

FHWA's Functional Classification and Adjusted Urban Area Boundary Guidelines



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Joseph Hausman and Supin Yoder
FHWA Office of Planning
Systems Planning & Analysis Team



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Highway Functional Classification Concepts, Criteria and Procedures



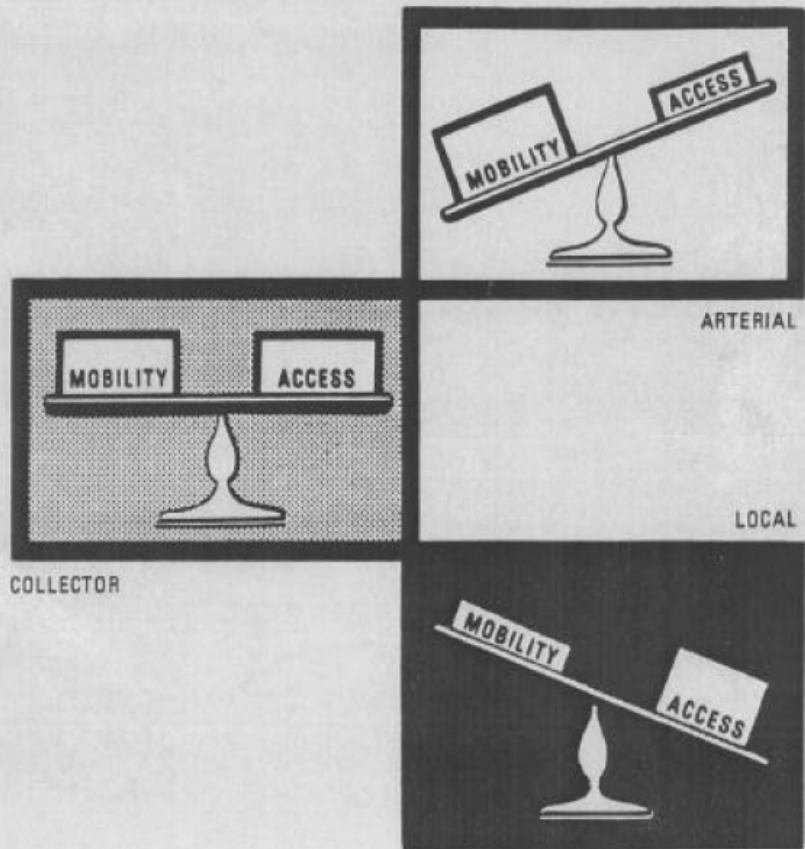
2013 Edition

https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/

Overview

Highway Functional Classification

Concepts, Criteria and Procedures



- 2013 Guidelines are a refresh, not a departure
- Acknowledges advances in mapping technologies and analysis capabilities
- Introduces relationship of design and functional classification
- Geared towards everyday practitioners and interested professionals



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Document Overview

- Builds on 1989 document and 2008 interim guidance
- Provides tangible “how to” – process and technical tasks
 - Clarifies what is mandatory and what is not
- Describes concepts and ideas behind functional classification
 - Describes influence of functional class and factors that have an influence on functional class

Contents

	Rural	Urban
1	Principal Arterial – Interstate	Principal Arterial - Interstate
2	Principal Arterial - Other Freeways & Expressways	Principal Arterial - Other Freeways & Expressways
3	Principal Arterial – Other	Principal Arterial – Other
4	Minor Arterial	Minor Arterial
5	Major Collector	Major Collector
6	Minor Collector	Minor Collector
7	Local	Local

- How and where functional classification is used
- Definition of functional classifications
 - Retained original terms
 - Minimized urban and rural distinctions
 - Introduced OFE/minor and major collectors for all areas
- Description of mobility and access
- Updated mileage and VMT distribution ranges



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What's Changed?

- Federal Aid system is mature
- For States, level of coordination for decision-making is high and increasing
- Geospatial technologies and data acquisition capabilities have grown considerably
- Roadway design options have increased, to accommodate non-auto modes

Guidance Highlights



Other Principal Arterial in California



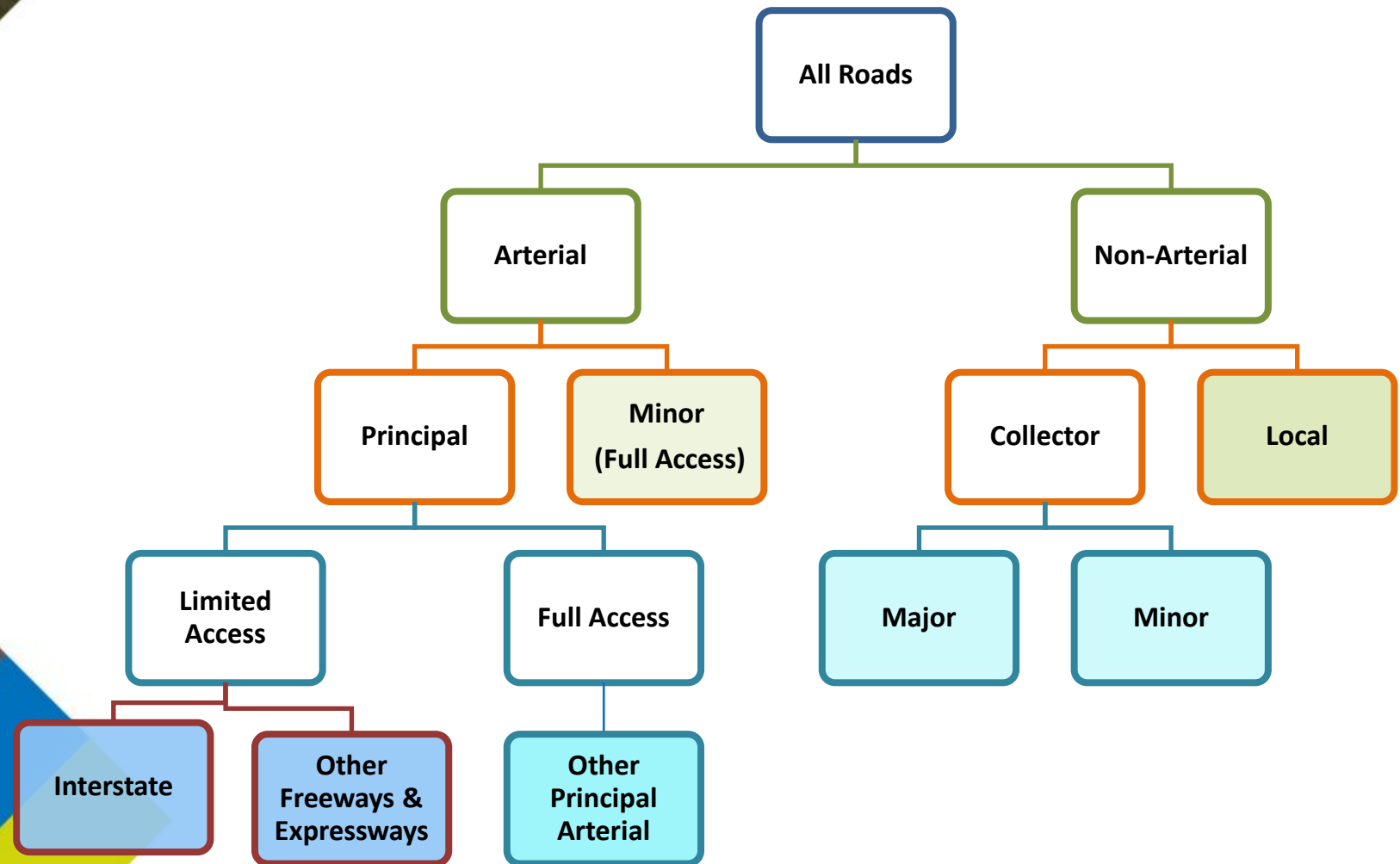
HOV lane on Interstate 95 in Woodbridge, VA

- Urban and rural demarcation defined by function not urban area boundary
- All functional classification exist in urban and rural categories
 - New Urban Minor Collector
- “Rule of Thumb” recommendations on VMT and mileage distributions
- Future roads – include only if in STIP
- Assign same FC to ramps as highest FC of connecting roadways

Functional Classification (FC) Decision Tree



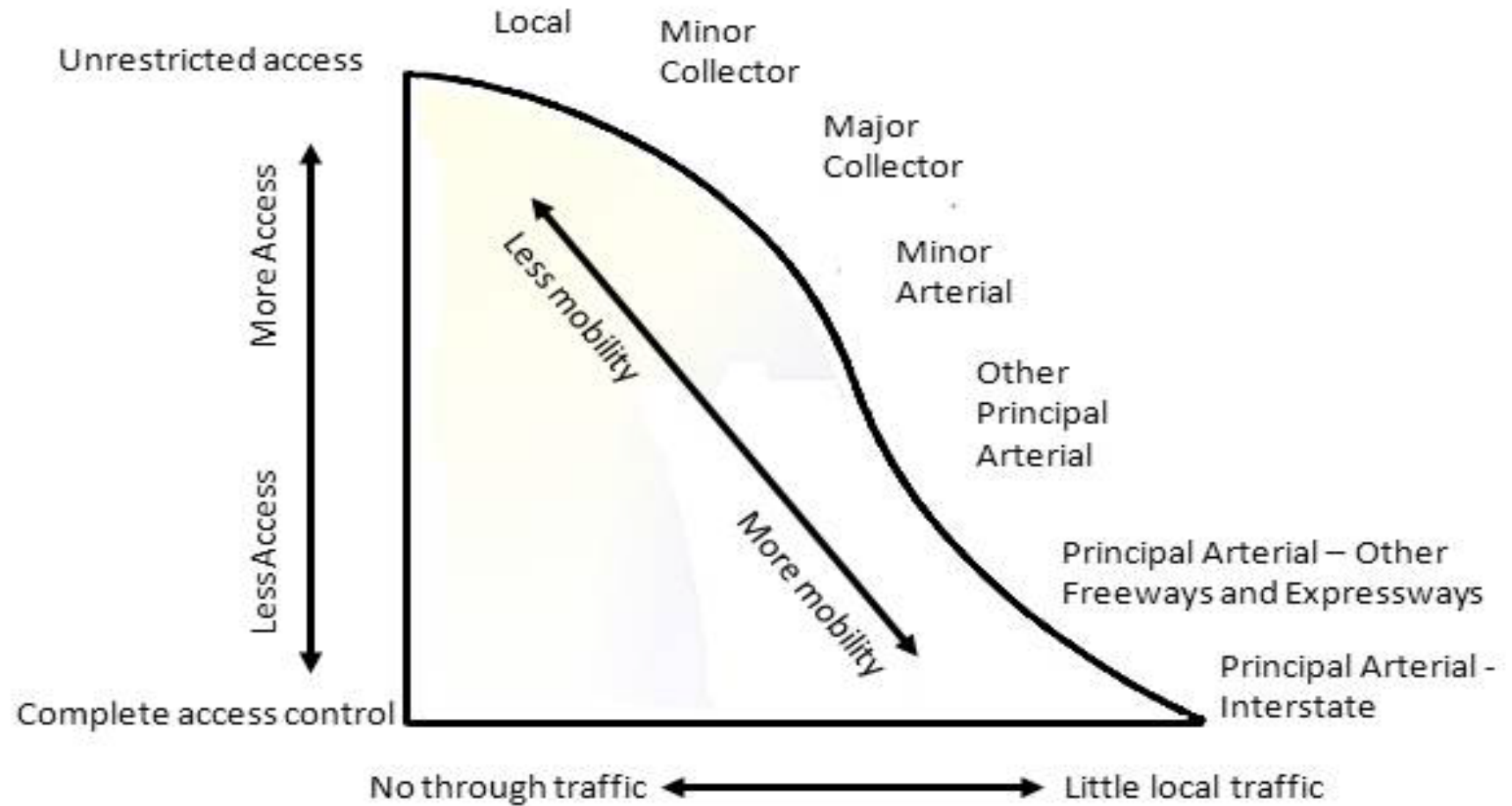
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Mobility vs. Accessibility





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FC Concepts - Mobility



Eisenhower (and Johnson) Tunnels along
I-70, west of Denver, CO



Inside the Eisenhower Tunnel



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FC Concepts - Access

Eisenhower Court

- Mobility: Few opportunities for entry and exit and low travel friction
- Accessibility function: Provides many opportunities for entry and exit; higher travel friction





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FC Influencers

Trip length: Longer trips – More Principal Arterial use.
Shorter trips – more Local/Collector use.

