

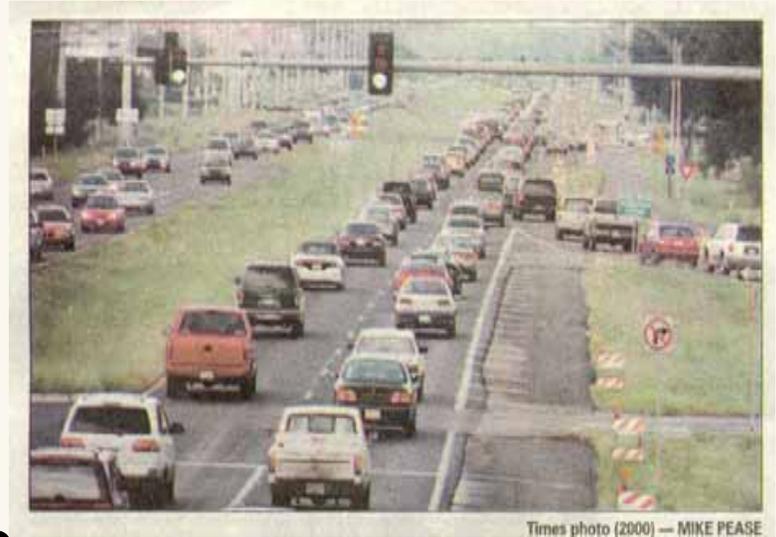
# Benefits/Costs of Access Control Near Interchanges

Waddah Farah  
Florida Department of Transportation

Larry Hagen, Kristine Williams, and Huaguo Zhou  
Center for Urban Transportation Research  
University of South Florida

# Problem Statement

- Access connections near an interchange off-ramp can cause safety and operational problems
- Is it cost-effective to control access by acquiring more LA ROW?



