

MEMORANDUM

Date:	March 4, 2025	TG:	1.23191.01
To:	Philip Hill, City Administrator, City of Lake Forest Park		
From:	Drew Heckathorn and Jon Pascal, PE, Transpo Group		
Subject:	Evaluation of New Marked Crosswalks along NE 178th Street & SR 104 Corridors		

This memorandum summarizes the analysis that was conducted to evaluate two potential new marked crosswalk locations: (1) NE 178th Street at the intersection with 40th Avenue NE and, (2) State Route (SR) 104 at the entrance to the Forest Park Condominiums (19115 Ballinger Way). This evaluation considered the WSDOT Traffic Manual criteria for pedestrian crossings at uncontrolled locations and national best practice guidance. The analysis included the following elements:

- Study Purpose and Background
- Roadway Characteristics
- Crosswalk Siting Considerations
- WSDOT Traffic Manual and National Best Practice Guidance
- Findings and Recommendations

Study Purpose and Background

The City of Lake Forest Park seeks to create a transportation system that is safe, sustainable, accessible and equitable for all people in the community. As part of this desired vision, the City is interested in evaluating a couple specific locations that may benefit from the installation of new marked crosswalks. Each location is a fairly long distance from the nearest marked crosswalk. Long distances between marked crosswalks make reaching destinations less accessible for people walking and taking transit and potentially reduce safety by encouraging people to cross roadways at unmarked mid-block locations.

This study specifically evaluates two locations: (1) NE 178th Street at the intersection with 40th Avenue NE and, (2) SR 104 at the entrance to the Forest Park Condominiums. Each location was evaluated for new marked crosswalks and the type of design features that would be necessary based on WSDOT and national best practice guidance. Guidance from the following resources were considered as part of this study.

WSDOT Traffic Manual

The WSDOT Traffic Manual¹ provides guidance for pedestrian crossings at locations where no traffic control is present. This guidance applies to locations without a stop sign, signal, or roundabout present. The WSDOT guidance provides crossing enhancement recommendations based on traffic volume, posted speed and number of lanes, and guidance from multiple national and state resources.

¹ *WSDOT Traffic Manual, Chapter 4-6.2*, Washington State Department of Transportation, May 2021

NCHRP Report 562

NCHRP Report 562 – *Improving Pedestrian Safety at Unsignalized Crossings*² summarizes an extensive research effort to inform unsignalized crosswalk treatment best practice guidance and expands upon the guidance in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)³.

MUTCD, 11th Edition

The MUTCD, 11th Edition provides public roadway design guidance compiled by the U.S. Department of Transportation's Federal Highway Administration. Design guidance in this resource includes roadway markings, signage, signals, and safety features with recommendations depending on a given roadway's design and operational characteristics. Chapter 4 of this manual includes recommendations for midblock crosswalks and pedestrian signal warrants.

NACTO Urban Street Design Guide

The National Association of City Transportation Officials (NACTO) *Urban Street Design Guide*⁴ is a national best practice resource for public roadway design, emphasizing safe and multimodal design for urban streets. This guidance includes recommendations for unsignalized and midblock crosswalks.

NE 178th Street at 40th Avenue NE

Roadway Characteristics

NE 178th Street at the intersection with 40th Avenue NE is a two-lane roadway with approximately 11-foot lanes and a posted speed limit of 25 mph. NE 178th Street provides access between single family residences and local parks and institutions such as Brookside Elementary School. There is a single existing streetlight on the south side of NE 178th Street at the intersection with 40th Avenue NE. One single family residential driveway exists on the south side of NE 178th Street directly across from the 40th Avenue NE approach. On-street parking is permitted only on the south side of NE 178th Street within the vicinity of the potential crosswalk location.

A sidewalk is present along the south side of NE 178th Street, however no marked crosswalk currently exists at this location to cross NE 178th Street and provide safer walking access for people traveling to and from 40th Avenue NE. No sidewalks or shoulder area currently exist along 40th Avenue NE on either side of the street. The closest marked crossing of NE 178th Street is located approximately 600 feet to the west at the intersection with NE 180th Street and Brookside Boulevard NE. There is no existing sidewalk along the north side of NE 178th Street from 40th Avenue NE to connect with a new marked crosswalk. Based on MUTCD guidance, people walking are typically willing to walk up to 300 feet to cross a roadway at a marked crossing. Since the distance from the 40th Avenue NE intersection to the closest marked crossing is significantly greater than 300 feet, it is likely that many people walking will attempt to cross at the current unmarked crossing at 40th Avenue NE to access the sidewalk on the south side of NE 178th Street.

