

EastCity Project – Part 1: Create New Map and Add Data

The EastCity projects is based on a small municipality in southern Ontario. This initial part of the project will introduce you to the rich EastCity dataset. You will first use **ArcCatalog** to familiarize yourself with six of the layers, their attributes and metadata, including the addition of metadata for one layer. You will then create a new map using **ArcMap**, add the six layers to it, and symbolize them.

1. Create a new subfolder named **EastCity** on your **H:** drive (root recommended). Navigate to **J:\GIST\7128\xxx7128_data\EastCity** (xxx= EVE|DEC) and copy its entire **Data** folder into your new **H:\...\EastCity** folder. Move all files in your **Data\Part-1** folder into your **EastCity** folder.

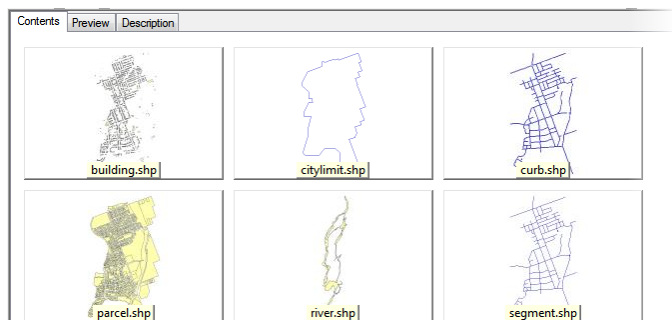
A. Use ArcCatalog – to examine spatial and attribute data, and related metadata.

2. Start **ArcCatalog** and create a Folder Connection to your **H:\...\EastCity** folder. [Text page 85]
3. In ArcCatalog, display the contents of the **Project** folder as thumbnail images.

4. To become familiar with this data, preview each of the six layers and create thumbnails for each [p89].

5. Display the **EastCity** folder contents as thumbnail images again; compare to the image at right.

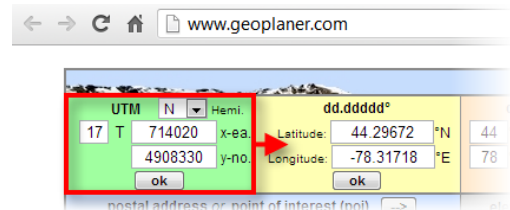
6. Now preview Parcel layer **attributes** by displaying its table [p90, step 20].



7. Note that the records for vacant properties are mostly empty. To determine how many vacant parcels are contained in this feature class: (a) sort the table on the ADDRESS field in Ascending order, (b) scroll down to the last vacant record, and (c) click on it to display its record number just below the table. Record this and the total number of records in the proper cell at the top of the *EastCity Project: Part 1 - Evaluation* sheet (page 3).
8. Likewise, preview the attribute table for the **Segment** layer. Find the record for the longest Segment and record its LENGTH and SEGMENTID values on the evaluation sheet.
9. Now display the metadata for the Parcel layer [p91,s23]. Note the thumbnail image you created earlier is included in the description, together with basic information about the parcel layer.
10. Display the **Segment** layer description to see that, other than the thumbnail image, no metadata is available. Click **Edit** and **Item Description** (under **Overview**) and enter metadata as follows:
 - a. **Tags** – “streets, centerlines, street network”
 - b. **Summary** – “street centerlines (segmented at intersections) as line features with attributes”
 - c. **Description** – copy the first two bullet points from the Parcel metadata (re: CS and Currency)
 - d. **Credits, Use Limitations, Scale Range** – copy from the Parcel metadata
 - e. **Extents** – this is a little more complex and requires the following four steps (i. – iv.):
 - i. Open the Properties window for the Segment layer and click on the Feature Extent tab to view the MinX (west), MinY (south), MaxX (east), and MaxY (north) extents of the layer.
 - ii. Record the coordinates in the proper cells on the evaluation sheet, but round each value to whole meters.

- iii. Extents are not included in the metadata; to add them as Latitude and Longitude values:

- www.geoplaner.com (coordinate converter)
 - enter the Eastings and Northings values recorded above together with proper zone (17) and Hemisphere (N) in the leftmost [green] box, and click OK
 - copy results from the second [yellow] box to *proper* fields in metadata (do *not* round).
- iv. Also record these values (do *not* round) into the *proper* fields on the evaluation sheet.

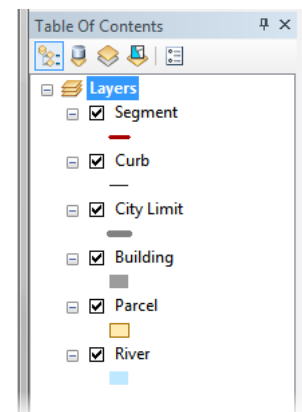


11. Save your metadata edits by clicking the **Save** icon. We will not edit metadata for other layers.

B. Use ArcMap – to create a new map, and to add and symbolize the above layers.

12. Start **ArcMap** from within ArcCatalog [p93].
13. Now create a new map by selecting **File > New...** in ArcMap and using the **Blank Map** template.
14. Enable relative paths (to store all data files in same folder as MXD): select **File > Map Document Properties**, ensure **Store relative pathnames to data sources** option is enabled, and click OK.
15. To start adding data to your new map, drag the **Segment** layer from ArcCatalog to ArcMap [p94].
16. Rather than dragging the other five layers one-at-a-time from ArcCatalog, add all the layers at once, like so: (a) click the **Add Data** button on the Standard toolbar, (b) using the **Look in:** menu on the Add data window that opens, select your **H:\...\EastCity** folder (note that Folder Connections created in ArcCatalog, like this one you created in step 2 above, are available in ArcMap, and vice-versa), (c) select all shape files except Segment, and (d) click Add.
17. In a moment, all selected the shape files will be added to the Table of Contents and to your map. Once ready, change the symbology [click on the symbol in the Table of Contents], the name (including case) [p39], and the order [p37] of each layer to match the following table and image:

Layer Name and Order	(Outline) Colour	(Outline) Width	Fill Colour
Segment	Tuscan Red	2	n/a
Curb	Gray 80%	1	n/a
City Limit	Gray 40%	4	n/a
Building	Gray 50%	1	Gray 20%
Parcel	Raw Umber	1	Topaz Sand
River	(Sodalite Blue)	0	Sodalite Blue



18. Now save your map, using **File > Save As...**, in your **H:\...\EastCity** folder with a filename of **Your-Name_EastCity-1.mxd** (replacing “Your” and “Name” with your first and last names).
19. Close ArcMap. Use Windows Explorer to navigate to your **H:\...\EastCity** folder and record the size of the map (.mxd) file you just saved on the evaluation sheet. It is a small file because it does *not* contain actual spatial or attribute data, only references to the other files in this folder.
20. Copy your map (.mxd) file to the **I:\GIST\7128** submission folder for this course, complete the feedback section on the evaluation sheet, add your name, and give it to the instructor.

EastCity Project – Part 1: Evaluation

Name: _____ Date: _____

EVALUATION Items						OK	Error
#	Recorded Values from Project Work (STUDENT TO COMPLETE)					TEACHER USE ONLY	
1	Step 7: Number of Vacant Lots =						/1
2	Step 7: Number of Total Lots =						/1
3	Step 8: Length of Longest Segment = (metres)						/1
4	Step 8: Segment ID of Longest Segment =						/1
--	Step 10: record the coordinates of bounding rectangle corner points below:						
--	Corner	Eastings (X)	Northing (Y)	Longitude (X)	Latitude (Y)		
5	Minimum:						/4
6	Maximum:						/4
7	Step 19: Size of your MXD file = (kilobytes)						/1
Map Document (MXD) File							
9	Submitted to proper folder, specified file name, data references in same folder						/3
10	Store Relative Pathnames enabled (step 14)						/2
11	Layer Names and Order (as listed below)						/12
Layer Symbology							
--	Layer	Line Colour	Width	Fill Colour			
13	Segment	Tuscan Red	2	n/a			/2
14	Curb	Gray 80%	1	n/a			/2
15	City Limit	Gray 40%	4	n/a			/2
16	Building	Gray 50%	1	Gray 20%			/3
17	Parcel	Raw Umber	1	Topaz Sand			/3
18	River	Sodalite Blue	0	(Sodalite Blue)			/3
TOTAL							/45
Errors x 0.2							
Project 1 Mark							/ 4.0

Labs: 3 4 5 6	/ 4.0
Term Mark	

Project 1 Feedback

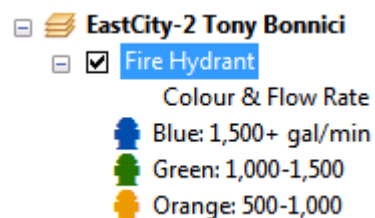
- Level of Difficulty (circle best alternative): Very Easy | Easy | Fine | Difficult | Very Difficult
- Did you use the references to pages in the textbook? Yes | No
- Do you find that this project reinforced the lecture and lab material for you? Yes | No
- Approximate amount of time you spent on this part of the project: _____

EastCity Project – Part 2: Symbolize, Classify, and Label

The textbook lab exercises that you completed so far have prepared you to symbolize, classify, and label layers in your EastCity project. Maptips will also be created for two layers. Specifications are included for each task, but detailed instructions are not provided for tasks covered in the lab exercises. In addition, images of parts of the final map are included; to view colour versions of these images, open the **EastCity_Project_Specs.PDF** file in your **H:\...\EastCity** folder (PDF will be copied in first step below).

