INSE-6311

Sustainable Infrastructure Planning and Management Systems (Summer 2022)

Assignment – 1

Submitted to: Professor Amin Hammad, PhD

Submitted by:

Gokula Rani Vallabhu - 40161606

Sai Chandra Sekhar Reddy Dwarampudi - 40189233

Date : 26-05-2022

Exercise 1: Exploring your Data

The purpose of this exercise is to identify all the schools near by to the airport which may be affected by the noise from the airport. By identifying these schools, we can take extra measures like soundproofing. We will be using the noise contour based on 65 Community Noise Equivalency level (CNEL) for identification.

We are provided with Schools data frame which includes layers: school, runways, arterials, cnel65, airport_area, country.

By checking all the available layers, we can see the location of schools, airport and noise contour in the map. We can easily zoom in and zoom out of the map by using the icons available in Tools toolbar or we can even use mouse scroll feature for zoom in and zoom out. Initially the schools are displayed using a purple dot and we can change the symbol using Symbol selector box.

We found that we can change the symbol to our custom image by clicking on edit symbol in Symbol Selector dialog box and use Picture Marker Symbol type and insert custom image by clicking on picture.

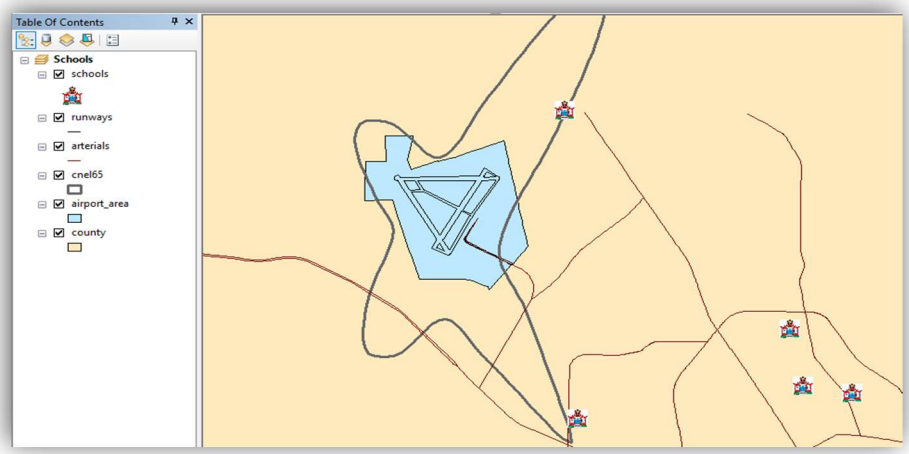


Fig 1.1: Custom Image Icon used to display Schools

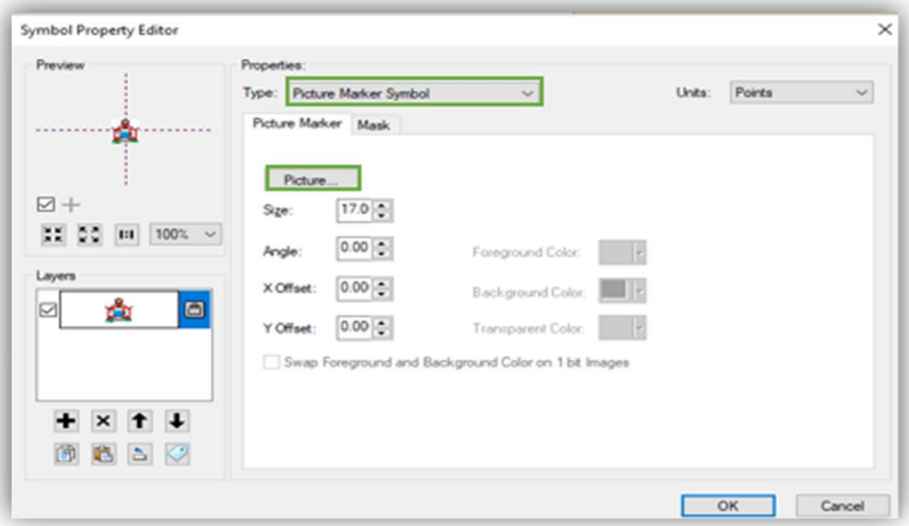


Fig 1.2: Edit Symbol Property Editor

The cnel65 layer displays the area which is going to get effected by the noise generated by airports. With this layer we were able to identify that there is 1 school which is getting impacted and by using the Identify tool from the toolbar we are able to find out the details of school. We can add the school name we found in the identify dialog box to map by using the New Text box button in the Draw toolbar, entering the name of the school “Northwestern Prep” and place the text box near to school icon.

