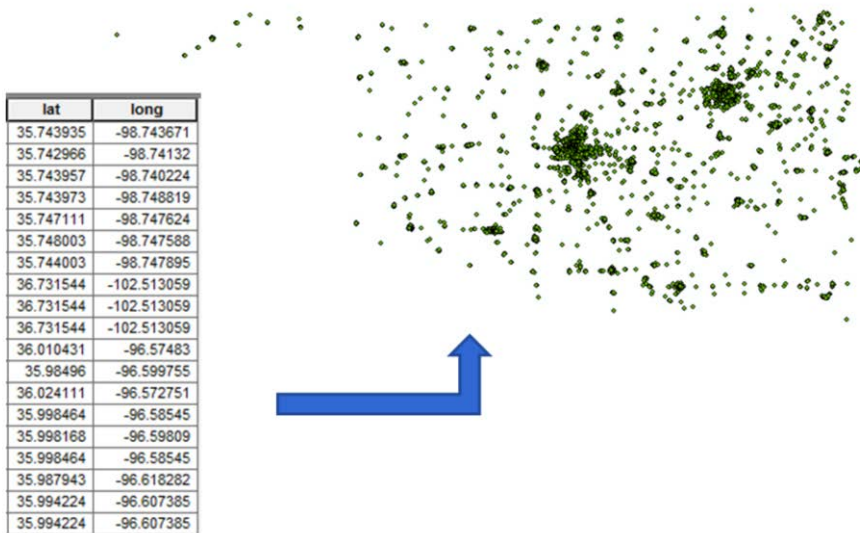


This module's topic is geocoding.

- Understand the concept of geocoding and the steps in the geocoding process
- Identify important geocoding considerations and potential challenges



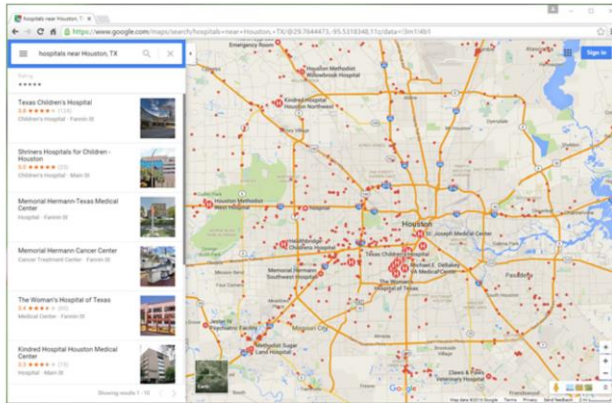
Displaying X/Y Data



So far when we've added data to the map, it's been a shapefile that already displays location for you, or it's been a table with an X and Y field. You simply use the "Display XY Data" function to place the points on a map... But how many of you can tell me what lat/long you live at? I bet most of you would tell me where you live using an address, right?

There are two means by which a table of records could be assigned coordinates: either recorded using GPS unit or through the processes of geocoding.

What is Geocoding?



Original Address:
6621 Fannin St,
Houston, TX 77030

Geocoded Address:
Latitude: 29.724205
Longitude: -95.401715



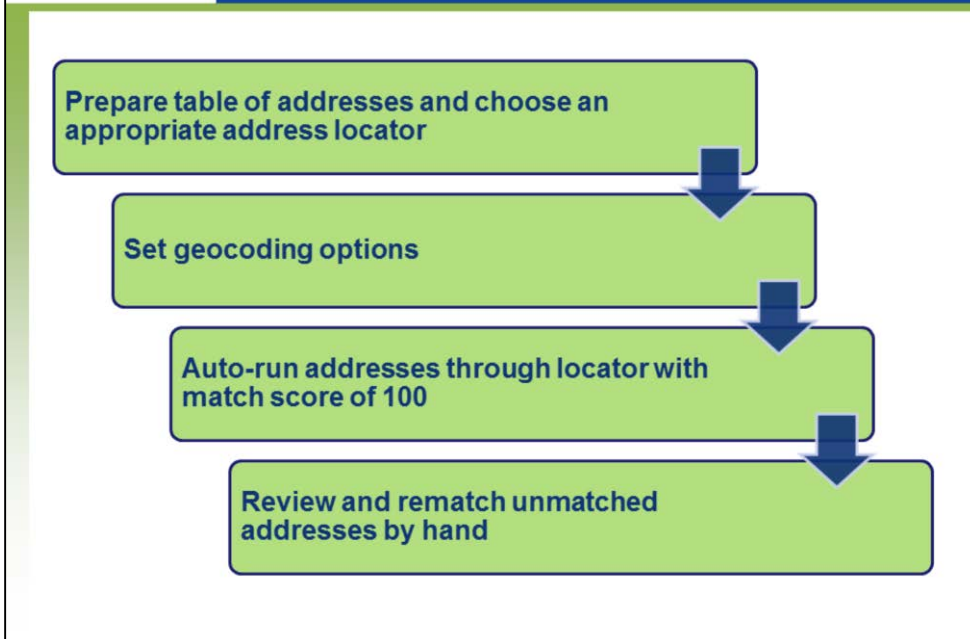
Geocoding converts a description of a location into spatial data and places it as a location on the map.

