Role of Technology & Data in Vision Zero Interventions

February 15, 2023

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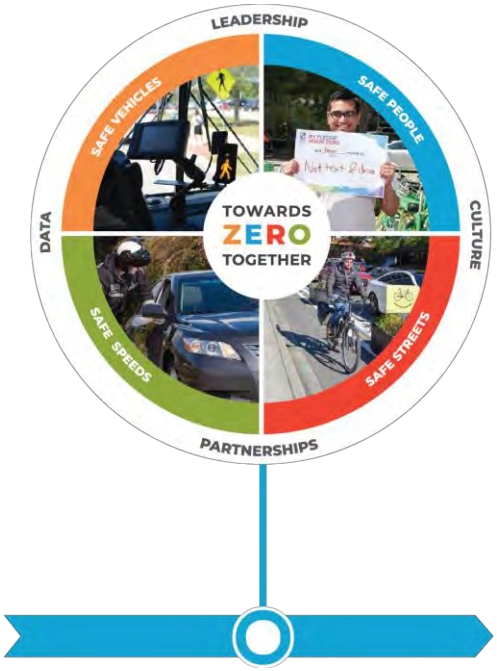
Bellevue, WA: A Vision Zero City



Safe System – Council Resolution (2020)

2020 Vision Zero Strategic Plan

2021 Vision Zero Action Plan

2022 Vision Zero Action Plan

Safe System Principles

Death/Serious Injury is Unacceptable

While no crashes are desirable, the Safe System approach prioritizes crashes that result in death and serious injuries, since no one should experience either when using the transportation system.

Humans Make Mistakes

People will inevitably make mistakes that can lead to crashes, but the transportation system can be designed and operated to accommodate human mistakes and injury tolerances and avoid death and serious injuries.

Humans Are Vulnerable

People have limits for tolerating crash forces before death and serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates human vulnerabilities.

Responsibility is Shared

All stakeholders (transportation system users and managers, vehicle manufacturers, etc.) must ensure that crashes don't lead to fatal or serious injuries.

Safety is Proactive

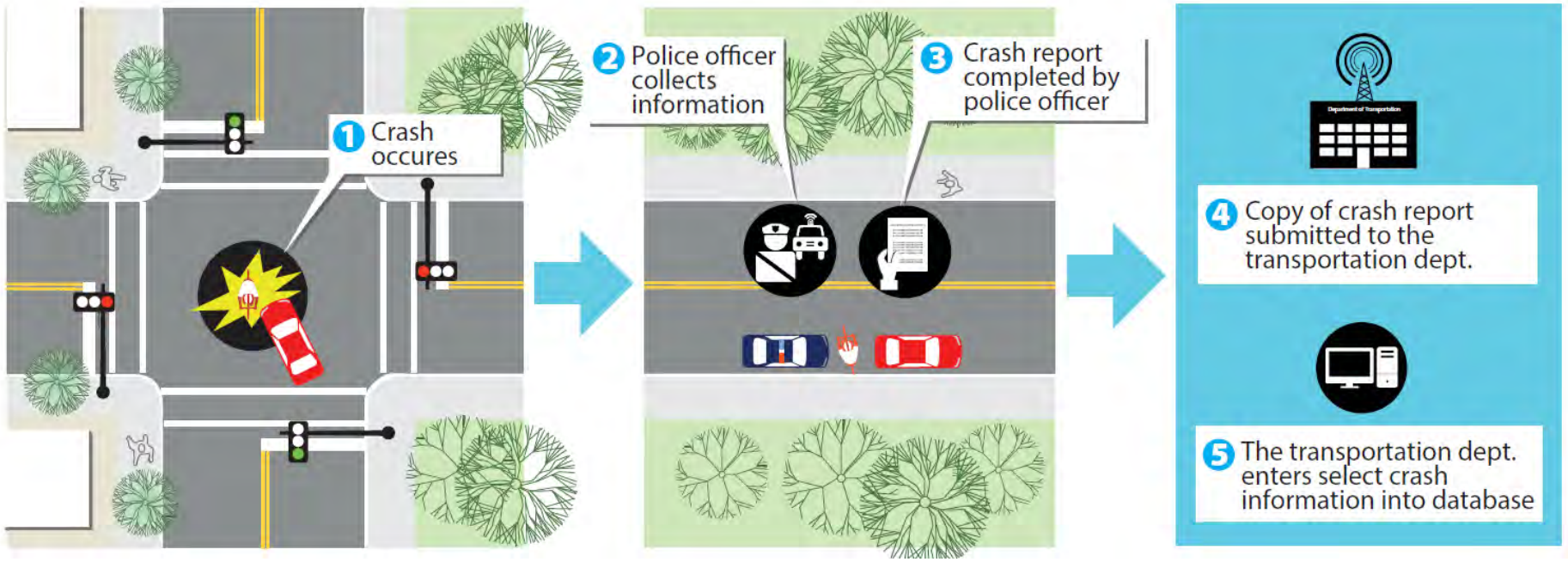
Proactive tools should be used to identify and mitigate latent risks in the transportation system, rather than waiting for crashes to occur and reacting afterwards.

Redundancy is Crucial

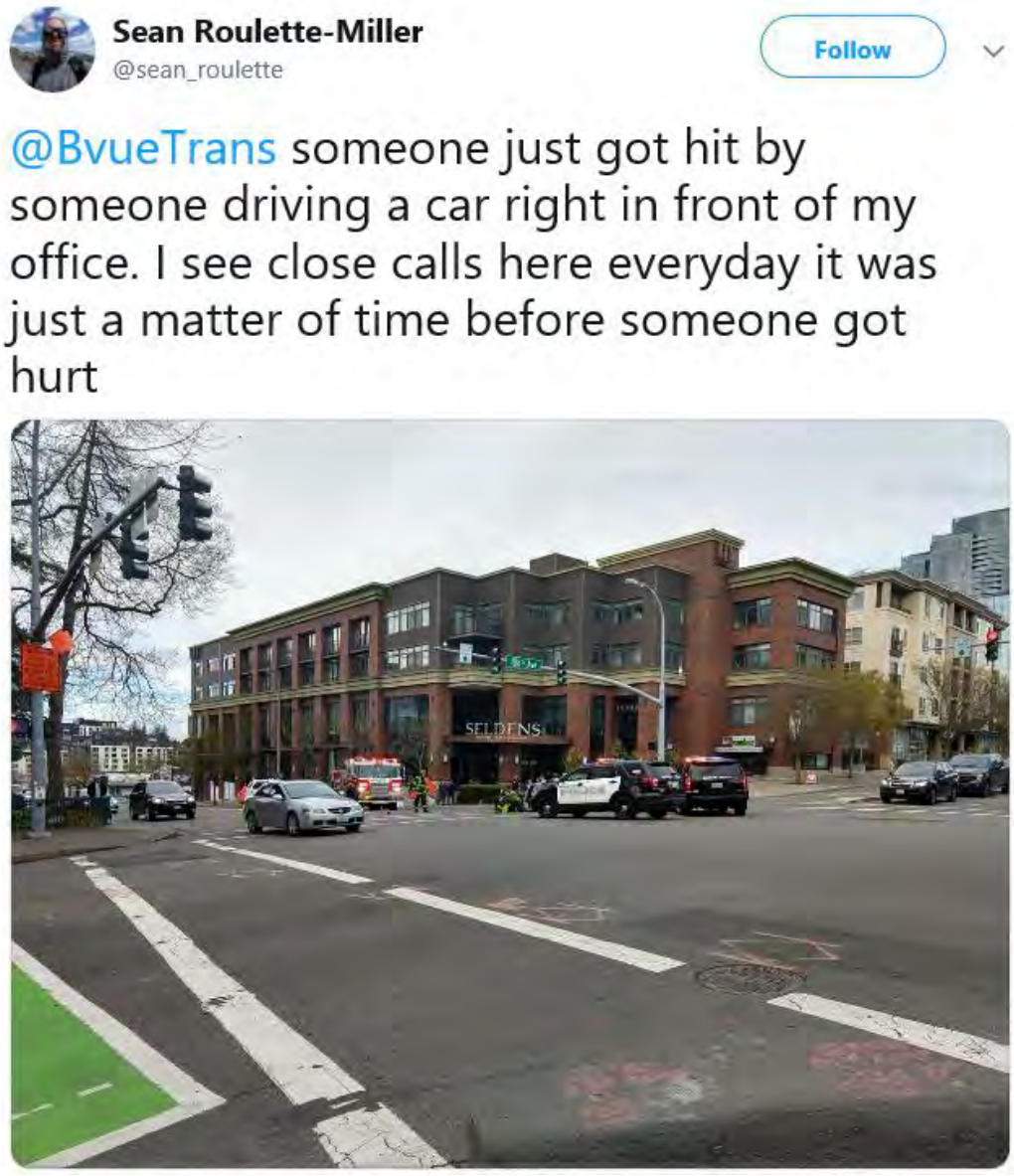
Reducing risks requires that all parts of the transportation system are strengthened, so that if one part fails, the other parts still protect people.

