SD Department of Transportation
Office of Research

Identification of Abnormal Accident Patterns at Intersections

SD98-12
Final Report

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16. Abstract

This report presents the findings and recommendations based on the Identification of Abnormal Accident Patterns at Intersections. This project used a statistically valid sampling method to determine whether a specific intersection has an abnormally high number of accidents.

The department researcher located intersections throughout the state and categorized them by geometric type, stop control type, and traffic volume. A sample of each intersection category was taken and coordinates for each intersection were found. Accident reports were obtained for the sampled intersections, and the data was entered into a spreadsheet for analysis. The mean and 90th and 95th percentile were calculated, and the expected value analysis tables were created for each category of intersections.

A total of fourteen (14) expected value analysis tables were produced for the various intersection types and compared to those received from other states. Recommendations were suggested for identifying abnormal accident patterns based on information that was received from other state Department of Transportation's, local agencies, and the South Dakota Expected Value Analysis Tables.

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Chapter 1

Executive Summary

This report presents the findings and recommendations on the Identification of Abnormal Accident Patterns at Intersections. South Dakota traffic engineers needed a statistically valid sampling procedure to determine whether a specific intersection has an abnormally high number of accidents. Since specific traffic volumes are not available for all intersections, accident rates could not be easily determined at all locations. Therefore, a statistical method was developed to determine the locations of frequent or severe accidents.

The South Dakota Department of Transportation (SDDOT) requested the development of their own expected value analysis tables based on their accident records. Sample expected value analysis tables from Virginia, Michigan, Texas, and the City of Atlanta, Georgia, were used as guidelines in developing the tables. In the future, the tables will be used by the SDDOT and others to determine if an intersection has a higher than normal number of a particular type of accident. The use of these tables could improve the identification of serious safety problems.

Research Objectives

The technical panel overseeing Research Project SD 98-12 "Identification of Abnormal Accident Patterns at Intersections", defined the following objectives for the study:

1) **To develop an efficient means of evaluating intersections which may require safety improvements.**

2) **Develop expected value analysis tables based on South Dakota information.**

Research

The project began by reviewing literature that had been put together regarding the identification of abnormal accident patterns. Once the material was read, other states' departments of transportation and local agencies were contacted in hopes that they might have information on the creation of the expected value analysis tables. Following this, the job of locating all of the intersections throughout South Dakota began. The thirteen Class 1 city engineers were contacted to obtain a list of their signalized intersections. The list containing the locations of the signalized intersections in each city was received, and the intersections were broken down according to geometric types, stop control types, and traffic volumes.

Once categorized according to type, a sampling method was devised and a sample of each intersection type was taken. Coordinates for the selected intersections were obtained and accident reports were run. The information was inserted into a spreadsheet, and the 90th and 95th percentile and mean were calculated. An expected value analysis table was made for each type of intersection category requested by the project's Technical Panel. At the completion of the project, South Dakota's expected value analysis tables were compared to tables received from Virginia and the city of Atlanta, Georgia, to determine if the end results were similar.

Findings and Conclusions

The expected value analysis table is a scientifically based statistical method for determining if an intersection has a higher than normal number of a particular type of accident. Fourteen (14) tables were created for the types of intersections requested by the project's Technical Panel. A sampling method was devised to find information on thirty (30) intersections per type or fifteen (15) intersections per type depending on the total number of intersections in each category. The rural, four lane, one way stop, three leg

intersections; three leg, signalized intersections in Rapid City; four leg, signalized intersections with a volume below 15,000 in Rapid City; and rural, four way stop, four leg intersections did not require a sampling method since the total number of intersections was nine (9), twenty-two (22), seven (7), and seven (7) respectively.

One example of an intersection that did need a sample taken was urban, four leg, signalized intersections with a volume below 15,000 for the state of South Dakota. There were a total of 137 intersections for this category; and a sample of thirty (30) intersections was taken. The mean and 90th and 95th percentile were calculated and five (5) more intersections were then added and the calculations were computed again. The difference in the numbers was very insignificant. This shows that the sampling technique used to create the expected value analysis table appears to be a valid and reliable method.

The expected value analysis tables will be very useful in determining if an intersection has an abnormally high number of severe or fatal accidents. The tables will be used in assisting the South Dakota Department of Transportation (SDDOT) in identifying serious safety problems at intersections.

Implementation Recommendations

Based on the findings of this study, the following recommendations are presented to the Research Review Board for their consideration:

1) **The South Dakota Department of Transportation (SDDOT) should use the expected value analysis tables created for South Dakota rather than using the tables created for other states.**

The tables created for South Dakota reflect our state more accurately than using a table created for another state. Other states may have more traffic and different driving conditions, which play a role in the number of accidents that occur. Therefore, it is

difficult to compare South Dakota's accident patterns with others when you consider all of the components.

2) The Office of Local Government Assistance can use the tables to evaluate possible hazardous intersections.

The tables will provide the Office of Local Government Assistance with a means in determining whether a particular intersection has a possible hazard. The Office of Local Government Assistance will use the expected value analysis tables as a basis for identifying abnormal accident patterns at certain intersections. If an intersection seems to have a higher than normal number of a particular type of accident, they can look at the table that coincides with the intersection type and decide if there is a problem or if something needs to be done.

3) A copy of the expected value analysis tables should be shared with offices of the South Dakota Department of Transportation (SDDOT), local agencies, and other states' Departments of Transportation.

The expected value analysis tables are a useful tool in identifying hazardous intersections. The tables are not only helpful to the Department of Transportation, but also to other agencies. A copy of the expected value analysis tables should be made accessible to offices that request a copy.

4) The Office of Local Government Assistance should update the expected value analysis tables every three (3) years.

In the future, updating of the expected value analysis tables will be necessary. The Office of Local Government Assistance should update the tables every three (3) years. The tables will consist of new accident records so the numbers stay up to date with the changing times. The new tables would then be compared with the old tables in determining if the necessary actions are being taken to make the roads safer.

Expected Value Analysis Tables

A total of fourteen (14) expected value analysis tables were created. The following is an example of one of the tables that was made. More tables may be found in Chapter 7.

EXPECTED VALUE ANALYSIS TABLE FOR THE STATE OF SOUTH DAKOTA
TYPE: URBAN, 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: 15,000 AND OVER

COLLISION TYPE	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
HEAD ON	0.00	0.00	0.00
ANGLE	1.61	1.96	2.03
REAR END	0.81	1.27	1.37
SS-OVTKIN	0.06	0.10	0.10
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.10	0.14	0.15
PARKED VEHICLE	0.01	0.02	0.02
PEDESTRIAN	0.05	0.09	0.10
ANIMAL	0.00	0.00	0.00
OTHER	0.27	0.36	0.37
LEFT TURN	2.18	2.80	2.92
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	1.80	2.20	2.28
PROP DMG ONLY	3.29	4.04	4.19
LIGHT CONDITION			
LIGHT	3.52	4.33	4.49
DAWN	0.08	0.13	0.15
DUSK	0.19	0.26	0.28
DARK	1.30	1.62	1.69
SURFACE CONDITION			
DRY	3.25	4.02	4.17
WET	1.03	1.30	1.35
ICE-FROST	0.33	0.43	0.45
SNOW-SLUSH	0.46	0.56	0.58
OTHER	0.02	0.03	0.04
SEASON OF YEAR			
DEC, JAN, FEB	1.45	1.75	1.81
MAR, APR, MAY	1.15	1.48	1.55
JUN, JUL, AUG	1.31	1.65	1.71
SEP, OCT, NOV	1.20	1.49	1.55
DAY OF WEEK			
SUNDAY	0.50	0.61	0.63
MONDAY	0.69	0.85	0.89
TUESDAY	0.67	0.87	0.91
WEDNESDAY	0.78	1.02	1.07
THURSDAY	0.79	1.01	1.05
FRIDAY	0.97	1.18	1.22
SATURDAY	0.69	0.90	0.95
HOUR OF DAY			
00:00-06:00	0.29	0.45	0.48
06:01-09:00	0.53	0.73	0.77
09:01-11:00	0.44	0.57	0.60
11:01-13:00	0.70	0.84	0.87
13:01-15:00	0.67	0.88	0.93
15:01-18:00	1.39	1.74	1.81
18:01-24:00	1.15	1.43	1.49
ALCOHOL/ DRUGS*			
ALCOHOL	0.35	0.47	0.49
DRUGS	0.02	0.04	0.04
ALCH-DRUGS	0.01	0.02	0.02
OTHER-NONE	10.22	12.56	13.03

NOTE: Database contains 224 locations. However, 35 locations were sampled.
          Accident data from 01-01-94 to 12-31-98.
          Expected values are based on 5-year period.
          * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

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Chapter 2

Problem Description

South Dakota traffic engineers needed a statistically valid sampling procedure to determine whether a specific intersection has an abnormally high number of accidents. Specific traffic volumes are not available for all intersections; therefore, accident rates could not be easily determined at all locations. South Dakota traffic engineers need to compare accidents in a certain range of traffic volumes, stop control types, and intersection geometries to determine if an abnormal number of accidents are occurring.

South Dakota is a rural state with a large portion of its rural highways receiving average daily traffic volumes of less than 3,000 vehicles per day. There are thirteen Class 1 cities with only two of these having a population ranging from 55,000 to 110,000. Presently South Dakota calculates accident rates by using known accident numbers and traffic volumes. Since site specific traffic volumes are not always immediately available for all intersections, accident rates can not be easily determined. The proposed expected value analysis table would be able to determine if a given intersection has an abnormal number of a particular type of accident.

South Dakota needed to create the expected value analysis tables. This method uses a statistical test in determining if a certain accident type occurs more or is more severe at a studied location. South Dakota is not the first state to use the expected value analysis method. The South Dakota Department of Transportation (SDDOT) used the techniques available from the other states, such as Virginia, Michigan, Texas, and the city of Atlanta, Georgia, to create their own guidelines to form the expected value analysis tables. Serious safety problems, especially hazardous intersections, can be identified by putting this method into effect.

Chapter 3

Objectives

The technical panel for SD98-12, the Identification of Abnormal Accident Patterns at Intersections, defined two objectives:

Objective 1 *To develop an efficient means of evaluating intersections which may require safety improvements.*

Objective 2 *Develop expected value analysis tables based on South Dakota information.*

The first objective was met by using collected data to create expected value analysis tables. The tables will help determine if an intersection has an abnormally high number of accidents occurring. By using the table to identify the types of accidents, safety measures can be taken at these specific intersections to lower the number of accidents.

Secondly, an expected value analysis table needed to be developed using South Dakota's information. The objective was accomplished by collecting data on randomly selected urban and rural intersections in South Dakota. Literature from Virginia, Michigan, Texas, and the city of Atlanta, Georgia, was used as an example for South Dakota to follow in creating expected value analysis tables.

Chapter 4

Task Description

The technical panel for SD98-12 defined the following tasks:

Task 1   *Review and summarize literature and contact a representative number of state DOT's and local agencies to identify what data, procedures, and sampling methods are being used to develop expected value analysis tables.*

The first task for the researcher to complete was to read all of the material that pertains to the project that was given to the SDDOT Office of Research from other state DOT's and local agencies. Various states were called in hopes that they could send information on how they performed the tasks of creating expected value analysis tables. Local agencies that use this procedure were also contacted. With this obtained information, the project of developing the expected value analysis table began.

Task 2   *Meet with the project's Technical Panel to review the project scope and work plan.*

The researcher met with the Technical Panel to review the agenda of the project and the proposed work plan. The meeting was used to give the panel a chance to ask questions and to provide any suggestions on the topic. All of the changes approved by the panel were put in the final work plan.

Task 3   *Obtain accident, traffic volume and other data from the SDDOT, local units of government, and sampling methods, which are necessary to create the expected value analysis tables for the most current five year period.*

There were a total of fourteen (14) different categories of intersections that the project's Technical Panel requested to be developed first. The first five (5) tables created were: urban, three leg, signalized intersections; urban, four leg, signalized intersections with a volume below 15,000; urban, four leg, signalized intersections with a volume above 15,000; rural, divided, four lane to two lane, two way stop intersections; and rural, four lane, one way stop, three leg intersections.

Nine (9) more expected value analysis tables were created. They were three leg, signalized intersections in Rapid City; four leg, signalized intersections with a volume below 15,000 in Rapid City; four leg, signalized intersections with a volume above 15,000 in Rapid City; three leg, signalized intersections in Sioux Falls; four leg, signalized intersections with a volume below 15,000 in Sioux Falls; four leg, signalized intersections with a volume above 15,000 in Sioux Falls; rural, one way stop, three leg intersections; rural, two way stop, four leg intersections; and rural, four way stop, four leg intersections.

