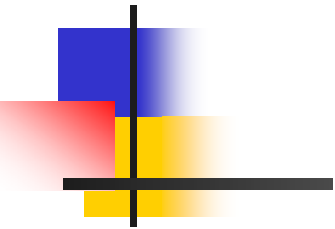# Simulated Capacity of Roundabouts and Impact of Roundabout Within a Progressed Signalized Road

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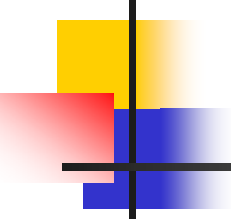
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Overview

- Roundabout Analysis – Empirical and Analytical Approaches

- Simulation Approach

- Simulation of Single Lane and Dual Lane Roundabouts

- Comparison of the Capacity Estimates –RODEL, aaSIDRA, VISSIM, and Field Data

- Impact of Signalized Intersection Proximity to Roundabouts

- Conclusions and Future Research

Roundabout Analysis – Empirical, Analytical, and Simulation Approaches

- Empirical – e.g.: RODEL

- Analytical - e.g.: aaSIDRA

- Simulation - e.g.: VISSIM

Simulation of Single Lane and Dual Lane Roundabouts

- Geometry of modeled Roundabouts
- VISSIM Priority Rules
    - Definition
    - Set Priority rules for Single Lane Roundabout
    - Set Priority rules for Dual Lane Roundabout

Comparison of the Capacity Estimates – RODEL, aaSIDRA, VISSIM, and Field Data

- Definition of Capacity (video1) (video 2)

- Single Lane Roundabout Capacity Estimates

- Dual Lane Roundabout Capacity Estimates

- Comparison of VISSIM and Field Data
  - Single Lane
  - Dual Lane

Impact of Signalized Intersection Proximity to Roundabouts

- <u>Arterial section studied</u>
  - Three coordinated Signalized Intersections
  - Second signal replaced by a dual lane roundabout (<u>video</u>)

- Comparison of Performance with and without roundabout
  - <u>Three cases Analyzed</u> - Case 1(High Flows), Case 2 (Medium Flows), Case 3 (Low Flows)

Conclusions and Future Research

- Simulated capacities of Single-lane roundabouts are noticeably lower than RODEL and aaSIDRA, however, they are comparable to fitted U.S field capacity data.

- Similarly, capacities of dual-lane roundabouts as simulated by VISSIM are significantly lower than RODEL and aaSIDRA, and are comparable to U.S field capacity data for a certain fitted regression.

- A roundabout placed within a signalized, coordinated arterial placed quarter mile from adjacent signals showed comparable delays to a fully signalized arterial. This finding is true when the roundabout is operating at or below capacity.
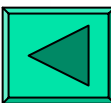
Thank you

Questions?
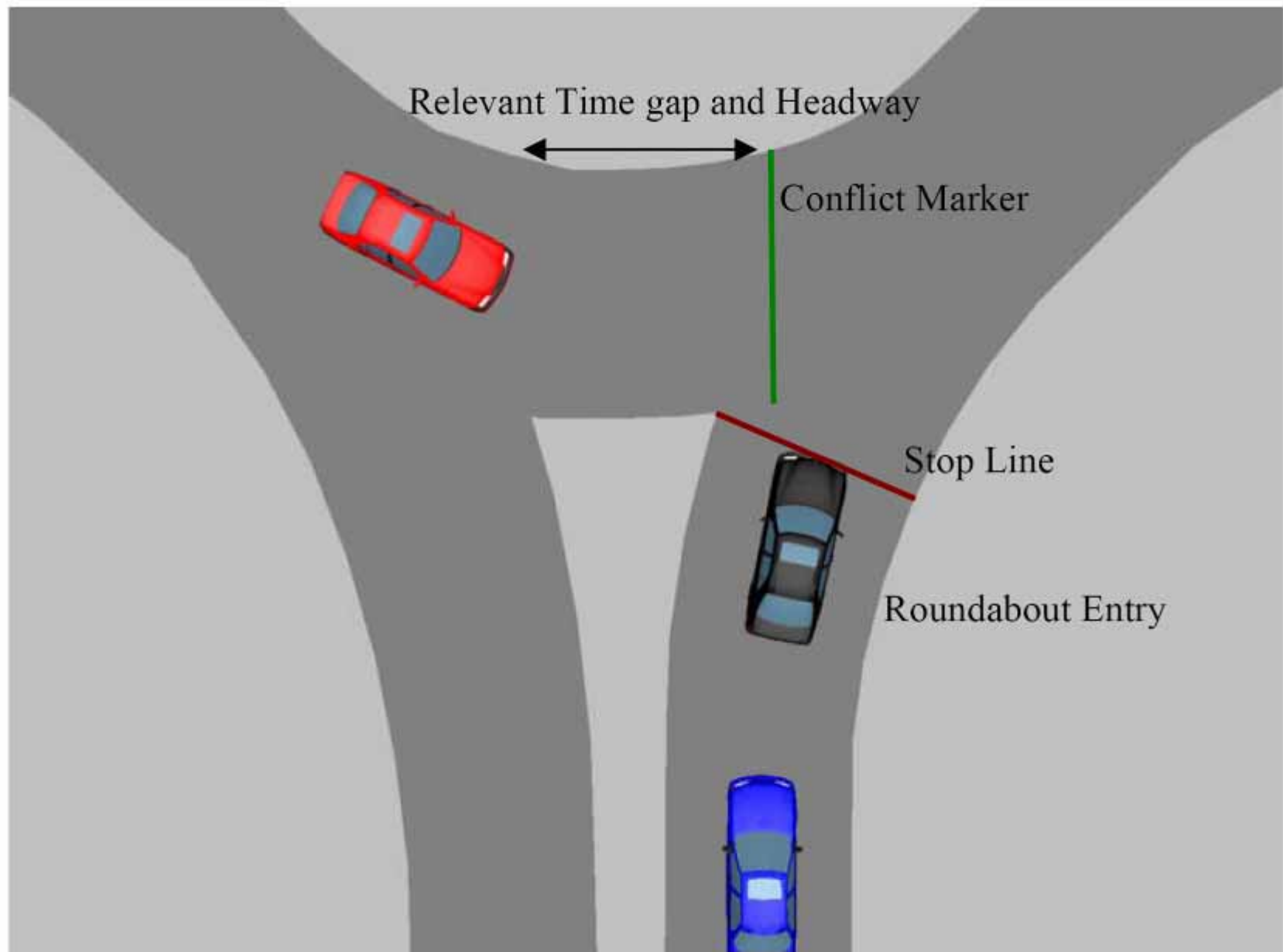
FIGURE 2 Definition of Priority Rules.

