

Safety Impacts of Access Management Techniques in Utah

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Outline

- Introduction
- Background
- Crash database
- Corridor selection
- Analysis procedure
- Analysis results
- Conclusions
- Future Research



Introduction

- Traffic volumes and congestion in Utah have increased in recent years
- One of the primary areas of congestion are arterial streets, which according to the AASHTO Green Book should provide “...*a high operating speed and level of service*”
- Utah has placed an increased emphasis on **access management techniques** to help manage this congestion

Introduction

- The Utah Department of Transportation (UDOT) recently established state law to help control access management:
 - *Administrative Rule R930-6: Accommodation of Utilities and the Control and Protection of State Highway Rights of Way*

Administrative Rule R930-6
ACCOMMODATION OF UTILITIES
AND THE
CONTROL AND PROTECTION OF STATE HIGHWAY RIGHTS OF WAY

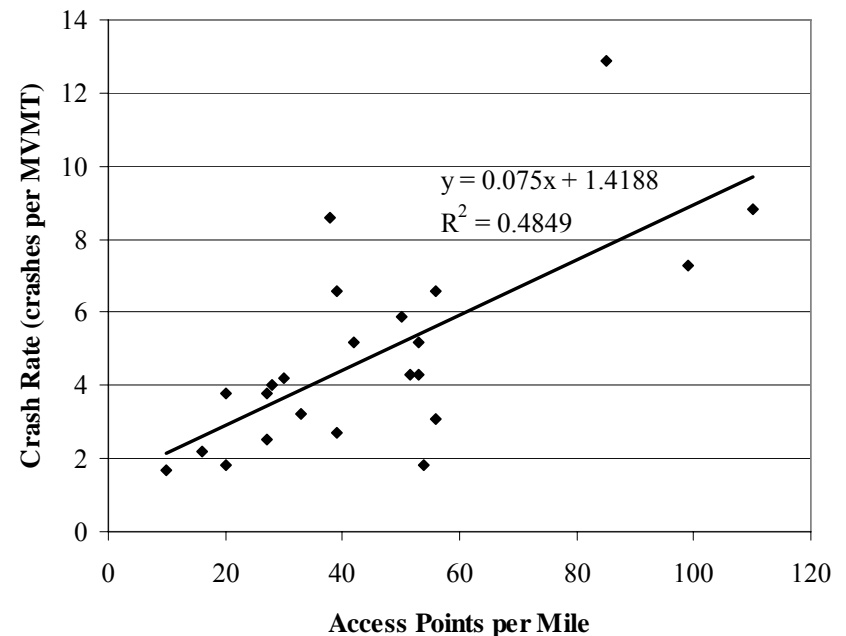
UTAH DEPARTMENT OF TRANSPORTATION
Division of Project Development, Railroads and Utilities Section
2003 Edition

Introduction

- One of the topics addressed in the Administrative Rule is **raised medians**
- UDOT was interested to determine if raised medians are an effective safety tool
- The purpose of this paper is to present the results of an assessment on the safety impacts of access management techniques (primarily raised medians) in Utah

