

**Lab X ENVR 4305 Fall 2019 (18 pts) Name \_\_\_\_\_**

## **Projecting Data and Evaluating Data Quality for Analysis**

Part I: From the “Getting to Know ArcGIS” book provided in lab, work through the Chapter 7 Exercises **6a and 6b**.

Part II: Go through the attached exercise “Evaluate data quality.”

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.

25 minutes



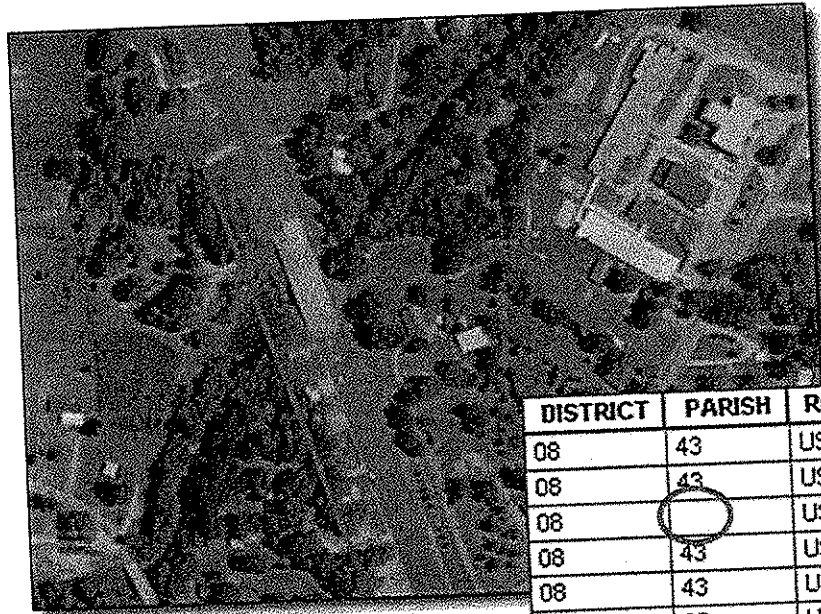
## Exercise 7 Evaluate data quality

You are preparing a database of highways that will be used specifically for analysis. You have received new highway data and will review the data quality by checking for errors using both automated and visual techniques.

In this exercise, you will:

- Evaluate data quality.
- Transform geographic coordinate systems.

Evaluating spatial and tabular data errors



DISTRICT	PARISH	ROUTE	NHS
08	43	US 171	1-02
08	43	US 171	1-02
08		US 171	1-02
08	43	US 171	1-02
08	43	US 171	1-02
05	25	US 167	1-
05	25	US 167	1-02
05	25	US 167	1-02
05		US 425	1-14

## Step 1: Evaluate data currency and credibility

You have received new highway data and want to use it for analysis purposes if it meets your standards for quality. Many GIS analysis projects require the use of current data to support reliable results from the analysis. The highway data you add to your GIS database needs to have been updated within the past few years. Older data may not include newer highways or changes in route numbers or classifications.

In this step, you will begin to evaluate the data using the Item Description.

- a Start ArcMap with a new blank map.
- b Open the Catalog window, and then browse to and expand your `..\ARC2\Data_quality\Transportation geodatabase`.
- c Right-click the Highways feature class and choose Item Description.

1. From the data description, can you determine the date when the data was produced?

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Even if the data appears to meet your needs in terms of currency, you must also have confidence that the data is from a reliable source.

2. From the Item Description, what is the source organization responsible for creating this data?

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Data is useful within a small range of map scales. If you zoom in beyond the source scale at which your data was captured, it may appear that the data is not positionally accurate. Before using data for GIS analysis, you will determine the scale and accuracy standards necessary to support your project.

3. What is the largest scale at which the Highways data should be used for analysis and display?

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Start by checking the Item Description or other included documentation to determine if the data will meet your requirements. If it will not, then you can continue looking for another data source without having spent the additional time checking the data's quality.

So far, you have determined that the data is current, comes from a reliable source, and can be used at scales up to 1:50,000. Next, you will continue to investigate the quality of this data.

- d Close the Item Description.

## Step 2: View the list of geographic transformations

Before you evaluate the data quality, you will project and transform the data to the coordinate system that your other feature classes use.

- a Make your Transportation geodatabase the default geodatabase.

*Hint:* Right-click the geodatabase and choose Make Default Geodatabase.

- b From your Transportation geodatabase, click and drag the Highways feature class into your map.
- c Open the Layer data frame properties, and on the Data Frames Properties dialog box click the Coordinate System tab.

4. What is the coordinate system currently used by your map?

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This data is for web mapping applications and is stored in the Web Mercator coordinate system. You will transform these geographic coordinates into the coordinate system used by your GIS database: North American Datum of 1983, commonly known as NAD83.

- d Close the Data Frame Properties dialog box.
- e Minimize ArcMap.

A number of geographic transformations are available for converting between these two geographic coordinate systems. ArcMap will not choose a transformation for you; you must

decide the most appropriate transformation on your own. To help you select a transformation, you will view a PDF file that is included with ArcGIS Desktop that lists all the supported transformations and their areas of use.

