

**CARE 9 INDIVIDUALIZED TRAINING**  
**Problems and Exercises Including Roadway Characteristics – State of Alabama**  
(Updated November 18 2009)

Keep this document handy for reference to refresh your memory or to train someone else. It is designed to enable someone who has not had any training to operate the *CARE* desktop system, particularly the latest version, *CARE 9*. To use this as a tutorial refresher, perform the function or answer the question given in the first sentence of each item. Attempt to do it first *without* reading the directions given. The directions are often abbreviated as A/B/C, which means click button A, and then click button B, and then click button C.

## GENERAL

- G1. *Start the CARE Desktop System up* by clicking the *CARE* icon. (Be careful – if you have installation icons on your desktop, do not click them by mistake. Also, be sure to click on *CARE 9*, not *CARE 8*.) We will refer to the resulting screen as the *CARE Main Environment*. Seven buttons exist at the top of the screen: File, Filters, Analysis, Search, Continuous, Tools, and Help. An eighth button will show up on some screens. For example, if you are running a Frequency a button titled Frequency will show up. This new eighth button will give you capabilities specific to the screen you are working with.

Below the seven buttons in the main *CARE* environment are two shortcuts and one information line: Default Data Source, Default Filter and Filter Logic. These are only defaults – it will be possible to alter the data source and current filter by using the drop-downs. We will learn more about all of these buttons and shortcuts in due time. If you wish to resize the main environment you can do so with standard Windows procedures. For now, note the following definitions that pertain to the shortcuts:

### *Definitions:*

*Data Source* – the specification of the data that *CARE* is currently set to process ... it might be one or more years of Crash data, or it could be Person or Road data. These are referred to as *datasets* in this manual. The one that is currently specified will be called the *current* dataset.

*Dataset* – A *CARE* dataset should be viewed as much more than just a file of data to be processed. It also contains all of the labels, codes and filters to facilitate processing and understand the resulting outputs. The actual data are also structured with *CARE*'s proprietary data structures to enable virtually instantaneous results.

*Filter* – a mechanism that defines the *subset* of the dataset that is being given special attention ... it might be a particular area of the state, a particular type of crash (fatal, pedestrian, alcohol, motorcycle, bicycle, etc.) or any combination of types. The filter that is in effect at any given time will be called the *current* filter. The “ALL” filter is included for completeness, although technically it does not filter out any crashes.

*Filter Logic* – this is the combination of variables' codes that are logically combined to perform the filtering. Usually it will not be of concern, but at times it will be useful in answering the question: “Just what is it that makes up this filter?”

/ – In the “clicking” instructions that follow, a slash (/) is used to demark the clicks. For example, the button given to the left of the slash might generate a drop-down menu containing several options, one of which is the button to the right of the slash. The first item in the list will generally be one of the seven buttons at the top of the *CARE* Main Environment.

- G2. *Take a look at the variables that are in the dataset that you are processing.* From the main environment click File/View Variable Names and Codes. This gives a listing of the

*variables* for the default dataset (or data source). You can view the variables in one of three orders: Original Order, User Order and Alphabetical Order. The difference between these three orders will be discussed in more detail later. To view how any of these variables is *coded*, click on it and the codes for that variable will appear. This listing is fairly consistent with how the variables exist on the AUTAR crash report form itself. This introduces the following definitions.

*Definitions:*

*Variables* – the characteristics that are under consideration within the *CARE* crash database; the data elements available for information generation. In relational database terminology, these would be called *attributes*.

*Codes* – the values that any given variable can take on; click on the “V008: Day of the Week” variable and note that the codes for day of the week are:

Null  
Sunday  
Monday  
Tuesday  
Wednesday  
Thursday  
Friday  
Saturday

When finished, close the variable viewer tool by clicking “Exit.”

***Exit.*** This is true of all *CARE* screens; i.e., if you click the Exit button, that screen will disappear and *CARE* will return to what was on the screen prior to the function being performed. Many screens in *CARE 9* do not have an Exit button. If a screen does not have an Exit button, the exit function is performed by clicking the smaller X in the upper right corner of the output screen (**not the one at the very top, since that will exit *CARE***). However, usually you do not have to exit the current screen to perform another function. If you do not, it will just overlay the next function on top of the previous one. Note that the Data Source and Filter specification in the shortcuts at the top of the screen are *always* the **current** data source and filter; it does not necessarily specify the data source and filter that were in effect when any given output was generated. With *CARE 9* you can choose the data source and filter on a per screen basis, so each screen open within *CARE* could use a different data source and filter in order to generate results. This is useful for comparing various outputs, but it can be confusing.

- G3. *Select the most recent Alabama Crash Data (or Crash-Road Data) for the Data Source.* Click to the right of the Default Data Source box and a drop down menu will appear. This will list out all datasets that you have installed on your system. Click the “Alabama Crash Data” with the most recent year, and it will become the current data source (it will appear in the “Default Data Source” box until it is changed).

- G4. *Set the filter for “all crashes.”* Click to the right of the “Default Filter” box and scroll up and down to see all of the filters that you have available to you. Then select “All records (do not apply filter)” from the drop-down menu. The “All” filter is available for any dataset; it is really not a filter since it allows *all* crashes in the dataset to be processed.
- G5. *Find the number and percentage of **all** crashes that occurred on Interstate 10.* Your current filter is “All” so any analyses will be for all crashes. Click Analysis /Frequency/ V267: Route /OK. You will get a tabular frequency output as well as a bar chart.

GENERAL OBSERVATION: Note that the buttons at the top of the *CARE* Main Environment are arranged in the order that they are normally used: (1) “File” to establish the dataset (also done by the “Default Data Source” shortcut below it); (2) “Filter” to set the current filter or to define new filters; and then (3) “Analysis” to generate output information from the data set according to the current filter.

- G6. *Obtain the number of crashes that occurred in your county and city during the year using the Frequency analysis.* Click Analysis/Frequency/highlight V001: County and V002: City/OK. Once the output is generated, notice that when you drag the cursor across any cell of the bar chart it will tell you the code for that cell. Perform some frequencies on other variables as you see fit (click Exit/Analysis/Frequency and go from there.)
- G7. There are some interesting variables near the bottom of the list. *Get frequency information for all crashes on lighting conditions and severity* by scrolling down to the bottom and working your way back up. Severity is Variable 237.

*Selecting multiple items in a list.* Use standard Windows methods for selecting multiple variables. Any one of the following methods can be used: (1) Hold down the shift key on the keyboard and move down the list using the arrows on the keyboard or the mouse (2) Hold down the Ctrl key on the keyboard and click on multiple variables using the mouse (3) Use the mouse to drag over a list of consecutive variables, thereby selecting them.

- G8. Notice the other selections and check boxes on the “Frequency Parameters” screen:
- The “Select All” option allows you to select all of the variables quickly and easily. For a large dataset with many variables, choosing this option can hang you for a minute or so. If you click it by mistake you can reverse the process by clicking “Unselect All.”
  - “Original Order” radio button – re-sorts the list into the original numerical (V001, V002, V003, etc.) order, which usually corresponds to the ordering within the database.
  - “User Order” radio button – re-sorts the list into the order that the user specified for that dataset. The user can specify an order for the variables within a dataset using the Tools/Manage Variables option. This would be helpful if the user had a subset of variables that they used most often. By re-sorting their list so that these variables always fell at the top of the list they would be more easily accessible to the user.

- “Alphabetical” radio button – re-sorts the list of variables into alphabetical order.
- “Suppress null values” will eliminate the consideration of those cases where the variable could not be resolved into one of the meaningful codes. In some cases null is used to handle missing cases or out of range values.

- G9. *Get a feel for all of the variables in the crash dataset.* All analysts should know what data are in their databases and what the general shapes of the distributions are. Set the filter to “All Records”, and then click Analysis/Frequency and click the “Select All” button under the list of variables. Then click OK. (Note: try out the “Suppress null values” option when a large number of nulls make the bar chart less meaningful. This is primarily to assist in making the tables and charts more readable.) Note the list of variables that appears in the window in the upper right corner of the Frequency output screen. Click on any of these and the output jumps to it. You can move between variables using the variable selection at the top right of the screen.
- G10. *Get a feel for the variables in the other datasets.* Alabama has Crash, Crash-Road, Road, and Person datasets for each year or grouping of years. The Person dataset is broken out into a different dataset because generally there are multiple occurrences of these items per crash. The crash dataset generally contains information on the entire crash (although some of the data in other datasets is replicated to the crash dataset to make analysis easier, e.g., causal driver data). The Road dataset contains information about the roadway. To explore these datasets, repeat the exercise of [G9](#), but first change the current dataset to one of the datasets you have not used.
- G11. *Find the time of day distribution for Montgomery County.* First change the current dataset back to the Crash dataset and set the filter to Montgomery County in the Filter shortcut. (The County filters are contained in a separate folder. When you click on the Filter dropdown you will see a folder titled “County” on the left side of the dropdown. By opening that folder you will see a list of the County filters available and you can then select the filter you desire.) Then click Analysis/Frequency/V007: TIME/OK. Make sure that this is Montgomery County by also running a frequency on the county variable: Analysis/Frequency/V001: COUNTY/OK.

## QUERIES WITH ESTABLISHED FILTERS

### FREQUENCIES

- Q1. *Which route has the highest number of crashes (for all crashes)?* Be sure that your dataset is set to Crash Data and that the filter is set to “All records.” Click Analysis/Frequency/267/OK. From your traffic safety experience, why is Friday quite high and Sunday relatively low? SAME as G5. Should I change G5 or is the repetitiveness good (Q1 goes with Q2, so I would not change this one)?
- Q2. *Which route has the highest number of roadway defect crashes?* First change the filter to “Roadway Defect.” Click the right of the Filter box and select “Roadway Defect.” Then do the frequency as in [Q1](#). *How does this compare to the results of [Q1](#)?* Click the “Display Significance” check box towards the top right of the screen and the cells with significant differences will be shown in red. The threshold for the colors can be modified using the “Threshold” button to the right of the Significance check box. This feature takes into consideration relative percentage. In this case, the number of crashes on each road is considered.
- Q3. *Check to see how many roadway defect crashes you had in your county and city areas.* Roadway Defect should still be current so you don’t need to change filters. Click Analysis/Frequency and then Variable 1 and 2 to look at the county and city areas. (Remember to use the Ctrl or shift keys on your keyboard or drag with your mouse to select multiple variables. For more information on this see exercise [G7](#).) Click OK. Is Jefferson County over-represented? Click the “Display Significance” box. Even though Jefferson County has the highest frequency of any of the counties, it is not considered over-represented because of the high proportion of the total crashes in the state that it has in general.

### CROSS-TABULATION

- Q4. *For your Division, how does the number of fatalities vary on different road types?* First hint: you cannot get the answer with frequencies, since this requires a *cross-tabulation* of Number of Fatalities (Variable 021) and Highway Class (Variable 10). Make your Division filter current. Click Analysis/Crosstab and then Variable 021- Number of Fatalities (for the columns) and Variable 10-Highway Class (for the rows). Then click “OK.” The yellow shaded areas indicate greater than expected proportions; the red shaded areas indicated that this difference is greater than 10%, which is usually quite significant. Exceptions occur with small sample sizes so if the numbers in the cells are less than 20, no statistical conclusions should be drawn.
- Q5. *What are the best selective enforcement times for alcohol related crashes?* First hint: with the alcohol related filter current, run a time of day by day of the week crosstab. Click: Analysis/Crosstab/8-Day of the Week/7-Time/OK. Note the red in the Sunday morning cells as well as Friday PM and Saturday AM. Some of the numbers in late Saturday PM are higher than late Friday PM; why no red? Remember this adage: for every

over-representation there has to be a compensating under-representation. So, the over-representation on Saturday morning causes the proportions to be lower on Saturday night even though the numbers are quite high on Saturday night – in fact, some of the highest of all days for several of the time slots. Conclusion: don't just blindly follow the colors ... they serve a quick first guide, but it is important to give all outputs serious thought and consideration.

- Q6. *On what types of roads are rural and urban crashes happening on most?* Set your filter to All Records. Then do a Rural or Urban by Highway Classification crosstab. Notice the colors showing the overall pattern.
- Q7. *Compare Wet and Dry surface conditions for the Causal driver on the different road types.* Set your filter to reflect the whole state (All Records) or your area of concern. Click Analysis, then Crosstab. Choose Surface Cond Unit C (V073) as your Columns and Highway Class (V010) as your Rows. Click OK. Your results show you what roadways you will need to focus on when looking for specific locations that need surface improvement.
- Q8. *Which route had the most bicycle fatalities?* Use the cross-tab tool (Variable 267-Route x Variable 21-Number of Fatalities). Note that this is a different question than: which Route had the most bicycle fatal crashes, which could be obtained from Variable 237-Crash Severity. These results will show which routes may need improved bicyclist infrastructure.
- Q9. *Assess the First Harmful Events and their location to get a better idea of where improvements could be made.* Set your filter to reflect the whole state (All Records) or your area of concern. Click Analysis, then Crosstab. Choose Event Location (V015) as your Columns and First Harmful Event (V016) as your Rows. Click OK. This is an example where you cannot trust the colors for statistical significance, but they do show overall patterns.

It is advisable to “Exit” out of everything before going on. REMEMBER: To exit, click on the Windows X button at the top right of the individual screen you are working with. This will be NOT be the red X at the top right of the CARE program but instead is the smaller x that is seen at the top right of each individual analysis window.