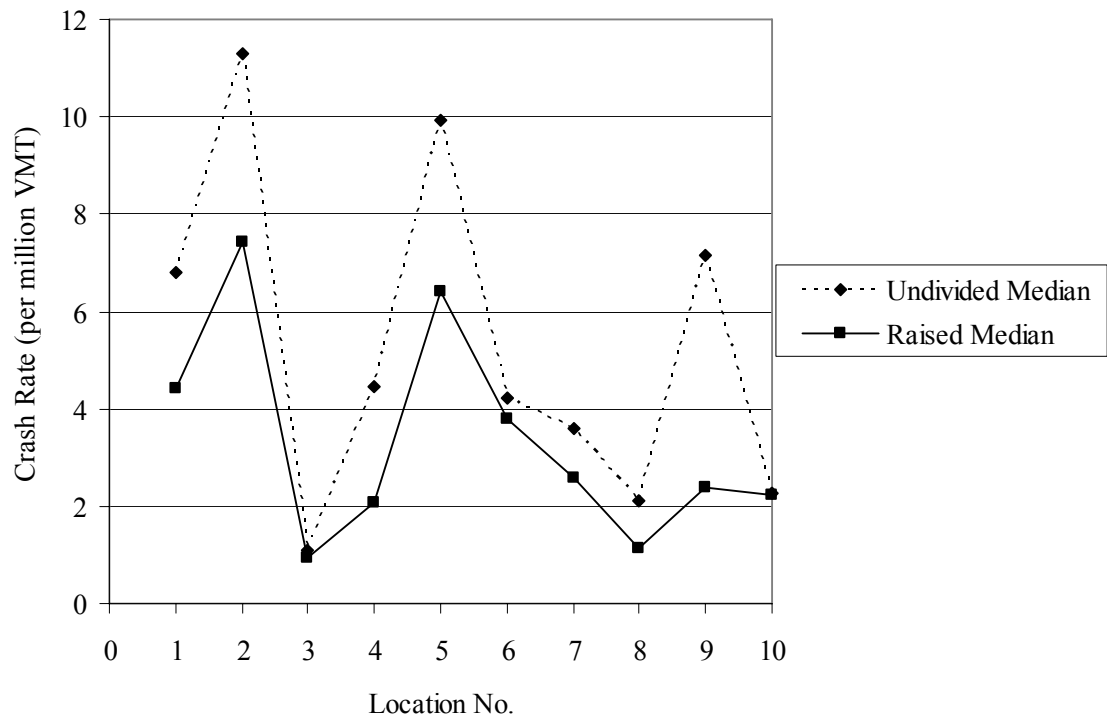
Background

- Access management techniques have generally been shown to have a positive impact on safety
- Access point density has been shown to be positively correlated with crash rates



Background

- Corner clearance is related to crash rates
- The type of median has a direct impact on the safety of the corridor



Background

- Previous studies on access management and raised median safety have been performed outside of Utah
- There was a need to determine the safety benefits provided by access management techniques within the state and to develop a methodology wherein this data could continually be monitored

Crash Database

- To complete this evaluation, a GIS enabled web delivered data almanac (i.e., crash database) was used to evaluate crash data

The screenshot shows a web interface for an accident database. At the top, there is a navigation bar with tabs for Search, Intersection, Filters, Reports, and Open Map. A dropdown menu is open, showing 'Accidents'. Below the navigation bar, there are links for Simple Search, Advanced Search, Fixed Segment Analysis, Floating Segment Analysis, Cluster Analysis, Help, and Home. The main content area is titled 'Accident Simple Search' and contains a search form with the following fields:

- Year: 1996 - 1998
- Route: 0186
- Milepoint: 5.54 - 7.59
- Filter: Select a Filter (Optional)

A 'Search' button is located below the filter field. To the right of the search form, there are four steps listed:

- Step 1 - Enter a Year.
- Step 2 - Select a Route.
- Step 3 - Enter the From-To Milepoint.
- Step 4 - (Optional) Select a Filter.

Crash Database

- The system was designed to enhance the analysis of the data through the:
 - Generation of custom tables and reports
 - Placement of the data on a “smart map” to visually identify hot spots or deficient areas
 - Ability to extract information through queries and save the data into a single file for analysis
 - Ability to shorten data collection time

Corridor Selection

- To analyze the results of access management techniques a sample of corridors was selected
- The corridors included locations where access management techniques (i.e., raised medians and/or driveway consolidation) had been implemented



Corridor Selection

- The analysis corridors included:
 - University Parkway (SR 265)
 - Alpine Highway (SR 74)
 - State Street (SR 89)
 - 400/500 South (SR 186)
 - 300 West (SR 89)
 - Redwood Road (SR 68)



Corridor Selection

- Several corridors were also selected as control sites including:
 - 700 East (SR 71)
 - 12300 South (SR 71)
 - Redwood Road (SR 68)
 - St. George Blvd. (SR 34)
 - SR 36



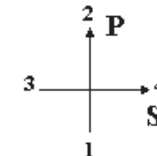
Analysis Procedure

- A set procedure was established to analyze the data that began with a thorough inspection of the site and proceeded through full analysis using the crash database

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Intersection Analysis
Criteria: SELECT all route_intsections WHERE accident data is (Year BETWEEN 1996 AND 1998) AND radius = 500 AND Total Accidents >= 0 AND (Route = 0089) AND (Milepoint BETWEEN 319 AND 326)
    