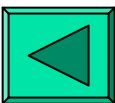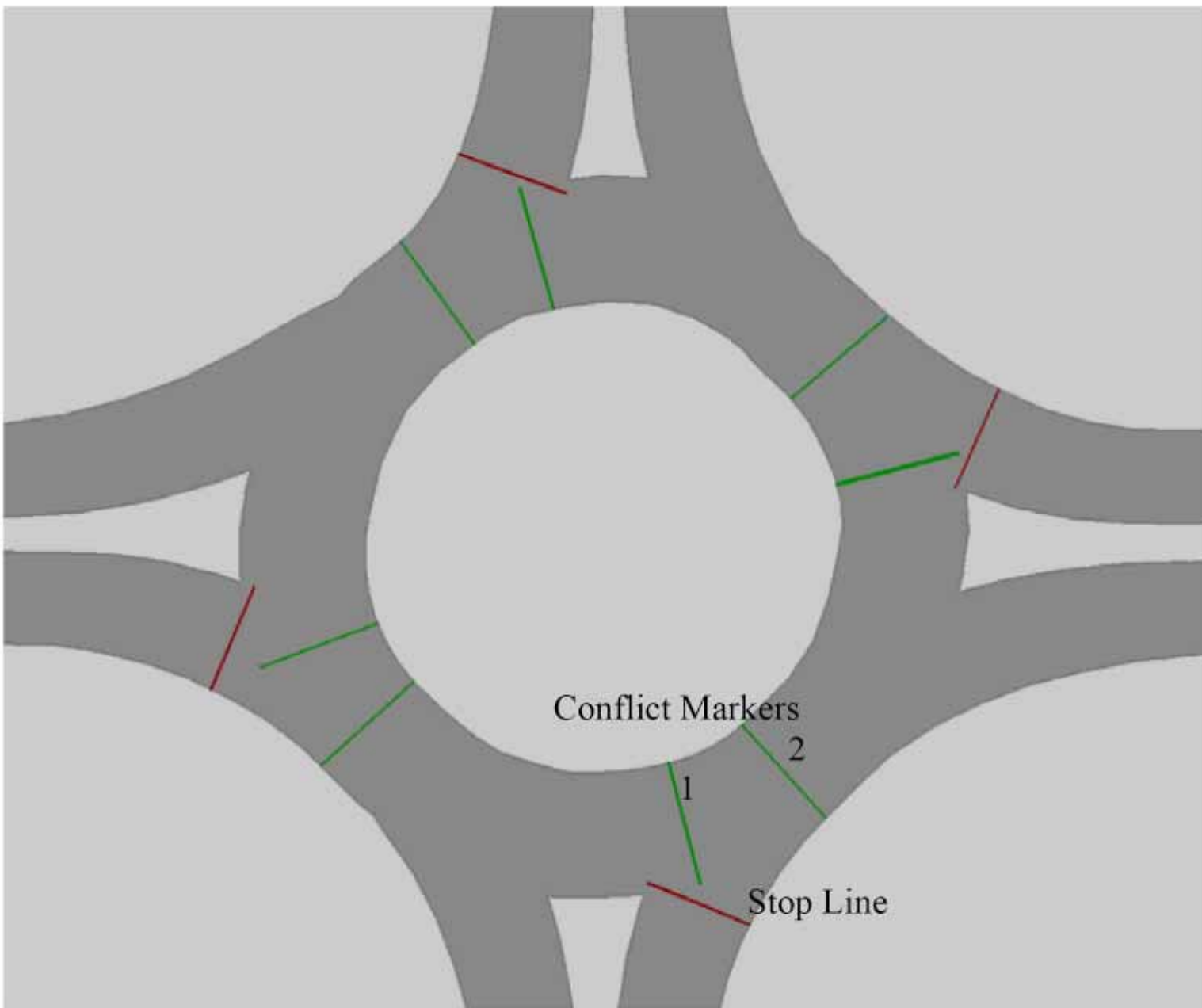Conflict Markers
2