1. Copy all the files from your **H:\...\EastCity\Data\Part-2** folder into your **H:\...\EastCity** folder. Remember, do not copy the Part-2 folder, just the files within it!
2. Start ArcMap.
3. Open your map document from part 1 or, if you are not sure that it was completed properly, use the **EastCity-1.mxd** map copied into your project folder in step 1. Either way, immediately save your map file to your **H:\...\EastCity** folder named as: **Your-Name_EastCity-2.mxd**
4. Change the Data Frame title in the Table of Contents from **Layers** to **EastCity-2 Your Name**.
5. Add the **hydrant** shape file to your map, and change its name in the ToC to **Fire Hydrant**.
6. Symbolize and label the **Fire Hydrant point** layer using these specs:
 - a. Use the Fire Hydrant 1 symbol found in the HazMat style reference
 - b. The default 18pt symbol size and Mars Red colour are fine for now
 - c. Hydrant *symbols* are displayed only at 1:2,500 and larger scales (in General tab)
 - d. The **HydrantID** field is used for the label
 - e. All labels appear in Arial / 8pt / Gray 80% and are centered below the point symbol
 - f. Hydrant *labels* are displayed only at 1:1,000 and larger scales
7. Fire Hydrants in EastCity are painted to represent their flow capacity (in gallons per minute). The colour is stored as a single letter in the **colorRate** field. Symbolize the hydrant layer accordingly, using the table data and image below for reference (note that <all other values> is disabled).

colorRate	Symbol Colour	ToC Label
B	Ultra Blue	Blue: 1,500+ gal/min
G	Fir Green	Green: 1,000-1,500
O	Seville Orange	Orange: 500-1,000



8. Change the **colorRate** heading in ToC under Fire Hydrant to Colour & Flow Rate as shown above.
9. Add Maptips for Fire Hydrants, using these steps (not covered in labs):
 - a. Click the Display tab in the Layer Properties window
 - b. Enable Show MapTips... checkbox and click the **Expression** button (if not available, close ArcMap and add a spatial index in ArcCatalog, on Hydrant.shp Properties, Indexes tab).
 - c. Delete the field name in the lower (Expression) text area
 - d. Select **HydrantID** in the upper (Fields) list box and click Append
 - e. Select **fullStatus** and click Append, and click OK to close the Display Expression window
10. Add the **water** shape file, symbolize the new layer with a colour of Moorea Blue and a width of 1.5, and change the layer name in the ToC to Water Line.

11. Change the ToC entry for the **Segment** layer to Street Segment.
12. Add labels to Street Segments, using these specs:
 - a. Label field: SEGMENTID (unique identifier for each street segment)
 - b. Text Symbol: Arial / 9pt / Tuscan Red
 - c. Placement: Parallel / Above / Page / Offset 1 meter / At Best / Remove duplicate labels
 - d. Scale Range: 1:1,500 and larger scales
13. Classify the **Parcel polygon** layer using the image below as a guide, and these specs:
 - a. Quantities > Graduated Colors category, based on the PROPVAL attribute
 - b. Set the classification method to Quantiles with 4 classes
 - c. Exclude all vacant parcels (which have a property value of zero) with the following statement on the Definition Query tab on the Properties window: "PROPVAL" <> 0
 - d. Ensure Show class ranges using feature values is disabled
 - e. Use the Orange Bright colour ramp
 - f. Round Label values to 4 significant digits and add thousands separator automatically [p265]
 - g. Change the first property value in the Labels column to the actual lowest value [Figure 2-1]
 - h. Change the field name under Parcel from PROPVAL to Property Value (\$)
14. Label the **Parcel** layer using the ADDNUM (address number) field and symbolize with: Arial / 9pt / Gray 60% / Placement: Always straight & Only place inside polygon / 1:2,500 and larger scales
15. Add a Maptip to the **Parcel** layer that displays the full address, owner name, and property value: enter the following line into the Expression field with Parser set to Python [see step 9 above]


```
' ' + [ADDRESS] + ' \n Owner: ' + [ONAME] + ' \n Value: $' + [PROPVAL]
```
16. Since vacant parcels were excluded from the map (in step 13c):
 - a. Add the **Parcel** shape file to the map a second time and rename the layer to Vacant Land in the ToC
 - b. Move the Vacant Land layer under the original Parcel layer [if you can't adjust layer order, enable List by Drawing Order mode with the icon in the top-left corner of the ToC]
 - c. Symbolize with Gray 10% fill and Gray 40% / 0.40 outline
 - d. Use a Definition Query to show only vacant parcels, using the complement of the statement in 13.c. above
17. Compare your ToC to *Figure 2-1* at right and make any necessary adjustments to text and layer order.
18. Also, verify your work by comparing it to *Figure 2-2* on the back of the evaluation page (or use the colour version in PDF file).
19. Save your MXD file and close ArcMap.
20. Copy your **MXD file** to the I:\GIST\7128 submission folder.
21. Complete the project 2 feedback section on the evaluation sheet and give it to the instructor.

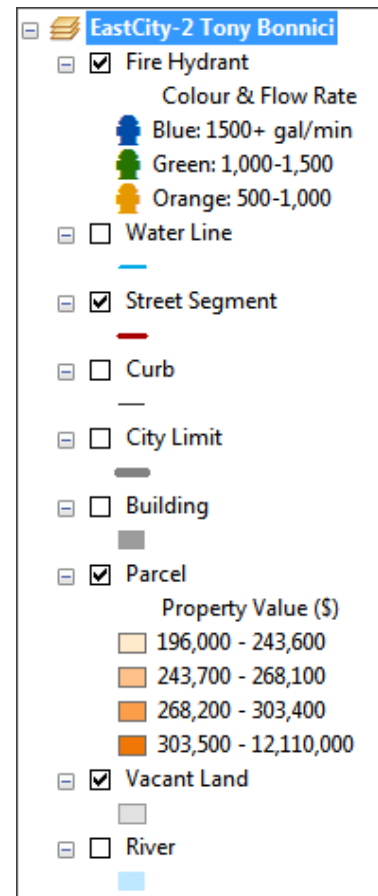


Figure 2-1: The Table of Contents as configured in part 2.

EastCity Project – Part 2: Evaluation

Name: _____ Date: _____

#	EVALUATION Items	OK	Error
General			
1	Submitted MXD to proper folder with specified name		/2
2	Shape files added: Hydrant, Water, and second Parcel		/3
3	ToC entries revised for data frame, layers, and symbols		/6
4	Layer order and data location		/6
Hydrant			
5	Classification: Unique Values on colorRate / ToC Labels for 3 classes		/5
6	Symbology: symbol, size, colour for 3 classes		/5
7	Label: HydrantID, Arial / 8pt / Gray 80%, centered below / enabled		/5
8	Symbol display scale: <= 2,500 / Label display scale: <= 1,000		/2
9	MapTips: HydrantID and fullStatus, with space		/3
Water Line			
10	Line symbology: Moorea Blue / width 1.5		/2
Segment			
11	Label: SegmentID / Arial, 9pt, Tuscan Red / Parallel, Above, Offset 1 m / enabled		/7
12	Segment label display scale: <= 1,500		/1
Parcel (classified)			
13	Classification: Quantiles with 4 classes on PROPVAL		/3
14	Vacant parcels excluded from classification		/2
15	Colour ramp: Orange Bright		/1
16	ToC labels: 4 sign. digits, thousands separator / first changed, correct		/4
17	Labels: ADDNUM / Arial, 9pt, Gray 60% / Straight, Only in. / <=1:2,500 / enabled		/7
18	Parcel maptip: ADDRESS, ONAME, PROPVAL / prompts, newlines, spaces, \$		/7
Parcel (unclassified)			
19	Definition Query to exclude non-vacant parcels		/3
20	Symbology: fill Gray 10% / outline Gray 40%, 0.40 width		/3
		TOTAL	/70
		Errors x 0.2	
		Project 2 Mark	/ 5.0

Labs: 7 8	/ 2.0
Term Mark	

Please provide feedback for project 2 on the reverse side...

Project 2 Feedback

- Level of Difficulty (circle best alternative): Very Easy | Easy | Fine | Difficult | Very Difficult
- Did you use the [hints] and references to the textbook? Yes | No
- Do you find that this project reinforced the lecture and lab material for you? Yes | No
- Approximate amount of time you spent on this part of the project: _____

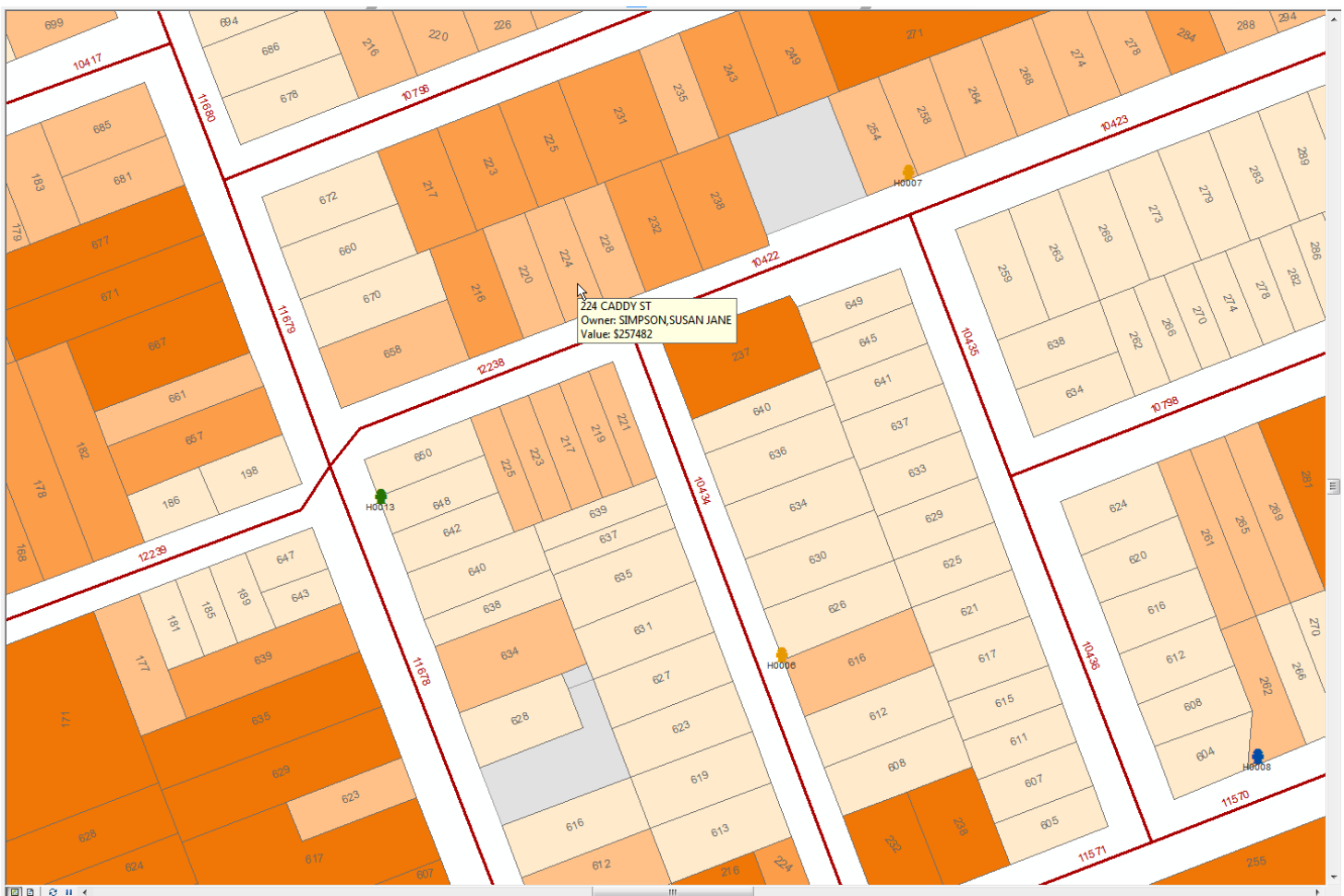


Figure 2-2: A portion of the finished map displayed in ArcMap at 1:1,000 scale, showing parcel, segment, and hydrant labels, parcel classification, and sample maptip.

