Wakarusa & Inverness/Legends

Intersection Control

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City of Lawrence

Roundabout at Wakarusa & Inverness/Legends

- Wakarusa & Inverness/Legends Intersection
- Roundabout Safety
- IIHS National Study
- Kansas Roundabout Study
- Golden Colorado Roundabouts
- Intersection of Wakarusa & Inverness/Legends
- How to use a multi-lane roundabout
- Public Acceptance
- Environmental Impacts
- Topeka
- Lawrence Roundabout Crash Data

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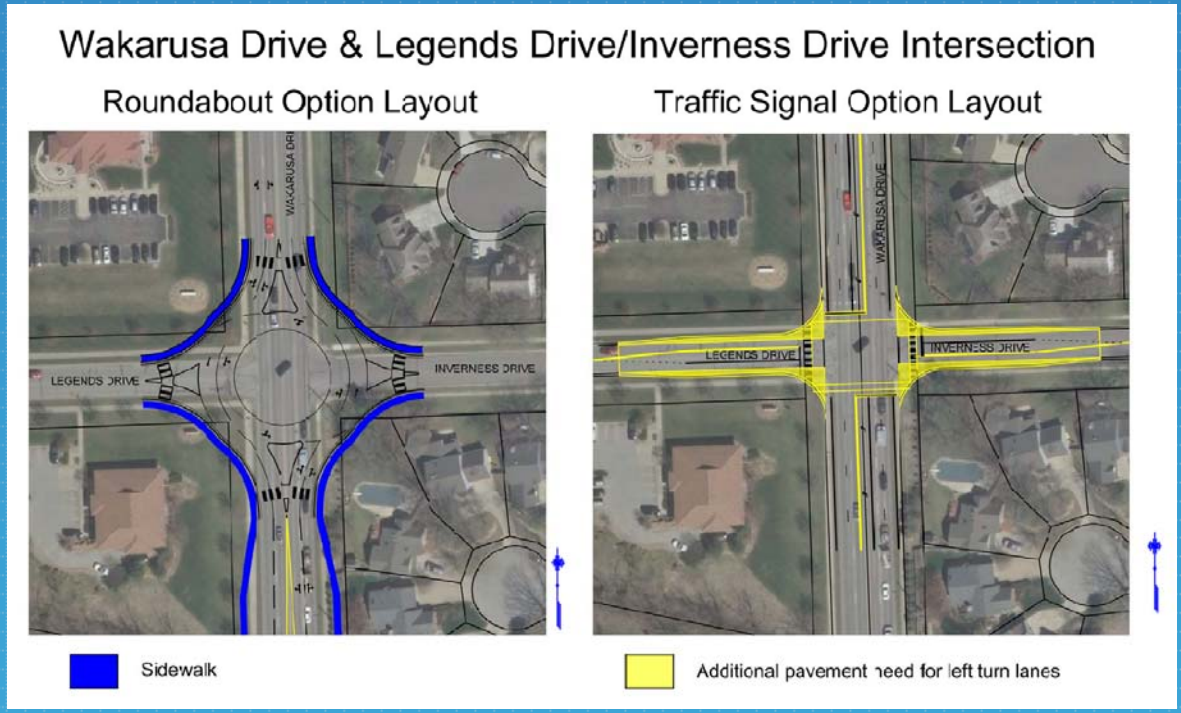
Wakarusa & Inverness/Legends Intersection

- Three options for the Wakarusa Drive & Inverness/Legends Intersection include a roundabout, traffic signal, or a four-way stop
- City staff is recommending a Roundabout
- Wakarusa speed study shows 85th percentile speed of 46 mph
- Kasold, north of Peterson speed study shows similar speeds



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Roundabout Safety for Vehicles

- Fewer conflict points
- High-severity conflicts of right angle and left-turn head-on crashes greatly reduced
- Low speeds allow drivers more time to react to potential conflicts
- Low speeds reduce crash severity
- Road users travel at similar speeds

