Comprehensive Plan

Ancillary Document

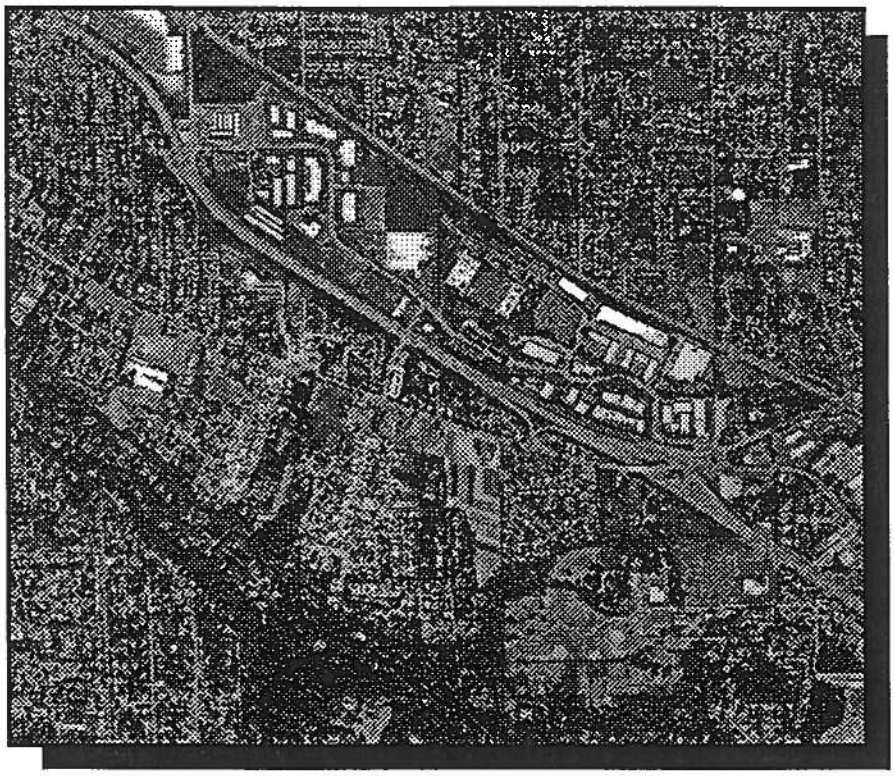
Lake Road Multimodal Plan

Adopted May 20, 1997—Ord. 1819

Prepared for

CITY OF MILWAUKIE

Lake Road Multi-modal Connection Study



prepared by

DKS Associates

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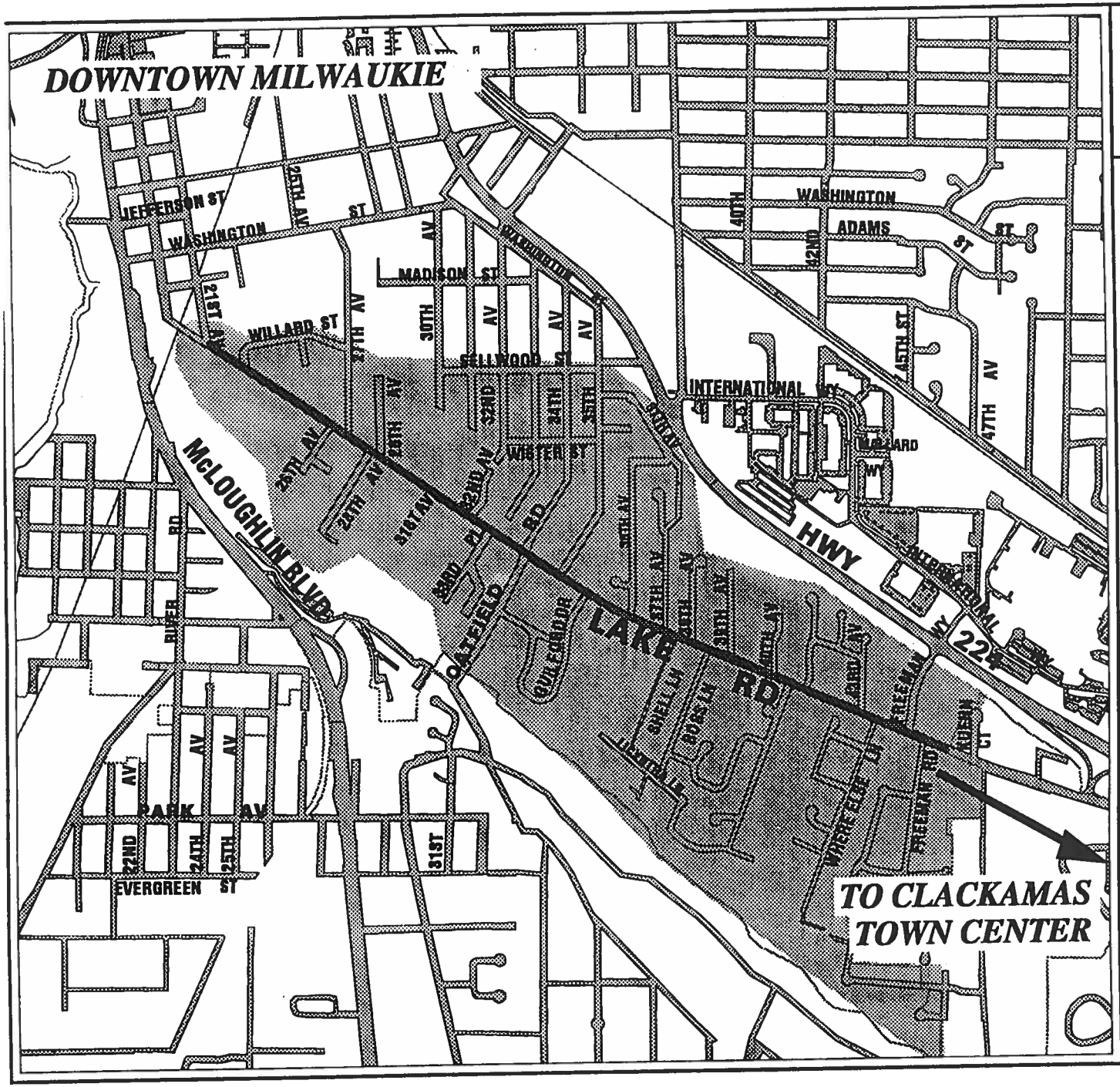
1 Introduction

The City of Milwaukie received a grant from the State of Oregon to undertake a transportation study of Lake Road. Lake Road is an arterial of local and regional significance to the City of Milwaukie. It forms a link between Metro designated regional centers in downtown Milwaukie and Clackamas Town Center. Historically, it has served as a key east-west connector from western areas of Milwaukie, unincorporated areas such as Oak Grove, and McLoughlin Boulevard to eastern areas of Milwaukie, the Town Center area, 82nd Avenue, I-205, and Sunnyside Road. With the completion of Milwaukie Expressway over 25 years ago, traffic levels decreased as the new principal regional facility served more through traffic. However, over time Lake Road has continued to serve as the only east-west link between Oak Grove and the commercial areas east of Milwaukie.

This regional context directly conflicts with the setting for Lake Road. Within the study area (defined to be between 21st Avenue and the eastern City Limit - near Kuehn Road, Figure 1), Lake Road has historically been a residential neighborhood. Many single family residences front onto Lake Road. There are schools (Milwaukie Elementary, Rowe Junior High, Milwaukie High and a private school) and churches near or with frontage along Lake Road. Additionally, due to the physical constraints of the neighborhood area (Kellogg Lake and Kellogg Creek to the south, ORE 224 to the north) there are small and emerging residential areas served by cul-de-sacs which rely on Lake Road as their primary route for local access.

The City of Milwaukie became aware of potential safety, circulation, livability issues and multi-modal travel needs along Lake Road through development of its Transportation System Plan over the past two years. The Lake Road Multi-modal Connection Plan and Study objectives are to:

- Work with study area residents including Neighborhood District Associations and City staff to identify specific transportation problems in the Lake Road area;
- Develop design options for Lake Road to solve these problems;
- Address local circulation and access management issues along Lake Road; and
- Complete a plan for the future of Lake Road that defines a framework for multi-modal, safety, connectivity, and access management issues to be addressed over time.



LAKE ROAD AREA MULTI-MODAL CONNECTIONS PLAN

VICINITY MAP

CITY OF MILWAUKIE BOUNDARY

LAKE ROAD CORRIDOR

STUDY AREA

Figure 1

MAP DATE : 04/25/96

Department of Community Development

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This report outlines the public process used in the study, existing conditions along Lake Road, provides detail regarding future conditions based upon regional 2015 travel demand forecasts, identifies alternatives developed for Lake Road and provides a framework plan for future improvements along the Lake Road corridor.

PUBLIC PROCESS

The Lake Road Area Multi-modal Plan draft has been prepared with extensive planning, engineering and public involvement. The process began with a widely advertised public open house to introduce the project and begin to obtain public feedback and participation on identifying transportation needs. A citizen questionnaire was mailed to residents in the Lake Road area and handed out the open house (results are discussed below). A Lake Road Area Citizens Working Group was formed to work with the consultant and City staff in developing a plan for multi-modal use of Lake Road. This committee met throughout the project process to review collected data, technical analysis, and provide public opinion on different modal needs, priorities, and plan recommendations. Additional public comment is planned through additional open houses and public hearings, to achieve a final Draft Lake Road Area Multi-modal Connection Plan for review and recommendation by the Milwaukie Planning Commission and adoption by the City Council for inclusion in the Comprehensive Plan.

CITIZEN QUESTIONNAIRE

An early key element of the public process was to identify citizen concerns and needs. A questionnaire was mailed to over 1,100 properties in the study area and handed out at the initial open house on the project. Over 13 percent of the property owners/residents in the Lake Road study area felt it was important enough to take the time to complete the questionnaire and provide comment. Responses were provided related to all modes of transportation: automobile, transit, walking, bicycling, trucks. Results of the survey and its methodology are summarized in a separate working paper[1]. Overall there was widespread and, at times, conflicting opinions on many traffic issues. However, there are also commonly identified needs and solutions that have been considered in this planning effort. The questionnaire indicates:

- Most of the respondents walk in the neighborhood

- Many pedestrians have identified walking along and across Lake Road as a safety concern due to the lack of or limited pedestrian facilities

[1] Lake Road Area Multi-modal Connections Plan, Citizen Questionnaire Results Report, City of Milwaukie, July 22, 1996.

