# Traffic Congestion: Finding Sustainable Solution through Transport Modelling

Presenter

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12/19/2021

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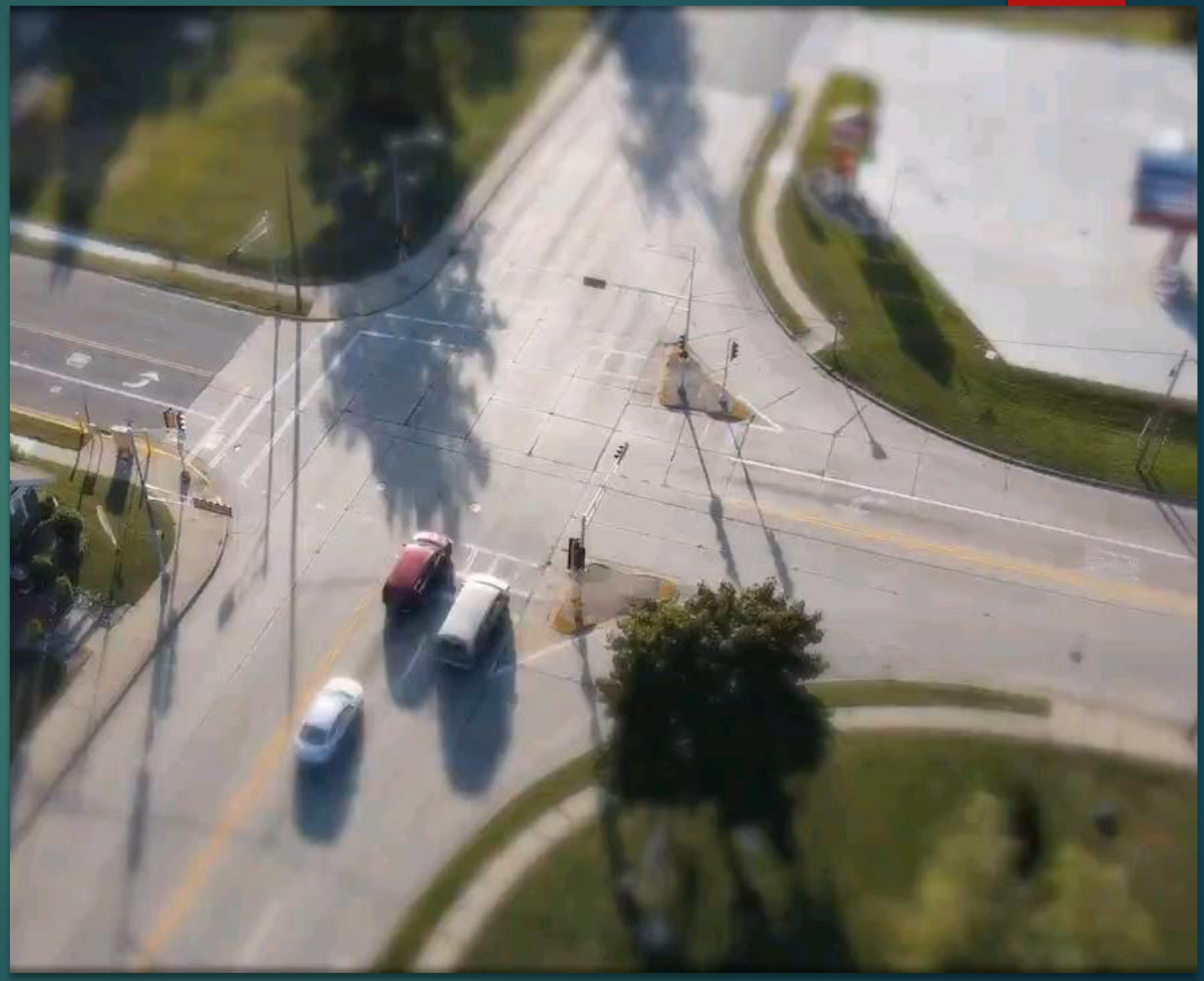
# Traffic Operation Analysis

- Delay/ vehicle
- Travel Time
- Level of Service
- Cycle length
- Queue Length
- Vehicle/ Capacity Ratio



# Traffic Operation Analysis

- Delay/ vehicle
- Travel Time
- Level of Service
- Cycle length
- Queue Length
- Vehicle/ Capacity Ratio
- Pedestrian delay

# Traffic Operation Analysis

- How to do analysis for Long Arterial?

## Importance of Modeling

- To understand the existing condition of the road section/link/network.
- To understand the future needs for improvement (time-based, location-based).

## Importance of Simulation

- Platform to create the model.
- Handling of Complex scenarios.
- Time Saving.
- Scientific way of Analysis- Reliability.