Due to the large number of some categories of intersections, a sampling method was devised. Martin R. Parker, Jr. from Martin R. Parker and Associates, Inc. suggested that a sample of thirty (30) intersections per type or fifteen (15) intersections per type depending on the total number of intersections in each category be taken. The mean and 90th and 95th percentile were calculated and five (5) more intersections were then added and the calculations were computed again. The difference in the numbers was very insignificant. This shows that the sampling technique used to create the expected value analysis table appears to be a valid and reliable method.

The rural, four lane, one way stop, three leg intersections; three leg, signalized intersections in Rapid City; four leg, signalized intersections with a volume below 15,000 in Rapid City; and rural, four way stop, four leg intersections did not require a sampling method since the total number of intersections was nine (9), twenty-two (22), seven (7), and seven (7) respectively. One instance where a sampling method was applied was with the category regarding urban, four leg, signalized intersections with a volume below 15,000 for the state of South Dakota. This category had a total of 137 intersections and a sample of thirty (30) was taken, and then five (5) more added after the first calculations. A list of accident reports from the previous five years was obtained from the SDDOT Office of Accident Records for the sampled locations to use in the analysis.

The researcher worked with the Offices of Research, Local Government Assistance, Road Design, and Data Inventory to create the sampling methods to apply. Listed below are the steps that were decided upon.

Determines Random Sample

Step 1 The intersections need to be listed in Microsoft Excel according to whether they were three leg, four leg above 15,000, etc.

Step 2 Once listed according to type, a random sample must be made. Each intersection is numbered. Then a sample is selected by the following steps:

1) Go to Tools

2) Select Data Analysis

3) Choose sampling

4) Select random

5) Fill in the input range, number of samples, and output range.

Step 3 When the samples are chosen you want to list them in order by their numbers. To do this go to:

1) Data

2) Sort

3) Ascending

This gives you the list of intersections to be used as the random sample.

Step 4   Copy the intersections that were picked into a new spreadsheet. This will be your random sample.

Proceed onto finding the coordinates for the selected intersections. This was accomplished by the use of Microsoft Access. Listed below are the directions that need to be taken to find an intersection's coordinates.

Locates Coordinates

Step 1   Open the database of the city where the intersection is located

Step 2   Choose forms

Step 3   Select read ordered list

Step 4   Strike open

Step 5   To find the intersections go to:

    1) Edit

    2) Find or control F

    3) Type in the street name that you want

    4) Do a search all

    5) Match any part of field

    6) Take off the arrow on the search only current field

    7) Hit the find first button

An intersection will come up. If this is the intersection you were looking for write down the coordinates, otherwise keep hitting the find next button until it comes up. After determining the coordinates, go to the Office of Accident Records and have accident reports generated for the intersections. The information was then ready to create the expected value analysis tables for the state of South Dakota.

Task 4   *Prepare the expected value analysis tables for each of the accident and location types approved by the Technical Panel.*

Once the intersections were broken down according to type, the process of setting up the expected value analysis tables began. The tables had eight (8) different divisions, which

consisted of collision type, severity class, light conditions, surface conditions, season of the year, day of the week, hour of the day, and alcohol-drug involvement. Collision type can be further disassociated into head on, angle, rear end, sideswipe overtaking, sideswipe opposite direction, overtaking road, ran off road, fixed object, parked vehicle, pedestrian, animal, left turn, and other collisions. Another category, severity class, is subcategorized into fatal, injury, and property damage. There is no further breakdown of injury severity. The total number of cars that had injuries was used.

The third and fourth categories are light and surface conditions. Light condition can be branched off to light, dawn, dusk, and dark. Surface conditions can be separated into dry, wet, ice-frost, snow-slush, and other.

Another group of categories was months of the year, day of the week, and time of the day. Months of the year was put into groups of three, which correlate to the seasons. Winter: December, January, and February; Spring: March, April, and May; Summer: June, July, and August; and Fall: September, October, and November are the four groups. Each day of the week is a separate category and time of the day is divided into seven groups. The groups consist of 00:00-06:00, 06:01-09:00, 09:01-11:00, 11:01-13:00, 13:01-15:00, 15:01-18:00, and 18:01-24:00.

The final category added was Alcohol-Drugs. This category is subdivided into alcohol, drugs, alcohol-drugs, and other-none. In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

The accident data for the sampled intersections uses the following formula to create the information needed for the expected value analysis tables. This formula was acquired from the Highway Safety Engineering Studies Procedural Guide written by Martin R. Parker, Jr.

Mean and Standard Deviation Formula

$$\overline{X} = \frac{\sum fx}{n}$$

and

$$S = \frac{\sqrt{\sum f(x - \overline{x})^2}}{n - 1}$$

$\overline{x}$ = mean accident frequency for the specific characteristic

f = number of sites with a given frequency for the specific accident characteristic

x = number of accidents for the specific characteristic for each site

n = total number of sites included in the analysis

s = standard deviation of the specific accident characteristic

Abnormal Upper Limit Formula

$$UL = \overline{x} + Ks$$

UL = Abnormal upper limit of a specific accident characteristic

K = The probability, $1 - P$, of the specific accident characteristic being exceeded by chance. Typical values for K are 1.96 for $P = 0.05$ (95th percentile) and 1.645 for $P = 0.10$ (90th percentile).

Starts New Data in Systat 8.0

Step 1   Begin by going to:

         1)   File

         2)   New

         3)   Data

Step 2   Copy the intersection information for one category from Excel

Step 3   Right click on the title

Step 4   Go to Variable Property and put in a new name

Step 5   Proceed to the second column and do the same process, but make a different name for it

Step 6   Once this is completed go to:

         1)   Data

         2)   Transform

         3)   Let the second row equal the first row divided by five

This gives you the information for one year. Finally, you calculate the mean and 90th and 95th percentile. In order to do this you must follow the instructions below.

Calculates 90th and 95th Percentile and Mean

Step 1   Proceed to:

         1)   Statistics

         2)   Descriptive Statistics

         3)   Basic Statistics

Step 2   Highlight your one-year information name and add it to the list

Step 3   Under options choose mean and the Cl of mean 95

Step 4   Strike OK

Step 5   Repeat it again with mean and Cl of mean 90

The 90th and 95th percentile and mean were formulated and the information was placed into the expected value analysis tables according to the categories. This procedure can be used to create new expected value analysis tables in the future.

Task 5   *Compare the expected value analysis tables developed for South Dakota to a representative sample of similar tables developed for other states and determine the applicability of using this method on intersections in South Dakota.*

The completed expected value analysis tables for South Dakota were compared to tables received from Virginia and the city of Atlanta, Georgia. When compared, the data for South Dakota was either close to their data or less than their data. An instance where the numbers were relatively close was when South Dakota's urban, three leg, signalized intersection table was compared to Virginia's three leg, signalized intersection with a volume below 10,000. The mean number of head on accidents per year for South Dakota was 0.01 while the mean for Virginia was 0.03.

An example when South Dakota's numbers were less than Virginia's was with an angle collision. Virginia had a mean of 1.41 while South Dakota had a mean of 0.41. The Technical Panel overseeing the project came to the conclusion that the expected value analysis tables made for South Dakota were reliable and would be used.

Task 6   *Prepare a final report and executive summary of the literature review, findings and conclusions, including expected value analysis tables for the state of South Dakota.*

The researcher prepared a final report and executive summary of the literature review, findings and conclusions. The expected value analysis tables were also included in the final report.

Task 7 *Make an executive presentation to the Research Review Board at the conclusion of the project.*

At the conclusion of the research, the researcher made an executive presentation to the Research Review Board on the study concerning the Identification of Abnormal Accident Patterns at Intersections.

Chapter 5

Findings and Conclusions

The expected value analysis table is a scientifically based statistical method for determining if an intersection has a higher than normal number of a particular type of accident. Fourteen (14) tables were created for the types of intersections requested by the project's Technical Panel.

Finding 1   *The technique of creating the expected value analysis tables was a valid and reliable method.*

The statistical sampling method for creating the expected value analysis table was valid and reliable for several reasons. One of the reasons was the result of sampling the intersections. The sampling method that was devised found information for thirty (30) intersections per type or fifteen (15) intersections per type depending on the total number of intersections in each category.

A sampling method was not used on the rural, four lane, one way stop, three leg intersections; three leg, signalized intersections in Rapid City; four leg, signalized intersections with a volume below 15,000 in Rapid City; and rural, four way stop, four leg intersections due to the total number of the intersections only being nine (9), twenty-two (22), seven (7), and seven (7) respectively.

There were a total of 137 intersections for the category regarding urban, four leg, signalized intersections with a volume below 15,000 for the state of South Dakota. A sample of thirty (30) intersections was taken and the mean and 90th and 95th percentile were calculated. Another five (5) intersections were added and the mean and 90th and 95th percentile were recalculated. The difference in results was insignificant which shows that the technique of creating the expected value analysis tables is a valid and reliable method.

A second reason as to why it is a valid technique is the result of comparing the tables made for South Dakota with those made for other states. When comparing tables that were made for the same type of intersections, the numbers were closely related. There is a slight difference in some of the numbers, which is to be expected due to the fact that different factors, such as environmental conditions and driver habits, play a part in accidents.

Finding 2 *When comparing South Dakota's accident statistics with those for other states, South Dakota's are typically smaller than other states.*

After the completion of the expected value analysis tables for South Dakota, they were compared to other states' tables. When looking at the numbers for the different intersections, South Dakota's were usually lower than those for other states. This draws you to the conclusion that South Dakota has a lower chance of accidents occurring than other states. This may be due to various factors such as the traffic volume, the difference in driving tactics or the environmental conditions. South Dakota's values are lower than those of other states such as Virginia.

Finding 3 *The expected value analysis tables provide information to assist with the identification of hazardous intersections.*

Since the method of creating the expected value analysis tables is reliable, the information that the tables provide will be very useful in assisting the South Dakota Department of Transportation (SDDOT) with the identification of abnormal accident patterns at certain intersections. If a certain type of intersection seems to have a higher number of a particular type of accident, then the coinciding table may be looked at to determine if this is in fact true. If there are more accidents than in the table, safety precautions can be taken to help reduce the number of accidents.

Chapter 6

Implementation Recommendations

Based on the findings of this study, the following recommendations are presented to the Research Review Board for their consideration:

Recommendation 1 *The South Dakota Department of Transportation (SDDOT) should use the expected value analysis tables created for South Dakota rather than using the tables created for other states.*

The tables created for South Dakota reflect our state more accurately than using a table created for another state. Other states may have more traffic and different driving conditions, which play a role in the number of accidents that occur. Therefore, it is difficult to compare South Dakota's accident patterns with others when you consider all of the components.

Recommendation 2 *The Office of Local Government Assistance can use the tables to evaluate possible hazardous intersections.*

The tables will provide the Office of Local Government Assistance with a means in determining whether a particular intersection has a possible hazard. The Office of Local Government Assistance will use the expected value analysis tables as a basis for identifying abnormal accident patterns at certain intersections. If an intersection seems to have a higher than normal number of a particular type of accident, they can look at the table that coincides with the intersection type and decide if there is a problem or if something needs to be done.

Recommendation 3   *A copy of the expected value analysis tables should be
shared with offices of the South Dakota Department of
Transportation (SDDOT), local agencies, and other states'
Departments of Transportation.*

The expected value analysis tables are a useful tool in identifying hazardous
intersections. The tables are not only helpful to the Department of Transportation, but
also to other agencies. A copy of the expected value analysis tables should be accessible
to offices that request a copy.

Recommendation 4   **The Office of Local Government Assistance should update
the expected value analysis tables every three (3) years.**

In the future, updating of the expected value analysis tables will be necessary. The
Office of Local Government Assistance should update the tables every three (3) years.
The tables will consist of new accident records so the numbers stay up to date with the
changing times. The new tables would then be compared with the old tables in
determining if the necessary actions are being taken to make the roads safer.

Chapter 7

Expected Value Analysis Tables

A total of fourteen (14) expected value analysis tables were developed to assist in the identification of intersections with abnormal accident patterns. The following are the final tables that were created. The sampled intersections that were used in the calculating of the mean and 90th and 95th percentile are located in Appendix B.

