IMPACT CALCULATOR
Impacts of Access Management Techniques

NCHRP Report 420
Transportation Research Board
Washington, D.C.

Version 2.0.4

Urbitran Associates
New York, New York

Impact Calculator of NCHRP Report 420: "Impacts of Access Management Techniques" (NCHRP 3-52)

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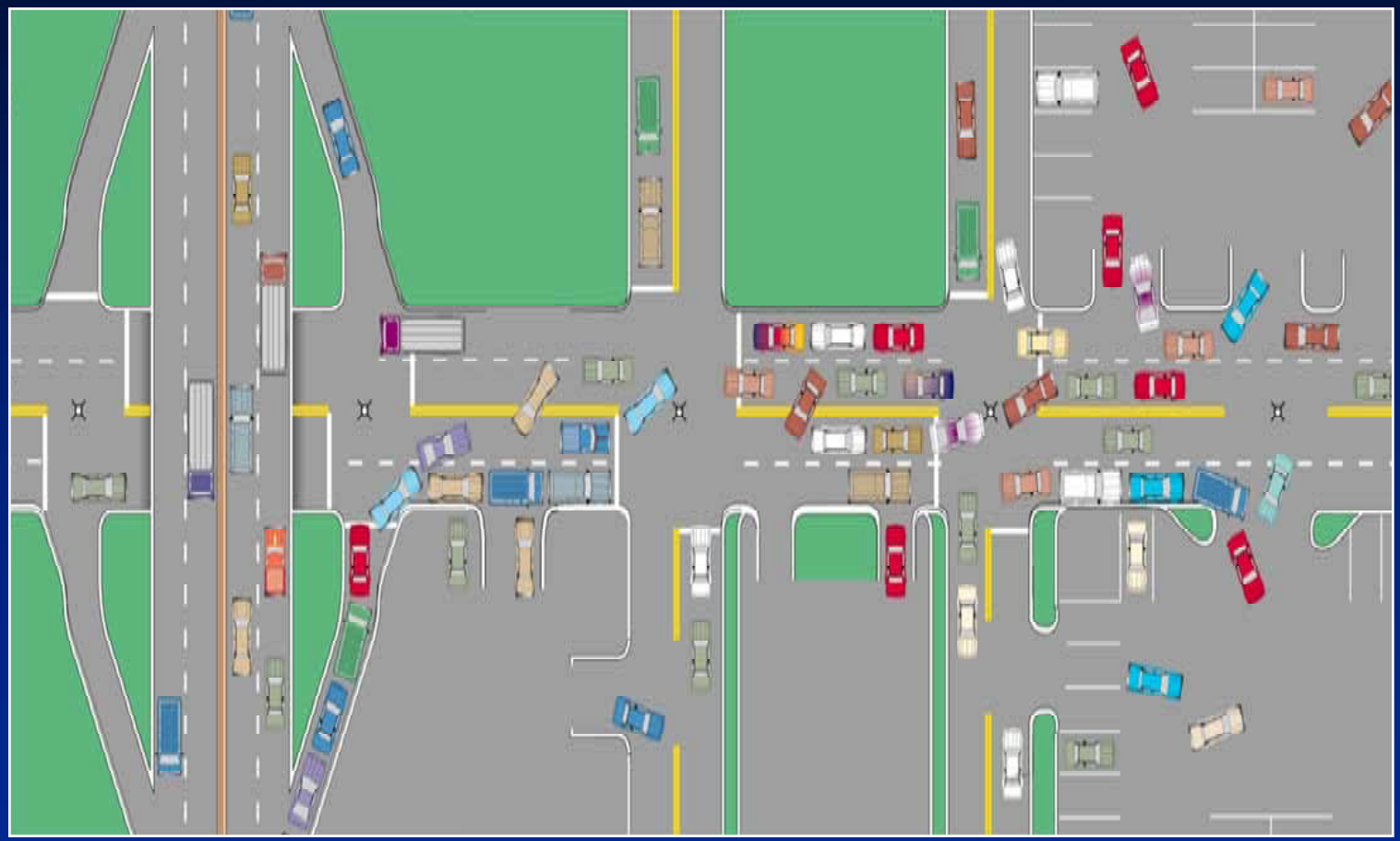
Impact Calculator Workshop Format

- NCHRP 3-52 Background
- Software Review
  - Basis for Calculations
  - Structure – The “Tour”
  - Applications/Examples

NCHRP Project 3-52 Background



NCHRP Project 3-52 Study Purpose

- Quantify the Safety and Traffic Operation Impacts of Selected Access Management Techniques

NCHRP Project 3-52 Panel Members Represent:

- British Columbia Ministry of Transport
- Federal Highway Administration
- Florida DOT
- Illinois DOT
- New Jersey DOT
- Ohio DOT
- Oregon DOT
- Polytechnic University

NCHRP Project 3-52
Phase I:

- Identify Access Management Techniques
- Classify Techniques
- Recommend Priority Techniques for Further Analyses
- Survey Practitioners
- Prepare Study Plan

NCHRP Project 3-52 Phase II:

- Assemble Secondary Data and Collect Primary Data
- Analyze Data to Quantify Impacts of Priority Techniques
- Prepare Project Report

Access Management Techniques:

A. Policy

- Administrative & Regulatory Procedures 12
- Zoning & Subdivision Regulations 5
- Other 3

B. Design

- Interchanges 3
- Frontage Roads 5
- Medians – Left Turns 21
- Right Turns 7
- Access Location –Design 23
- Access Location - Retrofit 13

NCHRP Project 3-52 Priority Techniques

- Traffic Signal Spacing
- Integrated Median Techniques
- Unsignalized Access Spacing (including Corner Clearance)
- Left - Turn Lanes
- Access Spacing at Interchanges
- Frontage Roads

NCHRP Report 420 Contents

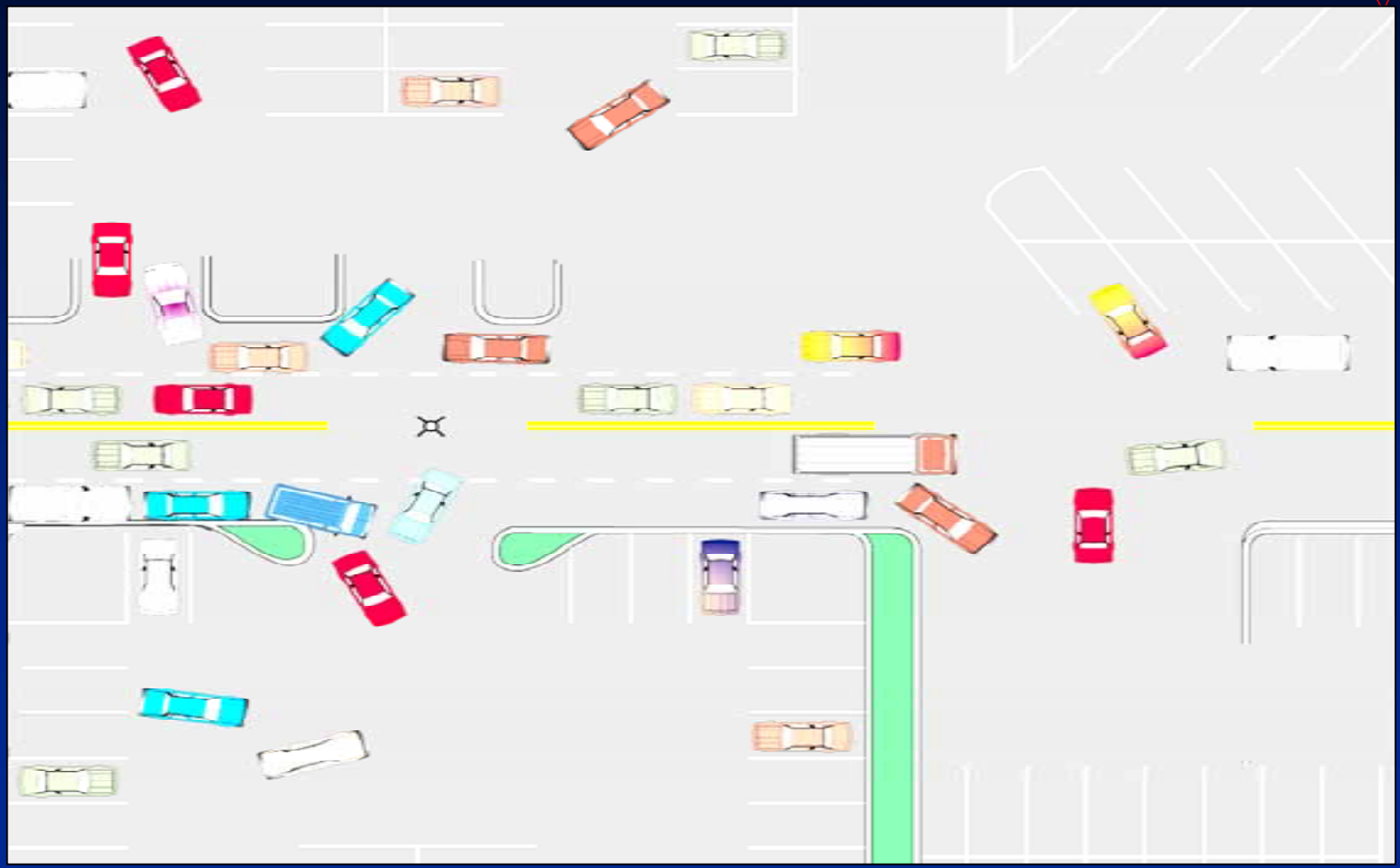
- Introduction & Research Approach
- Access Management Techniques & Impacts
- Traffic Signal Spacing
- Unsignalized Access Spacing
- Corner Clearances
- Median Alternatives
- Left-Turn Lanes
- U-Turns as Alternatives to Direct Left Turns
- Access Separation at Interchanges
- Frontage Roads
- Policy Considerations