1

Stop Line

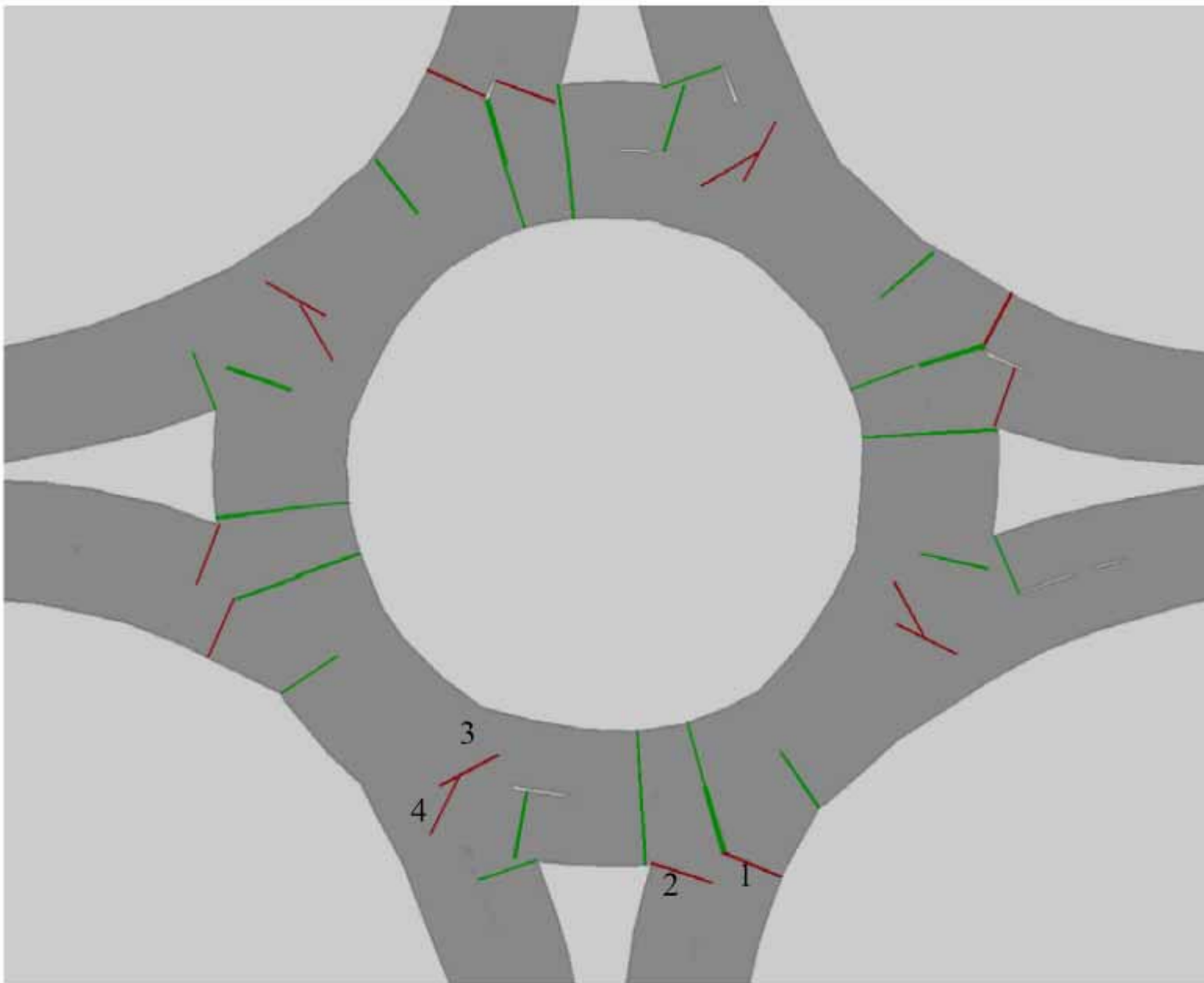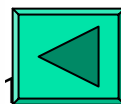**FIGURE 3 Single Lane Roundabout – Priority rules in VISSIM.**

FIGURE 4 Dual Lane Roundabout – Priority rules in VISSIM.

