CHARLOTTE
CHARLOTTE DEPARTMENT OF TRANSPORTATION

Sustainable Street Network

Emergency Responder Perspective

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Charlotte Dept of Transportation
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Purpose

Demonstrate how a connected street network provides better emergency response while saving tax dollars.

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Shared Interests

	Fire Department	Transportation
Disperse traffic	☆	☆
Link land uses		☆
Reduce vehicle-miles of travel (VMT)	☆	☆
Alternate routes & Access	☆	☆
Safe streets	☆	☆
Improved response	☆	☆

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CFD Service Standards

- 1 fire company arrives in 6 minutes or less, 80% of time
- 3 fire companies arrives in 9 minutes or less, 80% of time

2 minutes call and dispatch
4 or 7 minutes travel time

Station with Engine serves 2½-mi. radius
Station with Ladder serves 4-mi. radius

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Financial Aspects of Building and Operating a Fire Station

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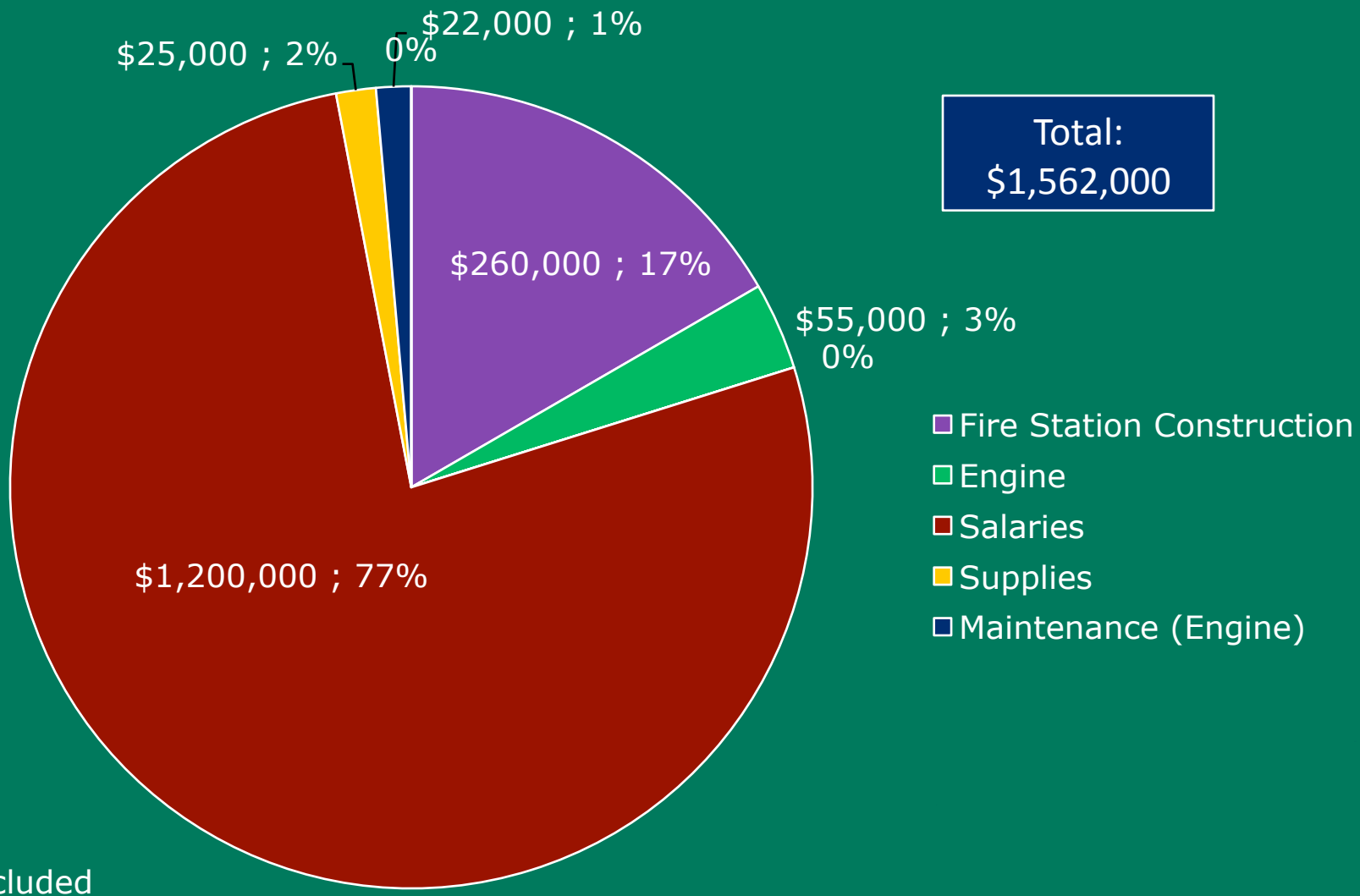
Non-inflated Annual Cost for 1 Fire Station with 1 Apparatus



Total: $1,562,000

Fuel not included

Assumes 1 engine per station (3 companies each)