- Half of the respondents bicycle and many more would do so if bikeways were provided

- Some of the respondents use public transit (bus) and many are satisfied with the current accommodations

- Covered bus shelters were the most popular improvement suggested

- One out of five respondents have been personally or know a family member who have been in a car accident along Lake Road

- Over half of the respondents find left turning vehicles along Lake Road to pose a safety problem. Key intersections of concern that were noted include: Freeman Way, Where Else Lane. 35th Avenue, 37th Avenue, 43rd Avenue, Oatfield Road and Rowe Junior High School.

The general comments section of the questionnaire provided a wealth of citizen input, again related to a variety of transportation system topics. While it is not easy to condense the breadth of these comments, there were some continual themes or consideration stated, including:

- Recognize that Lake Road is a residential area

- Discourage through traffic

- There is too much traffic, especially east of Oatfield Road

- Reduce travel speed and the number of speeding vehicles on Lake Road

- Provide better law enforcement especially for speeding vehicles and vehicles using the bicycle lanes to pass left turning vehicles

- Provide pedestrian improvements such as curbed sidewalks and crosswalks along and across Lake Road

- Consider neighborhood traffic management techniques to slow traffic and provide greater safety to other modes

- Provide bicycle lanes along Lake Road and in the study area to encourage greater bicycle use

- Discourage truck traffic on Lake Road in the study area

- Consider intersection improvements at key locations on Lake Road (e.g. Oatfield Road, Rowe Junior High, Freeman Way)

- Consider adding continuous left turn lanes or adding left turn lanes at key intersections along Lake Road

- Recognize that some residents believe Lake Road and the study area are not in need of any transportation system improvements

- Recognize that local street circulation within the study area functions well for local traffic

WORKING GROUP

The Lake Road Area Multi-modal Plan Working Group consists of twenty-one Lake Road Area residents who volunteered at the first open house to serve on the committee. At the beginning of the Lake Road Area Multi-modal Plan Working Group process, the working group developed a mission statement which states:

> *Produce a safe, livable, and accessible corridor area that better manages vehicle speed and volume and provides improved access for all modes; especially pedestrian, bicyclists, motorist, and transit.*

During subsequent meetings the working group outlined a series of concerns. Many of these mirror those found in the surveys.

- Demand of road exceeds desired function and intended capacity

- Safety/sight distance at Lake/Oatfield intersection needs improvement

- Pedestrian paths on Lake Road are inadequate, particularly for school children

- Accessibility to Freeman Way and Lake Road is restricted by volume

- Pedestrian safety on Lake Road

- Excessive speeds, especially near school zones

- Road conditions are a problem for bicyclists (puddles, uneven pavement, holes)

- Sight distance along Lake Road is restricted by vegetation in several locations

- Excessive vehicle speeds and through traffic

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2 Existing Conditions

Using a combination of transportation data and public input, a clear picture of existing conditions can be developed for Lake Road. The following sections summarize key transportation conditions in the study area.

Roadway Authority

Within the study area, the City of Milwaukie has operating and maintenance authority of Lake Road (speed zone changes must be approved by ODOT). East of Kuehn Road, Lake Road is under the authority of Clackamas County and the Oregon Department of Transportation (near the ORE 224 interchange).

Functional Classification

Lake Road is classified as **minor arterial** in the Milwaukie Comprehensive Plan. The draft Transportation System Plan designates Lake Road as an **arterial**. These designations are consistent with Clackamas County's designations. The City also designates Lake Road as a **bikeway, a pedestrianway and a transit route**. Metro designates Lake Road as a **Multi-modal Minor Arterial** and part of the **regional bicycle network** as part of its functional classifications. As part of Metro's recent functional plan, Lake Road has been designated a **Community Street** which provides certain guidelines for street design.

Other streets in the study area with specific functional classifications include Oatfield Road (classified as an arterial) and 34th Avenue (classified as a collector). All other public streets in the study area are local streets, very few of which are not cul-de-sacs.

Traffic Volumes

Based upon traffic counts conducted in 1994 and 1995, Table 1 provides a summary of current traffic volumes in the study area. Traffic volume on Lake Road changes significantly at Oatfield Road. Traffic goes down 57 percent from east of Oatfield Road to west of Oatfield Road. This demonstrates the strong linkage of the east/west movement between Oak Grove and areas east of Milwaukie.

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Table 1
Existing Traffic Data
Two-way Volumes

Street	Daily Vehicles	PM Peak Hour Vehicles
Lake Road		
At 40th Avenue	11,618	1,146
At 28th Avenue	5,067	571
Oatfield Road		
At Kellogg Creek Bridge	12,448	1,200
34th Avenue		
North of Lake Road	3,364	348

SOURCE: City of Milwaukie, 1994, 1995.

Through Traffic

Due to Lake Road's unique characteristic of serving both a regional and local function, the level of use of the street by through and local traffic was evaluated. Using the Metro Regional Travel Demand Forecast Model, specifically modified for Milwaukie (as part of the TSP), detailed select link analysis was performed on Lake Road and Oatfield Road. A select link analysis indicates where vehicle trips that use Lake Road (considering a point near Freeman Way) came from (origins) and end up (destinations). Table 2 summarizes the findings.

The majority of traffic using Lake Road could be considered through traffic. The largest trip combination is to and from Oak Grove and Harmony Road to the east. From a design perspective, it should be noted that a significant share of the traffic using Lake Road is local (nearly a third) and accommodations must be made to service this traffic. The small amount of traffic identified with the "Local Area East" is the result of the location of the roadway segment at Freeman Way (it is so far to the east of the study area there are few destinations in the study area east of Freeman Way).

Traffic Control

Lake Road only has one signalized intersection at Oatfield Road. All other intersections are uncontrolled (no stop signs or traffic signals). To the east, the ramps with ORE 224 are signalized. A 30 mile per hour speed zone is in place on Lake Road from 21st Avenue to approximately 43rd Avenue. The speed zone changes to 40 miles per hour 250 feet east of Vernie Avenue. School zones are in place near Rowe Junior High and Milwaukie High School (20 miles per hour). Speed zones on all other public streets in the study are 25 miles per hour.

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Table 2
Through Traffic Evaluation of Lake Road
PM Peak Hour

Eastbound Lake Road Percent of Traffic on Segment near Freeman Way	**Areas**	**Westbound Lake Road** Percent of Traffic on Segment near Freeman Way
Origins		**Destinations**
12%	Downtown Milwaukie/to North	3%
58%	Oak Grove	64%
3%	McLoughlin to South	2%
1%	34th to North	1%
26%	Local Area West	30%
100%	**TOTAL**	**100%**
Destinations		**Origins**
11%	Linwood/Railroad/to North	8%
44%	Harmony Road/to East	46%
25%	ORE 224/ to East	23%
5%	Areas just North of ORE 224	10%
9%	Areas near Rusk/Webster	8%
6%	Local Area East	5%
100%	**TOTAL**	**100%**

SOURCE: DKS Associates

Many drivers do not perceive a difference in roadway characteristics along Lake Road and continue to travel 40 miles per hour well into the 30 mph zone. Speed measurements on westbound Lake Road at 40th Avenue indicate the 85th percentile speed are about 40 mph. At 28th Avenue, 85th percentile speeds are about 39 mph westbound and 35 miles per hour eastbound[2].

In 1996, roughly 177 traffic citations were issued along the study area of Lake Road. Of these, 67 were for speeding, 41 for no seat belts, and five for failing to obey traffic signals. The majority of the speeding citations were issued for exceeding the 30 mph speed zone limit. Generally for the citations issued, speed limits were exceeded by 18 to 20 mph.

Roadway Geometry

Lake Road is primarily a two lane roadway within the study area. Left turn lanes are provided at Oatfield Road and at ORE 224. Bike lane/shoulder areas are provided

[2] City of Milwaukie data, October 1995. 85th percentile refers to the speed that 85 percent of the vehicles were traveling on the day of measurement.

from Oatfield Road to the eastern City limit. The segment west of Oatfield Road has curbs and sidewalks and the segment to the east has unimproved frontage (no curbs or sidewalks except in a few locations). A series of utility poles are located along the south edge of roadway, set back from the edge of pavement about five feet. Pavement condition is generally good to fair. Curbs on the western segment will need to be replaced in any reconstruction due to multiple overlays. Table 3 summarizes the pavement width in the study area.

Table 3
Lake Road Widths

Location	Paved Width
West of ORE 224	60 feet
Kuehn Road	36 feet
Freeman Road	37 feet
Freeman Way	46 feet
Where Else Lane	38 feet
Vernie Avenue	38 feet
Boss Lane	40 feet
Rowe Junior High	38 feet
Guilford Drive	38 feet
Oatfield Road	36 to 38 feet
32nd Avenue	30 feet

Traffic Operation

Traffic operation can be measured using the capacity analysis methodology outlined in the *1994 Highway Capacity Manual*[3] at signalized intersections. There is one signalized intersection at Lake Road and Oatfield Road that has been analyzed in the past (Table 4). Additionally, using criteria developed from the regional travel demand model in studying roadway links, the overall link capacity can be assessed[4]. In either consideration, there is little available capacity on Lake Road in the evening peak hour. The intersection of Lake/Oatfield already operates at level of service D and the link volumes represent 72 to 92 percent of capacity in the PM peak hour.

Accidents

Between January 1992 and June 1994 there were 40 reported accidents involving automobiles in the study area. In addition, there were two reported accidents involving

[3] Refer to appendix for description of level of service.
[4] The Metro model establishes typical link capacities. A 700 to 900 vehicles per hour capacity (per direction) would be used for Lake Road.

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Table 4
Existing Intersection Performance

Intersection	LOS	Average Delay	Volume-Capacity Ratio
Lake Road/Oatfield Road	D	31.9	0.90

SOURCE: Milwaukie TSP, 1995.

pedestrians and one reported accident involving a bicyclist. Figure 2 provides a summary of the locations of accidents in the study area.

