U.S. Department of Transportation
**Federal Highway Administration**

CITY OF BELLEVUE

# SPEED MANAGEMENT PLAN


January 2024

## NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation (USDOT) in the interest of information exchange. The U.S. Government assumes no liability for the use of the information contained in this document.

The U.S. Government does not endorse products, manufacturers, or outside entities. Trademarks, names, or logos appear in this report only because they are considered essential to the objective of the document. They are included for informational purposes only and are not intended to reflect a preference, approval, or endorsement of any one product or entity.

## NON-BINDING CONTENTS

Except for the statutes and regulations cited, the contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies. While this document contains nonbinding technical information, you must comply with the applicable statutes and regulations.

## QUALITY ASSURANCE STATEMENT

The Federal Highway Administration (FHWA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

Cover Image Credit: City of Bellevue

# TECHNICAL REPORT DOCUMENTATION PAGE

| 1. Report No. | 2. Government Accession No. | 3. Recipient's Catalog No. |
|---|---|---|
| | | |

| 4. Title and Subtitle | 5. Report Date |
|---|---|
| City of Bellevue Speed Management Plan | January 2024 |
| | 6. Performing Organization Code |

| 7. Author(s) | 8. Performing Organization Report No. |
|---|---|
| Mackenzie Allan, Franz Loewenherz, John Murphy, Venkat Nallamothu, Virginia O'Connor, Bianca Popescu, Stephen Taylor | |

| 9. Performing Organization Name and Address | 10. Work Unit No. (TRAIS) |
|---|---|
| toXcel, LLC<br>7140 Heritage Village Plaza<br>Gainesville, VA 20155 | |
| | 11. Contract or Grant No.<br>693JJ320D000024 |

| 12. Sponsoring Agency Name and Address | 13. Type of Report and Period Covered |
|---|---|
| Office of Safety<br>Federal Highway Administration<br>U.S. Department of Transportation<br>1200 New Jersey Avenue, SE<br>Washington, DC 20590 | |
| | 14. Sponsoring Agency Code |

**15. Supplementary Notes**

Guan Xu, Transportation Specialist from the Office of Safety, served as the FHWA project manager for this task.

**16. Abstract**

From 2012-2021, there were 30 speeding-related fatal or serious injury crashes in Bellevue. The city is committed to a Vision Zero goal of zero traffic fatalities or serious injuries by 2030, and safe speeds are a critical component of the Vision Zero Safe System approach. To work towards the 2030 goal, this Speed Management Plan (SMP) analyzes speed-related safety concerns along Bellevue's 30+ mph arterials, outlines potential safety countermeasures, and identifies key next steps. Together with the city's Speed Limit Standard Operating Procedure (SOP)—which enables the evaluation and reassigning of speed limits—and the Residential Traffic Guidebook—which identifies strategies for traffic calming on neighborhood streets—the SMP rounds out the city's speed management program. The SMP utilizes various data to understand safety concerns and identify corridors with speed management needs and appropriate countermeasures to address these needs. To track progress towards the 2030 Vision Zero goal, the SMP includes key performance indicators (KPIs) at both the citywide and corridor-specific scales. The citywide KPIs will be tracked on an annual basis and corridor specific KPIs will be measured one-year post-implementation of speed management countermeasures. The SMP concludes with next steps.

| 17. Keywords | 18. Distribution Statement |
|---|---|
| Speed management, speed management plan, speed limits, speeding, Safe System Approach, Bellevue | No Restrictions |

| 19. Security Classification (of this report) | 20. Security Classification (of this page) | 21. No. of Pages | 22. Price |
|---|---|---|---|
| Unclassified | | 113 | N/A |

**Form DOT F 1700.7 (8-72)** **Reproduction of completed page authorized**

Thank you to all staff and external experts involved in the development of this report:

- Stela Nikolova Abed, Transportation Department, City of Bellevue
- Darcy Akers, Transportation Department, City of Bellevue
- Mark Anderson, Fire Department, City of Bellevue
- Shelly Baldwin, Washington Traffic Safety Commission
- Joel Barnett, FHWA
- Landon Barnwell, Police Department, City of Bellevue
- Anthony Boutros, FHWA
- Geoff Bradley, Parks & Community Services Department, City of Bellevue
- Monica Buck, City Attorney's Office, City of Bellevue
- Justin Chan, City Manager's Office, City of Bellevue
- Dongho Chang, WSDOT
- Don Dixon, Bellevue School District
- Matthew Enders, WSDOT
- Wen Hu, IIHS
- Vanessa Humphreys, Transportation Department, City of Bellevue
- Darek Jarzynski, Transportation Department, City of Bellevue
- Bryan Katz, toXcel
- Jeffrey King, FHWA
- Janine Koffel, Washington Traffic Safety Commission
- Paul LaFleur, FHWA
- Daniel Lai, Transportation Department, City of Bellevue
- Kurt Latt, Transportation Department, City of Bellevue
- Chris Long, Transportation Department, City of Bellevue
- Sharang Malaviya, PennDOT
- Anyesha Mookherjee, FHWA
- Kevin Murphy, DVRPC
- Reo Nelson, FHWA
- Tanisha Sepulveda, Disability Rights Washington
- Janet Shull, Community Development, City of Bellevue
- Jennifer Symoun, toXcel
- Tim Taylor, FHWA
- Linda Whitehead, City Manager's Office, City of Bellevue
- Abdul Zineddin, FHWA

*Note that the publication and graphics therein were produced by an external designer, and therefore may not meet the City of Bellevue publication standards.*

# Contents

# EXECUTIVE SUMMARY

From 2012-2021, there were 30 speeding-related fatal or serious injury crashes in Bellevue. The city is committed to a Vision Zero goal of zero traffic fatalities or serious injuries by 2030, and safe speeds are a critical component of the Vision Zero Safe System approach.

To work towards the 2030 goal, this Speed Management Plan (SMP) analyzes speed-related safety concerns along Bellevue's 30+ mph arterials, outlines potential safety countermeasures and identifies key next steps. Together with the city's Speed Limit Standard Operating Procedure (SOP)—which enables the evaluation and reassigning of speed limits—and the Residential Traffic Guidebook—which identifies strategies for traffic calming on neighborhood streets—the SMP rounds out the city's speed management program (see *Chapter 1*).

The SMP utilizes various data to understand safety concerns and identify corridors with speed management needs. All 30+ mph arterials are classified into eight categories based on speed limit (30, 35, and 40 mph) and surrounding land use (urban core, urban, and suburban). The category framework is used to evaluate speeding data citywide, segment arterials for analysis, and identify context-sensitive countermeasures (see *Chapter 2*).

The arterial segments are evaluated using the Corridor Sorting Tool, which scores each 30+ mph arterial corridor with a range of factors. This includes speeding and crash data, equity and infrastructure context. The outputs from the Corridor Sorting Tool assist city staff with selecting corridors for further evaluation and speed management countermeasures (see *Chapter 3*). These measures comprise the Countermeasure Toolbox, which includes engineering and enforcement strategies for speed management on 30+ mph arterials (see *Chapter 4*).

To track progress towards the 2030 Vision Zero goal, the SMP includes key performance indicators (KPIs) at both the citywide and corridor-specific scales (see *Chapter 5*). The citywide KPIs will be tracked on an annual basis and corridor specific KPIs will be measured one year post-implementation of speed management countermeasures. The SMP concludes with next steps (see *Table 10* in *Chapter 5*) :

(1) Develop an implementation team

(2) Establish programming and funding

(3) Strategically align within and outside of the city

(4) Monitor, refine and evaluate the SMP and speed management progress

# LIST OF ABBREVIATIONS

The following abbreviations are used frequently in the report.

| | |
|---|---|
| **APWA** | American Public Works Association |
| **DVRPC** | Delaware Valley Regional Planning Commission |
| **ECI** | Equity Composite Index (from the City of Bellevue's MIP) |
| **EMS** | Emergency medical services |
| **FHWA** | Federal Highway Administration |
| **HIN** | High injury network |
| **ITE** | Institute of Transportation Engineers |
| **KPIs** | Key performance indicators |
| **LTS** | Level of Traffic Stress (for cyclists, from the City of Bellevue's MIP) |
| **MIP** | Mobility Implementation Plan |
| **MOU** | Memorandum of Understanding |
| **Mph** | Miles per hour |
| **NRSS** | National Roadway Safety Strategy (from US DOT) |
| **NTSS** | Neighborhood Traffic Safety Services |
| **PennDOT** | Pennsylvania Department of Transportation |
| **RCW** | Revised Code of Washington |
| **RRFBs** | Rectangular rapid flashing beacons |
| **RSA(s)** | Road Safety Assessment(s) |
| **SMP** | Speed Management Plan |
| **SOP(s)** | Standard Operating Procedure(s) |
| **SSC(s)** | Speed safety camera(s) |
| **WSDOT** | Washington State Department of Transportation |
| **WTSC** | Washington Traffic Safety Commission |
| **US DOT** | United States Department of Transportation |

# LIST OF DEFINITIONS

**50th Percentile Speed** – The speed at which 50 percent of free-flowing vehicles are traveling at or below. The other 50 percent of free-flowing vehicles would be traveling above this speed.

**85th Percentile Speed** – The speed at which 85 percent of free-flowing vehicles are traveling at or below. The other 15 percent of free-flowing vehicles would be traveling above this speed.

**Corridor Sorting Too**l – A digital tool created with the Speed Management Plan to evaluate 30+ mph arterials using various data, including crashes, speeding, infrastructure and equity. The tool provides scores to the corridors evaluated, but these scores do not determine prioritization of corridors chosen for further speed limit and management actions. Rather, the outputs are one of multiple considerations to identify corridors for speed management.

**Countermeasure(s)** – Engineering and enforcement strategies that may be used to reduce speeds on arterial corridors.

**High Injury Network (HIN)** – The collection of roadways with the highest level of fatal and serious injury crashes in Bellevue. For the 2010-2019 HIN, 8% of streets account for 83% of all fatal and serious injury crashes in the city, as measured by mileage.

**Kinetic Energy** – The energy of a moving object (in reference to the transportation system, often a vehicle), which is directly proportional to the object's mass and velocity.

**Level of Traffic Stress (LTS)** – A performance metric used to describe the user experience on the bicycle network, as outlined in Bellevue's Mobility Implementation Plan. There are four categories of LTS, with LTS 1 (All Ages and Abilities) describing a corridor that most children and parents would find comfortable and safe for riding, and LTS 4 (Strong and Fearless) describing a corridor that is tolerated for any significant distance by 'strong and fearless' bicycle riders who are comfortable in a mixed-traffic environment.

**Mobility Implementation Plan (MIP**) – A performance measurement and prioritization system that aligns transportation investments with the city's land use vision; providing the platform for Bellevue to meet the multimodal future envisioned in the Comprehensive Plan.

**Operating Speed(s)** – The speed at which traffic operates during free flow conditions, without interruption by traffic control devices or vehicles traveling in the same, opposite, or crossing directions. 85th percentile speeds are often used to describe the operating speed (see above).

**Percentile Speeds** – Represent the percentage of the free-flowing vehicles that are traveling at or below a specific speed.

**Priority Bicycle Corridor** – The City of Bellevue's designated key routes for the planned bicycle network, as outlined in the Mobility Implementation Plan.

**Recommended Speed Limit** – The speed limit outcome from Step 2 in Bellevue's Speed Limit Standard Operating Procedure (SOP) and supplemental Speed Limit Setting Methods and Step-by-Step procedures, which is recommended by an engineer.

**Speed Limit Setting Methods and Step-by-Step Procedures** – A City of Bellevue document that details the actions required to determine three speed limit-related values: (1) suggested speed limit, (2) recommended speed limit and (3) approved speed limit. This document is a supplement to the Speed Limit Standard Operating Procedure.

**Speed Limit Standard Operating Procedure (SOP)** – A City of Bellevue document that provides an overview of the process for how the city reviews, identifies and assigns speed limits for arterials and local streets. The Speed Limit Setting Methods and Step-by-Step Procedures are a supplement to the SOP.

**Speeding** – Exceeding the posted speed limit or exceeding the appropriate speed for conditions.

**Standard Deviation of Speeds** – A measure of how much variation from the mean operating speeds exists in a dataset of the observed operating speeds on a given corridor for a given timespan. Standard deviations of speed demonstrate the range of vehicle speeds on a roadway.

**Suggested Speed Limit** – The speed limit outcome from Step 1 in Bellevue's Speed Limit SOP and supplemental Speed Limit Setting Methods and Step-by-Step procedures. This is then utilized by an engineer to determine the most appropriate recommended speed limit for a corridor (see Recommended Speed Limit above).

**Urban Core, Urban and Suburban** – The three land use designations used in the Speed Management Plan and the Speed Limit SOP to describe the land use context. The three designations derive from the Mobility Implementation Plan. Urban Core refers to areas in Downtown, BelRed and Wilburton/East Main that are high density, mixed-used activity centers. Urban refers to areas Crossroads, Eastgate and Factoria that are medium density, mixed-used commercial and residential activity centers. Suburban includes the remainder of the city which is characterized by lower-density residential areas.


Credit: City of Bellevue

# 01

# INTRODUCTION

## ▶ Why is speed management needed in Bellevue?

## ▶ What is the Speed Management Plan (SMP) and what is it for?

## ▶ How was the SMP created?

## ▶ How does the SMP support existing speed management practices in Bellevue?

Speed is a fundamental factor in crash likelihood and severity.[ii] [iii] From 2012 to 2021, there were 30 speeding-related fatal and serious injury crashes in Bellevue (*Figure 1*); and 23 of these 30 crashes occurred on arterials with speed limits of 30 mph or greater. From 2018-2022, Bellevue streets with a posted speed limit of 30 mph or more accounted for 88 percent of fatalities and serious injuries but represented only 25 percent of total street mileage (*Figure 2*).

Speeding is routinely in the top five contributing factors to fatal and serious injury collisions in the city. The human body can only tolerate a certain amount of kinetic energy in a crash, after which a fatal or serious injury occurs.[iv] Reducing vehicle speed to mitigate kinetic energy is therefore essential to creating safer streets for all people in Bellevue, particularly for vulnerable road users such as pedestrians and cyclists. Even small reductions in operating speed greatly reduce the potential of injury or death: the likelihood of a pedestrian being killed by a vehicle traveling at 20 mph is 13%; however, it increases almost six-fold to 73% at 40 mph (*Figure 3*). As these statistics indicate, maintaining safe speeds is a vital part of achieving a safe transportation system.

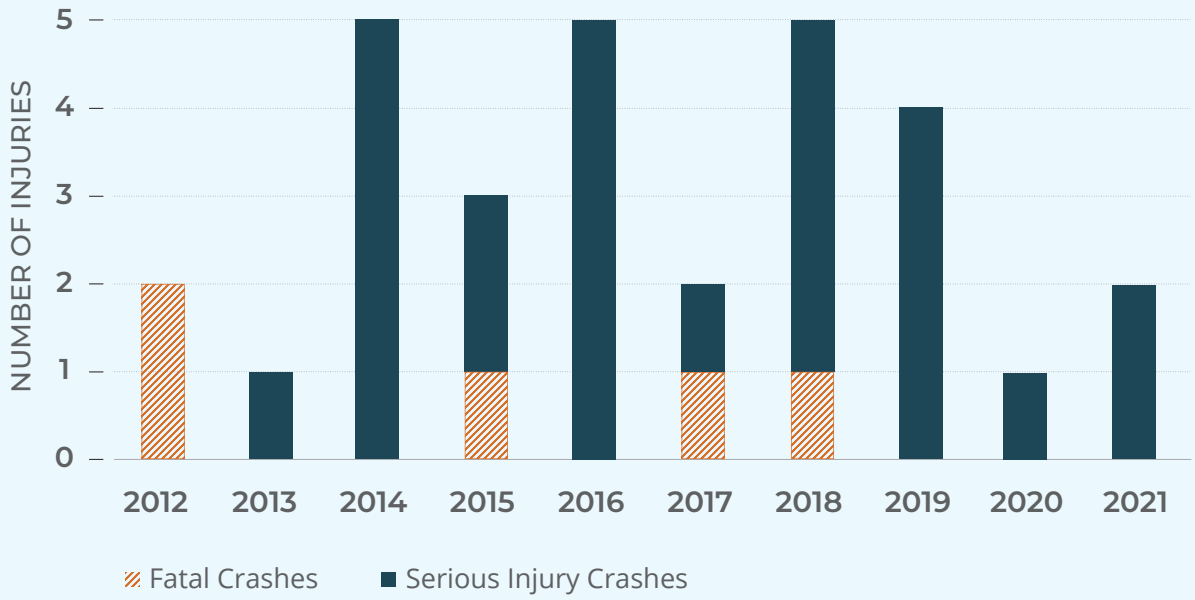



**Figure 1: Speeding-related crashes that resulted in fatal and serious injuries from 2012 to 2021 in Bellevue.**

Credit: R. Homolya and the City of Bellevue

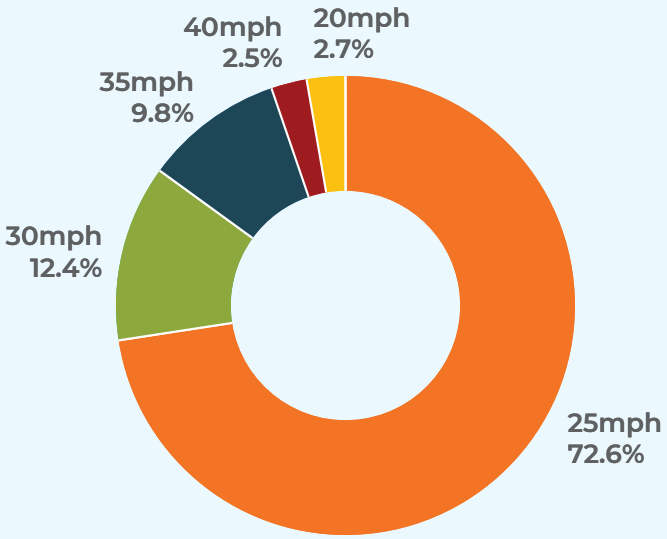
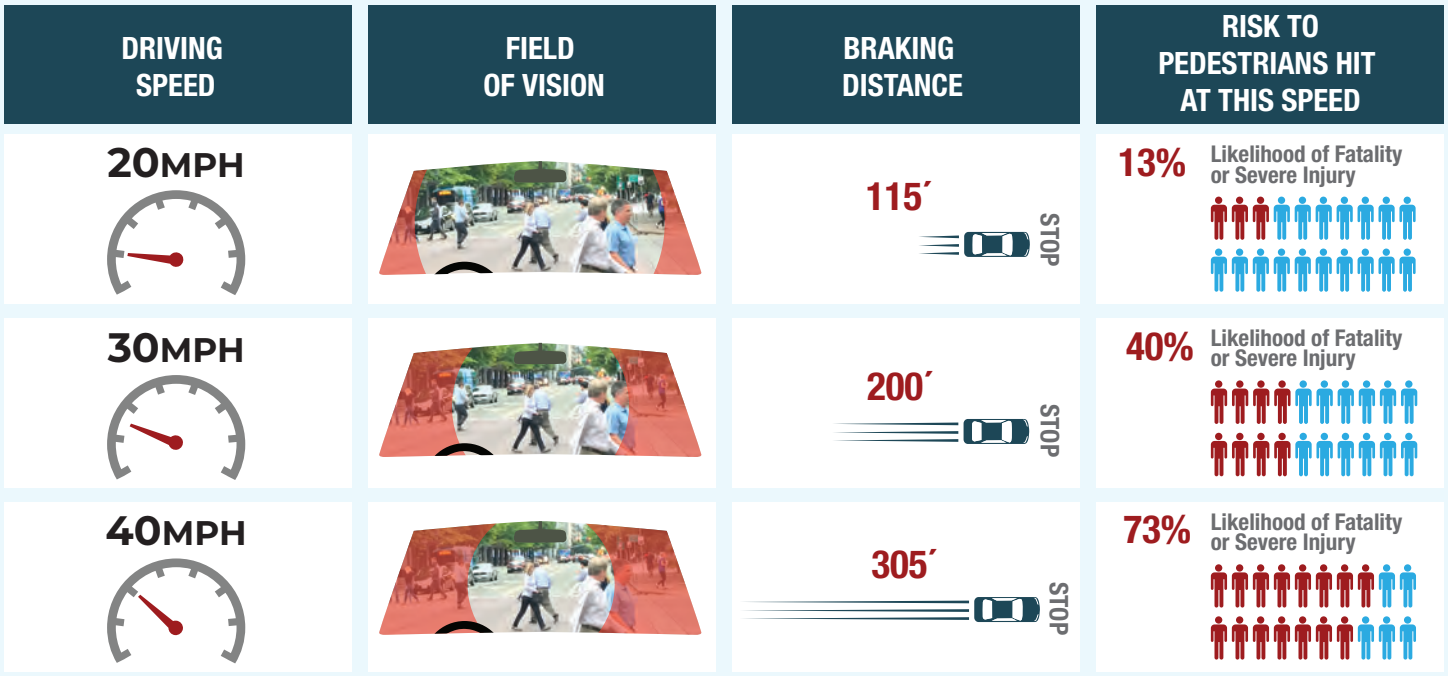



**Figure 2: Percentage of road mileage in Bellevue as broken down by posted speed limit in 2023.**

Credit: R. Homolya and the City of Bellevue

Reducing speeds, assessing the appropriateness of posted limits, and altering the transportation system through engineering, policy, enforcement and communications are all important aspects of speed management on Bellevue streets. Addressing speed-related safety concerns requires proactive and substantive measures, which aligns with the city's Safe System approach to Vision Zero.[v] [vi]

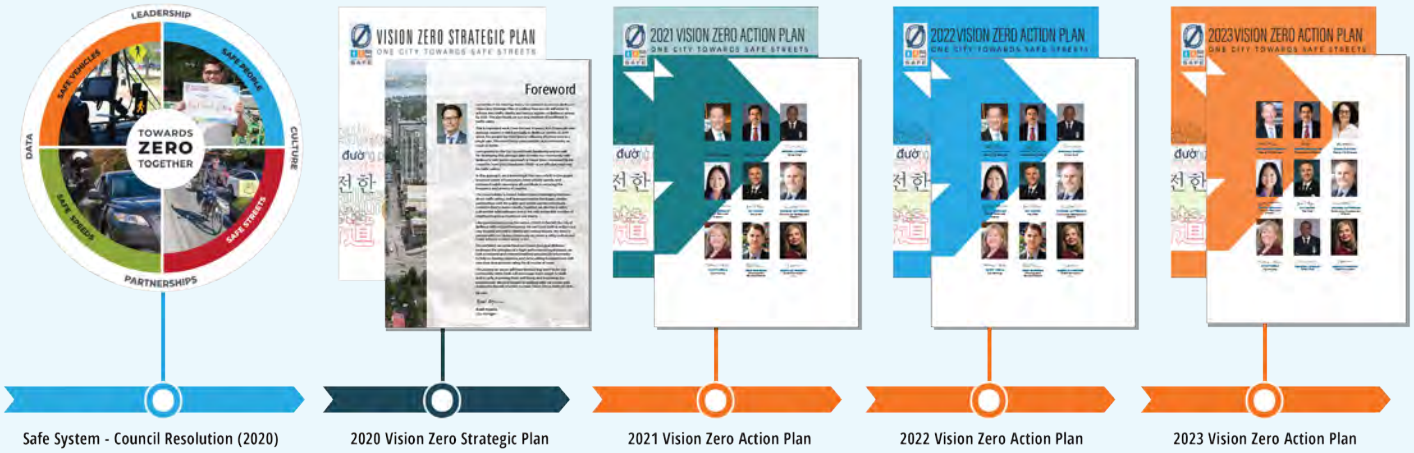
In December 2015, the City Council passed a resolution that provided a framework to pursue Vision Zero. In 2020, following Council's adoption of the Safe System approach, staff developed and the City Manager approved the Vision Zero Strategic Plan that articulates a coordinated approach across city departments, ensuring that transportation engineers, first responders, and other key staff work together. To keep Bellevue's goal of zero on track and to monitor progress, a cross-departmental team of city staff was convened to develop annual action plans.[vii] Developing the Speed Management Plan (SMP) is Action 5 in the 2023 Bellevue Vision Zero Action Plan (*Figure 4*).[viii] The next steps from the SMP—further described in in *Chapter 5* (*Table 10 > Action 2*) —will be integrated into subsequent annual action plans.




*Braking distance includes 2.5 seconds of reaction time

**Figure 3: The effect of speed on a driver's field of vision and risk of pedestrian death**

(Source NHTSA).




Credit: R. Homolya and the City of Bellevue

**Figure 4: The Speed Management Plan developed from the Safe Speeds aspect of the Vision Zero Safe System approach. The 2023 Vision Zero Action Plan identified the creation of the SMP as an annual outcome.**

## Goal and Purpose of the Speed Management Plan

Deriving from the 'Safe Speeds' aspect of the Safe System approach, the goals of the Speed Management Plan (SMP) are:

- **Goal 1:** To support the 2030 Vision Zero goal to eliminate fatal and serious injury crashes attributed to vehicle speed on arterial roadways, and
- **Goal 2:** To improve compliance with speed limits in Bellevue through implementing speed management on arterials.

The SMP complements existing speed management practices on neighborhood streets, as summarized in the Residential Traffic Guidebook.[ix] As there is no current framework to manage speeds on 30+ mph arterials, the purpose of the City of Bellevue's first SMP is three-fold:

- **Purpose 1:** To provide a data-informed approach to categorize, analyze and sort all 30+ mph arterials in the city.
- **Purpose 2:** To identify context-sensitive strategies for speed management on arterials, which may be implemented to encourage operating speeds in line with engineers' recommended speed.
- **Purpose 3.** To establish next steps for monitoring, evaluating, and strengthening speed management in Bellevue on 30+ mph arterials citywide.

## Development of the Speed Management Plan

The SMP follows the five-step framework identified by the FHWA's Safe System Approach to Speed Management, as outlined below.[x]

1. **Establish a vision and build consensus for speed management** The vision and consensus for the SMP draw from existing citywide support for safe speeds; including the Vision Zero Strategic Plan and annual Action Plans (refer to *Chapter 1*), as well as departmental support through the existing work areas (see *Appendix A*).
2. **Collect and analyze speed and safety data** A variety of Bellevue-specific data, including citywide speed data collected through Iteris ClearGuide and crash data through WSDOT, is used to analyze the eight arterial categories and analyze segments of arterials with the Corridor Sorting Tool (refer to *Chapter 2* and *Chapter 3*). See *Appendix B* for data gathering steps and limitations.
3. **Identify locations for speed management proactively** The Corridor Sorting Tool (refer to *Chapter 3*) evaluates segments of 30+ mph arterials using a range of factors, including crash and speeding data, existing facilities, infrastructure targets and equity, to quantify relative difference between arterial segments. Note that the SMP does not prioritize corridors for speed management. See *Appendix C* for the 2023 outputs.

4. **Select speed management countermeasures** The Countermeasure Toolbox (refer to *Chapter 4*) provides a framework for context-sensitive countermeasures. See *Appendix D* for the Countermeasure Toolbox and *Appendix E* for an analysis of speed safety cameras, one of the countermeasures in the toolbox.
5. **Conduct ongoing monitoring, evaluation, and adjustment** Key performance indicators (KPIs) (refer to *Chapter 5*) are outlined to track progress for monitoring, evaluation, and adjustment of speed management countermeasures and safe speed efforts. See *Appendix F* for the data gathering and calculations for the KPIs.

## Aligning the Framework with Best Practices

To establish the vision for speed management, the SMP aligns with national and local initiatives focused on roadway safety; a brief outline is provided below (*Table 1*).

| Type | Title | Description | SMP Alignment |
|---|---|---|---|
| **National Strategy** | US Department of Transportation (US DOT): National Roadway Safety Strategy (NRSS)[xi] | Highlights the urgent need to address traffic fatalities on U.S. roads. Adopts the Safe System approach and focuses on five key objectives: Safe People, Safe Roads, Safe Vehicles, Safe Speeds, and Post-Crash Care. | The SMP aligns with the Safe System Approach and is a product of Bellevue's Vision Zero Action Plan – Safe Speeds objectives (*Chapter 1*). |
| **National Guidance** | Federal Highway Administration (FHWA): Safe System Approach to Speed Management[xii] | Outlines a five-step framework for speed management through the lens of the Safe System approach. | This document follows the framework for a Safe System approach for speed management (*Chapter 1*). |
| **National Guidance** | US Department of Transportation (US DOT): Improving Pedestrian Safety on Urban Arterials: Learning from Australasia[xiii] | Promotes the Movement and Place framework which coordinates the vision of future transportation and land use for all modes.[xiv] [xv] | The arterial categories are based on speed limit and land use context (*Chapter 2*). The Corridor Sorting Tool includes factors for place and movement (*Chapter 3*). |
| **National Guidance** | Federal Highway Administration (FHWA): Proven Safety Countermeasures[xvi] | Identify the engineering solutions jurisdictions may employ that have proven efficacy. [xvii] [xviii] | Influenced the development of the Countermeasure Toolbox (*Chapter 4*). |
| **State Guidance** | WSDOT facilitated Multi-agency Work Group: Washington Injury Minimization and Speed Management Policy Elements and Implementation Recommendations[xix] | Highlight the need for changes in speed limit setting and roadway design to achieve lower operating speeds in Washington State. | The SMP aligns with this state guidance and is intended to be a flexible document that may be updated to continue to align with future WSDOT guidance (*Chapter 5*). |
| **Local Initiative** | City of Bellevue: Vision Zero Initiative | Aims to eliminate traffic deaths and serious-injury collisions on city streets by 2030. | Outlined the need for and provided the basis of the SMP. |

**Table 1: Best Practices that informed the Speed Management Plan.**

## Citywide Speed Management: Integrating the SMP, Speed Limit SOP, and the Residential Traffic Guidebook

The SMP and the Speed Limit Standing Operating Procedure (including the Speed Limit Setting Tool and the Methods and Step-by-Step Procedures) together form the basis of speed management for Bellevue's arterial roadways.[xx] *Table 2* provides a brief distinction of what the SMP and the Speed Limit SOP, Tool, and Methods offer.

| The Speed Management Plan | The Speed Limit SOP, Tool, and Methods |
|---|---|
| **Does provide** | **Do provide** |
| + A framework to analyze 30+ mph arterials corridors by land use and speed limits | + An updated framework to evaluate current speed limits and identify if a change to the limit is suggested |
| + A sorting tool to identify 30+ mph arterials corridors with speeding concerns | + Procedures to set speed limits that inform motorists of the appropriate travel speed under normal conditions |
| + A toolbox of potential countermeasures based on land use and speed limit context | + Separate evaluation procedures for arterial roadways and local streets |
| **Does not provide** | **Do not provide** |
| – Direct guidance to review speed limits<br>– Prioritization of corridors for speed management | – Provide a recommended speed limit (an engineer must review to provide a recommended speed limit) |

**Table 2: An overview of what the Speed Management Plan and the Speed Limit SOP, Tool, and Methods.**

The SMP and the Speed Limit SOP, Tool, and Methods work hand-in-hand to guide speed management of 30+ mph arterials. The pathway to identify a safety need and utilize these frameworks is described in the following steps and in *Figure 5*.

