



TECHNICAL MEMORANDUM

DATE: June 17, 2026

TO: Carrie Harris | City of Bend

FROM: Kayla Fleskes-Lane, Anders Hart, Efren Alonzo, Casey Dobbert | DKS Associates

SUBJECT: Hawthorne Avenue and Harriman Street Connections Study – Project #24998-003
Multimodal Needs Analysis

The Hawthorne Avenue and Harriman Street Connections project will identify and evaluate multimodal street improvements for two street segments through the core of Bend, with a focus on enhancing walking and biking connectivity in the area. Specifically, the project will evaluate cross-section improvements and intersection treatments using best engineering practices (e.g., National Association of City Transportation Officials, or NACTO, guidance) to address key barriers in the walking and biking network. These improvements will enhance safety and comfort for all road users.

This document includes a discussion of:

- The study area and relevant project background,
- Existing multimodal volumes and traffic speeds in the study area
- Existing conditions and needs for each study segment, focused on conditions for people walking and biking, safety, parking and potential changes to traffic control to enhance safety and multimodal connectivity.

A future concept workshop will help identify alternatives for evaluation which will then be presented to the public for feedback. The Appendix includes supporting documentation and is organized into the following sections:

- Section 1: Traffic Counts
- Section 2: Crash Data
- Section 3: All-way Stop Control Warrant Worksheets
- Section 4: NCHRP 562 Pedestrian Crossing Analysis Worksheets
- Section 5: Traffic Signal Warrant Worksheets for Hawthorne Avenue/3rd Street
- Section 6: HCM Reports for Harriman Street Intersections
- Section 7: HCM Reports for the 3rd Street Intersections
- Section 8: SimTraffic Report for 3rd Street with a Signal at Hawthorne Avenue

PROJECT BACKGROUND AND STUDY AREA

The City of Bend is investing in Key Walking and Bicycling Route improvements across the City, as identified in the City's Transportation System Plan (TSP) and the voter-approved General Obligation Transportation Bond (GO Bond). The City has identified the need for enhanced low-stress connections to fill gaps in the City's Key Walking and Biking Routes between planned, on-going projects. This need includes two segments (see Figure 1):

- Hawthorne Avenue between 3rd Street and 5th Street
- Harriman Street between Greenwood Avenue and Franklin Avenue

These segments are on either side of a planned bicycle and pedestrian overcrossing of US 97 along Hawthorne Avenue. Bend's Low Stress Bicycle Network (LSN) includes both segments and extends to Juniper Park to the east.

The Core Area around this project is expected to see redevelopment in the coming years, with an increased number of people living and working in the area. This redevelopment along with the planned Hawthorne Overcrossing over US 97 connecting the two areas (see Figure 2) is expected to result in substantially more people walking and biking in the area. On the east side this includes an increased number of people crossing 3rd Street to access the grocery store, transit, and Juniper park. The west side of the project will connect people to City-wide bikeways and provide access to Downtown and West Bend.

The City is also building or has built several other active transportation projects in the area, including a bikeway project on Franklin Avenue, a quick-build project on Greenwood Avenue and several others (see Figure 2). It will be important for all these projects to be coordinated to provide the best connectivity for people walking and biking near Downtown and through the Core Area.

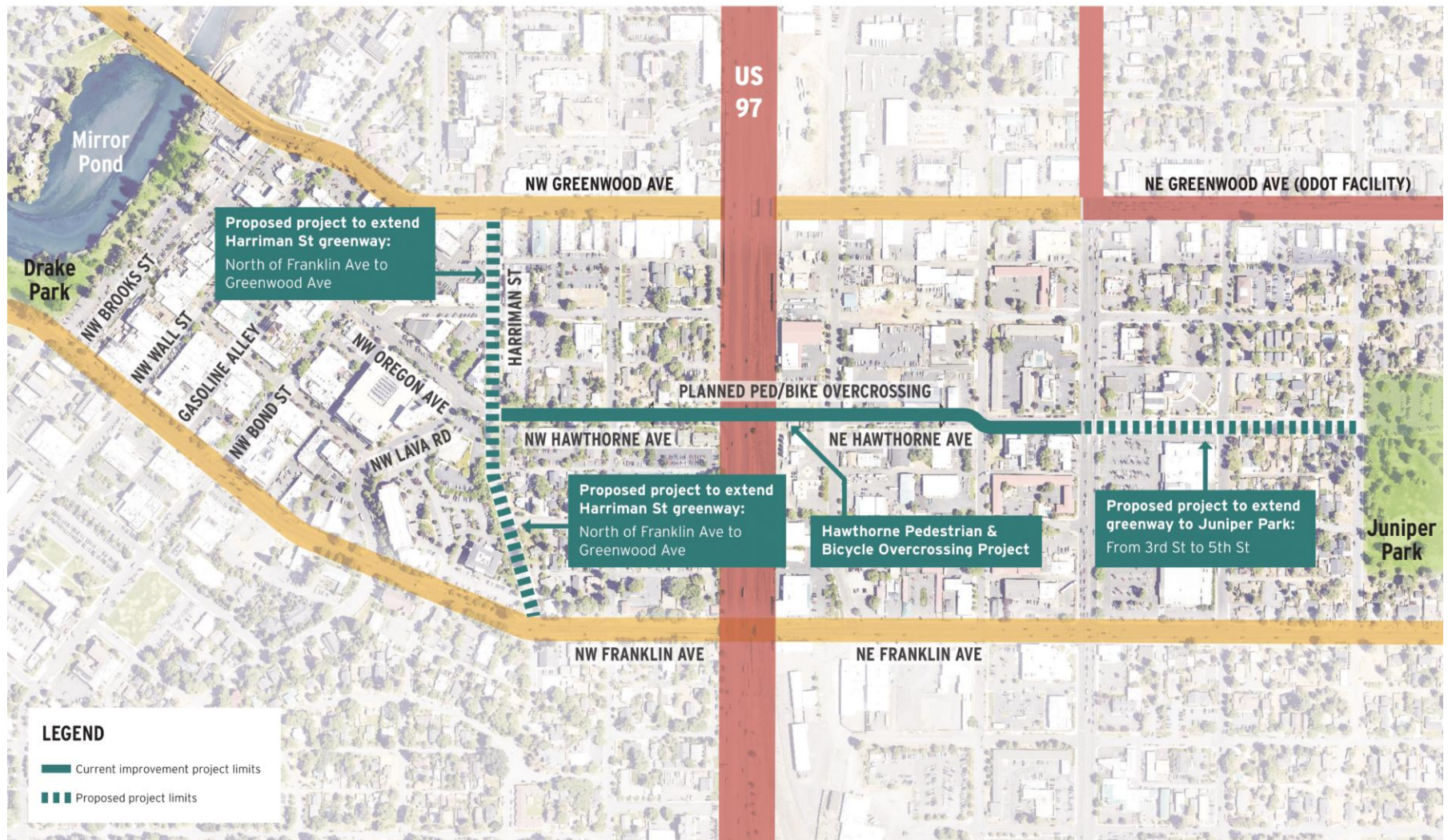


FIGURE 1: STUDY AREA

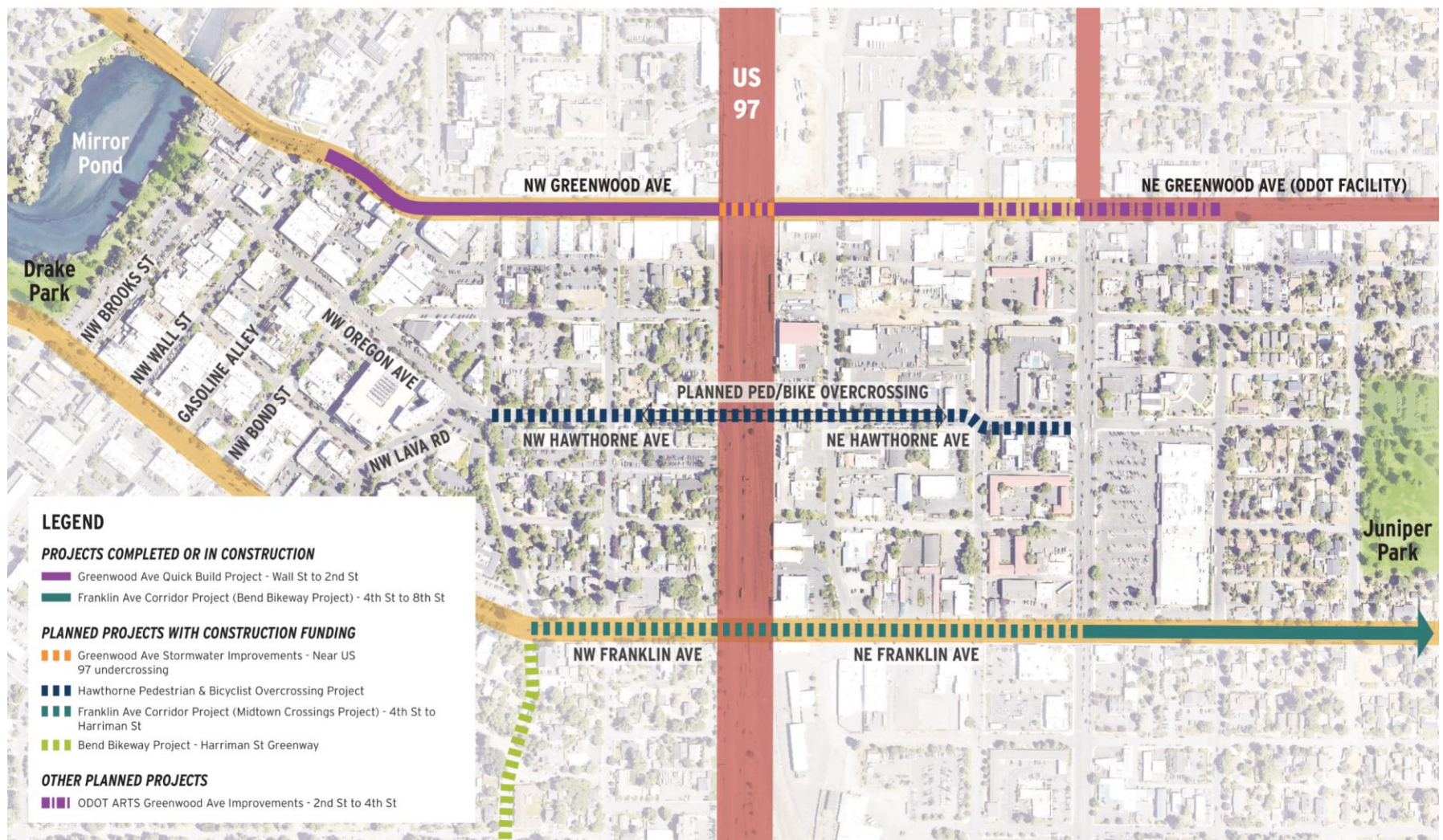


FIGURE 2: ACTIVE PROJECTS IN THE STUDY AREA

HAWTHORNE OVERCROSSING

While not part of this project, the planned Hawthorne Overcrossing will provide key connections over US 97 and the railroad and connects the two segments for this project. For the Hawthorne Overcrossing project, the City has identified several alternatives for connecting the Hawthorne overcrossing to the adjacent street network, and currently the Promenade concept (see Figures 3 and 4) is expected to advance to the design stage. This option would convert Hawthorne Avenue to a one-way (westbound only) street between Harriman Street and 3rd Street and would add a shared pedestrian and bikeway on the south side of the street.



FIGURE 3: PROMENADE STREET CONCEPT FOR HAWTHORNE AVENUE BETWEEN HILL STREET AND HARRIMAN STREET

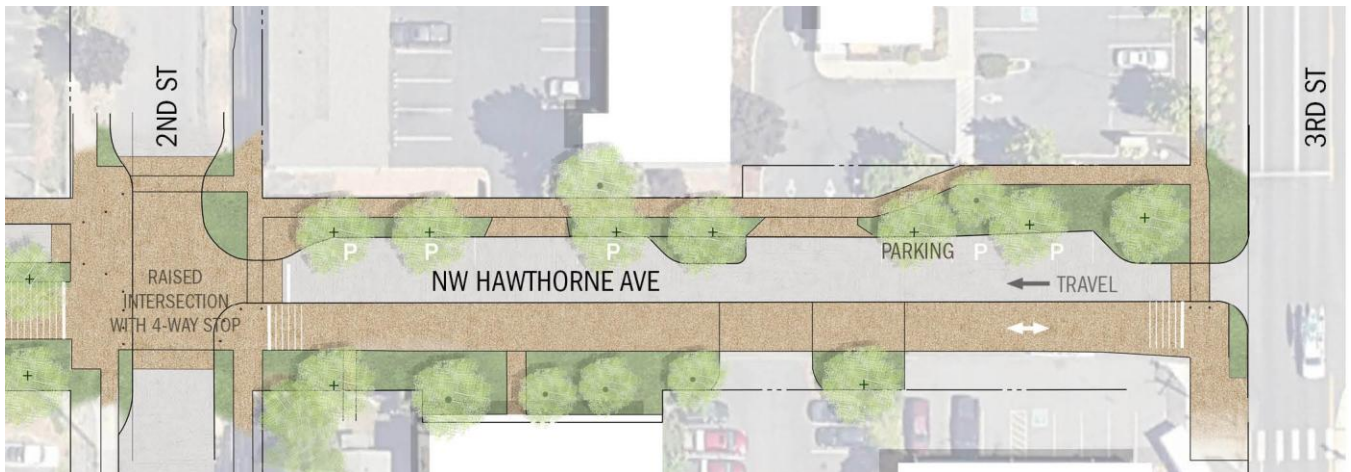


FIGURE 4: PROMENADE STREET CONCEPT FOR HAWTHORNE AVENUE BETWEEN 2ND STREET AND 3RD STREET

EXISTING MULTIMODAL VOLUMES AND TRAFFIC SPEEDS

Traffic volumes and speeds are important considerations when selecting facilities for people walking and biking, as higher traffic volumes and speeds require greater separation between people inside and outside of vehicles. For example, the National Association of City Transportation Officials (NACTO)'s *Urban Bikeway Design Guide*¹ has guidelines for selecting bikeway facilities based on road cross-section, speed, and volume. The data summarized in this section will be used to inform recommendations for safer facilities for people and walking in the study area.

