
CE 453 Lecture 3

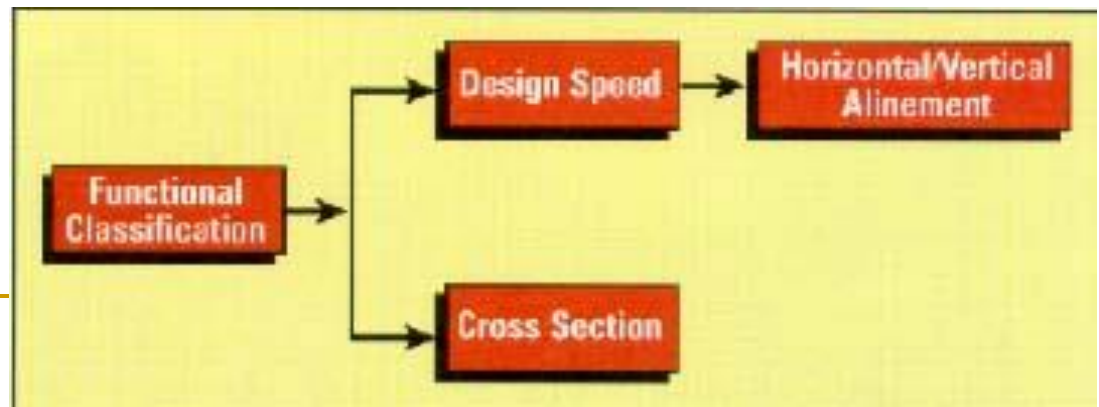
Functional Classification

Objectives

- Summarize general highway design process
 - Identify different roadway classification systems
 - Identify and describe functional classes and their characteristics
 - Summarize functional system characteristics (rural – urban)
 - Gain basic knowledge and feel for extent of Iowa system by class
-

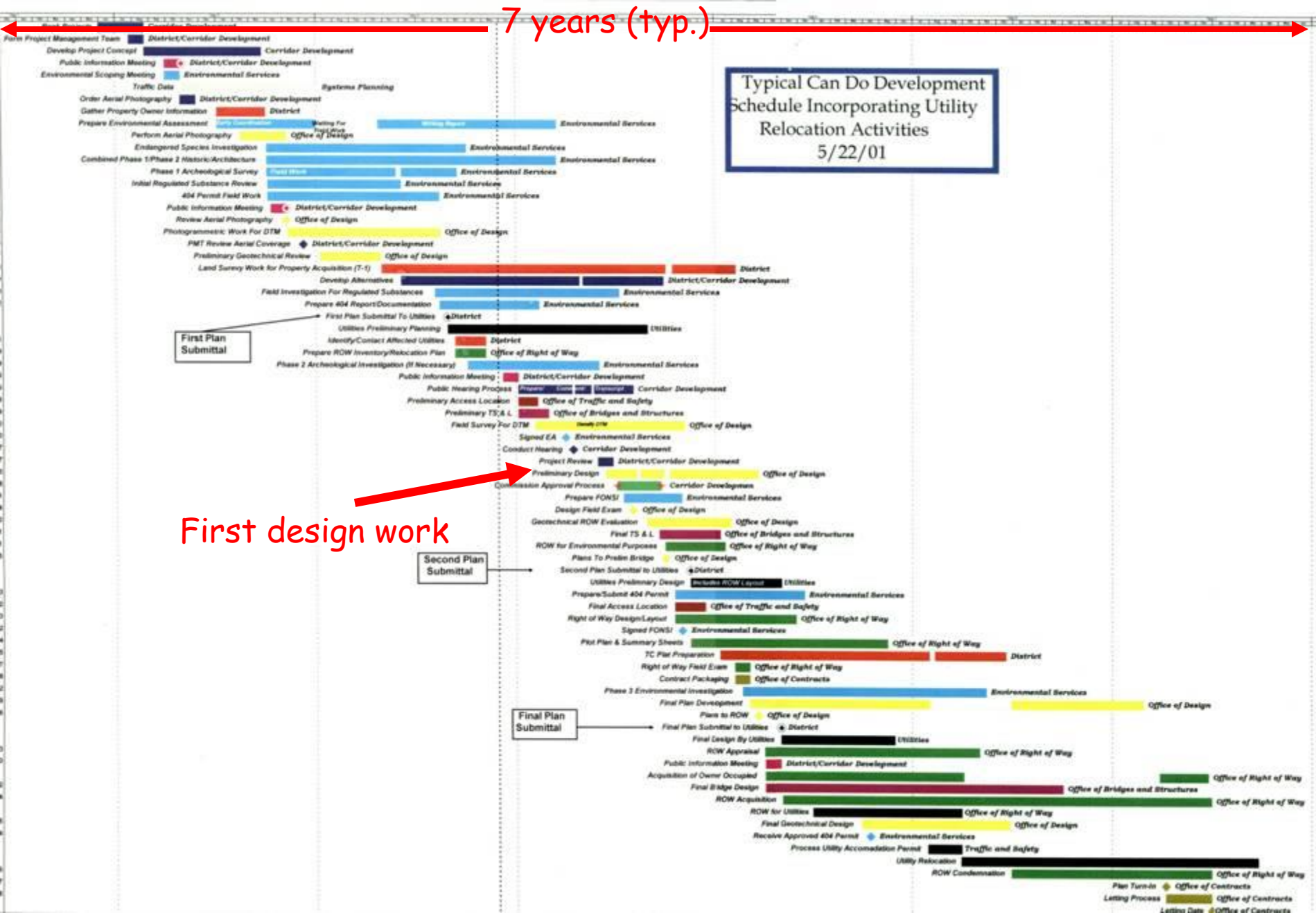
Design Process (General)

- Much is decided in **early stages** (concept and alternative planning/design)
- **Environmental concerns and public involvement** are very important
- Involves generating **full range of alternatives** and technically evaluating
- One of the most important parts of the design process is determining what **purpose** (or **who**) a roadway serves?