## FILTER CREATION AND COMBINATION

### FILTER COMBINATION

- F1. *On which route did a bicycle fatality occur on a school day?* You cannot get this from a crosstab because there are four factors involved: bicycles, fatalities, day and route. (If you only had three, as in [Q8](#), this could be done with a crosstab.) However, *CARE* easily enables *any* degree of specification. In this case, use the “Combine Filters” tool (Filters/Combine Filters) to create a filter for fatal bicycle crashes. Select “Bicycle” for one filter, “Fatal Crashes” for the other, and combine with an “AND.” A name for this filter will be automatically generated for you in the field titled “Combined Filter Name:” You can use the title given here (Bicycle and Fatal Crashes) or you can enter a new name such as “Bicycle-Fatal.” Once you are satisfied with the title for the filter, click “Generate Combined Filter.” Click OK when notified that the filter has been created and then click “Close” (to get rid of the Combine Filters tool). Once you do that the new filter will become current. Run frequencies of Variable 22-Type-Causal Vehicle and Variable 237-Crash Severity to validate the filter (i.e., to make sure it was set up properly). Then cross-tab day of the week by route with this filter current (Analysis/Crosstab/8-Day of the Week/267-Route/OK). (Note: all filters created get added to the filter list and remain there forever or until deleted.)

Note 1: *Need to click “Close” on the Combine Filters tool.* The Combine Filters tool was set up to create as many new filters (by combining old ones) as the user wants to at one time. For this reason it is necessary to click Close in order to get the tool off of the screen, to make the most recently created filter current and to be able to get on with the analyses.

Note 2: *Complements (the NOT check box).* The Combine Filters tool has an option to combine the complement of any filter as opposed to the filter itself. The *complement* of a filter is defined to be all cases that are not defined by the filter itself, e.g., the complement of the bicycle filter would be the filter that creates the subset of all crashes that did *not* involve bicycles. Without the capability users would have to create the “not bicycle” filter.

This is particularly handy when information mining runs ([IMPACT](#), discussed below) are being set up for particular local areas. For example, it might be of interest to compare roadway defect crashes in Montgomery County with all non-roadway defect crashes in Montgomery County; or similarly, to compare all of the roadway defect crashes in Montgomery County with those outside of Montgomery County. The Combine Filters tool enables these filters to be set up easily without the need to create a non-roadway defector a non-Montgomery county filter. Just click the appropriate “NOT” check box to get the complement of the filter that appears.

Note 3: *Filter Validation.* This is very important. Hours can be totally wasted if you think you have set up a filter correctly but later discover that there is something wrong with it (e.g., you used an AND when it should have been an OR). A common mistake is

to use a  $\geq$  on a “Vehicle 2” variable. This will include all of the single vehicle crashes in the subset (rarely if ever what is desired). Validation flushes out these inevitable errors and enables you to be sure that you are right before going ahead. Validation is not always 100%. By this we mean that the filters that are defined and combined are not always totally verifiable with a single (or even multiple) variable(s). For example, in exercise [F1](#) above, V237-Crash Severity totally validates that all of the crashes were fatal. However, V022-Type Causal Vehicle does not verify that all of the cases are bicycles. This is because we are only looking at the causal vehicle type, and the bicycle filter was made up of all possible ways that bicycles could be involved (not just as the causal vehicle). However, since the vast majority of causal vehicles are bicycles in the V022-Type Causal Vehicle output, that gives us the assurance that (1) we did in fact combine the right filters, and (2) the bicycle filter that we used indeed did specify bicycles. It is always a possibility in combining filters that those being combined are deficient.

Note 4: *Updates to the filter list.* The creation or combination of a filter, regardless of how it is done, creates an update to the filter list that is permanent until the user deletes it. Note, however, that all filters apply strictly and only to the dataset for which they were created. If you go to another year or another dataset for the same year, these filters will not be in that list. Filters are pointers to specific cases in the datasets, and therefore are local to the specific dataset. Filters are very small files that contain numbers that point to locations of the records of interest. They do not take up much space at all, and therefore there is no good reason to ever delete a good filter. Those that need to be deleted include: (1) those that were set up with errors in them (obviously), (2) those set up with misleading or untenable names – recreate them with names that are meaningful and that fall into the alphabetical listing in a place where you can easily find them, and (3) duplicates, since this can be very confusing for future reference.

- F2. *Create the following by combining filters: roadway defect motorcycle fatalities.* This will require two applications of the Combine Filter tool. Click Filters/Combine Filters and then AND together the Roadway Defect and Motorcycle filters. Once a title appears, click on “Generate Combined Filter.” Once this is created it will be necessary to Cancel out and get back into the Combine Filter tool in order for the Motorcycle and Roadway Defect filter to appear on the list. Click Cancel/Filters/Combine Filters and then set the Motorcycle and Roadway defect filter and Fatal Crashes into the tool. (All of these operations are AND operations, which is the default.) A name will be given to this filter but you may want to give the filter a shorter name (e.g., “Mot Rdwy Def Fatal”), and click “Generate Combined Filter.” This time when you click cancel this filter will become current. It would have been safer to validate after each step of this process, but since we did not do that, run a Frequency of the following variable for validation: 237-Crash Severity, 267-Roadway Defect and 22-Type – Causal Vehicle. Variable 237 will show 100% fatal, 267 will show only roadway defects and not the ‘None’ value, and the other will just show strong over-representation in the motorcycle area.
- F3. *Create the following by combining filters: roadway defect or crossover on interstates related injury or fatal crashes.* This is an **OR** of roadway defect and crossover, and an **OR** of injury and fatal, but the two must be **AND**ed together. (NOTE: An “Injury and Fatal

Crashes” filter should already exist on your system.) You can choose between “And” and “Or” using the radio buttons in the center section of the Combine Filters tool. Create the “roadway defect or crossover” and then the “injury or fatal” (if it is not already on your system) filters first, and then combine their resultant filters with an AND. Validate this filter by running frequencies for Variable 237-Crash Severity and Variable 13-Primary Contributing Circumstance and Variable 37 Maneuver Dr C.

## NEW FILTER CREATION USING FREQUENCY AND CROSS-TABLATIONS

Comment. This is a very powerful feature within *CARE* that allows the creation of very sophisticated filters directly from cross-tabulations. This has two advantages: (1) it allows filters to be generated without having to worry about AND and OR errors, and (2) it enables users to create filters as the result of the discovery of other important facts without going through the filter generation tools. Generally when using the tools above, it does not matter what the current filter is – that is ignored by the filter generation or combination tools. However, when generating filters from cross-tabs, *CARE* automatically “ANDs” the “OR” of the cells selected in the cross-tab to form the new filter.

Simple filters can also be created from Frequency outputs. Theoretically, any filter could be created by using the Frequency method to create a series of simple filters and then combining them with the filter combination tool.

- F4. *Create a simple Roadway defect Causal Vehicle filter just using V071.* With the All Records filter current, click Analysis/Frequency/V071: –Road Defects Veh C /OK. This will produce the frequency distribution for Road Defects of the Causal Vehicle. Then do the following:
- Hold the Ctrl key down and click the codes that involve road defects, e.g., “all but ‘None’, ‘Null’, and ‘No Causal Vehicle’ so that they are highlighted.
  - Right click in the shaded area and the left click on the Create New Filter From Selected Values” option. The Filter Editor will appear, but no edits are required.
  - Enter the Filter Name “Road Defects Vehicle C” in the appropriate space toward the bottom of the screen.
  - Click “Make This Filter” at the bottom right of the screen.
  - When the message appears indicating that the filter has been created, click OK. The newly created filter will be current.

Note: if you started with another (non-All) filter current, this would AND the filter that you just created to that filter. Thus, for example, if you wanted to create Fatal-Road Defect-Causal crashes, this could be done merely by making the Fatal Crashes filter current, and repeating the procedure given above.

- F5. *Suppose you were performing a road defect analysis and discovered from a crosstab that fatal and injury crashes were greatly over-represented in rural areas. You want to instantly create a filter of road defect rural injury and fatal crashes to do a follow-up study.* First set up the cross-tab. Make Roadway defect the current filter, and click Analysis/Crosstab/V237: Crash Severity/V009: Rural or Urban/OK. Single click on each of the

two cells in the top row (Fatal Crashes in Rural Areas and Injury Crashes in Rural Areas). When you single click on the cells they should show up in bold to let you know that they are selected.

In order to create the filter click on the Create Filter from Selected Cells button at the top of the screen. At that point the Filter Name Dialog box will appear to allow you to give it a name, e.g., Rd Def Rural Fatal and Injury. Click “Make This Filter.” The Create Filter tool appears briefly to verify that the filter has been created. Click OK. Validate the filter by running frequencies on variable 237-Crash Severity, 9-Rural or Urban and 38 Other Circ Driver C. Also, run a crosstab on 237 by 9 to see that everything else is filtered out except the two cells that were selected. Notice once again that *CARE* automatically ANDed the Road Defect Filter (that was current) with the cells of the cross-tab that were double-clicked.

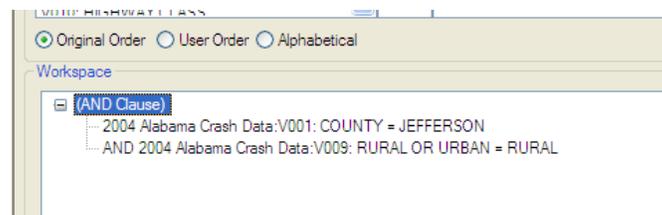
## NEW FILTER CREATION USING THE NARRATIVES

- F6. Create two filters: one for struck deer and a second for deer involved. The one for deer strikes is coded “Collision with animal: deer.” It occurs in seven different variables: C017, C019, C201 and C204-C207. OR them together to get all possible deer strikes. Note however, that this filter will not include those crashes that a deer caused but was not struck. Here is the procedure to get these records included using the narrative:
- Click the “Search” button (fourth from the left).
  - If you have not indexed the Narrative Data, click “Index Narrative Data.” When the Narrative Data Index Manager appears, click in the checkbox for the Crash Narrative line. Then click OK. It might take a while to index the narrative. However, once this is done it will not have to be repeated for other (i.e., non-deer) applications. Just skip this step.
  - Once indexing is completed click Search/Search Narrative Data. This will bring up the Narrative Data Search Pane.
  - Put the text that you want to search the narrative for in the blank line labeled “Query.” In this case it will be “deer” (not case sensitive).
  - Click Search. The results will appear below. In some complex cases it might be necessary to read through the results and determine which records really qualify and which do not. Click the checkboxes that you want included in the filter.
  - In this case it is highly unlikely that a narrative will contain the word “deer” and it may not be something that we want. So, just click “Select All” and they will all be selected.
  - Click Generate Filter. You will notice the typical filter generation screen appears.
  - All you need to do (in fact, all you can do) at this point is put something on the Filter Name line (be sure it is well chose ... not just Deer ... we would suggest “Deer Involved – From Narrative).
  - Click “Make this Filter” and it will create the filter and make it current.

It is interesting to compare the subsets created by these two filters. Our experience is that the “Deer Involved” subset will be about twice as large as the “Deer Struck” subset. Clearly education is needed to enable Alabama drivers to know the best maneuvers to minimize the severity or to even avoid crashes caused by deer. We remind you, however, that this exercise is not to make you a deer expert – it is to demonstrate how you might use the narrative to create filters. You might repeat the process with the word “dog.” There is no code in any variable for “Collision with Animal: Dog.” If you want dog related crashes this would be the only way to get to them. The applications are endless.

## NEW FILTER CREATION USING THE CREATE FILTER TOOL

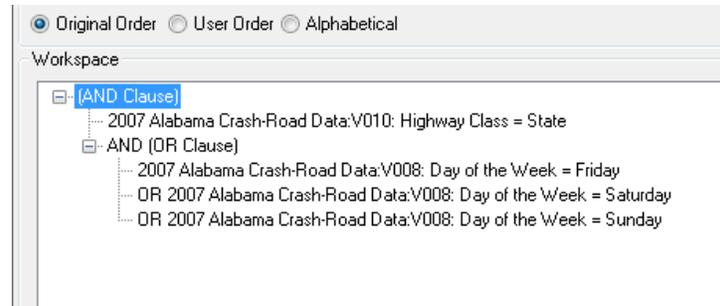
- F7. *Create a new filter for State Route Crashes only (use Variable 10).* Using a single year crash dataset, click Filters/Create or Modify Filters. Be sure you are using the *CARE 9* view (as opposed to the *CARE Classic View*) and then click Variable 10 and the code for “State.” Be sure that the line shown in your Workspace is highlighted, give it a “Filter Name” e.g., “State Route Crashes,” and then click “Make This Filter.” (The Create Filter tool works best at full screen – if it is not at full screen, click the square in the upper right hand corner of the tool.) Be sure to validate it by running a frequency on Variable 10.
- F8. *Create a new filter for Rural Crashes in Jefferson County.* (This is an AND, not an OR.) Click Filters/Create or Modify. Then click Variable 1 and set the county equal to Jefferson County. Then click Variable 9-Rural or Urban, and set this to Rural. No logic has yet been generated to combine these two items. On the right side of the screen, click on the “(AND Clause).” You should now see an “AND Clause” in your workspace. In order to combine Rural Crashes and Jefferson County, you will need to drag and drop both lines (one at a time) in your workspace *on top* of the “(AND Clause).” Once you do this you will see a tree structure (like the one below) that shows the “(AND Clause)” with two items listed below it.