EastCity Project – Part 3: East City Maps

As the city's only GIS technician on staff, you have been asked to prepare informational maps for an upcoming council meeting to evaluate a proposal for improvements to the EastCity Museum building, property, and relevant municipal services. Of course, you would first design the maps and compile the specifications, but in this case the specs are already provided as shown in the table on page 11 below (to a large degree, your maps will be evaluated based on how well you follow these specs). A sample of the final product appears on page 12 (where the sample and specs are different, follow the specs).

The following is an outline of the recommended procedure for completing this mapping project.

1. Copy all the files from your **H:\...\EastCity\Data\Part-3** folder to your **H:\...\EastCity** folder (including colour PDF and PNG Map-Samples for reference).
2. Open your EastCity map document from part 2 or, if you are not sure that it was completed properly, use the **EastCity-2.mxd** map just copied to your project folder in the previous step.
3. Immediately save your map file to your **H:\...\EastCity** folder as: **Your-Name_EastCity-3.mxd**, and update the data frame title to: **East City Property Values**
4. Add the new layers in your Project folder to your map, based on the specs in this table:

Shape File	Layer Name	Line Colour	Width	Other Specs
contour.shp	Contour	Burnt Umber	1	n/a
lane.shp	Lane	Gray 40%	1	n/a
light.shp	Street Light	Gray 50%	n/a	Circle 2 / Fill Solar Yellow / Size 10
parking.shp	Parking	Gray 40%	1	n/a
railway.shp	Railway	Ultramarine*	6	Symbol = Railroad (*purple)
trail.shp	Trail	Fir Green	1.5	Symbol = Dashed

5. Re-order the layers in the Table of Contents to match Figure 3-1.
6. Switch to **Layout View**; use **File > Page and Print Setup** to implement the Page Setup options in the last row of the specs table on page 11.
7. Use the Customize menu to open the ArcMap Options... window; click the Layout View tab and set the Units to inches for Rulers.
8. Double-click the frame name in the Table of Contents to open its *Properties* window. Set the Frame Background Colour to **Olive** and revise its Title and Size based on **Map 1** specs at the top of page 11.
9. Set the map scale in the *Scale* field (on the *Standard* toolbar) and use the *Pan* tool (*Tools* toolbar) to position the map features within the frame as shown in the project sample.
10. Select the frame in the layout view, copy it, and paste it twice. Use the *Select Elements* tool (*Tools* toolbar) to select and move each frame to arrange them within the layout border. Then use shift+Select to select all three frames and right-click on any of them to apply the *Align Top* and *Distribute Horizontally* options.

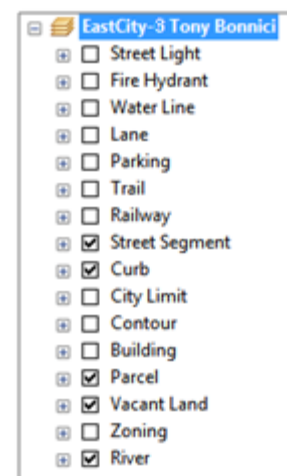


Figure 3-1: the final list of all project layers, listed in the required order

You should now focus on one map at a time to make the necessary changes and additions. Critical steps are outlined below for each map:

Map 1

11. Remove unnecessary layers based on *Layers Included* list in the specs table, adjust layer order as needed, and disable all Labels.
12. Insert the Legend as specified in table on page 11 (including the Legend background colour specified in the lower-right corner of the table). *Map 1 is done!*

Map 2

13. Add the Zoning shapefile as a new layer and classify the data by Unique Values on the ZONE field, use the Prediction colour ramp [*right-click the Color Ramp menu and disable Graphic View to display the name*], Add All Values [*if the colours are not orders as a smooth graduation, select the colour ramp again*], and disable the <all other values> symbol entry.
14. Change frame size and name; remove unnecessary layers; add legend, north arrow, and text, scale ratio, and scale bar as specified in the specs table and shown on the sample map.

Map 3

15. Change frame size, scale, and name; remove unnecessary layers and add new layers as needed; add the legend, scale ratio statement, and scale bar as specified on page 11 (incl. hints at bottom).
16. **Street Segment** layer: change symbology to *width 0.5, colour Gray 10%*. Also improve labelling by: (a) add the **STREET** table from the **eastcity.mdb** database to your map, *Join* it to the Segment layer based on **StreetID** fields, (b) set *Label Field*: fullName (from Joined table), Text Symbol: *size 10pt, Bold, colour Gray 70%, Scale Range: don't show > 1:5000, Placement: On the line*
17. Change the symbology of the **Parcel** layer: Single Symbol, *width 1.0, colour Gray 50%, no Fill*.
18. Change the **Hydrant** layer symbology: Circle, Mars Red, 12pt; and display scale to display them.

Map 4

19. Copy Map 3 and paste for use as Map 4; arrange to proper position on the layout; change the frame name; remove unnecessary layers and add new layers as needed; and add the legend as specified in the table and shown on the sample map.
20. Change the symbology for **Parking & Lane** layers: *symbol Major Road, colour Gray 70%, width 2*
21. Finally, add the Museum callout, project title, each map title, and the Credit and Source notes shown on the map sample, using the fonts specified in the bottom row of the table.

Final Steps

22. Add the extents of an inset map to map 2 using Frame Properties: Data Frame Extent and use the extents of map 3 (or map 4). Use appropriate line width & colour and add the text label as well.
23. Use File > Export Map... to generate a PDF file of your mapping project with the same filename as your map document. Check PDF output; if any issues exist, export to hi-res PNG image instead.
24. Submit your MXD and PDF (or PNG) files to the **I:\GIST\7128** folder. Complete the project 3 feedback section on the evaluation sheet (page 14). Call the instructor over to check your project work when done; if not possible, just give your evaluation sheet to the instructor.

East City Maps – Specifications – WORKING COPY

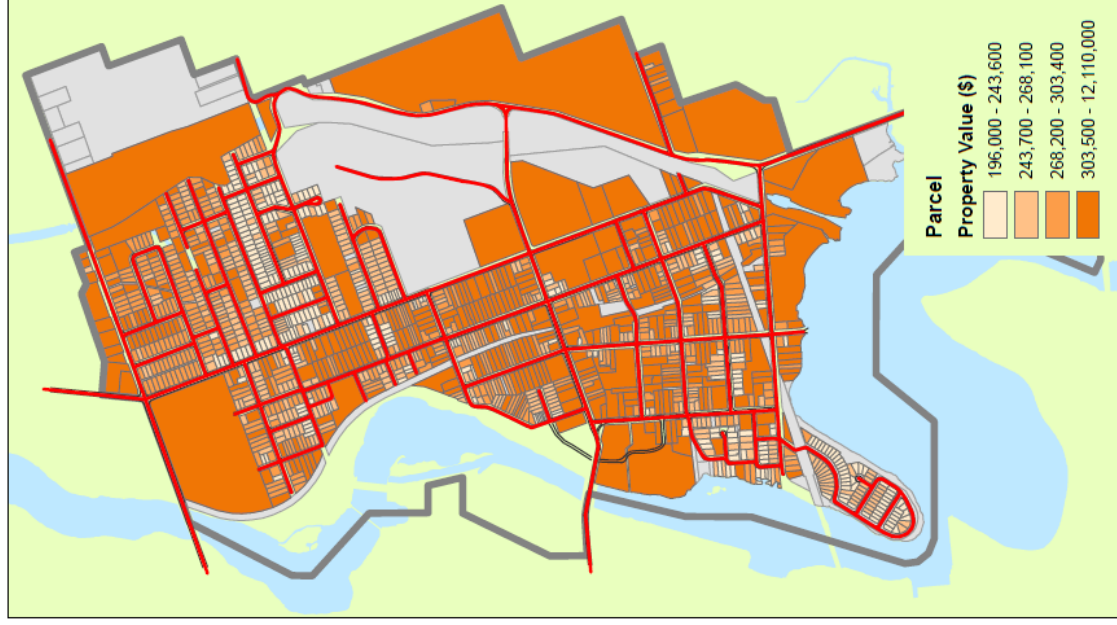
Map Number:	1	2	3	4
Title	East City – Property Values	East City – Land Use Zoning	Museum – Watermains & Fire Hydrants	Museum – Parking & Street Lights
Scale	1 : 15,000	1 : 15,000	1 : 5,000	1 : 5,000
Frame Size	5.0 in wide 9.0 in high	5.5 in wide 9.0 in high	5.0 in wide 4.0 in high	5.0 in wide 4.0 in high
Layers Included (listed in display order)	Street Segment Curb City Limit Parcel Vacant Land River	Street Segment City Limit Contour Zoning River	Hydrant Water Line Railway Street Segment Curb Building Parcel River	Street Light Lane Parking Railway Street Segment Building Curb Parcel River
Layer Details	Parcel layer classification	Zoning layer classification	Street Segment layer joined to STREET table (in EastCity.MDB) on StreetID fields	
Labels	none	none	Segments labelled with STREET fullName field	
Surround Elements	Map Title Legend Credit Note: “Designed and produced by <i>Your Name</i> using ArcGIS 10.3”	Map Title North Arrow Legend Inset Extents Scale RF Scale Bar	Map Title Legend Scale RF Scale Bar	Map Title Legend Museum callout Data source note: “Data courtesy of the City of Peterborough Ontario, Dec 2016”
*Legend Entries <i>see Hints below</i>	Parcel classification Property Value (\$)	Zoning Land Use	Hydrant Building Watermain Parcel Railway River	Street Light Building Parking Parcel Railway River
Scale Bar <i>Specific →</i>	Division value: 300 m Number of subdivisions: 3		Division value: 100 m Number of subdivisions: 4	
<i>Same for all maps →</i>	Number of divisions: 4 Label Position: after labels	When resizing...: Adjust width Label: m		Division Units: Metres Gap: 3
Text Fonts	Use Calibri font for all Main Title: 48 pt bold Map Titles: 20 pt bold	Legend Title: 14 pt bold Legend Heading: 12 pt bold Legend Labels: 10 pt		Notes: 14.5 pt Scale RF: 16 pt Scale Labels: 12 pt
Background	All Frames: Olive	Legend 1,2: Olive		Legend 3,4: Lt. Blue
Page Setup	Printer: Adobe PDF	Orientation: Landscape (twice)		Paper/Page Size: 11x17/Tabloid

Additional specifications are provided within the procedural outline on pages 9 and 10. All other specs should be approximated from the finished project sample provided on page 12; as an additional reference, open the colour **Map-Sample_EastCity-3** PDF or PNG files (copied to your EastCity folder during step 1).

