RTC REGIONAL SIGNAL TIMING PLANS

PILOT BEFORE/AFTER REPORT: STATE ROUTE 503 SOUTH

MAY 2025

PREPARED FOR:

Southwest Washington
Regional Transportation Council

PREPARED BY DKS ASSOCIATES

Brianna Velasquez, EIT

Eileen Chai, EIT

Ilana Burstein, P.E.

Pamela O'Brien, P.E., PTOE

Bob Hart

Brian Chandler, P.E., PTOE, RSP_{2IB}, PMP

TABLE OF CONTENTS

PROJECT BACKGROUND **1**

PILOT CORRIDOR EVALUATION: STATE ROUTE 503 SOUTH 1

PERFORMANCE ANALYSIS 2

TRAVEL TIME COMPARISON **3**

FULL PROJECT CORRIDOR 4

EMISSION COMPARISON **9**

SAFETY **11**

APPENDIX **12**

LIST OF FIGURES

FIGURE 1. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (NORTHBOUND, WEEKDAY).....5

FIGURE 2. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (SOUTHBOUND, WEEKDAY).....5

FIGURE 3. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (NORTHBOUND, WEEKEND).....6

FIGURE 4. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (SOUTHBOUND, WEEKEND).....6

LIST OF TABLES

TABLE 1: TIMING PLAN CYCLE LENGTHS FOR STUDY INTERSECTIONS ALONG THE SR 503 SOUTH CORRIDOR 2

TABLE 2. AVERAGE TRAVEL TIME SAVING FOR THE PROJECT CORRIDOR 4

TABLE 3. SYNCHRO PERFORMANCE MEASURES FOR THE PROJECT CORRIDOR 9

PROJECT BACKGROUND

The Infrastructure Investment and Jobs Act (IIJA) established the Carbon Reduction Program (CRP), a new regionally competitive grant program managed by the Southwest Washington Regional Transportation Council (RTC). The CRP authorizes grant funding for projects designed to reduce transportation emissions. RTC was awarded funds to develop signal timing to improve traffic flow, air quality, and safety in the Clark County urban area. RTC, in coordination with local agencies in Clark County, Washington and DKS, are developing regional signal timing plans along major corridors in Clark County.

The list of corridors considered in the prioritization process utilized the RTC Congestion Management Process (CMP) corridors as the candidates for updated signal timing. Major tasks for this project include evaluating and prioritizing non-freeway CMP corridors to develop and apply new signal timing strategies based on existing conditions and regional goals.

The process involved evaluating historical performance data, applying a weighted ranking scheme, and incorporating agency input. This approach guided the selection of 7 pilot corridors and helped define the project goals of **improving traffic flow, air quality, and safety**. The full prioritization methodology is documented in the project's *Corridor Prioritization Memorandum*, included as Appendix A, outlining the 3-step approach used to prioritize corridors for the regional signal timing plans pilot.

PILOT CORRIDOR EVALUATION: STATE ROUTE 503 SOUTH

As part of this effort, this report summarizes the evaluation completed under the regional signal timing plans pilot for State Route (SR) 503 from Fourth Plain Boulevard to 119th Street plus the signal at the Fourth Plain Boulevard & NE 121st Avenue intersection, a total of 10 study intersections. The nine signals along SR 503 are owned and operated by the Washington State Department of Transportation (WSDOT), while the signal at NE 121st Avenue is owned by the City of Vancouver and operated by WSDOT. All study intersections, except 119th Street, currently operate in coordination mode. A review of existing conditions was conducted to assess corridor operations and identify key needs. The findings are detailed in the *Existing Conditions Memorandum*, included as Appendix B.

This three-mile long north-south study corridor with a 40 miles per hour (MPH) posted speed limit and two through-lanes in each direction is a key route connecting Vancouver, Battle Ground, and the surrounding communities in north and central Clark County, Washington. The businesses and residents along this corridor attract a mix of local commuters, freight and regional recreational traffic. In 2025, weekday counts were taken along SR503 at NE 95th Street to estimate average annual daily traffic (AADT) and 37,224 vehicles were counted on this section of the corridor. Transit Route 7 travels along the corridor and operates with a frequency of about every 30 minutes.

Updates to the timing plans include optimizing local and coordination timings, sequences, and offsets to enhance operational performance. In addition to the project goals, the benefits of these updates also support improved traffic flow along SR 503 and reduced delays for side streets and left turn phases.

Coordinated signal timing aims to enhance directional traffic flow by creating vehicle platoons that can move through multiple intersections with fewer stops. 119th Street is approximately a mile away from the coordinated group at 99th Street; therefore, it is recommended to have 119th Street continue as its current operation in Free mode with updated signal timings.

Table 1 below presents a comparison of the before and after signal timing plans, shown as cycle lengths by weekday and weekend Time of Day (TOD) schedules. Minor adjustments to the TOD time intervals were also part of the update as follows:

- Morning (AM) plan: 6:00 a.m. to 9:00 a.m. (previous signal timing plan ended at 11:00 a.m.)
- Midday (MD) plan: 9:00 a.m. to 2:30 p.m. (previous signal timing plan began at 11:00 a.m.)
- Evening (PM) plan: 2:30 p.m. to 7:00 p.m.
- Weekend (WKN) plan: 9:00 a.m. to 6:00 p.m.

TABLE 1: TIMING PLAN CYCLE LENGTHS FOR STUDY INTERSECTIONS ALONG THE SR 503 SOUTH CORRIDOR

CROSS STREET	BEFORE				AFTER			
	AM	MD	PM	WKN	AM	MD	PM	WKN
FOURTH PLAIN BLVD TO NE 99TH ST	125	130	150	125	130	Cycle length unchanged; signal timings updated	140	140
NE 119TH ST	Free				Free; signal timings updated			

PERFORMANCE ANALYSIS

An analysis was conducted to compare the performance of the updated ("after") coordinated signal timing plans against the former ("before") plans. The analysis aims to address three key areas that align with the project goals of improving traffic flow, enhancing air quality, and promoting safety. analysis includes:

- Travel time performance, based on real-world traffic data
- Emission impacts, derived from simulation model
- Safety impacts, a brief qualitative review based on signal timing updates and corresponding performance measures

TRAVEL TIME COMPARISON

Travel time data along the study corridor was obtained from TomTom, a location-based company that provides traffic analytics using Global Positioning System (GPS)-based data. TomTom provides high-resolution, anonymized GPS data aggregated from a wide range of connected devices, including navigation devices, mobile applications, and fleet vehicles. TomTom allows users to select routes between two points along roadways and produce cumulative travel time results for the selected routes.

This analysis evaluates the project corridor directionally, both northbound and southbound. The updated signal timing along the project corridor was implemented during the week of February 10th, 2025. Before data was obtained from a full month of historical records, while after data was selected from the period of February 24th to March 23rd, 2025, representing one full month following implementation.

The before period would ideally be based on data from the same month in the previous year, however, construction projects in the vicinity during that time, including the NE 99th Street project and the NE 130th Avenue project, caused traffic delays and a shift in travel patterns along the project corridor.[1] Therefore, the March 2024 data does not accurately reflect the before conditions and would not serve as a reliable baseline for the before and after analysis.

To better represent typical traffic conditions before the timing update, October 2024 was selected as the before period since it falls between the summer break and winter holidays, making it a more stable and representative timeframe. The analysis periods are defined as follows:

- Before (weekday): Tuesdays, Wednesdays, and Thursdays in October 2024
- Before (weekend): Saturdays in October 2024
- After (weekday): Tuesdays, Wednesdays, and Thursday from February 24th to March 23rd, 2025
  After (weekend): Saturdays from February 24th to March 23rd, 2025

For each direction of travel, data was aggregated by 15-minute time-of-day intervals. Average travel times were calculated for each interval over the corresponding analysis period. It should be noted that the travel time savings shown in Table 2 below are based on common peak periods for consistency since the before and after periods have different TOD intervals. Additionally, the weekend analysis includes only four Saturdays in both the before and after periods. This limited dataset may result in gaps or variability in the results. It is anticipated that using a longer data range would help eliminate these data gaps and produce more reliable outcomes.

[1] Clark County, Construction Traffic Delays, https://clark.wa.gov/public-works/construction-traffic-delays

FULL PROJECT CORRIDOR

Travel time data was analyzed for the coordinated grouping of signals along the project corridor to evaluate the overall impact of the updated signal timing plans. Table 2 summarizes the average travel time savings for each direction and evaluation period.