Next, highlight the line in the Workspace that says “(AND Clause)” and give the filter a name, e.g., “Jefferson Rural Crashes.” Once you have named the filter and you are sure that the line in the Workspace that is highlighted is the line that says “(AND Clause)”, click on “Make This Filter.” Be sure to validate it by running a frequency on Variables 1 and 9, both of which should be at 100%.

- F9. *Create a new filter for all State Route crashes occurring on Friday, Saturday or Sunday.* This requires you to OR the days of the week together and then AND the “State Route Crashes” to that. Click Filter/Create or Modify, then OR together the days of the week (Variable 8: Day of Week = Friday or Saturday or Sunday). To do this you will add Fri-

day, Saturday and Sunday as three lines in your workspace and then add an “(OR Clause)” into your workspace. Next you will drag and drop each of the three codes (Friday, Saturday and Sunday) on top of the “(OR Clause).” Once that is complete, you will want to AND the State Route Crashes (Variable 10: Highway Class = State) specification to it. Once you click on 10: Highway Class, click “State” to add it to your workspace. Then add an “(AND Clause)” to your workspace. In order to achieve the desired result you will need to drag the line for “State” on top of the “(AND Clause)” and then you will need to drag the entire “(OR Clause)” on top of the “(AND Clause).” The finished product should look like the following:



Once you have your filter set up, be sure to highlight the top line of the filter (the “(AND Clause)”), give the filter a name, e.g. (“Friday, Saturday, Sunday State Route Crashes”), and click on “Make This Filter.” Validate this by doing a frequency on Variables 8 and 10; or perform a cross-tab of 8 x 10.

If there is any confusion in using the General filter generation tool, this can be eliminated by generating a simple filter for each of the components of the filter and then combining the simple filters with the Combine Filter tool.

Some CARE users prefer the filter creation tool that existed in CARE 7. Notice to the right of the Workspace there are radio buttons labeled “View.” These enable you to shift between the default view and what we have called “CARE Classic,” i.e., the method that was available in and before CARE 7. Try both of them and see which approach you like best. If you wish to reset the default for View, this can be done under Tools/Options. If you would like for CARE Classic to be set as your default type of filter creation, you can choose to do that under Tools/Options.

## FILTER CONVERSION, IMPORTING, AND DELETING

### FILTER CONVERSION

Filters in one type of dataset (e.g., person) can be used in another type (e.g., crash), provided the two datasets span the same time period. This would be useful, for example, if you wanted to obtain information that was in the Crash Dataset (e.g., Causal Driver Age) for all crashes in which at least one passenger was not restrained. In order to use a filter created in another type of dataset, it must be *converted* to the other type, and hence this process is called *filter conversion*.

- F10. *Convert your filter for the Roadway defect crashes so it can be used in the Person Data Source.* This requires you to first change your active dataset to the Alabama Person Data. This is done by clicking on the dataset dropdown and choosing the appropriate Default Data Source. Once the appropriate data source has been selected, click Filters/Convert Filters. Next, make sure that the Alabama Person Data is selected as the source dataset in the Convert Filter box that appears. Then select the filter that you wish to convert from the Crash Dataset into the Person Dataset (“Roadway defect” in this case). After you have selected the filter from the Source Dataset, click on “Add Selected Filters” and click “OK.” Once you have converted the filter and closed the Convert Filter window, you will need to change the current filter in order to use the filter that you just converted.

With the Convert Filter tool you can move any filter between the various datasets for a particular year. As you have just seen in [F10](#), once a filter has been created in one of the various datasets for a particular year, you simply need to convert it into another dataset. In many cases the supporting variables will not exist in the target dataset to create the filter without this type of conversion.

### FILTER IMPORTING

- F11. While filter conversion changes filters between types of datasets, filter importing changes filters of the *same type* between years (or other time periods). This is extremely valuable since if you have created dozens of filters in one year, you do not want to have to go through all of the trouble of creating them again when a subsequent year’s data is available. For example, any filters created for the 2004 Crash data could be imported into the 2003 Crash data. Click Filter/Import and choose a filter that was created in another dataset. Filters that were *converted* from other datasets cannot be imported.

### FILTER DELETION

- F12. *Delete any “bad” filters that you may have created.* Click Filter/Delete Filters and select from the list of user created filters (standard filters that are included with the data source download cannot be deleted). Once you have selected one or more filters to delete, click “OK” and follow the instructions.

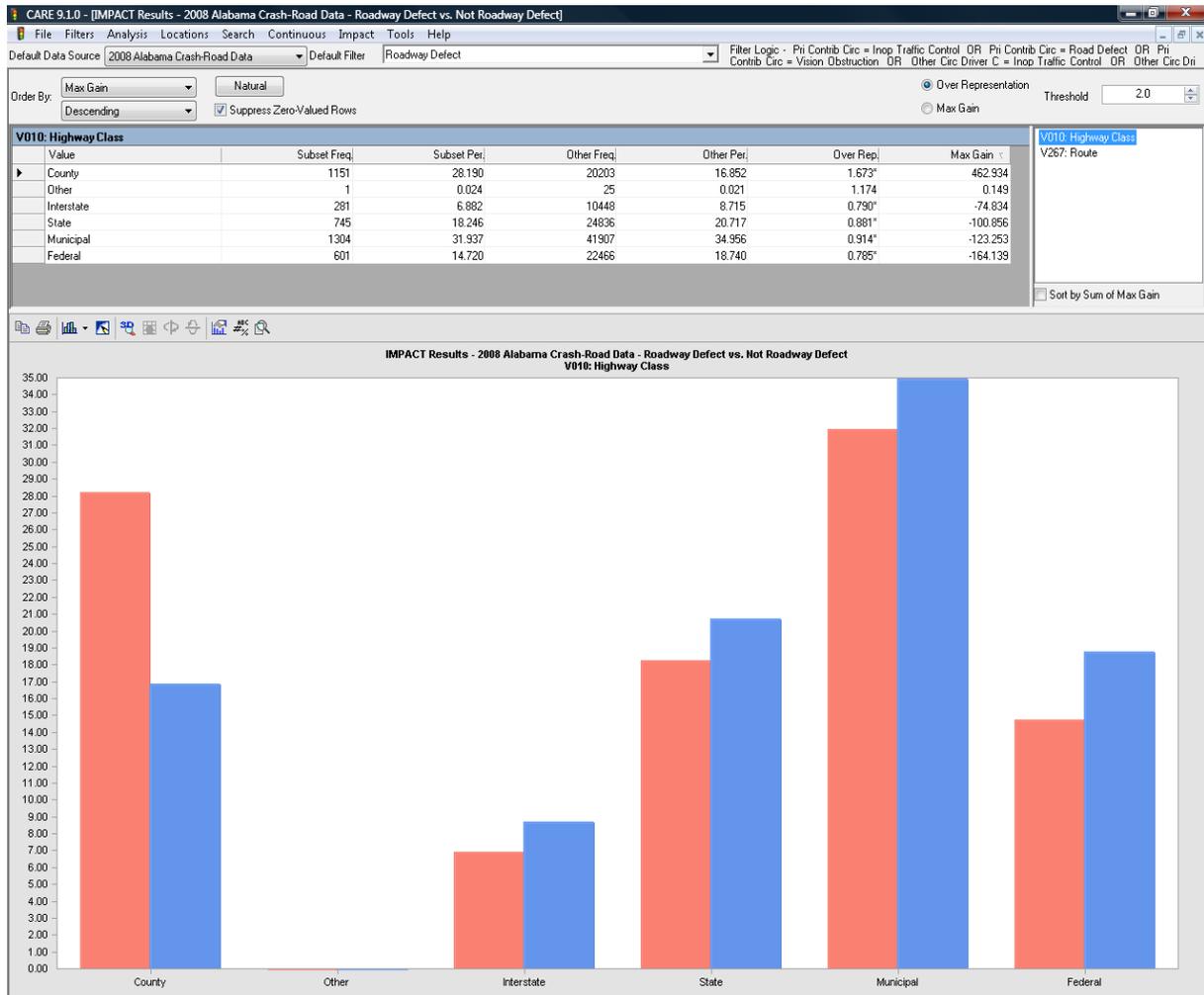
## INFORMATION MINING (IMPACT)

### IMPACT WITH SINGLE VARIABLES

11. *Use IMPACT to find which route would have the greatest impact in implementing roadway defect countermeasures.* Change your dataset to (the most recent year) 20XX Alabama Crash Data. Set “Roadway defect” as the current filter. Click: Analysis/IMPACT/ and then choose the variables that you wish to study, in this case Route (V267). Let all of the other options in the IMPACT Parameters pane default. The resulting default tabular and bar-chart outputs are in order of worst-first (i.e., the cell that has the greatest potential for gain is placed first and to the left). The ordering of the graphical output can be altered – see the [next exercise](#). Also, note the position of the Null value, which you will probably want to suppress in most future outputs.
  
12. *Put the graphical output of 11 in a natural ordering.* For variables that have a “natural ordering” such as time and days, this is quite useful for added visualization. In the upper left corner see the “Order By:” options. Where it says Max Gain, change it to Natural Order. You can also use the button to the right of the “Order By:” buttons, above the Suppress Zero-Valued Rows check box. This is a button that will allow you to toggle between Natural Order and Max Gain. The results will be re-ordered both in the table and the chart. Another way to change the ordering is to click on any of the table headings. Another click reverses the ordering.

*Description of IMPACT outputs.* An example IMPACT output for the roadway defect route variable is given below for the CY 2008 dataset. (Null value has been suppressed and the output has been placed in its “Max Gain” ordering.) The left (red) bars represent the current subset (Roadway defect Crashes for this example), while the right (blue) bars represent the proportion of crashes that are in the subset being compared (in this case the complement, which is all crashes for which no roadway defect causation was reported). Note the largest Max Gain first output lists the “worst first” – all other things being equal. The first two numeric columns of the chart give the frequency and percentage for the subset (as defined by the current filter). So, Alabama had 1,151 roadway defect crashes on County roads, which were 28.19% of its total roadway defect crashes. This is compared against the “Other” subset, which in this case is the non-roadway defect crashes. This indicates that 20,203 non-roadway defect crashes occurred on County roads, which is 16.852% of all non-roadway defect crashes. To determine if there is an over-representation of roadway defect crashes on County roads, the *proportions* must be compared. In this example,  $28.19/16.8524 = 1.673$ , which is to say that there are more than one and a half times the number of crashes than would typically be expected if County road roadway defect crashes were the same as County road non-roadway defect crashes. Note the double bar chart for County roads, which shows the same thing visually. A statistical test is performed, and the asterisk (\*) on the 1.673\* indicates that this is significant at the 99% level according to a statistical t-test that assumes a normal approximation of the binomial distribution. Statistical tests are not performed (no asterisk will ever appear) if either of the sample sizes used to compute the proportions (percentages) are less than 20.

Finally, the Max Gain (Maximum Gain) is the number of crashes that would be saved if we could somehow eliminate the over-representation. The total number of these crashes is 462,934 – notice that this is almost half of the 1,151 roadway defect crashes that occur on County roads. All other things being equal, this over-representation gives a measure of the maximum gain that could be expected if we could eliminate the particular (in this case “County road”) problem.



## IMPACT WITH MULTIPLE VARIABLES

- I3. *Run IMPACT for the first 20 variables for the Roadway defect subset and determine the most over-represented county, day of week, time of day, etc. The procedure is the same as I1, but now instead of running just one variable, click the first 20 variables in the IMPACT Parameters pane (this can also be done by clicking the first variable and then holding down the Down Arrow). Also, while in the IMPACT Parameters pane, click the “Suppress nulls values” option. Once the output is generated, click a variable in the variable list box and you can use your up and down buttons to control the display.*

## INFORMATION MINING (IMPACT WITH ALL VARIABLES)

- I4. *What information is in the database for roadway defect crashes?* IMPACT enables you to mine information from the database without having to even know what might be there. This is done by repeating exercise [13](#), but instead of just looking at the first 20 variables, click the “Select All” button to the bottom right of the “Variables” list. This will run IMPACT for all of the variables and display them all. Significance is determined by an asterisk and red highlighting in the Over Rep column. If you find that “vehicle 2” and “vehicle 3” variables do not add information, rerun the analysis with them excluded.
- I5. *Local area analysis.* Change the filter to your county and repeat the above study for your county (filters exist for all counties). Compare your county against the rest of the state for all variables. In other words, determine what is different and over-represented in your county as opposed to the rest of the state.

## INFORMATION MINING WITH NON COMPLEMENTARY FILTERS

- I6. *Local area analysis for a particular topic—compare your county’s roadway defect crashes with those of the rest of the state.* Create a filter of the roadway defect crashes in your county. (This can be done by forming a county frequency for roadway defect crashes and creating a filter for your county from that frequency.) Determine how they vary from those in the rest of the state. Notice that you can either compare your area’s roadway defect against all of the state alcohol, or you can compare your area’s roadway defect against all non-roadway defect crashes in your area. *Once the appropriate filters are set up*, the procedure is as follows:
- Set the current filter to what you want to appear on the left (subset) columns of the table and the left (red) bars.
  - Click Analysis/IMPACT/ to bring up the IMPACT Parameters pane.
  - Unclick the box in the Settings (lower) area that says “Use the complement of the selected subset as the comparison subset.” This will enable the “Comparison Subset” area above it.
  - Choose the filter for the subset that you want to compare the current filter’s subset to.
  - Select the variables that you want to output, or Select All.
  - Click OK.

