



720 SW Washington St  
Suite 500  
Portland, OR 97205  
dksassociates.com

## MEMORANDUM

DATE: January 16, 2020

TO: Tessie Prentice | City of Milwaukie

FROM: Reah Flisakowski, P.E.  
Kamilah Buker, E.I.T. and Amanda Deering, E.I.T.

SUBJECT: City of Milwaukie Lake Road Corridor Plan

19220-000

---

## INTRODUCTION

A high-level corridor study of Lake Road in Milwaukie, Oregon was conducted to determine future travel lane needs. The study evaluated safety, existing and future traffic volumes, pedestrian and bicycling needs, and transit service.

### Project Description

The analysis was used to guide recommendations on the number of vehicle lanes needed along the study corridor (Figure 1). The following ten study intersections were analyzed:

1. Lake Road at Guilford Drive
2. Lake Road at 35<sup>th</sup> Avenue
3. Lake Road at 34<sup>th</sup> Avenue-Oatfield Road
4. Lake Road at 33<sup>rd</sup> Place
5. Lake Road at 32<sup>nd</sup> Avenue
6. Lake Road at 31<sup>st</sup> Place
7. Lake Road at 28<sup>th</sup> Avenue
8. Lake Road at 27<sup>th</sup> Avenue
9. Lake Road at 26<sup>th</sup> Avenue
10. Lake Road at 23<sup>rd</sup> Avenue-Willard Street

Figure 1. Study Area



## EXISTING CONDITIONS

This section includes a description of the study area roadway network, existing motor vehicle volumes, existing traffic operations, and safety analysis results.

### Study Area Roadway Network

Key roadways within the study area are Lake Road, 34<sup>th</sup> Avenue-Oatfield Road, and 27<sup>th</sup> Avenue. Their functional classifications and other important roadway characteristics are listed in Table 1. It should be noted that although Lake Road is classified as an arterial, the Milwaukie Public Works street design standards allow, but do not require, a center travel lane for arterial streets<sup>1</sup>.

<sup>1</sup> City of Milwaukie Public Works Design Standards, Section 5.0030 Street Design Standards, rev. November 2018.

**Table 1. Study Area Roadway Characteristics**

Roadway	Functional Classification <sup>a</sup>	Auto Lanes	Posted Speed (mph)	Sidewalks	Bike Lanes	On-Street Parking
Lake Rd (west of 28 <sup>th</sup> Ave)	Arterial	2	25/20 <sup>c</sup>	Yes	No	No
Lake Rd (east of 28 <sup>th</sup> Ave)	Arterial	2	30	Yes	No	No
34 <sup>th</sup> Ave (north of Lake Rd)	Collector	2	25	Yes	No	No
Oatfield Rd (south of Lake Rd)	Arterial	2	30	Yes	No	No
27 <sup>th</sup> Avenue	Neighborhood Route	2	25 <sup>b</sup>	Yes	No	Yes

<sup>a</sup> City of Milwaukie Transportation System Plan (TSP), latest amendments through 2016

<sup>b</sup> Not posted, but assumed to be 25 miles per hour

<sup>c</sup> Speed limit is 20 mph when school zone applies

## Sight Distance

The intersections along Lake Road should meet American Association of State Highway and Transportation Officials (AASHTO) stopping sight distance requirements for safe stopping along the roadway behind turning vehicles. Based on speeds of 25 and 30 miles per hour, the roadway would require a minimum of 155 and 200 feet of stopping sight distance, respectively<sup>2</sup>. The sight distance triangles should be clear of permanent objects (large signs, landscaping, etc.) that could potentially limit vehicle sight distance.

Based on a recent field visit, the available stopping sight distance at all study intersections meets stopping sight distance requirements.

## Multimodal Facilities

### Pedestrian and Bicycle Facilities

Sidewalks are present throughout the study area. Five marked crossings across Lake Road currently exist, by transit stops or as marked school crossings. However, there are no marked bike lanes. With future growth and development, bicycle lanes may be needed.

### Pedestrian and Bicycle Volumes

Pedestrian and bicycle count data were collected during the AM and PM peak periods at each of the study area intersections<sup>3</sup>. Generally, the number of people biking along Lake Road is low, less than 10 people per hour. This is not surprising, given the lack the bike lanes along the roadway. Pedestrian crossings across Lake

<sup>2</sup> Geometric Design of Highways and Streets, AASHTO, Table 9-6.