First, the Transportation Department identifies the need to evaluate a corridor's speed limit appropriateness. This may arise from an identified speeding concern from data (such as through the SMP sorted corridor list), community feedback, current/future projects, and/or existing policy goals.

If the corridor is a 30+ mph arterial, Transportation staff use the Speed Limit SOP and Setting Tool to produce a "suggested speed limit", which may be lower, higher, or the same as the posted speed limit. An engineer will separately review the corridor and develop a "recommended speed" that is independent of operating speeds.

If the engineer's recommended speed matches the "suggested speed limit", the recommendation may be reasonably adopted without speed management, then the city can proceed with accepting and implementing the recommended speed limit.

As the Speed Limit Setting Tool is partially based on operating speeds, the suggested speed limit may be higher than the engineer's recommended speed limit for the corridor. In cases where the suggested speed limit is higher than the engineer's recommended speed limit, the recommended speed limit should be implemented and additional speed countermeasures should be introduced to help reduce operating speeds to the new posted speed limit.

The SMP Countermeasure Toolbox (see *Chapter 5* and *Appendix D*) may be used to identify potential countermeasure to help influence speeds. The engineer will determine the recommended safety

intervention. For example, if a corridor's speed limit is set at 35 mph but the Speed Limit Setting Tool suggests 30 mph, which aligns with the engineers recommended speed of 30 mph, then the only change needed on the roadway would be new 30 mph speed limit signs. However, if a corridor is signed at 35 mph, the speed limit setting tool suggests 35 mph, but the engineer recommends a speed limit of 30 mph, then in addition to changing the speed limit signage, additional speed management countermeasures found in the SMP Countermeasure Toolbox may be applied to align operating speeds with the speed limit.

If the corridor to be evaluated is a local street, the Neighborhood Traffic Safety Services (NTSS) group will manage the street and use the Residential Traffic Guidebook for speed management countermeasures. If the corridor is a 25 mph arterial, coordination between the NTSS and Traffic Engineering groups will determine the path forward.

Over time, all arterials in Bellevue will be reviewed using the Speed Limit Setting Tool. This is important when considering that the city has changed speed limits on only two corridors in the last 20 years; one for the Eastgate annexation and the second for a major capital project on Northeast Fourth (see *Appendix A* for additional information on existing speed management practices in Bellevue). A follow-on activity to the SMP is to determine the program, funding, timeline and sequence of this speed limit review (e.g. undertaking a review of all corridors all at once, focusing on specific geographic areas [i.e. downtown] or street types [all suburban, 40+ mph roadways], or other approach). See Actions 1, 3, 4 and 5 of the next steps in *Chapter 5* for further information on these next steps.

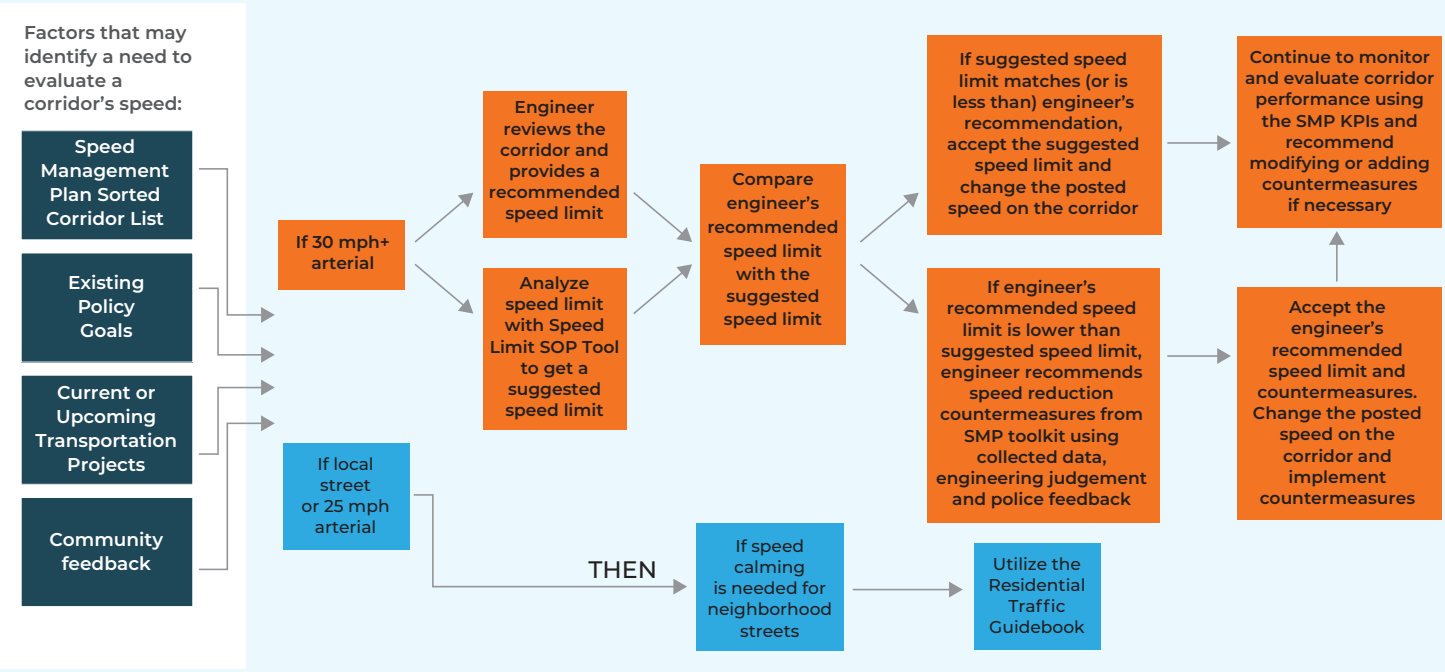



**Figure 5: Process for Speed Limit Setting and Speed Management by Corridor.**

Credit: R. Homolya and the City of Bellevue


Credit: City of Bellevue

# 02

# BELLEVUE ARTERIALS

## ▶ What are the eight categories of 30+ mph arterials in this plan?

## ▶ How does speeding and crash data differ between arterial categories?

## ▶ What is unique about each category?

Bellevue arterials vary widely based on a range of factors, such as their speed limit, street classification, and surrounding land use. The SMP creates eight arterial categories—based on a combination of land use context and speed limit—to understand speed safety concerns across 30+ mph arterials, as well as what countermeasures may be appropriate for mitigating unsafe speeds without detrimental impact on accessibility or throughput. The three land use contexts derive from the Mobility Implementation Plan (MIP) and the Speed Limit SOP: High Density Mixed Use (Urban Core), Medium Density Mixed Use (Urban), and Low Density Residential (Suburban). Arterial speed limits in Bellevue range from 25-40 mph, and the SMP focuses on arterials that are 30 mph and above. An overview of the categories is provided in *Figure 6* and a map in *Figure 7*. These eight categories reflect conditions in Bellevue at the time of publication and should be revised as street conditions change using the defined methodology (see *Chapter 5* > *Table 10* > *Action 10*).

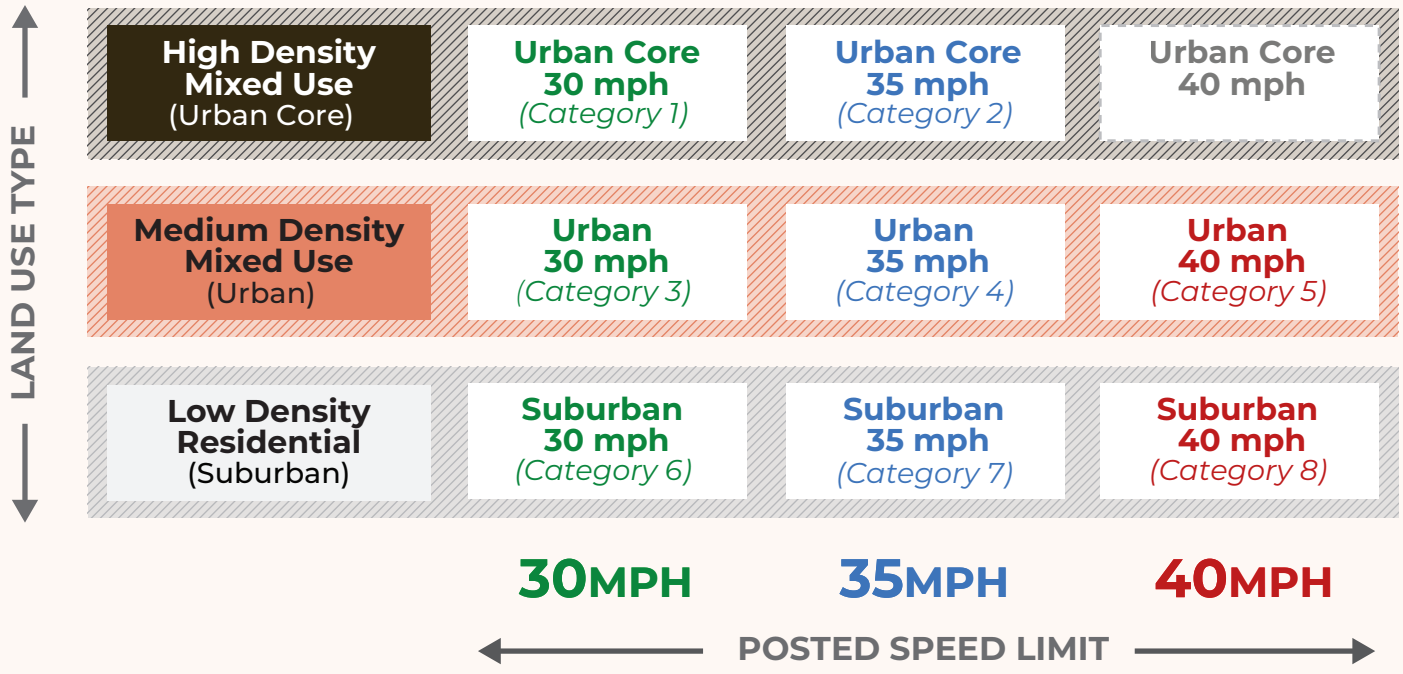



**Figure 6: The eight categories of arterials with speed limits of 30 mph or greater. It is worth noting that there are no existing arterials in the urban core with a speed limit of 40 mph, and it is unlikely that there will be in the future. As such, there is not a category for this land use and speed limit.**

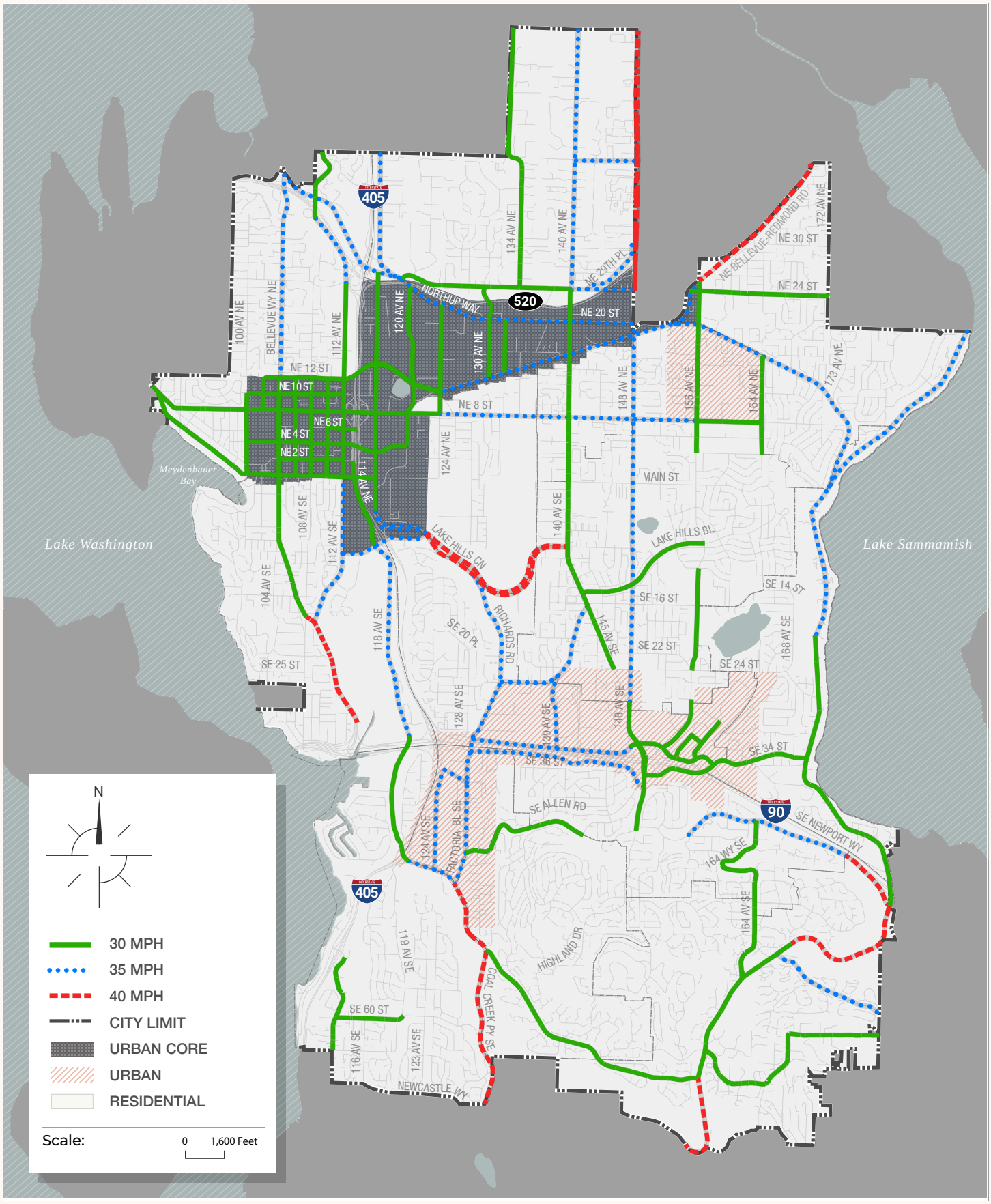



**Figure 7: All arterials 30 mph or greater in the City of Bellevue, organized by land use and speed limit.**

Credit: R. Homolya and the City of Bellevue

## Crash Data and the Arterial Categories

Speed related crashes in Bellevue do not occur evenly across the city (*Figure 10*). From 2012-2021, higher speed limits and suburban land use account for the majority of speeding-related fatal or serious injury crashes (*Figure 8*). Suburban 40 mph arterials represent 38%, while Suburban 35 mph and Suburban 40 mph together amount to nearly 66%. This is notable, as Suburban 35 and 40 mph roads only represent 35% of total arterial mileage.

When normalizing the fatal and serious injury crash data by mileage, higher speed limits similarly rise to the top (*Figure 9*). Suburban 40 mph, Urban 40 mph, and Urban 35 mph streets represent the highest numbers of speeding-related fatal or serious injury crashes when normalized by length. For each land use, the number of crashes increase for each 5 mph added to the speed limit. Note the Urban 40 mph rate is high due to the limited mileage (0.35 miles) of this type of roadway.

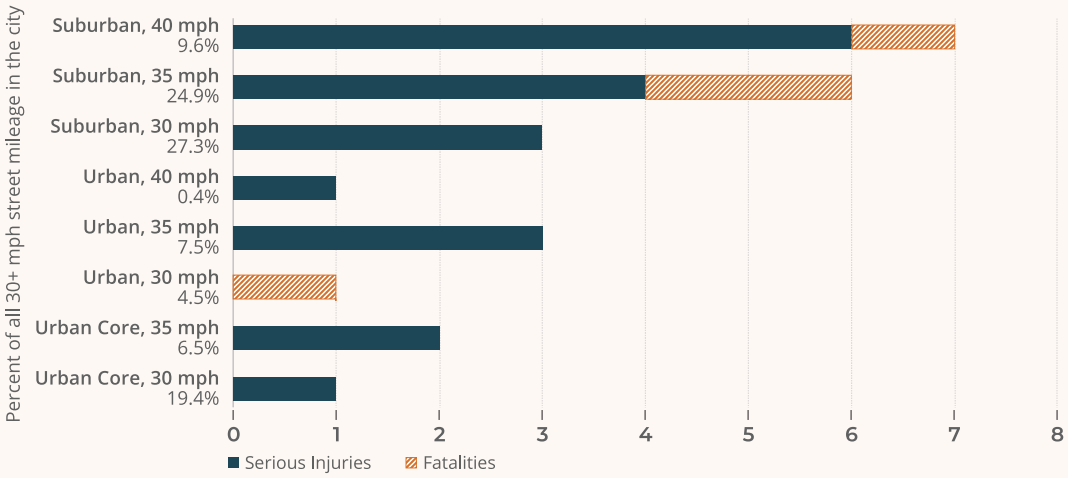



**Figure 8: The number of fatal and serious injuries for each of the eight categories of arterials with speed limits of 30 mph or greater, from 2012 to 2021.**

Credit: R. Homolya and the City of Bellevue

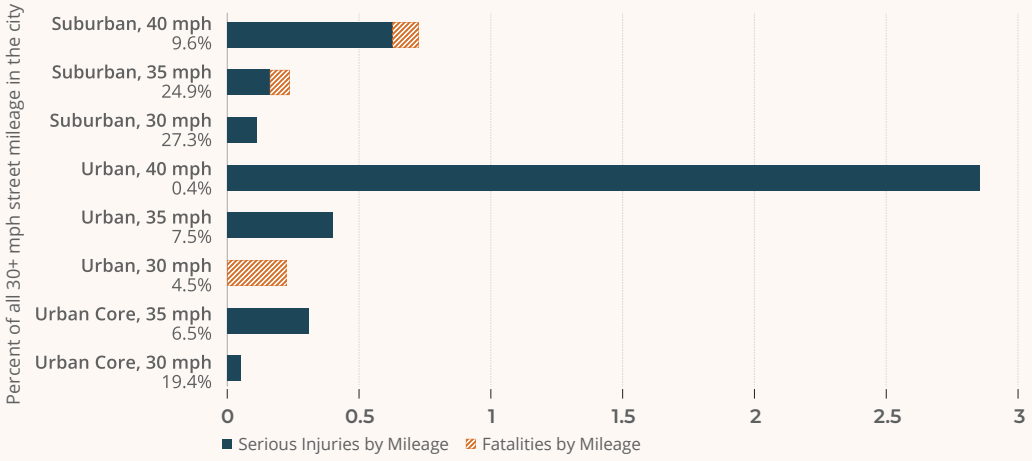



**Figure 9: The number of speeding-related fatal and serious injuries from 2012-2021, for each of the arterial categories, divided by the mileage for each category. Note that there is very little mileage (0.35) for Urban, 40 mph arterials, so this exaggerates the category's value.**

Credit: R. Homolya and the City of Bellevue

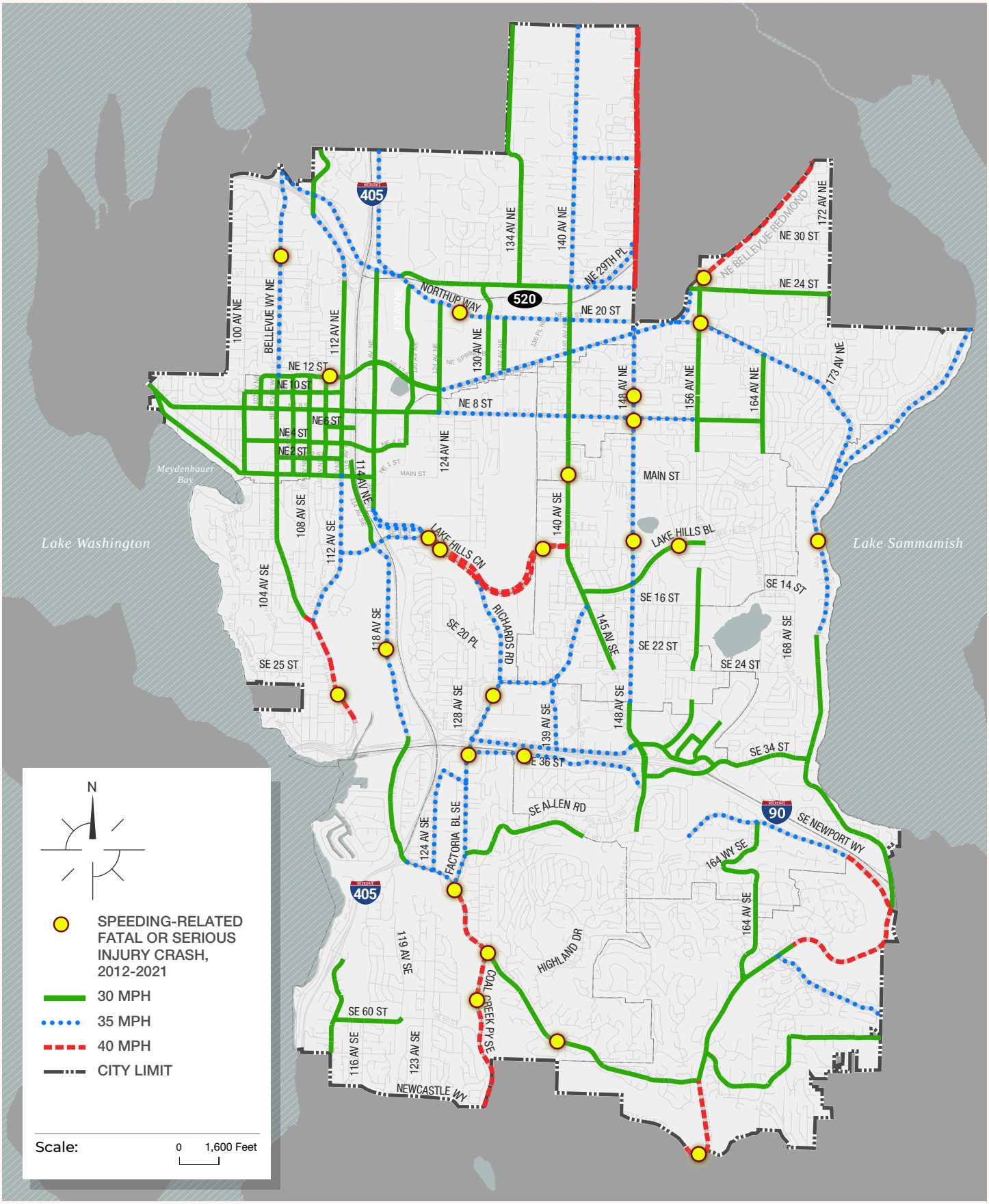



**Figure 10: All arterials 30 mph or greater in the City of Bellevue, organized by land use and speed limit.**

Credit: R. Homolya and the City of Bellevue

## The Eight Arterial Categories

This section provides an overview of each arterial category, including a brief discussion of relevant context and characteristics, findings from citywide speeding analyses and a map of each arterial category.

All 30+ mph arterials were analyzed using Iteris ClearGuide[xxi], which features probe-data (i.e. cellular tracking data) from HERE Technologies. While traditional speed studies involve measuring speeds at a few locations for a specific period, the ClearGuide dashboard provides continuous measurement of speeding-related metrics at a citywide scale. Each attribute—percent of drivers over the speed limit, percentile speeds, and standard deviation of speeds—provides a different view of speeding-related safety concerns citywide and by corridor:

- The percentage of drivers over the speed limit metric demonstrates where there may be discrepancies between the posted speed limit and what feels like a comfortable speed to motorists. A high percentage of drivers exceeding the speed limit could be a good indicator that a roadway should incorporate design elements that encourage drivers to slow down. For the SMP, the analysis included drivers exceeding the posted speed limit by 10+ mph.

- The percentile speeds represent the percentage of the population that is traveling at a specific speed or slower. The SMP includes analysis of the 50th and 85th percentiles, as well as the difference between them to understand the potential risks associated with disparate speeds on roadways.

- The standard deviations of speed metric denotes the range of vehicle speeds on a roadway. High variabilities in speeds pose an increased risk of crashes, particularly rear-end collisions, as well as unsafe driving conditions such as frequent lane changes, overtaking maneuvers to navigate around slower vehicles, and a wider range of reaction times.

Each attribute was analyzed and conducted in a manner to be easily replicated in the future. Additional information on how to download and analyze the data is available in *Appendix B*. [xxii] [xxiii]

# Urban Core 30mph

These include arterials within the Urban Core that have a posted speed limit of 30 mph, which represent the majority of streets in the Urban Core (*Figure 11*). This encompasses many streets in Downtown Bellevue, Wilburton/ East Main station areas, and BelRed. Urban Core 30 mph is generally characterized by the highest levels of pedestrian traffic in the city.

Many of these arterials are essential for moving people, goods, and services through the most populated areas of the city, but are also often used as places for people and can enhance characteristics of surrounding land use. The street-eateries along Main Street provide an example of pedestrian-oriented use, while Northeast Eighth Street is a major east-west connection through the center of downtown Bellevue, off Interstate 405.

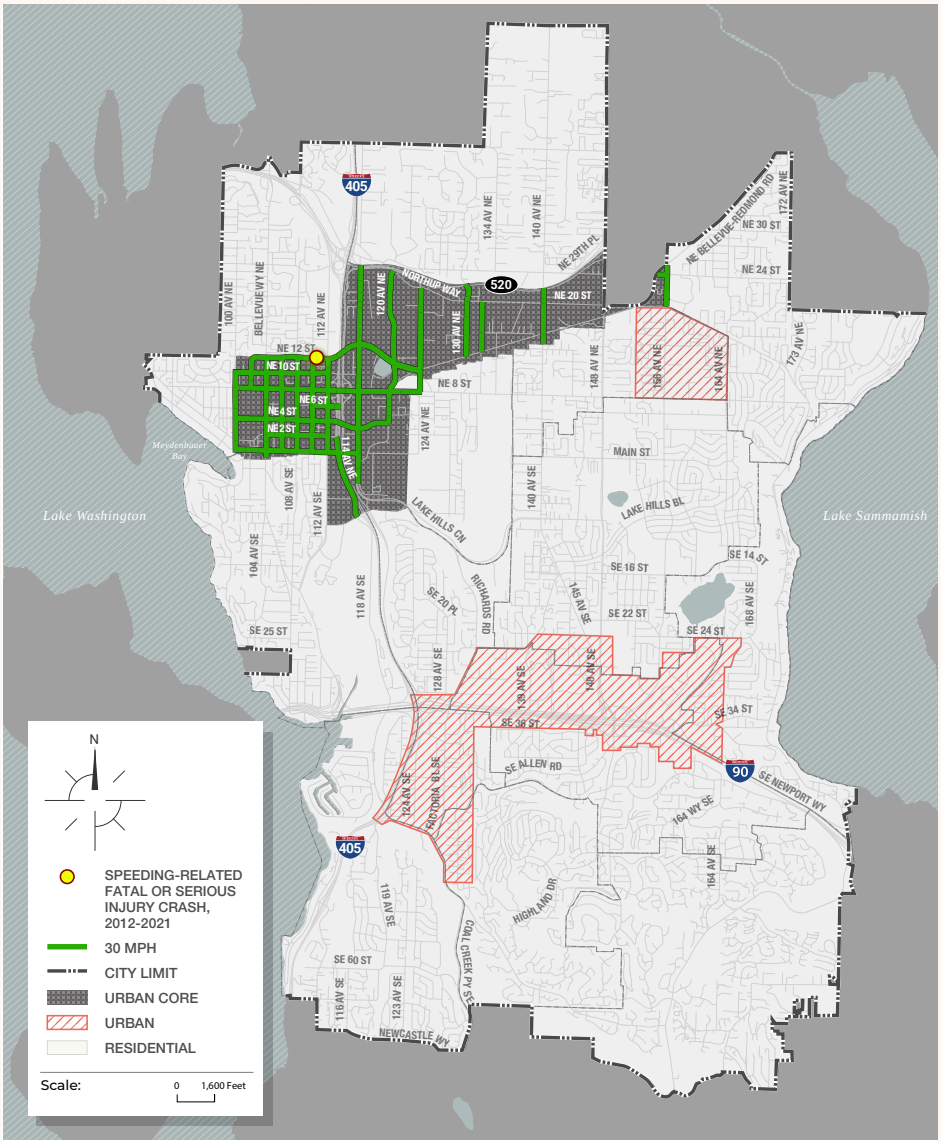



**Figure 11: Urban Core, 30 mph arterials.**

Credit: R. Homolya and the City of Bellevue

**Total Length:** 18.6 miles
**Speeding-related Fatal or Serious Injury Crashes (2012-2021):** One (1)

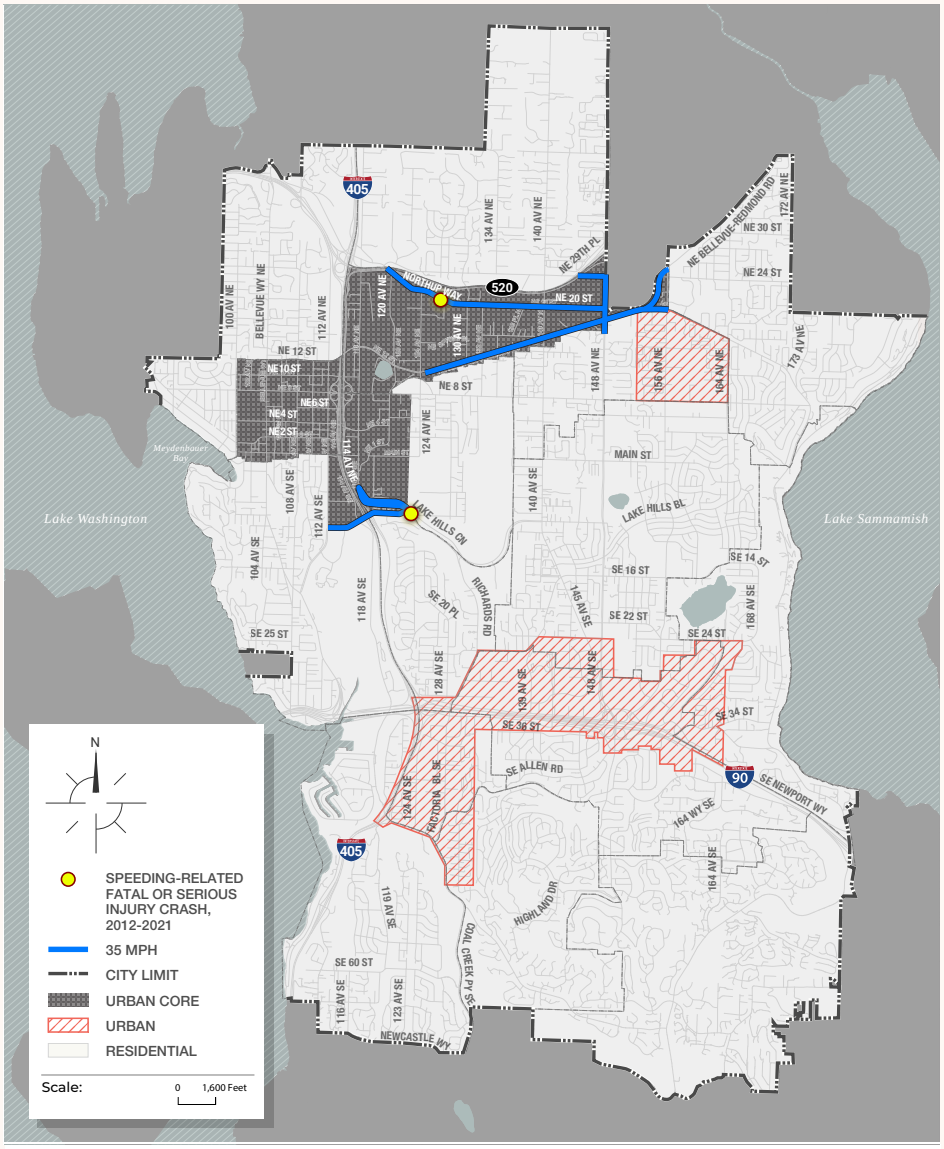

**Figure 12: Main Street in Downtown Bellevue is an Urban Core 30 mph arterial.**

Credit: City of Bellevue

# Urban Core 35mph

These include arterials within the Urban Core that have a posted speed limit of 35 mph (*Figure 13*). These are generally key streets in Wilburton/East Main station areas and BelRed. Urban Core 35 mph arterials facilitate traffic in and out of the Downtown and BelRed areas, such as Bel-Red Road, 112th Avenue Southeast, and Northup Way Northeast to Northeast 20th Street.