² *NCHRP Report 562 – Improving Pedestrian Safety at Unsignalized Crossings*, National Cooperative Highway Research Program, 2006

³ *Manual on Uniform Traffic Control Devices for Streets and Highways, 11th Edition*, Federal Highway Administration, December 2023

⁴ *Urban Street Design Guide*, National Association of City Transportation Officials, October 2013

Since 40th Avenue NE approaches NE 178th Street at an angle, the intersection includes a wide turning radius on the northeast corner and blind spot challenges for drivers making a southbound left turn onto NE 178th Street. The 40th Avenue NE approach is approximately 70 feet across to accommodate the angled turns. The shallow angle of the westbound right turning movement allows drivers to make this turning maneuver at higher speeds than they could for a typical 90-degree turn. The current intersection layout is shown in Figure 1.



Figure 1 – NE 178th Street Intersection with 40th Avenue NE

Traffic volumes and vehicle speeds were collected along NE 178th Street for one week in October 2024 and are summarized in Table 1. Available sight distance was also measured at the intersection in November 2024 and shown in Table 1.

Table 1. NE 178th Street Traffic Volumes, Speeds, and Sight Distance

Location	Daily Traffic Volume	Peak Hour Volume	Speed Limit	85th Percentile Speed	Percent Trucks	Available Sight Distance
NE 178th Street	5,600	600	25	26	1.1%	425 feet

Traffic volumes and speeds are key considerations to help determine safe crosswalk treatments at unsignalized locations. Higher traffic volumes create more potential for vehicle-pedestrian conflicts and decrease available gaps in traffic for people to cross. Higher traffic speeds increase the stopping sight distance required for vehicles and further reduce available gaps in traffic. Higher traffic speeds are also associated with a greater risk of severe injuries and fatalities when collisions do occur. Figure 2 illustrates how even a small increase in vehicle travel speeds can significantly affect the risk of severe injuries and fatalities for people walking and biking.



Figure 2 - The Likelihood of Fatality Increases Exponentially with Vehicle Speed

Even at locations where marked crosswalks do exist, vehicle speed can have a significant influence on whether drivers will yield to people crossing. For example, the NCHRP Report 562 study found that the compliance rate for drivers yielding to people crossing at crosswalks with high-visibility markings decreased from approximately 60% for 25 mph speed limit roadways to below 20% for 35 mph speed limit roadways. On roadways with few available gaps in traffic and a significant number of drivers refusing to yield at crosswalk locations, people walking may be pressured to accept riskier behavior to cross the roadway such as running or crossing with a narrow gap between vehicles.

The available sight distance at the intersection is at least 425 feet in each direction along NE 178th Street. Based on guidance found in the WSDOT Design Manual⁵, this sight distance is more than adequate for vehicles to safely come to a stop to yield to a person crossing the roadway.

Crosswalk Siting Considerations

As mentioned, the angled approach of 40th Avenue NE at its intersection with NE 178th Street creates blind spot challenges for drivers making southbound left turns and allows drivers to make westbound right turns at higher speeds. A crosswalk located to the west of the 40th Avenue NE approach would allow people crossing the street to avoid both of these potentially less safe turning maneuvers. A crosswalk located to the west of the approach would also provide more direct access to common walking destinations such as Brookside Elementary School.

The City could also consider roadway geometry enhancements to potentially further reduce the risk of collisions from these less safe turning maneuvers. Enhancements could include curb extensions and rechannelizing the 40th Avenue NE approach to narrow the approach width and allow both southbound left and westbound right turning vehicles to make safer 90-degree turns. These enhancements could potentially be achieved with lower capital cost intensive features such as striping and “candlestick” bollards. However, depending on the final design of the enhanced intersection layout, additional features such as ADA-compliant pedestrian ramps and tactile strips, along with stormwater drainage improvements may be necessary. For example, the inclusion of pedestrian ramps on the northwest corner of the intersection may require some tunneling of the

⁵ WSDOT Design Manual, Chapter 1260, Washington State Department of Transportation, September 2024

existing drainage ditch. Also, the location of pedestrian ramps may conflict with the location of existing catch basins. Potential adjustments to the drainage system and construction of pedestrian ramps may require the crosswalk improvement to be programmed as a capital project. Figure 3 shows how these roadway geometry enhancements could alter the layout of the intersection.

