

# **SEISMIC VULNERABILITY & EMERGENCY RESPONSE ANALYSES OF UDOT LIFELINES**

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## **EXECUTIVE SUMMARY**

Earthquakes damage transportation infrastructure. In addition to replacement and repair costs for damage to transportation structures, large earthquakes can increase time delays resulting from a network component's loss of function. Damage to the network can severely disrupt traffic flows for several months or years. The Utah Department of Transportation (UDOT) recognizes the risks posed by these hazards and initiated this analysis. Impacts on road users can be estimated in terms of user costs from travel time delay. This report presents estimated traffic disruption user delay costs resulting from two earthquake scenarios in Utah. The VISUM traffic macro-simulation model was used to estimate the delay-based user costs. Road segments, which are vulnerable yet critical to detour traffic following an earthquake, are prioritized for rehabilitation. The calculated user costs show that the Taylorsville Scenario would incur \$65 million, which is significantly lower than the Wasatch Scenario of \$1.312 billion. Links that are susceptible to damage in one scenario, but critical in carrying detour traffic for the other scenario, are defined as lifelines. A shortlist of lifelines is provided for each earthquake scenario with detailed information, including names, directions, and addresses.



## 1. INTRODUCTION

Earthquakes damage transportation infrastructure. The impacts of bridge damage include not only short-term costs of structural repair, but also long-term economic consequences (1). This research assumes that one long-term consequence is the loss of time as commuters and freight travel slows down to navigate disrupted networks. In addition to initial replacement or repair costs of damage to the transportation structures, large earthquakes increase time delays because of network components' loss of function (2). After a severe earthquake, different parts of a roadway system will receive various levels of damage, and the capacity of those severely affected portions will be reduced, which will cause further traffic congestion (3). Damage to the transportation network can disrupt traffic flows from months to years. The disrupted traffic flows can impact the economic recovery of the region as well as post-earthquake emergency response and reconstruction operations (4). The Utah Department of Transportation (UDOT) recognized the risks posed by these hazards and initiated this analysis.

Earthquake related economic losses due to the increased travel times may be evaluated by examining the difference between network performance before and after an earthquake. The user equilibrium network flow model is one of the most useful traffic assignment models in transportation analysis.

Post-earthquake travel times are compared to pre-earthquake travel times in order to understand the effects of earthquake damage on travel times (5). Werner (6) developed methodologies to estimate the delay-based user costs using Risks from Earthquake DAmage to Roadway Systems (REDARS) software. Post-earthquake damage information was supplied as REDARS output. The traffic disruption assessment is delivered through VISUM simulation software. VISUM is a refined and site-specific macrosimulation model of Salt Lake County.

This report presents the estimated delay-based user costs due to the traffic disruptions caused by two earthquake scenarios: (1) the Wasatch Scenario and (2) the Taylorsville Scenario. Road segments that come under fault zones are most likely to get damaged after an earthquake. These road segments are defined as vulnerable links. Links that can carry considerable detour traffic after an earthquake are defined as critical links. A list of links susceptible to damage, yet critical for each scenario, was prioritized for rehabilitation.

The objectives of this report are to:

- Compile a list of links that would be:
  - Vulnerable to both the Wasatch Scenario and the Taylorsville Scenario (The most vulnerable links)
  - Critical to both the Wasatch Scenario and the Taylorsville Scenario (The most critical links)
  - Vulnerable in the Wasatch Scenario and critical in the Taylorsville Scenario (Lifelines for the Taylorsville Scenario)
  - Vulnerable in the Taylorsville Scenario and critical in the Wasatch Scenario (Lifelines for the Wasatch Scenario)
- Recommend UDOT potential protection, improvement, and maintenance procedures for lifelines.
- Determine how the earthquake damage influence traffic in terms of AM peak, mid day, PM peak, and off peak traffic.
- Assess the impact of degree of damage on the traffic in terms of user delay costs.

This report explains the data collection, software tools, and the methodology used in Section 2. The results are presented in Section 3, followed by conclusions drawn from the study in Section 4. Limitations and suggestions for future work are presented in Sections 5.



## 2. METHODOLOGY

### 2.1 Study Area

Figure 1 displays the study area in Salt Lake County. The part of the network, in which most of the damage is expected resulting from both the Wasatch Scenario and the Taylorsville Scenario, is circled. The transportation network for the study region encompasses several major roadways and bridge structures. Major highways in the area include Interstates 15, 80, 215, and several other state highways.

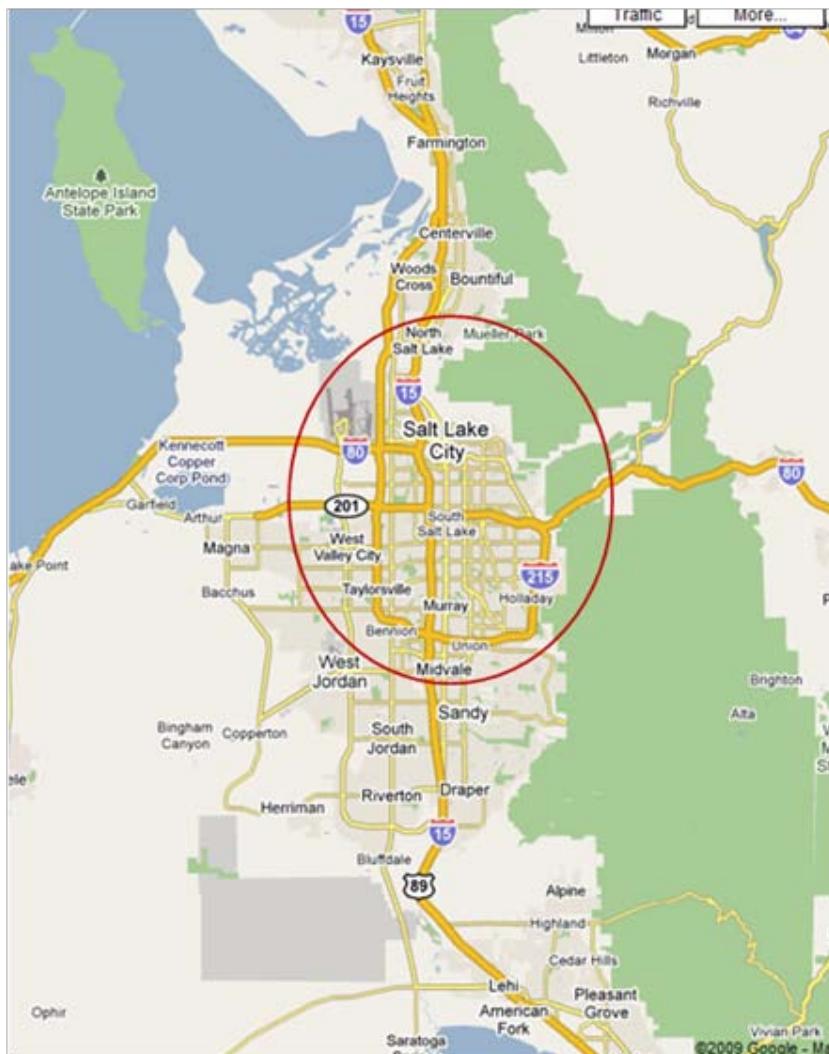


Figure 2.1 Study area in Salt Lake County

## 2.2 Flow Process of Methodology for Delay Costs

An economic analysis was developed to quantify the economic losses due to the decreased performance of the network from bridge damage. The methodology is shown as a schematic flowchart in Figure 2 below.

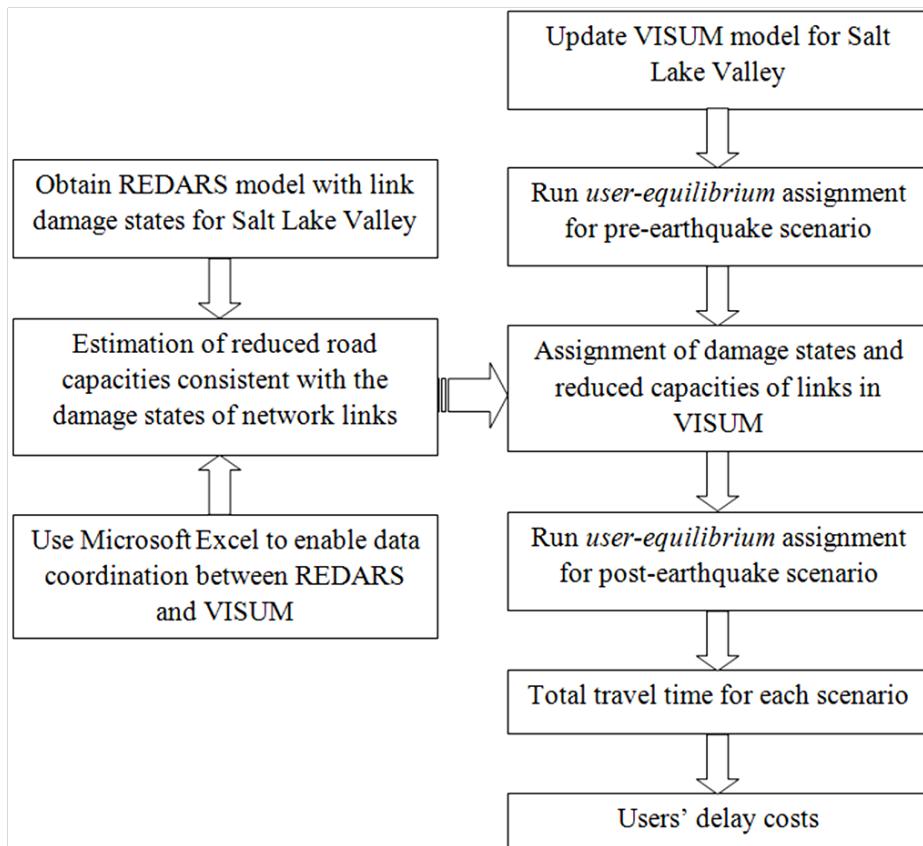


Figure 2.2 Flow chart of methodology

## 2.3 Delay Based User Costs

The economic losses due to earthquake are a combination of direct and indirect losses. Direct losses are due to rehabilitation of damaged network and indirect losses are due to impacts on traffic delays. The indirect costs associated with the functionality of the transportation network can be much more significant than repairing the actual physical damage. Evaluating the economic loss of a highway transportation system in a metropolitan area is a significant and important task that can be used by decision makers to assign resources in accordance with the estimated economic risk (7). The first step in the transportation analysis was defining the Measure of Effectiveness (MOE). MOEs are used to compare and evaluate network performance. Since the major focus was the impact on road users, user cost was selected as the MOE. Impacts on road users can be estimated in terms of user costs due to travel time delay. User costs represent the monetary value of travel delays (8). U.S. Department of Transportation (USDOT) suggests monetary value of time savings depending on the trip purpose and conditions under which the trip is made (9).

## 2.4 Data Collection

### 2.4.1 O-D Matrices

Local and state governments subdivide the roadway system into a set of sub-regions called Traffic Analysis Zones (TAZs) to monitor user trip demands on the roadway system. The O-D matrix defines the number of trips from each TAZ to all other TAZs in the region. Origin-Destination (O-D) data estimate the location of travel origins and destinations and the corresponding number of trips from and to all the different TAZs in the region (1). TAZ and O-D data enabled the current VISUM model to measure travel time between different sub-regions of the network as well as link volumes.

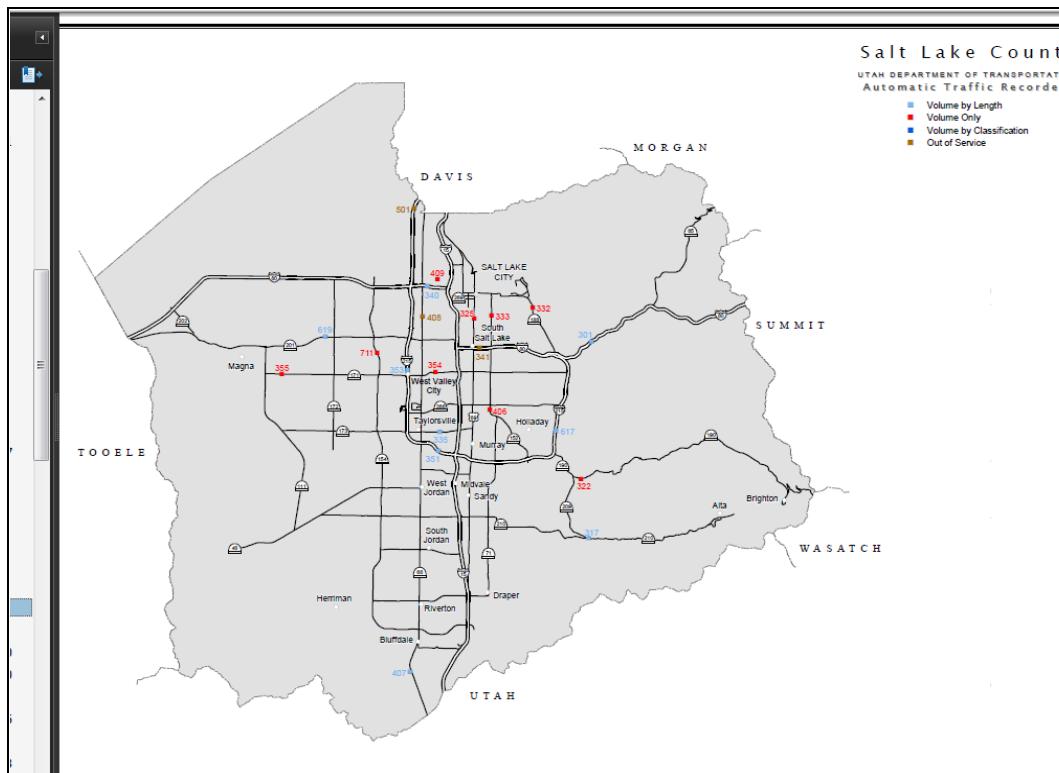
The O-D demand tables for 2008 were obtained from WFRC and used in the analysis. Diurnal periods in the analysis were defined in such a way that morning and afternoon peaks are distinguished from rest of the day. Additionally, hours after afternoon peak were split into evening and night periods as traffic demand significantly varies in those time periods (8). The diurnal periods for this study are presented in Table 2.1.

**Table 2.1** Diurnal periods for the analysis

Notation	Description	Period
AM	Morning peak period (3 hours)	6am – 9am
MD	Midday period (6 hours)	9am – 3pm
PM	Afternoon peak period (3 hours)	3pm – 6pm
PEV	Evening period (4 hours)	6pm – 10pm
NEV	Night period (8 hours)	10pm – 6am

### 2.4.2 Truck Traffic

Truck percentages of Annual Average Daily Traffic (AADT) were obtained from UDOT's traffic statistics for the year 2008 (10). Data were collected from the permanent traffic counters in the study area. Figure 2.3 shows the map of permanent traffic counters in Salt Lake County. The average value of truck percentage was derived as 9% of AADT.



**Figure 2.3** Permanent traffic counter location map in Salt Lake County (11)

### 2.4.3 Value of Travel (VOT)

Data for Values of Travel (VOTs) were gathered from Texas Department of Transportation. VOTs were estimated at \$15.47 per hour of person travel and \$102.12 per hour of truck time. These values are based on a calculation that weighs several value categories, including average wages and fringe benefits, costs of employees, freight inventory values, and average vehicle occupancies (12).

## 2.5 REDARS

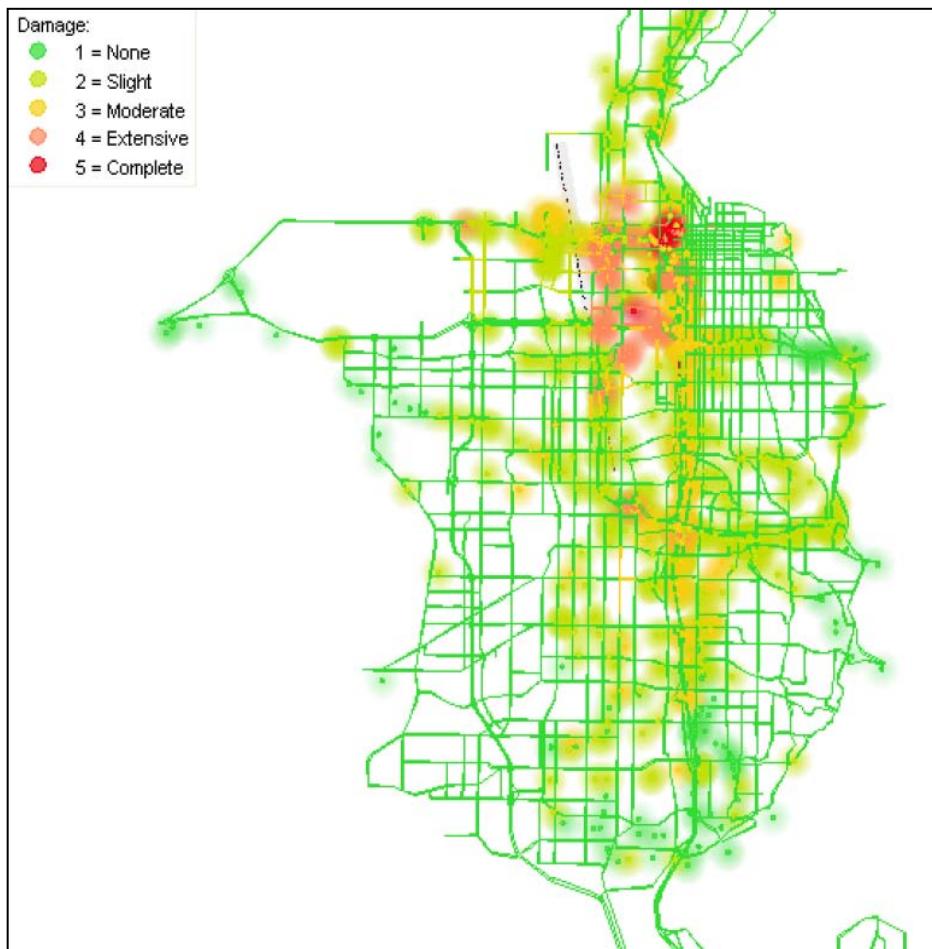
REDARS is a software program that estimates the extent and location of earthquake damage to a roadway system, how this damage affects system-wide post-earthquake travel times and traffic flows, and the economic losses caused by travel time delays (13). REDARS combines structural, geotechnical, transportation, and economic methodologies to perform deterministic and probabilistic analysis of the network model as part of a comprehensive seismic risk assessment. The literature supplies a more detailed description of REDARS (1).

Earthquakes result in damage to links. However, the severity of damage will not be the same for all the links. So, link damages should be classified in such a way that similar types of links will respond alike for a certain rehabilitation process. The different Permanent Ground Displacement Damage States (PGD DS) are (14) slight or PGD DS = 2, moderate or PGD DS = 3, extensive or PGD DS = 4 and collapse or PGD DS = 5. Table 2.2 shows the classification of damage states based on the type of damage in the structure.