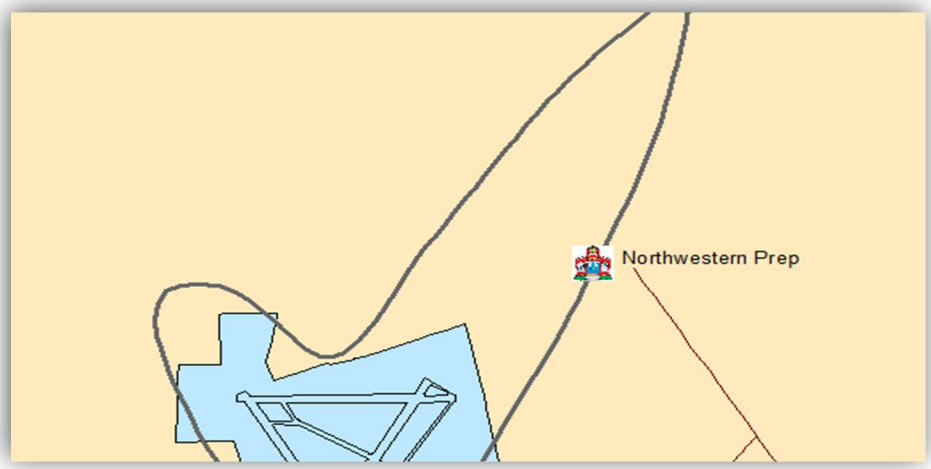


Fig 1.3: Displaying school name which is identified to be affected by noise.

With ArcMap application we can work with 2 view: Data view and Layout view. Data view can be used for exploring and editing the data. Layout view is used for composing and printing the map. Our Data view is completed as we have identified the schools which will get affected by noise. Now for printing the map we will be using the layout view where we can set the title of the map by going to Insert Tab and click on Title and enter “Schools and Noise Contour”. We can also enter the legends like scale, compass, meaning of the symbols used by using the Legend icon in Insert Tab.

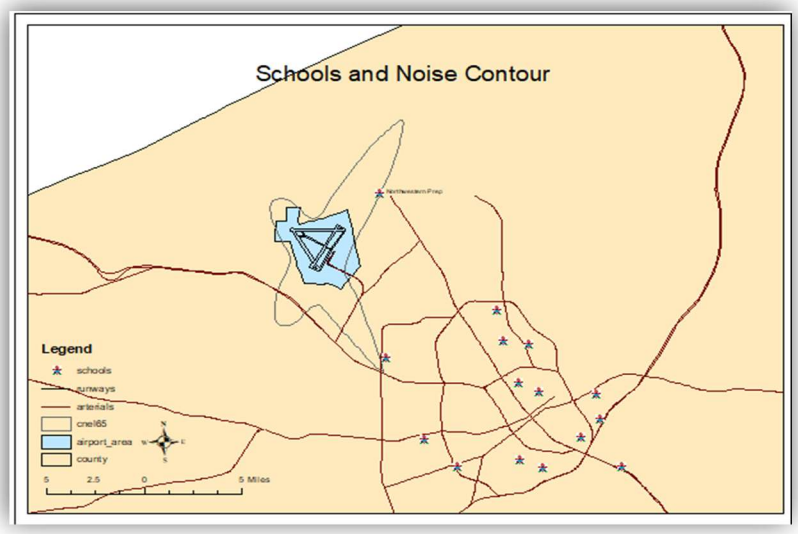


Fig 1.4: Final output of the map with legend and title

We can now print the map with required dimensions. The final map displays the school which are going to be affected by the noise generated by airports.

Exercise 2: Working with geographic features

The purpose of this exercise is to analyze quantity of parcels being used by the different types of land that are covered by the noise contour. We will use graphs and tables to represent the statistical data of parcels of each type of land which is covered by the noise contour of airports.

We are provided with airport map which includes layers: school, runways, arterials, cnel65, airport_area, country and a data layer of parcels which has details of all the different types of land

By using the layout view we are able change the dimensions of the existing airport map with the help of Page and Print Setup. By doing this we are creating space for creating a new data frame “Land Use”. This data frame has parcels layer.

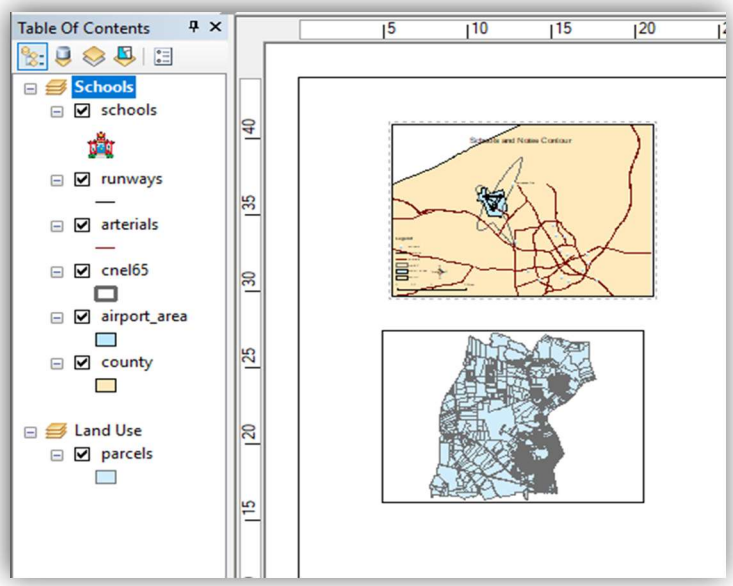


Fig 2.1: Added Land use data frame

We select Land Use data frame and switch to Data View for getting a closer view. We can easily use layers from other data frame with copy – paste. We copied the cnel65, airport_area layers into Land Use data frame for identifying the land which will be covered by noise contour.