Source: FHWA Safe System Approach

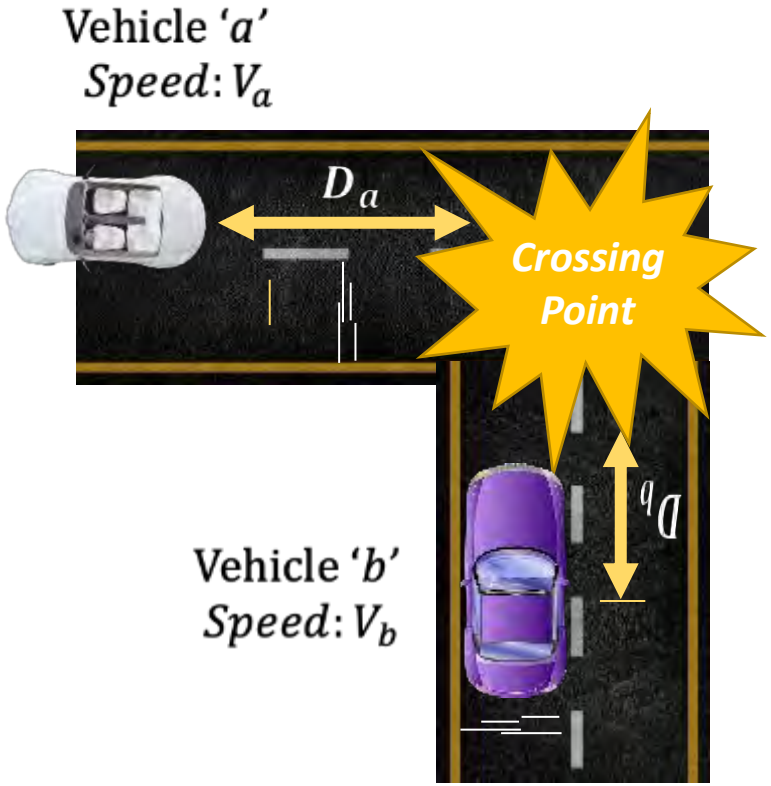
Crash-Based (Ad-Hoc) Approach



Conflict-Based (Optimized) Approach



Surrogate Indicators of Safety



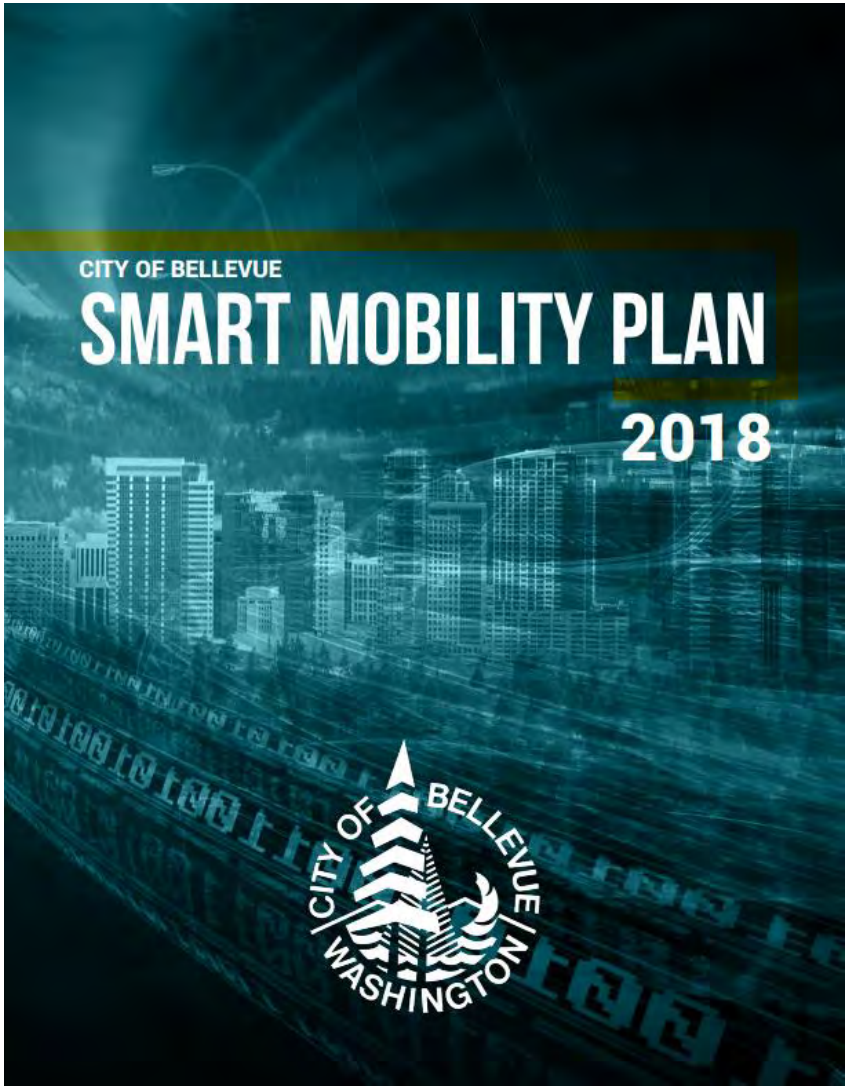
$$T_a = \frac{D_a}{V_a} ; T_b = \frac{D_b}{V_b}$$

Post-Encroachment Time (PET):

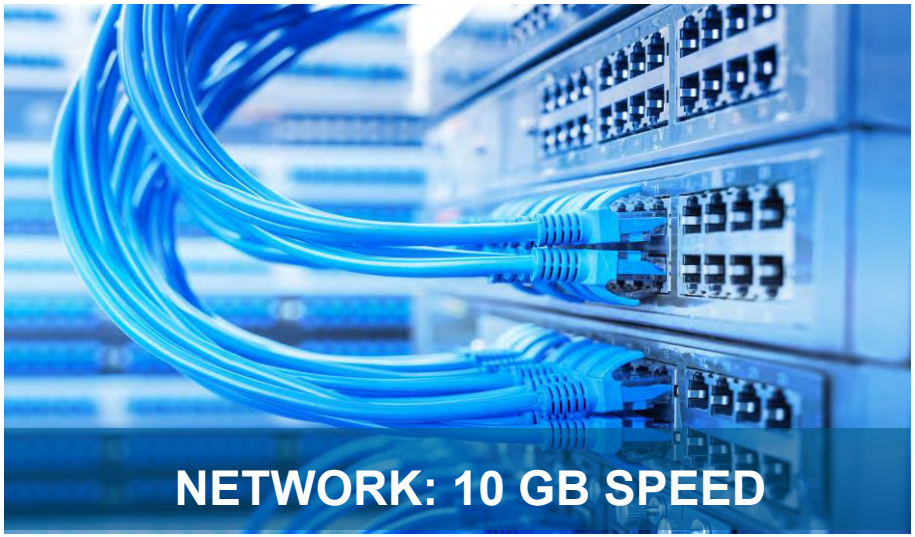
Time elapsed between vehicle '*a*' leaving crossing point and vehicle '*b*' arriving there

