

REVISED DRAFT MEMORANDUM

Date: February 16, 2022

Project #: 23232.9B

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Clackamas County
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Project: OR 212 (187th to 242nd) Intersection Refinement Study

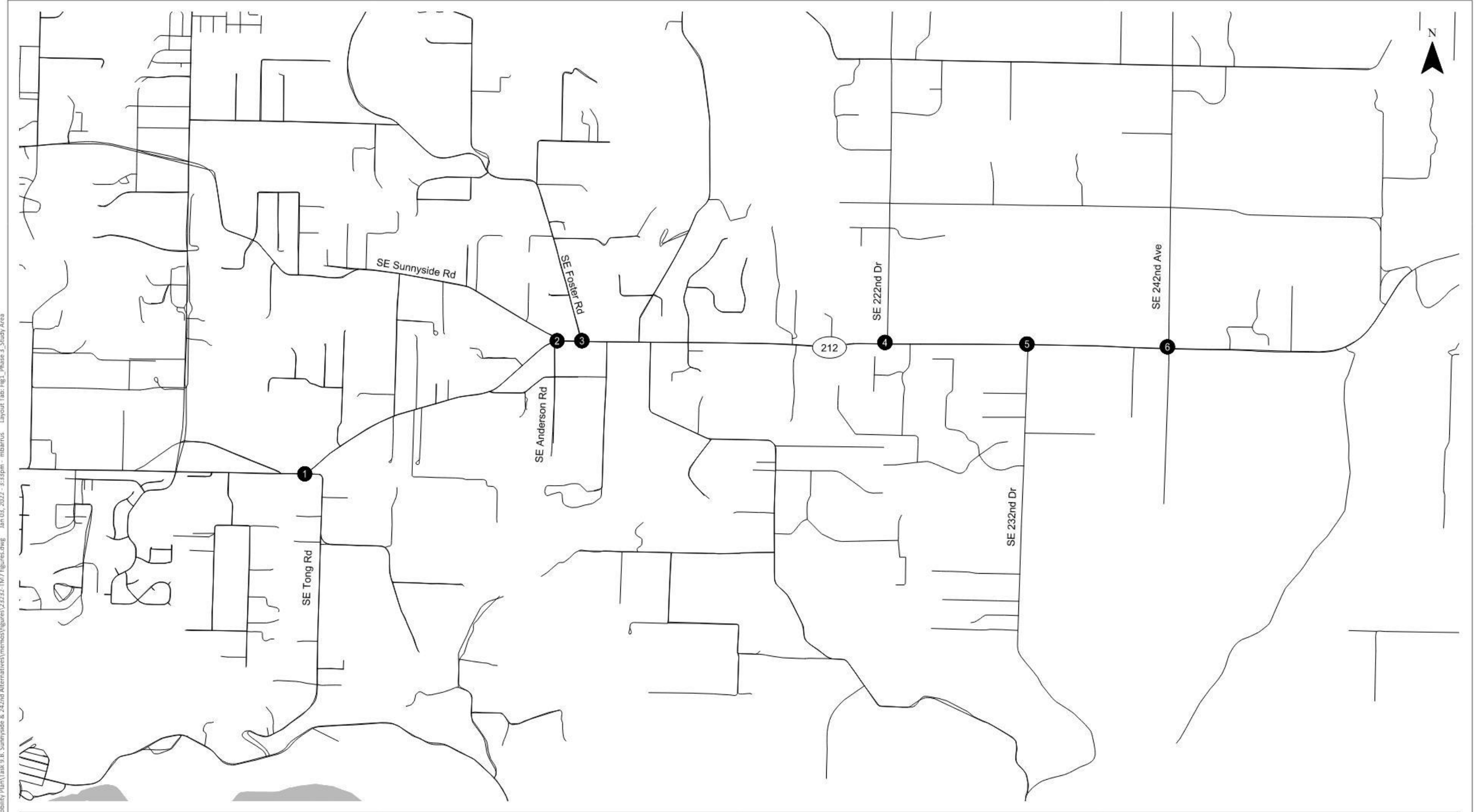
Subject: Revised Draft Study Recommendations

Clackamas County is exploring transportation options for the key intersections along OR 212 between SE 187th Avenue and SE 242nd Avenue to improve safety and intersection mobility. (It should be noted that this effort does not evaluate overall capacity needs or alternative alignments of the OR 212 corridor. As this is identified as a long-term need, Clackamas County and ODOT are currently working on securing funding for the segment of OR 212 between SE 122nd Avenue and SE 172nd Avenue.). This memorandum presents the following information:

- Previous planning efforts completed in the study area that could influence potential intersection improvements
- Existing and future traffic conditions at the major intersections along with OR 212 between SE 187th Avenue and SE 242nd Avenue
- Initial improvement alternatives and fatal flaw analysis based on operations and high-level cost and right-of-way impact assessments
- Refined improvement alternatives, including double-line concepts, and full evaluation of these promising alternatives
- Preliminary and refined recommendation alternatives based on the evaluation results and guidance from the Technical Advisory Committee (TAC), and will be updated with public input

The OR 212 (187th to 242nd) Intersection Refinement study area and intersections are shown in Figure 1.

1. OR 212 / SE Tong Road
2. OR 212 / SE Sunnyside Road-SE Anderson Road
3. OR 212 / SE Foster Road
4. OR 212 / SE 222nd Drive
5. OR 212 / SE 232nd Drive
6. OR 212 / SE 242nd Avenue



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● - Study Intersections

Study Area and Intersections
Clackamas County, Oregon

Figure
1

PREVIOUS PLANNING EFFORTS

Several planning efforts have either analyzed or potentially influence the OR 212 (187th to 242nd) Intersection Refinement study area and recommended improvements. The most relevant plans include:

- Clackamas County Comprehensive Plan (2005)
- Sunrise Project Final Environmental Impact Statement (FEIS) (2010)
- Clackamas County Transportation System Plan (TSP) (2013)
- City of Damascus Transportation System Plan (never adopted) (2013)
- Metro Regional Transportation Plan (RTP) (2018)
- Clackamas to Columbia (C2C) Corridor Plan (2020)
- Pleasant Valley/North Carver (PV/NC) Comprehensive Plan (adoption expected in 2022)

A summary of these plans and their applicability to the broader Damascus Mobility Plan is provided in *Memorandum #3: Damascus Mobility Plan Transportation Planning Framework*. Table 1 lists projects (adopted and unadopted) previously identified specific to the OR 212 (187th to 242nd) Intersection Refinement study area.

Table 1. Previous Planned Projects in the OR 212 (187th to 242nd) Intersection Refinement Area

Project Description	Priority/Time Frame	Source
OR 212 from SE 162 nd Avenue to SE Anderson Road: Add bikeways, pedestrian facilities ways, and landscape pedestrian facilities buffer; widen to 6 lanes within Happy Valley; add center turn lane within Damascus	High	Clackamas County TSP (included as a regional project)
OR 212 within the [former] Damascus City Limits (Armstrong Circle to 257 th): Obtain right-of-way for future 4-lane facility with planted median and 5 lanes at major intersections; build as major development occurs and apply access management to reduce number of driveways. NOTE: 5 lanes not included in the Metro RTP model, as the project is to preserve right-of-way, not construct in planning horizon.	Low	Clackamas County TSP (included as a regional project)
SE 232 nd Avenue from OR 212 to OR 224: Reconstruct and widen (rural)	N/A	Clackamas County Comprehensive Plan
The FEIS identified a preferred alternative for the OR 212/224 corridor between I-205 and the Rock Creek Junction. The completed first phase of the project between I-205 and SE 122 nd Avenue provides a new 4-lane roadway to relieve congestion on OR 212 and OR 224.	First phase complete, funding not identified for future phases	Sunrise Project FEIS
Town Center Refinement Plan (with possible one-way couplet, additional east-west collector connections, additional north-south local connections)	20-Year Needs Projects	City of Damascus TSP (never adopted)
SE 187 th Avenue arterial urban upgrades and extension north to SE Foster Road/SE Vogel Road	20-Year Needs Projects	City of Damascus TSP (never adopted)

Project Description	Priority/Time Frame	Source
New southern arterial from OR 212/SE Tong Road to SE 202 nd Avenue	20-Year Needs Projects	City of Damascus TSP (never adopted)
SE 202 nd Avenue urban upgrades	20-Year Needs Projects	City of Damascus TSP (never adopted)
SE Tong Road urban upgrades	20-Year Needs Projects	City of Damascus TSP (never adopted)
OR 212 widening to 5 lanes and urban upgrades between OR 224 (Rock Creek Junction) and SE 222 nd Avenue (Town Center cross-section to be determined)	20-Year Needs Projects	City of Damascus TSP (never adopted)
SE 222 nd Drive urban upgrades	Long-Term Projects (20-40 Years)	City of Damascus TSP (never adopted)
SE 232 nd Avenue urban upgrades and connection between SE Tillstrom Road and OR 212	Long-Term Projects (20-40 Years)	City of Damascus TSP (never adopted)
OR 212 widening to 5 lanes and urban upgrades east of SE 222 nd Drive	Long-Term Projects (20-40 Years)	City of Damascus TSP (never adopted)
SE 242 nd Avenue widening to 5 lanes and urban upgrades	Long-Term Projects (20-40 years)	City of Damascus TSP (never adopted)
Realign SE Tong Road to intersection with SE 187 th Avenue at OR 212 with a traffic signal	Shown in Street Plan	PV/NC Comprehensive Plan (Draft)
Realign SE Sunnyside Road near OR 212 to create a T-intersection with SE Foster Road; provide separate SE Sunnyside Road East Extension from SE 172 nd Avenue to SE Foster Road	Shown in Street Plan	PV/NC Comprehensive Plan (Draft)
Sunrise Corridor Phase 3: Provides improvements east of SE 172 nd Avenue	Long Term (15+ Years)	C2C Corridor Plan

EXISTING AND FUTURE TRAFFIC CONDITIONS

This section summarizes existing and future conditions at the study intersections. It describes the traffic count data, analysis methodology, existing and future volume development, and traffic operations under existing and future conditions.

Traffic Counts

The COVID-19 pandemic and related economic recession resulted in reduced traffic levels starting in spring 2020 and continuing through to the present. As a result, this plan has been developed using traffic counts collected prior to April 2019 that were deemed to be more representative of actual traffic conditions.

For the purposes of this OR 212 (187th to 242nd) Intersection Refinement Study, turning movement counts were collected on a typical weekday during the PM peak period (4-6 PM) at these six intersections:

1. OR 212 / SE Tong Road
2. OR 212 / SE Sunnyside Road-SE Anderson Road
3. OR 212 / SE Foster Road
4. OR 212 / SE 222nd Drive
5. OR 212 / SE 232nd Drive
6. OR 212 / SE 242nd Avenue

All counts include the total number of pedestrians, bicyclists, and motor vehicles that entered the intersection in 15-minute intervals. A growth factor was uniformly applied to the 2019 traffic counts to estimate 2021 volumes for the 2021 existing conditions analysis. A one-percent growth factor was used based on historic growth and estimated growth in the area, but that is likely conservative given the impacts of COVID-19. *Appendix A contains the traffic count worksheets.*

Analysis Methodology

Level-of-service (LOS) and volume-to-capacity (v/c) were assessed for the study intersections to measure how well they accommodate existing and future traffic demand. The highest 15-minute flow rates were used to reflect traffic conditions during the peak 15 minutes of the weekday PM peak hour. Analyses were performed using Synchro 10 software in accordance with procedures stated in the *Highway Capacity Manual 6th Edition* (HCM, Reference 1).