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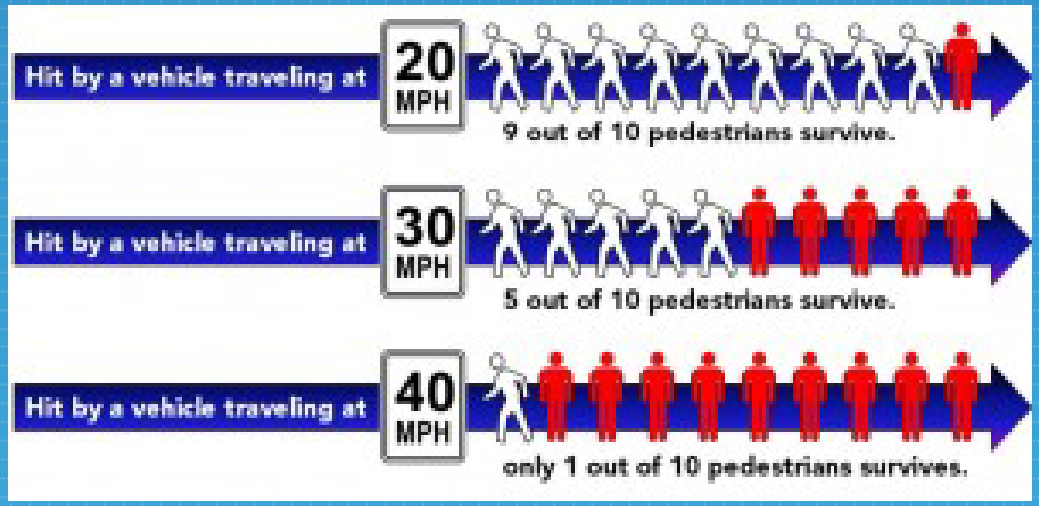
Roundabout Safety for Pedestrians

- Pedestrians only cross one direction of traffic at a time
- Pedestrians vehicle conflict points are reduced
- Low speeds reduce injury chances
- Low speeds increase driver reaction time
- Bike users can use bicycles as vehicles in the roundabout or exit bike lane onto sidewalk and use as a pedestrian



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Insurance Institute for Highway Safety Study

- The Insurance Institute for Highway Safety (IIHS) conducted a comprehensive study of crashes at 24 intersections before and after construction of roundabouts in 2001
- 39% overall decrease in crashes
- 76% decrease in injury crashes
- 90% decrease in fatal or incapacitating injuries

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

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K-DOT Kansas Roundabout Study

- Operational Performance of Kansas Roundabouts Study
- 11 Kansas roundabouts including Harvard/Monterey Way
- Before conditions include two-way and four-way stops and signals
- Average Intersection Delay went from 20 seconds to 8 seconds
- Percent of Vehicles Stopped went from 58% to 29%

TABLE A-1: Kansas Average Results Table [1]

Measures of Effectiveness	Before [2]	R.A [3]	% Diff.	Stat. Diff [4]
Average Intersection Delay (Sec/veh)	20.2	8.0	-65%	Yes
Maximum Approach Delay (Sec/veh)	34.4	10.4	-71%	Yes
95% Queue Length (Feet)	190	104	-44%	Yes
Degree of Saturation (V/C) Intersection	0.463	0.223	-53%	Yes
Proportion of vehicles Stopped (%) Intersection	58	29	-52%	Yes
Max. Proportion of vehicles Stopped (%) Approach	62	37	-42%	Yes

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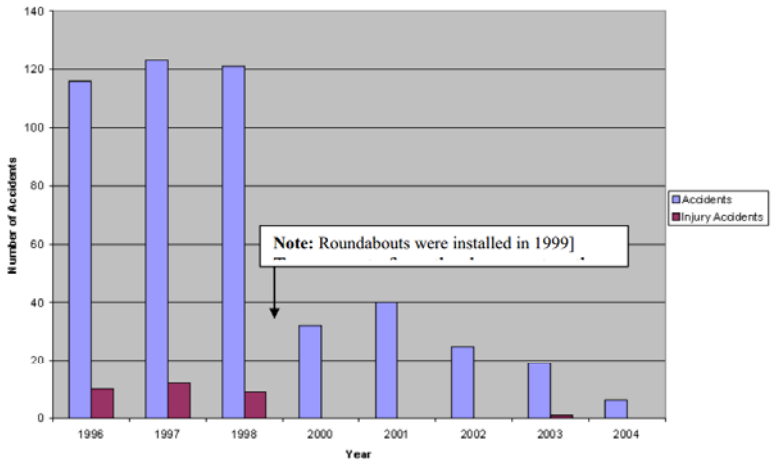
Golden, Colorado Case Study