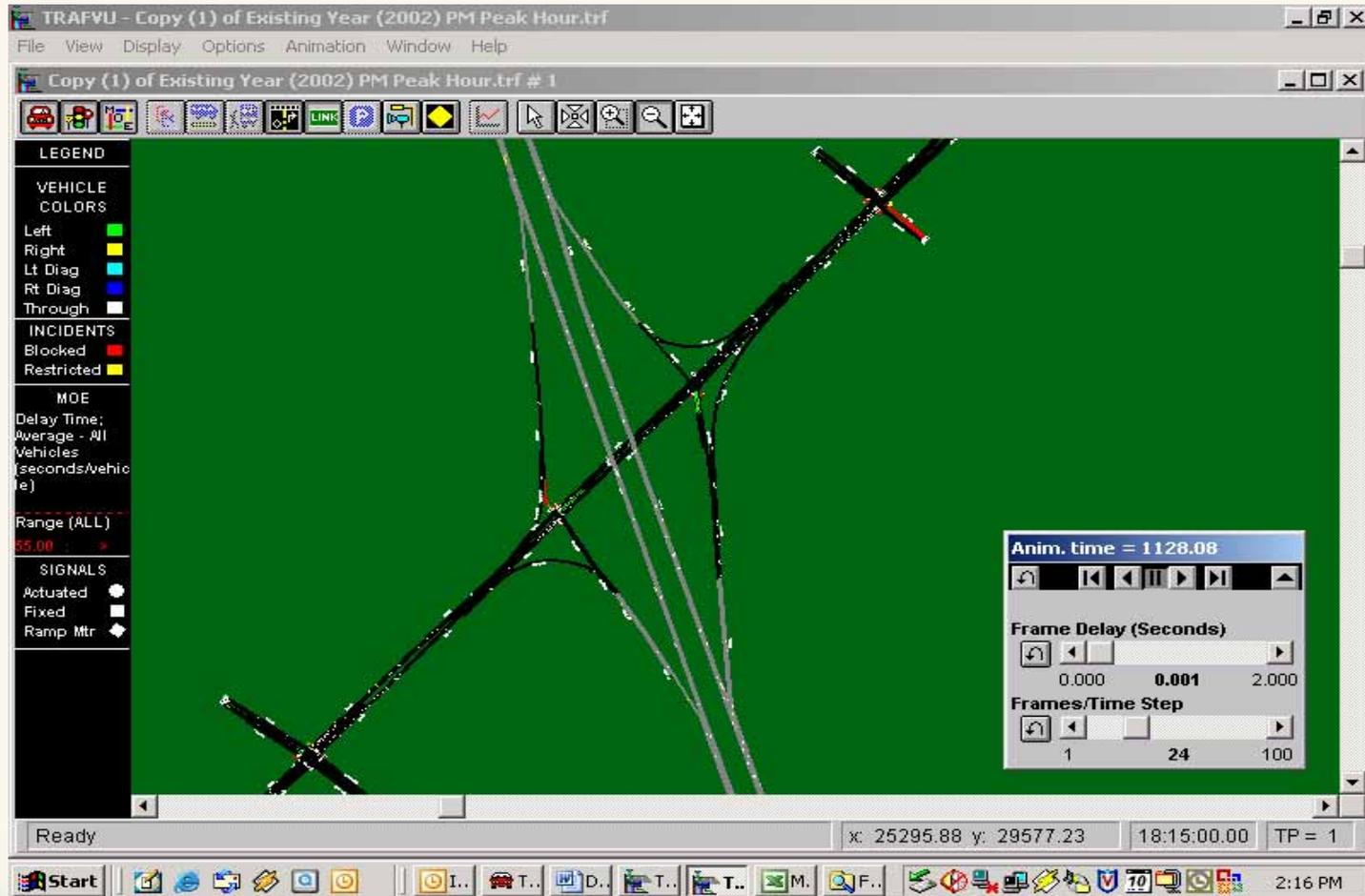
# Background

- Interchanges attract development
  - Seldom any coordinated plan
- FDOT has no control over land-use
- Current practice is to acquire 100 ft of LA ROW in urban areas, 300 ft in rural areas
- ROW costs are prohibitive in developed interchange areas

# Methodology

- Operational Analysis
  - Extend the operational life of interchange
  - Delay savings by increasing the length of access controlled frontage
- Safety Analysis
  - Effects of access spacing on crash frequency
- B/C Analysis
  - Computing B/C ratio for three scenarios

# Original Interchange Model



# Operational Analysis (Corsim)

- Modify the existing interchange configuration to an average urban diamond design
- Simulate the operational impacts of 200 feet access spacing
- Continue to simulate the impacts of access spacing at 200-foot increments

# New Simulation Model

The screenshot displays the TRAFVU simulation software interface. The main window is titled "2004 PM Peak\_400 ft.TRF # 1". The interface includes a menu bar (File, View, Display, Options, Animation, Window, Help), a toolbar with various icons, and a central map area showing a road network. A path is highlighted in yellow and orange on the map. On the left side, there is a legend panel with the following sections:

- VEHICLE COLORS**
  - Left: Green
  - Right: Yellow
  - Lt Diag: Cyan
  - Rt Diag: Blue
  - Through: White
- INCIDENTS**
  - Blocked: Red
  - Restricted: Yellow
- SIGNALS**
  - Actuated: White circle with a dot
  - Fixed: White square
  - Ramp Mtr: White diamond

On the right side, there is an animation control panel with the following settings:

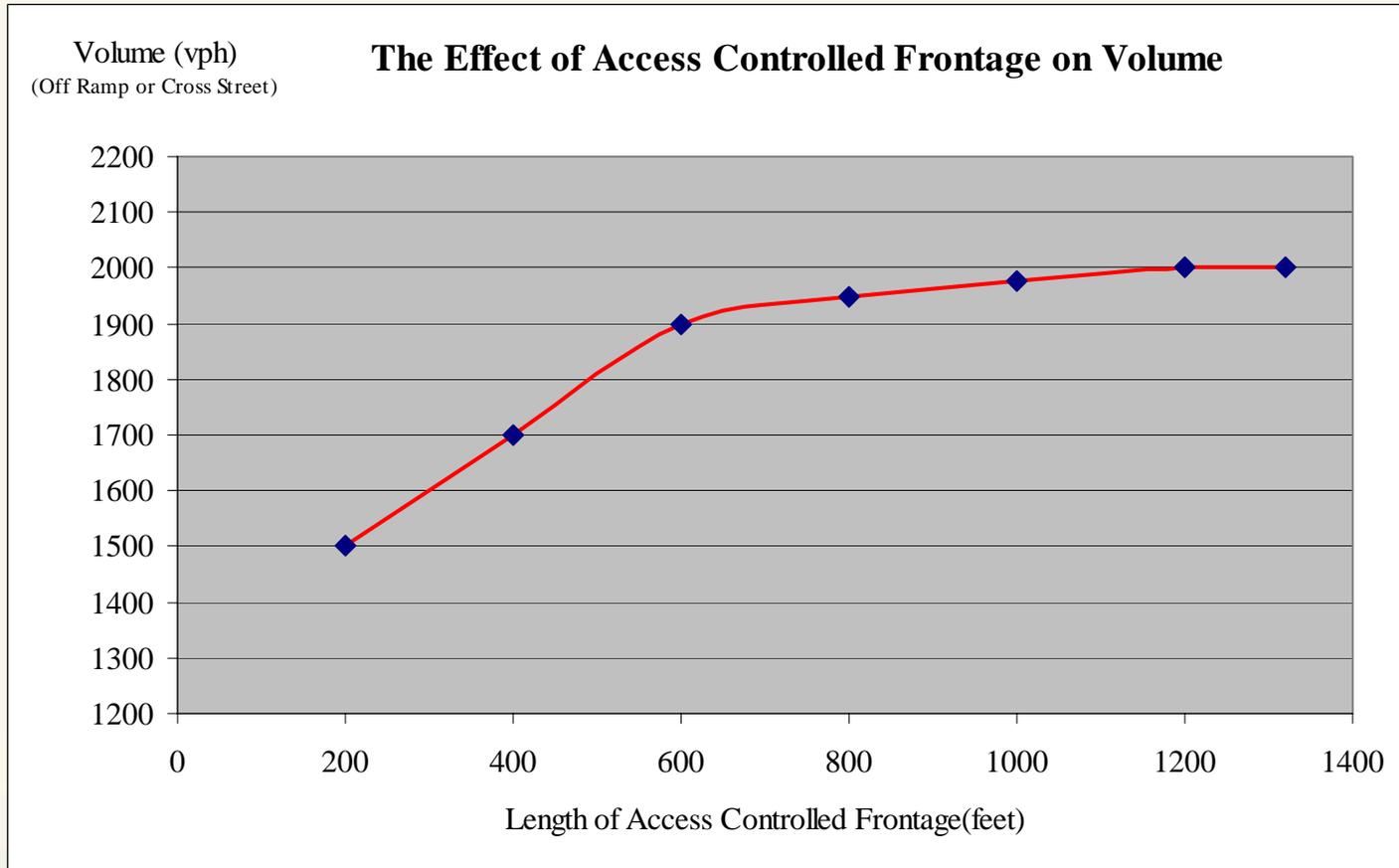
- Anim. time = 290.42
- Frame Delay (Seconds): 0.000, 0.001, 2.000
- Frames/Time Step: 1, 8, 100

At the bottom of the window, there is a status bar with the text "Displays sensors on the map" and coordinates "x: 534523.79 y: 12734.14". The system tray at the bottom shows the time "2:37 PM" and the date "13:00:00.00 TP = 1".

# Assumptions

- Traffic volume proportion on freeway ramp
- Traffic volume proportion on arterial
- Intersection turning movement counts
- Proportion of weaving vehicles
- Heavy vehicle percentage
- Signal progression effects