Review of Impact Calculator

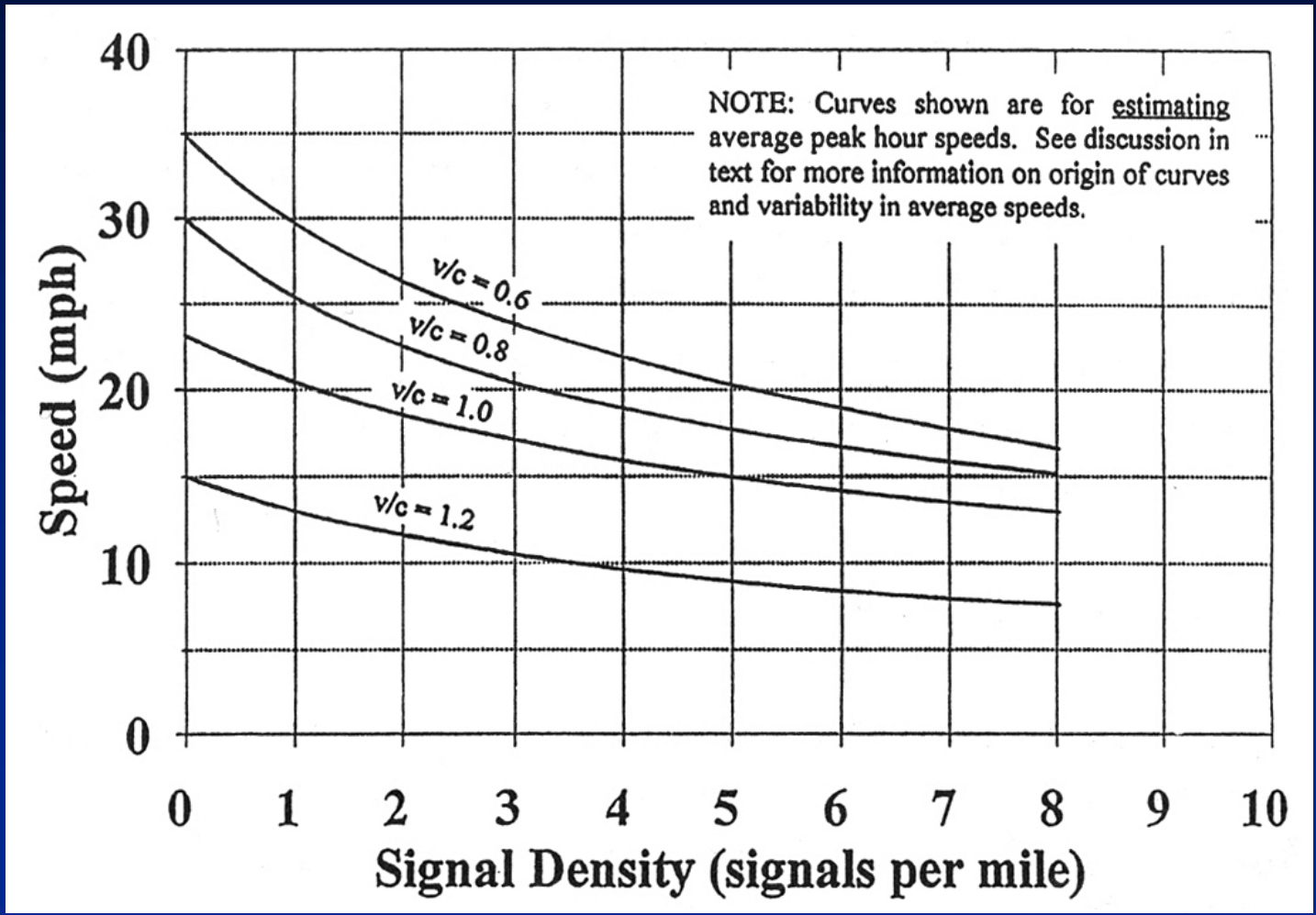
Impact Calculator Modules

- Traffic Signal Spacing
- Unsignalized Access Spacing - Safety
- Unsignalized Access Spacing - Operations
- Interchanges
- Economic Impact of Medians

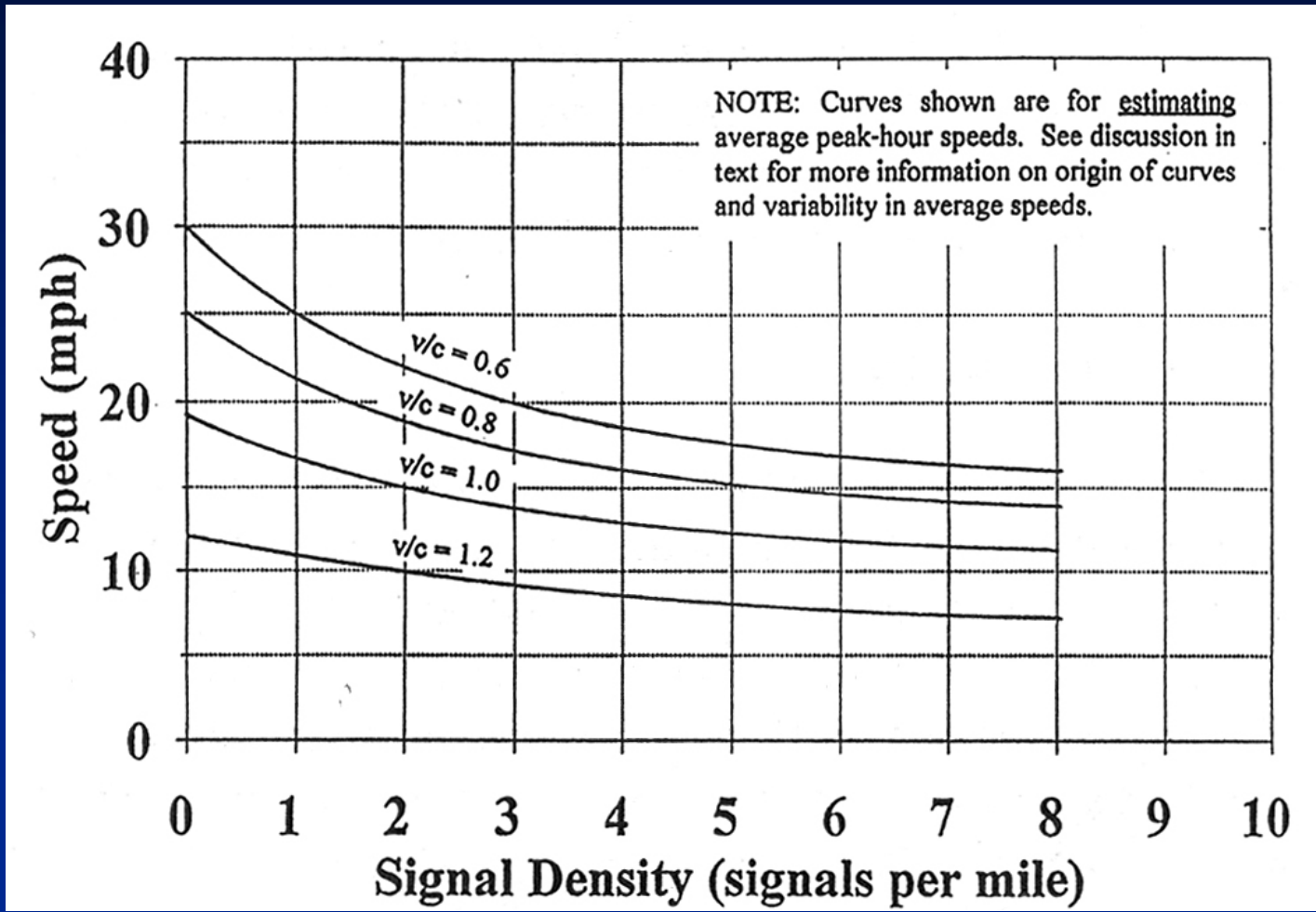
Traffic Signal Spacing



Suggested speed estimation curves for Class I arterials using v/c ratio



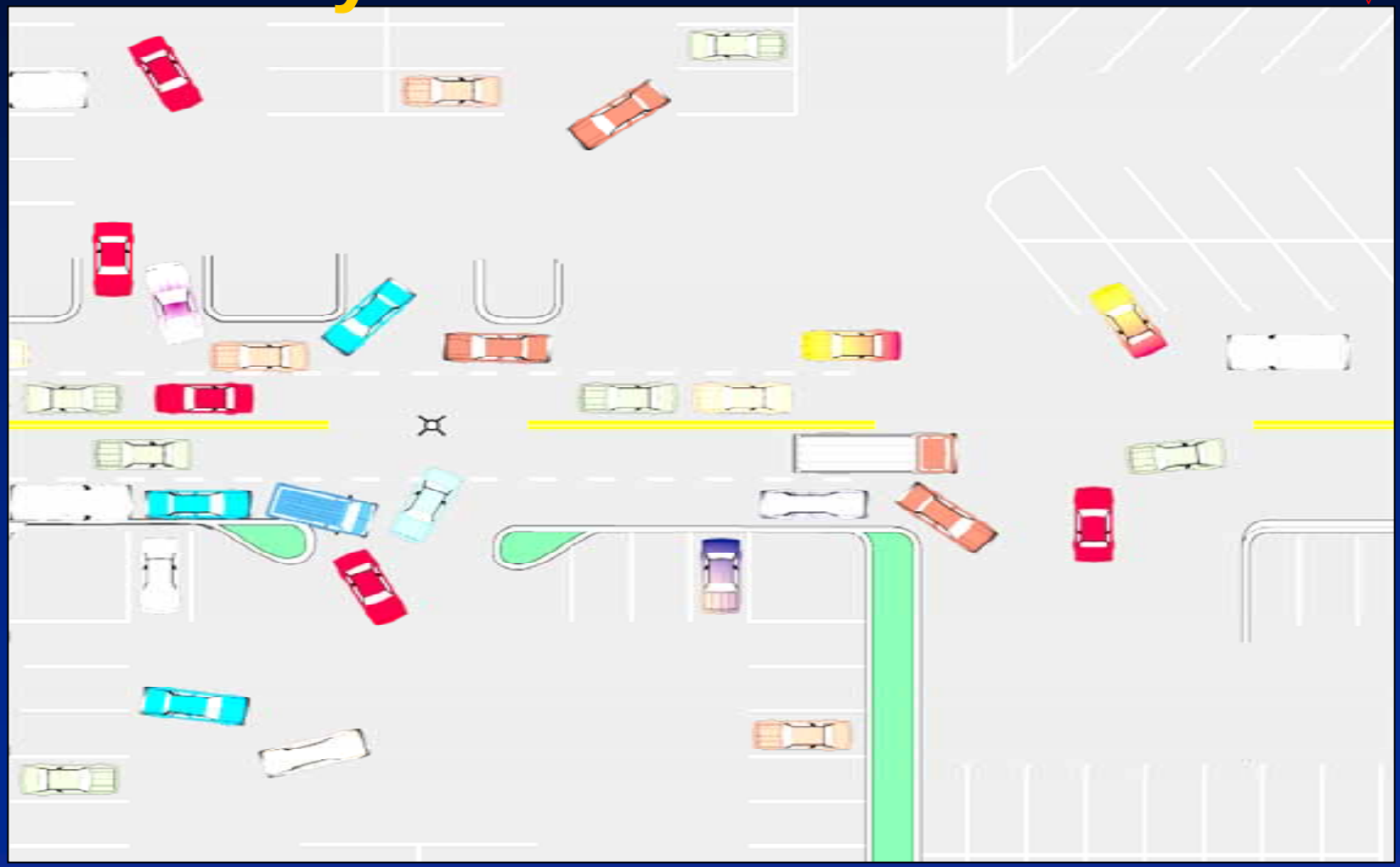
Suggested speed estimation curves for Class II & III arterials using v/c ratio