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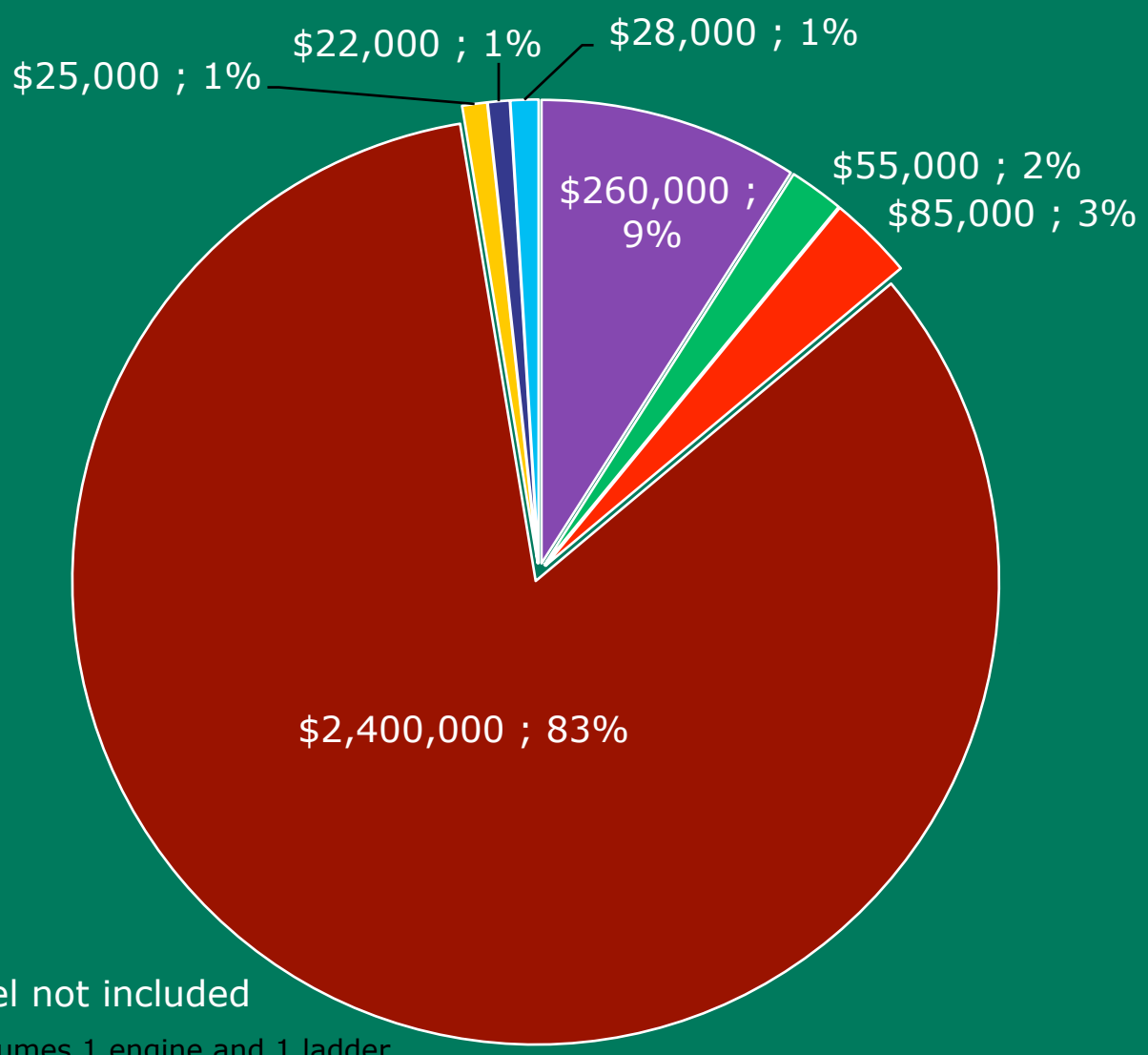
Non-inflated Annual Cost for 1 Fire Station with 2 Apparatus



Total: $2,790,000

- Fire Station Construction
- Engine
- Ladder
- Salaries
- Supplies
- Maintenance (Engine)
- Maintenance (Ladder)

Fuel not included

Assumes 1 engine and 1 ladder per station (3 companies each)

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Distribution of Costs

- Costs to operate a fire station generally are fixed
- Costs are independent of…
  - Service area
  - Number of properties served per station
- More efficient for taxpayers when…
  - Service area per station is maximized
  - Number of properties served is maximized
- Fire station costs are mostly operating costs

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Comparison of 8 Fire Stations in Charlotte

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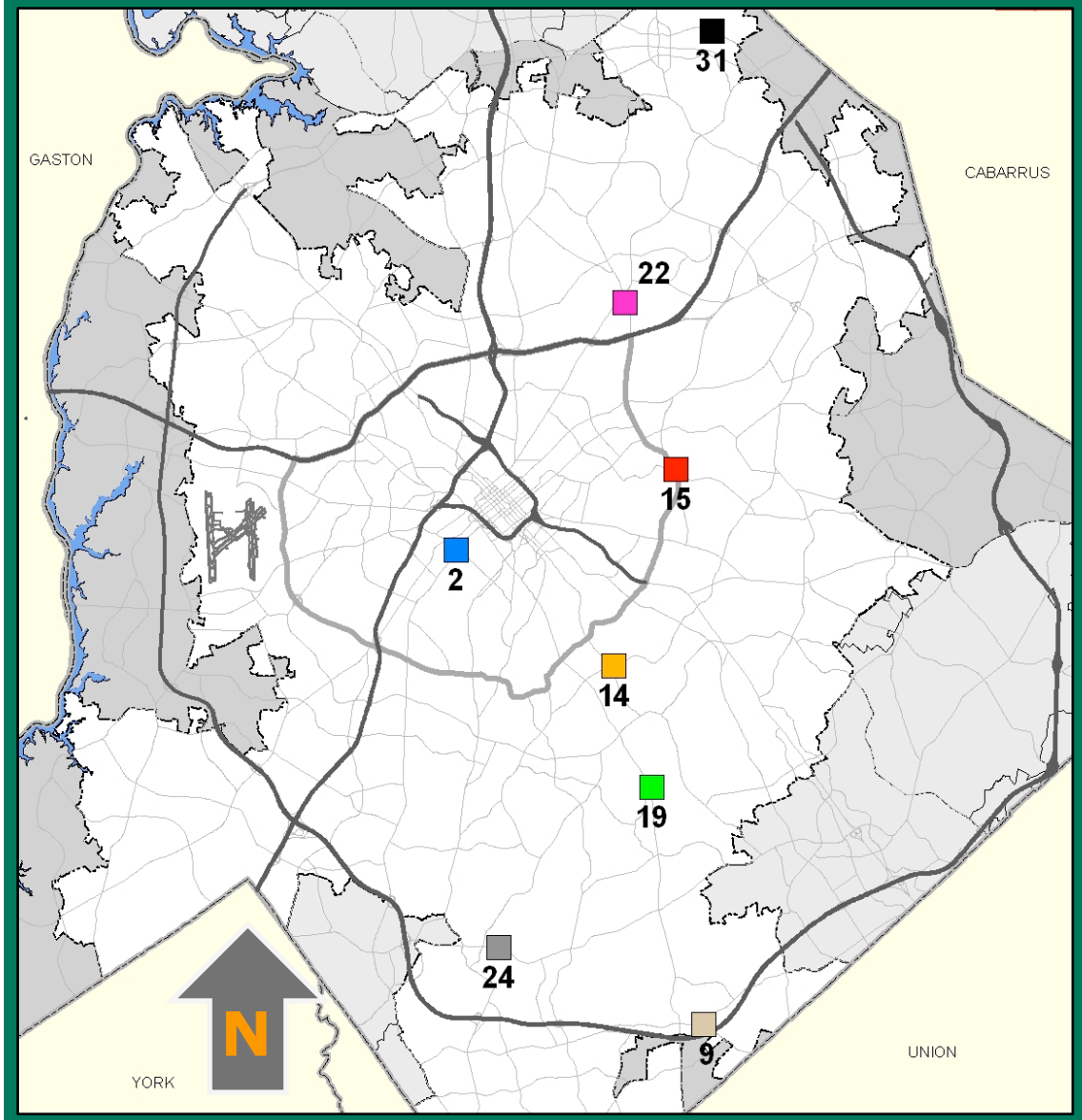
Fire Stations Studied