***Legend Adjustment Hints:** (1) You can adjust the text size for Layer Name, Heading, and All Labels on the Items and Layout tab of the Legend Properties window. (2) To manually adjust legend items for maps 3 & 4, right-click and Convert to Graphics and then right-click again and Ungroup (multiple times as needed). (3) Suggested Patch: Height = 10pt, Width = 20pt, Gap = 2pt

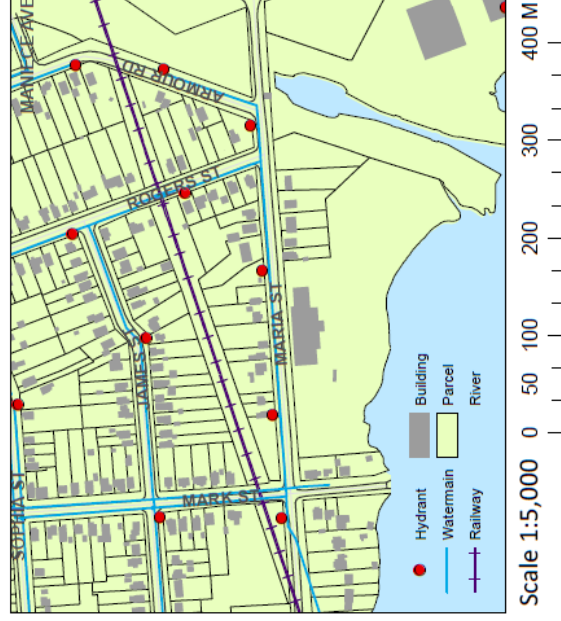
East City Museum - Evaluation and Reassessment

East City - Property Values



Designed and produced by Dan Vujicic using ArcGIS 10.1

Museum - Watermains & Fire Hydrants

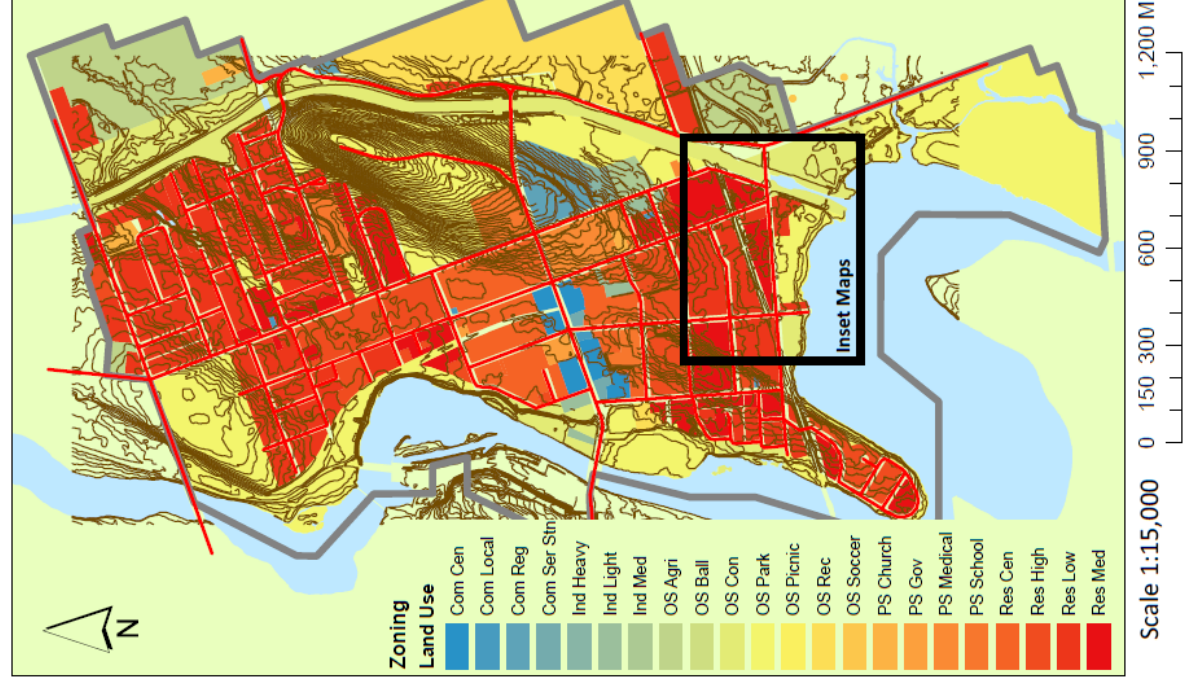


Museum - Parking & Street Lights



Data courtesy of the City of Peterborough Ontario, Dec 2013

East City - Land Use Zoning



Part 3: Project Evaluation – East City Maps

Name: _____ Date: _____

Map:	1	2	3	4
Title	East City – Property Values	East City – Land Use Zoning	Museum – Watermains & Fire Hydrants	Museum – Parking & Street Lights
Scale	1 : 15,000	1 : 15,000	1 : 5,000	1 : 5,000
Frame Size	5.0 in wide 9.0 in high	5.5 in wide 9.0 in high	5.0 in wide 4.0 in high	5.0 in wide 4.0 in high
Layers Included (listed in display order)	Segment Curb City Limit Parcel Vacant Land River	Segment City Limit Contour Zoning River	Hydrant Water Line Railway Segment Curb Building Parcel River	Street Light Lane Parking Railway Segment Building Curb Parcel River
Details	Parcel layer classification	Zoning layer classification	Street Segment layer joined to STREET table	
Labels	none	none	Segments labelled with STREET fullName field	
Surround Elements	Map Title Legend Credit Note: “Designed and produced by <i>Your Name</i> using ArcGIS 10.3”	Map Title North Arrow Legend Inset Extents Scale RF Scale Bar	Map Title Legend Scale RF Scale Bar	Map Title Legend Museum callout Data source note: “Data courtesy of the City of Peterborough Ontario, Dec 2016”
Legend Entries	Property Value classification with “Property Value (\$)”	Zoning Land Use	Hydrant Building Watermain Parcel Railway River	Street Light Building Parking Parcel Railway River
Scale Bar <i>Unique:</i>	Division value: 300 m Number of subdivisions: 3		Division value: 100 m Number of subdivisions: 4	
<i>Same for all maps:</i>	Number of divisions: 4 Label Position: after labels	When resizing...: Adjust width Label: m	Division Units: Metres Gap: 3	
Text Fonts	Use Calibri font for all Main Title: 48 pt bold Map Titles: 20 pt bold	Legend Title: 14 pt bold Legend Heading: 12 pt bold Legend Labels: 10 pt (not bold)	Notes: 14.5 pt Scale RF: 16 pt Scale Labels: 12 pt	
Backgrnd.	All Frames: Olive	Legend 1,2: Olive	Legend 3,4: Lt. Blue	
Pg. Setup	Printer: Adobe PDF	Orientation: Landscape (twice)	Paper/Page Size: 11x17/Tabloid	
Other Specs <i>(from procedure steps)</i>	Filename: <i>Your-Name_EastCity-3</i> .PDF (or .PNG) Each frame arranged within the layout border as shown on sample (Map 2) Contour: <i>width 1 / colour</i> Burnt Umber (Map 3) Street Segment: <i>width 0.5 / colour</i> Gray 10% / <i>label with</i> fullName / On the line (Map 3) Hydrant: <i>symbol</i> Circle / <i>colour</i> Mars Red / <i>size</i> 12 (Map 4) Parking & Lane: <i>symbol</i> Major Road / <i>colour</i> Gray 70% / <i>width 2</i> Light: <i>name</i> Street Light / <i>symbol</i> Circle 2 / <i>fill colour</i> Solar Yellow / <i>size</i> 10 Railway: <i>symbol</i> Railroad / <i>colour</i> Ultramarine / <i>width 6</i> Inset Map extents and text (in map 2) / Museum Callout (in map 4)			
ACCURACY	0.2 marks deducted for each specification missed as indicated above			/6.0
QUALITY	Layout of maps and legends / Placement of titles, scale bars, and notes			/4.0
MARKS	Labs: 9 10 11 12 /4.0	Term: / (%)	Project - Part 3 mark: /10.0	

Please provide feedback for project 3 on the reverse side...

Project 3 Feedback

- Level of Difficulty (circle best alternative): Very Easy | Easy | Fine | Difficult | Very Difficult
- Did you use the references in the textbook and/or lecture notes? Yes | No
- Do you find that this project reinforced the lecture and lab material for you? Yes | No
- Approximate amount of time you spent on this part of the project: _____
- Any comments or suggestions:

EastCity Project – Part 4: Query, Join, and Locate

As the EastCity GIS technician, you've been asked to complete site selection analysis to identify candidate properties in EastCity that satisfy the following **Site Selection Criteria**:

- (1) Property Value of \$200,000 ± \$25,000
(i.e. PropVal range of \$175,000 to \$225,000 inclusive)
- (2) Area of over 400 square meters
- (3) Parcel is a residential property (i.e. isBusiness is false)
- (4) Property is currently for sale (i.e. ForSale is true)
- (5) Within 400m of a public school property (PS School zone)
- (6) Within 200m of a public park (OS Park zone)
- (7) At least 100m away from busy streets (Segment TrafficInd >= 7)

In this part of the project, you will test each of the above 7 criteria individually. Attribute-based criteria (1-4) will be checked in section B, and the spatial criteria (5-7) will be examined in section C.