$$PET = T_a - T_b$$

Bellevue Camera & Communications Systems

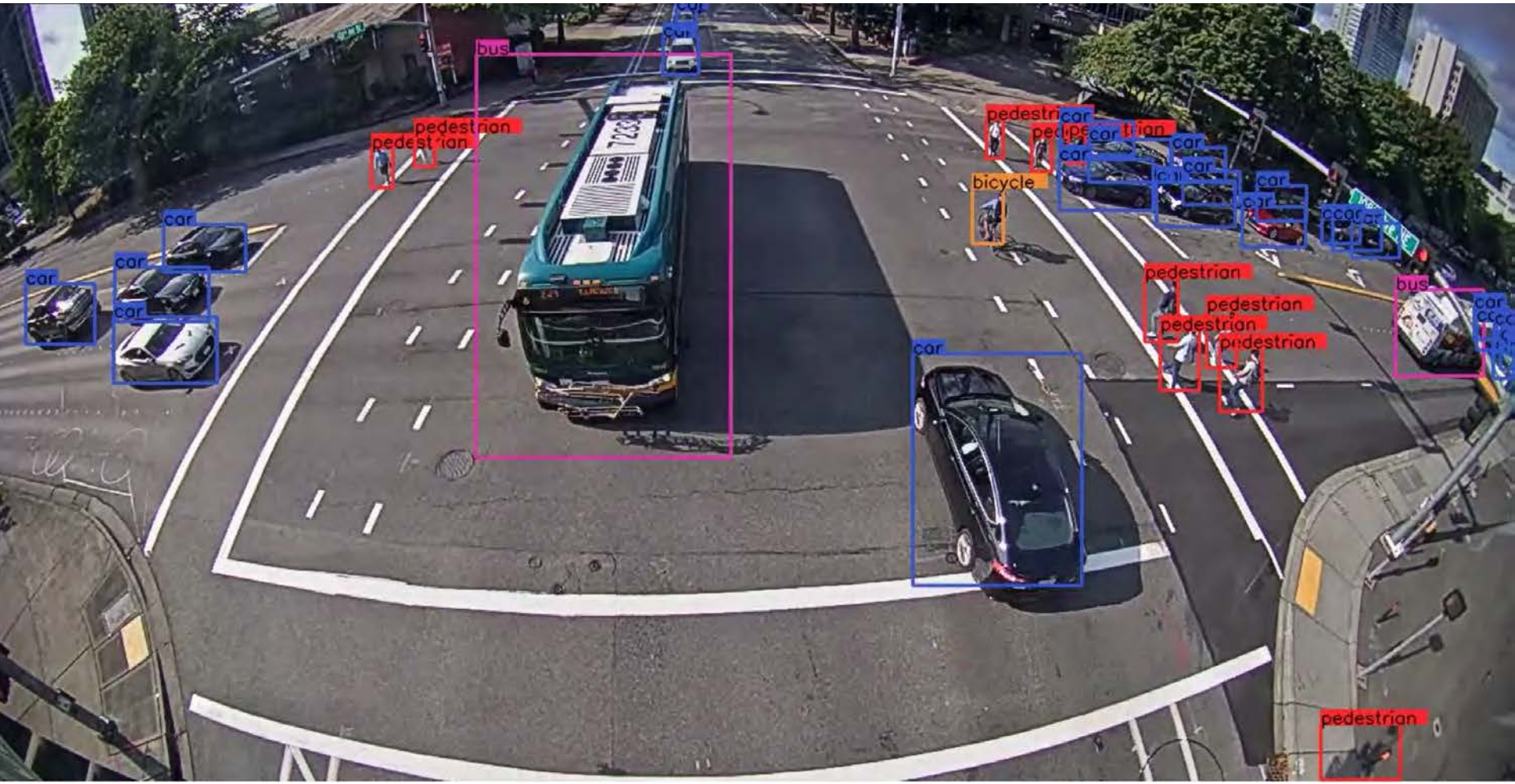


360 HD CAMERAS: 100% COVERAGE

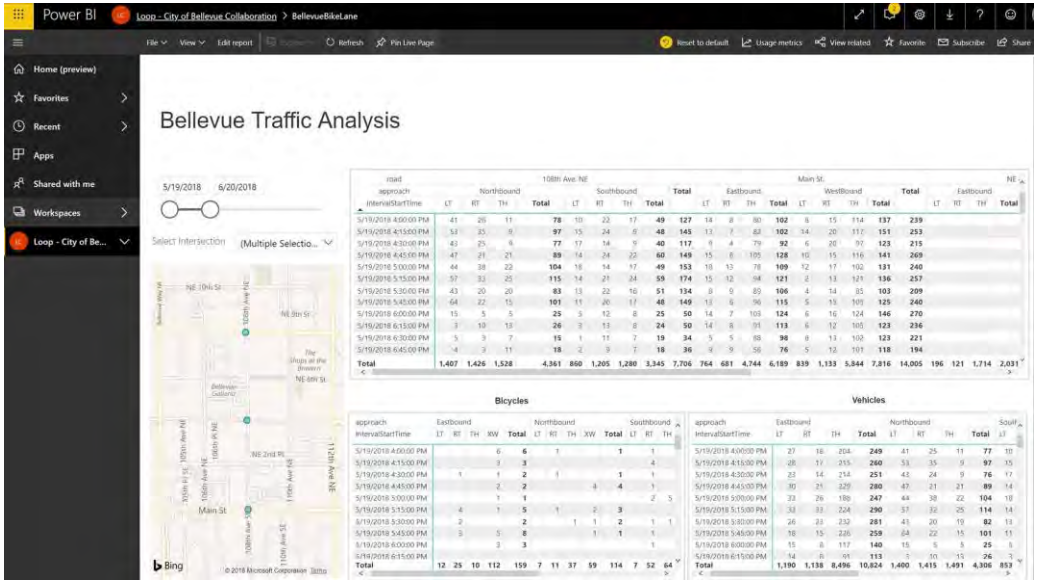


NETWORK: 10 GB SPEED

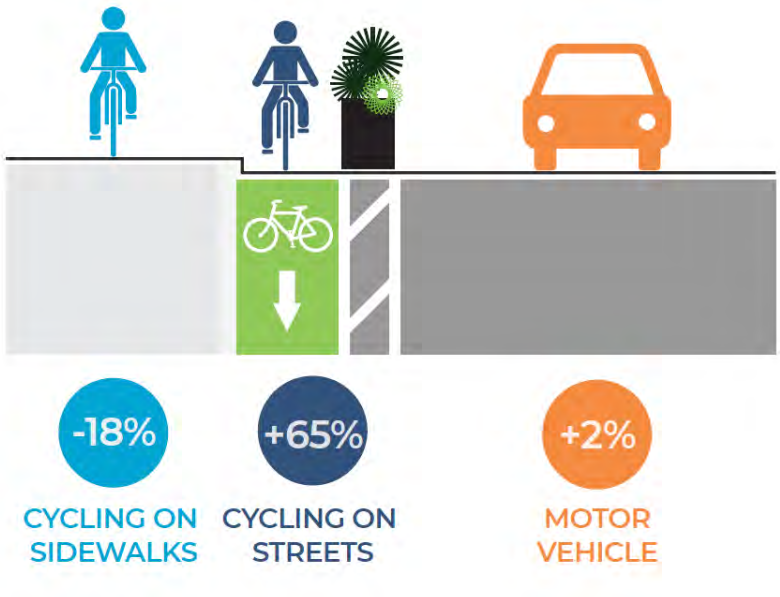
Cloud Computing + AI + Video Analytics



2016-18 Video Analytics Partnership with Microsoft

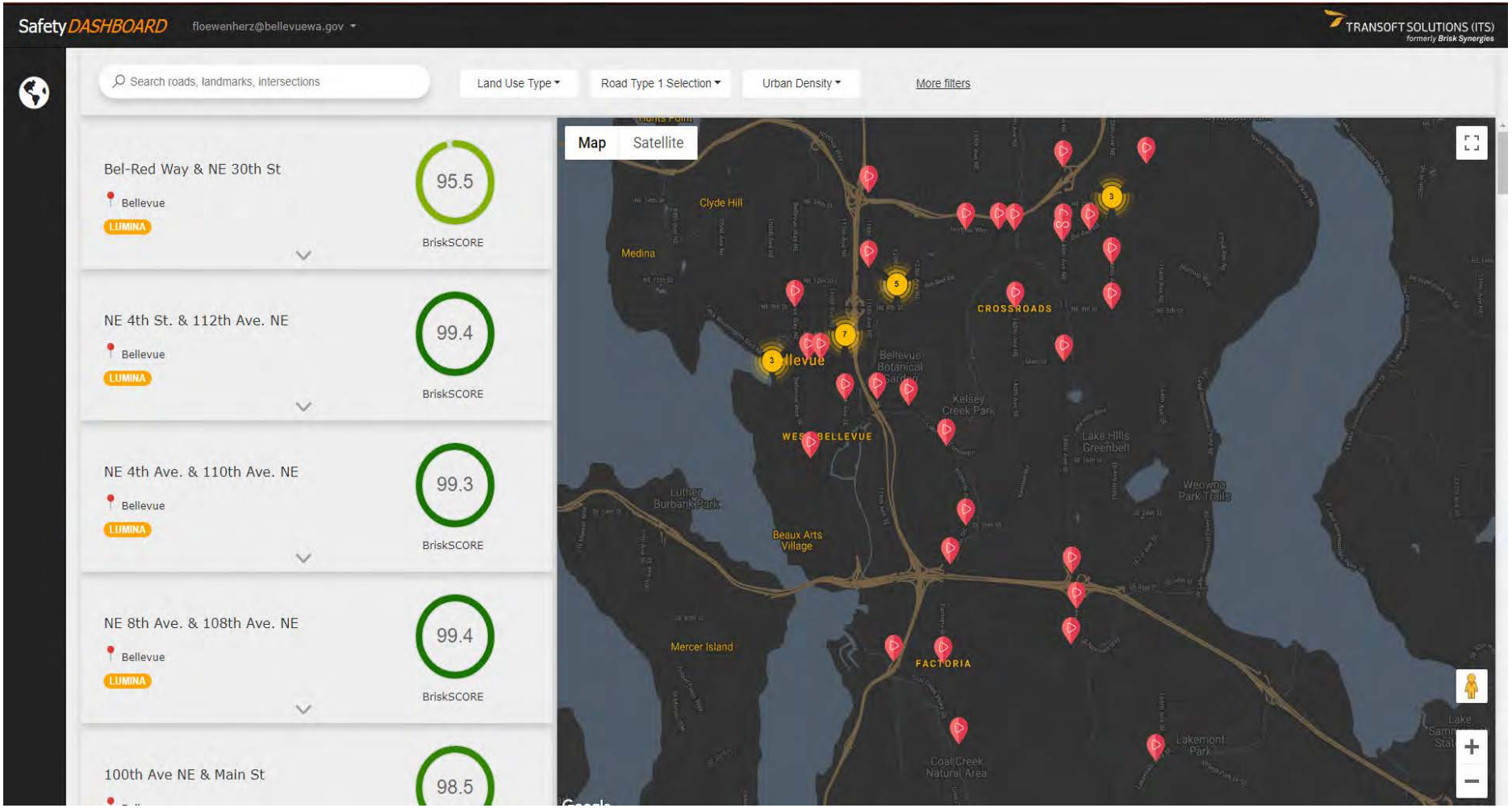


Results from Demonstration Bikeway Assessment



2019-20 Network-Wide Traffic Safety Partnership

Transoft Solutions (ITS) Safety Dashboard



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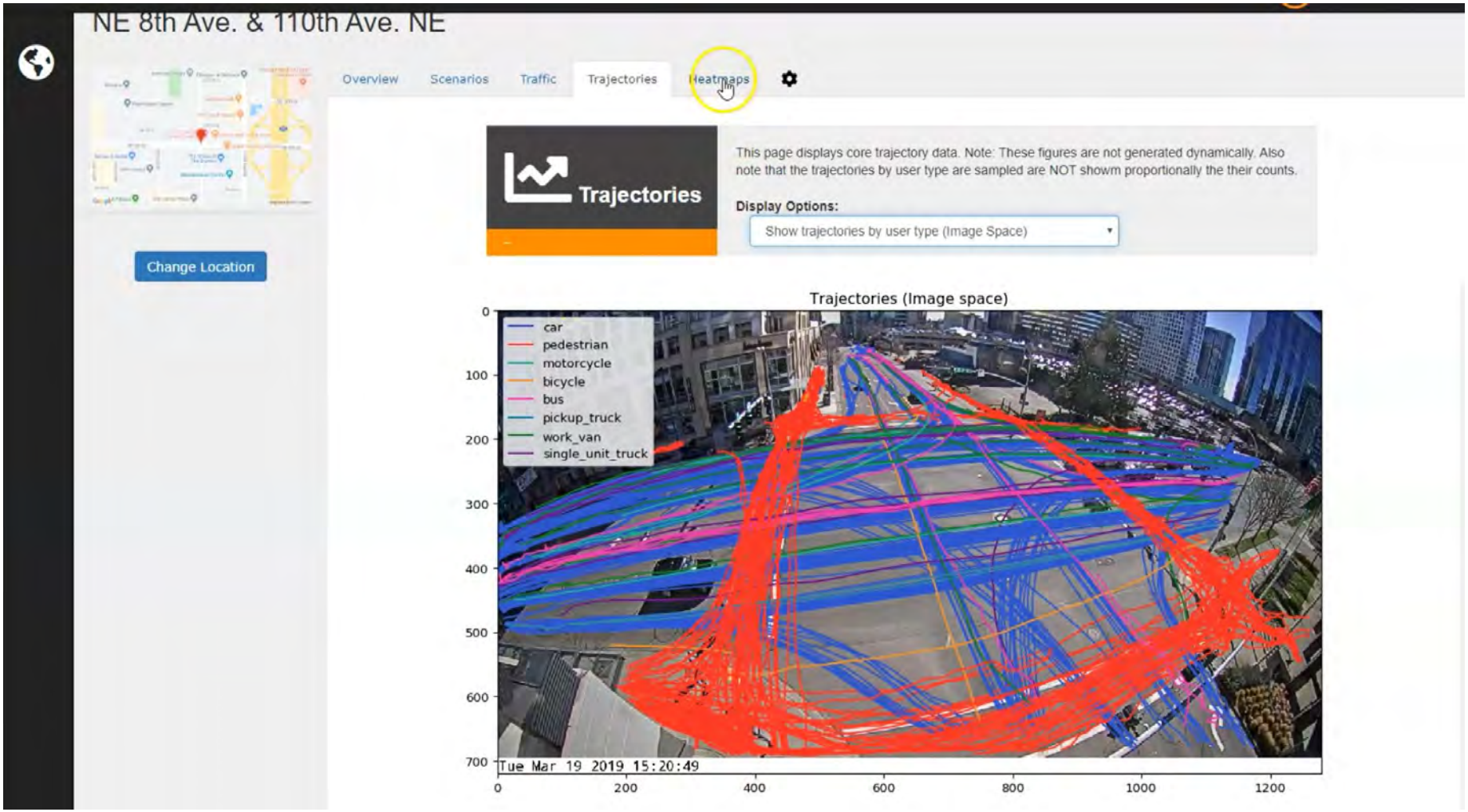

