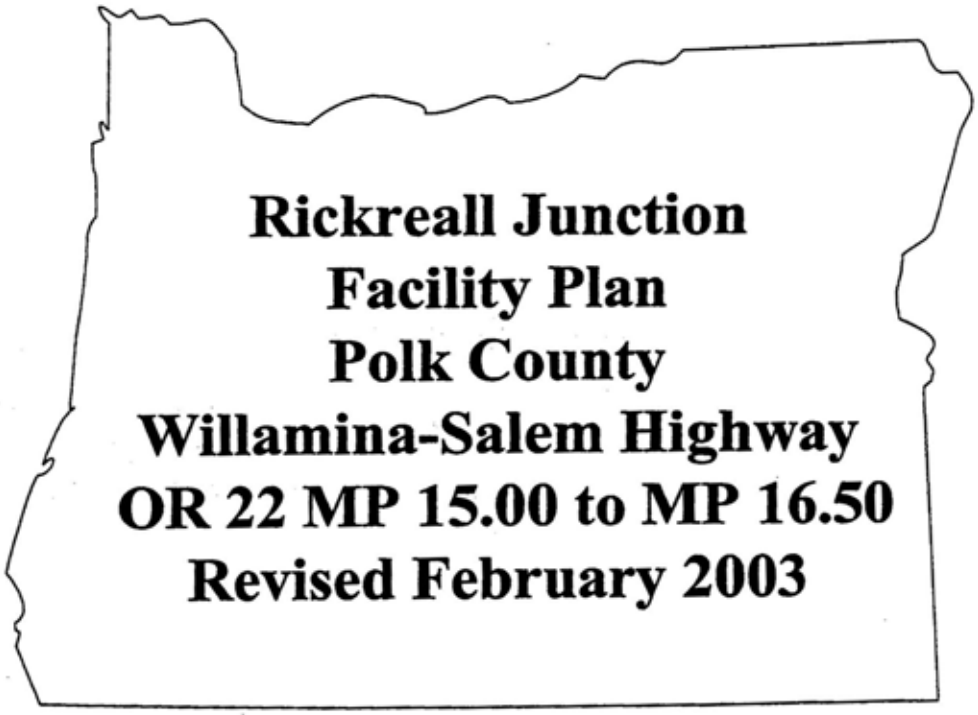
APPENDIX G

Operational Analysis

The following technical report describes the full operations analysis for all improvement alternatives developed by the Technical Advisory Committee. The report also includes analysis of the "no-build" alternative using 1999 traffic volumes and 2025 projected traffic volumes.

Oregon Department of Transportation



Rickreall Junction
Facility Plan
Polk County
Willamina-Salem Highway
OR 22 MP 15.00 to MP 16.50
Revised February 2003

Transportation Planning Analysis Unit

Transportation Development Division, Salem, Oregon

RICKREALL JUNCTION FACILITY PLAN

Oregon Department of Transportation
Transportation Planning Analysis Unit
555 13th Street NE, Suite. 2
Salem, Oregon 97301-4178

Prepared by: Harlan Nale, P.E.

Reviewed by: Dorothy J. Upton, P.E.

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SUMMARY

The Rickreall Junction Facility Plan was originated to address the safety concerns and the congestion at the signalized OR 22/OR 99W and the unsignalized OR 22/Dallas-Rickreall Highway (DRH) intersections. The Refinement Study goal was to develop a long-term solution that meets the mobility and spacing standards required in the 1999 Oregon Highway Plan (OHP).

The Technical Advisory Committee (TAC) considered approximately 20 proposed build alternatives as possible short-term or long-term solutions. Ten of the 20 build alternatives were advanced for further consideration and are explained in detail in the report. The remaining ten build alternatives that were considered, but not advanced, have brief explanations in Appendix A about why the proposed alternative was dropped from further consideration. Solutions ranged from immediate improvements such as striping, signing, visibility enhancements, ITS, etc. to a full interchange that combines the traffic flows on OR 22, OR 99W and DRH. Long-term solutions that could be phased were given special consideration. The traffic development and analysis methodology is furnished in Appendix B. The traffic analysis summarized in this narrative resulted in the following recommendations:

- Alternative 7-A is the best long-term alternative for traffic operation and safety. This is the only alternative evaluated that eliminates the OR 22/OR 99W traffic signal while eliminating the potentially dangerous weave movements.

- Alternative 2-C with improvements such as striping, signing, visibility enhancements, ITS, etc. will improve both safety and traffic flow in the near future.

- Alternative 4-B is the most effective short-term alternative. The eastbound OR 22 fly-over eliminates the need for westbound OR 22 drivers to stop and wait for gaps in opposing traffic flows before turning southwesterly on DRH to travel toward Dallas. However, the length of the eastbound OR 22 queue at the signalized OR 22/OR 99W intersection will increase in future years making it more difficult for drivers coming from the coast to weave into the left-turn refuge to travel northbound on OR 99W toward McMinnville.

The analysis also revealed the likelihood of longer-term operational problems on OR 99W in Rickreall and at the OR 99W/Rickreall Road intersection. Several options for addressing these facilities were analyzed and the analysis results are included in Appendix C. These results should be considered as further work is done to determine how these facilities should be addressed over the 20-year planning horizon.

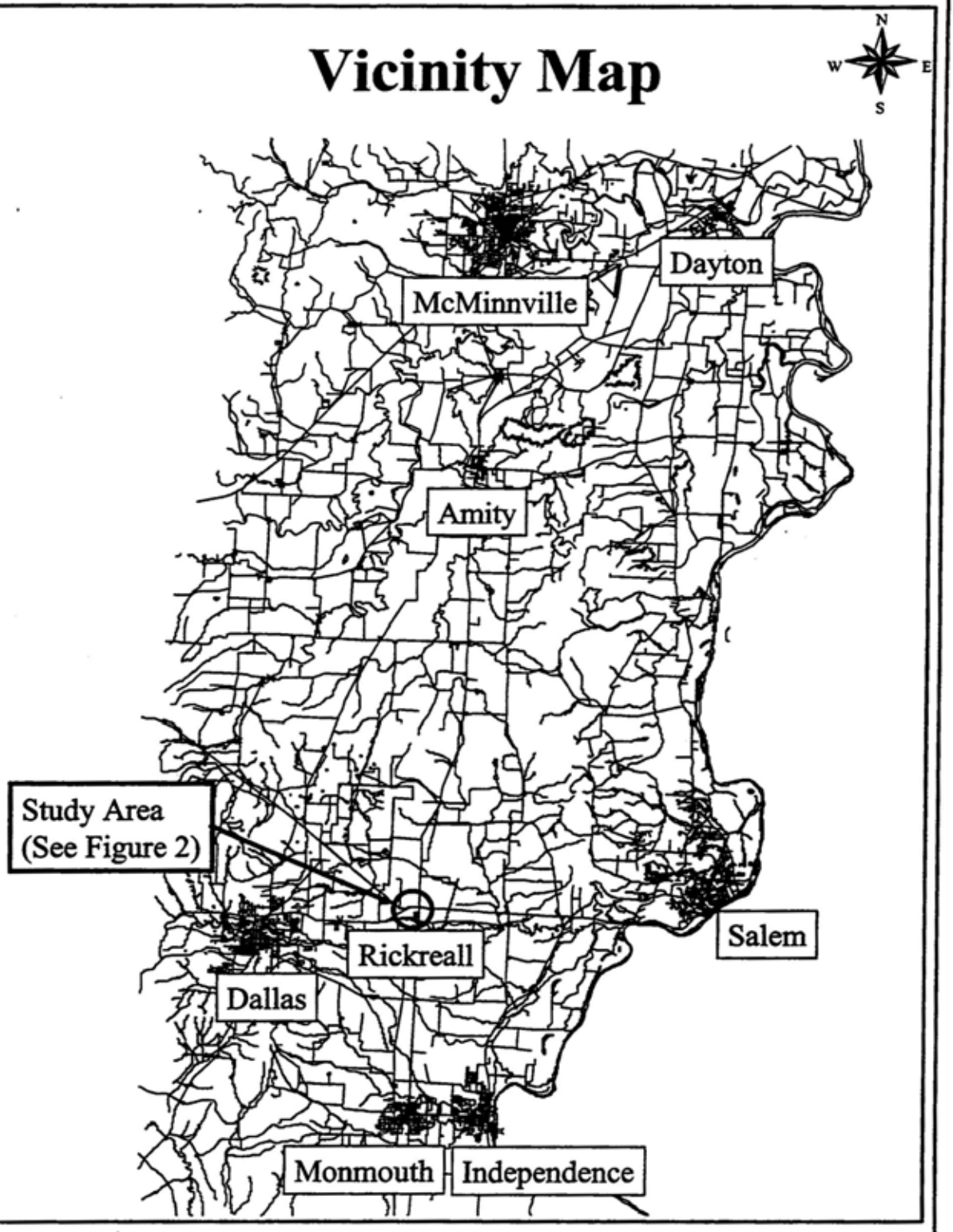
BACKGROUND INFORMATION

The OR 99W/OR 22 Junction is located on OR 22 approximately seven miles west of Salem (See Figures 1 and 2). Dallas-Rickreall Highway (OR 223 or DRH), Pacific Highway West (OR 99W) and Willamina-Salem Highway No. 30 (OR 22) are the main roadways studied in this refinement plan. OR 22 is both a commuter and tourist route. OR 22 connects the communities of Dallas, Monmouth and Independence to the employment centers of Salem, McMinnville and Portland. As a tourist route, this roadway connects Salem to the coastal communities via Lincoln City.

Presently, the OR 22/OR 99W intersection has a traffic signal and the OR 22/DRH intersection is unsignalized. These intersections are located approximately 400 meters apart. Safety and operational characteristics have been sacrificed at both intersections due to increased traffic flows. Forecasted growth trends indicate traffic flows will continue to increase into the future and cause more concerns.

Improvements to OR 99W in Rickreall and at the OR 99W and Rickreall Road intersection are being considered separately. Forecasted growth trends indicate that within the 15-20 year time frame OR 99W through Rickreall and its intersection with Rickreall Road will not be able to meet OHP mobility standards. Potential OR 99W/Rickreall Road intersection improvements are discussed in a separate technical memorandum (Appendix C).

Vicinity Map

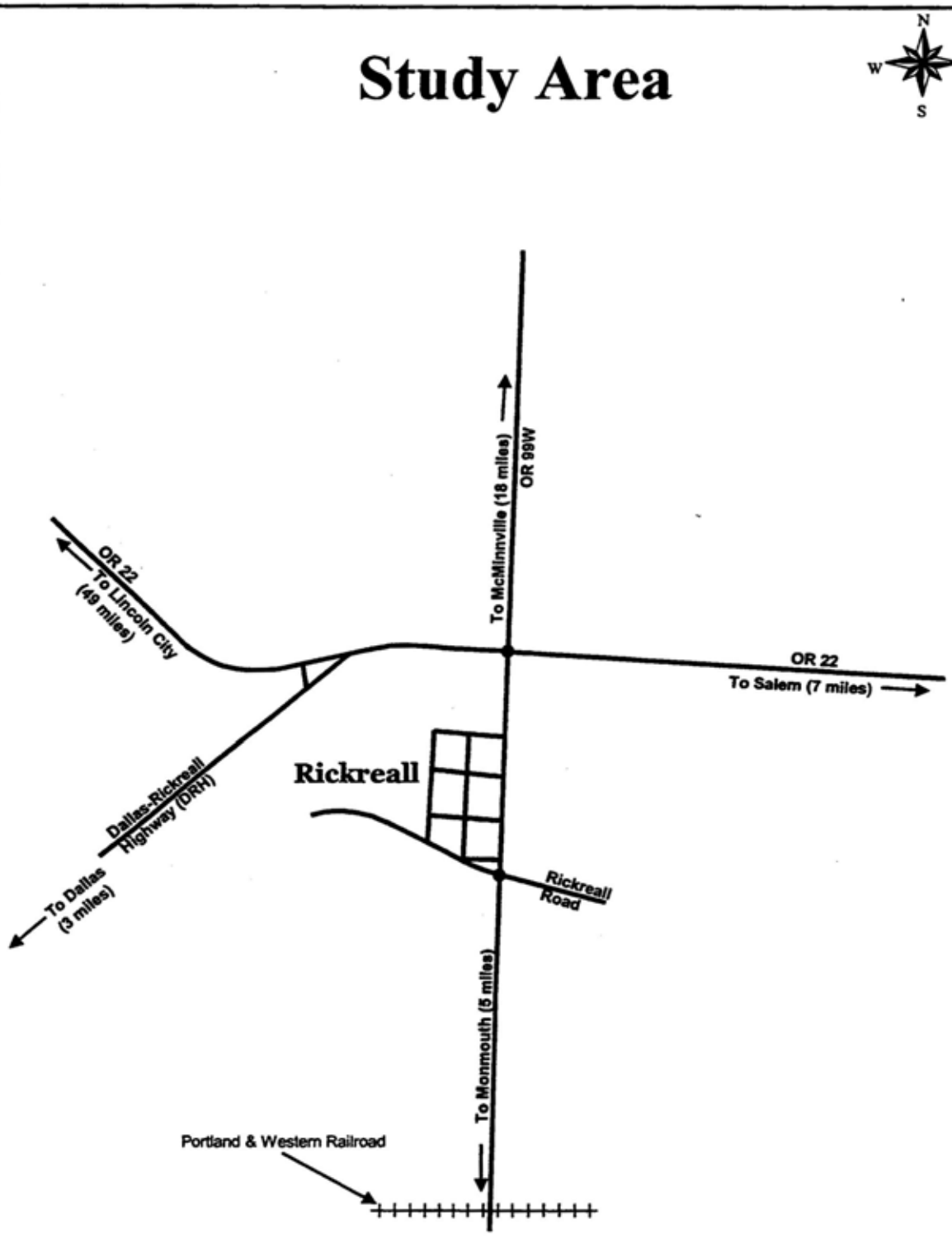


OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RStudyArea.ppt	Prepared By: HLN	FIGURE 1
	DATE :01/19/2001	Reviewed By: BGD	

Study Area



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OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RStudyArea.ppt	Prepared By: HLN	FIGURE 2
	DATE :01/19/2001	Reviewed By: BGD	

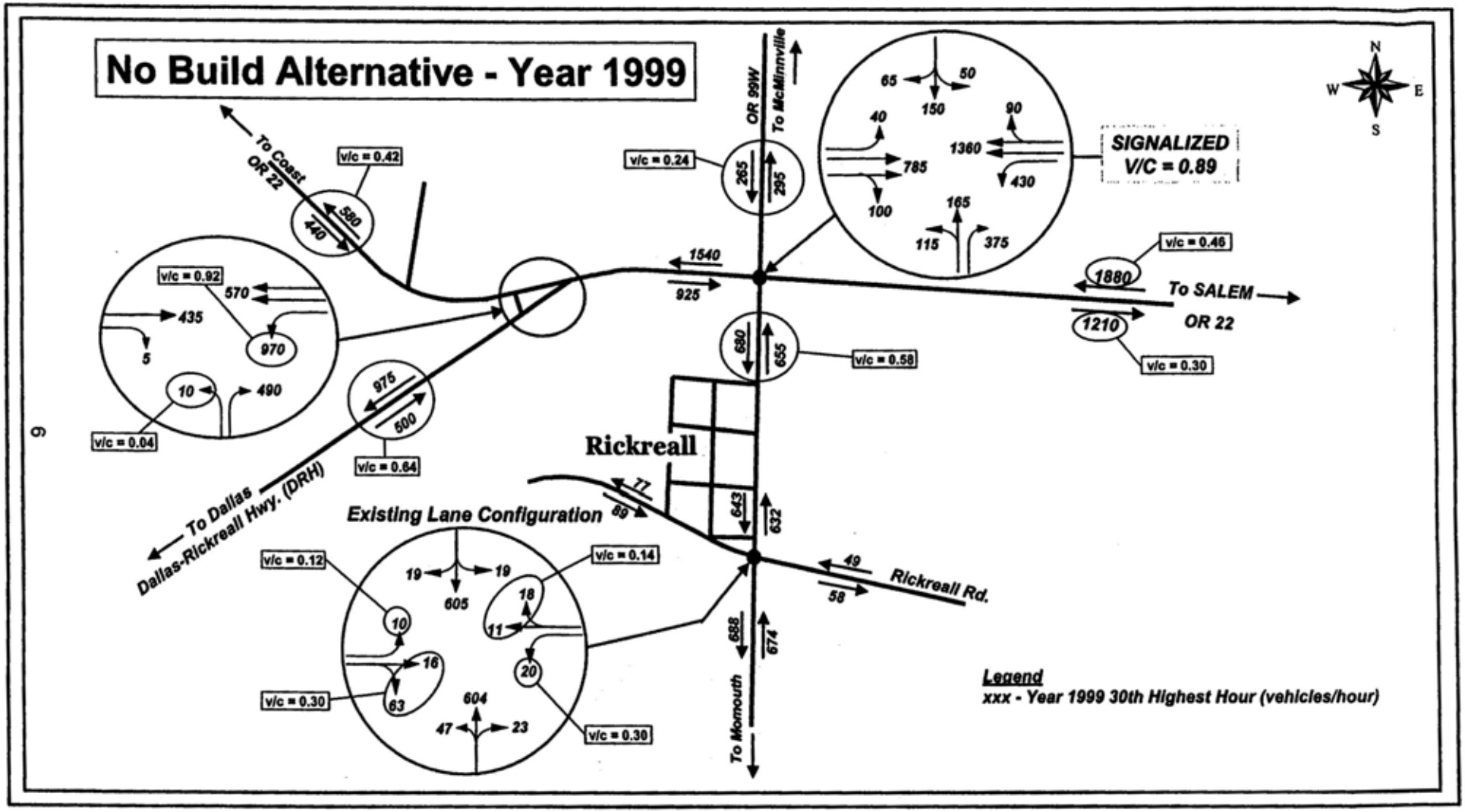
NO-BUILD ALTERNATIVE

No Build Analysis Summary – Year 1999

The analysis for the no-build alternative was completed using the 30th highest hour traffic volumes for all the roadways located within the study area (Figure 3). Appendix B describes both the current and the future traffic volume development and the analysis methodology used in the development of this narrative.

OR 22 is a Statewide (NHS) Non-Freight Route and OR 99W is a Regional Route. The 1999 Oregon Highway Plan (OHP) requires both of these roadways (in rural lands) to operate at a Volume to Capacity (V/C) ratio equal to or less than 0.70. The maximum allowable V/C ratio for the portion of OR 99W through the unincorporated community of Rickreall is 0.75. The mobility standard for the Dallas-Rickreall Highway (DRH) is less stringent, since DRH is a District Route; therefore, the maximum allowable V/C is 0.80. The Year 1999 No-Build Alternative analysis indicates the following:

- The OR 22/OR 99W and OR 22/DRH intersections do not meet mobility standards in 1999. The existing signalized OR 22/OR 99W intersection operates at a V/C of 0.89. The westbound OR 22 to DRH traffic movement at the existing unsignalized OR22/DRH intersection operates at a V/C of 0.92.
- There is only 400 meters (0.25 miles) on OR 22 between the DRH and OR 99W intersections. The intersections are too close together and, at times, traffic backs up from the westbound OR 22/DRH intersection approximately 75 percent of the way back toward the OR 22/OR 99W intersection creating both speed differential and safety concerns.
- The free flow sections of OR 22, OR 99W and DRH meet mobility standards.
- The OR22/OR 99W and OR 22/DRH intersections are experiencing a high number of crashes typically associated with the combination of traffic signals and high-speed turning movements on rural highways.



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OREGON DEPARTMENT OF TRANSPORTATION

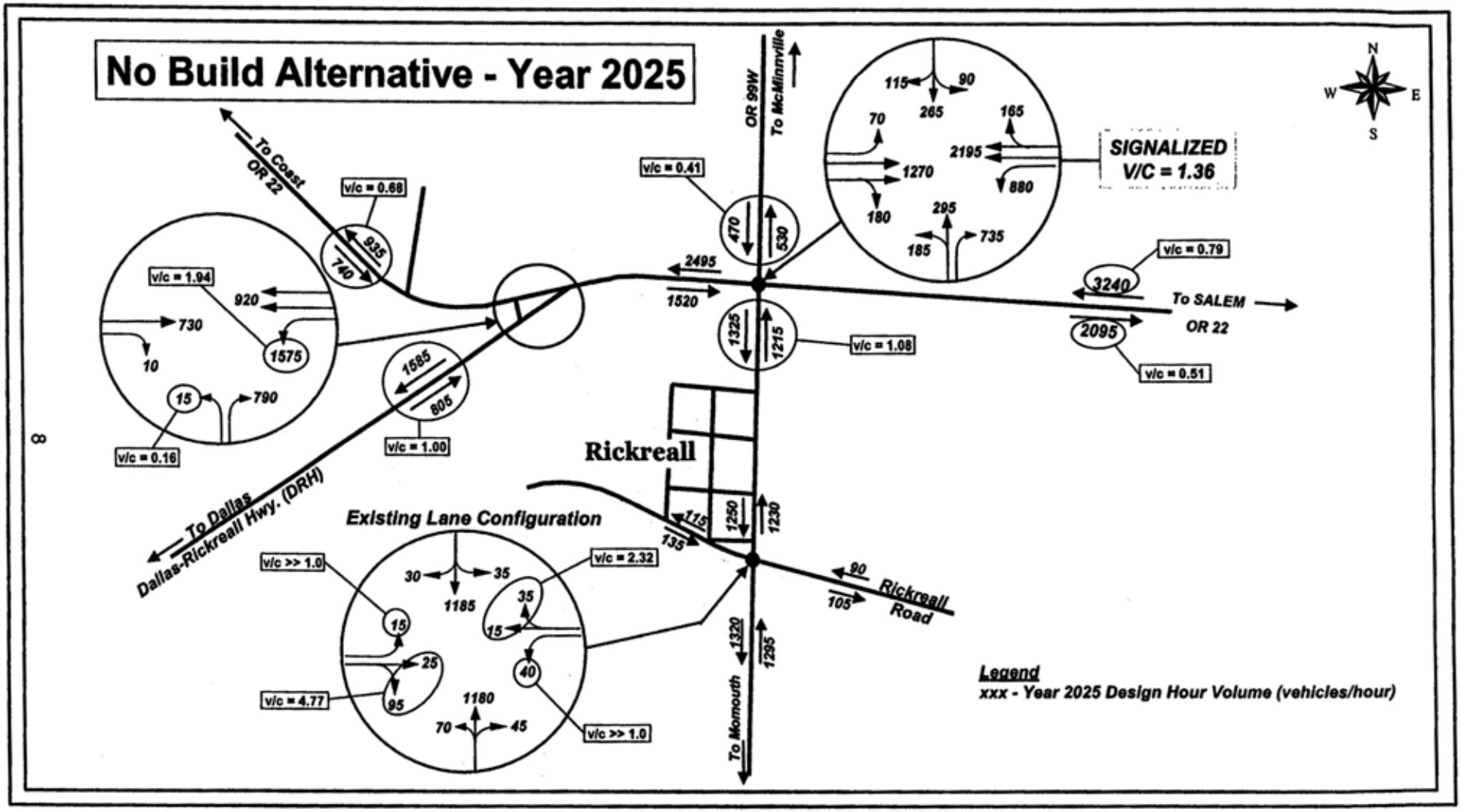
TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan No Build Alternative - Year 1999	File : RickDraft.ppt Date : 01/29/01	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 3

No Build Analysis Summary – Year 2025

The future year traffic volumes for this project are for the year 2025, which is approximately 20 years beyond the end of project construction (Figure 4). The future no-build alternative was evaluated using the same street network used in the year 1999 no-build analysis. The traffic volumes for the future no-build alternative were based on historical growth rates of the roadways within the surrounding area. The No-Build Alternative analysis summary for the year 1999 indicates that both the OR 22/OR 99W and the OR 22/DRH intersections do not meet mobility standards required in the 1999 OHP. Figure 4 shows the V/C ratios for the year 2025 No Build Alternative. The year 2025 No-Build Analysis indicates the following:

- The OR 22/OR 99W and OR 22/DRH intersections do not meet mobility standards. The V/C ratio for the signalized OR 22/OR 99W and the unsignalized OR 22/DRH intersections will exceed a V/C ratio of 1.0.
- There is only 400 meters (0.25 miles) on OR 22 between the DRH and OR 99W intersections. The intersections are too close together, by the year 2025 traffic will back up from the westbound OR 22/DRH intersection into the OR 22/OR 99W intersection on a regular basis.
- The free flow section of OR 22 will operate at a V/C of 0.79 in the westbound direction west of OR 22/OR 99W intersection and will not meet mobility standards.
- The free-flow section of OR 99W located between the OR 22/OR 99W intersection and the OR 99W/Rickreal Road intersection will exceed a V/C ratio of 1.0 and will not meet mobility standards.
- The two-lane free-flow section of DRH will exceed a V/C ratio of 1.0 and will not meet mobility standards.
- The free-flow section of OR 99W north of OR 22 will meet mobility standards.



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TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan No Build Alternative - Year 2025	File : RickTown.ppt Date : 01/29/01	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 4

BUILD ALTERNATIVES

The Technical Advisory Committee (TAC) considered approximately 20 proposed build alternatives as possible short-term or long-term solutions. Solutions ranged from immediate improvements such as striping, signing, visibility enhancements, ITS, etc. to a full interchange that combines the traffic flows on OR 22, OR 99W and DRH. Long-term solutions that could be phased were given special consideration. The intention was to identify the potential to phase in incremental improvements over the next 15 years or so that could eventually be used as components of a long-term solution. The goal was to find ways for ODOT to provide acceptable traffic flows within the study area in the short-term if funding could not be found to fully implement the long-term build alternative all at once.

The TAC selected ten of the 22 proposed build alternatives as possible short-term or long-term build alternatives. The longest-term alternative identified (Alternative 7-A) met the following TAC project goals.

- Meet OHP policies (Mobility, Major Investment, Access, Safety, etc.).
- Meet geometric standards as per ODOT Highway Design Manual.
- Minimize impact on the Rickreall community.
- Alternatives that provide the highest overall short- and long-term value per dollar invested.