Performance Standards

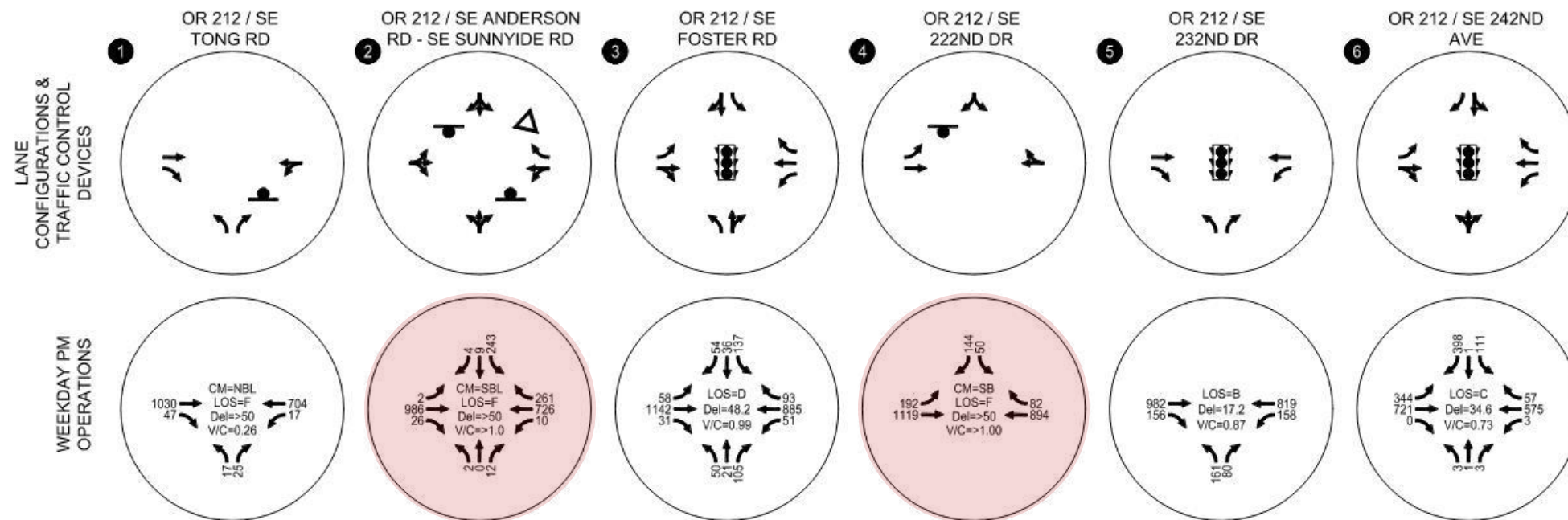
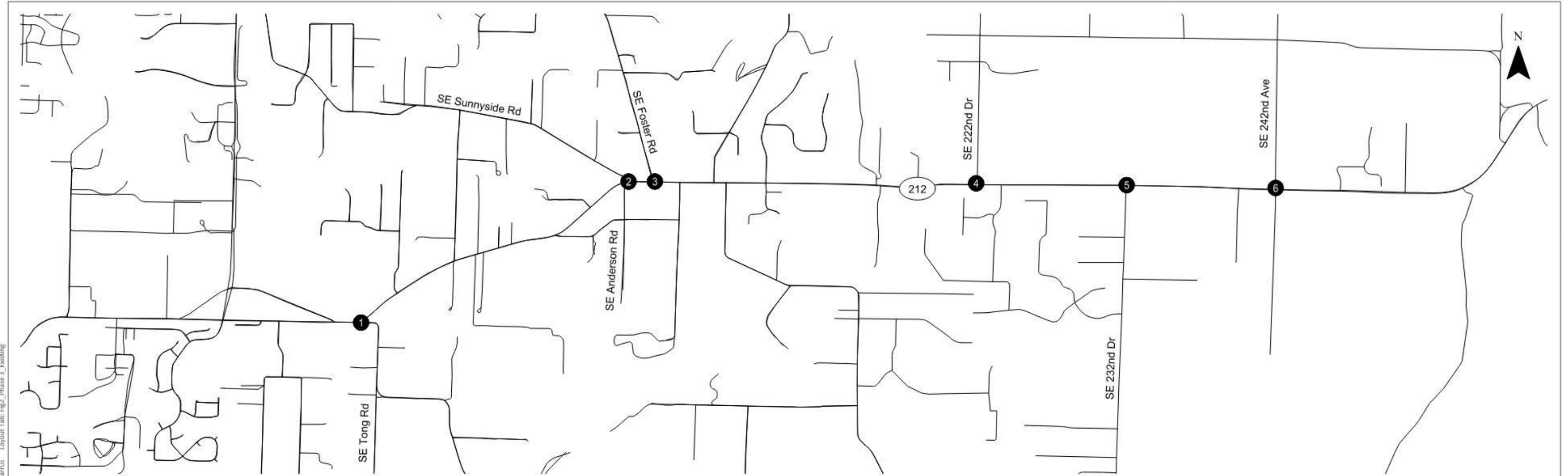
The Oregon Highway Plan (OHP, Reference 2) identifies volume-to-capacity (v/c) thresholds for ODOT facilities inside the Portland metropolitan area. At unsignalized study intersections, a v/c ratio threshold of 0.99 applies to the state highway approaches. At signalized study intersections, a 0.99 v/c threshold applies to the overall intersection.

Existing Traffic Operations Analysis

The existing traffic operations analysis identifies how the study intersections operate under existing traffic conditions during the weekday PM peak hour. The study area has a local system peak hour of 4:35 to 5:35 PM, which was used for the analysis at all intersections. Figure 2 summarizes the study intersection lane configurations, traffic control devices, weekday PM peak hour traffic volumes, and traffic operations. *Appendix B contains the existing traffic conditions worksheets.* As shown in the following figure, the following intersections exceed v/c ratio thresholds (indicated in red shading):

- OR 212 / SE Sunnyside Road-SE Anderson Road
- OR 212 / SE 222nd Drive

Note that the OR 212 / SE Foster Road intersection operates at the 0.99 v/c ratio threshold and assumes that near-term improvements (providing protected northbound and southbound left-turns, estimated completion 2021) to the traffic signal are in-place.



- STOP SIGN
- TRAFFIC SIGNAL
- YIELD SIGN

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

Existing Traffic Conditions
 Weekday PM Peak Hour
 Clackamas County, Oregon

Figure
 2

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Further, the Synchro HCM 6th Edition reports for OR 212 / SE 242nd Avenue indicated the intersection operates over capacity. However, Vistro HCM 6th Edition and Synchro HCM 2000 Edition results indicate the intersection is below capacity, largely attributed to the minor northbound movements. This analysis and the 2040 analysis assume the Vistro HCM 6th Edition results as accurate.

The OR 212 / SE 222nd Drive intersection meets traffic signal warrants under existing traffic conditions according to the Manual on Uniform Traffic Control Devices (MUTCD, Reference 3). *Appendix B contains the traffic signal warrant analysis worksheet.*

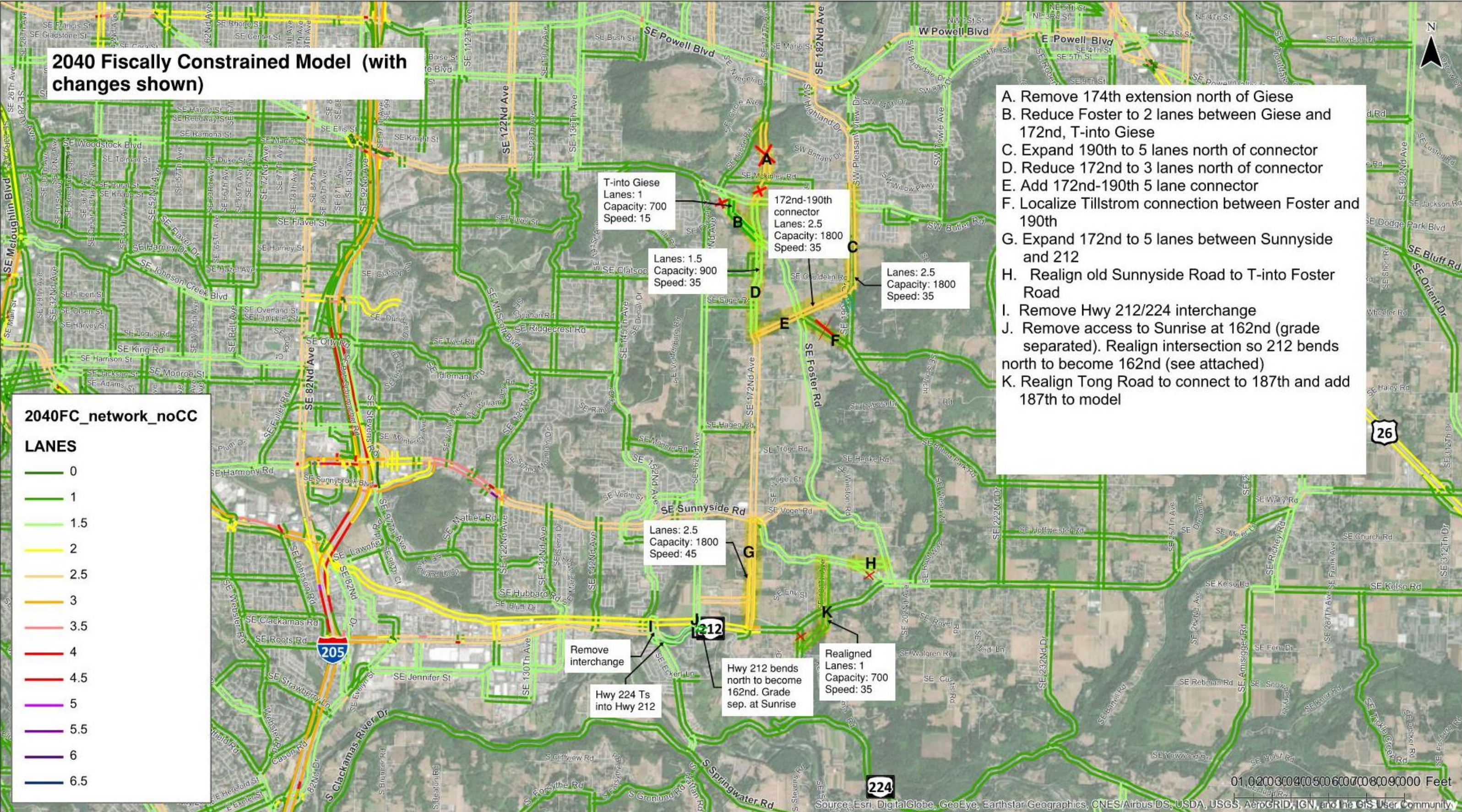
Future Volume Development

Forecast traffic volumes were developed for the study intersections based on the estimated 2021 volumes and base year 2015 and future year 2040 travel demand models. The 2040 Metro fiscally constrained travel demand model forecasts year 2040 traffic volumes for the study corridor that reflect planned transportation improvements affecting the study area, including a three-lane Sunrise Corridor through to SE 222nd Drive. Several changes were made to the model for this analysis based on input from the City of Gresham, the City of Happy Valley, ODOT, and Metro to reflect their more recent planning efforts completed since the 2015 model. Changes include:

- Removing the SE 174th Avenue extension north of Giese (based on the Pleasant Valley Transportation System Plan Refinement project),
- Reducing SE Foster Road to 2 lanes between SE Giese Road and SE 172nd Avenue and creating a T-intersection between SE Foster Road and SE Giese Road (based on the Pleasant Valley Transportation System Plan Refinement project),
- Adding the SE 172nd Avenue-SE 190th Avenue connector as 5 lanes,
- Removing the Damascus Parkway proposed by the City of Damascus,
- Providing 5 lanes for the SE Sunnyside Road Extension from SE 172nd Avenue to SE Foster Road,
- Adding the SE 187th Avenue segment between SE Sunnyside Road and OR 212 and realigning the Tong Road approach¹,
- Reducing SE Sunnyside Road between SE 172nd Avenue to SE Foster Road from 3 lanes to 2 lanes near OR 212, and
- Removing the interchange at OR 212/224.

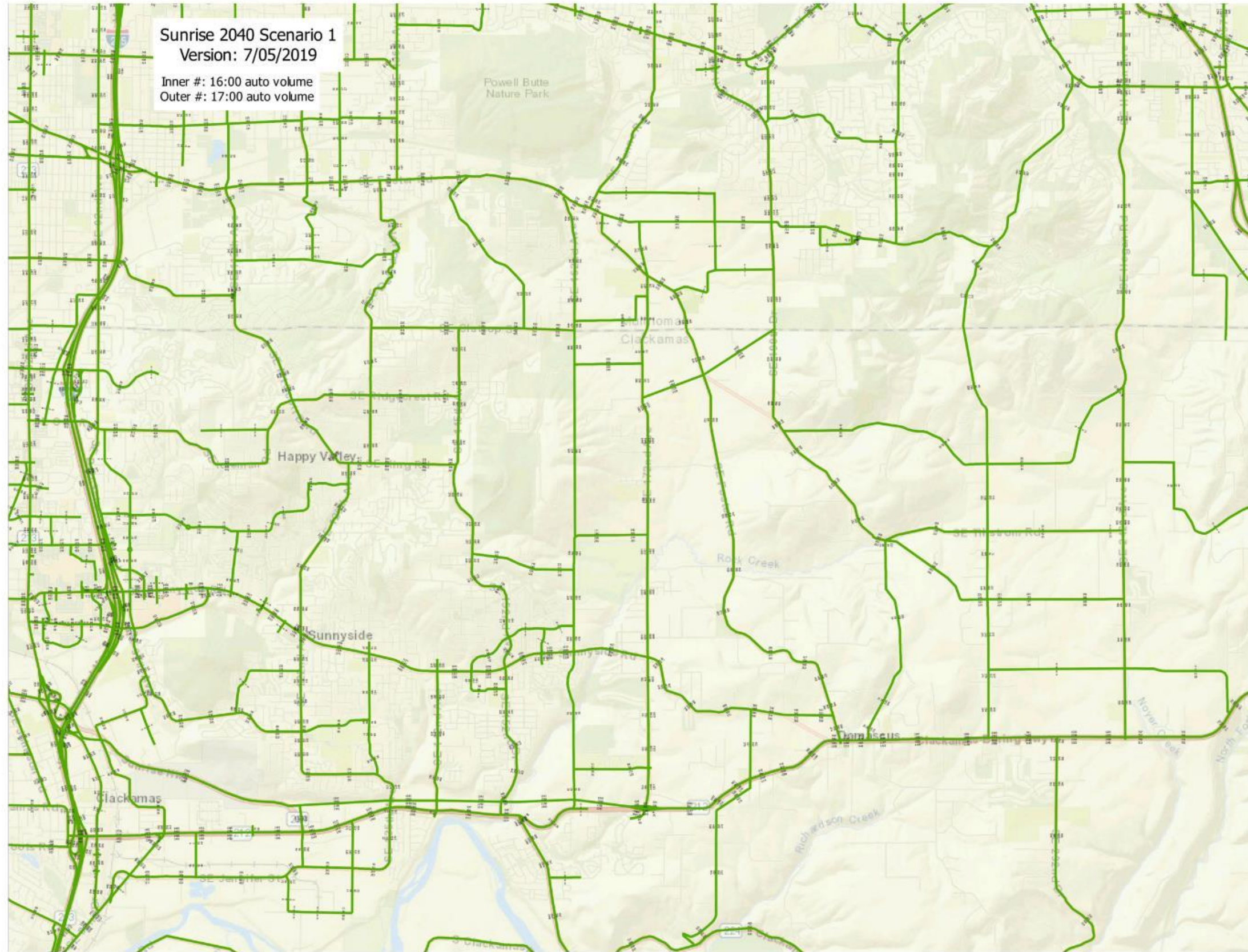
These changes are illustrated in Figure 3, 2040 Fiscally Constrained Metro Model with Changes, and Figure 4, 2040 Fiscally Constrained Metro Model, Weekday PM Peak Hour.

¹ Note that this change is a **draft** in the Pleasant Valley – North Carver Comprehensive Plan Update and Sunrise Gateway Corridor Concept. SE 187th Avenue is not currently in the Metro Model and was needed to understand future traffic operations alternatives. Other network changes for alternatives will be completed in post-processing.



