

Editing a Subdivision using a CAD drawing

ISTC Topic:

7.17

In this Chapter you will learn

- A method for using a CAD drawing of a new subdivision to update a parcels GIS layer
- How to import a CAD drawing and export it to a shapefile
- How to clean up a shapefile and prepare it for use as a construction layer
- How to rotate and move a group of parcels
- How to use the spatial adjustment tool bar to fit the construction layer into the parcel that needs to be replaced by the subdivision
- How to use the trace tool to trace features in the construction layer to edit a parcel polygon layer

1. Using a CAD drawing as construction lines

This exercise assumes you have a CAD drawing, which usually come in .dwg format that shows you a proposed subdivision along with the blocks and lots contained within. If you are presented with a legal description that you need to draft yourself, you can do that in ArcGIS using the COGO tools (which are only available for the ArcEditor and ArcInfo license levels and you can learn about in topic 7.14), or a drafting program like AutoCAD, PC Traverse or Deed Plotter. The exercises in this chapter also assume that your CAD drawing is georeferenced which means that the drawing appears in the correct location on your map when you bring it into GIS. If you are working with a drawing that is not georeferenced you may be able to assign a projection to it (see topic 1.23).

In Exercise 1 you will bring in a CAD drawing, select line features from this drawing that you will need to construct the new subdivision in you GIS parcels layer and export those lines to a new shapefile called “FairviewEstates_Construction_Lines”.

In Exercise 2 you will clean up this newly created construction shapefile which includes using the spatial adjustment toolbar to fit the drawing into the parcel that is being replaced by the subdivision. Even though we will end up using the spatial adjustment toolbar to fit and rotate the subdivision, we will - as a side note – also practice rotating and moving a group of polygons manually.

Finally, in Exercise 3 we will update the parcels layer by deleting the parcel that will be replaced by the subdivision, and using the trace tool to build the new parcels from the construction shapefile.

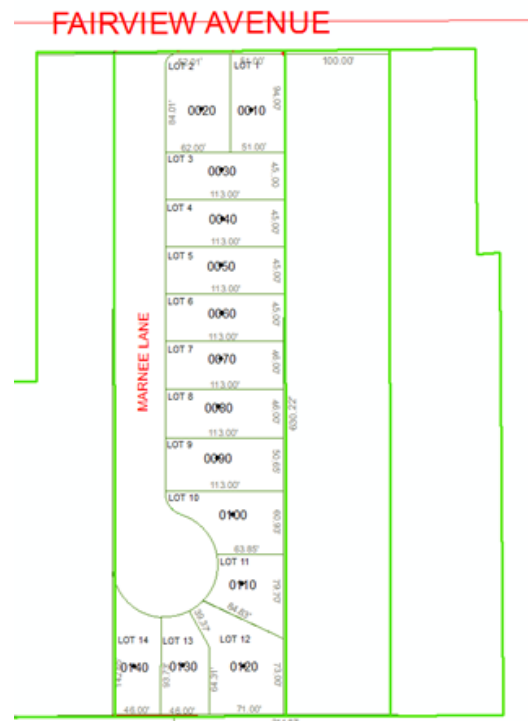
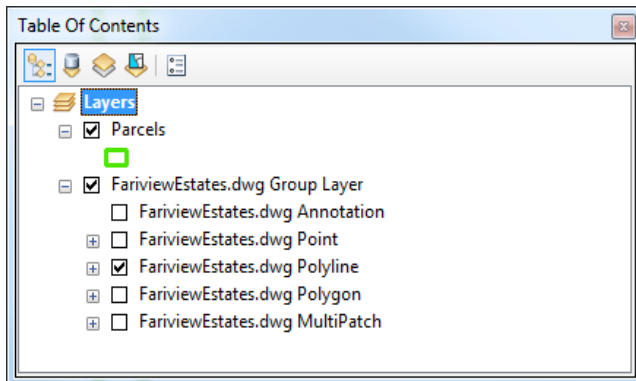
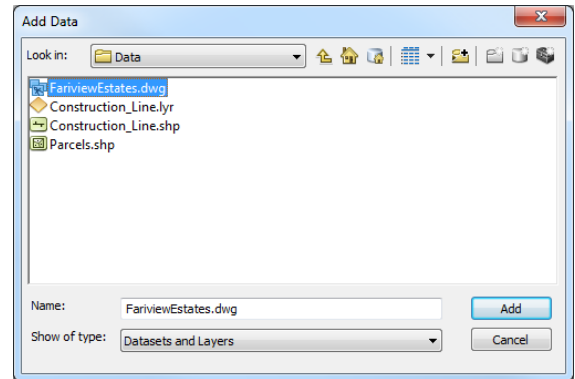
Note that video 7.17 titled “Editing a Subdivision Using a CAD drawing” shows all the steps in exercises 1, 2 and 3.