TABLE 1 Geometry of the modeled roundabouts

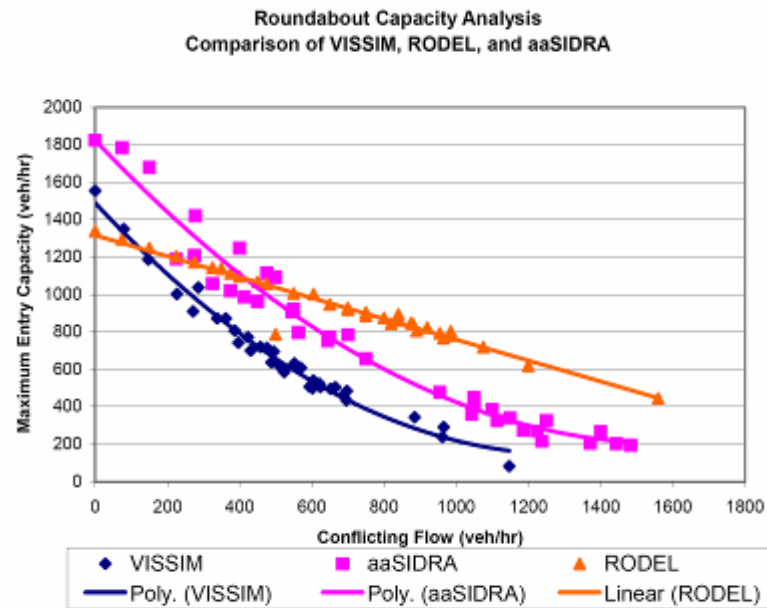|	Single Lane	Dual Lane
Inscribed circle diameter	35m	55m
Entry radius	20m	40m
Exit radius	20m	40m
Entry width	4.5m	8.5m
Approach width	4m	7.3m
Departure width	4m	7.3m
Exit width	4.5m	8.5m
Circulatory road width	6m	9.5m

