Video Analytics Towards Vision Zero

Bellevue Neighborhood Conference

April 21, 2018

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City of Bellevue, WA

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amazon
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VALVE
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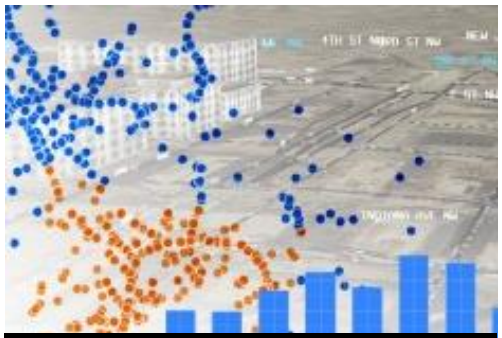
inspur

Smart City Solutions

ADAPTIVE SIGNAL SYSTEM

VIDEO ANALYTICS PARTNERSHIP

CONNECTED VEHICLE PILOT

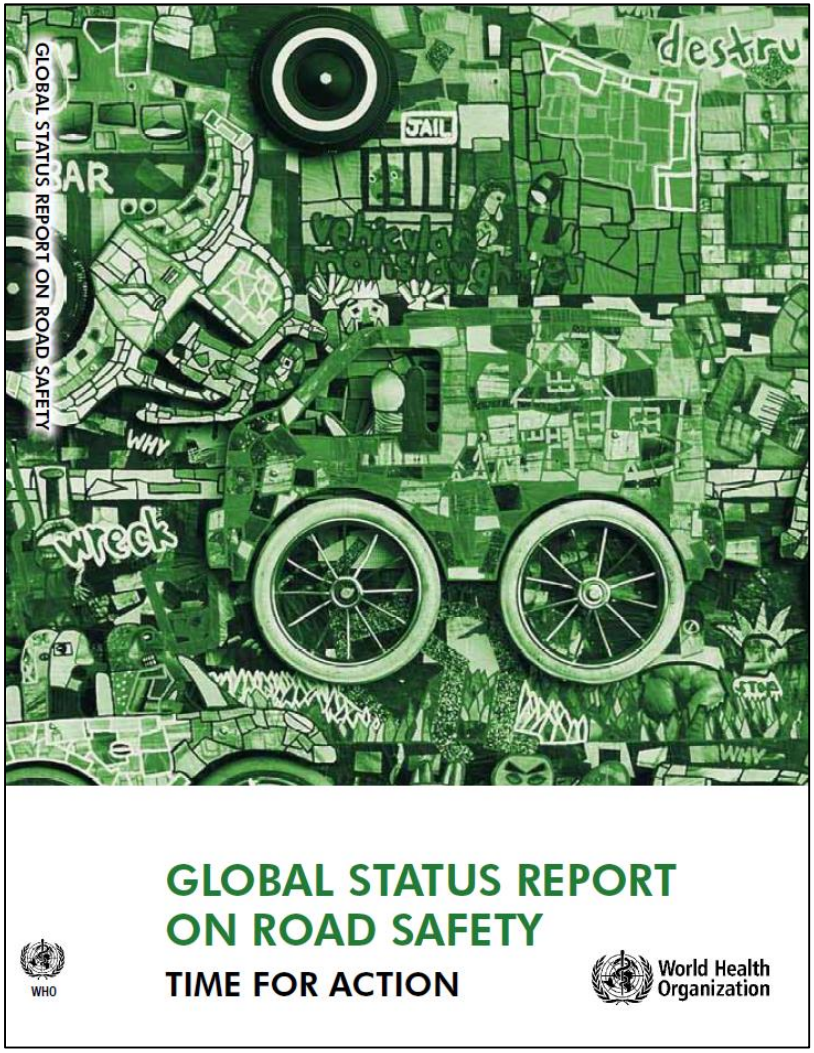


PERFORMANCE MEASURES

TRANSIT SIGNAL PRIORITY

LIGHTING CONTROLS

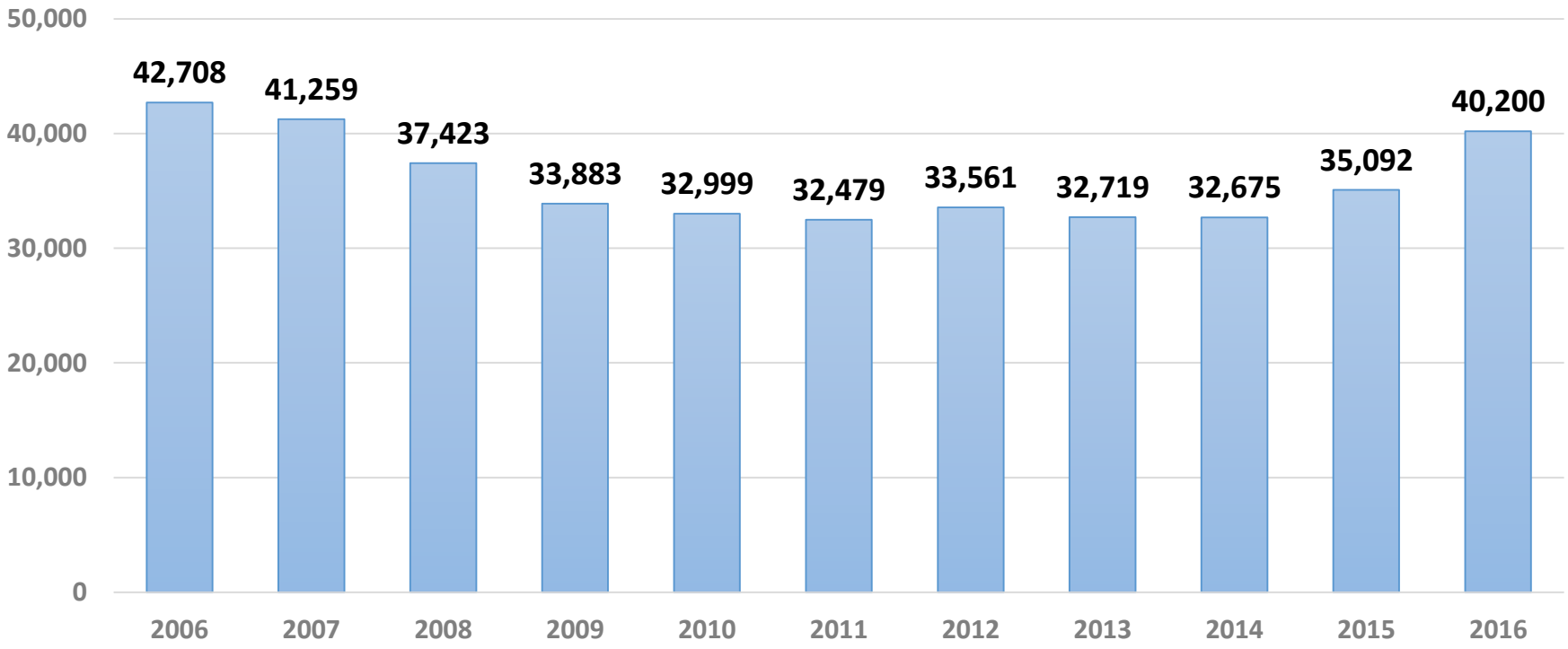
Worldwide: Traffic Fatalities



Leading Causes of Death (2004)

RANK	LEADING CAUSE	%
1	Ischaemic heart disease	12.2
2	Cerebrovascular disease	9.7
3	Lower respiratory infections	7.0
4	Chronic obstructive pulmonary disease	5.1
5	Diarrhoeal diseases	3.6
6	HIV/AIDS	3.5
7	Tuberculosis	2.5
8	Trachea, bronchus, lung cancers	2.3
9	Road traffic injuries	2.2
10	Prematurity and low birth weight	2.0
11	Neonatal infections and other	1.9
12	Diabetes mellitus	1.9
13	Malaria	1.7
14	Hypertensive heart disease	1.7
15	Birth asphyxia and birth trauma	1.5
16	Self-inflicted injuries	1.4
17	Stomach cancer	1.4
18	Cirrhosis of the liver	1.3
19	Nephritis and nephrosis	1.3
20	Colon and rectum cancers	1.1

