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LAM TUX TRANSPORTATION IMPACT ANALYSIS

To
City of Tualatin

For
Lam Research

Dated
July 8, 2024
(Revised October 10, 2024)
(Revised July 21, 2025)

Project Number
2250180.00

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I. EXECUTIVE SUMMARY

1. Three new buildings are proposed on both the east side and at the southwest corner of the Lam campus in Tualatin, Oregon.
2. TUX project includes a four-story office building with an area of up to 120,000 square feet (SF) at the southeast corner of the campus and a two-story utility building with approximately 29,000 SF and a laboratory building with approximately 85,000 SF at the southwest corner of the campus.
3. At full occupancy, the proposed campus expansion is estimated to generate an additional 244 AM peak hour, 233 PM peak hour, and 2036 daily trips.
4. A safety review, capacity analysis, and queuing analysis was conducted for all City intersections within a 1/4-mile of the project site, all ODOT facilities anticipated to be impacted by 50 or more peak hour trips, and intersections of concern as noted by ODOT or the City.
5. No study area intersections were found to have a crash rate higher than 1.0 for the five-year crash data from 2019 through 2023, nor were significant patterns found that could be addressed by improvements to the intersections.
6. All public street intersections but one are projected to meet City of Tualatin and ODOT mobility standards with the proposed TUX project. The intersection of SW Hazelbrook Road/OR 99W experiences long delays in the PM peak hour for vehicles turning right onto OR 99W.
7. Queuing for all study area intersections is currently estimated to be accommodated by existing storage areas except for intersections along OR 99W.
8. Based on a review of safety, capacity, and queuing, the following mitigation measures are recommended:
    A. Coordinate left turn movements from OR 99W to SW Tualatin Road at the intersections with SW 124th Avenue. This will minimize the queue lengths and delays for southbound left turns on SW 124th Avenue and avoid potential spill back to OR 99W.
    B. Trim vegetation at the site access locations as needed to provide the recommended intersection sight distances.

II. INTRODUCTION

This Transportation Impact Analysis (TIA) has been prepared in support of an Architectural Review for the proposed laboratory/research and development building, office building, and utility building at the Lam Research campus in Tualatin, Oregon. Figure 1 in Appendix A presents a vicinity map indicating the project location.

Project Description

The TUX project includes the addition of three buildings. Building H is a four-story office building with an area of up to 120,000 square feet (SF), Building U is a two-story utility building with approximately 29,000 SF, and Building X is a laboratory building with approximately 85,000 SF. The total area of the TUX projects adds up to approximately 234,000 SF with an estimated net gain of 600 employees to the campus when the new buildings are at full occupancy.

The new office will be located on the east side of campus replacing the existing parking between Building G and Building B. The new lab and utility buildings will be located at the southwest corner of the site, replacing the existing surface parking. The existing access to SW Leveton Drive will remain and an additional driveway adjacent to the access road and loading dock at building C will serve as truck access for deliveries to the existing and proposed buildings.

The parking areas along the north side of the campus will be expanded and additional parking will be added to the adjacent west property to offset the loss of the southwest lot and to accommodate additional need with the TUX project. The permanent access to the expanded employee parking lots is proposed at the existing West Access from SW Leveton Drive and the North Access from SW 108th Avenue. North Access has previously been used for access to Lam's existing utility yard north of Building B and has served low volumes of employee trips. With this proposal, the driveway will be convenient for employees in the north lots, but no connection is planned to the parking lot constructed with Building G.

Scope of Analysis

This TIA has been prepared in accordance with the City of Tualatin Traffic Study Requirements (updated March 16, 2022), Tualatin Development Code (TDC) Section 74.440, and the Oregon Department of Transportation's (ODOT) Analysis Procedures Manual (APM) Version 2. This study includes a summary of existing traffic conditions, crash review, proposed trip generation, and an analysis of intersection operations, sight distance, queuing, and signal and turn-lane warrants.

Appendix B includes the scoping documents including a TIA scoping letter dated June 25,2025, and email requests from City of Tualatin and ODOT staff.

Study Area

The City's Traffic Study Requirements document requires all intersections along the frontage of the site and any intersection where the site is anticipated to generate more than 500 daily or 60 peak hour trips be included as part of the study area. Washington County requires analysis for all intersections where project trips will exceed 10% of the existing average daily traffic (ADT). No Washington County intersections were found to meet this threshold. In general, ODOT intersections impacted with 50 or more site peak hour trips or with specific concerns were included in the study area.

These public intersections are included in the study area:

- SW Leveton Drive/SW 118th Avenue
- SW Leveton Drive/SW 108th Avenue
- SW Tualatin Road/SW Teton Avenue
- SW Tualatin Road/SW 108th Avenue
- SW Tualatin Road/SW 112th Avenue
- SW Tualatin Road/SW 115th Avenue
- SW 124th Avenue/SW Leveton Road
- SW 124th Avenue/SW Tualatin Road
- SW 124th Avenue/OR 99W
- SW Herman Road/SW 108th Avenue
- SW Hazelbrook Road/SW 115th Avenue
- SW Hazelbrook Road/OR 99W
- SW Herman Road/SW Teton Avenue
- OR 99W/SW Fischer Road
- OR 99W/SW Durham Road

The following site driveways will also be studied (includes those opposite public streets listed above):

- SW Leveton Drive/West Access
- SW Leveton Drive/New Access (trucks only)
- SW Leveton Drive/Center Access
- SW Leveton Drive/East Access
- SW 108th Avenue/North Access
- SW 108th Avenue/Center Access (approved with Building G)
- SW 108th Avenue/South Access (approved with Building G)
- SW Tualatin Road/SW 115th Avenue

All study area intersections are located within City of Tualatin jurisdiction or are along OR 99W, an ODOT facility.

Analysis Scenarios

This TIA addresses AM and PM peak hour conditions for the following scenarios:

- 2025 Seasonally Adjusted Existing Volumes
- 2027 2030 Pre-Development without the TUX project
- 2030 Post-Development with the TUX project

III. EXISTING CONDITIONS

The existing conditions analysis is based on a current year 2025 inventory of transportation facilities and traffic data.