TABLE 2. AVERAGE TRAVEL TIME SAVING FOR THE PROJECT CORRIDOR

ANALYSIS PERIOD	TIME PERIOD	TRAVEL TIME SAVINGS (SEC)	
		NORTHBOUND (4TH PLAIN BLVD TO 99TH ST)	SOUTHBOUND (99TH ST TO 4TH PLAIN BLVD)
WEEKDAY	AM Peak: 7am to 9am	-11 (3.7%)	-108 (25.4%)
	MD Peak: 11am to 1pm	-22 (6.9%)	-59 (15.8%)
	PM Peak: 4pm to 6pm	-18 (4.4%)	-107 (23.2%)
	Daily (24-hour)	-6 (2.1%)	-39 (12.8%)
WEEKEND	WKN Peak: 11am to 1pm	-45 (13.5%)	-40 (9.4%)

Figures 1 through 4 complement the summary in Table 2, showing before and after travel time data through the corridor. These figures present average travel time in 15-minute intervals throughout the day for both northbound and southbound directions, across weekdays and weekends, with the implemented TOD plan periods indicated for reference.

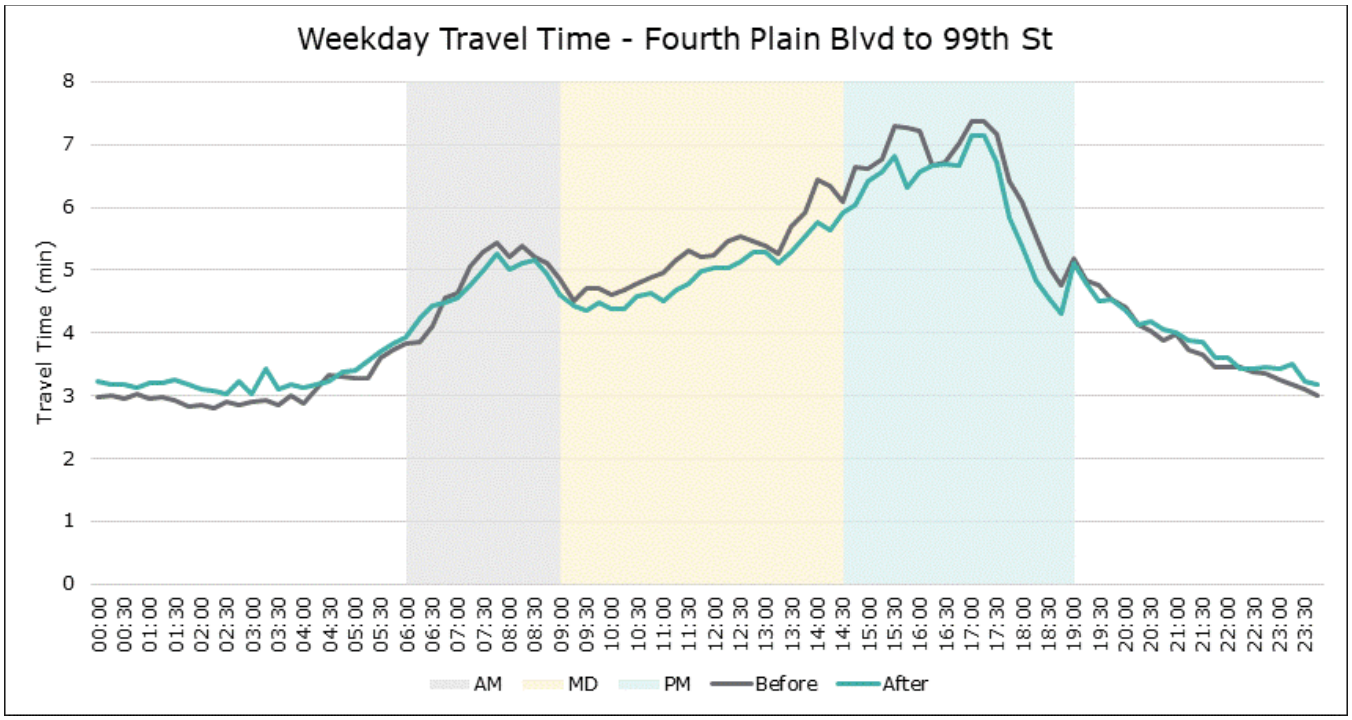

FIGURE 1. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (NORTHBOUND, WEEKDAY)

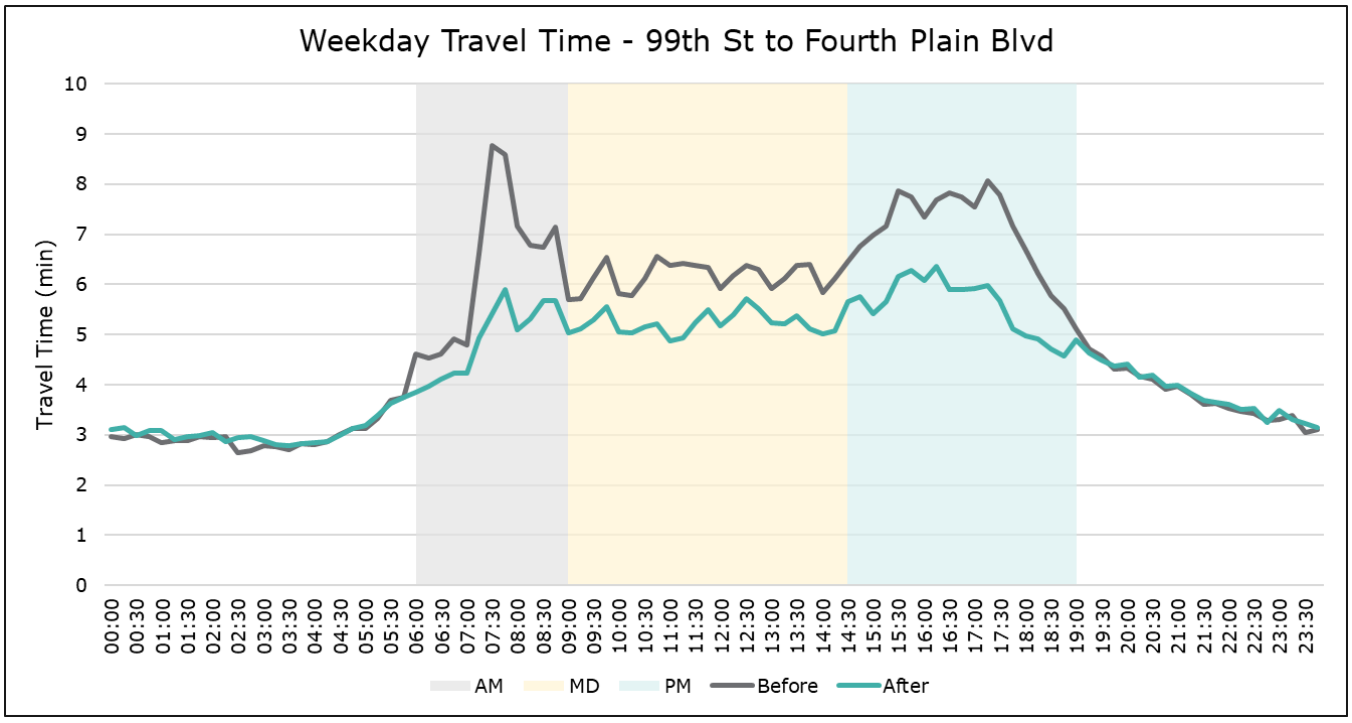

FIGURE 2. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (SOUTHBOUND, WEEKDAY)