## LOCATIONS: MILEPOSTED

### MILEPOSTED HOT SPOTS

LM-1. *How many 1.0 mile segments had 100 or more crashes?* Set your Data Source to Alabama Crash-Road Data. Click Locations/Mileposted Locations to bring up the “Select An Analysis” window. Note the parameters that can be selected to specify your search:

- High Crash – Search by X crashes in Y distance.
- Early Warning – Search by increased crash rates between 2 times periods.
- Comparison – Search by crash percentages between 2 subsets of crashes.
- Rate/QC – Search by high crash rates as compared to other roads with similar ADT and volume characteristics.
- User-Specified – Examine user-selected routes/hotspots.
- High Crash Variable Size – Search by X crashes in Y distance, adjacent hotspots combined.
- Kernel – Locate hotspots with kernel weight above the mean plus a user-defined number of standard deviations.

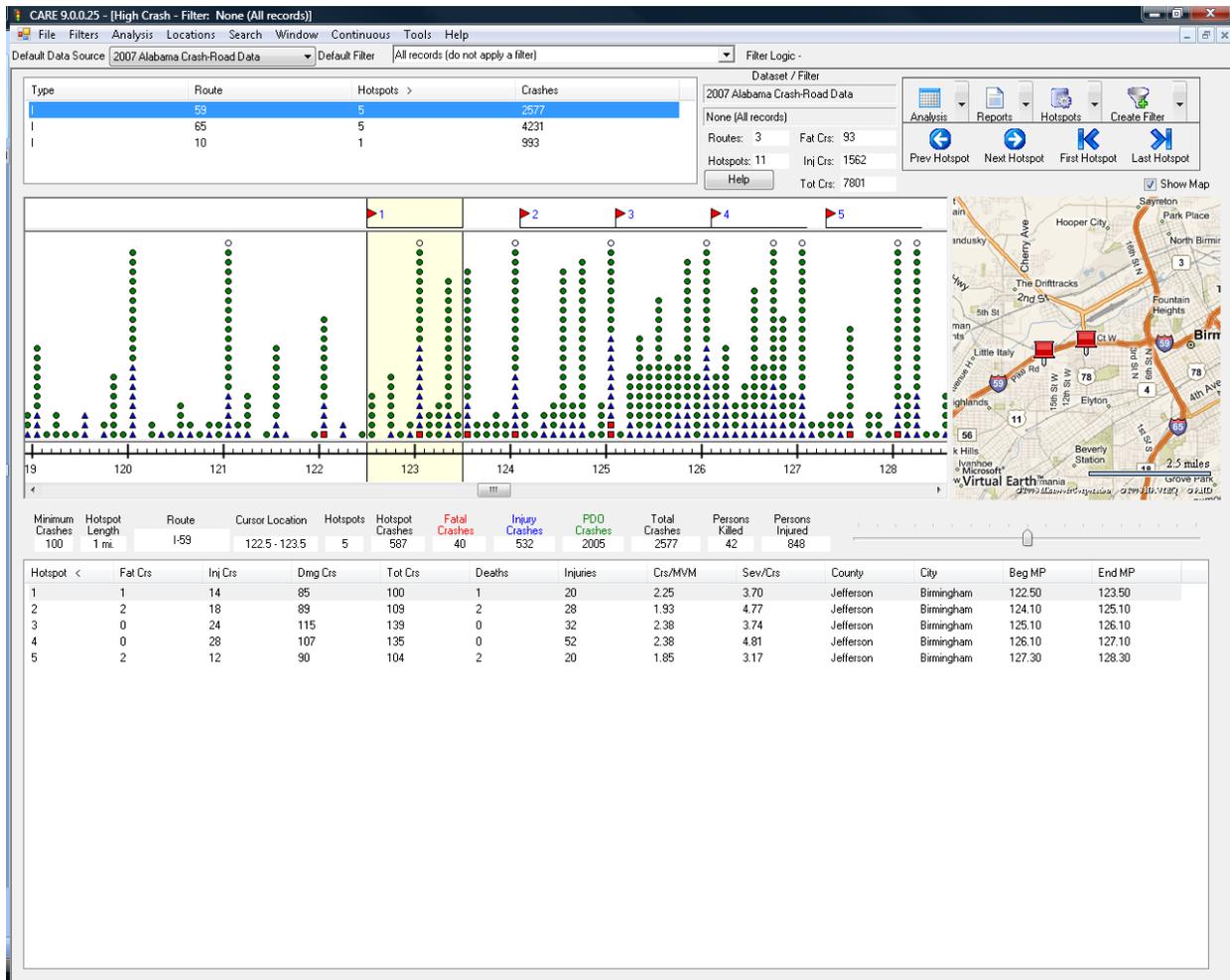
Choose High Crash and click Next to bring up the “Select Dataset/Filter Parameters” window. Note the items that can be entered to specify locations:

- Dataset – this indicates the dataset you will be using but does not allow you to change the dataset from this screen.
- Filter (defaults to filter set as “Default Filter” in main CARE environment) – the filter in place for the location analysis you are performing. The filter can be changed from this tool at any time.
- Months in Database (defaults to number of months in active dataset) – the number of months in the dataset you are using. This will rarely need to be changed but can be changed at any time. An example of when you might need to change this is if you were using a one year filter in a three year dataset. In that case the default would be 36 but you would want to change it to 12.

For this example, be sure your filter is set to “All records” and then click Next to bring up the “Select Route/Hotspot Parameters” window. Note the items that can be entered to specify locations:

- Minimum Crashes (default 5) – the minimum number of crashes in order for a segment to qualify (to get all segments, enter 1).
- Hotspot Length (default 0.5 miles) – the segment length in which the minimum number of crashes must occur in order for the segment to qualify.
- Route Type (default All – all route types) – This indicates the route type your search will be restricted to but it does not allow you to change the route type from this screen. To look at a certain route or routes, you can create a filter (see [F6](#)) for the desired route(s) prior to running Locations or use the Route Selector that appears on your Locations results screen. The [Route Selector](#) will be addressed on page 19.
- Minimum Hotspots – the minimum number of hotspots for the road to qualify to be in the list (defaults to 1).

Change the Minimum Crashes to 100 and the Hotspot Length to 1.0 and then click Finish. This will bring up your results screen, similar to the one seen below.



This screen combines the summary information for all routes with the specific information for the route in question along with the ability to change between any routes in the search. In order to fully describe this screen, it will be broken down into four main sections: (1) Summary Information, (2) Route Selector, (3) Specific Hotspot Information and (4) the Location Toolbar.

In the top middle of the screen (to the right of the route selector) you will see some basic summary information returned after your search. The screen should be similar to the one below:

Dataset / Filter	
2007 Alabama Crash-Road Data	
None (All records)	
Routes: 3	Fat Crs: 93
Hotspots: 11	Inj Crs: 1562
Help	
Tot Crs: 7801	

The information contained in this screen will be summary information based on the criteria you entered in the [“Select Route/Hotspot Parameters”](#) screen. The following is a brief description of what each of the rows tells you:

- Dataset/Filter – the Dataset and Filter used to achieve the results displayed
  - Routes – the total number of routes in the state in your dataset that matched the criteria you set
  - Hotspots – the total number of hotspots found on the routes within the state based on the criteria you set
  - Fatal Crashes – The total number of fatal crashes found on the routes returned in the route selector. This includes all crashes, and not just those contained within the hotspots.
  - Injury Crashes – The total number of injury crashes found on the routes returned in the route selector. This includes all crashes, and not just those contained within the hotspots.
  - Total Crashes – the total number of crashes found on the routes returned in the route selector. This includes all crashes, and not just those contained within the hotspots.
- Once you have reviewed the summary information, you are ready to select a route for investigation.

The Route Selector is included at the top left of the screen and allows you to move between the various routes returned in your search. Each route that meets the criteria you set in the route search parameters is included in the route selector. Below is a screenshot of the Route Selector section of the screen.

Type	Route	Hotspots >	Crashes
	59	5	2577
I	65	5	4231
I	10	1	993

Note the column headings seen in the Route Selector:

- Type – the roadway type: Interstate or State Route
- Route – the route number of the roadway.

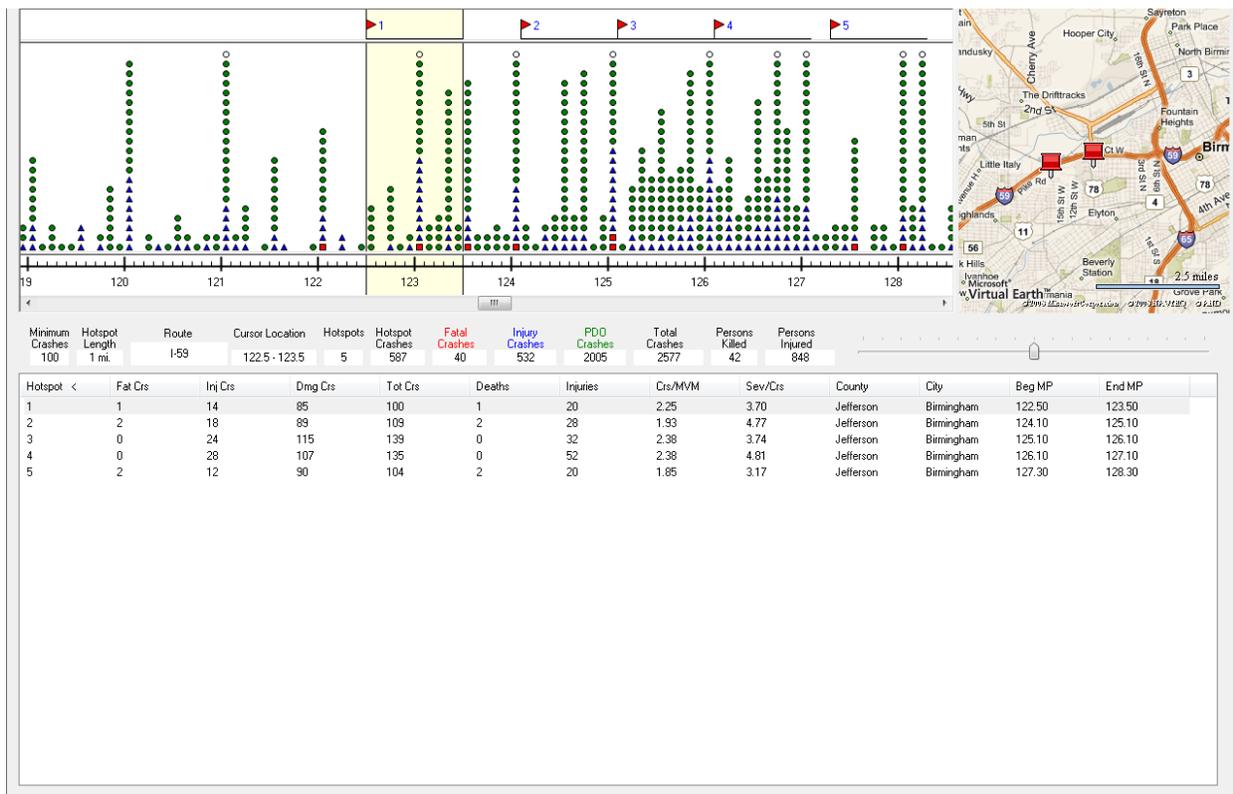
- Hotspots – a location that qualifies according to the criteria that was specified in the [“Select Route/Hotspot Parameters”](#) tool is called a hotspot. This column indicates the number of hotspots found for the roadway.
- Crashes – the number of crashes found for the entire roadway.

Note that the number of hotspots and crashes will depend on the current filter.

You can sort by any of these columns simply by clicking on the column heading.

Finally, to get detailed graphical output on any specific roadway, highlight the line by clicking on it. As you do this, the Specific Hotspot Information at the bottom of the screen will change. If the criterion needs to be adjusted to get more or less locations, click Locations/Mileposted/ High Crash and repeat the [process](#) given above.

### SPECIFIC HOTSPOT INFORMATION SCREEN DESCRIPTION



The following describes the various characteristics of the Specific Hotspot Information screen (see example above):

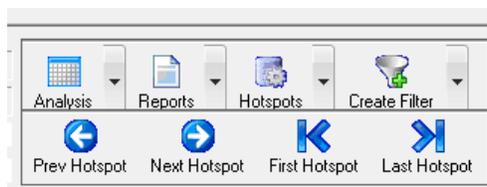
- Minimum Crashes – this information (seen between the graphical representation of the crashes and the list of hotspots) reminds the user of the minimum crashes per hotspot length they set in their search criteria
- Hotspot Length – this information (seen between the graphical representation of the crashes and the list of hotspots) reminds the user of the hotspot length they set in their search criteria

- Route – this indicates the route that you are looking at within the Specific Hotspot Information screen
- Cursor Location – In the graphical representation of the roadway there is a cursor (sometimes referred to as a “bucket”) that shows up shaded in light yellow/beige. This bucket can be moved up and down the roadway and its size can be adjusted smaller or larger using the mouse. This information tells you the exact parameters and location of the bucket.
- Hotspots – the total number of hotspots on the route selected
- Hotspot Crashes – the total number of crashes that occurred in the hotspots on the particular route you are looking at
- Fatal Crashes – the total number of fatal crashes on the route you are looking at
- Injury Crashes – the total number of injury crashes on the route you are looking at
- PDO Crashes – the total number of property damage only crashes on the route you are looking at
- Total Crashes – The total number of crashes on the route you are looking at. This number will always be greater than or equal to the number of hotspot crashes.
- Persons Killed – The total number of people killed on the route you are looking at. This number will always be greater than or equal to the number of fatal crashes.
- Persons Injured – The total number of people injured on the route you are looking at. This number will always be greater than or equal to the number of injury crashes.

