TUTORIAL 7
SPATIAL ANALYSIS

Spatial analyses are advanced applications of GIS such as determining relationships between locations, identifying locations that meet criteria. For instance, it is possible to place buffers around features to retrieve nearby features for proximity analysis. An example is to retrieve crime locations near properties at high-risk of criminal activity such as bars. A classical spatial analysis consists of a site selection or suitability analysis for facilities, especially when this involves several selection criteria such as being in a business area, on a major street, and centrally located. Finally, it is possible to carry out complex spatial processing for approximation purposes, for example, to estimate demographic attributes for administrative areas that do not follow census tracts. In this case, census tracts may be subdivided among two or more administrative areas, so an approximation is needed to split up or apportion tract data to the administrative areas.

Main learning objectives are following :

- Buffer Points for proximity analysis
- Conduct a site suitability analysis

TUTORIAL 7.1

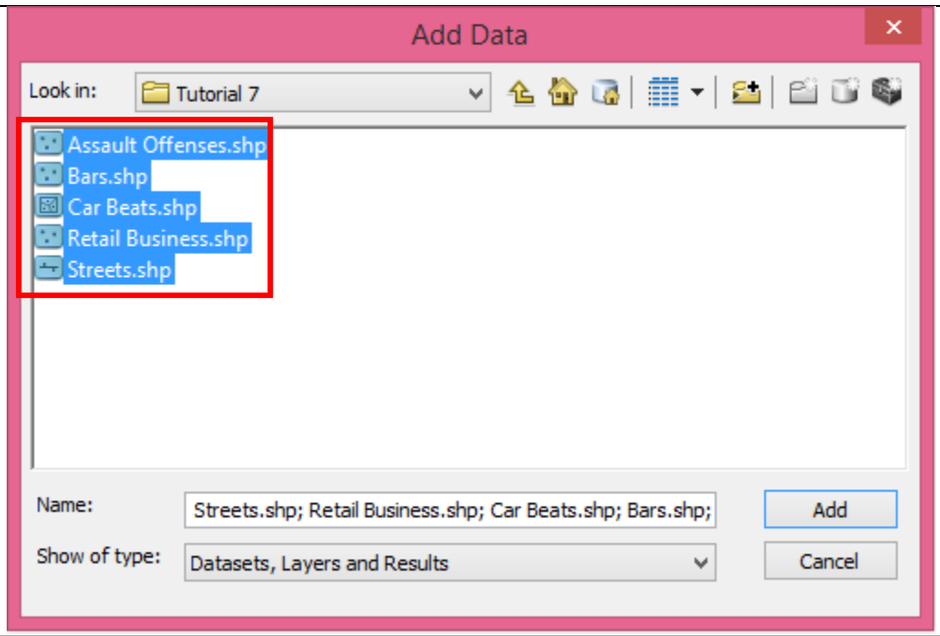
BUFFER POINTS FOR PROXIMITY ANALYSIS

Some land uses attract crime, such as taverns and bars. So, it's a good idea for police to monitor crimes in the vicinity of bars, and this is possible with GIS using circular buffers.

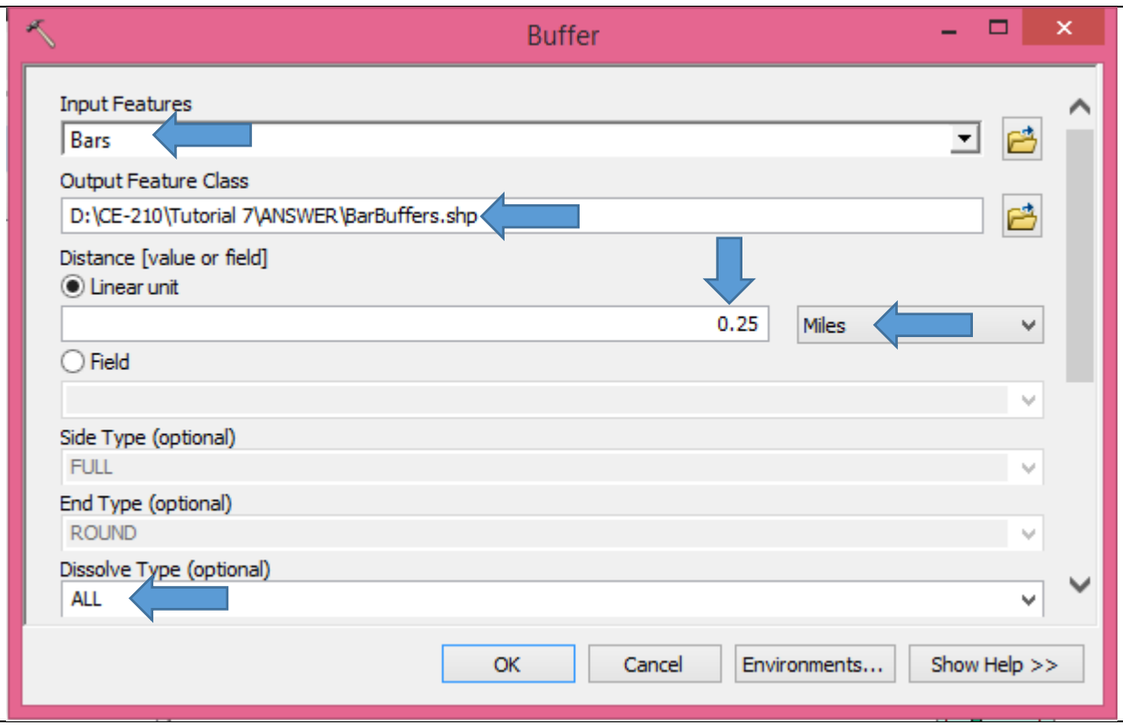
7.1.1	Buffer Bars
7.1.2	Extract assault offenses in bar buffers

