

Incorporating the Effects of Intersection Delays on Congestion in Subarea Travel Demand Modeling

presented to

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presented by

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Objectives

- ① Investigate Congestion Effects
 - » Delay at the link and intersection level
- ① Analyze Traffic Impacts of Land Development
 - » Level of services (LOS)
- ① Evaluate Mitigation Options
 - » Measures of effectiveness

Analytical Tools

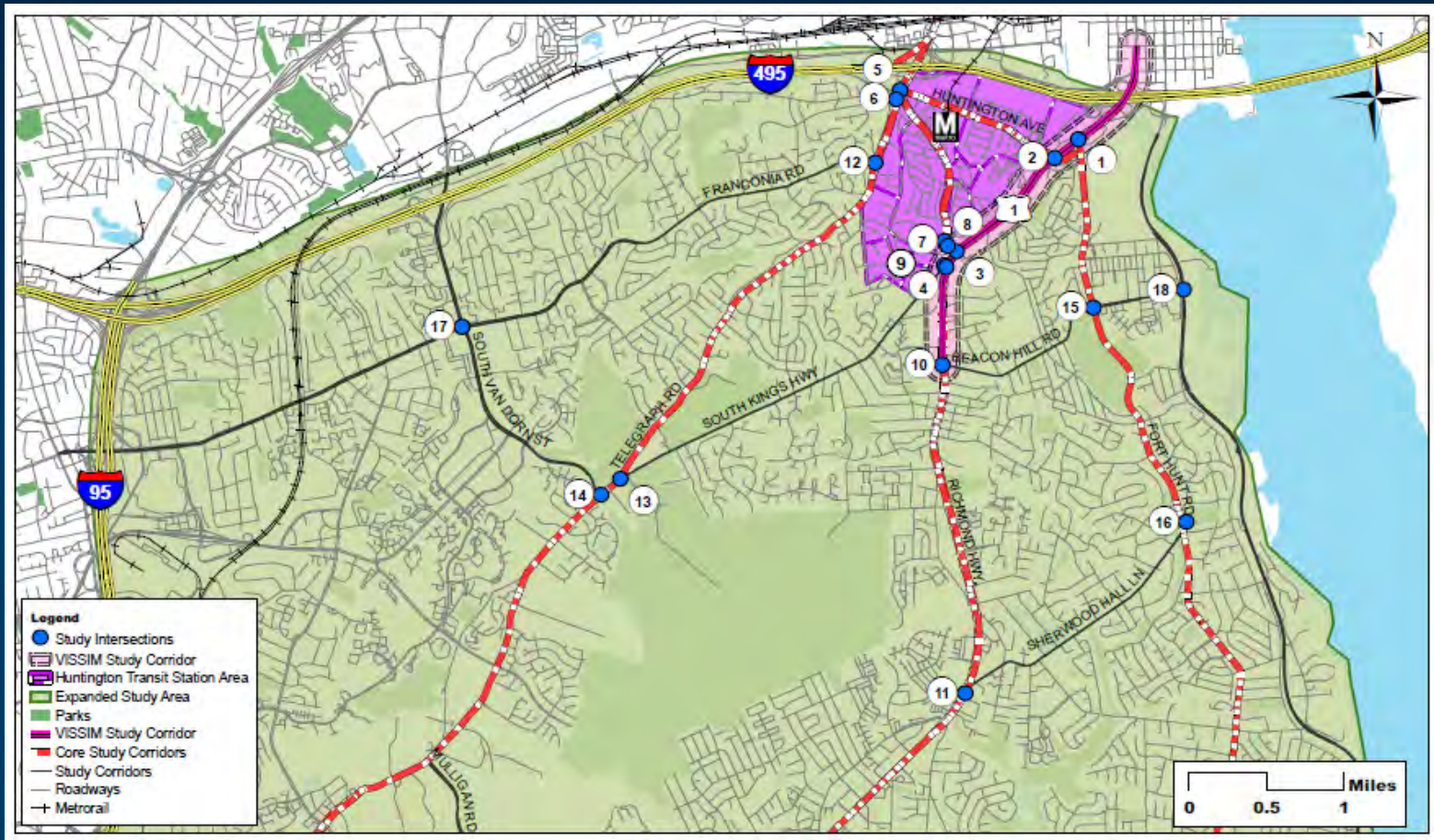
- ◎ Traffic Analysis Software
 - » HCM-based methodology for analyzing intersection LOS
 - » Traffic volumes estimated externally
 - » No feedback
- ◎ Regional Travel Demand Modeling
 - » Estimate/forecast traffic volumes
 - » No consideration of the effects of intersection delay
- ◎ Subarea Travel Demand Modeling
 - » Consideration of the effects of intersection delay