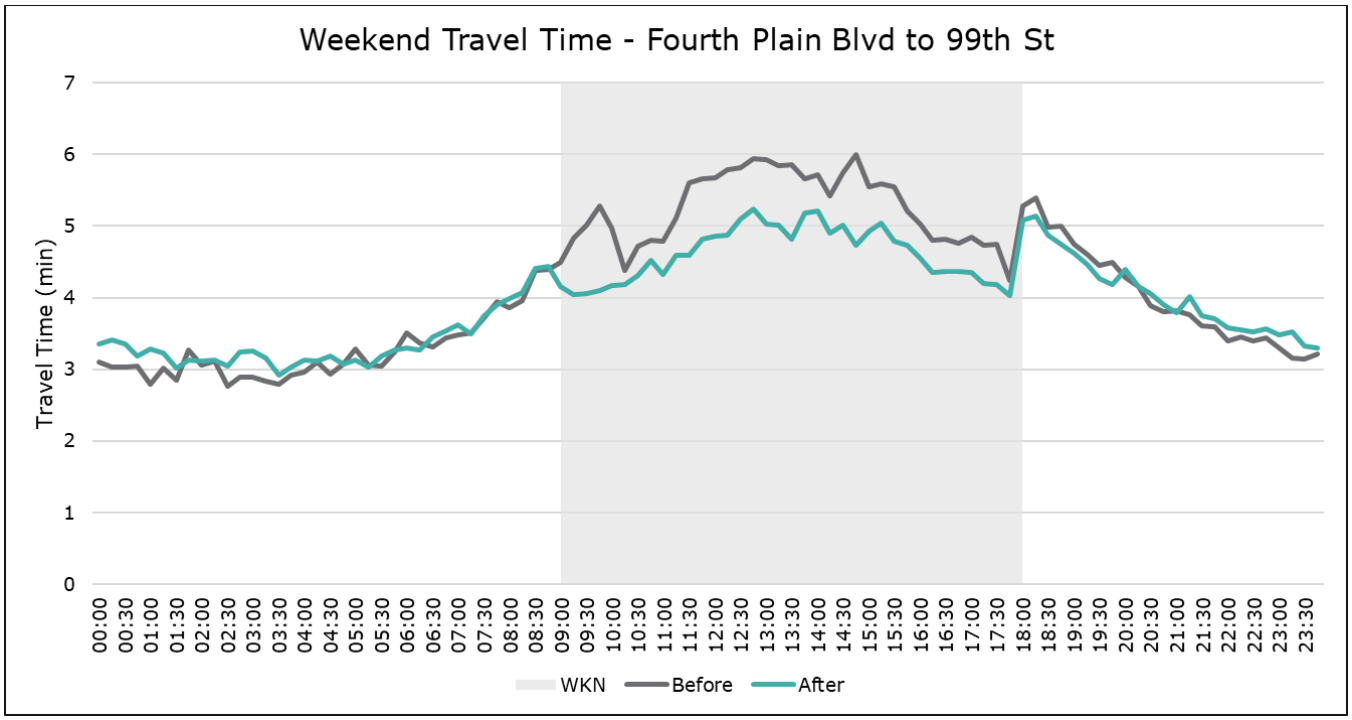

FIGURE 3. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (NORTHBOUND, WEEKEND)

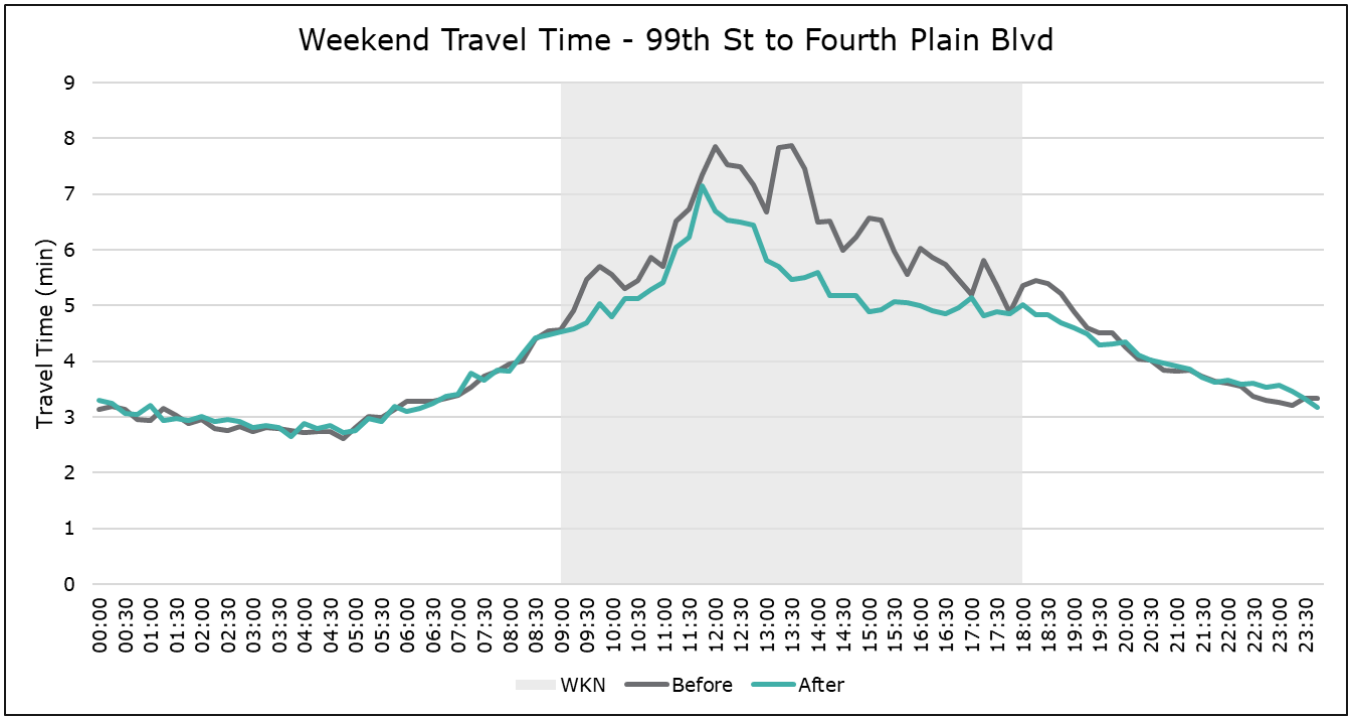

FIGURE 4. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (SOUTHBOUND, WEEKEND)

One of the primary objectives of this project was to improve traffic flow along the corridor. Under existing conditions, traffic congestion was most prominent to and from SR 500 towards Interstate 205. Under proposed conditions, daily travel time savings resulted across all analysis periods for

the project corridor between Fourth Plain Boulevard and 99th Street. The general shape of the travel time curves remains consistent before and after implementation, but notable reductions are observed during the peak periods, especially in the weekday southbound direction.

For weekdays, southbound travel time improvements are greater than the northbound direction as shown in both figures and table above. A common challenge in implementing coordinated signal timing is achieving a balance between both travel directions since optimizing offsets to favor one direction can often reduce performance in the opposite direction. In this case, the updated timing plans appear to favor southbound progression more for vehicles without significantly impacting northbound flow. For weekends, the opposite is the case; northbound travel time improvements are greater than the southbound direction.

P.M. CYCLE LENGTH EVALUATION

Due to traffic conditions observed during field implementation the week of February 24th, 2025, an additional 10 seconds was added to the p.m. cycle lengths in an effort to improve progression throughout the corridor. Another round of travel time data was selected from the period of April 7th to May 2nd, 2025, representing one full month following the updated implementation.

Figure 5 and Figure 6 below show the travel time results comparing the before (October 2024), 140 second (March 2025), and 150 second (After) scenarios for both northbound and southbound directions. Similar travel time performance is shown across both cycle lengths, yet there is a brief period where the 140 second cycle appeared to perform better for northbound traffic. Given the comparable outcomes and minimal benefit from the 150-second scenario, it is recommended to continue with the 140 second cycle length throughout the corridor.