Functional Classification	20 mph	30 mph	40 mph	50 mph	60 mph	70 mph
Rural Principal Arterial				X	X	X
Rural Minor Arterial				X	X	X
Rural Collector	X	X	X			
Rural Local Road	X	X	X			

Flexibility in Highway Design - Chapter 3 - FHWA.htm, Roadway Design Manual, Virginia DOT, 1995



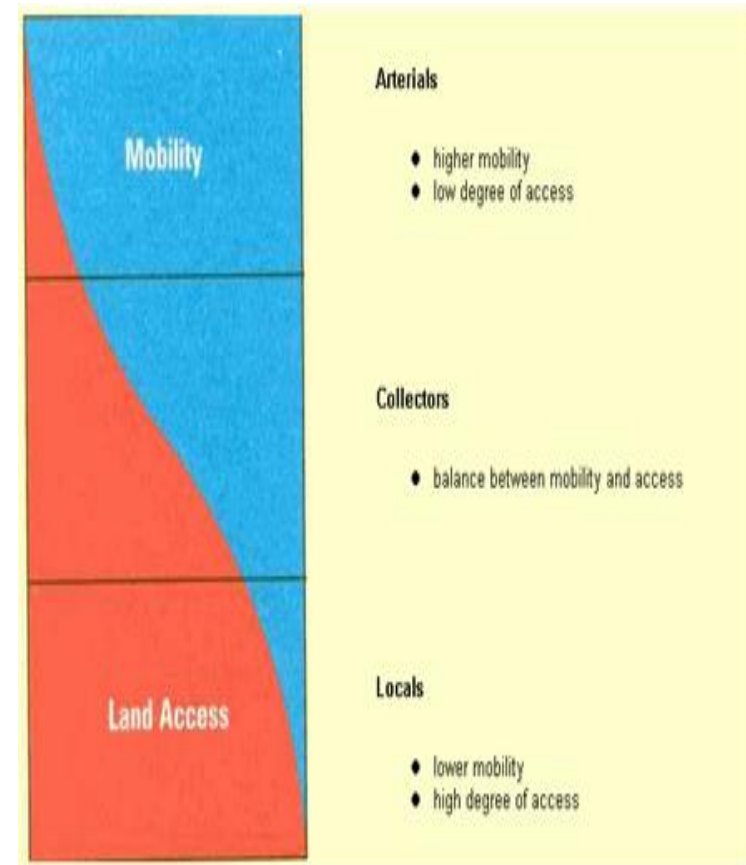
-
- Classification schemes:
 - Design Type – Design and Traffic Engineers – examples?
 - Route – Traffic Engineers, cartographers?
 - Administrative – Financial and Program Managers
 - Function – Planners and planning engineers
-

Functional Classification

- Determined by system network planning (how it fits in system)
 - Goals:
 - Match trip portion with roadway
 - Aggregate trips safely and efficiently
 - Satisfy trip demands
 - Fit to the context/environment
 - Basis of Current Design Approach (form follows function)
 - Defines Design Standards
 - Sizing based on function and demand
-

Roadway Functional Classes

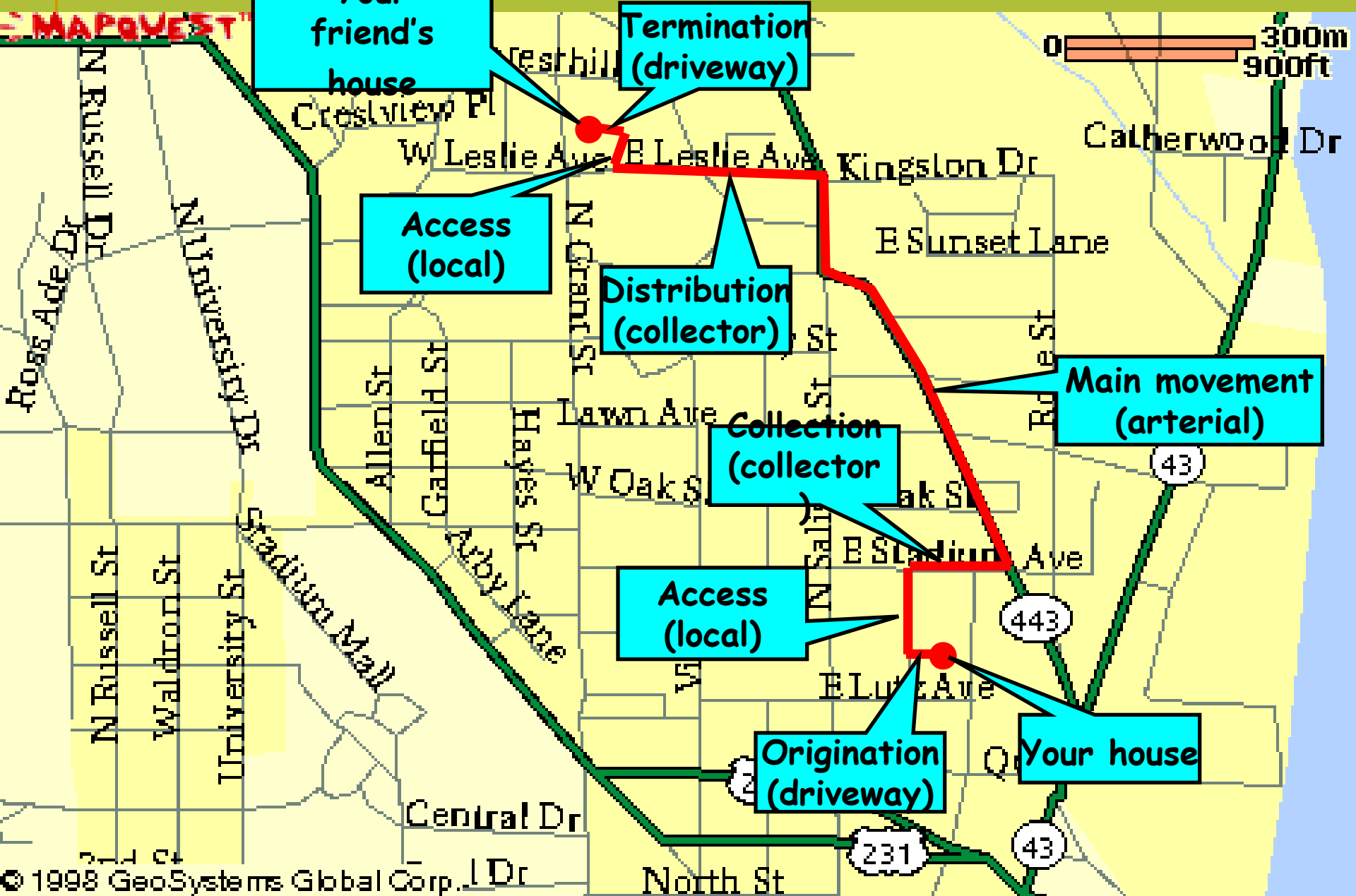
- Determined by characteristics:
 - ❑ function
 - ❑ access density
 - ❑ traffic demands
 - ❑ trip length
 - ❑ expected speed