By editing the properties of parcels layer and click on Categories we are able to add all the different types of land use. We can also change the color of the different categories.

For identifying how much of each land use is within the noise contour, we have highlighted area only where the parcels are connecting with the noise contour. This was done by clicking on Selection tab and choose select by location where we will set the target layers (parcels) and source layer (cnel65).

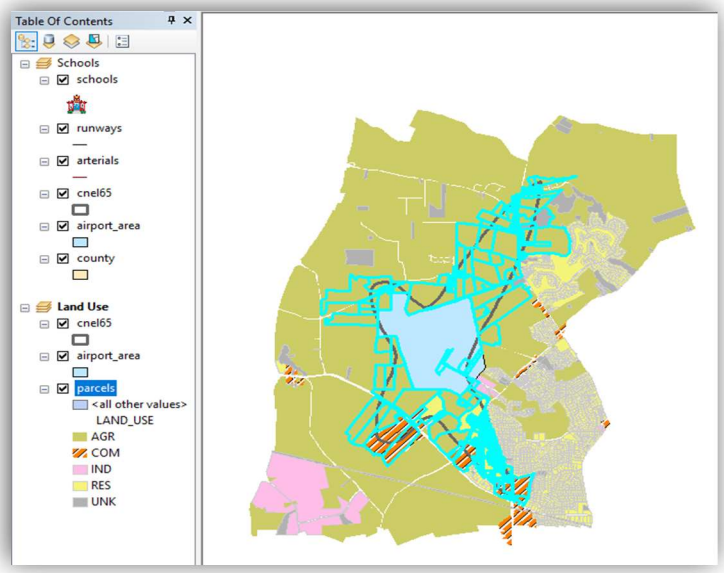


Fig 2.2: Identifying the area which is within noise contour

We have exported the selected area and named it as “parcel_sel” and We rearrange the order of layers so that parcel_sel layer is below cnel65 and airport_area layer. This ensures that the noise contour and airport area are visible from parcel_sel layer.

By right click on parcels_sel layer and click on Open Attribute table we are able to see all the details of parcels like PARCEL_ID, LAND_USE, SHAPE_AREA, etc. From this table we are summarizing the total number of parcels each land type is having. We can also sort the values into ascending or descending.

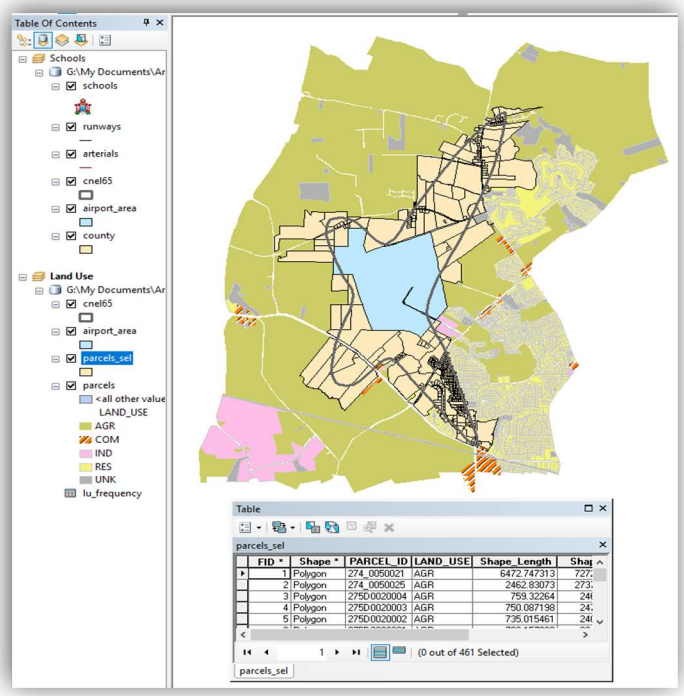
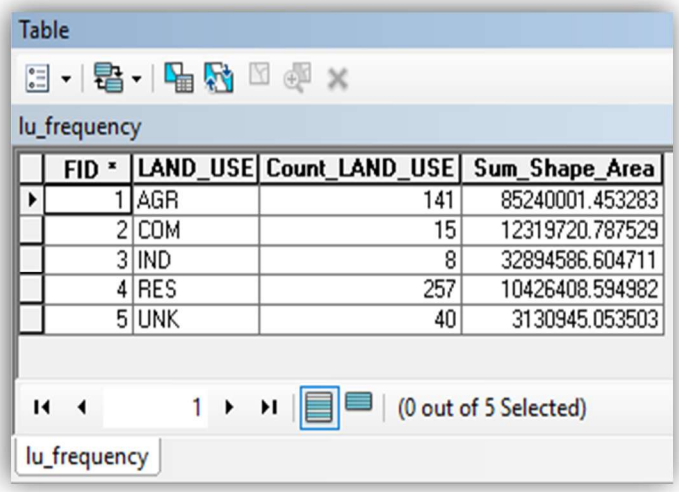


