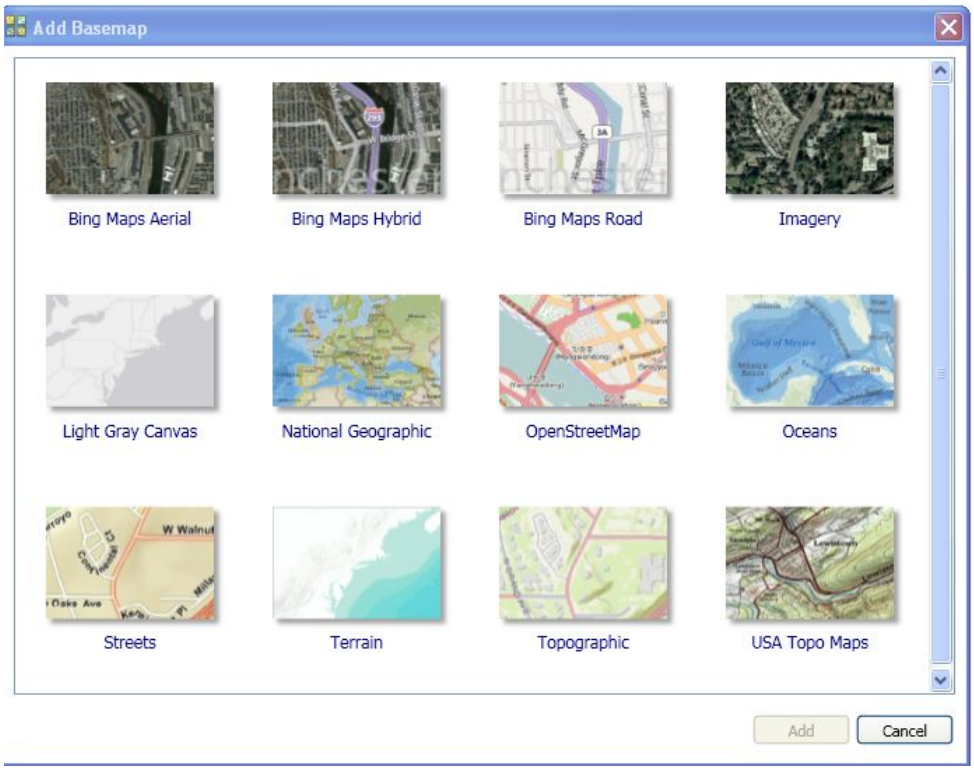
ArcGIS Guide

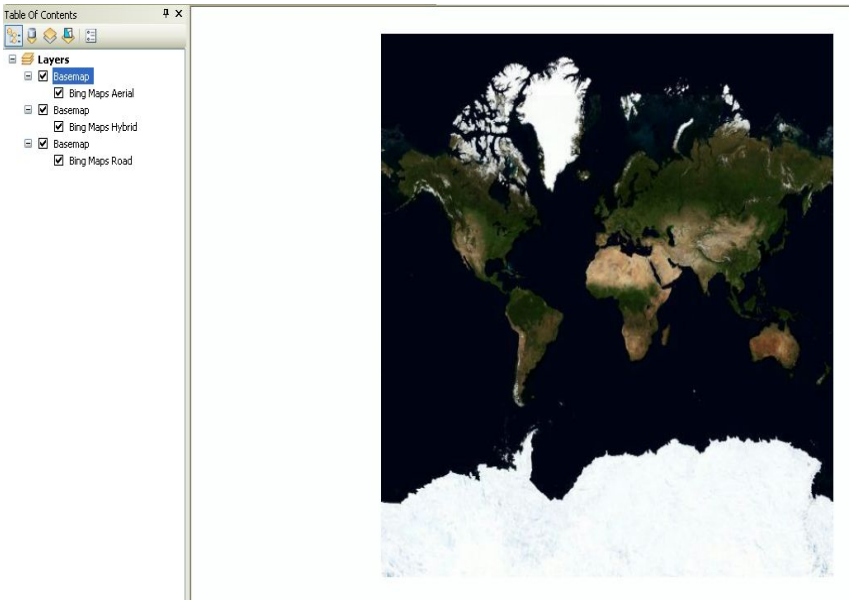
Neighborhood Mapping

SECTION 1: Opening ArcMap and Loading Basemaps

1. Start ArcMap 10 on your computer. Choose New Maps, and choose Blank Map for your template.
2. Load Bing base maps by going to **File** → **Add data** → **Add Basemap**
3. Here you can load the 3 base maps you will use to trace the neighborhood boundaries over. Select the **Bing Maps Road** and press **Add**. Do the same for **Bing Maps Hybrid** and **Bing Maps Aerial**.

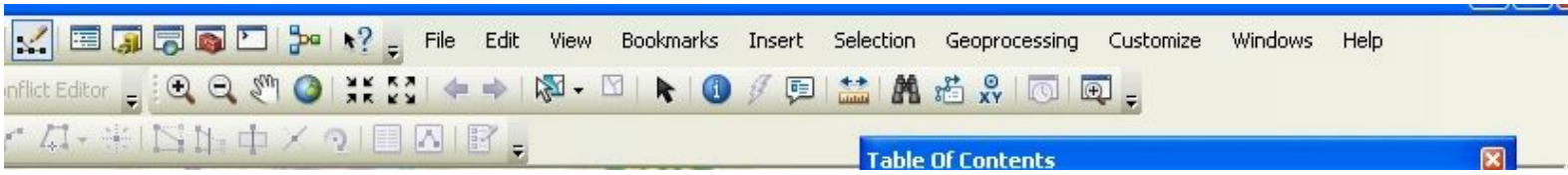


4. Your screen should look something like this. (Which map you have displayed depends on which layer you have on top of the left)



5. Create a new folder in your c: drive where you will store your GIS files. I just named mine “Florence” for the city I am doing.

6. Save your new map document with the name of your chosen city. **File** → **Save As** Or, if you’re mapping a city along with its accompanied suburbs title it: Name of your city_Metro_Area.



SECTION 2: Creating Your Vector Shapefile

7. Now you want to create another file where you can draw the neighborhood boundaries. You are creating a type of vector-based ArcGIS file called a **shapefile**. To do this, open up **ArcCatalog**, (another program that’s installed with your ArcGIS)

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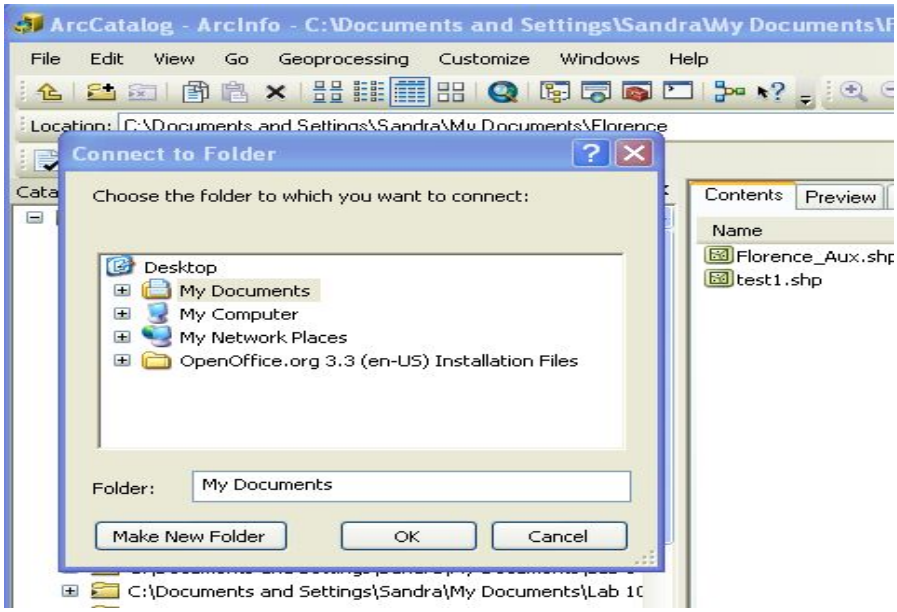

