



INDIANA GEOGRAPHIC
INFORMATION OFFICE



The State of Indiana's Geocoding Tools

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Agenda



IGIO Introduction



Data Harvest & Integration with Geocoding Tools



Geocoding Overview



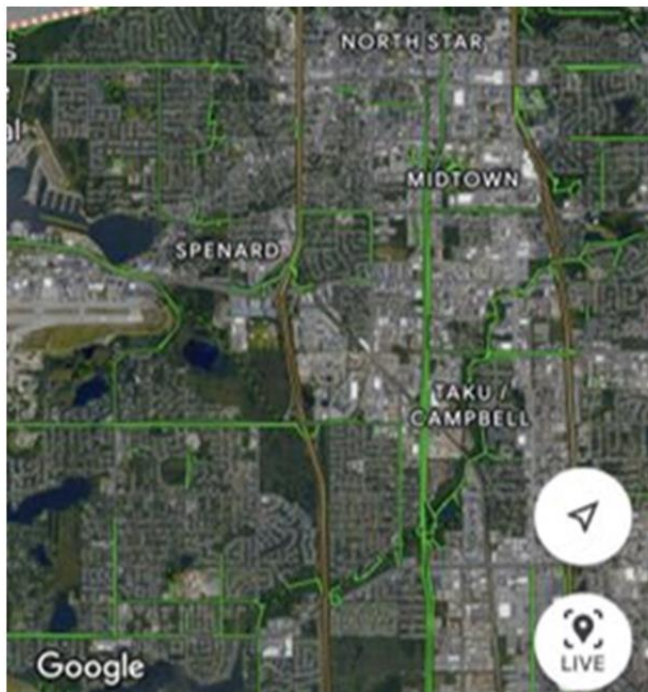
Using the Tools & Interpreting Results



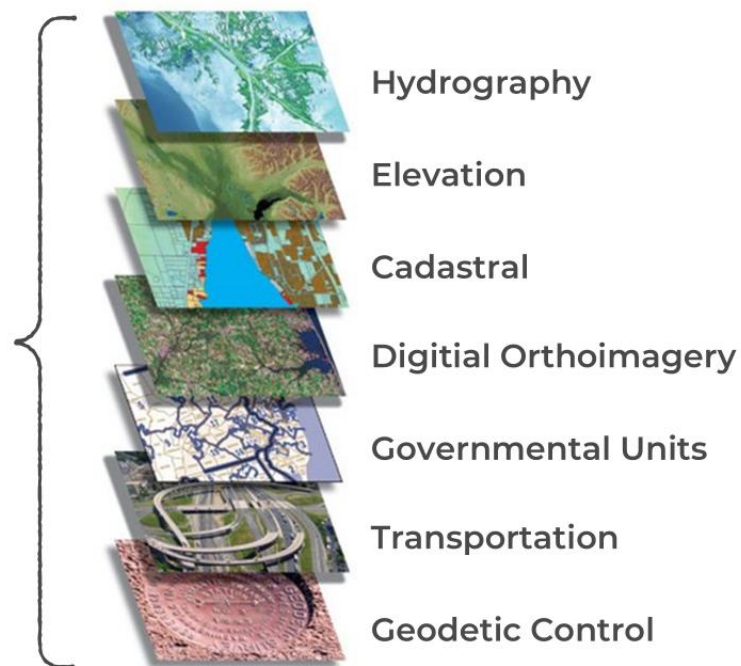
WHAT IS GIS?

GIS is a way of organizing database records by tying them to geographically synchronized slices of the world

THE REAL WORLD



GIS WORLD MODEL





THE IGIO'S MISSION

To facilitate the development, maintenance, distribution, and use of statewide geographic data to address issues affecting Indiana's physical, economic, and social well-being.

Enterprise and Infrastructure



Programs and Outreach



INDIANA GEOGRAPHIC
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➤ THE IGIO'S 2025 PRIORITIES

