# TO COLLECT AND ANALYZE SAFETY DATA IN ORDER TO IMPLEMENT THE "SAFETY ANALYST" APPLICATION

**FINAL REPORT**

**Prepared by:**

**Alexander Paz, Ph.D., P.E.**
Associate Professor
Director, Transportation Research Center
apaz@unlv.edu
(702) 895-0571

**Naveen Veeramisti, M.S.,E.I.**
Senior Transportation Engineer
veeramis@unlv.nevada.edu

**Indira Khanal, M.S., E.I.**
Senior GIS Engineer

and

**Justin Baker, M.S.**
Senior Software Engineer

Transportation Research Center
College of Engineering
Department of Civil and Environmental Engineering
University of Nevada, Las Vegas
4505 S Maryland Parkway, PO Box 454015
Las Vegas, NV 89154

in cooperation with

Safety Engineering Division
Nevada Department of Transportation
1263 South Stewart Street
Carson City, NV 89712

July 16, 2014

## EXECUTIVE SUMMARY

This study developed a comprehensive database system to provide data to multiple applications with focus on AASHTOware Safety Analyst for Clark County, Nevada. Safety Analyst is the state-of-the-art software for comprehensive highway safety management. It has significant capabilities and cutting-edge research analytical methods for safety analysis and management. Considering multiple data needs and sources of data, the data obtained required review, processing and formatting. Based on the data collection or generation processes chosen for each of the various data sets, the corresponding data were collected or estimated. The various datasets that are obtained, collected or generated were filtered, processed and formatted to ensure consistency with Safety Analyst. A number of data management tools were developed to extract, collect, transform, integrate and load the data. In addition, the proposed system includes consistency-checking capabilities to ensure the adequate insertion and update of data into the database system. The proposed system caters roadway, ramp, intersection and traffic characteristics dataset for Safety Analyst. The database was proposed for the entire Clark County, the largest county in Nevada including the cities of Las Vegas, Henderson, Boulder City, Mesquite and North Las Vegas.

The datasets obtained included the County-level Data Set (CDS) Roadway Network. The HPMS functional classification network layer, obtained from the Nevada Department of Transportation (NDOT), was used to select the roadway segments consisting of freeways (functional class 1, 2 and 3) and arterials (functional class 3, 4, 5, and 6), and ramp segments. The developed database includes Roadway and ramp segments, signalized, and stop control intersections. Driveways, local streets, and uncontrolled intersections were not considered because Safety Analyst does not provide capabilities to study these types of facilities.

The developed database was then used to identify the sites with potential for safety improvements using the Network Screening methods provided by the Safety Analyst analytical tool. Various analyses, using different Network Screening methods, were conducted for:

- Analysis of roadway and ramp segments, and intersections,
- Analysis of roadway segments based on functional classification,
- Analysis of signalized and stop controlled intersections, and
- Analysis of ramp segments

Guidelines were provided about how to select a particular network screening type or performance measure for network screening.

Safety Analyst provides a rudimentary approach to display the results. To address this limitation, a Visualization System for the Safety Analyst outputs was developed and implemented. The Visualization System for Safety Analyst significantly expands the input and output capabilities provided by Safety Analyst. The primary objectives of the system are to enable an easy use of Safety Analyst and to provide visual tools not provided by Safety Analyst. The proposed system provides spatial displays using Google Map and includes multiple complimentary visuals of the results including spatial maps, bar charts, tables and editable reports. The advantage of using Google Map is its simplicity. The displays are very intuitive and can be customized based on the user needs. The displays facilitate the analysis and the decision making process as they enable the user to see the locations of every specific site and develop potential conclusions. The Visualization System interacts with Safety Analyst so that the user can use the tools throughout the entire modeling and analysis process. In addition, the tools

provide analytics of estimated safety performance measures which can be used by decision makers.

The proposed database was tested with Safety Analyst by the engineers of NDOT. Comments and concerns provided by NDOT were addressed within the limitations of Safety Analyst. In summary, this study illustrates how to address barriers associated with the use of Safety Analyst. This study further discusses a few recommendations for a system for further visual effectiveness.

Considering that the location of **c**rashes are a critical input for Safety Analyst and that crash location is a significant issue in Nevada, a field test of a GPS-base system (GPS-BS) was conducted with the involvement of the Las Vegas Metropolitan Police Department (Metro). The system involves a GPS unit, a real-time database, and a dashboard. The figure below illustrates these three components and their interdependencies. The role of the GPS unit is to collect and send the crash coordinates to a remote server hosting a real time database that stores this information. Along with the crash coordinates, the GPS unit sends the corresponding collection date and time as well as the device ID. This information is critical to match the data collected by the GPS unit with the official crash records collected by the police officers. The database provides the crash, time, and device ID information to the dashboard which role is to enable the visualization of the crash location as well as to provide a large number of query options. Using the dashboard, crash records and patterns can be analyzed. Various colors are used to differentiate between active, recent, and older crashes. Time and device ID can be obtained through the Report list menu or through the balloons. Polygons can be created to select regions. Statistics can be generated for the entire region of for the regions selected using polygons.

The GPS-BS device proved to be effective. It was documented as being highly accurate in sending X, Y crash coordinates. When used properly, matches to the actual crash records were relatively easy to make. As expected, usefulness of the overall system was strongly based on consistency of officer use and adherence to following operating instructions (a user guide was prepared). As the above results show, voluntary compliance would render the system quite ineffective. During the field test, Metro realized the value of having immediate information about where crashes are, and have been occurring. Metro highlighted the tactical advantage that this information provides to supervisors who are responsible for assigning responsibilities to the officers. Thanks to this project, and the highly beneficial experience that Metro had with the research team and sub-contractor, Metro has recently begun to consider the potential benefits of cooperation with NDOT and UNLV in order to upgrade their entire crash and citation data collection system. In addition, Metro has reported that they were impressed with the capabilities and commitment of the UNLV Project Team.

## TABLE OF CONTENTS


EXECUTIVE SUMMARY ..... 2
LIST OF FIGURES ..... 5
LIST OF TABLES ..... 5
CHAPTER 1 INTRODUCTION ..... 6
1.1 Project Needs and Literature Review ..... 6
1.2 Project Objectives ..... 7
1.3 Report Organization ..... 8
CHAPTER 2 DATA COLLECTION, PROCESSING AND FORMATTING ..... 9
2.1 Data Collection and Generation ..... 9
2.2 Data Management Tools for Collection, Process and Format ..... 11
2.3 Datasets ..... 13
CHAPTER 3 DESIGN, DEVELOPMENT, AND IMPLEMENTATION OF THE PROPOSED DATABASE SYSTEM ..... 17
3.1 Database Schema ..... 17
3.2 Data Attribute Mapping Interface ..... 18
3.3 Data Instantiation and Insertion ..... 19
3.4 View Tool for Safety Analyst ..... 19
3.5 Safety Database ..... 20
CHAPTER 4 TESTING AND ANALYSIS OF THE DATABASE WITH SAFETY ANALYST ..... 24
4.1 Safety Analyst ..... 24
4.2 Testing and Analysis of the Database with Safety Analyst ..... 25
CHAPTER 5 VISUALIZATION SYSTEM FOR SAFETY ANALYST ..... 28
5.1 Background ..... 28
5.2 Output files ..... 29
5.3 Visualization System for Safety Analyst ..... 29
5.4 Visualization System: Google Maps Interface Tool ..... 30
5.5 Evaluation of the Visualization System ..... 35
CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS ..... 39
6.1 Conclusions ..... 39
6.2 Recommendations ..... 40
CHAPTER 7 FIELD TESTING THE GPS-BASED SYSTEM FOR THE COLLECTION AND REPORTING OF CRASH COORDINATES ..... 41
7.1 Introduction ..... 41
7.2 GPS-based System for the Collection and Reporting of Crash Coordinates ..... 42
APPENDIX A STATUS OF ROADWAY SEGMENTS, RAMPS AND INTERSECTIONS INCLUDED IN THIS PROJECT ..... 50
APPENDIX B ENTITY RELATIONSHIP DIAGRAM OF THE PROPOSED SAFETY DATABASE 139
APPENDIX C RESULTS OF NETWORK SCREENING ANALYSES ..... 140
APPENDIX D TUTORIAL OF NETWORK SCREENING ANALYSIS IN SAFETY ANALYST ..... 200
APPENDIX E LETTER FROM METRO ..... 214
APPENDIX F PROJECT COSTS AND EXPENSES ..... 215
APPENDIX G RECEIPTS ..... 216

## LIST OF FIGURES

FIGURE 1 Conceptual framework for the proposed comprehensive database and visualization system. ..... 8
FIGURE 2 Mandatory data elements required by Safety Analyst. ..... 9
FIGURE 3 CDS Road Network – Clark County. ..... 15
FIGURE 4 Segments selected based on HPMS Functional Classification for Freeways, Ramps and Arterials. ..... 16
FIGURE 5 Physical data model of proposed database. ..... 18
FIGURE 6 Functionally classified Freeways, Arterials and Ramps Analyzed in this report ..... 22
FIGURE 7 Signalized and Stop Control intersections included in the database. ..... 23
FIGURE 8 Web portal of Safety Analyst output visualization with Google Map. ..... 31
FIGURE 9 Visualization of Network Screening results – tabular presentation. ..... 32
FIGURE 10 Visualization of network screening results – spatial and bar chart presentation. ..... 32
FIGURE 11 Visualization of network screening results – report presentation. ..... 33
FIGURE 12 Economic appraisal results as provide by Safety Analyst. ..... 34
FIGURE 13 Economic appraisal and priority ranking results as provide by the proposed Visualization System. ..... 34
FIGURE 14 GPS-based system for the collection and reporting of Crash coordinates. ..... 43

## LIST OF TABLES

TABLE 1 Source Files and Their Data Elements to Build a Safety Database ..... 11
TABLE 2 Portion of the Metadata File for Data Mapping ..... 19
TABLE 3 Mapping between a General View and the Safety Analyst View ..... 20
TABLE 4 Safety Analyst Results Format from Network Screening ..... 30
TABLE 5 Total Number of Responses ..... 35
TABLE 6 Number Coding For the Type of Answer of the Respondents ..... 36
TABLE 7 Total Numbers of Responses with Traffic Safety Experience ..... 36
TABLE 8 Total Numbers of Responses in with Traffic Engineering Experience ..... 36
TABLE 9 Total Numbers of Respondents with Transportation Planning Experience ..... 37
TABLE 10 Total Numbers of Responses with GIS Experience ..... 37
TABLE 11 Overall Rating about the Experience with the Visualization System ..... 38
TABLE 12 Overall Rating about the usability of the Visualization System ..... 38

# CHAPTER 1

# INTRODUCTION

## 1.1 Project Needs and Literature Review

The National Highway Traffic Safety Administration's (NHTSA) FY2013 Highway Traffic Safety Grants estimates a total of $643 million *(1)*. In spite of enormous resources spent on highway traffic safety, motor vehicle crashes is a critical concern in the United States. Based on the Fatality Reporting and Analysis System's (FARS) statistical projections, traffic fatalities have increased from 32,367 in 2011 to 34,080 in 2012; this represents a 5.3% increase. Since 2005, 2012 was the first year with a year-to-year increase in fatalities. This indicates that considerable work still is needed to improve highway safety *(2)*.

The Highway Safety Improvement Program (HSIP) is one of the critical components of the safety provisions in Moving Ahead for Progress in the 21st Century (MAP–21) act (*3*). As a part of HSIP, state Departments of Transportation (DOTs) develop a Strategic Highway Safety Plan (SHSP) to identify, analyze and address traffic safety problem. State-of-the-art tools have been created to support the development of SHSP and generate better traffic solutions for existing and emerging safety problems. Some of these tools include the Interactive Highway Safety Design Model (IHSDM), the Highway Safety Manual (HSM), and Safety Analyst. In addition, these tools can be used by DOTs to satisfy MAP-21's performance-based federal program. For example, the performance-based federal program mandates state DOTs to establish safety performance targets and achieve them within 2 years (*3*). This requires a comprehensive highway safety management program which should include:

a. Identification of hazardous locations,
b. Diagnosis of the identified hazardous locations and countermeasure selection,
c. An estimation of the cost of the countermeasures, and
d. An estimation of the benefits of the countermeasures.

In addition, these new tools address many limitations of traditional safety analysis tools, including bias associated with volume, segment length and regression-to-the-mean as well as incorrect model form and lack of a reliability measure (*4–9*). In order to address these limitations, state-of-the-art tools, including Safety Analyst, use analytical methods that require comprehensive data sets to provide sufficient information to capture intricate spatio-temporal characteristics and interactions in the traffic system.

NHTSA, in their FY2013 budget estimate, determined to develop and implement data-driven, self-sustaining highway safety programs that reduce highway injuries and fatalities (*1*). The federal government has been spending considerable resources to build accurate and timely safety data sets at the national and state level (*10*). Key safety data include information about crashes, roadways, traffic flow, driver history, citation/adjudication, and construction projects (*4, 11*). Furthermore, these data are required by a number of other safety programs, such as the Highway Rail Grade Crossing Program and the High Risk Rural Road Program. Currently, different divisions at many state DOTs collect and maintain various datasets based on their corresponding data needs; in addition, some data is shared across divisions. This approach may not be the best for a number of following reasons:

a. Not all interested groups are aware of the availability of data at each division.
b. There is no consistency in terms of how the information is stored and the data normalized.

c. Typically, the datasets are developed without explicitly considering the needs of the various applications used by different divisions.
d. New emerging tools, such as Safety Analyst, require data to be collected from multiple divisions; they also need data collected that typically is not available.
e. The training of traffic safety engineers and professionals on the use of new applications, such as Safety Analyst, requires the corresponding applications to be ready for use with all the necessary data available.
f. Coordination with other statewide public safety agencies requires a comprehensive approach to integrate and enable access to the data as well as to provide maintenance capabilities.

Considering the existing data needs, which are significant, and the potential to develop better solutions using state-of-the-art analysis tools, a comprehensive approach for data collection and management is required. A body of literature reports the development of data collection and integration methods for transportation applications, including geographic information system (GIS) frameworks (*12–18*) and database/data-warehouse systems (*19–22*) as well as visualization tools (*23–25*). However, most DOTs do not have access yet to a comprehensive database system that enables them to take full advantage of the existing available tools.

This study developed a comprehensive database and visualization system for traffic safety engineering. The database system has been designed to provide data to multiple transportation applications. However, currently, the development focuses on providing data and visualization capabilities for Safety Analyst. A recent nationwide survey reveals major deterrents for using Safety Analyst (*26*). Some of these deterrents include non-availability of comprehensive data sources and tedious data importing and processing. Hence, the proposed database system significantly contributes to the adoption of Safety Analyst.

In particular, this study developed a database system tailored to provide data for the use of Safety Analyst for traffic safety analysis in Clark County, Nevada. However, all the tools developed to create the database system could be used to create similar databases for other locations and/or to expand the existing database. Figure 1 illustrates the conceptual framework for this proposed comprehensive database and visualization system. Raw data is processed using Data Management Tools to create a comprehensive, normalized, and optimized database. View Tools are used to provide the data required by each application in the corresponding format and level of resolution. Visualization Tools are used to provide multiple graphical representations of the inputs and outputs for each application. Many existing analysis tools, including Safety Analyst, do not provide visualization capabilities. This is a significant limitation considering the spatial nature of the problem context.

## 1.2 Project Objectives

The objectives of this project are:

1. Data collection from various sources (agencies); generation of missing data; processing and formatting of mandatory and non-mandatory data required by Safety Analyst.
2. Design, development, and implementation of the proposed database system.
3. Testing and analysis of the implemented database with Safety Analyst.
4. A Visualization system to visualize the results of Safety Analyst in spatial, tabular and graphical methods.

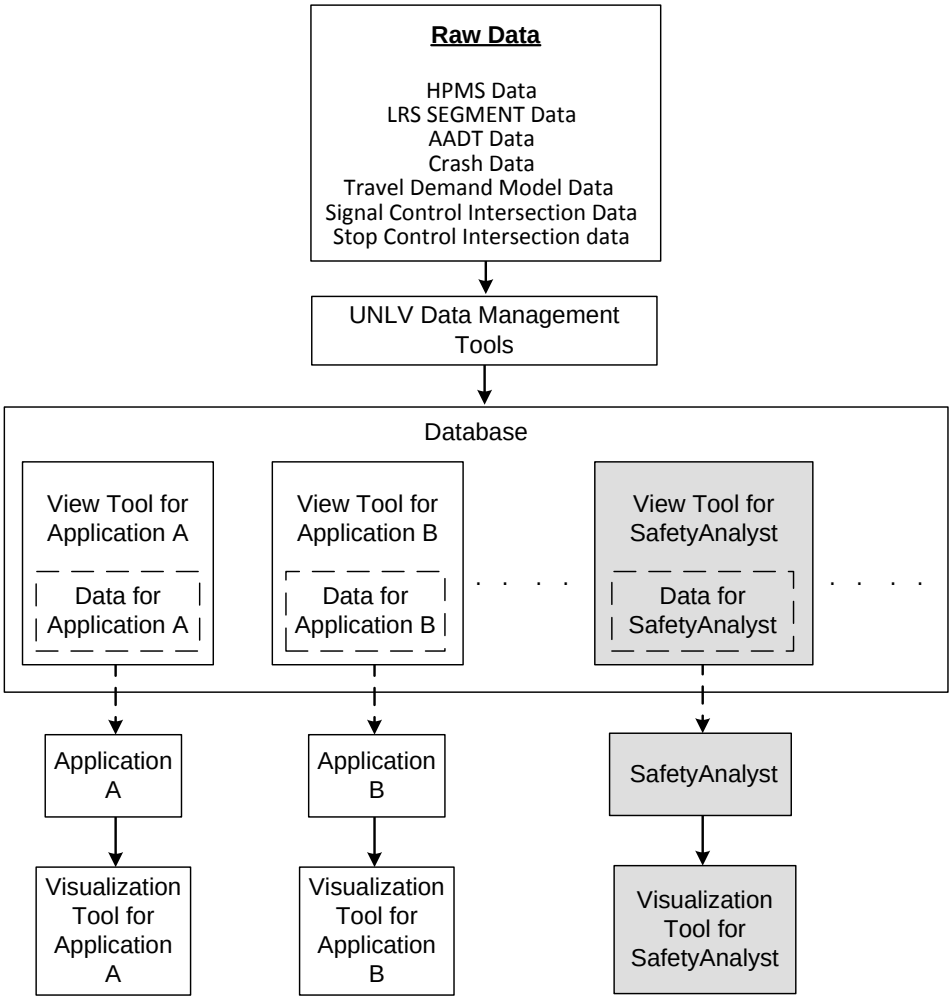



**FIGURE 1 Conceptual framework for the proposed comprehensive database and visualization system.**

## 1.3 Report Organization

The rest of the report is organized as follows. Chapter 2 summarizes the inventory of existing data, data collection and generation, data processing and formatting. Chapter 3 briefly summarizes the design, development, and implementation of the proposed database system. Chapter 4 describes the testing and various analysis of the implemented database with Safety Analyst's network screening module. Chapter 5 presents the development of visualization system for displaying the results of the network screening module. Chapter 6 provides an outcome of this project effort and provides recommendations to make this project more useful for NDOT. To conclude, Chapter 7 provides the results of a field test for a GPS-based system for the collection and reporting of crash coordinates. This type of information is critical for Safety Analyst. All chapters include literature review when and where required.

# CHAPTER 2

# DATA COLLECTION, PROCESSING AND FORMATTING

This Chapter summarizes the data collection and generation, data processing and formatting, required by Safety Analyst. Considering the multiple data needs and sources of data, the data obtained from various sources is required to review, process and formatting. Depending on the characteristics of the missing data, the development of data collection tools was proposed. Based on the data collection and generation processes chosen for each of the various missing data sets, the corresponding data were collected or generated. The various datasets that are obtained, collected and generated were filtered, processed and formatted to ensure consistency with Safety Analyst.

## 2.1 Data Collection and Generation

Critical data to perform traffic safety studies include crash, roadway, control, and traffic flow data. A comprehensive data collection plan was developed to obtain available data from various state agencies in Nevada, based on the Model Minimum Uniform Crash Criteria (MMUCC) and Model Inventory of Roadway Elements (MIRE) (*28*, *29*). Based on these guidelines, approximately 130 data attributes are necessary for the development of a comprehensive safety database. All these data are not required by Safety Analyst. In this study, a data dictionary was developed to explicitly identify the mandatory data for Safety Analyst (*4*, *27*), and are shown in the Figure 2.

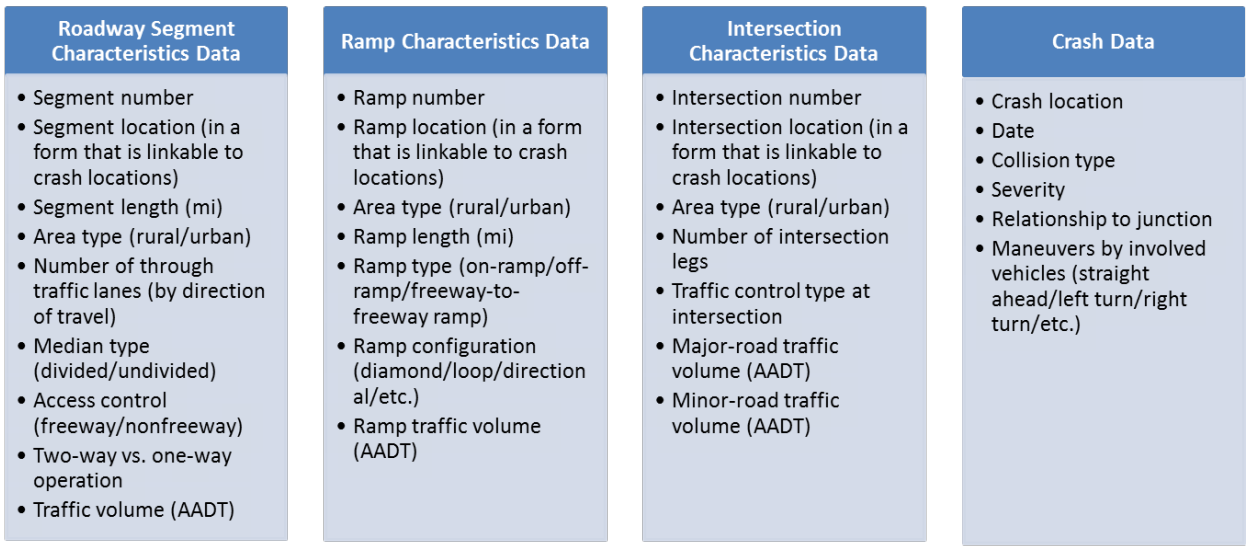



**FIGURE 2 Mandatory data elements required by Safety Analyst.**

Most of the data in Figure 2 is typically available through various DOT sources, including the Highway Performance Monitoring System (HPMS), Linear Referencing System (LRS) of road network, Travel Demand Models (TDM), intersection, traffic volume, and crash datasets (*26*). For this study, roadway segment and ramp data were obtained from the LRS, HPMS and TDMs. Crash data was obtained from the Nevada Accident and Citation Tracking System. Annual Average Daily Traffic (AADT) was obtained from Traffic Records Information Access (TRINA).

### *2.1.1 Road Network*

A road network is the center line map of routes in a GIS LRS. Most of the state DOTs have two levels of road network: a State-level Data Set (SDS) and a County-level Data Set (CDS). The SDS can be used for federal aid and national highway system roads in Safety Analyst, and the CDS can be used for county-level minor arterial roads as well as for major and minor collector roads. Typically, a SDS road network is similar to a HPMS routes layer. When both SDS and CDS road network are unavailable, the HPMS routes layer in LRS (*30*) can be used with some modifications.

For this study, the CDS road network in LRS was used. This reference included an additional system 'Route Master' for relating a route to the road network. A Route Master ID (RMID) is a unique identifier for reference to the route in the road network. The RMID improves the ability to reference the other data source to the road network. And also, it is used as a unique route identifier required by safety analyst location reference system. The road network data includes the segment id, RMID, type of road, county, begin and end milepost of the segment, cardinal direction, and length of the segment. The cardinal direction reflects the direction in which the road begins and ends.

### *2.1.2 HPMS Data*

The HPMS is a FHWA-maintained national-level system that includes data on the extent, condition, performance, use, and operating characteristics of the state owned and some non-state owned highways (*30*). The HPMS data model by FHWA is in a GIS framework, and thus provides the spatial relationships between data elements. FHWA mandates the state DOTs to submit complete, timely, and accurate HPMS data every year (*30*). Hence, this data integrated with other data sources available at state DOTs can be used for database development required for the Safety Analyst.

For this study, Nevada HPMS data layers that were used included access control, facility type, functional classification, speed limit, through lanes, AADT, and urban code.

### *2.1.3 Travel Demand Model*

Urban metropolitan planning organizations (MPOs) usually have a GIS-based TDM for purposes of transportation planning and transportation improvement programs. The data from this model – such as number of lanes, speed limit, access control, functional classification, area code, travel direction, one-way or two-way, ramp configuration –can be used when HPMS data is not available. If a distinct county-level road network is not available, a TDM model road network can be used for road segments, ramp segments, length, and milepost data.

For this study, the TDM of the Regional Transportation Commission of Southern Nevada (RTC-SN) was used to obtain data that were not available in the HPMS layers.

### *2.1.4 Crash Data*

Every year, NHTSA spends a considerable portion of its budget in their Highway Safety Grants for the Crash Data Collection Program (*1*). Collection of crash data from the states has to be based on MMUCC guidelines. The crash data required by Safety Analyst also is based on MMUCC guidelines. This study used located crashes (crash with coordinates) and crash characteristics from NCATS.

### *2.1.5 AADT Data*

Safety Analyst requires AADT for all the segments to be used in the network level analysis. Frequently, however, they are not available for all roadway classes. Typically, DOTs collect data

to estimate AADTs for high functional classes of roads, such as freeways and state roads. Collecting similar data for arterials and local roads is an extensive and expensive process. Hence, this study used a simulation-based dynamic traffic assignment model, DynusT (*31*, *32*), to estimate AADT for locations with missing AADT.

### *2.1.6 Intersection Data*

Typically, county agencies or MPOs have data for signalized intersections with the location and type of control information. However, data for stop-controlled intersections is not common, and needs to be collected.

In this study, a methodology and a tool was developed to collect stop-control data efficiently, as described in the following section. Signalized intersection data was obtained from Freeway and Arterial System of Transportation (FAST); a division of RTC-SN.

## 2.2 Data Management Tools for Collection, Process and Format

Table 1 shows the source files typically available in State DOTs and/or MPOs as well as the data in those files required by Safety Analyst. With this information, agencies can begin collecting these files to start developing a database for Safety Analyst. Agencies can either choose only HPMS Files, Road Network and Crash data for State DOT-maintained roads or HPMS Files, Road Network, TDM, Crash and intersection data for county-level roads.

**TABLE 1 Source Files and Their Data Elements to Build a Safety Database**

| HPMS Files | Road Network | TDM Model | Crash Data | Intersection |
|---|---|---|---|---|
| Functional Classification | Segment ID | Travel Direction | Accident ID | Intersection ID |
| Access Control | Ramp ID | Operation Way (1 or 2 Way) | Crash Location | Intersection location |
| Speed Limit | Segment length | Functional Classification | Crash Date | Type of Control |
| Through lanes | begin Milepost | Speed Limit | Collision Type | Number of Legs |
| Lanes_Left | End Milepost | Number of Lanes | Severity | |
| Lanes_Right | Route ID | County | Relationship To Junction | |
| AADT | County | Area Code | Direction of Involved Vehicle | |
| Urban | Increasing Milepost Direction | Ramp configuration (sometimes available) | Manuevers by Involved Vehicle | |
| Routes | | Ramp Type (Sometimes available) | | |
| County | | Segment ID | | |
| | | Ramp ID | | |
| | | Segment Length | | |

The road network – along with HPMS, including AADT, and crash data – form an integrated database covering at least all state-owned roadways and ramp segments. However, this

study required data on county-level roads as well. Therefore, data from the CDS road network were integrated with data from the HPMS layers, TDM, intersections, AADT, and crashes. During integration, some of the issues found among these datasets were:

a. A spatial shift/gap exists among GIS shape files of various datasets, such as HPMS, CDS road network, and TDM layers;
b. No common id exists among the HPMS, CDS road network, and TDM layers;
c. Segmentation lengths differ in HPMS layers and the CDS road network;
d. There is no unique route id (RMID) among datasets; and
e. Some data is incorrectly represented, such as ramp configuration and the number of lanes.

Certain issues in datasets are common because there is no consistency in how the data was formatted and stored among the different divisions or departments. Furthermore, the collected data may or may not have been stored in the same geographical format, such as cardinal measurements, coordinate systems, and geometry. ArcGIS ModelBuilder (*33*) was used to develop the automated tools that solved these issues; these tools are discussed in the following.

### *2.2.1 Data Collection Tool*

Even though multiple data sources exist that provide a vast amount of the required data for Safety Analyst, various data attributes were missing or incomplete. Some of the missing attributes, included ramp type, ramp configuration, and the type of control at intersections. Most of the missing data were collected using Google Earth; the missing information was observed and coded in Google Earth.

A Data Collection Tool was developed to extract the data. The tool also could create ArcGIS shape files with all the information. This capability facilitated the development and integration of the database.

Safety Analyst requires that all the collected data be integrated using either (i) a route and milepost index, (ii) a route, county and milepost index, (iii) a route, section and distance, or (iv) a section and distance. This study used a route, county and milepost index to integrate all data because some of the data sets already had this information. Although there are available various commercial methods and tools (*12–18*) to integrate the data, integration tools using ArcGIS ModelBuilder were developed in this study so as to gain total control of the process and seek further automation.

### *2.2.2 ArcGIS ModelBuilder Tool*

The ModelBuilder (*33*) is an application existing inside ArcGIS, in which models can be created, edited, and managed. A model is built with a sequence of processes and data chained together. A completely built model can be saved as a tool and embedded in an ArcMap tool bar. The two primary uses of ModelBuilder are to immediately execute a process sequence that was created and to create additional tools with new capabilities. These tools can be launched from the tool dialog box or from Python scripts. With the developed ModelBuilder tool, the following operations can be performed:

1. Change parameter values, such as buffer radius or tolerance limits, and re-run models;
2. Add more processes, for example, such components as a buffer or intersect, as well as data;
3. Delete processes and intermediate data; and

4. Visualize and explore the results in ArcMap.

ModelBuilder tools were developed to overcome all the encountered data issues with HPMS, road networks, TDM, and AADT. Three primary tools used were:

1. A mapping tool that maps road network segments spatially to data elements in HPMS when there is geometry shift and no common field between them;
2. A linear referencing tool that creates a milepost for each crash with respect to roadway segment, ramp, or intersection mileposts; and
3. A dynamic segmentation tool that breaks/join the segments at required locations such as at intersections and freeway influence zone.

As mentioned earlier the Safety Analyst supports four different types of location reference system for different facilities. It requires the location of segment, ramps or intersections in any of the following four systems (*27*).

1. Route/Milepost: In this system, a milepost value is assigned along the route of a particular facility. For example, the location of a roadway segment is provided with name or route number and its numeric begin and end milepost value.
2. Route/County/Milepost: In this system, a milepost value is assigned to a route in a county. For example, the location of a roadway segment is provided with route name or route number, county name or county code and its numeric begin and end milepost values.
3. Route/Section/Distance: In this system a segment length is assigned to a route instead of the milepost values. For example, the location of a roadway segment is provided with route name or number, section ID or code and the distance of the segment.
4. Section/Distance: In this system, a route name or number is not provided. Section Id or code and the numeric distance of the segment are assigned to a particular route.

All the roadway inventory data for the Safety Analyst needs to be generated using one of the above mentioned any one of the four location reference system. Safety Analyst identifies the facility type and assigns the crash locations based on these location reference systems. In addition, the crash data also must possess either a milepost location or a distance value to exactly locate on any type of facility. For this study, Route/County/Milepost location reference system was used. The Route is the combination of Route Types such as ‘I’ for Interstate, ‘SR’ for State Route, ‘CR’ for County Route and ‘L’ for Local, and unique route identifier, RMID. The County is the county location of the site (in this study, always Clark). The milepost values for each crash data can be computed using the Linear Referencing System of Arc map. The Linear Referencing System is the standard method of spatially referencing any feature by determining its relative location along a measured linear feature. This system is also very important for the proposed Google Map visualization tool, as it correctly locates the spatial location of potential sites of improvement in the maps.

## 2.3 Datasets

The required datasets, roadway characteristics including freeway (functional class 1, 2 and 3) and arterial segments (functional class 3, 4, 5 and 6), ramp characteristics including ramp segments, intersection characteristics including signalized and stop control intersections were processed and formatted using data management tools in section 2.2. These datasets were

obtained for the Clark County using County-level Data Set (CDS) Roadway Network, as illustrated Figure 3. Driveways and local streets were not included because Safety Analyst does not provide capabilities to analyze these types of facilities. The HPMS functional classification network layer, obtained from the Nevada Department of Transportation (NDOT), was used to select the freeway, arterial, and ramp segments considered in this report as illustrated in Figure 4. This selection includes a total of 661 freeway, 11,941 arterial and 897 ramp segments, and 876 signalized and 946 stop control intersections. The total number of roadway segments, ramps and intersections included in the database for analysis in Safety Analyst is described in Chapter 3.

### *2.3.1. AADT Estimation*

AADT for each of the analysis years are required inputs for analysis in Safety Analyst. AADT for 30% of the segments were obtained from the NDOT's Traffic Records and Information Access (TRINA) data system. AADT for an additional 57% of the segments were estimated using a simulation based Dynamic Traffic Assignment (DTA) Model, DynusT. The remaining 13% of AADT were not available through TRINA or DynusT.

Similar to the estimation of AADT for temporary stations in TRINA, the estimation of AADT based on DTA requires the use of seasonal and daily volume factors which were obtained using Automatic Traffic Recorder's (ATR) data. This project used the same seasonal factors that were estimated by NDOT to estimate AADT. These factors were estimated as a single number for the entire network. In contrast, to increase the quality of the estimates, in this report, the daily factors were estimated for various zones in the network. The average daily factors for a zone were calculated using all ATR stations in that zone. In addition, yearly factors were estimated to enable the estimation of AADT for each of the analysis years.

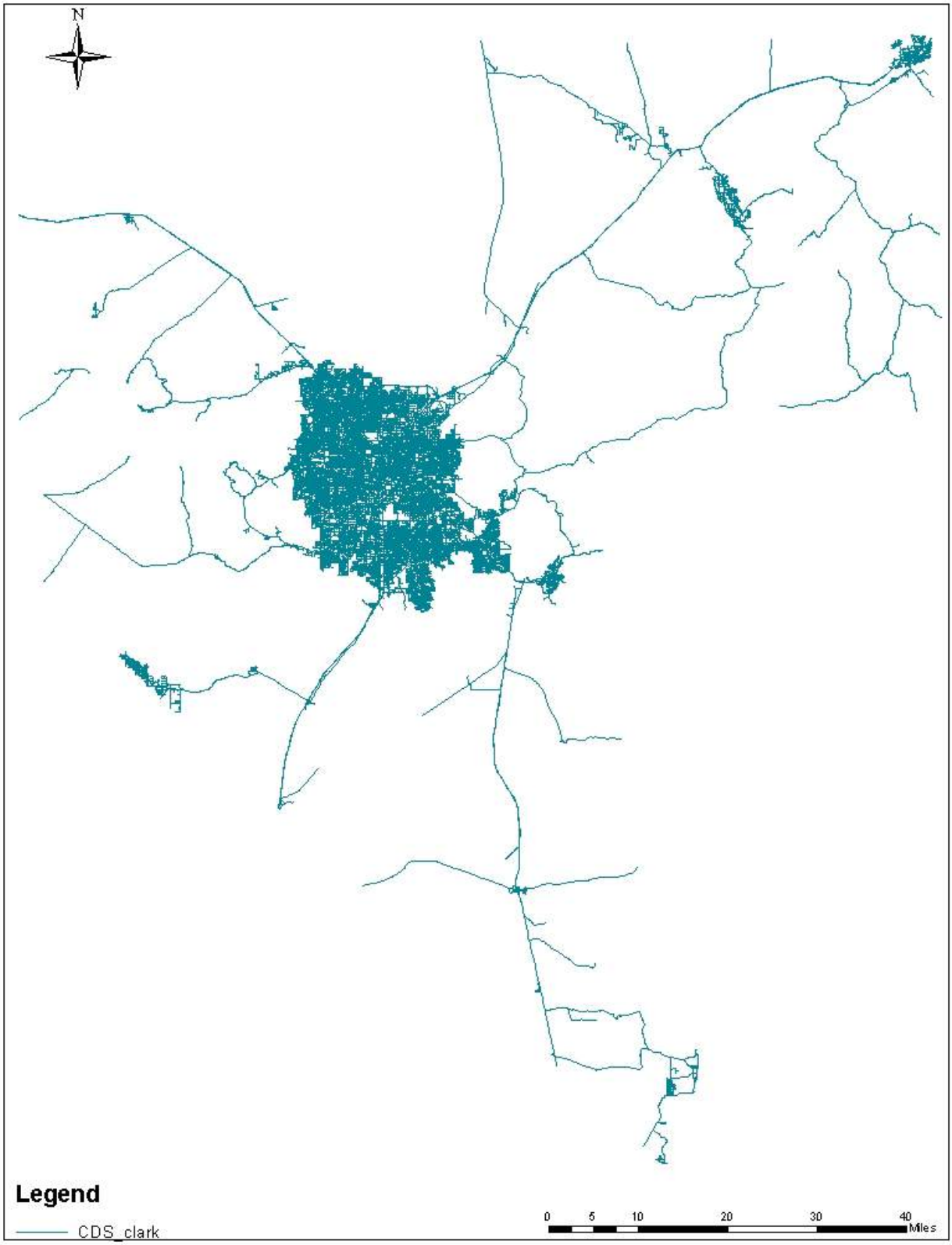



**FIGURE 3 CDS Road Network – Clark County.**

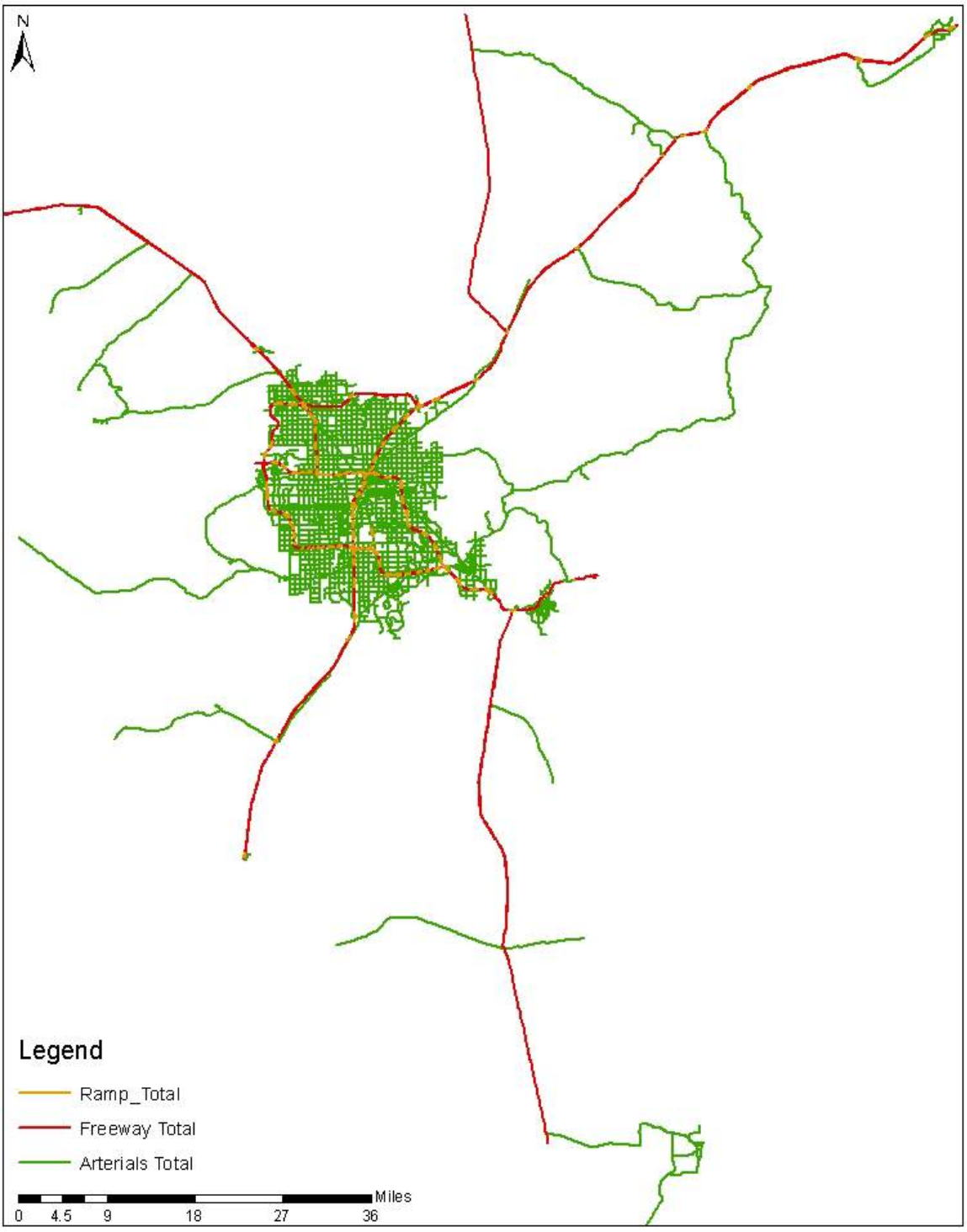



**FIGURE 4 Segments selected based on HPMS Functional Classification for Freeways, Ramps and Arterials.**

# CHAPTER 3

# DESIGN, DEVELOPMENT, AND IMPLEMENTATION OF THE PROPOSED DATABASE SYSTEM

This Chapter includes the design, development, and implementation of the proposed database system. A Data-mapping interface was developed to map the data from various sources and create the tables with database schema. A Data Instantiation and Insertion Tool was developed to input data into the database. A View tool was developed to process the data into a specific format required by Safety Analyst.

## 3.1 Database Schema

The database schema provides the structure of a DBMS described in a formal modeling language. The prevalent database modeling languages are the Entity-Relationship (ER) model and the Unified Modeling Language (UML). The ER is a conceptual data model that views the real world as entities and relationships. The basic constructs in an ER model are the entities, attributes, and relationships that are typically presented in an ER Diagram. The ER model focuses on the conceptual and logical design phase of the database. It can be used for developing SQL-compliant database systems. Using SQL is convenient for users who are unfamiliar with database operations (*34*).

The UML is an object-oriented visual modeling language that is used to specify, visualize, analyze, and control the objects of a software system. It is used to understand, design, browse, configure, maintain, and control information about software systems (*34*). This study used the ER model for three important reasons. First, Safety Analyst only supports SQL-compliant databases. Second, ER diagrams, revealing the design of the database, are easier to understand compared to UML diagrams. Third, most applications similar to Safety Analyst are likely to be compatible with an ER model.

The physical data model for the database was built using the ER model which indicates how data should be represented and stored by a DBMS, such as Oracle, MySQL, SQLServer, or Derby (*35*). The user has the option to choose either MySQL or Derby as a comprehensive database system in this study. However, for the Safety Analyst View, only Derby is enabled because MySQL is not really compatible with Safety Analyst. Both databases are open-source, SQL-compliant DBMS, and provide all the required capabilities of a reliable, flexible, and robust DBMS. SQL scripts were developed to generate database tables and the relationships among them in MySQL and Derby.

Once the physical data model for the database is created, the database is ready to be populated with data. Physical data model diagram for proposed safety database is illustrated in Figure 5 and the complete ERD diagram with tables and field names are illustrated in Appendix B. Data insertion is a process that can happen once, periodically, or sporadically. The methodology to populate the database is designed to account for most potential scenarios that can arise. For example, various empty tables were designed and created for future data that will become available and/or is desirable.

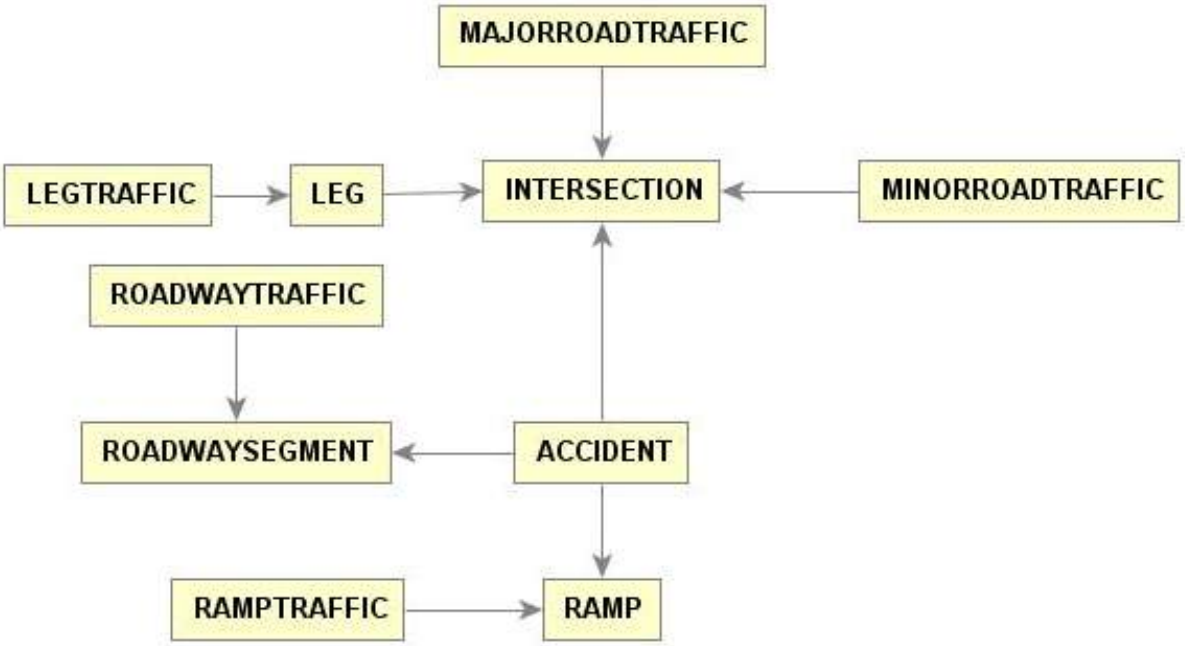



**FIGURE 5 Physical data model of proposed database.**

### 3.2 Data Attribute Mapping Interface

A data attribute mapping interface was developed to populate the database using data from existing sources. The interface established a mapping for every attribute and data source from user file data attributes to the corresponding database attributes in the database tables. Thus, the interface enables the user to use existing data files without any modifications.

The interface uses a simple Microsoft Excel spreadsheet (.xlsx), a metadata file with four columns. The first and second columns include the database table name and attributes name, respectively. These names are fixed, and do not need to be changed. The third and fourth columns include the user's (agency) file name and attribute name, respectively.

Table 2 illustrates the metadata file. Only the user file name and user file attribute name have to be filled by the user. Different DOTs store their data in various files, and a common unique ID relates those files and attributes. For example, Nevada has roadway attributes in different files, such as CDS_Network, Las Vegas Median, HPMS_Access, and HPMS_SpeedLimit. Once metadata file is filled-in, the data attribute mapping interface is used to insert and store data from the user file into the corresponding database tables and attributes.

**TABLE 2 Portion of the Metadata File for Data Mapping**

| Database Table Name (Fixed) | Database Attribute Name (Fixed) | User File Name (To be filled by User) | User File Attribute Name (To be Filled by User) |
|---|---|---|---|
| RoadwaySegment | agencySegmentID | CDS_Network | ID1 |
| RoadwaySegment | beginLocation | CDS_Network | Beg_Route_ |
| RoadwaySegment | endLocation | CDS_Network | End_Route_ |
| RoadwaySegment | routeName | CDS_Network | Route_MAST |
| RoadwaySegment | routeType | CDS_Network | Route |
| RoadwaySegment | county | CDS_Network | county_code |
| RoadwaySegment | length | CDS_Network | Datum_Seg2 |
| RoadwaySegment | terrain | HPMS_terrain | Terrain |
| RoadwaySegment | roadwayClass | CDS_Network | F08_FType1 |
| RoadwaySegment | medianType | LasVegas_Median | MedianType |
| RoadwaySegment | accessControl | HPMS_Access | Value_name |
| RoadwaySegment | medianWidth | LasVegas_Median | MedianWidt |
| RoadwaySegment | postedSpeed | HPMS_SpeedLimit | PostedSpeed |

### 3.3 Data Instantiation and Insertion

Inputs to an existing database can be new or an update of previously inserted data. A Data Instantiation and Insertion Tool was developed to input data into the database, taking into consideration the interdependencies of the data. Input files were streamed and parsed with a *Simple API for XML* (SAX) parser to store the data in a matrix.

When a row is read in the matrix, a 'select' query is performed on the database to determine existence of the object. If the object exists, an update has to be done: a java object is instantiated and its fields are updated with the values in the input file. Then, the update method of this java object is processed to update the database. If there is no matching object, a new object is instantiated and inserted into an 'EntityManager' class. Once all files are parsed and all the objects instantiated, the data can be inserted into the database.

The priorities of the tables are handled automatically by the *'EntityManager'* class in order to satisfy interdependencies between tables. Inputting data without using the *EntityManager* might lead to data insertion failure or database corruption due to violation of table interdependencies. For example, Accident Vehicle data is depended on Accident data. Hence, a mechanism is required to account this dependency.

### 3.4 View Tool for Safety Analyst

Such analysis tools as Safety Analyst and HSM require data in a particular format. For example, Safety Analyst requires accident severity type in the form of K for fatal, A for severe injury, P for property damage only. However, it is unlikely that the source of the data uses the same formatting. Having the requirement to follow a particular formatting is one of the primary barriers for DOTs to use Safety Analyst (*26*). The database developed in this study stores accident severity type in the form of Fatal, Injury, or Property Damage.

A View Tool for Safety Analyst was developed to provide a database view consistent with the requirements of Safety Analyst. Table 3 illustrates a portion of a MS Excel sheet used to establish mapping between the general database view and the Safety Analyst view. Database Table Name, Attribute Name, and Attribute Values are mapped between the two views. For example, in Table 3, the Database table Name is 'Accident', the Attribute Name is 'severity', and Attribute Values are 'fatal injury', 'severe injury', and 'property damage only'. The corresponding Safety Analyst values are Accident; accidentSeverity1; and K, A, or P.

The back-end of the View Tool for Safety Analyst has a MS Excel parser that streams the data providing mapping and storing the data in a matrix. Hashmaps are created, and a relationship is established between the database and the Safety Analyst view.

**TABLE 3 Mapping between a General View and the Safety Analyst View**

| Database Table Name | Attribute Name | Attribute Values | Safety Analyst View Table Name | Safety Analyst View Attribute Name | Safety Analyst View Attribute Value |
|---|---|---|---|---|---|
| Accident | severity | Fatal injury | Accident | accidentSeverity1 | K |
| Accident | severity | Severe injury | Accident | accidentSeverity1 | A |
| Accident | severity | Property damage only | Accident | accidentSeverity1 | P |
| RoadwaySegment | routeType | State Route | RoadwaySegment | routeType | SR |
| RoadwaySegment | routeType | Interstate | RoadwaySegment | routeType | I |
| RoadwaySegment | routeType | US Route | RoadwaySegment | routeType | US |
| RoadwaySegment | roadwayClass | Principal arterial-other | RoadwaySegment | roadwayClass | 3 |
| RoadwaySegment | roadwayClass | Minor arterial | RoadwaySegment | roadwayClass | 4 |
| RoadwaySegment | roadwayClass | Local | RoadwaySegment | roadwayClass | 7 |
| RoadwaySegment | roadwayClass | Major Collector | RoadwaySegment | roadwayClass | 5 |
| RoadwaySegment | roadwayClass | Principal arterial-other freeway or expressway | RoadwaySegment | roadwayClass | 2 |
| RoadwaySegment | roadwayClass | Principal arterial-interstate | RoadwaySegment | roadwayClass | 1 |
| RoadwaySegment | roadwayClass | Minor Collector | RoadwaySegment | roadwayClass | 6 |
| RoadwaySegment | roadwayClass | Other | RoadwaySegment | roadwayClass | 0 |
| RoadwaySegment | roadwayClass | Unknown | RoadwaySegment | roadwayClass | 99 |

## 3.5 Safety Database

This section provides a status of various roadway facilities included in a database to be used with Safety Analyst (SA). The database was developed to include freeways (functional class 1, 2 and 3), arterials (functional class 3, 4, 5 and 6) and ramp segments, signalized, and stop control intersections. Driveways, local roads, and uncontrolled intersections were not considered because Safety Analyst does not provide capabilities to study these types of facilities. For roadway and ramp segments, as discussed in Section 2.4, 13% of AADT were not available through TRINA or DTA. AADT is the mandatory data required by Safety Analyst hence segments with no AADT cannot be included in the database. Figure 6 includes the segments included in the proposed safety database for freeways, arterials and ramps.

### *3.5.1. Arterial Segments*

Segments without AADT data cannot be included in the analysis. Hence, only 10,258 of 11,946 arterial segments were considered. Table A-1 in Appendix A illustrates the arterial routes, total length, length covered and their percentage of segments included for SA. The details of routes covered and the corresponding data is part of an ArcGIS repository.

### *3.5.2. Freeway Segments*

Only 493 of 661 freeway segments (functional class 1, 2 and 3) were included in the database. Table A-2 in Appendix A illustrates the freeway routes and total length of the routes, length of the routes covered and the percentage length of covered routes. The details of routes covered and the corresponding data is part of an ArcGIS repository.

### *3.5.3 Ramp Segments*

Ramp Segments without AADT data cannot be included in the analysis. Hence, only 733 of 897 ramp segments were considered. Table A-3 in Appendix A illustrates the ramps, total length, length covered and their percentage of segments included for SA. The details of ramp routes covered and the corresponding data is part of an ArcGIS repository.

### *3.5.4 Signalized Intersections*

AADT is also required for intersection analysis. Hence, only intersections along segments with AADT data can be included in the database. A total of 300 signalized intersections, as illustrated in Table A-4 in Appendix A, are along segments with partial AADT information. For example, only AADT is available for three approaches but required for four approaches. Currently, 576 signalized intersections as illustrated in Table A-5 were included in the database. Furthermore, 115 signalized intersections belong to ramp terminals (ramp and arterial segments). Only, 40 of 115 signalized intersections at ramp terminals, as illustrated in Table A-6 in Appendix A, have AADT hence included in the database. The remaining 75, as illustrated in Table A-7 in Appendix A, with partial AADT information is not included in the database. Figure 7 illustrates the selected signalized intersections using GIS road network. Details of routes covered and the corresponding data is part of an ArcGIS repository.

### *3.5.5 Stop Control Intersections*

Based on selected arterial, freeway and ramp segments, a total of 946 stop control intersections were considered. However, only 347 stop control intersections were included in the database because the remaining 599 intersections have missing AADT data for some of their approaches. Figure 4 illustrates the selected and analyzed stop control intersections. Table A-8 in Appendix A illustrates 347 stop control intersection in the database and the remaining 599 intersections were illustrated in Table A-9 in Appendix A.

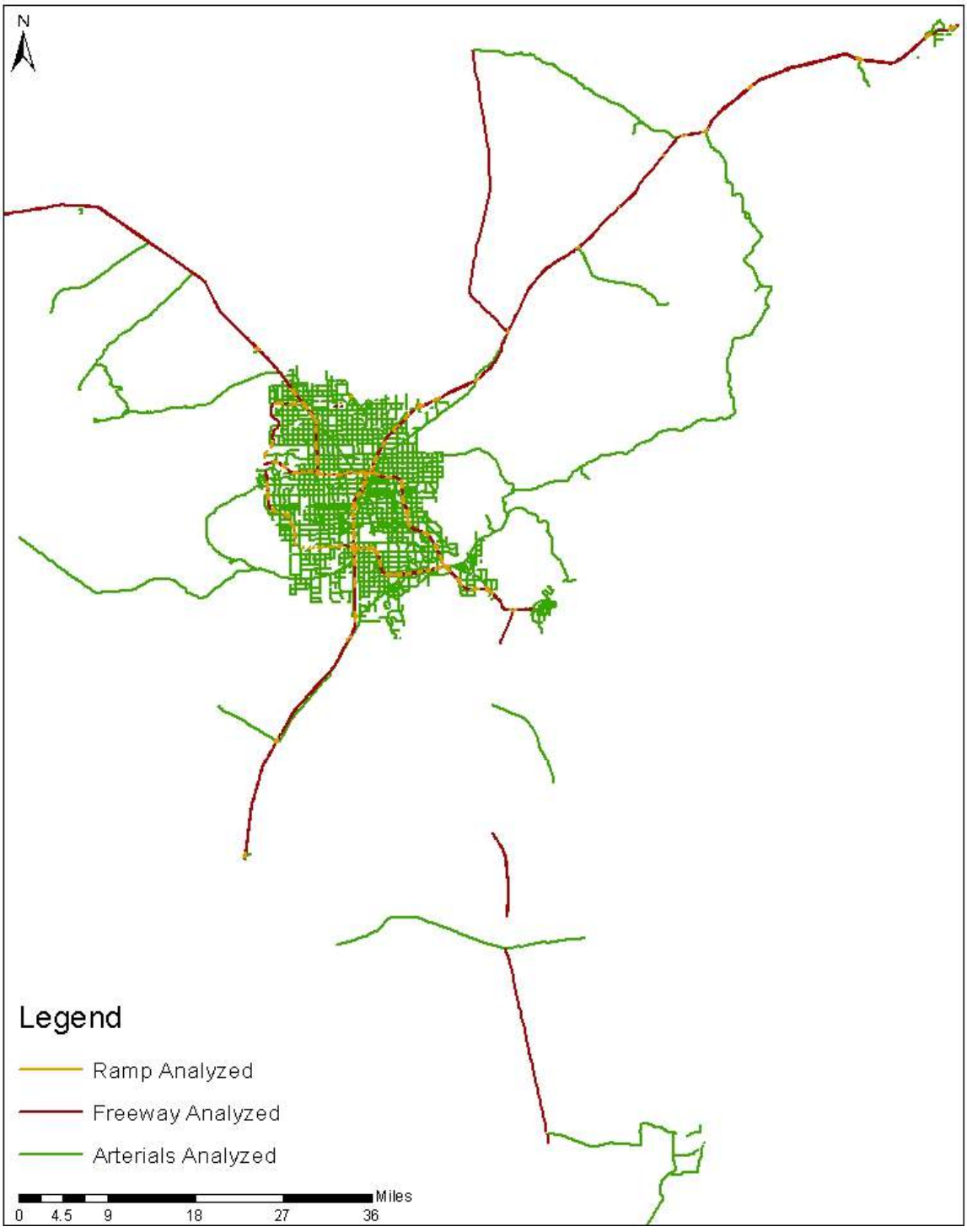



**FIGURE 6 Functionally classified Freeways, Arterials and Ramps Analyzed in this report.**

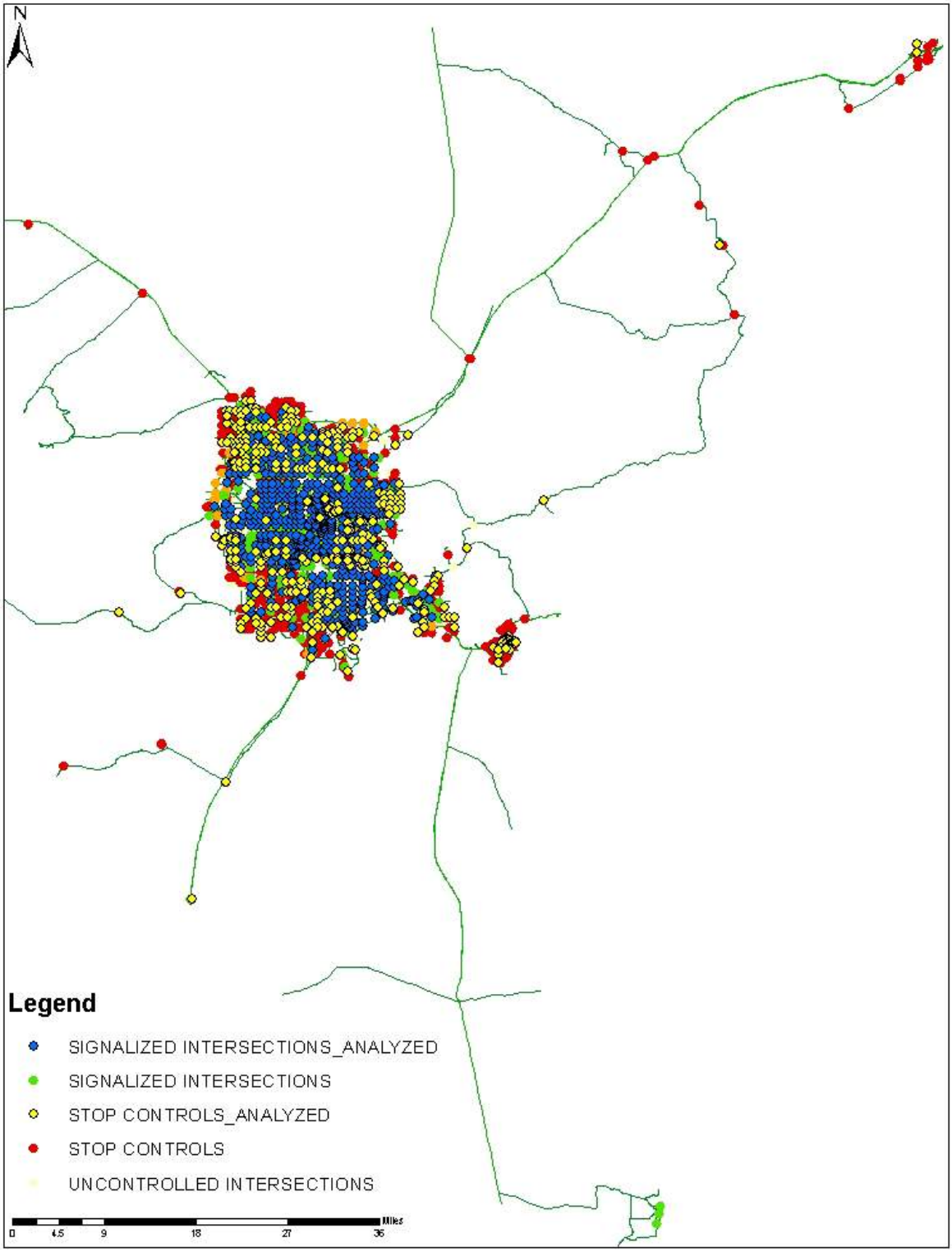



**FIGURE 7 Signalized and Stop Control intersections included in the database.**

# CHAPTER 4

# TESTING AND ANALYSIS OF THE DATABASE WITH SAFETY ANALYST

This chapter discusses the testing and analysis of the proposed safety database with Safety Analyst. The proposed database is mapped to database schema in Safety Analyst with the help of data management tool and various analyses were performed. After in-house testing, the database was deployed in the NDOT systems for conformity testing. The deployed safety database was tested with Safety Analyst by Engineers at the NDOT. Comments provided were addressed by UNLV and presented to NDOT on June 11, 2014.

## 4.1 Safety Analyst

Safety Analyst provides a suite of analytical tools to identify and manage system-wide safety improvements (*5*). Safety Analyst uses an empirical bayes (EB) method as an alternative to such traditional safety analysis methods as frequency, rate, critical rate, or crash index. The EB approach provides a mechanism to address issues associated with bias, incorrect model form, and lack of a reliability measure, which cannot be addressed using traditional methods (*4–10*).

Safety Analyst consists of four tools for Administration, Data Management, Analysis, and Implementation of Countermeasures. The Administration Tool includes federal, agency, and system components (*27*). The federal component provides access to the default site subtype definitions, countermeasure management, national default crash costs and Safety Performance Functions (SPFs). The agency component provides access to various operations, including adding, changing, and removing data attributes with the exception of mandatory data attributes. This component also enables the modification of national SPFs with agency specific SPFs and national crash cost to region specific crash cost. The system component maintains local or remote databases, and combines the database with the federal and agency components.

Local or remote databases can be imported using the Data Management Tool (*27*). Currently, Safety Analyst supports two basic mechanisms for data import, a File Import, and Database-to-Database Mapping. For DOTs that maintain their complete data inventory in an Structured Query Language (SQL)-compliant Database Management System (DBMS), the Database-to-Database Mapping mechanism is probably the best alternative to load data into Safety Analyst. Providing all the required data for Safety Analyst in a database, the View Tools for Safety Analyst developed in this study can be used to generate a SQL-compliant DBMS for Database-to-Database Mapping. For DOTs that do not maintain a database with all the required data for Safety Analyst, the Data Management Tools developed in this study were used to generate a DBMS with all the required data.

The File Import is a less desirable mechanism because it does not provide all the capabilities of having the data in a DBMS. Safety Analyst supports extensive mark-up language (xml) and comma separated value (csv) format data inventory files. However, the inventory files have to satisfy a particular format. It is very unlikely that DOTs have readily available xml or csv datasets that satisfy the required format. Hence, it is recommended to develop a DBMS for Safety Analyst.

The Analysis Tool is used to perform various analyses (*27*) using a set of four modules including (*4, 27*):

a. *Network Screening Module:* identifies and ranks sites using the empirical bayes method for potential safety improvements.

b. *Diagnosis and Countermeasure Selection Module:* helps to diagnose safety problems at specific sites using answers provided by the user for a set of built-in questions. Based on the diagnosis, the user can select countermeasures to reduce crash rates and severity at specific sites.
c. *Economic Appraisal and Priority Ranking Module:* provides economic evaluation of a specific or several alternative countermeasures for a specific or multiple sites. It also provides a priority ranking of sites and proposed improvement projects based on benefit and cost estimates.
d. *Implemented Countermeasure Module:* provides before/after evaluation of implemented safety improvements. Data for construction projects and implemented countermeasures are required. These data can be imported using the countermeasure implementation tool.

### 4.2 Testing and Analysis of the Database with Safety Analyst

The comprehensive safety database and database view of Safety Analyst for Clark County, Nevada, was developed with the proposed data management tools and populated using the data sources described in Chapter 2 and 3. Using the Safety Analyst's data management tool, the database view of Safety Analyst was mapped, imported, post-processed, and calibrated. Network Screening analysis was performed using the analytical tool in Safety Analyst to determine sites with the most potential for safety improvements.

Network screening analysis can be performed using multiple combinations of screening types, safety performance measures, severity, and screening attributes. Network Screening results can be reported with two different report types (i) conventional, with all the site results; and (ii) a percentage type, specifying the percent (eg., the top 5% sites). Two basic screening types are available that reports i) expected and excess crash frequency, with Peak Searching on roadway segments using Coefficient of Variation (CV) limits (*8, 27, 36*); and a Sliding Window on roadway segments as well as corridor screening (*8, 27, 36*). The peak searching approach tests the statistical validity of expected or excess crash frequencies by calculating coefficients of variation and comparing them to a specified CV limit. The coefficient of variation is the ratio of the standard deviation to the mean of the expected value. If standard deviation is less than the mean of expected or excess crash frequency (a small CV), it indicates a high level of precision in the estimate. Thus, smaller CV values increases the user confidence level about the results and vice versa (*8, 27, 36*). Other screening types analyze a high proportion of specific crash types, sudden and steady increase in mean frequency, and corridor screening (*27, 36*). Safety performance measures, expected and excess crash frequency for different severities and various screening attributes can be computed (*8, 27, 36*).

It was observed that many segments were very short, less than 0.1 mile which is the shortest recommended analysis length in SA. Hence, in order to improve the quality of the results, analyses were conducted using both aggregation and non-aggregation of homogeneous segments. However, it was recommended to use aggregation of homogenous segments method by Safety Analyst consultant (MRI Global Inc.). Homogeneous segments for roadway and ramp segments were determined based on number of total through lanes, roadway functional class, median type, median width, speed limit and the AADT. For intersections, always simple ranking methodology is used irrespective of Peak Search or Sliding Window selection in Analytical tool.

With the proposed database, Safety Analyst was used to conduct various analyses. Basic Network Screening was performed for different facilities with Peak Searching and Sliding Window on roadway segments. Safety Analyst allows the user to analyze sites based on functional class. This requires querying data element "Roadway Class 1" in the Analytical Tool

of Safety Analyst under Roadway Segments Data Elements. Roadway Class 1 data element has the following functional class values:

1) Functional Class 1: Principal Arterial – Interstate
2) Functional Class 2: Principal Arterial – Other Freeways or Expressways
3) Functional Class 3: Principal Arterial – Other
4) Functional Class 4: Minor Arterial
5) Functional Class 5: Major Collector
6) Functional Class 6: Minor Collector
7) Functional Class 7: Local

The following analyses were performed for different roadway facilities to confirm that the database works with all the data elements:

1. Analysis 1: Roadway and ramp segments, and intersections – total crashes – with Peak Searching on roadway segments and CV test
2. Analysis 2: Roadway and ramp segments, and intersections – fatal and all injury crashes – with Peak Searching on roadway segments and CV test
3. Analysis 3: Roadway and ramp segments, and intersections – total crashes – Sliding Window on Roadway Segments
4. Analysis 4: Roadway and ramp segments, and intersections – fatal and all injury crashes – Sliding Window on Roadway Segments
5. Analysis 5: Roadway segments of functional class 1 and 2 – total crashes – with Peak Searching on roadway segments and CV test
6. Analysis 6: Roadway segments of functional class 1 and 2 – fatal and all injury crashes – with Peak Searching on roadway segments and CV test
7. Analysis 7: Roadway segments of functional 3, 4, 5, 6 and 7 – total crashes – Peak Searching on Roadway Segments
8. Analysis 8: Roadway segments of functional 3, 4, 5, 6 and 7 – fatal and all injury crashes – Peak Searching on Roadway Segments
9. Analysis 9: Roadway segments of functional class 1 and 2 – total crashes – Sliding Window on Roadway Segments
10. Analysis 10: Roadway segments of functional class 1 and 2 – fatal and all injury crashes – Sliding Window on Roadway Segments
11. Analysis 11: Roadway segments of functional class 3, 4, 5, 6 and 7 – total crashes – Sliding Window on Roadway Segments
12. Analysis 12: Roadway segments of functional class 3, 4, 5, 6 and 7 – fatal and all injury crashes – Sliding Window on Roadway Segments
13. Analysis 13: Signalized Intersections – total crashes
14. Analysis 14: Signalized Intersections – fatal and all injury crashes
15. Analysis 15: Stop Controlled Intersections – total crashes
16. Analysis 16: Stop Controlled Intersections – fatal and all injury crashes
17. Analysis 17: Ramp segments – total crashes – Peak Searching on Roadway Segments
18. Analysis 18: Ramp segments – fatal and all injury crashes – Peak Searching on Roadway Segments

All the analyses listed above used excess crash frequency as a safety performance measure. For finding sites with a potential for safety improvements, network wide, excess crash frequency

should be used, because it is a measure of a crash frequency that might be reduced if a safety improvement was implemented (*27*). The results for all the analysis are reported in Appendix C. In addition, tutorial for Network Screening is provided in Appendix D.