- 8 fire stations
- Areas all generally built-out
  - Land generally developed
  - Street network generally complete
- Distance from Center City generally correlates negatively with connectivity

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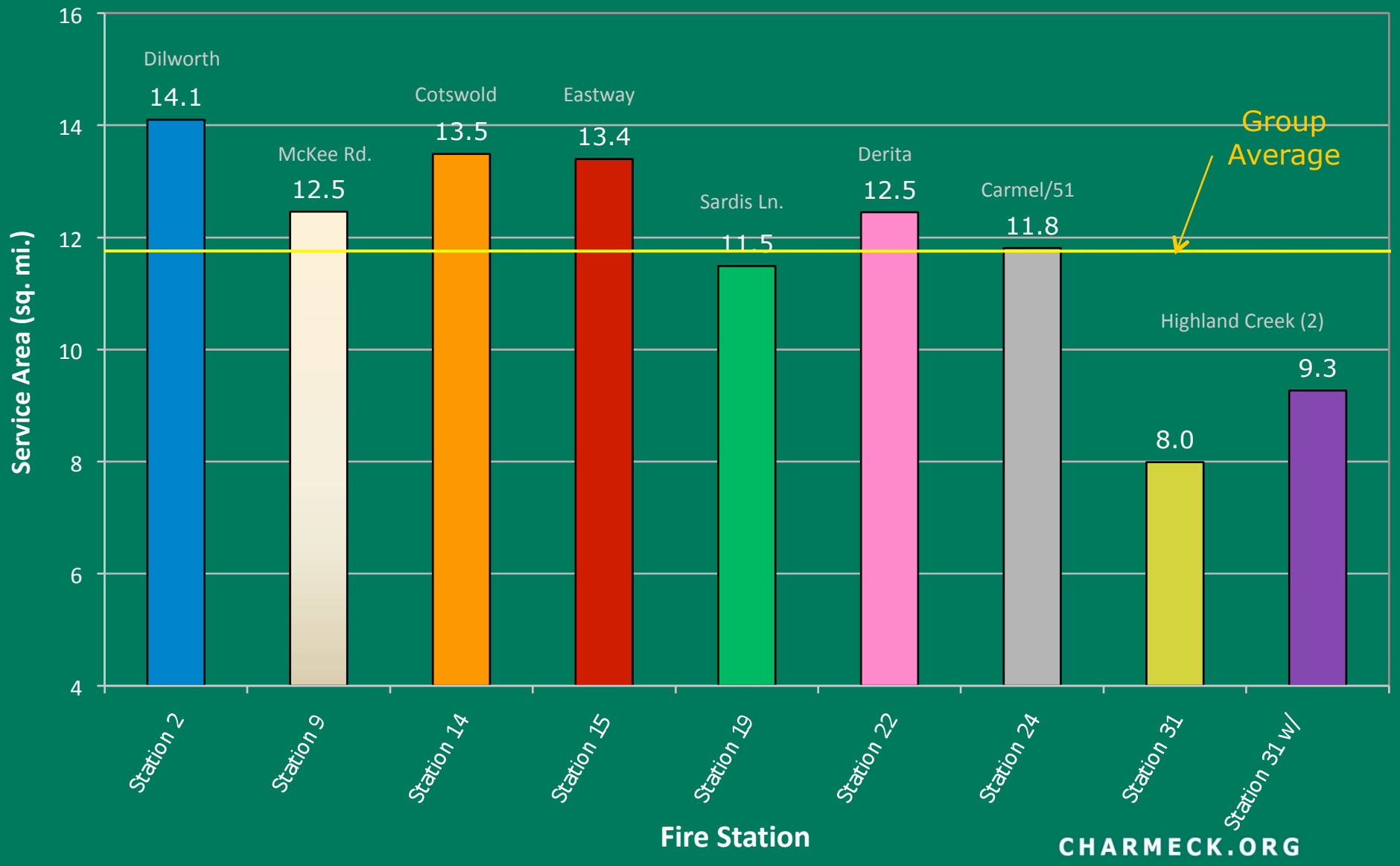
Service Area Size
(Based on 2½-mile travel distance)



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Definition

Connectivity Ratio (CR) or *Connectivity Index (CI)*

A quantitative measure of connectivity in a given area, equal to:

$$\frac{\text{Number of street segments}}{\text{Number of Intersections + Cul-de-sacs + Dead Ends}}$$

Connectivity ratio ranges from 1.00 (one cul-de-sac) to 2.00 (a perfect grid)