1

Improve Data Discovery and Access

2

Expand Support and Capacity for our Geospatial Community

3

Advance Framework Data Capabilities

Introduction to the Data Harvest Program

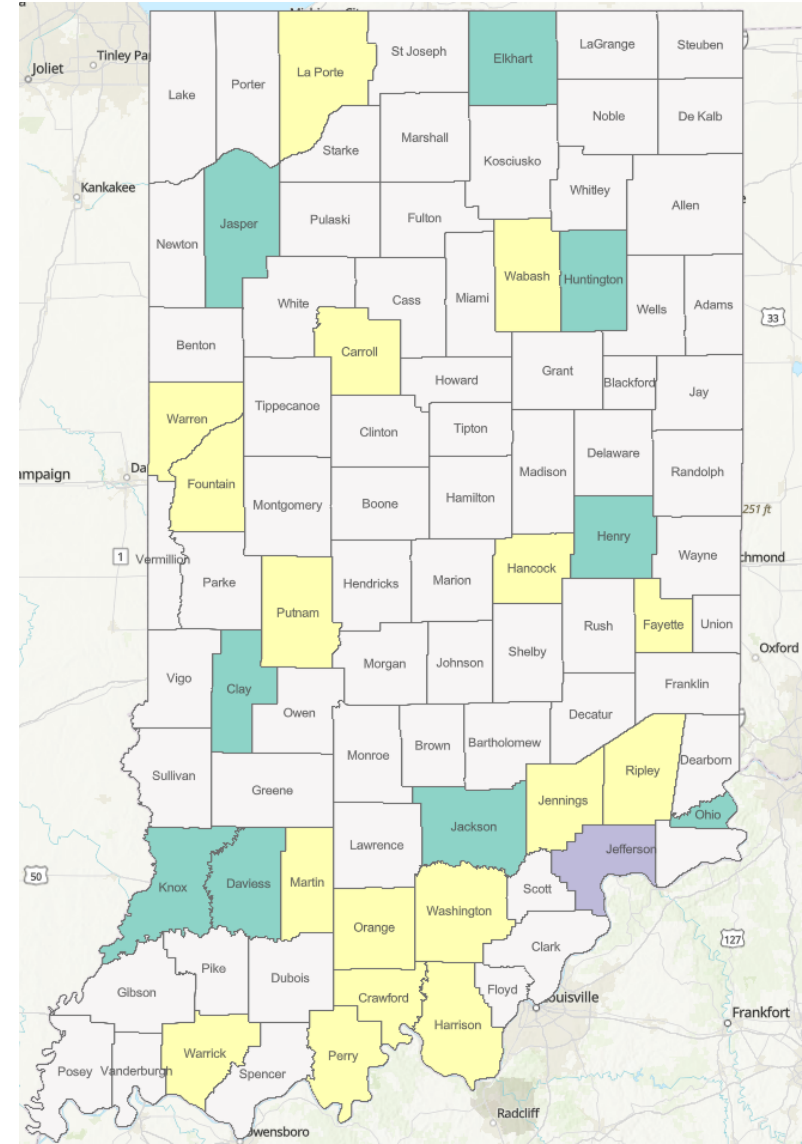
► Collecting Indiana's Geospatial Data



- Annual effort by the IGIO and participating local governments
- Began in 2008
- Took until 2014 to get 100% participation
- Datasets
 - Address Points
 - Street Centerlines
 - Parcel Boundaries
 - Administrative Boundaries (Cities/Towns, Emergency Services, etc)
- All data is publicly available through IndianaMap

Improving Indiana's Spatial Data

- Grants opened in Fall 2024
- Focused on Next-Generation 911 data conversion
Geocoding is critical for NG911 call routing
- Data validation and minimum passing scores
- About 1/3 of Indiana's counties have applied so far



| What is Geocoding?

➤ General Overview



Transforms a location's description (address, place name, etc) into geographic coordinates

- Forward vs Reverse
- Batch Capabilities

Available as APIs or downloadable files for use in various software systems

Many paid options, some free options

The IGIO's Geocoding Tools & Data Considerations



Specific Geocoding Tools

All free for unlimited use

Composite Locators

- Built from multiple participating individual locators
- Submitted locations “fall back” if matches can’t be found by each individual locator

Composite Locator

MultiRole Locator

ZIP Code, Place, & County Locator

Geocode Addresses: (Geocode/State_Geocoder_MultiRole_WGS84)

Addresses:

```
{
  "records": [
    {
      "attributes": {
        "OBJECTID": 1,
        "Address": "50 N 5th St, Richmond, IN
47374"
      }
    }
  ]
}
```

Category:

Source Country:

Match out of range: ☒ True ☐ False

Language Code:

Location Type:

Search Extent:

Output Spatial Reference:

Out Fields:

Preferred Label Values:

Format:

Geocoded Addresses:

address: 50 N 5TH ST, RICHMOND, IN, 47374
location: {"x":-84.89587499999965,"y":39.830049000000486}
score: 100

