Session #10

ACCIDENT DATA USE AND GEOGRAPHIC INFORMATION SYSTEM (GIS)

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ABSTRACT

Project Description: The Cheyenne Area Transportation Planning Process (ChATPP) has developed a PowerPoint presentation demonstrating how to use an existing accident database with GIS software. The slides are followed by a hands-on demonstration of the GIS system using the actual data.

ChATPP has been intensely involved and a leader in GIS development in the City of Cheyenne and Laramie County. Recently we have taken the steps to try and interest users, that are not GIS technical people, in the use of ArcView in a desktop application. One of the projects that has been developed, is making accident data obtained from Wyoming Department of Transportation (WYDOT) available to ArcView users. How this project was developed is explained briefly below. What is important to stress is that the information is available to users and demonstrating to them how the software works.

Background: The Cheyenne urban area has a population of approximately 72,000 people. We have a slow but steady growth of about 1% and is the northern most city along the rapidly growing Front Range in Colorado. The Metropolitan Planning Organization (MPO) is responsible for transportation planning in the urban area. To assure the safety of the traveling public as the population grows, we are looking at access management standards for our main arterials.

Need: Our first step was to establish if there was a need for access management standards. The number and cause of collisions are the main determinate of the safety of the roadway. So, we needed to be able to examine, in depth, the collisions that occurred along our arterial roadways to determine if they could be prevented by having access control measures in place.

GIS: The Wyoming Department of Transportation is responsible for collecting all of the accident information in Wyoming. Using an extract of the state's database, we obtained database files for accidents from 1984 to 1996. The files were then put into ArcView GIS to create maps of specific locations or to use the databases for queries. The end result could then be displayed graphically as well as in tabular form. The GIS also allows inquires on the map that is linked to the database.

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INTRODUCTION

Need for Traffic Crash Analysis

The need for crash data in Cheyenne, Wyoming started with the Metropolitan Planning Organization (MPO) looking at access management controls on functionally classified streets. Cheyenne is a steadily growing community of approximately 72,000 people living in the urban area. It is felt that as the community grows, the need for access controls will become more necessary. Out of this project, the ability to analyze crash data became apparent as a means to determining the need and type of access controls. Safety is a driving factor in access management and the crash reports are the best indicator of the lack of safe roads. This paper presents the development and findings of crash data from police reports and how they are being used in a Geographic Information System (GIS).

Development of the Data

The City of Cheyenne had been producing an accident report annually. This report contained limited information. The type and cause of the crashes were not included. Plus the location of the accidents was summarized and not detailing specifically where the crashes had occurred. The City report did contain every crash, including private property, that occurred in the City limits. The geographic scope of this report was limited to just the City, not the complete urban area, nor was the detail adequate for the type of analysis desired.

The next step in the search was the Wyoming Department of Transportation (WYDOT), Safety Branch. This office receives all accident reports statewide. The State of Wyoming is fortunate in that all police agencies including highway patrol, sheriff departments, and municipal police use the same traffic accident report form. A copy of this form is shown in Figure 1, *State of Wyoming, Investigator's Traffic Accident Report*. These respective enforcement agencies send all reports to WYDOT where they are scanned and input into a database. All of the information, over 150 different pieces of information, are input into the database.

Limitations of Data

The decision was made to use the WYDOT data as the basis for accident analysis. This data covers the desired geographic area and includes all police agencies. There are limitations however, on the data from WYDOT that need to be kept in mind while performing crash analysis. If an accident could be located within 50 feet on a map from the report, it is given an x,y coordinate with a digitizer. If an accident could not be located on a map, a coordinate was not assigned but the data still resides in the database. (The coordinate system that WYDOT uses is the same as the City and County in State Plane Coordinates). The lack of coordinates occurs in about 10% of the data for each year.

Second, if the crash damage is less than $500 it is not included in the database. This eliminates the small crashes from being reported and therefore would not be in the database. Thirdly, private property accidents are not included unless related to an access or intersection onto a public roadway.

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Obtaining the Data

The first step to obtaining the data was to look at the database structure and determine what fields were needed and which where not. The MPO did not want any data that would be of a confidential nature, such as names, addresses, and social security numbers. Also, information that was not relevant to the study where eliminated.

The data was extracted and compressed in a ASCII comma delimited text format. The software used to extract and run the data is PKUnzip, a spreadsheet, and ArcView. A spreadsheet software was also used for data manipulation after the Dbase file was established.

The format of the database is actually four separate databases for each year. The main database is called *base*. This contains all of the general information about the accident such as date, time, conditions, and if available, the coordinates. The other databases called *vehicle*, *driver*, and *person* detailed each of these areas of the crash. These four databases contain a common "Key" field that keeps the data elements tied together.

