Barlow Road/Arndt Road/OR 99E Corridor Concept Study

Clackamas County

CLACKAMAS COUNTY

October 2022

KITTELSON & ASSOCIATES

Barlow Road/Arndt Road/OR 99E Corridor Concept Study

Clackamas County

Prepared for:
Clackamas County

In association with:
City of Barlow
City of Canby
Oregon Department of Transportation

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PROJECT MANAGEMENT TEAM

- Scott Hoelscher, Clackamas County
- Ellen Rogalin, Clackamas County
- Steve Williams, Clackamas County

TECHNICAL ADVISORY COMMITTEE

- Karen Buehrig, Clackamas County
- Joe Marek, Clackamas County
- Christian Snuffin, Clackamas County
- Scott Archer, City of Canby
- Don Hardy, City of Canby
- Jerry Nelzen, City of Canby
- Glen Bolen, Oregon Department of Transportation
- Seth Brumley, Oregon Department of Transportation
- Bob Stolle, Oregon Department of Transportation

Special thanks to these individuals, as well as the community members who provided comments and input through the public engagement process.

STUDY DISCLAIMER

The purpose of this plan is to identify potential property and environmental impacts, design and construction costs, and feasibility of the improvements. Actual impacts, further refinements, discussion with property owners, and timing of improvements will be subject to future funding availability and addressed during the project delivery phase.

Projects on state facilities (i.e. OR 99E) will require coordination with ODOT and approval from the State or Regional Traffic Engineer. Inclusion of an improvement in the Plan does not represent a commitment by ODOT to fund, allow, or construct the project.

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A. Working Paper #1: Traffic Analysis
B. Working Paper #2A: Short-Term Alternatives
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1. PROJECT OVERVIEW

1. Project Overview

In 2003, Clackamas County adopted an alignment for Phase II of the Arndt Road Extension and undertook a goal exception process that was needed for that alignment, which would provide a connection between Arndt Road/Barlow Road to OR 99E just west of the Molalla River. Since that time, conditions have changed, and the County is interested in identifying a corridor that serves future needs. This Barlow Road/Arndt Road/OR 99E Corridor Concept Study was needed to provide potential future short- and long-term improvement packages, conceptual costs and traffic impacts.

This study is intended to:

- Identify short-term upgrades to the OR 99E/Barlow Road and Arndt Road/Barlow Road intersections;
- Provide long-term alternatives analysis for the Arndt Road extension, and
- Identify needed changes to the Clackamas County Comprehensive Plan that would implement the selected alternative.

Key outcomes of this study include:

- Identify existing and future operational and safety deficiencies
- Improve the circulation in southwest Clackamas County, including between Canby and Barlow
- Enhance the attractiveness of the industrial land within the greater Canby area for economic development opportunities
- Reduce vehicular gas emissions
- Improve traffic operations and safety

Additionally, this study seeks to identify potential property and environmental impacts, design and conceptual costs, and feasibility of the improvements.

The proposed projects are under consideration, but have not been approved by Clackamas County. If any of the projects are approved by the county, then determining the actual impacts, discussions with property owners and setting project schedules will depend on the availability of future funding and would take place during the design and construction phase.

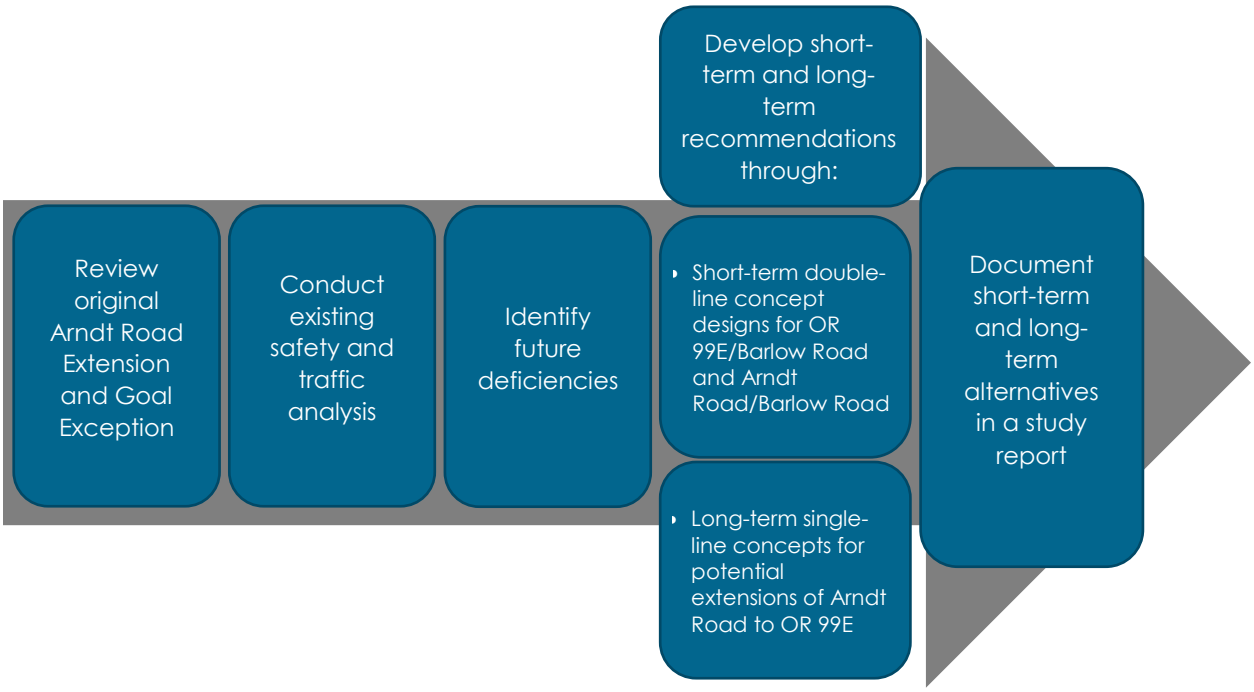
This document includes the following sections:

1. **Project Overview:** project goals and report content overview
2. **Engagement:** key sources of feedback throughout the project development
3. **Existing and Future Conditions:** existing land use, safety performance, and operational performance, including train traffic and I-205 tolling impacts
4. **Alternative Development:** development, evaluation, and preliminary recommendations for short-term and long-term improvements for the Arndt Road/Barlow Road/OR 99E corridor

5. **Next Steps:** outlines the process to refine and adopt the draft recommendations

Figure 1 provides an overview of the tasks that contributed to development of the plan.

Figure 1. Arndt Road Extension Plan Development



OR 99E &
Barlow Road

2. PUBLIC ENGAGEMENT

2. Engagement

Engagement activities shaped the plan's priorities, needs, vision and project recommendations. Key components of these activities include:

- A **Technical Advisory Committee (TAC)** comprised of staff from the County, ODOT, and City of Canby provided technical review and feedback during the development of the draft plan.
- Discussions with City of Barlow and City of Canby staff and council provided feedback during the development of the draft plan.

OR 99E &
Berg Parkway

3. Existing and Future Conditions

3. Existing and Future Conditions

This section provides an overview of existing (2021) and future operations (forecast year 2040) at the study intersections. This information was used to inform the development of alternatives, including short-term upgrades to the Arndt Road/Barlow Road and Barlow Road/OR 99E intersections, and potential long-term extensions of Arndt Road to OR99E. This section includes the following:

- Existing land uses within the study area
- Existing transportation facilities
- Existing and future traffic operations at the following study intersections:
  - Knights Bridge Road/Arndt Road
  - Barlow Road/Arndt Road
  - Barlow Road/OR 99E
  - Berg Parkway/OR 99E
- Crash analysis at the study intersections and review of ODOT's Safety Priority Index System (SPIS)
- Key findings and short-and long-term transportation needs

Supporting existing and future conditions analysis can be found in Attachment A: Working Paper #1: Traffic Analysis.