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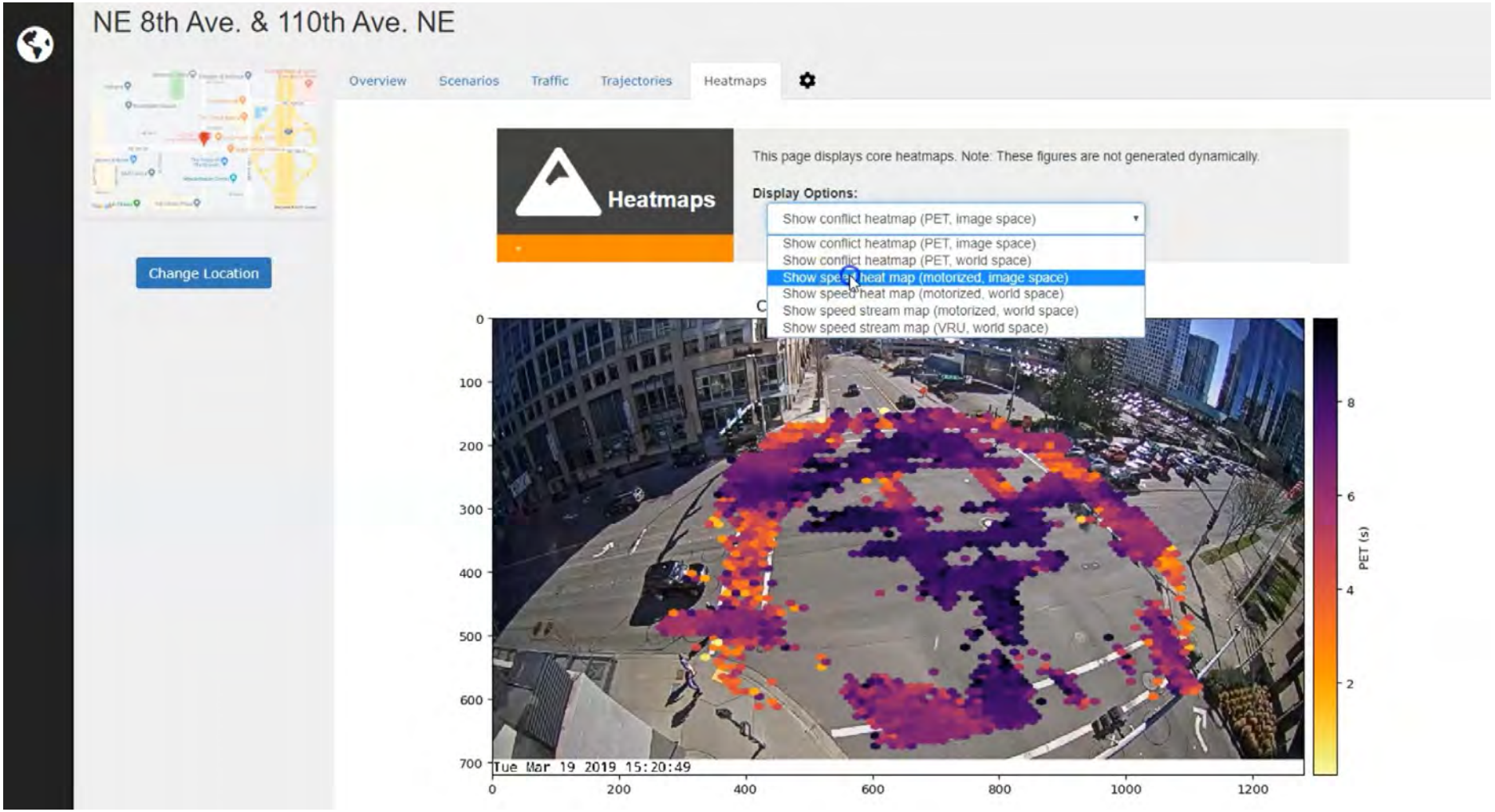

Transoft Solutions (ITS) Safety Dashboard

Conflict (Motorists)

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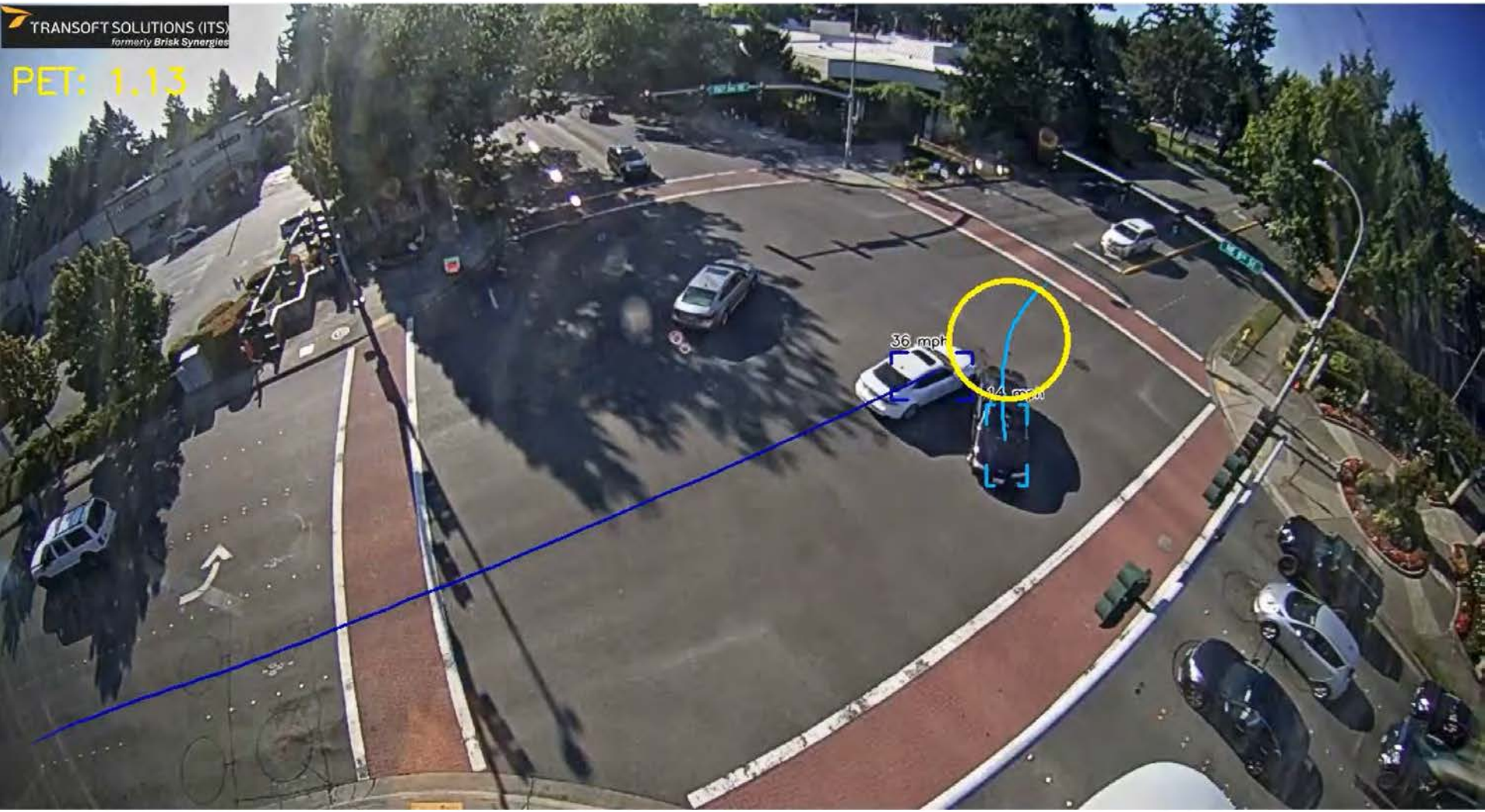


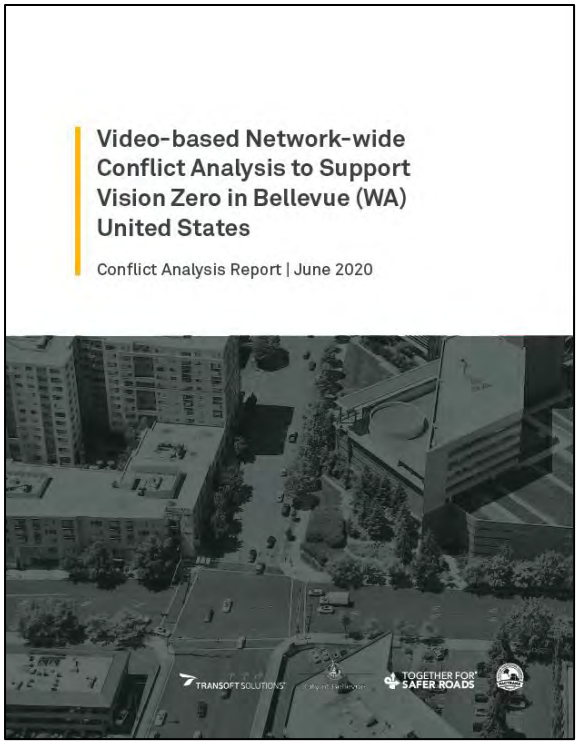
Speeding

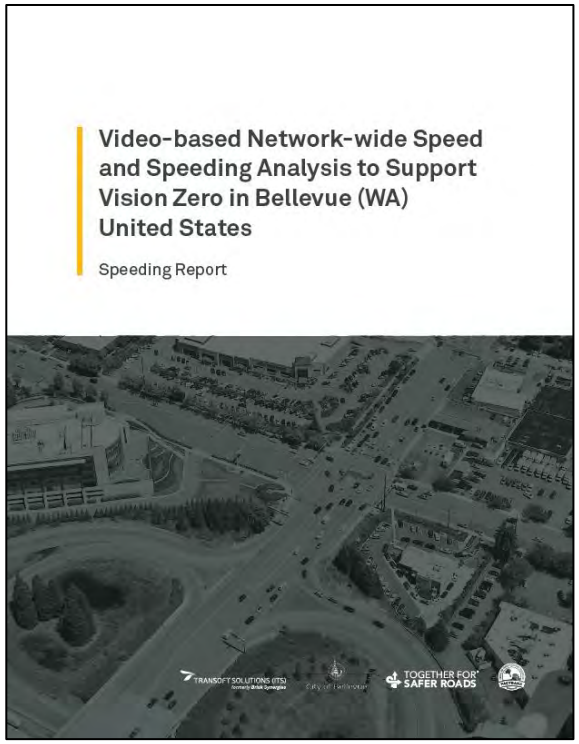

TRANSOFT SOLUTIONS (ITS)
formerly Brisk Synergies
Limit 35 mph
63 mph
29 mph Excess Speed

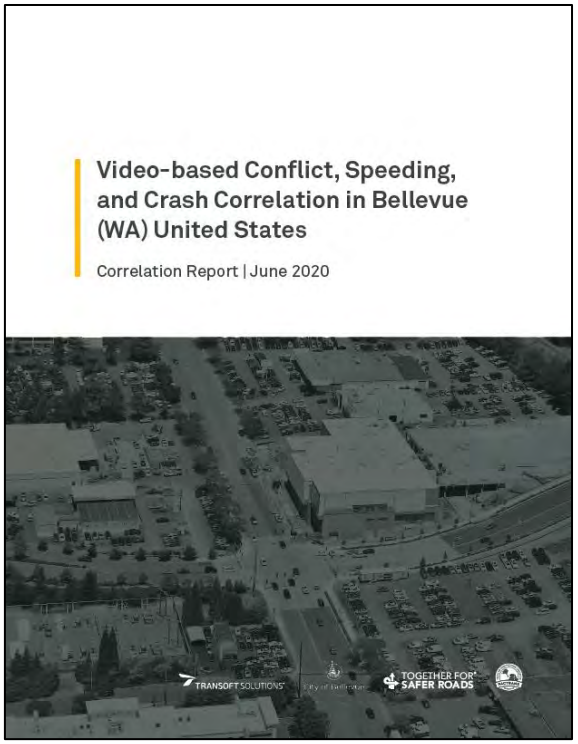
Speeding


TRANSOFT SOLUTIONS (ITS)
formerly Brisk Synergies
Limit 35 mph
Max 68 mph
68 mph
33 mph Excess Speed