<sup>3</sup> AM traffic counts were collected on December 5<sup>th</sup>, 2019. PM traffic counts were collected on December 4<sup>th</sup>, 2019 at all intersections.

Road are also fairly low, with less than 10 crossings per hour during both the AM and PM peak hours. In general, pedestrian volumes along Lake Road range from 8 to 32 people per hour during the peak hours. This pedestrian volume includes students walking to school and neighborhood activity.

### Transit Facilities

TriMet provides two fixed bus routes and Dial-A-Ride (LIFT) service within the study area.

- Line 32 – Oatfield: This route runs weekdays between Milwaukie City Center and Clackamas Community College. On weekends, line 32 runs between the Oregon City Transit Center and Clackamas Community College. Bus headways range from every half hour to an hour.
- Line 29 – Lake/Webster Road: This route runs weekdays between Milwaukie City Center and Clackamas Community College. Line 29 does not provide service on the weekends. Bus headways range from every hour to an hour and a half.

There are four transit stops for Line 32 and one stop for Line 29 along each direction of the Lake Road study area. Passenger boardings and alightings for this corridor are low, ranging from 1 to 6 passengers boarding or alighting per stop on an average weekday<sup>4</sup>.

### Existing Motor Vehicle Volumes

Traffic counts were collected for the AM (7:00 – 9:00) and PM (4:00 – 6:00) peak periods for a typical weekday<sup>5</sup>. The raw traffic data is included in the Appendix. The weekday AM and PM peak hour volumes were used in the left turn warrant analysis and are shown in Figure 2.

Two 24-hour volume and speed surveys were collected along Lake Road near 26<sup>th</sup> Avenue and 35<sup>th</sup> Avenue to determine average daily traffic (ADT) volumes. Along Lake Road, just west of 26<sup>th</sup> Avenue, the measured daily volume was 3,321, while just east of 35<sup>th</sup> Avenue it was 10,966 vehicles per day. The westbound direction peaks in the AM on the west end of the corridor, and peaks in the PM on the east end of the corridor. The eastbound direction has fairly even peaks along the corridor in both the AM and PM. The drop in over 7,000 vehicles per day from the east to the west end of the corridor is due to about 5,000 vehicles turning to and from Oatfield Road and the dense residential development along the corridor.