This work is good preparation for the full spatial analysis workflow in part 5, the results of which will satisfy all criteria simultaneously.

A. Map Additions and Improvements

In this first section, you will extend and improve your map from part 2 by improving the presentation of the Street Segment layer, adding and classifying the Zoning layer (repeating some of the work done in part 3... consider it good practise!).

1. Copy all the files from your H:\...\EastCity\Data\Part-4 folder to your H:\...\EastCity folder.
2. Open your Map Document from part 2 or, if you are not sure that it was completed properly, use the **EastCity-2.mxd** map copied into your project folder in the previous step.
3. Either way, save your map file to your H:\...\EastCity folder as: **Your-Name_EastCity-4.mxd** and update the data frame title.
4. Improve Segment labelling:
 - a. Add the **STREET** table from the **eastcity.mdb** database
 - b. Join it to the Segment layer on **StreetID** fields
 - c. Change the Segment labels:
 - i. Use the **fullName** field (from the Joined table)
 - ii. Change label size to **10pt** and enable **Bold**
 - iii. Change colour to **Gray 70%**
 - iv. Change Scale Range to **<=1:5,000**
 - v. Change placement to **On the line**
5. Since the curb features provide good street definition on the map, the **Street Segments** can be de-emphasized; change the segment line colour to **Gray 20%** and width to **1.00**

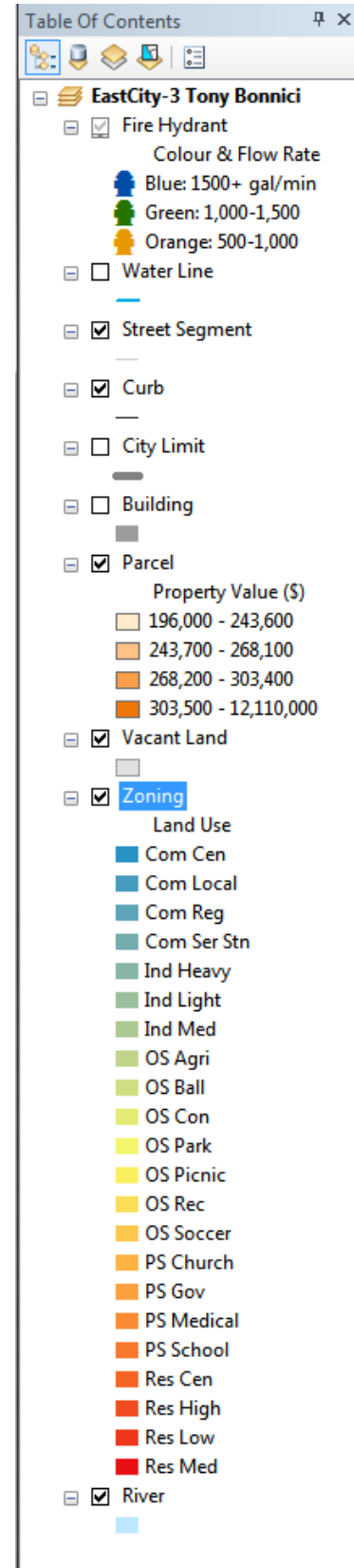


Figure 4-1: the Table of Contents with new layers and revisions (colour version in EastCity_Project_Specs.PDF file in H:\...\EastCity).

6. Optimize label placement using the Labeling toolbar:
 - a. Enable **Use Maplex Label Engine** on the Labeling menu
 - b. Click the **Label Manager** tool and select **Default** under **Street Segment** (with both enabled)
 - c. Placement Properties: select Street Placement, click Position..., and select Centered Straight
7. Add a maptip for Street Segments composed of the Segment ID (SEGMENTID), street name (fullName), left and right address ranges (LEFTFROM, LEFTTO, etc). Refer to the details in Part 2, step 15 (page 6) if needed, and the example at right. (If the Maptip option is dimmed, you need to create a spatial index for the layer.)
8. Add the Zoning shapefile as a new layer and classify the data by Unique Values on the ZONE field, using the Prediction colour ramp, and with the <all other values> symbol entry disabled.
9. Change the **zoning** layer name in the ToC to Zoning and the heading from ZONE to Land Use, as shown in *Figure 4-1*; also move the layer down between the **Vacant Land** and **River** layers.

B. Satisfy Attribute Criteria (with Select by Attributes)

*In this section, you will examine data in the Parcel layer, and use the **Select by Attributes** tool to identify the parcels that satisfy each of the four attribute-based criteria above. But first, you will join an Access database table to the Parcel layer to provide an additional attribute required for criteria 4.*

10. The **PARCEL_MLS** table is provided in the **EastCity.mdb** database with Real Estate MLS (Multiple Listing Service) data that indicate which properties are currently for sale. Join this table to the **Parcel** layer based on the **ParcelID** field for both.
11. Examine the **Parcel** layer:
 - a. Make all layers non-selectable, except for the **Parcel** layer (*not* the Vacant Land layer) [p505]
 - b. Reduce the Selection tolerance to **1**
 - c. **Find** parcel with PARCELID = 10597 and zoom to it [*right-click entry at bottom of Find window*]
 - d. Examine its attributes with **Identity** tool. Record the owner (**Oname**) on the evaluation sheet.
 - e. Visually check the four fields to be used to satisfy the first four criteria (at the top of page 15).
12. Use **Select by Attributes** to test each of the first four criteria above and complete the table on the Evaluation sheet; the WHERE clause for the fourth one is a bit tricky, and is therefore provided.
13. Now use **Select by Attributes** with a WHERE clause that combines all four clauses in the previous step into a single clause. Display the Attribute table for parcels and show only the selected records. On the evaluation sheet, record the SQL Operator used to connect the four clauses and the number of parcels selected.

continued...

C. Satisfy Spatial Criteria (with Select By Location)

*In this section, you will first use the **Select By Location** tool (together with the Select By Attributes tool) to identify the parcels that satisfy each of the three spatial-based criteria.*

14. Clear any feature selections so you can start fresh, and make the Street Segment and Zoning layers selectable (in addition to the Parcel layer that is already selectable).
15. Use **Select by Location** to identify all the parcels that satisfy criterion (5) only (no other criteria required). You first need to select the required **Zoning** features for use in this operation using **Select by Attributes** [see slide 23 in lecture 7 or Labs 17a & 17b]. On the evaluation sheet, record the WHERE clause for the Zoning layer and the number of features selected in the Parcels layer.
16. Repeat this combination of Select by Attributes and Select by Location tools to satisfy criterion (6). Again, record the WHERE clause for the Zoning layer and the number of features selected in the Parcels layer on the evaluation sheet.
17. Use the same tools to satisfy criterion (7). [Hint: due to the negative criteria in this case, after selecting the *required segments with Select By Attributes*, you should *select all parcels and then use the "Remove from the currently selected features" selection method with Select By Location*]. Record the WHERE clause for the Segment layer and the number of Parcels selected.

*Although isolating the input features with the Select By Attributes tool in the above steps works fine, and the resultant selection set can be saved in the map document, it will be more convenient when working with multiple layers to use a **Definition Query** to filter the required input features instead. To prepare for the full site selection workflow in the next part of the project, you will now add Definition Queries to the Parcel, Zoning, and Street Segment layers to filter the required input map features.*

18. Enter the combined WHERE clause used earlier (in step 13) to satisfy criteria (1) to (4) as the **Definition Query** for the **Parcel** layer.
19. Use another Definition Query on the **Zoning** layer based on a combination of the WHERE clauses used above (in steps 15 & 16) to isolate PS School and OS Park features for criteria (5) and (6).
20. And finally, use a third Definition Query on the **Segment** layer to isolate the busy streets features required for criterion (7) based on the WHERE clause used above (in step 17).
21. Save your map document and close ArcMap.
22. Copy your **MXD file** to the **I:\GIST\7128** submission folder, complete the feedback section below and submit your evaluation sheet to the instructor.

Project 4 Feedback

- Level of Difficulty (circle best alternative): Very Easy | Easy | Fine | Difficult | Very Difficult
- Did you use the references in the textbook and/or lecture notes? Yes | No
- Do you find that this project reinforced the lecture and lab material for you? Yes | No
- Approximate amount of time you spent on this part of the project: _____

EastCity Project – Part 4: Evaluation

Name: _____ Date: _____

#	EVALUATION Items	OK	Error	
Recorded Values from Project Work				
1	Step 11d: Owner name =		/1	
Record the WHERE Clause and number of selected parcels for each criterion in this table:				
Step	Site Selection Criteria	WHERE clause for Select By Attributes	Parcels	
12	(1) Value \$200K ± \$25K			/2
12	(2) Area over 400m ²			/2
12	(3) Residential property			/2
12	(4) Currently for sale	PARCEL_MLS.ForSale <> 0		/1
13	(1)-(4) Candidate Props	SQL Operator used to connect the four clauses above (one word):		/2
15	(5) 400m of School			/2
16	(6) 200m of Park			/2
17	(7) 100m busy Streets			/2
Map Document (MXD) File				
10	Submitted to proper folder with specified name		/2	
11	Segment layer: STREET joined on StreetID, Gray 20%, width 1.0 / maptip text, layout		/5	
12	Segment label: fullName / 10pt, bold, Gray 70% / <=1:5,000 / On line / enabled		/7	
13	Zoning layer: Unique Values on ZONE, Prediction, no <all other values>		/3	
14	Zoning in ToC: Zoning, Land Use, second from bottom		/3	
15	Parcel layer: PARCEL_MLS table joined on ParcelID		/5	
16	Definition Queries: for Zoning and Segments		/6	
17	Selectable Layers: Parcel, Zoning, Segments only		/3	
		TOTAL	/50	
Labs: 13 14		/ 2.0		
Term Mark				
		Errors x 0.2		
		Project 4 Mark	/ 4.0	

Please provide feedback for project 4 on the reverse side...

