Methodology

Candidate FSP Sites

Input Data
- Crashes
- GIS Files
- ADT

Input Data
- Incident and crash profiles
- Traffic profiles
- FSP unit costs
- FSP fleet size

Planning
Analysis
Site-Rankings

Operational
Analysis

Visual Display
Of Candidate
Sites (GIS)

Models
- Delay
- Cost
- Fleet size

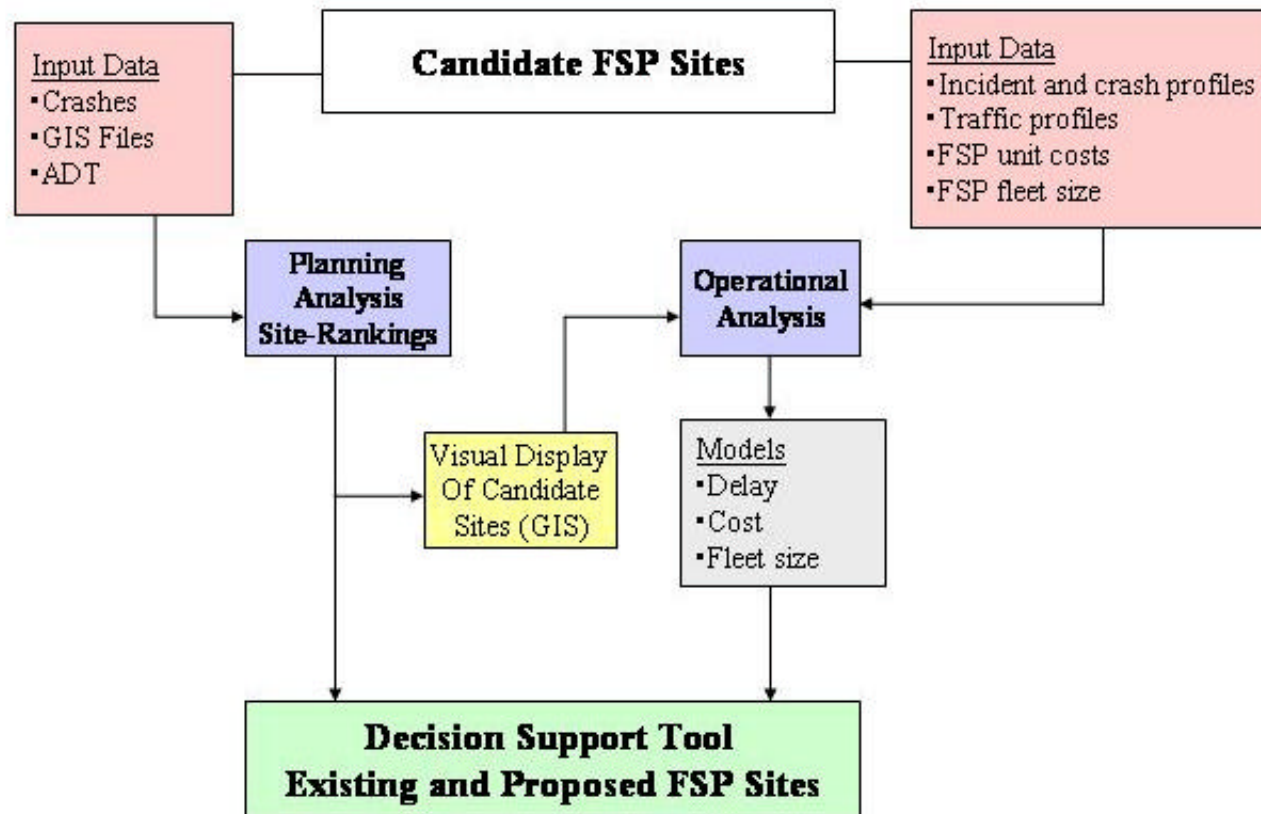**Decision Support Tool**
Existing and Proposed FSP Sites

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Input Data

- **Planning Analysis (data-driven)**
  - NC DOT GIS Shapefiles
  - NC DOT Crash Data
  - HSIS Crash and Roadway Data