Methodology: Two Modeling Approaches

| | Control Device Method | Intersection Modeling |
|----------------------------|--|--|
| Methodology | Capacity-restrained assignment with link capacity and speed modified by intersection delays | Intersection-constrained capacity-restrained assignment, with HCM intersection methodology |
| Input/Parameters | <p>Network attributes: control devices, link facility types, total number of turn lanes</p> <p>Default: degree of progression (arrival type), cycle time, green time to cycle time ratios, and signal progression factor</p> | <p>Network attributes: link and intersections</p> <p>Geometric characteristics</p> <p>Signal timing</p> |
| Intersection types | <p>No control device;</p> <p>Stop sign;</p> <p>Yield sign;</p> <p>Major approach to a signalized intersection; and</p> <p>Minor approach to a signalized intersection</p> | <p>Signal-controlled intersections (four types)</p> <p>All-way stop-controlled intersection</p> <p>Two-way stop-controlled intersection</p> <p>Priority intersection (two-way yield controlled intersection)</p> <p>Roundabout</p> |
| Output | Link level LOS | Intersection Delays and LOS |
| Mitigation measures | Evaluated directly (limited) and indirectly | Evaluated directly |

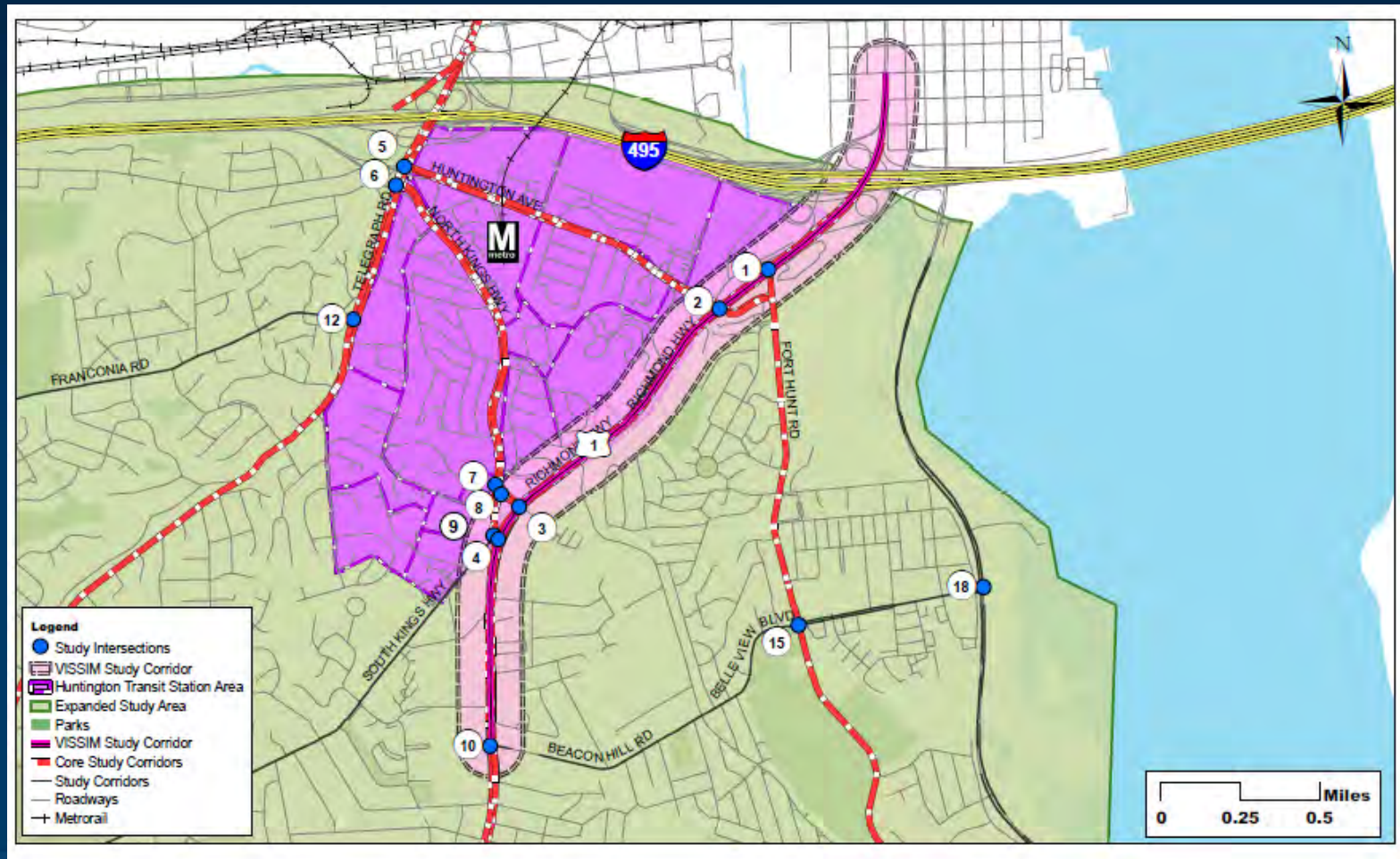
STUDY AREA

General Study Area



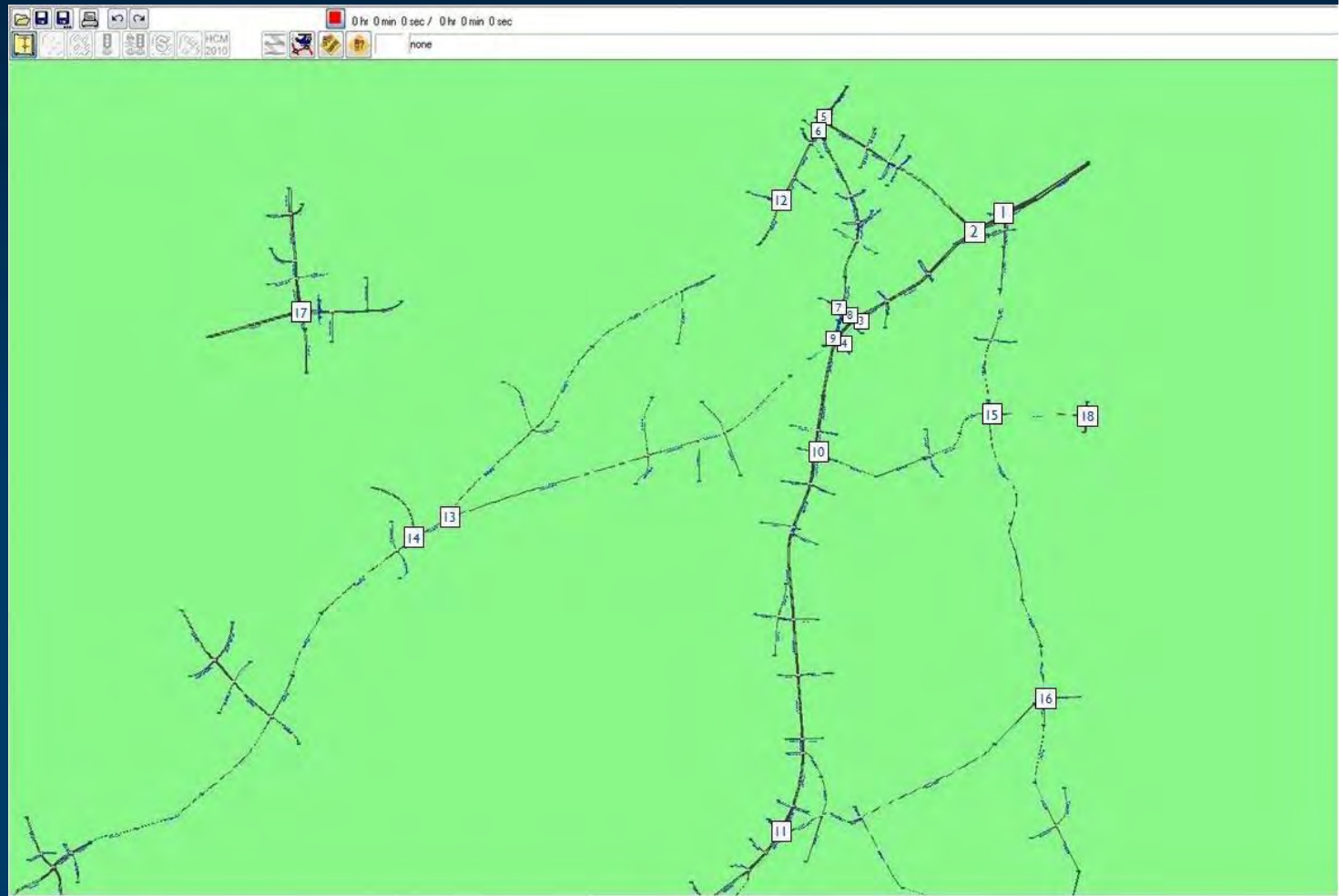
STUDY AREA

◎ Core Study Area