EastCity Project – Part 5: Spatial Analysis

Completion of the textbook exercises in chapters 10 to 12 have prepared you to complete this part of the project, which is also dependent on the preparatory steps completed in Part 4. Detailed instructions are not provided, although some specifications are included as needed. Here are the Selection Criteria again:

- (1) Property Value of \$200,000 ± \$25,000 (i.e. PropVal range of \$175,000 to \$225,000 inclusive)
- (2) Area of over 400 square meters
- (3) Parcel is a residential property (i.e. isBusiness is false)
- (4) Property is currently for sale (i.e. ForSale is true)
- (5) Within 400m of public school property (PS School zone)
- (6) Within 200m of a public park (OS Park zone)
- (7) At least 100m away from busy streets (i.e. Segment TrafficInd >= 7)

A. Create Candidate Properties Layer & Map

At this point, your map document should include definition queries on parcel, zoning, and street segment layers to filter the features of interest (see steps 15-17 in Part 3). You will now perform the site selection analysis to isolate the candidate properties (i.e. parcels that simultaneously satisfy the criteria above).

1. Open your Map Document from Part 4 or, if you are not sure that it was completed properly, use the **EastCity-4.mxd** map found in your **H:\...\EastCity\Data\Part-5** folder

2. Either way, immediately save your map file to your **H:\...\EastCity** folder as:

Your-Name_EastCity-5.mxd and update the data frame title. It should be similar to *Figure 5-1*.

3. To store geoprocessing results, create a new File Geodatabase:

- a. Activate List by Source mode in the Table of Contents [second icon at top]

- b. Click the **Add Data** tool (on Standard toolbar or the Data frame title context menu)

- c. Navigate, if necessary, to your **H:\...\EastCity** folder on Add Data window that opens

- d. Click **New File Geodatabase** tool near top-right corner of the Add Data window

- e. Change the name of the new geodatabase to **scratch.gdb** and click Add

- f. Note that ArcCatalog can also be used to create and manage the geodatabase.

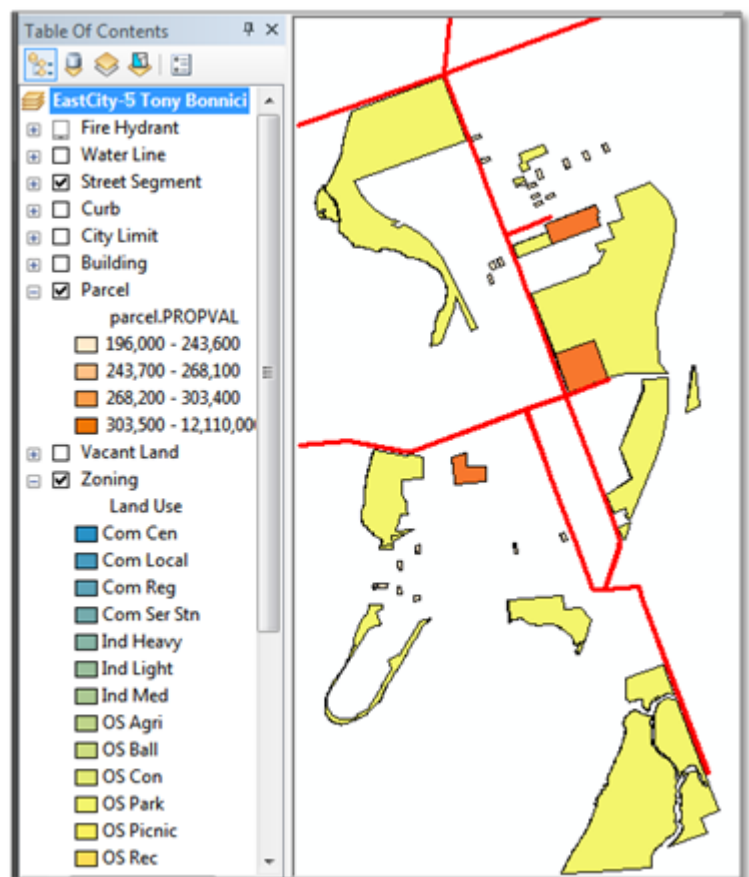


Figure 5-1: the initial state of the map document for part 4 of the project. Layer symbology above has been altered to emphasize map features.

- g. Note that the geodatabase will not appear in the ToC until some data are added to it.
 - h. Once all geoprocessing steps are complete, geodatabase “scratch” layers will be listed as in *Figure 5-2* at right.
4. Also, to make geoprocessing operations more obvious, select **Geoprocessing Options...** from the Geoprocessing menu, and disable the **Background Processing** option.
 5. Complete the required spatial analysis to satisfy the site selection criteria above, saving all new layers (shown at right) in your new scratch geodatabase, and using the following references for help:
 - a. Refer to the spatial analysis tools (buffer, intersect, erase, clip) covered in the textbook exercises
 - b. See slides 33 – 36 in lecture 8 (PDF version available in the **Docs** folder on the **J:** drive)
 - c. The definition query on the Zoning layer will be split up into two definition queries in order to generate separate buffers on the park features and the school features.
 6. Once finished, save the final candidate parcels as a Shape file:
 - a. Right-click on the resultant Candidate Parcels layer
 - b. Select **Data > Export Data...** and set the following in the **Export Data** window that opens:
 - i. Export: **All features**
 - ii. Coordinate system: **this layer’s source data**
 - iii. Output feature class: click the folder icon and set the options in the **Saving Data** window:
 - Name: **Your-Name_EastCity-5_CandProp.SHP**
 - Look in: **H:\...\EastCity**
 - Save as type: **Shapefile**
 - iv. Click **Add** to save the data and then click **No** to not add it as a layer to your map.
 7. Use **File > Export Map...** to generate a PDF file of your map emphasising the Candidate Properties layer with other layers for background (see *Figure 5-3* for ideas), with this filename: **Your-Name_EastCity-5_Map.PDF**

If creating a PDF is a problem, export your map to a high resolution PNG image file with the same filename and a PNG extension.

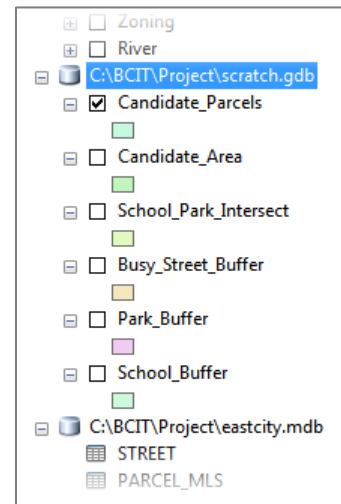
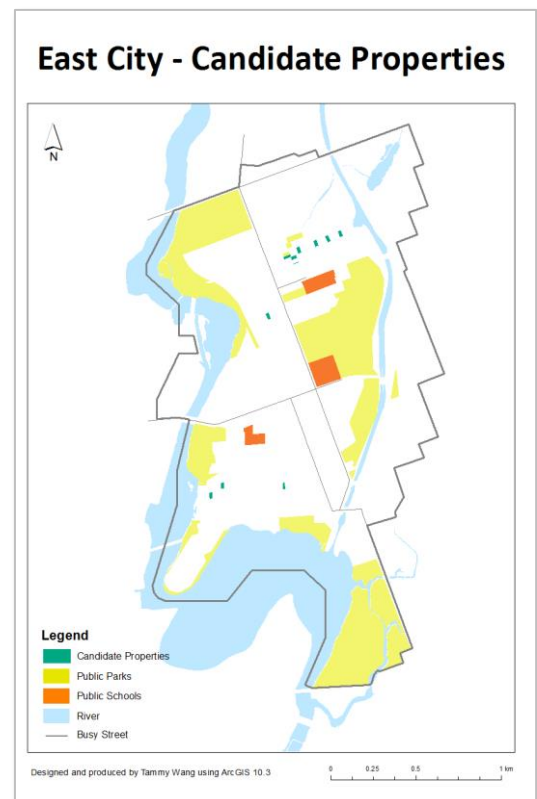


Figure 5-2: temporary layers created during the spatial analysis workflow and stored in the new “scratch” file geodatabase. (A colour PDF version of this handout is available in the J:\...\Docs folder.)

Figure 5-3: a sample map depicting Candidate Properties that satisfy the criteria for the spatial analysis problem in this part of the project.



B. Create Candidate Properties Report

You will now generate a report of the Candidate Properties as determined in the previous section.

8. Select all the parcels on the Candidate parcels layer.
9. Create a **Parcel** report with these settings:
 - a. Fields: ParcelID, Address, Oname, Area, PropVal, IsBusiness, ForSale (in this order)
 - b. Dataset Options: Selected Set
 - c. Grouping: none
 - d. Sorted: by ParcelID (ascending)
 - e. Summary Options: Average, Max, Min for PropVal & Area, at End of Report
 - f. Layout: Outline
 - g. Orientation: Landscape
 - h. Adjust the field width so...: enabled
 - i. Style: Copenhagen
 - j. Title: Candidate Properties by Your Name
 - k. Preview the Report
10. In the Report Viewer:
 - a. Edit the layout to improve the report presentation as needed, including number formatting (see *Figure 5-4* for ideas; only the first two and the last records are included in this sample).
 - b. Save the report layout as a Report Layout (RLF) file (so that it can be loaded into the Report Designer or run later) in your project folder as ***Your-Name_EastCity-5_Report.RLF***
 - c. Print the report to a PDF file, and save it in your project folder, using the same filename as above, except with a ***.PDF*** extension. Close the Report Designer.

Candidate Properties by Tammy Wang						
PARCELID	ADDRESS	ONAME	AREA	PROPVAL	ISBUSINESS	ForSale (1=True)
10238	678 ARMOUR RD	CLIFFORD,RAY LEWIS	504.1	\$221,094.00	No	1
10248	708 ARMOUR RD	LANE,RONALD ERIC	533.1	\$222,776.00	No	1
11280	146 JAMES ST	AFFLECK,ANDREW	400.7	\$210,372.00	No	1
Average AREA		459.2	Max AREA	538.4	Min AREA	400.7
Average PROPVAL		\$215,217.43	Max PROPVAL	\$223,938.00	Min PROPVAL	\$199,427.00
Page 1 of 1						

Figure 5-4: a sample report on Candidate Properties (not all records are shown)

11. Save your MXD file and close ArcMap.
12. Create a ZIP file named ***Your-Name_EastCity-5.ZIP*** with your project files: Map Document (MXD), Shape (.SHP) and associated (.DBF, .PRJ, .SHX) files, Map (PDF/PNG), and Report (PDF).
13. Submit your ZIP file to the I:\GIST\7128\ submission folder, and hand in your evaluation sheet.