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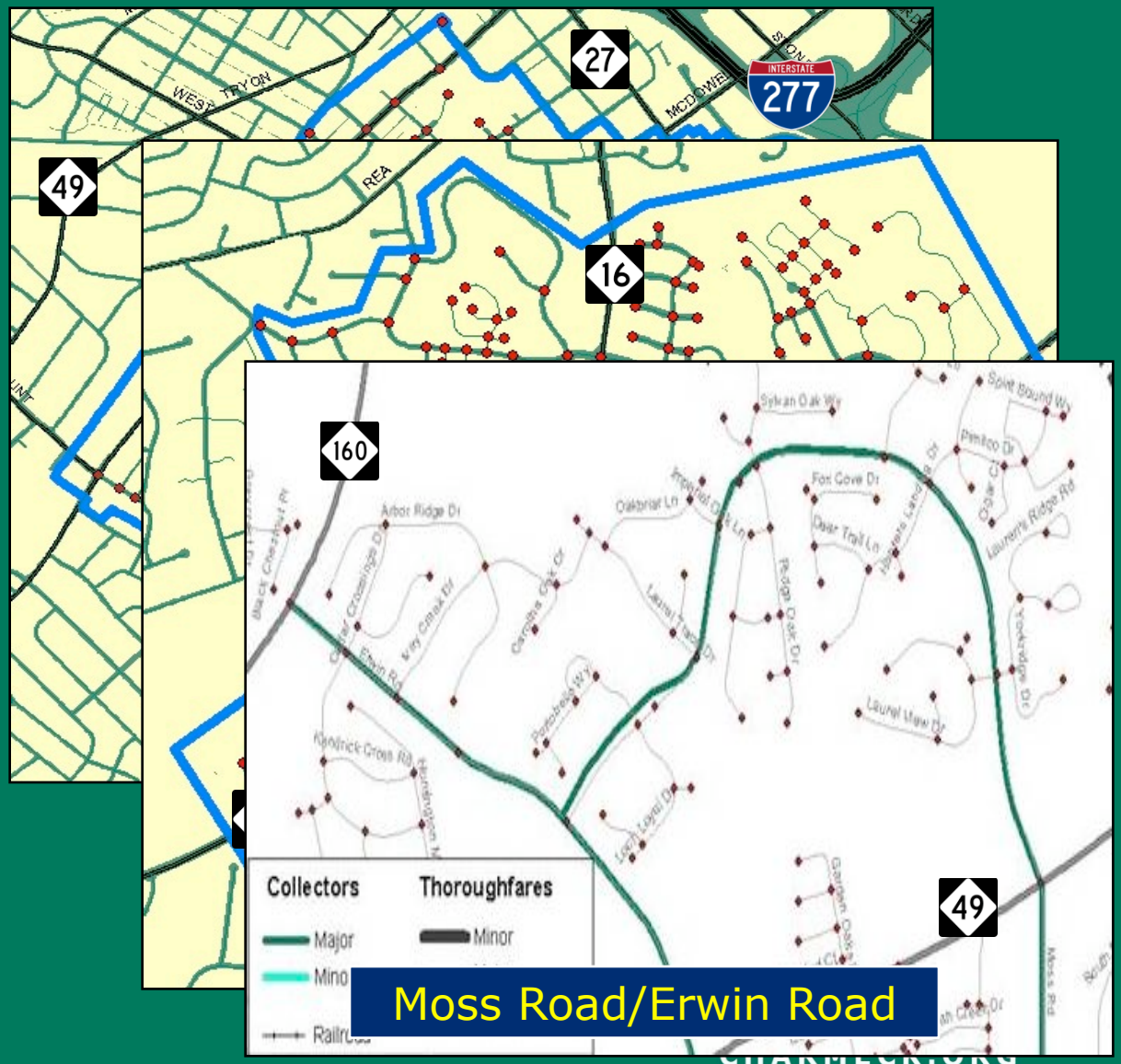
Three Connectivity Ratios

- CR = 1.40
- CR = 1.20
- CR = 1.04



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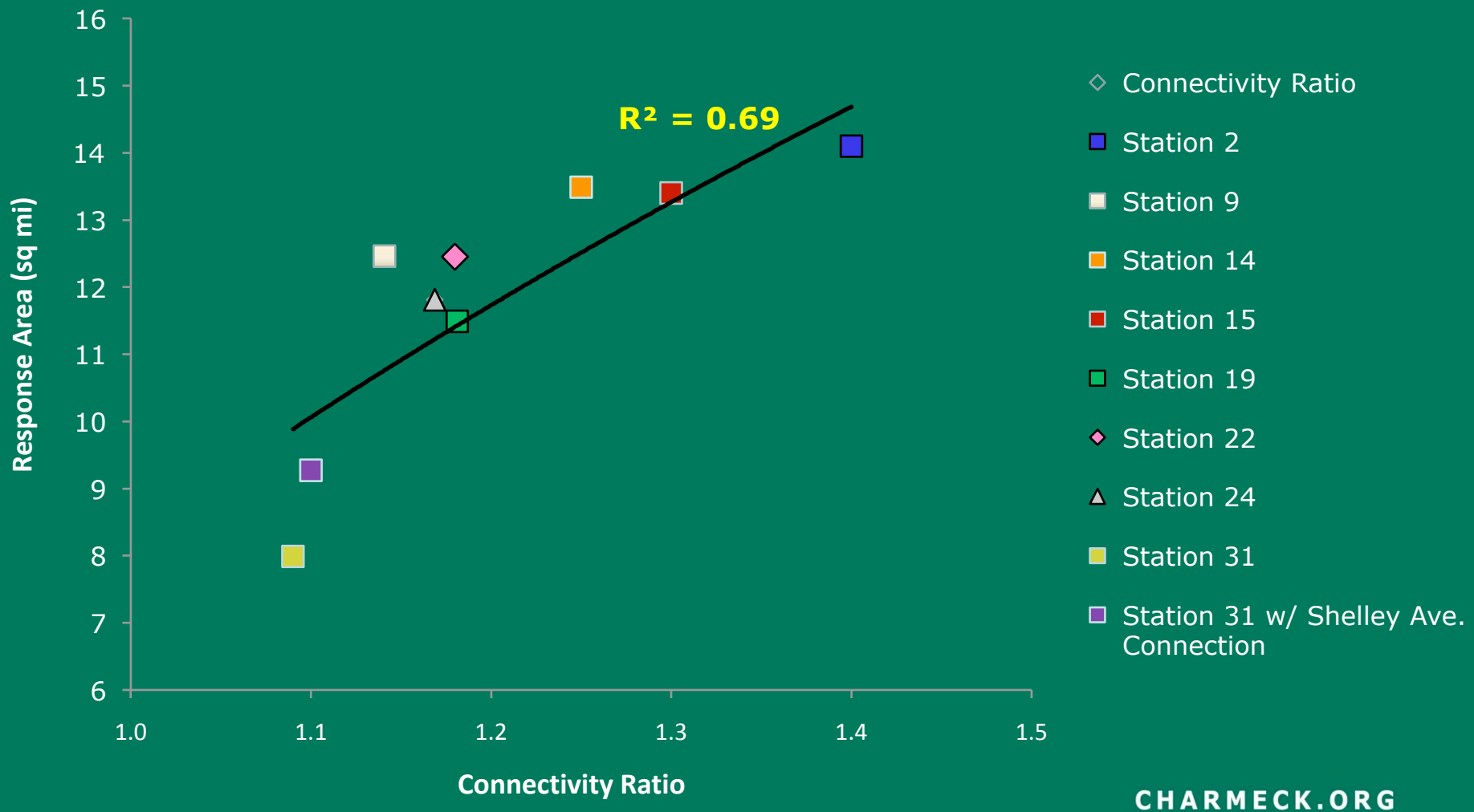
Service Area as a Function of Connectivity Ratio