Site Conditions

The project site is in Tualatin, Oregon, within the Portland metropolitan area. The site is approximately 75.95 acres and consists of tax lot 100 of Washington County tax map 2S1 22BA, lot 100 of map 2S1 22AB, and lots 500 and 800 of map 2S1 22AA. The site is part of the City's Manufacturing Park (MP) Planning District. The Novellus Industrial Master Plan (IMP) was approved in 2001 as a four-phase development consisting of 1,440,000 SF. The proposed site plan for the TUX project is presented in Figure 2 in Appendix A.

Vehicular Transportation Facilities

Figure 3 in Appendix A presents existing lane configurations and traffic control devices for all study area intersections. Table 1 below summarizes roadway characteristics within the study area.

TABLE 1 – ROADWAY CHARACTERISTICS

Roadway	Functional Classification	Posted Speed	Travel Lanes	Bike Lanes	On-Street Parking	Sidewalks
OR 99W (Pacific Highway W)	Major Arterial/ (Urban Principal Arterial)	45/55 mph	4	Yes	None	Intermittent
SW 124th Avenue	Major Arterial	45 mph	4/5	Yes	None	Yes
SW Tualatin Road	Major Collector	35 mph	3	Yes	None	Yes
SW Leveton Drive	Minor Arterial	35 mph	2	Yes	None	Yes
SW 108th Avenue	Minor Collector (north of SW Leveton Drive)	35 mph	2	Yes	None	Yes
SW Herman Road	Minor Arterial	35 mph	2	Yes	None	North Side
SW Teton Avenue	Minor Arterial	35 mph	2	Yes	None	Yes
SW 115th Avenue	Minor Collector	35 mph	2	Yes	None	Yes
SW Hazelbrook Road	Minor Collector	35 mph	2	No	None	South Side

Pedestrian and Bicycle Facilities

The study area has nearly complete bicycle and pedestrian networks. Clearly marked bike lanes are provided on all study area roadways. Curb-tight sidewalks are provided on SW 108th Avenue and SW Tualatin Road, as well as some segments of the north side of SW Herman Road. Separated sidewalks are provided on all other study roadways and segments.

Transit Facilities

The study area is served by TriMet Bus Lines 94 and 97 with stops on OR 99W (Pacific Highway W) and SW Tualatin Road. The Tualatin Shuttle Blue Line has two stops on SW Leveton Drive just south of the site and a stop on SW Tualatin Road east of SW Teton Avenue. Transit maps and bus schedules are provided in Appendix C for reference.

Existing Traffic Counts

Traffic counts were conducted at the intersections listed above on Tuesday, May 13, 2025, for standard peak periods of 7:00-9:00 AM and 4:00-6:00 PM. An extended PM time period from 3:00-6:00 PM was counted at five intersections where the nearby Hazelbrook Middle School might cause an earlier peak.

Per ODOT standards, system peak hours from 7:30 AM to 8:30 AM and 4:30 PM to 5:30 PM are proposed for the OR 99W intersections in the AM and PM. The observed site peaks from 8:00 AM to 9:00 AM and 4:45 PM to 5:45 PM are proposed as a system peak for all site driveways. The remaining intersections will be analyzed at individual intersection peaks. The site volumes are 449 (391 enter/58 exit) in the AM and 430 (67 enter/363 exit) in the PM, which is approximately 7% higher than 2024 counts, mostly due to construction activity for Building G with 85 contractors.

A summary of all intersection turning movement counts collected in 2025 is presented in Figure 4 in Appendix A.

Tualatin-Sherwood Road Construction

Traffic volumes on Tualatin Road have increased since 2024, which may be in part to construction activity on SW Tualatin-Sherwood Road and the small increase in site trips. No adjustments are proposed for this analysis.

Seasonal Adjustment

OR 99W is a state facility which requires a seasonal adjustment as specified in ODOT's Analysis Procedures Manual (APM). There is no seasonal adjustment data available for this location as there is no nearby Automatic Traffic Recorder (ATR). Therefore, a seasonal adjustment of 1.03 derived from data presented in ODOT's 2023 Seasonal Trend Table for the "Commuter" trend was applied to 2025 existing through volumes on OR 99W. The 2025 seasonally adjusted traffic volumes are presented in Figure 5 in Appendix A. The seasonal adjustment calculation is provided in Appendix E for reference.

Crash Analysis

Historical crash data reported for the study area intersections were evaluated to identify patterns that might indicate a safety concern. Crash data for the most recent available 5-year period of 2019 through 2023 were obtained from ODOT's online crash data system and used to review crash patterns and estimate intersection crash rates.

Intersection Crash Rates

Intersection crash rates were calculated as a measure of the number of crashes occurring per one million entering vehicles (MEV) per year. The intersection crash rate is calculated by dividing the average number

of crashes per year by the MEV per year. An average daily traffic (ADT) volume was estimated by dividing the PM peak hour volume at each intersection by a peak-to-daily factor, or k-factor, of 0.09 obtained from ODOT's 2023 traffic flow data on OR 99W just west of SW 124th Avenue.

A crash rate of 1.0 crashes per MEV is typically used as a threshold above which additional traffic safety analysis is warranted. In addition, per Chapter 4 of the ODOT APM, any intersection that exceeds the 90th percentile values provided in Exhibit 4-1 of the APM should be flagged for further analysis. The ODOT 90th percentile crash rates have been provided for each intersection type in Table 2.

ODOT's Safety Priority Index System (SPIS) is a method developed to identify highway segments or locations with crash frequency, rates or severity that are in the highest 10 percent of locations statewide. We found that none of the study area intersections appear on either the ODOT or Washington County SPIS lists.

All intersections have crash rates below 1.0/MEV and below the ODOT 90th percentile crash rate threshold for intersection type. No further analysis is recommended.

The crash evaluation is summarized in Table 2. The raw crash data are provided in Appendix F.