Access points: In theory, Surface Arterials provide the least access for-grade roads – Access Management tries to preserve function.

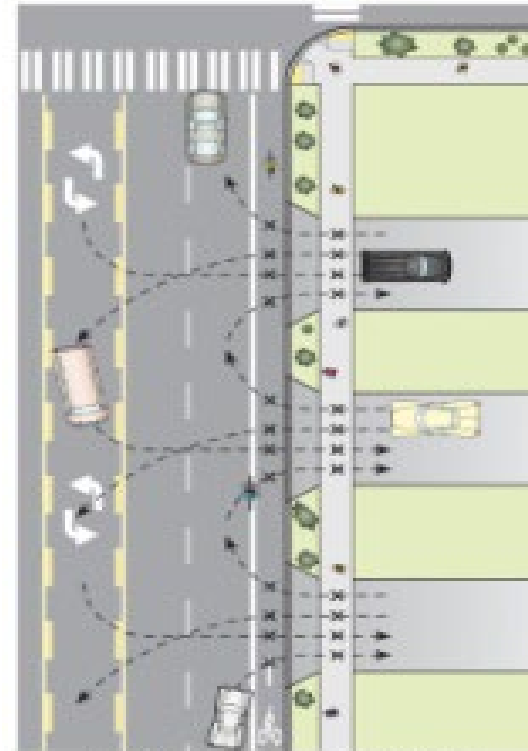
Speed limit

Route spacing

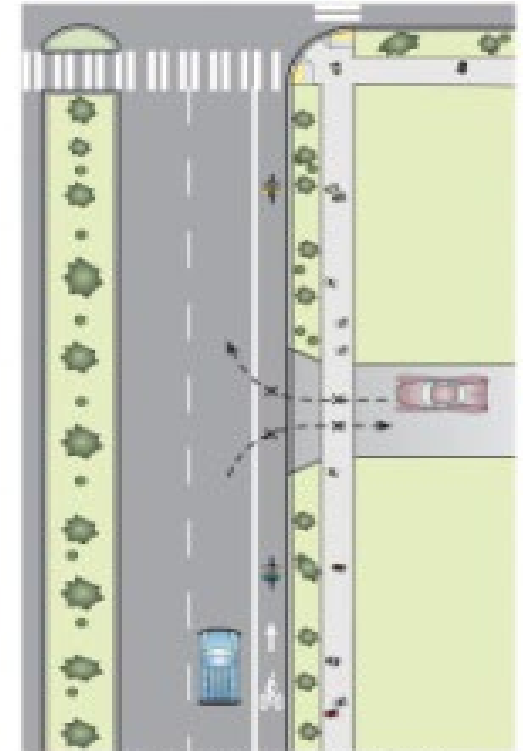
Usage / traffic volume

Number of lanes

Connections to activity centers



Uncontrolled accesses create 8 potential conflict points at every driveway.



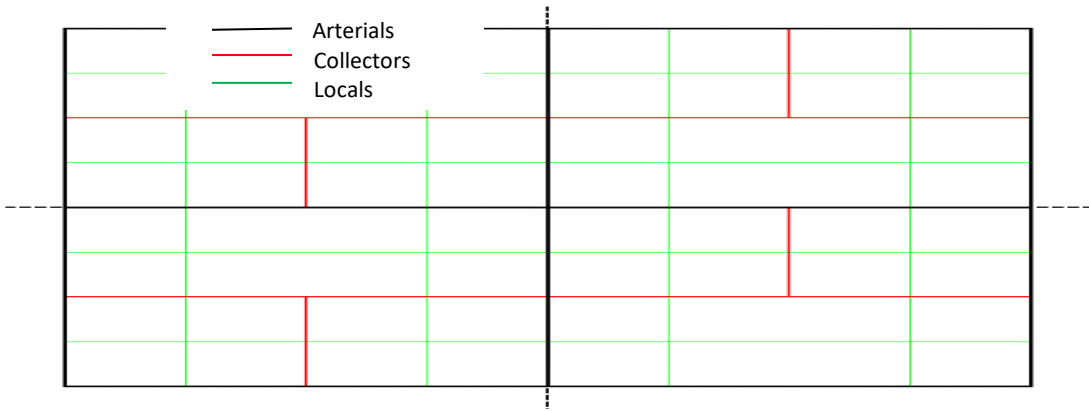
A raised median and consolidating driveways reduce conflict points.

FC Concepts: Continuity



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- A roadway of a higher classification should not terminate at a single roadway of a lower classification.
- Of course there are exceptions...





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Principal Arterials Characteristics

Urban	Rural
<ul style="list-style-type: none">• Serve major activity centers, highest traffic volume corridors and longest trip demands• Carry high proportion of total urban travel on minimum of mileage• Interconnect and provide continuity for major rural corridors to accommodate trips entering and leaving urban area and movements through the urban area• Serve demand for intra-area travel between the central business district and outlying residential areas	<ul style="list-style-type: none">• Serve corridor movements having trip length and travel density characteristics indicative of substantial statewide or interstate travel• Connect all or nearly all Urbanized Areas and a large majority of Urban Clusters with 25,000 and over population• Provide an integrated network of continuous routes without stub connections (dead ends)



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Minor Arterials- Characteristics

Urban

- **Interconnect and augment the higher-level Arterials**
- **Serve trips of moderate length at a somewhat lower level of travel mobility than Principal Arterials**
- **Distribute traffic to smaller geographic areas than those served by higher-level Arterials**
- **Provide more land access than Principal Arterials without penetrating identifiable neighborhoods**
- **Provide urban connections for Rural Collectors**

Rural

- Link cities and larger towns (and other major destinations such as resorts capable of attracting travel over long distances) and form an integrated network providing interstate and inter-county service
- Be spaced at intervals, consistent with population density, so that all developed areas within the State are within a reasonable distance of an Arterial roadway
- Provide service to corridors with trip lengths and travel density greater than those served by Rural Collectors and Local Roads and with relatively high travel speeds and minimum interference to through movement



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Major Collectors- Characteristics

Urban

- Serve both land access and traffic circulation in higher density residential, and commercial/industrial areas
- Penetrate residential neighborhoods, often for significant distances
- Distribute and channel trips between Local Roads and Arterials, usually over a distance of greater than three-quarters of a mile
- Operating characteristics include higher speeds and more signalized intersections

Rural

- Provide service to any county seat not on an Arterial route, to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intra-county importance such as consolidated schools, shipping points, county parks and important mining and agricultural areas
- Link these places with nearby larger towns and cities or with Arterial routes
- Serve the most important intra-county travel corridors



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Minor Collectors- Characteristics

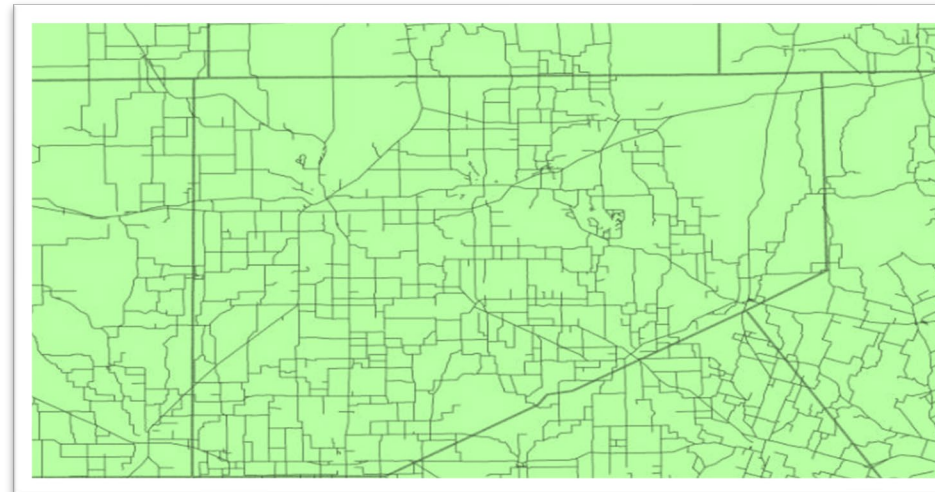
Urban	Rural
<ul style="list-style-type: none">• Provide direct access to adjacent land• Provide access to higher systems• Carry no through traffic movement• Constitute the mileage not classified as part of the Arterial and Collector systems	<ul style="list-style-type: none">• Primarily, provide access to adjacent land• Provide service to travel over short distances as compared to higher classification categories• Constitute the mileage not classified as part of the Arterial and Collector systems



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FC – Typical Rural and Urban Distinctions

