RTC REGIONAL SIGNAL TIMING PLANS

PILOT BEFORE/AFTER REPORT: MILL PLAIN EAST BOULEVARD

APRIL 2025

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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: MILL PLAIN BOULEVARD EAST

As part of this effort, this report summarizes an evaluation completed under the regional signal timing plans pilot for Mill Plain Boulevard East, from 104th Avenue to 192nd Avenue. This corridor includes 23 signalized intersections, 21 of which are owned and operated by the City of Vancouver (City), and 2 by the Washington State Department of Transportation (WSDOT). A review of existing conditions was conducted to assess corridor operations and identify key needs. The findings are detailed in the *Existing Conditions Memorandum* for Mill Plain East Boulevard, included as Appendix B.

This four-and-a-half-mile long east-west study corridor with a 35 miles per hour (MPH) posted speed west of Chkalov Drive and 40 MPH east of Chkalov Drive that has between two and three through-lanes in each direction is a key route in east Vancouver connecting to the surrounding communities in south Clark County, Washington. The businesses and residents along this corridor attract a mix of local commuters, freight, and regional recreational traffic. In 2023, weekday counts were taken along Mill Plain Boulevard at 164th Avenue to estimate average annual daily traffic (AADT). 22,359 vehicles were counted west of 164th Avenue and 19,250 vehicles were counted east of 164th Avenue. The Vine (Red Line) travels along the corridor and operates with a frequency of about every 15 minutes.

Updates to the timing plans include optimizing coordination groupings, 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, minimizing queueing on the I-205 ramp approaches, and reduced delays for side streets and left-turn phases. It should be

noted that the signal timing at 164th Avenue and 192nd Avenue remain unchanged, as these intersections are currently coordinated with the signals on the north/south corridor and are part of future study corridors.

Table 1 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 10:00 a.m.
- Midday (MD) plan: 10:00 a.m. to 2:00 p.m. (previous signal timing plan ended at 2:30 p.m.)
- Evening (PM) plan: 2:00 p.m. to 7:30 p.m. (previous signal timing plan began at 2:30 p.m.)
- Weekend (WKN) plan: 10:30 a.m. to 5:00 p.m.

TABLE 1. TIMING PLAN CYCLE LENGTHS FOR STUDY INTERSECTIONS ALONG THE MILL PLAIN BOULEVARD EAST CORRIDOR

CROSS STREET	BEFORE				AFTER			
	AM	MD	PM	WKN	AM	MD	PM	WKN
SE 104TH AVE TO SE HEARTHWOOD BLVD	110	110	120	120	Cycle lengths unchanged; signal timings updated			
SE 155TH AVE TO SE 160TH AVE	Free	Free	Free	Free	110	110	120	120
SE 164TH AVE	120	120	120	120	No changes; scheduled for future corridor re-timing			
SE 168TH AVE TO SE 190TH AVE	Free	Free	Free	Free	Free; signal timings updated	100	100	100
SE 192ND AVE	100	100	100	100	No changes; scheduled for future corridor re-timing			

PERFORMANCE ANALYSIS

An analysis was conducted to compare the performance of the updated ("after") coordinated signal timing plans against the previous ("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. The 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, including both eastbound and westbound. To better understand the effects of the updated signal timing, two additional segments within the project corridor were selected based on corridor characteristics, traffic patterns, and the grouping of coordinated signals:

- Segment 1: 104th Avenue to 164th Avenue
- Segment 2: 164th Avenue to 192nd Avenue

The updated signal timing along the project corridor was implemented during the week of February 10, 2025. Before data was obtained from a full month of historical records, while after data was selected from the period of February 24 to March 23, 2025, representing one full month following implementation.

Ideally, the before period would have been based on data from the same month in the previous year. However, the second phase of the 1st Street Improvement Project (from 177th Avenue to 192nd Avenue) began in late May 2024. This construction actively caused significant traffic rerouting onto Mill Plain Boulevard East, causing noticeable shifts in travel patterns. 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 for the before period as 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 24 to March 23, 2025
- After (weekend): Saturdays from February 24 to March 23, 2025

For each travel time segment and direction, 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 savings shown in the table 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.

FULL PROJECT CORRIDOR

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

TABLE 2. AVERAGE TRAVEL TIME SAVING FOR FULL PROJECT CORRIDOR

ANALYSIS PERIOD	TIME PERIOD	TRAVEL TIME SAVINGS (SEC)	
		EASTBOUND (104TH AVE TO 192ND AVE)	WESTBOUND (192ND AVE TO 104TH AVE)
WEEKDAY	AM Peak: 7am to 9am	-20 (2.9%)	-48 (6.4%)
	MD Peak: 11am to 1pm	-20 (2.4%)	-81 (9.2%)
	PM Peak: 4pm to 6pm	-10 (1.1%)	-89 (9.2%)
	Daily (24-hour)	-8 (1.1%)	-36 (5.0%)
WEEKEND	WKN Peak: 11am to 1pm	-29 (3.7%)	-29 (3.4%)

