

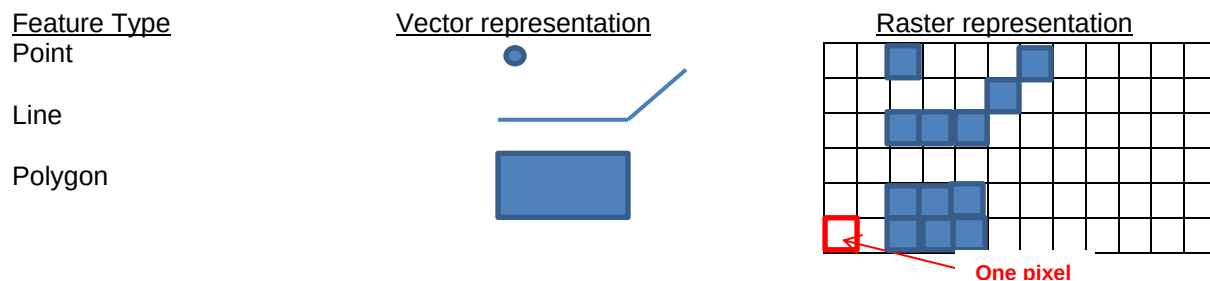
NJCU GIS I Exercise 2 (ArcPro) – Geocode & GPS Your Home v2, 200303

Learning Objectives:

- **IMPORT** MS Excel data in a GIS
- **ORGANIZE** GIS data appropriately
- **DIFFERENTIATE** methods of data collection (OSD, geocoding, GPS)
- **PERFORM** geocoding of your home location
- **EVALUATE** methods of data collection
- **INTEGRATE** Smartphone, GIS, and GPS technologies together

Introduction – Anyone who uses a cell phone to view maps is familiar with **raster** GIS data, often used as the bottom layer of an “imagery” or “satellite” base map. Because of its inherent nature (a collection of tiny squares known as “**pixels**”), raster data is excellent for mapping “continuous” surfaces such as topography, ocean surface temperature, aerial photography, satellite imagery, etc. However, a raster downside is that, unlike vector data, wherein many attributes can be connected to a feature in a layer, only ONE attribute can be represented by one pixel in a raster layer. For example, if the data layer is color aerial photography, each pixel displays a unique color. Similarly, if the data layer is topography of a land surface, each pixel represents ONE elevation value (typically feet or meters above or below Sea Level) at that location.

Another downside to raster data is that, while a “raster” GIS can be used to represent vector features (points, lines, polygons), the results do NOT accurately resemble the real world. This is because a raster GIS layer represents the world as a collection of tiny squares. Raster-based points, lines, and polygons (below) become “pixelated” and unrealistic if the user “zooms in” close enough to the layer: See below for examples:

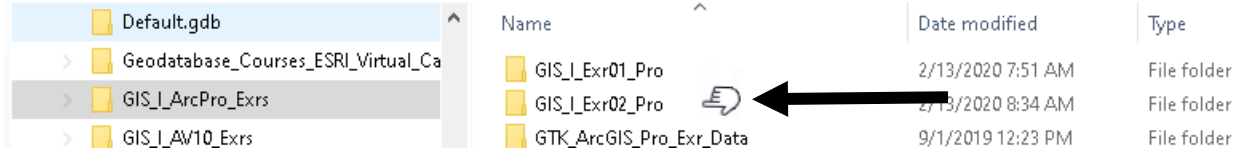


In Exercise 02, you will do a number of new things:

- Access imagery online and create a base map layer in ArcMap
- Geocode your home address and create a point on the map
- Measure the distance between your geocoded point and the OSD point created in Exr01
- Create a 3rd point of your home by using your cell phone’s GPS / positioning capabilities

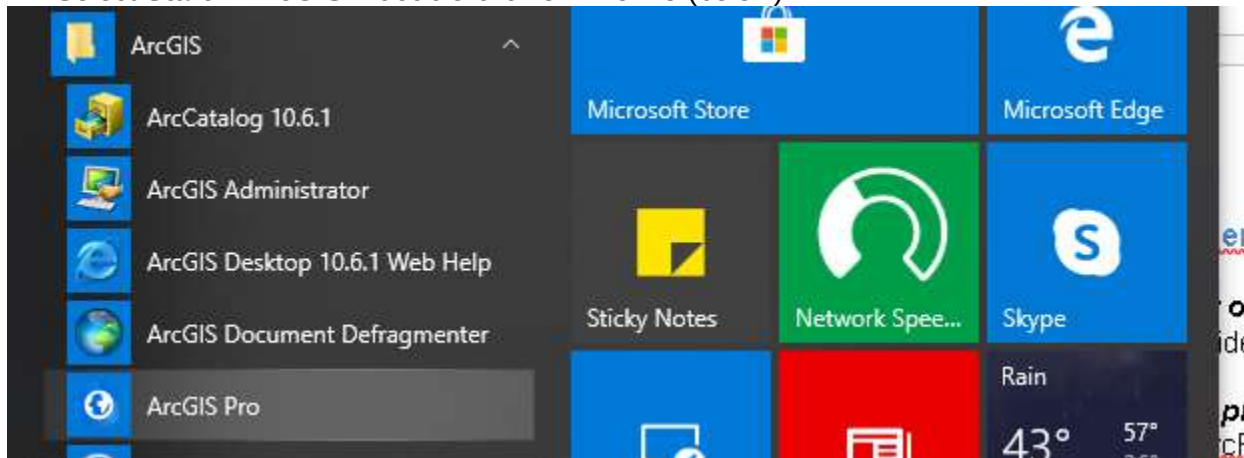
Part A – Map your Home Location through Geocoding

Step 1 – Create GIS_I_Exr02_Pro folder on your storage device inside GIS_I main folder

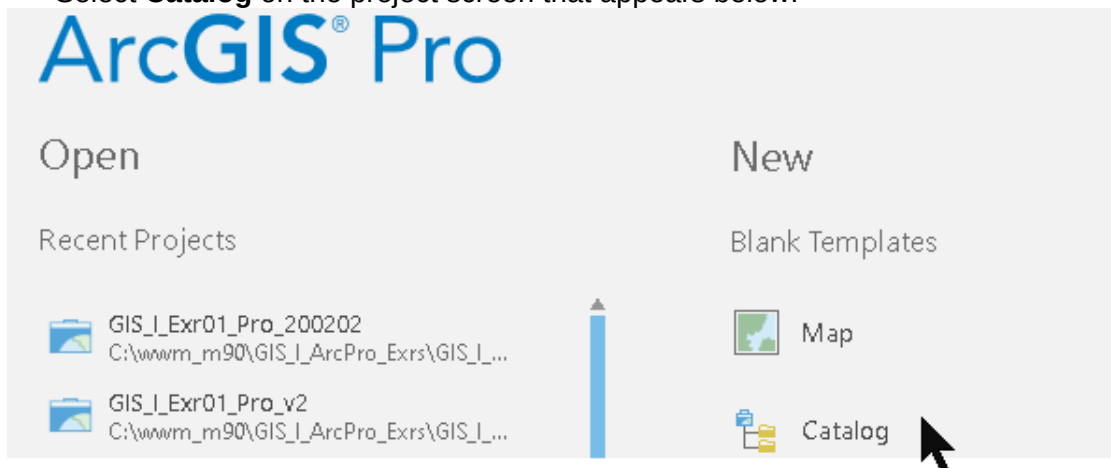


Step 2 – Create new ArcPro project

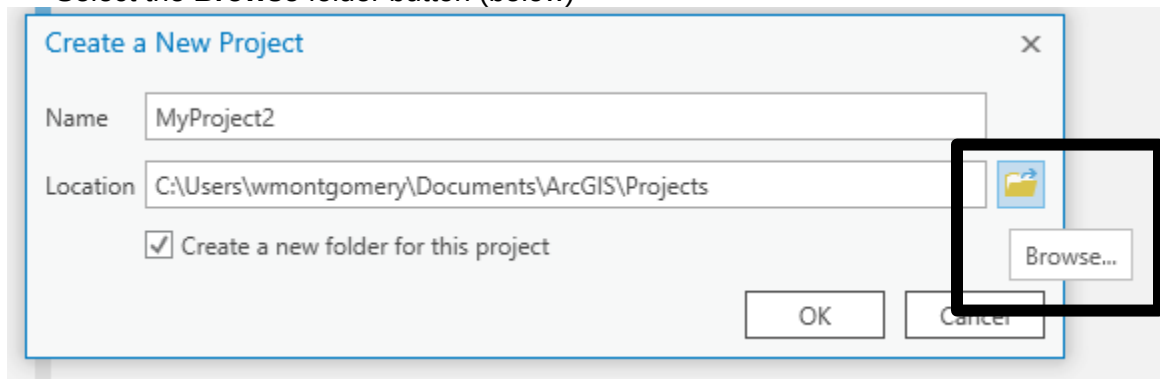
- Select **Start > ArcGIS > double-click on ArcPro** (below)



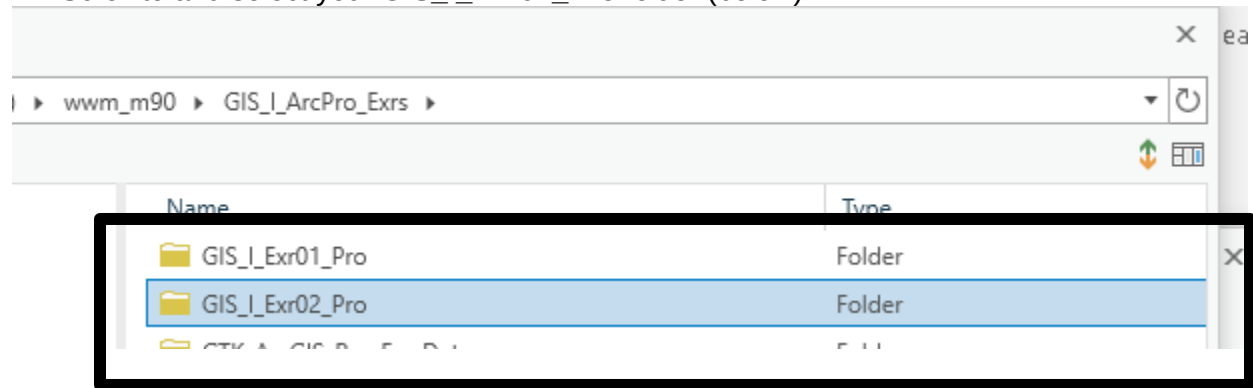
- Select **Catalog** on the project screen that appears below:



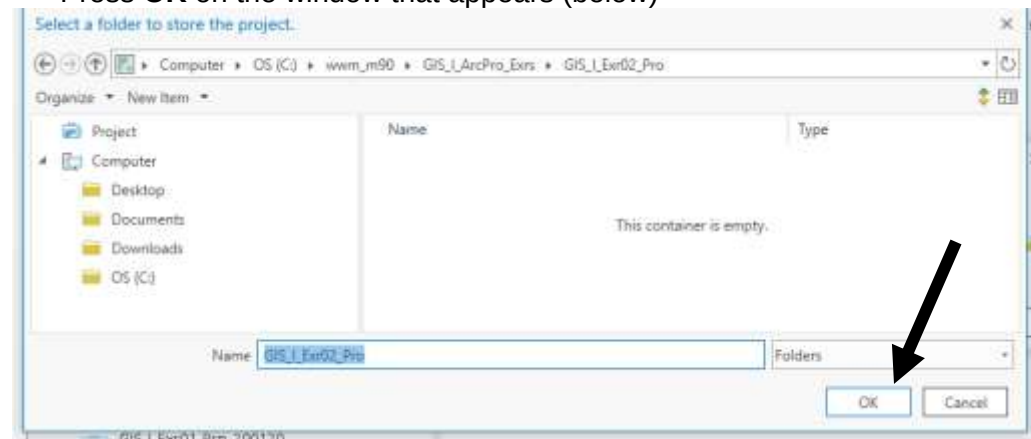
- Select the **Browse** folder button (below)



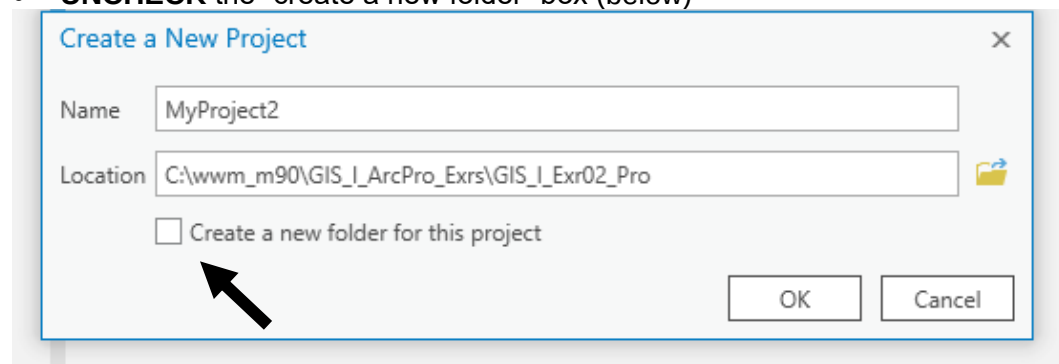
- Scroll to and select your **GIS_I_Exr02_Pro** folder (below)



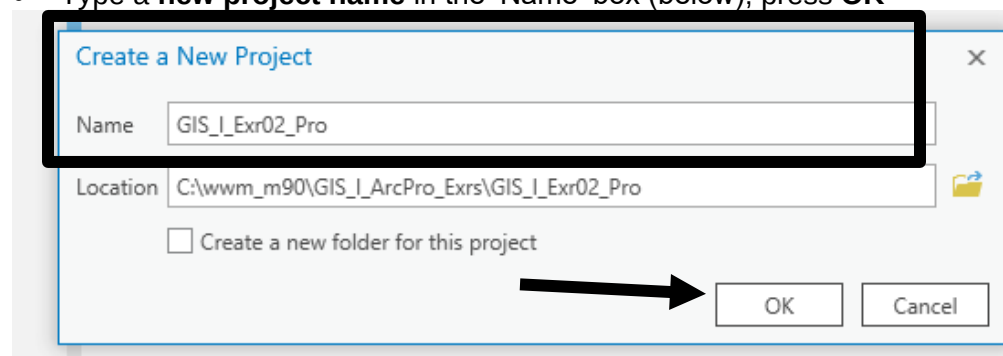
- Press **OK** on the window that appears (below)



- **UNCHECK** the “create a new folder” box (below)

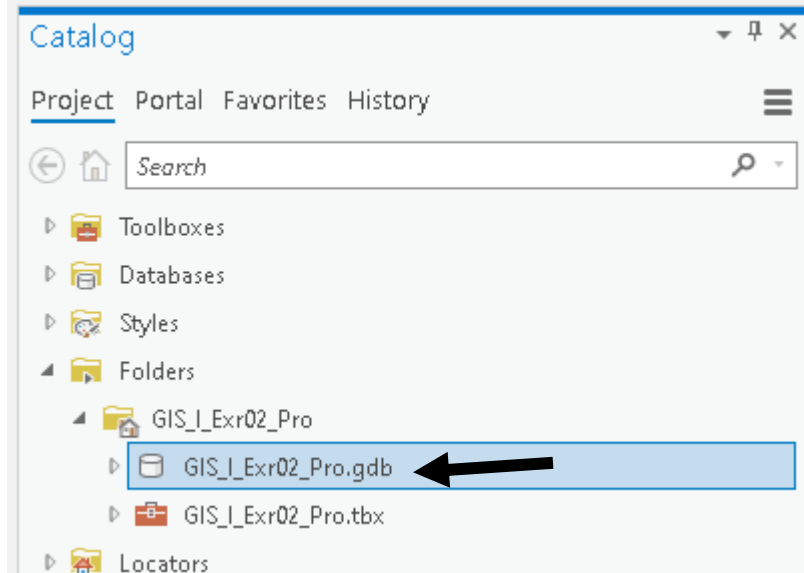


- Type a **new project name** in the 'Name' box (below); press **OK**

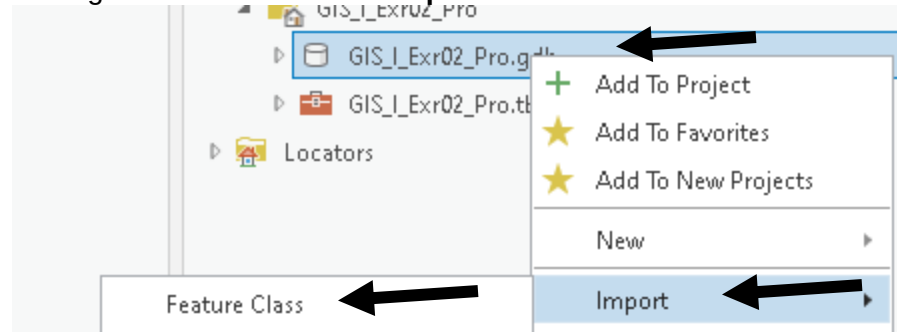


Step 03- Import Exr01 data into Exr02 Geodatabase

- From the newly-opened GIS_I_Exr02_Pro project, select “**Catalog**” in the RH pane (below)
- Select **Folders > GIS_I_Exr02_Pro > GIS_I_Exr02_Pro.gdb**