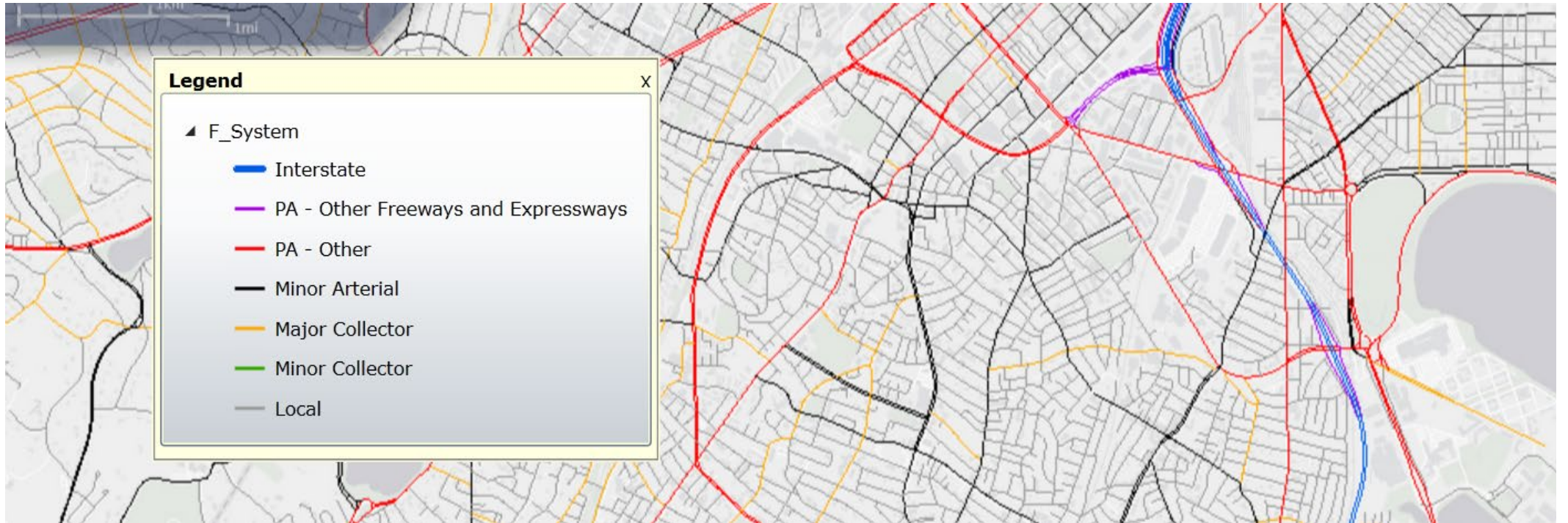
- Urban area networks more diverse
 - Greater variety in density, land use
 - Generally, stronger land use controls
- Rural area networks less diverse
 - Less variety in density, land use, less zoning control





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Boston, MA

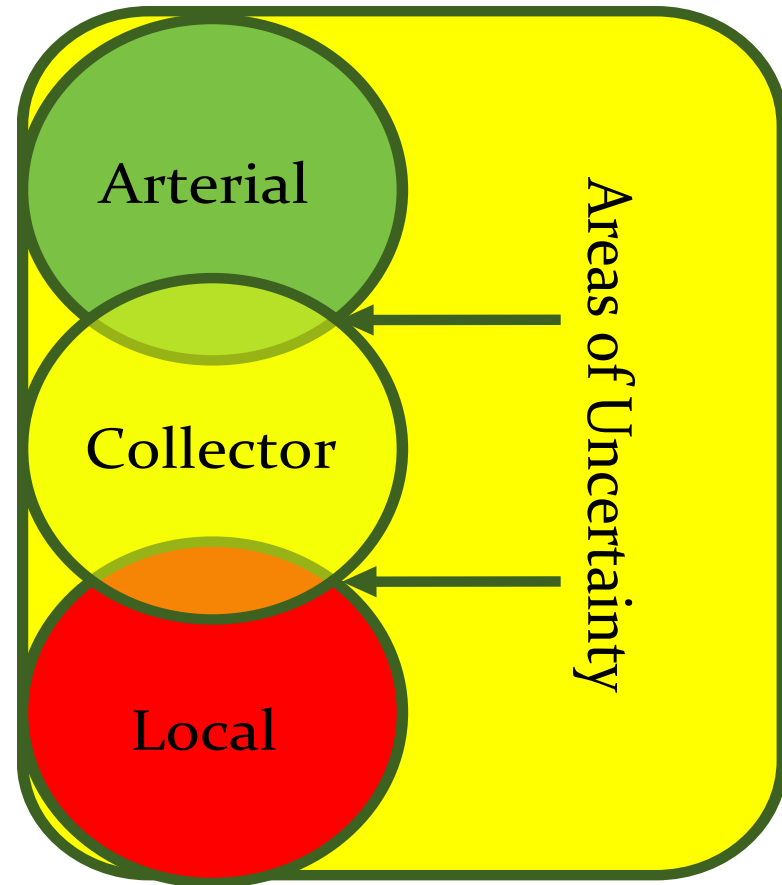


FC – Flexibility and Overlap



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- Common sense should be guide
- Look at over all distribution and spacing when in doubt
- Be consistent with community standards





FC – Typical Characteristics

Typical Characteristics	Interstate	Other Freeways and Expressways	Other Principal Arterials	Minor Arterials
Lane Width	12 feet	11 - 12 feet	11 - 12 feet	10 feet - 12 feet
Inside Shoulder Width	4 feet - 12 feet	0 feet - 6 feet	0 feet	0 feet
Outside Shoulder Width	10 feet - 12 feet	8 feet - 12 feet	8 feet - 12 feet	4 feet - 8 feet
AADT (Rural)	12,000 - 34,000	4,000 - 18,500	2,000 - 8,500	1,500 - 6,000
AADT (Urban)	35,000 - 129,000	13,000 - 55,000	7,000 - 27,000	3,000 - 14,000
Divided/Undivided	Divided	Undivided/ Divided	Undivided/ Divided	Undivided
Access	Fully Controlled	Partially/Fully Controlled	Partially/Fully Controlled	Uncontrolled



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FC – Mileage/VMT Guidelines (Rural System)

Typical Characteristics	Interstate	Other Freeways and Expressways	Other Principal Arterials	Minor Arterials
Mileage Extent for Rural States	1% - 3%	0% - 2%	2% - 6%	2% - 6%
Mileage Extent for Urban States	1% - 2%	0% - 2%	2% - 6%	3% - 7%
Mileage Extent for All States	1% - 2%	0% - 2%	17% - 36%	3% - 7%
VMT Extent for Rural States	18% - 38%	0% - 7%	15% - 31%	9% - 20%
VMT Extent for Urban States	18% - 34%	0% - 8%	12% - 29%	12% - 19%
VMT Extent for All States	20% - 38%	0% - 8%	14% - 30%	11% - 20%



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FC – Mileage/VMT Guidelines (Urban System)

Typical Characteristics	Interstate	Other Freeways and Expressways	Other Principal Arterials	Minor Arterials
Mileage Extent for Rural States	1% - 3%	0% - 2%	4% - 9%	7% - 14%
Mileage Extent for Urban States	1% - 2%	0% - 2%	4% - 5%	7% - 12%
Mileage Extent for All States	1% - 3%	0% - 2%	4% - 5%	7% - 14%
VMT Extent for Rural States	17% - 31%	0% - 12%	16% - 33%	14% - 27%
VMT Extent for Urban States	17% - 30%	3% - 18%	17% - 29%	15% - 22%
VMT Extent for All States	17% - 31%	0% - 17%	16% - 31%	14% - 25%



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FC – Mileage/VMT Guidelines

Typical Characteristics	Major Collector	Minor Collector	Local
Lane Width	10 feet - 12 feet	10 - 11 feet	8 - 10 feet
Inside Shoulder Width	0 feet	0 feet	0 feet
Outside Shoulder Width	1 feet - 6 feet	1 feet - 4 feet	0 feet - 2 feet
AADT (Rural)	300 - 2,600	150 - 1,110	15 - 400
AADT (Urban)	1,100 - 6,300 ²		80 - 700
Divided/Undivided	Undivided	Undivided	Undivided
Access	Uncontrolled	Uncontrolled	Uncontrolled



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FC – Mileage/VMT Guidelines

Mileage/VMT Extent (Percentage Ranges)	Major Collector	Minor Collector	Local
Rural System			
Mileage Extent for Rural States	8% - 19%	3% - 15%	62% - 74%
Mileage Extent for Urban States	10% - 17%	5% - 13%	66% - 74%
Mileage Extent for All States	9% - 19%	4% - 15%	64% - 75%
VMT Extent for Rural States	10% - 23%	1% - 8%	8% - 23%
VMT Extent for Urban States	12% - 24%	3% - 10%	7% - 20%
VMT Extent for All States	12% - 23%	2% - 9%	8% - 23%
Urban System			
Mileage Extent for Rural States	3% - 16%		62% - 74%
Mileage Extent for Urban States	7% - 13%		67% - 76%
Mileage Extent for All States	7% - 15%		63% - 75%
VMT Extent for Rural States	2% - 13%	2% - 12%	9% - 25%
VMT Extent for Urban States	7% - 13%		6% - 24%
VMT Extent for All States	5% - 13%		6% - 25%



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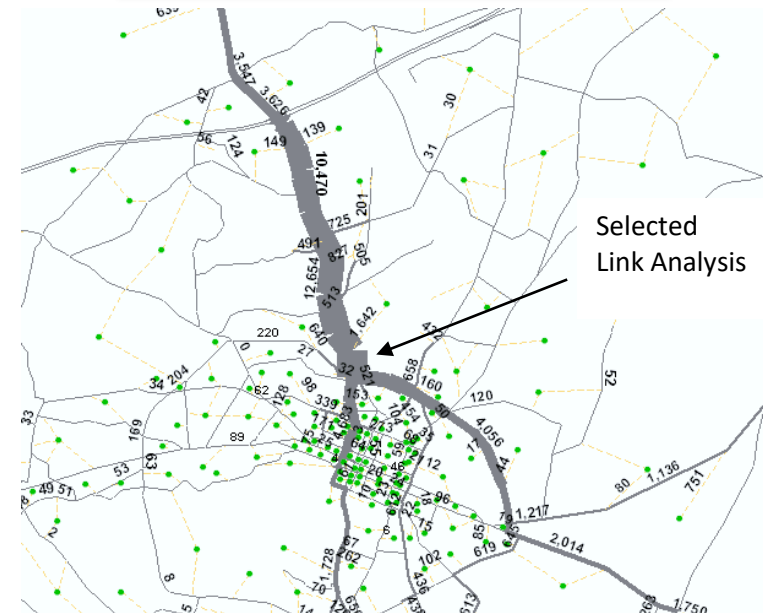
FC Update Triggers

- New significant roadways that may warrant Arterial or Collector status
- Any Principal Arterial roadway reconstructed as a divided facility
- Construction of major development that has caused traffic patterns to change
- Significant growth that causes new access or mobility needs
- Arterial or Collector roadways been extended or to attract more through trip movements?
- Significant growth in daily traffic volumes?