Trucks

There are no regional truck routes in the study area. The draft Milwaukie Transportation Plan does not recommend any minor preferred truck routes in the study area. Counts at the intersection of Lake Road and Oatfield Road measured 1.5 percent trucks in the total traffic stream[5]. It is typical for arterial and collector streets in the Portland area carry between one and three percent trucks during comparable periods. If the Lake Road truck percentage is applied to the daily traffic on Lake Road it would represent about 200 daily trucks.

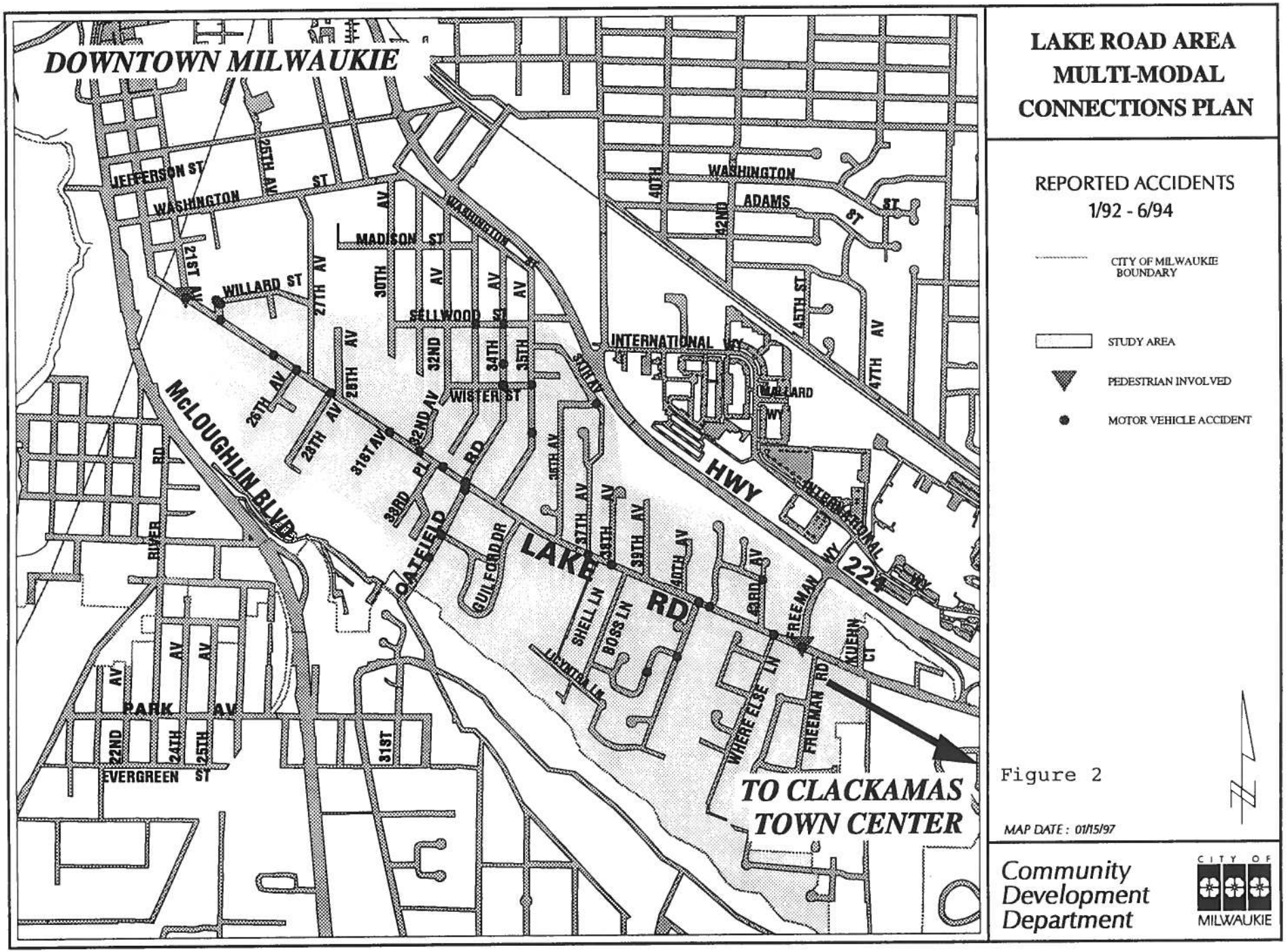
Pedestrian

Sidewalks exist along Lake Road from 21st Avenue to Oatfield Road on both sides of the street. To the east of this point, sidewalk provision is sporadic along Lake Road. Most of the sidewalks in the eastern study area are located north of Lake Road, west of 37th Avenue and south of Lake Road along Freeman Road and Vernie Avenue leading to Lake Road (Figure 3). Pedestrian volumes along Lake Road vary depending upon the provision of sidewalks. West of Oatfield typical hourly volumes of pedestrians on Lake Road range from a dozen to two dozen an hour (east of Oatfield volumes are lower). Pedestrian volumes are highest at school times.

Bicycle

Bicycle lanes exist on Lake Road east of Oatfield Road, on the highest vehicle volume segment of the corridor. Bicycle lanes also exist south of the Oatfield/Lake intersection. No bicycle lanes exist on Lake Road west of Oatfield Road. The current condition of the bicycle lanes on Lake Road would be considered poor in wet weather since significant ponding occurs. Clackamas County considers the riding experience on Lake Road as "good" on their bicycle map.

[5] Based upon available counts conducted in 1994 for the TSP between 4:00 PM and 6:00 PM.



LAKE ROAD AREA MULTI-MODAL CONNECTIONS PLAN

REPORTED ACCIDENTS
1/92 - 6/94

CITY OF MILWAUKIE BOUNDARY

STUDY AREA

PEDESTRIAN INVOLVED

MOTOR VEHICLE ACCIDENT

Figure 2

MAP DATE : 01/15/97

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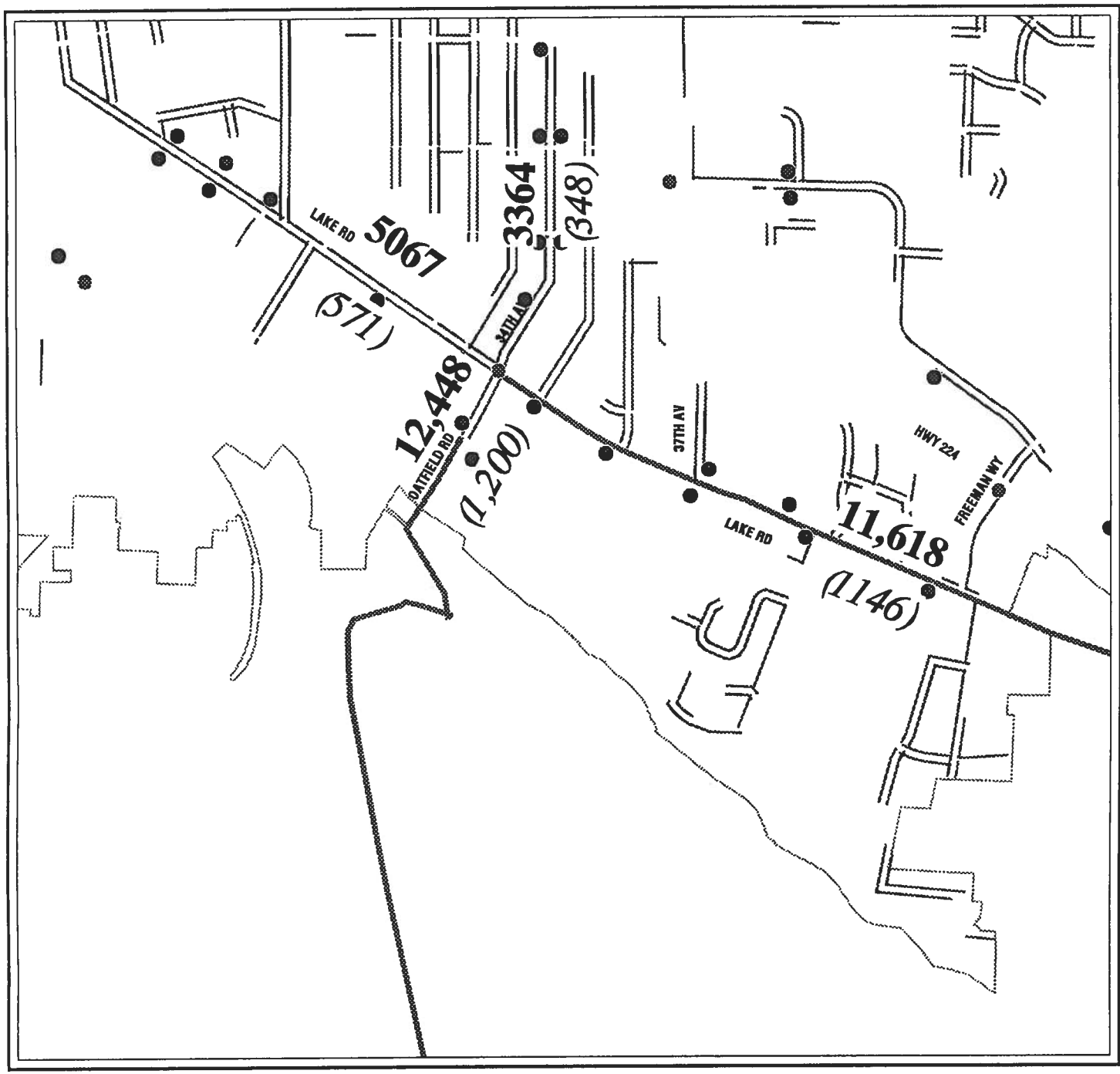

LAKE ROAD AREA CONNECTIONS PLAN

Existing Transportation Facilities And Key Activity Destinations

CITY OF MILWAUKIE BOUNDARY

EXISTING WALKWAYS

EXISTING BIKEWAYS

BUS STOPS

TRAFFIC CONTROL SIGNALS

0000 – Average Daily Traffic

(000) – PM Peak Hour Volume

Source: Draft Milwaukie Transportation System Plan, April 1996.

