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I-76 INTEGRATED CORRIDOR MANAGEMENT PROJECT

Penn State Transportation Engineering and Safety Conference

December 11th, 2019

Session 2C

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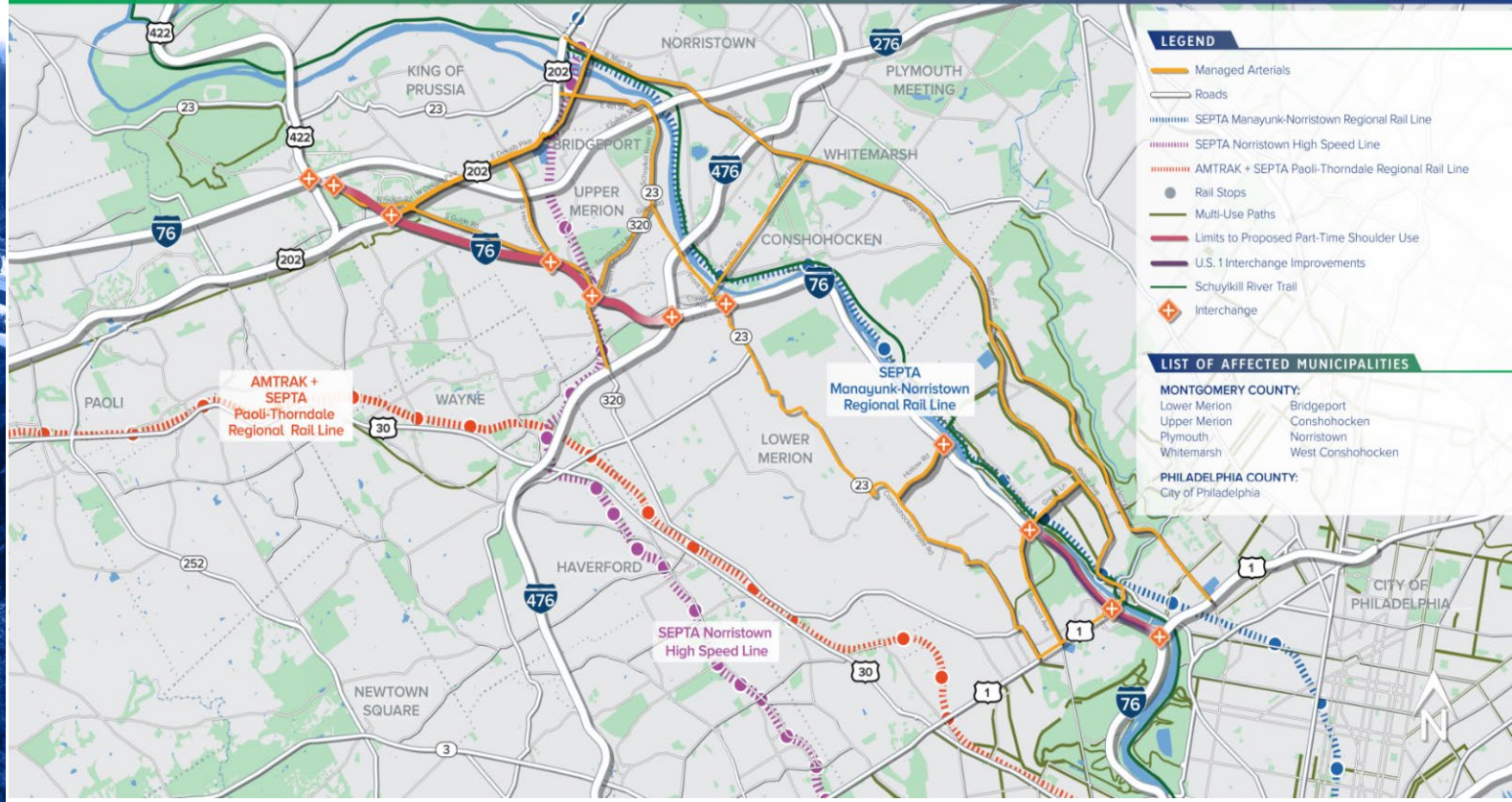
I-76 CORRIDOR COMPREHENSIVE TRANSPORTATION MANAGEMENT PLAN

Project Location Map

PARTNERS

Delaware Valley Regional Planning Commission · U.S. Department of Transportation Federal Highway Administration · SEPTA



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I-76 ITS Enhancements ConOps (2016) Vision and Goals