Fig 2.3: New layer parcel_sel and its Attribute Table



FID *	LAND_USE	Count_LAND_USE	Sum_Shape_Area
1	AGR	141	85240001.453283
2	COM	15	12319720.787529
3	IND	8	32894586.604711
4	RES	257	10426408.594982
5	UNK	40	3130945.053503

Fig 2.4: lu_frequency table

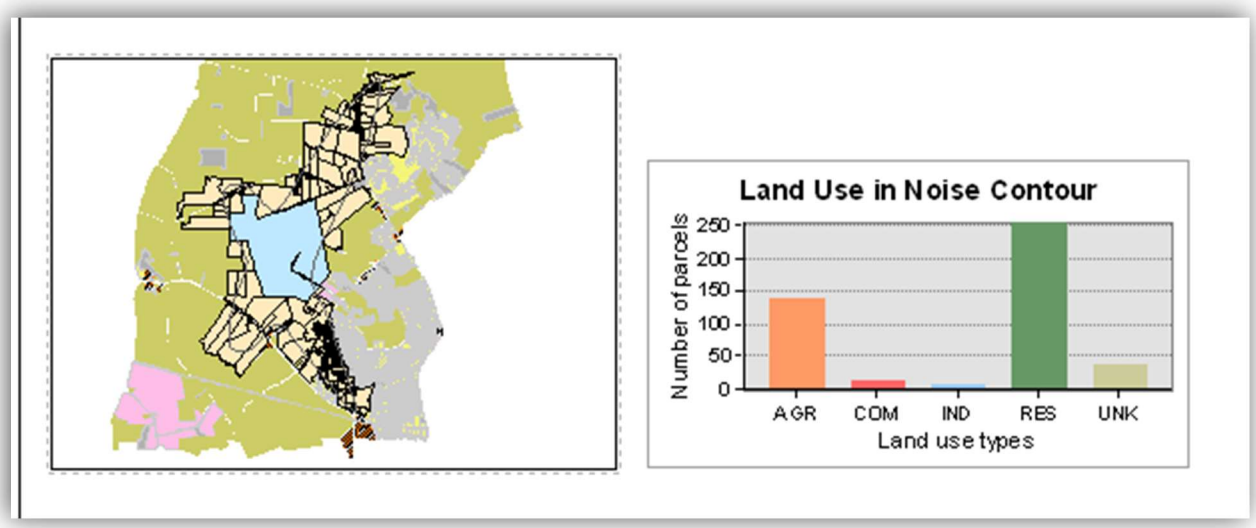


Fig 2.5: Parcels Data Frame and Graph of Land Use types

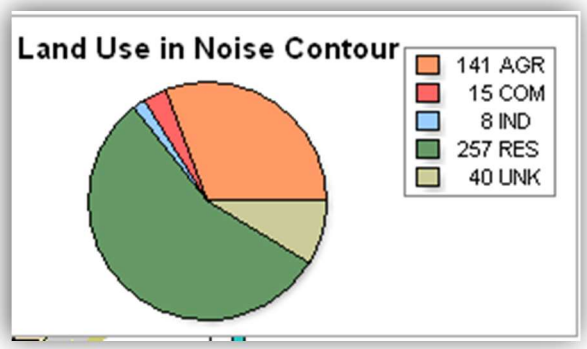


Fig 2.6: Pie chart representation of Land use in Noise Contour

By using Graphs, we have represented number of parcels each land type within the noise contour in a Vertical Bar graph using the data from lu_frequency table. We are having a wide range of graphs like histograms, pie charts, etc. We have also represented the noise contour in Land use using pie chart. We can change the color to Palette and choose any type of style. We can see that RES land type has the maximum number of parcels and IND has the least number of parcels.

Exercise 3: Working with tables

The purpose of this exercise is to generate a population density map which displays the places where people are more.

We are provided with layers: arterials, airport_area, tracts. Tract_pop table

Change the view to Layout view. A new data frame “Population Density” is created. We changed the data frame’s position by mentioning the x and y coordinates in the Size and Position tab, with this feature, we can easily arrange all the data frames in specific positions as needed.

Using the ArcCatalog we have added all the layers: arterials, airport_area, tracts in our data frame. With ArcCatalog, we can create, organize, and manage all of our ArcGIS content, such as geodatabases, maps, globes, layers, etc. We have added population data into the data frame and then used the join function to merge two tables: the table which has the tracts details and the table which has details about the population present in each tract where the common field in both these tables is TRACT_ID.

Then we used the calculator for calculating the population density of each tract per square mile using a formula and stored the resulting values in a new field POP_DEN we created in the joined table.