FC – Validation/Review

- Use of GIS

- Identify traffic generators/activity centers
- Rank / estimate traffic generated
- Connect with roadway system/validate FC
- Travel demand models (Select Link Analysis) can estimate the origin and destination of trips on a facility
- Results of GIS-based mapping and editing should synch up with enterprise data systems





FC Good Practice - Steps/Schedule

Create a multi-agency review team- stay in touch

Build/share understanding of game plan

Generate maps and share electronically – use GIS if at all possible

Encourage/work towards timely delivery of FC revisions


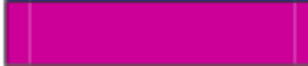

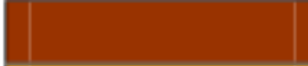



Event	Month Following FHWA Adjusted Urban Area Boundary Approval
State DOT launches the formal Functional Classification update process after FHWA approves the State's adjusted urban area boundaries	Month 1
State DOT works with planning partners to review and propose changes to the functional classification of its roadways	Months 2-17
State DOT gathers and processes all proposed function classification changes and submit draft final data and/or maps to FHWA division office for review	Months 18-20
DOT incorporates updates into planning process and related databases, to ensure submittal of updated functional classification in upcoming June 15 th HPMS submittal	Months 22-24



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Map Colors

Figure 4-3 Sample Roadway Color Scheme

	Interstate	1
	Other Freeways and Expressways	2
	Other Principal Arterial	3
	Minor Arterial	4
	Major Collector	5
	Minor Collector	6
	Local	7



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Urban Area - Urban/Rural Definition



https://www.fhwa.dot.gov/planning/census_issues/



2020 Census Urban Area Boundary Release Schedule



Boundaries Released 12/29/2022



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Summaries of Final Criteria for Delineating 2020 Census Urban Areas

- Increase the **minimum population threshold** from 2,500 to 5,000
- Include additional housing unit (≥ 2000) parameter to qualify as an Urban Area:
- Use **housing unit** density instead of population density to define initial Urban Area Cores
- Use only **Census Block** instead of Census Tract & Block to define initial Urban Area Cores
- Reduce the maximum jump distance from 2.5 miles to 1.5 miles
- Exclude the low density Hop or Jump corridors
- Cease distinguishing between urbanized areas and urban clusters
- Use LEHD worker flow data to determine whether to merge or split between 2010 urban areas



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2010 & 2020 Census Urban Area Thresholds

2010 Census Urban Area Definition

Census Bureau Urban Area Definition	Population Range
Urban Areas	2,500+
-- Urban Clusters	2,500-49,999
-- Urbanized Areas	50,000+

2020 Census Urban Area Definition

Census Bureau Urban Area Definition	Population	Housing Units
Urban Areas	5,000	or 2,000
-- Urban Clusters	No longer distinguishing between the two types of urban areas	
-- Urbanized Areas	No longer distinguishing between the two types of urban areas	



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2010 and 2020 Initial Urban Area Cores/Low Density Fill

Census Bureau Urban Areas	Population Density	Housing Units Density	Analysis Unit
2010 Initial Urban Area Cores	1000/500		Census Tract & Block
2020 Initial Urban Area Cores	**	1275*/425/200	Census Block

* **A high-density nucleus** is defined as a collection of blocks (Eligible Block Aggregations), with at least 500 housing units where each census block has density of at least 1,275 housing unit.

** Census Blocks that contain a **group quarter** and has a **population density of 500** adjacent to already qualified blocks will be included.



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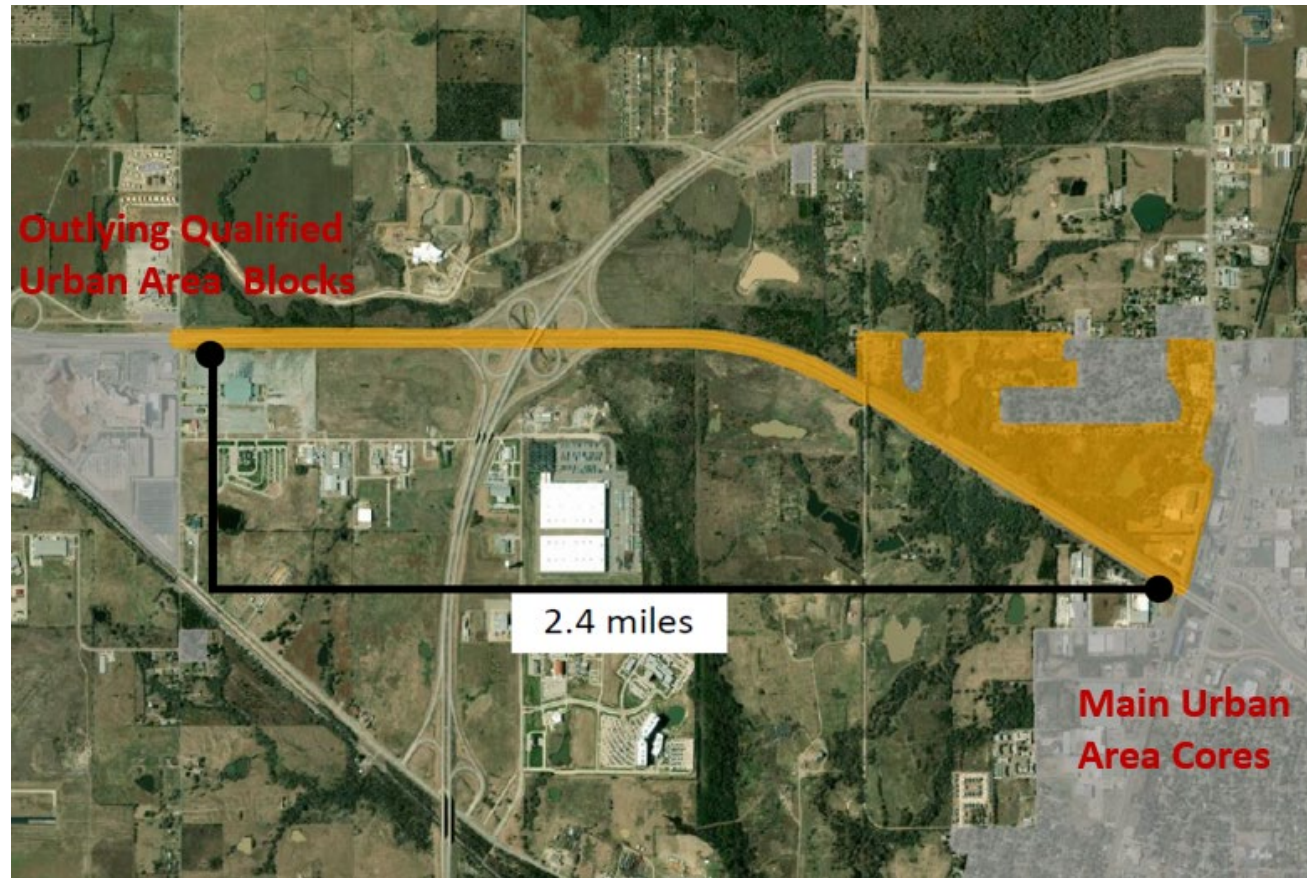
Potential Benefits of Using Housing Unit Density

- Better measurement of built environment. Housing Units include both occupied and vacant units, consistent with using impervious surfaces to define commercial and other non-residential urban land uses.
- Census Block level housing unit counts are invariant – the new 2020 Differential Privacy methodology applies only to population counts, not housing unit counts.
- Ability to update urban areas between censuses.

Reducing Maximum Distance of Jumps from 2.5 to 1.5 miles



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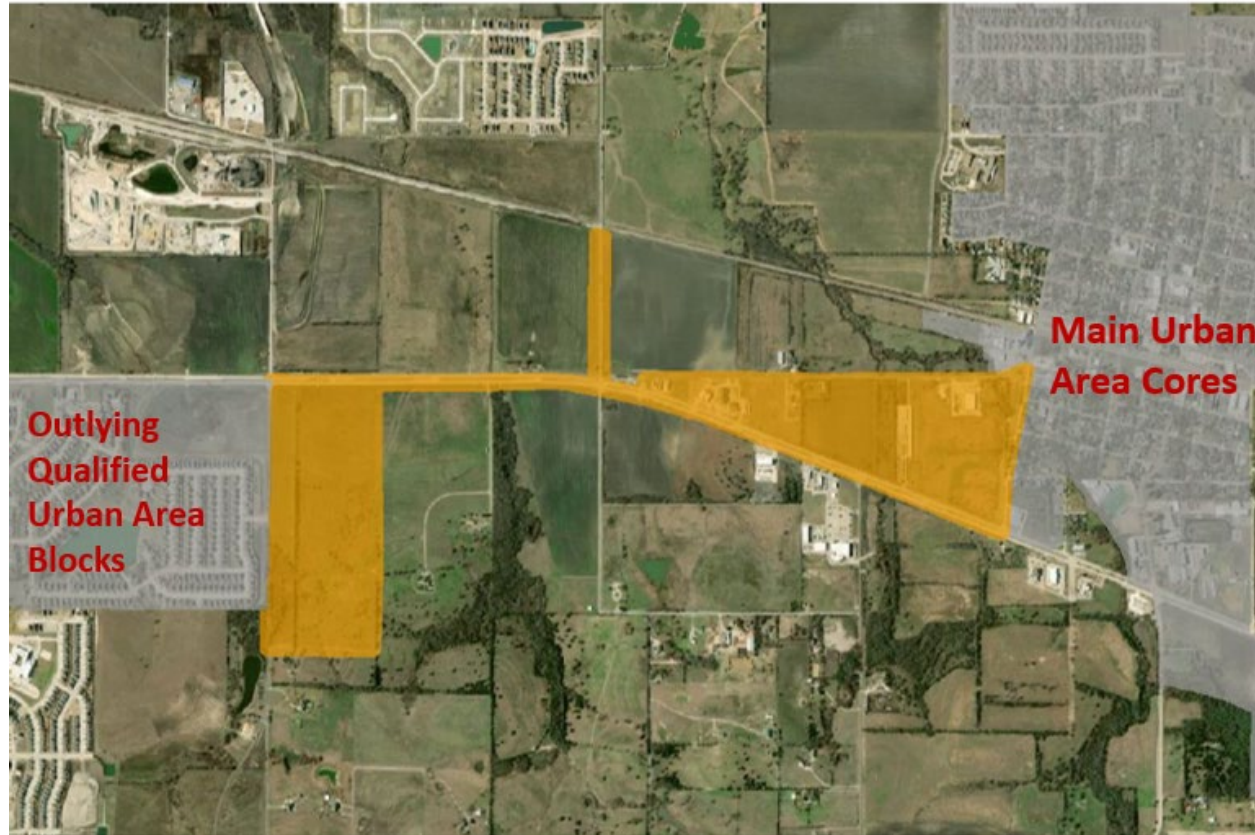




- 2010 Jump Blocks
- 2010 Qualified Urban Blocks



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No Longer Include the Low Density Hop and Jump “Corridors” in Urban Areas



-  2010 Jump Blocks
-  2010 Qualified Urban Blocks



Census & FHWA 2020 Urban Area Definition

Census Bureau Urban Area Definition	Population or Housing Unit
Population Threshold	5,000
Housing Unit Threshold	2,000
FHWA Urban Area Definition	Population
Urban Areas	5,000+
-- Small Urban Areas	5,000-49,999
-- Urbanized Areas	50,000+



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Authority for Adjusting UABs