7.1.1 Buffer Bars

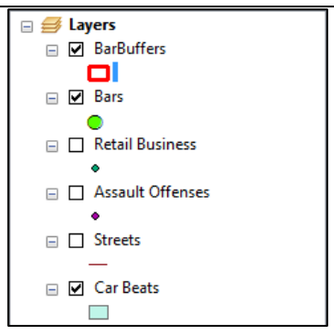
1. Navigate to the D:\CE210\Tutorial 7 and add following shape files.

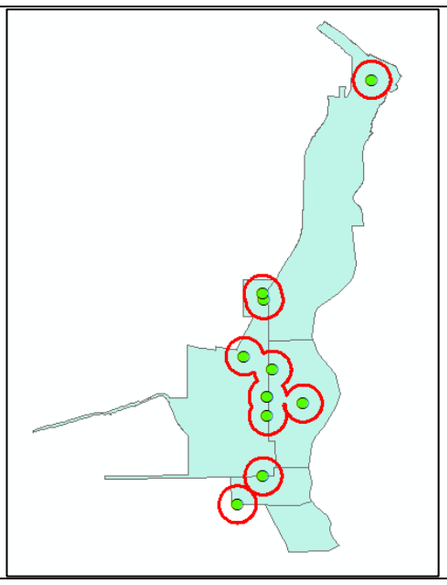


2. On the main menu, click Geoprocessing, Select Buffer.
3. Make selections as shown in the image



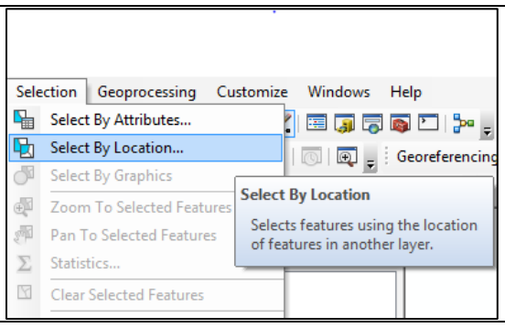
4. Click OK.
5. Move BarBuffers to the top of the TOC and change its symbology to a hollow fill.