Type of Data

The initial data that was obtained spanned the years 1984 to 1996. Annual updates are obtained to keep the data current. The type of information that the MPO obtained included such items as:

- the number of vehicles involved
- the number of injuries
- number of fatalities
- number of alcohol involved accidents
- violations issued
- type of and severity of injuries
- type of accident
- activity prior to the accident
- human contributing factors
- safety restraints

This level of detail allowed the more in depth analysis that was necessary for the project.

Data Conversion

The ASCII text file was unzipped, renamed to a ".txt" file, and opened in a spreadsheet, (Figure 2). Column titles were added to the spreadsheet as well as parsing the street code into two separate fields (Figure 3). The *vehicle*, *driver*, and *person* databases went through the same process including parsing the "Key" field to correspond to the *base* database. Each spreadsheet is saved in a .dbf format.

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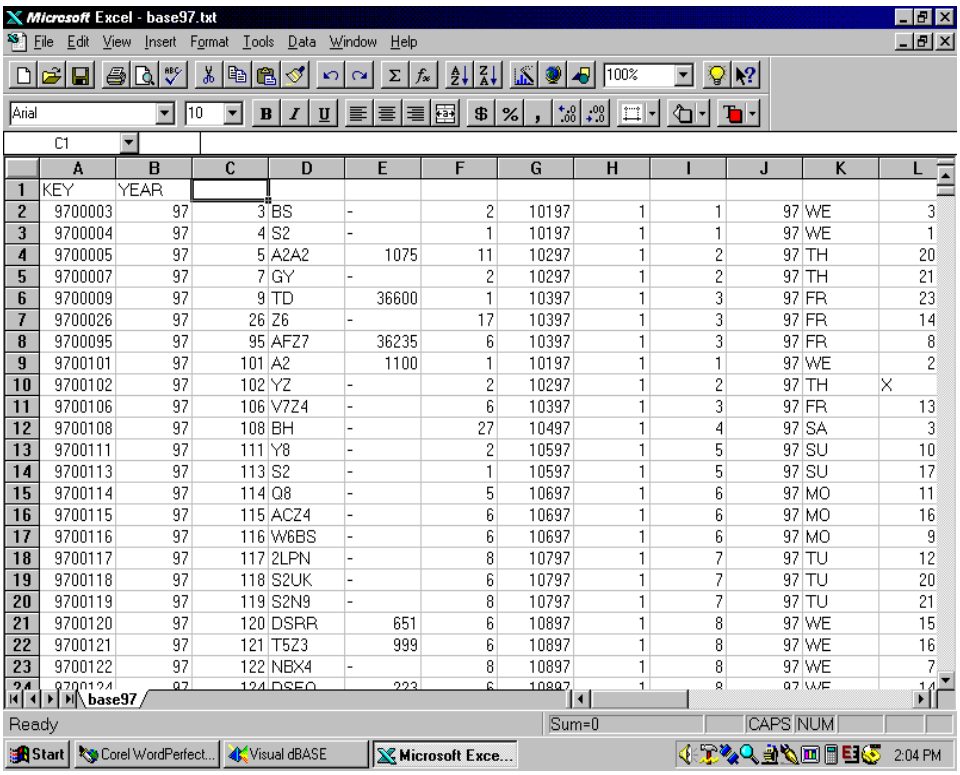

	A	B	C	D	E	F	G	H	I	J	K	L
1	KEY	YEAR										
2	9700003	97	3	BS	-	2	10197	1	1	97	WE	3
3	9700004	97	4	S2	-	1	10197	1	1	97	WE	1
4	9700005	97	5	A2A2	1075	11	10297	1	2	97	TH	20
5	9700007	97	7	GY	-	2	10297	1	2	97	TH	21
6	9700009	97	9	TD	36600	1	10397	1	3	97	FR	23
7	9700026	97	26	Z6	-	17	10397	1	3	97	FR	14
8	9700095	97	95	AFZ7	36235	6	10397	1	3	97	FR	8
9	9700101	97	101	A2	1100	1	10197	1	1	97	WE	2
10	9700102	97	102	YZ	-	2	10297	1	2	97	TH	X
11	9700106	97	106	V7Z4	-	6	10397	1	3	97	FR	13
12	9700108	97	108	BH	-	27	10497	1	4	97	SA	3
13	9700111	97	111	Y8	-	2	10597	1	5	97	SU	10
14	9700113	97	113	S2	-	1	10597	1	5	97	SU	17
15	9700114	97	114	Q8	-	5	10697	1	6	97	MO	11
16	9700115	97	115	ACZ4	-	6	10697	1	6	97	MO	16
17	9700116	97	116	W6BS	-	6	10697	1	6	97	MO	9
18	9700117	97	117	2LPN	-	8	10797	1	7	97	TU	12
19	9700118	97	118	S2UK	-	6	10797	1	7	97	TU	20
20	9700119	97	119	S2N9	-	8	10797	1	7	97	TU	21
21	9700120	97	120	DSRR	651	6	10897	1	8	97	WE	15
22	9700121	97	121	T5Z3	999	6	10897	1	8	97	WE	16
23	9700122	97	122	NBX4	-	8	10897	1	8	97	WE	7
24	9700124	97	124	DSEQ	223	6	10897	1	8	97	WE	14