# Operational Effects



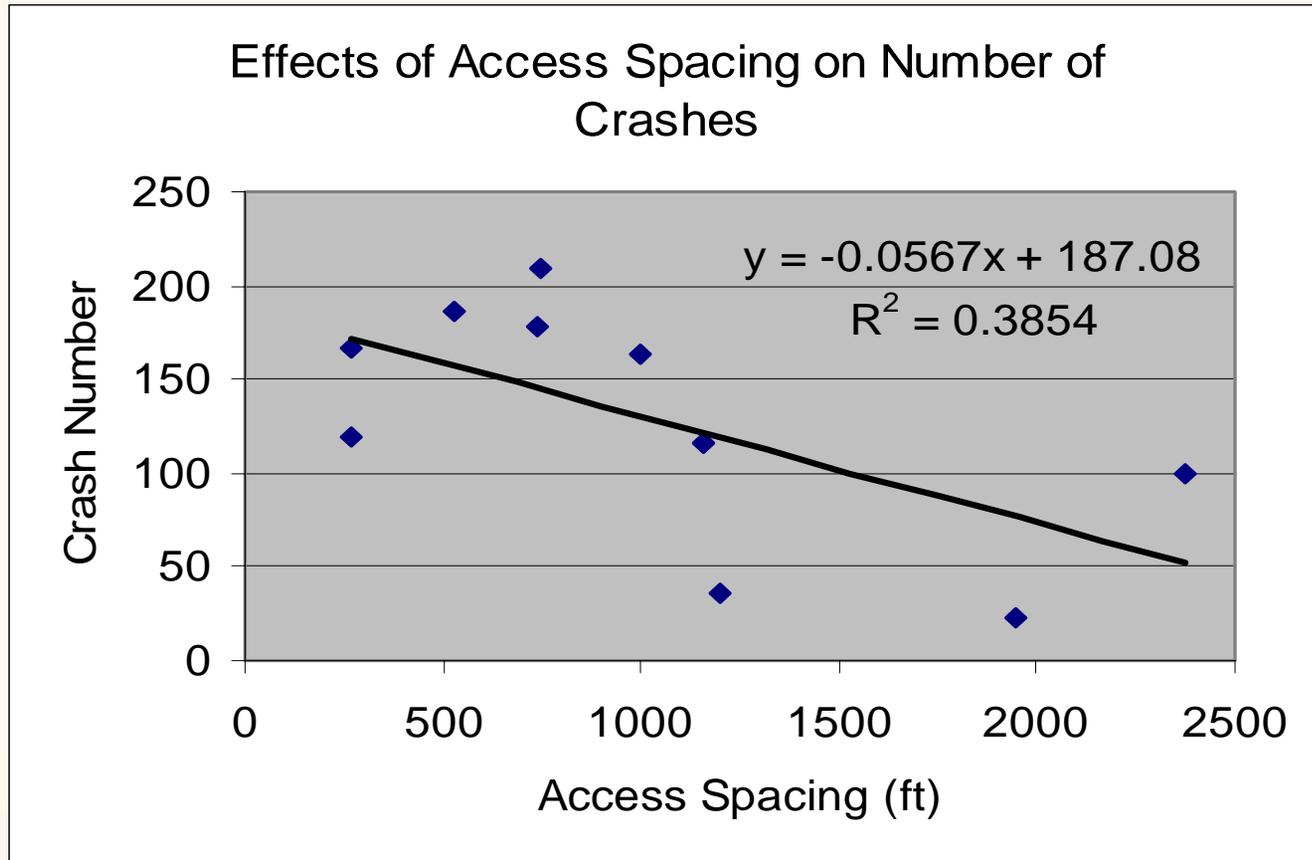
# Reduced Delay (per hour)

- 20 years
- Total reduced delay for 600' vs. 200' is about 6950 veh-hrs
- Total reduced delay for 1320' vs. 200' is about 7730 veh-hrs