As there are minimum guidelines about which screening type or performance measure to choose for specific analysis, Safety Analyst results were inferred to form guidelines. From the inference of results, the following conclusions were obtained:

a. Peak searching screening type was not good for segments less than 0.1 mile. For such segments, Sliding Window was better as it moves the window on contiguous segments for a performance measure calculation.
b. In Safety Analyst, peak searching analysis is better as it had the coefficient-of-variation limit, whereas Sliding Window did not.
c. Peak searching was not good for very long segments. Peak searching provides one rank per site (with a window length of 0.1 mile); other windows with second highest expected/excess crash frequencies will be provided in additional windows of interest. Hence, the user has to investigate additional windows of interest to make certain that same site does not have next highest expected or excess crash frequency. Longer segments will have multiple additional windows of interest.
d. For finding sites with a potential for safety improvements, network wide, excess crash frequency can be used, because it is a measure of a crash frequency that might be reduced if a safety improvement was implemented (*27*).
e. No particular screening type was preferred for the entire analysis. An analyst is encouraged to analyze a given site list using multiple combinations of a network screening approach to find common sites from the output. When the same site is identified through multiple screening method, it reinforces that the site deserves further investigation (*27*).

The proposed safety database was deployed at NDOT on Engineers' computers for conformity testing. The deployed safety database was mapped to database schema in Safety Analyst through the data management tool. Then the database was imported, post processed and calibrated. The calibrated database was tested with Safety Analyst by Engineers at the NDOT. Comments provided were addressed by UNLV and final version was presented to NDOT on June 11, 2014.

# CHAPTER 5

# VISUALIZATION SYSTEM FOR SAFETY ANALYST

This chapter presents a visualization system for Safety Analyst. A limitation of Safety Analyst is the lack of visualization capabilities to support the analysis of results. This is a significant issue considering the spatial nature of traffic safety. Safety Analyst reports results from the analysis are in a tabular form. These are difficult to interpret for users. Hence, UNLV proposed the development of an alternative and effective method to visualize the results, generated by Safety Analyst, in a graphical and spatial format in addition to tabular format.

## 5.1 Background

Safety Analyst software integrates the analytic methods recommended in the HSM (Part B) to identify and manage the site specific highway safety improvements. Safety Analyst enables data input using a file import or a database to database mapping approach. Results from the analysis are provided using a tabular data. Thus, Safety Analyst does not provide a user friendly Graphical User Interface (GUI) to interpret the results. In a recent version (4.3.1), released on 28 June, 2013, a map viewer capability has been provided. The map viewer is capable of displaying the site location map or an aerial view in a separate window (*37*). However, this tool does not allow multiple displays and only operates for a single site at a time. In addition, the user needs to be very familiar with the analytical tool of Safety Analyst in order to be able to use the map viewer. It requires a lot of learning and time to use the viewer.

Predominantly, various geographic information system (GIS) methods are used to analyze and visualize the data in the field of traffic safety. Graettinger et al. (*38*) and Roche (*39*) discussed how to represent different entities of highway components (roads, crashes, traffic volume) using various features such as lines, points, colors and shapes in ArcGIS. Krishnakumar, et.al (*40*) developed a GIS based tools to identify and rank the sites with potential for pedestrian safety improvements. The tool identifies high crash zones based on kernel density maps and ranks them based on a crash score. The entire map is projected with calculated densities in the ESRI ArcMap. The ranking of sites are in separate output in a tabular format. The user has to travel back and forth, to the map and table, to find the ranks and corresponding densities.

Xiao et al (*41*) developed a road maintenance management system based on WebGIS using ArcGIS server and client system. ArcSDE client and ArcSDE server in the ArcGIS is used for data storage. The data is stored in the SQL format. Authors have developed a Web-based interface for querying, displaying the road maintenance data through thematic maps. But, the study does not provide clear information about the front-end visualization or creation of thematic maps using ArcGIS. Qin and Wellner (*42*) developed GIS Highway Safety Review Tools (GIS-HSR tools) to identify high risk locations with data driven methodology using Python script; can be embedded with other tools in ArcGIS. However the results interface of this tool lacks intuitive visualization and hence requires manual interpretation of the results.

University of Minnesota and Claremont Graduate University (*43*) developed SafeRoadMaps visualization tool that produces heat maps. The heat maps provide crash risk across an entire area which is similar to kernel density maps/hotspots in ArcGIS. The tool infers crash risk across the entire map area, instead of considering geometric boundary of entity where crashes occur. This limitation restricts use of the tool to its capabilities. Similar to SafeRoadsMaps, several tools were developed to visualize roadway safety such as usRAP by

AAA foundation for traffic safety (*44*), MassTRAC by Massachusetts Traffic Records Analysis Center (*45*), and Critical Analysis Reporting Environment (CARE) by the Center for Advanced Public Safety at the University of Alabama (*46*). Amongst the visualization tools, CARE tool is far advanced than its peers.

CARE was developed primarily for crash analysis with both an online and desktop version. The online version is known for its visual representation whereas the desktop version known for its statistical analysis ability. Both the versions provide various graphs with the help of querying and filter techniques based on crash attributes. CARE also has a GIS extension that enables spatial analysis. With this capability, CARE provides the sliding window line diagram that represents stack of observed crashes those occurred along the route. This methodology is unique to CARE and easier to interpret the observed crashes. However, CARE does not provide any visual representation of results of high crash locations based on safety analysis (*46*).

Ma et al (*47*) developed a GIS system that allows user to select site locations and display the Safety Analyst results spatially. The developed GIS system is capable to visualize both the input and output data of Safety Analyst. Yet the system developed by them only allows user to visualize the results of network screening module. To the best of authors' understanding, most of the existing analysis tools, including Safety Analyst, do not provide visualization capabilities that facilitates user to understand the output of all the modules with ease. This is a significant limitation considering the voluminous data involvement and spatial nature of the problem context. This study proposed a Visualization System that addresses the current limitations. The following are the benefits of using the proposed system

1. provides multiple graphical representations of the inputs and outputs for each module in Safety Analyst
2. Google map is used to display spatial characteristics of the inputs and outputs
3. several charts and plots display various safety performance measures

### 5.2 Output files

Safety Analyst provides a tabular data to display the results. The output from network screening module in the Analytical Tool is available in csv, portable document format (pdf), rich text format (rtf) and hypertext markup language (html) formats (*27*). The csv file is used at the back end to process the results while the pdf and rtf files are used at the front end for editable report generation. Other three modules provide output in html, pdf and rtf file formats. Table 4 shows the output file of the top 5 ranked sites from the network screening module of analytical tool.

### 5.3 Visualization System for Safety Analyst

In general, the data used in transportation engineering has spatial context. In 2011, FHWA (*49*) released a peer exchange summary report on applications of GIS for highway safety. This report summarizes GIS capabilities and spatial nature of rich data readiness at various State DOTs. There is a concern of lack of visualization for safety programs among safety engineering professionals. Assimilating the spatial capabilities of data and state-of-the-art tool outputs, a Visualization System for Safety Analyst is proposed. The proposed system consist Google Map tools, which has multiple complimentary menus of the results including spatial maps, bar charts, tables and editable reports. The tools embedded in the system interact with Safety Analyst assisting the user in every step of the analysis.

**TABLE 4 Safety Analyst Results Format from Network Screening**

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 22710 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.223 | 40.886 | 444.93 | 1159.97 | 69.09 | 1050.56 | 4097.6 | | | 40.223 | 40.323 | 1 |
| 638_640 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.886 | 41.525 | 309.42 | 711.82 | 85.97 | 607.58 | 6128 | | | 41.386 | 41.486 | 2 |
| 7015 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 35.112 | 35.768 | 153.15 | 566.63 | 74.48 | 475.05 | 4608.7 | | | 35.668 | 35.768 | 3 |
| 6607_99 | Seg/Urb; Fwy in intchng area (6 ln) | IR15 | 37.596 | 38.269 | 291.9 | 671.82 | 220.82 | 442.53 | 29422 | | | 37.996 | 38.096 | 4 |
| 639 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 41.525 | 41.667 | 418.54 | 416.48 | 81.01 | 325.1 | 5397.5 | | | 41.567 | 41.667 | 5 |

## 5.4 Visualization System: Google Maps Interface Tool

Visualization system with Google Map display has a set of applications that is equipped with a web based front end which provides easy access to multiple menus. It is designed with multiple GIS functions that allow the user to interact with the graphical display such as zoom in, zoom out, pan and select sites. At the back-end there are Python, Java, JavaScript, HTML and CSS applications that read, parse, extract and process output files from Safety Analyst. In addition, the source file coordinate system (NAD_1983_UTM_Zone_11N) is automatically converted to Google Map's (GCS_WGS_1984) projection system. This tool provides support for all the four modules of the Analytical Tool in Safety Analyst. The user can use this tool as a Web-based application.

The web-based application displays a comprehensive interface over the internet with the deployment of Safety Analyst results. Figure 8 below shows the web portal of the Safety Analyst visualization with Google Maps display. The network screening types are conventional report type and percentage report type and each type has six different algorithms of screening. A dropdown box is provided for each network screening method to select the type of algorithm.

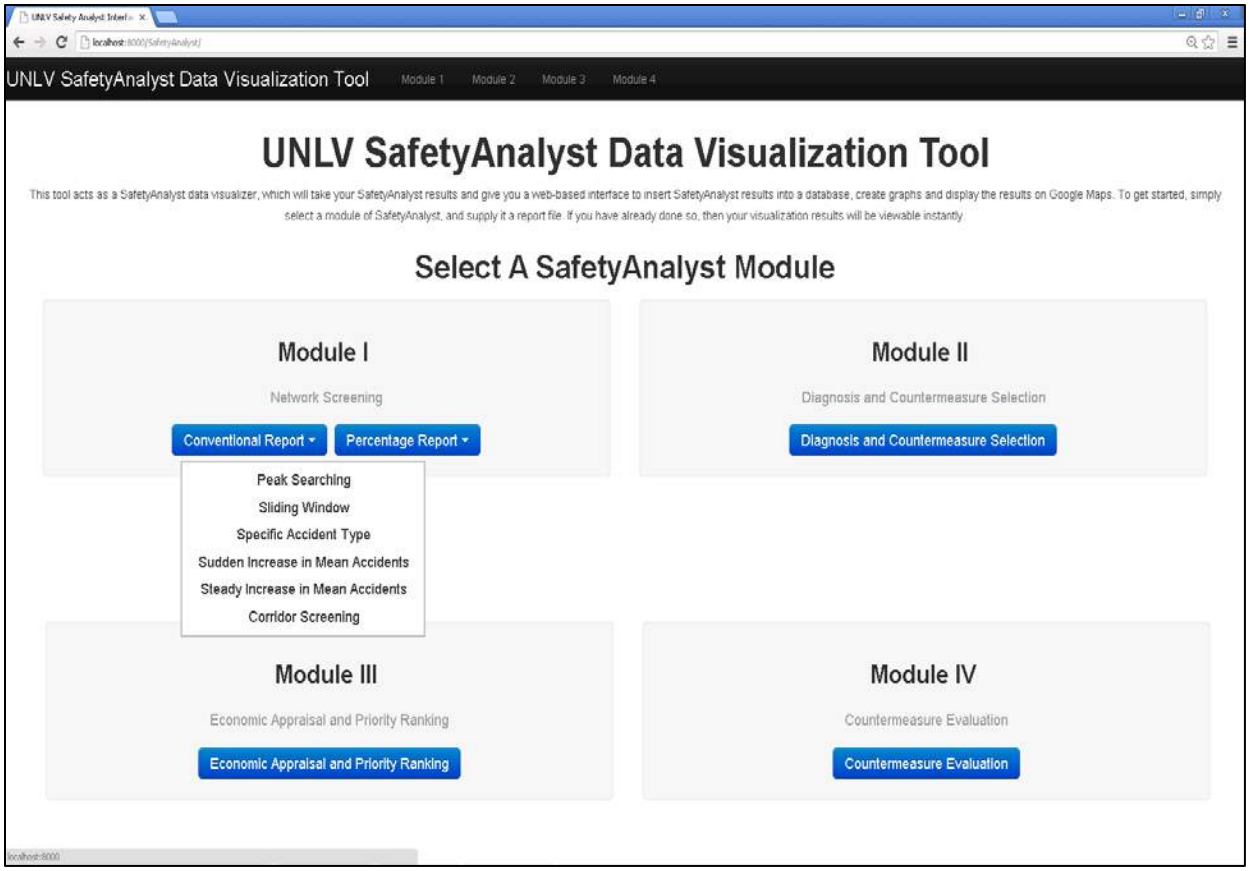



**FIGURE 8 Web portal of Safety Analyst output visualization with Google Map.**

Figures 9 to 11 illustrate, for the network screening results, three complementary visualization options provided by the web-based application. Three tabs provide these options. The first tab enables to choose the ranking of the sites and generates, for the desired ranks, Figure 4 which provides a side by side display of spatial and tabular output. The Google Map is provided with a function of selecting the ranked sites with balloon icons. The icons have different colors to distinguish among roadway segments, ramps and intersections. In cases of roadway segments and ramps, each site is displayed as a line shape with its segment length, i.e. begin and end mileposts of the segment. The user can zoom in or select the specific site by clicking the balloon icons. The selection of site in the map highlights the corresponding row of the site in an adjacent tabular section. The second tab generates Figure 5 which provides bar charts for various safety performance measures such as observed, predicted and expected crash frequency. In this tab user can select the type of graphs either as stacked bar or simple bar chart. The third tab generates a Safety Analyst report with all results. User has an option of editing this report with the inclusion of spatial maps and bar charts (Figure 9).

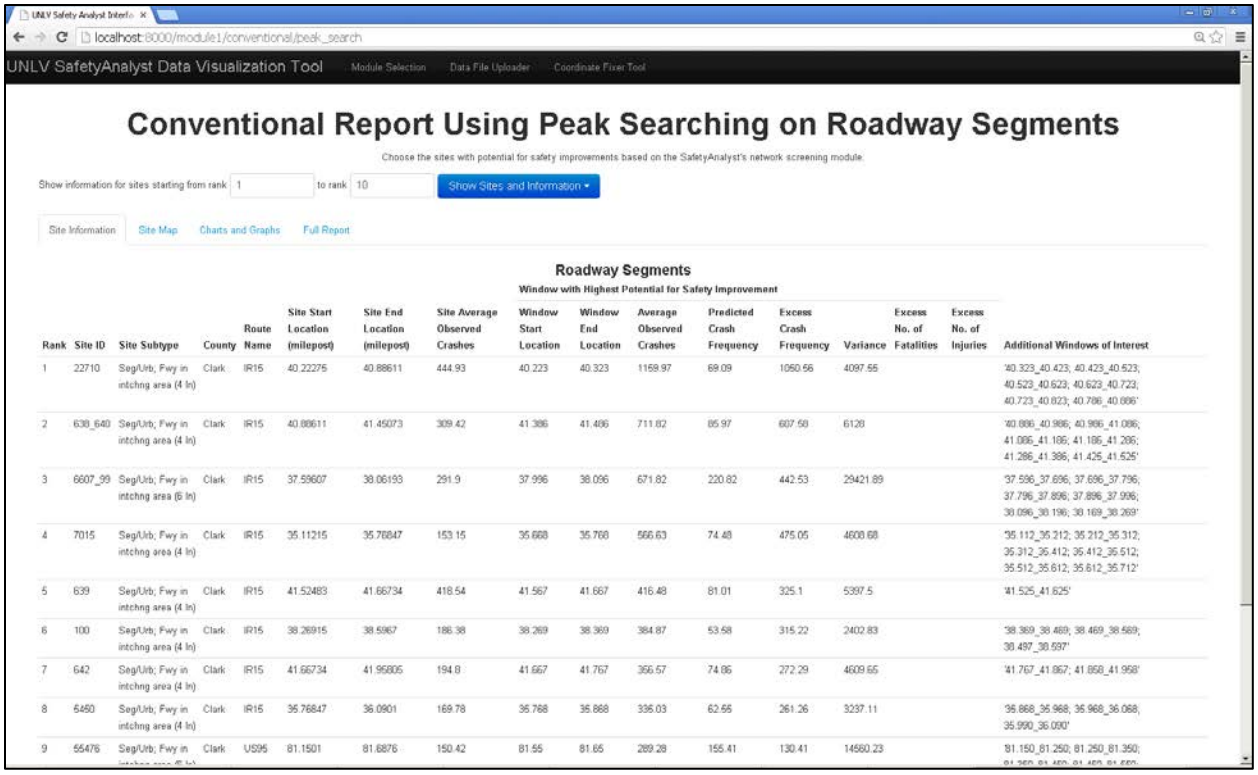



**FIGURE 9 Visualization of Network Screening results – tabular presentation.**

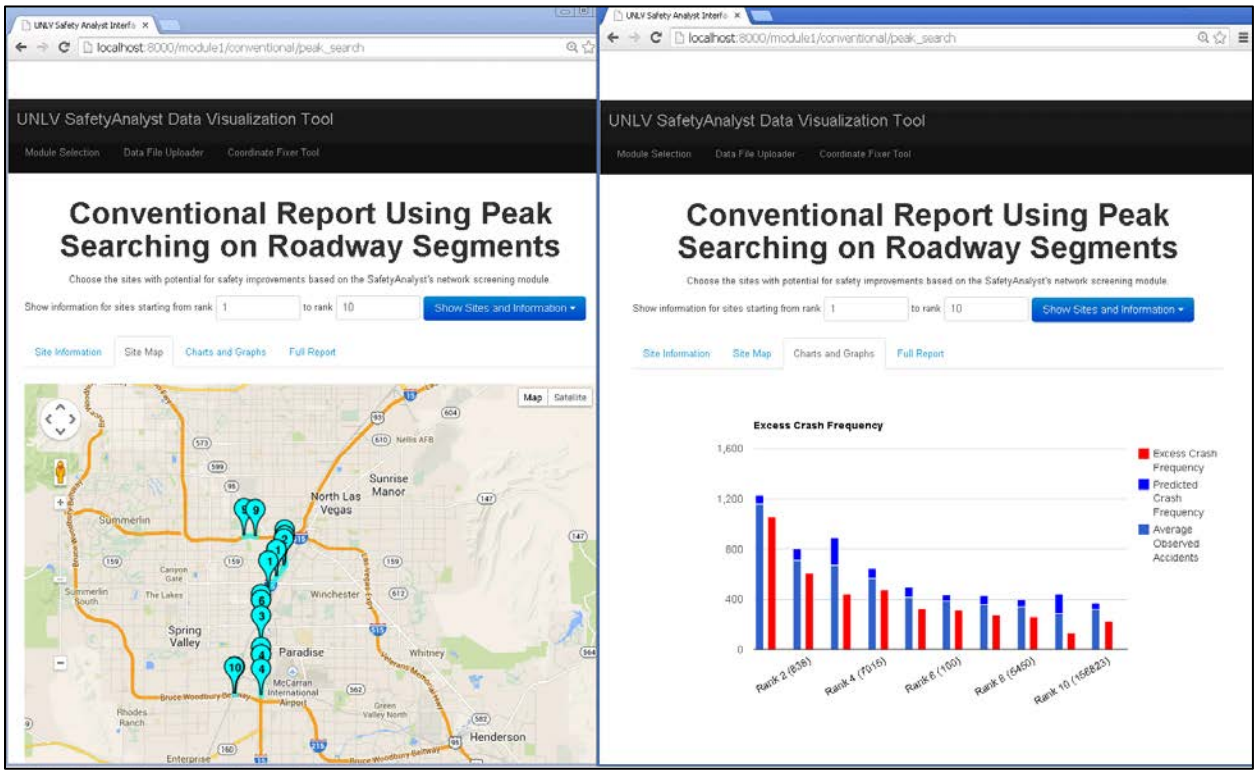



**FIGURE 10 Visualization of network screening results – spatial and bar chart presentation.**

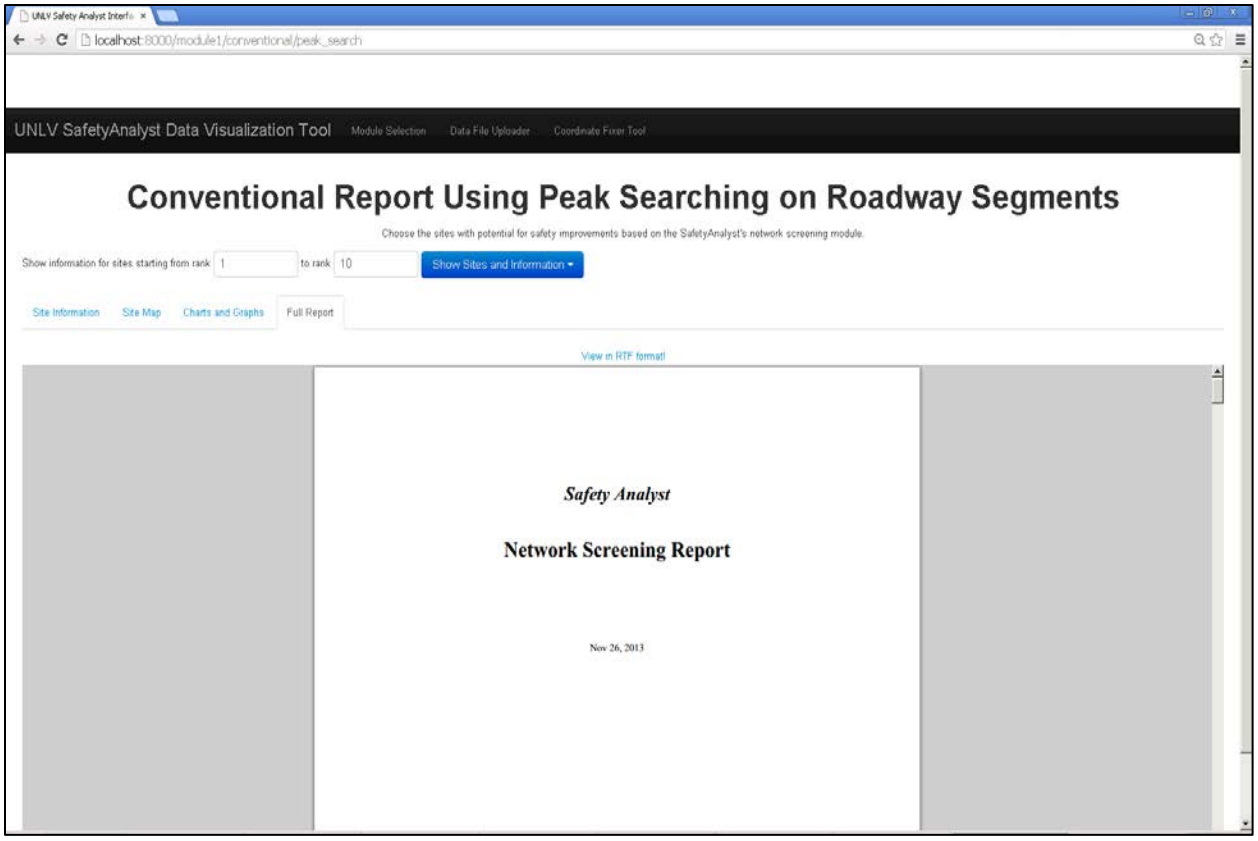
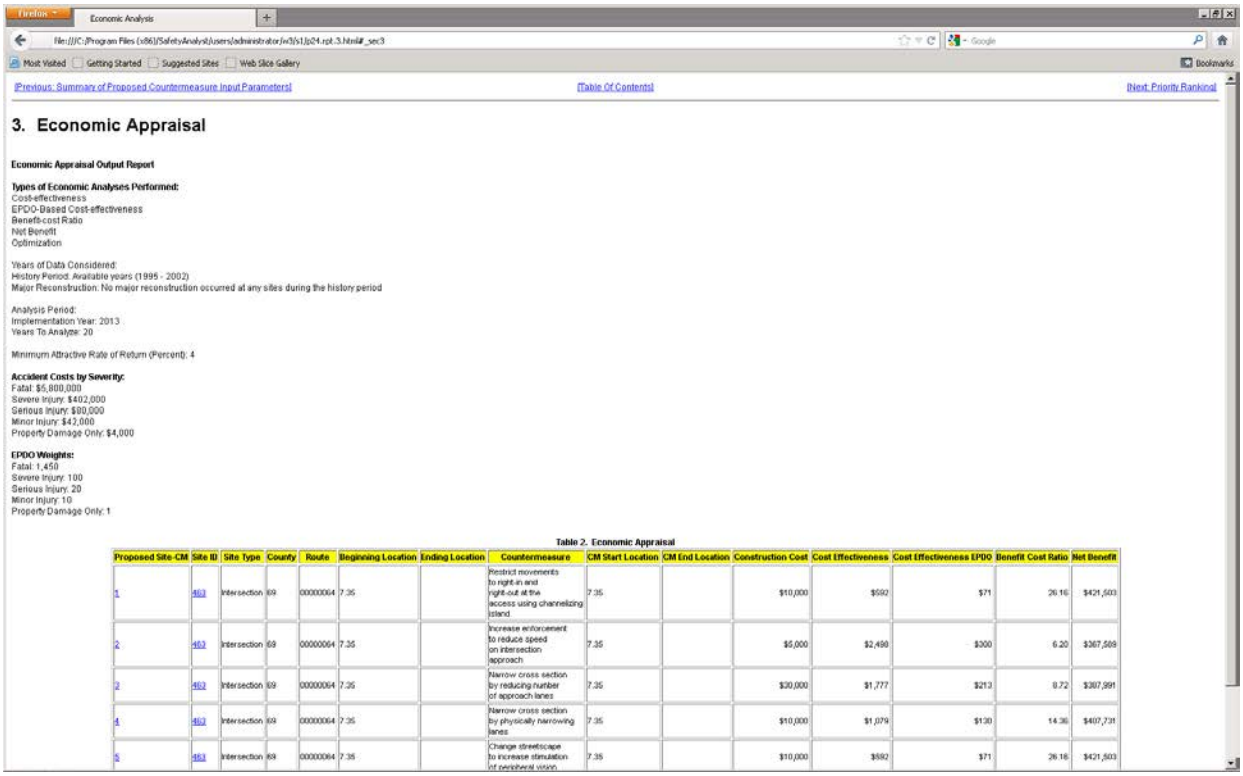



**FIGURE** 11 **Visualization of network screening results – report presentation.**

The second module, diagnosis and countermeasure selection does not necessarily require visualization support because the interpretation of its output is straightforward. However the proposed visualization tool provides an interface where the user can view the crash summary reports, and collision diagrams generated by the second module of Safety Analyst, along with the corresponding site map. This module can be expanded to include the condition diagram (*3*).

Figure 12 shows how the results from the third module are provided to the user by Safety Analyst and Figure 13 illustrates the results as provided by the interface. Economic appraisal measures include countermeasure cost per crash reduced, benefit-cost ratio and/or net present value (*27*). The user has the option to use default values or the state specific value for various attributes used in the calculation of economic appraisal methods. Priority ranking is provided for alternative countermeasures of a specific site or countermeasures at multiple sites based on economic appraisal. It is easy and beneficial to compare the alternative countermeasures result for single and multiple sites in a graphical format. The application provides the location of multiple selected sites on a Google Map, a table with all the relevant information for each site, and bar charts for desired variables.

The visualization for fourth module, countermeasure evaluation, is currently being developed to provide the before and after evaluations of the implemented countermeasures. The Google Map displays the site location, in order to advance the improvement of the potential sites after the implementation of countermeasure.



[Previous: Summary of Proposed Countermeasure Input Parameters] [Table Of Contents] [Next: Priority Ranking]

## 3. Economic Appraisal

**Economic Appraisal Output Report**

**Types of Economic Analyses Performed:**
Cost-effectiveness
EPDO-Based Cost-effectiveness
Benefit-cost Ratio
Net Benefit
Optimization

Years of Data Considered:
History Period: Available years (1995 - 2002)
Major Reconstruction: No major reconstruction occurred at any sites during the history period

Analysis Period:
Implementation Year: 2013
Years To Analyze: 20

Minimum Attractive Rate of Return (Percent): 4

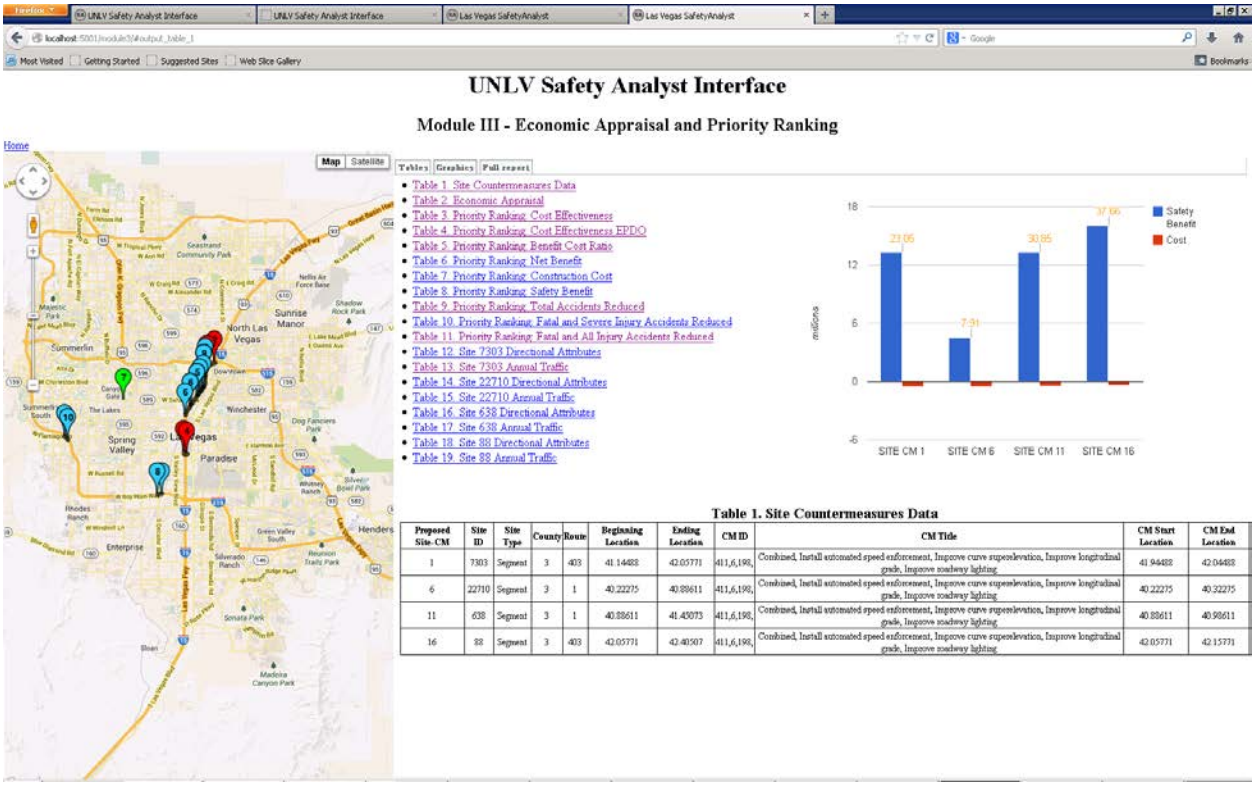
**Accident Costs by Severity:**
Fatal: $5,800,000
Severe Injury: $402,000
Serious Injury: $80,000
Minor Injury: $42,000
Property Damage Only: $4,000

**EPDO Weights:**
Fatal: 1,450
Severe Injury: 100
Serious Injury: 20
Minor Injury: 10
Property Damage Only: 1

Table 2. Economic Appraisal

| Proposed Site-CM | Site ID | Site Type | County | Route | Beginning Location | Ending Location | Countermeasure | CM Start Location | CM End Location | Construction Cost | Cost Effectiveness | Cost Effectiveness EPDO | Benefit Cost Ratio | Net Benefit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 463 | Intersection | 69 | 00000064 | 7.35 | | Restrict movements to right-in and right-out at the access using channelizing island | 7.35 | | $10,000 | $592 | $71 | 26.16 | $421,603 |
| 2 | 463 | Intersection | 69 | 00000064 | 7.35 | | Increase enforcement to reduce speed on intersection approach | 7.35 | | $5,000 | $2,490 | $300 | 6.20 | $367,589 |
| 3 | 463 | Intersection | 69 | 00000064 | 7.35 | | Narrow cross section by reducing number of approach lanes | 7.35 | | $30,000 | $1,777 | $213 | 0.72 | $387,991 |
| 4 | 463 | Intersection | 69 | 00000064 | 7.35 | | Narrow cross section by physically narrowing lanes | 7.35 | | $10,000 | $1,079 | $130 | 14.36 | $407,731 |
| 5 | 463 | Intersection | 69 | 00000064 | 7.35 | | Change streetscape to increase stimulation of peripheral vision | 7.35 | | $10,000 | $592 | $71 | 26.16 | $421,603 |

**FIGURE** 12 **Economic appraisal results as provide by Safety Analyst.**



**UNLV Safety Analyst Interface**

**Module III - Economic Appraisal and Priority Ranking**

Home

Map Satellite

Tables Graphics Full report

- Table 1. Site Countermeasures Data
- Table 2. Economic Appraisal
- Table 3. Priority Ranking: Cost Effectiveness
- Table 4. Priority Ranking: Cost Effectiveness EPDO
- Table 5. Priority Ranking: Benefit Cost Ratio
- Table 6. Priority Ranking: Net Benefit
- Table 7. Priority Ranking: Construction Cost
- Table 8. Priority Ranking: Safety Benefit
- Table 9. Priority Ranking: Total Accidents Reduced
- Table 10. Priority Ranking: Fatal and Severe Injury Accidents Reduced
- Table 11. Priority Ranking: Fatal and All Injury Accidents Reduced
- Table 12. Site 7303 Directional Attributes
- Table 13. Site 7303 Annual Traffic
- Table 14. Site 22710 Directional Attributes
- Table 15. Site 22710 Annual Traffic
- Table 16. Site 638 Directional Attributes
- Table 17. Site 638 Annual Traffic
- Table 18. Site 88 Directional Attributes
- Table 19. Site 88 Annual Traffic



**Table 1. Site Countermeasures Data**

| Proposed Site-CM | Site ID | Site Type | County | Route | Beginning Location | Ending Location | CM ID | CM Title | CM Start Location | CM End Location |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7303 | Segment | 3 | 403 | 41.14488 | 42.05771 | 411,6,198, | Combined, Install automated speed enforcement, Improve curve superelevation, Improve longitudinal grade, Improve roadway lighting | 41.94488 | 42.04488 |
| 6 | 22710 | Segment | 3 | 1 | 40.22275 | 40.89611 | 411,6,198, | Combined, Install automated speed enforcement, Improve curve superelevation, Improve longitudinal grade, Improve roadway lighting | 40.22275 | 40.32275 |
| 11 | 638 | Segment | 3 | 1 | 40.88611 | 41.45073 | 411,6,198, | Combined, Install automated speed enforcement, Improve curve superelevation, Improve longitudinal grade, Improve roadway lighting | 40.88611 | 40.98611 |
| 16 | 88 | Segment | 3 | 403 | 42.05771 | 42.40507 | 411,6,198, | Combined, Install automated speed enforcement, Improve curve superelevation, Improve longitudinal grade, Improve roadway lighting | 42.05771 | 42.15771 |

**FIGURE** 13 **Economic appraisal and priority ranking results as provide by the proposed Visualization System.**

## 5.5 Evaluation of the Visualization System

A survey questionnaire was developed and used to evaluate, to the extent possible, the effectiveness of the proposed visualization system. The survey questionnaire is provided in Appendix A. Given various time constraints and limited resources, only the Google Maps version of the proposed visualization system was evaluated. The survey was developed with questions grouped in three major categories:

- Experience with Safety Analyst and the proposed Visualization System
- Usability
- Experience of the respondents on various transportation fields

The first category included questions to capture the users' familiarity with the Analytical Tool in Safety Analyst. In addition, questions were designed to capture the user's experience and associated preference with results provided using and not using the proposed Visualization System. The second category of questions sought to evaluate the overall usability of the Visualization System. The third category of questions was designed to collect relevant information about the technical background of the responders.

### *5.5.1 Data Collection*

In order to include a representative sample of the population of potential users of the Visualization Tool, the survey was administered only to traffic safety engineers, transportation engineers and transportation engineering students. A hands on tutorial of Safety Analyst and the developed Visualization System was provided to NDOT engineers and planners as well as to members of the safety engineering team of the University of Nevada, Reno (UNR). Similarly, the tutorial was also provided to transportation engineering students at the University of Nevada, Las Vegas. Finally, a similar tutorial was provided to interested participants of 93rd Transportation Research Board (TRB) Annual Meeting, 2014. Altogether, a total of 38 responses were collected. Table 5 provides the counts of responses.

**TABLE 5 Total Number of Responses**

| Respondents | Count | Percentage |
|---|---|---|
| NDOT and UNR | 11 | 29% |
| UNLV | 22 | 58% |
| TRB | 5 | 13% |
| **Total Respondents** | **38** | **100%** |

### *5.5.2 Data Coding*

Most of the questions were prepared using a 5 point Likert scale starting from Strongly Agree to Strongly Disagree. Codes were assigned to each answer given numerical weight. Table 6 shows the options to the answers as well as the corresponding codes/weights. These codes were used to compute the mean value of responses. Questions with a large mean value are associated with Strongly Agree. In contrast, questions with a small mean value are associated with Strongly Disagree.

**TABLE 6 Number Coding For the Type of Answer of the Respondents**

| Answer Options | Code |
|---|---|
| Strongly Agree | 5 |
| Agree | 4 |
| Neutral | 3 |
| Disagree | 2 |
| Strongly Disagree | 1 |

### *5.5.3 Distribution of Responses*

An important aspect to consider is how much experience influences users' perceptions and preferences.

#### 5.5.3.1 Experience with Traffic Safety Studies

Table 7 provides the distribution of responses with experience conducting traffic safety studies.

**TABLE 7 Total Numbers of Responses with Traffic Safety Experience**

| Categories | Total Respondents |
|---|---|
| experience group with 1-5 years | 53% |
| experience group with 6-10 years | 18% |
| experience group with 11-15 years | 13% |
| experience group with 16+ years | 16% |

The large number of sample in group 1-5 is a consequence of having the majority of the respondents being UNLV students.

#### 5.5.3.2 Experience with Traffic Engineering Studies

Table 8 provides the distribution of responses with experience conducting traffic engineering studies.

**TABLE 8 Total Numbers of Responses in with Traffic Engineering Experience**

| Categories | Total Respondents |
|---|---|
| experience group with 1-5 years | 47% |
| experience group with 6-10 years | 21% |
| experience group with 11-15 years | 18% |
| experience group with 16+ years | 13% |

#### 5.5.3.3 Experience with Traffic Planning Studies

Table 9 provides the distribution of responses with experience conducting transportation planning studies.

**TABLE 9 Total Numbers of Respondents with Transportation Planning Experience**

| Categories | Total Respondents |
|---|---|
| experience group with 1-5 years | 58% |
| experience group with 6-10 years | 11% |
| experience group with 11-15 years | 24% |
| experience group with 16+ years | 8% |

#### 5.5.3.4 Experience with GIS

Table 10 provides the distribution of responses with GIS experience.

**TABLE 10 Total Numbers of Responses with GIS Experience**

| Categories | Total Respondents |
|---|---|
| experience group with 1-5 years | 55% |
| experience group with 6-10 years | 34% |
| experience group with 11-15 years | 11% |

### *5.5.4 Overall Rating*

The first section of the questionnaire contained a total of 10 questions. Most of these questions are related to the capabilities of the Visualization System to help the user navigate through the various modules and tools in Safety Analyst. In addition, it contains questions about the capabilities of the System to present and communicate information to the users. Table 11 shows the average rating for the responses received for the questions about the experience of the users with the Visualization System.

In general, the results clearly indicate the preference for using the Visualization System in conjunction with Safety Analysis. The answers to the first question indicate that the Visualization System clearly complements the location options provided by Safety Analyst. This question has the highest mean value, 4.34, suggesting that it was extremely evident to most of the respondents that the Visualization System complements Safety Analyst in terms of location. The entire diagnosis of the sites with the visualization tool without going to the field was ranked with smallest mean value, 2.37. This is associated with Disagree on the Likert scale. However, the second question stating that the Visualization System helps to perform preliminary diagnosis without going to the field was ranked with the second highest mean value, 4.29. This suggests that although the preliminary diagnosis can be performed using the Visualization System, a detailed diagnosis of the sites without going to the field is not recommended in any case. This is expected as field investigation is a major part of roadway safety management process. The Visualization System is rated with the second highest mean value, 4.29, in terms of its ability to improve communication between the analyst and the decision makers.

### *5.5.5 Overall Rating of the Visualization System in Terms of Usability*

Table 12 provides the mean values associated with the usability of the proposed Visualization System.

**TABLE 11 Overall Rating about the Experience with the Visualization System**

| Respondents Ratings for the Visualization tool based on: | Mean of Total Sample | Standard Deviation |
|---|---|---|
| 1. Clearly complements SA location options | 4.34 | 0.53 |
| 2. Helps to perform preliminary diagnosis before going to field | 4.29 | 0.65 |
| 3. Helps to perform entire diagnosis of the sites without going to the field | 2.37 | 0.85 |
| 4. Helps to select effective countermeasure | 3.39 | 0.97 |
| 5. Effectively presents information to decision makers | 4.08 | 0.54 |
| 6. Assists in step by step procedures for all SA tools resulting prompt decision and actions | 4.00 | 0.77 |
| 7. Is only important for network screening tool of SA | 3.08 | 1.00 |
| 8. Finds out the errors in the input data and actual site characteristics | 3.84 | 0.75 |
| 9. Enables sharing of information regarding sites with potential for safety improvement across various divisions within an agency | 4.00 | 0.77 |
| 10. Improves the communication between analyst and the decision makers | 4.29 | 0.52 |

**TABLE 12 Overall Rating about the usability of the Visualization System**

| Respondents Ratings of the Visualization tool based on: | Mean of Total Sample | Standard Deviation |
|---|---|---|
| 11. Presentation of results compared to text/table formats as provided by SA | 4.16 | 0.68 |
| 12. Helps to learn about SA | 3.63 | 1.13 |
| 13. Demands less time and manual interaction | 3.76 | 0.94 |
| 14. Conveys clear sense to its intended users | 3.92 | 0.94 |
| 15. Very simple to use and visually attractive | 3.92 | 0.94 |
| 16. Makes interaction with SA more intuitive | 3.76 | 0.82 |
| 17. Appropriate for all users | 3.55 | 0.98 |

The responders clearly indicate their preference for using the Visualization System over Safety Analyst alone. This is illustrated by the mean value of 4.16 in question 11. Almost all the questions in this category have mean values near to the “Good” rating in the Likert scale. The lowest mean value, 3.55, is associated with question 17. This suggests that it was almost a neutral average response. Hence, we could conclude that the Visualization System is only appropriate for those users who are familiar with the Safety Analyst.

# CHAPTER 6

# CONCLUSIONS and RECOMMENDATIONS

## 6.1 Conclusions

The benefits of developing and using a comprehensive database system for traffic safety studies are significant. This study developed a comprehensive database system that can provide data to multiple applications used for traffic safety engineering and other potential needs. Furthermore, it provides the guidance to develop the database from the existing easily available data sources at the State DOTs and/or MPOs. Furthermore, the tools developed to build the comprehensive database and view for Safety Analyst can be used by any agency as most of them were developed using non-commercial software. The comprehensive database system enabled use of state-of-the-art traffic safety tools that can support the development of federal requirements as well as to develop better traffic safety solutions for existing and emerging problems. The use of state-of-the-art tools represents significant savings in terms of time, money, and lives.

In particular, the proposed database system has the capability to provide data to Safety Analyst, state-of-the-art highway safety management software. With the advanced empirical Bayes methodology, Safety Analyst has tremendous data analysis capabilities. Although Safety Analyst provides tremendous analysis capabilities, few agencies take advantage of these capabilities. Barriers that prevent the use of Safety Analyst primarily are based on significant data needs, complex development of the require inputs, and lack of experience and knowledge in creating the required inputs and using the software.

Safety Analyst includes a map viewer display with very limited visualization capabilities. The Visualization System proposed in this study facilitates the use of Safety Analyst. It provides displays with location and color-coded information as well as charts and tables summarizing safety performance measures. In addition, Google Maps and/or ESRI ArcGIS can be used to generate the displays. The system transforms tabular results into intuitive displays that support both detailed analysis as well as higher-level decision making. The charts provide various degrees of resolution and aggregation.

A survey questionnaire was used to evaluate the effectives of the Visualization System to complement and enhance the capabilities provided by Safety Analyst. The overall analysis suggested that people support the use of the proposed Visualization System for Safety Analyst. In addition, people find the Visualization System easy to use, especially when people are familiar with Safety Analyst.

The proposed database system, along with its data management and visualization tools, provides significant support to circumvent these barriers. Provided with the required data, the proposed suite of tools enables developing and/or updating a database for Safety Analyst with minimum time and effort.

### *6.1.1 Testing of database with Safety Analyst at NDOT*

Testing the proposed database with Safety Analyst was accomplished in several steps. UNLV helped NDOT to install and configure Safety Analyst in their computers. Datasets were loaded, post-processed and calibrated using data management tool in Safety Analyst. Analysis using the analytical tool in Safety Analyst was demonstrated to the Engineers at the NDOT. After demonstration, Engineers performed various analysis and comments were provided to the UNLV. Comments were addressed; the updated database will be loaded, post-processed and calibrated at NDOT on June 30, 2014. Three modules 1, 2 and 3 of Safety Analyst will be tested

to the satisfaction of NDOT. Snapshots of these modules working on NDOT systems will be sent to NDOT after this test is conducted.

### 6.2 Recommendations

As discussed in Chapter 2, AADT data is a mandatory data required for every segment for an analysis. Currently, AADT data is missing in various segments of network because of several reasons that include non-availability of TRINA stations, non-availability of historical data in certain TRINA stations, segments are not functionally classified to generate missing data through existing models. If missing AADT can be generated or collected on these segments, then entire network analysis can be performed. Geometry data on segments can be updated if available in the HPMS database or can be collected through satellite imagery such as Google Earth. Provided a located crash database or shape files, crash data can be updated for the years 2012 and 2013. All the data and more up-to-date data will provide higher reliable results. These data can be collected in coordination with others. The collected data can then be uploaded in the safety database with the help of the UNLV proposed tools.

This study can further also be expanded to develop tools that create different site subtypes based on the data in the Safety Analyst view. SPFs then can be developed for those site subtypes and the coefficients input into the administration tool to obtain better predicted crash frequency. Predictive methods in the Part C of the *Highway Safety Manual* (*10*) can be used for SPF development. In this case, the developers of Safety Analyst should expand the capabilities of administration tool to accommodate the agency-specific multi-parameter SPFs and their coefficients. The proposed Visualization System needs to be further developed to enable capabilities to support all the modules in Safety Analyst using the ArcGIS interface. In addition, concepts used by CARE, such as a sliding window to depict crashes (*46*), can be borrowed to enhance the display features of the Visualization System. This sliding window will provide observed, predicted, and expected crash frequencies, which are vital safety performance measures that should be considered for the management and analysis of traffic safety.

# CHAPTER 7

# FIELD TESTING THE GPS-BASED SYSTEM FOR THE COLLECTION AND REPORTING OF CRASH COORDINATES

## 7.1 Introduction

On July 15, 2013 UNLV was authorized to begin a new sub-project within the Safety Analyst (SA) Agreement. This project (known as Amendment No. 2 to Inter-local Agreement No. P203-12-816) was tasked with field testing a device that would collect Real-Time GPS coordinates of crash sites, and display locations via real-time mapping. Such data would greatly improve the results of the Safety Analyst Application.

ADV Solutions have developed a prototype device to generate the GPS coordinates of crash sites, and display these sites via real-time mapping. However, the device's hardware and software needed to be Field Tested so that Law Enforcement Agencies (LEA), with no coordinate handling software, could greatly enhance the accuracy of their crash locations. Accurate crash locations on the road network are a key dataset input to the Safety Analyst Application, and crashes collected by the Las Vegas Metropolitan Police Department (Metro) represent a critical proportion of statewide crashes (50%). Hence, NDOT was highly interested in a solution that could add GPS coordinates to the Metro Crash (Form 5) reports.

Metro in Clark County uses the MC-75 PDA in conjunction with a crash reporting software package (provided by Crossroads Company) - which has a GPS capability, but no coordinate collecting software.

After demonstrations and negotiations at Metro, the Metro Traffic Bureau determined that the NDOT/UNLV system would be highly beneficial to the PD and in a letter dated 4/25/2013 (Appendix E), agreed to a program of system testing. Metro stated that the system would:

- Produce precise crash locations
- Produce better data analyses to determine high crash zones within Clark County.
- Enable more efficient deployment of officers, and
- Reduce fatalities and overall crashes

The prototype device was tested by a selected group of officers considering its compatibility with a typical officer's demanding patrol duties and functions.

It is important to keep in mind that at the commencement of the Project, NDOT was working under the following assumptions:

1. Metro did not have sufficient funds to pay for the upgrade of hardware and software required to collect and report GPS coordinate crash locations.
2. There were no plans or discussions about upgrading Metro's existing crash data collection system and/or any relevant components of the system with new hardware or software.
3. About 30% of all crashes are "mis-located" or "unlocatable" in urban areas. This was based on previous analyses of several years of "location verification" conducted by NDOT. In rural areas the "mis-located" or "unlocatable" crashes can be up to 50%. Hence, the deployment of the GPS-based system (GPS-BS) can significantly improve the quality of the crash data.

4. In order for the GPS-BS to be effective, police officers will need to be persistent/accurate/and thorough in its use.

Typically, crashes are “mis-located” or “unlocatable” due to the following “Form 5” entry errors:

- Crash On-Street is unmarked or no name available – null entry.
- An alias street name is different than the official or map name.
- Wrong street suffix or prefix (eg, North Gillman St entered as West Gillman St, Nellis Ave N entered as Nellis Ave E, etc).
- Incorrect name entered (eg. the map/official name is Garden Blvd, but Garden Ave entered –both names exist).
- Error in direction code entered (eg. 150’ west (W) of an intersection; however, “E” should have been recorded).
- Human errors or simple street name typos (“fat fingers”).
- The wrong City/County code is entered (eg. crash can be located in the wrong city or county - given that both 1st and Main streets exist in multiple cities); or, the crash will be “unlocatable” because the entered intersection does not exist in that county.
- On State routes – the wrong ‘US’ or ‘SR’ number is entered.
- On State routes – the wrong Milepost number is entered; or no milepost number entered.
- Any “Key” locating field that is left blank (null entry).

### 7.2 GPS-based System for the Collection and Reporting of Crash Coordinates

The system involves a GPS unit, a real-time database, and a dashboard. The Figure 14 illustrates these three components and their interdependencies. The role of the GPS unit is to collect and send the crash coordinates to a remote server hosting a real time database that stores this information. Along with the crash coordinates, the GPS unit sends the corresponding collection date and time as well as the device ID. This information is critical to match the data collected by the GPS unit with the official crash records collected by the police officers. The database provides the crash, time, and device ID information to the dashboard which role is to enable the visualization of the crash location as well as to provide a large number of query options. Using the dashboard, crash records and patterns can be analyzed. Various colors are used to differentiate between active, recent, and older crashes. Time and device ID can be obtained through the Report list menu or through the balloons. Polygons can be created to select regions. Statistics can be generated for the entire region of for the regions selected using polygons.

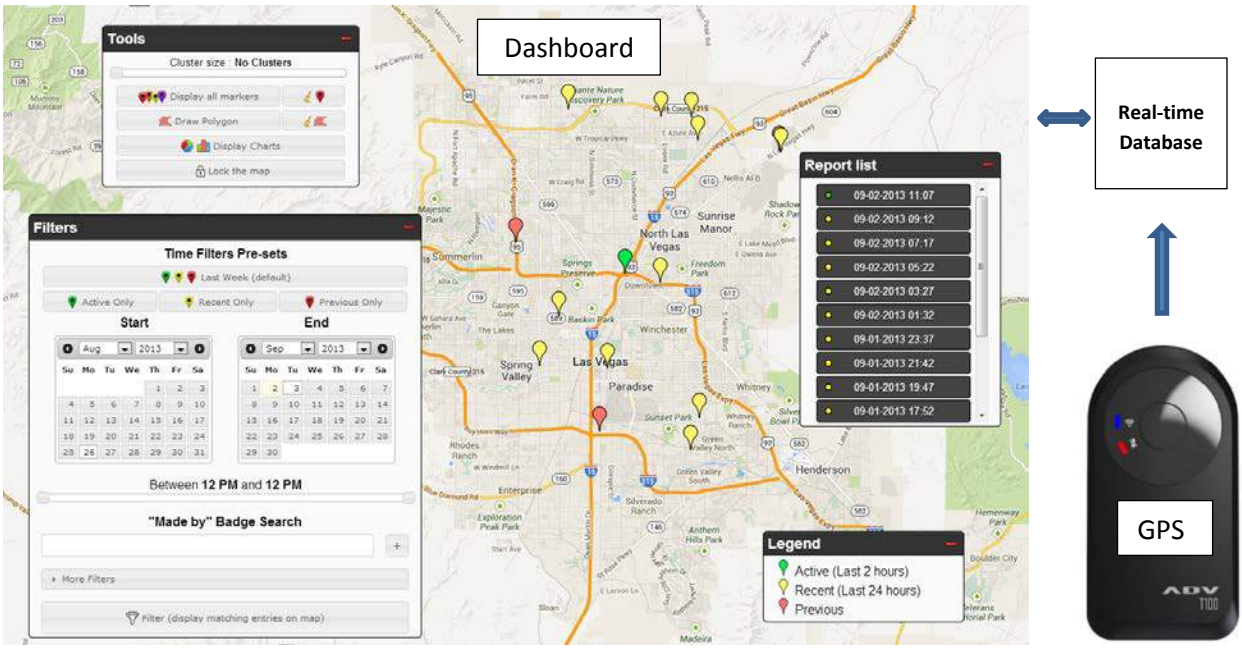



**FIGURE 14 GPS-based system for the collection and reporting of Crash coordinates.**

The field test conducted to test the GPS-BS involved the following activities:

### *7.2.1 Task 1. Interviewing the Police Data Analyst and Updating the Dashboard*

Meetings were conducted to show the dashboard to the Police Data Analyst and police officers who were part of the field test. Feedback, comments, and requests for changes were received. The dashboard was upgraded to address all input provided by Metro. For example, a measurement tool was added to determine the distance between a crash and the nearest intersection.

### *7.2.2 Task 2. System Setup and Training of Police Officers*

Meetings were conducted to provide instructions and give demonstrations on the use the GPS unit and dashboard. During these meetings, Metro requested to add capabilities to the systems such as the ability to receive an email and a text message every time that a crash location was collected. These capabilities were provide as well as mechanisms to active and/or deactivate them at the device level using the web-based dashboard.

### *7.2.3 Task 3. Deployment*

A total of 35 devices were deployed for the field test for a period of four months. However, due to limited data provided by Metro for verification, only data from two devices and one month were used in the evaluation. Analyses of the results are provided below in Task 6.

### *7.2.4 Task 4. Continuous Monitoring, Consistency Check and Upgrading*

Meetings, phone conversations, and continuous monitoring of the devices, the database, and the dashboard were part of the work performed for this part of the project. As described before, various upgrades were required to address Metro's needs and preferences. Those upgrades involved changes to the three components of the entire system.

### *7.2.5 Task 5. Interviewing Participants*

Regular meetings were conducted to interview the participants. In particular, most of the meetings involved discussions with Metro Traffic Division Leader, Officer Todd Raybuck. He provided the communication channel between the officers in the field using the GPS units and the research team. Metro expressed satisfaction with all aspects of the project and research team. In particular, they were very enthusiastic about having the opportunity to request changes and upgrades to the system. They were also pleased to obtain a extremely fast and effective turnaround regarding their requests (mostly due to the flexible and innovative team at the UNLV Research Center). In addition, they appreciated and emphasized the importance of having a) immediate (real-time) access to crash locations; and b) tactical information on the geographic location of their officers.

### *7.2.6 Task 6. Statistical Analysis*

**Preliminary Assessment: Consistency of Use by Officers**

Seven police officers were chosen by Metro Traffic Division Leader, Todd Raybuck, to conduct preliminary testing of the GPS-BS. The test period was from November 1st to November 30th of 2013. The data collected with the GPS-BS and the Metro Crash Reports (MCR) for the month of November were compared. The MCR data corresponded to a summary of the actual crash record.

For each day in November, the number of GPS-BS entries was totaled by officer (or device ID). Similarly, the total number of MCR entries for that officer was totaled. Comparisons were made for consistency. A consistency rate by officer was generated. The most diligent or thorough officers were identified. Two officers achieved an 80% consistency between the number of GPS-BS and MCR entries.

**Matching GPS-BS Entries with the Final Approved MCR Records**

After a lengthy process, Metro's Information Technology (IT) Department created a custom small crash database for testing. This database contained requested data elements required for matching and representing the final approved crash records. This database was released to NDOT for testing purposes, prior to being sent to the NCATS repository.

Records were filtered by Officer Badge Number in order that the entries for the two most thorough officers (see above) could be identified. Therefore, for November 2013, a matrix was developed whereby data from the two sources could be analyzed and compared.

In order to match/join the GPS-BS entries (including the coordinates) with the actual approved MCR entries, the following data elements were compared and analyzed:

*MCR entries (Crossroads Database):*

- Record ID
- Officer ID
- Accident number
- Collision Date and Time
- Status (Approved, Hit and Run, Superceded)
- Primary Road
- Secondary Road
- Distance (ft)
- Direction

*GPS-BS database:*

- Coordinates (Located point on Google Map)
- Device ID (Badge ID)
- Date and Time of entry

**The Matching Process**

For each GPS-BS entry, the primary and secondary streets were identified projecting the coordinates in a Google Map. Distance from intersection was measured using the dashboard measuring tool. The location was then compared against the MCR record. Considering that were could be multiple crashes at the same location, date and time entries used for matching. The collected data did not include multiple records within a 2-hour period for the same location.

### *7.2.7 Task 7. Conclusions and Recommendations*

**A) Technical**

- There was a notable crash time range difference between the two data sets – from two to four hours. It appears that in most cases the officers dealt with the crash scene details first and then made the GPS-BS entry (as the approved MCR entry showed).
- There are GPS-BS records but no matching MCR records. The officers may have clicked by mistake, or were testing the device, and perhaps clicked twice.
- There are MCR records with no matching GPS-BS records. The officers omitted to use the GPS unit.
- For the month of November, for both officers, there were a total of 58 MCR entries.
- For the month of November, for both officers, there were a total of 32 GPS-BS entries that matched MCR records, or 55.2%. The discrepancy being; a) the officers did not use device; or b) some MCD entries may not have been approved as official Metro crashes.
- **Nine out of 32 MCR (Crossroad) matches when compared to the GPS-BS entries with coordinates were inconsistent or unlocated. Therefore, if we assume that the GPS coordinate is the true and accurate location of the crash, 28.1% of Metro's approved crashes were mis-located or unlocated (probably for reasons listed above).**
- One officer had significantly fewer inconsistencies than the other - indicating that officer diligence and thoroughness varies greatly (under volunteer conditions).
- The major and minor streets associated with a crash record were determined using the coordinates collected with the GPS-BS. These names were compared with those in the MCR. There was a 99 % matching for the major street and 69 % matching for the minor street.

B) Overall Conclusions

- The GPS-BS device proved to be effective. It was documented as being highly accurate in sending X, Y coordinates. When used properly, matches to the actual MCR record were relatively easy to make.
- As expected, usefuleness of the overall system is strongly based on consistency of officer use and adherence to following operating instructions (a user guide was prepared). As the above results show, voluntary compliance would render the system quite ineffective.

- Since officer discretion is paramount in using the system, a major disadvantage may lie in the fact that superior officers would have to make a decision on whether to mandate its use.
- Officers have reported that improvements to the device's robustness are still needed - if used extensively.
- During the field test, Metro realized the value of having immediate information about where crashes are, and have been occurring. Metro highlighted the tactical advantage that this information provides to supervisors who are responsible for assigning responsibilities to the officers.
- Thanks to this project, and the highly beneficial experience that Metro had with the research team and sub-contractor, Metro has recently begun to consider the potential benefits of cooperation with NDOT and UNLV in order to upgrade their entire crash and citation data collection system. In addition, Metro has reported that they were impressed with the capabilities and commitment of the UNLV Project Team.
- Preliminary discussions among NDOT, Metro, and UNLV have started - with the aim of developing a plan for upgrading Metro's crash and citation data collection in conjunction with NDOT's Statewide "Brazos" software.
- It is uncertain whether Metro will adopt the GPS-BS or a different approach such as a Tablet. However, Metro and NDOT are now aware of the capabilities as well as the limitations of the GPS-BS. Hence, going forward, an informed decision can be made about what type of technology to use and the associated cost and limitations.

### *7.2.8 Task 8. Report*

This chapter corresponds to the required technical report for Amendment #2 of the Interlocal Agreement No.P203-12-816.

**REFERENCES**


1. National Highway Traffic Safety Administration. *Budget Estimates Fiscal Year 2013.* http://www.nhtsa.gov/Laws+&+Regulations/NHTSA+Budget+Information. Accessed May 30, 2013.
2. National Highway Traffic Safety Administration. *Early Estimates of Motor vehicle Traffic Fatalities in 2012*, April 2013. http://www-nrd.nhtsa.dot.gov/Pubs/811741.pdf. Accessed May 30, 2013.
3. Federal Highway Administration. Moving Ahead for Progress in the 21st Century (MAP-21). *Safety Provisions. http://www.fhwa.dot.gov/map21/safety_overview.cfm*. Accessed July 31, 2013.
4. *Highway Safety Manual, 2010*.American Association of State Highway and Transportation Officials.
5. American Association of State Highway and Transportation Officials. *Safety Analyst*. http://www.safetyanalyst.org/. Accessed Nov 15, 2011.
6. Montella, A. A Comparative Analysis of Hotspot Identification Methods. *Accident Analysis & Prevention*, Vol. 42, No. 2, 2010, pp. 571-581.
7. Alluri, P. *Development of Guidance for States Transitioning to New Safety Analysis Tools*. Doctoral Degree Dissertation, 2010.
8. Hauer, E. *Observational before-After Studies in Road Safety*. Pergamon Press Inc, 1997.
9. iTRANS Consulting Ltd, and Human Factors North INC. *New Approaches to Highway Safety Analysis*, 2003.
10. Alluri, P. Assessment of Potential Site Selection Methods for use in Prioritizing Safety Improvements on Georgia Roadways, Master's Thesis report, 2008.
11. Ogle, J. H. Technologies for Improving Safety Data: A Synthesis of Highway Practice. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 367, Transportation Research Board of the National Academies, Washington DC, 2007.
12. A.K. Ziliaskopoulos and S.T. Waller. An Internet Based Geographic Information System that Integrates Data, Models and Users for Transportation Applications. *Transportation Research Part C: Emerging Technologies*, 8 (1-6), 2000, pp. 427–444.
13. Khan, G., K. R. Santiago-Chaparro, M. Chiturri, and D.A. Noyce. Development of Data Collection and Integration Framework for Road Inventory Data. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 2160, Transportation Research Board of the National Academics, Washington, D.C., 2010, pp. 29–39.
14. *Data Integration Primer, Aug. 2001*. Federal Highway Administration. U.S. Department of Transportation.
15. Dueker, K., Butler, J.A. GIS-T enterprise data model with suggested implementation choices. *Journal of the Urban and Regional Information Systems Association*, 10 (1), 1998, pp.12-36.
16. Devogele, T., C. Parent, S. Spaccapietra. On spatial database integration. *International Journal of Geographic Information Sciences* 12 (4), 1998, pp. 335-352.
17. Vonderohe, A., C. Chou, F. Sun, T. Adams, 1998. A generic data model for linear referencing systems. *Research Results Digest Number 218*, National Cooperative Highway Research Program, Transportation Research Board.
18. Pendyala, R. M., and Oak Ridge National Laboratory. *Development of GIS-Based Conflation Tools for Data Integration and Matching: Final Report.* Florida Department

of Transportation, Tallahassee, Fla., 2002. Presented at 87th Annual Meeting of the Transportation Research Board, Washington, D.C., 2008.
19. O'Packi, P., R. Dubois, N. Armentrout, and S. Bower. Maine's Approach to Data Warehousing for State Departments of Transportation. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1719, Transportation Research Board of the National Academics, Washington, D.C., 2000, pp. 227–232.
20. Quin Ming and shi lei. Comprehensive transportation Information Platform based CORBA Framework and XML data Exchange Technology. *ICCTP 2010: Integrated Transportation Systems – Green, Intelligent and Reliable Conference Proceedings*, 2010, pp 1218-1225.
21. Pack, M. L., J. R. Bryan, and A. Steffes. *Overview and Status of the Regional Integrated Transportation Information System in the National Capital Region*. Presented at 87th Annual Meeting of the Transportation Research Board, Washington, D.C., 2008.
22. Hall, J.P., R. Robinson, and M. A. Paulis. Enterprisewide Spatial Data Integration of Legacy Systems for Asset Management–The Case of the Illinois Department of Transportation. In *Transportation Research Record: Journal of the Transportation Research Board*, No.1917, Transportation Research Board of the National Academics, Washington, D.C., 2005, pp. 11–17.
23. Gan, A., K. Haleem, P. Alluri, J. Lu, T. Wang, M. Ma, C. Diaz . *Preparing Florida for Deployment of SafetyAnalyst for all roads*. Miami: Lehman Center for Transportation Research, Florida International University, 2012.
24. Xiao Qin, A. W. *Development Of Safety Screening Tool For High Risk Rural Roads In South Dakota*. Civil Laboratory for Operations and Safety Engineering In Transportation, South Dakota State University, 2011.
25. Wu, Y.-J., Y. Wang, and D. Qian. A Google-Map-Based Arterial Traffic Information System. *Proc., ITSC 2007: IEEE Intelligent Transportation Systems Conference*, 2007 Proceedings, Seattle, Washington, pp. 968–973.
26. Alluri, P. and J. Ogle. Road Safety Analysis: States' Current Practices and Their Future Direction. In 91st Annual *Meeting Transportation Research Board*, CD-ROM Transportation Research Board of the National Academies, Washington, D. C., 2011.
27. *Safety Analyst User Manual, 2011*. ITT Corporation, Colorado Springs, CO.
28. National Highway Traffic Safety Administration. *Model Minimum Uniform Crash Criteria*. http://www.mmucc.us/2008MMUCCGuideline.pdf. Accessed Dec 11, 2011.
29. Council, F. M., D. L. Harkey, D. L. Carter, and B. White. *Model Minimum Inventory of 7 Roadway Elements—MMIRE*. FHWA-HRT-07-046, Federal Highway Administration, McLean, VA, 2007.
30. Highway Performance Monitoring System, 2010. Federal Highway Administration. http://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/chapter1.cfm. Accessed March 10, 2012
31. *A Primer for Dynamic Traffic Assignment, 2010.* Transportation Network Modeling Committee. Transportation Research Board. http://nextrans.org/ADB30/sites/default/files/dta_primer.pdf. Accessed Mar 15, 2011.
32. *DynusT User's Manual, 2008*. http://dynust.net/ wikibin/doku.php. Accessed Mar 02, 2009.
33. *Geoprocessing with ModelBuilder, ESRI ArcGIS*. http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#. Accessed April 2013.

34. Song E., S. Yin, and I. Ray. Using UML to model relational database operations. *Computer Standards and Interfaces*, 29 (3), 2007, pp. 343-354.
35. Wikipedia. *Database schema.* http://en.wikipedia.org/wiki/Database_schema. Accessed May 02, 2012.
36. Hauer, E., D.W. Harwood, F.M. Council, and M.S. Griffith. Estimating Safety by the Empirical Bayes Method: A Tutorial. *Transportation Research Record: Journal of the Transportation Research Board*, No.1784, Transportation Research Board of the National Academics, Washington, D.C., 2002, pp. 126–131.
37. American Association of State Highway and Transportation Officials. *Safety Analyst v4.3.1 Release Notes*, *June 2013*. www.aashtoware.org/Safety/Pages/default.aspx. Accessed July 2013.
38. Graettinger, A., J. K. Lindy, and G. J. Mistry. *Display and Analysis of Crash Data.* University Transportation Center for Alabama (UTCA), Tuscaloosa, AL, 2005.
39. Roche, J. Geographic Information Systems-Based Crash Data Analysis and the Benefits to Traffic Safety. *2000 MTC Transportation Scholars Conference*, Ames, IA, pp. 110-122.
40. Krishnakumar, V.K., S.S. Pulugurtha, S. S. Nambisan. Identification and Ranking of High Pedestrian Crash Zones Using GIS. *2000 Annual ESRI International User Conference,*San Diego, California, 2005.
41. Xiao,F.,Z. Hongyu, Y. Caixia. Development of Road Maintenance Management System Based onWebGIS. *International Journal of Civil and Environmental Engineering*, Issue 6, 2012, pp. 333-337.
42. Xiao Qin, A. W. *Development of Safety Screening Tool For High Risk Rural Roads In South Dakota*. Civil Laboratory for Operations and Safety Engineering In Transportation, South Dakota State University, 2011.
43. SafeRoadMaps. *Safe Road Maps: Envisioning Safer Roads*. http://saferoadmaps.org. Accessed May 2013.
44. American Automobile Association (AAA). *usRAP: United States Road Assessment Program.* http://www.usrap.us/home. Accessed May 2013.
45. Cambridge Systematics. *MassTRAC-Massachusetts Traffic Records Analysis Center*. http://masstrac.chs.state.ma.us/. Accessed June 2013.
46. Center for Advanced Public Safety (CAPS). *CARE – Critical Analysis Reporting Environment.* http://care.cs.ua.edu/care.aspx. Accessed April 2013.
47. Ma, M., P. Alluri, A. Gan. Development of a Geographic Information System for SafetyAnalyst for Location Selection and Output Visualization. In 92nd Annual *Meeting of the transportation research Board*, CD-ROM Transportation Research Board of the National Academies, Washington, D. C., 2012.
48. Federal Highway Administration. *Applications of GIS for Highway safety-Peer Exchange Summary Report.* http://www.gis.fhwa.dot.gov/documents/GIS_Safety_Proceedings.pdf. Accessed May 2013.