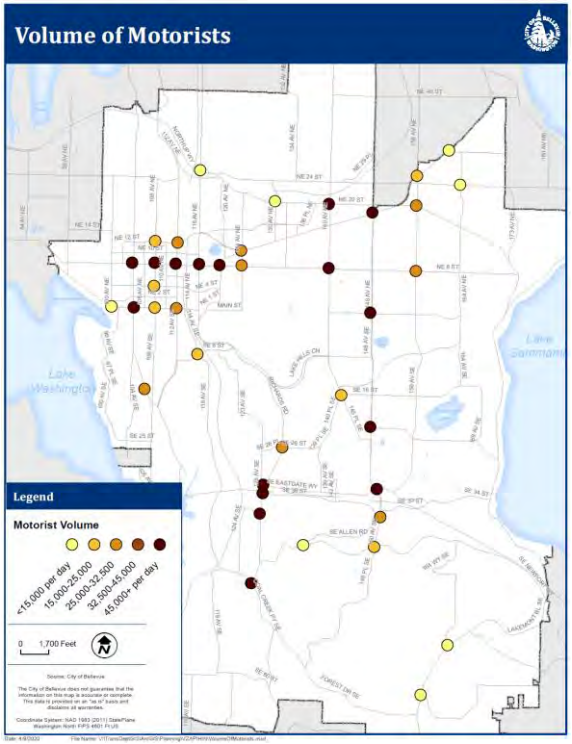
Partnership Reports

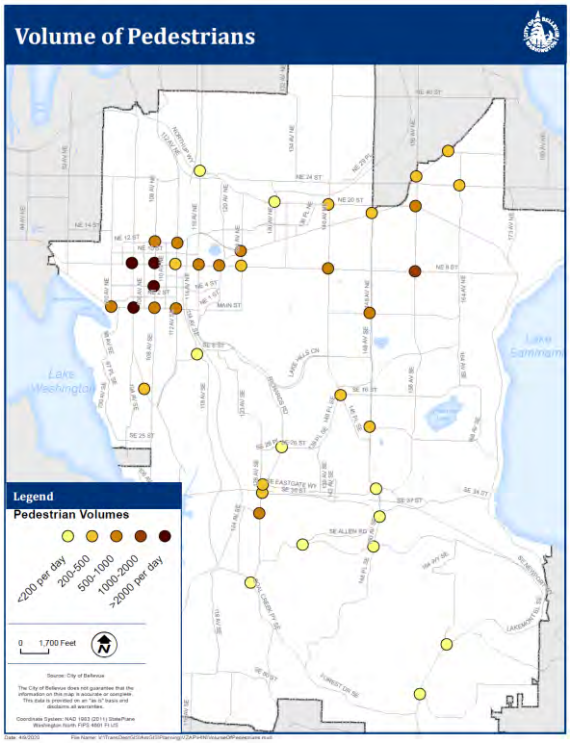


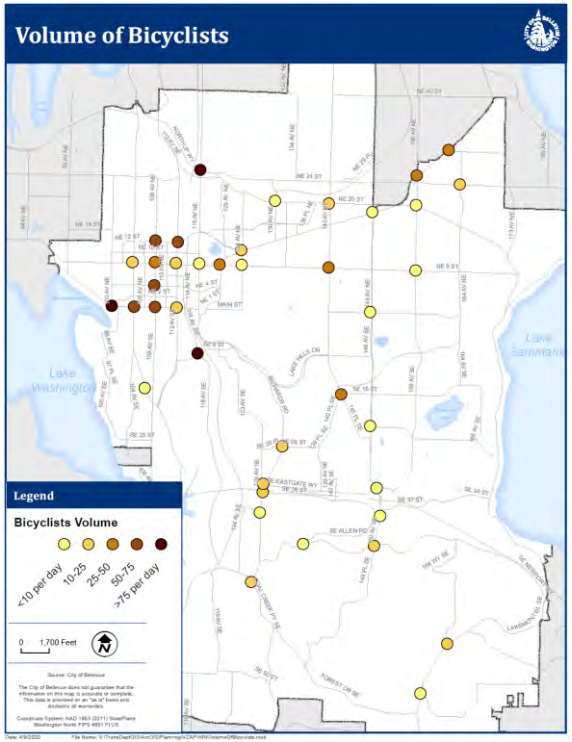




Report 1: Volume Data





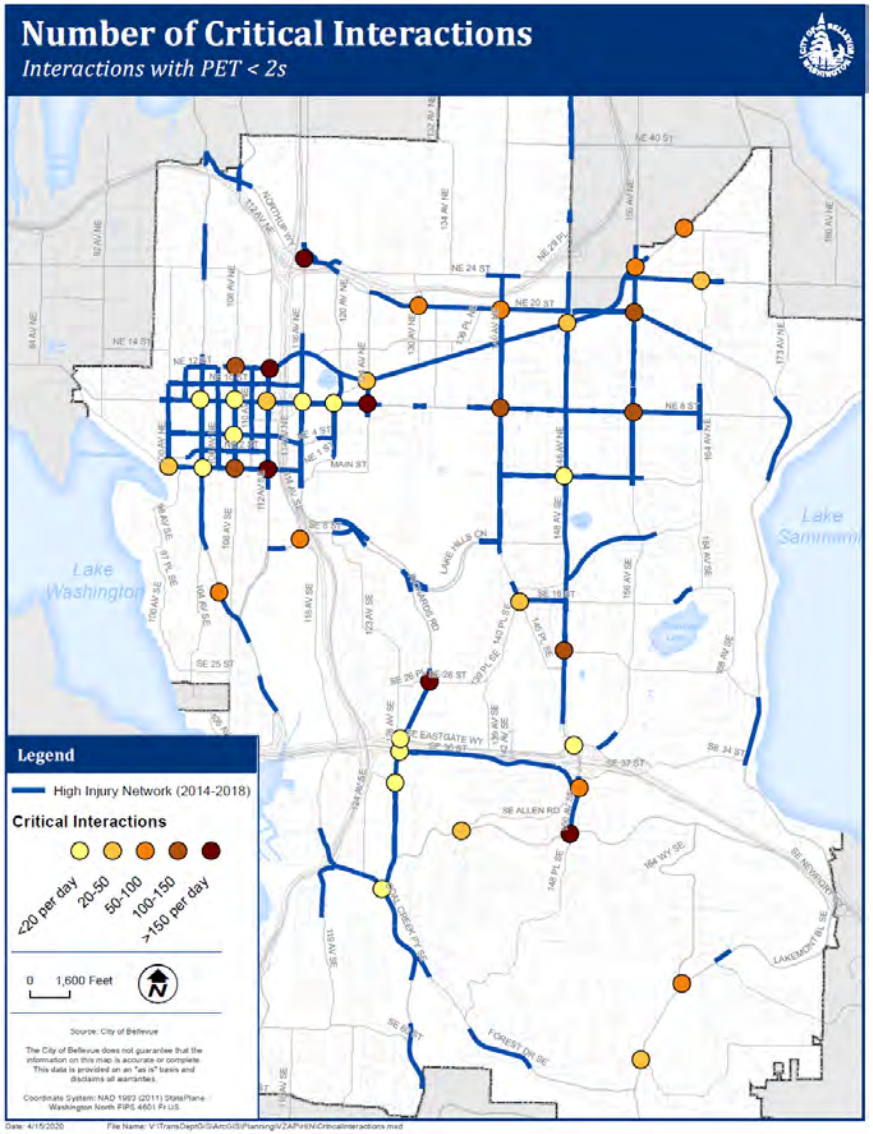


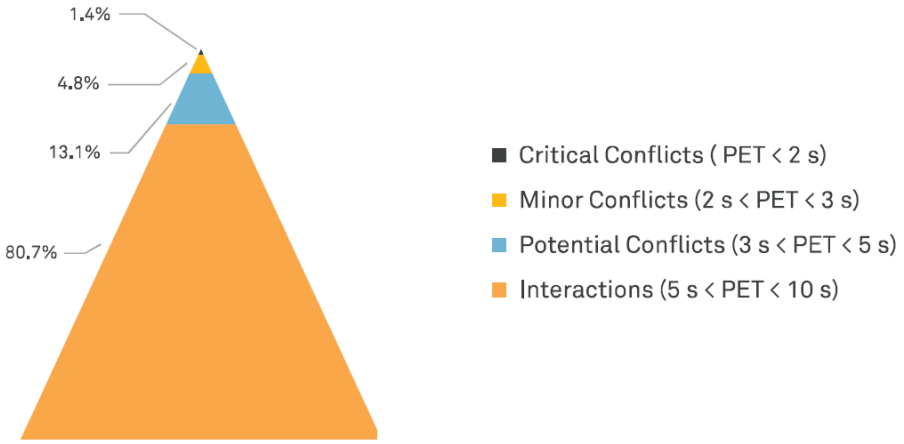
Motorists
97.3% of total road users
8 million observed

Pedestrians
2.6% of total road users
0.2 million observed

Bicyclists
0.1% of total road users
8,000 observed

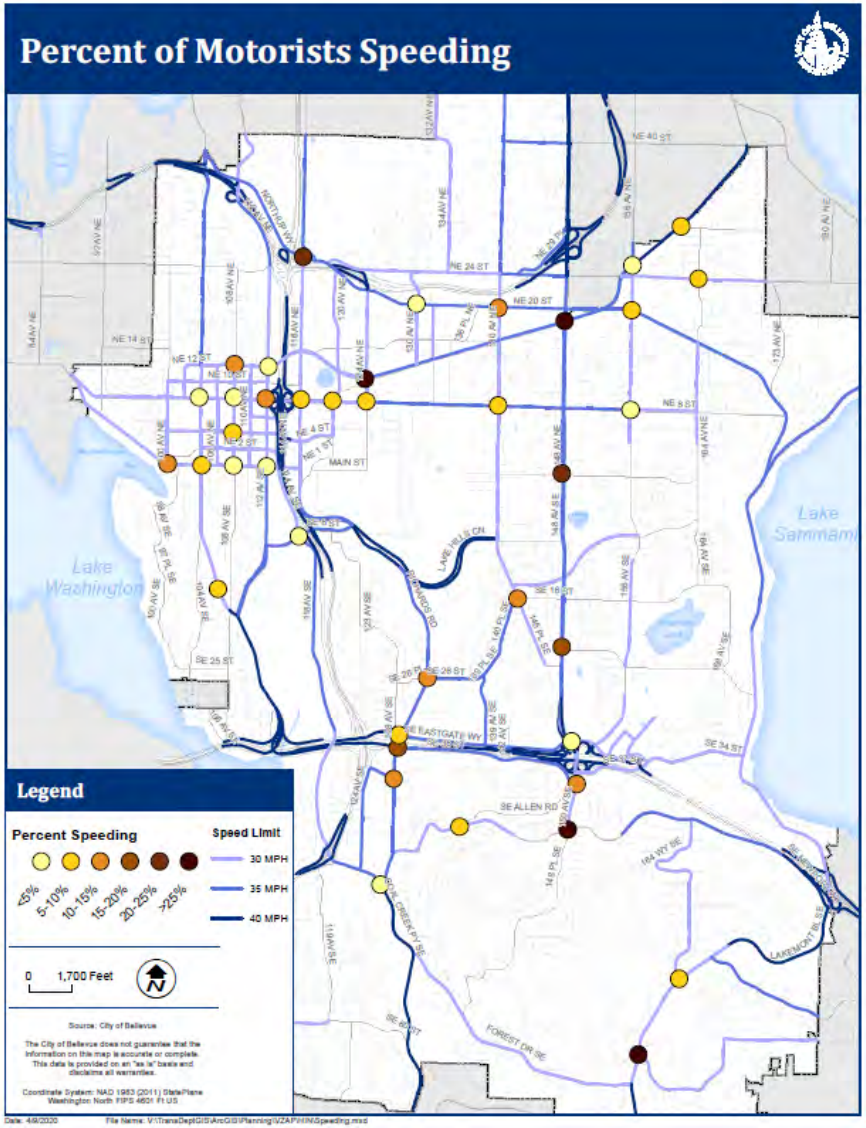
Report 1: Conflict Analysis





20K critical conflict events were observed (PET < 2 seconds) during one week at the 40 intersections.