- f Open Windows Explorer and navigate to  
C:\Program Files (x86)\ArcGIS\Desktop10.5\Documentation.
- g Double-click geographic\_transformations.pdf to open it in Adobe Reader.
- h View page 45 of the PDF document.

Near the middle of the page, you will find a list of transformation methods from NAD 1983 to WGS 1984.

Which transformation is likely the most appropriate? There are several that you can disregard because your data is located in the state of Louisiana. The only suitable choices are:

- NAD\_1983\_To\_WGS\_1984\_1
- NAD\_1983\_To\_WGS\_1984\_4
- NAD\_1983\_To\_WGS\_1984\_5

The transformations can be used in either direction. In your case, you want to transform from WGS84 to NAD83.

- i Close the PDF document.

### Step 3: Transform the geographic coordinate system

- a Restore ArcMap.

Your data frame is set to match your Highways layer, WGS84. You will set the coordinate system of your data frame to match your other GIS data, which is stored in a UTM projected coordinate system using NAD83 geographic coordinates. You will then apply a transformation to allow your WGS84 Highways layer to display correctly in your data frame.

- b Open the data frame properties.
- c On the Coordinate System tab, scroll to the top and expand Projected Coordinate Systems.
- d Scroll down to and expand UTM.

- e Expand NAD 1983 and click NAD 1983 UTM Zone 15N.
- f Click Transformations.
- g At the bottom of the Geographic Coordinate System Transformations dialog box, click the About Geographic Transformations link.

This opens the ArcGIS Help.

- h Scroll to the bottom of the page and read the short section about converting between NAD 1983 and WGS 1984.

5. Based on the Help document, which transformation method is most appropriate?

- NAD\_1983\_To\_WGS\_1984\_1
- NAD\_1983\_To\_WGS\_1984\_4
- NAD\_1983\_To\_WGS\_1984\_5

- i Close the ArcGIS Help window.
- j Complete the Geographic Coordinate System Transformations dialog box to include the following parameters:
  - Convert From: GCS\_WGS\_1984
  - Into: GCS\_North\_American\_1983
  - Using: NAD\_1983\_To\_WGS\_1984\_5

Convert from:  
GCS\_WGS\_1984

Into:  
GCS\_North\_American\_1983

Using (choices are sorted by suitability for the layer's extent):  
NAD\_1983\_To\_WGS\_1984\_5

- k Click OK.

- 1 Click OK to close the Data Frame Properties dialog box and apply the transformation.

Your WGS84 roads data has now been transformed to display in NAD83, UTM Zone 15 coordinates. Your source data is still in WGS84; however, the map document has transformed the data to NAD83 on-the-fly.


#### Step 4: Create a selection and export transformed data

Now that the data frame is in the same coordinate system as your other datasets, you can start evaluating the quality of this data. The highway data you received includes all the federal and state highways for the state of Louisiana. You are interested only in the interstate and U.S. highways. You will select these highways and export the data to your geodatabase in the new coordinate system.

- a Open the attribute table for the Highways layer.
- b Examine the values of the NHS attribute.


Each NHS value starts with 0 or 1, followed by a dash (-) and another number. The leading 0 or 1 indicates whether the road is part of the National Highway System, such as an interstate highway or a U.S. route. The number after the dash indicates the road class, which further categorizes each highway segment.

Because you are interested only in the federal highways for your project, you will select only the NHS values that begin with 1 and then export these to your geodatabase.

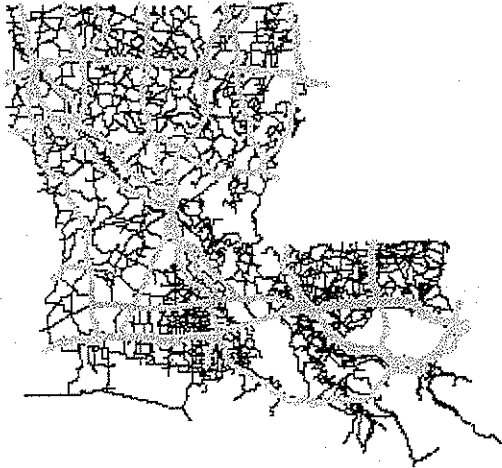
- c At the top of the attribute table, click the Select By Attributes button .
- d Confirm that the Method is set to Create A New Selection.
- e In the list of attributes, scroll to and double-click the NHS attribute.
- f Click the Like operator.
- g At the end of your expression, add the value '1%'.