## APPENDIX A

## STATUS OF ROADWAY SEGMENTS, RAMPS AND INTERSECTIONS INCLUDED IN THIS PROJECT

**TABLE A-1** Arterial Segments Routes and their Percentage of Route Length Included in the Database

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| SR146 | 23 | 6.673 | 6.512 | 0.161 | 97.6 | |
| SR147 | 24 | 14.313 | 13.629 | 0.684 | 95.2 | |
| SR156 | 25 | 17.523 | 17.421 | 0.102 | 99.4 | |
| SR157 | 26 | 21.448 | 20.949 | 0.499 | 97.7 | |
| SR158 | 27 | 8.853 | 8.853 | 0.000 | 100.0 | |
| SR159 | 28 | 31.201 | 31.187 | 0.014 | 100.0 | |
| SR160 | 29 | 39.200 | 39.200 | 0.000 | 100.0 | |
| SR161 | 30 | 7.326 | 7.283 | 0.043 | 99.4 | |
| SR163 | 31 | 19.120 | 15.943 | 3.177 | 83.4 | |
| SR164 | 32 | 18.694 | 18.694 | 0.000 | 100.0 | |
| SR165 | 33 | 11.043 | 11.043 | 0.000 | 100.0 | |
| SR168 | 34 | 24.237 | 23.811 | 0.425 | 98.2 | |
| SR169 | 35 | 18.711 | 18.711 | 0.000 | 100.0 | |
| SR170 | 36 | 12.266 | 4.226 | 8.039 | 34.5 | This route is near Mesquite. Not many AADT stations available. In addition, the missing route segments are not included in the DTA model. Hence, AADT could not be estimated. |
| SR171 | 37 | 0.670 | 0.347 | 0.323 | 51.7 | The length of this route is short. Hence, 51.7% seems small. However, only 0.323 miles were not |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| | | | | | | covered |
| SR562 | 118 | 6.071 | 5.995 | 0.076 | 98.7 | |
| SR564 | 119 | 8.414 | 8.414 | 0.000 | 100.0 | |
| SR573 | 120 | 5.813 | 5.316 | 0.497 | 91.4 | |
| SR574 | 121 | 10.443 | 9.738 | 0.705 | 93.3 | |
| SR578 | 122 | 0.658 | 0.658 | 0.000 | 100.0 | |
| SR579 | 123 | 2.189 | 2.189 | 0.000 | 100.0 | |
| SR582 | 124 | 16.782 | 10.353 | 6.429 | 61.7 | SA requires reliable AADT data for at least the last five years. In this route, some of the AADT stations have incorrect information for some years. |
| SR589_Sahara | 125 | 10.023 | 9.690 | 0.333 | 96.7 | |
| FRCL51 | 126 | 0.559 | 0.559 | 0.000 | 100.0 | |
| SR592 | 127 | 8.577 | 8.405 | 0.171 | 98.0 | |
| SR593_Tropicana Av | 128 | 10.846 | 10.782 | 0.064 | 99.4 | |
| SR595 | 130 | 5.639 | 5.639 | 0.000 | 100.0 | |
| SR596-Jones Blvd | 131 | 7.135 | 7.055 | 0.079 | 98.9 | |
| SR599 | 132 | 6.957 | 6.225 | 0.732 | 89.5 | |
| SR602 | 134 | 0.245 | 0.245 | 0.000 | 100.0 | |
| SR604-Las Vegas Blvd | 135 | 13.518 | 12.653 | 0.865 | 93.6 | |
| FRCL53 | 136 | 0.170 | 0.144 | 0.026 | 84.7 | |
| SR610 | 137 | 2.318 | 2.253 | 0.065 | 97.2 | |
| SR612 | 138 | 9.394 | 9.353 | 0.041 | 99.6 | |
| FRCL40 | 209 | 0.180 | 0.058 | 0.122 | 32.4 | |
| FRCL06 | 218 | 0.598 | 0.598 | 0.000 | 100.0 | |
| FRCL02 | 270 | 0.232 | 0.176 | 0.056 | 75.9 | |
| FRCL26 | 287 | 0.126 | 0.126 | 0.000 | 100.0 | |
| FRCL25 | 288 | 0.430 | 0.430 | 0.000 | 100.0 | |
| FRCL07 | 375 | 11.819 | 6.071 | 5.749 | 51.4 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| SR147 | 409 | 0.487 | 0.398 | 0.089 | 81.6 | |
| FRCL22 | 1060 | 0.572 | 0.572 | 0.000 | 100.0 | |
| FRCL24 | 1062 | 3.995 | 2.025 | 1.970 | 50.7 | |
| FRCL46 | 1063 | 1.002 | 1.002 | 0.000 | 100.0 | |
| FRCL47 | 1064 | 1.065 | 1.037 | 0.028 | 97.4 | |
| SO1502 | 1502 | 0.075 | 0.075 | 0.000 | 100.0 | |
| SO1503 | 1503 | 0.116 | 0.116 | 0.000 | 100.0 | |
| ARCL53 | 1507 | 0.126 | 0.126 | 0.000 | 100.0 | |
| SO1513 | 1513 | 0.271 | 0.271 | 0.000 | 100.0 | |
| FRCL50 | 1685 | 0.293 | 0.293 | 0.000 | 100.0 | |
| SR564 | 1689 | 0.369 | 0.194 | 0.176 | 52.4 | |
| FRCL49 | 1690 | 0.186 | 0.031 | 0.155 | 16.9 | |
| SO1691 | 1691 | 0.059 | 0.059 | 0.000 | 100.0 | |
| SO1508 | 1693 | 0.114 | 0.114 | 0.000 | 100.0 | |
| S010035 | 10035 | 0.324 | 0.324 | 0.000 | 100.0 | |
| FRCL52 | 10061 | 0.250 | 0.250 | 0.000 | 100.0 | |
| FRCL54 | 10127 | 0.180 | 0.180 | 0.000 | 100.0 | |
| FRCL55 | 10147 | 0.148 | 0.148 | 0.000 | 100.0 | |
| FRCL56 | 10157 | 0.153 | 0.153 | 0.000 | 100.0 | |
| FRCL57 | 10192 | 0.277 | 0.214 | 0.063 | 77.2 | |
| FRCL59 | 10211 | 0.258 | 0.124 | 0.134 | 48.0 | |
| SO10285 | 10285 | 0.436 | 0.436 | 0.000 | 100.0 | |
| FRCL60 | 10295 | 0.099 | 0.099 | 0.000 | 100.0 | |
| FRCL39 | 10535 | 0.533 | 0.350 | 0.184 | 65.6 | |
| SR172 | 11202 | 1.205 | 1.205 | 0.000 | 100.0 | |
| SR147E | 134864 | 44.276 | 44.276 | 0.000 | 100.0 | |
| SR 75 | 134871 | 13.105 | 13.105 | 0.000 | 100.0 | |
| S 13TH ST | 100035 | 0.680 | 0.680 | 0.000 | 100.0 | |
| S 15TH ST | 100047 | 1.120 | 0.982 | 0.138 | 87.6 | |
| S 3RD ST | 100205 | 0.379 | 0.379 | 0.000 | 100.0 | |
| N 4TH ST | 100230 | 1.695 | 1.597 | 0.098 | 94.2 | |
| 5TH ST | 100257 | 6.522 | 4.879 | 1.643 | 74.8 | |
| S 6TH ST | 100265 | 0.955 | 0.864 | 0.091 | 90.4 | |
| ADAMS BLVD | 100449 | 2.930 | 2.479 | 0.451 | 84.6 | |
| AIRPORT ARRIVAL RTN | 100590 | 0.242 | 0.103 | 0.139 | 42.7 | |
| AIRPORT ARRIVALS | 100591 | 0.125 | 0.125 | 0.000 | 100.0 | |
| AIRPORT CONN N | 100594 | 1.276 | 0.495 | 0.780 | 38.8 | |
| AIRPORT DEPARTURES | 100596 | 0.283 | 0.045 | 0.238 | 15.9 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| AIRPORT RETURN | 100610 | 0.261 | 0.261 | 0.000 | 100.0 | |
| AIRPORT ZERO LEVEL | 100621 | 0.110 | 0.110 | 0.000 | 100.0 | |
| ALDEBARAN AV | 100708 | 0.182 | 0.182 | 0.000 | 100.0 | |
| ALEXANDER RD | 100755 | 14.327 | 13.517 | 0.810 | 94.3 | |
| ALLEGRO ST | 100824 | 0.260 | 0.260 | 0.000 | 100.0 | |
| SAPPHIRE SEA CT | 100831 | 4.039 | 4.039 | 0.000 | 100.0 | |
| ALTA DR | 100968 | 11.190 | 10.988 | 0.202 | 98.2 | |
| AMERICAN PACIFIC DR | 101137 | 1.895 | 1.511 | 0.384 | 79.7 | |
| AMIGO ST | 101163 | 0.353 | 0.353 | 0.000 | 100.0 | |
| ANASAZI DR | 101193 | 2.280 | 2.098 | 0.182 | 92.0 | |
| ANN RD | 101321 | 11.960 | 11.164 | 0.796 | 93.3 | |
| ANTELOPE WY | 101391 | 1.023 | 1.023 | 0.000 | 100.0 | |
| APPALOOSA RD | 101498 | 1.023 | 1.023 | 0.000 | 100.0 | |
| ARCATA WY | 101642 | 0.611 | 0.611 | 0.000 | 100.0 | |
| ARIZONA ST | 101729 | 0.719 | 0.703 | 0.016 | 97.8 | |
| ARROYO GRANDE BLVD | 101829 | 3.685 | 3.451 | 0.234 | 93.6 | |
| ARROYO RD | 101832 | 0.376 | 0.376 | 0.000 | 100.0 | |
| ARVILLE ST | 101882 | 9.641 | 6.623 | 3.018 | 68.7 | |
| ASPEN DR | 101983 | 0.275 | 0.275 | 0.000 | 100.0 | |
| W ATLANTIC AV | 102081 | 1.057 | 1.036 | 0.021 | 98.0 | |
| AUTO SHOW DR | 102185 | 0.501 | 0.501 | 0.000 | 100.0 | |
| AVENUE A | 102288 | 0.220 | 0.220 | 0.000 | 100.0 | |
| AVENUE B | 102291 | 0.644 | 0.624 | 0.020 | 96.9 | |
| AVENUE G | 102304 | 0.667 | 0.551 | 0.116 | 82.6 | |
| AVENUE I | 102308 | 0.375 | 0.205 | 0.170 | 54.7 | |
| AVENUE K | 102310 | 0.387 | 0.387 | 0.000 | 100.0 | |
| AVENUE L | 102312 | 0.256 | 0.123 | 0.133 | 48.1 | |
| AZURE DR | 102394 | 3.156 | 1.743 | 1.413 | 55.2 | |
| W AZURE AV | 102403 | 0.506 | 0.506 | 0.000 | 100.0 | |
| BACKSTAGE BLVD | 102461 | 0.576 | 0.576 | 0.000 | 100.0 | |
| BADURA AV | 102485 | 3.624 | 1.780 | 1.844 | 49.1 | |
| BARBARA LA | 102692 | 0.826 | 0.691 | 0.136 | 83.6 | |
| E BARRETT ST | 102798 | 0.614 | 0.614 | 0.000 | 100.0 | |
| W BASIC RD | 102841 | 1.451 | 1.451 | 0.000 | 100.0 | |
| BELMONT ST | 103273 | 1.130 | 0.706 | 0.424 | 62.5 | |
| BELROSE ST | 103277 | 0.234 | 0.234 | 0.000 | 100.0 | |
| E ERIE AV | 103389 | 6.904 | 6.280 | 0.624 | 91.0 | |
| BONANZA RD | 104197 | 7.932 | 7.907 | 0.025 | 99.7 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| BONNEVILLE AV | 104231 | 1.487 | 1.487 | 0.000 | 100.0 | |
| BOULDER BEACH | 104328 | 10.869 | 10.869 | 0.000 | 100.0 | |
| W BOULDER LA | 104342 | 0.318 | 0.318 | 0.000 | 100.0 | |
| BRADLEY RD | 104468 | 5.108 | 4.318 | 0.789 | 84.5 | |
| BRIDGER AV | 104707 | 1.084 | 1.012 | 0.072 | 93.4 | |
| BRISTLECONE DR | 104806 | 0.635 | 0.635 | 0.000 | 100.0 | |
| BROADBENT BLVD | 104850 | 1.959 | 1.924 | 0.035 | 98.2 | |
| BRONCO RD | 104935 | 0.423 | 0.423 | 0.000 | 100.0 | |
| N BRUCE ST | 105054 | 0.398 | 0.398 | 0.000 | 100.0 | |
| BRUCE ST | 105055 | 5.631 | 5.202 | 0.430 | 92.4 | |
| BRUCE WOODBURY DR | 105058 | 3.079 | 2.730 | 0.349 | 88.7 | |
| E BRUNER AV | 105066 | 0.500 | 0.500 | 0.000 | 100.0 | |
| BUCHANAN BLVD | 105116 | 3.496 | 3.017 | 0.479 | 86.3 | |
| BUFFALO DR | 105227 | 20.520 | 19.007 | 1.513 | 92.6 | |
| BURKHOLDER BLVD | 105342 | 2.696 | 0.823 | 1.872 | 30.5 | |
| BURNS RD | 105365 | 0.291 | 0.291 | 0.000 | 100.0 | |
| CABANA DR | 105496 | 1.518 | 0.658 | 0.860 | 43.4 | |
| CACTUS AV | 105527 | 8.229 | 6.427 | 1.802 | 78.1 | |
| CAMERON ST | 105868 | 3.015 | 2.261 | 0.755 | 75.0 | |
| CAMINO AL NORTE | 105875 | 1.786 | 1.786 | 0.000 | 100.0 | |
| CAMINO BRAVO | 105877 | 0.361 | 0.201 | 0.159 | 55.8 | |
| CAMINO ELDORADO | 105889 | 1.462 | 1.462 | 0.000 | 100.0 | |
| CANYON RUN DR | 106144 | 1.741 | 1.374 | 0.368 | 78.9 | |
| CAPELLA AV | 106191 | 0.128 | 0.128 | 0.000 | 100.0 | |
| CAREY AV | 106302 | 10.265 | 9.501 | 0.764 | 92.6 | |
| CARNEGIE ST | 106399 | 2.337 | 2.209 | 0.128 | 94.5 | |
| CARSON AV | 106479 | 0.939 | 0.939 | 0.000 | 100.0 | |
| S CASINO CENTER BLVD | 106623 | 1.651 | 1.651 | 0.000 | 100.0 | |
| CASINO DR | 106625 | 6.174 | 5.903 | 0.271 | 95.6 | |
| CASTALIA ST | 106653 | 0.284 | 0.284 | 0.000 | 100.0 | |
| CATHEDRAL WY | 106750 | 0.127 | 0.127 | 0.000 | 100.0 | |
| CEDAR DR | 106852 | 0.078 | 0.078 | 0.000 | 100.0 | |
| CENTENNIAL CENTER BLVD | 106964 | 1.770 | 1.770 | 0.000 | 100.0 | |
| CENTENNIAL PKWY | 106968 | 9.528 | 7.333 | 2.195 | 77.0 | |
| CENTER ST | 106989 | 1.294 | 1.258 | 0.036 | 97.2 | |
| CHARLESTON BLVD | 107203 | 2.514 | 2.036 | 0.478 | 81.0 | |
| CHESTNUT LA | 107393 | 0.138 | 0.138 | 0.000 | 100.0 | |
| CHEYENNE AV | 107411 | 5.418 | 4.224 | 1.194 | 78.0 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| CHRISTY LA | 107586 | 3.613 | 3.069 | 0.544 | 84.9 | |
| CIMARRON RD | 107655 | 13.069 | 9.927 | 3.142 | 76.0 | |
| CIRCUS CIRCUS DR | 107728 | 0.378 | 0.378 | 0.000 | 100.0 | |
| CIVIC CENTER DR | 107766 | 3.280 | 2.317 | 0.963 | 70.6 | |
| CLARK AV | 107808 | 1.084 | 1.084 | 0.000 | 100.0 | |
| CLARK ST | 107823 | 0.071 | 0.071 | 0.000 | 100.0 | |
| CLAYTON ST | 107858 | 6.265 | 5.605 | 0.660 | 89.5 | |
| CLIFF SHADOWS PKWY | 107947 | 2.092 | 2.092 | 0.000 | 100.0 | |
| COLLEGE DR | 108251 | 2.309 | 1.808 | 0.500 | 78.3 | |
| COLORADO ST | 108315 | 0.646 | 0.646 | 0.000 | 100.0 | |
| COMMERCE ST | 108396 | 6.158 | 5.624 | 0.534 | 91.3 | |
| CONVENTION CENTER DR | 108577 | 0.553 | 0.553 | 0.000 | 100.0 | |
| CORONADO CENTER DR | 108834 | 1.915 | 1.813 | 0.102 | 94.7 | |
| E COTTONWOOD COVE RD | 108976 | 8.240 | 8.240 | 0.000 | 100.0 | |
| COTTONWOOD DR | 108980 | 0.173 | 0.173 | 0.000 | 100.0 | |
| COTTONWOOD ST | 108999 | 0.309 | 0.309 | 0.000 | 100.0 | |
| CRAIG RD | 109265 | 8.396 | 7.508 | 0.888 | 89.4 | |
| D ST | 109804 | 0.594 | 0.071 | 0.522 | 12.0 | |
| W DALE AV | 109858 | 0.316 | 0.316 | 0.000 | 100.0 | |
| DAVIS DAM RD | 110081 | 2.000 | 2.000 | 0.000 | 100.0 | |
| DECATUR BLVD | 110219 | 21.778 | 20.050 | 1.728 | 92.1 | |
| DEER SPRINGS WY | 110289 | 10.053 | 8.375 | 1.677 | 83.3 | |
| DEL PRADO DR | 110358 | 0.522 | 0.368 | 0.154 | 70.5 | |
| DEL WEBB BLVD | 110382 | 1.446 | 1.446 | 0.000 | 100.0 | |
| DESERT FOOTHILLS DR | 110578 | 2.088 | 1.336 | 0.752 | 64.0 | |
| DESERT INN ART EAST | 110605 | 0.985 | 0.719 | 0.266 | 73.0 | |
| DESERT INN ART WEST | 110606 | 0.910 | 0.607 | 0.303 | 66.7 | |
| DESERT INN RD | 110608 | 15.968 | 13.199 | 2.769 | 82.7 | |
| DESERT LA | 110615 | 0.126 | 0.126 | 0.000 | 100.0 | |
| DIO DR | 110914 | 0.406 | 0.406 | 0.000 | 100.0 | |
| DONOVAN WY | 111119 | 3.191 | 2.862 | 0.329 | 89.7 | |
| DORRELL LA | 111165 | 2.093 | 1.285 | 0.809 | 61.4 | |
| DURANGO DR | 111533 | 21.198 | 18.168 | 3.031 | 85.7 | |
| EASTERN AV | 111773 | 15.657 | 15.387 | 0.270 | 98.3 | |
| EASTGATE RD | 111778 | 1.820 | 1.705 | 0.115 | 93.7 | |
| EGAN CREST DR | 111960 | 2.303 | 2.303 | 0.000 | 100.0 | |
| EL CAMINO WY | 112017 | 0.368 | 0.200 | 0.168 | 54.3 | |
| EL CAPITAN WY | 112028 | 10.093 | 9.205 | 0.888 | 91.2 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| ELKHORN RD | 112230 | 8.002 | 6.834 | 1.167 | 85.4 | |
| ENDORA WY | 112491 | 0.232 | 0.232 | 0.000 | 100.0 | |
| EQUESTRIAN DR | 112569 | 1.528 | 1.528 | 0.000 | 100.0 | |
| E ERIE AV | 112580 | 0.746 | 0.746 | 0.000 | 100.0 | |
| ERNEST MAY LA | 112599 | 0.272 | 0.272 | 0.000 | 100.0 | |
| ESSEX AV | 112650 | 0.989 | 0.494 | 0.496 | 49.9 | |
| EVANS AV | 112747 | 0.756 | 0.756 | 0.000 | 100.0 | |
| EXECUTIVE AIRPORT DR | 112851 | 1.846 | 0.954 | 0.892 | 51.7 | |
| F ST | 112889 | 0.167 | 0.167 | 0.000 | 100.0 | |
| FAIRWAY DR | 112971 | 0.766 | 0.493 | 0.273 | 64.4 | |
| FAR HILLS AV | 113106 | 1.832 | 1.832 | 0.000 | 100.0 | |
| FARM RD | 113128 | 6.705 | 5.721 | 0.984 | 85.3 | |
| FLAMINGO RD | 113550 | 8.416 | 7.643 | 0.773 | 90.8 | |
| FOGG ST | 113714 | 1.013 | 1.013 | 0.000 | 100.0 | |
| FOOTHILLS DR | 113754 | 0.996 | 0.996 | 0.000 | 100.0 | |
| FORT APACHE RD | 113819 | 17.817 | 15.570 | 2.246 | 87.4 | |
| INDUSTRIAL RD | 113992 | 2.544 | 2.502 | 0.042 | 98.3 | |
| FRANK SINATRA DR | 114015 | 3.139 | 2.095 | 1.044 | 66.7 | |
| FREHNER RD | 114078 | 0.147 | 0.147 | 0.000 | 100.0 | |
| FREMONT ST | 114089 | 0.144 | 0.144 | 0.000 | 100.0 | |
| W GALLERIA DR | 114332 | 1.991 | 1.465 | 0.526 | 73.6 | |
| GANN AV | 114372 | 0.255 | 0.255 | 0.000 | 100.0 | |
| GEORGIA AV | 114643 | 1.899 | 1.387 | 0.512 | 73.0 | |
| GIBSON RD | 114712 | 3.849 | 3.529 | 0.320 | 91.7 | |
| GILES ST | 114731 | 0.246 | 0.246 | 0.000 | 100.0 | |
| GINGERWOOD PKWY | 114764 | 0.218 | 0.218 | 0.000 | 100.0 | |
| GINGERWOOD ST | 114765 | 0.465 | 0.256 | 0.209 | 55.1 | |
| ANTHEM PKWY | 114781 | 4.763 | 2.822 | 1.941 | 59.3 | |
| GLORIA LA | 114954 | 0.286 | 0.286 | 0.000 | 100.0 | |
| GOMER RD | 115246 | 2.619 | 1.783 | 0.836 | 68.1 | |
| GOWAN RD | 115315 | 12.503 | 10.800 | 1.703 | 86.4 | |
| GOWAN RD | 115316 | 1.328 | 1.328 | 0.000 | 100.0 | |
| GRAND CANYON DR | 115369 | 12.638 | 10.909 | 1.729 | 86.3 | |
| S GRAND CENTRAL PKWY | 115372 | 1.196 | 0.860 | 0.336 | 71.9 | |
| GRAND TETON DR | 115418 | 8.989 | 6.611 | 2.378 | 73.5 | |
| GREEN VALLEY PKWY | 115662 | 5.368 | 5.368 | 0.000 | 100.0 | |
| GREENWAY RD | 115739 | 3.034 | 2.605 | 0.428 | 85.9 | |
| H ST | 115996 | 1.277 | 1.277 | 0.000 | 100.0 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| W HACIENDA AV | 116005 | 12.195 | 10.669 | 1.526 | 87.5 | |
| HAFEN LA | 116033 | 1.038 | 0.796 | 0.241 | 76.7 | |
| HAMPTON RD | 116141 | 1.580 | 1.580 | 0.000 | 100.0 | |
| HARDY WY | 116246 | 0.888 | 0.888 | 0.000 | 100.0 | |
| E HARMON AV | 116259 | 8.952 | 8.554 | 0.398 | 95.5 | |
| HEATHER DR | 116549 | 0.755 | 0.755 | 0.000 | 100.0 | |
| HIGHLAND AV | 116937 | 0.431 | 0.431 | 0.000 | 100.0 | |
| HIGHLAND DR | 116943 | 1.620 | 1.187 | 0.432 | 73.3 | |
| HIGHLAND DR | 116946 | 0.279 | 0.183 | 0.096 | 65.7 | |
| HIGH VIEW DR | 116990 | 0.711 | 0.711 | 0.000 | 100.0 | |
| HILLS CENTER DR | 117015 | 0.878 | 0.878 | 0.000 | 100.0 | |
| HILLSIDE DR | 117081 | 0.907 | 0.907 | 0.000 | 100.0 | |
| HOLLYWOOD BLVD | 117231 | 8.910 | 6.272 | 2.638 | 70.4 | |
| HORIZON DR | 117379 | 1.969 | 1.969 | 0.000 | 100.0 | |
| HORIZON RIDGE PKWY | 117387 | 9.982 | 9.818 | 0.164 | 98.4 | |
| HORSE DR | 117413 | 3.570 | 2.138 | 1.432 | 59.9 | |
| HOTEL RIO DR | 117461 | 0.279 | 0.279 | 0.000 | 100.0 | |
| N HUALAPAI WY | 117488 | 13.050 | 10.005 | 3.045 | 76.7 | |
| INDIOS AV | 117841 | 0.266 | 0.266 | 0.000 | 100.0 | |
| INDUSTRIAL RD | 117853 | 0.780 | 0.780 | 0.000 | 100.0 | |
| IONE RD | 117938 | 0.118 | 0.118 | 0.000 | 100.0 | |
| IRON MOUNTAIN RD | 117979 | 2.759 | 1.271 | 1.488 | 46.1 | |
| ISABEL DR | 118036 | 0.040 | 0.040 | 0.000 | 100.0 | |
| ITHACA AV | 118090 | 0.682 | 0.495 | 0.187 | 72.5 | |
| JEFFREYS ST | 118425 | 1.320 | 1.320 | 0.000 | 100.0 | |
| N JENSEN ST | 118456 | 1.015 | 1.015 | 0.000 | 100.0 | |
| JIMMY DURANTE BLVD | 118534 | 1.442 | 1.362 | 0.080 | 94.4 | |
| JOE W BROWN DR | 118577 | 1.123 | 1.123 | 0.000 | 100.0 | |
| JONES BLVD | 118634 | 15.778 | 14.263 | 1.515 | 90.4 | |
| JUDSON AV | 118736 | 0.047 | 0.047 | 0.000 | 100.0 | |
| KAREN AV | 118932 | 3.714 | 3.666 | 0.049 | 98.7 | |
| KINGS WY | 119338 | 0.179 | 0.179 | 0.000 | 100.0 | |
| KOVAL LA | 119542 | 1.723 | 1.723 | 0.000 | 100.0 | |
| W LA MADRE WY | 119665 | 0.270 | 0.270 | 0.000 | 100.0 | |
| LAKE LAS VEGAS PKWY | 119854 | 2.636 | 2.236 | 0.399 | 84.8 | |
| LAKE MEAD BLVD | 119856 | 11.607 | 10.418 | 1.189 | 89.8 | |
| LAKE MEAD PKWY | 119858 | 1.637 | 1.637 | 0.000 | 100.0 | |
| LAKE MOUNTAIN DR | 119866 | 0.683 | 0.462 | 0.221 | 67.6 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| LAMB BLVD | 119961 | 9.602 | 8.726 | 0.876 | 90.9 | |
| LARSON LA | 120150 | 2.070 | 2.070 | 0.000 | 100.0 | |
| S LAS VEGAS BLVD | 120183 | 0.739 | 0.472 | 0.267 | 63.9 | |
| LINDELL RD | 120787 | 8.191 | 7.110 | 1.081 | 86.8 | |
| LOG CABIN WY | 121017 | 1.005 | 0.502 | 0.503 | 49.9 | |
| LONE MOUNTAIN RD | 121108 | 13.366 | 11.529 | 1.837 | 86.3 | |
| LOS FELIZ ST | 121265 | 1.979 | 1.979 | 0.000 | 100.0 | |
| LOSEE RD | 121286 | 7.184 | 7.184 | 0.000 | 100.0 | |
| LOTTO STORE RD | 121317 | 0.185 | 0.185 | 0.000 | 100.0 | |
| S MAGIC WY | 121681 | 1.601 | 1.601 | 0.000 | 100.0 | |
| MAJOR AV | 121796 | 1.938 | 1.938 | 0.000 | 100.0 | |
| MANCHA DR | 121877 | 0.377 | 0.377 | 0.000 | 100.0 | |
| E MANDALAY BAY RD | 121886 | 0.594 | 0.410 | 0.184 | 69.0 | |
| MARINA DR | 122167 | 0.975 | 0.391 | 0.584 | 40.1 | |
| MARION DR | 122188 | 4.262 | 3.510 | 0.752 | 82.3 | |
| MARITA DR | 122203 | 0.706 | 0.657 | 0.049 | 93.1 | |
| MARKS ST | 122244 | 1.869 | 1.688 | 0.181 | 90.3 | |
| MARTIN L KING BLVD | 122331 | 5.399 | 5.265 | 0.134 | 97.5 | |
| MARYLAND PKWY | 122385 | 10.192 | 9.958 | 0.233 | 97.7 | |
| W MAULE AV | 122467 | 2.592 | 0.512 | 2.079 | 19.8 | |
| MACFARLAND AV | 122556 | 0.806 | 0.510 | 0.296 | 63.3 | |
| MCLEOD DR | 122641 | 4.808 | 4.538 | 0.270 | 94.4 | |
| MCLEOD ST | 122642 | 0.258 | 0.097 | 0.161 | 37.6 | |
| MEADOWS LA | 122768 | 1.223 | 1.125 | 0.097 | 92.0 | |
| MESQUITE BLVD | 123011 | 2.181 | 1.954 | 0.227 | 89.6 | |
| MICHAEL WY | 123094 | 3.457 | 2.981 | 0.476 | 86.2 | |
| MISSION DR | 123438 | 2.121 | 1.398 | 0.723 | 65.9 | |
| MISSOURI AV | 123458 | 0.336 | 0.057 | 0.279 | 17.0 | |
| MITCHELL ST | 123515 | 0.645 | 0.518 | 0.127 | 80.2 | |
| N RESERVATION RD | 123534 | 1.651 | 1.651 | 0.000 | 100.0 | |
| MOHAWK DR | 123574 | 0.248 | 0.248 | 0.000 | 100.0 | |
| MOJAVE RD | 123589 | 3.619 | 3.619 | 0.000 | 100.0 | |
| MOJAVE RD | 123590 | 2.050 | 2.039 | 0.011 | 99.4 | |
| MOUNTAIN VISTA ST | 124224 | 4.824 | 4.695 | 0.129 | 97.3 | |
| MT HOOD ST | 124280 | 2.784 | 2.012 | 0.772 | 72.3 | |
| NAVAJO DR | 124570 | 0.116 | 0.116 | 0.000 | 100.0 | |
| NEEDLES HWY | 124618 | 11.514 | 11.514 | 0.000 | 100.0 | |
| S NELLIS BLVD | 124639 | 1.204 | 1.204 | 0.000 | 100.0 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| NEVADA STATE DR | 124701 | 0.829 | 0.358 | 0.471 | 43.2 | |
| NEVADA WY | 124712 | 1.935 | 1.712 | 0.223 | 88.5 | |
| NEW MEXICO ST | 124740 | 0.718 | 0.592 | 0.126 | 82.5 | |
| NEWPORT DR | 124801 | 1.170 | 0.995 | 0.175 | 85.0 | |
| NORTHBRIDGE LA | 125447 | 0.195 | 0.195 | 0.000 | 100.0 | |
| NORTHRIDGE DR | 125466 | 0.271 | 0.271 | 0.000 | 100.0 | |
| OAKEY BLVD | 125632 | 9.032 | 8.417 | 0.615 | 93.2 | |
| E OGDEN AV | 125788 | 2.009 | 1.729 | 0.279 | 86.1 | |
| OLIVIA HEIGHTS AV | 125970 | 0.680 | 0.490 | 0.190 | 72.0 | |
| OLMO WY | 125973 | 0.147 | 0.062 | 0.085 | 42.2 | |
| OLSEN ST | 125976 | 0.917 | 0.917 | 0.000 | 100.0 | |
| OWENS AV | 126336 | 8.050 | 7.429 | 0.620 | 92.3 | |
| PABCO RD | 126389 | 1.405 | 1.159 | 0.246 | 82.5 | |
| PACIFIC AV | 126401 | 0.307 | 0.057 | 0.250 | 18.6 | |
| E PACIFIC AV | 126404 | 1.895 | 1.742 | 0.153 | 91.9 | |
| PACIFICA WY | 126449 | 0.464 | 0.464 | 0.000 | 100.0 | |
| PALM ST | 126621 | 1.327 | 1.327 | 0.000 | 100.0 | |
| PALO VERDE DR | 126697 | 1.679 | 1.629 | 0.050 | 97.0 | |
| PALOMA DR | 126711 | 0.404 | 0.404 | 0.000 | 100.0 | |
| PARADISE HILLS DR | 126837 | 2.479 | 1.897 | 0.582 | 76.5 | |
| PARADISE RD | 126845 | 7.899 | 7.432 | 0.467 | 94.1 | |
| PARK ST | 126903 | 0.144 | 0.144 | 0.000 | 100.0 | |
| PARK VISTA DR | 126951 | 1.406 | 0.945 | 0.462 | 67.2 | |
| PASEO VERDE PKWY | 127060 | 4.682 | 4.421 | 0.261 | 94.4 | |
| PATO DR | 127109 | 0.031 | 0.031 | 0.000 | 100.0 | |
| E PATRICK LA | 127125 | 8.122 | 6.250 | 1.873 | 76.9 | |
| PAUITE WY | 127151 | 0.724 | 0.503 | 0.221 | 69.4 | |
| PEACE WY | 127208 | 3.207 | 2.239 | 0.968 | 69.8 | |
| PEBBLE RD | 127326 | 11.170 | 8.978 | 2.192 | 80.4 | |
| PECOS MCLEOD INT | 127352 | 1.176 | 1.114 | 0.063 | 94.7 | |
| PECOS RIDGE PKWY | 127353 | 0.686 | 0.686 | 0.000 | 100.0 | |
| PECOS RD | 127354 | 15.658 | 15.237 | 0.422 | 97.3 | |
| W PERKINS AV | 127524 | 0.380 | 0.380 | 0.000 | 100.0 | |
| W PIONEER BLVD | 127969 | 3.128 | 2.688 | 0.440 | 85.9 | |
| POLLOCK DR | 128311 | 2.483 | 2.454 | 0.029 | 98.8 | |
| PRIMM BLVD | 128646 | 0.386 | 0.386 | 0.000 | 100.0 | |
| PRIMM VALLEY BLVD | 128647 | 0.201 | 0.201 | 0.000 | 100.0 | |
| N PUEBLO BLVD | 128788 | 3.134 | 2.298 | 0.836 | 73.3 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| PYLE AV | 128880 | 4.451 | 2.307 | 2.144 | 51.8 | |
| QUARTZITE RD | 129009 | 0.818 | 0.469 | 0.350 | 57.3 | |
| RACEL ST | 129148 | 3.383 | 1.871 | 1.512 | 55.3 | |
| RACETRACK RD | 129149 | 4.018 | 2.680 | 1.338 | 66.7 | |
| RAILROAD AV | 129207 | 0.143 | 0.143 | 0.000 | 100.0 | |
| RAINBOW BLVD | 129234 | 15.803 | 14.602 | 1.201 | 92.4 | |
| RALEIGH LA | 129295 | 0.250 | 0.250 | 0.000 | 100.0 | |
| RAMPART BLVD | 129518 | 0.284 | 0.284 | 0.000 | 100.0 | |
| RANCHO DR | 129569 | 2.912 | 2.670 | 0.242 | 91.7 | |
| RANGE RD | 129645 | 2.065 | 1.487 | 0.578 | 72.0 | |
| RED HILLS RD | 129852 | 0.681 | 0.611 | 0.070 | 89.8 | |
| RED ROCK RANCH RD | 129885 | 1.295 | 1.295 | 0.000 | 100.0 | |
| RED ROCK RD | 129887 | 0.498 | 0.498 | 0.000 | 100.0 | |
| RENO AV | 130108 | 5.081 | 4.241 | 0.840 | 83.5 | |
| FIESTA HENDERSON BLVD | 130134 | 0.475 | 0.475 | 0.000 | 100.0 | |
| REVERE ST | 130171 | 4.558 | 3.616 | 0.942 | 79.3 | |
| RIVER MOUNTAIN AV | 130572 | 0.267 | 0.267 | 0.000 | 100.0 | |
| RIVIERA BLVD | 130639 | 0.415 | 0.415 | 0.000 | 100.0 | |
| E ROBINDALE RD | 130738 | 10.343 | 9.344 | 0.999 | 90.3 | |
| ROME BLVD | 130983 | 2.373 | 0.820 | 1.553 | 34.5 | |
| S RUE 13 | 131379 | 0.325 | 0.325 | 0.000 | 100.0 | |
| RUSSELL RD | 131475 | 14.335 | 14.232 | 0.103 | 99.3 | |
| W SADDLE AV | 131609 | 0.189 | 0.189 | 0.000 | 100.0 | |
| SAHARA AV | 131772 | 7.579 | 7.419 | 0.159 | 97.9 | |
| SAN FELIPE DR | 131919 | 1.245 | 0.715 | 0.529 | 57.5 | |
| S SANDHILL RD | 132068 | 5.749 | 5.615 | 0.134 | 97.7 | |
| SANDHILL BLVD | 132069 | 0.522 | 0.118 | 0.405 | 22.5 | |
| N SANDHILL RD | 132073 | 1.416 | 1.102 | 0.315 | 77.8 | |
| SANDS AV | 132102 | 0.917 | 0.917 | 0.000 | 100.0 | |
| SANTIAGO DR | 132232 | 0.494 | 0.494 | 0.000 | 100.0 | |
| SEBRING HILLS DR | 132637 | 0.337 | 0.337 | 0.000 | 100.0 | |
| SERENE AV | 132800 | 6.622 | 4.399 | 2.223 | 66.4 | |
| SEVEN HILLS DR | 132842 | 3.300 | 2.759 | 0.541 | 83.6 | |
| SHADOW LA | 132924 | 0.508 | 0.508 | 0.000 | 100.0 | |
| SHAUMBER RD | 133103 | 3.025 | 3.025 | 0.000 | 100.0 | |
| SIENA HEIGHTS DR | 133409 | 1.387 | 1.387 | 0.000 | 100.0 | |
| SILVER SPRINGS PKWY | 133701 | 0.841 | 0.667 | 0.174 | 79.3 | |
| SILVERADO RANCH BLVD | 133744 | 5.876 | 4.157 | 1.718 | 70.8 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| SIMMONS ST | 133788 | 6.072 | 5.389 | 0.683 | 88.8 | |
| SLOAN LA | 134065 | 3.835 | 3.562 | 0.273 | 92.9 | |
| SMOKE RANCH RD | 134103 | 3.451 | 3.414 | 0.037 | 98.9 | |
| SOUTHBRIDGE LA | 134400 | 0.223 | 0.223 | 0.000 | 100.0 | |
| SOUTHERN HIGHLANDS PKWY | 134434 | 3.285 | 2.134 | 1.151 | 65.0 | |
| SPEEDWAY BLVD | 134562 | 1.521 | 1.506 | 0.015 | 99.0 | |
| SPENCER ST | 134570 | 7.008 | 6.483 | 0.525 | 92.5 | |
| SPRING MOUNTAIN RD | 134712 | 7.621 | 7.117 | 0.505 | 93.4 | |
| S SPRING VALLEY PKWY | 134739 | 2.026 | 2.005 | 0.020 | 99.0 | |
| SR 372 COLDCREEK RD | 134869 | 13.083 | 13.083 | 0.000 | 100.0 | |
| SR 41 | 134870 | 3.176 | 3.176 | 0.000 | 100.0 | |
| SR ROAD | 134872 | 1.634 | 1.634 | 0.000 | 100.0 | |
| ST LOUIS AV | 134916 | 4.345 | 4.093 | 0.252 | 94.2 | |
| STARDUST RD | 135042 | 0.425 | 0.425 | 0.000 | 100.0 | |
| STARR AV | 135078 | 2.298 | 0.996 | 1.302 | 43.3 | |
| STARR HILLS AV | 135082 | 1.344 | 1.105 | 0.239 | 82.2 | |
| STATZ ST | 135168 | 2.154 | 1.901 | 0.253 | 88.2 | |
| STEPHANIE ST | 135212 | 6.996 | 6.820 | 0.176 | 97.5 | |
| STEWART AV | 135271 | 7.289 | 7.289 | 0.000 | 100.0 | |
| STUFFLEBEAM AV | 135518 | 1.023 | 0.360 | 0.663 | 35.2 | |
| SUN CITY ANTHEM DR | 135717 | 3.280 | 2.988 | 0.292 | 91.1 | |
| SUNSET RD | 135972 | 11.935 | 7.843 | 4.092 | 65.7 | |
| SWENSON ST | 136195 | 2.908 | 2.908 | 0.000 | 100.0 | |
| TAM DR | 136330 | 0.076 | 0.076 | 0.000 | 100.0 | |
| TEDDY DR | 136556 | 0.171 | 0.171 | 0.000 | 100.0 | |
| TEMPLE ROCK RD | 136601 | 0.283 | 0.075 | 0.208 | 26.6 | |
| N TENAYA WY | 136621 | 18.163 | 13.651 | 4.512 | 75.2 | |
| TOIYABE ST | 137130 | 0.836 | 0.501 | 0.335 | 59.9 | |
| TORREY PINES DR | 137281 | 18.614 | 14.424 | 4.190 | 77.5 | |
| S TOWN CENTER DR | 137334 | 6.884 | 5.241 | 1.643 | 76.1 | |
| TRAIL CANYON RD | 137382 | 1.004 | 1.004 | 0.000 | 100.0 | |
| TREE LINE DR | 137469 | 1.650 | 1.501 | 0.149 | 91.0 | |
| TROPICAL PKWY | 137603 | 15.309 | 12.926 | 2.382 | 84.4 | |
| TROPICANA AV | 137611 | 9.023 | 9.023 | 0.000 | 100.0 | |
| TULE SPRINGS RD | 137683 | 0.891 | 0.634 | 0.257 | 71.2 | |
| TURTLEBACK RD | 137799 | 0.765 | 0.765 | 0.000 | 100.0 | |
| TWAIN AV | 137831 | 12.568 | 11.820 | 0.748 | 94.0 | |
| W UTAH AV | 138068 | 0.395 | 0.172 | 0.223 | 43.5 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| UTAH ST | 138074 | 1.800 | 0.987 | 0.814 | 54.8 | |
| VALLE VERDE DR | 138148 | 4.248 | 3.962 | 0.286 | 93.3 | |
| VALLEY DR | 138166 | 4.063 | 3.064 | 0.999 | 75.4 | |
| VALLEY VIEW BLVD | 138215 | 13.188 | 9.990 | 3.198 | 75.7 | |
| W VAN WAGENEN ST | 138276 | 1.937 | 1.937 | 0.000 | 100.0 | |
| VEGAS DR | 138337 | 7.088 | 6.776 | 0.312 | 95.6 | |
| VEGAS VALLEY DR | 138341 | 6.146 | 4.870 | 1.276 | 79.2 | |
| VETERANS MEMORIAL DR | 138481 | 0.440 | 0.440 | 0.000 | 100.0 | |
| VETERANS MEMORIAL DR | 138482 | 3.161 | 1.541 | 1.619 | 48.8 | |
| VILLAGE CENTER CIR | 138773 | 0.976 | 0.377 | 0.600 | 38.6 | |
| VILLE DR | 138797 | 0.510 | 0.510 | 0.000 | 100.0 | |
| VISTA RUN DR | 138984 | 1.582 | 1.033 | 0.549 | 65.3 | |
| VOLUNTEER BLVD | 139027 | 1.948 | 1.697 | 0.251 | 87.1 | |
| WAGON WHEEL DR | 139084 | 0.611 | 0.506 | 0.106 | 82.7 | |
| WALL ST | 139148 | 0.096 | 0.014 | 0.082 | 14.6 | |
| S WALNUT RD | 139183 | 4.481 | 3.632 | 0.849 | 81.1 | |
| WARM SPRINGS RD | 139262 | 17.893 | 16.488 | 1.405 | 92.1 | |
| WASHBURN RD | 139301 | 9.237 | 8.844 | 0.392 | 95.8 | |
| WASHINGTON AV | 139307 | 13.977 | 13.664 | 0.313 | 97.8 | |
| S WATER ST | 139358 | 1.722 | 0.635 | 1.087 | 36.9 | |
| WAYNE NEWTON BLVD | 139447 | 1.354 | 1.023 | 0.331 | 75.6 | |
| WESTCLIFF DR | 139632 | 1.880 | 1.728 | 0.151 | 92.0 | |
| WESTERN AV | 139643 | 1.253 | 0.976 | 0.277 | 77.9 | |
| WHITMORE ST | 140004 | 0.762 | 0.762 | 0.000 | 100.0 | |
| WHITNEY RANCH DR | 140013 | 1.829 | 1.513 | 0.315 | 82.8 | |
| WIESNER WY | 140039 | 0.616 | 0.616 | 0.000 | 100.0 | |
| WIGWAM AV | 140044 | 7.501 | 5.737 | 1.764 | 76.5 | |
| WIGWAM PKWY | 140046 | 4.299 | 4.263 | 0.036 | 99.2 | |
| WILBER CLARK DI EAST RD | 140050 | 1.068 | 0.805 | 0.263 | 75.4 | |
| WILBER CLARK DI WEST RD | 140051 | 1.142 | 0.958 | 0.184 | 83.9 | |
| W WINDMILL LA | 140403 | 7.837 | 5.593 | 2.244 | 71.4 | |
| WINDMILL PKWY | 140405 | 3.299 | 3.299 | 0.000 | 100.0 | |
| WYNN RD | 140830 | 2.031 | 1.655 | 0.377 | 81.5 | |
| WYOMING AV | 140834 | 2.592 | 2.100 | 0.492 | 81.0 | |
| WYOMING ST | 140838 | 1.166 | 1.166 | 0.000 | 100.0 | |
| YUCCA ST | 140975 | 0.384 | 0.384 | 0.000 | 100.0 | |
| S MAIN ST | 141126 | 0.285 | 0.157 | 0.128 | 55.2 | |
| KNOTTY PINE WY | 170043 | 0.077 | 0.077 | 0.000 | 100.0 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RAINBOW CANYON BLVD | 170048 | 0.407 | 0.145 | 0.263 | 35.5 | |
| WILLIAMS RANCH RD | 170112 | 0.126 | 0.126 | 0.000 | 100.0 | |
| DEMOCRACY DR | 170172 | 0.491 | 0.116 | 0.375 | 23.6 | |
| ALIANTE PKWY | 170176 | 2.816 | 2.683 | 0.132 | 95.3 | |
| S LAS VEGAS BLVD | 170186 | 0.212 | 0.212 | 0.000 | 100.0 | |
| GILESPIE ST | 170188 | 6.621 | 5.115 | 1.506 | 77.2 | |
| SYMPHONY PARK AV | 170457 | 0.424 | 0.233 | 0.191 | 54.9 | |
| ANTHEM HIGHLANDS DR | 179342 | 1.055 | 0.863 | 0.192 | 81.8 | |
| AVIARY WY | 179491 | 1.768 | 1.619 | 0.148 | 91.6 | |
| AZURE DR | 179505 | 0.806 | 0.124 | 0.682 | 15.3 | |
| BICENTENNIAL PKWY | 179663 | 0.509 | 0.281 | 0.229 | 55.1 | |
| FALCON RIDGE PKWY | 180924 | 0.186 | 0.186 | 0.000 | 100.0 | |
| HARMON AV | 181382 | 0.481 | 0.234 | 0.248 | 48.5 | |
| HORIZON BLVD | 181506 | 0.904 | 0.904 | 0.000 | 100.0 | |
| MOUNTAINS EDGE PKWY | 182327 | 3.064 | 3.064 | 0.000 | 100.0 | |
| SUNRIDGE HEIGHTS PKWY | 183718 | 2.324 | 2.294 | 0.031 | 98.7 | |
| WALNUT RD | 184246 | 1.039 | 0.511 | 0.529 | 49.1 | |
| GRAND MONTECITO PKWY | 184495 | 1.166 | 0.310 | 0.856 | 26.6 | |
| E ERIE AV | 186393 | 0.248 | 0.248 | 0.000 | 100.0 | |
| S GREEN VALLEY PKWY | 187736 | 0.104 | 0.104 | 0.000 | 100.0 | |
| ERIE AV | 188350 | 1.010 | 1.010 | 0.000 | 100.0 | |
| ACCESS ENSWORTH | 188767 | 0.200 | 0.200 | 0.000 | 100.0 | |
| ACCESS LUXOR | 188773 | 0.254 | 0.204 | 0.050 | 80.4 | |
| DEAN MARTIN DR | 188960 | 10.338 | 10.218 | 0.120 | 98.8 | |
| JERRY TARKANIAN WY | 189122 | 2.032 | 1.644 | 0.388 | 80.9 | |
| MAIN ST | 189177 | 3.173 | 3.147 | 0.027 | 99.2 | |
| RAPHAEL RIVERA WY | 189302 | 3.773 | 0.755 | 3.018 | 20.0 | |
| ROY HORN WY | 189323 | 3.961 | 0.756 | 3.205 | 19.1 | |
| BRENT THURMAN WY | 189528 | 1.929 | 1.019 | 0.910 | 52.8 | |
| WETLANDS PARK LA | 189536 | 0.139 | 0.139 | 0.000 | 100.0 | |
| CITY PKWY | 189543 | 0.260 | 0.260 | 0.000 | 100.0 | |
| FLIGHT PATH AV | 189556 | 0.237 | 0.094 | 0.143 | 39.5 | |
| SKY POINTE DR | 189572 | 0.916 | 0.664 | 0.252 | 72.5 | |
| RAMP CHAR SUM CEN | 189573 | 0.190 | 0.190 | 0.000 | 100.0 | |
| RAMP CHAR SUM CEN E | 189574 | 0.038 | 0.038 | 0.000 | 100.0 | |
| RAMP SAHAR SUM CEN W | 189577 | 0.036 | 0.036 | 0.000 | 100.0 | |
| RAMP SUM CEN CHAR | 189578 | 0.212 | 0.212 | 0.000 | 100.0 | |
| RAMP SUM CEN SAHAR | 189580 | 0.493 | 0.493 | 0.000 | 100.0 | |

| Route Full Name | RMID | Total length (Miles) | Length covered (Miles) | Length not covered (Miles) | Percentage length covered (%) | Explanation |
|---|---|---|---|---|---|---|
| MEL TORME WY | 189594 | 0.215 | 0.215 | 0.000 | 100.0 | |
| LAS VEGAS BLVD | 189603 | 31.148 | 29.226 | 1.922 | 93.8 | |
| ATHENS AVE | 200022 | 0.748 | 0.748 | 0.000 | 100.0 | |
| RAMP SAHAR SUM CEN | 200039 | 0.419 | 0.419 | 0.000 | 100.0 | |
| SR169 | 200043 | 1.473 | 1.473 | 0.000 | 100.0 | |
| VALLEY OF FIRE RD | 200053 | 0.934 | 0.934 | 0.000 | 100.0 | |
| MARYLAND PKWY S | 200297 | 0.183 | 0.183 | 0.000 | 100.0 | |

**TABLE A-2** Freeway Segments Routes and their Percentage of Routes Length Included in the Database

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| IR 15 N | 1 | 123.749 | 121.489 | 2.260 | 98.2 | Segments outside the city limits only have a few AADT stations. In addition, these segments are not included in DTA model. |
| US93 N | 10 | 47.245 | 35.831 | 11.414 | 75.8 | Segments outside the city limits only have a few AADT stations. In addition, these segments are not included in DTA model. |
| IR15 S | 403 | 123.749 | 119.569 | 4.180 | 96.6 | Segments outside the city limits only have a few AADT stations. In addition, these segments are not included in DTA model. |
| CC215N | 107810 | 38.624 | 11.866 | 26.758 | 30.7 | The CDS network and the DTA model do not match because many segments of CC215 are constructed recently. SA requires reliable AADT for at least past five years. Very few AADT stations have the last five years of data. |
| CC215S | 184498 | 32.135 | 5.301 | 26.833 | 16.5 | The CDS network and the DTA model do not match |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| | | | | | | because many segments of CC215 are constructed recently. SA requires reliable AADT for at least past five years. Very few AADT stations have the last five years of data. |
| W SUMMERLIN PKWY | 135658 | 6.531 | 5.490 | 1.041 | 84.1 | Not many AADT stations. In addition, the last five years of AADT were not meaningful. |
| IR215 W | 2 | 11.689 | 11.385 | 0.304 | 97.4 | |
| IR515 N | 3 | 20.024 | 20.024 | 0.000 | 100.0 | |
| IR215 E | 404 | 11.668 | 11.668 | 0.000 | 100.0 | |
| IR515 S | 405 | 19.922 | 19.922 | 0.000 | 100.0 | |
| US93 S | 413 | 5.062 | 5.062 | 0.000 | 100.0 | |
| US95S | 414 | 84.939 | 64.672 | 20.267 | 76.1 | |
| US95N | 12 | 112.661 | 89.039 | 23.622 | 79.03 | |
| E SUMMERLIN PKWY | 191864 | 5.528 | 5.528 | 0.000 | 100.0 | |