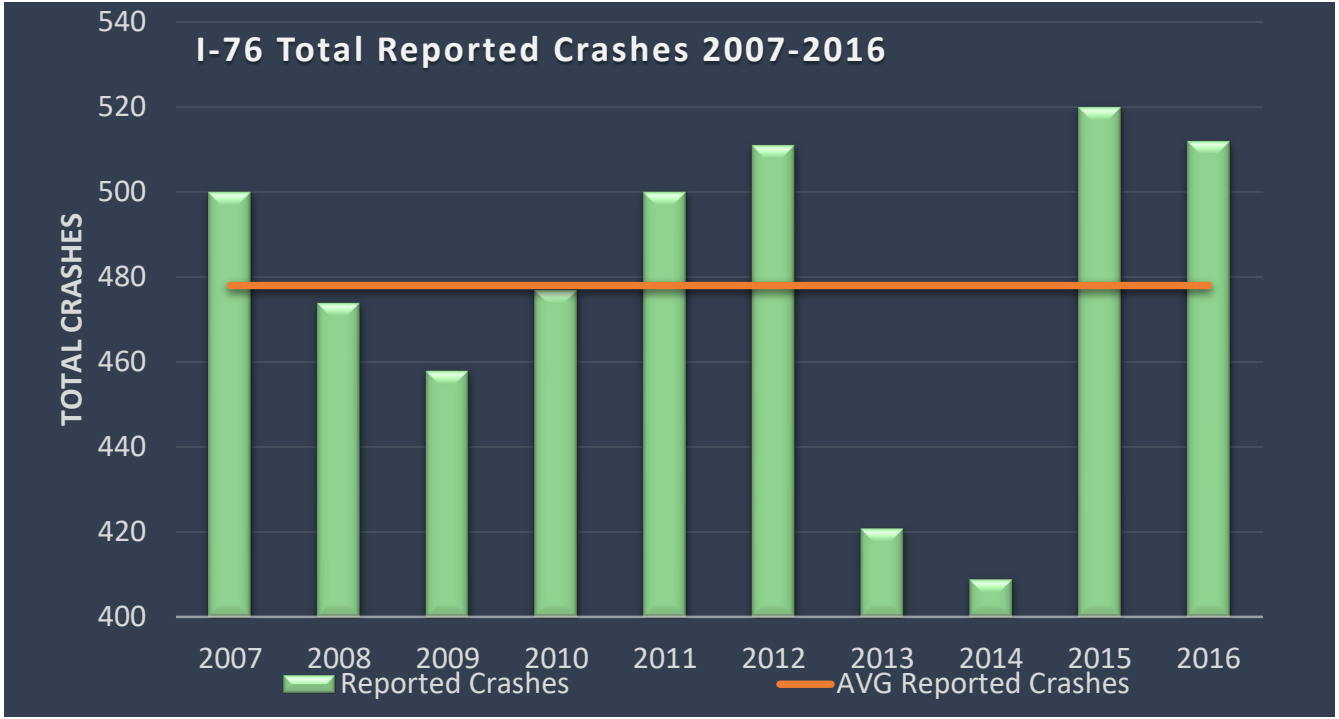
The traffic and transit operations of the Schuylkill Expressway Corridor will be managed seamlessly across multiple jurisdictional and agency boundaries, with the assistance of advanced technologies and cooperative strategies.

- Project Goals
  - Alleviate persistent recurrent congestion along the corridor
  - Reduce crashes, more specifically those related to rear-end collisions
  - Better manage unbalanced traffic volumes
  - Better incentivize transit, bicycle and pedestrian trips throughout the corridor

Operational Focus Focus Areas

	 VARIABLE SPEED LIMITS	 QUEUE WARNING	 JUNCTION CONTROL	 RAMP METERING	 PART-TIME SHOULDER USE	 MULTI-MODAL IMPROVEMENTS	 CONNECTED VEHICLE APPLICATIONS	 MANAGED ARTERIALS
IMPROVE TRAFFIC OPERATIONS	☑	☑	☑	☑	☑	☑	☑	☑
REDUCE INCIDENTS	☑	☑	☑	☑			☑	☑
CAPACITY ENHANCEMENT	☑		☑	☑	☑	☑	☑	☑
OPTIMIZE MULTI-MODAL OPTIONS						☑	☑	☑

Historical Crash Performance



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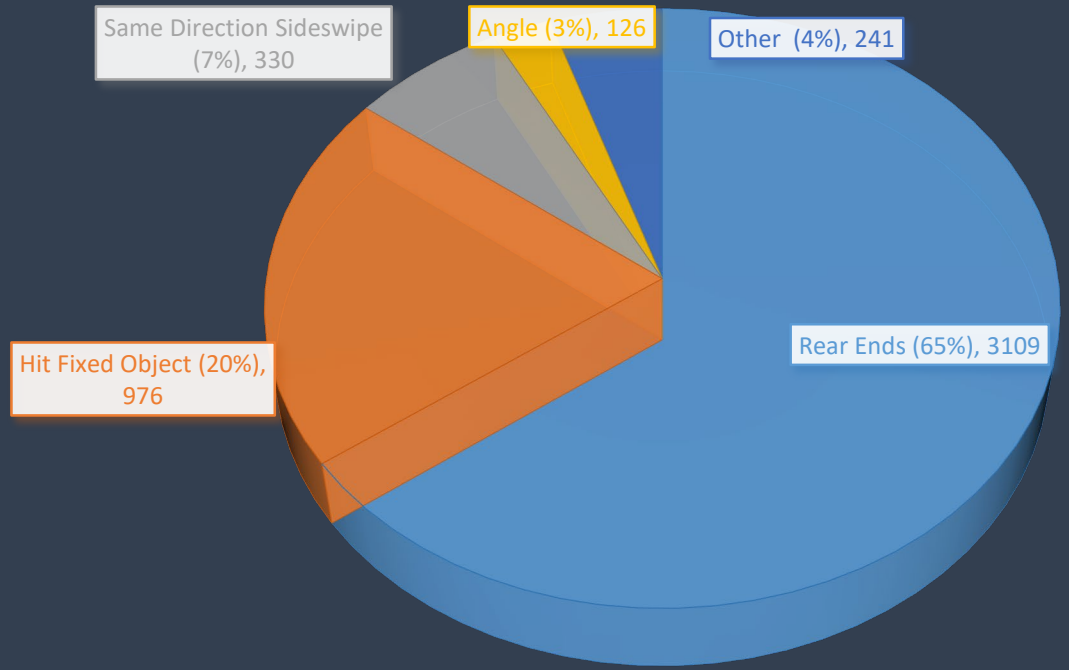
I-76 REPORTED CRASHES BY TYPE