**Table 2.2** Classification of Damage States

Classification	Damage State (DS)	Damage Types
None	1	No damage
Slight	2	Minor cracks/spalling
Moderate	3	Cracking, spalling/cracking, shear keys, rocker bearing failure
Extensive	4	Column degradation without collapse (shear failure)
Complete	5	Unseating of deck, collapse of column

Figure 2.4 displays the Wasatch Scenario post-earthquake network model in REDARS. Links at different PGD DS values are shown in different color



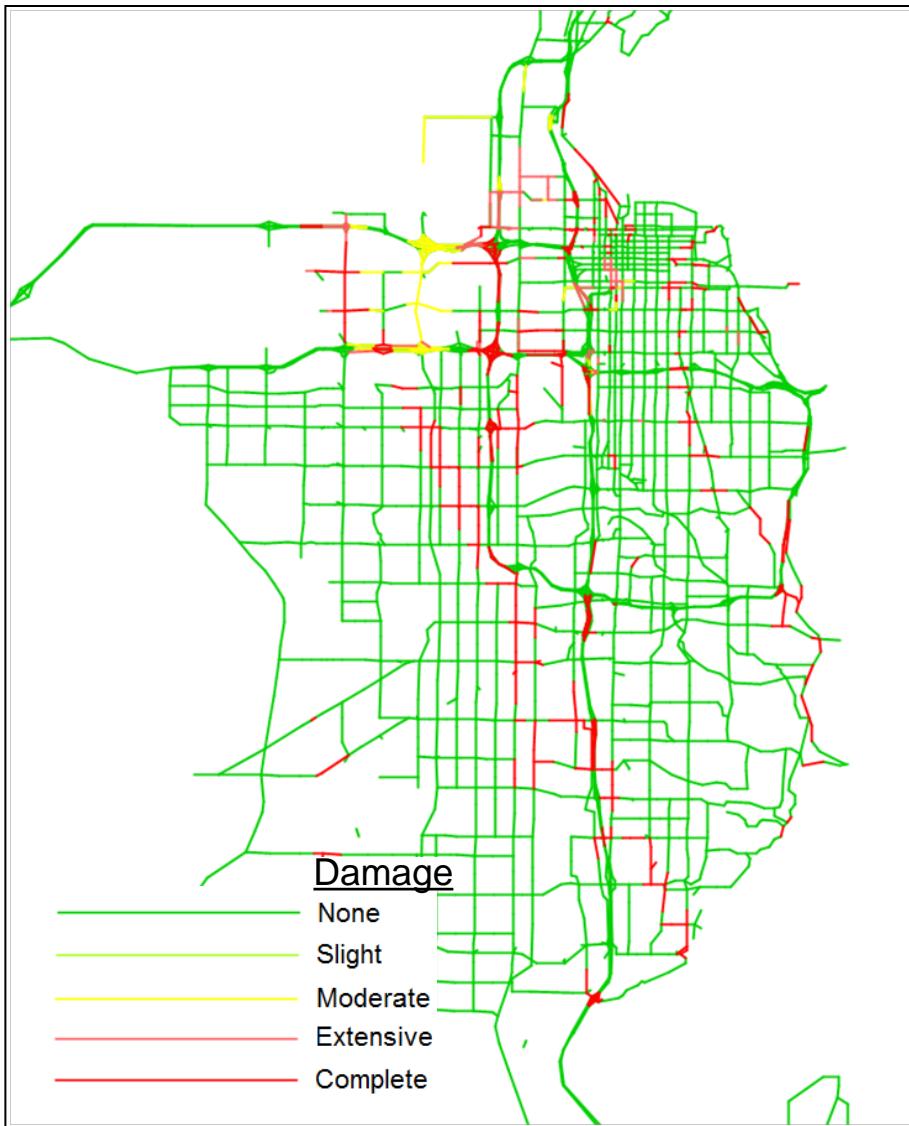
**Figure 2.4** REDARS map of damage states in Salt Lake County, Utah

## **2.6 Transferring Data from REDARS to VISUM**

REDARS was not used for the traffic modeling because more refined and site specific transportation planning model in VISUM is available for Salt Lake County. With a more refined VISUM model, the results of the traffic assignments reflect the dynamics of a post-earthquake traffic demand in a better way. Analysis of post-earthquake traffic flows in REDARS is based on a User-Equilibrium (UE) model of transportation-system user behavior, which assumes that all users follow routes that minimize their travel times. At user equilibrium conditions, no traveler has an incentive to change paths because all paths used between any given origin-destination pair have equal cost (15). The assignment procedures in VISUM are based on search algorithms which determine routes between O-Ds. The search procedure is followed by a choice procedure, which distributes the travel demand of an O-D pair onto links (16). The default model in REDARS assumes that post-earthquake trip demands on the highway system are equal to pre-earthquake trip demands (4). The same concept was adopted for the analysis in VISUM.

The interface between REDARS and VISUM was one of the key components of this study. The hazard and vulnerability assessments performed within REDARS were incorporated into VISUM using spreadsheet (Microsoft Excel) tools. Hazard and vulnerability assessments provided outputs in terms of link damage states. Capacity loss for a link depends upon the degree of damage to the link. The link damage represents the worst state of damage to the bridges in that link. For example, if at least one of the bridges in a link suffers major damage, and if that is the greatest state of damage, the whole link is considered having major damage (17).

The damage data from post-earthquake REDARS model were incorporated into VISUM model. Figure 2.5 displays the freeway and state highway network in VISUM for Salt Lake County, Utah. The colors display links at different damage states.



**Figure 2.5** VISUM post-earthquake model with damaged links

## 2.7 Analysis in VISUM

The methods described in the following sections reflect all diurnal periods in both the Wasatch Scenario and the Taylorsville Scenario.

### 2.7.1 Pre-Earthquake Analysis

The damage model in VISUM consists of links with PGD DS values ranging from 0 to 6. Each PGD DS value represents the level of damage on the link. However, these values do not affect the original capacities and free flow speeds that already existed in the VISUM model. These parameters were kept unchanged to conduct experiments for pre-earthquake conditions.

Traffic analysis was done for each diurnal period separately. The capacity available on a link was represented in terms of capacity per hour per lane (CPHPL). Both CPHPL and free flow speed on a link are constant and do not vary with time of day. In VISUM, total capacity on a link is the product of CPHPL, number of lanes in that link, and the number of hours in the diurnal period. So, the total capacity for a link changes from one diurnal period to other. Total capacities were measured for all links and a model was prepared for initial traffic assignment.

The next step in the analysis was assigning traffic demand on the network. OD demand matrices were developed separately for each diurnal period. These demands were then assigned on the respective VISUM models using equilibrium assignment (17). This procedure resulted in average link travel times and link-volumes for all links in the network. The product of average link travel time and link-volume for a link resulted in total link travel time in vehicle-hours. Summation of all link travel times provided total network travel time for that diurnal period. It is not required to conduct pre-earthquake analysis separately for the Wasatch Scenario and the Taylorsville Scenario since the capacity and diurnal demands are constant in both cases. However, post-earthquake analysis must be done for each scenario separately since each of them results in different magnitude of damage and have different levels of total network capacity. Therefore, the pre-earthquake travel times were the same for both the Wasatch Scenario and the Taylorsville Scenario.

## 2.7.2 Post-Earthquake Analysis

Following an earthquake, the roadway systems usually will encounter different levels of damage. The PGD DS value of a link represents the level of damage. Damage states and their default capacity and free flow speed change rates from REDARS are shown in Table 2.3. Percentage values also account for the changes resulting from the repair work and the detour of traffic. These values are hypothetical and future research is needed to validate them (17).

**Table 2.3** Change in road capacity and free flow speed due to damages

State of Link Damage	PGD DS	Capacity Change Rate	Free Flow Speed Change Rate
None	1	100%	100%
Minor	2	100%	75%
Moderate	3	75%	50%
Major	4	50%	50%
Collapse	5	50%	50%

Table 2.4 shows the variation in timeframes for links at different damage states to reach fully-open status. All these values are based on a research limited to a particular location. Further research needs to be done for sight-specific values.

**Table 2.4** Default damage states and their timeframes to reach fully-open status

<b>Damage State</b>	<b>PGD DS</b>	<b>Time to Reach Fully Open Status (Days, After Rehabilitation Started )</b>
None	1	-
Slight	2	0
Moderate	3	4
Extensive	4	12
Collapse	5	140, 180 or 220 depending on the number of bridge spans

Any of the default values determining traffic states can be modified by the user, including the default assumption that a bridge is either fully opened or fully closed during repair. The user can override this assumption so that a “partially opened” bridge is considered where the number of lanes closed to traffic is a function of the damage state, total number of lanes, and the number of bridge spans (1). This analysis assumed default values for capacity and free flow speed changes for all damage types except collapse. The collapse state should be redefined for more accurate analysis. Although the defaults values suggest that collapsed links will retain 50% capacity and speed, it might not be the same in case of bridges. A bridge is very unlikely to carry any traffic when it has collapsed. The default traffic model in REDARS assumes that a bridge is either fully closed or fully open to traffic during repair. Therefore, all collapsed bridges are assumed to be closed, so that they have 0% capacity and 0% free flow speed during the entire rehabilitation period. The changed values are shown in Table 2.5.

**Table 2.5** Modified road capacity and free flow speeds due to damages

<b>State of Link Damage</b>	<b>PGD DS</b>	<b>Capacity Change Rate</b>	<b>Free Flow Speed Change Rate</b>
None	1	100%	100%
Minor	2	100%	75%
Moderate	3	75%	50%
Major	4	50%	50%
Collapsed Bridges	5	0%	0%

From the REDARS user manual (13), the relationship between travel-related costs and time suggests that for the first seven days the delay cost per day is constant. This may be due to the emergency activities that would take place during the initial days following an earthquake. During this time no rehabilitation would occur and the daily delay costs would be at peak level. The delay costs should be calculated immediately from the day the earthquake occurs, but not from the day when rehabilitation starts. Therefore, seven more days were added to the total timeframes to measure delay costs. The changed timeframes are shown in Table 2.6.

**Table 2.6** Damage states and modified timeframes to reach fully-open status

<b>Damage State</b>	<b>PGD DS</b>	<b>Time to Reach Fully Open Status (Days, After Earthquake)</b>
None	1	-
Slight	2	7
Moderate	3	11
Extensive	4	19
Collapse	5	187

These capacity and free flow speed changes were incorporated into the VISUM model and the traffic assignment was run again. Since the capacity was decreased for the same demand, traffic is congested and the total travel times were increased. Similar to the pre-earthquake conditions, the total daily network travel times were calculated for all diurnal periods. Tables 2.7-2.8 show pre-earthquake and post-earthquake travel times for all diurnal periods in both the Wasatch Scenario and the Taylorsville Scenario.

**Table 2.7** Average network travel times, the Wasatch Scenario

Diurnal Period	Average Network Travel Times (Vehicle Hours)				
	Pre-Earthquake	Post-Earthquake			
		0-7 Days	7-11 Days	11-19 Days	19-187 Days
AM	155,100	205,778	205,774	199,471	193,895
MD	296,650	370,739	370,712	365,151	359,877
PM	273,637	469,891	469,914	462,658	446,992
PEV	140,998	163,404	163,382	161,558	160,035
NEV	49,675	54,179	54,174	53,689	53,296

**Table 2.8** Average network travel times, the Taylorsville Scenario

Diurnal Period	Average Network Travel Times (Vehicle Hours)				
	Pre-Earthquake	Post-Earthquake			
		0-7 Days	7-11 Days	11-19 Days	19-187 Days
AM	155,100	158,512	158,044	156,518	155,580
MD	296,650	305,868	304,722	301,372	299,054
PM	273,637	293,306	292,253	288,008	282,143
PEV	140,998	144,156	143,666	142,524	141,828
NEV	49,675	50,493	50,346	49,973	49,818

The difference between total travel times for pre-earthquake and post-earthquake conditions resulted in delay times in vehicle-hours. These delay times were multiplied with VOTs to derive travel costs. As link-volumes consist of both passenger cars and trucks, separate VOTs were used for measuring delay costs.

## **2.8 Evaluation of Vulnerability and Importance of the Links in Network**

One of the objectives of this research was to recommend to UDOT potential protection, improvement, and maintenance procedures for critical lifelines for post-earthquake conditions. However, it is impractical to improve all vulnerable bridges for seismic hazards due to limited resources. Therefore, only road segments (links), which are vulnerable in one scenario but still can carry a considerable amount of detour traffic in the other scenario, were selected for rehabilitation. UDOT can concentrate only on these prioritized links and avoid all others to minimize the improvement costs.

Links, which are damaged under both earthquake scenarios, are defined as most vulnerable links.

Hence, all these links will have at least one damage state between slight and collapse in both scenarios. VISUM damage models were processed and filtered for the links with damage state between 2 and 5.

The most critical links are defined as the links with the highest increase in traffic (ratio of traffic volumes after and before the earthquake) under both earthquake scenarios. VISUM assigns the redundant traffic, which would go on damaged links had no earthquake occurred, onto the neighboring links. So, the traffic volumes on neighboring links were increased following each earthquake scenario. Critical links play an important role in maintaining regular traffic when all the freeway and major roads, which carry much of the daily traffic, are damaged due to earthquake.

Finally, a list of both critical and vulnerable links was prepared for each scenario. Due to the constraint of limited resources, it is vital to manage disaster mitigation resources with strategic budget planning. These lists can be more informative for UDOT to optimize the rehabilitation resources and to reduce the vulnerability of the critical links.

All three categories of links, which are most vulnerable, most critical, and a combination of critical and vulnerable, were produced using a filtering process in VISUM.



### 3. RESULTS

#### 3.1 Delay-Based User Costs

##### 3.1.1 Average Daily User Costs

The cumulative average daily user costs were measured on the 7th, 11th, 19th and 187th day following each earthquake. This was to understand how the average costs varied due to less damaged types opened during rehabilitation. Tables 3.1-3.2 show average user costs for the Wasatch Scenario and the Taylorsville Scenario, respectively.

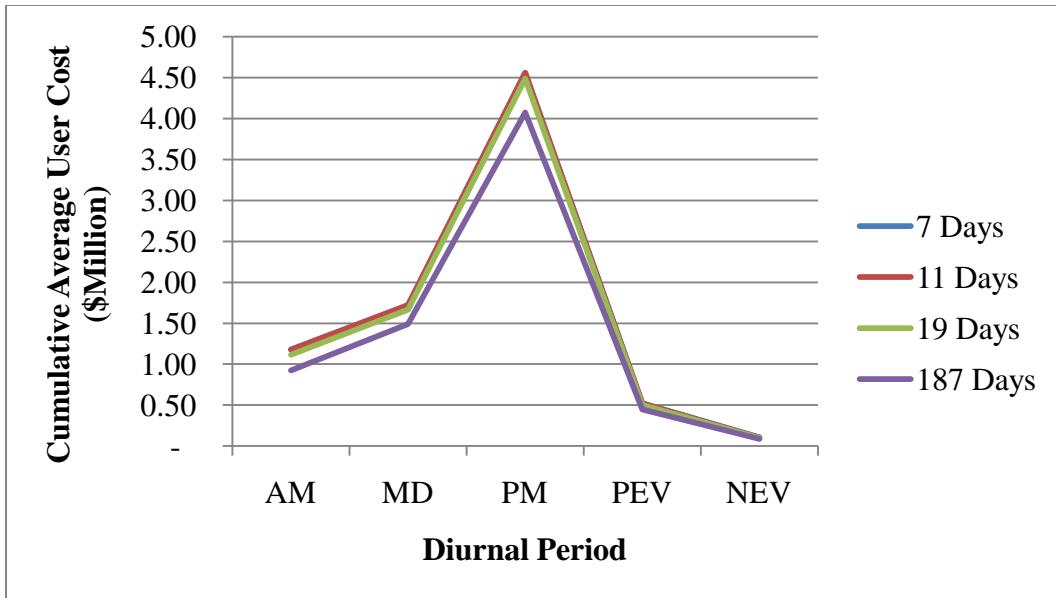
**Table 3.1** Cumulative average user delay costs, the Wasatch Scenario

Diurnal Period	Cumulative Average User Delay Costs (\$Million)			
	7 Days	11 Days	19 Days	187 Days
AM	1.18	1.18	1.12	0.92
MD	1.72	1.72	1.67	1.49
PM	4.56	4.56	4.49	4.07
PEV	0.52	0.52	0.50	0.45
NEV	0.10	0.10	0.10	0.09
Total	8.08	8.08	7.87	7.02

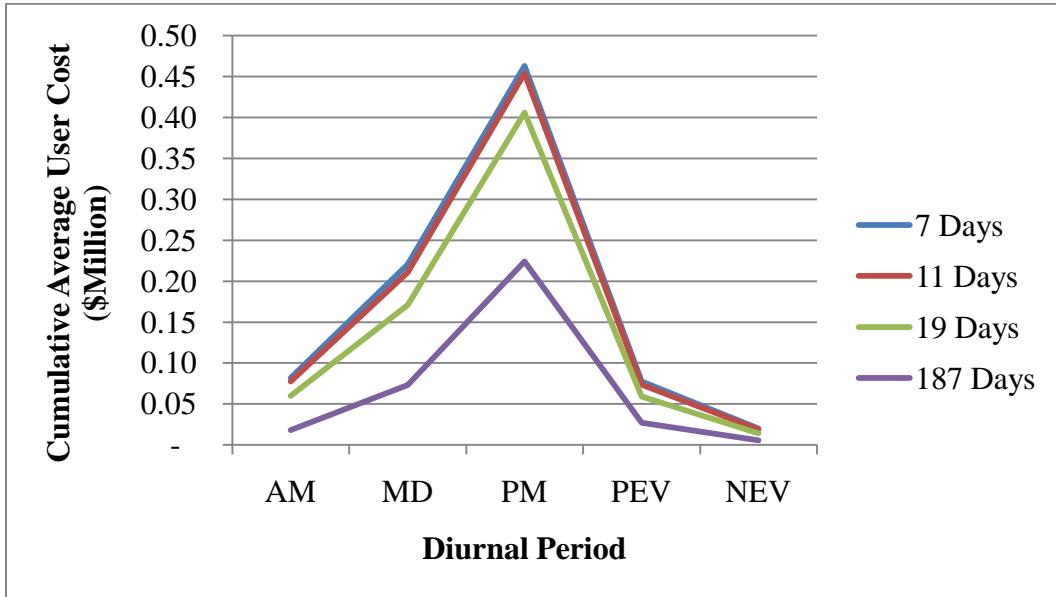
**Table 3.2** Cumulative average user delay costs, the Taylorsville Scenario

Diurnal Period	Cumulative Average User Delay Costs (\$Million)			
	7 Days	11 Days	19 Days	187 Days
AM	0.08	0.08	0.06	0.02
MD	0.22	0.21	0.17	0.07
PM	0.46	0.45	0.41	0.22
PEV	0.08	0.07	0.06	0.03
NEV	0.02	0.02	0.01	0.01
Total	0.86	0.83	0.71	0.35

These results are also presented in Figures 3.1 and 3.2 to visualize the variation. Each data series represents cumulative average user costs for all diurnal periods. Regardless of time, the delay cost patterns were found to be similar with peak level at PM. As the rehabilitation progresses, the average delay cost tends to decrease relative to original costs.