8. On ArcCatalog, go to **File** → **Connect Folder**. Then find the folder you created on your computer and click OK

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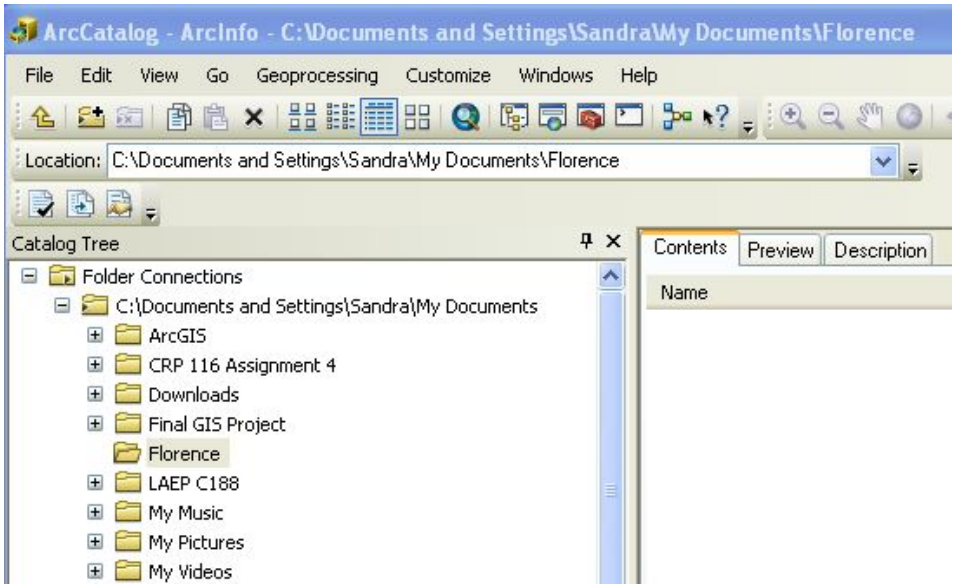
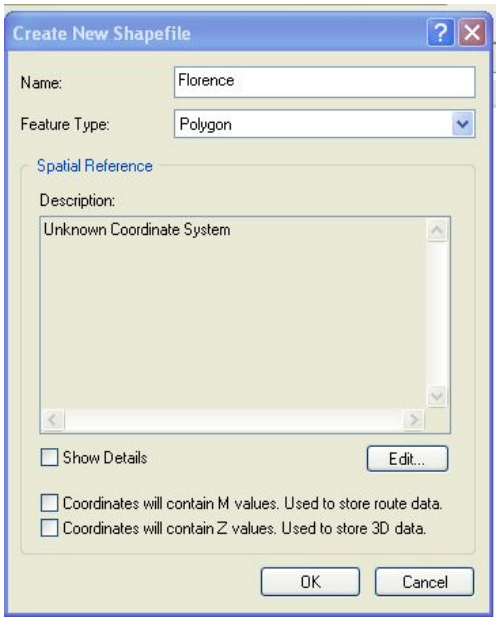
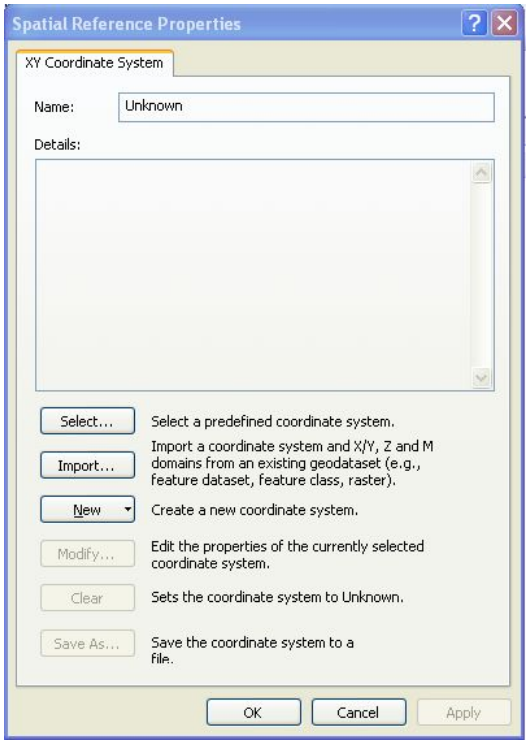


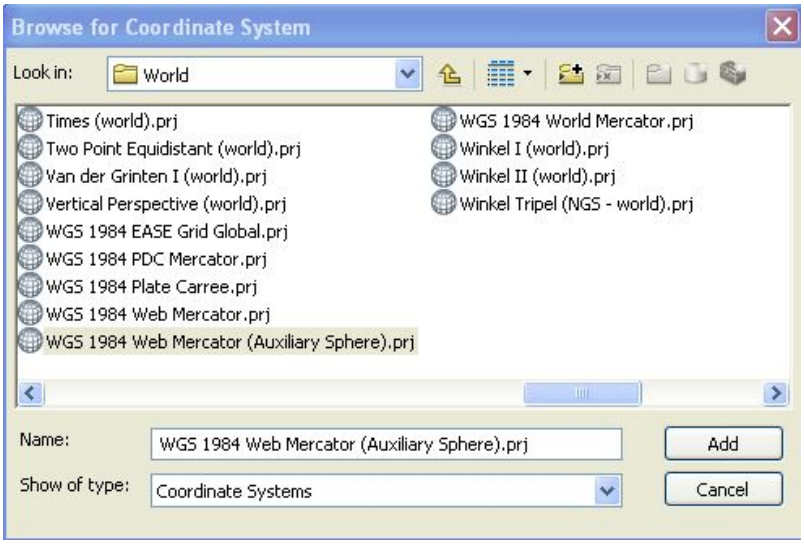
9. You should see you folder under Folder Connections under Catalog Tree on the left side of the screen now. Make sure your folder is selected. (Florence is selected on mine)



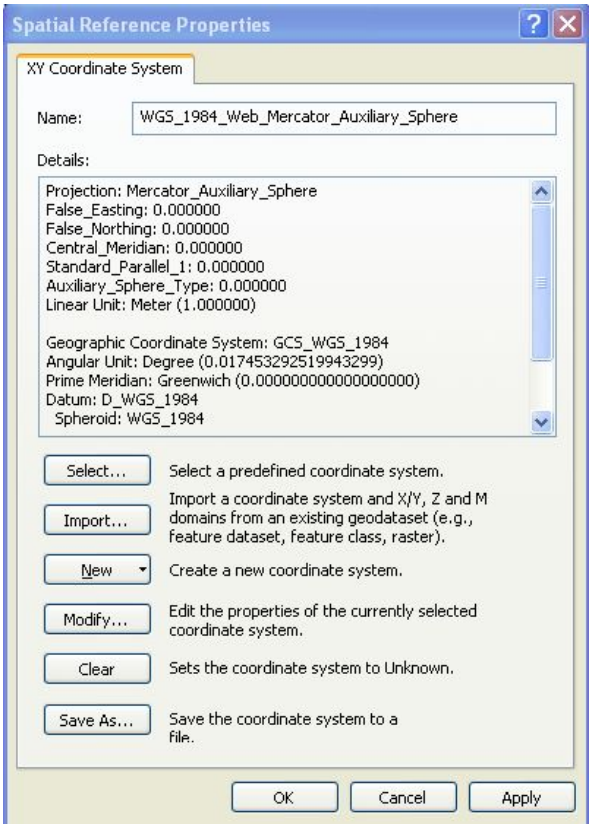
10. Now go to **File** → **New** → **Shapefile**. The window below should show up. Name your shapefile after your city. Under **Feature Type**, select **Polygon**.



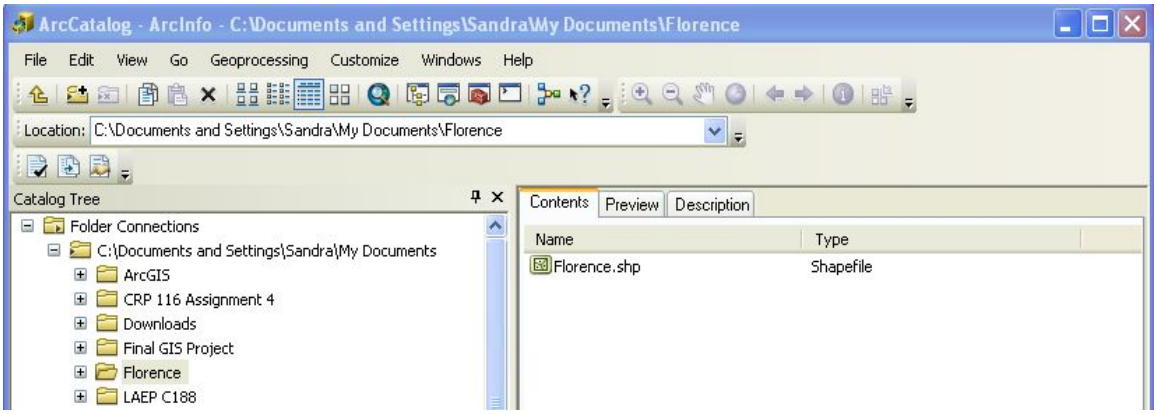
11. Now Click on the **Edit** button to to change the Coordinate System.



12. Click on **Select** to select predefined coordinate system.



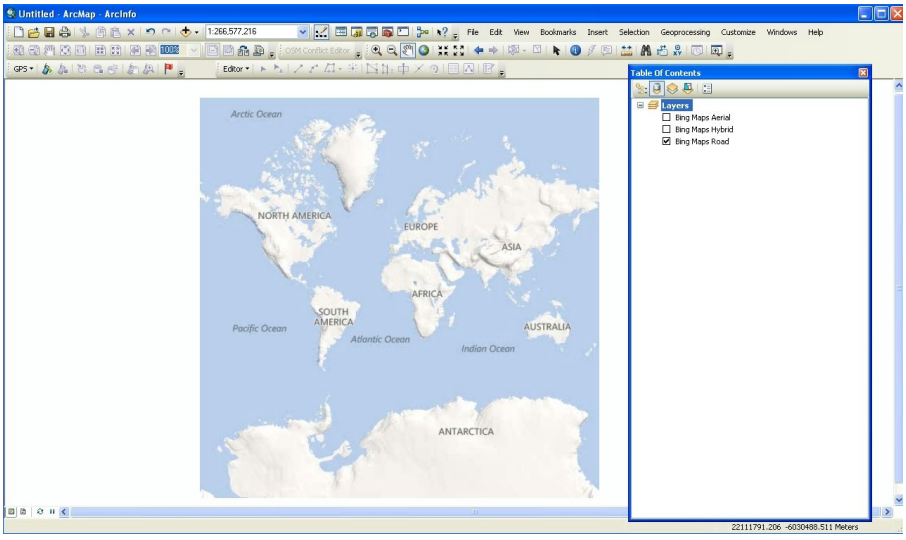
13. Select **Projected Coordinate Systems** → **World**. Then make sure you select the correct projection called **WGS 1984 Web Mercator (Auxiliary Sphere).prj**. This is very important. If your projection is incorrect, your boundary shapefile will not match up with the Bing maps you are tracing over.
Press OK.