Travel time rates and speeds for 40 mph

Effective Signals/Mile	Volume-to-Capacity Ratio				
	0.0	0.6	0.8	1.0	1.2
	Minutes Per Mile				
0.0	1.50	1.64	1.90	2.43	3.28
0.5	1.70	1.84	2.20	2.74	3.72
1.0	1.84	2.01	2.34	2.98	4.04
2.0	2.08	2.28	2.66	3.37	4.56
3.0	2.28	2.49	2.90	3.69	5.00
4.0	2.43	2.66	3.09	3.93	5.34
5.0	2.56	2.79	3.26	4.16	5.61
6.0	2.68	2.92	3.40	4.35	5.88
7.0	2.80	3.06	3.56	4.55	6.15
8.0	2.90	3.15	3.68	4.70	6.35
	Miles Per Hour				
0.0	40	37	32	25	18
0.5	35	33	27	22	16
1.0	33	30	26	20	15
2.0	29	26	23	18	13
3.0	26	24	21	16	12
4.0	25	23	19	15	11
5.0	23	22	18	14	11
6.0	22	21	18	14	10
7.0	21	20	17	13	10
8.0	21	19	16	13	9

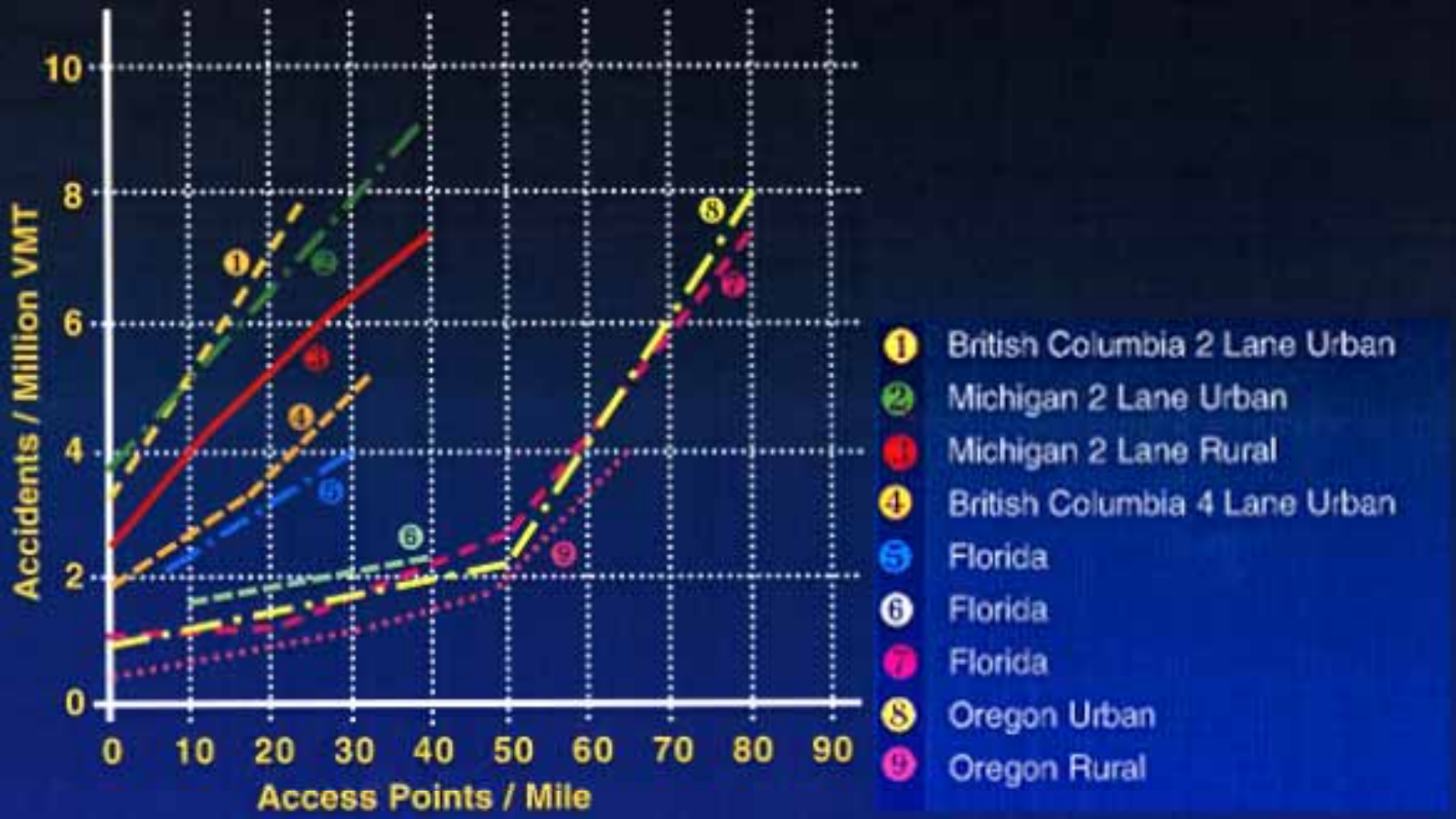
Unsignalized Access Spacing - Safety



NCHRP Project 3-52 Safety Analysis

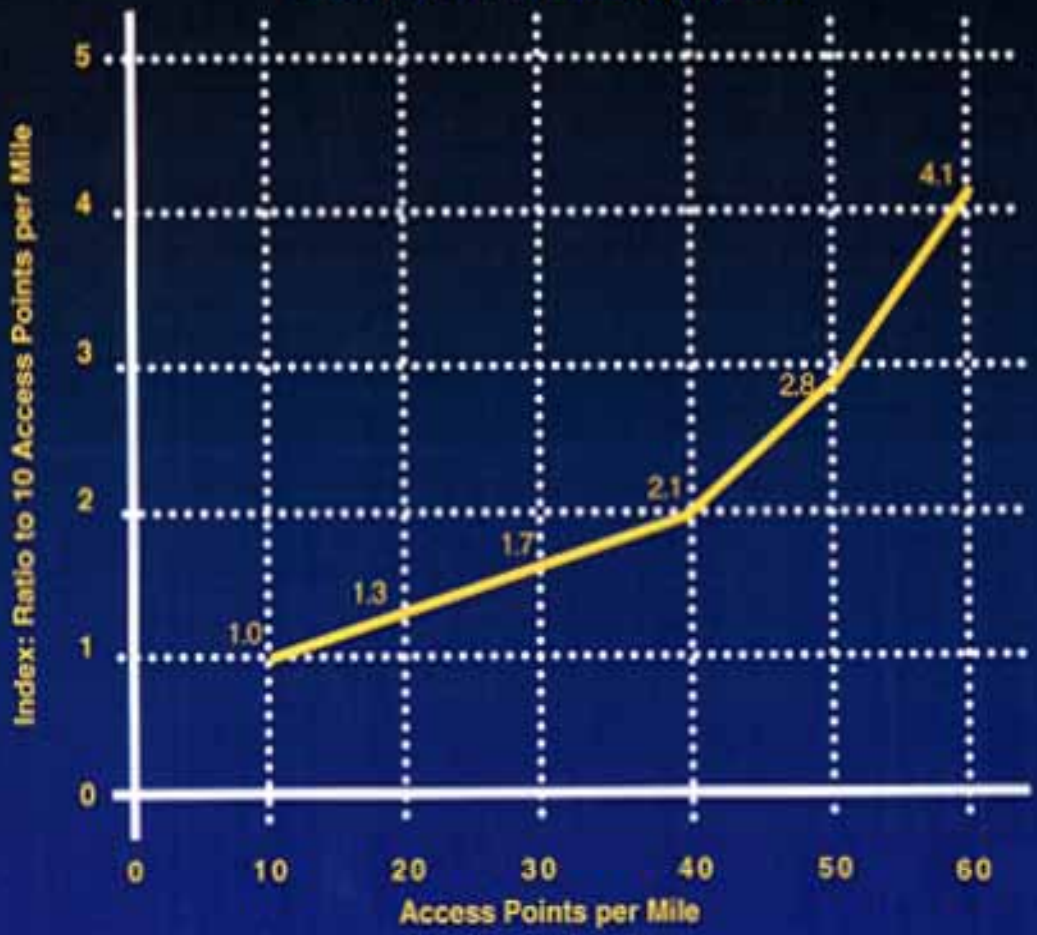
- Performed Synthesis of Prior Research
- Analyzed Crash Data for 8 States
  - 152 Urban/Suburban Segments
  - 89 Rural Segments
- Developed Data Base Representing 37,500 Crashes

Effect of Access Spacing on Accident Rates (Composite)