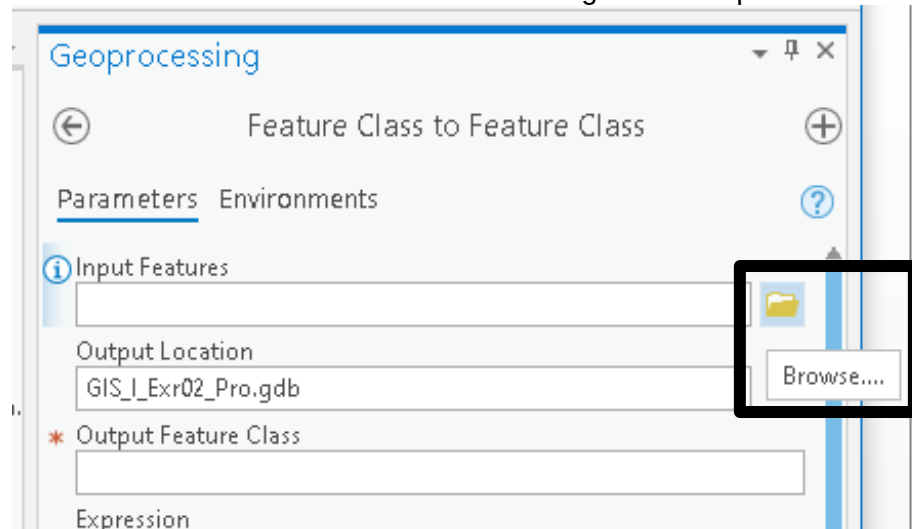


- Right-click on the **GDB > Import > select Feature Class**

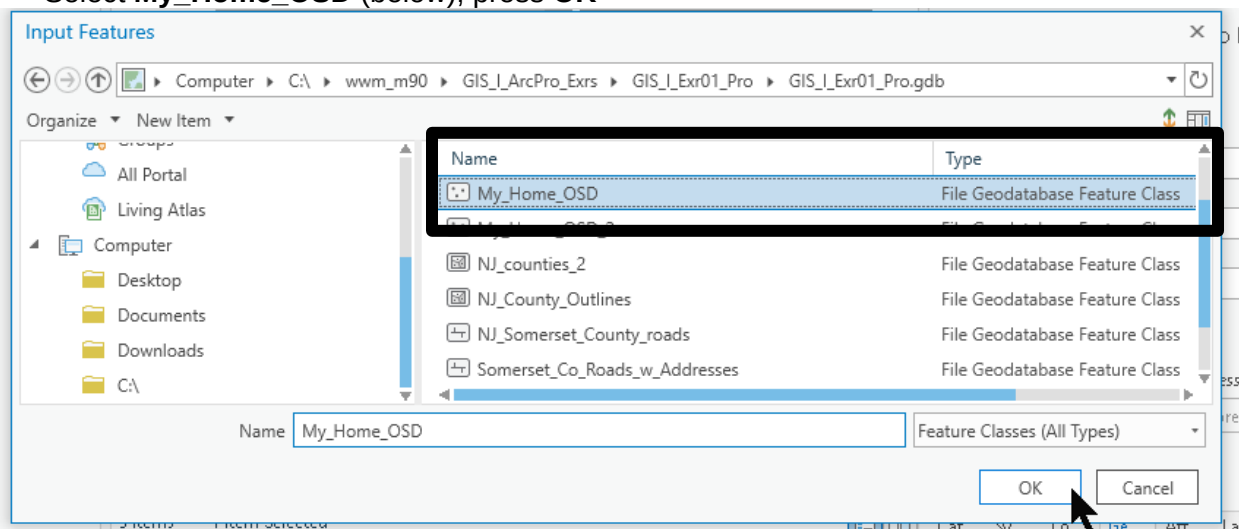


The RH pane auto-switches to “**Geoprocessing**” (below)

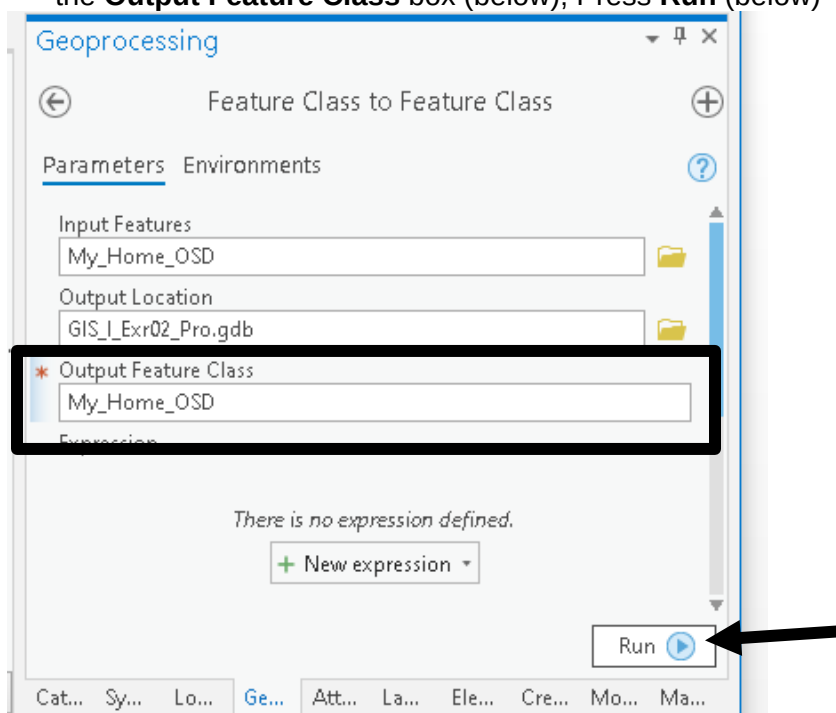
- Select the **Browse** folder button to the right of the Input Features line (below)



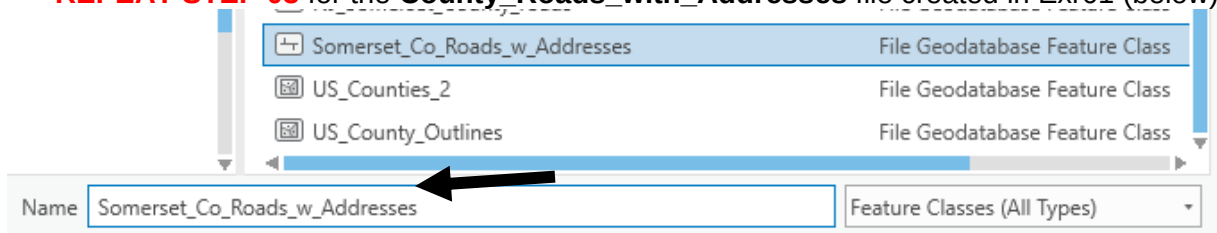
- Browse to your **Exercise 01 GDB** (below)
- Select **My_Home_OSD** (below); press **OK**



- When the Catalog Pane returns (below), **type the name for the file being imported into the Output Feature Class box** (below); Press **Run** (below)



- **REPEAT STEP 03** for the **County_Roads_with_Addresses** file created in Exr01 (below):



- **Project > Save** your project from the upper menu ribbon of ArcPro main screen

Step 04 – Use ArcPro to select a raster base map

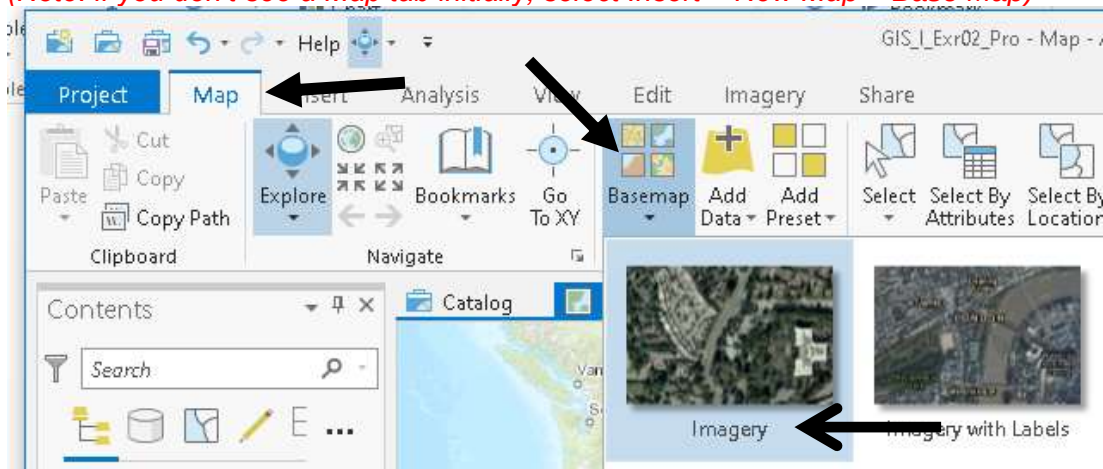
Here is a helpful ESRI link for learning more about [basemaps](#)

ArcGIS Pro provides several predefined basemap layers for you to use in your maps. After you add a map to your project, the basemap can be changed from the **Map** tab.

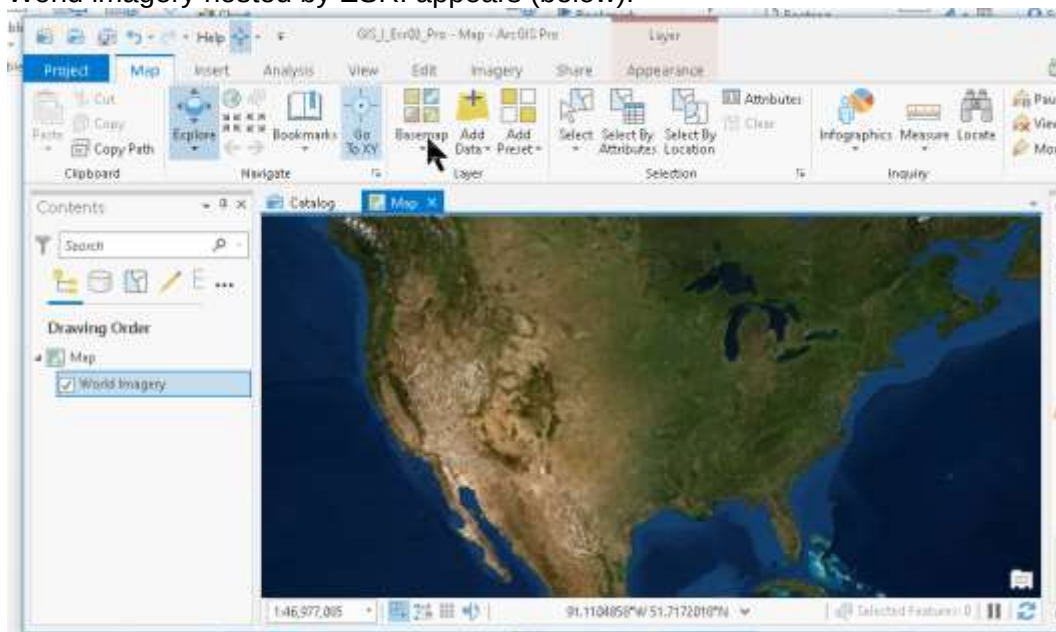
- 1 On the **Map** tab, in the **Layer** group, click **Basemap** to open the Basemap gallery.
- 2 Click an icon in the gallery to choose a basemap.

Let's do what ESRI tells us (above)

- From the ArcPro upper ribbon (below), Select **Map** tab > **Basemap** > **Imagery** (below)
(Note: if you don't see a Map tab initially, select Insert > New Map > Base Map)

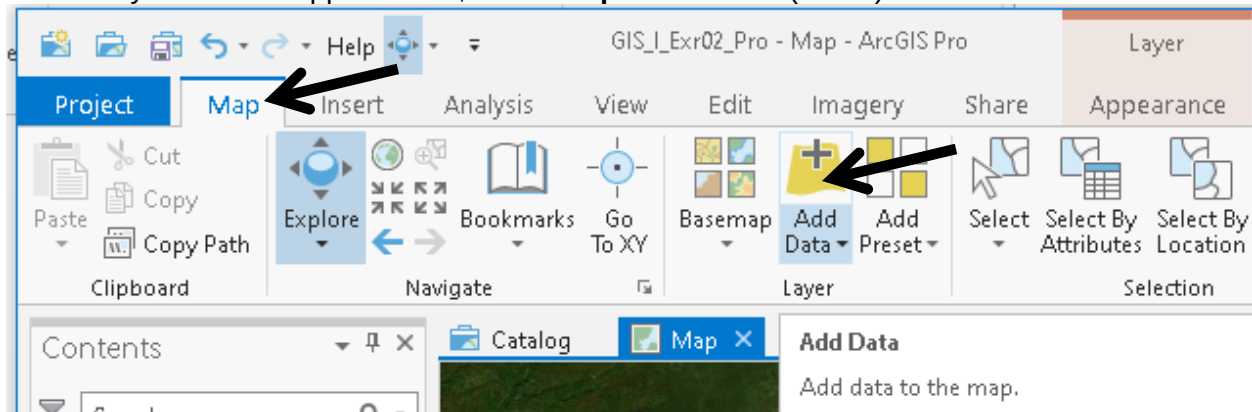


World imagery hosted by ESRI appears (below):

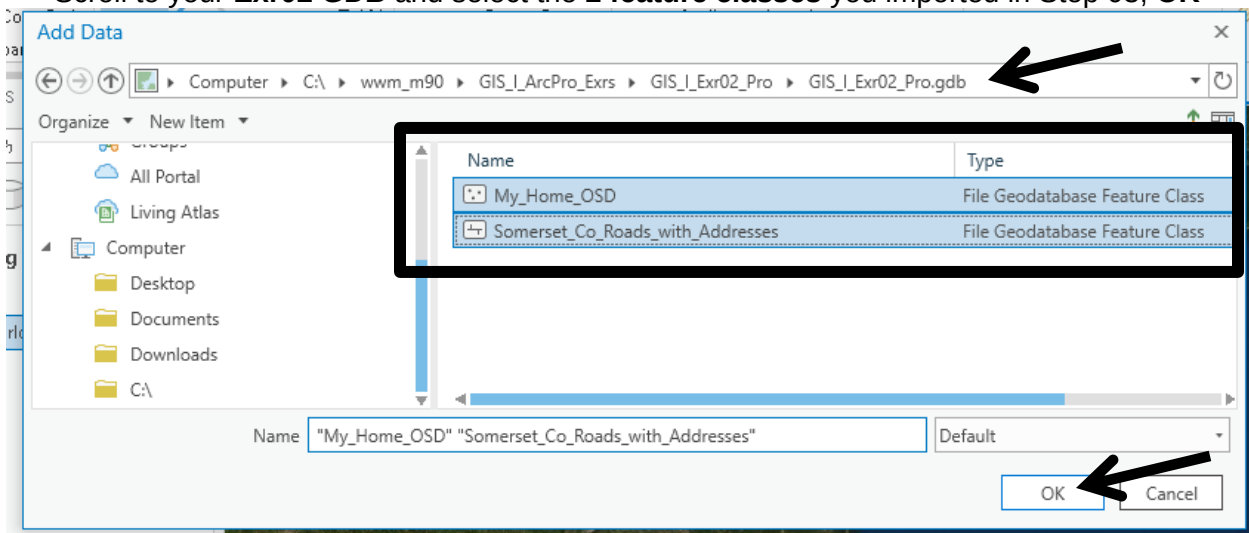


Step 05 – Add Exercise 01 feature classes to Exr02 map

- From your ArcPro upper ribbon, select **Map > Add Data** (below)

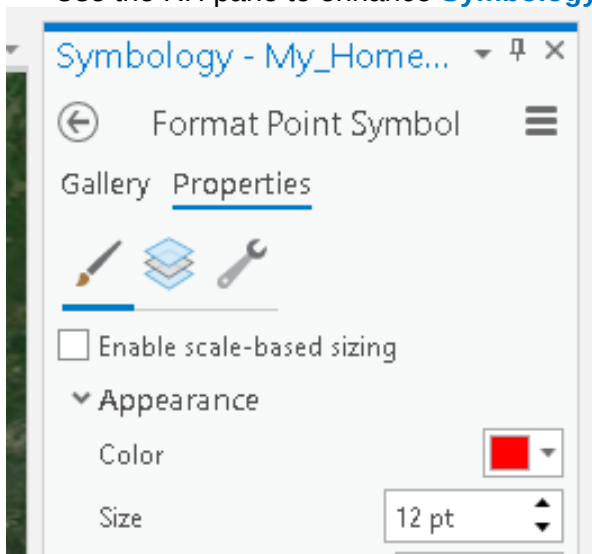


- Scroll to your **Exr02 GDB** and select the **2 feature classes** you imported in Step 03; **OK**