Metro Model Data - Proposed Changes
2040 Fiscally Constrained Network

Figure
3



2040 Fiscally Constrained Metro Model
Weekday PM Peak Hour
Clackamas County, Oregon

Figure
4

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In addition, traffic operations were evaluated without the SE Sunnyside Road Extension to SE Foster Road in order to understand long-term traffic operations if the extension isn't in-place when SE Sunnyside Road/SE Foster Road improvements are made at OR 212. These traffic volumes were hand-assigned based on travel patterns and model volumes. *Appendix C contains the model plot used for the future conditions analysis.*

Forecast traffic volumes were developed by applying the post-processing methodology identified in the National Cooperative Highway Research Program (NCHRP) Report 765, *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (Reference 4), which is the update to NCHRP Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design*. The methodology derives forecast traffic volumes at the study intersections based on the existing traffic counts and base and future year traffic volume model projections.

Future Traffic Operations Analysis

The future traffic operations analysis identifies how the study intersections are expected to operate during the weekday PM peak hour in the year 2040 with the fiscally constrained improvements in place.

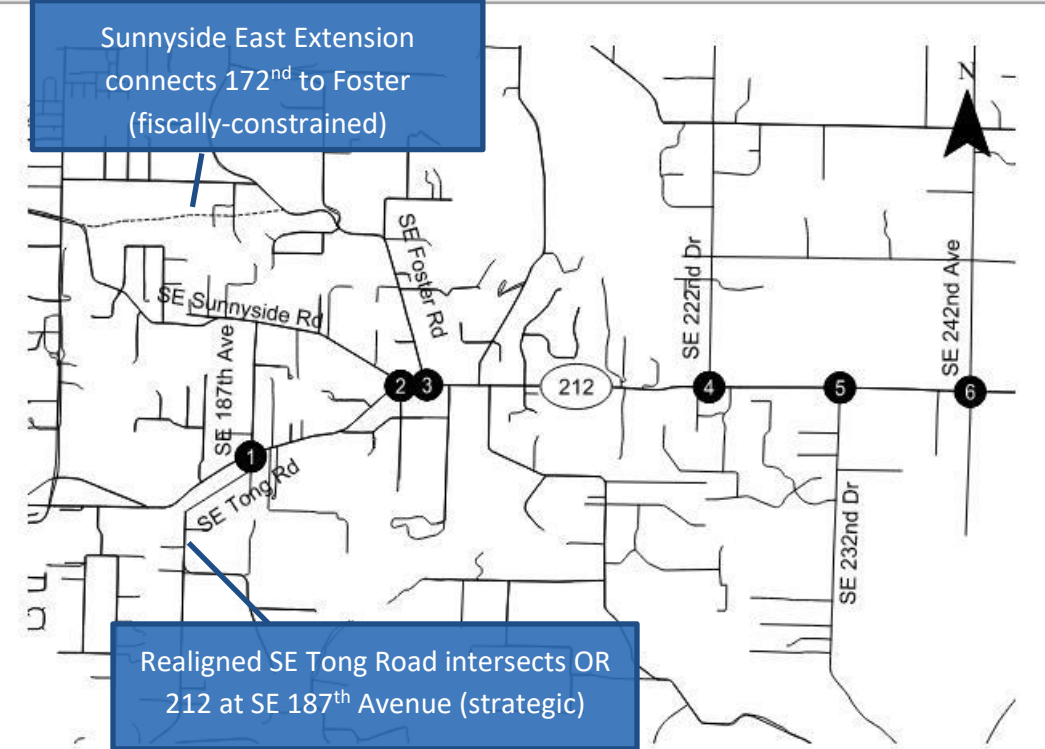
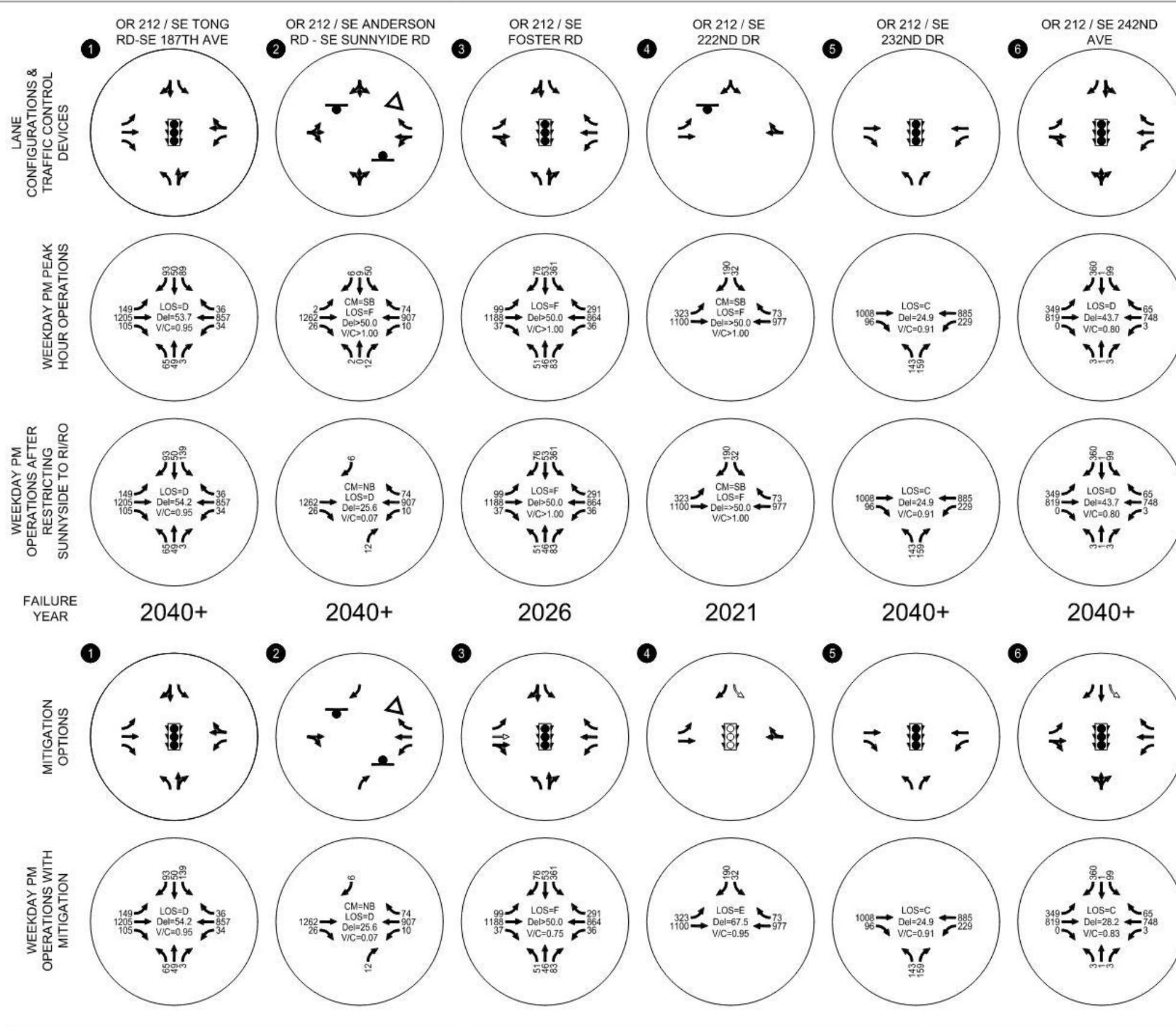
- Figure 5 summarizes the forecast weekday PM peak hour traffic volumes and operations at the study intersections, assuming a three-lane section on OR 212 from SE 172nd Avenue to SE 222nd Drive and an in-place SE Sunnyside Road Extension to SE Foster Road.
- Figure 6 summarizes the forecast weekday PM peak hour traffic volumes and operations at the study intersections, assuming a three-lane section on OR 212 from SE 172nd Avenue to SE 222nd Drive but **no SE Sunnyside Road Extension to SE Foster Road**.

In both scenarios, the southbound left-turn lane at OR 212 / SE Foster Road is protected, an improvement Clackamas County and ODOT made in December 2021. *Appendix D contains the future traffic conditions worksheets.*

With the fiscally constrained improvements in place, the following intersections are forecasted to exceed applicable v/c ratio thresholds in the year 2040 in both scenarios:

- OR 212 / SE Sunnyside Road-SE Anderson Road
- OR 212 / SE Foster Road
- OR 212 / SE 222nd Drive

The OR 212 / SE 222nd Drive intersection is forecast to continue meeting traffic signal warrants into the year 2040. *Appendix D contains the traffic signal warrant analysis worksheet.*



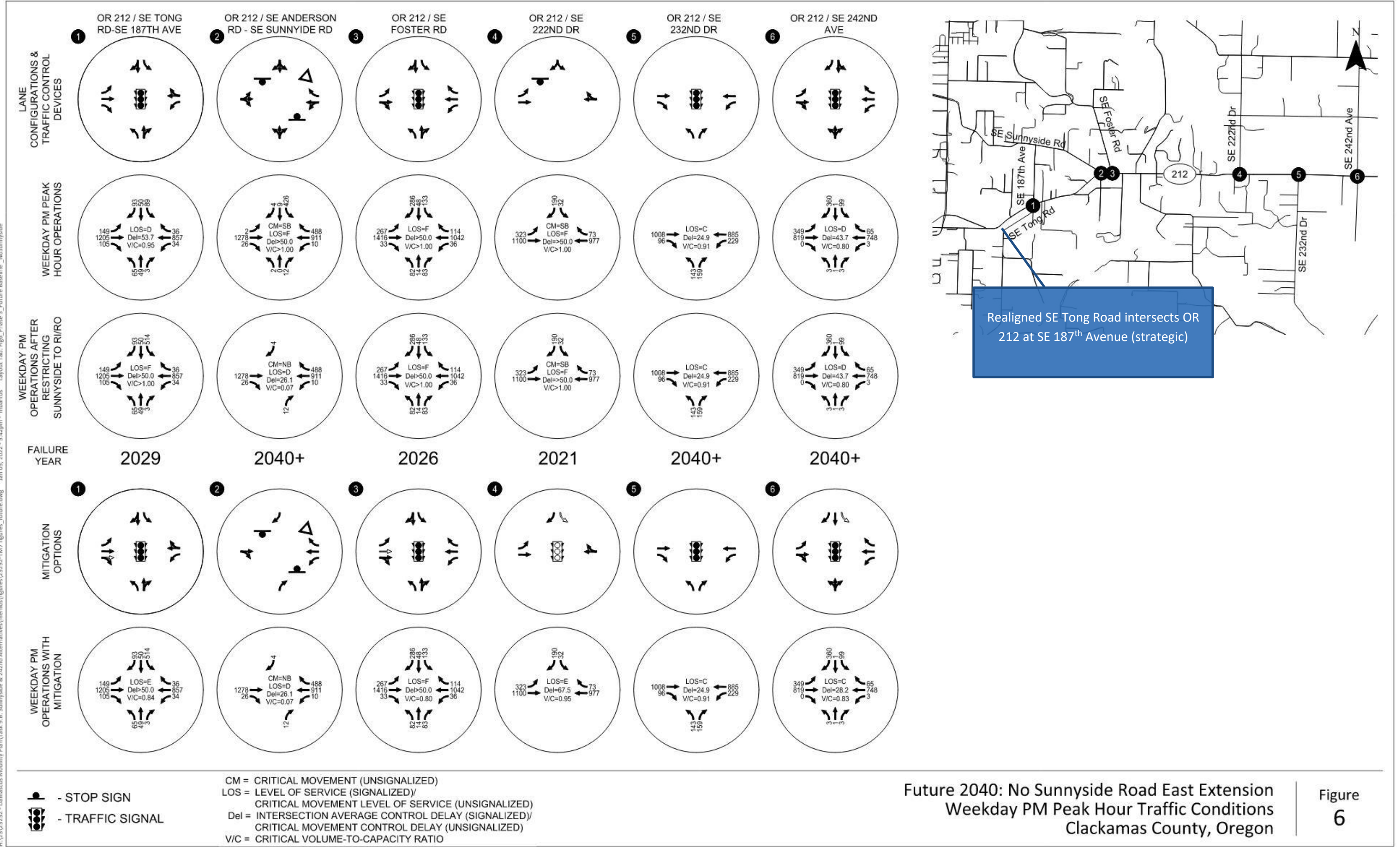
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
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 CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/
 CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

- STOP SIGN
 - TRAFFIC SIGNAL

Future 2040: Sunnyside Road East Extension
 Weekday PM Peak Hour Traffic Conditions
 Clackamas County, Oregon

Figure 5

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Future 2040: No Sunnyside Road East Extension
 Weekday PM Peak Hour Traffic Conditions
 Clackamas County, Oregon

Figure 6

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CRASH ANALYSIS

A crash analysis was performed for the study area, including a review of historic crash data along OR 212 and at the six study intersections. The following sections summarize the crash history and crash patterns, fatal crashes, intersection crash rates, and ODOT Safety Priority Index System (SPIS) sites in the study area.

Historic Crash Data

The crash analysis is based on the most recent five years of reported crash data available in the study area obtained from ODOT's Crash Analysis Reporting Unit and at the study intersections (January 1, 2015 through December 31, 2019) provided by ODOT. The data includes the location, type, and severity of crashes reported in the study area. *Appendix E contains the intersection crash data.*

Crash Patterns

A total of 300 crashes were reported along the OR 212 corridor from 2015 to 2019, including 97 crashes at the six study intersections. Of the 300 reported crashes:

- Four fatalities were reported during the study period (details provided below);
- 60 percent resulted in injury;
- The top reported collision type included rear-end (62 percent) and turning movement (22 percent).
- Two involved pedestrians (one of which resulted in a fatal injury and is detailed below).

Additional information on the corridor's crash history is in Appendix E.

Fatal Crashes

Four fatal crashes, including one pedestrian crash, took place in the study area between 2015 and 2019.

1. A turning movement crash occurred on OR 212 east of SE Tong Road, on a vertical curve, when a westbound vehicle collided with an eastbound vehicle that was making an illegal U-turn. The crash took place at 5:00 PM on a Saturday in November 2016 under rainy, dark (no street lights) conditions and on a wet roadway surface. No speeding, drugs, or alcohol were reported as being involved.
2. A head-on crash occurred on OR 212 east of SE 187th Avenue, on a vertical curve, when a westbound vehicle drove left of the roadway centerline and collided with an eastbound vehicle. The crash took place at 7:00 AM on a Sunday in November 2018 under cloudy, daylight conditions and on a snowy roadway surface. The crash report noted that drugs were involved in the incident; speeding and alcohol were not reported.
3. A fixed-object crash occurred on OR 212 at SE 222nd Drive when a driver collided with a utility pole due to improper driving/driving in excess of the posted speed. The crash took place at 12:00 AM on a Tuesday in August 2018 under dark conditions (no street lights);

weather and roadway conditions are unknown. The crash report noted that alcohol and speeding were involved in the incident; drugs were not reported.