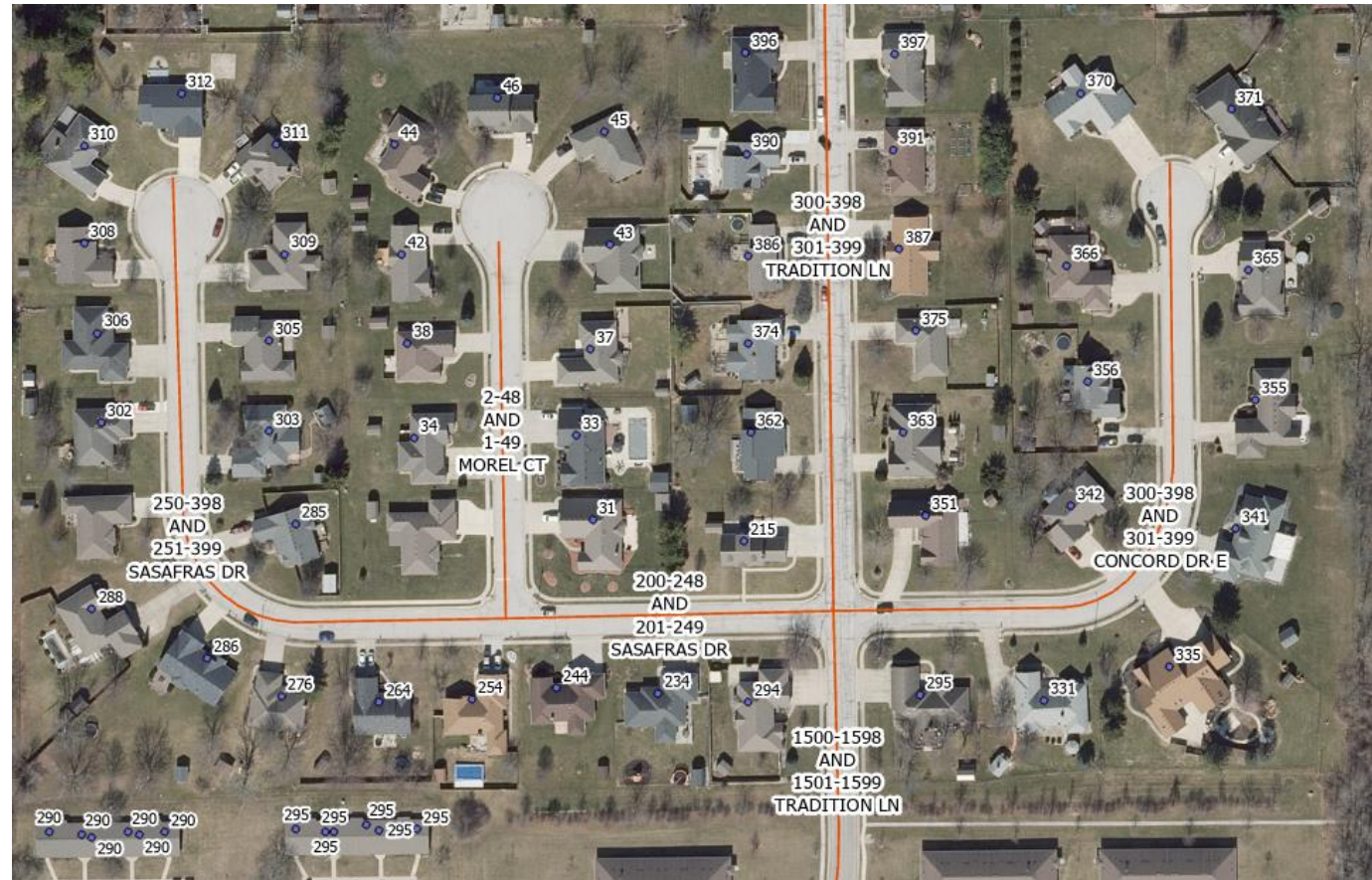
Primary Datasets Used by the Tools

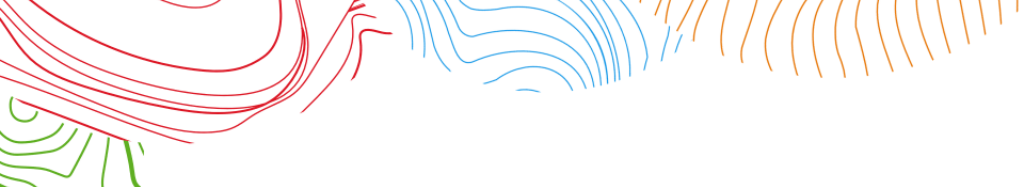
Addresses

- Point Locations
- Most similar to a set of civic addresses

Street Centerlines

- Lines representing the center of a real-world roadway
- Addresses are associated to them through a series of Left/Right attributes





Civic Address Hierarchy

Address	Best Resolution	Probably Resolution	Ambiguity	Rank
1 East Ohio Street, Unit 444, Indianapolis, IN, 46204-1912	Sub-Parcel	Sub-Parcel	None	0
1 East Ohio Street, Indianapolis, IN, 46204-1912	Parcel	Parcel	Unit, Floor	1
1 East Ohio Street, Indianapolis, IN, 46204	Parcel	Parcel	Unit, Floor, ZIP+4	2
1 Ohio Street, Indianapolis, IN 46204	Parcel	Street	Unit, Floor, Street, ZIP+4	3
Ohio Street, Indianapolis, IN 46204	Street	ZIP	Building, Unit, Floor, Street, ZIP+4	4
46204	ZIP	ZIP	Building, Unit, Floor, Street, City, ZIP+4	5
Ohio Street, Indianapolis, IN	City	City, but possibly ZIP	Building, Unit, Floor, Street, ZIP, ZIP+4	6
Indianapolis, IN	City	City	Building, Unit, Floor, Street, ZIP, ZIP+4	7
Ohio Street, IN	State	State	Building, Unit, Floor, Street, ZIP, ZIP+4	8
IN	State	State	Building, Unit, Floor, Street, ZIP, ZIP+4, City	8