Report 2: Speeding Analysis



Percentile	mph Above Speed Limit
5th	1.1
15th	3.1
50th	11.4
85th	23.8
95th	26.9

870K speeding events were observed (indicating 10.8% of drivers were speeding) during one week at the 40 intersections.

Report 3: Conflict and Crash Correlation

$$C = \alpha_0 V^{0.4} PET^{0.3}$$

C = Expected crashes
V = Observed traffic volume
PET = Observed conflicts (PET < 3sec)

- An increase in either volume or conflicts with PET < 3s correlates to an increase in crashes.
- This relationship is statistically significant and has a R-square of 38 percent.
- The strong association between crashes and conflicts show the promising capability of the surrogate safety approaches.
- These preliminary results (with only 10 intersections) are in the process to be improved with more data (more intersections).

Case Study: 124th Ave NE & NE 8th Street

Figure 5.1 Aerial image of intersection

Figure 5.2 Aerial image with aerial trajectories

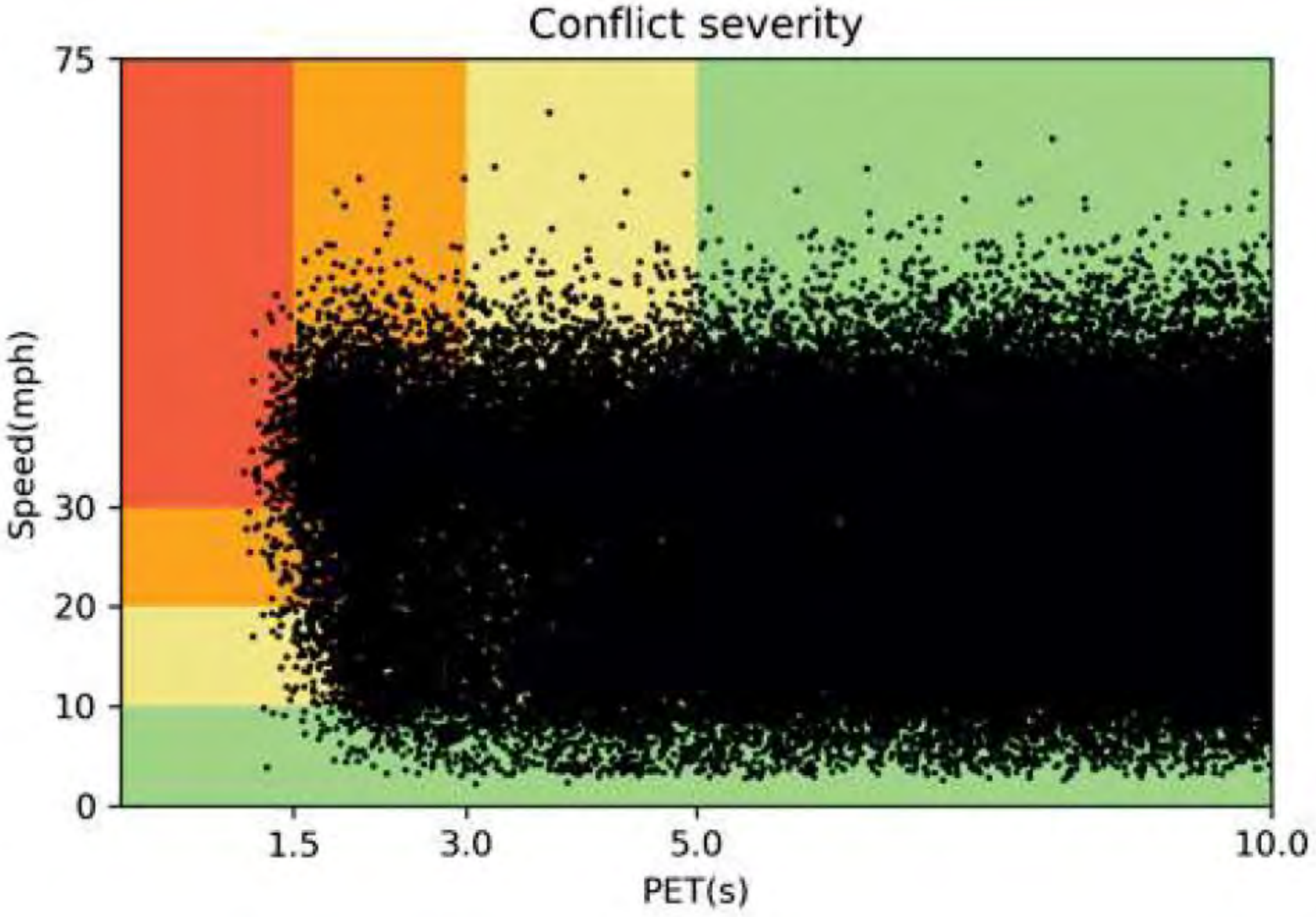
Table 5.1 – Average Hourly Weekday Driver Volumes

Northbound			Eastbound			Southbound			Westbound		
LT	Thru	RT	LT	Thru	RT	LT	Thru	RT	LT	Thru	RT
26	106	51	203	564	15	91	129	204	50	620	64

Before: 124th Ave NE & NE 8th Street

"Currently there is no green left turn arrow phase for cars on 124th so the left-turning traffic has to make a best effort to choose a safe time to cross the intersection but this is very difficult (and I often feel like I made a dangerous turn just to get through the intersection time)."