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

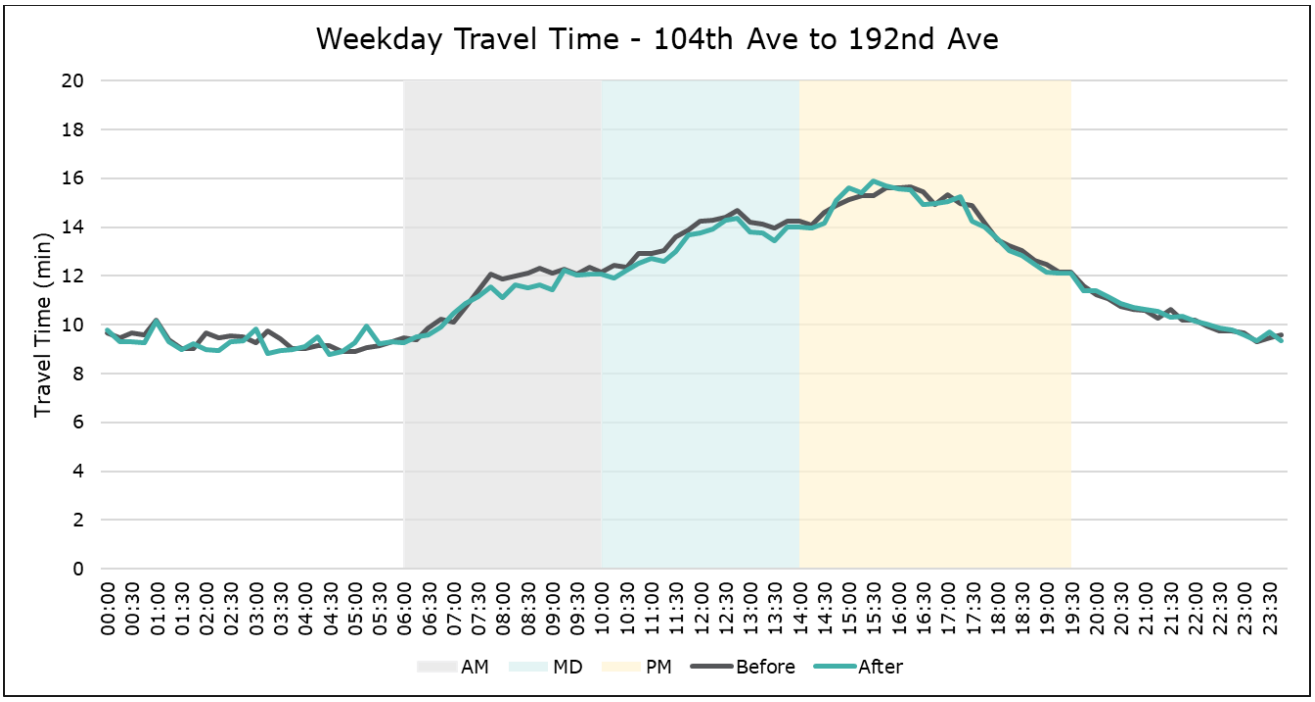

FIGURE 1. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (EASTBOUND, WEEKDAY)