# Popular Simulation Software

- PTV group (Germany)
- VISSIM – Freeway, Arterial (Signalized, unsignalized) Traffic Operation Analysis
- VISSUM- Travel demand modeling
- VISTRO- Intersection Analysis
- VISWALK- Pedestrian movement analysis

- Trafficware
- Synchro- Intersection Analysis based on HCM
- Simtraffic- Traffic Operation

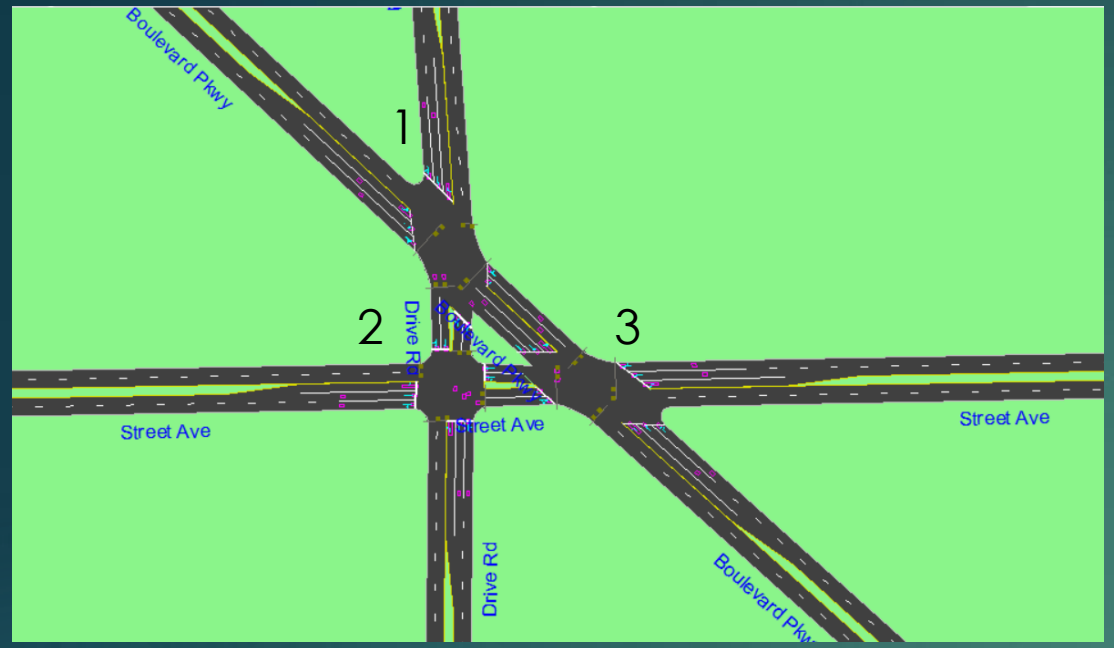
- SIDRA- Intersection, Network Analysis
- CUBE- Travel demand Modeling
- Aimsun- Traffic Operation Analysis

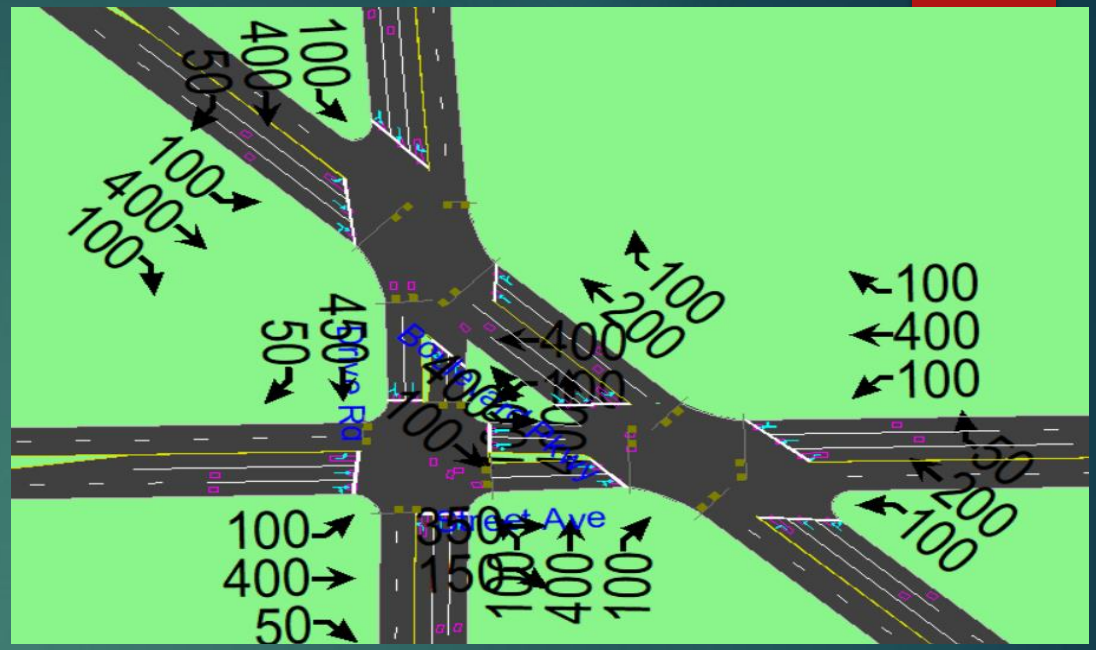
# Case Study: Intersection Operation Improvement Using Synchro