USA: Traffic Fatalities



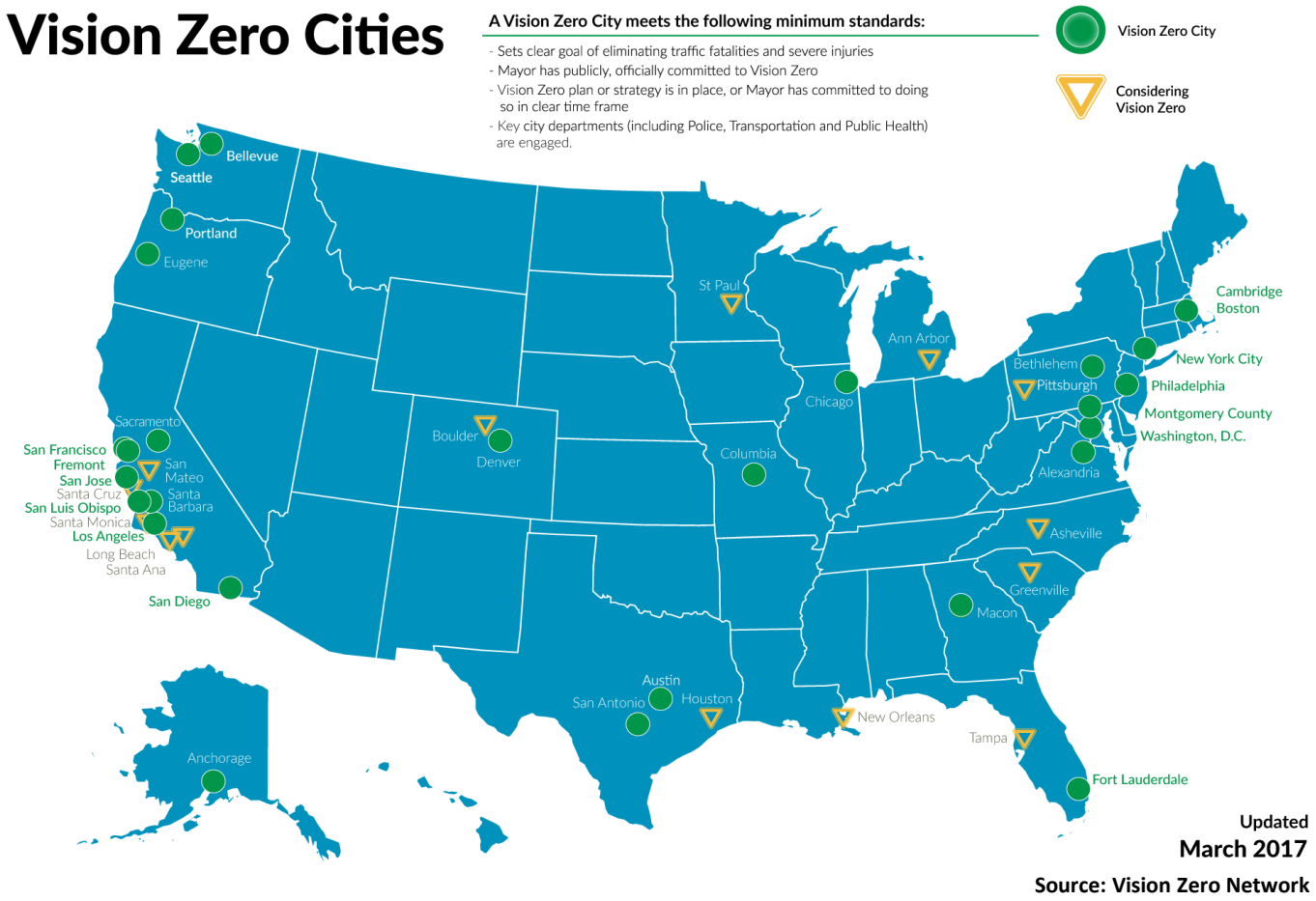
NHTSA, Impact of Crashes (2010): Economic Cost: $242B; Societal Harm: $836B

Bellevue Resolution No. 9035

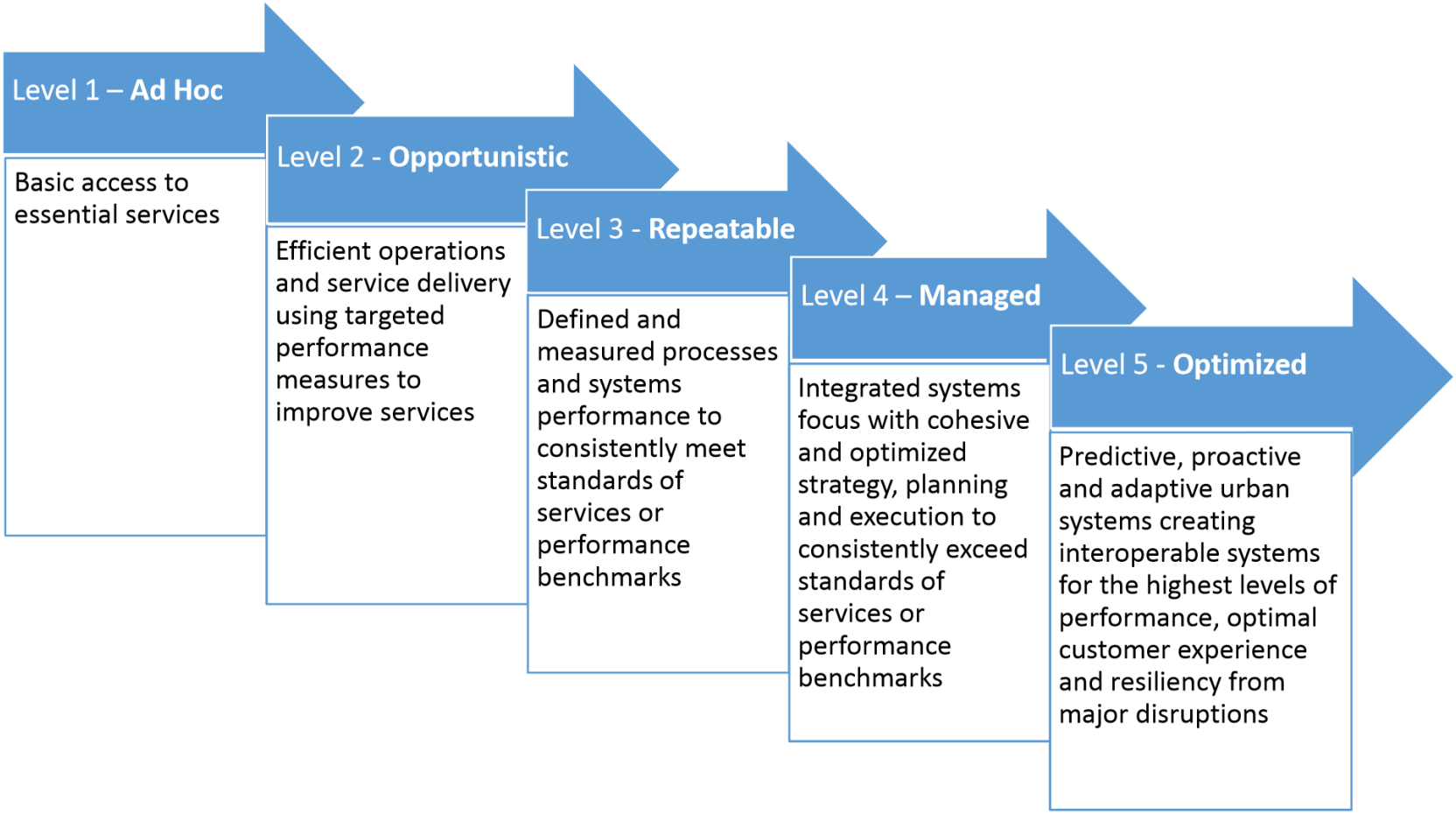
WHEREAS, the worldwide Vision Zero movement is founded on the belief that death and injury on city streets is unacceptable and preventable

- The City of **Bellevue endorses Vision Zero** as part of a comprehensive effort to strive to achieve zero traffic deaths and serious injuries on Bellevue streets by 2030.