Hotspots can be sorted by any of the columns by clicking on the column heading.

- Green Dots on screen – Each dot seen on the milepost screen represents a crash. The dots represent PDO crashes.
- Blue Triangles on screen – Each blue triangle seen on the milepost screen represents an injury type crash.
- Red Squares on screen – Each red square seen on the milepost screen represents a fatal type crash.
- Numbers and tick marks on screen – Each number represents a milepost and each tick mark represents a subsection of that mile (typically one tenth of a mile).
- Scroll bar – This scroll bar, seen immediately under the dots on the screen allows the user to move up and down the roadway.
- Scale bar – Beneath the scroll bar and to the right of the “Persons Injured” information there is a scale bar. This can be adjusted to the right or to the left in order to change the scale of the milepost and crashes seen on the screen.
- Street Map – This feature, located to the right of the strip map (dots, etc.), shows you the geographic location of the current selected hotspot. The pins point to the beginning and end milepost of the selected hotspot. Using the scroll button on your mouse or by double clicking anywhere on the map, you can zoom in to any location. A left-mouse double click while holding Alt will zoom out. You can always click on a hotspot in the hotspot list to return to the default view.

Once you are familiar with a particular route or a particular hotspot, you may be interested in doing some analysis on these hotspots. To aid in this, the Location Toolbar (shown below) has been added at the top right of the screen:



This toolbar allows the user to perform analysis using the mileposted routes information.

- Analysis – provides Frequency, Crosstab, IMPACT, and Profiling capabilities for selected hotspot(s), all hotspots, and several other options.
- Reports – a number of standardized reports can be produced for one or all of the hotspots. These reports are exported to Word by default and are generally used for field investigation. You can also export any of these reports to Excel using the Reports menu. Also, under this feature, you can produce a map of hotspots using the GIS option.
- Hotspots – allows you to add, modify, define or delete a hotspot on a route.
- Create Filter – allows you to create a filter from one or more hotspots on the current route.
- Prev Hotspot – this moves the bucket to the previous hotspot on the selected route and makes it current (highlights it in the list at the bottom of the page).
- Next Hotspot – this moves the bucket to the next hotspot on the selected route and makes it current (highlights it in the list at the bottom of the page).
- First Hotspot – this moves the display to the beginning of the roadway and makes the first hotspot on the selected route current; it also places the bucket on this hotspot.
- Last Hotspot – this moves the display to the end of the roadway and makes the last hotspot on the selected route current; it also places the bucket on this hotspot.

LM-2. *Find the top twenty 0.2 mile segment locations in the state for injury (including fatal) crashes. Make the “Injury or Fatality” filter current; validate this filter with a frequency of V237 before proceeding. Click Locations/Mileposted Locations to bring up the “Select An Analysis” window. Select High Crash/Next. On the “Select Dataset/Parameters” window, change the filter to “Injury and Fatal Crashes” if you have not already and click Next. On the “Select Route/Parameters” window, set the “Hotspot Length” entry to 0.2 miles. It will be necessary to play with the number of crashes in order to get the list to approximately 20 or so hotspots. Try 10 crashes in 0.2 miles. This produces a list of about 5 roads and 15 hotspots. This is fewer hotspots than what we are looking for. The general rule is: *to increase the number of roads and locations on the list, increase the segment length and/or reduce the minimum number of crashes; to reduce the number, reduce the segment length and/or increase the minimum number of crashes.* Currently there is no way that the system will find a specific number of hotspots, so it is up to the user to fine tune the number in this way to get the number of locations that will be given further consideration (e.g., for HES funding).*

LM-3. *View the specific hotspot information screen and adjust the hotspots on any of the roads in the Route Search Results list.* Using the results from [LM-1](#) or [LM-2](#), click on the road that you wish to view using the Route Selector. At this point you will be presented with the specific hotspot information screen of the roadway with dots, triangles, and/or squares above it representing the crashes. Green dots represent property damage only crashes; blue triangles are non-fatal injury crashes and red squares are fatal crashes. Hotspots are flagged. A list of the hotspots is given at the bottom of the screen. This list is “clickable” and the current hotspot indicator (also called a “bucket”) will move to the location selected on the strip map.

Notice the columns of output on the hotspot listing under the strip map. Most of these are self explanatory. The severity metric (Sev/Crs) is calculated based on the number of injuries in the crashes and their respective severities. The weighting factors for the severities are as follows:

- Each C injury = 2
- Each B injury = 4
- Each A injury = 6
- Each fatality = 10

These weighting factors are summed over all crashes at the location and then divided by the million vehicle miles in order to get a relative weighting factor. This is a relative weighting only, but large disparities should be given special consideration since a relatively high value here will indicate a location that has more severe crashes in terms of severe injuries and perhaps fatalities.

Recognize that generally the purpose of the “High Crash Locations Display [Hotspots]” is to generate information that can be used in field investigation, so that countermeasures to roadway hazards can be formulated and evaluated. Other uses of this display may include the formulation of non-roadway countermeasures as well, such as the development of selective enforcement strategies. This display is a powerful and flexible tool in this regard, which enables the analyst not only to view hotspots, but to obtain information on them and even to modify them when the visualization indicates that the criteria omitted crashes that should be included in the hotspot.

LM-4. *Find all of the locations on I-10 that have 6 or more crashes in 0.4 miles.* Create an I-10 filter using V267: Route (See [F7](#)). Click Locations/Mileposted Locations/High Crash/Next, make sure your filter is set to I-10/Next and make the following adjustments to the “Set Route/Hotspot Parameter” screen:

1. Set the minimum number of crashes to 6.
2. Set the Hotspot Length to 0.4 miles.
3. Click the “Finish” button.

Notice that in your Route Selector at the top left of the screen you only have one route that appears.

- LM-5. Once you get the I-10 output (there are buttons on the screen – primarily in the hotspot listing or in the location toolbar – for each of the following functions):
- a. Find the highest frequency location (click on the heading: Tot Crs).
  - b. Find the location with the most injury crashes (click on the heading).
  - c. Find the location with the highest rate (Crs/MVM).
  - d. Find the roadway defect of vehicle C distribution for c.
  - e. Modify the location to include some of the surrounding crashes (drag the bucket by the handle with the left mouse button and stretch it by grabbing the right side of the bucket).
  - f. Crosstab surface condition by surface type for e.
  - g. Perform an IMPACT on e for Variable 13.
  - h. Enlarge the highest frequency location to be an even 1 mile. Include as many crashes around the original location in this mile-long segment as possible.

LM-6. *Repeat some of the analyses above with other criteria, e.g., 10 or more crashes in 0.4 miles, and 10 or more crashes in 0.3 miles.*

LM-7. *How many locations on all interstates have 6 or more crashes in 0.4 miles?* Using the Interstate filter, click Locations/Mileposted Locations/High Crash/Next. Be sure your filter is set to “Interstate,” set your Minimum Crashes = 6 and your Hotspot Length = 0.4. Click “Finish” and a list containing all of the Interstate routes that match your criteria will appear.

## **LOCATIONS: NON-MILEPOSTED**

Be careful of what filter is set when doing high crash locations. If just one type of crash is under consideration (e.g., pedestrian), then a filter may be in order. However, most of the time investigators will want to look at all crashes at a location, and therefore the “ALL” filter should be selected (if not already current) when doing location work.

## **NON-MILEPOSTED INTERSECTIONS**

Important NOTE: Just because a location comes up in the “non-mileposted” CARE outputs does NOT mean that these locations are not on mileposted roads. Non-mileposted roads (i.e., city streets and county roads) can only be accessed by the “non-mileposted” options. However, you will notice that some of these listing will contain information on mileposted (State, U.S. and Interstate) roads as well. The rule is this: whatever is entered into the database will be processed by CARE. So, for example, if the officer in the field records a location by milepost and also puts in node number(s) for it, CARE will process it both ways.

- LI-1. *Find and list all of the intersections that had 40 or more crashes.* Click Locations/Non-Mileposted Locations/High Crash/Next, make sure your filter is set to All Records, click Next, change the default minimum number of crashes to 40, make sure that only Intersections are selected and click Finish. The Maximum Locations can be used to restrict the number of locations that are output. If you do not use the Maximum Locations to restrict the list and the list is too long, you will need to raise the threshold (the lower the threshold, the longer the list). In order to adjust your list of results you will need to go back to Locations/ Non-Mileposted Locations/High Crash and enter your new criteria in the “Maximum Locations” space.

## SPECIFIC HOTSPOT INFORMATION SCREEN DESCRIPTION

Totals/Averages													
Crashes	Fatal	Injury	PDO	Avg Sev	Persons Killed	Persons Injured	Total Locations						
3548	6	453	3088	2.50	6	601	62						
Type	Total	Fatal	Injury	PDO	Sev	Per KI	Per Inj	County	City	Link	Node1	Node2	Description
Int	122	0	12	110	1.95	0	16	Mobile	Mobile	140	1319	N/A	AIRPORT BLVD at I40
Int	108	0	11	97	1.76	0	13	Jefferson	Homewood	5-3	344	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	108	0	17	51	2.41	0	20	Tuacalosa	Tuacalosa	5-7	16	N/A	ALA 6 MC FARLAND BLVD at AL 7 MCFARLAND BLVD
Int	108	0	19	89	3.23	0	23	Jefferson	Homewood	145	3525	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	87	0	11	75	2.18	0	17	Tuacalosa	Tuacalosa	5-6	269	N/A	15TH ST/5168 at ALA 6 MCFARLAND 15 ST E
Int	85	0	12	74	3.14	0	15	Madison	Huntsville	5-83	2396	N/A	JORDAN LN SR-83 at UNIVERSITY DR
Int	85	0	6	79	1.41	0	9	Jefferson	Hoover	1-659	15139	N/A	INTERSTATE 459 at SR-150 INTERCHANGE
Int	81	0	6	75	1.23	0	9	Jefferson	Hoover	5-150	195	N/A	MONTGOMERY HWY US-31 at RIVERCHASE RD
Int	78	0	18	63	3.85	0	19	Mobile	Standard	1-65	9410	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	77	0	10	67	2.73	0	10	Shelby	Hoover	1-425	8200	N/A	INTERSTATE 65 at VALLEDALE RD
Int	73	0	9	64	2.05	0	14	Lee	Auburn	5-147	834	N/A	SR 147 COLLEGE ST at SR 267 SHUG JORDAN PKWY
Int	70	0	5	65	1.71	0	12	Montgomery	Montgomery	1187	4223	N/A	TAYLOR RD at VAUGHN RD SR 110
Int	70	1	9	60	2.43	1	13	Jefferson	Hoover	1-459	252	N/A	INTERSTATE 459 at SR-3 US-31 INTERCHANGE
Int	68	0	4	64	1.32	0	4	Montgomery	Montgomery	1187	7740	N/A	INTERSTATE 65 at CITY LIMIT
Int	66	0	9	57	3.18	0	11	Shelby	Alabaster	1-65	175	N/A	INTERSTATE 65 at US-31 SR-3 INTERCHANGE
Int	64	2	16	46	7.03	2	22	Jefferson	Hoover	1-459	15132	N/A	INTERSTATE 459 at I-65 INTERCHANGE
Int	64	0	5	59	1.56	0	8	Tuacalosa	Tuacalosa	1305	591	N/A	ALA 6 MC FARLAND BLVD at RICE MING RD 1305
Int	63	0	10	53	2.06	0	10	Montgomery	Montgomery	5-8	1377	N/A	EAST BLVD SR-8 US-80 at ATLANTA HWY SR-8 US 80
Int	61	1	7	53	2.95	1	11	Mobile	Mobile	1346	2123	N/A	AIRPORT BLVD at UNIVERSITY BLVD
Int	58	0	3	55	1.03	0	3	Tuacalosa	Northport	5-4	391	N/A	AL 13 US 43 at AL 6 / MCFARLAND BLVD
Int	57	0	6	51	1.58	0	7	Fla	Trey	5-10	47	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	57	0	7	50	2.11	0	12	Shelby	Hoover	9-38	8097	N/A	US 280 at VALLEDALE RD
Int	56	0	8	48	2.68	0	8	Jefferson	Birmingham	1-65	8299	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	56	0	8	48	2.68	0	8	Jefferson	Birmingham	1-65	1771	N/A	INTERSTATE 59 at ARADELPHIA RD SR4 US78
Int	55	0	4	51	2.18	0	5	Jefferson	Birmingham	1-65	2136	N/A	INTERSTATE 59 at I-85 INTERCHANGE
Int	54	0	8	46	2.96	0	10	Montgomery	Montgomery	5-8	3124	N/A	EAST BLVD SR-8 US-80 at I-85 INTERCHANGE
Int	53	0	5	48	1.70	0	5	Mobile	Mobile	1-65	1361	N/A	GOVERNMENT BLVD US HWY 90 at I-65
Int	53	0	6	47	2.26	0	7	Montgomery	Montgomery	1-85	3095	N/A	INTERSTATE 65 at PERRY HILL RD INTERCHANGE
Int	52	0	7	45	2.50	0	9	Tuacalosa	Tuacalosa	5-69	12172	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	50	0	7	43	2.00	0	7	Houston	Dehan	5-210	1256	N/A	ENTERPRISE HWY US 84 at SR 210 ROSS CLARK CIRCLE
Int	50	0	7	43	2.20	0	9	Baldwin	Daphne	5-19	459	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	50	0	2	48	0.80	0	3	Montgomery	Montgomery	1-65	3014	N/A	HWY 31 at I-65 INTERCHANGE
Int	50	1	9	40	4.40	1	18	Montgomery	Montgomery	1187	7514	N/A	EASTWOOD GLEN DR at TAYLOR RD
Int	49	0	5	44	1.84	0	5	Lee	Auburn	1137	683	N/A	SR 267 SHUG JORDAN PKWY at WIRE RD
Int	47	0	4	43	1.91	0	6	Montgomery	Montgomery	5-6	4718	N/A	INTERSTATE 65 at SOUTH BLVD INTERCHANGE
Int	46	0	3	44	0.43	0	2	Jefferson	Homewood	5-148	295	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	46	0	8	38	3.70	0	9	Madison	Madison	1-565	539	N/A	NO DESCRIPTION AVAILABLE at NO DESCRIPTION AVAILABLE
Int	46	0	5	41	1.96	0	12	Madison	Huntsville	5-1	897	N/A	MEMORIAL PKWY N SR-1 at SPARKMAN DR AT US 72 E
Int	45	0	3	37	3.56	0	8	Jefferson	Birmingham	7675	4625	N/A	GADSDEN HWY at ROEBUCK PKWY