TABLE 2 – INTERSECTION CRASH RATES

Intersection (Traffic Control Type)	Year					Total Crashes	ADT	Crash Rate (Crashes/ MEV)	ODOT 90th Percentile Crash Rate
	2019	2020	2021	2022	2023				
OR 99W/ SW 124th Avenue (3SG)	4	1	4	3	1	13	44,800	0.13	0.509
SW Tualatin Road/ SW 124th Avenue (3SG)	3	1	4	5	3	16	24,889	0.29	0.509
SW Tualatin Road/ SW 115th Avenue (3ST)	0	0	0	0	1	1	14,844	0.03	0.293
SW Tualatin Road/ SW 112th Avenue (3ST)	0	0	0	0	0	0	14,456	0.00	0.293
SW Tualatin Road/ SW 108th Avenue (3ST)	0	1	1	1	2	5	14,744	0.15	0.293
SW Leveton Drive/ SW 124th Avenue (4SG)	4	1	0	1	2	8	15,533	0.24	0.860
SW Leveton Drive/ SW 118th Avenue (3ST)	0	0	0	0	0	0	4,533	0.00	0.293
SW Leveton Drive/ Center Site Access (3ST)	0	0	0	2	0	2	3,233	0.28	0.293
SW Leveton Drive/ SW 108th Avenue (3ST)	0	0	0	0	1	1	4,000	0.11	0.293

TABLE 2 – INTERSECTION CRASH RATES									
Intersection (Traffic Control Type)	Year					Total Crashes	ADT	Crash Rate (Crashes/ MEV)	ODOT 90th Percentile Crash Rate
	2019	2020	2021	2022	2023				
SW Herman Road/ SW 108th Avenue (3SG)	0	1	0	0	0	1	11,967	0.04	0.509
SW Tualatin Road/ SW Teton Avenue (3ST)	2	0	0	0	1	3	15,011	0.09	0.293
SW Hazelbrook Road/ SW 115th Avenue (3ST)	0	0	0	0	0	0	4,267	0.00	0.293
SW Hazelbrook Road/ OR 99W (3ST)	1	1	0	2	0	4	38,067	0.05	0.293
SW Herman Road/ SW Teton Avenue (4SG)	2	0	2	1	1	6	15,478	0.18	0.860
OR 99W/ SW Fischer Road (3SG)	6	2	3	5	7	23	43,211	0.24	0.509
OR 99W/ SW Durham Road (4SG)	4	4	6	4	15	33	46,044	0.33	0.860

3SG: Three-legged signalized intersection
3ST: Three-legged stop-controlled intersection
4SG: Four-legged signalized intersection

Crash Data Summary

All study area intersections had crash rates below the ODOT 90th percentile crash rates, and no fatal crashes have occurred at the study area intersections within the five-year study period. Collisions that involve pedestrians and bicyclists, as well as any consistent crash patterns, are detailed below.

OR 99W/SW 124th Avenue

At the intersection of OR 99W and SW 124th Avenue, 13 crashes were reported. Eight of these were rear-end crashes, the most common crash type. These are largely due to inattention, and none resulted in serious injury (Injury Type A or B) being reported.

SW Tualatin Road/SW 124th Avenue

One crash involving a pedestrian occurred at the intersection of SW Tualatin Road and SW 124th Avenue in 2019, resulting in a possible injury (Injury C).

There were 16 crashes reported at the intersection. Of these, 13 were turning movement crashes mostly caused by a failure to yield right-of-way. All left turn movements already have protected turning phases.

SW Leveton Drive/SW 124th Avenue

There were eight crashes reported at the intersection of SW Leveton Drive and SW 124th Avenue. Of these, five were turning movement crashes, mostly in the southbound and westbound directions. The remainder of the crashes were rear-ends or "non-collisions."

SW Leveton Drive/Center Site Access

One crash involving a bicyclist occurred at the center Lam site access on SW Leveton Drive in 2022, resulting in a suspected serious injury (Injury A) to the cyclist. The crash was caused by a failure to yield. One other crash was reported at the driveway: a turning movement crash which did not result in an injury (PDO only).

OR 99W/SW Fischer Road

There were 23 crashes reported at the intersection of OR 99W and SW Fischer Road. Nine of these were turning movement crashes, and ten of them were rear-ends. The remaining collisions include two fixed-object collisions and two crashes involving pedestrians at the crosswalk, resulting in a possible and suspected minor injury (Injury C and B), caused by a failure to yield and/or disregard for the traffic control.

OR 99W/SW Durham Road

There were two crashes involving pedestrians at the crosswalk at the intersection of OR 99W and SW Durham Road in 2020 and 2023, both resulting in a suspected minor injury (Injury B) and both caused by a driver's failure to yield. There was one crash involving a bicycle in 2023, caused by driver inattention and resulting in a suspected minor injury (Injury B).

There were 33 crashes reported at the intersection. Of these, 17 were rear-ends and most of the remainder were either sideswipe or turning movement crashes.

IV. PRE-DEVELOPMENT CONDITIONS

The pre-development conditions reflect build-out year conditions without the proposed development. This scenario includes existing year 2025 traffic volumes, a seasonal adjustment to traffic on OR 99W, a background growth to 2030, and in-process trips from nearby approved developments. The pre-development traffic without project trips will indicate if traffic issues are present before the addition of the proposed development.

Planned Transportation Improvements

The City of Tualatin Capital Improvement Plan 2025-2029 (CIP) was reviewed for any planned transportation improvements in the area that may affect capacity. SW Herman Road will be improved from SW Cipole Road to SW 124th Avenue; however, none of these improvements will affect any of the study area intersections.

SW Tualatin-Sherwood Road is currently under construction for a widening project, and appears to have resulted in an increase in volumes on Tualatin Road. For purposes of this analysis, we have not adjusted the volumes due to uncertainty in the amount of the increase attributable to the construction project. For this reason, actual intersection operation is expected to be better than presented in this report.

The City of Tualatin Transportation System Plan (TSP) has planned for a future traffic signal at the intersection of SW Tualatin Road with SW 115th Avenue, but no funding or schedule has been determined.

To our knowledge, no mitigations or improvements have been required for development of the other in-process projects at any study area intersections included in this analysis.

Background Traffic Growth

Background traffic growth was applied to adjusted year 2025 traffic volumes to forecast future traffic demand. A linear 1% annual growth rate over three years was applied to year 2025 traffic volumes to estimate 2030 background traffic volumes. This growth adjustment was based on ODOT traffic volume projections for OR 99W just south of SW 124th Avenue between years 2019 and 2040. Background growth was applied to all movements at all intersections, except driveways. Figure 6 in Attachment A presents the background growth from 2024 to 2030 for the AM and PM peak hours.