Alternatives Evaluated

The TAC considered approximately 22 build alternatives. Table 1 shows the No Build Alternative along with 20 of the 22 build alternatives:

Table 1: Alternative Summary Table

Alternative**	Meets Required OHP V/C Ratio (0.70) ?	Meets Required OHP Spacing Standard ?	Promotes Expressway Standards (Eliminates Traffic Signals on OR 22)?	Is Alternative A Viable Short-Term Solution ?	Is Alternative Phaseable?
No Build	No	No	No	N.A.	N.A.
1-A	No	No	No	Yes	Yes
2-A	No	No	No	No	Yes
2-B	No	No	No	No	Yes
2-C	No	No	No	Yes	Yes
2-D	No	No	No	No	Yes
3-A	No	No	No	No	Yes
3-B	No	No	No	No	Yes
3-C	No	No	No	No	Yes
4-A	N.A.	N.A.	No	No	Yes
4-B	No	N.A.	No	Yes	Yes
5-A	No	N.A.	Yes	No	No
5-B	Yes	N.A.	Yes	Yes	Yes
5-C	Yes	N.A.	Yes	Yes	Yes
6-A	No	No	Yes	No	No
6-B	Yes	No	Yes	Yes	Yes
6-C	Yes	No	Yes	Yes	Yes
7-A	Yes	Yes	Yes	Yes	Yes
7-A.1***	No	Yes	Yes	Yes	Yes
7-B	Yes	Yes	Yes	Yes	No
7-C***	No	Yes	Yes	Yes	Yes

* N.A. – Not applicable

** Shaded alternatives were advanced for further, more detailed analysis.

*** These alternatives were added after the initial analysis as lower cost variations of 7-A

The alternative names shown in Table 1 reflect the complexity and timing of proposed alternatives. There are 7 levels of proposed improvements, which are described below:

Level 1 Immediate improvements such as striping, signing, visibility enhancements, ITS, etc.

Level 2	Channelization improvements for existing OR 22/OR 99W intersection and proposed traffic signal for OR 22/Dallas-Rickreall Highway (DRH) intersection.
Level 3	Proposed "at-grade" jug-handle design with ramps in two quadrants at OR 22/OR 99W intersection. A traffic signal is used to regulate OR 22 and OR 99W traffic flows at the OR 22/OR 99W intersection, thereby saving the cost of building a structure over one of these roadways.
Level 4	Construct a fly-over west of the OR 22/OR 99W intersection to eliminate left-turning traffic flows at the OR 22/DRH intersection.
Level 5	Proposed jug-handle style interchange options at OR 22/OR 99W intersection, with OR 22 going over OR 99W.
Level 6	Construct a fly-over west of the OR 22/OR 99W jug-handle interchange proposed in Level 5 Alternatives to improve traffic flows at the OR 22/DRH intersection.
Level 7	Full interchange concepts with freeway style ramps including connections to DRH.

As the level of design alternatives increase so does the cost and impacts of implementing. Although the level 7 alternatives were initially thought to be the most expensive alternatives, the level 6 and 7 alternatives were ultimately estimated to have very similar costs.

The ten alternative concepts shaded in Table 1 underwent more detailed analysis. Discussions about these alternatives included the configuration of the OR 22/OR 99W intersection regarding which road was elevated (OR 22 or OR 99W). The resulting operational characteristics for these scenarios are basically the same. Concerns related to the scenarios involve the grade of the road into town and the spacing on OR 99W between the OR 22 eastbound ramp terminals and the OR 99W/Rickreall Road intersection. The distance between these two roads in both scenarios is greater than the 400 meters (1,320 feet) required by the OHP. However, all other intersections in Rickreall between Rickreall Road and the eastbound ramp terminals are located too close to the ramp terminals to meet OHP intersection spacing standards. Pageant Street will need to be closed at its OR 99W intersection because it will affect the interchange operation. The OR 99W/Church Street intersection is located further away from the interchange than the OR 99W/Pageant Street Intersection (more than 260 meters –850 feet) is and will not adversely impact the operation of the interchange at this time. The future design of OR 99W south of OR 22, including the disposition of the 99W/Church Street intersection will be addressed as part of a future facility planning process that ODOT will begin in FY 2004.

The alternatives not shaded (see Appendix A for list) in Table 1 were dropped from further consideration by the TAC during the initial round of analysis. Figures are

provided in Appendix A showing each alternative along with a short explanation for the reason why each alternative was dropped from further consideration.

The TAC also dropped two additional alternatives not shown in Table 1 after some initial analysis. One alternative considered roundabouts at either or both of the OR 22/OR 99W and OR 22/DRH intersections. The other alternative considered a Single Point Interchange at the OR 22/OR 99W intersection. The TAC dropped both of these alternatives in the early stages of this planning project. The proposed roundabouts will not function at acceptable levels and the Single Point Interchange was costly and was not phaseable. A Technical Memorandum explaining why each alternative was dropped is provided in Appendix A.

Forwarded Alternatives (Ten Alternatives)

The shaded alternatives in Table 1 are the alternatives that both the Transportation Planning Analysis Unit (TPAU) and Preliminary Design Unit forwarded to the TAC for further analysis and consideration. Alternative 7-A is the long-term alternative recommended in this plan. Alternatives 1-A, 2-C, 5-B, and 6-B are short to mid-term build alternatives that will not meet either mobility or spacing standards in the design year (year 2025). These alternatives have limited merit for their ability to improve the safety and the operation of the transportation system in the near future at a lower cost. The more expensive short to mid-term alternatives (Alternatives 4-B, 5-C, and 6-C) have somewhat greater merit based on their ability to better meet mobility and spacing standards and be "phased-in" as components of the best long-term alternative.

After further analysis and consideration, Alternative 7-A.1 was the alternative that was selected to for construction with OTIA funding. This is a "scaled-down" version of Alternative 7-A. There was not enough OTIA funding to fully build Alternative 7-A, therefore, the design was modified to both meet the funding restrictions while still providing the interchange enough lane capacity to meet the 20- to 25-year traffic demand. However, while it will not fail (operationally) during the planning horizon, 7-A.1 will not fully meet OHP mobility standards in the later years of the planning horizon for OR 22 in the vicinity of the interchange without adding an eastbound lane on the bridge structure and an additional turn lane from westbound OR 22 to the DRH.

Alternative 1-A (No Figure):

This alternative is comprised of low cost, easy to implement features meant to improve safety in the area. While no specific features were identified as part of this planning activity, concepts discussed included rumble strips for shoulders and median areas, glare shield on signals to reduce impacts from the sun, ITS reader boards for traffic conditions and accidents, possible signing or striping modifications.

No analysis was performed for this alternative, although, the Project Planning Team acknowledged the potential for immediate safety benefits from this alternative and recommended that Region 2 Traffic and Planning coordinate with District 3 and Traffic Management Section to pursue ideas for implementation.

Alternative 2-C (Figure 5):

This alternative increases the capacity of the existing signalized OR 22/OR 99W intersection. However, there are safety concerns regarding a traffic signal continuing to be located on a high-speed rural transportation facility.

This alternative improves the operation of the existing signalized OR 22/OR 99W intersection by adding left turn refuge lanes on OR 99W and additional lanes on the two approaches of OR 22. This is a relatively low-cost improvement that could increase both safety and capacity of the existing intersection in the short-term.

There is lane imbalance on the westbound approach of this intersection resulting from drivers traveling in the inside lane of the two westbound OR 22 lanes preparing to turn left to travel toward Monmouth or Dallas. If approximately 67 percent of the westbound vehicles were traveling in the inside lane and 33 percent traveling in the outside lane, the proposed intersection will operate at a V/C ratio of 0.84 and 1.14 in the years 1999 and 2015, respectively. Year 2025 has an even higher V/C ratio. This is a good short-term solution; the channelization on OR 99W may improve safety at this intersection. However, the existing safety concerns regarding the traffic signal on a 50 or 55-mile/hour rural facility will continue into the future.

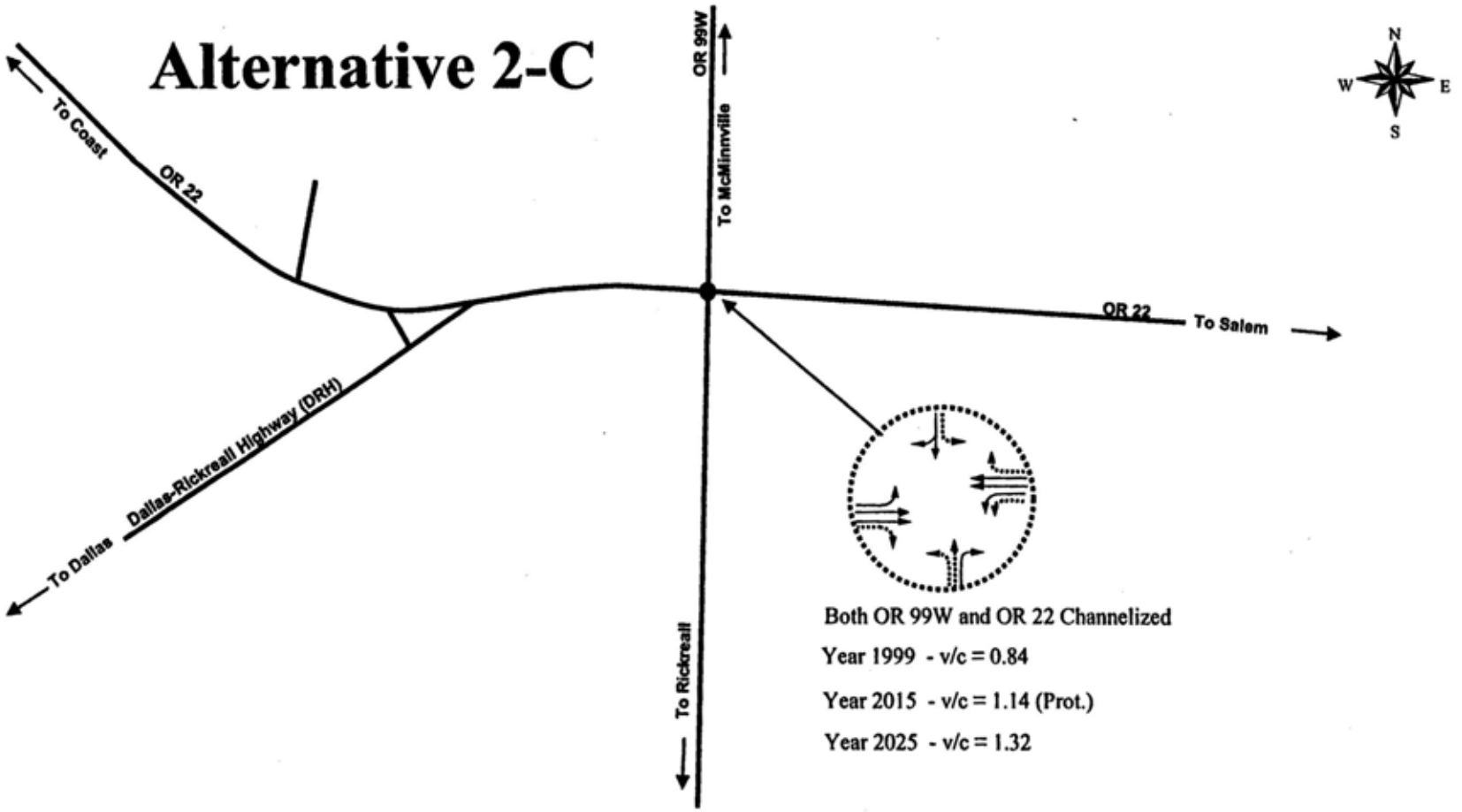
Alternative 4-B (Figure 6):

Alternative 4-B is also an acceptable short-term alternative. Alternative 4-B provides grade separation on eastbound OR 22 for the coast to Salem traffic movement. Eastbound OR 22 vehicles traveling toward Salem will go over the DRH on a fly-over and become an add-lane when connected to OR 22. The eastbound OR 22 fly-over eliminates the stacking on OR 22 for Salem to Dallas traffic flows. However, the safety concern regarding the existing traffic signal located on a high-speed rural transportation facility (at the OR 22/OR 99W intersection) will continue into the future.

At the westbound OR 22/DRH intersection, the three westbound OR 22 lanes will split into two lanes for westbound OR 22 vehicles traveling to the coast and two lanes for DRH vehicles traveling to Dallas. There will be approximately 495 meters of distance between the split and the existing OR 22/OR 99W intersection.

This design is compatible with the longer-term level 6 and 7 alternatives. A "through" lane should be added in both directions on OR 22 east of the OR 99W intersection to carry "through" traffic flows through the signalized OR 22/OR 99W intersection. The third westbound OR 22 through" lane will distribute vehicles traveling from Salem to Dallas into two lanes instead of one lane at the OR 22/OR 99W intersection, thereby, improving the operation of the proposed traffic signal. The OR 22/OR 99W traffic signal will operate at a V/C ratio of 0.60, 0.82 and 1.00 in the years 1999, 2015 and 2025, respectively.

Alternative 2-C



Both OR 99W and OR 22 Channelized

Year 1999 - v/c = 0.84

Year 2015 - v/c = 1.14 (Prot.)

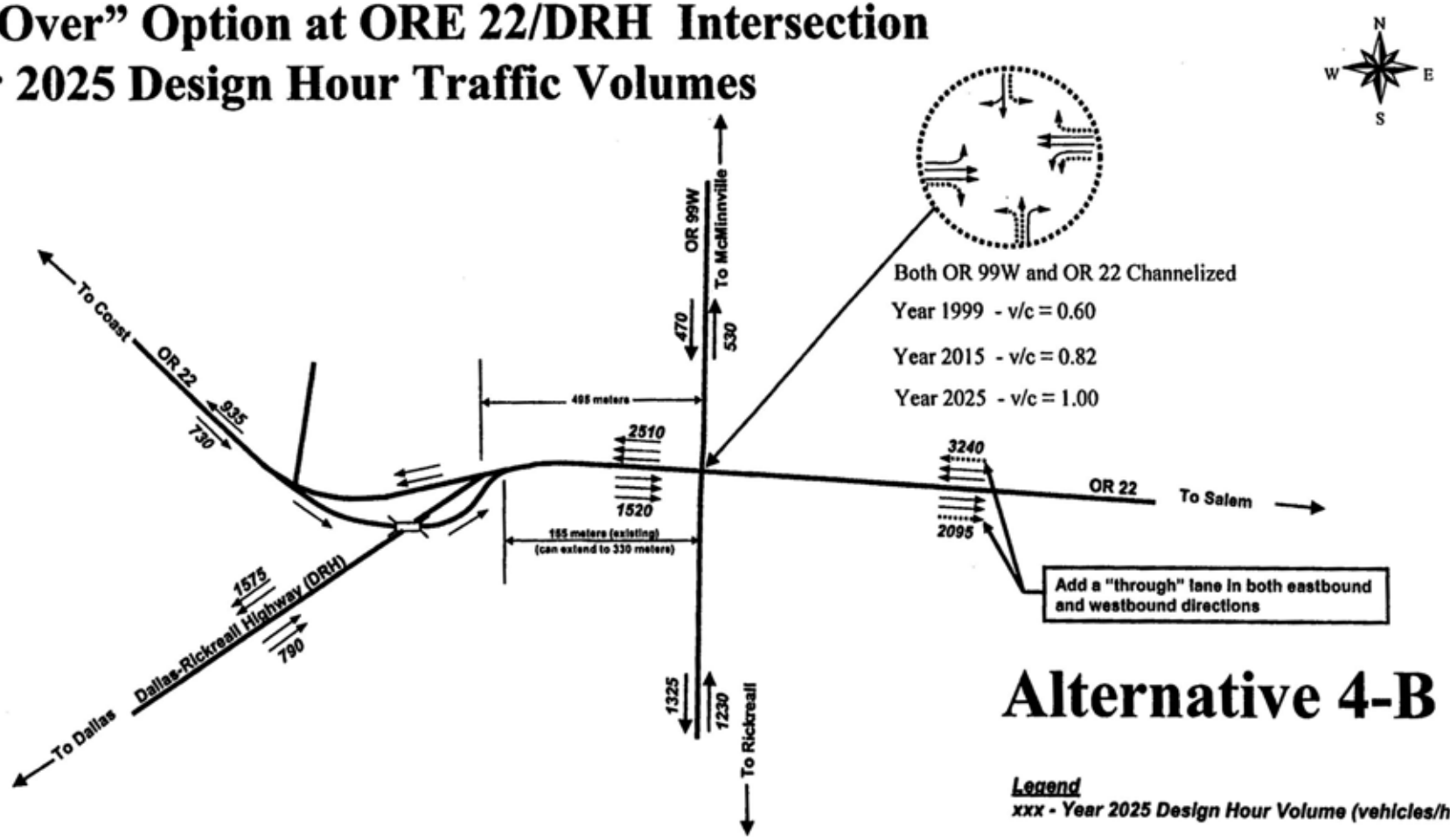
Year 2025 - v/c = 1.32

OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RAdvanced.ppt Date : 1/30/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 5

"Fly-Over" Option at ORE 22/DRH Intersection
Year 2025 Design Hour Traffic Volumes



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TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RAdvanced.ppt	Prepared By: Harlan Nale, P.E.	FIGURE 6
	Date : 1/30/2001	Reviewed By: Brian Dunn, P.E.	

There is a safety concern for fly-over drivers traveling from the coast to McMinnville. These drivers will have to weave across two lanes of traffic and decelerate from 60 miles/hour to 25 miles/hour in a distance of approximately 330 meters. A total minimum distance of 345 meters is required for vehicles making this maneuver to decelerate, weave, and stop. Safe operation requires a desirable distance of 295 meters and a minimal distance of 185 meters for these vehicles to decelerate and weave before reaching the last eastbound "through" vehicles stopped by the proposed traffic signal. In the year 2015, approximately 160 meters will be needed to store the eastbound "through" vehicles stopped at the traffic signal. Using desirable conditions for the deceleration and weave will add another 110 meters to 345 meters for a total of 455 meters. The minimum distance of 345 meters may be used in this case because there is a low volume of approximately 20 eastbound OR 22 vehicles making this weave and there will be good visibility in the year 2015. The eastbound fly-over will elevate vehicles so drivers will start preparing to stop when they see the traffic signal ahead. This alternative is an improvement over the No Build Alternative, but will create safety concerns before the year 2015 if limited condition criteria is used.

The safety concerns regarding the retention of a traffic signal on a 50-55 mile/hour facility may be exacerbated because of the different expectation created with the addition of a free-flow movement at the OR 22/DRH intersection. Drivers traveling from the coast will be free-flow all the way to this intersection. The addition of the fly-over enforces the driver expectancy of the "free-flow condition so a traffic signal may not be expected by first time drivers. That there will be high-speed differentials between vehicles stopped at the traffic signal and traffic coming from the coast compounds these safety concerns. Although the fly-over will elevate OR 22 drivers and enable them to see the traffic signal at the OR 99W intersection, the larger speed differential creates a new safety concern.

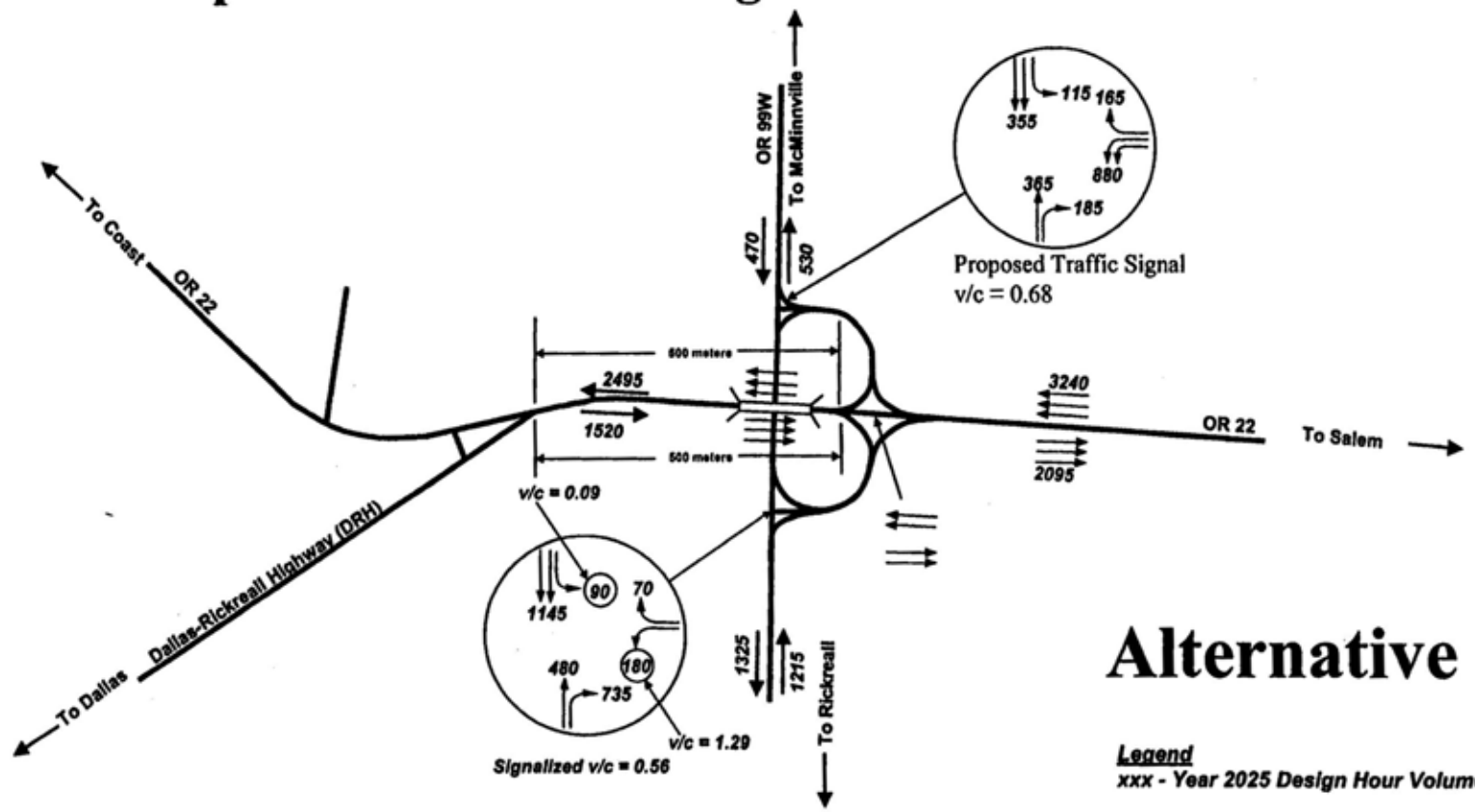
Alternative 4-B could be implemented as a short-term improvement. It eliminates the westbound queue for traffic traveling westerly on OR 22 and turning southwest onto DRH to proceed toward Dallas. As the eastbound OR 22 queue at the OR 99W intersection increases, a concern arises from reducing the available weave distance for traffic flows from the coast turning north toward McMinnville. As the small number of vehicles currently making this movement increases, this may become a problem.

This design will not meet ODOT spacing standards due to the short distance between the eastbound OR 22 on-ramp and the existing OR 22/OR 99W intersection. We do not recommend this alternative as a stand-alone mid- or long-term solution since any increase in the coast to McMinnville traffic flows may create an unsafe weave section.

Alternative 5-B (Figure 7)

Alternative 5-B is a jug-handle interchange with jug-handle ramps located in both northeast and southeast quadrants. Alternative 5-B improves the operation of the OR 22/OR 99W intersection, but does nothing to improve the existing unsignalized OR 22/DRH intersection. This alternative is not recommended due to the high number of vehicles (>600 vehicles/hour) that will travel through the dual left-turn lanes at the westbound OR 22 ramp terminals. This is a large volume of traffic flow to travel through dual left-turn lanes at a signalized intersection.

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection
"Structure" Option - Year 2025 Design Hour Traffic Volumes



OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RAdvanced.ppt	Prepared By: Harlan Nale, P.E.	FIGURE 7
	Date : 1/30/2001	Reviewed By: Brian Dunn, P.E.	

OR 22 is elevated above OR 99W to lessen impacts to the community of Rickreall. Preliminary ADT Traffic Signal Warrants should be met at the westbound ramp terminals in approximately 2010, while the eastbound ramp terminals should be met in the 2015-2020 time frame. However, the signalization at the eastbound ramp terminal would not be approved for the initial construction. Both ramp terminals will meet mobility standards in the design year after signalization.

There will be two eastbound lanes on DRH for vehicles traveling from Dallas to Salem. This will merge with the one eastbound lane of OR 22. Vehicles traveling from the coast to McMinnville will have approximately 500 meters to weave over two lanes into the right travel lane and decelerate to a speed of 25 miles/hour to use the off-ramp. The 1994 AASHTO recommends 100 meters for a vehicle to decelerate from 55 to 25 MPH leaving approximately 400 meters for the weaving maneuver.

A major concern with this alternative is lane distribution for eastbound traffic during the A.M. peak hour in the year 2025. A very high percentage of the vehicles (approximately 1400 per hour) will avoid the trap lane onto the eastbound OR 22 off-ramp by being in the inside lane of the two eastbound DRH travel lanes. If a third travel lane was extended through the eastbound off-ramp rather than terminating as a trap-lane into the off-ramp, there would be better lane distribution.

Another problem is that a driver traveling from OR 99W southbound who is destined for the DRH would enter OR 22 from the westbound on-ramp has approximately 500 meters to:

- accelerate from a speed of 25 to 55 MPH,
- weave into the left lane of the three westbound OR 22 lanes, and then
- decelerate from 55 to 0 MPH to wait in the left turn queue for travel to Dallas.

The 1994 AASHTO recommends a distance of approximately 280 meters for a vehicle to accelerate from 25 to 55 MPH. If the westbound left onto DRH does not have to stop so westbound OR 22 vehicles 220 meters for weaving, the westbound weaving section would operate at an acceptable V/C ratio of 0.65 in the design year. However, under Alternative 5-B the westbound left onto DRH must decelerate to a stop at the end of the queue and wait for a gap. Presently, the vehicles turning left at the OR 22/DRH intersection back up approximately 75 percent of the way to the OR 22/OR 99W intersection. This turning movement will fail around the year 2004 and back through the OR 22/OR 99W intersection. Therefore, this turning movement will block the weave movement causing it to fail.

Traffic Management Section typically will not recommend installing a traffic signal at the westbound OR 22 ramp terminals even though this intersection will meet traffic signal warrants. However, the State Traffic Engineer can approve the traffic signal anyway if Region has recommended it. This is due to the high number (880 vehicles/hour) of left-turning vehicles in the dual left-turn lanes (>600 vehicles/hour).

This alternative will somewhat improve traffic flows on OR 22 by eliminating the traffic signal at the OR 22/OR 99W intersection. However, the weaving problems discussed

above will diminish these gains. Furthermore, westbound OR 22 traffic flows turning southbound to travel toward Dallas will experience unacceptable delays. This alternative will not meet mobility standards.

OHP spacing standards will not be met on OR 22 between the existing OR 22/DRH intersection and this interchange. The long westbound queues will encourage drivers to make unsafe left-turns. The long queue will also spill into the adjacent through lanes causing large speed differentials on OR 22. Because of these problems, the TAC does not recommend any additional consideration of this alternative.

Alternative 5-C (Figure 8)

Alternative 5-C improves the operation of the OR 22/OR 99W intersection, but does not improve the existing unsignalized OR 22/DRH intersection. The westbound OR 22 vehicles turning left at the OR 22/DRH intersection will continue to experience long delays. As the eastbound traffic volumes increase, the left turn queues will get longer and adversely impact the eastbound OR 22 through movements.