The following describes the various characteristics of the Specific Hotspot Information screen (see example above):

- Crashes – the total number of crashes that occurred under the particular criteria you specified.
- Fatal – the total number of fatal crashes on the route you are looking at.
- Injury – the total number of injury crashes on the route you are looking at.
- PDO – the total number of property damage only crashes on the route you are looking at
- Persons Killed – The total number of people killed on the route you are looking at. This number will always be greater than or equal to the number of fatal crashes.
- Persons Injured – The total number of people injured on the route you are looking at. This number will always be greater than or equal to the number of injury crashes.
- Total Locations – the total number of hotspots on the route selected.

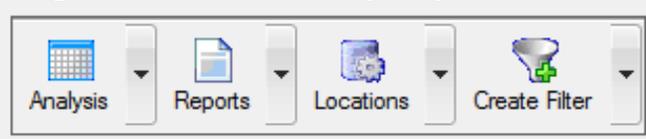
These are all directly from their corresponding *CARE* variables with the exception of the severity index. This is calculated from the most severe injury in the crash (*CARE* Variable 217). It does not depend on the numbers that were injured within each crash, since this is mostly a function of the number of passengers in the vehicles involved; instead, we feel that the worst injured person provides a better metric as to the overall severity of the crash. A weighting factor is applied to produce a metric with a unit related to the “equivalent C injuries” based on the Variable 217

(worst injury in the crash) value for all of the crashes at that location. The index reflects the following weightings:

- Fatal injury = 5 C injuries,
- A injury (visible/carried from the scene) = 3 C injuries,
- B injury (bruises/abrasion/swelling) = 2 C injuries,
- C injury (minor/pain/fainting) = 1 C injury,
- Property damage only = 0 C injuries.

These numbers are obtained and summed for all crashes at the location, and then divided by the number of crashes at that location. Since the number of PDO crashes is usually proportionally high, this resultant number is multiplied by 10 to get the index. Thus, the final unit obtained for the severity index is: equivalent C injuries per crash times ten. This index will always be between 0 (exclusively PDO crashes) and 50 (exclusively fatal crashes). Thus, the higher the number, the more likely the location is to produce fatal injuries, while if it is zero, it indicates that it is likely to have only PDO crashes. Typically this index falls between zero and five.

Hotspots can be sorted by any of the columns by clicking on the column heading.



This toolbar allows the user to perform analysis using the mileposted routes information.

- Analysis – provides Frequency, Crosstab, IMPACT, and Profiling capabilities for selected hotspot(s), all hotspots, and several other options.
- Reports – a number of standardized reports can be produced for one or all of the hotspots. These reports are exported to Word by default and are generally used for field investigation. You can also export any of these reports to Excel using the Reports menu. Also, under this feature, you can produce a map of hotspots using the GIS option.
- Hotspots – allows you to add, modify, define or delete a hotspot on a route.
- Create Filter – allows you to create a filter from one or more hotspots on the current route.

LI-2. For the location with the greatest number of fatalities in the [LI-1](#) output, find the following:

- surface condition (V072) and surface type (V073) distributions for the causal vehicle,
  - So, this is good information about this particular crash location, but what if you want to know which wet road crashes were on what surface type.
- surface condition by surface type crosstab,
  - One of the yellow shaded cells is telling you that as far as crashes on wet concrete go, there was more than the state average at this location. Remember, it is taking into consideration the volume of traffic at this location.
- IMPACT to compare this location against the rest of the locations in the dataset (the rest of the state). Hold control down while you select variables 008, 063, 072, 082, 252, 255, 256, 257, 258, 259, 261, and 267.

All of this can be done by first highlighting the location of concern and then using the Analysis dropdown menu at the top right of the screen. The options seen in the Locations Toolbar are similar to those discussed in the Mileposted section of the training. Note that multiple locations can be highlighted, if collective results are of interest.

- LI-3. *For the location at the bottom of the list generated in [LI-1](#), obtain Crash Numbers (which can be used to retrieve hard copy of the original report). Go to the bottom of the list and highlight the target location. Then use the Reports dropdown menu at the top right of the screen to select “Crash Numbers” in order to obtain Crash Numbers.*
- LI-4. *Generate a collision diagram for the location still highlighted from [LI-3](#). Click the Reports dropdown menu at the top right of screen, and near the bottom of the reports list, click Intersection Magic (IM). (We will have a session on [IM](#) later on in our training.) To get out of IM, click the X at the upper right corner of its screen and respond to the query box with Yes. Note: IM will not work on 64-bit machines.*

REPORTS. Notice that in the upper right portion of the screen that there is a drop-down menu for Reports. We will not generate these reports in our exercises. However, it is important for you to know that these are available. These are generally the standard reports that ALDOT has specified to be used to perform crash location investigation for hazard elimination. Each of them comes out and appears in a Word or Excel document that can be saved, edited and then printed by standard Word or Excel output techniques.

## NON-MILEPOSTED SEGMENTS

- LI-5. *Repeat Exercises [LI-1-LI-4](#), but this time for segments (generally non-mileposted). Go back to the CARE main environment window (click Exit). The only change in procedure here is at the very beginning. Click: Locations/Non-Mileposted Locations/High Crash/Next, make sure your filter is set to All Records, click Next, and choose the radio button for Segments rather than Intersections. All of the other procedures are identical to those given above.*
- LI-6. *Explanation of the severity calculations for intersections and segments. The outputs for all of the intersection and non-mileposted segment locations list the total number of crashes (Crashes), the number of fatal crashes (Fatal), the number of non-fatal injury crashes (Injury), the number of Property Damage Only (PDO) crashes, a severity index (Avg Sev), the number of persons fatally injured (Persons Killed) and the number of persons injured (Persons Injured).*
- LI-7. *Find and list the top 30 non-mileposted crash frequency locations in the state, and order the list by number of injury crashes first. Click Locations/Non-Mileposted Locations/High Crash/Next, make sure your filter is set to All Records, click Next and select a minimum number of crashes that will generate at least this number. Change the “Maximum Locations” from its default to 30, change the radio button to Both, and click Finish. Then click the Injury column heading. Note that the output listing is in order of the number of injury crashes.*

LI-8. *Obtain a list of 50 locations (intersection and segments) statewide that have the highest number of injury and fatal crashes.* Set the current filter to “Injury or Fatality.” Set Minimum Crashes to a low enough number to generate at least 50 locations (5 will do it). Set Maximum Locations to 50. Be sure the radio button is used to select “Both” Intersections and Segments. Click Finish. Note that the statistics given are strictly for injury and fatal crashes – all PDO crashes have been filtered out.

## INTERSECTION MAGIC

Intersection Magic (IM) is a powerful collision diagram generator that has been incorporated into *CARE* so that you can draw collision diagrams for any location specified with *CARE* as either a high-crash location or individually specified (above two sections). Note: IM will not work on 64-bit machines.

WARNING: Some of the options below will change parameters within IM. As long as you stick to the directions given below, there will be no permanent damage. However, if you go beyond these directions and attempt to perform other functions, damage could result in terms of not being able to restore IM to its original state. Until you get experience with IM, we urge you to limit the options to those detailed here.

- IM-1. *Obtain the collision diagram for the highest crash “intersection” location in Autauga County.* First, establish the filter for Autauga County. From the *CARE* main interface, click the shortcut drop-down menu for “Default Filter:” click the County Filters folder and then Autauga County. This will set Autauga County as the area for analysis.

From the *CARE* main interface, click Locations/Non-Mileposted Locations/High Crash/Next, verify that filter is set to Autauga County/Next, check the Intersections radio button and change the minimum crashes from 20 to 15 and click Finish. Once the locations are listed out, click and highlight the one at the top. Then click Reports/Intersection Magic Diagram of Current Location.

Note: The Intersection Magic option is available under the Reports button in the Locations Toolbar regardless of how a location is defined (even for mileposted segments). It is not *just* for intersections. The following exercises are for the purpose of demonstrating additional capabilities once an Intersection Magic collision diagram is generated. Generate the diagram specified in [IM-1](#) or any other diagram in order to try out these capabilities. It is recommended that the diagram that you experiment on not have too many crashes displayed on it, since once the diagram gets too crowded it fails to communicate effectively. However, we will see below how to use IM to easily subdivide complex diagrams.

- IM-2. *Move a given crash on the diagram.* This re-spacing can be quite helpful in improving the readability of the diagram. Placing all similar crashes together can be quite helpful since it organizes the diagram. While IM places icons on the diagram according to where it best determines the crash to occur, space limitations require crashes to be offset on a first come-first served basis. To move a crash, move the cursor (which is in the form of a magnifying glass) over the *center* of the crash and drag it (move the mouse holding the left button down) to the location where you want it. The bulls-eye in the magnifying glass disappears when it is centered over the crash.

Comment 1: Be sure that you click and drag *only* on the center of the crash. Doing this in any other portion of the diagram will move or “pan” the entire diagram (reverse the process to pan it back).

Comment 2: Recognize that IM has no way from the crash records to place crashes on the diagram. It infers the location from the directions, damage areas and crash types. Thus, it is quite important that you fine tune a diagram to be sure that the crashes are located within the intersection or segment properly.

IM-3. *Get detailed information on a specific crash.* If you want to know what the information is that is driving IM (along with some other information that is retained for your information), left click on the center of the crash of interest and a list of this information will be produced, along with an enlargement of the diagram of the crash.

Comment 1: IM only has space for about 44 variables, some of which are mandatory to make IM run. We have included within IM those variables that are crash dependent and not location dependent, since location dependent variables will be the same for all crashes (e.g., the type of traffic control). Most all of the causal-driver variables are included, most of which do not impact the icons on the diagram, so these provide additional information on that particular event that can be quite useful in analyzing the one event.

Comment 2: If more information is desired on a given crash, or for summaries of all crashes at the location, go back to the [Reports](#) menu within *CARE* where any of the standardized reports, frequencies and cross-tabulations are available. This gives access to *all* available information on the crash and location, not just the subset that drives IM. Generally, the standardized reports within *CARE* that summarize the crashes for a given location are more comprehensive and useful than those produced by IM.

Comment 3. It is possible to format a report for a given crash and print it using IM. Explore this by clicking on the “Reports,” “Listings,” and choosing one of the options listed. You can also click the Acc List button to the left of the diagram in this exercise. These features allow you to sort the crashes based on several different criteria. Both will produce a list of the crash dates and report numbers.

## INTERSECTION MAGIC SHORTCUT ICONS

The next few exercises will use the IM shortcut icons that appear in a column to the left of the IM diagram. *These icons will be referenced by the names listed below*, which also includes a brief description of their use within the context of *CARE*:

- NEW – this button enables you to specify another location directly using IM. This is a fairly complex procedure, and it is much easier to specify locations within *CARE* first, so we defer discussion of this until the fundamentals of IM are covered.
- Tools (Screwdriver and Wrench) – this brings up the “Diagram Settings” tool (can also be generated with F4). Think of this as enabling you to do most things that affect the appearance of the diagram. We will call it the “tools” button.
- Backdrop (looks like an intersection backdrop with a red X in the middle) – gives options for changing backdrop for such things as T intersections or segments.