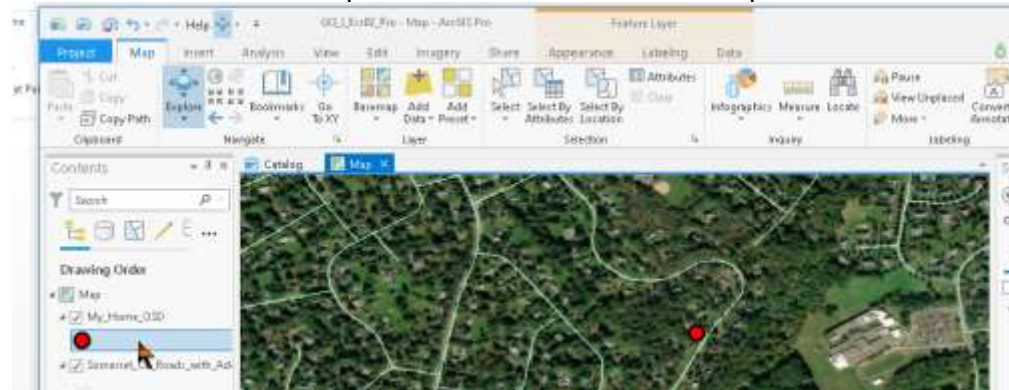


Zoom into these 2 feature classes on your map:

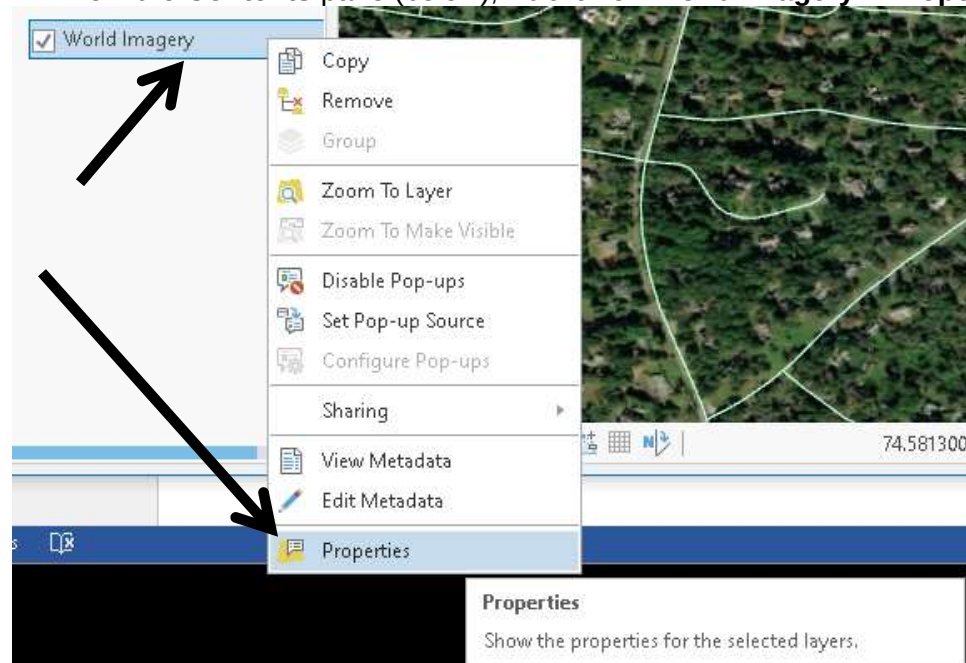
- Use the RH pane to enhance **Symbology** of county_roads and/or **My_Home_OSD** (below)



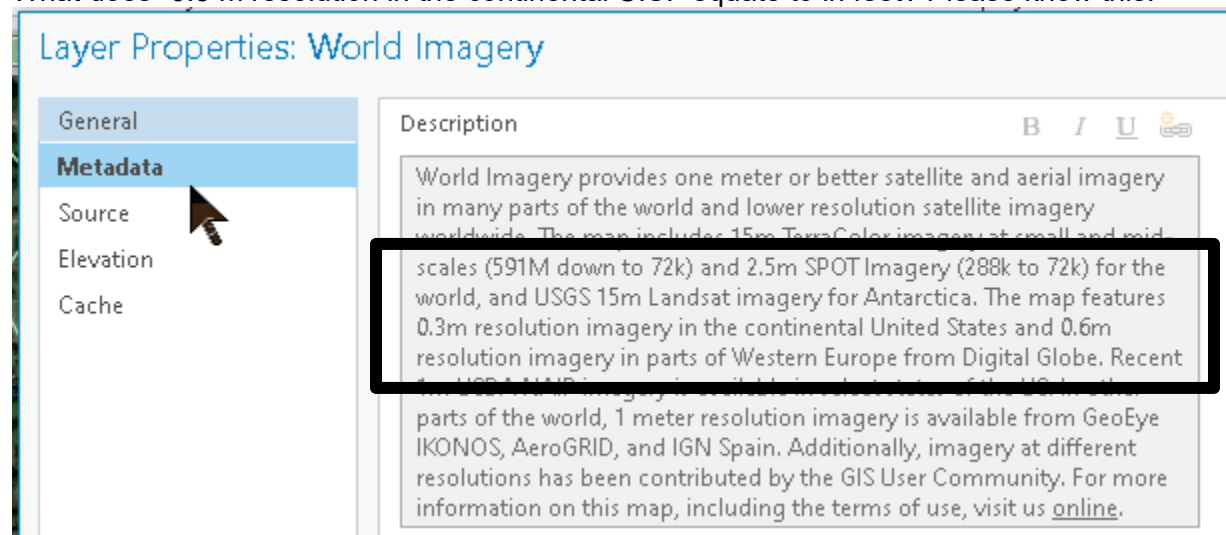
You see a **raster** basemap overlain with **vector** line and point files. Be able to identify these.



- From the **Contents** pane (below), Rt-click on **World imagery** > **Properties**



- Select **Metadata** > Description (below). **Note the 0.3 m resolution in Continental US.** What does “0.3 m resolution in the continental U.S.” equate to in feet? Please know this.



Step 06 – Find or Re-Create your Home Address table for geocoding

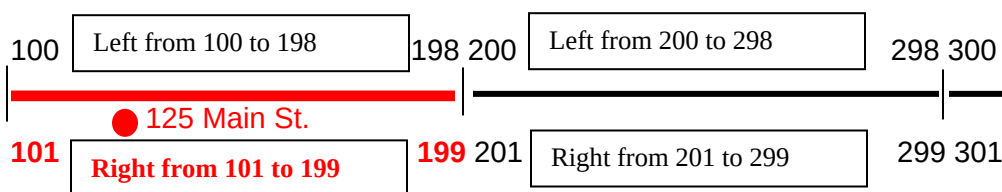
Discussion: Now you will learn how to use geocoding to convert a street address into a point on a map. We want you to understand the fundamentals of the geocoding process.

You can think of geocoding as a 3-step process:

1. Create an **input address table**
2. Create an **address locator**
3. Select a **reference file** (a “streets” file from the US Census Bureau or ArcPro basemap).

To see how geocoding actually WORKS, let us try to geocode an “input address”, 125 Main Street (below). You saw this diagram previously in Exr01. The GIS:

- uses an “address locator” to search the “reference table”,
- finds the **line segment** whose address endpoints “bracket” the input address,
- **estimates** the location of 125 Main (including the even or odd side of street), and
- **plots a point:**



In the following steps, you will use your **Ast01 home address table** as the input for geocoding, or create a new table if you cannot locate this one. You will also build an “address locator” that is based upon a “reference table”, in this case the DBF (aka “attribute table” of your County_Roads_with_Addresses file.

To appreciate and understand the geocoding process, I recommend you try to mentally “link” the steps in the geocoding process to your experience with your Smartphone or navigation system with the diagram above. Your smartphone is using this very process of “geocoding” every time you ask it to show you the way to a destination on a road “network”. You will learn how to build “networks” in GIS III.

As you work through this portion of Exr02, **ask yourself a few questions:**

- **Why** does your GPS not always take you to the EXACT location of your destination?
- **How** would you explain why 125 Main St. might not be located EXACTLY $\frac{1}{4}$ of the distance between 100 Main St and 200 Main St?

In your exercise summary, please answer the following questions:

1. What is the straight-line distance (feet) between the OSD and geocoded locations?
 2. What is the distance from each location to your home location on the basemap?
 3. Which of the three locations is most accurate?
- Locate your Excel “contact_info” table you created in Assignment 01 (**NOTE: If you cannot find the table, make a new one**)

If making the table, please **re-format** the **ID** and **Zipcode** columns to **TEXT**:

	A	B	C	D	E	F	G
1	ID	ame	Address	City	State	Zipcode	Phone
2	1234567	IS student	2039 JF Kennedy Blvd	Jersey City	NJ	07305	201-200-2000

- **Close** Excel. **WARNING:** Open Tables aren’t **recognized** by ArcPro or ArcMap.

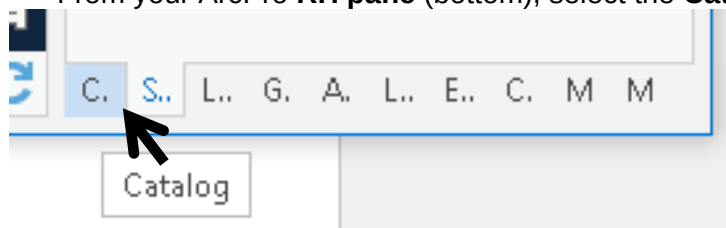
Step 07 –Import Home_Address table into Geodatabase

Here is an active [link](#) to the following discussion, so you can better understand tables and GIS:

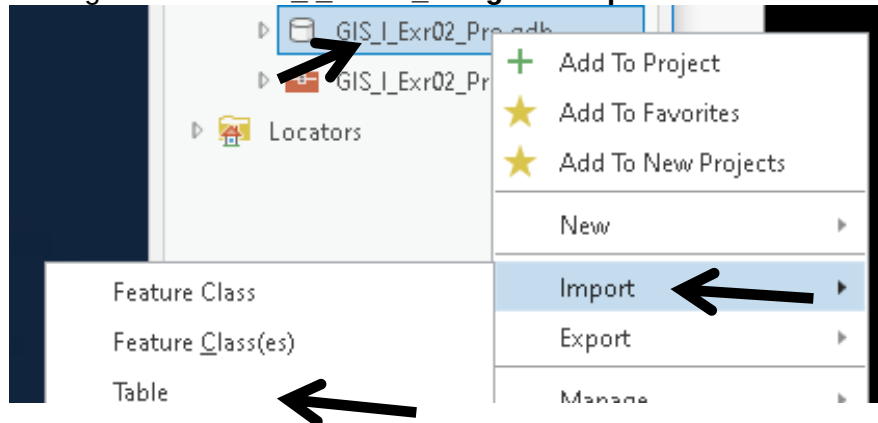
Import tables

You can import tables into a geodatabase using the context menu in the **Catalog** pane. dBASE, INFO, vector product format (VPF), OLE DB, or geodatabase tables can all be imported in this way. You have two options for importing tables when you right-click on a geodatabase:

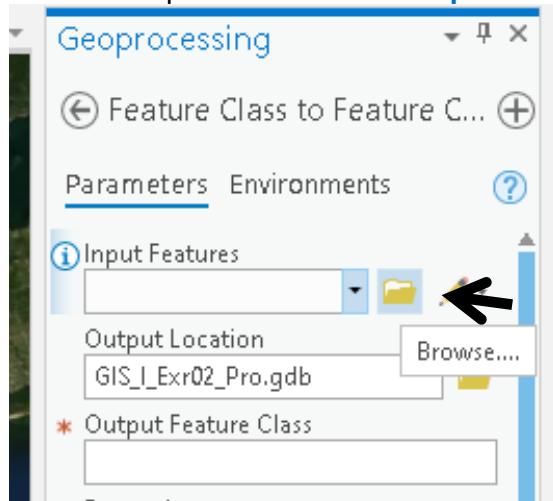
- **Table** - Converts an input table to a dBASE table, a file geodatabase or enterprise geodatabase table using the [Table to Table](#) tool
- **Table(s)** - Imports one or more tables into a file or enterprise geodatabase using the [Table to Geodatabase](#) tool
- From your ArcPro **RH pane** (bottom), select the **Catalog** tab (below)



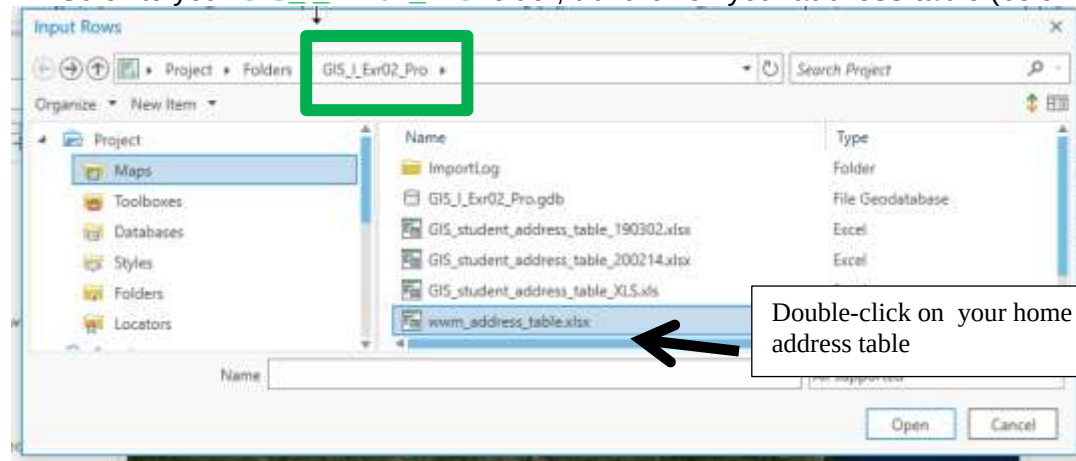
- Right-click on **GIS_I_Exr02_Pro.gdb > Import > Table**



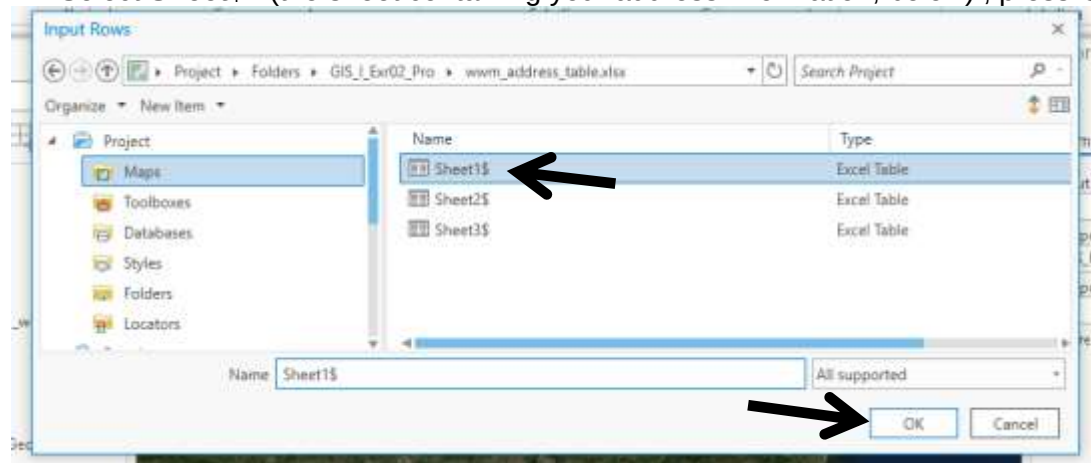
- The RH pane switches to **Geoprocessing**; select the **Browse Folder** button



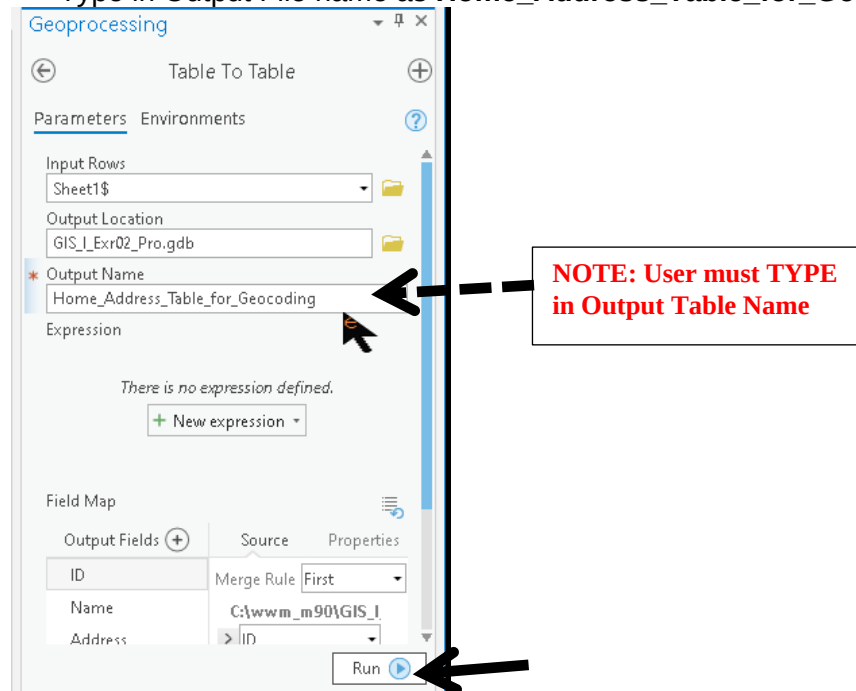
- Scroll to your **GIS_I_Exr02_Pro** folder; dbl-click on your **address table** (below); press **OK**