FIGURE 5 Single Lane Roundabout Capacity Analysis.
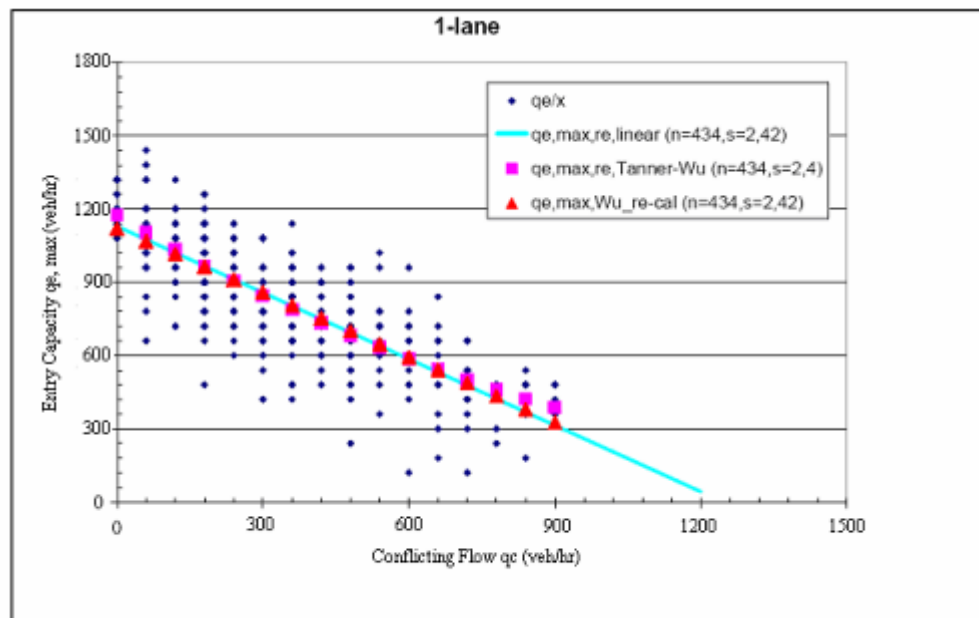