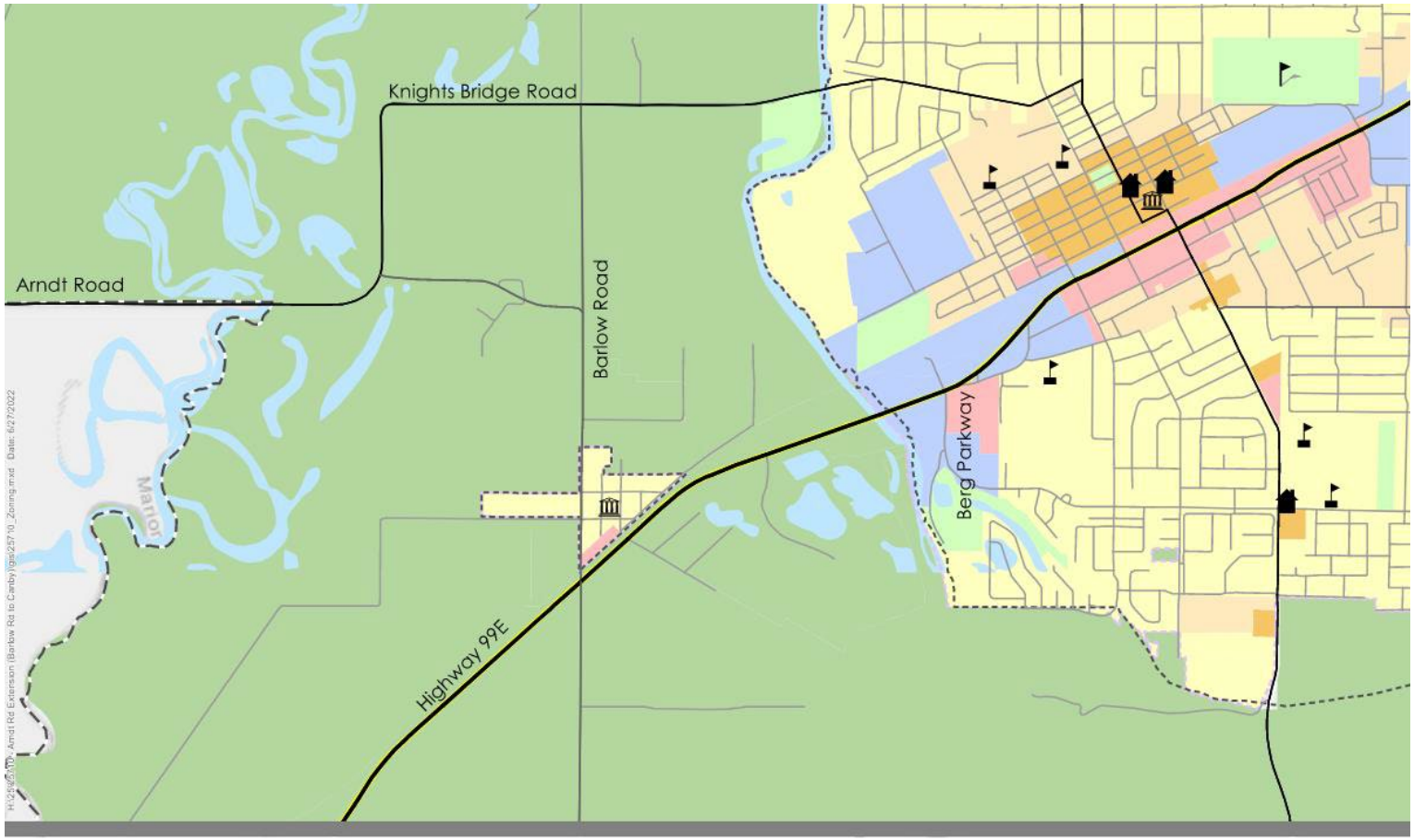
STUDY AREA

The study area is focused on the roadway network surrounding, adjacent to and along the Arndt Road/Barlow Road/OR 99E corridor between Barlow and Canby. The four study intersections used in the operational and safety analysis are shown in Figure 2. The analysis evaluated existing traffic conditions, and short-term and long-term alternatives within the study area.

Figure 2. Study Area

Figure 3 shows the land use and activity centers in the study area. As shown, land use in the area is primarily rural, with single-family residential, industrial, and recreational areas near the study intersections. In Barlow activity centers near study intersections are limited to Barlow City Hall.

Figure 3. Study Area Land Use and Activity Centers



EXISTING AND FUTURE TRAFFIC OPERATIONS

This section summarizes existing and future conditions within the study area, including the existing transportation system and traffic operations under existing and future conditions.

Existing Transportation Facilities

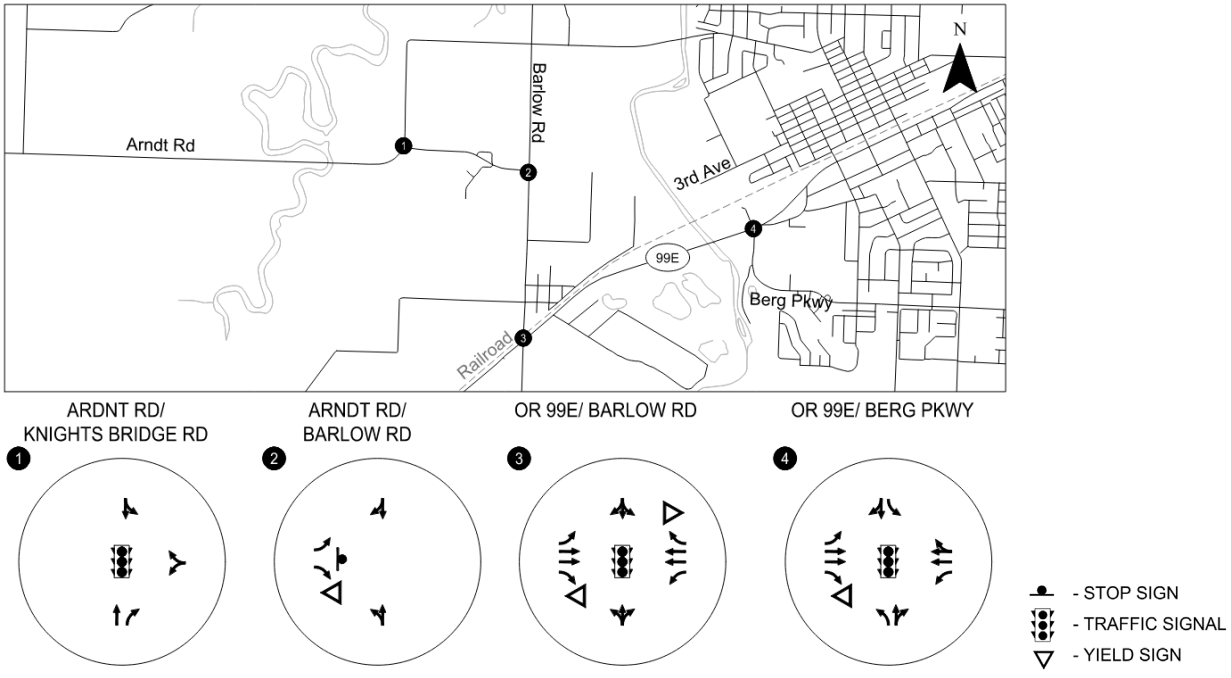
Table 1 summarizes the attributes of key roadways. The existing lane configurations and traffic control devices are summarized in Figure 4 . Most roadways are two-lane major arterials without striped bicycle lanes and sidewalks within the traffic analysis study area. Additionally, there are currently no sidewalks or ADA ramps at the Arndt Road/Knights Bridge Road, Barlow Road/Arndt Road, or Barlow Road/OR 99E intersections.

Table 1. Existing Transportation Facilities and Roadway Designations

Street	Classification[1]	Motor Vehicle Travel Lanes	Posted Speed (MPH)	Sidewalks	Striped Bicycle Lanes	On-Street Parking
Arndt Road	Major Arterial	2	45	No	No	No
Knights Bridge Road	Major Arterial	2	45	No	No	No
Barlow Road	Collector/Major Arterial	2	35-55	No	No	No
Berg Parkway	Minor Arterial	2	25	Yes	Yes	No
OR 99E	Major Arterial[2]	4	55	No	No	No

[1] *Per Clackamas County Transportation System Plan, Map 5-4a*
[2] *OR 99E owned by ODOT and classified as a Minor Arterial per ODOT functional classification and national highway system status as of March 2022*