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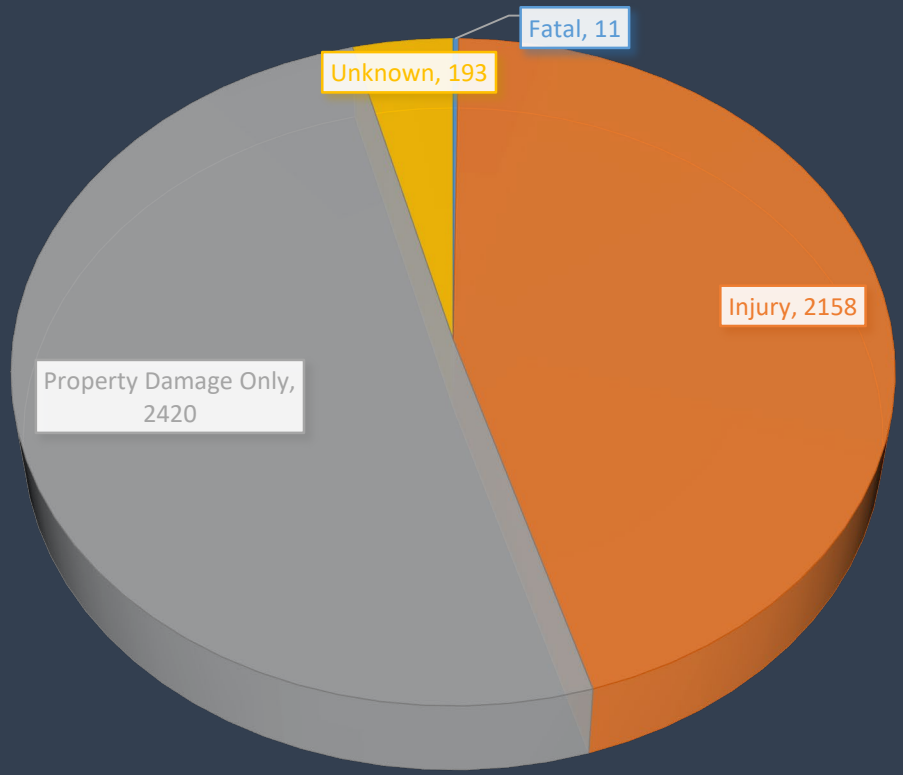
I-76 REPORTED CRASHES BY SEVERITY



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Variable Speed Limit and Queue Warning Early Action

- Primary Goal – Reduce Rear-End Crashes and Harmonize Traffic Flow
- Project Status
  - Construction Start Date – April 2018
  - Construction Complete/Go Live – Spring, 2020
- Project Elements
  - 73 Variable Speed Limit Signs
  - Nine (9) Dynamic Message Signs
  - New ATMS Software Module

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Alternatives Analysis

- Report Submitted to PennDOT April, 2019
- Identified Overall Design Criteria
  - Roadway
  - Structures
  - ITS
- Evaluated Options for Flex Lane Limits
  - **Traffic and Safety Metrics were Modeled and Analyzed**
- Evaluated Options for Highway Widening & associated SWM
- Evaluated Options for Structure Accommodations
- Identified Constraints – Environmental, Socioeconomic, Geotechnical
- Identified Emergency Access Enhancements

Base Model Development

- Import Highway Geometry into IHSDM – InRoads – Assistance from FHWA IHSDM Development Team
- Import Traffic Volumes – Same as used in VISSIM analysis – Hourly/partial counts were aggregated into ADT.
  - Volumes assigned to geometric limits – not continued through interchanges.
  - Generated errors for ADT falling outside of model limits.

197+10.662(1)	197+58.662(1)	for segment #45 (197+10.662(1) to 197+58.662(1)), traffic volume (129,477 vpd) for 2018 exceeds model limit (110,000 vpd) for reliable results for segment type 4F

- Import existing crash resumes into IHSDM
- Run model and assess results

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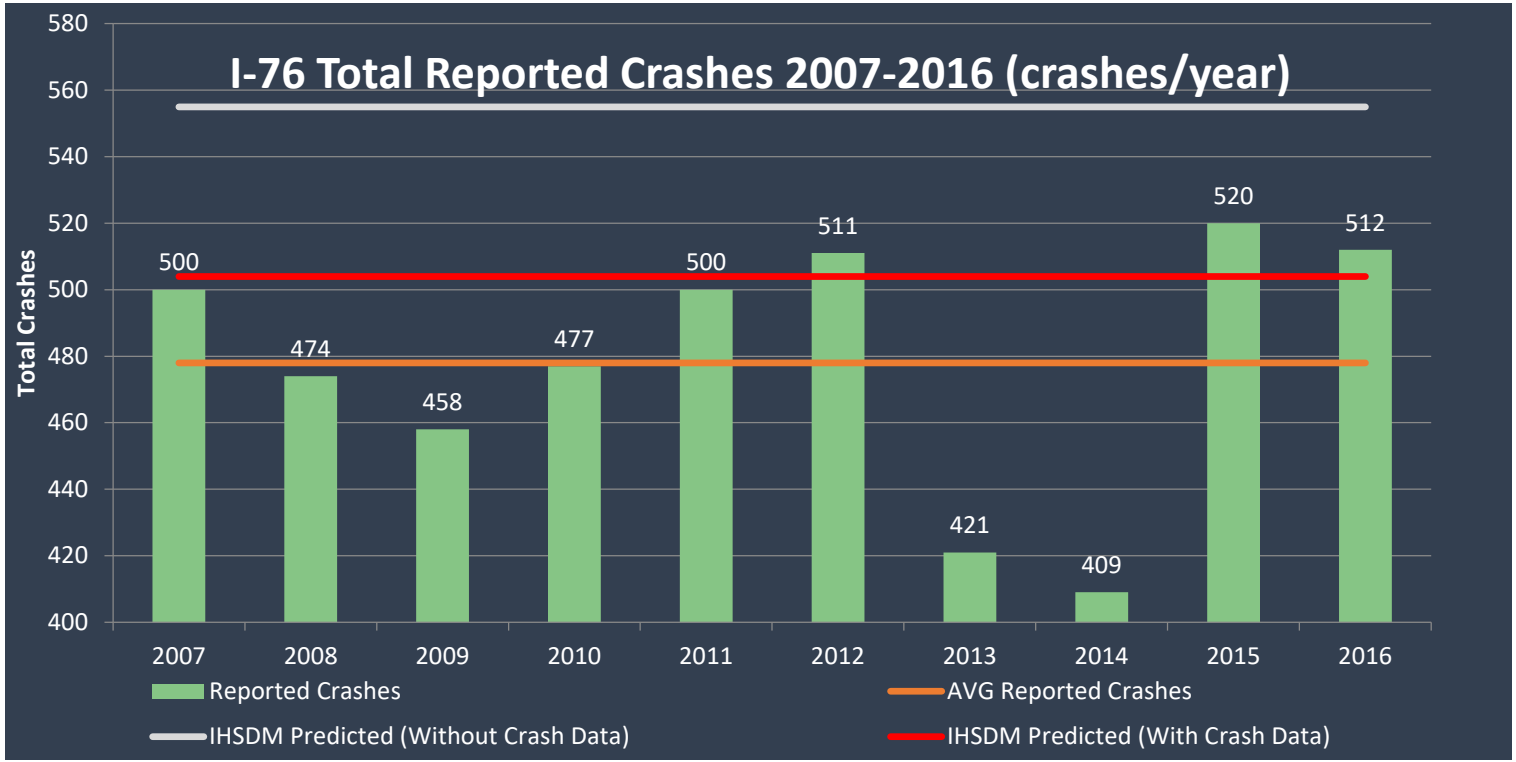
Base Model Outputs