**Figure 3.1** Post-earthquake cumulative average user delay costs, the Wasatch Scenario



**Figure 3.2** Post-earthquake cumulative average user delay costs, the Taylorsville Scenario

### 3.1.2 Total User Costs

Tables 3.1 and 3.2 show the cumulative total user costs at different points of time for which slightly, moderately, extensively, and completely damaged links are fully open to the traffic. The total cumulative user costs are presented in Figures 3.1 and 3.2 to visualize the variation. The graphs show a similar pattern from 7 to 19 days but abrupt increases at 187 days. This might be due to the large interval between 19 and 187 days compared with the others. From these figures it can be understood that most of the costs were imposed by completely damaged links. This was not only due to severity of their damage but also to longer timeframes they take for rehabilitation. The calculated user costs show that the maximum impacts

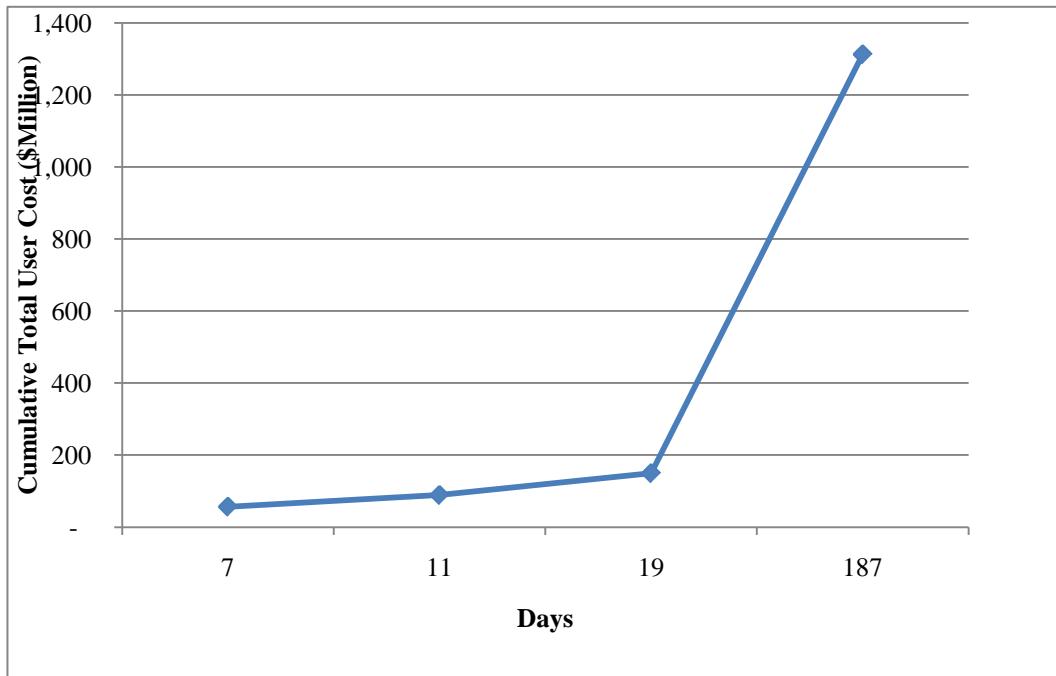
would be imposed on PM traffic. Also, the Taylorsville Scenario would incur a delay cost of \$65 million, which is significantly lower than the Wasatch Scenario of \$1.312 billion. This might be due to larger extent of damage in the Wasatch Scenario compared with the Taylorsville Scenario.

**Table 3.3** Cumulative total user delay costs (\$ million), the Wasatch Scenario

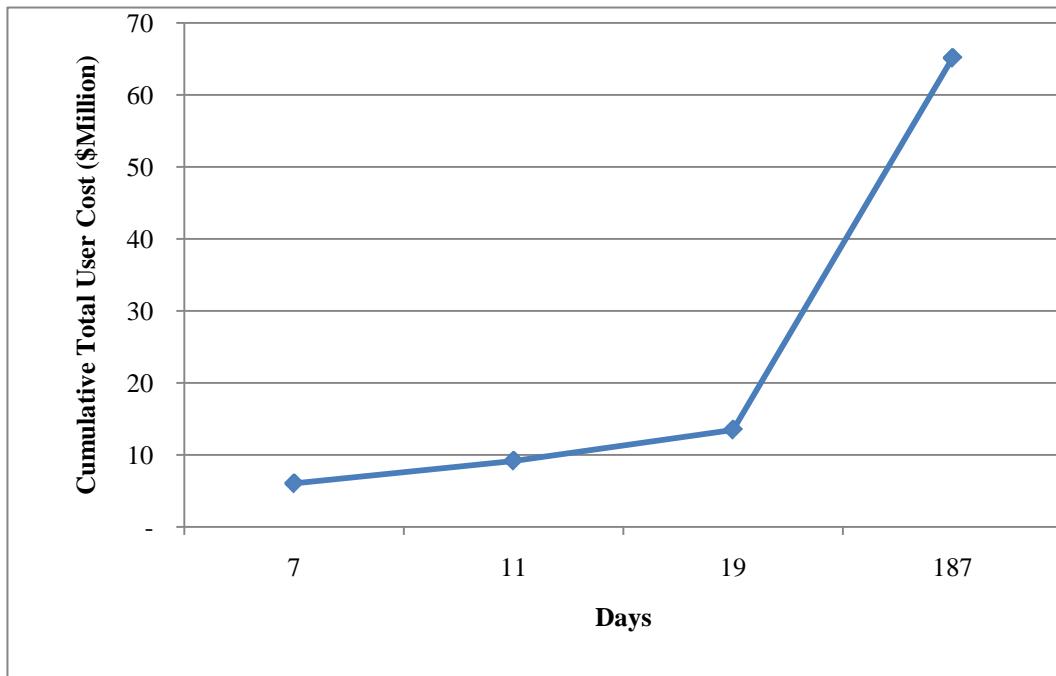
<b>Diurnal Period</b>	<b>Cumulative Total User Costs (\$Million)</b>			
	<b>7 Days</b>	<b>11 Days</b>	<b>19 Days</b>	<b>187 Days</b>
AM	8.24	12.95	21.19	172.55
MD	12.04	18.92	31.65	278.33
PM	31.90	50.14	85.25	761.59
PEV	3.64	5.72	9.54	83.81
NEV	0.73	1.15	1.90	16.02
Total	57	89	150	1,312

**Table 3.4** Cumulative total user delay costs (\$ million), the Taylorsville Scenario

<b>Diurnal Period</b>	<b>Cumulative Total User Costs (\$Million)</b>			
	<b>7 Days</b>	<b>11 Days</b>	<b>19 Days</b>	<b>187 Days</b>
AM	0.57	0.85	1.14	3.41
MD	1.54	2.32	3.25	13.72
PM	3.24	4.99	7.71	41.90
PEV	0.54	0.81	1.13	5.07
NEV	0.14	0.21	0.27	1.02
Total	6	9	13	65



**Figure 3.3** Post-earthquake cumulative total user delay costs, the Wasatch Scenario



**Figure 3.4** Post-earthquake cumulative total user delay costs, the Taylorsville Scenario

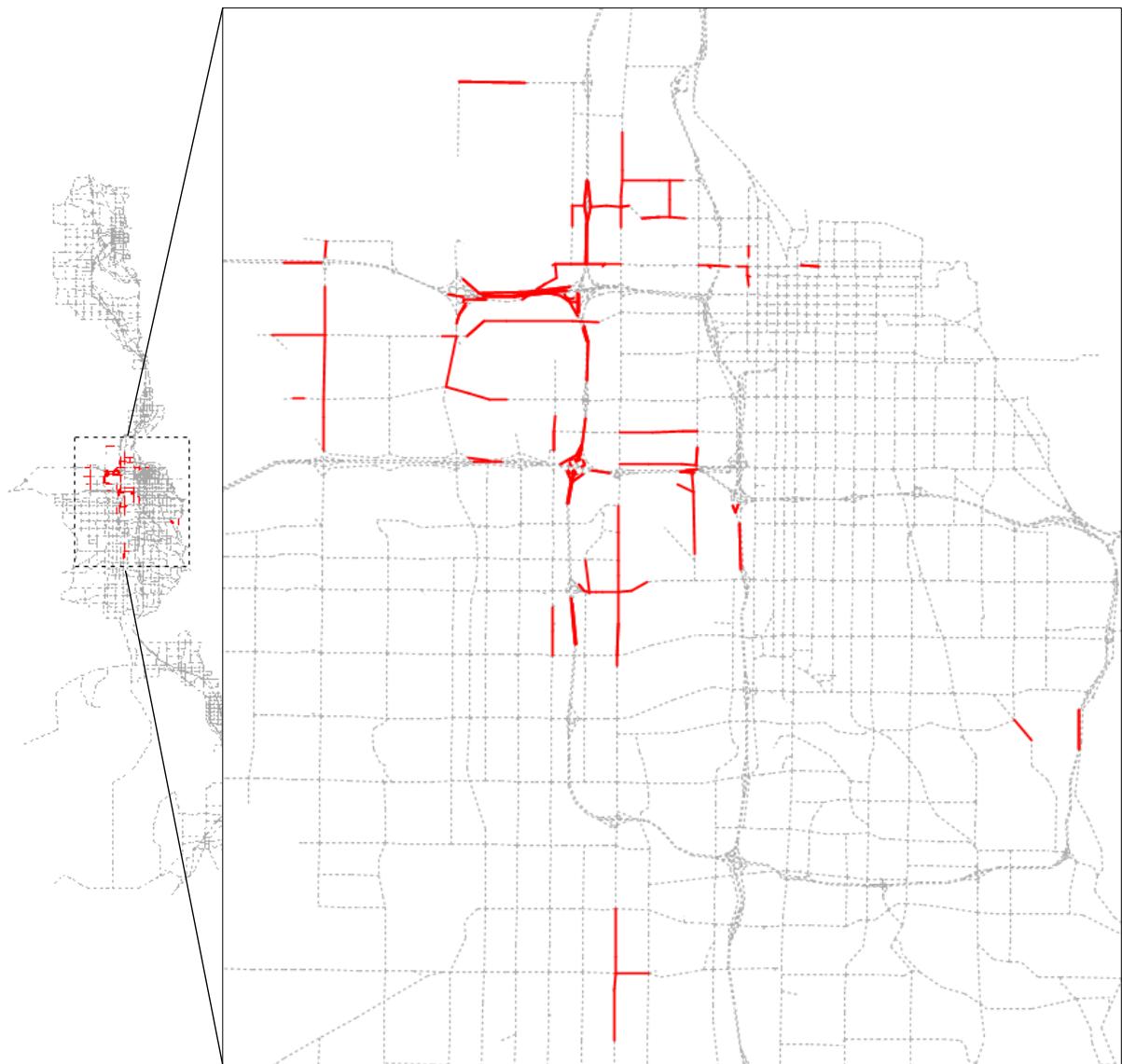
## 3.2 Vulnerable and Critical Road Segments

Figures 3.5–3.8 show maps of links classified into different types. Figure 3.5 shows the most vulnerable links, and Figure 3.6 shows the most critical links. Figure 3.7 shows links that are critical in the Wasatch Scenario and vulnerable in the Taylorsville Scenario. Similarly, Figure 3.8 presents links that are critical in the Taylorsville Scenario and vulnerable in the Wasatch Scenario.

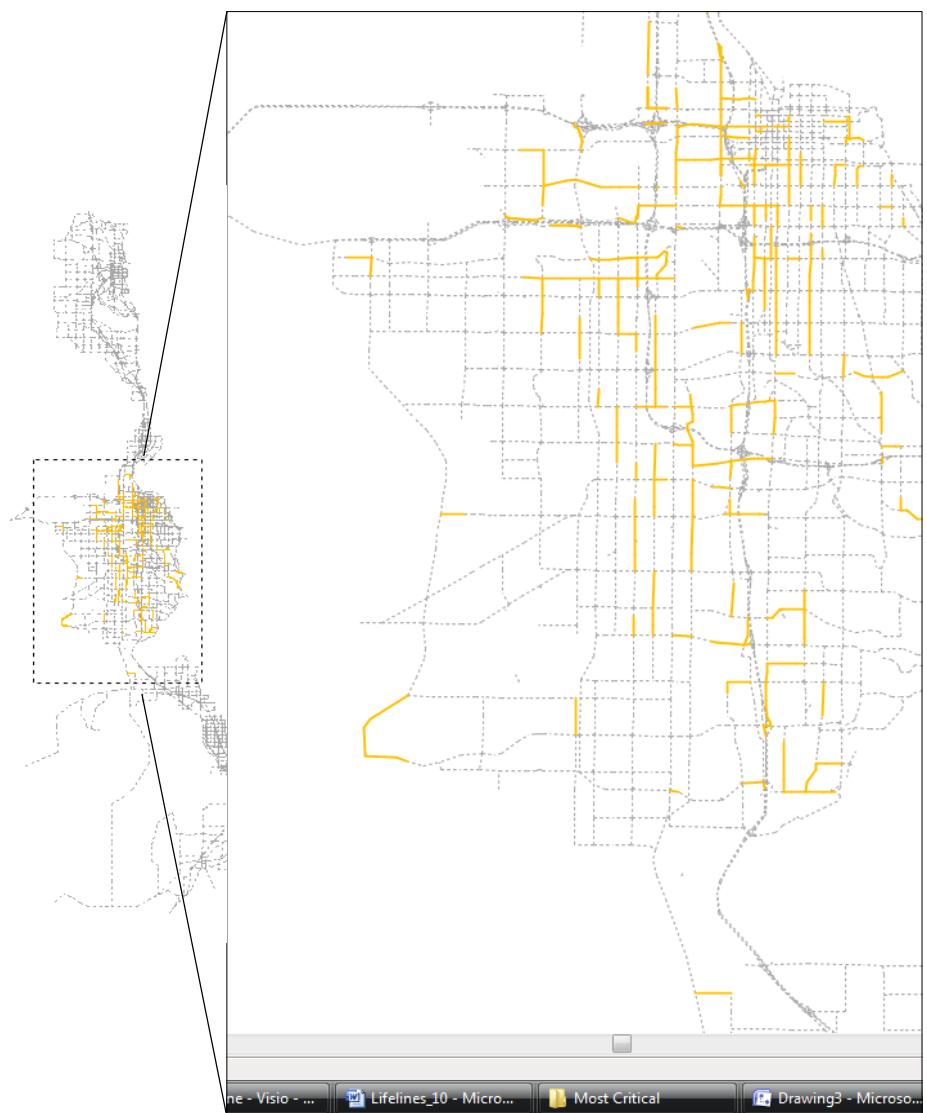
Each map is also transformed into a table of links for detailed results, with the link numbers in ascending order. These tables (A-1–A-4) are presented in Appendix A. Tables 3.3 and 3.4 present the lists of most vulnerable and most critical links with link numbers in ascending order. The direction of each link is provided to distinguish links with only one direction (e.g., on/off ramps) from others. Generally, each road will have a single name throughout its length in the network. However, it might have both damaged and undamaged links in it as a result of earthquake. Therefore, to differentiate damaged links from all others, they are defined with names and from/to information.

In Table A-1, among 237 most vulnerable links, approximately 25% have bridges in them. This provides a clear understanding of the severity of damage. However, some of these links might still be critical even after earthquake. For example, links which are slightly damaged would still have 100% capacity, although their speed is reduced for safety reasons. Most critical links in Table A-2 are the ones on which traffic is increased (i.e., the ratio of traffic volumes after and before earthquake is more than 1) in both scenarios.

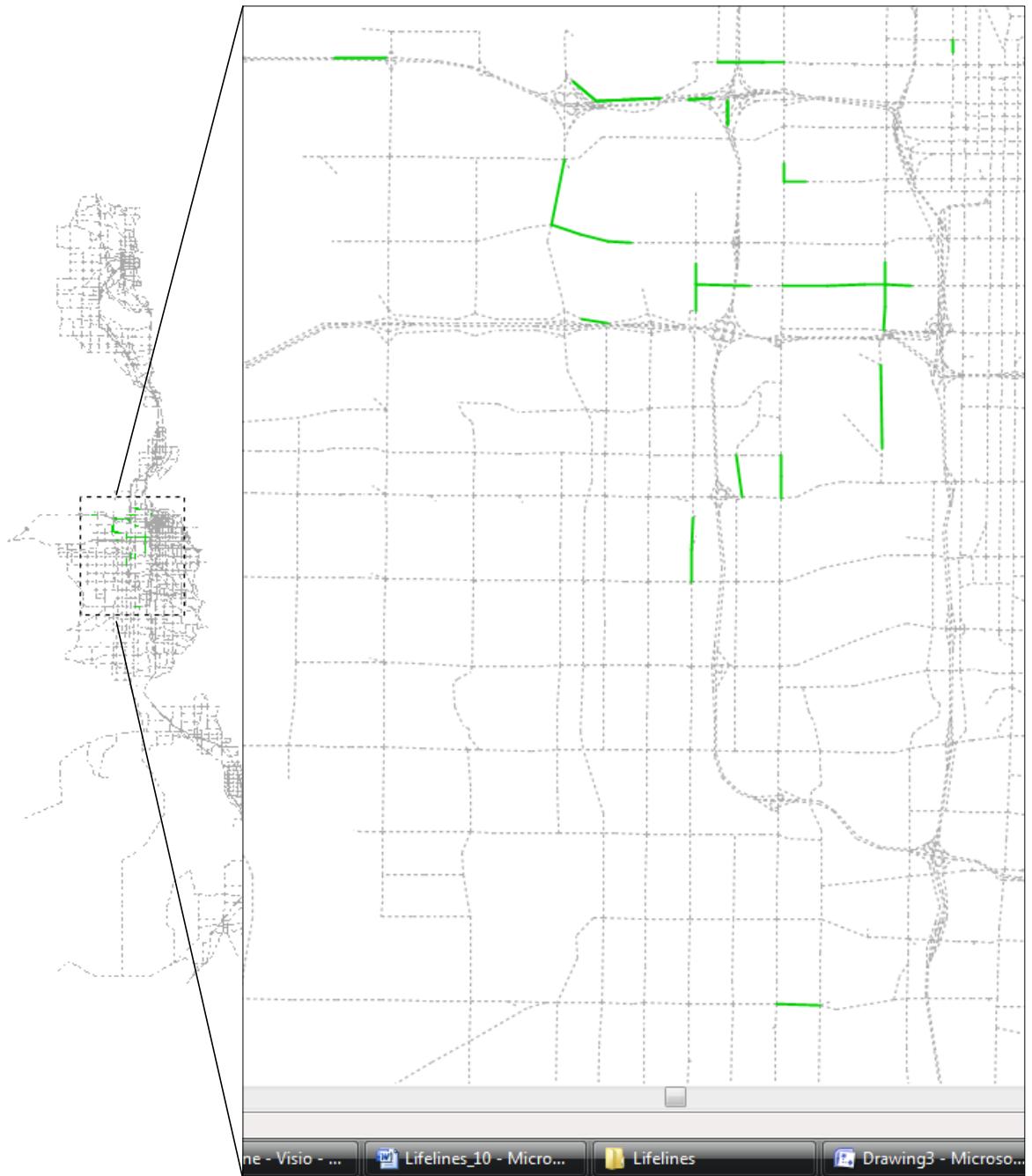
Finally, a list of vulnerable yet critical road sections is prepared for each scenario. Tables A-3 and A-4 present a combination of critical and vulnerable links (lifelines) for the Wasatch Scenario and the Taylorsville Scenario, respectively. All these links should have volumes increased due to detour traffic and should have a damage state between 2 and 5. For example, Table A-3 shows a combination of links with traffic ratios more than 1 in the Wasatch Scenario and having damage states between 2 and 5 in the Taylorsville Scenario. A final list of links can be created from these two by eliminating all the repeated link numbers. This short list of links can be used by UDOT to minimize the traffic disruptions caused by any of the two earthquakes.