In-Process Traffic

In-process traffic volumes account for developments that have been approved or that are under construction at the time of a traffic study. These traffic volumes account for traffic that will be added to the external roadway network before buildout of the proposed development. Traffic volumes for the following developments were included as in-process:

- Lam Building G
- 124th Business Park
- KAI USA Warehouse Expansion
- Fujimi Expansion

Figure 7 in Attachment A presents the total trip assignment for the 124th Business Park, KAI USA Warehouse Expansion, and Fujimi Expansion.

The Lam Building G project was approved with two new driveways on SW 108th Avenue and a change in use of the existing East Access on SW Leveton Drive to be exclusive for trucks. Figure 8 in Attachment A presents the Lam Building G trip assignment as approved for that project. These Lam Building G trips have been decreased by 34 trips in the AM and 32 trips in the PM to account for current Building G construction traffic showing up in the counts. This is based on the trip rate for 85 Research and Development employees. Detailed copies of the respective project trip assignment sheets are included in Appendix G.

Pre-Development Traffic

The 2030 pre-development analysis scenario is a combination of existing year 2025 traffic volumes, a seasonal adjustment factor on OR 99W, background growth of 1% over five years, and in-process trips from nearby approved developments. Figure 9 in Attachment A presents the 2030 pre-development traffic volumes during the AM and PM peak hours.

V. SITE DEVELOPMENT

The trip-making characteristics of the proposed development are described below.

Trip Generation

Trip generation estimates for the full occupancy of approximately 600 employees were prepared utilizing rates for a Research and Development Center from the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 11th Edition. This land use was found to best match the existing campus trip generation based on employees. Trip generation estimates for the planned expansion are presented in Table 3.

TABLE 3 – PROPOSED TRIP GENERATION

ITE Land Use	Employees	AM Peak Hour			PM Peak Hour			Daily
		In	Out	Total	In	Out	Total	
Research and Development Center (LUC 860)	360	124	22	146	17	123	140	1222

As shown in Table 3, the planned campus expansion is estimated to generate an additional 244 AM peak hour, 233 PM peak hour, and 2036 daily trips with both phases of development.

Transportation Demand Management

According to Lam Research, there are currently no Transportation Demand Management (TDM) programs on site. Carpool and bicycle parking are provided per requirements. No other TDM programs are proposed with this project.

Leveton Access Reroutes

Construction of the TUX project will result in changes to existing campus traffic patterns. The location of Building H will displace approximately 82 parking spaces, which are conveniently accessed from the Center Leveton Access and a new truck only access between the existing Center and West Leveton Accesses will shift truck traffic away from the West Leveton Access.

The displaced parking spaces represent approximately 6% of campus trips during the peak hours, so we have shifted these trips away from the Center Leveton Access and relocated them to the recently contstructed accesses on SW 108th Avenue.

All peak hour existing truck trips at the West Access on SW Leveton Drive have been routed to the new access between the West Access and the Center Access.

Figure 10 in Attachment A presents both reroutes of existing volumes.

Trip Distribution and Assignment

Site trip distribution has been modified slightly from the original master plan based on employee zip code information provided by Lam, as well as counts conducted in May 2025 at the active site driveways on SW Leveton Drive and SW 108th Avenue and the surrounding intersections. Employee zip code information provides more granular and accurate trip distribution assumptions than modeling or other methods. The following general percentages apply to both the AM and PM Peak hours.

- 24.5% to/from the north on Highway 99W
- 26.5% to/from the south on Highway 99W
- 13.5% to/from the east on SW Tualatin Road and SW Herman Road
  - 8.5% on SW Tualatin Road and 5% on SW Herman Road in the AM peak hour
  - 4% on SW Tualatin Road and 9.5% on SW Herman Road in the PM peak hour
- 4.5% to/from the south on SW 118th Avenue
- 10% to/from the south on SW 124th Avenue
- 21% to/from the south on SW Teton Avenue

New trips generated by the project are expected to follow a similar distribution on the roadway network, but the driveways being used will differ from existing campus traffic. Because most new employees will be assigned to Building H, available parking in its proximity will attract the employees. The expanded southeast campus lot with Building G is expected to accommodate up to 30% of the building H demand. Remaining parking demand will be primarily located to new and expanded lots at the north end of the campus. The detailed site trip distribution is based on the following assumptions:

- 30% of new site trips are expected to utilize the West Leveton Access, 20% at the Center Leveton Access, 30% split evenly between the Center and South 108th Accesses, and the remaining 20% at the North 108th Access.
- 10% of new site trips will use SW Tualatin Road to access the North 108th Access.
  - Half of these trips, or 5% total, are expected to use SW 115th Avenue and SW Hazelbrook Road to access Highway 99W when exiting the site.

At ODOT's request, trip distribution estimates were carried out to the Nyberg and Boones Ferry interchanges with Interstate 5 in order to address the anticipated number of vehicles that would be added at these locations.

Figure 11 in Attachment A presents the overall trip distribution at the study area intersections and routes to Interstate 5. Figure 12 in Attachment A presents the trip assignment for TUX project trips.

Post-Development Traffic

Post-Development traffic volumes are the sum of the pre-development traffic volumes, project-related reroutes, and project trips. Figure 13 presents the 2030 post-development traffic volumes for the AM and PM peak hours.

VI. SITE ACCESS AND CIRCULATION

The on-site evaluation of traffic access and circulation and a review of sight distance at the proposed site driveways are presented below.

Site Access

To accommodate added TUX employee traffic to the new parking lots at the north side of the site, existing North Access on SW 108th Avenue is proposed to be opened for Lam employee access. A new access is proposed on SW Leveton Drive between the existing West and Center Accesses for trucks only.

Access Standards

The TDC includes several sections related to access standards. Chapter 75 of the TDC presents access standards relative to driveway widths and spacing on the site. Per Table 75-1 of the TDC, minimum driveway approach width for industrial driveways is 36' and the maximum is 40' for driveways providing access for over 250 parking spaces. The existing driveways for the site meet these standards. The proposed New Access on SW Leveton Drive will meet these standards at a proposed width of 36'.

Per TDC 75.120, driveways on Minor Collectors must be spaced at a minimum of 100'. Driveways must be located at least 150' from the intersection of Collector or Arterial streets, as measured from the stop bar, per TDC 75.040(11)(a). Additionally, driveways must provide a minimum distance of 40' between on-site driveways per TDC 75.040(10). Table 4 below presents a summary of required and proposed access spacing.