Figure 2

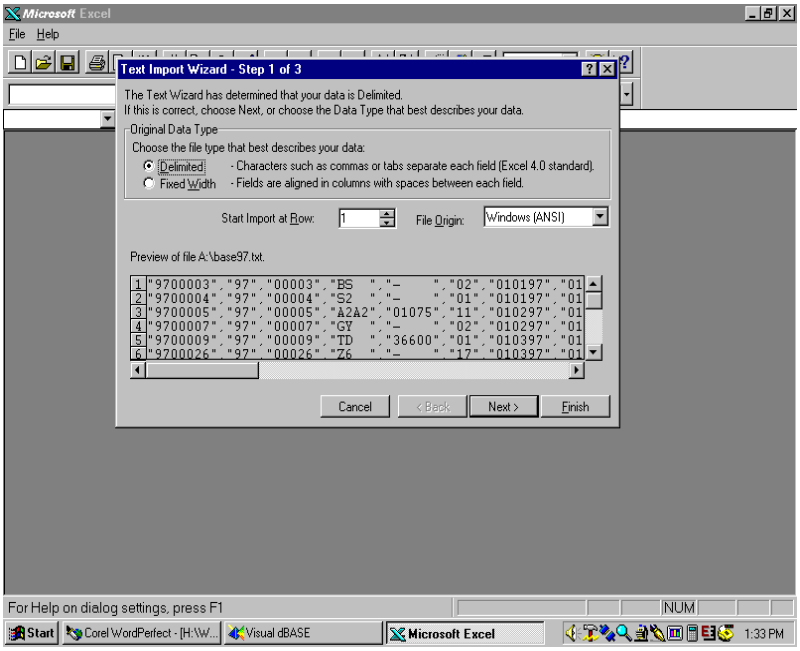

Figure 3

Using GIS

ArcView GIS and Dbase are directly compatible. The coordinates in the *base* database allows the locations to be read directly into ArcView. Using the street centerline as a backdrop an "Event Theme" is added (figure 5) using the Dbase database. Once added, the database is converted into

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a shapefile, ".shp", that can be edited and manipulated in ArcView.

The GIS platform allows for a visual map connection to the database. Figure 4 shows the accident locations across Cheyenne and the database connected to the map. This allows queries to be made either from the map or from the database. This system allows various maps and charts to be made that go into the annual report production.