4. A pedestrian crash occurred on OR 212 east of SE Regner Terrace, when an eastbound vehicle collided with a pedestrian (pedestrian found at fault; cited as in the road illegally and wearing non-visible clothing). The crash took place at 12:00 AM on a Sunday in January 2018 under clear, dark (no street lights) conditions and on a dry roadway surface. The crash report noted that alcohol was reported as involved in the incident; speeding and drugs were not reported.

Intersection Crash Analysis

The intersection crash analysis evaluated possible crash patterns at the study intersections as well as intersection crash rates (number of crashes compared to amount of traffic) against statewide crash performance standards, based on crashes reported between 2015 and 2019.

Intersection Crash Patterns

Ninety-seven (97) crashes were reported at the study intersections over the study period. Of these, approximately 86 percent consisted of rear-end or turning movement crashes and about 59 percent resulted in some injury (e.g., not just property damage to vehicles), including one fatality at OR 212 / SE 222nd Drive described in the previous section. Table 2 summarizes the reported crashes at each study intersection by collision type and severity.

Table 2: Study Intersection Crashes by Collision Type and Severity (Jan 1, 2015 through Dec 31, 2019)

Intersection	Total Crashes	Collision Type ¹							Severity	
		Rear-End	Turning	Angle	Fixed	Ped	SSM	Other	PDO ²	Injury
OR 212 / SE Tong Rd	8	6	2	-	-	-	-	-	3	5
OR 212 / SE Sunnyside Rd-SE Anderson Rd	21	4	10	5	-	-	1	1	8	13
OR 212 / SE Foster Rd	15	9	3	1	1	1	-	-	10	5
OR 212 / SE 222 nd Dr	24	4	16	1	3	-	-	-	9	15
OR 212 / SE 232 nd Dr	14	12	2	-	-	-	-	-	6	8
OR 212 / SE 242 nd Ave	15	9	6	-	-	-	-	-	4	11
Total	97	44	39	7	4	1	1	1	40	57

¹ Turning = Turning Movement; Fixed = Fixed-Object; Ped = Pedestrian; SSM = Sideswipe-Meeting; Other = Animal and/or Overturning

² PDO = property damage only

Crash Rate Analysis

The state has identified several safety performance standards in evaluating intersection safety, including 90th percentile crash rates. Per ODOT's Analysis Procedures Manual (APM, Reference 5), the 90th percentile crash rate performance standard is used to identify intersections with more crashes than expected based on traffic volume. Intersection crash rates are compared to the statewide 90th percentile crash rates for similar intersection types.

Statewide 90th percentile crash rates were developed from a study of 500 intersections in Oregon and are organized by land type and traffic control. Table 3 compares the intersection crash rates (calculated according to ODOT APM Chapter 4) with the urban statewide 90th percentile crash rates by intersection type. As shown, the OR 212 / SE Sunnyside Road-SE Anderson Road and OR 212 / SE 222nd Drive intersection crash rates exceed 90th percentile crash rates. *Appendix E contains the analysis sheet.*

Table 3: Intersection and 90th Percentile Crash Rate Comparison

Intersection	Total Crashes (2015-2019)	90 th Percentile Crash Rate ¹	Intersection Crash Rate ²	Does Intersection Rate Exceed 90 th Rate?
OR 212 / SE Tong Rd	8	0.293	0.24	No
OR 212 / SE Sunnyside Rd-SE Anderson Rd	21	0.408	0.50	Yes
OR 212 / SE Foster Rd	15	0.860	0.31	No
OR 212 / SE 222 nd Dr	24	0.293	0.53	Yes
OR 212 / SE 232 nd Dr	14	0.509	0.33	No
OR 212 / SE 242 nd Ave	15	0.860	0.37	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

Crash patterns at study intersections exceeding 90th percentile crash rates include:

- SE Sunnyside Rd-SE Anderson Rd / OR 212
 - The top 2 crash types were turning movement (48%) and angle (24%).
 - 62% of crashes resulted in injuries.
- SE 222nd Drive / OR 212
 - The top 2 crash types were turning movement (67%) and rear-end (17%).
 - 63% of crashes resulted in injuries.
 - 1 fatal crash occurred at this intersection, described in the previous section.

Safety Priority Index System (SPIS) Sites

This element of the crash analysis included a review of the top 5 and 10 percent SPIS locations that ODOT has identified in the study area. The SPIS is a systemic scoring method that identifies potential safety problems on state highways. SPIS scores are based on three years of crash data and consider crash frequency, crash rate, and crash severity. A highway segment becomes a SPIS site if a location has three or more crashes – or one or more fatal crashes – over the three-year period (SPIS brochure, Reference 6). According to the 2019 SPIS report for Region 1, OR 212 from milepost 3.63 to 3.77 is a top five percent SPIS segment and milepost 3.61 to 3.79 is a top 10 percent SPIS segment. These segments capture the eastbound and westbound approaches of the OR 212 / SE 222nd Drive intersection.

SUMMARY OF DEFICIENCIES

The following deficiencies were identified in the study area through the crash and 2040 traffic operations analyses:

- SE Sunnyside Road-SE Anderson Road / OR 212 exceeds its v/c ratio threshold today and through 2040.
- SE Foster Road / OR 212 exceeds its v/c ratio threshold before 2040.
- SE 222nd Drive / OR 212 exceeds its v/c ratio threshold today and through 2040, had one fatal crash (fixed-object – utility pole), exceeds the applicable 90th percentile crash rate, and has top 5 and top 10 percent SPIS sites along its OR 212 approaches as identified by ODOT.
- The OR 212 intersections exhibit a high proportion of rear-end and turning movement crashes within the study area.
- More than half of crashes in the study area and at the study intersections resulted in some level of injury.
- In addition to the above deficiencies, the Technical Advisory Committee reported community concerns at the SE Wiese Road and SE Royer Road intersections with OR 212. Although these were not initial study intersections, this effort will consider long-term capacity needs and potential solutions for these intersections.

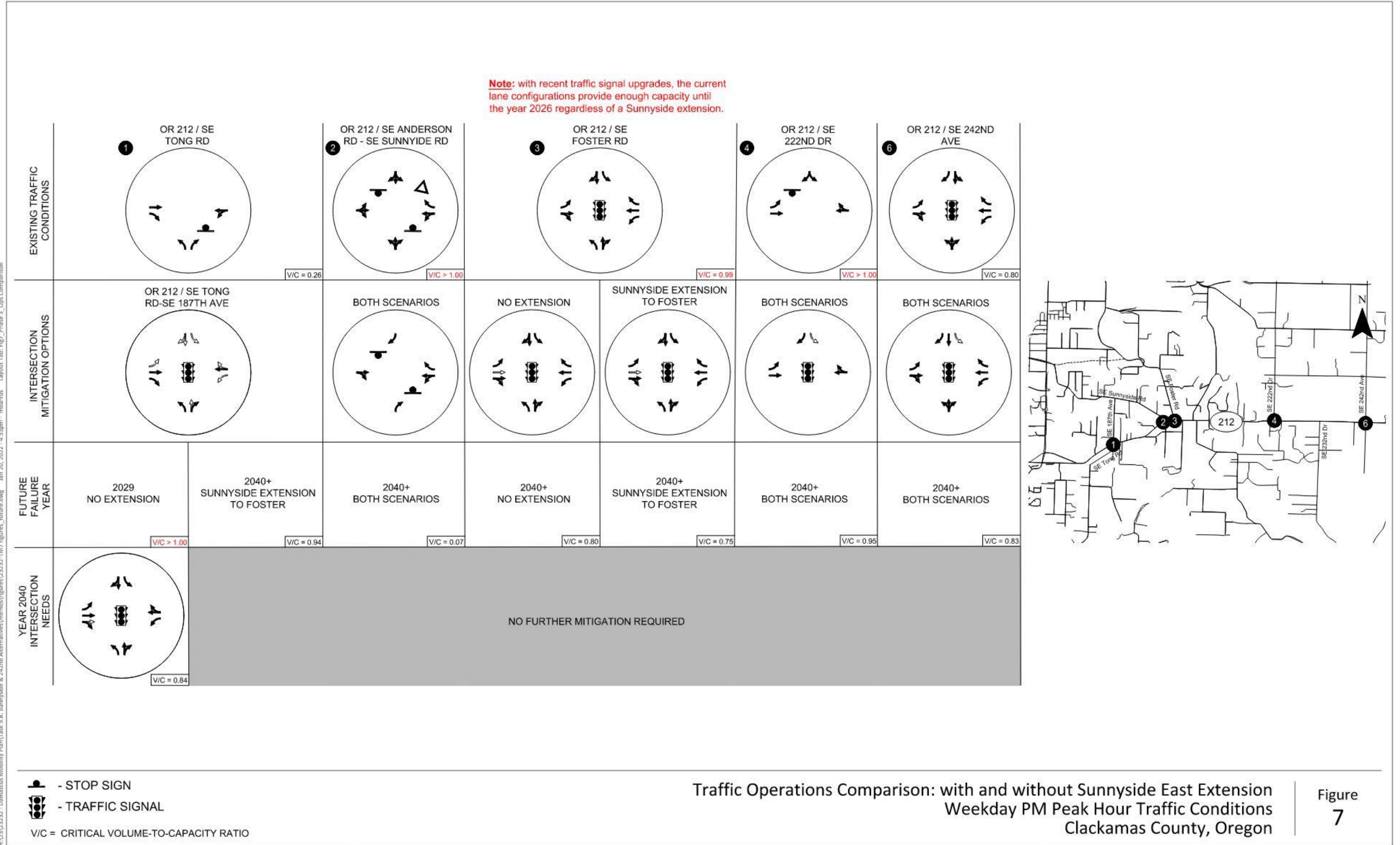
INTERSECTION IMPROVEMENT ALTERNATIVES

This section describes the process undertaken to develop initial network and intersection alternatives, perform a fatal flaw analysis, refine the promising concepts, establish evaluation criteria, and evaluate the alternatives.

Initial Alternatives

Figure 7 presents preliminary intersection mitigation options for the adopted ODOT, Happy Valley, and Clackamas County projects and the draft Pleasant Valley / North Carver Comprehensive Plan projects network with and without the SE Sunnyside Road Extension to SE Foster Road. As shown, most intersections can be mitigated with similar improvements with and without the extension, except for SE 187th Avenue / SE Tong Road / OR 212. This intersection has one set of improvements that provides acceptable operations through the year 2029 without the extension, requiring additional improvements to have acceptable operations to the year 2040. In comparison, fewer improvements are needed if the SE Sunnyside Road Extension to SE Foster Road is in-place. Additional intersection and system mitigation options were developed and assessed through work sessions with Clackamas County, City of Happy Valley, and Oregon Department of Transportation staff, shown in the next section.

Note: with recent traffic signal upgrades, the current lane configurations provide enough capacity until the year 2026 regardless of a Sunnyside extension.



-  - STOP SIGN
-  - TRAFFIC SIGNAL

V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

Traffic Operations Comparison: with and without Sunnyside East Extension
 Weekday PM Peak Hour Traffic Conditions
 Clackamas County, Oregon

Figure 7

Alternatives Development and Fatal Flaw Analysis

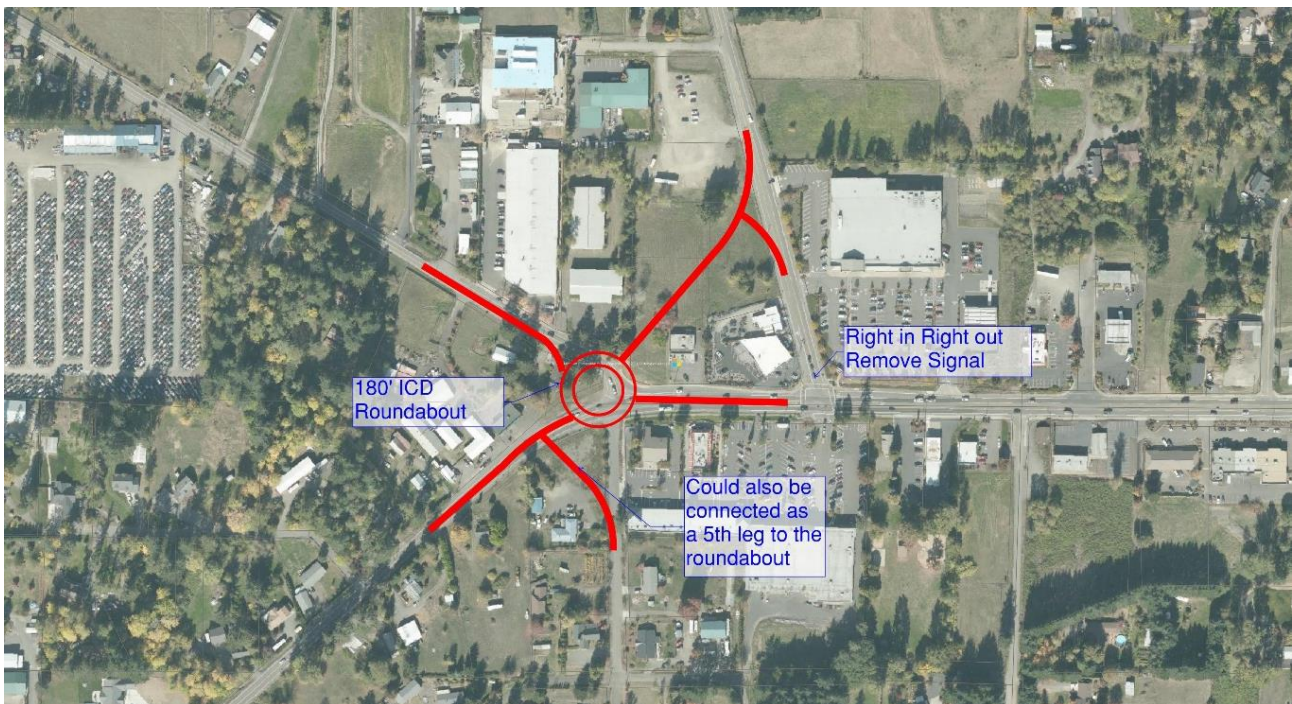
Network alternatives were developed to address existing and future deficiencies and were presented to Clackamas County, ODOT, and City of Happy Valley staff at Work Session #1 for feedback and additional ideas. The alternatives included different options for roadway configurations, access, and intersection control types. *The presentation slides and summary from Work Session #1 are in Appendix F.*

Sunnyside-Foster (SF) Alternatives

The series of improvement alternatives presented in this section focuses on the SE Sunnyside Road and SE Foster Road roadway network.