Figure 3

MAP DATE : 01/15/97

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Transit

Two Tri-Met buses serve the study area. Route 32 (Oatfield) travels on Oatfield Road and Lake Road to the west connecting to downtown Portland and the Oregon City Transit Center. Route 29 (Lake/Webster) travels on 34th Avenue and Lake Road east of Oatfield Road between Milwaukie and Clackamas Town Center Transit Centers. Bus stops exist along Lake Road, 34th Avenue and Oatfield Road. Data indicates these routes carry about 300 to 600 people a day in Milwaukie[6].

Other Studies

There are several other studies that provide information regarding the study area. The following list summarizes these studies.

Milwaukie Regional Center. A study is currently underway that is evaluating the needs for the development of a regional center in downtown Milwaukie. Since Main Street and 21st Avenue link to Lake Road providing a connection to the regional center at Clackamas Town Center, findings from that work will need to incorporate Lake Road findings.

Milwaukie TSP. The draft Milwaukie Transportation System Plan is going through final approval process. That document outlined the issues surrounding Lake Road and identified potential need for turn lanes, neighborhood traffic management and improved connections between McLoughlin Boulevard and ORE 224. Citizen working groups outlined resurfacing of Lake Road and reconstruction of bicycle lanes, and resurfacing of Oatfield Road shoulder areas as needed.

34th Avenue Traffic Analysis. This study was completed in January 1994 to address citizen concerns with excessive through traffic volumes and speeds on 34th Avenue. A six hour survey revealed that 46 percent of the traffic on 34th Avenue was through traffic. A range of roadway and traffic control features were reviewed and traffic humps were installed in October 1994 by the City. This study followed a neighborhood task force document developed in 1992.

Clackamas County Long-Term Capital Improvement Plan (1992-2010). The long range capital improvement plan recommended that the Oatfield Road/Park Avenue intersection be signalized with a left turn lane. It also recommended reconstruction of Lake Road east of the Milwaukie city limit to ORE 224, including turning lanes. Neither of these projects are on the five year CIP list.

Milwaukie Public Facilities Plan 1988-2008. This study completed in 1988 by Kampe recommended improving the curves on Oatfield Road between Park Avenue and Lake

[6] Draft Milwaukie TSP, Existing Conditions, Transit Services.

Road, upgrading ORE 224 from an expressway to a freeway, reconstructing Lake Road with a continuous left turn lane, and reconstruction of Sellwood Street/34th Avenue/Edison Street to ORE 224.

LAND USE

The Lake Road study area is characterized by residential land uses. Current zoning provides for primarily single family and multi-family residential development. Other uses include churches and schools with little commercial activity at the east and west ends of the road. While much of the land area is already developed, there are areas of vacant land (especially in the eastern end of the study area) that have the potential to develop in the near future. These properties are mostly zoned for residential land use (R-7 and R-10). Because the lands adjacent to Lake Road are residential in nature (not commercial) they create different needs for the roadway design. For example, residential used (particularly at the density of current development) do not generate as many vehicle trips as commercial uses, lessening the need for left turn access. On the other hand, the residential uses are more impacted by the volume of traffic on Lake Road (noise, speed, etc.).

Land uses in the study area were inventoried using the Metro regional data base developed for the Milwaukie TSP. Metro's 2015 forecast for land use growth reflecting concentrations of development in regional centers. Table 5 summarizes the number of households and employees in the area. Relative to many areas in the Portland region, growth in this area is modest to low as forecasted for the next 20 years.

Table 5
Land Use Data for Study Area

Year	Households	Employees
1994	1,183	872
2015	1,453	1,167
Percentage Change	**+23%**	**+34%**

The following sections discuss key elements relating land use with transportation on Lake Road.

Access Management

Access management is a key roadway operational element that seeks to manage the conflicts created by land use access needs, thereby improving safety of the transportation system. Lake Road is characterized with several driveways and public streets accessing the traveled way. Between 21st Avenue near downtown Milwaukie to ORE 224 there are approximately 72 driveways and 29 public street access points.

Many of the public streets do align between the north and south side of Lake Road. The offset intersections create a unique operating environment. Because most of the public streets in the study area serve limited amounts of land use, left turning conflicts are limited. Left turn lanes would not be warranted on the segment of Lake Road west of Oatfield Road[7] due to the lower traffic volumes. At Oatfield Road and some of the intersections east of Oatfield, left turn lanes would be warranted. More data is necessary to evaluate specific intersections, but key intersections likely to warrant left turn lanes include Freeman Way, Kuehn Road, Where Else Lane and the ORE 224 ramps.

Private resident driveways along Lake Road provide another level of access conflict. The city conducted a review of properties with frontage to Lake Road and found very few opportunities to reconfigure access to a side street or shared access point to limit the number of access points. The localized impact of such actions would be significant in terms of property impact and would result in right-of-way damages and takings which would be difficult to balance with the benefits produced by limited driveway closure.

Local Street Connections

The local street system is another key element that relates land use to transportation, since most uses gain access to local streets. As part of the Transportation System Plan and implementing ordinances of the Transportation Planning Rule enacted by the City of Milwaukie, it is the city's policy to increase the number of local connections that enhance pedestrian and bicycle movement, as well as reduce out of direction travel. The Lake Road study area is characterized by a significant number of cul-de-sacs, formed by the barriers created by the state highway (ORE 224) and environmentally (Kellogg Creek). These cul-de-sacs make it difficult to circulate within the neighborhood without first accessing a collector (34th Avenue) or arterial street (Lake Road). Because of these constraints, most of the local street system cannot be significantly changed.

[7] Based upon 1994 and 1995 traffic data provided by the City of Milwaukie and Highway Research Board Record Number 211, 1967, page 9.

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3 Future Conditions

Future traffic conditions can be estimated using the regional travel demand forecast model. For the Milwaukie TSP, the Metro regional model was tailored to Milwaukie with more land use data developed within the City. The 2015 forecasts provide an indication of the potential growth in traffic and potential changes in travel patterns. This section summarizes the forecasted growth in traffic, the operating characteristics anticipated if improvements are not made to Lake Road as the rest of the region grows in the future and the potential changes in uses of Lake Road by through traffic.

2015 Traffic Growth

Based upon the forecasts conducted for the Milwaukie TSP, the travel demand model was run specifically for the Lake Road study. Table 6 summarizes the growth in traffic anticipated on study area streets in 2015 based upon planned land use growth in Milwaukie and the region. The forecast accounts for the potential congested conditions along Lake Road in assigning future traffic (in that, further growth in through traffic is constrained by future congestion and potentially seeks alternate routes).

Table 6
Change in Traffic with 2015 Conditions
PM Peak Hour

Location	Existing PM Peak Hour Vehicle Volume	Change to 2015
Lake Road		
At 40th Avenue	1,150	+14%
At 28th Avenue	570	
Oatfield Road		
South of Lake Road	1,200	+16%
34th Avenue		
North of Lake Road	350	+12%
ORE 224		
At Freeman Way	3100	+24%

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Traffic Operation

Based upon the Milwaukie TSP, intersection analysis was performed at the signalized intersection of Lake Road and Oatfield Road. Level of service degrades to E in 2015 with a demand to capacity ratio in excess of 1.0, indicating operating conditions are over capacity. Table 7 summarizes these findings. Additionally, the growth in traffic represented by the regional travel demand forecast would take the traffic volumes on segments of Lake Road from 82 to 105 percent of capacity during the peak period. Without improvement, this would result in congested conditions and extended delays to residents and through traffic.

Table 7
Future Intersection Level of Service[8]

Intersection	Existing			Future 2015		
	LOS	Delay	V/C	LOS	Delay	D/C
Lake Road/Oatfield Road	D	31.9	0.90	E	52.8	>1.00

SOURCE: Milwaukie TSP.

Through Traffic Changes

Performing the same select link analysis as discussed in Existing Conditions, the amount of through traffic was evaluated on Lake Road with 2015 conditions. The level of traffic destined/originating to/from Oak Grove and the Harmony Road area to the east, as a percentage of the future total Lake Road traffic, increases by a few percentage points, the local share stays about the same and the other non-local shares of traffic decrease slightly. Generally, the same characteristics exist as today, but with increasing demand for through traffic.

[8]Note that LOS = Level of Service, Delay = Average Stopped Vehicle Delay in seconds, V/C = Volume-to-Capacity ratio, D/C = Demand-to-Capacity ratio.

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4 Strategies/Alternatives

Working with the citizen advisory group, a series of strategies were outlined to address the future needs of the Lake Road area. The strategies are summarized by mode and action, including bicycle actions, pedestrian actions, transit actions, roadway actions, local street actions and access management actions. The roadway actions include a broad range of measures including enhancement to regional facilities to neighborhood traffic management measures. For each of the actions identified, a summary regarding its status is provided. This screening was done combining technical and public input. Through the review of this draft, revisions and input will be included in this document to refine the Lake Road Plan. This specifically includes the findings and status of various concepts. Status of the actions was grouped into actions rejected, actions to be considered further in the future, actions to be recommended.

Bicycle Actions

Several options were developed to meet the needs identified in the study for bicyclists. Table 8 summarizes the various actions, findings and status.

Table 8
Bicycle Action Summary

Action	Finding	Status
Do Nothing	• Low cost/No residential impact on frontage • Does not meet City and regional policy • Results in less safe future condition for bicyclists • Does not link Regional Centers	REJECTED
Rebuild Existing On-street Bike Lane Oatfield to the east	• Key link in regional bikeway system • Safer conditions for bicyclists/Meets standards • Better provision for school linkage	RECOMMENDED

Action	Finding	Status
Extend Bike Lane on-street west to Downtown	• Key link in regional bikeway system • Safer conditions for bicyclists/Meets standards • Better provision for school linkage • Establishes link to Regional Center and Waterfront	RECOMMENDED
Shared Sidewalk/Bike Lane	• Less Right of Way impact • Greater impact to pedestrian safety • Street crossing safety problem • Not standard design	REJECTED
Off-Street Bike Lane	• Greater right of way impact • Street crossing safety concern • Free of conflicts with autos • Generally not as efficient for bicycle commuters • Greater cost	REJECTED

Pedestrian Actions

Pedestrian actions focused on improving safety and facilities to accommodate pedestrians. Table 9 reviews the concepts considered.