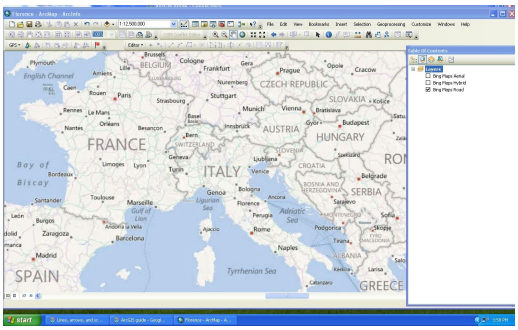


You should see your shapefile now created in the folder.

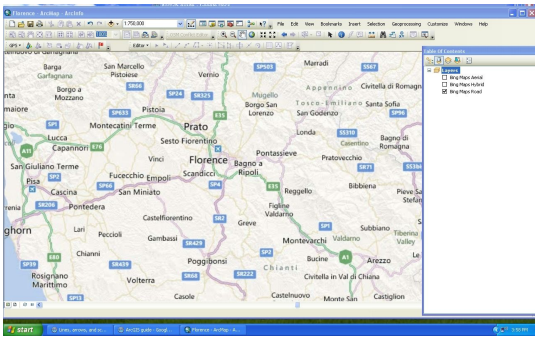
SECTION 3

1. Now go to the folder where you store all your GIS files and open up our saved ArcGIS Map, in my case "Florence." Turn off the Bing Aerial and Bing Hybrid layers.





Zoom in #1

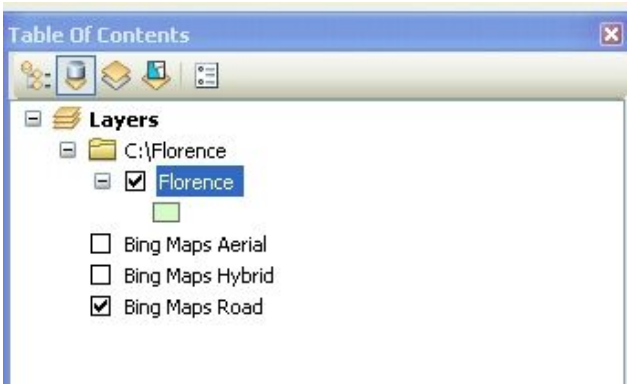


2. Zoom in by selecting the zoom tool  and drag a box around the area you want to zoom into. You will need to zoom in several times until you get to the scale you want to work in.

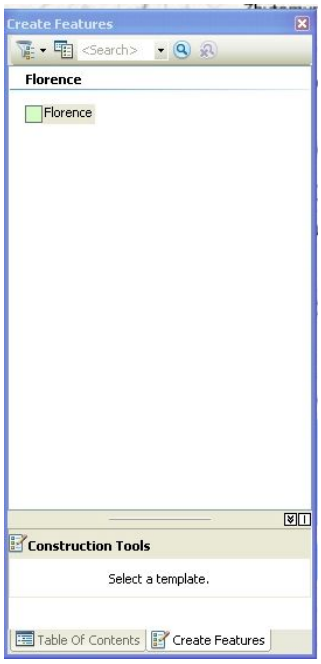
Zoom in #2

Zoom in #3 (This is how far you need to be zoomed in to begin.)

3. Add the shapefile polygon layer that you created in ArcCatalog by clicking on the Add Data  button. The shapefile layer should be added to your Table of Contents window.



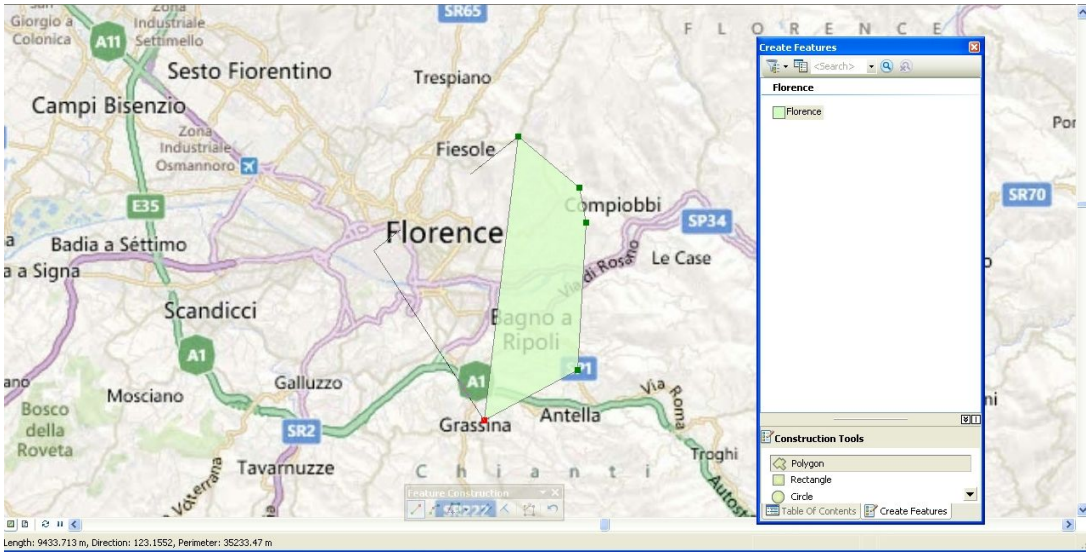
4. Find the Editor Toolbar  located in the top center part of your screen. Click on the drop down error and select “Start Editing.” When you do this the *Create Features* window will appear as shown below.

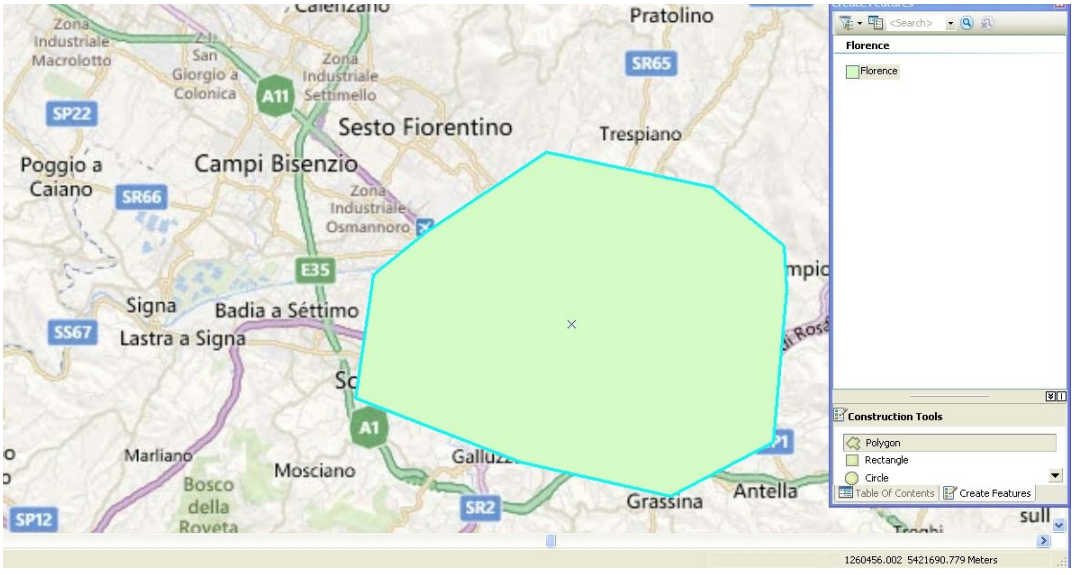


5. Click on your new shapefile layer in the Create Features window (it should be the only one), in my case “Florence”. This will activate the Construction Tools window at the bottom of your page.

6. Click on “Polygon.” This will active your editing toolbar and you are now ready to begin creating your neighborhood map.

7. When you select the polygon construction tool your arrow cursor will turn into a crosshair cursor.

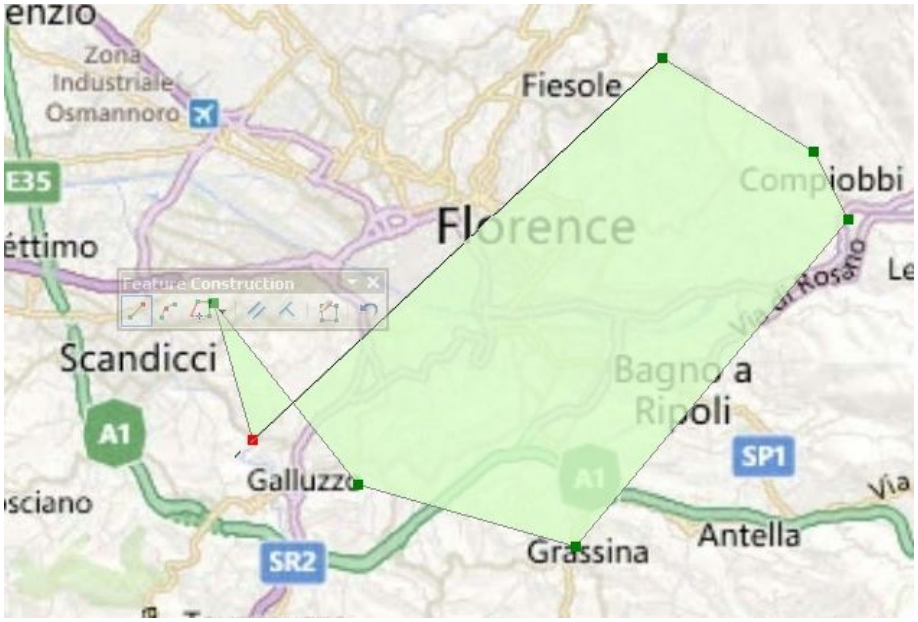




Completed Polygon

8. Click once on your map to begin where you want to begin drawing. This will place a node(vertex) on your screen. Continue clicking to lay more nodes(vertices) down to create one large polygon to **roughly**

cover the boundaries of your city or metro area you are going to draw. Double click to complete drawing the polygon, this will create a bright blue border around your polygon. Don't worry about messing up because you can add, delete, or move all nodes(vertices) you draw. This step will create **straight** segment lines **only**.