Figure 4. Existing Lane Configurations and Traffic Control Devices

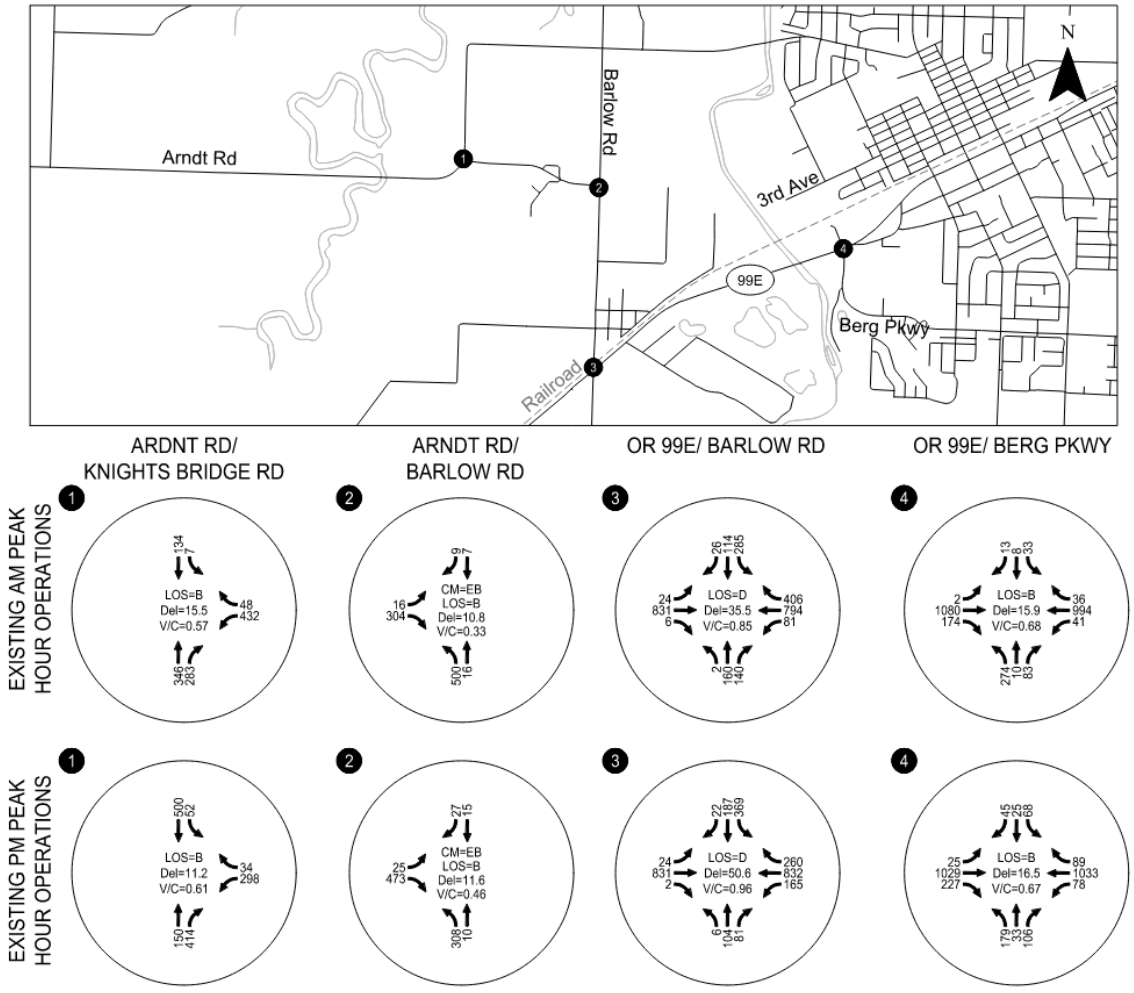


Existing Traffic Operations

The existing traffic operations analysis identifies how the study intersections operate under existing traffic conditions during the weekday AM and PM peak hours. Figure 5 summarizes the traffic volumes and operations for the weekday AM and PM peak hours using adjusted historic 2018 counts.

As shown in Figure 5, all the study intersections satisfy applicable performance standards under existing traffic conditions. Barlow Road/OR 99E is nearing capacity in the weekday PM peak hour under existing traffic conditions.

Figure 5. 2021 Existing Traffic Conditions



CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = CRITICAL MOVEMENT LEVEL OF SERVICE (SIGNALIZED)/ CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/ CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

Year 2040 Traffic Operations

The future traffic operations analysis identifies how the study intersections are expected to operate during the weekday AM and PM peak hours in the year 2040.

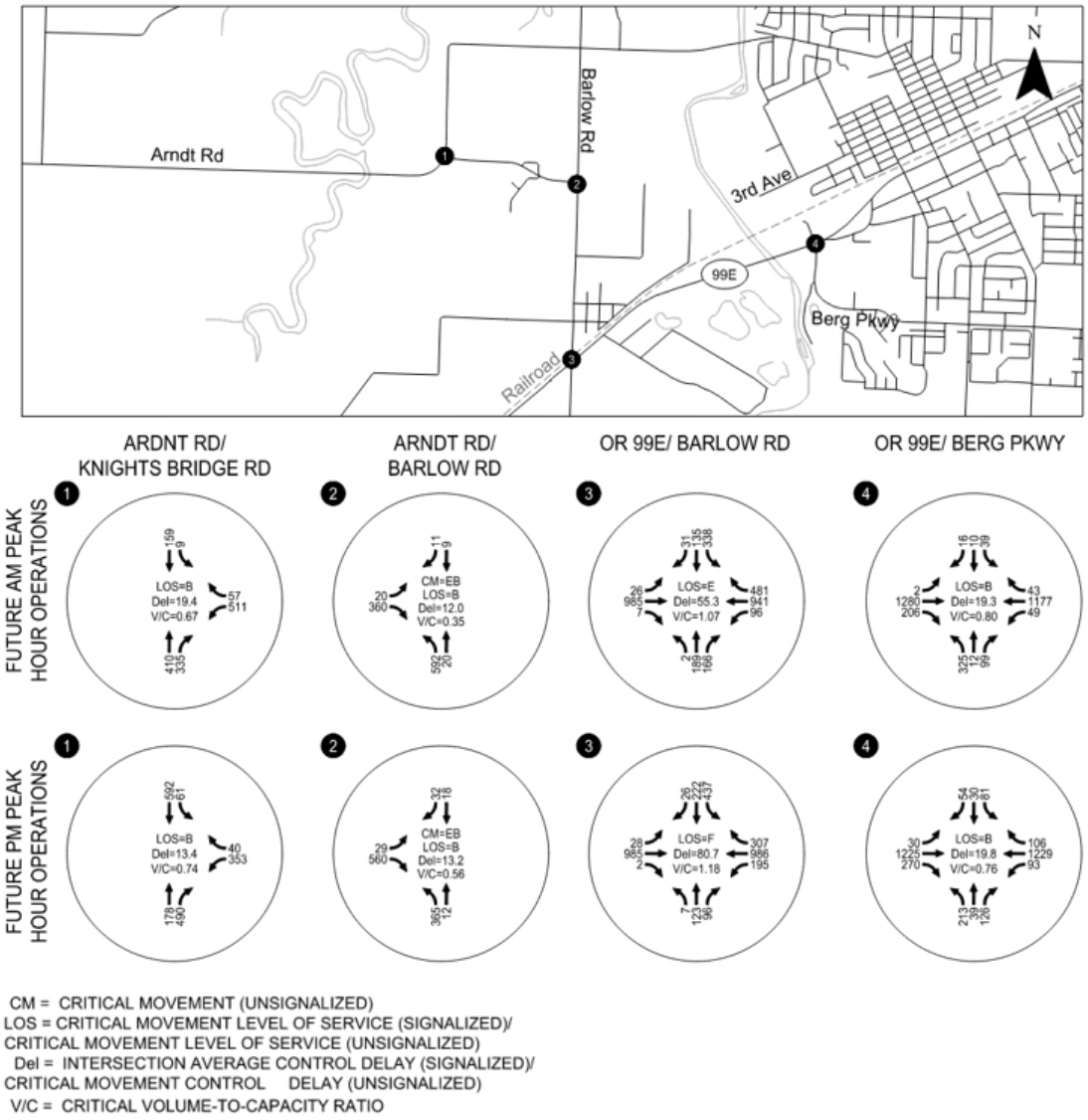
Forecast traffic volumes were developed for the study intersections based on count volumes, the Metro Regional Travel Demand Model traffic forecasts for the model 2015 base year, year 2040 Metro RTP fiscally-constrained travel demand model, and ODOT future volume traffic volume tables.

Per these sources, forecast traffic volumes are expected to increase in the Canby area at a roughly 1.0% per year growth rate.

Figure 6 summarizes the forecast weekday AM and PM peak hour traffic volumes from the historic 2018 (to reflect pre-COVID conditions) counts and traffic operations at the study intersections, assuming current lane configurations and traffic control devices.

As shown in Figure 6, all study intersections satisfy applicable performance standards under future traffic conditions, except the Barlow Road/ OR 99E intersection which is forecast to operate at a LOS E and a v/c ratio of 1.07 during the weekday AM peak hour and at LOS F and a v/c ratio of 1.18 during the weekday PM peak hour.

Figure 6. Year 2040 Traffic Conditions



I-205 TOLLING CONSIDERATIONS

Impacts of potentially tolling I-205 were analyzed to identify the overall changes in traffic patterns in the greater Barlow-Canby area. The ODOT I-205 Toll Project Comparison of Screen Alternatives provides estimates of increased traffic patterns during the weekday AM and PM peak hours. The analysis included the traffic impact of the bridge tolls on Abernethy Bridge and Tualatin River Bridge (I-205 Alternative #3).

The bridge tolls result in an estimated 20 percent increase in traffic on OR 99E in the weekday AM and PM peak hours. As such, the eastbound and westbound through traffic along OR 99E was increased by 20 percent during the weekday AM and PM peak hours for I-205 Alternative #3.

Barlow Road/OR 99E operations worsen with tolling and still fails in the AM and PM peak hours. The Berg Parkway/OR 99E intersection continues to meet performance standards.

TRAIN TRAFFIC CONSIDERATIONS

Impacts of train traffic along the Union Pacific railroad crossing north of the Barlow Road/OR 99E intersection were evaluated for the existing and future year 2040 AM and PM traffic conditions. Projected queueing outcomes during a six-minute train crossing[1] were used to estimate queueing. Outcomes were calculated using the at-grade volumes, including the total southbound and northbound approaches, given the lack of separate lanes for turning movements on these approaches.