<http://www.digitalcamerainfo.com/news/maperture-pro-for-apple-aperture-2-20566.htm>

Geocoding is a process by which textual information, such as an address, is converted into spatial data and assigned a location i.e. latitude/longitude coordinates.

A popular example of this that you've likely used is Google Maps which searches by street address to find a location.

It's important to know where things are happening. Geocoding allows us to map locations where events of interest occur. Once these locations are displayed on a map you can determine relationships between these points as well as possible connections with something else.



There are several steps in the geocoding process.

A table of addresses you are preparing to geocode should have fields for Address (includes street number, name, direction, type), City, State, and ZIP code as well as a unique ID for each record.

The address locator is the mechanism by which your addresses are matched to a reference dataset (usually a network of streets).

First round of matching occurs automatically – may take minutes to hours depending on the volume. We recommend a match score of 100 to ensure the highest quality matches on the first round.


When the matching process is completed, you will have the opportunity to review and rematch addresses. You can do this automatically by sending them through the address locator again or interactively via the interactive rematch dialog box.

Prepare table of addresses and choose an appropriate address locator

Set geocoding options

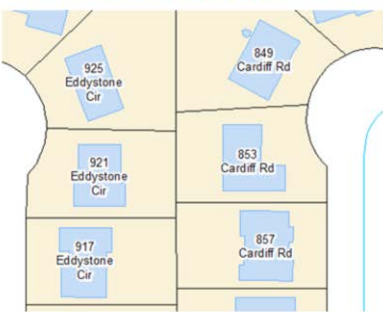
Auto-run addresses through locator with match score of 100

Review and rematch unmatched addresses by hand

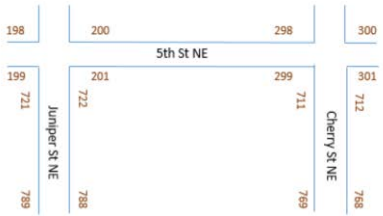


Choosing an Address Locator

Point Locators



Street Locators



Default and Online Address Locators

Choose an Address Locator to use...

Name	Description
World Geocode Service (ArcGIS Online)	
MGRS (Military Grid Reference System)	MGRS Coordinates
<input checked="" type="checkbox"/> StreetMapUSA Locator	US Streets with City, State, and ZIP for StreetMap

Add...

OK
Cancel

Local Address Locator (recommended)

Because there are a number of different address locators, choosing the right one depends on what format the addresses you want to map are in, and the type of reference data you are matching your addresses to.

Local address locators come along with your ArcGIS software in the Data and Maps package. They can be installed directly to your individual computer or to a shared network for your organization. Using these locators for geocoding does not require internet use. And therefore they are essential for geocoding if you have security concerns.

Online locators are also available and can be useful, but should **ONLY** be used if your data is publicly available and should never be used for confidential data.