Table

tracts

FID	Shape	TRACT_ID	Shape_Length	Shape_Area	Rowid	TRACT_ID	POPULATION	tracts.POP_DEN
1	Polygon	100	23359.064618	29501864.071879	1	100	4231	3998
2	Polygon	200	20350.821322	17906796.472795	2	200	1683	2620
3	Polygon	300	19764.506863	17038547.962973	3	300	2580	4221
4	Polygon	400	71734.650764	182638877.306748	4	400	6012	918
5	Polygon	500	41535.388851	101159098.3431	5	500	7046	1942
6	Polygon	600	61452.662248	183391558.187717	6	600	5170	786
7	Polygon	700	91262.743612	292795476.83694	7	700	6203	591
8	Polygon	801	18980.414003	17437646.734043	8	801	2914	4659
9	Polygon	802	108657.097455	452483831.055717	9	802	3295	203
10	Polygon	900	182284.761421	982326195.003156	10	900	3059	87
11	Polygon	1000	124503.43505	510338863.638371	11	1000	1364	75
12	Polygon	1100	161714.527502	1171289698.142465	12	1100	1868	44
13	Polygon	1200	168383.265964	1277251210.400921	13	1200	3070	67
14	Polygon	1300	173305.56971	1271243904.096527	14	1300	5442	119
15	Polygon	1400	110685.412067	569971341.488668	15	1400	2945	144
16	Polygon	1500	200138.818819	1454467245.024219	16	1500	3496	67
17	Polygon	1600	161157.789413	1019499405.547365	17	1600	2305	63
18	Polygon	1700	156142.837956	880859065.893682	18	1700	3378	107

Fig 3.1: Table after using Join and New field POP_DEN is calculated

Finally, we used the POP_DEN field values as the quantities value, changed the graduated colour scheme for the different ranges of quantities in the tracts layer and rearranged the layers, changed the colour of airport_area and arterials layers so that they will be more visible. Now we are able to clearly see where there is more concentration of population in the tracts.

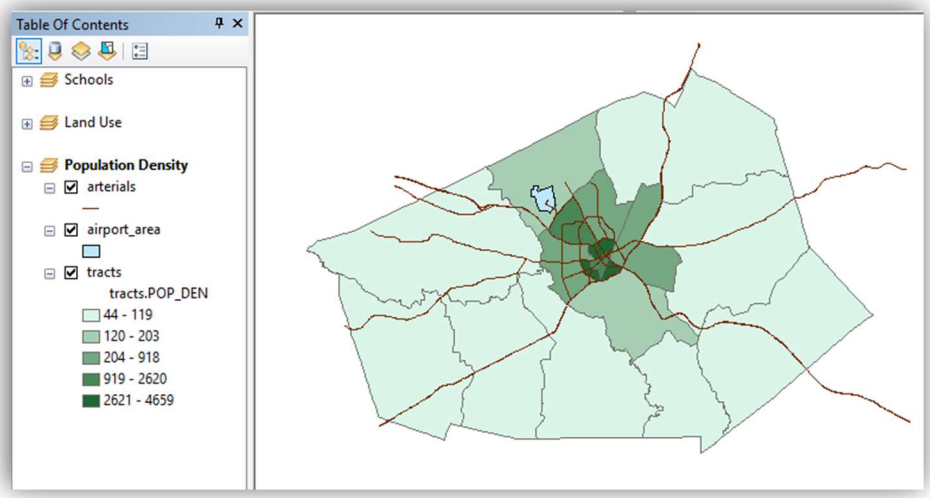


Fig 3.2: Final output of population density of each tract

Exercise 4: Editing Features

The purpose of the exercise is to extend the airport road by creating a new loop road for the existing arterial architecture of roads. Learning outcome will be that we are able understand how to add new features to the map.

We are provided with schools' data frame with layers: airport_area, schools, cnel65, runaways, arterials, country

We selected the schools' data frame and switched to the Data view. We make a copy of the existing arterials by using the export feature so that there is a backup ready in case we have made any errors. We have unchecked arterials, cnel65, and airport_area layers from the data frame so that the road will be more clearly visible to us and we won't be disturbed by other layers. By using the snapping feature are able to display the existing arterials endpoints.

Then by using the Sketch tool we have created a new feature where we made use of straight line and tangent curve for creating the new loop road near airport. We can see the newly created road is highlighted. With the help of the Attributes button, we have entered the name of the road.