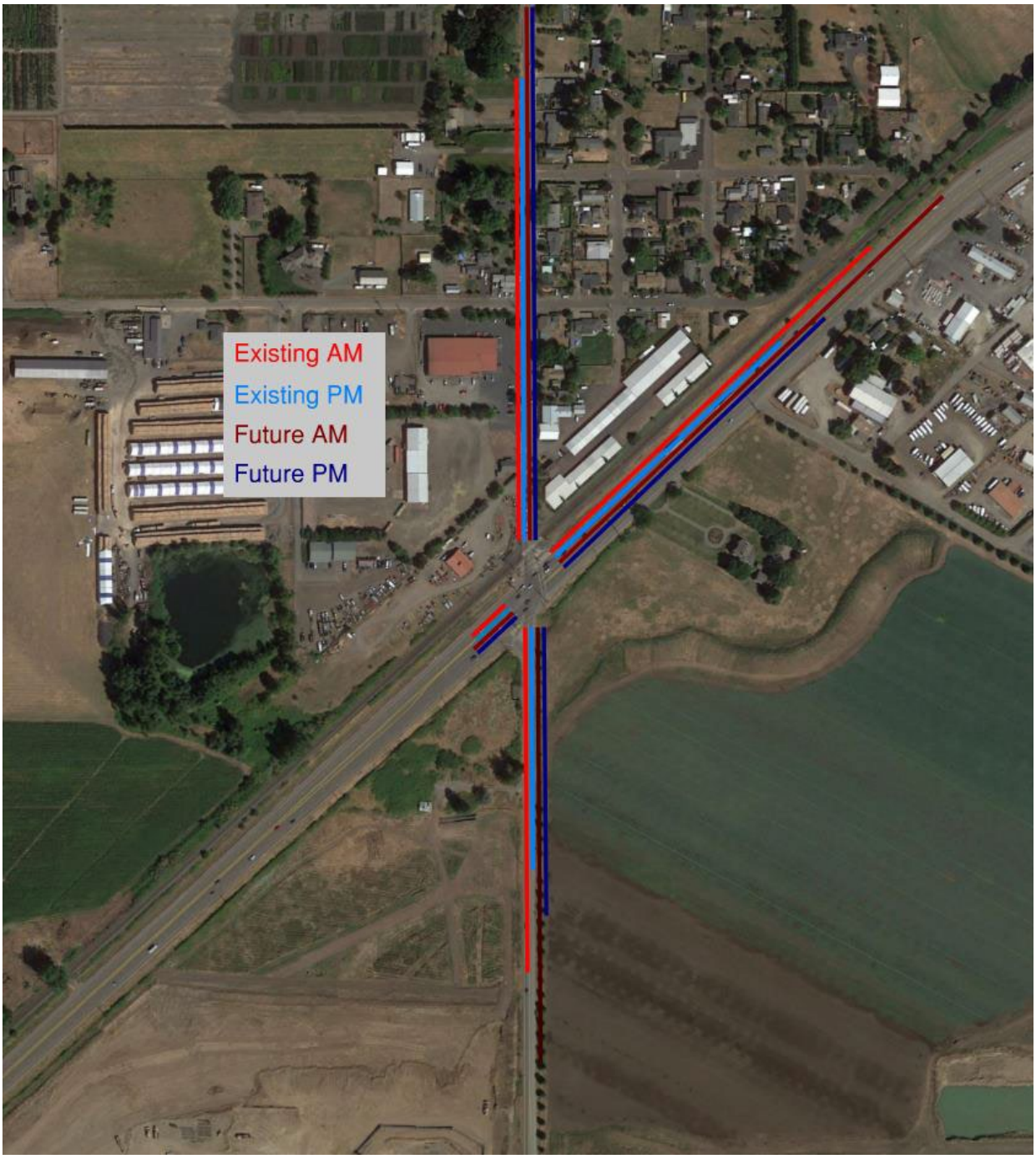
The 95th percentile queue lengths shown in Figure 7 quantify the queue lengths that have a 5% probability of being exceeded during a six-minute train crossing.

As shown, the 95th percentile queue lengths are within storage lengths during crossings with the exception of the southbound and westbound right-turn movements. During a train crossing:

- southbound traffic is forecasted to back-up north of 2nd Street.
- westbound right-turn traffic will spillback into the OR 99E through lane, negatively impacting traffic operations and safety for through vehicles in addition to turning vehicles.

[1] Train-crossing assumes a 3-mile long train (15,840 feet), train speed of 40 mph (58.7 ft./sec), and 25 seconds of gates down both before and after the train crossing for lowering and clearance. The resulting 320 seconds is rounded up to six minute.

Figure 7. Queueing Lengths



CRASH ANALYSIS

A crash analysis was performed at the study intersections based on the most recent five years of reported crash data available (January 1, 2015 through December 31, 2019), provided by ODOT.

Intersections and 90th Percentile Crash Rate

Table 2 summarizes the crash occurrence and severity at study intersections. As shown, rear-end is the most frequent collision type, particularly for the Arndt Road/Barlow Road and Barlow Road/OR 99E intersections.

- The majority of rear-end collisions on the Barlow Road/OR 99E and Berg Parkway/OR 99E intersections occurred along OR 99E from both approaches, likely due to phasing changes and standing queues from signalized traffic control and the higher traffic on OR 99E.
- The majority of the crashes at Arndt Road/Barlow Road are rear-end collisions occurring on the west leg between vehicles traveling eastbound. The west leg has the highest volumes of the Arndt Road/Barlow Road intersection, which could account for it experiencing more crashes than the north or south legs. Additionally, the placement angle of vehicles performing eastbound right-turns creates an acute angle of visibility, causing drivers to turn their head sharply to the left to look for a gap, instead of watching the vehicle in front of them.

Table 2. Intersection Crash Frequency and Severity

Intersection	Collision Type						Severity			Total
	Angle	Turn	Rear-End	Fixed Object	Pedestrian	Side swipe	PDO[1]	Injury	Fatal	
Arndt Rd/ Knights Bridge Rd	-	2	6	2	-	-	5	5	-	10
Arndt Rd/Barlow Rd	-	5	15	1	-	1	13	9	-	22
Barlow Road/OR 99E	3	10	16	2	-	1	9	23	-	32
Berg Parkway/OR 99E	1	5	6	-	1	-	9	4	-	13

[1] *Property Damage Only*

The intersection crash rate represents the number of crashes at an intersection per million vehicles entering the intersection. ODOT utilizes the 90th percentile crash rates to identify intersections experiencing more crashes than expected based on traffic volume for similar intersection types. As shown in Table 3, only the Arndt Road/Barlow Road intersection exceeds the 90th percentile rate.

Table 3. Intersection Crash Rate Comparison

Intersection	Total Crashes	90th Percentile Crash Rate[1]	Intersection Crash Rate[2]	Does Intersection Rate Exceed 90th Rate?
Arndt Rd/Knights Bridge Rd	10	0.51	0.39	No
Arndt Rd/Barlow Rd	22	0.29	1.45	Yes
Barlow Road/OR 99E	32	0.86	0.63	No
Berg Parkway/OR 99E	13	086	0.26	No

[1] Calculated using Exhibit 4-1 from the ODOT APM
[2] Calculated using the equation for intersection crash rate per million entering vehicles from the ODOT APM. Average Annual Daily Traffic was estimated based on weekday PM peak hour traffic volumes

Safety Priority Index System (SPIS) Sites

ODOT provides an annual list of safety priority index system (SPIS) locations based on reported crash data. The intent of the list is to identify roadway segments with an unusually high occurrence of crashes and/or high incidences of crash severity, and is used to select locations for further investigation. The most recent list of SPIS sites based on data from 2016-2018 identified the segment of OR 99E between S Tull Road and just southwest of S Barlow Road within the top 15% of the state.

KEY FINDINGS & TRANSPORTATION SYSTEM NEEDS

This analysis identified transportation system needs to be addressed through the short- and long-term alternative analysis, including:

- Capacity - The Barlow Road/OR 99E intersection is nearing capacity under existing conditions and will not meet ODOT performance standards in the year 2040. The I-205 tolling alternatives will worsen operations in the study area, with through traffic on OR 99E increasing 20% in the weekday AM and PM peak hour.
  - Without tolling:
    - 55.3 seconds of average delay in the 2040 weekday AM peak hour
    - 80.7 seconds of average delay in the 2040 weekday PM peak hour
  - With tolling:
    - 70.3 seconds of average delay in the 2040 weekday AM peak hour
    - 97.2 seconds of average delay in the 2040 weekday PM peak hour
- Queue Storage - Train traffic at Barlow Road/OR 99E cause ques exceeding the storage length of the southbound approach and westbound right-turn lane today and in the future.
- Safety - A crash analysis indicates that only the Arndt Road/Barlow Road intersection exceeds the 90th percentile crash rate for similar facilities. The intersection recorded majority rear-end collisions, which can potentially be attributed to visibility concerns of the westbound right-turn lane to advancing traffic. In addition, the 2019 SPIS list noted the segment of OR 99E between S Tull Road and just southwest of S Barlow Road is within the top 15% of the state.