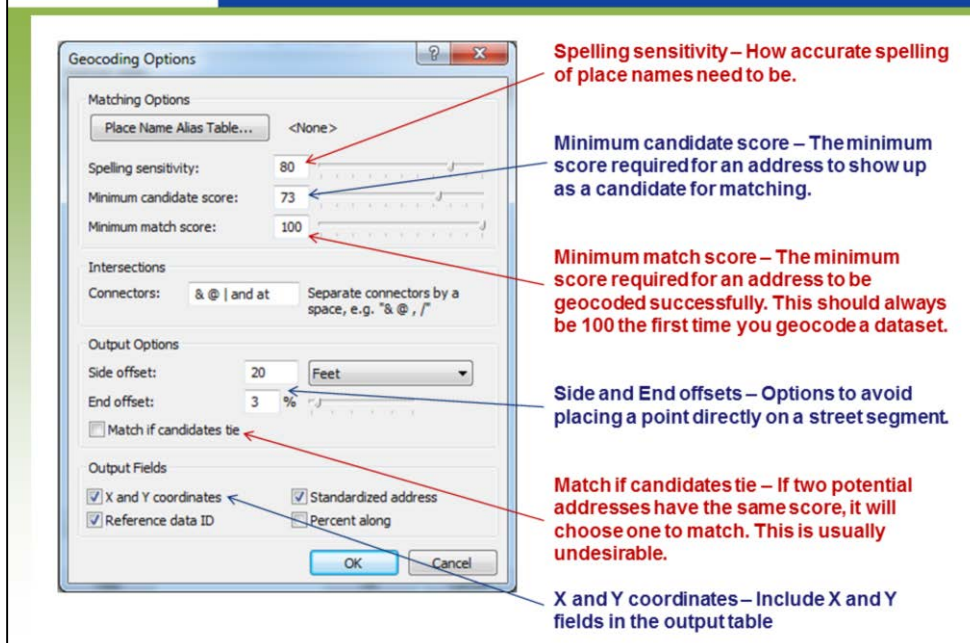
Prepare table of addresses and choose an appropriate address locator

Set geocoding options

Auto-run addresses through locator with match score of 100

Review and rematch unmatched addresses by hand

Geocoding Options



Geocoding Options

Matching Options

- Place Name Alias Table...: <None>
- Spelling sensitivity: 80
- Minimum candidate score: 73
- Minimum match score: 100

Intersections

- Connectors: & @ | and at
- Separate connectors by a space, e.g. "& @, /"

Output Options

- Side offset: 20 Feet
- End offset: 3 %
- ☐ Match if candidates tie

Output Fields

- ☒ X and Y coordinates
- ☒ Standardized address
- ☒ Reference data ID
- ☐ Percent along

Annotations:

- Spelling sensitivity** – How accurate spelling of place names need to be.
- Minimum candidate score** – The minimum score required for an address to show up as a candidate for matching.
- Minimum match score** – The minimum score required for an address to be geocoded successfully. This should always be 100 the first time you geocode a dataset.
- Side and End offsets** – Options to avoid placing a point directly on a street segment.
- Match if candidates tie** – If two potential addresses have the same score, it will choose one to match. This is usually undesirable.
- X and Y coordinates** – Include X and Y fields in the output table

After you select your address locator, you will have the ability to specify the geocoding options. You will want to set your geocoding options carefully as they can determine the precision and accuracy of your results.

Matching Options: When an address locator has generated a set of potential candidates, it scores each candidate in order to determine how closely each one matches the address that you are geocoding.

Spelling sensitivity setting controls how much variation the locator allows when it searches for likely candidates in the reference data.

Minimum candidate score determines the set of candidates that will be potential matches for an address.

Minimum match score setting allows you to control how closely your input addresses have to match their most likely candidate in the reference data to be considered a match.

The **intersection connectors** setting allows you to specify all the strings that the address locator will recognize as intersection connectors. There are default symbols, but you can add additional symbols or words.

Output Options for street address locator style

Address locators that use reference data with street centerline geometry, divide street features into segments that have beginning and ending addresses. The address locator tries to find the correct street segment (address range), and then interpolates/estimates

where along the line, the plot point would be. You can use the output options to specify where the points will be placed in relation to the street segment.

Side Offset: places a point at a specified distance to the side of the street segment. Address locators with reference data containing address range information for each side of the street, can determine on which side of the street an address is located.

End Offset: places a point off of the end of a street segment at a user defined-distance in order to prevent points from falling on top of cross streets

Match if best candidates tie: If a locator finds two or more reference features that have the same highest match score but different geometries, you can specify whether to match randomly to one of these features.