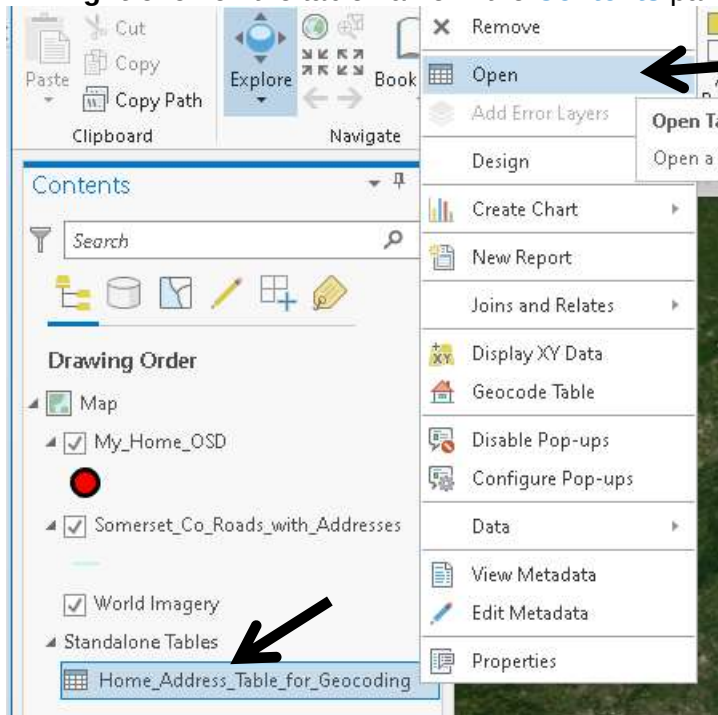
- Select **Sheet\$1** (the sheet containing your address information, below); press **OK**



- Type in Output File name as **Home_Address_Table_for_Geocoding** (below); press **Run**



- **Right-click** on the table name in the **Contents** pane > select **Open** (below)

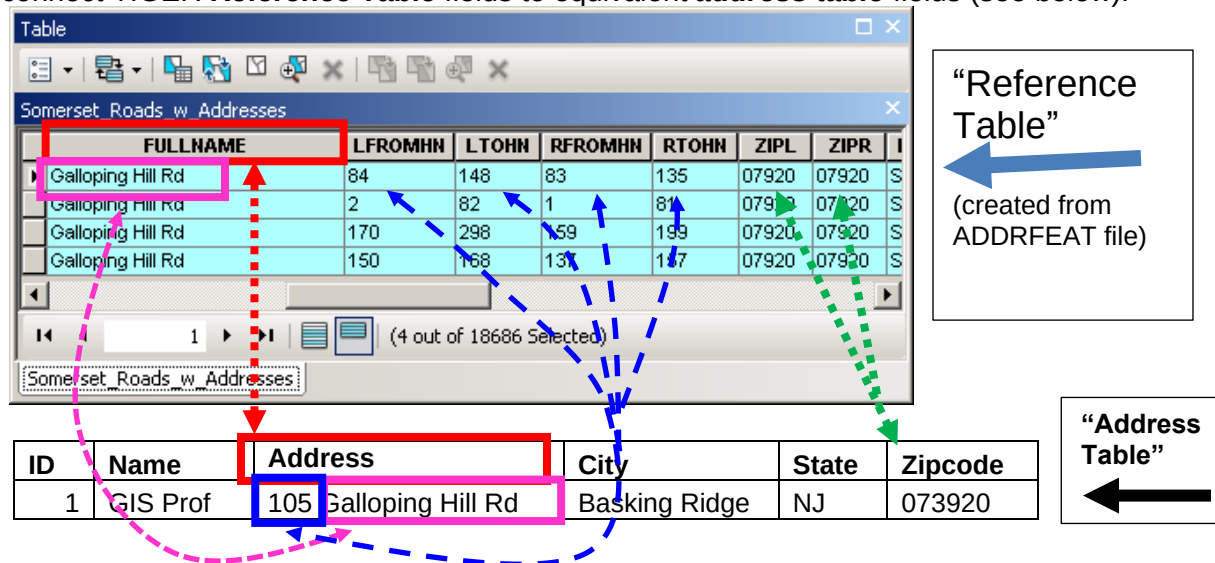


- Review your table's contents for accuracy, ESPECIALLY for a **5-digit Zipcode** (below)

Home_Address_Table_for_Geocoding						
ID	Name	Address	City	State	Zipcode	
0000000	GIS Prof	105 Galloping Hill Rd	Basking Ridge	NJ	073920	

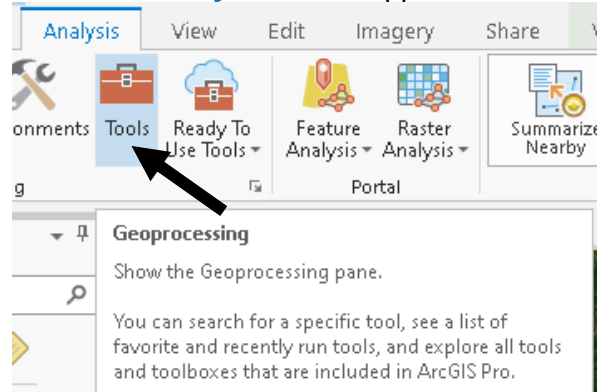
Step 08 - Create the geocoding address locator from "addrfeat" data

Discussion: For geocoding to occur, an "address locator" must be created as a "translator" to connect TIGER **Reference Table** fields to equivalent **address table** fields (see below):

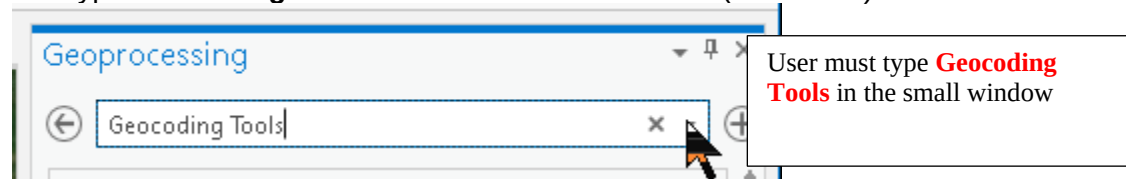


If you run into problems following my directions below, here is a [LINK](#) to ESRI's directions

- Select **Analysis** on the upper ribbon of ArcPro > **Tools** (see below)

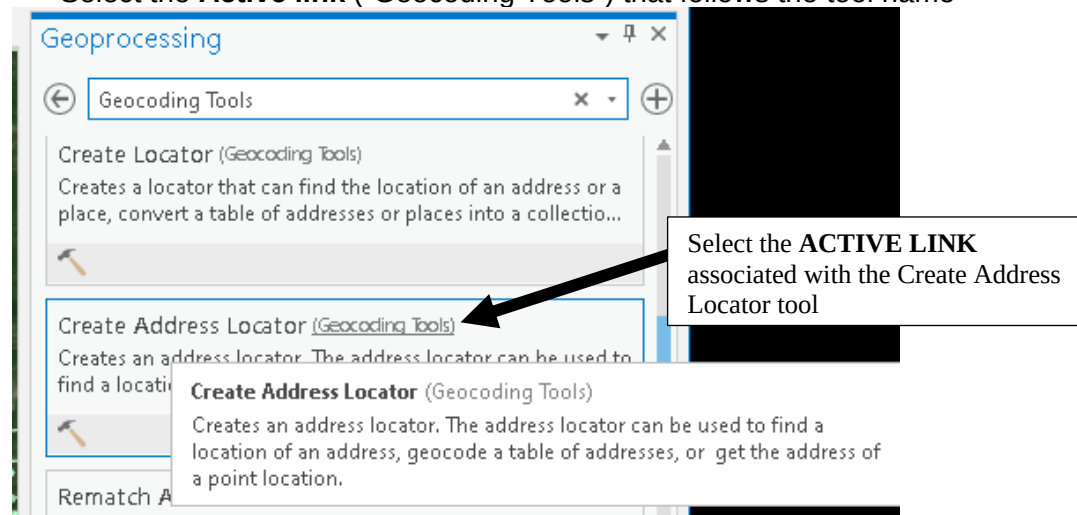


- Type **Geocoding Tools** in the “Find tools” window (see below)

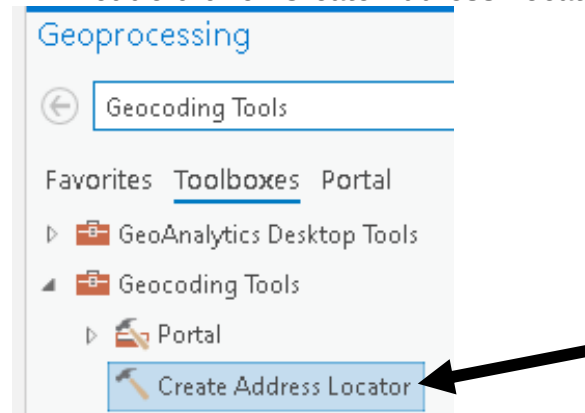


A list of geocoding tools appears below the “find” window (see below)

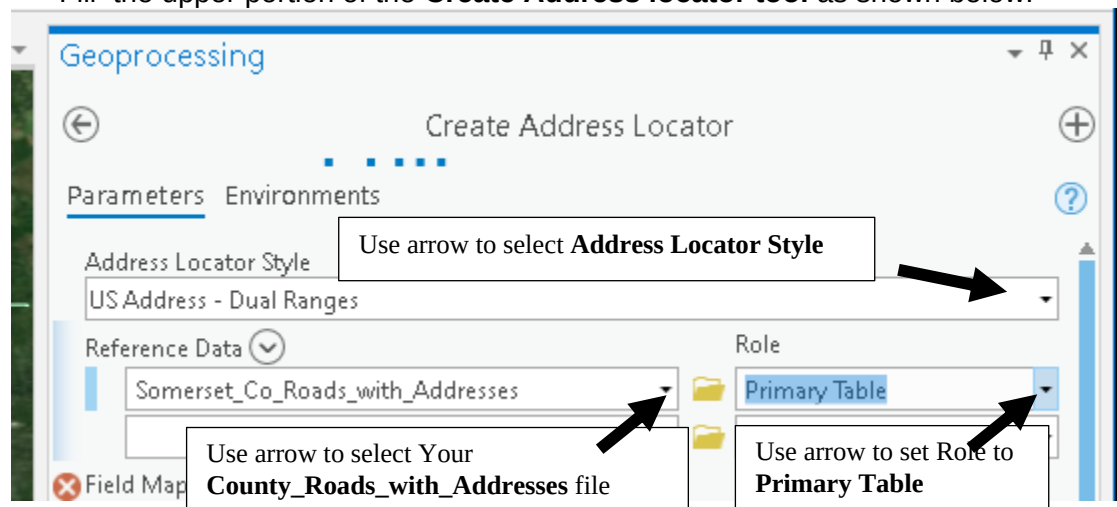
- Pull the **blue scroll bar** down to **Create Address Locator**:
- Select the **Active** link (“Geocoding Tools”) that follows the tool name



- Double-click on **Create Address Locator** (below)

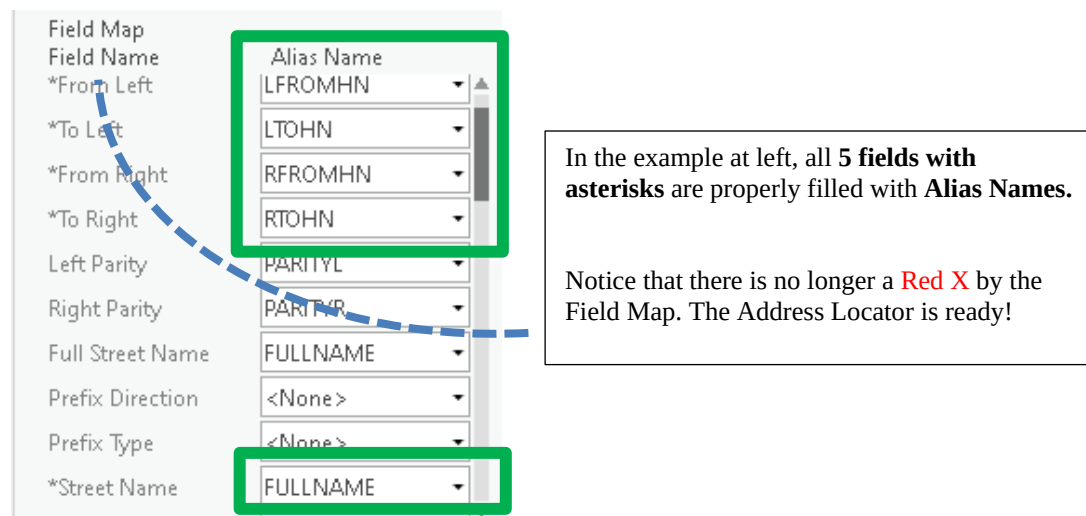
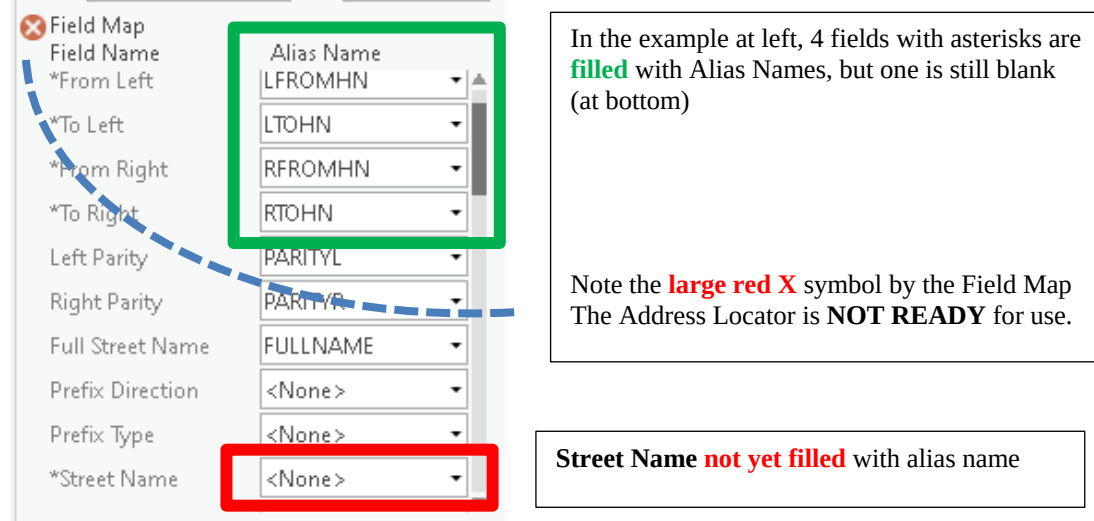


- Fill the upper portion of the **Create Address locator tool** as shown below:



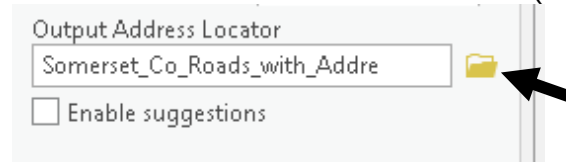
- Fill in the middle portion of the Create Address Locator tool as shown below. You will recognize the Field Names from Exr01, when you OSD'd your home

NOTE: FIVE (5) Fields marked with asterisks (*) MUST be FILLED with alias names

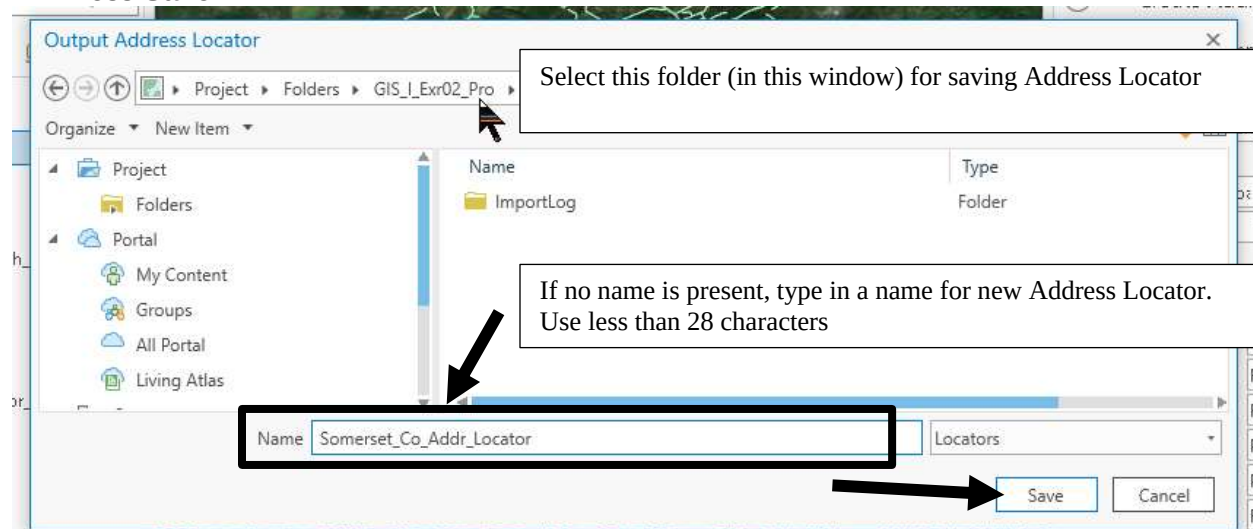


At the bottom of the Create Address Locator tool in the ArcPro RH pane is an **Output Address Locator** window with an auto-created output name (see below). ArcPro auto-selected the TIGER reference file ("addrfeat") and **shortened** it to **28 characters**