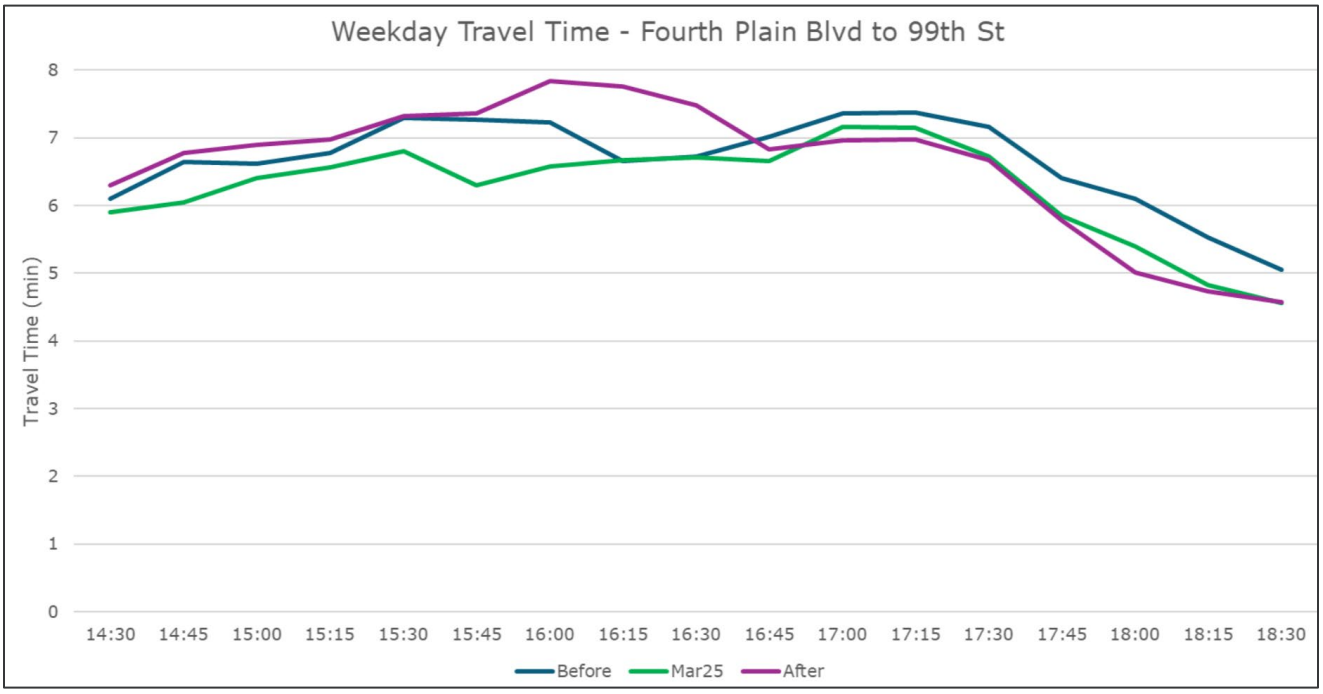

FIGURE 5: PM PEAK HOUR TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (NORTHBOUND, WEEKDAY)

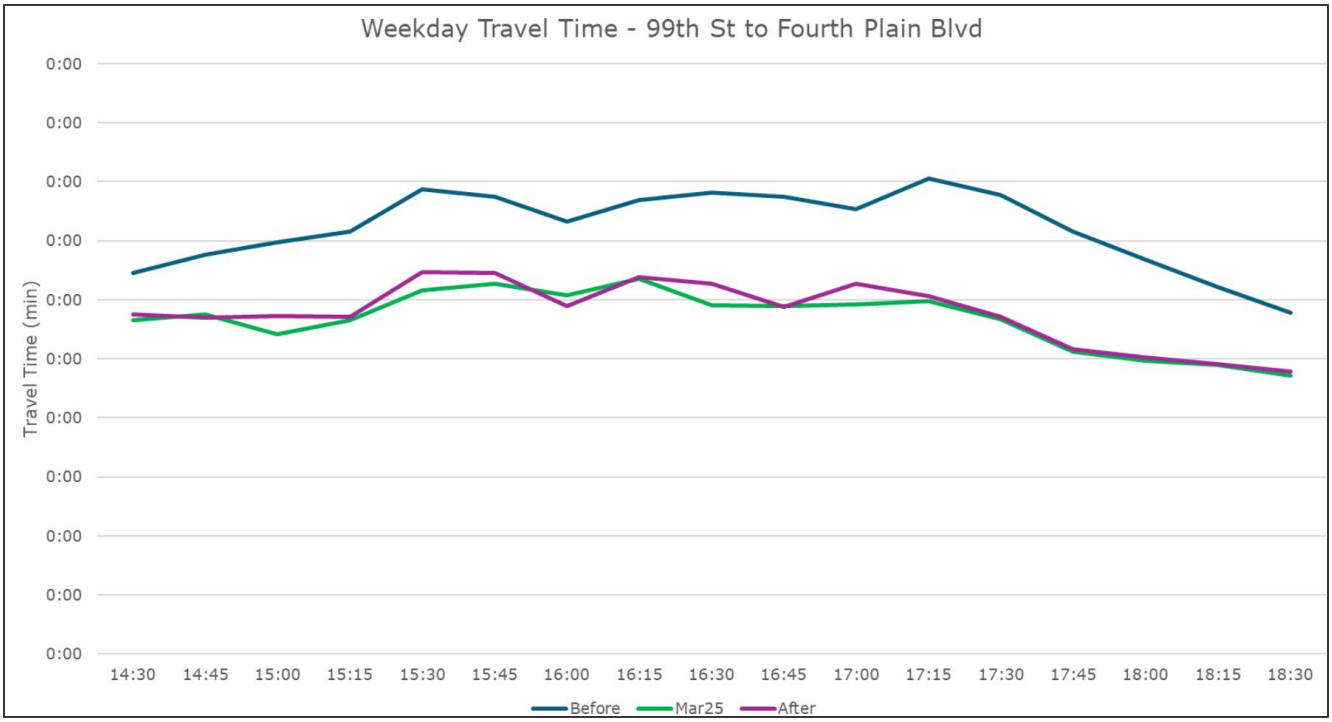

FIGURE 6: PM PEAK HOUR TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (SOUTHBOUND, WEEKDAY)

EMISSION COMPARISON

Emission performance was evaluated using reports generated by Synchro, a traffic signal optimization and simulation tool that estimates intersection-level measures of effectiveness (MOEs), including but not limited to total delay, number of stops, fuel consumed, Carbon Monoxide (CO) emissions, and Nitrogen Oxides (NO_X) emissions.

Two Synchro models were used for this analysis:

- Existing model, representing the before conditions
- Fine-tuned model, reflecting the updated signal timing plans

It should be noted that Synchro provides an effective and widely accepted method for assessing the relative emission benefits of signal timing improvements. Though the results are based on modeled estimates and may not fully represent realistic conditions.

Additionally, the results from Synchro do not account for the presence of hybrid and electric vehicles, which produce significantly lower or zero emissions. According to Washington State vehicle registration data, approximately 4 percent of residential vehicles in Clark County were hybrids and 2 percent were electric as of 2024. While this could theoretically reduce the estimated emission savings to some extent, the impact is not included in this analysis due to the current limitations of the modeling tool. Table 3 shows the performance measures for the updated signal timing plans for the project corridor, including 121st Avenue.

TABLE 3. SYNCHRO PERFORMANCE MEASURES FOR THE PROJECT CORRIDOR

CORRIDOR PERFORMANCE MEASURES	BEFORE				AFTER			
	AM	MD	PM	WKN	AM	MD	PM	WKN
TOTAL DELAY (HOURS)	182	205	316	252	161 (-12.5%)	199 (-2.9%)	260 (-17.7%)	261 (+3.6%)
TOTAL STOPS (STOPS)	14200	15158	20346	19022	14095 (-0.7%)	16376 (+8.0%)	19201 (-5.6%)	18903 (-0.6%)
FUEL CONSUMED (GAL)	525	557	722	659	510 (-2.9%)	565 (+1.4%)	670 (-7.2%)	664 (+0.8%)
CO EMISSIONS (KG)	36.73	38.94	50.48	46.09	45.14 (-3.0%)	39.5 (+1.4%)	46.84 (-7.2%)	46.43 (+0.7%)
NO_X EMISSIONS (KG)	7.15	7.58	9.82	8.97	8.78 (-3.1%)	7.69 (+1.5%)	9.11 (-7.2%)	9.03 (+0.7%)

As shown in Table 3, the performance measures for the updated timing plans along SR 503 indicate general improvements in total delay, stops, and emissions. In general, the updated timing plans resulted in reductions across most measures during the analysis periods:

- Total delay reduced between 3 and 17 percent on the weekdays.
- Total stops reduced by up to 6 percent, suggesting improvement of progression and fewer interruptions.
- Fuel consumption, CO emissions, and NO_X emissions were reduced by 1 to 7 percent.

The reductions indicated that the updated plans improve corridor efficiency by providing smoother flow and reducing vehicle idling during the weekday peak periods. However, during the midday, an 8 percent increase in total stops was observed. This increase may be the result of balancing high traffic volumes in both directions to improve northbound and southbound progression. Still, the total delay on the corridor is reduced and the vehicle idling performance measures (fuel consumption, CO emissions, and NO_X emissions) are minimally affected.

Similarly, during the weekend, a slight increase of 3.6 percent in total delay was observed. The increase is relatively minor and may reflect variability in modeled signal operations under weekend conditions with lower volumes, and small changes in arrival patterns can disproportionately affect delay estimates. Despite the increase in total delay, weekend performance still shows a reduction in total stops and less than one percent change in vehicle idling (fuel consumption, CO emissions, and NO_X emissions), indicating overall operational improvements.

