

## **i-Tree Streets Random Street Segments Workbook**

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These instructions help users of all skill levels create random i-Tree Streets (STRATUM) sample street segments for use in field data collection. ESRI ArcGIS 9.x software is used. For purposes of example, US Census TIGER map data are utilized for an entire city. If zones within a city will be used, follow the basic directions for EACH zone.

These instructions are composed of two basic steps:

1. Project Area Data Preparation
2. Sample Street Segment Generation

These instructions result in these items:

- Area-of-interest POLYGON map layer.
- Random street segments LINE map layer.

### **Tips**

- These instructions require use of basic ArcGIS functions at the ArcView level. No extensions are necessary.
- Advanced GIS users: primarily follow the bulleted Overviews with attention given to the Detailed Instructions in areas such as field names and types.
- For advanced GIS users with Spatial Analyst: First clip the streets layers by the area of interest (AOI) in order to cut the streets at the AOI boundary. For a zones-based analysis, after creating a random sample segments layer, union it with a zones polygon layer in order to split the segments by zone borders.
- If desired, obtain projection/coordinate system and map unit information from the map data provider.
- AOI examples are large polygons such as: city boundary, park areas, or individual management zone(s).
- ESRI Shapefiles, Coverages, or Geodatabases can be used; Shapefiles are easiest.
- Practice good file management using folders to hold copies of original data, folders to hold output, employ logical file naming, etc.
- Save your work in an ArcGIS \*.mxd project periodically through all steps.
- Actions in **red** represent standard ArcGIS operations.



## Project Area Data Preparation

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### Overview:


- Obtain a GIS map layer representing the Area-of-Interest (AOI) polygon(s) for your project area.
- Obtain a GIS map layer representing the Street centerlines for your project area.
- Launch the ArcMap application of ArcGIS at the ArcView, ArcEditor, or ArcInfo level.
- **Save** an \*.mxd project file with a user-defined name at a user-defined location.
- Load the Area-of-Interest (AOI) and Streets map layers into the view.
- If needed, **select** the AOI polygon(s) that best represent your project area.
- **Export** selected AOI polygon(s).
- If needed, **select** only the Street lines that lay within your AOI.
- **Export** selected Street lines.

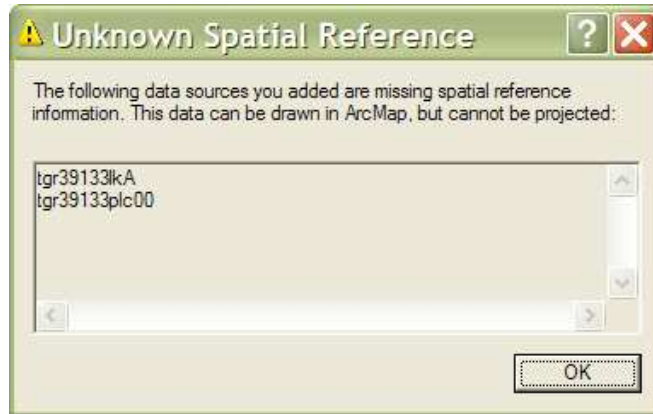
### Results:


- AOI map layer composed of one or more polygons
  - Associated street lines map layer.
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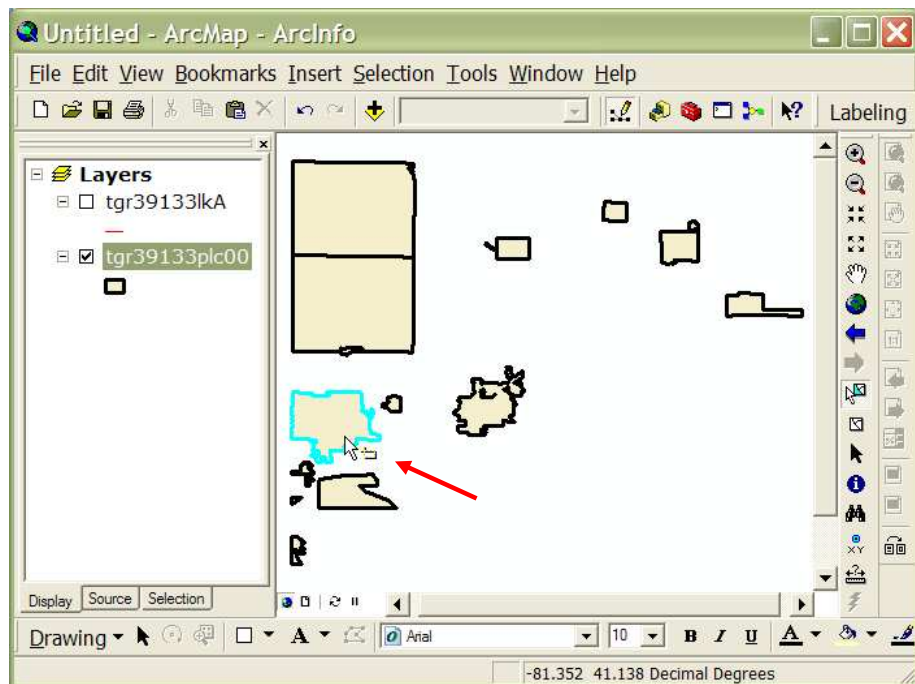
### Detailed Instructions:

1. Obtain an Area-of-Interest (AOI) polygon from your GIS Department or an online resource such as ESRI's Geography Network (<http://www.geographynetwork.com/>).
  - a. To obtain US Census TIGER map data, navigate your web browser to the Geography Network.
  - b. Under **Featured Content** choose **Census TIGER/2000**.
  - c. Click the link **TIGER/Line Files, Redistricting Census 2000**.
  - d. Select **Preview and Download**.
  - e. Choose your state under **Select a State**; click **Submit Selection**.
  - f. Choose your county under **Select by County**; click **Submit Selection**.
  - g. Under **Available Data Layers**, check the box next to these two files:
    - i. Designated Places 2000
    - ii. Line Features – Roads
  - h. Select **Proceed to Download**; select **Download File**.
  - i. Save file to disk and unzip into your working directory, or another location that you can easily find again. You may need to turn off any pop-blockers in your web browser.
2. Launch ESRI's ArcMap application at the ArcView (or ArcEditor or ArcInfo) level.

3. Use the Add Data button  to browse for and to load the TIGER "Designated Places" and "Line Features – Roads" map layers to the current view.
  - a. An "Unknown Spatial Reference" message may appear; click OK to move past it.

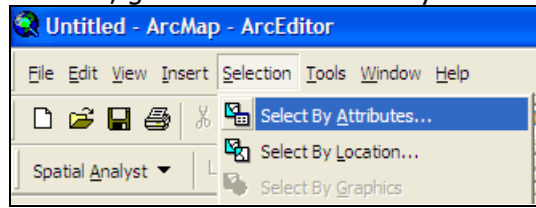


4. TIGER Designated Places data are typically organized by county and often include multiple place polygons. Use the select tool  to **select** your specific AOI polygon from those on the screen. Peruse the attribute table or use the feature labeling functions to help identify your AOI polygon if necessary.



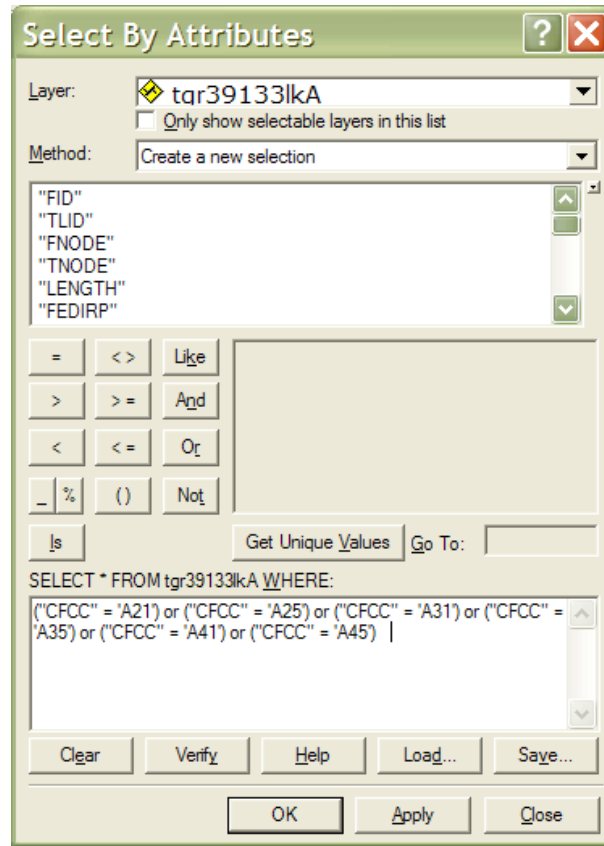
5. **Export** the selected AOI polygon(s) to a separate map layer and add the exported layer to the view:

- a. Right-click on the TIGER Designated Places map layer and select Data > Export Data.
  - b. Verify that the Export dropdown is set to "Selected features".
  - c. Choose an appropriate name for the AOI polygon map layer and save it.
  - d. When prompted, Click Yes to add the exported data as a map layer to the view.
6. **Query** the TIGER Road Lines map layer to select street segments suitable for sampling:
- a. In the Table of Contents (TOC) map layer list, click the Road Lines map layer to select it (verify the map layer is also checked in the TOC and thus visible in the map view).
  - b. From the menu, go Selection > Select by Attributes

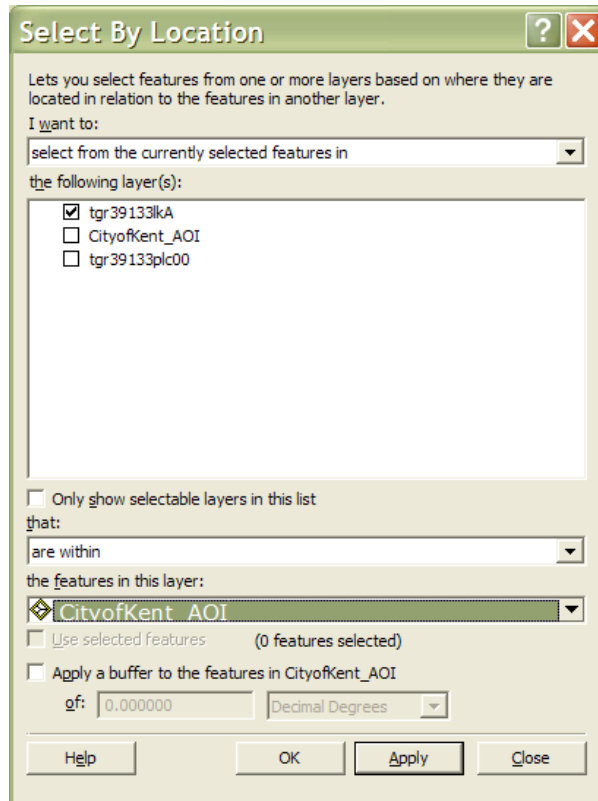


- c. In the resulting dialog window:
  - i. Verify that Road Lines map layer is selected in the dropdown.
  - ii. Verify the chosen Method is set to: Create new selection.
  - iii. Copy and paste this query right from this help document into the query box at the bottom of the window:

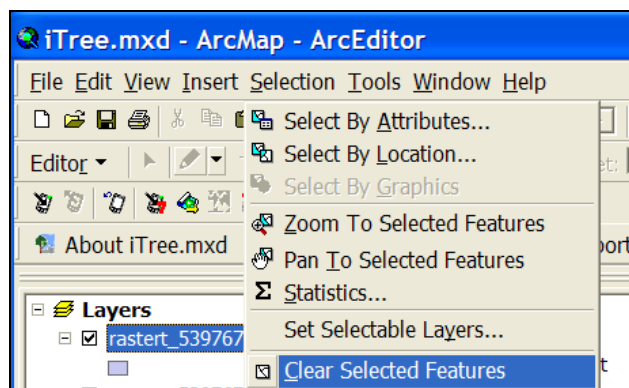
**("CFCC" = 'A21') or ("CFCC" = 'A25') or ("CFCC" = 'A31') or ("CFCC" = 'A35') or ("CFCC" = 'A41') or ("CFCC" = 'A45')**



7. Perform an additional **query** on the selected streets to identify those that are WITHIN the exported AOI:
  - a. In the Table of Contents (TOC) map layer list, click the Road Lines map layer to select it (verify the map is also checked and visible).
  - b. From the menu, go Selection > Select by Location and in the resulting dialog window:
    - i. In the "I want to" dropdown box, choose "select from the currently selected features in"
    - ii. Make sure ONLY the TIGER Road Lines layer is checked in "the following layer(s)" list.
    - iii. In the "that" dropdown box, choose "are within" (the choice "completely within" will not work for this operation)
    - iv. Make sure the AOI polygon layer exported above is selected in the "the features in this layer" dropdown box.
    - v. Do NOT apply a buffer to the AOI polygon.
    - vi. Click OK

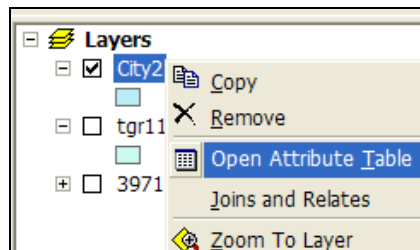


8. **Export** the subset of selected TIGER Road Lines to a separate map layer and add the layer to the view:
  - a. Right-click on the TIGER Roads Lines map layer and select Data > Export Data.
  - b. Verify that the Export dropdown is set to "Selected features".
  - c. Choose an appropriate name for the selected streets line map layer and save it.
  - d. When prompted, Click Yes to add the exported data as a map layer to the view.
9. From the menu, go Selection > Clear Selected Features to unselect the AOI polygon and Streets features.