Three Major Roadway Classes and their functions:

- Arterial (high mobility, low access, long trips, fast speeds)
- Collector (moderate, moderate, moderate, moderate)
- Local (low, high, short, slow)





Hierarchy of Movements and Roads

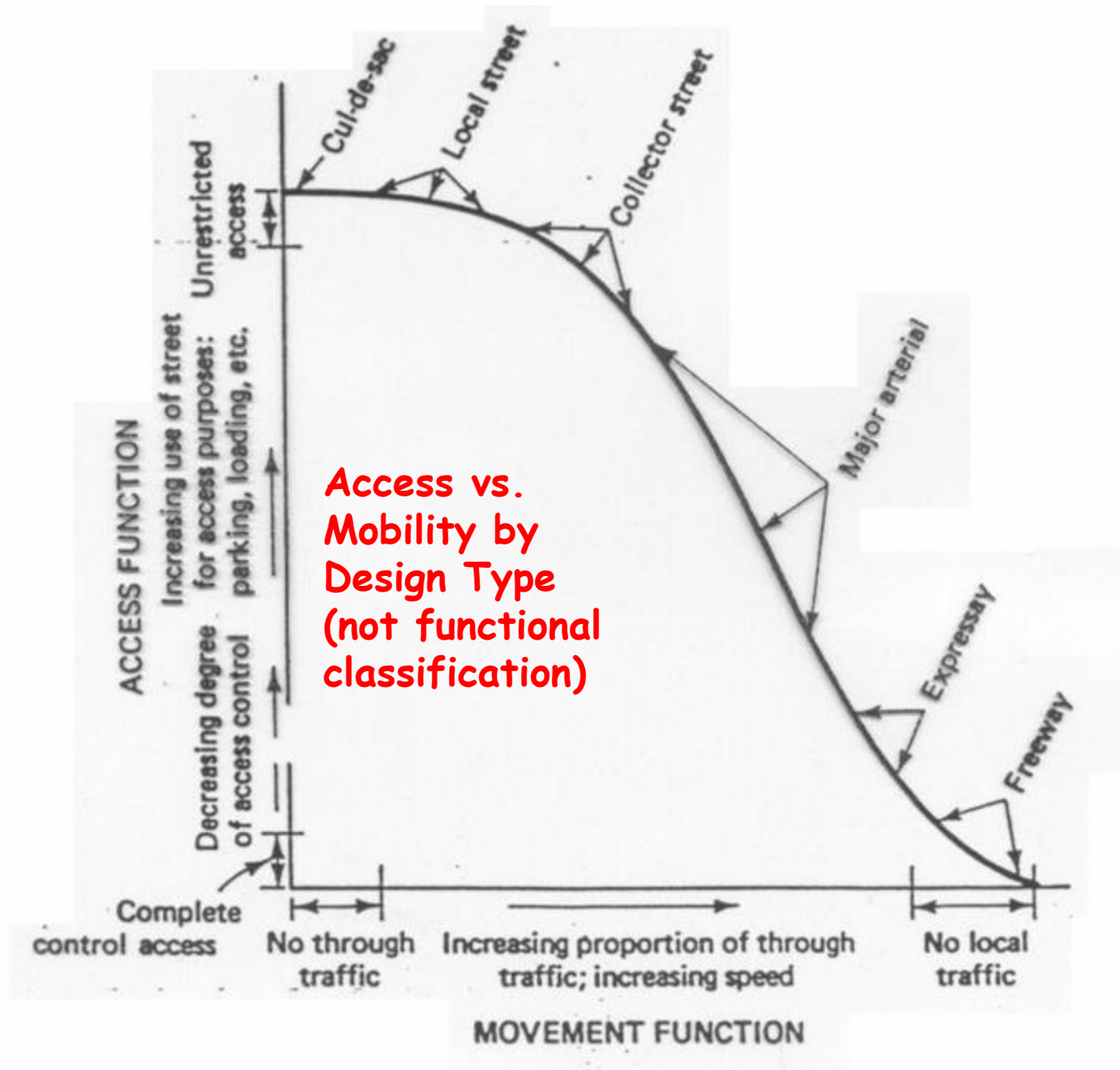


Table 1. Design Classes and Design Types Associated with Each Functional Class

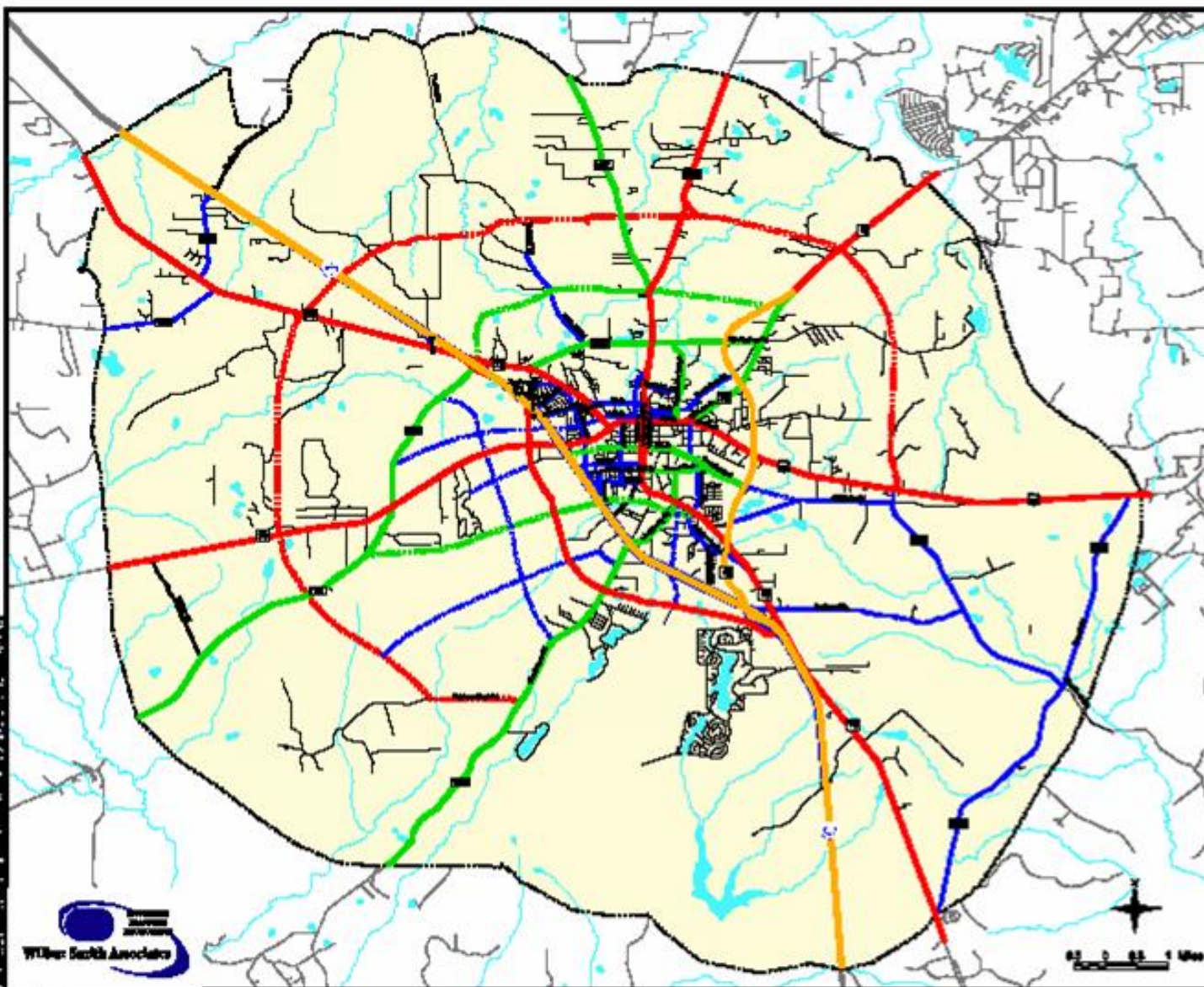
Functional Class	Design Class	Design Type
Arterial	Freeway	8-Lane 6-Lane 4-Lane
	Major Arterial	6-Lane Divided 4-Lane Divided
	Minor Arterial	5-Lane 4-Lane
Collector	Major Collector	5-Lane 4-Lane 3-Lane
	Minor Collector	2-Lane
Local	Local	Loop Cul-de-Sac