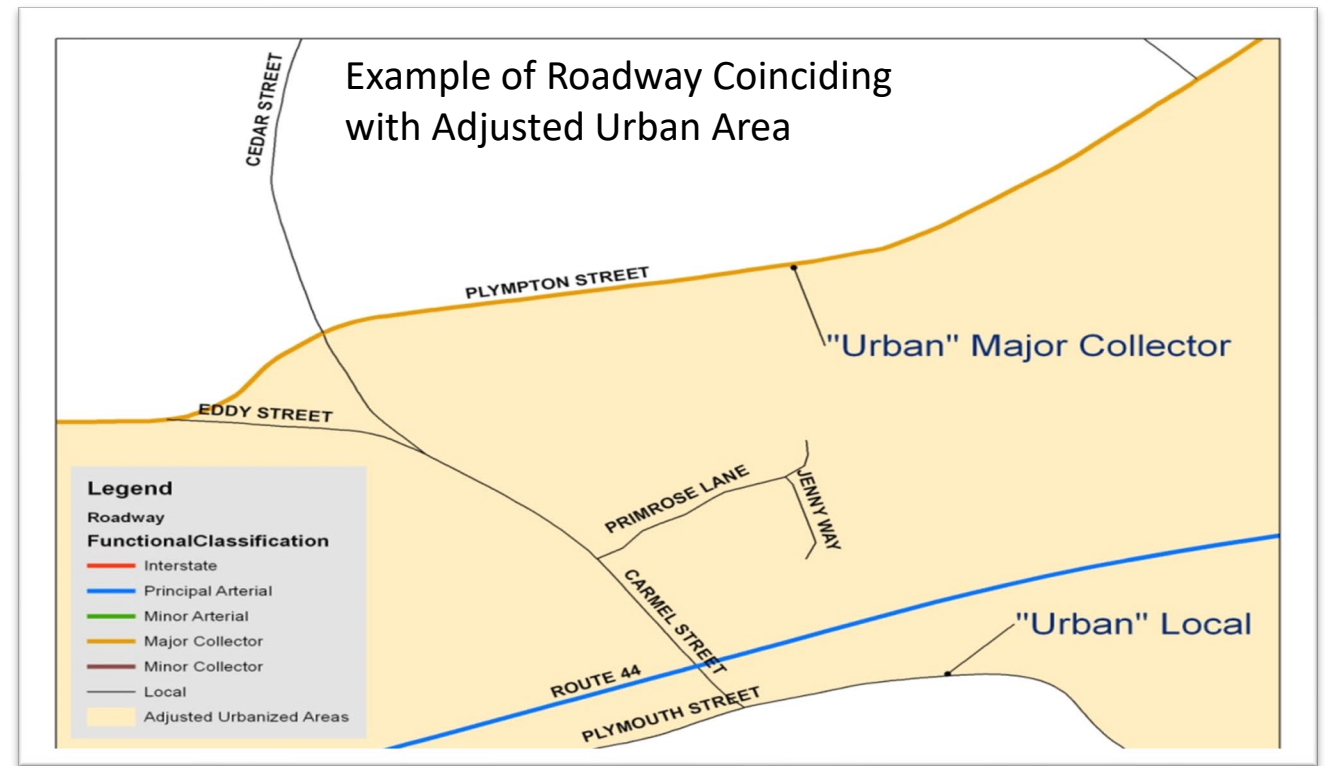
- State and local officials authorized to cooperatively adjust Urban Area boundaries by [23 U.S.C. 101\(a\)\(35\)](#)
 - Primary responsibility lies with the States
 - If an urban area is located outside of an MPO's MPA, the local officials coordinate urban area adjustments with their State DOT
 - If an urban area is within an MPO's MPA, local officials coordinate with their MPO and State DOT
 - [FHWA Order M1100.1A](#) delegates the authority to approve adjusted UABs to FHWA Division Administrators



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Census Urban Area Boundaries – Reasons to Expand

- Aligning with existing planning boundaries
- Incorporating local knowledge of urban landscape
- Addressing irregularities in boundary shapes
- Maintaining consistency with highway functional classifications

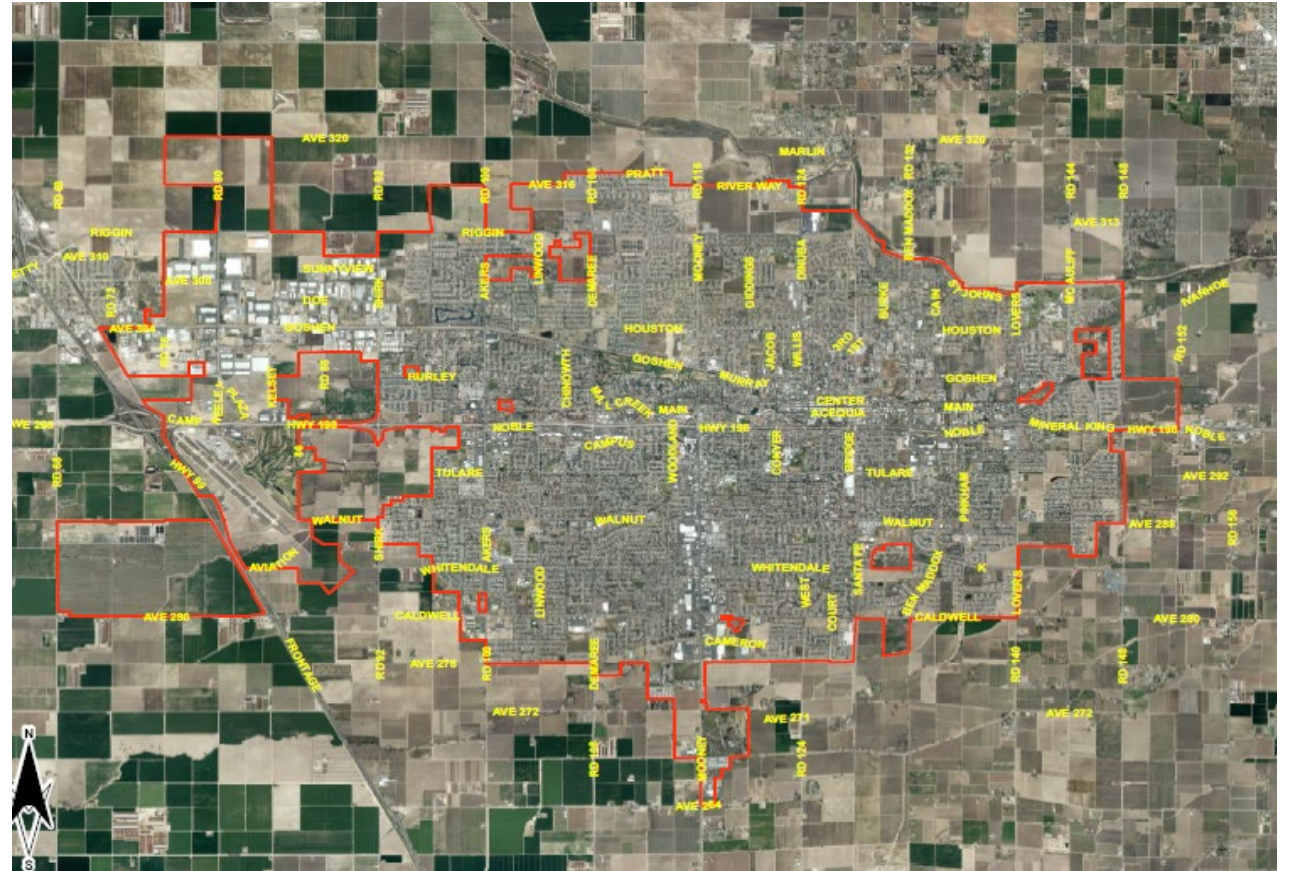




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Census Urban Area Boundaries – Adjustment Considerations

- Include entire municipality
- Include areas with urban characteristics
- Include large/significant traffic generators, e.g., airports, industrial areas, transportation terminals, transit routes





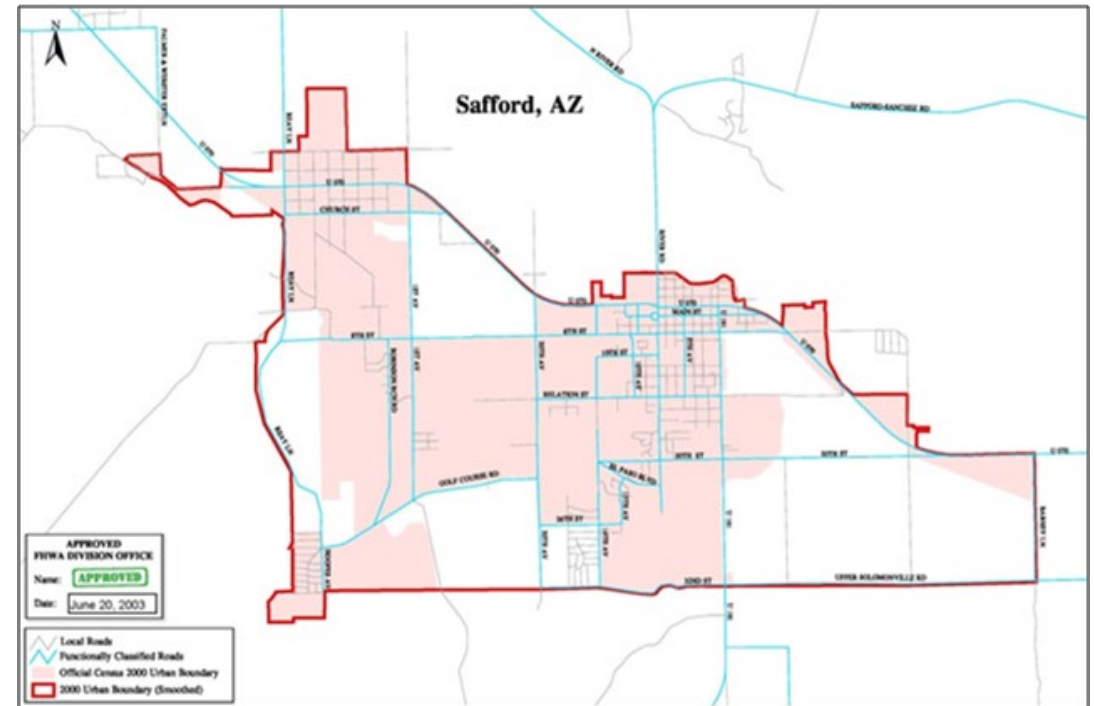
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Census Urban Area Boundaries – Adjustment Considerations

Boundaries should be simple,
without irregularities

Boundaries should not split
roadways or ramps

Boundaries should be one
contiguous area



Example Boundary Adjusted to Align with Major East-West
Roadway to the South



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Summary of Common Errors in Adjusting 2010 Census Urban Boundaries

- Boundaries do not encompass an entire Census Bureau urban area
- One adjusted urban area is not associated with one census urban area
- States do not coordinate in adjusting multi-state urban areas
- Adjustment of those Census urban areas that are not defined as FHWA urban areas
- Adjustment of Census urban areas that are defined by earlier decennial census urban areas