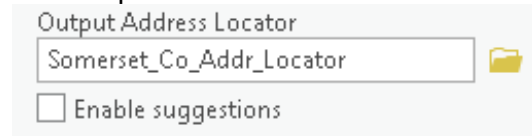
- Press the **folder** next to the window (below)



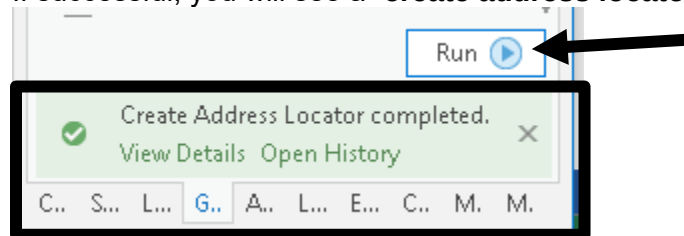
- Scroll to your **GIS_I_Exr02_Pro** project folder (below) **NOTE:** have **that folder** selected
- **Type in a locator name** using no more than 28 characters (see below), one that will be recognizable to YOU. I suggest inclusion of "co_addr_locator" in the name.
- Press **Save**



The Output Address Locator returns in the ArcPro RH pane (below), with the name you created



- Press **RUN** at bottom of ArcPro RH pane (below)
- If successful, you will see a "create address locator completed" message appear (below)



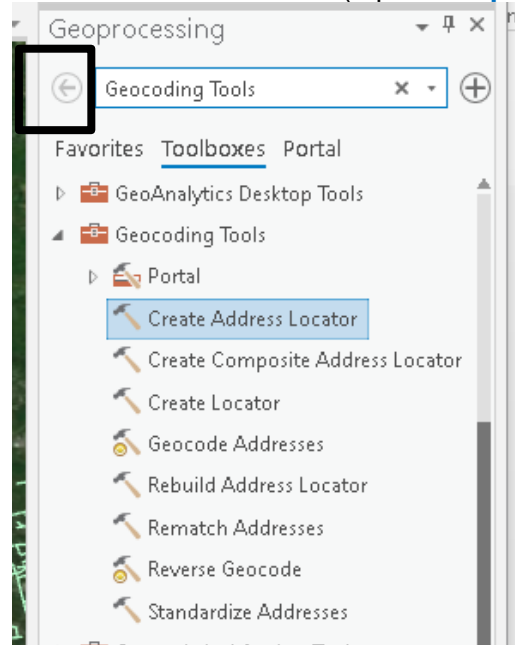
There are **3 components** to the Address Locator in your **GIS_I_Exr02_Pro** folder (below)

	Somerset_Co_Addr_Locator.loc	2/14/2020 1:07 PM	LOC File
	Somerset_Co_Addr_Locator.loc	2/14/2020 1:07 PM	XML Document
	Somerset_Co_Addr_Locator.loc	2/14/2020 1:07 PM	LOX File

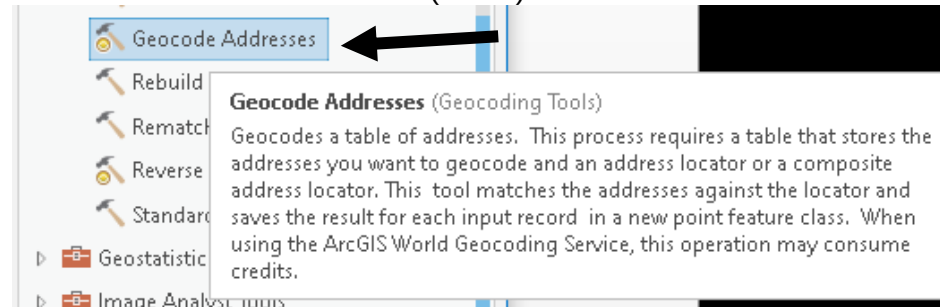
- Select **Project > Save** from the upper ArcPro ribbon to save all of your hard work up to now.

Step 09 – Geocode your Home

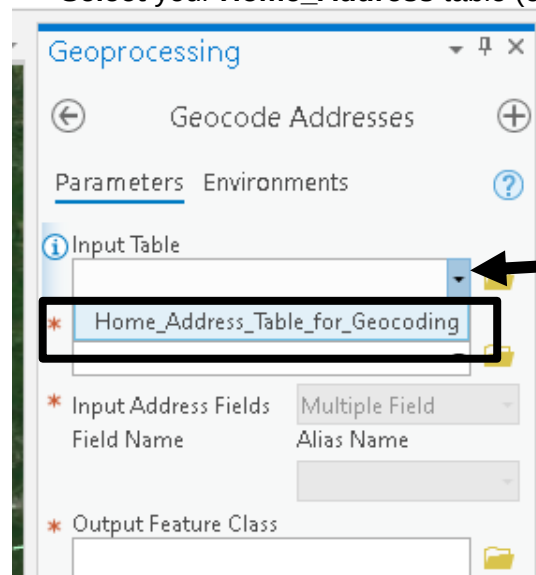
- Use the “**back**” button (top of **Geoprocessing** pane, below) to return to **Geocoding tools**



- Select **Geocode Addresses** (below)



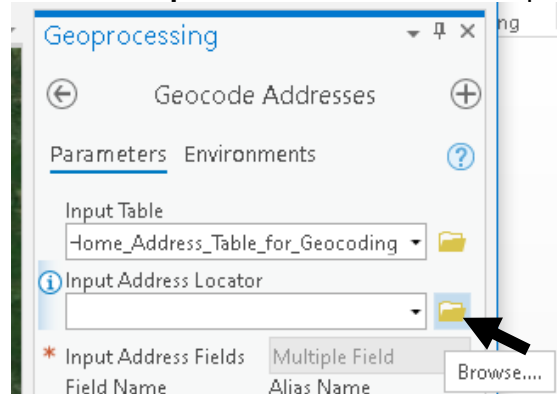
- If your Input Table (Your Home Address table from Ast01) is already in the Contents pane (from Step 07), **press the small black arrow** to the right of the window (see below)
- Select your **Home_Address** table (or whatever you have named your table)



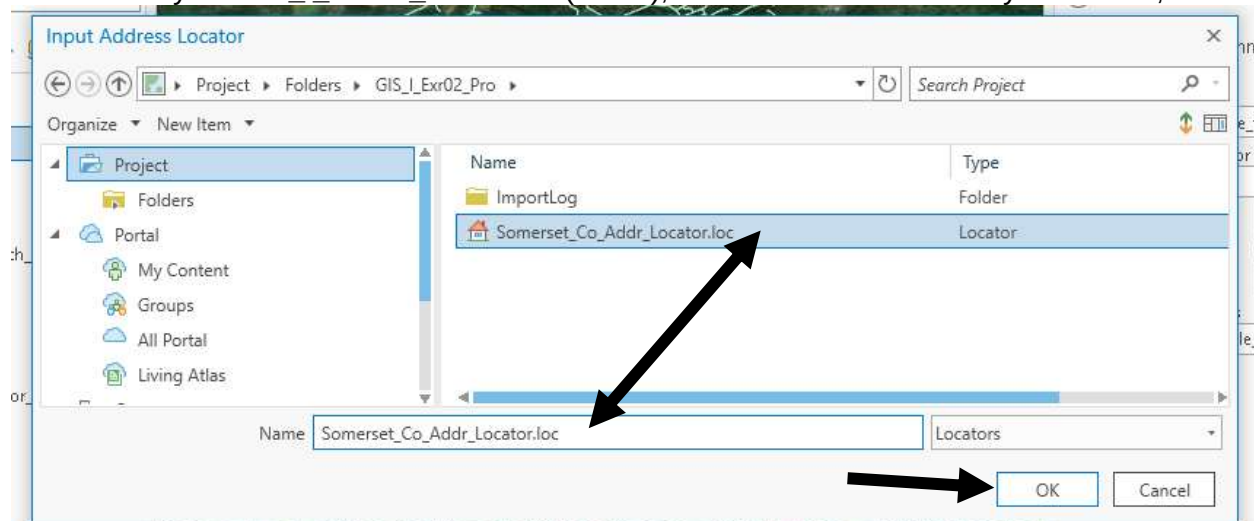
Press small black arrow to add your Home_Address table (from ArcPro Contents (LH) pane.)

Otherwise, press the folder button and search for your file on your flash or C: drive.

- At the **Input Address Locator** line, press the **folder button** (see below)

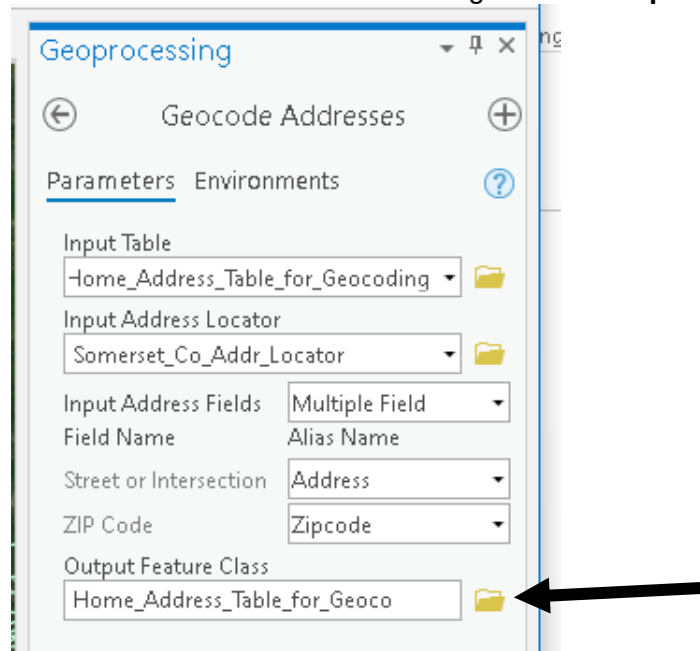


- Scroll to your **GIS_I_Exr02_Pro** folder (below), select **Address Locator** you created; **OK**

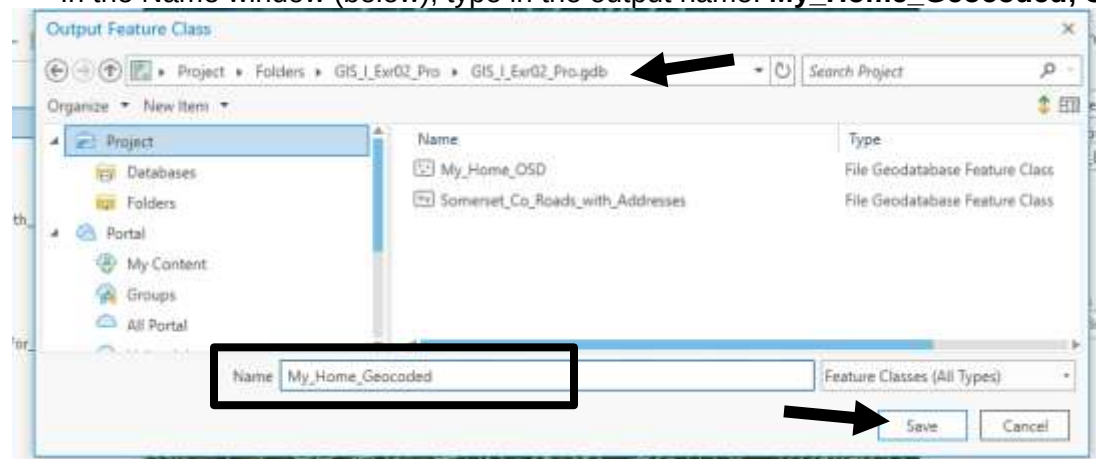


As we saw in the previous step, ArcPro once again tries to “auto-name” the Output File name with the original input file name, but **truncated to 28 characters** (below)

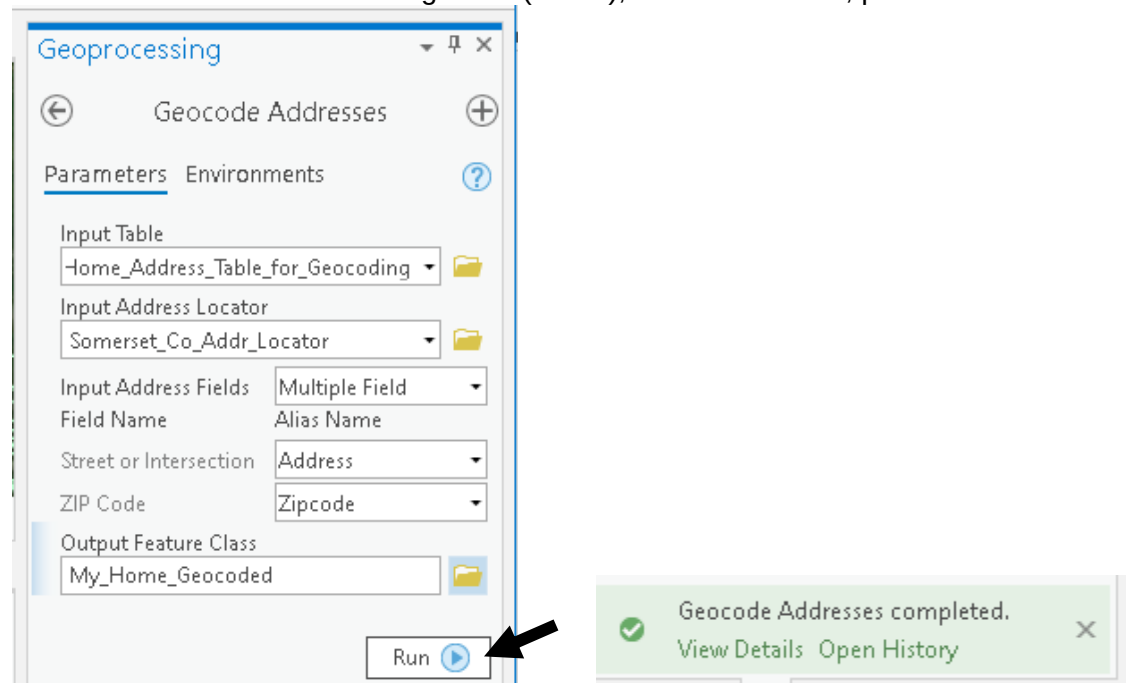
- Press the **folder button** to the right of the **Output Feature Class** window (below)



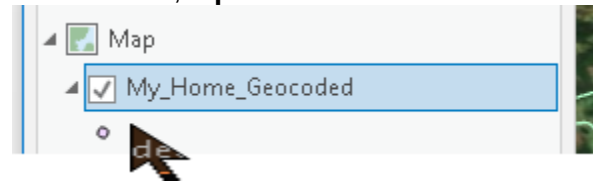
- Scroll to your **GIS_I_Exr02_Pro.gdb** (below)
- In the Name window (below), type in the output name: **My_Home_Geocoded**; Save



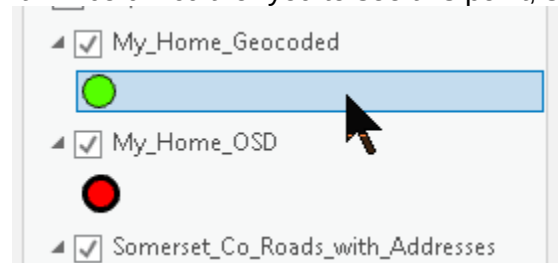
When returned to the Geocoding Pane (below), if fields are filled, press **Run**



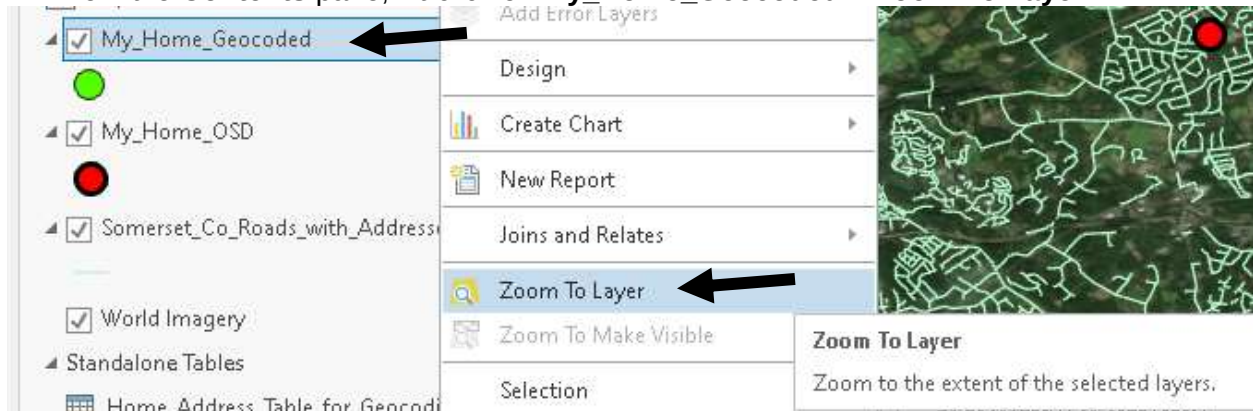
If successful, a **point** will be created and added to the map and the **Contents** pane (below)



It will be difficult for you to see this point, so click on it and use **Symbology** to increase visibility



- From the **Contents** pane, Rt-click on **My_Home_Geocoded** > **Zoom To Layer**



The map re-appears with your **My_Home_Geocoded** point more visible (but that did NOT happen for me, below). Instead I have a problem, but you might be fine. Read on...