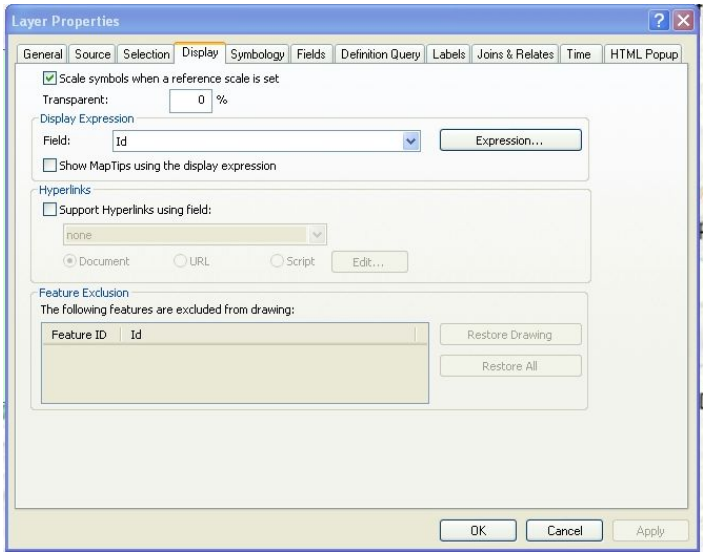
Overlapping sides erases portion of polygon

9. **WARNING**: Make sure you don't overlap straight segment sides when creating angled sides, this will only cause you to erase parts of your polygon.

10. Go back to your Table of Contents window by clicking on the Table of Contents icon  located in the top center section of your tools.

11. Once back in your Table of Contents window right click on your polygon shapefile layer and select "Properties" at the very bottom. This table should appear:

12. In the Transparent tab located at the top, change the percent from 0% to 60%.



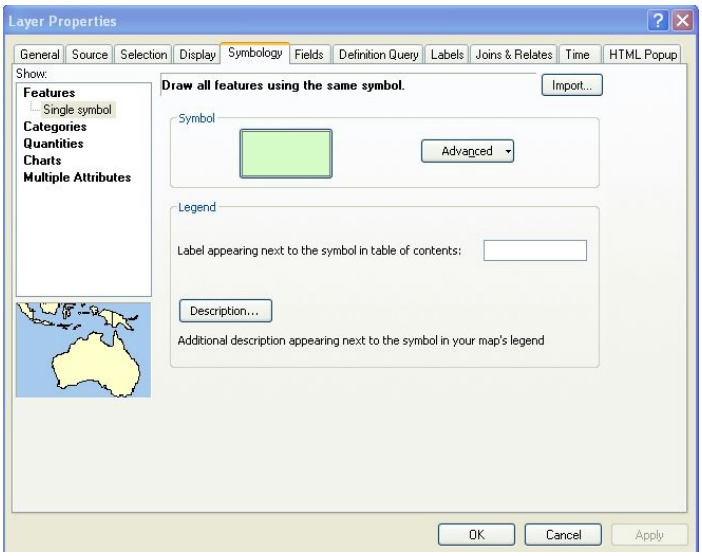
This step makes it easier to view your base map and overlying shapefile layer at the same time.

NOTICE: The “Redo Move” and “Undo Move”  tools will redo or undo any work that is done. It comes in very handy if you accidentally delete something, or want a shorthand way of starting over. They are located in the the top right corner of your screen.

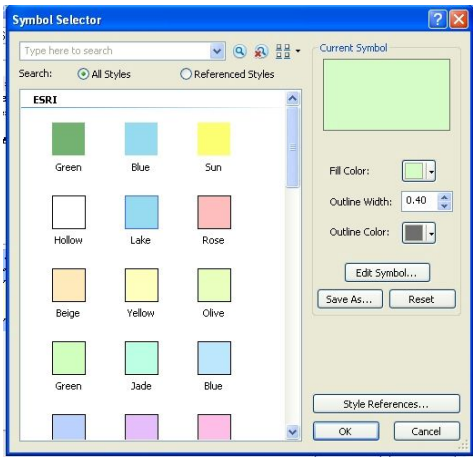
13. **(If you want)** You can also change the fill color of the overlying shapefile layer by again right clicking on your shapefile layer in the Table of Contents window and clicking on “Properties” at the very bottom.

Click on the “Symbology” tab 

at the top of the Layer Properties window, this window should appear.



14. Click on the rectangular polygon icon in the middle of the screen.



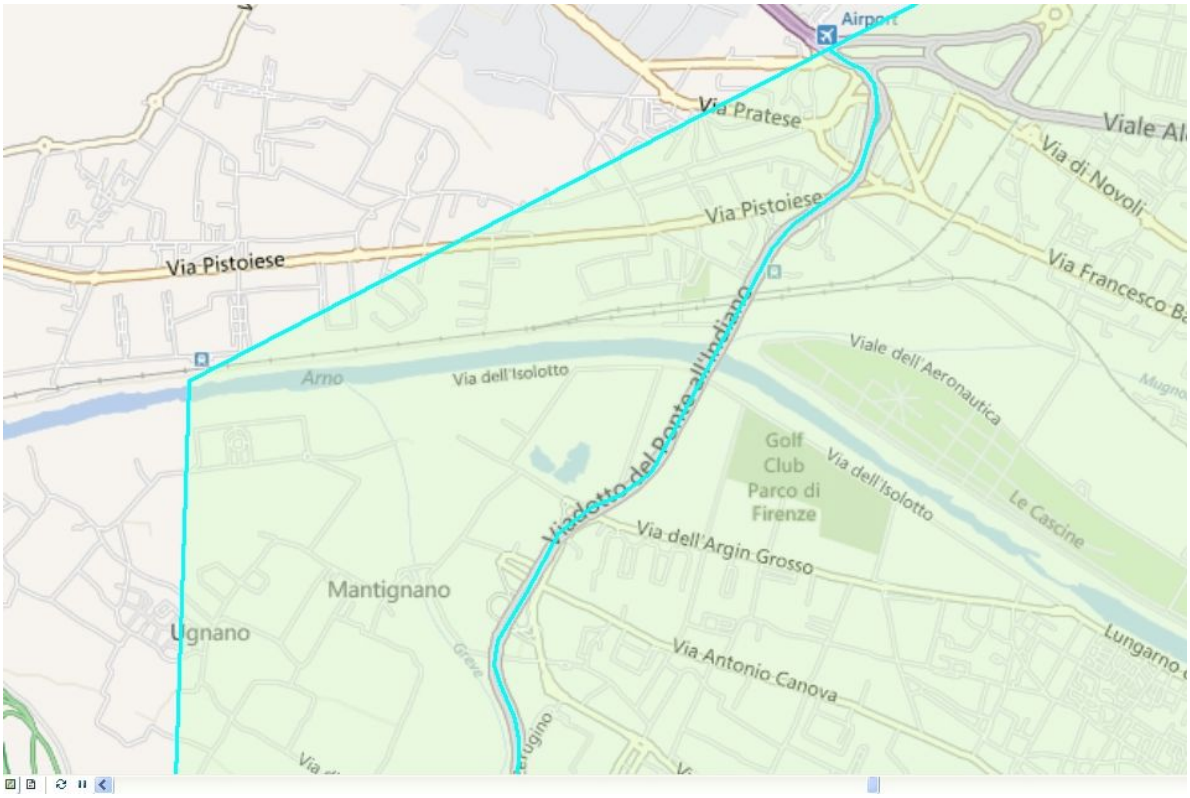
15. Change the fill color, outline width, or outline color of your shapefile layer if desired.

SECTION 4

1. Now that you have your neighborhood polygon shapefile drawn and formatted to the appearance you want, you can begin to cut the city or metro area boundaries precisely. To do this select the Cut Polygons

Tool  located in the Editor Toolbar.

IMPORTANT: It is very important that you zoom in close when cutting any boundary precisely because the location of the line you are drawing may completely change depending on the zoom level.