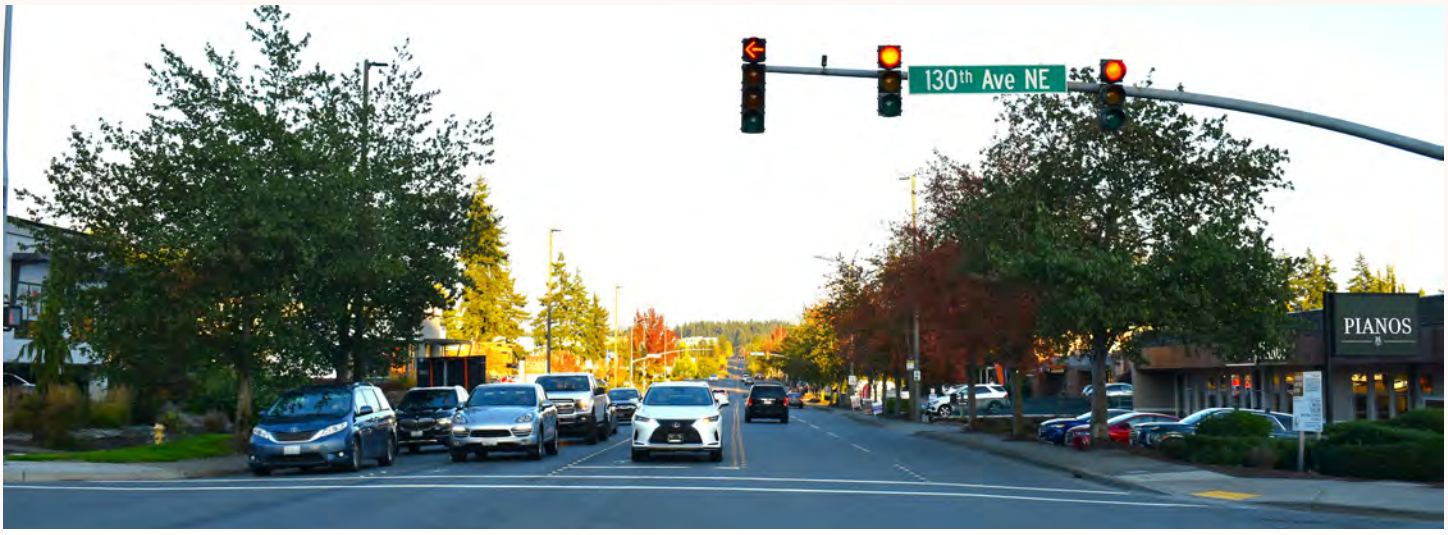
In the analysis of standard deviation of speeds, both Northeast 24th Street and Northeast Bel-Red Road are in the top ten corridors citywide and had a standard deviation over 10 mph.




Credit: R. Homolya and the City of Bellevue

**Figure 13: Urban Core, 35 mph arterials.**

**Total Length:** 7.8 miles
**Speeding-related Fatal or Serious Injury Crashes (2012-2021):** Two (2)



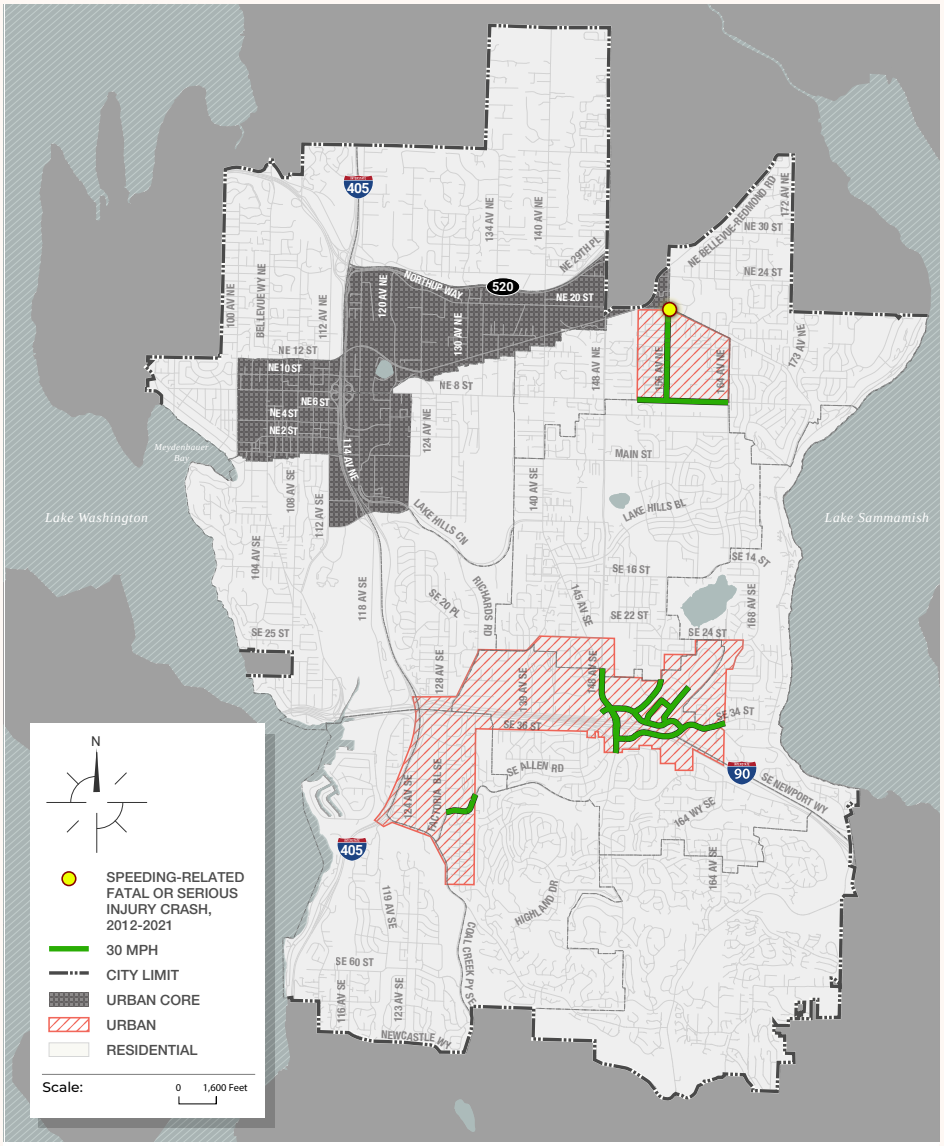

Credit: City of Bellevue

**Figure 14: Northup Way provides an example of an Urban Core 35 mph arterial.**

# Urban 30 mph

These include arterials within the Urban land use that have a posted speed limit of 30 mph (*Figure 15*). The majority of Urban 30 mph roads are around the Eastgate and Crossroads mixed-use commercial areas, including 156th Avenue Northeast, and Northeast Eighth Street near Crossroads; and 150th Avenue Southeast and Southeast Eastgate Way in Eastgate. These corridors see significant pedestrian activity due to the nearby amenities, including shopping centers, transit hubs and Bellevue College.

In an analysis of drivers exceeding the speed limit by 10 mph or greater, three of the top five routes citywide with the highest percentage of speeders occur in the Eastgate area (Southeast 37th Street, 150th Avenue Southeast, and 148th Avenue Southeast). In addition, Urban, 30 mph corridors display 85th percentile speeds 15-17% higher than the posted speed on average.




Credit: R. Homolya and the City of Bellevue

**Figure 15: Urban, 30 mph arterials.**

**Total Length:** 4.8 miles
**Speeding-related Fatal or Serious Injury Crashes (2012-2021):** One (1)

Credit: City of Bellevue

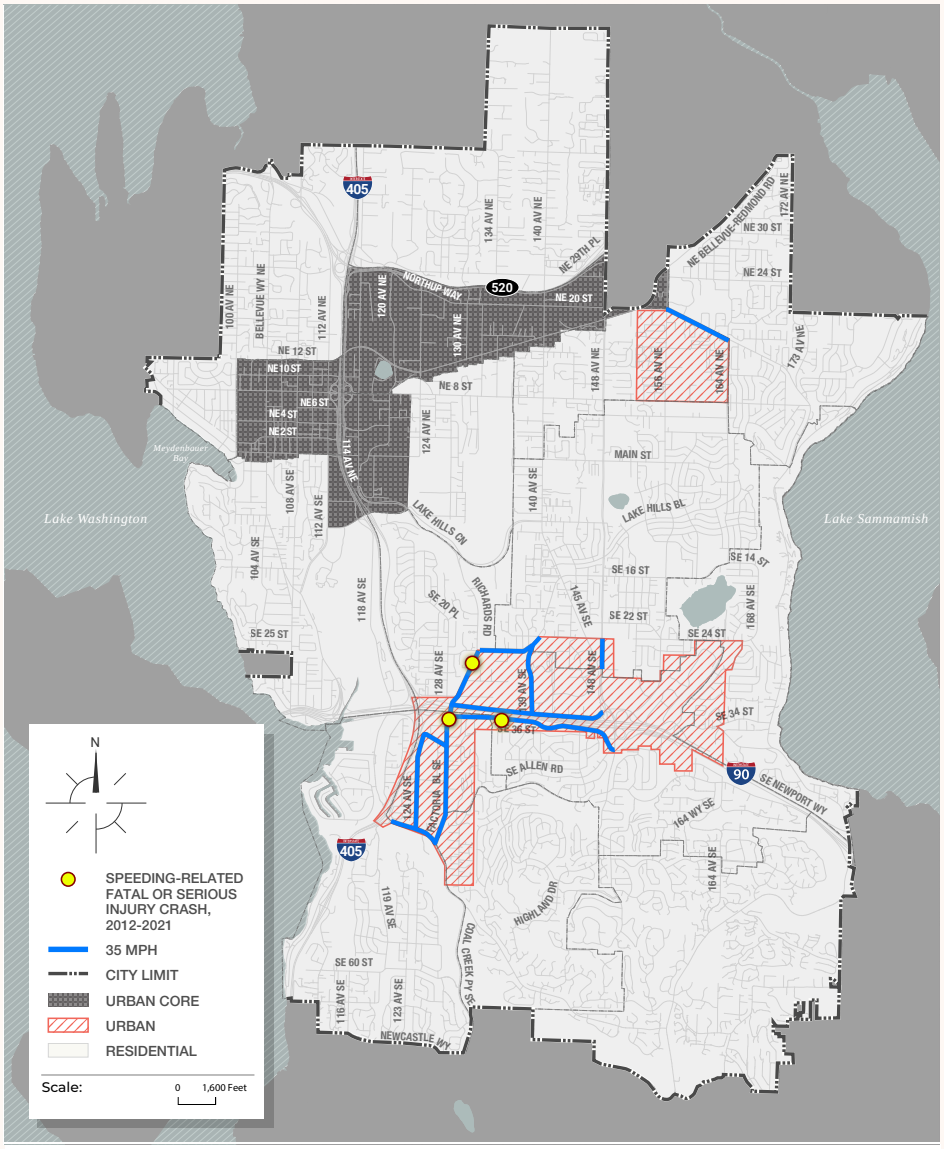
**Figure 16: NE Eighth Street along the Crossroads commercial area provides an example of an Urban 30 mph arterial.**

# Urban 35mph

These include arterials within the Urban land use context that have a posted speed limit of 35 mph (*Figure 17*). Urban 35 mph arterials include most arterials in Factoria such as Coal Creek Parkway Southeast, Southeast Newport Way, and Factoria Boulevard Southeast. Select roads around Crossroads, Factoria and Eastgate, are also a part of the category, including Southeast 36th Street and Southeast Eastgate Way.

Like Urban 30 mph streets, these corridors see high levels of pedestrian traffic given their proximty to shopping centers, Eastgate Transit Center, Bellevue College and Newport High School.

The analysis of standard deviation of speeds found that Southeast Eastgate Way has a standard deviation over 10 mph.




Credit: R. Homolya and the City of Bellevue

**Figure 17: Urban, 35 mph arterials.**

**Total Length:** 5.2 miles
**Speeding-related Fatal or Serious Injury Crashes (2012-2021):** Three (3)

Credit: City of Bellevue

**Figure 18: Factoria Boulevard Southeast provides an example of an Urban 35 mph arterial.**

# Urban 40 mph

These include arterials in the Urban land use context with a speed limit of 40 mph (*Figure 19*). As of 2023, there is only one portion of a 40 mph arterial that is within the Urban land use area. This is a 0.35 mile stretch of Coal Creek Parkway Southeast, south of Factoria Boulevard Southeast.

Despite representing the smallest category by mileage, Urban 40 mph is the fastest speed limit in a high or medium density area. In the Iteris ClearGuide analysis, this segment of Coal Creek Parkway Southeast was found to have 50th percentile speeds of 39 mph and 85th percentile speeds of 46 mph. In an analysis of the standard deviation of speeds citywide, this segment is in the top ten with a standard deviation of over 10 mph.

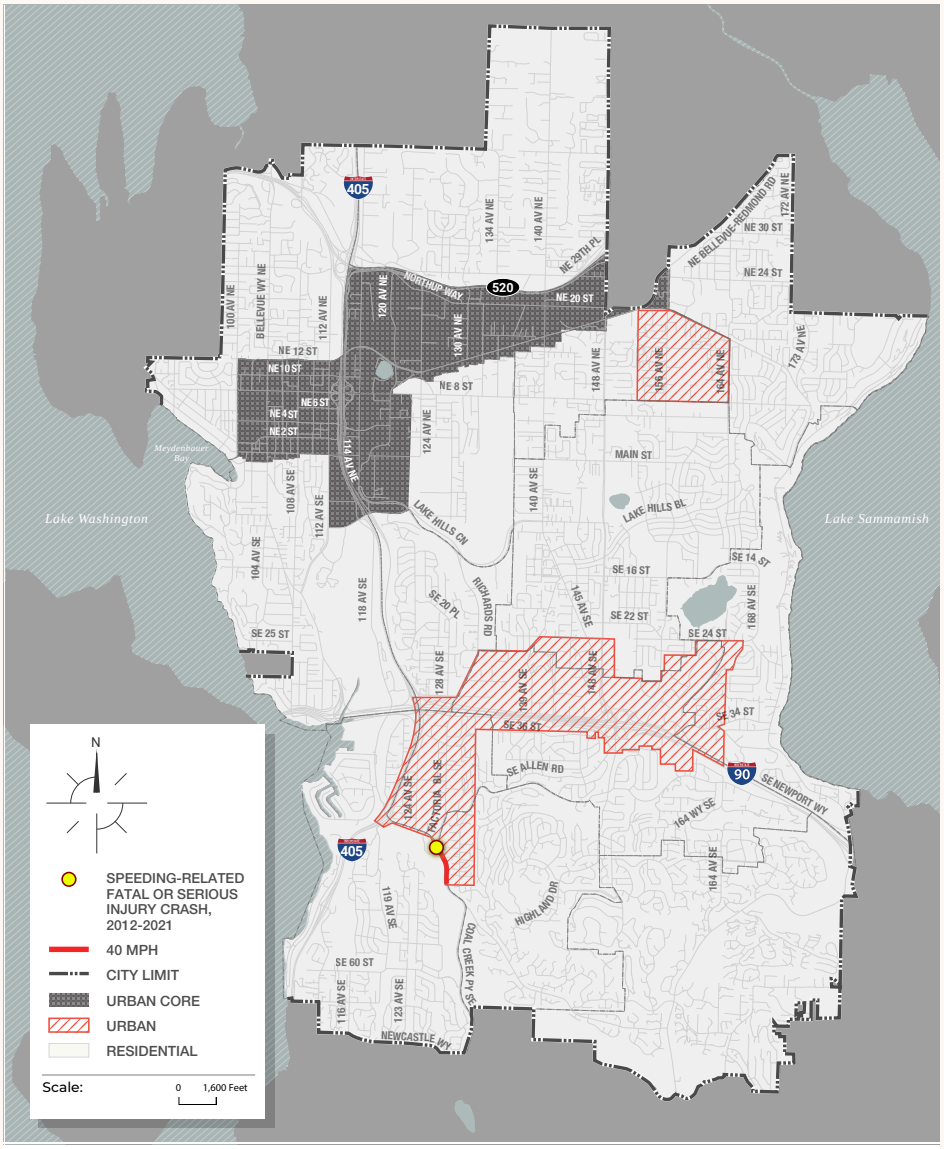



**Figure 19: Urban, 40 mph arterials.**

Credit: R. Homolya and the City of Bellevue

**Total Length:** 0.35 miles
**Speeding-related Fatal or Serious Injury Crashes (2012-2021):** One (1)

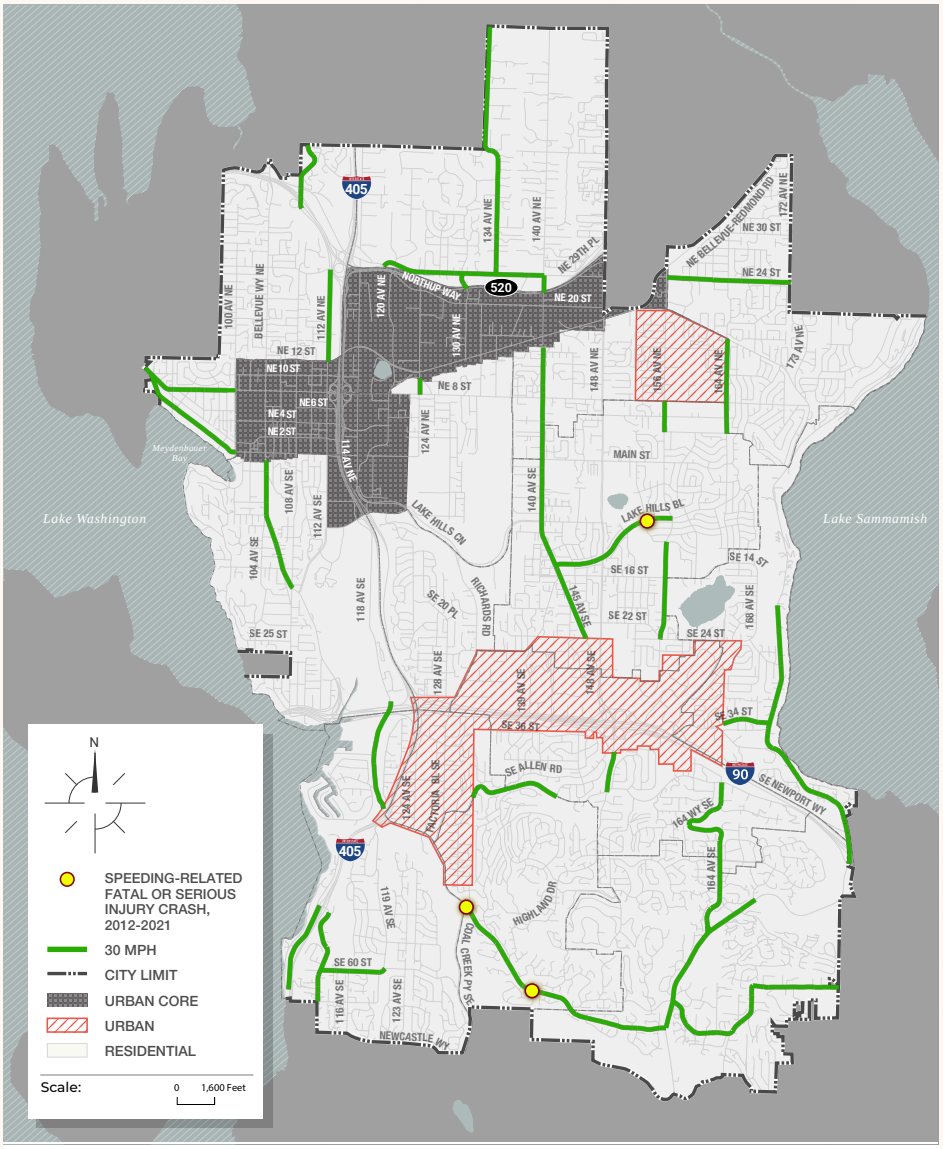

**Figure 20: Coal Creek Parkway Southeast is an example of an Urban 40 mph arterial.**

Credit: City of Bellevue

# Suburban 30 mph

These include arterials in the suburban land use context with a speed limit of 30 mph (*Figure 21*). Many roadways citywide fall within the Suburban 30 mph category. This includes 140th Avenue Northeast and Southeast; Bellevue Way Southeast and Lake Washington Boulevard Northeast; Forest Drive Southeast. Many of these roads facilitate travel to and from neighboring cities such as Redmond and Issaquah. Notably, some of these corridors are important connectors to Bellevue schools such as Sherwood Forest Elementary and multiple high schools.

In the analysis of drivers exceeding the speed limit by 10 mph or greater, Suburban 30 mph arterials represent five of the top ten corridors. This includes Bellevue Way Southeast (8%), Lakemont Boulevard Southeast (7%), Forest Drive Southeast (5%), 132nd Avenue Northeast (4.5%) and Southeast 34th Street (4.5%). For the speed distribution analysis, Suburban 30 mph streets experience 85th percentile speeds 15-17% higher than the posted speed on average.




Credit: R. Homolya and the City of Bellevue

**Figure 21: Suburban, 30 mph arterials.**

**Total Length:** 28.8 miles
**Speeding-related Fatal or Serious Injury Crashes (2012-2021):** Three (3)

Credit: City of Bellevue

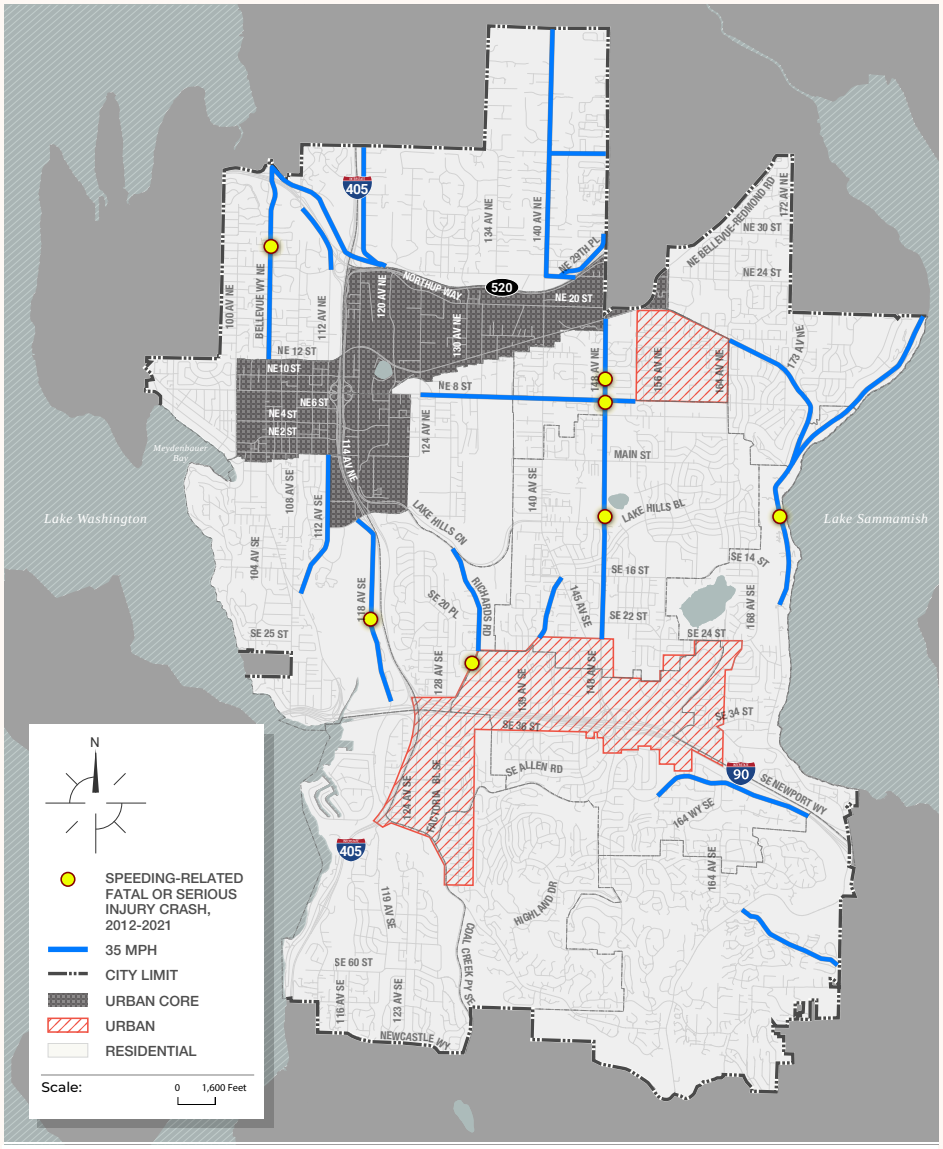
**Figure 22: Forest Drive Southeast provides an example of a Suburban 30 mph arterial.**

# Suburban 35 mph

These include arterials in the suburban land use context with a speed limit of 35 mph (*Figure 23*). Along with Suburban 30 mph, this category comprises the majority of arterials in Bellevue by street mileage. Examples arterials include Northeast Eighth Street, and 148th Avenue Northeast and Southeast.

Some Suburban 35 mph corridors serve as connectors to Bellevue schools such as Stevenson Elementary School, Odle Middle School, Highland Middle School, and International School.

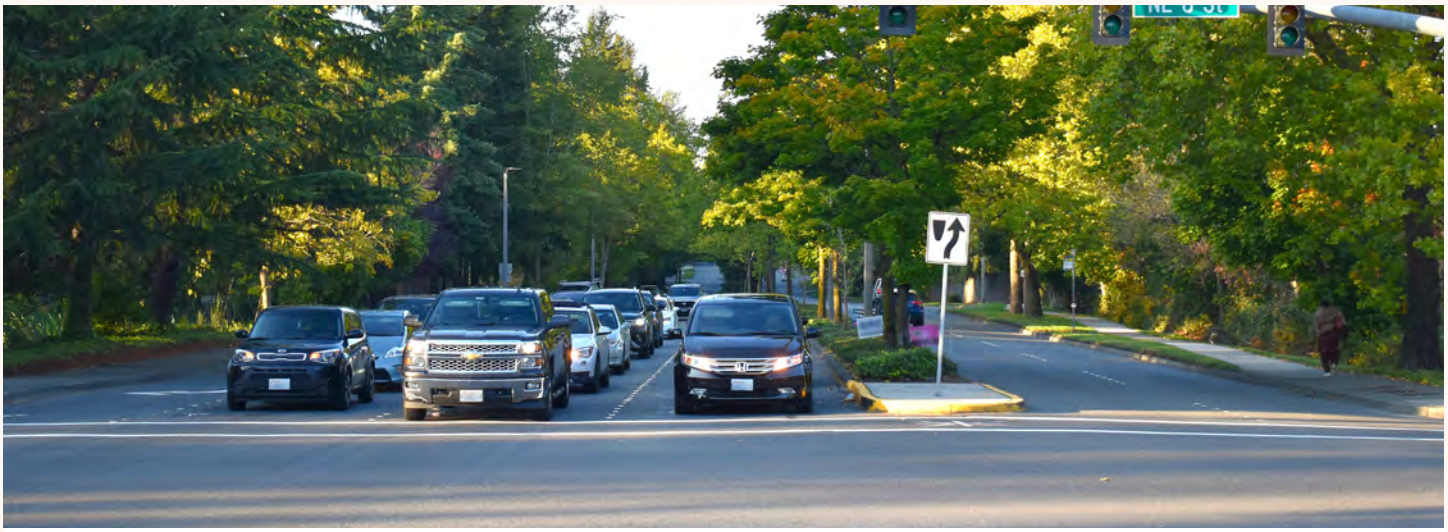
In the analysis of 50th and 85th percentile speed distribution, multiple arterials in this category had the greatest different between the 50th and 85th mph speeds. This includes Village Park Drive Southeast (50th of 38 mph, 85th of 46 mph), 138th Avenue Northeast (35 mph, 42 mph) and Richards Road (34 mph, 41 mph). Similarly, an analysis of standard deviations of speeds found that 112th Avenue Northeast, Northeast Eighth Street and Northeast 24th Street all have a standard deviation over 10 mph.