Existing traffic volumes were collected on December 17, 2025, at key intersections within the study area while speeds were collected on Harriman Street just south of Hawthorne Avenue and on Hawthorne Avenue between 3rd Street and 4th Street. During that time, Franklin Avenue between 4th Street and 8th Street was closed to westbound traffic, and detouring westbound vehicles were directed to travel north to Greenwood Avenue, west of Greenwood Avenue, and south of 3rd Street. This closure may have led to higher northbound and southbound traffic volumes on 3rd Street and lower westbound volume at the 3rd Street/Franklin Avenue intersection. To reduce the effect of this closure on the traffic analysis, counts from 2022 and 2021 were used at the Greenwood Avenue/3rd Street and Franklin Avenue/3rd Street intersections, respectively, in the traffic analysis (see the Intersection Operations at Hawthorne Avenue/3rd Street section for more details).

INTERSECTION VOLUMES

The following summarizes the p.m. peak hour intersection volumes observed in the study area (see Appendix for more details):

- At the Hawthorne Avenue/3rd Street intersection:
 - Northbound/southbound vehicle volumes averaged about 900 vehicles in each direction, and majority of the eastbound/westbound volume made right turns.
 - 32 people walking crossed 3rd Street during the busiest pedestrian hour, and 14 people biked through the intersection during the busiest hour for cyclists.
- At the Harriman Street/Hawthorne Avenue intersection:
 - Northbound/southbound vehicle volumes averaged about 100 in each direction, and eastbound/westbound volumes averaged about 175 in each direction (for context, the NACTO *Urban Bikeway Design Guide*'s² threshold for a Shared Street is 60 vehicles in the peak hour and direction). With the implementation of the Hawthorne overcrossing and a new modal filter planned at Franklin Avenue/Harriman Street, vehicle volumes are expected to decrease substantially at this intersection in the future.
 - A total of 16 people walking crossed one of the approaches of this intersection during the pedestrian peak hour, with most people crossing the north leg of the intersection (9 people).

¹ NACTO Urban Bikeway Design Guide, Designing for All Ages and Abilities, <https://nacto.org/publication/urban-bikeway-design-guide/designing-bikeways-for-all-ages-and-abilities/bikeways-on-low-speed-low-volume-streets/shared-spaces/>

² NACTO Urban Bikeway Design Guide, Designing for All Ages and Abilities, <https://nacto.org/publication/urban-bikeway-design-guide/designing-bikeways-for-all-ages-and-abilities/bikeways-on-low-speed-low-volume-streets/shared-spaces/>

- Only one person bicycling in the street was recorded (they made an eastbound left at the intersection).
- At the Harriman Street/Irving Avenue intersection:
 - Vehicle volumes were slightly lower at the Harriman Street/Irving Avenue intersection than at Harriman Street/Hawthorne Avenue while pedestrian and bicyclist volumes were less than five in the p.m. peak hour.

DAILY TRAFFIC VOLUMES

Figure 5 shows that during a typical weekday on Hawthorne Avenue east of 3rd Street, traffic gradually increases during the morning and peaks around 2:00 p.m., after which it declines more quickly. The 24-hour two-way volume was approximately 2,650 vehicles, which is typical of a local street or minor collector. However, per NACTO guidance³, this volume is higher than the threshold for a Shared Street (1,000 vehicles per day), indicating that greater separation between people walking and biking, such as painted bike lanes, from vehicles is recommended. The temporal pattern observed at this location also indicates that conflicts between vehicles and people walking or biking are most likely to occur between 10 a.m. and 6 p.m.

³ NACTO Urban Bikeway Design Guide, Designing for All Ages and Abilities, <https://nacto.org/publication/urban-bikeway-design-guide/designing-bikeways-for-all-ages-and-abilities/bikeways-on-low-speed-low-volume-streets/shared-spaces/>

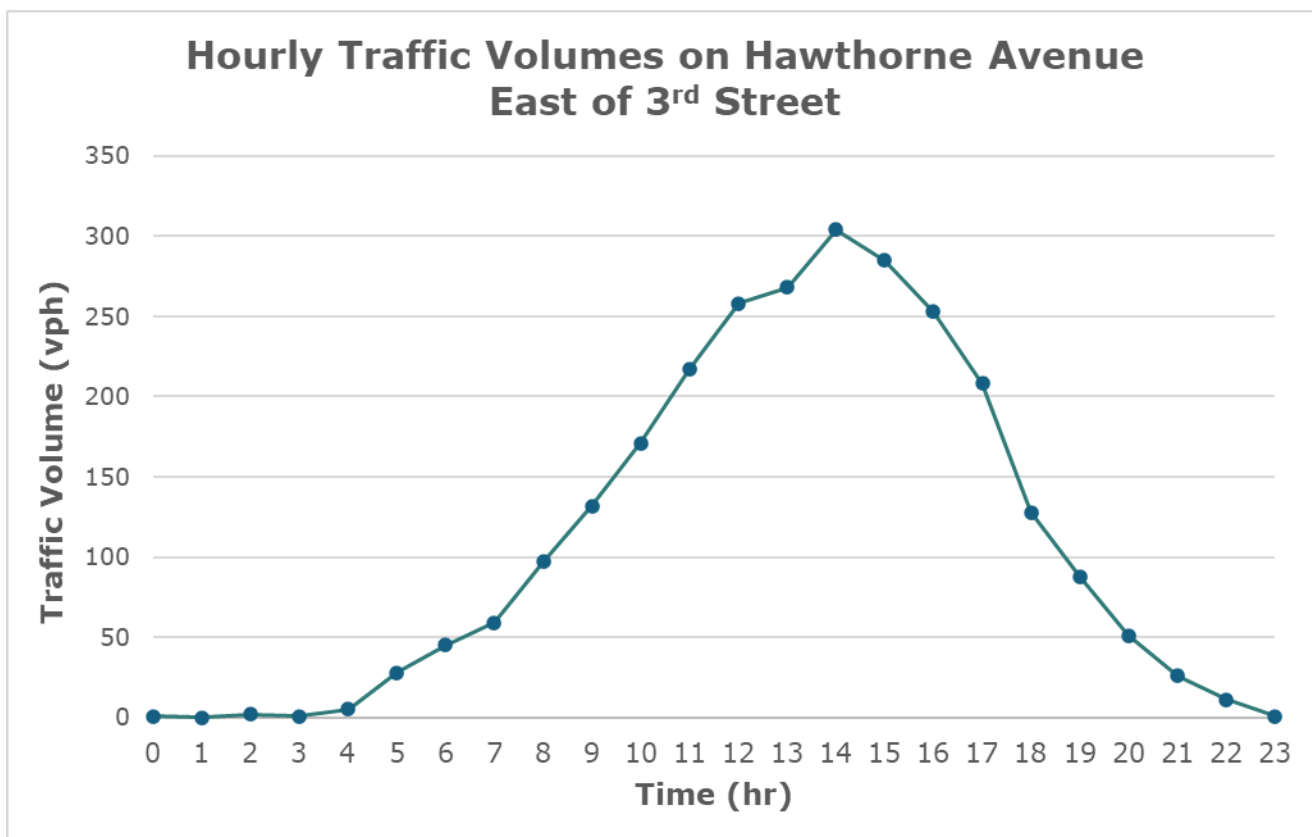


FIGURE 5: HOURLY TRAFFIC VOLUMES ON HAWTHORNE AVENUE EAST OF 3RD STREET

Figure 6 shows a similar pattern on Harriman Street south of Hawthorne Avenue, with the same peak of 2:00 p.m., though the volumes decline more gradually compared to Hawthorne Avenue. The 24-hour two-way volume was approximately 1,900 vehicles, with a roughly even split between northbound and southbound traffic. Similar to Hawthorne Street east of 3rd Street, these volumes also exceed the NACTO threshold for a Shared Street (1,000 vehicles per day and 60 vehicles in the peak hour and direction), indicating greater separation between motorized and non-motorized road users is recommended. However, with the closure of the Hawthorne Avenue/US 97 intersection and the addition of the Franklin Avenue modal filter, this volume may meet the NACTO thresholds; this would be the case if the northbound and southbound volume declined by approximately 50 percent.

The flatter peak compared to Hawthorne Avenue also shows that conflicts between vehicles and people walking or biking are likely to occur over a larger portion of the day.

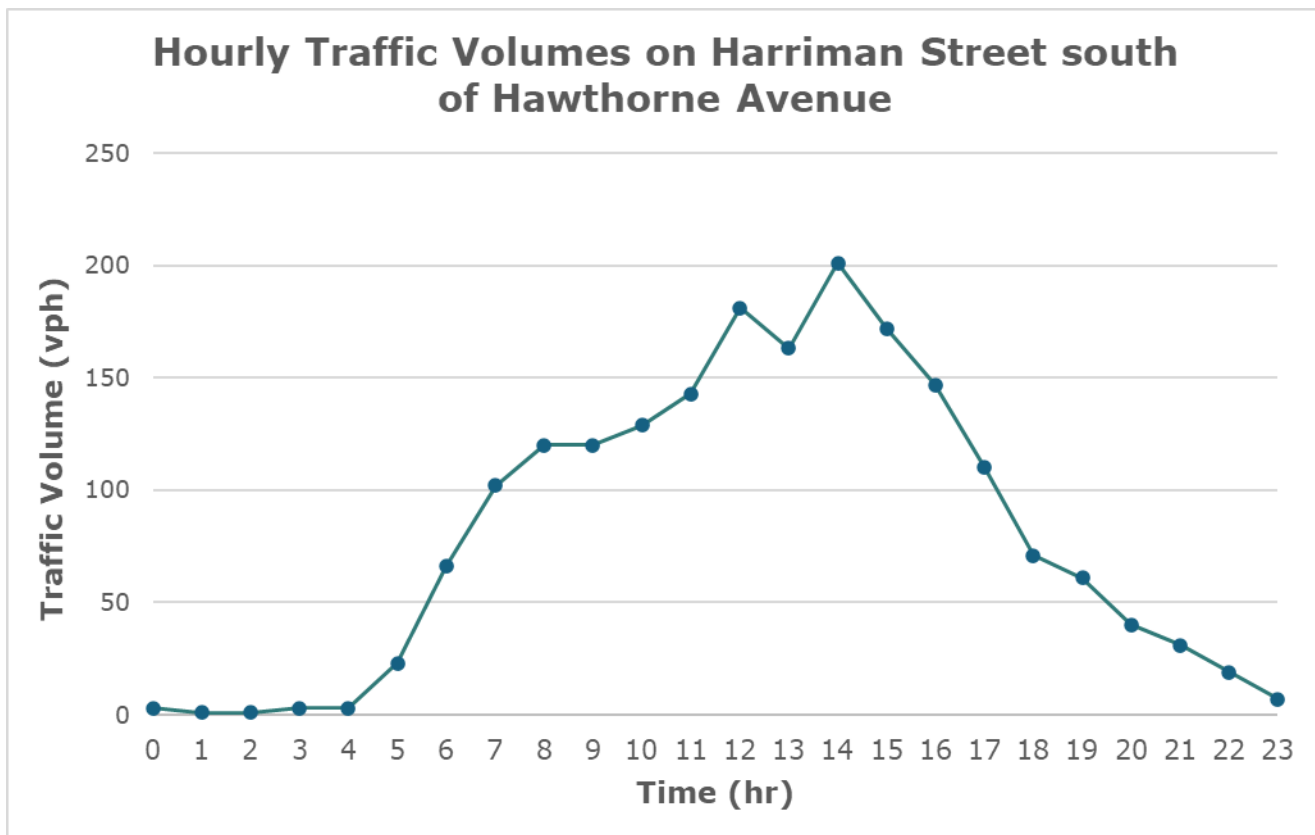


FIGURE 6: HOURLY TRAFFIC VOLUMES ON HARRIMAN STREET SOUTH OF HAWTHORNE AVENUE

TRAFFIC SPEEDS

Observed travel speeds on Hawthorne Avenue were obtained in five miles-per-hour (m.p.h.) increments on Hawthorne Avenue between 3rd Street and 4th Street and on Harriman Street between Hawthorne Avenue and Greeley Avenue. The results are summarized in Figures 7 and 8 for Hawthorne Avenue (for the eastbound and westbound directions, respectively) and Figures 9 and 10 for Harriman Street (for the northbound and southbound directions, respectively).