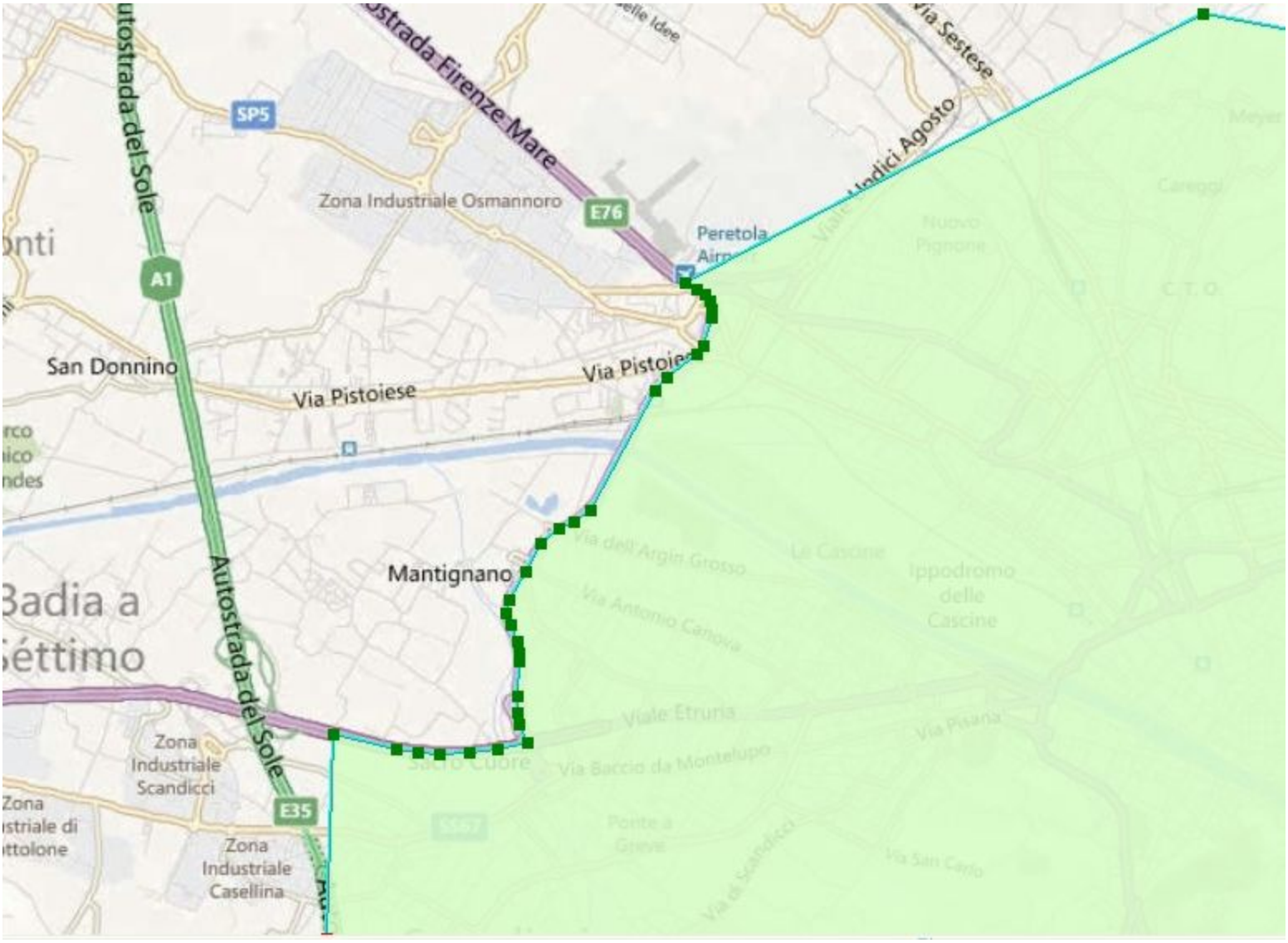
For this example, I used the freeway as a city border (it is not in reality the city border).

2. In order to cut a polygon you must place the Cut Polygons Tool on a preexisting boundary. Your crosshair cursor will turn into a flashing box, at this time click on the preexisting boundary of the polygon. With the polygon shapefile transparent, follow the city or metro boundary on the Bing Maps Base map by clicking on new nodes(vertices) along this path. You must finish this cut by ending back on a side of another or the same pre-existing line. Once your crosshair cursor reaches the pre-existing shapefile line, your cursor will again turn into a flashing box, at this time double click and your line will be drawn.

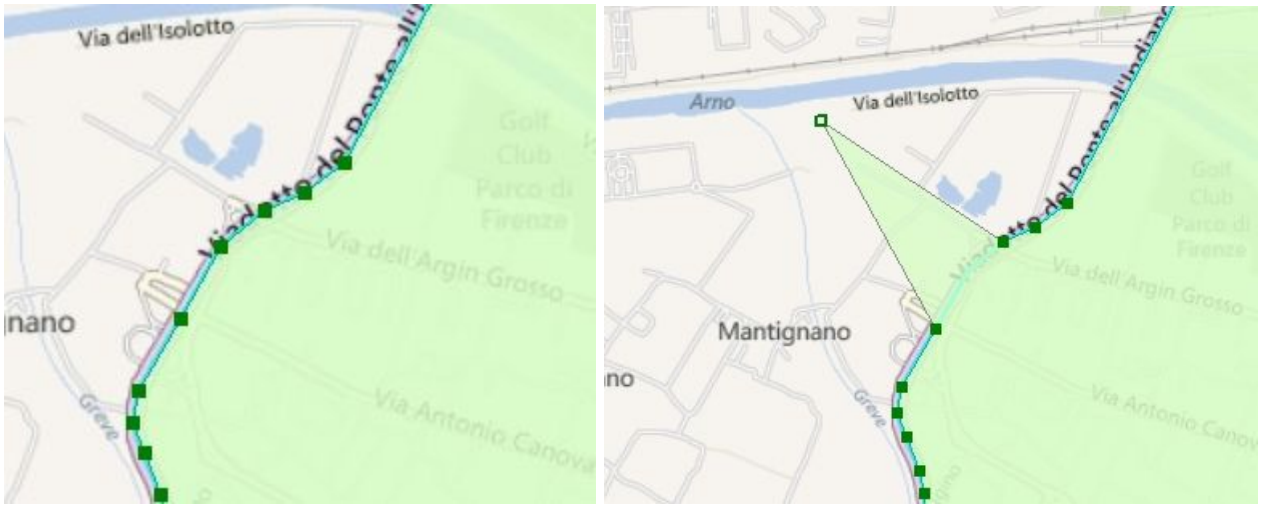
3. Once you have drawn the line, you will have two polygons. Your original polygon which will be cut countless more times into the neighborhoods to be later drawn, and a second one that should be thrown away. To throw away the polygon that you don't need anymore, select the Edit  Tool on the left side of the Editor Toolbar. Left click on this polygon so only it is highlighted, then right click and press "delete." This result will leave just one of the two polygons left with a precisely cut boundary.

4. You can also alter the boundary of your shapefile layer itself without creating any cuts. This is needed often after you make your polygon cut and you need to fix some slight errors in the shape of your polygon.

For this use the Edit Vertices  tool located in the Editor Toolbar.



5. When you activate the Edit Vertices tool all of your original nodes (vertices) drawn will appear on the edge of the polygon. In addition, the Edit Vertices Toolbar  will appear.



6. To move a node (vertice) to alter the boundary choose the “Modify Sketch Vertices”  tool which will highlight the node in white. Click and drag your mouse to place the node(vertice) to its new location.

7. Curved lines are comprised of many small straight line segments. To create a curved line select the Add Vertex  tool to create more nodes(vertices) for more complex and detailed shapes. Use the “Modify Sketch Vertices” tool to move the nodes (vertices) in a curved formation.

8. To delete unnecessary nodes(vertices) select the Delete Vertex  tool.

SECTION 5

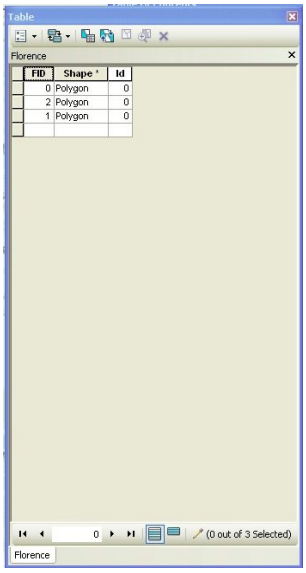
In addition to spatially drawing your polygons, you will also label and name each polygon in an attribute table.

1. To do this you must ***NOT*** be in Editing Mode. Go to the Editor dropdown arrow 

and select “Stop Editing.”

2.Go back to your Table of Contents window by clicking on the Table of Contents  icon in the top center part of your screen.

3. Right click on our shapefile layer and select from the dropdown menu “Open Attribute Table.”
The image to the right should appear.

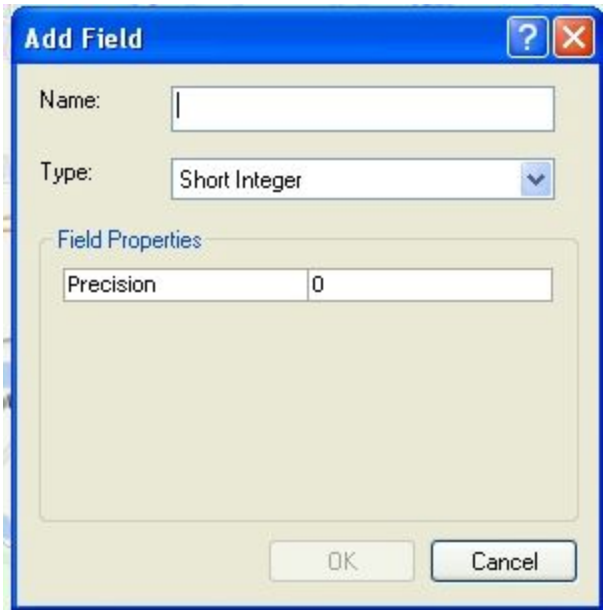


NOTICE: The amount of rows in the attribute table depends on the number of polygons you have drawn.