Credit: R. Homolya and the City of Bellevue

**Figure 23: Suburban, 35 mph arterials.**

**Total Length: 28.6 miles**
**Speeding-related Fatal or Serious Injury Crashes (2012-2021): Seven (7)**



Credit: City of Bellevue

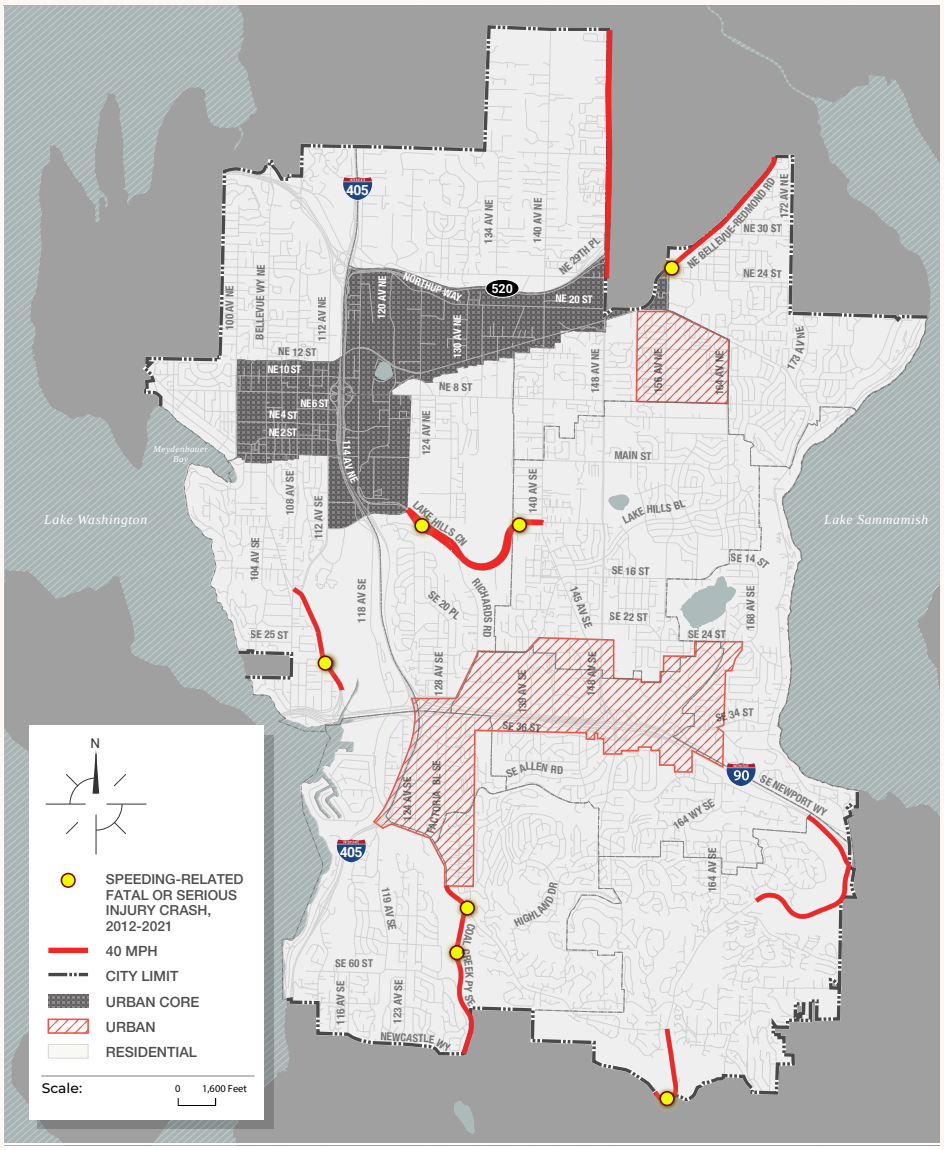
**Figure 24: 148th Avenue Northeast provides an example of a Suburban 35 mph arterial.**

# Suburban 40 mph

These include arterials in the suburban land use context with a speed limit of 40 mph (*Figure 25*). These arterials are located throughout the city and the majority of these arterials are close to the city limits or interstates.

In an analysis of drivers exceeding the speed limit by 10 mph or greater, multiple arterials in this category were among the highest in the city. This includes Lakemont Boulevard Southeast with 16% of drivers exceeding the speed limit by at least 10 mph and Lake Hills Connector with 11%.

As this category represents the highest speed limit for arterials, many of the corridors with the highest values and differentials between 50th and 85th percentile speeds are Suburban 40 mph as shown in Table 3.




Credit: R. Homolya and the City of Bellevue

**Figure 25: Suburban, 40 mph arterials.**

| Corridor | 50th Percentile | 85th Percentile |
|---|---|---|
| Coal Creek Parkway Southeast | 39 mph | 46 mph |
| Lakemont Boulevard Southeast | 38 mph | 46 mph |
| Lake Hills Connector | 37 mph | 44 mph |
| Bellevue Way Southeast | 37 mph | 43 mph |
| Southeast Newport Way | 37 mph | 45 mph |
| Northeast Bel-Red Road | 35 mph | 42 mph |

An analysis of standard deviations of speeds in Bellevue found multiple Suburban 40 mph corridors in the top ten. Lake Hills Connector had standard deviations of 11-12 mph and Coal Creek Parkway had standard deviations of 10-11 mph, suggesting a considerable range of speeds among drivers on this road.

**Total Length:** 28.8 miles
**Speeding-related Fatal or Serious Injury Crashes (2012-2021):** Seven (7)

Credit: City of Bellevue

**Figure 26: Lake Hills Connector—a two lane (by direction) roadway is physically separated from opposing traffic—runs east-west through Bellevue and provides an example of a Suburban 40 mph arterial.**

Credit: City of Bellevue

# 03

# SPEED MANAGEMENT CORRIDOR SORTING TOOL

## ▶ What factors are considered in the Corridor Sorting Tool and how are they weighted?

## ▶ What are the Sorting Tool outputs for 2023?

## ▶ What is the distribution of scores across arterial categories?

The Speed Management Corridor Sorting Tool (Sorting Tool) assesses arterials based on a range of safety, equity and infrastructure data. All 30+ mph arterials are sorted using consistent metrics, regardless of their individual speed limit or land use classification. The scored outputs from the Sorting Tool are one of the multiple considerations—alongside existing policy goals, upcoming or current transportation projects, and community feedback—to determine which corridors are evaluated for speed limit appropriateness with the Speed Limit Standard Operating Procedure (*see Figure 5 in Chapter 1*).

To create the corridor segments to input into the Sorting Tool, every 30+ mph arterial is categorized based on that corridor's land use and the route's speed limit. For the 2023 evaluation, this yielded eight categories (as described in *Chapter 2*). If a roadway spans numerous speed limits and/or land use designations (e.g. Bellevue Way Southeast), the corridor is discretely segmented based on continuous segments that have the same speed limit and land use (e.g. a portion of Bellevue Way Southeast that is in the same land use but changes speed limit would be separated into two corridor segments). If a corridor weaves in and out of a land use, resulting in small segment lengths (less than 1,000 feet), these segments are evaluated to be aggregated with a contiguous segment or remain separate, based on staff judgment. For the 2023 outputs, this segmentation provided 113 corridors for evaluation.

Each parameter in the Sorting Tool is weighted to reflect relative weighting of each dataset as well as to allow raw data to be added to the tool without modification (see *Table 3*). [xxiv] [xxv] [xxvi] For example, the number of fatal injury crashes is weighted higher than serious injury crashes (three rather than two), and the percent of speeders 10+ mph over the speed limit is weighted by 100 to convert the raw data (a decimal value) to a percentage. The following sections provide a discussion of the data-informed approach used with the Sorting Tool, an overview of the 2023 results, and the distribution of the results. Additional details about the parameters, data collection and outputs can be found in *Appendix B* and *Appendix C*.


Credit: City of Bellevue

| Parameter | Parameter definition | Location of Data | Weights |
|---|---|---|---|
| Along the HIN? | Is the corridor along the High Injury Network? (yes=1, no=0) | Bellevue's Vision Zero Story Map | 3 |
| Number of serious injury crashes (10 years) | Number of speed-related severe injury crashes in latest 10 years along the corridor | WSDOT's Online Crash Database | 2 |
| Number of fatal injury crashes (10 years) | Number of speed-related fatal crashes in latest 10 years along the corridor | WSDOT's Online Crash Database | 3 |
| Percent of speeders 10+ mph over speed limit | Percentage of vehicles traveling at least 10 mph above the speed limit (as a percent) | ClearGuide's speed data portal | 100 |
| Speed differential | Difference in mph between the 50th Percentile and 85th percentile speeds | ClearGuide's speed data portal | 0.3 |
| Equity | Highest Equity Composite Index (ECI) score of adjacent block groups along the corridor | Bellevue's Mobility Implementation Plan | 1 |
| Priority bicycle corridor | Is the corridor a priority bicycle corridor? (yes=1, no=0) | Bellevue's Mobility Implementation Plan Dashboard | 2 |
| Level of Traffic Stress (LTS) | Is the Level of Traffic Stress performance target from the MIP met? (yes=0, no=1) | Bellevue's Mobility Implementation Plan Dashboard | 2 |
| Sidewalk presence | Is 50%+ of the corridor missing sidewalk on one or both sides? (yes=1, no=0) | Bellevue's Mobility Implementation Plan Dashboard | 2 |
| Crosswalk presence | The number of mid-block crossings along the corridor (maximum of two) | Bellevue's internal CARTA GeoDatabase | 1 |

**Table 3: Speed Management Corridor Sorting Tool Parameters.**

## Data-informed Approach

The SMP leverages speeding, crash and other data to evaluate 30+ mph arterials using the same criteria. The sorting serves as a starting point to analyze relative differences between each corridor but stops short of creating a prioritized list. The Sorting Tool outputs are one of the four factors—alongside existing policy goals, future or current transportation projects and community feedback—that may initiate one or more corridors being reviewed using the Speed Limit Setting Tool (see *Figure 5* in *Chapter 1*).

It is recognized that even while using quantifiable data metrics such as speeding and crash rate, there is inherent subjectivity in how all factors that are part of the Sorting Tool are scored, weighted, and aggregated. There are also limitations with the data available, such as not all segments having speeding data available (see *Appendix B* for the proxy values used for these segments without data). Finally, while the Sorting Tool provides a local understanding of speeding, there are numerous other considerations that should be made when prioritizing corridors that require engineering judgment. These considerations cannot be automated into a single tool.

To this end, the Sorting Tool and the sorted outputs represent a first step to identify which corridors may be further reviewed using the Speed Limit Setting Tool (see *Chapter 5 > Table 10 > Action 5*) and help to surface general trends. The Sorting Tool does not create a framework to identify which corridors are to be first evaluated using the speed limit setting tool or, for example, that corridors with the highest

scores will be considered for countermeasures. Rather, there are other factors such as community interest, coordination with concurrent city projects/initiatives, or efforts focused on specific geographic areas that may initiate one or more corridors being reviewed with the Speed Limit Setting Tool. In this way, data are being used to inform decision making, not drive decision making.

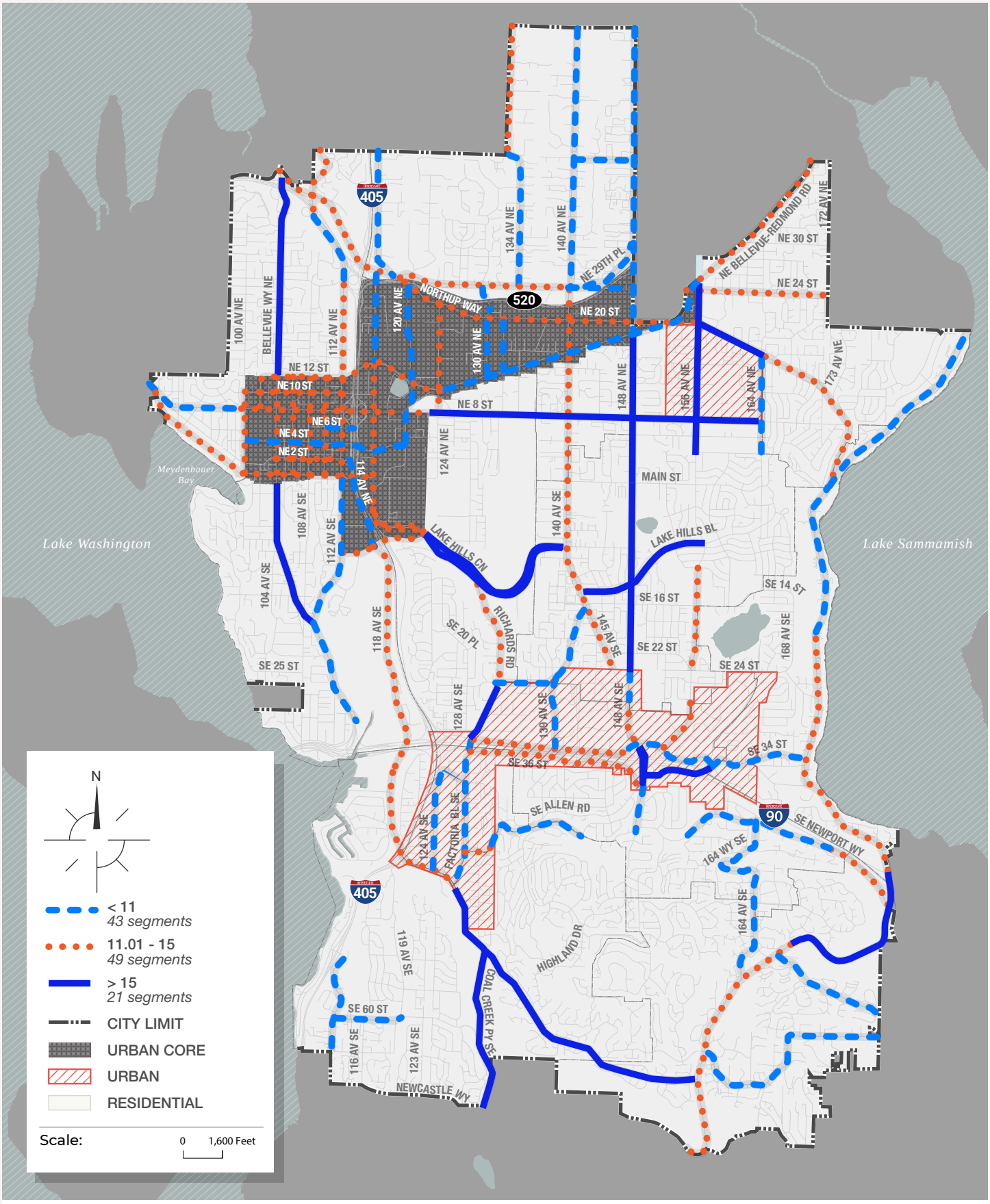
## 2023 Corridor Sorting Tool Results

The top ten corridors—based on weighted total—from the Sorting Tool's 2023 outputs are provided in *Table 4* below. Eight of the top ten (80%) are in the suburban land use, with four 30 mph, two 35 mph and two 40 mph suburban corridors. No corridors in the urban core land use are in the top ten. A list of all 113 sorted corridors is provided in *Appendix C.*

*Figure 27* shows a map of the weighted scores for all corridors. The three data classes (light, medium and dark blue) provide a sense of the sorted corridors data distribution, particularly related to crash data. Corridors that scored less than 11 (light blue) averaged 0.1 serious injury crashes, while those between 11-15 averaged 0.30 (medium blue) and corridors above 15 had an average of one (1) serious injury crash (dark blue)—meaning there was an approximately three-fold jump between each data class. For fatal injury crashes, corridors that scored less than 11 averaged 0, those between 11-15 averaged 0.13 and the corridors over 15 averaged 0.7 fatal crashes. Similar to the top ten (*Table 4*), the map shows that higher speed corridors in the suburban land use generally scored higher. Additional trends across all corridors are discussed in the following section.

| Corridor Segment | Speed Limit (mph) | Category | Weighted Total |
|---|---|---|---|
| **148th Avenue Northeast**<br>*Main Street to Northeast Bel-Red Road* | **35** | **7 – Suburban, 35 mph** | **20.33** |
| **156th Avenue Northeast**<br>*Northeast Eighth Street to Northeast 20th Street and Northup Way* | **30** | **3 – Urban, 30 mph** | **19.81** |
| **Lake Hills Connector**<br>*Southeast Eighth Street to 140th Avenue Southeast* | **40** | **8 – Suburban, 40 mph** | **18.83** |
| **Coal Creek Parkway Southeast**<br>*Between Factoria Blvd Southeast and Forest Drive Southeast (end of urban land use) to the city limit* | **40** | **8 – Suburban 40 mph** | **18.56** |
| **Lakemont Boulevard Southeast**<br>*West Lake Sammamish Parkway Southeast to Newport Way Southeast* | **30** | **6 – Suburban, 30 mph** | **18.56** |
| **Northeast Eighth Street**<br>*123rd Avenue Northeast to153rd Avenue Northeast* | **35** | **7 – Suburban, 35 mph** | **18.18** |
| **Forest Drive Southeast**<br>*Coal Creek Parkway Southeast to Lakemont Boulevard Southeast* | **30** | **6 – Suburban, 30 mph** | **18.02** |
| **Coal Creek Parkway Southeast**<br>*Factoria Boulevard Southeast to Forest Drive Southeast* | **40** | **5 – Urban, 40 mph** | **18.00** |
| **156th Avenue Northeast**<br>*Northeast Fourth Street to Northeast Eighth Street* | **30** | **6 – Suburban, 30 mph** | **17.36** |
| **Bellevue Way Southeast**<br>*Between Main Street and Southeast Third Street (end of urban core land use) to 108th Ave Southeast* | **30** | **6 – Suburban, 30 mph** | **17.28** |

**Table 4: 2023 Top 10 Weighted Arterial Corridors from the Speed Management Corridor Sorting Tool.**




Credit: R. Homolya and the City of Bellevue

**Figure 27: A map of the 2023 Weighted Scores from the Speed Management Corridor Sorting Tool.**

## Breakdown of Sorting Tool Scoring

The scoring distribution from the Sorting Tool provides insight into overall scoring ranges as well as what categories scored higher than others (*Figure 28*). Scores ranged from 3.9 to 20.33, with an average of 12.06. Of the 113 arterials evaluated, 71% scored less than 14.

Apart from Category 5 (Urban 40 mph), which only had a single arterial, Category 8 (Suburban 40 mph) had the highest average score with 14.39 points. Category 7 (Suburban 35 mph) had the highest scoring corridor with 20.33 points and Category 6 (Suburban 30 mph) had the lowest at 3.91 points (*Table 5)*. Limitations of the speed data and the sorting tool are further described in *Appendix B*.

Of the arterials that scored above 15 points (20 total), 60% are in the suburban land use. This is higher than average, as corridors in this land use represent 52% of total arterial mileage (*Figure 29*). Additionally, only 5% of arterials in the highest scoring segments were in the urban core, despite the urban core representing 27% of total arterial mileage.

As the factors included in the Sorting Tool are weighted, each factor impacts the total score differently. *Table 6* shows the average impact of each factor on the total score in the middle column (called 'Impact to Total Scoring'), i.e. the theoretical percentage of the score that is from each factor. The rightmost column shows the actual, averaged impact of each factor on the scoring across corridors. Not all factors have data for each corridor, therefore the theoretical impact ('Impact to Total Scoring') does not equal the real, average impact ('Impact When Present'). For example, while the High Injury Network (HIN) factor is weighted to impact the score 14%, if a corridor is not on the HIN, the impact of that factor would be 0%. If the corridor is on the HIN, and many of the other factors for that corridor have zero values, the impact when present for the HIN may greatly exceed 14%, such as representing 30% of the total score. As such, note that the sum of the impact when present values exceed 100% as these are the average impact to scoring across all corridors. The reason that the speeding factor's impact when present is less than the total impact to scoring is because this is the only factor with a non-zero value for all corridors (proxies were used if speeding data was missing, refer to *Appendix B*).

Across all categories, the Equity Composite Index (ECI) contributed the highest to the scoring, representing approximately 20% of the total score. The next largest contributors to the scoring were the speeding metrics accounting for 17% and 15% of the score. These speeding metrics include (1) the percentage of vehicles recorded exceeding the posted speed limit by more than 10 mph, and (2) the difference between the 50th and 85th percentile speeds for a given corridor. Serious injury and fatal crashes did not occur along many of the arterials analyzed, but when they did occur, they typically accounted for 13% and 18%, respectively, of the scoring for that segment. See *Table 6* for the impact of each weighted factor on the total scoring.

| Category | Average | STDEV | Max | Min |
|---|---|---|---|---|
| Category 1 – Urban Core, 30 mph | 11.24 | 2.23 | 16.09 | 6.88 |
| Category 2 – Urban Core, 35 mph | 11.99 | 1.73 | 14.42 | 9.76 |
| Category 3 – Urban, 30 mph | 13.46 | 3.90 | 19.81 | 6.77 |
| Category 4 – Urban, 35 mph | 12.19 | 2.38 | 15.86 | 7.65 |
| Category 5[1] - Urban, 40 mph | 18.00 | | 18.00 | 18.00 |
| Category 6 – Suburban, 30 mph | 11.93 | 3.27 | 18.56 | 3.91 |
| Category 7 – Suburban, 35 mph | 11.39 | 3.65 | 20.33 | 7.37 |
| Category 8 – Suburban, 40 mph | 14.39 | 3.05 | 18.83 | 9.80 |
| All Categories | 12.29 | 3.88 | 20.33 | 3.91 |

[1] *Category 5 only had a single arterial.*

**Table 5: Analytical metrics for the scoring tool output**

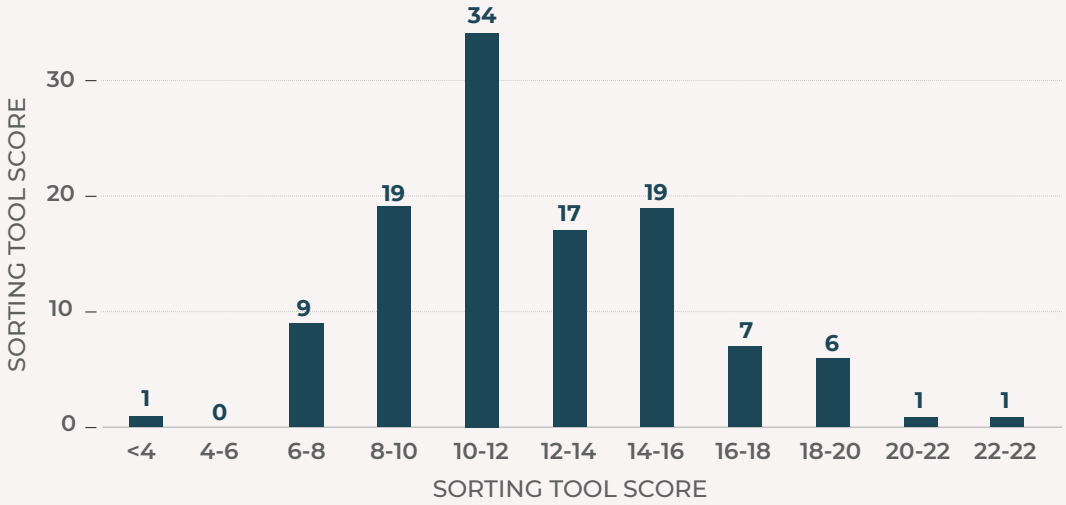



**Figure 28: Distribution of Sorting Tool Scores.**

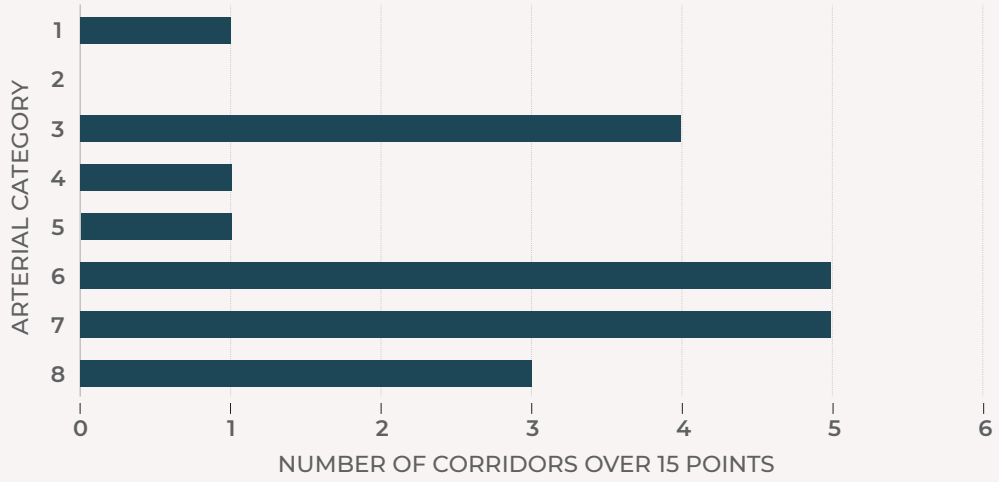



**Figure 29: Breakdown of the highest scoring routes (all segments that score above 15 points) by category.**

Credit: R. Homolya and the City of Bellevue

| Weighted Factor | Impact to Total Scoring | Impact When Present |
|---|---|---|
| High Injury Network (HIN) | 14% | 23% |
| Serious Injury Crash (SI) | 3% | 13% |
| Fatal Crash | 2% | 18% |
| Percent of Vehicles Speeding 10+ mph Over Speed Limit | 15% | 13% |
| Difference between the 85th and 50th Percentile Speeds | 17% | 19% |
| Equity Composite Index (ECI) Score | 20% | 22% |
| Presence of Existing Bike Facilities | 14% | 17% |
| If Bike Facilities Meet the Level of Traffic Stress (LTS) Target | 8% | 16% |
| Presence of Existing Sidewalks | 1% | 14% |
| Presence of Existing Crosswalks | 6% | 12% |

**Table 6: Impact of each weight on overall scoring.**


Credit: City of Bellevue

# 04

# COUNTERMEASURE TOOLBOX

## ▶ What tools (i.e. strategies and designs) can be used to manage speeds on arterials?

## ▶ For what types of arterials are these tools appropriate?

## ▶ What other strategies and designs can supplement speed management tools?

The Countermeasure Toolbox is a set of engineering and enforcement strategies that may be considered to reduce speeds on arterial corridors with speed limits of 30 mph or greater. This toolbox includes strategies which are in use or likely to be used in the city. Ongoing updates to the Countermeasure Toolbox are expected as the city's practices change over time, as described in (*Chapter 5* > *Table 10* > *Action 10*).

Not all countermeasures are appropriate for every corridor. Land use context and speed limit can vastly change the needs of a corridor and influence driver, cyclist and pedestrian behaviors. For example, engineering strategies that vertically deflect a vehicle, such as a raised crosswalk, may be appropriate for a lower speed arterial in a high or medium density area, but would not be appropriate for a 40 mph arterial. For all corridors, there will be unique considerations that influence an engineer's decision on the level of appropriateness. Alongside the land use, speed limit, and traffic considerations for each countermeasure, additional factors may include, but are not limited to:

- Is the arterial a priority truck or emergency response route? (see *Figure 33* in *Appendix D*)
- Does the Fire Department have feedback or preferred speed management countermeasures? (see *Appendix D*)
- Are there horizontal or vertical curves?
- Where are driveways and intersections located?
- Are large vehicle turning movements affected?

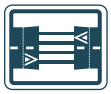
Timeline of implementation, funding, staff capacity, the presence of other safety improvements, and other factors will also inform what engineering and enforcement strategies are appropriate for a given corridor.

The Countermeasure Toolbox (*Table 7*) provides a summary of what countermeasures may be appropriate (either typically or sometimes) or inappropriate for a given corridor based on its land use and speed limit. Appropriateness is defined as follows:

- Typically appropriate: countermeasure is a vetted and effective speed management technique and doesn't require extensive testing, piloting or coordination to be considered for implementation
- Sometimes appropriate: countermeasure is likely an effective speed management technique but specific street characteristics may warrant more coordination and justification to be considered for implementation
- Not appropriate: countermeasure is not a viable speed management technique in any condition

Though each countermeasure is labeled as being either typically, sometimes or not appropriate, implementation of each countermeasure still requires vetting for feasibility, budget, and context. Like any other transportation investment, consideration of speed countermeasures on arterials includes careful coordination across city departments during the planning, design, construction and maintenance phases. There are some countermeasures, such as speed safety cameras (SSCs), which require additional consensus building. A next step for a review of SSCs is described in *Chapter 5* > *Table 10* > *Action 6*. Additional information on new legislation for SSCs is provided in *Appendix E*.

In addition, prior to plans for speed management being finalized, it is important to collaborate with the Fire Department, who can provide a final review from Operations and Prevention

| Countermeasure: | Urban Core | | Urban | | | Suburban | | |
|---|---|---|---|---|---|---|---|---|
| | 30 MPH | 35 MPH | 30 MPH | 35 MPH | 40 MPH | 30 MPH | 35 MPH | 40 MPH |
| **1. Horizontal Deflection** | | | | | | | | |
|  Lateral Shift | ◒ | ◒ | ◒ | ◒ | ○ | ◒ | ◒ | ○ |
| **2. Vertical Deflection** | | | | | | | | |
|  Raised Crosswalk | ◒ | ◒ | ◒ | ◒ | ○ | ◒ | ◒ | ○ |
|  Offset/Split Speed Table | ◒ | ◒ | ◒ | ◒ | ○ | ◒ | ◒ | ○ |
|  Raised Intersection | ● | ● | ● | ● | ○ | ◒ | ◒ | ○ |
|  Speed Cushion | ● | ● | ● | ◒ | ○ | ◒ | ◒ | ○ |
| **3. Travel Lane Width Reduction** | | | | | | | | |
|  Median Island | ● | ● | ● | ● | ◒ | ● | ● | ◒ |
|  Travel Lane Width Reduction | ● | ● | ● | ● | ◒ | ● | ● | ◒ |
| **4. Pavement Markings/Modifications** | | | | | | | | |
|   Advisory Speed Marking | ● | ● | ● | ● | ● | ● | ● | ● |
| **5. Signing and Speed limit Setting** | | | | | | | | |
|   Speed Feedback Signs | ● | ● | ● | ● | ◒ | ● | ● | ◒ |
|   Speed Limit Sign Density/Placement | ● | ● | ● | ● | ● | ● | ● | ● |
|   Signs Stating Speed Ticket Fine Amount | ● | ● | ● | ● | ● | ● | ● | ● |
| **6. Traffic Signal Operations** | | | | | | | | |
|  Signal Coordination Set for Speed Limit | ● | ● | ● | ● | ● | ● | ● | ● |
| **7. Enforcement Strategies** | | | | | | | | |
|   Speed Safety Cameras (Automated Enforcement) | ● | ● | ● | ● | ● | ● | ● | ● |
|  High Visibility Enforcement with Public Campaign | ● | ● | ● | ● | ● | ● | ● | ● |

● Typically appropriate ◒ Sometimes appropriate ○ Not appropriate

**Table 7: The Speed Management Countermeasure Toolbox**

for balancing speed management on arterials with emergency response times in the city. Strengthening and expanding the partnership between the Fire and Transportation Departments is a next step, as described in *Chapter 5 > Table 10 > Action 7*.