4. ALTERNATIVES DEVELOPMENT

4. Alternatives Development

Based on the existing and future conditions assessment and input from the Technical Advisory Committee (TAC), alternatives were identified in two efforts:

- **Short-Term Alternative Analysis** identified short-term alternative improvements at Arndt Road/Barlow Road and Barlow Road/OR 99E.
- **Long-Term Alternative Analysis** identified potential improvements that could be constructed in the absence or preceding the addition of a complete extension of Arndt Road.

Design objectives and evaluation criteria were developed to assess and evaluate the short-term and long-term alternatives. The design objectives for the alternatives include:

- Reduce greenhouse gas emissions through a reduction in intersection delay.
- Meet all relevant Clackamas County and ODOT roadway design standards.
- Identify where standards are unable to be met, and any potential design exceptions needed for approval.

The following evaluation criteria (placed alphabetically and not by relative importance) were established to assess and prioritize the short-term alternatives:

- **Business Access** – The ability of travelers to get to businesses was evaluated, in particular for consolidated or relocated driveways near the Barlow Road/OR 99E intersection.
- **Cost** – Cost estimates were developed for each alternative. These were quantified at a planning-level and include railroad components.
- **Operations** – Traffic operations considered quantified v/c ratios, delay and queuing at the study intersections.
- **Right-of-Way** – Right-of-way assessment included number of parcels impacted, number of structures impacted, and total square footage of potential right-of-way acquisition.
- **Safety** – Safety assessments quantified the benefit of changes such as intersection control, skew angles, and other factors using Highway Safety Manual (HSM) crash modification factors.

The key findings from the short-term and long-term analysis are summarized in the following sections. A complete list of the design objectives, evaluation criteria, and analysis of alternatives can be found in *Attachment B - Working Paper #2A: Short-Term Alternatives* and *Attachment C - Working Paper #2B: Long-Term Alternatives*, respectively.

SHORT-TERM ALTERNATIVES ANALYSIS

Short-term alternatives focused on opportunities to improve mobility and safety, based on the key findings from the existing and future conditions assessment and comments received through the TAC. Short-term alternatives were developed at the Arndt Road/Barlow Road and OR 99E/ Barlow Road intersections.

Arndt Road/Barlow Road Intersection

The Arndt Road/Barlow Road intersection has a high incidence of rear-end crashes. Two different roundabout alternatives, signalization, and all-way stop-control were considered to alleviate this safety issue. The alternatives considered are summarized as follows:

- Alternative 1.1, a **single-lane roundabout** centered on the existing intersection, which has the potential to provide the capacity and safety improvements needed at the intersection.
- Alternative 1.2, a **single-lane roundabout** shifted to the southwest quadrant of the existing intersection, with similar ability to address capacity and safety.
- A **traffic signal** would result in signal warrants being met for Year 2040 and could achieve acceptable traffic operations. However, current and future traffic patterns, including heavy existing northbound left-turn and eastbound right-turn movements and potential for future east-west travel with an extension in place, are better served with a roundabout operationally and provide enhanced safety benefits through a reduction of vehicular conflict points.
- An **all-way stop-controlled** intersection at S Arndt Road/S Barlow Road is anticipated to result in future traffic experiencing high delays. Additionally, the eastbound right-turn lane would need to be modified to reduce the visibility concerns currently in-place.

OR 99E/Barlow Road Intersection

The Barlow Road/OR 99E intersection has existing and projected operational and safety issues. To address these issues, several short-term alternatives were considered. An initial set of alternatives was evaluated maintaining the existing alignment and rail crossing. These alternatives were ultimately discarded, as they provided minimal operational benefit and did not address safety concerns related to the skewed intersection. Maintaining the existing alignment would also be a challenge for the rail crossing, and the railroad would likely require realignment to create a perpendicular crossing. Thus, realigned alternatives were further explored. Based on conversations with the TAC and considerations of potential property impacts the following two alternatives were developed:

- A **single through/right-turn lane**, a **single southbound left-turn lane** and a **southbound multi-use path with bike ramps**
- **Dual southbound left-turn lanes**, on-street bike lanes, and a median island. (Gate arms for the railroad crossing extend a maximum of 28 feet, requiring a median for a second gate arm with this scenario.)

Both alternatives have one northbound through-right lane, a northbound left-turn lane, and extended shoulder storage on the westbound right-turn lane, and maintain eastbound and westbound through lanes.

Recommendations

Based on the evaluation results from the short-term alternatives analysis, the following alternatives are recommended at the study intersections:

- **Alternative 1.1** – The centered roundabout alternative at Barlow Road/Arndt Road provides operational and safety benefits at a cost of approximately $2.6 million less than the offset alternative. Though harder to construct, the alternative has less right-of-way impacts and requires less road construction. Alternative 1.1 is shown in Figure 8.
- **Alternative 2.2** – The dual southbound left-turn lane alternative provides better operations, about $400,000 in safety benefits to the public per year from reduced property damage and injuries, and costs approximately $600,000 more than the single, southbound left-turn lane alternative. The alternative manages weekday AM and PM peak hour queueing during typical conditions and provides more storage when train crossings occur. Alternative 2.2 is shown in Figure 9.

Both alternatives would need to be further analyzed to explore business access to land uses on Barlow Road north of OR 99E. Land uses are currently served by full access driveways on both sides of Barlow Road and accesses on First Street. As alternatives begin further refinement, discussions with Union Pacific and nearby business owners should be initiated.