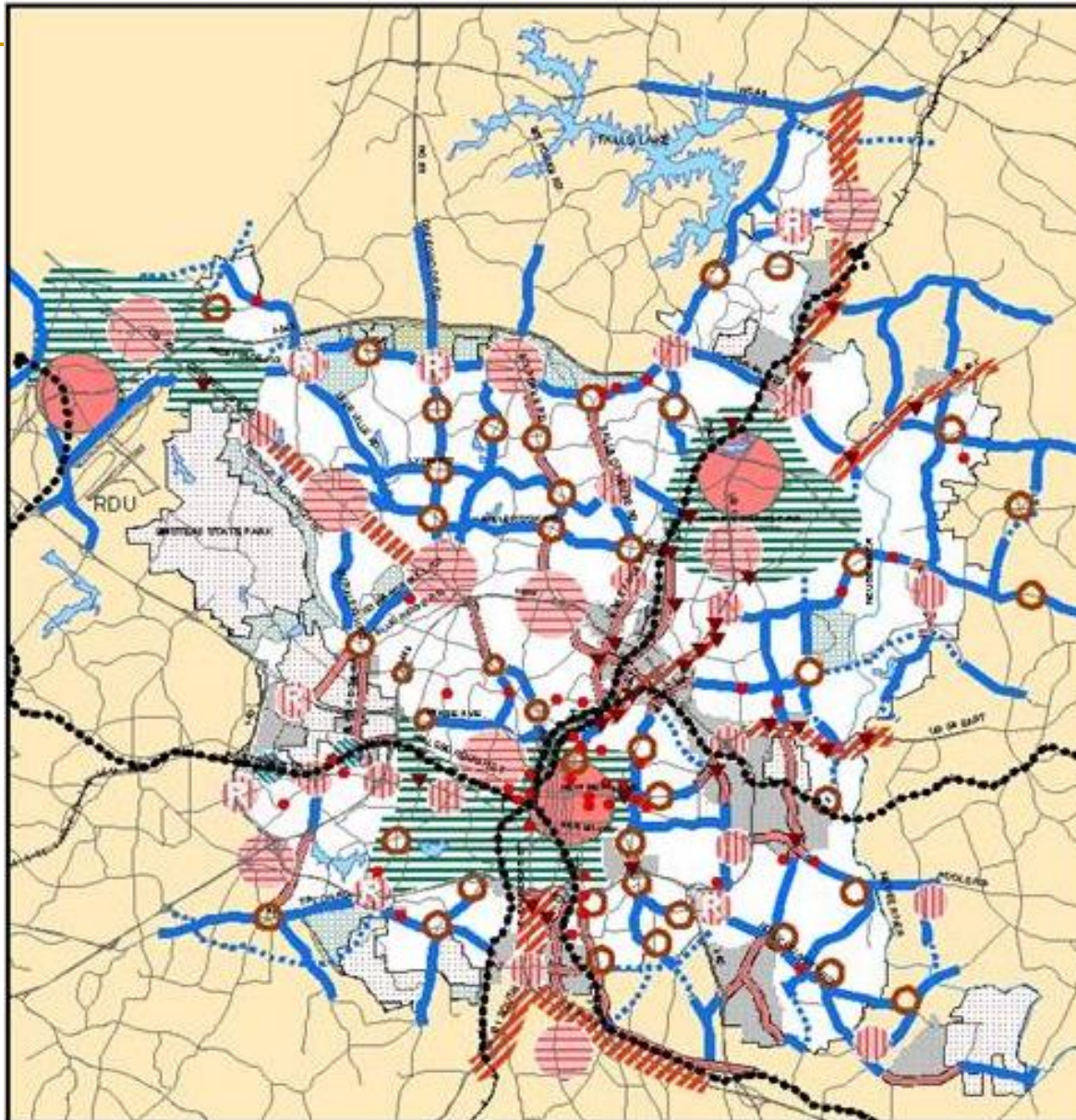
Figure 5-3

**Proposed Functional
Classifications**
Huntsville
Transportation Plan
Huntsville, Texas

-  Study Area
- Roadway Functional Class:**
-  Expressway/Bypass
 -  Primary Arterial
 -  Secondary Arterial
 -  Collector
 -  Local



From the Raleigh Comprehensive Plan



Recommended Urban Form



1 0.5 0 1
Miles



Systems	Percentage of Total Rural Kilometers
Principal arterial system	2-4
Principal arterial plus minor arterial system	6-12, with most States falling in 7-10 % range
Collector road	20-25
Local road system	65-75

Table I-1. Typical distribution of rural functional systems.

Systems	Range	
	Travel Volume (%)	Length (%)
Principal arterial system	40-65	5-10
Principal arterial plus minor arterial street systems	65-80	15-25
Collector street system	5-10	5-10
Local street system	10-30	65-80

Table I-2. Typical distribution of urban functional systems.

Rural Functional System

Principal Arterials

- Function: **Statewide/Interstate** Travel and Connect urbanized areas
- Characteristics: Long trips, no stubs, **high speed, widely spaced**, full/partial access control
- Subclasses: Freeways, Other non-Freeways with **access control**



Rural Minor Arterials

- Function: intrastate/inter-county trips, **connect small urban areas with major trip generators**
 - Characteristics: Moderate everything (routes, speed, spacing, mostly mobility)
-

Rural Collectors

- Major Collectors: Connect county seats to large towns not served by arterials, **link entities with nearby arterials, urban areas**
- Minor Collectors: Serve remaining small towns, link local traffic generators with rural areas
- Characteristics: Shorter, Moderate Speeds (in rural areas), Intermediate spacing



Rural Local Roads

- Function: Provide **access to land** on collector network, serve short distance travel



<http://www.glo.gis.iastate.edu/la562/images/Gravel%20road.jpg>

- Characteristics: Short routes that terminate at higher classes, relatively low speeds, intermediate spacing

Urban Functional System

Principal Arterials

- Functions: carry most trips entering/leaving urban area, serve intra-urban trips, carry intra-urban and intercity bus routes, provide continuity to rural arterials
- Characteristics: longest distance routes and highest volume, high speed, **spacing is less than 1 km in CBD and greater than 8 km in urban fringe**, full/partial access control
- Subclasses: interstates, other freeways and expressways, other principal arterials with partial access control



Urban Minor Arterials

- Functions: interconnect with and augment principal arterials, accommodate moderate length trips, **distribute traffic, carry local buses**, provide intra-community continuity, connect to urban collectors
- Characteristics: moderate trip length high volumes, moderate speeds, **spacing 0.2 to 1.0 km in CBD and 3 to 5 km in suburbs**



Urban Collectors

- Functions: Provide traffic circulation within residential neighborhoods and industrial/commercial areas, collect traffic from locals and channel to arterials, carry local buses, provide some direct land access
 - Characteristics: Shorter than minor arterials, moderate speeds, spacing intermediate to arterials, **penetrates residential neighborhoods**
 - Subclasses: major and minor
-

Urban Locals

- Functions: Provide **direct access to land**, connect properties to higher class streets (i.e., collectors)



- Characteristics: Short in length, dead end – terminate at collectors, low speeds, no bus routes

Table 1 – Function and Flow Guidelines

Residential Use Areas							
Street Character		Desired Vehicle Flow			Maximum Vehicle Flow		
<i>Function</i>	<i>Lanes</i>	<i>Minute</i>	<i>Hour</i>	<i>Day</i>	<i>Minute</i>	<i>Hour</i>	<i>Day</i>
Local	2	1.0	60	600	1.5	90	900
Collector	2-3	2.0	120	1,200	3.0	180	1,800
Non-Residential Use Areas							
Street Character		Desired Vehicle Flow			Maximum Vehicle Flow		
<i>Function</i>	<i>Lanes</i>	<i>Minute</i>	<i>Hour</i>	<i>Day</i>	<i>Minute</i>	<i>Hour</i>	<i>Day</i>
Local	2	2.0	120	1,200	3.0	180	1,800
Collector	3	4.0	240	2,400	5.0	300	3,000