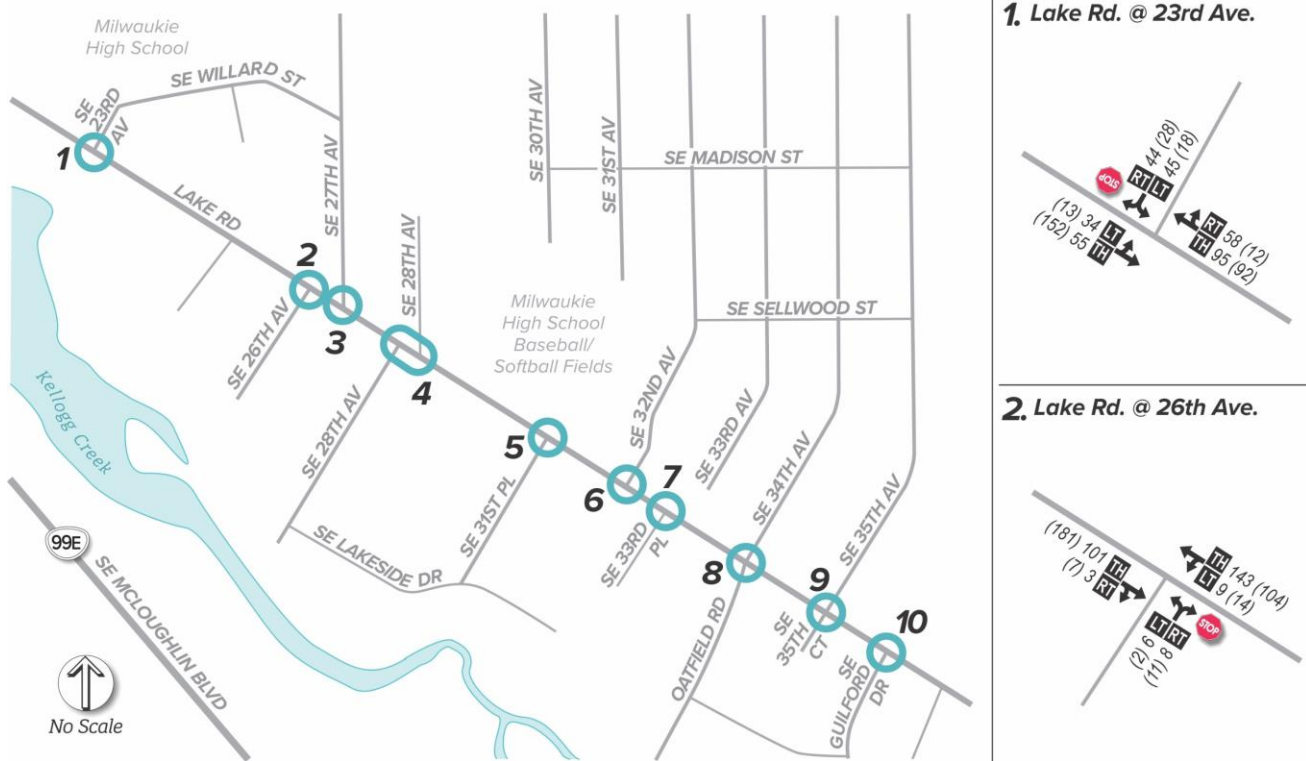
The tube counts also indicate that speeding is common along the corridor. In the western part of the corridor where the speed limit is 25 mph (20 mph in school zones), the 85<sup>th</sup> percentile speed is 29 mph. On the eastern end of the corridor where the speed limit is 30 mph, the 85<sup>th</sup> percentile speed is 34 mph.

---

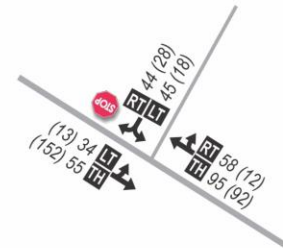
<sup>4</sup> Per TriMet's Spring 2019 Passenger Census

<sup>5</sup> AM traffic counts were collected on December 5<sup>th</sup>, 2019. PM traffic counts were collected on December 4<sup>th</sup>, 2019 at all intersections.

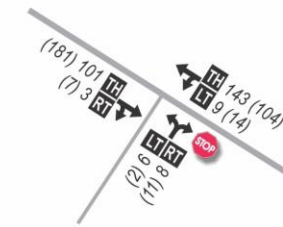
Figure 2. 2019 Existing Conditions Weekday AM/PM Peak Hour Traffic Volumes



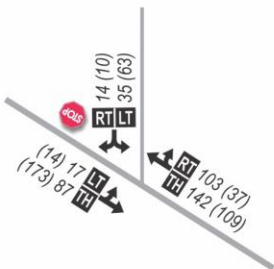
1. Lake Rd. @ 23rd Ave.



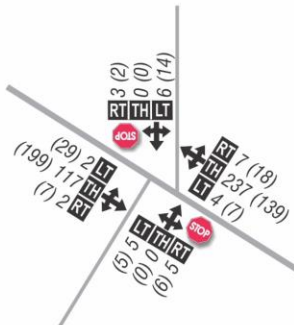
2. Lake Rd. @ 26th Ave.



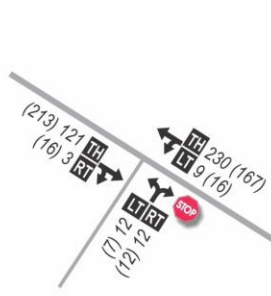
3. Lake Rd. @ 27th Ave.



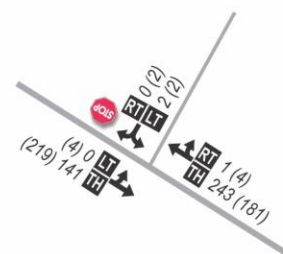
4. Lake Rd. @ 28th Ave.