Table 9
Pedestrian Actions

Action	Finding	Status
Do Nothing (retains existing sidewalks west of Oatfield)	• Low capital cost • Significant impact to long term pedestrian safety with increased traffic	REJECTED
Provide sidewalks on both sides of Lake Road east of Oatfield	• Meets City and Regional policy • Establishes elements of linkage between regional centers • Improves pedestrian safety • Encourages pedestrian activity • Best for school access • High costs due to grades and driveway adjustments on southside of Lake	RECOMMENDED

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Action	Finding	Status
Provide sidewalks on north side of Lake, east of Oatfield	• Partially meets City and Regional policy • Somewhat encourages pedestrian activity • Improves pedestrian safety • Reduces pedestrian convenience and increases pedestrian crossings of Lake Road • Less safe for school access than south sidewalk • Lower cost than two sides or south side sidewalk due to grade	CONSIDERATION ONLY IN UNIMPROVED EASTERN END OF STUDY AREA
Provide sidewalks on south side of Lake, east of Oatfield	• Same as above, but higher cost due to grade/driveway problems and safer for school	REJECTED
Pave pedestrian path to school from areas SE	• Shortens walking distance to Rowe Jr. High • Presents security issues	RECOMMENDED
Provide pedestrian links between cul-de-sacs	• Security issues • Limited ROW available	CONSIDER WITH ALL NEW DEVELOPMENT
Add traffic control at one or two crossings (pedestrian crossings, traffic signals , stop signs or other measures)	• Because of the steady stream of traffic, control would allow safer crossing • Must meet warrants • Freeman Way and Rowe Jr. High are sites	FURTHER CONSIDERATION IF WARRANTED
Provide school crossing guards	• Proven to increase safety of school crossings • Problem determining who pays • Problem with recruiting staff	FURTHER CONSIDERATION
Provide Enhanced School Traffic Control Strong Yellow Green signing Flashing Speed Zone	• MUTCD recommendations not final on signing • Improved speed zone recognition • Data indicates improved perception of safety • Typically low cost	RECOMMENDED
Provide flashing light for pedestrian crossings	Limited safety benefits Moderate cost compared to other measures Improves recognition of crossing	REJECTED

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Transit Actions

Few transit actions were identified. The working group generally felt that existing services were adequate in the Lake Road area. Table 10 reviews the transit actions.

Table 10
Transit Actions

Action	Finding	Status
Maintain and Improve Existing Bus Service	• Good transit coverage is provided to the area today • Service hours could be improved, particularly weekends/non-peak	RECOMMENDED
Provide transit shelters at key stops	• Transit passengers have little refuge today • Shelters cost about $2,500	RECOMMENDED

ROADWAY ACTIONS

A broad series of roadway actions were developed at the working group level and considered for the Lake Road area. These measures generally fell into six groups: roadway safety/capacity, neighborhood traffic management and areawide circulation, other roadway concepts, access management and local streets. Each of these groups are outlined below reviewing the findings and status.

A. Capacity/Safety

Existing and future traffic demand for Lake Road, along with accident records indicate needs for Lake Road. One immediate safety issue would be greater enforcement of passing on the right. This occurs frequently on Lake Road, where vehicles use the bicycle lane to pass left turning vehicles. Table 11 summarizes the capacity and safety strategies.

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Table 11
Capacity/Safety Actions

Action	Finding	Status
Do Nothing, just overlay street	• Minimal change to existing neighborhood • Does not improve safety to pedestrian, bicyclists • Left turn conflicts continue on Lake Road • Unacceptable delays at Lake/Oatfield	REJECTED
Widen Lake Road to three lanes throughout study area	• Can be done within right of way • Safer, fewer left turn conflicts • Significant impact to fronting properties • Widens crossing distance for pedestrians (at schools) • Left turn lanes not warranted at all cross streets	REJECTED
Selectively widen Lake Road to three lanes	• Can be done within ROW • Safer, reduces left turn conflicts • Allows turn lanes to be added where most needed • Reduces width near school, traffic calming • Adds turn lanes at most of the warranted locations - combined with added local connections south of Lake Road, provides safe turning options	RECOMMEND
Add turn lanes at Lake/Oatfield	• Intersection operates at deficient level of service in future • Even when improved, still LOS D • Northbound right turn lane reconstruction would allow school buses to make turn	RECOMMENDED
Seek to relocate the starting point for 30 MPH speed zone	• West of ORE 224 residential frontage becomes common • Other arterial streets in area with similar characteristics have 30 MPH speed zones	RECOMMENDED

	• Freeway is better location for speed zone change than middle of neighborhood • Reconstruction of Lake Road will result in new design characteristics more suitable to 30 MPH	
Seek to change speed zone to 25 MPH	• Lake Road has residential frontage • Residents desire reduced speed zone • Traffic is observed traveling 35 to 40 MPH today • Lake Road is an arterial	REJECTED
Improve sight distance by clearing corner obstructions (vegetation, cross street grades with reconstruction)	• Most obstructions in ROW • Property owner landscaping in public ROW to be impacted • Most problem intersections can be significantly improved by clearing out sight distance triangle • Most cross streets sight distance improved with addition of sidewalks/bicycle lanes	RECOMMENDED
Post through truck restriction on Lake Road west of ORE 224 ramps and at 34th Avenue and Freeman Way	• Lake Road is not a designated truck route • Alternative arterial routes exist for truck use • Residential/school zone are not compatible with truck route • Lake Road is not multi-lane which is not as desirable for trucks	RECOMMENDED

B. Neighborhood Traffic Management

Neighborhood traffic management (NTM) refers to measures which can balance the need for traffic movement with neighborhood livability. Techniques include a wide range of activities from narrowing streets to traffic circles to on-street parking to speed

humps and more. Various measures were identified for Lake Road and reviewed. Table 12 summarizes the findings of this review.

Table 12
Neighborhood Traffic Management

Action	Finding	Status
Narrowing Lane Width for Cars	• Slows traffic by defining a more constricted driving area • Helps identify Lake as not a truck route • Meets City guidelines • Works within street design • Shortens pedestrian crossing	RECOMMENDED
On-street Parking	• Can slow traffic • Conflicts with bicycles • Reduces safety on roadway with Lake Road volume • Useful to abutting properties	REJECTED
Traffic Circles	• Can slow traffic • Adds landscaping • Requires significant ROW • Less appropriate for arterial	REJECTED
Chokers (Narrow Points)	• Shortens pedestrian crossing • Can slow traffic • Not effective with bicycle lanes	REJECTED
Street Closure	• Reduces traffic and vehicle speeds • Not consistent with Citywide function • Impacts other neighborhoods	REJECTED
Selective Traffic Enforcement	• Helps maintain uniform speed of vehicles • Not continuous over time; speeds go back up after police leave • Limited resources • Enforces traffic laws related to bikes	RECOMMENDED
Median Treatment	• Can slow traffic • Provides opportunity for enhanced landscape - neighborhood entry • Emergency service concern if too long with single lane	RECOMMENDED

	• Useful on straight streets to break up wide, open view that results in speeding	
Permanent Photo Radar Enforcement	• Not approved for statewide use • Provides more constant level of enforcement • Can also address red light running with technology • Privacy issues	STRONG FURTHER CONSIDERATION
Road realignment/curvy street	• Can slow traffic • Significant impact to ROW • Negative impact on safety for arterial	REJECTED

C. Areawide Roadway Concepts

Working with the citizen working group for the Lake Road project, several concepts were developed to test if traffic volumes could be reduced on Lake Road by other actions. Seven concepts were evaluated using the Metro regional travel demand forecast model that was developed for the Milwaukie TSP. Specific adjustments in the roadway network were tested to determine their effect on Lake Road traffic in the year 2015 evening peak hour, using the base conditions as evaluated in the Milwaukie TSP for 2015. All comparisons provided are for year 2015 conditions. The following sections provide brief summaries of the findings.

1. Slow Down Lake Road: Lake Road was tested with speeds 10 MPH slower than in the base 2015 model. This action resulted in a significant reduction in traffic volume on Lake Road (nearly 50 percent). Additionally, traffic on Oatfield Road is reduced by about 20 percent. However, the traffic redistributes to other roadways, including 34th Avenue which would experience a 65 percent increase in traffic. Both ORE 224 and McLoughlin Boulevard experience increases in traffic also (3 to 5 percent). While bringing vehicle speeds more in conformance with speed zones is desirable, reductions beyond this have substantial impact on other neighborhoods and place increased burden on regional facilities. **STATUS: Rejected.**

2. ORE 224 Freeway with Washington Street Connection to ORE 99E: This test included upgrading ORE 224 to freeway operating characteristics with a split diamond interchange (of some form) between Harrison Street and 37th Avenue. The interchange would provide an improved link between ORE 224 and ORE 99E via Washington Street (which is present today). This would reduce traffic on Lake Road, Oatfield Road and 34th Avenue by about 5 to 10 percent. The level of reduction on

34th Avenue would be highly dependent upon the interchange design and access configuration (less access to 34th Avenue, lower traffic). Washington Street has several schools nearby. The facility enhancement on ORE 224 increases its ability to handle traffic accommodating the future increase in volume on ORE 224 of 15%. However, traffic on Washington Street increases 70 percent in this scenario significantly impacting this corridor. The overall benefit of this concept merits further consideration and evaluation in the corridor study of ORE 224. **STATUS: Further Consideration.**

3. High Speed Connector between ORE 224 and ORE 99E: This test was to identify if creating a direct link between ORE 224 and ORE 99E would substantially reduce traffic levels on Lake Road compared to the previous option. While the high speed link would reduce Lake Road traffic by 10 percent compared to scenario 2 (noted above), this level of reduction does not justify such a major transportation investment. It would take the combination of scenario 2 plus scenario 3 to substantially benefit Lake Road (25 percent reduction) and Oatfield Road (30 percent reduction). However, the high speed connector would have substantial negative environmental impacts, rendering it nearly infeasible. **STATUS: Rejected.**

4. Create New North/South Linkage from Lake Road to Hill Road via an Alignment near Kuehn Road: This option would create a new two to three lane roadway from the intersection of ORE 224 eastbound off-ramps and Hill Road at View Acres Road, crossing Kellogg Creek and intersecting with Aldercrest Road. This roadway option has significant ability to reduce traffic on Lake Road and Oatfield Road (33 percent reduction). Additionally, traffic on Webster Road is reduced by 15 percent and on Thiessen Road by over 50 percent. This benefit comes directly from providing another surface street connection between the Oak Grove area, ORE 224 and the 82nd/Avenue Clackamas Town Center area. The impact is that traffic on Hill Road more than doubles. Additionally, the grades, neighborhood disruption and environmental impacts of this alignment would be significant, resulting in substantial costs. The large traffic reductions to Lake Road and other routes in the area cannot be achieved by any other improvement. While this project creates significant impacts, it may warrant further consideration by the County in their planning process. However, this would take ten to twenty years to develop as a project, even if consensus could be achieved. **STATUS: Further Consideration.**

D. Other Roadway Concepts

The Lake Road Working Group defined several additional concepts that were felt to significantly reduce traffic on Lake Road. Some of these concepts had been outlined in

earlier neighborhood efforts to reduce traffic in the area[9], but without data to indicate the impacts of these actions. Each of these scenarios were tested in the same fashion as the scenarios above which focused more on using improved circulation to reduce traffic on Lake Road. The following concepts focused more on the reduction of circulation. Consistently, each of these scenarios significantly increases the amount of vehicle miles traveled due to out of direction travel, which is contrary to State policy to reduce vehicle miles traveled[10].