- Previous condition had 2 signals with a travel time of 78 seconds
- Third proposed signal would of increased travel time to 103 seconds
- Roundabouts were installed now the corridor has a travel time of 68 seconds
- Average delay entering or exiting businesses went from 28 seconds to 13 seconds
- 85th percentile speed reduced from 47mph to 33 mph
- Accidents in the corridor were reduced from 120 per year to 25 per year
- Injury accidents in the corridor were reduced from 10 to less then 1 per year

(Source: Ariniello 2004)
FIGURE 2.1
Roundabout Corridor in Golden, Colorado, on South Golden Road

Figure 2.5 shows the before and after roundabouts accident history.



(Source: Ariniello 2004)

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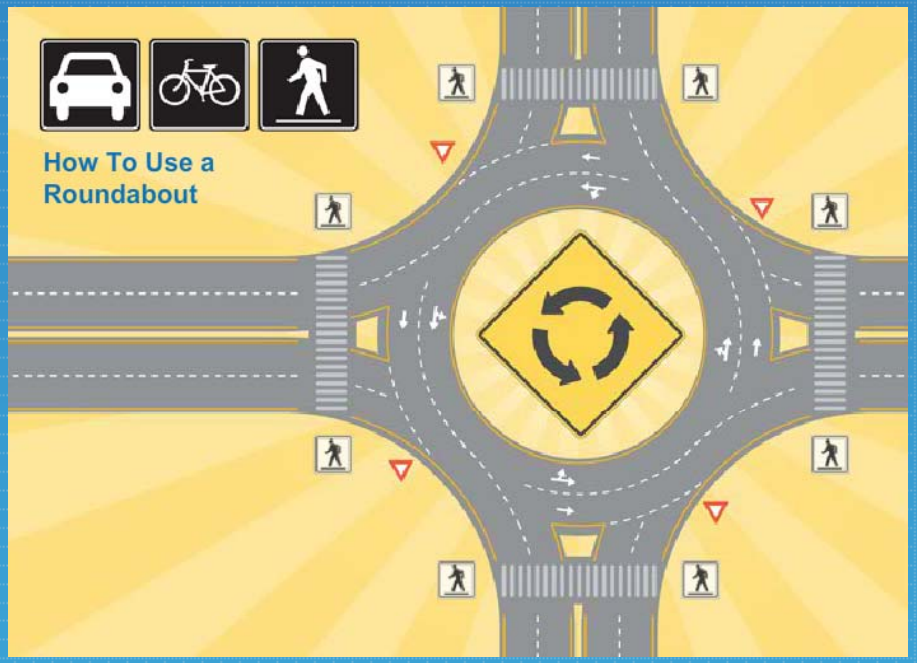
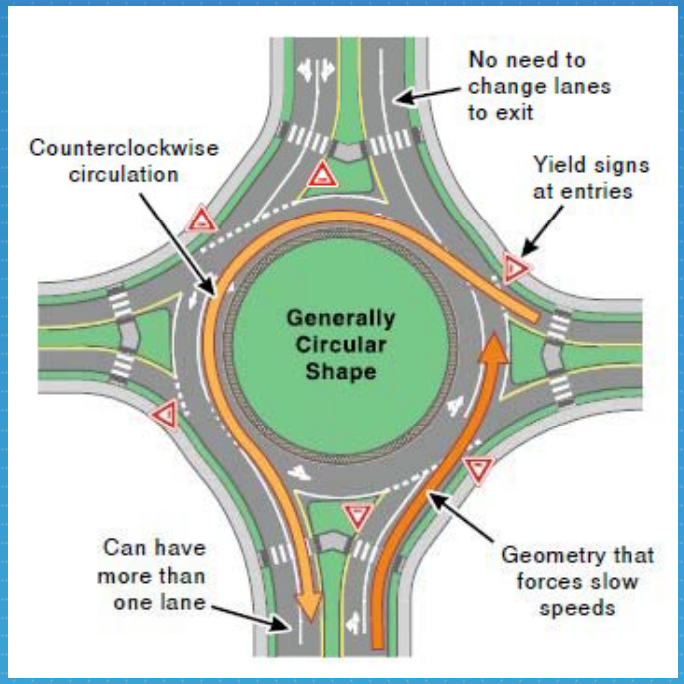
Roundabout How to Drive