On Hawthorne Avenue, both the median and 85th percentile speeds were low (11 to 19 miles per hour) and below the posted speed of 25 m.p.h.. This may be due to the proximity of the Cascades East Transit (CET)'s Hawthorne Station, which is on the northwest corner of Hawthorne Avenue and 4th Street, and the presence of stop control on either end of the street limiting the ability to get up to higher speeds. Buses lay over on this segment of Hawthorne Avenue, and are likely to travel slowly as they approach their stop. This pattern is shown on Figures 7 and 8, where the vast majority of vehicles traveled at 20 m.p.h. or slower.

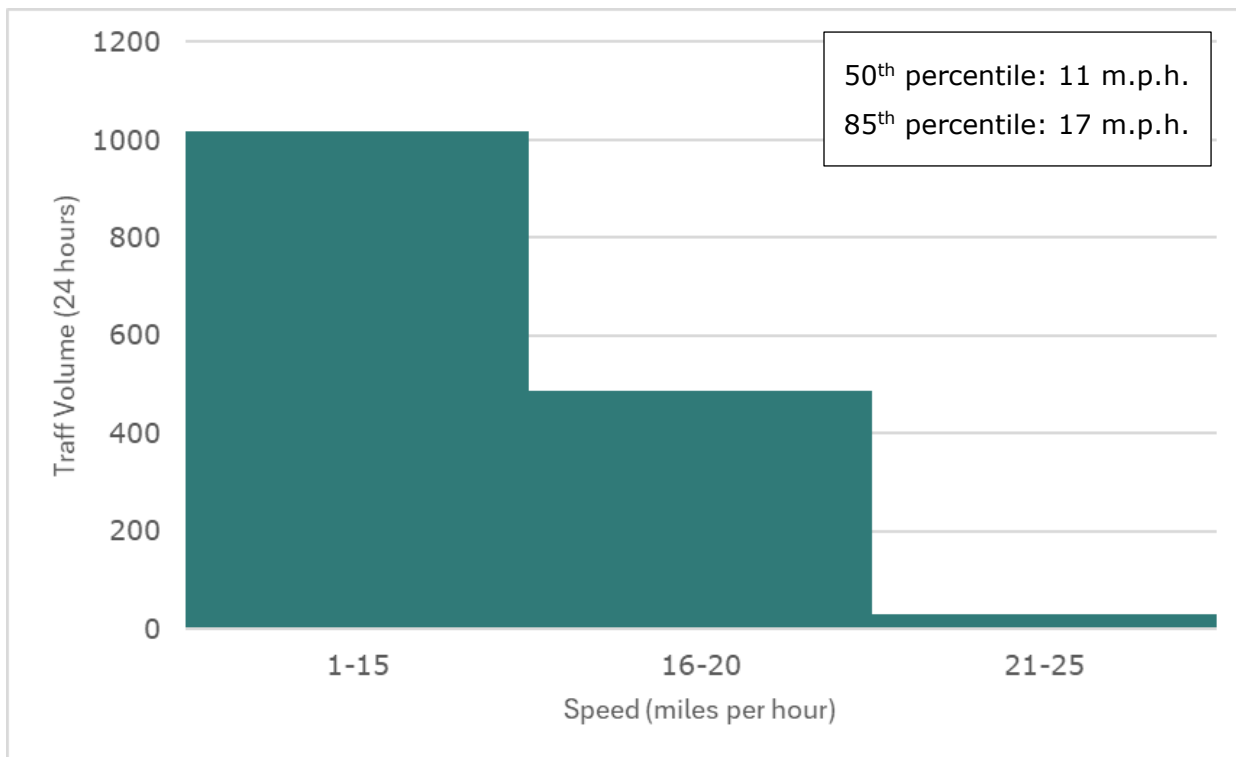


FIGURE 7: EASTBOUND SPEED DISTRIBUTION ON HAWTHORNE AVENUE EAST OF 3RD STREET

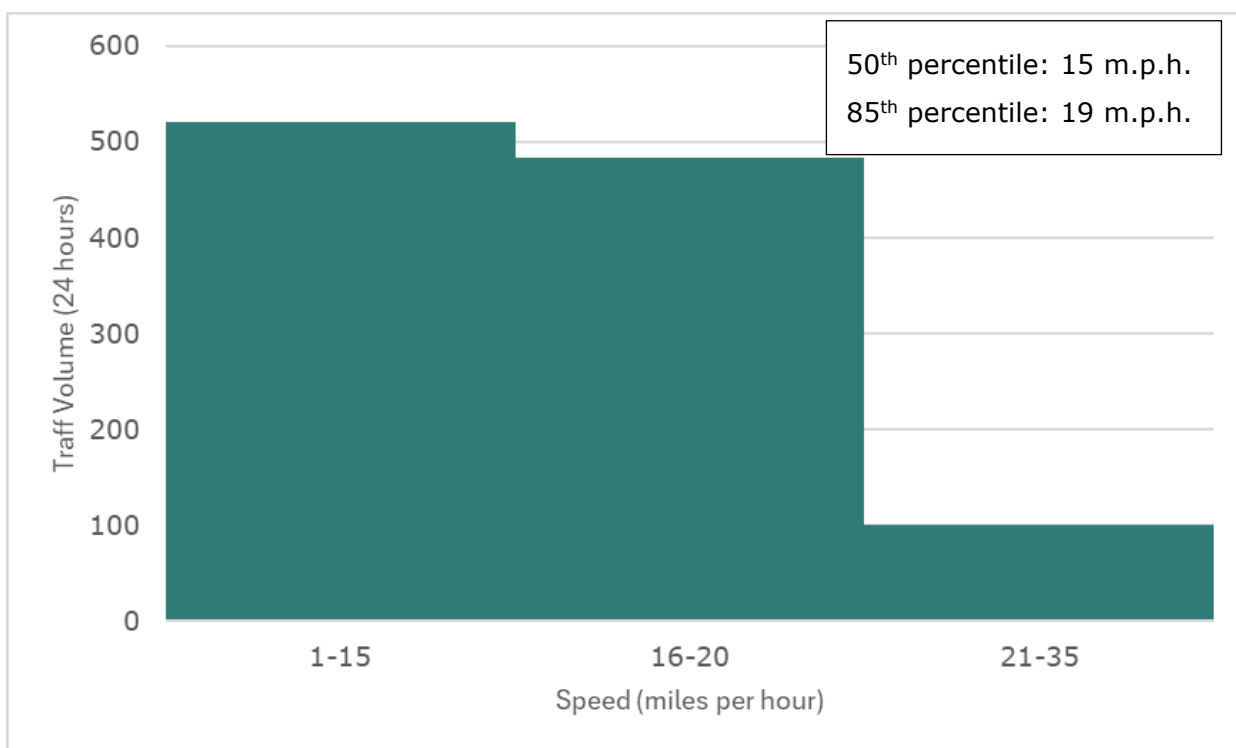


FIGURE 8: WESTBOUND SPEED DISTRIBUTION ON HAWTHORNE AVENUE EAST OF 3RD STREET

On Harriman Street, speeds were higher, with the median being 20-21 miles per hour and the 85th percentile being 24-27 miles per hour; this is higher than the posted speed of 20 m.p.h. The slightly higher speeds observed here (compared to Hawthorne Avenue) may be due to the absence of bus activity and the relatively open cross-section (parking is only allowed on the east side of the street). As shown on Figures 9 and 10, the most common observed speed was 21-25 m.p.h., with a small minority traveling faster than 25 m.p.h. These findings suggest that traffic calming treatments on this part of Harriman Street may be appropriate for slowing speeds to the posted speed of 20 m.p.h.

Historically in Oregon, the 85th percentile speeds were referenced when determining appropriate posted speed zones. However, following a recent rule change to OAR 734-020-0015, 50th percentile speeds are now referenced in urban areas and considered along with the land use context and safety factors⁴. The observed 50th percentile speeds here show that the posted speeds are properly set.

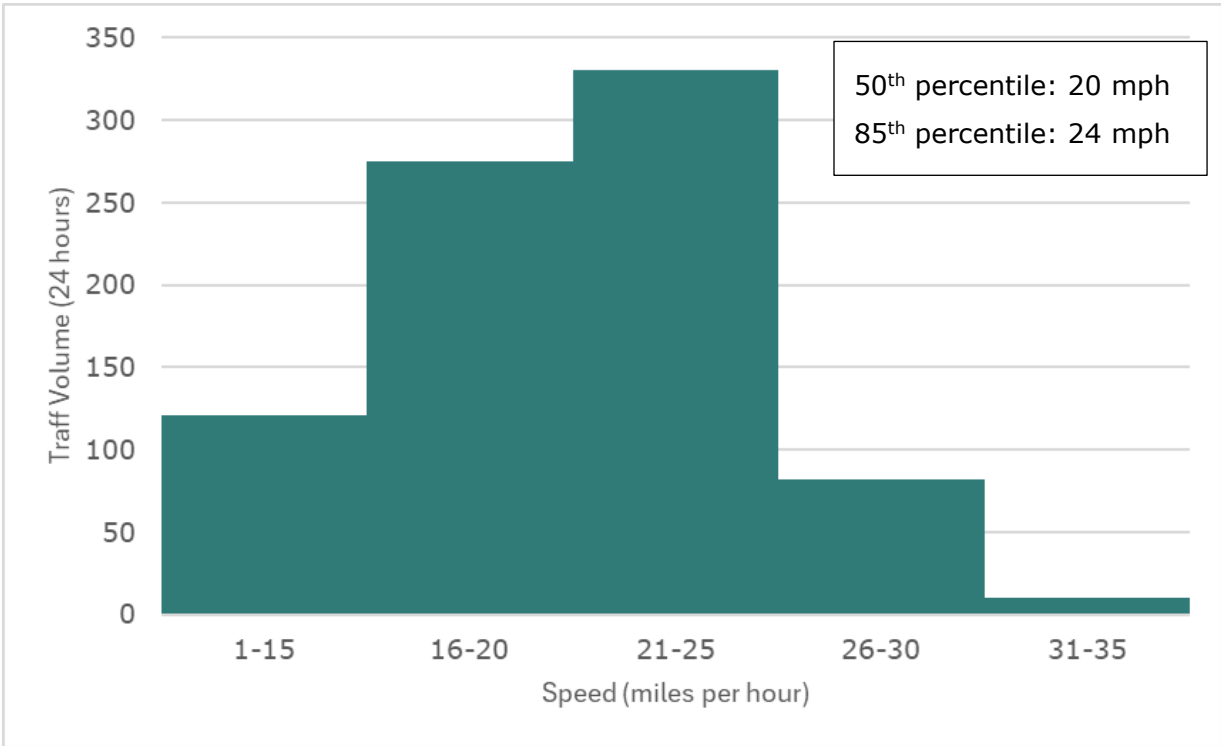


FIGURE 9: NORTHBOUND SPEED DISTRIBUTION FOR HARRIMAN STREET SOUTH OF HAWTHORNE AVENUE

⁴ ODOT Speed Zone Manual full access online: https://www.oregon.gov/odot/Engineering/Docs_TrafficEng/Speed-Zone-Manual.pdf

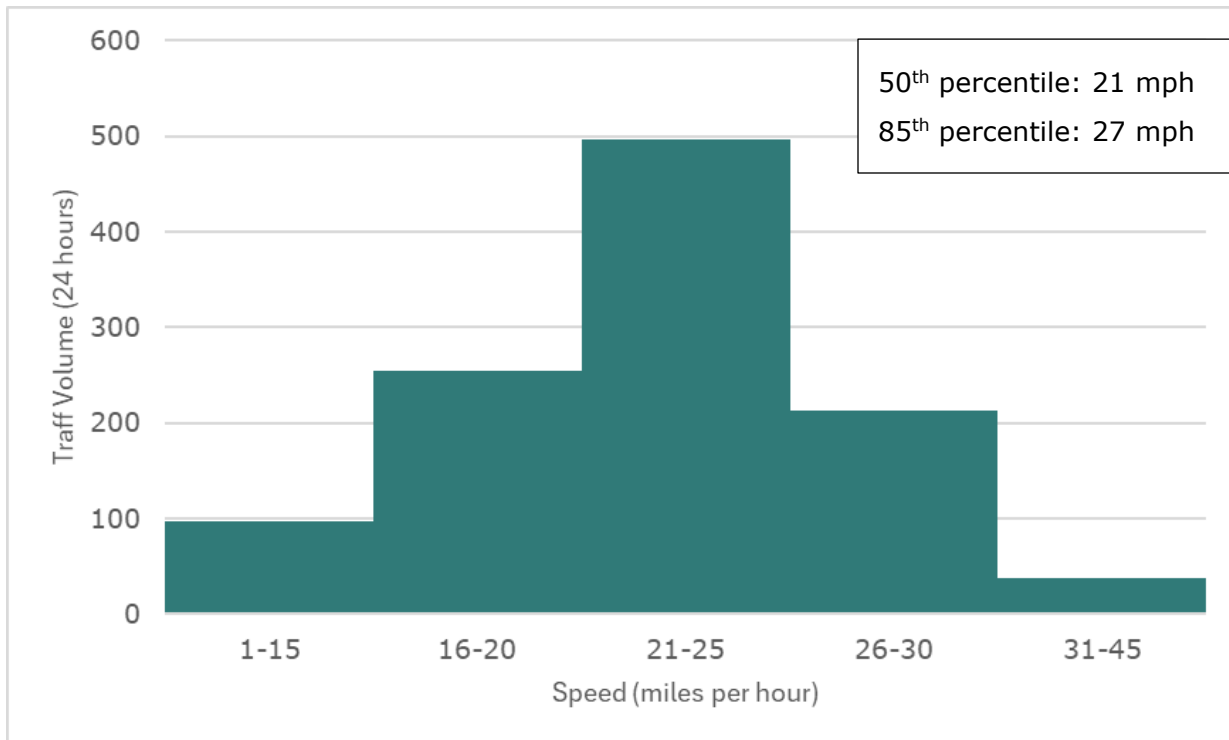


FIGURE 10: SOUTHBOUND SPEED DISTRIBUTION FOR HARRIMAN STREET SOUTH OF HAWTHORNE AVENUE

HARRIMAN STREET BETWEEN GREENWOOD AVENUE AND FRANKLIN AVENUE

CONDITIONS FOR PEOPLE WALKING AND BIKING

Harriman Street between Franklin Avenue and Greenwood Avenue has a two-lane cross section, with no dedicated bicycle facilities. Sidewalks are present on most of the segment, except for a 100-foot segment on the west side just south of Irving Avenue and a 50-foot segment just north of Irving Avenue, at two business parking lots. Compliant curb ramps are present at all intersections per available GIS data from the City of Bend, and there are marked crosswalks at the intersection with Greenwood Avenue. There are no biking facilities present along Harriman Street. Bicycle lanes are present on Franklin Avenue and Greenwood Avenue. Figure 11 shows the existing typical cross-section of Harriman Street between Hawthorne Avenue and Franklin Avenue. Note there is a mix of landscaping (e.g., bushes, trees, etc.) not shown in the image.