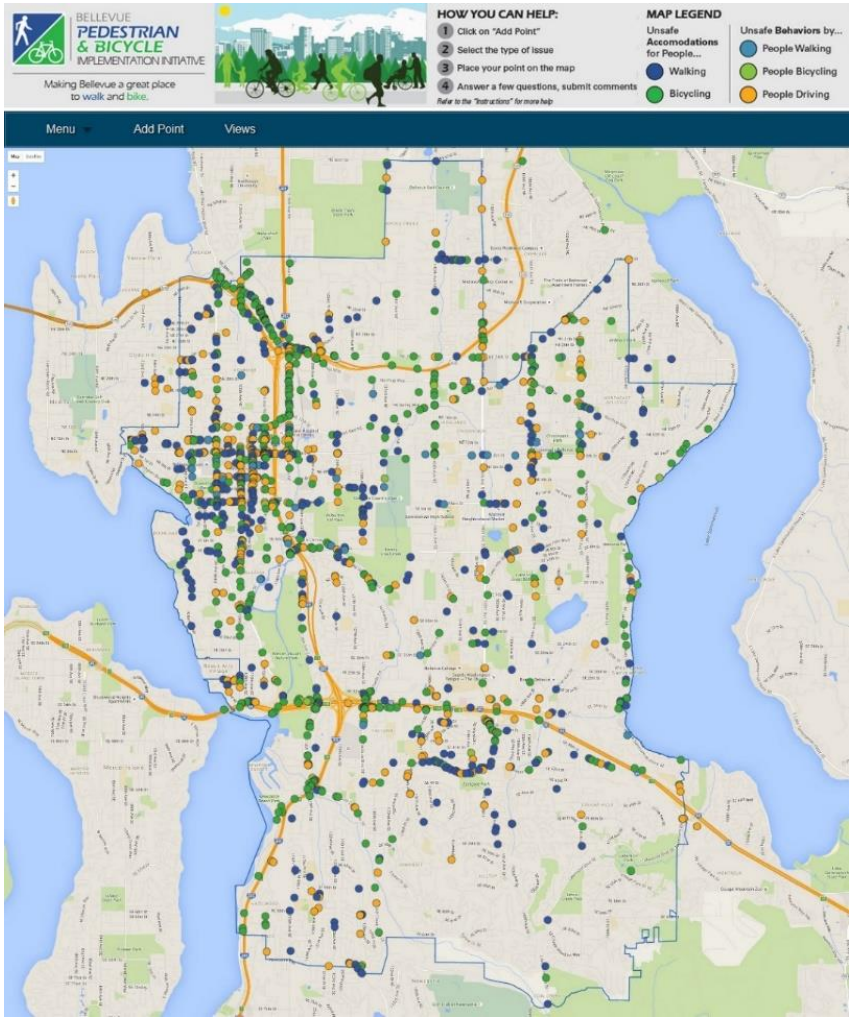
Bellevue: A Vision Zero City



Bellevue: A Smart City

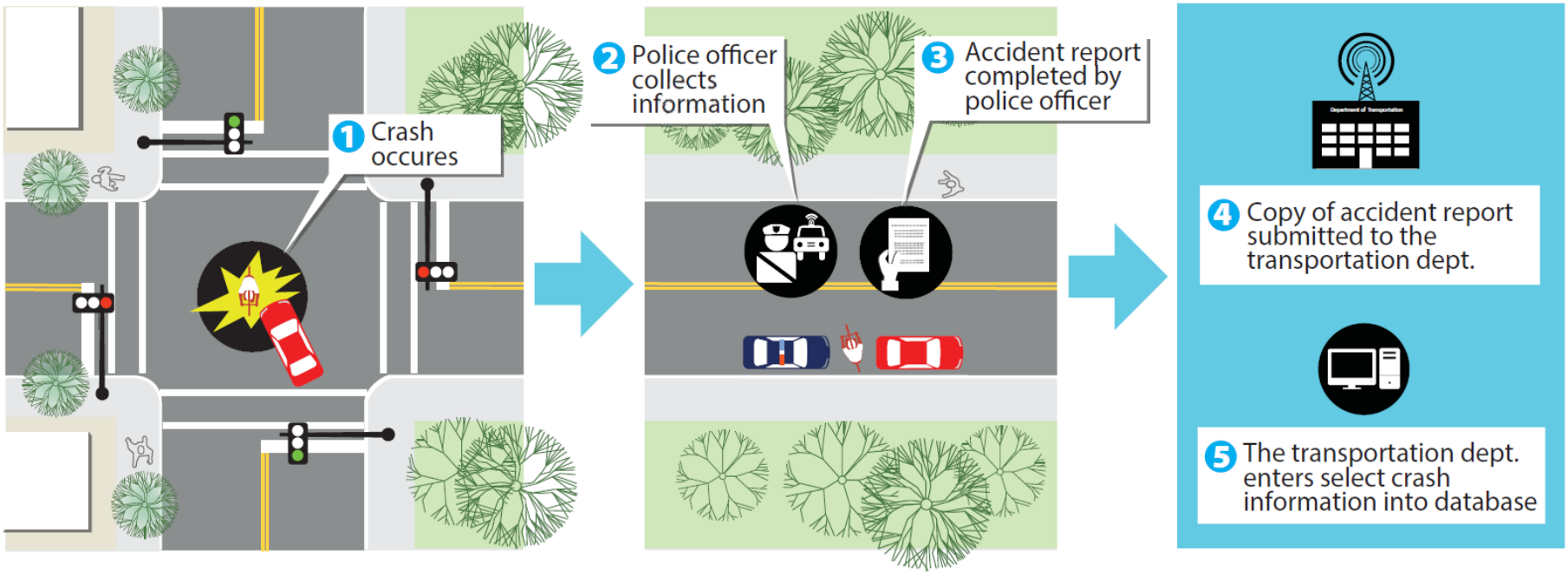


Road Safety Concerns

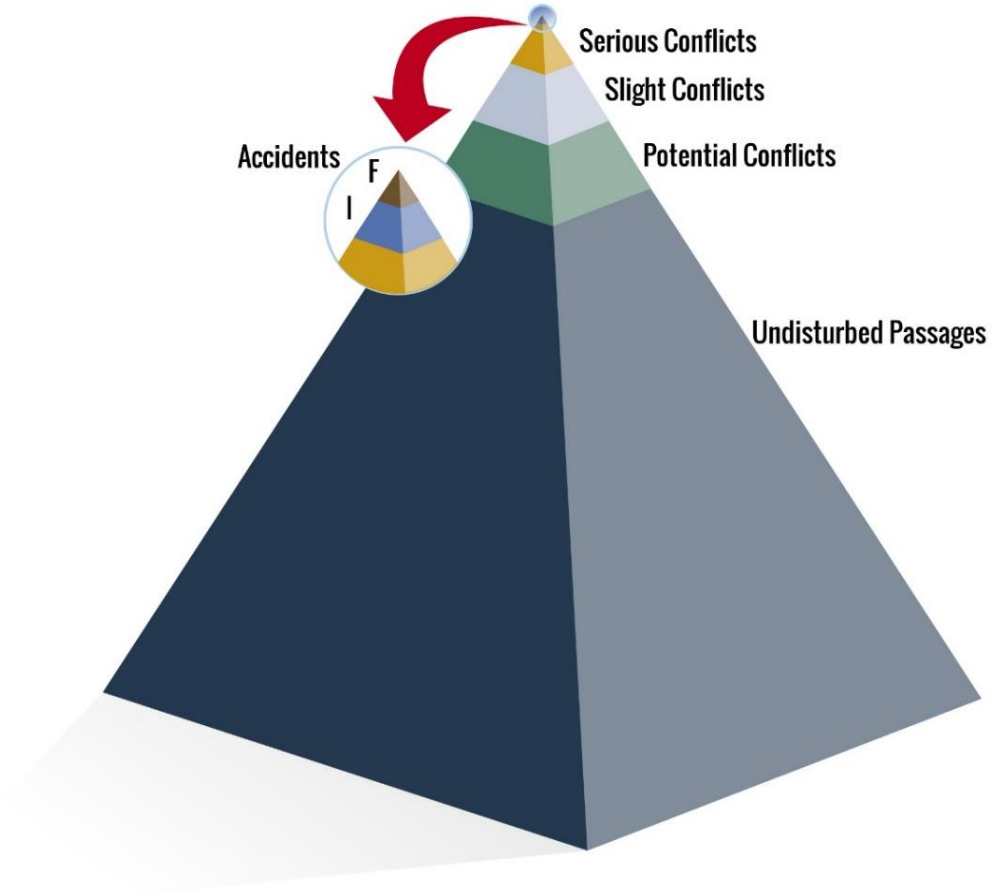


	Total Points Placed	
Ped Facilities	514	32%
Bike Facilities	573	35%
Ped Behaviors	57	4%
Bike Behaviors	22	1%
Car Behaviors	452	28%
Total	1618	

Crash-Based (Ad-Hoc) Approach

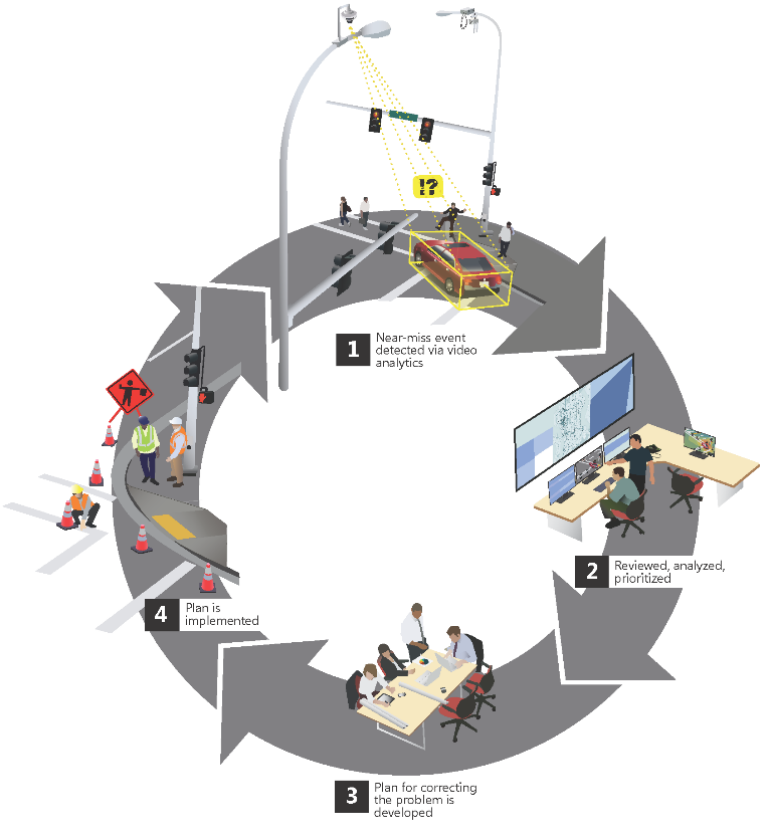


Conflict-Based (Optimized) Approach



Hyden's Safety Pyramid (adapted from Hyden, 1987)