The model outputs for total delay and fuel consumption savings were used to estimate the cost-related benefits of the updated signal timing. The outputs from Synchro models were estimated based on peak hour volumes. Therefore, a TOD factor, calculated using 24-hour tube count volumes along the corridor, was applied to convert the peak hour savings into daily savings. It should be noted that only weekday output was included in the daily benefit calculations.

Re-timing signals in congested transportation corridors is a low cost, transportation systems management and operations strategy that can improve travel time and reduce delay. This strategy can also reduce the number of collisions due to smoother traffic flow and fewer stops, and can minimize the number of drivers who divert to side streets to avoid congestion on the main corridor. This project provides an opportunity to quantitatively demonstrate that signal timing is a cost-effective approach to addressing operational challenges in the Clark County region.

The benefits for the SR 503 South corridor were estimated using delay savings and fuel savings. The reduced hours of delay was multiplied by a dollar-per-hour value. This value represents the 2024 average value of time, adjusted using the Consumer Price Index[2] (CPI) from the U.S. Bureau of Labor Statistics. For fuel savings, the dollar-per-gallon value was based on the 2024 annual average gasoline price in Washington State, obtained from the U.S. Energy Information Administration. Based on these assumptions, the estimated annual delay savings in dollars is $1,891,870, while the fuel consumption savings in dollars is $204,155, resulting in a combined

[2] https://www.bls.gov/cpi/data.htm

annual benefit of $2,096,025, with an estimated three-year total of $6,288,074 to reflect the anticipated duration of improvements.

SAFETY

Arterial corridors serve various needs that can affect roadway safety. Many of these segments are characterized by high vehicle volumes and relatively high motor vehicle operating speeds, while also featuring mixed land use (e.g., residential, commercial, and services) that encourage walking, cycling, and public transit use. This results in a mix of local and through corridor traffic demands, increasing the potential for conflicts between vehicles, pedestrians, cyclists, and transit users using the corridor for different purposes, presenting potential safety challenges.

According to the Crash Modification Factors[3] (CMF) Clearinghouse, coordinated signal timing has been associated with a 17 percent reduction in crashes of all severities, including property damage only (PDO) crashes. Coordination can also offer the following additional benefits:

- **Reduce Arrivals on Red.** Improving coordination can lower the number of drivers who arrive during the red phase, which also reduces stops. This decreases the likelihood of several crash types, including angle collisions (by reducing the opportunity for red-light running) and rear-end collisions.
- **Influence Operating Speeds.** By timing signal coordination based on a desired motor vehicle operating speed and messaging that to drivers, a coordinated system can reduce speeds and reduce speed differential through the corridor, both of which can reduce the number and severity of collisions.
- **Reduce Left Turn Crashes.** Permissive left turn phases are a common safety challenge at signalized intersections. Improved platooning can result in larger gaps for those left-turning drivers, reducing the likelihood of a collision with opposing through vehicles.
- **Reduced Anxiety to Support Decision-making**. Congestion can increase the stress level of motorists, negatively affecting how they interact with the system and each other. Reducing the frustration of driving by reducing congestion, changing stop-and-go traffic along a corridor to a smoother, more comfortable experience, can result in reduced aggression on the road, leading to a safer corridor.
- **Shorter Cycle Lengths in the PM Peak Hour Reduce "Pushing the Yellow."** In the PM peak period, the signal coordination includes reduced cycle lengths. When signal coordination includes reduced cycle lengths, drivers may be less apt to push the end of their phase, knowing they will be served relatively soon if they stop. Long cycle lengths can encourage more yellow-red-light running at the end of the phase.

[3] Crash Modification Factors Clearinghouse (CMF ID: 6856)

APPENDIX

Southwest Washington
Regional Transportation Council

APPENDIX A. CORRIDOR PRIORITIZATION MEMORANDUM

DKS 1050 SW 6TH AVENUE, SUITE 600 • PORTLAND, OR 97204 • 503.243.3500 • DKSASSOCIATES.COM

PRIORITIZATION METHODOLOGY MEMO

DATE: June 4, 2024

TO: Judith Perez Keniston | RTC

FROM: Maggie Lin & Michael Mauch | DKS Associates

SUBJECT: SWRTC Regional Signal Timing Plans Project #24070-000
FINAL Corridor Prioritization Memorandum

PROJECT BACKGROUND

Southwest Washington Regional Transportation Council (RTC) is the metropolitan planning organization (MPO) for Clark County, Washington. The Carbon Reduction Program (CRP) was established by the Bipartisan Infrastructure Law (BIL) to provide funds for projects designed to reduce vehicle greenhouse gas (GHG) emissions. RTC is leading this project, with the support of other VAST TSMO Steering Committee members, and will use CRP funds to implement updated signal timing plans along priority corridors within urban Clark County.

As a growing community, Clark County has seen significant population growth in the last decade and estimates a population of nearly 700,000 by 2045. The region's public roadway network includes both major interregional corridors and major arterial corridors that connect cities and communities. The intent of the regional traffic signal timing project is to help the region lower GHG emissions by making more efficient use of the existing transportation system, particularly as economic and population growth within the region continues.

PROJECT OVERVIEW

The goals of this project include improving mobility, safety, and air quality; while meeting the demands of all modes by reducing traffic signal delay. To accomplish this, the key components of the project scope include prioritizing and improving traffic signal timing and coordination along priority transportation corridors:

- Review the existing conditions along the signalized roadway corridors within urban Clark County,
- Prioritize the corridors based on screening criteria,
- Develop and deploy improved traffic signal coordination plans that meet the operational objectives and project goals.

The project team identified a list of corridors to be considered in the corridor prioritization process and potential candidates for updating the corridor signal timing. The RTC Congestion Management Process (CMP) corridors were used as the basis for corridor identification. The CMP corridors include freeway and arterial corridors. This project only considers the non-freeway CMP corridors. Figure 1 provides a map of the non-freeway CMP corridors and traffic signal locations in the region. Note that the signals shown in this map were from data collected in 2021. Any updates to the signal locations are not reflected in this map as it only intends to provide a high-level overview of the signal locations in the region. An online version of this map is also available through this link: https://shorturl.at/akCH9