Table 1

	Mean Accidents	Abnormally High Accidents/ Year 90th	95th
COLLISION TYPE	Per Year	Percentile	Percentile
HEAD ON	0.01	0.02	0.02
ANGLE	0.41	0.56	0.59
REAR END	0.48	0.68	0.72
SS-OVTKIN	0.06	0.09	0.10
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.01	0.02	0.02
RAN OFF RD	0.01	0.02	0.02
FIXED OBJECT	0.07	0.12	0.13
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.01	0.03	0.03
ANIMAL	0.01	0.02	0.02
OTHER	0.21	0.27	0.29
LEFT TURN	1.11	1.47	1.54
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	0.78	0.97	1.01
PROP DMG ONLY	1.60	2.01	2.09
LIGHT CONDITION			
LIGHT	1.81	2.23	2.32
DAWN	0.04	0.07	0.08
DUSK	0.03	0.06	0.06
DARK	0.49	0.64	0.67
SURFACE CONDITION			
DRY	1.42	1.78	1.85
WET	0.49	0.64	0.67
ICE-FROST	0.21	0.30	0.31
SNOW-SLUSH	0.22	0.29	0.31
OTHER	0.03	0.06	0.06
SEASON OF YEAR			
DEC, JAN, FEB	0.70	0.89	0.93
MAR, APR, MAY	0.53	0.66	0.68
JUN, JUL, AUG	0.57	0.74	0.77
SEP, OCT, NOV	0.58	0.74	0.77
DAY OF WEEK			
SUNDAY	0.21	0.30	0.32
MONDAY	0.38	0.49	0.51
TUESDAY	0.38	0.47	0.49
WEDNESDAY	0.36	0.48	0.50
THURSDAY	0.42	0.54	0.56
FRIDAY	0.42	0.56	0.59
SATURDAY	0.22	0.30	0.31
HOUR OF DAY			
00:00-06:00	0.07	0.10	0.11
06:01-09:00	0.28	0.37	0.39
09:01-11:00	0.23	0.31	0.33
11:01-13:00	0.35	0.46	0.48
13:01-15:00	0.34	0.44	0.46
15:01-18:00	0.61	0.77	0.81
18:01-24:00	0.50	0.67	0.70
ALCOHOL/ DRUGS*			
ALCOHOL	0.14	0.20	0.21
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	4.61	5.71	5.93

NOTE: Database contains 69 locations. However, 35 locations were sampled.
           Accident data from 01-01-94 to 12-31-98.
           Expected values are based on 5-year period.
          * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 2

EXPECTED VALUE ANALYSIS TABLE FOR THE STATE OF SOUTH DAKOTA
TYPE: URBAN, 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: LESS THAN 15,000

	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
COLLISION TYPE			
HEAD ON	0.01	0.02	0.02
ANGLE	0.88	1.12	1.17
REAR END	0.15	0.21	0.22
SS-OVTKIN	0.01	0.03	0.03
SS-OPSDIR	0.01	0.03	0.03
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.05	0.08	0.09
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.03	0.05	0.05
ANIMAL	0.00	0.00	0.00
OTHER	0.11	0.17	0.18
LEFT TURN	0.49	0.62	0.64
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	0.59	0.74	0.77
PROP DMG ONLY	1.15	1.37	1.42
LIGHT CONDITION			
LIGHT	1.31	1.59	1.65
DAWN	0.02	0.03	0.04
DUSK	0.07	0.10	0.11
DARK	0.34	0.44	0.45
SURFACE CONDITION			
DRY	1.13	1.37	1.42
WET	0.29	0.37	0.38
ICE-FROST	0.14	0.21	0.22
SNOW-SLUSH	0.18	0.24	0.25
OTHER	0.00	0.00	0.00
SEASON OF YEAR			
DEC, JAN, FEB	0.46	0.57	0.60
MAR, APR, MAY	0.37	0.45	0.47
JUN, JUL, AUG	0.41	0.53	0.55
SEP, OCT, NOV	0.50	0.61	0.64
DAY OF WEEK			
SUNDAY	0.11	0.15	0.16
MONDAY	0.29	0.36	0.38
TUESDAY	0.28	0.36	0.38
WEDNESDAY	0.28	0.36	0.38
THURSDAY	0.30	0.38	0.40
FRIDAY	0.29	0.37	0.39
SATURDAY	0.20	0.28	0.30
HOUR OF DAY			
00:00-06:00	0.08	0.13	0.14
06:01-09:00	0.17	0.23	0.25
09:01-11:00	0.18	0.24	0.25
11:01-13:00	0.27	0.38	0.40
13:01-15:00	0.21	0.28	0.29
15:01-18:00	0.47	0.61	0.63
18:01-24:00	0.36	0.46	0.48
ALCOHOL/ DRUGS*			
ALCOHOL	0.13	0.20	0.21
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	3.38	4.01	4.14

NOTE: Database contains 137 locations. However , 35 locations were sampled.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
 * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 3

	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
COLLISION TYPE			
HEAD ON	0.00	0.00	0.00
ANGLE	1.61	1.96	2.03
REAR END	0.81	1.27	1.37
SS-OVTKIN	0.06	0.10	0.10
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.10	0.14	0.15
PARKED VEHICLE	0.01	0.02	0.02
PEDESTRIAN	0.05	0.09	0.10
ANIMAL	0.00	0.00	0.00
OTHER	0.27	0.36	0.37
LEFT TURN	2.18	2.80	2.92
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	1.80	2.20	2.28
PROP DMG ONLY	3.29	4.04	4.19
LIGHT CONDITION			
LIGHT	3.52	4.33	4.49
DAWN	0.08	0.13	0.15
DUSK	0.19	0.26	0.28
DARK	1.30	1.62	1.69
SURFACE CONDITION			
DRY	3.25	4.02	4.17
WET	1.03	1.30	1.35
ICE-FROST	0.33	0.43	0.45
SNOW-SLUSH	0.46	0.56	0.58
OTHER	0.02	0.03	0.04
SEASON OF YEAR			
DEC, JAN, FEB	1.45	1.75	1.81
MAR, APR, MAY	1.15	1.48	1.55
JUN, JUL, AUG	1.31	1.65	1.71
SEP, OCT, NOV	1.20	1.49	1.55
DAY OF WEEK			
SUNDAY	0.50	0.61	0.63
MONDAY	0.69	0.85	0.89
TUESDAY	0.67	0.87	0.91
WEDNESDAY	0.78	1.02	1.07
THURSDAY	0.79	1.01	1.05
FRIDAY	0.97	1.18	1.22
SATURDAY	0.69	0.90	0.95
HOUR OF DAY			
00:00-06:00	0.29	0.45	0.48
06:01-09:00	0.53	0.73	0.77
09:01-11:00	0.44	0.57	0.60
11:01-13:00	0.70	0.84	0.87
13:01-15:00	0.67	0.88	0.93
15:01-18:00	1.39	1.74	1.81
18:01-24:00	1.15	1.43	1.49
ALCOHOL/ DRUGS*			
ALCOHOL	0.35	0.47	0.49
DRUGS	0.02	0.04	0.04
ALCH-DRUGS	0.01	0.02	0.02
OTHER-NONE	10.22	12.56	13.03

NOTE: Database contains 224 locations. However, 35 locations were sampled.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
* In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 4

EXPECTED VALUE ANALYSIS TABLE FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, DIVIDED, 4 LANE TO 2 LANE, TWO WAY STOP
VOLUMES NOT A CONSIDERATION

COLLISION TYPE	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
HEAD ON	0.00	0.00	0.00
ANGLE	0.02	0.06	0.06
REAR END	0.02	0.04	0.05
SS-OVTKIN	0.00	0.00	0.00
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.02	0.04	0.05
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.00	0.00	0.00
ANIMAL	0.09	0.14	0.15
OTHER	0.03	0.06	0.06
LEFT TURN	0.00	0.00	0.00
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	0.02	0.06	0.06
PROP DMG ONLY	0.15	0.23	0.25
LIGHT CONDITION			
LIGHT	0.06	0.12	0.14
DAWN	0.01	0.03	0.03
DUSK	0.01	0.03	0.03
DARK	0.10	0.16	0.18
SURFACE CONDITION			
DRY	0.14	0.22	0.24
WET	0.03	0.07	0.08
ICE-FROST	0.00	0.00	0.00
SNOW-SLUSH	0.01	0.03	0.03
OTHER	0.00	0.00	0.00
SEASON OF YEAR			
DEC, JAN, FEB	0.01	0.03	0.03
MAR, APR, MAY	0.04	0.08	0.09
JUN, JUL, AUG	0.06	0.12	0.14
SEP, OCT, NOV	0.07	0.11	0.12
DAY OF WEEK			
SUNDAY	0.05	0.10	0.11
MONDAY	0.01	0.03	0.03
TUESDAY	0.02	0.04	0.05
WEDNESDAY	0.01	0.03	0.03
THURSDAY	0.04	0.07	0.08
FRIDAY	0.02	0.04	0.05
SATURDAY	0.03	0.06	0.06
HOUR OF DAY			
00:00-06:00	0.01	0.03	0.03
06:01-09:00	0.03	0.06	0.06
09:01-11:00	0.01	0.03	0.03
11:01-13:00	0.03	0.07	0.08
13:01-15:00	0.00	0.00	0.00
15:01-18:00	0.01	0.03	0.03
18:01-24:00	0.09	0.14	0.15
ALCOHOL/ DRUGS*			
ALCOHOL	0.00	0.00	0.00
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	0.23	0.37	0.40

NOTE: Database contains 37 locations. However, 20 locations were sampled.
          Accident data from 01-01-94 to 12-31-98.
          Expected values are based on 5-year period.
          * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 5

EXPECTED VALUE ANALYSIS TABLE FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 4 LANE, 1-WAY STOP, 3-LEG
VOLUMES NOT A CONSIDERATION

	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
COLLISION TYPE			
HEAD ON	0.00	0.00	0.00
ANGLE	0.11	0.24	0.27
REAR END	0.07	0.13	0.14
SS-OVTKIN	0.00	0.00	0.00
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.04	0.10	0.11
FIXED OBJECT	0.13	0.24	0.27
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.00	0.00	0.00
ANIMAL	0.07	0.13	0.14
OTHER	0.07	0.15	0.18
LEFT TURN	0.11	0.20	0.22
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	0.20	0.34	0.37
PROP DMG ONLY	0.40	0.60	0.64
LIGHT CONDITION			
LIGHT	0.44	0.68	0.73
DAWN	0.00	0.00	0.00
DUSK	0.00	0.00	0.00
DARK	0.16	0.26	0.28
SURFACE CONDITION			
DRY	0.40	0.63	0.69
WET	0.07	0.15	0.18
ICE-FROST	0.09	0.22	0.25
SNOW-SLUSH	0.04	0.10	0.11
OTHER	0.00	0.00	0.00
SEASON OF YEAR			
DEC, JAN, FEB	0.11	0.20	0.22
MAR, APR, MAY	0.16	0.24	0.26
JUN, JUL, AUG	0.13	0.26	0.29
SEP, OCT, NOV	0.20	0.31	0.33
DAY OF WEEK			
SUNDAY	0.13	0.22	0.24
MONDAY	0.09	0.18	0.20
TUESDAY	0.09	0.18	0.20
WEDNESDAY	0.13	0.24	0.27
THURSDAY	0.04	0.10	0.11
FRIDAY	0.02	0.06	0.07
SATURDAY	0.09	0.15	0.17
HOUR OF DAY			
00:00-06:00	0.04	0.10	0.11
06:01-09:00	0.02	0.06	0.07
09:01-11:00	0.11	0.18	0.19
11:01-13:00	0.02	0.06	0.07
13:01-15:00	0.07	0.13	0.14
15:01-18:00	0.20	0.32	0.35
18:01-24:00	0.13	0.22	0.24
ALCOHOL/ DRUGS*			
ALCOHOL	0.02	0.06	0.07
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	0.87	1.31	1.42

NOTE: Database contains 9 locations.
          Accident data from 01-01-94 to 12-31-98.
          Expected values are based on 5-year period.
          * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 6