- Three closely intersections
- 7-10 minutes to clear the intersections
- Very short storage length
- Volume / Capacity ratio is more than 1.
- Pretimed signal system
- 17 parcels of land owned by the city, cost $900,000 per parcel.
- Bus stops are near the side of the intersections
- Bike crashes at NW and SE bound traffic (Boulevard Parkway).


| | Intersection 1 | Intersection 2 | Intersection 3 |
|---|---|---|---|
| Max V/C ratio | 1.37 | 1.37 | 1.37 |
| Int Delay (s) | 29.5 | 31.5 | 63.5 |
| LOS | C | C | E |
| Control Type | Pretimed | Pretimed | Pretimed |
| Cycle Length | 120 s | 120 s | 120 |

# Simulation Layout Preparation




Synchro 11 - C:\Users\...TE.zip\MWITE\PM PEAK_ST LOCATIONSBURG.syn (read-only)

File | Home | Options | Transfer | Optimize | Reports | Help | Scenario 1

Map View | Mapping | Zoom | View Ports | Select Int. | View Options | Lane Settings | Templates | Merge Template | Volume Settings | TIA | Lanes & Volumes | Timing Settings | Template | Ring & Barrier | Cluster Editor | Phasing Settings | TSD | Signal Timing | Detection Settings | Detector Template | Detection | HCM 6th Ed | Int. Results | Mvmt Results | Reset Warnings | HCM 6th Edition | HCM 2010 | Int. Results | Mvmt Results | Reset Warnings | HCM 2010 | Simulation Settings | SimTraffic | Simulation | Link | Node | Ln/Mvt | Display Results

103 Boulevard Pkwy & Street Ave

BING | SCENARIO MANAGER

| VOLUME SETTINGS | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lanes and Sharing (#RL) | | | | | | | | | | | | |
| Traffic Volume (vph) | 0 | 350 | 150 | 100 | 400 | 100 | 400 | 100 | 0 | 100 | 200 | 50 |
| Development Volume (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Combined Volume (vph) | 0 | 350 | 150 | 100 | 400 | 100 | 400 | 100 | 0 | 100 | 200 | 50 |
| Future Volume (vph) | 0 | 350 | 150 | 100 | 400 | 100 | 400 | 100 | 0 | 100 | 200 | 50 |
| Conflicting Peds. (#/hr) | 0 | — | 0 | 0 | — | 0 | 0 | — | 0 | 0 | — | 0 |
| Conflicting Bicycles (#/hr) | — | — | 0 | — | — | 0 | — | — | 0 | — | — | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Growth Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adjusted Flow (vph) | 0 | 380 | 163 | 109 | 435 | 109 | 435 | 109 | 0 | 109 | 217 | 54 |
| Heavy Vehicles (%) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Adj. Parking Lane? | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Parking Maneuvers (#/hr) | — | — | — | — | — | — | — | — | — | — | — | — |
| Traffic from mid-block (%) | — | 0 | — | — | 0 | — | — | 0 | — | — | 0 | — |
| Link OD Volumes | — | EB | — | — | — | — | — | SE | — | — | — | — |
| Traffic in shared lane (%) | — | — | — | — | — | — | — | — | — | — | — | — |
| Lane Group Flow (vph) | 0 | 543 | 0 | 109 | 544 | 0 | 435 | 109 | 0 | 109 | 271 | 0 |