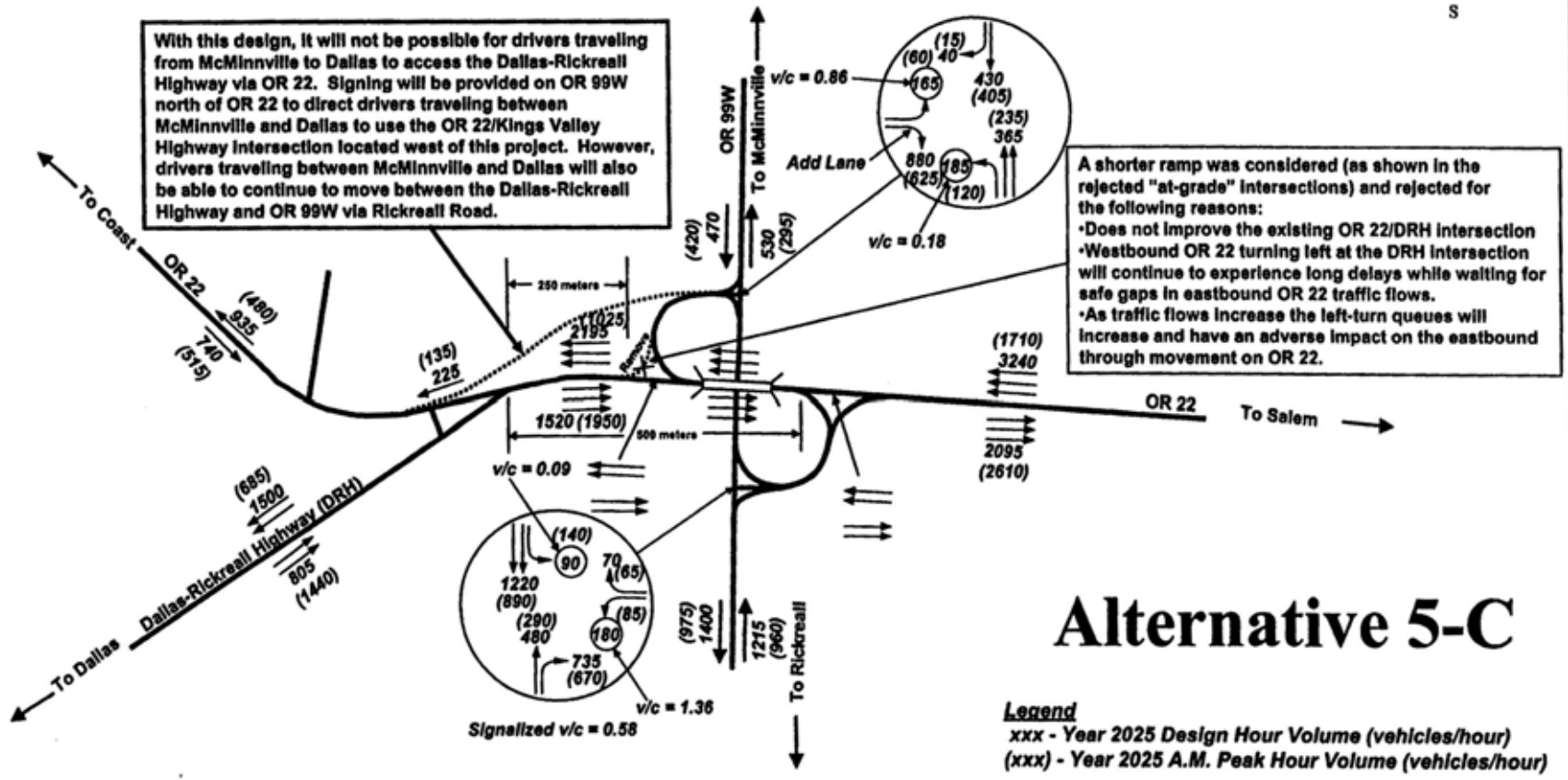
Alternative 5-C is a jug-handle interchange with ramps located in the northwest and southeast quadrants. OR 22 is elevated over OR 99W to lessen impacts to the community of Rickreall. The heavy Salem/Rickreall and Rickreall/Salem traffic movements can be accommodated without installing a traffic signal at the westbound ramp terminal for approximately 20-25 years. The eastbound ramp terminal would need a traffic signal in the 2015-2020 time frame. Signalization at either ramp terminal will not be approved for the initial construction.

There will be two eastbound lanes from the DRH onto OR 22 for vehicles traveling from Dallas to Salem. Vehicles traveling from the coast to McMinnville will have approximately 500 meters to weave over two lanes into the right travel lane and decelerate to a speed of 25 miles/hour to use the eastbound off-ramp. The 1994 AASHTO recommends 100 meters for a vehicle to decelerate from 55 to 25 MPH leaving approximately 400 meters for the weaving maneuver.

This alternative's major concern is the A.M. peak hour lane distribution in the year 2025. Approximately 1400 vehicles/hour traveling from Dallas to Salem will be in the inside of the two DRH travel lanes to avoid having to weave left one lane on OR 22 to avoid the eastbound trap lane to OR 99W. To achieve better lane distribution, the third eastbound OR 22 travel lane should be extended through the eastbound off-ramp rather than having a lane drop at the off-ramp. There should then be an acceleration lane for Rickreall to Salem traffic flows.

A design was considered that brought eastbound DRH into OR 22 with one lane and built a right turn deceleration lane to remove off-ramp traffic flows from OR 22 "through" traffic flows. The design kept the eastbound DRH traffic flows in the right most of the two lanes and avoided the one lane weave to the left before the off-ramp lane drop. However, this solution is not viable long-term since a single northeasterly lane on DRH will be operating at capacity with approximately 1445 vehicles/hour in it.

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection
"Structure" Option - Year 2025 Design Hour Traffic Volumes



OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RAdvanced.ppt Date : 1/30/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 8

Westbound OR 22 vehicles turning left at the DRH intersection back up about 75 percent of the way to the OR 22/OR 99W intersection which is east of the proposed westbound on-ramp, preventing McMinnville to Dallas travelers from entering the westbound OR 22 left-turn refuge. To make this alternative safe and work with the existing OR 22/DRH intersection, the westbound on-ramp traffic flows should be prevented from turning left at the OR 22/DRH intersection. A raised barrier is one technique that could be used to prevent this left turn movement and reroute the traffic flows to the OR 99W/Rickeall Road intersection. However, it is recommended that the short westbound on-ramp be disconnected and replaced with a longer one that connects the westbound ramp terminals to OR 22 west of the DRH intersection. This modification will reroute drivers traveling from McMinnville to Dallas from the DRH to the Kings Valley Highway via its intersection further west on OR 22. This traffic could also proceed southerly on OR 99W past the interchange to the OR 22/Rickreall Road intersection and west on Rickreall Road to reach the DRH and continue towards Dallas.

The west to south traffic movement at the unsignalized OR 22/DRH intersection will operate at a V/C of 0.92 and 1.38 in the years 1999 and 2015, respectively. This turning movement will fail around the year 2004. Once the V/C ratio reaches approximately 1.0, westbound OR 22 vehicles turning south toward Dallas will stack eastward past the OR 22/OR 99W interchange. The west to south traffic movement at the existing unsignalized OR 22/DRH intersection ultimately needs to be eliminated.

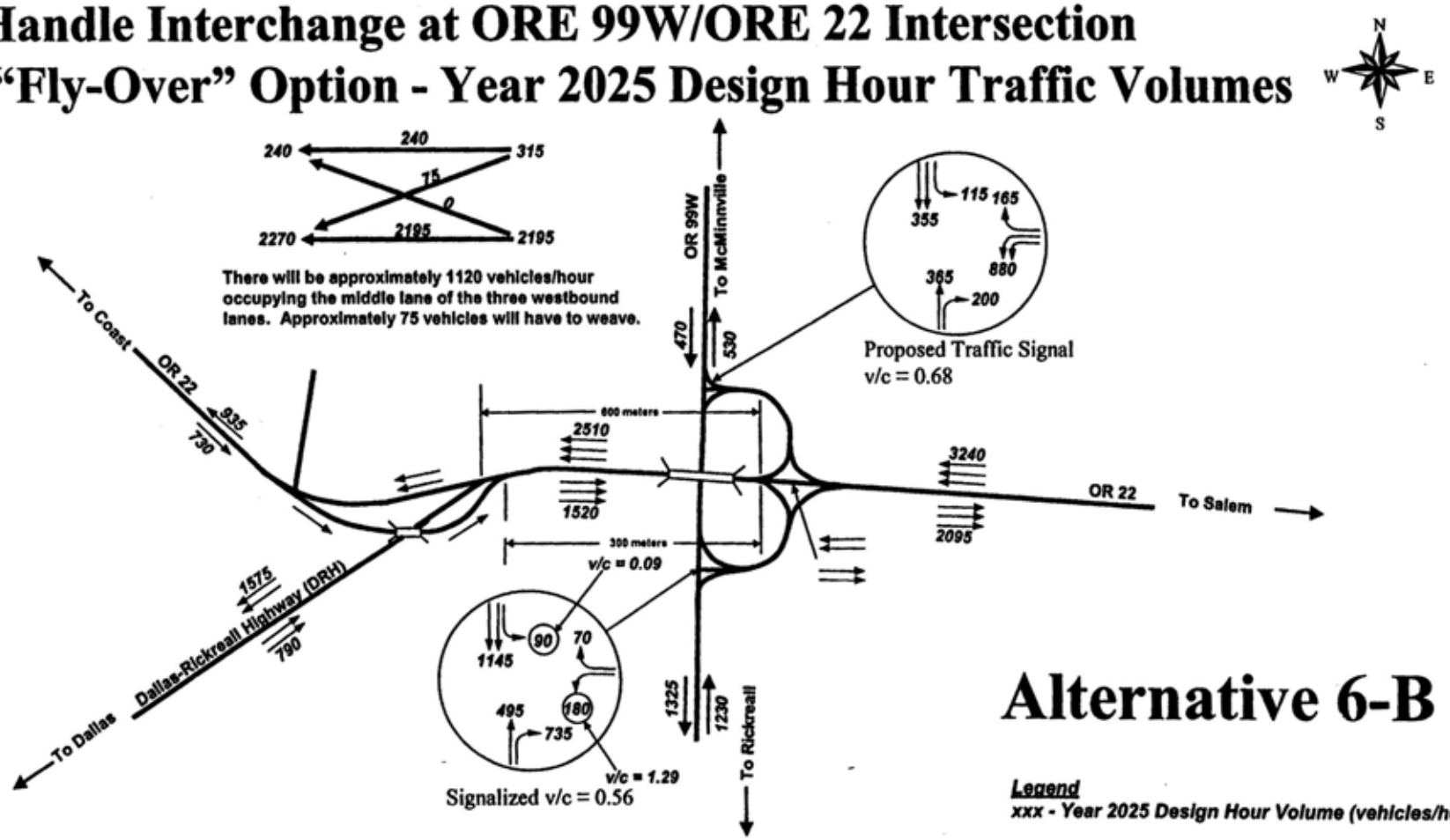
This alternative can be phased in as part of a complete solution without a major loss of investment. However, it will not meet mobility standards due to the stacking of the heavy westbound to southbound turning movement at the OR 22/DRH intersection. OHP spacing standards will not be met on OR 22 between the existing OR 22/DRH intersection and this interchange.

Alternative 6-B (Figure 9)

Alternative 6-B improves the operation of the existing OR 22/DRH intersection by eliminating the stacking of westbound OR 22 vehicles turning southwest at the DRH intersection. However, this alternative is not recommended due to the high number of vehicles that will travel through the dual left-turn lanes at the westbound OR 22 ramp terminals.

Alternative 6-B combines Alternative 4-B with the jug-handle interchange shown in Alternative 5-B. Eastbound OR 22 vehicles traveling will be routed on the south side of OR 22 onto the fly-over pass over the DRH. It then becomes an add-lane when connected to OR 22 with approximately 300 meters between the fly-over entrance to OR 22 and the southeast jug-handle ramp exit. With two northeasterly traffic lanes on DRH for the heavy Dallas to Salem A.M. peak hour the lane distribution for eastbound flows will be good because the DHR flows will be in both the left and the middle travel lanes of the three eastbound OR 22 lanes.

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection with "Fly-Over" Option - Year 2025 Design Hour Traffic Volumes



22

OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RAdvanced.ppt Date : 1/30/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 9

There will be three westbound lanes on OR 22 between the northeast jug-handle ramp entrance and the DRH. At the westbound OR 22/DRH intersection, the three lanes will split into two lanes for westbound OR 22 travel to the coast and two lanes for DRH vehicles traveling to Dallas. Two lanes will be needed on DRH for vehicles traveling from Dallas to Salem. There will be approximately 600 meters of distance between the split and the northeast jug-handle ramp entrance. This option eliminates the westbound queuing concern of Alternates 5-B and 5-C.

There are only 300 meters available on OR 22 for vehicles traveling from Dallas to McMinnville to weave into the right lane of the three eastbound OR 22 lanes and decelerate from a speed of 55 to 25 MPH to use the eastbound off-ramp. Elongating the eastbound ramp could increase this distance, but the shorter distance would not likely cause significant problems because of the low demand for this movement. The 1994 AASHTO recommends 100 meters to decelerate from 55 to 25 MPH leaving 200 meters for eastbound vehicles to weave. Using the latest HCS software, the eastbound weaving section will operate at a V/C ratio of 0.57 during the A.M. peak hour in the year 2025.

Drivers entering OR 22 from the westbound OR 22 on-ramp will have approximately 600 meters to accelerate from 25 MPH to 50 MPH and weave into the middle of the three westbound OR 22 lanes to travel to Dallas. The 1994 AASHTO recommends approximately 280 meters of distance for a vehicle to accelerate from 25 to 55 MPH and 320 meters for weaving. This is not a desirable situation as the speed differential is acceptable at about 9 MPH. The westbound weaving section will operate at a V/C ratio of 0.64 in the design year.

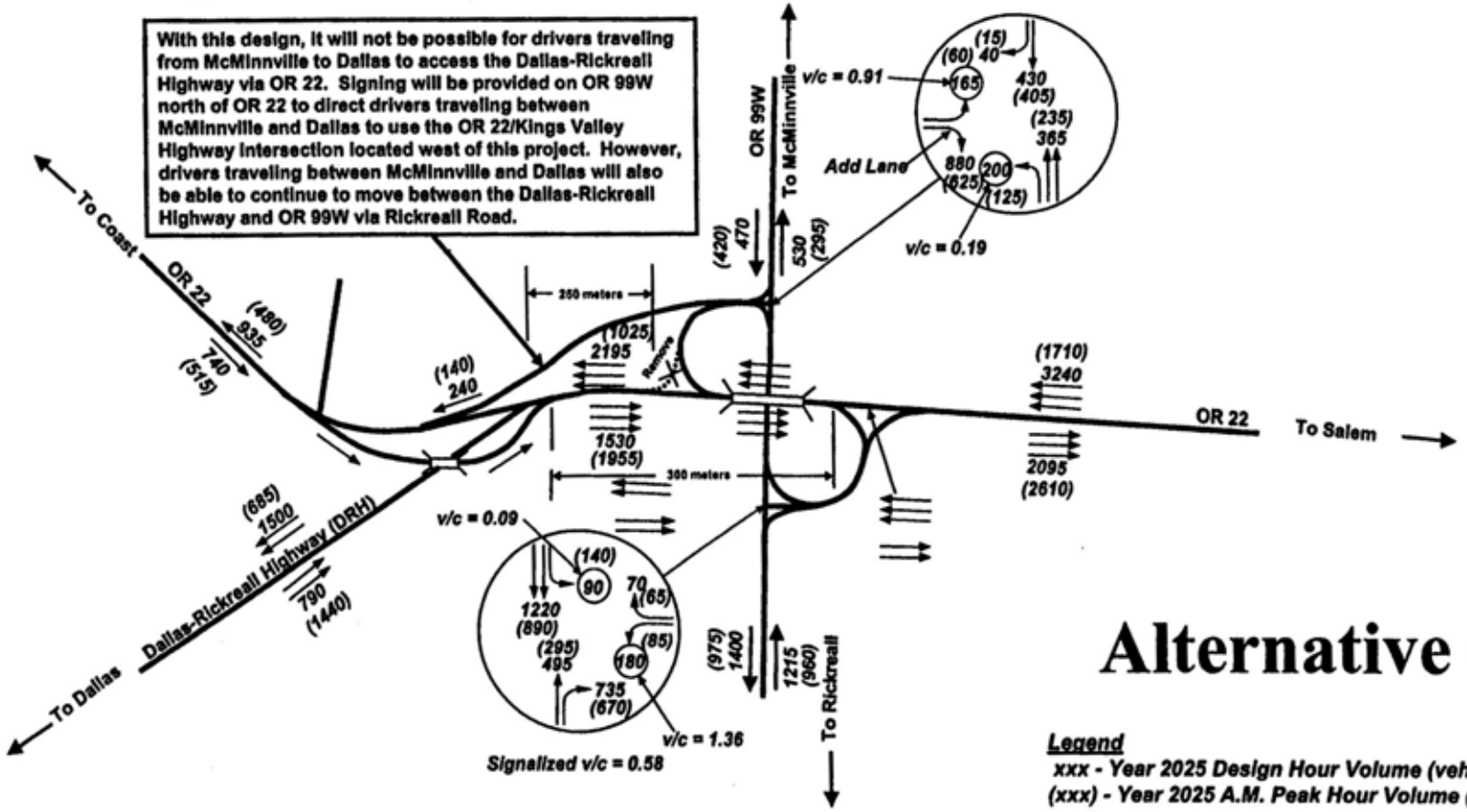
Preliminary ADT Traffic Signal Warrants should be met at the eastbound ramp terminals in the 2015-2020 time frame. The westbound ramp terminals will meet warrants about year 2010. Traffic Management Section typically will not recommend installing a traffic signal at the westbound OR 22 ramp terminals even though the intersection will meet traffic signal warrants. However, the State Traffic Engineer can approve the traffic signal anyway if Region has recommended it. This is due to the high number (880 vehicles/hour) of left-turning vehicles in the dual left-turn lanes (>600 vehicles/hour).

This design is compatible with one short-term (Alternative 4-B) and one long-term alternative (Alternative 7-A). Although this alternative will meet mobility standards it will not meet OHP spacing standards due to the short distance between the eastbound and westbound OR 22/DRH on- and off-ramps and merge/diverge points.

Alternative 6-C (Figure 10)

Alternative 6-C, combines Alternatives 4-B and 5-C into one alternative. It is the best of the mid-term alternatives. However, this alternative will not meet interchange spacing standards, but will operate acceptably until the design year.

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection
"Structure" Option - Year 2025 Design Hour Traffic Volumes



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OR 99W/OR 22 Junction Refinement Plan Polk County	File : RAdvanced.ppt	Prepared By: Harlan Nale, P.E.	FIGURE 10
	Date : 3/20/2001	Reviewed By: Brian Dunn, P.E.	

The OR 22/OR 99W intersection will have jug-handle ramps in both northwest and southeast quadrants. The heavy traffic flows between Salem and Rickreall are accommodated without installing a traffic signal at either ramp terminal for approximately 20-25 years. OR 22 is elevated above OR 99W, while the westbound OR 22 on-ramp will be extended past the westbound OR 22/DRH intersection. This eliminates the unsafe weaving maneuvers from OR 22 on DRH toward Dallas. Drivers traveling from McMinnville to Dallas will be rerouted from the DRH to the Kings Valley Highway via its intersection further west on OR 22. This traffic could also proceed southerly on OR 99W past the interchange to the OR 22/Rickreall Road intersection and west on Rickreall Road to reach the DRH and continue towards Dallas.

At the OR 22/DRH intersection, there will be a one-lane fly-over on OR 22 for drivers traveling eastbound between the coast and Salem. This lane will become an add-lane joining OR 22, forming the three eastbound OR 22 lanes between the OR 22/DRH intersection and the eastbound OR 22 off-ramp to OR 99W. With two northeasterly traffic lanes on DRH for the heavy Dallas to Salem A.M. peak hour the lane distribution for eastbound OR 22 traffic flows will be good since the heavy flow will be in the left and middle travel lanes when it becomes the three eastbound OR 22 lanes. However, there is only 300 meters (990 feet) available on OR 22 for vehicles traveling from Dallas to McMinnville to weave into the right most lane and decelerate from a speed of 55 to 25 MPH to use the eastbound off-ramp. This design will not meet OHP spacing distance between the eastbound OR 22 on-ramp and the lane drop at the southeast jug-handle off-ramp. The OHP requires a standard spacing of 1.6 kilometers (5,280 feet) between interchange ramps. However, the volume of vehicles making this weaving maneuver is small (less than 10 percent of the typical peak hour eastbound vehicles in 2025 even if all vehicles making this move came from DRH and none came from OR 22). The 1994 AASHTO recommends 100 meters to decelerate from 55 to 25 MPH leaving 200 meters for eastbound vehicles to weave. Using the latest HCS software, the eastbound weaving section will operate at a V/C ratio of 0.57 during the A.M. peak hour in the year 2025. Preliminary Design Unit does not consider it a fatal flaw.

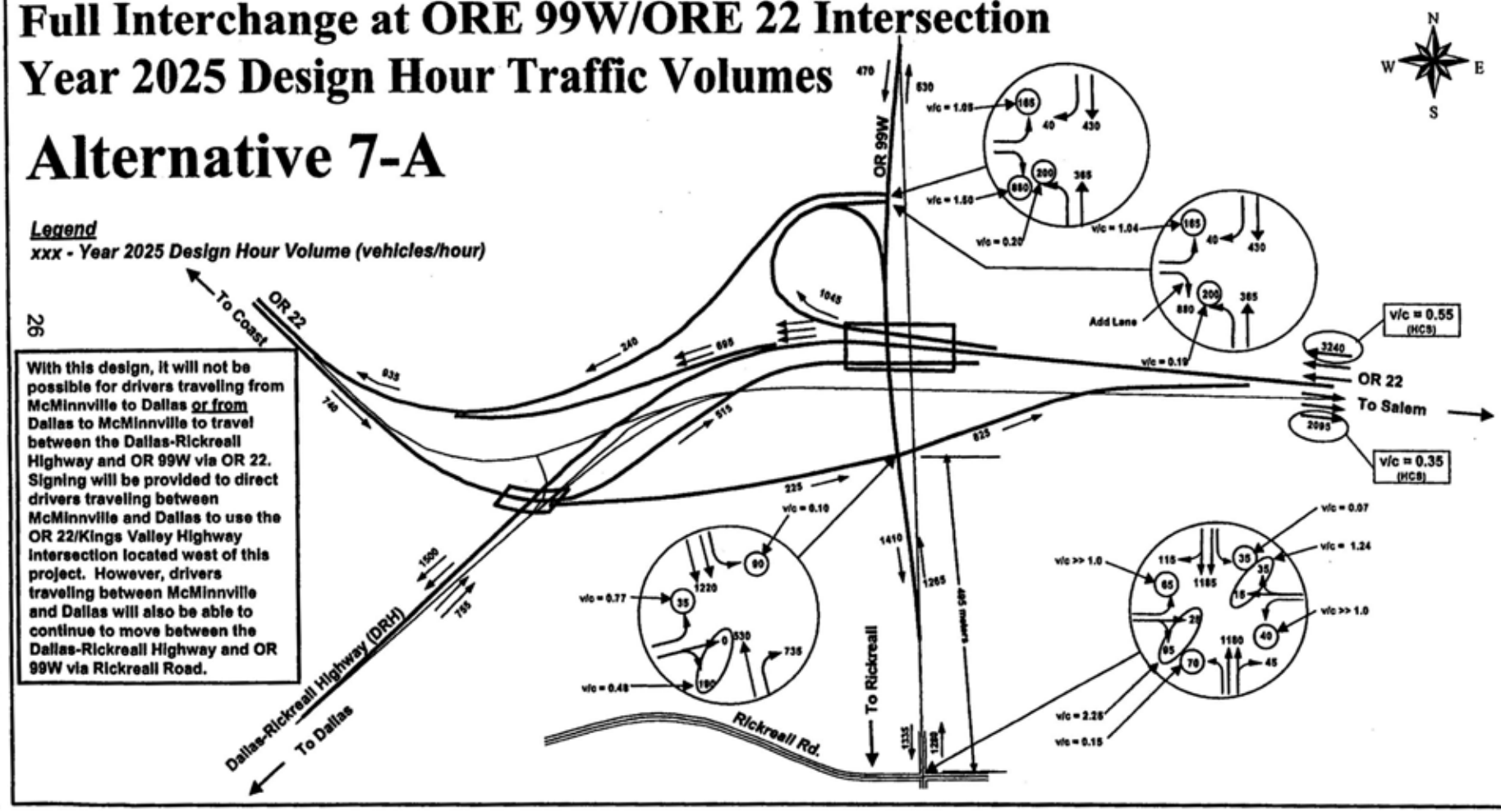
The three westbound OR 22 lanes split into two lanes for westbound (coast) OR 22 vehicles and two lanes for southwesterly DRH vehicles traveling to Dallas. Locating the westbound OR 22 on-ramp west of the westbound OR 22/DRH intersection eliminates the weave on OR 22 between the westbound OR 22 on-ramp and the DRH intersection. This eliminates the weave and speed differential concerns on OR 22 between OR 99W and DRH.

Alternative 7-A (Figure 11)

This is the best long-term alternative since it meets both interchange spacing and mobility standards.

Alternatives 7-A combines the two OR 22/OR 99W and OR 22/DRH intersections into a single interchange complex with freeway style ramps. This alternative includes a structure on OR 22 over OR 99W and a loop ramp in the northwest quadrant. OR 22 is

Full Interchange at ORE 99W/ORE 22 Intersection
Year 2025 Design Hour Traffic Volumes
Alternative 7-A



OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RAdvanced.ppt Date : 1/30/2001	Prepared By: Harian Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 11

elevated over OR 99W to lessen the impact to the community of Rickreall. Alternative 7-A has a one-lane structure over DRH for eastbound OR 22 vehicles traveling from the coast to Salem. Traffic signals are not needed at either eastbound or westbound ramp terminals if an "add-lane" is constructed on OR 99W southbound to move the traffic coming from the westbound ramp terminals (the Salem to OR 99W southbound vehicles).

Route continuity is preserved on OR 22 by having three westbound OR 22 lanes and then splitting these three lanes into two toward the coast and two toward Dallas. This will also better fulfill driver's expectations since OR 22 will have two lanes going to the coast instead of only one lane.

This interchange configuration will not provide a direct route for McMinnville/Dallas or Dallas/McMinnville traffic flows. These drivers will have to reroute to the Kings Valley Highway or one of the roads from Dallas that intersect with OR 99W to reach their destinations (Rickreall Road, Clow Corner Road, etc.). This rerouting of traffic flows will likely cause the OR 99W/Rickreal Road intersection to meet Preliminary ADT Traffic Signal warrants by about 2020. A technical memorandum explaining more detail about potential OR 99W/Rickreall Road intersection improvements is provided in Appendix C.

The interchange portion of this alternative will meet both mobility standards and spacing standards. The OR 99W/Rickreall Road unsignalized intersection will meet spacing standards, however, it will not meet mobility standards for the minor approaches until OR 99W is widened to five-lanes and the intersection is signalized or unless a way is found to reduce demand along OR 99W in Rickreall.