EXPECTED VALUE ANALYSIS TABLE FOR THE CITY OF RAPID CITY
TYPE: 3-LEG, SIGNALIZED
VOLUMES NOT A CONSIDERATION

	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
COLLISION TYPE			
HEAD ON	0.00	0.00	0.00
ANGLE	0.56	0.77	0.81
REAR END	0.68	1.01	1.07
SS-OVTKIN	0.11	0.19	0.20
SS-OPSDIR	0.01	0.03	0.03
OVTKIN RD	0.03	0.05	0.06
RAN OFF RD	0.01	0.03	0.03
FIXED OBJECT	0.18	0.32	0.35
PARKED VEHICLE	0.01	0.03	0.03
PEDESTRIAN	0.02	0.04	0.04
ANIMAL	0.01	0.03	0.03
OTHER	0.20	0.27	0.28
LEFT TURN	1.72	2.40	2.54
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	1.37	1.75	1.83
PROP DMG ONLY	2.16	2.92	3.07
LIGHT CONDITION			
LIGHT	2.61	3.39	3.56
DAWN	0.03	0.05	0.06
DUSK	0.06	0.10	0.10
DARK	0.85	1.18	1.25
SURFACE CONDITION			
DRY	2.30	3.00	3.15
WET	0.74	1.00	1.06
ICE-FROST	0.29	0.42	0.44
SNOW-SLUSH	0.20	0.31	0.33
OTHER	0.01	0.03	0.03
SEASON OF YEAR			
DEC, JAN, FEB	0.93	1.23	1.29
MAR, APR, MAY	0.77	1.05	1.11
JUN, JUL, AUG	0.90	1.17	1.22
SEP, OCT, NOV	0.94	1.27	1.34
DAY OF WEEK			
SUNDAY	0.26	0.39	0.42
MONDAY	0.46	0.65	0.69
TUESDAY	0.56	0.73	0.77
WEDNESDAY	0.53	0.70	0.74
THURSDAY	0.60	0.79	0.83
FRIDAY	0.64	0.84	0.88
SATURDAY	0.51	0.73	0.78
HOUR OF DAY			
00:00-06:00	0.16	0.27	0.30
06:01-09:00	0.32	0.45	0.47
09:01-11:00	0.36	0.49	0.52
11:01-13:00	0.49	0.65	0.68
13:01-15:00	0.46	0.63	0.66
15:01-18:00	1.04	1.40	1.48
18:01-24:00	0.67	0.93	0.99
ALCOHOL/ DRUGS*			
ALCOHOL	0.28	0.46	0.50
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	6.70	8.66	9.07

NOTE: Database contains 22 locations.
          Accident data from 01-01-94 to 12-31-98.
          Expected values are based on 5-year period.
          * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 7

EXPECTED VALUE ANALYSIS TABLE FOR THE CITY OF RAPID CITY
TYPE: 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: LESS THAN 15,000

	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
COLLISION TYPE			
HEAD ON	0.03	0.07	0.08
ANGLE	1.05	1.97	2.20
REAR END	0.10	0.20	0.23
SS-OVTKIN	0.00	0.00	0.00
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.05	0.15	0.17
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.00	0.00	0.00
ANIMAL	0.00	0.00	0.00
OTHER	0.28	0.42	0.45
LEFT TURN	0.33	0.54	0.59
SEVERITY			
FATAL	0.03	0.07	0.08
INJURY	0.83	1.41	1.55
PROP DMG ONLY	0.98	1.71	1.90
LIGHT CONDITION			
LIGHT	1.48	2.52	2.78
DAWN	0.00	0.00	0.00
DUSK	0.00	0.00	0.00
DARK	0.33	0.63	0.70
SURFACE CONDITION			
DRY	1.35	2.46	2.73
WET	0.25	0.39	0.42
ICE-FROST	0.08	0.18	0.20
SNOW-SLUSH	0.13	0.23	0.25
OTHER	0.03	0.07	0.08
SEASON OF YEAR			
DEC, JAN, FEB	0.45	0.89	1.00
MAR, APR, MAY	0.40	0.72	0.80
JUN, JUL, AUG	0.45	0.79	0.88
SEP, OCT, NOV	0.53	0.87	0.95
DAY OF WEEK			
SUNDAY	0.23	0.51	0.58
MONDAY	0.30	0.52	0.57
TUESDAY	0.28	0.65	0.74
WEDNESDAY	0.33	0.57	0.63
THURSDAY	0.15	0.27	0.30
FRIDAY	0.38	0.63	0.69
SATURDAY	0.18	0.29	0.32
HOUR OF DAY			
00:00-06:00	0.03	0.07	0.08
06:01-09:00	0.20	0.43	0.48
09:01-11:00	0.25	0.54	0.62
11:01-13:00	0.30	0.53	0.58
13:01-15:00	0.25	0.45	0.50
15:01-18:00	0.53	0.83	0.90
18:01-24:00	0.28	0.54	0.61
ALCOHOL/ DRUGS*			
ALCOHOL	0.13	0.31	0.36
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	3.55	6.08	6.71

NOTE: Database contains 7 locations.
         Accident data from 01-01-94 to 12-31-98.
         Expected values are based on 5-year period.
         * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 8

EXPECTED VALUE ANALYSIS TABLE FOR THE CITY OF RAPID CITY
TYPE: 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: 15,000 AND OVER

		Abnormally High Accidents/ Year	
	Mean Accidents	90th	95th
COLLISION TYPE	Per Year	Percentile	Percentile
HEAD ON	0.01	0.02	0.02
ANGLE	1.97	2.37	2.45
REAR END	1.39	2.14	2.29
SS-OVTKIN	0.05	0.07	0.08
SS-OPSDIR	0.01	0.03	0.03
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.10	0.14	0.15
PARKED VEHICLE	0.01	0.02	0.02
PEDESTRIAN	0.07	0.13	0.14
ANIMAL	0.00	0.00	0.00
OTHER	0.26	0.34	0.36
LEFT TURN	2.42	3.10	3.23
SEVERITY			
FATAL	0.01	0.03	0.03
INJURY	2.60	3.27	3.40
PROP DMG ONLY	3.67	4.50	4.67
LIGHT CONDITION			
LIGHT	4.34	5.42	5.64
DAWN	0.06	0.11	0.12
DUSK	0.17	0.23	0.24
DARK	1.72	2.12	2.20
SURFACE CONDITION			
DRY	4.50	5.52	5.73
WET	1.02	1.28	1.33
ICE-FROST	0.37	0.48	0.50
SNOW-SLUSH	0.37	0.48	0.50
OTHER	0.03	0.06	0.07
SEASON OF YEAR			
DEC, JAN, FEB	1.63	2.04	2.12
MAR, APR, MAY	1.32	1.72	1.80
JUN, JUL, AUG	1.83	2.25	2.33
SEP, OCT, NOV	1.51	1.84	1.91
DAY OF WEEK			
SUNDAY	0.63	0.81	0.84
MONDAY	0.89	1.11	1.15
TUESDAY	0.86	1.10	1.15
WEDNESDAY	0.99	1.28	1.34
THURSDAY	0.93	1.17	1.21
FRIDAY	0.97	1.23	1.28
SATURDAY	1.02	1.29	1.34
HOUR OF DAY			
00:00-06:00	0.52	0.70	0.74
06:01-09:00	0.53	0.70	0.74
09:01-11:00	0.61	0.79	0.83
11:01-13:00	0.94	1.18	1.23
13:01-15:00	0.87	1.13	1.18
15:01-18:00	1.39	1.79	1.87
18:01-24:00	1.38	1.71	1.77
ALCOHOL/ DRUGS*			
ALCOHOL	0.57	0.72	0.75
DRUGS	0.01	0.03	0.03
ALCH-DRUGS	0.01	0.03	0.03
OTHER-NONE	12.30	15.15	15.72

NOTE: Database contains 53 locations. However, 35 locations were sampled.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
 * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 9

EXPECTED VALUE ANALYSIS TABLE FOR THE CITY OF SIOUX FALLS
TYPE: 3-LEG, SIGNALIZED
VOLUMES NOT A CONSIDERATION

	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
COLLISION TYPE			
HEAD ON	0.01	0.03	0.03
ANGLE	0.44	0.74	0.81
REAR END	0.56	0.99	1.08
SS-OVTKIN	0.03	0.06	0.06
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.10	0.17	0.18
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.00	0.00	0.00
ANIMAL	0.02	0.04	0.05
OTHER	0.14	0.22	0.23
LEFT TURN	0.74	1.05	1.12
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	0.69	1.02	1.09
PROP DMG ONLY	1.35	2.01	2.15
LIGHT CONDITION			
LIGHT	1.53	2.23	2.38
DAWN	0.04	0.09	0.11
DUSK	0.07	0.14	0.16
DARK	0.39	0.59	0.63
SURFACE CONDITION			
DRY	1.22	1.81	1.93
WET	0.42	0.65	0.70
ICE-FROST	0.16	0.24	0.26
SNOW-SLUSH	0.22	0.32	0.35
OTHER	0.02	0.04	0.05
SEASON OF YEAR			
DEC, JAN, FEB	0.48	0.72	0.77
MAR, APR, MAY	0.51	0.78	0.83
JUN, JUL, AUG	0.58	0.89	0.95
SEP, OCT, NOV	0.47	0.71	0.76
DAY OF WEEK			
SUNDAY	0.16	0.27	0.29
MONDAY	0.31	0.47	0.50
TUESDAY	0.36	0.52	0.55
WEDNESDAY	0.33	0.56	0.61
THURSDAY	0.31	0.50	0.54
FRIDAY	0.42	0.65	0.70
SATURDAY	0.15	0.23	0.25
HOUR OF DAY			
00:00-06:00	0.08	0.14	0.15
06:01-09:00	0.25	0.39	0.41
09:01-11:00	0.24	0.36	0.39
11:01-13:00	0.21	0.34	0.37
13:01-15:00	0.28	0.43	0.46
15:01-18:00	0.54	0.86	0.93
18:01-24:00	0.43	0.63	0.68
ALCOHOL/ DRUGS*			
ALCOHOL	0.14	0.23	0.25
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	3.91	5.80	6.20

NOTE: Database contains 28 locations. However, 20 locations were sampled.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
* In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 10

	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
COLLISION TYPE			
HEAD ON	0.01	0.03	0.03
ANGLE	1.05	1.42	1.50
REAR END	0.09	0.15	0.17
SS-OVTKIN	0.02	0.04	0.05
SS-OPSDIR	0.01	0.03	0.03
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.07	0.13	0.15
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.07	0.12	0.13
ANIMAL	0.00	0.00	0.00
OTHER	0.10	0.15	0.16
LEFT TURN	0.30	0.42	0.44
SEVERITY			
FATAL	0.00	0.00	0.00
INJURY	0.65	0.86	0.90
PROP DMG ONLY	1.07	1.39	1.45
LIGHT CONDITION			
LIGHT	1.21	1.55	1.63
DAWN	0.01	0.03	0.03
DUSK	0.06	0.10	0.10
DARK	0.44	0.62	0.66
SURFACE CONDITION			
DRY	1.16	1.50	1.57
WET	0.33	0.44	0.46
ICE-FROST	0.08	0.14	0.16
SNOW-SLUSH	0.14	0.20	0.21
OTHER	0.01	0.03	0.03
SEASON OF YEAR			
DEC, JAN, FEB	0.49	0.68	0.71
MAR, APR, MAY	0.41	0.52	0.55
JUN, JUL, AUG	0.44	0.60	0.63
SEP, OCT, NOV	0.38	0.53	0.56
DAY OF WEEK			
SUNDAY	0.07	0.11	0.12
MONDAY	0.30	0.44	0.47
TUESDAY	0.24	0.35	0.38
WEDNESDAY	0.31	0.40	0.42
THURSDAY	0.24	0.36	0.38
FRIDAY	0.33	0.46	0.48
SATURDAY	0.23	0.33	0.35
HOUR OF DAY			
00:00-06:00	0.14	0.23	0.25
06:01-09:00	0.18	0.25	0.27
09:01-11:00	0.12	0.17	0.18
11:01-13:00	0.26	0.36	0.38
13:01-15:00	0.19	0.28	0.30
15:01-18:00	0.43	0.62	0.66
18:01-24:00	0.39	0.52	0.55
ALCOHOL/ DRUGS*			
ALCOHOL	0.19	0.29	0.31
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	3.25	4.14	4.33

NOTE: Database contains 33 locations. However , 20 locations were sampled.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
* In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 11