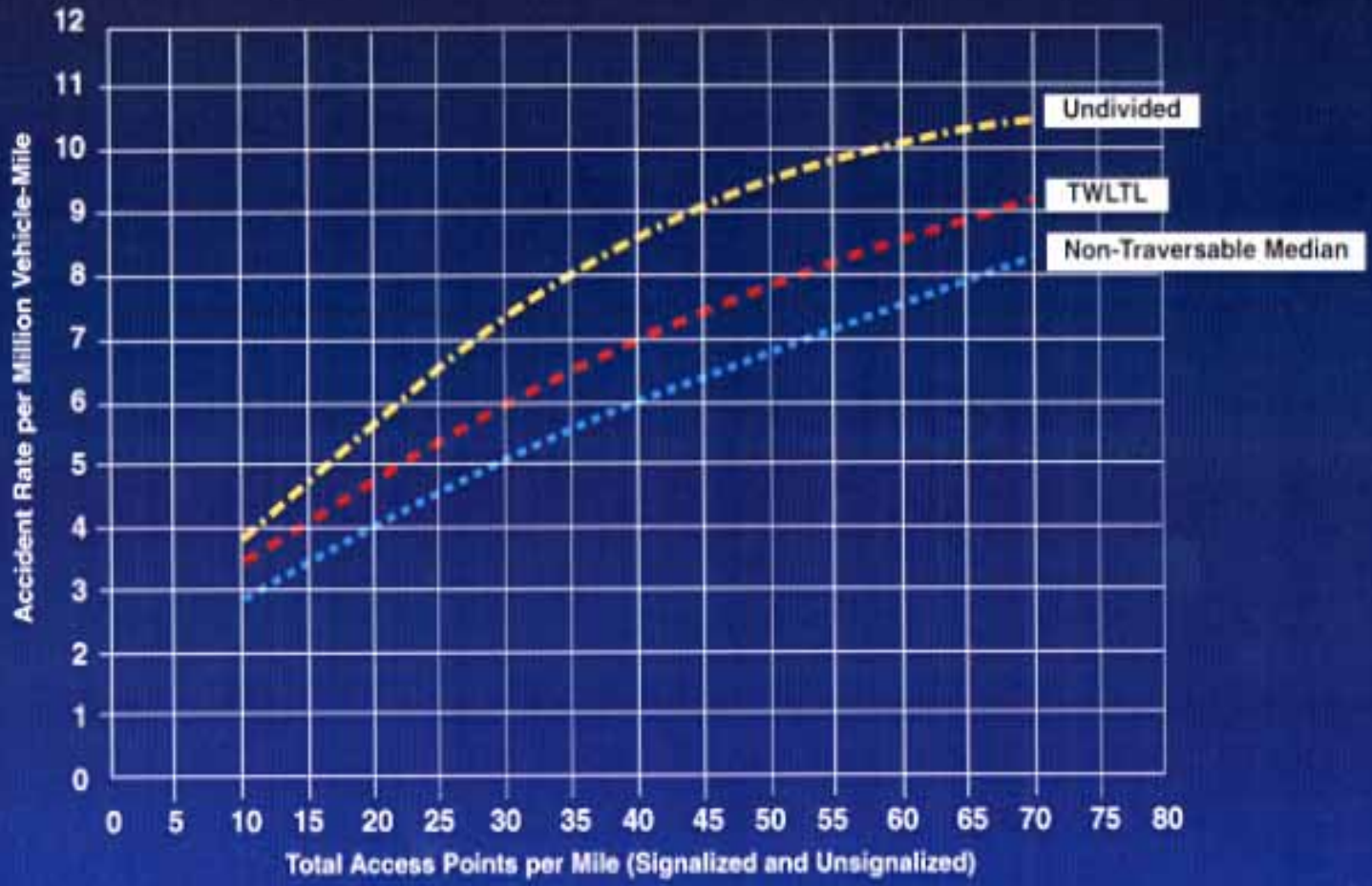


Composite Accident Rate Indices

Based on Literature Synthesis



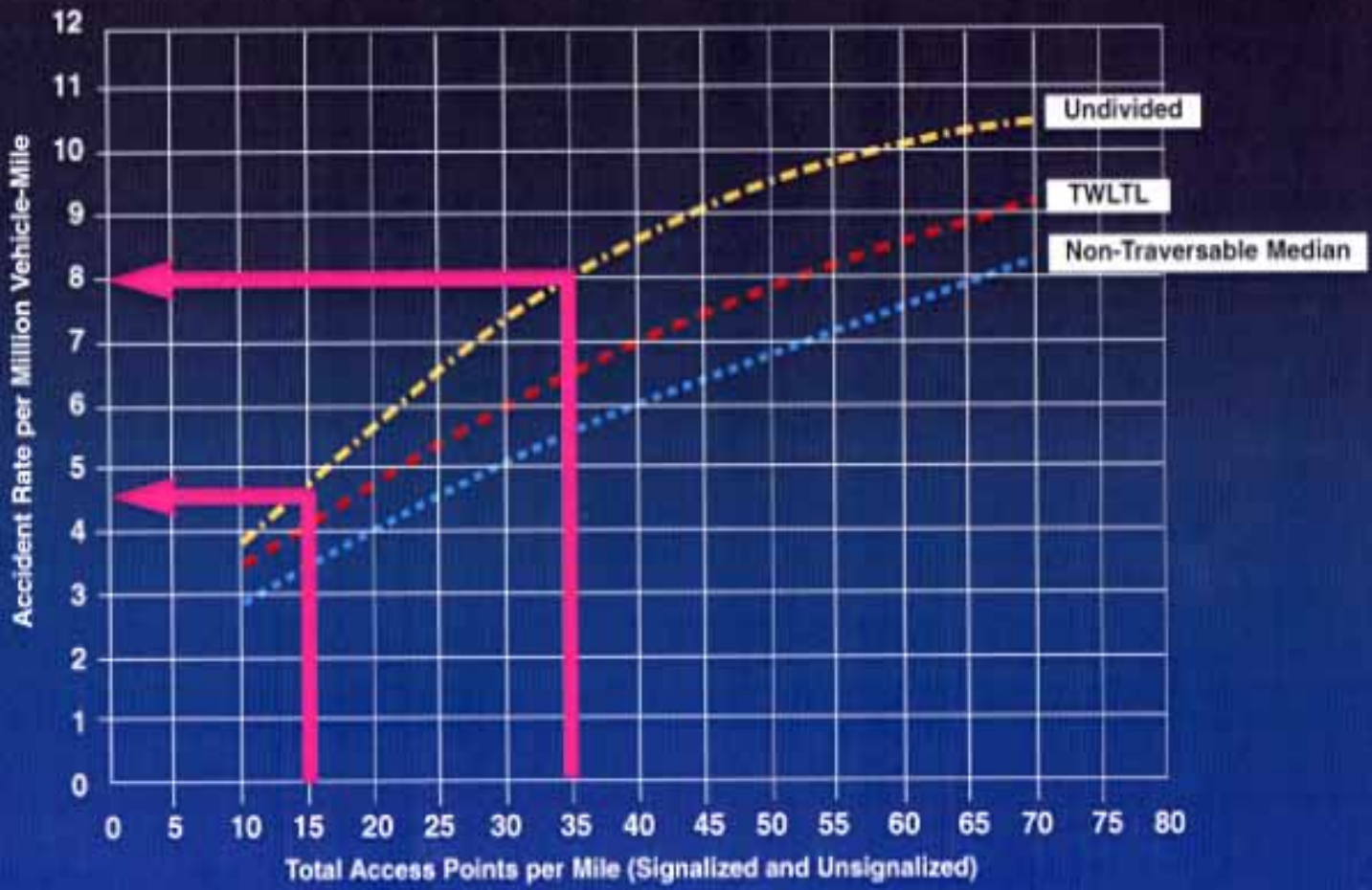
Estimated Accident Rates by Type of Median; Urban and Suburban Areas



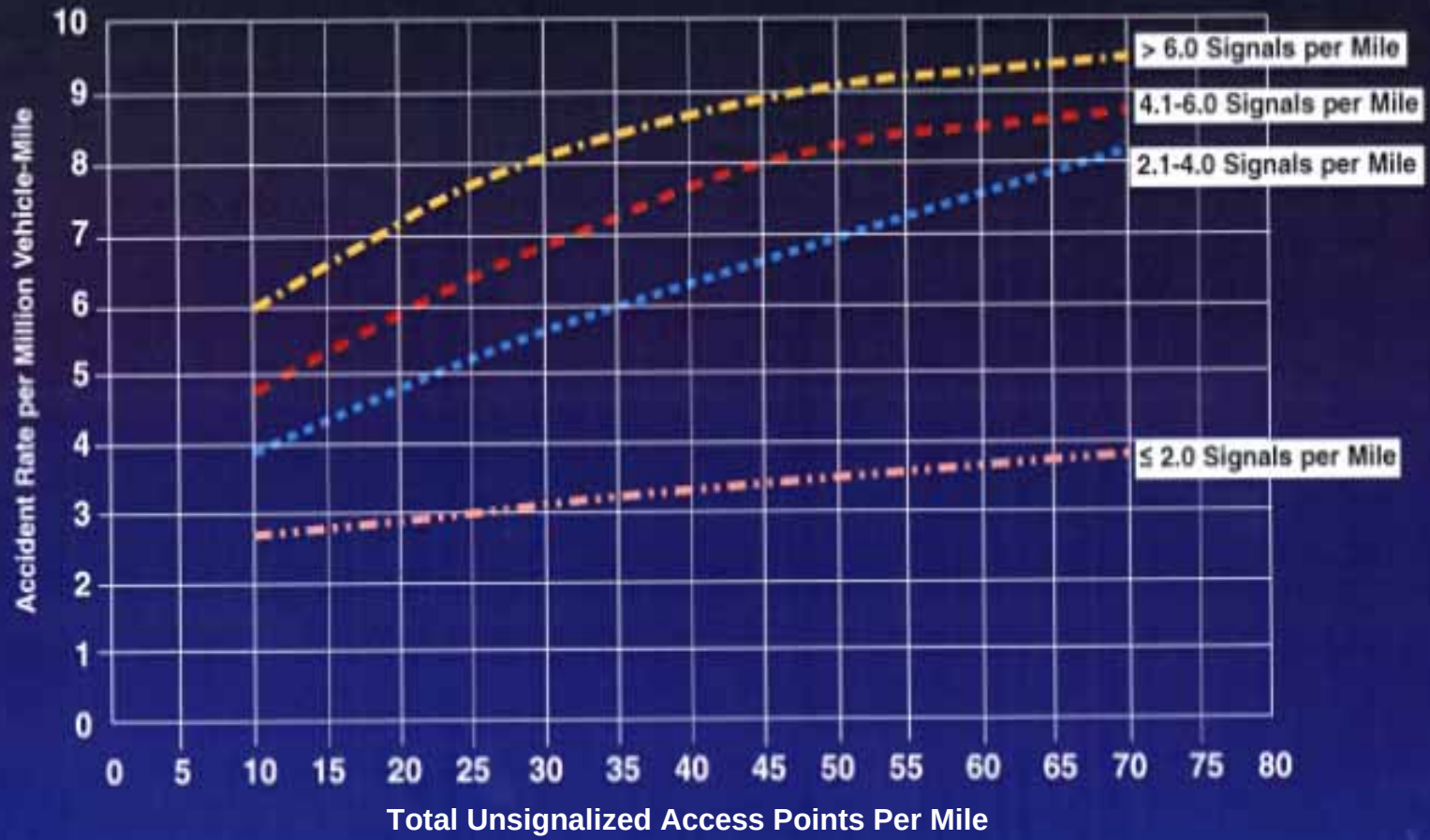
Application Example

- Current Condition on Segment
  - Undivided roadway in urban area
  - 15 Access Points Per Mile
  - Crash Rate Unknown
- Projected Conditions
  - 35 Access Points Per Mile
  - Estimated Crash Rate Increase of 74% [(8-4.6)/4.6]x100