Alias & Alternate Street Names

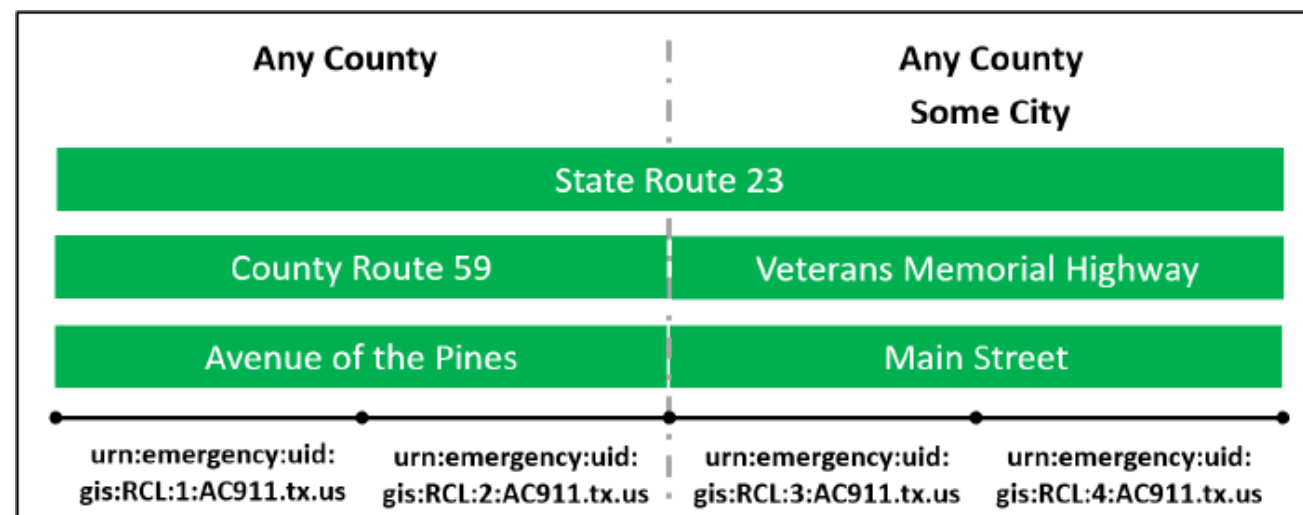
Alias

- Local governments have the authority to assign street names
- State & US Highways typically

Alternate

- How are users entering street names?
- N County Road 1000 W vs N 1000 W

How is the data integrated?



Address Point Considerations

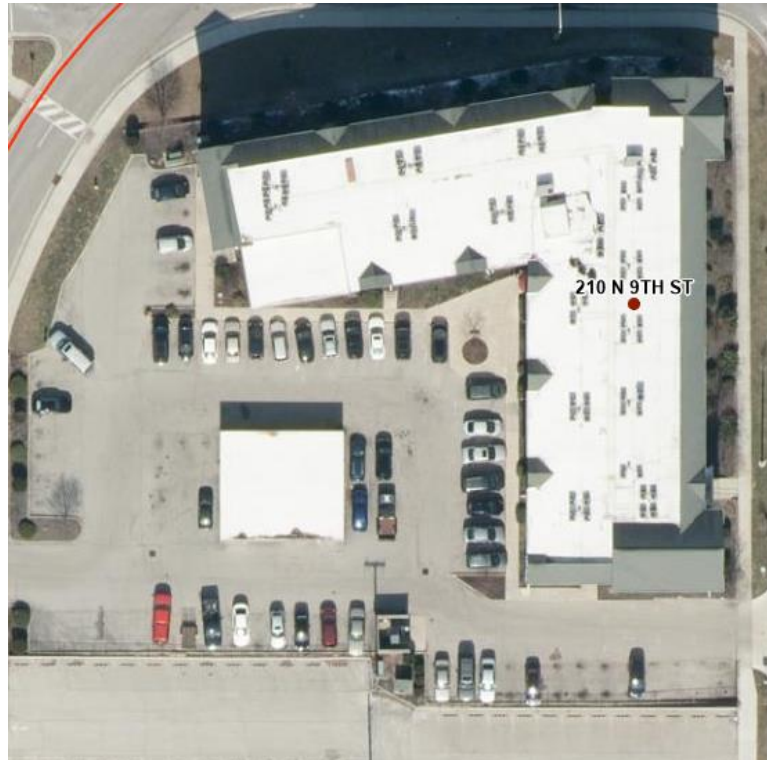
Placement Method

- Building centroid
- Parcel centroid
- Property access

Subaddresses

- Fractional addresses
- Units, Suites, etc

Jurisdictional Attributes



VS



Street Centerline Considerations

Directionality

- Every line feature has a start and end point (coordinate pair)