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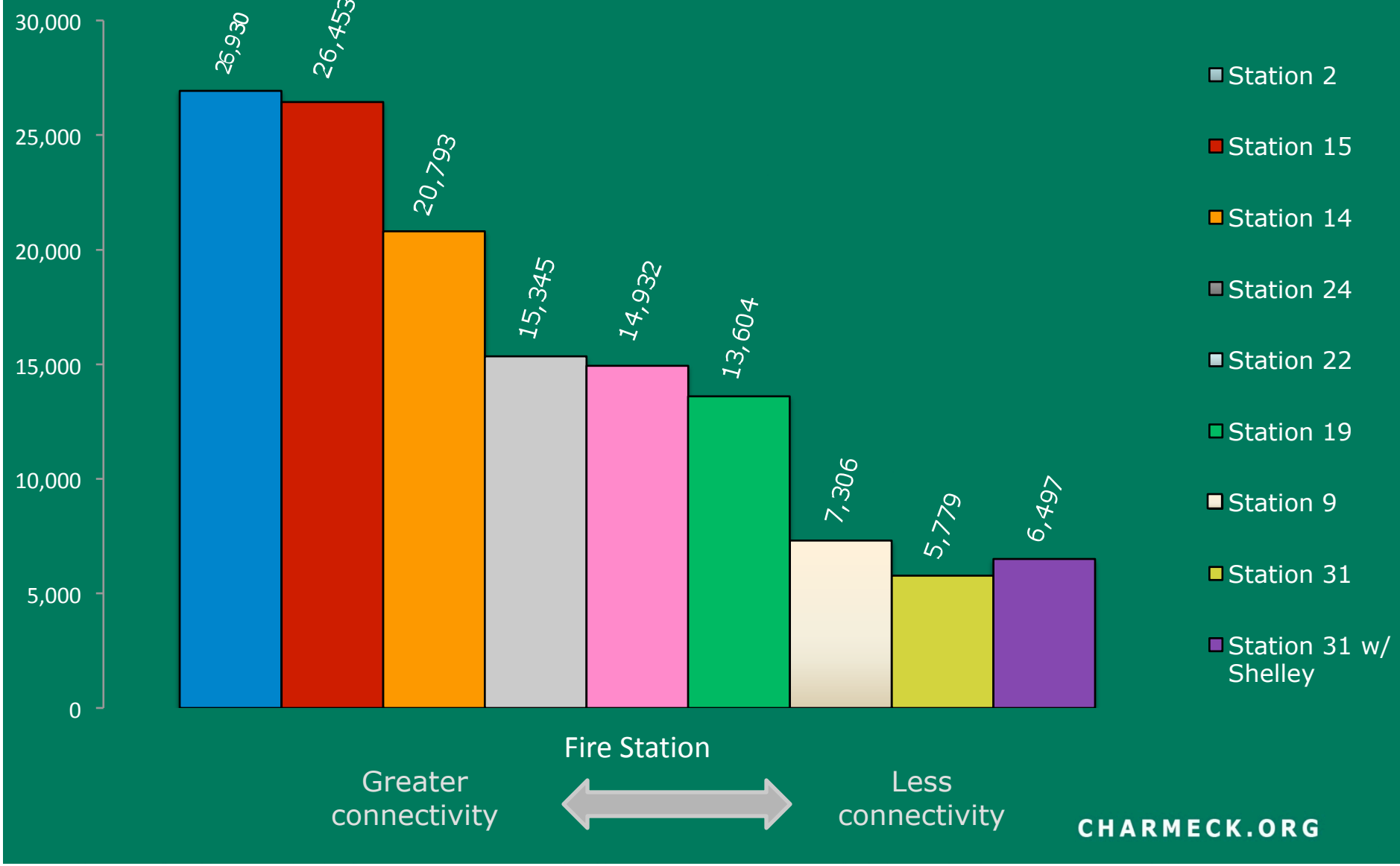
Households per Fire Station



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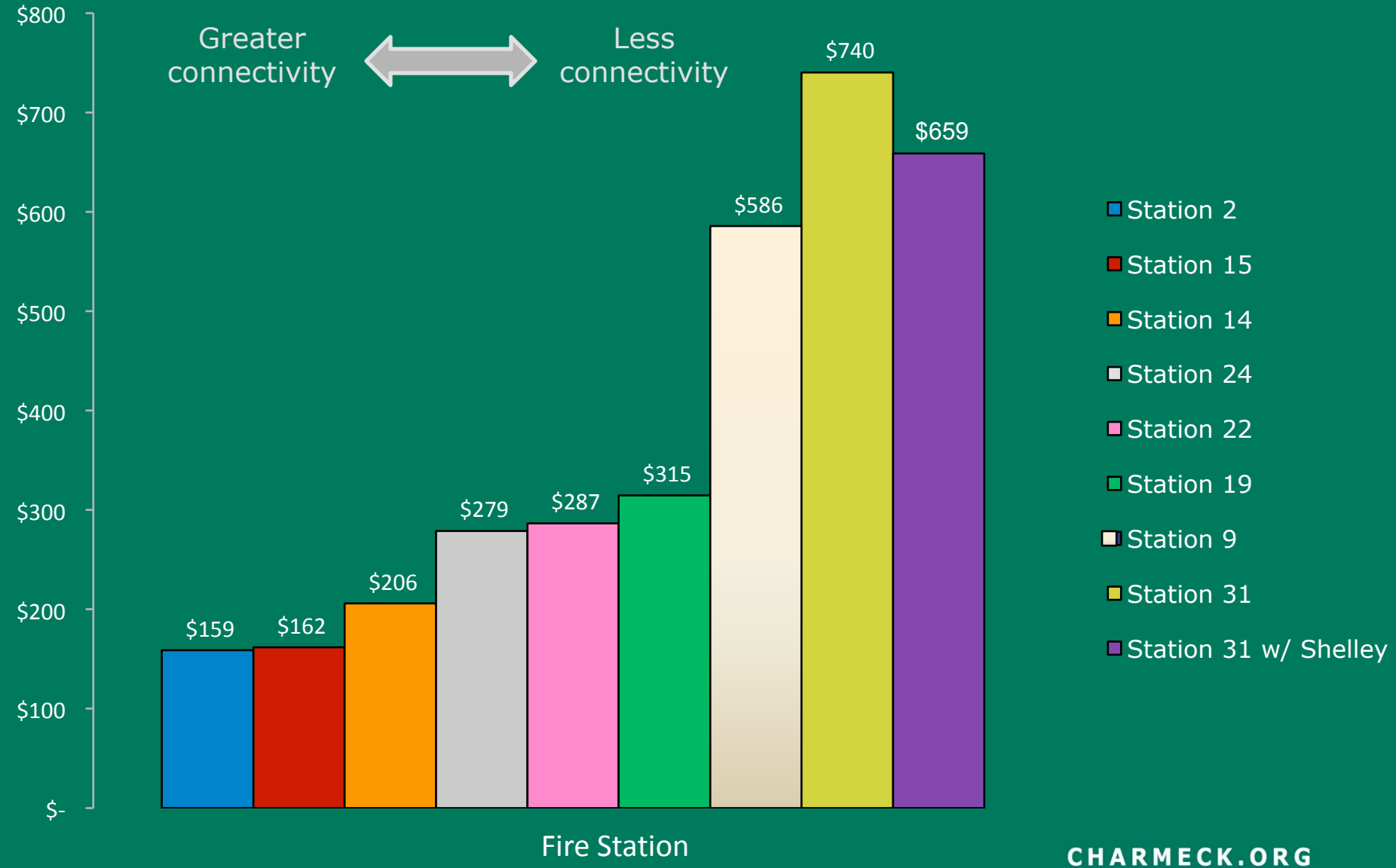
Annualized Per-Capita Life Cycle Costs (based on 2-apparatus station)