Adding a crosswalk at this location could also prompt concerns that the crosswalk does not connect to any sidewalks along the north side of NE 178th Street or along 40th Avenue NE. Addressing sidewalk gaps along the north side of NE 178th Street or along 40th Avenue NE would also require significant capital investment.

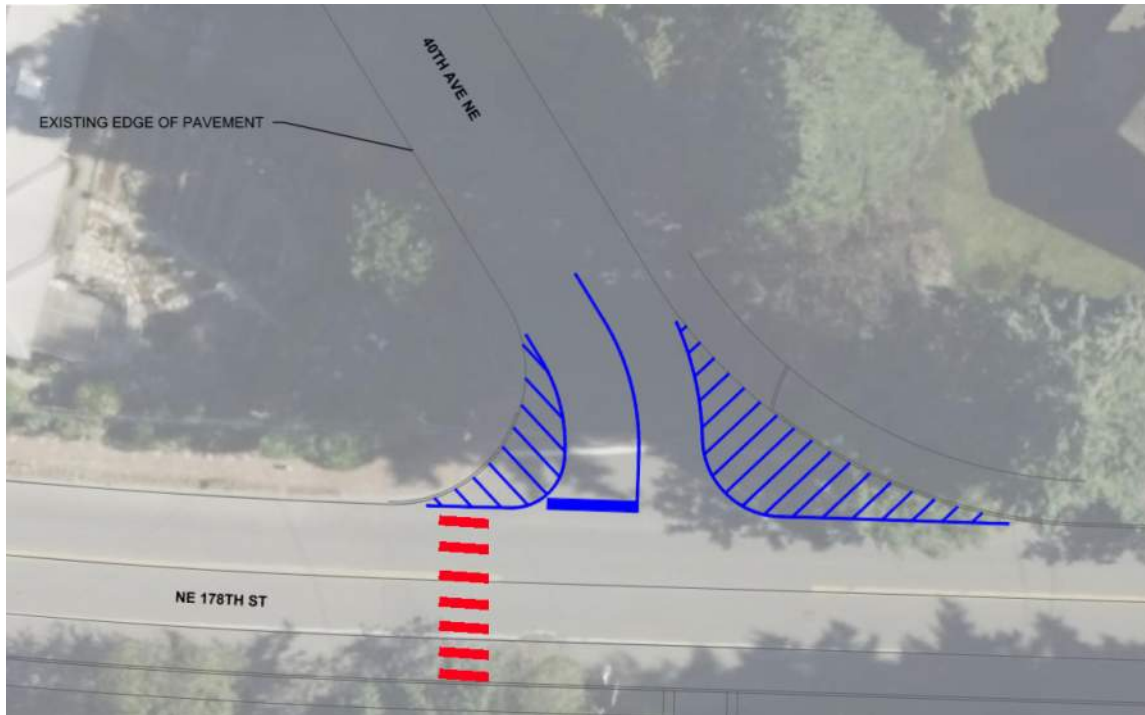


Figure 3 - Potential Roadway Geometry Enhancements

WSDOT Uncontrolled Pedestrian Crossing Guidance

The WSDOT Traffic Manual determines the need for additional crossing enhancements beyond marked crosswalks based on traffic volumes, posted speeds, and number of lanes present. Based on the criteria shown in Figure 4, marked crosswalks alone may be suitable for the NE 178th Street proposed crossing at 40th Avenue NE.