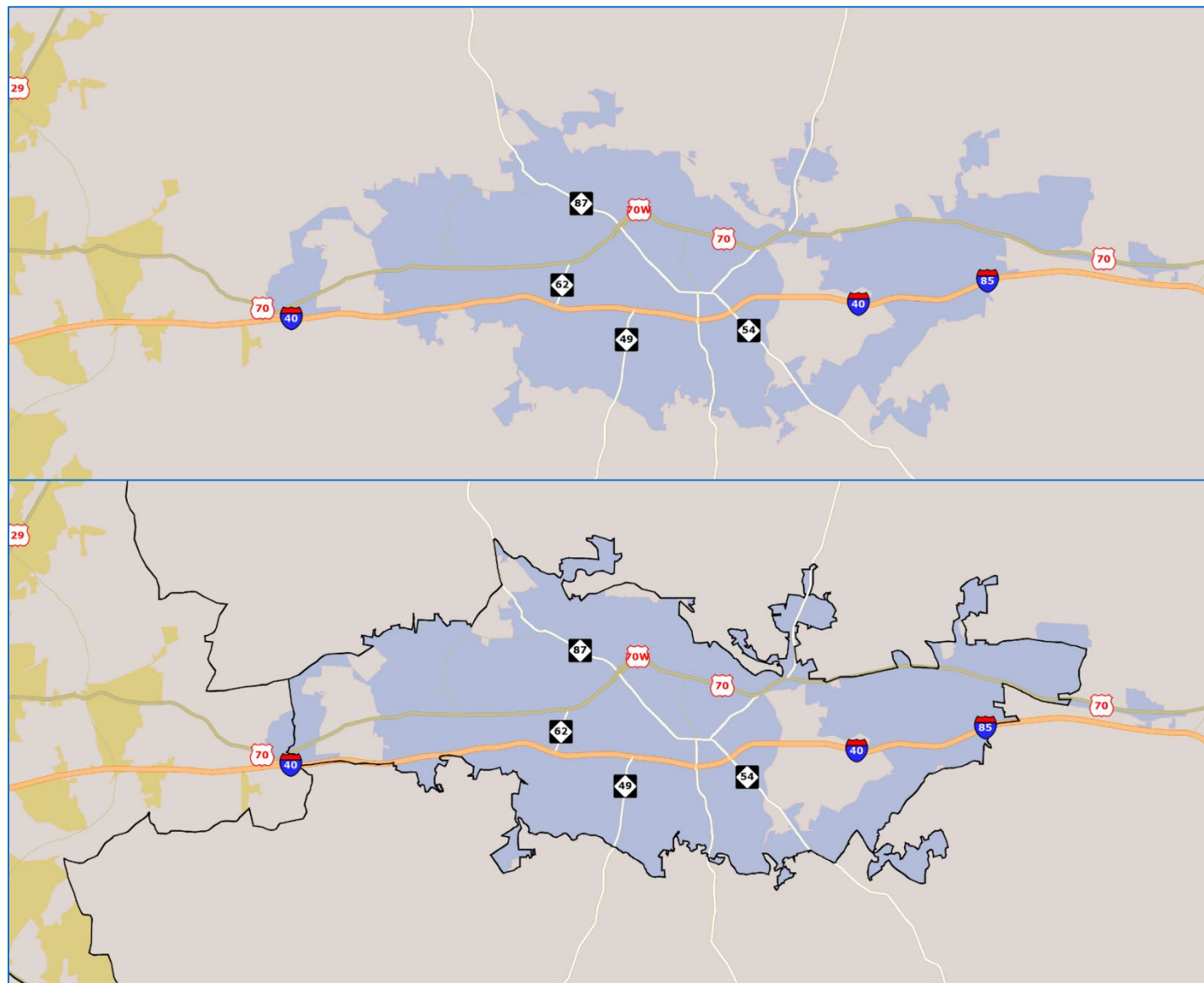


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Common Errors Found in Adjusting 2010 Census Urban Areas

Error:

- Missing portions of Census Urban areas

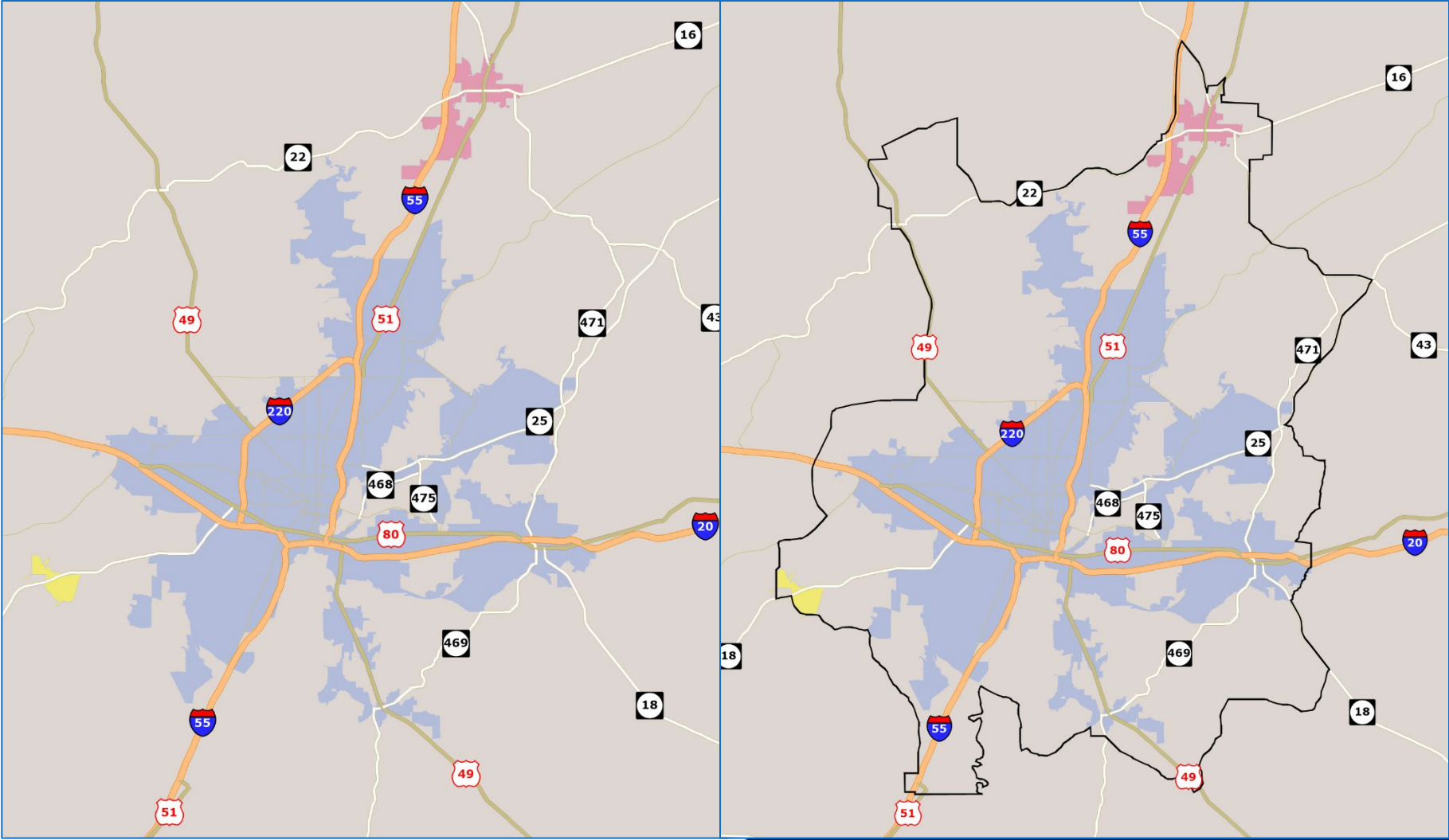


Common Errors Found



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Errors:
One-to-One relationship:
multiple Census Urban Areas in one Adjusted Urban Area, should be 3 Adjusted Urban Areas

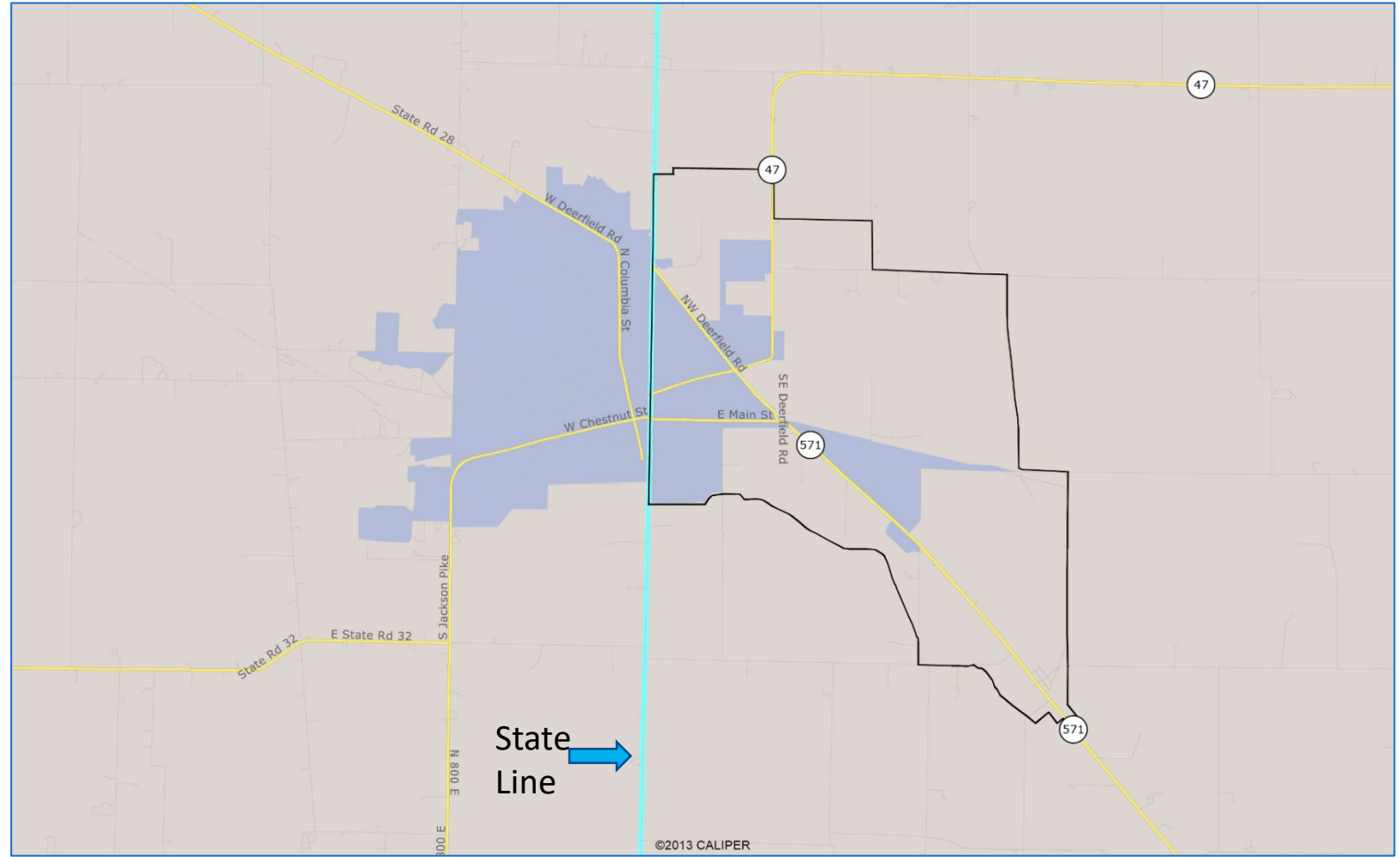




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Common Errors Found

Multi-State Urban Areas:
Each state adjusts only their
own state portion without
working with other states