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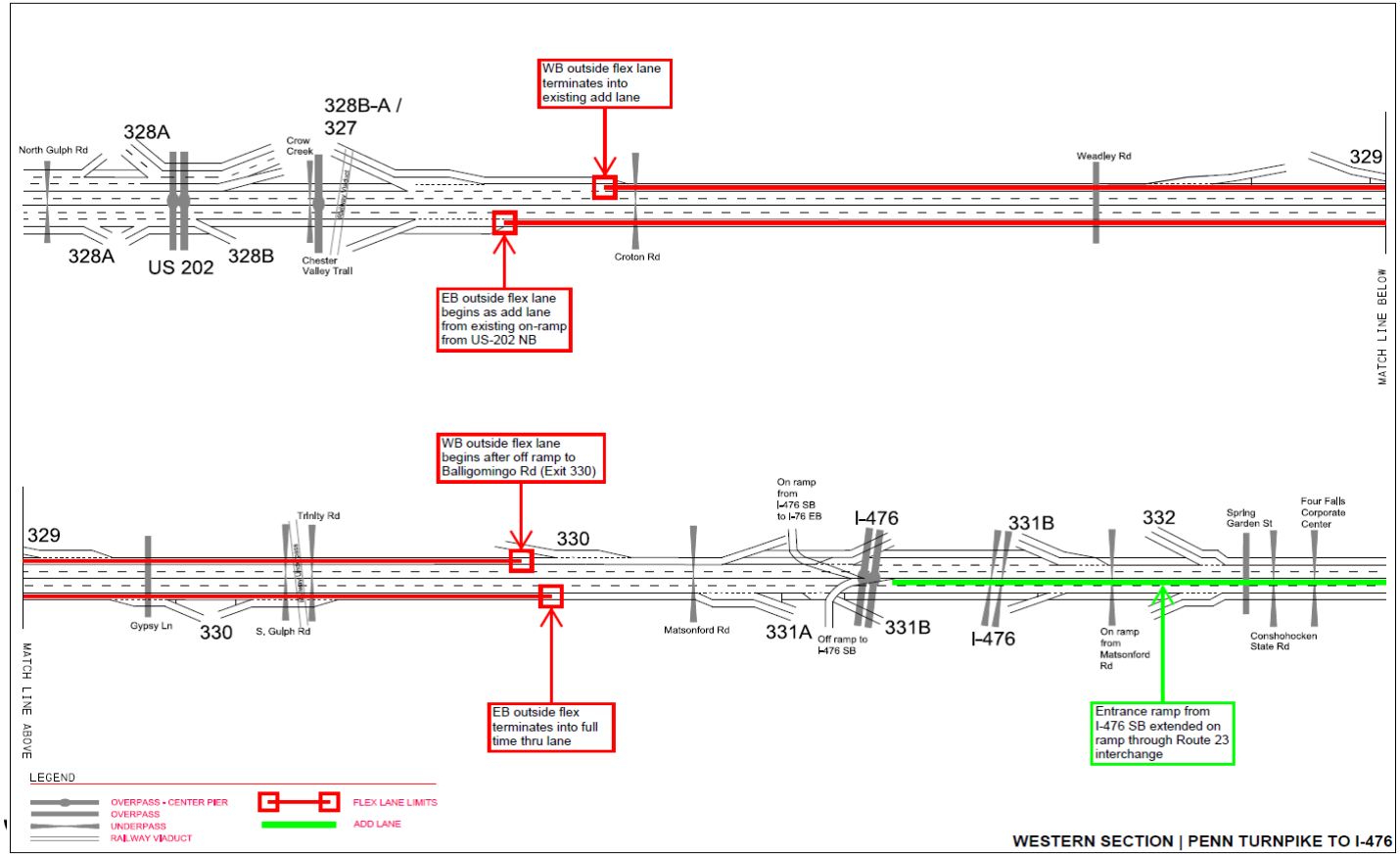
Flex Lane Limit Alternatives