**TABLE A-3** Ramps and their Percentage of Routes Length Included in the Database

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM451 | 451 | 0.418 | 0.418 | 0.000 | 100.000 | |
| RM454 | 454 | 0.397 | 0.397 | 0.000 | 100.000 | |
| RM455 | 455 | 0.308 | 0.308 | 0.000 | 100.000 | |
| RM457 | 457 | 0.228 | 0.228 | 0.000 | 100.000 | |
| RM458 | 458 | 0.505 | 0.505 | 0.000 | 100.000 | |
| RM459 | 459 | 0.05 | 0.05 | 0.000 | 100.000 | |
| RM460 | 460 | 0.205 | 0.205 | 0.000 | 100.000 | |
| RM462 | 462 | 0.418 | 0.418 | 0.000 | 100.000 | |
| RM465 | 465 | 0.206 | 0.162 | 0.044 | 78.641 | |
| RM466 | 466 | 0.198 | 0.198 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM467 | 467 | 0.239 | 0.239 | 0.000 | 100.000 | |
| RM468 | 468 | 0.314 | 0.314 | 0.000 | 100.000 | |
| RM469 | 469 | 0.068 | 0 | 0.068 | 0.000 | |
| RM470 | 470 | 0.479 | 0.38 | 0.099 | 79.332 | |
| RM474 | 474 | 0.593 | 0.593 | 0.000 | 100.000 | |
| RM475 | 475 | 0.455 | 0.455 | 0.000 | 100.000 | |
| RM477 | 477 | 0.201 | 0.201 | 0.000 | 100.000 | |
| RM478 | 478 | 0.064 | 0.064 | 0.000 | 100.000 | |
| RM479 | 479 | 0.245 | 0.245 | 0.000 | 100.000 | |
| RM480 | 480 | 0.043 | 0 | 0.043 | 0.000 | |
| RM482 | 482 | 0.278 | 0.278 | 0.000 | 100.000 | |
| RM489 | 489 | 0.262 | 0.262 | 0.000 | 100.000 | |
| RM490 | 490 | 0.291 | 0.291 | 0.000 | 100.000 | |
| RM496 | 496 | 0.492 | 0.418 | 0.074 | 84.959 | |
| RM499 | 499 | 0.263 | 0.263 | 0.000 | 100.000 | |
| RM500 | 500 | 0.47 | 0.47 | 0.000 | 100.000 | |
| RM502 | 502 | 0.254 | 0.254 | 0.000 | 100.000 | |
| RM510 | 510 | 0.198 | 0.198 | 0.000 | 100.000 | |
| RM511 | 511 | 0.633 | 0.633 | 0.000 | 100.000 | |
| RM514 | 514 | 0.23 | 0.23 | 0.000 | 100.000 | |
| RM515 | 515 | 0.288 | 0.27 | 0.018 | 93.750 | |
| RM520 | 520 | 0.055 | 0.055 | 0.000 | 100.000 | |
| RM521 | 521 | 0.379 | 0.379 | 0.000 | 100.000 | |
| RM522 | 522 | 0.317 | 0.317 | 0.000 | 100.000 | |
| RM524 | 524 | 0.211 | 0.211 | 0.000 | 100.000 | |
| RM525 | 525 | 0.251 | 0.251 | 0.000 | 100.000 | |
| RM526 | 526 | 0.221 | 0 | 0.221 | 0.000 | |
| RM527 | 527 | 0.397 | 0.369 | 0.028 | 92.947 | |
| RM528 | 528 | 0.195 | 0.195 | 0.000 | 100.000 | |
| RM529 | 529 | 0.239 | 0.239 | 0.000 | 100.000 | |
| RM532 | 532 | 0.072 | 0 | 0.072 | 0.000 | |
| RM534 | 534 | 0.02 | 0 | 0.020 | 0.000 | |
| RM536 | 536 | 0.264 | 0.264 | 0.000 | 100.000 | |
| RM537 | 537 | 0.474 | 0.474 | 0.000 | 100.000 | |
| RM538 | 538 | 0.304 | 0.304 | 0.000 | 100.000 | |
| RM539 | 539 | 0.293 | 0.293 | 0.000 | 100.000 | |
| RM544 | 544 | 0.293 | 0.271 | 0.022 | 92.491 | |
| RM753 | 753 | 0.441 | 0.441 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM755 | 755 | 0.347 | 0.347 | 0.000 | 100.000 | |
| RM756 | 756 | 0.285 | 0.285 | 0.000 | 100.000 | |
| RM757 | 757 | 0.268 | 0.268 | 0.000 | 100.000 | |
| RM758 | 758 | 0.254 | 0.254 | 0.000 | 100.000 | |
| RM760 | 760 | 0.217 | 0.217 | 0.000 | 100.000 | |
| RM782 | 782 | 0.292 | 0.292 | 0.000 | 100.000 | |
| RM783 | 783 | 0.282 | 0.282 | 0.000 | 100.000 | |
| RM784 | 784 | 0.323 | 0.323 | 0.000 | 100.000 | |
| RM785 | 785 | 0.329 | 0.329 | 0.000 | 100.000 | |
| RM786 | 786 | 0.303 | 0.303 | 0.000 | 100.000 | |
| RM787 | 787 | 0.338 | 0.338 | 0.000 | 100.000 | |
| RM788 | 788 | 0.364 | 0.364 | 0.000 | 100.000 | |
| RM790 | 790 | 0.203 | 0.203 | 0.000 | 100.000 | |
| RM791 | 791 | 0.4 | 0.4 | 0.000 | 100.000 | |
| RM792 | 792 | 0.333 | 0.333 | 0.000 | 100.000 | |
| RM793 | 793 | 0.307 | 0.307 | 0.000 | 100.000 | |
| RM796 | 796 | 0.295 | 0.295 | 0.000 | 100.000 | |
| RM797 | 797 | 0.26 | 0.26 | 0.000 | 100.000 | |
| RM798 | 798 | 0.113 | 0.113 | 0.000 | 100.000 | |
| RM799 | 799 | 0.23 | 0.23 | 0.000 | 100.000 | |
| RM800 | 800 | 0.22 | 0.22 | 0.000 | 100.000 | |
| RM801 | 801 | 0.126 | 0.126 | 0.000 | 100.000 | |
| RM802 | 802 | 0.175 | 0.175 | 0.000 | 100.000 | |
| RM803 | 803 | 0.277 | 0.277 | 0.000 | 100.000 | |
| RM804 | 804 | 0.336 | 0.336 | 0.000 | 100.000 | |
| RM805 | 805 | 0.184 | 0.184 | 0.000 | 100.000 | |
| RM806 | 806 | 0.207 | 0.207 | 0.000 | 100.000 | |
| RM807 | 807 | 0.23 | 0.23 | 0.000 | 100.000 | |
| RM808 | 808 | 0.358 | 0.358 | 0.000 | 100.000 | |
| RM810 | 810 | 0.356 | 0.356 | 0.000 | 100.000 | |
| RM812 | 812 | 0.225 | 0.225 | 0.000 | 100.000 | |
| RM815 | 815 | 0.318 | 0.318 | 0.000 | 100.000 | |
| RM875 | 875 | 0.242 | 0.242 | 0.000 | 100.000 | |
| RM955 | 955 | 0.266 | 0.265 | 0.001 | 99.624 | |
| RM958 | 958 | 0.416 | 0.416 | 0.000 | 100.000 | |
| RM962 | 962 | 0.338 | 0.338 | 0.000 | 100.000 | |
| RM963 | 963 | 0.077 | 0.077 | 0.000 | 100.000 | |
| RM964 | 964 | 0.336 | 0.336 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM966 | 966 | 0.385 | 0 | 0.385 | 0.000 | |
| RM969 | 969 | 0.445 | 0.346 | 0.099 | 77.753 | |
| RM970 | 970 | 0.588 | 0.588 | 0.000 | 100.000 | |
| RM1007 | 1007 | 0.349 | 0.349 | 0.000 | 100.000 | |
| RM1008 | 1008 | 0.246 | 0.201 | 0.045 | 81.707 | |
| RM1025 | 1025 | 0.476 | 0.476 | 0.000 | 100.000 | |
| RM1026 | 1026 | 0.157 | 0 | 0.157 | 0.000 | |
| RM1027 | 1027 | 0.084 | 0.084 | 0.000 | 100.000 | |
| RM1028 | 1028 | 0.059 | 0.059 | 0.000 | 100.000 | |
| RM1029 | 1029 | 0.083 | 0.083 | 0.000 | 100.000 | |
| RM1042 | 1042 | 0.069 | 0 | 0.069 | 0.000 | |
| RM1044 | 1044 | 0.417 | 0.417 | 0.000 | 100.000 | |
| RM1046 | 1046 | 0.321 | 0.321 | 0.000 | 100.000 | |
| RM1048 | 1048 | 0.388 | 0.388 | 0.000 | 100.000 | |
| RM1049 | 1049 | 0.382 | 0.104 | 0.278 | 27.225 | |
| RM1082 | 1082 | 0.139 | 0.088 | 0.051 | 63.309 | |
| RM10001 | 10001 | 0.286 | 0.286 | 0.000 | 100.000 | |
| RM10002 | 10002 | 0.405 | 0.405 | 0.000 | 100.000 | |
| RM10003 | 10003 | 0.338 | 0.338 | 0.000 | 100.000 | |
| RM10004 | 10004 | 0.816 | 0.816 | 0.000 | 100.000 | |
| RM10006 | 10006 | 0.366 | 0.366 | 0.000 | 100.000 | |
| RM10007 | 10007 | 0.83 | 0.244 | 0.586 | 29.398 | |
| RM10008 | 10008 | 0.243 | 0.243 | 0.000 | 100.000 | |
| RM10009 | 10009 | 0.408 | 0.408 | 0.000 | 100.000 | |
| RM10010 | 10010 | 0.26 | 0 | 0.260 | 0.000 | |
| RM10011 | 10011 | 0.376 | 0.376 | 0.000 | 100.000 | |
| RM10012 | 10012 | 0.423 | 0.423 | 0.000 | 100.000 | |
| RM10013 | 10013 | 0.534 | 0.534 | 0.000 | 100.000 | |
| RM10014 | 10014 | 0.297 | 0.297 | 0.000 | 100.000 | |
| RM10017 | 10017 | 0.247 | 0.247 | 0.000 | 100.000 | |
| RM10018 | 10018 | 0.298 | 0.298 | 0.000 | 100.000 | |
| RM10020 | 10020 | 0.385 | 0.385 | 0.000 | 100.000 | |
| RM10023 | 10023 | 0.372 | 0.372 | 0.000 | 100.000 | |
| RM10026 | 10026 | 0.349 | 0.349 | 0.000 | 100.000 | |
| RM10027 | 10027 | 0.394 | 0.394 | 0.000 | 100.000 | |
| RM10029 | 10029 | 0.066 | 0 | 0.066 | 0.000 | |
| RM10031 | 10031 | 0.516 | 0.516 | 0.000 | 100.000 | |
| RM10032 | 10032 | 0.44 | 0.44 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10034 | 10034 | 0.457 | 0.457 | 0.000 | 100.000 | |
| RM10036 | 10036 | 0.422 | 0.422 | 0.000 | 100.000 | |
| RM10038 | 10038 | 0.452 | 0.452 | 0.000 | 100.000 | |
| RM10039 | 10039 | 0.514 | 0.514 | 0.000 | 100.000 | |
| RM10041 | 10041 | 0.574 | 0.574 | 0.000 | 100.000 | |
| RM10043 | 10043 | 0.295 | 0.295 | 0.000 | 100.000 | |
| RM10044 | 10044 | 0.07 | 0.07 | 0.000 | 100.000 | |
| RM10045 | 10045 | 0.331 | 0.331 | 0.000 | 100.000 | |
| RM10052 | 10052 | 0.339 | 0.339 | 0.000 | 100.000 | |
| RM10054 | 10054 | 0.028 | 0.028 | 0.000 | 100.000 | |
| RM10055 | 10055 | 0.331 | 0.331 | 0.000 | 100.000 | |
| RM10057 | 10057 | 0.034 | 0.034 | 0.000 | 100.000 | |
| RM10058 | 10058 | 0.311 | 0.311 | 0.000 | 100.000 | |
| RM10060 | 10060 | 0.119 | 0.119 | 0.000 | 100.000 | |
| RM10062 | 10062 | 0.307 | 0.307 | 0.000 | 100.000 | |
| RM10064 | 10064 | 0.133 | 0.133 | 0.000 | 100.000 | |
| RM10065 | 10065 | 0.358 | 0.358 | 0.000 | 100.000 | |
| RM10067 | 10067 | 0.045 | 0.045 | 0.000 | 100.000 | |
| RM10068 | 10068 | 0.35 | 0.35 | 0.000 | 100.000 | |
| RM10070 | 10070 | 0.093 | 0.093 | 0.000 | 100.000 | |
| RM10071 | 10071 | 0.402 | 0.402 | 0.000 | 100.000 | |
| RM10073 | 10073 | 0.366 | 0.366 | 0.000 | 100.000 | |
| RM10074 | 10074 | 0.383 | 0.383 | 0.000 | 100.000 | |
| RM10075 | 10075 | 0.063 | 0.063 | 0.000 | 100.000 | |
| RM10076 | 10076 | 0.584 | 0.584 | 0.000 | 100.000 | |
| RM10077 | 10077 | 0.272 | 0.272 | 0.000 | 100.000 | |
| RM10078 | 10078 | 0.286 | 0.286 | 0.000 | 100.000 | |
| RM10079 | 10079 | 0.361 | 0.361 | 0.000 | 100.000 | |
| RM10082 | 10082 | 0.326 | 0.326 | 0.000 | 100.000 | |
| RM10085 | 10085 | 0.389 | 0.389 | 0.000 | 100.000 | |
| RM10087 | 10087 | 0.074 | 0.074 | 0.000 | 100.000 | |
| RM10088 | 10088 | 0.608 | 0.608 | 0.000 | 100.000 | |
| RM10089 | 10089 | 0.205 | 0.205 | 0.000 | 100.000 | |
| RM10091 | 10091 | 0.033 | 0.033 | 0.000 | 100.000 | |
| RM10093 | 10093 | 0.298 | 0.298 | 0.000 | 100.000 | |
| RM10096 | 10096 | 0.132 | 0.132 | 0.000 | 100.000 | |
| RM10097 | 10097 | 0.398 | 0.398 | 0.000 | 100.000 | |
| RM10098 | 10098 | 0.276 | 0.276 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10100 | 10100 | 0.05 | 0.05 | 0.000 | 100.000 | |
| RM10102 | 10102 | 0.348 | 0.348 | 0.000 | 100.000 | |
| RM10106 | 10106 | 0.31 | 0.31 | 0.000 | 100.000 | |
| RM10107 | 10107 | 0.054 | 0 | 0.054 | 0.000 | |
| RM10108 | 10108 | 0.286 | 0.286 | 0.000 | 100.000 | |
| RM10109 | 10109 | 0.251 | 0.213 | 0.038 | 84.861 | |
| RM10111 | 10111 | 0.25 | 0.25 | 0.000 | 100.000 | |
| RM10112 | 10112 | 0.282 | 0.257 | 0.025 | 91.135 | |
| RM10115 | 10115 | 0.113 | 0.035 | 0.078 | 30.973 | |
| RM10116 | 10116 | 0.855 | 0.855 | 0.000 | 100.000 | |
| RM10117 | 10117 | 0.395 | 0.395 | 0.000 | 100.000 | |
| RM10118 | 10118 | 0.329 | 0 | 0.329 | 0.000 | |
| RM10120 | 10120 | 0.572 | 0.572 | 0.000 | 100.000 | |
| RM10121 | 10121 | 0.667 | 0.162 | 0.505 | 24.288 | |
| RM10123 | 10123 | 0.097 | 0 | 0.097 | 0.000 | |
| RM10125 | 10125 | 0.063 | 0.063 | 0.000 | 100.000 | |
| RM10128 | 10128 | 1.536 | 1.264 | 0.272 | 82.292 | |
| RM10129 | 10129 | 0.835 | 0.079 | 0.756 | 9.461 | |
| RM10130 | 10130 | 0.5 | 0.5 | 0.000 | 100.000 | |
| RM10131 | 10131 | 0.614 | 0.614 | 0.000 | 100.000 | |
| RM10132 | 10132 | 1.449 | 1.449 | 0.000 | 100.000 | |
| RM10133 | 10133 | 0.332 | 0.332 | 0.000 | 100.000 | |
| RM10135 | 10135 | 0.076 | 0.076 | 0.000 | 100.000 | |
| RM10139 | 10139 | 0.04 | 0.04 | 0.000 | 100.000 | |
| RM10145 | 10145 | 0.357 | 0.357 | 0.000 | 100.000 | |
| RM10150 | 10150 | 0.722 | 0.498 | 0.224 | 68.975 | |
| RM10151 | 10151 | 0.36 | 0.36 | 0.000 | 100.000 | |
| RM10152 | 10152 | 0.254 | 0.254 | 0.000 | 100.000 | |
| RM10153 | 10153 | 0.047 | 0.047 | 0.000 | 100.000 | |
| RM10154 | 10154 | 0.322 | 0.321509 | 0.000 | 99.848 | |
| RM10156 | 10156 | 0.353 | 0.353 | 0.000 | 100.000 | |
| RM DECATUR BLVD N TO US95S INT79 | 10160 | 0.05 | 0 | 0.050 | 0.000 | |
| RM10161 | 10161 | 0.221 | 0.221 | 0.000 | 100.000 | |
| RM10162 | 10162 | 0.323 | 0.323 | 0.000 | 100.000 | |
| RM10163 | 10163 | 0.414 | 0.414 | 0.000 | 100.000 | |
| RM10164 | 10164 | 0.337 | 0.337 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10167 | 10167 | 0.87 | 0.493 | 0.377 | 56.667 | |
| RM10173 | 10173 | 0.529 | 0.413 | 0.116 | 78.072 | |
| RM10174 | 10174 | 0.335 | 0.335 | 0.000 | 100.000 | |
| RM10176 | 10176 | 0.602 | 0.602 | 0.000 | 100.000 | |
| RM10177 | 10177 | 0.407 | 0.407 | 0.000 | 100.000 | |
| RM10191 | 10191 | 0.471 | 0.471 | 0.000 | 100.000 | |
| RM10194 | 10194 | 0.175 | 0.175 | 0.000 | 100.000 | |
| RM10195 | 10195 | 0.381 | 0.381 | 0.000 | 100.000 | |
| RM10196 | 10196 | 0.304 | 0.304 | 0.000 | 100.000 | |
| RM10197 | 10197 | 0.298 | 0.298 | 0.000 | 100.000 | |
| RM10198 | 10198 | 0.393 | 0.393 | 0.000 | 100.000 | |
| RM10201 | 10201 | 0.414 | 0.414 | 0.000 | 100.000 | |
| RM10204 | 10204 | 0.409 | 0.409 | 0.000 | 100.000 | |
| RM10208 | 10208 | 0.463 | 0.463 | 0.000 | 100.000 | |
| RM IR15N TO SPEEDWAY BLVD E INT53 | 10209 | 0.224 | 0 | 0.224 | 0.000 | |
| RM10213 | 10213 | 0.397 | 0.397 | 0.000 | 100.000 | |
| RM10215 | 10215 | 0.386 | 0.386 | 0.000 | 100.000 | |
| RM10216 | 10216 | 0.394 | 0.394 | 0.000 | 100.000 | |
| RM10223 | 10223 | 0.524 | 0.524 | 0.000 | 100.000 | |
| RM10225 | 10225 | 0.461 | 0.461 | 0.000 | 100.000 | |
| RM10226 | 10226 | 0.714 | 0.714 | 0.000 | 100.000 | |
| RM10227 | 10227 | 0.206 | 0.206 | 0.000 | 100.000 | |
| RM10228 | 10228 | 0.097 | 0.097 | 0.000 | 100.000 | |
| RM10230 | 10230 | 0.393 | 0.393 | 0.000 | 100.000 | |
| RM10231 | 10231 | 1.184 | 1.183 | 0.001 | 99.916 | |
| RM10234 | 10234 | 0.284 | 0.284 | 0.000 | 100.000 | |
| RM10236 | 10236 | 0.506 | 0.506 | 0.000 | 100.000 | |
| RM10240 | 10240 | 0.102 | 0.102 | 0.000 | 100.000 | |
| RM10250 | 10250 | 0.125 | 0.125 | 0.000 | 100.000 | |
| RM10252 | 10252 | 1.102 | 0.604 | 0.498 | 54.809 | |
| RM10254 | 10254 | 0.375 | 0.375 | 0.000 | 100.000 | |
| RM10258 | 10258 | 0.558 | 0.367 | 0.191 | 65.771 | |
| RM10260 | 10260 | 0.38 | 0.38 | 0.000 | 100.000 | |
| RM10261 | 10261 | 0.745 | 0.745 | 0.000 | 100.000 | |
| RM10263 | 10263 | 0.773 | 0.773 | 0.000 | 100.000 | |
| RM10264 | 10264 | 0.377 | 0.377 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10266 | 10266 | 0.38 | 0.38 | 0.000 | 100.000 | |
| RM10268 | 10268 | 0.497 | 0.497 | 0.000 | 100.000 | |
| RM10269 | 10269 | 0.404 | 0.404 | 0.000 | 100.000 | |
| RM10270 | 10270 | 0.92 | 0.92 | 0.000 | 100.000 | |
| RM10271 | 10271 | 0.231 | 0.231 | 0.000 | 100.000 | |
| RM10273 | 10273 | 1.127 | 1.127 | 0.000 | 100.000 | |
| RM10275 | 10275 | 0.091 | 0.091 | 0.000 | 100.000 | |
| RM10276 | 10276 | 0.665 | 0.665 | 0.000 | 100.000 | |
| RM10277 | 10277 | 0.5 | 0.372 | 0.128 | 74.400 | |
| RM10279 | 10279 | 0.678 | 0.678 | 0.000 | 100.000 | |
| RM10280 | 10280 | 0.184 | 0 | 0.184 | 0.000 | |
| RM10282 | 10282 | 0.284 | 0 | 0.284 | 0.000 | |
| RM10283 | 10283 | 0.569 | 0.569 | 0.000 | 100.000 | |
| RM10284 | 10284 | 0.35 | 0.35 | 0.000 | 100.000 | |
| RM10286 | 10286 | 0.281 | 0.281 | 0.000 | 100.000 | |
| RM10287 | 10287 | 0.274 | 0.274 | 0.000 | 100.000 | |
| RM10289 | 10289 | 0.25 | 0.25 | 0.000 | 100.000 | |
| RM10290 | 10290 | 0.873 | 0.873 | 0.000 | 100.000 | |
| RM10291 | 10291 | 0.294 | 0 | 0.294 | 0.000 | |
| RM10294 | 10294 | 0.525 | 0.525 | 0.000 | 100.000 | |
| RM10296 | 10296 | 0.294 | 0.294 | 0.000 | 100.000 | |
| RM10297 | 10297 | 0.323 | 0.323 | 0.000 | 100.000 | |
| RM10458 | 10458 | 0.017 | 0 | 0.017 | 0.000 | |
| RM10459 | 10459 | 0.015 | 0 | 0.015 | 0.000 | |
| RM10460 | 10460 | 0.028 | 0 | 0.028 | 0.000 | |
| RM10511 | 10511 | 0.054 | 0.054 | 0.000 | 100.000 | |
| RM10516 | 10516 | 0.504 | 0.504 | 0.000 | 100.000 | |
| RM10522 | 10522 | 0.333 | 0.333 | 0.000 | 100.000 | |
| RM10523 | 10523 | 0.278 | 0.278 | 0.000 | 100.000 | |
| RM10529 | 10529 | 0.411 | 0 | 0.411 | 0.000 | |
| RM10530 | 10530 | 0.113 | 0.113 | 0.000 | 100.000 | |
| RM10531 | 10531 | 0.368 | 0.368 | 0.000 | 100.000 | |
| RM10532 | 10532 | 0.28 | 0.28 | 0.000 | 100.000 | |
| RM10533 | 10533 | 0.448 | 0.448 | 0.000 | 100.000 | |
| RM10534 | 10534 | 0.385 | 0.385 | 0.000 | 100.000 | |
| RM10538 | 10538 | 0.387 | 0.387 | 0.000 | 100.000 | |
| RM10539 | 10539 | 0.392 | 0 | 0.392 | 0.000 | |
| RM10541 | 10541 | 0.084 | 0 | 0.084 | 0.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10542 | 10542 | 0.129 | 0.129 | 0.000 | 100.000 | |
| RM10543 | 10543 | 0.133 | 0.133 | 0.000 | 100.000 | |
| RM10544 | 10544 | 0.199 | 0.199 | 0.000 | 100.000 | |
| RM10545 | 10545 | 0.129 | 0.129 | 0.000 | 100.000 | |
| RM10548 | 10548 | 0.093 | 0.093 | 0.000 | 100.000 | |
| RM10549 | 10549 | 0.1 | 0.1 | 0.000 | 100.000 | |
| RM10550 | 10550 | 0.137 | 0.137 | 0.000 | 100.000 | |
| RM10551 | 10551 | 0.107 | 0.107 | 0.000 | 100.000 | |
| RM10558 | 10558 | 0.045 | 0.045 | 0.000 | 100.000 | |
| RM10560 | 10560 | 0.043 | 0.043 | 0.000 | 100.000 | |
| RM10562 | 10562 | 0.401 | 0.401 | 0.000 | 100.000 | |
| RM10563 | 10563 | 0.091 | 0.091 | 0.000 | 100.000 | |
| RM10564 | 10564 | 0.389 | 0.389 | 0.000 | 100.000 | |
| RM10565 | 10565 | 0.099 | 0.099 | 0.000 | 100.000 | |
| RM10567 | 10567 | 0.379 | 0.379 | 0.000 | 100.000 | |
| RM10568 | 10568 | 0.051 | 0.051 | 0.000 | 100.000 | |
| RM10570 | 10570 | 0.385 | 0.385 | 0.000 | 100.000 | |
| RM10573 | 10573 | 0.394 | 0.394 | 0.000 | 100.000 | |
| RM10574 | 10574 | 0.049 | 0.049 | 0.000 | 100.000 | |
| RM10576 | 10576 | 0.083 | 0.083 | 0.000 | 100.000 | |
| RM10577 | 10577 | 0.404 | 0.404 | 0.000 | 100.000 | |
| RM10578 | 10578 | 0.063 | 0.063 | 0.000 | 100.000 | |
| RM10579 | 10579 | 0.392 | 0.392 | 0.000 | 100.000 | |
| RM10580 | 10580 | 0.026 | 0.026 | 0.000 | 100.000 | |
| RM10582 | 10582 | 0.438 | 0.438 | 0.000 | 100.000 | |
| RM10583 | 10583 | 0.083 | 0.083 | 0.000 | 100.000 | |
| RM10584 | 10584 | 0.078 | 0.078 | 0.000 | 100.000 | |
| RM10585 | 10585 | 0.32 | 0.32 | 0.000 | 100.000 | |
| RM10587 | 10587 | 0.325 | 0.325 | 0.000 | 100.000 | |
| RM10589 | 10589 | 0.26 | 0.26 | 0.000 | 100.000 | |
| RM10591 | 10591 | 0.318 | 0.217 | 0.101 | 68.239 | |
| RM10593 | 10593 | 0.054 | 0.054 | 0.000 | 100.000 | |
| RM10594 | 10594 | 0.049 | 0 | 0.049 | 0.000 | |
| RM10602 | 10602 | 0.326 | 0.326 | 0.000 | 100.000 | |
| RM10606 | 10606 | 0.451 | 0.451 | 0.000 | 100.000 | |
| RM10610 | 10610 | 0.214 | 0.214 | 0.000 | 100.000 | |
| RM10613 | 10613 | 0.364 | 0.364 | 0.000 | 100.000 | |
| RM10616 | 10616 | 0.363 | 0.363 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10618 | 10618 | 0.381 | 0.381 | 0.000 | 100.000 | |
| RM10622 | 10622 | 0.165 | 0.165 | 0.000 | 100.000 | |
| RM10623 | 10623 | 0.339 | 0.339 | 0.000 | 100.000 | |
| RM10625 | 10625 | 0.293 | 0.293 | 0.000 | 100.000 | |
| RM10626 | 10626 | 0.251 | 0.251 | 0.000 | 100.000 | |
| RM10631 | 10631 | 0.333 | 0.333 | 0.000 | 100.000 | |
| RM10633 | 10633 | 0.352 | 0.352 | 0.000 | 100.000 | |
| RM10634 | 10634 | 0.177 | 0.177 | 0.000 | 100.000 | |
| RM10641 | 10641 | 0.295 | 0.295 | 0.000 | 100.000 | |
| RM10644 | 10644 | 0.407 | 0.407 | 0.000 | 100.000 | |
| RM10645 | 10645 | 0.271 | 0.222 | 0.049 | 81.919 | |
| RM10646 | 10646 | 0.026 | 0.026 | 0.000 | 100.000 | |
| RM10648 | 10648 | 0.238 | 0.238 | 0.000 | 100.000 | |
| RM10649 | 10649 | 0.388 | 0.388 | 0.000 | 100.000 | |
| RM10650 | 10650 | 0.319 | 0.319 | 0.000 | 100.000 | |
| RM10654 | 10654 | 0.176 | 0.133 | 0.043 | 75.568 | |
| RM10702 | 10702 | 0.304 | 0.304 | 0.000 | 100.000 | |
| RM10723 | 10723 | 1.429 | 1.429 | 0.000 | 100.000 | |
| RM10724 | 10724 | 0.599 | 0.540385 | 0.059 | 90.215 | |
| RM10726 | 10726 | 0.62 | 0.62 | 0.000 | 100.000 | |
| RM10727 | 10727 | 0.814 | 0.814 | 0.000 | 100.000 | |
| RM10728 | 10728 | 0.249 | 0.249 | 0.000 | 100.000 | |
| RM10729 | 10729 | 0.476 | 0.476 | 0.000 | 100.000 | |
| RM10731 | 10731 | 0.431 | 0.431 | 0.000 | 100.000 | |
| RM10732 | 10732 | 0.689 | 0.689 | 0.000 | 100.000 | |
| RM10733 | 10733 | 0.187 | 0.187 | 0.000 | 100.000 | |
| RM10734 | 10734 | 0.227 | 0.226705 | 0.000 | 99.870 | |
| RM10735 | 10735 | 0.307 | 0.307 | 0.000 | 100.000 | |
| RM10736 | 10736 | 0.253 | 0.253 | 0.000 | 100.000 | |
| RM10737 | 10737 | 0.209 | 0.209 | 0.000 | 100.000 | |
| RM10738 | 10738 | 0.422 | 0.422 | 0.000 | 100.000 | |
| RM10739 | 10739 | 0.239 | 0.239 | 0.000 | 100.000 | |
| RM10774 | 10774 | 0.349 | 0.349 | 0.000 | 100.000 | |
| RM10775 | 10775 | 0.412 | 0.412 | 0.000 | 100.000 | |
| RM10802 | 10802 | 0.359 | 0.359 | 0.000 | 100.000 | |
| RM10803 | 10803 | 0.369 | 0.369 | 0.000 | 100.000 | |
| RM10804 | 10804 | 0.521 | 0.521 | 0.000 | 100.000 | |
| RM10805 | 10805 | 0.354 | 0.354 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10806 | 10806 | 0.17 | 0.17 | 0.000 | 100.000 | |
| RM10807 | 10807 | 0.091 | 0.091 | 0.000 | 100.000 | |
| RM10809 | 10809 | 0.386 | 0.386 | 0.000 | 100.000 | |
| RM10810 | 10810 | 0.449 | 0.449 | 0.000 | 100.000 | |
| RM10811 | 10811 | 0.276 | 0.276 | 0.000 | 100.000 | |
| RM10814 | 10814 | 0.093 | 0.093 | 0.000 | 100.000 | |
| RM10815 | 10815 | 0.238 | 0.187 | 0.051 | 78.571 | |
| RM10816 | 10816 | 0.393 | 0.393 | 0.000 | 100.000 | |
| RM10817 | 10817 | 0.091 | 0.091 | 0.000 | 100.000 | |
| RM10818 | 10818 | 0.342 | 0.342 | 0.000 | 100.000 | |
| RM10819 | 10819 | 0.08 | 0.08 | 0.000 | 100.000 | |
| RM10820 | 10820 | 0.249 | 0.249 | 0.000 | 100.000 | |
| RM10821 | 10821 | 0.071 | 0.071 | 0.000 | 100.000 | |
| RM10822 | 10822 | 0.298 | 0.298 | 0.000 | 100.000 | |
| RM10824 | 10824 | 1.327 | 1.327 | 0.000 | 100.000 | |
| RM10825 | 10825 | 0.332 | 0.332 | 0.000 | 100.000 | |
| RM10826 | 10826 | 0.09 | 0.09 | 0.000 | 100.000 | |
| RM10827 | 10827 | 0.229 | 0.229 | 0.000 | 100.000 | |
| RM10828 | 10828 | 0.078 | 0.078 | 0.000 | 100.000 | |
| RM10829 | 10829 | 0.321 | 0.321 | 0.000 | 100.000 | |
| RM10830 | 10830 | 0.095 | 0.095 | 0.000 | 100.000 | |
| RM10831 | 10831 | 0.337 | 0.337 | 0.000 | 100.000 | |
| RM10832 | 10832 | 0.084 | 0.084 | 0.000 | 100.000 | |
| RM10833 | 10833 | 0.141 | 0.141 | 0.000 | 100.000 | |
| RM10834 | 10834 | 0.4 | 0.382 | 0.018 | 95.500 | |
| RM10835 | 10835 | 0.342 | 0.342 | 0.000 | 100.000 | |
| RM10836 | 10836 | 0.06 | 0.06 | 0.000 | 100.000 | |
| RM10838 | 10838 | 0.243 | 0.243 | 0.000 | 100.000 | |
| RM10839 | 10839 | 0.051 | 0.051 | 0.000 | 100.000 | |
| RM10840 | 10840 | 0.234 | 0.17 | 0.064 | 72.650 | |
| RM10841 | 10841 | 0.06 | 0 | 0.060 | 0.000 | |
| RM10842 | 10842 | 0.323 | 0.323 | 0.000 | 100.000 | |
| RM10843 | 10843 | 0.047 | 0.047 | 0.000 | 100.000 | |
| RM10844 | 10844 | 0.31 | 0.31 | 0.000 | 100.000 | |
| RM10846 | 10846 | 0.452 | 0.452 | 0.000 | 100.000 | |
| RM10847 | 10847 | 0.078 | 0.078 | 0.000 | 100.000 | |
| RM10848 | 10848 | 0.386 | 0.386 | 0.000 | 100.000 | |
| RM10849 | 10849 | 0.13 | 0.13 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10850 | 10850 | 0.329 | 0.329 | 0.000 | 100.000 | |
| RM10851 | 10851 | 0.082 | 0.082 | 0.000 | 100.000 | |
| RM10852 | 10852 | 0.457 | 0.457 | 0.000 | 100.000 | |
| RM10853 | 10853 | 0.084 | 0.084 | 0.000 | 100.000 | |
| RM10854 | 10854 | 0.333 | 0.333 | 0.000 | 100.000 | |
| RM10855 | 10855 | 0.065 | 0.065 | 0.000 | 100.000 | |
| RM10856 | 10856 | 0.247 | 0.247 | 0.000 | 100.000 | |
| RM10857 | 10857 | 0.094 | 0.094 | 0.000 | 100.000 | |
| RM10858 | 10858 | 0.466 | 0.466 | 0.000 | 100.000 | |
| RM10859 | 10859 | 0.058 | 0.058 | 0.000 | 100.000 | |
| RM10860 | 10860 | 0.354 | 0.354 | 0.000 | 100.000 | |
| RM10861 | 10861 | 0.276 | 0.276 | 0.000 | 100.000 | |
| RM10862 | 10862 | 0.051 | 0.051 | 0.000 | 100.000 | |
| RM10863 | 10863 | 0.321 | 0.226 | 0.095 | 70.405 | |
| RM10864 | 10864 | 0.344 | 0.263 | 0.081 | 76.453 | |
| RM10865 | 10865 | 0.063 | 0 | 0.063 | 0.000 | |
| RM10866 | 10866 | 0.309 | 0.309 | 0.000 | 100.000 | |
| RM10867 | 10867 | 0.046 | 0.046 | 0.000 | 100.000 | |
| RM10868 | 10868 | 0.688 | 0.688 | 0.000 | 100.000 | |
| RM10869 | 10869 | 0.606 | 0.606 | 0.000 | 100.000 | |
| RM10870 | 10870 | 0.316 | 0.316 | 0.000 | 100.000 | |
| RM10871 | 10871 | 0.344 | 0.344 | 0.000 | 100.000 | |
| RM10899 | 10899 | 0.164 | 0.045 | 0.119 | 27.439 | |
| RM10900 | 10900 | 0.497 | 0.288 | 0.209 | 57.948 | |
| RM10901 | 10901 | 0.084 | 0.084 | 0.000 | 100.000 | |
| RM10902 | 10902 | 0.115 | 0.115 | 0.000 | 100.000 | |
| RM10903 | 10903 | 0.553 | 0.5536 | -0.001 | 100.108 | |
| RM10904 | 10904 | 0.356 | 0.356 | 0.000 | 100.000 | |
| RM10905 | 10905 | 0.344 | 0.344 | 0.000 | 100.000 | |
| RM10907 | 10907 | 0.67 | 0.67 | 0.000 | 100.000 | |
| RM10908 | 10908 | 0.51 | 0.51 | 0.000 | 100.000 | |
| RM10910 | 10910 | 0.204 | 0.204 | 0.000 | 100.000 | |
| RM10911 | 10911 | 0.085 | 0.077 | 0.008 | 90.588 | |
| RM10912 | 10912 | 0.411 | 0.411 | 0.000 | 100.000 | |
| RM10913 | 10913 | 0.04 | 0.04 | 0.000 | 100.000 | |
| RM10915 | 10915 | 0.194 | 0.194 | 0.000 | 100.000 | |
| RM10917 | 10917 | 0.44 | 0.44 | 0.000 | 100.000 | |
| RM10918 | 10918 | 0.058 | 0.01 | 0.048 | 17.241 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RM10919 | 10919 | 0.391 | 0.219 | 0.172 | 56.010 | |
| RM10920 | 10920 | 0.295 | 0.295 | 0.000 | 100.000 | |
| RM10921 | 10921 | 0.09 | 0.09 | 0.000 | 100.000 | |
| RM10922 | 10922 | 0.284 | 0.284 | 0.000 | 100.000 | |
| RM10923 | 10923 | 0.128 | 0.128 | 0.000 | 100.000 | |
| RM10925 | 10925 | 0.038 | 0.038 | 0.000 | 100.000 | |
| RM10926 | 10926 | 0.055 | 0.055 | 0.000 | 100.000 | |
| RM10928 | 10928 | 0.775 | 0.775 | 0.000 | 100.000 | |
| RM10929 | 10929 | 0.165 | 0.165 | 0.000 | 100.000 | |
| RM10930 | 10930 | 0.65 | 0.65 | 0.000 | 100.000 | |
| RM10931 | 10931 | 0.574 | 0.574 | 0.000 | 100.000 | |
| RM10932 | 10932 | 0.235 | 0.235 | 0.000 | 100.000 | |
| RM10933 | 10933 | 0.607 | 0.607 | 0.000 | 100.000 | |
| RM10934 | 10934 | 0.098 | 0.098 | 0.000 | 100.000 | |
| RM11017 | 11017 | 0.313 | 0 | 0.313 | 0.000 | |
| RM10014 | 11031 | 0.745 | 0.745 | 0.000 | 100.000 | |
| RM11044 | 11044 | 0.268 | 0.268 | 0.000 | 100.000 | |
| RM11010 | 11045 | 0.15 | 0 | 0.150 | 0.000 | |
| RM11011 | 11046 | 0.033 | 0 | 0.033 | 0.000 | |
| RM11205 | 11205 | 0.183 | 0 | 0.183 | 0.000 | |
| RAMP N CC215 DECAT S | 108652 | 0.227 | 0.227 | 0.000 | 100.000 | |
| RAMP BERMUDA G CROC | 129326 | 0.048 | 0.048 | 0.000 | 100.000 | |
| RAMP BUFF N SUM E | 129327 | 0.031 | 0.031 | 0.000 | 100.000 | |
| RAMP BUFF N SUM W | 129328 | 0.209 | 0.209 | 0.000 | 100.000 | |
| RAMP BUFF S SUM W | 129330 | 0.234 | 0.234 | 0.000 | 100.000 | |
| RAMP BUFF SUM E | 129331 | 0.268 | 0.268 | 0.000 | 100.000 | |
| RAMP BYRON N I15 | 129332 | 0.065 | 0 | 0.065 | 0.000 | |
| RAMP BYRON S I15 | 129333 | 0.018 | 0 | 0.018 | 0.000 | |
| RAMP S CC215 CHAR | 129337 | 0.406 | 0.406 | 0.000 | 100.000 | |
| RAMP N CC215 CHAR | 129338 | 0.367 | 0.367 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RAMP N CC215 SAHARA | 129339 | 0.387 | 0.387 | 0.000 | 100.000 | |
| RAMP S CC215 SAHARA | 129340 | 0.336 | 0.336 | 0.000 | 100.000 | |
| RAMP CHAR S CC215 | 129342 | 0.37 | 0.37 | 0.000 | 100.000 | |
| RAMP CHAR N CC215 | 129343 | 0.379 | 0.379 | 0.000 | 100.000 | |
| RAMP CONN AIRPORT S | 129345 | 0.299 | 0 | 0.299 | 0.000 | |
| RAMP CONN DEPARTURE | 129346 | 0.051 | 0 | 0.051 | 0.000 | |
| RAMP CONN NEWTON N | 129347 | 0.232 | 0 | 0.232 | 0.000 | |
| RAMP AIR CN N NEWTN | 129349 | 0.215 | 0 | 0.215 | 0.000 | |
| RAMP AIR CN N FLIGHT | 129351 | 0.116 | 0 | 0.116 | 0.000 | |
| RAMP DECAT N N CC215 | 129352 | 0.083 | 0.083 | 0.000 | 100.000 | |
| RAMP DECATR E I215 | 129353 | 0.248 | 0.248 | 0.000 | 100.000 | |
| RAMP DEPART TO RUSS | 129354 | 0.114 | 0 | 0.114 | 0.000 | |
| RAMP DI ART E HIGH | 129355 | 0.072 | 0.072 | 0.000 | 100.000 | |
| RAMP DI ART E HIGH S | 129356 | 0.087 | 0.087 | 0.000 | 100.000 | |
| RAMP DI ART E RANCHO | 129357 | 0.255 | 0.121 | 0.134 | 47.451 | |
| RAMP DI ART E HIGH | 129358 | 0.028 | 0.028 | 0.000 | 100.000 | |
| RAMP DI ART N RANCHO | 129360 | 0.004 | 0.004 | 0.000 | 100.000 | |
| RAMP DI ART RANC N | 129361 | 0.011 | 0.011 | 0.000 | 100.000 | |
| RAMP DI ART E HIGH | 129362 | 0.19 | 0.19 | 0.000 | 100.000 | |
| RAMP S CC215 FLAM | 129366 | 0.35 | 0.35 | 0.000 | 100.000 | |
| RAMP INDUST E SOBRID | 129369 | 0.045 | 0 | 0.045 | 0.000 | |
| RAMP FLAM S CC215 | 129382 | 0.334 | 0.334 | 0.000 | 100.000 | |
| RAMP FLAM N | 129383 | 0.391 | 0.391 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| CC215 | | | | | | |
| RAMP GRAN CEN I15 N | 129385 | 0.182 | 0.182 | 0.000 | 100.000 | |
| RAMP HIGH DI ART E | 129392 | 0.161 | 0.161 | 0.000 | 100.000 | |
| RAMP HIGH DI ART E | 129393 | 0.176 | 0.176 | 0.000 | 100.000 | |
| RAMP KTY HWK PARA S | 129428 | 0.038 | 0 | 0.038 | 0.000 | |
| RAMP N I 15 W CC 215 | 129436 | 0.224 | 0.224 | 0.000 | 100.000 | |
| RAMP N I15 BYRON | 129437 | 0.06 | 0 | 0.060 | 0.000 | |
| RAMP NEV WY US 93 E | 129439 | 0.153 | 0 | 0.153 | 0.000 | |
| RAMP NEWTON CONN S | 129440 | 0.103 | 0 | 0.103 | 0.000 | |
| RAMP PAR S KTY HWK W | 129442 | 0.036 | 0 | 0.036 | 0.000 | |
| RAMP PARA S KTY HWK | 129443 | 0.076 | 0 | 0.076 | 0.000 | |
| RAMP PARA S RUSS E | 129444 | 0.074 | 0 | 0.074 | 0.000 | |
| RAMP PARA S RUSS W | 129445 | 0.077 | 0 | 0.077 | 0.000 | |
| RAMP PARA S RUSSELL | 129446 | 0.149 | 0 | 0.149 | 0.000 | |
| RAMP RAM SUM E | 129451 | 0.272 | 0.272 | 0.000 | 100.000 | |
| RAMP RAM SUM W | 129452 | 0.169 | 0.169 | 0.000 | 100.000 | |
| RAMP FLIGHTP E PAR S | 129457 | 0.071 | 0 | 0.071 | 0.000 | |
| RAMP RUSS E PARA N | 129458 | 0.039 | 0 | 0.039 | 0.000 | |
| RAMP FLIGHTP NEWTON | 129459 | 0.147 | 0 | 0.147 | 0.000 | |
| RAMP RUSS TO PARA N | 129460 | 0.189 | 0 | 0.189 | 0.000 | |
| RAMP FLIGHTP W NEWT | 129461 | 0.037 | 0 | 0.037 | 0.000 | |
| RAMP RUSS W AIRPORT | 129462 | 0.055 | 0 | 0.055 | 0.000 | |
| RAMP RUSS W NEWTON | 129463 | 0.034 | 0 | 0.034 | 0.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RAMP RUSS W PARA N | 129464 | 0.049 | 0 | 0.049 | 0.000 | |
| RAMP RUSSELL E | 129465 | 0.075 | 0 | 0.075 | 0.000 | |
| RAMP RUSSELL W | 129466 | 0.063 | 0 | 0.063 | 0.000 | |
| RAMP S I15 BYRON | 129468 | 0.014 | 0 | 0.014 | 0.000 | |
| RAMP S I15 SR 161 | 129470 | 0.271 | 0 | 0.271 | 0.000 | |
| RAMP SAHARA S CC215 | 129471 | 0.376 | 0.376 | 0.000 | 100.000 | |
| RAMP SAHARA N CC215 | 129472 | 0.348 | 0.176 | 0.172 | 50.575 | |
| RAMP SAHARA W SOUTH | 129474 | 0.15 | 0.15 | 0.000 | 100.000 | |
| RAMP SUM E BUFF | 129477 | 0.297 | 0.297 | 0.000 | 100.000 | |
| RAMP BUFF S SUM E | 129478 | 0.045 | 0.045 | 0.000 | 100.000 | |
| RAMP SUM E BUFF S | 129479 | 0.03 | 0.03 | 0.000 | 100.000 | |
| RAMP SUM E RAM | 129480 | 0.263 | 0.263 | 0.000 | 100.000 | |
| RAMP SUM E TWN CTR | 129481 | 0.269 | 0.269 | 0.000 | 100.000 | |
| RAMP SUM W BUFF | 129482 | 0.29 | 0.29 | 0.000 | 100.000 | |
| RAMP SUM W BUFF N | 129483 | 0.049 | 0.049 | 0.000 | 100.000 | |
| RAMP SUM W BUFF S | 129484 | 0.055 | 0.055 | 0.000 | 100.000 | |
| RAMP SUM W RAM | 129485 | 0.307 | 0.307 | 0.000 | 100.000 | |
| RAMP SUM W TWN CTR | 129486 | 0.363 | 0.363 | 0.000 | 100.000 | |
| RAMP TO ARRIVALS | 129488 | 0.117 | 0 | 0.117 | 0.000 | |
| RAMP TO NEWTON N | 129489 | 0.089 | 0 | 0.089 | 0.000 | |
| RAMP TO PARK GARAGE | 129490 | 0.072 | 0 | 0.072 | 0.000 | |
| RAMP TO RETURN RD | 129491 | 0.027 | 0 | 0.027 | 0.000 | |
| RAMP TO | 129492 | 0.018 | 0 | 0.018 | 0.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| WRIGHT BRO | | | | | | |
| RAMP TWN CTR SUM E | 129496 | 0.286 | 0.286 | 0.000 | 100.000 | |
| RAMP TWN CTR SUM W | 129497 | 0.287 | 0.287 | 0.000 | 100.000 | |
| RAMP N CC215 FLAM | 129506 | 0.238 | 0.238 | 0.000 | 100.000 | |
| RAMP W SAHARA SCOT | 129510 | 0.099 | 0.099 | 0.000 | 100.000 | |
| RAMP ANAS SUM E | 170310 | 0.33 | 0.33 | 0.000 | 100.000 | |
| RAMP ANAS SUM W | 170311 | 0.339 | 0.339 | 0.000 | 100.000 | |
| RAMP L MEAD N CC215 | 170312 | 0.399 | 0.399 | 0.000 | 100.000 | |
| RAMP L MEAD S CC215 | 170313 | 0.245 | 0.245 | 0.000 | 100.000 | |
| RAMP N CC215 L MEAD | 170314 | 0.32 | 0.32 | 0.000 | 100.000 | |
| RAMP S CC215 L MEAD | 170315 | 0.426 | 0.426 | 0.000 | 100.000 | |
| RAMP SUM E ANAS | 170316 | 0.334 | 0.334 | 0.000 | 100.000 | |
| RAMP SUM W ANAS | 170317 | 0.325 | 0.325 | 0.000 | 100.000 | |
| RAMP ALIANTE N CC215 | 170449 | 0.246 | 0 | 0.246 | 0.000 | |
| RAMP ALIANTE S CC215 | 170450 | 0.262 | 0.262 | 0.000 | 100.000 | |
| RAMP N CC215 ALIANTE | 170451 | 0.273 | 0.273 | 0.000 | 100.000 | |
| RAMP S CC215 ALIANTE | 170452 | 0.306 | 0 | 0.306 | 0.000 | |
| RAMP S CC215 SUNSET | 178846 | 0.071 | 0.071 | 0.000 | 100.000 | |
| RAMP N CC215 CHEY E | 182938 | 0.077 | 0.077 | 0.000 | 100.000 | |
| RAMP N CC215 DURANGO | 182939 | 0.487 | 0.487 | 0.000 | 100.000 | |
| RAMP S CC215 CHEY W | 182940 | 0.121 | 0.121 | 0.000 | 100.000 | |
| RAMP S CC215 HUALA N | 182941 | 0.526 | 0.526 | 0.000 | 100.000 | |
| RAMP DURANGO N | 182942 | 0.414 | 0.414 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| CC215 | | | | | | |
| RAMP DURANGO S CC215 | 182943 | 0.484 | 0.484 | 0.000 | 100.000 | |
| RAMP S CC215 DECAT | 182946 | 0.18 | 0.18 | 0.000 | 100.000 | |
| RAMP FRANK V DEL NRD | 182947 | 0.256 | 0 | 0.256 | 0.000 | |
| RAMP BUFFALO S CC215 | 182948 | 0.258 | 0.258 | 0.000 | 100.000 | |
| RAMP S CC215 JONES | 182949 | 0.201 | 0.201 | 0.000 | 100.000 | |
| RAMP DECAT N CC215 | 182950 | 0.171 | 0.171 | 0.000 | 100.000 | |
| RAMP HUALAPA N CC215 | 182951 | 0.506 | 0.506 | 0.000 | 100.000 | |
| RAMP HUALAPA S CC215 | 182952 | 0.39 | 0.39 | 0.000 | 100.000 | |
| RAMP N CC215 HUALA | 182958 | 0.43 | 0.43 | 0.000 | 100.000 | |
| RAMP LAS VEGAS S 4TH | 182960 | 0.08 | 0 | 0.080 | 0.000 | |
| RAMP SCOTLAND WESTRN | 182964 | 0.045 | 0 | 0.045 | 0.000 | |
| RAMP CHEY W N CC215 | 182971 | 0.061 | 0.061 | 0.000 | 100.000 | |
| RAMP CHEY W S CC215 | 182972 | 0.081 | 0.081 | 0.000 | 100.000 | |
| RAMP N CC215 BUFFALO | 182973 | 0.168 | 0.168 | 0.000 | 100.000 | |
| RAMP S CC215 RAIN | 184496 | 0.323 | 0.323 | 0.000 | 100.000 | |
| RAMP RAIN S CC215 | 184503 | 0.257 | 0.257 | 0.000 | 100.000 | |
| RAMP N CC215 TC S | 187611 | 0.068 | 0.068 | 0.000 | 100.000 | |
| RAMP S CC215 TC N | 187612 | 0.073 | 0.073 | 0.000 | 100.000 | |
| RAMP S CC215 BUFFALO | 187613 | 0.192 | 0.192 | 0.000 | 100.000 | |
| RAMP S CC215 RUSSL | 187614 | 0.206 | 0.206 | 0.000 | 100.000 | |
| RAMP S CC215 SUNSET | 187615 | 0.083 | 0.083 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RAMP BUFFALO N CC215 | 187616 | 0.173 | 0.173 | 0.000 | 100.000 | |
| RAMP DUR N SUM E | 187617 | 0.361 | 0.361 | 0.000 | 100.000 | |
| RAMP RUSSL S CC215 | 187618 | 0.174 | 0.174 | 0.000 | 100.000 | |
| RAMP RUSSL N CC215 | 187619 | 0.123 | 0.123 | 0.000 | 100.000 | |
| RAMP DURANGO S CC215 | 187620 | 0.267 | 0.267 | 0.000 | 100.000 | |
| RAMP SUNSET N CC215 | 187621 | 0.247 | 0.247 | 0.000 | 100.000 | |
| RAMP TC N N CC215 | 187622 | 0.065 | 0.065 | 0.000 | 100.000 | |
| RAMP TC S S CC215 | 187623 | 0.056 | 0.056 | 0.000 | 100.000 | |
| RAMP TROP S CC215 | 187624 | 0.186 | 0.186 | 0.000 | 100.000 | |
| RAMP N CC215 DURANGO | 187626 | 0.195 | 0.195 | 0.000 | 100.000 | |
| RAMP N CC215 RUSSL | 187628 | 0.152 | 0.152 | 0.000 | 100.000 | |
| RAMP N CC215 TROP | 187629 | 0.18 | 0.18 | 0.000 | 100.000 | |
| RAMP W SUM N DUR | 187630 | 0.583 | 0.583 | 0.000 | 100.000 | |
| RAMP N DURANGO N CC215 | 187742 | 0.069 | 0.069 | 0.000 | 100.000 | |
| RAMP S EAST ANTHEM | 188469 | 0.061 | 0 | 0.061 | 0.000 | |
| RAMP S CC215 FLAM W | 188473 | 0.162 | 0.162 | 0.000 | 100.000 | |
| RAMP CHAR SUM CEN | 189573 | 0.19 | 0 | 0.190 | 0.000 | |
| RAMP CHAR SUM CEN E | 189574 | 0.038 | 0 | 0.038 | 0.000 | |
| RAMP CHAR SUM CEN W | 189575 | 0.043 | 0 | 0.043 | 0.000 | |
| RAMP SAHAR SUM CEN E | 189576 | 0.064 | 0 | 0.064 | 0.000 | |
| RAMP SAHAR SUM CEN W | 189577 | 0.036 | 0 | 0.036 | 0.000 | |
| RAMP SUM CEN CHAR | 189578 | 0.212 | 0 | 0.212 | 0.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| RAMP SUM CEN E CHAR | 189579 | 0.022 | 0 | 0.022 | 0.000 | |
| RAMP SUM CEN SAHAR | 189580 | 0.493 | 0 | 0.493 | 0.000 | |
| RAMP SUM CEN W CHAR | 189581 | 0.059 | 0 | 0.059 | 0.000 | |
| RAMP N CC215 DURANGO | 189582 | 0.39 | 0.39 | 0.000 | 100.000 | |
| RAMP N CC215 FLAM E | 189583 | 0.146 | 0.146 | 0.000 | 100.000 | |
| RAMP TC N S CC215 | 189584 | 0.064 | 0.064 | 0.000 | 100.000 | |
| RAMP S CC215 TC S | 189585 | 0.082 | 0.082 | 0.000 | 100.000 | |
| RAMP N CC215 TC | 189586 | 0.224 | 0.224 | 0.000 | 100.000 | |
| RAMP N CC215 TC N | 189587 | 0.064 | 0.064 | 0.000 | 100.000 | |
| RAMP S CC215 TC | 189588 | 0.233 | 0.233 | 0.000 | 100.000 | |
| RAMP S CC215 TROP | 189589 | 0.342 | 0.342 | 0.000 | 100.000 | |
| RAMP TC N CC215 | 189590 | 0.212 | 0.212 | 0.000 | 100.000 | |
| RAMP TC S CC215 | 189591 | 0.203 | 0.203 | 0.000 | 100.000 | |
| RAMP TC S N CC215 | 189592 | 0.059 | 0.059 | 0.000 | 100.000 | |
| RAMP TROP N CC215 | 189593 | 0.39 | 0.39 | 0.000 | 100.000 | |
| RAMP E I215 GIBS S | 191862 | 0.06 | 0.06 | 0.000 | 100.000 | |
| RAMP GIBS S E I215 | 191863 | 0.065 | 0.065 | 0.000 | 100.000 | |
| RAMP N CC215 CHEYENE | 191894 | 0.346 | 0.346 | 0.000 | 100.000 | |
| RAMP CHEYENE S CC215 | 200002 | 0.328 | 0.092 | 0.236 | 28.049 | |
| RAMP S CC215 CHEYENE | 200003 | 0.442 | 0.442 | 0.000 | 100.000 | |
| RAMP CHEYENE N CC215 | 200004 | 0.414 | 0.414 | 0.000 | 100.000 | |
| RAMP N CC215 DECAT N | 200033 | 0.087 | 0.087 | 0.000 | 100.000 | |
| RAMP JONES S | 200034 | 0.242 | 0.242 | 0.000 | 100.000 | |

| Route Full Name | RMID | Length - Total (Miles) | Length - Covered (Miles) | Length - Not Covered (Miles) | Percentage Length - Covered (%) | Explanation |
|---|---|---|---|---|---|---|
| CC215 | | | | | | |
| RAMP JONES N CC215 | 200035 | 0.203 | 0.203 | 0.000 | 100.000 | |
| RAMP RAIN N CC215 | 200036 | 0.259 | 0.259 | 0.000 | 100.000 | |
| RAMP N CC215 RAIN | 200037 | 0.313 | 0.313 | 0.000 | 100.000 | |
| RAMP N CC215 JONES | 200038 | 0.353 | 0.353 | 0.000 | 100.000 | |
| RAMP SAHAR SUM CEN | 200039 | 0.419 | 0 | 0.419 | 0.000 | |
| RAMP DURANGO S CC215N | 200054 | 0.079 | 0.079 | 0.000 | 100.000 | |

**TABLE A-4** Signalized Intersections with Missing AADT at one of the Approaches

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2011 | DESERT INN RD | SR582 |
| 2013 | SR582 | SR612 |
| 2019 | SR573 | SR604 |
| 2052 | INDUSTRIAL RD | FRANK SINATRA DR |
| 2063 | FLAMINGO RD | S DURANGO DR |
| 2072 | DESERT INN RD | S DURANGO DR |
| 2081 | TROPICANA AV | S BUFFALO DR |
| 2085 | PEBBLE RD | LAS VEGAS BLVD |
| 2089 | SR574 | SR604 |
| 2092 | E SERENE AV | SPENCER ST |
| 2110 | SAHARA AV | SLOAN LA |
| 2116 | DESERT INN ART EAST | PARADISE RD |
| 2130 | PEBBLE RD | MARYLAND PKWY |
| 2147 | TWAIN AV | ARVILLE ST |
| 2155 | SR594 | POLARIS AV |
| 2156 | RUSSELL RD | S VALLEY VIEW BLVD |
| 2185 | SPRING MOUNTAIN RD | CIMARRON RD |
| 2206 | THOMAS EDISON DR | CASINO DR |
| 2211 | LONE MOUNTAIN RD | N DURANGO DR |
| 2232 | W HACIENDA AV | ARVILLE ST |
| 2234 | W HACIENDA AV | LINDELL RD |
| 2237 | SANDS AV | PARADISE RD |
| 2238 | SR593 | PARADISE RD |
| 2241 | E SILVERADO RANCH BLVD | MARYLAND PKWY |
| 2254 | W SILVERADO RANCH BLVD | ACCESS ENSWORTH |
| 2259 | FLAMINGO ACCESS 2 | KOVAL LA |
| 2263 | SPRING MOUNTAIN RD | MEL TORME WY |
| 2270 | SUNSET RD | S VALLEY VIEW BLVD |
| 2287 | KITTY HAWK WY | PARADISE RD |
| 2288 | SPRING MOUNTAIN RD | WYNN RD |
| 2298 | W SILVERADO RANCH BLVD | DEAN MARTIN DR |
| 2308 | E WINDMILL LA | MARYLAND PKWY |
| 2310 | CATHEDRAL WY | LAS VEGAS BLVD |
| 2313 | E CHARLESTON BLVD | HOLLYWOOD BLVD |
| 2316 | SR592 | HOTEL RIO DR |
| 2355 | RUSSELL RD | S DURANGO DR |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2357 | SUNSET RD | JONES BLVD |
| 2413 | W SILVERADO RANCH BLVD | S DECATUR BLVD |
| 2430 | SUNSET RD | S DURANGO DR |
| 2432 | W WINDMILL LA | S DURANGO DR |
| 2447 | SR147 | LAMB BLVD |
| 2474 | DESERT INN RD | S VALLEY VIEW BLVD |
| 2475 | INDUSTRIAL RD | INDUSTRIAL RD |
| 2488 | SR594 | LAS VEGAS BLVD |
| 3021 | SR579 | MARTIN L KING BLVD |
| 3024 | SR579 | N MAIN ST |
| 3058 | E OGDEN AV | N CASINO CENTER BLVD |
| 3059 | STEWART AV | SR602 |
| 3068 | SR159 | SR582 |
| 3123 | E ST LOUIS AV | EASTERN AV |
| 3126 | OWENS AV | MOJAVE RD |
| 3141 | FREMONT ST | LAS VEGAS BLVD |
| 3144 | SR582 | S MOJAVE RD |
| 3154 | FAR HILLS AV | ANASAZI DR |
| 3196 | S 4TH ST | S LAS VEGAS BLVD |
| 3208 | SR578 | N MAIN ST |
| 3245 | W AZURE DR | N TENAYA WY |
| 3247 | FRCL24 | RM10622 |
| 3267 | WESTCLIFF DR | N CIMARRON RD |
| 3281 | ALTA DR | CIMARRON RD |
| 3312 | FRCL57 | ROCK SPRINGS DR |
| 3331 | RAINBOW BLVD | SR599 |
| 3351 | W CENTENNIAL PKWY | N TENAYA WY |
| 3362 | OWENS AV | D ST |
| 3371 | VEGAS DR | SIMMONS ST |
| 3373 | W DEER SPRINGS WY | N BUFFALO DR |
| 3380 | ELKHORN RD | JONES BLVD |
| 3389 | GRAND MONTECITO PKWY | N DURANGO DR |
| 3396 | ELKHORN RD | N BUFFALO DR |
| 3411 | FRCL23 | FRCL39 |
| 3432 | LAKE MEAD BLVD | SR599 |
| 3433 | SR599 | N DECATUR BLVD |
| 3434 | SR599 | N DECATUR BLVD |
| 3447 | VEGAS DR | N TORREY PINES DR |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3456 | FARM RD | N CIMARRON RD |
| 3458 | ELKHORN RD | N CIMARRON RD |
| 3466 | W ALEXANDER RD | N TENAYA WY |
| 3467 | GOWAN RD | N TENAYA WY |
| 3483 | W OGDEN AV | S GRAND CENTRAL PKWY |
| 3487 | SYMPHONY PARK AV | S GRAND CENTRAL PKWY |
| 3516 | ELKHORN RD | GRAND MONTECITO PKWY |
| 3520 | HORSE DR | FORT APACHE RD |
| 3525 | PENNWOOD AV | ARVILLE ST |
| 4028 | CRAIG RD | SAPPHIRE SEA CT |
| 4036 | LONE MOUNTAIN RD | CLAYTON ST |
| 4042 | LONE MOUNTAIN RD | LOSEE RD |
| 4049 | E CAREY AV | SR604 |
| 4053 | LONE MOUNTAIN RD | SIMMONS ST |
| 4061 | GOWAN RD | REVERE ST |
| 4063 | CAMINO ELDORADO | CLAYTON ST |
| 4065 | ELKHORN RD | ALIANTE PKWY |
| 4068 | W DEER SPRINGS WY | N DECATUR BLVD |
| 4069 | W CENTENNIAL PKWY | SAPPHIRE SEA CT |
| 4071 | CRAIG RD | REVERE ST |
| 4082 | WASHBURN RD | SIMMONS ST |
| 4094 | SR147 | CIVIC CENTER DR |
| 4102 | W DEER SPRINGS WY | AVIARY WY |
| 4109 | COLTON AV | LOSEE RD |
| 4115 | W CENTENNIAL PKWY | N COMMERCE ST |
| 4116 | W TROPICAL PKWY | N COMMERCE ST |
| 4177 | SR147 | SR604 |
| 4180 | SR147 | N PECOS RD |
| 5005 | SR582 | COLLEGE DR |
| 5007 | SR582 | MAJOR AV |
| 5011 | SR582 | N WATER ST |
| 5020 | WARM SPRINGS RD | SR564 |
| 5060 | WARM SPRINGS RD | STEPHANIE ST |
| 5095 | AUTO SHOW DR | N GIBSON RD |
| 5096 | VOLUNTEER BLVD | SUN CITY ANTHEM DR |
| 5097 | BICENTENNIAL PKWY | ANTHEM PKWY |
| 5117 | STUFFLEBEAM AV | N GIBSON RD |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 5126 | E BURKHOLDER BLVD | RACETRACK RD |
| 5128 | SUNRIDGE HEIGHTS PKWY | CORONADO CENTER DR |
| 2406 | PRIMM BLVD | S LAS VEGAS BLVD |
| 2321 | SR160 | RAINBOW BLVD |
| 5010 | SR582 | SR582 |
| 2107 | SR562 | PARADISE RD |
| 2390 | TROPICANA AV | SR596 |
| 2403 | TROPICANA AV | STEPHANIE ST |
| 2070 | FLAMINGO RD | GRAND CANYON DR |
| 2064 | FLAMINGO RD | S EL CAPITAN WY |
| 2138 | DESERT INN RD | CIMARRON RD |
| 3329 | SR589 | SR596 |
| 3191 | SR589 | LAS VEGAS BLVD |
| 3460 | SR159 | DESERT FOOTHILLS DR |
| 3069 | SR159 | FRCL06 |
| 3074 | SR159 | S MAIN ST |
| 3073 | SR159 | LAS VEGAS BLVD |
| 3344 | SR159 | S SANDHILL RD |
| 3147 | FREMONT ST | N 6TH ST |
| 3103 | SR579 | D ST |
| 3132 | W WASHINGTON AV | FRCL40 |
| 3514 | SR578 | FRCL41 |
| 4010 | SR147 | BELMONT ST |
| 2150 | SR147 | MT HOOD ST |
| 3155 | CHEYENNE AV | N CIMARRON RD |
| 4398 | SR574 | SIMMONS ST |
| 4393 | SR574 | CLAYTON ST |
| 4039 | SR574 | REVERE ST |
| 4030 | SR573 | N DECATUR BLVD |
| 4029 | CRAIG RD | VALLEY DR |
| 4015 | CRAIG RD | CLAYTON ST |
| 4005 | CRAIG RD | N BRUCE ST |
| 4013 | SR573 | LOSEE RD |
| 2021 | SR573 | SR610 |
| 3402 | GRAND TETON DR | N BUFFALO DR |
| 2225 | SR593 | SR612 |
| 2098 | SR592 | SR596 |
| 2343 | DESERT INN RD | HIGHLAND DR |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3240 | SR589 | RANCHO DR |
| 3071 | SR159 | SR596 |
| 3079 | SR159 | RANCHO DR |
| 3143 | SR582 | MARYLAND PKWY |
| 3159 | BANBURRY CROSS DR | ANASAZI DR |
| 3397 | OWENS AV | H ST |
| 4461 | SR147 | 5TH ST |
| 2001 | SR147 | HOLLYWOOD BLVD |
| 4258 | SR574 | LOSEE RD |
| 3174 | SR573 | SR599 |
| 4052 | ANN RD | SIMMONS ST |
| 2202 | BRUCE WOODBURY DR | CASINO DR |
| 2198 | SR163 | CASINO DR |
| 5056 | EQUESTRIAN DR | SR582 |
| 5004 | E HORIZON DR | SR582 |
| 5008 | E BASIC RD | SR582 |
| 5009 | E TEXAS AV | SR582 |
| 2347 | W WINDMILL LA | RAINBOW BLVD |
| 5055 | WARM SPRINGS RD | SR582 |
| 2349 | W BADURA AV | JONES BLVD |
| 5012 | E BARRETT ST | SR582 |
| 2300 | FRCL47 | FRCL60 |
| 5013 | SUNSET RD | SR582 |
| 5116 | STUFFLEBEAM AV | SR582 |
| 2278 | RUSSELL RD | AIRPORT CONN N |
| 2359 | W HACIENDA AV | FORT APACHE RD |
| 2489 | E MANDALAY BAY RD | LAS VEGAS BLVD |
| 2231 | E HACIENDA AV | S NELLIS BLVD |
| 2404 | RENO AV | LAS VEGAS BLVD |
| 2272 | TROPICANA AV | SR582 |
| 2075 | PEACE WY | S DURANGO DR |
| 2124 | W HARMON AV | DEAN MARTIN DR |
| 2348 | E HARMON AV | SR582 |
| 2083 | SR592 | SR595 |
| 2134 | SR592 | PARADISE RD |
| 2002 | SR592 | SR612 |
| 2291 | SR592 | SR582 |
| 2040 | TWAIN AV | DEAN MARTIN DR |
| 2184 | TWAIN AV | BUFFALO DR |
| 2074 | KIDS ZONE PKWY | S DURANGO DR |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2303 | INDIOS AV | SR582 |
| 2073 | SPRING MOUNTAIN RD | S DURANGO DR |
| 2192 | SANDS AV | LAS VEGAS BLVD |
| 2261 | DIO DR | LAS VEGAS BLVD |
| 2101 | CONVENTION CENTER DR | LAS VEGAS BLVD |
| 2353 | EDNA AV | SR596 |
| 3165 | PENNWOOD AV | S DECATUR BLVD |
| 2175 | CIRCUS CIRCUS DR | LAS VEGAS BLVD |
| 3283 | PENNWOOD AV | S VALLEY VIEW BLVD |
| 2333 | SR589 | SR612 |
| 3145 | SR589 | SR582 |
| 3078 | SR159 | SR595 |
| 3120 | SR582 | EASTERN AV |
| 2077 | SR159 | SR612 |
| 3151 | GASS AV | LAS VEGAS BLVD |
| 3322 | CARSON AV | MARYLAND PKWY |
| 3324 | E OGDEN AV | MARYLAND PKWY |
| 3489 | SYMPHONY PARK AV | MARTIN L KING BLVD |
| 3204 | W OGDEN AV | N MAIN ST |
| 3459 | HILLPOINTE RD | HILLS CENTER DR |
| 2336 | SR147 | SR612 |
| 3414 | SMOKE RANCH RD | SR596 |
| 3435 | SR574 | SR599 |
| 2337 | SR574 | SR612 |
| 3334 | LONE MOUNTAIN RD | SR599 |
| 4017 | WASHBURN RD | CAMINO AL NORTE |
| 3475 | W AZURE DR | JONES BLVD |
| 4088 | E CENTENNIAL PKWY | LAMB BLVD |
| 4009 | BELMONT ST | SR604 |
| 2220 | SOUTHERN HIGHLANDS PKWY | S VALLEY VIEW BLVD |
| 5101 | CORONADO CENTER DR | SR146 |
| 2008 | E WINDMILL LA | LAS VEGAS BLVD |
| 2315 | WARM SPRINGS RD | JONES BLVD |
| 2236 | W HACIENDA AV | S TORREY PINES DR |
| 2392 | TROPICANA AV | SR595 |
| 2032 | E HARMON AV | AUDRIE ST |
| 2022 | SR589 | SR595 |
| 3325 | SR589 | SR595 |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3122 | SR589 | S EASTERN AV |
| 3152 | E ST LOUIS AV | SR582 |
| 3064 | SR159 | EASTERN AV |
| 3229 | E OGDEN AV | N 6TH ST |
| 4086 | SR574 | CIVIC CENTER DR |
| 4108 | ANN RD | LOSEE RD |
| 5006 | PALO VERDE DR | GREENWAY RD |
| 2109 | FIRE STATION 34 | DURANGO |
| 2153 | HARMON | LV BLVD |
| 2196 | LE BARON | LV BLVD |
| 2199 | LAUGHLIN CENTER | CASINO |
| 2200 | RIVERSIDE | CASINO |
| 2201 | HILTON | CASINO |
| 2203 | COLORADO BELLE | CASINO |
| 2204 | GOLDEN NUGGET | CASINO |
| 2205 | RIVER PALMS | CASINO |
| 2208 | HARRAHS | CASINO |
| 2251 | OQUENDO | EASTERN |
| 2257 | SHELBOURNE | DEAN MARTIN |
| 2325 | ROCHELLE | JONES |
| 2334 | HARRIS | NELLIS |
| 2352 | FLAMINGO | AUDRIE |
| 2375 | VIKING | EASTERN |
| 2436 | RUSSELL | FRANK SINATRA |
| 3045 | VEGAS DR | RAMPART |
| 3057 | FOURTH | CASINO CENTER |
| 3062 | LAKE MEAD BLVD | GATEWAY / SUMMERHILL |
| 3089 | BONANZA | 28TH |
| 3138 | CHEYENNE | BUFFALO |
| 3146 | LOWE'S | FREMONT |
| 3157 | CHEYENNE | RAMPART |
| 3181 | CHARLESTON | SACRAMENTO |
| 3184 | WASHINGTON | TONOPAH |
| 3192 | LEWIS | FOURTH |
| 3214 | LONE MOUNTAIN | LOS PRADOS |
| 3256 | CRAIG | CAMINO DEL ORO |
| 3274 | CEDAR | EASTERN |
| 3288 | STEWART | 28TH |
| 3292 | SUNCOAST CASINO | RAMPART |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3299 | OWENS | J STREET |
| 3307 | DEL WEBB | RAMPART |
| 3332 | LEWIS X-WALK | LV BLVD |
| 3361 | TEDDY | RANCHO |
| 3376 | CHARLESTON | 28TH |
| 3383 | WESTCLIFF | DURANGO |
| 3392 | GRANDBANK-BOSECK | DURANGO |
| 3410 | SEARLES | EASTERN |
| 3424 | CHEYENNE | SHADY TIMBER |
| 3495 | BEST IN THE WEST | RAINBOW |
| 3496 | LAKE MEAD BLVD | BEST IN THE WEST |
| 4004 | CRAIG | HOME DEPOT |
| 4018 | RANCHO DEL NORTE | CAMINO AL NORTE |
| 4073 | CAREY | DONNA |
| 4078 | COLTON | NORTH 5TH |
| 4091 | CHEYENNE | VAN DER MEER |
| 4101 | GOWAN | FIRESTATION 53 |
| 5090 | SUMMIT GROVE | EASTERN |
| 5091 | ANTHEM CLUB | ANTHEM PKWY |
| 5112 | HORIZON RIDGE | CARMEL VALLEY |
| 2145 | SOMERSET HILLS AVE. | SOUTHERN HIGHLANDS PKWY. |
| 2408 | BLUE DIAMOND RD. | JONES BLVD. |
| 2421 | RIDGEDALE AVE. | LAMB BLVD. |
| 2429 | WARM SPRINGS RD. | DECATUR BLVD. |
| 2435 | SUNSET RD. | WINDY RD. |
| 3518 | HARRIS AVE. | PECOS RD. |
| 3530 | BONANZA RD. | TONOPAH DR. |
| 3531 | PALOMINO LN. | RANCHO DR. |
| 4117 | MAIN ST. | LAS VEGAS BLVD. |
| 5130 | SCOTTS VALLEY DR. | SUN CITY ANTHEM DR. |
| 5134 | LAS PALMAS ENTRADA AVE. | GIBSON RD. |
| 2415 | EMERGENCY SIGNAL | FRANK SINATRA DR. |
| 3502 | CEDAR TRAIL | LAMB BLVD. |
| 3114 | CENTENNIAL CENTER BLVD. | OSO BLANCA RD. |
| 4050 | SHADOW MOUNTAIN PL. | DECATUR BLVD. |