The countermeasures in the toolbox are primarily intended to reduce speeds on arterials in Bellevue. There are a host of other countermeasures which have speed mitigation benefits but primarily target safety or other benefits. In addition, there are countermeasures which may not yet be utilized in the City of Bellevue but have the potential to be used in the future. These are included as secondary countermeasures in *Table 8*. The following strategies may be used by the City of Bellevue in efforts to mitigate speed and improve safety on arterials 30 mph or greater, and are still an important option for speed management efforts. For example, a next step from this SMP is to conduct a Safe Speeds education campaign (see *Chapter 5 > Table 10 > Action 8*). The lists of primary and secondary countermeasures should be updated over time as new technologies are developed and arterials in the city change (see *Chapter 5 > Table 10 > Action 10.*).

| STRATEGY | SECONDARY COUNTERMEASURE |
|---|---|
| Horizontal Deflection | Roundabout |
| Travel Lane Width Reduction | Tighten Curb Radii |
| | Corner Bulb Out |
| | Slow-Turn Wedges |
| | Truck Apron |
| | Hardened Centerline |
| | Choker |
| | On-Street Parking |
| | Road Diet |
| | Roadway Landscaping |
| Signing | Curve Warning System |
| Pavement Markings | Transverse Rumble Strips |
| | Raised Pavement Markers |
| | Optical Speed Reduction Markings |
| | High Visibility Crosswalk |
| Traffic Signal Operations | Signal Phasing (Separate Users in Time) |
| | Signal Coordination Set for Bikes |
| Communication and Outreach Strategies | Social Media Campaign About Safe Speeds |
| | In-Vehicle Notifications about Safe Speeds, Speed Limit, etc. |
| | Public Outreach, Transparency about Crash Statistics and Trends |
| | Public Platform for Communicating/Receiving Roadway Safety Concerns |
| | School Campaigns/Workshops |
| | Portable Changeable Message Sign Campaign |

**Table 8: Secondary Speed Management Countermeasures**


Credit: City of Bellevue

# 05

# EVALUATION AND NEXT STEPS

## ▶ How can progress on speed management in Bellevue be monitored and evaluated?

## ▶ What are the next steps to continue the speed management work area?

The SMP provides a framework to address speed safety concerns on arterials roadways in Bellevue. It affirms that speeding directly impacts the severity and community burden of crashes, as measured by collisions with fatal or serious injuries. To ensure that this plan initiates targeted speed management action on Bellevue arterials, this final chapter outlines the KPIs for speed management on arterials and the next steps the city should consider to develop this work area.

### Bellevue Key Performance Indicators

The City of Bellevue collects, maintains and analyzes various types of speeding and crash data to understand challenges with speeding in the city. The speed management KPIs serve as interim checkpoints to ensure that the ultimate target of zero fatal or serious injury crashes on Bellevue's roads is met by 2030. These KPIs are informed by national and international best practices, and will be monitored and evaluated over time to align with state guidance and emerging practices (see *Table 10* > *Actions 9* and *11*).[xxvii] [xxviii] [xxix] [xxx] [xxxi] [xxxii] [xxxiii]

To ensure the speed management measures taken are effective, the KPIs for 30+ mph arterials are separated into two levels of analysis: network-wide and by individual corridor (*Table 9*). By monitoring the network-wide impact of countermeasures, the city can identify changes in speed-related patterns programmatically to understand how the interventions are affecting speeding citywide and over time (e.g. if speeds along one road increase as a result of countermeasures on a parallel roadway).[xxxiv]

| Key Performance Indicators | Network-wide: All Bellevue Arterials | | | Corridor-Specific: Post Countermeasure Implementation | Source |
|---|---|---|---|---|---|
| | 2022 Base Year Values | 2027 Goal | 2030 Goal | 1-Year Post Implementation | |
| Speed-related fatal and serious injury crashes per year | 5.36 crashes/ year | 0 crashes/ year | 0 crashes/ year | 100% reduction | WSDOT Crash Database |
| Percent of drivers exceeding speed limit 6+ mph | 7.6% | 6% | 4% | 50% reduction | Iteris Clearguide Speeding Map |
| Percent of drivers exceeding speed limit 10mph+ | 2.3% | 2% | 0% | 100% reduction | Iteris Clearguide Speeding Map |
| Gap in Level of Traffic Stress goal in MIP | 46% | 30% | 20% | Meets LTS Goal in MIP | COB MIP Dashboard |

**Table 9: Bellevue Speed Management Key Performance Indicators**

In *Table 9*, the network wide KPIs feature a 2027 and a 2030 goal. Alternatively, in monitoring individual corridors after implementing speed management measures, the city can understand direct corridor impacts, make additions or adjustments as needed, and ensure that crashes and speeds by corridor are on track to meet its Vision Zero goal by 2030. The corridor specific KPIs are designed for one-year post countermeasure implementation.

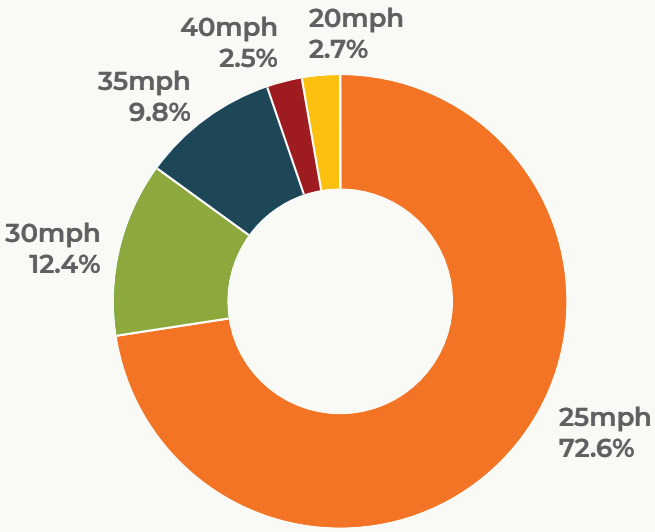



**Figure 30: Percent of streets for each speed limit in Bellevue in 2023.**

Credit: R. Homolya and the City of Bellevue

There are other datasets without set targets that are worth monitoring over time for speed management. For example, the percent of streets with each speed limit annually (see *Figure 30*). While 30+ mph arterials represent only 25% of total street mileage, they account for 88% of fatal and serious injuries. As various forms of data are available over time, the city should consider updating KPIs and other datasets to track progress (see *Table 10 > Action 11*).

## Speed Management Plan – Next Steps

The SMP is a first and important step towards reducing unsafe speeds on 30+ mph arterials in Bellevue. It does not answer the questions for all aspects of speed management; however, it represents a critical milestone in establishing clarity and consensus on the city's next steps towards safe speeds on arterials roadways. *Table 10* details the key next steps for speed management, influenced by FHWA's Speed Management Action Plan Implementation Steps.[xxxv]

| Strategies & Actions | Description | Estimated Target | Lead + Partners |
|---|---|---|---|
| **Strategy 1: Develop an Implementation Team** | | | |
| **Action 1: Establish a staff team and a program charter for the administration of the Speed Management Plan** | With the Traffic Engineering group as lead, identify staffing for program and project management. The city may create a program charter similar to those existing for other work areas in the Transportation department. | Establish by Quarter 4, 2024. | Traffic Engineering, NTSS (Lead) + Mobility Planning & Solutions (Support) |
| **Strategy 2: Establish Programming and Funding** | | | |
| **Action 2: Develop Speed Management Plan actions in the Vision Zero Action Plan.** | Determine realistic, measurable goals for the SMP, such as a target number of corridors to be analyzed and a target number of corridors with new speed management countermeasures implemented. Add the actions to the annual Vision Zero Action Plan. | Set by Quarter 2 annually. | Traffic Engineering, Mobility Planning & Solutions (Lead) + NTSS (Support) |
| **Action 3: Identify the funding source(s) for Speed Management Plan evaluations and countermeasure implementations.** | Identify the evaluation, implementation, and management of the SMP funding sources. Internal decision-makers may consider readjusting existing funding program allocations, creating a new funding program, pursuing grants, and/or utilizing a new revenue stream(s) such as those from new speed safety cameras and new capital allocations, among others. | Identify by Quarter 4, 2024. | Traffic Engineering, NTSS, Mobility Planning & Solutions (Lead) |
| **Action 4: Develop a program for deploying speed management countermeasures and funding their installation.** | Additional consideration (e.g. staff capacity, budget availability) is needed to identify capacity to introduce countermeasures on corridors. The SMP staff team should determine an approach to prioritizing and funding these countermeasures based on the results of future speed studies and the sorting from the corridor sorting tool. | Identify by Quarter 4, 2024. | Traffic Engineering, NTSS, Mobility Planning & Solutions (Lead) |
| **Strategy 3: Strategic Alignment and Tasks** | | | |
| **Action 5: Create a proactive approach to determining the "recommended" speed limits on multiple corridors.** | Establish an approach for determining engineer recommended speeds limits on multiple corridors, including staff leads, sequencing and timeline. While the Speed Limit Setting tool provides a procedure to receive a "suggested" speed from the tool and then develop a "recommended speed" by the engineer(s) (which may better match the roadway context and the Vision Zero 2030 goal), this procedure is limited to a corridor-by-corridor basis. | Develop by Quarter 2, 2024. | Traffic Engineering (Lead) + Mobility Planning & Solutions (Support) |

| Strategies & Actions | Description | Estimated Target | Lead + Partners |
|---|---|---|---|
| **Action 6: Conduct a One City review of the current speed safety camera (SSC) program and develop a Standard Operating Procedure.** | Assemble an interdisciplinary staff group to determine potential pathways forward with SSCs, considering Washington state law, industry best practices, community feedback, and internal expertise based on existing SSCs in Bellevue. | Timeline to be determined. | Mobility Planning & Solutions (Lead) + NTSS, PD, CMO, CAO, Transportation PIOs, Traffic Engineering (Support) |
| **Action 7: Strengthen and expand the partnership between the Transportation and Fire departments for speed management efforts.** | Update the existing Memorandum of Understanding (or similar agreement or procedure) between the Fire and Transportation departments, to include citywide speed management, beyond existing speed management on neighborhood streets. Develop working relationships between those responsible for the SMP evaluation and implementation, and the Fire Department. | Organize group by Quarter 2, 2024.<br><br>Update of MOU timeline to be determined. | Traffic Engineering, NTSS, Fire (Lead) + Mobility Planning & Solutions, CAO, Police (Support) |
| **Action 8: Develop a Safe Speeds education campaign.** | Leverage the SMP to develop a Safe Speeds educational campaign that notifies the public about upcoming traffic calming and speed management events, projects, and safety concerns. | Develop by Quarter 4, 2025. | Mobility Planning & Solutions, NTSS, Transportation PIOs (Lead) + Traffic Engineering, Police PIO (Support) |
| **Action 9: Continue to align speed management with WSDOT guidelines.** | Continue to coordinate safe speed strategies with Washington State Department of Transportation's guidance, such as the guidelines for an injury minimization speed setting approach. | Ongoing | Mobility Planning & Solutions (Lead) + Traffic Engineering, NTSS (Support) |
| **Strategy 4: Monitor, Refine and Evaluate** | | | |
| **Action 10: Utilize the SMP arterial categories, Sorting Tool and Countermeasure Toolbox; and update each over time.** | Periodically review the SMP, including the arterial categories, Sorting Tool and Countermeasures Toolbox to update with evolving state of arterials in Bellevue and industry best practices. | Ongoing | Traffic Engineering, Mobility Planning & Solutions (Lead) |
| **Action 11: Monitor and refine the Key Performance Indicators (KPIs) to measure performance of speed management by the city.** | Collect data, including citywide evaluation (macro level) and pre-/post-countermeasure implementation studies (micro level), to evaluate effectiveness of countermeasures deployed, and adjust KPIs over time. | Macro level by Quarter 3, annually.<br><br>Micro level subject to implementa-tion. | Mobility Planning & Solutions (Lead) + Traffic Engineering (Support) |

**Table 10: Next steps following publication of the Speed Management Plan.**


Credit: City of Bellevue

# Appendix A

## SPEED MANAGEMENT PLAN DEVELOPMENT

## Existing Speed Management Practices

The City of Bellevue has long-managed speeds on arterial and local streets. Approaches have historically relied on crash histories, resident requests, community interest, existing policy goals and other factors. There are several guiding documents that inform how and where speeds have been managed on city streets while setting the framework for engineering, education, encouragement, and enforcement efforts aimed at mitigating speed concerns. A summary of these is provided below.

### Guiding Policies

- **Vision Zero** – Aims to eliminate traffic deaths and serious-injury collisions on city streets by 2030, through an established Safe System approach.
- **Comprehensive Plan** – A foundational policy document, guiding growth and development in Bellevue for a 20-year span. Within the Transportation Element are several policies related to roadway safety and Vision Zero. These include TR-55 and TR-157 are related to roadway safety while TR-64, TR-65, and TR-66 are related to Vision Zero.
- **Bellevue City Code** – Chapter 11.32 Speed of the Bellevue City Code establishes the speed limits on city streets.

### Guiding Documents

- **Transportation Department's Design Manual** – Establishes requirements for transportation-related facilities in the city. The Design Manual sets the framework for how roadways sections are built and includes standard drawings for various speed management mitigation tools built in Bellevue, such as speed humps. The Design Manual applies to both arterial and local streets and is updated on a recurring basis.
- **Residential Traffic Guidebook** – A comprehensive toolkit of traffic calming measures used on local streets in Bellevue to improve traffic safety outcomes. There are 30 tools, 23 of which are identified to reduce excessive vehicle speeds. This document reflects a nearly 40-year history of residential traffic calming in Bellevue (program established in 1985) and aligns with national traffic calming guidance by ITE and the US DOT. [xxxvi] [xxxvii]
- **Speed Limit Standard Operating Procedure (SOP)** – Outlines the procedures to set speed limits that inform motorists of the appropriate travel speed for a roadway under normal conditions. The SOP was revised in 2022 to consider best practice factors such as land use context, collision experience, pedestrian and bicyclist usage, current travel speeds, and roadway and roadside characteristics. A speed limit setting tool was also developed to create a consistent evaluation framework for setting speed limits.
- **Memorandum of Understanding (MOU) between Transportation and Fire Departments** – Emergency response vehicles play a role in how city streets are designed, and the Fire Department has the critically important goal of reaching people in a time of need, quickly and with minimal impediment. The city has designated priority emergency response routes (primary and secondary) that serve as important arteries to get response vehicles to incidents with minimal friction. Recognizing this, the Transportation Department coordinates with the Fire Department to ensure that traffic calming on streets does not unduly impact emergency response. To that end, an MOU between the two departments exists to define the commitment to partner together while seeking to reach the goal of minimizing crashes and injuries.

## Engineering

Through strategic investments, the city has worked on various projects over the years that redesign the roadway to directly or indirectly manage speeds on arterial roadways. Speed calming engineering designs are generally installed as part of a wider transportation improvement or city project, in response to community concerns about speeding, or in support of re-allocating space to accommodate people riding bikes and walking. To date, the city has not had a standalone program specifically aimed at reducing speeds. A snapshot of the speed reducing efforts incorporated into other programs can be found below, with each indicating some of the street characteristics on which they've generally been implemented.

- **Radar signs** – Since 2000, the city has installed stationary radar feedback signs on arterial roadways. Following installation, they have been shown to decrease travel speeds by 3 mph, on average. As of May 2023, there 60+ radar signs in Bellevue. To date, radar signs have only been installed on city roadways with one lane per direction.
- **Vertical deflection** – The city is a leader in speed hump installation, with nearly 40 years of experience. The city currently employs 12' and 22' speed humps on local streets. Recently, speed cushions—treatments similar to speed humps but have channels in the hump to allow unimpeded passage by emergency vehicles on higher-speed, higher-volume collector arterials—have been tested in the city in collaboration with the Fire Department. Raised intersections have been deployed and are planned for arterials in the city's urban core area.
- **Medians** – Medians, often landscaped, have been used in Bellevue on arterials in uninterrupted lengths along a roadway or intermittently.
- **Travel lane width reduction** – Medians, often landscaped, have been used in Bellevue on arterials in uninterrupted lengths along a roadway or intermittently.
- **Road diet** – Reducing the number of travel lanes in a cross-section of roadway—a road diet—has been used on Bellevue arterial roadways, primarily when there is excess vehicle capacity and/or when trying to balance the roadway envelope for other uses (e.g. create a bike lane).
- **Compact roundabouts** – There are three compact roundabouts in Bellevue that have been installed to alleviate vehicle congestion and improve safety (both on arterials and local roadways).
- **Speed limit evaluation/reduction** – While the city has not conducted a comprehensive speed limit evaluation, there have been instances where speed limits have been reviewed and adjusted. This includes when new parts of the city were annexed or when new roadways were built. In 2020, the city started implementing 20 mph slow zones on local streets in select neighborhoods. To date, there have been three 20 mph slow zones established, with each showing speed reductions following installation.

## Encouragement and Education

The city deploys numerous programmatic and project-specific education and communications campaigns to encourage people to travel at appropriate speeds. Yard signs that convey messages such as "Slow Down, Kids Live Here" and "Slow Down, Set the Pace" are available to any resident that requests them. City residents can also borrow portable radar dollies—similar to the radar feedback signs—for two weeks to encourage people to drive the speed limit on their street. These are placed by city staff behind the face of the curb or in a parking shoulder. The city has a larger radar trailer that similarly displays the speed of passing motorists and is often placed on higher-speed/volume arterials. The city also utilizes several social media channels, such as Twitter, to periodically remind residents and visitors to travel at appropriate speeds.

### Enforcement

The city's Police Department has a traffic division that enforces speeds on city streets, among other duties. There are also three permanent speed safety cameras that enforce 20 mph speed limits in school zones. A sworn officer must review all violations issued from these cameras before the ticket is sent to the registered owner of the vehicle caught speeding.

- **Automated Traffic Safety Cameras** – Bellevue has utilized Automated Traffic Safety Cameras for red-light violations (four locations) and for school zone speed (three locations) violations since 2010. There has been a gradual decrease in annual violations for both types of photo enforcement in Bellevue along with a low rate of repeat violation (8.8% for school zone SSCs and 12.7% for red-light cameras). In 2022, there were 6,899 infractions recorded by the SSCs in the school zones. Recent Washington legislation has expanded the locations where photo enforcement may be utilized. Newly eligible locations are discussed further in *Appendix E*.

## Speed Management Plan Stakeholder Workshop 2023

To develop the SMP, the project team convened a two-day virtual Speed Management Workshop. Relevant information from the two day workshop is included below, including the list of participants in January 2023 and key takeaways.

| Attendees from Bellevue: | Attendees from toXcel: | Attendees from External Organizations: |
|---|---|---|
| • Bianca Popescu<br>• Stela Nikolova Abed<br>• John Murphy<br>• Kurt Latt<br>• Vanessa Humphreys<br>• Landon Barnwell<br>• Janet Shull<br>• Darcy Akers<br>• Justin Chan<br>• Christopher Long<br>• Franz Loewenherz<br>• Darek Jarzynksi<br>• Daniel Lai<br>• Geoff Bradley<br>• Mark Anderson<br>• Linda Whitehead<br>• Monica Buck | • Virginia O'Connor<br>• Venkat Nallamothu<br>• Stephen Taylor<br>• Bryan Katz<br>• Jennifer Symoun | • Don Dixon, Bellevue School District<br>• Shelly Baldwin, Washington Traffic Safety Commission<br>• Janine Koffel, Washington Traffic Safety Commission<br>• Tanisha Sepulveda, Disability Rights Washington<br>• Matthew Enders, WSDOT<br>• Dongho Chang, WSDOT<br>• Guan Xu, FHWA<br>• Anthony Boutros, FHWA<br>• Joel Barnett, FHWA<br>• Jeffrey King, FHWA<br>• Anyesha Mookherjee, FHWA<br>• Tim Taylor, FHWA<br>• Paul LaFleur, FHWA<br>• Abdul Zineddin, FHWA<br>• Reo Nelson, FHWA<br>• Wen Hu, IIHS<br>• Kevin Murphy, DVRPC<br>• Sharang Malaviya, PennDOT |

The purpose of the first day of the workshop was for city staff to learn speed management best practices from federal and state experts, as well as gain insights on the city's speed management history and current speed and safety data. A range of stakeholders provided presentations with important considerations for the development of the SMP, including:

- Pedestrian fatalities in Washington state are increasing.
- Self-enforcing street design and a cultural shift are important for prioritizing safe speeds and multi-modal accessibility in low-income areas.
- Speed safety cameras (SSCs) are shown to be effective to reduce speeding and injury crashes when used as part of a broader speed management plan.
- Considering equity and involving diverse stakeholders in every step of the SSC implementation process is important, including site location, penalty structure, and transparency.
- There is a need for new legislative policies to support the SMP, especially with regards to SSCs. There is a need for more tools and vocabulary to address equity considerations in traffic enforcement and fines.
- Representatives from the Delaware Valley Regional Planning Commission (DVRPC) and Pennsylvania Department of Transportation (PennDOT) presented on their data-driven approach to determine where speed management treatments are most appropriate on arterials in Philadelphia through developing arterial typologies.
- It is important when working on equity to address upstream factors such as institutional inequities and social inequities. One example given was to maintain the transportation system proactively rather than follow a complaint-based response practice.
- It is necessary to consider the needs of all road users (including emergency response) and to evaluate the suitability of speed management countermeasures on a case-by-case basis.
- The Iteris ClearGuide dashboard is one source for speed data, but it is important to also consider other non-vehicle-based factors, such as equity, land use, speed limit, or street classification when prioritizing locations or selecting countermeasures.

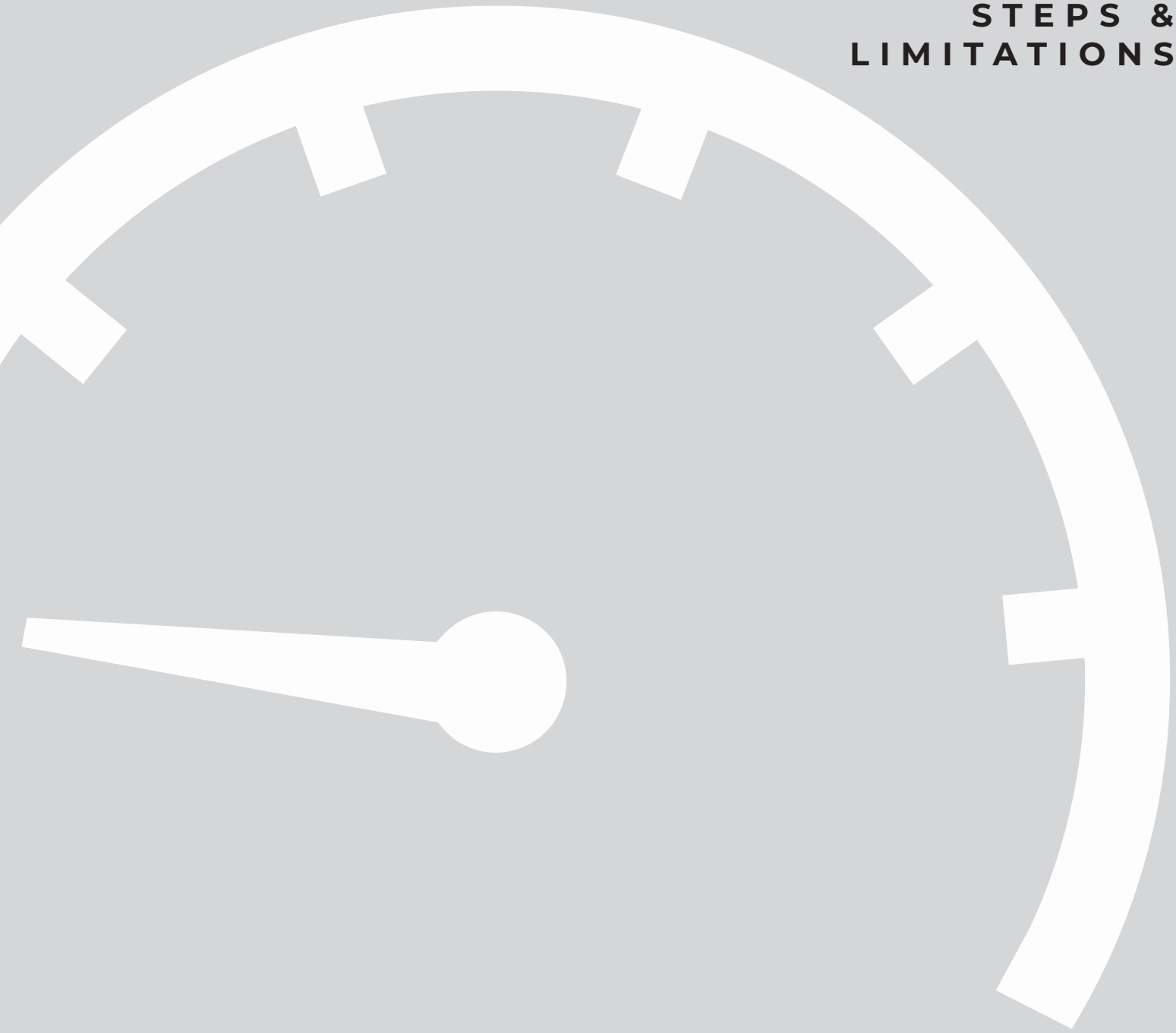
The purpose of the second day of the workshop was for city staff to gain consensus on speed management countermeasures for certain arterial categories and to understand the SMP next steps. The collective goals and vision of the SMP and an introduction to the proposed arterial categories (called typologies at the time) was presented to the city staff stakeholders. The stakeholder group then collectively used a virtual Mural Board to give their feedback on the appropriateness of the speed management countermeasures in Bellevue and for the arterial typologies.

Upon further internal discussion, concerns emerged that the typologies would be interpreted as a new classification in addition to existing arterial classifications. Therefore, for the Bellevue-specific context and for the interest of simplicity, the SMP relies only on speed limit and land use to discuss different types of arterial corridors in the city (see *Chapter 2*). In addition, concern with including tools in the Countermeasure Toolbox that are not currently in use or unlikely to be used near-term, as well as including tools which are not first and foremost targeting speed management, led to separation of primary and secondary countermeasures. See *Chapter 4* for the Countermeasure Toolbox.


Credit: City of Bellevue

# Appendix B

## SPEED MANAGEMENT CORRIDOR SORTING TOOL: DATA GATHERING STEPS & LIMITATIONS



## Data Gathering for the Sorting Tool

The Speed Management Corridor Sorting Tool requires a number of data inputs from various sources. This section identifies where each dataset is collected and how to analyze the data in support of future updates to sorting tool.

The base layer is the 'StreetCenterlines' layer provided by the City of Bellevue IT Department. Due to the granularity of the street data, this layer contains over 900 unique segments. It was used as the base to join the following layers used in the sorting tool:

1. Bellevue's latest High Injury Network (HIN)
2. Speed Related Crash Data
3. Speed Data
4. Equity Composite Index (ECI) Score
5. Bicycle Network Data
6. Sidewalk Coverage
7. Crosswalk Presence

After this, the Streets layer segments were joined for all segments that had the same continuous land use and speed limit, resulting in 113 segments.

- **Note:** *As a result of merging segments based on their land use, speed limit, and route name, some segments were too short because they: (1) ended shortly after a change in land use, (2) crossed multiple land uses, or (3) changed names but were still a part of the greater corridor. In these instances, corridor segments less than 1,000 feet were evaluated for potential aggregation. If deemed appropriate (based on staff judgment), these segments were merged by creating an attribute titled "Merge_On", which could be manually changed to match in instances where it made more sense to consider the corridor as a single unit rather than multiple units..*

## Adding Data to the Base Layer

Each of the following data sets was joined to the City of Bellevue 'Streets' layer, available through the Bellevue internal Carta database.

| Base Layer: StreetCenterlines | |
|---|---|
| **Location of Information:** | • Note that the staff member to collect and compile these layers needs permissions to access the Carta database, as well as have the database connection saved, as described in the City of Bellevue GIS User set up manuals provided by IT. Contact the IT department if there are issues accessing ArcGIS and/or the Carta database.<br>• Open a new or existing ArcMap. Select 'Add Data' →V:\ → MapEssentials → DatabaseConnections → Connection to Carta → Carta.LIS.MVSStreetCenterlines |

**How to limit the layer to only 30+ mph arterials**

To limit the layer to only arterials:

- Right click on the 'LIS.MVSStreetCenterlines' layer.
- Select 'Open Attribute Table'.
- Select 'Select by Attributes' at the top left of the attribute table.
- Fill out the 'Select by Attributes' table with the following:
  - Method: 'Create a new selection'
  - Double click 'ArterialClassification' from the list of attributes, which will populate 'ArterialClassification' in the text box below.
  - Select 'Get Unique Values'. The middle white box will populate with a list of all possible values for this attribute.
  - Select the '=' sign to populate this in the bottom box.
  - Double click 'Collector Arterial', then select 'Apply'.
  - In the method box, select 'Add to current selection'.
  - In the equation, erase 'Collector Arterial' and add (by double clicking) 'Major Arterial', and select 'Apply'. You'll see the selection is now both majors and collectors.
  - Erase 'Major Arterial', double click 'Minor Arterial', then select 'Apply'.
  - Erase 'Minor Arterial', double click 'Other Arterial', then select 'Apply'.
- Once all four types of arterials are selected, close the window.
- Right click on the 'LIS.MVSStreetCenterlines' layer again, with the arterials still selected.
- Hover over 'Export' → and select 'Export Data'.
- Ensure 'Selected features' is the export.
- With the folder at right of 'Output feature class' save the layer with the name and location desired. For example, 'ArterialsBaseLayer' in the V:\ → TransDeptGIS → GeoDB → Planning → SMP.
- There will be a prompt for 'Do you want to add the exported data to the map as a layer?', select 'Yes'.
- Select 'clear selection' at the top of the 'LIS.MVSStreetCenterlines' to remove the blue selection (note: do not select 'delete', this is only to deselect).