- Filter (looks like a coffee filter) – this is used to create, save, load and otherwise manipulate IM filters. Once defined, the filter immediately goes into effect and will therefore modify the current diagram. This is very effective when diagrams contain too many crashes to make them readable since it enables sub-diagrams to be generated based on filters that might be predefined (e.g., only rear-end crashes).
- Wand – changes color of crashes according to either a dynamic user-defined criteria or a pre-defined and saved filter.
- Acc List – is used to set up and create a sorted list of crash attributes (one line per crash).
- Chart (pie chart) – allows the set up and generation of a wide range of frequency charts for and IM variable for the location.
- Zoom out (Magnifying glass with a minus sign on it). This is generally disabled. To experiment with it on your machine, left click on blank space on a diagram with the shift key depressed. This will zoom in. Use this button to zoom back out. (There is no further discussion of this icon below.)
- Print – used to print IM diagrams; does the same thing as clicking File/Print.
- Script – IM support the creation and running of scripts for advanced users with programming capabilities. (There is no further discussion of this icon below.)

In the instructions that follow, the terms used above will be used to describe the icons on the various buttons (e.g., “the wand button”).

- IM-4. *Remove the labels on the crashes.* The default label that has been set up is the date of the crash (subject to change). Suppose you do not want any labels to come out on the diagram. Click the tools button, which brings up the “Diagram settings” dialogue box. To turn labels off, click the “Visible” button (slightly to the right of the very center of the dialogue box). Reverse the process to turn them back on.
- IM-5. *Modify the labels on the crashes.* Let us suppose that we want to replace the current label with the crash number. First, be sure that labels are “turned on” by applying procedures in IM-4. Changing the labels on each crash is not accomplished via the shortcut buttons. The Field List tool can be brought up using Ctrl + F3 (press the Ctrl key down and hold it down while you press the F3 button). This tool enables you to insert and delete the fields that you want to appear on the icons for each crash. Replace whatever is the current label with the time of day variable. In this example we first delete the item that is in the Field List by clicking “Delete line.” Then scroll to the Time in the “Field:” list and click “Insert.” Once this is done, click OK and the change should appear on the diagram. (A substitute for Ctrl + F3 exists using the buttons at the top of the IM display; click Diagram/Configuration/Edit Labels to get the Field list box.)
- IM-6. *Change the diagram default appearance.* Click the tools icon to get the Diagram settings box. We want to consider the following for this exercise (see the label within the box):
- Spacing (between crashes) – change the 50.0 to 100 and press Enter or click OK. Try other spacing’s until you are satisfied with the appearance.
  - Pen width – try changing it to 4.

- Label font – click this button and try changing the font size to 30. It can also change the font and the color of the label.

These settings revert back to their defaults once you get out of the diagram. Changing the defaults is covered below.

- IM-7. *Change the key (legend) to comments.* Click the tools icon to get the Diagram settings box. This will require two operations, one to tell the system that you want to replace the key (legend) with comments and the second to spell out the comments:
1. At the top under Window view: click the “6 Comments” radio button, which will automatically turn off the Key button. (Reverse the process to get the legend back).
  2. Toward the bottom of the Diagram settings box, click the Comments button. This will enable you to edit the (currently blank) comments.
- The first three comments are left justified; the last three are right justified.
- IM-8. *Change the heading.* This can be done by clicking Annotations (right above Comments – see [IM-7](#)) in the Diagram settings box. Or, for a shortcut, move the magnifying glass in the diagram with the mouse up until it is in the heading at the top of the diagram. It will change from a magnifying glass to the shape of an I. When that happens, click the mouse and the dialogue box will appear allowing you to modify the diagram’s heading.
- IM-9. *Change the backdrop to a T intersection.* Click the backdrop button (third button down – looks like an intersection). Double click on the [...] under “Directory:” to change to a higher level directory. (The highest level does not have a [...] on it. Double click on [int\_t] to bring up the t-intersections options (this is the 4<sup>th</sup> entry in the list). Then **SINGLE** click each of the various alternative backdrops under the “Schematic:” column. (Double clicking these options is equivalent to both selecting and clicking OK; it will change the backdrop schematic.) When satisfied with the backdrop that you want, click OK. *This becomes the default backdrop and it will remain in effect until changed, even if you bring up a completely new location.*
- IM-10. *Changing the backdrop **back** to its original default.* To reverse the process, click on the backdrop icon. It should be right where you left it. Double click on the [...] to change get to the highest level directory (that which has no [...] option on top of its list). The original default is in the [int\_4] subdirectory, so double click on [int\_4] (third down on the list). Then single click on “normal.ara” under the “Schematic:” column. Click OK and the original default will be restored.

*Warning: go through and totally understand [IM-9](#) and [IM-10](#) BEFORE you try any other backdrop changes. The following explanation will also help.*

*General explanation.* The backdrop on IM diagrams is changed by replacing the files that produce the backdrop. The “Select a schematic” tool is provided to aid you in changing the current backdrop file. The first column of this tool enables you to switch between subdirectories, each of which contains a set of backdrop files with a given set of characteristics. The second column contains the names of the files themselves. As long as you keep this in mind you cannot get into too much trouble. However, in order to take full

advantage of this feature, it will be necessary for you to browse around and try some things out. As long as you can get back to the default using Exercise [IM-10](#) above, there should be no problem.

Major rule: **double** click on the left (Directory :) column; **single** click on the right (Schematic :) column to surf the various backdrops.

If you double click on the right column it will go ahead and make this backdrop current without your clicking OK. This can be annoying, and you *are* going to do it, so get used to it.

IM-11. *Change to a non-intersection backdrop.* First, create an IM output for a segmental type location either for a mileposted or non-mileposted segment. Take a look at it first since some crashes that are listed as “segments” fall very close to intersections, and so cross traffic might not be in error. If all of the crashes (except a possible few coded in error) are running all north-south or all east-west, then obviously the intersection type backdrop needs to be replaced with something that is more realistic.

Usually the location of crashes will need to be changed (using the procedures given in IM-2) when the backdrop is changed, since IM tries to assign crash locations within an intersection.

Click the backdrop shortcut icon. Double click on the [..] until you get to the highest level. (This list will be: approach, corridor, int\_4, int\_t, int\_y, mid\_blk, mult\_int, old, special, sys.) There are several choices for a segment, either corridor or mid-block. We have found them in the [corridor], [mid\_blk] and [old] subdirectories. Some of these are still in development and they do not allow the crashes to appear. We have found most of the backdrops that we need in the [old] subdirectory. Experiment with different backdrops as you have opportunity.

In summary, the recommended procedure for setting up a north-south corridor type backdrop is to click the backdrop icon and then [..][..]/[old][old]/mid\_ns.ara/OK. Two occurrences indicate a double-click.

IM-12. *Limit the type of crashes output.* This is especially valuable when a diagram gets crowded with crashes to the point where it fails to effectively communicate. By filtering out certain crashes and allowing them to come out on another complementary diagram, the communication value of the collision diagram is maintained. It is necessary before going forward to do the following:

- Determine the variable(s) that you are going to use for filtering, and
- Determine the values of the variables to be used.
- Note: only IM variables can be used for filtering once in IM; any combination of variables can be used to filter within *CARE* prior to calling up IM.

For a simple example, consider restricting the output to just those that occurred in daylight. Bring up any diagram in IM. The IM variable to be used for filtering is Lighting

(click on any crash to see the list of variables within IM). Once the collision diagram has been produced by IM, click on the filter shortcut button (the one that looks like a coffee filter). This will bring up a (blank) filter creation tool. The creation of filters in IM is not that much different from *CARE*. To start the process, click on Edit1. Then, under “field names:” scroll down until you find the “Lighting” variable. Then, under “field values” scroll down until you find the daylight variable. Once set up, click on the “insert expression” button and (Lighting = Daylight) should appear. Click OK on this tool and on the next as well. The filter will automatically go into effect and limit the output to just daytime crashes. To summarize how to create a filter for a diagram:

- Click the filter icon,
- Click Edit1,
- Play with the edit tool until you get the right logical expression,
- Click OK twice.

IM-13. *Saving and calling back filters.* It is not necessary to create a new filter for each diagram. Instead of creating one as given above, it is possible to retrieve one that is previously created and stored. The process is quite simple:

- Click the filter icon,
- Create the filter as given in [IM-12](#),
- Before clicking the second OK, click Save filter and give it a name (this name must be eight characters or less but you should make it descriptive since this will make it much easier to retrieve later),
- Click OK to get out of the filter mode.

To call the filter up, a similar process is used:

- Click the filter icon,
- Click “Load filter,”
- Select the filter you want and click OK,
- The code for the filter will appear; click OK to make the filter current under IM.

IM-14. *Clearing the current filter.* To remove the filter that is in effect, click the filter icon and then “Clear filter.” IM will return to all crashes.

IM-15. *Changing colors of specific types of crashes.* Another way of making a collision diagram more readable is to select certain types of crashes and assign them a different color. This is done as follows:

- Click the wand shortcut icon to bring up the “Highlight” color bar,
- Click the color that you want to assign; this will bring up the “Field name” selection box,
- Click on the variable that you want to use to control the color of crashes (e.g., weather if we want to highlight those crashes that occurred in the rain); this will bring up “The value” selection box,
- Select the value that you wish to use to control the color.

The crashes that have the characteristics will be changed in color to what you selected on the color bar. More complex filters can be applied by right-clicking on the “Highlight”

color bar, which will bring up the “Filter name” selection box, so the same selection procedure can be applied from this point as applied as discussed in [IM-13](#).

IM-16. *Generating an accident list.* A report can be generated of any/all of the IM variables, one line per crash. The process for this is:

- Click the Acc List icon,
- Set up the report by clicking “Edit RPT,”
- Fields can be added or deleted from the report format, and the field widths can be altered,
- When satisfied with the variables that you have included, click OK
- A different sort order can be specified from the “Accident list” tool,
- When completed, click OK and the report will be generated.
- Clicking on the X in the upper right hand corner will bring up a query box: Save (Accident list)? If you want to print the report, save it under a name, and note the subdirectories. You can pull it up with Word and print it out.

IM-17. *Generating charts for the location.* IM has an extensive and sophisticated charting capability that enables the frequency distributions for the IM variables to be displayed for the location. To create such a chart:

- Click the chart shortcut icon,
- Choose any one of the existing example “Available charts,”
- Click OK.

To add another variable to the list of “Available charts:”

- Click the chart shortcut icon,
- Click New (at the bottom of the “Chart:” icons column),
- Click and select a variable from the X axis variable drop-down box,
- Click “Make it,”
- If necessary, change the name (generated from the variable name) to something that is more descriptive,
- Click OK – the “Available charts” box will re-appear;
- Click the name of the new chart that you just created, and then OK.

There are countless variations in the types and display options for IM charts. If you find these useful, wade into this and try out other options.

IM-18. *Printing a diagram.* Click the print icon (just below the magnifying glass). This brings up a tool that allows adjustment of margins.

IM-19. *Saving a diagram.* It is easy to generate and print diagrams. However, after changing the backdrop and dragging crashes around, quite a bit of time and effort will be put into a diagram. To save it click: File/Save diagram. You will be prompted to give the diagram a name. It is recommended that you accept the default folder since this will enable the other retrieval functions in IM to work properly. Give the diagram a meaningful name re-

cognizing that you will need this to retrieve it, and that you may be saving dozens of diagrams in the future.

IM-20. *Retrieving saved diagrams.* To retrieve saved diagrams, click: File/Open diagram and then select the name of the diagram that you want. Do not use “Retrieve last diagram” since the query method used within *CARE* does not support this function.

IM-21. *Updating defaults.* If you find yourself doing the same thing over and over again on every chart that you bring up, you might want to reset the defaults to save time in the future. Right click on the diagram and then click: Configuration/Save as default. Be careful since this will set all of the available defaults to what you currently are seeing on the screen.

Summary. It is obvious that IM has far more options than we have reviewed here. However, this is sufficient for most of the modifications that most users will ever need. Feel free to browse around the various menus that have been discussed above and try out different options. Be careful, however, in that some of these get “under the hood” and may not be easy to reverse. Those that involve the alteration of IM systems files (as opposed to just the selection of options on a tool) are the ones that need to be handled with care.

IM-22. *Using IM to call up a new location apart from CARE.* Considerable effort was expended in setting up IM as a procedure that could be called by *CARE* to avoid the data handling complexities that IM requires. It is simple to specify a location in *CARE* using any of the high-crash location or location specification tools and then turn it over to IM by clicking Intersection Magic on the Reports drop-down menu. However, IM does have a capability, once it is invoked, to process a location directly. The purpose for specifying the procedure here is to support advanced users who might wish to use this feature. The following must be performed prior to specifying a location directly within IM:

- The *CARE* subset current when IM was invoked must contain that location.
- The city code must be specified in the IM filter (realize that a rural area in a county is specified by a city code).
- The IM Node1 specification must be set to the location of concern (the location with the appropriate node code within the city specified).
- The IM filter must also specify that Node2 = 0 (to avoid also including those segment locations that have the same Node1 specifications).

To try out the feature, use the New button to reproduce a diagram that you generate out of *CARE*. In the following we will be looking at node 890 in Prattville (city 426):

- Click the New shortcut icon,
- Click Node at the top of the dialogue box,
- Make sure the date range is consistent with the dataset that is current,
- Click # to the right of “The node:” specification and enter the node code (in this example 890),
- Click Edit in the “Filter:” space and be sure that the filter that you create is set to city = Prattville and Node2 = 0. It will appear: ((City = Prattville)) & ((Node2 = 0))
- Click OK to generate the diagram.