Figure 8. Arndt Road/Barlow Road Single-Lane Roundabout

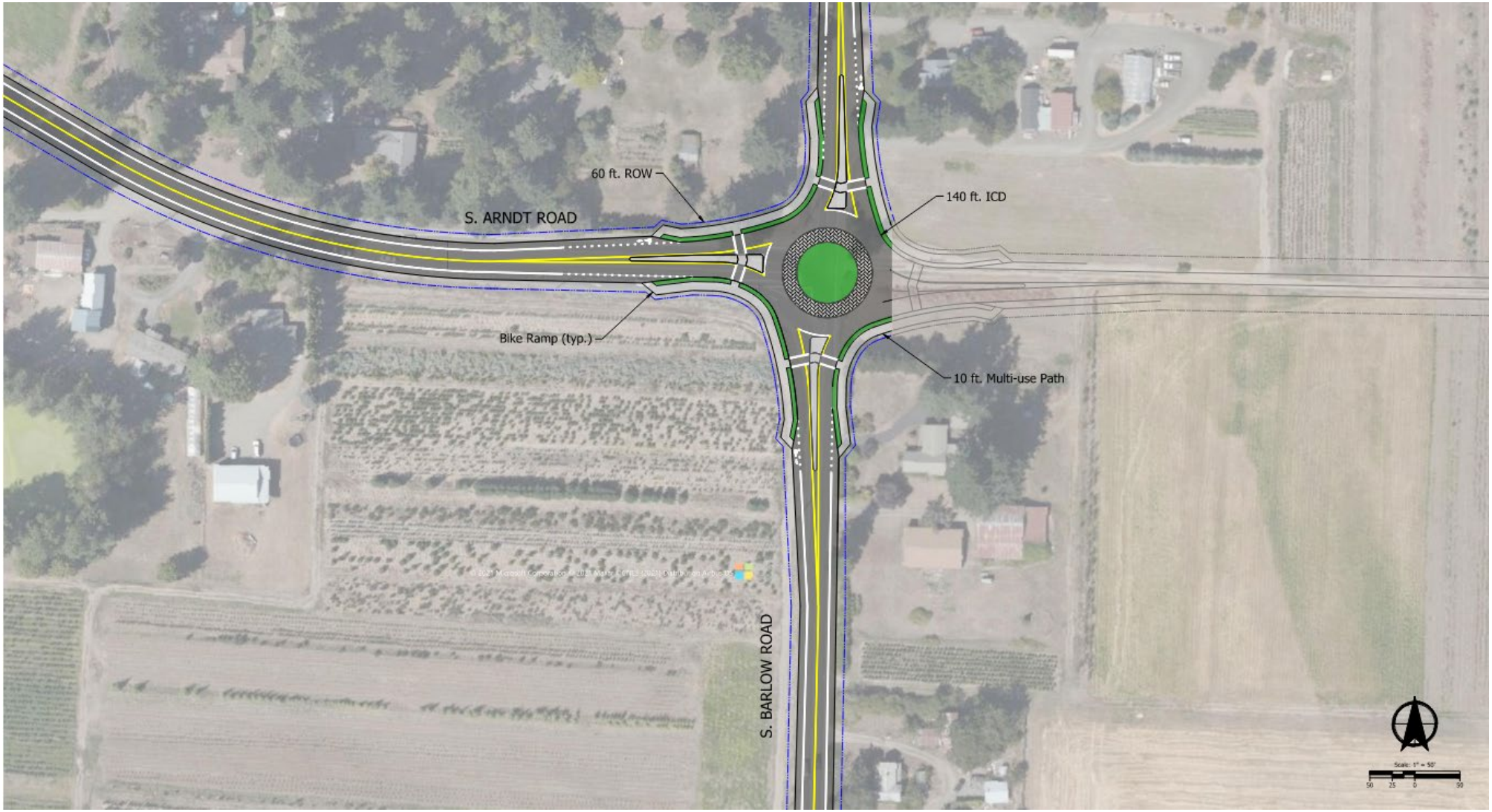
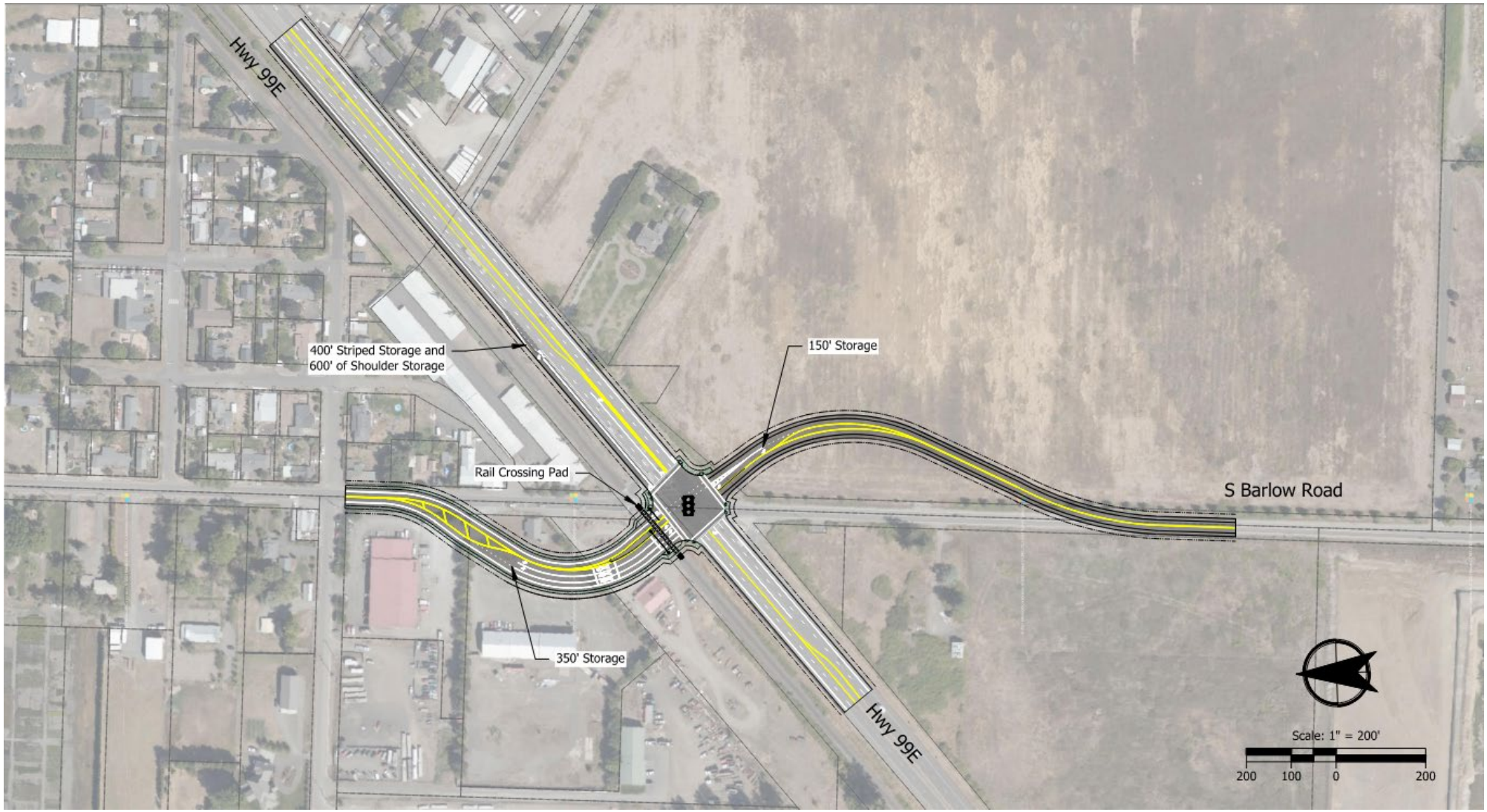


Figure 9. OR 99E/Barlow Road Dual Southbound Left-Turn Lanes



LONG-TERM ALTERNATIVES ANALYSIS

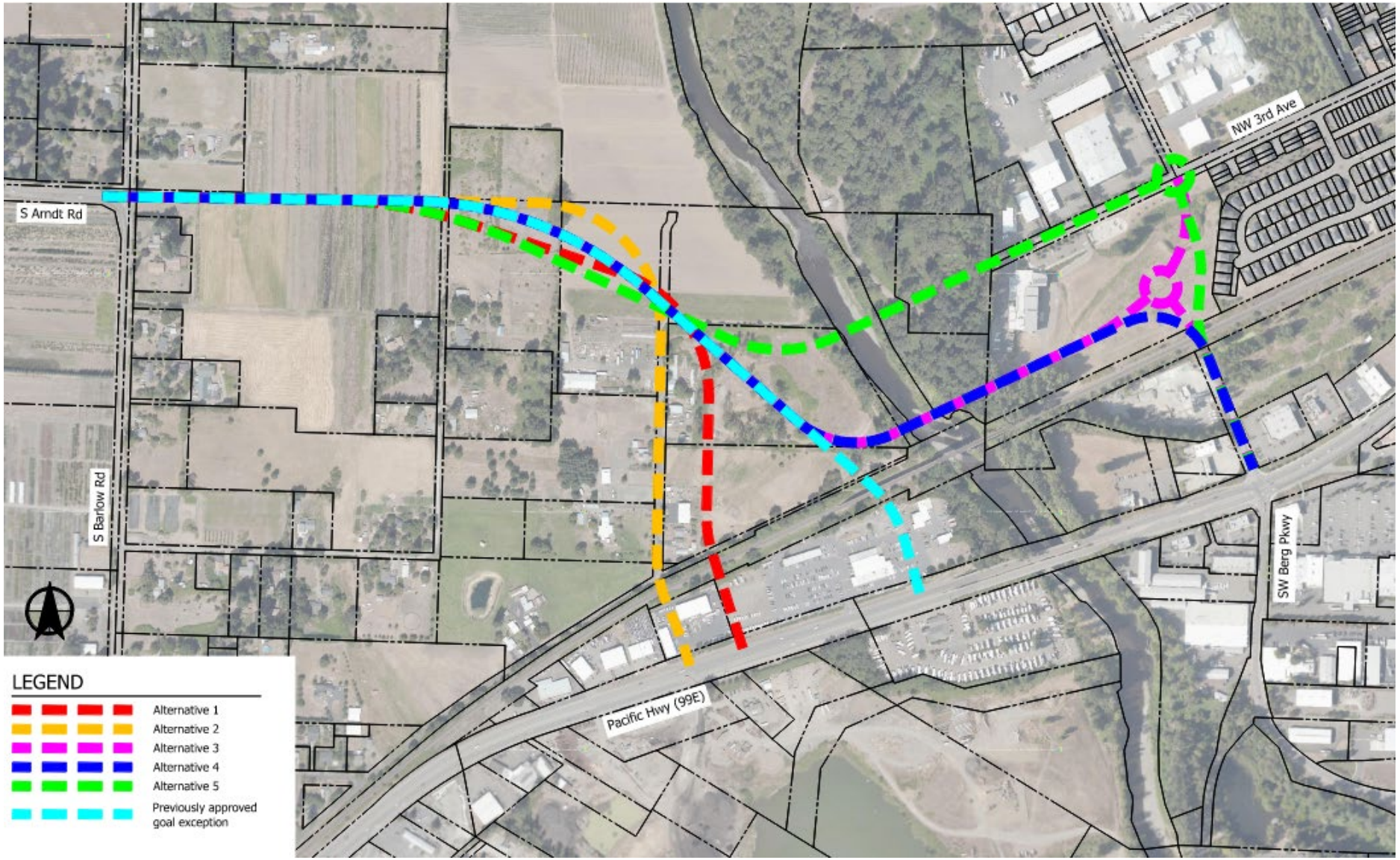
The preceding section described short-term alternatives that could be developed without an extension of Arndt Road. This section describes the development of two conceptual feasible extensions of Arndt Road connecting to OR 99E/Berg Parkway and one conceptual design extension of Arndt Road to a new OR-99E intersection approximately 1,300 feet west of the Molalla River.

For the long-term analysis, six alignment options for an Arndt Road extension east of Barlow Road were identified in an initial screening process that included assessment of existing grades, railroad impacts, and right-of-way impacts.

The previously approved goal exception alignment had substantial impacts to businesses (e.g., the Canby Ford dealership). It was also determined that the previously approved goal exception alignment would be costly to develop since turn lanes for the intersection with OR 99E would require widening the OR 99E bridge.

Other alignments were screened out due to infeasible locations for railroad crossings and scale of roadway improvements that would be required. The five potential new long-term alternatives considered in addition to the original goal exception alignment are shown in Figure 10.