To limit the layer to only 30, 35 and 40 mph arterials:

- Right click the newly created arterials-only file.
- Select 'Open Attribute Table'.
- Select 'Select by Attributes' at the top left of the attribute table.
- Fill out the 'Select by Attributes' table with the following:
- Method: 'Create a new selection'
  - Double click 'SpeedLimit' from the list of attributes, which will populate 'SpeedLimit' in the text box below.
  - Select 'Get Unique Values'. The middle white box will populate with a list of all possible values for this attribute.
  - Select the '=' sign to populate this in the bottom box.

| | |
|---|---|
| | - Double click '30, then select 'Apply'.<br>- In the method box, select 'Add to current selection'.<br>- In the equation, erase '30' and add (by double clicking) '35', and select 'Apply'. You'll see the selection is now both 30 and 35.<br>- Erase '35', double click '40', then select 'Apply'.<br>• Once all three speed limits are selected, close the window ('X' at the top right or 'Close' at the bottom right).<br>• Right click on the arterials-only layer again, with the 30+ mph arterials still selected.<br>• Hover over 'Export' → and select 'Export Data'.<br>• Ensure 'Selected features' is the export.<br>• With the folder at right of 'Output feature class' save the layer with the name and location desired. For example, '30mphArterialsBaseLayer' in the V:\ → TransDeptGIS → GeoDB → Planning → SMP.<br>• There will be a prompt for 'Do you want to add the exported data to the map as a layer?', select 'Yes'.<br>• This new layer (30+ mph arterials) is the base layer for the SMP. |

| **Dataset 1: High Injury Network (HIN)** | |
|---|---|
| **Location of Information:** | Check with the Mobility Planning and Solutions team, which is responsible for the creation and maintenance of the most recent HIN shapefiles. At the time of this plan's development, the shapefile was stored in the internal drive (V drive → TransDeptGIS → GeoDB → Planning → VisionZero → HIN.gdb → HIN_2010_2019). |
| **How to fill out the HIN column in the Sorting Tool spreadsheet:** | To add the HIN to the sorting tool spreadsheet and shapefile:<br>• Import the HIN shapefile into a GIS tool (e.g. ArcMap).<br>• Create a 30-foot buffer of the HIN.<br>- Select the Buffer tool: Search tool → type "Buffer" → select "Buffer (Analysis)", OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the HIN layer.<br>- Output feature class: select the folder at right to add the name and location of the output feature.<br>- Distance: select linear unit, feet, and type "30" in the text box.<br>- Select "OK".<br>• Spatially join the HIN to the existing roadways.<br>- Right click the base layer (30+ mph arterials).<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the HIN layer for the layer to join. |

| | |
|---|---|
| | - Keep the 'Each line will be given a summary of the numeric attributes of the lines in the layer being joined...' option.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>• Add an attribute to indicate "0" for any Null values and "1" for any arterials that had overlap with the HIN.<br>- With the new joined layer (base layer + HIN), there is a new field called 'Count_' in the attribute table. This indicates if the corridor segment is on the HIN (a non-zero value) or if it is not (a zero value).<br>- Note that you can fix the name and the number by starting an editing session. The assigning of ones and zeros can be done when the street segments are aggregated by speed limit and land use.<br>- When applicable: If the corridor is along the HIN, add a "1" in this column, if not, add a "0" to this column. For corridors with only a segment along the HIN, still mark that column with a "1." |

| **Dataset 2: Speed Related Crash Data** | |
|---|---|
| **Location of Information:** | At the beginning of the project, crash data was requested from WSDOT for a 10 year period for the City of Bellevue. These data were filtered to identify Serious Injury and Fatal Crashes that occurred as a result of speeding. The Mobility Planning and Solutions team maintains this data, pulled from the WSDOT Crash Database. |
| **How to use the 2) Crashes and # Serious Injury Crashes (10 Years) Column in the Tool:** | Were there speeding-related severe injury (SI) crashes along this corridor in the past 10 years? If so, add the number to this column.<br>• To add Serious Injury Crashes to the sorting tool:<br>• Import all crashes into a GIS tool (V:\ → TransDeptGIS → GeoDB → Planning → VisionZero → annual crash data layer). For 2023, the file is 'WSDOT_Collisions_2012_2021_FINAL'.<br>• Filter crashes to only include serious injury crashes that are speeding related.<br>- Right click on the crash layer.<br>- Select 'Properties'.<br>- Filter the attributes contributing factors to include all those that are serious injury AND speeding-related.<br>• Create a 40-foot buffer of filtered crashes.<br>- Select the Buffer tool: Search tool → type "Buffer" → select "Buffer (Analysis)", OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the crash layer.<br>- Output feature class: select the folder at right to add the name and location of the output feature. |

| | |
|---|---|
| | Distance: select linear unit, feet, and type “40” in the text box.<br>- Select “OK”.<br>• Join crashes to the existing roadways by location.<br>- Right click the base layer.<br>- Select ‘Join’.<br>- For ‘What do you want to join to this layer?’ select ‘Join data from another layer based on spatial location’.<br>- Select the filtered crash layer for the layer to join.<br>- Keep the ‘Each line will be given a summary of the numeric attributes of the points that are:’ option and select ‘intersected by it’.<br>- Select ‘sum’ for ‘How do you want the attributes to be summarized?’.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select ‘OK’.<br>- The new layer and table will be populated with a count summary of the serious injury crashes. |
| **How to use the 2) Crashes and # Fatal Crashes (10 Years) Column in the Tool:** | Were there speeding-related fatal crashes along this corridor in the past 10 years? If so, add the number to this column.<br><br>To add Fatal Crashes to the sorting tool (same as above, written in brief below):<br><br>• Import all crashes into a GIS tool.<br>- (V:\ → TransDeptGIS → GeoDB → Planning → VisionZero → annual crash data layer). For 2023, the file is ‘WSDOT_Collisions_2012_2021_FINAL’.<br>• Filter crashes to only include fatal crashes that are speeding related.<br>- Right click on the crash layer.<br>- Select ‘Properties’.<br>- Filter the attributes contributing factors to include all those that are fatalities AND speeding-related.<br>• Create a 40-foot buffer of filtered crashes.<br>- Select the Buffer tool: Search tool → type “Buffer” → select “Buffer (Analysis)”, OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the crash layer.<br>- Output feature class: select the folder at right to add the name and location of the output feature.<br>- Distance: select linear unit, feet, and type “40” in the text box.<br>- Select “OK”.<br>• Join crashes to the existing roadways by location. Use a count summary to join the fatal crashes.<br>- Right click the base layer.<br>- Select ‘Join’. |

| | |
|---|---|
| | - For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the filtered crash layer for the layer to join.<br>- Keep the 'Each line will be given a summary of the numeric attributes of the points that are:' option and select 'intersected by it'.<br>- Select 'sum' for 'How do you want the attributes to be summarized?'.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>- The new layer and table will be populated with a count summary of the serious injury crashes. |

| **Dataset 3: Speed Data** | |
|---|---|
| **Location of Information:** | This information was obtained through Bellevue's speed data portal. At the time of this document's development, Bellevue held a 3-year service agreement with Iteris for their ClearGuide Speeding Map dashboard. |
| **How to use the 3) Speeding and % Speeders exceeding speed limit >10 MPH Column in the Tool:** | The percentage of speeders is the percentage of vehicles recorded exceeding the posted speed limit by more than 10 MPH. Put the percentage of speeders in this column.<br>To add speeding data to the sorting tool:<br>• Export speeding data from ClearGuide (see parameters for download at the end of this section).<br>• Import CSV of speeding data into GIS tool.<br>• Join the CSV to the ClearGuide shapefile on the TMC code.<br>- Right click the ClearGuide shapefile (see explanation at the end of this appendix for how to get this shapefile).<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join attributes from table'.<br>- Select the CSV for the table to join to this layer.<br>- Select the TMC code attribute.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>• Convert the vector to centroids.<br>- Select the Feature to Point tool: Search tool → type 'vector to centroid' → select "Feature To Point (Data Management)", OR ArcToolbox → Data Management Tools → Features → Feature to Point.<br>- Input feature: the percent of speeders value. |

| | |
|---|---|
| | - Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>• Buffer the centroids 30 feet.<br>- Select the Buffer tool: Search tool → type "Buffer" → select "Buffer (Analysis)", OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the new layer for percent of speeders.<br>- Output feature class: select the folder at right to add the name and location of the output feature.<br>- Distance: select linear unit, feet, and type "30" in the text box.<br>- Select "OK".<br>• Join buffer to existing roadway by location summary.<br>- Right click the base layer.<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the new percent of speeders layer for the layer to join.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'. |
| **How to use the 3) Speeding and Difference between 85th and 50th Column in the Tool:** | The speed differential is the difference between the 85th percentile speed and the 50th percentile speed along the corridor. Put the speed differential in MPH in this column.<br>The 85th percentile speeds and 50th percentile speeds were each joined to the Bellevue street base layer as described above. Then a table calculation was utilized to take the difference between the 85th and 50th percentile speed for each segment. |

| **Dataset 4: Equity Composite Index (ECI) Score** | |
|---|---|
| **Location of Information:** | Check with the Long Range Planning staff and the Mobility Planning and Solutions team, which are responsible for the creation and maintenance of the most recent ECI shapefiles. At the time of this plan's development, the shapefile was stored in the internal drive (V drive → TransDeptGIS → GeoDB → Planning → VisionZero → MIP). |
| **How to use the 4) ECI Score Column in the Tool:** | Identify the highest Equity Composite Index ranking (ECI) of the block groups adjacent to the corridor.<br>To add the ECI Score to the sorting tool: |

| | |
|---|---|
| | • Import the composite score layer into a GIS tool.<br>• Spatially join the existing network to the composite score.<br>- Right click the base layer.<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the new percent of speeders layer for the layer to join.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>- Keep the score that the longest portion of the corridor passes through. |

| **Dataset 5: Bicycle Network Data** | |
|---|---|
| **Location of Information:** | Check with the Long Range Planning staff and the Mobility Planning and Solutions team, which are responsible for the creation and maintenance of the most recent bike network and MIP LTS shapefiles. At the time of this plan's development, the shapefiles were stored in the internal drive (V drive → TransDeptGIS → GeoDB → Planning). |
| **How to fill out the 5) Bicycle Network and Priority Bicycle Corridor Column in the Tool:** | Has the corridor been identified as being along Bellevue's Priority Bicycle Network? If so, add a "1" in this column, if not, add a "0" to this column.<br>To add the Priority Bicycle Corridor Score to the sorting tool:<br>• Import the Priority Bicycle Corridor shapefile (V drive → TransDeptGIS → GeoDB → Planning → PriorityBicycleCorridors).<br>• Buffer the layer 30 feet.<br>- Select the Buffer tool: Search tool → type "Buffer" → select "Buffer (Analysis)", OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the priority bike corridor layer.<br>- Output feature class: select the folder at right to add the name and location of the output feature.<br>- Distance: select linear unit, feet, and type "30" in the text box.<br>- Select "OK".<br>• Spatially join the buffer to the base layer.<br>- Right click the base layer.<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the Priority Bicycle Corridor layer for the layer to join.<br>- Keep the 'Each line will be given a summary of the numeric attributes of the lines in the layer being joined…' option. |

| | |
|---|---|
| | - Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>• Create an attribute that returns "0" if the sum of the priority is Null or 0 and "1" otherwise.<br>- With the new joined layer, there will be a new field called 'Count_' or similar in the attribute table. This indicates if the corridor segment is a priority corridor (a non-zero value) or if it is not (a zero value).<br>- Note that you can fix the name and the number by starting an editing session. The assigning of ones and zeros can be done when the street segments are aggregated by speed limit and land use. |
| **How to use the 5) Bicycle Network and Level of Traffic Stress Column in the Tool:** | Does this corridor meet the Level of Traffic Stress performance target in the Mobility Implementation Plan? If so, add a "0" in this column, if not, add a "1" to this column.<br>To add the LTS Score to the sorting tool:<br>• Import the Existing LOS shapefile for the bicycle network. (V drive → TransDeptGIS → GeoDB → Planning → VisionZero → MIP).<br>• Buffer the layer 30 feet.<br>- Select the Buffer tool: Search tool → type "Buffer" → select "Buffer (Analysis)", OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the priority bike corridor layer.<br>- Output feature class: select the folder at right to add the name and location of the output feature.<br>- Distance: select linear unit, feet, and type "30" in the text box.<br>- Select "OK".<br>• Spatially join the buffer to the existing roadway network.<br>- Right click the base layer.<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the LTS layer for the layer to join.<br>- Keep the 'Each line will be given a summary of the numeric attributes of the lines in the layer being joined…' option.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>• Create an attribute that returns "0" if the sum of the priority is Null or 0 and "1" otherwise.<br>- There is an attribute that identifies is the LTS is met, partially met or not met. This can be used to identify the "0" and "1" values. |

| | |
|---|---|
| | - Note that you can fix the name and the number by starting an editing session. The assigning of ones and zeros can be done when the street segments are aggregated by speed limit and land use. |

| **Dataset 6: Sidewalk Coverage** | |
|---|---|
| **Location of Information:** | Check with the Long Range Planning staff and the Mobility Planning and Solutions team, which are responsible for the creation and maintenance of the most recent pedestrian network shapefiles. At the time of this plan's development, the shapefiles were stored in the internal drive (V drive → TransDeptGIS → GeoDB → Planning). |
| **How to use the 6) Sidewalk Coverage and Missing Sidewalk on One or both sides Column in the Tool:** | Identify the highest Equity Composite Index ranking (ECI) of the block groups adjacent to the corridor.<br>To add the ECI Score to the sorting tool:<br>• Import the existing sidewalk network into a GIS tool.<br>• Create a 30-foot buffer of the network.<br>- Select the Buffer tool: Search tool → type "Buffer" → select "Buffer (Analysis)", OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the sidewalk layer.<br>- Output feature class: select the folder at right to add the name and location of the output feature.<br>- Distance: select linear unit, feet, and type "30" in the text box.<br>- Select "OK".<br>• Spatially join the buffer to the existing roadways.<br>- Right click the base layer.<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the sidewalk layer for the layer to join.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>• Add an attribute to indicate "0" for any Null values and "1" for any arterials that had overlap with the network.<br>• Take the inverse of the attribute and multiply by 2 calculated to get the score.<br>- (1-Attribute)*2<br>- If the sidewalk is missing, it receives a score of 2, otherwise it receives a score of 0.<br>- Note that you can fix the name and the number by starting an editing session. |

| Dataset 7: Crosswalk Presence | |
|---|---|
| **Location of Information:** | Check with the Mobility Planning and Solutions team. At the time of this plan's development, the shapefiles were stored in the internal drive (V drive → Trans-DeptGIS → GeoDB → Planning). |
| **How to use the 7) Crosswalk Presence and # of Midblock Crosswalks (Maximum of 2) Column in the Tool:** | How many midblock crossings are there across the corridor? Add the number of midblock crossings in this column, with a maximum of two (2). If there are no crosswalks, add a "0" in this column.<br><br>To add the crosswalk score to the scoring tool:<br>• Import the midblock crosswalks layer to a GIS tool.<br>• Create a 50-foot buffer of midblock crosswalks.<br>- Select the Buffer tool: Search tool → type "Buffer" → select "Buffer (Analysis)", OR ArcToolbox → Analysis Tools → Proximity → Buffer.<br>- Input feature: select the crosswalk layer.<br>- Output feature class: select the folder at right to add the name and location of the output feature.<br>- Distance: select linear unit, feet, and type "30" in the text box.<br>- Select "OK".<br>• Join crosswalks to the existing roadways by location. Use a count summary to join the crosswalks.<br>- Right click the base layer.<br>- Select 'Join'.<br>- For 'What do you want to join to this layer?' select 'Join data from another layer based on spatial location'.<br>- Select the midblock crosswalks for the layer to join.<br>- Keep the 'Each line will be given a summary of the numeric attributes of the points that are:' option and select 'intersected by it'.<br>- Select 'sum' for 'How do you want the attributes to be summarized?'.<br>- Use the folder icon to identify the name and select the location for the output shapefile from the join.<br>- Select 'OK'.<br>• Limit the number of crosswalks to a maximum of 2 for scoring.<br>- Note that you can fix the name and the number by starting an editing session. |

## Scoring Aggregated Corridors

Once all the data listed above were joined into a single shapefile with metrics for each of the >900 segments, the segments were grouped by category (including land use and speed limit) and by street name. An additional attribute was added titled "Merge_On" which linked the street name and category. The Merge_On attribute could then be manually changed for routes that needed to be aggregated or disaggregated to create continuous corridor segments with the same land use and speed limit.

To manually edit the corridor segments:

- Select 'Edit' in the Editor toolbar.
- Select the corridor segments to merge (the street names) that are a continuous segment corridor with the same speed limit, land use and street name.
- Select 'Merge' in the Editor menu.
- Select the corridor segment that the others will be merged into.
- Select 'OK'.

The following aggregation techniques were used for each metric:

1. Is the corridor along Bellevue's latest High Injury Network (HIN)? - Maximum of all values from the aggregated segments to mark the entire corridor as being on the HIN if any segment along the corridor is on the HIN.
2. Speed Related Crash Data - Sum values to determine how many crashes were along the corridor.
3. Speed Data – Average all values to determine the average number of speeders and the average difference in speeds along the corridor.
4. Equity Composite Index (ECI) Score – Average all values to determine what the average ECI score is for the entire corridor.
5. Bicycle Network Data – Maximum of all values to mark the entire corridor as being on the priority network if any segment along the corridor was in the network.
6. Sidewalk Coverage – Maximum of all values to mark the entire corridor as having sidewalk coverage if any segment along the corridor had coverage.
7. Crosswalk Presence – Sum of all values to count the number of midblock crossings along the entire corridor. The number of midblock crossings were limited to two prior to using this metric in the sorting tool final total.

Once the segments (>900) were merged into corridors (113), the sorting tool scored every corridor by multiplying each metric by the weights in *Table 1* and summing the weighted scores. This process was performed in 2023 on data from 2012-2021.

## How to Use Iteris ClearGuide

Note that the directions for how to use Iteris ClearGuide is directed for City of Bellevue staff use only. All data used in the SMP is available in the Speeding Map on Iteris ClearGuide. The path to access: Login → Quick Links → Speeding Map.

The page will display: (1) editable search parameters, (2) a navigable map, (3) data layers, (4) options to download README, SHP, or CSV files, (5) a preview box of the highest value corridors, and (6) a legend at bottom left.

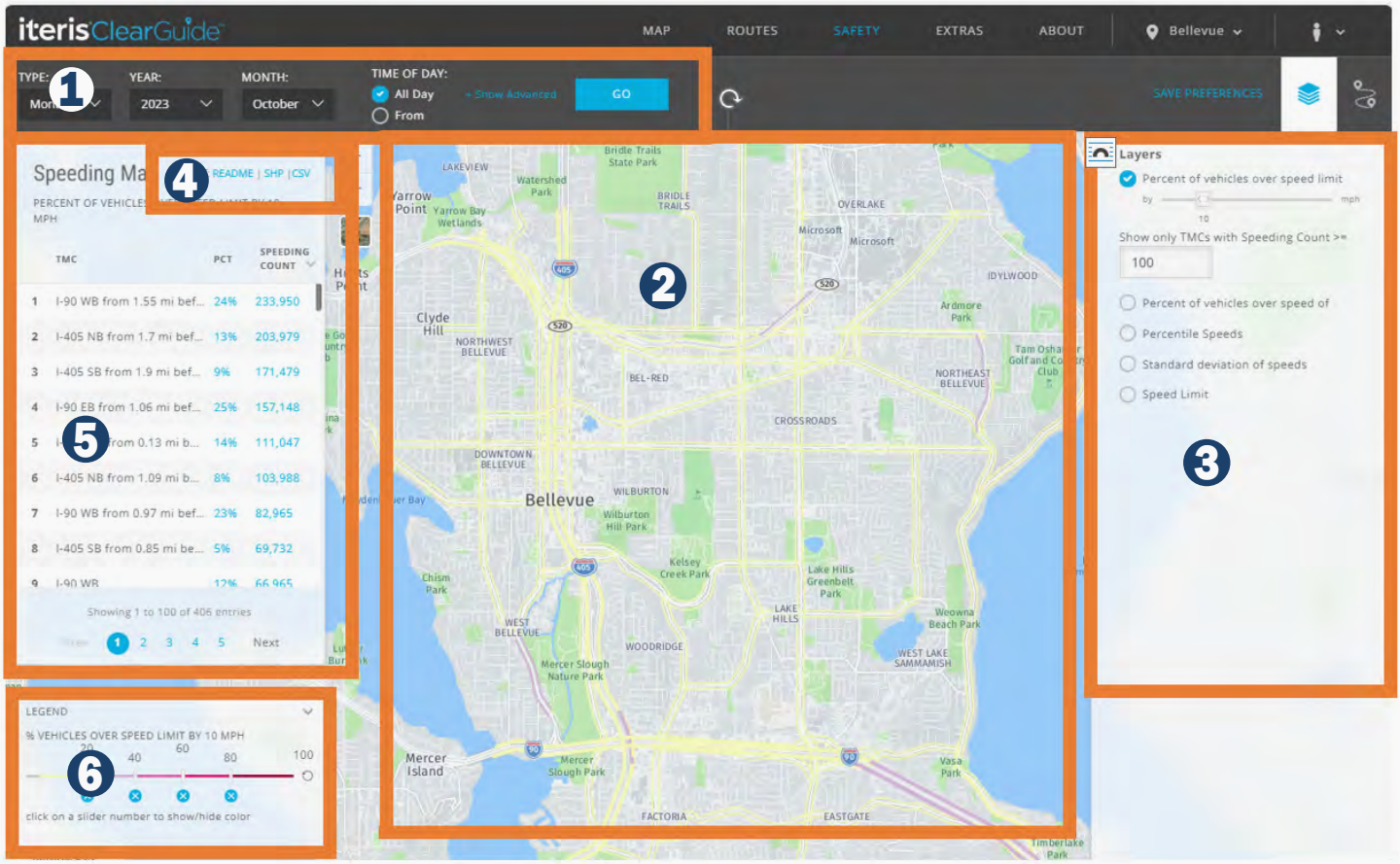



**Figure 31: The Iteris ClearGuide Speeding Map.**

Credit: Iteris ClearGuide platform

## Visualize or Download Data

To visualize or download data, select the desired data parameters at top (box 1, *Figure 31*) and data layer at right (box 3, *Figure 31*). Note that with longer data timespans, there are longer load times which may exceed 5 minutes. Once selected, the platform will automatically visualize the data. To download the data, select the 'CSV' option (box 4, *Figure 31*).

The 2023 data search parameters for all data collection and analyses:

| Corridor | 50th Percentile |
|---|---|
| Type (Data Timespan): | Year |
| Year: | 2022 |
| Time of Day: | All Day (select all hours) |
| Day of Week: | Select 'exclude holidays' |
| Roadway Type: | Select 'Arterials' only |
| Owner: | Leave State, County, and Local selected |

## Map Data in ArcMap

To map the data in ArcGIS, select the 'SHP' (shapefile) export option. Note that this is a generic shapefile of the arterials and does not feature the speeding data that is seen in the Speeding Map on the Iteris ClearGuide platform. The shapefile must have the project defined and then joined with a CSV to show speeding data.

### To Define the Projection:

- Save the SHP files (all three) in a folder that may be accessed from ArcMap.
- Open ArcMap (or similar platform) and add the SHP files. Note that the shapefile may not visualize due to the lack of projection.
- Go to the 'Define Projection' tool. This may be accessed either from the Search bar or the ArcToolbox → Data Management Tools → Projections and Transformations → Define Projection.
- Select the Iteris ClearGuide shapefile for the 'Input Dataset or Feature Class' and select the WGS 1984 (GCS_WGS_1984) coordinate system.
- Select 'OK'. This will define the projection to the same system that other Bellevue datasets (on CARTA) use.
- Save the data layer for future use.

### To visualize speeding data in ArcMap:

- Download the CSV file for the desired speed data. Save in a folder that may be accessed from ArcMap
- If the defined shapefile is not already in ArcMap, add this. Ensure that the projection is defined as WGS 1984 (see above).
- Right click on the defined shapefile. Hover over 'Joins and Relates" → select "Join...".
- Select 'tmc_code' for the field that the join will be based on.
- Select the desired speed data excel spreadsheet for the table to join the layer.
- Select 'tmc_code' for the field in the table to base the join on.
- Select 'validate join'. This will confirm that the join is possible and no data will be lost.
- Once validated, select 'OK'. Save the data layer and the map.
- Right click on the defined shapefile and select 'Properties'.
- Go to the Symbology tab. Select 'Quantities' to visualize the data in classes or 'Categories' for individual values. Select the Value Field to visualize and associated colors and labels for the unique values or classes.
- Once all visual selections are complete, click 'OK'.
- Save the map for future use.

## Sorting Tool Limitations

The SMP Sorting Tool is designed to provide a citywide reference for understanding what corridors are generally higher or lower priority for speed management action. While this is a new, useful tool for the city, there are limitations to this citywide approach. This includes:

- Missing speeding data for select arterial roadways. As described in *Appendix A*, there are a variety of corridors which do not have speeding data. Speed data estimates were created for these corridors so that they were not penalized in their scoring based on lack of data. However, it should be noted that this artificial estimate may be falsely inflating or deflating the corridor's true speeding.
- A wide variety of corridor segment lengths. The city took all arterial roadways with a speed limit of 30 mph or greater and divided these arterial segments based on their land use (urban core, urban, or suburban) and their speed limit (30, 35, or 40 mph). This segmentation was not based on distance, so smaller corridor segments (i.e. of 1,000 feet) may be compared to longer segments (i.e. 3,000 feet or greater). While there is representation of different corridor lengths across the sorted list, it is possible that longer corridor segments may benefit from greater availability of data (for crashes, infrastructure, or otherwise).

## Speed Data Gathering Limitations

All speeding data used for the Sorting Tool comes from HERE Technologies through Iteris ClearGuide. This dataset is limited to corridors that are Traffic Message Channel (TMC) encoded. As there are some arterial roadways in Bellevue with a posted speed limit of 30 mph or greater that are not TMC encoded, there is not speeding data from HERE Technologies and Iteris ClearGuide for those select segments. The following map demonstrates the TMC encoded corridors available in ClearGuide in green and all 30 mph or greater arterials which are not TMC encoded in red (*Figure 31*). The following table summarizes these segments which do not have speeding data (*Table 10*).

| Roadway Segment | From | To |
|---|---|---|
| **East-West** | | |
| Northeast 40th Street | 140th Avenue Northeast | 148th Avenue Northeast |
| Northeast 29th Place | Northeast 24th Street | 148th Avenue Northeast |
| Northeast 12th Street | 102nd Avenue Northeast | Bellevue Way Northeast |
| Northeast 10th Street | 100th Avenue Northeast | 112th Avenue Northeast |
| Northeast Fourth Street | 100th Avenue Northeast | Bellevue Way Northeast |
| Northeast Second Street | Bellevue Way Northeast | 112th Avenue Northeast |
| Northeast First Street | Northeast 10th Street | Northeast Eighth Street |
| Lake Hills Boulevard | 145th Place Southeast | 156th Avenue Southeast |
| Village Park Drive Southeast | Lakemont Boulevard Southeast | City limit |
| Southeast 38th Street | 124th Avenue Southeast | Factoria Boulevard Southeast |
| Southeast 44th Way | 164th Way Southeast | 164th Avenue Southeast |
| Southeast 60th Street | 112th Avenue Southeast | 119th Avenue Southeast |
| Southeast 60th Street | 168th Place Southeast | 170th Avenue Southeast |

| Roadway Segment | From | To |
|---|---|---|
| **North-South** | | |
| 100th Avenue Northeast | Northeast 10th Street | Main Street |
| 102nd Avenue Northeast | Northeast 12th Street | Northeast Eighth Street |
| 106th Avenue Northeast | Northeast 12th Street | Main Street |
| 108th Avenue Northeast | Northeast 12th Street | Northeast Eighth Street |
| 108th Avenue Northeast | Northeast Fourth Street | Main Street |
| 110th Avenue Northeast | Northeast 12th Street | Northeast Eighth Street |
| 120th Avenue Northeast | Northup Way | Northeast Fourth Street |
| 130th Avenue Northeast | Northeast 24th Street | Bel-Red Road |
| 132nd Avenue Northeast | Northup Way | Bel-Red Road |
| 156th Avenue Northeast | City limit | Bel-Red Road |
| 156th Avenue Northeast | Northeast 20th Street | Northeast Fourth Street |
| 114th Avenue Northeast-<br>114th Avenue Southeast | Northeast Second Street | Southeast Eighth Street |
| 124th Avenue Southeast | Southeast 38th Street | Coal Creek Parkway Southeast |
| 139th Avenue Southeast | Southeast 26th Street / Kamber Road | Southeast Eastgate Way |
| 145th Place Southeast | Southeast 16th Street | Southeast 24th Street |
| 156th Avenue Southeast | Southeast 11th Street | Southeast 24th Street |
| 156th Avenue Southeast | Southeast 27th Street | Southeast Eastgate Way |
| 164th Avenue Southeast | Southeast 44th Way | Lakemont Boulevard Southeast |
| 164th Way Southeast | 164th Avenue Southeast | Southeast 44th Way |
| 168th Place Southeast | Southeast 60th Street | North of Southeast 62nd Street |

**Table 12: Corridors that are not Traffic Message Channel (TMC) encoded and therefore are not represented in Iteris Clearguide.**

The City of Bellevue is working with TomTom, HERE Technologies, and Iteris Clearguide to encode additional arterial roadways in the city. TMC encoded roadways are limited due to communications protocols as well as bandwidth for delivering data into navigation systems in an efficient, compact manner. Due to the selectivity, TMC encoding process is slow moving given the review required by the consortium that governs TMC codes for roadways.