However, the WSDOT guidance recommends considering additional enhancements at this location, such as high-visibility crosswalk markings, parking restrictions on crosswalk approaches, adequate nighttime lighting, and crossing warning signs. Other treatment options to consider include raised crosswalks, in-street pedestrian crossing signs, and pedestrian refuge islands, however, these additional treatment options may only be necessary if field observations demonstrate many vehicles refusing to yield to people crossing the roadway. Based on the traffic volumes and speeds on NE 178th Street, it is reasonable to anticipate that most vehicles will yield to people crossing the roadway with the WSDOT recommended additional enhancements of high-visibility crosswalk markings, parking restrictions on crosswalk approaches, adequate nighttime lighting, and crossing warning signs.

As shown in Figure 4, rectangular rapid-flashing beacons (RRFBs) are not included as a treatment to consider for lower volume roadways with speed limits less than 30 mph like NE 178th Street. As mentioned, driver yielding behavior at crosswalks is significantly affected by traffic speeds, with lower rates of drivers yielding to people walking across roadways with higher traffic speeds. The RRFB treatment was intentionally designed to improve the yielding compliance rate for these higher speed roadways, especially where more costly improvements such as full pedestrian signals are not warranted. While the WSDOT guidance does not recommend RRFBs for roadways like NE 178th Street, the City still has discretion to install RRFBs at this location. However, given there are many lower volume, lower speed roadways in Lake Forest Park with unmarked crossings, the City should develop guidance for when RRFBs should and should not be considered on these types of roadways to provide for consistent application of these devices.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	1 2 4 5 6	1 5 6 7 9	1 5 6 7 9	1 4 5 6 7 9	1 5 6 7 9	1 5 6 7 9	1 4 5 6 7 9	1 5 6 7 9	1 5 6 9
3 lanes with raised median (1 lane in each direction)	1 2 3 4 5	1 3 5 7 9	1 3 5 7 9	1 3 4 5 7 9	1 3 5 7 9	1 3 5 7 9	1 3 4 5 7 9	1 3 5 7 9	1 3 5 9
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	1 2 3 4 5 6	1 3 5 6 7 9	1 3 5 6 9 7 9	1 3 4 5 6 7 9	1 3 5 6 7 9	1 3 5 6 9 7 9	1 3 4 5 6 7 9	1 3 5 6 9	1 3 5 6 9
4+ lanes with raised median (2 or more lanes in each direction)	1 3 5 7 8 9	1 3 5 7 8 9	1 3 5 8 9 7 8 9	1 3 5 7 8 9	1 3 5 7 8 9	1 3 5 8 9 7 8 9	1 3 5 7 8 9	1 3 5 8 9	1 3 5 8 9
4+ lanes w/o raised median (2 or more lanes in each direction)	1 3 5 7 8 9	1 3 5 6 7 8 9	1 3 5 6 8 9 7 8 9	1 3 5 6 7 8 9	1 3 5 6 7 8 9	1 3 5 6 8 9 7 8 9	1 3 5 6 7 8 9	1 3 5 6 8 9	1 3 5 6 8 9

Given the set of conditions in a cell,

Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.

● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.

○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs

2 Raised crosswalk

3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line

4 In-Street Pedestrian Crossing sign

5 Curb extension

6 Pedestrian refuge island

7 Rectangular Rapid-Flashing Beacon (RRFB)**

8 Road Diet

9 Pedestrian Hybrid Beacon (PHB) and Pedestrian Signals**

Figure 4 - Application of Pedestrian Crash Countermeasures by Roadway Feature (WSDOT Traffic Manual)

Findings/Recommendations

- **Provide a high-visibility marked crosswalk on NE 178th Street to the west of the 40th Avenue NE approach, restrict parking and install adequate nighttime lighting and crossing warning signs along both approaches to the crosswalk.** Crosswalk warning signs should be adequately spaced from existing signs, such as the speed camera enforcement signs, to give drivers enough time to register the information on each sign. Installing a crosswalk at this location may require additional capital investments, such as alterations to the drainage system, construction of ADA-accessible ramps, and addressing sidewalk gaps.

- Consider additional roadway geometry enhancements, as shown in Figure 4, that would allow southbound left and westbound right turning vehicles to make safer 90-degree turns.