FIGURE 1 CORRIDORS TO BE CONSIDERED FOR PRIORITIZATION

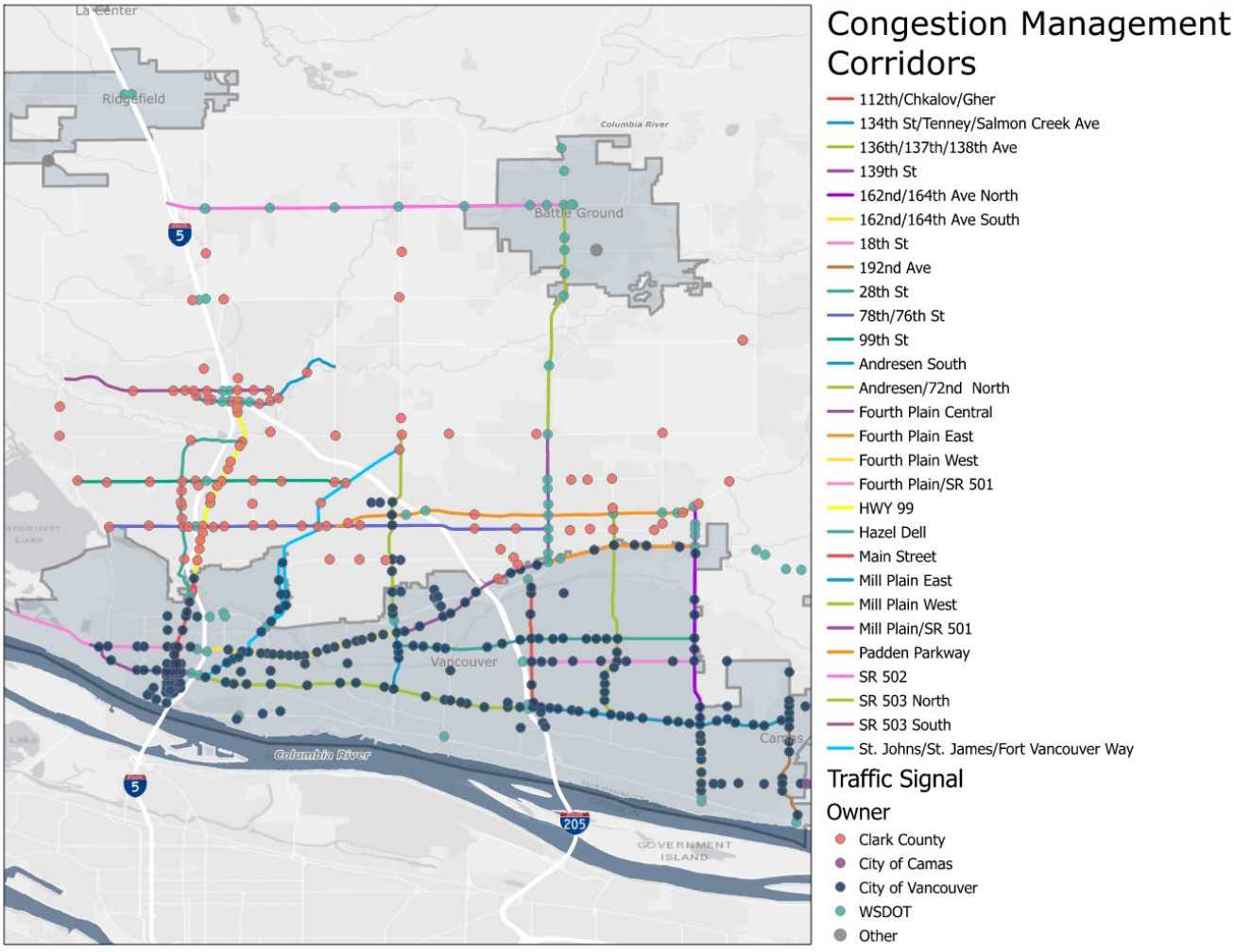

Table 1 lists the 28 CMP corridors identified for prioritization by the VAST/TSMO Steering Committee. The corridors are arranged in alphabetical order.

TABLE 1: CORRIDORS BEING EVALUATED

CORRIDOR NAME AND DESCRIPTION
112TH/CHKALOV/GHER (FROM SR 500 TO MILL PLAIN)
134TH ST/TENNEY/SALMON CREEK AVE (FROM NE 139TH ST TO NE 50TH AVE)
136TH/137TH/138TH AVE (FROM PADDEN PKWY TO MILL PLAIN)
139TH ST (FROM NW 36TH ST TO NE 29TH AVE)
162ND/164TH AVE NORTH (FROM WARD RD TO MILL PLAIN)
162ND/164TH AVE SOUTH (FROM MILL PLAIN TO SR 14)
18TH ST (FROM 112TH AVE TO 162ND AVE)
192ND AVE (FROM SE 1ST ST TO SR 14)
28TH ST (FROM ANDRESEN RD TO 162ND AVE)
78TH/76TH ST (FROM LAKESHORE AVE TO SR 503/117TH AVE)
99TH ST (FROM LAKESHORE AVE TO ST JOHN RD)
ANDRESEN SOUTH (FROM SR 500 TO MILL PLAIN)
ANDRESEN/72ND NORTH (FROM 119TH ST TO SR 500)
FOURTH PLAIN CENTRAL (FROM ANDRESEN RD TO SR 503/117TH AVE)
FOURTH PLAIN EAST (FROM SR 503/117TH AVE TO 162ND AVE)
FOURTH PLAIN WEST (FROM I-5 TO ANDRESEN RD)
FOURTH PLAIN/SR 501 (FROM NW LOWER RIVER RD TO I-5)
HAZEL DELL (FROM HWY 99 TO 63RD ST)
HWY 99 (FROM 139TH ST TO ROSS ST)
MAIN STREET (FROM ROSS ST TO MILL PLAIN)
MILL PLAIN EAST (FROM I-205 TO 192ND AVE)
MILL PLAIN WEST (FROM I-5 TO I-205)
MILL PLAIN/SR 501 (FROM FOURTH PLAIN TO I-5)
PADDEN PARKWAY (FROM 78TH ST TO 162ND AVE)
SR 502 (FROM I-5 TO SR 503)
SR 503 NORTH (FROM SR 502 TO 119TH ST)
SR 503 SOUTH (FROM 119TH ST TO FOURTH PLAIN/SR 500)
ST. JOHNS/ST. JAMES/FORT VANCOUVER WAY (FROM NE 72ND AVE TO MILL PLAIN)

CORRIDOR PRIORITIZATION METHODOLOGY

This section describes the methodology to evaluate the existing corridor performance and prioritize the corridors for the signal coordination efforts. As mentioned in the previous section, CMP corridors and key urban corridors confirmed by VAST TSMO Steering Committee members were used as the initial list of corridors considered for this project.

A three-step approach was used to prioritize the needs for updating the traffic signal timing plans for the County's urban corridors. Each of the steps are described in the subsections below.

1. Evaluate the corridor performance based on historical data.
2. Develop a weighting scheme and corridor ranking.

3. Obtain agency input on additional information and identify the set of corridors to be re-timed.

STEP 1. EVALUATE CORRIDOR PERFORMANCE BASED ON HISTORICAL DATA

For each of the County's urbanized CMP corridors considered in this process, the following corridor performance measures were quantified and evaluated:

- **Traffic Volume** – to measure and compare the utilization of each corridor (in vehicles per hour during the peak hour on an average non-holiday weekday).
- **Travel Time and Travel Time/Mile** – to measure the impacts of congestion on the signalized corridors, two measures will be used: corridor travel time and travel-times per mile (sometimes called "pace"). TomTom travel time data served as the primary data source for the travel time measures.
- **Speed/Posted Speed Percent** – The peak period speed to posted speed ratio (expressed as a percentage) captures the impact of peak period traffic congestion on the corridor's overall performance.
- **CCI (Corridor Capacity Index)** – The corridor capacity index is an indicator of congestion. The higher the ratio, the more traffic congestion a driver is likely to experience. The corridor capacity index is an aggregation of the volume/capacity ratios for the individual general-purpose segments that make up a facility within a corridor.
- **Transit ridership** – To gauge transit utilization within each corridor, the measure selected was the count of transit riders utilizing the study corridors.
- **Safety** – Three measures were selected to quantify safety along the study corridors:
  1) Total corridor crashes (2017 -2022),
  2) Crashes per centerline-mile of the corridor, and
  3) A binary "high crash corridor" designation as identified in local road safety plans.

The performance of the corridors may vary by time of day; that is, the AM peak, midday, and PM peak performance may differ. For the vast majority of the analysis corridors in the region, PM peak dominated the corridor utilization; therefore, PM peak period was used in the evaluation for all of the analysis corridors. In addition, four of the corridors also experienced significant AM period utilization, so AM peak period was also used in the evaluation for those three corridors, i.e. Main Street, Andresen/72nd North, 139th Street, and Mill Plain/SR501.

STEP 2. DEVELOP WEIGHTING SCHEME AND CORRIDOR RANKING

DKS developed a corridor ranking methodology based on the relative importance of the performance metrics listed in Step 1. "Weights" are assigned to each of the performance metrics and represent the comparative level of importance.

Table 2 shows the draft criteria weighing factors proposed by DKS in this process.

TABLE 2: DRAFT WEIGHTING FACTORS

PERFORMANCE MEASURE	WEIGHTING FACTOR
TRAFFIC VOLUME	5
TRAVEL TIME	0
TRAVEL TIME/MILE	2
SPEED / POSTED SPEED PERCENT	4
CCI	2
2019 TRANSIT RIDERS	3
TOTAL CORRIDOR CRASHES (2017-2022)	0
CRASHES/MILE	3
HIGH CRASH CORRIDOR	0

A few of the corridor performance metrics identified in Step 1 were not used (with a zero weight) in the draft weighting factors, either because they were redundant or because another performance measure more appropriately captured the underlying phenomena or events. For example, corridor travel time is directly dependent on the corridor distance; including this would favor longer corridors over shorter ones. As such, it was given a "0" weight. Instead, the corridor's travel times per mile (Travel Time/Mile) was used, which normalized the corridors' performance, removing the bias toward longer corridors. Likewise, the Total Corridor Crashes was not used, and Crashes/Mile was selected to represent the corridors crash rates.

A corridor prioritization workshop was included during the April 24th VAST/TSMO Steering Committee meeting. Local agency staff were asked to collaboratively review the draft weighting criteria and develop the final weighting factors based on consensus from the group. Table 3 lists the agency's inputs on weighting collected during the meeting and the final weighting factor used in the process.