Introduction of Two New Alternative Proposals During the Later Stages of this Refinement Study (Alternatives 7-A.1 and 7-C)

When discussion of this project began during the OTIA project selection process, Alternative 6-C was thought to be the most cost-effective solution for the 20-year planning horizon. However, there was concern about eastbound traffic flows traveling from the coast on OR 22 weaving across two lanes of traffic to exit at the eastbound OR 22 interchange off-ramp. In order to address this concern, Alternative 7-A.1 was proposed, which would design the eastbound OR 22 ramp terminals as a half-diamond interchange and eliminate the weave.

Alternative 7-C, which has a standard diamond interchange design in the northeast quadrant, was proposed as a way to potentially address concerns that removing the signal at OR 22 and OR 99W would eliminate gaps in the traffic flow in Rickreall. This alternative was the only alternative that would warrant a traffic signal on OR 99W at the end of construction that ODOT Traffic Management Section would support. This signal would be located at the westbound OR 22 off-ramp intersection with OR 99W. This alternative was analyzed to determine if the signal would improve gap opportunities in Rickreall and, as a result, improve pedestrian safety and local accessibility to OR 99W.

Both of these alternatives are discussed in more detail below:

Alternative 7-A.1 (Figure 12)

Alternative 7-A.1 is a "scaled-down" version of Alternative 7-A. Alternative 7-A.1 has one less lane on OR 22 in both eastbound and westbound directions and DRH remains a two-lane roadway in lieu of the four-lane roadway proposed in Alternative 7-A. Like Alternative 7-A, Alternative 7-A.1 has a loop ramp in the northwest quadrant which is an "add-lane" onto OR 99W that enables off-ramp drivers to "free-flow" onto southbound OR 99W with minimal interference from other southbound OR 99W vehicles. As with all of the alternatives, a new local (county) road north from Rickreall Road along the eastern portion of Rickreall will provide access to the elementary school, Grange and Mason Lodge and enable implementation of the access plan for the interchange.

There are approximately 490 meters (1,600 feet) between the eastbound OR 99W ramp terminals and Rickreall Road. This meets the OHP ramp-to-local street spacing of 400 meters (1,320 feet). However, there are two streets between Rickreall Road and the ramp terminals. Pageant Street, located approximately 140 meters (500 feet) south of the ramp terminals, will need to be closed because direct access from the street onto OR 99W will affect interchange operations. Church Street is located approximately 270 meters (890 feet) south of the eastbound OR 22 ramp terminals. Region has indicated that the OR 99W/Church Street intersection will remain a full movement access at this time. When additional turn lanes or travel lanes are needed on OR 99W to handle traffic flows, it is possible that the Church Street access will be limited to right in/out movements through the use of a median. Any median in this vicinity would need to be "mountable" (i.e., designed to allow Fire and Emergency vehicles to cross over). These issues will be studied in a future refinement plan that will deal with capacity, safety and access issues while trying to maintain a "livable community".

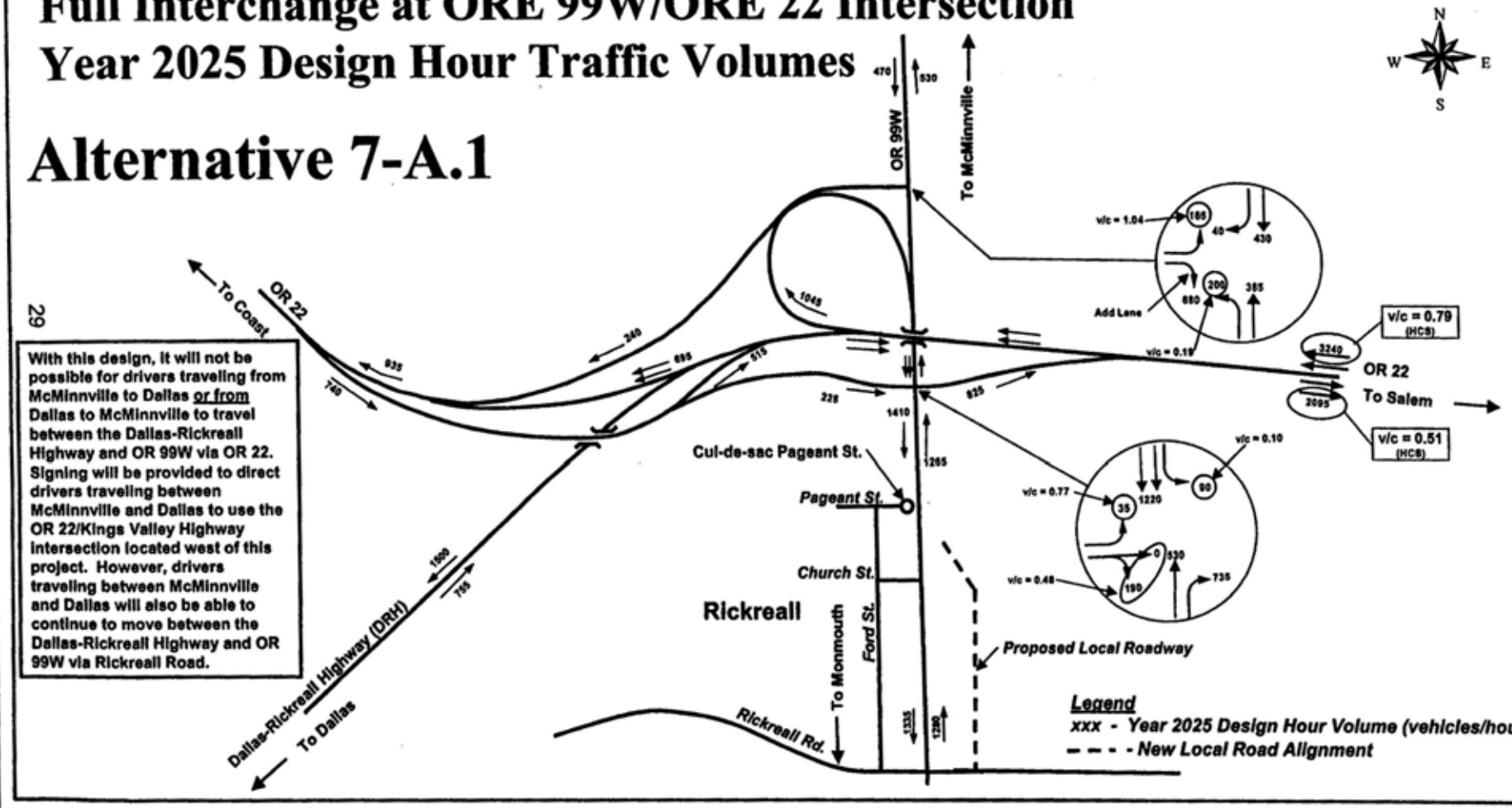
It is anticipated that the need to add lanes to and implement more stringent access management on OR 99W will occur within an approximately 15-20-year horizon. It is also anticipated that traffic signal warrants at Rickreall Road will also be met in this same period. When signalized, Rickreall Road will be better able to handle additional traffic diverted from residences and businesses whose access may be affected by installation of a median.

There was concern within the community that there would not be sufficient gaps within future OR 99W traffic flows for pedestrian to safely cross OR 99W and particularly for children to walk to and from school. Concern about access to homes and businesses were also raised. A simulation using SYNCHRO software has indicated there will be adequate gaps within future OR 99W traffic flows for pedestrians and local access. As with all other interchange alternatives, this alternative provides an improved school crossing with a center-median pedestrian refuge area enabling pedestrians to cross OR 99W in two stages (crossing just one lane of traffic at a time).

After further analysis and consideration, Alternative 7-A.1 was the alternative that was selcected to build. There was not enough funding to build Alternative 7-A, therefore, the design was modified to both meet the funding restrictions while still providing the

Full Interchange at ORE 99W/ORE 22 Intersection
Year 2025 Design Hour Traffic Volumes

Alternative 7-A.1



With this design, it will not be possible for drivers traveling from McMinnville to Dallas or from Dallas to McMinnville to travel between the Dallas-Rickreall Highway and OR 99W via OR 22. Signing will be provided to direct drivers traveling between McMinnville and Dallas to use the OR 22/Kings Valley Highway intersection located west of this project. However, drivers traveling between McMinnville and Dallas will also be able to continue to move between the Dallas-Rickreall Highway and OR 99W via Rickreall Road.

OREGON DEPARTMENT OF TRANSPORTATION

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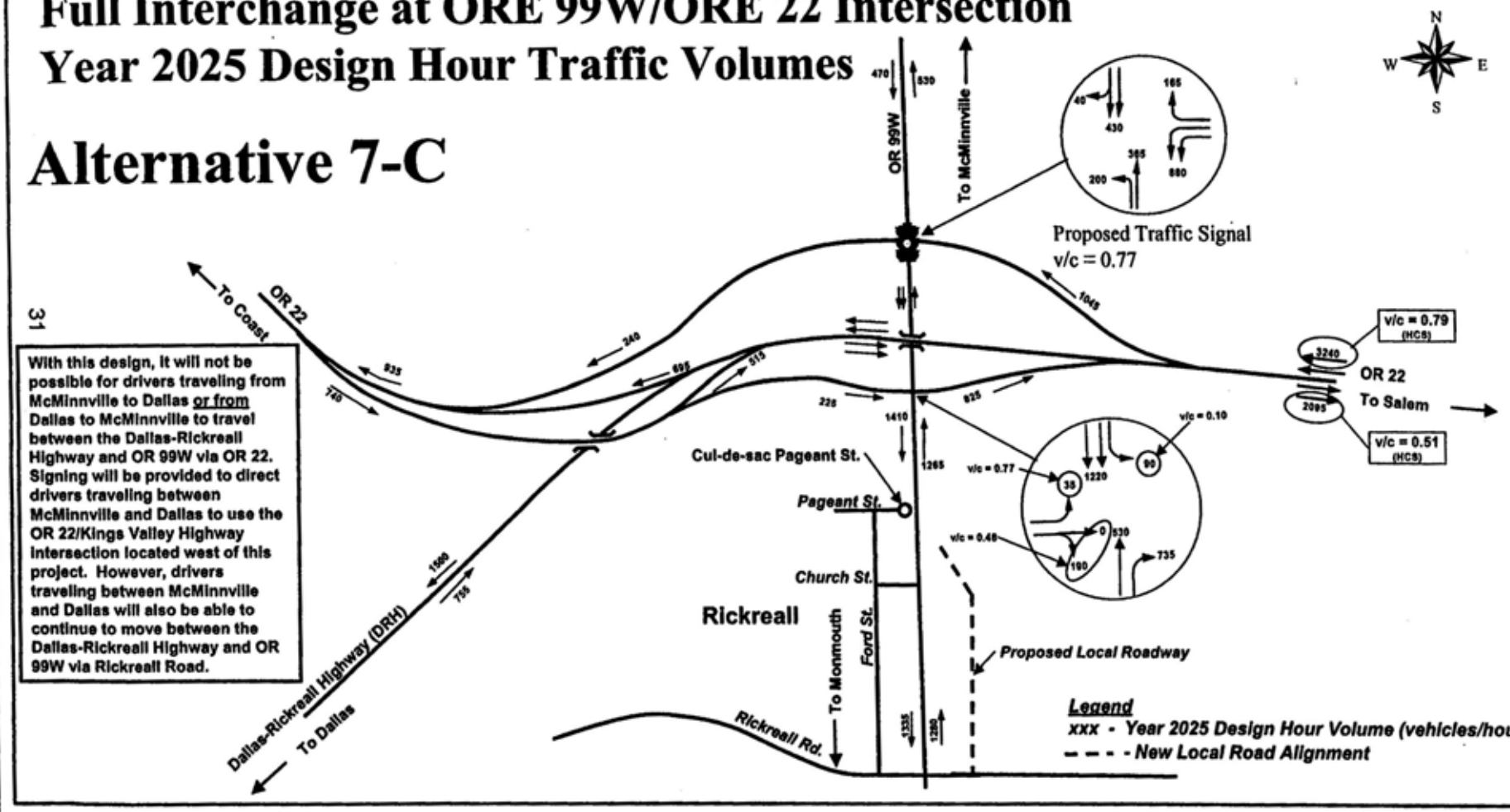
OR 99W/OR 22 Junction Refinement Plan Polk County	File : Rick7-A.1.ppt Date : 10/15/2002	Prepared By: Harlan Nale, P.E. Rev. By: Dorothy Upton, P.E.	FIGURE 12

Full Interchange at ORE 99W/ORE 22 Intersection
Year 2025 Design Hour Traffic Volumes

Alternative 7-C



With this design, it will not be possible for drivers traveling from McMinnville to Dallas or from Dallas to McMinnville to travel between the Dallas-Rickreall Highway and OR 99W via OR 22. Signing will be provided to direct drivers traveling between McMinnville and Dallas to use the OR 22/Kings Valley Highway intersection located west of this project. However, drivers traveling between McMinnville and Dallas will also be able to continue to move between the Dallas-Rickreall Highway and OR 99W via Rickreall Road.

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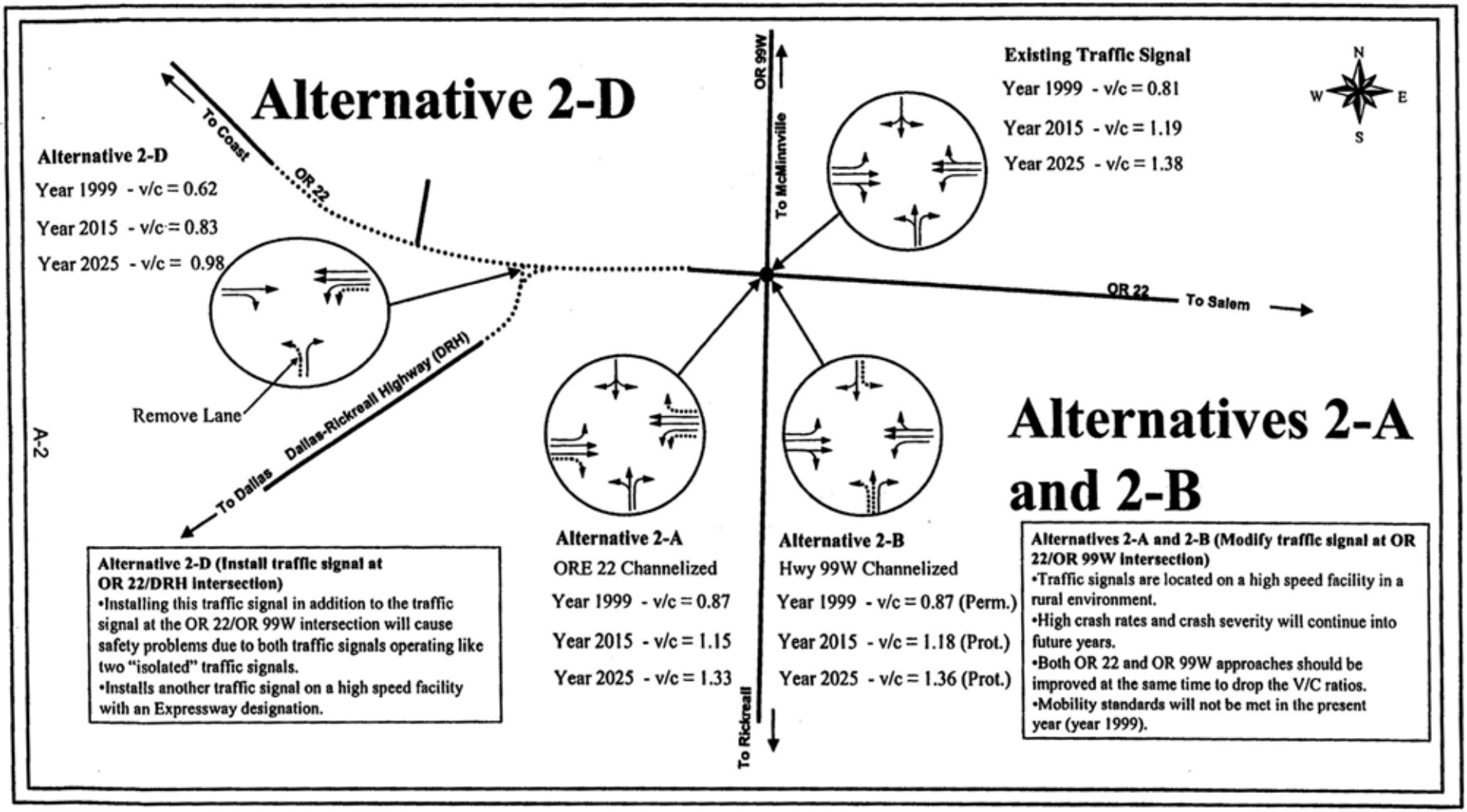
Recommendation

Alternative 7-A is the best long-term alternative for traffic. However, due to funding limitations, Alternative 7-A.1 is the selected alternative. It provides the interchange with enough lane capacity to meet the 20- to 25-year traffic demand and can be expanded into the full Alternative 7-A configuration at a later date. Alternatives 7-A and 7-A.1 are the only alternatives evaluated that eliminates the OR 22/OR 99W traffic signal while eliminating the potential dangerous weave movements on OR 22 between OR 99W and the Dallas Rickreall Highway (OR 223).

APPENDIX A

ALTERNATIVES CONSIDERED, BUT NOT ADVANCED

1. Appendix A summarizes the alternatives that were considered, but not advanced for this project. More information about the alternatives may be found in the "Build Alternatives" Section, and Table 1 in the main body of this report.
2. Geometric Design and Operational Analysis for Roundabout Intersection Alternatives.
3. Geometric Design and Operational Analysis for Single Point Interchange Alternative.



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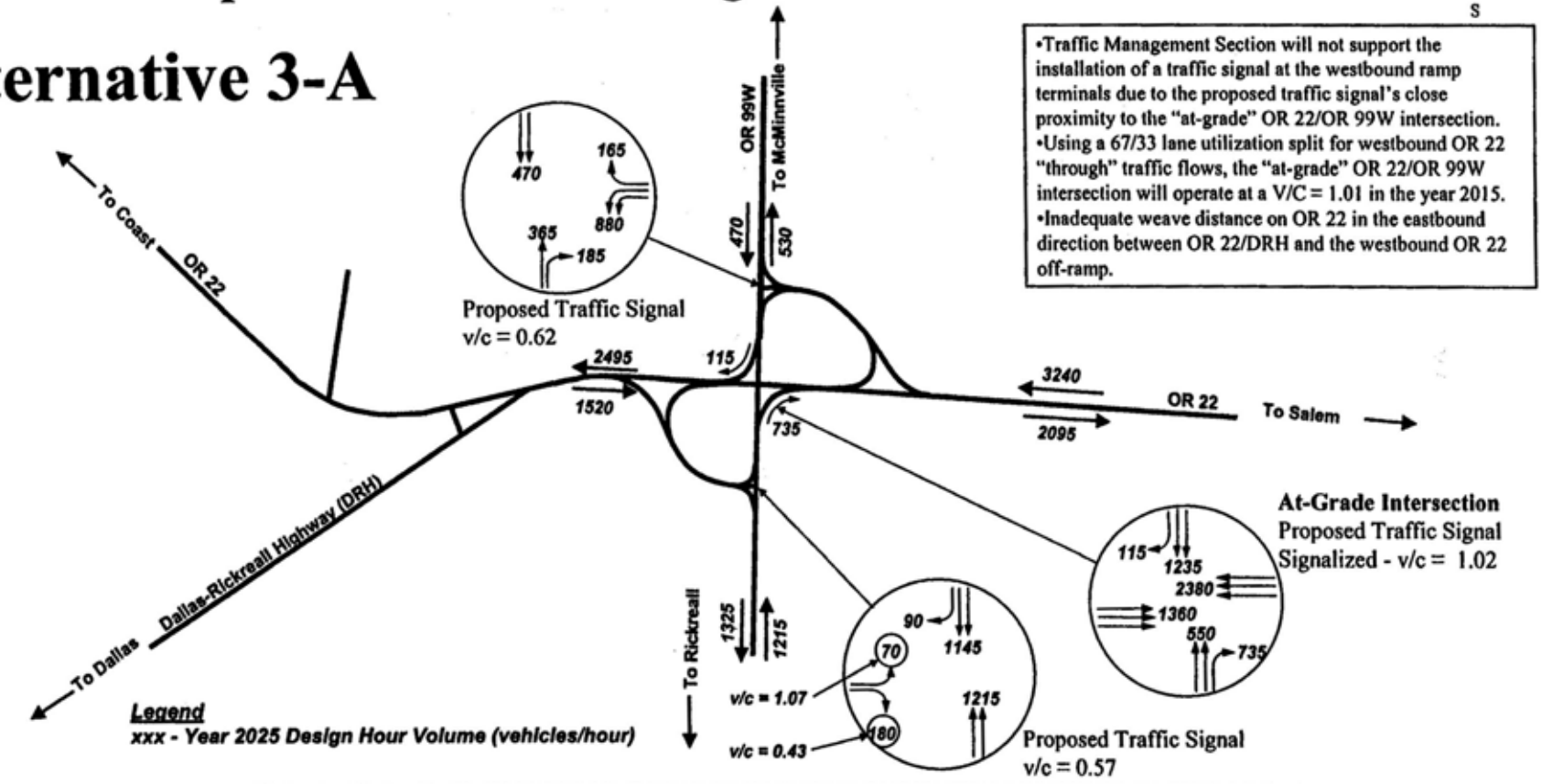
OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 14

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection
"At-Grade" Option - Year 2025 Design Hour Traffic Volumes

Alternative 3-A



A-3

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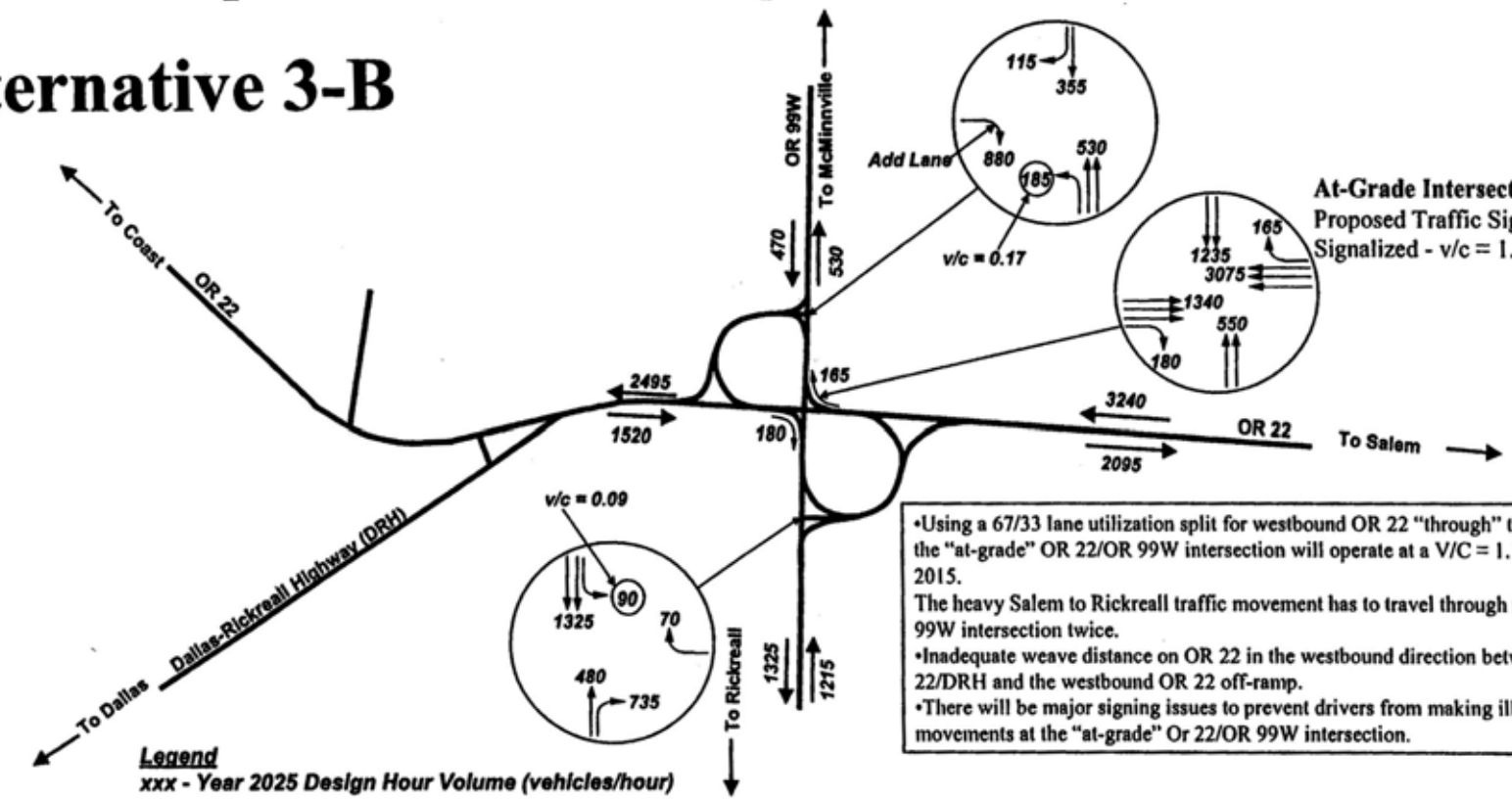
TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 15

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection
"At-Grade" Option - Year 2025 Design Hour Traffic Volumes

Alternative 3-B



- Using a 67/33 lane utilization split for westbound OR 22 "through" traffic flows, the "at-grade" OR 22/OR 99W intersection will operate at a V/C = 1.11 in the year 2015.
- The heavy Salem to Rickreall traffic movement has to travel through the OR 22/OR 99W intersection twice.
- Inadequate weave distance on OR 22 in the westbound direction between OR 22/DRH and the westbound OR 22 off-ramp.
- There will be major signing issues to prevent drivers from making illegal turning movements at the "at-grade" Or 22/OR 99W intersection.