SR 104 at the Forest Park Condominiums Driveway

Roadway Characteristics

The SR 104 corridor in Lake Forest Park at the entrance to the Forest Park Condominiums (19115 Ballinger Way) has a two-lane cross-section with approximately 11-foot lanes and a posted speed limit of 35 mph. The speed limit was recently modified from 40 mph to 35 mph in August 2024. A sidewalk is located on the east side of SR 104 and a northbound bus pullout is located just to the north of the Forest Park Condominiums driveway. A southbound bus stop is also located just to the south of the Forest Park Condominiums driveway. There is a single existing streetlight on the west side of SR 104, adjacent to the Forest Park Condominiums driveway. One residential driveway exists on the east side of SR 104 directly across from the Forest Park Condominiums driveway. On-street parking is not permitted on SR 104 within the vicinity of the potential crosswalk location. A general location for a potential crosswalk is shown in Figure 5.



Figure 5 – SR 104 Intersection with Forest Park Condominiums Driveway

No marked crosswalks currently exist at this location to cross SR 104. The closest marked crossing of SR 104 is located approximately a quarter mile to the northwest at the intersection with NE 195th Street and 25th Avenue NE. This existing marked crossing is well beyond the willingness to walk distance guidance provided in the MUTCD. The lack of a marked crosswalk at this location also reduces accessibility for people taking transit at the bus stops on either side of SR 104 and prevents residents of the Forest Park Condominiums from safely accessing the sidewalk and northbound transit stop on the east side of SR 104.

Traffic volumes and vehicle speeds were collected along SR 104 for one week in October 2024 and are summarized in Table 2. Available sight distance was also measured at the intersection in November 2024 and shown in Table 2.

Location	Daily Traffic Volume	Peak Hour Volume	Speed Limit	85th Percentile Speed	Percent Trucks	Available Sight Distance
SR 104	15,300	1,200	35	40	1.2%	>450 feet

The available sight distance at the intersection is at least 450 feet in each direction along SR 104. Based on WSDOT design requirements, this sight distance is more than adequate for vehicles to safely come to a stop to yield to a person crossing the roadway.

Crosswalk Siting Considerations

A crosswalk located to the south of the Forest Park Condominium driveway would allow people to cross the roadway behind each of the nearby bus stops on SR 104. In the *Urban Street Design Guide*, NACTO recommends placing midblock crosswalks behind bus stops. This placement decreases the likelihood of bus-pedestrian conflicts due to people walking in front of buses as a bus departs the bus stop. Vehicle-pedestrian conflicts may arise when a bus driver is unable to see a person crossing the roadway due to a potential blind spot in front of the bus.

Additionally, when the project advances towards implementation, the City should work more closely with WSDOT to identify the optimal crosswalk location. The design phase would gather more site specific data and survey, which will help in confirming the best location for the crosswalk.

WSDOT Uncontrolled Pedestrian Crossing Guidance

Based on the criteria in Figure 4, the potential crossing location along SR 104 at the entrance to the Forest Park Condominiums would require additional crossing treatments beyond a marked crossing. The required enhancements would include high-visibility crosswalk markings, adequate nighttime lighting, and crossing warning signs.

The WSDOT guidance also recommends considering additional enhancements at this location, such as pedestrian hybrid beacons (PHBs) or a pedestrian signal. However, the MUTCD recommends placing pedestrian signals more than 100 feet away from driveways. Pedestrian signals can give people walking potentially false perceptions that all nearby vehicles will yield to their right-of-way. However, drivers of vehicles at nearby driveways which are controlled by stop signs may not be aware of the pedestrian signals and turn in front of people crossing the roadway. Additionally, the MUTCD pedestrian signal warrants for a 35 mph roadway would only be met if 428 people crossed the roadway during a peak four-hour period or 133 people crossed the roadway during a peak one-hour period.

Other treatments to consider based on WSDOT guidance include curb extensions, pedestrian refuge islands, and RRFBs. RRFBs would provide higher visibility than just a marked crosswalk and lower capital investment compared to a PHB or pedestrian signal. RRFBs could be paired with curb extensions to further enhance the safety and visibility of the crosswalk.

Findings/Recommendations

- **Provide a high-visibility marked crosswalk with RRFBs on SR 104 to the south of the Forest Park Condominiums driveway and install adequate nighttime lighting and crossing warning signs along both approaches to the crosswalk.**
- Consider installing curb extensions to further enhance the safety of the crossing.
- Confirm the optimal crosswalk location during the design phase when more specific data is available.