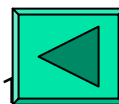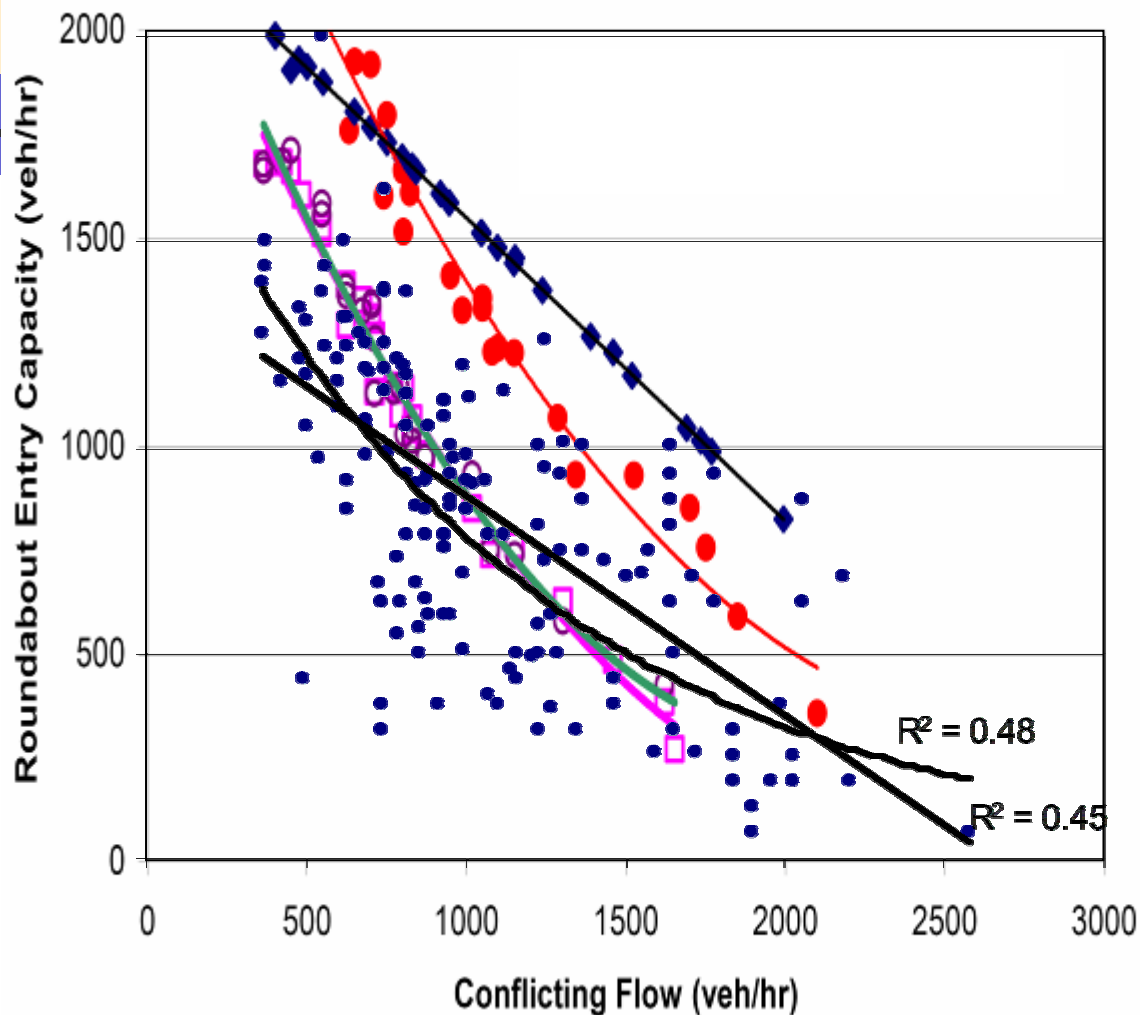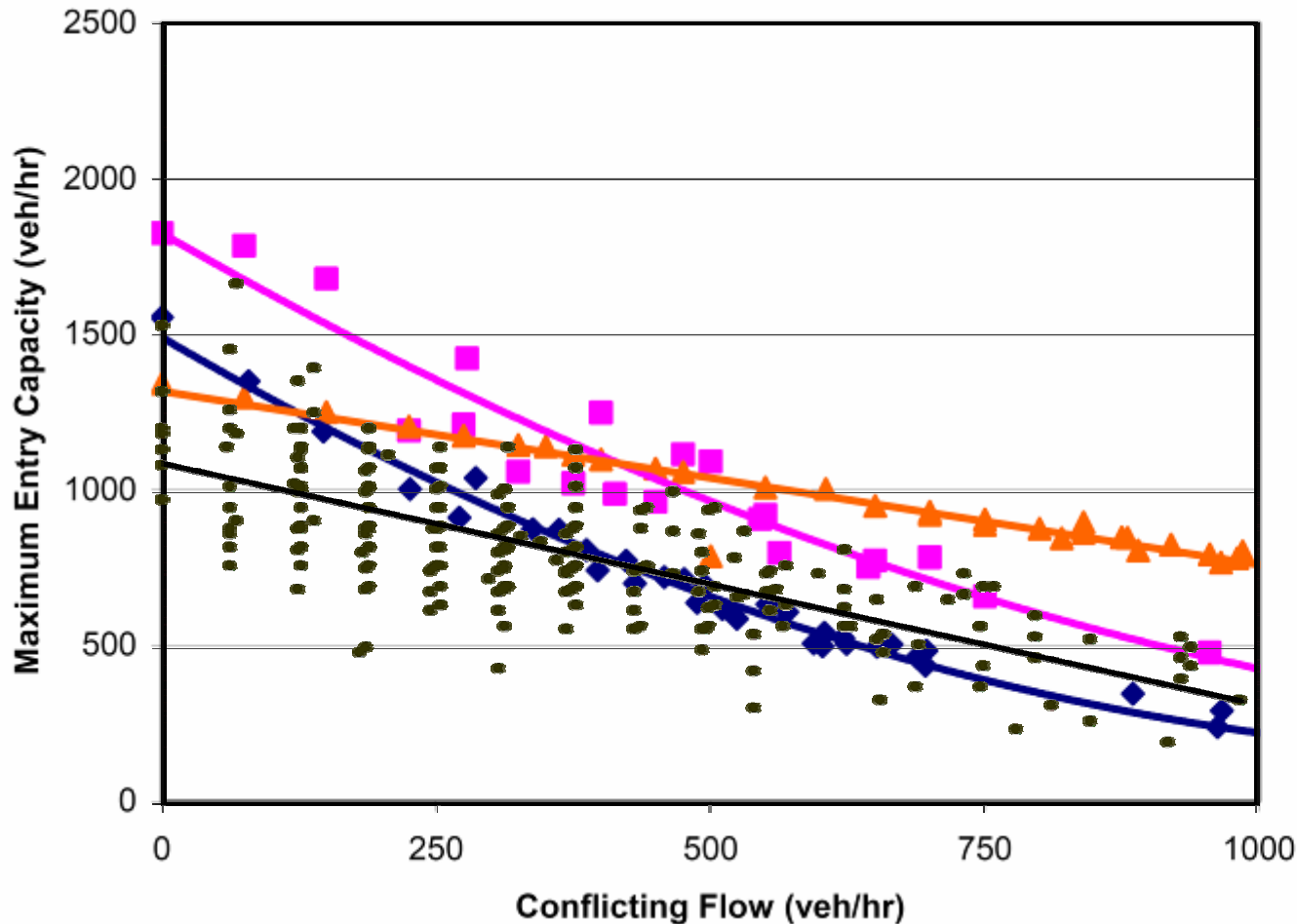