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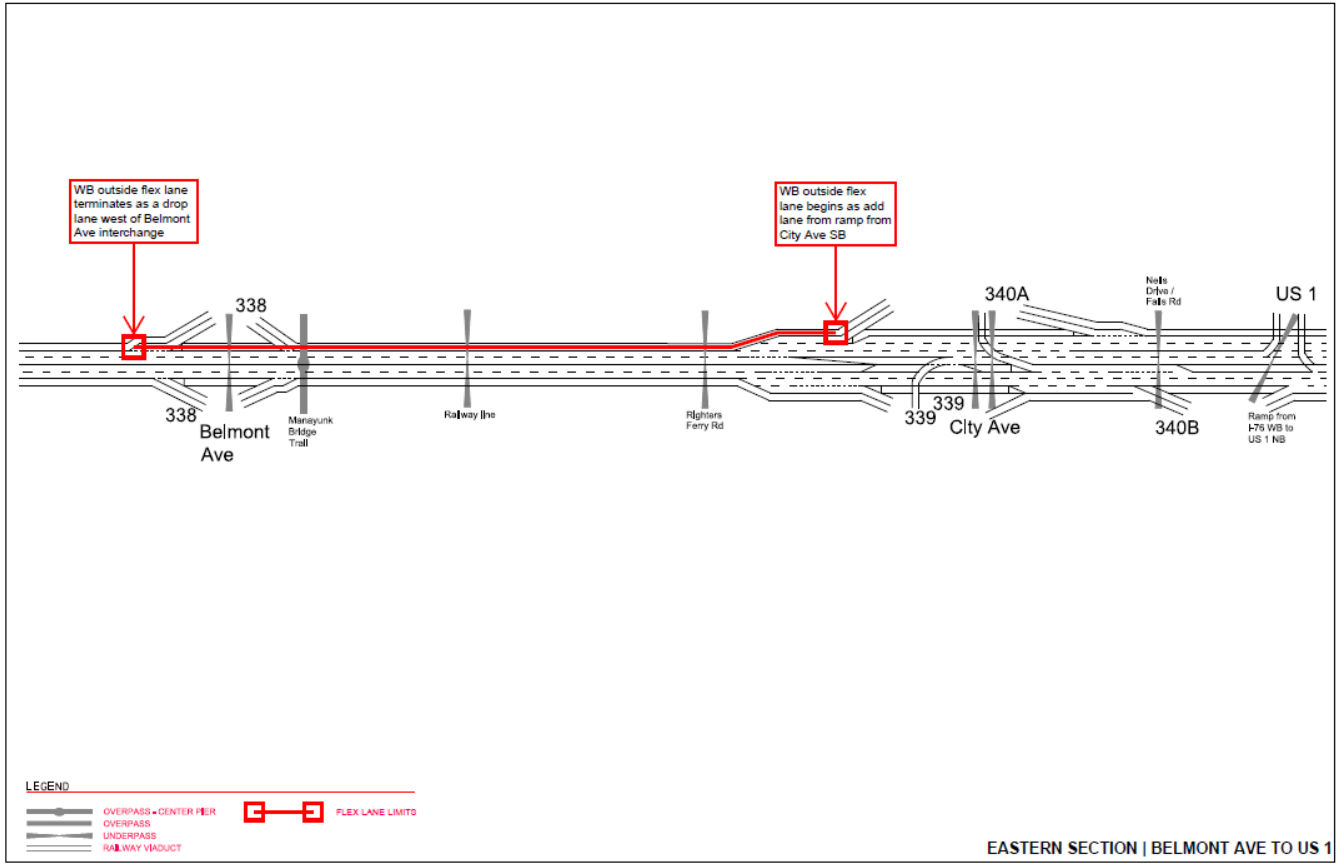
Flex Lane Limit Alternatives



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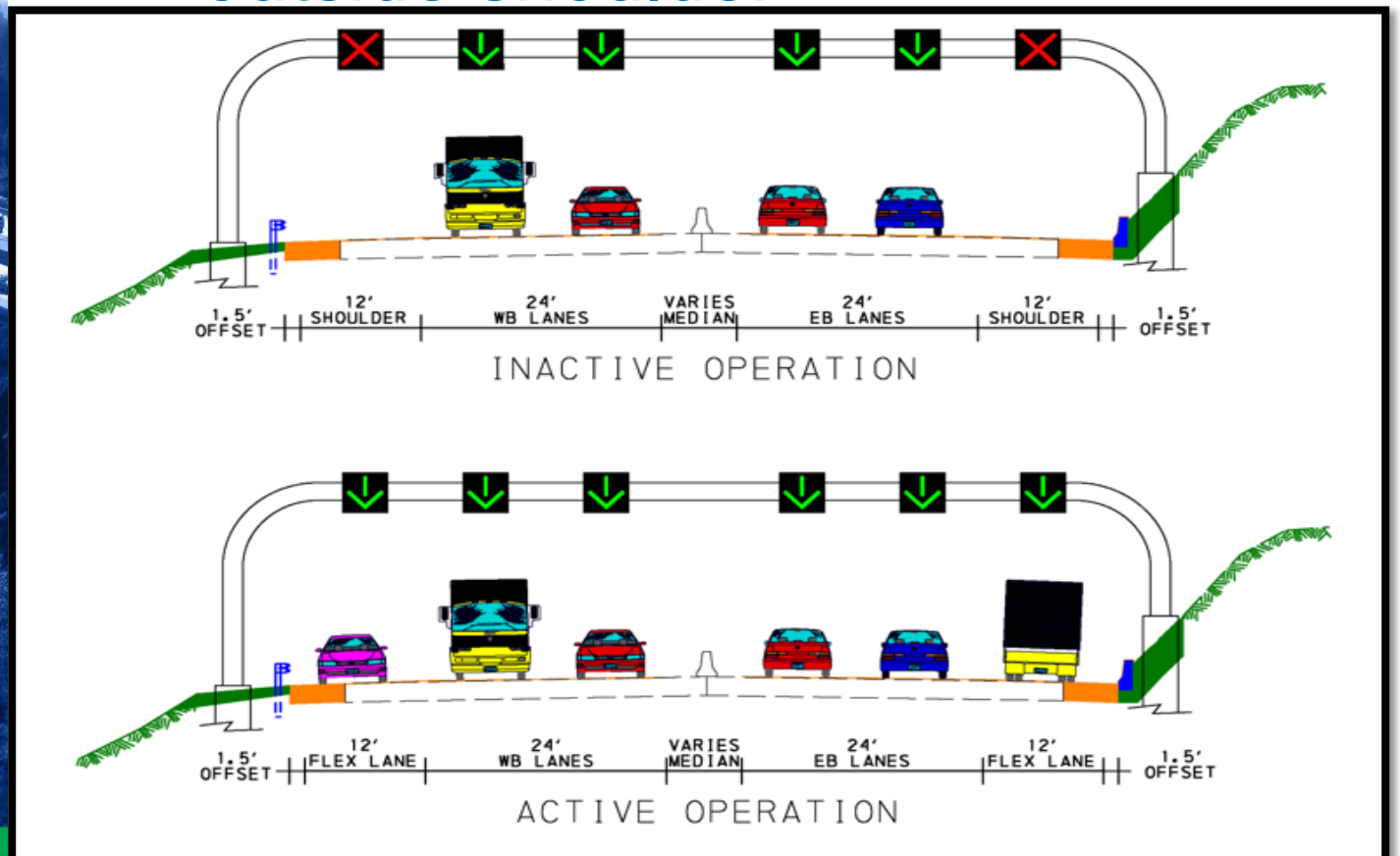
Widening Alternative – Symmetrical – outside shoulder