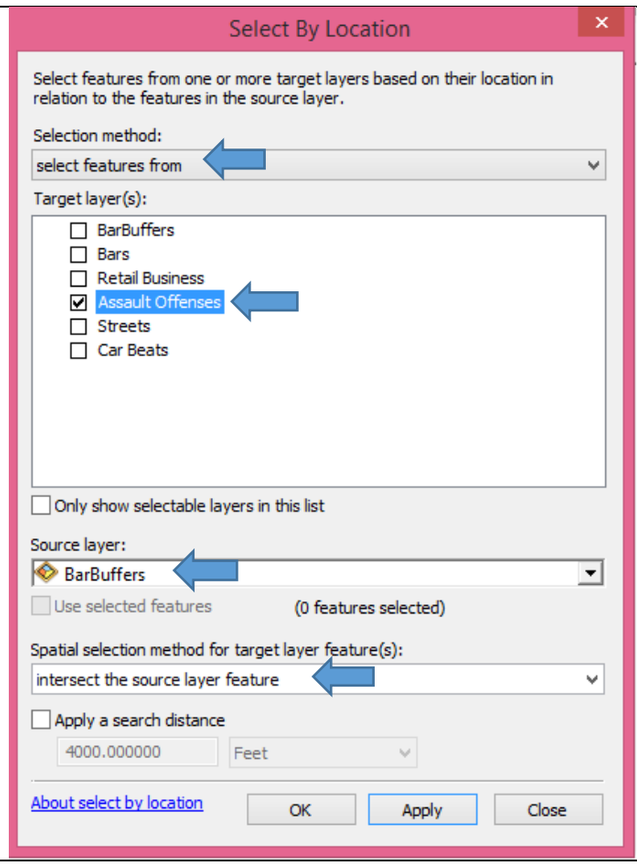


9.1.2 Extract assault offenses in bar buffers

1. On the main menu, click Selection, click Select By Location.

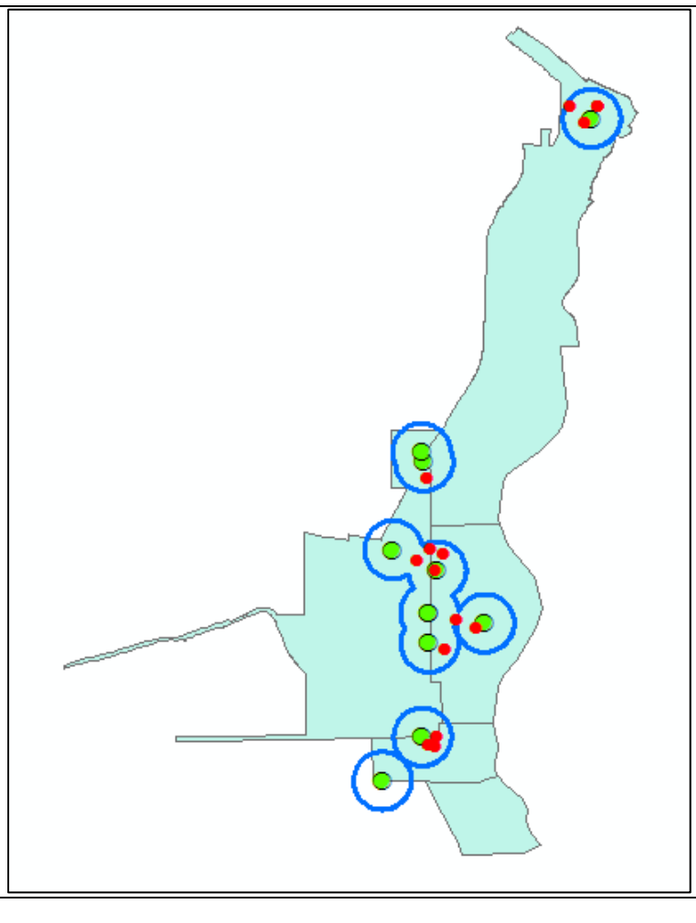


2. Make selections as shown in the image
3. Click Apply and Close.



4. In the TOC right click Assault Offenses layer. Click Data, Export Data.
5. In the Export Data dialogue box, make sure that selected features is selected, make the output feature class D:\CE-210\Tutorial 7\ANSWER\AssaultsInBarBuffers.shp ,click OK then click Yes
6. Symbolize the new layer using a bright red circle 1 marker, size 8.
7. Remove Assault Offenses layer from TOC.

This is a map that a task force would want for making the case to enforce laws at bars or close bars down. For example, three of the bars have three or four assaults in their vicinity.



