
Case Study A.2. Video-Based Network-Wide Speed and Speeding Analysis—Bellevue, Washington, USA

Key Successes

The Video-Based Network-Wide Speed and Speeding Analysis project in Bellevue, Washington, developed a video-based network screening methodology to identify locations with high risk for vehicular speeding and improve the city’s understanding of the factors contributing to speeding at hot spots. This proactive approach allows the implementation of safety countermeasures before crashes occur.

The Safe System Approach Highlights

- Death/serious injury is unacceptable: Adoption of a Vision Zero resolution in 2015
- Humans make mistakes/humans are vulnerable: Efforts to understand contributing factors to reduce speeding-related fatalities and serious injuries
- Responsibility is shared: Collaborative approach between the City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans – University of Washington
- Safety is proactive: Identifying crash contributing factors (such as speeding) citywide through video-based analysis of near-misses to improve safety conditions before crashes occur
- Redundancy is crucial: Data collection, engineering measures, and enforcement to reduce speeding in Bellevue

Background

The City of Bellevue is in the Eastside region of King County and is the fifth largest city in Washington, with a population of approximately 152,000.¹ Bellevue adopted a Vision Zero resolution in 2015 with the goal of eliminating fatalities and serious injuries on City streets by 2030.² The city’s focus has been to understand the factors contributing to these fatalities and serious injuries and develop effective countermeasures.

The city partnered with Transoft Solutions (formerly Brisk Synergies), Together for Safer Roads, and PacTrans – University of Washington to conduct a network-level analysis of traffic camera video data to identify locations with high risk of crashes based on near misses. The project used video footage from Bellevue’s network of existing traffic cameras, which was processed and analyzed using Transoft Solutions’ traffic and road safety technology.³

¹ United States Census Bureau. (2020). “2020 Census.” Retrieved from <https://www.census.gov/programs-surveys/decennial-census/decade/2020/2020-census-main.html>.

² City of Bellevue. (2015). “Resolution No. 9035: A Resolution Endorsing Vision Zero.” Retrieved from <https://bellevue.legistar.com/LegislationDetail.aspx?ID=2529869&GUID=AC438708-5B2B-40BB-A155-D41457B5DDEF>.

³ City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans – University of Washington. (2020). *Video-Based Network-Wide Speed and Speeding Analysis*. Retrieved from <https://safety.transoftsolutions.com/resources/>.

Together for Safer Roads is a corporate social accelerator that leverages private sector technology, data, and expertise to prevent traffic crashes; the University of Washington was part of the team that had previously launched a pilot video analytics program in Bellevue and contributed to the project by sharing lessons learned. This project is one of three similar efforts conducted through this partnership; the other two are the Video-Based Network-Wide Conflict Analysis project⁴ and the Video-Based Conflict, Speeding, and Crash Correlation project.⁵

Implementation

The Video-Based Network-Wide Speed and Speeding Analysis in Bellevue was a large scale network screening project using video data from traffic surveillance cameras and TrafXSAFE (previously identified as BriskLUMINA), a specialized automated-road-safety platform developed by Transoft Solutions. The project evaluated 40 signalized intersections, mostly outside of the downtown area, including 34 four-legged intersections, 5 three-legged intersections, and 1 five-legged intersection. The intersections were selected to represent different geographic locations, land uses, population density, and road geometry. All intersections have a posted speed limit of 30 or 35 mph, except for the Bel-Red Road and NE 30th Street intersection, which had a 40-mph posted speed limit.

Traffic cameras at the study intersections recorded daily for 16 hours (from 6 a.m. to 10 p.m.) for the months of August and September in 2019. Road user counts, operating speeds, and near-miss data was derived from the processing of the video footage. To understand factors contributing to speeding, statistical models that included the following variables were developed by Transoft Solutions:

- Urban density (high or medium)
- Land use (commercial or residential)
- Presence of school within less than 0.125 miles from the intersection
- Road user types (car driver, bus or truck operator, motorcyclist)
- Road user movement (through, left turn, or right turn)
- Vehicular traffic phasing (protected vs. non-protected left turns)
- Pedestrian traffic phasing
- Traffic volumes
- Number of lanes
- Lane width
- Crosswalk width
- Presence of bike infrastructure (dedicated bike path, shared bike path, both, or neither)
- Time of the day
- Day of the week

⁴ City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans – University of Washington. (2020). *Video-Based Network-Wide Conflict Analysis*. Retrieved from <https://brisk-cdn.s3.amazonaws.com/www/articles/2020-07-05/VZ-ITS-Bellevue-Report-1-web.pdf>.