# Simulation Running Video

## Future Expectations

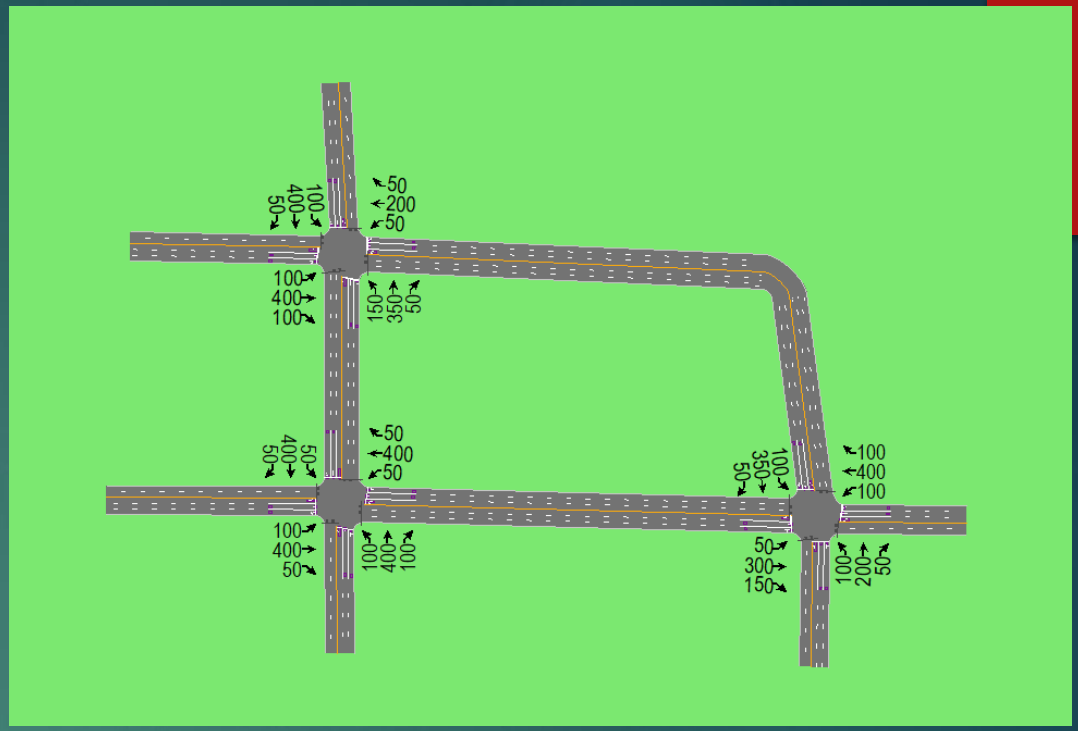
- Decreasing The Waiting Time In The Intersections
- Improving The Mobility Of The Road Users
- Enhancing The Safety Of The Bikers, Pedestrians, Transit Users, Vehicles By Reducing Crash Severity.
- Developing Bike Routes Infrastructure In All Over The City.
- Reshape The Parcels After Proposing New Layout Of The Road Geometry.

## Design Motivations For The Alternative Solution

- Reducing Heavily Congested Intersections And Making New Three Regular Standard Intersections.
- Relocate Intersection One And Three By Replacing The Diagonal Road With New Convenient Route.
- Relocating Bus Stops At Farther Sides Of The Intersections.
- Creating New Routes For The Bikers And Pedestrians.