10. Final results:

- a. Area-of-Interest (AOI) POLYGON map layer and associated AOI Streets in a LINE layer that are suitable for sampling.
  - i. Verify AOI polygon and Streets map layers are loaded into the map view. It may be necessary to right-click the new AOI layer and select "Zoom to Layer".
  - ii. Right-click the new AOI layer name in the map layers list, and choose "Open Attribute Table" to verify you have the correct AOI polygon using an attribute field such as "name".
  - iii. Verify the street lines do not extend past the AOI polygon.



The street lines are now ready to be sampled.

Instructions continue below.

## Street Segment Sample Generation

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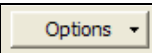
### Overview:

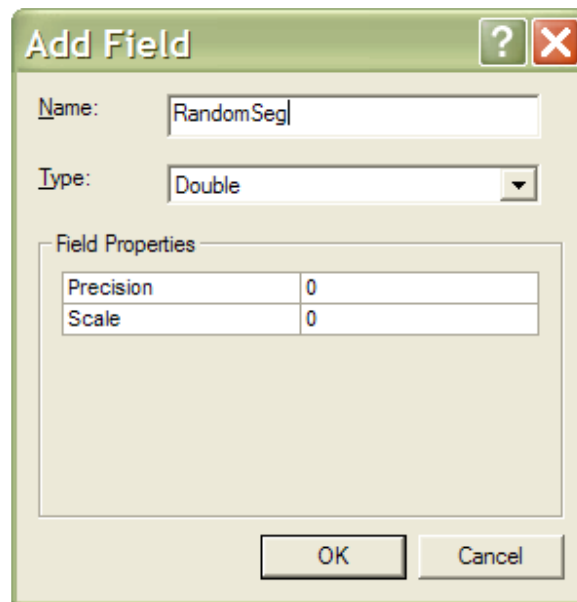
- **Add** a field to the Streets data
- **Calculate** random number values for the Streets data
- **Select** the desired number of street segment samples from the attribute table
- **Export** the street sample data and map

### Results:

- Random street segments for field sampling
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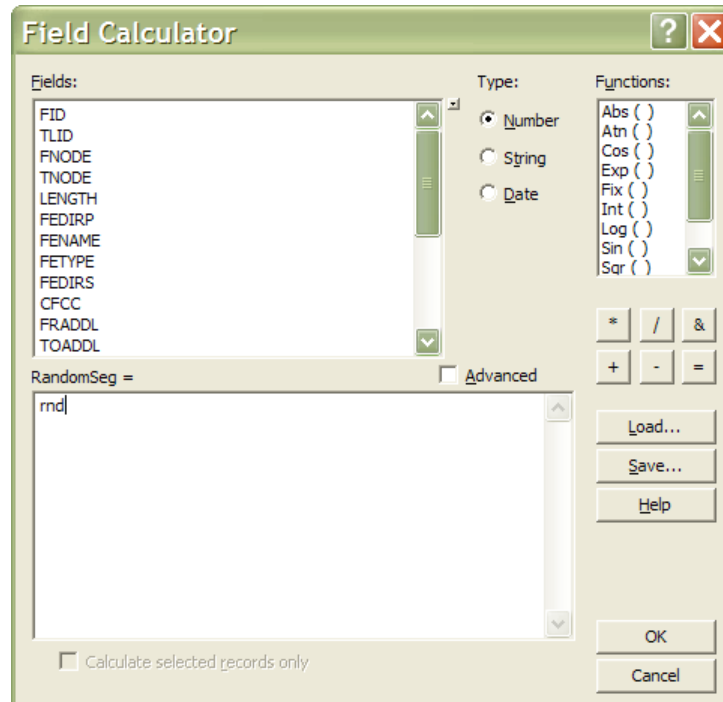
### Detailed Instructions:

1. On the Streets map layer, open the table by right-clicking on the layer name in the TOC.
2. Through the Options button  at bottom right of the table window, **Add** a field named RandomSeg of type double to the Streets table:




Ignore the Precision and Scale entries.