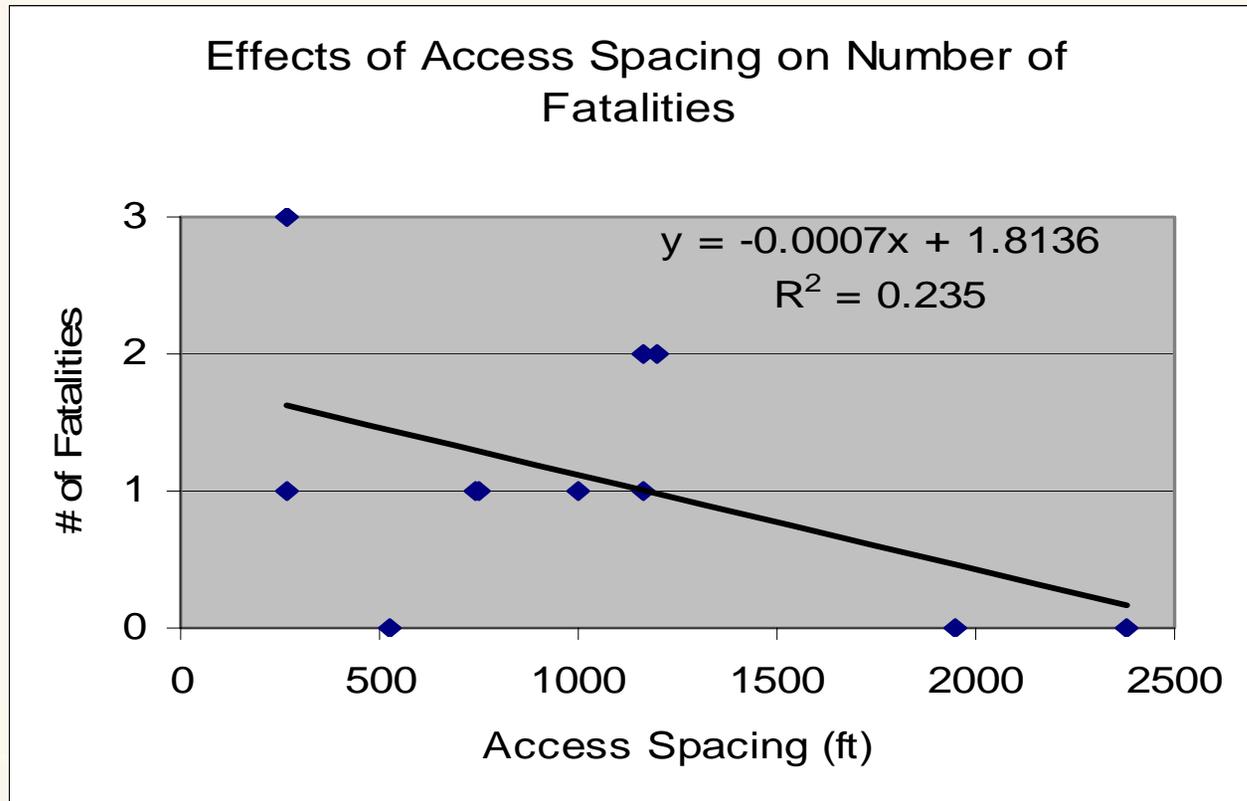
# Safety Analysis

- Objective
  - to relate crash frequency to the length of access controlled frontage
- Data Collection
  - 8 Study Sites
  - Crash Data from Year 1999 to 2003