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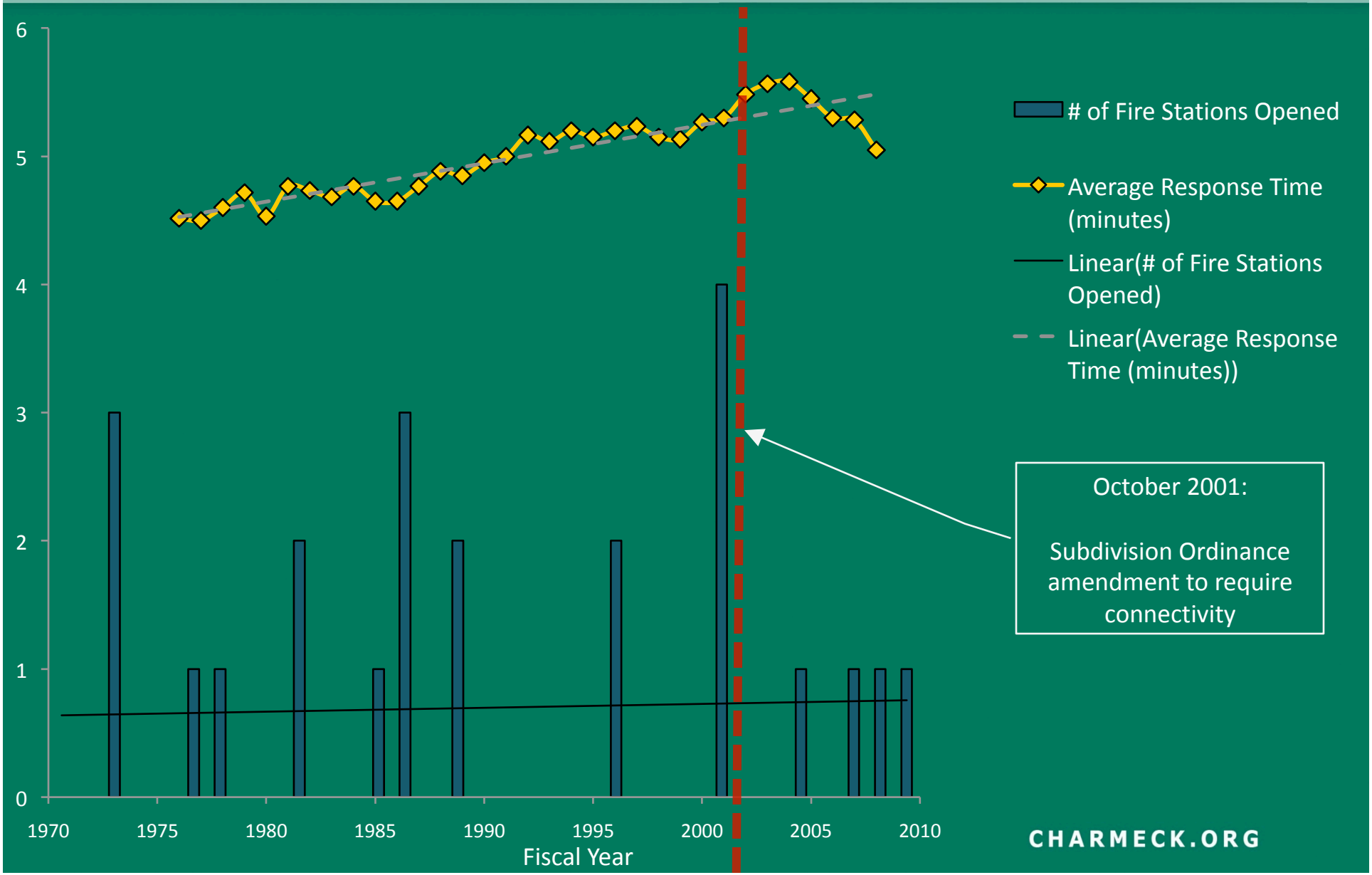
Average Citywide Response Time and Connectivity Ratio



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Conclusions

- Degree of connectivity directly affects Fire Station service area size
  - Higher connectivity ratios = larger service areas
- Larger service area distributes fixed costs over more households
- Fire station costs are fixed
- Good connectivity = Financial efficiency

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Station 15 / Station 31
Case Study on Connectivity

Or…

Why 300 Feet of Road
Can Be Very Important

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Fire Station Contexts

- Station 15
  - Located at Eastway/Shamrock intersection (E Charlotte)
  - Area developed in 1950's – 1960's ~ older suburbs
  - Connectivity ratio of 1.30
  - 2½-mile response area: 13.4 mi^2
- Station 31
  - Located on Ridge Road near Highland Creek (NE Charlotte)
  - Area developed in 1980's – 1990's ~ recent suburbs
  - Connectivity ratio of 1.09
  - 2½-mile response area: 8.0 mi^2

Question:
Does increased connectivity increase fire response areas?