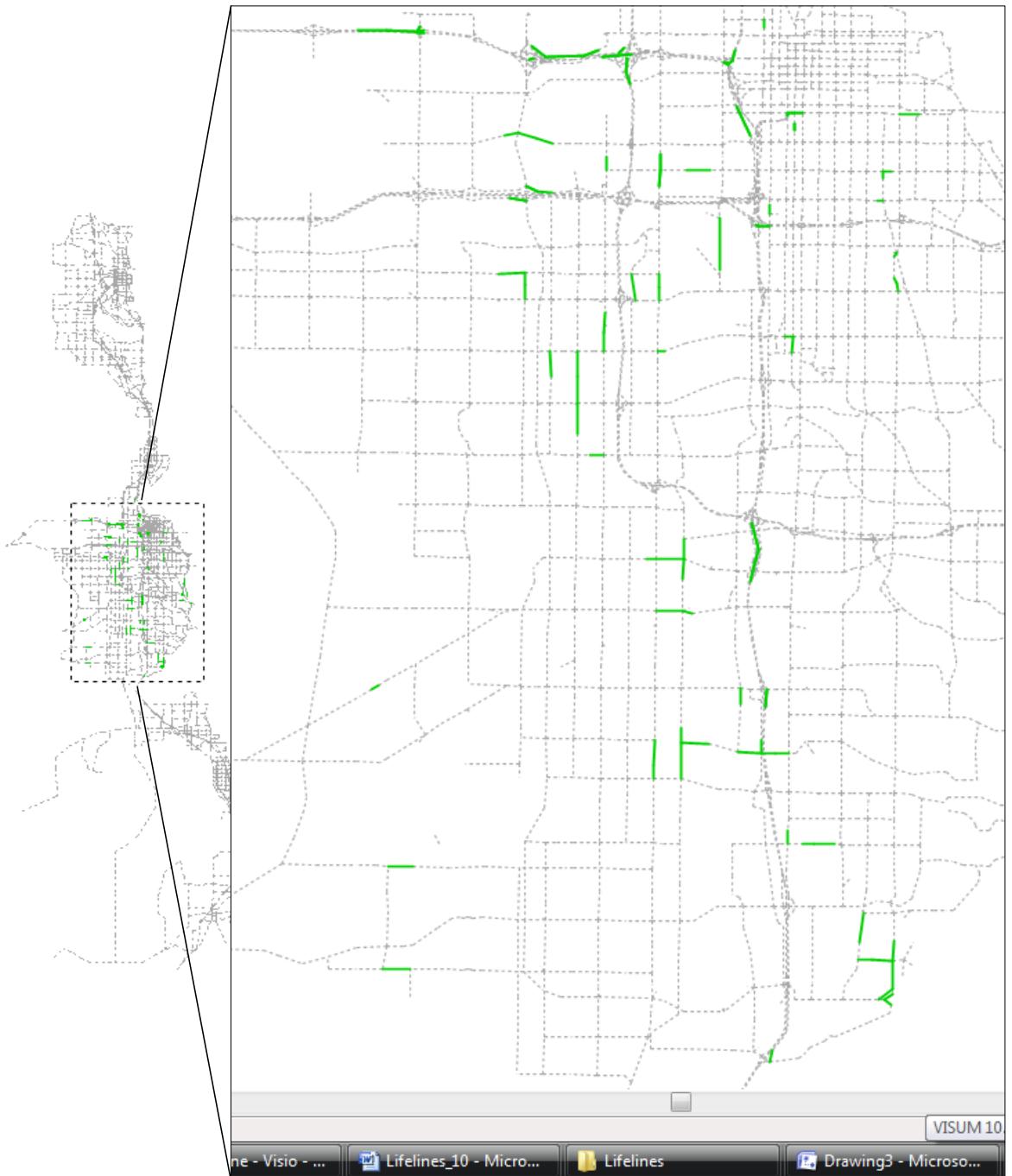
**Figure 3.5** Most vulnerable links (VISUM) in Salt Lake County



**Figure 3.6** Most critical links (VISUM) in Salt Lake County



**Figure 3.7** Combination of critical and vulnerable links (Lifelines for the Wasatch Scenario)



**Figure 3.8** Combination of critical and vulnerable links (Lifelines for the Taylorsville Scenario)



## **4. CONCLUSIONS**

The purpose of this study was to estimate the delay-based user costs following an earthquake and also help UDOT make informed decisions on disaster mitigation plans. Costs were estimated for both the Wasatch Scenario and the Taylorsville Scenario. REDARS, VISUM, and MS Excel were the tools used for this analysis.

A list of road segments (lifelines) with names, directions, and addresses was prepared for each scenario. These segments are vulnerable but still can carry considerable detour traffic if strengthened for seismic hazards. This information could help UDOT in prioritizing vulnerable links for improvements and using its limited resources effectively.

The calculated user costs indicated that the maximum impacts would be imposed on PM traffic.

The completely damaged links contributed more to the total delay costs. This is not only due to their severity of damage, but also due to larger rehabilitation periods required.

The Taylorsville Scenario would incur a delay cost of \$65 million were there to be an earthquake.

The Wasatch Scenario would incur a delay cost of \$1.312 billion were there to be an earthquake.



## **5. LIMITATIONS AND FUTURE RESEARCH**

Most of the study has used only default values derived from limited research in this field. The hypothetical values to measure retained capacity and speed on damaged links should be refined more accurately. A further classification of damage types and their capacities can affect final results. For estimation of more accurate delay based user costs and rehabilitation time periods, location based parameters should be taken into consideration. For example, emergency response system, immediate and long-term post-earthquake traffic volumes, weather conditions, and type of work zone operations may significantly affect the delay costs and reconstruction activities. Considering hourly, daily, monthly, and seasonal demand variations may considerably change final outputs.



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## **APPENDIX A. VULNERABLE AND CRITICAL LINKS**

**Table A.1** Most vulnerable links (VISUM) in Salt Lake County

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
20593909	2059	3909	Yes	5	4	2100 South	EB	Redwood Rd	900 W
20593909	3909	2059	Yes	5	4	2100 South	WB	Redwood Rd	900 W
20595749	2059	5749	No	5	4	2100 South	WB	Redwood Rd	900 W
20595749	5749	2059	No	5	4	2100 South	EB	Redwood Rd	900 W
23015364	2301	5364	Yes	4	3	400 West	SB	North Temp	200 S
23015364	5364	2301	Yes	4	3	400 West	NB	North Temp	200 S
23015470	2301	5470	Yes	5	4	400 West	NB	North Temp	200 S
23015470	5470	2301	No	5	4	400 West	SB	North Temp	200 S
25254329	2525	4329	Yes	5	4	Redwood R	NB	Parkway B	Cent
25254329	4329	2525	Yes	5	4	Redwood R	SB	Parkway B	Cent
25254396	2525	4396	Yes	5	3	Redwood R	SB	Cent	3100 S
25254396	4396	2525	No	5	3	Redwood R	NB	Cent	3100 S
26223832	2622	3832	No	4	2	California	EB	7200 W	5600 W
26223832	3832	2622	No	4	2	California	WB	7200 W	5600 W
34325013	3432	5013	Yes	3	2	Blank	EB	4000 W	SR-186
34335013	3433	5013	Yes	3	2	CD Road	EB	Terminal Dr	SR-186
35215013	3521	5013	Yes	3	2	CD Road	EB	I-80 E	SR-186
35215294	3521	5294	Yes	3	2	Blank	NB	I-80 E	4000 W
35223711	3522	3711	Yes	5	2	5600 West	SB	I-80	700 S
35223711	3711	3522	No	5	2	5600 West	NB	I-80	700 S
35295850	3529	5850	No	4	2	Blank	SB	Amelia Ea	I-80
35295850	5850	3529	No	4	2	Blank	NB	Amelia Ea	I-80
35303531	3530	3531	Yes	4	2	700 North	WB	2200 W	I-215
35303531	3531	3530	No	4	2	700 North	EB	2200 W	I-215
35313625	3531	3625	No	4	2	2200 West	SB	700 N	North Temp
35313625	3625	3531	No	4	2	2200 West	NB	700 N	North Temp

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
35323680	3532	3680	Yes	5	3	CD Road	EB	CD Road	2200 W
35333534	3533	3534	No	4	2	700 North	EB	I-215	Redwood Rd
35333534	3534	3533	No	4	2	700 North	WB	I-215	Redwood Rd
35343535	3534	3535	No	4	3	700 North	EB	I-215	Redwood Rd
35343535	3535	3534	No	4	3	700 North	WB	I-215	Redwood Rd
35353613	3535	3613	No	4	3	Redwood R	NB	1000 N	700 N
35353613	3613	3535	No	4	3	Redwood R	SB	1000 N	700 N
35353628	3535	3628	No	4	3	Redwood R	SB	700 N	North Temp
35353628	3628	3535	No	4	3	Redwood R	NB	700 N	North Temp
35354199	3535	4199	No	4	3	700 North	EB	Redwood Rd	1200 W
35363587	3536	3587	No	4	3	Redwood R	NB	1000 N	700 N
35363587	3587	3536	No	4	3	Redwood R	SB	1000 N	700 N
35363613	3536	3613	No	4	3	Redwood R	SB	1000 N	700 N
35363613	3613	3536	No	4	3	Redwood R	NB	1000 N	700 N
35363616	3536	3616	No	4	2	1000 North	EB	Redwood Rd	1200 W
35363616	3616	3536	No	4	2	1000 North	WB	Redwood Rd	1200 W
35373538	3537	3538	No	4	2	1200 West	NB	1000 N	600 N
35373538	3538	3537	No	4	2	1200 West	SB	1000 N	600 N
35373541	3537	3541	No	4	2	600 North	EB	1200 W	900 W
35373541	3541	3537	No	4	2	600 North	WB	1200 W	900 W
35373617	3537	3617	No	3	2	600 North	WB	Redwood Rd	1200 W
35373617	3617	3537	No	3	2	600 North	EB	Redwood Rd	1200 W
35383539	3538	3539	No	4	2	1200 West	NB	1000 N	600 N
35383539	3539	3538	No	4	2	1200 West	SB	1000 N	600 N
35393545	3539	3545	No	4	2	1000 North	EB	1200 W	900 W
35393545	3545	3539	No	4	2	1000 North	WB	1200 W	900 W
35393616	3539	3616	No	4	2	1000 North	WB	Redwood Rd	1200 W

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
35393616	3616	3539	No	4	2	1000 North	EB	Redwood Rd	1200 W
35874630	3587	4630	No	4	2	Redwood R	EB	Redwood Rd	1200 W
35874630	4630	3587	No	4	2	Redwood R	SB	1700 N	1000 N
36083610	3608	3610	No	3	2	2100 North	EB	4000 W	2200 W
36174191	3617	4191	No	4	2	700 North	WB	Redwood Rd	1200 W
36313710	3631	3710	Yes	5	4	North Tem	EB	900 W	I-15
36313710	3710	3631	Yes	5	4	North Tem	WB	900 W	I-15
36385470	3638	5470	Yes	5	5	North Tem	EB	I-15	400 W
36385470	5470	3638	No	5	5	North Tem	WB	I-15	400 W
36393640	3639	3640	Yes	3	2	Blank	NB	4000 W	SR-186
36403413	3640	3413	Yes	3	2	CD Road	NB	4000 W	I-80
36403801	3640	3801	Yes	3	2	Blank	NB	4000 W	SR-186
36663671	3666	3671	No	5	4	2nd Ave	EB	State St	B St
36803688	3688	3680	Yes	4	2	North Tem	WB	2200 W	Redwood Rd
36883717	3688	3717	Yes	4	3	North Tem	EB	I-215	Redwood Rd
36883717	3717	3688	Yes	4	3	North Tem	WB	I-215	Redwood Rd
37034204	3703	4204	Yes	3	2	700 South	WB	4800 W	4000 W
37034558	3703	4558	Yes	3	2	4000 West	SB	700 S	California
37034558	4558	3703	No	3	2	4000 West	NB	700 S	California
37105445	3710	5445	Yes	5	4	North Tem	EB	900 W	400 W
37105445	5445	3710	Yes	5	4	North Tem	WB	900 W	400 W
37113850	3711	3850	No	5	2	700 South	WB	7200 W	5600 W
37113850	3850	3711	No	5	2	700 South	EB	7200 W	5600 W
37115542	3711	5542	No	5	2	5600 West	SB	700 S	California
37115542	5542	3711	No	5	2	5600 West	NB	700 S	California
37133874	3713	3874	Yes	3	2	500 South	EB	4000 W	I-215
37133874	3874	3713	No	3	2	500 South	WB	4000 W	I-215

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
37134052	3713	4052	Yes	3	2	500 South	WB	4000 W	I-215
37143748	3714	3748	Yes	5	3	500 South	EB	4000 W	Redwood Rd
37143748	3748	3714	Yes	5	3	500 South	WB	4000 W	Redwood Rd
37143874	3714	3874	Yes	5	3	500 South	WB	4000 W	I-215
37143874	3874	3714	Yes	5	3	500 South	EB	4000 W	I-215
38724589	3872	4589	No	3	2	California	WB	4000 W	Pioneer Rd
38724589	4589	3872	No	3	2	California	EB	4000 W	Pioneer Rd
39094264	3909	4264	Yes	5	4	2100 South	EB	Redwood Rd	900 w
39094264	4264	3909	Yes	5	4	2100 South	WB	Redwood Rd	900 w
39444407	4407	3944	No	5	4	900 West	SB	SR-201	2300 S
39444535	3944	4535	Yes	5	4	900 West	SB	SR-201	2300 S
39444535	4535	3944	No	5	4	900 West	NB	SR-201	2300 S
40255852	4025	5852	No	5	2	Frontage	NB	California	2100 S
40255852	5852	4025	No	5	2	Frontage	SB	California	2100 S
40404141	4040	4141	No	5	4	Pioneer R	NB	1700 S	2100 S
40514239	4051	4239	No	3	2	2100 South	EB	4000 W	Gladiola
40514239	4239	4051	No	3	2	2100 South	WB	4000 W	Gladiola
40604143	4060	4143	No	5	4	1700 South	WB	Redwood Rd	900 W
40604143	4143	4060	No	5	4	1700 South	EB	Redwood Rd	900 W
40605088	4060	5088	No	5	4	1700 South	EB	Redwood Rd	900 W
40605088	5088	4060	No	5	4	1700 South	WB	Redwood Rd	900 W
40674264	4264	4067	Yes	5	4	900 West	NB	1700 S	2100 S
41415184	4141	5184	No	5	4	Pioneer R	NB	California	1700 S
41415184	5184	4141	No	5	4	Pioneer R	SB	California	1700 S
41455088	5088	4145	No	5	4	1700 South	EB	Redwood Rd	900 W
42444233	4244	4233	No	3	2	SR-201	WB	4000 W	Gladiola
42465236	4246	5236	No	5	4	SR-201 WB	SB	SR-201	I-215 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
42494251	4249	4251	No	5	3	SR-201	EB	I-215	Redwood Rd
43904391	4390	4391	Yes	5	3	3500 South	EB	I-215	2200 W
43904391	4391	4390	Yes	5	3	3500 South	WB	I-215	2200 W
43905461	4390	5461	Yes	5	3	I-215 NB	NB	3500 S	I-215 N
43914399	4391	4399	No	5	3	2200 West	NB	3100 S	3500 S
43914399	4399	4391	No	5	3	2200 West	SB	3100 S	3500 S
43914675	4391	4675	Yes	5	3	3500 South	EB	2200 W	Redwood Rd
43914675	4675	4391	No	5	3	3500 South	WB	2200 W	Redwood Rd
43915832	4391	5832	No	5	3	2200 West	SB	3500 S	4100 S
43915832	5832	4391	No	5	3	2200 West	NB	3500 S	4100 S
43924393	4392	4393	No	5	3	3500 South	EB	2200 W	Redwood Rd
43924393	4393	4392	No	5	3	3500 South	WB	2200 W	Redwood Rd
43924675	4392	4675	No	5	3	3500 South	WB	2200 W	Redwood Rd
43924675	4675	4392	No	5	3	3500 South	EB	2200 W	Redwood Rd
43934394	4393	4394	No	5	3	Redwood R	NB	3100 S	3500 S
43934394	4394	4393	No	5	3	Redwood R	SB	3100 S	3500 S
43934553	4393	4553	No	5	3	3300 South	EB	Redwood Rd	900 W
43934553	4553	4393	No	5	3	3300 South	WB	Redwood Rd	900 W
43934602	4393	4602	No	5	2	Redwood R	SB	3500 S	4100 S
43934602	4602	4393	No	5	2	Redwood R	NB	3500 S	4100 S
43944396	4394	4396	No	5	3	Redwood R	NB	3100 S	3500 S
43944396	4396	4394	No	5	3	Redwood R	SB	3100 S	3500 S
44014553	4401	4553	No	5	3	3300 South	WB	Redwood Rd	900 W
44014553	4553	4401	No	5	3	3300 South	EB	Redwood Rd	900 W
45355409	4535	5409	No	5	3	900 West	SB	SR-201	3300 S
45355409	5409	4535	No	5	3	900 West	NB	SR-201	3300 S
45574558	4557	4558	No	3	2	California	WB	4000 W	Pioneer Rd