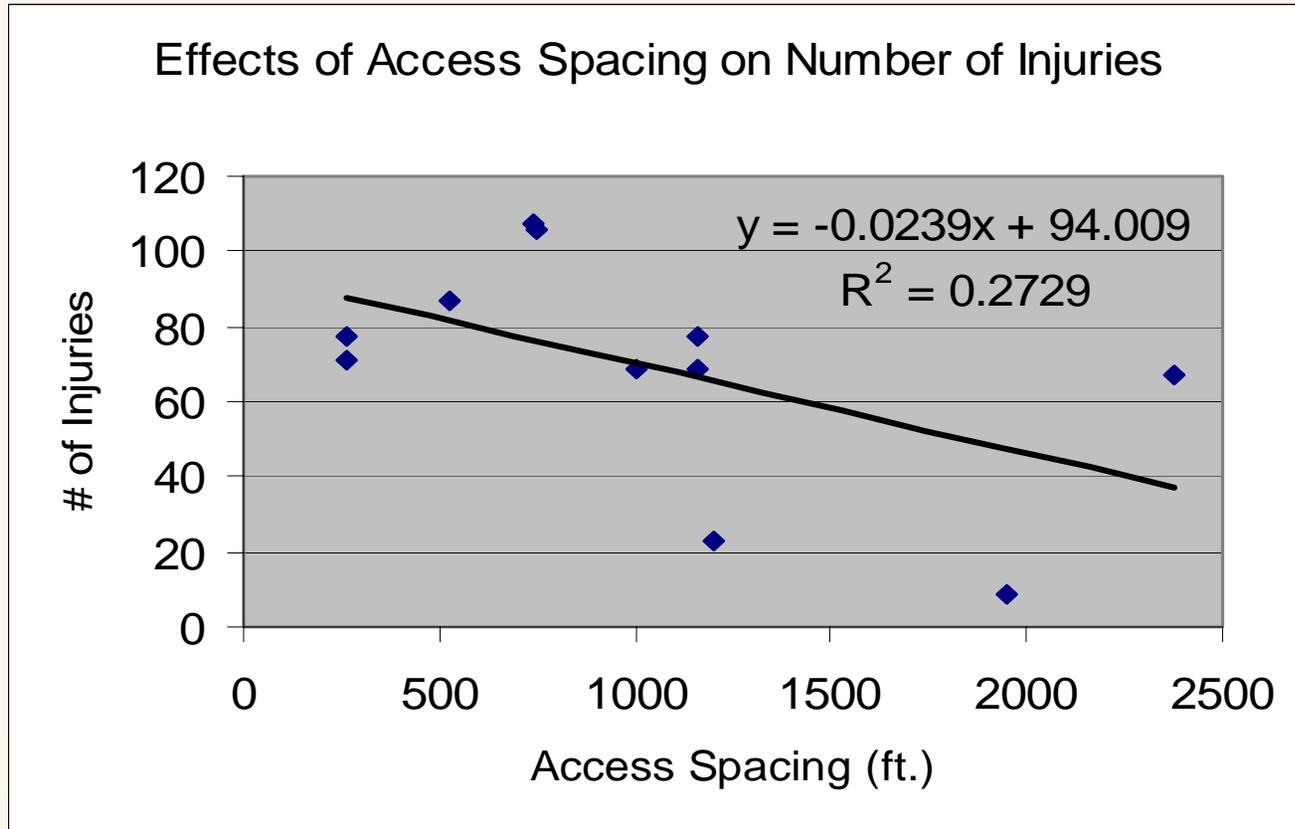
# Safety Analysis



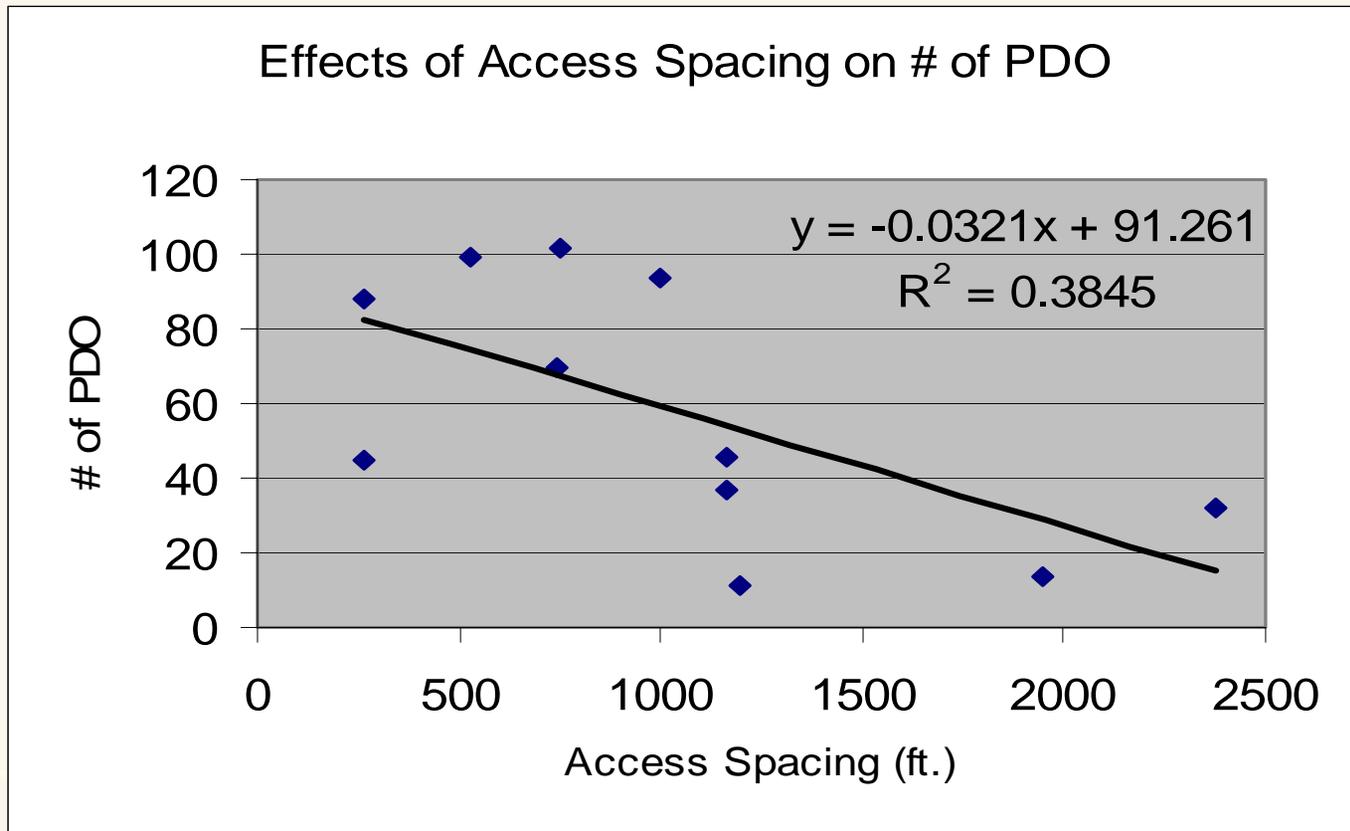
# Safety Analysis (Cont'd)



