

Lab V ENVR 4305 Fall 2019 (18 pts) Name _____

Working with Tabular Data and Attributes

Part I: From the “Getting to Know ArcGIS” book provided in lab, work through the Chapter 7 Exercises 15a, 15b.

Part II: Go through the attached exercise “Explore tables and attributes.”

The data files for part I should be in the C drive under folder EsriPress/GTKarcGIS/

The data files for part II should be in the C drive under folder EsriTraining/ARC2/

Ask the TA or Instructor for help if you are confused at any time.

Each student should sign their own lab and turn it in at the end of lab.

35 minutes



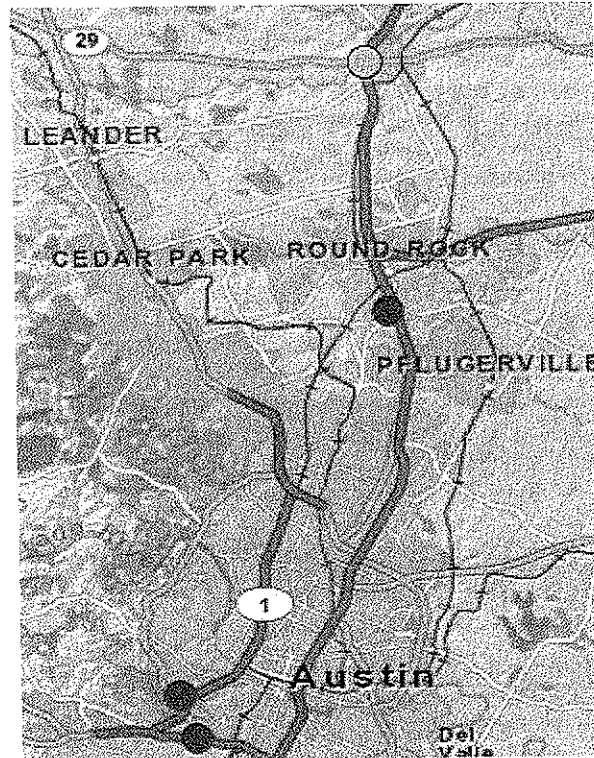
Exercise 3A: Explore tables and attributes

Find total sales based on customer data from a small chain of stores in Austin, Texas.

In this exercise, you will:

- Display spatial locations from tabular data.
- Change the appearance and structure of tables.
- Summarize data.

Figure
Austin, Texas area stores
with attributes



Shopping Center	Street	City
Westgate Shopping Ctr	4477 S Lamar Blvd	Austin
La Frontera Village	120 Sundance Parkway	Round Rock
Wolf Ranch	I-35 and SR 29	Georgetown
Barton Creek Square Mall	2901 S Capital of Texas Highway	Austin

Step 1: Explore tabular data

Many tables contain geographic information that allows you to display locations directly on your map. Street addresses or geographic coordinates (for example, longitude and latitude), are the most common type of attributes that allow you to display point locations on your map.

In this step, you will display store locations from a table.

- a Start ArcMap.
- b In the Catalog window, browse to and expand the ..\ARC2\Tables folder.
- c Expand the Stores geodatabase.

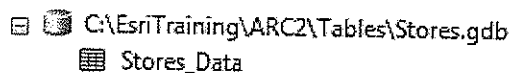


- d Right-click the Stores geodatabase and choose Make Default Geodatabase.
- e Click the Stores_Data table and drag the table onto your map.

Your table of contents changes to the List By Source view as indicated by the selected button at the top of the window.



This view allows you to see tables used in your map as well as the paths to data sources for the layers.



- f Open the table.

Hint: Right-click the table and choose Open.

- g Examine the attributes.

The table has several attributes, including the store address, number of parking spaces, and number of employees. You will use the Lon and Lat attributes to display the location of each store.

- h Close the Table window.

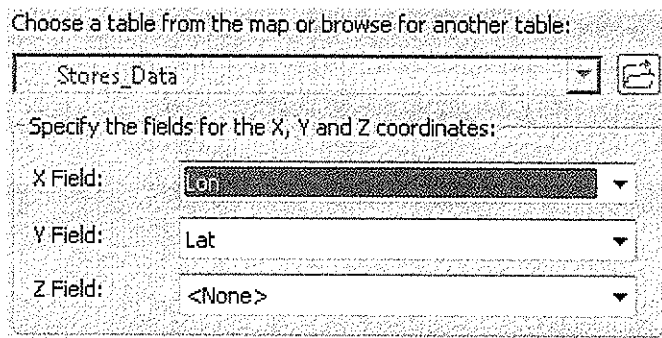
Step 2: Display points based on geographic coordinates

In this step, you will display locations for the stores based on the geographic coordinates provided in the Stores_Data table.