Project 5 Feedback

- Level of Difficulty (circle best alternative): Very Easy | Easy | Fine | Difficult | Very Difficult
- Did you use the references in the textbook and/or lecture notes? Yes | No
- Do you find that this project reinforced the lecture and lab material for you? Yes | No
- Approximate amount of time you spent on this part of the project: _____

EastCity Project – Part 5: Evaluation

Name: _____ Date: _____

#	EVALUATION Items	OK	Error
Results ZIP file			
1	Submitted to proper folder with specified name		/2
2	Contains 7 specified files: MXD, SHP, DBF, PRJ, SHX, PDF/PNG (map), PDF (report)		/7
Map Document (MXD) File			
3	Submitted with specified name in above ZIP file		/2
4	Data Frame title revised		/1
5	Store relative pathnames to data sources is enabled		/1
6	Scratch file geodatabase created with specified name		/2
7	Second Candidate Parcels layer not added		/1
Candidate Properties Map (PDF/PNG)			
8	Submitted with specified name		/2
9	Correct parcels included		/11
10	Map effectiveness and clarity		/7
Candidate Properties Report (PDF)			
11	Submitted with specified name		/2
12	Step 9a: Fields included and order		/3
13	9b: Dataset Options: Selected Set		/1
14	9c: Grouping: none		/1
15	9d: Sorted: by ParcelID (ascending)		/1
16	9e: Summary Options: Ave, Max, Min for PropVal and Area		/3
17	9f: Layout: Outline		/1
18	9g: Orientation: Landscape		/1
19	9h: Adjust the field width so...: enabled		/1
20	9i: Style: Copenhagen		/1
21	9j: Title: Candidate Properties by <i>Your Name</i>		/2
22	Refinements: headings, width, summary layout, page number		/4
23	Number formatting: decimal places, currency		/3
		TOTAL	/60
		Errors x 0.2	
		Project 5 Mark	/ 4.0
Labs 15 16 17			/ 3.0
Term Mark			

EastCity Project – Part 6: More Spatial Analysis

To reinforce your new Spatial Analysis skills, you will solve another GIS problem in this part of the project. After a recent incident in which EastCity firefighting crews were not able to control a residential fire, an investigation was launched to determine the cause. The resultant report stated that EastCity fire hydrant coverage was not sufficient, but it provided no scientific evidence to back up the claim. As the EastCity GIS Technician, you have been asked to prove or disprove this claim using GIS data and functionality. You will use spatial analysis tools and techniques, together with your GIS problem solving skills, to determine which buildings in the city are further than a prescribed distance from any fire hydrant. If needed, new hydrants will be considered and installed to fill gaps in coverage.

A. Create New Map

1. Create a new Map Document, revise the data frame title to **EastCity-6 Your Name** and save the MXD to your **H:\...\EastCity** folder as: **Your-Name_EastCity-6.mxd**.
2. Also, to make geoprocessing operations more obvious, disable the **Background Processing** option accessed with the Geoprocessing > Geoprocessing Options... menu.
3. Add the following five layers: **building, citylimit, hydrant, parcel, river**

B. Enhance Building Dataset

The building features are crucial for this analysis (since distances between hydrants and buildings – not parcels – will be used), but building features do not have adequate attributes for identification. So you will first perform a Spatial Join to copy attributes from each parcel to its building(s) in a new layer. You will then create centroids for the new building layer since the analysis will be based on straight line distances between hydrants and the geometric center of each building.

4. Start the Spatial Join tool from ArcToolbox (as shown in Figure 6-1) and fill in the fields as follows:
 - a. Target Features: building
 - b. Join Features: parcel
 - c. Output Feature Class: ...\\EastCity\\building_parceldata.shp
 - d. Join Operation: JOIN_ONE_TO_ONE
 - e. Keep All Target Features: *enabled*
 - f. Match Option: HAVE_THEIR_CENTER_IN
5. Once finished, the ToC should appear similar to Figure 6-2.
6. Isolate buildings that were not joined and/or have no parcel data by sorting the **building_parceldata** attribute table on the AREA field. Select the records with an AREA value of zero *or* no ADDRESS. Check the map to see that these buildings exist on vacant land and can be ignored. Enter the number of these buildings on the evaluation sheet.
7. Disable the display of the original **building** layer; and add a Definition Query to the new **building_parceldata** layer to filter out the buildings on vacant land. Record the Definition Query on the evaluation sheet.
8. Find the **Feature To Point** tool and set as follows:
 - a. Input Features: **building_parceldata**
 - b. Output Feature Class: ...\\EastCity\\building_centroid.shp
 - c. Inside: disabled [problems? see note at top of next page]

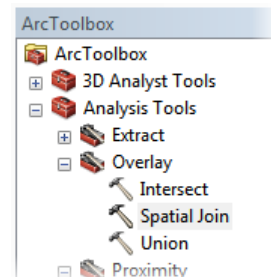


Figure 6-1: the Spatial Join tool under Analysis Tools > Overlay

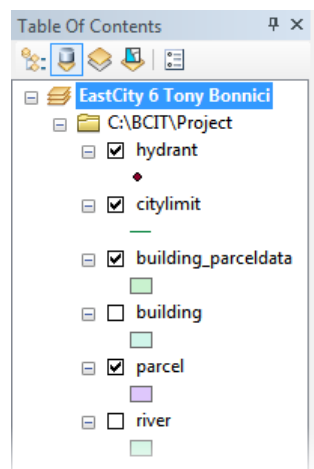


Figure 6-2: the ToC as it should appear after step 4.

Note: if step 8 reports an error or produces no results, delete the building record with FID = 5 (not “FID_”) due to data corruption (after you Start Editing). If it persists, ask instructor for the centroid shape file.

C. Generate Variable Hydrant Buffer

With the buildings ready, you can now create a buffer around hydrants to determine if any buildings are beyond the required distance of any hydrant. Since hydrants with higher flow rates can provide water across greater distances, this buffer will be generated at a variable radius for each hydrant based on its flow rate, which must first be translated to a numeric distance in the next few steps.

9. Open the Attribute Table for the **hydrant** layer and add a new field named **bufferDist** with Type of **Short Integer** and Precision of **0**.

10. Use the **Field Calculator** to populate the new field based on the Flow Rate like so:

- a. Field Calculator: *enable* Python, String, Show Codeblock

- b. *Pre-Logic Script Code:*

Note: each diamond shape “♦” represents one space (indentation is critical for Python)

```
def♦SetDist(rate):  
    ♦if♦rate♦==♦'B':  
        ♦♦return♦125  
    ♦if♦rate♦==♦'G':  
        ♦♦return♦100  
    ♦if♦rate♦==♦'O':  
        ♦♦return♦75
```

- c. *bufferDist* =
 SetDist(!colorRate!)

11. Now generate the buffer around hydrants with the following settings:

- a. Input Features: **hydrant**
- b. Output Feature Class: ...\\EastCity\\hydrant_buffer.shp
- c. Distance: **Field** = **bufferDist**
- d. Dissolve Type: **ALL**

12. Isolate the building centroids that are not included in the hydrant buffer, using the **Erase** tool, with these settings:

- a. Input Features: **building_centroid**
- b. Erase features: **hydrant_buffer**
- c. Output Feature Class: ...\\EastCity\\building_at_risk.shp

13. Create a quick report of the **building_at_risk** layer including at least the FID (or your own numbering) and the address of each affected parcel, and Export it to a PDF file named:
Your-Name_Eastcity-6_Report.pdf

14. Create a quick map displaying appropriate base layers and the segment layer. Include the **hydrant_buffer** layer and a highlighted version of the **building_at_risk** layer. [hint: use transparency on any buffer layer you include]. Export your map as a PDF file named:
Your-Name_Eastcity-6_Map.pdf

D. Add New Hydrants to Map

Your map and report were well received by the EastCity council. They passed the data to Public Works and asked them to remedy the situation. As a result, some hydrants were upgraded to higher capacity, and a few isolated properties were serviced by private hydrants fed from local water supplies. For the remaining properties, a dozen new hydrants were installed; the positions of these have been provided to you as coordinates in a text file so you can update the GIS system.

- 16.** Copy the **New_Hydrants.txt** file from your **H:\...\EastCity\Data\Part-6** folder to your **H:\...\EastCity** folder.
- 17.** Use the **Add Data** tool to add this text file to your current Map Document as a table.
- 18.** Switch to **List by Source** mode to view the table in the Table of Contents, and right-click on it to open it in table view. Note that the new hydrant locations are specified simply by their Easting and Northing coordinate values.
- 19.** Now use **File > Add Data > Add XY Data...** and, on the window that opens, set the following:
 - a. Choose a table...: **New_Hydrants.txt**
 - b. X Field: **Easting**
 - c. Y Field: **Northing**
 - d. Z Field: leave as is
 - e. Coordinate System: leave as is
- 20.** Once loaded, change the symbology of the new hydrant layer so that it stands out (e.g. Circle, Mars Red, Size 15).
- 21.** Save your MXD file, and submit it together with the Report and Map (PDF) files you created above to the **I:\GIST\7128** submission folder.
- 22.** Complete the evaluation sheet and give it to the instructor.