1. Close Oatfield Road south of Lake Road. Closing of Oatfield Road would reduce traffic on Lake Road east of Oatfield Road (by 35 percent), but increase traffic west of Oatfield Road (by 47 percent). Traffic on Oatfield Road and 34th Avenue (45%) are also substantially reduced. The majority of traffic diverted due to the closure of Oatfield Road would use McLoughlin Boulevard, linking to the east via Washington Street and Harrison Street to reach destination formerly made via Oatfield, Lake and 34th. Additionally, other streets south of Lake Road would experience significant increases in traffic by this action: Aldercrest Road (over a tenfold increase), Hill Road (33 % increase), Thiessen Road (15% increase), Webster Road (79% increase), and the north end of River Road (13% increase). This closure is inconsistent with regional policy for connectivity and imposes substantial impacts to surrounding neighborhoods and streets. **STATUS: Rejected.**

2. Close Oak Street at ORE 224. This option has little impact to traffic on Lake Road or Oatfield Road (slight increases occur on Lake Road). Traffic is reduced on Oak Street and increased on 37th Avenue and Washington Street. The large reduction of traffic on the north end of 34th Avenue is not matched by comparable reductions on the south end (only a 22 percent reduction) due to cut through traffic from Edison Street. Substantial impact would occur on Edison, 35th, 36th and Wister. **STATUS: Rejected.**

3. Close 34th Avenue north of Lake Road. This option increases traffic on the west end of Lake Road prior to Oatfield Road by 38 percent, while traffic on the north end of 34th Avenue is reduced over 60 percent. Traffic on McLoughlin Boulevard, Washington Street and Harrison Street all would experience increased traffic as alternative routes to 34th Avenue. Lake Road traffic to the east of Oatfield Road would remain basically unchanged and Oatfield Road itself would experience a small reduction (8 percent). Increasing traffic on Lake Road was not an objective of this study. **STATUS: Rejected.**

4. Install Turn Prohibitions at Lake/Oatfield that Eliminate Westbound Left and Northbound Right Turns. This option would require enforcement to be as effective as what was analytically tested, since all other movements would remain at the

[9] 34th Avenue Neighborhood Task Force: A Report to the Milwaukie Traffic Safety Commission, November 9, 1992.
[10] Transportation Planning Rule, OAR 660-012-045-3b.

intersection (it would be difficult to restrict just two turn movements with physical obstructions). The net effect is somewhat similar to closing Oatfield Road. Traffic on Oatfield Road and Lake Road east of Oatfield Road are reduced significantly (24 and 35 percent, respectively). However, several other routes are impacted with increased traffic including Lake Road west of Oatfield Road (69 percent increase), 34th Avenue (97 percent increase), Aldercrest Road (over a five fold increase), Hill Road (17 percent increase), Thiessen Road (6 percent increase) and Webster Road (38 percent increase). This would be contrary to regional policy regarding connectivity and reduced trip lengths. **STATUS: Rejected**

E. Access Management

In discussion with the Lake Road Working Group, access management was viewed as a limited benefit, significant impact action. Even though reducing the number of access points reduces the level of conflicts with left turning traffic, driveway maneuvers and pedestrian/bicycle movement, the working group did not perceive the potential benefits as greater than the resulting impacts.

Much of the frontage of Lake Road already has residential frontage. While access management can be applied to new development to control the number of access points on Lake Road it will be difficult to address the existing driveways which have evolved over time. Many of these driveways were approved at times in the past when traffic levels were lower and the level of conflict were much smaller than they are today. With current and future traffic levels, additional access to Lake Road will require significant documentation to support the safety of such driveways if they do not meet the recommended TSP spacing standard (300 feet to the nearest access point - driveway or street - in either direction on either side of the street).

The policy on Lake Road should be to not allow any new private driveway access points to fronting property. Over time, if redevelopment of properties occurs, access points should be consolidated or removed to private properties to the greatest extent possible. The Milwaukie TSP access management element calls for 300 foot spacing between access points. The following table summarizes the access management strategies considered in this study.

F. Local Street Connections

There are three elements of the local street system that have the potential in the future to be interconnected, providing enhanced pedestrian, bicycle and auto circulation. These connections would only be developed over time as changes (development or redevelopment) in land use occur, allowing for construction. The Lake Road Plan would not pursue these connections, but would encourage them to occur in time (with the exception of the paved walking path to Rowe Junior High).

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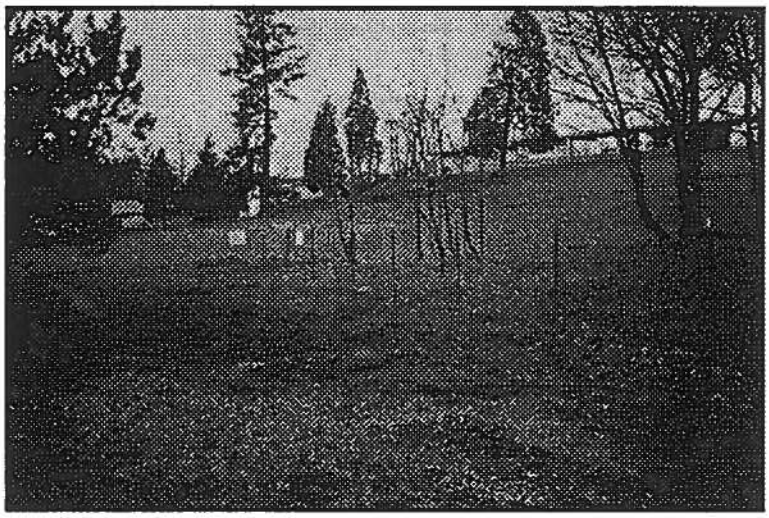
Table 13
Access Management

Action	Finding	Status
Close Private Access Where Possible to Lake Road	• Reduces left turn conflicts • Reduce parking maneuver conflicts • Improves safety • Reduces conflicts with bikes and pedestrians • Major property impact	FOR CONSIDERATION WITH REDEVELOPMENT
Limit New Access Points onto Lake Road	• Reduces conflicts • Relates to current traffic levels where left turns create conflicts • Requires consideration of common/consolidated access points to meet 300 foot spacing requirement	RECOMMENDED
Left Turn Lanes west of Oatfield	• Reduces left turn impacts • Major reconstruction impact since sidewalks and curb in place • Not warranted	REJECTED
Left Turn Lanes (continuous) east of Oatfield	• Reduces left turn impacts • Less reconstruction impact since unimproved frontage (no curbs and sidewalks) • Warranted	RECOMMENDED East of Vernie Avenue if no local connections, east of Where Else Lane with local connections
Realign offset public street Intersections	• Improves safety, reduces conflicts • ROW impacts • Property impacts	FURTHER CONSIDERATION

Local Pedestrian/Bicycle Path between Rowe Jr. High and Licyntra Lane. Presently there is a worn walking path at the western end of Licyntra Lane connecting to Rowe Jr. High. This path allows for students to walk directly to school from areas south and east of the site without having to travel up the cul-de-sacs to Lake Road. While slopes along this path are significant, a paved trail would enhance the safe east-west movement of pedestrians and bicycles. Coordination will be needed between the residents, school district and city to determine the most effective connection points, width, lighting and alignment. **STATUS: Recommended.**

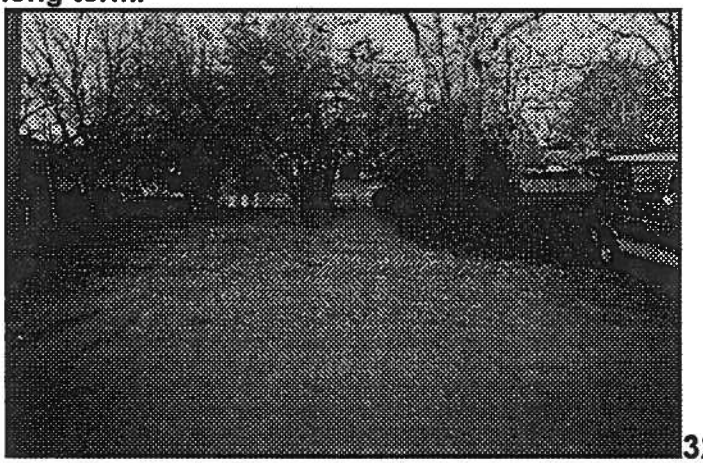


Local East-West Connection: Licyntra Lane/Vernie Lane/Bowman/Brae Streets. The cul-de-sacs south of Lake Road mostly do not interconnect. This limits the ability to link neighborhoods together and allow people to walk to school. Since there is little threat of through traffic (due to Kellogg Creek) these local connections can improve the neighborhood's ability to serve walkers, bicyclists and people driving to neighbors homes without having to use Lake Road. The objective would be to link the Kuehn Road, Freeman Road, Where Else Lane, Vernie Avenue, Boss Lane and Rowe Jr. High through a series of local connections. Because the potential linkages of these roadways would mostly rest in undeveloped areas, the local street connections would need to be developed on an opportunity basis in the future (as land develops or redevelops). The linkages are critical to the design of Lake Road. Should these local connections not be made, the left turn lane cross section of Lake Road would need to be extended west to Vernie Avenue from Where Else Lane (for westbound left turns into neighborhood from Lake Road. **STATUS: Recommended.**