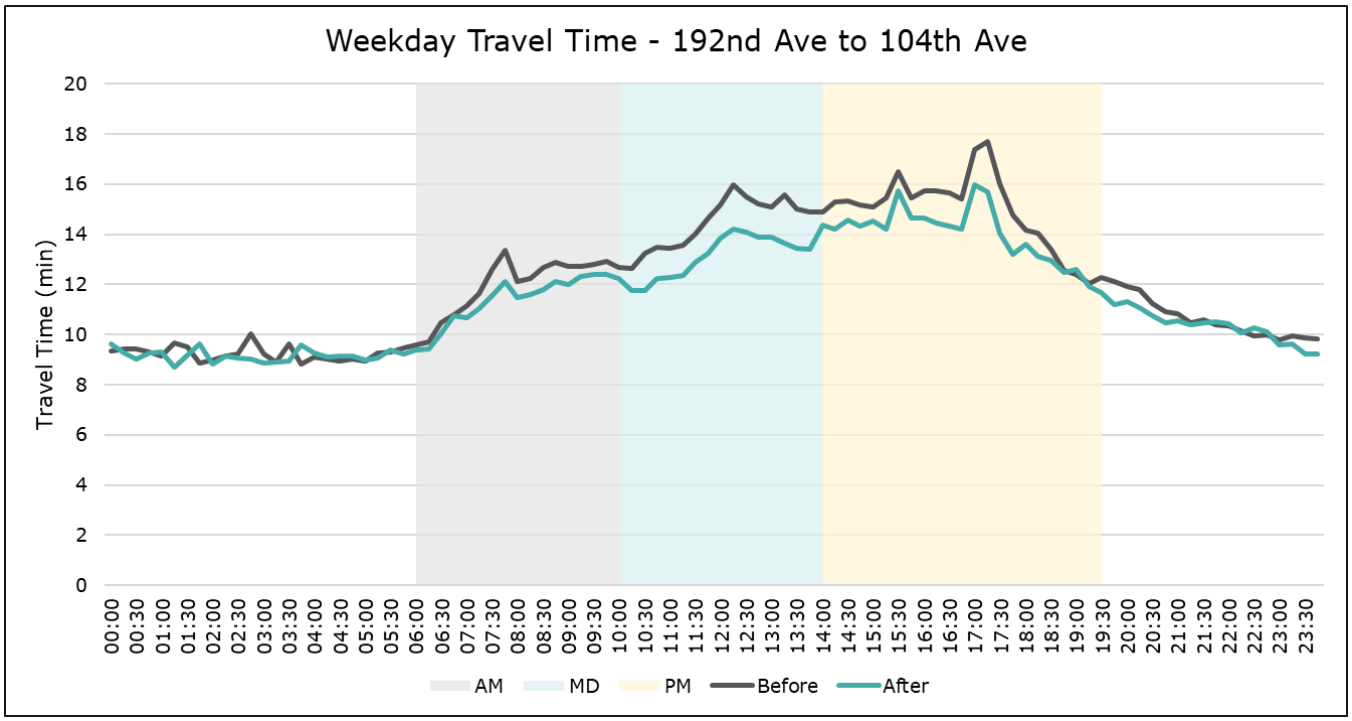

FIGURE 2. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (WESTBOUND, WEEKDAY)

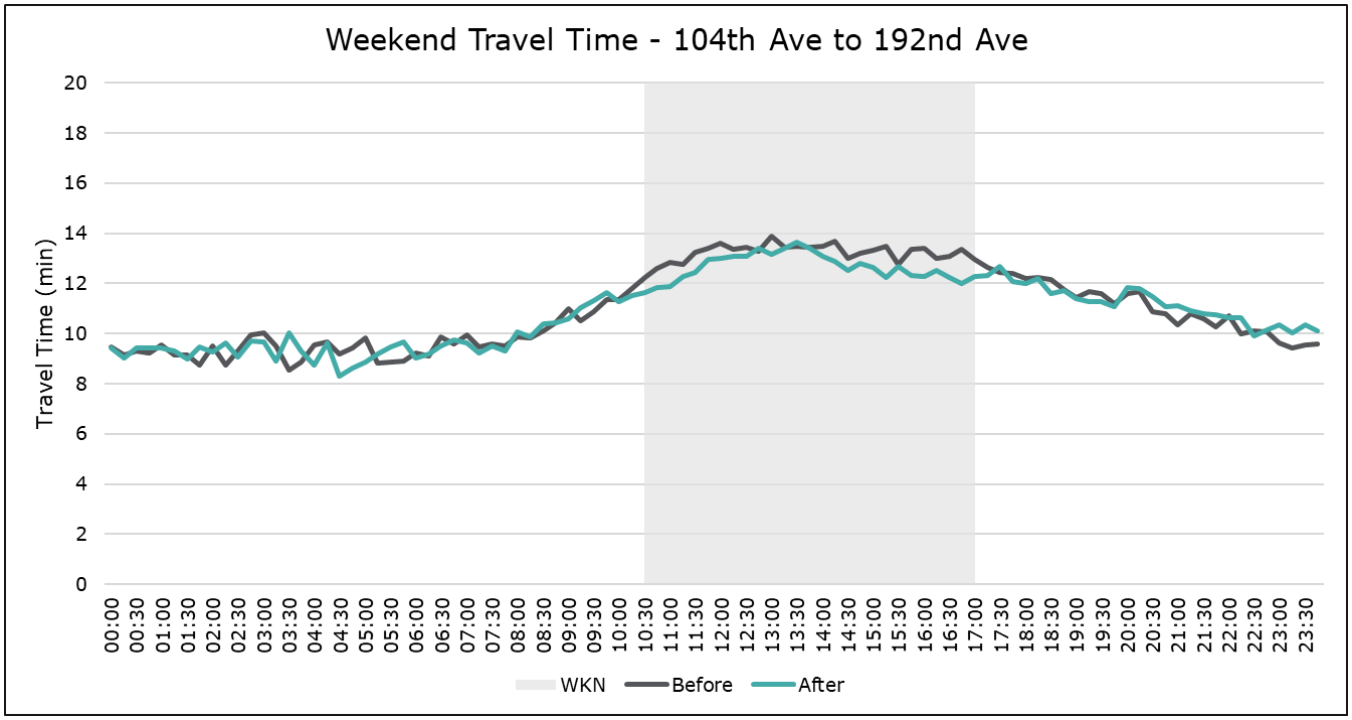

FIGURE 3. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (EASTBOUND, WEEKEND)