		Abnormally High Accidents/ Year	
	Mean Accidents	90th	95th
COLLISION TYPE	Per Year	Percentile	Percentile
HEAD ON	0.01	0.02	0.02
ANGLE	2.03	2.53	2.64
REAR END	0.94	1.41	1.50
SS-OVTKIN	0.07	0.14	0.15
SS-OPSDIR	0.01	0.02	0.02
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.10	0.15	0.16
PARKED VEHICLE	0.01	0.03	0.03
PEDESTRIAN	0.05	0.10	0.11
ANIMAL	0.00	0.00	0.00
OTHER	0.38	0.49	0.51
LEFT TURN	2.40	3.06	3.19
SEVERITY			
FATAL	0.01	0.02	0.02
INJURY	2.14	2.58	2.67
PROP DMG ONLY	3.85	4.71	4.89
LIGHT CONDITION			
LIGHT	4.17	5.08	5.27
DAWN	0.12	0.17	0.18
DUSK	0.18	0.25	0.26
DARK	1.53	1.88	1.96
SURFACE CONDITION			
DRY	3.89	4.74	4.91
WET	1.29	1.29	1.66
ICE-FROST	0.33	0.43	0.45
SNOW-SLUSH	0.47	0.59	0.62
OTHER	0.02	0.03	0.04
SEASON OF YEAR			
DEC, JAN, FEB	1.78	2.16	2.24
MAR, APR, MAY	1.95	3.00	3.22
JUN, JUL, AUG	1.47	1.82	1.89
SEP, OCT, NOV	1.35	1.68	1.75
DAY OF WEEK			
SUNDAY	0.56	0.71	0.74
MONDAY	0.78	0.94	0.97
TUESDAY	1.04	1.34	1.40
WEDNESDAY	0.97	1.22	1.27
THURSDAY	0.90	1.10	1.14
FRIDAY	0.97	1.21	1.26
SATURDAY	0.78	0.99	1.03
HOUR OF DAY			
00:00-06:00	0.26	0.35	0.37
06:01-09:00	0.69	0.91	0.95
09:01-11:00	0.65	0.83	0.87
11:01-13:00	0.74	0.93	0.96
13:01-15:00	0.71	0.93	0.98
15:01-18:00	1.55	1.91	1.99
18:01-24:00	1.35	1.67	1.73
ALCOHOL/ DRUGS*			
ALCOHOL	0.32	0.41	0.43
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.03	0.05	0.05
OTHER-NONE	12.10	14.73	15.26

NOTE: Database contains 117 locations. However, 35 locations were sampled.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
* In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 12

EXPECTED VALUE ANALYSIS TABLE FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 1-WAY STOP, THREE LEG INTERSECTION
VOLUMES NOT A CONSIDERATION

COLLISION TYPE	Mean Accidents Per Year	Abnormally High Accidents/ Year 90th Percentile	95th Percentile
HEAD ON	0.00	0.00	0.00
ANGLE	0.11	0.23	0.25
REAR END	0.08	0.16	0.18
SS-OVTKIN	0.02	0.05	0.05
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.03	0.05	0.06
RAN OFF RD	0.05	0.09	0.10
FIXED OBJECT	0.05	0.07	0.08
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.00	0.00	0.00
ANIMAL	0.01	0.02	0.02
OTHER	0.06	0.13	0.14
LEFT TURN	0.06	0.13	0.14
SEVERITY			
FATAL	0.01	0.02	0.02
INJURY	0.16	0.28	0.31
PROP DMG ONLY	0.30	0.49	0.52
LIGHT CONDITION			
LIGHT	0.33	0.58	0.63
DAWN	0.00	0.00	0.00
DUSK	0.02	0.04	0.05
DARK	0.12	0.19	0.20
SURFACE CONDITION			
DRY	0.32	0.52	0.57
WET	0.05	0.09	0.10
ICE-FROST	0.05	0.09	0.09
SNOW-SLUSH	0.05	0.10	0.11
OTHER	0.01	0.02	0.02
SEASON OF YEAR			
DEC, JAN, FEB	0.12	0.20	0.22
MAR, APR, MAY	0.10	0.17	0.19
JUN, JUL, AUG	0.15	0.25	0.27
SEP, OCT, NOV	0.10	0.18	0.20
DAY OF WEEK			
SUNDAY	0.07	0.13	0.15
MONDAY	0.05	0.08	0.08
TUESDAY	0.09	0.15	0.17
WEDNESDAY	0.10	0.17	0.19
THURSDAY	0.05	0.07	0.08
FRIDAY	0.07	0.12	0.13
SATURDAY	0.05	0.08	0.09
HOUR OF DAY			
00:00-06:00	0.06	0.10	0.10
06:01-09:00	0.06	0.12	0.13
09:01-11:00	0.06	0.13	0.14
11:01-13:00	0.04	0.08	0.09
13:01-15:00	0.05	0.09	0.10
15:01-18:00	0.12	0.21	0.23
18:01-24:00	0.09	0.13	0.14
ALCOHOL/ DRUGS*			
ALCOHOL	0.05	0.09	0.10
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	0.75	1.32	1.43

NOTE: Database contains 100 locations. However, 35 locations were sampled.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
* In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 13

EXPECTED VALUE ANALYSIS TABLE FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 2-WAY STOP, FOUR LEG INTERSECTION
VOLUMES NOT A CONSIDERATION

		Abnormally High Accidents/ Year	
	Mean Accidents	90th	95th
COLLISION TYPE	Per Year	Percentile	Percentile
HEAD ON	0.00	0.00	0.00
ANGLE	0.10	0.14	0.15
REAR END	0.00	0.00	0.00
SS-OVTKIN	0.01	0.03	0.03
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.02	0.03	0.04
RAN OFF RD	0.02	0.03	0.04
FIXED OBJECT	0.01	0.03	0.03
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.00	0.00	0.00
ANIMAL	0.02	0.03	0.04
OTHER	0.02	0.04	0.04
LEFT TURN	0.04	0.07	0.08
SEVERITY			
FATAL	0.01	0.03	0.03
INJURY	0.10	0.15	0.16
PROP DMG ONLY	0.12	0.17	0.18
LIGHT CONDITION			
LIGHT	0.15	0.23	0.24
DAWN	0.01	0.02	0.02
DUSK	0.01	0.03	0.03
DARK	0.06	0.09	0.10
SURFACE CONDITION			
DRY	0.17	0.23	0.25
WET	0.01	0.02	0.02
ICE-FROST	0.05	0.07	0.08
SNOW-SLUSH	0.01	0.03	0.04
OTHER	0.00	0.00	0.00
SEASON OF YEAR			
DEC, JAN, FEB	0.06	0.10	0.11
MAR, APR, MAY	0.07	0.11	0.11
JUN, JUL, AUG	0.03	0.05	0.06
SEP, OCT, NOV	0.07	0.10	0.11
DAY OF WEEK			
SUNDAY	0.03	0.05	0.05
MONDAY	0.02	0.05	0.05
TUESDAY	0.03	0.06	0.06
WEDNESDAY	0.01	0.03	0.03
THURSDAY	0.05	0.08	0.09
FRIDAY	0.06	0.09	0.10
SATURDAY	0.03	0.05	0.05
HOUR OF DAY			
00:00-06:00	0.03	0.06	0.07
06:01-09:00	0.03	0.05	0.05
09:01-11:00	0.03	0.05	0.05
11:01-13:00	0.02	0.04	0.05
13:01-15:00	0.02	0.05	0.05
15:01-18:00	0.06	0.10	0.10
18:01-24:00	0.04	0.06	0.07
ALCOHOL/ DRUGS*			
ALCOHOL	0.03	0.06	0.06
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	0.35	0.49	0.52

NOTE: Database contains 105 locations. However, 35 locations were sampled.
          Accident data from 01-01-94 to 12-31-98.
          Expected values are based on 5-year period.
          * In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

Table 14

EXPECTED VALUE ANALYSIS TABLE FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 4-WAY STOP, FOUR LEG INTERSECTION
VOLUMES NOT A CONSIDERATION

| | | Abnormally High Accidents/ Year | |
| | Mean Accidents | 90th | 95th |
COLLISION TYPE	Per Year	Percentile	Percentile
HEAD ON	0.00	0.00	0.00
ANGLE	0.17	0.33	0.37
REAR END	0.03	0.08	0.10
SS-OVTKIN	0.00	0.00	0.00
SS-OPSDIR	0.00	0.00	0.00
OVTKIN RD	0.00	0.00	0.00
RAN OFF RD	0.00	0.00	0.00
FIXED OBJECT	0.03	0.08	0.10
PARKED VEHICLE	0.00	0.00	0.00
PEDESTRIAN	0.00	0.00	0.00
ANIMAL	0.00	0.00	0.00
OTHER	0.00	0.00	0.00
LEFT TURN	0.00	0.00	0.00
SEVERITY			
FATAL	0.06	0.17	0.20
INJURY	0.09	0.16	0.19
PROP DMG ONLY	0.09	0.20	0.23
LIGHT CONDITION			
LIGHT	0.20	0.37	0.41
DAWN	0.00	0.00	0.00
DUSK	0.00	0.00	0.00
DARK	0.03	0.08	0.10
SURFACE CONDITION			
DRY	0.14	0.31	0.35
WET	0.03	0.08	0.10
ICE-FROST	0.03	0.08	0.10
SNOW-SLUSH	0.03	0.08	0.10
OTHER	0.00	0.00	0.00
SEASON OF YEAR			
DEC, JAN, FEB	0.06	0.13	0.15
MAR, APR, MAY	0.09	0.16	0.19
JUN, JUL, AUG	0.03	0.08	0.10
SEP, OCT, NOV	0.06	0.13	0.15
DAY OF WEEK			
SUNDAY	0.03	0.08	0.10
MONDAY	0.03	0.08	0.10
TUESDAY	0.09	0.16	0.19
WEDNESDAY	0.03	0.08	0.10
THURSDAY	0.00	0.00	0.00
FRIDAY	0.03	0.08	0.10
SATURDAY	0.03	0.08	0.10
HOUR OF DAY			
00:00-06:00	0.00	0.00	0.00
06:01-09:00	0.00	0.00	0.00
09:01-11:00	0.03	0.08	0.10
11:01-13:00	0.06	0.13	0.15
13:01-15:00	0.00	0.00	0.00
15:01-18:00	0.09	0.20	0.23
18:01-24:00	0.06	0.13	0.15
ALCOHOL/ DRUGS*			
ALCOHOL	0.03	0.08	0.10
DRUGS	0.00	0.00	0.00
ALCH-DRUGS	0.00	0.00	0.00
OTHER-NONE	0.40	0.73	0.81

NOTE: Database contains 7 locations.
Accident data from 01-01-94 to 12-31-98.
Expected values are based on 5-year period.
* In this category, the numbers are total number of drivers/pedestrians/bicyclists involved, not total number of accidents.

References

FHWA-HI-88-039, March 1991, "Highway Safety Engineering Studies: Procedural
      Guide," Martin R. Parker, Jr., p. 27.

      Martin R. Parker & Associates, Inc.