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
45574558	4558	4557	No	3	2	California	EB	4000 W	Pioneer Rd
45574589	4557	4589	No	3	2	California	EB	4000 W	Pioneer Rd
45574589	4589	4557	No	3	2	California	WB	4000 W	Pioneer Rd
45954596	4595	4596	Yes	5	3	2700 West	NB	3500 S	4100 S
45954596	4596	4595	No	5	3	2700 West	SB	3500 S	4100 S
45964671	4596	4671	No	5	3	2700 West	NB	3500 S	4100 S
45964671	4671	4596	No	5	3	2700 West	SB	3500 S	4100 S
46014602	4601	4602	No	5	2	Redwood R	NB	3500 S	4100 S
46014699	4699	4601	No	5	2	Redwood R	NB	4100 S	Taylorsville
48735776	4873	5776	No	5	2	Holladay	SB	Murray Ho	6200 S
48735776	5776	4873	No	5	2	Holladay	NB	Murray Ho	6200 S
48824960	4882	4960	Yes	5	3	I-215 SB	EB	I-215 S	I-80 E
48844897	4884	4897	Yes	5	3	I-215 SB	EB	I-215 S	I-80 E
49604884	4960	4884	Yes	5	3	I-215 SB	EB	I-215 S	I-80 E
50135200	5013	5200	Yes	3	2	CD Road	EB	I-80 E	2200 W
50175018	5017	5018	No	5	3	Redwood R	NB	7000 S	7800 S
50175018	5018	5017	No	5	3	Redwood R	SB	7000 S	7800 S
50175022	5017	5022	No	5	3	7800 South	EB	Redwood Rd	1300 W
50175022	5022	5017	No	5	3	7800 South	WB	Redwood Rd	1300 W
50175736	5017	5736	No	5	3	Redwood R	SB	7800 S	9000 S
50175736	5736	5017	No	5	3	Redwood R	NB	7800 S	9000 S
50185436	5018	5436	Yes	5	3	Redwood R	NB	7000 S	7800 S
50185436	5436	5018	No	5	3	Redwood R	SB	7000 S	7800 S
51135736	5113	5736	No	5	3	Redwood R	NB	7800 S	9000 S
51135736	5736	5113	No	5	3	Redwood R	SB	7800 S	9000 S
51953669	5195	3669	Yes	4	2	CD Road	NB	4000 W	2200 W
52765825	5276	5825	No	5	4	I-215 NB	WB	I-215 N	SR-201 W

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
53255823	5325	5823	No	5	4	I-215 SB	EB	I-215 S	SR-201 E
53584241	5358	4241	No	5	4	CD Road	WB	I-215 S	SR-201 W
53665367	5366	5367	No	5	4	400 West	NB	300 N	North Temp
53665367	5367	5366	No	5	4	400 West	SB	300 N	North Temp
55425852	5542	5852	No	5	2	5600 West	SB	California	2100 S
55425852	5852	5542	No	5	2	5600 West	NB	California	2100 S
57905261	5790	5261	No	5	4	SR-201 WB	SB	SR-201 W	I-215 S
58215276	5821	5276	No	5	4	I-215 NB	WB	I-215 N	SR-201 W
58235293	5823	5293	No	5	4	I-215 SB	EB	I-215 S	SR-201 E
58254248	5825	4248	No	5	4	I-215 NB	WB	I-215 N	SR-201 W
100304407	10030	4407	No	5	4	SR-201 EB	EB	Off Ramp	900 W
101943660	10194	3660	No	3	2	CD Road	NB	SR-186	4000 W
101955039	10195	5039	Yes	4	3	CD Road	SB	I-80 E	I-215 S
101974950	10197	4950	Yes	5	3	CD Road	NB	I-80 W	I-215 N
101985149	10198	5149	No	5	3	CD Road	WB	I-215 S	I-80 W
102483530	10248	3530	No	3	2	I-215 SB	SB	Off Ramp	700 N
102513533	10251	3533	No	4	2	I-215 NB	NB	Off Ramp	700 N
102615325	10261	5325	No	5	4	I-215 SB	WB	I-215 S	SR-201 W
102625358	10262	5358	No	5	4	CD Road	EB	I-215 S	SR-201 E
102655270	10265	5270	No	5	4	I-215 NB	WB	I-215 N	SR-201 W
102692429	10269	2429	No	5	4	CD Road	EB	I-215 N	SR-201 E
230112501	12501	2301	No	4	3	Cent	NB	North Temp	200 S
241410268	2414	10268	Yes	5	4	CD Road	SB	SR-201 W	I-215 S
353010250	3530	10250	Yes	4	2	I-215 SB	SB	On Ramp	700 N
353210590	3532	10590	Yes	5	3	CD Road	WB	North Temple	I-80 W
353210590	10590	3532	No	5	3	CD Road	EB	North Temple	I-80 W
353212545	3532	12545	Yes	5	3	Cent		North Temple	I-80 W

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
353310249	3533	10249	No	3	2	I-215 NB	NB	On Ramp	700 N
366910590	3669	10590	Yes	4	3	CD Road	EB	I-80 E	2200 W
366910590	10590	3669	No	4	3	CD Road	WB	2200 W	I-80 W
368812553	12553	3688	No	4	3	Cent		I-215	Redwood Rd
371012546	3710	12546	Yes	5	4	Cent		900 W	I-15
425810030	4258	10030	No	5	3	SR-201	WB	Redwood Rd	900 W
426310079	4263	10079	Yes	5	4	SR-201 WB	WB	On Ramp	900 W
453512602	12602	4535	No	5	3	Cent		SR-201	3300 S
503910197	5039	10197	Yes	5	3	CD Road	SB	I-80 W	I-215 S
514910331	5149	10331	Yes	4	3	CD Road	WB	I-215 S	I-80 W
527910260	5279	10260	No	5	4	SR-201 EB	NB	SR-201 E	I-215 N
582410264	5824	10264	No	5	4	SR-201 WB	SB	SR-201 W	I-215 S
1003010040	10030	10040	No	5	4	SR-201	EB	Redwood Rd	900 W
1008810118	10088	10118	Yes	5	5	I-15	SB	I-80	3300 S
1011010088	10110	10088	No	5	3	I-15	SB	I-80	3300 S
1019310678	10193	10678	No	3	2	I-80	EB	4000 W	I-215
1019510203	10195	10203	No	4	3	I-80	EB	4000 W	I-215
1019610194	10196	10194	No	3	2	CD Road	WB	2200 W	I-80 W
1019710199	10197	10199	No	5	3	CD Road	SB	I-80 E	I-215 S
1019810196	10198	10196	No	4	3	CD Road	WB	I-215 S	I-80 W
1025010589	10250	10589	No	4	2	I-215	SB	700 N	North Temp
1025410587	10254	10587	No	5	3	I-215	SB	I-80	500 S
1025610592	10256	10592	No	5	3	I-215	SB	500 S	California
1026110268	10261	10268	No	5	4	I-215	SB	SR-201	Parkway B
1026210264	10262	10264	No	5	4	I-215	SB	1700 S	SR-201
1026310308	10263	10308	No	5	4	I-215	NB	SR-201	California
1026510263	10265	10263	No	5	4	I-215	NB	SR-201	1700 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Damage State	The Taylorsville Scenario Damage State	Road Name	Direction	From	To
1026810593	10268	10593	No	5	4	I-215	SB	SR-201	Parkway B
1026910260	10269	10260	No	5	4	I-215	NB	Parkway B	SR-201
1027210597	10272	10597	No	5	3	I-215	SB	3500 S	4100 S
1030610591	10306	10591	No	4	3	I-215	NB	500 S	California
1033110679	10331	10679	No	4	2	I-80	WB	I-215	4000 W
1033310192	10333	10192	No	3	2	I-80	WB	I-215	4000 W
1033310194	10333	10194	No	3	2	CD Road	WB	I-80 W	4000 W
1039310703	10393	10703	No	4	2	I-80	EB	7200 W	5600 W
1054310110	10543	10110	No	5	3	I-15	SB	SR-201 E	I-15 S
1054510110	10545	10110	No	5	3	CD Road	SB	I-80 W	I-15 S
1058310251	10583	10251	No	4	2	I-215	NB	700 N	North Temp
1058810586	10588	10586	No	5	3	I-215	NB	500 S	I-80
1059110259	10591	10259	No	5	3	I-215	NB	500 S	California
1059210305	10592	10305	No	5	4	I-215	SB	500 S	California
1059410269	10594	10269	No	5	4	I-215	NB	SR-201	Parkway B
1059510274	10595	10274	No	5	3	I-215	NB	3500 S	4100 S
1063710635	10637	10635	No	5	2	I-215	SB	4500 S	6200 S
1067810195	10678	10195	No	4	2	I-80	EB	4000 W	I-215
1067910333	10679	10333	No	3	2	I-80	WB	4000 W	I-215
1068010215	10680	10215	No	3	2	I-80	EB	On 4000 W	On 4000 W
1069510079	10695	10079	No	5	4	SR-201	WB	900 W	Redwood Rd
1070410392	10704	10392	No	4	2	I-80	WB	7200 W	5600 W

**Table A.2** Most critical links (VISUM) in Salt Lake County

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
19304592	4592	1930	No	4	4	3200 West	NB	3500 S	4100 S
19304593	1930	4593	No	5	5	3200 West	NB	3500 S	4100 S
19304593	4593	1930	No	4	4	3200 West	SB	3500 S	4100 S
20605224	5224	2060	No	11	11	9800 South	WB	State St	700 E
20605260	2060	5260	Yes	11	11	9800 South	WB	State St	700 E
21534923	2153	4923	Yes	2	2	5300 South	WB	I-15	State St
21535457	5457	2153	No	2	2	5300 South	WB	I-15	State St
23414916	2341	4916	Yes	6	6	Wincheste	WB	I-15	State St
23414916	4916	2341	Yes	6	6	Wincheste	EB	I-15	State St
23414917	2341	4917	Yes	7	7	Wincheste	EB	I-15	State St
23414917	4917	2341	Yes	8	8	Wincheste	WB	I-15	State St
25235653	2523	5653	No	3	3	Blank	WB	SR-111	13400 S
25235653	5653	2523	No	4	4	Blank	EB	SR-111	13400 S
25615034	2561	5034	Yes	5	5	Center St	WB	I-15	State St
25615035	5035	2561	No	4	4	Center St	EB	I-15	State St
34853511	3485	3511	Yes	3	3	I-15 SB o	SB	Off Ramp	2300 N
35053507	3505	3507	Yes	6	6	2300 North	EB	I-15	Redwood Rd
35053507	3507	3505	No	3	3	2300 North	WB	I-15	Redwood Rd
35073511	3507	3511	Yes	4	4	I-15 SB 2	SB	On Ramp	2300 N
35073511	3511	3507	No	3	3	I-15 SB 2	NB	On Ramp	2300 N
35113477	3511	3477	Yes	4	4	I-15 SB o	SB	On Ramp	2300 N
35313663	3663	3531	No	85	85	2200 West	SB	1700 N	700 N
35423544	3542	3544	No	5	5	900 West	NB	1000 N	600 N
35423544	3544	3542	No	44	44	900 West	SB	1000 N	600 N
35423634	3542	3634	Yes	6	6	900 West	SB	600 N	300 N

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
35423634	3634	3542	Yes	12	12	900 West	NB	600 N	300 N
35443771	3544	3771	No	5	5	I-15 NB o	NB	On Ramp	1000 N
35573639	3639	3557	Yes	3	3	4000 West	SB	I-80	700 S
35573703	3557	3703	Yes	3	3	4000 West	SB	I-80	700 S
35993592	3599	3592	No	5	5	I-15 NB o	NB	On Ramp	1000 N
36253680	3680	3625	Yes	3	3	2200 West	NB	700 N	North Temp
36283717	3717	3628	No	3	3	Redwood R	NB	700 N	North Temp
36313719	3631	3719	Yes	4	4	900 West	NB	300 N	North Temp
36313719	3719	3631	Yes	3	3	900 West	SB	300 N	North Temp
36313727	3727	3631	Yes	4	4	900 West	NB	North Temp	I-80
36323639	3632	3639	Yes	3	3	4000 West	SB	I-80	700 S
36333634	3633	3634	Yes	6	6	900 West	NB	600 N	300 N
36333634	3634	3633	Yes	4	4	900 West	SB	600 N	300 N
36333719	3633	3719	Yes	4	4	900 West	SB	300 N	North Temp
36333719	3719	3633	Yes	4	4	900 West	NB	300 N	North Temp
36335760	3633	5760	Yes	8	8	300 North	EB	900 W	400 W
36335760	5760	3633	No	17	17	300 North	WB	900 W	400 W
36475367	3647	5367	Yes	13	13	300 North	WB	400 W	300 W
36475367	5367	3647	No	9	9	300 North	EB	400 W	300 W
36743806	3674	3806	No	4	4	I-15 SB o	SB	Off Ramp	1000 N
36803688	3688	3680	Yes	3	3	North Tem	WB	2200 W	Redwood Rd
36895216	3689	5216	Yes	4	4	500 West	SB	9800 S	South Jor
36895216	5216	3689	Yes	5	5	500 West	NB	9800 S	South Jor
36895729	3689	5729	Yes	9	9	500 West	NB	9800 S	South Jor
36895729	5729	3689	No	7	7	500 West	SB	9800 S	South Jor
37023726	3702	3726	Yes	7	7	200 South	EB	Redwood Rd	900 W

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
37023726	3726	3702	Yes	10	10	200 South	WB	Redwood Rd	900 W
37024953	3702	4953		8	8	200 South	WB	Redwood Rd	900 W
37024953	4953	3702		3	3	200 South	EB	Redwood Rd	900 W
37094953	4953	3709	Yes	4	4	Redwood R	NB	I-80	200 S
37123893	3893	3712	No	3	3	700 South	WB	5600 W	4800 W
37163926	3716	3926	Yes	2	2	Redwood R	SB	400 S	Indiana Ave
37163926	3926	3716	Yes	5	5	Redwood R	NB	400 S	Indiana Ave
37164953	3716	4953	Yes	7	7	Redwood R	NB	400 S	I-80
37243725	3724	3725	Yes	5	5	900 West	NB	400 S	I-80
37243933	3933	3724	Yes	2	2	900 West	NB	400 S	Indiana Ave
37253726	3725	3726	Yes	4	4	900 West	NB	200 S	400 S
37263727	3726	3727	Yes	4	4	900 West	NB	North Temp	200 S
37263727	3727	3726	Yes	5	5	900 West	SB	North Temp	200 S
37263739	3726	3739		8	8	200 South	WB	900 W	400 W
37263739	3739	3726		9	9	200 South	EB	900 W	400 W
37314723	4723	3731	Yes	4	4	400 South	EB	I-15	400 W
37353837	3735	3837	No	6	6	4800 West	SB	700 S	California
37353837	3837	3735	No	8	8	4800 West	NB	700 S	California
37353893	3735	3893	No	38	38	4800 West	NB	700 S	California
37353893	3893	3735	No	15	15	4800 West	SB	700 S	California
37373632	3737	3632	Yes	3	3	I-80 EB o	SB	I-80 E	4000 W
37395469	3739	5469		5	5	200 South	WB	I-15	400 W
37395469	5469	3739		6	6	200 South	EB	I-15	400 W
37435533	3743	5533	No	5	5	300 South	EB	300 W	200 W
37435533	5533	3743	No	3	3	300 South	WB	300 W	200 W
37453746	3745	3746	No	7	7	200 South	EB	400 W	300 W

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
37453746	3746	3745	No	9	9	200 South	WB	400 W	300 W
37455469	3745	5469	No	9	9	200 South	WB	400 W	300 W
37455469	5469	3745	No	7	7	200 South	EB	400 W	300 W
37495530	3749	5530	No	3	3	South Tem	EB	300 W	200 W
37675532	3767	5532	No	3	3	200 South	WB	200 W	West Temp
37713599	3771	3599	No	5	5	I-15 NB o	NB	On Ramp	1000 N
37833797	3783	3797	No	2	2	200 South	EB	Main St	State St
37973813	3797	3813	No	3	3	200 South	EB	State St	200 E
38063544	3806	3544	No	4	4	I-15 SB o	SB	Off Ramp	1000 N
38133824	3813	3824	No	2	2	200 South	EB	200 E	300 E
38213980	3980	3821	No	3	3	300 East	NB	400 S	500 S
38263827	3826	3827	No	3	3	100 South	EB	200 E	300 E
38273829	3827	3829	No	12	12	300 East	NB	South Temp	100 S
38303935	3830	3935	Yes	2	2	Indiana A	EB	Redwood Rd	900 W
38303989	3830	3989	No	4	4	Indiana A	WB	Redwood Rd	900 W
38303989	3989	3830	No	3	3	Indiana A	EB	Redwood Rd	900 W
38373932	3837	3932	No	7	7	4800 West	SB	California	2100 S
38374548	4548	3837	No	5	5	California	WB	4800 W	California
38393935	3839	3935	Yes	4	4	800 South	WB	900 W	400 W
38393935	3935	3839	Yes	4	4	800 South	EB	900 W	400 W
38393936	3839	3936	Yes	3	3	800 South	EB	400 W	300 W
38395288	5288	3839	No	7	7	400 West	SB	600 S	800 S
38403987	3840	3987	Yes	3	3	I-215 SB	SB	Off Ramp	California
38493936	3849	3936	Yes	4	4	300 West	SB	600 S	800 S
38493936	3936	3849	Yes	4	4	300 West	NB	600 S	800 S
38493937	3849	3937	Yes	4	4	300 West	NB	600 S	800 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
38493937	3937	3849	Yes	4	4	300 West	SB	600 S	800 S
38683887	3868	3887	No	825	825	100 South	EB	900 E	1300 E
38683887	3887	3868	No	242	242	100 South	WB	900 E	1300 E
38723875	3875	3872	No	2	2	California	WB	4000 W	Pioneer Rd
38724589	3872	4589	No	2	2	California	WB	4000 W	Pioneer Rd
38753970	3970	3875	No	2	2	California	EB	4000 W	Pioneer Rd
38823883	3883	3882	No	7	7	1300 East	SB	400 S	500 S
38833891	3883	3891	No	753	753	South Cam	EB	1300 E	Univer St
38833891	3891	3883	No	533	533	South Cam	WB	1300 E	Univer St
38873888	3888	3887	No	8	8	100 South	WB	900 E	1300 E
38893894	3889	3894	No	4	4	South Tem	EB	1300 E	Univer St
38893894	3894	3889	No	3	3	South Tem	WB	1300 E	Univer St
38915330	3891	5330	No	9	9	Universit	NB	North Cam	South Cam
38915330	5330	3891	No	101	101	Universit	SB	North Cam	South Cam
38915765	3891	5765	No	86	86	South Cam	EB	Univer St	Guardsman
38915765	5765	3891	No	32	32	South Cam	WB	Univer St	Guardsman
38945330	3894	5330	No	234	234	Universit	SB	South Temp	100 S
39133982	3982	3913	No	3	3	500 East	NB	600 S	800 S
39223923	3923	3922	No	3	3	2100 South	WB	Frontage	4800 W
39224309	3922	4309	No	3	3	2100 South	WB	Frontage	4800 W
39243925	3924	3925	Yes	5	5	Redwood R	NB	400 S	Indiana Ave
39243925	3925	3924	No	2	2	Redwood R	SB	400 S	Indiana Ave
39243927	3924	3927	No	2	2	Indiana A	EB	Redwood Rd	900 W
39244038	3924	4038	Yes	2	2	Redwood R	SB	Indiana A	California
39244038	4038	3924	No	4	4	Redwood R	NB	Indiana A	California
39253926	3925	3926	Yes	5	5	Redwood R	NB	400 S	Indiana Ave