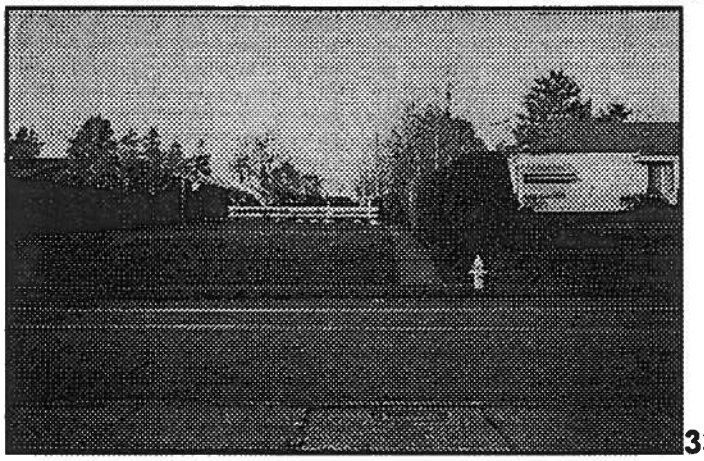
32nd/33rd Avenue Connections to Lake Road. Presently, the area northwest of the intersection of Lake Road/Oatfield Road/34th Avenue must use 34th Avenue to access Lake Road. This neighborhood area has two streets with right-of-way on record that link to Lake Road but are not built as roadways. There is a paved sidewalk that links 33rd Avenue to Lake Road. However, north of Lake Avenue there is no street connection (about 150 to 300 feet to the stub end of 33rd Avenue). On 32nd Avenue, there is a gap about 100 feet where there are no sidewalk or roadway improvements north of Lake Road. Presently, 34th Avenue is used by most through moving traffic between Lake Road and ORE 224. The neighborhood access to Lake Road adds to the 34th Avenue traffic.

There are two issues to address on 32nd and 33rd Avenue regarding connectivity. First, is creating improved bicycle/pedestrian connections from the neighborhood to Lake Road. This could be accomplished by creating a sidewalk connection on 32nd

Avenue (right-of-way conditions would need to be studied further) and widening the sidewalk connection along 33rd Avenue to better accommodate bicyclists. This would be a short term priority. The second issue would address vehicle access. While 34th Avenue is impacted by neighborhood traffic accessing Lake Road/Oatfield Road, there is substantial opposition to creating vehicle linkages on these two streets as long as Oak Street connects the neighborhood to ORE 224. With future reconstruction of ORE 224, changes in access many eliminate the existing northern access to the neighborhood from Oak Street. To allow neighborhood traffic (and emergency access) alternative access points and a means to disperse, linkages to Lake Road should be considered. However, this could result in some increase in traffic to 32nd and 33rd Avenues at certain segments. Because of the potential for traffic intrusion, neighborhood traffic management techniques (circles, humps, etc...) would be necessary (including possible turn restrictions at Lake Road). These vehicle linkages would only be considered together with future projects on ORE 224 which may restrict or eliminate ORE 224 access through this neighborhood. **STATUS: Recommend Improved Pedestrian and Bicycle Linkages in short term; Further Consideration of Vehicle Linkages contingent with ORE 224 Access Restrictions via Oak Street in long term.**



32nd Avenue looking north



33rd Avenue looking north

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5 Design Considerations

The design of improvements on Lake Road will include many features of the street. This chapter provides an outline to guide future designers of the Lake Road improvements. The following sections discuss key features of the street design.

CROSS SECTION

Sample cross sections were developed for Lake Road (Figure 4). Key features include:

- Use of 11 foot travel lanes with 10 foot left turn lanes near Oatfield to keep cross section width to minimum.
- Use of 5 foot sidewalks. Vary between curb tight and setback walks where flexibility exists. For example, sidewalks set back from curb might be possible near Rowe Junior High.
- Six foot bicycle lanes. This allows maximum safety for bicyclists given heavy auto flows.
- Median applications would be limited to 100 to 300 foot lengths were possible, typically 10 feet wide.
- Where possible, street trees will be added along Lake Road (preferably in a planter strip or behind the sidewalk).

STREET FEATURES

The Lake Road Task Force discussed several features of the street design over its meetings. The following list provides some inputs:

- Storm drain inlets should not extend into bicycle lanes. Curb inlets should be used.
- Larger street name signs or advance signs for key cross streets should be used.
- Bus shelters should be set behind sidewalks, to avoid intrusion into walking area.
- Street light and utility poles should be set behind sidewalk.
- Driveways for fronting residents should be wide enough to allow flexibility in street access.
- Concrete pavement, colored pavement and/or special textured pavement should be used in association with school crossing areas. Any texturing should minimize

noise impacts. Slightly raised pavement may be considered for this crossing in design.

- Sidewalks should continue around curb returns of each cross street before stopping or tying into existing sidewalks.
- Ramps (for ADA) with textured paving surface should be installed at intersection corners per ODOT standards.
- Consideration of underground utilities. Coordinate any utility work (sewer) prior to road construction.
- Place storm drains in locations to best avoid conflicts of water flow and pedestrian paths (at ADA ramps). Address current storm drainage problems on Lake Road.
- A geotechnical investigation will be required in preliminary engineering to determine any site specific needs which may affect pavement design.

OPERATIONAL FEATURES

Some key operational features include:

- Traffic signal interconnect between Oatfield Road and any future signals to the east, linking to ORE 224.

- Traffic signal warrant analysis at Freeman Way and Rowe Junior High School.

- Use 8 inch white painted lines (not thermoplastic) to delineate bicycle lanes. Use ODOT standard bicycle lane markings.

- Use thermoplastic (or equivalent) for traffic pavement markings for greater durability (double yellow and left turn channelization).

- Use integral curb/gutter pan design to allow for more cost effective pavement maintenance/overlays.

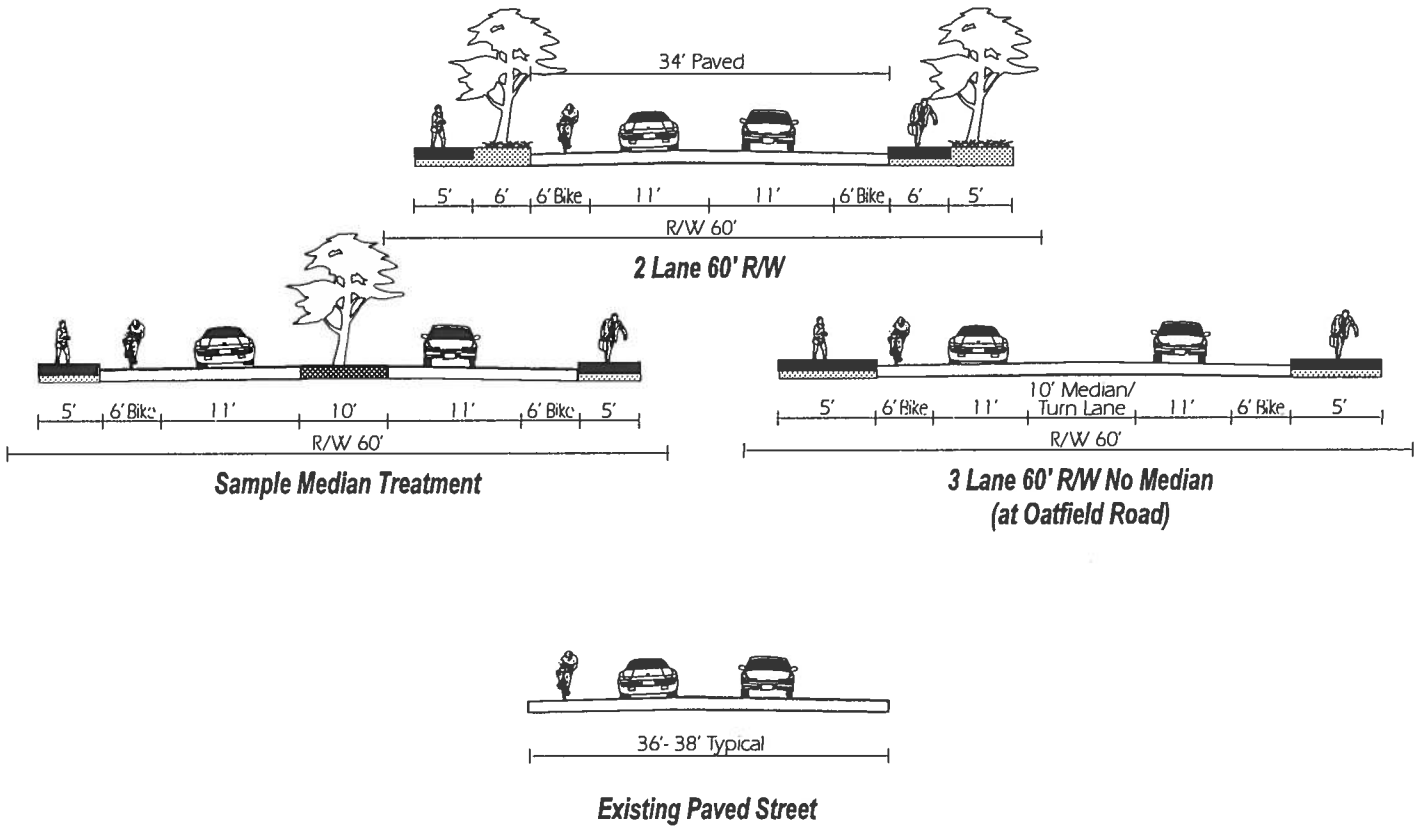

Figure 4
Lake Road
SAMPLE STREET CROSS SECTIONS

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6 The Plan

Based upon the findings of this study and the input of the Lake Road Working Group, the recommended plan for Lake Road was developed. This chapter outlines the key recommendations and the priority (immediate action- within the next three years, and plan development - beyond three years). A rough order of magnitude cost estimate is provided and a series of further studies are called out.