4. In the upper right corner select the “Table Options”  icon .

5. Click on the dropdown arrow and select “Add Field.” The below image should appear.

NOTICE: If the Add Field option is not activated it means you are still in Editing Mode.



6. The Name field is limited to 10 characters so naming it “Neighborhoods” won’t work, instead name it Neigh_hood.

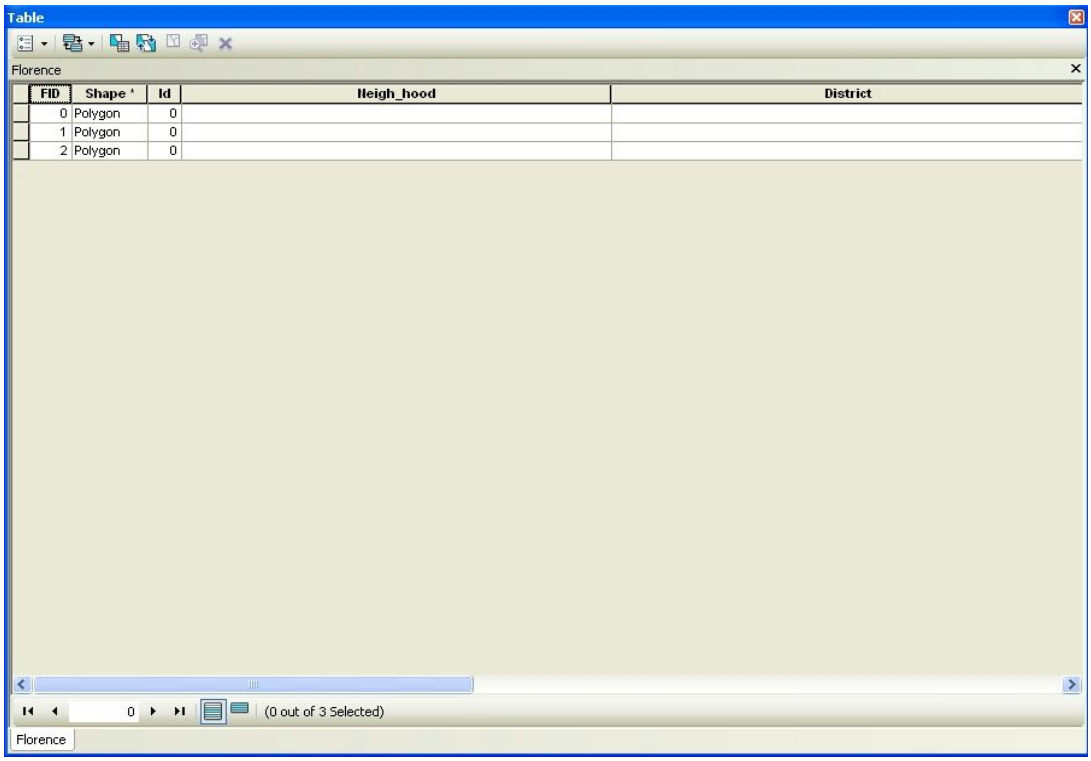
7. For Type select the value “Text.”

8. For Precision enter the value 100. This determines how many letters will be allowed to fit in your new fields. I chose 100 letters because some names are very long and you always want extra space to write names.

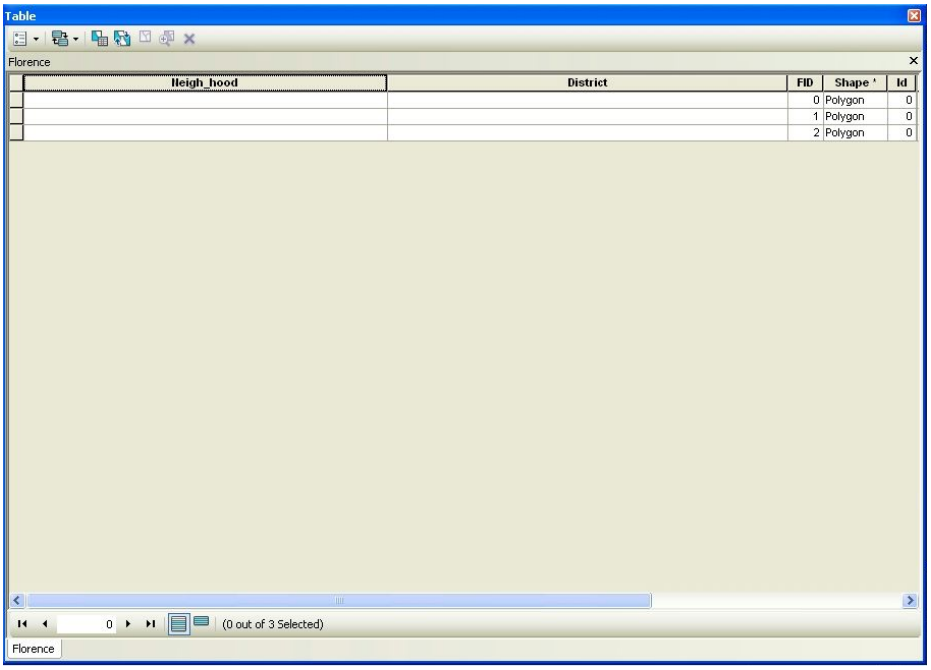
9. Click OK to finish.

10. Repeat steps 4-9 but this time label the second field “District.” For many metropolitan cities you will want to group your neighborhoods into larger District zones which is how many metropolitan cities are represented in maps. .

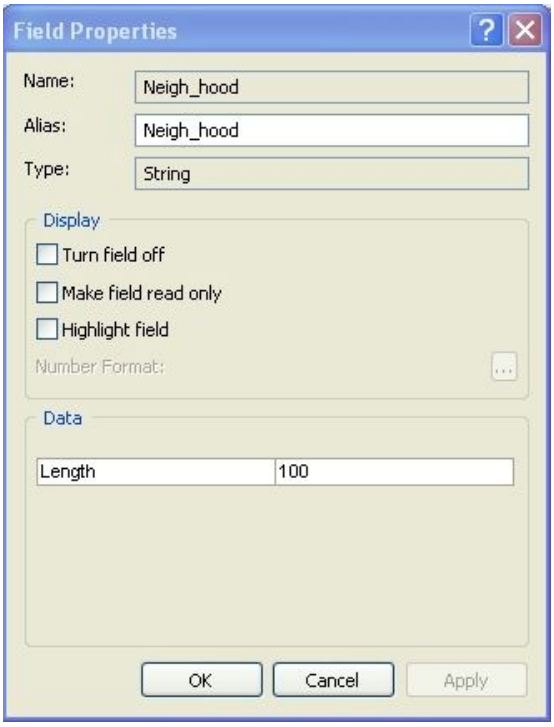
When done the your Attribute Table should now look like this.



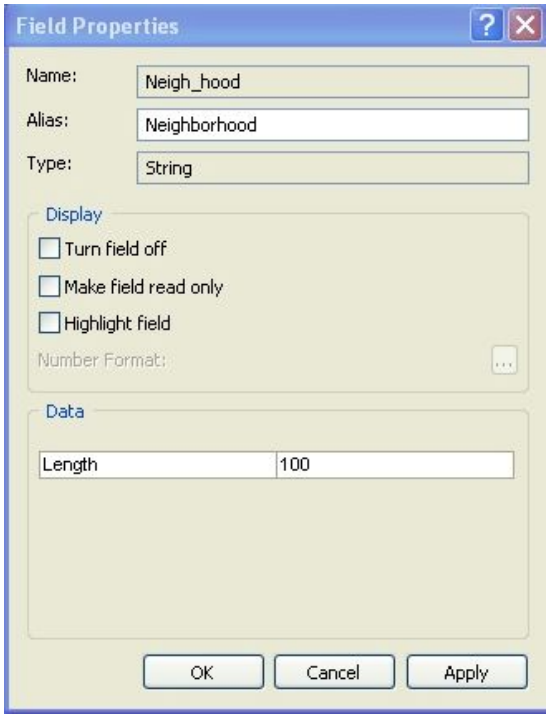
11. Next drag you new fields (Neigh_hood, and District) by clicking on the the heading tags and drag them to the front of the Attribute Table. It should now look like the below image.



12. Right click on the heading tags and in the dropdown menu select “Properties.” The below image should appear.



13. Under “Alias” write “Neighborhood.” This will correct the field name in the Attribute Table.



14. To fill in the Neighborhood and District names in the Attribute Table turn on Editing Mode back on.

15. Double click in the cell you want to write in and type your desired text.

TIPS

⚠ **1.)** It is very important that you ***SAVE*** your work often to prevent your work from being lost. To do this you need to go to the Editor toolbar 

and select from the drop down arrow "Stop Editing." or “Save Edits.” Do this about every 5-10 minutes.

⚠ If you are drawing a cut using the “cut polygon” tool then you cannot save your work until the cut is finished. This is important when cutting out the boundary of your city where you will need to complete dozens of cuts before finished.