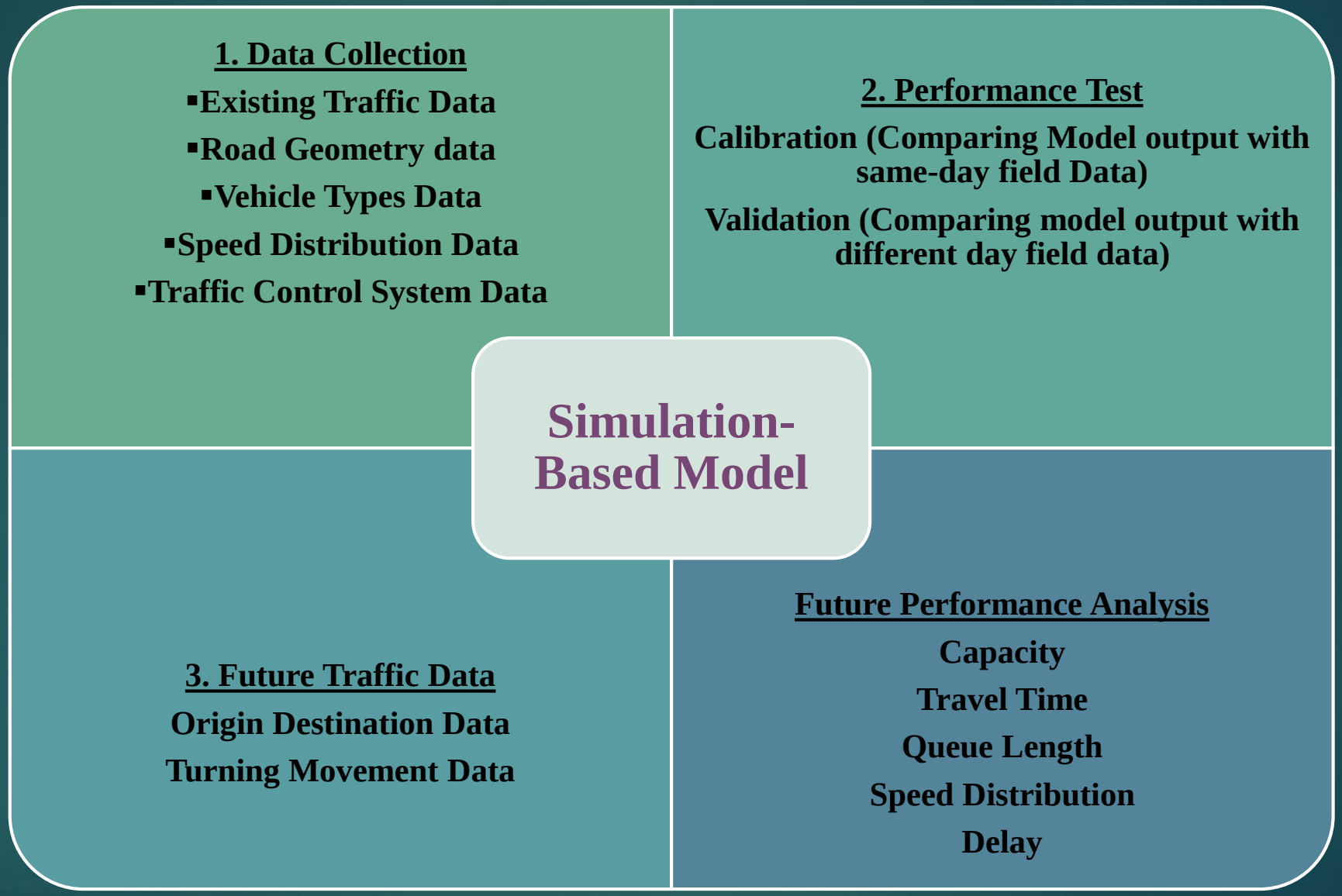
# Proposed Alternative

- Proposed a New route removing the diagonal road
- Proposed new bike routes sharing with roads
- Far side bus stops