7.17. Editing a
Subdivision Using a
CAD drawing

Exercise 1: Importing a CAD drawing into GIS and creating a Construction_Lines shapefile

1. Start ArcMap and open a new map document.
2. Add the Parcels shapefile to your map. Symbolize the parcels so that the polygons are hollow and have a bright green outline with a width of 2.
3. Add the FairviewEstates.dwg. To do this click the “Add Data” button, and click once on FairviewEstates.dwg to highlight it. Then click “Add” to add all the layers contained in this drawing at once.
4. If your parcels are not already on top in your table of contents, then move them to the top now.
5. Notice on your map (and in the figure on the right) that the subdivision falls completely inside one existing parcel.
6. Click the “+” in front of the FairviewEstates.dwg Group layer to expose all the layers that are inside this group as shown below.



7. Turn off all layers in the FairviewEstates.dwg group, except for the Polylines. This is the layer that we will use to create the “FairviewEstates Construction_Lines” shapefile, which we will then use in Exercise 3 to edit a parcel layer in GIS.
8. Follow the instructions on the next page to select all the polylines we need to build our “Construction_Lines” shapefile.

1. Right-click on FairviewEstates.dwg Polyline and Choose Selection > Make This The Only Selectable Layer

2. Click on the "Select by Rectangle" your Tools toolbar

3. Using the selection tool draw a box around the subdivision as shown with the dotted line in this figure

4. Hold down the shift key while clicking – still with the selection tool – on the selected lines outside the subdivision to unselect them..

5. ...until only the lines inside the subdivision are selected

9. Right-click on the FairviewEstates.dwg Polyline layer and choose "Open Attribute Table". Follow the steps below to only select those polylines we need in later steps.

1. Click on this button so that you can only see the selected features

2. Right-click on the word "Layer" and click "Sort Ascending". Note that all the features come from either the "PARCEL_BDY", "parcelsides" or "SUBDIVISION" layers

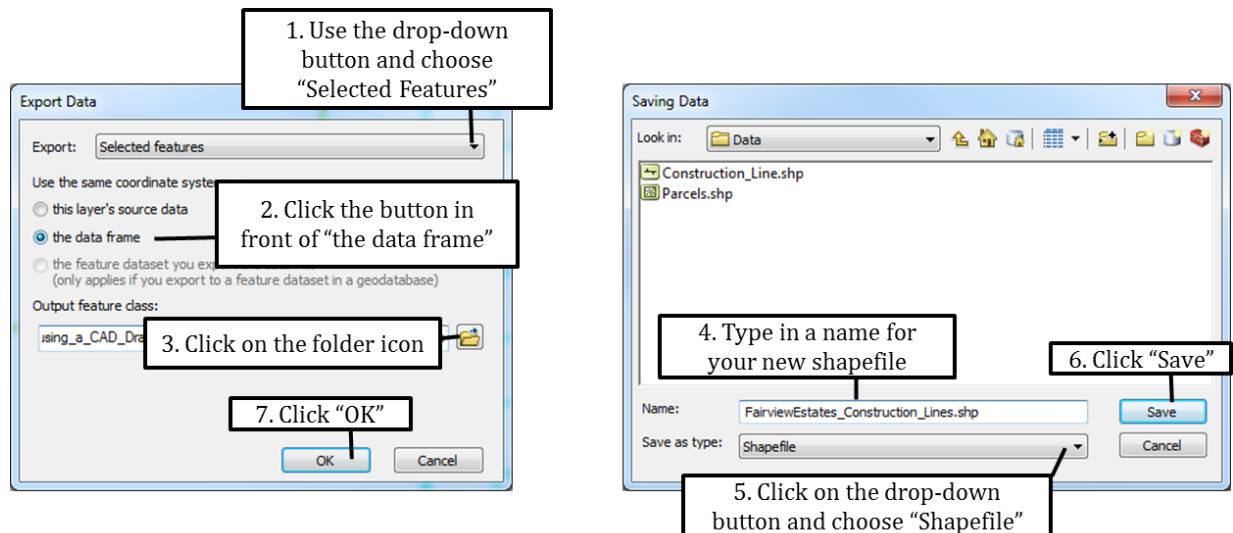
3. Click in this square, and then drag your mouse down to highlight all features from the "PARCEL_BDY" layer in yellow