TABLE 4 – ACCESS SPACING SUMMARY

Access	Roadway	Functional Classification	Spacing Standard (feet)	Access Spacing Measured Edge-to-Edge (feet)	
				To South/East	To North/West
North Access	SW 108th Avenue	Minor Collector	100' from nearest driveway	100'	100'
New Access	SW Leveton Drive	Minor Arterial	150' from intersection with Arterial or Collector	>600'	>600'

On-Site Circulation

The parking areas along the north side of the campus will be expanded and additional parking will be added to the adjacent west property to offset the loss of the southwest lot and to accommodate additional need with the TUX project. The permanent access to the expanded employee parking lots is proposed at the existing West Access from SW Leveton Drive and the North Access from SW 108th Avenue. North Access has previously been used for access to Lam's existing utility yard north of Building B and has served low volumes of employee trips. With this proposal, the driveway will be convenient for employees in the north lots, but no connection is planned to the parking lot constructed with Building G.

The new driveway to SW Leveton Drive is intended to serve trucks to and from the existing and new buildings.

The existing JAE access to Tualatin Road will remain available for JAE vehicles only per agreement with JAE. Because these vehicles will be traveling through the project site instead of a dedicated driveway, a gate will be used to limit access to JAE. No Lam vehicles will be allowed access through the gate. Only emergency access is allowed for Lam

Sight Distance Evaluation

Intersection sight distance was evaluated for the proposed site driveway locations. The American Association of State Highway and Transportation Officials' (AASHTO) A Policy on Geometric Design of Highways and Streets, 7th Edition provides recommendations for intersection sight distance (ISD) based on roadway design speed. At minimum, stopping sight distance (SSD), also based on roadway design speed, must be provided.

One existing access north of the two recently constructed accesses on SW 108th Avenue will be opened and used by employees. One new access is proposed on SW Leveton Drive between the existing West and Center Accesses, intended for trucks only.

The posted speed on SW Leveton Drive is 35 mph, for a design speed of 40 mph. There is no posted speed on SW 108th Avenue north of SW Herman Road. Therefore, the design speed on SW 108th Avenue is assumed to be 5 mph over the posted speed of 35 mph for other Minor Collectors in the area, or 40 mph. A time gap of 7.5 seconds and 11.5 seconds were assumed for passenger vehicles and combination trucks completing a left turn from stop, respectively. The recommendations for ISD have been noted for left turns from stop on a stop-controlled minor approach (driveway). The sight distance evaluation for the proposed site driveways is presented in Table 5.

TABLE 5 – SIGHT DISTANCE EVALUATION

Access/ Intersection	Design Speed (mph)	Design Vehicle	Recommended Intersection Sight Distance (feet)	Required Stopping Sight Distance (feet)	Available Sight Distance (feet)	
					To North/West	To South/East
North Access SW 108th Avenue	40	Passenger Car	445'	305'	305'	500'
New Access SW Leveton Drive	40	Combination Truck	680'	305'	680'	680'

As presented in Table 5, sight distances for the North Access on SW 108th Avenue were reviewed and found to be met to the south. To the north, the access is spaced about 305' from the intersection with SW Tualatin Road, meeting required SSD and meaning that approaching vehicles are unlikely to be travelling at full speed as they make the turn from SW Tualatin Road. At the proposed New Access on SW Leveton Drive, sight distance can be made available up to 680', meeting the standards for intersection sight distance, though some landscaping and street trees may need to be trimmed.

VII. OPERATIONAL ANALYSIS

Two aspects of operational analysis were evaluated for the study area intersections: 1) intersection operations analysis, which evaluates how well an intersection processes traffic demand; and 2) queuing analysis, which compares intersection queues with available storage for different travel lanes.

Intersection Operation Analysis

Intersection operations are generally measured by three mobility standards: volume-to-capacity (v/c) ratio, level-of-service (LOS), and delay (measured in seconds). Signalized and all-way, stop-controlled (AWSC) intersections are measured by one overall v/c ratio, LOS, and delay. Two-way, stop-controlled (TWSC) intersections are typically measured by a single v/c ratio, LOS, and delay representative of the worst stopped movement.

Performance Measures

Most study area intersections are located within the City of Tualatin jurisdiction with the exception of the intersections on OR 99W which are under ODOT jurisdiction.

City of Tualatin

The TDC Section 74.440(3)(e) requires the following mobility standards for intersections within City jurisdiction:

- LOS D or better for signalized intersections
- LOS E or better for unsignalized intersections

ODOT

The *Oregon Highway Plan* (OHP) designates OR 99W as a Principal Arterial Route. Table 7 of the OHP establishes a v/c target of 0.99 for the OR 99W intersections with SW 124th Avenue, SW Fischer Road, and SW Durham Road.

Methodology

Intersection operations were analyzed with the use of Synchro 12 software, which utilizes the Transportation Research Board's *Highway Capacity Manual* (HCM) 2000, HCM 2010, and HCM 7 methodologies. Signalized study area intersections were reported using the v/c calculator tool from ODOT when possible and HCM 2000 reports when not for overall v/c ratio and HCM 7 reports for delay and LOS. Two-way, stop-controlled (TWSC) and AWSC intersections were reported using HCM 7 reports. Signal timing plans were obtained from the Washington County traffic plans database, as well as from ODOT staff, and are provided in Appendix H for reference.

Calibration

For 2024 Existing conditions at several intersections, Synchro and SimTraffic delay and queue results were not consistent with field observations. The City's Traffic Study Requirements document states that the existing conditions calculations shall be calibrated to reflect observed site conditions through delay studies and other observations, so queue and delay studies were conducted in order to determine the methodology and any calibration needed to best match observed conditions in the field.

In order to calibrate the model for consistency with existing conditions, the critical gap setting was adjusted from 7 seconds to 6 seconds for right turns onto OR 99W from SW Hazelbrook Road. HCM 2000 results are reported for this intersection to show the impact of this calibration.

In some cases, alternate results were reported in all scenarios as they proved to be more consistent with existing conditions: SimTraffic delay are reported for the intersection of SW 115th Avenue/SW Tualatin Road, and HCM 2000 results are reported for SW Tualatin Road/SW Teton Avenue.

Findings

Table 6 below summarizes the AM and PM peak hour capacity results. For signalized intersections, the overall intersection performance (v/c ratio, LOS, delay) is reported. For unsignalized intersections, the intersection movement with the maximum v/c ratio and delay is reported. The Synchro output reports and summary tables of all lane groups are provided in Appendix I.