TUTORIAL 7.2

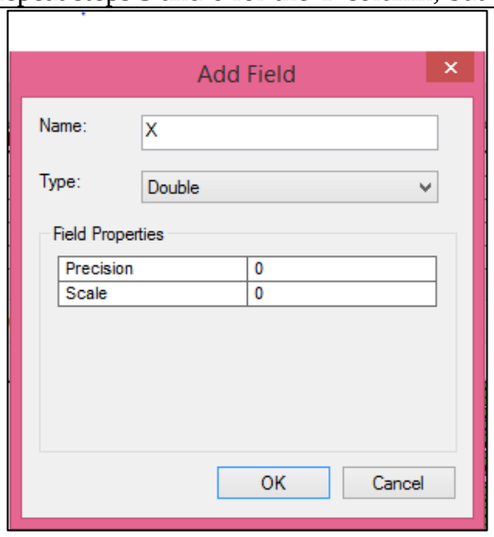
CONDUCT A SITE SUITABILITY ANALYSIS

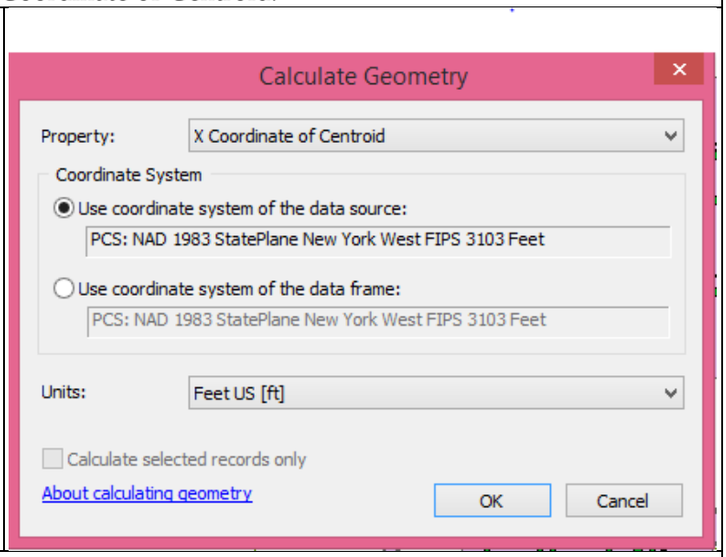
Suitability analysis for facility location is a classic GIS application. In this exercise, you will perform suitability analysis for the purpose of locating potential areas for new police satellite stations in each car beat of Lake Precinct. Criteria for locating these stations are that the site must be centrally located in each car beat (within a 0.33-mile radius buffer of car beat centroids), in retail/commercial areas (within 0.10 mile of a least one retail business), and within 0.05 mile of major streets. Typically, analysis consists of several steps that include attribute- and location-based queries, buffers, spatial joins, and other geoprocessing steps.

7.2.1	Add X and Y columns to car beats
7.2.2	Map car beat centroids
7.2.3	Buffer car beat centroids
7.2.4	Buffer retail businesses
7.2.5	Select major streets
7.2.6	Buffer major streets
7.2.7	Intersect buffers

7.2.1 Add X and Y columns to car beats

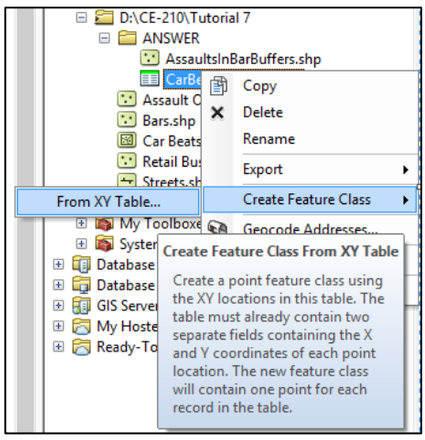
1. In the TOC, right-click the Car Beats layer and click Open Attribute Table.
2. In the Attributes of Car Beats table, click the Table Option button and Add Field.
3. In the Add Field dialogue box, name the new field **X**. Choose Double from the Type drop-down list, and click OK.
4. Repeat steps 2 and 3, but name the field **Y**.
5. In the attributes of Car Beats table, right-click the **X** column heading. Click Calculate Geometry, and click Yes.
6. In the Calculate Geometry dialogue box, select X Coordinate Centroid for Property. Click OK.
7. Repeat steps 5 and 6 for the Y column, but select Y Coordinate of Centroid.