4. Right-click on the first square (the same one you left-clicked in the previous step). Choose "Unselect Highlighted".

FID	Shape	Entity	Layer	Color	Linetype	Elevation
1	Polylines	Line	parcelsides	74	CONTINUOU	
2	Polylines	Insert	SUBDIVISION	1	CONTINUOU	
12	Polylines	Line	parcelsides	74	CONTINUOU	
13	Polylines	Arc	parcelsides	74	CONTINUOU	
14	Polylines	Line	parcelsides	74	CONTINUOU	
15	Polylines	Line	parcelsides	74	CONTINUOU	
16	Polylines	Line	parcelsides	74	CONTINUOU	
17	Polylines	Line	parcelsides	74	CONTINUOU	
18	Polylines	Line	parcelsides	74	CONTINUOU	
19	Polylines	Line	parcelsides	74	CONTINUOU	
20	Polylines	Line	parcelsides	74	CONTINUOU	
21	Polylines	Line	parcelsides	74	CONTINUOU	
22	Polylines	Line	parcelsides	74	CONTINUOU	
23	Polylines	Line	parcelsides	74	CONTINUOU	
24	Polylines	Line	parcelsides	74	CONTINUOU	
25	Polylines	Line	parcelsides	74	CONTINUOU	
26	Polylines	Line	parcelsides	74	CONTINUOU	
27	Polylines	Line	parcelsides	74	CONTINUOU	
28	Polylines	Line	parcelsides	74	CONTINUOU	

10. Close the attribute table.

11. Right-click on “FairviewEstates.dwg Polyline” and choose Data > Export data. Follow the instructions below to save the selected features as a shapefile.



12. Click “Yes” when asked whether you would like to add the exported data to the map as a layer.

13. Clear selected features by clicking on the “Clear Selected Features” button or by going to Selection > Clear Selected Features along the top of your screen.

14. Save you map document (call it “Fairview_Estates.mxd”). Leave your map open if you are planning to do exercise 2 right away.


Exercise 2: Cleaning up the Construction_Lines shapefile

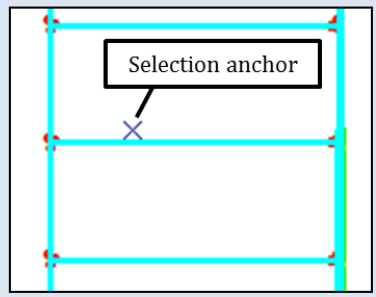
1. Start ArcMap and open the FairviewEstates map document you created in Exercise 1.
2. Before using the spatial adjustment toolbar to fit the new subdivision into the existing parcels layer experiment with rotating and moving the FairviewEstates_Construction Lines as explained in “Moving Polygons” and “Rotating Polygons” that can be found in the blue box on the next page.
3. Turn off the parcel layer.
4. Add the “Construction_Line.lyr” to your map. This layer is symbolized in a unique way that will help you spot problems in a layer that consists out of lines. The only reason you are temporarily adding this Construction_Line.lyr is to copy this unique symbology to the Fairview_Estates_Construction_Lines shapefile in the previous example.