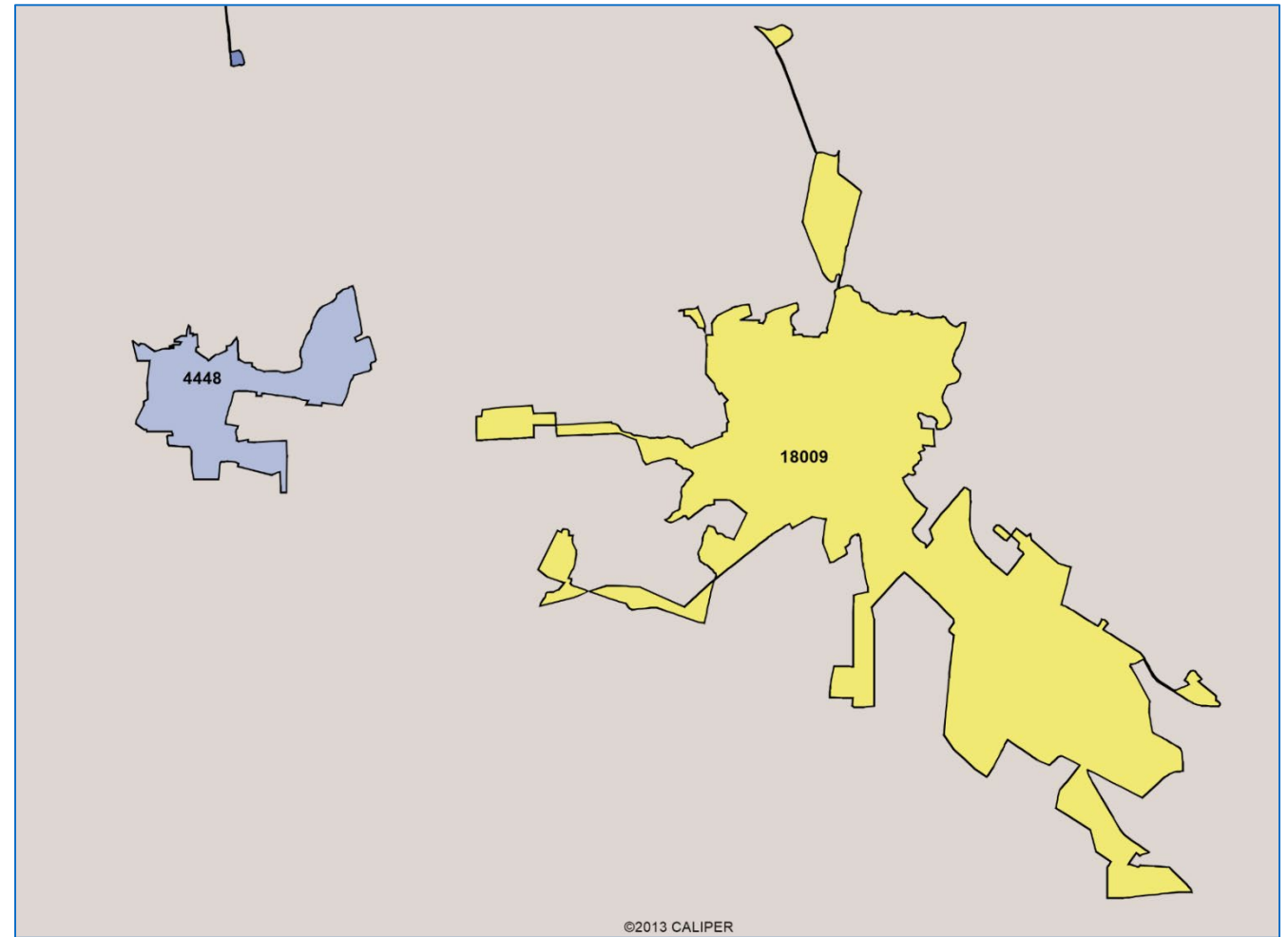


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FHWA Urban Area Definition:

Decennial Census Population of 5000 or more, the one in blue should not be included as an FHWA urban area (population =4448)

Common Errors Found





Common Errors Found

in Adjusting 2010 Census Urban Areas

Did not use the latest Census Urban Area as basis for Adjustment

- Previous decennial Census Urban Areas are irrelevant
- Start with the latest decennial Census urban areas

Common Errors Found

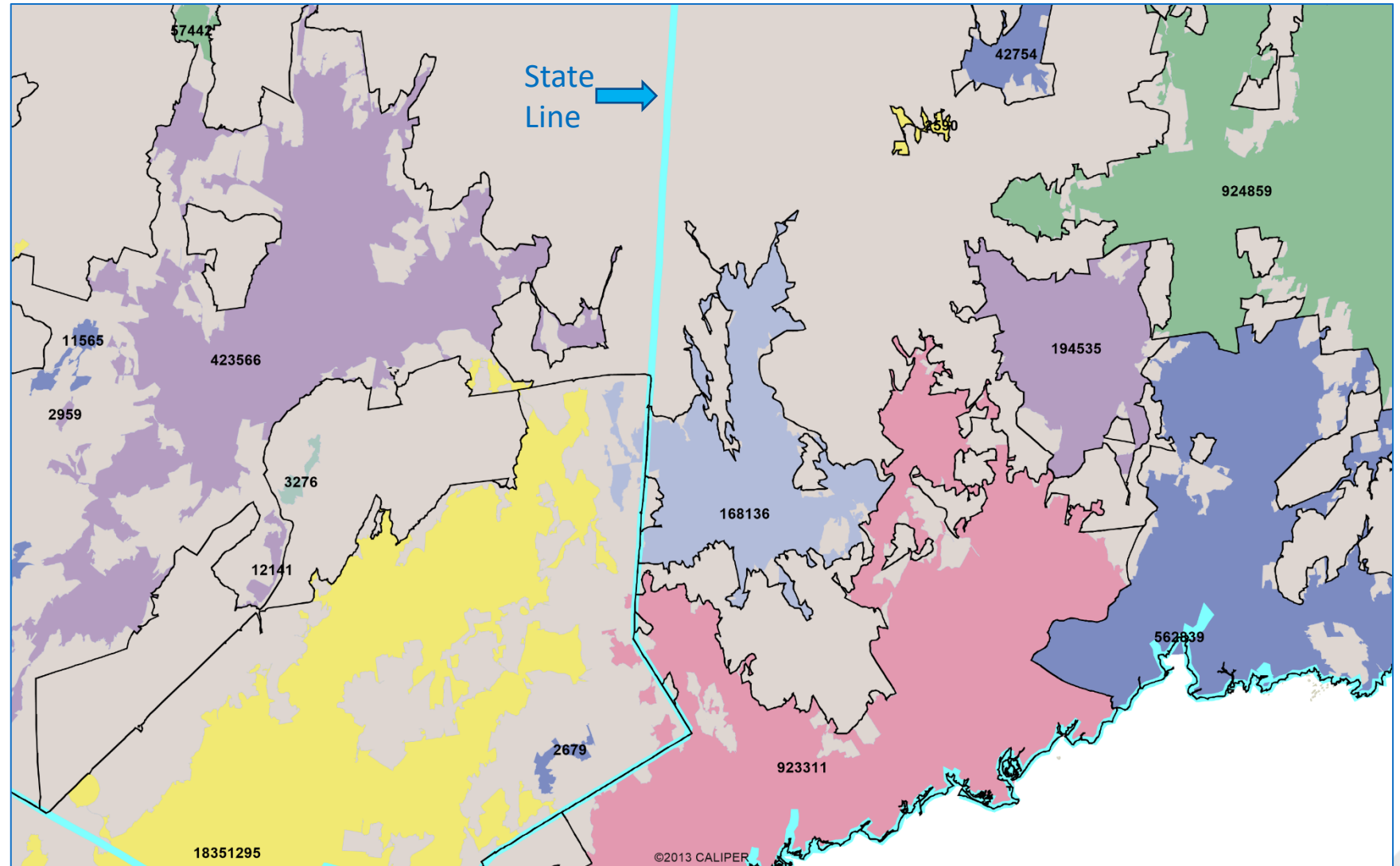


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Summary

(figures shown are 2010
Census Population):

How many errors can you
find?



Common Errors Found

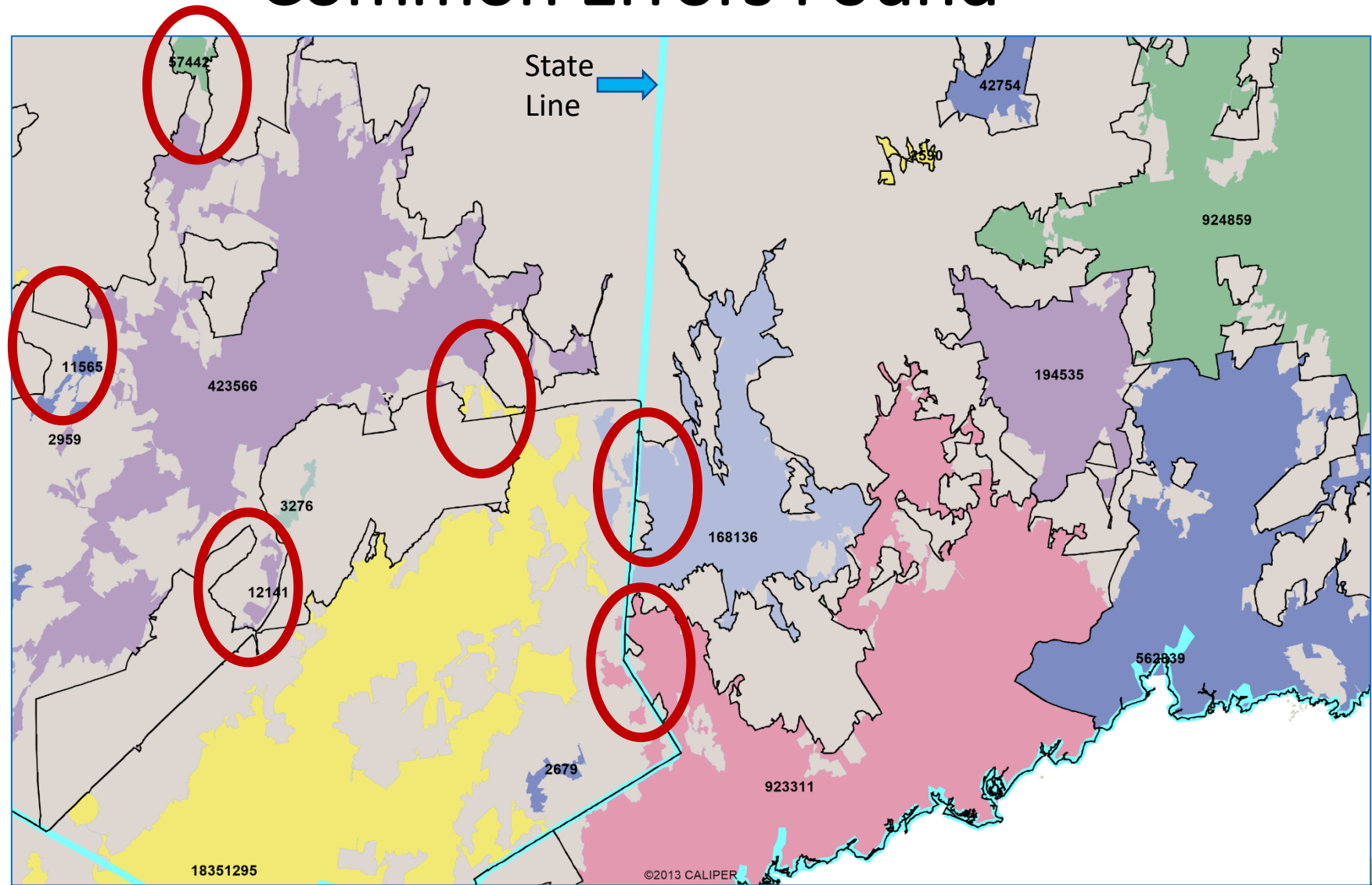


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Summary

(figures shown are 2010
Census Population):

How many errors can you
find?