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
39253926	3926	3925	No	2	2	Redwood R	SB	400 S	Indiana Ave
39273989	3927	3989	No	3	3	Indiana A	EB	Redwood Rd	900 W
39273989	3989	3927	No	4	4	Indiana A	WB	Redwood Rd	900 W
39333935	3935	3933	Yes	2	2	900 West	NB	400 S	Indiana Ave
39354046	4046	3935	Yes	2	2	900 West	NB	800 S	900 S
39364055	3936	4055	Yes	5	5	300 West	SB	800 S	900 S
39364055	4055	3936	Yes	4	4	300 West	NB	800 S	900 S
39743975	3974	3975	No	9	9	300 East	NB	600 S	800 S
39743975	3975	3974	No	8	8	300 East	SB	600 S	800 S
39744095	3974	4095	No	8	8	300 East	SB	800 S	900 S
39744095	4095	3974	No	10	10	300 East	Nb	800 S	900 S
39753977	3975	3977	No	4	4	300 East	NB	600 S	800 S
39753977	3977	3975	No	4	4	300 East	SB	600 S	800 S
39773978	3977	3978	No	3	3	300 East	NB	500 S	600 S
39773978	3978	3977	No	3	3	300 East	SB	500 S	600 S
39783980	3978	3980	No	4	4	300 East	NB	500 S	600 S
39783980	3980	3978	No	4	4	300 East	SB	500 S	600 S
39824100	4100	3982	No	3	3	500 East	NB	800 S	900 S
39934006	4006	3993	Yes	17	17	2100 South	EB	Gladiola	2700 W
39934040	3993	4040	Yes	17	17	2100 South	EB	Gladiola	2700 W
40034006	4003	4006	No	17	17	2100 South	EB	Gladiola	2700 W
40034222	4222	4003	No	17	17	2100 South	EB	Gladiola	2700 W
40194113	4019	4113	No	9	9	1100 East	SB	900 S	1300 S
40194113	4113	4019	No	10	10	1100 East	NB	900 S	1300 S
40194115	4019	4115	No	12	12	1100 East	NB	900 S	1300 S
40194115	4115	4019	No	9	9	1100 East	SB	900 S	1300 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
40254309	4309	4025	No	3	3	2100 South	WB	4800 W	Frontage
40385060	5060	4038	No	2	2	Redwood R	NB	California	1700 S
40404141	4141	4040	No	6	6	Pioneer R	SB	1700 S	SR-201
40444146	4044	4146	No	3	3	900 West	SB	California	1700 S
40444146	4146	4044	No	6	6	900 West	NB	California	1700 S
40465750	5750	4046	No	2	2	900 West	NB	900 S	1300 S
40534054	4053	4054	Yes	4	4	300 West	NB	900 S	1300 S
40534054	4054	4053	Yes	3	3	300 West	SB	900 S	1300 S
40544055	4054	4055	Yes	4	4	300 West	NB	900 S	1300 S
40544055	4055	4054	Yes	4	4	300 West	SB	900 S	1300 S
40554066	4055	4066		20	20	900 South	EB	300 W	West Temp
40554066	4066	4055		60	60	900 South	WB	300 W	West Temp
40555003	4055	5003	Yes	30	30	900 South	WB	400 W	300 W
40664076	4066	4076	No	76	76	900 South	EB	West Temp	Main St
40704145	4070	4145	Yes	11	11	1700 South	WB	900 W	I-15
40704145	4145	4070	Yes	4	4	1700 South	EB	900 W	I-15
40704149	4070	4149	Yes	4	4	1700 South	EB	900 W	I-15
40704149	4149	4070	Yes	11	11	1700 South	WB	900 W	I-15
40734229	4229	4073	No	2	2	Frontage	WB	4800 W	4000 W
40735185	4073	5185	No	2	2	Frontage	WB	4800 W	4000 W
40764077	4076	4077	No	76	76	900 South	EB	West Temp	Main St
40774085	4077	4085	No	50	50	900 South	EB	Main St	State St
40784286	4078	4286	Yes	4	4	West Temp	NB	1700 S	2100 S
40854095	4085	4095	No	77	77	900 South	EB	State St	300 E
40854095	4095	4085	No	17	17	900 South	WB	State St	300 E
40874158	4158	4087	No	2	2	State St	SB	1700 S	2100 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
40874293	4087	4293	No	2	2	State St	SB	1700 S	2100 S
40884111	4088	4111	Yes	4	4	Parkway B	EB	4000 W	3600 W
40884111	4111	4088	Yes	4	4	Parkway B	WB	4000 W	3600 W
40924093	4092	4093	No	4	4	300 East	NB	900 S	1300 S
40924162	4162	4092	No	8	8	300 East	NB	1300 S	1700 S
40934095	4093	4095	No	4	4	300 East	NB	900 S	1300 S
40974098	4097	4098	No	4	4	500 East	NB	900 S	1300 S
40984100	4098	4100	No	3	3	500 East	NB	900 S	1300 S
41115053	4111	5053	No	6	6	Parkway B	EB	3600 W	3200 W
41115053	5053	4111	No	5	5	Parkway B	WB	3600 W	3200 W
41154119	4115	4119	No	15	15	900 South	EB	1100 E	1300 E
41154119	4119	4115	No	19	19	900 South	WB	1100 E	1300 E
41164141	4116	4141	No	9	9	1700 South	WB	Pioneer Rd	Redwood Rd
41164143	4143	4116	No	34	34	1700 South	WB	Pioneer Rd	Redwood Rd
41194120	4119	4120	No	14	14	900 South	EB	1100 E	1300 E
41224367	4122	4367	No	3	3	1500 East	NB	900 S	1300 S
41224367	4367	4122	No	4	4	1500 East	SB	900 S	1300 S
41234125	4123	4125	No	3	3	1500 East	NB	900 S	1300 S
41234125	4125	4123	No	4	4	1500 East	SB	900 S	1300 S
41234367	4123	4367	No	4	4	1500 East	SB	900 S	1300 S
41234367	4367	4123	No	3	3	1500 East	NB	900 S	1300 S
41254131	4125	4131	No	5	5	900 South	EB	1300 E	Guardsman
41344135	4134	4135	No	2	2	2100 East	NB	Sunnyside	1300 S
41354136	4135	4136	No	2	2	2100 East	NB	Sunnyside	1300 S
41454146	4145	4146	Yes	8	8	900 West	NB	California	1700 S
41454146	4146	4145	No	3	3	900 West	SB	California	1700 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
41494152	4149	4152	Yes	2	2	1700 South	EB	300 W	West Temp
41494152	4152	4149	Yes	4	4	1700 South	WB	300 W	West Temp
41494283	4149	4283	Yes	3	3	300 West	SB	1700 S	2100 S
41524155	4152	4155	No	2	2	1700 South	EB	West Temp	Main St
41524155	4155	4152	No	4	4	1700 South	WB	West Temp	Main St
41524286	4286	4152	No	4	4	West Temp	NB	1700 S	2100 S
41554158	4158	4155	No	3	3	1700 South	WB	Main St	State St
41684303	4168	4303	No	2	2	700 East	SB	1700 S	2100 S
41724308	4172	4308	No	4	4	900 East	SB	1700 S	2100 S
41854187	4187	4185	No	3	3	1700 South	WB	1900 E	2100 E
41904206	4190	4206	No	7	7	Parkway B	EB	3200 W	2700 W
41904206	4206	4190	No	8	8	Parkway B	WB	3200 W	2700 W
41905053	4190	5053	No	5	5	Parkway B	WB	3600 W	3200 W
41905053	5053	4190	No	6	6	Parkway B	EB	3600 W	3200 W
42064503	4206	4503	Yes	3	3	2700 West	SB	Parkway B	3100 S
42064503	4503	4206	No	3	3	2700 West	NB	Parkway B	3100 S
42065379	4206	5379	Yes	4	4	Parkway B	EB	2700 W	2200 W
42065379	5379	4206	No	5	5	Parkway B	WB	2700 W	2200 W
42204221	4221	4220	No	2	2	Parkway B	WB	9200 W	8400 W
42214349	4221	4349	No	2	2	8400 West	EB	9200 W	8400 W
42214349	4349	4221	No	2	2	8400 West	NB	Parkway B	3100 S
42594256	4259	4256	No	3	3	SR-201 WB	WB	Off Ramp	Redwood Rd
42814283	4283	4281	Yes	3	3	300 West	SB	1700 S	2100 S
42884362	4288	4362	Yes	4	4	Main St	SB	2100 S	I-80
42924293	4293	4292	Yes	2	2	State St	SB	1700 S	2100 S
43054306	4306	4305	No	4	4	900 East	SB	1700 S	2100 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
43064308	4308	4306	No	4	4	900 East	SB	1700 S	2100 S
43164382	4316	4382	No	3	3	3100 South	WB	3200 W	2700 W
43164382	4382	4316	No	2	2	3100 South	EB	3200 W	2700 W
43164385	4316	4385	No	4	4	3100 South	EB	3200 W	2700 W
43164385	4385	4316	No	3	3	3100 South	WB	3200 W	2700 W
43194462	4319	4462	Yes	2	2	700 East	SB	I-80	2700 S
43194464	4464	4319	No	2	2	700 East	SB	I-80	2700 S
43224369	4322	4369	No	4	4	3100 South	WB	4800 W	4000 W
43224369	4369	4322	No	4	4	3100 South	EB	4800 W	4000 W
43224376	4322	4376	No	3	3	3100 South	EB	4800 W	4000 W
43224376	4376	4322	No	3	3	3100 South	WB	4800 W	4000 W
43304416	4330	4416	Yes	4	4	300 West	SB	2700 S	3300 S
43304417	4417	4330	Yes	4	4	300 West	SB	2700 S	3300 S
43354346	4335	4346	Yes	2	2	2200 West	SB	Parkway B	3100 S
43355442	5442	4335	No	2	2	2200 West	SB	Parkway B	3100 S
43364338	4338	4336	No	2	2	2300 East	SB	1700 S	2100 S
43414417	4341	4417	Yes	3	3	300 West	SB	2100 S	2700 S
43464351	4346	4351	Yes	2	2	2200 West	SB	Parkway B	3100 S
43514399	4351	4399	Yes	2	2	2200 West	SB	Parkway B	3100 S
43584369	4369	4358	No	3	3	3100 South	WB	5600 W	4800 W
43604429	4360	4429	Yes	6	6	Main St	SB	2100 S	I-80
43604430	4430	4360	Yes	7	7	Main St	SB	2100 S	I-80
43624430	4362	4430	Yes	5	5	Main St	SB	2100 S	I-80
43695050	4369	5050	No	3	3	4800 West	NB	3100 S	3500 S
43695050	5050	4369	No	3	3	4800 West	SB	3100 S	3500 S
43734586	4373	4586	No	2	2	4800 West	SB	3500 S	4100 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
43735050	4373	5050	No	3	3	4800 West	NB	3100 S	3500 S
43735050	5050	4373	No	3	3	4800 West	SB	3100 S	3500 S
43754590	4375	4590	No	2	2	4000 West	SB	3500 S	4100 S
43765399	4376	5399	No	4	4	3100 South	EB	4000 W	Bangerter
43765399	5399	4376	No	3	3	3100 South	WB	4000 W	Bangerter
43775399	4377	5399	No	4	4	3100 South	WB	4000 W	3600 W
43775399	5399	4377	No	4	4	3100 South	EB	4000 W	3600 W
43775923	4377	5923	No	3	3	3100 South	EB	3600 W	3200 W
43775923	5923	4377	No	3	3	3100 South	WB	3600 W	3200 W
43775925	4377	5925	No	141	141	3600 West	SB	3100 S	3500 S
43775925	5925	4377	No	19	19	3600 West	NB	3100 S	3500 S
43805925	4380	5925	No	19	19	3600 West	NB	3100 S	3500 S
43805925	5925	4380	No	141	141	3600 West	SB	3100 S	3500 S
43814593	4381	4593	No	4	4	3200 West	SB	3500 S	4100 S
43814593	4593	4381	No	8	8	3200 West	NB	3500 S	4100 S
43815922	5922	4381	No	3	3	3200 West	SB	3100 S	3500 S
43825922	4382	5922	No	6	6	3200 West	SB	3100 S	3500 S
43825923	4382	5923	No	3	3	3100 South	WB	3600 W	3200 W
43825923	5923	4382	No	3	3	3100 South	EB	3600 W	3200 W
43844432	4384	4432	Yes	7	7	State St	SB	2700 S	3300 S
43844434	4434	4384	Yes	6	6	State St	SB	2700 S	3300 S
43854399	4385	4399	Yes	3	3	3100 South	EB	2700 W	2200 W
43854399	4399	4385	No	4	4	3100 South	WB	2700 W	2200 W
43854503	4385	4503	No	3	3	2700 West	NB	Parkway B	3100 S
43855921	4385	5921	Yes	4	4	2700 West	SB	3100 S	3500 S
43855921	5921	4385	No	4	4	2700 West	NB	3100 S	3500 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
43954396	4395	4396	No	5	5	3100 South	EB	2200 W	Redwood Rd
43954399	4399	4395	No	4	4	3100 South	EB	2200 W	Redwood Rd
43974434	4397	4434	Yes	5	5	State St	SB	I-80	2700 S
43974436	4436	4397	No	5	5	State St	SB	I-80	2700 S
44134414	4414	4413	Yes	2	2	3300 South	WB	500 W	300 W
44154416	4416	4415	No	4	4	300 West	SB	2700 S	3300 S
44174423	4423	4417	Yes	3	3	2700 South	WB	300 W	West Temp
44234429	4429	4423	Yes	2	2	2700 South	WB	West Temp	Main St
44235708	4423	5708	Yes	9	9	West Temp	SB	2700 S	3300 S
44314432	4432	4431	No	7	7	State St	SB	2700 S	3300 S
44314617	4431	4617	No	3	3	State St	SB	3300 S	3900 S
44454453	4453	4445	No	2	2	2700 South	WB	300 E	500 E
44564479	4479	4456	No	3	3	700 East	SB	2700 S	3300 S
44564624	4456	4624	No	2	2	700 East	SB	3300 S	3900 S
44624480	4462	4480	No	3	3	700 East	SB	2700 S	3300 S
44654488	4465	4488	No	2	2	700 East	NB	2100 S	I-80
44754476	4475	4476	No	3	3	900 East	NB	I-80	2700 S
44794480	4480	4479	No	3	3	700 East	SB	2700 S	3300 S
45484558	4558	4548	No	5	5	California	WB	4800 W	California
45574558	4557	4558	No	3	3	California	WB	4000 W	Pioneer Rd
45574558	4558	4557	No	8	8	California	EB	4000 W	Pioneer Rd
45574589	4557	4589	No	8	8	California	EB	4000 W	Pioneer Rd
45574589	4589	4557	No	3	3	California	WB	4000 W	Pioneer Rd
45645765	4564	5765	No	32	32	South Cam	WB	Univer St	Guardsman
45645765	5765	4564	No	86	86	South Cam	EB	Univer St	Guardsman
45854586	4585	4586	No	3	3	4800 West	NB	3500 S	4100 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
45854586	4586	4585	No	3	3	4800 West	SB	3500 S	4100 S
45905687	4590	5687	No	4	4	4000 West	SB	4100 S	4700 S
45905687	5687	4590	No	5	5	4000 West	NB	4100 S	4700 S
45924594	4594	4592	No	3	3	4100 South	WB	3200 W	2700 W
45944595	4594	4595	No	3	3	4100 South	EB	3200 W	2700 W
45944595	4595	4594	No	3	3	4100 South	WB	3200 W	2700 W
45955346	5346	4595	No	4	4	2700 West	NB	4100 S	4700 S
45984673	4598	4673	No	3	3	2200 West	NB	3500 S	4100 S
45984673	4673	4598	No	3	3	2200 West	SB	3500 S	4100 S
45984698	4598	4698	No	7	7	2200 West	SB	4100 S	Taylorsville
45984698	4698	4598	No	3	3	2200 West	NB	4100 S	Taylorsville
46035405	4603	5405	No	2	2	Meadow Br	EB	Redwood Rd	500 W
46084725	4608	4725	Yes	2	2	500 West	SB	Meadow Br	Taylorsville
46164676	4676	4616	No	3	3	State St	SB	3300 S	3900 S
46164734	4616	4734	No	3	3	State St	SB	3900 S	Hill Ave
46174676	4617	4676	No	3	3	State St	SB	3300 S	3900 S
46234624	4624	4623	No	2	2	700 East	SB	3300 S	3900 S
46234739	4623	4739	No	2	2	700 East	SB	3900 S	4500 S
46965230	4696	5230	Yes	8	8	9800 South	WB	State St	700 E
46965260	5260	4696	No	8	8	9800 South	WB	State St	700 E
46984715	4698	4715	Yes	13	13	2200 West	SB	4100 S	Taylorsville
46984715	4715	4698	No	4	4	2200 West	NB	4100 S	Taylorsville
47154798	4715	4798	No	3	3	2200 West	SB	Taylorsville	5400 S
47235468	5468	4723	No	3	3	400 South	WB	900 W	400 W
47334734	4734	4733	No	3	3	State St	SB	3900 S	4500 S
47384739	4739	4738	No	2	2	700 East	SB	3900 S	4500 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
47454806	4745	4806	No	2	2	700 West	NB	5400 S	5900 S
47454806	4806	4745	No	2	2	700 West	SB	5400 S	5900 S
47454915	4745	4915	No	2	2	700 West	SB	5400 S	5900 S
47454915	4915	4745	No	3	3	700 West	NB	5400 S	5900 S
47524806	4806	4752	Yes	3	3	5400 South	EB	700 W	I-15
47525784	4752	5784	Yes	2	2	5400 South	EB	700 W	I-15
47534855	4753	4855	No	2	2	1300 East	SB	4500 S	Murray Ho
47575271	4757	5271	Yes	7	7	State St	NB	11400 S	12300 S
47575271	5271	4757	Yes	13	13	State St	SB	11400 S	12300 S
47575720	4757	5720	Yes	13	13	State St	SB	11400 S	12300 S
47575720	5720	4757	No	7	7	State St	NB	11400 S	12300 S
47605269	4760	5269	Yes	13	13	State St	SB	11400 S	12300 S
47605269	5269	4760	No	7	7	State St	NB	11400 S	12300 S
47605720	4760	5720	Yes	7	7	State St	NB	11400 S	12300 S
47605720	5720	4760	No	13	13	State St	SB	11400 S	12300 S
47935297	4793	5297		3	3	Bangerter	EB	700 W	I-15
47945928	4794	5928	No	6	6	3200 West	SB	5400 S	6200 S
47945928	5928	4794	No	5	5	3200 West	NB	5400 S	6200 S
47964797	4796	4797		3	3	5400 South	EB	2700 W	2200 W
47964797	4797	4796		3	3	5400 South	WB	2700 W	2200 W
47974798	4797	4798	No	4	4	2200 West	NB	Taylorsville	5400 S
47974798	4798	4797	No	4	4	2200 West	SB	Taylorsville	5400 S
47975363	4797	5363	No	3	3	5400 South	EB	2200 W	Redwood Rd
47994800	4799	4800	No	8	8	3600 West	NB	4700 S	5400 S
47994800	4800	4799	No	12	12	3600 West	SB	4700 S	5400 S
48014805	4801	4805	No	2	2	5400 South	EB	Redwood Rd	Canal St