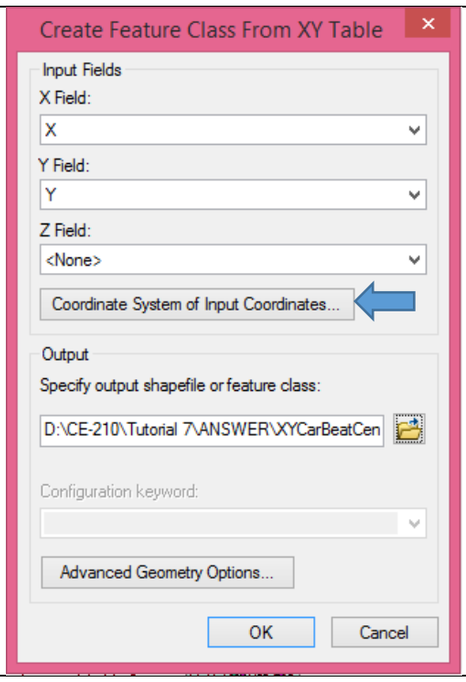




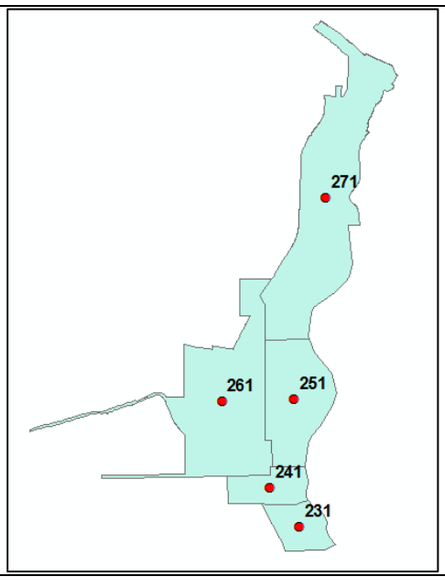
7.2.2 Map car beat centroids

1. Click the Table option button, click Export.
2. In the Export Data dialogue box, click the Browse button for Output table field. Change the Save as type to dBASE Table, browse to D:\CE-210\Tutorial 7\ANSWER, change the Name to CarBeatCentroids, click Save, then click OK and No.
3. Close the Attribute table.
4. Expand the D:\CE-210\Tutorial 7 folder in Catalog window. Right-click CarBeatCentroids. Click Create Feature Class and From XY Table.
5. In the Create Feature Class From XY Table dialogue box, click the Coordinate System of Input Coordinate button.
6. In the Spatial Reference Properties dialogue box, click Import. Browse to D:\CE-210\Tutorial 7\Car Beats, Add, and OK.
7. Specify the output feature class location as per requirement.



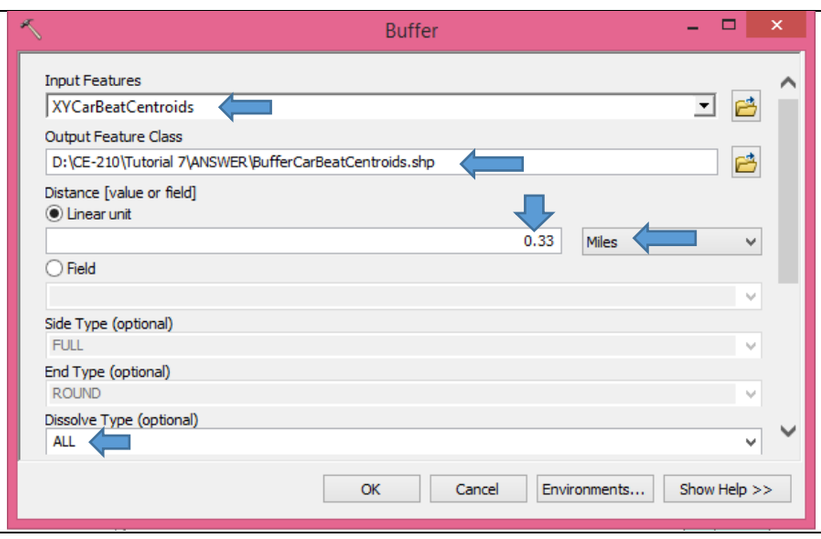


8. Add XYCarBeatCentroid layer to the TOC and symbolize with Circle 2, Mars Red and size 10.Lable the centroids with Beat instead of the original Car Beat polygons.