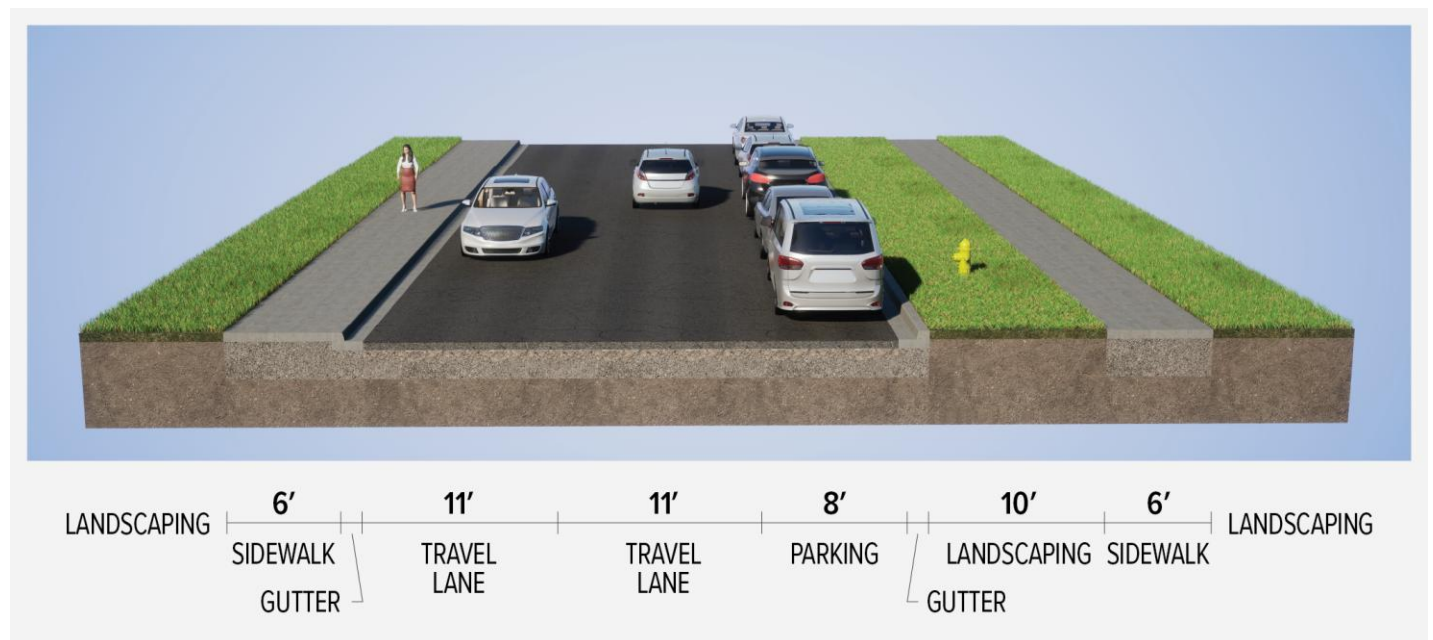


FIGURE 11: HARRIMAN STREET CROSS-SECTION BETWEEN HAWTHORNE AVENUE AND FRANKLIN AVENUE, LOOKING NORTH

Currently, bicycle volumes are low along Harriman Street (no bicycles were recorded traveling northbound or southbound during the p.m. peak hour). Additionally, only 13 people walking during the p.m. vehicular peak hour were recorded at the intersection with Hawthorne Avenue and five were recorded at the intersection with Irving Avenue during the p.m. vehicular peak hour. Note that the count was collected in mid-December, the daytime high temperature on the day counts were collected was 45 degrees Fahrenheit, the low temperature was 34 degrees, and light rain fell between 1:00 a.m. and 3:00 a.m.⁵. The number of people walking and biking at this location may be higher during warmer and drier weather. Additionally, with the completion of the Hawthorne Avenue overcrossing of US 97, these volumes are likely to increase as more people biking use Harriman Street as a Key Walking and Biking Route.

Four streets cross the Harriman Street segment in this area: Greenwood Avenue, Irving Avenue, Hawthorne Avenue and Franklin Avenue. One street, NW Greeley Avenue, terminates at NW Harriman Street, but can still be accessed on either side by bikes and pedestrians. Key features at these intersections that influence conditions for people walking and biking include:

- At Greenwood Avenue, a modal filter was installed at the intersection in 2024 that converted the intersection to right-in/right-out (RIRO), except for bicycles (see Figure 12).
- At Hawthorne Avenue, the planned overcrossing will include the Promenade option, which will make Hawthorne Avenue one-way westbound between 3rd Street and Harriman Street. This modification will require changes at the intersection with Harriman Street to accommodate the new travel pattern and higher volumes of people walking and biking.
- At Franklin Avenue, the Franklin Avenue Improvements Project⁶, parts of which are under construction as of early 2026, includes a crossing improvement at the intersection with Harriman Street. At the Harriman Street/Franklin Avenue intersection, the draft project improvements include separated bicycle lanes (transitioning from unprotected bike lanes west of the intersection), a modal filter to convert the intersection to RIRO, and crosswalk and crossbike markings (see Figure 13).

⁵ Weather Underground data for Bend, Oregon on December 17, 2025,
<https://www.wunderground.com/history/daily/us/or/bend/KBDN/date/2025-12-17>

⁶ <https://www.bendoregon.gov/services/city-projects/midtown-crossing-project/franklin-avenue-improvements#ad-image-2>



**FIGURE 12: MODAL FILTER AT THE HARRIMAN STREET/GREENWOOD AVENUE INTERSECTION
(LOOKING SOUTH TOWARD HARRIMAN STREET)**

Image Credit: Google Maps

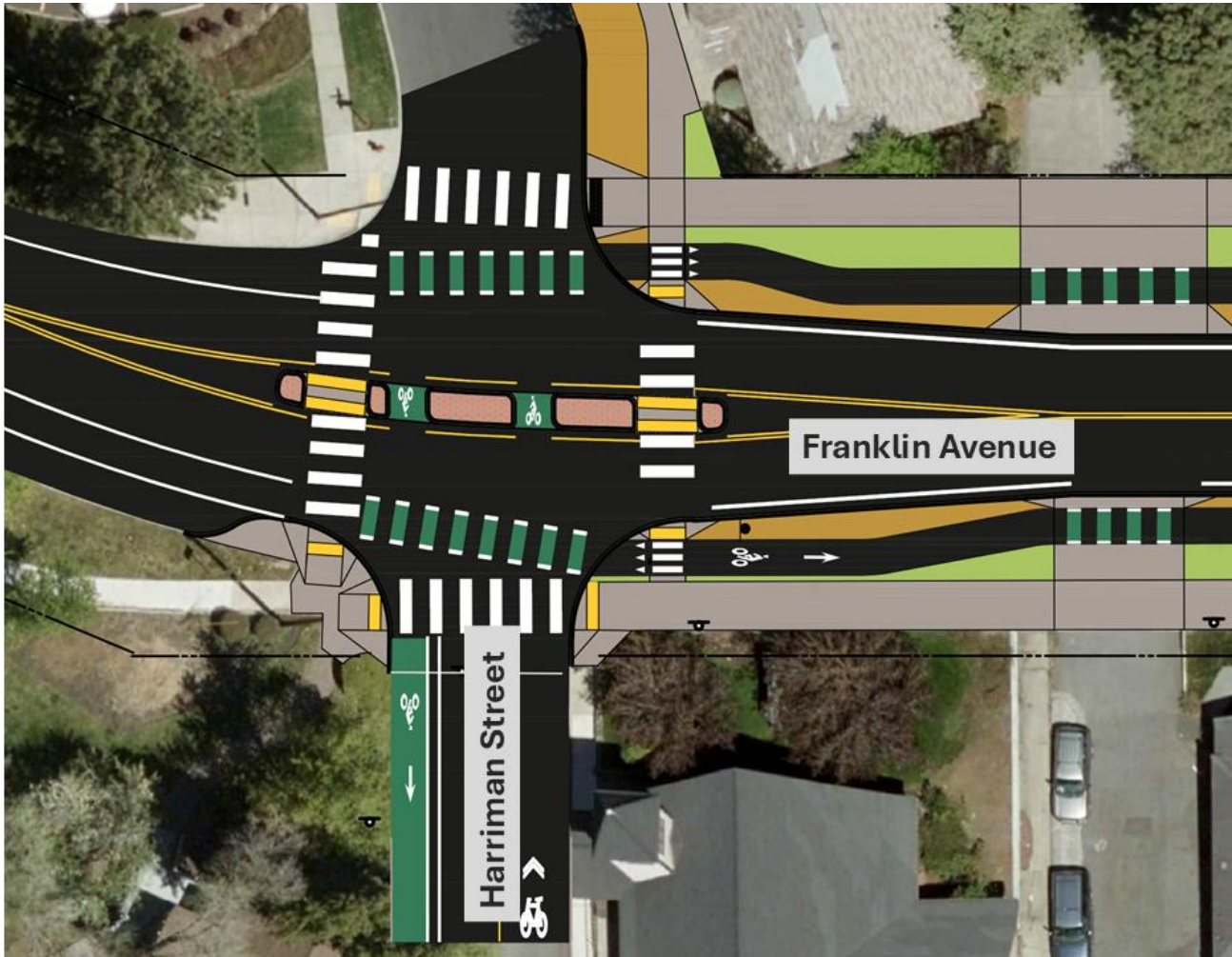


FIGURE 13: DRAFT DESIGN FOR THE HARRIMAN STREET/FRANKLIN AVENUE INTERSECTION

Image credit: City of Bend, DOWL Engineering; design is current as of January 2025.

EXISTING SAFETY NEEDS

The most recent five years of reported crash data⁷ (2019 to 2023⁸) was analyzed on Harriman Street between Franklin Avenue and Greenwood Avenue (including the Franklin Avenue and Greenwood Avenue intersections) to understand potential safety concerns in the area. The modal filter at the intersection with Greenwood Avenue was added after the period of available crash data, so its effect is not represented in the data. For detailed crash data see Appendix.

The following summarizes the crash patterns observed on this segment of Harriman Street:

- 19 crashes occurred on this stretch of Harriman Street between 2019 and 2023.
- There were two minor injury crashes, eight possible injury crashes, and nine property damage only (PDO) crashes.
- All of the ten injury or possible injury crashes occurred at either the intersection with Franklin Avenue or Greenwood Avenue.
- One of the minor injury crashes occurred at the intersection with Franklin Avenue and involved a person bicycling; the primary cause was a failure to yield the right-of-way by the vehicle.
- The other minor injury crash also occurred at the intersection with Franklin Avenue and involved a person walking; the primary cause was careless driving.

Table 1 shows the reported crash types that occurred on Harriman Street by severity. The most common crash types were angle, rear-end, and turning.

TABLE 1: HARRIMAN STREET CRASH TYPES BY SEVERITY

CRASH TYPE	MINOR INJURY	POSSIBLE INJURY	PDO*	TOTAL
ANGLE	0	5	6	11
REAR-END	0	2	1	3
TURNING	0	1	2	3
BICYCLE-INVOLVED	1	0	0	1
PEDESTRIAN-INVOLVED	1	0	0	1
TOTAL	2	8	9	19

* Property damage only

⁷ Oregon Department of Transportation Crash Analysis and Reporting Unit

⁸ Crash data does include Covid-19 pandemic years, which resulted in abnormal traffic patterns

As shown on Table 2, the most common crash causes were failure to yield the right-of-way, careless driving, and following too closely.

TABLE 2: HARRIMAN STREET CRASH CAUSES BY SEVERITY

CRASH CAUSE	MINOR INJURY	POSSIBLE INJURY	PDO*	TOTAL
DID NOT YIELD RIGHT-OF-WAY	1	6	5	12
CARELESS DRIVING	1	0	1	2
FOLLOWING TOO CLOSELY	0	1	1	2
PASSED STOP SIGN	0	0	1	1
FAILURE TO AVOID VEHICLE AHEAD	0	1	0	1
OTHER IMPROPER DRIVING	0	0	1	1
TOTAL	2	8	9	19

*Property damage only

POTENTIAL SAFETY COUNTERMEASURES

The Franklin Avenue Improvements Project⁹, which is described above, is under construction as of early 2026. These improvements, along with the similar ones made in 2024 at the intersection with Greenwood Avenue, are expected to enhance multimodal safety and address many of the turning and angle crashes that have occurred on Harriman Street.