```

Update Radius			
Leg 1:	<input type="text" value="500"/>	Leg 2:	<input type="text" value="500"/>
Leg 3:	<input type="text" value="500"/>	Leg 4:	<input type="text" value="500"/>
<input type="button" value="Update Radius"/>			



Primary Route	MP 1	Secondary Route	MP 2	Type	Score	Total All Legs		Fatal All Legs	Primary Route (P)				Secondary Route (S)				Analyze			
						#	Rate		#	Rate	#	Rate	#	Rate	#	Rate				#
0089	319.38	0266	3.53	Signal	417.2	138	5.88	0	26	4.93	50	9.47	31	4.80	31	4.80	Info	Acc	Veh	Tot
0089	321.14	0171	10.75	Signal	572.3	172	7.75	0	60	11.89	24	4.76	63	10.41	25	4.13	Info	Acc	Veh	Tot
0089	325.04	0269	0.90	Signal	601.6	35	1.54	0	21	4.06	6	1.16	7	1.13	1	0.16	Info	Acc	Veh	Tot
0089	325.19	0269	0.90	Signal	1082.8	53	2.37	0	27	5.44	18	3.63	7	1.13	1	0.16	Info	Acc	Veh	Tot
0089	325.33	0186	5.70	Signal / Trax Xing	2267.7	106	5.87	0	19	3.83	51	10.28	30	7.36	6	1.47	Info	Acc	Veh	Tot

Analysis Procedure

- Several analyses were performed including:
 - Segment analysis
 - Intersection analysis
 - Collision type analysis
 - Crash severity analysis

State Road Intersection Search	