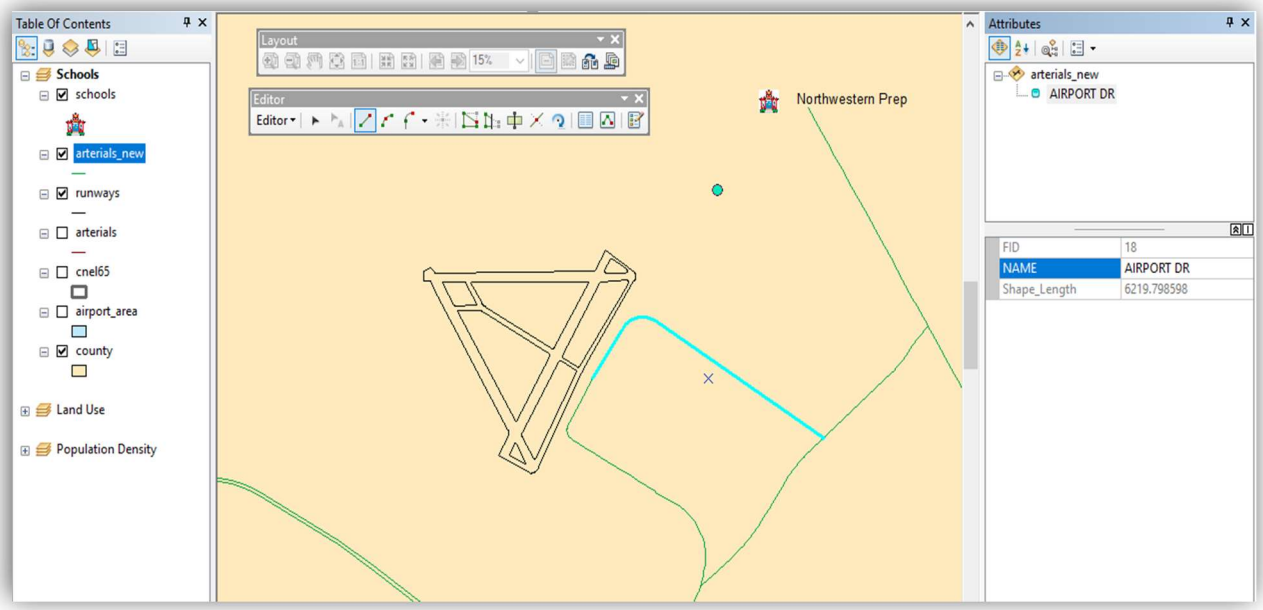


Fig 4.1: New road is added to the map which is highlighted by blue line

The label feature in the new arterials layer is used to label all the road names. We didn't have to manually insert the text box and enter the name of each road in the map, which is very handy. The label feature works for all the layers, we have used the feature for the school's layer where it displays all the school names.

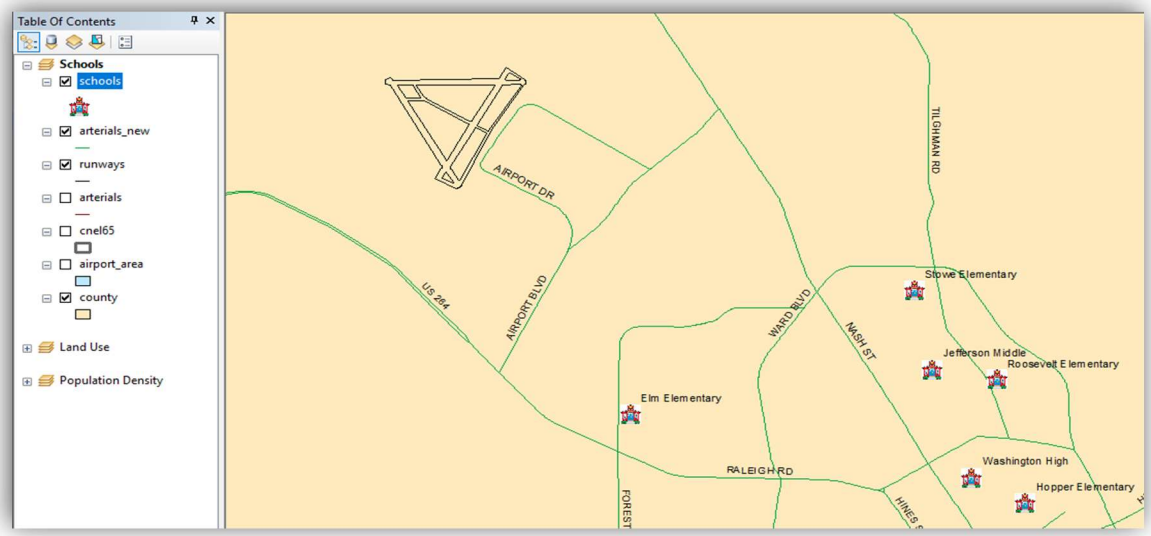


Fig 4.2: Map after Label feature function is used for displaying names of roads and schools

Switching into Layout View and zooming in as per necessary, we are able to view the road we have newly added to the map.