**TABLE A-5** Signalized Intersections Included in the Database

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2007 | SR593 | SPENCER ST |
| 2012 | SR160 | DEAN MARTIN DR |
| 2016 | E HARMON AV | S SANDHILL RD |
| 2023 | SR573 | N NELLIS BLVD |
| 2028 | SR562 | MCLEOD DR |
| 2029 | SR562 | S PECOS RD |
| 2033 | E WINDMILL LA | E ERIE AV |
| 2034 | E WINDMILL LA | POLLOCK DR |
| 2038 | FLAMINGO RD | FORT APACHE RD |
| 2042 | TWAIN AV | WYNN RD |
| 2046 | WARM SPRINGS RD | BERMUDA RD |
| 2048 | DESERT INN RD | S TORREY PINES DR |
| 2050 | KAREN AV | JOE W BROWN DR |
| 2055 | DESERT INN RD | GRAND CANYON DR |
| 2057 | FLAMINGO RD | S TENAYA WY |
| 2058 | FLAMINGO RD | BUFFALO DR |
| 2059 | FLAMINGO RD | CIMARRON RD |
| 2079 | TROPICANA AV | FORT APACHE RD |
| 2080 | TROPICANA AV | S EL CAPITAN WY |
| 2086 | SR146 | LAS VEGAS BLVD |
| 2087 | PEBBLE RD | POLLOCK DR |
| 2088 | PEBBLE RD | BERMUDA RD |
| 2093 | PEBBLE RD | SPENCER ST |
| 2097 | SR562 | S SANDHILL RD |
| 2099 | WARM SPRINGS RD | SPENCER ST |
| 2100 | SO10285 | PARADISE RD |
| 2106 | SR562 | SPENCER ST |
| 2112 | DESERT INN RD | S TENAYA WY |
| 2114 | DESERT INN RD | JOE W BROWN DR |
| 2115 | DESERT INN RD | MARYLAND PKWY |
| 2117 | DESERT INN RD | MCLEOD DR |
| 2118 | DESERT INN RD | S SANDHILL RD |
| 2131 | FLAMINGO RD | KOVAL LA |
| 2132 | FLAMINGO RD | LAS VEGAS BLVD |
| 2135 | SR592 | PECOS MCLEOD INT |
| 2137 | DESERT INN RD | BUFFALO DR |
| 2157 | RUSSELL RD | ARVILLE ST |
| 2158 | RUSSELL RD | CAMERON ST |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2159 | SR592 | S DECATUR BLVD |
| 2166 | DESERT INN RD | S HUALAPAI WY |
| 2169 | SR593 | DEAN MARTIN DR |
| 2172 | SR160 | S DECATUR BLVD |
| 2176 | SR593 | KOVAL LA |
| 2177 | E SILVERADO RANCH BLVD | E ERIE AV |
| 2178 | E SILVERADO RANCH BLVD | POLLOCK DR |
| 2179 | W SILVERADO RANCH BLVD | LAS VEGAS BLVD |
| 2195 | SR593 | SR604 |
| 2207 | SPRING MOUNTAIN RD | ARVILLE ST |
| 2209 | SPRING MOUNTAIN RD | S TENAYA WY |
| 2212 | SAHARA AV | TREE LINE DR |
| 2213 | E ERIE AV | E PYLE AV |
| 2215 | SR593 | MARYLAND PKWY |
| 2218 | FLAMINGO RD | CABANA DR |
| 2219 | VEGAS VALLEY DR | CABANA DR |
| 2221 | SR593 | MOUNTAIN VISTA ST |
| 2228 | SR160 | S DURANGO DR |
| 2230 | RUSSELL RD | S NELLIS BLVD |
| 2239 | SR593 | S PECOS RD |
| 2242 | E WARM SPRINGS RD | GILESPIE ST |
| 2244 | SR593 | S SANDHILL RD |
| 2245 | SANDS AV | KOVAL LA |
| 2246 | FLAMINGO RD | S HUALAPAI WY |
| 2252 | RUSSELL RD | MCLEOD DR |
| 2253 | SR160 | S BUFFALO DR |
| 2260 | DESERT INN RD | S MOJAVE RD |
| 2265 | SR592 | MOUNTAIN VISTA ST |
| 2266 | SR592 | S SANDHILL RD |
| 2267 | SR592 | SPENCER ST |
| 2268 | SR592 | SWENSON ST |
| 2275 | RUSSELL RD | SPENCER ST |
| 2277 | RUSSELL RD | MARYLAND PKWY |
| 2281 | TWAIN AV | PECOS MCLEOD INT |
| 2283 | SR160 | S VALLEY VIEW BLVD |
| 2289 | TROPICANA AV | S VALLEY VIEW BLVD |
| 2290 | TROPICANA AV | WYNN RD |
| 2292 | DESERT INN RD | S PECOS RD |
| 2294 | SR593 | SWENSON ST |
| 2304 | E WINDMILL LA | SPENCER ST |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2309 | SR160 | ARVILLE ST |
| 2312 | RUSSELL RD | FORT APACHE RD |
| 2314 | SR589 | S SANDHILL RD |
| 2318 | E CHARLESTON BLVD | TREE LINE DR |
| 2329 | SR592 | WYNN RD |
| 2356 | SUNSET RD | S DECATUR BLVD |
| 2369 | SR592 | ARVILLE ST |
| 2371 | DESERT INN RD | SR596 |
| 2379 | SR592 | S TORREY PINES DR |
| 2381 | TROPICANA AV | JIMMY DURANTE BLVD |
| 2385 | SR589 | LAMB BLVD |
| 2387 | TROPICANA AV | ARVILLE ST |
| 2388 | TROPICANA AV | CAMERON ST |
| 2389 | TROPICANA AV | S DECATUR BLVD |
| 2391 | TROPICANA AV | S TORREY PINES DR |
| 2394 | TROPICANA AV | GRAND CANYON DR |
| 2401 | OWENS AV | HOLLYWOOD BLVD |
| 2407 | FLAMINGO RD | GRAND CANYON DR |
| 2411 | SR593 | MCLEOD DR |
| 2412 | SR593 | S MOJAVE RD |
| 2426 | E CAREY AV | HOLLYWOOD BLVD |
| 2440 | W HACIENDA AV | CAMERON ST |
| 2444 | DESERT INN RD | ARVILLE ST |
| 2446 | SR147 | N WALNUT RD |
| 2448 | SR592 | MCLEOD DR |
| 2450 | SR592 | LINDELL RD |
| 2457 | E CHARLESTON BLVD | S CHRISTY LA |
| 2458 | E CHARLESTON BLVD | SLOAN LA |
| 2459 | SR147 | N CHRISTY LA |
| 2473 | SPRING MOUNTAIN RD | S TORREY PINES DR |
| 2485 | DESERT INN RD | LINDELL RD |
| 2497 | SR574 | N WALNUT RD |
| 2498 | SR574 | LAMB BLVD |
| 3002 | STEWART AV | MARION DR |
| 3003 | ALTA DR | MARTIN L KING BLVD |
| 3005 | SR579 | SR602 |
| 3006 | SR589 | ARVILLE ST |
| 3008 | SR159 | ARVILLE ST |
| 3010 | STEWART AV | N SANDHILL RD |
| 3011 | WESTCLIFF DR | ANTELOPE WY |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3012 | SAHARA AV | FORT APACHE RD |
| 3013 | E WASHINGTON AV | MOJAVE RD |
| 3014 | LAKE MEAD BLVD | H ST |
| 3015 | W WASHINGTON AV | N TORREY PINES DR |
| 3016 | E BONANZA RD | N BRUCE ST |
| 3017 | SR159 | FORT APACHE RD |
| 3019 | SR579 | CITY PKWY |
| 3020 | SR579 | H ST |
| 3025 | E BONANZA RD | MARYLAND PKWY |
| 3030 | E BONNEVILLE AV | S CASINO CENTER BLVD |
| 3031 | E BONNEVILLE AV | S 4TH ST |
| 3039 | SR159 | S BRUCE ST |
| 3040 | SR582 | N BRUCE ST |
| 3051 | CARSON AV | S 4TH ST |
| 3055 | SR159 | S CASINO CENTER BLVD |
| 3061 | SMOKE RANCH RD | MICHAEL WY |
| 3063 | SR159 | S DECATUR BLVD |
| 3066 | SR159 | S 15TH ST |
| 3067 | SR159 | S 4TH ST |
| 3072 | SR159 | LAMB BLVD |
| 3075 | SR159 | MARYLAND PKWY |
| 3076 | SR159 | S MOJAVE RD |
| 3077 | LAKE MEAD BLVD | MICHAEL WY |
| 3080 | SR159 | SHADOW LA |
| 3082 | SR159 | S TORREY PINES DR |
| 3084 | SR159 | S VALLEY VIEW BLVD |
| 3090 | W WASHINGTON AV | N VALLEY VIEW BLVD |
| 3096 | W OAKEY BLVD | FRCL06 |
| 3098 | OWENS AV | MARION DR |
| 3110 | SR589 | S DECATUR BLVD |
| 3118 | W WASHINGTON AV | H ST |
| 3128 | SR582 | S 15TH ST |
| 3148 | W BONNEVILLE AV | S GRAND CENTRAL PKWY |
| 3169 | SR599 | W ALEXANDER RD |
| 3176 | SR599 | W ALEXANDER RD |
| 3177 | SR573 | JONES BLVD |
| 3180 | SR159 | S HUALAPAI WY |
| 3183 | SR159 | S TOWN CENTER DR |
| 3194 | ALTA DR | SHADOW LA |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3211 | SR589 | MARYLAND PKWY |
| 3218 | SR589 | MCLEOD ST |
| 3222 | SAHARA AV | HUALAPAI WAY |
| 3225 | SAHARA AV | GRAND CANYON DR |
| 3228 | W OAKEY BLVD | WESTERN AV |
| 3231 | E BONANZA RD | MOJAVE RD |
| 3234 | SR589 | LINDELL RD |
| 3235 | E ST LOUIS AV | PARADISE RD |
| 3236 | SR589 | PARADISE RD |
| 3237 | CHEYENNE AV | N EL CAPITAN WY |
| 3238 | CHEYENNE AV | FORT APACHE RD |
| 3239 | CHEYENNE AV | GRAND CANYON DR |
| 3243 | SR589 | S VALLEY VIEW BLVD |
| 3249 | CRAIG RD | S TENAYA WY |
| 3257 | SR159 | S GRAND CENTRAL PKWY |
| 3258 | SR573 | RAINBOW BLVD |
| 3264 | SMOKE RANCH RD | N TORREY PINES DR |
| 3268 | ANN RD | RAINBOW BLVD |
| 3272 | ANN RD | JONES BLVD |
| 3273 | ANN RD | BRADLEY RD |
| 3289 | TENAYA WY | SKY POINTE DR |
| 3295 | E BONANZA RD | N SANDHILL RD |
| 3298 | FRCL26 | NORTHBRIDGE LA |
| 3304 | SR589 | TEDDY DR |
| 3309 | E BONANZA RD | MARION DR |
| 3311 | FRCL57 | RAINBOW BLVD |
| 3313 | LAKE MEAD BLVD | N TENAYA WY |
| 3314 | LAKE MEAD BLVD | N BUFFALO DR |
| 3326 | SR159 | N PECOS RD |
| 3349 | LAKE MEAD BLVD | MARTIN L KING BLVD |
| 3357 | SR159 | S CIMARRON RD |
| 3363 | W OAKEY BLVD | S TORREY PINES DR |
| 3365 | W OAKEY BLVD | LINDELL RD |
| 3366 | W OAKEY BLVD | ARVILLE ST |
| 3372 | CRAIG RD | S BUFFALO DR |
| 3381 | SR159 | MARION DR |
| 3387 | VEGAS DR | N DURANGO DR |
| 3393 | CHEYENNE AV | N HUALAPAI WY |
| 3394 | SR589 | S MOJAVE RD |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3401 | SR159 | ANTELOPE WY |
| 3406 | OWENS AV | LAMB BLVD |
| 3408 | SR589 | S TORREY PINES DR |
| 3409 | ALTA DR | PARK VISTA DR |
| 3413 | LAKE MEAD BLVD | SR596 |
| 3416 | LAKE MEAD BLVD | ANASAZI DR |
| 3418 | E WASHINGTON AV | MARION DR |
| 3419 | VEGAS DR | MICHAEL WY |
| 3422 | LAKE MEAD BLVD | DEL WEBB BLVD |
| 3423 | LONE MOUNTAIN RD | RAINBOW BLVD |
| 3428 | SAHARA AV | S CIMARRON RD |
| 3431 | SR589 | JOE W BROWN DR |
| 3438 | LAKE MEAD BLVD | N TORREY PINES DR |
| 3439 | SR574 | JONES BLVD |
| 3440 | SR574 | RAINBOW BLVD |
| 3443 | CHEYENNE AV | N TENAYA WY |
| 3446 | FRCL26 | SOUTHBRIDGE LA |
| 3452 | W ALEXANDER RD | N HUALAPAI WY |
| 3454 | SR159 | S BUFFALO DR |
| 3457 | FARM RD | TULE SPRINGS RD |
| 3463 | W OAKEY BLVD | S CIMARRON RD |
| 3469 | SR574 | MICHAEL WY |
| 3470 | SR574 | N TORREY PINES DR |
| 3473 | OWENS AV | N SANDHILL RD |
| 3478 | SAHARA AV | S TENAYA WY |
| 3497 | CLARK AV | S 4TH ST |
| 3504 | GRAND TETON DR | JONES BLVD |
| 3510 | SR159 | S 3RD ST |
| 3517 | W WASHINGTON AV | N TENAYA WY |
| 4003 | CRAIG RD | MARTIN L KING BLVD |
| 4006 | CRAIG RD | N COMMERCE ST |
| 4007 | SR573 | MITCHELL ST |
| 4011 | SR573 | DONOVAN WY |
| 4014 | CRAIG RD | 5TH ST |
| 4016 | SR573 | N WALNUT RD |
| 4021 | CRAIG RD | SIMMONS ST |
| 4023 | W CAREY AV | N COMMERCE ST |
| 4038 | SR574 | VALLEY DR |
| 4041 | SR147 | N BRUCE ST |
| 4056 | ANN RD | CLAYTON ST |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 4057 | ANN RD | VALLEY DR |
| 4058 | ANN RD | SAPPHIRE SEA CT |
| 4062 | W CAREY AV | SIMMONS ST |
| 4070 | W CAREY AV | CLAYTON ST |
| 4074 | ANN RD | REVERE ST |
| 4075 | E CAREY AV | N PECOS RD |
| 4079 | SAPPHIRE SEA CT | LONE MOUNTAIN RD |
| 4090 | SR574 | N PECOS RD |
| 4103 | LAKE MEAD BLVD | SIMMONS ST |
| 4111 | SAPPHIRE SEA CT | W ALEXANDER RD |
| 4330 | SR574 | SAPPHIRE SEA CT |
| 4417 | SR574 | N COMMERCE ST |
| 4419 | SR574 | N DECATUR BLVD |
| 4421 | SR147 | LOSEE RD |
| 4462 | SR147 | 5TH ST |
| 5001 | E HORIZON DR | COLLEGE DR |
| 5003 | E HORIZON DR | W PACIFIC AV |
| 5015 | SR564 | S WATER ST |
| 5016 | SR564 | W VAN WAGENEN ST |
| 5017 | SR564 | FIESTA HENDERSON BLVD |
| 5025 | SUNSET RD | MARKS ST |
| 5028 | SUNSET RD | WHITNEY RANCH DR |
| 5029 | SUNSET RD | N ARROYO GRANDE BLVD |
| 5030 | SUNSET RD | VALLE VERDE DR |
| 5031 | SUNSET RD | SUNSET RD |
| 5039 | WARM SPRINGS RD | N GREEN VALLEY PKWY |
| 5047 | E WARM SPRINGS RD | N PECOS RD |
| 5048 | WARM SPRINGS RD | VALLE VERDE DR |
| 5049 | WARM SPRINGS RD | N ARROYO GRANDE BLVD |
| 5057 | WARM SPRINGS RD | N GIBSON RD |
| 5058 | WARM SPRINGS RD | MARKS ST |
| 5061 | SR562 | N GIBSON RD |
| 5065 | HORIZON RIDGE PKWY | CARNEGIE ST |
| 5066 | HORIZON RIDGE PKWY | VALLE VERDE DR |
| 5067 | HORIZON RIDGE PKWY | S GIBSON RD |
| 5081 | SR146 | JEFFREYS ST |
| 5088 | HORIZON RIDGE PKWY | HORIZON RIDGE PKWY |
| 5089 | SUNRIDGE HEIGHTS PKWY | S EASTERN AV |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 5093 | PASEO VERDE PKWY | VALLE VERDE DR |
| 5105 | HORIZON RIDGE PKWY | S GREEN VALLEY PKWY |
| 5111 | SR564 | W BASIC RD |
| 5113 | HORIZON RIDGE PKWY | STEPHANIE ST |
| 5124 | W VAN WAGENEN ST | W PACIFIC AV |
| 2004 | WIGWAM PKWY | S EASTERN AV |
| 2005 | W HACIENDA AV | RAINBOW BLVD |
| 2006 | E WINDMILL LA | LAS VEGAS BLVD |
| 2014 | E WARM SPRINGS RD | LAS VEGAS BLVD |
| 2024 | E WINDMILL LA | S EASTERN AV |
| 2025 | W ROBINDALE RD | S EASTERN AV |
| 2027 | E BONANZA RD | SR612 |
| 2030 | E PATRICK LA | S PECOS RD |
| 2035 | W HARMON AV | SR596 |
| 2044 | TWAIN AV | FORT APACHE RD |
| 2053 | W ROBINDALE RD | RAINBOW BLVD |
| 2060 | SPRING MOUNTAIN RD | SR595 |
| 2066 | W HACIENDA AV | S DURANGO DR |
| 2067 | W HACIENDA AV | JONES BLVD |
| 2071 | SR562 | LAS VEGAS BLVD |
| 2076 | TROPICANA AV | S DURANGO DR |
| 2082 | E ALEXANDER RD | SR610 |
| 2084 | PEACE WY | S BUFFALO DR |
| 2094 | TWAIN AV | FRANK SINATRA DR |
| 2102 | CONVENTION CENTER DR | PARADISE RD |
| 2104 | WARM SPRINGS RD | S DURANGO DR |
| 2111 | SPRING MOUNTAIN RD | S DECATUR BLVD |
| 2113 | DESERT INN RD | S EASTERN AV |
| 2119 | SR592 | S EASTERN AV |
| 2120 | E SERENE AV | MARYLAND PKWY |
| 2125 | SR593 | S EASTERN AV |
| 2126 | VEGAS VALLEY DR | S EASTERN AV |
| 2133 | SR592 | MARYLAND PKWY |
| 2136 | SPRING MOUNTAIN RD | BUFFALO DR |
| 2144 | HOTEL RIO DR | DEAN MARTIN DR |
| 2154 | E HARMON AV | PARADISE RD |
| 2161 | RUSSELL RD | S DECATUR BLVD |
| 2162 | E HARMON AV | KOVAL LA |
| 2170 | W ROBINDALE RD | JONES BLVD |
| 2171 | WARM SPRINGS RD | RAINBOW BLVD |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2173 | KAREN AV | MARYLAND PKWY |
| 2174 | KAREN AV | PARADISE RD |
| 2181 | W HACIENDA AV | S DECATUR BLVD |
| 2182 | RUSSELL RD | RAINBOW BLVD |
| 2183 | SR592 | S VALLEY VIEW BLVD |
| 2186 | SPRING MOUNTAIN RD | FORT APACHE RD |
| 2187 | PEBBLE RD | S EASTERN AV |
| 2190 | E SERENE AV | S EASTERN AV |
| 2191 | E SILVERADO RANCH BLVD | S EASTERN AV |
| 2197 | W CACTUS AV | SOUTHERN HIGHLANDS PKWY |
| 2210 | E PYLE AV | MARYLAND PKWY |
| 2216 | TWAIN AV | MARYLAND PKWY |
| 2217 | VEGAS VALLEY DR | MARYLAND PKWY |
| 2223 | KAREN AV | S EASTERN AV |
| 2224 | STEWART AV | SR612 |
| 2229 | E PYLE AV | SPENCER ST |
| 2233 | RIVIERA BLVD | PARADISE RD |
| 2235 | RUSSELL RD | JONES BLVD |
| 2247 | SPRING MOUNTAIN RD | S VALLEY VIEW BLVD |
| 2249 | TWAIN AV | SWENSON ST |
| 2250 | S SPRING VALLEY PKWY | SR595 |
| 2255 | PEACE WY | FORT APACHE RD |
| 2258 | W ROBINDALE RD | S DURANGO DR |
| 2269 | SUNSET RD | RAINBOW BLVD |
| 2271 | CRAIG RD | N DURANGO DR |
| 2273 | E HARMON AV | MARYLAND PKWY |
| 2282 | S MOJAVE RD | TWAIN AV |
| 2293 | E HARMON AV | SWENSON ST |
| 2297 | CIRCUS CIRCUS DR | INDUSTRIAL RD |
| 2299 | FRCL46 | FRCL60 |
| 2302 | SPRING MOUNTAIN RD | SR596 |
| 2306 | E WIGWAM AV | MARYLAND PKWY |
| 2320 | E CAREY AV | LAMB BLVD |
| 2331 | E WASHINGTON AV | SR612 |
| 2332 | VEGAS VALLEY DR | SR612 |
| 2335 | OWENS AV | SR612 |
| 2338 | GOWAN RD | SR612 |
| 2339 | E CAREY AV | SR612 |
| 2340 | E ERIE AV | SR562 |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 2342 | W BADURA AV | RAINBOW BLVD |
| 2344 | W WIGWAM AV | RAINBOW BLVD |
| 2350 | E HACIENDA AV | S PECOS RD |
| 2351 | RUSSELL RD | S PECOS RD |
| 2354 | SR562 | S EASTERN AV |
| 2370 | TWAIN AV | S VALLEY VIEW BLVD |
| 2372 | DESERT INN RD | S DECATUR BLVD |
| 2376 | E HARMON AV | S EASTERN AV |
| 2377 | RUSSELL RD | S EASTERN AV |
| 2378 | E PATRICK LA | S EASTERN AV |
| 2380 | TWAIN AV | S DECATUR BLVD |
| 2382 | TWAIN AV | SR612 |
| 2386 | VEGAS VALLEY DR | LAMB BLVD |
| 2393 | W WIGWAM AV | LAS VEGAS BLVD |
| 2397 | E HARMON AV | S PECOS RD |
| 2400 | E BONANZA RD | HOLLYWOOD BLVD |
| 2409 | DESERT INN RD | SR612 |
| 2422 | RENO AV | S PECOS RD |
| 2423 | N SPRING VALLEY PKWY | SR595 |
| 2425 | E WYOMING AV | LAMB BLVD |
| 2431 | PEBBLE RD | S DURANGO DR |
| 2434 | TROPICANA AV | S HUALAPAI WY |
| 2438 | JUDSON AV | SLOAN LA |
| 2445 | TWAIN AV | SR595 |
| 2451 | DESERT INN RD | SR595 |
| 2460 | MEL TORME WY | INDUSTRIAL RD |
| 2463 | TWAIN AV | SR596 |
| 2465 | RENO AV | S EASTERN AV |
| 2466 | E HACIENDA AV | S EASTERN AV |
| 2467 | DESERT INN RD | INDUSTRIAL RD |
| 2471 | WARM SPRINGS RD | S EASTERN AV |
| 2472 | W HARMON AV | S DECATUR BLVD |
| 3001 | ALTA DR | S DECATUR BLVD |
| 3004 | ALTA DR | RANCHO DR |
| 3007 | STEWART AV | N PECOS RD |
| 3009 | STEWART AV | MOJAVE RD |
| 3018 | E BONANZA RD | EASTERN AV |
| 3022 | CANYON RUN DR | RAMPART BLVD |
| 3023 | SR579 | LAS VEGAS BLVD |
| 3026 | BRIDGER AV | S MAIN ST |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3028 | W BONANZA RD | SR599 |
| 3029 | W BONANZA RD | N VALLEY VIEW BLVD |
| 3032 | E BONNEVILLE AV | LAS VEGAS BLVD |
| 3033 | E BONNEVILLE AV | S MAIN ST |
| 3034 | E BONNEVILLE AV | MARYLAND PKWY |
| 3035 | BRIDGER AV | S CASINO CENTER BLVD |
| 3036 | S 4TH ST | BRIDGER AV |
| 3037 | BRIDGER AV | LAS VEGAS BLVD |
| 3050 | CARSON AV | S CASINO CENTER BLVD |
| 3052 | CARSON AV | LAS VEGAS BLVD |
| 3060 | TENAYA WY | FRCL22 |
| 3097 | E WASHINGTON AV | N PECOS RD |
| 3101 | E OGDEN AV | EASTERN AV |
| 3102 | CENTENNIAL CENTER BLVD | FRCL22 |
| 3106 | SMOKE RANCH RD | N BUFFALO DR |
| 3108 | W OAKEY BLVD | S DECATUR BLVD |
| 3109 | VEGAS DR | N DECATUR BLVD |
| 3111 | CENTENNIAL CENTER BLVD | CENTENNIAL CENTER BLVD |
| 3112 | W WASHINGTON AV | N DECATUR BLVD |
| 3115 | SR582 | S 13TH ST |
| 3116 | STEWART AV | N RUE 13 |
| 3117 | CARSON AV | S 13TH ST |
| 3119 | OWENS AV | N PECOS RD |
| 3121 | E OAKEY BLVD | EASTERN AV |
| 3124 | STEWART AV | EASTERN AV |
| 3125 | OWENS AV | EASTERN AV |
| 3127 | E WASHINGTON AV | EASTERN AV |
| 3129 | OWENS AV | N BRUCE ST |
| 3131 | E WASHINGTON AV | N BRUCE ST |
| 3139 | E OGDEN AV | N 4TH ST |
| 3140 | STEWART AV | N 4TH ST |
| 3149 | E OGDEN AV | N 13TH ST |
| 3153 | ALTA DR | S HUALAPAI WY |
| 3158 | VEGAS DR | MARTIN L KING BLVD |
| 3161 | W WASHINGTON AV | MARTIN L KING BLVD |
| 3163 | N EL CAPITAN WY | FRCL39 |
| 3166 | LAKE MEAD BLVD | N DECATUR BLVD |
| 3170 | W WYOMING AV | INDUSTRIAL RD |
| 3173 | GOWAN RD | SR599 |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3175 | SYMPHONY PARK AV | MARTIN L KING BLVD |
| 3179 | SR159 | S DURANGO DR |
| 3182 | STEWART AV | LAMB BLVD |
| 3185 | W OAKEY BLVD | SR596 |
| 3186 | E OAKEY BLVD | LAS VEGAS BLVD |
| 3187 | E OGDEN AV | LAS VEGAS BLVD |
| 3188 | OWENS AV | LAS VEGAS BLVD |
| 3190 | E ST LOUIS AV | LAS VEGAS BLVD |
| 3193 | STEWART AV | LAS VEGAS BLVD |
| 3195 | VEGAS DR | N TENAYA WY |
| 3197 | SR578 | LAS VEGAS BLVD |
| 3198 | E WYOMING AV | LAS VEGAS BLVD |
| 3205 | OWENS AV | N MAIN ST |
| 3206 | STEWART AV | N MAIN ST |
| 3207 | W ALEXANDER RD | RAINBOW BLVD |
| 3209 | E WYOMING AV | S MAIN ST |
| 3210 | E OAKEY BLVD | MARYLAND PKWY |
| 3212 | E ST LOUIS AV | MARYLAND PKWY |
| 3213 | STEWART AV | MARYLAND PKWY |
| 3215 | W GOWAN RD | JONES BLVD |
| 3216 | LONE MOUNTAIN RD | JONES BLVD |
| 3217 | ANASAZI DR | N TOWN CENTER DR |
| 3226 | W OAKEY BLVD | RANCHO DR |
| 3227 | W OAKEY BLVD | S VALLEY VIEW BLVD |
| 3232 | VEGAS DR | SR599 |
| 3241 | W WASHINGTON AV | SR599 |
| 3246 | E BONANZA RD | N PECOS RD |
| 3248 | E BONANZA RD | LAMB BLVD |
| 3251 | ALTA DR | S VALLEY VIEW BLVD |
| 3252 | MEADOWS LA | S DECATUR BLVD |
| 3253 | MEADOWS LA | S VALLEY VIEW BLVD |
| 3255 | W BONANZA RD | N DECATUR BLVD |
| 3261 | SMOKE RANCH RD | RAINBOW BLVD |
| 3262 | ERNEST MAY LA | SR599 |
| 3263 | SMOKE RANCH RD | N TENAYA WY |
| 3271 | WESTCLIFF DR | SR595 |
| 3275 | ALTA DR | SR596 |
| 3276 | VEGAS DR | SR596 |
| 3277 | W WASHINGTON AV | SR596 |
| 3285 | ALTA DR | SR595 |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 3291 | STEWART AV | N BRUCE ST |
| 3300 | W ALEXANDER RD | N DURANGO DR |
| 3301 | E WASHINGTON AV | LAMB BLVD |
| 3302 | GOWAN RD | N DURANGO DR |
| 3321 | VEGAS DR | N BUFFALO DR |
| 3323 | RED HILLS RD | FORT APACHE RD |
| 3330 | ANN RD | N DURANGO DR |
| 3341 | VEGAS DR | RAINBOW BLVD |
| 3348 | W TROPICAL PKWY | JONES BLVD |
| 3358 | GOWAN RD | N BUFFALO DR |
| 3360 | W ALEXANDER RD | N BUFFALO DR |
| 3364 | ALTA DR | ANTELOPE WY |
| 3374 | W WASHINGTON AV | MICHAEL WY |
| 3377 | ALTA DR | S TOWN CENTER DR |
| 3386 | W WASHINGTON AV | N DURANGO DR |
| 3388 | W TROPICAL PKWY | N DURANGO DR |
| 3390 | W CENTENNIAL PKWY | N DURANGO DR |
| 3391 | ALTA DR | DURANGO DR |
| 3395 | FARM RD | N BUFFALO DR |
| 3405 | SAHARA AV | S DURANGO DR |
| 3412 | ELKHORN RD | N DURANGO DR |
| 3415 | SMOKE RANCH RD | SR599 |
| 3417 | GOWAN RD | RAINBOW BLVD |
| 3420 | W WASHINGTON AV | RAINBOW BLVD |
| 3421 | KINGS WY | TEDDY DR |
| 3426 | W OAKEY BLVD | S BUFFALO DR |
| 3429 | W OAKEY BLVD | SR595 |
| 3430 | SMOKE RANCH RD | N DECATUR BLVD |
| 3448 | W OAKEY BLVD | S DURANGO DR |
| 3449 | ELKHORN RD | N TENAYA WY |
| 3450 | W DEER SPRINGS WY | N DURANGO DR |
| 3472 | CLARK AV | LAS VEGAS BLVD |
| 3479 | SAHARA AV | S BUFFALO DR |
| 3482 | FARM RD | N TENAYA WY |
| 3490 | ALTA DR | S BUFFALO DR |
| 3491 | WESTCLIFF DR | N BUFFALO DR |
| 3494 | W WASHINGTON AV | N BUFFALO DR |
| 3503 | FARM RD | JONES BLVD |
| 4001 | GOWAN RD | MARTIN L KING BLVD |
| 4002 | W ALEXANDER RD | MARTIN L KING BLVD |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 4019 | ANN RD | CAMINO AL NORTE |
| 4026 | E ALEXANDER RD | N PECOS RD |
| 4027 | GOWAN RD | N PECOS RD |
| 4031 | ANN RD | N DECATUR BLVD |
| 4033 | GOWAN RD | N DECATUR BLVD |
| 4034 | W ALEXANDER RD | N DECATUR BLVD |
| 4035 | LONE MOUNTAIN RD | N DECATUR BLVD |
| 4040 | CAMINO AL NORTE | CAMINO AL NORTE |
| 4048 | E CAREY AV | CIVIC CENTER DR |
| 4054 | W DEER SPRINGS WY | ALIANTE PKWY |
| 4059 | E TROPICAL PKWY | 5TH ST |
| 4060 | W TROPICAL PKWY | CAMINO ELDORADO |
| 4064 | W CENTENNIAL PKWY | SIMMONS ST |
| 4066 | CAMINO ELDORADO | CAMINO ELDORADO |
| 4072 | W ALEXANDER RD | SIMMONS ST |
| 4077 | WASHBURN RD | N DECATUR BLVD |
| 4083 | WASHBURN RD | CLAYTON ST |
| 4084 | E ALEXANDER RD | 5TH ST |
| 4085 | WASHBURN RD | 5TH ST |
| 4093 | E EVANS AV | CIVIC CENTER DR |
| 4098 | W TROPICAL PKWY | SIMMONS ST |
| 4104 | W TROPICAL PKWY | N DECATUR BLVD |
| 4106 | WASHBURN RD | LOSEE RD |
| 4118 | WASHBURN RD | N COMMERCE ST |
| 4300 | W CAREY AV | MARTIN L KING BLVD |
| 4416 | SR574 | 5TH ST |
| 4418 | SR574 | MARTIN L KING BLVD |
| 5019 | PASEO VERDE PKWY | SR146 |
| 5027 | SUNSET RD | STEPHANIE ST |
| 5033 | SUNSET RD | N GREEN VALLEY PKWY |
| 5038 | HIGH VIEW DR | N GREEN VALLEY PKWY |
| 5040 | W ROBINDALE RD | N GREEN VALLEY PKWY |
| 5041 | WINDMILL PKWY | N GREEN VALLEY PKWY |
| 5042 | WINDMILL PKWY | N GREEN VALLEY PKWY |
| 5043 | WIGWAM PKWY | N GREEN VALLEY PKWY |
| 5044 | WIGWAM PKWY | N PECOS RD |
| 5045 | WINDMILL PKWY | N PECOS RD |
| 5046 | W ROBINDALE RD | N PECOS RD |
| 5068 | TRAIL CANYON RD | STEPHANIE ST |
| 5069 | W GALLERIA DR | STEPHANIE ST |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 5070 | PEBBLE RD | N GREEN VALLEY PKWY |
| 5073 | PASEO VERDE PKWY | S GREEN VALLEY PKWY |
| 5075 | AMERICAN PACIFIC DR | N ARROYO GRANDE BLVD |
| 5076 | PASEO VERDE PKWY | STEPHANIE ST |
| 5077 | WIGWAM PKWY | STEPHANIE ST |
| 5078 | SO1513 | HORIZON RIDGE PKWY |
| 5080 | EXECUTIVE AIRPORT DR | SR146 |
| 5083 | W BURKHOLDER BLVD | SR564 |
| 5084 | IONE RD | S EASTERN AV |
| 5085 | S EASTERN AV | SR146 |
| 5086 | SIENA HEIGHTS DR | S EASTERN AV |
| 5087 | CORONADO CENTER DR | CORONADO CENTER DR |
| 5092 | SUNRIDGE HEIGHTS PKWY | SEVEN HILLS DR |
| 5094 | SPENCER ST | SR146 |
| 5102 | OLSEN ST | SR564 |
| 5107 | SANTIAGO DR | STEPHANIE ST |
| 5108 | AMERICAN PACIFIC DR | STEPHANIE ST |
| 5109 | PEBBLE RD | S PECOS RD |
| 5115 | S ARROYO GRANDE BLVD | S ARROYO GRANDE BLVD |
| 5122 | CARNEGIE ST | S GREEN VALLEY PKWY |
| 5125 | CENTER ST | E BURKHOLDER BLVD |
| 5127 | HORIZON RIDGE PKWY | JEFFREYS ST |
| 5129 | HORIZON RIDGE PKWY | SEVEN HILLS DR |
| 5131 | W DALE AV | LAS VEGAS BLVD |

**TABLE A-5** Signalized Intersections at Ramp Terminals Included in the Database

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 4004 | BLUE DIAMOND | I-15 (W) |
| 4005 | BLUE DIAMOND | I-15 (E) |
| 4008 | TROPICANA | I-15 |
| 4012 | SPRING MOUNTAIN | I-15 SB OFF |
| 4021 | 515 SOUTH RAMPS | COLLEGE |
| 4022 | 515 NORTH RAMPS | COLLEGE |
| 4023 | HORIZON | I-515 (E & W) |
| 4024 | SO1513 | I-515 (E & W) |
| 4027 | TROPICANA | US 95 (E) |
| 4029 | FLAMINGO | US 95 (E) |
| 4033 | CHARLESTON | US 95 (E) |
| 4034 | CHARLESTON | US 95 (W) |
| 4036 | US 95 (N) | EASTERN |
| 4037 | US 95 (N) | LV BLVD |
| 4039 | US 95 | MLK |
| 4044 | US 95 (S) | VALLEY VIEW |
| 4045 | US 95 (N) | DECATUR |
| 4050 | SUMMERLIN PKWY (N) | BUFFALO |
| 4051 | SUMMERLIN PKWY (S) | BUFFALO |
| 4054 | SUMMERLIN PKWY | ANASAZI |
| 4058 | CHEYENNE | LV BW EAST |
| 4059 | CHEYENNE | LV BW WEST |
| 4062 | LV BW (N) | DURANGO |
| 4063 | LV BW (S) | DURANGO |
| 4067 | US 95 RAMPS | CENTENNIAL CENTER |
| 4069 | ANN | US 95 (W) |
| 4070 | ANN | US 95 (E) |
| 4071 | CRAIG | US 95 (W) |
| 4072 | CRAIG | US 95 (E) |
| 4091 | CHARLESTON | CC 215 |
| 4092 | CHARLESTON | CC 215 |
| 4094 | FLAMINGO | LV BELTWAY |
| 4095 | FLAMINGO | CC 215 (W) |
| 4114 | WARM SPRINGS | LV BELTWAY WEST |
| 4115 | WARM SPRINGS | LV BELTWAY EAST |
| 4117 | 215 WB OFF | EASTERN |
| 4118 | 215 EB OFF | EASTERN |
| 4120 | IR215 | SR146 |
| 4122 | 215 NORTH RAMPS | STEPHANIE |
| 4123 | 215 SOUTH RAMPS | STEPHANIE |

**TABLE A-6** Signalized Intersections at Ramp Terminals with Missing AADT at one of the Approaches

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 4001 | ST ROSE PKWY | I-15 |
| 4002 | SILVERADO RANCH | I-15 SB RAMPS |
| 4003 | SILVERADO RANCH | I-15 NB RAMPS |
| 4119 | I-215 | PECOS |
| 4121 | LV BW | GREEN VALLEY PKWY |
| 4116 | WINDMILL | I-215 |
| 4113 | LV BW SOUTH | LV BLVD |
| 4026 | SUNSET | I-515 (S) |
| 4025 | SUNSET | I-515 (N) |
| 4112 | LV BW NORTH | LV BLVD |
| 4105 | LV BW (S) | BUFFALO |
| 4102 | 215 (S) | DURANGO |
| 4107 | LV BW (S) | RAINBOW |
| 4109 | LV BW (S) | JONES |
| 4111 | I-215 (S) | DECATUR |
| 4104 | LV BW (N) | BUFFALO |
| 4103 | I-215 | DURANGO |
| 4106 | LV BW (N) | RAINBOW |
| 4108 | LV BW (N) | JONES |
| 4110 | I-215 (N) | DECATUR |
| 4101 | SUNSET | 215 (W) |
| 4100 | SUNSET | 215 (E) |
| 4099 | RUSSELL | 215 (W) |
| 4098 | RUSSELL | 215 (E) |
| 4007 | RUSSELL | I-15 (E) |
| 4006 | RUSSELL | I-15 (W) |
| 4097 | TROPICANA | 215 (W) |
| 4096 | TROPICANA | 215 (E) |
| 4028 | TROPICANA | US 95 (W) |
| 4009 | I-15 HOOK RD | FRANK SINATRA |
| 4010 | FLAMINGO | I-15 (W) |
| 4011 | FLAMINGO | I-15 (E) |
| 4030 | FLAMINGO | US 95 (W) |
| 4093 | TOWN CENTER | 215 SPUI |
| 4031 | BOULDER HWY | US 95 (N) |
| 4032 | BOULDER HWY | US 95 (N) |
| 4013 | SAHARA | I-15 (E) |
| 4035 | US 95 (S) | EASTERN |

| Signalized Intersection ID | East-West Street | North-South Street |
|---|---|---|
| 4048 | UPLAND/US 95 SB | JONES |
| 4047 | US 95 (N) | JONES |
| 4040 | US 95 SOUTH | MLK |
| 4041 | US 95 (S) | RANCHO |
| 4042 | US 95 (S) | RANCHO |
| 4049 | US 95 (S) | RAINBOW |
| 4043 | US 95 (N) | VALLEY VIEW |
| 4052 | SUMMERLIN PKWY | RAMPART |
| 4014 | I-15 (S) | D STREET |
| 4015 | I-15 (N) | D STREET |
| 4089 | FAR HILLS | CC 215 |
| 4088 | FAR HILLS | CC 215 |
| 4090 | FAR HILLS | CC 215 |
| 4056 | SUMMERLIN PKWY. | I - 215 (NB) |
| 4016 | LAKE MEAD BLVD | I-15 SB RAMP |
| 4057 | LAKE MEAD BLVD | CC 215 |
| 4017 | CHEYENNE | I-15 (SPUI) |
| 4073 | CHEYENNE | US 95 (W) |
| 4074 | CHEYENNE | US 95 (E) |
| 4018 | CRAIG | I-15 (W) |
| 4019 | CRAIG | I-15 (E) |
| 4060 | LONE MOUNTAIN | LV BW |
| 4020 | I-15 | LAMB |
| 4061 | ANN | LV BELTWAY |
| 4077 | LV BELTWAY | DECATUR |
| 4075 | LV BW | JONES |
| 4076 | LV BW | BRADLEY |
| 4086 | LV BELTWAY | RANGE |
| 4068 | CC 215 | SKY POINTE |
| 4066 | CC 215 | OSO BLANCA |
| 4081 | LV BELTWAY EB | LOSEE |
| 4083 | LV BELTWAY EB | PECOS |
| 4079 | LV BW | SIMMONS |
| 4085 | LV BELTWAY EB | LAMB |
| 4078 | CC 215 | ALIANTE |
| 4080 | LV BELTWAY WB | LOSEE |
| 4082 | LV BELTWAY WB | PECOS |
| 4084 | LV BELTWAY WB | LAMB |
| 4065 | US 95 (W) | DURANGO |
| 4064 | US 95 (E) | DURANGO |

**TABLE A-7** Stop Control Intersections Included in the Database

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3000 | W CACTUS AV | DEAN MARTIN DR |
| ST3005 | GOMER RD | S EL CAPITAN WY |
| ST3007 | GOMER RD | S CIMARRON RD |
| ST3011 | W SILVERADO RANCH BLVD | LINDELL RD |
| ST3015 | WARM SPRINGS RD | S BUFFALO DR |
| ST3021 | WARM SPRINGS RD | ARVILLE ST |
| ST3022 | WARM SPRINGS RD | S VALLEY VIEW BLVD |
| ST3029 | W BADURA AV | LINDELL RD |
| ST3052 | RUSSELL RD | GRAND CANYON DR |
| ST3067 | TROPICANA AV | S TENAYA WY |
| ST3069 | TROPICANA AV | LINDELL RD |
| ST3073 | RENO AV | KOVAL LA |
| ST3080 | N SPRING VALLEY PKWY | PEACE WY |
| ST3081 | S SPRING VALLEY PKWY | W HARMON AV |
| ST3083 | W HARMON AV | LINDELL RD |
| ST3094 | SPRING MOUNTAIN RD | GRAND CANYON DR |
| ST3095 | TWAIN AV | GRAND CANYON DR |
| ST3099 | TWAIN AV | S TORREY PINES DR |
| ST3100 | TWAIN AV | LINDELL RD |
| ST3112 | W ALEXANDER RD | N JENSEN ST |
| ST3115 | W ALEXANDER RD | GRAND CANYON DR |
| ST3116 | GOWAN RD | GRAND CANYON DR |
| ST3117 | GOWAN RD | FORT APACHE RD |
| ST3118 | W ALEXANDER RD | FORT APACHE RD |
| ST3120 | CRAIG RD | N EL CAPITAN WY |
| ST3121 | W ALEXANDER RD | N EL CAPITAN WY |
| ST3123 | CRAIG RD | N CIMARRON RD |
| ST3134 | W ALEXANDER RD | N TORREY PINES DR |
| ST3135 | GOWAN RD | BRADLEY RD |
| ST3136 | W ALEXANDER RD | BRADLEY RD |
| ST3138 | GOWAN RD | VALLEY DR |
| ST3139 | GOWAN RD | SAPPHIRE SEA CT |
| ST3141 | W GOWAN RD | CLAYTON ST |
| ST3144 | GOWAN RD | N COMMERCE ST |
| ST3161 | W WASHINGTON AV | N CIMARRON RD |
| ST3166 | W WASHINGTON AV | F ST |
| ST3173 | W CENTENNIAL PKWY | FORT APACHE RD |
| ST3181 | W TROPICAL PKWY | FORT APACHE RD |
| ST3182 | W TROPICAL PKWY | S EL CAPITAN WY |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3184 | ANN RD | FORT APACHE RD |
| ST3185 | ANN RD | GRAND CANYON DR |
| ST3192 | WASHBURN RD | N CIMARRON RD |
| ST3194 | LONE MOUNTAIN RD | N TENAYA WY |
| ST3195 | LONE MOUNTAIN RD | N TENAYA WY |
| ST3196 | LONE MOUNTAIN RD | N BUFFALO DR |
| ST3197 | LONE MOUNTAIN RD | N CIMARRON RD |
| ST3199 | LONE MOUNTAIN RD | FORT APACHE RD |
| ST3200 | LONE MOUNTAIN RD | GRAND CANYON DR |
| ST3201 | LONE MOUNTAIN RD | N JENSEN ST |
| ST3205 | W TROPICAL PKWY | CLAYTON ST |
| ST3206 | W TROPICAL PKWY | SAPPHIRE SEA CT |
| ST3210 | W TROPICAL PKWY | RAINBOW BLVD |
| ST3212 | ANN RD | N TORREY PINES DR |
| ST3221 | E CENTENNIAL PKWY | WALNUT RD |
| ST3224 | E CENTENNIAL PKWY | N BRUCE ST |
| ST3230 | E TROPICAL PKWY | N BRUCE ST |
| ST3231 | E TROPICAL PKWY | STATZ ST |
| ST3232 | E TROPICAL PKWY | N PECOS RD |
| ST3235 | ANN RD | N COMMERCE ST |
| ST3237 | ANN RD | N BRUCE ST |
| ST3239 | WASHBURN RD | STATZ ST |
| ST3240 | WASHBURN RD | N BRUCE ST |
| ST3246 | LONE MOUNTAIN RD | STATZ ST |
| ST3258 | W ROBINDALE RD | ARVILLE ST |
| ST3270 | W DORRELL LA | EGAN CREST DR |
| ST3274 | W DEER SPRINGS WY | GRAND CANYON DR |
| ST3275 | W DEER SPRINGS WY | FORT APACHE RD |
| ST3280 | GRAND TETON DR | GRAND CANYON DR |
| ST3281 | GRAND TETON DR | FORT APACHE RD |
| ST3306 | HORSE DR | BRADLEY RD |
| ST3322 | GRAND TETON DR | N DECATUR BLVD |
| ST3327 | GRAND TETON DR | N CIMARRON RD |
| ST3328 | GRAND TETON DR | N EL CAPITAN WY |
| ST3335 | ELKHORN RD | AVIARY WY |
| ST3337 | ELKHORN RD | BRADLEY RD |
| ST3372 | E CAREY AV | MARION DR |
| ST3380 | E BONANZA RD | N 15TH ST |
| ST3383 | OWENS AV | N CHRISTY LA |
| ST3384 | OWENS AV | SLOAN LA |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3385 | OWENS AV | MT HOOD ST |
| ST3386 | OWENS AV | N LOS FELIZ ST |
| ST3387 | E WASHINGTON AV | N LOS FELIZ ST |
| ST3390 | E WASHINGTON AV | SLOAN LA |
| ST3392 | E BONANZA RD | N CHRISTY LA |
| ST3393 | E BONANZA RD | SLOAN LA |
| ST3394 | E BONANZA RD | MT HOOD ST |
| ST3395 | E BONANZA RD | N LOS FELIZ ST |
| ST3398 | STEWART AV | FOGG ST |
| ST3399 | E CHARLESTON BLVD | FOGG ST |
| ST3400 | E BONNEVILLE AV | S 6TH ST |
| ST3405 | STEWART AV | N 6TH ST |
| ST3406 | CARSON AV | S 6TH ST |
| ST3408 | BRIDGER AV | S 6TH ST |
| ST3435 | E WYOMING AV | S WALNUT RD |
| ST3439 | E ST LOUIS AV | S WALNUT RD |
| ST3445 | RUSSELL RD | S MOJAVE RD |
| ST3446 | RUSSELL RD | LAMB BLVD |
| ST3447 | RUSSELL RD | PALM ST |
| ST3452 | DESERT INN RD | MOUNTAIN VISTA ST |
| ST3456 | TWAIN AV | SPENCER ST |
| ST3459 | TWAIN AV | S PECOS RD |
| ST3460 | TWAIN AV | S SANDHILL RD |
| ST3461 | TWAIN AV | BACKSTAGE BLVD |
| ST3466 | FLAMINGO RD | STEPHANIE ST |
| ST3470 | E HARMON AV | S MOJAVE RD |
| ST3474 | RENO AV | SPENCER ST |
| ST3486 | RUSSELL RD | BROADBENT BLVD |
| ST3495 | SUNSET RD | BURNS RD |
| ST3498 | E ROBINDALE RD | GILESPIE ST |
| ST3499 | E ROBINDALE RD | E ERIE AV |
| ST3503 | E WINDMILL LA | GILESPIE ST |
| ST3508 | E WIGWAM AV | SPENCER ST |
| ST3510 | PEBBLE RD | GILESPIE ST |
| ST3515 | WARM SPRINGS RD | EASTGATE RD |
| ST3526 | CORONADO CENTER DR | SIENA HEIGHTS DR |
| ST3527 | E SILVERADO RANCH BLVD | GILESPIE ST |
| ST3529 | E PYLE AV | GILESPIE ST |
| ST3534 | E CACTUS AV | GILESPIE ST |
| ST3539 | SUNRIDGE HEIGHTS PKWY | JEFFREYS ST |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3550 | VOLUNTEER BLVD | SEBRING HILLS DR |
| ST3596 | HORIZON RIDGE PKWY | E PARADISE HILLS DR |
| ST3599 | EQUESTRIAN DR | S MAGIC WY |
| ST3662 | ADAMS BLVD | UTAH ST |
| ST3663 | ADAMS BLVD | SAN FELIPE DR |
| ST3664 | ADAMS BLVD | AVENUE G |
| ST3669 | ADAMS BLVD | COTTONWOOD ST |
| ST3673 | CEDAR DR | YUCCA ST |
| ST3683 | ADAMS BLVD | CHESTNUT LA |
| ST3728 | SR160 | WILLIAMS RANCH RD |
| ST3735 | PRIMM BLVD | PRIMM VALLEY BLVD |
| ST190 | W ROBINDALE RD | LINDELL RD |
| ST774 | FLAMINGO RD | JIMMY DURANTE BLVD |
| ST3147 | GOWAN RD | LOSEE RD |
| ST3168 | ANN RD | SHAUMBER RD |
| ST3183 | ANN RD | S EL CAPITAN WY |
| ST3187 | ANN RD | EGAN CREST DR |
| ST3209 | W TROPICAL PKWY | S TORREY PINES DR |
| ST3278 | GRAND TETON DR | EGAN CREST DR |
| ST3321 | GRAND TETON DR | AVIARY WY |
| ST3377 | E CAREY AV | N LOS FELIZ ST |
| ST3396 | STEWART AV | N LOS FELIZ ST |
| ST3488 | RUSSELL RD | STEPHANIE ST |
| ST3504 | W WIGWAM AV | GILESPIE ST |
| ST3572 | WARM SPRINGS RD | PALO VERDE DR |
| ST3588 | E ATLANTIC AV | E PACIFIC AV |
| ST3595 | E MISSION DR | GREENWAY RD |
| ST3600 | EQUESTRIAN DR | APPALOOSA RD |
| ST3601 | EQUESTRIAN DR | FOOTHILLS DR |
| ST3602 | WAGON WHEEL DR | FOOTHILLS DR |
| ST3634 | ARIZONA ST | AVENUE L |
| ST3638 | WYOMING ST | AVENUE B |
| ST3640 | WYOMING ST | NORTHRIDGE DR |
| ST3644 | NEW MEXICO ST | AVENUE A |
| ST3654 | NAVAJO DR | PALOMA DR |
| ST3657 | RIVER MOUNTAIN AV | PATO DR |
| ST3704 | SR147E | SR ROAD |
| ST3717 | HARDY WY | HORIZON BLVD |
| ST3718 | W PIONEER BLVD | HORIZON BLVD |
| ST3729 | ARROYO RD | ALLEGRO ST |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3731 | SR161 | LAS VEGAS BLVD |
| ST3743 | MOUNTAINS EDGE PKWY | S CIMARRON RD |
| ST3761 | PEBBLE RD | LINDELL RD |
| ST3763 | PEBBLE RD | S TORREY PINES DR |
| ST3766 | PEBBLE RD | S EL CAPITAN WY |
| ST3776 | W ROBINDALE RD | S CIMARRON RD |
| ST3779 | W ROBINDALE RD | S TENAYA WY |
| ST3010 | W SILVERADO RANCH BLVD | JONES BLVD |
| ST3027 | W BADURA AV | S BUFFALO DR |
| ST3030 | W BADURA AV | S DECATUR BLVD |
| ST3032 | W MAULE AV | S VALLEY VIEW BLVD |
| ST3044 | W PATRICK LA | FORT APACHE RD |
| ST3048 | W PATRICK LA | RAINBOW BLVD |
| ST3057 | W HACIENDA AV | S HUALAPAI WY |
| ST3058 | W HACIENDA AV | GRAND CANYON DR |
| ST3061 | ALDEBARAN AV | DEAN MARTIN DR |
| ST3065 | RENO AV | S HUALAPAI WY |
| ST3066 | RENO AV | GRAND CANYON DR |
| ST3070 | RENO AV | S VALLEY VIEW BLVD |
| ST3075 | PEACE WY | GRAND CANYON DR |
| ST3082 | W HARMON AV | S TORREY PINES DR |
| ST3087 | FLAMINGO RD | S TOWN CENTER DR |
| ST3090 | DESERT INN RD | RED ROCK RANCH RD |
| ST3091 | TWAIN AV | S TOWN CENTER DR |
| ST3092 | TWAIN AV | S HUALAPAI WY |
| ST3093 | SPRING MOUNTAIN RD | S HUALAPAI WY |
| ST3103 | GRAND CANYON DR | GRAND CANYON DR |
| ST3104 | S TENAYA WY | W OAKEY BLVD |
| ST3122 | GOWAN RD | N EL CAPITAN WY |
| ST3124 | W ALEXANDER RD | N CIMARRON RD |
| ST3125 | GOWAN RD | N CIMARRON RD |
| ST3126 | S CIMARRON RD | S CIMARRON RD |
| ST3133 | W GOWAN RD | N TORREY PINES DR |
| ST3140 | GOWAN RD | SIMMONS ST |
| ST3142 | W ALEXANDER RD | CLAYTON ST |
| ST3143 | W ALEXANDER RD | REVERE ST |
| ST3145 | GOWAN RD | 5TH ST |
| ST3163 | W BONANZA RD | BELROSE ST |
| ST3189 | WASHBURN RD | FORT APACHE RD |
| ST3213 | WASHBURN RD | N TORREY PINES DR |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3214 | WASHBURN RD | JONES BLVD |
| ST3215 | WASHBURN RD | VALLEY DR |
| ST3217 | LONE MOUNTAIN RD | VALLEY DR |
| ST3220 | E DEER SPRINGS WY | LOSEE RD |
| ST3222 | E CENTENNIAL PKWY | N PECOS RD |
| ST3225 | E CENTENNIAL PKWY | 5TH ST |
| ST3226 | W CENTENNIAL PKWY | REVERE ST |
| ST3227 | W AZURE AV | REVERE ST |
| ST3228 | W AZURE AV | N COMMERCE ST |
| ST3229 | W TROPICAL PKWY | REVERE ST |
| ST3234 | E TROPICAL PKWY | RANGE RD |
| ST3242 | W LA MADRE WY | CAMINO AL NORTE |
| ST3243 | LONE MOUNTAIN RD | N COMMERCE ST |
| ST3257 | W ROBINDALE RD | S DECATUR BLVD |
| ST3260 | W ROBINDALE RD | DEAN MARTIN DR |
| ST3267 | W DORRELL LA | N DURANGO DR |
| ST3268 | W DORRELL LA | FORT APACHE RD |
| ST3269 | W DORRELL LA | N HUALAPAI WY |
| ST3276 | W DEER SPRINGS WY | GRAND MONTECITO PKWY |
| ST3279 | GRAND TETON DR | N HUALAPAI WY |
| ST3284 | FARM RD | FORT APACHE RD |
| ST3292 | ELKHORN RD | FORT APACHE RD |
| ST3298 | IRON MOUNTAIN RD | N EL CAPITAN WY |
| ST3313 | RACEL ST | N DURANGO DR |
| ST3332 | FARM RD | BRADLEY RD |
| ST3333 | FARM RD | N DECATUR BLVD |
| ST3336 | ELKHORN RD | N DECATUR BLVD |
| ST3339 | ELKHORN RD | RAINBOW BLVD |
| ST3340 | W DEER SPRINGS WY | N CIMARRON RD |
| ST3341 | W DEER SPRINGS WY | N BUFFALO DR |
| ST3343 | W DEER SPRINGS WY | JONES BLVD |
| ST3344 | W DEER SPRINGS WY | BRADLEY RD |
| ST3353 | SPEEDWAY BLVD | SR604 |
| ST3355 | HOLLYWOOD BLVD | SR604 |
| ST3378 | N BRUCE ST | SR604 |
| ST3388 | E WASHINGTON AV | HOLLYWOOD BLVD |
| ST3389 | E WASHINGTON AV | MT HOOD ST |
| ST3397 | STEWART AV | HOLLYWOOD BLVD |
| ST3407 | CLARK AV | S 6TH ST |
| ST3409 | CLARK AV | MARYLAND PKWY |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3412 | S 13TH ST | S RUE 13 |
| ST3415 | BRIDGER AV | S 15TH ST |
| ST3420 | E OGDEN AV | N BRUCE ST |
| ST3436 | E WYOMING AV | SR612 |
| ST3437 | E ST LOUIS AV | SR612 |
| ST3438 | E ST LOUIS AV | LAMB BLVD |
| ST3440 | E ST LOUIS AV | MCLEOD ST |
| ST3441 | KAREN AV | S MOJAVE RD |
| ST3443 | VEGAS VALLEY DR | S MOJAVE RD |
| ST3444 | VEGAS VALLEY DR | MCLEOD DR |
| ST3454 | DESERT INN RD | LAMB BLVD |
| ST3457 | TWAIN AV | S EASTERN AV |
| ST3468 | E HARMON AV | JIMMY DURANTE BLVD |
| ST3471 | E HARMON AV | MCLEOD DR |
| ST3472 | E HARMON AV | SPENCER ST |
| ST3473 | RENO AV | MARYLAND PKWY |
| ST3475 | RENO AV | MCLEOD DR |
| ST3476 | RENO AV | S SANDHILL RD |
| ST3478 | E HACIENDA AV | PALM ST |
| ST3479 | E HACIENDA AV | LAMB BLVD |
| ST3481 | E HACIENDA AV | MCLEOD DR |
| ST3482 | E HACIENDA AV | SPENCER ST |
| ST3483 | E HACIENDA AV | SWENSON ST |
| ST3485 | E HACIENDA AV | STEPHANIE ST |
| ST3491 | W PATRICK LA | STEPHANIE ST |
| ST3500 | E ROBINDALE RD | PARADISE RD |
| ST3506 | E WIGWAM AV | POLLOCK DR |
| ST3509 | PEBBLE RD | PARADISE RD |
| ST3512 | E SERENE AV | E ERIE AV |
| ST3513 | E SERENE AV | POLLOCK DR |
| ST3514 | WHITNEY RANCH DR | N ARROYO GRANDE BLVD |
| ST3516 | E BARRETT ST | PABCO RD |
| ST3521 | SILVER SPRINGS PKWY | VALLE VERDE DR |
| ST3522 | WINDMILL PKWY | VALLE VERDE DR |
| ST3523 | WIGWAM PKWY | N ARROYO GRANDE BLVD |
| ST3528 | E PYLE AV | LAS VEGAS BLVD |
| ST3531 | E CACTUS AV | SPENCER ST |
| ST3532 | E CACTUS AV | MARYLAND PKWY |
| ST3533 | E CACTUS AV | E ERIE AV |
| ST3536 | E ERIE AV | LAS VEGAS BLVD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3544 | BARBARA LA | LAS VEGAS BLVD |
| ST3552 | S EASTERN AV | SUN CITY ANTHEM DR |
| ST3553 | SUN CITY ANTHEM DR | ANTHEM PKWY |
| ST3554 | PECOS RIDGE PKWY | S EASTERN AV |
| ST3557 | ANTHEM HIGHLANDS DR | ANTHEM HIGHLANDS DR |
| ST3560 | LARSON LA | LAS VEGAS BLVD |
| ST3561 | PASEO VERDE PKWY | S ARROYO GRANDE BLVD |
| ST3562 | S ARROYO GRANDE BLVD | STEPHANIE ST |
| ST3563 | PASEO VERDE PKWY | S GIBSON RD |
| ST3567 | ESSEX AV | N PUEBLO BLVD |
| ST3580 | NEWPORT DR | S MAGIC WY |
| ST3586 | E PACIFIC AV | S WATER ST |
| ST3590 | MAJOR AV | E VAN WAGENEN ST |
| ST3592 | GREENWAY RD | GREENWAY RD |
| ST3593 | HEATHER DR | GREENWAY RD |
| ST3624 | COLORADO ST | UTAH ST |
| ST3626 | PARK ST | NEVADA WY |
| ST3682 | EL CAMINO WY | BUCHANAN BLVD |
| ST3685 | HIGHLAND DR | SAN FELIPE DR |
| ST3687 | HIGHLAND DR | GEORGIA AV |
| ST3738 | W ERIE AV | S BUFFALO DR |
| ST3740 | W CACTUS AV | S BUFFALO DR |
| ST3741 | MOUNTAINS EDGE PKWY | RAINBOW BLVD |
| ST100 | W WINDMILL LA | PARADISE RD |
| ST1763 | ANN RD | N COMMERCE ST |
| ST1840 | W WIGWAM AV | S DURANGO DR |
| ST2281 | TWAIN AV | SR612 |
| ST2583 | W SERENE AV | S DECATUR BLVD |
| ST2589 | PEBBLE RD | S DECATUR BLVD |
| ST2787 | W PATRICK LA | JONES BLVD |
| ST2914 | PEBBLE RD | RAINBOW BLVD |
| ST477 | RUSSELL RD | S BUFFALO DR |
| ST807 | DESERT INN RD | RED ROCK RANCH RD |
| ST3059 | W HACIENDA AV | S BUFFALO DR |
| ST3074 | PEACE WY | S HUALAPAI WY |
| ST3077 | PEACE WY | S CIMARRON RD |
| ST3079 | PEACE WY | S TENAYA WY |
| ST3179 | W TROPICAL PKWY | S HUALAPAI WY |
| ST3186 | ANN RD | S HUALAPAI WY |
| ST3188 | WASHBURN RD | GRAND CANYON DR |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3190 | WASHBURN RD | S EL CAPITAN WY |
| ST3193 | WASHBURN RD | S BUFFALO DR |
| ST3287 | FARM RD | EGAN CREST DR |
| ST3299 | IRON MOUNTAIN RD | S DURANGO DR |
| ST3314 | RACEL ST | S CIMARRON RD |
| ST3342 | W DEER SPRINGS WY | S TENAYA WY |
| ST3411 | BRIDGER AV | S 13TH ST |
| ST3413 | CLARK AV | S 13TH ST |
| ST3416 | CARSON AV | N 15TH ST |
| ST3427 | E UTAH AV | INDUSTRIAL RD |
| ST3565 | ATHENS AVE | RACETRACK RD |
| ST3569 | ITHACA AV | N PUEBLO BLVD |
| ST3620 | QUARTZITE RD | NEVADA WY |
| ST3623 | AVENUE I | NEVADA WY |
| ST3625 | PARK ST | UTAH ST |
| ST3627 | COLORADO ST | NEVADA WY |
| ST3632 | ARIZONA ST | UTAH ST |
| ST3647 | NEW MEXICO ST | AVENUE G |
| ST3652 | NAVAJO DR | NORTHRIDGE DR |
| ST3677 | GINGERWOOD PKWY | BUCHANAN BLVD |
| ST3699 | BUCHANAN BLVD | GEORGIA AV |
| ST3703 | SR 41 | LAKE MEAD PKWY |
| ST3711 | W PERKINS AV | WHITMORE ST |
| ST3736 | E STARR AV | RAINBOW BLVD |
| ST3737 | E STARR AV | S BUFFALO DR |
| ST3742 | MOUNTAINS EDGE PKWY | S BUFFALO DR |
| ST3746 | MOUNTAINS EDGE PKWY | FORT APACHE RD |
| ST3747 | W CACTUS AV | FORT APACHE RD |

**TABLE A-8** Stop Control Intersections with Missing AADT at one of the Approaches

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST33 | W SILVERADO RANCH BLVD | S VALLEY VIEW BLVD |
| ST142 | W WINDMILL LA | S BUFFALO DR |
| ST145 | W WINDMILL LA | S TENAYA WY |
| ST154 | W WINDMILL LA | S TORREY PINES DR |
| ST158 | W WINDMILL LA | JONES BLVD |
| ST165 | W WINDMILL LA | S DECATUR BLVD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST168 | W WINDMILL LA | ARVILLE ST |
| ST174 | W ROBINDALE RD | S CIMARRON RD |
| ST179 | W ROBINDALE RD | S BUFFALO DR |
| ST181 | W ROBINDALE RD | S TORREY PINES DR |
| ST193 | W ROBINDALE RD | S DECATUR BLVD |
| ST198 | W ROBINDALE RD | ARVILLE ST |
| ST201 | W ROBINDALE RD | S VALLEY VIEW BLVD |
| ST203 | W ROBINDALE RD | LAS VEGAS BLVD |
| ST204 | W ROBINDALE RD | LAS VEGAS BLVD |
| ST229 | E ROBINDALE RD | SPENCER ST |
| ST255 | WARM SPRINGS RD | FORT APACHE RD |
| ST277 | WARM SPRINGS RD | S CIMARRON RD |
| ST279 | WARM SPRINGS RD | S TENAYA WY |
| ST293 | WARM SPRINGS RD | S TORREY PINES DR |
| ST302 | WARM SPRINGS RD | CAMERON ST |
| ST308 | WARM SPRINGS RD | S VALLEY VIEW BLVD |
| ST364 | SUNSET RD | S HUALAPAI WY |
| ST370 | SUNSET RD | GRAND CANYON DR |
| ST377 | SUNSET RD | FORT APACHE RD |
| ST380 | SUNSET RD | QUARTERHORSE LA |
| ST381 | SUNSET RD | QUARTERHORSE LA |
| ST390 | SUNSET RD | ARVILLE ST |
| ST452 | RUSSELL RD | S HUALAPAI WY |
| ST483 | RUSSELL RD | S TENAYA WY |
| ST493 | RUSSELL RD | S TORREY PINES DR |
| ST503 | RUSSELL RD | LINDELL RD |
| ST508 | RUSSELL RD | WYNN RD |
| ST773 | FLAMINGO RD | JIMMY DURANTE BLVD |
| ST797 | TWAIN AV | S EL CAPITAN WY |
| ST806 | TWAIN AV | CIMARRON RD |
| ST915 | DESERT INN RD | BACKSTAGE BLVD |
| ST919 | DESERT INN RD | DESERT INN RD |
| ST926 | SAHARA AV | DESERT FOOTHILLS DR |
| ST1212 | W WASHINGTON AV | N CIMARRON RD |
| ST1275 | W WASHINGTON AV | ROBIN ST |
| ST1309 | E WASHINGTON AV | N SANDHILL RD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST1328 | E WASHINGTON AV | N CHRISTY LA |
| ST1336 | LAKE MEAD BLVD | HILLPOINTE RD |
| ST1375 | LAKE MEAD BLVD | LAKE MEAD BLVD |
| ST1560 | CRAIG RD | N JENSEN ST |
| ST1561 | CRAIG RD | GRAND CANYON DR |
| ST1566 | CRAIG RD | FORT APACHE RD |
| ST1765 | ANN RD | 5TH ST |
| ST1816 | E CENTENNIAL PKWY | STATZ ST |
| ST1819 | E CENTENNIAL PKWY | WALNUT RD |
| ST1823 | W CACTUS AV | S DURANGO DR |
| ST1826 | MOUNTAINS EDGE PKWY | S DURANGO DR |
| ST1829 | GOMER RD | S DURANGO DR |
| ST1861 | W BADURA AV | S DURANGO DR |
| ST1865 | W PATRICK LA | S DURANGO DR |
| ST1950 | W CACTUS AV | S VALLEY VIEW BLVD |
| ST1951 | W SERENE AV | S VALLEY VIEW BLVD |
| ST1953 | PEBBLE RD | S VALLEY VIEW BLVD |
| ST2071 | E ROBINDALE RD | PARADISE RD |
| ST2143 | BRIDGER AV | MARYLAND PKWY |
| ST2158 | TRAIL CANYON RD | N GIBSON RD |
| ST2231 | SILVER SPRINGS PKWY | VALLE VERDE DR |
| ST2302 | E ST LOUIS AV | SR612 |
| ST2306 | E WYOMING AV | SR612 |
| ST2336 | ALTO AV | SR612 |
| ST2347 | S EASTERN AV | S EASTERN AV |
| ST2352 | S EASTERN AV | S EASTERN AV |
| ST2445 | TWAIN AV | S EASTERN AV |
| ST2496 | BARBARA LA | LAS VEGAS BLVD |
| ST2498 | E STARR AV | LAS VEGAS BLVD |
| ST2501 | E ERIE AV | LAS VEGAS BLVD |
| ST2502 | E CACTUS AV | LAS VEGAS BLVD |
| ST2503 | E PYLE AV | LAS VEGAS BLVD |
| ST2591 | W WIGWAM AV | S DECATUR BLVD |
| ST2594 | W WINDMILL LA | S DECATUR BLVD |
| ST2600 | W ROBINDALE RD | S DECATUR BLVD |
| ST2611 | W PATRICK LA | S DECATUR BLVD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST2734 | W ROME BLVD | N DECATUR BLVD |
| ST2739 | ELKHORN RD | N DECATUR BLVD |
| ST2741 | FARM RD | N DECATUR BLVD |
| ST2744 | GRAND TETON DR | N DECATUR BLVD |
| ST2749 | N DECATUR BLVD | N DECATUR BLVD |
| ST2752 | IRON MOUNTAIN RD | N DECATUR BLVD |
| ST2757 | W CACTUS AV | JONES BLVD |
| ST2761 | W PYLE AV | JONES BLVD |
| ST2763 | W SILVERADO RANCH BLVD | JONES BLVD |
| ST2766 | W SERENE AV | JONES BLVD |
| ST2770 | W WIGWAM AV | JONES BLVD |
| ST2773 | W WINDMILL LA | JONES BLVD |
| ST2860 | PEAK DR | JONES BLVD |
| ST2890 | WASHBURN RD | JONES BLVD |
| ST2904 | W ERIE AV | RAINBOW BLVD |
| ST2905 | MOUNTAINS EDGE PKWY | RAINBOW BLVD |
| ST2910 | W SERENE AV | RAINBOW BLVD |
| ST2953 | W PATRICK LA | RAINBOW BLVD |
| ST3001 | SOUTHERN HIGHLANDS PKWY | SOUTHERN HIGHLANDS PKWY |
| ST3002 | SOUTHERN HIGHLANDS PKWY | SOUTHERN HIGHLANDS PKWY |
| ST3003 | SOUTHERN HIGHLANDS PKWY | SOUTHERN HIGHLANDS PKWY |
| ST3006 | GOMER RD | S DURANGO DR |
| ST3008 | GOMER RD | S BUFFALO DR |
| ST3009 | GOMER RD | S TENAYA WY |
| ST3012 | W SILVERADO RANCH BLVD | ARVILLE ST |
| ST3013 | W SILVERADO RANCH BLVD | S VALLEY VIEW BLVD |
| ST3014 | WARM SPRINGS RD | S CIMARRON RD |
| ST3016 | WARM SPRINGS RD | S TENAYA WY |
| ST3017 | S TENAYA WY | S TENAYA WY |
| ST3018 | WARM SPRINGS RD | S TORREY PINES DR |
| ST3019 | WARM SPRINGS RD | LINDELL RD |
| ST3020 | WARM SPRINGS RD | CAMERON ST |
| ST3023 | W MAULE AV | FORT APACHE RD |
| ST3024 | W MAULE AV | QUARTERHORSE LA |
| ST3025 | W BADURA AV | S DURANGO DR |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3026 | W BADURA AV | S CIMARRON RD |
| ST3028 | W BADURA AV | S TENAYA WY |
| ST3031 | W MAULE AV | ARVILLE ST |
| ST3033 | SUNSET RD | S HUALAPAI WY |
| ST3034 | SUNSET RD | GRAND CANYON DR |
| ST3035 | SUNSET RD | FORT APACHE RD |
| ST3036 | SUNSET RD | QUARTERHORSE LA |
| ST3037 | SUNSET RD | S BUFFALO DR |
| ST3038 | SUNSET RD | S TENAYA WY |
| ST3039 | RAPHAEL RIVERA WY | S TENAYA WY |
| ST3040 | ROY HORN WY | S TENAYA WY |
| ST3041 | ROY HORN WY | S TORREY PINES DR |
| ST3042 | SUNSET RD | ARVILLE ST |
| ST3043 | W PATRICK LA | GRAND CANYON DR |
| ST3045 | W PATRICK LA | S DURANGO DR |
| ST3046 | W PATRICK LA | S BUFFALO DR |
| ST3047 | W PATRICK LA | S TENAYA WY |
| ST3049 | W PATRICK LA | LINDELL RD |
| ST3050 | W PATRICK LA | S DECATUR BLVD |
| ST3053 | RUSSELL RD | S TENAYA WY |
| ST3054 | RUSSELL RD | S TORREY PINES DR |
| ST3055 | RUSSELL RD | LINDELL RD |
| ST3056 | RUSSELL RD | WYNN RD |
| ST3060 | W HACIENDA AV | S TENAYA WY |
| ST3062 | W MANDALAY BAY RD | DEAN MARTIN DR |
| ST3063 | ACCESS FRANK SINATRA | FRANK SINATRA DR |
| ST3064 | ACCESS FRANK SINATRA | ACCESS LUXOR |
| ST3068 | RENO AV | S TORREY PINES DR |
| ST3071 | RENO AV | FRANK SINATRA DR |
| ST3072 | RENO AV | ACCESS LUXOR |
| ST3076 | PEACE WY | S EL CAPITAN WY |
| ST3078 | PEACE WY | S TENAYA WY |
| ST3084 | W HARMON AV | CAMERON ST |
| ST3085 | W HARMON AV | ARVILLE ST |
| ST3086 | W HARMON AV | WYNN RD |
| ST3089 | W SADDLE AV | OLD FLAMINGO WY |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3096 | TWAIN AV | S EL CAPITAN WY |
| ST3097 | TWAIN AV | CIMARRON RD |
| ST3098 | TWAIN AV | S TENAYA WY |
| ST3101 | DESERT INN RD | WESTERN AV |
| ST3105 | EDNA AV | SR595 |
| ST3106 | EDNA AV | S TORREY PINES DR |
| ST3107 | EDNA AV | LINDELL RD |
| ST3108 | NOVAT ST | NOVAT ST |
| ST3109 | GOWAN RD | CLIFF SHADOWS PKWY |
| ST3110 | GOWAN RD | NOVAT ST |
| ST3111 | GOWAN RD | N HUALAPAI WY |
| ST3113 | CRAIG RD | N JENSEN ST |
| ST3114 | CRAIG RD | GRAND CANYON DR |
| ST3127 | S CIMARRON RD | S CIMARRON RD |
| ST3128 | PEAK DR | N BUFFALO DR |
| ST3129 | PEAK DR | N TENAYA WY |
| ST3130 | PEAK DR | RAINBOW BLVD |
| ST3131 | PEAK DR | N TORREY PINES DR |
| ST3132 | PEAK DR | JONES BLVD |
| ST3137 | W ALEXANDER RD | VALLEY DR |
| ST3146 | GOWAN RD | N BRUCE ST |
| ST3148 | GOWAN RD | CIVIC CENTER DR |
| ST3149 | E ALEXANDER RD | N BRUCE ST |
| ST3150 | E ALEXANDER RD | ARCATA WY |
| ST3151 | ALTA DR | DESERT FOOTHILLS DR |
| ST3152 | ALTA DR | VISTA RUN DR |
| ST3153 | VISTA RUN DR | TALEGA ST |
| ST3154 | DIVELEY AV | TALEGA ST |
| ST3155 | CRESTDALE LN | CRESTDALE LN |
| ST3156 | CRESTDALE LN | CRESTDALE LN |
| ST3157 | CRESTDALE LA | CRESTDALE LA |
| ST3158 | HILLPOINTE RD | HILLPOINTE RD |
| ST3159 | LAKE MEAD BLVD | HILLPOINTE RD |
| ST3162 | LAKE MEAD BLVD | LAKE MEAD BLVD |
| ST3164 | W WASHINGTON AV | ROBIN ST |
| ST3165 | HARRISON AV | H ST |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3167 | LONE MOUNTAIN RD | CLIFF SHADOWS PKWY |
| ST3169 | W TROPICAL PKWY | SHAUMBER RD |
| ST3170 | W CENTENNIAL PKWY | SHAUMBER RD |
| ST3171 | W CENTENNIAL PKWY | N HUALAPAI WY |
| ST3172 | W CENTENNIAL PKWY | GRAND CANYON DR |
| ST3174 | GRAND MONTECITO PKWY | GRAND MONTECITO PKWY |
| ST3175 | W AZURE DR | GRAND CANYON DR |
| ST3176 | W AZURE DR | N HUALAPAI WY |
| ST3177 | W AZURE DR | EGAN CREST DR |
| ST3178 | W TROPICAL PKWY | EGAN CREST DR |
| ST3180 | W TROPICAL PKWY | GRAND CANYON DR |
| ST3191 | WASHBURN RD | N DURANGO DR |
| ST3198 | LONE MOUNTAIN RD | N EL CAPITAN WY |
| ST3202 | W AZURE DR | RAINBOW BLVD |
| ST3203 | W AZURE DR | N TORREY PINES DR |
| ST3204 | W AZURE DR | BRADLEY RD |
| ST3207 | W TROPICAL PKWY | VALLEY DR |
| ST3208 | W TROPICAL PKWY | BRADLEY RD |
| ST3211 | W TROPICAL PKWY | S TENAYA WY |
| ST3216 | WASHBURN RD | SAPPHIRE SEA CT |
| ST3219 | W DEER SPRINGS WY | 5TH ST |
| ST3223 | E CENTENNIAL PKWY | STATZ ST |
| ST3233 | E TROPICAL PKWY | WALNUT RD |
| ST3238 | WASHBURN RD | N PECOS RD |
| ST3241 | CAMINO BRAVO | CAMINO BRAVO |
| ST3244 | LONE MOUNTAIN RD | 5TH ST |
| ST3245 | LONE MOUNTAIN RD | N BRUCE ST |
| ST3247 | W PYLE AV | S TORREY PINES DR |
| ST3248 | W PYLE AV | JONES BLVD |
| ST3249 | W PYLE AV | LINDELL RD |
| ST3250 | W PYLE AV | S DECATUR BLVD |
| ST3251 | W PYLE AV | DEAN MARTIN DR |
| ST3252 | W CACTUS AV | S VALLEY VIEW BLVD |
| ST3253 | W CACTUS AV | ARVILLE ST |
| ST3254 | W CACTUS AV | LINDELL RD |
| ST3255 | W CACTUS AV | JONES BLVD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3256 | W CACTUS AV | S TORREY PINES DR |
| ST3259 | W ROBINDALE RD | S VALLEY VIEW BLVD |
| ST3261 | W WINDMILL LA | ARVILLE ST |
| ST3262 | W WINDMILL LA | S DECATUR BLVD |
| ST3263 | W WIGWAM AV | S DECATUR BLVD |
| ST3264 | W WIGWAM AV | ARVILLE ST |
| ST3265 | W WIGWAM AV | S VALLEY VIEW BLVD |
| ST3266 | W WIGWAM AV | DEAN MARTIN DR |
| ST3271 | W DORRELL LA | SHAUMBER RD |
| ST3272 | W DEER SPRINGS WY | EGAN CREST DR |
| ST3273 | W DEER SPRINGS WY | N HUALAPAI WY |
| ST3277 | GRAND TETON DR | SHAUMBER RD |
| ST3282 | GRAND TETON DR | FRCL23 |
| ST3283 | FARM RD | FRCL23 |
| ST3285 | FARM RD | GRAND CANYON DR |
| ST3286 | FARM RD | N HUALAPAI WY |
| ST3288 | FARM RD | SHAUMBER RD |
| ST3289 | ELKHORN RD | EGAN CREST DR |
| ST3290 | ELKHORN RD | N HUALAPAI WY |
| ST3291 | ELKHORN RD | GRAND CANYON DR |
| ST3293 | MOCCASIN RD | N DURANGO DR |
| ST3294 | LOG CABIN WY | N DURANGO DR |
| ST3295 | LOG CABIN WY | N EL CAPITAN WY |
| ST3296 | SR157 | FRCL24 |
| ST3297 | SR157 | FRCL23 |
| ST3300 | IRON MOUNTAIN RD | N TORREY PINES DR |
| ST3301 | IRON MOUNTAIN RD | JONES BLVD |
| ST3302 | IRON MOUNTAIN RD | BRADLEY RD |
| ST3303 | IRON MOUNTAIN RD | N DECATUR BLVD |
| ST3304 | HORSE DR | AVIARY WY |
| ST3305 | HORSE DR | N DECATUR BLVD |
| ST3307 | HORSE DR | JONES BLVD |
| ST3308 | HORSE DR | N TORREY PINES DR |
| ST3309 | HORSE DR | RAINBOW BLVD |
| ST3310 | HORSE DR | N EL CAPITAN WY |
| ST3311 | FORT APACHE RD | FORT APACHE RD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3312 | RACEL ST | N EL CAPITAN WY |
| ST3315 | RACEL ST | SILVERSTONE RANCH DR |
| ST3316 | RACEL ST | RAINBOW BLVD |
| ST3317 | RACEL ST | N TORREY PINES DR |
| ST3318 | RACEL ST | JONES BLVD |
| ST3319 | HORSE DR | ALIANTE PKWY |
| ST3320 | GRAND TETON DR | ALIANTE PKWY |
| ST3324 | GRAND TETON DR | N TORREY PINES DR |
| ST3325 | GRAND TETON DR | RAINBOW BLVD |
| ST3326 | GRAND TETON DR | N TENAYA WY |
| ST3329 | N EL CAPITAN WY | N EL CAPITAN WY |
| ST3330 | FARM RD | RAINBOW BLVD |
| ST3331 | FARM RD | N TORREY PINES DR |
| ST3334 | ALIANTE PKWY | ALIANTE PKWY |
| ST3338 | ELKHORN RD | N TORREY PINES DR |
| ST3345 | W DEER SPRINGS WY | VALLEY DR |
| ST3346 | AVIARY WY | AVIARY WY |
| ST3347 | W DEER SPRINGS WY | CLAYTON ST |
| ST3348 | W ROME BLVD | VALLEY DR |
| ST3349 | W ROME BLVD | N DECATUR BLVD |
| ST3350 | W ROME BLVD | BRADLEY RD |
| ST3351 | W ROME BLVD | N TENAYA WY |
| ST3352 | HOLLYWOOD BLVD | HOLLYWOOD BLVD |
| ST3354 | E TROPICAL PKWY | HOLLYWOOD BLVD |
| ST3356 | SLOAN LA | SLOAN LA |
| ST3357 | LONE MOUNTAIN RD | SR610 |
| ST3358 | MITCHELL ST | MITCHELL ST |
| ST3359 | E ALEXANDER RD | N WALNUT RD |
| ST3360 | E ALEXANDER RD | PUEBLA ST |
| ST3361 | PUEBLA ST | PUEBLA ST |
| ST3362 | GOWAN RD | N WALNUT RD |
| ST3363 | N WALNUT RD | N WALNUT RD |
| ST3364 | N WALNUT RD | N WALNUT RD |
| ST3365 | CHEYENNE AV | HOLLYWOOD BLVD |
| ST3366 | ALTO AV | HOLLYWOOD BLVD |
| ST3367 | ALTO AV | SR612 |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3368 | ALTO AV | MARION DR |
| ST3369 | ALTO AV | LAMB BLVD |
| ST3370 | ALTO AV | N WALNUT RD |
| ST3371 | ALTO AV | N PECOS RD |
| ST3373 | E CAREY AV | N CHRISTY LA |
| ST3374 | E CAREY AV | SLOAN LA |
| ST3375 | E CAREY AV | TOIYABE ST |
| ST3376 | E CAREY AV | MT HOOD ST |
| ST3379 | N BRUCE ST | N BRUCE ST |
| ST3381 | OWENS AV | STATZ ST |
| ST3382 | E WASHINGTON AV | N SANDHILL RD |
| ST3391 | E WASHINGTON AV | N CHRISTY LA |
| ST3401 | W WILSON AV | D ST |
| ST3402 | FRCL48 | CITY PKWY |
| ST3403 | GASS AV | S MAIN ST |
| ST3404 | GASS AV | S 4TH ST |
| ST3410 | BRIDGER AV | MARYLAND PKWY |
| ST3414 | CLARK AV | S 15TH ST |
| ST3417 | E OGDEN AV | N 15TH ST |
| ST3418 | E OGDEN AV | N 15TH ST |
| ST3419 | STEWART AV | N 15TH ST |
| ST3421 | HASTINGS AV | MARTIN L KING BLVD |
| ST3422 | WALL ST | FRCL06 |
| ST3423 | WALL ST | WESTERN AV |
| ST3424 | E COLORADO AV | S 4TH ST |
| ST3425 | E UTAH AV | S CASINO CENTER BLVD |
| ST3426 | W UTAH AV | S MAIN ST |
| ST3428 | WESTERN AV | WESTERN AV |
| ST3429 | HIGHLAND AV | HIGHLAND DR |
| ST3430 | SR589 | WESTERN AV |
| ST3431 | HIGHLAND DR | HIGHLAND DR |
| ST3432 | E OAKEY BLVD | SR582 |
| ST3433 | E WYOMING AV | E WYOMING AV |
| ST3434 | E WYOMING AV | S SANDHILL RD |
| ST3448 | SAHARA AV | HOLLYWOOD BLVD |
| ST3449 | VEGAS VALLEY DR | TREE LINE DR |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3450 | VEGAS VALLEY DR | HOLLYWOOD BLVD |
| ST3451 | DESERT INN RD | HOLLYWOOD BLVD |
| ST3453 | DESERT INN RD | DESERT INN RD |
| ST3455 | DESERT INN RD | BACKSTAGE BLVD |
| ST3458 | TWAIN AV | MCLEOD DR |
| ST3462 | TWAIN AV | MOUNTAIN VISTA ST |
| ST3463 | TWAIN AV | SR582 |
| ST3464 | TWAIN AV | SR612 |
| ST3465 | TWAIN AV | CABANA DR |
| ST3467 | FLAMINGO RD | JIMMY DURANTE BLVD |
| ST3469 | STEPHANIE ST | STEPHANIE ST |
| ST3477 | RENO AV | LAMB BLVD |
| ST3484 | CLARK ST | MISSOURI AV |
| ST3487 | RUSSELL RD | HOLLYWOOD BLVD |
| ST3489 | W PATRICK LA | W GALLERIA DR |
| ST3490 | W PATRICK LA | WHITNEY RANCH DR |
| ST3492 | WHITNEY RANCH DR | WHITNEY RANCH DR |
| ST3493 | STUFFLEBEAM AV | EASTGATE RD |
| ST3494 | E GALLERIA DR | WIESNER WY |
| ST3496 | W ROBINDALE RD | LAS VEGAS BLVD |
| ST3497 | W ROBINDALE RD | LAS VEGAS BLVD |
| ST3501 | E ROBINDALE RD | SPENCER ST |
| ST3505 | E WIGWAM AV | E ERIE AV |
| ST3507 | E WIGWAM AV | PARADISE RD |
| ST3511 | E SERENE AV | GILESPIE ST |
| ST3517 | SUNSET RD | PABCO RD |
| ST3518 | AUTO SHOW DR | EASTGATE RD |
| ST3520 | TRAIL CANYON RD | MARKS ST |
| ST3524 | PEBBLE RD | CARNEGIE ST |
| ST3525 | E SERENE AV | SR146 |
| ST3530 | E PYLE AV | POLLOCK DR |
| ST3535 | E CACTUS AV | LAS VEGAS BLVD |
| ST3537 | E ERIE AV | GILESPIE ST |
| ST3538 | E ERIE AV | E ERIE AV |
| ST3540 | SEVEN HILLS DR | SEVEN HILLS DR |
| ST3541 | E STARR AV | E ERIE AV |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3542 | E STARR AV | GILESPIE ST |
| ST3543 | E STARR AV | LAS VEGAS BLVD |
| ST3545 | BARBARA LA | GILESPIE ST |
| ST3546 | EXECUTIVE AIRPORT DR | EXECUTIVE AIRPORT DR |
| ST3547 | E BRUNER AV | E ERIE AV |
| ST3548 | VOLUNTEER BLVD | GILESPIE ST |
| ST3549 | VOLUNTEER BLVD | ACCESS VIA INSPIRADA |
| ST3551 | HAMPTON RD | SUN CITY ANTHEM DR |
| ST3555 | SUN CITY ANTHEM DR | SUN CITY ANTHEM DR |
| ST3556 | BICENTENNIAL PKWY | ANTHEM HIGHLANDS DR |
| ST3558 | DEMOCRACY DR | ANTHEM HIGHLANDS DR |
| ST3559 | SR739 | LAS VEGAS BLVD |
| ST3564 | HORIZON RIDGE PKWY | HORIZON RIDGE PKWY |
| ST3566 | ESSEX AV | RACETRACK RD |
| ST3568 | ITHACA AV | RACETRACK RD |
| ST3570 | CENTER ST | CENTER ST |
| ST3571 | WARM SPRINGS RD | CENTER ST |
| ST3573 | WARM SPRINGS RD | MAJOR AV |
| ST3574 | WARM SPRINGS RD | N PUEBLO BLVD |
| ST3575 | WARM SPRINGS RD | N PUEBLO BLVD |
| ST3576 | WARM SPRINGS RD | RACETRACK RD |
| ST3577 | CHAMPLIN AV | PALO VERDE DR |
| ST3578 | PALO VERDE DR | PALO VERDE DR |
| ST3579 | S PUEBLO BLVD | S PUEBLO BLVD |
| ST3581 | NEWPORT DR | RACETRACK RD |
| ST3582 | NEWPORT DR | S PUEBLO BLVD |
| ST3583 | MAJOR AV | MAJOR AV |
| ST3584 | S WATER ST | S WATER ST |
| ST3585 | E ATLANTIC AV | S WATER ST |
| ST3587 | E PACIFIC AV | E PACIFIC AV |
| ST3589 | W PACIFIC AV | W PACIFIC AV |
| ST3594 | E MISSION DR | COLLEGE DR |
| ST3597 | E PARADISE HILLS DR | GREENWAY RD |
| ST3598 | E PARADISE HILLS DR | COLLEGE DR |
| ST3603 | WAGON WHEEL DR | APPALOOSA RD |
| ST3604 | E PARADISE HILLS DR | OLD VEGAS TRL |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3605 | E PARADISE HILLS DR | NEVADA STATE DR |
| ST3606 | MARINA DR | LAKE MOUNTAIN DR |
| ST3607 | LAKE MOUNTAIN DR | LAKE MOUNTAIN DR |
| ST3608 | MARINA DR | VILLE DR |
| ST3609 | VILLE DR | VILLE DR |
| ST3610 | ISABEL DR | JUDI LA |
| ST3611 | MARINA DR | ISABEL DR |
| ST3612 | PACIFICA WY | JUDI LA |
| ST3613 | PACIFICA WY | PACIFICA WY |
| ST3614 | PACIFICA WY | PACIFICA WY |
| ST3615 | TEMPLE ROCK RD | TEMPLE ROCK RD |
| ST3616 | RED ROCK RD | RED ROCK RD |
| ST3617 | TEMPLE ROCK RD | TEMPLE ROCK RD |
| ST3618 | QUARTZITE RD | QUARTZITE RD |
| ST3619 | QUARTZITE RD | QUARTZITE RD |
| ST3621 | NEVADA WY | NEVADA WY |
| ST3622 | AVENUE I | AVENUE I |
| ST3628 | RAILROAD AV | CHERRY ST |
| ST3629 | ARIZONA ST | AVENUE B |
| ST3630 | ARIZONA ST | AVENUE G |
| ST3631 | UTAH ST | UTAH ST |
| ST3633 | ARIZONA ST | AVENUE I |
| ST3635 | WYOMING ST | AVENUE L |
| ST3636 | WYOMING ST | AVENUE I |
| ST3637 | WYOMING ST | AVENUE G |
| ST3639 | WYOMING ST | NEVADA WY |
| ST3641 | CANYON RD | CANYON RD |
| ST3642 | NEVADA WY | NEVADA WY |
| ST3643 | NEW MEXICO ST | CHERRY ST |
| ST3645 | AVENUE A | AVENUE A |
| ST3646 | NEW MEXICO ST | AVENUE B |
| ST3648 | NEW MEXICO ST | AVENUE K |
| ST3649 | AVENUE L | AVENUE L |
| ST3650 | UTAH ST | UTAH ST |
| ST3653 | UTAH ST | UTAH ST |
| ST3655 | PALOMA DR | PALOMA DR |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3656 | OLMO WY | PATO DR |
| ST3658 | DEL PRADO DR | OLMO WY |
| ST3659 | DEL PRADO DR | DEL PRADO DR |
| ST3661 | DEL PRADO DR | UTAH ST |
| ST3665 | ADAMS BLVD | AVENUE B |
| ST3666 | JERI LA | MARITA DR |
| ST3667 | JERI LA | GLORIA LA |
| ST3668 | ADAMS BLVD | GLORIA LA |
| ST3670 | ADAMS BLVD | BUCHANAN BLVD |
| ST3671 | INDUSTRIAL RD | YUCCA ST |
| ST3672 | VETERANS DR | VETERANS MEMORIAL DR |
| ST3675 | ADAMS BLVD | ASPEN DR |
| ST3676 | ADAMS BLVD | GINGERWOOD ST |
| ST3678 | MARITA DR | MARITA DR |
| ST3679 | EL CAMINO WY | MARITA DR |
| ST3680 | EL CAMINO WY | GLORIA LA |
| ST3681 | EL CAMINO WY | MANCHA DR |
| ST3684 | BRONCO RD | UTAH ST |
| ST3686 | HIGHLAND DR | PUEBLO DR |
| ST3689 | GEORGIA AV | GEORGIA AV |
| ST3690 | GEORGIA AV | GEORGIA AV |
| ST3691 | GEORGIA AV | GEORGIA AV |
| ST3692 | FAIRWAY DR | PUEBLO DR |
| ST3693 | SAN FELIPE DR | SAN FELIPE DR |
| ST3694 | PUEBLO DR | PUEBLO DR |
| ST3695 | SAN FELIPE DR | SAN FELIPE DR |
| ST3696 | SAN FELIPE DR | SAN FELIPE DR |
| ST3697 | VAQUERO DR | SAN FELIPE DR |
| ST3700 | GEORGIA AV | GEORGIA AV |
| ST3701 | SR172 | BOULDER BEACH |
| ST3702 | VIA ANTINCENDIO | LAKE LAS VEGAS PKWY |
| ST3705 | FRCL07 | FRCL07 |
| ST3706 | FRCL08 | US93 |
| ST3707 | SR168 | HIDDEN VALLEY RD |
| ST3708 | SR168 | RM527 |
| ST3709 | SR168 | SR168 |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3710 | GANN AV | SR169 |
| ST3712 | W PERKINS AV | SR169 |
| ST3713 | VALLEY OF FIRE RD | SR169 |
| ST3714 | SR170 | SR170 |
| ST3715 | SR170 | S MAIN ST |
| ST3716 | E VIRGIN ST | S MAIN ST |
| ST3719 | HAFEN LA | SR170 |
| ST3720 | SR170 | SR170 |
| ST3721 | HAFEN LA | THISTLE ST |
| ST3722 | HAFEN LA | ARROWHEAD LA |
| ST3723 | MESQUITE BLVD | ARROWHEAD LA |
| ST3724 | W PIONEER BLVD | W PIONEER BLVD |
| ST3725 | OASIS BLVD | KITTY HAWK DR |
| ST3726 | SR156 | SR156 |
| ST3727 | W BOULDER LA | MACFARLAND AV |
| ST3730 | SR159 | CASTALIA ST |
| ST3732 | PACIFIC AV | N ESMERALDA ST |
| ST3733 | SR161 | S ESMERALDA ST |
| ST3734 | S KINGSTON RD | S KINGSTON RD |
| ST3744 | MOUNTAINS EDGE PKWY | S DURANGO DR |
| ST3745 | MOUNTAINS EDGE PKWY | S EL CAPITAN WY |
| ST3748 | W CACTUS AV | S EL CAPITAN WY |
| ST3749 | W CACTUS AV | S DURANGO DR |
| ST3750 | W SERENE AV | RAINBOW BLVD |
| ST3751 | W SERENE AV | S TORREY PINES DR |
| ST3752 | W SERENE AV | JONES BLVD |
| ST3753 | W SERENE AV | S DECATUR BLVD |
| ST3754 | W SERENE AV | ARVILLE ST |
| ST3755 | W SERENE AV | S VALLEY VIEW BLVD |
| ST3756 | W SERENE AV | DEAN MARTIN DR |
| ST3757 | PEBBLE RD | DEAN MARTIN DR |
| ST3758 | PEBBLE RD | S VALLEY VIEW BLVD |
| ST3759 | PEBBLE RD | ARVILLE ST |
| ST3760 | PEBBLE RD | S DECATUR BLVD |
| ST3762 | PEBBLE RD | S BRONCO ST |
| ST3764 | PEBBLE RD | RAINBOW BLVD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3765 | PEBBLE RD | S TENAYA WY |
| ST3767 | PEBBLE RD | FORT APACHE RD |
| ST3768 | W WIGWAM AV | S DURANGO DR |
| ST3769 | W WIGWAM AV | S CIMARRON RD |
| ST3770 | W WIGWAM AV | S TENAYA WY |
| ST3771 | W WIGWAM AV | JONES BLVD |
| ST3772 | W WINDMILL LA | JONES BLVD |
| ST3773 | W WINDMILL LA | S TORREY PINES DR |
| ST3774 | W WINDMILL LA | S TENAYA WY |
| ST3775 | W WINDMILL LA | S BUFFALO DR |
| ST3777 | W ROBINDALE RD | S BUFFALO DR |
| ST3778 | W ROBINDALE RD | S TENAYA WY |
| ST3780 | W ROBINDALE RD | S TORREY PINES DR |
| ST3781 | W ROBINDALE RD | LINDELL RD |
| ST3782 | W CACTUS AV | S TORREY PINES DR |
| ST3783 | W WIGWAM AV | DEAN MARTIN DR |
| ST31 | W SILVERADO RANCH BLVD | LINDELL RD |
| ST88 | E WINDMILL LA | GILESPIE ST |
| ST202 | W ROBINDALE RD | DEAN MARTIN DR |
| ST210 | E ROBINDALE RD | GILESPIE ST |
| ST210 | E ROBINDALE RD | GILESPIE ST |
| ST214 | E ROBINDALE RD | E ERIE AV |
| ST221 | E ROBINDALE RD | PARADISE RD |
| ST278 | WARM SPRINGS RD | S BUFFALO DR |
| ST304 | WARM SPRINGS RD | ARVILLE ST |
| ST458 | RUSSELL RD | GRAND CANYON DR |
| ST518 | RUSSELL RD | S MOJAVE RD |
| ST536 | RUSSELL RD | LAMB BLVD |
| ST538 | RUSSELL RD | PALM ST |
| ST585 | TROPICANA AV | S TENAYA WY |
| ST597 | TROPICANA AV | LINDELL RD |
| ST651 | FLAMINGO RD | S TOWN CENTER DR |
| ST775 | FLAMINGO RD | STEPHANIE ST |
| ST776 | TWAIN AV | S TOWN CENTER DR |
| ST779 | TWAIN AV | S HUALAPAI WY |
| ST784 | TWAIN AV | GRAND CANYON DR |