Output Fields: Some locator-specific fields can be displayed when you geocode an address. These fields are used to provide additional information of the candidates. They do not participate in the score calculation.

****We recommend that you discuss and document guidelines for setting the geocoding options to ensure consistency among your team/department, and help to standardize your geocoding products.**

Prepare table of addresses and choose an appropriate address locator



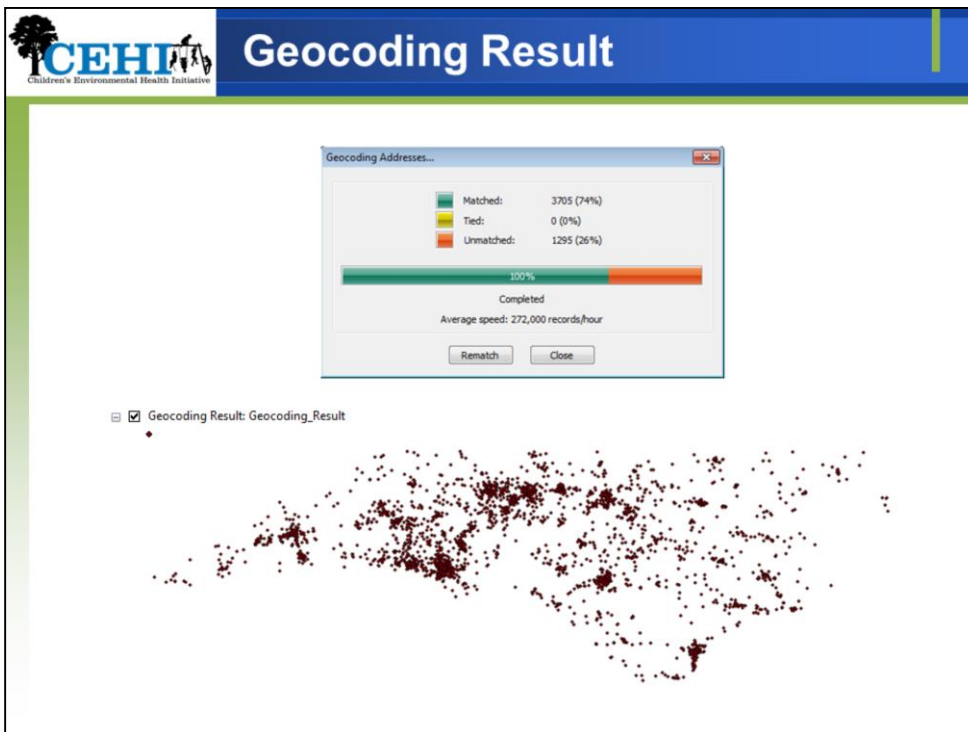
Set geocoding options



Auto-run addresses through locator with match score of 100



Review and rematch unmatched addresses by hand



The result will show you how many records are matched/tied/unmatched and what percent of your total dataset that is.

A new shapefile will be added to your map with all the matched records as points but retains the unmatched records in the table.

Prepare table of addresses and choose an appropriate address locator



Set geocoding options

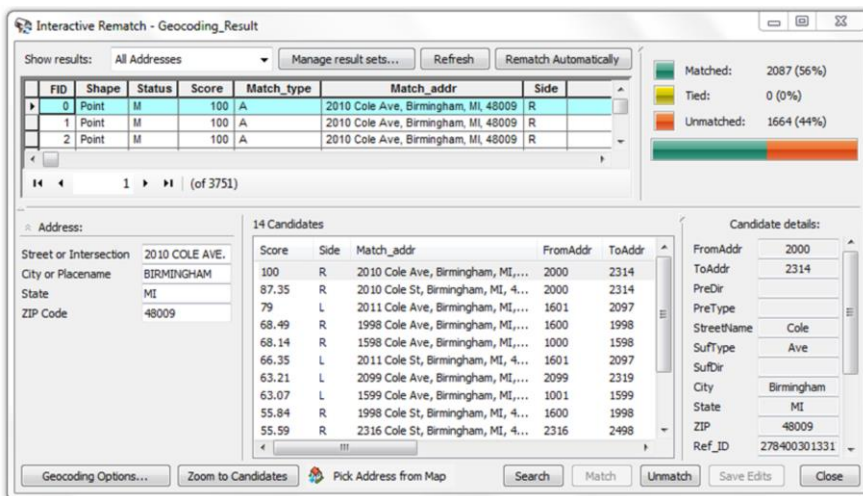


Auto-run addresses through locator with match score of 100



Review and rematch unmatched addresses by hand


Review matched addresses and examine potential candidates for unmatched addresses



If you elect to rematch interactively, you will be working in the Interactive Rematch dialog box to review candidates and see if you can find a possible match...