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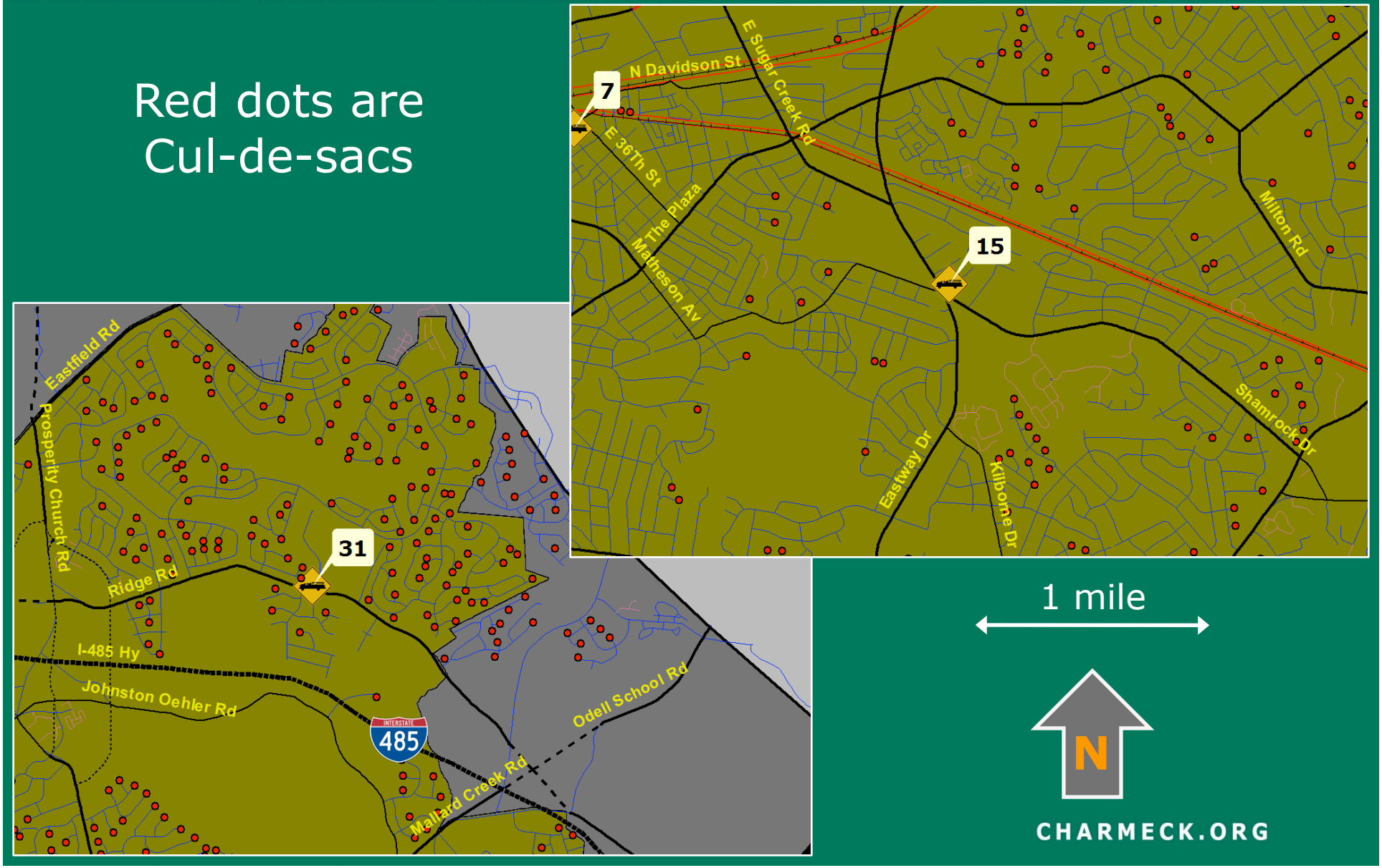
Fire Station Contexts

Red dots are
Cul-de-sacs



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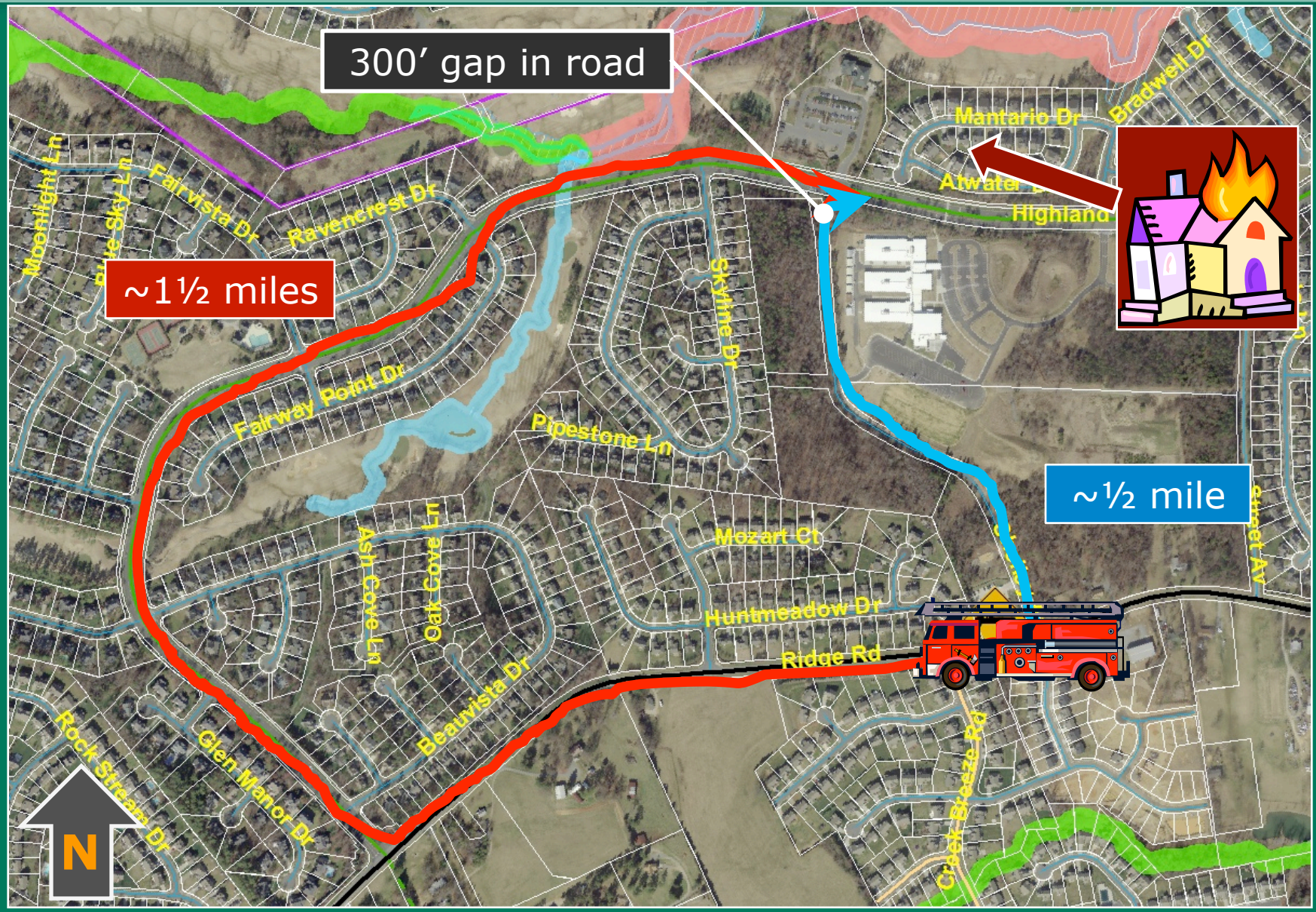
Access Route for FS 31