- Reduce speed and choose a lane
- Yield to pedestrians and traffic to your left
- Follow lane to exit





http://www.th.gov.bc.ca/roundabouts/index.html

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Insurance Institute for Highway Safety Acceptance Study

- Compare before and after public opinion where roundabouts had been installed
- The “strongly favor” category doubled from 16% to 32%
- The "somewhat favor” category doubled from 15% to 31%
- The “strongly oppose” category went from 41% to 15%.

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Insurance Institute for Highway Safety Acceptance Study

- Compare before and after public opinion on two lane roundabout in Washington (State)
- The “strongly favor” category went from 19% to 37%
- The "somewhat favor” category doubled from 16 to 33%
- The “strongly oppose” category went from 42% to 17%.

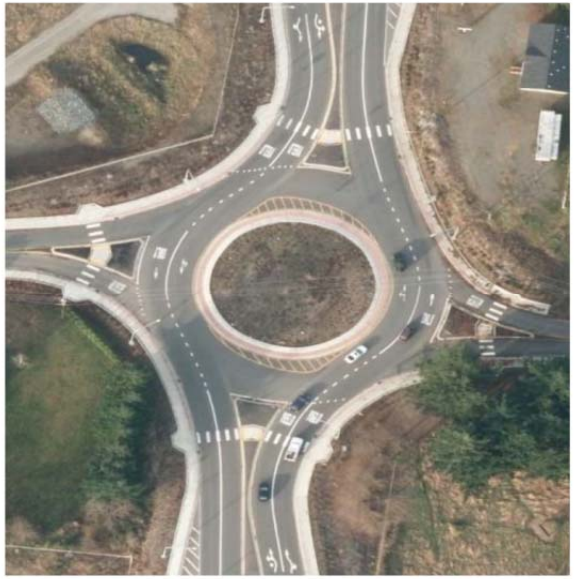

Figure 1. Guide Meridian-Wiser Lake Road Roundabout

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Insurance Institute for Highway Safety Environmental Study

- Compare environmental impact of a roundabout and signalized intersection
- A roundabout uses 34% less fuel consumption then a signalized intersection
- A roundabout produces 34 % less carbon dioxide then a signalized intersection
- A roundabout produces 40 % less hydrocarbons then a signalized intersection
- A roundabout produces 45 % less carbon monoxide then a signalized intersection
- A roundabout produces 44 % less nitrogen oxide then a signalized intersection

TABLE 1 Results of Models of Traffic Performance and Environmental Measures Before and After the Construction of Roundabouts at the Guide Meridian-Pole Road Intersection

		Models with traffic volumes after roundabout construction			
	Scenario 1: Before period	Scenario 2: Intersection before construction	Scenario 3: Hypothetical signalized intersection with expanded travel lanes[1]	Scenario 4: Roundabout	Percent change: roundabout vs. hypothetical modified intersection
Traffic Operations					
Degree of saturation (vehicle-to-capacity-ratio)	0.52	0.50	0.33	0.34	3
Average intersection control delay (sec)	13.1	12.5	6.4	7.8	22
Maximum control delay (sec)	28.4	27.0	16.2	10.9	-33
95% queue length (ft), worst lane	393.6	370.2	89.1	32.3	-64
Proportion queued (%)	60.0	58.1	53.6	34.7	-35
Intersection level of service	B	B	A	A	--
Level of service, worst approach	C	C	B	B	--
Fuel Consumption and Emissions					
Fuel consumption (gal/hr)	35.9	35.6	34.4	22.8	-34
Carbon dioxide (kg/hr)	340.2	337.9	326.2	216.2	-34
Hydrocarbons (kg/hr)	0.5	0.5	0.5	0.3	-40
Carbon monoxide (kg/hr)	26.3	26.4	25.5	14.1	-45
Nitrogen oxide (kg/hr)	0.9	0.9	0.9	0.5	-44

[1]Hypothetical signalized intersection: On Guide Meridian Road approaches, right lane (through and right turn), middle lane (through), short exclusive left-turn lane, optimized two-phase signal timing with permitted left turn.