Figure 10. Long-Term Alternatives Considered



OR 99E Connection West of Molalla River

This alignment alternative (**Alternative #1**) shown in Figure 11 includes a new arterial roadway connection between the Arndt Road/Barlow Road intersection and OR 99E west of the Molalla River. The new intersection would be located on OR 99E approximately 1,300 feet west of the river.

OR 99E Connection via Berg Parkway

Two alternatives were further developed for the Arndt Road extension, including a new arterial roadway connection between the Arndt Road/Barlow Road intersection and OR99E/Berg Parkway intersection:

- **Alternative 3** includes a new arterial roadway connection between the Arndt Road/Barlow Road intersection and OR 99E via the existing Berg Parkway intersection as shown in Figure 12. In addition, a roundabout would be constructed between 3rd Avenue and the railroad to provide a new connection to 3rd Avenue.
- **Alternative 4** includes a new arterial roadway connection between the Arndt Road/Barlow Road intersection and OR 99E via the existing Berg Parkway intersection as shown in Figure 13. It is similar to the other Berg Parkway connection alternative; however, it removes the roundabout and new roadway connection to 3rd Avenue.

Figure 11. Long-Term Arndt Road Extension Alignment Alternative 1

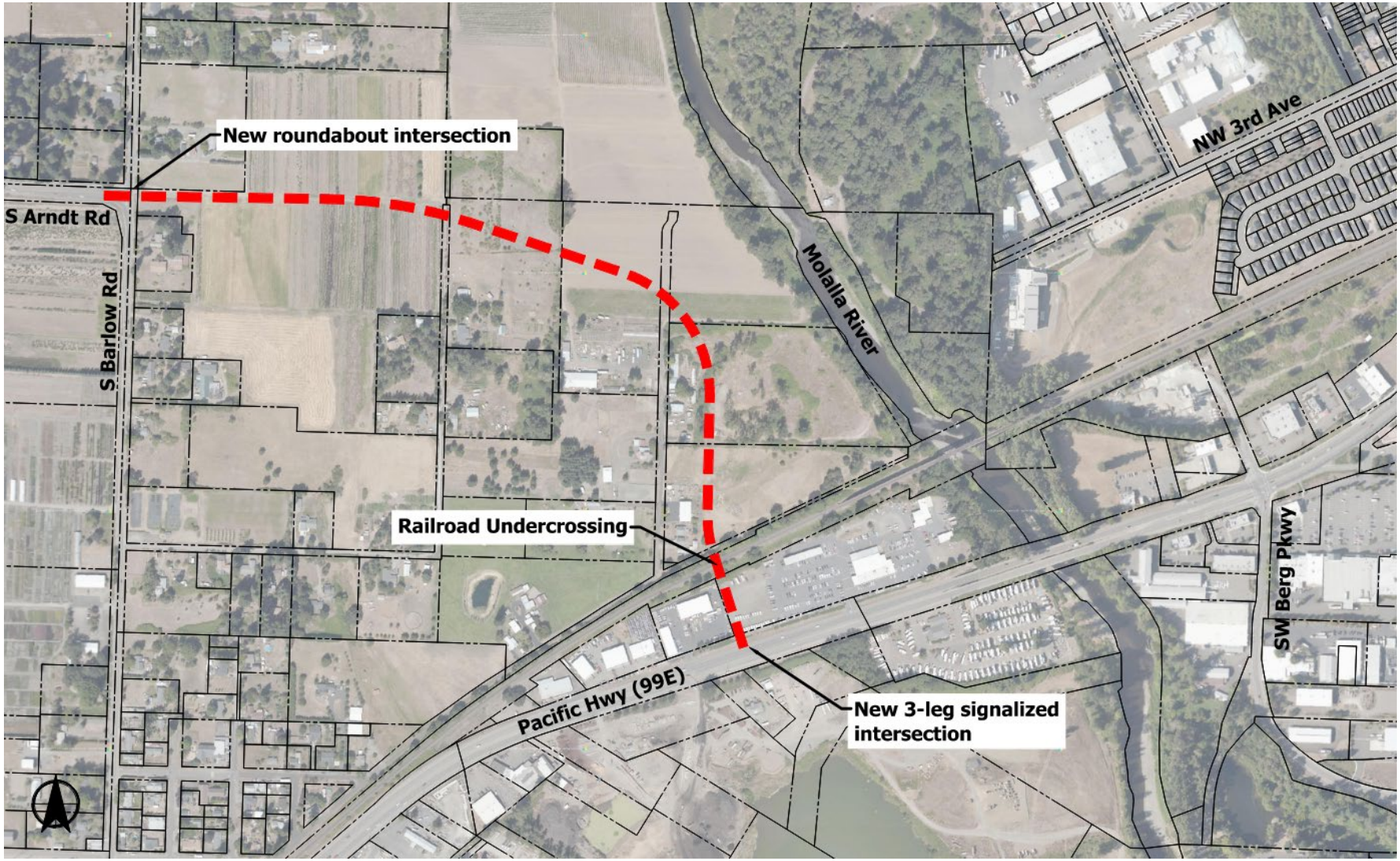


Figure 12. Long-Term Arndt Road Extension Alignment Alternative 3

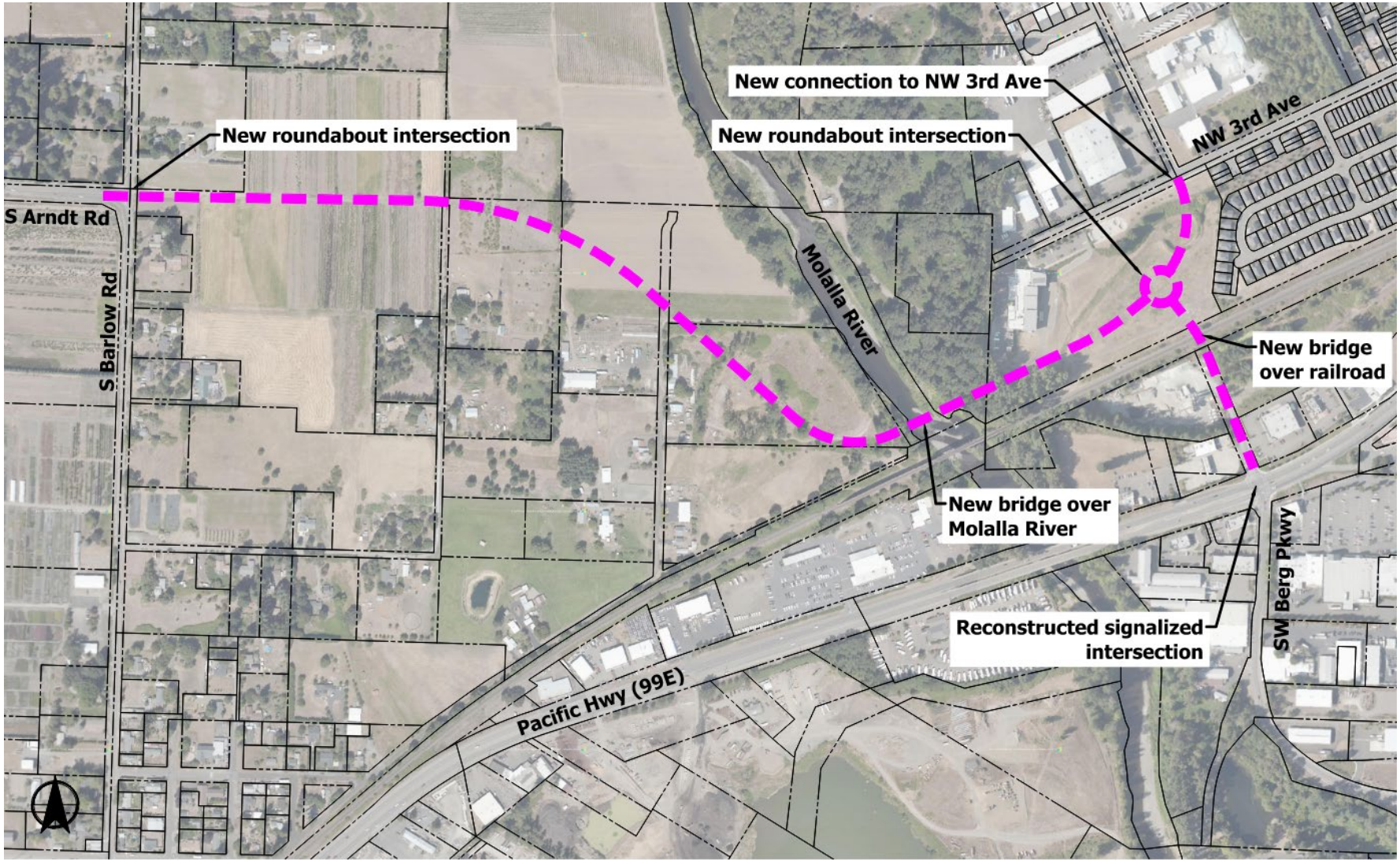
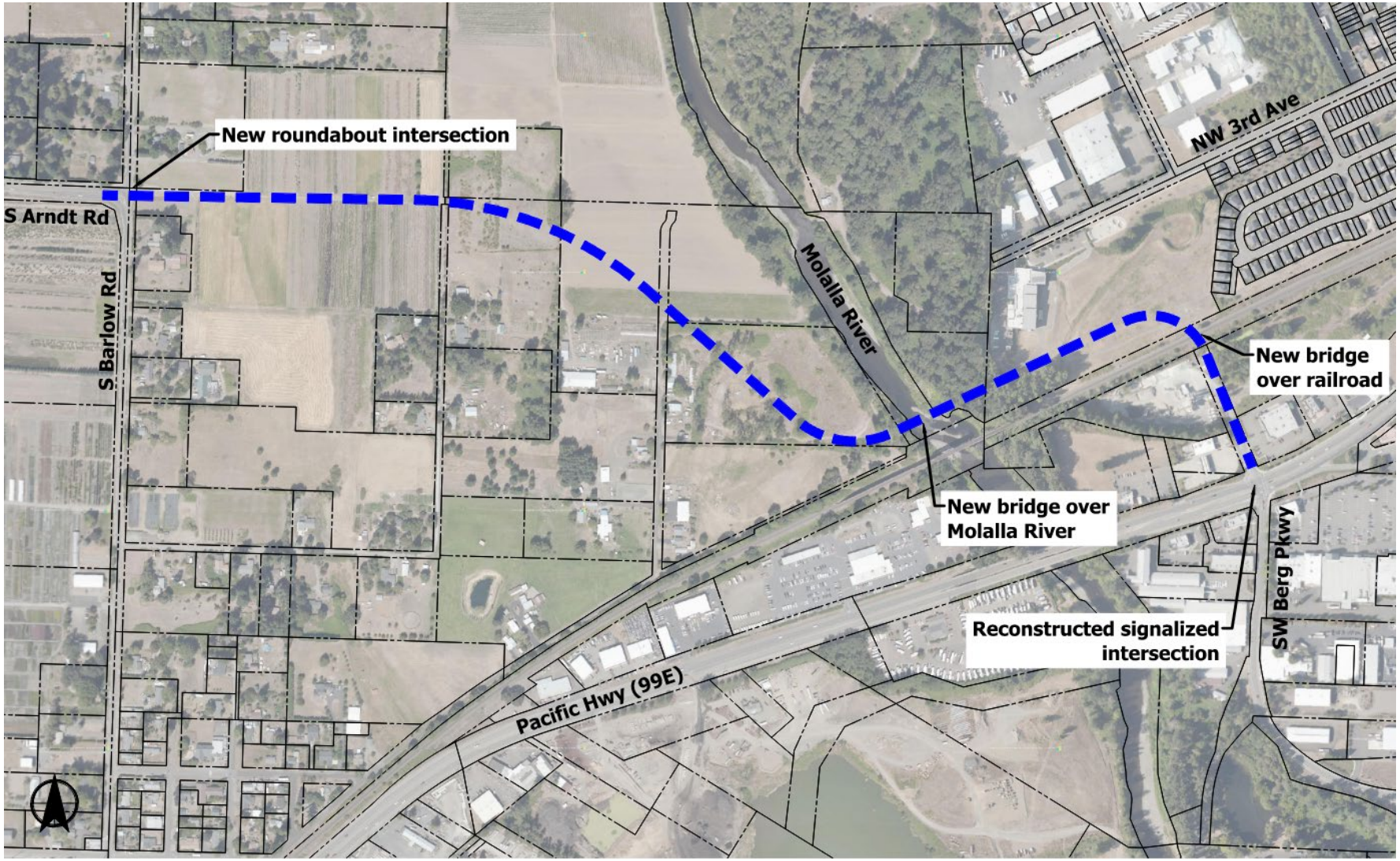