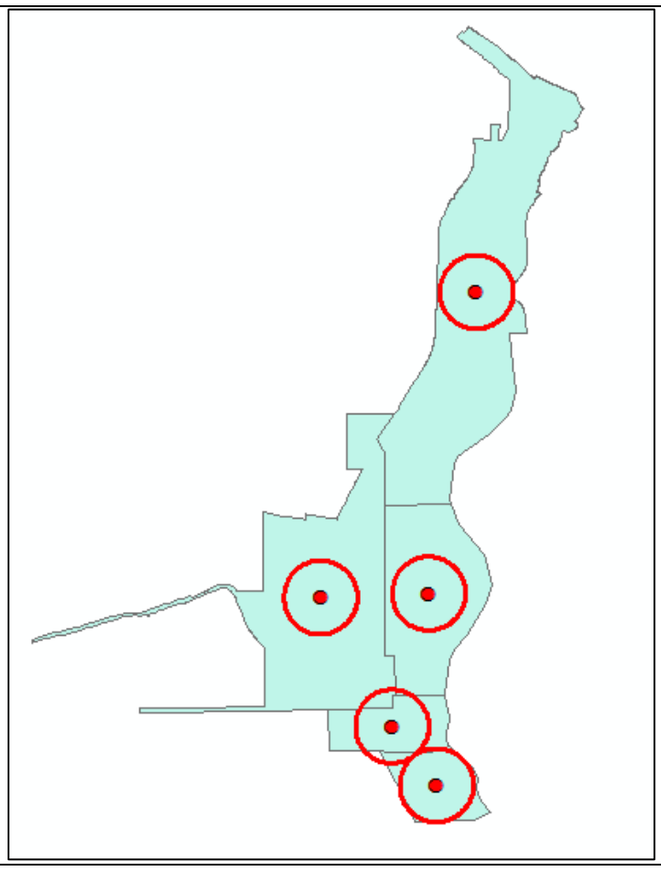


7.2.3 Buffer car beat centroids

1. On the main menu, click Geoprocessing, Select Buffer.
2. Make selections as shown in the image.
3. Click OK.

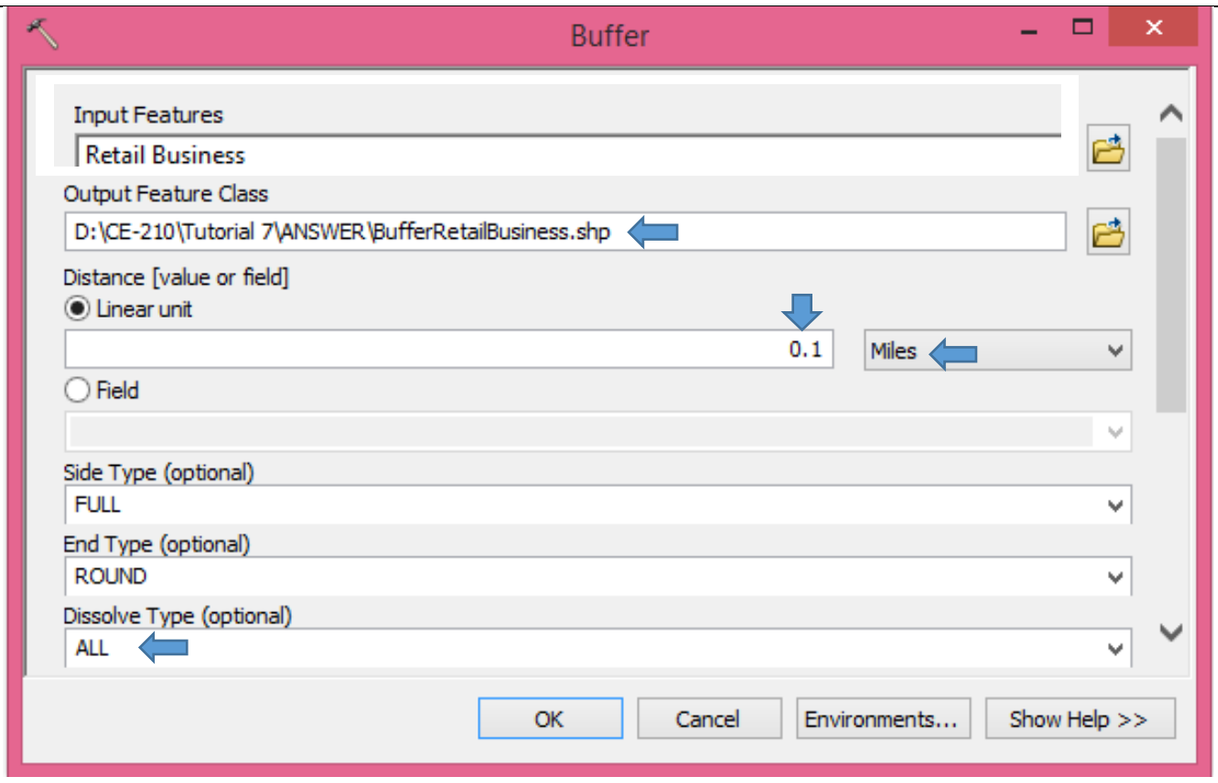


4. Symbolize the Buffer polygons with a hollow fill, set the Outline Color to Mars Red, and then set the Outline Width to 2.



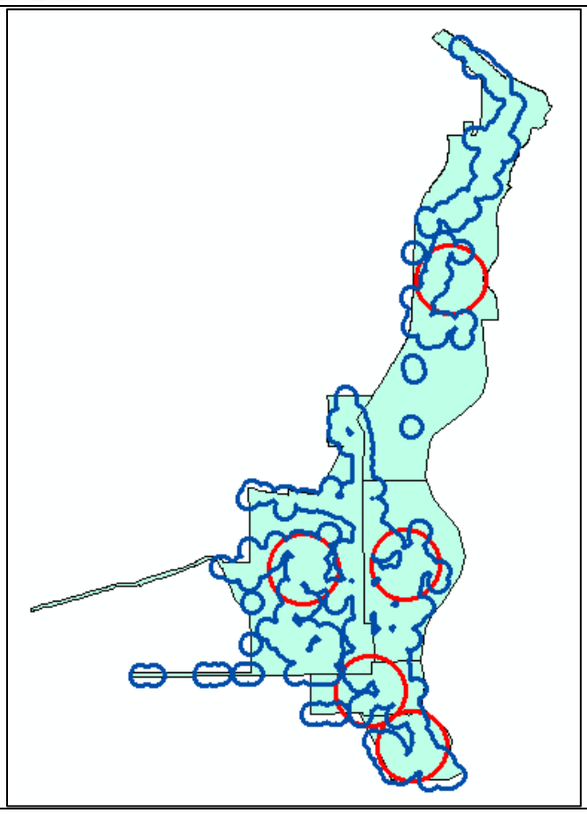
7.2.4 Buffer retail businesses

1. On the main menu, click Geoprocessing, Select Buffer.
2. Make selections as shown in the image.
3. Click OK.



4. Symbolize the new Buffer layer with a hollow fill, set the Outline Color to Ultra Blue, and then set the Outline Width to 2.