1. Before you begin, take a look at the **statistics panel** to see how many of your original addresses are matched, tied, or unmatched.
2. In the **Geocoding results panel**, start by specifying a set of addresses you want to rematch, usually those that failed to match. You can select individual addresses by clicking a record in the table or using the Record selector on the lower left side of the panel.
3. **Output attributes**: Status (M, U, T), Score (100), Match_type (A, M, PP) Side: (L, R) and Match_addr.
4. The **Address panel** displays the selected record's address that is used as input for matching. You can edit the information in the text box to possibly find a better match.
5. The **Candidates list panel** displays the candidates for the address you selected.
6. The **Candidate details panel** shows you the same attributes as the **Candidates list** but displays only one record at a time so it is easier to read.
7. You can use the **Pick Address from Map** tool if you know where some addresses should be on the map, but for which no candidates were found.
8. **Zoom to Candidates**: click to zoom to the set of candidates on the map
9. **Match** button: click to rematch the selected address to the candidate you think matches. Use **Unmatch** if an address has been matched incorrectly.

You can spend a considerable amount of time reviewing and rematching addresses manually. You will need to decide how much time you want to spend and evaluate the tradeoff between time and additional matches.



Address Standardization

Geocoding Tools

- Consolidate Locator
- Create Address Locator
- Create Composite Address Locator
- Geocode Addresses
- Package Locator
- Rebuild Address Locator
- Rematch Addresses
- Reverse Geocode
- Standardize Addresses