Additional safety countermeasures may enhance safety at this location by addressing risk factors that may or may not be represented in the crash history. These include:

- Striping crosswalks at the intersections with Irving Avenue, Hawthorne Avenue, and Greeley Avenue (note that the Bend Signing and Marking Manual¹⁰ does not recommend marking crosswalks where the average daily traffic is less than 4,500, which applies to this section of Harriman Street; engineering judgement should be applied when determining whether to mark crosswalks at these locations).

⁹ <https://www.bendoregon.gov/services/city-projects/midtown-crossing-project/franklin-avenue-improvements#ad-image-2>

¹⁰ City of Bend Signing and Marking Manual (2022), see Table 1, full access online: <https://www.bendoregon.gov/home/showpublisheddocument/52577/637825980552630000>

- Filling the sidewalk gap between Irving Avenue and Hawthorne Avenue; adding sidewalk has a crash reduction factor (CRF) of 20 percent for pedestrian crashes of all severities¹¹.
- Consider converting the intersections with Irving Avenue and Hawthorne Avenue to all-way stop control (see the Traffic Control Analysis section below). This countermeasure has a CRF of 75 percent for angle crashes at all severities¹².

EXISTING PARKING NEEDS

On-street parking is allowed on Harriman Street between Franklin Avenue and Greenwood Avenue and Hawthorne Avenue between Harriman Street and Hill Street. Key features of existing on-street parking include:

- On-street parking is signed for a three-hour time limit in this area.
- Parking is diagonal on the east side of Harriman Street between Greenwood Avenue and Irving Avenue and parallel elsewhere.
- Parking is prohibited on the west side of Harriman Street between Irving Avenue and Franklin Avenue.

On-street parking occupancy along in this area was observed on a weekday (December 11, 2025) and a Saturday (December 13, 2025) to understand the existing parking demand in the area. Figure 14 shows the day-long average for weekday and weekend parking.

Observations included:

- Weekday daily average parking occupancy was highest on the east side of Harriman Street between Irving Avenue and Hawthorne Avenue (88 percent) and the east side of Harriman Street between Greenwood Avenue and Irving Avenue (95 percent).
- The lowest weekday daily average occupancy was on Harriman Street between Greeley Avenue and Franklin Avenue (47 percent) and Hawthorne Avenue between Harriman Street and Hill Street (49 percent).
- Weekend daily average parking occupancy was highest on the east side of Harriman Street between Greenwood and Irving Avenues (91 percent).
- Weekend daily average occupancy was lowest on the east side of Harriman Street between Greeley Avenue and Franklin Avenue (1 percent) and the north side of Hawthorne Avenue between Harriman Street and Hill Street (31 percent).

¹¹ Oregon Department of Transportation Crash Reduction Factor Manual (2024 Edition), countermeasure BP-29 <https://www.oregon.gov/odot/Engineering/ARTS/CRF-Manual.pdf>

¹² Oregon Department of Transportation Crash Reduction Factor Manual (2024 Edition), countermeasure H-20 <https://www.oregon.gov/odot/Engineering/ARTS/CRF-Manual.pdf>

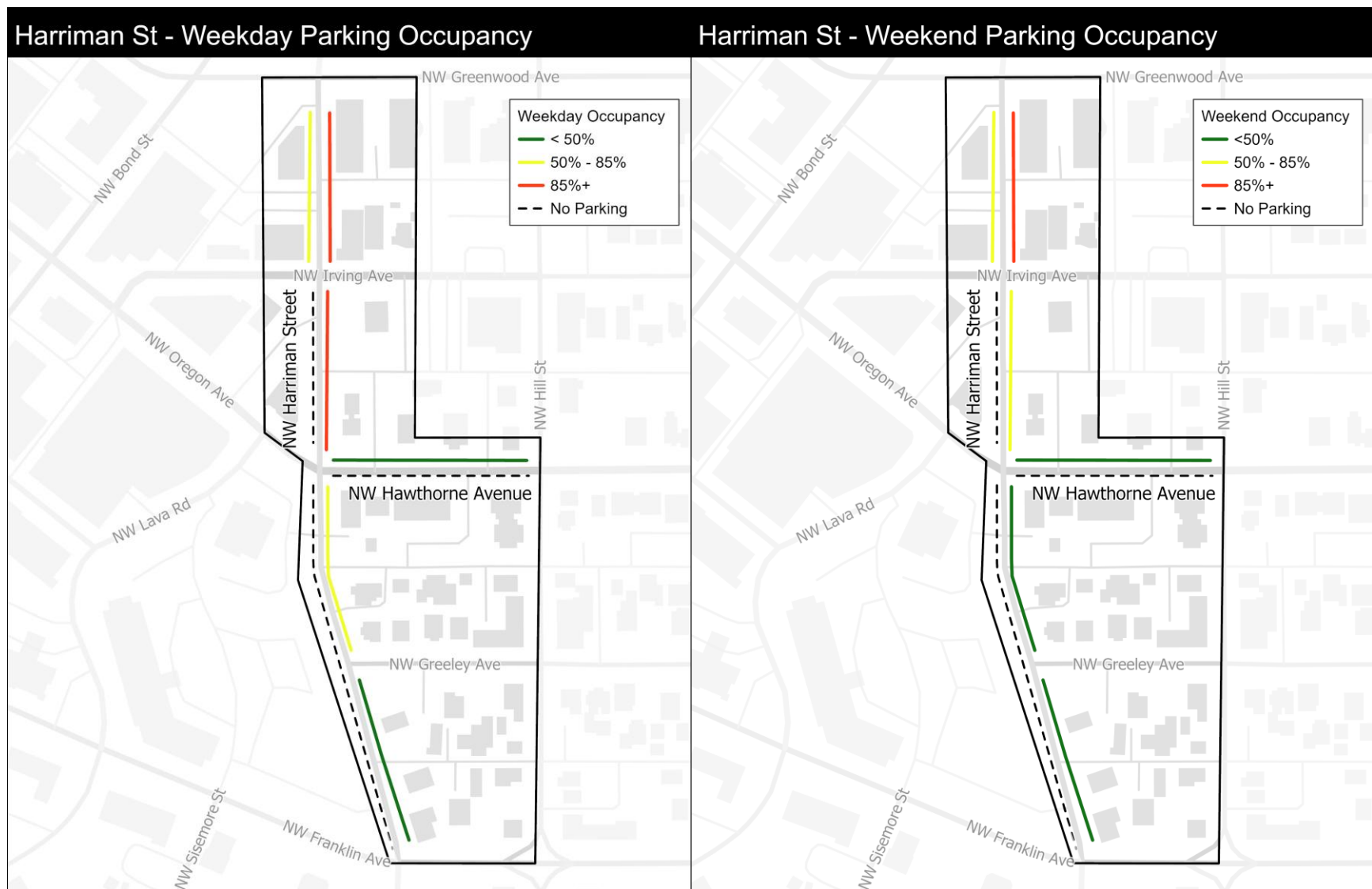


FIGURE 14: AVERAGE WEEKDAY (LEFT) AND WEEKEND (RIGHT) PARKING OCCUPANCY ON HARRIMAN STREET AND HAWTHORNE AVENUE

This data indicates that on-street parking demand is highest on Harriman Street near Greenwood Avenue, with lower demand further south and on Hawthorne Avenue. While there is high demand for free on-street parking, data collected during the summer of 2024 at the Centennial parking garage (located one block west of the Harriman Street/Hawthorne Avenue intersection) indicates that there is still excess parking capacity downtown. At the parking garage, the average weekday occupancy was 45 percent on weekdays and 44 on Saturdays¹³. The same study found that occupancy on Oregon Avenue in Downtown Bend was 73 percent on weekdays and 71 percent on weekends; on Minnesota Avenue, the average occupancy was 78 on weekdays and 75 percent on weekends. This data shows that while on-street parking near the study area can see occupancy percentages approaching 80 percent¹⁴, there is plentiful parking available at the Centennial garage (even if the Promenade option for Hawthorne Avenue reduces on-street parking supply slightly on Hawthorne Avenue between Hill Street and Harriman Street).

TRAFFIC CONTROL ANALYSIS

To understand the potential for traffic control changes at the major intersections along the corridor where recent walking and biking improvements have not already been constructed or planned (e.g., Greenwood Avenue and Franklin Avenue), warrants for converting the Harriman Street/Hawthorne Avenue and Harriman Street/Irving Avenue intersections to all-way stop control were evaluated based on the 11th Edition of the Manual on Uniform Traffic Control Devices (MUTCD)¹⁵.

HARRIMAN STREET/HAWTHORNE AVENUE

Based on the existing traffic volume and crash history at this intersection, none of the warrants are met except for Warrant B (Sight Distance), which may be met depending on sight distance measurements. This warrant states that “all-way stop control may be installed at an intersection where an engineering study indicates that sight distance on the minor-road approaches controlled by a stop sign is not adequate for a vehicle to turn onto or cross the major (uncontrolled road).”¹⁶ Sight distance at this intersection was approximated using aerial imagery and Google Streetview and is summarized in Table 3. Figures 15 and 16 show the sight distance triangles for this intersection using this methodology. For the southbound approach, the intersection sight distance may not be met per *A Policy on Geometric Design of Highways and Streets, 7th Edition*¹⁷ (see Table

¹³ Planning for People Streets (May 2025), DKS Associates, Walker Macy, Toole Design, and Leland Consulting, prepared for the City of Bend

¹⁴ 85 percent occupancy is a commonly used performance metric in the parking industry; see the Oregon Department of Transportation’s *Managing On-Street Parking in Residential Areas* guide: <https://www.oregon.gov/lcd/TGM/Documents/ManagingResidentialParking.pdf>

¹⁵ https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm

¹⁶ 11th Edition of the Manual on Uniform Traffic Control Devices, Section 2B.14, https://mutcd.fhwa.dot.gov/pdfs/11th_Edition/Chapter2b.pdf

¹⁷ *A Policy on Geometric Design of Highways and Streets, 7th Edition* (2018), American Association of State Highway and Transportation Officials, See Chapter 9.5, <https://transportation.org/design/resources/>

3). For the northbound approach, the intersection sight distance is likely met. However, actual sight distance would need to be measured in a field survey to determine if this warrant is met. It should be noted that the all-way stop control warrant analysis combines vehicle, pedestrian, and bicycle volumes to determine treatment and therefore the thresholds for meeting volume-related warrants are not sensitive to increases in walking and biking traffic.

Warrant E (Other Factors) may be applicable after the completion of the Hawthorne overcrossing, as Factor C applies when “pedestrian and/or bicyclist movements support the installation of all-way stop control.” Additional information on all-way stop control warrants for this intersection is found in the Appendix.

TABLE 3: APPROXIMATED INTERSECTION SIGHT DISTANCE EVALUATION FOR HARRIMAN STREET/HAWTHORNE AVENUE

DIRECTION OF VIEW	ACTUAL SIGHT DISTANCE (FT)	STOPPING SIGHT DISTANCE (FT)	INTERSECTION SIGHT DISTANCE (FT)	INTERSECTION SIGHT DISTANCE MET?
SOUTHBOUND				
LOOKING RIGHT	140	115	225	No
LOOKING LEFT	70	115	225	No
NORTHBOUND				
LOOKING RIGHT	265	115	225	Yes
LOOKING LEFT	>350	115	225	Yes
Based on Table 9-7 (Design Intersection Sight Distance—Case B1, Left Turn from Stop) for 20 m.p.h. in <i>A Policy on Geometric Design of Highways and Streets, 7th Edition</i>				



FIGURE 15: SOUTHBOUND SIGHT DISTANCE FOR HARRIMAN STREET/HAWTHORNE AVENUE



FIGURE 16: NORTHBOUND SIGHT DISTANCE AT HARRIMAN STREET/HAWTHORNE AVENUE

Because Harriman Street/Hawthorne Avenue may meet a warrant for conversion to all-way stop control, this alternative was tested using *Highway Capacity Manual 6th Edition* methodology, in addition the existing two-way stop control. A scenario was also tested for the Promenade concept for Hawthorne Avenue, which would allow westbound vehicle traffic only between US 97 and Hill Street. For this scenario, reduced volumes were estimated to account for the closure of access to US 97 and the one-way traffic expected with the Promenade concept on Hawthorne Avenue. As shown in Table 4, the intersection is well below capacity and experiences minimal delay in all three scenarios.

Based on this finding, it is recommended that the City consider converting this intersection to all-way stop control at this location.

TABLE 4: P.M. PEAK HOUR INTERSECTION OPERATION RESULTS AT HARRIMAN STREET/HAWTHORNE AVENUE

SCENARIO	V/C	LOS	DELAY (SEC)
EXISTING CONFIGURATION ^A	0.05/0.24	A/C	8/15
ALL-WAY STOP CONTROL ^B	0.30	A	10
ALL-WAY STOP CONTROL, PROMENADE SCENARIO ^B	0.15	A	8

^A Results shown for the worst major/minor approach movement.

^B Results shown for the worst approach.

Additionally, curb extensions or a raised intersection could be added to increase pedestrian comfort at this intersection.