Parity

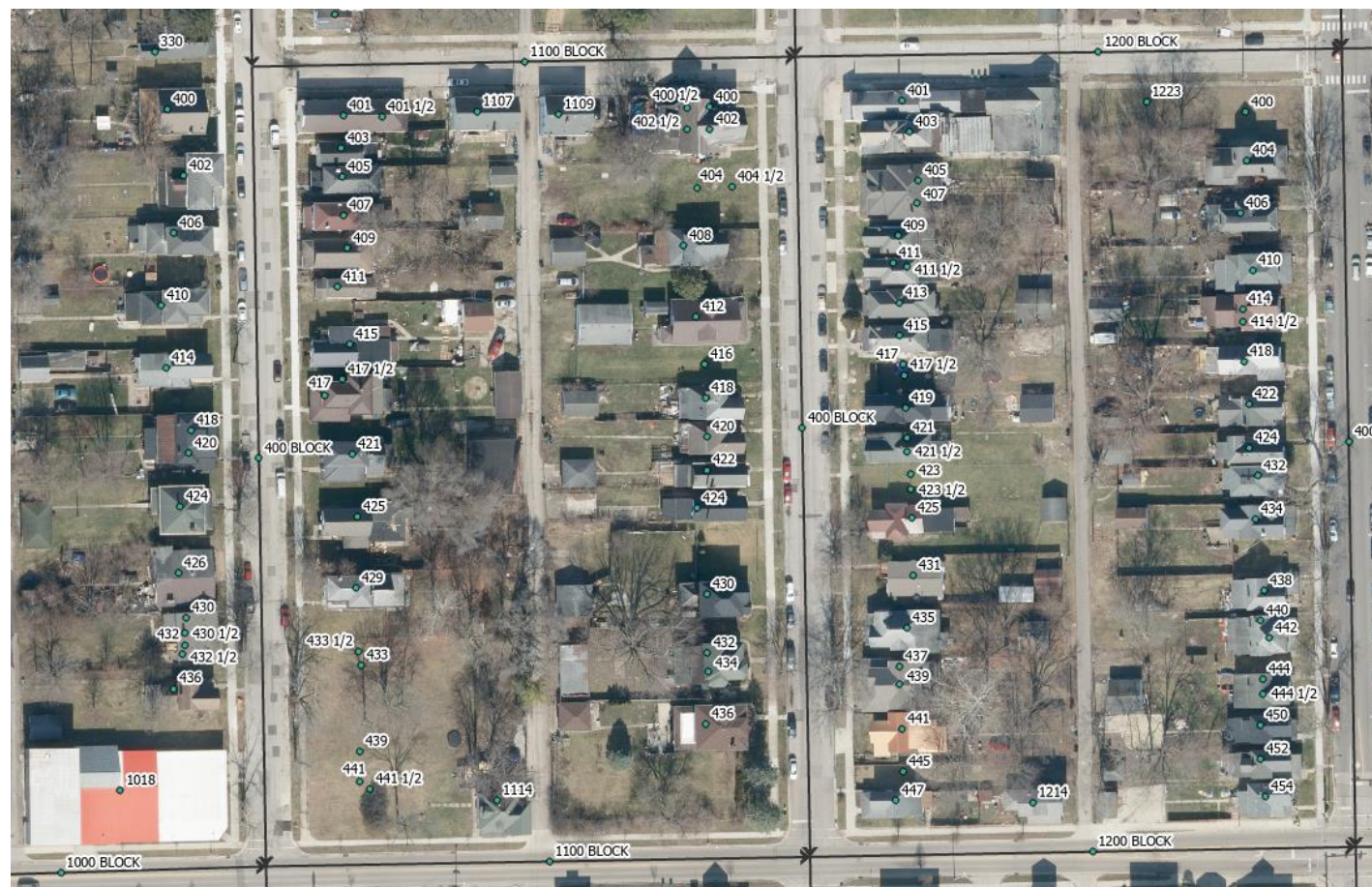
Jurisdictional Attributes

- County-supplied vs post-processed

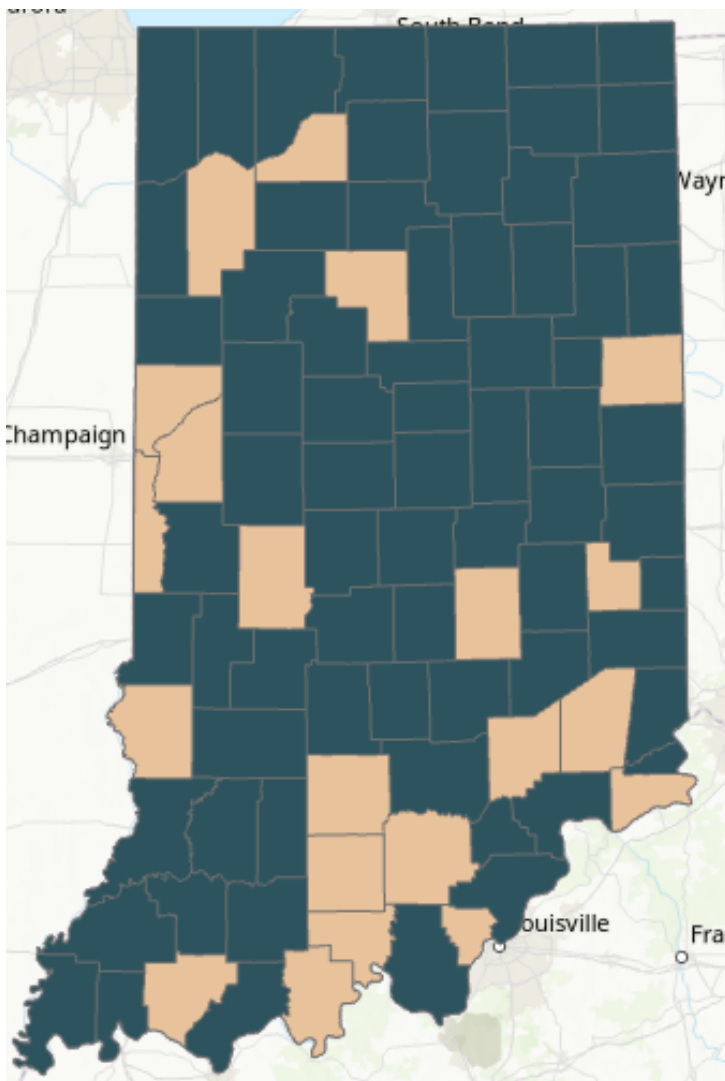
Address Range Method

- Actual – only assigned/existing addresses are attributed
- Theoretical – “block” addressing