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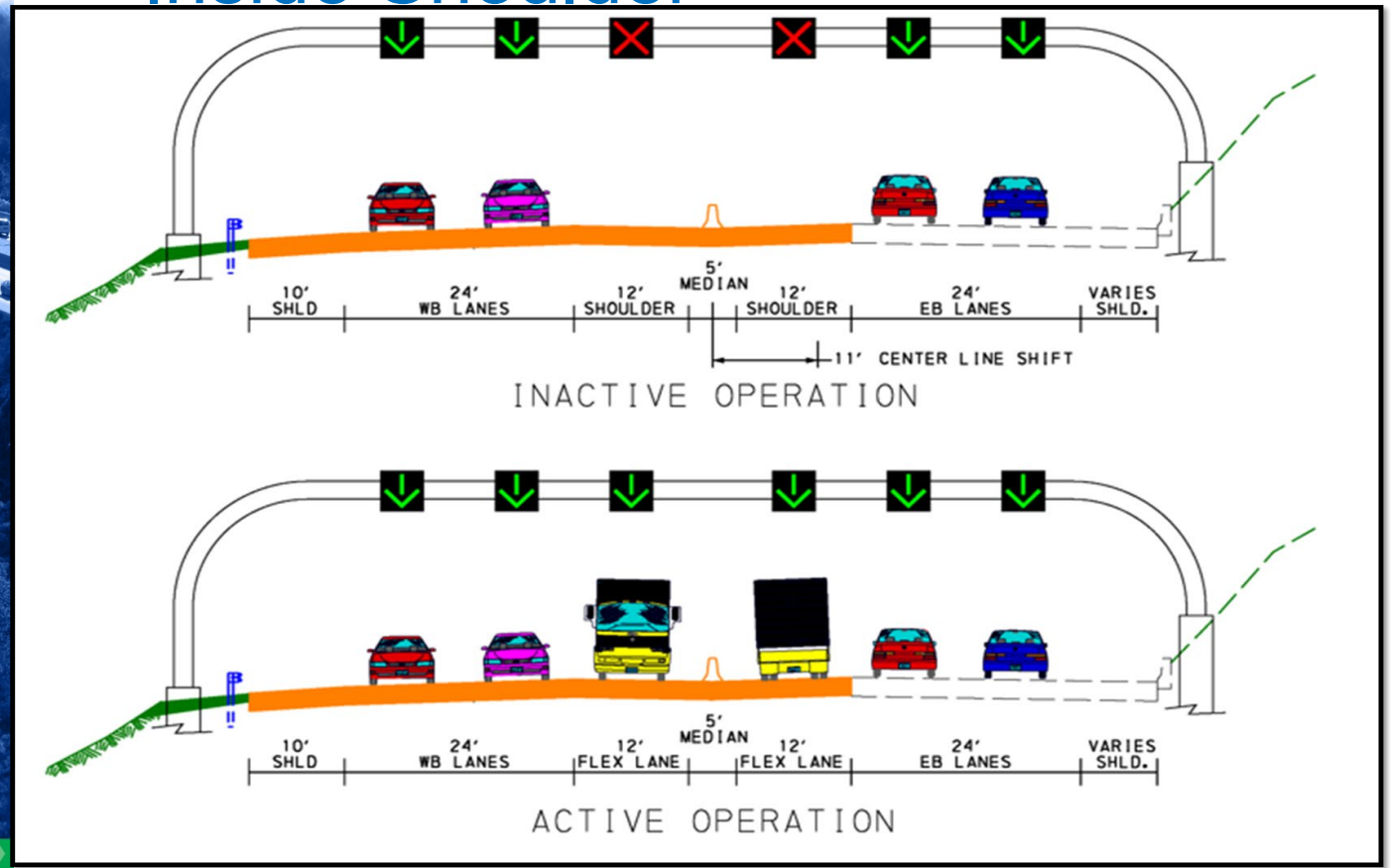
Widening Alternative – Directional – Inside Shoulder