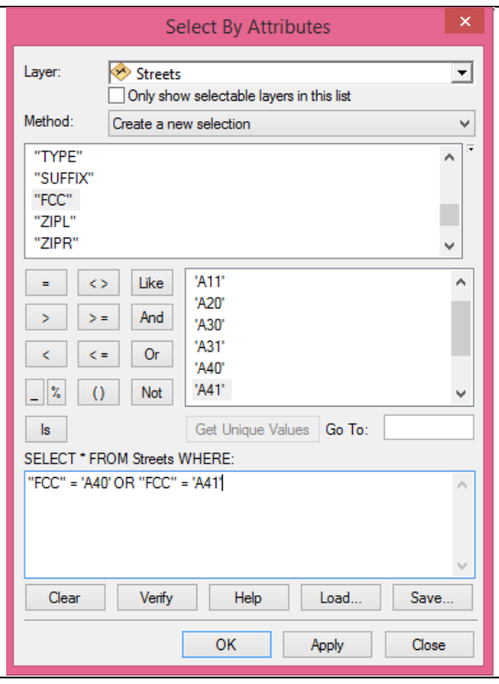
In the TOC turn off the XYCarBeatCentroids and Retail Business layers. The intersection of the two buffers nearly satisfies the suitability criteria, but you still need to buffer the streets. Then you can take an intersection of all buffers to find suitable areas.



7.2.5 Select major streets

Tiger streets records have an FCC (Feature Classification Code) that classifies streets by type. Major and commercial streets have FCC values A40 and A41.You will select only those streets and then Buffer them.

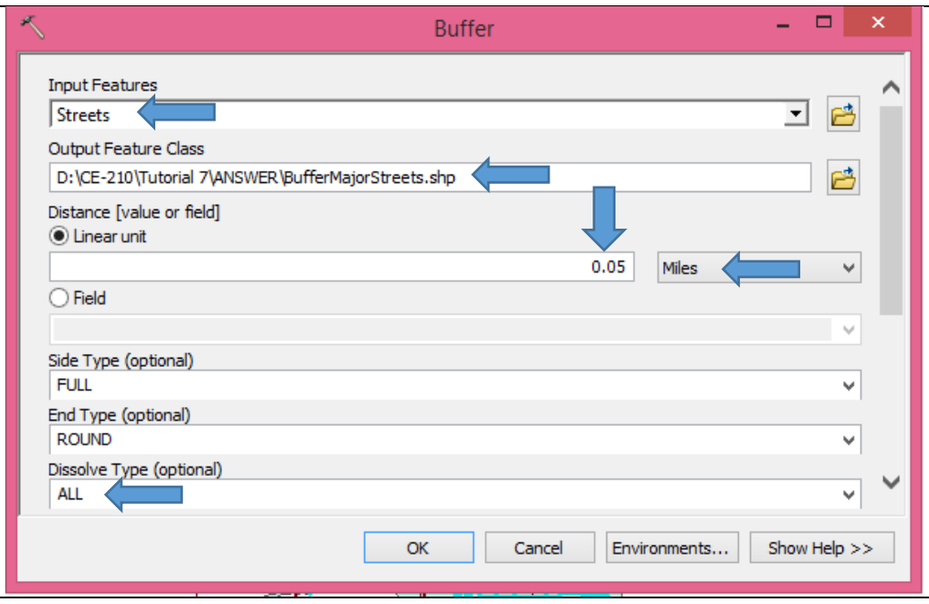
1. On the main menu, click Selection, Select By Attributes.
2. Type or Make selections as shown in the image.
3. Click OK.