Offsets



► Identifying Valid Data for Geocoding



Addresses

- Must have both a street name and house number

Street Centerlines

- Left and Right Address Range fields must be populated
- Must have a street name
- 23 counties have invalid data due to missing address ranges



External Data Used by the Geocoder

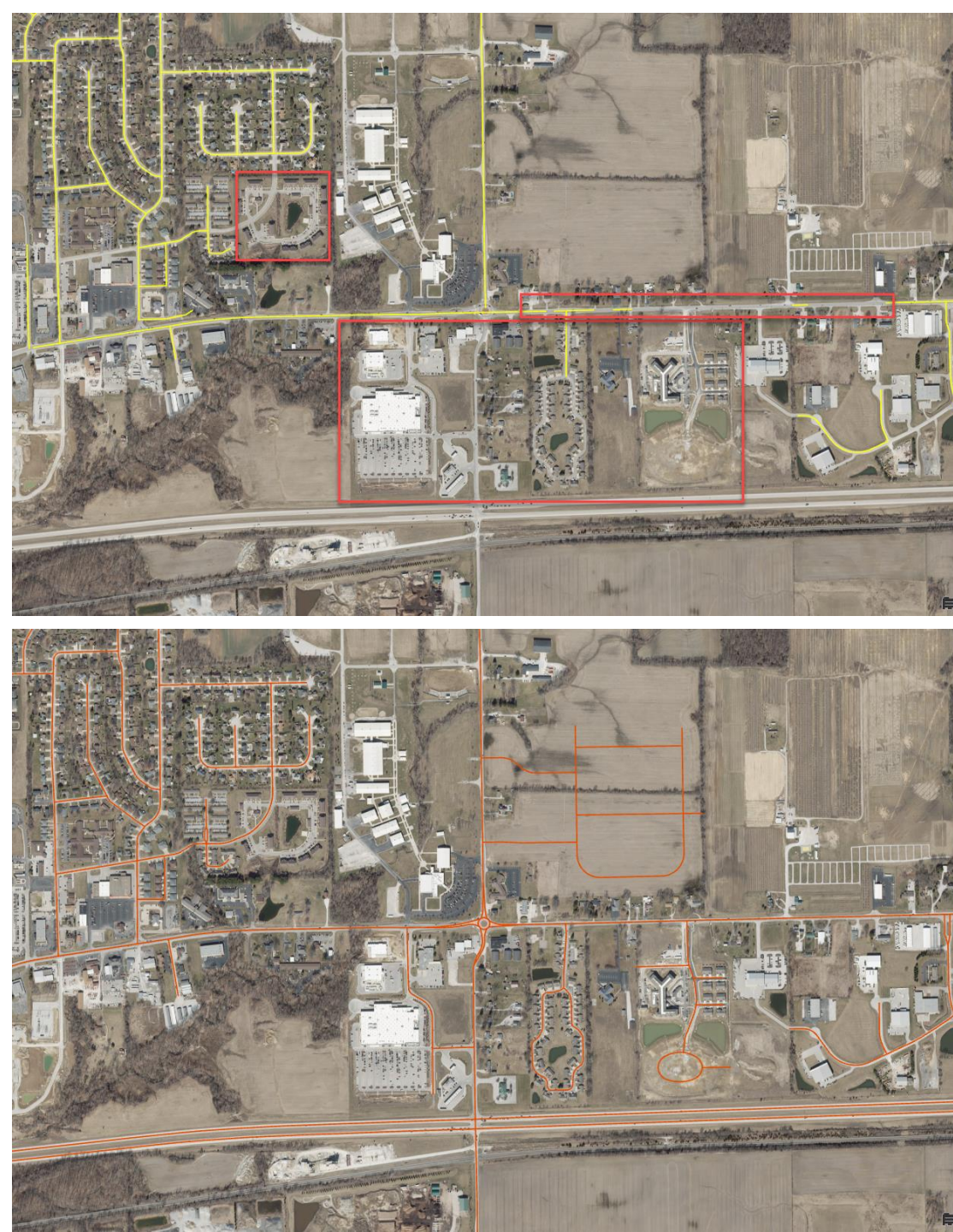
TIGER Data

- Used by the US Census to represent physical and cultural features

Data not always complete or accurately drawn at the same scale as authoritative county-maintained features