SF-1

SF-1 creates a roundabout intersection of SE Sunnyside Road, SE Foster Road, and OR 212. Since this alternative would require substantial right-of-way and impact business access in the area, it was not moved forward.



ICD = Inscribed Circle Diameter

SF-2

SF-2 converts the existing OR 212 / SE Foster Road intersection into right-in/right-out, removing the traffic signal, and adds a new traffic signal at the OR 212 / SE Sunnyside Road intersection with an eastbound slip lane, offset with the existing SE Anderson Road leg. Since this concept is likely fatally flawed due to the close spacing between the offset SE Sunnyside Road and SE Anderson Road intersections, it was not moved forward.



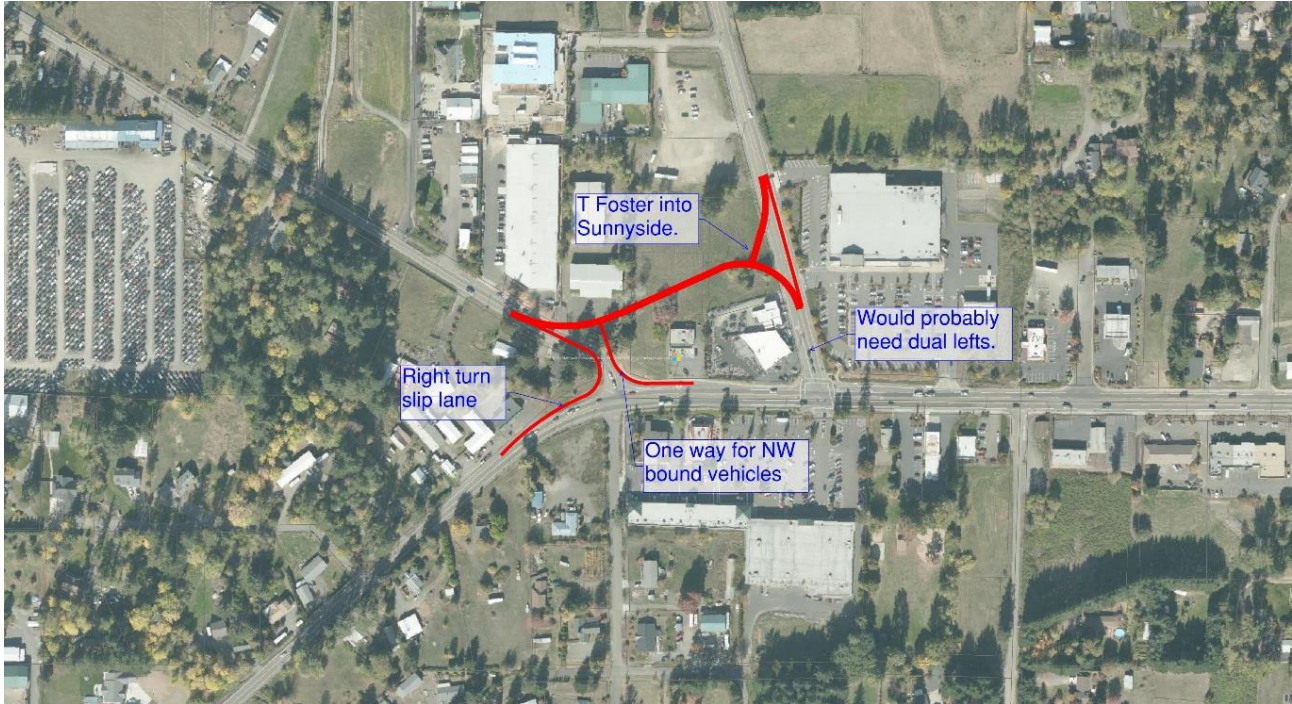
SF-3

SF-3 converts the existing OR 212 / SE Sunnyside Road intersection to a right-in, right-out for the north leg and provides a separate access road to a new intersection with SE Foster Road. Though this alternative has limited right-of-way impacts, it would require dual southbound left-turn lanes at SE Foster Road that would still spillback to the new intersection of SE Sunnyside Road / SE Foster Road. Therefore, this alternative was not moved forward.



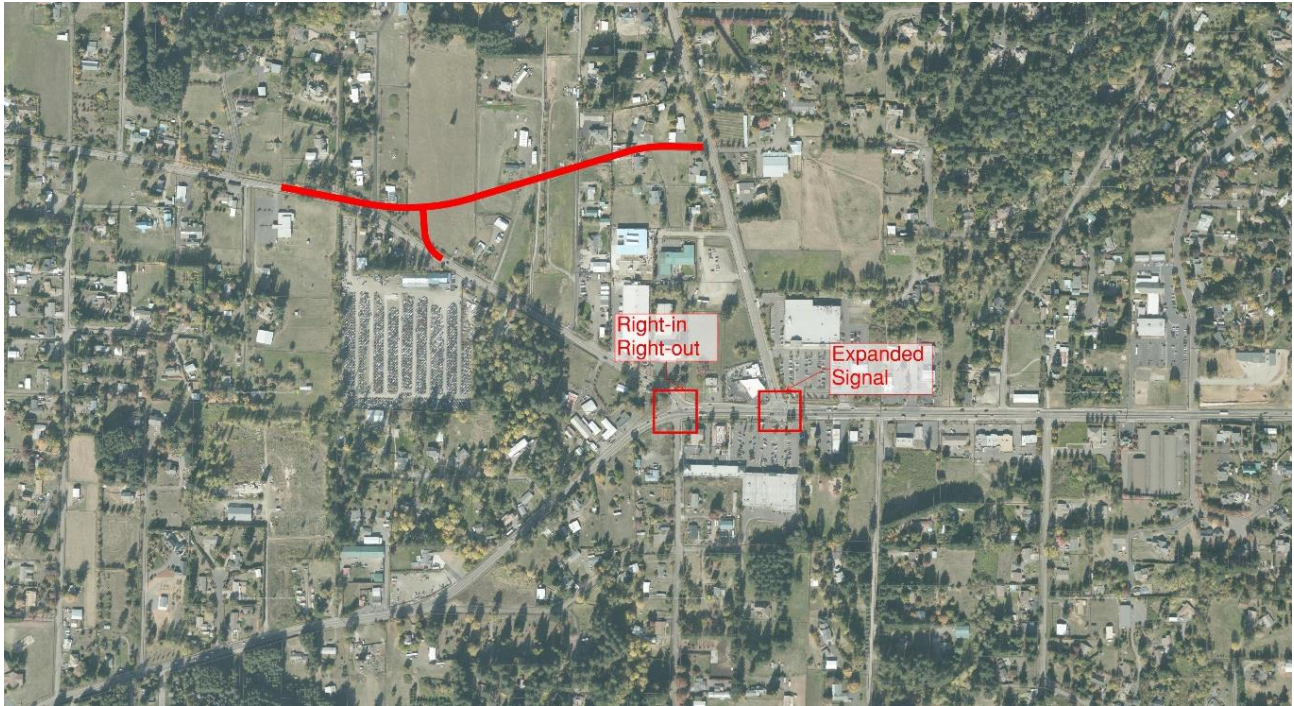
SF-4

Similar to SF-3, SF-4 converts the existing OR 212 / SE Sunnyside Road intersection to a right-in, right-out for the north leg and provides a separate access road to a new intersection with SE Foster Road. This alternative realigns SE Foster Road into SE Sunnyside Road, making SE Sunnyside Road feed into the existing OR 212 / SE Foster Road intersection. Similar to SF-3, this alternative would likely require dual southbound left-turn lanes at SE Foster Road that would still spillback to the new intersection of SE Sunnyside Road / SE Foster Road. As such, this alternative was not moved forward.



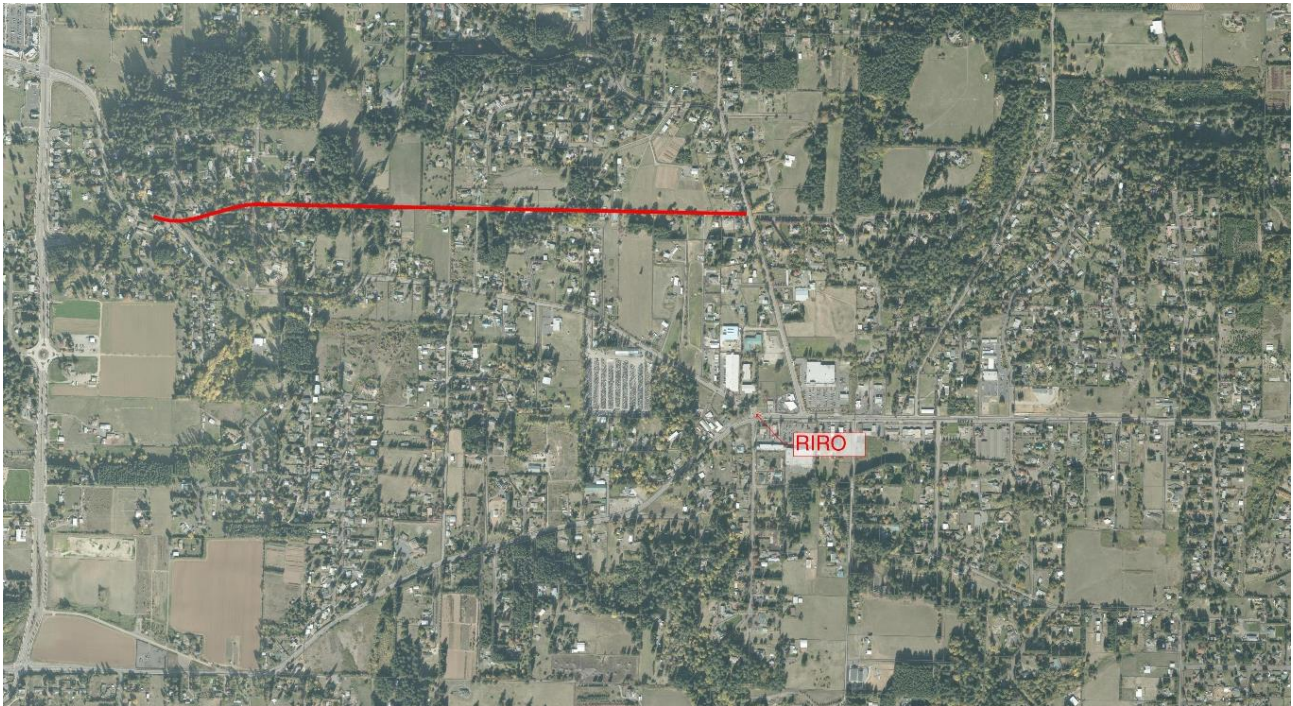
SF-5

SF-5 provides a new east-west connection from SE Sunnyside Road to SE Foster Road, converts the existing SE Sunnyside Road intersection with OR 212 to a right-in, right-out, and expands the signal at OR 212 / SE Foster Road. Since this alternative has substantial right-of-way impacts and cost and duplicates the planned SE Sunnyside East Extension to SE Foster Road further north, it was not moved forward.



SF-6

Similar to SF-5, SF-6 provides a new east-west connection from SE Sunnyside Road to SE Foster Road, converts the existing SE Sunnyside Road intersection with OR 212 to a right-in, right-out, and expands the signal at OR 212 / SE Foster Road. This alternative has substantial right-of-way impacts and cost and duplicates the planned SE Sunnyside Road East Extension to SE Foster Road further north. An alignment further north is likely to be less impactful. Therefore, this alternative was not moved forward.



RIRO = Right-In/Right-Out

SF-7

SF-7 converts the existing OR 212 / SE Sunnyside Road intersection to a right-in, right-out for the north leg and provides a separate access road to a new intersection with SE Foster Road. Since this alternative has substantial right-of-way impacts and still requires expansion at OR 212 / SE Foster Road, it was not moved forward.



RAB = Roundabout

SF-8

SF-8 converts the existing OR 212 / SE Sunnyside Road intersection to a right-in, right-out for the north leg and provides a separate access road to a new intersection with SE Foster Road and a new intersection with a realigned OR 212. Since this alternative has substantial right-of-way impacts and costs, especially related to realignment of OR 212, it was not moved forward.



RIRO = Right-In/Right-Out; RAB = Roundabout

SF-9

SF-9 converts the existing OR 212 / SE Sunnyside Road intersection to a signal and expands OR 212 to 5-lanes. Since this alternative would have substantial costs to expand OR 212 and require coordination of closely spaced signals, it was not moved forward.