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Adjusted Urban Area Boundaries Guideline Summaries

- Boundaries should encompass the entire Census Bureau urban area
- Boundaries should encompass one contiguous area
- Boundaries should be simple, without irregularities
- Boundaries should follow municipal boundaries or other physical features
- Boundaries should include areas with urban characteristics, such as airports, industrial areas, transportation terminals, major activity centers, etc.
- Reference:
https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/fcauab.pdf

Note: States and MPOs may choose not to adjust the Census urban boundaries



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Relationship between Functional Class & Adjusted Urban Area Boundaries

Federal-Aid Highway System Impact

Functional Class System	Urban	Rural
1 - Interstate	Yes	Yes
2 - Principal Arterial - Other Freeways and Expressways	Yes	Yes
3 - Principal Arterial - Other	Yes	Yes
4 - Minor Arterial	Yes	Yes
5 - Major Collector	Yes	Yes
6 - Minor Collector	Yes	No
7 - Local	No	No



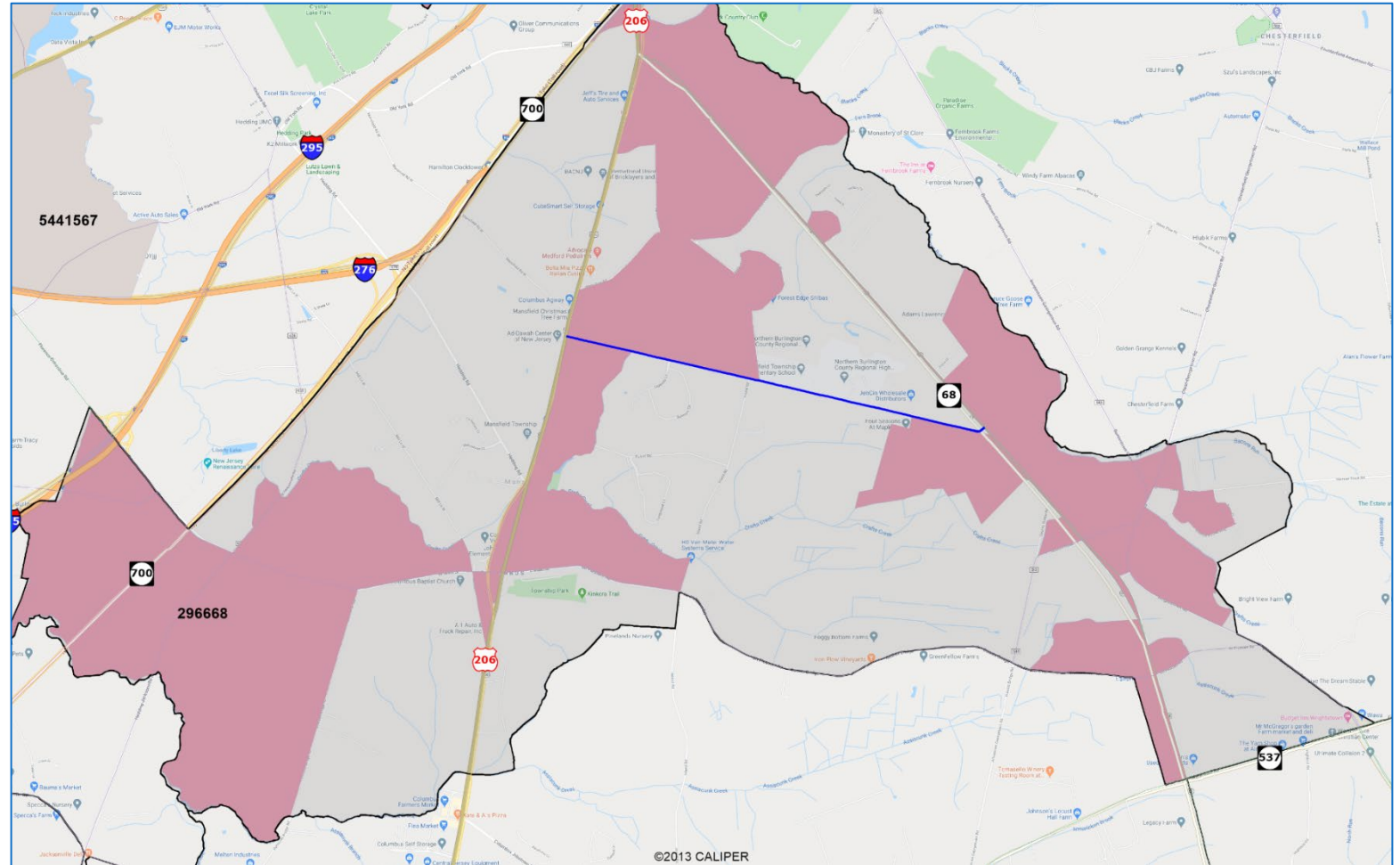
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Example of Benefit

Maintaining consistency with highway functional classifications

Benefits of Adjusted Urban Area

Example: With the adjusted urban area boundaries, the Minor Connector shown in blue connecting two arterials can be uniformly designated as an Urban Minor Collector. Without adjusting the urban boundaries, the connector would be divided into three roadway segments: urban, rural and then again urban minor connectors, making the roadway planning, programming and maintenance difficult



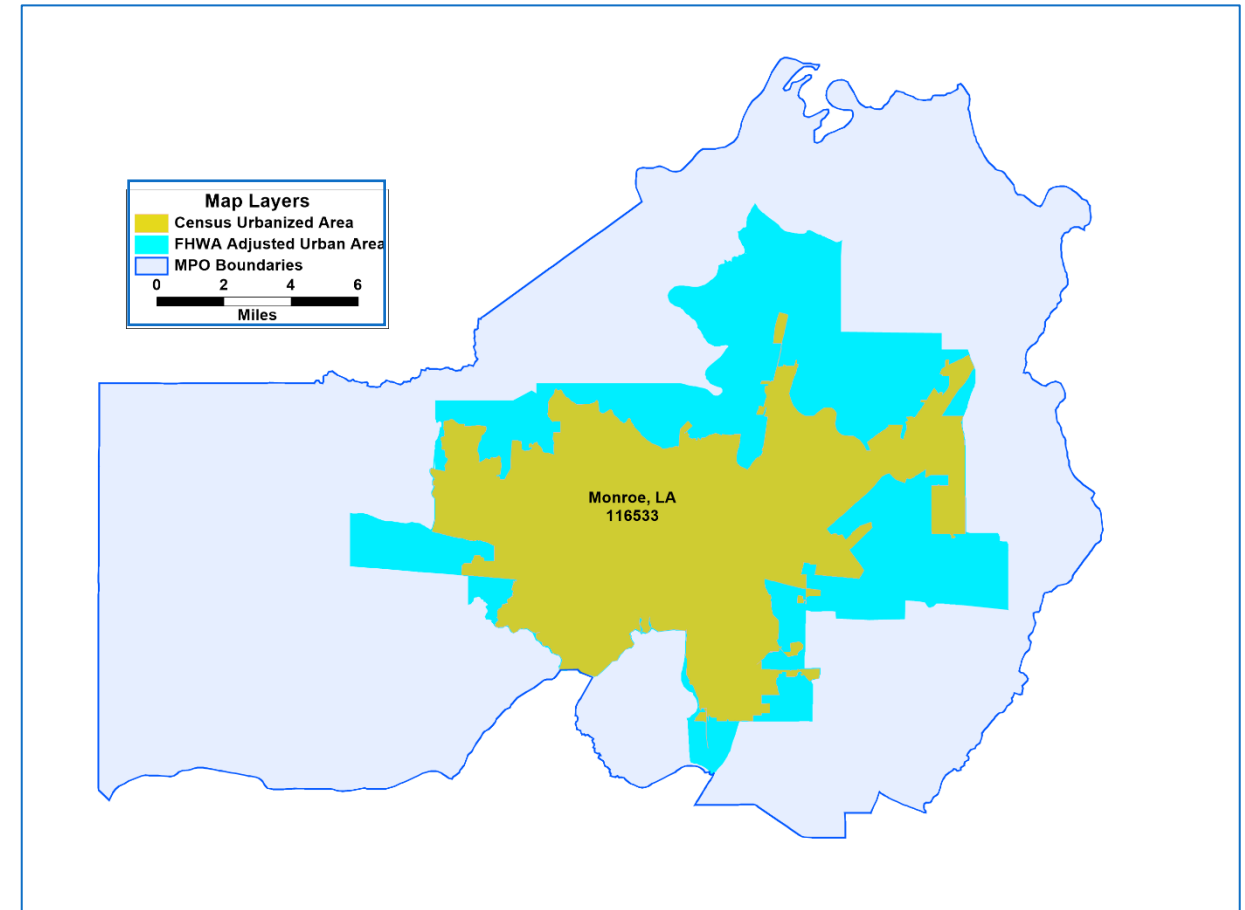


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Boundary Development Sequency

Census Urban Area → Adjusted Urban Area → MPO Boundaries

- MPO boundaries can include multiple urbanized areas
- A MPO can also cover portions of urbanized areas inasmuch as the remaining portions of the UZA are covered by other MPOs
- Requirement: an Urbanized Area must be covered entirely by one or more MPO boundaries



Urban Area Boundary Adjustment Good Practice Steps/Schedule



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Recommended 12 month schedule following Census release of Urban Area Boundaries.

At a minimum – confirm Census boundaries are adequate, also...

- Build/share understanding of game plan

- Generate maps and share electronically – use GIS if at all possible

- Encourage/work towards timely delivery of UAB revisions

Event	Months Following Release of 2020 Census Urban Area boundaries
<u>FHWA posts Census Boundaries on HEPGIS</u>	ASAP after Census Release
Begin adjusted urban area boundary update process	Month 1
DOT works with planning partners to define adjusted urban area boundaries	Month 3-9
Provide draft final data and/or maps to FHWA Division Office for review	Month 10
DOT incorporates Review Comments	Month 11
DOT submits adjusted urban area boundaries to FHWA Office of Planning	Month 12

https://www.fhwa.dot.gov/planning/census_issues/urbanized_areas_and_mpo_tma/schedule/

Questions?

Joseph Hausman

Senior Community Planner
FHWA Office of Planning

Joseph.Hausman@dot.gov, Phone: 407-209-4988

[FHWA - Office of Planning](#)

Ms. Supin L. Yoder

Travel Demand Forecasting & GIS Specialist
FHWA Office of Planning

Supin.Yoder@dot.gov, Phone: 312-257-6356

[FHWA HEPGIS Maps](#)



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