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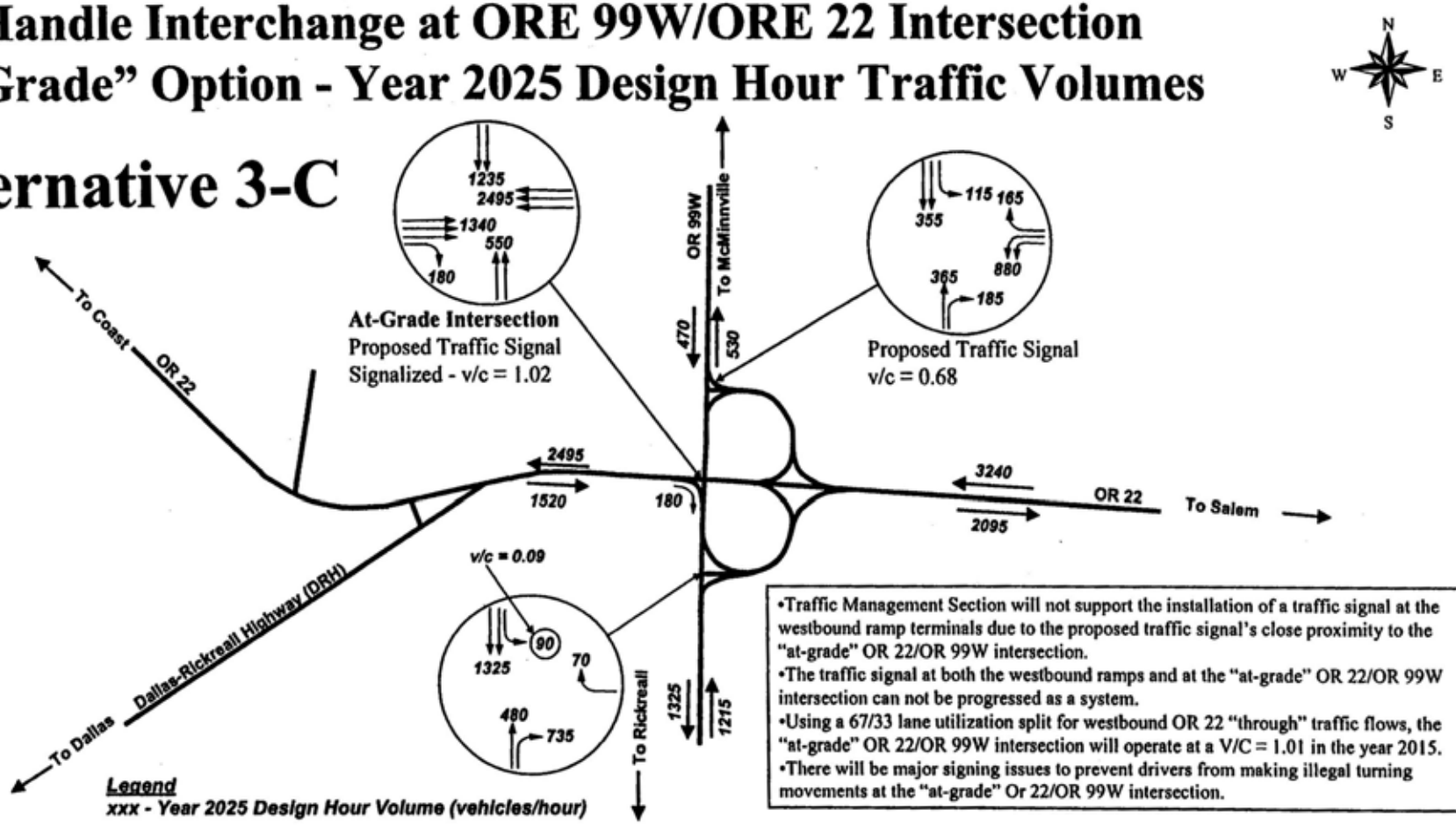
OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 16

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection
"At-Grade" Option - Year 2025 Design Hour Traffic Volumes

Alternative 3-C



- Traffic Management Section will not support the installation of a traffic signal at the westbound ramp terminals due to the proposed traffic signal's close proximity to the "at-grade" OR 22/OR 99W intersection.
- The traffic signal at both the westbound ramps and at the "at-grade" OR 22/OR 99W intersection can not be progressed as a system.
- Using a 67/33 lane utilization split for westbound OR 22 "through" traffic flows, the "at-grade" OR 22/OR 99W intersection will operate at a V/C = 1.01 in the year 2015.
- There will be major signing issues to prevent drivers from making illegal turning movements at the "at-grade" Or 22/OR 99W intersection.

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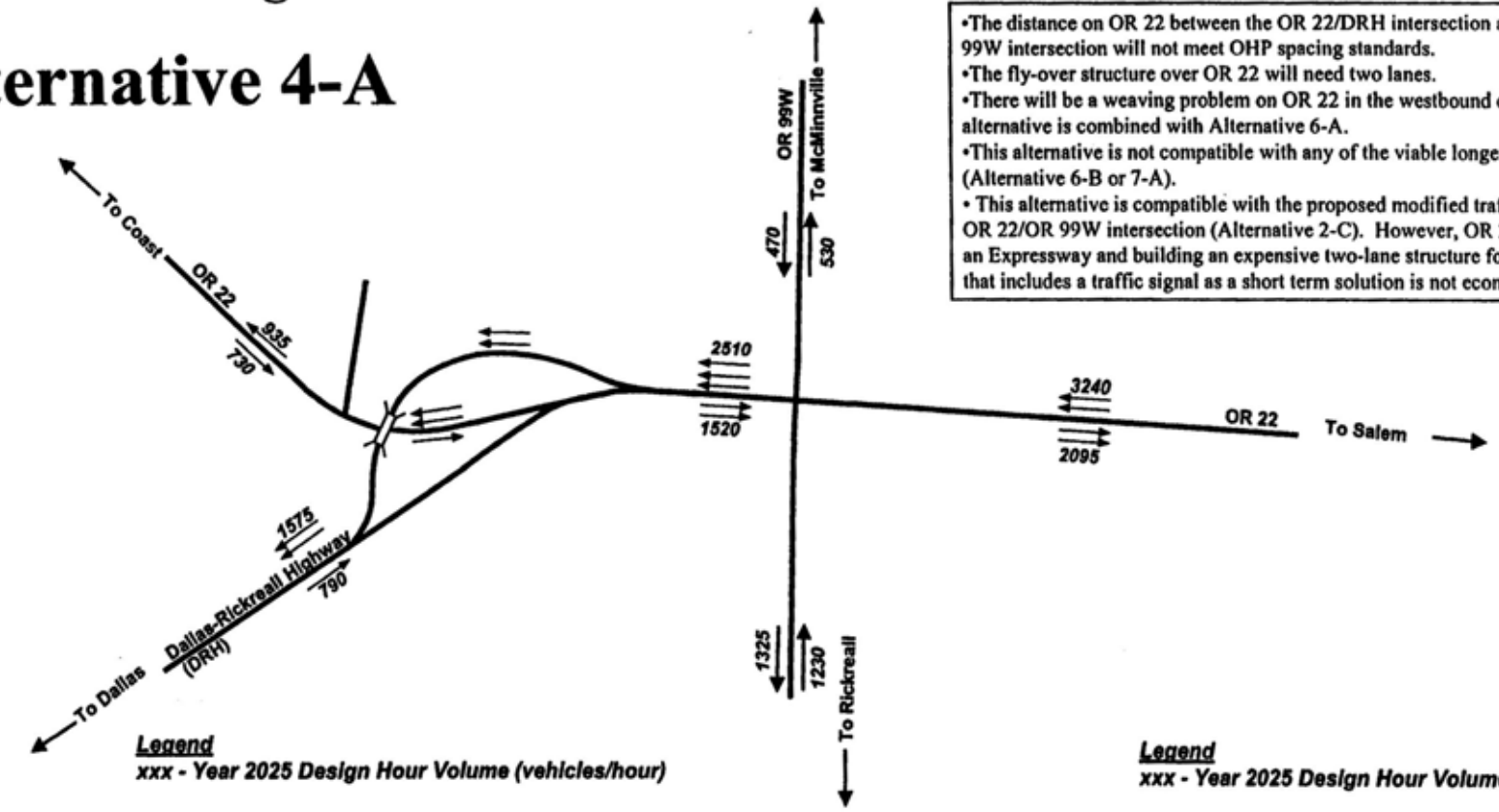
OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 17

"Fly-Over" Option at ORE 22/DRH Intersection
Year 2025 Design Hour Traffic Volumes

Alternative 4-A



- The distance on OR 22 between the OR 22/DRH intersection and the OR 22/OR 99W intersection will not meet OHP spacing standards.
- The fly-over structure over OR 22 will need two lanes.
- There will be a weaving problem on OR 22 in the westbound direction if this alternative is combined with Alternative 6-A.
- This alternative is not compatible with any of the viable longer term Alternatives (Alternative 6-B or 7-A).
- This alternative is compatible with the proposed modified traffic signal at the OR 22/OR 99W intersection (Alternative 2-C). However, OR 22 is designated as an Expressway and building an expensive two-lane structure for an alternative that includes a traffic signal as a short term solution is not economically feasible.

Legend
xxx - Year 2025 Design Hour Volume (vehicles/hour)

A-6

OREGON DEPARTMENT OF TRANSPORTATION

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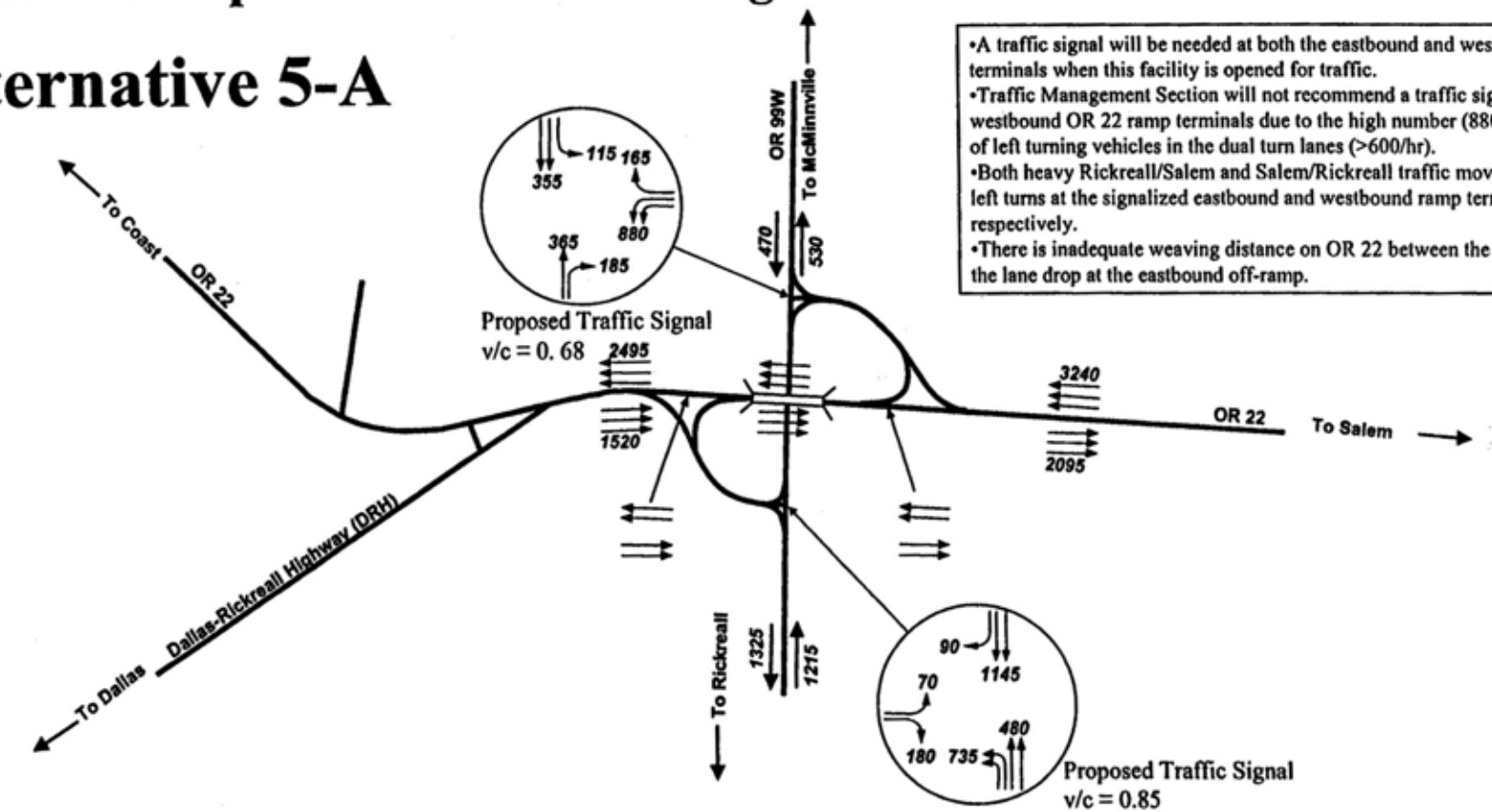
OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 18

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection
"Structure" Option - Year 2025 Design Hour Traffic Volumes

Alternative 5-A



A-7

OREGON DEPARTMENT OF TRANSPORTATION

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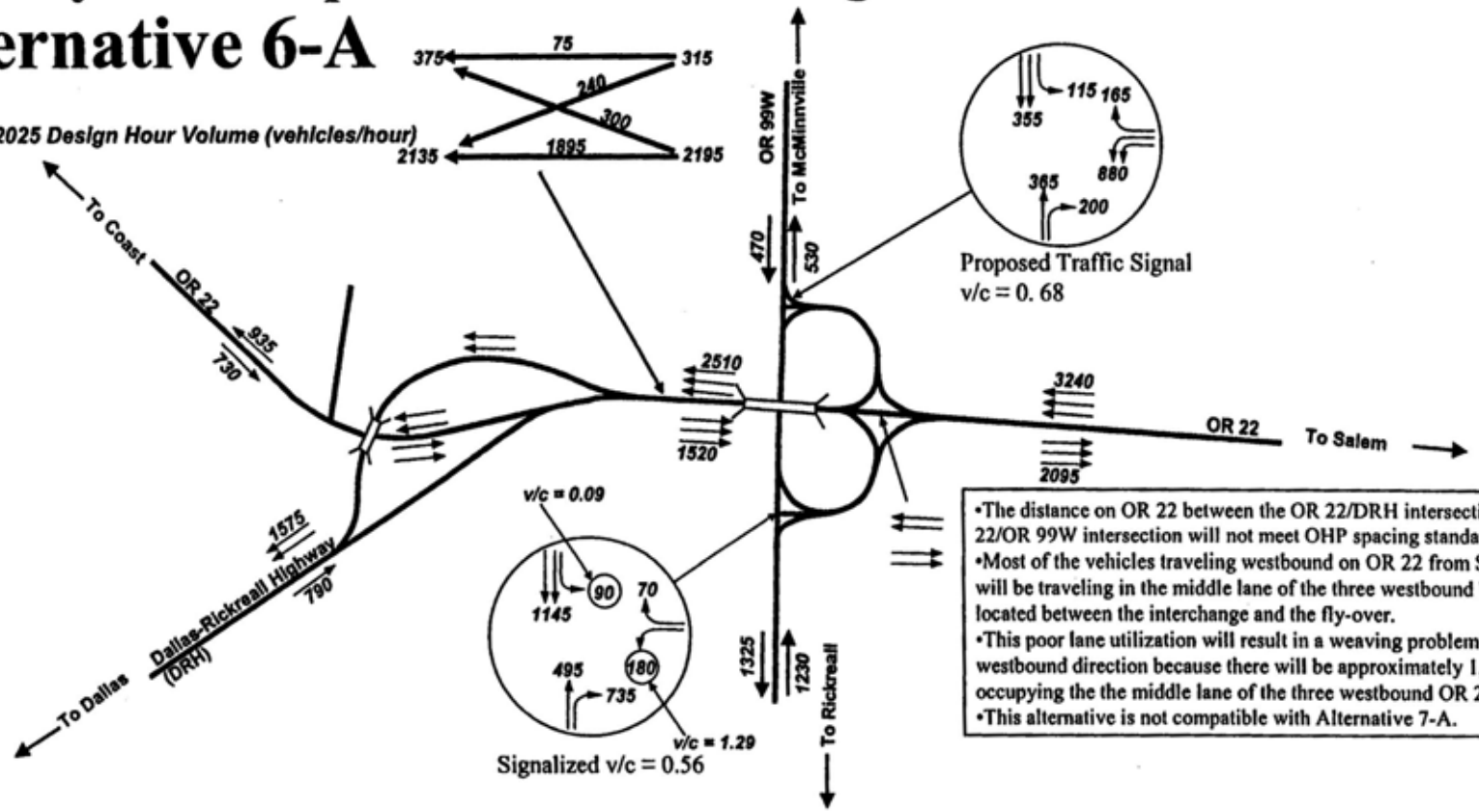
OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 19

Jug-Handle Interchange at ORE 99W/ORE 22 Intersection with "Fly-Over" Option - Year 2025 Design Hour Traffic Volumes

Alternative 6-A



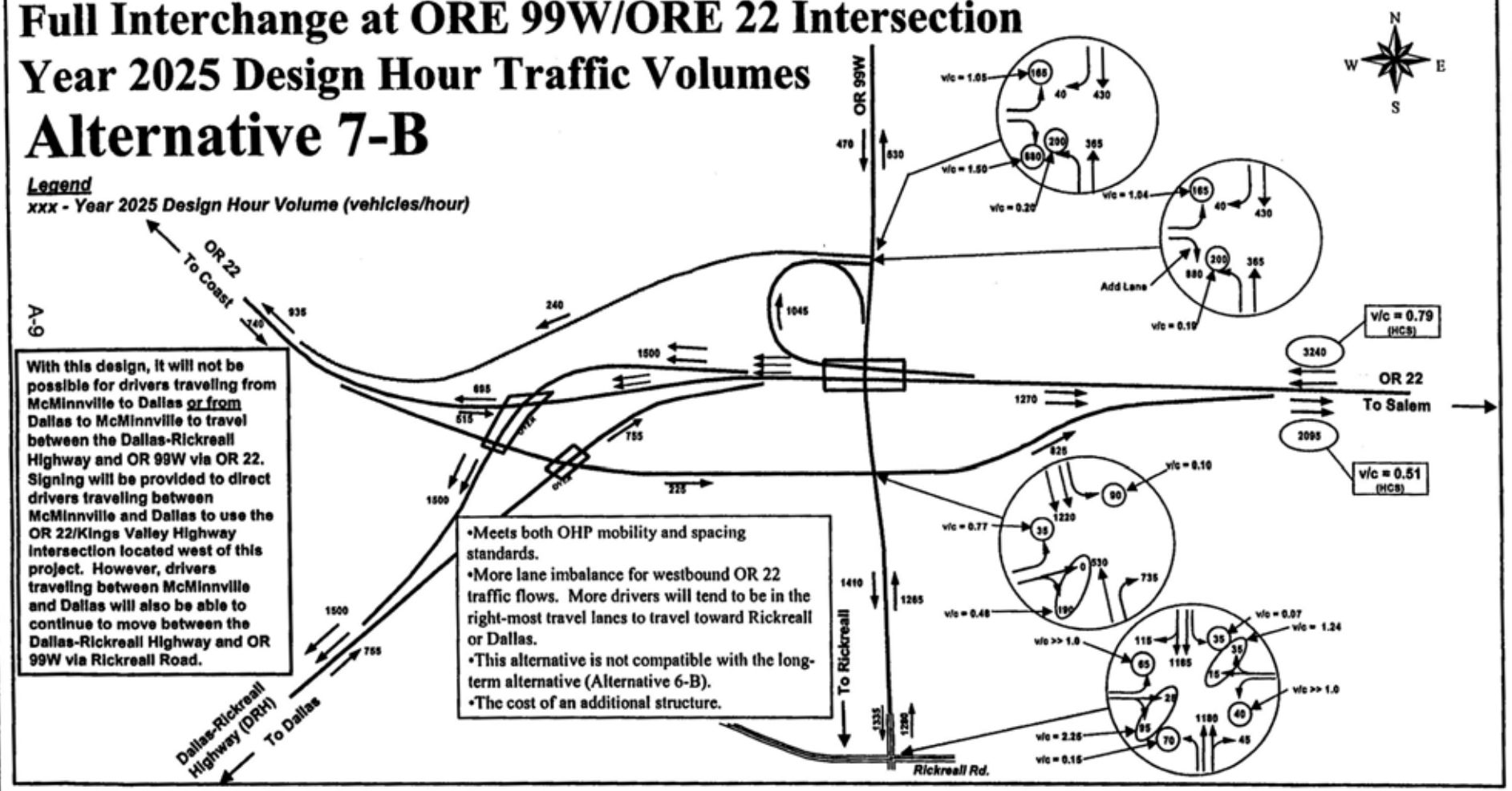
- The distance on OR 22 between the OR 22/DRH intersection and the OR 22/OR 99W intersection will not meet OHP spacing standards.
- Most of the vehicles traveling westbound on OR 22 from Salem to Dallas will be traveling in the middle lane of the three westbound lanes that are located between the interchange and the fly-over.
- This poor lane utilization will result in a weaving problem on OR 22 in the westbound direction because there will be approximately 1,740 vehicles/hour occupying the the middle lane of the three westbound OR 22 lanes.
- This alternative is not compatible with Alternative 7-A.

OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 20

Full Interchange at ORE 99W/ORE 22 Intersection
Year 2025 Design Hour Traffic Volumes
Alternative 7-B



OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	File : RLosers.ppt Date : 2/02/2001	Prepared By: Harlan Nale, P.E. Reviewed By: Brian Dunn, P.E.	FIGURE 21

OR 99W/22 Rickreall Junction Refinement Plan
Geometric Design and Operational Analysis
Technical Memorandum #1
Roundabout Intersection Alternatives

Roundabout intersection control was evaluated for both the intersections of Hwy. 22 @ 99W and Hwy. 22 and Hwy. 189 (Dallas – Rickreall Hwy.). Transportation analysis provided by ODOT's Transportation Planning and Analysis Unit showed that each intersection would require two lane roundabouts and that the OHP mobility standards would still be violated at both intersections. In addition to the traffic analysis there are several safety and geometric concerns that would suggest roundabout intersection control is not appropriate at either of the two proposed locations.

Geometric Design and Safety Issues:

The Preliminary Design Unit, lead a recent research project evaluating the effectiveness of roundabouts and developed siting criteria to help aide in locating these types of intersection control in the areas that best suit their operating characteristics. Evaluating these intersections with the adopted siting criteria (attached) shows that the proposed locations violate several of the recommended characteristics.

- Speed – Posted speed should be 60 km/h (35 mph) or less. These intersections are located in rural high speed environments posted speed of 50 mph with actual 85% speeds closer to 60 mph. Roundabout intersections require every entering vehicle to slow and yield to traffic already within the circulatory roadway. In some cases entering vehicles will be required to stop. Either a slow yielding entry or a stopped vehicle produces a large speed differential from the traveling speeds of the highway. The speed differential could range anywhere from 40 mph to 60 mph, which is very significant. Large speed differentials can often lead to high accident locations. This is evident at the existing signalized intersection of Hwy. 99 and 99W. This signalized intersection encounters a very high number of rear end crashes most of which can be attributed to the high-speed differential. In addition, drivers in rural environments do not expect to encounter situations that provide high-speed differentials and therefore the crash potential is even higher.

  Any roundabout design at these locations would need to provide mitigation measures to reduce the speed differential. This means physical adjustments to all highway segments approaching the roundabout to transition traffic speeds from high speed to low speed. However, these types of physical

modifications can also lead to an increase in some accidents particularly rear end crashes. Therefore, the actual crash experience will extend beyond the limits of the roundabout and include the highway speed transition segments.

- Trucks – Roundabouts should not be located at intersections that accommodate a large volume of trucks. The Hwy. 22 @ 99W intersection accommodates on average approximately 2000 trucks per day. This is a large volume of truck traffic. Moderate to large trucks have difficulty in maneuvering through a roundabout. Roundabouts are designed to provide low speed movements for passenger type vehicles and even slower movements for truck traffic. This is accomplished by requiring vehicles to accommodate a turning roadway with small radii. Two lane roundabouts require large trucks to utilize both circulatory lanes due to the trailer off tracking. This can create safety as well as operational efficiency problems.

- Number of lanes in roundabout – The interim siting criteria recommends that roundabouts operate as only single lane. This is to reduce the complexity of driving roundabouts. Multi-lane roundabouts offer multiple challenges for drivers. As roundabouts are a relatively new form of intersection control in the USA and particularly in Oregon, drivers need to understand the basic operating principles of single lane roundabouts before they can be expected to use a multi-lane roundabout efficiently and safely. The complexity of multi-lane roundabouts increases with the number of entering legs. The analysis performed by TPAU shows that both intersections would require multi-lane roundabouts with today's volumes.

  Multi-lane roundabouts create several internal conflicts. Truck traffic will use most, if not all of the circulatory roadway. Vehicles on the inside circulatory lane may be sideswiped by the trailer off-tracking. Drivers are used to having their own lane without worrying about infringement from other vehicles. This may cause some problems. Additionally, there are high volumes of left turning traffic at these intersections. Proper use of the roundabout requires left turning traffic to use the inside portion of the roundabout and leave from the inside as well. This will be difficult for many drivers to comprehend and some will make a left turn from the outside lane, which may create safety problems as well as operational efficiency issues.

In addition, roundabouts at both proposed locations are not consistent with other site characteristics that are recommended by the recently completed ODOT Roundabout research study. These include:

- Equal Traffic Flows – Roundabout intersections operate best where the volume entering the roundabout from each direction are nearly equal. Roundabouts do not operate effectively where one or two entry volumes are significantly higher than the other entries. Additionally, roundabouts are less effective with high left turn volumes. Both the Hwy. 22 @ 99W and Hwy. 22 @ 189 intersections accommodate heavy left turn traffic from westbound to

southbound. These left turn demands are forecast to be 880 and 1575 respectively. These are very large volumes and will reduce the effectiveness and safety of a roundabout intersection.

- Roundabout interaction with other traffic control devices – Roundabout intersection control was discussed in conjunction with one of the intersections being signalized. Additionally, a roundabout was proposed at Dallas – Rickreall Highway with an interchange at the Hwy. 22 @ 99W intersection. Both of these proposals create significant operational issues. First of all queuing, or storage problems at either the roundabout or signalized intersection could affect the operations at one or both intersections. Additionally, there will be operational problems for westbound traffic from an interchange at Hwy. 22 @ 99W to a roundabout intersection at the Dallas – Rickreall Highway. Traffic will be accelerating to highway speeds and merging, drivers will not expect an intersection control closely spaced that requires them to slow to 20 mph or even stop. Therefore roundabout intersection control at both intersections would be necessary to ensure proper vehicle interaction between the two intersections.

Traffic Analysis Results:

The following tables show the traffic analysis results for roundabout intersection control at both Hwy. 22/99W and Hwy. 22/DRH. As the analysis shows, the existing traffic demand at the Hwy. 22/99W intersection requires a double lane roundabout with 1999 volumes. The Hwy. 22/DRH intersection does operate at acceptable levels as a single lane roundabout with two by-pass lanes (DRH to Salem and WB traffic on Hwy. 22) under 1999 traffic conditions. However, by the time any improvement would be constructed, the single lane roundabout V/C ratio will most likely be over the OHP mobility standards for this highway and therefore require construction of a double lane roundabout immediately.