Unknown address range quality

- Data is augmented with Census MAF files



► ZIP Code Challenges

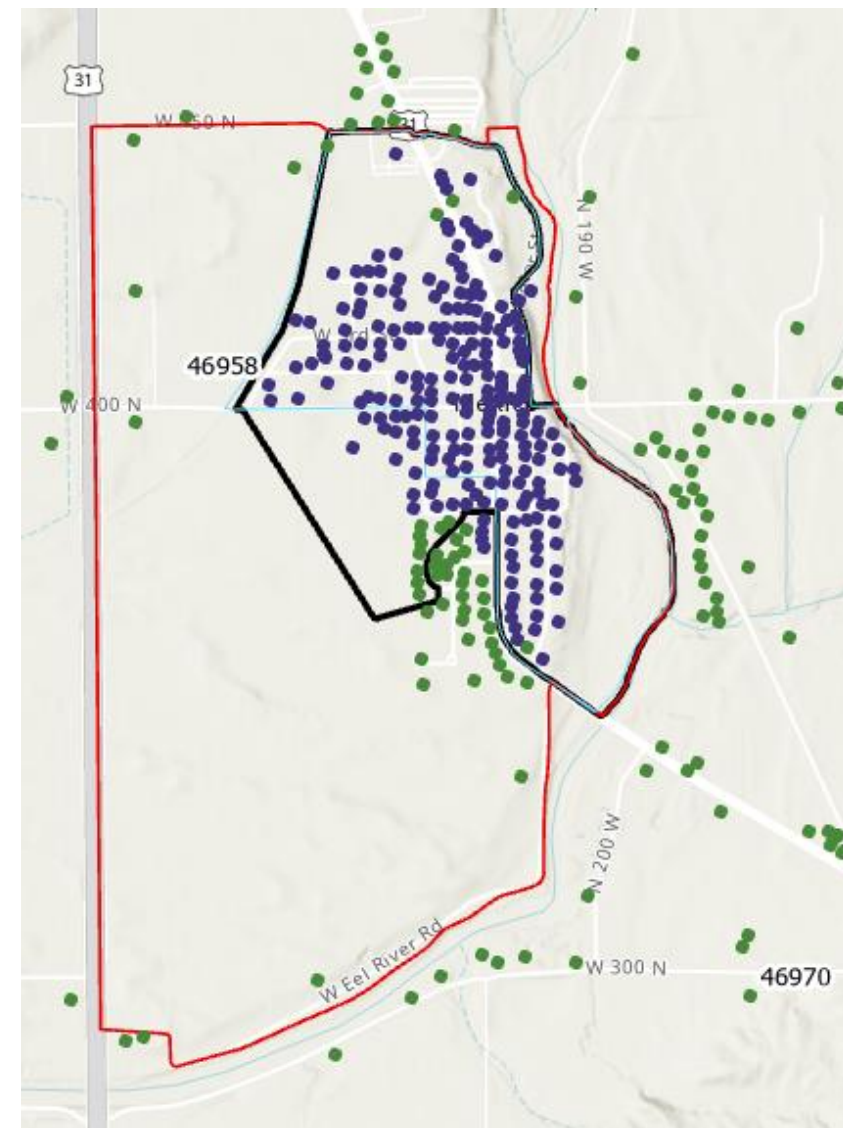
ZIP Code not included in ~1/3 of collected addresses and street centerlines

ZIP Codes

- Are sets of mail carrier routes and associated points of delivery
- Various issues with aggregating to polygon data
- USPS address validation APIs can only be used for shipping or mailing services

What source to use?

- ESRI – derived from TomTom, missing ZIP Codes
- US Census – aligned with other Census boundaries
- USPS – NAD project, generalized boundaries



Using the Geocoder & Interpreting Results



For GIS Software Users

Download

- Locator Geocoder files
- Reference geodatabase

REST API

- Available as a utility service for IGIO Portal Users
- Usable for geocoding tool requests

Locate addresses or batch geocode a database table/external file

Accessing the Geocoders

The state geocoders are available as web services, or as downloadable geocoder files. Links to these options can be found below:

Web Services

MultiRole Locator: https://gisdata.in.gov/server/rest/services/Geocode/State_Geocoder_MultiRole_WGS84/GeocodeServer

Composite Locator: https://gisdata.in.gov/server/rest/services/Geocode/State_Geocoder_WGS84/GeocodeServer

File Downloads

MultiRole Locator: [MultiRole Locator.zip](#)

Composite Locator: [Composite Locator.zip](#)

Documentation

Documentation (metadata) about the geocoder tools can be found here: [DataHarvest_2024_Geocoder_v1.pdf](#)

Documentation about how to use the geocoder can be found here: [How to Use the Indiana State Locator 092024.pdf](#). This document focuses on the MultiRole locator but the instructions are very similar for the Composite option.



For Developers

Primary Address Geocoder:

https://gisdata.in.gov/server/rest/services/Geocode/State_Geocoder_MultiRole_WGS84/GeocodeServer

Primary ZIP Code, Place, & County Geocoder:

https://gisdata.in.gov/server/rest/services/Geocode/State_Geocoder_ZIP_Place_County_WGS84/GeocodeServer

API Documentation:

<https://developers.arcgis.com/rest/geocode/>

- REST APIs
- Return results in HTML or JSON Format
- Key Functions:
 - FindAddressCandidates
 - GeocodeAddresses
 - ReverseGeocode
 - Suggest