Case Study: 124th Ave NE & NE 8th Street



Before: 124th Ave NE & NE 8th Street

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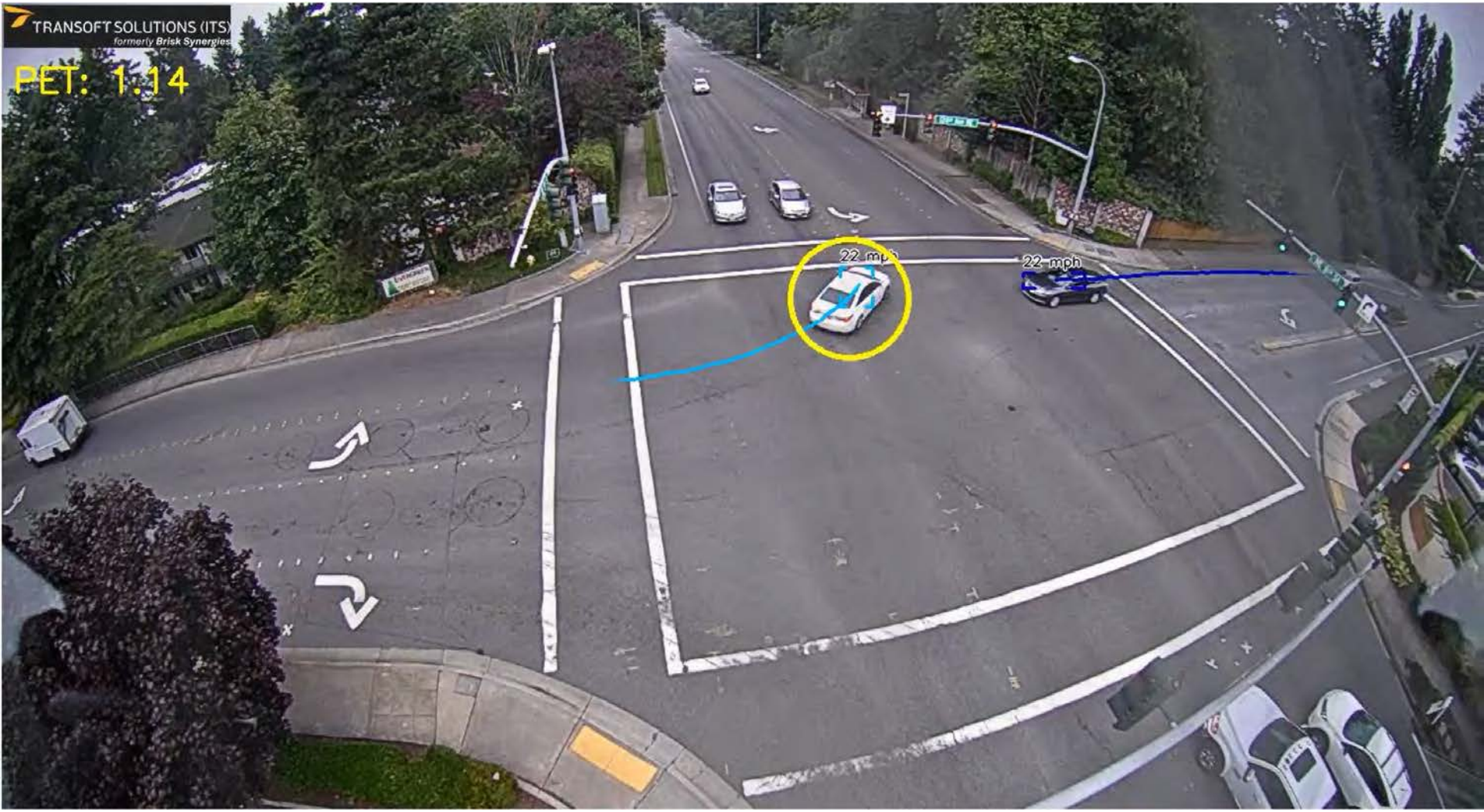
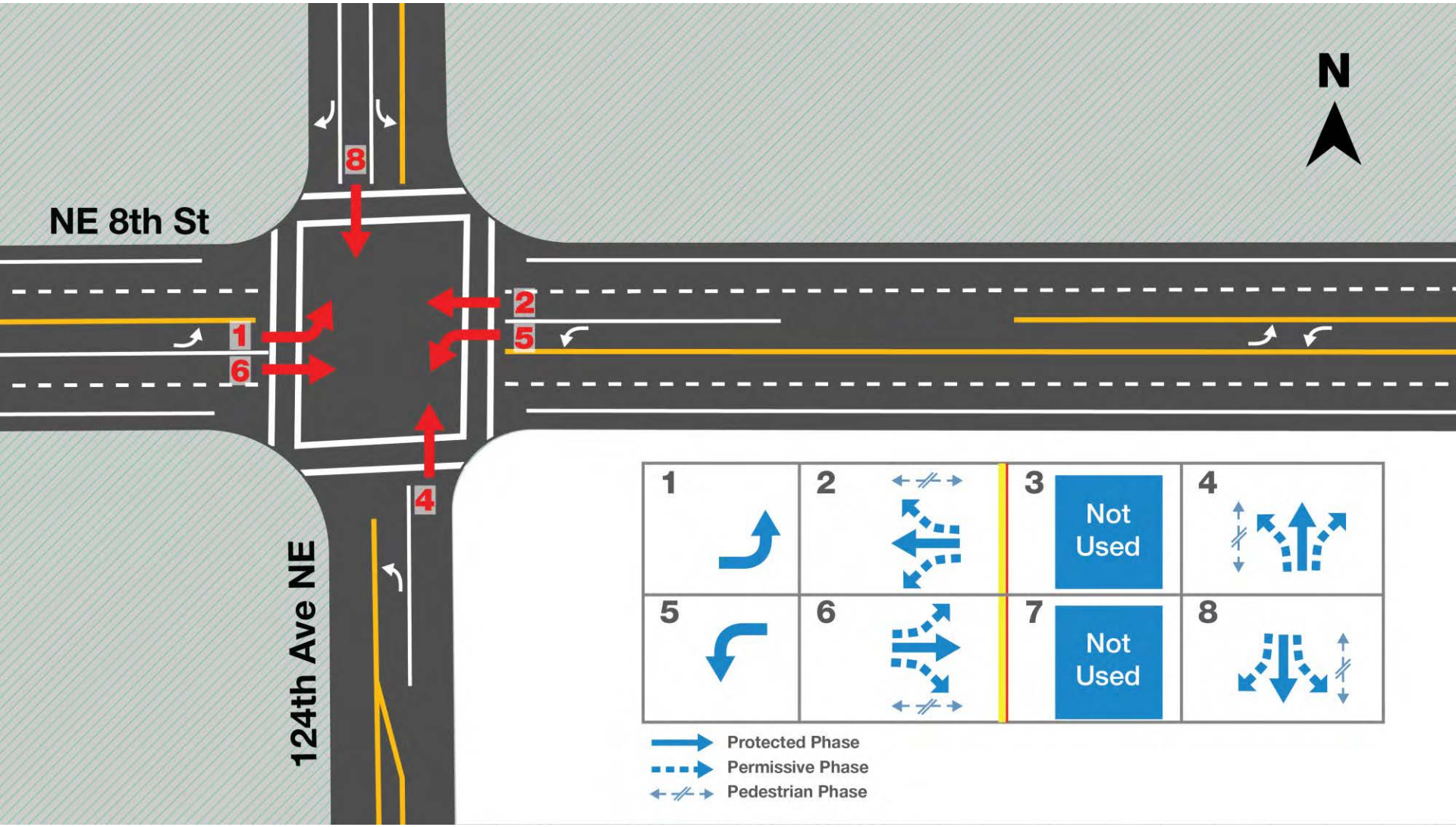
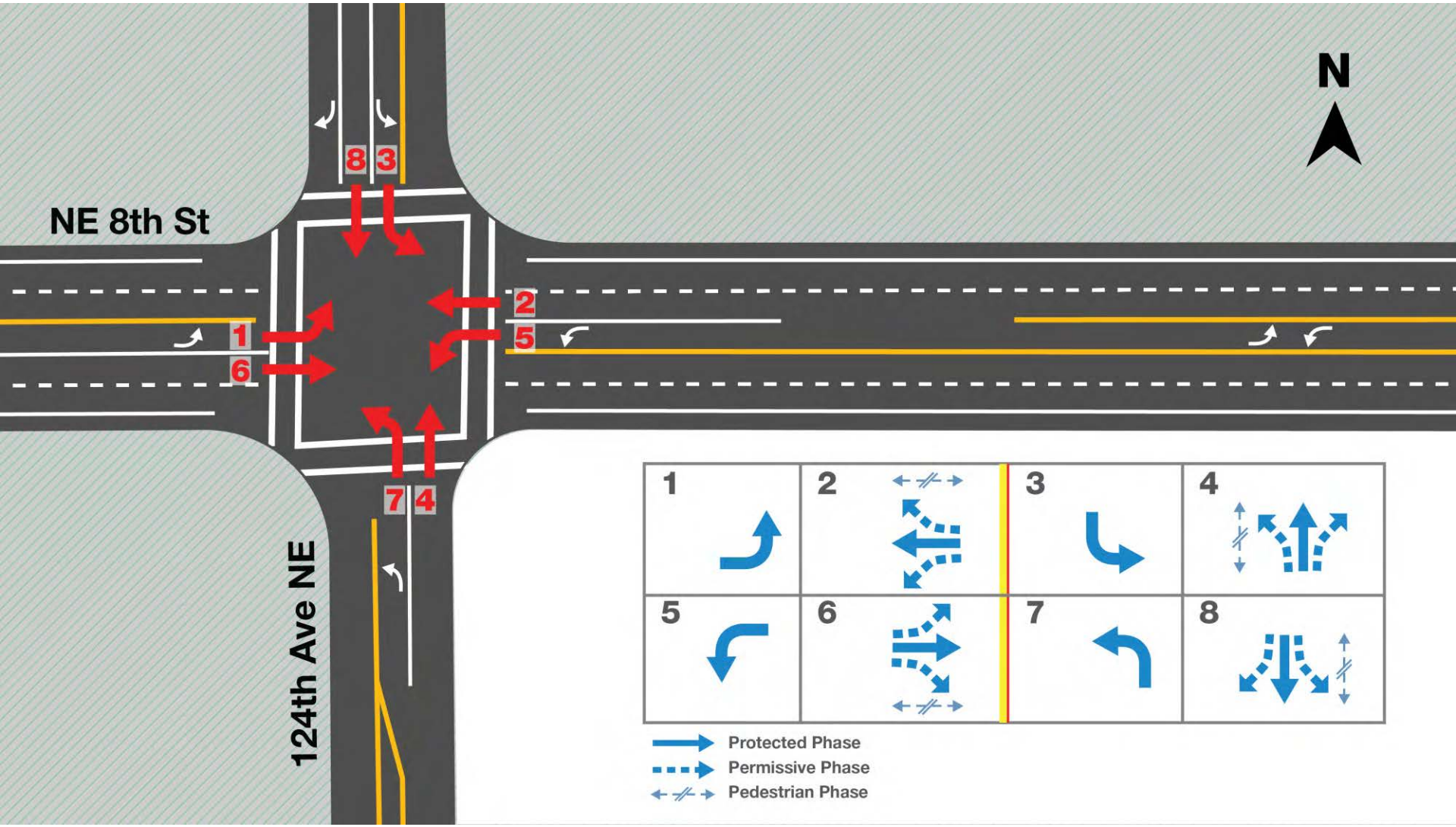