Year	1996 - 1998
Route	Route
Shed	0186
District	From - To Milepoint
Region	5.54 - 7.59
County	
Display As Radius of Influence	<input checked="" type="checkbox"/>
Radius of Influence	50
Total Accidents Greater Than	0
Select Filter (Optional)	<--Optional-->

Search

Analysis Results

- Results are summarized for Redwood Road (SR 68):
 - Raised median installed in 1994
 - Data analyzed from 1992 to 1993 and again from 1995 to 1997



Redwood Road Analysis Results

- Crash data and access point density for Redwood Road:
 - Crash rate decreased 13%
 - Number of access points per mile decreased 26%
 - AADT increased 12%

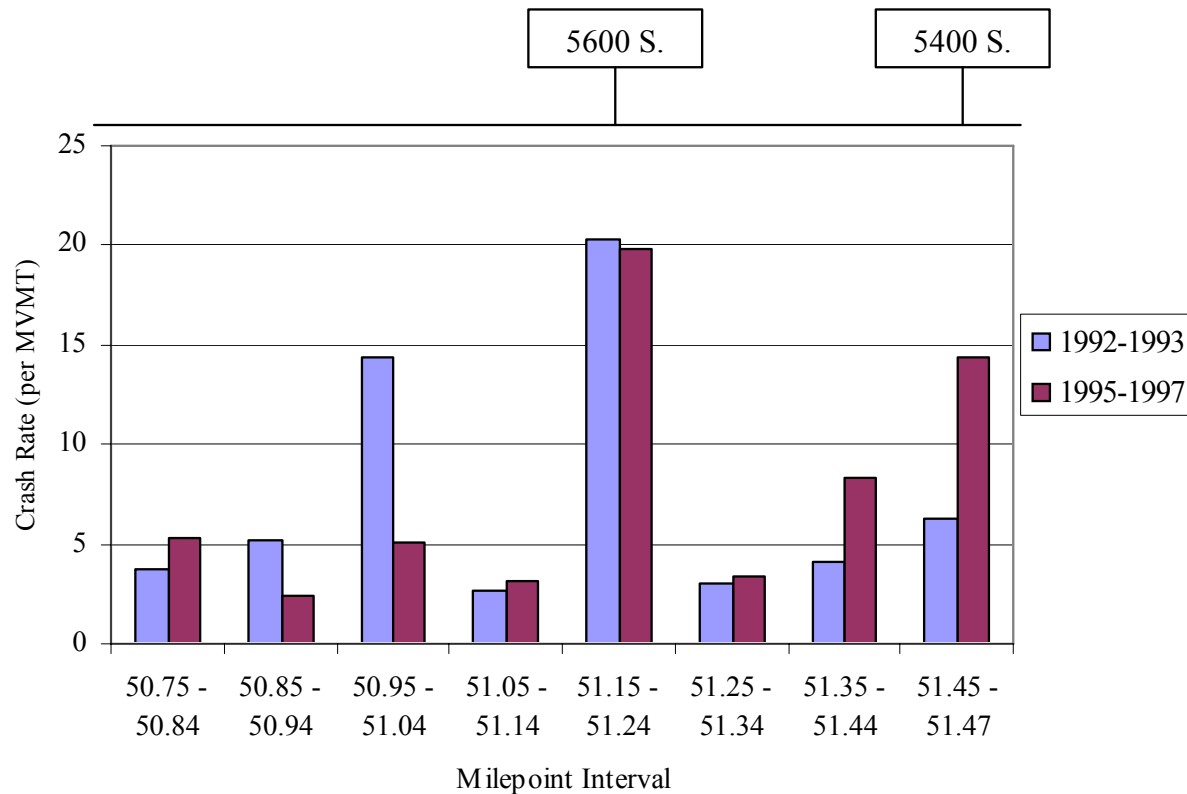
	Before (1992–1993)	After (1995–1997)
Crashes Per Year	112.5	110.3
Crash Rate (Crashes/MVMT ¹)	8.36	7.25
Fatality Rate (Fatalities/100 MVMT ¹)	0.00	0.00
Access Points	27	20
Length of Section (mi.)	0.73	0.73
Access Points per Mile	37.0	27.4
AADT ²	50,490	57,082

¹MVMT = Million Vehicle Miles Traveled

²AADT is a weighted average for the segment

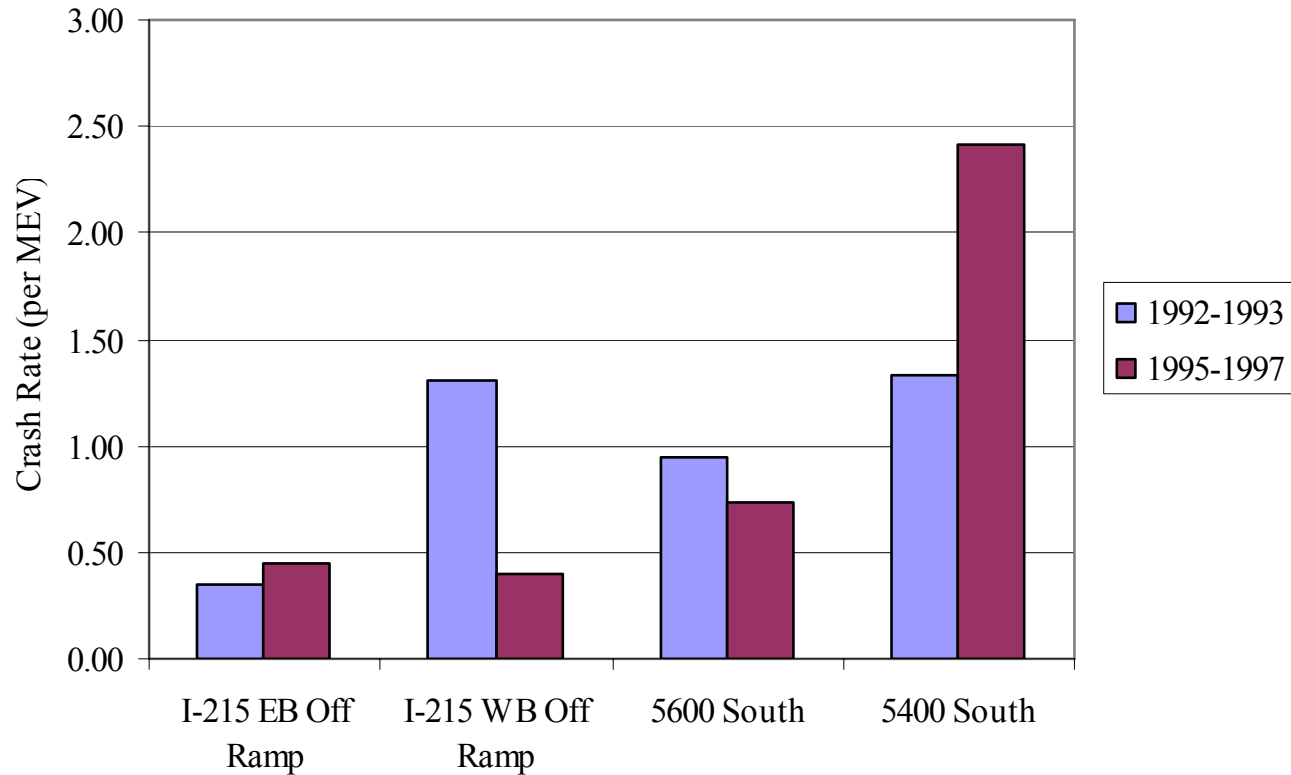
Redwood Road Analysis Results