- **Operational Analysis (data + models)**
  - NC DOT Automatic Traffic Recorder (ATR)
  - FSP Sites' Incident Data
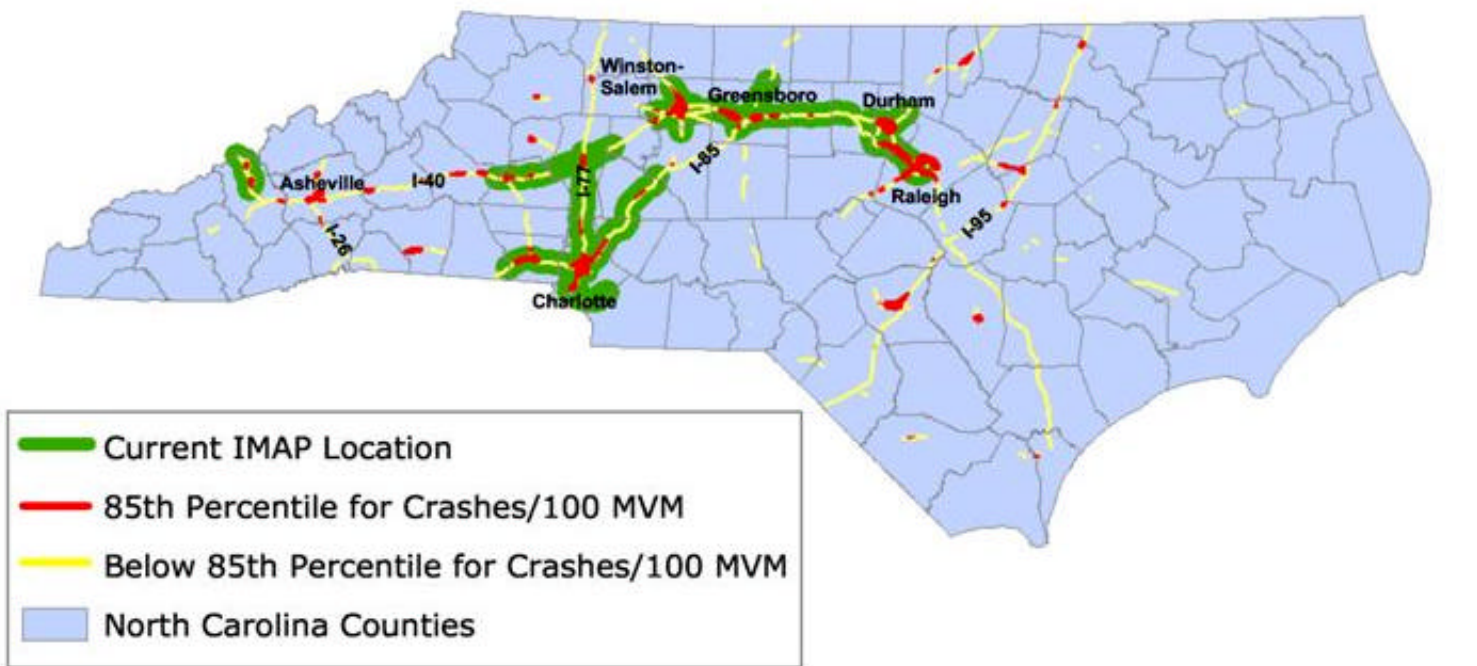 - FSP Cost Data
  - Delay vs incident characteristics (models)

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Expansion Criteria

- **Planning Analysis– initial screening**
  - Crashes per Mile per Year (last 3 year data)
  - AADT per Lane
  - Crashes per 100 Million Vehicle Miles

- **Operational Analysis**
  - Benefit / Cost ratio based on traveler delay savings with FSP vs. cost of FSP deployment

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Visual Displays- Density Map

Crashes per 100 Million Vehicle Miles Density

Legend:
- **Current IMAP Location** (green)
- **85th Percentile for Crashes/100 MVM** (red)
- **Below 85th Percentile for Crashes/100 MVM** (yellow)
- **North Carolina Counties** (light blue)