- a In the table of contents, right-click the Stores_Data table and choose Display XY Data.

In the Display XY Data dialog box, you can specify which attributes ArcMap should use to display the data.

- b Confirm that the top portion of your dialog box includes the following parameters:
 - X Field: Lon
 - Y Field: Lat
 - Z Field: <None>



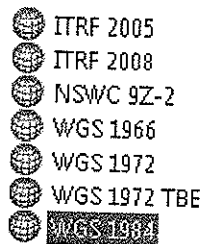
ArcMap tries to determine attribute fields that may contain X and Y coordinate values. If the chosen fields are not correct, you can choose the correct attributes from the drop-down lists.



Next, you will specify the output coordinate system for your points. The Lon and Lat values in your table are WGS 1984 geographic coordinates.

- c Near the bottom of the dialog box, click Edit.


d In the Spatial Reference Properties dialog box:

- Expand Geographic Coordinate Systems.
- Scroll down and expand World.
- Scroll to the bottom of the list and click WGS 1984.



  Projected Coordinate Systems




To reduce the list of choices in the coordinate system folders, type **WGS 1984** in the search box and click the Search button .

e Click OK in both open dialog boxes to display your store locations.

Your map displays four points that correspond to the Lon and Lat attributes.

A new layer named Stores_Data Events has been added to your table of contents. Event layers display geographic locations that are stored in a tabular (rather than spatial) format.

Next, you will add a basemap layer to provide background reference for your stores.

f On the Standard toolbar, click the down arrow next to the Add Data button  and choose Add Basemap.

g Select the Streets basemap and click Add.

It will take a few moments for the map to display the new basemap layer.


Step 3: Export point locations to create a new feature class

The store locations on your map are a visual representation of the Stores_Data table. In this step, you will create a geodatabase feature class of these store locations.

a Right-click the Stores_Data Events layer, point to Data, and choose Export Data.

b In the Export Data dialog box, click the Browse button .

c In the Saving Data dialog box:

- Click the Go To Default Geodatabase button .
- For Name, type **Store_Locations**.
- Click Save.

d Click OK to export your data.

e When prompted to add your exported data as a layer, click Yes.

Now that you have a feature class of store locations, you can remove the event layer.

f Right-click Stores_Data Events and choose Remove.

g Open the attribute table for the Store_Locations layer.

1. How is this table different from the Stores_Data table?

h Close the attribute table.

Step 4: Symbolize point locations

In this step, you will symbolize your store locations.

a Open the layer properties for the Store_Locations layer.



You can double-click the layer to open the properties.

b In the Layer Properties, dialog box, click the Symbology tab.

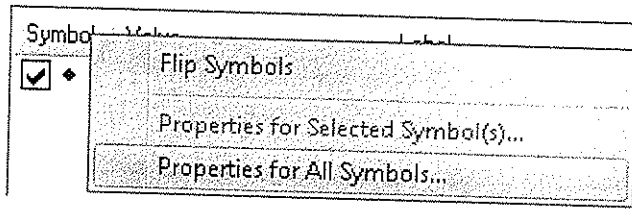
You will symbolize each store based on its STORE_ID attribute.

c On the left, click Categories and confirm that the Unique Values renderer is selected.

d For Value Field, choose Store_ID from the list.

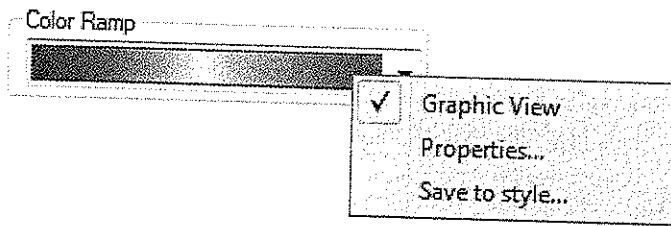
e Click Add All Values.

- f Click the Symbol column heading and choose Properties For All Symbols (as shown).



- g In the Symbol Selector dialog box, click the Circle 1 symbol and click OK.

- h Right-click the Color Ramp.



- i Click Graphic View to remove the check mark.

The color ramps are now listed by name.

- j Choose the Enamel color ramp from the list.

ArcMap chooses random colors from the color ramp.