TABLE 6 – PEAK HOUR INTERSECTION OPERATIONS

Intersection (Control)	Peak Hour	Analysis Results (v/c-LOS-Delay in seconds)		
		2025 Existing	2030 Pre-Development	2030 Post-Development
OR 99W/ SW 124th (Signalized)	AM	0.85-C-32.9	0.91-D-43.8	0.94-D-49.8
	PM	0.75-C-28.6	0.80-C-30.4	0.82-C-31.3
SW Tualatin/ SW 124th (Signalized)	AM	0.69-B-12.8	0.72-B-14.8	0.77-B-14.9
	PM	0.70-B-19.9	0.77-C-21.8	0.81-C-23.1
SW Tualatin/ SW 115th/ JAE Access (TWSC)	AM	0.44 (SB) C-19.1 (SB)	0.51 (EBL) C-18.8 (SB)	0.53 (SB) C-19.9 (NBL)
	PM	0.20 (SB) C-19.6 (SBL)	0.23 (SB) D-22.2 (NB)	0.24 (SB) D-29.1 (NB)
SW Tualatin/ SW 112th (TWSC)	AM	0.09-C-17.0 (SB)	0.10-C-17.9 (SB)	0.10-C-18.2 (SB)
	PM	0.05-C-17.9 (SB)	0.05-C-18.8 (SB)	0.05-C-19.2 (SB)
SW Tualatin/ SW 108th (TWSC)	AM	0.07-C-18.9 (NB)	0.10-C-20.3 (NB)	0.13-C-21.4 (NB)
	PM	0.16-C-16.1 (NB)	0.22-C-17.5 (NB)	0.31-C-19.7 (NB)
SW 108th/ North Access (TWSC)	AM	0.01-A-9.6 (EB)	0.01-A-9.8 (EB)	0.02 (NBL) B-10.2 (EB)
	PM	0.01-A-8.69 (EB)	0.01-A-9.0 (EB)	0.05-A-9.0 (EB)
SW 108th/ Center Access (TWSC)	AM	0.02 (NBL) A-9.1 (EB)	0.11 (NBL) A-9.4 (EB)	0.13 (NBL) B-10.0 (EB)
	PM	0.04-A-8.7 (EB)	0.13-A-9.1 (EB)	0.17-A-9.4 (EB)
SW 108th/ South Access (TWSC)	AM	0.05 (NBL) A-8.8 (EB)	0.08 (NBL) A-9.3 (EB)	0.11 (NBL) A-9.6 (EB)
	PM	0.06-A-8.7 (EB)	0.11-A-9.6 (EB)	0.19-B-10.5 (EB)

TABLE 6 – PEAK HOUR INTERSECTION OPERATIONS				
Intersection (Control)	Peak Hour	Analysis Results (v/c-LOS-Delay in seconds)		
		2025 Existing	2030 Pre-Development	2030 Post-Development
SW 124th/ SW Leveton (Signalized)	AM	0.37-B-13.2	0.46-B-14.3	0.53-B-15.4
	PM	0.43-B-16.8	0.51-B-19.7	0.59-C-23.0
SW Leveton/ SW 118th (AWSC)	AM	0.43-A-10.0 (EB)	0.58-B-12.4 (EB)	0.72-C-17.6 (EB)
	PM	0.44-B-10.7 (WB)	0.61-B-14.3 (WB)	0.79-C-22.3 (WB)
SW Leveton/ West Access (TWSC)	AM	0.12 (EBL) B-14.4 (SBL)	0.13 (EBL) C-16.9 (SBL)	0.17 (EBL) C-22.7 (SBL)
	PM	0.11-B-10.8 (SBL)	0.26 (SBR) B-12.3 (SBL)	0.38 (SBR) B-14.4 (SBL)
SW Leveton/ New Access (TWSC)	AM	N/A	N/A	0.03 (EBL) B-10.6 (SB)
	PM	N/A	N/A	0.01-B-12.1 (SB)
SW Leveton/ Center Access (TWSC)	AM	0.02-B-10.9 (SBL)	0.03-B-12.6 (SBL)	0.04-B-14.6 (SBL)
	PM	0.06-B-10.5 (SBL)	0.08-B-11.8 (SBL)	0.10 (SBR) B-13.0 (SBL)
SW Leveton/ East Access (TWSC)	AM	No minor road volume	0.04-B-12.2 (NB)	0.04-B-13.3 (NB)
	PM	0.01-B-11.4 (NB)	0.09-B-12.3 (NB)	0.10-B-13.4 (NB)
SW Leveton/ SW 108th (TWSC)	AM	0.22-B-11.7 (EB)	0.46-C-17.3 (EB)	0.69-D-28.9 (EB)
	PM	0.16-A-9.7 (EB)	0.24-B-11.3 (EB)	0.32-B-12.9 (EB)
SW Herman/ SW 108th (Signalized)	AM	0.39-A-5.9	0.47-A-6.5	0.53-A-7.0
	PM	0.51-A-9.6	0.59-B-12.0	0.64-B-14.3
SW Tualatin/ SW Teton (TWSC)	AM	0.51 (EB) C-17.3 (NBL)	0.53 (EB) C-18.4 (NBL)	0.53 (EB) C-18.6 (NBL)
	PM	0.46 (WBT) C-20.7 (NBL)	0.49 (WBT) C-22.8 (NBL)	0.49 (WBT) C-22.9 (NBL)
SW Hazelbrook/ SW 115th (TWSC)	AM	0.44-B-14.2 (NB)	0.47-B-14.6 (NB)	0.47-C-15.0 (NB)
	PM	0.35-B-11.6 (NB)	0.37-B-11.9 (NB)	0.39-B-12.0 (NB)

TABLE 6 – PEAK HOUR INTERSECTION OPERATIONS				
Intersection (Control)	Peak Hour	Analysis Results (v/c-LOS-Delay in seconds)		
		2025 Existing	2030 Pre-Development	2030 Post-Development
SW Hazelbrook/ OR 99W (TWSC)	AM	0.47-C-20.3 (WBR)	0.52-C-22.7 (WBR)	0.53-C-23.1 (WBR)
	PM	0.80-E-39.1 (WBR)	**0.86-F-50.4 (WBR)**	**0.91-F-59.5 (WBR)**
SW Herman/ SW Teton (Signalized)	AM	0.64-C-20.9	0.70-C-23.6	0.74-C-26.3
	PM	0.73-C-24.3	0.82-C-31.3	0.88-D-37.8
OR 99W/ SW Fischer (Signalized)	AM	0.67-C-27.2	0.72-C-30.1	0.73-C-30.4
	PM	0.77-D-41.7	0.80-D-45.4	0.80-D-45.0
OR 99W/ SW Durham (Signalized)	AM	0.70-C-33.8	0.74-D-35.0	0.74-D-35.4
	PM	0.88-E-55.8	0.93-E-64.4	0.95-E-67.9

*Capacity results which exceed the City or ODOT performance thresholds are **bolded**.