Your completed expression should match the following:

```
NHS LIKE '1%'
```

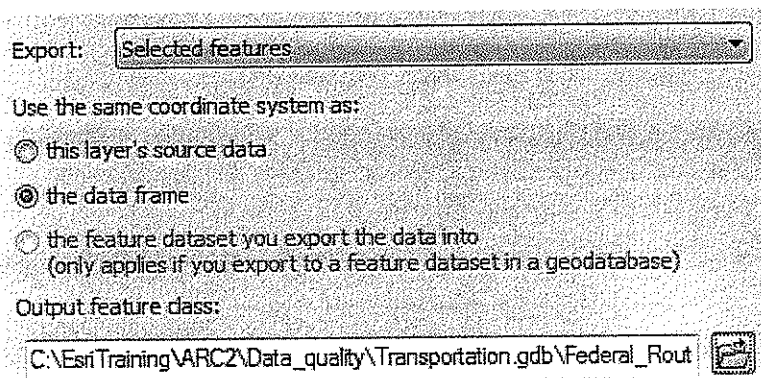
 The Like operator allows you to select all the values that match an expression using a wildcard character. In this case, you are selecting all the highways that have an NHS value starting with 1, followed by any additional characters, which is indicated by the percent (%) character.


- h** Click Apply to execute your selection statement.
- i** Close the Select By Attributes dialog box and the attribute table.



The interstate highways are selected on your map.

- j** Right-click the Highways layer, point to Data, and choose Export Data.
- k** In the Export Data dialog box, specify the following settings:
  - Export: Selected Features
  - Use the same coordinate system as: The Data Frame
  - Output feature class: ..\ARC2\Data\_quality\Transportation.gdb\Federal\_Routes



 Because you have already set a geographic transformation within your data frame, ArcMap will apply this transformation when creating the new exported data.



- l Click OK to export your data.
- m Click Yes to add the new Federal\_Routes feature class to your map.
- n Remove the Highways layer.

*Hint:* Right-click Highways and choose Remove.

## Step 5: Evaluate data completeness

In this step, you will evaluate the completeness of your data.

- a Open the attribute table for the Federal\_Routes layer.

Each road segment should have a corresponding PARISH attribute value. There should be no empty values for this attribute. You could scroll through the table and manually look for missing values. This may be effective for a small attribute table, but for a large table use a faster and more reliable method.

- b Right-click the PARISH attribute heading and choose Sort Ascending.

Any empty values will be at the top of the attribute column.


6. Are there any empty values? If so, how many?

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## Step 6: Evaluate data consistency

In this step, you will evaluate the consistency of your data.

For all interstate routes, the ROUTE column should have the characters "I-" before the route number; for example, I-10. You could scroll through the table looking for values that may be missing the dash character, but for a large table, ArcGIS can do this for you.



- a At the top of the attribute table, click the Select By Attributes button .

- b Build the following expression:

```
ROUTE LIKE 'I%'
```

- c Click Apply to select all the records with a Route value that starts with the letter I.
- d Close the Select By Attributes dialog box.
- e In the table, right-click the ROUTE field heading and choose Summarize.

In the Summarize dialog box, notice that section 2 allows you to choose summary statistics for each unique ROUTE value. In this case, you want to see only the unique ROUTE values for your selected features, so you will not add any additional statistics.

- f For section 3, to specify an output table, click the Browse button , and then click the Go To Default Geodatabase button .
- g Name your new output table **Route\_Summary**.
- h Click Save.
- i Confirm that the box is checked to summarize on the selected records only.
- j Click OK to create your new summary table.
- k Click Yes to add the summary table to your map.
- l Open the Route\_Summary table.

7. Do you see any ROUTE values without a dash after the letter I?




The summary table is much easier to review for errors because it contains only unique values.

- m Close the Table window.
- n Clear your selected features.

## Step 7: Evaluate data accuracy

Up to this point, you have been evaluating the attributes of your data. Now, you will evaluate the features on your map for accuracy.

- a Change the line symbol for your Federal\_Routes layer to a medium red color with a width of 2.
- b In the Catalog window:
  - Browse to and select the ..\ARC2\Data\_quality folder.
  - At the top of the window, click the Toggle Contents Panel button  to display the folder contents below the catalog tree.
- c At the bottom of the window, select the three TIFF files and drag them into your map.
- d Click Yes for each window that appears to build pyramids for each raster.



It is almost always a best practice to build pyramids when adding rasters as this will reduce drawing time when working with the map. Because the pyramid information is stored along with the file within the database, Building Pyramids will need to be run only once for each file.

- e In the table of contents, verify that only the I-49.tif layer is selected, then right-click and choose Zoom to Layer.
- f Set your map scale to 1:24,000.

At this scale, the Federal\_Routes layer should align with one lane of the interstate highway.

8. Does the Federal\_Routes layer match the location of the interstate highway or are there positional accuracy errors?

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- g Verify that only the US\_90.tif image is selected, zoom to it, and set your scale to 1:24,000.

9. Does the data match the underlying image?

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11 Repeat this process for US\_425.tif.

10. What do you notice about the road position in this image?

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Depending on your specific positional accuracy standards, you may not want to use this data. If you worked with a data vendor to create the data, you could reject this data and have the vendor correct the attribute and spatial errors before you accept the delivery. However, through further checks, you may determine that this is an isolated error. In that case, you may decide to correct the error by editing the highway yourself, allowing the data to meet your quality standards.

12 Close ArcMap without saving changes to the map document.