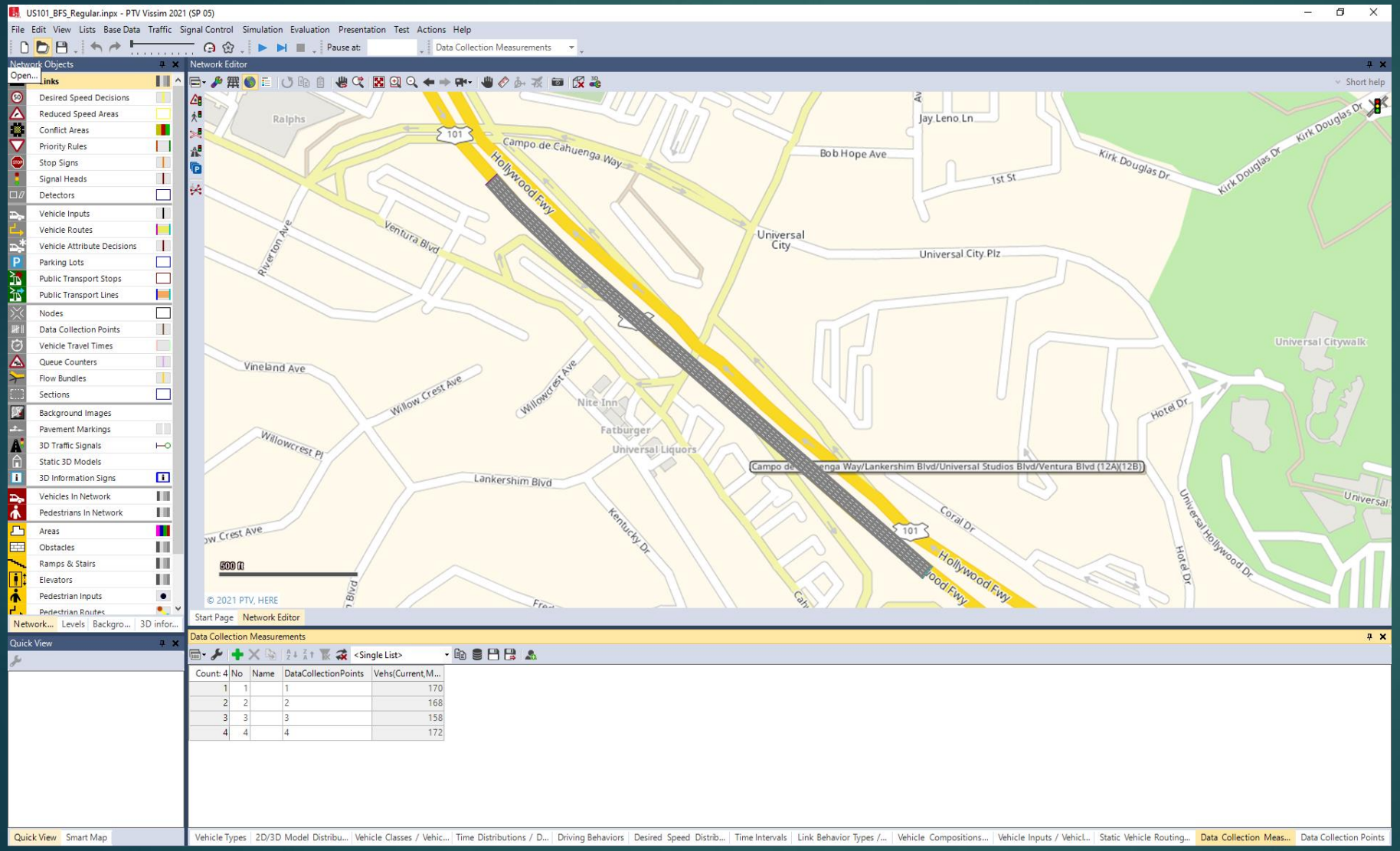



| Parameters | Intersection 1 | | Intersection 2 | | Intersection 3 | |
|---|---|---|---|---|---|---|
| | Before | After | Before | After | Before | After |
| Max V/C ratio | 1.37 | 0.8 | 1.37 | 0.71 | 1.37 | 0.74 |
| Int Delay | 29.5 | 20.8 | 31.5 | 20.3 | 63.5 | 22.6 |
| LOS | C | C | C | C | E | C |
| Control Type | Pretimed | Actd-Coord | Pretimed | Actd-Coord | Pretimed | Actd-Coord |
| Cycle Length | 120 s | 90 s | 120 s | 90 s | 120 | 90 s |

# Transportation Modeling



# Case Study: Basic Freeway Capacity Analysis in VISSIM




- Objective: Capacity Analysis for Basic freeway segment under mixed traffic with Autonomous and Connected Autonomous Vehicle
- Data: Trajectory Data for Traditional Vehicle
- Methodology: Wiedemann Car Following model
- Base case Scenario: Capacity Assessment for Traditional Vehicle
- Mixed Case Scenario: changing relative flow of vehicles with proportion and assessing optimum traffic flow.
- Comparison with the base case.

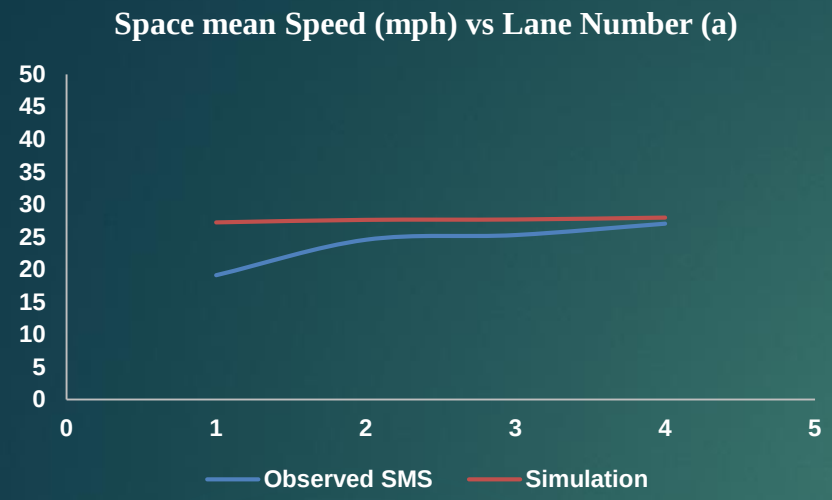
# Simulation Layout Preparation

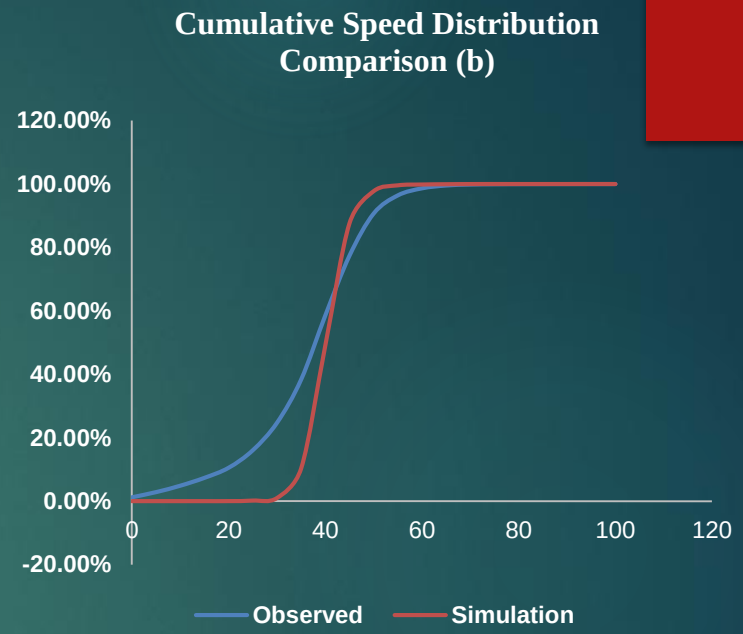
| Selection of | |
|---|---|
| Vehicle Type | Car, Bus, Autonomous Vehicle (Cautious, Normal, Aggressive) |
| Driving behavior | Freeway |
| Desired Speed Distribution | 55 mph, 60 mph, 65 mph, 70 mph |
| Vehicle Composition | Different Composition for Assessment |
| Vehicle Input | 1st 5 minutes for warm-up Next 15 minutes field-collected vehicle data running |
| Data Collection Measurement | Collecting Flow data from the simulation |