- k In the Symbol column, clear the check box next to the symbol for <all other values>.

Symbol	Value	Label
<input type="checkbox"/> ●	<all other values>	<all other values>
	<Heading>	Store_ID
●	1	1
●	2	2
●	3	3
●	4	4

You will display a unique symbol for each STORE_ID value, so you do not need a symbol to represent "all other values."

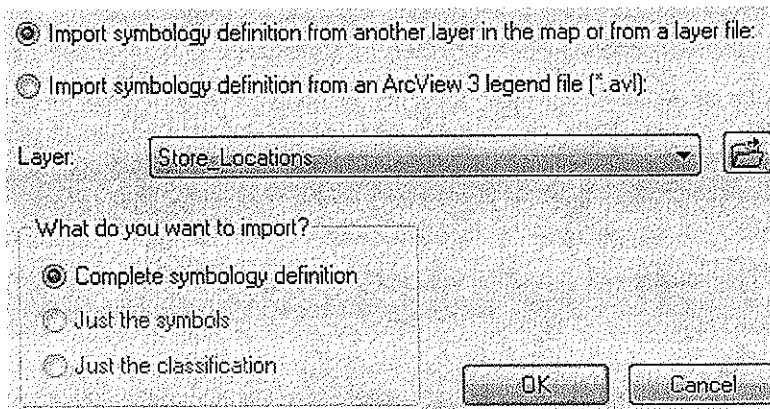
- l Click OK to apply the new symbols to your layer.

- m Save your map as **Stores.mxd** in your ..\ARC2\Tables folder.

Step 5: Import symbology to match corresponding features

In this step, you will display customers who have made purchases from one or more of these stores. You will also import the symbology from your Store_Locations layer so that the customer points for each store match the color of the store symbol.

- a In the Catalog window, from the Stores geodatabase (Tables folder), add the Customers feature class to your map.
- b Open the layer properties for the Customers layer.
- c On the Symbology tab, click the Categories renderer.
- d For Value Field, choose STOREID.
- e Click Import.
- f In the Import Symbology dialog box, confirm that Layer is set to Store_Locations.



- g Click OK.

Next, you will specify which field in the Customers layer matches the values used for symbolizing the Store_Locations layer.

- h In the Import Symbology Matching dialog box, choose STOREID from the list, and click OK.

Now that your customer symbols match the color of the store symbols, you will change the size of the customer symbols.

- i Click the Symbol column heading and choose Properties For All Symbols.

- j** In the Symbol Selector dialog box, change Size to **5** and click OK.

Symbol	Value	Label
<input type="checkbox"/>	• <all other values>	<all other values>
	<Heading>	Store_ID
•	1	1
•	2	2
•	3	3
•	4	4


- k** Click OK to apply your changes.

Now your map shows customers based on the store from which they purchased items.

Step 6: Change the appearance of the attribute table

In this step, you will change the appearance of your Store_Locations attribute table.

- a** Open the Store_Locations attribute table.

- b** In the Table window, click the Table Options button  and choose Appearance.

The Table Appearance dialog box allows you to change the font and color settings for your table.

- c** Explore the different options for changing the appearance of this table, and then click OK to see any changes you have made.

Next, you will change an attribute field.

- d** Right-click the Ctr_Name field heading and choose Properties.

- e** For Alias, type **Shopping Center** and click OK.

The field name changes to display the alias.

You can also turn off fields.

- f** Right-click the OBJECTID field heading and choose Turn Field Off.

Some fields (such as OBJECTID) are used by ArcGIS for system and database functions. You can turn off these fields if you do not want to see them.

g Turn off the Shape field.



To turn a field on again, open the layer properties, click the Fields tab, and select the check box next to the field name.


You no longer need the information in the Lon and Lat fields, so you will delete these fields and the information they contain. Be certain you want to delete fields before doing so because you cannot undo a deleted field in a table.

h Right-click the Lon field heading and choose Delete Field.

i Click Yes to confirm the deletion.

j Delete the Lat field.

Next, you will add a field to hold the total sales attribute of each store.

k Click the Table Options button  and choose Add Field.

l In the Add Field dialog box, for Name, type **Store_Sales**.



Be sure to include an underscore (`_`) as a substitute for a space character. Spaces cannot be used in field names. If you want to include a space, create an Alias value for the field, such as Store Sales.

m For Type, choose Double and then click OK.

Your new field is added to the table, but there are no attribute values. Later in this lesson, you will populate this empty column with the total sales of each store.

n Close the Table window.