SF-10

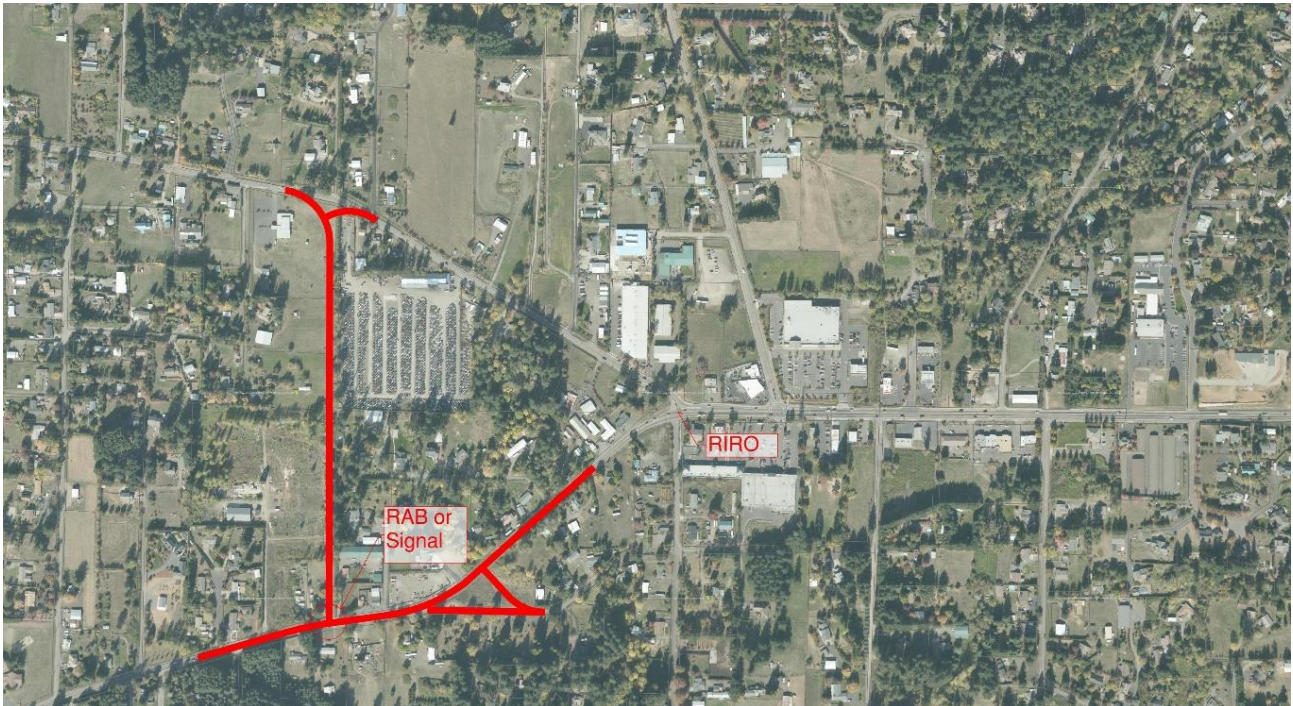
SF-10 converts the existing OR 212 / SE Sunnyside Road intersection to a right-in, right-out for the north leg and provides a separate access road to a new intersection with OR 212, either as a roundabout or signal. This alternative has substantial costs affiliated with the right-of-way and cost, remains relatively close to the SE Foster Road intersection with potential for queue spillback and does not support any planned connections south of OR 212. Therefore, this alternative was not moved forward.



RIRO = Right-In/Right-Out; RAB = Roundabout

SF-11

SF-11 converts the existing OR 212 / SE Sunnyside Road intersection to a right-in, right-out and provides a new road (SE Scooter Lane) connection between SE Sunnyside Road and OR 212. This alternative has limited right-of-way impacts compared to other new or expanded connections. Though this alternative may be infeasible given the planned signal and realignment of SE Tong Road, which may result in closely spaced traffic signals, it was moved forward.



RIRO = Right-In/Right-Out; RAB = Roundabout

SF-12

SF-12 converts the existing OR 212 / SE Sunnyside Road intersection to a right-in, right-out or right-in, right-out, left-in controlled access and improves SE 187th Avenue for a new signal connection with the realigned SE Tong Road. The alternative provides additional lanes at OR 212 / SE Foster Road and is consistent with the draft Pleasant Valley / North Carver Comprehensive Plan and Sunrise Corridor plans for SE Tong Road and SE 187th Avenue. Use of the existing roadway may help to reduce right-of-way impacts. This alternative was moved forward.



SF-13

SF-13 provides signals at both OR 212 / SE Sunnyside Road and OR 212 / SE Foster Road, similar to SF-9. However, this alternative closes the south leg of the OR 212 / SE Foster Road intersection, providing a more efficient signal and potentially reducing the need for a 5-lane cross-section at the signals. The alternative would still need to provide multiple through and left-turn lanes at SE Foster Road, which would need to be coordinated with the new signal at OR 212 / SE Sunnyside Road given the proximity and propensity for queue spillback. Further analysis for this alternative was performed, as shown in later sections, before choosing not to move it forward.



SF-14

SF-14 disconnects SE Anderson Road at OR 212 and realigns it as the south leg of OR 212 /SE Foster Road. This alternative would have several right-of-way and business impacts and doesn't directly address operational and safety issues at OR 212 / SE Sunnyside Road unless paired with another alternative. This alternative was not moved forward.



Alternatives for Additional OR 212 Intersections

This series of improvement alternatives focuses on the remaining intersections in the study area with existing and future deficiencies summarized in previous sections.

Weise Road – Royer Road / OR 212 (WR-01)

Alternative WR-01 realigns SE Wiese Road to SE Royer Road and converts the two offset intersections into a single intersection. We recommend the current businesses fronting the existing SE Wiese Road alignment near OR 212 should be served with a backage road from the new SE Wiese Road alignment instead of direct access to OR 212. The current OR 212 / SE Wiese Road intersection would be closed and the south end of SE Wiese Road would be converted into a cul-de-sac. This alternative will not be further refined as part of this project but was developed in response to Work Session #1 and #2 feedback that the area is a concern for community members.



OR 212 / SE 222nd Avenue (222-01)

To address the intersection's crash history and capacity constraints, this alternative adds a traffic signal and separates the southbound right- and left-turn lanes. Sight distance triangles should be verified. Vegetation as well as a vertical crest to the east currently impede sight distance. This alternative was moved forward.



OR 212 / SE 242nd Avenue (242-01)

The following alternative shows an improvement for OR 212 / SE 242nd Avenue. Though no capacity constraints are projected by 2040, this option could be considered beyond 2040 or if demand increases faster than projected. This alternative was moved forward.



Evaluation Criteria and Results

The following evaluation criteria were established to assess and prioritize the network alternatives:

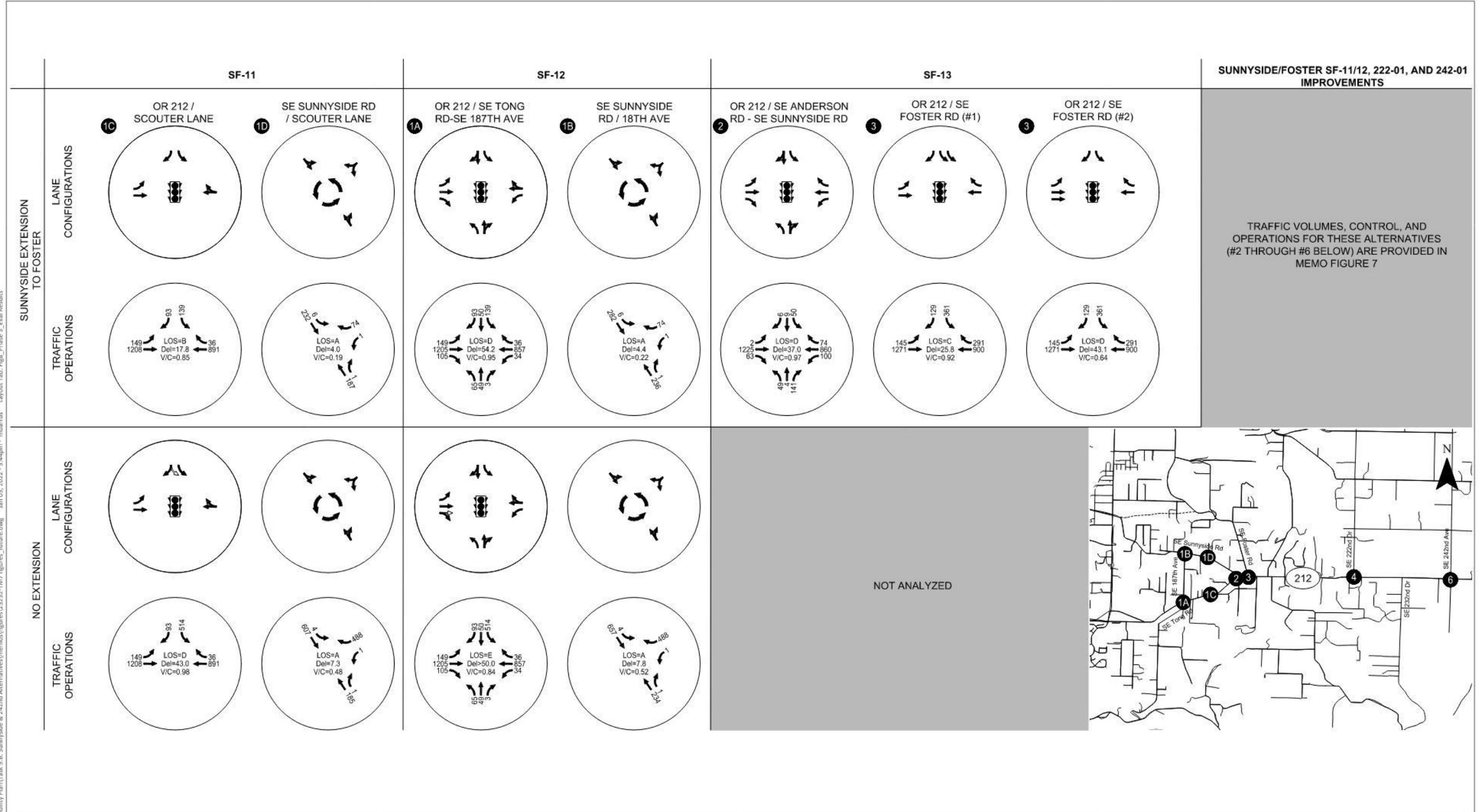
- **Environmental Constraints** – Identified qualitatively, highlighting where and how alternatives may impact natural resources such as trees/forested areas, waterways, and other resources.
- **Safety Enhancements** – Qualitatively assess the impact to safety, including the presence of enhanced bicycle and pedestrian facilities, number of left-turn and through-movements made from stop-controlled approaches through uncontrolled approaches, and other factors as appropriate.
- **Traffic Operations Improvements** – Consider delay and volume-to-capacity at key intersections and whether these meet County and/or ODOT standards; also highlights where queuing backs-up to neighboring intersections occurs, if applicable.
- **Business Access** – Consider the out-of-direction travel that may occur as the result of network changes or movement restrictions; qualitatively describes impacts to businesses.
- **Cost** – Quantified at a planning-level and include design, construction, and contingency costs. Right-of-way costs are quantified at cost per square foot, and are not in-depth relocation and displacement calculations. This evaluation criteria will be completed for alternatives that pass the operations screening.
- **Right-of-Way** – The number of parcels and structures impacted, and total square footage of right-of-way takes. This evaluation criteria will be completed for alternatives that pass the operations screening.

Initial evaluation results are shown in Table 4 and Figure 8. Specific cost and right-of-way calculations are completed for preferred alternative(s) later in this memorandum. Each alternative assumes SE Tong Road is realigned regardless of whether SE 187th Avenue is improved. As shown, SF-13 was not moved forward. The SF-13 alternative substantially affects business access and requires expanding and signalizing OR 212 / SE Sunnyside Road to address traffic operations deficiencies, as compared to the OR 212 / SE Sunnyside Road and OR 212 / SE Foster Road intersection improvements.

Table 4. Evaluation Results

Improvement	Environmental Constraints	Safety Enhancements	Year 2040 Traffic Operations (AM/PM)	Business Access
SE Sunnyside Road/SE Foster Road				
SE Tong Road Realignment	Minimal; No major resources impacted	Realigns skewed intersection	Depending on Alternative	No Impact
OR 212 / SE Sunnyside Road and OR 212 / SE Foster Road Intersection Improvements	Minimal; No major resources impacted	Restricts movements at skewed OR 212 / SE Sunnyside Road intersection	W/ and W/O Sunnyside Extension Acceptable through 2040 with second EB through lane (see Figure 7)	No Impact
SE Scooter Lane and OR 212 / SE Sunnyside Road Restrictions (SF-11)	Moderate; New roadway through greenspace	Restricts movements at skewed Sunnyside intersection	W/O Sunnyside Extension Separate SB left- and right turn lanes acceptable until 2034; requires second SB left as a shared movement with the right-turn lane through 2040 W/Sunnyside Extension Separate SB left- and right turn lanes acceptable through 2040	Moderate; Potential out-of-direction travel for businesses north of OR 212 / SE Sunnyside Road
SE 187 th Avenue and OR 212 / SE Sunnyside Road Restriction (SF-12)	Minimal; No major resources impacted	Restricts movements at skewed Sunnyside intersection	W/O Sunnyside Extension Proposed traffic signal in Figure 8 acceptable until 2029; requires second EB lane through 2040 W/Sunnyside Extension Proposed traffic signal in Figure 8 acceptable through 2040	Minimal; Potential out-of-direction travel for businesses north of OR 212 / SE Sunnyside Road
OR 212 / SE Sunnyside Road Traffic Signal (SF-13)	Minimal; No major resources impacted	Signalizes skewed OR 212 / SE Sunnyside Road intersection	W/Sunnyside Extension Foster requires a second EB through lane <u>or</u> a second SB left-turn lane through 2040 Sunnyside requires a separate EB right-turn lane and separate NB left-turn lane through 2040	Substantial; Relocates OR 212 access for businesses using south leg of OR 212 / SE Foster Road
SE Wiese Road/SE Royer Road				
SE Wiese Road Realignment (WR-01)	Moderate; New roadway through greenspace	Realigns offset intersections	No Counts Available/ Not Analyzed	Minimal; Converts SE Wiese Road to a driveway for several businesses

Improvement	Environmental Constraints	Safety Enhancements	Year 2040 Traffic Operations (AM/PM)	Business Access
OR 212 / SE 222 nd Drive				
OR 212 / SE 222 nd Avenue Intersection (signal, separate SB Left- and Right-turn lanes) (222-01)	Minimal; No major resources impacted	Separates turning movements; Provides signal	Separate SB left-turn lane proposed in Figure 7 acceptable through 2040	No Impact
OR 212 / SE 242 nd Drive				
OR 212 / SE 242 nd Avenue Intersection (separate SB Left-turn Lane) (242-01)	Minimal; No major resources impacted	Separates turning movements	Separate SB left-turn lane proposed in Figure 7 acceptable through 2040	No Impact



- STOP SIGN
 - TRAFFIC SIGNAL
 - ROUNDABOUT
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

Traffic Operations for Intersection Improvement Alternatives Being Advanced
 Weekday PM Peak Hour Traffic Conditions
 Clackamas County, Oregon

Figure 8

H:\23\23232 - Damascus Mobility Plan\Task 9 B. Sunnyside & 242nd Alternatives\memos\figures\23232-TM7 figures_future.dwg Jan 03, 2022 - 3:44pm - mbaraus Layout Tab: Fig_3_Eval Results

PRELIMINARY RECOMMENDATIONS

Based on the evaluation results, it is recommended to advance SF-11, SF-12, WR-01, 222-01, and 242-01 as the preferred OR 212 intersection alternatives for refinement. These alternatives exhibit the following key benefits:

- Address capacity needs at OR 212 / SE Sunnyside Road-SE Anderson Road, OR 212 / SE Foster Road, OR 212/ SE 222nd Drive, and OR 212/ SE 242nd Avenue.
- Reduce congestion and provide separate lanes for turning movements along OR 212, potentially reducing safety issues related to rear-end and turning movement crashes.
- Address community concerns at the SE Wiese Road/SE Royer Road intersections with OR 212.

