property Damage Only (PDO)	-5.04	0.45	1.06	0.086	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.813	0.086	0.94	1.00	0.081

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6	(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000	0.018	1.000	0.081	0.099
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001	0.000	0.063	0.005	0.005
Collision with fixed object	0.500	0.009	0.813	0.065	0.075
Collision with other object	0.028	0.001	0.016	0.001	0.002
Other single-vehicle collision	0.471	0.009	0.108	0.009	0.017

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$ from Table 12-7	Coefficient for traffic adjustment, $t$ from Table 12-7	Initial $N_{brdwy}$	Overdispersion parameter, $k$ from Table 12-7
				Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	
Major commercial	0	0.033	1.106	0.000	--
Minor commercial	5	0.011	1.106	0.140	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	1	0.003	1.106	0.008	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.148	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dvw}$ )	Adjusted $N_{brdwy}$	Combined CMFs	Calibration factor, $C_r$	Predicted $N_{brdwy}$
	(5) <sub>TOTAL</sub> from Worksheet 1G	from Table 12-7	(2) <sub>TOTAL</sub> * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.148	1.000	0.148	0.94	1.00	0.139
Fatal and injury (FI)	--	0.284	0.042	0.94	1.00	0.040
Property damage only (PDO)	--	0.716	0.106	0.94	1.00	0.100

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$	Calibration factor, $C_r$	Predicted $N_{pedr}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.748	0.099	0.139	0.986	0.067	1.00	0.066
Fatal and injury (FI)	--	--	--	--	--	1.00	0.066

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$	CMF for Multi-Use Bike Path	Calibration factor, $C_r$	Predicted $N_{biker}$
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9	from Ped & Safety Toolbox		(5)*(6)*(7)*(8)
Total	0.748	0.099	0.139	0.986	0.013	0.23	1.00	0.003
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.003

Alternative: 3 (Modified)

Segment: 4-Lane Section to Old Willow/Northfield

Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.168	0.361	0.529
Head-on collisions (from Worksheet 1D)	0.004	0.004	0.008
Angle collisions (from Worksheet 1D)	0.008	0.020	0.028
Sideswipe, same direction (from Worksheet 1D)	0.010	0.122	0.132
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.001	0.003
Driveway-related collisions (from Worksheet 1H)	0.040	0.100	0.139
Other multiple-vehicle collision (from Worksheet 1D)	0.010	0.039	0.048
Subtotal	0.241	0.646	0.887
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.009	0.065	0.075
Collision with other object (from Worksheet 1F)	0.001	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.009	0.009	0.017
Collision with pedestrian (from Worksheet 1I)	0.066	0.000	0.066
Collision with bicycle (from Worksheet 1J)	0.003	0.000	0.003
Subtotal	0.087	0.081	0.168
Total	0.329	0.726	1.055

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		
Total	1.1	0.12	8.8
Fatal and injury (FI)	0.3	0.12	2.7
Property damage only (PDO)	0.7	0.12	6.1

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Intersection Analysis**  
**Willow Road at Old Willow Road/ Northfield Road**

Alternative: 3 (Modified)

Intersection: Willow Road at Old Willow/Northfield Road

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Old Willow/Northfield Rd.
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	36,000
AADT <sub>minor</sub> (veh/day)		--	6,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			105
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	7
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	5

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.96	0.96	1.00	0.91	1.00	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.55

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bimv}$	Proportion of Total Crashes	Adjusted $N_{bimv}$	Combined CMFs	Calibration Factor, $C_i$	Predicted $N_{bimv}$
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL} * (5)$	(7) from Worksheet 2B		$(6) * (7) * (8)$
	a	b	c							
Total	-10.99	1.07	0.23	0.39	9.361	1.000	9.361	0.55	1.00	5.106
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.170	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.351	3.284	0.55	1.00	1.791
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	5.865	$(5)_{TOTAL} - (5)_{FI}$ 0.649	6.077	0.55	1.00	3.314