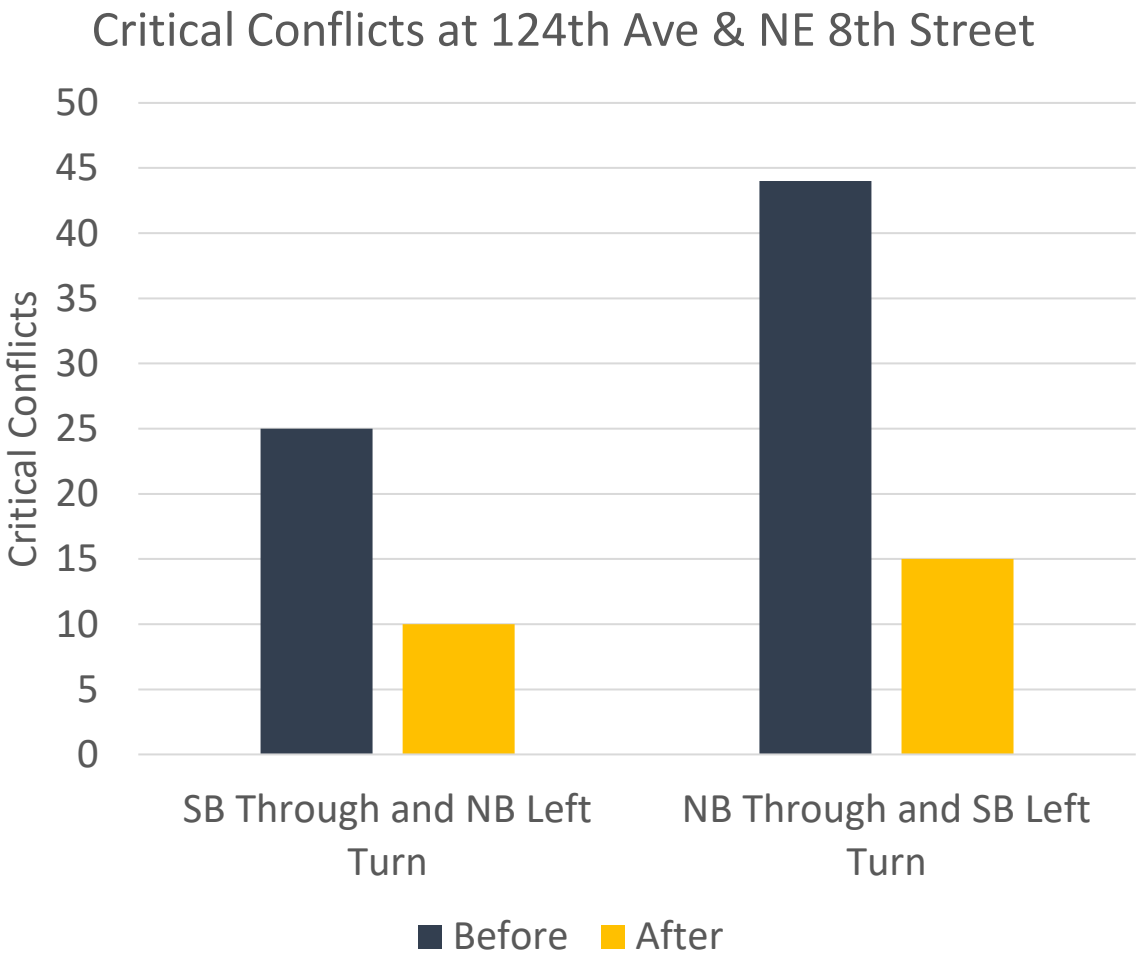
Before: 124th Ave NE & NE 8th Street



After: 124th Ave NE & NE 8th Street



Before/After Analysis: 124th Ave NE & NE 8th Street

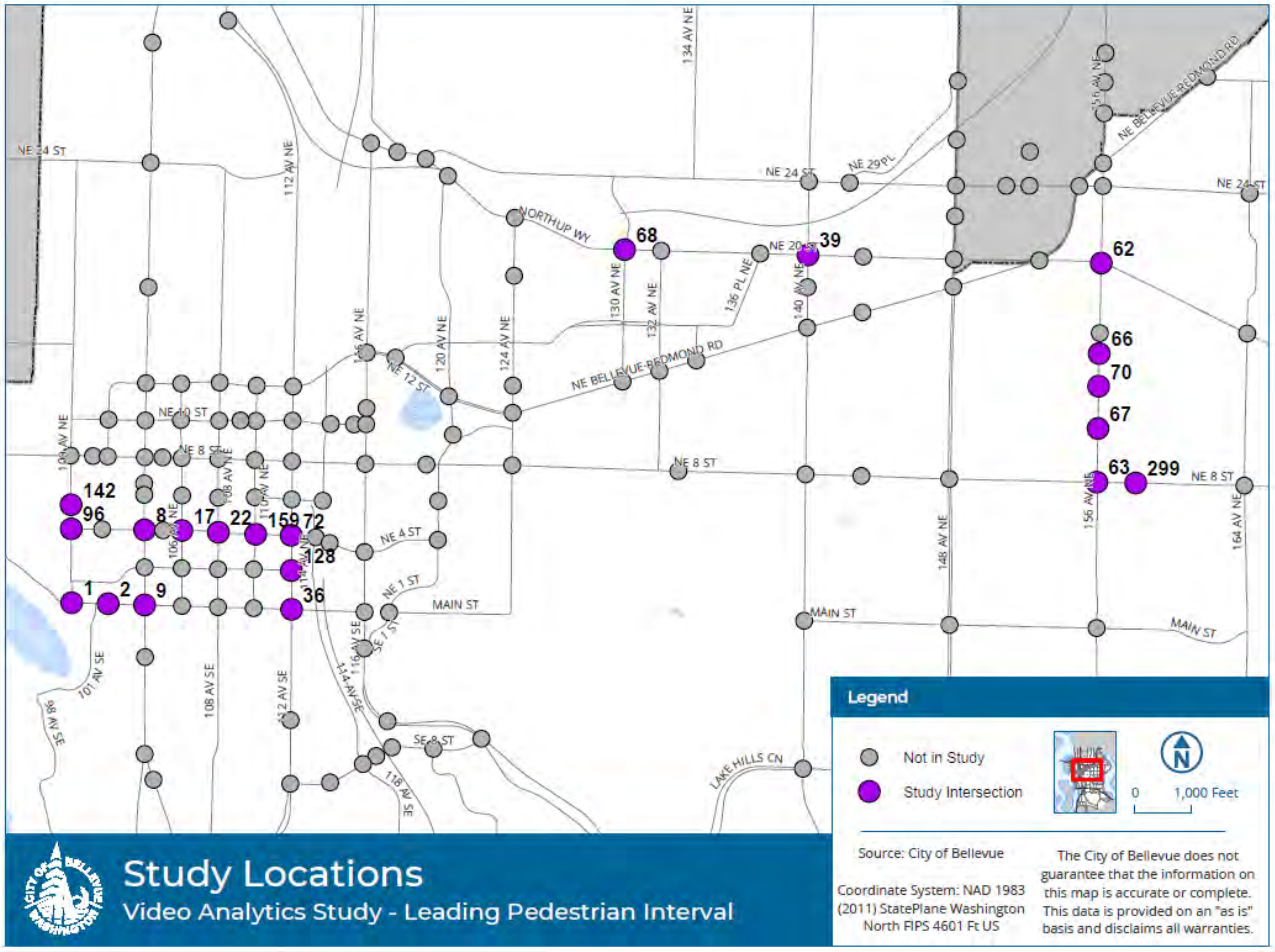


Critical Conflict Reductions:
60% between SBT & NBL
65% between SBL & NBT

After: 124th Ave NE & NE 8th Street

"I would like to say a BIG THANK YOU for installing the left turn light from 124th Ave NE to NE 8th Street. This is a big relief for many Wilburton residents who regularly get out of neighborhood via 124th Ave. They expressed great appreciation to this effort and they want me to let you know. Thank you for always listening to us and work hard on it. Together we will achieve the Vision Zero mission."

2020-21 Leading Pedestrian Interval Partnership



Microsoft

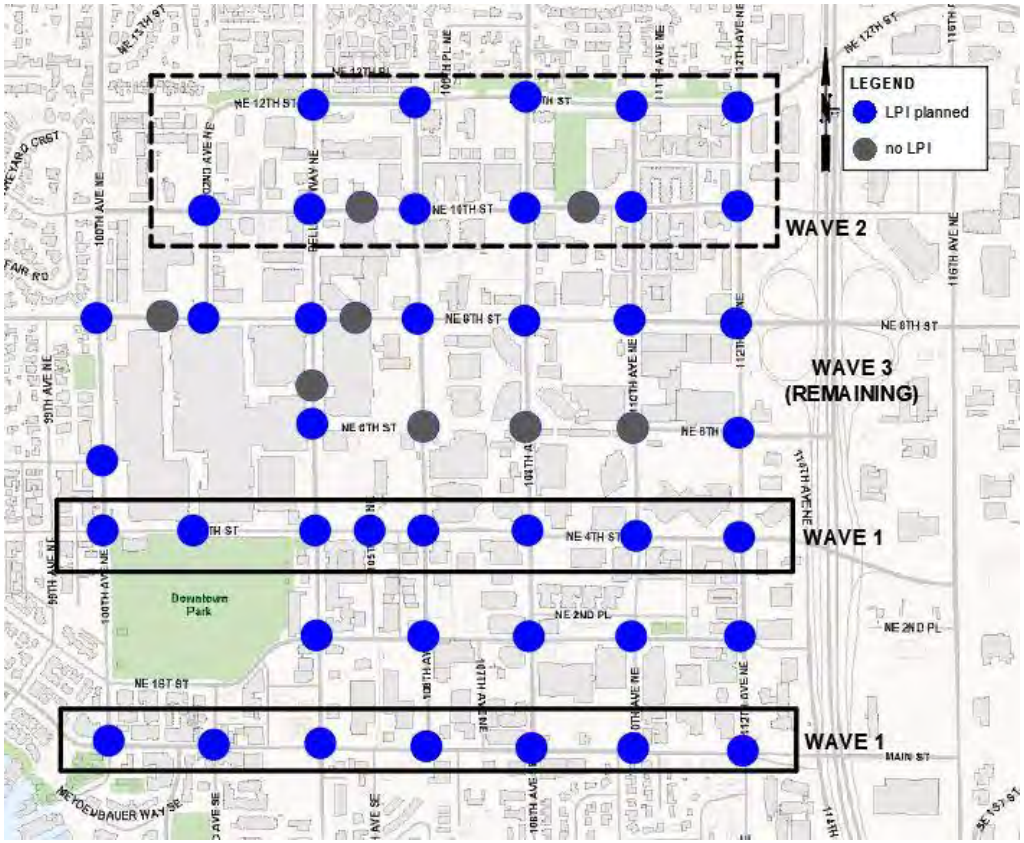
Jacobs

AMAG
Reimagine Transport Analytics

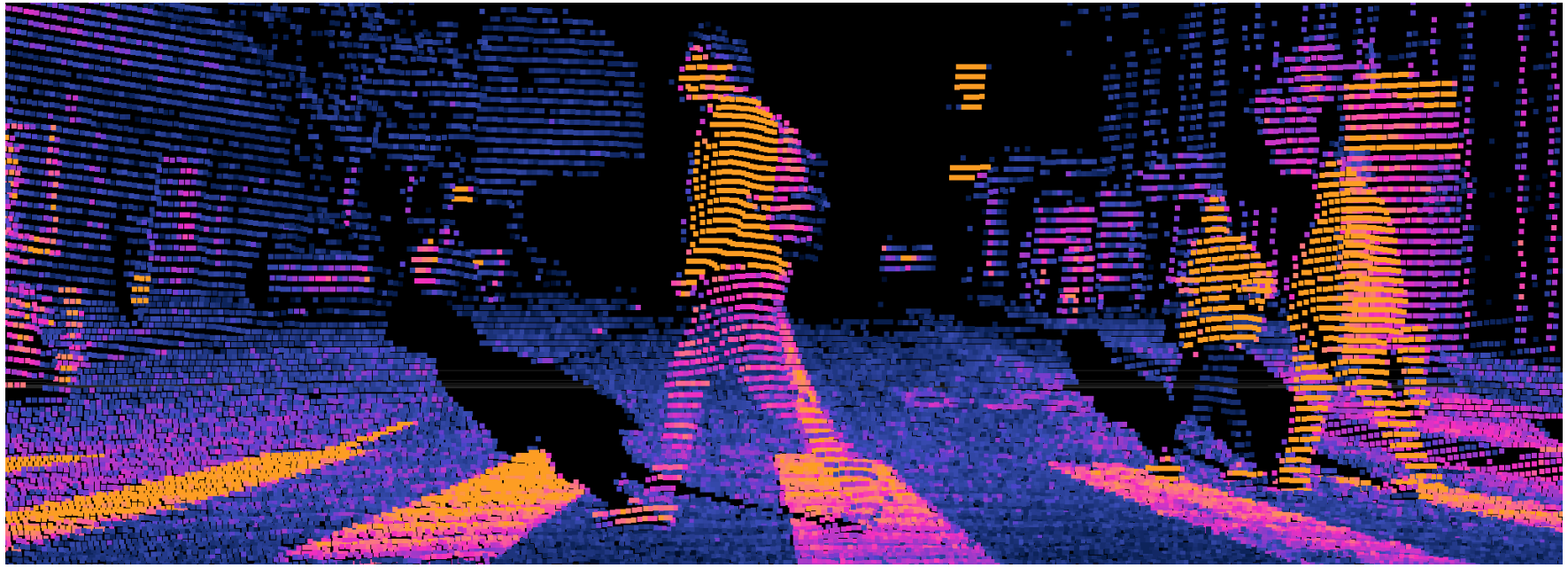
LPI Study Results

LPI results: 42% reduction in vehicle-pedestrian conflicts

2022 LPI Deployment



2022-2023 Edge Compute Partnership



CITY OF BELLEVUE WASHINGTON

aws

AMAG Reimagine Transport Analytics

OUSTER

outsight

FEHR PEERS

scats Move Smarter

2023-2024 Cellular Vehicle-to-Everything Partnership


The Seattle Times

$2.00

Bellevue blazes trail in technology to make roads safer for cars, bikes, pedestrians

For More Information

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