Although these were not initial study intersections, this effort will consider long-term capacity needs and potential solutions for these intersections.

In addition to these recommendations, the project team also noted the need to layout the SE Sunnyside Road to SE Foster Road Extension to understand roadway configuration, network connectivity, and costs as they impact recommendations at OR 212. A conceptual layout and cost estimate were developed for Work Session #2. It should be noted that this segment is within the City of Happy Valley's Pleasant Valley/North Carver Comprehensive Plan study area and outside of the County's study area. For this reason, the extension does not have traffic impact analyses at its intersections.

Work Session #2 Feedback and Refinement

The full evaluation results with cost estimates in today's dollars and right-of-way acquisition for the preferred alternative layouts are shown in Table 5. Detailed layouts of the OR 212 / SE Sunnyside Road and OR 212 / SE Foster Road intersection improvements, SF-12 alternative, and SE Sunnyside Road to SE Foster Road extension are shown in Figure 9 through Figure 11, respectively, after Table 5.

Work Session #2 feedback for the SE Sunnyside Road-SE Foster Road at OR 212 concept included:

- The raised median on the eastbound approach of the OR 212 / SE Sunnyside Road intersection will trigger ODOT mobility committee review.
- Visibility of the northbound right-turn movement on SE Anderson Road should be evaluated for view angle obstacles.
- Bike facilities on OR 212 will need more separation or protection. Further, agencies generally prefer wider bike lanes and narrower buffers for buffered bike lanes due to maintenance challenges with diagonal buffer stripes.

Work Session #2 feedback for the SE Scooter Lane (SF-11) and SE 187th Avenue (SF-12) alternatives included:

- Considering a roundabout at the northern connection with SE Sunnyside Road in either alternative;

- Considering sight distance of each intersection – the horizontal curve on OR 212 may cause sight line issues for SE Scooter Lane;
- Considering speed changes in the area as development increases (e.g., reducing current 45 MPH to 35 MPH);
- Considering the Blueprint for Urban Design guidance in design refinement in the future; and,
- Considering how these improvements are proposed to be funded.

Several clarification requests during Work Session #2 asked for stormwater detention factors and sidewalk extents. Cost estimates consider stormwater detention as a percentage of the total cost, but detention locations are not factored into right-of-way impacts. Cost estimates do not include sidewalks beyond the immediate vicinity of these intersections and study segments. *The presentation slides and summary from Work Session #2 are in Appendix F and the cost estimates are in Appendix G.*

Table 5. Evaluation Results with Cost Estimates (2021 Dollars)

Improvement	Cost	Right-of-Way	Environmental Constraints	Safety Enhancements	Year 2040 Traffic Operations (AM/PM)	Business Access
SE Sunnyside Road/SE Foster Road						
SE Tong Road Realignment	\$8.0 Million	12 Properties 183,144 SF 1 Structure	Minimal; No major resources impacted	Realigns skewed intersection	Depends on alternative	No Impact
OR 212 / SE Sunnyside Road and OR 212 / SE Foster Road Intersection Improvements (See Figure 9)	\$8.8 Million	21 Properties 17,452 SF 0 Structures	Minimal; No major resources impacted	Restricts movements at skewed Sunnyside intersection	W/ and W/O Sunnyside Extension Acceptable thru 2040 with second EB thru lane (See Figure 7)	No Impact
SE Scooter Lane and OR 212 / SE Sunnyside Road Restrictions (SF-11)	\$13.4 Million	18 Properties 140,750 SF 1 Structure	Moderate; New roadway through greenspace	Restricts movements at skewed OR 212 / SE Sunnyside Road intersection	W/O Sunnyside Extension Separate SB left- and right turn lanes acceptable until 2034; requires second SB left as a shared movement with right-turn lane thru 2040 (See Figure 8) W/Sunnyside Extension Separate SB left- and right turn lanes acceptable thru 2040 (See Figure 8)	Moderate; Potential out-of-direction travel for businesses north of OR 212 / SE Sunnyside Road
SE 187 th Avenue and OR 212 / SE Sunnyside Road Restriction (SF-12)	\$13.0 Million	41 Properties 128,645 SF 1 Structure	Minimal; No major resources impacted	Restricts movements at skewed OR 212 / SE Sunnyside Road intersection	W/O Sunnyside Extension Proposed traffic signal acceptable until 2029; requires second EB lane thru 2040 (See Figure 8) W/Sunnyside Extension	Minimal; Potential out-of-direction travel for businesses north of

Improvement	Cost	Right-of-Way	Environmental Constraints	Safety Enhancements	Year 2040 Traffic Operations (AM/PM)	Business Access
					Proposed traffic signal in Figure 8 acceptable thru 2040 (See Figure 8)	OR 212 / SE Sunnyside Road
SE Wiese Road/SE Royer Road						
SE Wiese Road Realignment (WR-01)	\$2.7 Million	5 Properties 20,680 SF 0 Structures	Moderate; New roadway through greenspace	Realigns offset intersections	No counts available/ not analyzed	Minimal; Converts Wiese to a driveway for several businesses
OR 212 / SE 222 nd Drive						
OR 212 / SE 222 nd Avenue Intersection (signal, separate SB Left- and Right-turn lanes) (222-01)	\$1.4 Million	No Impact	Minimal; No major resources impacted	Separates turning movements; provides signal	Proposed separate SB left-turn lane acceptable thru 2040 (See Figure 7)	No Impact
OR 212 / SE 242 nd Drive						
OR 212 / SE 242 nd Avenue Intersection (separate SB Left-turn Lane) (242-01)	\$1.8 Million	No Impact	Minimal; No major resources impacted	Separates turning movements	Proposed separate SB left-turn lane acceptable thru 2040 (See Figure 7)	No Impact
SE Sunnyside Road to SE Foster Road Extension						
SE Sunnyside Road to SE Foster Road Extension (See Figure 11)	\$18.7 Million	30 Properties 322.8k SF 0 Structures	Moderate; New roadway through greenspace	Reduced congestion at OR 212 / SE Sunnyside Road	N/A	No Impact

Figure 9. SE Sunnyside Road and SE Foster Road Modification Concepts

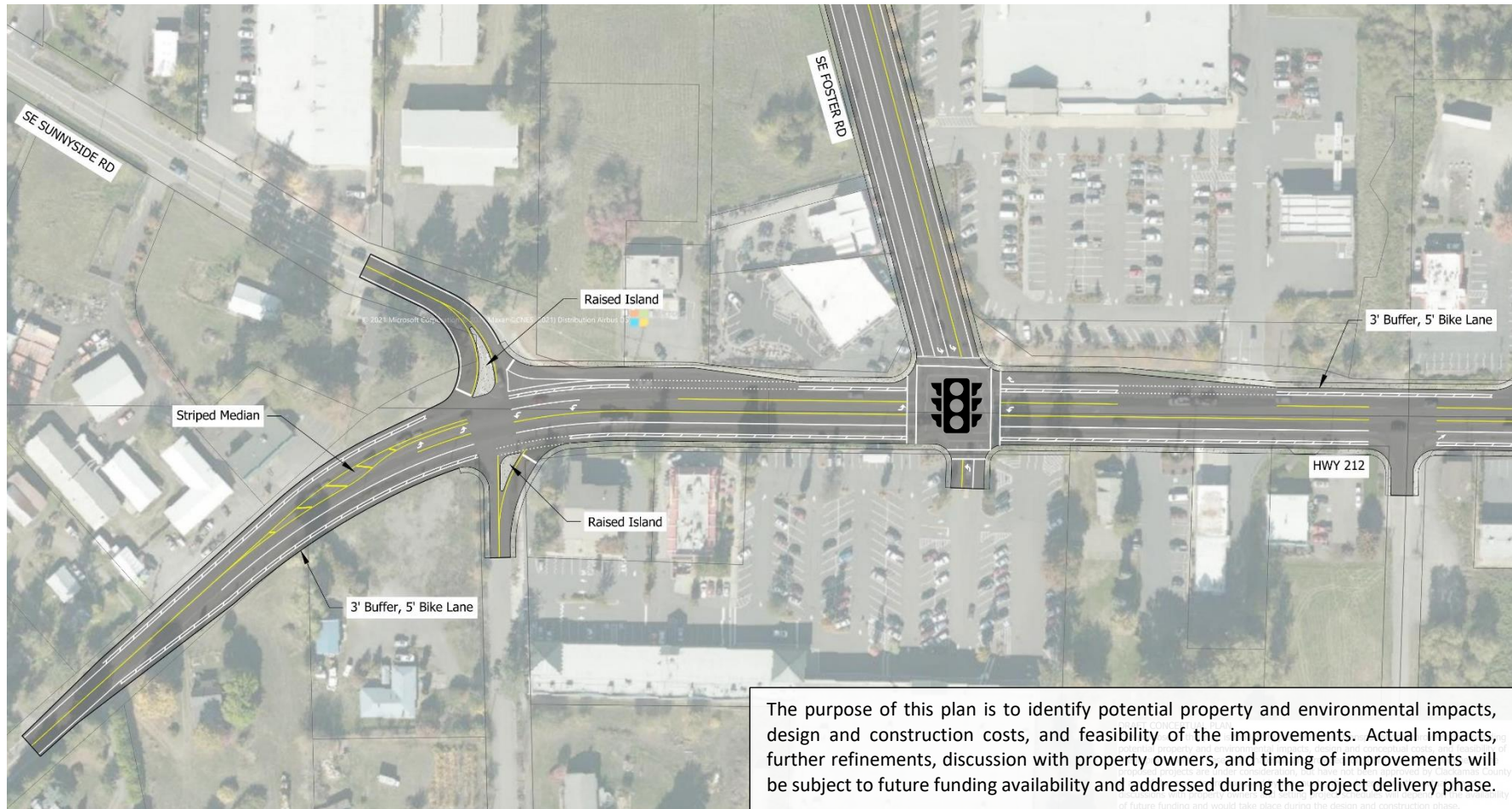


Figure 10. OR 212 / SE 187th Avenue Concept (SF-12)

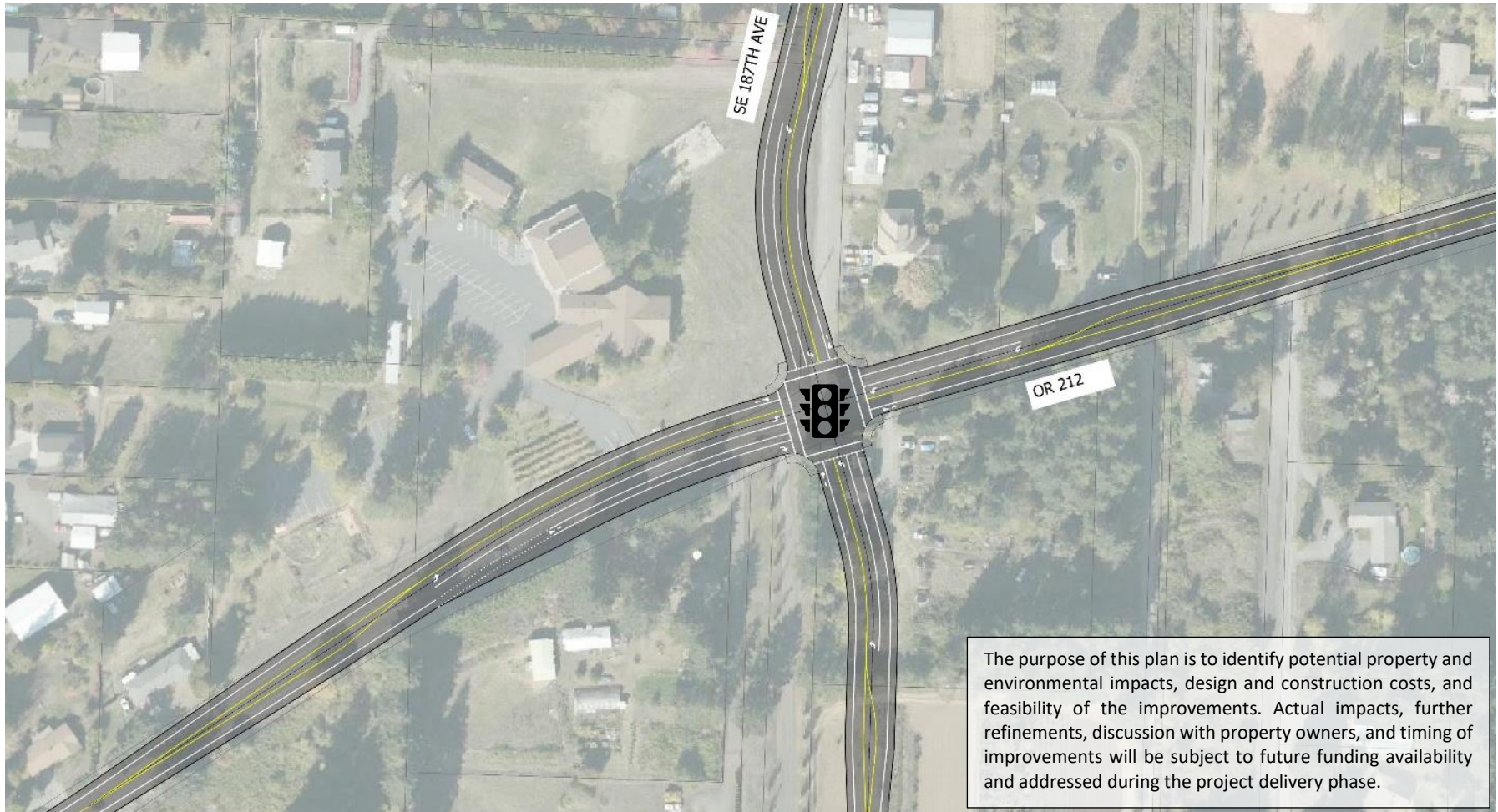


Figure 11. SE Sunnyside Road to SE Foster Road Extension Concept



REFINED RECOMMENDATIONS

After a series of review, work sessions, and feedback from the TAC, the project team reached the refined improvement recommendations detailed in