Jurisdictional Responsibility	Mileage
Iowa DOT	10,234
Iowa DNR	344
Dept. of Social Services	45
Board of Regents	97
Federal Domain	113
Local	103,638
Iowa National Guard	19
Other State Lands	10

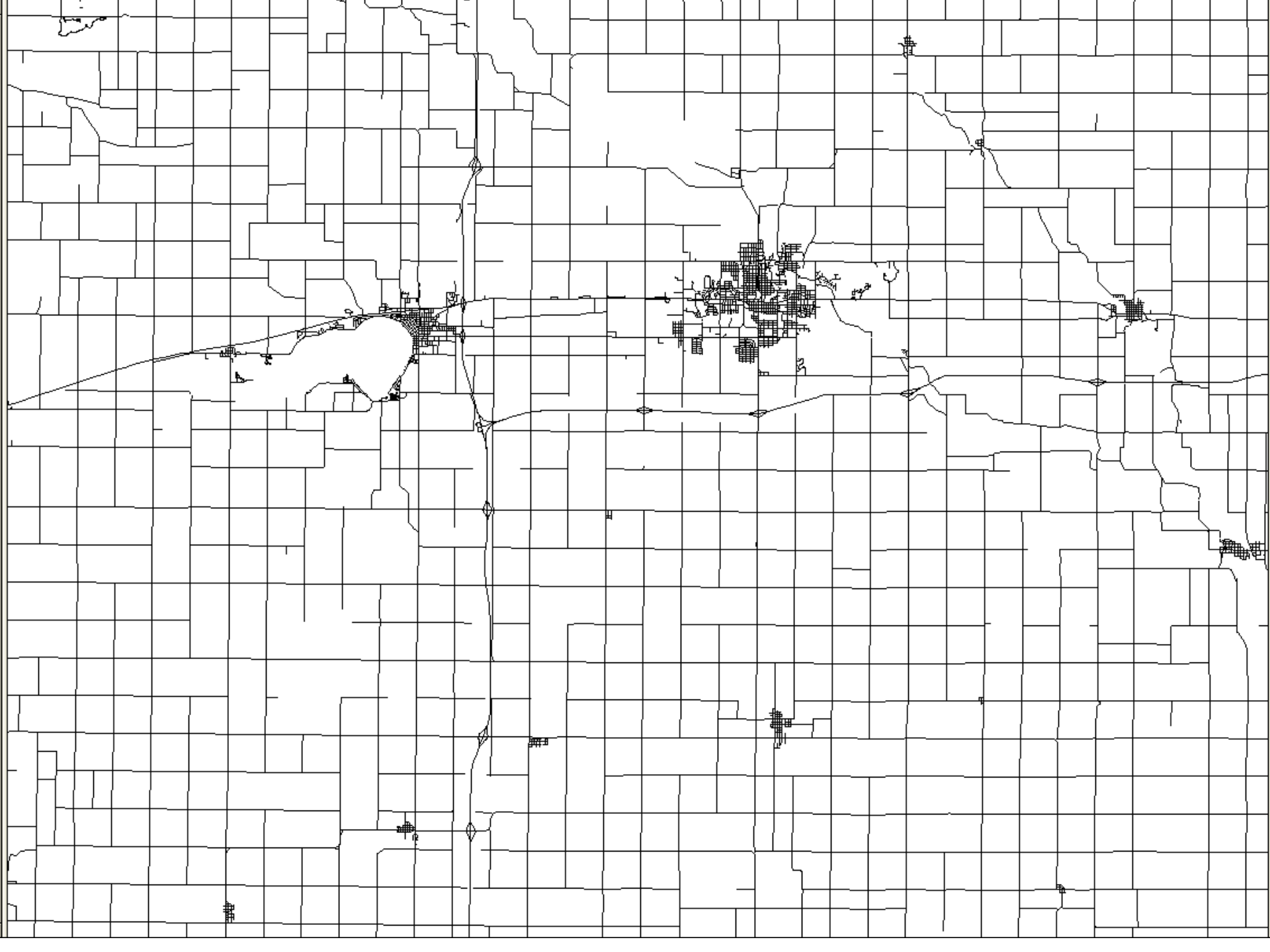
Iowa Extent of System (approximate)