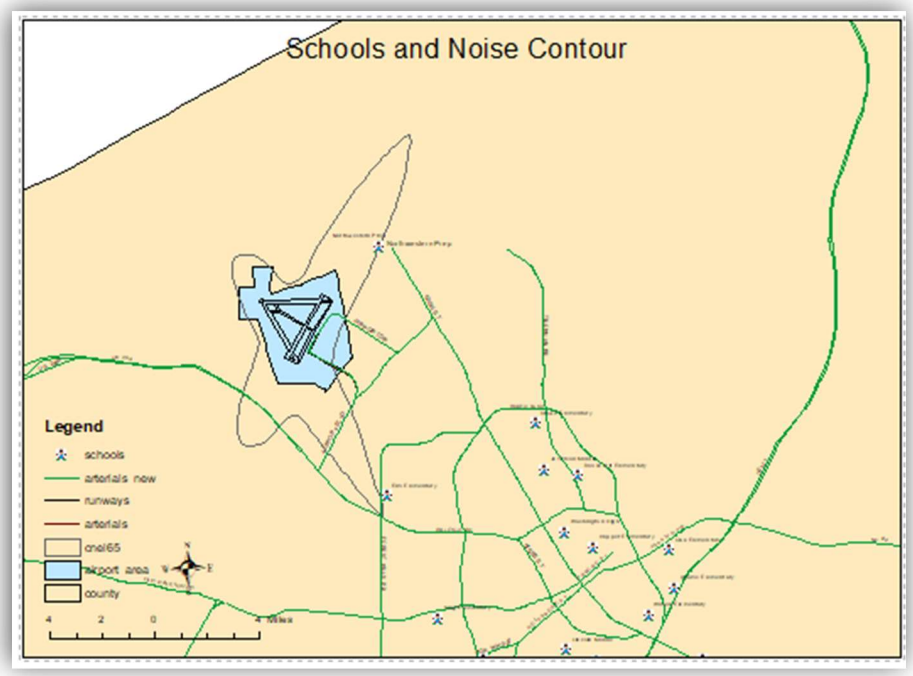


Fig 4.3: Layout view of the map with newly added road

Exercise 5: Working with map elements

The purpose of this exercise is to make all the data frames more presentable by mentioning all the titles, background colours, legends and scales, so that we can get final version of the map which we can print.

We begin by selecting the land use data frame and switched to the layout view then remove the parcels_sel layer so that map will show the land usage types within the noise contour. We changed the background color to yellow using the properties of the data frame and named title as “Land use within Noise Contour” and added default legends to the map.

To make legends more styling, we used the items tab in the properties of the legends and selected Horizontal with Heading and labels style. We also renamed the names of the labels that appear in the legends box, for instance we are changed the name of “Land_USE” to “Land use” and we inserted the scale bar at the bottom of the legends. Now we are repeating the similar steps for population density data frame where we are adding the title as “Population density”, setting the background color to yellow, rename the items in the data frame, inserting the legends and styling them, inserting a scale bar in the lower left end, resizing the legends and aligning them.

Since all the maps pointing in the same direction we need only one North arrow, so we used the arrow added in schools data frame, increased its size and moved it to the lower right corner of the page and We added a title for our poster as “Posted Airport Extension”.

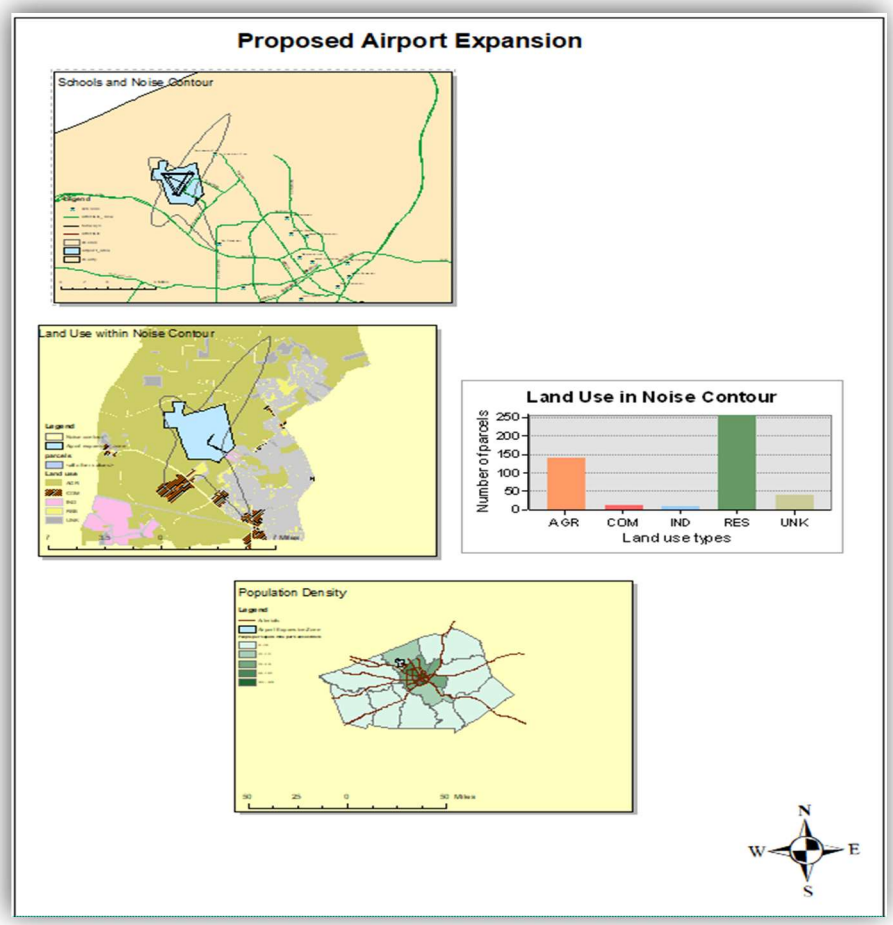


Fig 5.2: Inserting title to the map and aligning the north arrow for the complete map