Figure 13. Long-Term Arndt Road Extension Alignment Alternative 4



Evaluation Results

Evaluation results for the long-term alternatives are shown in Table 4. Not that long-term alternative costs are in addition to the short-term alternative package costs. Results were determined through the following criteria for long-term alternatives:

- Costs estimates
- Right-of-way: 1) the number of impacted parcels; 2) Impacted structures, and 3) The total square footage across all properties
- Operations
- Resilience

Table 4. Evaluation Results

Alternative	Cost (millions)	Right-of-Way	Year 2040 Operations (AM/PM)	Resilience
Short-Term Alternative Package	$18.7M	10 Parcels 0 Structures 197,891 SF	Meet Mobility Standards at Arndt Rd/Barlow Rd, OR 99E/Barlow Rd, and OR 99E/Berg Pkwy	No additional bridges crossing Molalla River
Alt 1	$40.0M	9 Parcels 12 Structures 1,355,458 SF		No additional bridges crossing Molalla River
Alt 3	$136.5M	13 Parcels 7 Structures 1,378,636 SF		1 new bridge crossing Molalla River
Alt 4	$116.8M	13 Parcels 7 Structures 1,244,013 SF		1 new bridge crossing Molalla River

Recommendations

Based on the evaluation results from the long-term alternatives analysis, in particular the high cost of an Arndt Road Extension, and the ability of the short-term improvements to address future 2040 operational and safety issues, a long-term alternative is not recommended in a 20-year timeframe. Beyond that timeframe, Clackamas County can work with the cities of Barlow and Canby and the community to determine which alternative may be needed in the future. Below are considerations for each of the long-term alternatives:

- **Alternative 1** provides a grade-separated railroad crossing at the lowest cost. However, it does not provide an additional bridge crossing of the Molalla River nor improve local connections to Canby.
- **Alternative 3** provides a grade-separated railroad crossing and Molalla River crossing, as well as a new direct connection to Canby. However, it comes at a higher cost and there are higher environmental and land use permitting requirements with the new Molalla River bridge.

- **Alternative 4** provides a grade-separated railroad crossing and Molalla River crossing, as well as a connection to local Canby streets. However, this connection needs further evaluation for traffic impacts and would likely lead to higher levels of traffic on local roads in Canby. The river crossing also has higher environmental and land use permitting requirements.

In comparing the long-term alternatives to recommended short-term alternatives in 2040, the long-term alternatives provide only weekday p.m. peak hour travel time saving of an estimated 5 to 65 seconds between the west end of the Arndt Road/ Barlow Road intersection and the east end of the OR 99E/Berg Parkway intersection (i.e., connecting between OR 99E and I-5). However, all study intersections would perform acceptably in 2040 with or without the long-term alternatives. The long-term alternatives also have high environmental and land use permitting requirements, especially for Alternatives 3 and 4 crossing the Molalla River.

Table 5 summarizes the benefits and costs of the short-term and long-term alternatives.

Table 5. Short-Term/Long-Term Alternative Comparison

Alternative	Year 2040 Traffic Operations	Safety	Environmental/Land Use Permitting	Cost (millions)
Short-Term	✓	✓	✗	$18.7M
Alt 1	✓	✓	✗	$40.0M
Alt 3	✓	✓	✗	$136.5M
Alt 4	✓	✓	✗	$116.8M

**note: long-term alternative costs are in addition to the short-term alternative package costs*

✓ **Addresses the Need** ✗ **Moderate Permitting And Impacts** ✗ **High Permitting and Impacts**

Berg Parkway
North of OR 99E

6. NEXT STEPS

5. Next Steps

Further refinements to the selected alternatives are needed. Right-of-way impacts will require conversations with property owners and businesses during the project development process. If the County moves forward with a long-term Arndt Road extension, further study would also be needed to determine roadway typical and structural sections and to evaluate embankment or retaining wall structures.

The Clackamas County Transportation System Plan (TSP) identifies dual left-turn lanes to Barlow Road/OR 99E (PN 1094) as a Tier 1 project, and paved shoulders to Barlow Road (PN 2030) and a 2-to-3 lane Arndt Road Extension (PN 2029) as Tier 2 projects. Tier 1: 20-year capital projects are needed investments matched with anticipated funding. Tier 2: Preferred capital projects are investments needed to meet population, housing, and employment projections that do not have identified funding at this time. The recommendations presented herein are consistent with these descriptions. However, this effort determined the Arndt Road Extension is not needed within the 20-year planning horizon. Clackamas County intends to update its TSP beginning in 2023, and can reassess the Arndt Road Extension prioritization at that time and also potentially update project descriptions to reflect the information gained through this concept study.

Additionally, if the Arndt Road Extension moves forward, the original Arndt Road goal exception would need to be amended to incorporate long-term Alternative #1. The long-term alternatives with a Molalla River crossing I would require a new goal exception.

Berg Parkway north of OR 99E

ATTACHMENTS

Attachments

A. Working Paper #1: Traffic Analysis
B. Working Paper #2A: Short-Term Alternatives
C. Working Paper #2B: Long-Term Alternatives

Attachment A

Working Paper #1: Traffic Analysis

Attachment B

Working Paper #2A: Short-Term Alternatives

Attachment C

Working Paper #2B: Long-Term Alternatives