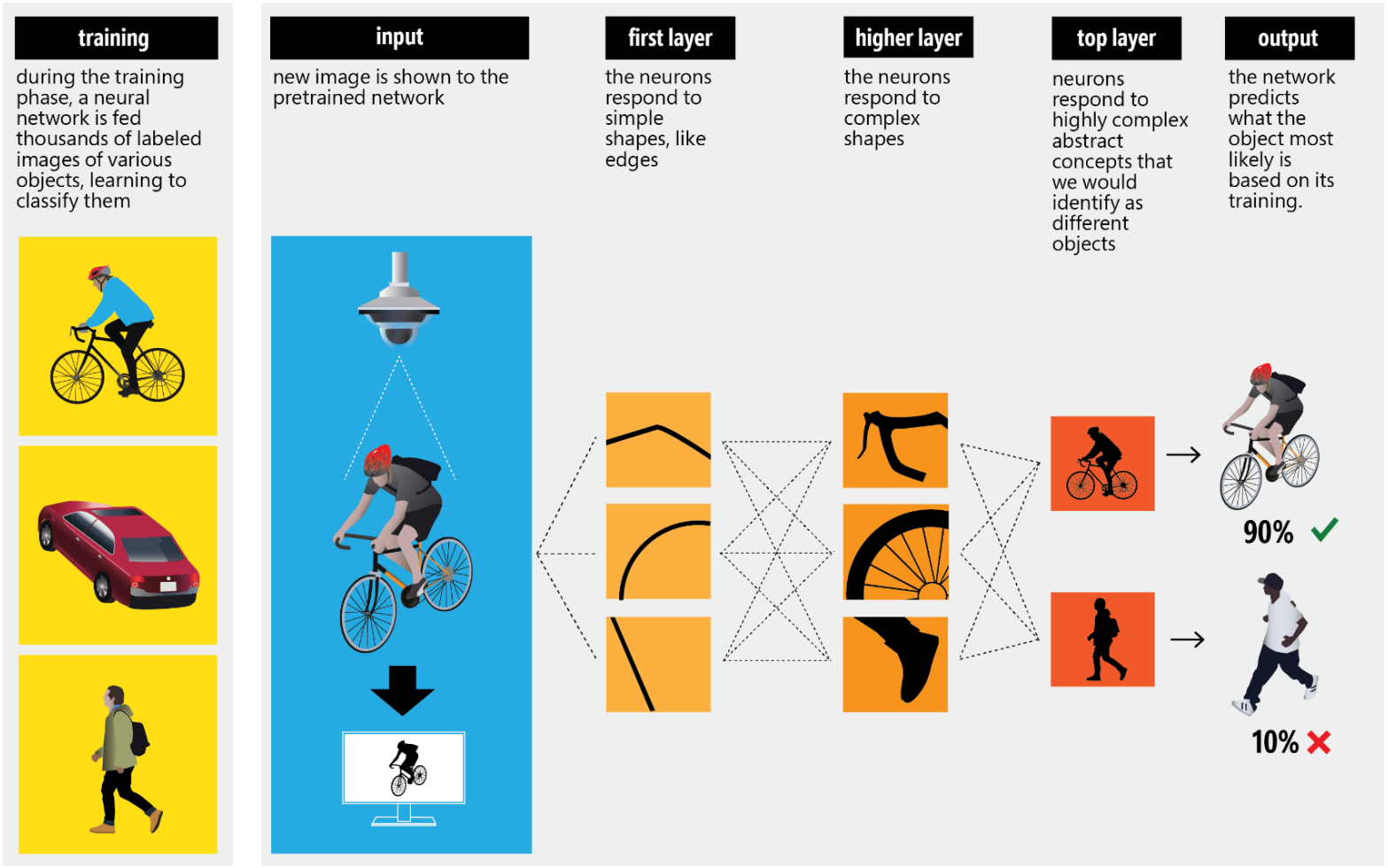
Video Analytics Platform



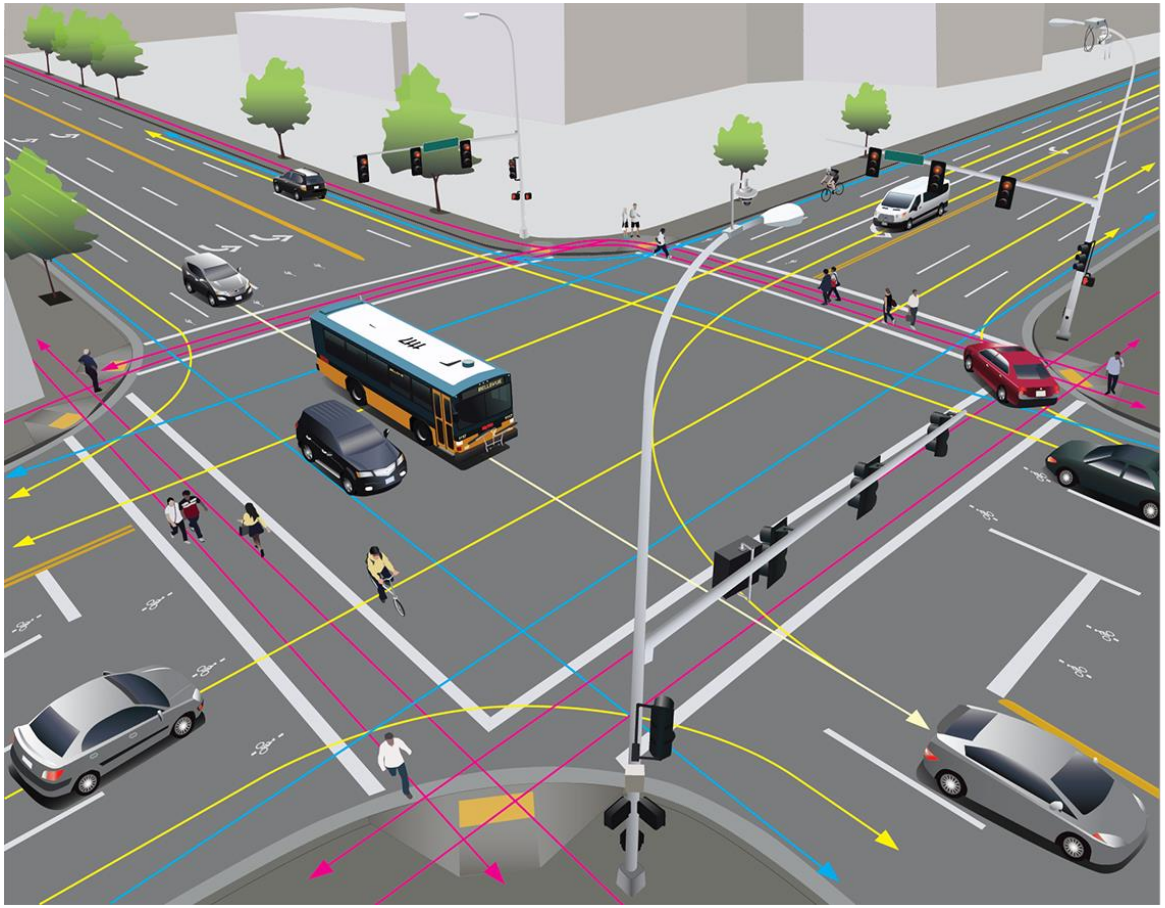
Leverage a city's existing traffic camera system to simultaneously:

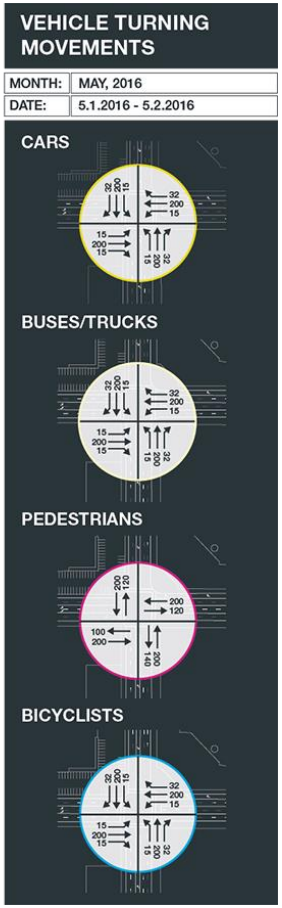
- **monitor counts and travel speed of all road user groups (vehicle, pedestrian, and bicycle);**
- **document the directional volume of all road user groups as they move through an intersection; and,**
- **assess unsafe "near-miss" trajectories and interactions between all road user groups.**