Step 7: Summarize a table

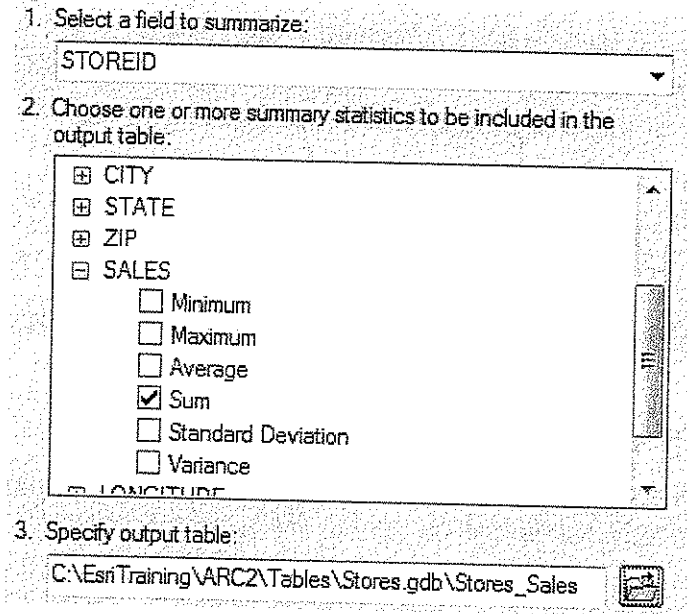
In this step, you will create a summary table to calculate the total sales and customers for each store.

a Open the Customers attribute table.

b Right-click the STOREID field heading and choose Summarize.

c In the Summarize dialog box:

- For item 1, choose STOREID.
- For item 2, expand SALES and select the box next to Sum.
- For item 3, browse to ..\ARC2\Tables\Stores.gdb, name the table **Store_Sales**, and then click Save.



d Click OK to create your summary table.

e Click Yes to add the result table to your map.

f Keep the Table window open.

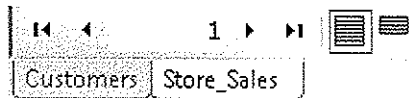
g Open the Store_Sales table.

	OBJECTID *	STOREID	Count_STOREID	Sum_SALES
▶	1	1	4020	684270.8631
	2	2	3413	522882.5635
	3	3	3115	474500.4352
	4	4	1516	193137.3807

The new Store_Sales table is a summary of your customers attribute table. The total sales were added for each STOREID, as were the total number of customers.

- The total sales for each store is displayed in the Sum_SALES field.
- The number of customers for each store is displayed in the Count_STOREID field.

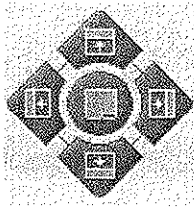
Notice that your table window has two tabs at the bottom: Customers and Store_Sales.



- h Click the Customers tab to view the Customers table.

If you want to view both tables at the same time within the Table window, you can display them side by side using a drag-and-drop operation.

- i Click the Customers tab and drag it into the Table window and on top of one of the blue docking icon arrows that appear.



You can choose the top, bottom, left, or right docking arrows to position the Customers table relative to the Store_Sales table. Using the docking arrows allows you to view multiple tables at the same time in the Table window. (To stack the tables again, choose the center position.)

- j Click the X in the upper-right corner of the Customers table to close only that table.



If you accidentally close the entire Table window, reopen the Store_Sales table.

Step 8: Format a field

In this step, you will format the sales values in the Store_Sales table.

- a Open the properties for the Sum_SALES field.

Hint: Right-click the Sum_SALES field and choose Properties.

- b Click the Numeric button .

- c In the Number Format dialog box, under Category, choose Currency.

- d Click OK in all open dialog boxes to see the changes in your table.

Sum_SALES
\$684,270.86
\$522,882.56
\$474,500.44
\$193,137.38

The Sum_SALES values are now formatted as currency.

- e Close the Table window.
- f Save your map document.
- g Minimize ArcMap.

You will use this map document in the next exercise in this lesson.

25 minutes



Exercise 3B: Join and relate tables

Join the customer sales summary table to the store locations attributes to update the stores data.

In this exercise, you will:

- Determine table cardinality.
- Discover table relationships through common attributes.
- Calculate and display attribute values based on a relationship.

Figure 1

After relating the tables, selecting a feature in the stores table selects the corresponding features in the related customer sales table.