5. Lake Rd. @ 31st Pl.



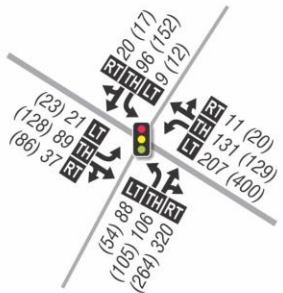
6. Lake Rd. @ 32nd Ave.



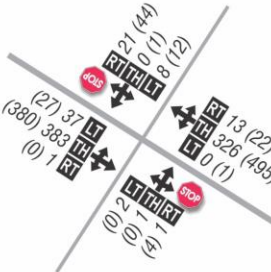
7. Lake Rd. @ 33rd Pl.



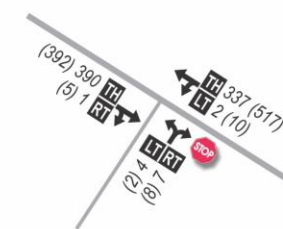
8. Lake Rd. @ 34th Ave./ Oatfield Rd.



9. Lake Rd. @ 35th Ave./ 35th Ct.



10. Lake Rd. @ Guilford Ave.



# Study Intersection  
 Traffic Signal  
 Stop Sign  
 Lane Configuration  
 AM (PM) Peak Hour Traffic Volumes  
 Volume Turn Movement (Left-Thru-Right)

## Left Turn Warrant Analysis

To determine the appropriate number of vehicle lanes along the study corridor, a left turn warrant analysis was conducted based on existing conditions. According to ODOT, providing a left turn lane at an intersection will improve the safety of the intersection.<sup>6</sup> In order to warrant the installation of a left turn lane, one of the following criteria must be met<sup>7</sup>:

1. Vehicular volume
2. Crash Experience
3. Special Cases (e.g. railroad crossing, passing lanes, etc.)

The following analysis considered the first criteria by assessing the left turn volume, approaching volume, opposing volume and warrant volume threshold as described in the Analysis Procedures Manual. Crash experience s addressed in the safety section of this report.

Left turn warrants were performed for left turning movements off Lake Road onto the side streets at all study intersections in the eastbound and westbound directions. During the AM peak hour, the following intersections warrant left turn lanes under existing conditions:

- Lake Road/34<sup>th</sup> Avenue-Oatfield Road (in the westbound direction)
- Lake Road/35<sup>th</sup> Avenue (in the eastbound direction)

During the PM peak hour, the following intersections either met the left turn warrant analysis or should be considered for the addition of a left turn lane:

- Lake Road/34<sup>th</sup> Avenue-Oatfield Road (in the westbound direction)
- Lake Road/35<sup>th</sup> Avenue (in both directions)
- Lake Road/Guilford Drive (in the westbound direction)

Left turn lanes on Lake Road already exist at the signalized intersection of Lake Road/34<sup>th</sup> Avenue-Oatfield Road. These turn lanes were warranted and are recommended to remain. In addition to these, two other stop-controlled intersections to the east are warranted to have center left turn lanes. This is primarily due to the high conflicting volumes along Lake Road. Details can be found in the appendix.

An eastbound turn pocket currently exists on Lake Road at 23<sup>rd</sup> Avenue to access the Milwaukie High School. The warrant analysis at this location showed 21 additional eastbound left turn movements are needed to warrant a separate turn lane at 23<sup>rd</sup> Avenue during the AM peak hour. Based on information provided by the Milwaukie High School Remodel Traffic Memorandum<sup>8</sup>, distribution from the Metro regional travel demand model, and current traffic count data, more than 20 additional vehicles are forecasted to make an eastbound left turn at 23<sup>rd</sup> Avenue in the AM peak hour once the school remodel is complete. In addition, school traffic peaking behavior is concentrated within short durations when school starts and ends, rather than spread out

---

<sup>6</sup> Highway Design Manual, ODOT, 2012.

<sup>7</sup> Analysis Procedure Manual Version 2, ODOT, 2019.

<sup>8</sup> Milwaukie High School Remodel Traffic Memorandum, Lancaster Engineering, 2017.

evenly over an hour, which contributes to the need for left turn lane queue storage. It is recommended to retain this turn lane, in order to maintain the safety and current operating conditions at Lake Road/23<sup>rd</sup> Avenue. After the school construction is complete, it is unlikely that access at Lake Road/27<sup>th</sup> Avenue would warrant an eastbound left turn lane since school access from the north is likely to occur from 23<sup>rd</sup> Avenue.