HARRIMAN STREET/IRVING AVENUE

Based on the existing volume and crash history at this intersection, none of the warrants were met except Warrant B (Sight Distance), which may be met depending on sight distance measurements. Sight distance at this intersection was approximated using aerial imagery and Google Streetview and is summarized in Table 5. Figures 17 and 18 show the sight distance triangles for this intersection using this methodology. As shown in Table 5, none of the stopping or intersection sight distances may be met per *A Policy on Geometric Design of Highways and Streets, 7th Edition* for both the southbound and northbound approaches. The southbound sight distance for vehicles looking right is constrained by on-street parking and the building on the northwest corner. Similarly, vehicles parked on the street may constrain the southbound sight distance for vehicles looking left. On-street vehicle parking also may restrict the sight distance for northbound vehicles. Additional information on all-way stop control warrants for this intersection is found in the Appendix.

TABLE 5: APPROXIMATED INTERSECTION SIGHT DISTANCE EVALUATION FOR HARRIMAN STREET/IRVING AVENUE

DIRECTION OF VIEW	ACTUAL SIGHT DISTANCE (FT)	STOPPING SIGHT DISTANCE (FT)	INTERSECTION SIGHT DISTANCE (FT)	INTERSECTION SIGHT DISTANCE MET?
SOUTHBOUND				
LOOKING RIGHT	55	115	225	No
LOOKING LEFT	85	115	225	No
NORTHBOUND				
LOOKING RIGHT	60	115	225	No
LOOKING LEFT	80	115	225	No
Based on Table 9-7 (Design Intersection Sight Distance—Case B1, Left Turn from Stop) for 20 m.p.h. in <i>A Policy on Geometric Design of Highways and Streets, 7th Edition</i>				



FIGURE 17: SIGHT DISTANCE AT HARRIMAN STREET/IRVING AVENUE



FIGURE 18: NORTHBOUND SIGHT DISTANCE AT HARRIMAN STREET/IRVING AVENUE

Because the Harriman Street/Hawthorne Avenue may meet a warrant for conversion to all-way stop control, this alternative was tested using *Highway Capacity Manual 6th Edition* methodology, in addition the existing two-way stop control. A scenario was also tested with all-way stop control and volumes from the Promenade concept, which has slightly higher northbound volumes at the intersection due to shifted traffic patterns associated with westbound only traffic on Hawthorne Avenue. As shown in Table 6, the intersection is well below capacity and experiences minimal delay in all three scenarios. Based on this finding, it is recommended that the City consider converting this intersection to all-way stop control to address the sight-distance issues at this location. It is also recommended that the City consider adding curb extensions at this location to shorten pedestrian crossing distances (currently 30-45 feet).

TABLE 6: INTERSECTION OPERATIONS RESULTS AT HARRIMAN STREET/IRVING AVENUE

SCENARIO	V/C	LOS	DELAY (SEC)
EXISTING CONFIGURATION ^A	0.01/0.18	A/B	7/10
ALL-WAY STOP CONTROL ^B	0.17	A	8
ALL-WAY STOP CONTROL, PROMENADE SCENARIO ^B	0.19	A	8

^A Results shown for the worst major/minor approach

^B Results shown for the worst approach

HAWTHORNE AVENUE BETWEEN 3RD STREET AND 5TH STREET

CONDITIONS FOR PEOPLE WALKING, BIKING AND TAKING TRANSIT

This segment of Hawthorne Avenue has a two-lane cross-section. Sidewalk coverage is intermittent, with gaps between 3rd Street and 4th Street on the north side and no sidewalk at all on the south side of the street between 4th Street and 5th Street. Compliant curb ramps are present where there is sidewalk per available GIS data from the City of Bend but missing where the sidewalk is absent. There are also no bicycle facilities on this stretch of Hawthorne Avenue. **Figure 19** shows the existing typical cross-section of Hawthorne Avenue just west of 4th Street, adjacent to Hawthorne Station. Note that buses frequently park along the north curb. **Figure 20** shows the existing cross-section of Hawthorne Avenue between 4th Street and 5th Street. This segment has intermittent sidewalks and a narrower cross-section that does not allow for two-way vehicle travel when there are parked vehicles on both sides of the street.

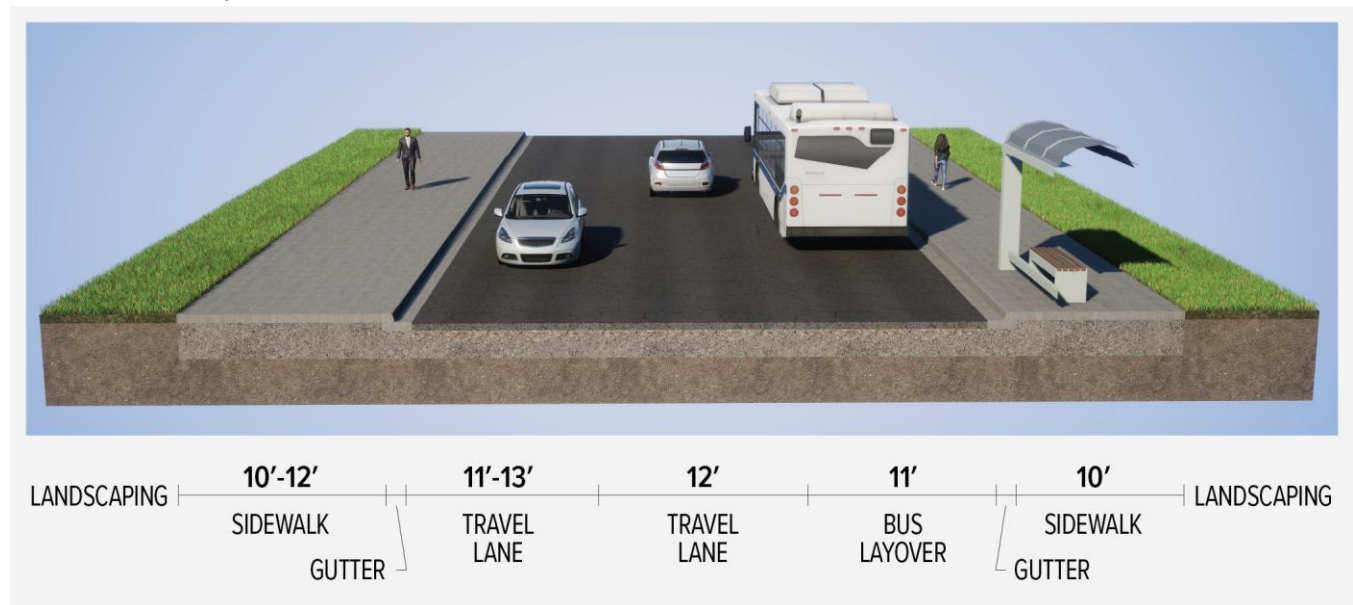


FIGURE 19: CROSS-SECTION OF HAWTHORNE AVENUE BETWEEN 3RD AND 4TH STREET

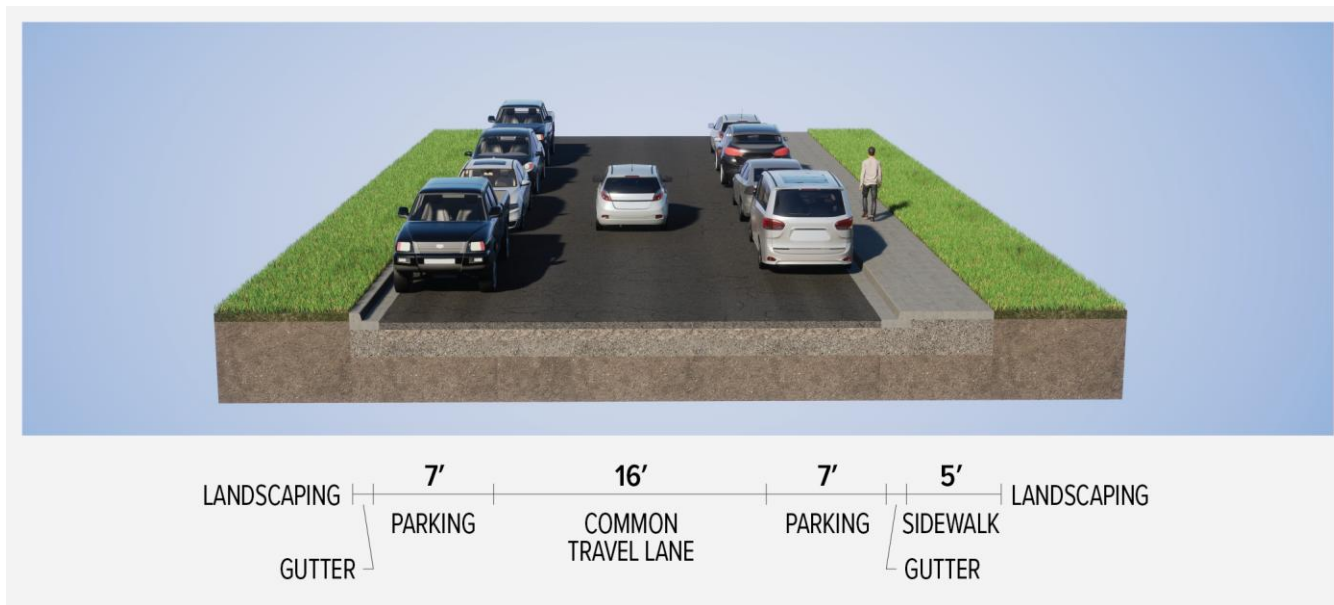


FIGURE 20: CROSS-SECTION OF HAWTHORNE AVENUE BETWEEN 4TH STREET AND 5TH STREET

3RD STREET AND HAWTHORNE AVENUE

3rd Street at Hawthorne Avenue has a five-lane cross-section (four general-purpose lanes and a two-way left-turn lane). At the intersection with 3rd Street, there is a marked crosswalk and pedestrian refuge island with a rectangular rapid flashing beacon (RRFB) on the south leg. However, the placement of the island and RRFB push buttons limit the functionality of the intersection. Specific challenges include:

- The current RRFB placement requires people biking to leave the travel lane; this is especially inconvenient for people biking westbound, as they need to cross to the other side of the street to reach the crosswalk. Without treatment, this issue would still be present with the installation of the promenade in **Figure 4**.
- Anecdotally, the current RRFB placement also presents accessibility issues for people using mobility devices and for people who are visually impaired, given its offset at the intersection.
- Additionally, there is a gap in the sidewalk on Hawthorne Avenue east of 3rd street on the north side, adjacent to the Cascades East Transit (CET) Hawthorne Station. This gap in a sidewalk can create a midblock crossing risk near an active driveway for a shopping center for people traveling from Hawthorne Station to reach the RRFB at 3rd Street.

CASCADES EAST TRANSIT HAWTHORNE STATION

CET's Hawthorne Station is on the northwest corner of the Hawthorne Avenue/4th Street intersection. Hawthorne Station is currently an important transit stop in CET's network, including for people walking and biking to and from the Station. Hawthorne Station currently serves nearly a dozen CET routes, providing a transit connection to most routes within Bend and routes between Bend and Redmond, La Pine, and Sisters. Several routes currently turn through the intersection at Hawthorne Avenue/3rd Street, including a southbound left turn and westbound right turn. Buses layover and pick up/drop off passengers within the Station (off-street) and on-street along the north curb of Hawthorne Avenue.

CET's *2040 Transit Development Plan*¹⁸ calls for reducing the importance of Hawthorne Station in its network by re-routing several of its fixed routes away from the Station and adding other mobility hubs through its service area in the medium- and long-term¹⁹. Changes in this area will need to be based on CET conversations. CET has stated that there are options for alternate routing in this area, and so their operations may be flexible depending on which street alternatives are considered, although the intersection of 3rd Street and Greenwood Avenue is a source of high bus delay today and ideally could be avoided for most routes.

SUMMARY OF WALKING AND BIKING CONDITIONS

The following summarizes the walking and biking conditions recorded on December 17, 2025 on this stretch of Hawthorne Avenue:

- 19 people walking crossed 3rd Street during the p.m. peak vehicle hour,
- five people biking were recorded at that intersection in the p.m. peak hour;
- a total of 19 people walking and six people walking were recorded at the Hawthorne Avenue/4th Street intersection during the p.m. peak hour.
- The daytime high temperature on the day counts were collected was 45 degrees Fahrenheit, the low temperature was 34 degrees, and light rain fell between 1:00 a.m. and 3:00 a.m.²⁰.

The number of people walking and biking at this location may be higher during warmer and drier weather. Additionally, the new overcrossing of US 97 is expected to lead to a significant increase in these volumes and more activity would be expected as the Core Area continues to redevelop.

¹⁸ Cascades East Transit *2040 Transit Development Plan* (2020), <https://cascadeseasttransit.com/wp-content/uploads/2022/12/2040-Master-Plan-with-Mobility-Hub-Final.pdf>

¹⁹ See Chapter 8.0 in the *2020 Transit Development Plan*

²⁰ Weather Underground data for Bend, Oregon on December 17, 2025, <https://www.wunderground.com/history/daily/us/or/bend/KBDN/date/2025-12-17>

EXISTING SAFETY NEEDS

The most recent five years of reported crash data²¹ (2019-2023)²² was analyzed for Hawthorne Avenue between 3rd Street and 5th Street (including the 3rd and 5th Street intersections). It should be noted that the intersection of Hawthorne Avenue and 3rd Street was identified in the Bend Transportation Safety Action Plan (2019)²³ as a location within the top 10 percent of high collision frequency and severity intersections in the city. For detailed crash data see Appendix. Key findings from the reported crash data include:

- 14 crashes occurred on this segment, including four minor injury crashes and six possible injury crashes;
- 12 of the 14 crashes, including all of the injury crashes, occurred at the intersection with 3rd Street;
- As shown on Table 7, the most common crash types were turning, angle, and rear-end.
- Two crashes involved a pedestrian which resulted in a minor injury, and both occurred at the 3rd street RRFB.
- One crash involved a bicycle which resulted in a possible injury, occurring at Hawthorne Avenue and 3rd street.