TABLE 3: FINAL WEIGHTING FACTORS

PERFORMANCE METRIC	AGENCY INPUT					FINAL WEIGHTING FACTOR
	WSDOT	CLARK COUNTY	VANCOUVER	C-TRAN	RTC	
TRAFFIC VOLUME	5	5	5	4	5	**4.8**
TRAVEL TIME	0	0	0	0	0	**0**
TRAVEL TIME/MILE	3	2	2	2	2	**2.2**
SPEED / POSTED SPEED PERCENT	2	3	3	3	3	**2.8**
CCI	4	4	4	4	4	**4**
2019 TRANSIT RIDERS	3	4	4	5	4	**4**
TOTAL CORRIDOR CRASHES (2017-2022)	0	0	0	0	0	**0**
CRASHES/MILE	4	4	3	3	3	**3.4**
HIGH CRASH CORRIDOR	0	0	0	0	0	**0**

The corridor ranking was updated based on the final weighting factors and presented to the VAST members during the April 24th meeting.

TABLE 4: CORRIDOR RANKING RESULTS

CORRIDOR RANKING	CORRIDOR NAME AND DESCRIPTION	PEAK PERIOD
1	SR 503 South (from 119th St to Fourth Plain/SR 500)	PM
2	Mill Plain East (from I-205 to 192nd Ave)	PM
3	112th/Chkalov/Gher (from SR 500 to Mill Plain)	PM
4	Fourth Plain West (from I-5 to Andresen Rd)	PM
5	162nd/164th Ave South (from Mill Plain to SR 14)	PM
6	Fourth Plain East (from SR 503 (117th Ave) to 162nd Ave)	PM
7	18th St (from 112th Ave to 162nd Ave)	PM
8	Main Street (from Ross St to Mill Plain)	AM
9	HWY 99 (from 139th St to Ross St)	PM
10	SR 503 North (from SR 502 to 119th St)	PM
11	136th/137th/138th Ave (from Padden Pkwy to Mill Plain)	PM
12	Mill Plain West (from I-5 to I-205)	PM
13	Andresen/72nd North (from 119th St to SR 500)	AM
14	162nd/164th Ave North (from Ward Rd to Mill Plain)	PM
15	Andresen South (from SR 500 to Mill Plain)	PM
16	28th St (from Andresen Rd to 162nd Ave)	PM
17	139th St (from NW 36th St to NE 29th Ave)	AM
18	78th/76th St (from Lakeshore Ave to SR 503 (117th Ave))	PM
19	99th St (from Lakeshore Ave to St John Rd)	PM
20	Fourth Plain Central (from Andresen Rd to SR 503 (117th Ave))	PM
21	192nd Ave (from SE 1st St to SR 14)	PM
22	Mill Plain/SR 501 (from Fourth Plain to I-5)	AM
23	134th St/Tenney/Salmon Creek Ave (from NE 139th St to NE 50th Ave)	PM
24	SR 502 (from I-5 to SR 503)	PM
25	Padden Parkway (from 78th St to 162nd Ave)	PM
26	Hazel Dell (from Hwy 99 to 63rd St)	PM
27	St. Johns/St. James/Fort Vancouver Way (from NE 72nd Ave to Mill Plain)	PM
28	Fourth Plain/SR 501 (from NW Lower River Rd to I-5)	PM

Table 4 shows the resulting corridor ranking using the weighting factors listed in Table 3. As noted in Step 1, four of the corridors had both AM and PM peak performance metrics considered. Only the higher ranking between AM and PM of each corridor is presented in this table.

STEP 3. ADDITIONAL AGENCY INPUTS

At the April 24th meeting, the agencies also discussed other factors needing to be considered in the development of a final list of prioritized corridors. Several agencies also provided additional information after the meeting. Consideration factors that may impact the decision of whether to prioritize a corridor for signal retiming included:

- Whether a recent signal timing effort has been conducted on a corridor
- Whether a signal timing effort is planned/programmed for a corridor in the next few years
- Whether a construction project is planned/schedule for a corridor and if it has an impact on this project
- Whether a corridor is identified as an existing or future BRT route

These factors will be considered in the development of signal timing plans. For example, a corridor with a construction project schedule in 2025 may be removed from the priority list for developing updated signal timing plans as this project would likely be completed by the end of 2025. These details will be discussed between RTC, the local agencies, and DKS and the final decisions will be documented.

NEXT STEPS

DKS will start to collect data and develop existing conditions models for the top two corridors in May 2024, and move forward with developing updated signal timing plans for the top two corridors and deploying the new timing plans afterwards. Additional corridors will be added throughout the study, with the project concluding in December 2025.

APPENDIX B. EXISTING CONDITIONS MEMORANDUM

DKS 1050 SW 6TH AVENUE, SUITE 600 • PORTLAND, OR 97204 • 503.243.3500 • DKSASSOCIATES.COM

TECHNICAL MEMORANDUM - REVISED

DATE: December 2, 2024

TO: Judith Perez Keniston | RTC

FROM: Brianna Velasquez, EIT, Ilana Burstein, PE and Pamela O'Brien, PE, PTOE | DKS Associates

SUBJECT: SWRTC Regional Signal Timing Update
Task 4 Existing Conditions

Project #24070-000

This memorandum highlights the existing conditions, the data used, and traffic operation observations along Corridor 1: State Route 503 from NE Fourth Plain Boulevard to NE 119th Street.

EXISTING CONDITIONS

The traffic signals along State Route 503 (SR 503) are owned and operated by the Washington State Department of Transportation (WSDOT). They use Trafficware local software and are connected to the WSDOT ATMS.now central system.

The signals mostly operate in coordination with each other, except for NE 119th Street which operates as free. Figure 1 and Figure 2 below summarize the timing plans according to the weekday and weekend Time of Day (TOD) schedule.

DATA

For most intersections, WSDOT provided hourly Turning Movement Counts (TMCs) collected by GRIDSMART technology on February 14th, 2024 for 24-hours. Weekend mid-day peak hour (11:00 a.m. to 1:00 p.m.) Saturday TMCs were collected May 18th, 2024 for key intersections (NE Fourth Plain Boulevard, NE 76th Street, NE 99th Street, and NE Padden Parkway) and vehicle volumes were estimated and balanced and based on Weekday traffic patterns and judgement. Signal as-build, phasing plans, and signal timings were provided by WSDOT.

FIGURE 1: STATE ROUTE 503 EXISTING WEEKDAY TIMING PLAN SCHEDULES

Intersection	0:00	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	24:00
SR 503 & NE Fourth Plain Blvd	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE 65th Street	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE 71st Street	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE 76th Street	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE Padden Parkway	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE 87th Street	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE 95th Street	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE 99th Street	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F
SR 503 & NE 119th Street	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	free	a.m. plan											m.d. plan						p.m. plan									free	
		Plan 1 = 150								Plan 2 = 125			Plan 3 = 130						Plan 4 = 125										

FIGURE 2: STATE ROUTE 503 EXISTING WEEKEND TIMING PLAN SCHEDULES

Intersection	0:00	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	24:00
SR 503 & NE Fourth Plain Blvd	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE 65th Street	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE 71st Street	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE 76th Street	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE Padden Parkway	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE 87th Street	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE 95th Street	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE 99th Street	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F
SR 503 & NE 119th Street	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	free									m.d. plan																free			
	Plan 4 = 125																												

OBSERVED TRAFFIC ISSUES

DKS conducted field observations of traffic conditions along the SR 503 study corridor from NE Fourth Plain Boulevard to NE 119th Street, on July 10th, 2024 during weekday peak periods.

The following sections summarize notable observed characteristics at each intersection. It should be noted that observations were made in the summer when school was not in session. All the observed issues will be considered when the new signal timing plans are developed.