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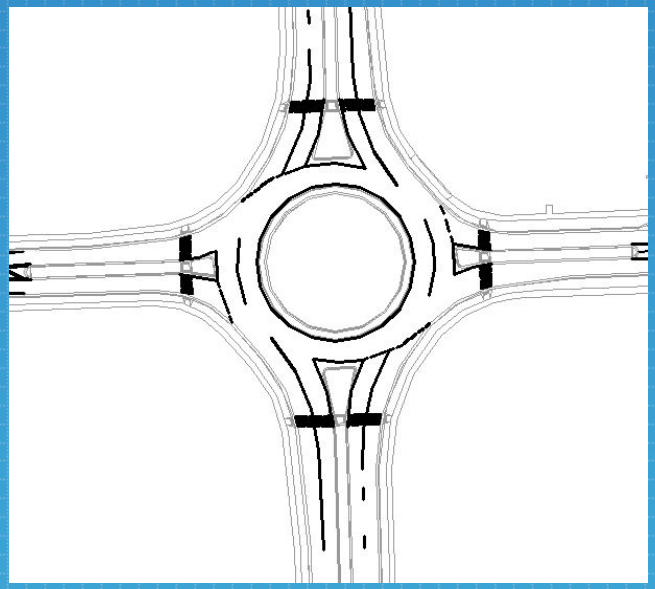
Roundabout Crash History in Topeka

- Topeka 37th & Wanamaker Road
- Average 2 crashes per year before roundabout
- Average 2 crashes per year after roundabout
- No injury accidents after roundabout



Year	Read End	Right Angle	Path Overlap*	Fail to Yield	Loss of Control	Total
2002		2(Ix2)		1		3
2003						0
2004				3		3
2005						0
2006				1	1	2
2006	Construction Year					
2007	1		1	2		4
2008				2		2
2009	1		1	2		4
2010						0
2011	1		1			2
2012				1		1
2013				3		3

*Includes roundabout lane change and exit overlap accidents

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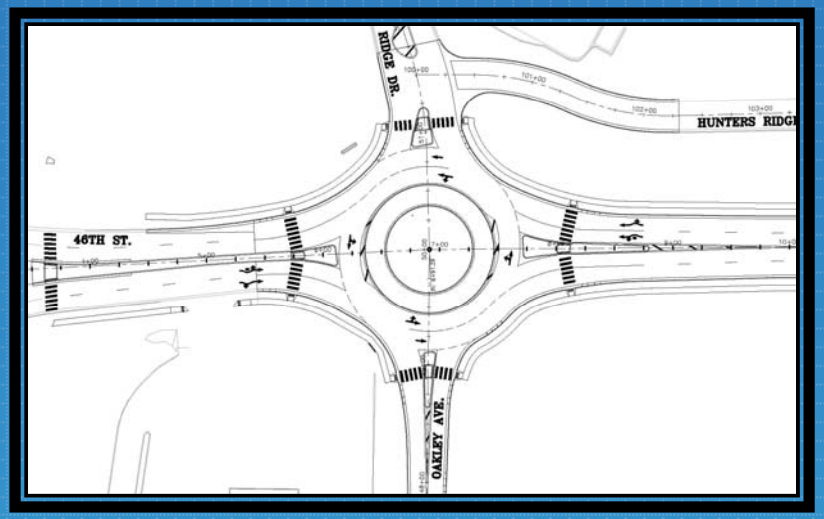
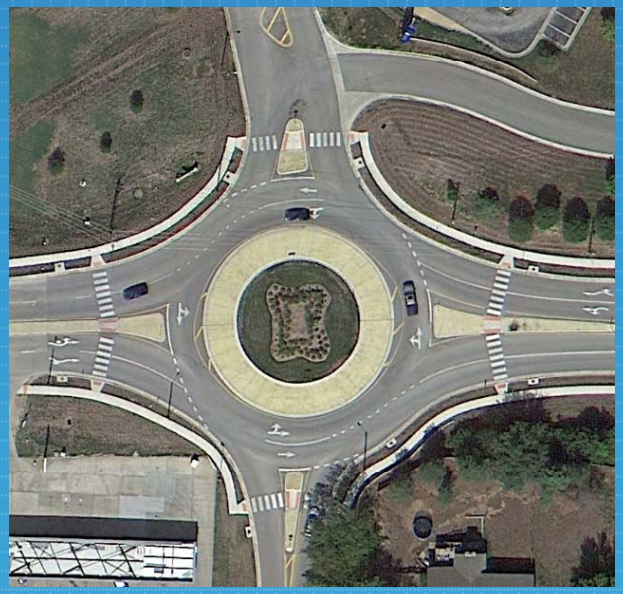
Roundabout Crash History in Topeka