      38549 Laurenwood Drive

      Wayne, Michigan 48184-1073

Appendix A

Glossary

1) **Mean:**   *the average that is calculated by summing all measurements and then dividing this sum by the number of measurements.*

2) **90th percentile:**   *the probability that less than 10% of the selected accident characteristics exceed this number.*

3) **95th percentile:**   *the probability that less than 5% of the selected accident characteristics exceed this number.*

Appendix B

Section 1

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: URBAN, 3-LEG, SIGNALIZED
VOLUMES NOT A CONSIDERATION

	CITY	SIGNAL LOCATION	X	Y
1	Sioux Falls	60th St. North and Citibank Entrance	20.80	18.00
2	Sioux Falls	60th St. North and Fourth Ave.	21.35	18.00
3	Sioux Falls	60th St. North and Minnesota Ave.	21.12	18.00
4	Sioux Falls	Benson Rd. and Minnesota Ave.	21.13	19.00
5	Sioux Falls	10th St. and Bahnson Ave.	23.46	21.81
6	Sioux Falls	10th St. and Jessica Ave.	22.44	21.81
7	Sioux Falls	12th St. and West Ave.	20.21	22.00
8	Sioux Falls	12th St. and Westport Ave.	19.23	22.00
9	Sioux Falls	20th St. and Cliff Ave.	22.00	22.63
10	Sioux Falls	41st St. and Cliff Ave.	22.00	23.89
11	Sioux Falls	41st St. and Elmwood Ave.	19.74	24.00
12	Sioux Falls	49th St. and Oxbow Ave.	19.25	24.50
13	Sioux Falls	49th St. and Terry Ave.	18.25	24.50
14	Rapid City	US 16 and Cathedral	41.97	31.57
15	Rapid City	SD 44/79 and 3rd St.	42.55	29.99
16	Rapid City	SD 44 and Twilight Dr.	45.59	31.30
17	Rapid City	Deadwood Ave. and Plant Rd.	40.48	29.24
18	Rapid City	5th St. and New York St.	42.44	29.73
19	Rapid City	Disk Dr. and Haines Ave.	42.50	28.25
20	Rapid City	Jackson Blvd. and West Fulton St.	41.07	30.34
21	Rapid City	Prairie Ave. and St. Patrick St.	42.50	31.00
22	Rapid City	Soo San Dr. and West Main St.	39.75	30.00
23	Rapid City	Sturgis Rd. and West Main St.	39.95	30.00
24	Aberdeen	US 12 and South Lawson	13.48	34.00
25	Brookings	Orchard Dr. and 22nd Ave. South	19.00	17.83
26	Brookings	6th St. and 25th Ave.	19.26	17.00
27	Pierre	Sioux Ave. and Washington Ave.	12.47	13.45
28	Pierre	Nicollet and Capitol Ave.	12.09	13.04
29	Vermillion	Cherry and Ratingen Strasse	13.00	21.49
30	Sturgis	SD 79/ Junction Ave. and Vanocker Canyon Rd.	4.04	45.24
31	Sioux Falls	Dardanella Rd. and Marion Rd.	18.00	22.45
32	Sioux Falls	26th St. and Yeager Rd.	22.40	23.00
33	Sioux Falls	49th St. and Western Ave.	20.00	24.46
34	Rapid City	Deadwood Ave. and Universal Dr.	40.00	27.96
35	Rapid City	Nordby Ln. and West Main St.	39.37	30.00

Appendix B

Section 2

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: URBAN, 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: LESS THAN 15,000

	CITY	SIGNAL LOCATION	X	Y
1	Sioux Falls	6th St. and Phillips Ave.	21.24	21.50
2	Sioux Falls	6th St. and Main Ave.	21.16	21.50
3	Sioux Falls	9th St. and Phillips Ave.	21.24	21.77
4	Sioux Falls	12th St. and Cleveland Ave.	23.00	22.00
5	Sioux Falls	18th St. and Cleveland Ave.	23.01	22.50
6	Sioux Falls	18th St. and Southeastern Ave.	22.60	22.50
7	Sioux Falls	22nd St. and Grange Ave.	20.50	22.74
8	Sioux Falls	26th St. and Lake Ave.	20.31	23.00
9	Sioux Falls	57th St. and Tomar Rd.	21.72	25.00
10	Rapid City	Sheridan Lake Rd. and West Flormann St.	40.51	31.25
11	Aberdeen	South Main St. and 1st Ave.	12.35	33.49
12	Aberdeen	South Main St. and 4th Ave.	12.35	33.28
13	Aberdeen	South Dakota St. and 1st Ave.	13.00	33.66
14	Aberdeen	South Roosevelt St. and 3rd Ave.	14.00	33.80
15	Watertown	3rd Ave. North and 11th St. East	20.50	18.00
16	Watertown	1st Ave. North and 2nd St. East	19.80	18.25
17	Watertown	2nd Ave. South and Broadway	19.56	18.44
18	Brookings	6th St. North and Main Ave.	17.50	17.00
19	Brookings	4th St. South and Main Ave.	17.51	17.66
20	Brookings	3rd St. North and Main Ave.	17.50	17.25
21	Mitchell	South Ohlman and West Havens St.	15.00	11.00
22	Pierre	Euclid Ave. and Broadway Ave.	12.07	12.82
23	Pierre	Euclid Ave. and Elizabeth St.	12.08	12.49
24	Yankton	Hwy. 81 and 31st St.	13.00	19.00
25	Yankton	3rd and Douglas	13.25	21.67
26	Huron	SD 37 and 18th St. South	25.00	20.74
27	Huron	3rd St. S and Wisconsin	24.91	19.51
28	Vermillion	Center and Main	12.60	22.00
29	Spearfish	Main St. and Michigan St.	10.48	8.61
30	Spearfish	Main St. and Hudson	10.56	8.98
31	Sioux Falls	10th St. and West Ave.	20.21	21.86
32	Aberdeen	8th Ave. North and Roosevelt St. NE	14.00	33.00
33	Watertown	1st Ave. North and Broadway	19.58	18.36
34	Mitchell	1st and Gamble	16.75	10.50
35	Vermillion	Cherry and Cottage	12.58	21.49

Appendix B

Section 3

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: URBAN, 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: 15,000 AND OVER

	CITY	SIGNAL LOCATION	X	Y
1	Sioux Falls	Russell St. and Kiwanis Ave.	19.49	20.59
2	Sioux Falls	Madison St. and Kiwanis Ave.	19.49	21.00
3	Sioux Falls	2nd St. and Minnesota Ave.	21.00	21.13
4	Sioux Falls	3rd St. and Cliff Ave.	22.00	21.25
5	Sioux Falls	10th St. and Cliff Ave.	22.00	21.81
6	Sioux Falls	14th St. and Minnesota Ave.	21.00	22.17
7	Sioux Falls	18th St. and Minnesota Ave.	21.00	22.50
8	Sioux Falls	26th St. and Sycamore Ave.	24.00	23.00
9	Sioux Falls	26th St. and Bahnson Ave.	23.50	23.00
10	Sioux Falls	26th St. and Phillips Ave.	21.26	23.00
11	Sioux Falls	26th St. and Minnesota Ave.	21.00	23.00
12	Sioux Falls	33rd St. and Cliff Ave.	22.00	23.50
13	Sioux Falls	37th St. and Western Ave.	20.00	23.74
14	Sioux Falls	41st St. and Minnesota Ave.	21.00	24.00
15	Sioux Falls	41st St. and West Ave.	20.24	24.00
16	Sioux Falls	41st St. and Kiwanis Ave.	19.50	24.00
17	Sioux Falls	41st St. and Valley View	17.50	24.00
18	Sioux Falls	49th St. and Marion Rd.	18.00	24.48
19	Rapid City	US 16 and St. Joseph St.	42.04	30.12
20	Rapid City	SD 44/79 and Maple Ave.	43.00	30.05
21	Rapid City	3rd St. and Main St.	42.52	30.14
22	Rapid City	7th St. and Main St.	42.15	30.06
23	Rapid City	East North St. and Spruce St.	43.67	29.63
24	Rapid City	Sheridan Lake Rd. and West Main St.	40.50	30.00
25	Aberdeen	US 12 and South 1st St.	12.28	34.03
26	Watertown	US 212 and 19th St.	21.00	19.00
27	Watertown	US 81 and Kemp	20.02	18.40
28	Brookings	8th St. South and Main St.	17.51	18.00
29	Brookings	6th St. and 22nd Ave.	19.00	17.00
30	Spearfish	Jackson Blvd. and Main St.	10.53	8.83
31	Sioux Falls	6th St. and West Ave.	20.21	21.50
32	Rapid City	5th St. and North St.	42.47	29.51
33	Watertown	US 81 and 4th Ave. South	20.12	17.91
34	Brookings	6th St. and Medary	18.00	17.00
35	Pierre	Sioux Ave. and Central Ave.	11.69	12.95

Appendix B

Section 4

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, DIVIDED, 4 LANE TO 2 LANE, TWO WAY STOP
VOLUMES NOT A CONSIDERATION

	COUNTY	INTERSECTION NAME	X	Y
1	Brown	US 281 and Brown County Rd. 15	11.30	32.00
2	Brown	US 12 and County Rd.	17.00	34.00
3	Brown	US 12 and County Rd.	19.00	34.00
4	Brown	US 12 and County Rd.	21.00	34.00
5	Brown	US 12 and County Rd.	29.00	34.00
6	Spink	US 281 and Spink County Rd. 4	11.00	4.00
7	Beadle	US 14 and Beadle County Rd. 19	23.00	18.90
8	Beadle	SD 37 and County Rd.	25.00	22.00
9	Beadle	SD 37 and Beadle County Rd. 24	25.00	23.00
10	Beadle	SD 37 and County Rd.	25.00	27.00
11	Beadle	SD 37 and County Rd.	25.00	28.00
12	Beadle	SD 37 and Beadle County Rd. 28	25.00	29.00
13	Sanborn	SD 37 and County Rd.	7.00	5.00
14	Sanborn	SD 37 and Sanborn County Rd. 15	7.00	6.00
15	Sanborn	SD 37 and County Rd.	7.00	7.00
16	Brown	US 281 and Brown County Rd. 28 (Warner Rd.)	11.00	43.03
17	Brown	US 12 and County Rd.	27.00	34.00
18	Brown	US 12 and County Rd.	30.00	34.00
19	Beadle	US 14 and Beadle County Rd. 21	28.00	19.00
20	Beadle	SD 37 and County Rd.	25.00	30.00

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Section 5

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 4-LANE, 1-WAY STOP, 3-LEG
VOLUMES NOT A CONSIDERATION

	COUNTY	INTERSECTION NAME	X	Y
1	Walworth	US 12 and US 83 (south intersection)	22.00	11.00
2	Walworth	US 12 and US 83 (north intersection)	20.50	5.00
3	Codington	US 212 and Codington County Rd. 17-6	15.00	19.00
4	Brookings	US 14 and US 81	1.00	16.00
5	Lake	SD 34 and SD 19	15.50	15.50
6	Clay	SD 50 and 454th Ave.	3.00	16.00
7	Clay	SD 50 and 457th Ave.	5.50	17.50
8	Codington	US 212 and Codington County Rd. 17-5	14.50	19.00
9	Clay	SD 50 and 467th Ave.	16.00	21.50

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Section 6

INTERSECTIONS FOR THE CITY OF RAPID CITY
TYPE: 3-LEG, SIGNALIZED
VOLUMES NOT A CONSIDERATION

	SIGNAL LOCATION	X	Y
1	US 16 and Cathedral	41.97	31.57
2	SD 44/79 and 6th St.	42.28	29.93
3	SD 44/79 and 3rd St.	42.55	29.99
4	SD 44 and Twilight Dr.	45.59	31.30
5	Truck 16 and East North St.	44.00	29.62
6	SD 79 and West Chicago St.	39.67	29.76
7	SD 79 and Deadwood Ave.	40.75	29.82
8	Deadwood Ave. and Cement Plant Rd.	40.48	29.24
9	Deadwood Ave. and North Plaza Dr.	40.00	28.36
10	Deadwood Ave. and Universal Dr.	40.00	27.96
11	SD 44 and Canyon Lake Dr.	41.00	30.25
12	SD 44 and Park Dr.	39.35	31.45
13	SD 44 and Mountain View Rd.	41.00	29.91
14	5th St. and New York St.	42.44	29.73
15	Canyon Lake Dr. and Mountain View Rd.	41.00	30.25
16	Corral Dr. and Sheridan Lake Rd.	40.00	33.03
17	Disk Dr. and Haines Ave.	42.50	28.25
18	Jackson Blvd. and West Fulton St.	41.07	30.34
19	Nordby Ln. and West Main St.	39.37	30.00
20	Prairie Ave. and St. Patrick St.	42.50	31.00
21	Soo San Dr. and West Main St.	39.75	30.00
22	Sturgis Rd. and West Main St.	39.95	30.00

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Section 7

INTERSECTIONS FOR THE CITY OF RAPID CITY
TYPE: 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: LESS THAN 15,000

	SIGNAL LOCATION	X	Y
1	Truck 16 and East Anamosa St.	42.28	29.00
2	East St. Patrick St. and South Valley Dr.	45.00	31.00
3	Deadwood Ave. and Lien/Commerace Rd.	40.33	29.00
4	32nd St. and Canyon Lake Dr.	39.95	30.61
5	Creek Dr. and East St. Patrick St.	44.25	31.00
6	Elm Ave. and East Fairmont Blvd.	43.09	31.89
7	Sheridan Lake Rd. and West Flormann St.	40.51	31.25