As shown in Table 6, all but one of the study area intersections will meet operational standards with the addition of site trips:

- SW Hazelbrook Road/OR 99W – long delays are expected on the stop-controlled approach to OR 99W during the PM peak hour. Mitigation is not recommended because it would encourage vehicles to travel this route from SW Tualatin Road instead of using SW 124th Avenue to access OR 99W northbound.

Intersection Queuing Analysis

An intersection queuing analysis was conducted for the study area intersections for both the AM and PM peak hours to evaluate any potential queue spillbacks.

Methodology

The 95th percentile queues during the AM and PM peak hours were estimated using Synchro and SimTraffic software. The 95th percentile queue is not indicative of a typical queue experienced by drivers and is instead a reasonable worst-case queue possible and is measured by a calculation of 1.65 standard deviations of the average queue and is sometimes longer than the maximum queue observed in traffic modelling. Queue demand results were rounded to the nearest 25' to represent average vehicle lengths. Because queues are based on an average of five traffic simulations using random arrivals, some fluctuation in results can be anticipated, particularly for movements that are near or over-capacity.

For intersections on OR 99W, SimTraffic modelling results were reviewed against traffic count video and found to be inconsistent with existing conditions. Synchro HCM 2000 queuing results were found to match observed queuing for the 2025 Existing scenario and are reported instead for all scenarios. Synchro HCM

2000 results were also used for the SW 115th Avenue/SW Hazelbrook Road intersection, as inaccurate SimTraffic queues were shown backing up to this intersection and creating unreliable results.

Available queue lengths were estimated using Google Earth Pro software and rounded to the nearest 5'. For turn lanes, two available storage values are stated: the first represents the striped storage and the second is the effective storage, or the length physically available regardless of striping, such as a center turn lane upstream of a striped left-turn lane at an intersection. Although travel lanes have no storage defined by striping at signalized locations, we note the distance to an upstream public street intersection.

Findings

The 95th percentile queues obtained from SimTraffic or Synchro as described above for the AM and PM peak hours are presented in Table 7. The detailed SimTraffic reports are provided in Appendix J for reference. Queue lengths in **bold** type show movements which exceed the effective storage length.

TABLE 7 – 95TH PERCENTILE QUEUING ANALYSIS

Intersection (Control)	Approach/ Movement	Striped/ Effective Storage (feet)	AM/PM Peak Hour Queue (feet)		
			2025 Existing	2030 Pre-Development	2030 Post-Development
OR 99W/ SW 124th (Signalized)	EBT1	>1,000	700/400	750/425	750/425
	EBT2	>1,000	700/400	750/425	750/425
	EBR	225/305	300/50	400/50	500/50
	WBL1	550/770	575/300	675/325	725/325
	WBL2	550/690	575/300	675/325	725/325
	WBT1	>1,000	200/325	225/325	225/325
	WBT2	>1,000	200/325	225/325	225/325
	NBL1	315/475	75/300	75/350	75/375
	NBL2	315/475	75/300	75/350	75/375
	NBR1	295/330	125/300	125/350	125/350
	NBR2	295/315	125/300	125/350	125/350
SW 124th/ SW Tualatin (Signalized)	WBL	310/350	75/100	100/100	100/100
	WBR	300/>1,000	125/400	125/500	125/500
	NBT1	995	100/275	150/425	125/600
	NBT2	995	200/375	275/600	225/825
	NBR	145/250	50/100	100/**275**	75/**325**
	SBL	200/300	**425/425**	**400/425**	**375/425**
	SBT1	450	325/150	325/200	275/225
	SBT2	450	125/125	125/175	125/150

TABLE 7 – 95TH PERCENTILE QUEUING ANALYSIS					
Intersection (Control)	Approach/ Movement	Striped/ Effective Storage (feet)	AM/PM Peak Hour Queue (feet)		
			2025 Existing	2030 Pre-Development	2030 Post-Development
SW Tualatin/ SW 115th/ JAE Access (TWSC)	EBL	60	50/50	50/50	50/50
	WBL	60	25/25	25/350	25/25
	NBL	100	25/25	25/25	25/25
	NB	100	25/50	25/25	25/50
	SB	630	100/75	75/75	75/75
SW Tualatin/ SW 112th (TWSC)	EBL	750	25/25	25/25	25/25
	SBL+R	95	50/50	50/50	50/50
SW Tualatin/ SW 108th (TWSC)	WBL	140	50/25	50/25	50/25
	NB	330	50/75	50/125	75/125
SW 108th/ North Access (TWSC)	EB L+R	TBD	25/25	25/25	50/75
SW 108th/ Center Access (TWSC)	EB L+R	60	25/50	50/75	50/75
SW 108th/ South Access (TWSC)	EB L+R	60	25/50	50/75	50/75
SW 124th/ SW Leveton (Signalized)	EBL	100/130	50/50	50/50	50/75
	EBT+R	580	150/75	175/100	200/125
	WBL	145/185	50/75	75/75	75/125
	WBT+R	>1,000	50/100	75/125	100/175
	NBL	155/230	25/25	25/25	50/25
	NBT	>1,000	100/150	100/150	100/175
	NBT+R	>1,000	175/175	175/225	200/250
	SBL	165/245	125/50	125/75	150/75
	SBT	>1,000	100/125	100/125	125/150
	SBT+R	995	125/150	150/150	125/175
SW Leveton/ SW 118th (AWSC)	EB	>1,000	100/50	125/50	150/75
	WB	>1,000	75/75	50/100	75/225
	NB	>1,000	50/50	50/50	50/50