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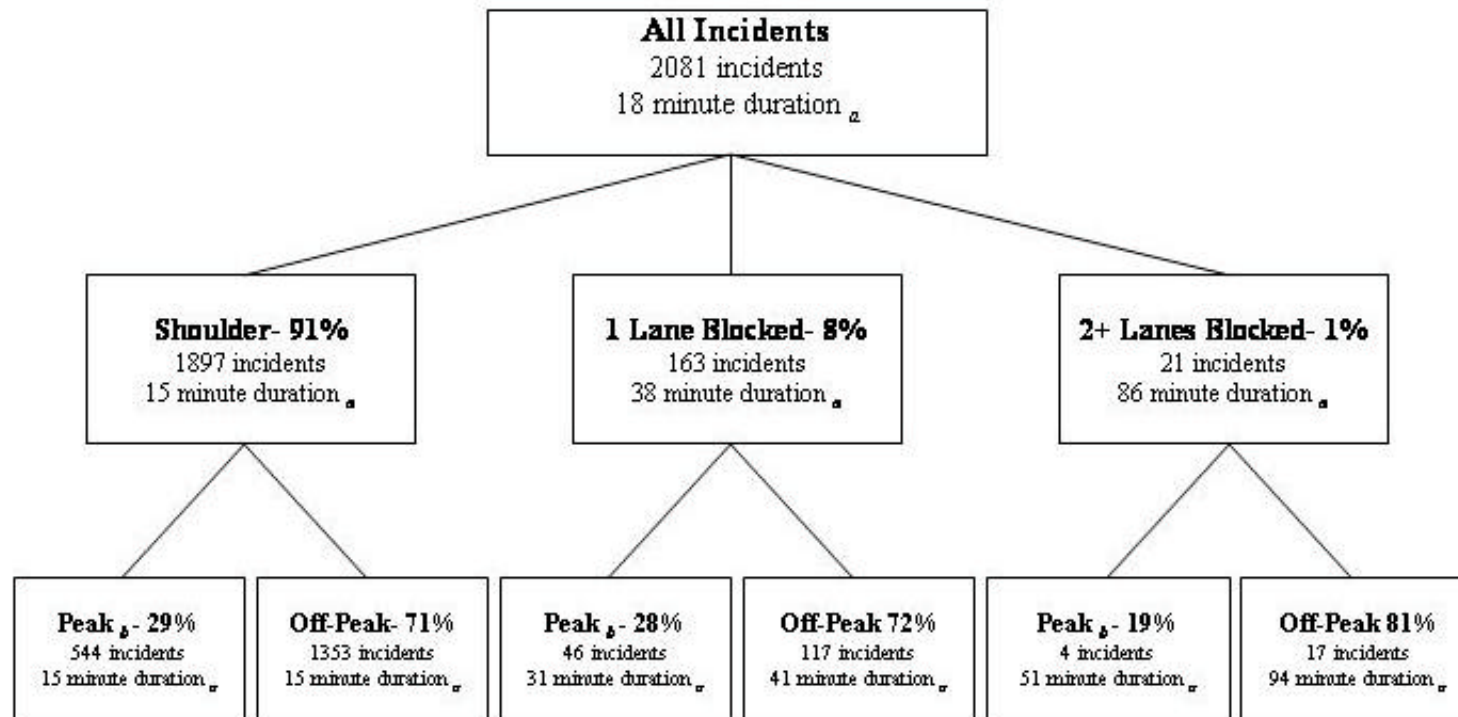Carolina Transportation Program

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Input Data-Crash to Non-Crash Incidents Ratios