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Section 8

INTERSECTIONS FOR THE CITY OF RAPID CITY
TYPE: 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: 15,000 AND OVER

	SIGNAL LOCATION	X	Y
1	US 16 and St. Patrick St.	41.97	31.00
2	US 16 and Franklin	41.97	30.79
3	US 16 and Columbus	41.99	30.33
4	US 16 and St. Joseph St.	42.04	30.12
5	US 16 and Main St.	42.05	30.04
6	US 16 and SD 44/79	42.09	29.89
7	SD 44/79 and I-190	41.90	29.85
8	SD 44/79 and 5th St.	42.37	29.95
9	SD 44/79 and East Blvd.	42.84	30.05
10	SD 44/79 and La Crosse St.	43.50	30.05
11	SD 44/79 and Cambell	44.00	30.05
12	SD 79 and Fairmont Blvd.	44.00	32.00
13	SD 79 and St. Patrick St.	44.00	31.00
14	SD 44 and West Main St.	41.00	30.08
15	3rd St. and Main St.	42.52	30.14
16	5th St. and Columbus St.	42.27	30.37
17	5th St. and Main St.	42.33	30.10
18	5th St. and Meade St.	42.26	31.28
19	6th St. and Main St.	42.24	30.08
20	7th St. and St. Joseph St.	42.13	30.13
21	9th St. and St. Joseph St.	41.94	30.09
22	Anamosa St. and Haines Ave.	42.50	29.00
23	Canyon Lake Dr. and Sheridan Lake Rd.	40.50	30.25
24	East North St. and La Crosse St.	43.50	29.63
25	East North St. and Milwaukee St.	43.20	29.63
26	East Blvd. and Main St.	42.81	30.20
27	Haines Ave. and Lindberg Ave.	42.50	28.76
28	Main St. and West Blvd.	41.86	30.00
29	Mountain View Rd. and West Main St.	41.00	30.08
30	St. Joseph St. and West Blvd.	41.86	30.06
31	US 16 and Kansas City St.	42.02	30.18
32	SD 44/79 and Maple Ave.	43.00	30.05
33	7th St. and Main St.	42.15	30.06
34	Anamosa St. and North La Crosse St.	43.50	29.00
35	East Blvd. and St. Joseph St.	42.79	30.28

Appendix B

Section 9

INTERSECTIONS FOR THE CITY OF SIOUX FALLS
TYPE: 3-LEG, SIGNALIZED
VOLUMES NOT A CONSIDERATION

	SIGNAL LOCATION	X	Y
1	60th St. North and Citibank Entrance	20.80-21.00	18.00
2	60th St. North and Fourth Ave.	21.35	18.00
3	60th St. North and Minnesota Ave.	21.12	18.00
4	Benson Rd. and Minnesota Ave.	21.13	19.00
5	Russell St. and West Ave.	20.21	20.64
6	2nd St. and Main Ave.	21.16	21.13
7	6th St. and Bahnson Ave.	23.50	21.50
8	6th St. and Highland Ave.	22.36	21.50
9	10th St. and Bahnson Ave.	23.46	21.81
10	10th St. and Jessica Ave.	22.44	21.81
11	12th St. and Westport Ave.	19.23	22.00
12	14th St. and Seventh Ave.	21.74	22.18
13	18th St. and Summit Ave.	20.79	22.50
14	49th St. and Oxbow Ave.	19.25	24.50
15	49th St. and Terry Ave.	18.25	24.50
16	Rice St. and Wayland Ave.	22.19	20.74
17	12th St. and West Ave.	20.21	22.00
18	20th St. and Cliff Ave.	22.00	22.63
19	26th St. and Kiwanis Ave.	19.50	23.00
20	41st St. and Elmwood Ave.	19.74	24.00

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Section 10

INTERSECTIONS FOR THE CITY OF SIOUX FALLS
TYPE: 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: LESS THAN 15,000

	SIGNAL LOCATION	X	Y
1	6th St. and Phillips Ave.	21.24	21.50
2	6th St. and Main Ave.	21.16	21.50
3	8th St. and Phillips Ave.	21.24	21.68
4	8th St. and Dakota Ave.	21.09	21.68
5	9th St. and Phillips Ave.	21.24	21.77
6	12th St. and Highland Ave.	22.38	22.00
7	12th St. and 2nd Ave.	21.38	22.03
8	12th St. and Valley View	17.52	22.00
9	18th St. and Bahnson Ave.	23.50	22.50
10	18th St. and 4th Ave.	21.53	22.50
11	18th St. and Phillips Ave.	21.26	22.50
12	22nd St. and Grange Ave.	20.50	22.74
13	22nd St. and Lake Ave.	20.31	22.74
14	33rd St. and Phillips Ave.	21.26	23.50
15	57th St. and Tomar Rd.	21.72	25.00
16	3rd St. and Sycamore Ave.	24.00	21.25
17	9th St. and Dakota Ave.	21.09	21.77
18	10th St. and West Ave.	20.21	21.86
19	18th St. and Southeastern Ave.	22.60	22.50
20	49th St. and Southeastern	23.10	24.50

Appendix B

Section 11

INTERSECTIONS FOR THE CITY OF SIOUX FALLS
TYPE: 4-LEG, SIGNALIZED
TOTAL ENTERING ADT: 15,000 AND OVER

	SIGNAL LOCATION	**X**	**Y**
1	60th St. North and Cliff Ave.	22.00	18.00
2	54th St. North and Cliff Ave.	22.13	24.83
3	Russell St. and Kiwanis Ave.	19.49	20.59
4	Russell St. and Minnesota Ave.	21.00	20.61
5	Russell St. and Western Ave.	19.74	20.61
6	Rice St. and Cliff Ave.	22.00	20.75
7	10th St. and Lowell Ave.	22.75	21.81
8	10th St. and Cliff Ave.	22.00	21.81
9	10th St. and Main Ave.	21.16	21.86
10	11th St. and Main Ave.	21.16	21.95
11	11th St. and Minnesota Ave.	21.00	21.95
12	12th St. and Minnesota Ave.	21.00	22.03
13	12th St. and Elmwood Ave.	19.74	22.00
14	12th St. and Lyons Blvd.	18.83	22.00
15	12th St. and Marion Rd.	18.00	22.00
16	14th St. and Cliff Ave.	22.00	22.18
17	14th St. and Minnesota Ave.	21.00	22.17
18	17th St. and Cliff Ave.	22.00	22.44
19	18th St. and Minnesota Ave.	21.00	22.50
20	22nd St. and Minnesota Ave.	21.00	22.74
21	26th St. and Sycamore Ave.	24.00	23.00
22	26th St. and Western Ave.	20.00	23.00
23	Oak St. and Western Ave.	20.00	23.26
24	33rd St. and Minnesota Ave.	21.00	23.50
25	41st St. and Norton Ave.	20.81	24.00
26	41st St. and Western Ave.	20.00	24.00
27	41st St. and Kiwanis Ave.	19.50	24.00
28	41st St. and Marion Rd.	18.00	24.00
29	57th St. and Minnesota Ave.	21.00	25.00
30	I-229 and Louise Ave. South	8.92	1.47
31	2nd St. and Minnesota Ave.	21.00	21.13
32	10th St. and Minnesota Ave.	21.00	21.86
33	22nd St. and Kiwanis Ave.	19.50	22.74
34	37th St. and Minnesota Ave.	21.00	23.75
35	49th St. and Louise Ave.	19.00	24.50

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Section 12

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 1-WAY STOP, 3-LEG
VOLUMES NOT A CONSIDERATION

	COUNTY	LOCATION	X	Y
1	Corson	US 12 and SD 65 N	33.70	2.70
2	Ziebach	SD 65 and SD 20 S	26.00	7.00
3	Dewey	SD 65 and SD 20 N	5.00	6.00
4	Dewey	US 212 and SD 63 N	18.00	33.00
5	Jackson	SD 73 and SD 248	32.00	12.00
6	Lyman	SD 47 and SD 49	41.80	33.80
7	Todd	US 18 and US 83 N	28.00	7.00
8	Walworth	US 12 and SD 271	29.00	11.00
9	Walworth	US 12 and SD 47 S	34.00	11.00
10	Walworth	SD 20 N and SD 47	34.00	25.00
11	Potter	US 212 and US 83 S	17.00	17.00
12	Hughes	US 14 and US 83 N	26.00	3.80
13	Fall River	US 18 and US 385	30.90	4.80
14	Fall River	US 18/38S and SD 79	34.20	6.40
15	Custer	US 385 and SD 89	24.50	18.00
16	Custer	US 16A and SD 36	36.90	6.50
17	Custer	SD 79 and SD 40S	44.00	2.00
18	Custer	SD 87 and SD 89	25.80	1.90
19	Pennington	US 385 and SD 44	27.90	29.00
20	Meade	SD 34 and SD 79	7.70	44.00
21	Meade	US 212 and SD 73 N	72.80	2.00
22	Butte	SD 79 and SD 168	32.00	17.50
23	Harding	US 85 and SD 20S	26.00	28.00
24	Brown	US 281 and SD 10N	11.00	13.00
25	Hamlin	US 81 and SD 28N	19.00	15.00
26	Clark	US 212 and SD 25N	23.00	20.00
27	Kingsbury	US 14 and US 81S	37.00	13.50
28	Brookings	US 14 and SD 13	33.00	20.00
29	Gregory	US 18 and SD 43	33.30	35.00
30	Minnehaha	SD 11 and SD 42	28.00	23.40
31	Corson	US 12 and SD 65 S	34.00	3.00
32	Tripp	US 18 and US 183	28.00	35.60
33	Custer	US 385 and SD 87	29.60	20.40
34	Harding	SD 20 and SD 79W	48.00	29.00
35	Yankton	SD 50 and SD 314	8.50	19.00

Appendix B

Section 13

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 2-WAY STOP, 4-LEG
VOLUMES NOT A CONSIDERATION

	COUNTY	LOCATION	X	Y
1	Haakon	SD 34 and SD 73	17.00	25.00
2	Jackson	SD 248 and SD 63	44.60	11.80
3	Tripp	US 183 and SD 44	12.00	23.00
4	Bennett	US 18 and SD 73	20.00	16.00
5	Potter	US 212 and US 83N	18.00	17.00
6	Perkins	US 12 and SD 73	38.00	2.00
7	Edmunds	US 12 and SD 45	34.00	11.00
8	Roberts	SD 127 and SD 106	11.00	7.00
9	Grant	US 12 and SD 123	19.00	5.50
10	Hamlin	US 81 and SD 22N	20.00	4.00
11	Codington	US 212 and SD 139	13.00	18.90
12	Spink	SD 37 and SD 28	25.00	43.00
13	Hyde	SD 47 and SD 26	12.00	9.00
14	Beadle	US 281 and US 14	11.00	13.00
15	Buffalo	SD 34 and SD 50	12.10	9.00
16	Gregory	US 18 and SD 1806S	30.00	30.10
17	Douglas	SD 44 and US 281N	16.00	9.00
18	Douglas	SD 44 and US 281S	19.00	9.00
19	Hanson	SD 25 and SD 38	16.00	11.00
20	Hanson	SD 25 and SD 262	16.00	17.00
21	Miner	SD 34 and SD 25S	10.00	14.00
22	Hutchinson	US 18 and SD 25S	21.00	19.00
23	Yankton	SD 50 and SD 52	5.00	19.00
24	Yankton	SD 50 and SD 153	8.00	19.00
25	Turner	US 18W and SD 19	17.00	19.00
26	Lincoln	SD 17 and SD 44	3.00	12.00
27	Lincoln	SD 46 and SD 17N	3.00	30.00
28	Minnehaha	SD 19S and SD 42	2.00	22.00
29	Minnehaha	SD 19N and SD 42	3.00	22.00
30	Moody	SD 13 and SD 34	16.00	14.00
31	Campbell	SD 10 and SD 271	35.00	13.00
32	Edmunds	SD 47 and SD 253	4.00	2.00
33	Beadle	US 281S and US 14	13.00	19.00
34	Charles Mix	US 18/281 and SD 46	38.80	30.70
35	Lincoln	US 18 and SD 11S	16.00	15.00

Appendix B

Section 14

INTERSECTIONS FOR THE STATE OF SOUTH DAKOTA
TYPE: RURAL, 4-WAY STOP, 4-LEG
VOLUMES NOT A CONSIDERATION

	COUNTY	LOCATION	X	Y
1	Buffalo	SD 34 and SD 45	29.00	9.00
2	Gregory	SD 44 and SD 47	6.00	9.00
3	Jerauld	SD 34 and US 281	25.00	10.00
4	Mc Cook	SD 42 and US 81	12.00	22.00
5	Hutchinson	US 81 and SD 44	36.00	8.00
6	Hutchinson	SD 37 and SD 44	7.00	9.00
7	Bon Homme	SD 37 and SD 46	9.00	7.00