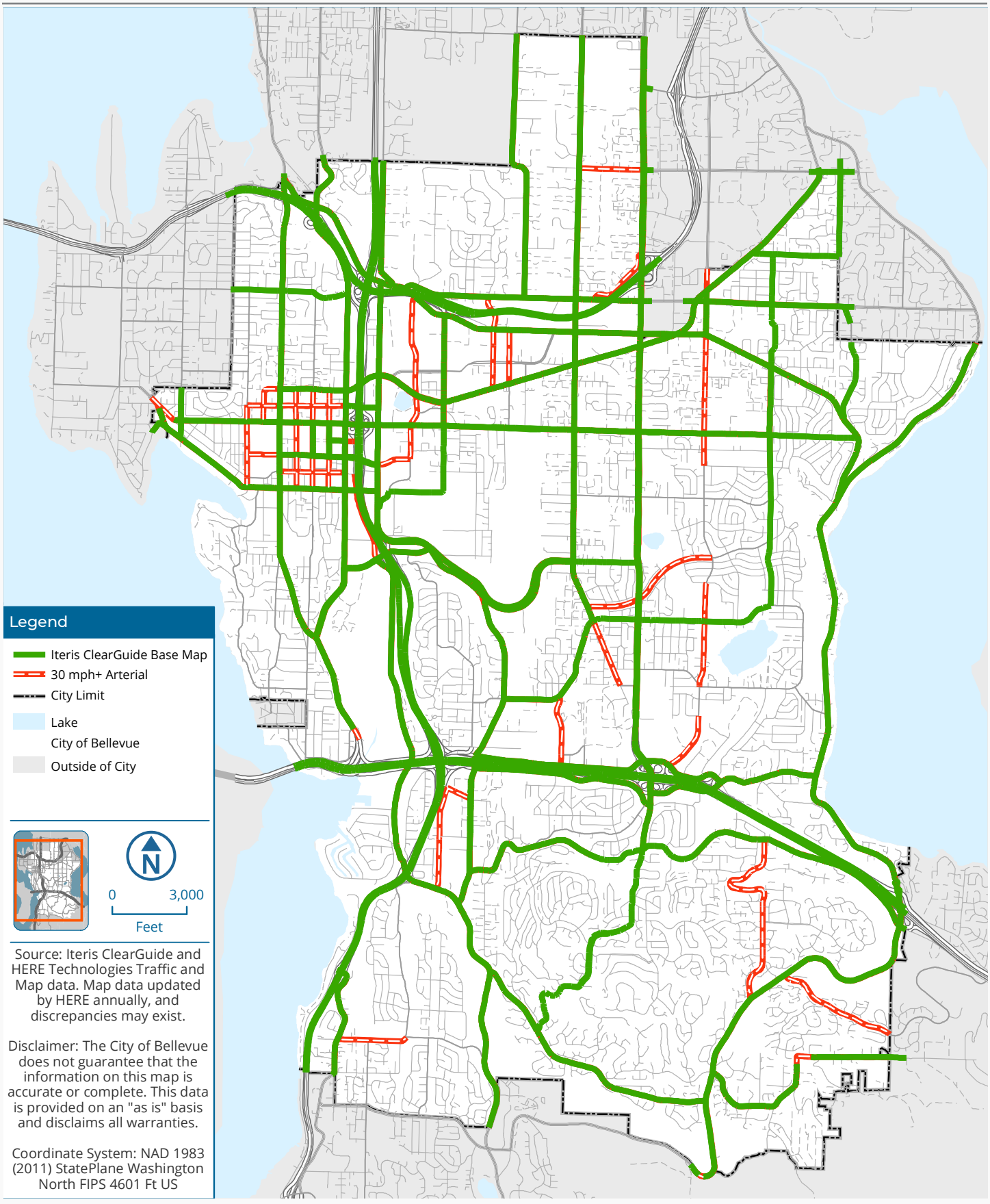



**Figure 32: The 30mph + arterials which are included in Iteris Clearguide are green and those that are not included are in red. The City of Bellevue is working with TomTom, Here Technologies, and Iteris Clearguide to get these missing arterials TMC encoded so the data may be available to the city.**

Credit: R. Homolya and the City of Bellevue

## Speeding Data Estimates

For the corridor segments that did not have speeding data, the score of these corridors was falsely deflated due to the '0' values. When scoring without adjusting the false zeros, these arterial segments clustered towards the end of the sorted list. As such, staff investigated various ways to reduce the impact to the score of corridors without speed data. Given concerns with utilizing more than one dataset, the city opted to create average speed data estimates for each arterial category. These were averaged across all corridor segments in each category but did not include corridors with missing data (e.g. the corridors with zero speeding data values) in the average. The following averages were used for each category (*Table 11*).

| Category | Average Speed Data Estimate Per Category | |
|---|---|---|
| | % of Speeders Exceeding Speed Limit > 10mph | Difference Between 50th and 85th |
| Urban Core, 30 mph | 0.5% | 8.1 |
| Urban Core, 35 mph | 0.5% | 7.5 |
| Urban, 30 mph | 2.6% | 7.0 |
| Urban, 35 mph | 1.5% | 7.4 |
| Urban, 40 mph | 1.7% | 7.0 |
| Suburban, 30 mph | 2.3% | 6.5 |
| Suburban, 35 mph | 1.4% | 6.6 |
| Suburban, 40 mph | 5.5% | 7.5 |

**Table 13: Average speed data estimates for each arterial category.**


Credit: City of Bellevue

# Appendix C

## SPEED MANAGEMENT CORRIDOR SORTING TOOL: 2023 RESULTS

*Table 14* shows the 2023 Sorting Tool results, based on the available data in spring 2023 for 2022. The crash data used for the scoring was from 2012-2021, and the speed data was for the entire year of 2022. Importantly, the Sorting Tool does not create a framework in which the corridors that are first evaluated using the speed limit setting tool or considered for countermeasures have the highest score. Rather, the Sorting Tool outputs are one of multiple factors—alongside existing policy goals, future or current transportation projects and community feedback—that may initiate one or more corridors being reviewed using the speed limit setting tool/installing countermeasures versus another (see *Figure 5* in *Chapter 1*).

| fid | Street Name | From Address | To Address | Corridor Length (ft) | Category | Weighted Total |
|---|---|---|---|---|---|---|
| **56** | 148th Avenue Northeast | Main Street | Northeast Bel-Red Road | 6,097 | 7 | 20.33 |
| **20** | 156th Avenue Northeast | Northeast Eighth Street | Northeast 20th Street and Northup Way | 3,900 | 3 | 19.81 |
| **79** | Lake Hills Connector | Southeast Eighth Street | 140th Avenue Southeast | 7,750 | 8 | 18.83 |
| **54** | Coal Creek Parkway Southeast | Between Factoria Blvd SE and Forest Drive SE (end of urban land use) | City limit | 7,868 | 8 | 18.56 |
| **70** | Lakemont Boulevard Southeast | West Lake Sammamish Parkway Southeast | Newport Way Southeast | 1,363 | 6 | 18.56 |
| **71** | Northeast Eighth Street | 123rd Avenue Northeast | 153rd Avenue Northeast | 9,720 | 7 | 18.18 |
| **65** | Forest Drive Southeast | Coal Creek Parkway Southeast | Lakemont Boulevard Southeast | 10,939 | 6 | 18.02 |
| **33** | Coal Creek Parkway Southeast | Factoria Boulevard Southeast | Forest Drive Southeast | 1,848 | 5 | 18.00 |
| **102** | 156th Avenue Northeast | Northeast Fourth Street | Northeast Eighth Street | 1,311 | 6 | 17.36 |
| **72** | Bellevue Way Southeast | Between Main Street and Southeast Third Street (end of urban Core land use) | 108th Avenue Southeast | 5,608 | 6 | 17.28 |
| **74** | 148th Avenue Southeast | Main Street | Southeast 24th Street | 17,601 | 7 | 16.67 |
| **97** | Lake Hills Boulevard | 145th Place Southeast | 156th Avenue Southeast | 5,714 | 6 | 16.21 |
| **101** | 156th Avenue Northeast | Northeast 20th Street | Bel-Red Road | 1,793 | 1 | 16.09 |
| **38** | 150th Avenue Southeast | Southeast Eastgate Way | Southeast 38th Street | 1,845 | 3 | 16.05 |
| **63** | Bellevue Way Northeast | Northeast 12th Street | Northup Way | 8,770 | 7 | 15.99 |
| **34** | Richards Road | Southeast 26th Street | Southeast Eastgate Way | 2,570 | 4 | 15.86 |
| **78** | Lakemont Boulevard Southeast | 171st Avenue Southeast | Southeast Newport Way | 5,780 | 8 | 15.84 |
| **37** | Southeast 37th Street | 150th Avenue Southeast | Southeast Eastgate Way | 3,026 | 3 | 15.64 |

| fid | Street Name | From Address | To Address | Corridor Length (ft) | Category | Weighted Total |
|---|---|---|---|---|---|---|
| **21** | Northeast Eighth Street | 151st Place Northeast | 164th Avenue Northeast | 3,859 | 3 | 15.20 |
| **24** | Northup Way | 156th Avenue Northeast | 164th Avenue Northeast | 2,911 | 4 | 15.08 |
| **108** | 118th Avenue Southeast | Southeast Eighth Street | Southeast 32nd Street | 8,218 | 7 | 14.54 |
| **30** | Southeast 36th Street | Factoria Boulevard Southeast | Southeast Allen Road | 7,589 | 4 | 14.51 |
| **32** | 128th Avenue Southeast | Southeast Eastgate Way | Southeast 36th Street | 515 | 4 | 14.50 |
| **23** | Northeast 20th Street | 130th Avenue Northeast | 156th Avenue Northeast | 8,558 | 2 | 14.42 |
| **11** | Main Street | 100th Avenue Northeast | 116th Avenue Northeast | 5,259 | 1 | 14.41 |
| **13** | 110th Avenue Northeast | Main Street | Northeast 12th Street | 4,002 | 1 | 14.36 |
| **35** | 156th Avenue Southeast | Southeast 27th Street | Southeast Eastgate Way | 2,455 | 3 | 14.36 |
| **81** | 132nd Avenue Northeast | Northeast 40th Street | Northeast 60th Street | 5,279 | 6 | 14.27 |
| **19** | Southeast Eighth Street | 112th Avenue Southeast | Lake Hills Connector | 3,662 | 2 | 14.20 |
| **104** | Northeast Bel-Red Road | 156th Avenue Northeast | City limit | 6,696 | 8 | 14.18 |
| **42** | 148th Avenue Southeast | Southeast 28th Street | Southeast Eastgate Way | 1,844 | 3 | 14.17 |
| **99** | 124th Avenue Northeast | Northeast Eighth Street | Northeast 10th Place | 641 | 6 | 14.15 |
| **66** | Richards Road | Lake Hills Connector | Southeast 26th Street | 5,291 | 7 | 14.10 |
| **111** | Lakemont Boulevard Southeast | Forest Drive Southeast | City limit (east of 155th Avenue Southeast) | 3,919 | 8 | 13.82 |
| **61** | 145th Place Southeast | Southeast 10th Street | Southeast 24th Street | 4,900 | 6 | 13.30 |
| **59** | 140th Avenue Northeast | Main Street | Northeast Bel-Red Road | 5,268 | 6 | 13.26 |
| **58** | West Lake Sammamish Parkway Southeast | Approximately halfway between Southeast 34th Street and Northup Way | Interstate 90 Off-ramp | 11,401 | 6 | 13.22 |
| **107** | Southeast Newport Way | East of Southeast 42nd Place | Lakemont Boulevard Southeast | 3,475 | 8 | 13.20 |
| **1** | Bellevue Way Northeast | South of Main Street | Northeast 12th Street | 4,386 | 1 | 13.06 |

| fid | Street Name | From Address | To Address | Corridor Length (ft) | Category | Weighted Total |
|---|---|---|---|---|---|---|
| **27** | Coal Creek Parkway Southeast | 119th Avenue Southeast | Factoria Boulevard Southeast | 2,108 | 4 | 13.03 |
| **113** | Lake Hills Connector | 116th Avenue Southeast | Southeast Eighth Street | 2,597 | 2 | 12.90 |
| **86** | Lakemont Boulevard Southeast | Around 171st Avenue Southeast | Forest Drive Southeast | 7,021 | 6 | 12.76 |
| **3** | Northeast 12th Street | 102nd Avenue Northeast | 124th Avenue Northeast | 7,661 | 1 | 12.68 |
| **94** | 140th Avenue Southeast | Main Street | Southeast 10th Street | 3,139 | 6 | 12.66 |
| **8** | Northeast Eighth Street | 100th Avenue Northeast | 123rd Avenue Northeast | 17,209 | 1 | 12.37 |
| **4** | Northeast 10th Street | 100th Avenue Northeast | 112th Avenue Northeast | 3,968 | 1 | 12.35 |
| **2** | Northeast Second Street | Bellevue Way Northeast | 112th Avenue Northeast | 2,631 | 1 | 12.28 |
| **9** | 112th Avenue Northeast | Main Street | Northeast 12th Street | 4,007 | 1 | 12.27 |
| **31** | Southeast Eastgate Way | Richards Road | 148th Avenue Southeast | 6,595 | 4 | 12.23 |
| **89** | 112th Avenue Northeast | Northeast 12th Street | Northeast 24th Street | 3,939 | 6 | 12.09 |
| **95** | Lake Washington Boulevard Northeast | 88th Avenue Northeast | 100th Avenue Northeast | 5,464 | 6 | 11.91 |
| **29** | Southeast 38th Street | 124th Avenue Southeast | Factoria Boulevard Southeast | 1,027 | 4 | 11.86 |
| **53** | Northeast 24th Street | 154th Avenue Northeast | City limit (around 172nd Avenue Northeast) | 5,305 | 6 | 11.84 |
| **90** | Northeast 24th Street | Northup Way | 140th Avenue Northeast | 7,004 | 6 | 11.81 |
| **48** | 140th Avenue Northeast | Northeast Bel-Red Road | State Route 520 | 2,630 | 1 | 11.73 |
| **114** | Lake Washington Boulevard Southeast | Southeast 32nd Street | 119th Avenue Southeast | 5,444 | 6 | 11.68 |
| **88** | 108th Avenue Northeast | State Route 520 on-ramp | South of Northeast 41st Drive | 2,962 | 6 | 11.63 |
| **76** | Northup Way | Northeast 24th Street | City limit (around Lake Washington Boulevard Northeast) | 7,249 | 7 | 11.42 |

| fid | Street Name | From Address | To Address | Corridor Length (ft) | Category | Weighted Total |
|---|---|---|---|---|---|---|
| **50** | Northup Way | State Route 520 | 130th Avenue Northeast | 4,046 | 2 | 11.41 |
| **51** | Northeast 24th Street | Northeast Bel-Red Road | 156th Avenue Northeast | 420 | 1 | 11.39 |
| **69** | Northup Way | 164th Avenue Northeast | West Lake Sammamish Parkway Northeast | 7,268 | 7 | 11.39 |
| **10** | 102nd Avenue Northeast | Northeast Eighth Street | Northeast 12th Street | 1,290 | 1 | 11.38 |
| **14** | 106th Avenue Northeast | Main Street | Northeast 12th Street | 3,997 | 1 | 11.37 |
| **5** | 108th Avenue Northeast | Main Street | Northeast 12th Street | 4,035 | 1 | 11.33 |
| **28** | Southeast Newport Way | Factoria Boulevard Southeast | 131st Place Southeast | 1,420 | 3 | 11.32 |
| **52** | 156th Avenue Southeast | Southeast 11th Street | Southeast 22nd Place and Southeast 24th Street | 4,209 | 6 | 11.17 |
| **45** | 124th Avenue Northeast | Northeast Eighth Street | Northup Way | 3,809 | 1 | 11.15 |
| **17** | 116th Avenue Northeast | Southeast Fifth Street and Lake Hills Connector | Northeast 12th Street | 5,980 | 1 | 11.10 |
| **12** | 100th Avenue Northeast | Main Street | Northeast 10th Street | 3,307 | 1 | 11.09 |
| **22** | Northeast Bel-Red Road | 124th Avenue Northeast | 156th Avenue Northeast | 12,017 | 2 | 10.97 |
| **25** | Factoria Boulevard Southeast | Southeast 36th Street | Southeast Coal Creek Parkway | 5,550 | 4 | 10.96 |
| **85** | Northeast Eighth Street | Lake Washington Boulevard and Northeast 10th Street | 100th Avenue Southeast | 3,878 | 6 | 10.92 |
| **112** | 148th Avenue Northeast | Northeast 24th Street | City limit | 10,661 | 8 | 10.91 |
| **26** | 124th Avenue Southeast | Southeast 38th Street | Coal Creek Parkway Southeast | 4,119 | 4 | 10.86 |
| **98** | 134th Avenue Northeast | Northeast 24th Street | Northeast 40th Street | 5,680 | 6 | 10.53 |
| **83** | Southeast 60th Street | Lake Washington Boulevard Southeast | 119th Avenue Southeast | 2,821 | 6 | 10.41 |
| **16** | 114th Avenue Northeast | Northeast Second Street | Southeast Eighth Street | 3,594 | 1 | 10.33 |
| **47** | 148th Avenue Northeast | South of Northeast 17th Place | Northeast 24th Street | 2,240 | 2 | 10.27 |

| fid | Street Name | From Address | To Address | Corridor Length (ft) | Category | Weighted Total |
|---|---|---|---|---|---|---|
| **55** | West Lake Sammamish Parkway Southeast | South of Northeast Second Place | Approximately halfway between Southeast 34th Street and Northup Way | 6,162 | 7 | 10.25 |
| **68** | 164th Avenue Southeast | Southeast Newport Way | Lakemont Boulevard Southeast | 8,981 | 6 | 10.24 |
| **73** | 130th Avenue Northeast | Interstate 520 | Northeast 24th Street | 830 | 6 | 10.21 |
| **110** | 112th Avenue Northeast | Northeast 24th Street | State Route 520 off-ramp | 3,087 | 7 | 10.09 |
| **18** | 120th Avenue Northeast | Northeast Fourth Street | Northup Way | 6,665 | 1 | 10.08 |
| **39** | 148th Avenue Southeast | Southeast 24th Street | Southeast 28th Street | 1,318 | 4 | 10.04 |
| **103** | 150th Avenue Southeast | Southeast 38th Street | Southeast Newport Way | 1,821 | 6 | 9.96 |
| **93** | Village Park Drive Southeast | Lakemont Boulevard Southeast | City limit | 4,986 | 7 | 9.84 |
| **91** | Bellevue Way Southeast | 108th Avenue Southeast | Interstate 90 On-ramp | 4,895 | 8 | 9.80 |
| **43** | Northeast 24th Street | State Route 520 | 148th Avenue Northeast | 1,251 | 2 | 9.76 |
| **109** | Northeast 24th Street | 140th Avenue Northeast | State Route 520 | 1,384 | 7 | 9.76 |
| **40** | 139th Avenue Southeast | Southeast 24th Street | Southeast Eastgate Way | 3,506 | 4 | 9.69 |
| **57** | 140th Place Southeast | 145th Place Southeast | Southeast 24th Street | 2,774 | 7 | 9.66 |
| **82** | Southeast 34th Street | Southeast 35th Place and 164th Place Southeast | West Lake Sammamish Parkway Southeast | 2,423 | 6 | 9.57 |
| **67** | West Lake Sammamish Parkway Northeast | South of Northeast Second Place | South of Northeast 20th Court | 8,905 | 7 | 9.29 |
| **84** | Northeast 40th Street | 140th Avenue Northeast | 148th Avenue Northeast | 2,607 | 7 | 8.97 |
| **44** | 130th Avenue Northeast | Bel-Red Road | Interstate 520 | 2,949 | 1 | 8.73 |
| **106** | 112th Avenue Southeast | Main Street | Bellevue Way Southeast | 6,277 | 7 | 8.52 |
| **60** | Southeast Newport Way | 155th Place Southeast | Southeast 42nd Place | 6,384 | 7 | 8.49 |

| fid | Street Name | From Address | To Address | Corridor Length (ft) | Category | Weighted Total |
|---|---|---|---|---|---|---|
| **105** | 156th Avenue Northeast | Bel-Red Road | City limit (Around Northeast 28th Street) | 896 | 7 | 8.39 |
| **92** | Northeast 29th Place | Northeast 24th Street | 148th Avenue Northeast | 2,960 | 7 | 8.34 |
| **87** | Southeast Newport Way | 131st Place Southeast | 142nd Place Southeast | 4,353 | 6 | 8.34 |
| **7** | Northeast Fourth Street | 100th Avenue Northeast | 120th Avenue Northeast | 6,676 | 1 | 8.24 |
| **49** | 116th Avenue Northeast | Northeast 12th Street | Northup Way | 3,764 | 1 | 8.10 |
| **77** | 112th Avenue Southeast | Southeast 61st Place | Southeast 64th Street | 4058 | 6 | 8.03 |
| **36** | Southeast Eastgate Way | 148th Avenue Southeast | Southeast 37th Street | 3,838 | 3 | 7.84 |
| **80** | Southeast 26th Street | Richards Road | 139th Avenue Southeast | 2,250 | 4 | 7.65 |
| **64** | 140th Avenue Northeast | Northeast 24th Street | City limit | 10,616 | 7 | 7.54 |
| **75** | Southeast Cougar Mountain Way | Lakemont Boulevard Southeast | Southeast 60th Street | 5,685 | 6 | 7.48 |
| **62** | 116th Avenue Northeast | Northup Way | City limit (around Northeast 41st Street) | 5,211 | 7 | 7.37 |
| **96** | 164th Avenue Northeast | Northeast Fourth Street | Northup Way | 4,047 | 6 | 7.17 |
| **46** | 132nd Avenue Northeast | Northeast Bel-Red Road | Northeast 20th Street | 2,161 | 1 | 6.88 |
| **15** | Northeast Sixth Street | 110th Avenue Northeast | Interstate 405 | 1,219 | 1 | 6.88 |
| **41** | Southeast 35th Place | Southeast Eastgate Way | Southeast 34th Street and 164th Place Southeast | 1550 | 3 | 6.77 |
| **100** | Southeast 60th Street | 168th Place Southeast | City limit (Around 700 feet east of 178th Court Southeast) | 3,680 | 6 | 3.91 |

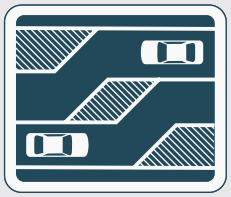
**Table 14: The 2023 results of the Speed Management Corridor Sorting Tool.**

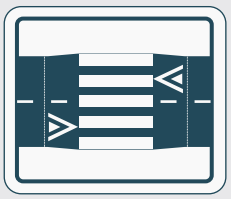

Credit: City of Bellevue

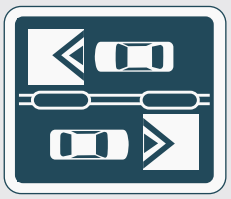
# Appendix D

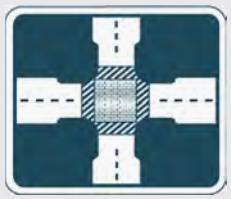
## COUNTERMEASURE TOOLBOX

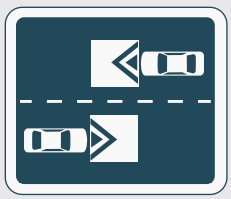
The following tables provide brief descriptions of the appropriate contexts and traffic considerations for each countermeasure. A map of the primary and secondary emergency vehicle response routes is provided at the end of the appendix for reference.

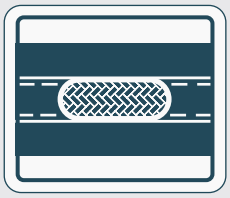
| COUNTERMEASURE: | Type: Horizontal Deflection | |
|---|---|---|
| **LATERAL SHIFT**  | May consider in: | Sometimes appropriate:<br>• Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • May need to be used with additional countermeasures for greater efficacy.<br>• May be considered with curb use and management techniques such as curb extensions.<br>• Compatible with emergency response vehicles, but not preferred by Fire Department. |
| | May be used with: | *corner bulb outs, roadway landscaping, hardened centerline, high visibility crosswalks* |

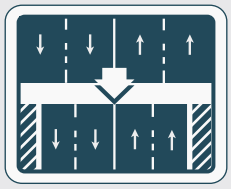
| COUNTERMEASURE: | Type: Vertical Deflection | |
|---|---|---|
| **RAISED CROSSWALK**  | May consider in: | Sometimes appropriate:<br>• Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • May be considered at signalized crosswalks.<br>• Can be used in conjunction with other tools such as curb extensions, which narrow the crossing distance for pedestrians.<br>• May be used on streets with one lanes in each direction.<br>• Implementation of raised crosswalks, particularly as they are a vertical deflection technique, should involve community outreach and awareness.<br>• Significant impact to emergency response vehicles. |
| | May be used with: | *high visibility crosswalk, median island, choker* |

| COUNTERMEASURE: | Type: Vertical Deflection | |
|---|---|---|
| **OFFSET/SPLIT SPEED TABLE**  | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • May be used on streets with one lane in each direction.<br>• May contain landscaped medians as part of the project.<br>• Compatible with emergency response vehicles, preferred by the Fire Department. |
| | May be used with: | *roadway landscaping, median island, hardened centerline, transverse rumble strips* |

| COUNTERMEASURE: | Type: Vertical Deflection | |
|---|---|---|
| **RAISED INTERSECTION**  | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Significant impact to emergency response vehicles.<br>• Typically implemented at minor intersections where speed control at pedestrian crossings is desired, such as in commercial areas within the urban core with high pedestrian traffic. |
| | May be used with: | *signal phasing, signal coordination* |

| COUNTERMEASURE: | Type: Travel lane width reduction | |
|---|---|---|
| **SPEED CUSHION**  | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • May be considered to be placed in a series for greater efficacy.<br>• May be used on streets with one lane in each direction.<br>• Posted speed limit of 30 mph.<br>• Limited impact to EMS vehicles, preferred by Fire Department particularly for larger vehicles. |
| | May be used with: | *hardened centerline, roadway landscaping, median island* |

| COUNTERMEASURE: | Type: Signing | |
|---|---|---|
| **MEDIAN ISLAND**  | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Compatible with emergency response vehicles, depending on location.<br>• Separation between directions of travel may encourage higher speeds and therefore pairing with additional countermeasures may be most effective.<br>• Has potential for temporary testing and rapid build with low-cost paint and posts prior to permanent installation. |
| | May be used with: | *high visibility crosswalk, roadway landscaping* |

| COUNTERMEASURE: | Type: Travel lane width reduction | |
|---|---|---|
| **TRAVEL LANE WIDTH REDUCTION**  | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • May be compatible with emergency response vehicles, if nearby traffic moves to the right properly for the emergency vehicle.<br>• When evaluating a corridor for travel lane width reduction, emergency response, truck, and transit routes and use of the road should be considered to define a minimum travel lane width appropriate.<br>• The reduction of travel lane widths may also be considered with speed limit reductions.<br>• This countermeasure may be paired well with medians on high speed or volume roadways.<br>• Consideration of transitions from adjacent roadways and through intersections. [xxxviii] |
| | May be used with: | *road diet, on-street parking, roadway landscaping* |

| COUNTERMEASURE: | Type: Pavement marking/modification | |
|---|---|---|
| **ADVISORY SPEED MARKINGS**   | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Compatible with emergency response vehicles<br>• Since these markings may be quickly completed, they are an option for rapid testing.<br>• This countermeasure may be considered alongside other countermeasures for greater efficacy. |
| | May be used with: | *any of the countermeasures* |

| COUNTERMEASURE: | Type: Signing | |
|---|---|---|
| **SIGNS STATING SPEEDING TICKET FINE AMOUNT**   | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Compatible with emergency response vehicles.<br>• Consider fine signs without the amount listed to accommodate changing fines.<br>• Fine changes may require Council approval.<br>• There may be short term decreased speeding without enforcement measures, but it is likely that this countermeasure would need to be coupled with enforcement to be effective as drivers can ignore these signs over time. |
| | May be used with: | *any of the countermeasures* |

| COUNTERMEASURE: | Type: Speed limit setting/signing | |
|---|---|---|
| **SPEED FEEDBACK SIGNS**   | May consider in: | Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Compatible with emergency response vehicles.<br>• If used on roadways with more than one lane per direction, sign placement and size and other operational factors may need to be considered.<br>• In partnership with the Police Department, trailers equipped with radar signs can also be deployed on Bellevue roadways for short periods of time.<br>• Typically, these signs are installed where other physical traffic calming measures are not appropriate. |
| | May be used with: | *any of the countermeasures* |

| COUNTERMEASURE: | Type: Speed limit setting/signing | |
|---|---|---|
| **SPEED FEEDBACK SIGNS**   | May consider in: | Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Compatible with emergency response vehicles.<br>• Minimum density of speed limit signage depends on context, including land use, speed limit, surrounding speed limits and recent change in speed limits, among others. |
| | May be used with: | *any of the countermeasures* |

| COUNTERMEASURE: | Type: Traffic signal operations | |
|---|---|---|
| **SIGNAL COORDINATION SET FOR SPEED LIMIT**  | May consider in: | Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Compatible with emergency response vehicles.<br>• Setting signal coordination for speeds other than the posted speed limit is newer to the city and may require additional analysis prior to implementation. |
| | May be used with: | *signal phasing (separating users in time), signal coordination set for bikes* |

| COUNTERMEASURE: | Type: Enforcement | |
|---|---|---|
| **SPEED SAFETY CAMERAS**<br>  | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Requires public trust.<br>• Compatible with emergency response vehicles.<br>• Some locations, such as school zones or streets with high fatal or serious injuries, are usually more favored for speed safety cameras than other locations.<br>• Washington state law limits the number and expands possible locations of speed safety cameras within each city and has additional requirements for implementation such as equity analyses of proposed locations. Refer to *Chapter 7* for additional details. |
| | May be used with: | *any of the countermeasures* |

| COUNTERMEASURE: | Type: Enforcement | |
|---|---|---|
| **HIGH VISIBILITY ENFORCEMENT WITH PUBLIC CAMPAIGN**<br>  | May consider in: | • Urban Core (30-35 mph)<br>• Urban (30-35 mph)<br>• Suburban (30-35 mph) |
| | Traffic considerations: | • Compatible with emergency response vehicles.<br>• Consideration of how to conduct the campaign to be highly accessible across the community and how to target specific areas.<br>• Equity analyses of where traditional enforcement is conducted and who it is impacting.<br>• Consideration of staffing. |
| | May be used with: | *any of the countermeasures* |

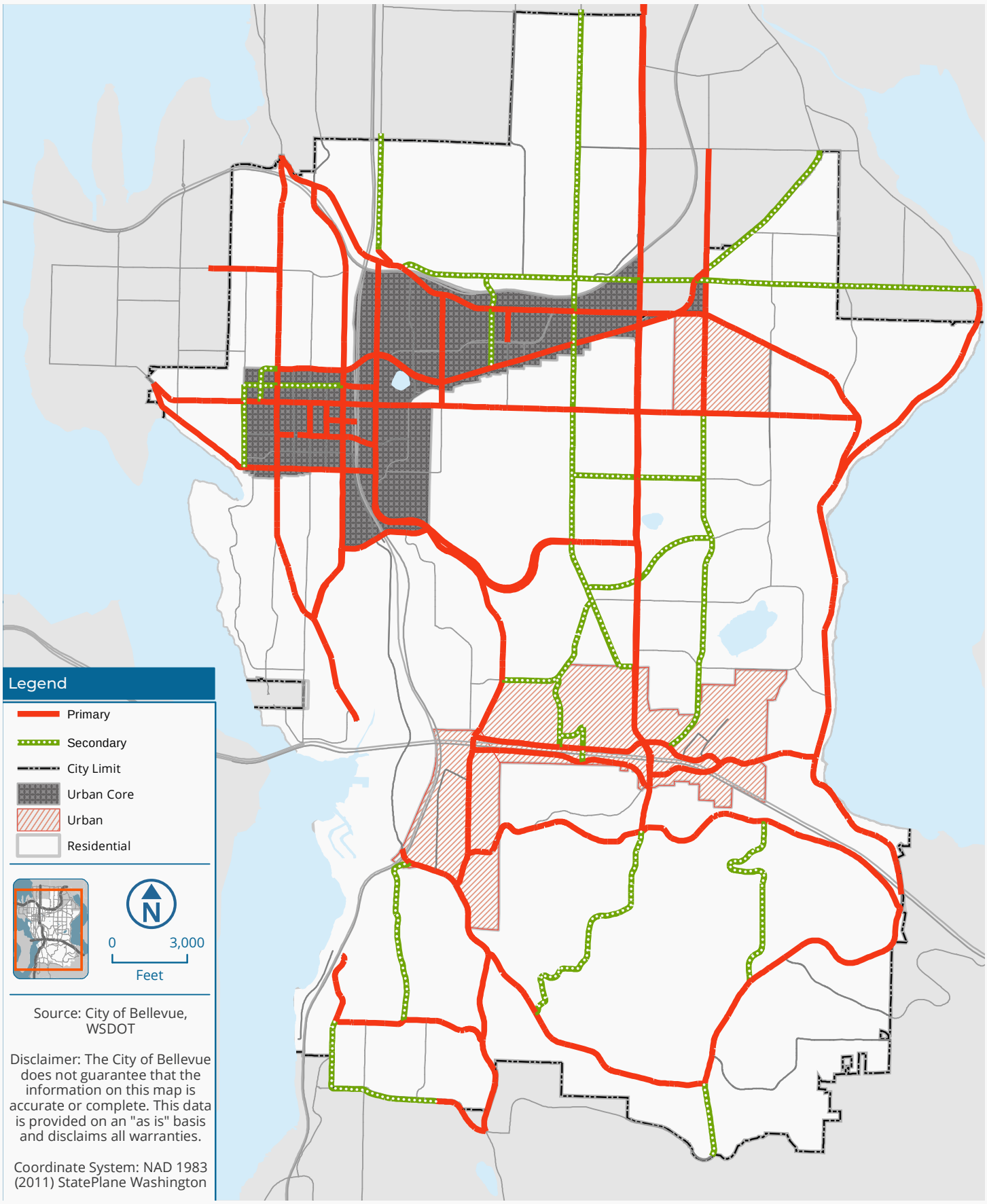



**Figure 33: Primary and secondary emergency response corridors in Bellevue as of 2023**

Credit: R. Homolya and the City of Bellevue

## Emergency Response Routes for Consideration

The Transportation Department works with the Fire Department to ensure that speed management countermeasures considered for implementation meet the needs of both departments to ensure public safety. The primary and secondary response routes are of particular interest to the Fire Department and are a consideration for the Transportation Department in identifying appropriate speed management for a given corridor.