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{bimv (FI)}$ (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{bimv (PDO)}$ (crashes/year)	Predicted $N_{bimv (TOTAL)}$ (crashes/year)
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	1.791	1.000	3.314	5.106
		$(2) * (3)_{FI}$		$(4) * (5)_{PDO}$	$(3) + (5)$
Rear-end collision	0.450	0.806	0.483	1.601	2.407
Head-on collision	0.049	0.088	0.030	0.099	0.187
Angle collision	0.347	0.622	0.244	0.809	1.430
Sideswipe	0.099	0.177	0.032	0.106	0.283
Other multiple-vehicle collision	0.055	0.099	0.211	0.699	0.798

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bisv}$	Proportion of Total Crashes	Adjusted $N_{bisv}$	Combined CMFs	Calibration Factor, $C_i$	Predicted $N_{bisv}$
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL} * (5)$	(7) from Worksheet 2B		$(6) * (7) * (8)$
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.483	1.000	0.483	0.55	1.00	0.264
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.109	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.225	0.109	0.55	1.00	0.059
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.375	$(5)_{TOTAL} - (5)_{FI}$ 0.775	0.374	0.55	1.00	0.204

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.059	1.000	0.204	0.264
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.001
Collision with fixed object	0.744	0.044	0.870	0.178	0.222
Collision with other object	0.072	0.004	0.070	0.014	0.019
Other single-vehicle collision	0.040	0.002	0.023	0.005	0.007
Single-vehicle noncollision	0.141	0.008	0.034	0.007	0.015

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Install Refuge Island	CMF for Replace W/DW Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmfclearinghouse.org	cmfclearinghouse.org	(1)*(2)*(3)*(4)*(5)
1.00	1.00	1.12	0.44	0.75	0.37

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections												
(1)	(2)					(3)	(4)	(5)	(6)	(7)		
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>		
	from Table 12-14									from Equation 12-29	(4) from Worksheet 2H	(4)*(5)*(6)
	a	b	c	d	e							
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.035	0.37	1.00	0.013		
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.013		

Alternative: 3 (Modified)

Intersection: Willow Road at Old Willow/Northfield Road

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	5.106	0.264	5.369	0.015	1.00	0.081
Fatal and injury (FI)	--	--	--	--	1.00	0.081

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.806	1.601	2.407
Head-on collisions (from Worksheet 2D)	0.088	0.099	0.187
Angle collisions (from Worksheet 2D)	0.622	0.809	1.430
Sideswipe (from Worksheet 2D)	0.177	0.106	0.283
Other multiple-vehicle collision (from Worksheet 2D)	0.099	0.699	0.798
Subtotal	1.791	3.314	5.106
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.001
Collision with fixed object (from Worksheet 2F)	0.044	0.178	0.222
Collision with other object (from Worksheet 2F)	0.004	0.014	0.019
Other single-vehicle collision (from Worksheet 2F)	0.002	0.005	0.007
Single-vehicle noncollision (from Worksheet 2F)	0.008	0.007	0.015
Collision with pedestrian (from Worksheet 2G or 2I)	0.013	0.000	0.013
Collision with bicycle (from Worksheet 2J)	0.081	0.000	0.081
Subtotal	0.153	0.204	0.357
Total	1.944	3.519	5.463

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	5.5
Fatal and injury (FI)	1.9
Property damage only (PDO)	3.5

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Segment Analysis**  
**Willow Road – Old Willow Road/ Northfield Road to**  
**Central Avenue/ Happ Road**

Alternative: 3 (Modified)

Segment: Old Willow/Northfield to Central/Happ

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Roadway Section	Old Willow/Northfield to Central/Happ
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Roadway type (2U, 3T, 4U, 4D, ST)		--	4D
Length of segment, L (mi)		--	0.09
AADT (veh/day)		--	36,000
Type of on-street parking (none/parallel/angle)		None	None
Proportion of curb length with on-street parking		--	0
Median width (ft) - for divided only		15	20
Lighting (present / not present)		Not Present	Present
Auto speed enforcement (present / not present)		Not Present	Not Present
Major commercial driveways (number)		--	1
Minor commercial driveways (number)		--	0
Major industrial / institutional driveways (number)		--	0
Minor industrial / institutional driveways (number)		--	0
Major residential driveways (number)		--	0
Minor residential driveways (number)		--	0
Other driveways (number)		--	0
Speed Category		--	Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		0	100
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		30	9
Calibration Factor, Cr		1.00	1.00