FIGURE 7 Single Lane Roundabout – Real data (6).

Dual Lane Roundabout Plots

Single Lane Roundabout Plots

National Roundabout Conference 2005 DRAFT

Dual Lane Roundabout-Real data plots

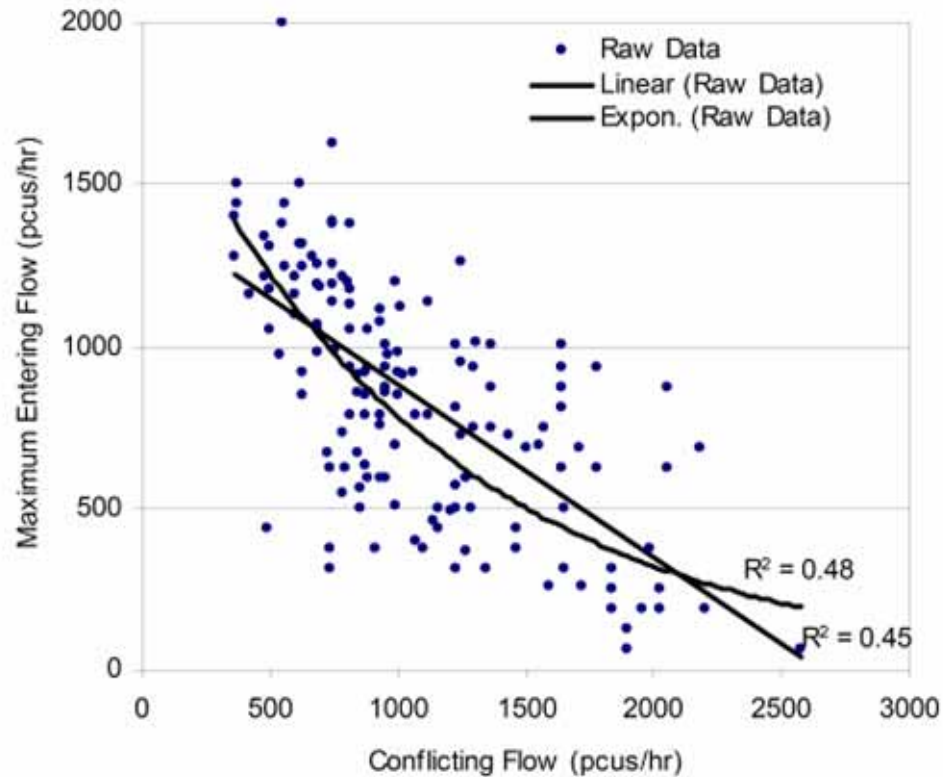Figure 114: Multi-Lane Data Regression

Single Lane Roundabout-Real data plots

Figure 106: Single-Lane Data Regression
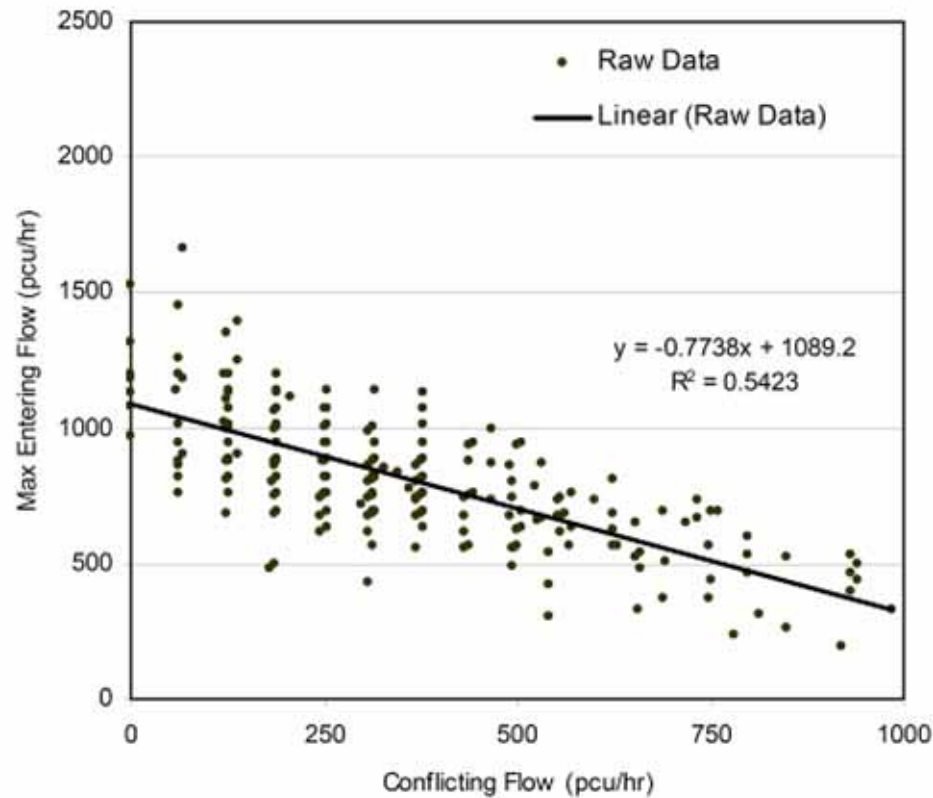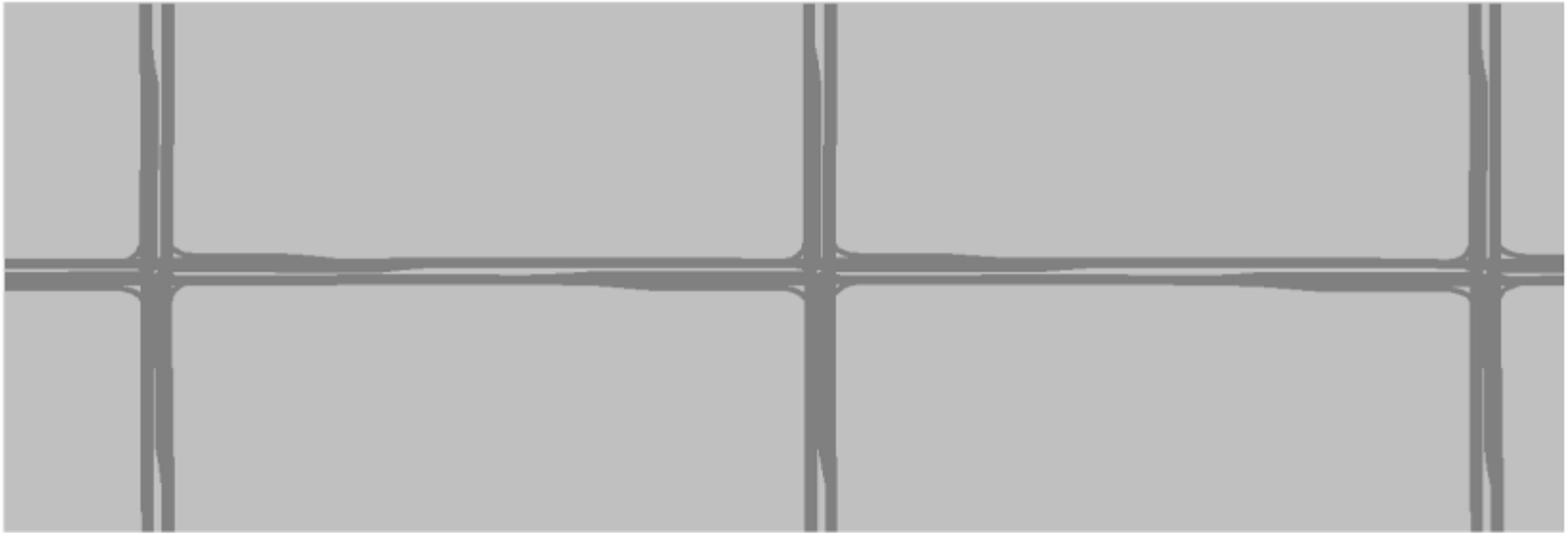
$y = -0.7738x + 1089.2$
$R^2 = 0.5423$