- No central repository for incident data
- Charlotte and Greensboro FSP data
- Create incident distribution tree
- Use known crash figures to estimate non-crash incidents
  - Ratio based on data→ **7.2:1**
- In the long-term, incident rates can be predicted using ADT, truck volume, length & weather
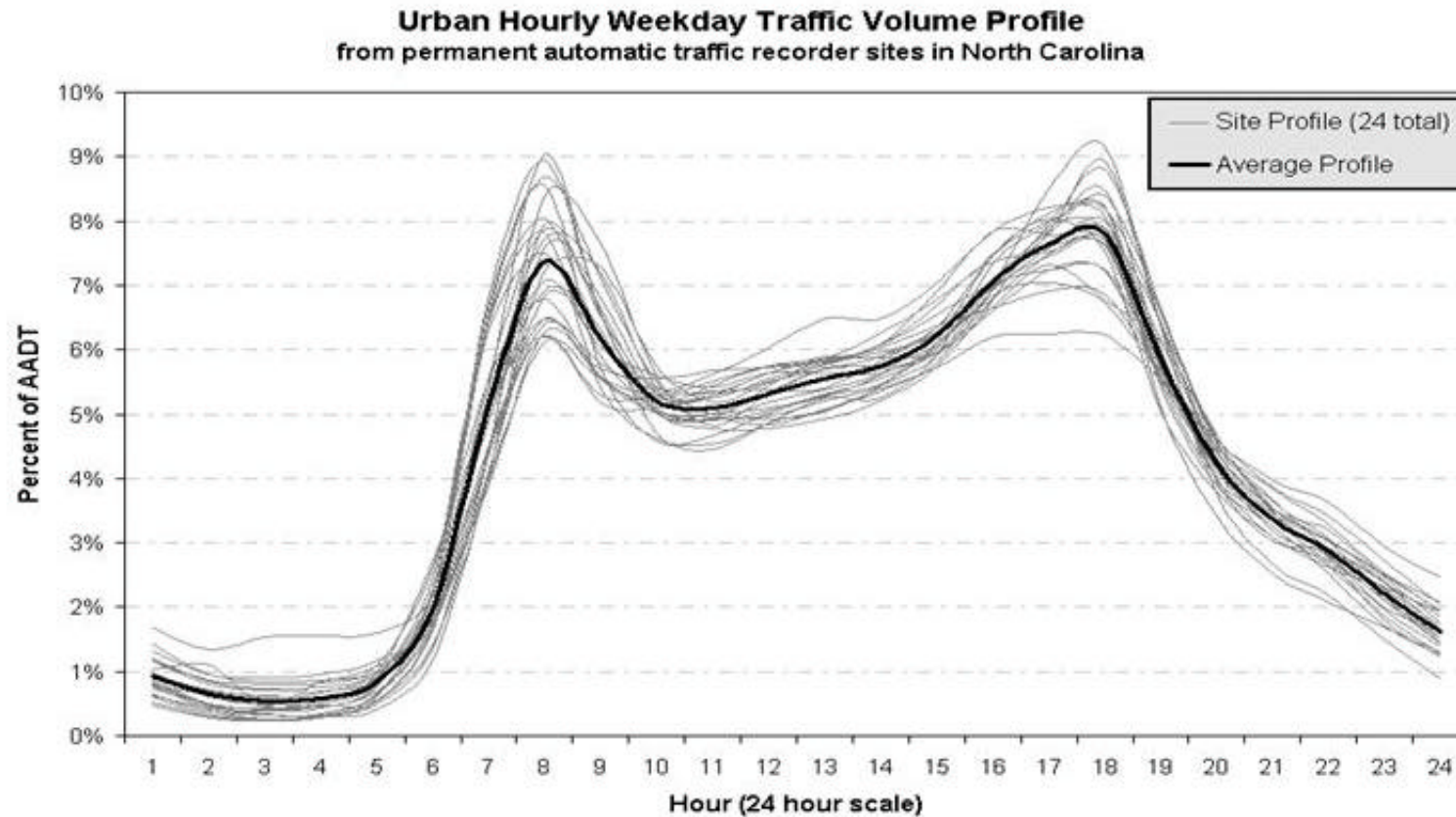
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Incident Distribution Tree

All Incidents
2081 incidents
18 minute duration [a]

Shoulder- 91%
1897 incidents
15 minute duration [a]

1 Lane Blocked- 8%
163 incidents
38 minute duration [a]

2+ Lanes Blocked- 1%
21 incidents
86 minute duration [a]

Peak [b]- 29%
544 incidents
15 minute duration [a]

Off-Peak- 71%
1353 incidents
15 minute duration [a]

Peak [b]- 28%
46 incidents
31 minute duration [a]

Off-Peak 72%
117 incidents
41 minute duration [a]

Peak [b]- 19%
4 incidents
51 minute duration [a]

Off-Peak 81%
17 incidents
94 minute duration [a]

a Average Duration with Freeway Service Patrol

b Peak periods are assumed to be Monday- Friday, 7 – 9 am and 4 - 6 pm

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Traffic Profile Data for Delay Analysis

Urban Hourly Weekday Traffic Volume Profile
from permanent automatic traffic recorder sites in North Carolina

Delay Model development using FREEVAL

- Model of HCM2000 Freeway Facilities
- Allows for temp. capacity reductions
- Modeled 2-5 lane, 10 mile sections; incident duration; incident severity; normal d/c; urban/rural segments
- FREEVAL$\rightarrow$ Veh-hours delay per VMT
- Statistical models for delay estimation based on facility and incident features

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