DNN Architecture

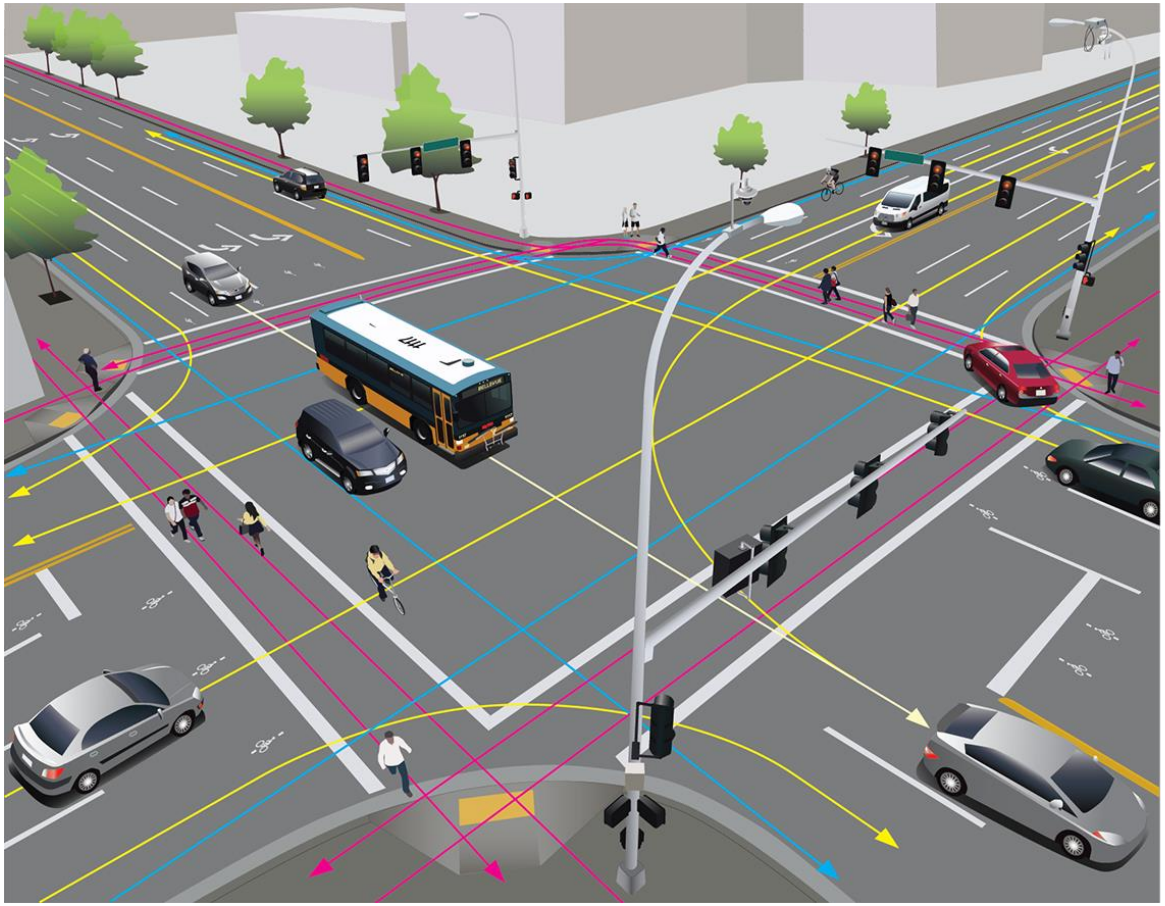


Turning Movements





Volume Charts



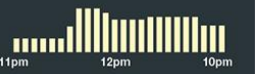
VEHICLE DISTRIBUTION CHARTS BY TIME OF DAY