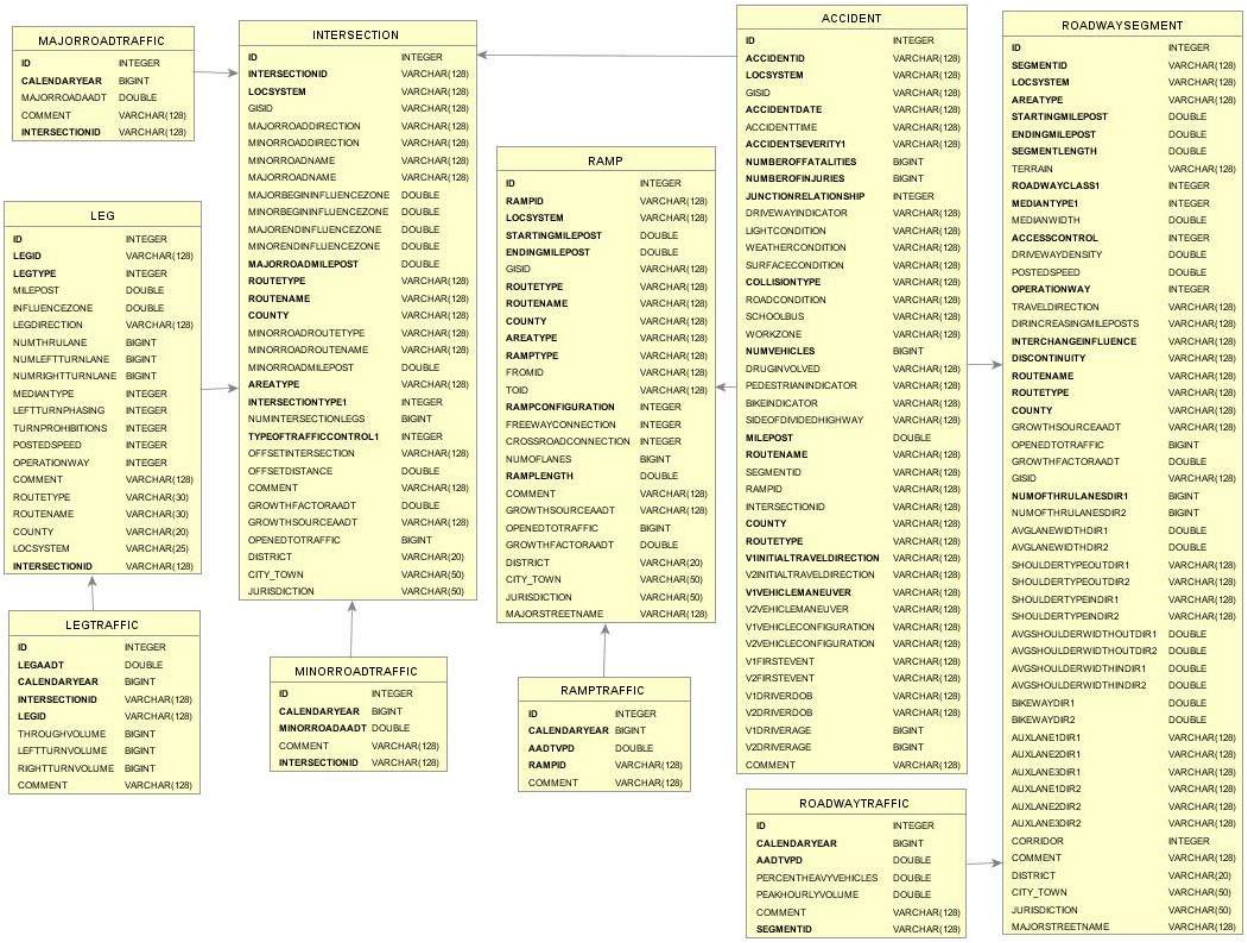
| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST917 | DESERT INN RD | LAMB BLVD |
| ST921 | DESERT INN RD | MOUNTAIN VISTA ST |
| ST1196 | E CHARLESTON BLVD | FOGG ST |
| ST1211 | W WASHINGTON AV | N CIMARRON RD |
| ST1287 | W WASHINGTON AV | F ST |
| ST1333 | E WASHINGTON AV | SLOAN LA |
| ST1567 | CRAIG RD | N EL CAPITAN WY |
| ST1567 | CRAIG RD | N EL CAPITAN WY |
| ST1574 | CRAIG RD | S CIMARRON RD |
| ST1680 | ANN RD | SHAUMBER RD |
| ST1683 | ANN RD | EGAN CREST DR |
| ST1685 | ANN RD | S HUALAPAI WY |
| ST1688 | ANN RD | GRAND CANYON DR |
| ST1692 | ANN RD | FORT APACHE RD |
| ST1695 | ANN RD | S EL CAPITAN WY |
| ST1721 | ANN RD | S TORREY PINES DR |
| ST1768 | ANN RD | ANN RD |
| ST1768 | ANN RD | N BRUCE ST |
| ST1793 | W CENTENNIAL PKWY | REVERE ST |
| ST1793 | W CENTENNIAL PKWY | REVERE ST |
| ST1805 | E CENTENNIAL PKWY | 5TH ST |
| ST1807 | E CENTENNIAL PKWY | N BRUCE ST |
| ST1818 | E CENTENNIAL PKWY | N PECOS RD |
| ST1968 | W MAULE AV | S VALLEY VIEW BLVD |
| ST1991 | RENO AV | S VALLEY VIEW BLVD |
| ST2031 | W CACTUS AV | MARYLAND PKWY |
| ST2031 | E CACTUS AV | MARYLAND PKWY |
| ST2094 | RENO AV | MARYLAND PKWY |
| ST2141 | CLARK AV | MARYLAND PKWY |
| ST2141 | S RUE 13 | S RUE 13 |
| ST2141 | MARYLAND PKWY | MARYLAND PKWY |
| ST2147 | PASEO VERDE PKWY | S GIBSON RD |
| ST2175 | S ARROYO GRANDE BLVD | STEPHANIE ST |
| ST2175 | S ARROYO GRANDE BLVD | STEPHANIE ST |
| ST2227 | WINDMILL PKWY | VALLE VERDE DR |
| ST3004 | GOMER RD | FORT APACHE RD |

| Stop Control Intersection ID | East-West Street | North-South Street |
|---|---|---|
| ST3051 | RUSSELL RD | S HUALAPAI WY |
| ST3088 | W SADDLE AV | FORT APACHE RD |
| ST3102 | SAHARA AV | DESERT FOOTHILLS DR |
| ST3119 | CRAIG RD | FORT APACHE RD |
| ST3160 | VEGAS DR | S CIMARRON RD |
| ST3218 | N COMMERCE ST | N COMMERCE ST |
| ST3236 | ANN RD | 5TH ST |
| ST3323 | GRAND TETON DR | BRADLEY RD |
| ST3442 | KAREN AV | LAMB BLVD |
| ST3480 | E HACIENDA AV | S MOJAVE RD |
| ST3502 | E WINDMILL LA | PARADISE RD |
| ST3519 | TRAIL CANYON RD | N GIBSON RD |
| ST3591 | E VAN WAGENEN ST | GREENWAY RD |
| ST3651 | UTAH ST | NORTHRIDGE DR |
| ST3660 | DEL PRADO DR | DEL PRADO DR |
| ST3674 | ADAMS BLVD | BRISTLECONE DR |
| ST3688 | FAIRWAY DR | GEORGIA AV |
| ST3739 | W ERIE AV | RAINBOW BLVD |

# APPENDIX B

## ENTITY RELATIONSHIP DIAGRAM OF THE PROPOSED SAFETY DATABASE

This Appendix illustrates the Entity Relation Diagram (ERD) of the proposed Safety Database. Accident table is related to Roadway Segment, Intersection and Ramp illustrating that each crash in Accident Table is mapped to either Roadway Segment table through Segment ID , Ramp table through Ramp ID or Intersection table through Intersection ID. Roadway Traffic table is mapped to Roadway Segment table through Segment ID. Ramp Traffic table is mapped to Ramp table through Ramp ID. Leg, Minorroadtraffic and Majorroadtraffic table is mapped to Intersection table through Intersection ID. Legtraffic is mapped to Leg table through Leg ID and Intersection ID.



# APPENDIX C

## RESULTS OF NETWORK SCREENING ANALYSES

This Appendix provides the results of various analyses performed with the proposed safety database. In each of the analyses, inputs and parameters used for the analysis were given. Then the output in tabular form as resulted in Safety Analyst was provided.

The description of each column in the output report is provided from Safety Analyst User Manual (*27*). The columns ID, Segment Type, Site Subtype, County, Route, Site Start Location, and Site End Location provide descriptive and location information for the entire site. Safety Analyst uses county, route system (in our analysis, I, SR, CR or L), unique route identifier (in our analysis, RMID) and beginning milepost information in 'Route' column. One of the comments provided by NDOT was that the information provided by Safety Analyst in 'Route' column is confusing. Hence, for easier identification, Route Full Name is used in 'Route' column for roadway and ramp segments, major and minor street names are used for intersections. In this report, Segment Type and County are not included because of space and legibility constraints while creating tables in the document. The Segment Type column provides information whether the site is roadway segment, ramp or intersection. County column provides county information of the site; in our analysis, always Clark County. Also, only top ten ranks were shown in this report.

The remaining columns present information related to the safety performance of the site as follows:

- **Average Observed Crashes for Entire Site**: This column on the output report the Average Observed Crashes for the Entire Site, take into consideration an ADT growth factor to scale the observed crash frequency to the final year of the analysis period.

- **Average Observed Crashes**: This column on the output report presents the average observed crash frequency for that portion of the site identified as having the greatest potential for safety improvement. Only those observed crashes reported to have occurred between the start milepost and end milepost are included in this calculation. The average observed crash frequency is scaled to the final year of the analysis period so that the observed, predicted, and expected crash frequencies are directly comparable. This calculation considers only observed crash frequencies and growth in ADT.

- **Predicted Crash Frequency**: This column on the output report presents the predicted crash frequency for that portion of the site identified as having the greatest potential for safety improvement. This predicted value is calculated directly from a safety performance function. This calculation does not consider the "observed" crashes at the site. This is essentially a preliminary calculation in the EB methodology. The predicted crash frequency is for the final year of the analysis period.

- **Expected Crash Frequency/Excess Crash Frequency**: This column on the output report presents the expected crash frequency or excess crash frequency for that portion of the site identified as having the greatest potential for safety improvement. This expected value is calculated from a safety performance function and observed crash data. This is essentially the final output from the EB calculations. The expected crash frequency is for the final year of the analysis period. The value of the Expected Crash Frequency is always between the values for the Average Observed Crashes and the Predicted Crash Frequency for that portion of the site identified as having the greatest potential for safety improvement. If the analyst selects to screen based upon Excess Crash Frequency, the heading will be Excess Crash Frequency. The Excess Crash Frequency is calculated as the difference between the Expected Crash Frequency and the Predicted Crash Frequency. The units are the same for both expected and excess crash frequency. The Expected Crash Frequency or Excess Crash Frequency is the measure used to rank order sites for their potential for safety improvement. Sites with higher Expected or Excess Crash Frequencies have greater potential for safety improvement.

- **Variance (Var)**: This column on the output report presents the variance of the expected or excess crash frequency. For roadway segments and ramps, the units for this measure are acc/mi2/yr. For intersections, the units are acc/yr.

- **Start Location**: For roadway segments, this column on the output report presents the initial location (i.e., upstream boundary) of the window identified as having the highest potential for safety improvement. Thus, this is the initial location of the window that met the screening criteria and had the maximum (i.e., peak) expected or excess crash frequency. This column is left blank for intersections and ramps.

- **End Location**: For roadway segments, this column on the output report presents the end location (i.e., downstream boundary) of the window identified as having the highest potential for safety improvement. Thus, this is the end location of the window that met the screening criteria and had the maximum (i.e., peak) expected or excess crash frequency. For intersections and ramps, this column is left blank. For peak searching the distance from the Start and End Location of the window with the highest potential for safety improvement will always be a multiple of 0.1 mi or will be the length of the entire site.

- **No. of Expected Fatalities**: This column on the output report presents the expected number of fatalities for the final year of the analysis period for the location with the highest potential for safety improvement. This measure is provided only when the screening is based upon fatal and all injury and fatal and severe crash severity levels. This measure is a prediction of the number of fatalities at the person level.

- **No. of Expected Injuries**: This column on the output report presents the expected number of injuries for the final year of the analysis period for the location with the highest potential for safety improvement. This measure is provided only when the

screening is based upon fatal and all injury and fatal and severe crash severity levels. When screening is based upon the fatal and all injury crash severity level, this measure is the expected number of all injuries. When screening is based upon the fatal and severe crash severity level, this measure is the expected number of severe injuries. This measure is a prediction of the number of injuries at the person level. Therefore, in most cases, the number of expected injuries will be greater than the expected injury crash frequency.

- **Rank**: The ranking of the site is based upon the expected or excess crash frequency. Sites with higher expected or excess crash frequencies are ranked higher in terms of their potential for safety improvement. Sites with lower expected or excess crash frequencies are ranked lower in terms of their potential for safety improvement.

- **Additional Windows of Interest**: For roadway segments, the entries in this column of the output report are the boundaries of other windows (i.e., subsegments) within the site that met the screening criteria but did not have the maximum (i.e., peak) expected or excess crash frequency. For intersections and ramps, this column is always blank.

**Analysis 1: Roadway and ramp segments, and intersections – total crashes – with Peak Searching on roadway segments and CV test**

Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Segments, Intersections, Ramps
Roadway Segments: Peak Searching
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
Limiting Value (Intersections): 5.0 crashes/yr
Limiting Value (Ramps): 5.0 crashes/mi/yr
CV limit (roadway segments): 0.5
CV limit (intersections): 0.5
CV limit (ramps): 0.5
Number of sites in the site list: 7343
Number of sites evaluated: 7156
Number of segments evaluated: 5649
Total length of segments evaluated: 2122.713
Number of intersections evaluated: 887
Number of ramps evaluated: 620
Number of sites flagged: 434
Total Roadway Segments Ranked = 360 out of 5649 total segments in sitelist.
Total Roadway Segment Length Ranked = 168.031 out of 2122.713 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 7.9
Number of Intersections Ranked = 31 out of 887 total intersections in sitelist.
Percentage of Intersections Ranked = 3.5
Number of Ramps Ranked = 43 out of 620 total ramps in sitelist.
Percentage of Ramps Ranked = 6.9
* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr), Intersections (crashes/yr), Ramps (crashes/mi/yr)
** Units for Variance
  - Roadway Segments (crashes/mi**2/yr), Intersections (crashes/yr), Ramps (crashes/mi**2/yr)

**TABLE C-1 Results of Analysis 1: Roadway and Ramp Segments, and Intersections – Total Crashes – with Peak Searching on Roadway Segments and CV test**

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 22710 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.223 | 40.886 | 444.93 | 1159.97 | 69.09 | 1050.56 | 4097.6 | | | 40.223 | 40.323 | 1 |
| 638_640 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.886 | 41.525 | 309.42 | 711.82 | 85.97 | 607.58 | 6128 | | | 41.386 | 41.486 | 2 |
| 7015 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 35.112 | 35.768 | 153.15 | 566.63 | 74.48 | 475.05 | 4608.7 | | | 35.668 | 35.768 | 3 |
| 6607_99 | Seg/Urb; Fwy in intchng area (6 ln) | IR15 | 37.596 | 38.269 | 291.9 | 671.82 | 220.82 | 442.53 | 29422 | | | 37.996 | 38.096 | 4 |
| 639 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 41.525 | 41.667 | 418.54 | 416.48 | 81.01 | 325.1 | 5397.5 | | | 41.567 | 41.667 | 5 |
| 100 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 38.269 | 38.597 | 186.38 | 384.87 | 53.58 | 315.22 | 2402.8 | | | 38.269 | 38.369 | 6 |
| 642 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 41.667 | 41.958 | 194.8 | 356.57 | 74.86 | 272.29 | 4609.7 | | | 41.667 | 41.767 | 7 |
| 5450 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 35.768 | 36.09 | 169.78 | 335.03 | 62.55 | 261.26 | 3237.1 | | | 35.768 | 35.868 | 8 |
| 144261 | Seg/Urb; Multilane divided | S DECATUR BLVD | 4.624 | 4.64 | 299.06 | 299.06 | 20.22 | 252.51 | 2462.7 | | | 4.624 | 4.64 | 9 |
| 3242_3259 | Seg/Urb; Fwy in intchng area (4 ln) | IR515 | 19.314 | 19.607 | 224.69 | 288.21 | 32.25 | 239.25 | 888.8 | | | 19.414 | 19.514 | 10 |

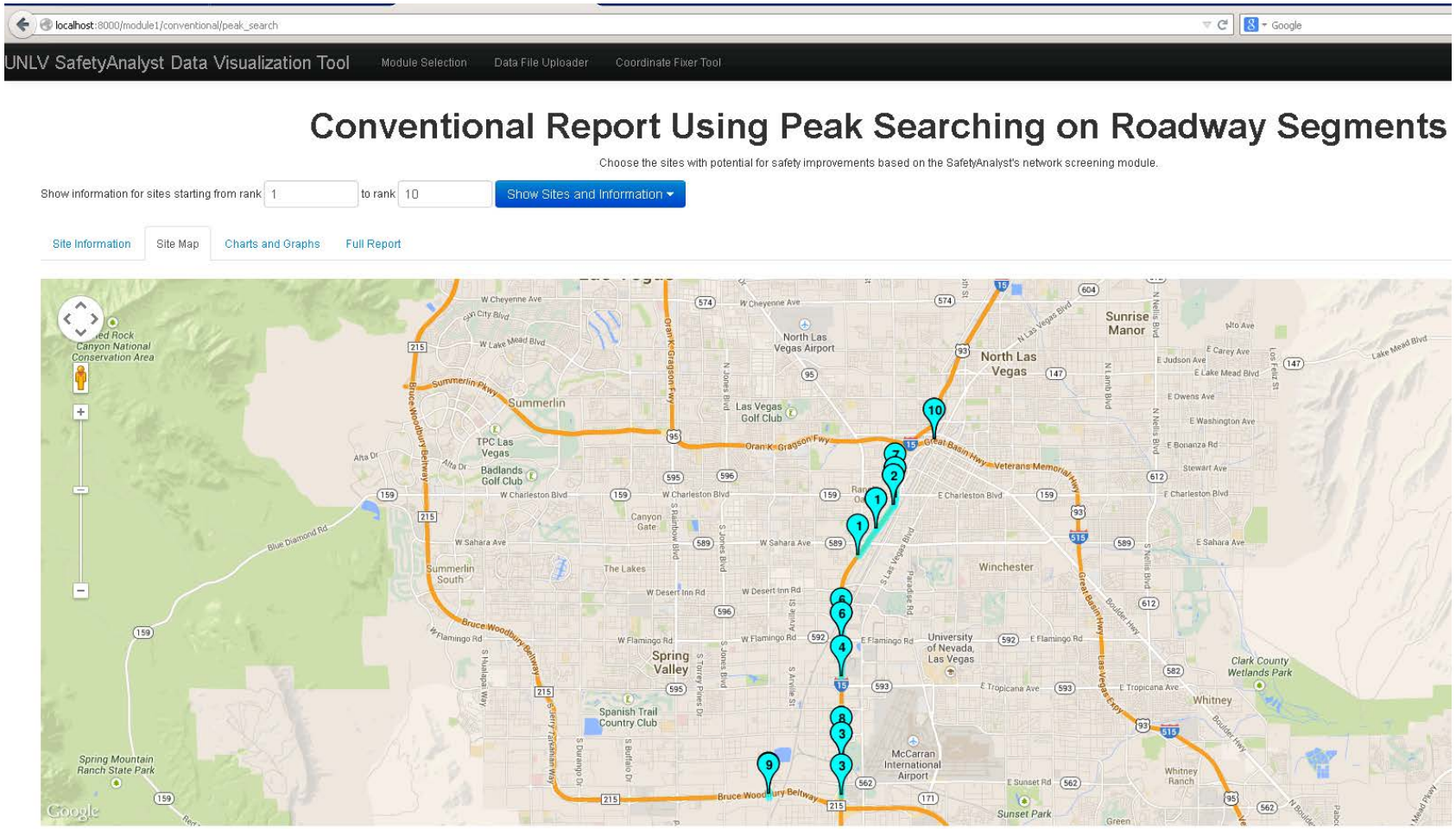



**FIGURE C-1 Visualization of Results of Analysis 1: Roadway and Ramp Segments, and Intersections – Total Crashes – with Peak Searching on Roadway Segments and CV test**

**Analysis 2: Roadway and ramp segments, and intersections – fatal and all injury crashes – with Peak Searching on roadway segments and CV test**

Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Segments, Intersections, Ramps
Roadway Segments: Peak Searching
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
Limiting Value (Intersections): 5.0 crashes/yr
Limiting Value (Ramps): 5.0 crashes/mi/yr
CV limit (roadway segments): 0.5
CV limit (intersections): 0.5
CV limit (ramps): 0.5
Number of sites in the site list: 7343
Number of sites evaluated: 7156
Number of segments evaluated: 5649
Total length of segments evaluated: 2122.713
Number of intersections evaluated: 887
Number of ramps evaluated: 620
Number of sites flagged: 256
Total Roadway Segments Ranked = 222 out of 5649 total segments in sitelist.
Total Roadway Segment Length Ranked = 93.659 out of 2122.713 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 4.4
Number of Intersections Ranked = 19 out of 887 total intersections in sitelist.
Percentage of Intersections Ranked = 2.1
Number of Ramps Ranked = 15 out of 620 total ramps in sitelist.
Percentage of Ramps Ranked = 2.4
* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr), Intersections (crashes/yr), Ramps (crashes/mi/yr)
** Units for Variance
  - Roadway Segments (crashes/mi**2/yr), Intersections (crashes/yr), Ramps (crashes/mi**2/yr)

**TABLE C-2 Results of Analysis 2: Roadway and Ramp Segments, and Intersections – Fatal and All Injury Crashes – with Peak Searching on Roadway Segments and CV test**

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 22710 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.223 | 40.886 | 113.21 | 291.56 | 20.43 | 238.49 | 379.89 | 2.21 | 339.36 | 40.223 | 40.323 | 1 |
| 638_640 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.886 | 41.525 | 99.9 | 189.06 | 25.76 | 147.7 | 558.06 | 1.37 | 210.18 | 41.386 | 41.486 | 2 |
| 6588d_6588e | Seg/Urb; Multilane divided | SR589 | 2.411 | 3.657 | 47.68 | 156.49 | 19.18 | 135.02 | 2166.3 | 1.46 | 204.07 | 3.311 | 3.411 | 3 |
| 7015 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 35.112 | 35.768 | 44.42 | 155.78 | 22.12 | 118.56 | 414.43 | 1.1 | 168.71 | 35.668 | 35.768 | 4 |
| 1421c | Seg/Urb; Multilane divided | SR612 | 5.124 | 5.633 | 31.95 | 100.37 | 10.91 | 87.08 | 708.05 | 0.94 | 131.62 | 5.324 | 5.424 | 5 |
| 639 | Seg/Urb; Fwy in | IR15 | 41.525 | 41.667 | 119.07 | 118.14 | 24.19 | 84.46 | 483.08 | 0.78 | 120.18 | 41.567 | 41.667 | 6 |

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| | intchng area (4 ln) | | | | | | | | | | | | | |
| 144261 | Seg/Urb; Multilane divided | S DECATUR BLVD | 4.624 | 4.64 | 106.95 | 106.95 | 8.99 | 77.99 | 483.65 | 0.84 | 117.88 | 4.624 | 4.64 | 7 |
| 642 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 41.667 | 41.958 | 59.27 | 105.53 | 22.24 | 74.2 | 409.34 | 0.69 | 105.58 | 41.667 | 41.767 | 8 |
| 376f | Seg/Urb; Multilane divided | SR599 | 4.493 | 5.702 | 15.17 | 82.74 | 7.85 | 72.04 | 372.09 | 0.78 | 108.89 | 5.293 | 5.393 | 9 |
| 11305_102275 | Seg/Urb; Multilane divided | MARYLAND PKWY | 9.694 | 10.227 | 25.54 | 82.69 | 11.22 | 69.51 | 746.15 | 0.75 | 105.06 | 9.794 | 9.894 | 10 |

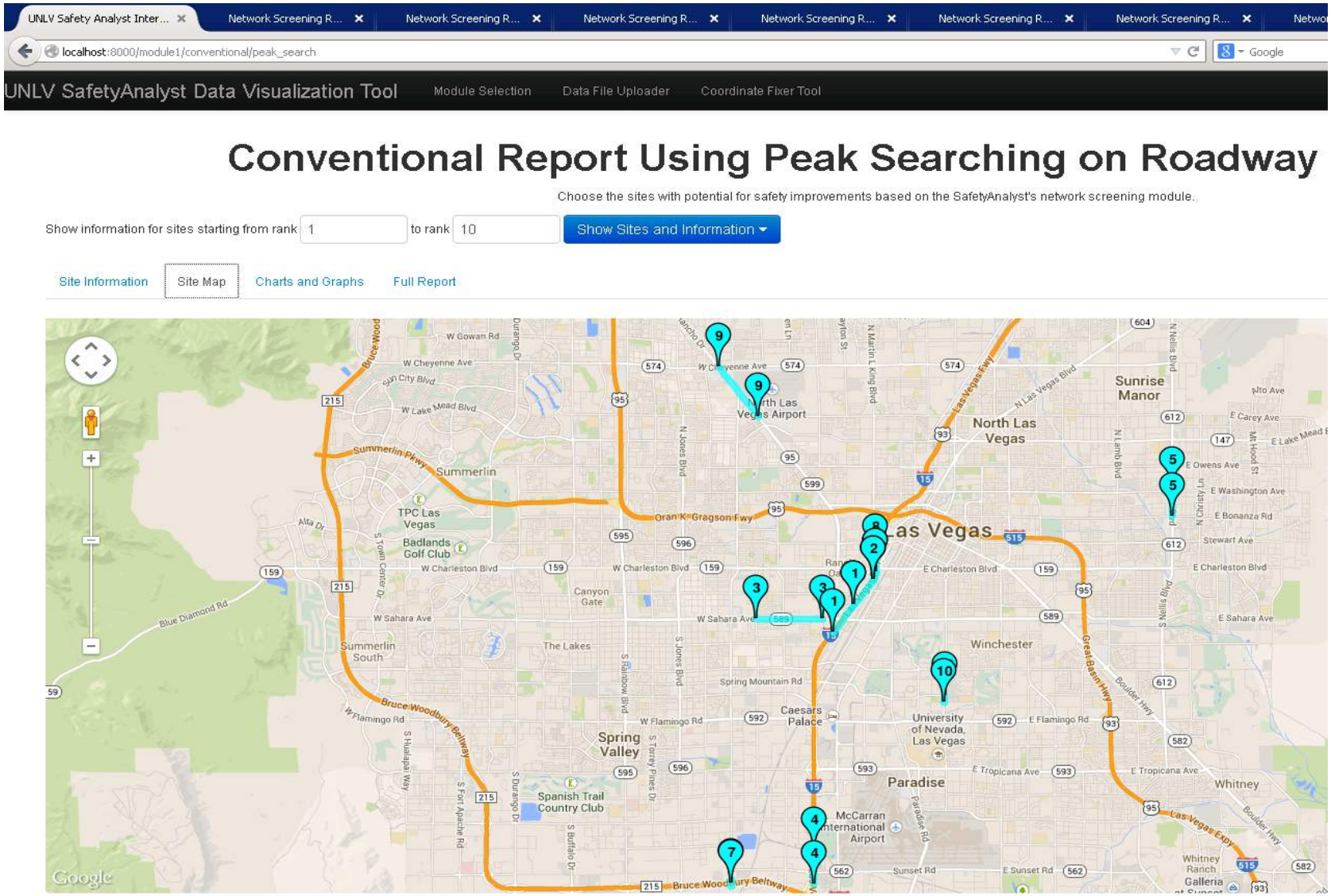



**FIGURE C-2 Visualization of Results of Analysis 2: Roadway and Ramp Segments, and Intersections – Fatal and All Injury Crashes – with Peak Searching on Roadway Segments and CV test**

**Analysis 3: Roadway and ramp segments, and intersections – total crashes – Sliding Window on Roadway Segments**
Basic Network Screening (with Sliding Window on roadway segments) for total Crashes
Site Types: Segments, Intersections, Ramps
Roadway Segments: Sliding Window
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
Limiting Value (Intersections): 5.0 crashes/yr
Limiting Value (Ramps): 5.0 crashes/mi/yr
Window Length: 0.3 mi, Window Increment: 0.1 mi
Number of sites in the site list: 7343
Number of sites evaluated: 7156
Number of segments evaluated: 5649
Total length of segments evaluated: 2122.713
Number of intersections evaluated: 887
Number of ramps evaluated: 620
Number of sites flagged: 1507
Total Roadway Segments Ranked = 1350 out of 5649 total segments in sitelist.
Total Roadway Segment Length Ranked = 495.157 out of 2122.713 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 23.3
Number of Intersections Ranked = 88 out of 887 total intersections in sitelist.
Percentage of Intersections Ranked = 9.9
Number of Ramps Ranked = 69 out of 620 total ramps in sitelist.
Percentage of Ramps Ranked = 11.1

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr), Intersections (crashes/yr), Ramps (crashes/mi/yr)
** Units for Variance
  - Roadway Segments (crashes/mi**2/yr), Intersections (crashes/yr), Ramps (crashes/mi**2/yr)

**TABLE C-3 Results of Analysis 3: Roadway and Ramp Segments, and Intersections – Total Crashes – Sliding Window on Roadway Segments**

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 41046 | Seg/Urb; Fwy in intchng area (6 ln) | IR15 | 39.569 | 40.223 | 3.87 | 589.79 | 56.98 | 524.55 | 3012.95 | | | 40.169 | 40.469 | 1 |
| 22710 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.223 | 40.886 | 444.93 | 589.79 | 56.98 | 524.55 | 3012.95 | | | 40.169 | 40.469 | 1 |
| 638_640 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 40.886 | 41.525 | 309.42 | 525.42 | 83.55 | 432.85 | 3167.36 | | | 41.369 | 41.669 | 3 |
| 639 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 41.525 | 41.667 | 418.54 | 525.42 | 83.55 | 432.85 | 3167.36 | | | 41.369 | 41.669 | 3 |
| 642 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 41.667 | 41.958 | 194.8 | 525.42 | 83.55 | 432.85 | 3167.36 | | | 41.369 | 41.669 | 3 |
| 6607_99 | Seg/Urb; Fwy in intchng area (6 ln) | IR15 | 37.596 | 38.269 | 291.9 | 513.82 | 203.62 | 300.21 | 23985.1 | | | 38 | 38.3 | 6 |
| 100 | Seg/Urb; Fwy in intchng | IR15 | 38.269 | 38.597 | 186.38 | 513.82 | 203.62 | 300.21 | 23985.1 | | | 38 | 38.3 | 6 |

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| | area (4 ln) | | | | | | | | | | | | | |
| 7015 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 35.112 | 35.768 | 153.15 | 362.81 | 69.25 | 286.39 | 2277.55 | | | 35.6 | 35.9 | 8 |
| 5450 | Seg/Urb; Fwy in intchng area (4 ln) | IR15 | 35.768 | 36.09 | 169.78 | 362.81 | 69.25 | 286.39 | 2277.55 | | | 35.6 | 35.9 | 8 |
| 3149 | Seg/Urb; Fwy in intchng area (4 ln) | IR515 | 18.728 | 19.314 | 78.63 | 273.69 | 36.77 | 227.47 | 727.38 | | | 19.216 | 19.516 | 10 |
| 3242_3259 | Seg/Urb; Fwy in intchng area (4 ln) | IR515 | 19.314 | 19.607 | 224.69 | 273.69 | 36.77 | 227.47 | 727.38 | | | 19.216 | 19.516 | 10 |

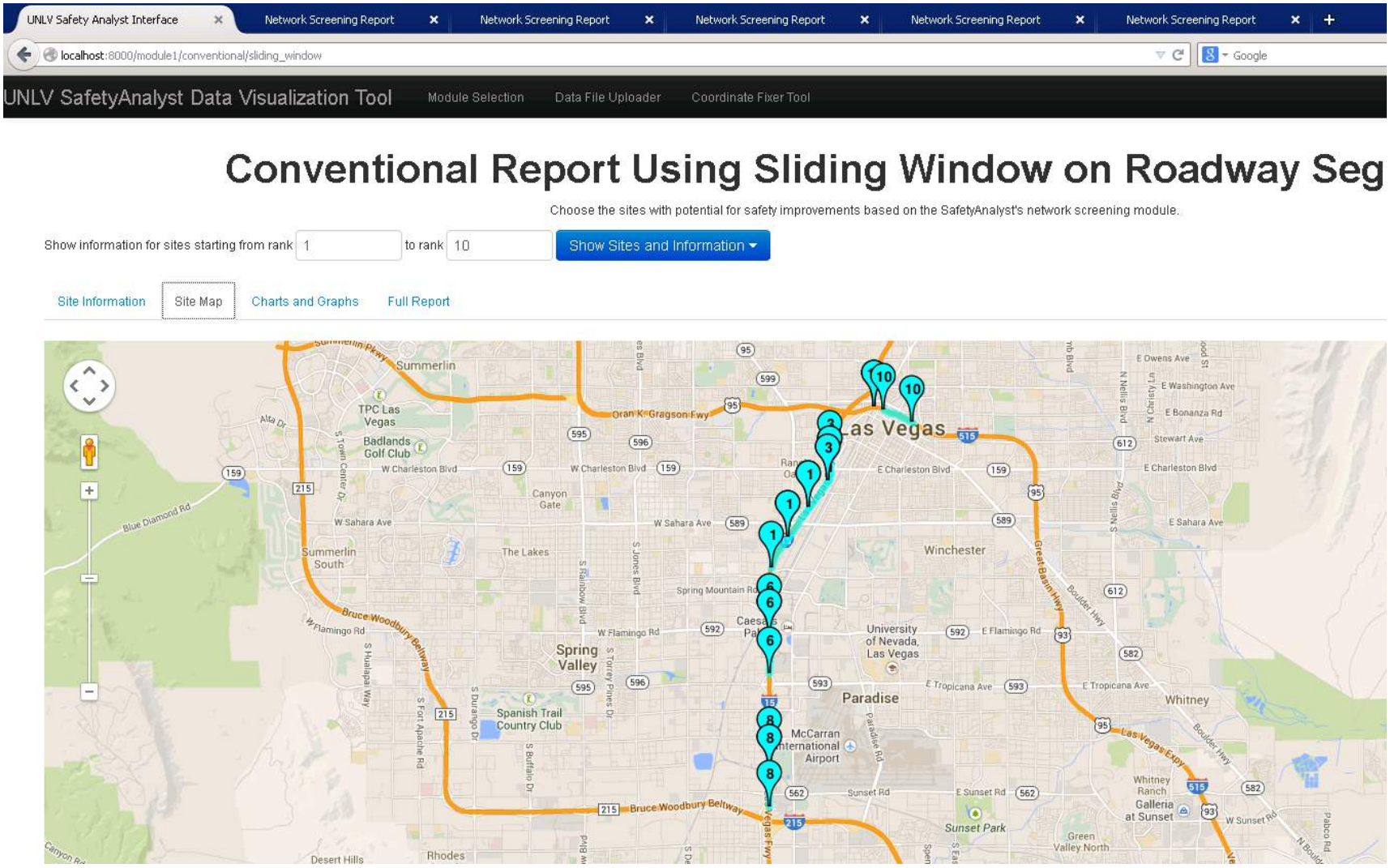



**FIGURE C-3 Visualization of Results of Analysis 3: Roadway and Ramp Segments, and Intersections – Total Crashes – Sliding Window on Roadway Segments**

**Analysis 4: Roadway and ramp segments, and intersections – fatal and all injury Crashes – Sliding Window on Roadway Segments**

Basic Network Screening (with Sliding Window on roadway segments)
Site Types: Segments, Intersections, Ramps
Roadway Segments: Sliding Window
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
Limiting Value (Intersections): 5.0 crashes/yr
Limiting Value (Ramps): 5.0 crashes/mi/yr
Window Length: 0.3 mi, Window Increment: 0.1 mi
Number of sites in the site list: 7343
Number of sites evaluated: 7156
Number of segments evaluated: 5649
Total length of segments evaluated: 2122.713
Number of intersections evaluated: 887
Number of ramps evaluated: 620
Number of sites flagged: 773
Total Roadway Segment Length Ranked = 257.423 out of 2122.713 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 12.1
Number of Intersections Ranked = 27 out of 887 total intersections in sitelist.
Percentage of Intersections Ranked = 3.0
Number of Ramps Ranked = 19 out of 620 total ramps in sitelist.
Percentage of Ramps Ranked = 3.1
* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr), Intersections (crashes/yr), Ramps (crashes/mi/yr)
** Units for Variance
  - Roadway Segments (crashes/mi**2/yr), Intersections (crashes/yr), Ramps (crashes/mi**2/yr)

**TABLE C-4 Results of Analysis 4: Roadway and Ramp Segments, and Intersections – Fatal and All Injury Crashes – Sliding Window on Roadway Segments**

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 41046 | Seg/Urb ; Fwy in intchng area (6 ln) | IR15 | 39.569 | 40.223 | 0.7 | 150.05 | 16.81 | 126.17 | 321.48 | 0.8 | 200.91 | 40.169 | 40.469 | 1 |
| 22710 | Seg/Urb ; Fwy in intchng area (4 ln) | IR15 | 40.223 | 40.886 | 113.21 | 150.05 | 16.81 | 126.17 | 321.48 | 1.17 | 179.53 | 40.169 | 40.469 | 1 |
| 638_ 640 | Seg/Urb ; Fwy in intchng area (4 ln) | IR15 | 40.886 | 41.525 | 99.9 | 146.08 | 24.99 | 113.07 | 337.89 | 1.05 | 160.89 | 41.369 | 41.669 | 3 |
| 639 | Seg/Urb ; Fwy in intchng area (4 ln) | IR15 | 41.525 | 41.667 | 119.07 | 146.08 | 24.99 | 113.07 | 337.89 | 1.05 | 160.89 | 41.369 | 41.669 | 3 |
| 642 | Seg/Urb ; Fwy in intchng area (4 ln) | IR15 | 41.667 | 41.958 | 59.27 | 146.08 | 24.99 | 113.07 | 337.89 | 1.05 | 160.89 | 41.369 | 41.669 | 3 |
| 6588d _ 6588e | Seg/Urb ; Multilane divided | SR589 | 2.411 | 3.657 | 47.68 | 102.44 | 19.18 | 82.79 | 2201.5 | 0.9 | 125.13 | 3.2 | 3.5 | 6 |
| 7015 | Seg/Urb ; Fwy in intchng | IR15 | 35.112 | 35.768 | 44.42 | 99.48 | 20.48 | 72.6 | 236.73 | 0.67 | 103.31 | 35.6 | 35.9 | 7 |

| ID | Site Subtype | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| | area (4 ln) | | | | | | | | | | | | | |
| 5450 | Seg/Urb ; Fwy in intchng area (4 ln) | IR15 | 35.768 | 36.09 | 46.47 | 99.48 | 20.48 | 72.6 | 236.73 | 0.67 | 103.31 | 35.6 | 35.9 | 7 |
| 3149 | Seg/Urb ; Fwy in intchng area (4 ln) | IR515 | 18.728 | 19.314 | 19.66 | 75.4 | 10.47 | 56.22 | 82.12 | 0.52 | 80 | 19.216 | 19.516 | 9 |
| 3242_ 3259 | Seg/Urb ; Fwy in intchng area (4 ln) | IR515 | 19.314 | 19.607 | 56.64 | 75.4 | 10.47 | 56.22 | 82.12 | 0.52 | 80 | 19.216 | 19.516 | 9 |

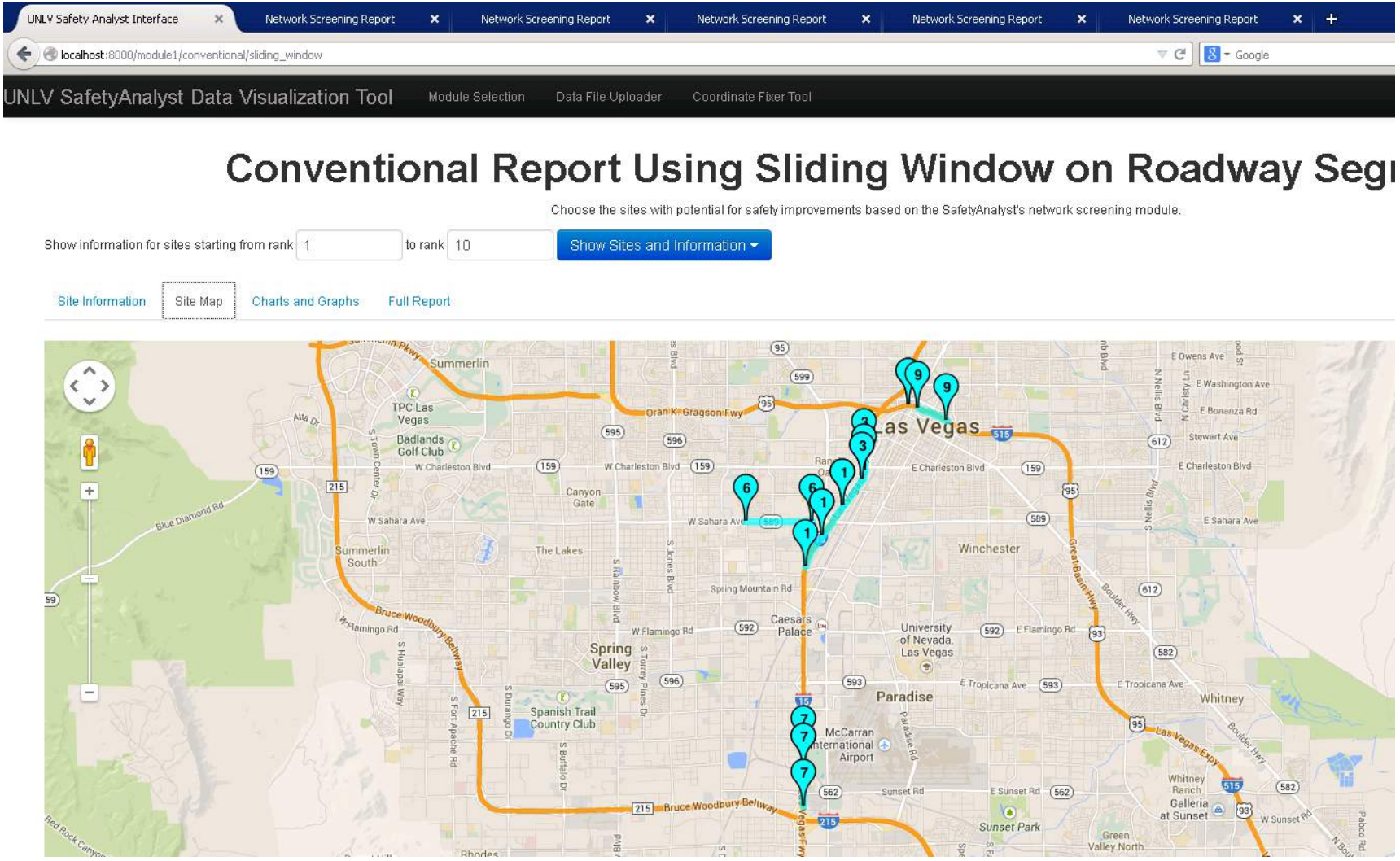



**FIGURE C-4 Visualization of Results of Analysis 4: Roadway and Ramp Segments, and Intersections – Fatal and All Injury Crashes – Sliding Window on Roadway Segments**

**Analysis 5: Roadway segments of Functional Class 1 and 2– total crashes – with Peak Searching on roadway segments and CV test**

Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Segments
Roadway Segments: Peak Searching
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
CV limit (roadway segments): 0.5
Number of sites in the site list: 429
Number of sites evaluated: 429
Number of segments evaluated: 429
Total length of segments evaluated: 351.743
Number of sites flagged: 70
Total Roadway Segments Ranked = 70 out of 429 total segments in sitelist.

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-5 Results of Analysis 5: Roadway Segments of Functional Class 1 and 2 – Total Crashes – with Peak Searching on Roadway Segments and CV Test**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var** | No. of Fatalities | No. of Injuries | | | |
| 22710 | IR15 | 40.223 | 40.886 | 444.93 | 1159.97 | 69.09 | 1050.56 | 4097.55 | | | 40.223 | 40.323 | 1 |
| 638_640 | IR15 | 40.886 | 41.525 | 309.42 | 711.82 | 85.97 | 607.58 | 6128.00 | | | 41.386 | 41.486 | 2 |
| 7015 | IR15 | 35.112 | 35.768 | 153.15 | 566.63 | 74.48 | 475.05 | 4608.68 | | | 35.668 | 35.768 | 3 |
| 6607_99 | IR15 | 37.596 | 38.269 | 291.9 | 671.82 | 220.82 | 442.53 | 29421.89 | | | 37.996 | 38.096 | 4 |
| 639 | IR15 | 41.525 | 41.667 | 418.54 | 416.48 | 81.01 | 325.10 | 5397.50 | | | 41.567 | 41.667 | 5 |
| 100 | IR15 | 38.269 | 38.597 | 186.38 | 384.87 | 53.58 | 315.22 | 2402.83 | | | 38.269 | 38.369 | 6 |
| 642 | IR15 | 41.667 | 41.958 | 194.8 | 356.57 | 74.86 | 272.29 | 4609.65 | | | 41.667 | 41.767 | 7 |
| 5450 | IR15 | 35.768 | 36.09 | 169.78 | 335.03 | 62.55 | 261.26 | 3237.11 | | | 35.768 | 35.868 | 8 |
| 3242_3259 | IR515 | 19.314 | 19.607 | 224.69 | 288.21 | 32.25 | 239.25 | 888.80 | | | 19.414 | 19.514 | 9 |
| 156823 | CC215S | 0.857 | 0.889 | 319.91 | 319.91 | 52.42 | 226.81 | 2283.04 | | | 0.857 | 0.889 | 10 |

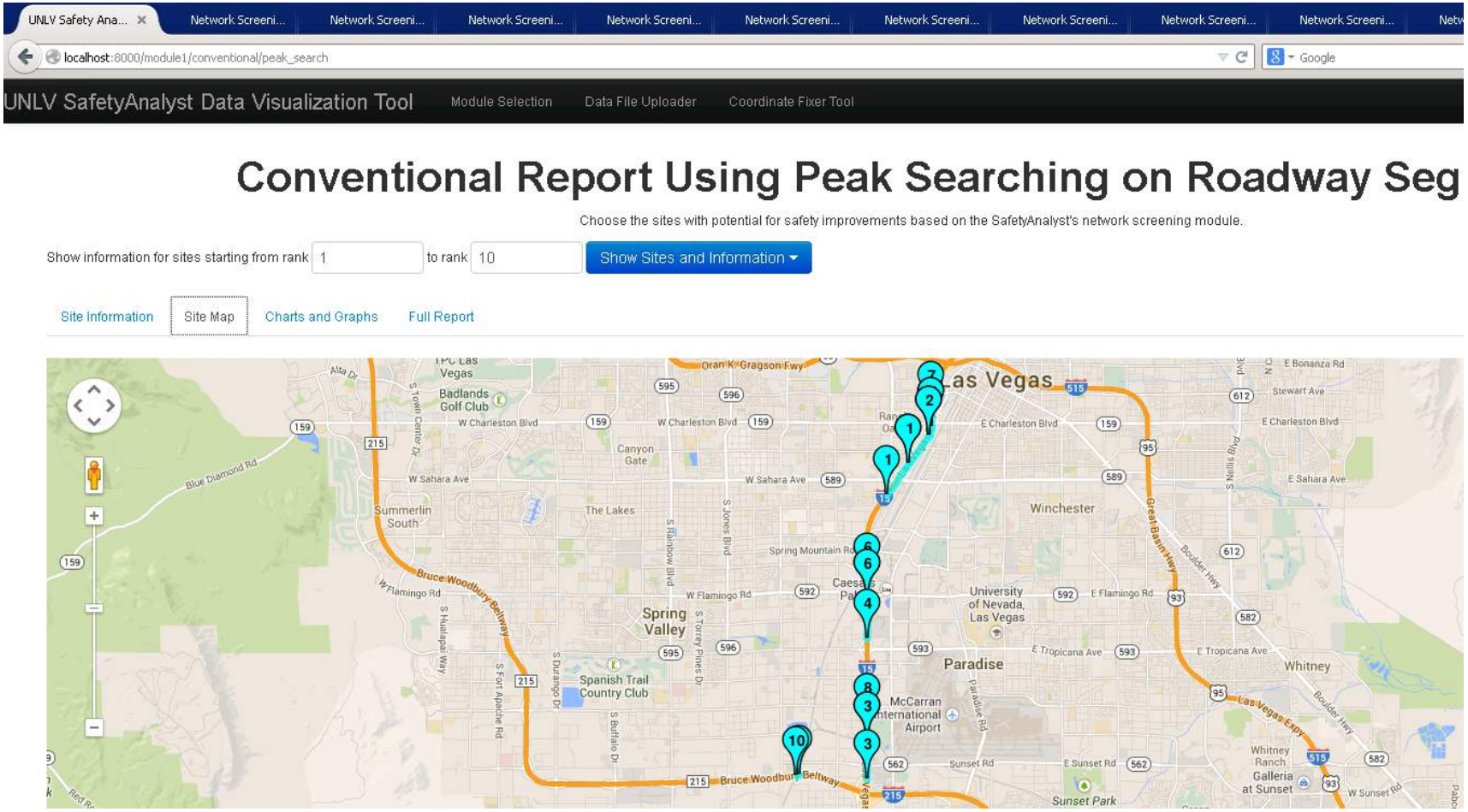



**FIGURE C-5 Visualization of results of analysis 5: Roadway segments of functional class 1 and 2 – total crashes – with Peak Searching on Roadway Segments and CV Test**

**Analysis 6: Roadway segments of functional class 1 and 2 – fatal and all injury crashes – Peak Searching on Roadway Segments**

Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Segments
Roadway Segments: Peak Searching
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Area Weights (Rural): 1.0
Area Weights (Urban): 1.0
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
CV limit (roadway segments): 0.5
Number of sites in the site list: 429
Number of sites evaluated: 429
Number of segments evaluated: 429
Total length of segments evaluated: 351.743
Number of intersections evaluated: 0
Number of ramps evaluated: 0
Number of sites flagged: 39
Total Roadway Segments Ranked = 39 out of 429 total segments in sitelist.