Appendix C

Section 1

EXPECTED VALUE ANALYSIS FOR:
ALL DISTRICTS IN VIRGINIA
TOTAL ENTERING ADT: 0-10,0O0
TYPE: 3-LEG, SIGNALIZED

COLLISION TYPE	Mean Accidents Per Year	Abnormally High Accidents/Year 90th Percentile	95th Percentile
REAR END:	1.09	3.00	3.40
ANGLE:	1.41	3.94	4.46
HEAD ON:	0.03	0.18	0.21
SIDESWIPE SD:	0.44	1.33	1.51
SIDESWIPE OD:	0.04	0.22	0.26
PEDESTRIAN:	0.05	0.26	0.30
FIXED OBJECT:	0.26	0.86	0.99
SEVERITY			
FATAL:	0.01	0.12	0.15
INJURY:	1.05	2.62	2.95
PROP DAM ONLY:	2.44	5.57	6.22
LIGHT CONDITION			
DAY:	2.58	5.80	6.46
NIGHT:	0.65	1.69	1.90
DAWN/DUSK:	0.23	0.81	0.92
SURFACE CONDITION			
DRY:	2.62	5.81	6.47
WET:	0.73	1.89	2.13
SNWY/ICY:	0.13	0.56	0.64
SEASON OF YEAR			
WINTER:	0.79	2.11	2.38
SPRING:	0.77	1.59	1.75
SUMMER:	0.90	2.33	2.63
FALL:	1.01	2.78	3.14
DAY OF WEEK			
MONDAY:	0.53	1.44	1.63
TUESDAY:	0.50	1.31	1.47
WEDNESDAY:	0.38	1.08	1.22
THURSDAY:	0.38	0.98	1.10
FRIDAY:	0.88	2.76	3.14
SATURDAY:	0.49	1.23	1.38
SUNDAY:	0.33	0.91	1.03
HOUR OF DAY			
00:00 – 06:00:	0.15	0.56	0.64
06:00 – 09:00:	0.38	1.08	1.22
09:00 – 11:00:	0.31	0.99	1.13
11:00 – 13:00:	0.45	1.17	1.31
13:00 – 15:00:	0.51	1.16	1.29
15:00 – 18:00:	1.03	2.71	3.06
18:00 – 24:00:	0.67	1.85	2.09

IF ACCIDENTS EXCEED THESE VALUES FURTHER STUDY IS WARRENTED!
NOTE: DATABASE CONTAINS   26 LOCATIONS
Accident data from 01-01-85 to 12-31-87.
Expected values are based on 3-year period.

Appendix C

Section 2

EXPECTED VALUE ANALYSIS FOR:
ALL DISTRICTS IN VIRGINIA
TOTAL ENTERING ADT: 0-10,0O0
TYPE: 4-LEG, SIGNALIZED

	Mean Accidents Per Year	Abnormally High Accidents/Year 90th Percentile	95th Percentile
COLLISION TYPE			
REAR END:	0.91	3.02	3.45
ANGLE:	2.35	7.23	8.21
HEAD ON:	0.10	0.42	0.48
SIDESWIPE SD:	0.60	1.82	2.07
SIDESWIPE OD:	0.06	0.41	0.48
PEDESTRIAN:	0.08	0.41	0.48
FIXED OBJECT:	0.35	1.02	1.16
SEVERITY			
FATAL:	0.01	0.10	0.12
INJURY:	1.57	4.38	4.95
PROP DAM ONLY:	3.05	8.14	9.17
LIGHT CONDITION			
DAY:	3.14	8.62	9.72
NIGHT:	1.27	3.88	4.41
DAWN/DUSK:	0.19	0.71	0.81
SURFACE CONDITION			
DRY:	3.69	9.80	11.03
WET:	0.84	2.50	2.83
SNWY/ICY:	0.09	0.37	0.43
SEASON OF YEAR			
WINTER:	1.06	3.02	3.41
SPRING:	1.10	2.72	3.05
SUMMER:	1.14	3.27	3.70
FALL:	1.32	3.90	4.42
DAY OF WEEK			
MONDAY:	0.57	1.87	2.13
TUESDAY:	0.67	1.86	2.10
WEDNESDAY:	0.65	1.97	2.24
THURSDAY:	0.75	2.23	2.53
FRIDAY:	0.87	2.41	2.72
SATURDAY:	0.70	2.13	2.42
SUNDAY:	0.42	1.35	1.54
HOUR OF DAY			
00:00 – 06:00:	0.23	0.75	0.86
06:00 – 09:00:	0.53	1.64	1.87
09:00 – 11:00:	0.47	1.28	1.44
11:00 – 13:00:	0.44	1.44	1.64
13:00 – 15:00:	0.47	1.38	1.56
15:00 – 18:00:	1.19	3.25	3.67
18:00 – 24:00:	1.28	3.91	4.44

IF ACCIDENTS EXCEED THESE VALUES FURTHER STUDY IS WARRENTED!
NOTE: DATABASE CONTAINS   35 LOCATIONS
Accident data from 01-01-85 to 12-31-87.
Expected values are based on 3-year period.

Appendix C

Section 3

***Expected-Value Accident Analysis For* the** *Atlanta Area*
Total Entering ADT: 10,000 - 20,000
Type: 4-Leg Signalized

		Abnormally High Accidents/Year	
	Mean Accidents/Year	90th Percentile	95th Percentile
Collision Type			
Angle	2.2	5.0	6.2
Head On	0.2	0.9	1.2
Rear End	2.1	4.7	5.7
Sideswipe (Same Direction)	0.4	1.0	1.4
Left Turn with Through	0.9	2.0	2.4
Sideswipe (Opposite Direction)	0.1	0.2	0.6
Overturned	0.0	0.2	0.2
Struck Object	0.3	0.9	1.3
Pedestrian	0.0	0.0	0.0
Parked Vehicle	0.0	0.0	0.0
Severity			
Fatal	0.1	0.3	0.4
Injury	1.5	3.7	4.2
Property Damage Only	4.0	8.6	10.6
Light Condition			
Day	4.3	9.2	10.2
Dusk	0.2	0.9	1.0
Dawn	0.1	0.3	0.5
Dark & Lighted	0.5	2.5	2.7
Dark & Not Lighted	0.6	7.0	2.1
Surface Condition			
Dry	4.0	8.2	9.7
Wet	1.5	3.3	4.1
Season of Year			
Spring	1.3	2.9	3.4
Summer	1.4	3.1	3.9
Fall	1.4	3.3	4.0
Winter	1.4	3.5	4.4
Day of Week			
Monday	0.8	2.0	2.6
Tuesday	1.0	2.4	3.1
Wednesday	0.9	2.4	2.8
Thursday	0.9	2.1	2.6
Friday	0.8	2.1	2.7
Saturday	0.7	1.9	2.3
Sunday	0.6	1.8	1.9
Hour of Day			
00:00 - 06:00	0.2	1.0	1.2
06:00 - 09:00	0.5	1.3	1.8
09:00 - 11:00	0.4	1.4	1.8
11:00 - 13:00	0.6	1.7	2.1
13:00 - 15:00	0.5	1.6	1.7
15:00 - 18:00	1.0	3.0	4.0
18:00 - 24:00	1.0	2.7	3.7

Note: Database contains 143 locations; accident data from 1990, 1991, and 1992

Appendix D

Accident Report

Sioux Falls   6th St. and West Ave.

LOCATION   2021 2021   2150 2150 50 940101 981231
FISCAL YEAR = 940101 – 951231   960101 – 971231   980101 - 981231

ACCIDENT SUMMARY

VIOLATION

SPEED RELATED =	1	WRONG SIDE ROAD =	1	OTHER =	6
FAIL TO YIELD =	18	IMPROP TURN-LANE CHNG =	9	FELL ASLEEP =	0
FOLLOW TOO CLOSE=	1	FAIL OR IMPROP SIGNAL =	1	TRAFF SIGNAL=	2
IMPROPER PASSING=	0	STOP SIGN, FLASHING RED=	0	NO VIOLATION= 27	

****

ROADWAY SURFACE-COND		WEATHER		REL-TO-INTERSECTION		
DRY=	22	CLEAR =	16	NON-INTERSEC	=	0
WET=	4	RAIN =	3	INTERSECTION	=	26
ICE-FROST=	0	SNOW-SLEET =	1	INTERSECT REL=		1
SNOW-SLUSH=	2	FOG-SMOKE=	0	INTERCHANGE	=	0
OTHER=	0	CLOUDY =	8	DRIVEWAY	=	1
		OTHER-UNK=	0	RAIL CROSS	=	0
				CROSS OVER	=	0
				UNKNOWN	=	0

****

ROAD ALIGNMENT		ALCOHOL/DRUGS		TYPE VEHICLE		
STRAIGHT- LEVEL=	27	ALCOHOL=	2	PASSENGER CAR =		46
CURVE-LEVEL=	1	DRUGS=	0	PICKUP	=	8
CURVE-GRADE=	0	ALCH-DRUGS=	0	TRUCK	=	1
STRAIGHT-GRADE=	0	OTHER-NONE=	56	TRUCK-TRLR	=	0
STRAIGHT-CREST=	0			TRUCK-MU-TRLR =		0
CURVE-CREST=	0			OTHER-NOTSTST =		1
OTHER=	0					

****

TIME	12	1	2	3	4	5	6	7	8	9	10	11	TOT
AM	0	0	0	0	0	0	2	2	0	0	0	2	6
PM	3	3	1	1	6	1	3	1	2	0	1	0	22

****

KILLED	(INJURED	BY	SEVERITY)	PROP DMG ONLY	LIGHT	DAWN	DUSK	DARK
	2	3	4	ACCIDENTS				
0	4	9	9	14	24	0	1	3

****

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1	3	2	2	7	4	1	6	1	1	0	0	28

****

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	TOTAL
0	4	3	6	6	8	1	28

****

PROPERTY DAMAGE ESTIMATE = $ 108,600

Appendix D

LOCATION   2021   2021   2150   2150 50 940101 981231
FISCAL YEAR   940101 - 951231   960101 - 971231   980101 - 981231
ACCIDENT SUMMARY BY TYPE OF ACCIDENTS

TYPE	940101 951231				960101 971231				980101 981231				TOTAL			
	F	I	P	T	F	I	P	T	F	I	P	T	F	I	P	T
HEADON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANG-INSEC	0	0	1	1	0	0	1	1	0	0	0	0	0	0	2	2
ANG-NO IN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REAR END	0	1	0	1	0	0	0	0	0	1	0	1	0	2	0	2
SS-OVTKIN	0	0	0	0	0	0	1	1	0	0	1	1	0	0	2	2
SS-OPSDIR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OVTINROAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RAN OF RD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FIXED OBJ	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
PKED VEH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PED	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1
ANIMAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	1	0	1	0	0	0	0	0	1	0	1	0	2	0	2
LEFT TURN	0	4	2	6	0	3	4	7	0	2	3	5	0	9	9	18
TOTALS	0	7	4	11	0	3	6	9	0	4	4	8	0	14	14	28

Appendix D

LOCATION	2021	2021	2150	2150	50	940101 981231
FISCAL YEAR = 940101 – 951231			960101 – 971231			980101 – 981231
ACC NO	YEAR	MONTH	DAY	X COORD	Y COORD	REL TO JCT
--------	------	----------	------	-------	---------	-------
B0363	94	2	4	2021	2150	1
F1304	94	6	25	2021	2150	1
H0200	94	8	5	2021	2150	1
H1392	94	8	31	2021	2150	1
B0322	95	2	8	2021	2150	1
B1169	95	2	27	2021	2150	1
C1071	95	3	20	2021	2150	1
60766	95	7	17	2021	2150	1
H0168	95	8	4	2021	2150	1
10613	95	9	15	2021	2150	1
J0219	95	10	5	2021	2150	4
C0602	96	3	8	2021	2150	1
D1018	96	4	25	2021	2150	1
E0889	96	5	20	2021	2150	1
E0949	96	5	21	2021	2150	1
E0956	96	5	22	2021	2150	1
F1487	96	6	27	2021	2150	1
E0954	97	5	27	2021	2150	1
F0149	97	6	4	2021	2150	1
H0244	97	8	5	2021	2150	1
A0633	98	1	14	2021	2150	1
D1017	98	4	30	2021	2150	1
E0509	98	5	14	2021	2150	1
E0679	98	5	15	2021	2150	1
E1213	98	5	27	2021	2150	1
F0268	98	6	5	2021	2150	1
H1079	98	8	20	2021	2150	1
H1318	98	8	21	2021	2150	2