Credit: City of Bellevue

# Appendix E

## SPEED SAFETY CAMERA ANALYSIS

## Introduction to Speed Safety Cameras

Speed safety cameras (SSC) are utilized to detect speeding and capture photographic or video evidence of the vehicles that exceed speed limits.[xxxix] These devices are seen as highly effective countermeasures for reducing speeding-related injury crashes, yielding estimated reductions of 20-25%.[xl] At a national level, FHWA supports the use of speed safety cameras in conjunction with a broader comprehensive speed management program.[xli] The implementation of speed safety cameras in neighboring cities of Kirkland and Seattle have yielded positive results, with 89-90% of drivers not re-offending since the program was initiated (2012 for Seattle and 2019 for Kirkland).[xlii] As of May 2023, there are three speed safety cameras in use in Bellevue. These are present in school zones:

- Stevenson Elementary School and Odle Middle School, 14200 block of Northeast Eighth Street
- Lake Hills Elementary School, 14300 block of Southeast Eighth Street
- Sunset Elementary School, 4200 West Lake Sammamish Parkway Southeast

## Relevant Speed Safety Camera Legislation

In Washington state, new legislation (RCW 46.63.170,[xliii] ) in July 2022 gave cities expanded authority to install automated traffic safety cameras to enforce speed limits in specific contexts.[xliv] State law now authorizes speed safety cameras at the following locations:

| Location | Location definition in 46.63.170 | Application to Bellevue |
|---|---|---|
| **Railroad crossings** | *No additional definition in RCW 46.63.170.* | This location exists within the city and therefore may be possible location for SSCs; subject to other restrictions. |
| **School speed zones** | *No additional definition in RCW 46.63.170.* | This location exists within the city and therefore may be possible location for SSCs; subject to other restrictions. |
| **Roadways identified in a school walk area** | *"Area around a school with an adequate roadway configuration to provide students access to school with a walking distance of less than one mile. Mileage must be measured along the shortest roadway or maintained public walkway where hazardous conditions do not exist … each elementary school shall identify walk routes within the walk area."* | This location exists within the city and therefore may be possible location for SSCs; subject to other restrictions. |
| **Public park speed zones** | *"The marked area within public park property and extending 300 feet from the border of public park property (I) consistent with active park use; and (II) where signs are posted to indicate the location is within a public park speed zone."* | This location exists within the city and therefore may be possible location for SSCs; subject to other restrictions. |
| **Hospital speed zones** | *"The marked area within hospital property and extending 300 feet from the border of hospital property (I) consistent with hospital use; and (II) where signs are posted to indicate the location is within a hospital speed zone".* | This location exists within the city and therefore may be possible location for SSCs; subject to other restrictions. |

In addition to the above locations, the state legislation allows for placement of one automated speed camera, plus an additional camera for every 10,000 residents in a city, as described below. These SSCs may be located in the following areas so long as an equity analysis is completed (additional information on the equity analysis is in subsequent section):

| Location | Location definition in 46.63.170 | Application to Bellevue |
|---|---|---|
| **Priority locations in local road safety plans as defined by the City and accepted by the State** | *"The location has been identified as a priority location in a local road safety plan that a city has submitted to the Washington state department of transportation and where other speed reduction measures are not feasible or have not been sufficiently effective at reducing travel speed"* | The city completes Local Road Safety Plans on a bi-annual basis, with the next plan to be released in 2024. |
| **Locations with higher collisions** | *"The location has a significantly higher rate of collisions than the city average in a period of at least three years prior to installation and other speed reduction measures are not feasible or have not been sufficiently effective at reducing travel speed";* | The Bellevue High-Injury Network (HIN) shows where in the city there are significantly higher rates of collisions than the citywide average. As the HIN is continually updated, the most recent version may be found on the city's Vision Zero Storymap.[xlv] |
| **Areas designated as racing zones with specified restrictions and penalties** | *"The location is in an area within the city limits designated by local ordinance as a zone subject to specified restrictions and penalties on racing and race attendance."* | Bellevue city code does not designate locations that are subject to restrictions and penalties for racing and there are no known locations for these activities in Bellevue. No applicable locations within the City of Bellevue for speed safety cameras. |

**Table 15: Locations where SSCs may be used in Washington state jurisdictions.**

Locations deemed appropriate for an SSC under Washington state law may indicate that these locations could become priorities for engineering countermeasures. Checking the feasibility of alternative speed management countermeasures is particularly important if the location is in an area of higher equity concern.

## Equity Analysis for SSCs in Priority Locations, Locations with Higher Collisions, and Areas Designated as Racing Zones

Equitable placement of SSCs requires careful consideration of the communities they will affect. As referenced in the February 2023 Speed Safety Camera Readiness Guide,[xlvi] published by the Washington Traffic Safety Commission (WTSC), SSCs can appear to be implemented fairly, but can still disproportionately impact low-income and historically marginalized communities. As of 2022, Washington State Legislation RCW 46.63.170 requires an equity analysis for the additional SSC locations (priority locations, locations with higher collisions, and areas designated as racing zones) that,

> *"Evaluates livability, accessibility, economics, education, and environmental health, and shall consider the outcome of that analysis when identifying where to locate an automated traffic safety camera".* [xlvii]

Based on these required elements from the RCW 46.63.170, an equity analysis for SSCs may consider the following:

- **Context.** Historic decisions on roadway funding, design and operations have created more dangerous conditions for underrepresented communities, leading to disproportionate impacts. The context of the roadway should be considered when installing SSCs in these communities, since it may be seen as penalizing the residents for the city's neglect rather than addressing the root cause of the problem.
- **Target Speeder Demographic:** The target demographic for the SSCs should also be considered as those speeding through these areas might not be those living in the community.
- **Location.** The analysis should consider who benefits from the chosen location of the camera, who uses the roadway and for what purpose, and who will be impacted by the proposed camera location. For example, it is important to consider if the corridor will mainly be used by lower-income households and if the SSC would primarily target lower-income families. SSCs can be an appropriate measure in locations with primarily lower income/historically disadvantaged communities if these locations have disproportionately higher fatal/injury rates. The SSC can serve as a temporary measure until more permanent engineering measures can be installed.
- **Fines.** SSC fines should be designed to modify driver behavior, without causing undue financial hardship. The penalty structure should be designed to avoid disproportionate impacts on BIPOC and low-income communities. The WTSC 2023 SSC Readiness Guide recommends the following measures for low-income violators: (1) due date extensions, (2) payment plans, (3) ticket reduction hearing, (4) community service, and (5) traffic safety education. In addition, fines should aim to fund the program itself. If fine revenue exceeds the operational needs of the SSC program, the excess funds should go to fund more permanent engineering measures to compel drivers to lower speeds in a more permanent way.

Equitable implementation of an SSC program involves a comprehensive approach. Some of the equity considerations for SSCs discussed above will need to be performed on a case-by-case basis. A systematic approach to considering these impacts by evaluating the proximity of corridors to tracks with a higher Equity Composite Index (ECI) ranking (*Appendix F* of Bellevue's 2022 MIP[xlviii] ). In order to promote equity, impacted communities should be engaged in the decision-making process to gather their input and feedback. This can help to address any concerns or potential biases and ensure that the program serves the needs of all community members.

Additional SSC guidance can be found in FHWA's Speed Safety Camera Program Planning and Operations Guide[xlix] and WTSC's Speed Safety Camera Readiness Guide.[l]
Check FHWA Speed Management Resources[li] and WTSC's Resources tab[lii] for potential updates to these guides.


Credit: City of Bellevue

# Appendix F

## KPI DEVELOPMENT

This appendix records how each of the four speed management KPIs were calculated for future replication.

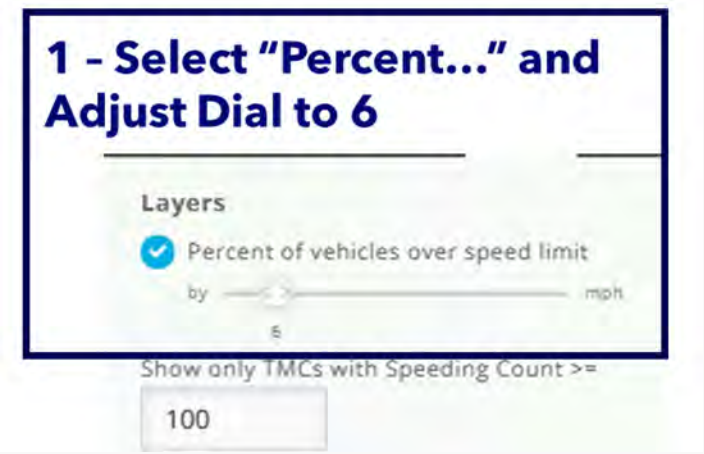
**Fatal and Serious Injury Base Year Value Development:**

The base year value for fatal and serious injury crashes was calculated using the average of the most recent 10 years of data. This data is collected annually from WSDOT and verified with City of Bellevue Police and Transportation Departments. Crashes (and fatal and serious injury crashes in particular) do not appear to follow a particular trend in occurrence. With a very small sample size an analysis may be falsely skewed if a large enough range is not included. As such, the individuals responsible for future analyses should similarly consider the use of a 10-year data set.

**Percentage of Drivers Exceeding the Speed Limit by 6 MPH+ Development:**

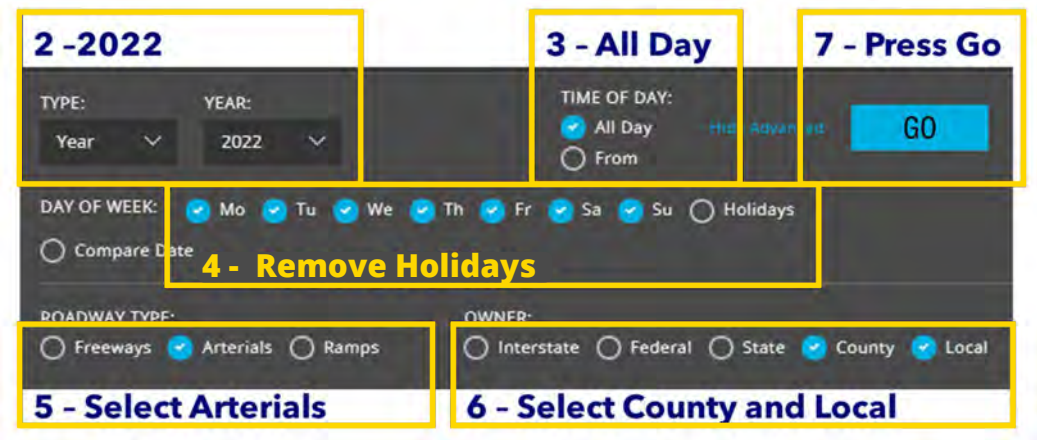
The process to calculate the Percentage of Drivers Exceeding Speed Limit by 6 MPH metric using the Iteris ClearGuide Speeding Map interface is provided below.

1. Under the Layers menu, select **Percent of Vehicles over Speed Limit** and adjust the dial to **6**.




Credit: Iteris

2. Under the Filter menu select "show advanced" change the date type to **Year** and change the Year to **2022**.
3. Set the Time of Day to **All Day**.
4. Under Day of Week **remove Holidays**.
5. Under Roadway Type Select Only **Arterials**.
6. 6Under Owner select only **County and Local**.

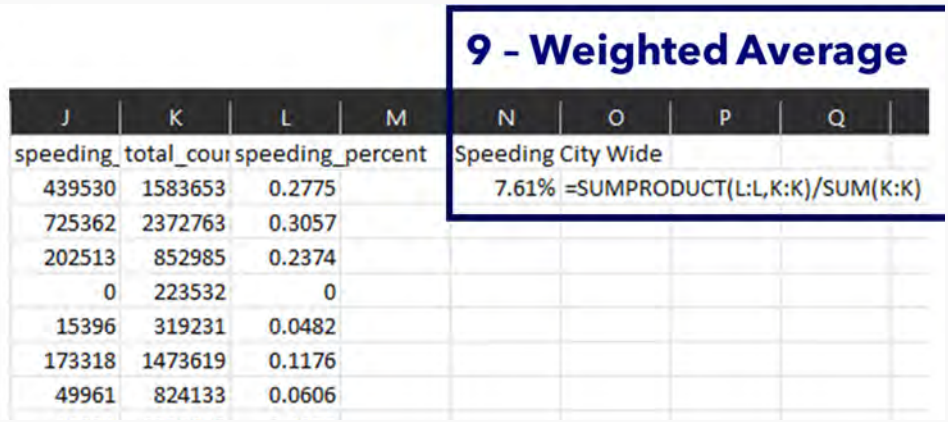



Credit: Iteris

7. Press **Go**.
8. Under the speeding table **Export the CSV**.


Credit: Iteris

9. Take an average of the percent of speeders weighted by the total number of records.



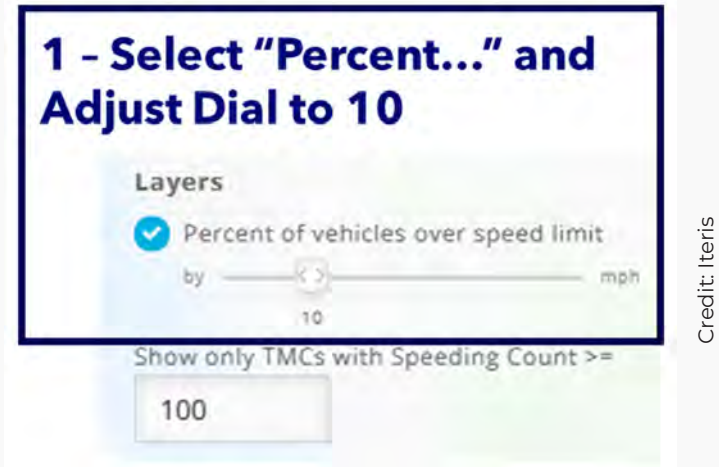

| J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|
| speeding_ | total_cou | speeding_percent | | Speeding City Wide | | | |
| 439530 | 1583653 | 0.2775 | | 7.61% | =SUMPRODUCT(L:L,K:K)/SUM(K:K) | | |
| 725362 | 2372763 | 0.3057 | | | | | |
| 202513 | 852985 | 0.2374 | | | | | |
| 0 | 223532 | 0 | | | | | |
| 15396 | 319231 | 0.0482 | | | | | |
| 173318 | 1473619 | 0.1176 | | | | | |
| 49961 | 824133 | 0.0606 | | | | | |

Credit: Iteris

**Drivers Exceeding the Speed Limit by 10 MPH+ Development:**

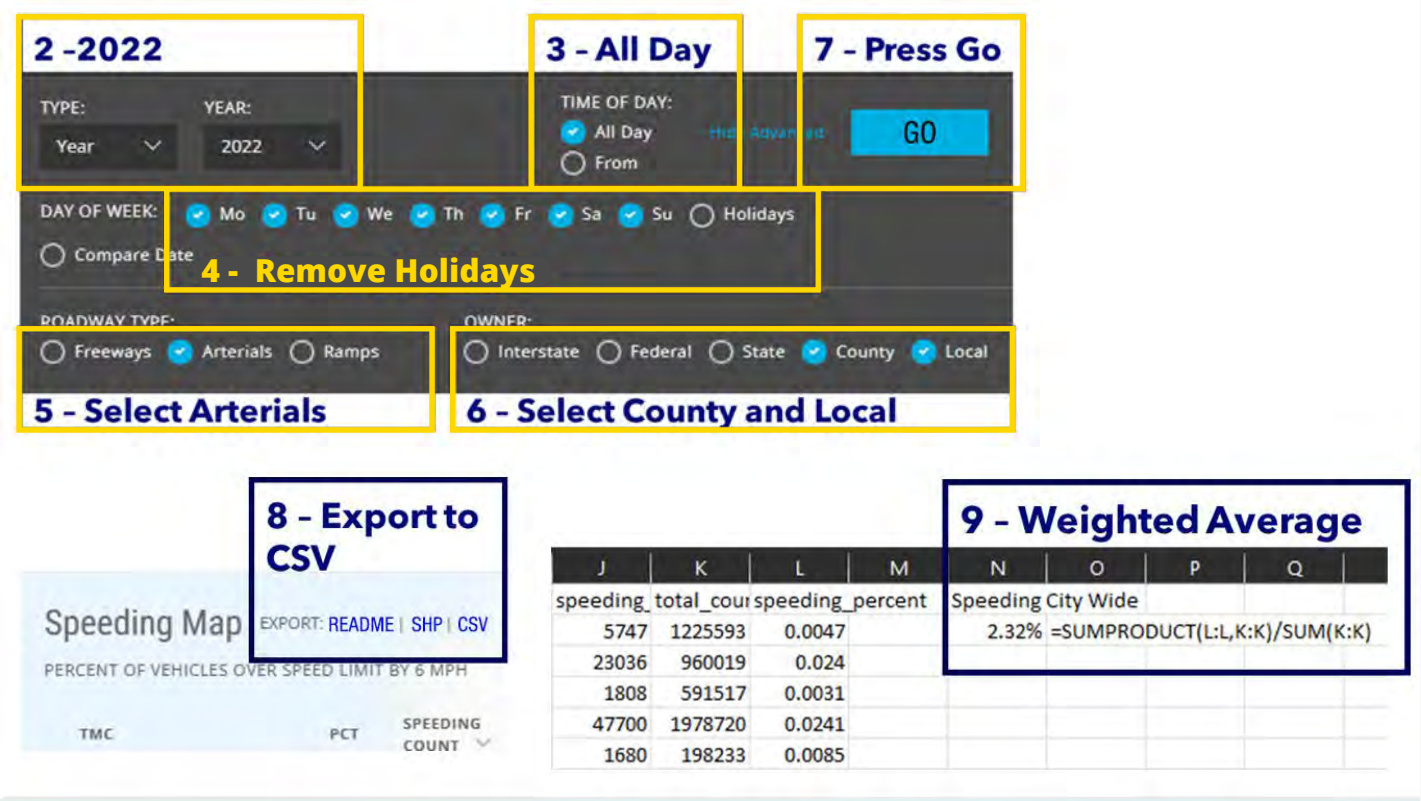
The process to calculate the percentage of Drivers Exceeding Speed Limit by 10 MPH metric using the Iteris ClearGuide Speeding Map interface is provided below.

1. Under the Layers menu, select **Percent of Vehicles over Speed Limit** and adjust the dial to **10**.




Credit: Iteris

2. Repeat the steps for the Percentage of Drivers Exceeding the Speed Limit by 6 MPH+.




Credit: Iteris

**Percentage of Drivers Exceeding the Speed Limit by 10 MPH+ Development:**

The Mobility Implementation Plan (MIP) Dashboard provides a "Performance Target Gaps" section. Under that section, the latest gaps in the LTS are provided. The gap as of 2022 (used for the base year KPI) was 46.2% (24.4%+21.9%).


Credit: City of Bellevue

# References

[i] City of Bellevue. (2020). Vision Zero Strategic Plan. vision-zero-strategic-plan-120120.pdf (bellevuewa.gov)

[ii] Institute for Road Safety Research (SWOV). (2012). The Relationship Between Speed and Crashes. https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa1304/Resources3/08%20-%20The%20Relation%20Between%20Speed%20and%20Crashes.pdf

[iii] National Transportation Safety Board (NTSB). (2017). Reducing Speeding-Related Crashes Involving Passenger Vehicles. Reducing Speeding-Related Crashes Involving Passenger Vehicles (ntsb.gov)

[iv] Federal Highway Administration (FHWA). (2023). Safe System Approach to Speed Management. Safe System Approach for Speed Management (dot.gov)

[v] City of Bellevue. (2020). Vision Zero Strategic Plan. vision-zero-strategic-plan-120120.pdf (bellevuewa.gov)

[vi] National Transportation Safety Board (NTSB). (2017). Reducing Speeding-Related Crashes Involving Passenger Vehicles. Reducing Speeding-Related Crashes Involving Passenger Vehicles (ntsb.gov)

[vii] City of Bellevue. (n.d.). Vision Zero Plans. https://bellevuewa.gov/city-government/departments/transportation/safety-and-maintenance/traffic-safety/vision-zero/vision-zero-action-plan

[viii] City of Bellevue. (2023). 2023 Vision Zero Action Plan. 2023 VZAP_2023.03.28-V4 (bellevuewa.gov)

[ix] City of Bellevue. (2013). Residential Traffic Guidebook. Guidebook_Web.pdf (bellevuewa.gov)

[x] Federal Highway Administration (FHWA). (2023). Safe System Approach to Speed Management. Safe System Approach for Speed Management (dot.gov)

[xi] United States Department of Transportation (US DOT). (2022). National Roadway Safety Strategy. National Roadway Safety Strategy (transportation.gov)

[xii] Federal Highway Administration (FHWA). (2023). Safe System Approach to Speed Management. Safe System Approach for Speed Management (dot.gov)

[xiii] US Department of Transportation (US DOT). (2023). Improving Pedestrian Safety on Urban Arterials: Learning from Australasia. Improving Pedestrian Safety on Urban Arterials: Learning from Australasia (dot.gov)

[xiv] US Department of Transportation (US DOT). (2023). Improving Pedestrian Safety on Urban Arterials: Learning from Australasia. Improving Pedestrian Safety on Urban Arterials: Learning from Australasia (dot.gov)

[xv] New South Wales Government. (2021). Future Transport Strategy 2056. Future_Transport_2056_Strategy.pdf (nsw.gov.au)

[xvi] Federal Highway Administration (FHWA). (n.d.). Proven Safety Countermeasures. https://highways.dot.gov/safety/proven-safety-countermeasures

[xvi] Montella, A., Imbriani, L. L., Marzano, V., & Mauriello, F. (2014). Effects on speed and safety of point-to-point speed enforcement systems: evaluation on the urban motorway A56 Tangenziale di Napoli. Accident ; analysis and prevention, 75, 164–178. Effects on speed and safety of point-to-point speed enforcement systems: evaluation on the urban motorway A56 Tangenziale di Napoli - PubMed (nih.gov)

[xvii] Li, R., El-Basyouny, K., & Kim, A. (2015). Before-and-After Empirical Bayes Evaluation of Automated Mobile Speed Enforcement on Urban Arterial Roads. Transportation Research Record, 2516(1), 44–52. Before-and-After Empirical Bayes Evaluation of Automated Mobile Speed Enforcement on Urban Arterial Roads - Ran Li, Karim El-Basyouny, Amy Kim, 2015 (sagepub.com)

[xviii] Washington Injury Minimization and Speed Management Policy and Guidelines Workgroup. (2020). Washington State Injury Minimization and Speed Management Policy Elements and Implementation Recommendations. Injury Minimization and Speed Management Policy Elements and Recommendations (wa.gov)

[xix] City of Bellevue. (n.d.). Speed Limit Standard Operating Procedures (SOP). Speed Limit Operating Procedure.

[xx] Iteris. (n.d.). Iteris ClearGuide. https://www.iteris.com/oursolutions/traffic-analytics-software/clearguide

[xxi] Soloman, D. (1964). Accidents on Main Rural Highways Related to Speed, Driver, and Vehicle. Bureau of Public Roads.

[xxii] Johnson, S. L. (2005). Cost-Benefit Evaluation of Large Truck-Automobile Speed Limit Differentials on Rural Interstate Highways. MackBlackwell Transportation Center, University of Arkansas.

[xxiii] Minnesota Department of Transportation. (2021). Otter Tail County, County Roadway Safety Plan: Moving Towards Zero Deaths. https://ottertailcounty.gov/wp-content/uploads/2021/02/CRSP-2021-Final.pdf

[xxiv] Virginia Department of Transportation. (2018). Pedestrian Safety Action Plan. https://vdot.maps.arcgis.com/apps/webappviewer/index.html?id=02a155fedefa4e71bdb8c0cf524b636f

[xxv] Virginia Department of Transportation. (n.d.). Virginia iCAP. https://www.vdot.virginia.gov/info/innovative_intersections_and_interchanges/virginia_icap.asp

[xxvi] Khan, N. A., & Habib, M. A. (2022). Exploring the impacts of built environment on pedestrian injury severity involving distracted driving. Journal of safety research, 80, 97–108. https://pubmed.ncbi.nlm.nih.gov/35249632/

[xxvii] Seattle Department of Transportation. (2020). Speed Limit Case Studies. https://www.seattle.gov/documents/Departments/SDOT/VisionZero/SpeedLimit_CaseStudies_Report.pdf

[xxviii] Hu, W. & McCartt , A. T. (2016). Effects of automated speed enforcement in Montgomery County, Maryland, on vehicle speeds, public opinion, and crashes, Traffic Injury Prevention, 17:1, 53-58. https://www.tandfonline.com/doi/full/10.1080/15389588.2016.1189076

[xxix] Florida Department of Transportation. (2023). Design Manual. https://www.fdot.gov/roadway/fdm/default.shtm

[xxx] New South Wales Government. (2023). 2026 Road Safety Action Plan: Towards Zero Trauma on NSW Roads. https://towardszero.nsw.gov.au/sites/default/files/2023-05/TNSW10046-Road-Safety-Action-Plan-2026_1.pdf

[xxxi] PedBikeInfo (2023, September 25). Part 1: Introduction and Overview of Study Findings. [Webinar]. Pedestrian & Bicycle Information Center (pedbikeinfo.org)

[xxxiii] Swedish Transport Administration (Trafikverket). (2023). Analysis of Road Safety Trends 2022: Management by objectives for road safety work towards the 2030 interim targets. Analysis of road safety trends 2022 - Management by objectives for road safety work towards the 2030 interim targets (diva-portal.org)

[xxxiv] Federal Highway Administration (FHWA). (2023). Safe System Approach to Speed Management. Safe System Approach for Speed Management (dot.gov)

[xxxv] Federal Highway Administration (FHWA). (n.d.). Speed Management Action Plan – Implementation Steps. Speed Management - Reference Materials - Safety | Federal Highway Administration (dot.gov)

[xxxvi] Institute of Transportation Engineers (ITE). (n.d.). Traffic Calming. Traffic Calming - Institute of Transportation Engineers (ite.org)

[xxxvii] United States Department of Transportation (USDOT). (2019). Traffic Calming to Slow Vehicle Speeds. Traffic Calming to Slow Vehicle Speeds | US Department of Transportation

[xxxviii] Institute of Transportation Engineers (ITE). (2018). Traffic Calming Fact Sheets. Traffic Calming Fact Sheets - Road Diet (ite.org)

[xxxix] Federal Highway Administration (FHWA). (n.d.). Speed Safety Cameras. Speed Safety Cameras | FHWA (dot.gov)

[xl] National Highway Traffic Safety Administration (NHTSA). (n.d.). Countermeasures That Work - 2.1 Automated Enforcement. 2.1 Automated Enforcement | NHTSA

[xli] Federal Highway Administration (FHWA). (n.d.). Speed Safety Cameras. Speed Safety Cameras | FHWA (dot.gov)

[xlii] Washington Traffic Safety Commission (WTSC). (2023). Speed Safety Camera Readiness Guide: An Introduction to Speed Safety Cameras and What's Involved in Starting a Program in Your Community. Speed-Safety-Camera-Readiness-Guide-02-2023.pdf (wa.gov)

[xliii] Washington State Legislature. (n.d.). RCW 46.63.170. RCW 46.63.170: Automated traffic safety cameras—Definition. (Effective until June 30, 2025.) (wa.gov)

[xliv] Municipal Research and Services Center of Washington (MRSC). (2023). Automated Traffic Safety Cameras. MRSC - Automated Traffic Safety Cameras

[xlv] City of Bellevue. (2023). Vision Zero. Vision Zero | Bellevue (arcgis.com)

[xlvi] Washington Traffic Safety Commission (WTSC). (2023). Speed Safety Camera Readiness Guide: An Introduction to Speed Safety Cameras and What's Involved in Starting a Program in Your Community. Speed-Safety-Camera-Readiness-Guide-02-2023.pdf (wa.gov)

[xlvii] Washington State Legislature. (n.d.). RCW 46.63.170. RCW 46.63.170: Automated traffic safety cameras—Definition. (Effective until June 30, 2025.) (wa.gov)

[xlviii] City of Bellevue. (2022). Mobility Implementation Plan. Bellevue_MIP_Vol1&2_8.1.22.pdf (bellevuewa.gov)

[xlix] United States Department of Transportation Federal Highway Administration (FHWA) and National Highway Traffic Safety Administration (NHTSA). (2023). Speed Safety Camera Program Planning and Operations Guide. Speed Safety Camera Program Planning and Operations Guide (dot.gov)

[l] Washington Traffic Safety Commission (WTSC). (2023). Speed Safety Camera Readiness Guide: An Introduction to Speed Safety Cameras and What's Involved in Starting a Program in Your Community. Speed-Safety-Camera-Readiness-Guide-02-2023.pdf (wa.gov)

[li] United States Department of Transportation Federal Highway Administration (FHWA). (n.d.). Speed Management Safety Reference Materials. Reference Materials | FHWA (dot.gov)

[lii] Washington Traffic Safety Commission (WTSC). (n.d.). Resources. Resources - Washington Traffic Safety Commission