MONTH:	MAY, 2016
DATE:	5.1.2016 - 5.1.2016

CARS

30,000 cars/day

BUSES/TRUCKS



400 buses & trucks/day

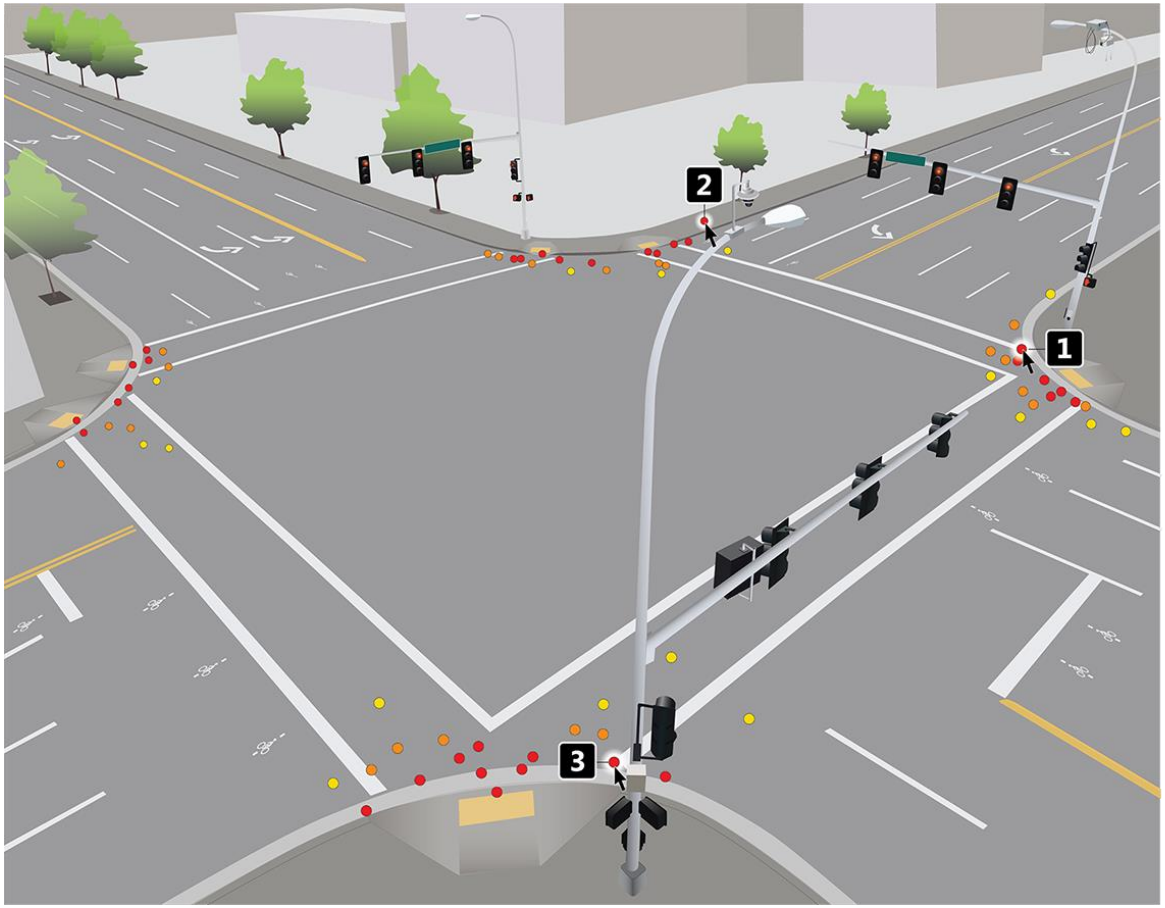
PEDESTRIANS

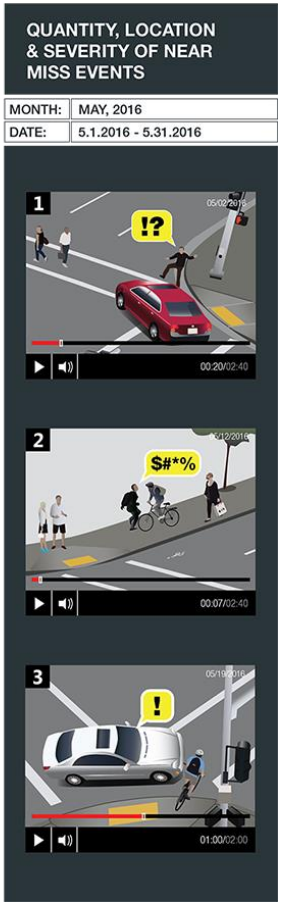
1,000 pedestrians/day

BICYCLISTS

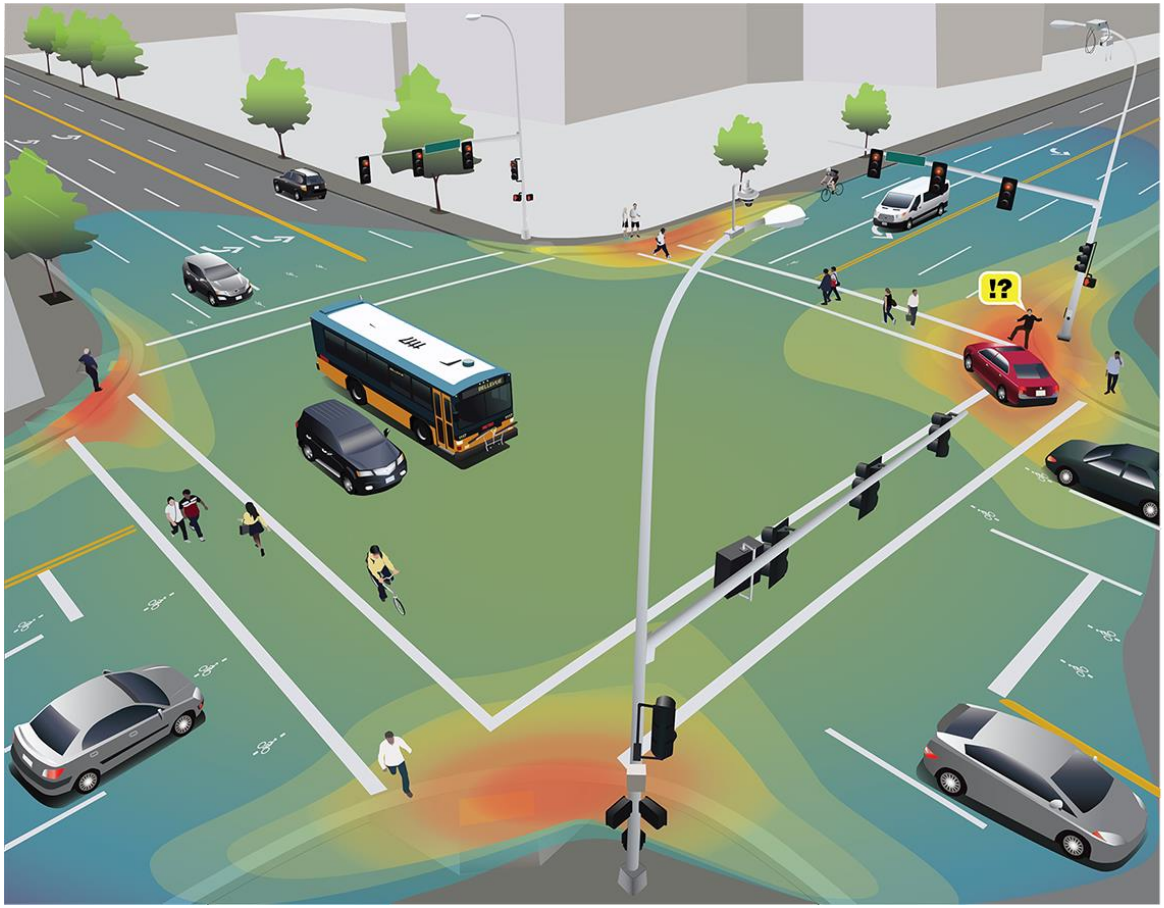
100 bikes/day

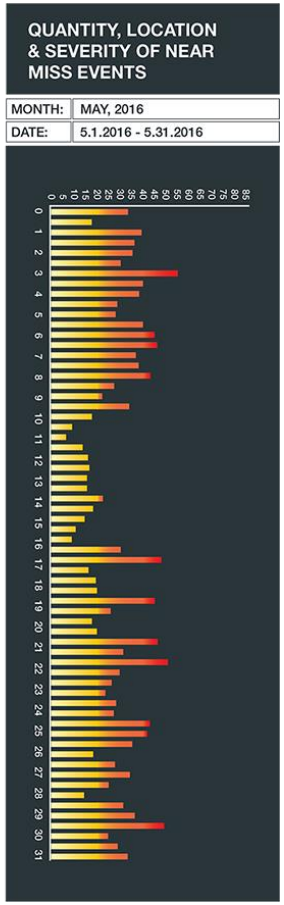
Traffic Conflict Detection





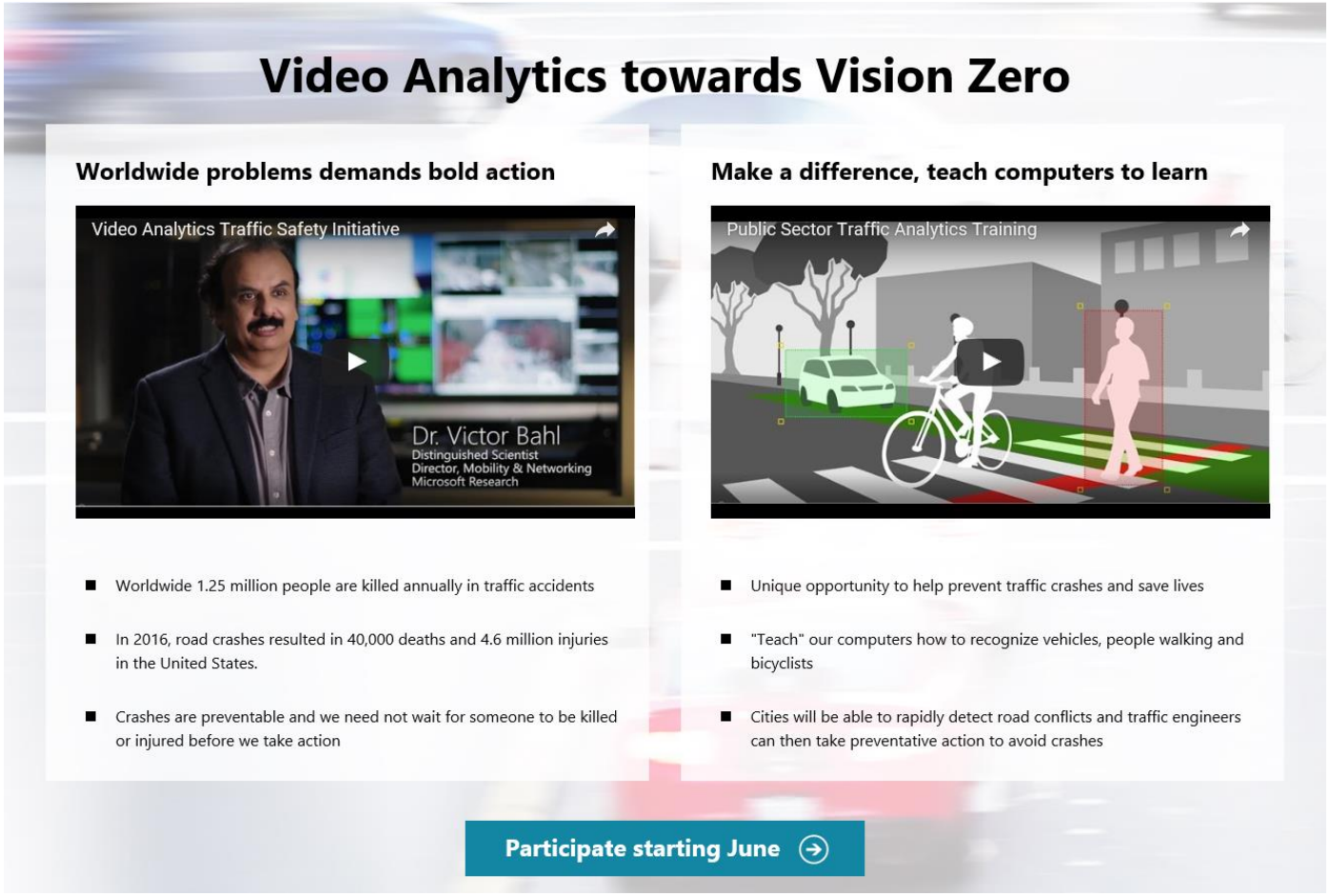
Traffic Conflict Detection





Partnership Momentum

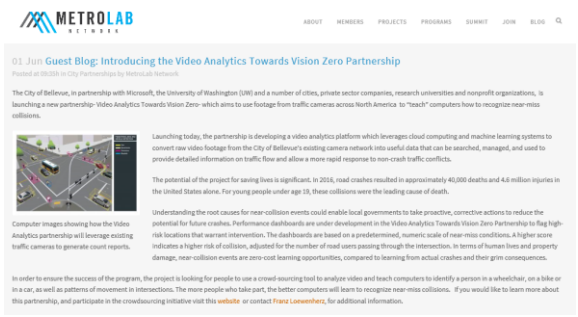
Crowdsourcing Initiative

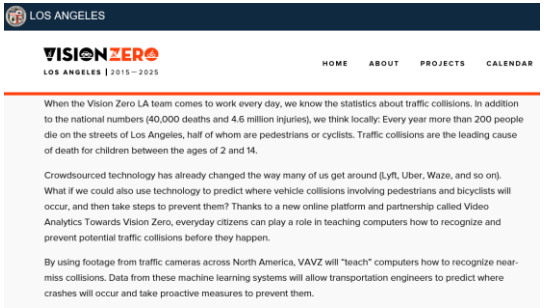


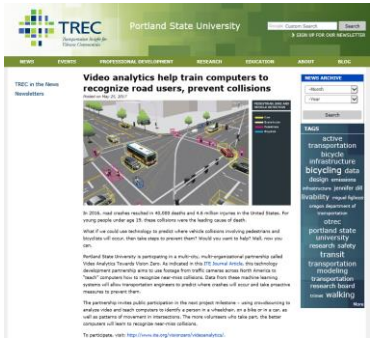
http://www.ite.org/visionzero/videoanalytics/