3. Right-click the newly created RandomSeg field title and use the **Field Calculator** to populate the field using the **rnd** function:



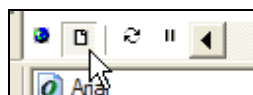
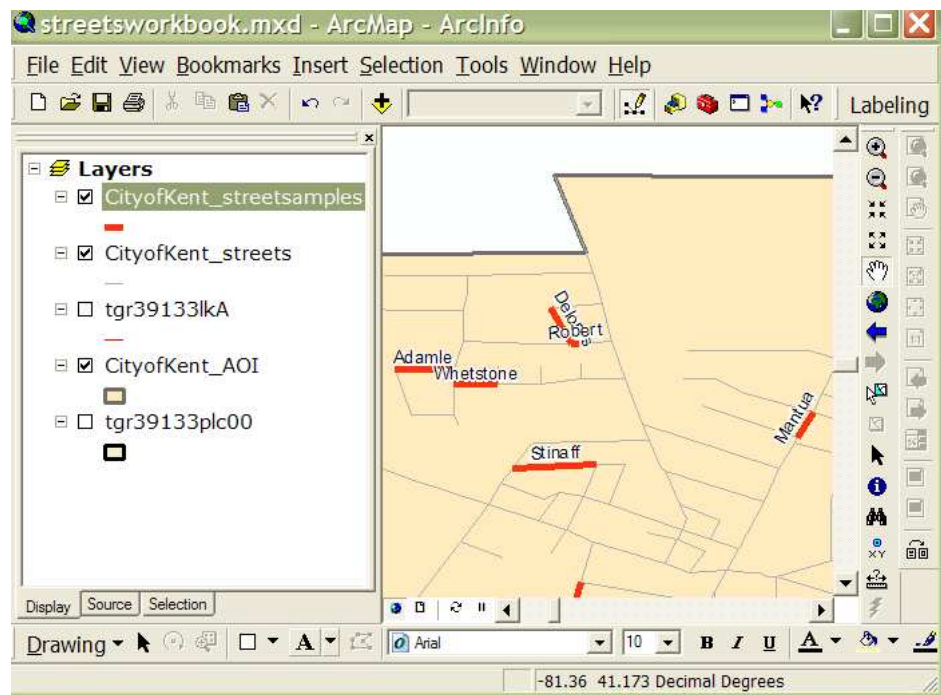
4. When populated, right-click the RandomSeg field title to **sort** the field in ascending order.
5. Scroll down the attribute table to reach the desired number of street segments and **select** them:


- a. Click one of the cells in the table to see which record number it is in the Record count box  .
- b. When the desired number of records is found, shift-select the records using the gray buttons to the left of the records.

	1335	1352	0.06106	N	Mantua	St		A31	
	2448	2457	0.04195		Summit	Rd		A41	
	2104	2082	0.07055		Petrarca	Dr		A41	
	1023	986	0.09051		Delores	Ave		A41	
	2104	2190	0.14685		Petrarca	Dr		A41	

6. Close the table window and return to the map view to **export** the selected Streets map layer samples and add them to the view.
  - a. Right-click on the Streets map layer and select Data > Export Data.
  - b. Verify that the Export dropdown is set to "Selected features".
  - c. Choose an appropriate name for the selected street samples map layer and save it.
  - d. When prompted, Click Yes to add the exported data as a map layer to the view.
7. From the menu, go Selection > Clear Selected Features to unselect the Streets features.

8. As needed, open the newly created street samples attribute table and export the records for use in Microsoft Excel (for printing, etc.):
  - a. Attribute table > Options button > Export > All records
  - b. Export as a dBase file which can be read by MS Excel.
9. As needed, print a map of the segments for planning and field use:
  - a. Label the street segments with a name field in the map view.
  - b. Recolor the map layers for better visibility by right-clicking on their symbology in the TOC.



- c. Switch to the Layout view  and add map elements such as north arrow and scale bar via the Insert menu at top.
  - d. From the menu, go File > Print and select appropriate printer and paper.
  - e. Optional: go File > Export Map to save an electronic copy of the map.
10. Optional: For zones within an AOI, add in a zones polygon layer. Use the "Select by location" function for each zone in order to tally street sample counts within each zone.
11. Final results:
  - a. Desired number of random Street Segment Samples in a LINE map layer.
  - b. MS Excel file of Street Segment Samples attribute data.
  - c. Hardcopy or electronic maps of Sample Segments.