⚠ **2.)** Why you might lose your work which brings us to the second tip to be aware of. When you start cutting out the

city, district, and neighborhood boundaries you will be using the Cut Polygon  tool countless times. You will be using this tool to draw your nodes that form to create your polygon boundaries. Many times I go too fast and accidentally press the Edit Vertices  tool because they are close to each other and look similar when going to fast and not thinking. Make sure you go slowly even though you will have the urge to speed up when you start to learn how to use the "cut polygon" tool more efficiently.

3.) Make sure you draw your draw your city, district, and neighborhood polygon boundaries CORRECTLY your FIRST time. If you don't, it will take you twice as long to fix misdrawn boundary lines because you will have to edit the vertece (node) location of two lines instead of one. You will need to zoom into the 1:1500 zoom in level to acquire optimal results.

When there is a discrepancy between your Bings Road Layer and Bing Hybrid layer always go with the **satellite** image. The satellite image **ALWAYS** takes precedence.

4.) When working on your city you will need to pan across your "slippy tile" Bing base map layer. This is done using the Pan  tool. A more convenient way to pan is to just click on the scroll wheel located between the right and left click button of your mouse.

In addition to defining the boundaries of districts and neighborhoods, there is a special third class of autonomous locations that you will outline in ArcGIS. In addition, you will place the names of these locations in the same column as neighborhoods in the Attribute Table. They are as follows:

1. Shopping Center/Mall
2. Cemetery
3. Zoo/Bird Sanctuary
4. Golf Course
5. Major Park (i.e Golden Gate Park)
6. Airport
7. Fair Ground
11. Industrial Zone
12. Power Station
13. Sewerage Treatment Plan
14. Race Course
15. Prison
16. Town Square/Circle
17. Hospital/Mental Hospital

8. Nature Reserve 18. Cathedral/Mosque/Synagogue
9. University/College Campus 19. Military Base
10. Casino 20. Convention Center
-These regions are generally the same size as neighborhoods, and are critical features for your maps when used in search engines.

RESEARCH

When performing research I usually use four sources to find district, neighborhood, and special feature boundaries. They are:

1. **Wikimapia** <wikimapia.org>
2. **Openstreetmap** <openstreemap.org>
3. **MapCarta**
4. **Bing Maps** (has already been added when you added your basemap layer)
5. **Google Maps** google.com/maps (used as a **comparison** only)

Wikimapia and Openstreemap are open source data sights, whereas Bing Maps and Google Maps get their data from private companies.

-We use the open source data sights to get the date for our maps
-We look at Bing Maps and Google Maps as a reference source to see what others have done.

SYSTEMATIC ERRORS TO AVOID

1. MOVING POLYGONS OUT OF PLACE

You will frequently be panning across the screen using the Pan  tool. You will be using the Edit  tool even more frequently to select polygons to cut up. A common mistake you can

make is by accident use the Edit  tool to pan across the screen. The is very **DANGEROUS**

because when you pan across the screen you need to hold down the left click button, and if you are in the Edit tool mode and drag your mouse with the left click button held down, this results in every polygon that is selected (highlighted in light blue) to be moved out of their spot in the mosaic of polygons. This will result in you having to painstakingly drag each polygon back into its rightful spot again using the Edit  tool with the left button on the mouse held down.
IMPORTANT: You can avoid having to fix your mistake if see your mistake right away by using the Undo

 move button (curved arrow on the left).

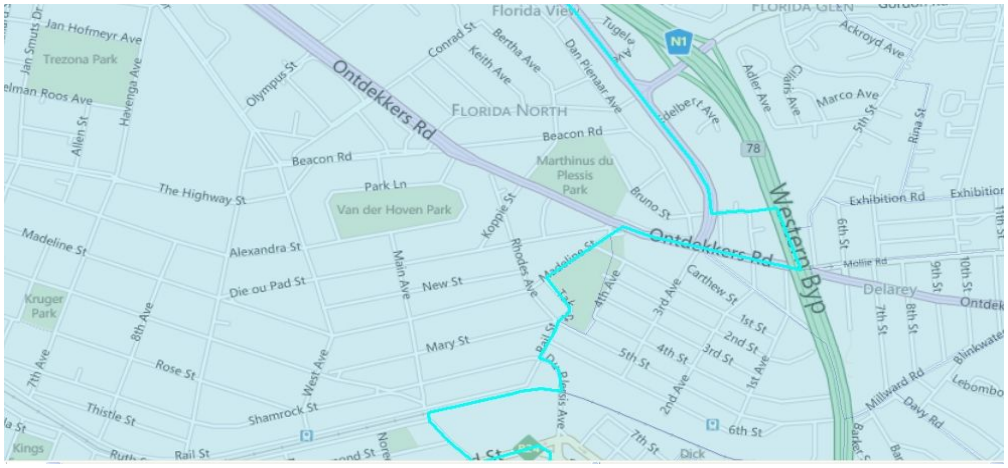
2. PROGRAM WON'T ALLOW YOU TO COMPLETE ANY POLYGON CUTS

In this scenario you are cutting up your polygon when you get to the end and want to double click to finish your cut but get the error message "Can't compete task because program can't determine left and right of selected line." And all your work cutting the polygon will be lost.

This means the polygon that you are cutting up isn't selected and thus you are not on the polygon so you can't cut it. To fix this, use the Edit  tool and click on the polygon that you want to cut, when you do this, its boundaries should be highlighted in blue.

Creating a Polygon with No Shared Boundary

In this example I am going to show you how to draw a polygon boundary when it doesn't share a side with a pre-existing line. For this example, we are going to outline the boundaries of the Van Der Hoven Park located in the center left section of the image below. This park is located in Johannesburg, South Africa.

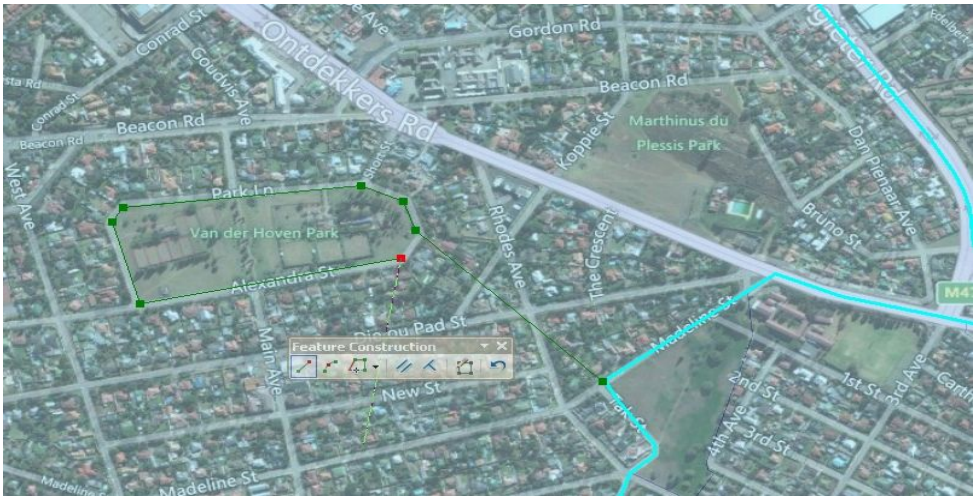


1. Begin by activating the Bing Hybrid layer to see if the satellite image agrees with the Bing Roads layer.

Sometimes there are discrepancies with the layers such as newly built residential houses built on what is supposed to be park land (within the green polygon in the Roads layer).

2. Select the Cut Polygon  tool.

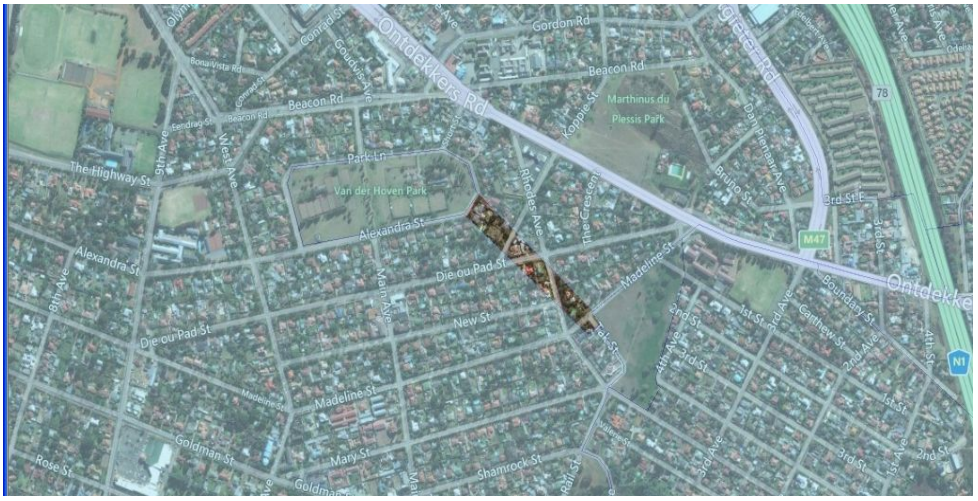
3. Begin your cut by selecting a point on the pre-existing boundary highlighted in blue and draw your way to the Van Der Hoven Park Next, carefully trace around the perimeter of the park.



4. Finish your trace by tracing back to the pre-existing boundary in which you started with. Double click to complete the trace. Notice how you will not be able to finish the trace around the park completely.

5. Complete the trace of the park by again selecting the Cut Polygon tool. This will cut the highlighted polygon in half. One polygon of your traced park, and the other polygon which connects your park with the preexisting line.