⁵ City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans – University of Washington. (2020). *Video-Based Conflict, Speeding, and Crash Correlation*. Retrieved from <https://brisk-cdn.s3.amazonaws.com/www/articles/2020-07-05/VZ-ITS-Bellevue-Report-3-web.pdf>.

Outcomes

The evaluation of video footage in Bellevue resulted in the following network-wide findings:

- Vehicular speed was higher in residential locations than in commercial locations.
- Vehicular speeds were higher at intersections outside of the downtown area.
- Vehicular speeds were higher on the weekend.
- Approximately 11 percent of drivers were speeding. Driver speeding incidence was higher in the downtown area.
- Motorcyclists were the fastest motorized road users.
- There was a decrease in vehicular speeding during peak hours.
- The video-based network screening allowed the development of a map showing the percentage of motorists speeding (**Figure 4**).



Source: City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans.

Figure 4. Percentage of motorists speeding.

An in-depth analysis was conducted at the intersection of Bel-Red Road and NE 30th Street, the study intersection most prone to vehicular speeding. The four-legged intersection includes a small traffic island separating the westbound right-turning movements and another island for southbound left-turning drivers. No northbound left-turn, eastbound left-turn, eastbound through, and westbound through movements are permitted at the intersection (**Figure 5**). In addition, pedestrian volumes are low at the intersection.



Source: City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans – University of Washington.

Figure 5. Bel-Red Road and NE 30th Street in Bellevue.



Source: City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans – University of Washington.

Figure 6. Speed heatmap at the Bel-Red Road and NE 30th Street intersection.

The analysis of the Bel-Red Road and NE 30th Street intersection, which had the highest risk for motorist speeding, resulted in the following insights:

Northbound and southbound through speeds were high (**Figure 6**). Only two through movements are allowed at this intersection, which are along the North-South corridor, where traffic volumes are significantly higher. Additionally, only one left turn is permissible along this corridor, and it is protected by a traffic island. Speeding at this intersection can be attributed to the excessive confidence of drivers because of the lower volumes of surrounding movements and the prohibition of several other movements. The speeding behavior is similar to that of drivers increasing their speeds to catch the end of a green or yellow traffic light (**Figure 7**).



Source: City of Bellevue, Transoft Solutions, Together for Safer Roads, and PacTrans – University of Washington.

Figure 7. Through driver speeding to cross red light.

All right turning movements had similar speeds except for the northbound right-turning movement. This can be attributed to the wider turning radius available for this movement compared to the other right-turning movements.

The Video-Based Network-Wide Speed and Speeding Analysis demonstrates the scalability of the network screening methodology to identify locations with high risk for vehicular speeding and understanding factors contributing to speeding at hot spots. This approach allows the implementation of safety countermeasures before crashes occur, and this analytics solution can support Vision Zero programs. The City of Bellevue plans on implementing safety countermeasures at high- risk locations identified with this network screening methodology in the near future.

Additional Information

In addition to the Video-Based Network-Wide Program to identify speeding contributing factors, the City of Bellevue has several speed management programs. The city has slowly started rolling out 20 mph neighborhood speeds through its Neighborhood Slow Zone program and recently updated its Standard Operating Procedures for evaluating existing speed limits based on the latest information from NCHRP and NACTO. The city's Neighborhood Traffic Safety Services group works with residents to discourage speeding near schools by installing permanent speed feedback signs and school zone flashing beacons in the vicinity of schools. To support speeding concerns in neighborhoods, the city has a program that allows residents to request temporary speed feedback signs, special police speed enforcement, use of a radar gun to do an evaluation of speed concerns, and lawn signs that encourage safe speeds. For additional information, contact Franz Loewenherz, City of Bellevue Mobility Planning and Solutions Manager, at Floewenherz@bellevuewa.gov.