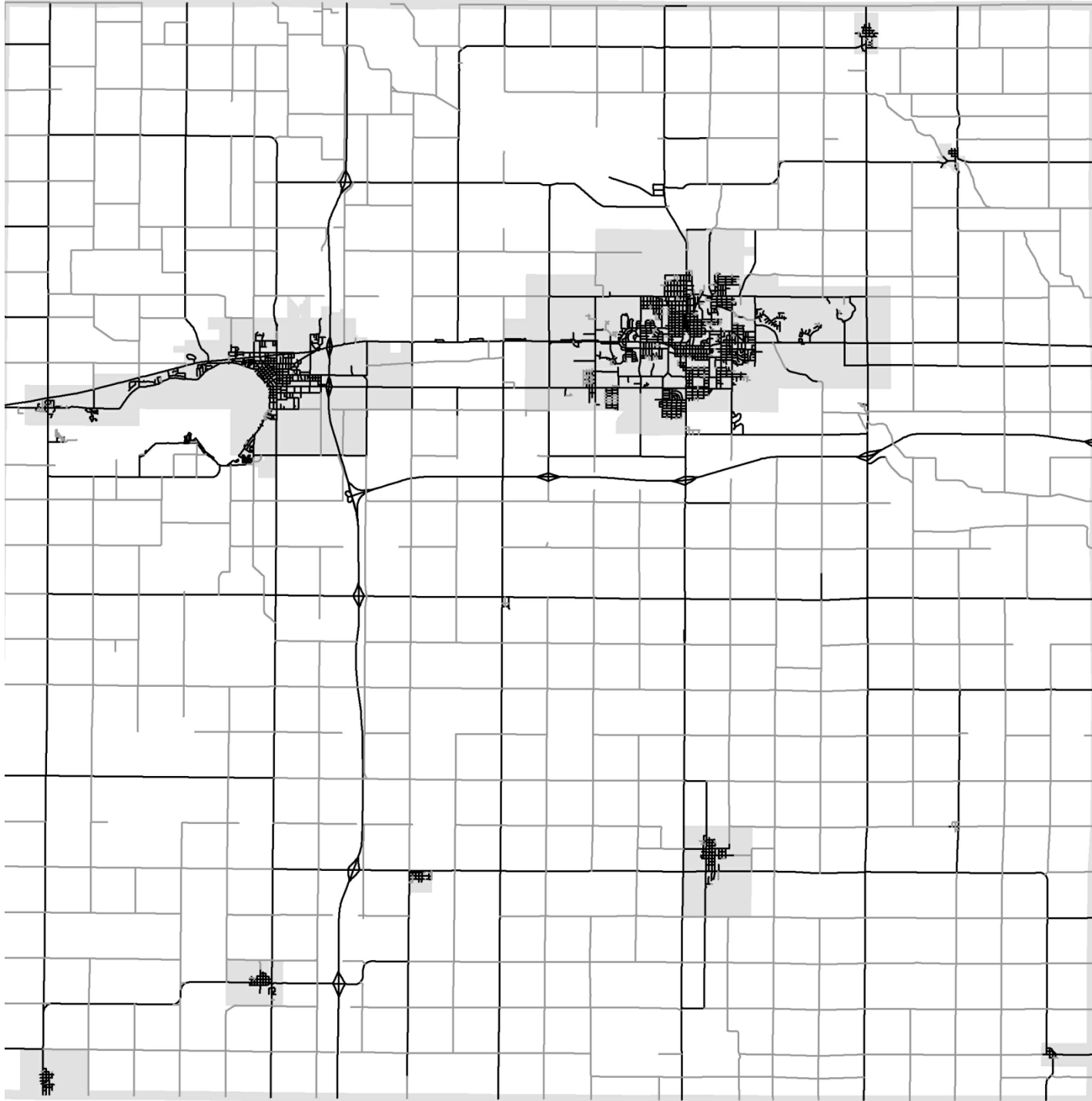
- By ownership:
 - ❑ *Interstate: 800 mi.*
 - ❑ *US Highways: 4000 mi.*
 - ❑ *Other State Routes: 5000 mi.*
 - ❑ Total Iowa DOT: 10,000 mi.
 - ❑ Municipal: 13,000 mi.
 - ❑ County: 90,000 mi.
 - ❑ **Total: 115,000 mi.**
 - By purpose:
 - ❑ Farm to Market: 30,000
 - ❑ Local: 70,000
-

Iowa Extent of System (approximate)