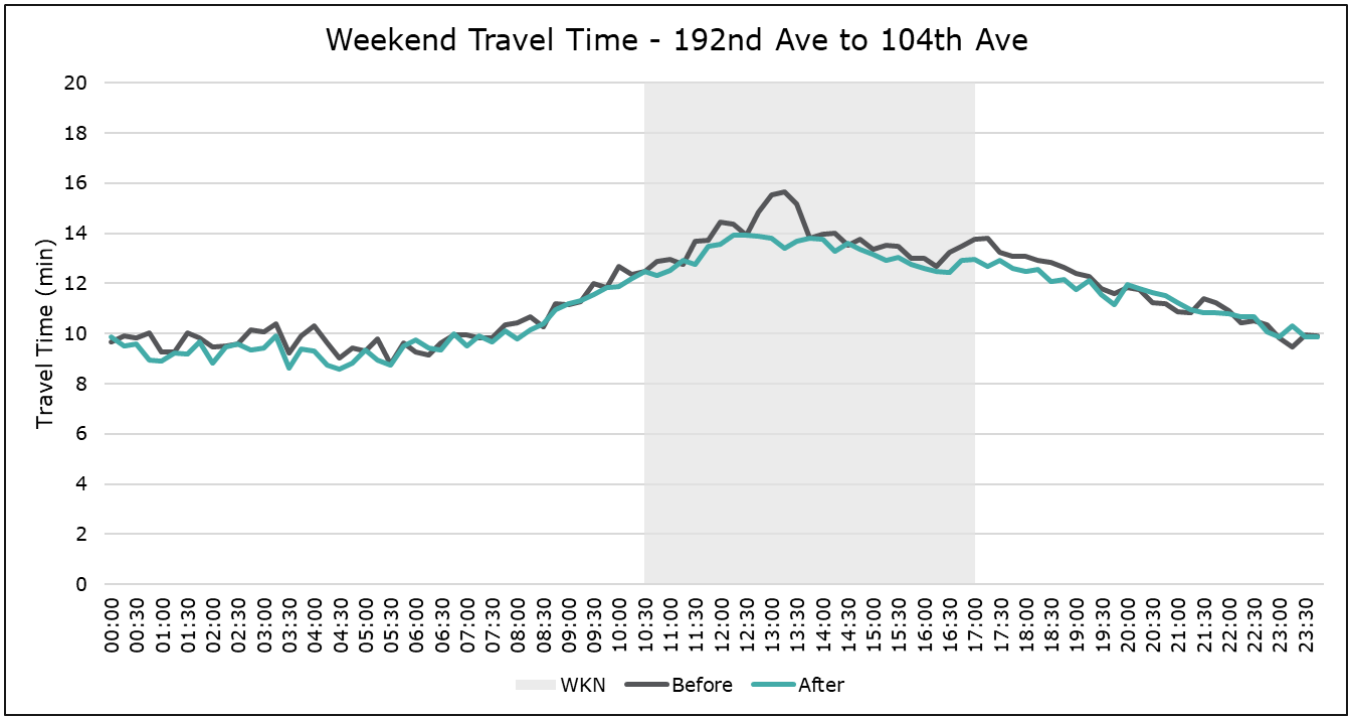

FIGURE 4. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (WESTBOUND, WEEKEND)

Overall, the optimized signal timing plans resulted in daily travel time savings across all analysis periods for the full project corridor between 104th Avenue and 192nd Avenue. 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 westbound direction.

For weekdays, westbound travel time improvements are greater than the eastbound direction as shown in both the figures and table. One of the primary objectives of this project was to improve traffic flow along the corridor. A common challenge in implementing coordinated signal timing is achieving a balance between both travel directions because optimizing offsets to favor one direction can often reduce performance in the opposite direction. In this case, the updated timing plan appears to favor westbound progression more strongly, but not significantly impacting eastbound flow.

The segmented results, discussed in the following sections, will further evaluate travel time savings along shorter portions of the project corridor to help identify specific factors contributing to the directional differences in performance. It should be noted that during the a.m. plan, intersections east of 164th Avenue operate in free mode, which explains the smaller improvements observed in that period compared to the midday and p.m. peaks for westbound.

For weekends, travel time reductions appear more consistent between both directions, showing around 3.5 percent of travel time savings during the weekend midday peak.

SEGMENT 1: 104TH AVENUE TO 164TH AVENUE

The purpose of Segment 1 is to evaluate the effectiveness of signal coordination within a single coordination section of the project corridor, between 104th Avenue and 164th Avenue, including the I-205 Ramps. Table 3 summarizes the average travel time savings for each direction and peak periods. To support the summary in Table 3, Figures 5 through 8 present the before and after travel times for this segment.

TABLE 3. AVERAGE TRAVEL TIME SAVING FOR SEGMENT 1

ANALYSIS PERIOD	TIME PERIOD	TRAVEL TIME SAVINGS (SEC)	
		EASTBOUND (104TH AVE TO 164TH AVE)	WESTBOUND (164TH AVE TO 104TH AVE)
WEEKDAY	AM Peak: 7am to 9am	-16 (3.3%)	-39 (7.7%)
	MD Peak: 11am to 1pm	-15 (2.6%)	-73 (12.1%)
	PM Peak: 4pm to 6pm	+20 (3.3%)	-58 (8.9%)
	Daily (24-hour)	-1 (0.3%)	-13 (5.3%)
WEEKEND	WKN Peak: 11am to 1pm	-29 (5.4%)	-26 (4.7%)