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-6 Results of Analysis 6: Roadway Segments of Functional Class 1 and 2 – Fatal and All Injury Crashes – Peak Searching on Roadway Segments**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | **Start Location** | **End Location** | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 22710 | IR15 | 40.223 | 40.886 | 113.21 | 291.56 | 20.43 | 238.49 | 379.89 | 2.21 | 339.36 | 40.223 | 40.323 | 1 |
| 638_640 | IR15 | 40.886 | 41.525 | 99.9 | 189.06 | 25.76 | 147.70 | 558.06 | 1.37 | 210.18 | 41.386 | 41.486 | 2 |
| 7015 | IR15 | 35.112 | 35.768 | 44.42 | 155.78 | 22.12 | 118.56 | 414.43 | 1.1 | 168.71 | 35.668 | 35.768 | 3 |
| 639 | IR15 | 41.525 | 41.667 | 119.07 | 118.14 | 24.19 | 84.46 | 483.08 | 0.78 | 120.18 | 41.567 | 41.667 | 4 |
| 642 | IR15 | 41.667 | 41.958 | 59.27 | 105.53 | 22.24 | 74.20 | 409.34 | 0.69 | 105.58 | 41.667 | 41.767 | 5 |
| 5450 | IR15 | 35.768 | 36.09 | 46.47 | 89.23 | 18.38 | 61.41 | 282.37 | 0.57 | 87.39 | 35.768 | 35.868 | 6 |
| 3242_3259 | IR515 | 19.314 | 19.607 | 56.64 | 84.85 | 9.1 | 60.28 | 75.58 | 0.56 | 85.77 | 19.414 | 19.514 | 7 |
| 100 | IR15 | 38.269 | 38.597 | 52.95 | 86.71 | 15.59 | 60.00 | 206.68 | 0.56 | 85.38 | 38.269 | 38.369 | 8 |
| 3149 | IR515 | 18.728 | 19.314 | 19.66 | 80.48 | 13.28 | 55.66 | 151.8 | 0.52 | 79.2 | 19.214 | 19.314 | 9 |
| 7303 | IR15 | 41.145 | 42.058 | 22.38 | 82.58 | 22.99 | 53.22 | 432.21 | 0.49 | 75.73 | 41.958 | 42.058 | 10 |

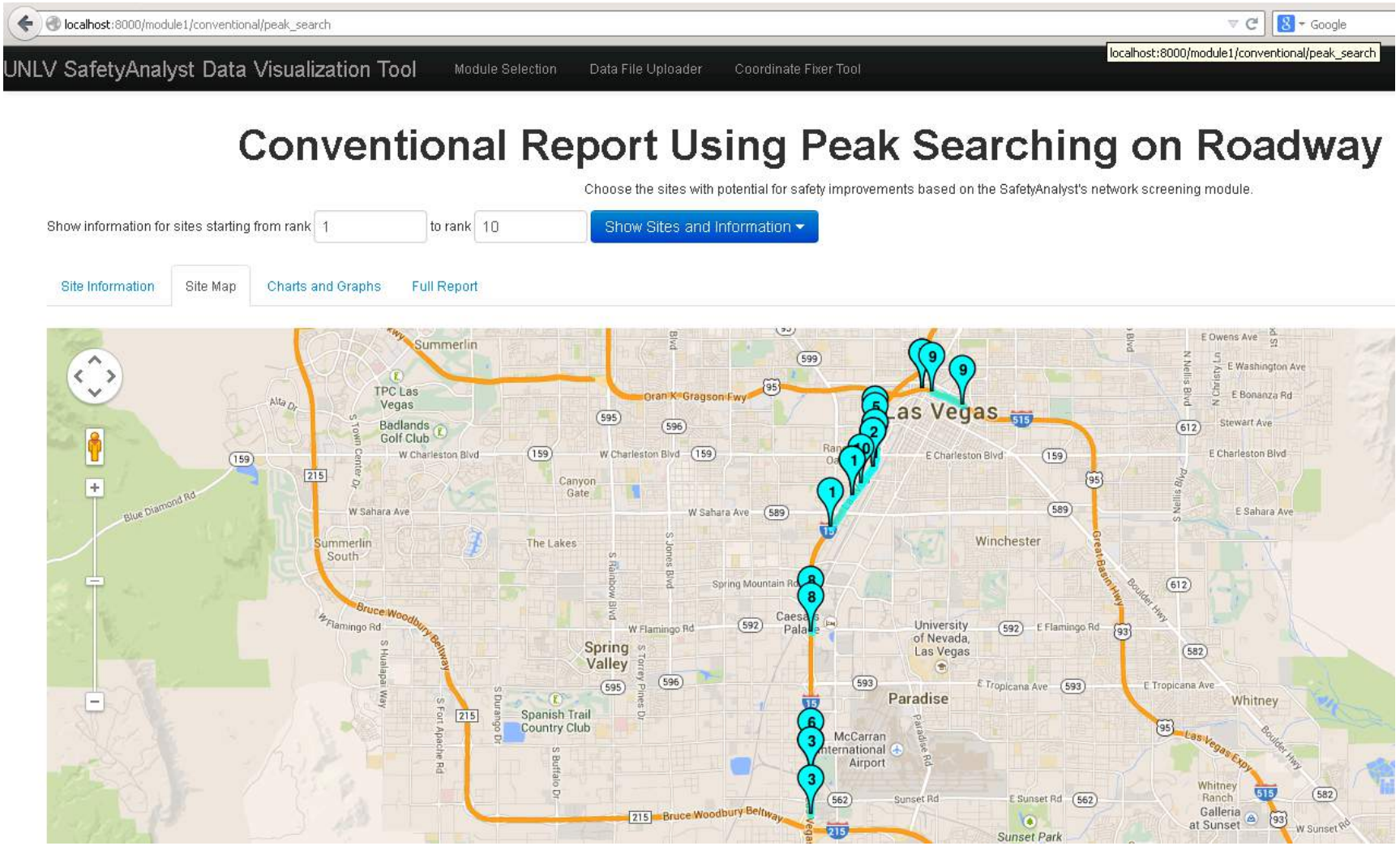



**FIGURE C-6 Visualization of results of Analysis 6: Roadway segments of functional class 1 and 2 – fatal and all injury crashes – Peak Searching on Roadway Segments**

**Analysis 7: Roadway segments of functional class 3, 4, 5, 6 and 7 – total crashes – with Peak Searching on roadway segments and CV test**

Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Segments
Roadway Segments: Peak Searching
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
CV limit (roadway segments): 0.5
Number of sites in the site list: 5228
Number of sites evaluated: 5220
Number of segments evaluated: 5220
Total length of segments evaluated: 1770.969
Number of sites flagged: 365
Total Roadway Segments Ranked = 365 out of 5220 total segments in sitelist.
Total Roadway Segment Length Ranked = 304.738 out of 1770.969 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 17.2

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-7 Results of Analysis 7: Roadway Segments of Functional Class 3, 4, 5, 6 and 7 – Total Crashes – with Peak Searching on Roadway Segments and CV Test**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var** | No. of Fatalities | No. of Injuries | | | |
| 144261 | S DECATUR BLVD | 4.624 | 4.64 | 299.06 | 299.06 | 20.22 | 252.51 | 2463 | | | 4.624 | 4.64 | 1 |
| 1421c | SR612 | 5.124 | 5.633 | 58.67 | 196.97 | 23.98 | 171.01 | 3431 | | | 5.324 | 5.424 | 2 |
| 117227 | S EASTERN AV | 9.904 | 9.913 | 336.93 | 336.93 | 24.59 | 168.97 | 530.4 | | | 9.904 | 9.913 | 3 |
| 4631 | US93 | 0 | 0.208 | 118.36 | 203.8 | 10.48 | 154.64 | 117 | | | 0 | 0.1 | 4 |
| 126113_113437 | PARADISE RD | 5.071 | 5.983 | 73.7 | 190.37 | 30.43 | 153.87 | 1307 | | | 5.271 | 5.371 | 5 |
| 376f | SR599 | 4.493 | 5.702 | 31.69 | 171.3 | 17.95 | 150.94 | 1932 | | | 5.293 | 5.393 | 6 |
| 11305_102275 | MARYLAND PKWY | 9.694 | 10.227 | 55.03 | 176.85 | 24.59 | 150.46 | 3602 | | | 9.794 | 9.894 | 7 |
| 106601 | LAKE MEAD BLVD | 5.65 | 5.887 | 112.14 | 163.79 | 22.2 | 139.56 | 2944 | | | 5.787 | 5.887 | 8 |
| 172760 | SR599 | 1.846 | 2.09 | 101.55 | 165.2 | 24.44 | 139.26 | 3556 | | | 1.99 | 2.09 | 9 |
| 59435 | S GRAND CENTRAL PKWY | 0.144 | 0.21 | 160.59 | 160.59 | 17.73 | 139.12 | 1886 | | | 0.144 | 0.21 | 10 |

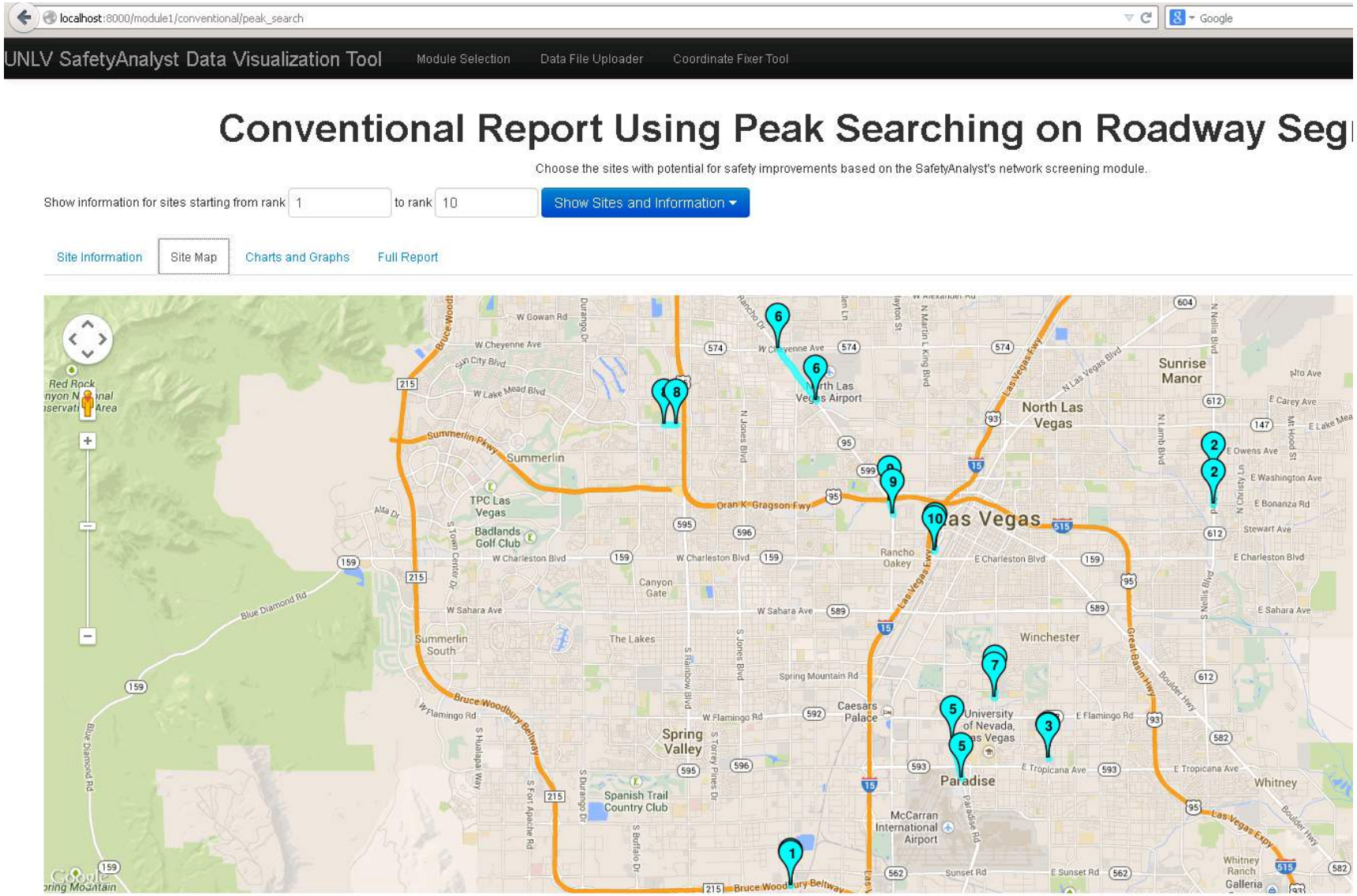



**FIGURE C-7 Visualization of results of Analysis 7: Roadway segments of functional class 3, 4, 5, 6 and 7 – total crashes – with Peak Searching on roadway segments and CV test**

**Analysis 8: Roadway segments of functional class 3, 4, 5, 6 and 7 – fatal and all injury crashes – Peak Searching on Roadway Segments**

Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Segments
Roadway Segments: Peak Searching
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Area Weights (Rural): 1.0
Area Weights (Urban): 1.0
Limiting Value (Roadway Segments): 1.0 crashes/mi/yr
CV limit (roadway segments): 0.5
Number of sites in the site list: 5228
Number of sites evaluated: 5220
Number of segments evaluated: 5220
Total length of segments evaluated: 1770.969
Number of intersections evaluated: 0
Number of ramps evaluated: 0
Number of sites flagged: 268
Total Roadway Segments Ranked = 268 out of 5220 total segments in sitelist.
Total Roadway Segment Length Ranked = 151.037 out of 1770.969 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 8.5

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-8 Results of Analysis 8: Roadway Segments of Functional Class 3, 4, 5, 6 and 7 – Fatal and All Injury Crashes – Peak Searching on Roadway Segments**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | **Start Location** | **End Location** | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 6588d_6588e | SR589 | 2.411 | 3.657 | 47.68 | 156.49 | 19.18 | 135.02 | 2166 | 1.46 | 204.07 | 3.311 | 3.411 | 1 |
| 1421c | SR612 | 5.124 | 5.633 | 31.95 | 100.37 | 10.91 | 87.08 | 708.1 | 0.94 | 131.62 | 5.324 | 5.424 | 2 |
| 144261 | S DECATUR BLVD | 4.624 | 4.64 | 106.95 | 106.95 | 8.99 | 77.99 | 483.7 | 0.84 | 117.88 | 4.624 | 4.64 | 3 |
| 376f | SR599 | 4.493 | 5.702 | 15.17 | 82.74 | 7.85 | 72.04 | 372.1 | 0.78 | 108.89 | 5.293 | 5.393 | 4 |
| 11305_102275 | MARYLAND PKWY | 9.694 | 10.227 | 25.54 | 82.69 | 11.22 | 69.51 | 746.2 | 0.75 | 105.06 | 9.794 | 9.894 | 5 |
| 5164a_5164b | SR159 | 21.057 | 22.161 | 23.46 | 79.94 | 10.68 | 67.37 | 676.5 | 0.73 | 101.82 | 21.757 | 21.857 | 6 |
| 1772 | SR593 | 9.774 | 10.825 | 15.82 | 76.6 | 4.24 | 67.26 | 116.9 | 0.73 | 101.66 | 10.574 | 10.674 | 7 |
| 106601 | LAKE MEAD BLVD | 5.65 | 5.887 | 54.89 | 79.53 | 10 | 67.17 | 596 | 0.73 | 101.52 | 5.787 | 5.887 | 8 |
| 110427 | LAMB BLVD | 3.806 | 4.056 | 46.43 | 71.26 | 6.99 | 61.92 | 293.8 | 0.67 | 93.58 | 3.906 | 4.006 | 9 |
| 3327d_3327f | SR159 | 27.117 | 28.037 | 28.05 | 67.22 | 6.03 | 58.25 | 221.8 | 0.63 | 88.04 | 27.717 | 27.817 | 10 |

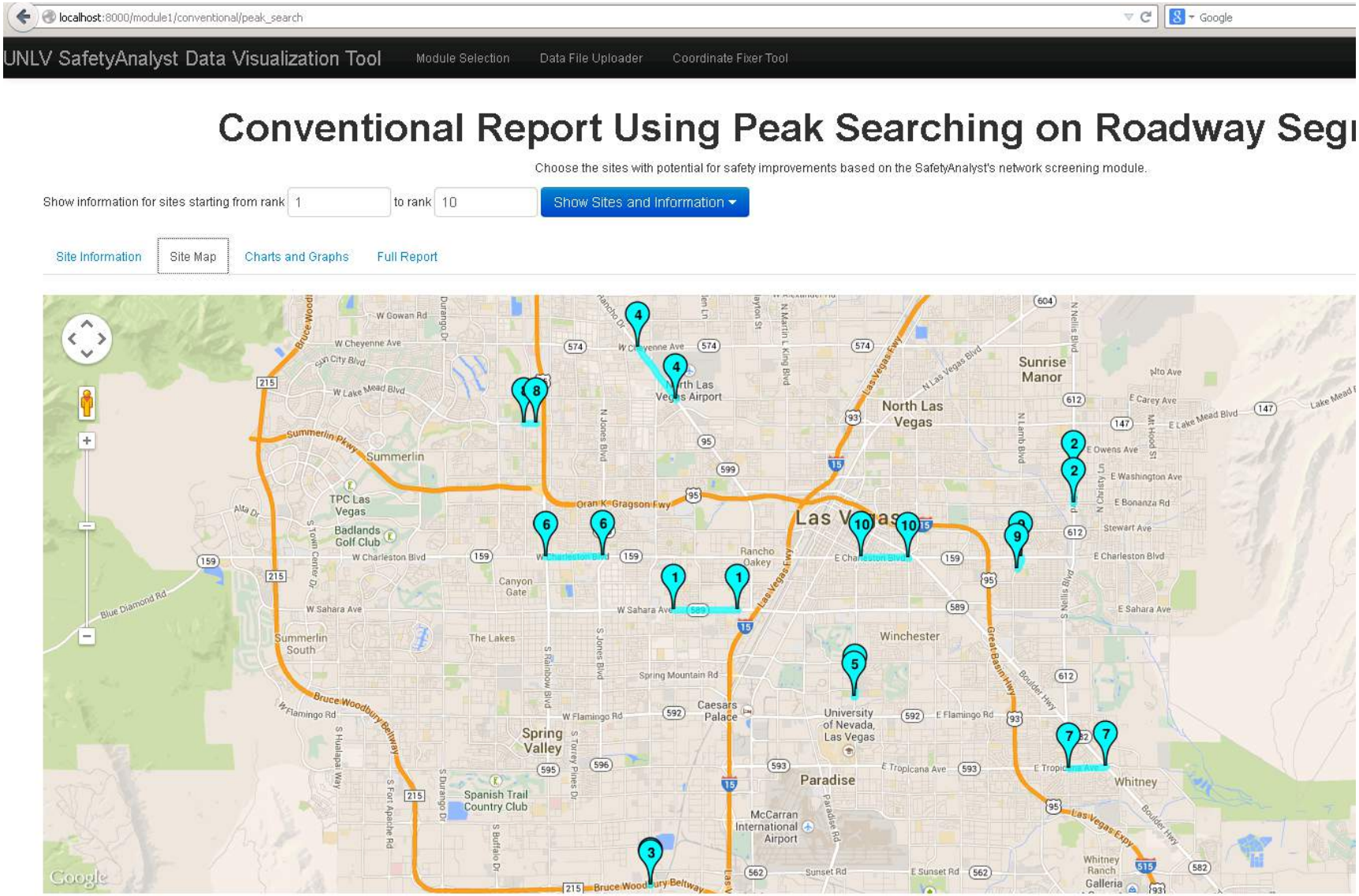



**FIGURE C-8 Visualization of results of Analysis 8: Roadway segments of functional class 3, 4, 5, 6 and 7 – fatal and all injury crashes – Peak Searching on Roadway Segments**

**Analysis 9: Roadway segments of functional class 1 and 2 – total crashes – Sliding Window on Roadway Segments**
Basic Network Screening (with Sliding Window on roadway segments)
Site Types: Segments
Roadway Segments: Sliding Window
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; September; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
Window Length: 0.3 mi
Window Increment: 0.1 mi
Number of sites in the site list: 429
Number of sites evaluated: 429
Number of segments evaluated: 429
Total length of segments evaluated: 351.743
Number of sites flagged: 218

* Units for Observed, Predicted, Expected and Excess Crash Frequency
- Roadway Segments (crashes/mi/yr)
- Intersections (crashes/yr)
- Ramps (crashes/mi/yr)

** Units for Variance
- Roadway Segments (crashes/mi**2/yr)
- Intersections (crashes/yr)
- Ramps (crashes/mi**2/yr)

**TABLE C-9 Results of Analysis 9: Roadway Segments of Functional Class 1 and 2 – Total Crashes – Sliding Window on Roadway Segments**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 41046 | IR15 | 39.569 | 40.223 | 3.87 | 589.79 | 56.98 | 524.55 | 3012.95 | | | 40.169 | 40.469 | 1 |
| 22710 | IR15 | 40.223 | 40.886 | 444.93 | 589.79 | 56.98 | 524.55 | 3012.95 | | | 40.169 | 40.469 | 1 |
| 638_640 | IR15 | 40.886 | 41.525 | 309.42 | 525.42 | 83.55 | 432.85 | 3167.36 | | | 41.369 | 41.669 | 3 |
| 639 | IR15 | 41.525 | 41.667 | 418.54 | 525.42 | 83.55 | 432.85 | 3167.36 | | | 41.369 | 41.669 | 3 |
| 642 | IR15 | 41.667 | 41.958 | 194.8 | 525.42 | 83.55 | 432.85 | 3167.36 | | | 41.369 | 41.669 | 3 |
| 6607_99 | IR15 | 37.596 | 38.269 | 291.9 | 513.82 | 203.62 | 300.21 | 23985.05 | | | 38 | 38.3 | 6 |
| 100 | IR15 | 38.269 | 38.597 | 186.38 | 513.82 | 203.62 | 300.21 | 23985.05 | | | 38 | 38.3 | 6 |
| 7015 | IR15 | 35.112 | 35.768 | 153.15 | 362.81 | 69.25 | 286.39 | 2277.55 | | | 35.6 | 35.9 | 8 |
| 5450 | IR15 | 35.768 | 36.09 | 169.78 | 362.81 | 69.25 | 286.39 | 2277.55 | | | 35.6 | 35.9 | 8 |
| 3149 | IR515 | 18.728 | 19.314 | 78.63 | 273.69 | 36.77 | 227.47 | 727.38 | | | 19.216 | 19.516 | 10 |

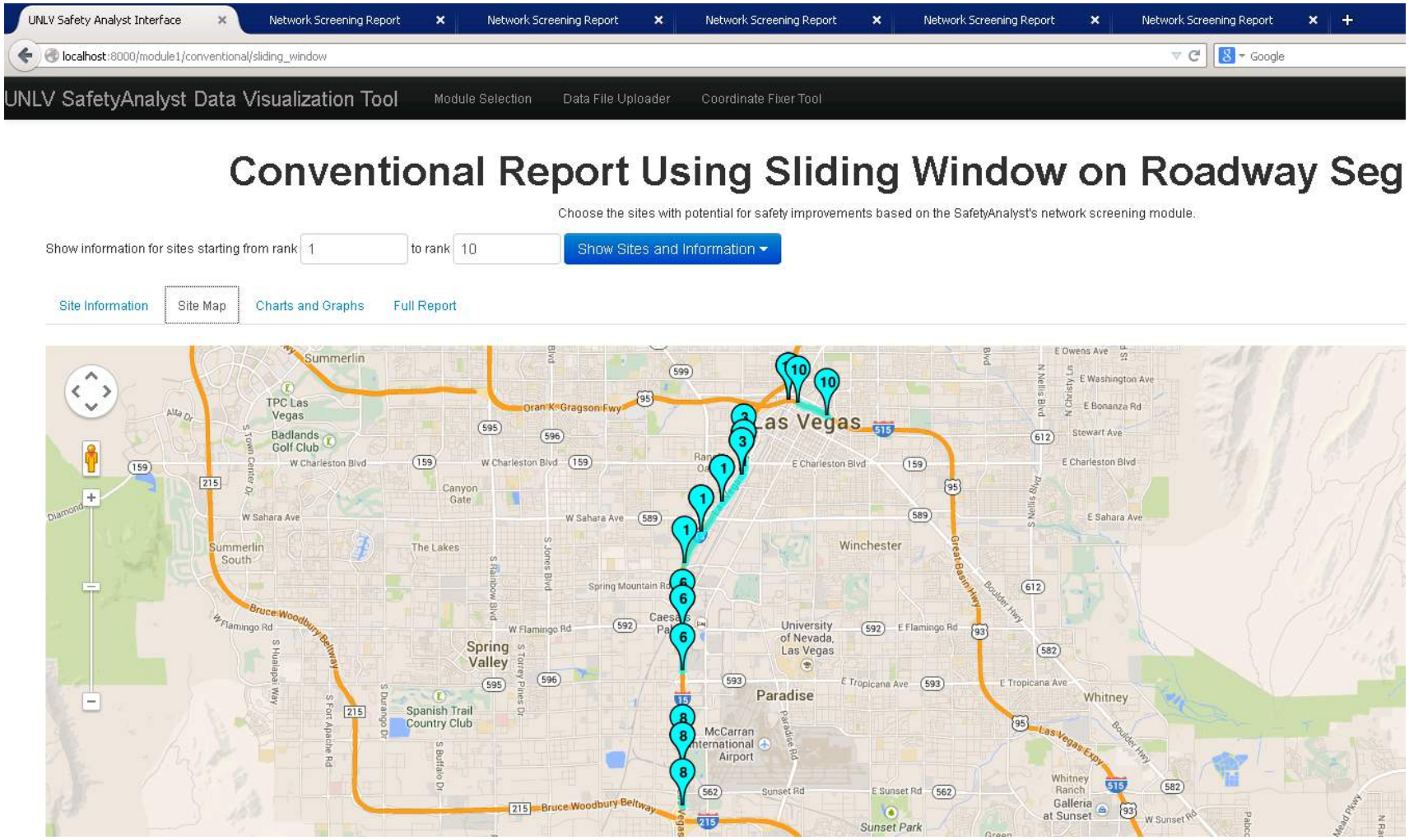



**FIGURE C-9 Visualization of results of Analysis 9: Roadway segments of functional class 1 and 2 – total crashes – Sliding Window on Roadway Segments**

**Analysis 10: Roadway segments of functional class 1 and 2 – fatal and all injury crashes – Sliding Window on roadway segments**

Basic Network Screening (with Sliding Window on roadway segments)
Site Types: Segments
Roadway Segments: Sliding Window
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 5.0 crashes/mi/yr
Window Length: 0.3 mi, Window Increment: 0.1 mi
Number of sites in the site list: 429
Number of sites evaluated: 429
Number of segments evaluated: 429
Total length of segments evaluated: 351.743
Number of sites flagged: 93
Total Roadway Segments Ranked = 93 out of 429 total segments in sitelist.

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-10 Results of Analysis 10: Roadway Segments of Functional Class 1 and 2 – Fatal and All Injury Crashes – Sliding Window on Roadway Segments**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 41046 | IR15 | 39.569 | 40.223 | 0.7 | 150.05 | 16.81 | 126.17 | 321.48 | 0.8 | 200.91 | 40.169 | 40.469 | 1 |
| 22710 | IR15 | 40.223 | 40.886 | 113.21 | 150.05 | 16.81 | 126.17 | 321.48 | 1.17 | 179.53 | 40.169 | 40.469 | 1 |
| 638_640 | IR15 | 40.886 | 41.525 | 99.9 | 146.08 | 24.99 | 113.07 | 337.89 | 1.05 | 160.89 | 41.369 | 41.669 | 3 |
| 639 | IR15 | 41.525 | 41.667 | 119.07 | 146.08 | 24.99 | 113.07 | 337.89 | 1.05 | 160.89 | 41.369 | 41.669 | 3 |
| 642 | IR15 | 41.667 | 41.958 | 59.27 | 146.08 | 24.99 | 113.07 | 337.89 | 1.05 | 160.89 | 41.369 | 41.669 | 3 |
| 7015 | IR15 | 35.112 | 35.768 | 44.42 | 99.48 | 20.48 | 72.6 | 236.73 | 0.67 | 103.31 | 35.6 | 35.9 | 6 |
| 5450 | IR15 | 35.768 | 36.09 | 46.47 | 99.48 | 20.48 | 72.6 | 236.73 | 0.67 | 103.31 | 35.6 | 35.9 | 6 |
| 3149 | IR515 | 18.728 | 19.314 | 19.66 | 75.4 | 10.47 | 56.22 | 82.12 | 0.52 | 80 | 19.216 | 19.516 | 8 |
| 3242_3259 | IR515 | 19.314 | 19.607 | 56.64 | 75.4 | 10.47 | 56.22 | 82.12 | 0.52 | 80 | 19.216 | 19.516 | 8 |
| 6607_99 | IR15 | 37.596 | 38.269 | 73.85 | 115.54 | 61.81 | 48.31 | 2092.7 | 0.3 | 76.93 | 38 | 38.3 | 10 |
| 100 | IR15 | 38.269 | 38.597 | 52.95 | 115.54 | 61.81 | 48.31 | 2092.7 | 0.45 | 68.74 | 38 | 38.3 | 10 |

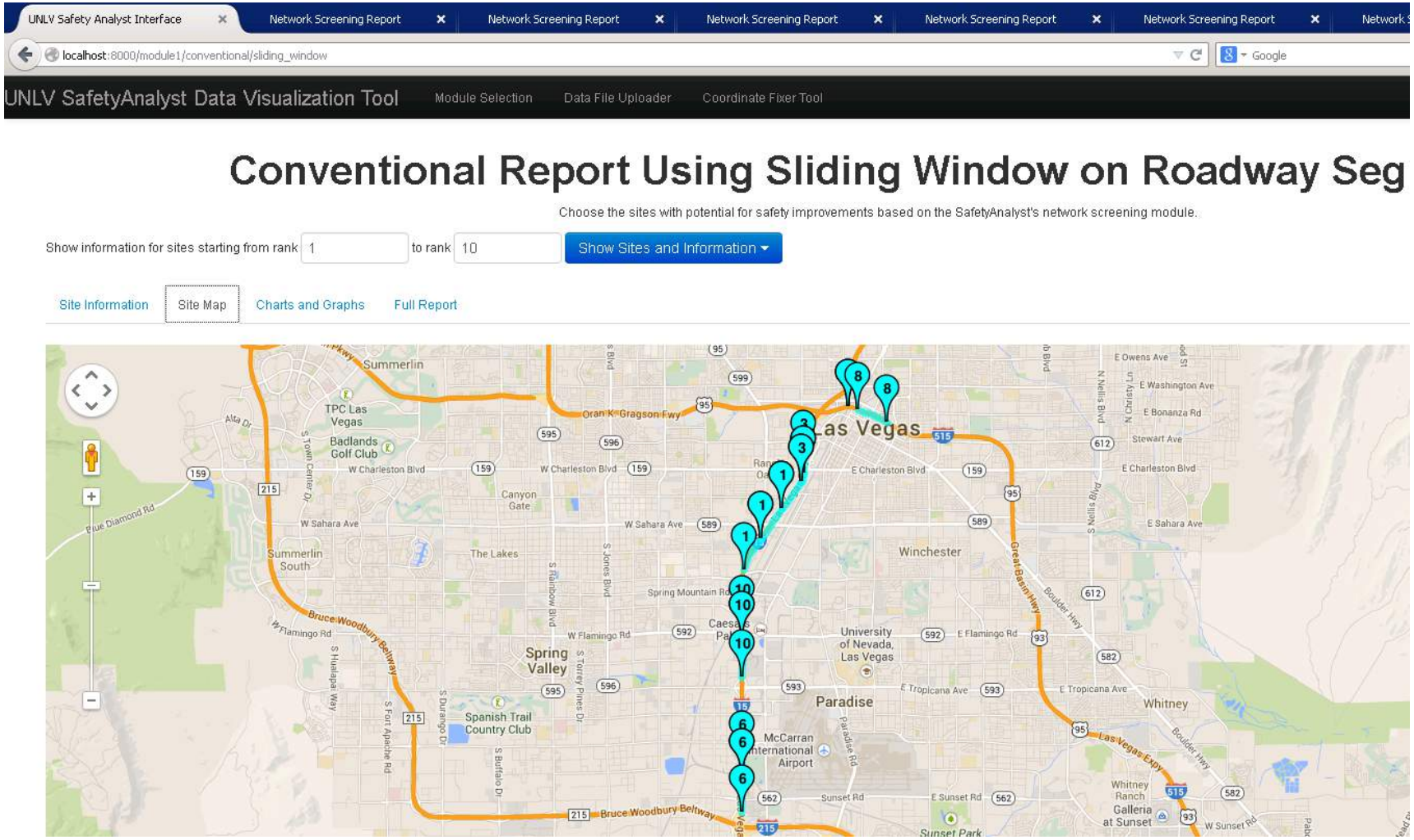



**FIGURE C-10 Visualization of results of Analysis 10: Roadway segments of functional class 1 and 2 – fatal and all injury crashes – Sliding Window on roadway segments**

**Analysis 11: Roadway segments of functional class 3, 4, 5, 6 and 7 – total crashes – Sliding Window on Roadway Segments**
Basic Network Screening (with Sliding Window on roadway segments)
Site Types: Segments
Roadway Segments: Sliding Window
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; September; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 1.0 crashes/mi/yr
Window Length: 0.3 mi
Window Increment: 0.1 mi
Number of sites in the site list: 5228
Number of sites evaluated: 5220
Number of segments evaluated: 5220
Total length of segments evaluated: 1770.969
Number of sites flagged: 2269
Total Roadway Segment Length Ranked = 842.272 out of 1770.969 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 47.6

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-11 Results of Analysis 11: Roadway Segments of Functional Class 3, 4, 5, 6 and 7 – Total Crashes – Sliding Window on Roadway Segments**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 6588d_ 6588e | SR589 | 2.411 | 3.657 | 89.74 | 171.82 | 39.44 | 132.05 | 9293.39 | | | 3.2 | 3.5 | 1 |
| 3579d | SR593 | 3.045 | 3.784 | 92.69 | 151.62 | 45.43 | 105.96 | 12286.8 | | | 3.4 | 3.7 | 2 |
| 174082 | LAS VEGAS BLVD | 26.032 | 26.112 | 184.04 | 154.04 | 51.16 | 101.82 | 13900.3 | | | 26.095 | 26.395 | 3 |
| 125957 | LAS VEGAS BLVD | 26.112 | 26.409 | 127.16 | 154.04 | 51.16 | 101.82 | 13900.3 | | | 26.095 | 26.395 | 3 |
| 126113_ 113437 | PARADISE RD | 5.071 | 5.983 | 73.7 | 130.77 | 30.43 | 99.05 | 1347.96 | | | 5.187 | 5.487 | 5 |
| 4792a | SR159 | 29.664 | 30.193 | 132.78 | 158.57 | 64.33 | 94.09 | 24550.3 | | | 29.671 | 29.971 | 6 |
| 3386_ 4757 | SR159 | 29.526 | 29.664 | 16.84 | 140.68 | 50.94 | 89.51 | 12024.8 | | | 29.571 | 29.871 | 7 |
| 76888 | TROPICANA AV | 7.543 | 7.662 | 85.83 | 135.7 | 47.7 | 87.59 | 9127.41 | | | 7.6 | 7.9 | 8 |
| 104939_ 99879 | TROPICANA AV | 7.662 | 7.924 | 121.37 | 135.7 | 47.7 | 87.59 | 9127.41 | | | 7.6 | 7.9 | 8 |
| 376f | SR599 | 4.493 | 5.702 | 31.69 | 100.63 | 17.95 | 82.25 | 1959.79 | | | 5.246 | 5.546 | 10 |

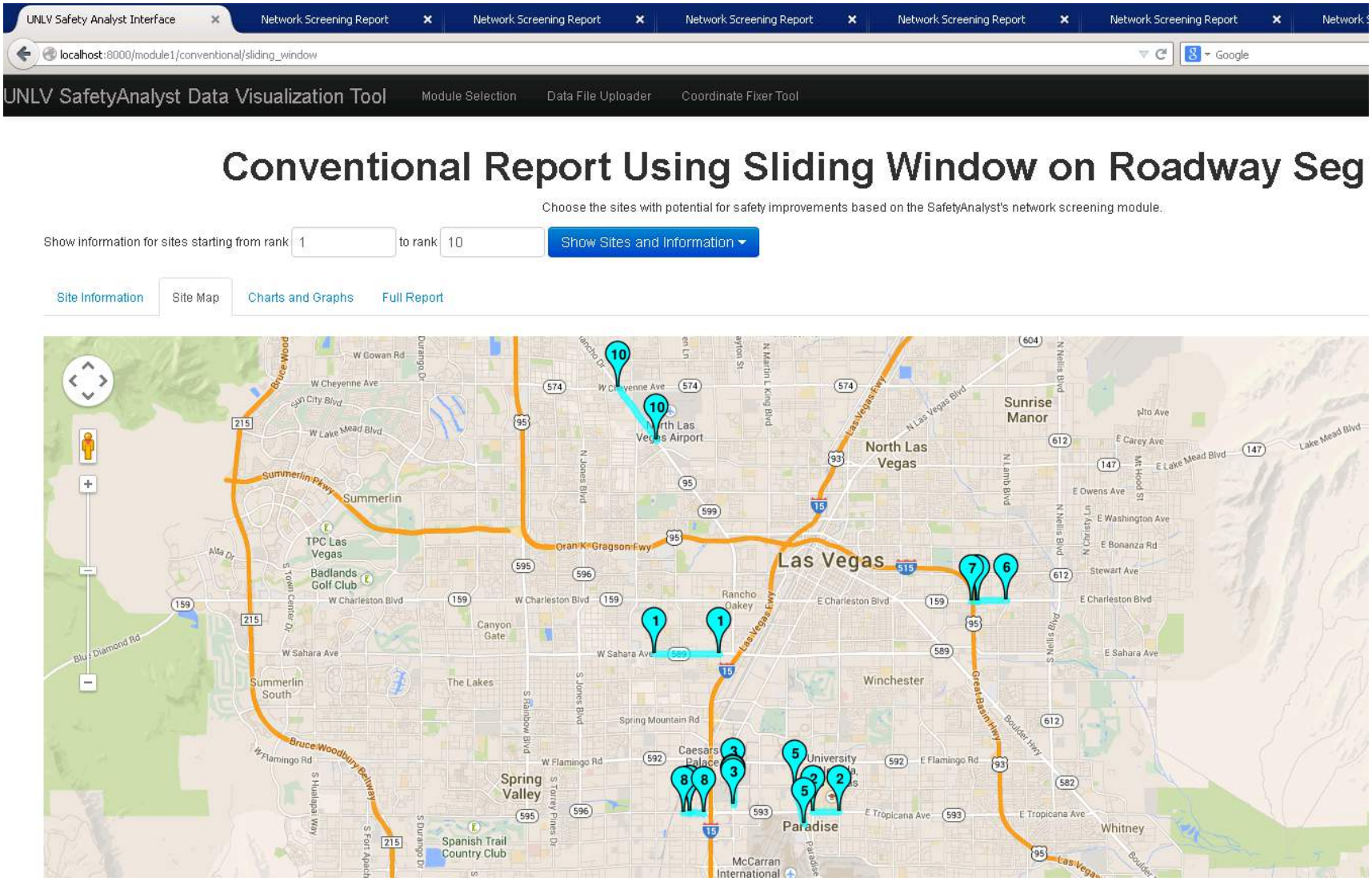



**FIGURE C-11 Visualization of results of Analysis 11: Roadway segments of functional class 3, 4, 5, 6 and 7 – total crashes – Sliding Window on Roadway Segments**

**Analysis 12: Roadway segments of functional class 3, 4, 5, 6 and 7 – fatal and all injury crashes – Sliding Window on roadway segments**

Basic Network Screening (with Sliding Window on roadway segments)
Site Types: Segments
Roadway Segments: Sliding Window
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Roadway Segments): 1.0 crashes/mi/yr
Window Length: 0.3 mi, Window Increment: 0.1 mi
Number of sites in the site list: 5228
Number of sites evaluated: 5220
Number of segments evaluated: 5220
Total length of segments evaluated: 1770.969
Number of intersections evaluated: 0
Number of ramps evaluated: 0
Number of sites flagged: 1777
Total Roadway Segments Ranked = 1777 out of 5220 total segments in sitelist.
Total Roadway Segment Length Ranked = 606.438 out of 1770.969 total segment length in sitelist.
Percentage of Roadway Segment Length Ranked = 34.2

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-12 Results of Analysis 12: Roadway Segments of Functional Class 3, 4, 5, 6 and 7 – Fatal and All Injury Crashes – Sliding Window on Roadway Segments**

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 6588d_ 6588e | SR589 | 2.411 | 3.657 | 47.68 | 102.44 | 19.18 | 82.79 | 2201.48 | 0.9 | 125.13 | 3.2 | 3.5 | 1 |
| 3327d_ 3327f | SR159 | 27.117 | 28.037 | 28.05 | 49.53 | 6.03 | 42.79 | 239.3 | 0.46 | 64.67 | 27.7 | 28 | 2 |
| 3579d | SR593 | 3.045 | 3.784 | 37.14 | 64.1 | 22.52 | 41.39 | 2986.28 | 0.45 | 62.55 | 3.4 | 3.7 | 3 |
| 376f | SR599 | 4.493 | 5.702 | 15.17 | 47.36 | 7.85 | 39.00 | 385.99 | 0.42 | 58.94 | 5.246 | 5.546 | 4 |
| 126113_ 113437 | PARA DISE RD | 5.071 | 5.983 | 29.48 | 52.43 | 12.42 | 38.69 | 253.92 | 0.09 | 51.09 | 5.187 | 5.487 | 5 |
| 1421c | SR612 | 5.124 | 5.633 | 31.95 | 48.46 | 10.91 | 37.21 | 719.05 | 0.4 | 56.23 | 5.179 | 5.479 | 6 |
| 5164a_ 5164b | SR159 | 21.057 | 22.161 | 23.46 | 46.92 | 10.68 | 35.90 | 689.99 | 0.39 | 54.26 | 21.8 | 22.1 | 7 |
| 6001a_ 6001b | SR159 | 22.161 | 23.173 | 24.1 | 47.46 | 11.73 | 35.41 | 828.59 | 0.38 | 53.51 | 22.8 | 23.1 | 8 |
| 126146_ 120152 | JONE S BLVD | 6.577 | 7.257 | 24.29 | 42.88 | 7.13 | 35.26 | 306.01 | 0.38 | 53.29 | 6.977 | 7.277 | 9 |
| 81363 | JONE S BLVD | 7.257 | 7.357 | 5.34 | 42.88 | 7.13 | 35.26 | 306.01 | 0.38 | 53.29 | 6.977 | 7.277 | 9 |

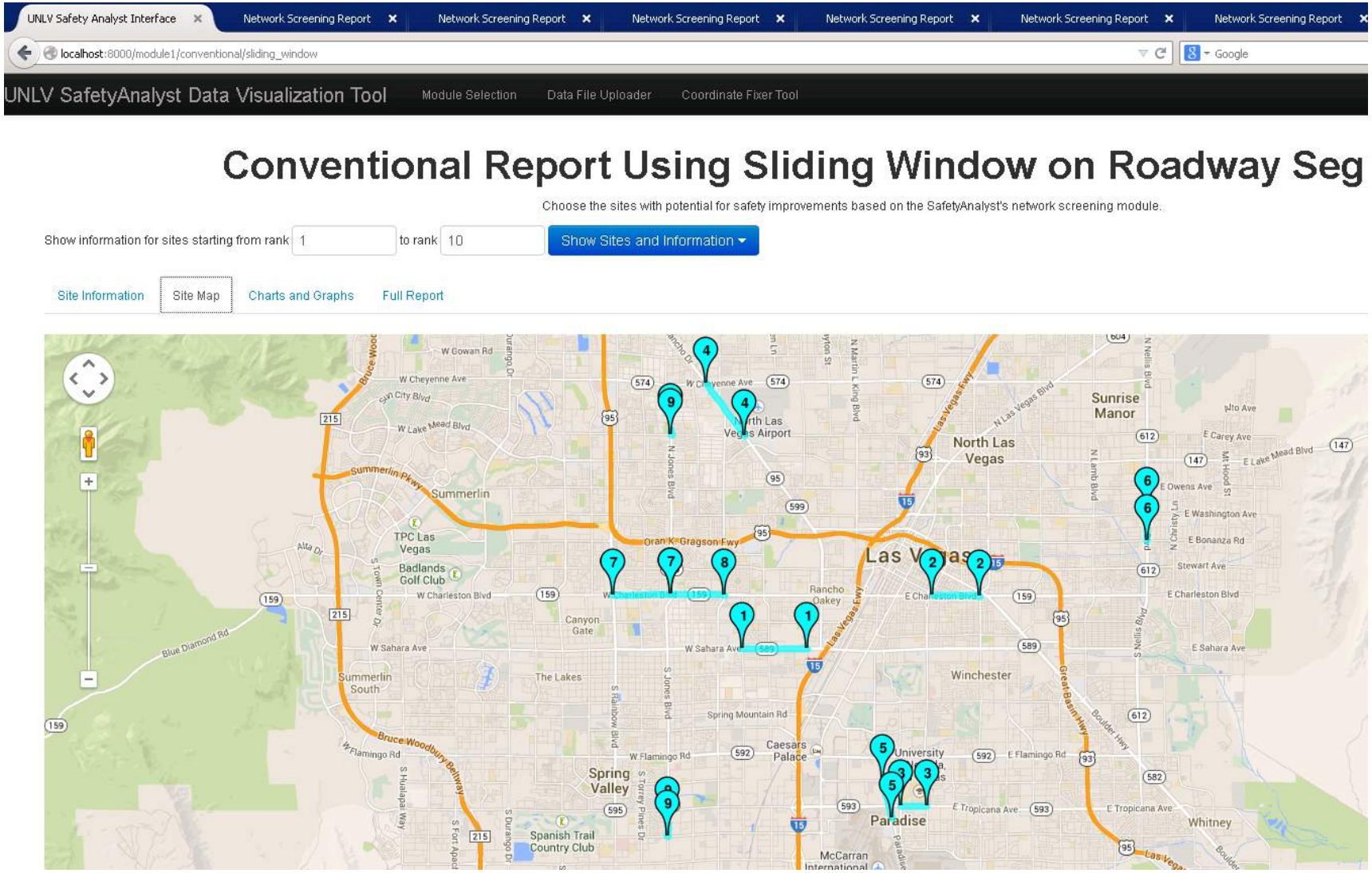



**FIGURE C-12 Visualization of results of Analysis 12: Roadway segments of functional class 3, 4, 5, 6 and 7 – fatal and all injury crashes – Sliding Window on roadway segments**

**Analysis 13: Signalized Intersections – total crashes**
Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Intersections
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Intersections): 5.0 crashes/yr
CV limit (intersections): 0.5
Number of sites in the site list: 586
Number of sites evaluated: 574
Number of segments evaluated: 0
Total length of segments evaluated: 0.000
Number of intersections evaluated: 574
Number of ramps evaluated: 0
Number of sites flagged: 28
Number of Intersections Ranked = 28 out of 574 total intersections in sitelist.
Percentage of Intersections Ranked = 4.9

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

## TABLE C-13 Results of Analysis 13: Signalized Intersections – Total Crashes

| ID | Major Route | Minor Route | Major Route Milepost | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | |
| | | | | | | | Excess Frequency * | Variance ** | No. of Fatalities | No. of Injuries | |
| 3072 | SR159 | LAMB BLVD | 30.193 | 94.49 | 94.49 | 26.19 | 66.77 | 236.86 | | | 1 |
| 2176 | SR593 | KOVAL LA | 1.574 | 93.41 | 93.41 | 28.90 | 63.18 | 284.84 | | | 2 |
| 2195 | SR593 | SR604 | 0.827 | 92.14 | 92.14 | 33.89 | 57.21 | 385.17 | | | 3 |
| 4071 | SR573 | RM10618 | 0.054 | 70.98 | 70.98 | 16.94 | 52.11 | 105.24 | | | 4 |
| 3017 | SR159 | FORT APACHE RD | 18.389 | 54.74 | 54.74 | 10.57 | 40.86 | 35.04 | | | 5 |
| 2133 | MARYLAND PKWY | SR592 | 9.483 | 61.75 | 61.75 | 20.97 | 39.69 | 151.62 | | | 6 |
| 2239 | SR593 | S PECOS RD | 6.731 | 63.18 | 63.18 | 23.61 | 38.62 | 189.65 | | | 7 |
| 2132 | FLAMINGO RD | LAS VEGAS BLVD | 6.386 | 69.44 | 69.44 | 30.71 | 37.98 | 314.94 | | | 8 |
| 2027 | SR612 | E BONANZA RD | 5.124 | 56.98 | 56.98 | 20.20 | 35.74 | 140.83 | | | 9 |
| 3232 | SR599 | VEGAS DR | 3.273 | 51.59 | 51.59 | 20.81 | 29.92 | 148.01 | | | 10 |

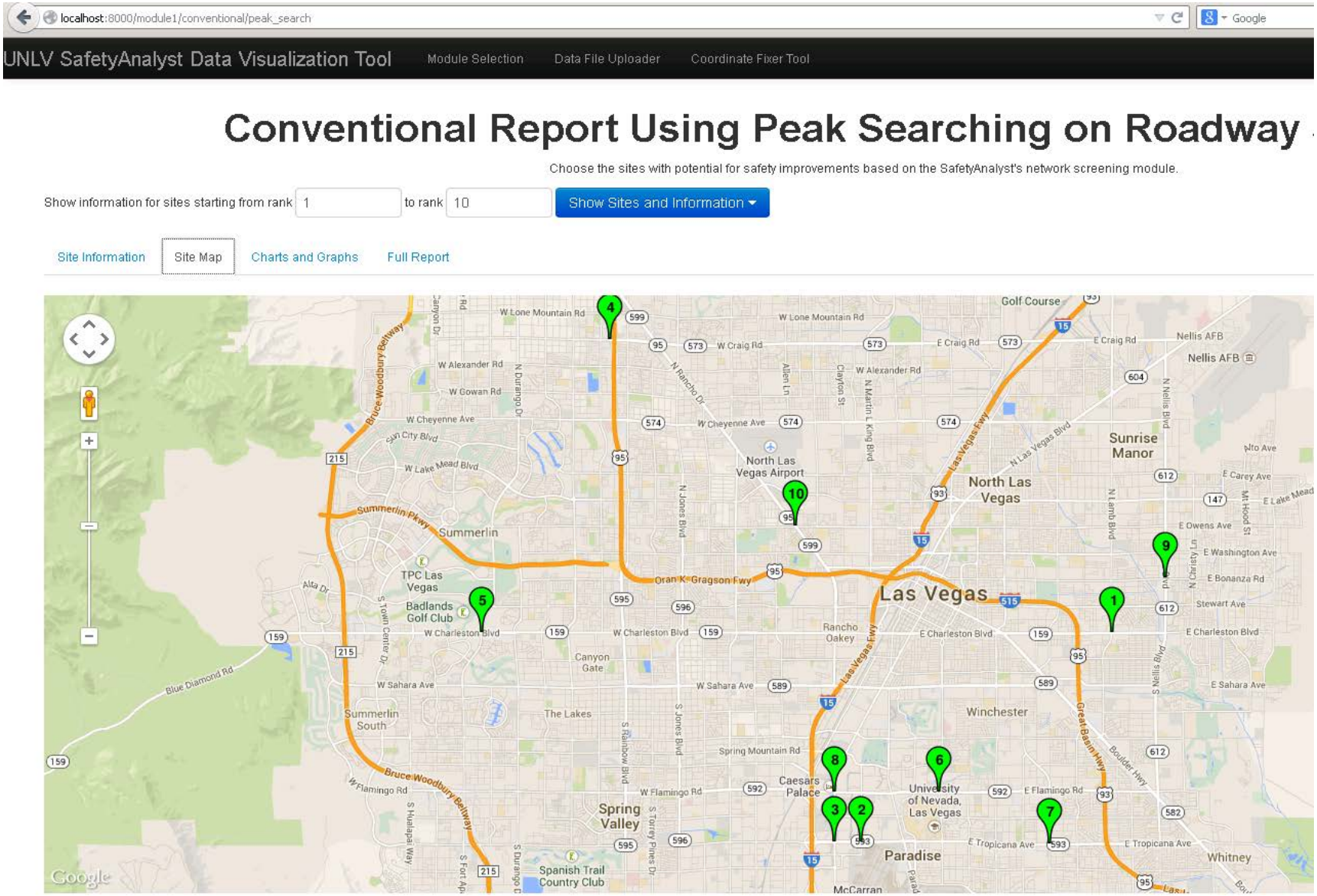



**FIGURE C-13 Visualization of results of Analysis 13: Signalized Intersections – total crashes**

**Analysis 14: Signalized Intersections – fatal and all injury crashes**
Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Intersections
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Intersections): 5.0 crashes/yr
CV limit (intersections): 0.5
Number of sites in the site list: 586
Number of sites evaluated: 574
Number of segments evaluated: 0
Total length of segments evaluated: 0.000
Number of intersections evaluated: 574
Number of ramps evaluated: 0
Number of sites flagged: 19
Screening time: 17 seconds
Number of Intersections Ranked = 19 out of 574 total intersections in sitelist.
Percentage of Intersections Ranked = 3.3

* Units for Observed, Predicted, Expected and Excess Crash Frequency
- Roadway Segments (crashes/mi/yr)
- Intersections (crashes/yr)
- Ramps (crashes/mi/yr)

** Units for Variance
- Roadway Segments (crashes/mi**2/yr)
- Intersections (crashes/yr)
- Ramps (crashes/mi**2/yr)

## TABLE C-14 Results of Analysis 14: Signalized Intersections – Fatal and All Injury Crashes

| ID | Major Route | Minor Route | Major Route Milepost | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | |
| | | | | | | | Excess Frequency * | Variance ** | No. of Fatalities | No. of Injuries | |
| 3072 | SR159 | LAMB BLVD | 30.193 | 38.27 | 38.27 | 11.94 | 24.93 | 49.77 | 0.16 | 38.52 | 1 |
| 2176 | SR593 | KOVAL LA | 1.574 | 34.40 | 34.40 | 13.40 | 19.98 | 60.43 | 0.13 | 30.87 | 2 |
| 2239 | SR593 | S PECOS RD | 6.731 | 30.69 | 30.69 | 10.58 | 18.94 | 39.04 | 0.12 | 29.27 | 3 |
| 3017 | SR159 | FORT APACHE RD | 18.389 | 23.89 | 23.89 | 4.240 | 16.74 | 8.42 | 0.11 | 25.24 | 4 |
| 2027 | SR612 | E BONANZA RD | 5.124 | 26.07 | 26.07 | 8.84 | 16.03 | 28.04 | 0.10 | 24.77 | 5 |
| 3232 | SR599 | VEGAS DR | 3.273 | 24.04 | 24.04 | 9.15 | 13.87 | 29.45 | 0.09 | 21.43 | 6 |
| 2302 | SR596 | SPRING MOUNTAIN RD | 1.760 | 21.85 | 21.85 | 7.32 | 13.34 | 19.79 | 0.09 | 20.62 | 7 |
| 2133 | MARYLAND PKWY | SR592 | 9.483 | 22.31 | 22.31 | 9.20 | 12.26 | 29.23 | 0.08 | 18.95 | 8 |
| 2135 | SR592 | PECOS MCLEOD INT | 6.550 | 21.35 | 21.35 | 9.34 | 11.22 | 29.99 | 0.07 | 17.33 | 9 |
| 3006 | SR589 | ARVILLE ST | 2.411 | 20.66 | 20.66 | 8.62 | 11.19 | 25.91 | 0.07 | 17.3 | 10 |

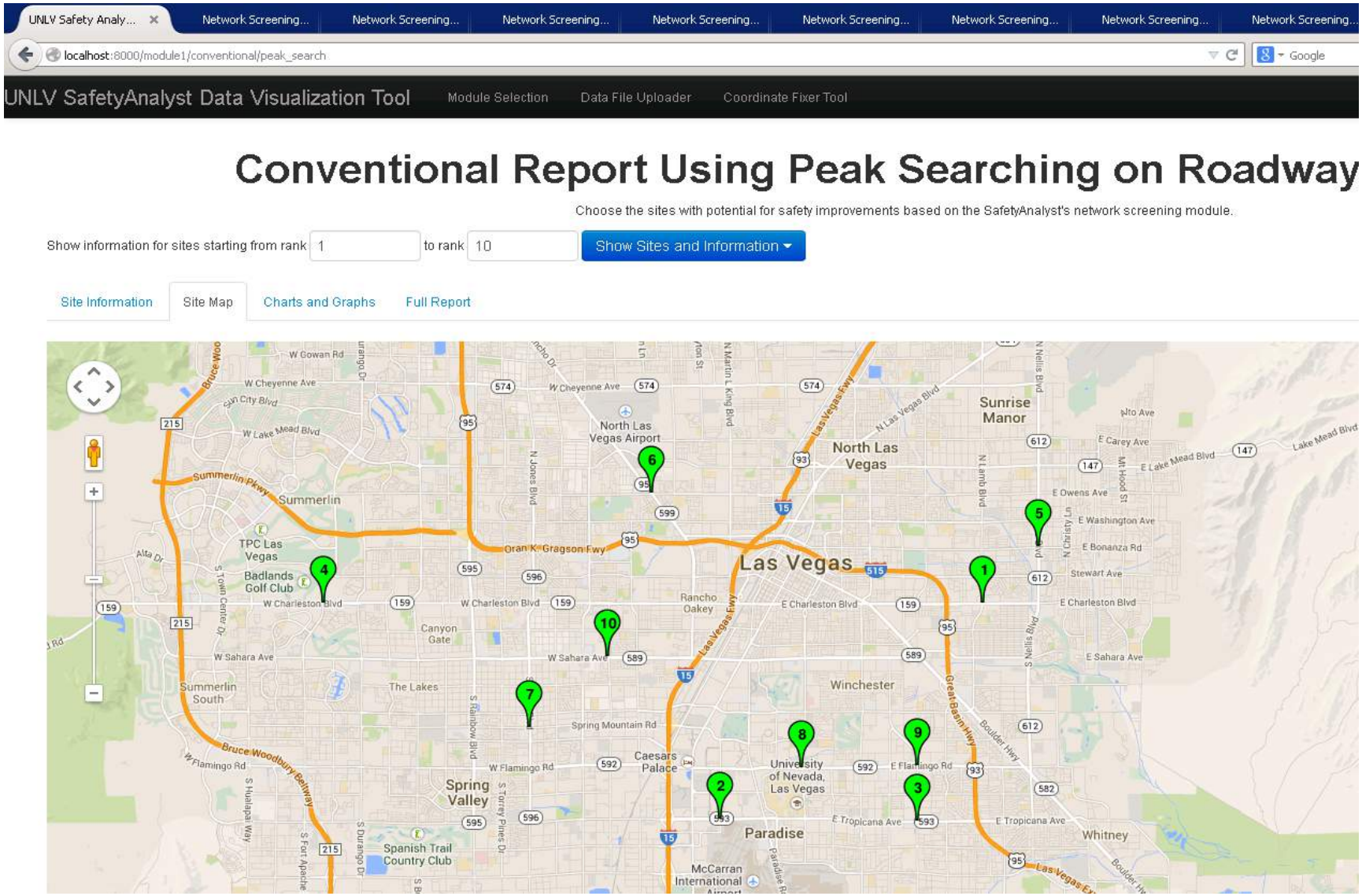



**FIGURE C-14 Visualization of results of Analysis 14: Signalized Intersections – fatal and all injury crashes**

**Analysis 15: Stop Controlled Intersections – total crashes**
Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Intersections
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; September; October; November; December
Analysis Period: From 2007 To 2011
Major Reconstruction: No major reconstruction occurred at any sites during the analysis period
Limiting Value (Intersections): 1.0 crashes/yr
CV limit (intersections): 0.5
Number of sites in the site list: 337
Number of sites evaluated: 313
Number of segments evaluated: 0
Total length of segments evaluated: 0.000
Number of intersections evaluated: 313
Number of ramps evaluated: 0
Number of sites flagged: 18
Screening time: 4 seconds
Number of Intersections Ranked = 18 out of 313 total intersections in sitelist.
Percentage of Intersections Ranked = 5.8

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

## TABLE C-15 Results of Analysis 15: Stop Controlled Intersections – Total Crashes

| ID | Major Route | Minor Route | Major Route Milepost | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | |
| ST3488 | RUSSELL RD | STEPHANIE PL | 15.616 | 12.39 | 12.39 | 1.86 | 9.72 | 6.57 | | | 1 |
| ST3473 | MARYLAND PKWY | RENO AV | 8.294 | 11.72 | 11.72 | 1.28 | 9.28 | 4.04 | | | 2 |
| ST3378 | SR604 | N BRUCE ST | 0.926 | 7.99 | 7.99 | 0.81 | 6.04 | 1.97 | | | 3 |
| ST3436 | SR612 | E WYOMING AV | 3.563 | 6.24 | 6.24 | 0.66 | 4.58 | 1.34 | | | 4 |
| ST3092 | S HUALAPAI WY | TWAIN AV | 4.612 | 4.9 | 4.9 | 0.71 | 3.41 | 0.9 | | | 5 |
| ST3242 | CAMINO AL NORTE | W LA MADRE WY | 0.972 | 4.24 | 4.24 | 0.57 | 2.98 | 0.9 | | | 6 |
| ST3225 | 5TH ST | E CENTENNIAL PKWY | 5.68 | 5.1 | 5.1 | 0.65 | 2.63 | 0.61 | | | 7 |
| ST3471 | MCLEOD DR | E HARMON AV | 6.11 | 4.6 | 4.6 | 1.17 | 2.62 | 1.13 | | | 8 |
| ST3091 | S TOWN CENTER DR | TWAIN AV | 2.479 | 3.98 | 3.98 | 0.91 | 2.6 | 1.68 | | | 9 |
| ST3058 | GRAND CANYON DR | W HACIENDA AV | 2.847 | 3.73 | 3.73 | 0.47 | 2.43 | 0.48 | | | 10 |

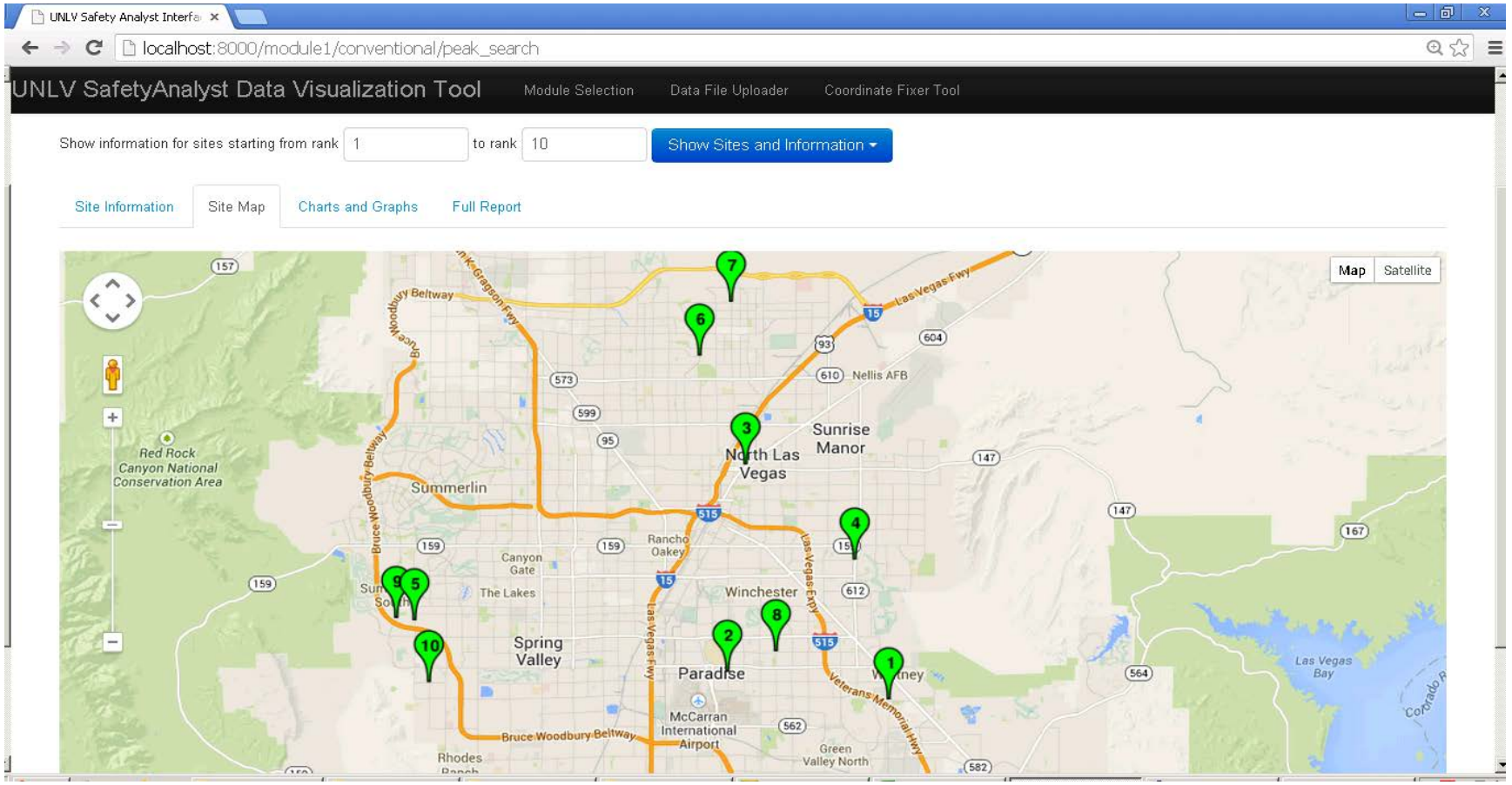



**FIGURE C-15 Visualization of results of Analysis 15: Stop Controlled Intersections – total crashes**

**Analysis 16: Stop Controlled Intersections – fatal and all injury crashes**
Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Intersections
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Intersections): 1.0 crashes/yr
CV limit (intersections): 0.5
Number of sites in the site list: 337
Number of sites evaluated: 313
Number of segments evaluated: 0
Total length of segments evaluated: 0.000
Number of intersections evaluated: 313
Number of ramps evaluated: 0
Number of sites flagged: 12
Number of Intersections Ranked = 12 out of 313 total intersections in sitelist.
Percentage of Intersections Ranked = 3.8

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

**TABLE C-16 Results of Analysis 16: Stop Controlled Intersections – Fatal and All Injury Crashes**

| ID | Major Route | Minor Route | Major Route Milepost | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | |
| ST3488 | RUSSELL RD | STEPHANIE PL | 15.616 | 6.44 | 6.44 | 1.09 | 4.59 | 2.56 | 0.12 | 6.72 | 1 |
| ST3473 | MARYLAND PKWY | RENO AV | 8.294 | 5.78 | 5.78 | 0.64 | 3.97 | 1.32 | 0.1 | 5.82 | 2 |
| ST3075 | GRAND CANYON DR | PEACE WY | 3.876 | 4.89 | 4.89 | 0.61 | 2.85 | 0.95 | 0.11 | 4.73 | 3 |
| ST3092 | S HUALAPAI WY | TWAIN AV | 4.612 | 3.64 | 3.64 | 0.44 | 2.37 | 0.51 | 0.02 | 4.04 | 4 |
| ST3378 | SR604 | N BRUCE ST | 0.926 | 3.86 | 3.86 | 0.33 | 2.31 | 0.51 | 0.06 | 3.39 | 5 |
| ST3436 | SR612 | E WYOMING AV | 3.563 | 3.35 | 3.35 | 0.25 | 1.89 | 0.33 | 0.05 | 2.77 | 6 |
| ST3058 | GRAND CANYON DR | W HACIENDA AV | 2.847 | 3.14 | 3.14 | 0.28 | 1.85 | 0.28 | 0.02 | 3.15 | 7 |
| ST3091 | S TOWN CENTER DR | TWAIN AV | 2.479 | 3.09 | 3.09 | 0.39 | 1.81 | 0.54 | 0.05 | 2.65 | 8 |
| ST3225 | 5TH ST | E CENTENNIAL PKWY | 5.68 | 2.87 | 2.87 | 0.49 | 1.49 | 0.53 | 0.03 | 2.09 | 9 |
| ST3145 | 5TH ST | GOWAN RD | 2.143 | 2.28 | 2.28 | 0.49 | 1.38 | 0.45 | 0.01 | 2.35 | 10 |

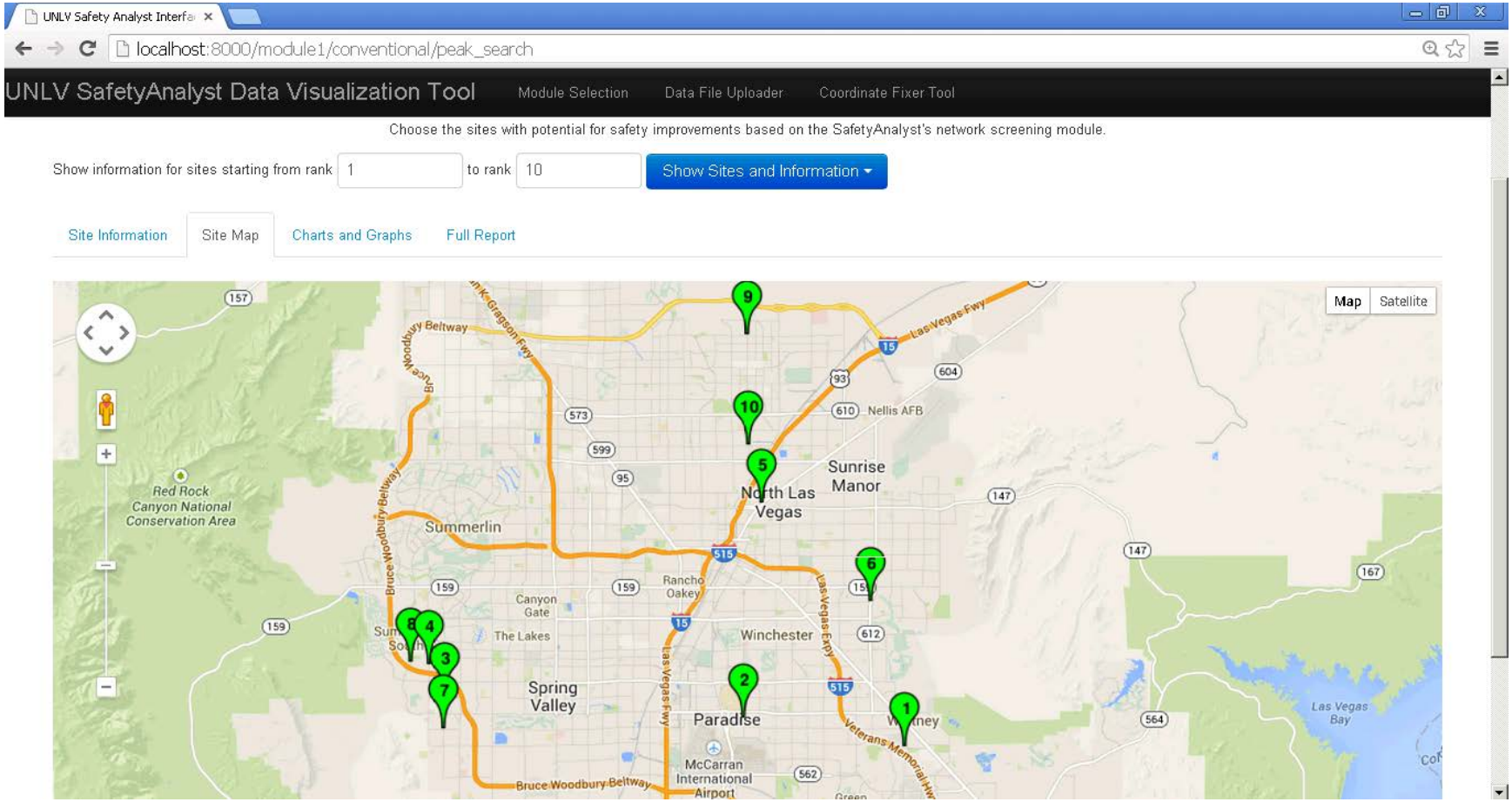



**FIGURE C-16 Visualization of results of Analysis 16: Stop Controlled Intersections – fatal and all injury crashes**

**Analysis 17: Ramp segments – total crashes**
Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Ramps
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Total Crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; September; October; November; December
Analysis Period: From 2007 To 2011
Major Reconstruction: No major reconstruction occurred at any sites during the analysis period
Limiting Value (Ramps): 1.0 crashes/mi/yr
CV limit (ramps): 0.5
Number of sites in the site list: 763
Number of sites evaluated: 620
Number of segments evaluated: 0
Total length of segments evaluated: 0.000
Number of intersections evaluated: 0
Number of ramps evaluated: 620
Number of sites flagged: 53
Number of Ramps Ranked = 53 out of 620 total ramps in sitelist.
Percentage of Ramps Ranked = 8.5

* Units for Observed, Predicted, Expected and Excess Crash Frequency
- Roadway Segments (crashes/mi/yr)
- Intersections (crashes/yr)
- Ramps (crashes/mi/yr)

** Units for Variance
- Roadway Segments (crashes/mi**2/yr)
- Intersections (crashes/yr)
- Ramps (crashes/mi**2/yr)

## TABLE C-17 Results of Analysis 17: Ramp Segments, and Intersections – Total Crashes

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 3562 | RM963 | 0 | 0.077 | 128.73 | 128.73 | 9.48 | 110.66 | 151.77 | | | 0 | 0.077 | 1 |
| 6647 | RM10550 | 0 | 0.137 | 133.4 | 133.4 | 7.04 | 102.83 | 70.55 | | | 0 | 0.137 | 2 |
| 3302 | RM10913 | 0 | 0.04 | 125.31 | 125.31 | 8.01 | 87.31 | 105.72 | | | 0 | 0.04 | 3 |
| 4397 | RM1007 | 0 | 0.167 | 85.71 | 85.71 | 5.72 | 70.43 | 47.66 | | | 0 | 0.167 | 4 |
| 6281 | RM799 | 0 | 0.23 | 87.88 | 87.88 | 1.12 | 59.77 | 7.06 | | | 0 | 0.23 | 5 |
| 6637 | RM10563 | 0 | 0.091 | 125.72 | 125.72 | 2.93 | 59.44 | 14.54 | | | 0 | 0.091 | 6 |
| 1483 | RM10191 | 0 | 0.471 | 111.76 | 111.76 | 49.49 | 57.86 | 315.16 | | | 0 | 0.471 | 7 |
| 5063 | RM10226 | 0 | 0.714 | 65.21 | 65.21 | 8.26 | 55.22 | 111.24 | | | 0 | 0.714 | 8 |
| 3335 | RM10578 | 0 | 0.063 | 109.1 | 109.1 | 2.94 | 53.66 | 14.43 | | | 0 | 0.063 | 9 |
| 129 | RM458 | 0 | 0.017 | 100.64 | 100.64 | 8.82 | 51.69 | 120.05 | | | 0 | 0.017 | 10 |

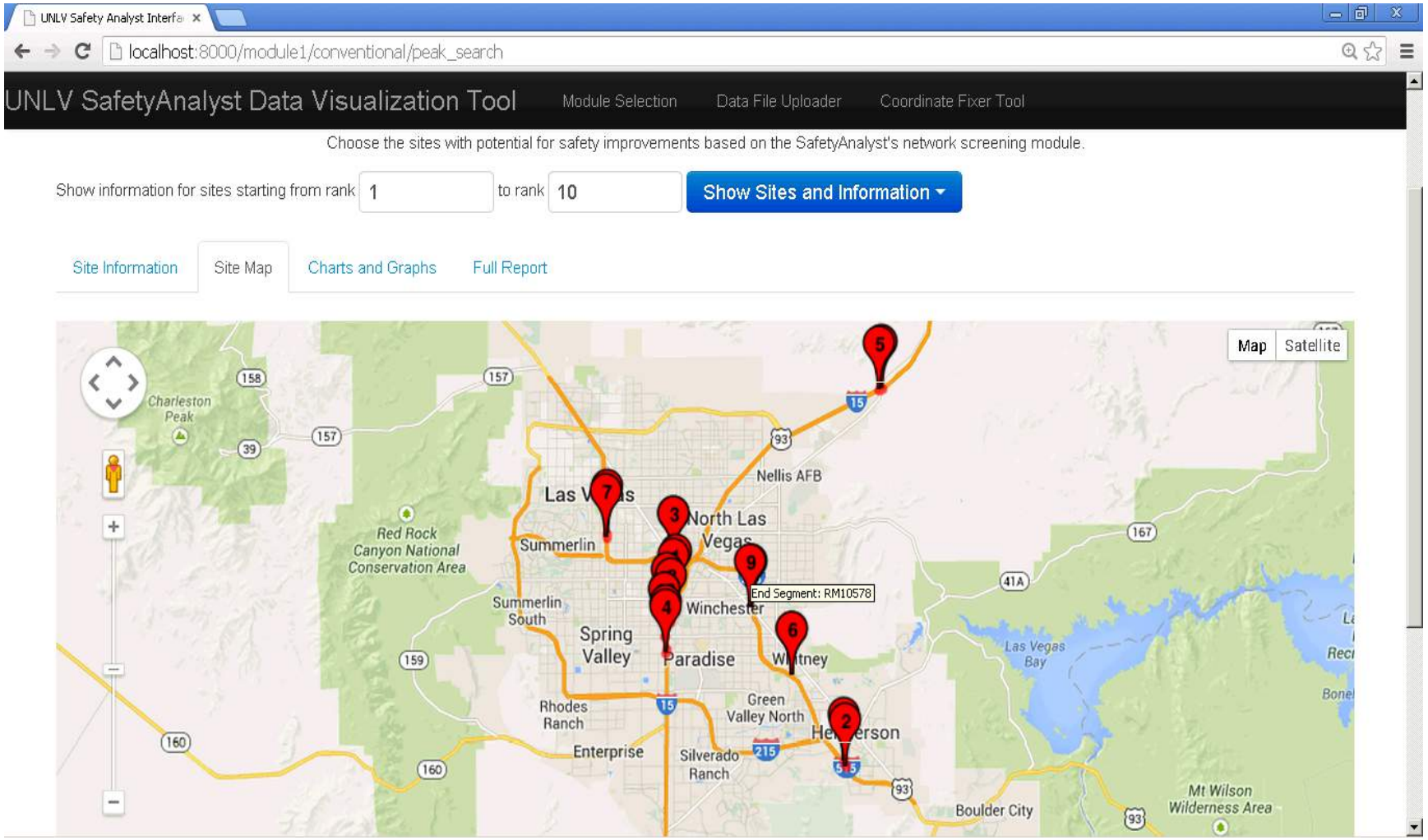



**FIGURE C-17 Visualization of results of Analysis 17: Ramp segments – total crashes**

**Analysis 18: Ramp segments – fatal and all injury crashes**
Basic Network Screening (with Peak Searching on roadway segments and CV test)
Site Types: Ramps
Potential for Safety Improvement Using: Excess crash frequency
Crash Severity Level: Fatal and all injury crashes
Screening Attribute: Crash Month = January; February; March; April; May; June; July; August; Sep; October; November; December
Analysis Period: From 2007 To 2011
Limiting Value (Ramps): 1.0 crashes/mi/yr
CV limit (ramps): 0.5
Number of sites in the site list: 763
Number of sites evaluated: 620
Number of segments evaluated: 0
Total length of segments evaluated: 0.000
Number of intersections evaluated: 0
Number of ramps evaluated: 620
Number of sites flagged: 24
Screening time: 4 seconds
Number of Ramps Ranked = 24 out of 620 total ramps in sitelist.
Percentage of Ramps Ranked = 3.9

* Units for Observed, Predicted, Expected and Excess Crash Frequency
  - Roadway Segments (crashes/mi/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi/yr)

** Units for Variance
  - Roadway Segments (crashes/mi**2/yr)
  - Intersections (crashes/yr)
  - Ramps (crashes/mi**2/yr)

## TABLE C-18 Results of Analysis 18: Ramp Segments – Fatal and All Injury Crashes

| ID | Route | Site Start Location | Site End Location | Average Observed Crashes for Entire Site * | Location with Highest Potential for Safety Improvement | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Average Observed Crashes * | Predicted Crash Frequency * | Excess Crash Frequency | | | | Start Location | End Location | |
| | | | | | | | Excess Frequency * | Var ** | No. of Fatalities | No. of Injuries | | | |
| 3562 | RM963 | 0 | 0.077 | 46.34 | 46.34 | 2.54 | 34.44 | 13.28 | 0.09 | 46.31 | 0 | 0.077 | 1 |
| 4397 | RM1007 | 0 | 0.167 | 32.37 | 32.37 | 1.48 | 23.67 | 7.05 | 0.23 | 32.14 | 0 | 0.167 | 2 |
| 6647 | RM10550 | 0 | 0.137 | 36.37 | 36.37 | 1.77 | 22.62 | 8.44 | 0.22 | 30.72 | 0 | 0.137 | 3 |
| 3335 | RM10578 | 0 | 0.063 | 38.64 | 38.64 | 0.83 | 12.58 | 2.01 | 0.12 | 17.08 | 0 | 0.063 | 4 |
| 129 | RM458 | 0 | 0.017 | 43.88 | 43.88 | 2.35 | 11.15 | 8.1 | 0.03 | 14.99 | 0 | 0.017 | 5 |
| 6637 | RM10563 | 0 | 0.091 | 35.17 | 35.17 | 0.83 | 10.74 | 1.87 | 0.11 | 14.59 | 0 | 0.091 | 6 |
| 100892 | RAMP N CC215 FLAM E | 0 | 0.146 | 15.36 | 15.36 | 1.65 | 10.38 | 6.63 | 0.1 | 14.1 | 0 | 0.146 | 7 |
| 3302 | RM10913 | 0 | 0.04 | 24.67 | 24.67 | 2.12 | 10.19 | 6.96 | 0.03 | 13.71 | 0 | 0.04 | 8 |
| 3325 | RM455 | 0 | 0.308 | 13.06 | 13.06 | 1.7 | 9.35 | 5.39 | 0.02 | 12.57 | 0 | 0.308 | 9 |
| 6011 | RM10173 | 0 | 0.055 | 20.03 | 20.03 | 2.32 | 9.32 | 8.37 | 0.02 | 12.54 | 0 | 0.055 | 10 |

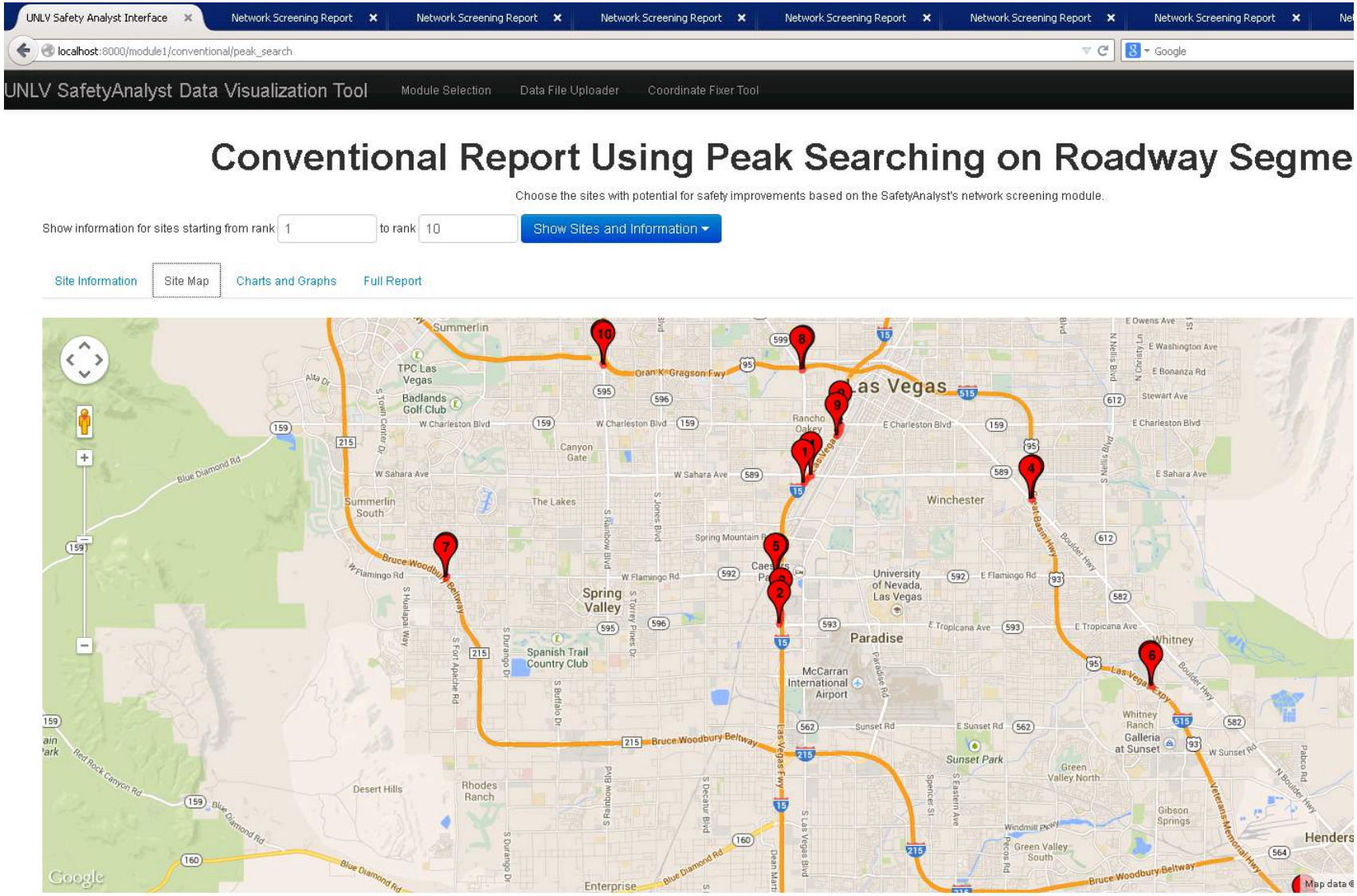
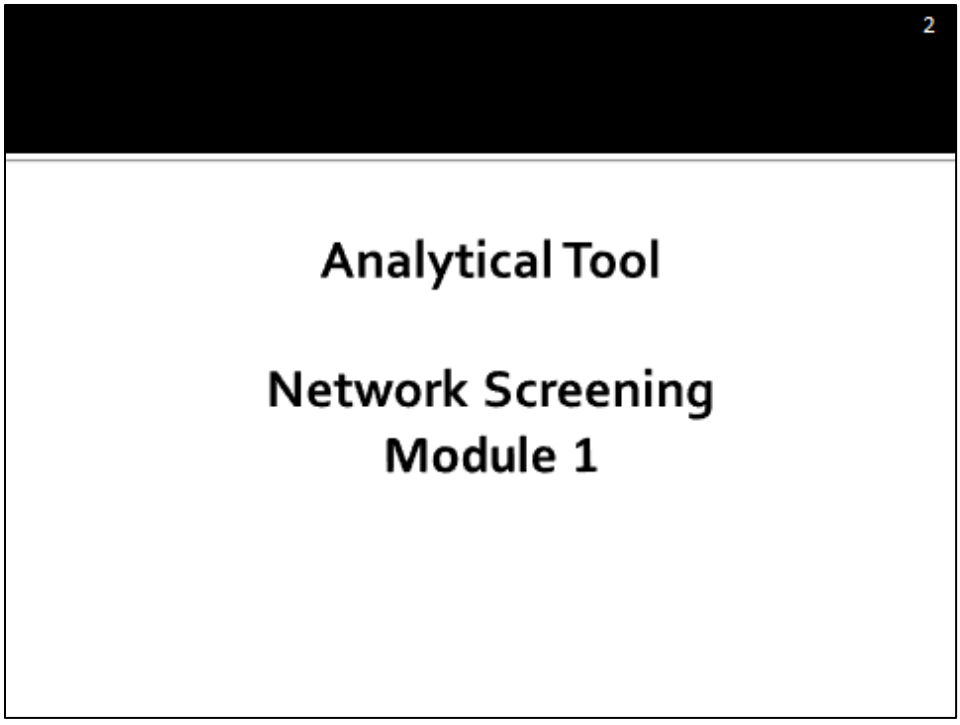



**FIGURE C-18 Visualization of results of Analysis 18: Ramp segments – fatal and all injury crashes**

## APPENDIX D

## TUTORIAL OF NETWORK SCREENING ANALYSIS IN SAFETY ANALYST

This Appendix provides the tutorial of Network Screening Analysis in Safety Analyst. Tutorial includes visualization of results through proposed visualization tool.