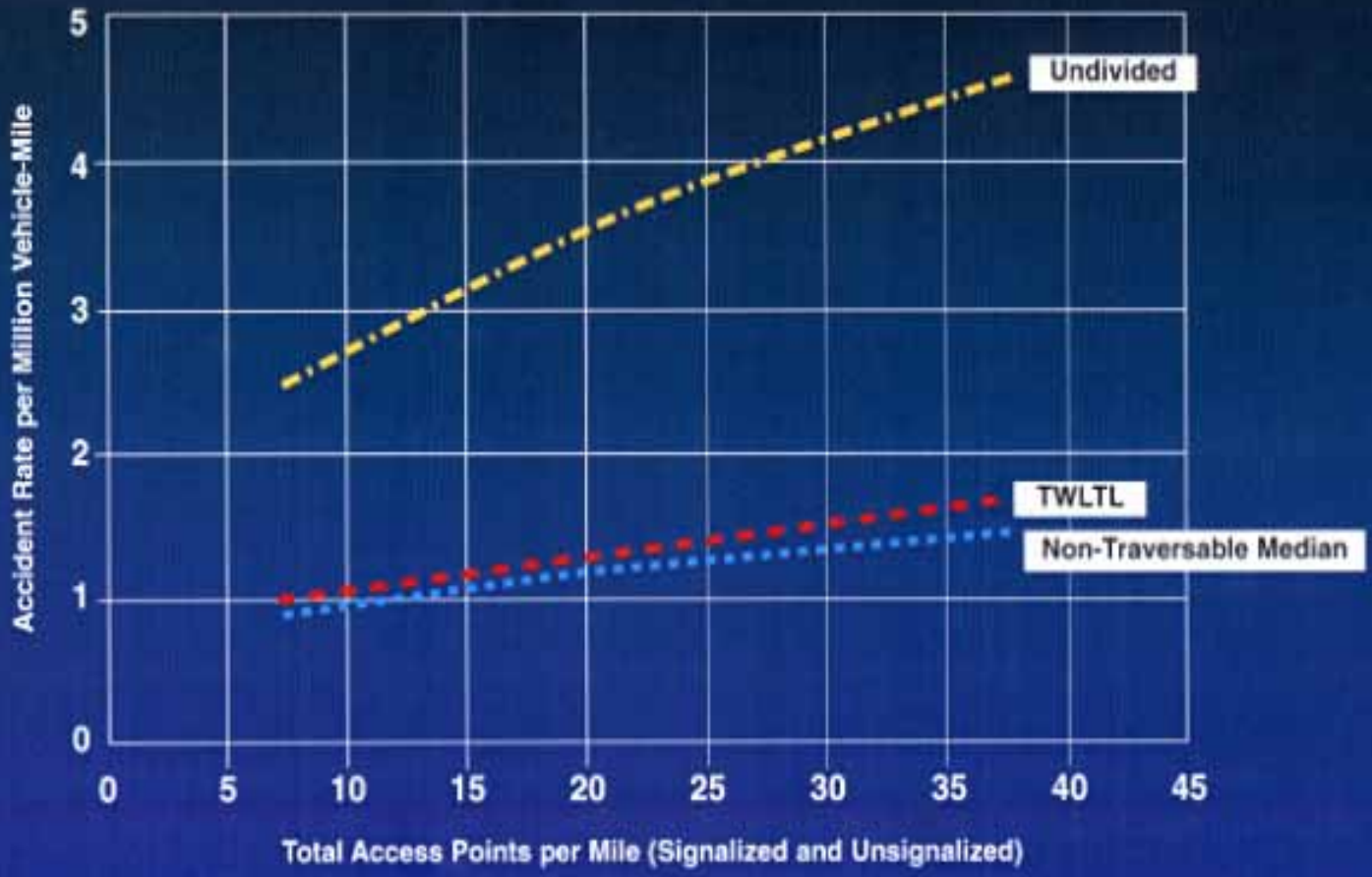
Estimated Accident Rates by Type of Median; Urban and Suburban Areas



Estimated Accident Rates by Access Density; Urban and Suburban Areas



Estimated Accident Rates by Type of Median; Rural Areas



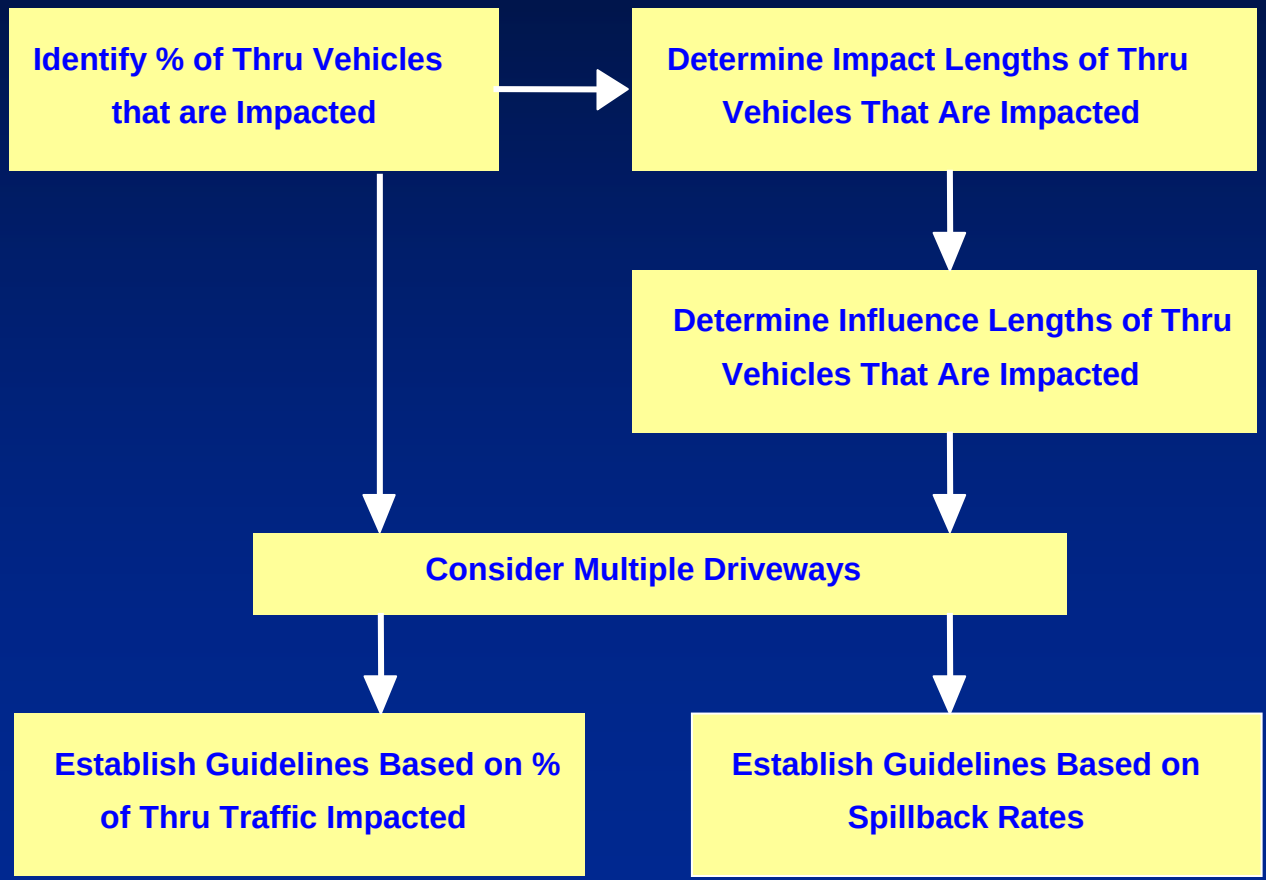
Unsignalized Access Spacing - Operations

NCHRP Project 3-52 Unsignalized Access Spacing

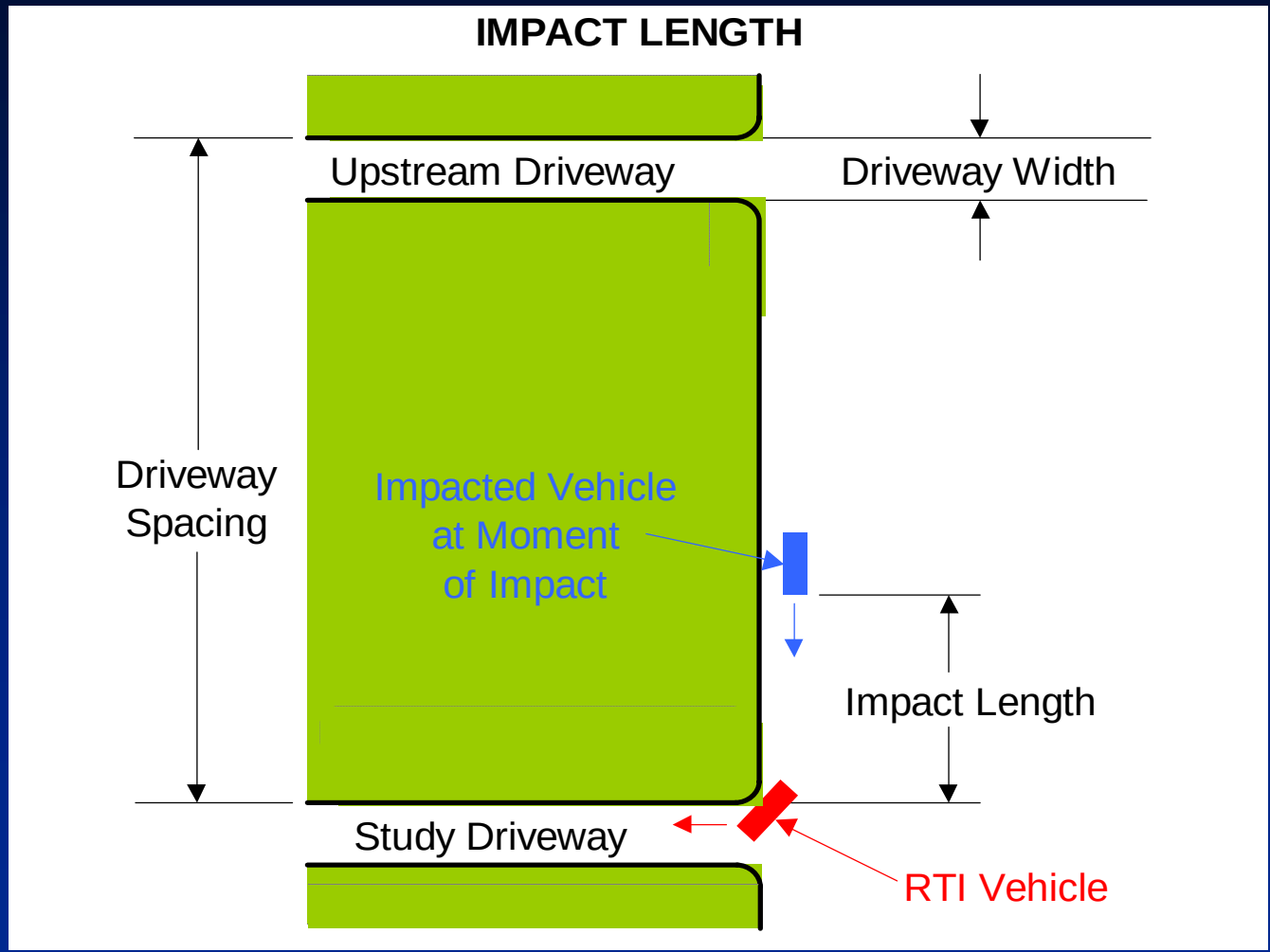
Operational Effects of Driveway Traffic:

- Impacts on Through Vehicles
- Influence Area
- Access Separation Guidelines

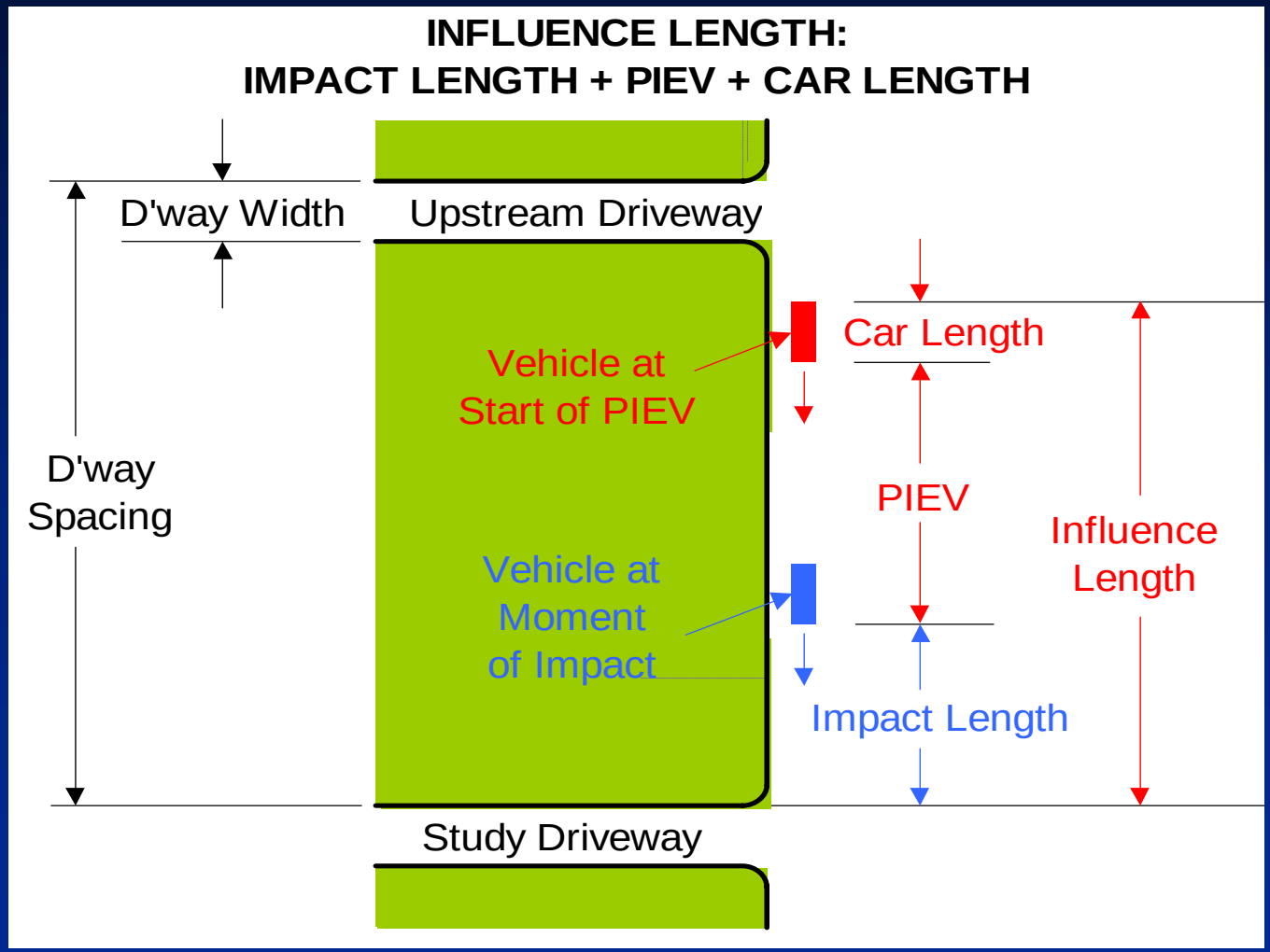
Establishing Unsignalized Access Spacing Guidelines