Original address

1133 North Ellsworth Road, Mesa, Arizona 85207

Address parsed

1133 | North | Ellsworth | Road | Mesa | Arizona | 85207

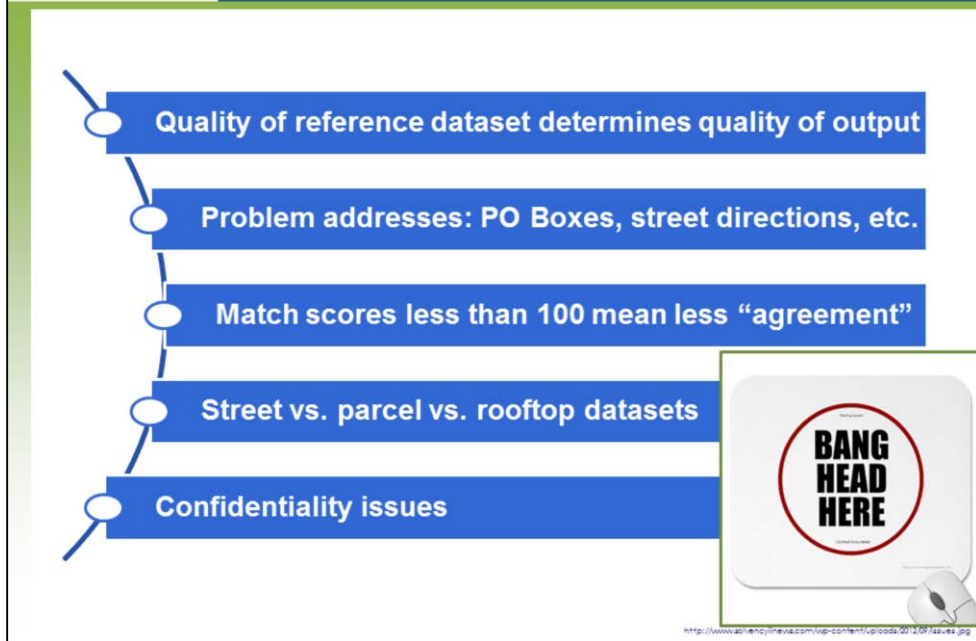
Abbreviations standardized

1133 | N | Ellsworth | Rd | Mesa | AZ | 85207

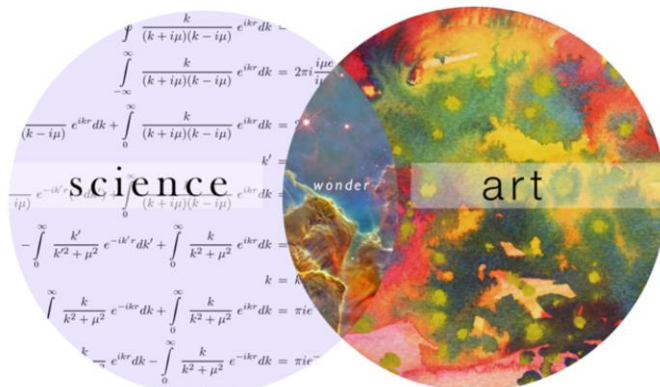
Input Addresses	Output Standardized Addresses																																																															
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ADDRESS</th> </tr> </thead> <tbody> <tr><td>1171 PIEDMONT AVENUE NE</td></tr> <tr><td>1670 WEST PEACHTREE ST NE</td></tr> <tr><td>400 FIRST ST NW</td></tr> <tr><td>241 16TH STREET NW</td></tr> <tr><td>120 MEMORIAL DRIVE SE</td></tr> <tr><td>360 AVENUE B NORTH</td></tr> <tr><td>151 HIGHWAY 13</td></tr> <tr><td>200 ST LAUREN BOULEVARD</td></tr> </tbody> </table>	ADDRESS	1171 PIEDMONT AVENUE NE	1670 WEST PEACHTREE ST NE	400 FIRST ST NW	241 16TH STREET NW	120 MEMORIAL DRIVE SE	360 AVENUE B NORTH	151 HIGHWAY 13	200 ST LAUREN BOULEVARD	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>HouseNum</th> <th>PreDir</th> <th>PreType</th> <th>StreetName</th> <th>SufType</th> <th>SufDir</th> </tr> </thead> <tbody> <tr><td>1171</td><td></td><td></td><td>PIEDMONT</td><td>AVE</td><td>NE</td></tr> <tr><td>1670</td><td>W</td><td></td><td>PEACHTREE</td><td>ST</td><td>NE</td></tr> <tr><td>400</td><td></td><td></td><td>1ST</td><td>ST</td><td>NW</td></tr> <tr><td>241</td><td></td><td></td><td>16TH</td><td>ST</td><td>NW</td></tr> <tr><td>120</td><td></td><td></td><td>MEMORIAL</td><td>DR</td><td>SE</td></tr> <tr><td>360</td><td></td><td>AVE</td><td>B</td><td></td><td>N</td></tr> <tr><td>151</td><td></td><td>HWY</td><td>13</td><td></td><td></td></tr> <tr><td>200</td><td></td><td></td><td>SAINT LAUREN</td><td>BLVD</td><td></td></tr> </tbody> </table>	HouseNum	PreDir	PreType	StreetName	SufType	SufDir	1171			PIEDMONT	AVE	NE	1670	W		PEACHTREE	ST	NE	400			1ST	ST	NW	241			16TH	ST	NW	120			MEMORIAL	DR	SE	360		AVE	B		N	151		HWY	13			200			SAINT LAUREN	BLVD	
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While not perfect, a useful tool in the geocoding process is standardization.

The standardization tool in ArcToolbox will parse your address into its core component fields. Many elements of an address, such as direction or street type, will be abbreviated. It may also eliminate non essential address information such as apt numbers so that the address is easier for the address locator to recognize.



- Locators and reference datasets are constantly improving. If you are using an old one, it might not have current street names, numbers, or new subdivisions.
- Some addresses are simply not geocode-able if they are missing key address information.
- Match scores only reflect address agreement and NOT accuracy.
- Positional accuracy differs if you geocode to a street address (interpolated) versus a parcel location.
- With sensitive data, you should NEVER use an online locator and should ALWAYS use masking techniques when displaying data.



<http://www.brainpickings.org/index.php/2012/04/25/e-o-wilson-on-art/>