- Crash rates for one-tenth-mile intervals:



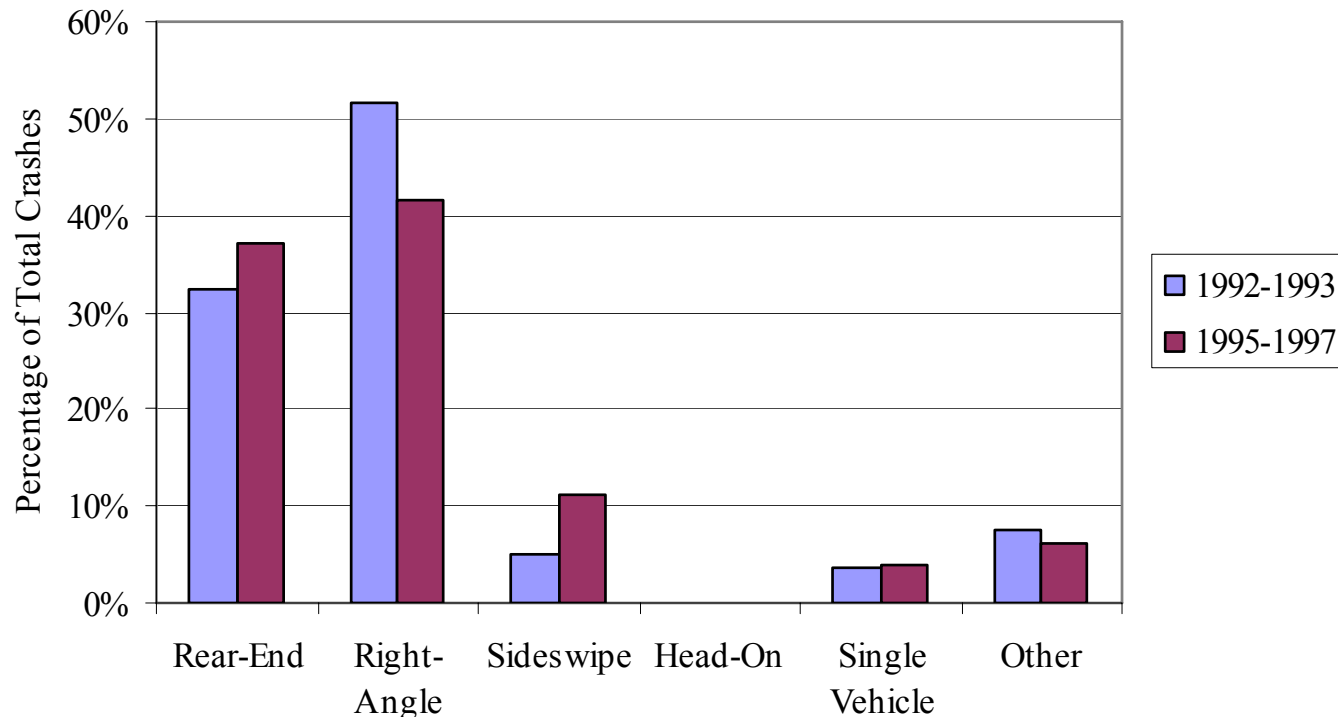
Redwood Road Analysis Results

■ Intersection crash rates:



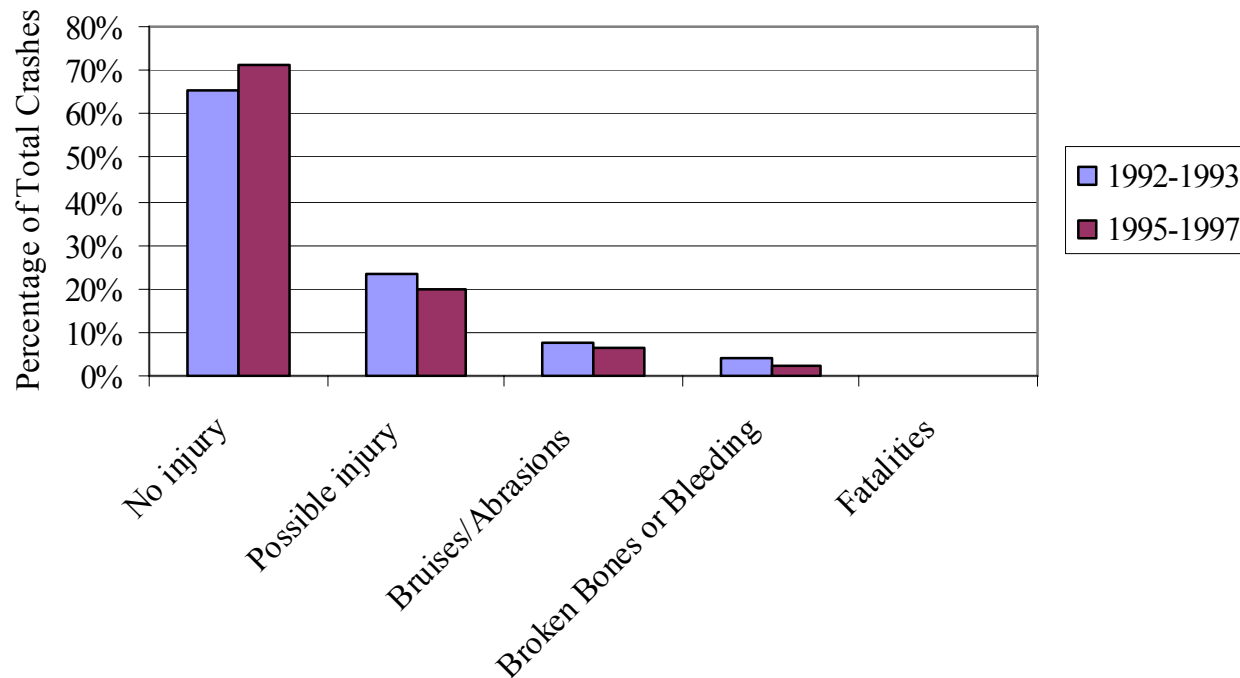
Redwood Road Analysis Results

- Collision types as a percentage of total crashes:



Redwood Road Analysis Results

- Severity of crashes as a percentage of total crashes:



Redwood Road Analysis Results

- Cost of crashes:

- As a result of the reduction in severity, the overall cost of crashes per year decreased by approximately \$565,000 per year

Crash Severity	Unit Cost	Before (1992–1993)	After (1995–1997)
No injury	\$ 4,500	\$ 661,500	\$1,062,000
Possible injury	\$ 25,000	\$1,300,000	\$1,650,000
Bruises/Abrasions	\$ 48,000	\$ 816,000	\$1,008,000
Broken Bones or Bleeding Wounds	\$ 228,000	\$2,052,000	\$1,824,000
Fatalities	\$2,720,000	\$ 0	\$ 0
Total Cost of Crashes		\$4,829,500	\$5,544,000
Cost of Crashes Per Year		\$2,414,750	\$1,848,000

Summary Analysis Results

- Changes in collision types at Analysis Locations:

		Types of Collisions					
		Rear-End	Right-Angle	Sideswipe	Head-on	Single Vehicle	Other