- By pavement type:
 - ❑ Paved: 40,000 mi.
 - ❑ Unpaved: 75,000 mi.
- By Function:
 - ❑ Principal arterials: 5000 mi.
 - ❑ Minor arterials: 5500 mi.
 - ❑ Major collectors: 16,000 mi.
 - ❑ Minor collectors: 16,000 mi.
 - ❑ Local: 75,000 mi.

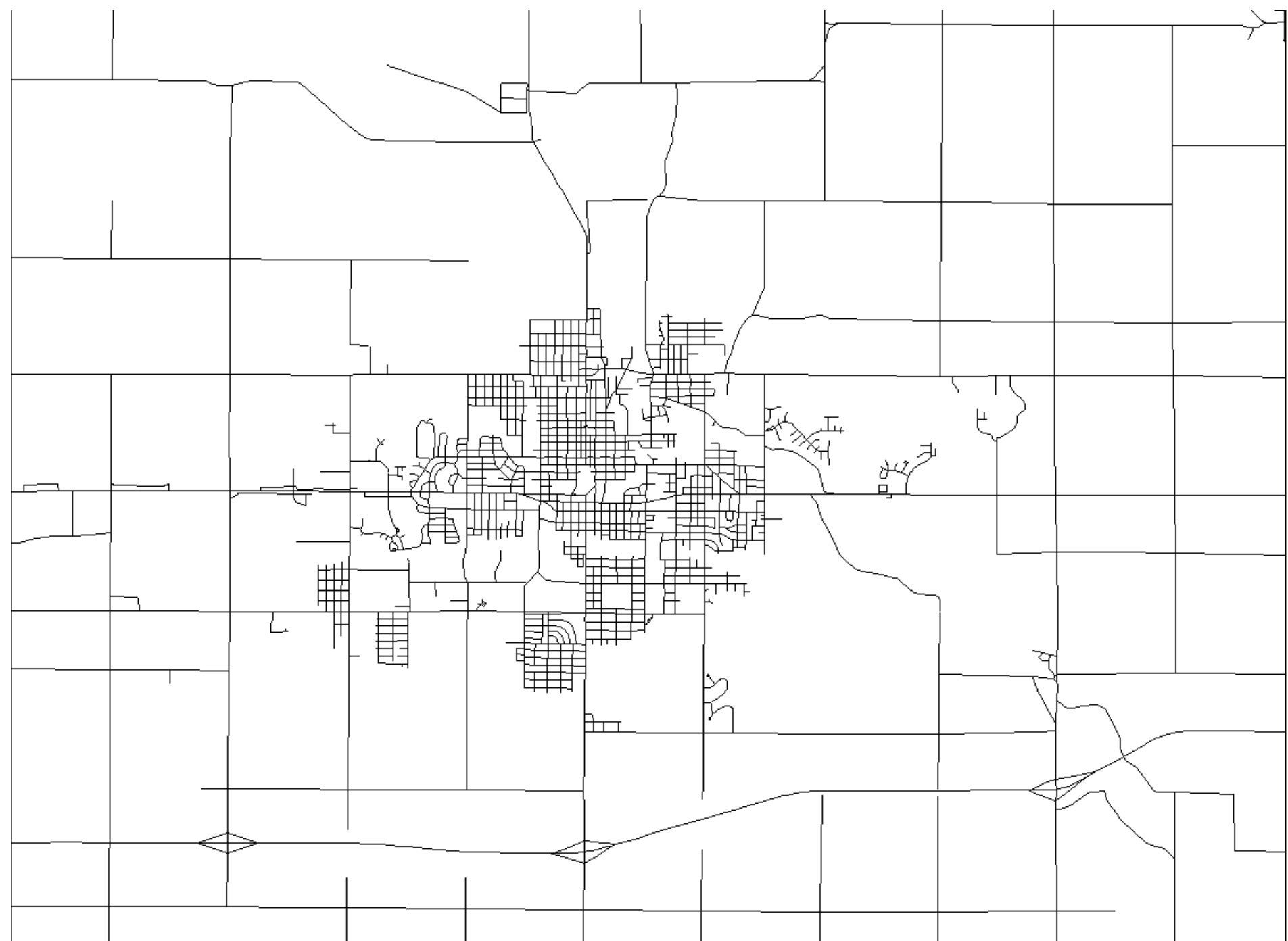
In Class Exercise: Functional Classification