Worksheet 1B -- Crash Modification Factors for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
<i>CMF 1r</i>	<i>CMF 2r</i>	<i>CMF 3r</i>	<i>CMF 4r</i>	<i>CMF 5r</i>	<i>CMF comb</i>
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.30	0.99	0.91	1.00	1.17

Worksheet 1C -- Multiple-Vehicle Nondriveway Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brmv</sub>	Proportion of Total Crashes	Adjusted N <sub>brmv</sub>	Combined CMFs	Calibration Factor, Cr	Predicted N <sub>brmv</sub>
	a	b							
Total	-12.34	1.36	1.32	0.619	1.000	0.619	1.17	1.00	0.726
Fatal and Injury (FI)	-12.76	1.28	1.31	0.176	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.269	0.167	1.17	1.00	0.195
Property Damage Only (PDO)	-12.81	1.38	1.34	0.477	$(5)_{TOTAL} - (5)_{FI}$ 0.731	0.452	1.17	1.00	0.531

Worksheet 1D -- Multiple-Vehicle Nondrivable Collisions by Collision Type for Urban and Suburban Roadway Segments						
(1)	(2)		(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>		Predicted N <sub>brmv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brmv (PDO)</sub> (crashes/year)	Predicted N <sub>brmv (TOTAL)</sub> (crashes/year)
	from Table 12-4		(9) <sub>FI</sub> from Worksheet 1C	from Table 12-4	(9) <sub>PDO</sub> from Worksheet 1C	(9) <sub>TOTAL</sub> from Worksheet 1C
Total	1.000		0.195	1.000	0.531	0.726
			(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Rear-end collision	0.832		0.163	0.662	0.351	0.514
Head-on collision	0.020		0.004	0.007	0.004	0.008
Angle collision	0.040		0.008	0.036	0.019	0.027
Sideswipe, same direction	0.050		0.010	0.223	0.118	0.128
Sideswipe, opposite direction	0.010		0.002	0.001	0.001	0.002
Other multiple-vehicle collision	0.048		0.009	0.071	0.038	0.047

Worksheet 1E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Roadway Segments									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients		Overdispersion Parameter, k	Initial N <sub>brsv</sub>	Proportion of Total Crashes	Adjusted N <sub>brsv</sub>	Combined CMFs (6) from Worksheet 1B	Calibration Factor, Cr	Predicted N <sub>brsv</sub>
	from Table 12-5		from Table 12-5	from Equation 12-13		(4) <sub>TOTAL</sub> *(5)			(6)*(7)*(8)
	a	b							
Total	-5.05	0.47	0.86	0.080	1.000	0.080	1.17	1.00	0.094
Fatal and Injury (FI)	-8.71	0.66	0.28	0.015	(4) <sub>FI</sub> /((4) <sub>FI</sub> +(4) <sub>PDO</sub> ) 0.187	0.015	1.17	1.00	0.018
Property Damage Only (PDO)	-5.04	0.45	1.06	0.065	(5) <sub>TOTAL</sub> -(5) <sub>FI</sub> 0.813	0.065	1.17	1.00	0.076

Worksheet 1F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Roadway Segments						
(1)	(2)		(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>		Predicted N <sub>brsv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>brsv (PDO)</sub> (crashes/year)	Predicted N <sub>brsv (TOTAL)</sub> (crashes/year)
	from Table 12-6		(9) <sub>FI</sub> from Worksheet 1E	from Table 12-6	(9) <sub>PDO</sub> from Worksheet 1E	(9) <sub>TOTAL</sub> from Worksheet 1E
Total	1.000		0.018	1.000	0.076	0.094
			(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with animal	0.001		0.000	0.063	0.005	0.005
Collision with fixed object	0.500		0.009	0.813	0.062	0.071
Collision with other object	0.028		0.000	0.016	0.001	0.002
Other single-vehicle collision	0.471		0.008	0.108	0.008	0.017