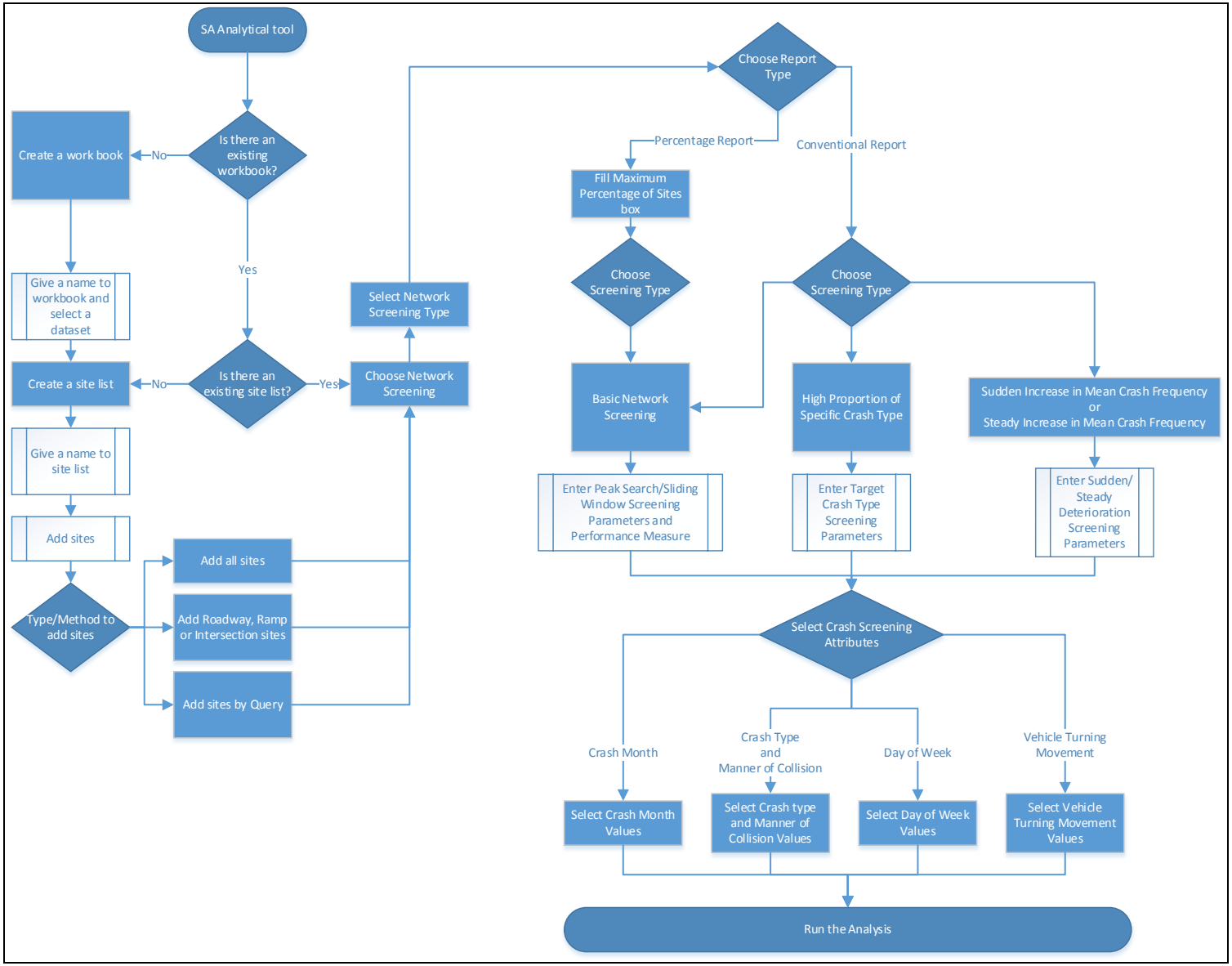
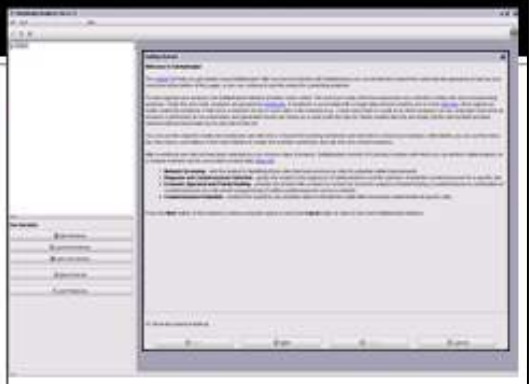



**FIGURE D-1 Process flow chart of Safety Analyst Analytical Tool**

3

# Open Safety Analyst - Analytical Tool

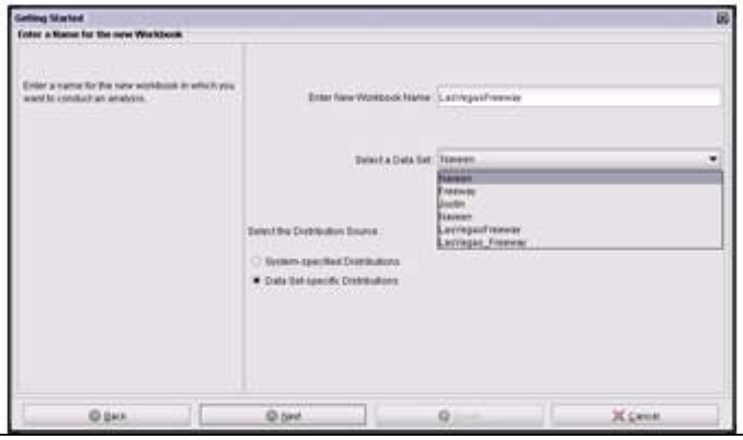
- Start>All Programs> AASHTOWare Safety Analyst>Analytical Tool
- Analytical tool should open with *Getting Started Wizard* box
- If not, Click *File>Getting Started Wizard*
- Click *Next*
- Choose *create a new workbook and a new site list* and then *Next*



4

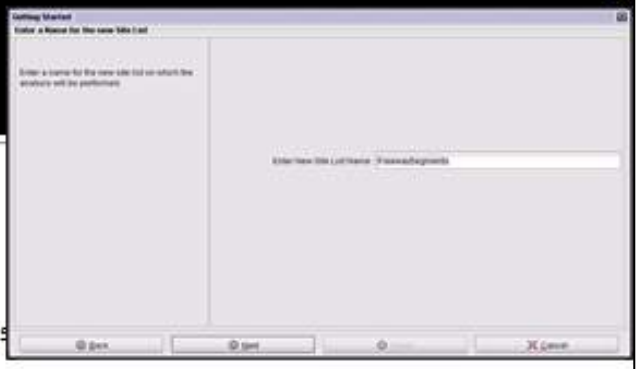
# Analytical Tool – workbook and data set setup

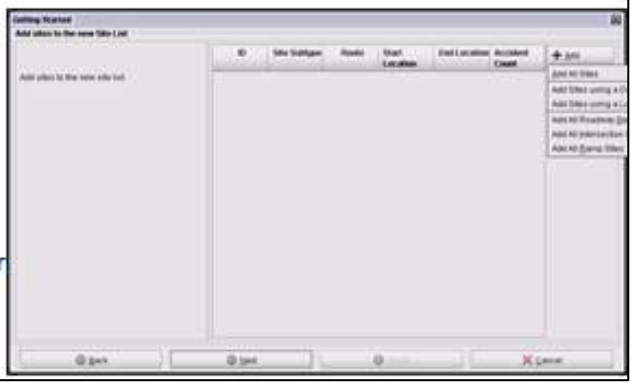
- Enter New Workbook Name: Example-LasVegasFreeway
- Select a Data Set: Example-LasVegasFreeway
- Select the Distribution Source: Data Set-specific Distributions



5

- Enter a New Site List Name: FreewaySegments
- Click *Add*
- You can see the various options such as adding all sites and etc.,
- You can add sites using the query such as Site IDs etc.,
- Click *Add all Roadway Segments* for Freeway Segments analysis
- You can add all intersections and all ramps like same way for respective analysis





6

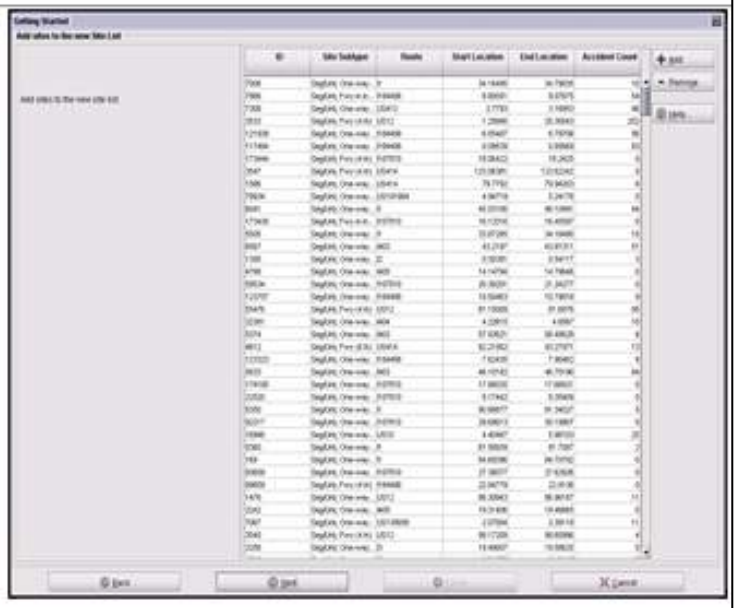
# Site Selection Query Wizard

- If user wants to select specific sites then use this slide otherwise this slide is for reference only

## continuation

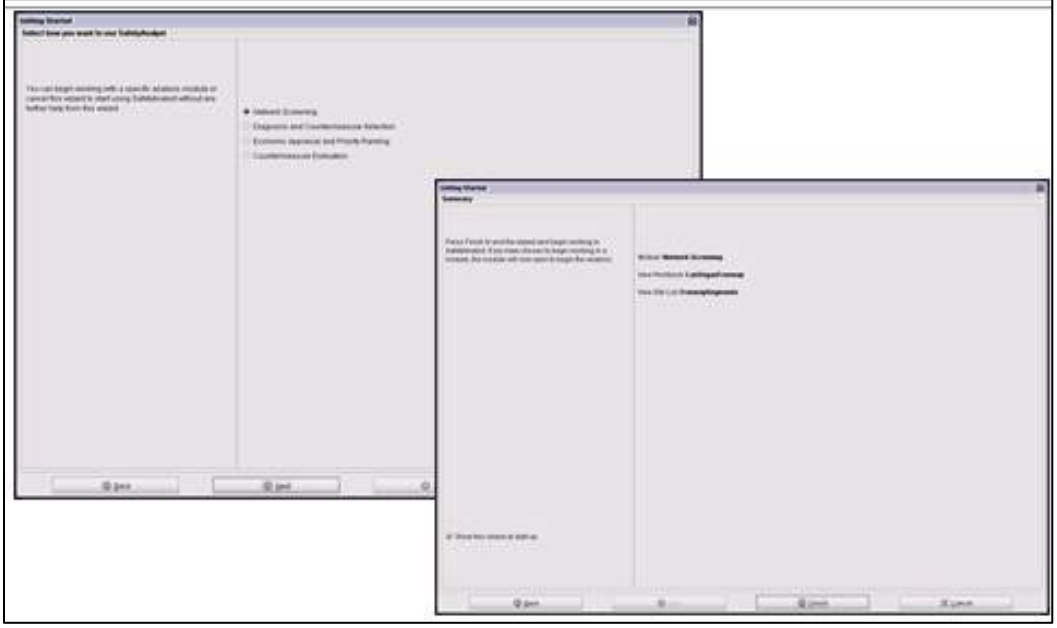
7

- Tool adds all the freeway segments sites
- In this case, only freeway segments
- Click *Next*



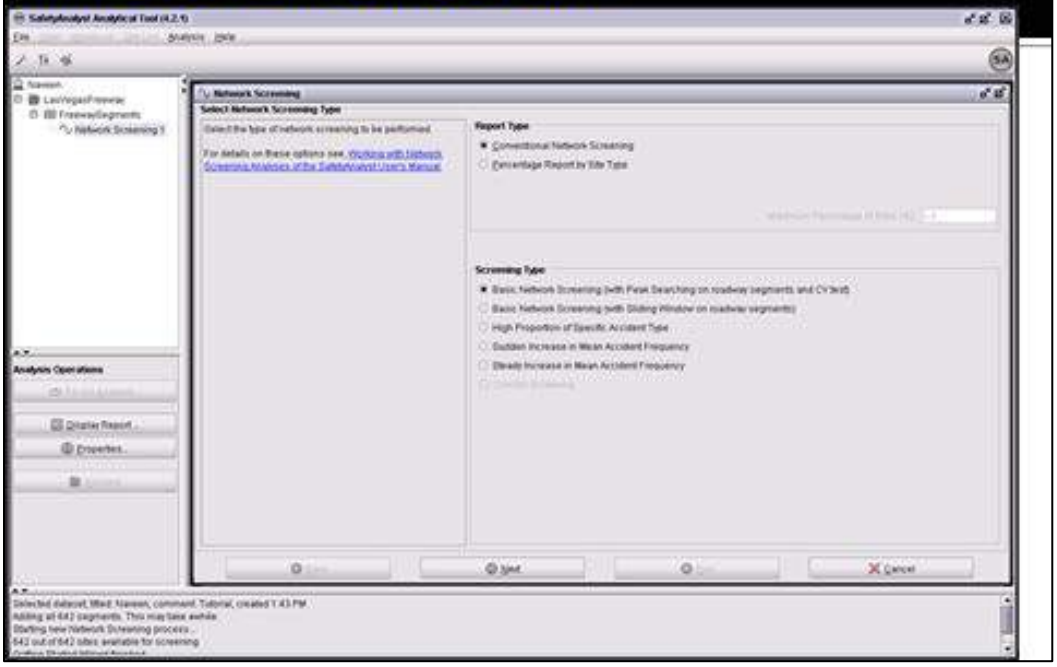
## Select *Network Screening* and click *Next* and *Finish*

8



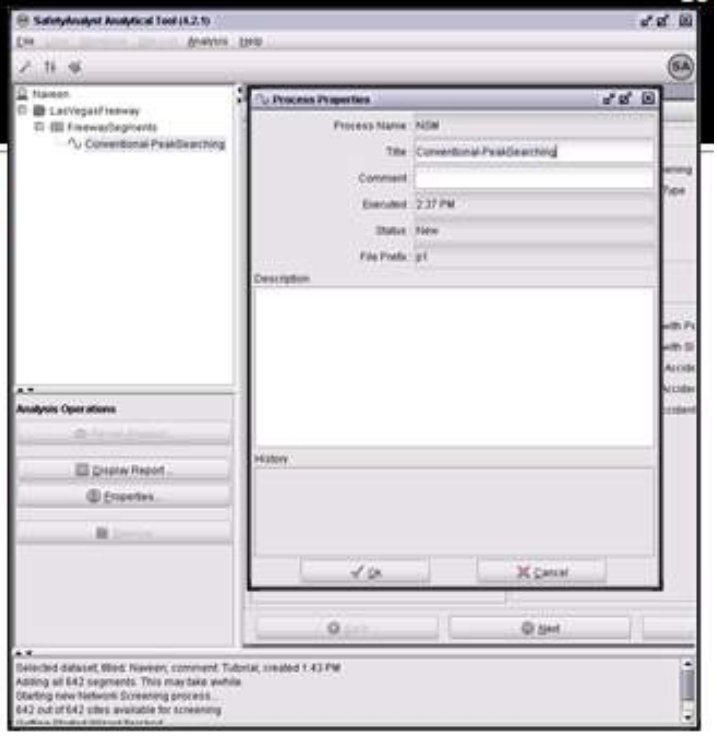
9

## The window shows the Network Screening with all the network screening Options



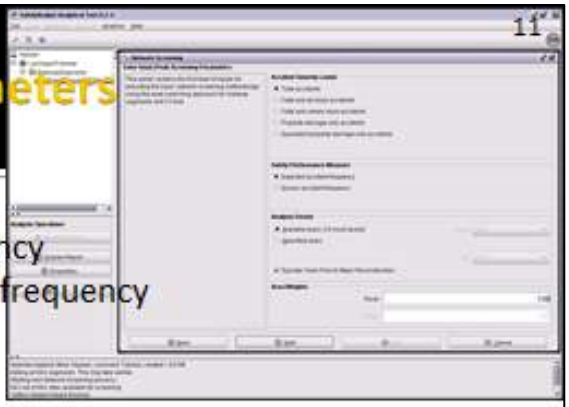
10

- Right Click *Network Screening 1* on left hand side window and select *Process properties*
- Change the title as *Conventional-PeakSearching* and then click *ok*
- After screening method selection, click *Next*



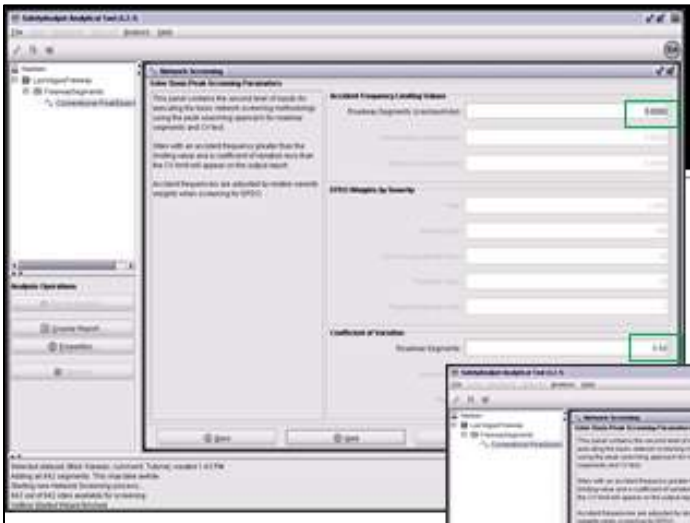
## Analysis Input Parameters

11

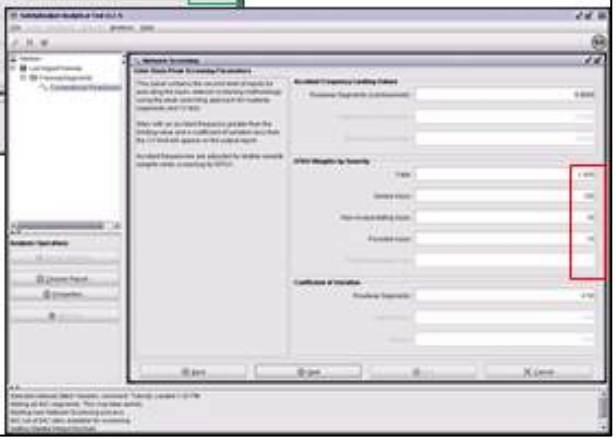


- Performance measures
  - Expected accident frequency
  - Expected excess accident frequency
- Accident severity level
  - Total accidents
  - Fatal and severe injury accidents
  - Fatal and all injury accidents
  - Property damage only accidents
  - Equivalent property damage only accidents
- Analysis period
  - All available years
  - Specified years
  - Choose to exclude years prior to major reconstruction

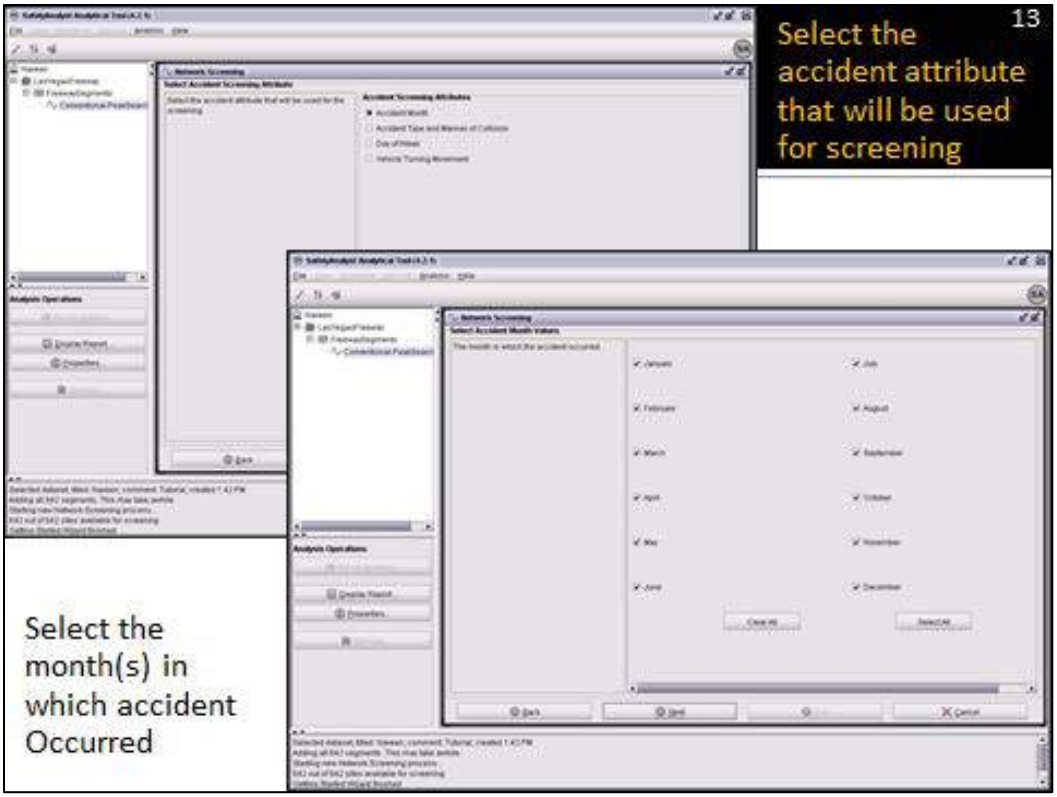
12

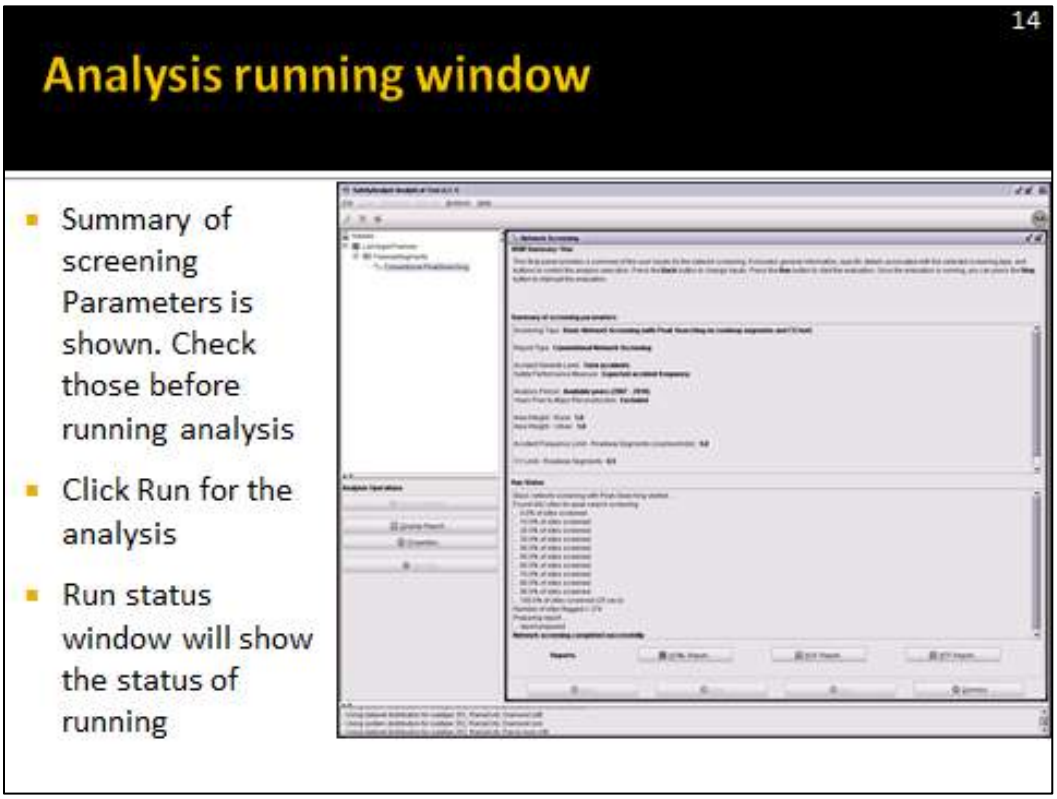


- Shows window for Total accidents Analysis
- Shows Accident Frequency Limiting Values and the coefficient of variation



- Shows window for Equivalent PDO accident Severity level Analysis
- EPDO weights by Severity default values are given. The users can change it to their regional level values


13
Select the accident attribute that will be used for screening
Select the month(s) in which accident Occurred


14
Analysis running window
Summary of screening Parameters is shown. Check those before running analysis
Click Run for the analysis
Run status window will show the status of running

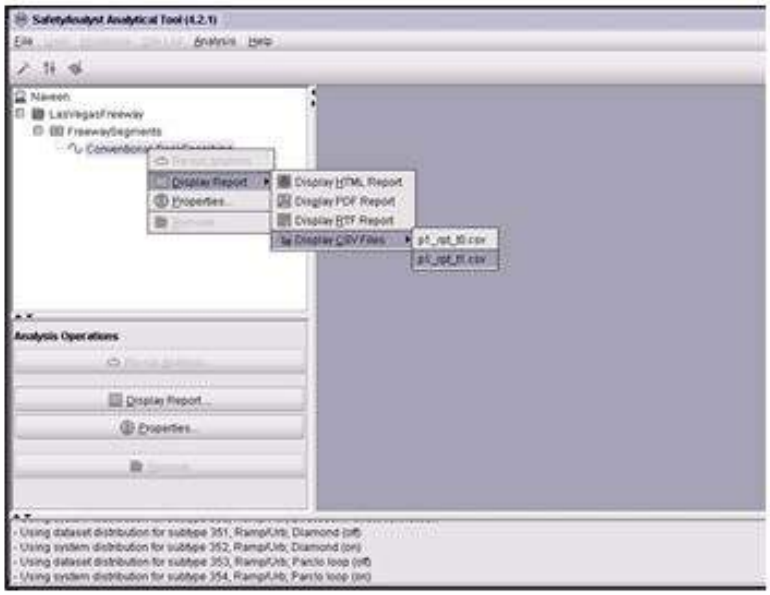
15

## Results Reports

- Once analysis completed HTML webpage will open showing the results of the analysis
- RTF and pdf format of the report can be generated from the analysis running window
- csv files are stored in the root folder and it can be retrieved

16

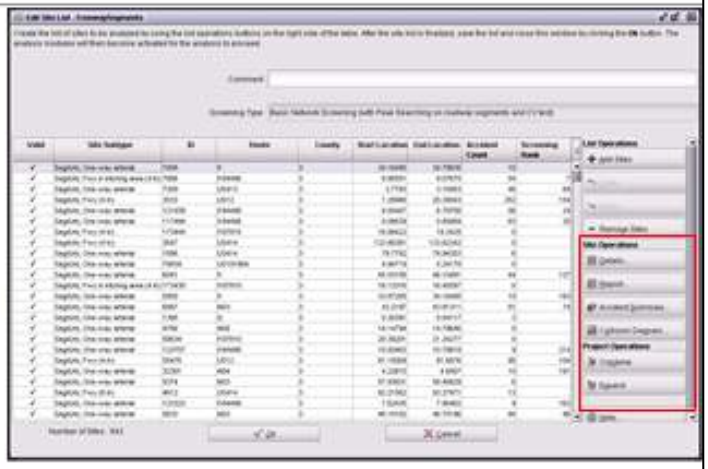
## Retrieving csv results file



17

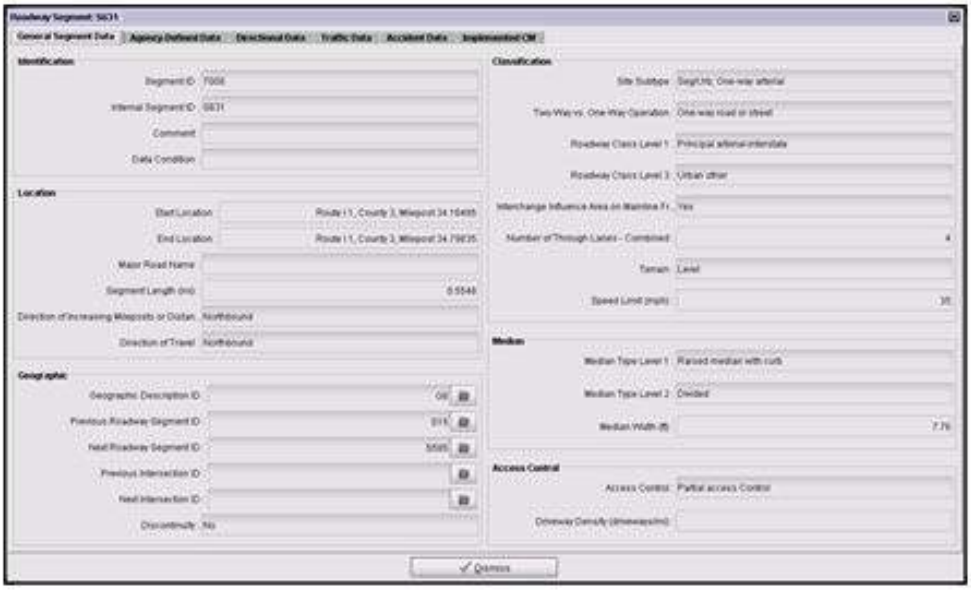
# Network Screening Ranked site operations

- Go to the site list *SigIntersections*
- Right click and select *Edit/View*
- After Analysis, Right hand side of the Edit Site List box now highlights *site operations* and *project operations*
- Click *Details* tab



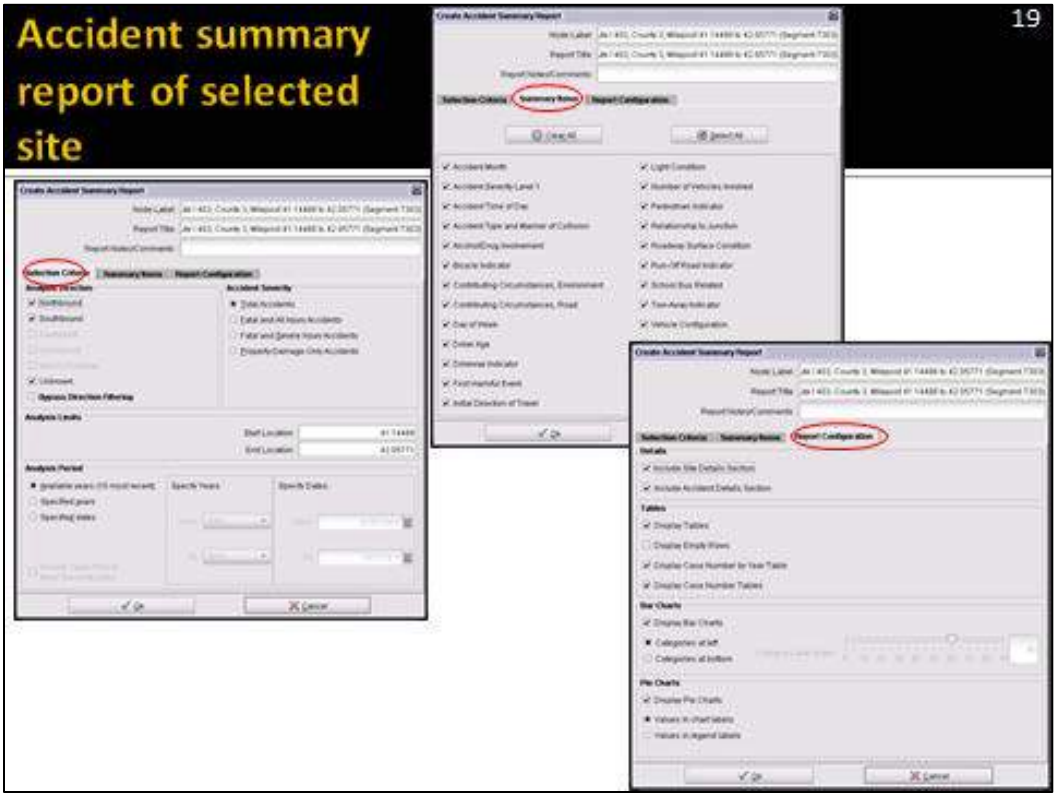
18

# Details box shows the details of the selected site



## Accident summary report of selected site

19



20

Please follow the same procedure for network screening of all midblock Arterial segments – Please choose appropriate data set: Arterial Segments

21

# UNLV Visualization Tool

- Inside the UNLV server, open Internet browser such as Mozilla Firefox, Google Chrome etc.,
- Type *http://localhost:8000/*
- Following page will be opened. Click on Data File Uploader


22

# UNLV Visualization Tool

- Page displayed in the picture will be opened
- Select the *Module* as Module 1
- Then Select *Report type* (select the same type used in analysis)
- Then select *Screening Type* ((select the same type used in analysis)
- click *Browse* to select the Analysis results that needs to displayed in the Visualization tool

23

# UNLV Visualization Tool

- Browse the path where the results are stored
- The results are stored in the following path

C:\Users\Erfaneh\AppData\Roaming\AASHTOWare Safety Analyst\users\username\w1\s1

  - *username is NDOT* in your case
  - *w# is workbook number.* Unfortunately SA does not use workbook name in results storage directory
  - *s# is the sitelist number.* Unfortunately SA does not use sitelist name in results storage directory
  - *p#_rpt_t1 is the screening type result.* Unfortunately SA does not use Screening Type name in results storage directory

- Once the results of the analysis selected, the Visualization tool is ready to display the result for the ranked elements

24

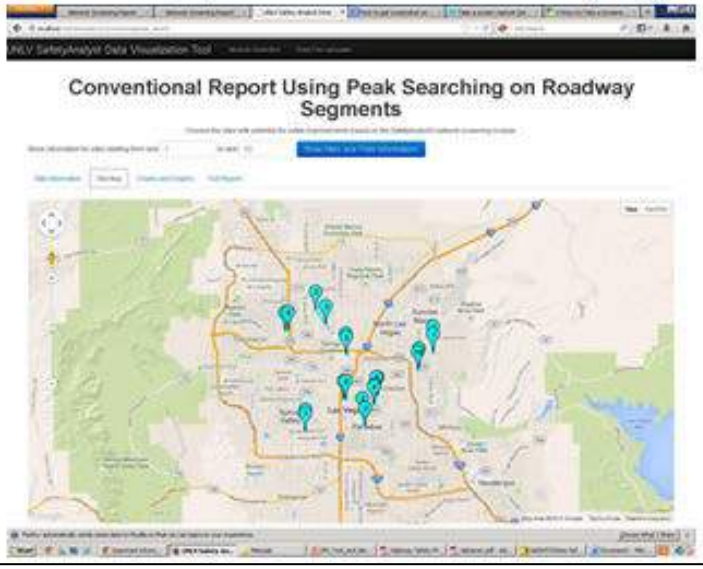
# UNLV Visualization Tool

- Type From rank and To rank – Rank of sites the user wants to display the information;
  - for roadway segments, at a time only 10 sites can be selected
  - for Intersections, any number of sites can be selected
- click show sites and their information
- The user can browse through tabs: *Site Map* for corresponding spatial locations , *charts and graphs* for observed, predicted and expected crash frequencies

## UNLV Visualization Tool – displaying selected ranks of Roadway Segments spatial information

25

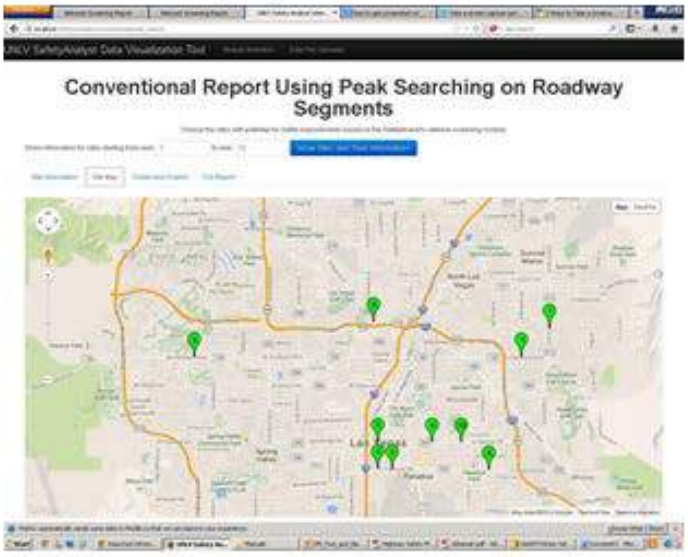
- Roadway segments will be displayed with balloons indicating begin and end segment




## UNLV Visualization Tool – displaying selected ranks of Intersection spatial information

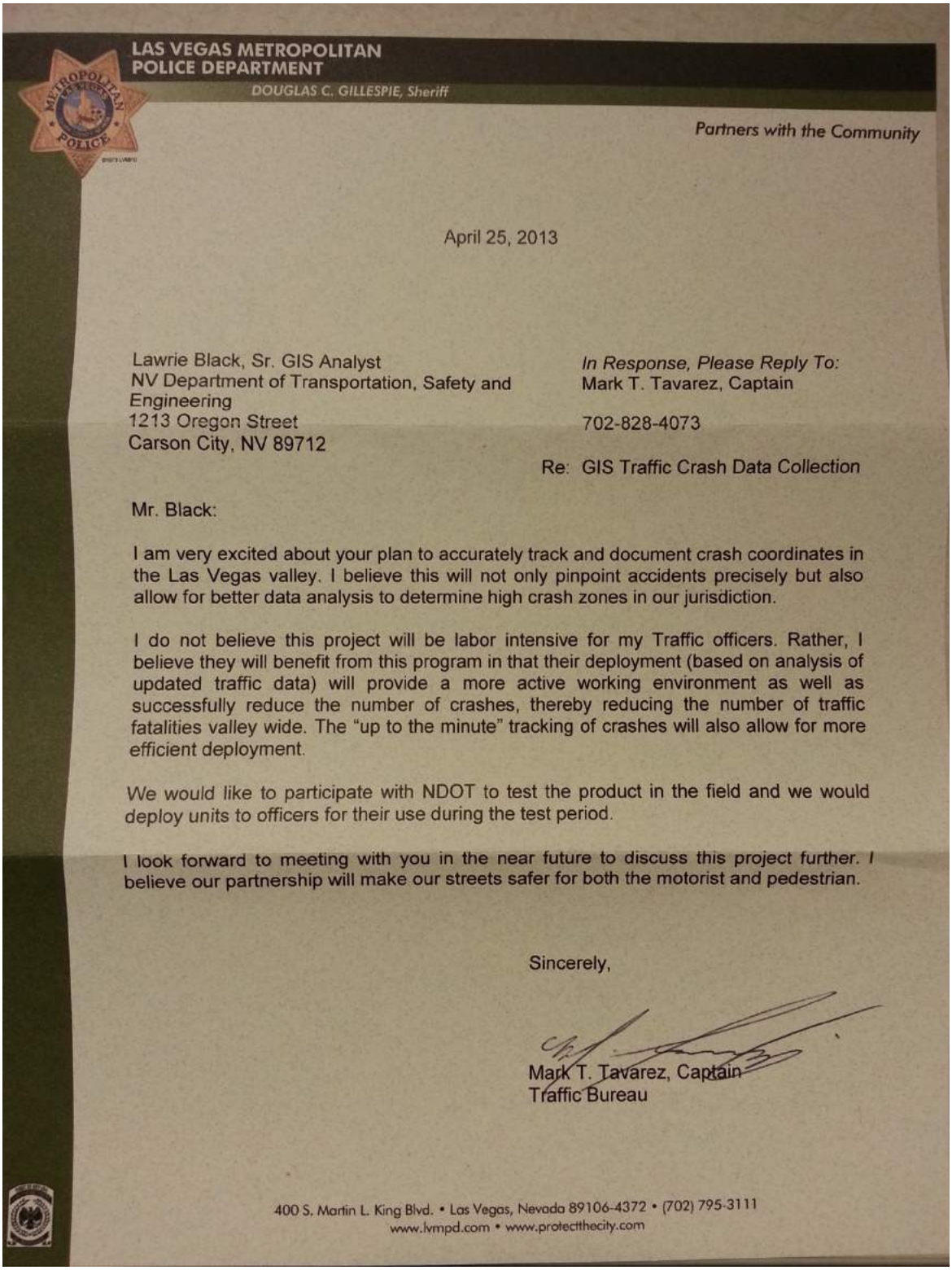
26

- Intersections will be displayed with balloons at cross roads



# APPENDIX E

## LETTER FROM METRO



LAS VEGAS METROPOLITAN
POLICE DEPARTMENT
DOUGLAS C. GILLESPIE, Sheriff

*Partners with the Community*

April 25, 2013

Lawrie Black, Sr. GIS Analyst
NV Department of Transportation, Safety and Engineering
1213 Oregon Street
Carson City, NV 89712

*In Response, Please Reply To:*
Mark T. Tavarez, Captain

702-828-4073

Re: GIS Traffic Crash Data Collection

Mr. Black:

I am very excited about your plan to accurately track and document crash coordinates in the Las Vegas valley. I believe this will not only pinpoint accidents precisely but also allow for better data analysis to determine high crash zones in our jurisdiction.

I do not believe this project will be labor intensive for my Traffic officers. Rather, I believe they will benefit from this program in that their deployment (based on analysis of updated traffic data) will provide a more active working environment as well as successfully reduce the number of crashes, thereby reducing the number of traffic fatalities valley wide. The "up to the minute" tracking of crashes will also allow for more efficient deployment.

We would like to participate with NDOT to test the product in the field and we would deploy units to officers for their use during the test period.

I look forward to meeting with you in the near future to discuss this project further. I believe our partnership will make our streets safer for both the motorist and pedestrian.

Sincerely,

Mark T. Tavarez, Captain
Traffic Bureau

400 S. Martin L. King Blvd. • Las Vegas, Nevada 89106-4372 • (702) 795-3111
www.lvmpd.com • www.protectthecity.com

## APPENDIX F

## PROJECT COSTS AND EXPENSES

The total cost of the SA project was approximately $ 336,684. At the time of developing this report, the principal investigator does not have complete information about project expenses. A few minor extra charges are still for coming. The cost listed here is the total SA Agreement project cost.

The development of the database, visualization, and testing of the database for network screening was: $249,280.00. This task was completed conducted by UNLV. The cost of the field test of the GPS-BS was: $ 87,404. This task was led by ADV Solutions with support of Design Catapult and San Francisco Circuits.

The field test involved the following costs and the corresponding subcontractors:

The development and construction of the cases for the GPS unit was conducted by Design Catapult under the supervision of ADV Solutions. Design Catapult charged $ 53,550.73. This cost stems mainly from the firm requirements and modifications set by Metro. These included: expanded size to allow for a more powerful antenna; a water resistant case; large battery life; fire proof; and controls to enable fast and reliable "officer under stressful conditions" operation). The cost of the hardware required by the GPS units was $ 13,830.23 charged by San Francisco Circuits. This cost did not include design cost. The design was conducted by ADV Solutions. This report includes the corresponding invoices and/or receipts in Appendix G at the end of this report.

ADV Solutions did not charge for the development and implementation of the dashboard, database, and software and hardware used by the GPS-BS. ADV Solutions only charged for Tasks 1 to 6 of Amendment 2 of the Interlocal Agreement. The cost of these tasks was $ 14,267.04. Dr. Paz assisted throughout the project with Tasks 1-6 and performed Tasks 7-8.

**Summary of Cost**

| Task | Lead | Cost | |
|---|---|---|---|
| **Safety Analyst** | UNLV | $ | 249,280.00 |
| **Field Test of GPS-BS** | | | |
| Cases | Design Catapult | $ | 53,550.73 |
| Hardware (design not included) | San Francisco Circuits | $ | 13,830.23 |
| Dashboard | ADV Solutions | $ | - |
| Database | ADV Solutions | $ | - |
| Hardware and Software Design | ADV Solutions | $ | - |
| Tasks 1 to 6 of the Field Test | ADV Solutions | $ | 14,267.04 |
| Administration | UNLV Overhead | $ | 2,878.00 |
| **Total** | | **$** | **333,806.00** |

# APPENDIX G

# RECEIPTS

San Francisco Circuits, Inc
1660 S Amphlett Blvd #200
San Mateo, CA 94402

# Invoice

| Date | Invoice # |
|---|---|
| 9/18/2013 | 28859 |

**Bill To**

ADV Solutions
1851 N. Green Valley Pkwy
#1124
Henderson, NV 89074

**Ship To**

ADV Solutions
1851 N. Green Valley Pkwy
#1124
Henderson, NV 89074
(Assembly House)

| SO# | PO# | Terms | Ship Date | Via | Resale# |
|---|---|---|---|---|---|
| 28859 | CC | credit card | 9/18/2013 | delivery | N/A |

| Qty | Item | Description | Price Ea... | Amount |
|---|---|---|---|---|
| 16 | PCB | New Board Rev 6L<br>Delivered to Assembly house<br>**********<br>This is a PAID Invoice.<br>Amount was already collected via<br>Visa xxxx3852 on 26-Sep-2013.<br>Thank you for your business -we appreciate it very much!<br>********** | 125.00 | 2,000.00 |

Thank you for your business,your prompt payment is appreciated. Invoices that are not paid within agreed term are subject to finance charge of 18%, please include finance charge if paid after due date.

**Total** $2,000.00



| Phone # | Fax # | E-mail |
|---|---|---|
| 650.655.7202 | 650.655.7206 | support@SFcircuits.com |



QF - INV, REV A
1.14.2012

San Francisco Circuits, Inc
1660 S Amphlett Blvd #200
San Mateo, CA 94402

# Invoice

| Date | Invoice # |
|---|---|
| 9/20/2013 | 28863 |

Bill To

ADV Solutions
1851 N. Green Valley Pkwy
#1124
Henderson, NV 89074

Ship To

ADV Solutions
1851 N. Green Valley Pkwy
#1124
Henderson, NV 89074

| SO# | PO# | Terms | Ship Date | Via | Resale# |
|---|---|---|---|---|---|
| 28863 | Check | Check | 9/20/2013 | FedExSatDel | N/A |

| Qty | Item | Description | Price Ea... | Amount |
|---|---|---|---|---|
| 16 | PCB | New Board Rev 6L | 194.67 | 3,114.72 |
| 1 | Shipping | FedEx Tracking #796738560020 | 82.51 | 82.51 |
| | | ********** | | |
| | | This is a PAID Invoice.<br>Amount was already collected via<br>Check#2743 on 23-Sep-2013.<br>Thank you for your business -we appreciate it very much!<br>********** | | |

Thank you for your business,your prompt payment is appreciated. Invoices that are not paid within agreed term are subject to finance charge of 18%, please include finance charge if paid after due date.

**Total** $3,197.23

| Phone # | Fax # | E-mail |
|---|---|---|
| 650.655.7202 | 650.655.7206 | support@SFcircuits.com |

QF - INV, REV A
1.14.2012

San Francisco Circuits, Inc
1660 S Amphlett Blvd #200
San Mateo, CA 94402

# Invoice

| Date | Invoice # |
|---|---|
| 1/22/2014 | 29364 |

Bill To

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

Ship To

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

| SO# | PO# | Terms | Ship Date | Via | Resale# |
|---|---|---|---|---|---|
| 29364 | Wire Transfer | Prepaid | 1/22/2014 | FEDEXP1 | |

| Qty | Item | Description | Price Ea... | Amount |
|---|---|---|---|---|
| 12 | PCB | 6-Layer Board<br>**********<br>This is a PAID Invoice.<br>Amount was already collected via<br>WIRE TRANSFER.<br>Thank you for your business -we appreciate it very much!<br>********** | 101.36 | 1,216.32 |

Thank you for your business,your prompt payment is appreciated. Invoices that are not paid within agreed term are subject to finance charge of 18%, please include finance charge if paid after due date.

**Total** $1,216.32



| Phone # | Fax # | E-mail |
|---|---|---|
| 650.655.7202 | 650.655.7206 | support@SFcircuits.com |

San Francisco Circuits, Inc
1660 S Amphlett Blvd #200
San Mateo, CA 94402

# Invoice

| Date | Invoice # |
|---|---|
| 8/1/2013 | 28635 |

**Bill To**

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

**Ship To**

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

| SO# | PO# | Terms | Ship Date | Via | Resale# |
|---|---|---|---|---|---|
| 28635 | CC | Prepaid | 8/1/2013 | FEDEXP1 | N/A |

| Qty | Item | Description | Price Ea... | Amount |
|---|---|---|---|---|
| 30 | PCB | Deigo 4L | 53.35 | 1,600.50 |
| 1 | Shipping | FedEx Tracking #796376947207<br>**********<br>This is a PAID Invoice.<br>Amount was already collected via<br>Visa xxxx8582 on 31-Jul-2013.<br>Thank you for your business -we appreciate it very much!<br>********** | 54.27 | 54.27 |

Thank you for your business,your prompt payment is appreciated. Invoices that are not paid within agreed term are subject to finance charge of 18%, please include finance charge if paid after due date.

**Total** $1,654.77

| Phone # | Fax # | E-mail |
|---|---|---|
| 650.655.7202 | 650.655.7206 | support@SFcircuits.com |

QF - INV, REV A
1.14.2012

San Francisco Circuits, Inc
1660 S Amphlett Blvd #200
San Mateo, CA 94402

# Invoice

| Date | Invoice # |
|---|---|
| 12/11/2013 | 29242 |

Bill To

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

Ship To

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

| SO# | PO# | Terms | Ship Date | Via | Resale# |
|---|---|---|---|---|---|
| 29242 | Prepaid | Prepaid | 12/11/2013 | | n/a |

| Qty | Item | Description | Price Ea... | Amount |
|---|---|---|---|---|
| 50 | PCB | 6 Layer<br>**********<br>This is a PAID Invoice.<br>Amount was paid via Wire Transfer on 09-DEC-2013<br>Thank you for your business -we appreciate it very much!<br>********** | 50.00 | 2,500.00 |

Thank you for your business,your prompt payment is appreciated. Invoices that are not paid within agreed term are subject to finance charge of 18%, please include finance charge if paid after due date.

**Total** $2,500.00



| Phone # | Fax # | E-mail |
|---|---|---|
| 650.655.7202 | 650.655.7206 | support@SFcircuits.com |



QF - INV, REV A
1.14.2012

San Francisco Circuits, Inc
1660 S Amphlett Blvd #200
San Mateo, CA 94402

# Invoice

| Date | Invoice # |
|---|---|
| 12/13/2013 | 29278 |

**Bill To**

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

**Ship To**

Diego Franco
1851 North Green Valley Pkwy
#1124
Henderson, NV 89074

| SO# | PO# | Terms | Ship Date | Via | Resale# |
|---|---|---|---|---|---|
| 29278 | Wire Transfer | Prepaid | 12/13/2013 | FedExSatDel | N/A |

| Qty | Item | Description | Price Ea... | Amount |
|---|---|---|---|---|
| 25 | PCB | 6 layer board | 127.16 | 3,179.00 |
| 1 | Shipping | FedEx Tracking #797402336667 | 82.91 | 82.91 |
| | | ********** | | |
| | | This is a PAID Invoice.<br>Amount was already collected via Wire Transfer on 13-DEC-13<br>Thank you for your business -we appreciate it very much!<br>********** | | |

Thank you for your business,your prompt payment is appreciated. Invoices that are not paid within agreed term are subject to finance charge of 18%, please include finance charge if paid after due date.

**Total** $3,261.91



| Phone # | Fax # | E-mail |
|---|---|---|
| 650.655.7202 | 650.655.7206 | support@SFcircuits.com |

POSTED 10/29/13

**Invoice: 8127**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: October 29, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: N/A

Term: **Due Now**

**Customer P.O.:** **Proposal/Alex Paz/Diego Franco**

Shipper: **5154 - FedEx**

| Line | Description | Hrs | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Crash Finder Housing (Previously Charged) | 27 | $0.00 | $0.00 |
| 2 | Lenmar Batteries with Foam Tape | 30 | $20.66 | $619.80 |
| 3 | 2 Set of Serial Numbers @ No Charge per Sam (SN: 10001 - SN:10050) | 100 | $0.00 | $0.00 |

Comments

| | | |
|---|---|---|
| Subtotal: | $ | 619.80 |
| Sales Tax Line : | | $0.00 |
| Shipping/Mileage/Supplies Charges: | | $134.56 |
| Total | $ | 754.36 |

Thank you for your order

RECEIVED
CK#317290000765
JAN 07 2014
PD.$754.36

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com

POSTED 10/24/13

**Invoice: 8112**

**To:**
ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: October 24, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: N/A

Term: **Due Now**

**Customer P.O.:** **Proposal/Alex Paz/Diego Franco**

Shipper: **5115 & 5127 - FedEx**
Shipped on 10/17/13 & 10/24/13

| Line | Description | Hrs | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Crash Finder Housing (Previously Charged) | 20 | $0.00 | $0.00 |
| 2 | Lenmar Batteries with Foam Tape | 20 | $20.66 | $413.20 |

Subtotal: $ 413.20

Sales Tax Line : $0.00

Shipping/Mileage/Supplies Charges: $126.33

**Total** $ 539.53

Thank you for your order

RECEIVED
CK#317290 QUICKBOOKS
JAN 07 2014
DD. $539.53

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com

POSTED 10/16/13

**Invoice: 8086**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: October 16, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: 10/01/13 Thru 10/15/13

Term: **Due Now**

**Customer P.O.: Proposal/Alex Paz/Diego Franco**

Shipper: **N/A**

| Line | Description | Hrs | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Phase 3, Prototype Development and Assistant, Software Assistant for Debugging Program<br>Bert 6 Hours, May 35.5 Hours<br>Prototype Housing and Battery and Support<br>Jason 3 Hours, Sam 4 Hours | 48.5 | $150.00 | $7,275.00 |

Comments

| | | |
|---|---|---|
| Subtotal: | $ | 7,275.00 |
| Sales Tax Line : | | $0.00 |
| Shipping/Mileage/Supplies Charges: | | $95.64 |
| Total: | $ | 7,370.64 |

Thank you for your order

RECEIVED
CK #324720034565
DEC 09 2013
PD. $7370.64

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com

POSTED 10/8/13

**Invoice: 8059**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: October 8, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: N/A

Term: **Due Now**

**Customer P.O.:** **Proposal/Alex Paz/Diego Franco**

Shipper: **5074 - FedEx**

| Line | Description | Hrs | Cost | Ext. Cost |
|---|---|---|---|---|
| 1 | Crash Finder Cases (Previously Charged) | 10 | $0.00 | $0.00 |
| 2 | Chinese Batteries with Foam Tape ( 3 @ DC) | 10 | $9.70 | $97.00 |
| 3 | Lenmar Batteries with Foam Tape<br>(3 were shipped before on 9/16/13 Shipper #5013) | 6 | $20.66 | $123.96 |

Comments:

| | |
|---|---|
| Subtotal: | $ 220.96 |
| Sales Tax Line : | $0.00 |
| Shipping/Mileage/Supplies Charges: | $77.44 |
| Total: | $ 298.40 |

Thank you for your order

CK#355 3100294 65
OCT 2013
DI$298.40

**Invoice: 8042**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: October 4, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: 09/16/13 Thru 09/30/13

Term: **Due Now**

**Customer P.O.:** **Proposal/Alex Paz/Diego Franco**

Shipper: **N/A**

| Line | Description | Hrs | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Phase 3, Prototype Fabrication, 60 Units ($132.00 Each)<br>*** Units are ready for assembly once PCBA received | | | $7,920.00 |
| 2 | Additional Set of RTV Molds | | | $1,500.00 |

Comments

| | |
|---|---|
| Subtotal: | $ 9,420.00 |
| Sales Tax Line : | $0.00 |
| Shipping/Mileage/Supplies Charges: | $68.78 |
| Total: | $ 9,488.78 |

Thank you for your order



17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com

**Invoice: 8041**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: October 4, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: 09/16/13 Thru 09/30/13

Term: **Due Now**

**Customer P.O.: Proposal/Alex Paz/Diego Franco**

Shipper: **5016 -FedEx 09/18/13**

| Line # | Description | Hrs | Cost / Hr | Ext Cost |
|---|---|---|---|---|
| 1 | Phase 3, Prototype (Belt Clip & Mounting Bracket) (Jason 12 Hrs., Sam 3 Hrs.) | 15 | $150.00 | $2,250.00 |
| 2 | 2 Complete Units (ADV Holster and Mounting Assembly) | 2 | $695.00 | $1,390.00 |

Comments:

Thank you for your order

| | |
|---|---|
| Subtotal: | $ 3,640.00 |
| Sales Tax Line : | $0.00 |
| Shipping/Mileage/Supplies Charges: | $95.64 |
| Total: | $ 3,735.64 |

RECEIVED
CF#355 3700294ES
OCT 21 2013
PO #3765.64

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com

POSTED 9/16/13

**Invoice: 7982**

Revised on 9/18/13

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: September 16, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: 09/01/13 Thru 09/15/13

Term: **Due Now**

**Customer P.O.:** **Proposal/Alex Paz/Diego Franco**

Shipper: **N/A**

| Line | Description | Qty | Rate | Ext Cost |
|---|---|---|---|---|
| 1 | Industrial Design for Belt Clip & Mounting Brake (Doug 12, Jason 18, Sam 4, and Scott 12 Hours) | 46 | $150.00 | $6,900.00 |
| 2 | Courtesy Discount per Sam | | | ($1,900.00) |

Comments

Thank you for your order

| | |
|---|---|
| Subtotal: | $ 5,000.00 |
| Sales Tax Line : | $0.00 |
| Shipping/Mileage/Supplies Charges: | $89.03 |
| Total: | $ 5,089.03 |

RECEIVED
CK#4435007705
SEP 27 2013
PD. $6,089.03

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3131 Fax: 714.556.3170 www.designcatapult.com

POSTED 9/16/13

**Invoice: 7981**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: September 16, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: 09/01/13 Thru 09/16/13

Term: **Due Now**

**Customer P.O.:** **Proposal/Alex Paz/Diego Franco**

Shipper: **5013 -FedEx**

| Line | Description | Hrs | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Phase 2, Industrial Design and Engineering, Partial (Bert 6 Hrs., Jason 10 Hrs., Sam 3 Hrs.) | 19 | $150.00 | $2,850.00 |
| 2 | 3 Units (Housing, Battery, and Connectors)) | 3 | $225.00 | $675.00 |

Comments

Thank you for your order

| | | |
|---|---|---|
| Subtotal: | $ | 3,525.00 |
| Sales Tax Line : | | $0.00 |
| Shipping/Mileage/Supplies Charges: | | $115.85 |
| Total: | $ | 3,640.85 |

RECEIVED
CK#44135407705
SEP 27 2013
DD $3,640.85
RECEIVED

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com

POSTED 9/2/13

**Invoice: 7944**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: September 3, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: 08/16/13 Thru 08/31/13

Term: **Due Now**

**Customer P.O.:** **Proposal/Alex Paz/Diego Franco**

Shipper: **N/A**

| Line | Description | Hrs | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Phase 2, Industrial Design and Engineering, Partial<br>(Bert 12 Hrs., Jason 37 Hrs., Sam 6 Hrs.) | 55 | $150.00 | $8,250.00 |
| 2 | Material: | | | |
| | SLA | 2 | $760.00 | $1,520.00 |
| | RTV Mold | 1 | $1,500.00 | $1,500.00 |
| | Parts | 2 | $225.00 | $450.00 |

Custom Note

Thank you for your order

| | |
|---|---|
| Subtotal: | $ 11,720.00 |
| Sales Tax Line : | $0.00 |
| Shipping/Mileage/Supplies Charges: | $138.75 |
| Total: | $ 11,858.75 |

RECEIVED
CK#359870035365
SEP 10 2013
DD: $11,858.75

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com

POSTED 8/19/13

**Invoice: 7903**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: August 16, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: Thru 08/15/2013

Term: **Due Now**

**Customer P.O.: Proposal/Alex Paz/Diego Franco**

Shipper: **N/A**

| Line | Description | Hrs | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Phase 2, Industrial Design and Engineering, Partial (Bert 11 Hrs., Jason 23 Hrs., Sam 4 Hrs.) | 38 | $150.00 | $5,700.00 |

Comments

Thank you for your order

| | |
|---|---|
| Subtotal: | $ 5,700.00 |
| Sales Tax Line : | $0.00 |
| Packaging/Mileage/Supplies Charges: | $73.75 |
| Total: | $ 5,773.75 |

RECEIVED
CK# 3793400238E5
AUG 26 2013
PD - $5773.75

*17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatapult.com*

**Invoice: 7886**

**To:**

ADV Solutions LLC
Attention: Account Payable
1851 N Green Valley Pkwy.,#1124
Henderson NV 89074

Date: August 8, 2013

Project #: **2771-01**

Project Name: **Plastic Housing**

Period: N/A

Term: **N/A**

**Customer P.O.:** **Proposal**

Shipper: **N/A**

| Line | Description | Qty | Cost | Ext Cost |
|---|---|---|---|---|
| 1 | Phase 1, Discovery Phase, Concept Sketches | | | $5,001.00 |

Comments

Thank you for your order

| | |
|---|---|
| Subtotal: | $ 5,001.00 |
| Sales Tax Line : | $0.00 |
| Packaging/Mileage/Supplies Charges: | $0.00 |
| Total: | $ 5,001.00 |

RECEIVED
CK #3000300223ES
AUG 08 2013
$5000.

17361 Newhope St, Fountain Valley, CA 92708 Tel: 714.556.3171 Fax: 714.556.3170 www.designcatepult.com