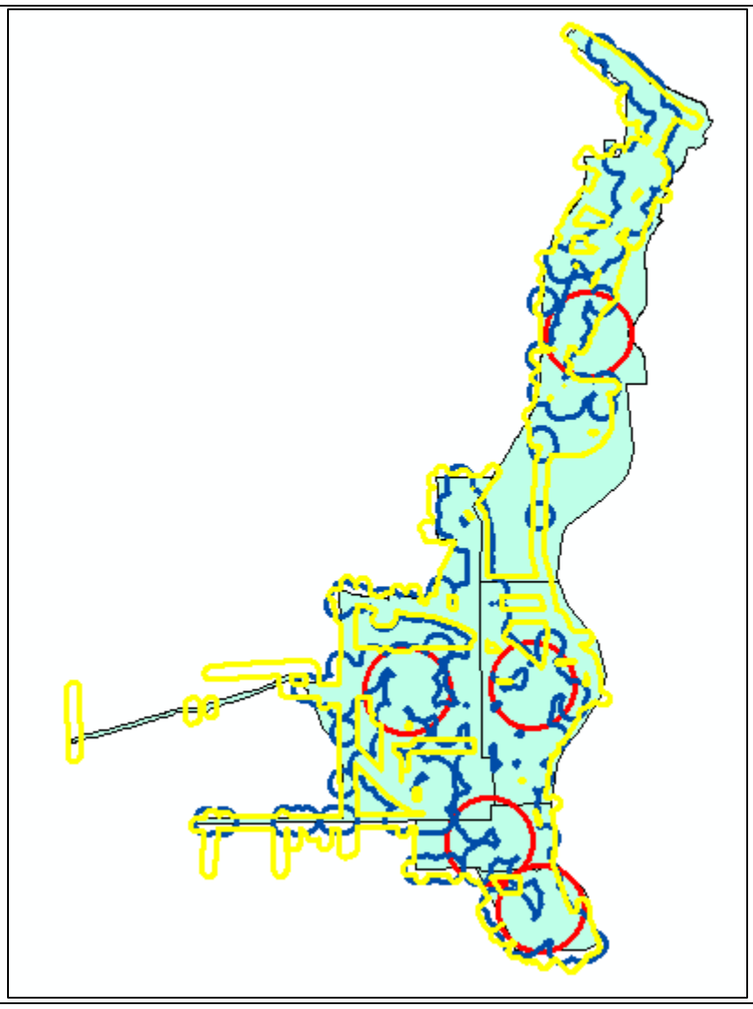
7.2.6 Buffer major streets

1. On the main menu, click Geoprocessing, Select Buffer.
2. Make selections as shown in the image.

3. Click OK.



4. Symbolize the new Buffer layer with a hollow fill, set the Outline Color to Solar Yellow, and then set the Outline Width to 2.
5. Click Selection and Clear Selected Features.

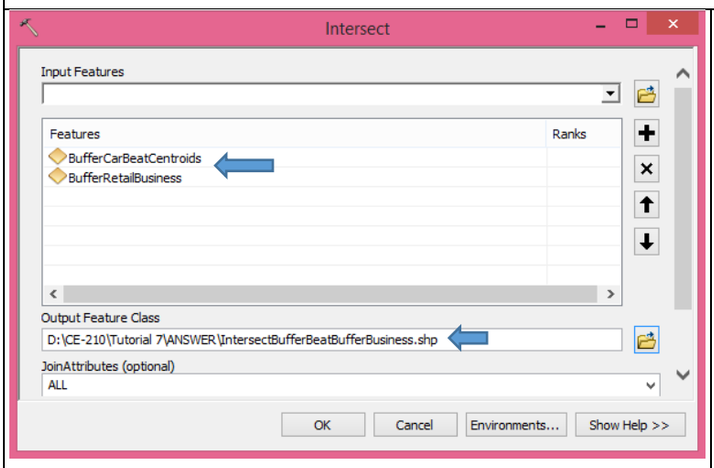


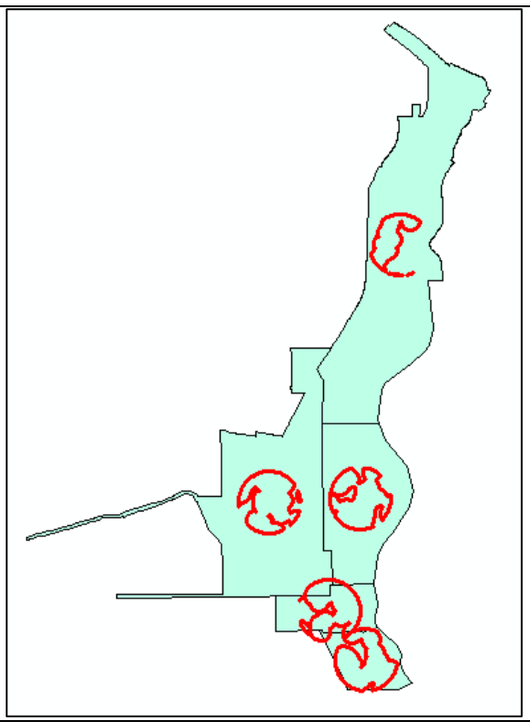
7.2.7 Intersect buffers

It is getting difficult to identify areas that meet all three proximity criteria, but an intersection of all three buffers will show those areas directly.

1. On the main menu, click Geoprocessing, Select Intersection.
2. Type or Make selections as shown in the image.

3. Click OK.





4. Intersect the Intersection you have just created with BufferMajorStreets to produce BufferSuitabilty.

Notice that some of the suitable area for car beat 241 is in car beat 261.Obviously, you would not choose a site in the wrong car beat. Otherwise, the results are ready for use for finding sites for the satellite police stations.