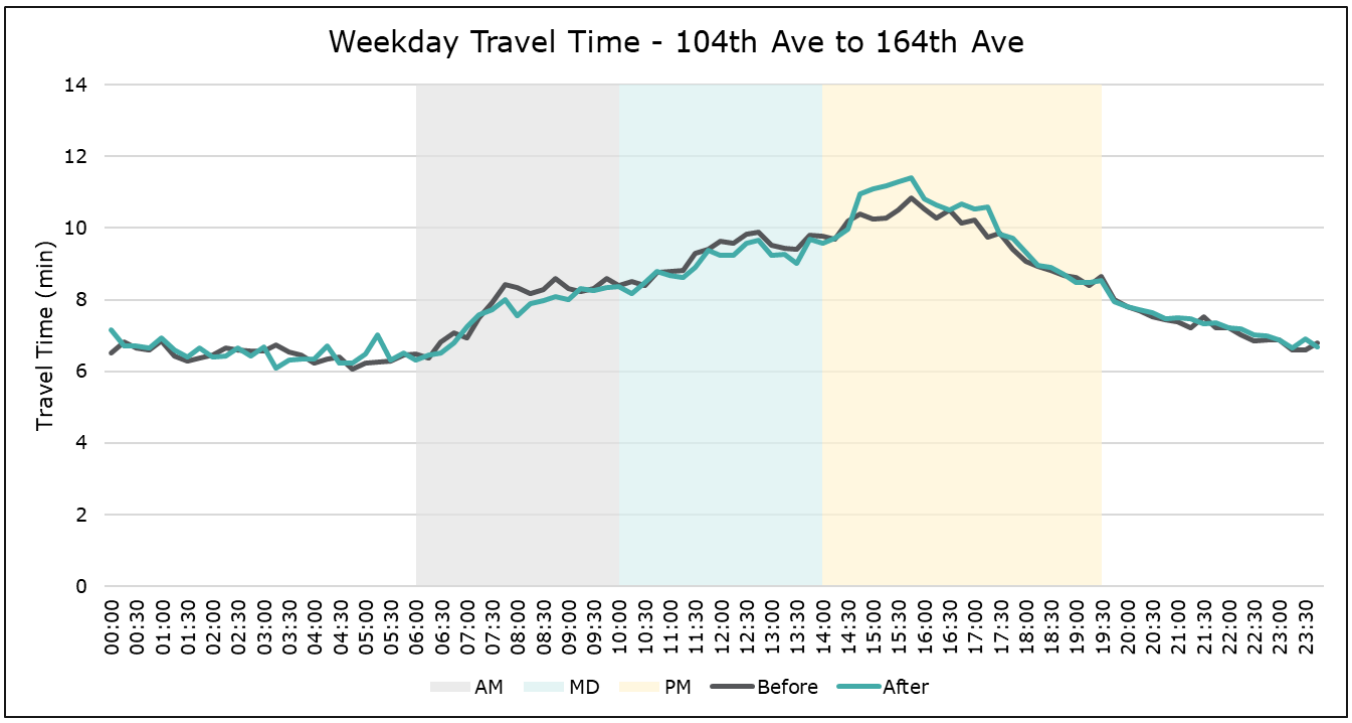

FIGURE 5. TRAVEL TIME COMPARISON FOR SEGMENT 1 (EASTBOUND, WEEKDAY)

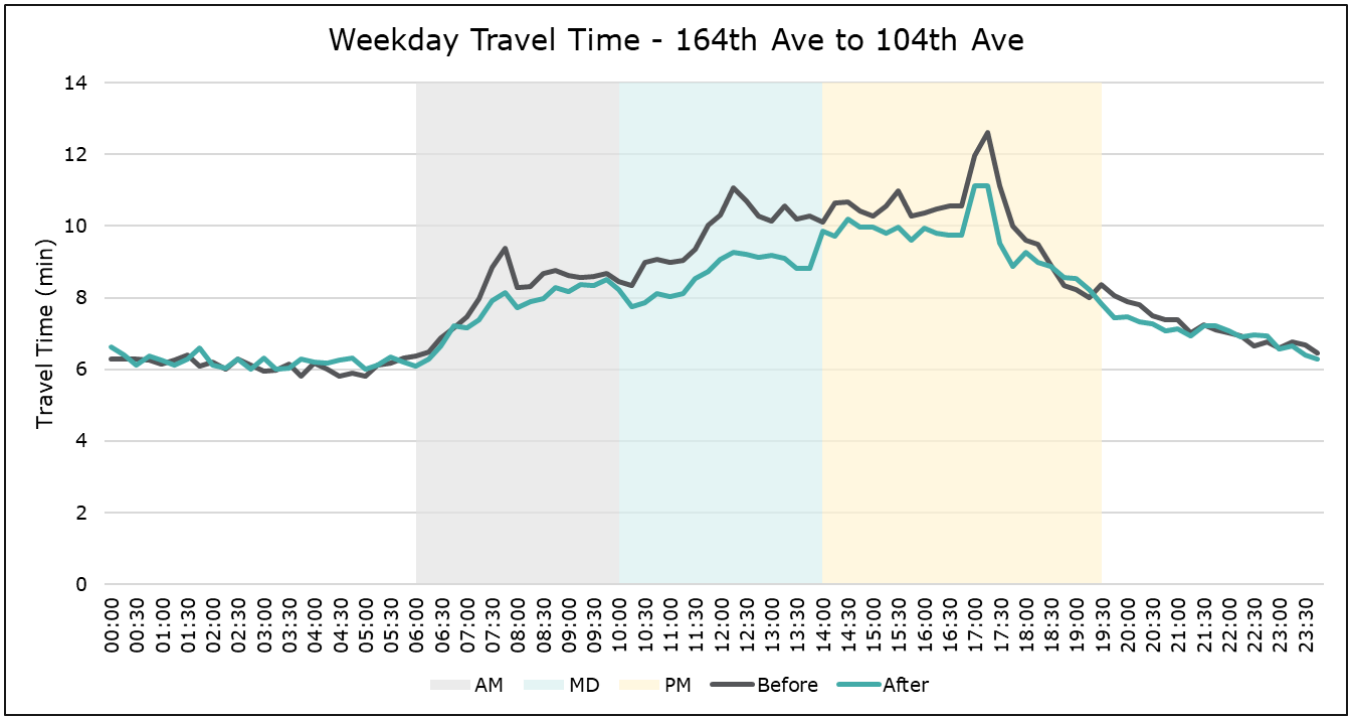

FIGURE 6. TRAVEL TIME COMPARISON FOR SEGMENT 1 (WESTBOUND, WEEKDAY)