Table 6 and illustrated in following pages. Note that certain improvements are standalone and can be implemented as such, and some improvements rely on the implementation of others. The summary recommendation graphic on the following pages provides these details. The refined recommendations include:

- **SE Tong Road Realignment** to relocate and improve the existing skewed intersection with OR 212 and be consistent with the draft Pleasant Valley/North Carver Comprehensive Plan.
- **OR 212 / SE Sunnyside Road and OR 212 / SE Foster Road Intersection Improvements** to provide capacity, bicycle and pedestrian facilities, and safety benefits at intersections experiencing capacity and safety constraints.
- **SE 187th Avenue & OR 212 / SE Sunnyside Road Restriction (SF-12)** alternative over the SE Scooter Lane (SF-11) alternative as SF-12 aligns with SE Tong Road on a tangent segment of OR 212, improves sight distance, and is located near the urbanizing area, promoting future partial improvements as redevelopment occurs.
- **SE Wiese Road Realignment (WR-01)** to realign offset intersections.
- **OR 212 / SE 222nd Drive Intersection (signal, separate SBL and SBR)** to provide additional capacity and improve safety at an intersection with severe crashes.
- **OR 212 / SE 242nd Drive Intersection (separate SBL)** to provide additional capacity for growth beyond 2040.
- **SE Sunnyside Road to SE Foster Road Extension** to promote the use of SE Foster Road over SE Sunnyside Road at OR 212 and alleviate the capacity and safety issues at the existing OR 212 / SE Sunnyside Road, promote development-funded improvements in the Pleasant Valley/North Carver area, and be consistent with the 2018 Metro Regional Transportation Plan and the draft Pleasant Valley/North Carver Comprehensive Plan

The cost estimate worksheets are included in Appendix G.

Table 6: Refined Improvement Package Recommendation

Improvement	Cost	Right-of-Way	Environmental Constraints	Safety Enhancements	Year 2040 Traffic Operations (AM/PM)	Business Access
OR 212 / SE Sunnyside Road and SE Foster Road						
SE Tong Road Realignment	\$8.0M	12 Properties 183k SF 1 Structure	Minimal	Skewed intersection realigned	Depends on alternative	No Impact
SE Sunnyside Road / SE Foster Road Intersection Improvements	\$8.8M	21 Properties 17.5k SF 0 Structures	Minimal	Skewed Sunnyside movements restricted	Acceptable thru 2040 with second EB thru lane (Figure 7)	No Impact
SE 187 th Avenue and OR 212 / SE Sunnyside Road Restriction (SF-12)	\$13.0M	41 Properties 128.7k SF 1 Structure	Minimal	Skewed SE Sunnyside Road movements restricted	Proposed traffic signal (Figure 8) acceptable thru 2040	Minimal; Potential out-of-direction travel for businesses north of OR 212 / SE Sunnyside Road
OR 212 / SE Wiese Road-SE Royer Road						
SE Wiese Road Realignment (WR-01)	\$2.7M	5 Properties 20.7k SF 0 Structures	Moderate; New roadway through greenspace	Offset intersections realigned	No counts available/ not analyzed	Minimal; Requires backage road to new alignment for affected businesses
OR 212 / SE 222nd Drive						
OR 212 / SE 222 nd Avenue Intersection (signal, separate SB Left- and Right-turn lanes) (222-01)	\$1.4M	No Impact	Minimal	Signalized and SB turn movements separated	Proposed separate SB left-turn lane (Figure 7) acceptable thru 2040	No Impact
OR 212 / SE 242nd Drive						
OR 212 / SE 242 nd Avenue Intersection (separate SB Left-turn Lane) (242-01)	\$1.8M	No Impact	Minimal	SB turn movements separated	Proposed separate SB left-turn lane (Figure 7) acceptable thru 2040	No Impact

Improvement	Cost	Right-of-Way	Environmental Constraints	Safety Enhancements	Year 2040 Traffic Operations (AM/PM)	Business Access
SE Sunnyside Road to SE Foster Road Extension						
SE Sunnyside Road to SE Foster Road Extension	\$18.7M	30 Properties 322.8k SF 0 Structures	Moderate; New roadway through greenspace	Reduced congestion at OR 212 / SE Sunnyside Road	N/A	No Impact

In addition, the following planning efforts are needed to address existing intersection deficiencies and promote cohesive planning efforts within the entire OR 212 corridor:

- **OR 212 (SE 172nd Avenue to US 26) Corridor Plan** – To establish the long-term vision, conceptual alignment, cross-section, and access locations for OR 212 between SE 172nd Avenue and US 26.
- **OR 212 (Rock Creek Junction to SE Foster Road) Alternative Mobility and Fee In Lieu Strategy** – To establish potential alternative mobility standards and funding strategy to allow near-term development and move towards long-term acceptable traffic operations at existing over-capacity intersections.

IMPROVEMENT PACKAGE RECOMMENDATION

OR 212 (187th to 242nd) Intersection Refinement Study

SUNNYSIDE EXTENSION TO FOSTER

- Creates new alignment from SE Sunnyside Road to SE Foster Road, potentially along existing SE Vogel Road
 - \$18.7M
 - Needed in 5 years (in conjunction with OR 212/SE Foster Road improvement)
- From Happy Valley's draft Pleasant Valley/North Carver Comprehensive Plan



WIESE-ROYER/OR 212 (WR-01)

- Realigns existing SE Wiese Road to align with SE Royer Road
- Existing SE Wiese Road becomes a cul-de-sac and business access is provided with backage road from new SE Wiese Road
- \$2.7M
- Needed in 20+ years



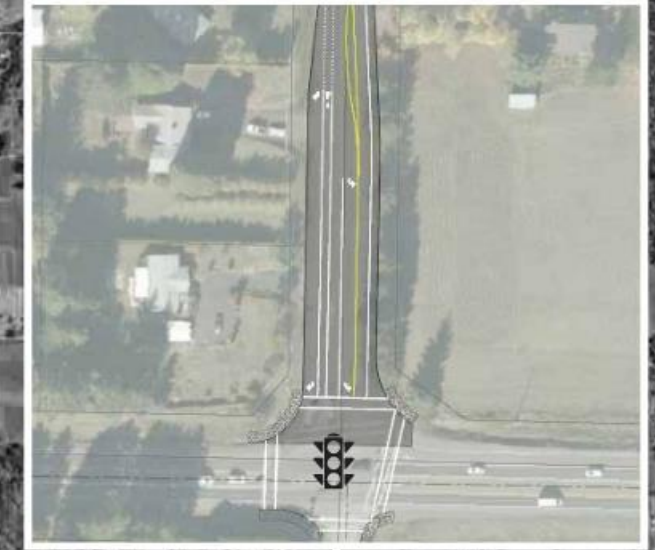
SE 222ND AVENUE/OR 212 (222-01)

- Signalizes intersection and separates southbound left and right lanes
- \$1.4M
- Needed now



SE 242ND AVENUE/OR 212 (242-01)

- Provides separate southbound left-turn lane
- \$1.8M
- Needed in 20+ years



SE 187TH AVENUE (SF-12)

- Signalizes OR 212/SE 187th Avenue-SE Tong Road
 - Constructs Roundabout at SE Sunnyside Road/SE 187th Avenue
 - \$13.0M
 - Needed now (in conjunction with Sunnyside/Anderson improvement)
- From Happy Valley's draft Pleasant Valley/North Carver Comprehensive Plan

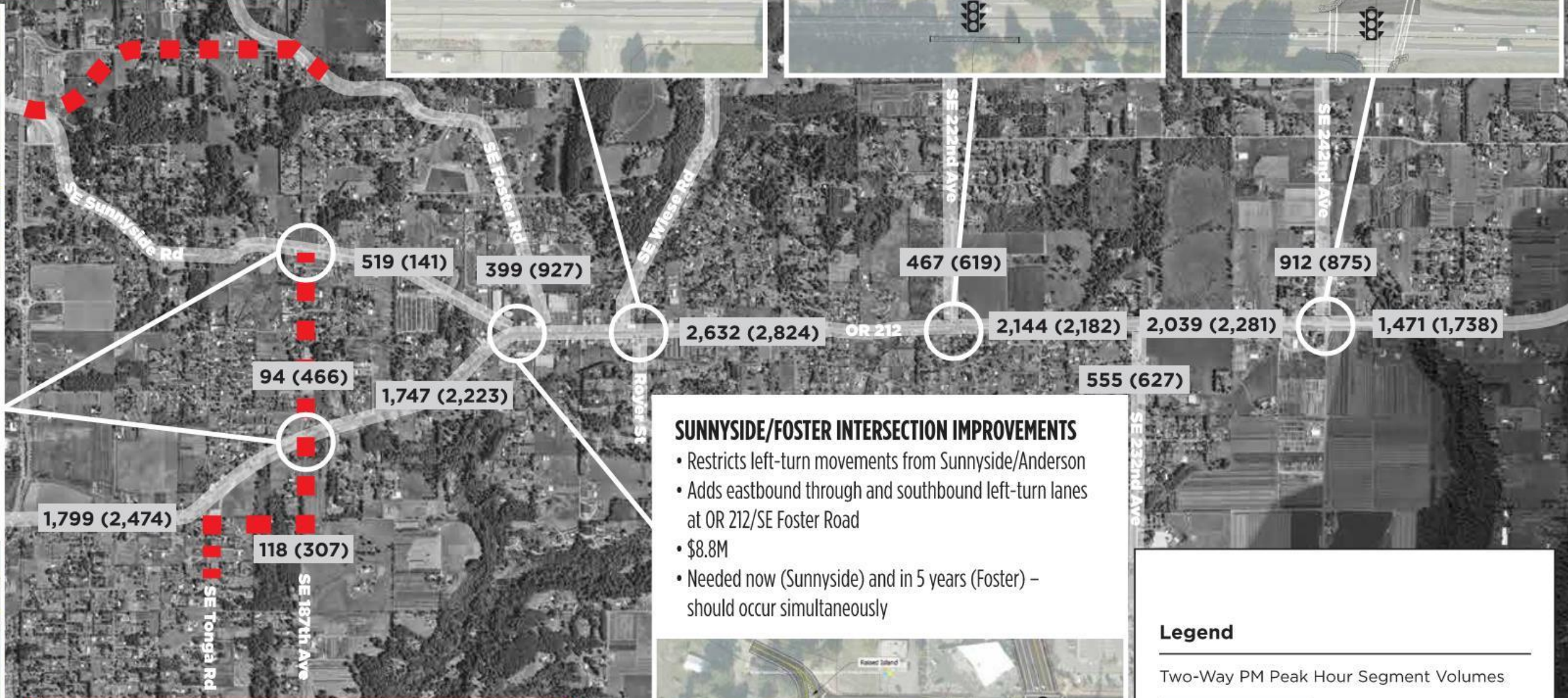


TONG REALIGNMENT

- Realigns existing OR 212/SE Tong Road intersection to SE 187th Avenue
 - \$8.0M
 - Needed in 20+ years
- From Happy Valley's draft Pleasant Valley/North Carver Comprehensive Plan

SUNNYSIDE/FOSTER INTERSECTION IMPROVEMENTS

- Restricts left-turn movements from Sunnyside/Anderson
- Adds eastbound through and southbound left-turn lanes at OR 212/SE Foster Road
- \$8.8M
- Needed now (Sunnyside) and in 5 years (Foster) – should occur simultaneously



Legend

Two-Way PM Peak Hour Segment Volumes

Existing (Future)

FINAL WORK SESSION FEEDBACK

A final work session was conducted to review Work Session #2 clarification requests and discuss next steps. The findings from this work session included wording adjustments to Figure 12, though no other feedback resulted in changes to the recommendations themselves. *The presentation slides and summary from Work Session #3 are in Appendix F.*

NEXT STEPS

The refined recommendations will be presented to the public for feedback alongside other recommendations from the *Damascus Mobility Plan* efforts. The recommendations from this memorandum will be incorporated into the *Damascus Mobility Plan* and its updates to the Clackamas County Transportation System Plan project lists, maps, and tables.

REFERENCES

1. Transportation Research Board. Highway Capacity Manual, 6th Edition. 2016.
2. Oregon Department of Transportation. Oregon Highway Plan. 2015.
3. Federal Highway Administration. Manual on Uniform Traffic Control Devices. 2009.
4. Transportation Research Board. NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design. 2014.
5. Oregon Department of Transportation. Analysis Procedures Manual. 2020.
6. Oregon Department of Transportation. SPIS Brochure. 2009.

APPENDICES

- A. Traffic Count Worksheets
- B. Existing Intersection Operations Worksheets
- C. Model Changes
- D. Future Intersection Operations Worksheets
- E. Crash Data and Additional Analyses
- F. Work Session #1, #2 and #3 Slides and Summaries
- G. Cost Estimate Worksheets