Moving polygons

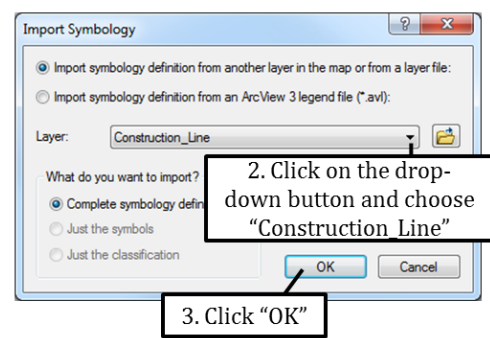
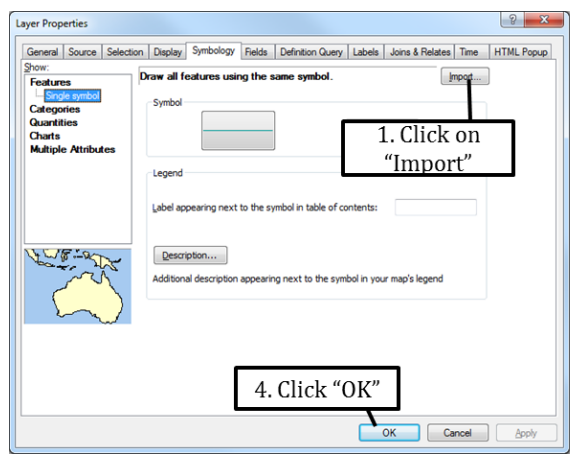
1. Select all the polygons in the FairviewEstates_Construction_Lines shapefile by right-clicking on this shapefile in the table of contents and choosing Selection > Select All.
2. Right-click on the FairviewEstates_Construction_Lines and again and choose Edit Features > Start Editing. Ignore the spatial reference warnings and click "Continue" in the dialog box containing the warnings.
3. Hover your mouse over the selected parcels until your mouse turns into a four headed arrow (+). Then click and drag all selected lines to a new location.
4. Click "Edit" along the top of your screen and choose "Undo Move" to move your lines back to where they were.

Rotating polygons

1. Select all the polygons in the FairviewEstates_Construction_Lines shapefile by right-clicking on this shapefile in the table of contents and choosing Selection > Select All.
2. Right-click on the FairviewEstates_Construction_Lines and again and choose Edit Features > Start Editing. Ignore the spatial reference warnings and click "Continue" in the dialog box containing the warnings.
3. Note the X in the middle of the selected lines (which is also shown in the figure on the right-hand side). This X is called a selection anchor around which all the selected lines will rotate.
4. Hold down the control key and notice that your mouse changes into a  which allows you to move the selection anchor to a different position. Go ahead, and move the anchor to the NW corner of the subdivision.
5. Click on the rotate button and rotate all the parcel.
6. Click Editor > Stop Editing. Do **NOT** save your edits.

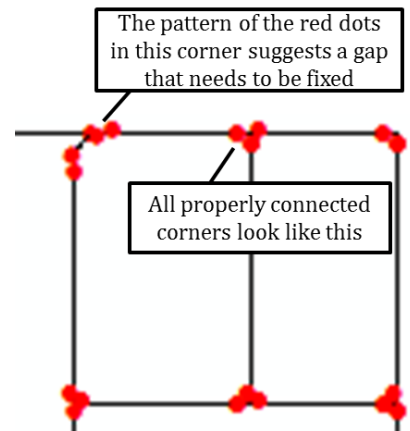
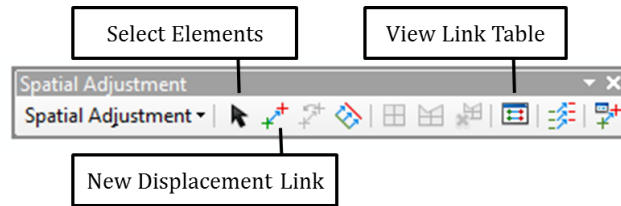


5. Right-click on the FairviewEstates_Construction_Lines shapefile and choose Properties. Go to the Symbology tab.
6. Follow the instructions below to import the symbology from the Construction_Line shapefile.

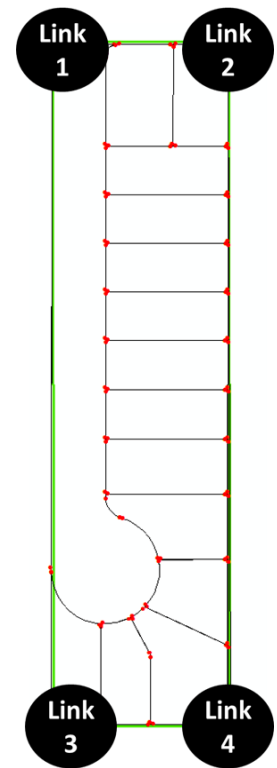


7. Remove the Construction_Line layer from your map (hint: right-click on the layer and choose "Remove").

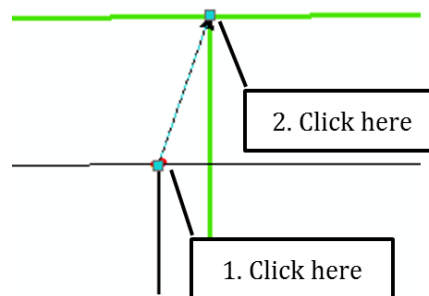
- Turn off (do not remove) the FairviewEstates.dwg group, and look at the red dots that are part of the FairviewEstates_Construction_Lines. The figure on the right hand side explains what a properly connected corner looks like and where you can suspect a gap. Note that you will see two dots when only two lines connect, for example when a straight line turns into a curve.
- Click on “Customize” along the top of your screen and then choose Toolbars > Spatial Adjustment. This will add the following toolbar to ArcMap:



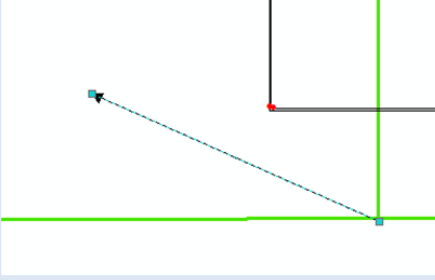
- To use this toolbar you first create displacement links from where the data is **now** to where the data **needs to go**. In the next couple of steps we will create four of those links as shown on the right, and then use those to move the whole FairviewEstates_Construction_Lines shapefile.
- Right-click on the FairviewEstates_Construction_Lines and choose Edit Features > Start Editing.
- Zoom in closely (1:50 or closer) to the North West corner of the subdivision where the first link will be placed (see figure on the right). Click on the “New Displacement Link” on the Spatial Analyst.



- Click on the intersection on the FairviewEstates_Construction_Lines (in black) and then on the same intersection in the Parcels layer (in green) as shown on the right.
- Zoom to Link 2 in the North East corner of the subdivision and create a displacement link (hint: click on “New Displacement Link”, then click on the corner in the FairviewEstates Construction_Lines layer followed by the same corner in the Parcel layer).



15. Create displacement links 3 and 4 in the South West and South East corners of the subdivision. If you make any mistakes, refer to the blue box below to delete incorrectly placed displacement links.




Deleting incorrectly placed displacement links

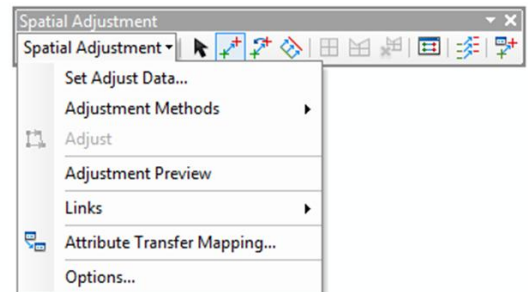
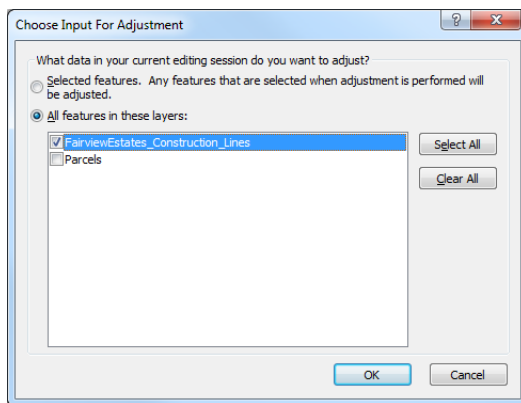
As you can see on the left hand side, this displacement link is placed incorrectly. Here are the steps to delete this link:

1. Finish the link anyway so that you see a completed arrow. For example, if you started a link in the wrong location, go ahead and click again to finish the link.
2. If your link is selected (i.e. you see little blue squares at either end of the arrow – note that those squares are visible in the figure on the left) go ahead and click the **delete button** on your keyboard.
3. If it is not already selected, click on the “Select Elements” tool on the Spatial adjustment toolbar and then click on the displacement link. Once selected, you can click the **delete button** to delete the link.

Select Elements



16. Once all four links are placed click the word “Spatial Adjustment” and choose “Set Adjust Data...”



17. Make sure the “Choose Input for Adjustment” dialog matches the dialog box displayed above and click OK.
18. Click on Spatial Adjustment > Adjustment Methods > Rubbersheet
19. Finally click on Spatial Adjustment > Adjust. Note that your FairViewEstates_Construction_Lines now fit perfectly into the parcel where the new subdivision is being build.
20. It is good practice to clean up the displacement links because, if you wish to do another spatial adjustment later on, you want to make sure you are not re-using the ones we just set up. Click on the View Link Table button to open the Link Table.