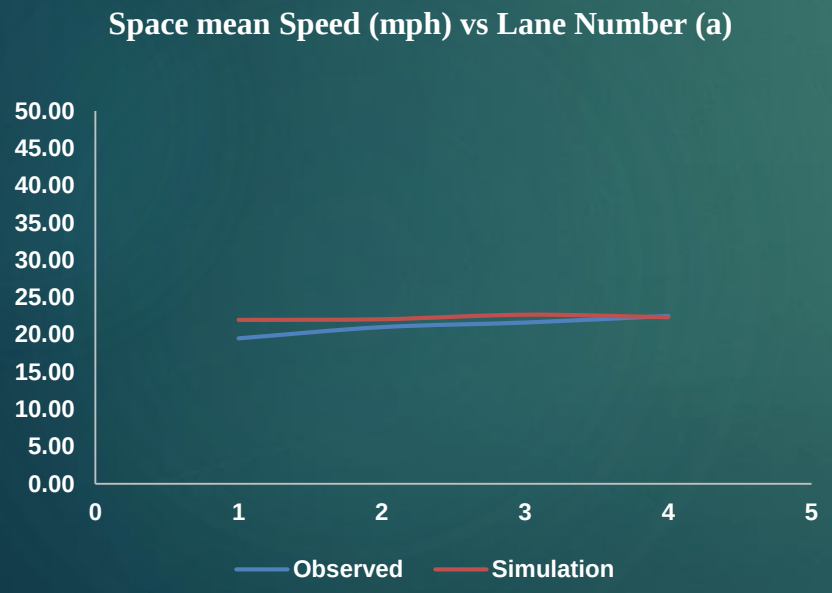


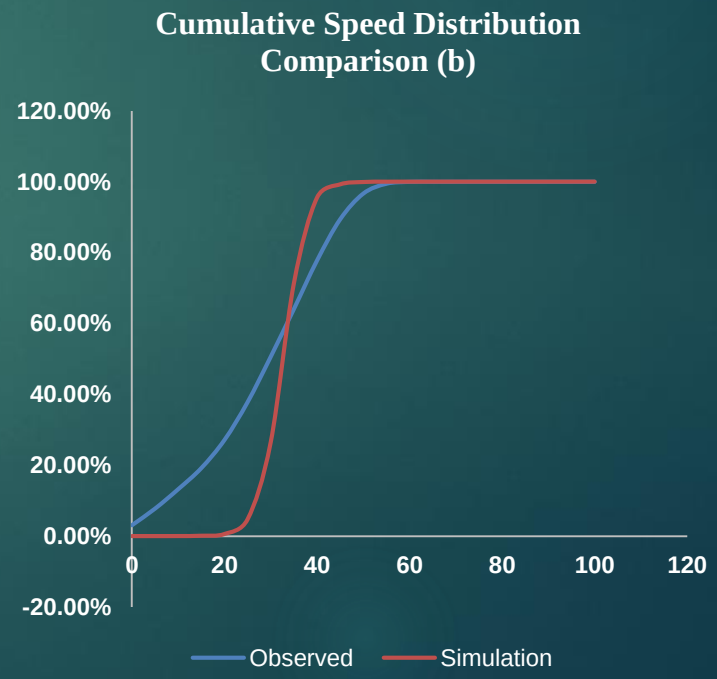
| Count: 5 | VehType | DesSpeedDistr | RelFlow |
|---|---|---|---|
| 1 | 100: Car | 1051: 65 mp | 0.390 |
| 2 | 200: HGV | 1051: 65 mph | 0.010 |
| 3 | 630: AV... | 1051: 65 mph | 0.200 |
| 4 | 640: AV... | 1051: 65 mph | 0.100 |
| 5 | 650: AV... | 1051: 65 mph | 0.300 |