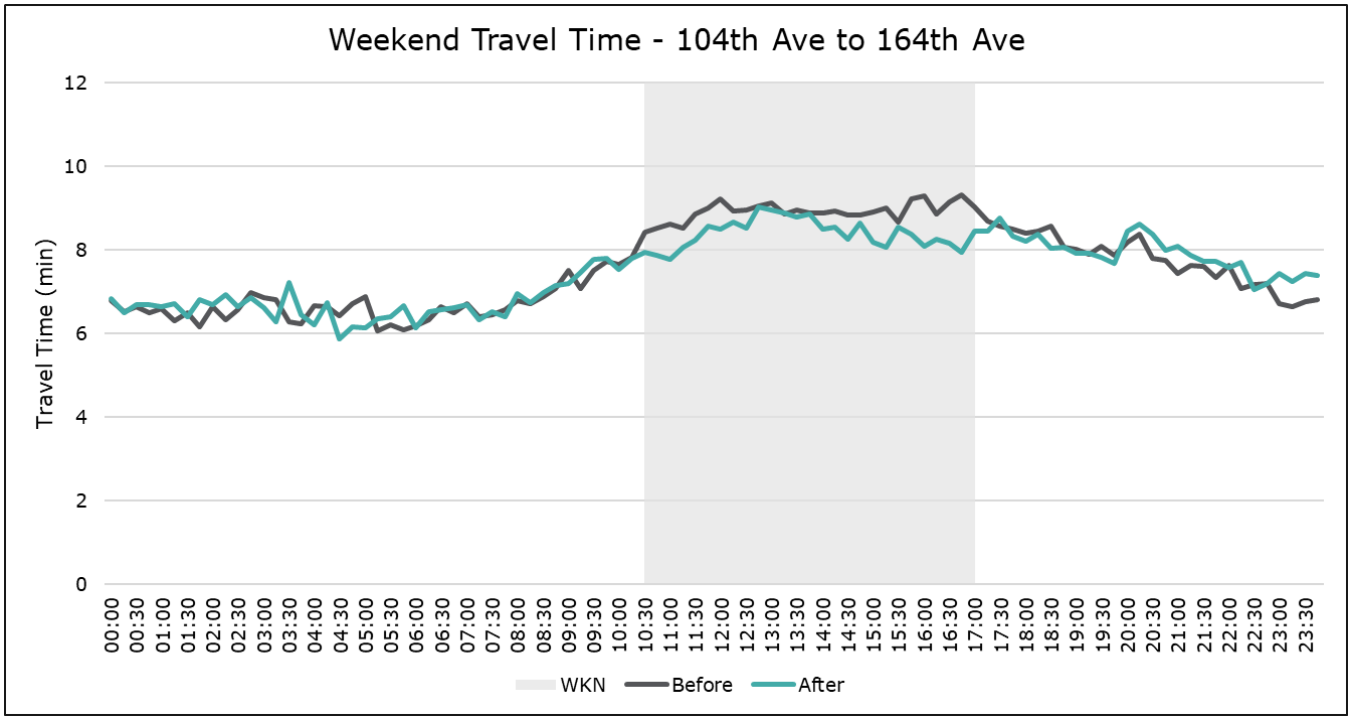

FIGURE 7. TRAVEL TIME COMPARISON FOR SEGMENT 1 (EASTBOUND, WEEKEND)