Worksheet 1G -- Multiple-Vehicle Driveway-Related Collisions by Driveway Type for Urban and Suburban Roadway Segments					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	Number of driveways, $n_j$	Crashes per driveway per year, $N_i$ from Table 12-7	Coefficient for traffic adjustment, $t$ from Table 12-7	Initial $N_{brdwy}$	Overdispersion parameter, $k$ from Table 12-7
				Equation 12-16 $n_i * N_j * (AADT/15,000)^t$	
Major commercial	1	0.033	1.106	0.087	--
Minor commercial	0	0.011	1.106	0.000	
Major industrial/institutional	0	0.036	1.106	0.000	
Minor industrial/institutional	0	0.005	1.106	0.000	
Major residential	0	0.018	1.106	0.000	
Minor residential	0	0.003	1.106	0.000	
Other	0	0.005	1.106	0.000	
Total	--	--	--	0.087	

Worksheet 1H -- Multiple-Vehicle Driveway-Related Collisions by Severity Level for Urban and Suburban Roadway Segments						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Initial $N_{brdwy}$	Proportion of total crashes ( $f_{dwy}$ ) from Table 12-7	Adjusted $N_{brdwy}$ (2) <sub>TOTAL</sub> * (3)	Combined CMFs (6) from Worksheet 1B	Calibration factor, $C_r$	Predicted $N_{brdwy}$ (4)*(5)*(6)
	(5) <sub>TOTAL</sub> from Worksheet 1G					
Total	0.087	1.000	0.087	1.17	1.00	0.102
Fatal and injury (FI)	--	0.284	0.025	1.17	1.00	0.029
Property damage only (PDO)	--	0.716	0.062	1.17	1.00	0.073

Worksheet 1I -- Vehicle-Pedestrian Collisions for Urban and Suburban Roadway Segments							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{pedr}$ from Table 12-8	Calibration factor, $C_r$	Predicted $N_{pedr}$ (5)*(6)*(7)
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)			
Total	0.726	0.094	0.102	0.922	0.019	1.00	0.018
Fatal and injury (FI)	--	--	--	--	--	1.00	0.018

Worksheet 1J -- Vehicle-Bicycle Collisions for Urban and Suburban Roadway Segments								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	Predicted $N_{brmv}$	Predicted $N_{brsv}$	Predicted $N_{brdwy}$	Predicted $N_{br}$	$f_{biker}$ from Table 12-9	CMF for Multi-Use Bike Path from Ped & Safety Toolbox	Calibration factor, $C_r$	Predicted $N_{biker}$ (5)*(6)*(7)*(8)
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)				
Total	0.726	0.094	0.102	0.922	0.005	0.23	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	--	1.00	0.001

<b>Worksheet 1K -- Crash Severity Distribution for Urban and Suburban Roadway Segments</b>			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J	(5) from Worksheet 1D and 1F; and (7) from Worksheet 1H	(6) from Worksheet 1D and 1F; (7) from Worksheet 1H; and (8) from Worksheet 1I and 1J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 1D)	0.163	0.351	0.514
Head-on collisions (from Worksheet 1D)	0.004	0.004	0.008
Angle collisions (from Worksheet 1D)	0.008	0.019	0.027
Sideswipe, same direction (from Worksheet 1D)	0.010	0.118	0.128
Sideswipe, opposite direction (from Worksheet 1D)	0.002	0.001	0.002
Driveway-related collisions (from Worksheet 1H)	0.029	0.073	0.102
Other multiple-vehicle collision (from Worksheet 1D)	0.009	0.038	0.047
Subtotal	0.224	0.604	0.828
<b>SINGLE-VEHICLE</b>			
Collision with animal (from Worksheet 1F)	0.000	0.005	0.005
Collision with fixed object (from Worksheet 1F)	0.009	0.062	0.071
Collision with other object (from Worksheet 1F)	0.000	0.001	0.002
Other single-vehicle collision (from Worksheet 1F)	0.008	0.008	0.017
Collision with pedestrian (from Worksheet 1I)	0.018	0.000	0.018
Collision with bicycle (from Worksheet 1J)	0.001	0.000	0.001
Subtotal	0.036	0.076	0.112
Total	0.261	0.680	0.941