Analysis Locations	University Parkway	●	○	○	-	●	●
	Alpine Highway	○	●	●	-	●	○
	State Street	●	○	○	-	○	○
	400/500 South	●	○	●	-	●	○
	300 West	○	○	-	-	○	●
	Redwood Road	●	○	●	-	●	○

"●" indicates an increase

"○" indicates a decrease

"-" indicates no change

Summary Analysis Results

- Changes in crash severity at analysis locations:

		Crash Severity				
		No Injury	Possible Injury	Bruises/ Abrasions	Broken Bones or Bleeding	Fatalities
Analysis Locations	University Parkway	●	●	●	○	○
	Alpine Highway	○	●	●	●	-
	State Street	●	●	●	○	○
	400/500 South	●	○	○	○	●
	300 West	○	●	●	○	-
	Redwood Road	●	○	○	○	-

"●" indicates an increase

"○" indicates a decrease

"-" indicates no change

Summary Analysis Results

■ Overall changes in traffic characteristics:

		Crash Rate	Fatality Rate	Access Points per Mile	AADT	Total Cost of Crashes per Year
Analysis Locations	University Parkway	●	○	○	●	○
	Alpine Highway	○	-	-	○	●
	State Street	●	○	●	●	○
	400/500 South	●	●	○	○	○
	300 West	●	-	-	○	○
	Redwood Road	○	-	○	●	○
Control Sites	700 East	○	●	-	○	●
	12300 South	●	●	-	●	●