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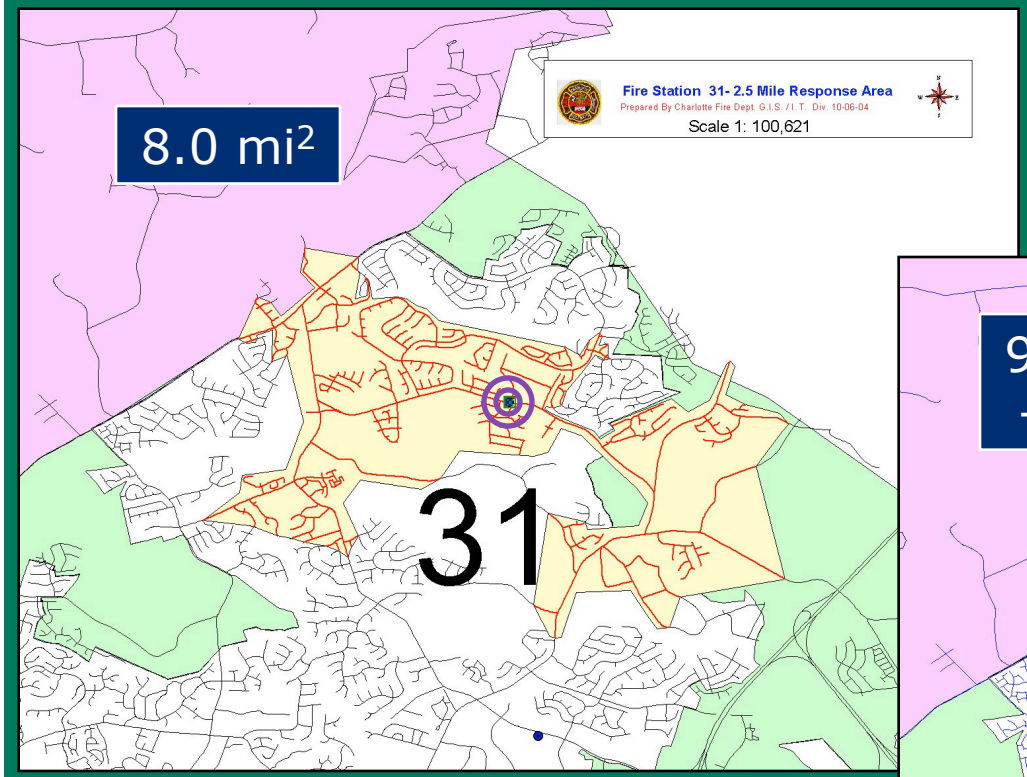
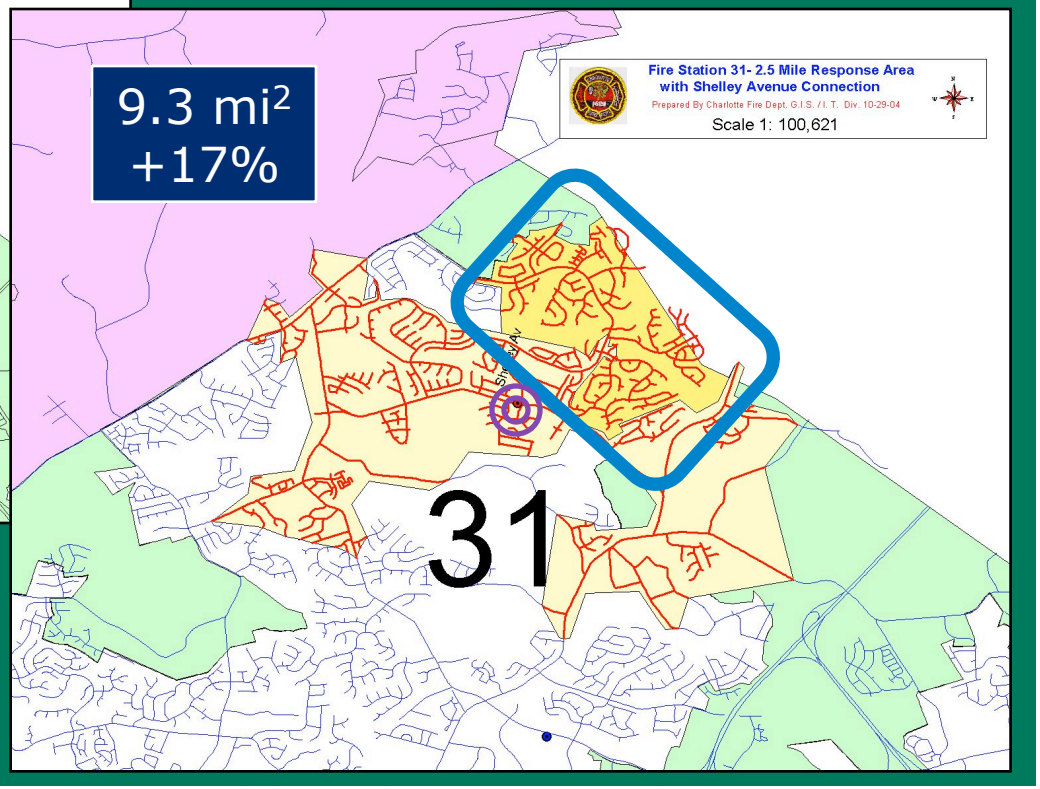
FS 31 Service Area Comparison

Without Shelley Ave. Connection



With Shelley Ave. Connection

CMS to complete by 8/09



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Conclusions

- **There is a business case for having better connectivity**
- Connectivity CIP projects/Land Development
  - One-time capital cost, plus occasional maintenance
  - $1 million or less
  - Connectivity through Land Development analogous
- Fire Stations
  - Annual operating costs
  - One-time capital costs [property, construction]
  - Recurring capital costs [equipment]
  - Averages $1.5 - $2.7 million annually (non-inflated)

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Thanks To…

- CDOT staff
  - Matt Magnasco
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  - Dan Gallagher
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  - Benny Warwick
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  - Bridget Hayes
  - Deputy Chief Rob Kinniburgh
  - Deputy Chief Rich Granger
  - Deputy Chief Pete Key

Connecting Charlotte

Charlotte Fire Department

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Questions and Comments?