RECOMMENDATIONS

Figure 5 provides a summary of the key features of the Lake Road Multi-modal Connection Plan. Samples of what Lake Road will look like with the recommended improvements are also provided using visual simulations that show existing and proposed conditions. The key features by mode are summarized below.

Bicycle

Better maintain bicycle lanes to clear debris and minimize standing water *(Immediate)*

Post bicycle signs on Lake Road (*Immediate)*

Six foot on-street bicycle lanes between ORE 224 and downtown Milwaukie *(Plan Development)*

Pedestrian

Coordinate with school district to provide enhanced School Traffic Control, including new strong yellow green signs (in process of approval for use by MUTCD), flashing lights on school speed zone sign and school crossing guards, as appropriate. These elements require School District involvement (*Immediate)*

Work with school district to create paved pedestrian link from Licyntra Lane to Rowe Junior High *(Immediate)*

Create pedestrian linkages between any new cul-de-sac near Lake Road and adjacent roadways. These should focus on direct path to transit routes and school areas. In

particular, develop pedestrian/bicycle linkages from 32nd and 33rd Avenues to Lake Road *(Immediate)*

Provide sidewalks on both sides of Lake Road from east city limits to downtown Milwaukie *(Plan Development)*

Transit

Maintain existing services levels and add bus shelters as funds are available *(Immediate)*

Integrate bus amenities into the design of Lake Road *(Plan Development).*

Street Design

Seek modification of speed zone to 30 MPH west of ORE 224 *(Immediate)*

Post through truck restriction on Lake Road west of ORE 224, including access from Freeman Way, 34th Avenue and from the west near downtown Milwaukie *(Immediate)*

Clear sight distance triangle at each cross street to Lake Road, trimming or removing vegetation *(Immediate)*

Greater enforcement of passing on the right regulation on Lake Road. Vehicles frequently use bicycle lane to pass left turning vehicles *(Immediate)*

Provide striping for channelization at the intersection of Lake Road and Freeman Way to better delineate stopping area for northbound vehicle, improving sight distance. Enforce long term parking regulation for vehicles parking on Lake Road at this intersection to eliminate sight distance constraint *(Immediate)*

Provide left turn lanes on east end of study area and at Oatfield Road. Start a three lane cross section for Lake Road at Vernie Avenue if local connections are not made or start at Where Else Lane if local connections are made - extend east to ORE 224 *(Plan Development)*

Add northbound right turn lane on Oatfield Road at Lake Road, specifically designed to accommodate bus movements. *(Plan Development and TSP)*

Neighborhood Traffic Management

Support and enhance selective enforcement of Lake Road traffic conditions. This may include consideration of Saturday enforcement when many non-commuters are on the road *(Immediate)*

Design Lake Road with narrow lanes (11 foot through, 10 foot left turn lane) and medians with reconstruction *(Plan Development)*

Seek photo enforcement for Lake Road, potentially in a permanent installation with red light running enforcement at Oatfield Road *(In future when possible)*

Consider neighborhood traffic management on 32nd and 33rd Avenues in future if they are connected to Lake Road *(potentially part of future ORE 224 reconstruction mitigation)*

Consider neighborhood traffic management on Lake Road, if appropriate *(in future when possible)*

Local Streets

Develop local street connectivity as development occurs in future between Kuehn Road, Freeman Road, Where Else Lane, Vernie Avenue, Boss Lane and Licyntra Lane. Figure 5 represents one example of the arrangement of streets to provide connectivity. This does not need to be a continuous route, but allow connection without access to Lake Road *(Plan Development, part of Development Review process)*

Access Management

No new or redeveloped access points that do not meet 300 foot spacing to adjacent access point (driveway or public street on either side of street) onto Lake Road without overriding evidence that access to cross street or shared access point is not feasible *(Immediate, part of Development Review process)*

PRELIMINARY COSTS

Given the conceptual nature of the project, identifying detailed cost for the proposed project is premature at this time. However, given the general scope and nature of the recommended project and its elements a order of magnitude cost estimate was developed. To address the rebuilding of Lake Road from 21st Avenue to east of Kuehn Road would potentially require between $2.5 and $3.5 million. This is a rough estimate and subject to refinements (such as the need for storm drainage - which was included or utilities - which were not included).

FURTHER STUDY

The development of the Lake Road Multi-modal Connection Study pointed out certain areas where further analysis and investigation will be needed. These include:

- Traffic signal warrants on Lake Road

- Speed zone boundary modifications
- ORE 224 reconstruction impacts to the neighborhoods north of Lake Road
- Left turn warrant analysis on Lake Road
- Evaluation of possible feasibility of new north-south connection at east end of study area

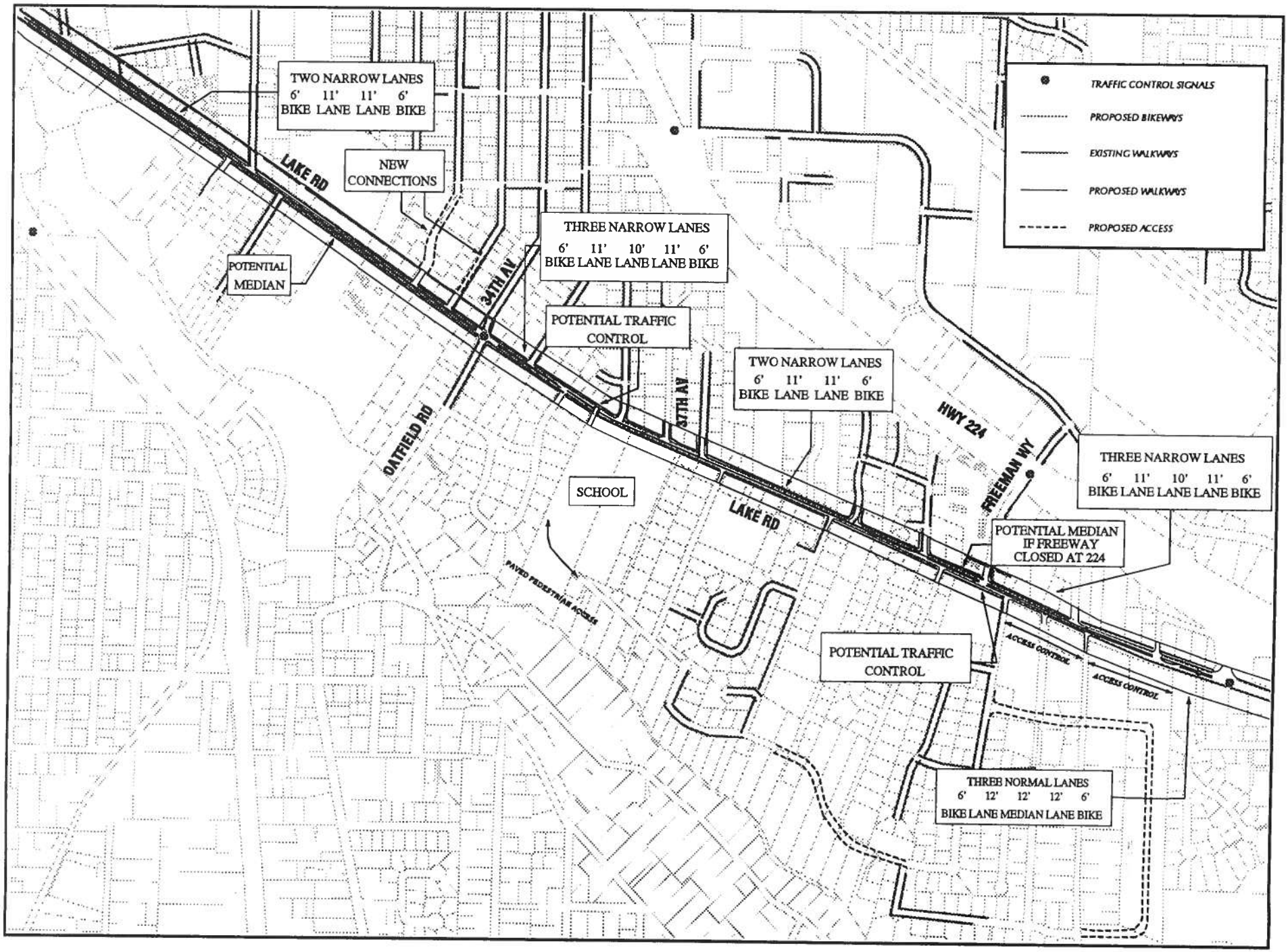
TRAFFIC CONTROL SIGNALS
PROPOSED BIKEWAYS
EXISTING WALKWAYS
PROPOSED WALKWAYS
PROPOSED ACCESS
TWO NARROW LANES
6' 11' 11' 6'
BIKE LANE LANE BIKE
NEW CONNECTIONS
LAKE RD
POTENTIAL MEDIAN
34TH AV
THREE NARROW LANES
6' 11' 10' 11' 6'
BIKE LANE LANE LANE BIKE
POTENTIAL TRAFFIC CONTROL
TWO NARROW LANES
6' 11' 11' 6'
BIKE LANE LANE BIKE
37TH AV
OATFIELD RD
HWY 224
FREEMAN WY
THREE NARROW LANES
6' 11' 10' 11' 6'
BIKE LANE LANE LANE BIKE
SCHOOL
LAKE RD
POTENTIAL MEDIAN IF FREEWAY CLOSED AT 224
PAVED PEDESTRIAN ACCESS
ACCESS CONTROL
ACCESS CONTROL
POTENTIAL TRAFFIC CONTROL
THREE NORMAL LANES
6' 12' 12' 12' 6'
BIKE LANE MEDIAN LANE BIKE

Figure 5

Existing

Proposed

Lake Road at Boss Lane

Existing

Proposed

Lake Road at Kuehn Road

Existing

Proposed

Lake Road at Oatfield Road

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Lake Road Area Multimodal Plan Working Group

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