I have an **Unmatched** point, as I can see if I open the Attribute table (below). The point's **Status** = **U (Unmatched)** because the geocoding **Score** = **0**, so a point has **not** yet been created.

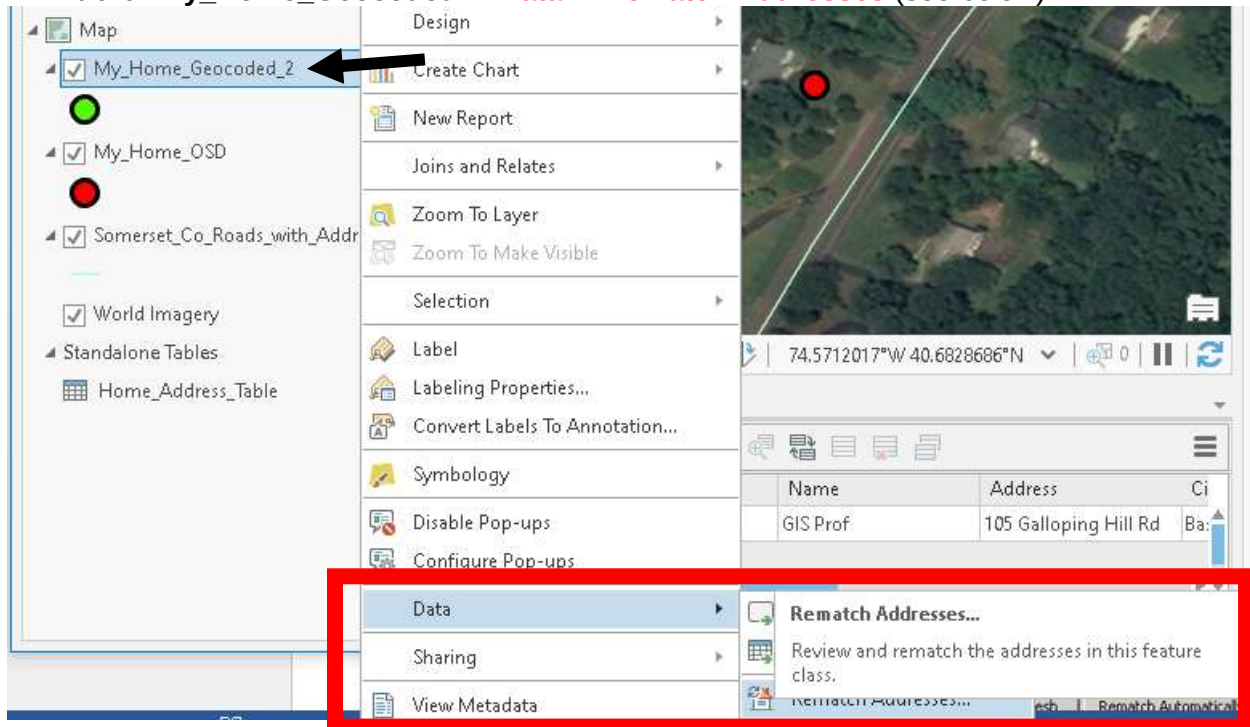
My_Home_Geocoded							
Field:	Selection:						
ObjectID	Shape	Status	Score	Match_type	Match_addr	Addr_type	AddNum
1	Point	U	0				
Click to add new row.							

If you **DO** see a **My_Home_Geocoded** point on your map, Jump to **Step 10a**.

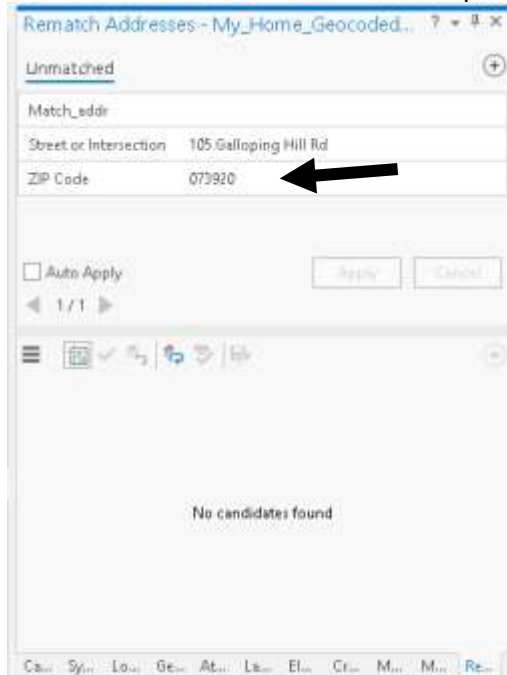
If you do **NOT** SEE a **GEOCODED POINT** for your home, **Don't Panic!** Initial geocoding operations frequently **DO NOT** produce points, so we will continue on to Step 10

Step 10 (IF REQUIRED) – Manually match an “unmatched” point

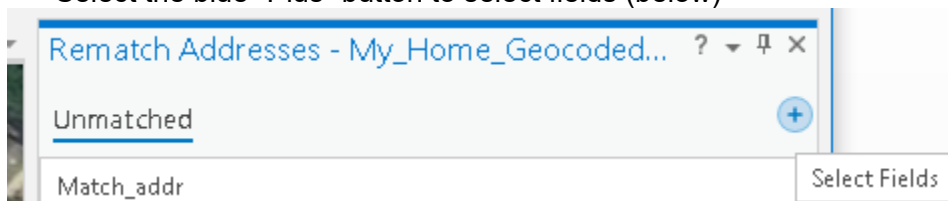
- Rt-click **My_Home_Geocoded** > **Data** > **Rematch Addresses** (see below):



An **Rematch Addresses** window opens in the RH pane of Pro (below): My **Zipcode** is WRONG



- Select the blue “Plus” button to select fields (below)



I select the Zipcode window from the Pane (somehow.....still not sure exactly)

- I try to edit the zip code down to **07920**

Unmatched

Match_addr

ZIP

Street or Intersection 105 Galloping Hill Rd

ZIP Code 073920

- I click on the ZIP Code window and **eliminate the errant "3"** (below); press ENTER; **Apply**

Unmatched

Match_addr

ZIP

Street or Intersection 105 Galloping Hill Rd

ZIP Code 07920

☐ Auto Apply

Apply Cancel

2 possible "match" candidates appear (**A** and **B**, below); I select **A**; press **Green check**

Rematch Addresses - My_Home_Geocoded...

Unmatched

Match_addr

ZIP

Street or Intersection 105 Galloping Hill Rd

ZIP Code 07920

☐ Auto Apply

Apply Cancel

1 / 1

Address Type Score

A 105 Galloping Hill Rd, 07920 StreetAddress 100

B 106 Galloping Hill Rd, 07920 StreetAddress 79

Notice too that the attribute table becomes populated with information after the **Match**(below)

My_Home_Geocoded_2

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

Status	Score	Match_type	Match_addr	Addr_type	AddNum	AddNumFrom	AddNumTo
M	100	M	105 Galloping Hill Rd, 07920	StreetAddress	105	1	135

Click to add new row.

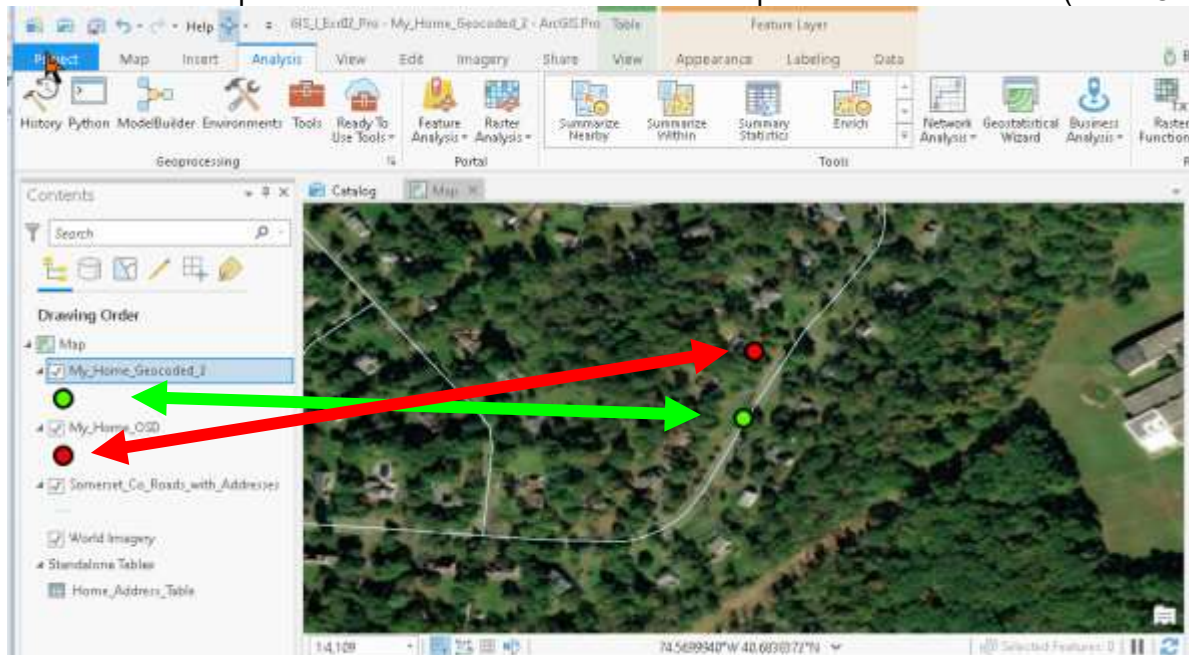
- I select **save edits** (below)

Save Edits

Save all edits made since the last save. After saving, you cannot undo previous editing operations.

When I finish the Save Edits, I clicked the small X on the upper RH corner of the **Rematch** pane

The map now shows one **My_Home_Geocoded** point and one **My_Home_OSD** point (below):
 The “unmatched” point from the manual rematch address process was not saved (that’s OK)



Part B - GPS Data Collection and Importation into a GIS

GPS Positioning Basics

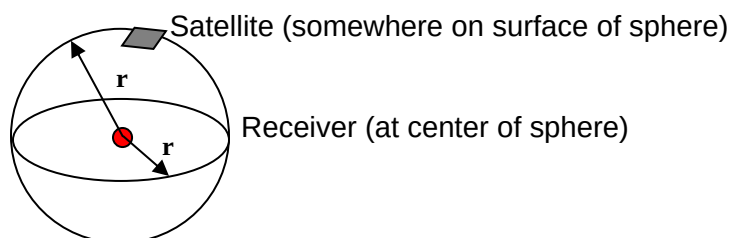
Satellite positioning with a GPS receiver is based upon a simple equation:

$$\text{Velocity} = \text{Distance} / \text{Time}$$

GPS satellites circle the Earth and send signals traveling at the speed of light (186,000 miles/sec) continuously. Embedded in the signal sent by each satellite is the time that the signal was sent, and the GPS unit receiving the signal has a clock that records the time the signal was received. Therefore, the above equation can be re-written:

$$186,000 \text{ miles/sec} = \text{Distance} / T_{\text{received}} - T_{\text{sent}}$$

Because Velocity and Time are now “known”, the equation can be re-arranged and solved for distance. However, the only thing that this one GPS receiver “knows” is that it is a certain distance from one particular satellite. Visualize the GPS receiver at the center of a sphere (below) whose surface has a radius (“r”) equal to the distance from the receiver to the satellite:



Geometry dictates that 3 satellites are needed to create a point in X-Y space, and 4 intersecting spheres are required to produce a 3D point X-Y-Z space.

Here is an excellent visual [link](#) that describes GPS positioning.

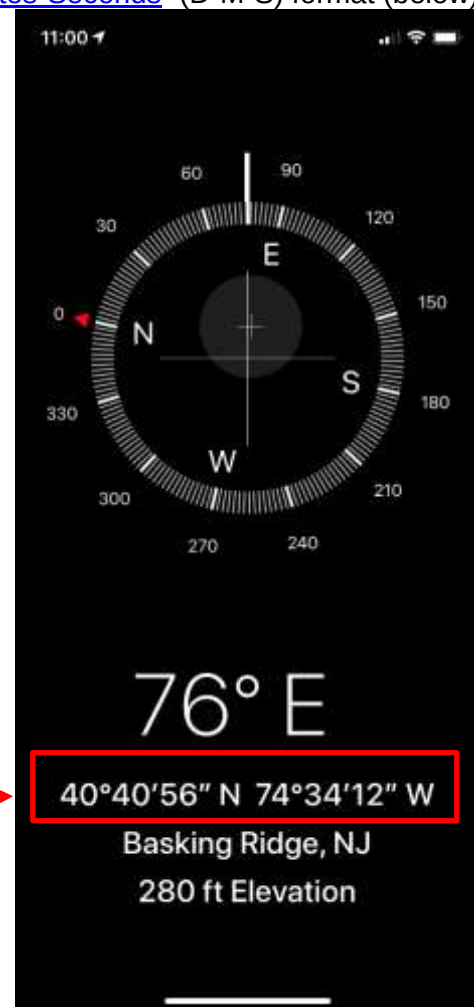
Step 11 - Collect a GPS position with your mobile phone

- If possible, find an exterior feature that is **visible** on your airphoto. For example, corners of sidewalks, centers of driveways, etc. are sometimes visible if you enlarge the map and the original pixel size is small enough. Below is the “food truck” that typically parks next to the Audubon Ave. entrance to NJCU. Note the parking space lines – the end of one of those lines is a good example of a visible feature.



- Use your Mobile Phone (search for **Compass** on **iPhone**) to determine your [Latitude & Longitude](#). These are likely to be in a “[Degrees-Minutes-Seconds](#)” (D-M-S) format (below)

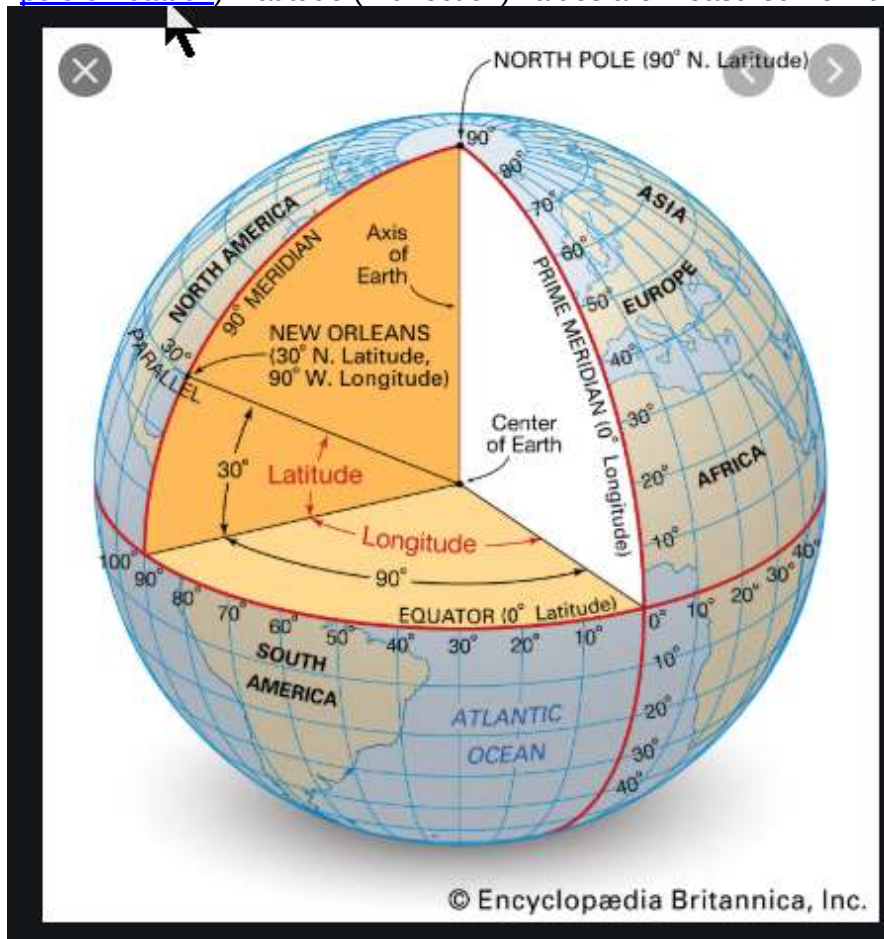
AAA°BB’CC” where for each coordinate,
AAA = no. of degrees (up to +/- 180)
BB = no. of minutes (60 minutes in 1 degree)
CC = no. of seconds (60 seconds in 1 minute)