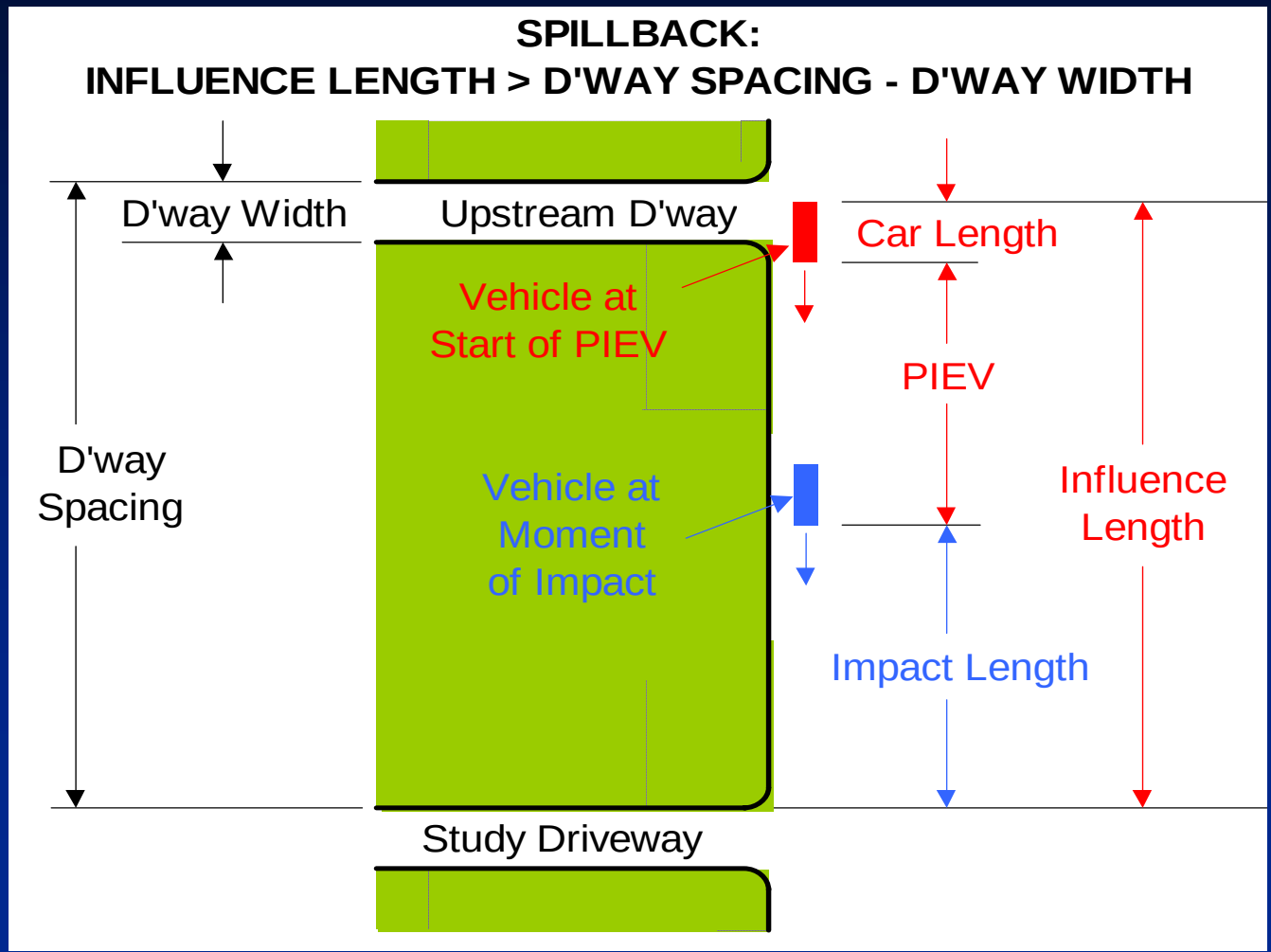
Measuring Impact Length

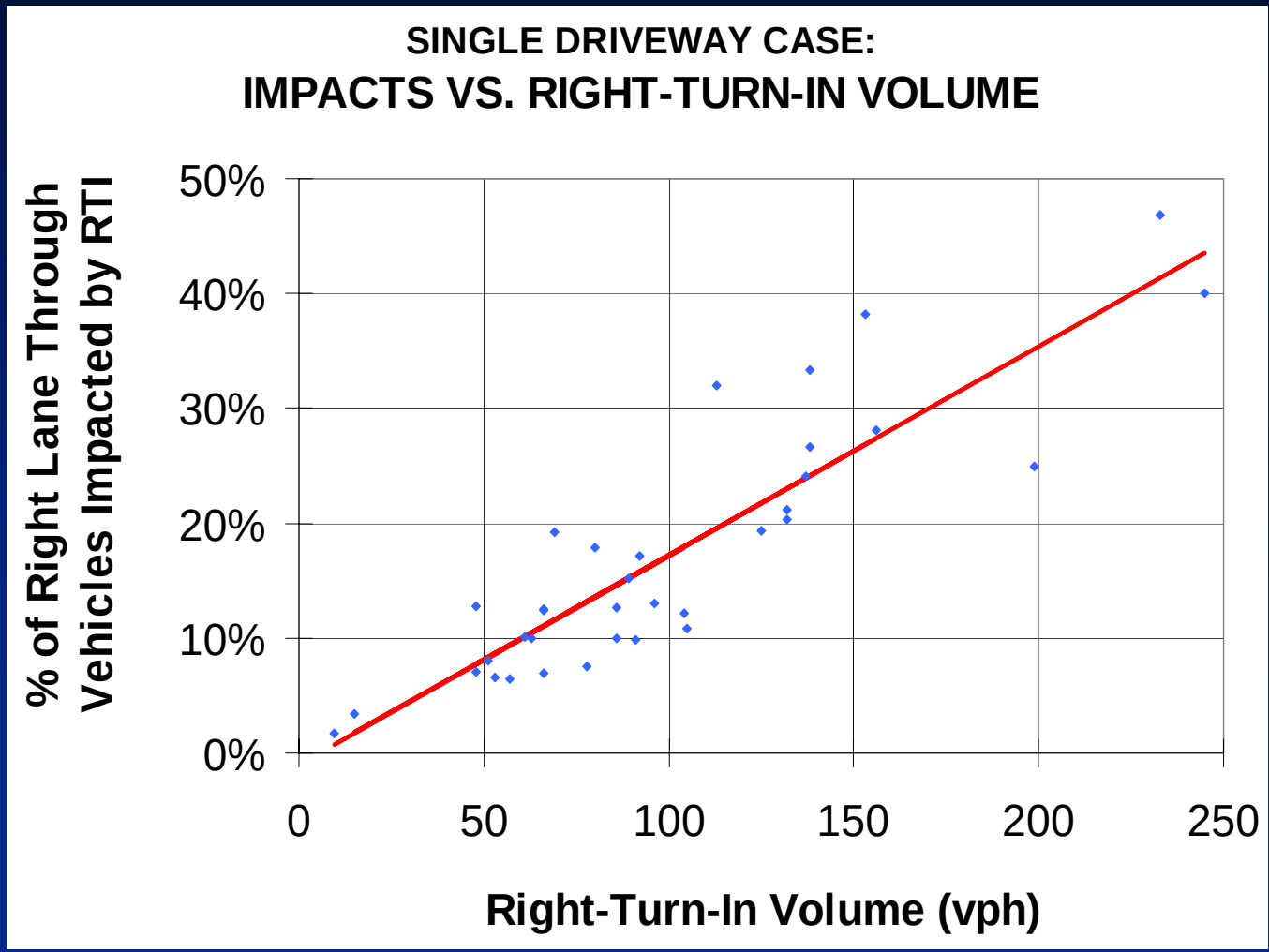


Estimating Influence Length

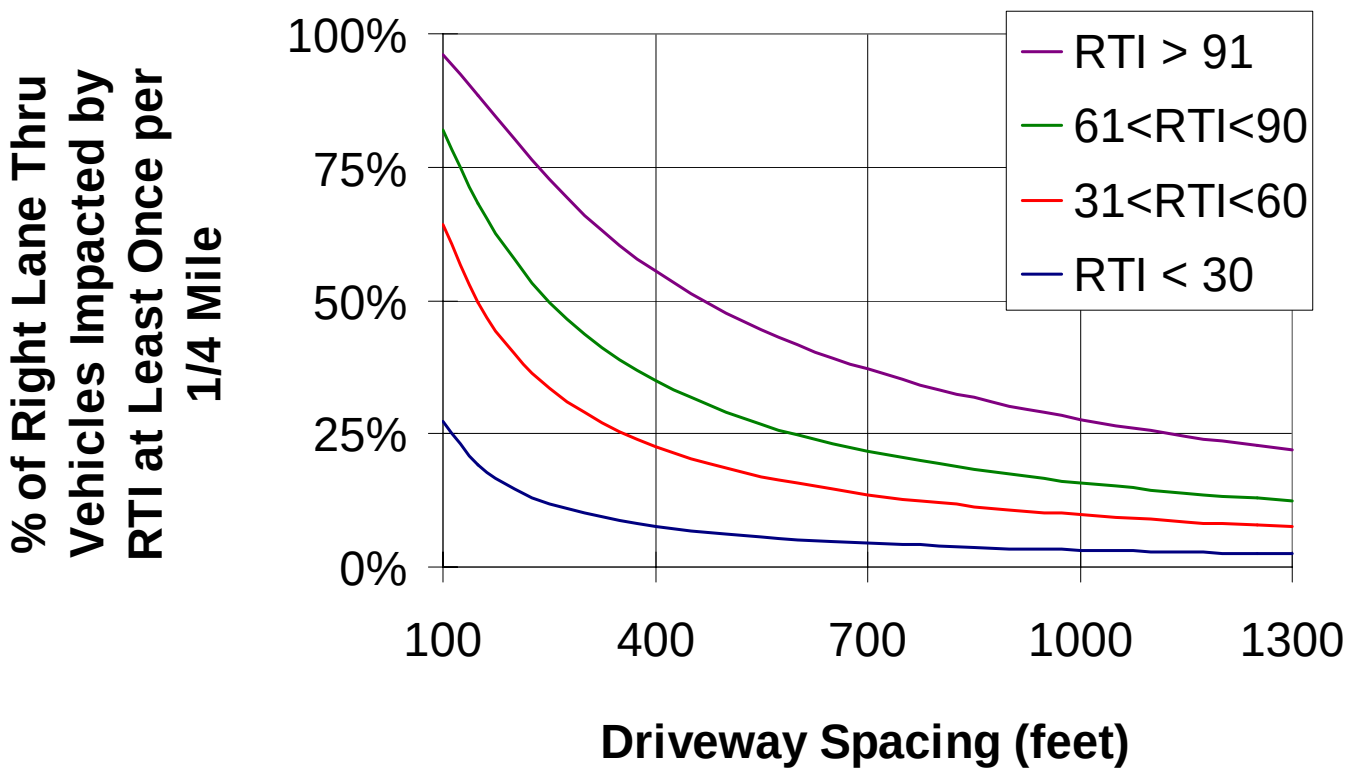


Concept of Spillback




SINGLE DRIVEWAY CASE:
IMPACTS VS. RIGHT-TURN-IN VOLUME
% of Right Lane Through Vehicles Impacted by RTI
50%
40%
30%
20%
10%
0%
0
50
100
150
200
250
Right-Turn-In Volume (vph)