Table 1 shows the results for the Hwy. 22/99W intersection:

Table 1: Analysis Results for Hwy. 22/99W Intersection

Type of Roundabout	Year	Approach Volume to Capacity (V/C) Ratio			
		South	West	North	East
Single	1999	1.03	0.82	1.40	1.39
Double	1999	0.37	0.45	0.38	0.70
Double	2015	0.75	0.77	2.42	1.15
Double	2025	1.18	0.96	1.71	1.53

As can be seen in Table 1, a double lane roundabout barely meets the OHP mobility standards for 1999 traffic volumes. By the time construction would be completed (at least 2005, the mobility standards will not be met at this

intersection. Additionally, the roundabout would be over capacity before 2015. Extrapolating the above data shows that the roundabout will be at capacity for the east approach around 2010. This means that a double lane roundabout constructed in 2005 would at most only last 5 years before reaching capacity.

Table 2 shows the results for the Hwy. 22/DRH intersection:

Table 2: Analysis Results for Hwy. 22/DRH Intersection

Type of Roundabout	Year	Approach Volume to Capacity (V/C) Ratio		
		South	West	East
Single (No Bypass Lanes)	1999	0.46	0.60	0.81
Single (With Two Bypass Lanes)	1999	0.01	0.65	0.54
Single (With Two Bypass Lanes)	2025	0.01	6.80	0.87
Double	1999	0.39	0.27	0.50
Double	2015	0.62	0.61	0.68
Double	2025	0.67	1.42	0.81

Table 1 shows that a double lane roundabout at the Hwy. 22/DRH intersection would function within the OHP mobility standards through 2015. However, the OHP standards would be violated the next year. In addition, extrapolating the data for the west approach shows that the roundabout would reach capacity around 2020.

The computer program SIDRA was used to do the analysis. This program may be a little optimistic when it comes to computing roundabout operation within the United States. The analysis model was developed in Australia where roundabouts have been used extensively for over 50 years. The model assumes that drivers actually drive multi-lane roundabouts in an aggressive and optimistic manner. Drivers in the United States will probably drive roundabouts much more conservatively than in areas where they have been used for a long time. The research work actually confirmed that US drivers do not drive multi-lane roundabouts properly therefore reducing the efficiency of the intersection. This means that the actual operations of the double lane roundabouts will most likely be worse than the model is predicting.

Summary:

Roundabout intersection control is not recommended at either intersection due to the numerous safety and operational aspects of this type of intersection control at these locations. These problems include large speed differentials, truck volume, truck – vehicular conflicts, unequal traffic volumes, complexity of multi-lane operation, lack of compatibility with other design options, and highway mobility standards cannot be met in the design year.

OR 99W/22 Rickreall Junction Refinement Plan
Geometric Design and Operational Analysis
Technical Memorandum #2
Single Point Interchange Alternative

A Single Point Interchange alternative was evaluated for the intersection of Hwy. 22 @ 99W. This alternative was discussed as a design technique that could reduce the impacts of an interchange to the Rickreall community. This alternative was not advanced due to higher overall construction costs, right of way impacts, lack of compatibility of phasing, and the alternative did not offer any real advantages over other long term design alternatives. No transportation analysis was performed for this alternative.

Alternative Description:

This alternative consists of building a single point diamond interchange at the Hwy. 22 @ 99W intersection as well as grade separating the Hwy. 22 @ 189 intersection. The single point diamond design is a tight or compressed design where the ramps are closely spaced to the highway and curve inward towards each other to form one singe intersection underneath the overcrossing structure. However, due to the close proximity of the Hwy. 22 @ 189 intersection, the ramps to the Dallas – Rickreall Highway (189) need to be separated from the Hwy. 22 @ 99W ramps. This requires exiting westbound traffic bound for Hwy. 189 prior to the exit to Highway 99W. The ramp roadway then crosses over Hwy. 99W, then curves over Hwy. 22 to connect with the existing Hwy. 189. For eastbound traffic there are two options. The first option is to realign the eastbound portion of Hwy. 189 to run parallel to and south of Hwy. 22. Hwy. 189 eastbound would then cross over Hwy. 99W and then merge with Hwy. 22 just prior to the railroad structure. The second option is to braid the eastbound portion of Hwy. 189 with the eastbound exit ramp to Hwy. 99W. This option may reduce the overall footprint over the first option.

Alternative Evaluation:

This alternative was not advanced for the following reasons:

- Cost – The estimated construction cost for this alternative is approximately $17.5 million. This is $1.5 - $3 million more than the other two full build interchange alternatives. This alternative requires 4 structures, 1 – 2 more than the other alternatives. Additionally, this design requires substantial retaining walls along the Hwy. 99W ramps. Finally, this alternative may require additional right of way than the other alternatives that would increase the costs further.

- Right of Way Impacts – This alternative would likely require more right of way than the other full build alternatives. This would require taking more farmland. It is a statewide planning and project goal to minimize or avoid taking farmland whenever possible.

- Ability to Phase the Project – This alternative can not be phased with any of the short to mid-range solutions being considered. All short and mid-range solutions would end up being throw away if this alternative is selected as the full long term solution. The ability to phase improvements was an important element in selection of preferred alternatives. This alternative fails this goal.

- No Distinctive Advantages – The single point interchange option did not offer any significant or unique benefits as far as operational performance, right of way impacts, community impacts, cost, or phasing. Overall, this alternative performed at a level equal to or less than the other grade-separated alternatives in all of the evaluation categories.

On the basis of the reasons above, the single point interchange alternative was not advanced and is not recommended for further consideration.

APPENDIX B

TRAFFIC DEVELOPMENT & ANALYSIS METHODOLOGY

TRAFFIC DEVELOPMENT

Base and future year traffic data used for the transportation analysis was developed from the following:

- Manual Counts at key locations
- ODOT's Permanent Recorder Stations
- ODOT's Traffic Volume Tables
- Maps depicting land use and development potential in the study area.
- Anticipated major traffic generators within the region
- Proposed expansion of major traffic generators within the region
- Polk County Fairgrounds Traffic Information
- Alternative Mode Projections
- Bridgehead Engineering Study
- Population Projections

Manual Counts at Key Locations

Manual turn movement counts including truck classification breakdowns were taken at the following locations shown in Table 2:

Table 2: Manual Count Locations

Location	Date	Duration (hours)
Or 22/Greenwood Road	August 17/19, 1997	14
OR 22/Or 99W	November 17/18, 1997	14
OR 22/Or 99W	October 28/29, 1999	16
OR 22/Or 99W	May 17, 2000	2
OR 22/Dallas-Rickreall Highway (DRH)	December 17/20, 1999	16
OR 22/Dallas-Rickreall Highway (DRH)	May 17, 2000	2
OR 22/Kings Valley Highway	July 31 & Aug. 1, 1996	14
OR 99W/Rickreall Road	April 20/22, 1999	14
OR 99W/Rickreall Road	December 21/22, 1999	16
OR 99W/Rickreall Road	November 29, 2000	14
OR 99W/0.02 miles north of Portland & Western Railroad Crossing	March 5,6,10 & 11, 1997	24
OR 99W/0.02 miles north of Portland & Western Railroad Crossing	March 31/April 19/May 2, 2000	24
OR 99W/0.02 miles north of Portland & Western Railroad Crossing	March 5,6,10 & 11, 1997	24

ODOT's Permanent Recorder Stations

ODOT maintains 120 permanent automatic Traffic recorder (ATR) stations throughout the state highway system that record information about highway use throughout the year. The data gathered from these recorders include Average Daily Traffic (ADT), Maximum Day, Maximum Hour, 10th, 20th, 30th Highest Hours shown as a percentage of ADT, truck classification breakdowns, Historical Annual Average Daily Traffic (AADT) by Year, directional traffic splits, and seasonal variations in traffic. The general seasonal adjustments were derived from an average of ATR's that have operational characteristics similar to OR 22.

ODOT's Traffic Volume Tables

ODOT's transportation Volume Tables contain the tabulation listing of ADT values for state highways. Information from these tables provides a basis for the current ADT values and historical growth trends.

Future year traffic projections are typically performed through the use of cumulative analysis, historic growth trends or transportation models. Historic growth trends were determined to be the most accurate method to use for this project. Future growth trends were analyzed at 11 locations and the results are shown in the Table 3:

Table 3: Year 1999 – 2025 Growth Rates for Specific Roadway Sections

Road-Way	Location	Traffic Volume Tables ADT (vehicles/day)			Predicted ADT (vehicles/ day)	Linear Annual Growth Rate	'99-'25' Linear Growth Increase
		1995	1996	1997	2017	(%)	(%)
OR 22	0.02 m. east of Perry-dale Rd. (Dolph Cor.)		7,100		9,400	1.5426	40.11
OR 22	0.21 m. west of Dallas-Rickreall Hwy.		7,200		10,700	2.3148	60.19
OR 22	0.01 m. west of OR 99W		17,100		25,200	2.2556	58.65
OR 22	0.01 M. east of OR 99W		19,300		30,600	2.7881	72.49
OR 22	0.01 m. east of Greenwood Rd.		23,300		35,500	2.4934	64.83*
OR 99W	0.01 m. north of OR 22	4,400			7,300	2.9959	77.89
OR 99W	0.01 m. south of OR 22	8,900			16,100	3.6772	95.61
OR 99W	At Rickreall Bridge	10,500			17,800	3.1602	82.16
OR 99W	0.01 m. north of Orrs Corner Rd.	10,100			16,200	2.7453	71.38
DRH **	0.02 m. west of OR 22			10,800	15,700	2.2685	58.98
DRH **	0.01 m. west of connection to OR 99W			12,500	17,400	1.9600	50.96

* Growth rate is consistent with Salem Model.
** DRH – Dallas-Rickreall Highway

Maps Depicting Land Use and Development Potential in the Study Area

Mid-Willamette Valley Council of Governments (MWVCOG) developed generalized land use and location maps. Vacant lands within the study area and Rickreall community were zoned either Exclusive Farm Use (EFU) or Light Industrial (IL). There were approximately 6.57acres of vacant industrial land. The land use plan for the community of Rickreall may change. The Polk County Planning Department is eliciting proposals from anyone in Rickreall that would like to have their property rezoned.

Presently, there is not any large land use rezoning proposals within the project area that would have a significant effect on the projected traffic volumes for this project.

Anticipated Major Generators within the Region

MWVCOG provided the following list of anticipated traffic generators within the region. Here is the list:

City of Dallas

- A second major grocery store within the next five years.
- More commercial growth is expected along Ellendale Road and Kings Valley Highway.
- City hopes to have wastewater treatment facility expansion completed by August 2003.
- City still receives an increased amount of sewer connections.

City of Monmouth

- Development of a nine-acre commercial development along the Monmouth-Independence Highway (at the S-curve) is expected within the next several years.
- City has annexed approximately 80 acres of residential property that could add approximately 800 residential units.

The additional traffic flow generated from the anticipated major generators that are located within the region will increase traffic volumes significantly within the study area.

Proposed Expansion of Major Traffic Generators within the Region

Dalton Rock - Dallas
- Quarry operations could increase
- It is estimated that 10 percent of the firm's trucks (about 10 trucks) use the OR 22/OR 99W intersection today and could increase about 50 percent in future years.

Hampton Lumber – Willamina
- Ed Immel of ODOT's Rail Division assured the Hampton rail line will continue to operate into the future. Hampton has invested in new railcars.

Willamette Industries – Dallas
- The sawmill facility will be retooled and truck traffic will increase from 30 to 60 percent.
- Presently, approximately 80 trucks/day of the 130 trucks/day travel through the OR 22/OR99W intersection.
- There is a potential for expansion.

Spirit Mountain – Grand Ronde
- Approximately 100 rooms may be added to the existing 100-room overnight facility.
- There are physical constraints at the site that limits growth.

Valley Concrete – Independence
- Approximately five trucks/day use the OR 22/OR 99W intersection.
- The company does not expect this number to increase.

Chinook Winds Casino
- The casino did not respond to MWVCOG.

The additional traffic flows generated from the proposed expansion of major traffic generators within the region will increase traffic volumes within the study area.

Polk County Fairgrounds Information

- The fairground has had a dramatic increase in use during the past two years.
- Moving the Polk County museum to the fairgrounds will increase the visitation at the fairgrounds from 72,000 visitors/year to 76,000 visitors/year.
- It is booked on weekends and does not have much going on during the week.

The use of the Polk County Fairgrounds will continue to increase into the future and will not have a significant impact on the traffic flows within the study area. It is economically infeasible to design the project to adequately handle the traffic flow generated while the Polk County Fair is going on.

Alternative Mode Projections

Hampton Lumber – Willamina

- More lumber will travel by train from Willamina, since Hampton is expected to add new railcars to the rail line.

Public Transit

- CART's makes six trips per day between Salem and Dallas.
- No long-range feasibility studies or trip projections have been made.

Mid-Valley Rideshare

- This program consists of a database of persons interested in carpooling within Salem and outlying communities.
- It is impossible to determine the exact number of commuters from the Dallas area that use the program or to project future use of the program.

Pedestrian and Bicycle Travel

- The study area provides either a bike lane or a shoulder/bikeway and connects to the coast, which makes this roadway a popular bikeway for long-distance touring.
- Paved shoulders serve as pedestrian walkways.

The alternative mode projections have a negligible effect on traffic flows through the study area.

Bridgehead Engineering Study

The Bridgehead Engineering Study concerns future improvements at the bridgeheads at both the Marion Street and the Center Street Bridges in Salem. Region reported at the Technical Advisory Committee (TAC) meeting on June 27, 2000 that future improvement will add enough capacity so that future OR 22 traffic flows will not be restricted on OR 22 between Salem and the study area. If there is spreading at the bridges, the result at the study area would be merely a shifting of the peak hour.

If the transportation system is restricted at the bridgeheads, the design on this project could be reduced in magnitude because fewer vehicles will be able to reach the study area at one time.

Population Projections

Projections were obtained for Polk County and the communities of Dallas, Monmouth and Independence. Both past population values and projections were furnished by the MDWVCOG. Population projections for the years 2020 to 2025 were extrapolated from the Polk County Transportation Systems Plan. These values are shown in Table 4:

Table 4
Projected Population Growth
Polk County and Selected Cities
2000-2025

	1980	2000	Percent Increase 1980-2000 (20 years)	2020	2025*	Percent Increase 2000-2025 (25 years)
Polk Co.	45,203	63,268	40.0%	101,588	114,950	81.7%
Dallas	8,530	12,278	43.9%	18,009	19,823	61.5%
Monmouth	5,594	8,322	48.8%	15,117	17,550	110.9%
Independence	4,024	6,204	54.2%	9,559	10,650	71.7%

Source: Polk county Transportation Plan, 1997
* Extrapolated from 2020 projections in the Polk County Transportation System Plan

The range of growth in the past 20 years for the communities of Dallas, Monmouth and Independence range from 44 to 54 percent. The forecasted growth in the next 25 years for the same communities ranges from 62 to 111 percent. The population is forecasted to grow at a higher rate in the future than in the past.

The traffic flows on the highways are expected to increase between 60 and 91 percent between the years 1999 and 2025. Traffic flow projections do not necessary coincides with population projections, but both indicators do show there will be rapid growth rates in both population and traffic flows in future years.

Traffic Development Summary

The existing traffic volumes for this study were projected into the future using linear growth rates shown in Table 1. The traffic volumes on OR 22 (within the study area) will increase between 60 and 72 percent between the years 1999 and 2025. OR 99W is expected to grow between 71 and 96 percent and DRH between 51 and 59 percent during the same time period.

The projected traffic volumes should incorporate the following items adequately:

- The 6.57 acres of vacant industrial land available within Rickreall.
- The second major grocery store proposed in Dallas within the next five years.
- The potential development in Dallas allowed once the wastewater treatment facility is completed.
- The addition of approximately 800 residential units in Monmouth.

- The major generators within the region will add some traffic flows, but not that much.
- The Polk County Fairgrounds will continue to expand, however, the additional traffic flows generated from this facility will be small.
- Alternative modes will have a negligible effect on the transportation system.
- The Bridgehead Engineering Study indicates there will be enough capacity at both the Marion Street and Center Street Bridgeheads so vehicles will be able to travel on OR 22 between Salem and the study area without being restricted.
- The increase of population within the communities of Dallas, Monmouth and Independence.

Analysis Methodology

The Volume to Capacity (V/C) ratios signalized intersections for were analyzed using ODOT's computer program SIGCAP2. The V/C ratios for both the unsignalized intersections and multilane highways were analyzed using McTrans HCS Version 3.2 software. The V/C ratios for the rural two-lane highways calculated using HCS Release 1.5. These V/C ratios are compared with the V/C mobility standards listed in the 1999 Oregon Highway Plan (OHP) based on highway classification and surrounding land use.

Both Synchro and SimTraffic were used to analyze the "at-grade" jug-handle intersection alternatives for this project. Synchro is a software package for intersection capacity analysis; modeling actuated traffic signals and optimizing traffic signal timings, which implements the methods of the 1994 Highway Capacity Manual, Chapter 9. SimTraffic is traffic simulation and animation software. SimTraffic includes the vehicle and driver performance characteristics developed by the Federal Highway Administration for use in traffic modeling.

An Australian computer program, aaSIDRA (Signalised & unsignalised Intersection Design and Research Aid) Version 1.0 by Akcelik and Associates was used to analyze roundabouts at both the OR 22/OR 99W and OR 22/Dallas-Rickreall Highway (DRH) intersections.

The Transportation Planning Analysis Unit (TPAU) uses Traffic Signal Warrant 1 (Minimum Vehicular Volume) and Warrant 2 (Interruption of Continuous Traffic) from the Manual on Uniform Traffic Control Devices (MUTCD) for a preliminary traffic signal warrant analysis. These warrants deal primarily with high volumes on the intersecting minor street, and high volumes on the major street. Meeting preliminary traffic signal warrants does not guarantee that a traffic signal will be conducted by Region. If traffic signal warrants are met, the ODOT Traffic Management Section will make the final decision on the installation of a traffic signal on the State Highway System.

APPENDIX C

OR 99W/RICKREALL ROAD INTERSECTION TECHNICAL MEMORANDUM BUILD ALTERNATIVES

OR 99W/Rickreall Road Intersection Traffic Analysis
Technical Memorandum

Intersection Build Alternatives (April 9, 2001)

The OR 99W/Rickreall Road intersection is located within the community of Rickreall, approximately 600 meters (0.38 miles) south of the OR 22/OR 99W intersection. The Rickreall Junction Facility Plan is considering future build alternatives for both the OR 22/OR 99W and the OR 22/Dallas-Rickreall Highway (DRH) intersections. The purpose of this memorandum is to address the future operation of the OR 99W/Rickreall Road intersection, keeping in mind that the build alternatives for the OR 22/OR 99W and the OR 99W/Rickreall Road intersections must operate together as a single transportation system.

The analysis indicates that, unless some as yet unforeseen regional alternative reduces traffic demand on this segment of OR 99W, it will need four through lanes at Rickreall Road in approximately 15 to 20 years. The form of intersection control used at the OR 99W/Rickreall Road intersection has a direct bearing on the left-turn lane needs on OR 99W. The following build alternatives were analyzed for this intersection:

- Unsignalized intersection - Existing two-lane, and build alternatives with three, four and five-lane sections on OR 99W (Figures 1-5).
- Signalized intersection – Build alternatives with three, four and five-lane sections on OR 99W (Figure 6).
- Converting existing "4-way" intersection into two "T" intersections.(Figure 7)
- Widening OR 99W to four lanes and eliminating left turns from either one or both of the Rickreall Road Approaches (Figures 8-9).
- Two-lane section on OR 99W with single lane roundabout (Figure 10).
- Four-lane section on OR 99W with double lane roundabout (Figure 11).

Tables 1 and 2 show the effects that different forms of intersection control combined with multiple lanes on OR 99W have on traffic flows on OR 99W and Rickreall Road, respectively. The V/C ratios shown in the tables are for the year 2025 and do not assume OR 22/OR 99W Alternative 7-A.1 improvements. The 1999 Oregon Highway Plan (OHP) indicates the maximum acceptable V/C ratio for the OR 99W/Rickreall Road intersection is 0.80. Construction of Alternative 7-A.1 will likely send slightly more traffic onto OR 99W through Rickreall. In the worst case this shift in volume would amount to approximately 100 peak hour vehicles or 3.7% or the total traffic volume. This increase will make all of these results slightly worse.

Table 1: Year 2025 Volume to Capacity (V/C) Ratios for OR 99W

OR 99/Rickreall Road Intersection Control	Number of Lanes on OR 99W			
	Two	Three	Four	Five
Unsignalized	1.08	0.98	0.50	0.40
Signal	*N.A.	1.01	0.82	0.61
Two "T" Intersections	* N.A.	0.98	0.50	0.40
No WB Left-Turn	1.08	0.98	0.50	0.40
No WB or EB Left-Turns	1.08	0.98	0.50	0.40
Single Lane Roundabout	**0.75/1.11	*N.A.	*N.A.	*N.A.
Double Lane Roundabout	*N.A.	*N.A.	0.41***	*N.A.

* N.A. Not Available
** Highest Approach V/C Ratio: Using AASIDRA Methodology/German Methodology
*** Highest Approach V/C Ratio (Using AASIDRA Methodology)

Based on current traffic volume growth trends, Table 1 indicates that OR 99W will need to have four through lanes in 2025 to meet the OHP mobility standard regardless of the intersection control used at the Rickreall Road intersection. At first glance, it appears that the single lane roundabout may allow OR 99W to remain a two-lane facility. Using the AASIDRA Method, a single lane roundabout will meet mobility standards in 2025. Using the German Methodology, the single lane roundabout will fail before the year 2025. The actual operation of the single lane roundabout will likely be approximately the average of the two methodologies giving a V/C of 0.93, which does not meet the OHP standard.

If a signal is installed at the OR 99W/Rickreall Road intersection, four through lanes and a channelized left-turn lane will be needed to meet the mobility standard. OR 99W meets the ODOT left-turn lane criteria in the year 1999 at the Rickreall Road intersection. A left-turn lane should be installed on OR 99W at this location as soon as funding is available (adding a turn lane to Rickreall Road on OR 99W will require replacement of the OR 99W bridge over Rickreall Creek, in either the two or four lane cross-section).

Converting the existing OR 99W/Rickreall Road intersection from a single "four-way" intersection into two "T" intersections will meet mobility standards on OR 99W when there is either a four or five-lane free-flow section on OR 99W.

Eliminating the westbound left-turn or both the westbound and the eastbound left-turn movements at the unsignalized OR 99W/Rickreall Road intersection will meet mobility standards on OR 99W when there is either a four or five-lane free-flow section on OR 99W.

As discussed above, a single lane roundabout will not meet mobility standards. The AASIDRA Methodology shows that a double lane roundabout meets mobility standards with a four-lane cross section on OR 99W. Note that ODOT does not use the German Methodology to calculate a V/C ratio for a double lane roundabout.

Roundabouts operate most effectively and safely where there are balanced traffic flows on all four legs of an intersection. Vehicles exiting a roundabout leave gaps in the circulating roadway for vehicles entering the roundabout from other legs. The traffic

flows on the legs of this intersection are very unbalanced. There will be a tendency for "through" OR 99W traffic flows to dominate the circulatory lane or lanes of the roundabout and possibly not yield to the traffic already on the circulatory roadway or allow the traffic on Rickreall Road to enter the roundabout. This would further diminish the apparent V/C ratios shown in Table 1.

Additionally, Table 1 shows that any traffic control change that requires OR 99W traffic flows to slow down or stop will have an adverse impact on the operation of OR 99W "through" traffic flows.

Table 2: Year 2025 Volume to Capacity (V/C) Ratios for Rickreall Road

OR 99/Rickreall Road Intersection Control	Number of Lanes on OR 99W			
	Two	Three	Four	Five
Unsignalized	>> 1.0	>> 1.0	>> 1.0	>>1.0
Signal	*N.A.	1.01	0.82	0.61
Two "T" Intersections	*N.A.	2.28	*N.A.	*N.A.
No WB Left-Turn	*N.A.	*N.A.	>> 1.0	*N.A.
No WB or EB Left-Turns	*N.A.	*N.A.	3.80	*N.A.
Single Lane Roundabout	**0.75/1.11	*N.A.	*N.A.	*N.A.
Double Lane Roundabout	*N.A.	*N.A.	0.41***	*N.A.

* N.A. Not Available
** Highest Approach V/C Ratio: Using AASIDRA Methodology/German Methodology
*** Highest Approach V/C Ratio (Using AASIDRA Methodology)

Table 2 shows that the V/C ratio for Rickreall Road at OR 99W will exceed 1.0 in the year 2025 with every intersection control type except a signal or a double lane roundabout. As mentioned earlier, the single lane V/C will be approximately 0.93 which does not meet mobility standards.

A traffic signal will operate acceptably at the OR 99W/Rickreall Road intersection when there are four through lanes and a left-turn refuge on OR 99W

The analysis shows that Rickreall Road drivers (who comprise approximately 8 percent of the intersection traffic flows) will experience unacceptable delays unless there is intersection control at OR 99W/Rickreall Road that creates gaps in the heavy OR 99W traffic flows. Improving the operation for the 8 percent of the drivers approaching the OR 99W/Rickreall Road intersection from Rickreall Road will have a negative impact on the 92 percent of the drivers on OR 99W.

Unsignalized Intersection

The effects of widening OR 99W at this unsignalized intersection from the existing two-lanes to three, four and five lane-sections have been analyzed using the unsignalized intersection portion of the 1997 Highway Capacity Software. OR 99W at Rickreall Road meets the ODOT left-turn lane criteria. The analysis shows that adding left-turn lanes to OR 99W will improve safety and operation of OR 99W. In general, adding capacity to

OR 99W improves the function of the roadway, but does not address the long delays that the Rickreall Road drivers will experience.

Existing Two-Lane Section

The existing OR 99W/Rickreall Road intersection has two lanes on OR 99W (one lane on OR 99W in both northbound and southbound directions) and a left-turn lane and a "through-right" lane on both westbound and eastbound approaches of Rickreall Road (Figure 1). The present unsignalized intersection operates acceptably in the year 1999. OR 99W will meet ODOT left-turn lane criteria in1999.

In the year 2015, the V/C ratios for both of the traffic movements on the west approach and the single left-turn lane on the on the east approach exceed the OHP mobility standards. As expected, the V/C ratios for the design year (year 2025) are higher than the results for the year 2015.

In the year 2025, the free-flow traffic movement of OR 99W will operate at a V/C ratio of 1.08. This does not meet mobility standards.

Build Three-Lane Section

Figure 2 shows the results when a left-turn refuge is added in both northbound and southbound directions on OR 99W at the existing intersection. The left-turn refuges improve the safety and operation of the intersection, but does not improve the intersection enough to meet OHP mobility standards in the year 2015. In the year 2025, the "through" traffic movements on OR 99W will operate at a V/C ratio of 0.98. This does not meet mobility standards.

The eastbound Rickreall Road to northbound OR 99W traffic movement and the westbound Rickreall Road to southbound OR 99W traffic movement will operate at V/C ratios of 1.00 and 3.10 in the year 2015, respectively. The 3.10 V/C ratio involves approximately 30 vehicles/hour. Drivers of these vehicles will experience unacceptable delays and may use unsafe gaps on OR 99W to turn southbound on OR 99W. Drivers that have experienced this delay during peak traffic flow periods will tend to use another roadway to reach destinations located south of this intersection. If these Rickreall Road drivers do not reroute, continuous traffic flows will have to be interrupted on OR 99W to let a few Rickreall Road drivers turn onto OR 99W.