# Calibration and Validation

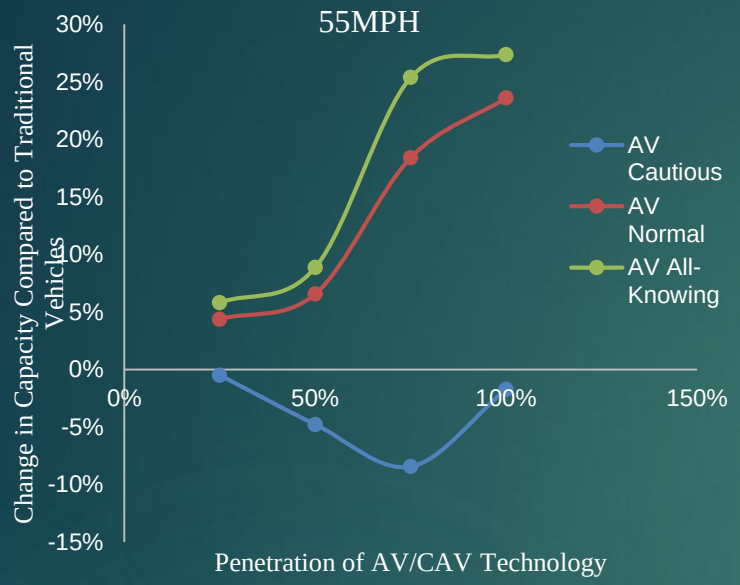


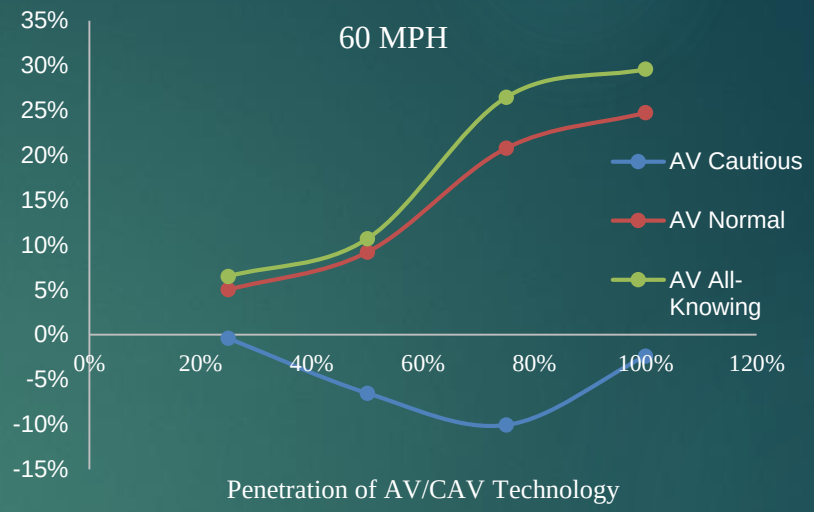



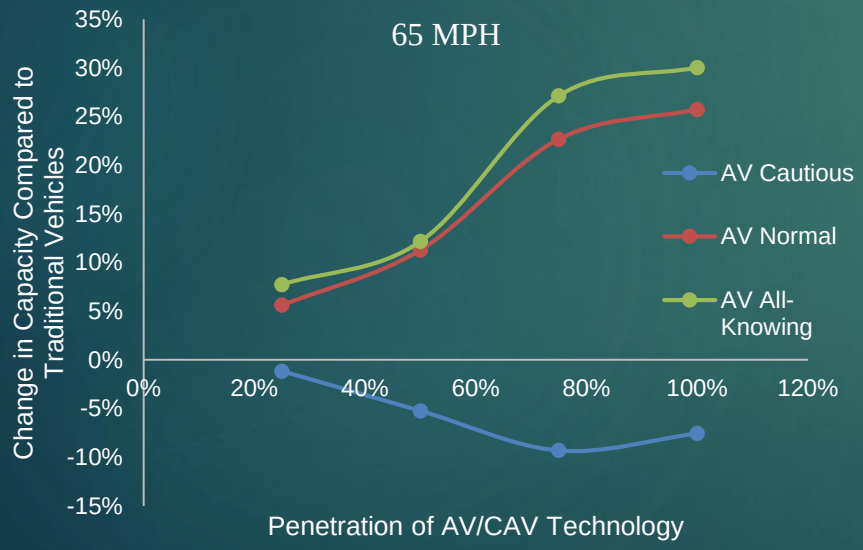



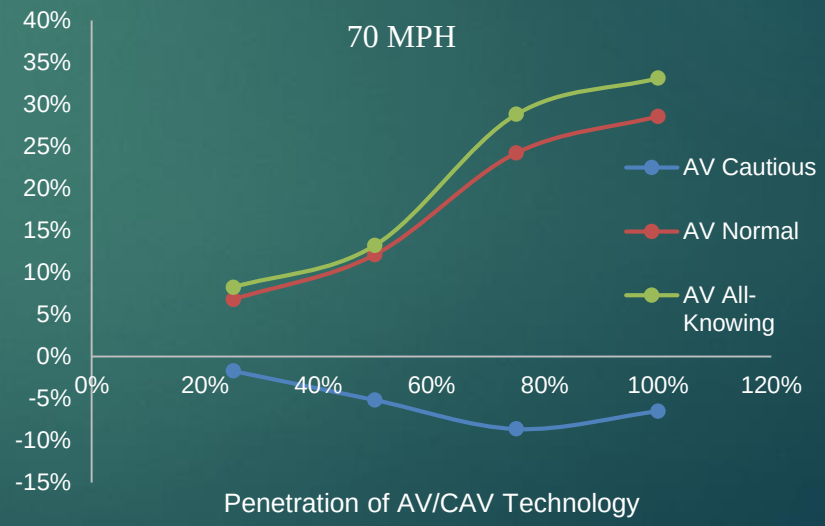



# Capacity Assessment in Mixed Scenarios



## How can we solve the Congestion Problem in Bangladesh?

- Do we have a proper data collection system/devices?
- Do we have the appropriate software to analyze?
- Do you have skilled persons to run that software?
- Do we have sufficient funding to implement the solution?
- Do we have a consultancy firm?
- Do we have a traffic warrant/manual for implementation?


Thank You!