<b>Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments</b>			
(1)	(2)	(3)	(4)
Crash Severity Level	Predicted average crash frequency, $N_{\text{predicted rs}}$ (crashes/year)	Roadway segment length, L (mi)	Crash rate (crashes/mi/year)
	(Total) from Worksheet 1K		(2) / (3)
Total	0.9	0.09	10.5
Fatal and injury (FI)	0.3	0.09	2.9
Property damage only (PDO)	0.7	0.09	7.6

**Alternative #3M**  
**Willow Road 4-10' Lanes with Curbed Median**

**Intersection Analysis**  
**Willow Road at Central Avenue/ Happ Road**

**Alternative: 3 (Modified)**  
**Intersection: Willow Road at Central/Happ**

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		Location Information	
Analyst	R. Jacox	Roadway	Willow Road
Agency or Company	TranSystems	Intersection	at Central/Happ
Date Performed	09/22/11	Jurisdiction	IDOT
		Analysis Year	2040
Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT <sub>major</sub> (veh/day)		--	36,000
AADT <sub>minor</sub> (veh/day)		--	19,000
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C <sub>i</sub>		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected / Permissive
Type of left-turn signal phasing for Leg #2		--	Protected / Permissive
Type of left-turn signal phasing for Leg #3		--	Protected / Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected / Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			133
Maximum number of lanes crossed by a pedestrian (n <sub>lanesx</sub> )		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	6

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	CMF for Advance Street Name Signs
<i>CMF 1i</i>	<i>CMF 2i</i>	<i>CMF 3i</i>	<i>CMF 4i</i>	<i>CMF 5i</i>	<i>CMF 6i</i>	<i>CMF 7i</i>
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	cmfclearinghouse.org
0.66	0.96	0.92	1.00	0.91	1.00	0.98
						(8)
						Combined CMF
						<i>CMF<sub>COMB</sub></i>
						(1)*(2)*(3)*(4)*(5)*(6)*(7)
						0.52

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bimv}$	Proportion of Total Crashes	Adjusted $N_{bimv}$	Combined CMFs	Calibration Factor, $C_i$	Predicted $N_{bimv}$
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL} * (5)$	(7) from Worksheet 2B		$(6) * (7) * (8)$
	a	b	c							
Total	-10.99	1.07	0.23	0.39	12.203	1.000	12.203	0.52	1.00	6.389
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	4.084	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.346	4.217	0.52	1.00	2.208
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.734	$(5)_{TOTAL} - (5)_{FI}$ 0.654	7.986	0.52	1.00	4.181

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted $N_{bimv (FI)}$ (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted $N_{bimv (PDO)}$ (crashes/year)	Predicted $N_{bimv (TOTAL)}$ (crashes/year)
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	2.208	1.000	4.181	6.389
		$(2) * (3)_{FI}$		$(4) * (5)_{PDO}$	$(3) + (5)$
Rear-end collision	0.450	0.994	0.483	2.020	3.013
Head-on collision	0.049	0.108	0.030	0.125	0.234
Angle collision	0.347	0.766	0.244	1.020	1.786
Sideswipe	0.099	0.219	0.032	0.134	0.352
Other multiple-vehicle collision	0.055	0.121	0.211	0.882	1.004