6. Select and highlight the connecting polygon by selecting the Edit  tool, then right clicking and press “delete.”



7. You will now have a hole in your map as shown above.

8. Your next step is to close this gap. You do this by selecting the Edit Vertices  Tool and and then selecting the Add Vertex  tool. Add new vertexes (nodes) so that there are vertexes in the top and bottom corners of the rectangular gap in the map. **Only do this if the nodes are not already drawn.**

9. Then add a second vertex just below the first vertex (as you see with the white vertex shown below).

In the image below I fused the top of the gap.

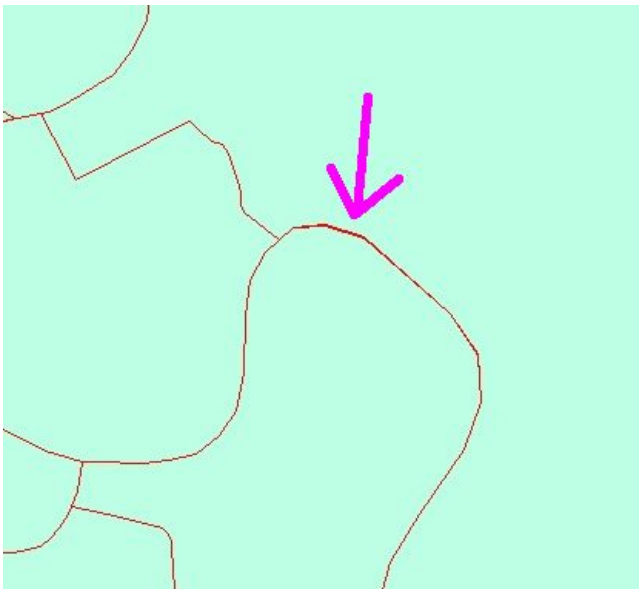
In the image below I fused the bottom of the gap.

10. Then select the Modify Sketch Vertices  tool and drag the the second vertex (highlighted in white) so that it stacks up exactly on top of the opposite corner of the rectangular gap (in this case the top left corner). This action thus fusing the gap shut.

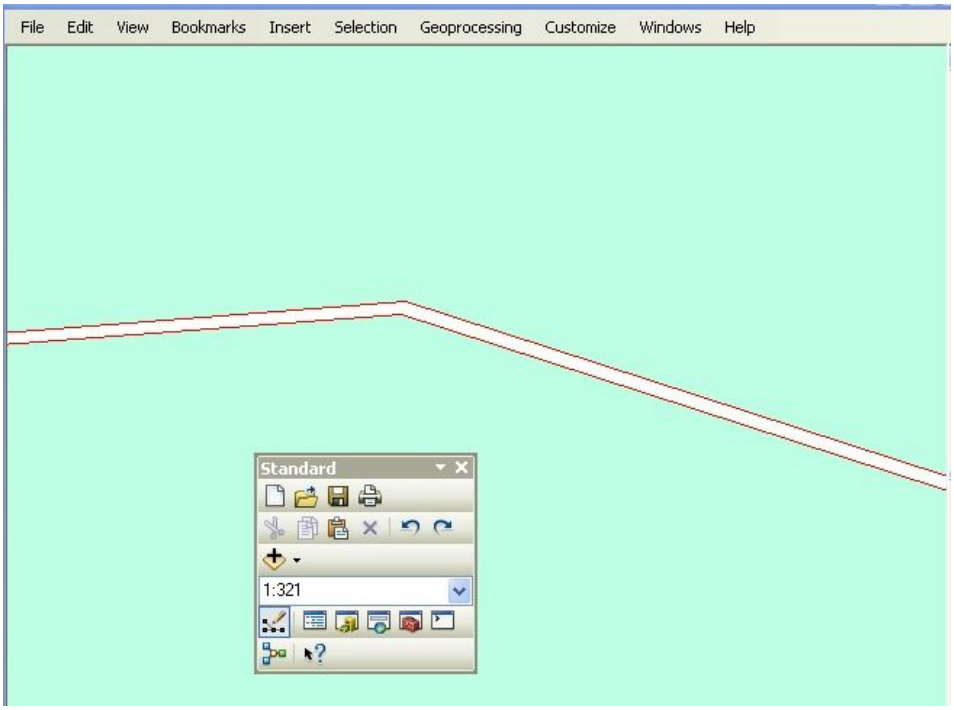
11. When you finish fusing together the gap the line segment connecting your trace of Van der Hoven Park with the pre-existing boundary highlighted in blue disappears giving you the desired effect.

How to Fix Moved Polygons

How you know your polygons have moved:
(I recommend changing the fill color of your city to clear, so you can see the overlap boundaries better.)



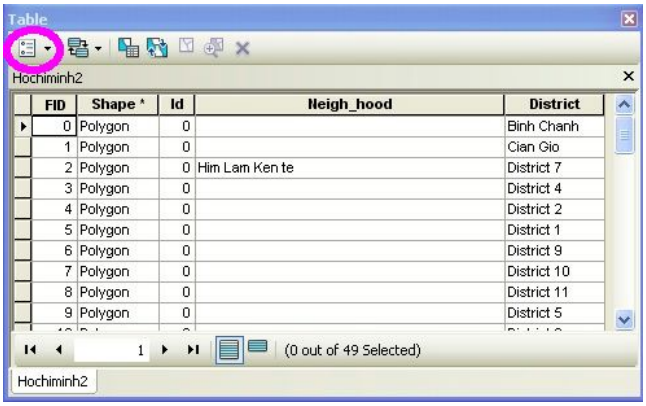
1. Some boundaries have thicker lines. They look like this:



2. Sometimes you can't tell from far away, so zoom in on areas with thicker line boundaries or any boundary to check if there is overlap or gaps. You may find something that looks like this:
How to fix this:

⚠ SAVE A COPY OF YOUR SHAPEFILE ON A SEPARATE DISK/SOMEWHERE ELSE FIRST. ALL CHANGES MAY BE PERMANENT AND CANNOT BE UNDONE IF RESULTS ARE UNDESIRABLE.

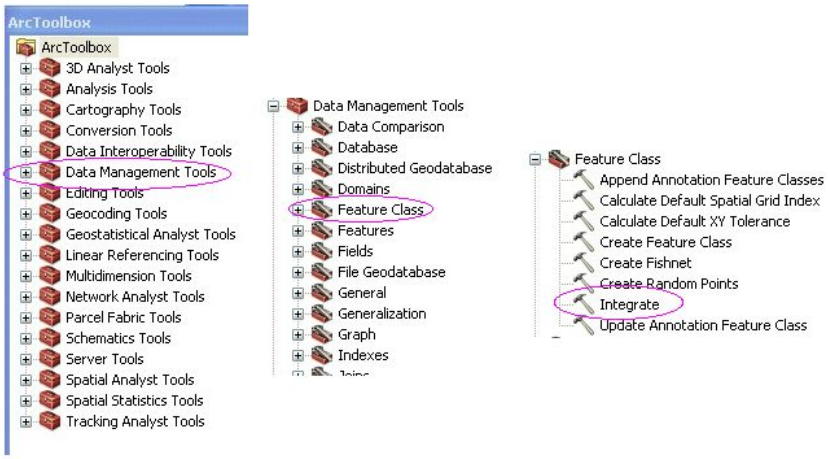
1. Make sure you are not in editing mode. Open your attribute table. In the upper right corner click the "table options" menu and select "select all attributes" or you can use "Ctrl A" on the keyboard. This should highlight all the rows and columns in your table.



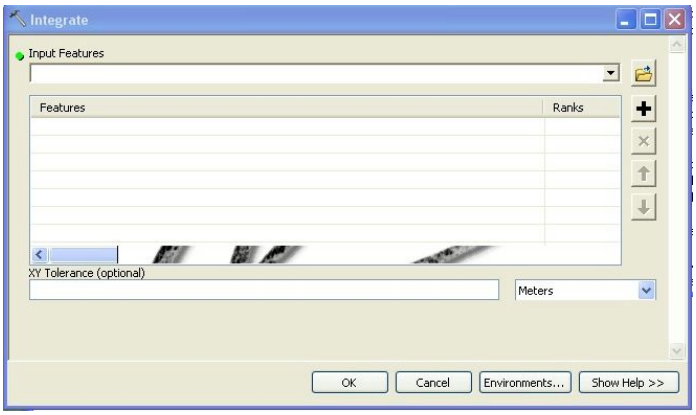
FID	Shape *	Id	Neigh_hood	District
0	Polygon	0		Binh Chanh
1	Polygon	0		Cian Gio
2	Polygon	0	Him Lam Ken te	District 7
3	Polygon	0		District 4
4	Polygon	0		District 2
5	Polygon	0		District 1
6	Polygon	0		District 9
7	Polygon	0		District 10
8	Polygon	0		District 11
9	Polygon	0		District 5

2. Click on the toolbox button  to pull up the toolbox window.

3. Click the “+” on “data management” and then “+” under “feature class” to uncollapse the tools. Double click “integrate”



4. You will get this window. Click the drop down menu “input features” and select your city’s shapefile.



5. At the bottom enter in “10” for X,Y tolerance, select meters in the unit menu. Click “OK”

6. The overlap and gaps should be gone. This is the results:

Before:

After:

7. Zoom out to the city's extent and make sure everything looks ok. Changes should not be noticeable from far away. Now zoom in on the boundaries. You must check to see if your boundaries are still correct and follow the streets, canals, etc. that they are suppose to.