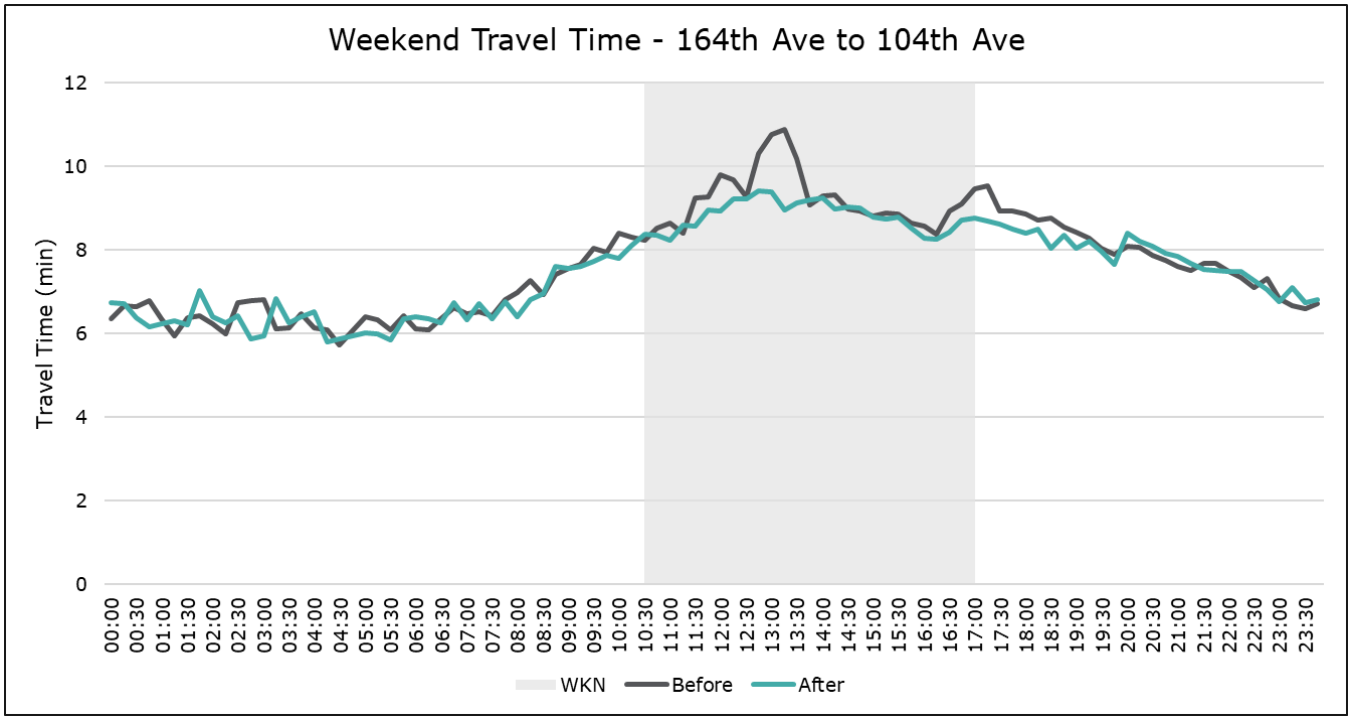

FIGURE 8. TRAVEL TIME COMPARISON FOR SEGMENT 1 (WESTBOUND, WEEKEND)

Segment 1 includes the portion of the corridor between 104th Avenue and 164th Avenue, where two additional intersections (previously operating in free mode at the eastern end) were added into the coordination plans. These added intersections were expected to enhance traffic progression along the corridor. However, their direct impact is difficult to identify due to the limited number of intersections and available data.

Overall, the travel time trends in Segment 1 across analysis periods are consistent with the full project corridor, generally showing slightly higher percentages of travel time savings. However, during the weekday p.m. peak period in the eastbound direction, travel times increased by approximately 3 percent, resulting in lower daily travel time savings for eastbound in this segment. The increase is believed to be the result of a tradeoff made to benefit ramp operations. During field fine-tuning, reduced queuing was observed on the I-205 Ramps approaches, indicating the optimized signal timing plan helps meet one of the key corridor objectives of minimizing queues on the ramps. As shown in Figure 9, travel times for the southbound left-turn movement at the I-205 Southbound Ramp reduced after implementation, supporting this observation.

Additionally, Segment 1 excludes the intersections east of 164th Avenue, which operated in free mode under the previous timing plans. That eastern section (Segment 2, discussed more in later section) likely experiences lower side street volumes in most analysis time periods, contributing less to overall savings and potentially reducing the average improvement for the full project corridor. Therefore, Segment 1 shows slightly higher travel time savings than the full project corridor in most analysis time periods.

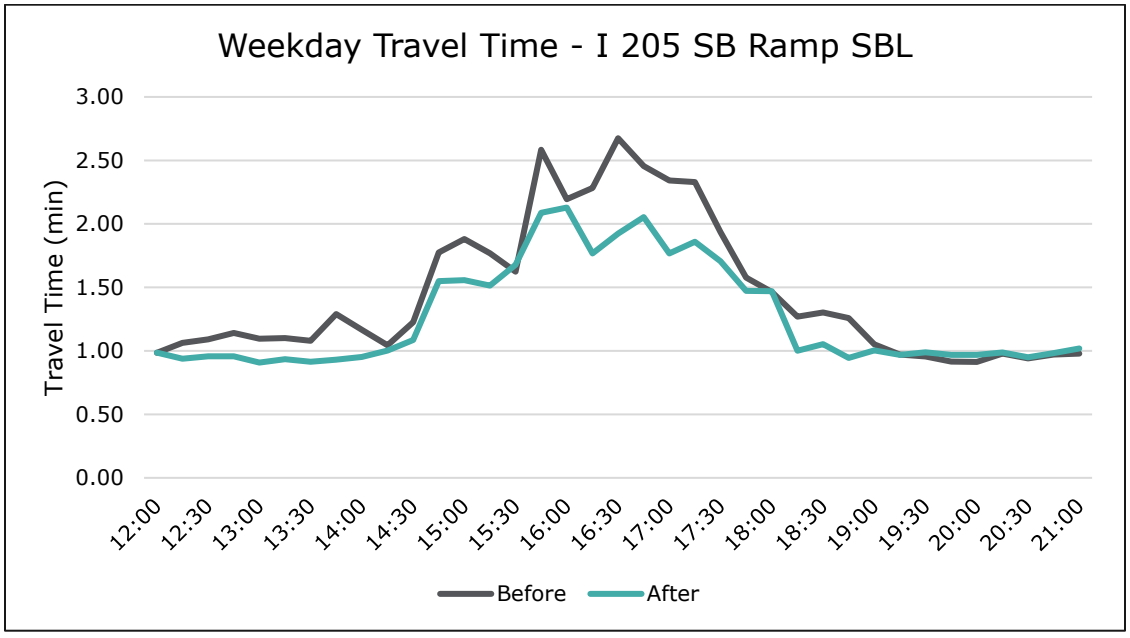

FIGURE 9. TRAVEL TIME COMPARISON FOR SOUTHBOUND LEFT-TURN AT I-205 SOUTHBOUND RAMP (WEEKDAY)