# Safety Analysis (Cont'd)



# Safety Analysis (Cont'd)



# Benefit/Cost Analysis

$B/C = \Delta \text{ user benefits} / \Delta \text{ investment cost}$

- Alternative A: Purchasing 200 ft of LA Right of Way (Current Practice)
- Alternative B: Purchasing 600 ft of LA Right of Way
- Alternative C: Purchasing 1320 ft of LA Right of Way

# Constants for Operational Benefits

- Vehicle Occupancy : 1.25 persons per vehicle
- Working Days: 250 days per year
- Average Cost of Time (\$2002) \$13.25 per person hour

Source: TTI Urban Mobility Study 2002

# Average ROW Costs (per front foot)

- Rural Unimproved: \$500
- Rural improved: \$1,000
- Urban unimproved: \$1,625
- Urban improved: \$15,000

Source: FDOT D7

# Average Cost of Crashes

- Death: \$1,120,000
- Nonfatal Disability Injury: \$45,500
- PDO: \$8,200

Source: National Safety Council 2003

# Benefits and Costs

- Benefits
  - \$ Savings of Not Purchasing LA ROW on Developed Land (B1)
  - Decreased Delay (B2)
  - Fewer Crashes (B3)
- Costs
  - Initial Cost of Purchasing Additional LA Right of Way on Undeveloped Land (C1)

# B/C Ratio

- Alternative A (200 ft) vs. Alternative B (600 ft)
- Alternative A (200 ft) vs. Alternative C (1320 ft)

## Benefit/Cost Ratio - 200' vs. 600'

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
<b>ROW</b>	\$6,000,000	\$650,000	\$400,000	\$200,000
<b>Delay</b>	\$57,536,883	\	\$57,536,883	\
<b>Crashes</b>	\$3,415,472	\	\$3,415,472	\
<b>Total</b>	\$66,952,355	\$650,000	\$61,352,355	\$200,000
<b>B/C Ratio</b>	<b>103.00</b>		<b>306.76</b>	

## Benefit/Cost Ratio - 200' vs. 1320'

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
<b>ROW</b>	\$6,000,000	\$1,820,000	\$400,000	\$560,000
<b>Delay</b>	\$64,037,167	\	\$64,037,167	\
<b>Crashes</b>	\$9,563,322	\	\$9,563,322	\
<b>Total</b>	\$79,6000,489	\$1,820,000	\$74,000,489	\$560,000
<b>B/C Ratio</b>	<b>43.74</b>		<b>132.14</b>	

# Conclusions

- The benefits of acquiring additional LA ROW near an interchange in advance of development far exceed the cost.
- Minimum Length of LA ROW: 600 feet
- Desirable Length of LA ROW: 1320 feet

# Questions?