SR 503 & NE FOURTH PLAIN BOULEVARD

- Heavy traffic was observed during all peak periods. The heaviest traffic volumes were observed for the southbound through and westbound left turn movements, likely due to daily commuter traffic traveling through SR 503, which also leads to Interstate 205 and Interstate 5.
- In the southbound direction, the through movement had congestion issues all day, while the turning movements had little to no queuing. During all peak periods, there was not adequate green time within one cycle to serve the through queues, which caused spillback into the intersections upstream. The worst-case queueing scenario for southbound through extended back to NE 71st Street.
- During the a.m. peak hour, not enough green time was provided for the westbound left-turning traffic demand. Vehicles were observed turning during the yellow phase often and during the red phase at least once every peak period. The dual westbound left-turn lanes provided just enough length for the queues to build without affecting the westbound through traffic; this was not the case during the other two peak periods. Westbound congestion at this intersection would affect the adjacent intersection at NE 121st Avenue and created unused green time.
- The westbound left-turn green phase cannot run concurrently with the eastbound-left turn green phase due to the geometric constraints of the turning paths caused by the dual left turns. No congestion issues were observed in the eastbound direction; vehicle queues cleared within a cycle with additional green time.
- In the northbound direction, all queues were adequately served in one cycle during the a.m. and mid-day peak periods. However, during the afternoon, traffic operations were severely affected by commuters returning home. The left-turning traffic had minor congestion, but the through- and right-turn movement flow was slowed down by congestion along SR 503 and Fourth Plain Boulevard. The northbound queue could extend about a quarter-mile back from the signal, which consisted of both through and right turning vehicles. The right-turning traffic was also affected by eastbound congestion along Fourth Plain Boulevard at 121st Avenue.

SR 503 & NE 65TH STREET

- Heavy traffic on the mainline was observed during all peak periods. Most of the traffic builds at this intersection due to spillback queues from the Fourth Plain Boulevard intersection about 900-feet downstream. Many vehicles arrive during the red phase. During the p.m. peak, there was a large moving queue of vehicles.
- Queues on the minor streets mostly cleared within a cycle but there was some unused green time for the turning movements caused by queues on SR 503 spilling back (eastbound left and

westbound right had nowhere to go during some cycles). During the p.m. peak period, northbound congestion affected flow and caused longer queues on the minor streets.

SR 503 & NE 71ST STREET

- The minor street primarily serves the shopping centers on either side of SR 503. A queue of five vehicles built on the minor streets while the major movements were given priority.
- Most northbound/southbound traffic arrived on green while traveling through the intersection. A
- All queues were adequately served during all peak periods. All storage lengths were sufficient.

SR 503 & NE 76TH STREET

- High volumes of traffic were observed during the p.m. peak period. The minor streets had relatively little volume but had high delay.
- The northbound queues occasionally extended to the intersection upstream (NE 71st Street) but could clear within a cycle. The northbound-left is a protected-permissive movement, however, there were not enough gaps in the southbound through traffic to safely allow left turning vehicles to take advantage of flashing-yellow.
- The southbound queues would also reach the upstream intersection (NE Padden Parkway) but could still clear within a cycle. All green times were sufficient to clear the queues.
- The eastbound approach lane utilization factor in Synchro was adjusted to account for lane drop east of intersection.

SR 503 & NE PADDEN PARKWAY

- Heaviest traffic was during the p.m. peak period. All westbound/eastbound queues were adequately served during all peak periods, and all storage lengths were sufficient.
- Long northbound/southbound queues occurred during all peak periods. Queues would frequently extend to adjacent intersections (NE 87th Street & NE 76th Street). Green phases were not sufficient to clear queues; up to five through vehicles in each lane waited more than a cycle.

SR 503 & NE 87TH STREET

- The cycle grants majority of the cycle to the major northbound/southbound movements, which creates a long delay for the minor street. However, the minor street primarily serves material suppliers in the east and residents to the west. At most, three vehicles queued on the minor street.
- All queues were adequately served during all peak periods, and all storage lengths were sufficient, but there were instances where the southbound traffic flow was affected by congestion downstream and some green time was unused.

SR 503 & NE 95TH STREET

- The cycle grants majority of the cycle to the major northbound/southbound movements, which creates a long delay for the minor street. All queues were adequately served during all peak

periods. The minor street queue did not exceed more than five vehicles but would occasionally block the surrounding driveway access.

- There were short queues, less than three vehicles, at the green phase startup of the major street. Most northbound/southbound traffic arrived on green while traveling through the intersection.

SR 503 & NE 99TH STREET

- No issues related to westbound/eastbound traffic. All queues were adequately served during all peak periods, and all storage lengths were sufficient.
- Long northbound/southbound queues were observed during all peak periods. Green phases were sufficient to clear queues, still northbound through queues occasionally extended to the downstream intersection (NE 95th Street). The northbound left is a protected-permissive movement, however, there were not enough gaps in the southbound through traffic to permit left turning vehicles to take advantage of flashing-yellow.

SR 503 & NE 119TH STREET

- All queues were adequately served during all peak periods, and all storage lengths were sufficient. No prominent issues need to be addressed.
- The northbound left turn lane utilization factor in Synchro was adjusted to account for the Winco driveway west of intersection.

AGENCY INPUT

In addition to the field review, WSDOT staff provided input on the following operational issues:

- The peak direction in the AM is southbound along SR 503 and westbound from Fourth Plain. In the PM, it is northbound, and during midday, the traffic is mixed.
- The primary objective is to prioritize movements along SR 503. Additionally, side streets at Fourth Plain, Padden Parkway, and 99th Street should also be considered for prioritization.

General

- Cycle lengths should not exceed 150 seconds unless necessary for a specific intersection.
  - Half cycle lengths or double cycle lengths at certain locations may be effective for progression.
- WSDOT has no preference for leading or lagging left turns, they should be determined based on progression with the time space diagram.
- WSDOT is evaluating restricting FYA by time of day. They will provide the locations of protected only operations for DKS to use in proposed timings.
- The HAWK signal at 116th Street will be the first one on the state highway and will not be coordinated when it turns on.

Fourth Plain / SR 503

- This intersection has phasing constraints, so eastbound and westbound left turns do not run concurrently.

- DKS will check if removing one of the eastbound left turn lanes, and allowing concurrent left turns, would benefit the intersection operation.

- In the PM peak, the goal is to manage northbound queues since this intersection is at the end of the expressway, a high-speed location and a known crash location.
- The proposed timings should aim to improve northbound progression and decrease queueing in the PM, while increasing southbound throughput and managing queues in the AM.
- There is some spillback from southbound queues, though it is not a major concern.
- Fourth Plain / 121st Street is coordinated with this intersection.
  - The Synchro model includes timings for this intersection to avoid negatively affecting it when optimizing along SR 503.

65th Street / SR 503

- This intersection is a known choke point and a major challenge along the corridor.
- Adjusting the offsets should improve this intersection.

71st Street / SR 503

- The side streets are underutilized today.
- A large development will be built in the southwest quadrant, which will increase traffic volume after construction.
- The pedestrian timings are driving the side street splits due to long crossing times.

76th Street / SR 503

- Challenging location to optimize the offsets, many vehicles are arriving on red and stop at this intersection.
- Lots of queueing occurs in both directions between this intersection and Padden Parkway.

Padden Parkway / SR 503

- Southbound queues are long at all times of day.
- The southbound through movement is so heavy that it backs up and blocks the right turn pocket.
  - The southbound right turn is also a heavy movement.

95th Street / SR 503

- This intersection is not an issue for signal timings.
- WSDOT has indicated that the 95th percentile queues can see around 10 to 12 vehicles per cycle in the westbound direction during end-of-work shifts which does not necessarily coincide with the corridor's PM peak.
- The westbound approach is striped as a single wide lane but functions as two lanes (one left lane and one right lane). This approach may be restriped to create two lanes – a dedicated left turn lane and a shared left/right lane.
  - DKS will check if this configuration would improve operations and if the approach’s split time can be decreased.

99th Street / SR 503

- This is a high-volume intersection, with growing side street volume.

- This intersection needs split optimization.
- There are many northbound U-turns, so proposed timings should not assume that eastbound right turns are allowed on red.

119th Street / SR 503

- This intersection most likely does not need to be coordinated because it is a mile away and loses all platooning.
- In the past, WSDOT did not think it was beneficial to coordinate.
- This intersection runs free with no cycle length limit. WSDOT is open to adjusting the max times to mimic the coordination cycle lengths along SR 503.
- There is a school along 119th Street, which is one reason this intersection does not run in coordination.
    - After school times have a heavy eastbound left turn due to buses, lasting approximately 10-15 minutes. Different cycle lengths could be used during school release times.

Intersection Groupings

- Fourth Plain to 99th Street is currently grouped together and can be kept as is.
- The Fourth Plain and Padden Parkway intersections drive the corridor's cycle lengths.
- NE 119th Street is to remain free.
- Two possible options to explore:
    - Keep Padden Parkway free and coordinate the intersections north and south of it.
    - Group Fourth Plain to Padden Parkway and have 87th Street to 99th Street as a separate group.