	Redwood Road	○	○	-	●	○
	St. George Blvd.	●	●	-	○	●
	SR 36	○	-	-	●	●

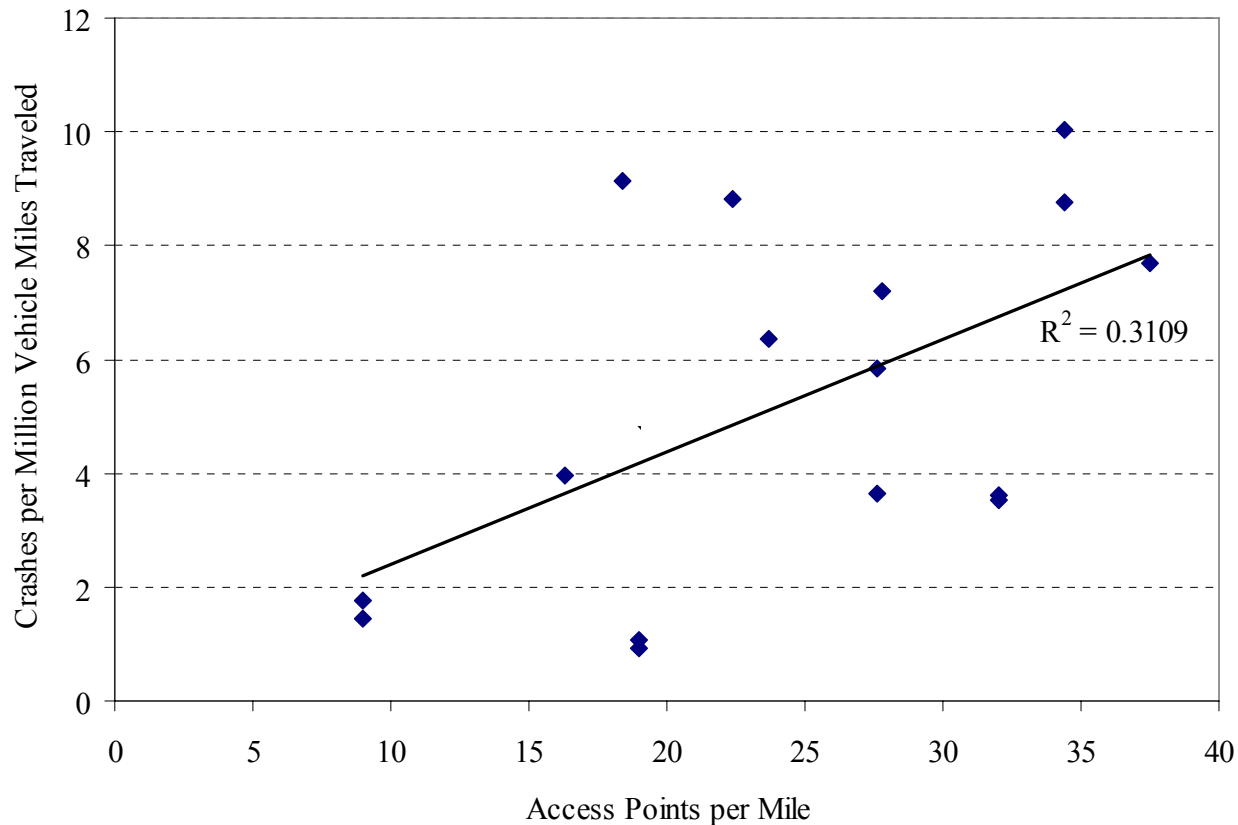
"●" indicates an increase

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Summary Analysis Results

- Relationship between access density and crash rate:



Conclusions

- Research was performed to evaluate safety of access management techniques in Utah
- Results showed that access management techniques may not necessarily be effective in reducing overall crashes ...
- However, other safety improvements were consistently observed, primarily the reduction in crash severity along with the corresponding reduction in the costs associated with crashes

Future Research

- More corridors are needed to develop a stronger correlation between sites
- A possible correlation was noted between crash rates and the characteristics of the corridors (e.g., land use, # lanes, AADT, etc.), which are being evaluated in a current research project to develop an access management performance index for the state

Acknowledgements

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