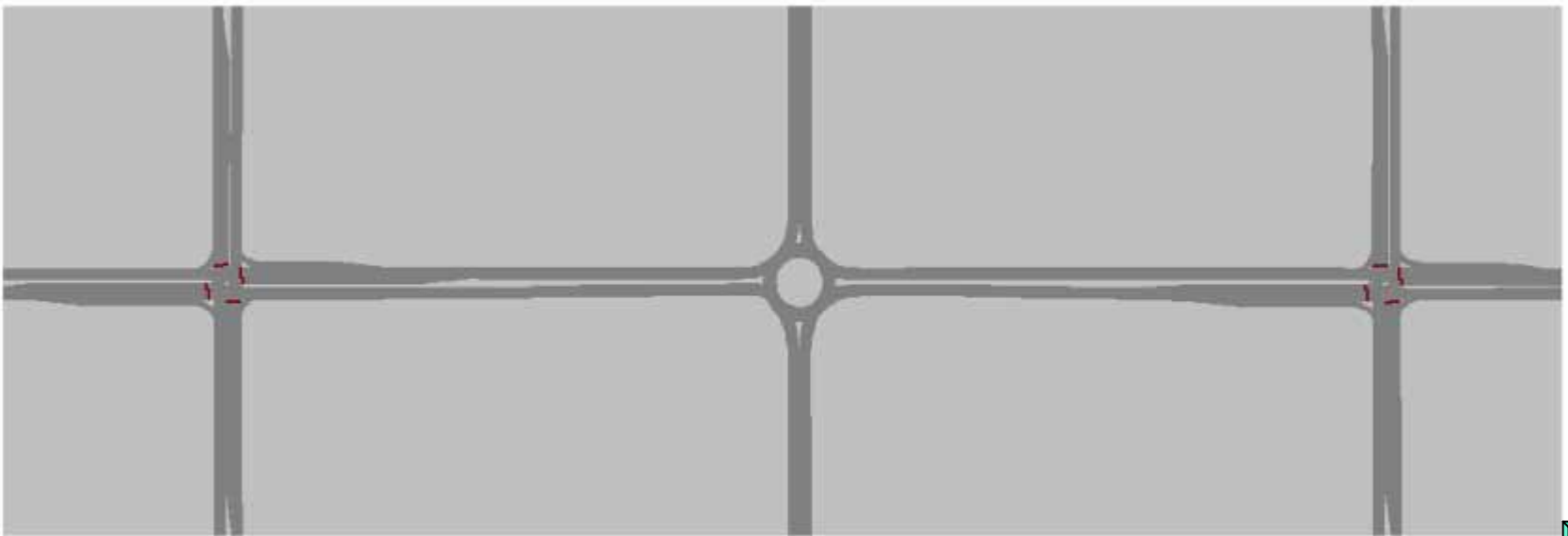**FIGURE 9 VISSIM screenshot of three coordinated signalized intersections.**

FIGURE 10 Second signal replaced by a roundabout.

TABLE 3 Single lane roundabout - Comparison of VISSIM results with Real Data

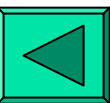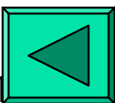| Observation No.	Conflicting Flow (veh/hr)	Maximum Entry Flow (veh/hr)	
		Real Data (veh/hr)	VISSIM (veh/hr)
1	120	1020	1250
2	300	852	930
3	480	690	700
4	600	588	550
5	720	480	400
6	900	312	290

TABLE 4 Dual lane roundabout - Comparison of VISSIM results with Real Data

Observation No.	Conflicting Flow (veh/hr)	Maximum Entry Flow (veh/hr)	
		Real Data (veh/hr)	VISSIM (veh/hr)
1	300	1620	1800
2	600	1290	1350
3	900	990	1000
4	1200	750	700
5	1500	552	450
6	1800	372	300

TABLE 6 Comparison of traffic performance

	Average Delay (sec/veh)		Average Queue (ft)	
	VISSIM-Signalized Intersection	VISSIM-Roundabout	VISSIM-Signalized Intersection	VISSIM-Roundabout
CASE 1	35	42	53	72
CASE 2	28	24	18	15
CASE 3	27	25	28	23