- In the table highlight all the link records (hint: click on the first record, hold down the shift button, and then click on the last record) and then click on "Delete Link" as shown on the right.

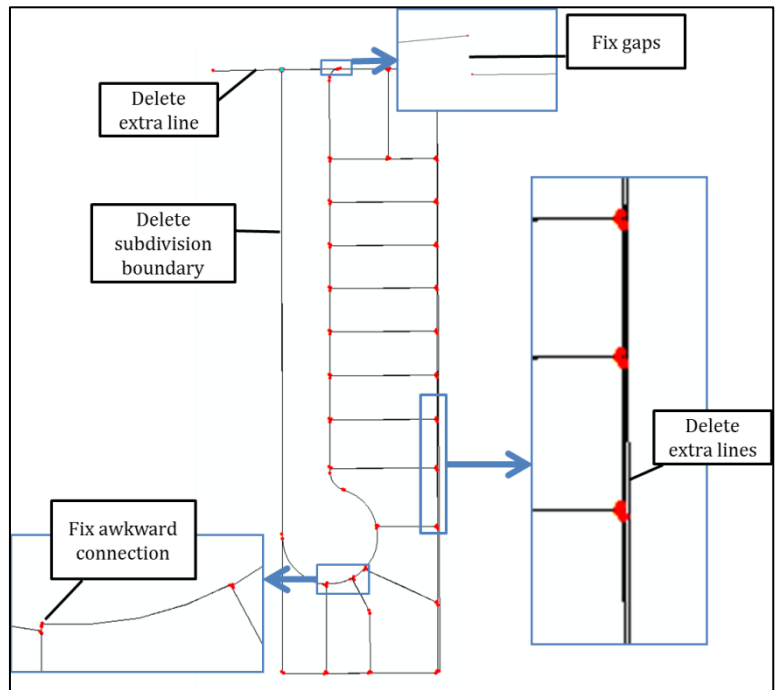
ID	X Source	Y Source	X Destination	Y Destination	Resid
Identity Link	1725210.317210	345427.141348			
Identity Link	1725047.327046	345426.484032			
Identity Link	1725209.484576	346062.503313			
Identity Link	1725046.501130	346061.275936			

- Save your edits (hint: if you are unhappy with the adjustment stop editing without saving the edits, then repeat from step 11)

- Turn off the parcel layer and zoom out so you can see the whole FairviewEstates_Construction_Lines layer. During the next steps we will delete a number of lines so that all we have left are single or perfectly stacked lines indicating the outside of the parcels.

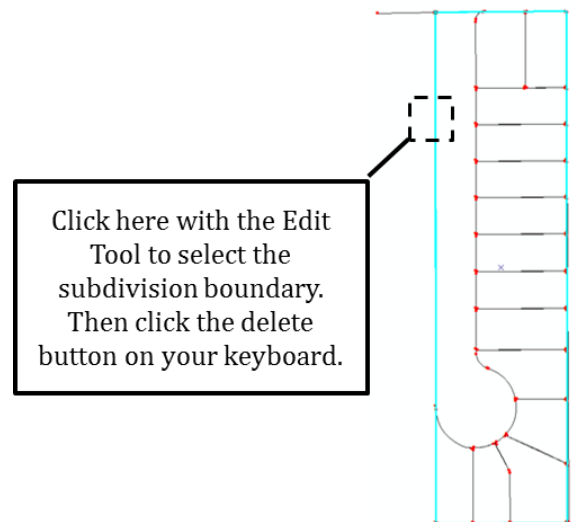
- The figure on the right shows a number of errors that we will correct in the next couple of steps.

- Click on the Edit Tool on the Editor Toolbar .



- Using the Edit Tool click on the subdivision boundary and then on the delete button on your keyboard as shown on the right.

- Keep using the Edit Tool to select and delete extra and duplicate lines. If you accidentally delete a line you want to keep go to Edit (along the top of your screen) and choose "Undo". If you really mess up you can always click Editor > Stop Editing without saving your edits and then try again.