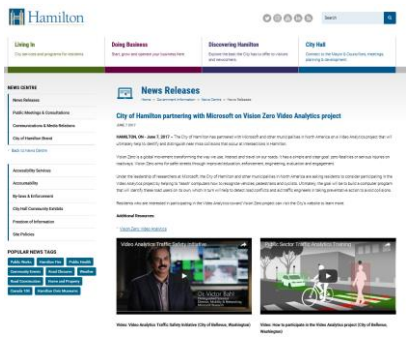
Crowdsourcing Initiative

Media Coverage





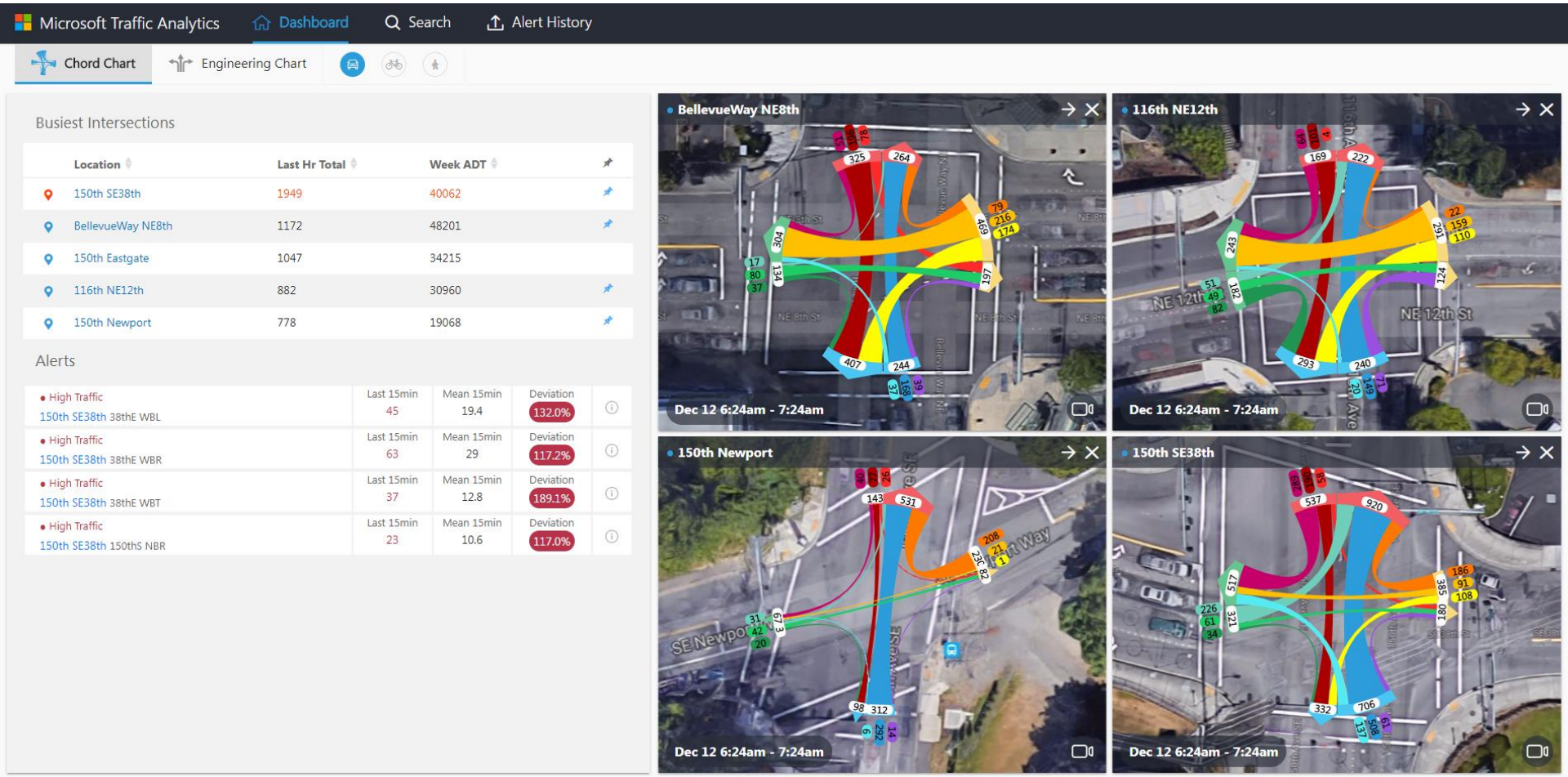




Traffic Analytics Dashboard

https://vavz.azurewebsites.net/

Traffic Analytics Dashboard (Overview)



Traffic Analytics Dashboard (Bellevue Way & NE 8th)

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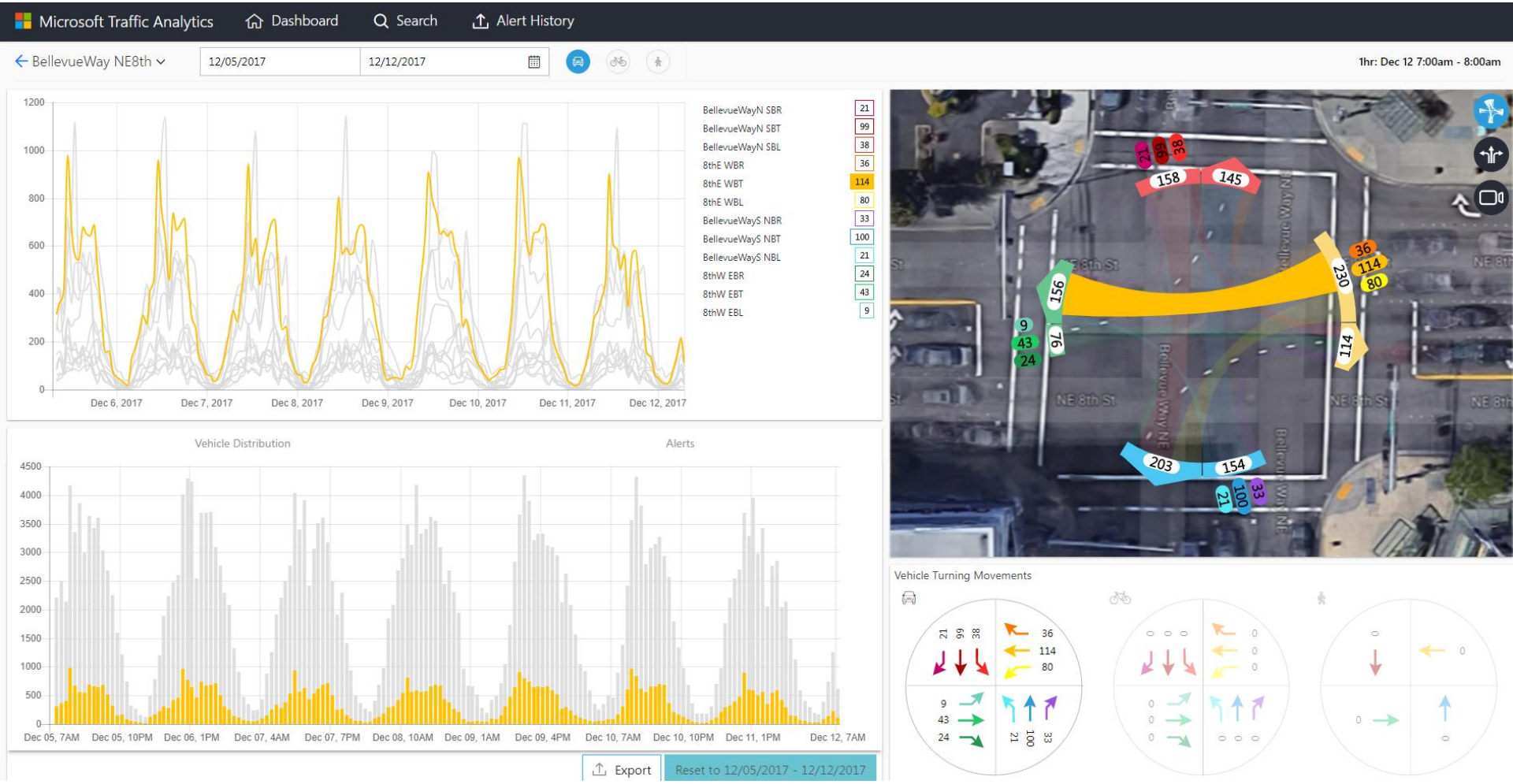

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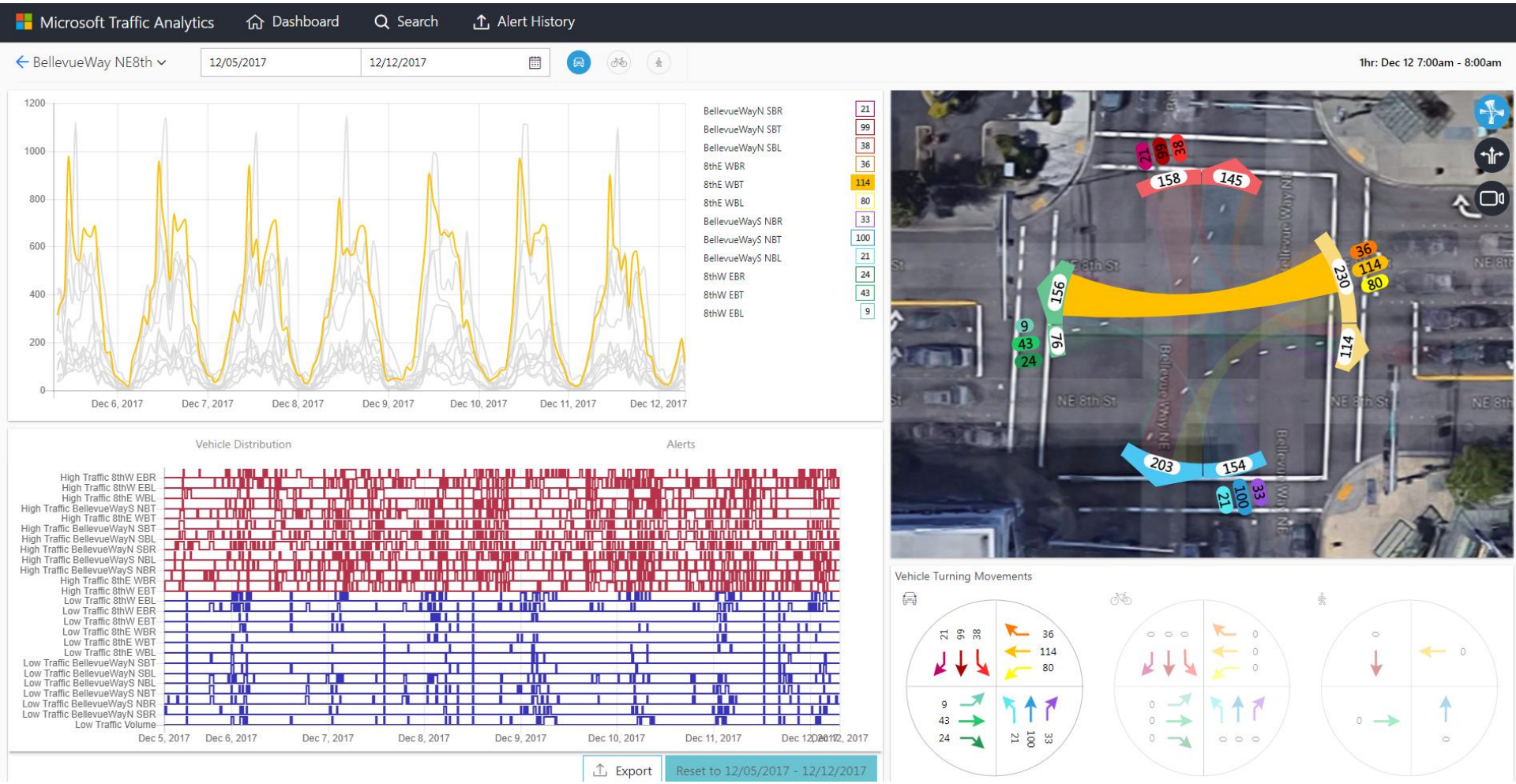