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
48034805	4803	4805	Yes	5	5	Canal St	NB	5400 S	6200 S
48034941	4941	4803	No	5	5	Canal St	NB	5400 S	6200 S
48054957	4805	4957	No	2	2	Canal St	NB	Murray Ta	5400 S
48224925	4822	4925	No	2	2	State St	SB	5300 S	5600 S
48264836	4836	4826	No	2	2	Murray Ho	WB	State St	900 E
48285405	5405	4828	No	2	2	Meadow Br	EB	Redwood Rd	500 W
48304864	4830	4864	No	2	2	Murray Ho	WB	Highland	Holladay
48304872	4872	4830	No	2	2	Murray Ho	WB	Highland	Holladay
48635775	4863	5775	No	2	2	Murray Ho	EB	1300 E	Highland
48635775	5775	4863	No	2	2	Murray Ho	WB	1300 E	Highland
48645775	4864	5775	No	2	2	Murray Ho	WB	1300 E	Highland
48645775	5775	4864	No	2	2	Murray Ho	EB	1300 E	Highland
48724873	4872	4873	No	2	2	Murray Ho	EB	Highland	Holladay
48724873	4873	4872	No	2	2	Murray Ho	WB	Highland	Holladay
48855383	4885	5383	No	4	4	7800 South	EB	SR-111	4800 W
48855383	5383	4885	No	2	2	7800 South	WB	SR-111	4800 W
48935437	4893	5437	No	3	3	3200 West	SB	6200 S	7000 S
48935928	4893	5928	No	42	42	3200 West	NB	5400 S	6200 S
48935928	5928	4893	No	36	36	3200 West	SB	5400 S	6200 S
48984996	4898	4996	Yes	7	7	6200 South	EB	Redwood Rd	1300 W
48994900	4899	4900	Yes	4	4	700 West	NB	Wincheste	7000 S
48994900	4900	4899	Yes	7	7	700 West	SB	Wincheste	7000 S
49004912	4900	4912	Yes	5	5	700 West	NB	Wincheste	7000 S
49004912	4912	4900	Yes	8	8	700 West	SB	Wincheste	7000 S
49064907	4907	4906	Yes	7	7	1300 West	SB	6200 S	Wincheste
49064911	4906	4911	Yes	3	3	Wincheste	EB	1300 W	700 W

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
49074984	4907	4984	Yes	4	4	Canal St	NB	5400 S	6200 S
49074996	4996	4907	No	7	7	6200 South	EB	Redwood Rd	1300 W
49114912	4911	4912	Yes	3	3	Wincheste	EB	1300 W	700 W
49125455	4912	5455	Yes	6	6	Wincheste	EB	700 W	State St
49125455	5455	4912	Yes	6	6	Wincheste	WB	700 W	State St
49165455	4916	5455	Yes	6	6	Wincheste	WB	700 W	State St
49165455	5455	4916	Yes	6	6	Wincheste	EB	700 W	State St
49244925	4925	4924	No	2	2	State St	NB	5600 S	5900 S
49414949	4949	4941	No	5	5	Canal St	NB	5400 S	6200 S
49495741	5741	4949	No	5	5	Canal St	NB	5400 S	6200 S
49525022	4952	5022	No	4	4	1300 West	SB	7000 S	7800 S
49525022	5022	4952	No	8	8	1300 West	NB	7000 S	7800 S
49525440	4952	5440	No	5	5	1300 West	NB	7000 S	7800 S
49544956	4956	4954	No	2	2	Highland	SB	5600 S	6200 S
49565777	5777	4956	No	2	2	Highland	SB	Murray Ho	5600 S
49624963	4963	4962	Yes	2	2	6200 South	WB	Highland	2300 E
49624988	4962	4988	Yes	2	2	6200 South	WB	Highland	2300 E
49624988	4988	4962	Yes	2	2	6200 South	EB	Highland	2300 E
49845741	4984	5741	No	4	4	Canal St	NB	5400 S	6200 S
50035466	5003	5466	Yes	30	30	900 South	WB	400 W	300 W
50095027	5027	5009	Yes	5	5	Center St	WB	1300 W	700 W
50105027	5010	5027	Yes	6	6	700 West	SB	7000 S	Center St
50145015	5014	5015	No	3	3	2700 West	NB	7000 S	7800 S
50145023	5023	5014	No	2	2	2700 West	NB	7800 S	9000 S
50165434	5434	5016	No	2	2	2700 West	NB	6200 S	7000 S
50225103	5022	5103	No	2	2	1300 West	SB	7800 S	9000 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
50235105	5105	5023	No	2	2	2700 West	NB	7800 S	9000 S
50275034	5034	5027	Yes	5	5	Center St	WB	700 W	State St
50305861	5861	5030	No	3	3	7000 South	EB	1300 W	700 W
50675069	5067	5069	No	3	3	2300 East	NB	Fort Unio	Bengal Bl
50675069	5069	5067	No	4	4	2300 East	SB	Fort Unio	Bengal Bl
50675446	5067	5446	No	2	2	Bengal Bl	EB	Highland	Danish Rd
50915377	5091	5377	No	6	6	Danish Rd	SB	Creek Rd	Wasatch B
50915377	5377	5091	No	8	8	Danish Rd	NB	Creek Rd	Wasatch B
50915427	5091	5427	No	2	2	Danish Rd	NB	Creek Rd	Bengal Bl
50915427	5427	5091	No	2	2	Danish Rd	SB	Creek Rd	Bengal Bl
50925360	5092	5360	No	3	3	Bengal Bl	WB	2300 E	Wasatch B
50925360	5360	5092	No	3	3	Bengal Bl	EB	2300 E	Wasatch B
50925388	5092	5388	No	2	2	Danish Rd	SB	Creek Rd	Bengal Bl
50925388	5388	5092	No	2	2	Danish Rd	NB	Creek Rd	Bengal Bl
50945600	5094	5600	No	6	6	Fort Unio	WB	3000 E	Wasatch B
50955600	5600	5095	No	6	6	Fort Unio	WB	3000 E	Wasatch B
51035114	5103	5114	No	2	2	1300 West	SB	7800 S	9000 S
51055107	5107	5105	No	2	2	2700 West	NB	7800 S	9000 S
51115579	5111	5579	No	8	8	2200 West	SB	9000 S	9800 S
51115579	5579	5111	No	8	8	2200 West	NB	9000 S	9800 S
51155377	5115	5377	No	8	8	Danish Rd	NB	Creek Rd	Wasatch B
51155377	5377	5115	No	6	6	Danish Rd	SB	Creek Rd	Wasatch B
51155598	5115	5598	Yes	3	3	Danish Rd	SB	Creek Rd	Wasatch B
51325235	5132	5235	No	3	3	700 East	SB	9400 S	9800 S
51525159	5152	5159	No	3	3	Blank	NB	SR-111	13400 S
51525159	5159	5152	No	4	4	Blank	SB	SR-111	13400 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
51525653	5152	5653	No	4	4	Blank	WB	SR-111	13400 S
51525653	5653	5152	No	3	3	Blank	EB	SR-111	13400 S
51595649	5159	5649	No	3	3	SR-111	NB	SR-111	13400 S
51595649	5649	5159	No	4	4	SR-111	SB	SR-111	13400 S
51665598	5598	5166	No	3	3	Danish Rd	SB	Creek Rd	Wasatch B
51745587	5587	5174	No	2	2	South Jor	WB	1300 W	500 W
51745868	5174	5868	No	2	2	South Jor	WB	1300 W	500 W
51755730	5175	5730	No	4	4	700 West	NB	9000 S	9800 S
52045205	5204	5205	No	2	2	2700 West	SB	9800 S	10400 S
52045205	5205	5204	No	2	2	2700 West	NB	9800 S	10400 S
52075734	5207	5734	No	5	5	2200 West	NB	9800 S	10400 S
52075734	5734	5207	No	3	3	2200 West	SB	9800 S	10400 S
52085214	5208	5214	No	2	2	South Jor	EB	Redwood Rd	1300 W
52165356	5216	5356	Yes	2	2	South Jor	EB	500 W	I-15
52165868	5868	5216	No	2	2	South Jor	WB	1300 W	500 W
52225228	5222	5228	No	2	2	700 East	NB	9800 S	10600 S
52225228	5228	5222	No	2	2	700 East	SB	9800 S	10600 S
52245235	5235	5224	No	3	3	700 East	SB	9400 S	9800 S
52245617	5224	5617	No	2	2	700 East	NB	9800 S	10600 S
52245617	5617	5224	No	2	2	700 East	SB	9800 S	10600 S
52285617	5228	5617	No	2	2	700 East	NB	9800 S	10600 S
52285617	5617	5228	No	2	2	700 East	SB	9800 S	10600 S
52635268	5268	5263	No	2	2	12300 Sou	WB	500 W	Minuteman
52685269	5269	5268	No	2	2	12300 Sou	WB	500 W	Minuteman
52715273	5271	5273	Yes	7	7	State St	NB	11400 S	12300 S
52715273	5273	5271	No	13	13	State St	SB	11400 S	12300 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
52735656	5656	5273	No	4	4	State St	SB	11000 S	11400 S
52995665	5299	5665	Yes	10	10	Fort St	NB	13200 S	13800 S
52995665	5665	5299	No	7	7	Fort St	SB	13200 S	13800 S
52995670	5299	5670	Yes	5	5	13800 Sou	WB	300 E	Fort St
52995670	5670	5299	No	6	6	13800 Sou	EB	300 E	Fort St
52995684	5299	5684	Yes	3	3	13800 Sou	EB	Fort St	1300 E
52995684	5684	5299	No	4	4	13800 Sou	WB	Fort St	1300 E
53185751	5318	5751	No	2	2	Bangerter	EB	Redwood Rd	1300 W
53235664	5323	5664	No	4	4	300 East	NB	12300 S	13800 S
53235664	5664	5323	No	4	4	300 East	SB	12300 S	13800 S
53235670	5323	5670	No	3	3	13800 Sou	EB	300 E	Fort St
53235670	5670	5323	No	3	3	13800 Sou	WB	300 E	Fort St
53265664	5326	5664	No	3	3	300 East	SB	12300 S	13800 S
53265664	5664	5326	No	3	3	300 East	NB	12300 S	13800 S
53605446	5360	5446	No	3	3	Bengal Bl	WB	2300 E	Wasatch B
53605446	5446	5360	No	3	3	Bengal Bl	EB	2300 E	Wasatch B
53675760	5367	5760	No	12	12	300 North	WB	I-15	400 W
53675760	5760	5367	No	9	9	300 North	EB	I-15	400 W
53715372	5371	5372	No	6	6	13200 Sou	NB	13200 S	13800 S
53715372	5372	5371	No	5	5	13200 Sou	SB	13200 S	13800 S
53715665	5371	5665	No	5	5	Fort St	SB	13200 S	13800 S
53715665	5665	5371	No	6	6	Fort St	NB	13200 S	13800 S
53725674	5674	5372	No	4	4	13200 Sou	WB	Fort St	1300 E
53755379	5375	5379	No	5	5	Parkway B	WB	I-215	2200 W
53755379	5379	5375	No	4	4	Parkway B	EB	I-215	2200 W
53755442	5375	5442	No	3	3	Parkway B	EB	I-215	2200 W

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
53885393	5388	5393	No	2	2	Danish Rd	SB	Creek Rd	Bengal Bl
53885393	5393	5388	No	2	2	Danish Rd	NB	Creek Rd	Bengal Bl
53935427	5427	5393	No	2	2	Danish Rd	NB	Creek Rd	Bengal Bl
54035607	5403	5607	No	4	4	700 West	NB	11400 S	12300 S
54035607	5607	5403	No	14	14	700 West	SB	11400 S	12300 S
54035732	5403	5732	No	14	14	11400 Sou	EB	700 W	500 W
54035732	5732	5403	No	4	4	11400 Sou	WB	700 W	500 W
54165674	5416	5674	No	5	5	13200 Sou	WB	Fort St	1300 E
54415861	5441	5861	No	3	3	7000 South	EB	1300 W	700 W
54755649	5475	5649	No	4	4	SR-111	SB	SR-111	13400 S
54755649	5649	5475	No	3	3	SR-111	NB	SR-111	13400 S
55325533	5532	5533	No	6	6	200 West	SB	200 S	300 S
55765737	5576	5737	No	3	3	2200 West	NB	7000 S	7800 S
55775738	5738	5577	No	2	2	7000 South	EB	2200 W	Redwood Rd
55795580	5579	5580	No	3	3	2200 West	SB	9800 S	10400 S
55795580	5580	5579	No	3	3	2200 West	NB	9800 S	10400 S
55805734	5580	5734	No	3	3	2200 West	SB	9800 S	10400 S
55805734	5734	5580	No	4	4	2200 West	NB	9800 S	10400 S
56185656	5618	5656	No	4	4	State St	SB	11000 S	11400 S
56185721	5618	5721	No	27	27	11000 Sou	EB	State St	700 E
56185721	5721	5618	No	19	19	11000 Sou	WB	State St	700 E
56205721	5620	5721	No	9	9	11000 Sou	WB	State St	700 E
56205721	5721	5620	No	12	12	11000 Sou	EB	State St	700 E
56255627	5625	5627	No	2	2	1000 East	NB	11400 S	12300 S
56835768	5683	5768	No	6	6	13800 Sou	WB	Fort St	1300 E
56835768	5768	5683	No	5	5	13800 Sou	EB	Fort St	1300 E

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario Volume Ratio (after/before)	Road Name	Direction	From	To
56845768	5684	5768	No	3	3	13800 Sou	EB	Fort St	1300 E
56845768	5768	5684	No	4	4	13800 Sou	WB	Fort St	1300 E
57025762	5762	5702	No	3	3	West Temp	SB	3300 S	3900 S
57085718	5708	5718	No	15	15	West Temp	SB	2700 S	3300 S
57085718	5718	5708	No	3	3	West Temp	NB	2700 S	3300 S
57185762	5718	5762	No	148	148	West Temp	SB	2700 S	3300 S
57375738	5737	5738	No	3	3	2200 West	NB	7000 S	7800 S
57385740	5738	5740	No	15	15	2200 West	NB	6200 S	7000 S
57805781	5780	5781	No	2	2	Highland	SB	I-215	I-215
58105812	5810	5812		3	3	4000 West	SB	11800 S	12600 S
58575855	5857	5855	No	12	12	CD Road	SB	I-15 S	1300 S
90719126	9126	9071	No	14	14	Blank	WB	Redwood Rd	500 W
100433485	10043	3485	No	3	3	I-15 SB o	SB	Off Ramp	2300 N
100473674	10047	3674	No	4	4	I-15 SB o	SB	Off Ramp	1000 N
347710045	3477	10045	Yes	4	4	I-15 SB o	SB	On Ramp	2300 N
359210046	3592	10046	No	5	5	I-15 NB o	NB	On Ramp	1000 N
373110002	3731	10002	Yes	2	2	I-15 NB o	NB	On Ramp	400 S
393710074	3937	10074	Yes	4	4	300 West	NB	600 S	800 S
393710074	10074	3937	No	4	4	300 West	SB	600 S	800 S
441310120	4413	10120	Yes	4	4	I-15 SB o	SB	On Ramp	3300 S
526310155	5263	10155	No	2	2	I-15 SB o	SB	On Ramp	12300 S
529710159	5297	10159		3	3	I-15 SB o	SB	On Ramp	Baneter
1018512878	10185	12878		3	3	I-80 EB o	SB	I-80 E	4000 W
1020110207	10201	10207	No	2	2	I-80	EB	I-215	Redwood Rd
1020310201	10203	10201	No	2	2	I-80	EB	4000 W	Redwood Rd
1287610537	12878	3737		3	3	I-80 EB o	SB	I-80 E	4000 W

<b>Link Number</b>	<b>From Node</b>	<b>To Node</b>	<b>Is Bridge Present</b>	<b>The Wasatch Scenario Volume Ratio (after/before)</b>	<b>The Taylorsville Scenario Volume Ratio (after/before)</b>	<b>Road Name</b>	<b>Direction</b>	<b>From</b>	<b>To</b>
1288512949	12930	5457		2	2	5300 South	WB	300 W	S Intermountain
1288512950	4822	12930		2	2	5300 South	WB	S Intermountain	State St

**Table A.3** Links critical in the Wasatch Scenario and vulnerable in the Taylorsville Scenario

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario PGD DS	Road Name	Direction	From	To
35354199	3535	4199	No	2	3	700 North	EB	Redwood Rd	1200 W
36174191	4191	3617	No	2	2	700 North	EB	Redwood Rd	1200 W
36803688	3688	3680	Yes	3	2	North Tem	WB	2200 W	Redwood Rd
36883717	3717	3688	Yes	2	3	North Tem	WB	2200 W	Redwood Rd
37034558	3703	4558	Yes	2	2	4000 West	SB	700 S	California
38724589	3872	4589	No	2	2	California	WB	4000 W	Pioneer Rd
38724589	4589	3872	No	4	2	California	EB	4000 W	Pioneer Rd
39243925	3924	3925	Yes	5	3	Redwood R	NB	400 S	Indiana A
39243925	3925	3924	No	2	3	Redwood R	SB	400 S	Indiana A
39243927	3924	3927	No	2	3	Indiana A	EB	Redwood Rd	900 W
39243927	3927	3924	No	3	3	Indiana A	WB	Redwood Rd	900 W
40404141	4040	4141	No	3	4	Pioneer R	NB	1700 S	SR-201
40404141	4141	4040	No	6	4	Pioneer R	SB	1700 S	SR-201
40514239	4051	4239	No	2	2	2100 South	EB	4000 W	Gladiola
40514239	4239	4051	No	8	2	2100 South	WB	4000 W	Gladiola
40604143	4143	4060	No	2	4	1700 South	WB	Redwood Rd	900 W
40605088	4060	5088	No	2	4	1700 South	EB	Redwood Rd	900 W
40674145	4145	4067	Yes	14	4	900 West	NB	1700 S	2100 S
40674264	4067	4264	Yes	2	4	900 West	SB	1700 S	2100 S
40704145	4070	4145	Yes	11	3	1700 South	WB	900 W	I-15
40704145	4145	4070	Yes	4	3	1700 South	EB	900 W	I-15
41164141	4116	4141	No	9	4	1700 South	WB	Redwood Rd	Pioneer Rd
41164141	4141	4116	No	2	4	1700 South	EB	Redwood Rd	Pioneer Rd
41415184	4141	5184	No	3	4	Pioneer R	NB	1700 S	California
41415184	5184	4141	No	2	4	Pioneer R	SB	1700 S	California
41454146	4145	4146	Yes	8	3	900 West	NB	1300 S	1700 S