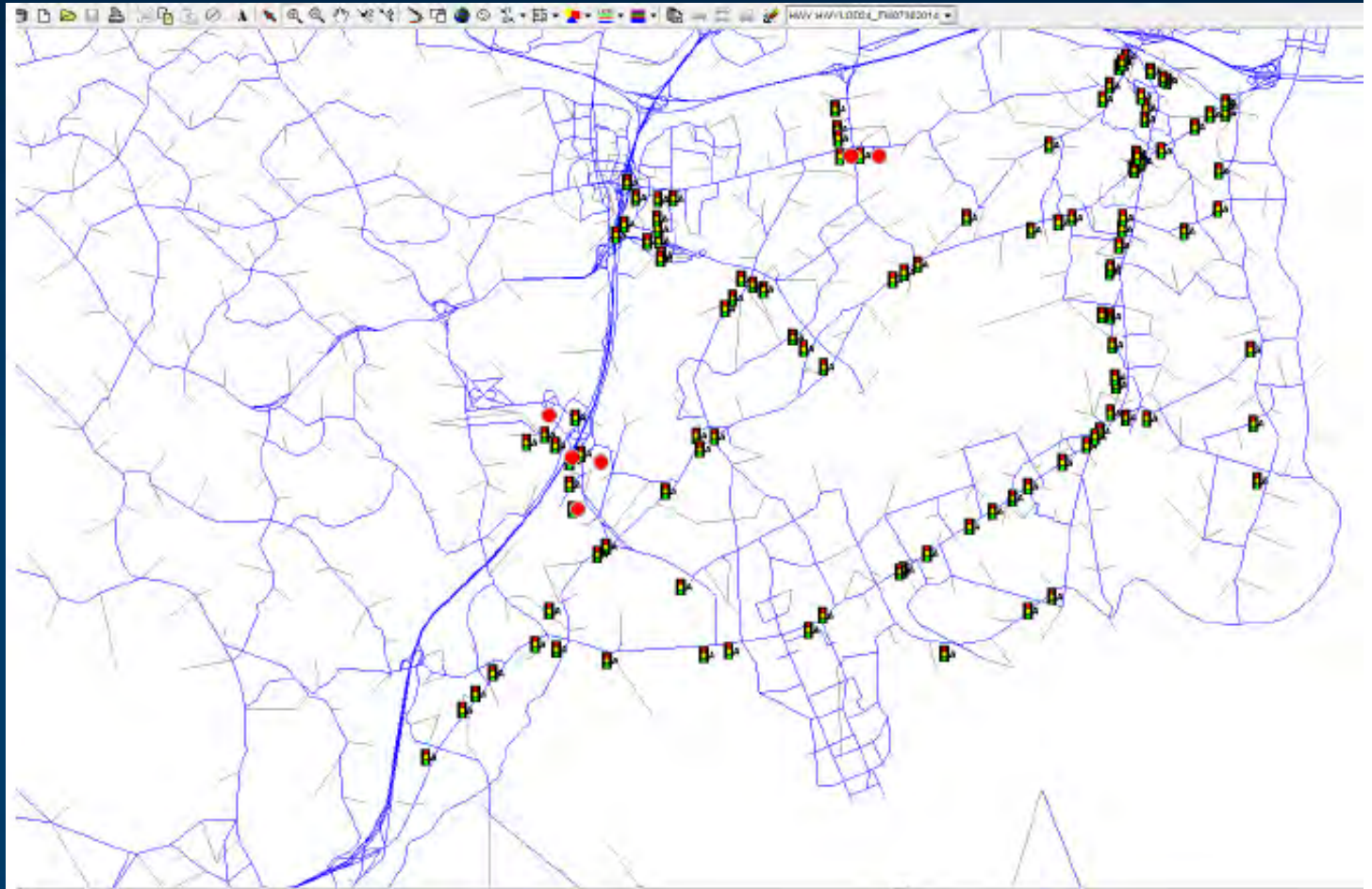
Intersection Modeling

© Traffic Analysis Network



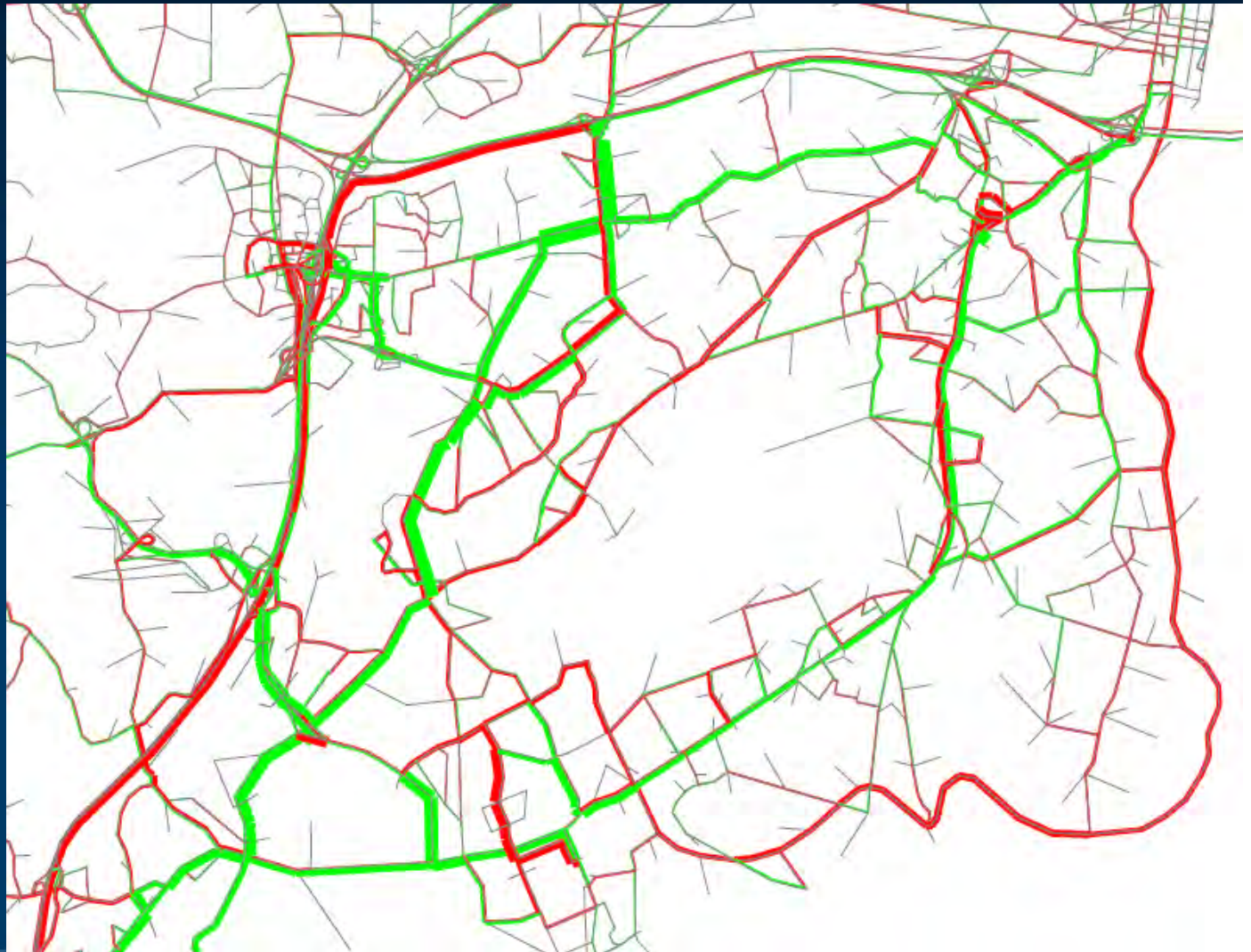
Intersection Modeling

© Subarea Model Network



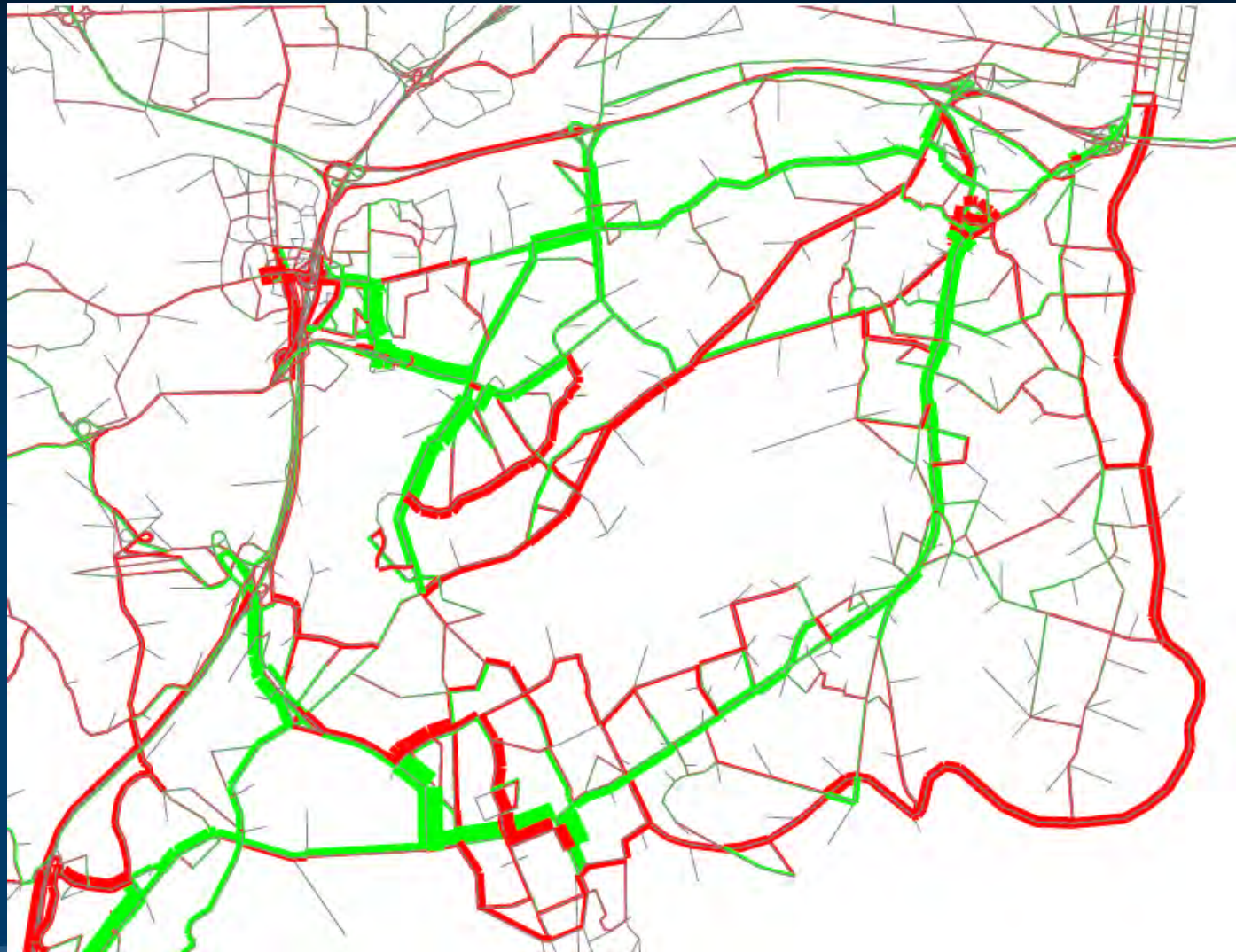
Intersection Modeling

- © AM Volume Comparison: Intersection Modeling vs Control Device Method



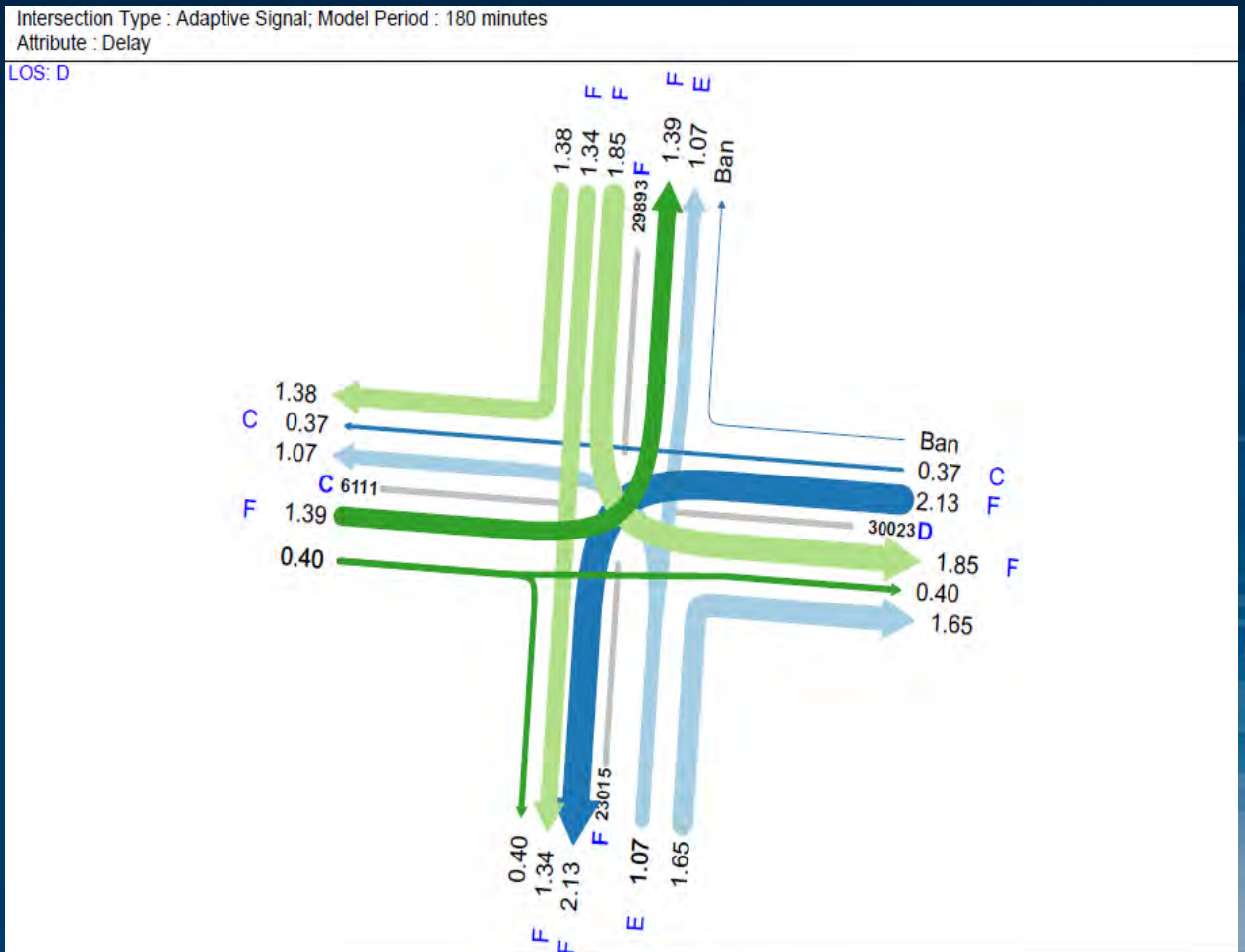
Intersection Modeling

- © PM Volume Comparison: Intersection Modeling vs Control Device Method



Intersection Modeling

- ◎ Intersection LOS
- ◎ Comparisons with Traffic Analysis Software



Source: Cambridge Systematics

Model Validation

◎ Screenlines



Source: Cambridge Systematics

Model Validation

Model-Estimated vs. Observed Daily Volumes -- % Difference (%RMSE)

| Facility Types | Control Device Method | Intersection Modeling |
|--------------------------|-----------------------|-----------------------|
| Freeway/ Expressway | 4% (32%) | -4% (27%) |
| Major Arterial | -15% (27%) | -7%(15%) |
| Medium/Minor Arterial | -1% (9%) | 1%(12%) |
| Collector | -7% (38%) | -5%(27%) |
| Total | -6% (27%) | -4%(18%) |

Conclusions

◎ Subarea Travel Demand Modeling

- » Control device modeling
- » Intersection modeling
 - HCM methodology
 - Detailed representation of intersection
 - Delays and intersection LOS
 - Congestion effects on route choice and diversion

◎ Model capability

- » Evaluate mitigation measures
- » Evaluate traffic impacts of land development