- Shawnee County 46th & Hunters Ridge
- Average 2 crashes per year before roundabout
- Average 2 crashes per year after roundabout
- No injury accidents after roundabout





Year	Read End	Right Angle	Path Overlap*	Fail to Yield	Loss of Control	Total
2003		6(Ix2)				6
2004	2	2				4
2005	3	1				1
2006		1				1
2007		1		1		2
2008		2				2
2009	2	1 (I)	1	1		1
2010	Contstruction Year					
2011			2		1	3

*Includes roundabout lane change and exit overlap accidents

Intersection is outside of City Limits

No data was avalible from Shawnee County for years 2012 & 2013

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Lawrence Roundabout Crash History

- 18 total crashes on Lawrence roundabouts from 2011 to 2013
- 17 of the 18 were property damage only
- The injury accident involved a motorcycle that skidded and lost control and suffered minor injuries amounting to scrapes and bruises

Lawrence Roundabouts Crash History

Location	2013		2012		2011	
	PDO	Injury	PDO	Injury	PDO	Injury
19th Street & Barker Avenue	2	0	1	0	0	0
24th Place & CrossgateDrive	2	0	1	0	0	0
24th Place & Inverness Drive	0	0	0	0	1	0
25th Terrace & O'Connell Road	0	0	0	0	0	0
28th Street & O'Connell Road	0	0	1	0	0	0
Bauer Farm Drive & Champion Lane	0	0	0	0	0	0
Clinton Parkway & Lake Pointe Drive	0	0	0	1	1	0
Congressional Drive & Overland Drive	0	0	0	0	0	0
Fall Creek Road & Running Ridge Road	0	0	0	0	0	0
Folks Road/Grove Drive & Harvard Road	0	0	0	0	0	0
George Williams Way & Harvard Road	2	0	0	0	1	0
Goldfield Street & Harvard Road	0	0	1	0	0	0
Grand Vista Drive & Kasold Drive	0	0	0	0	0	0
Harvard Road & Monterey Way	1	0	0	0	0	0
Inverness Drive & Sunflower Park Place	0	0	0	0	0	0
Monterey Way & Peterson Road	2	0	1	0	0	0
Overland Drive & Stone Ridge Drive	0	0	0	0	0	0
Tillerman Drive & Kasold Drive	0	0	0	0	0	0
TOTALS	9	0	5	1	3	0

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Lawrence Roundabout Crash History

- Of the 18 crashes 9 were single vehicle and 9 were two vehicles
- Of the 18 crashes there were 7 merging, 2 struck central island, 2 rear-end, 5 left roadway, 1 struck curb, and one slid on sand

Date	Severity			No. of Vehicles		Description					
	PD	I	F	1	2	merging	struck central island	rear-end	left roadway	struck curb	slid on sand
4-Feb-11	1				1	1					
24-Jun-11	1			1			1				
5-Dec-11	1			1			1				
18-Jan-12	1				1	1					
25-Jan-12	1				1			1			
17-May-12		1		1					1		
13-Jul-12	1				1	1					
25-Sep-12	1			1					1		
16-Dec-12	1			1					1		
8-Jan-13	1				1			1			
30-Jan-13	1			1						1	
19-Apr-13	1			1							1
13-Jun-13	1			1					1		
19-Jun-13	1				1	1					
23-Jul-13	1				1	1					
10-Sep-13	1				1	1					
12-Sep-13	1				1	1					
30-Sep-13	1			1					1		
Totals	17	1	0	9	9	7	2	2	5	1	1

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Questions?