TABLE 7 – 95TH PERCENTILE QUEUING ANALYSIS					
Intersection (Control)	Approach/ Movement	Striped/ Effective Storage (feet)	AM/PM Peak Hour Queue (feet)		
			2025 Existing	2030 Pre-Development	2030 Post-Development
	SB	650	25/50	25/50	25/25
SW Leveton/ West Access (TWSC)	EBL	>1,000	50/25	50/25	75/25
	SBL	135	25/50	25/75	25/75
	SBR	135	50/75	50/75	50/100
SW Leveton/ New Access (TWSC)	EBL	400	N/A	N/A	50/25
	SBL	TBD	N/A	N/A	50/25
SW Leveton/ Center Access (TWSC)	EBL	450	25/25	25/25	50/25
	SBL	125	25/50	25/50	50/50
	SBR	125	25/50	25/50	50/75
SW Leveton/ East Access (TWSC)	EBL	425	25/25	25/25	25/25
	SB	105	25/25	25/25	50/25
SW Leveton/ SW 108th (TWSC)	EB	270	75/25	100/75	125/75
	NB	175	25/25	50/50	50/50
SW Herman/ SW 108th (Signalized)	EBL	100/390	25/25	50/25	50/25
	EB	>1,000	125/125	125/150	150/150
	WB	435	175/200	200/225	225/325
	SBL	135/200	50/100	50/125	75/175
	SBR	115/790	25/25	25/25	25/75
SW Tualatin/ SW Teton (TWSC)	WBL	260	75/50	75/50	75/50
	NBL	95/175	100/150	125/200	125/175
	NBR	30/>1,000	75/100	75/250	100/200
SW 115th/SW Hazelbrook (TWSC)	NB	215	50/50	50/50	75/50
OR 99W/ SW Hazelbrook	WBR	325	50/175	75/200	75/250
SW Teton/	EBL	>1,000	50/25	25/25	50/25
	EB T+R	>1,000	300/400	325/600	400/775

TABLE 7 – 95TH PERCENTILE QUEUING ANALYSIS					
Intersection (Control)	Approach/ Movement	Striped/ Effective Storage (feet)	AM/PM Peak Hour Queue (feet)		
			2025 Existing	2030 Pre-Development	2030 Post-Development
SW Herman (Signalized)	WBL	100/150	75/100	50/100	75/100
	WB T+R	500	200/225	225/275	225/275
	NBL	>1,000	150/150	175/175	175/175
	NB T+R	800	175/225	275/325	300/425
	SBL	50/100	50/25	50/50	50/50
	SB T+R	>1,000	175/150	175/175	175/200
OR 99W/ SW Fischer (Signalized)	EBL	290/400	300/250	325/300	325/275
	EBR	300/>1,000	275/125	350/175	350/175
	NBL	270/475	225/450	225/450	225/475
	NBT1	80/>1,000	525/450	575/525	600/575
	NBT2	80/>1,000	525/450	575/525	600/575
	SBU	300/425	25/25	25/25	25/25
	SBT1	330/>1,000	700/800	775/850	825/850
	SBT2	330/>1,000	700/800	775/850	825/850
	SBR	200/725	25/75	25/75	25/75
OR 99W/ SW Durham (Signalized)	EB LT	275	50/100	50/100	50/100
	EB TR	175/440	50/100	50/100	50/100
	WBL	310/440	225/**475**	250/**500**	275/**500**
	WB LT	440	225/**475**	250/**500**	250/**500**
	WBR	310/440	75/100	75/125	75/125
	NBL	550/600	100/250	100/250	100/250
	NBT1	350/>1,000	600/800	650/900	650/950
	NBT2	350/>1,000	600/800	650/900	650/950
	NBR	230/260	25/75	25/75	25/75
	SBL1	240/300	225/300	250/**325**	250/**325**
	SBL2	240/300	225/300	250/**325**	250/**325**
	SBT1	890/1,300	450/500	500/550	525/550
	SBT2	890/1,300	450/500	500/550	525/550
	SBR	400/425	25/25	25/25	25/25

TABLE 7 – 95TH PERCENTILE QUEUING ANALYSIS					
Intersection (Control)	Approach/ Movement	Striped/ Effective Storage (feet)	AM/PM Peak Hour Queue (feet)		
			2025 Existing	2030 Pre-Development	2030 Post-Development

*Queues exceeding effective storage lengths are **bolded**.

Recommendations

As shown in Table 7, queues at some intersections along OR 99W appear to be longer than available storage lengths. These intersections are built out to their full capacity, and little can be done to mitigate these queues. At the intersections of OR 99W and SW Tualatin Road with SW 124th Avenue, we are recommending coordination of the left turn movement from OR 99W with the left turn movement to SW Tualatin Road in order to minimize queuing and delays in the short segment between the two intersections, especially during the AM commute times.

Pedestrian and Bicycle Facilities

Pedestrian and bicycle facilities are currently provided in the study area and along the frontages of the campus. With development of the TUX project, these facilities will remain and will be enhanced as appropriate with any required frontage or intersection improvements, especially where curb ramps are replaced. There are no gaps in the bicycle or pedestrian facilities that need to be addressed along the site frontage or nearby roadways.

Existing bicycle volumes along SW Tualatin Road are less than 10 per hour.

Pedestrian volumes on the SW Tualatin Road frontage are currently low with a maximum of 10 per hour. SW Leveton Avenue has higher pedestrian volumes including less than 15 pedestrians crossing at the Center and West Accesses during peak hours.

Transit Facilities

No changes are proposed to existing transit facilities or locations of stops.

VIII. RECOMMENDATIONS

The following recommendations for mitigation are made to address impacts of the project on the transportation system:

1. Coordinate left turn movements from OR 99W to SW Tualatin Road at the intersections with SW 124th Avenue. This will minimize the queue lengths and delays for southbound left turns on SW 124th Avenue and avoid potential spill back to OR 99W.
2. Trim vegetation at the site access locations as needed to provide the recommended intersection sight distances.

IX. APPENDIX

Appendix A. Figures

Appendix B. Scoping Material

Appendix C. Transit Information

Appendix D. Traffic Count Summaries

Appendix E. Seasonal Adjustment Data

Appendix F. Crash Data

Appendix G. In-Process Data

Appendix H. Signal Information

Appendix I. Operations Calculations

Appendix J. Queuing Analysis