TABLE 7: HAWTHORNE AVENUE CRASH TYPES BY SEVERITY

CRASH TYPE	MINOR INJURY	POSSIBLE INJURY	PROPERTY DAMAGE ONLY	TOTAL
TURNING	2	2	1	5
ANGLE	0	1	1	2
REAR-END	0	2	0	2
FIXED OBJECT	0	0	1	1
HEAD-ON	0	0	1	1
BICYCLE-INVOLVED	0	1	0	1
PEDESTRIAN-INVOLVED	2	0	0	2
TOTAL	4	6	4	14

²¹ Crash data does include Covid-19 pandemic years, which resulted in abnormal traffic patterns

²² Oregon Department of Transportation Crash Analysis and Reporting Unit

²³ Bend Area Transportation Safety Action Plan, September 2019. Full access online: https://bendoregon.gov/wp-content/uploads/2025/12/18TDAP_Report_Final-Draft-Bend-TSAP_093019_flattened.pdf

As shown on Table 8, the most common crash causes were failure to yield the right-of-way and following too closely.

TABLE 8: HAWTHORNE AVENUE CRASH CAUSE BY SEVERITY

CRASH CAUSE	MINOR INJURY	POSSIBLE INJURY	PROPERTY DAMAGE ONLY	TOTAL
DID NOT YIELD RIGHT-OF-WAY	4	4	1	9
FOLLOWED TOO CLOSELY	0	2	0	2
DISREGARDED TRAFFIC SIGNAL	0	0	1	1
WRONG WAY	0	0	1	1
IMPROPER TURNING	0	0	1	1
TOTAL	4	6	5	15

POTENTIAL SAFETY COUNTERMEASURES

Countermeasures that could improve safety on this segment of Hawthorne Avenue include filling sidewalk gaps (including on the north side immediately east of 3rd Street, and the entire south side of the street between 4th Street and 5th Street). Additionally, a traffic signal could improve safety for pedestrians and bicyclists crossing 3rd Street, as well as reduce angle crashes²⁴.

The following section also provides an evaluation of enhanced pedestrian and bicycle crossing options at the Hawthorne Avenue/3rd Street intersection and an analysis of traffic signal warrants for this location. Enhanced pedestrian and bicycle crossing facilities can provide safety benefits by separating people walking and biking from vehicles in time and space.

²⁴ See the Oregon Department of Transportation’s Crash Reduction Factor Manual (2024 Edition), CRF H-22, <https://www.oregon.gov/odot/Engineering/ARTS/CRF-Manual.pdf>

TRAFFIC CONTROL AND CROSSING ANALYSIS AT HAWTHORNE AVENUE/3RD STREET

A pedestrian and bicycle crossing needs analysis was conducted at the Hawthorne Avenue/3rd Street intersection to help inform what potential improvements will best support pedestrian and bicycle safety. Enhanced pedestrian and bicycle crossing facilities can provide increased safety benefits. For example, adding a pedestrian hybrid beacon (PHB) or a pedestrian signal can reduce pedestrian and bicycle crashes by 55 percent²⁵ compared to no crossing enhancement.

The Hawthorne Avenue/3rd Street intersection was chosen for further analysis due to its wide cross section and high volume on the major street approaches, both of which create a high-stress crossing environment for people walking and biking. The intersection is on the City's Key Walking and Biking Route established in the City's Transportation System Plan²⁶.

Based on findings from the pedestrian and bicycle crossing needs analysis discussed below, a traffic signal warrant analysis and intersection operations analysis were also conducted and discussed in later sections of the memo to help inform which intersection alternatives to advance for further evaluation.

EXISTING CONDITIONS

The intersection today consists of a five-lane cross-section (four general-purpose lanes and a two-way left-turn lane) going north/south with two unstripped general purpose lanes on the side street going east/west. A rectangular rapid flashing beacon (RRFB) exists on the south leg of the intersection, with a center median creating a pedestrian refuge island, with pedestrian push buttons on both sides of the street and on the refuge island. This is one of the few Key Route crossings of a five lane roadway in Bend.

This current median design is difficult for people biking westbound to use, as they are required to cross to the other side of the street to reach the crosswalk. It is also difficult to stage a bicycle in this median, especially if the bicycle has a trailer. The posted speed on 3rd Street is 35 m.p.h, with drivers typically travelling faster than the posted speed and the estimated average daily traffic (ADT) is approximately 18,000 vehicles²⁷. This crossing will provide connections between Downtown, Core Area development and CET's Hawthorne station, with an expected rise in bicyclists using this crossing once the Hawthorne overcrossing is constructed. When counts were taken, 24 cyclists were observed going eastbound and westbound at this intersection over a 16 hour period.

PEDESTRIAN AND BICYCLE CROSSING ANALYSIS

Several resources were reviewed to determine pedestrian and bicycle crossing needs. Table 9 below summarizes these results.

²⁵ Oregon Department of Transportation Crash Reduction Factor (2024 Version), CRFs BP18 and BP19, <https://www.oregon.gov/odot/Engineering/ARTS/CRF-Manual.pdf>

²⁶ Bend Transportation System Plan, September 2020. Full online access: <https://www.bendoregon.gov/home/showpublisheddocument/47764/638542216196630000>

²⁷ Based on 10 times the peak hour volume at Hawthorne Avenue/3rd Street to account for an average daily traffic volume.

TABLE 9. PEDESTRIAN AND BICYCLE CROSSING ANALYSIS SUMMARY

REFERENCE DOCUMENT	OVERVIEW AND CONTEXT	RECOMMENDATIONS AND NOTES
BEND SIGNING AND STRIPING MANUAL²⁸	Considers lane configuration, presence of a median, speed, and average daily traffic (ADT)	Based on Table 1: - RRFB recommended but results in high stress (level of traffic stress of three out of four). Note that RRFB treatment is already present at this location, though it is currently not intuitive for visually impaired users with a cane or users in a wheelchair to actuate the pedestrian push buttons. - When higher speeds are present (e.g., 40 miles per hour), evaluate a PHB and pedestrian signal warrants.
BEND COMPLETE STREETS MANUAL	Provides guidance for enhanced crosswalks along low-stress routes	Guidance includes: - PHB requires a traffic study, engineer approval, and formal community education plan. - Consider a left turn lane conversion to install a median island where a low-stress network crosses a 3-lane roadway and existing traffic patterns can be logically shifted. A traffic study is required.
NCHRP REPORT 926²⁹	Considers ADT, speed, number of lanes and median type. Bases recommendations on three roadway “tiers”: - Tier 1: countermeasures that support motorist yielding - Tier 2: interventions to induce motorist yielding - Tier 3: countermeasures that separate modes or require motorists to stop	3rd Street falls into Tier 3. This tier “generally requires intervention to require motorists to stop or to physically separate pedestrians and bicyclists from traffic.” Countermeasure types include: <i>Signals and Signal Timing</i> (for example, adding a signal with a leading bicycle or pedestrian interval and passive bicycle detection) <i>Signing and Striping</i> (for example, adding two-stage bicycle left-turn boxes or high-visibility crosswalk markings on multiple legs) <i>Intersection Control Conversion</i> (for example, adding a traffic signal or pedestrian hybrid beacon) <i>Physical Separation</i> (for example, curb extensions or curb radius reduction)

²⁸ Bend Signing and Marking Manual (2022), see Table 1, <https://www.bendoregon.gov/home/showpublisheddocument/52577/637825980552630000>

²⁹ NCHRP 926 Guidance to Improve Pedestrian and Bicyclist Safety at Intersections (2020) full access online: <https://nap.nationalacademies.org/read/25808/chapter/7>

REFERENCE DOCUMENT	OVERVIEW AND CONTEXT	RECOMMENDATIONS AND NOTES
		• <i>Traffic Calming</i> (for example, adding a continuous raised median or hardened centerline) • <i>Miscellaneous</i> (for example, a road diet or pedestrian-scale lighting)
NCHRP REPORT 562	Considers speed, major road volume during the peak hour, crossing distance, whether or not a median island is present, and expected motorist compliance.	Recommendations include: • With median island: Active or Enhanced (e.g., RRFB) • Without median island: Red Indication (e.g., PHB or signal)
MUTCD³⁰ - PHB ANALYSIS	Provides guidelines on when a PHB may be installed. Considers crosswalk length, presence of a median island, major street traffic volumes, and pedestrian volumes	Recommendations include: • With median island: PHB not recommended • Without median island: PHB recommended

³⁰ 11th Edition of the Manual on Uniform Traffic Control Devices, Section 4J, https://mutcd.fhwa.dot.gov/pdfs/11th_Edition/part4.pdf

Restricting vehicle movements at this intersection could also reduce conflicts between left-turning vehicles and people crossing 3rd Street. This could include adding a median to convert the intersection to right-in/right-out (RIRO). Two CET routes (6 and 7) currently make a southbound left movement at this location, and CET's *2040 Transit Development Plan*³¹ calls for changing these routes so they would no longer make this movement. During conversations with CET, it was expressed that CET could reroute buses if medians restricted current bus turning movements. However, to better accommodate current CET bus routing to the Hawthorne Station and potential delivery trucks to the Safeway and other business in the area, the southbound left could also be allowed.

Figure 21 shows an example of a RIRO median with pedestrian and bicycle cuts. Figure 22 shows an example of a median where one of the major street left-turn movement is allowed. While both of these examples include a traffic signal, these median configurations can be implemented with other treatments like a PHB or RRFB, although it would still not be a low stress crossing according to Bend's Signing and Striping Manual.

Because a traffic signal is among the recommended countermeasures based on these resources and would provide a low stress crossing, the following section describes a signal warrant analysis and traffic operations analysis at Hawthorne Avenue/3rd Street.

³¹ <https://cascadeseasttransit.com/wp-content/uploads/2022/12/2040-Master-Plan-with-Mobility-Hub-Final.pdf>



FIGURE 21: EXAMPLE OF A RIRO MEDIAN WITH PEDESTRIAN AND BICYCLE CUTS FROM PORTLAND, OR

Image Credit: Google Maps



FIGURE 22: EXAMPLE OF A RIRO MEDIAN WITH PEDESTRIAN CUTS AND A MAJOR STREET LEFT-TURN ALLOWED

Image Credit: Google Maps

SIGNAL WARRANT ANALYSIS

Counts collected at the Hawthorne Avenue/3rd Street intersection were used for a signal warrant analysis based on the 11th Edition of the MUTCD. A traffic signal is likely not warranted based on existing traffic volumes, as summarized in Table 9. Standard practice based on engineering judgment, is to reduce side-street right-turning traffic volume to avoid giving too much weight to right-turning traffic that would not see as much a delay-reduction benefit from a signal (compared to through and left-turning traffic). For this intersection, a sensitivity analysis was conducted to evaluate different levels of reduction and determine the impact on the signal warrant analysis. The 75 percent reduction scenario is preferred in this case, as it best addresses the need to avoid giving too much weight to right-turning vehicles and therefore, warrants would not be met. More details on the signal warrant analysis, including the 75 percent, 25 percent reduction, and no right-turn reduction are found in the Appendix.

However, the 11th Edition of the MUTCD does allow the City to install a traffic signal when warrants are not met, which would provide a red indication on 3rd Street when pedestrians and bicyclists are crossing the street and create a low stress crossing. Additionally, the City could install a half signal with signal head controlling the 3rd Street approaches but only stop signs and pedestrian signals controlling the Hawthorne Avenue approaches.

TABLE 10: SUMMARY OF SIGNAL WARRANT SENSITIVITY TESTS FOR HAWTHORNE AVENUE/3RD STREET

RIGHT-TURN VOLUME REDUCTION SCENARIO	SIGNAL WARRANTS MET?	NOTES
NO REDUCTION	Yes	Warrants 1 (Eight-Hour Volume) and 2 (Four-Hour Volume) are met. Warrant 7 (Crash Experience) would also be met if “adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency” at this location
25 PERCENT REDUCTION	No	Warrants 1 and 2 would only be met if the 85 th percentile speed on 3 rd Street was over 40 miles per hour. Warrant 7 would be met if “adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency” at this location.
75 PERCENT REDUCTION	No	None of the warrants are met in this scenario.

INTERSECTION OPERATIONS ANALYSIS

While signal warrants may not be met at the Hawthorne Avenue/3rd Street intersection, an existing conditions intersection operations analysis (Highway Capacity Manual 6th Edition), and queuing analysis with SimTraffic were conducted to test how a signal at this location could affect traffic patterns on 3rd Street, if it were built. The Greenwood Avenue/3rd Street and Franklin Avenue/3rd Street intersections were included to evaluate potential queue spillback from a signal at the 3rd Street/Hawthorne Avenue intersection.