EastCity Project – Part 6: Evaluation

Name: _____ Date: _____

#	EVALUATION Items	OK	Error
Answers to Specific Questions			
1	Step 6: Number of buildings on vacant land =		/1
2	Step 7: Definition Query to filter out these buildings =		/2
Results: Map and Report PDF files			
3	Correct number of buildings at risk on the map		/2
4	Effective map design to clearly communicate results		/5
5	Correct number of buildings at risk on the report		/2
6	Effective report design to clearly communicate results		/5
Map Document (MXD) File			
7	Submitted with specified name		/2
8	All five base layers included: hydrant / building / citylimit / parcel / river		/5
9	All five new layers included: Buildings: centroid, at risk, parcel data / Hydrant: buffer, new		/5
10	New Hydrants added as a layer and symbolized (circle / Mars Red / 15)		/5
		TOTAL	/34
		Errors x 0.2	
		Project 6 Mark	/ 3.0

Labs 18 19	/ 2.0
Term Mark	

Project 6 Feedback

- Level of Difficulty (circle best alternative): Very Easy | Easy | Fine | Difficult | Very Difficult
- Did you use the references in the textbook and/or lecture notes? Yes | No
- Do you find that this project reinforced the lecture and lab material for you? Yes | No
- Approximate amount of time you spent on this part of the project: _____

EastCity Project – Part 7: Working with Raster Data

This part's project work deals with storing raster data in a geodatabase. The textbook exercises that you completed have prepared you to complete the following project work to some degree, and additional instructions are provided as needed below. Specifically, you will create a new map and add individual ECW images to it. You will then create a file geodatabase as a repository for a new raster mosaic that you will create with the individual ECW images.

7.1 Prepare Data and Revise Map

We are finished with spatial analysis for now, so you can remove the artifacts from that project work.

1. Open your EastCity map document from part 4 or, if you are not sure that it was completed properly, use the **EastCity-4.mxd** map in the **H:\...\EastCity\Data\Part-5** folder.
2. Immediately save your map file to your **H:\...\EastCity** folder as: **Your-Name_EastCity-7.mxd**, and update the data frame title to: **EastCity-7 Your Name**
3. Remove the following six layers from your map: **Candidate_Parcels**, **Candidate_Area**, **School_Park_Intersect**, **Busy_Street_Buffer**, **Park_Buffer**, and **School_Buffer**. Note that the scratch.gdb is hidden once all its layers are removed.
4. Remove the Definition Query from each of the **Street Segment**, **Parcel**, and **Zoning** layers.
5. Enable the List by Drawing Order mode in your Table of Contents, which should now match Figure 7-1 at right.

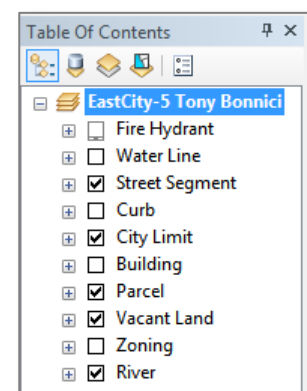


Figure 7-1: adjusted Table of Contents in project 5, after initial adjustments

7.2 Add Raster Images and Build Mosaic

You will now create a new map with fresh vector data (that has been converted to NAD83) for working with the raster images and creating a raster mosaic and storing it in a new file geodatabase.

6. With Windows Explorer, copy the **2006_ecw** folder from your **H:\...\EastCity\Data\Part-7** folder to your **H:\...\EastCity** folder.
7. Now add a raster image: click **Add Data**, select the **O15.ecw** image in **H:\...\EastCity\2006_ecw**, and click **Add**.
8. Note that the colour image is displayed in the table of contents with its red, green, and blue colour components shown as different bands.
9. Right-click on the ToC entry for the image and select **Zoom to Layer**
10. For better visibility:
 - a. Revise the **Street Segment** layer symbology to Mars Red and width 2
 - b. Disable the display of the Parcel, Vacant Land, and Zoning layers
 - c. Enable the display of the Curb, Building, and River layer

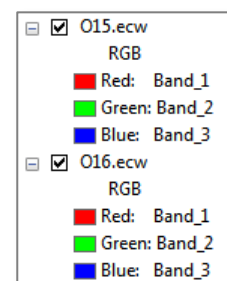




Figure 7-2: individual images added as separate datasets

11. Click **Add Data** again, select the **O16.ecw** image, and add it to your map.
12. **Zoom Out** to display both images.
13. Check the quality of the aerial photo images and their alignment with the vector map layers by zooming in and turning layers on and off to compare. You should find that:
 - a. The image quality is good, at 10cm resolution
 - b. The vector and raster alignment is off by several metres which is adequate for our purposes with this project, although it would not likely be acceptable in a production environment.
 - c. Note that when comparing the building features, the vector polygon should be aligned with the base of the building to ignore air photo parallax, especially for tall building.
14. Check the Table of Contents to see that each raster is listed separately and can be displayed independently (as shown at right). Turn one of the raster images off and then back on.

Each of these images is a separate “raster dataset”, as introduced in the lecture, and would likely be inconvenient to manage individually. You will now use ArcCatalog to create a raster mosaic to combine all the images into a single image to be stored in your file geodatabase.

15. Click the **Catalog** tool on the Standard toolbar to open the Catalog panel. Note that the **scratch.gdb** file geodatabase created in the previous part of the project is listed in this panel. Create a new file geodatabase and name it **raster.gdb**
16. Right-click on your new **raster.gdb** in the Catalog panel and click **New > Mosaic Dataset...**
17. In the Create Mosaic Dataset window that opens, populate the following fields:
 - a. Mosaic Dataset Name: **ecw_2006** (it cannot be entered as **2006_ecw** like the folder name)
 - b. Coordinate System: click the Properties  icon on the right to open the Spatial Reference Properties window, and double-click each of these folders: Projected Coordinate Systems > UTM > NAD 1983 > NAD 1983 UTM Zone 17N.prj
 - c. Click **OK** to close the Spatial Reference Properties window and click **OK** again to close the Create Mosaic Dataset window.
 - d. The Create Mosaic Dataset progress window opens; once the process is complete, click Close (do not enable the automatic close checkbox for now).

*The **ecw_2006** mosaic dataset is created in your raster geodatabase (as shown in Figure 5-3) and added to the ArcMap table of contents. This is an empty mosaic dataset. You will add the aerial photos to it in the next few steps.*

18. Ensure the **Background Processing** option is disabled in the Geoprocessing > Geoprocessing Options... window.
19. Right-click the **ecw_2006** mosaic dataset in ArcCatalog and select **Add Rasters...**
20. In the **Add Rasters To Mosaic Dataset** window, set the following:
 - a. **Raster Type:** Raster Dataset
 - b. **Input Data:** select Dataset and click the folder  icon; navigate to your **2006_ecw** folder, select all the raster images (with Shift+click), and click **Add**.

continued...

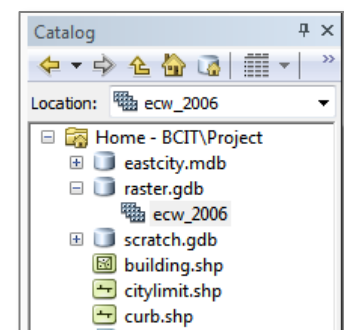


Figure 7-3: the new (empty) mosaic dataset added to the new raster geodatabase

- c. Enable all three options in the lower section of the window to:
 - i. Update Cell Size Ranges
 - ii. Update Boundary
 - iii. Update Overviews
- d. Expand **Advanced Options** (near the bottom of the window), *disable* the Include Sub Folders option, and *enable* the Build Thumbnails option.
- e. Click **OK** to add the aerial photos to the mosaic
- f. Note that each ECW image file is converted to a TIFF file
- g. Once completed, click the Close button on the progress box.

The aerial photos are added to the mosaic dataset, the footprints are created for each image, and the boundary is generated for the entire mosaic dataset; all of which appear as layers in ArcMap.

21. Close the Catalog panel.
22. Remove the individual **O15.ecw** and **O16.ecw** layers.
23. Change the name of the mosaic dataset entry in the ToC from **ecw_2006** to Air Photo 2006
24. Right-click on Air Photo 2006 and select **Zoom To Layer** and display the Boundary, Footprint, and Image components of the mosaic dataset separately.
25. Ensure that “Store Relative pathnames....” is enabled in MXD file properties.
26. Save your MXD file again and close ArcMap.
27. Copy your MXD file to the **I:\GIST\7128** submission folder and submit your evaluation sheet to the instructor.

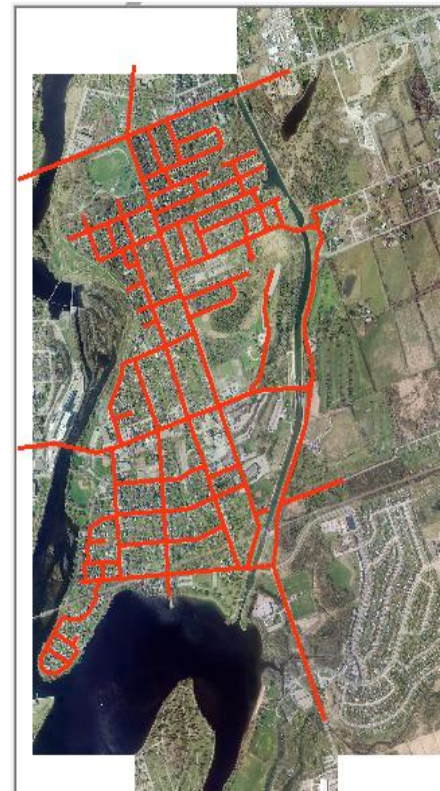


Figure 7-4: the resymbolized street segments displayed over the new mosaic dataset

EastCity Project – Part 7: Evaluation

Name: _____ Date: _____

#	EVALUATION Items	OK	Error
Recorded Values from Project Work			
1	MXD submitted to proper folder with specified name		/2
2	“Store relative pathnames...” is enabled		/1
3	Six interim layers from spatial analysis removed		/6
4	Definition Queries removed from Street Segment, Parcel, and Zoning layers		/3
5	Street Segment revised symbology: Mars Red / width 2		/2
6	New mosaic dataset: Name = ecw_2006 / CS = NAD 1983 UTM Zone 17N		/2
7	All 28 images added to mosaic dataset		/5
8	O15.ecw and O16.ecw layers removed		/2
9	Mosaic dataset name in ToC = <u>Air Photo 2006</u> (not ecw_2006)		/1
		TOTAL	/24
		Errors x 0.2	
		Project 5 Mark	/ 2.0

Labs 20	/ 1.0
Term Mark	

Project 7 Feedback

- Level of Difficulty (circle best alternative): Very Easy | Easy | Fine | Difficult | Very Difficult
- Did you use the references in the textbook and/or lecture notes? Yes | No
- Do you find that this project reinforced the lecture and lab material for you? Yes | No
- Approximate amount of time you spent on this part of the project: _____