Store_ID	Employees	Store_Sales
1	14	684270.8631
2	18	522882.5635
3	16	474500.4352
4	15	193137.3807


STOREID	ADDRESS	CITY	STATE	ZIP	SALES
1	5300 FORT MASON DR	AUSTIN	TX	7330	188.6632
1	3009 IRA YOUNG DR APT 701	TEMPLE	TX	7650	37.268
1	509 ARAPAHO DR	TEMPLE	TX	7650	140.9166
1	307 CARTER ST	KILLEEN	TX	7654	18.1379
1	1305 CAROL WAY	KILLEEN	TX	7654	76.2058
1	1003 MARY JANE CT	KILLEEN	TX	7654	97.3687

Step 1: Determine cardinality between tables

Often, you have one or more tables that can be related based on common attribute values. In this step, you will determine the relationship, or cardinality, between the Store_Locations and the Store_Sales tables.

a Restore ArcMap.



If you did not finish the previous exercise or you want to start with the finished results, open the ..\ARC2\Tables\Results\Stores.mxd and add the Streets basemap (click the down arrow next to the Add Data button  and choose Add Basemap).

b In the Stores map document, open the Store_Sales table and the Store_Locations attribute table.

c Examine the store ID values in both tables:

- the STOREID field in the Store_Sales table
- the Store_ID field in the Store_Locations table

1. How many records in the Store_Sales table match *each* record in the Store_Locations table?

2. What is the cardinality between the Store_Sales and Store_Locations tables?

d Close the Table window.

Step 2: Join two tables

In this step, you will join the two tables together, combining attributes from both tables into a single table view.



You determined that there is only one matching sales record for each store location. Therefore, you can combine these tables using a join. If there were many matching records for each location, you would use a relate.

- a Right-click the Store_Locations layer, point to Joins And Relates, and choose Join.

The Join Data dialog box opens.

- b Complete the Join Data dialog box to include the following parameters:
 - What Do You Want To Join To This Layer?: Join Attributes From A Table
 - Choose The Field In This Layer That The Join Will Be Based On: Store_ID
 - Choose The Table To Join To This Layer, Or Load The Table From Disk: Store_Sales
Show The Attribute Tables of Layers In This List: selected
 - Choose The Field In The Table To Base The Join On: STOREID

What do you want to join to this layer?

Join attributes from a table

1. Choose the field in this layer that the join will be based on:

Store_ID

2. Choose the table to join to this layer, or load the table from disk:

Store_Sales

Show the attribute tables of layers in this list

3. Choose the field in the table to base the join on:

STOREID

You have specified that you want to join these two tables together using the Store_ID values in the Store_Locations layer and the STOREID values in the Store_Sales table.


- c Click OK.
- d Open the Store_Locations attribute table.
- e Scroll to the far right in the table.

Notice the new joined attributes from the summary table. You have joined two tables together based on common attribute values.

The joined attributes look as though they are part of the Store_Locations attribute table. However, they are combined together only visually in this table view. If any of the values change in the joined table (Store_Sales), you would see the new values in the Store_Locations attribute table.



If you want to make the association permanent by adding these attributes to the layer's source data, you could export the layer as a new feature class. After you export the data, these attribute values would not update automatically if the other table values change.

- f Close the Table window.
- g Turn off the Customers layer.
- h With the Identify  tool, click one of your Store_Locations points on the map.

Notice that the joined attribute values are listed in the Identify window. By joining the two tables, you can easily find the total sales for a selected store.

- i Close the Identify window.

Step 3: Calculate values from the joined table

In this step, you will populate the empty Store_Sales field that you added to the locations table in the previous exercise.

- a Open the attribute table for the Store_Locations layer.

Notice that the Store_Sales attribute contains <Null>, or empty, values. You will use the Field Calculator to populate this field with the joined sales values.

- b Right-click the Store_Sales field heading and choose Field Calculator.

A warning appears, indicating that your calculations will be permanent.

- c Click Yes to continue.

You can use the Field Calculator to populate values in various ways. You can enter formulas to calculate numeric values or you can copy values from one field to another.

In the Fields section, notice that the name of each field is prefixed with the table name. This can help you identify which fields are native to the table and which are from a join.

The large empty space at the bottom of the dialog box is where you can enter your expression to calculate values. In this case, you want to copy the joined sales values from your summary table, so you will enter the name of the field that contains these values.

- d) In the Fields list, scroll to the bottom and double-click **Store_Sales.Sum_SALES**.

```
Store_Locations.Store_Sales =  
[Store_Sales.Sum_SALES]
```

The field name is added to the expression area of the Field Calculator.