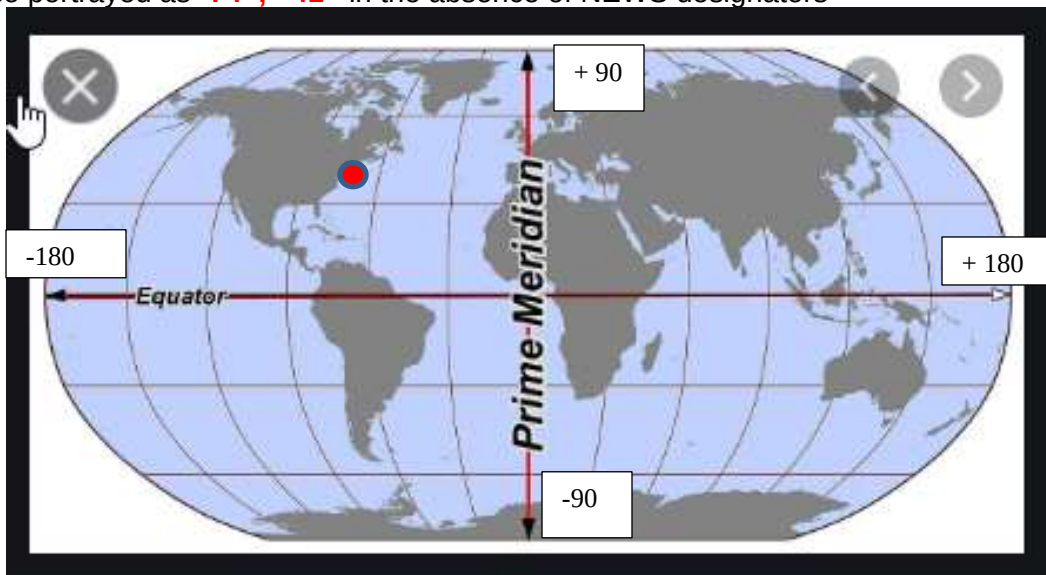
Note: If you are unable to GPS your home, this [link](#) will connect you to an address-to-latitude/longitude online coordinate converter

Step 12 – Convert GPS coordinates from Degrees-Minutes-Seconds to Decimal Degrees

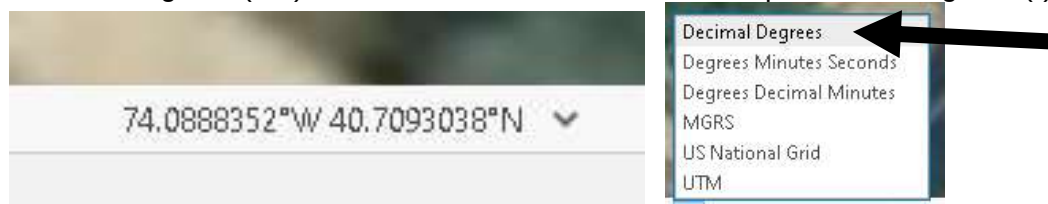
The cutaway drawing on the globe below shows the Earth with a set of X-Y axes at its center. These axes show the origins of longitude and latitude. Longitude (X direction) is measured from the Prime Meridian (0 degrees [°]), which is one of many [great circles](#) that cut through the Y axis (Earth's [pole of rotation](#)). Latitude (Y direction) values are measured from the Equator.



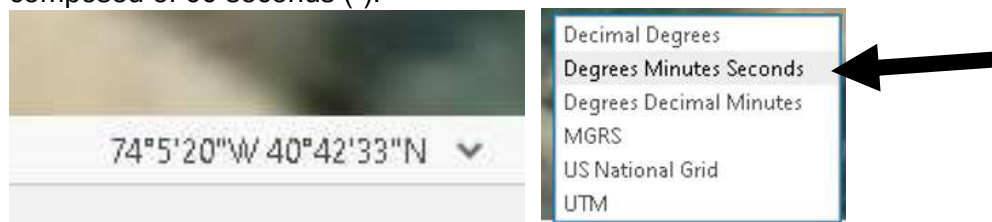
If you unfurl the 3D Earth above onto a 2D surface (below), the X and Y axes as well as latitude and longitude lines translate as shown. New Jersey is located at roughly **74° West, 41° North**, also portrayed as **-74°, +41°** in the absence of NEWS designators



At the bottom of your ArcPro Map screen (below), you will see Lon-Lat values most likely as Decimal Degrees (DD). In DD, X and Y coordinates are expressed in degrees (°)



The measurement units in the D-M-S system (below) are similar to a typical round clock face, where an hour is similar to a degree (°), which is composed of 60 minutes ('), and a minute is composed of 60 seconds (").



To convert from D-M-S to Decimal Degrees, the following formula is used:

$$\text{DD} = \text{Degrees} + \text{Minutes}/60 + \text{Seconds}/3600.$$

Let's try this out on the example above, near the NJCU Audubon entrance:

$$\text{Longitude DD} = 74 + (5/60) + (20/3600) = 74 + .0833333 + .0055556 = 74.0888889^\circ \text{ W}$$

$$\text{Latitude DD} = 40 + (42/60) + (33/3600) = 40 + .7000000 + .0091667 = 40.7091667^\circ \text{ N}$$

While not matching to the 7th decimal place, they do match to the 3rd or 4th decimal place.

Use either 12a or 12b (Extra Credit) to convert your home's GPS coordinates to DD

Step 12a – Use a coordinate converter

For converting your home GPS coordinates from D-M-S to DD, a [coordinate converter](#) is available (below)

Note: In the absence of NEWS indicators, you must know where to use MINUS signs (below)

Degrees Minutes Seconds to Decimal Degrees

Please enter the **degrees, minutes, seconds (DMS)** coordinates values to convert to **decimal degrees (dd)**.

Degrees for Latitude	Minutes	Seconds
40 °	40 '	56 "
Degrees for Longitude	Minutes	Seconds
-74 °	34 '	12 "
Convert to Decimal Degrees		
Decimal Degrees Lat	Decimal Degrees Long	
40.68222222	-74.57000000	

You have **D-M-S** from cell phone

You want to convert to **Decimal Degrees**



If you are in a hurry and don't care about Extra Credit for now, skip to Step 13

Step 12b (Extra Credit) Create your own Coordinate Converter

If you need a refresher on creating formulas in Excel, refer to your GIS_I_Ast01 or [here](#)

- Open MS Excel from the **Start** menu on your computer
- In the top row of MS Excel, create the **column headers** shown below:
Note: OID column is included for Object or Feature ID numbers, a good idea in any GIS table)

	A	B	C	D	E	F	G	H	I
1	OID	Lon_Deg	Lon_Min	Lon_Sec	Lat_Deg	Lat_Min	Lat_Sec	Lon_DD	Lat_DD
2									
3									
4									

- Select and **rt-click** on both of the **DD column headers** (below left); select **Format cells**:
- **Format** the DD columns as **Number** with **7 decimal places** (below right))

The screenshot shows a right-click context menu over columns H and I. The 'Format Cells...' option is highlighted. To the right, the 'Format Cells' dialog box is open, with the 'Number' tab selected. The 'Category' is set to 'Number', and the 'Decimal places' are set to 7. A box labeled 'SEVEN decimal places' points to the '7' in the 'Decimal places' field.

- Select the **Lon_DD** cell on the second row in Excel (under the column header)
- Create the equivalent of the formula below in **that cell**: *(for Longitude, multiply by (-1))*

$$\text{Lon_DD} = \text{Lon_Deg} + (\text{Lon_Min}/60) + (\text{Lon_Sec}/3600) * (-1)$$

The screenshot shows the formula bar with the formula $= (B2 + (C2/60) + (D2/3600)) * (-1)$ entered. Below the formula bar, the spreadsheet shows the formula entered into cell H2. Arrows point to the formula bar and cell H2 with labels: '2) Type in formula' and '1) Select Cell first'.

- Press **ENTER** on keyboard to save the formula for that cell
- **Repeat** the process and create a similar formula for the Lat_DD cell with the "Lat_" cells
- Enter DMS data in Columns A through G and take note of your results. Mine are below:

	A	B	C	D	E	F	G	H	I
1	OID	Lon_Deg	Lon_Min	Lon_Sec	Lat_Deg	Lat_Min	Lat_Sec	Lon_DD	Lat_DD
2	01	74	34	12	40	40	56	-74.5700000	40.6822222

- Save the Excel workbook with a name that makes sense (see below)

File name: **DMS_to_DD_converter**

Save as type: **Excel Workbook**

Step 13 – Create Excel workbook to hold ID, Lon_DD, Lat_DD values from your home

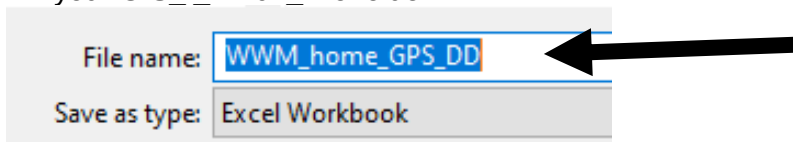
- Create an Excel workbook and fill in a worksheet with column headers as shown below.
 - Format the A column as **Text**
 - Format the B and C columns as **Number** with **7 decimal places**

	A	B	C
1	OID	Lon_DD	Lat_DD
2			
3			

- Add a 1 (one) to the OID column in Cell A2 (see below)
- Add the Lon_DD and Lat_DD values you determined in Step 12a or 12b. I show mine below:
*Remember that Lon must be **NEGATIVE** in the absence of NEWS direction indicators*

	A	B	C
1	OID	Lon_DD	Lat_DD
2	01	-74.5700000	40.6822222

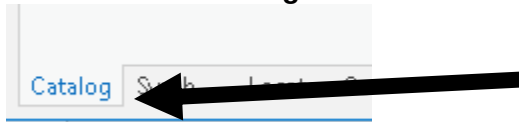
- **File > Save As** MS Excel Workbook with a name like **My_Home_GPS_DD** (below) inside your GIS_I_Exr02_Pro folder



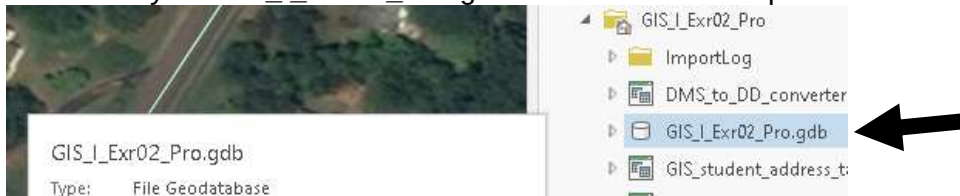
- **CLOSE MS Excel**

Step 14 – Import My_Home_GPS_DD table into GDB

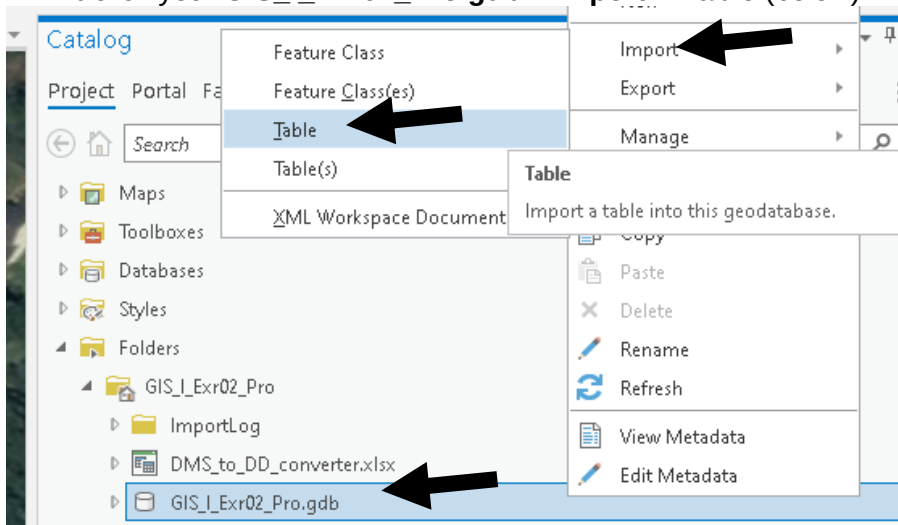
- Select the **Catalog** tab on the bottom of the ArcPro RH window (below)



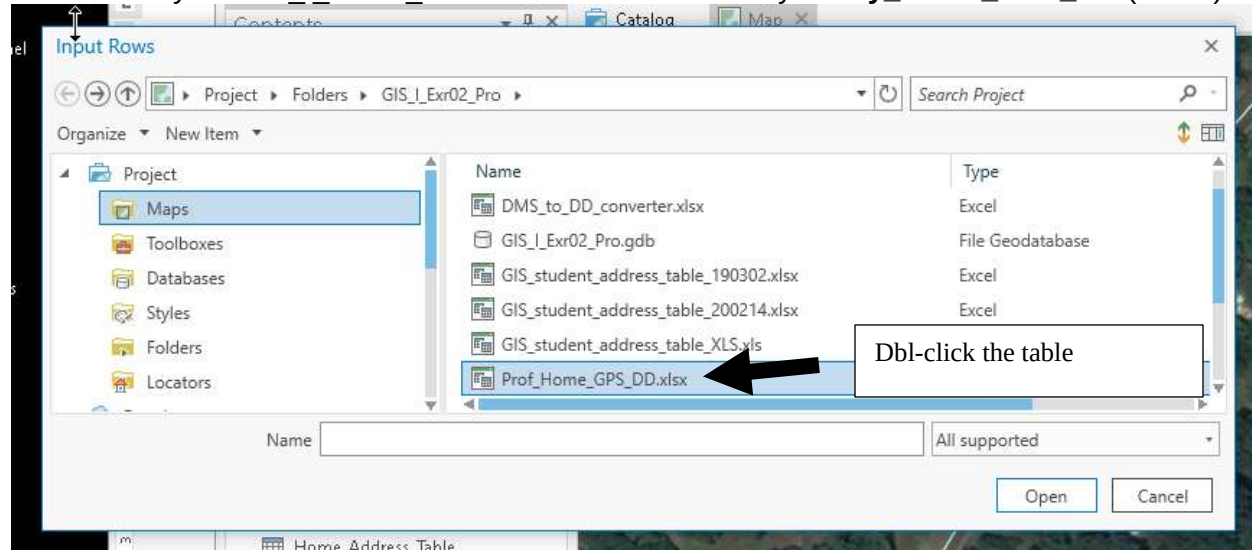
- Locate your **GIS_I_Exr02_Pro** geodatabase in the RH pane of ArcPro (below)



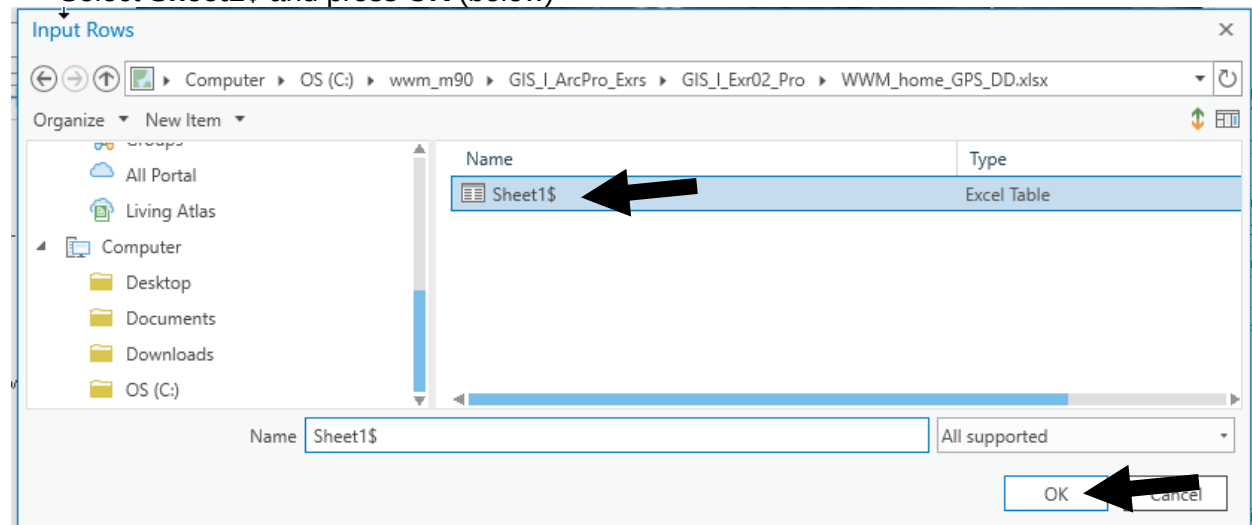
- Rt-click your **GIS_I_Exr02_Pro.gdb** > **Import > Table** (below)