28. Use the instructions below to fix the gap in the curve near the North West corner of the subdivision.

1. Zoom in close to the eastern side of this curve

2. Click on Editor > Snapping > Snapping Toolbar

3. Click on the "Vertex Snapping" button

4. Click on the Edit Tool

5. Select the line segment that is west of the gap

6. Click on the Edit Vertices button

7. Hover over this vertex until your mouse changes into a diamond

8. Click and drag the vertex until it snaps to the other line. Click F2 to finish the sketch.

29. Use the instructions below to fix part of the curve closer to the south of the subdivision.

1. Zoom in close to this area

2. Select this line with the Edit Tool. Then click the Edit Vertices button

3. Move this vertex up so it snaps to the line on the right. Click F2 to finish the sketch

4. Pan to the eastern side of this line

5. Select this line using the Edit Tool. Then click on the Edit Vertices button

6. Move this vertex down so it snaps to the intersection. Click F2 to finish sketch.

30. Save your edits and stop editing. Clear any selected features (hint: click on Selection along the top of your screen and choose "Clear Selected Features").

31. Save your map document.

Exercise 3: Using the Construction_Lines shapefile to edit a parcels GIS layer

1. Start ArcMap and open the FairviewEstates map document you created in Exercise 1 and worked on in Exercise 2.
2. Turn on the Parcel layer.
3. Zoom to the Parcel layer and make this layer the only selectable layer (hint: right-click on the Parcels layer and choose Selection > Make This The Only Selectable Layer).
4. To start an edit session right-click on the Parcels layer and click Edit Features > Start Editing.
5. To avoid ending up with overlapping parcels we will first delete the parcel that is being replaced with a subdivision, and then draw in the new parcels. Click on the Edit Tool on the Editor Toolbar and then click on the parcel underneath the new subdivision. Click the delete button on your keyboard.
6. Use the instruction below to draw the parcel in the North West corner of the subdivision.

1. Zoom to this area

2. Locate this dialog box near the right-hand side of your screen. (Hint: if you do not see this box click on Editor > Editing Windows > Create Features)

3. Click on "Parcels"

4. Click on Polygon. (Hint: you will repeat this step for every new polygon you want to create)

5. Click on the Trace Tool on the Editor Toolbar

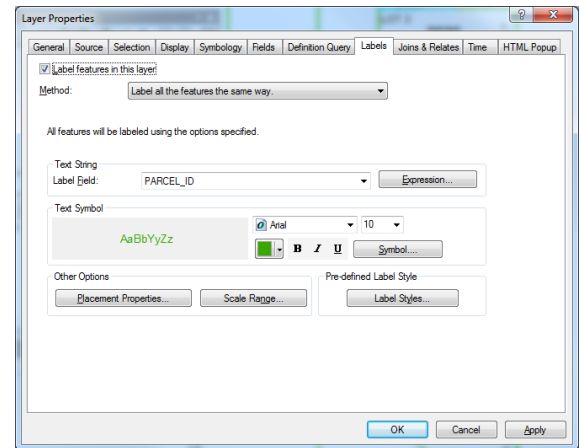
6. Click here and then **without clicking** move your mouse to the right following the outside of the parcel

7. Keep moving your mouse around the parcel until you are back where you started. Double-click to finish your sketch.

8. Click on "Polygon" again. Then click on the Trace Tool and trace the next parcel. Repeat until all parcels in the subdivision are created.

7. Once you have created all the parcel polygons click on Editor > Save Edits. Note that it is good practice to save your edits often, for example you should save your edits every time you create two or three parcels.

8. Turn off the FairviewEstates Construction_Lines layer and turn on the FairviewEstates.dwg Group Layer. Inside this Group Layer turn off all layers, except the annotation layer. We will use the Lot number annotation to edit the attributes of the new parcels and assign parcel numbers.
9. Zoom out so you can see the entire subdivision.
10. The following steps require you to be in an edit session. If you are not in an edit session already, start one now by right-clicking on the Parcels layer and choosing Edit Features > Start Editing. If you are unsure if you are in an edit session try starting a session. If the "Start Editing" is greyed out it means you are already in an edit session.
11. Open the properties for the Parcels layer and go to the Label tab. Label the PARCEL_ID field in a green font as shown on the right. Don't forget to click the box in the top-left corner to turn the labels on.



12. Click on the Edit tool and then click on Lot 1 in the North East corner.
13. Click on the Attributes button on the Editor toolbar and type in "LOT1" in the PARCEL_ID field for this parcel as shown on the right.
14. Click on Lot 2, and type "LOT2" in the Attributes dialog box. Repeat for all the parcels in the subdivision.
15. Save you edits and stop your edit session.
16. Save your map document.
17. Turn off the FairviewEstates.dwg Group Layer. Your parcels should now look like the ones in the figure on the right.