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	SPF Coefficients			Overdispersion Parameter, k	Initial $N_{bisv}$	Proportion of Total Crashes	Adjusted $N_{bisv}$	Combined CMFs	Calibration Factor, $C_i$	Predicted $N_{bisv}$
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL} * (5)$	(7) from Worksheet 2B		$(6) * (7) * (8)$
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.660	1.000	0.660	0.52	1.00	0.345
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.152	$(4)_{FI} / ((4)_{FI} + (4)_{PDO})$ 0.234	0.154	0.52	1.00	0.081
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.500	$(5)_{TOTAL} - (5)_{FI}$ 0.766	0.506	0.52	1.00	0.265

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	Proportion of Collision Type <sub>(FI)</sub>	Predicted N <sub>bisv (FI)</sub> (crashes/year)	Proportion of Collision Type <sub>(PDO)</sub>	Predicted N <sub>bisv (PDO)</sub> (crashes/year)	Predicted N <sub>bisv (TOTAL)</sub> (crashes/year)
	from Table 12-13	(9) <sub>FI</sub> from Worksheet 2E	from Table 12-13	(9) <sub>PDO</sub> from Worksheet 2E	(9) <sub>PDO</sub> from Worksheet 2E
Total	1.000	0.081	1.000	0.265	0.345
		(2)*(3) <sub>FI</sub>		(4)*(5) <sub>PDO</sub>	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.060	0.870	0.230	0.290
Collision with other object	0.072	0.006	0.070	0.019	0.024
Other single-vehicle collision	0.040	0.003	0.023	0.006	0.009
Single-vehicle noncollision	0.141	0.011	0.034	0.009	0.020

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N <sub>bimv</sub>	Predicted N <sub>bisv</sub>	Predicted N <sub>bi</sub>	f <sub>pedi</sub>	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales	CMF for Install Refuge Island	CMF for Replace W/DW Ped Signals	Combined CMF
CMF <sub>1p</sub>	CMF <sub>2p</sub>	CMF <sub>3p</sub>	CMF <sub>4p</sub>	CMF <sub>5p</sub>	
from Table 12-28	from Table 12-29	from Table 12-30	cmfclearinghouse.org	cmfclearinghouse.org	(1)*(2)*(3)*(4)*(5)
2.78	1.00	1.12	0.44	0.75	1.03

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	SPF Coefficients					Overdispersion Parameter, k	N <sub>pedbase</sub>	Combined CMF	Calibration factor, C <sub>i</sub>	Predicted N <sub>pedi</sub>
	from Table 12-14									from Equation 12-29
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.056	1.03	1.00	0.057
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.057

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted $N_{bimv}$	Predicted $N_{bisv}$	Predicted $N_{bi}$	$f_{bikei}$	Calibration factor, $C_i$	Predicted $N_{pedi}$
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	6.389	0.345	6.735	0.015	1.00	0.101
Fatal and injury (FI)	--	--	--	--	1.00	0.101

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
<b>MULTIPLE-VEHICLE</b>			
Rear-end collisions (from Worksheet 2D)	0.994	2.020	3.013
Head-on collisions (from Worksheet 2D)	0.108	0.125	0.234
Angle collisions (from Worksheet 2D)	0.766	1.020	1.786
Sideswipe (from Worksheet 2D)	0.219	0.134	0.352
Other multiple-vehicle collision (from Worksheet 2D)	0.121	0.882	1.004
Subtotal	2.208	4.181	6.389
<b>SINGLE-VEHICLE</b>			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.060	0.230	0.290
Collision with other object (from Worksheet 2F)	0.006	0.019	0.024
Other single-vehicle collision (from Worksheet 2F)	0.003	0.006	0.009
Single-vehicle noncollision (from Worksheet 2F)	0.011	0.009	0.020
Collision with pedestrian (from Worksheet 2G or 2I)	0.057	0.000	0.057
Collision with bicycle (from Worksheet 2J)	0.101	0.000	0.101
Subtotal	0.239	0.265	0.504
Total	2.447	4.446	6.893

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	redicted average crash frequency, $N_{predicted int}$ (crashes/ye
Fatal and injury (FI)	2.4
Property damage only (PDO)	4.4