To make the map more understandable about where the airport's expansion area is being proposed in the Schools data frame we are adding the extent rectangles to the frame. Extent rectangles are used to show the amount of data of one data frame in another data frame. For this we created a new data frame next to the schools and named it to "County overview". We copied the county area layer into our new data frame and used the extended rectangles tab in the data frame properties to show the amount of data of county layer on the school's data frame. The rectangle is specifying the proposed are for airport expansion.

Now we are adding shadows and neat line to all the data frames in the page to make it more presentable.

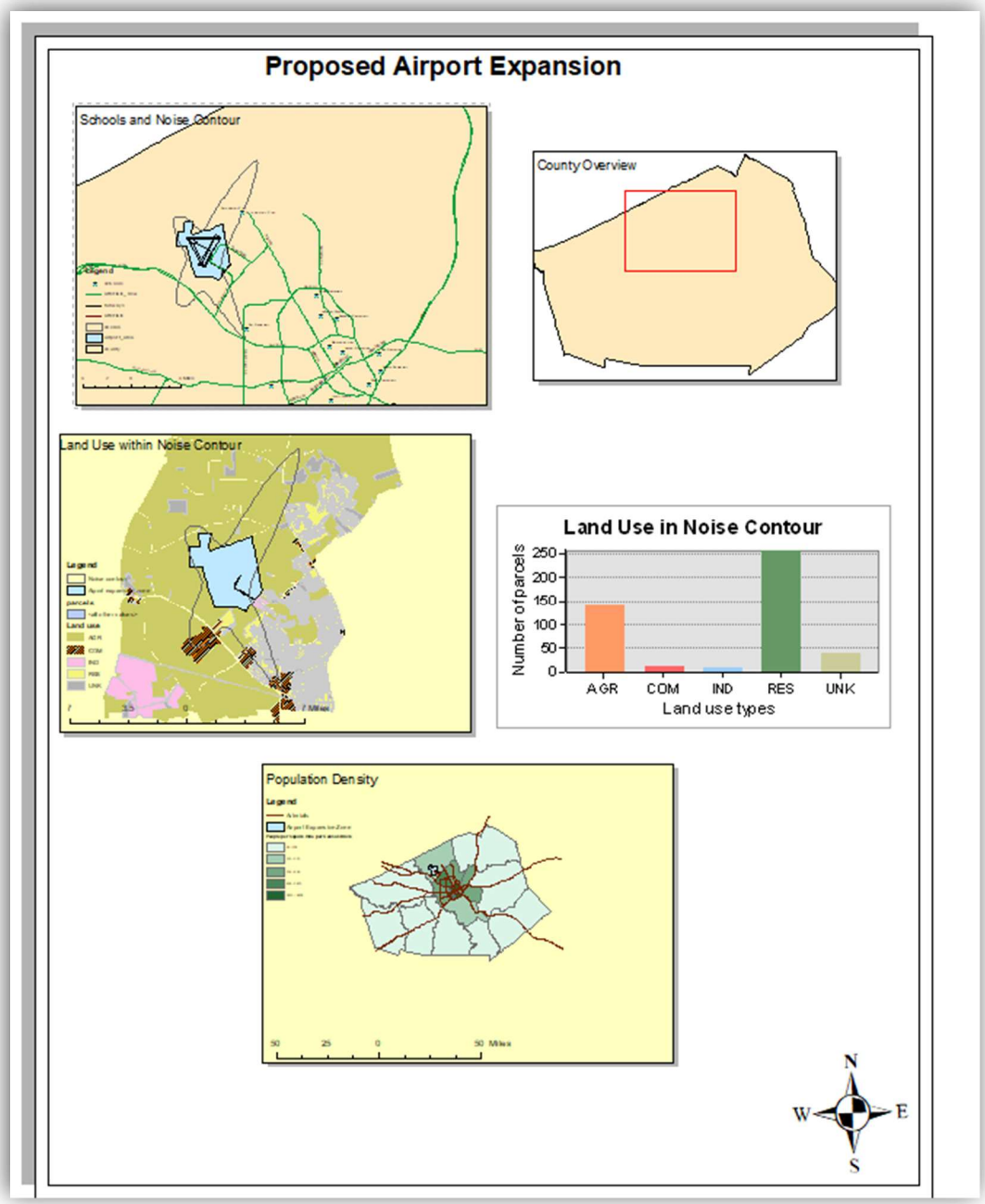


Fig 5.3: The final map with shadows and neat line