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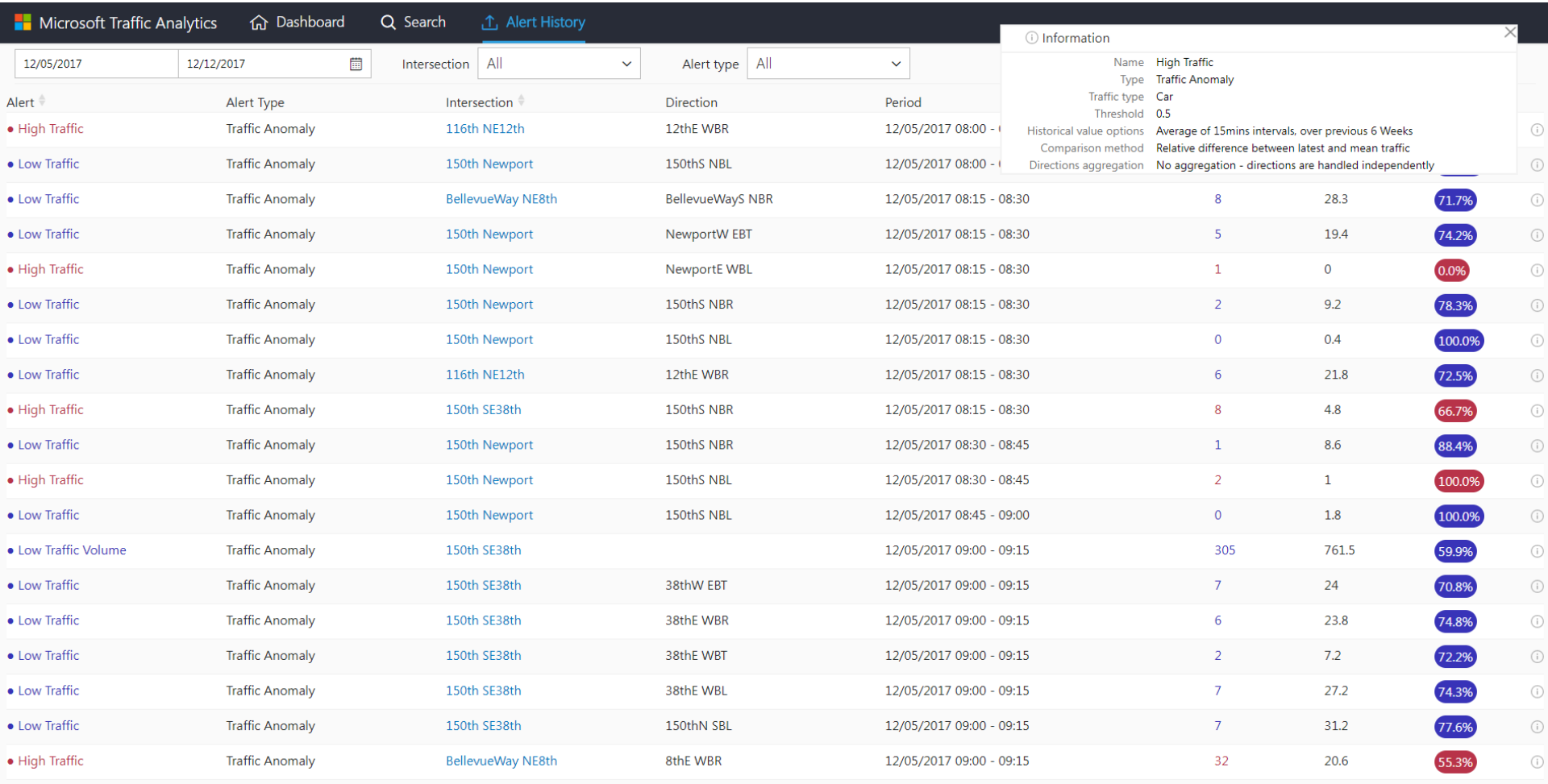

Alert	Alert Type	Intersection	Direction	Period			
High Traffic	Traffic Anomaly	116th NE12th	12thE WBR	12/05/2017 08:00 -			
Low Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:00 -			
Low Traffic	Traffic Anomaly	BellevueWay NE8th	BellevueWayS NBR	12/05/2017 08:15 - 08:30	8	28.3	71.7%
Low Traffic	Traffic Anomaly	150th Newport	NewportW EBT	12/05/2017 08:15 - 08:30	5	19.4	74.2%
High Traffic	Traffic Anomaly	150th Newport	NewportE WBL	12/05/2017 08:15 - 08:30	1	0	0.0%
Low Traffic	Traffic Anomaly	150th Newport	150thS NBR	12/05/2017 08:15 - 08:30	2	9.2	78.3%
Low Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:15 - 08:30	0	0.4	100.0%
Low Traffic	Traffic Anomaly	116th NE12th	12thE WBR	12/05/2017 08:15 - 08:30	6	21.8	72.5%
High Traffic	Traffic Anomaly	150th SE38th	150thS NBR	12/05/2017 08:15 - 08:30	8	4.8	66.7%
Low Traffic	Traffic Anomaly	150th Newport	150thS NBR	12/05/2017 08:30 - 08:45	1	8.6	88.4%
High Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:30 - 08:45	2	1	100.0%
Low Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:45 - 09:00	0	1.8	100.0%
Low Traffic Volume	Traffic Anomaly	150th SE38th		12/05/2017 09:00 - 09:15	305	761.5	59.9%
Low Traffic	Traffic Anomaly	150th SE38th	38thW EBT	12/05/2017 09:00 - 09:15	7	24	70.8%
Low Traffic	Traffic Anomaly	150th SE38th	38thE WBR	12/05/2017 09:00 - 09:15	6	23.8	74.8%
Low Traffic	Traffic Anomaly	150th SE38th	38thE WBT	12/05/2017 09:00 - 09:15	2	7.2	72.2%
Low Traffic	Traffic Anomaly	150th SE38th	38thE WBL	12/05/2017 09:00 - 09:15	7	27.2	74.3%
Low Traffic	Traffic Anomaly	150th SE38th	150thN SBL	12/05/2017 09:00 - 09:15	7	31.2	77.6%
High Traffic	Traffic Anomaly	BellevueWay NE8th	8thE WBR	12/05/2017 09:00 - 09:15	32	20.6	55.3%

Enhancing Pedestrian & Bicycle Accuracy

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Enhancing Pedestrian & Bicycle Accuracy

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NEWS

VIDEO ANALYTICS TOWARDS VISION ZERO PARTNERSHIP RECEIVES THE TRANSPORTATION ACHIEVEMENT AWARD FOR SAFETY FROM THE INSTITUTE OF TRANSPORTATION ENGINEERS

Toronto, ON, Canada— Video Analytics Towards Vision Zero Partnership, City of Bellevue, Washington USA received the Transportation Achievement Award for Safety at the Institute of Transportation Engineers (ITE) 2017 Annual Meeting & Exhibit, held July 30 – August 2, in Toronto, ON, Canada.

Consistent with its Vision Zero policies, the City of Bellevue, Washington is committed to generating better data on travel behavior, patterns, crashes, and conflicts and developing collaborations with others in the public and private sector to make our intersections smarter and safer. In recognition of the opportunities to enhance traffic operations and public safety, the City of Bellevue entered into a technology development partnership with Microsoft and the University of Washington.

The video analytics platform that was developed leverages cloud computing and machine learning systems to convert raw video footage from the City of Bellevue's existing camera network into useful data that can be searched, managed, and used to provide detailed information on traffic flow and allow a more rapid response to non-crash traffic conflicts.

The Transportation Achievement Awards are awarded annually for excellence in the advancement of transportation to meet human needs, by entities concerned with transportation such as governmental agencies, legislative bodies, consulting firms, industry, and other organizations. Awards are presented in the categories of planning, design, operations, and safety.

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For More Information

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