What Information is Returned?

```
{
  "spatialReference": {
    "wkid": 4326,
    "latestWkid": 4326
  },
  "locations": [
    {
      "address": "100 N SENATE AVE, INDIANAPOLIS, IN, 46202",
      "location": {
        "x": -86.164299000000028,
        "y": 39.769047000000057
      },
      "score": 99.5,
      "attributes": {
        "ResultID": 1,
        "Loc_name": "IDSI_MultiRole",
        "Status": "M",
        "Score": 99.5,
        "Match_addr": "100 N SENATE AVE, INDIANAPOLIS, IN, 46202",
        "LongLabel": "100 N SENATE AVE, INDIANAPOLIS, IN, 46202",
        "ShortLabel": "100 N SENATE AVE",
        "Addr_type": "PointAddress",
        "Type": "",
        "PlaceName": "",
        "Place_addr": "100 N SENATE AVE, INDIANAPOLIS, IN, 46202",
        "CNTY_TAX_DIST_CD": "49101",
        "TAX_COUNTY": "MARION COUNTY",
        "TAX_TOWNSHIP": "CENTER TOWNSHIP",
        "TAX_CITY": "INDIANAPOLIS CONSOLIDATED CITY",
        "TAX_SCHOOL": "INDIANAPOLIS PUBLIC SCHOOL CORPORATION",
        "TAX_LIBRARY": "INDIANAPOLIS-MARION COUNTY PUB LIBRARY",
        "TAX_SPECIAL": "INDIANAPOLIS SANITATION (SOLID);INDIANAPOLIS POLICE SPECIAL SERVICE;INDIANAPOLIS FIRE SPECIAL SERVICE;INDIANAPOLIS PUBLIC TRANSPORTATION;MARION COUNTY HEALTH AND HOSPITAL;MARION COUNTY AIRPORT;INDIANAPOLIS CONSOLIDATED CITY;INDIANAPOLIS CONSOLIDATED COUNTY;CAPITAL IMPROVEMENT BD OF MARION COUNTY",
        "NEAREST_STATE_PARCEL_ID": "491102251142000101",
        "NEAREST_STATE_PARCEL_ID_DIST": 0
      }
    }
  ]
}
```

Locator Name

Status

Address Type

Jurisdictional Information

Parcel-Level Information for address point matches



Improving Geocoder Quality

County	% Matched	% Matched to Multirole	% Matched to Good Multirole Address Type	% Matched to TIGER	Average MultiRole Line Distance	Average TIGER Line Distance
Adams	98.33%	98.03%	97.08%	0.58%	0.05	2.71
Allen	99.29%	99.00%	98.65%	0.31%	0.02	1.35
Bartholomew	98.23%	98.02%	97.59%	0.36%	0.02	0.57
Benton	93.61%	93.61%	93.14%	0.20%	0.03	0.02
Blackford	98.02%	92.86%	92.05%	5.16%	0.09	0.32
Boone	98.88%	98.66%	98.33%	0.22%	0.01	0.74
Brown	92.49%	92.34%	91.85%	0.15%	0.03	0.03
Carroll	95.58%	93.76%	93.33%	1.82%	0.06	1.28
Cass	96.08%	87.68%	87.54%	8.40%	0.37	1.5
Clark	97.15%	96.55%	95.93%	0.60%	0.01	1.54
Clay	95.62%	90.83%	90.81%	4.79%	0.05	0.97
Clinton	96.08%	94.95%	94.75%	1.13%	0.14	1.59
Crawford	95.65%	91.46%	91.46%	4.19%	0.01	0.27
Daviess	97.07%	96.44%	95.83%	0.64%	0.18	2.95
Dearborn	98.26%	96.32%	95.75%	1.94%	0.02	0.6
Decatur	94.48%	93.73%	92.99%	0.76%	0.29	1.01
DeKalb	97.37%	96.88%	96.63%	0.50%	0.01	0.41
Delaware	97.53%	97.01%	96.68%	0.53%	0.04	1.54
Dubois	97.81%	96.78%	96.41%	1.03%	0.14	1.44
Elkhart	97.22%	96.56%	96.25%	0.66%	0.01	0.59
Fayette	98.92%	95.47%	95.34%	3.45%	0.07	0.66
Floyd	98.71%	96.82%	92.29%	1.89%	0.02	0.7
Fountain	96.11%	91.27%	91.22%	4.83%	0.02	0.45
Franklin	95.71%	94.79%	94.27%	0.92%	0.02	0.3
Fulton	94.61%	92.25%	95.25%	2.36%	0.03	0.4
Gibson	96.73%	96.14%	95.29%	0.59%	0.03	0.66
Grant	96.54%	94.66%	96.68%	1.89%	0.02	0.56
Greene	97.12%	96.31%	96.09%	0.81%	0.03	0.79
Hamilton	99.14%	98.96%	98.70%	0.18%	0.01	1
Hancock	99.07%	98.81%	98.62%	0.26%	0.01	0.8

MultiRole locator solves many matching issues

Continued data analysis with DOR

2024 Comparison w/ Precisely
166k addresses

2025 Comparison w/ ESRI
2.7 million addresses

Finding ways to provide feedback to counties



Tips for Better Results

Enable/Disable Certain Address Types

- Varying level of accuracy between address types
- Is the center of a street name in a jurisdiction enough accuracy for your needs?

Don't Use Composite/MultiRole locator for PO Boxes

- PO Boxes are deliverable, but not typical physical addresses
- Use Boundary-level geocoder to match to ZIP codes

Include ZIP Code Data in Addresses

Separate ZIP+4 by a – character or parse into a second field

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