## LOCATION SPECIFICATION

An alternative to finding and analyzing high crash or high crash rate locations is to specify the particular location of concern to you. Before doing this, determine if the location is best located as a mileposted location or non-mileposted. If non-mileposted, then determine whether it is best located as an intersection (single node) or as a segment (two nodes). Given this, recognize that *you will need the following information before* attempting to process the location:

- Milepost location
  - Lowest state route number for the segment under concern
  - Milepost range corresponding to the location
- Non-mileposted intersection
  - City or county rural area in which location resides (select off drop down menu)
  - Node code for location
- Non-mileposted segment
  - City or county rural area in which location resides (select off drop down menu)
  - Beginning and ending node codes for location

City/county specifications are not required for mileposted locations in that the mileposts will specify this automatically, and these roads typically transcend cities and counties. For non-mileposted location, city/county specifications will be selected off of a drop-down menu. It is imperative that these are defined correctly in that most of the same node codes are re-used in every city and non-urban county areas throughout the state. It is also important to obtain the location node code(s) from the appropriate county or city map before attempting to locate them within *CARE*, since *CARE* does not provide a menu of nodes to select from.

Reminder: be sure your filter is set to ALL, unless you are only interested in a particular type of crash at the location.

Alternative methods: any of the locations below could be specified by creating a filter that excludes all crashes except for those at the location. This is accomplished by clicking Filters/Create Filter from Alabama Location..., and following the directions within the location filter tool. The disadvantage of this approach is that it does not give direct access to the location reports.

- LS-1. *Mileposted location.* Analyze the crashes occurring at I-10, milepost 22-29. This will use the User-Specified feature shown in the “Mileposted Locations” Section. To review: click Locations/Mileposted Locations/User-Specified/Next and follow these directions:
1. Be sure filter is set to “All” and then click Next.
  2. Set Route to IN0010 from the Route drop-down menu at the top of the screen.
  3. Set Start Milepost to 22 and End Milepost to 29.
  4. Click Add This Hotspot.
  5. Click Finish.

On the results screen you will only see results for I-10 in the route listing. The information below the route selector will be the graphical output for I-10. At this point you may “walk” up and down the roadway to get to the specific location using the scroll bar and

the scale bar (located to the bottom right of the scroll bar). This enables you to customize the display to make it the most useful to the user. Locations under 10 miles can generally be defined with the “bucket.” Locations over 10 miles long can be obtained by setting the criterion longer or by creating a filter for the location (Filters/Create Filters from Alabama Locations).

- LS-2. *Non-mileposted intersection.* Find all crashes at the intersection of I-165 and SR-17. Looking up the location on the node map, it is at Node 873 in the city of Prichard in the county of Mobile. Click Locations/Non-Mileposted Locations/User-Specified/Next. Make sure filter is set to All Records/Next. Then select the radio button for “List of Locations.” Click Next. Set the county to Mobile and the city to Prichard *first*. Then enter 873 in the Node 1 slot. Click Add To List and then click Finish.

The list that appears for this example contains just this one location. However, you probably noticed that multiple locations can be entered on the “Enter Location List” tool. In that case the output listing will be identical to that obtained by doing a high-crash listing on intersections or segments. The difference is that now you are controlling what is on this list (so it might not be a list of “high crash” locations). But, from this point forward you have all of the capabilities for output reports and IM that you had with the high-crash list. These capabilities are similar for all of the location specification examples given below.

- LS-3. *Non-mileposted segments.* Let’s try three of them in Montgomery city. You have already gone to the map and found the following: 2749 2846; 2614 2735; 5593 6112. The procedure is the same as that given for [LS-2](#), but instead of entering just one node number, enter two. Unless the county or city changes, they do not need to be re-specified for each location.

- LS-4. *Perform a corridor study (all segments and intersections in a continuous section of roadway)* that involves the following nodes in the city of Northport (Tuscaloosa County): 387, 388, 390, 391, 392 on S-13. Click Locations/Non-Mileposted Locations/User-Specified/Next. Make sure filter is set to All Records/Next. Click on the radio button for “Corridor.” Click Next. Set the county and city, enter S-13 in the Link box and then after entering each node number, click “Add To List.” After all nodes are added, click Finish. The nodes should be entered sequentially since they will come out in the same order as they are entered.

Note: be sure to check the city and the county after you enter them. The drop-downs do not always work as expected.

- LS-5. *Specified list of nodes.* Suppose you wanted to consider all possible combinations of the links and nodes associated with a given set of nodes. For this example consider all of the nodes in Tuscaloosa between the intersection University Blvd. and Crescent Ridge Road down University Blvd. to Route 216. Looking at the map, the nodes are 234, 9529, 236, 237, 239, 240 and 241. Click Locations/Non-Mileposted Locations/User-Specified/Next. Make sure filter is set to All Records/Next. Click on the radio button for “List of Nodes.”

Click Next. Select the county and city (both Tuscaloosa) from the dropdowns and then enter the nodes one at a time after each of which click “Add To List.” Note that the results might be over-kill, but there is no reason that detailed reports have to be generated for all of these locations. The only difference between this and the [LS-4](#) (corridor) program is that the “Specified List of Nodes” program searches all combinations of nodes, so if the officer “misses” a node between two that were entered, this will be output as well. However, if something is entered erroneously, it will be output as well.

LS-6. *Before-After Studies.* Typically before-after studies require multiple-year datasets, which are available at the *CARE* site for downloading. We will do this example using the one-year dataset just for an example. Suppose that some countermeasure was implemented on July 1<sup>st</sup> in the most current year on I-59, Milepost 72-92 (Tuscaloosa City rural). Determine if any effect is indicated. Click Locations/Before-After. Don’t be overwhelmed by this tool – it is for both mileposted and non-mileposted reference systems, and it allows multiple locations to be assigned differing dates. For this example, go through the following steps (use the Tab key or mouse to move to the next field):

1. Click Add Report,
2. Enter “Report Name” – I-59 Study (just a label, can be anything),
3. Click Ok,
4. Click View/Manage Locations in Selected Report/Yes,
5. Set “Location Type” to Mileposted,
6. Enter “Item Name” – Speed Limit Change (this will be the countermeasure or change implemented),
7. Set the city to Tuscaloosa,
8. Set Route ID to I-59,
9. Begin Milepost: 72,
10. End Milepost: 92,
11. Before Start: Jan 1 200X,
12. Before End: Jun 30 200X,
13. After Start: Jul 1 200X,
14. After End: Dec 31 200X,
15. Click Save,
16. Click OK.

Once back on the View, Print, and Manage Before-After Reports window, click View/Print Selected Report. Note where the “Report Name” and the “Item Name” appear. This capability allows for multiple locations to be processed simultaneously, so there is a line-by-line location summary by severity as well as a study summary.

LS-7. Add another location to the report. On the View, Print, and Manage Before-After Reports window, click View/Manage Locations in Selected Report. Click Add Location to clear all the fields so you can enter another location. Make sure you change Location Type to Int/Seg and change the Item Name. Dates stay the same. Use Highway 82 (S-6) in Tuscaloosa at node 391.

## ROADWAY CHARACTERISTICS INFORMATION

This section deals with roadway characteristics, and it is *strictly for mileposted roadways and crashes on these roadways*. There are two ways that roadway characteristics are represented:

1. The roadway characteristics have been appended to the normal *CARE* data so that there is an indication of the characteristics that apply for each crash – we call this the *crash-roadway* file; and
2. The crash information has been written to a location information file (one case for every 0.1 mile segment in each direction) – we call this the *roadway-crash* file.

The roadway-crash file is of particular interest in that it allows us to compare segments that have crashes against segments that do not have crashes using IMPACT. In addition, it would enable the comparison of crash histories on roadways with any two roadway different roadway characteristics.

We will see exactly what roadway characteristics are available when we open the Roadway-Crash file.

- R-1. Open the roadway-crash file that is available to you using *CARE*. This will usually be called Road Data or Crash-Road Data. Click the data set dropdown menu and select the Road Data.
- R-2. Explore the data on the Road Data. There are less than 30 variables (in the road data-sets), so run a frequency distribution for all of them. Analysis/Frequency/check Select All/OK.
- R-3. Run a cross-tab of Curvature by Superelevation. Generally, outside curves should have positive superelevation and inside curves should have negative superelevation (normal drop-off from the crown for drainage purposes). Click Analysis/Crosstab/8/12/Check Suppress Nulls/OK.

Comment: This is an example of situations/locations that can be identified as potentially hazardous without even looking at crash data. The ideal would be where all locations were either on or close to the diagonal that forms a line from the NW corner to the SE corner.

- R-4. Create a filter for crash segments and then do an IMPACT study of all crash segments vs. all non-crash segments. Filter: Filter/Create/Modify Filters/21/0 and then put “Crash Segments” in the Filter Name block. IMPACT: (make sure the “Crash Segments” filter is current); Analysis/IMPACT and be sure that the complement box is checked. Check Select All/OK. Check Sort by Sum Max Gain.

Why does this produce misinformation? Clue: the answer is in the ADT variable.

- R-5. To eliminate the problem with variations of ADT, it is necessary to only compare segments within a given ADT. Using V025 (ADT Rate 4), create a filter for 2-lane routes between 3501 and 5250 ADT. Then using that, create a filter of the 3501-5250 ADT segments that have crashes and those that do not. These two filters will enable a proper

comparison to be performed. This can be done by setting up the preliminary filters using frequencies and cross-tabulations, and then setting that filter current and further qualifying it with the crash and non-crash frequency. The following indicates the way to do it directly with the filter creation tool.

**2 Lane ADT 3501-5250 filter:** Filter/Create/Modify Filters/Var 25/“3501 to 5250”/Var 3/“Two Lanes”/AND Clause. Drag the two values on top of the AND Clause. Make sure the AND Clause is highlighted, Insert the filter name and click Make This Filter. A good filter name: “ADT 3501-5250 Two Lane.”

**ADT 3501-5250 2Ln Crash Segs:** Filter/Combine Filters and then AND together the filter created immediately above with the Crash Segments filter created in [R-4](#).

**ADT 3501-5250 2Ln Non-Crash Segs:** Filter/Combine Filters and then AND together the filter created immediately above with the *complement of* the Crash Segments filter created in [R-4](#).

- R-6. Create a filter of Severe and Large Positive Superelevation (outer lanes) coupled with Severe and Heavy Inside Curves. Using this filter, find all crash locations on interstates that qualify. Set up filter: Filter/Create/Modify Filters/V8 (crossfall)/10/11/V12 (curvature)/1/2/AND Clause/2 OR Clauses/pull V8 values onto one OR Clause and V12 values onto the other OR Clause/pull both OR Clauses onto AND Clause/highlight AND Clause/give it a name/Make This Filter. A good name: S&L Pos Super on S&H Inside Curve. Run high crash analysis: Locations/Mileposted/ High Crash. Select the Interstates/4. Select Criteria.

## ADVANCED EXERCISES

You might not have time to do all of these, so pick the ones that interest you most first. These exercises used 2008 Data.

- A1. What is the age distribution of injured *occupants* that are involved in crashes caused by 16-year-old drivers? The example outputs for this exercise used the “2008 Alabama Person Data.” You will need to first [create a filter](#) for 16-year-old drivers in the Crash records. Then [convert this filter](#) to the same year Person data. To do this, click Filters/Convert Filters and follow the directions within the tool. You will then need to change your Default Dataset, select the new filter that you just created and run the analyses.
- A2. While in the occupant data, do a complete [IMPACT](#) on 16-year-old causal drivers against the rest of the data.
- A3. You are doing a special study to determine the problems that 16-year-old drivers are having. Mine the database for this information by (1) [creating a filter](#) for just 16-year-old causal drivers, and then (2) run an [IMPACT](#) on it over all variables.
- A4. For the Graduated Drivers License (GDL), compare 16-year-old drivers against their 17-20-year-old counterparts on the crash data. Hint: [create the 17-20 filter](#) first. Make sure that the 16-year-old filter is current. Run [IMPACT](#) and be sure to select the two filters that you want to compare.
- A5. [Create filters](#) for:
  - a. All pedestrian and bicycle crashes (AND or OR?).
  - b. Fatal roadway defect crashes in Jefferson County (use Combine).
  - c. All fatal roadway defect crashes in Baldwin, Barbour and Bibb counties.
- A6. [Convert the roadway defect filter](#) in the Crash Data file to a filter for the Person Data file. Check it by comparing the rural-urban distributions of both.
- A7. [Create “child restraint using” and “child restraint not using” filters](#) in the person file (Variable 11). Not using consists of “Child in non-child Restraint” and “Child, No Restraint.”
  - a. Perform an [IMPACT](#) comparing these two subsets.
  - b. [Convert both](#) to the Crash Data file.
  - c. Perform an [IMPACT](#) like [A3](#) but using crash data.

The following might be performed on [mileposted](#) roadways as well with whatever criteria you wish to apply.

- A8. Find all intersections with multiple roadway defect crashes.
- A9. For the top one, what days did they occur?

- A10. Find the highest crash segments in Baldwin Co. (or *your* county). Get the crash numbers for the highest in [A3](#).
- A11. Perform a severity [IMPACT](#) (Variable 237) for the highest crash intersection in the state (all crashes).
- A12. Find the highest fatality segments in the state and in your county.