Build Four-Lane Section

Figure 3 includes a four-lane section on OR 99W at Rickreall Road. There are two lanes in both northbound and southbound directions on OR 99W and no left-turn refuges on OR 99W at this intersection. Both northbound and southbound OR 99W vehicles will block the inside travel lane while waiting for acceptable gaps in opposing traffic flows to turn left on Rickreall Road. Vehicles continuing through on OR 99W will either wait behind the turning vehicle or turn into the right travel lane to pass. Drivers familiar with the intersection will tend to use the outside travel lane to avoid getting stopped behind

vehicles that are waiting to turn left. This will create a lane imbalance and inefficient operation of the intersection.

ODOT left-turn lane criteria are met on OR 99W at Rickreall Road. Left-turn refuges are needed OR 99W in both northbound and southbound directions at this intersection to reduce delay and improve safety. This indicates that a five-lane section should be built instead of a four-lane facility.

The additional lane on OR 99W improves the operation of this intersection over a three-lane section, but not enough to fully meet mobility standards in the year 2015. The westbound Rickreall Road to southbound OR 99W traffic movement will operate at a V/C ratio of 1.41 in the year 2015. Like, the three-lane section, drivers will experience unacceptable delays and may use unsafe gaps on OR 99W to turn southbound on OR 99W.

The V/C ratio for the OR 99W "through" lanes on OR 99W is an acceptable V/C ratio of 0.50. This was calculated using Chapter 21 of the Highway Capacity Manual (2000) and making adjustments for the drivers stopped in the left through lane waiting for gaps in opposing traffic flows to turn left onto Rickreall Road at the OR 99W/Rickreall Road intersection.

Build Five-Lane Section

Figure 4 shows a five-lane section on OR 99W at this intersection. There are left-turn refuges on OR 99W on both northbound and southbound approaches. The V/C ratios for the five-lane section are similar to the V/C ratios for the four-lane section. However, the left-turn refuges improve safety on OR 99W. Like the four-lane section, mobility standards are not met for the Rickreall Road approaches.

The "through" lanes on OR 99W will operate at an acceptable V/C ratio of 0.40.

OR 99W and Rickreall Road Signalized Intersection

The OR 99W/Rickreall Road intersection does not meet Preliminary ADT Traffic Signal Warrants in the year 2025 using the forecasted traffic volumes. However, the on-going Rickreall Facility Plan is advancing a long-term alternative (Alternative 7-A) that adds traffic to the Or 99W/Rickreall Road intersection. The intersection meets the two-lane minor approach portion of the Preliminary ADT Traffic Signal Warrant 2 before the design year with the additional traffic. Additional traffic flows at this intersection resulting from future access management practices being incorporated on OR 99W throughout the community of Rickreall may warrant a traffic signal earlier. Meeting traffic signal warrants is not a guarantee that a traffic signal will be installed at this location. The State Traffic Engineer will make the final decision on whether or not to install the traffic signal.

The long-term OR 22/OR 99W alternative does not allow the Dallas to McMinnville and McMinnville to Dallas traffic movements now using OR 99W and the DRH at the proposed OR 22 and OR 99W interchange. Many of the peak-hour estimated 50

vehicles/hour traveling from Dallas to McMinnville and the 85 vehicles/hour traveling from McMinnville to Dallas will reroute to the OR 99W/Rickreall Road intersection to reach their destinations. Others will reroute to the Kings Valley Highway further west on OR 22.

Figure 6 shows the signalized intersection analysis results for the OR 99W/Rickreall Road intersection when OR 99W are three, four and five-lane sections.

Build Three-Lane Section

In the year 2025, the OR 99W/Rickreall Road intersection will operate at a V/C ratio of 1.01. The addition of a left-turn lane will improve safety at this location. This option does not meet the mobility standards.

Build Four-Lane Section

This intersection will operate at a V/C ratio of 0.82 in the year 2025. This alternative does not include any left-turn protection on OR 99W for drivers turning left to travel on Rickreall Road. Left-turning drivers will block the inside travel lane waiting for acceptable gaps in opposing traffic flows. Drivers traveling "through" in the inside travel lane will either wait behind the turning vehicle or turn into the right travel lane to pass. This intersection will meet guidelines for left-turn protection on OR 99W before the year 2025. In order to ensure safe operation of this intersection, left-turn lanes should be installed.

This alternative meets mobility standards; however, there are safety concerns caused by not having the left-turn lanes on OR 99W. OR 99W meets left-turn lane guidelines and they should be included to ensure safe and efficient operation.

Build Five-Lane Section

This intersection will operate at a V/C ratio of 0.61 and 0.65 without and with left-turn protection on OR 99W, respectively. This intersection is borderline in meeting the guideline for left-turn protection on OR 99W. If the left-turning vehicles on OR 99W are not protected, drivers turning left onto Rickreall Road will have a left-turn refuge to wait in until there are adequate gaps on OR 99W to turn left safely. If the left-turning turning movement is protected on OR 99W, drivers will have a "green-arrow" that will create gaps for these drivers to safely turn onto Rickreall Road.

Assuming no reduction in demand on OR 99W, five lanes will be needed on OR 99W in 2025 and the OR 99W/Rickreall Road intersection will need to be signalized in order to meet OHP mobility standards.

Existing "Four-Way" Intersection Converted to Two "T" Intersections

This alternative converts the existing OR 99W/Rickreall Road unsignalized intersection into two "T" unsignalized intersections (See Figure 7). The northern "T" intersection is formed by realigning Rickreall Road so that Rickreall Road will follow the alignment of

Burch Street to intersect OR 99W at the existing OR 99W/Burch Street intersection approximately 140 meters north of the existing intersection. Disconnecting the western leg of Rickreall Road from the existing "4-way" intersection at OR 99W will form the second "T" intersection located to the south.

The "T" intersections will not meet mobility standards in the design year. The eastbound Rickreall Road vehicles turning northbound onto OR 99W at the northern "T" intersection will operate at a V/C ratio of 0.83 in the design year. If the long-term OR 22/OR 99W build alternative (Alternative 7-A) is constructed and another 50 vehicles/hour is added to this left-turn movement, the V/C ratio will increase past 1.0 and these drivers will have difficulty turning left. The westbound to southbound traffic movement at the southern "T" intersection will operate at a V/C ratio of 2.28.

If an additional lane is added in both northbound and southbound directions on OR 99W, west/east and east/west Rickreall Road drivers will have to weave left one lane before reaching the left-turn refuge for Rickreall Road. For this reason, building the "T" intersections and widening OR 99W to a five-lane section is not recommended.

The northern "T" intersection will be located approximately 350 meters south of the eastbound ramp terminals for the long-term OR 22/OR 99W alternative. This will not meet the OHP spacing standards of 400 meters.

A typical "four-way" intersection has 32 conflict points while a typical "T" intersection has nine conflict points. In some cases, eliminating conflict points by converting a "four-way" to two "T" intersections can increase safety and operation of a transportation system. However, this proposed conversion is not a recommended treatment for this particular intersection because it does not meet either the OHP mobility standards or the ODOT spacing standards.

OR 99W widened to Four Lanes and the Westbound Rickreall Road Left-Turning Movements is Prohibited and Rerouted Straight Through the OR 99W/Rickreall Road Intersection.

This alternative (Figure 8) is an attempt to avoid the need for left-turn refuges on OR 99W at the OR 99W/Rickreall Road intersection, thereby, reducing possible impacts to homes and businesses on OR 99W. The westbound Rickreall Road left-turn movement will be prohibited and rerouted straight through the intersection to enter a jug-handle type intersection to travel southbound on OR 99W. This rerouting of traffic flows does improve the V/C ratios for the Rickreall Road traffic movements when compared to the V/C ratios shown in Figure 3 for the same year (year 2025) where this traffic movement is allowed. However, the improvement in the V/C ratios is not enough to meet OHP mobility standards.

OR 99W Widened to Four Lanes and both Eastbound and Westbound Rickreall Road Left-Turning Movements are Prohibited and Rerouted Straight Through the OR 99W/Rickreall Road Intersection.

This alternative (Figure 9) is a second attempt to avoid the need for left-turn refuges on OR 99W at the OR 99W/Rickreall Road intersection, thereby, limiting impacts to homes and businesses on OR 99W. The eastbound and westbound Rickreall Road left-turn movements will be prohibited and rerouted straight through the intersection to enter jug-handle type intersections to travel either northbound or southbound on OR 99W, respectively. This rerouting of traffic flows does improve the V/C ratios for the Rickreall Road traffic movements when compared to the V/C ratios shown in Figure 8, but not enough to meet mobility standards. The V/C ratios for the eastbound and the westbound Rickreall Road "through" traffic movements are 2.93 and 3.80, respectively.

Proposed Installation of a Roundabout at the OR 99W/Rickreall Road Intersection

Both a single lane and a double lane roundabout were analyzed for this intersection. The single lane roundabout was analyzed using both the Australian program (AASIDRA 1.0) and the German Methodology. The double lane roundabout was analyzed using AASIDRA 1.0. The analysis for each of the two types of roundabouts is dependent upon the alternative that is selected at the OR 22/OR 99W intersection. The rerouting of the Dallas/McMinnville and McMinnville/Dallas traffic flows shown in Alternative 7-A will likely add enough traffic to the roundabout to cause to operate slightly less efficiently. For this reason, each roundabout was analyzed both without and with the proposed interchange at the OR 22/OR 99W intersection.

Single Lane Roundabout (Figure 10)

The following dimensions were used to analyze the single lane roundabout:

- Inscribed Diameter 190 feet
- Circulatory Roadway 21 feet
- Truck apron 10 feet
- Entry lane Width 16 feet

The single lane roundabout will be 190 feet wide curb-to-curb and will have a single 21-foot wide circulatory lane. There will be a ten-foot wide truck apron constructed adjacent to the inside edge of the circulatory roadway to provide the extra width required for trucks traveling through the roundabout. Each of the four approaches to the roundabout will have single 16-foot entry lanes.

Table 3 shows the results for the single lane roundabout using AASIDRA and the German Methodology. Table 4 shows the results using the German Methodology.

Table 3 - Year 2025 Single Lane Roundabout V/C Ratios (AASIDRA)

	Volume to Capacity (V/C) Ratio				Queue (feet)			
Approach	West	South	East	North	West	South	East	North
No OR 22/OR 99W Interchange	0.38	0.75	0.24	0.75	67	223	41	223
With OR 22/OR 99W Interchange	0.52	0.78	0.28	0.80	121	246	43	271

Table 4 -Year 2025 Single Lane Roundabout V/C Ratios (German Methodology)

	Volume to Capacity (V/C) Ratio				Queue (feet)			
Approach	West	South	East	North	West	South	East	North
No OR 22/OR 99W Interchange	0.47	1.11	0.32	1.11	N.A.	N.A.	N.A.	N.A.
With OR 22/OR 99W Interchange	0.65	1.15	0.37	1.19	N.A.	N.A.	N.A.	N.A.

* N.A. – Not Available

The single lane roundabout will apply to alternatives that have single lane approaches. The OHP indicates that the maximum acceptable V/C ratio for the OR 99W/Rickreall Road intersection is 0.80. The results for the Australian program, AASIDRA, shows that a single lane roundabout will meet mobility standards in the design year, even with the additional traffic flows resulting from constructing the long-term alternative at the OR 22/OR 99W intersection. However, the German methodology indicates that a single lane roundabout will not meet mobility standards even without the influence of the interchange. The actual operation of the roundabout will probably be somewhere between the AASIDRA and German methodology results and will likely exceed the OHP mobility standard.

Vehicles entering the roundabout must slow down to approximately 20 MPH. This will stack vehicles approximately ten vehicles or 250 feet in both southbound and northbound directions on OR 99W.

Double Lane Roundabout (Figure 11)

The following dimensions were used to analyze both multi-lane roundabouts:

- Inscribed Diameter 200 feet
- Circulatory Roadway 28 feet
- Truck apron 10 feet
- Entry lane Width 28 feet

The double lane roundabout will be 200 feet wide curb-to-curb and will have two 14-foot circulatory lanes. Like the single lane roundabout, there will be a ten-foot wide truck apron. There will be two lanes on OR 99W, so there will be two 14-foot entry lanes for both northbound and southbound traffic flows entering the roundabout. There will be a single 16-foot entry lane for Rickreall Road vehicles entering the roundabout in both eastbound and westbound directions.

Table 5 shows the results for the double lane roundabout:

Table 5 - Year 2025 Double Lane Roundabout V/C Ratios (AASIDRA)

	Volume to Capacity (V/C) Ratio				Queue (feet)			
Approach	West	South	East	North	West	South	East	North
No OR 22/OR 99W Interchange	0.22	0.41	0.14	0.41	26	65	17	67
With OR 22/OR 99W Interchange	0.28	0.43	0.15	0.44	33	70	17	73

The double lane roundabout can be used when there are two lanes in both northbound and southbound directions on OR 99W. The additional lane for "through" OR 99W traffic flows drops both the V/C ratios and the queue lengths when compared to the single-lane roundabout. This roundabout will operate within OHP mobility standards.

Additional Comments Regarding Installing Roundabout at OR 99W/Rickreall Road Intersection

The highest approach V/C ratio for a single lane roundabout without the influence of an interchange at the OR 22/OR 99W intersection ranges between 0.75 and 1.11 depending upon the analysis methodology used to determine the operational characteristics.

Roundabouts operate most effectively and safely where there are balanced traffic flows on all four legs of an intersection. Vehicles exiting a roundabout leave gaps in the circulating roadway for vehicles entering the roundabout from other legs. The traffic flows on the legs of this intersection are very unbalanced. There will be a tendency for "through" OR 99W traffic flows to dominate the circulatory lane or lanes of the roundabout and possibly not yield to the traffic already on the circulatory roadway or allow the traffic on Rickreall Road to enter the roundabout. Each vehicle entering the roundabout will be delayed an average of 10 to 12 seconds.

The speed differentiation between vehicles traveling on OR 99W and the vehicles traveling within the roundabout may create safety problems. Northbound OR 99W vehicles traveling between 45 and 50 MPH (posted 40 MPH) will have to slow down to approximately 20 MPH to travel through the roundabout. There will be a safety concern if these vehicles do not recognize the hazard and slow down before entering the roundabout.

Recommendations

The existing OR 99W/Rickreall Road intersection and the portion of OR 99W located within the community of Rickreall currently operate within OHP mobility standards. As traffic flows grow, improvements should promote safety and efficient traffic flow through Rickreall.

Long-term Recommendations

Unless traffic demand for OR 99W between Monmouth and OR 22 is somehow reduced in the meantime, by the year 2025, OR 99W should have four lanes with channelized left turn lanes and the OR 99W/Rickreall Road Intersection should be signalized to ensure safe and efficient operation. The section of OR 99W located between OR 22 and Rickreall Road will have a higher capacity if the OR 99W/Rickreall Road Intersection is signalized.

OR 99W would not have as much capacity if a roundabout was installed at the OR 99W/Rickreall Road Intersection due to OR 99W traffic flows being delayed and to the absence of a progressed system.

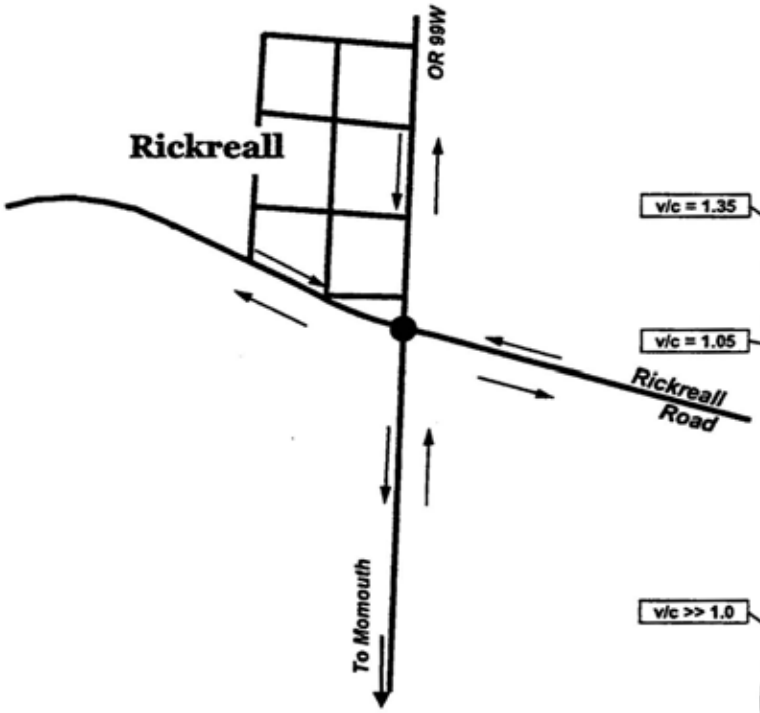
Short-term Recommendations

OR 99W currently meets ODOT left-turn lane criteria. In the short-term adding a left-turn lane to OR 99W at Rickreall Road will enhance safety. However, adding this lane will necessitate widening the Rickreall Creek bridge structure. Because of this additional cost, it may be best to defer adding the turn lane until the long-term improvements along this segment of OR 99W are implemented.

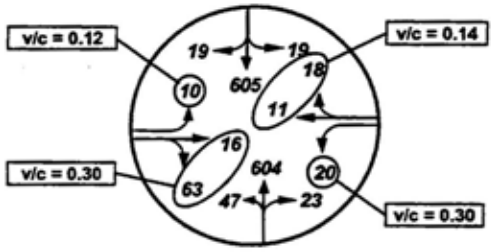
No Build Alternative - Years 1999, 2015 and 2025

Existing OR 99W/Rickreall Road Unsignalized Intersection

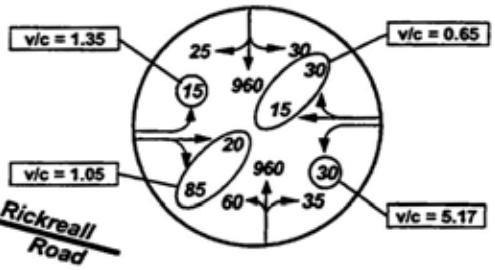
Two Lanes on OR 99W



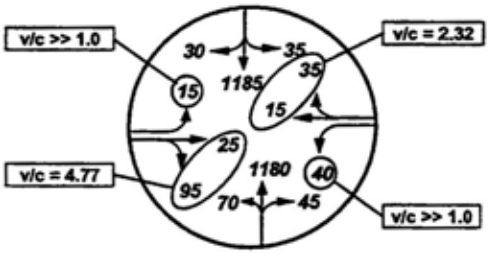
Year 1999



Year 2015



Year 2025



Note:
Traffic volumes do not reflect any additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

Legend
xxx 30th Highest Hour

OREGON DEPARTMENT OF TRANSPORTATION

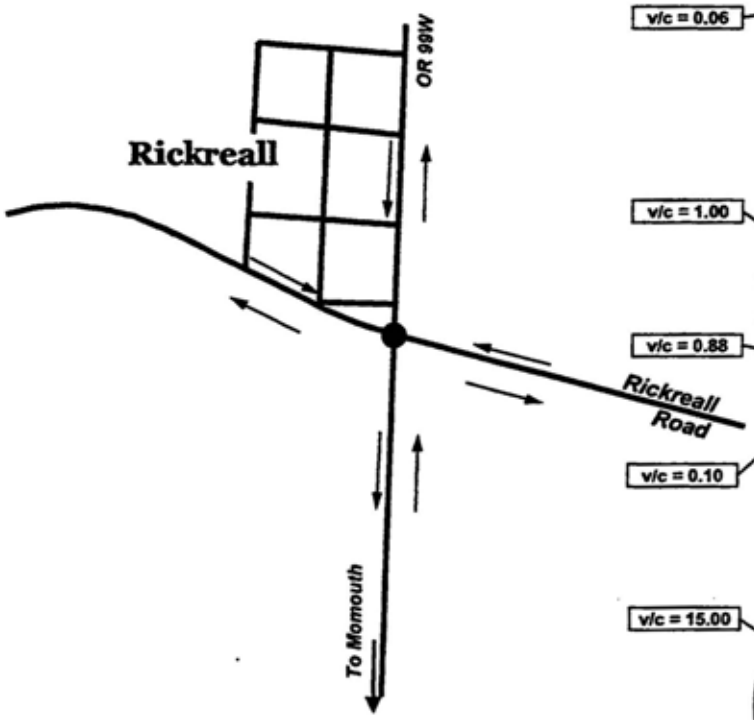
TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RIntersection.ppt	Prepared By: HLN	FIGURE 1
	DATE :02/28/2001	Reviewed By: BGD	

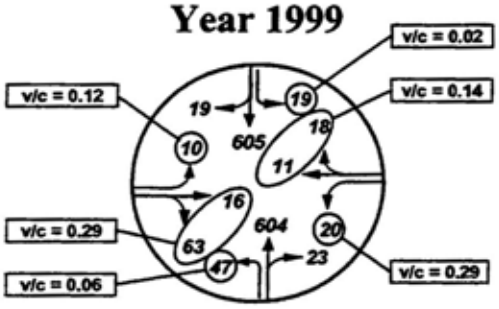
Build Alternative - Years 1999, 2015 and 2025

OR 99W/Rickreall Road Unsignalized Intersection

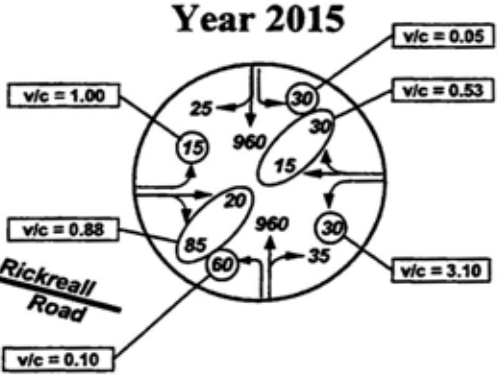
Three Lanes on OR 99W



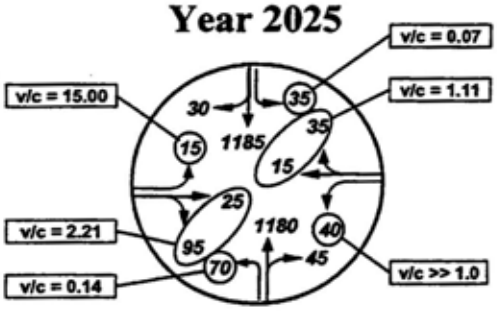
Year 1999



Year 2015



Year 2025



Note:
Traffic volumes do not reflect any additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

Legend
xxx 30th Highest Hour

OREGON DEPARTMENT OF TRANSPORTATION

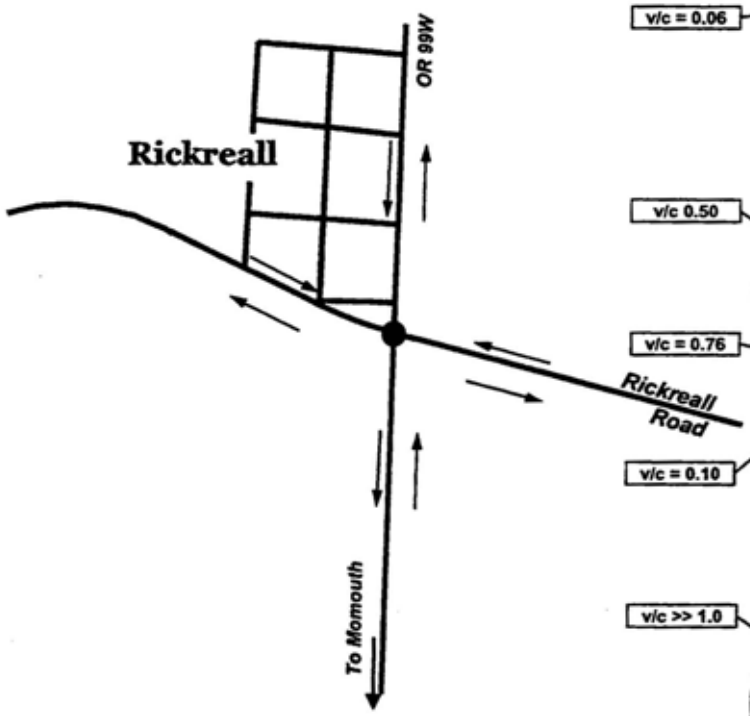
TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RIntersection.ppt	Prepared By: HLN	FIGURE 2
	DATE :02/28/2001	Reviewed By: BGD	

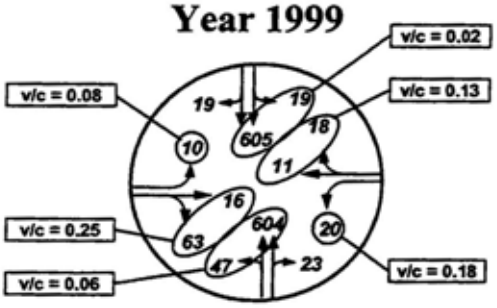
Build Alternative - Years 1999, 2015 and 2025

OR 99W/Rickreall Road Unsignalized Intersection

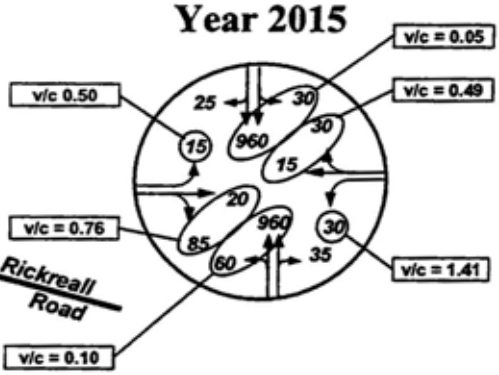
Four Lanes on OR 99W



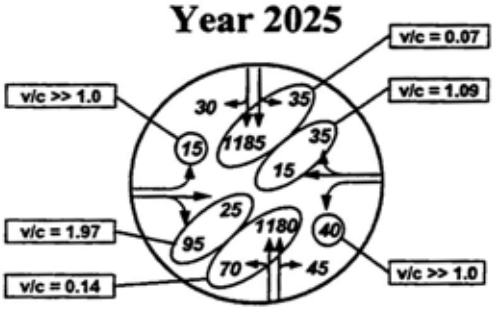
Year 1999



Year 2015



Year 2025



Note:
Traffic volumes do not reflect any additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