## Safety Analysis

A collision analysis was conducted for the study intersections. Collision data for the study intersections was obtained from ODOT for the period from 2013 through 2017. The collision data and traffic counts were used to calculate the collision rates at the study intersections. Table 2 summarizes the collisions experienced at each study intersection, and the resulting collision rate in the number of collisions per million vehicles entering the intersection.

Within the study area, none of the study intersections had a collision rate higher than 1.0. Therefore, there is no indication of a potential safety problem at the study intersections. However, it should be noted that the majority of crashes along the corridor are either rear-end or turning crashes. These could potentially be reduced with center left turn lanes, especially at Lake Road/34<sup>th</sup> Avenue-Oatfield Road, Lake Road/35<sup>th</sup> Avenue, and Lake Road/Guilford Drive where left turn lanes are already warranted by volume.

**Table 2. Collision Data Summary by Intersection (2013 through 2017)**

Intersection	PDO	Injury	Fatal	Total	Intersection Crash Rate
23 <sup>rd</sup> Ave	0	0	0	0	0.00
26 <sup>th</sup> Ave	0	1	0	1	0.13
27 <sup>th</sup> Ave	1	0	0	1	0.13
28 <sup>th</sup> Ave	0	0	0	0	0.00
31 <sup>st</sup> PI	0	2	0	2	0.32
32 <sup>nd</sup> Ave	0	0	0	0	0.00
33 <sup>rd</sup> PI	0	1	0	1	0.16
34 <sup>th</sup> Ave-Oatfield Rd	1	3	0	4	0.20
35 <sup>th</sup> Ave	3	2	0	5	0.25
Guilford Dr	0	0	0	0	0.00

Note: Collision Rate is expressed in Collisions per Million Entering Vehicles

PDO = A collision that resulted in Property Damage Only

Injury = A collision that resulted in an injury

Fatal = A collision that resulted in a fatality

## FUTURE CONDITIONS

In the future, traffic volumes along Lake Road will likely increase slightly due to background growth from infill development and completed development projects such as the Milwaukie High School reconstruction. Taking these projects into account, along with 2035 forecasts from the Milwaukie Transportation System Plan (TSP)<sup>9</sup>, ADT volumes were forecasted for the year 2035 using a 1 percent annual growth rate, for a total growth of 16 percent from counts collected in 2019. The 2035 ADT on Lake Road just west of 26<sup>th</sup> Avenue is estimated to be 3,850 vehicles per day, while just east of 35<sup>th</sup> Avenue it is about 12,700 vehicles per day. This relatively low level of growth indicates that additional left turn lanes beyond locations that are existing or warranted under existing conditions would likely not be needed in the future.

## SUMMARY OF RECOMMENDATIONS

Upon assessment of vehicle volumes, collision trends, multimodal facilities, and future conditions, it is recommended that the existing turn lanes on Lake Road at 23<sup>rd</sup> Avenue and 34<sup>th</sup> Avenue/Oatfield Road be maintained. In addition, new turn lanes are recommended at 35<sup>th</sup> Avenue (both directions) and Guilford Drive (eastbound direction). This would extend the existing three-lane cross section to the east from Guilford Drive to Oatfield Road/34<sup>th</sup> Avenue. Between Oatfield Road/34<sup>th</sup> Avenue to 23<sup>rd</sup> Avenue, it is recommended to retain the existing two-lane cross section.

At locations where high turning and conflicting volumes warrant a turn lane, safety and comfort of drivers should improve with the addition of left turn lanes. Maintaining the two-lane cross section at locations where turning demand is lower allows for a narrower cross section, which makes for a more comfortable walking and biking environment and encourages drivers to maintain lower speeds. Although Lake Road is classified as an arterial street, it has a residential feel along the study corridor. Since City design standards do not require a center turn lane, the above recommendations are intended to maintain the character of the street while improving mobility and safety along the corridor.

---

<sup>9</sup> Transportation System Plan, City of Milwaukie, Figure 8-2A, rev. October 2018.