Above the expression area, you see the attribute that will receive these values. This is the Store_Sales attribute that you right-clicked to open the Field Calculator.

- e) Click OK to execute the expression.

The Store_Sales attribute now contains the values from the joined Sum_SALES field.

Now that the sales values are a native attribute in the Store_Locations table, you will remove the join.

- f) Right-click the Store_Locations layer, point to Joins and Relates, choose Remove Join, and then choose Store_Sales.

Notice that the joined fields are removed from the table.

- g) Close the Table window.

Step 4: Relate tables

In this step, you will create a relationship between two tables using a relate.

- a) Turn on the Customers layer.

3. What is the cardinality between a store and its customers?

b Right-click the Store_Locations layer, point to Joins and Relates, and choose Relate.

c Read the description at the top of the Relate dialog box.

d Complete the dialog box to use the following parameters:

- Choose The Field In This Layer That The Relate Will Be Based On: Store_ID
- Choose The Table Or Layer To Relate To This Layer, Or Load From Disk: Customers
- Choose The Field In The Related Table Or Layer To Base The Relate On: STOREID
- Choose A Name For The Relate: **Store to Customers**

1. Choose the field in this layer that the relate will be based on:
Store_ID

2. Choose the table or layer to relate to this layer, or load from disk:
Customers

3. Choose the field in the related table or layer to base the relate on:
STOREID

4. Choose a name for the relate:
Store to Customers



Give your relate a descriptive name so you can easily identify it later. A recommended naming convention is to include both table names. This technique is especially useful if you have several relates.

e Click OK.

Step 5: Explore the relate

In this step, you will explore the relate.

a Open the Store_Locations attribute table.

Notice that the fields from the Customers attribute table were NOT added to the Store_Locations table. With a relate, the two tables are kept separate. However, you can use tools to see related features.

- b Click the row button next to Westgate Shopping Ctr to select the row.

	Shopping Center	Street	City	State	Zip
▶	Westgate Shopping Ctr	4477 S Lamar Blvd	Austin	TX	78745
	La Frontera Village	120 Sundance Parkway	Round Rock	TX	78681
	Wolf Ranch	I-35 and SR 29	Georgetown	TX	78627
	Barton Creek Square Mall	2901 S Capital of Texas Highway	Austin	TX	78748



The previous graphic does not show all the fields in the table.

Next, you will navigate the relationship to see all the customers associated with this store.

- c At the top of the Table window, click the Related Tables button

The option listed is the name of your relate (*Store to Customers*) and the related table (*Customers*).

- d Click Store to Customers: Customers.

The Customers table opens with records selected that have a store ID value that matches your selected store location. (The corresponding features are also selected in the map.)

4. How many customer records are in the selection?

Hint: Look at the bottom of the Customers table.



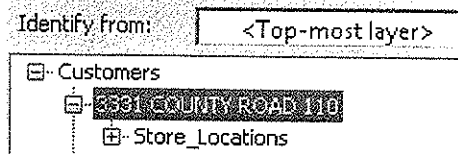
You can navigate relates in both directions. You also could have selected a customer record and navigated to the related Store_Location.


- e Close the Table window.

- f On the Tools toolbar, click the Clear Selected Features button

- g Use the Identify tool

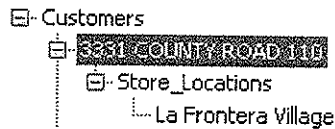
- h At the top of the Identify window, expand the identified record, which is shown as a street address.



 Your identified location may be different than this example.

The related table is listed.

- i Expand Store_Locations to see the name of the shopping center where the store is located.

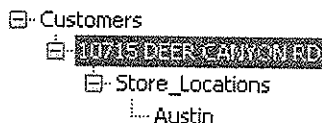



- j Click the name of the shopping center to see the location flash in your map.
- k Close the Identify window.

Step 6: Change the display expression



In this step, you will change the field that displays in your related table. Currently, when you navigate the relationship from the Customers table to the Store_Locations table, the Shopping Center appears. You will change this to display the City value.

- a Open the Layer Properties for the Store_Locations layer.
- b Click the Display tab.
- c Under Display Expression, for Field, choose City.
- d Click OK.
- e Identify another customer location and navigate the relationship.



 The City value for your point may be different than this example.

Now the city name is displayed for the related Store_Locations record.

-  Close the Identify window.
-  Save your map and close ArcMap.