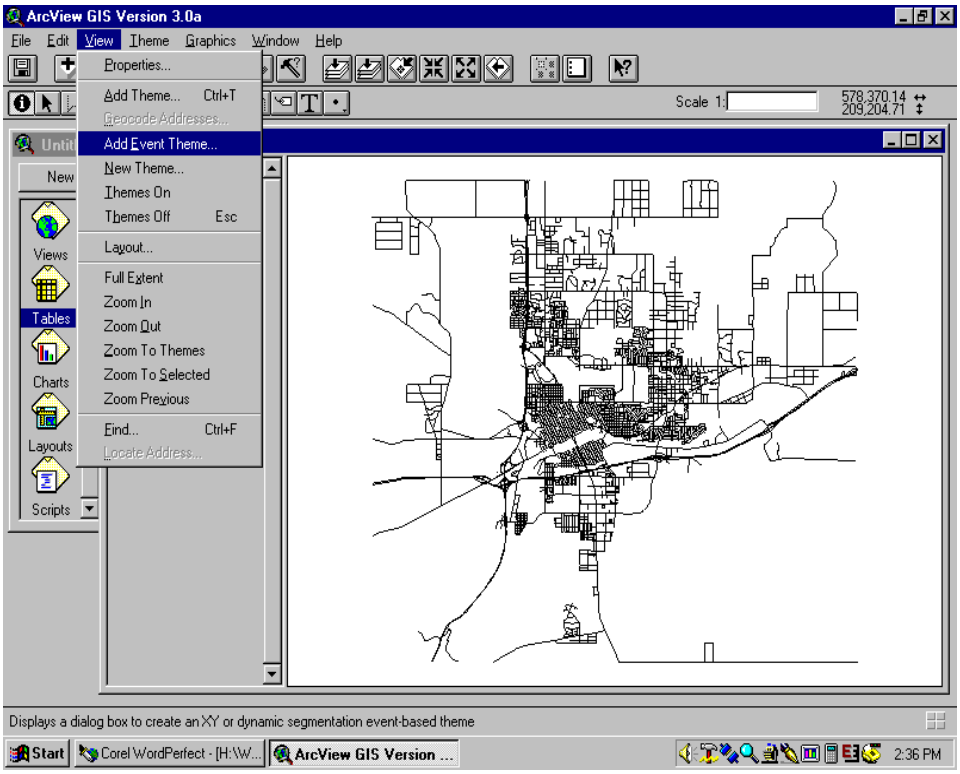

Figure 4

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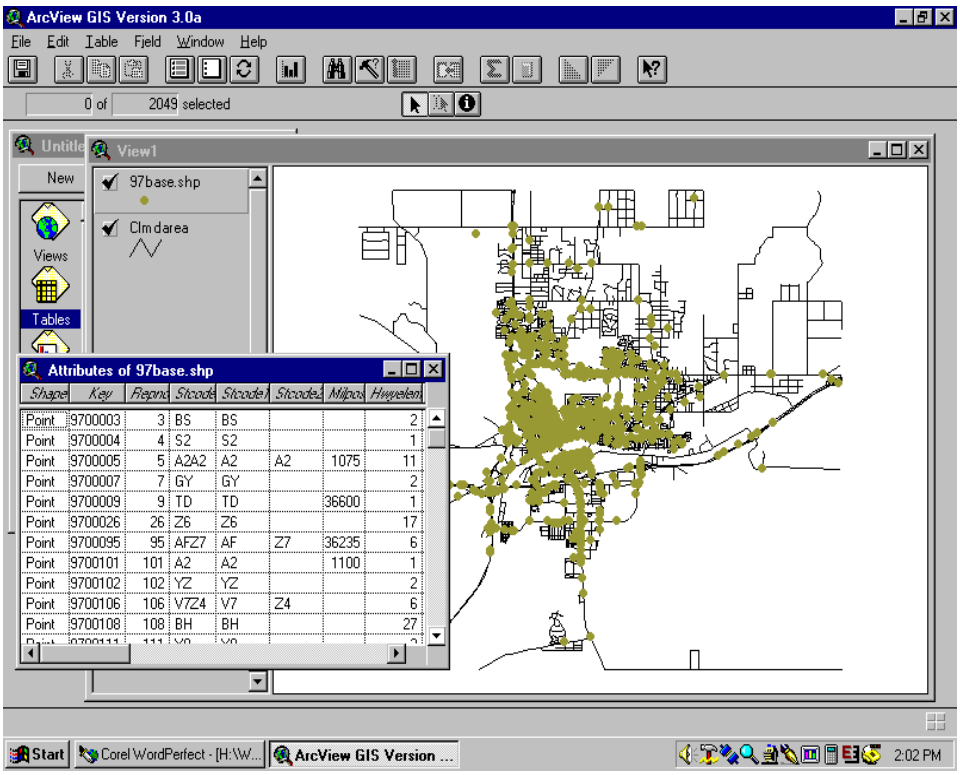

Figure 5

Linking Tables in ArcView

The *base* database is now useable in the GIS to use for queries, buffering, and other types of analysis. The three other databases *driver, vehicle, and person* are then linked in ArcView to the *base*. This allows all four databases to respond to analytical queries.

GIS Cooperative Agreement

The GIS system in Cheyenne is based on a cooperative agreement between the City of Cheyenne and Laramie County. This agreement, first established in 1992, has allowed for the free exchange of data and GIS products between these agencies. The duplication of effort has been virtually eliminated and each area can freely use anothers coverage or database. The accident data is on a network server that can be used by anyone with access to the server system.

Conclusion

In general, this has been an enviable project. There have been no complications in the use of the data and the conversion to the GIS system. The conversion of the data was fairly seamless, and the accident points matched well, generally within 40 feet, of the road centerline.

The future plans for the data include relating the two digit street code to the actual arc segments and tying this to the traffic count information. This will allow us to calculate accident rates rather than using raw crash numbers for analysis.

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Overall the data received has been an invaluable aid in the planning process. The data worked out well for the access management project and continues to be a valuable tool for applications other than originally intended. This was an important lesson to us in working with other agencies and departments.

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