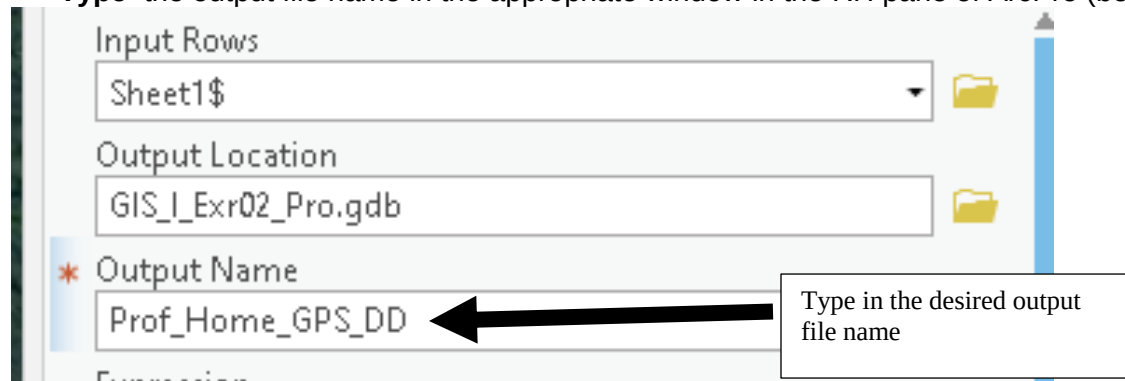
- Scroll to your GIS_I_Exr02_Pro folder and double-click your **My_Home_GPS_DD** (below)



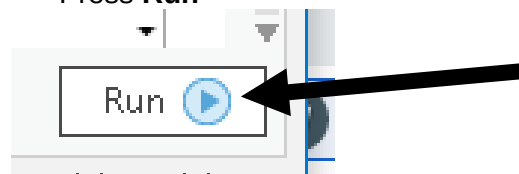
- Select **Sheet1\$** and press **OK** (below)



- **Type** the output file name in the appropriate window in the RH pane of ArcPro (below)

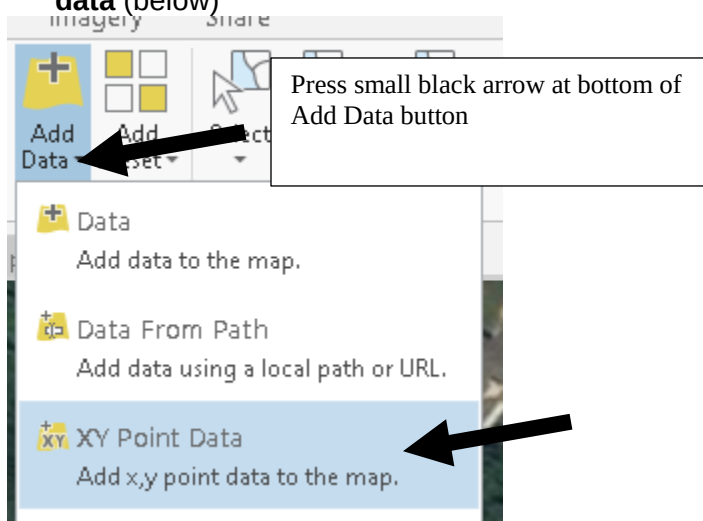


- Press **Run**

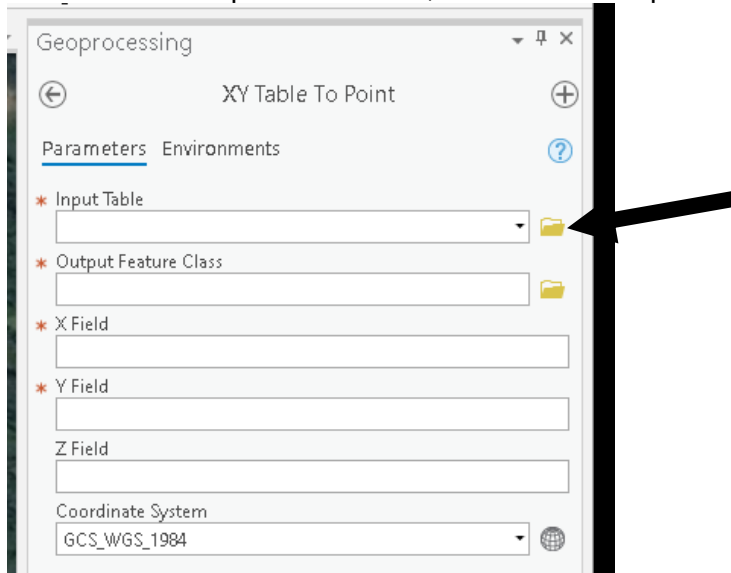


Step 15 – Import My_Home_GPS_DD table as “XY data” into ArcPro

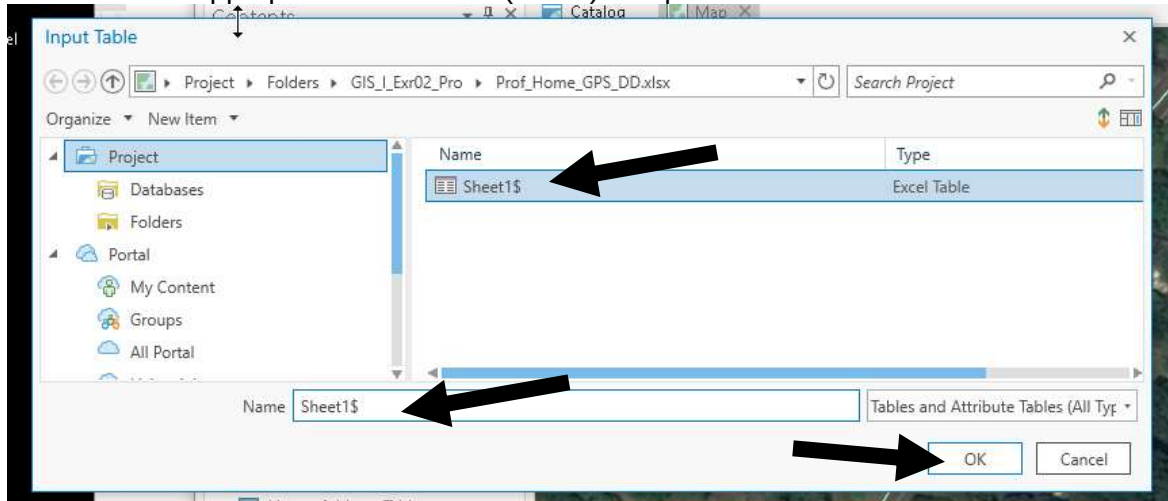
- From the ArcPro upper ribbon, Map tab choose bottom arrow of **Add Data > Add XY point data** (below)



- From the RH pane of ArcPro, **browse** to the input table



- Select the appropriate **worksheet** (below) and press **OK**

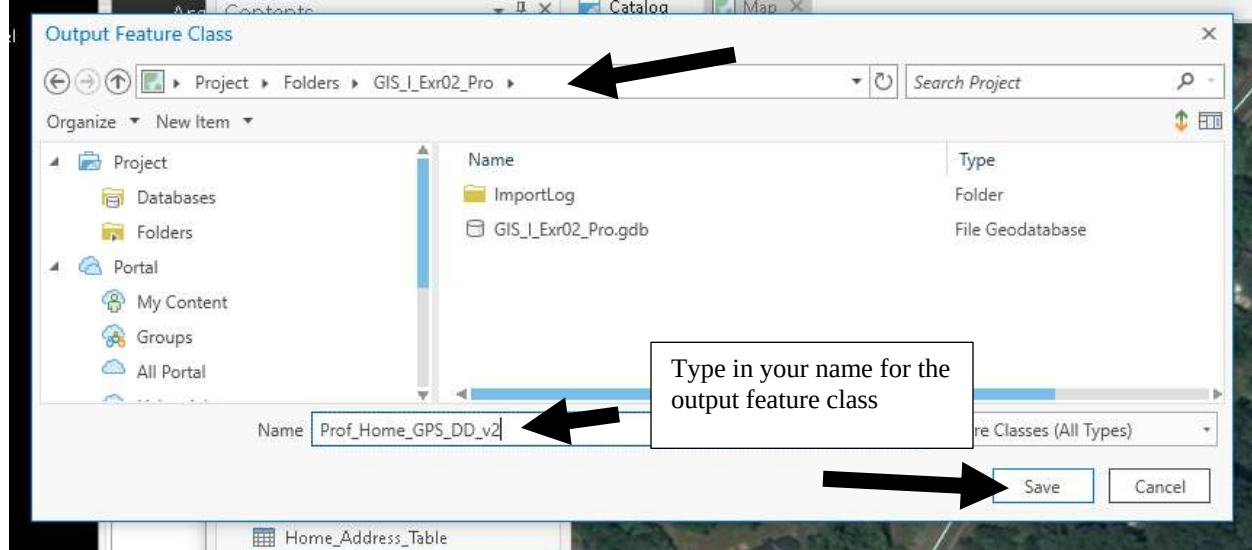


- ArcPro prompts you to save the output feature class (below) with an “automated” name
- I suggest that you **browse to your GDB**

Input Table
Sheet1\$

Output Feature Class
Sheet1_XYTableToPoint

- Once you have the output location set to the **GIS_I_Exr02_Pro** folder (below), type in your own name for the new output feature class, the GPS point for your home; Press **Save**



- Confirm that the **Lon_DD** field is the X field and the **Lat_DD** field is the Y field
Note: My new point is saved as a shapefile (.shp), since it is not stored inside the GDB

Input Table
Sheet1\$

Output Feature Class
Prof_Home_GPS_DD_v2.shp

X Field
Lon_DD

Y Field
Lat_DD

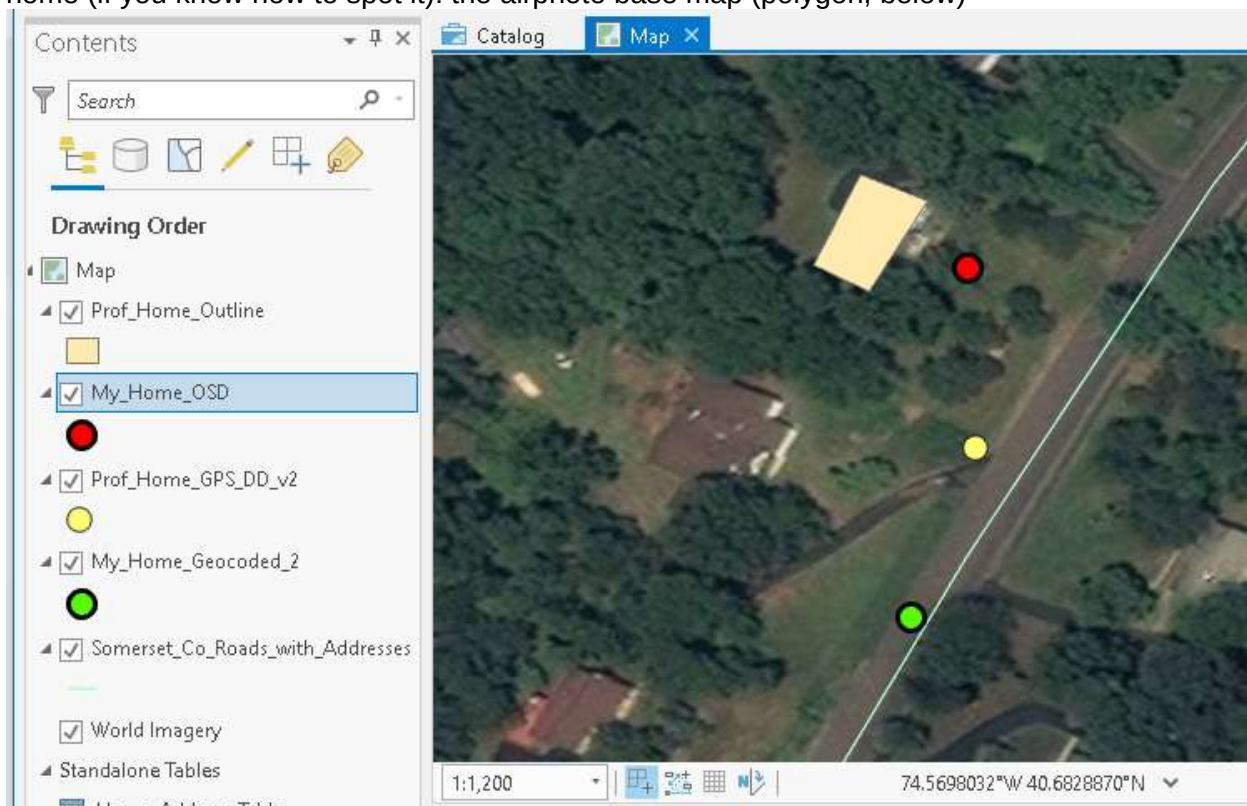
- Press **Run**

Once your map re-appears with the new GPS point of your home, improve its visibility (below)

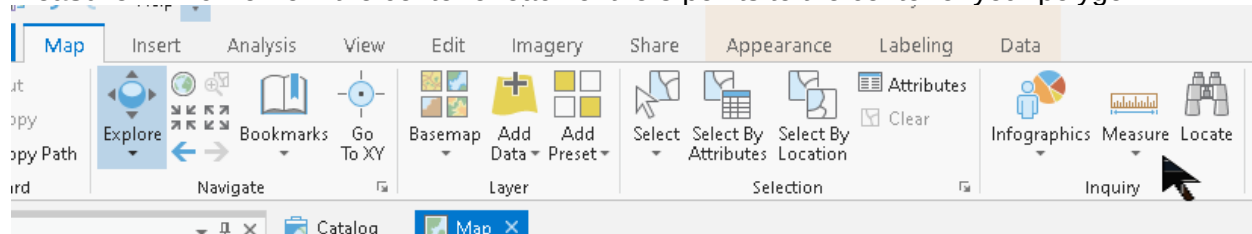


Step 16 – Determine closest “My_Home” location: OSD vs Geocoded vs GPS

Discussion: You now have a map with as many as 4 different locations of your home that purport to show the same thing: the CORRECT location of your home. Everything, in a perfect map world, SHOULD stack on top of each other. But in my case (and maybe yours), all 4 features are in slightly different locations (below). Measure to the one place we all agree is your home (if you know how to spot it): the airphoto base map (polygon, below)



Measure in ArcPro from the center of each of the 3 points to the center of your polygon:



I created a simple table (below right) based upon ArcPro measurements (below left).

Measure Distance

US Feet

Result

Distance

Segment (ftUS)	Path (ftUS)	Sum (ftUS)
55.31	55.31	437.21
145.46	145.46	
236.44	236.44	

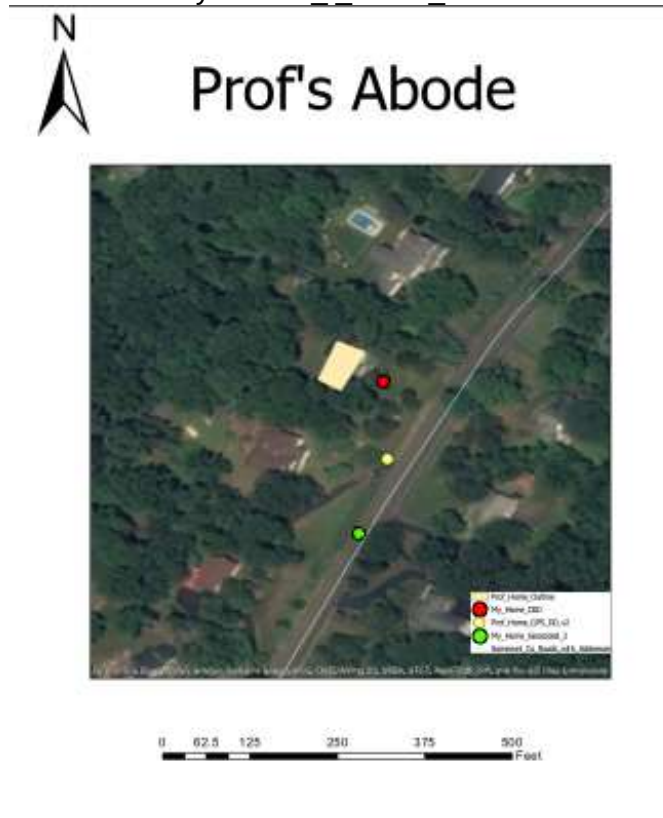
Path Net Bearing:

Path Net Distance:

Feature	Distance to Home on Airphoto
OSD	55 feet
GPS	145 feet
Geocoded	236 feet

Step 17 – Create a layout and Export as a JPG to GIS_I_Exr02_Pro folder

- As you did in Exr01, create a Layout of your map with North Arrow, Scale Bar, Legend, Title
- Export that Layout as a JPEG to your GIS_I_Exr02_Pro folder



Step 18 – Prepare a written summary with embedded map layout

- Prepare a 250-word (minimum) exercise summary. **Embed** the layout JPG and include a table of distances from your various locations to your home. Save the entire writeup, with the embedded JPG, as a PDF file.
- In the exercise summary, answer the various questions that were asked during the exercise.
- If you did **Step 12b XC** (Create your own Coordinate Converter), please include a screen shot of your converter, including the values that you converted
- In your writeup, indicate what you liked, did not like, and what you would change about the exercise.
- In your writeup, please reflect upon what value (or lack of value) you see in learning about how to create GIS data from different data sources such as onscreen digitizing, geocoding, and GPS. Do you have a favorite type of data collection?
- I am especially interested in your feedback on the videos accompanying these exercises.

Finally, student feedback is incredibly important and useful to us in creating better GIS experiences for all NJCU students. Thanks for helping us improve GIS instruction at NJCU!