Traffic counts from October 2022 were used for the Greenwood Avenue/3rd Street and Franklin Avenue/3rd Street intersections, respectively. The count collected in December 2025 was used for the 3rd Street/Hawthorne Avenue intersection. This method was chosen to minimize the impact of the closure of Franklin Avenue to westbound traffic between 4th and 8th Street on the day counts were collected in December 2025. The traffic count at Greenwood Avenue/3rd Street occurred one year post construction of Greenwood Avenue improvements reducing the cross section to three lanes. and the traffic count was seasonally factored to represent the 30th highest annual hour traffic volumes (30HV) consistent with methodology outlined in the Oregon Department of Transportation *Analysis Procedures Manual (APM)*³². Because there is not a representative Automatic Traffic Recorder (ATR) on US 20 near the study area, the ATR Characteristic Table method was utilized to identify an appropriate seasonal factor.

In Bend, traffic volumes typically peak during the summer due to recreational travel. Therefore, the traffic counts will be seasonally factored using data from three representative ATR locations across the state:

- ATR 09-003 on US 97, 0.17 miles south of China Hat Road in Bend
- ATR 24-004 on OR 22, 0.91 miles east of Lancaster Drive interchange (outside of Salem)
- ATR 24-005 on OR 22, 1.08 miles east of Shaw Highway interchange (near Aumsville)

The three ATRs listed above represent summer travel patterns in an urbanized area with four lanes of traffic and AADT ranging from 22,400 to 28,300 vehicles. Based on these ATRs, a seasonal factor of 1.12 was used for the count at Greenwood Avenue/3rd Street. Traffic counts at the other study intersections were balanced with these seasonally factored volumes.

Table 10 shows the volume-to-capacity (v/c) ratio, level of service (LOS), and delay for the Hawthorne Avenue/3rd Street intersection with its existing configuration and with a traffic signal, as well as for the intersections at Greenwood Avenue and Franklin Avenue. In both scenarios, the Hawthorne Avenue/3rd Street intersection experiences low levels of delay and operates well below capacity in the p.m. peak hour. However, the Greenwood Avenue/3rd Street operates near capacity with high levels of delay. The Franklin Avenue/3rd Street intersection operates with a lower v/c ratio but still moderate level of delay.

³² ODOT Analysis Procedures Manual Version 2, Chapter 5 (updated 2025),
<https://www.oregon.gov/odot/planning/pages/apm.aspx>

TABLE 11: P.M. PEAK HOUR INTERSECTION OPERATIONS AT HAWTHORNE AVENUE/3RD STREET

EXISTING CONFIGURATION				TRAFFIC SIGNAL AT HAWTHORNE/3 RD STREET		
INTERSECTION	V/C	LOS	DELAY (SEC)	V/C	LOS	DELAY (SEC)
GREENWOOD AVENUE/3 RD STREET	0.98	F	89	No change		
HAWTHORNE AVENUE/3 RD STREET	0.12/0.27*	B/C*	11/18*	0.50	A	9
FRANKLIN AVENUE/3 RD STREET	0.77	38	D	No change		

* Results shown for the worst major/minor movement

Table 11 shows the average and 95th percentile queues at the Hawthorne Avenue/3rd Street intersection obtained from SimTraffic. Most average and 95th percentile queues are well short of the next major intersection. The northbound queue spills back to Franklin Avenue driven by congestion from the Greenwood Avenue/3rd Street intersection, but this only occurs about three percent of the time during the p.m. peak hour in the SimTraffic simulation. These results suggest that if a traffic signal were built at the intersection of Hawthorne Avenue and 3rd Street, it would not generate substantial queue spillback between Greenwood Avenue and Franklin Avenue during the p.m. peak hour. Signal timing adjustments could likely help manage these impacts (e.g., prioritizing green time and coordination along 3rd Street to avoid queue spillback towards Greenwood Avenue).

TABLE 12: QUEUING RESULTS AT HAWTHORNE AVENUE/3RD STREET WITH A TRAFFIC SIGNAL

Approach	AVERAGE QUEUE (FT)	95 TH PERCENTILE QUEUE (FT)	DISTANCE TO NEXT MAJOR INTERSECTION
NORTHBOUND	350	700*	675
SOUTHBOUND	100	225	675
EASTBOUND	25	75	475
WESTBOUND	75	125	475

Red bold text indicates the queue exceeds the link distance.

*The northbound queue exceeds the distance to Franklin Avenue due to northbound congestion at the Greenwood Avenue/3rd Street intersection.

SUMMARY OF KEY OPPORTUNITIES AND CONSTRAINTS

The following summarizes key opportunities and constraints along the corridor, as documented in this technical memorandum that will be used to help inform the selection of alternatives for more detailed evaluation:

- Existing Multimodal Volumes and Vehicle Speed
 - Daily traffic volumes on Hawthorne Avenue east of 3rd Street (2,650 vehicles) exceed NACTO recommended thresholds for a Shared Street (1,000 vehicles), indicating more separation between people biking and driving is desired.
 - Daily traffic volumes on Harriman Street south of Hawthorne Avenue (1,900 vehicles) also exceed NACTO thresholds for a Shared Street. However, with the closure of the Hawthorne Avenue/ US 97 intersection and the modal filter at the Harriman Street/Franklin Avenue intersection, these volumes may decline to the point where the threshold is met.
 - Median and 85th-percentile speeds on Harriman Street south of Hawthorne Avenue were between 20 and 27 m.p.h., indicating additional traffic calming may be beneficial to encourage vehicle speeds closer to the posted speed of 20 m.p.h.
 - Median and 85th-percentile speeds on Hawthorne Avenue east of 3rd Street were 11-19 m.p.h., likely slower due to bus traffic slowing and stopping near the transit center.
 - The volume of people walking and biking on Hawthorne Avenue and Harriman Street was relatively low in the winter traffic counts, although higher numbers of people crossing 3rd Street were observed. It is likely that more people would be walking and biking in the summer and this activity is expected to further increase with the construction of the Hawthorne overcrossing and future development in the Core Area.
- Harriman Street between Greenwood Avenue and Franklin Avenue
 - Conditions for People Walking and Biking
 - Sidewalks are present on Harriman Street except for a 100-foot stretch just south of Irving Street. There are no bicycle facilities on Harriman Street.
 - A recent project at the intersection with Greenwood Avenue added a modal filter with marked crosswalks and bike cuts. The under-construction project on Franklin Avenue is adding separated bicycle lanes east of Harriman Street and a modal filter with marked crosswalks at the intersection with Harriman Street. Planned changes along Hawthorne Avenue will require modifications at the Hawthorne Avenue/Harriman Street intersection to best accommodate people walking and biking to the Hawthorne overcrossing via the Promenade Street option.
 - Safety Analysis
 - 19 crashes were reported on Harriman Street between 2019 and 2023. Ten of these resulted in a minor or possible injury, and all of these occurred either at the intersection with Greenwood Avenue or Franklin Avenue, which have recent or planned safety improvements. The most common crash types were angle, rear-end, and turning.
 - Potential safety improvements on Harriman Street include striping crosswalks (based on engineering judgment), filling the sidewalk gap between Irving Avenue and Hawthorne

Avenue, and converting the intersections with Irving Avenue and Hawthorne Avenue to all-way stop control.

- Parking Occupancy
 - > Weekday average parking occupancy was highest on Harriman Street between Greenwood Avenue and Hawthorne Avenue, with up to 95 percent of the available spaces occupied. A similar pattern was observed on the weekend (Saturday), though occupancy was slightly lower.
 - > While there is high demand for free on-street parking, parking occupancy at the Centennial parking garage is still fairly low and provides additional parking capacity.
- Traffic Control at Harriman Street/Hawthorne Avenue
 - > While traffic volumes are relatively low at this intersection, the City could consider converting this intersection to all-way stop control to address the limited sight distance on the Harriman Street approaches and accommodate people walking and biking on Hawthorne Avenue when it is converted to the Promenade option on the west leg (see Table 12 below, which summarizes the primary intersection options to consider for advancing). Converting to all-way stop control would have minimal delay impacts on any of the intersection approaches. Curb extensions or a raised intersection could be added to reduce pedestrian crossing distances and increase pedestrian comfort.
- Traffic Control at Harriman Street/Irving Street
 - > Traffic volumes are also low at this intersection; however, the City could also consider converting this intersection to all-way stop control to address the limited sight distance on the Harriman Street approaches (see Table 12 below, which summarizes the primary intersection options to consider for advancing). Converting to all-way stop control would have minimal delay impacts on any of the intersection approaches. Curb extensions could also be added at this location to reduce pedestrian crossing distances.
- Hawthorne Avenue between 3rd Street and 5th Street
 - Conditions for People Walking, Biking and Taking Transit
 - > Sidewalk coverage is intermittent on this section of Hawthorne Avenue, with gaps on each block. There is no sidewalk at all on the south side of the street between 4th Street and 5th Street. There are also no bicycle facilities on this stretch of Hawthorne Avenue.
 - > At the intersection with 3rd Street, there is a marked crosswalk and pedestrian refuge island with a rectangular rapid flashing beacon (RRFB) on the south leg. However, the location of the island crosswalk are inconvenient for people traveling westbound.
 - > Hawthorne Station is an important destination and connection point for people taking transit, who often walk or bike to this location. There are two routes that currently make a southbound left turn at 3rd Street/Hawthorne Avenue, however CET has expressed that they can easily manage a southbound left restriction at this intersection.
 - Safety Analysis
 - > 14 crashes occurred on this segment, including four minor injury crashes and six possible injury crashes. All of the injury crashes happened at the intersection with 3rd Street. The most common crash types were turning, angle, and rear-end.
 - > All of the injury crashes occurred at the intersection with 3rd Street, indicating there are not major safety concerns outside of that location.

- > Potential safety improvements on Hawthorne Avenue include filling the sidewalk gaps, and adding a traffic signal, PHB, or overhead RRFB at the intersection with 3rd Street, consistent with the recommendations shown in Table 12 below and elsewhere in this document.
- Traffic Control and Crossing Analysis at Hawthorne Avenue/3rd Street
 - > Traffic signal warrants are likely not met at this intersection due to the limited side street volume turning through and left. However, the City may still consider a traffic signal or half signal to support pedestrian and bicycle crossing needs. If a traffic signal were installed, it would operate acceptably and could be timed to avoid any queue spillback to US 20/Greenwood Avenue.
 - > Based on the existing site conditions and the expected increase in the number of people crossing 3rd Street after the completion of the Hawthorne overcrossing of US 97, the recommended alternatives for the Hawthorne Avenue/3rd Street are listed in Table 12 below.

TABLE 13: PROS AND CONS FOR INTERSECTION OPTIONS AT HARRIMAN STREET AND HAWTHORNE AVENUE

OPTION	PROS	CONS	RECOMMENDATION
HARRIMAN STREET			
Convert intersection with Hawthorne Avenue to All-Way Stop Control	Addresses potential sight distance issues and accommodate the Promenade option.	Would increase vehicle delay on the eastbound/westbound approaches.	Advance for further study.
Convert intersection with Irving Avenue to All-Way Stop Control and add curb extensions	Addresses potential sight distance issues.	Would increase vehicle delay on the eastbound/westbound approaches.	Advance for further study.
HAWTHORNE AVENUE ^{A, B}			
TRAFFIC CONTROL AND CROSSING OPTIONS			
Build a traffic signal or half signal at the 3rd Street intersection	Enhances safety for people crossing 3 rd Street and reduces angle crashes. Can be coordinated with adjacent signals.	Location does not meet signal warrants; could increase vehicle congestion on 3 rd Street.	Advance for further study.
Build a pedestrian hybrid beacon (PHB) at the 3rd Street intersection.	Enhances safety for people crossing 3 rd Street. Can be coordinated with adjacent signals.	Not recommended in Bend’s Striping and Marking Manual (unless speed is 40 m.p.h. on 3 rd Street); could increase vehicle congestion on 3 rd Street.	Do not advance for further study.
Build an overhead RRFB at the 3 rd Street intersection	Enhances safety people crossing 3 rd Street. Would be most effective with a median and crosswalk on the north leg.	May not provide as much of a safety benefit compared to a red indication like a traffic signal or RRFB.	Advance for further study.
Maintain existing RRFB	Requires fewer improvements, reducing cost	Does not accommodate people walking or biking across the north leg of the intersection.	Consider for further study.
MEDIAN OPTIONS			
Maintain existing ped refuge island and crosswalk (only works with RRFB).	No impact on existing traffic patterns.	Inconvenient for people crossing 3 rd Street on the north leg and allows for conflicts with left-turning vehicles. Current RRFB presents challenges for visually impaired and mobility device users.	Consider for further study.
Eliminate the existing ped refuge island but add a crosswalk to the north leg (only works with new traffic signal, half signal, or PHB).	Enhances safety for people crossing 3 rd Street.	Location does not meet signal warrants (but does meet MUTCD guidance for a PHB).	Consider for further study.
Build a RIRO median (can be done with any traffic control option).	Would reduce conflicts between left-turning vehicles and people crossing 3 rd Street.	Would disrupt traffic patterns, particularly to CET bus routes. Future changes to CET bus routes may limit impacts.	Advance for further study.
Build a RIRO median that allows southbound lefts (can be done with any traffic control option).	Would reduce conflicts between left-turning vehicles and people crossing 3 rd Street.	Would disrupt traffic patterns, but less so than a full right-in/right-out median. Changes to CET bus routes are possible and would reduce the need to allow southbound lefts.	Advance for further study.
^A All traffic control options should consider adding pedestrian-scale lighting and high visibility crosswalk/bike markings to the crossing at 3 rd Street.			
^B All median options can be combined with any of the traffic control options, except maintaining the existing configuration, which can only be used with the existing traffic control.			