Link Number	From Node	To Node	Is Bridge Present	The Wasatch Scenario Volume Ratio (after/before)	The Taylorsville Scenario PGD DS	Road Name	Direction	From	To
41454146	4146	4145	No	3	3	900 West	SB	1300 S	1700 S
41455088	4145	5088	Yes	2	4	1700 South	WB	Redwood Rd	900 W
41914199	4199	4191	No	2	3	700 North	WB	Redwood Rd	1200 W
43914399	4391	4399	No	3	3	2200 West	NB	3100 S	3500 S
43934394	4394	4393	No	2	3	Redwood R	NB	3100 S	3500 S
43944396	4396	4394	No	2	3	Redwood R	NB	3100 S	3500 S
45355409	4535	5409	No	2	3	900 West	SB	SR-201	3300 S
45574558	4557	4558	No	3	2	California	WB	4000 W	Pioneer Rd
45574558	4558	4557	No	8	2	California	EB	4000 W	Pioneer Rd
45574589	4557	4589	No	8	2	California	EB	4000 W	Pioneer Rd
45574589	4589	4557	No	3	2	California	WB	4000 W	Pioneer Rd
45954596	4596	4595	No	2	3	2700 West	NB	3500 S	4100 S
45964671	4671	4596	No	2	3	2700 West	NB	3500 S	4100 S
50175022	5022	5017	No	2	3	7800 South	EB	Redwood Rd	1300 W
53665367	5366	5367	No	4	4	400 West	NB	300 N	North Temp
53665367	5367	5366	No	21	4	400 West	SB	300 N	North Temp
101943660	10194	3660	No	2	2	CD Road	WB	2200 W	4000 W
1019510203	10195	10203	No	2	3	I-80	WB	4000 W	I-215
1019610194	10196	10194	No	2	2	CD Road	WB	2200 W	4000 W
1058810586	10588	10586	No	2	3	I-215	NB	I-80	500 S
1070410392	10704	10392	No	2	2	I-80	WB	7200 W	5600 W

**Table A-4** Links critical in the Taylorsville Scenario and vulnerable in the Wasatch Scenario

Link Number	From Node	To Node	Is Bridge Present	The Taylorsville Scenario Volume Ratio (after/before)	The Wasatch Scenario PGD DS	Road Name	Direction	From	To
19414380	4380	1941	No	2	5	3600 West	SB	3500 S	4100 S
21694433	4433	2169	No	2	5	Parkway B	WB	4800 W	4000 W
35113477	3511	3477	Yes	4	3	I-15 SB o	SB	2300 N	On ramp
35354199	3535	4199	No	2	4	700 North	EB	Redwood Rd	1200 W
35573639	3639	3557	Yes	3	3	4000 West	SB	700 S	I-80
35573703	3557	3703	Yes	3	3	4000 West	SB	700 S	I-80
35623736	3562	3736	No	3	5	300 West	SB	600 N	Victory Rd
36155165	3615	5165	Yes	2	3	On Ramp	WB	400 W	I-80 W
36323639	3632	3639	Yes	3	3	4000 West	SB	I-80	700 S
36323639	3639	3632	Yes	2	3	4000 West	NB	I-80	700 S
36323650	3632	3650	Yes	2	3	4000 West	NB	I-80	700 S
36503652	3650	3652	Yes	2	3	4000 West	SB	I-80	700 S
36523615	3652	3615	Yes	2	3	On Ramp	WB	400 W	I-80 W
36803688	3688	3680	Yes	3	4	North Tem	WB	2200 W	Redwood Rd
36883717	3717	3688	Yes	2	4	North Tem	WB	2200 W	Redwood Rd
37034558	3703	4558	Yes	2	3	4000 West	SB	700 S	California
37123893	3893	3712	No	3	3	700 South	WB	5600 S	4800 S
37373632	3737	3632	Yes	3	3	I-80 EB o	On Ramp	I-80 E	400 W
37385380	3738	5380	Yes	2	3	On Ramp	WB	400 W	I-80 W
37653766	3765	3766	No	7	5	300 South	EB	200 W	West Temp
37653766	3766	3765	No	2	5	300 South	WB	200 W	West Temp
37675532	3767	5532	No	3	5	200 South	WB	200 W	West Temp
37675532	5532	3767	No	4	5	200 South	EB	200 W	West Temp
37733903	3773	3903	No	4	5	South Tem	WB	200 W	West Temp
37733903	3903	3773	No	6	5	South Tem	EB	200 W	West Temp

Link Number	From Node	To Node	Is Bridge Present	The Taylorsville Scenario Volume Ratio (after/before)	The Wasatch Scenario PGD DS	Road Name	Direction	From	To
38365542	3836	5542	No	3	5	California	WB	5600 S	4800 S
38724589	3872	4589	No	2	3	California	WB	4000 W	Pioneer Rd
38724589	4589	3872	No	4	3	California	EB	4000 W	Pioneer Rd
39013921	3901	3921	No	2	5	Frontage	EB	Frontage	4800 W
39013952	3952	3901	No	2	4	Frontage	EB	Frontage	4800 W
39215185	3921	5185	No	2	5	Frontage	EB	4800 W	4000 W
39223923	3922	3923	No	3	5	2100 South	EB	Frontage	4800 W
39223923	3923	3922	No	3	5	2100 South	WB	Frontage	4800 W
39224309	4309	3922	No	3	3	2100 South	WB	Frontage	4800 W
39534077	3953	4077	No	2	4	Main St	SB	800 S	900 S
39624085	3962	4085	No	2	4	State St	SB	800 S	900 S
39705184	5184	3970	No	2	5	Pioneer R	NB	California	1700 S
39934006	3993	4006	Yes	324	4	2100 South	WB	3200 S	2700 S
39934006	4006	3993	Yes	17	4	2100 South	EB	3200 S	2700 S
39934040	3993	4040	Yes	17	4	2100 South	EB	3200 S	2700 S
39934040	4040	3993	Yes	324	4	2100 South	WB	3200 S	2700 S
40034006	4003	4006	No	17	5	2100 South	EB	3200 S	2700 S
40034006	4006	4003	No	324	5	2100 South	WB	3200 S	2700 S
40104179	4179	4010	No	12	5	3rd Ave	EB	State St	B St
40124014	4012	4014	No	2	5	Sunnyside	EB	1300 E	Guardsman
40124014	4014	4012	No	2	5	Sunnyside	WB	1300 E	Guardsman
40404041	4040	4041	Yes	4	4	2700 West	SB	1700 S	Parkway B
40404041	4041	4040	Yes	2	4	2700 West	NB	1700 S	Parkway B
40464048	4046	4048	Yes	6	3	900 South	EB	900 W	I-15
40485466	5466	4048	No	5	4	900 South	WB	900 W	400 W
40514231	4051	4231	Yes	8	4	2100 South	WB	4000 W	3600 W

Link Number	From Node	To Node	Is Bridge Present	The Taylorsville Scenario Volume Ratio (after/before)	The Wasatch Scenario PGD DS	Road Name	Direction	From	To
40514231	4231	4051	No	2	3	2100 South	EB	4000 W	3600 W
40514239	4051	4239	No	2	3	2100 South	EB	4000 W	Gladiola
40514239	4239	4051	No	8	3	2100 South	WB	4000 W	Gladiola
40605088	4060	5088	No	2	5	1700 South	EB	Redwood Rd	900 W
40654068	4065	4068	No	2	4	West Temp	NB	900 S	CD Road
40664068	4068	4066	No	2	5	West Temp	NB	900 S	CD Road
40664076	4066	4076	No	76	5	900 South	EB	West Temp	Main St
40664076	4076	4066	No	6	4	900 South	WB	West Temp	Main St
40734229	4229	4073	No	2	3	Frontage	WB	4800 W	4000 W
40744075	4075	4074	No	2	4	Main St	SB	900 S	1300 S
40764077	4076	4077	No	76	4	900 South	EB	West Temp	Main St
40774085	4085	4077	No	8	3	900 South	WB	Main St	State St
41204125	4120	4125	No	2	5	900 South	EB	1300 E	1500 E
41415184	4141	5184	No	3	5	Pioneer R	NB	California	1700 S
41415184	5184	4141	No	2	5	Pioneer R	SB	California	1700 S
41424143	4142	4143	No	2	4	Redwood R	NB	1700 S	2100 S
41435060	4143	5060	No	2	4	Redwood R	NB	California	1700 S
41644175	4164	4175	No	2	5	1100 East	NB	1700 S	2100 S
41754177	4175	4177	No	2	5	1700 South	EB	1100 E	1300 E
43004493	4493	4300	No	2	5	1300 East	NB	2700 S	3300 S
43124650	4650	4312	No	2	5	2100 South	EB	900 E	1100 E
43144496	4314	4496	No	2	5	1300 East	NB	2700 S	3300 S
43224376	4322	4376	No	3	5	3100 South	EB	4800 W	4000 W
43224376	4376	4322	No	3	5	3100 South	WB	4800 W	4000 W
43414419	4341	4419	Yes	2	4	300 West	NB	I-80	2100 S
43414419	4419	4341	Yes	2	4	300 West	SB	I-80	2100 S

Link Number	From Node	To Node	Is Bridge Present	The Taylorsville Scenario Volume Ratio (after/before)	The Wasatch Scenario PGD DS	Road Name	Direction	From	To
43914399	4391	4399	No	3	5	2200 West	NB	3100 S	3500 S
43934394	4394	4393	No	2	5	Redwood R	SB	3100 S	3500 S
43944396	4396	4394	No	2	5	Redwood R	SB	3100 S	3500 S
44924493	4492	4493	No	2	5	1300 East	NB	2700 S	3300 S
45355409	4535	5409	No	2	5	900 West	SB	SR-201	3300 S
45484558	4548	4558	No	2	3	California	EB	4800 W	4000 W
45484558	4558	4548	No	5	3	California	WB	4800 W	4000 W
45574558	4557	4558	No	3	3	California	WB	4000 W	Pioneer Rd
45574558	4558	4557	No	8	3	California	EB	4000 W	Pioneer Rd
45574589	4557	4589	No	8	3	California	EB	4000 W	Pioneer Rd
45574589	4589	4557	No	3	3	California	WB	4000 W	Pioneer Rd
45924707	4592	4707	No	2	5	3200 West	SB	4100 S	4700 S
45924707	4707	4592	No	2	5	3200 West	NB	4100 S	4700 S
45954596	4596	4595	No	2	5	2700 West	SB	3500 S	4100 S
45964671	4671	4596	No	2	5	2700 West	SB	3500 S	4100 S
45994600	4599	4600	No	2	5	3600 West	NB	4100 S	4700 S
46015217	4601	5217	No	2	5	Meadow Br	EB	Redwood Rd	500 W
46134614	4613	4614	No	2	5	3900 South	EB	West Temp	Main St
46144732	4614	4732	No	2	5	Main St	SB	3900 S	W Central Av
47064707	4706	4707	No	2	5	3200 West	NB	4100 S	4700 S
47064789	4706	4789	No	5	5	3200 West	SB	4700 S	5400 S
47064789	4789	4706	No	4	5	3200 West	NB	4700 S	5400 S
47965927	4796	5927	No	3	5	5400 South	WB	3200 W	2700 W
47965927	5927	4796	No	3	5	5400 South	EB	3200 W	2700 W
48165332	5332	4816	No	2	5	Minuteman	NB	Highland	Minuteman
49065440	4906	5440	No	2	5	1300 West	SB	Wincheste	7000 S

Link Number	From Node	To Node	Is Bridge Present	The Taylorsville Scenario Volume Ratio (after/before)	The Wasatch Scenario PGD DS	Road Name	Direction	From	To
49525440	4952	5440	No	5	5	1300 West	NB	7000 S	7800 S
49525440	5440	4952	No	3	5	1300 West	SB	7000 S	7800 S
49745320	4974	5320	No	6	5	Wasatch B	NB	6200 S	5600 S
49745320	5320	4974	No	6	5	Wasatch B	SB	6200 S	5600 S
49955320	4995	5320	No	6	5	Wasatch B	SB	6200 S	5600 S
49955320	5320	4995	No	6	5	Wasatch B	NB	6200 S	5600 S
49995019	4999	5019	No	2	5	New Bingh	EB	SR-111	5600 W
49995019	5019	4999	No	2	5	New Bingh	WB	SR-111	5600 W
50175022	5022	5017	No	2	5	7800 South	WB	Redwood Rd	1300 W
50225524	5524	5022	No	3	5	7800 South	WB	1300 W	700 W
50435307	5043	5307	No	6	5	Wasatch B	SB	4500 S	6200 S
50435307	5307	5043	No	4	5	Wasatch B	NB	4500 S	6200 S
50705328	5328	5070	No	2	5	Fort St	NB	Pioneer Rd	13200 S
50955600	5095	5600	No	3	5	Fort Union	WB	3000 E	Wasatch B
50955600	5600	5095	No	6	5	Fort Union	EB	3000 E	Wasatch B
50975462	5097	5462	No	2	5	Fort Union	WB	2300 E	3000 E
50975462	5462	5097	No	2	5	Fort Union	EB	2300 E	3000 E
51175730	5730	5117	No	2	5	700 West	NB	9000 S	9800 S
51653738	5165	3738	No	2	3	On Ramp	WB	400 W	I-80 W
51755729	5729	5175	No	4	5	9800 South	WB	700 W	500 W
52085209	5209	5208	No	2	5	Redwood R	SB	9800 S	10400 S
52095211	5211	5209	No	2	5	Redwood R	SB	9800 S	10400 S
52145232	5214	5232	No	2	5	1300 West	NB	9800 S	South Jor
52145232	5232	5214	No	2	5	1300 West	SB	9800 S	South Jor
52155232	5232	5215	No	2	5	9800 South	EB	1300 W	700 W
52195232	5219	5232	No	2	5	1300 West	SB	9000 S	9800 S

Link Number	From Node	To Node	Is Bridge Present	The Taylorsville Scenario Volume Ratio (after/before)	The Wasatch Scenario PGD DS	Road Name	Direction	From	To
52305929	5230	5929	No	3	5	9800 South	WB	I-15	State St
52305929	5929	5230	No	2	5	9800 South	EB	I-15	State St
52735656	5273	5656	No	2	5	State St	NB	11000 S	11400 S
52735656	5656	5273	No	4	5	State St	SB	11000 S	11400 S
53515683	5351	5683	No	2	5	Highland	WB	13800 S	1300 E
53515769	5769	5351	No	2	5	1300 East	WB	13800 S	Highland Dr
53665367	5366	5367	No	4	5	400 West	NB	300 N	North Temp
53665367	5367	5366	No	21	5	400 West	SB	300 N	North Temp
53725674	5372	5674	No	2	5	13200 Sou	EB	Fort St	1300 E
53725674	5674	5372	No	4	5	13200 Sou	WB	Fort St	1300 E
<b>54015416</b>	<b>5401</b>	<b>5416</b>	<b>No</b>	<b>2</b>	<b>5</b>	<b>1300 East</b>	<b>SB</b>	<b>Pioneer Rd</b>	<b>13200 S</b>
54165674	5416	5674	No	5	5	13200 Sou	WB	Fort St	1300 E
54165674	5674	5416	No	3	5	13200 Sou	EB	Fort St	1300 E
54165769	5416	5769	No	2	5	1300 East	SB	13200 S	13800 S
54225658	5422	5658	No	2	5	11400 Sou	EB	State St	700 E
54225658	5658	5422	No	2	5	11400 Sou	WB	State St	700 E
54365440	5436	5440	No	2	5	7000 South	EB	Redwood Rd	1300 W
54365577	5577	5436	No	2	5	7000 South	EB	2200 W	Redwood Rd
54485658	5448	5658	No	2	5	11400 Sou	WB	State St	700 E
54485658	5658	5448	No	3	5	11400 Sou	EB	State St	700 E
54965685	5685	5496	No	2	5	11800 Sou	EB	6000 W	4000 W
55285676	5528	5676	No	2	5	13400 Sou	EB	6000 W	5600 W
56825683	5683	5682	No	2	5	Vestry Rd	SB	Highland	Vestry Rd
57285729	5729	5728	No	2	5	500 West	NB	9000 S	9800 S
57295929	5729	5929	No	2	5	9800 South	EB	500 W	State St
57295929	5929	5729	No	3	5	9800 South	WB	500 W	State St

Link Number	From Node	To Node	Is Bridge Present	The Taylorsville Scenario Volume Ratio (after/before)	The Wasatch Scenario PGD DS	Road Name	Direction	From	To
57685769	5768	5769	No	2	5	13800 Sou	EB	Fort St	1300 E
57685769	5769	5768	No	4	5	13800 Sou	WB	Fort St	1300 E
58565857	5856	5857	No	3	4	CD Road	SB	800 S	1300 S
100443497	10044	3497	No	4	3	I-15 NB o	NB	Off Ramp	2300 N
101465120	10146	5120	No	2	5	I-15 NB o	NB	Off Ramp	9000 S
101943660	10194	3660	No	2	3	CD Road	WB	2200 W	4000 W
347710045	3477	10045	Yes	4	3	I-15 SB o	SB	On Ramp	2300 N
366910196	3669	10196	Yes	2	4	CD Road	WB	2200 W	4000 W
437610596	4376	10596	No	28	5	4000 West	SB	3100 S	3500 S
437610596	10596	4376	No	21	5	4000 West	NB	3100 S	3500 S
437810596	4378	10596	No	21	5	4000 West	NB	3100 S	3500 S
437810596	10596	4378	No	28	5	4000 West	SB	3100 S	3500 S
538010190	5380	10190	No	2	3	CD Road	WB	4000 W	I-80 W
585010704	5850	10704	No	5	4	5600 West	On Ramp	5600 W	I-80 W
1005410048	10054	10048	No	2	5	I-15	NB	600 N	600 N
1011710111	10117	10111	No	2	3	CD Road	EB	I-15 S	I-80 E
1013610557	10136	10557	No	2	5	I-15	SB	I-215	7000 S
1013810141	10138	10141	No	2	5	I-15	SB	7200 S	7200 S
1019510203	10195	10203	No	2	4	I-80	EB	4000 W	I-215
1019610194	10196	10194	No	2	3	CD Road	WB	2200 W	4000 W
1020310201	10203	10201	No	2	5	I-80	EB	4000 W	I-215
1021310059	10213	10059	No	2	5	CD Road	On Ramp	I-80 E	I-15 S
1021310526	10213	10526	No	3	5	CD Road	On Ramp	I-80 E	I-15 N
1025910588	10259	10588	No	2	5	I-215	NB	500 S	I-80
1030910626	10309	10626	No	2	5	I-215	NB	2300 E	5600 S
1039210390	10392	10390	No	2	5	I-80	WB	7200 W	5600 W

<b>Link Number</b>	<b>From Node</b>	<b>To Node</b>	<b>Is Bridge Present</b>	<b>The Taylorsville Scenario Volume Ratio (after/before)</b>	<b>The Wasatch Scenario PGD DS</b>	<b>Road Name</b>	<b>Direction</b>	<b>From</b>	<b>To</b>
1052510056	10525	10056	No	3	5	CD Road	On Ramp	I-80 E	I-15 N
1052610525	10526	10525	No	3	5	CD Road	On Ramp	I-80 E	I-15 N
1054710117	10547	10117	No	2	5	CD Road	EB	I-15 S	I-80 E
1055310136	10553	10136	No	2	5	I-15	SB	I-215	7200 S
1055710138	10557	10138	No	2	5	I-15	SB	I-215	7200 S
1058810586	10588	10586	No	2	5	I-215	NB	I-80	500 S
1062610628	10626	10628	No	2	5	I-215	NB	2300 E	5600 S
1062810311	10628	10311	No	2	5	I-215	NB	2300 E	5600 S
1069910198	10699	10198	No	2	5	CD Road	WB	I-215 S	I-80 W
1070310706	10703	10706	No	2	4	I-80	EB	5600 W	5600 W
1070410392	10704	10392	No	2	4	I-80	WB	7200 W	5600 W
1070510704	10705	10704	No	2	4	I-80	WB	5600 W	5600 W