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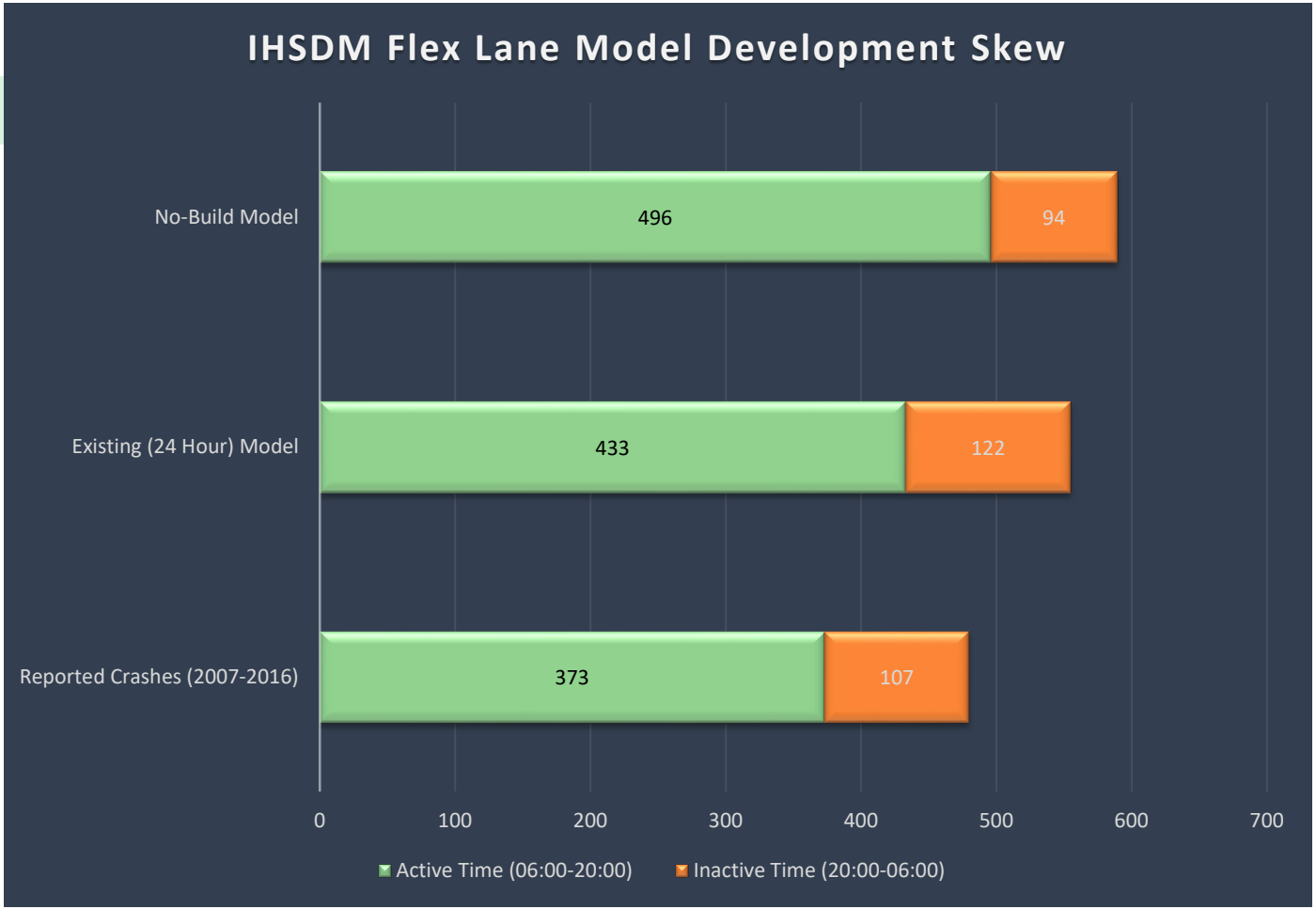
Build Models Developed

- Existing Conditions
- **No Build Model**
- Alternative 1 (symmetrical widening) – Outside Flex Lane
- Alternative 1 (symmetrical widening) – Inside Flex Lane
- Alternative 2 (WB directional widening) – Outside Flex Lane
- Alternative 2 (WB directional widening) – Inside Flex Lane

Adjustments to model flex lane usage

- Assumed operational flex lane from 6:00AM to 8:00 PM
- Use hourly volumes, when available, to determine active/inactive total volume
  - Apply percentage breakdown based on nearest hourly volumes in areas where only ADT data available
- Develop Equivalent ADTs
  - Equivalent Active Period ADT = (Total Active Period Volume) * 24 hours / 14 hours
  - Equivalent Inactive Period ADT = (Total Inactive Period Volume) * 24 hours / 10 hours
- Run IHSDM for each geometry (no-build, alt 1 and alt 2) with inactive and active ADT – 10 model runs total
- Calibrate results to equivalent periods and combine into total crashes for each build scenario.
  - Active Period Predicted Crashes = Active Model Crash Output * 14 hours / 24 hours
  - Inactive Period Predicted Crashes = Inactive Model Crash Output * 10 hours / 24 hours



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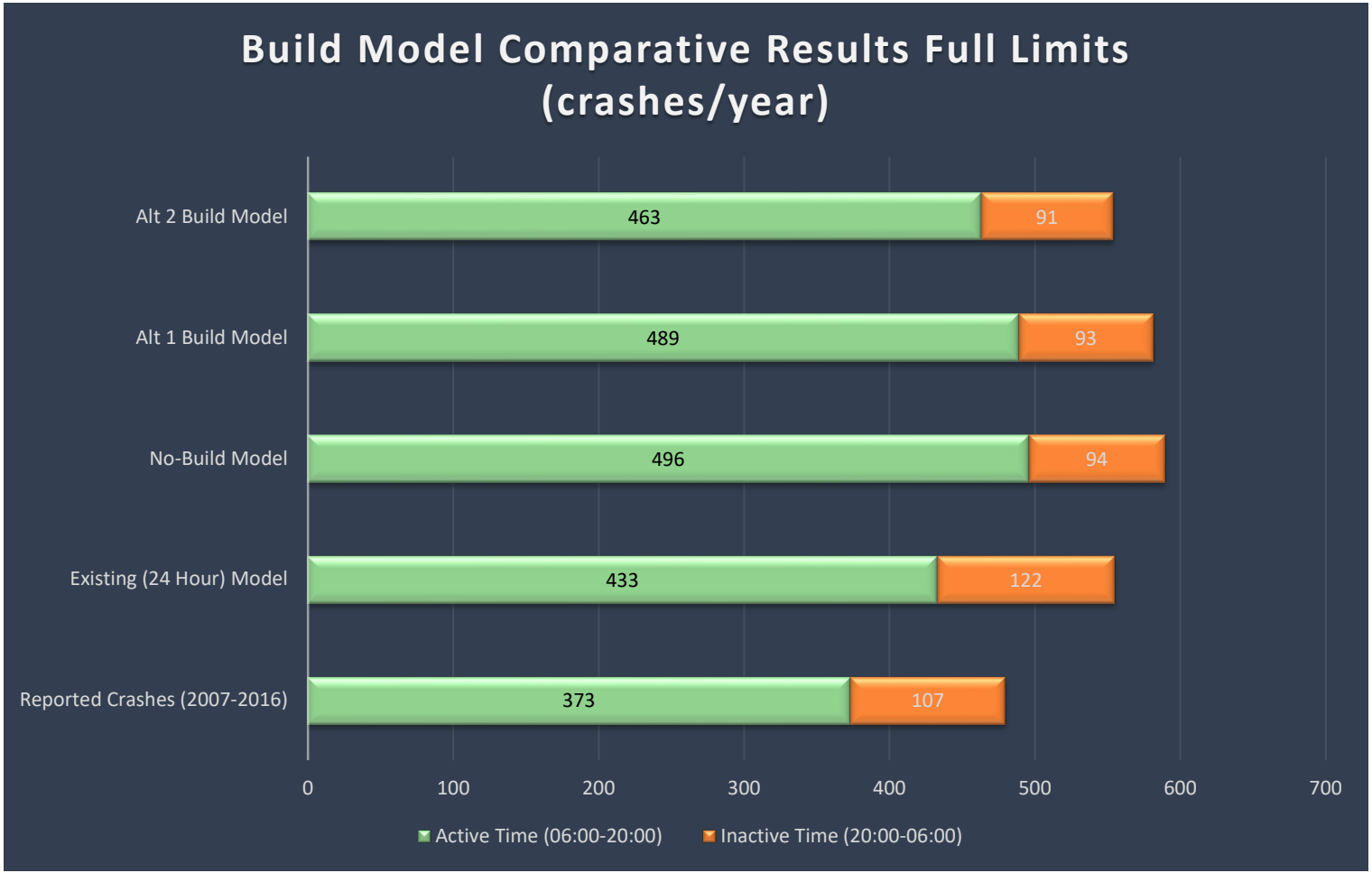