Legend
xxx 30th Highest Hour

OREGON DEPARTMENT OF TRANSPORTATION

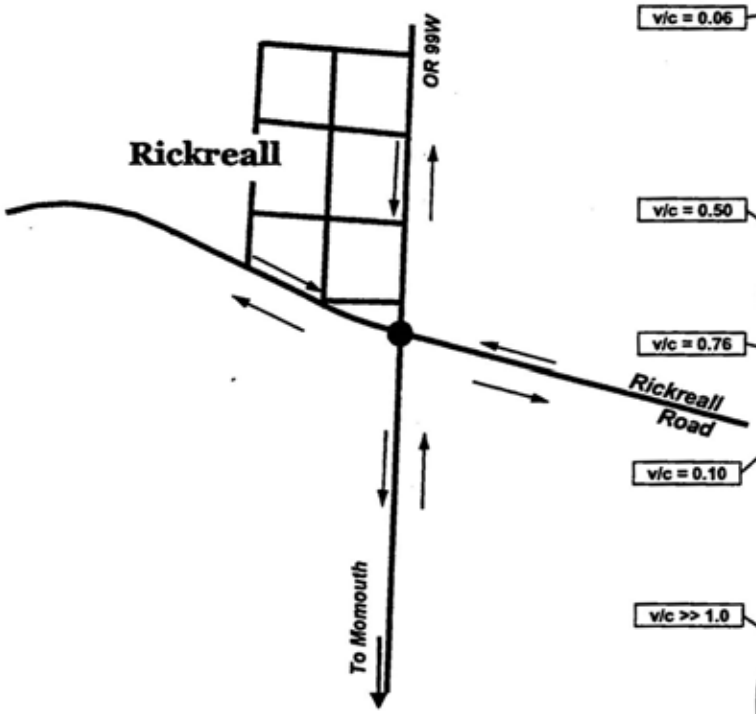
TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RIntersection.ppt	Prepared By: HLN	FIGURE 3
	DATE :02/28/2001	Reviewed By: BGD	

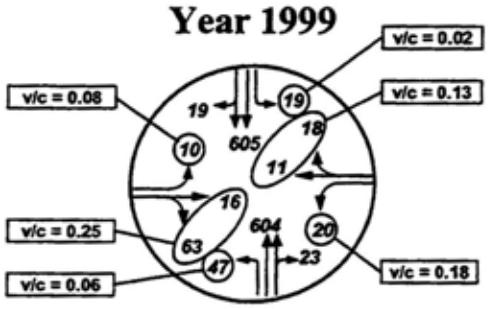
Build Alternative - Years 1999, 2015 and 2025

OR 99W/Rickreall Road Unsignalized Intersection

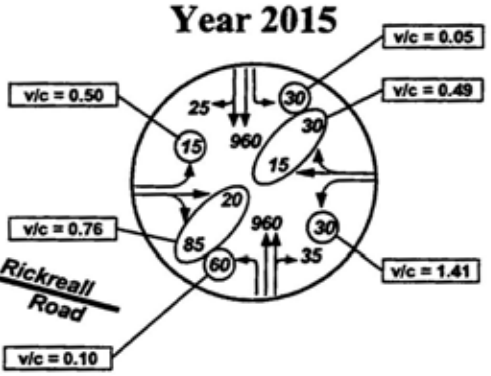
Five Lanes on OR 99W



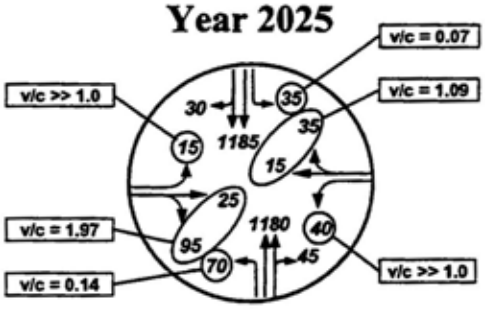
Year 1999



Year 2015



Year 2025



Note:
Traffic volumes do not reflect any additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

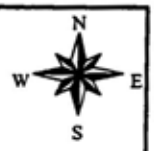
Legend
xxx 30th Highest Hour

OREGON DEPARTMENT OF TRANSPORTATION

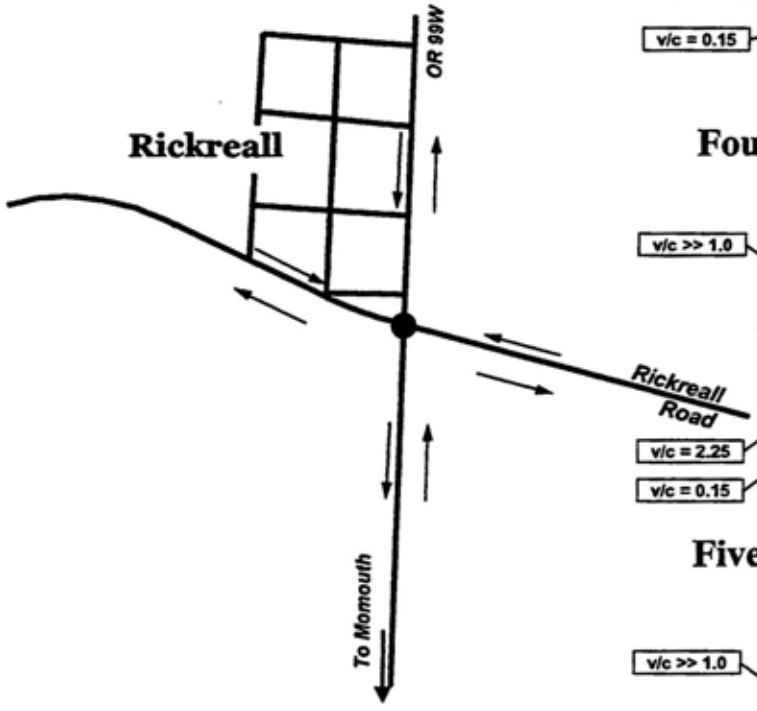
TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RIntersection.ppt	Prepared By: HLN	FIGURE 4
	DATE :02/28/2001	Reviewed By: BGD	

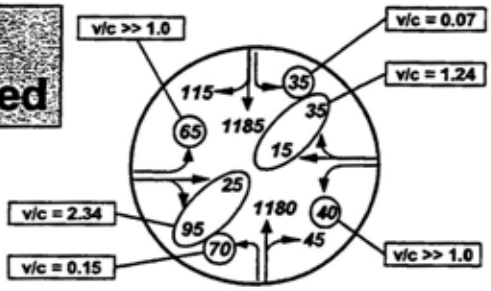
Build Alternative - Year 2025 (Includes Proposed OR 22/OR 99W Interchange)



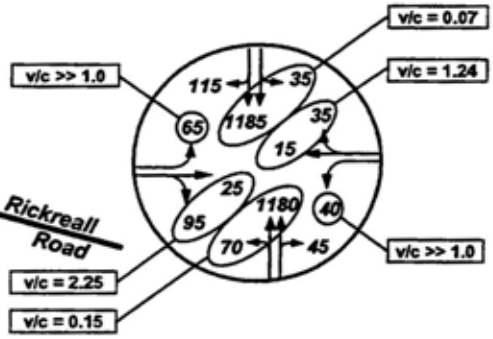
OR 99W/Rickreall Road Intersection is Unsignalized



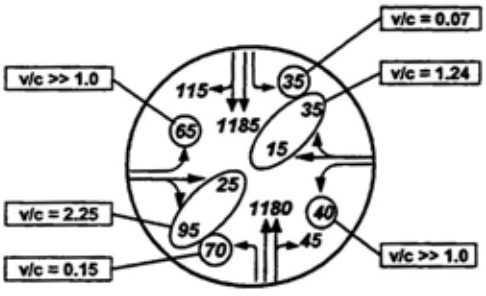
Three Lanes on OR 99W



Four Lanes on OR 99W



Five Lanes on OR 99W



Note:
Traffic volumes do reflect additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

Legend
xxx 30th Highest Hour

OREGON DEPARTMENT OF TRANSPORTATION

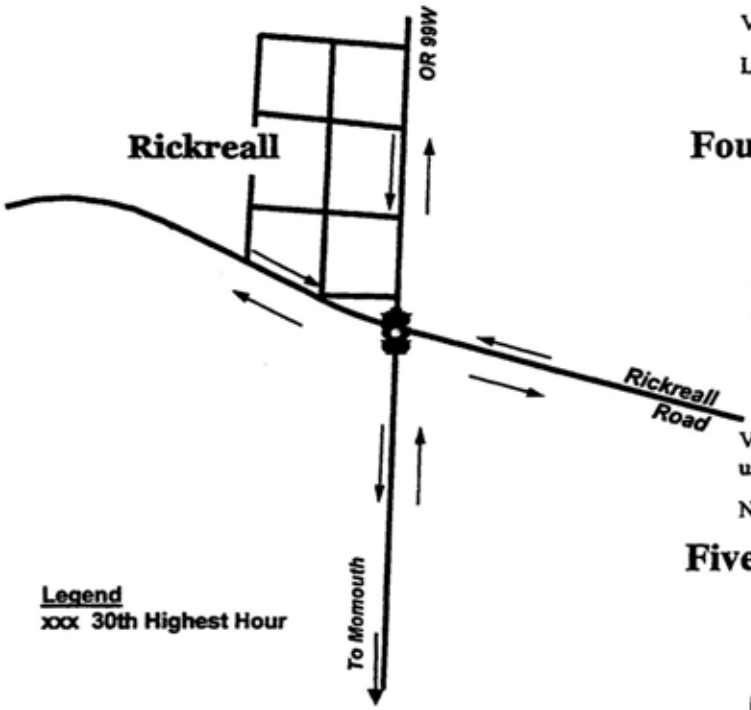
TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : Rintersection.ppt	Prepared By: HLN	FIGURE 5
	DATE :02/28/2001	Reviewed By: BGD	

Build Alternative - Year 2025 (Includes Proposed OR 22/OR 99W Interchange)

N
W E
S

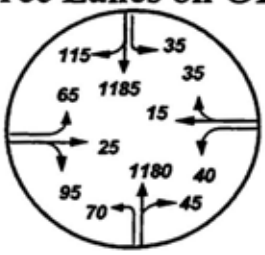
OR 99W/Rickreall Road Intersection is Signalized



Legend
xxx 30th Highest Hour

Note:
Traffic volumes do reflect additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

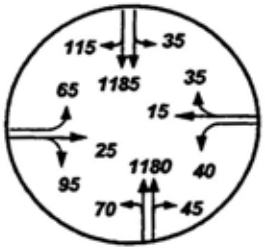
Three Lanes on OR 99W



V/C ratio = 1.01 (90 second cycle)

Left turns protected on OR 99W

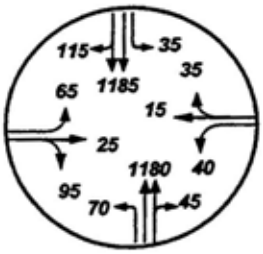
Four Lanes on OR 99W



V/C ratio = 0.82 (60 second cycle) using SYNCHRO (60/40 split)

No left turn protection

Five Lanes on OR 99W



V/C ratio = 0.63 (60 second cycle)

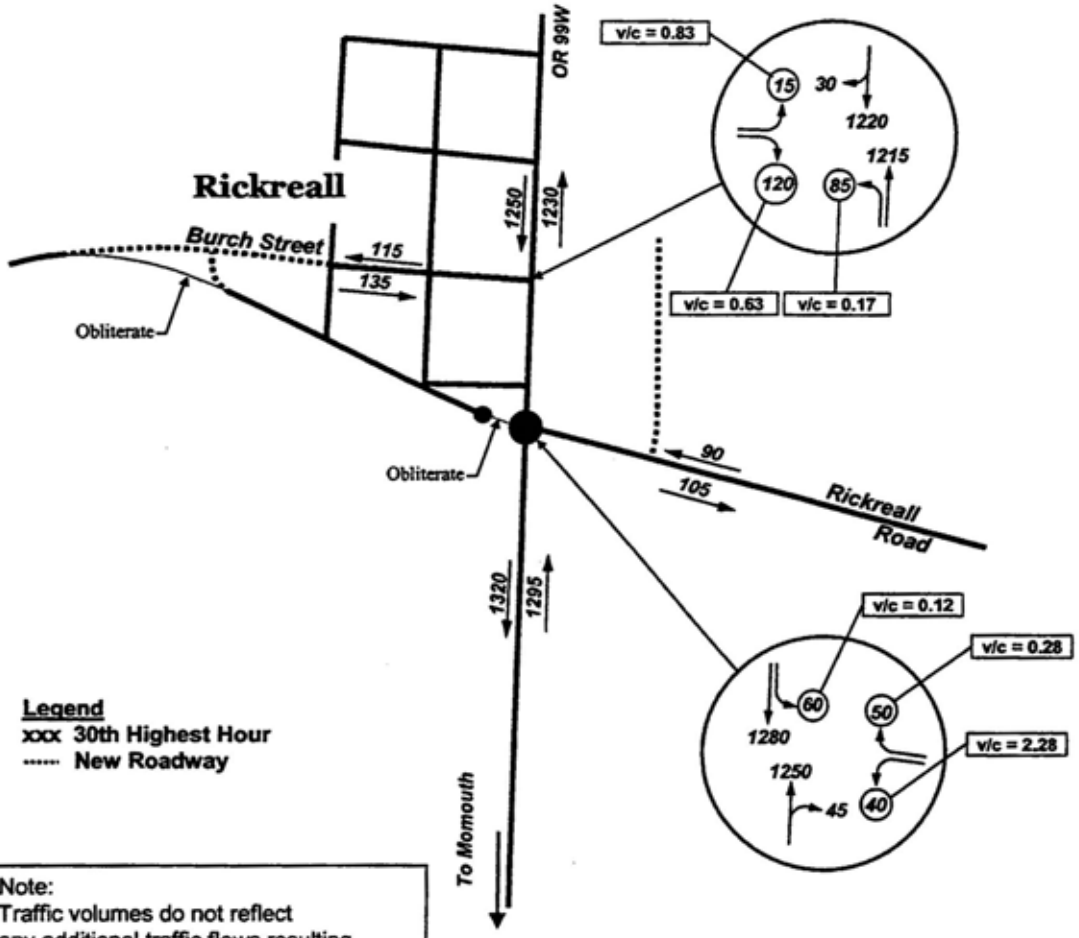
No left turn protection

OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RIntersection.ppt	Prepared By: HLN	FIGURE 6
	DATE :02/28/2001	Reviewed By: BGD	

Two "T" Intersection Build Alternative - Year 2025 - (No Proposed OR 22/OR 99W Interchange)



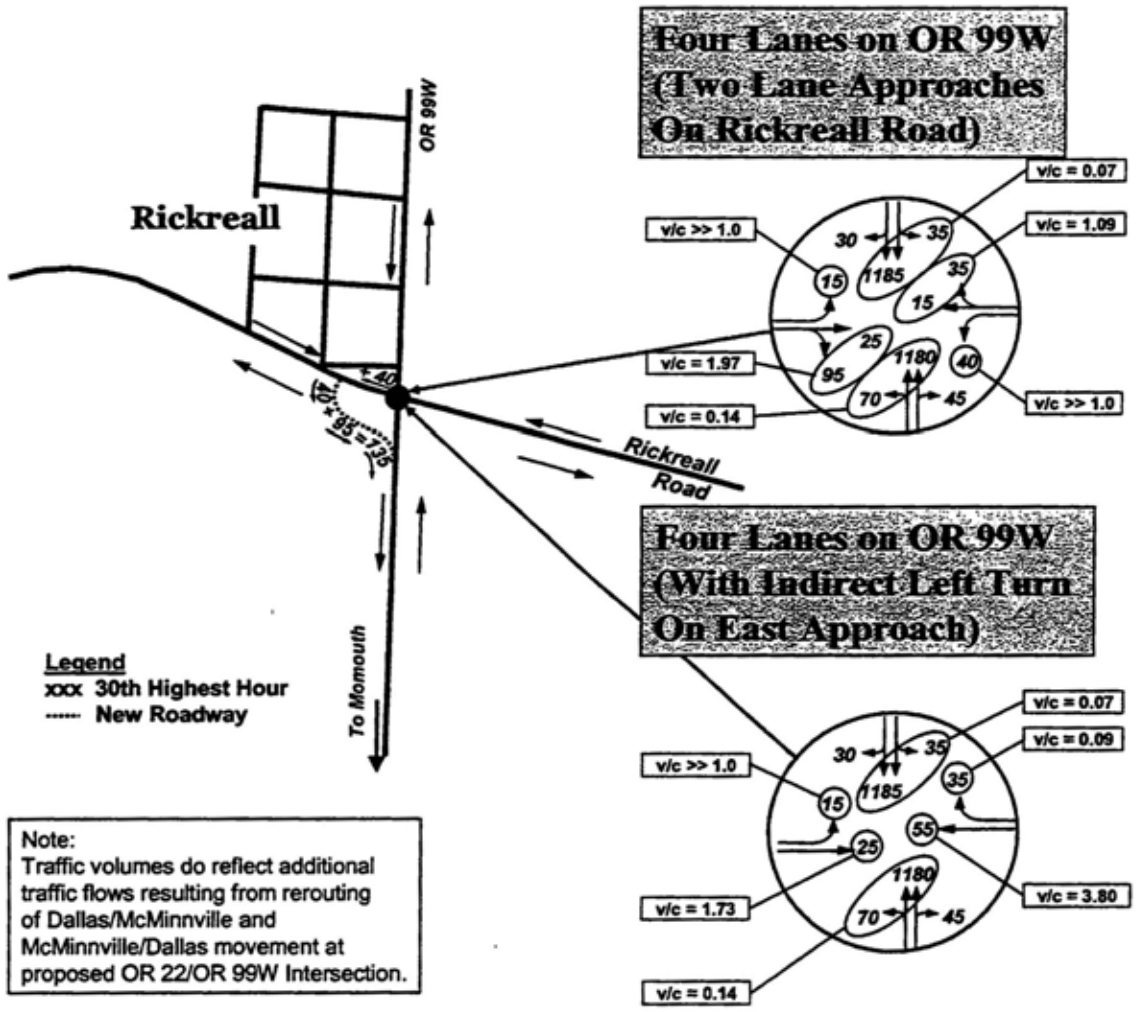
Note:
Traffic volumes do not reflect any additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : RIntersection.ppt	Prepared By: HLN	FIGURE 7
	DATE :02/28/2001	Reviewed By: BGD	

Year 2025 Build Alternatives Comparing OR 99W/Rickreall Road Intersection When The Eastbound Left Turn From Rickreall Road Is Allowed And The Westbound Left Turn Is Rerouted Directly Through The Intersection. (No Proposed OR 22/OR 99W Interchange)



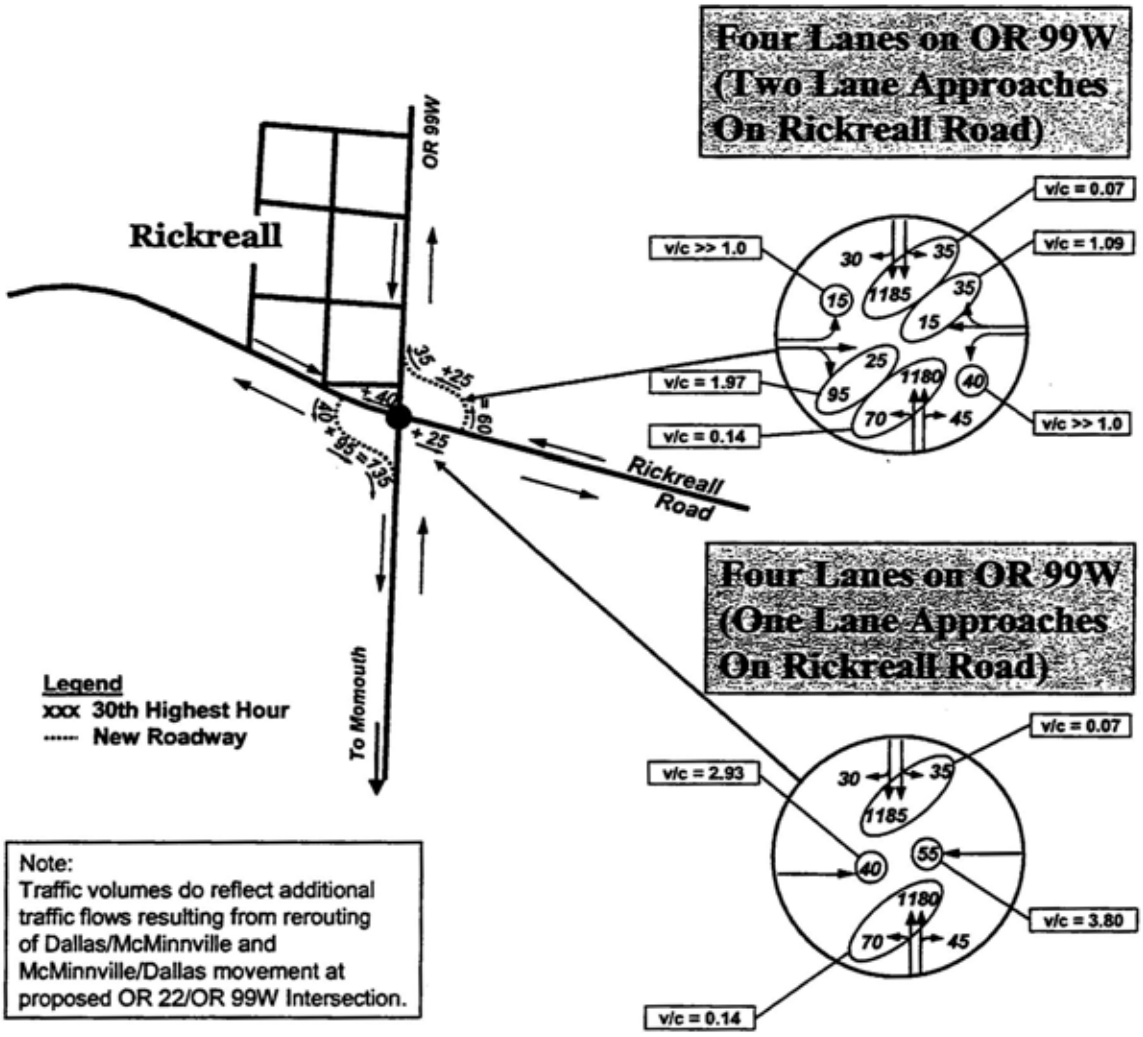
Note:
Traffic volumes do reflect additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : Rlntersection.ppt	Prepared By: HLN	FIGURE 8
	DATE :02/28/2001	Reviewed By: BGD	

Year 2025 Build Alternatives - Comparing OR 99W/Rickreall Road Intersection To "Through" Traffic Movements Being The Only Traffic Movements Allowed On Rickreall Road (No Proposed OR 22/OR 99W Interchange).



Note:
Traffic volumes do reflect additional traffic flows resulting from rerouting of Dallas/McMinnville and McMinnville/Dallas movement at proposed OR 22/OR 99W Intersection.

OREGON DEPARTMENT OF TRANSPORTATION

TPAU TRANSPORTATION PLANNING ANALYSIS UNIT

OR 99W/OR 22 Junction Refinement Plan Polk County	FILE : Rlntersection.ppt	Prepared By: HLN	FIGURE 9
	DATE :02/28/2001	Reviewed By: BGD	

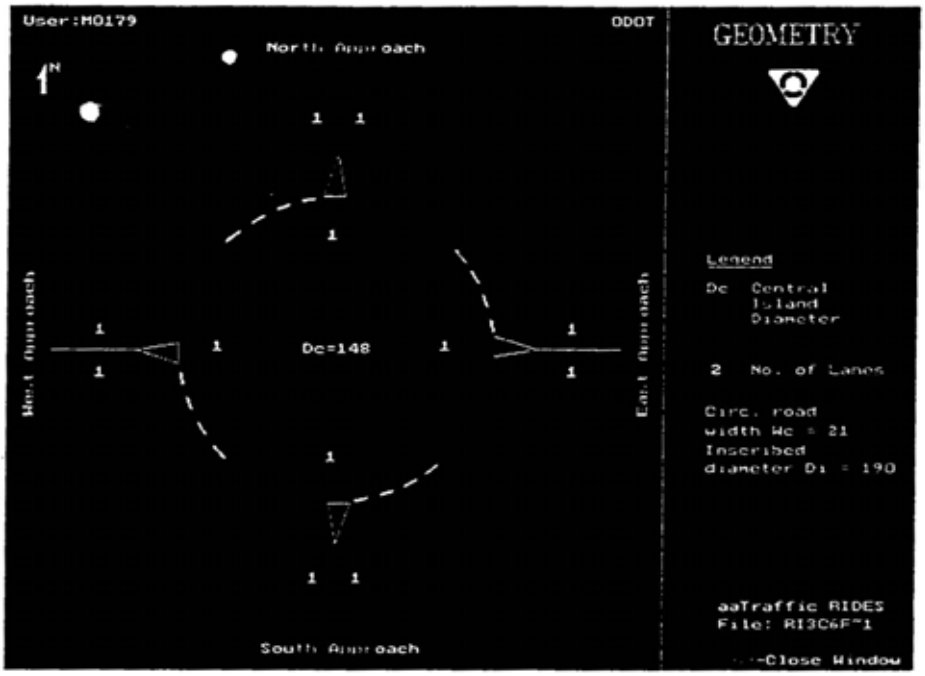


Figure 10 – Single Lane Roundabout

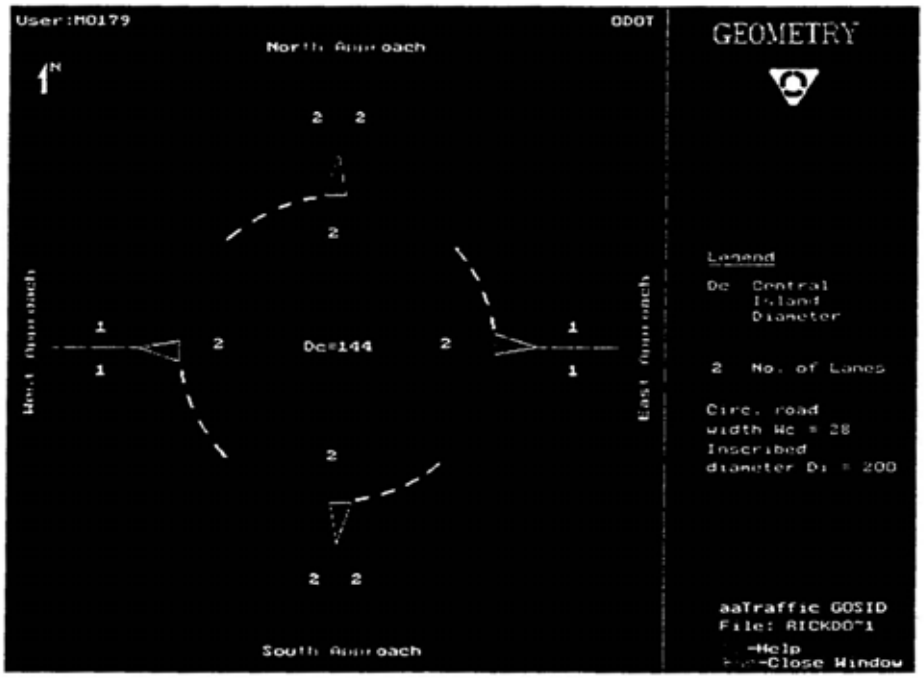


Figure 11 – Double Lane Roundabout