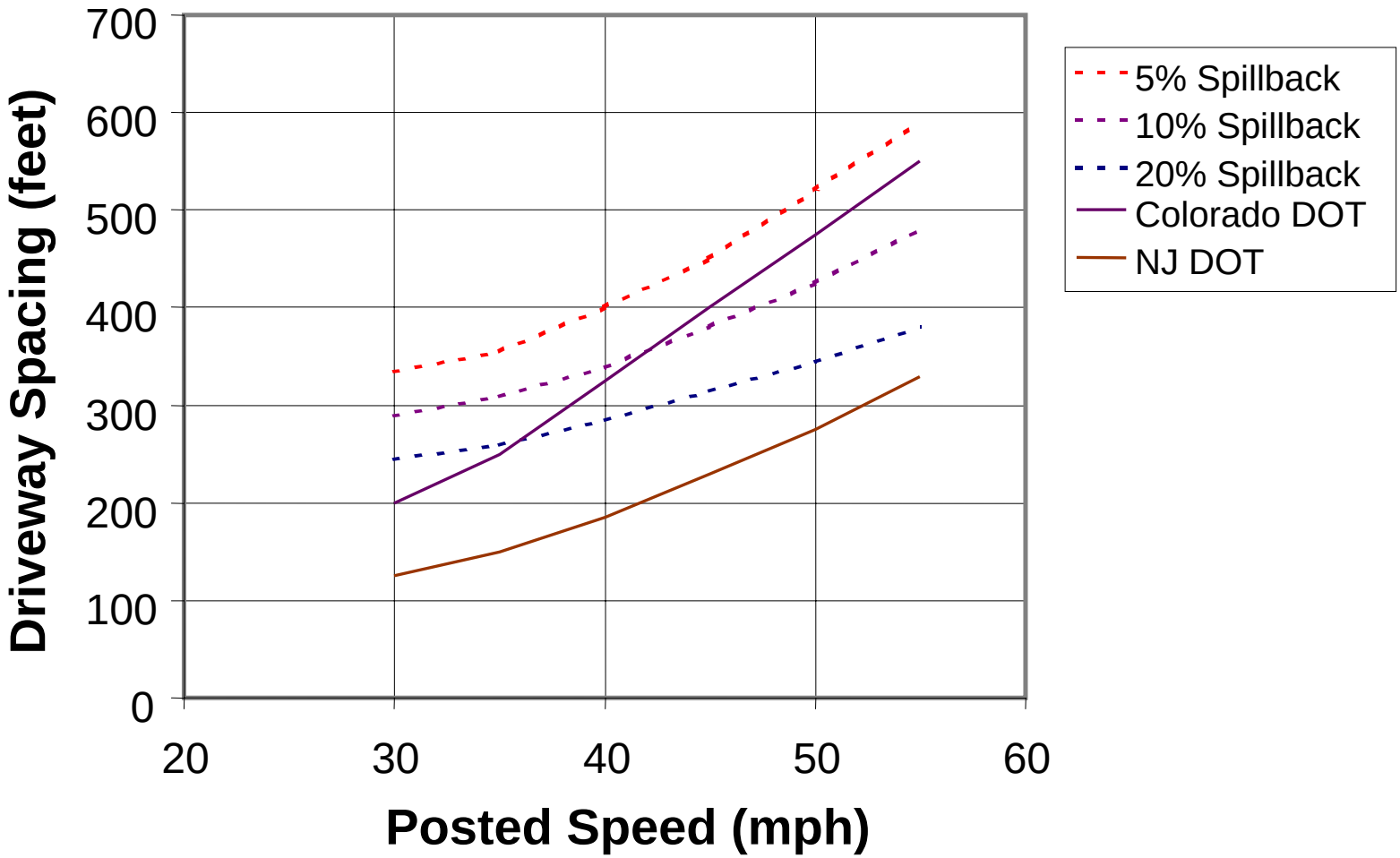
MULTIPLE DRIVEWAY CASE:
VEHICLES IMPACTED AT LEAST ONCE PER QUARTER MILE



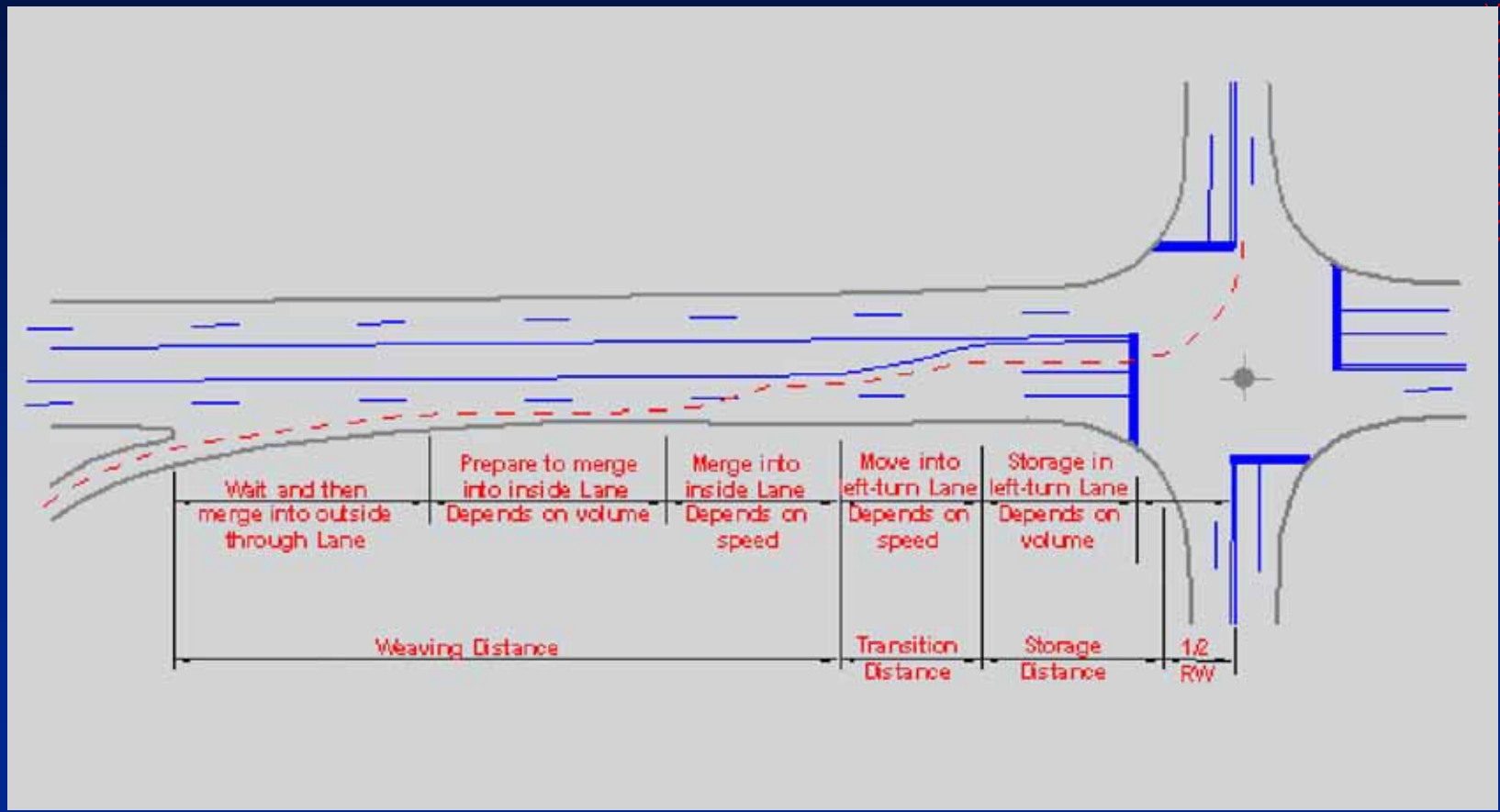
MULTIPLE DRIVEWAY CASE:
SPILLBACK RATES - AT LEAST ONCE PER 1/4 MI
POSTED SPEED = 45 MPH

D'way Spacing (ft)	Right Turn In Volume (vph)			
	RTI < 30	31<RTI<60	61<RTI<90	RTI > 91
100	27.3%	64.2%	82.1%	96.1%
150	19.1%	49.6%	68.2%	88.5%
200	14.6%	40.0%	57.5%	80.1%
250	11.3%	32.0%	47.5%	70.2%
300	7.8%	23.0%	35.3%	55.5%
350	4.4%	13.5%	21.2%	35.4%
400	2.6%	8.0%	12.9%	22.1%
450	1.6%	5.1%	8.2%	14.4%
500	0.9%	2.9%	4.7%	8.3%
550	0.5%	1.5%	2.5%	4.4%
600	0.3%	0.8%	1.3%	2.3%
650	0.1%	0.4%	0.6%	1.1%

COMPARISON OF ACCESS SEPARATION CRITERIA
31<RTI<60



Interchanges – Spacing on Cross Roads



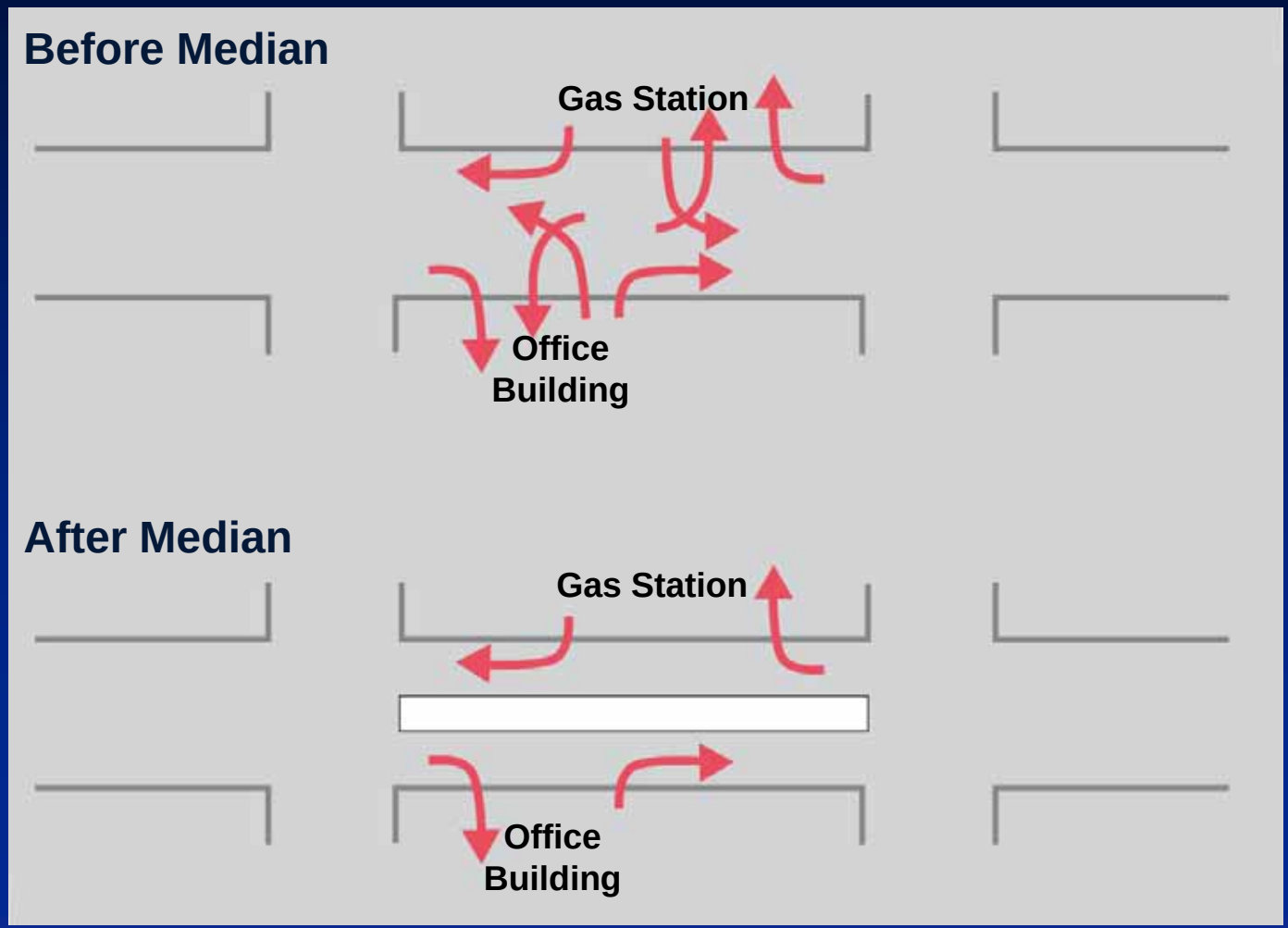
Estimated weaving distances

Weaving Volume (vph)	Speed (mph)				
	25-30	35	40	45	50
200	50	100	150	200	400
400	100	200	300	450	800
600	150	300	450	700	1,200
800	200	400	600	950	1,800
1,000	300	500	750	1,200	2,400
1,200	350	600	900	1,450	*
1,400	400	710	1,050	1,700	*
1,600	450	820	1,200	2,050	*
1,800	500	930	1,400	2,400	*
2,000	600	1,040	1,600	*	*
2,200	700	1,150	1,800	*	*
2,400	800	1,270	2,050	*	*
2,600	900	1,400	2,300	*	*

Notes: Use 400 feet for values above solid line.

* Speeds are not attainable.

Economic Impacts of Closing a Median Opening



Simplified Approach Economic Analysis Factors

- Size and Type of Each Activity where Left-Turn Access will be Removed
- Reliance of Each Activity on Pass-by Traffic
- Number of Vehicles Turning Left into the Activity or Land Use
- Average Purchase Per Vehicle

Calculating Maximum Economic Impact

Maximum Economic Impact

$= \sum_{I}^{M} N_I P_I D_I$

- Where: N_I= Number Turning Left at Location I Per Day
- P_I= % Pass by at Location I
- D_I= Dollars/Purchase
- M = Number of Businesses with Left-Turn Access Removed

Economic impact model

	Land Use	A % Pass-by	B Estimated Left Turns As % of Total Entering Traffic
1	Gasoline Service Station Convenience Mart Small Retail < 50,000 sq. ft.	55	ADT / % 5,000 / 43 10,000 / 40 20,000 / 30 30,000 / 15 or more
2	Fast Food Restaurant with Drive Through Window Supermarkets Shopping Center 50,000 - 100,000 sq. ft.	45	
3	High Turnover sit-down restaurant	40	
4	Shopping Centers 250,000 - 500,000 sq. ft.	30	
5	Shopping Centers Over 500,000 sq. ft.	20	

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