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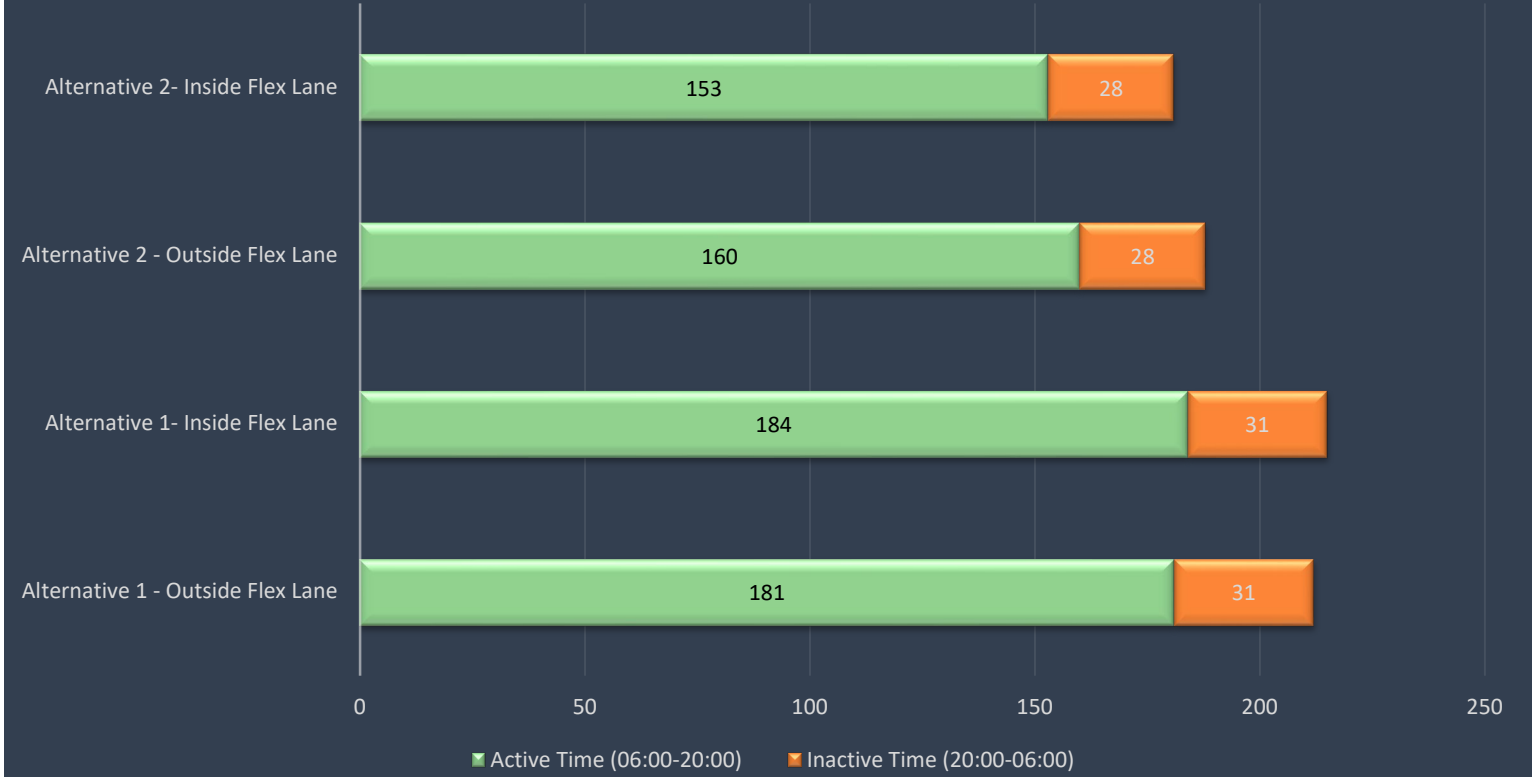
Alternative 1&2 Inside vs. Outside Flex Lane Comparison (US 202 to I-476



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Next Steps

- Re-Run symmetrical widening alternatives (Alt. 1) with a slightly wider shoulder (4’ vs. 1.5’)
- New IHSDM version allow CMFs to be applied
  - Lane use control
  - VSL
  - Queue Warning
  - Ramp Metering
- Re-Run analysis on selected alternative with preliminary design geometry
- Develop corridor specific CMF for VSL and Queue Warning.

Questions

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