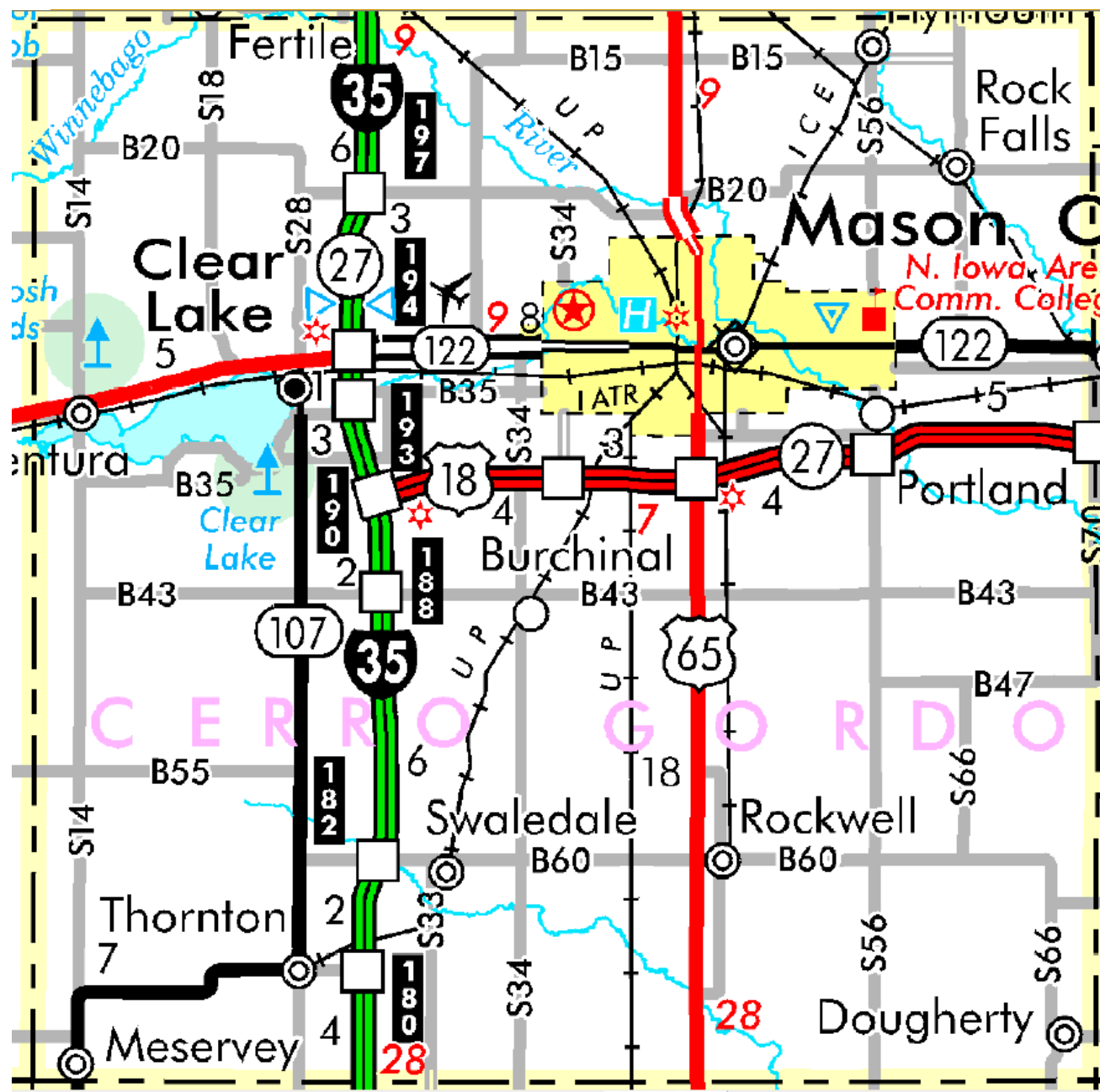


Darker lines
are paved









- PRINCIPAL STATE
 - INTERSTATE
 - FULL ACCESS CONTROL
 - MULTILANE DIVIDED
 - FULL ACCESS CONTROL
 - MULTILANE DIVIDED
 - PAVED
- OTHER STATE
 - MULTILANE DIVIDED
 - PAVED
 - DUSTLESS
 - UNMARKED PRIMARY
- COUNTY ROADS
 - PAVED
 - GRAVEL
 - SCENIC BYWAYS