SEGMENT 2: 164TH AVENUE TO 192ND AVENUE

Segment 2 represents the remainder of the project corridor, excluding the intersections covered in Segment 1. As noted earlier, Segment 2 operates in free mode during the a.m. plan period and all other TOD periods are under coordinated signal timing plans. Table 4 provides a summary of the average travel time savings for each direction and peak periods. This summary is further illustrated in Figures 10 through 13, presenting the before and after travel time data for this segment.

TABLE 4. AVERAGE TRAVEL TIME SAVING FOR SEGMENT 2

ANALYSIS PERIOD	TIME PERIOD	TRAVEL TIME SAVINGS (SEC)	
		EASTBOUND (104TH AVE TO 164TH AVE)	WESTBOUND (164TH AVE TO 104TH AVE)
WEEKDAY	AM Peak: 7am to 9am	-4 (2.0%)	-9 (3.7%)
	MD Peak: 11am to 1pm	-5 (2.0%)	-8 (2.9%)
	PM Peak: 4pm to 6pm	-31 (10.1%)	-30 (10.0%)
	Daily (24-hr)	-9 (4.2%)	-24 (4.8%)
WEEKEND	WKN Peak: 11am to 1pm	-0.5 (0.2%)	-2 (0.7%)

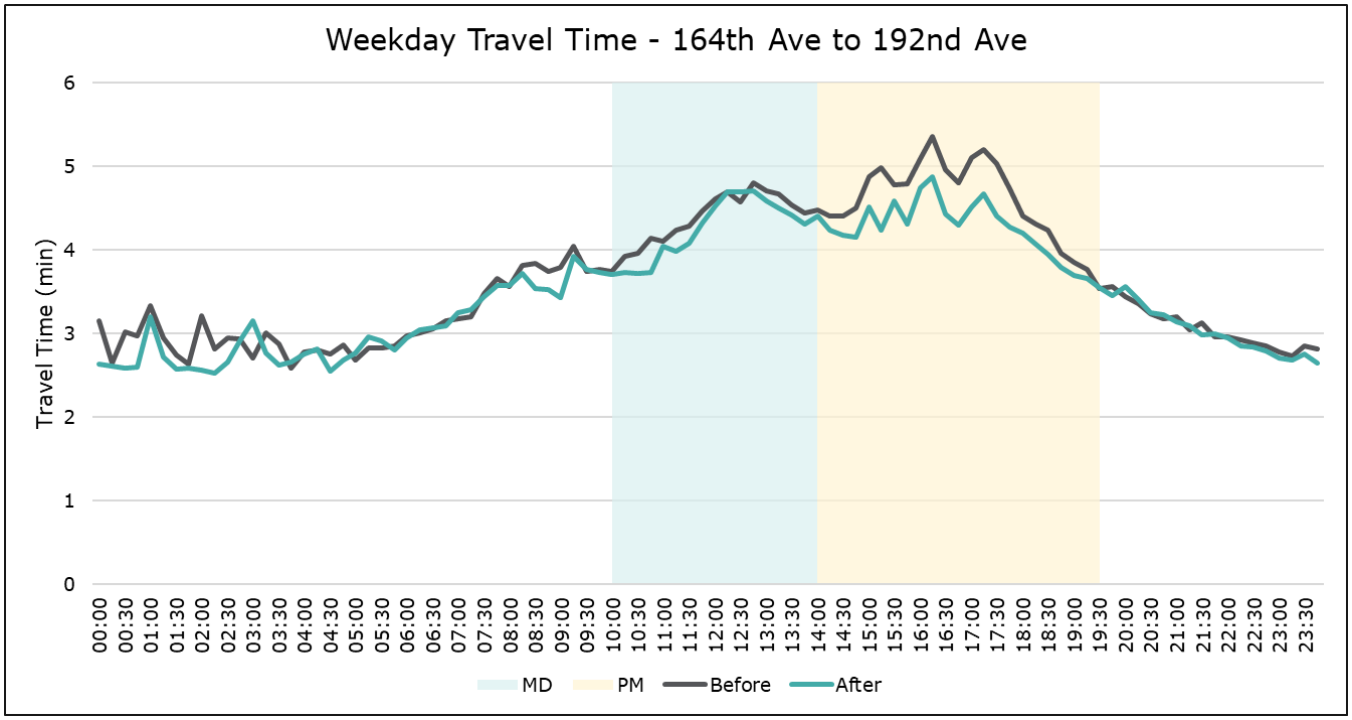

FIGURE 10. TRAVEL TIME COMPARISON FOR SEGMENT 2 (EASTBOUND, WEEKDAY)

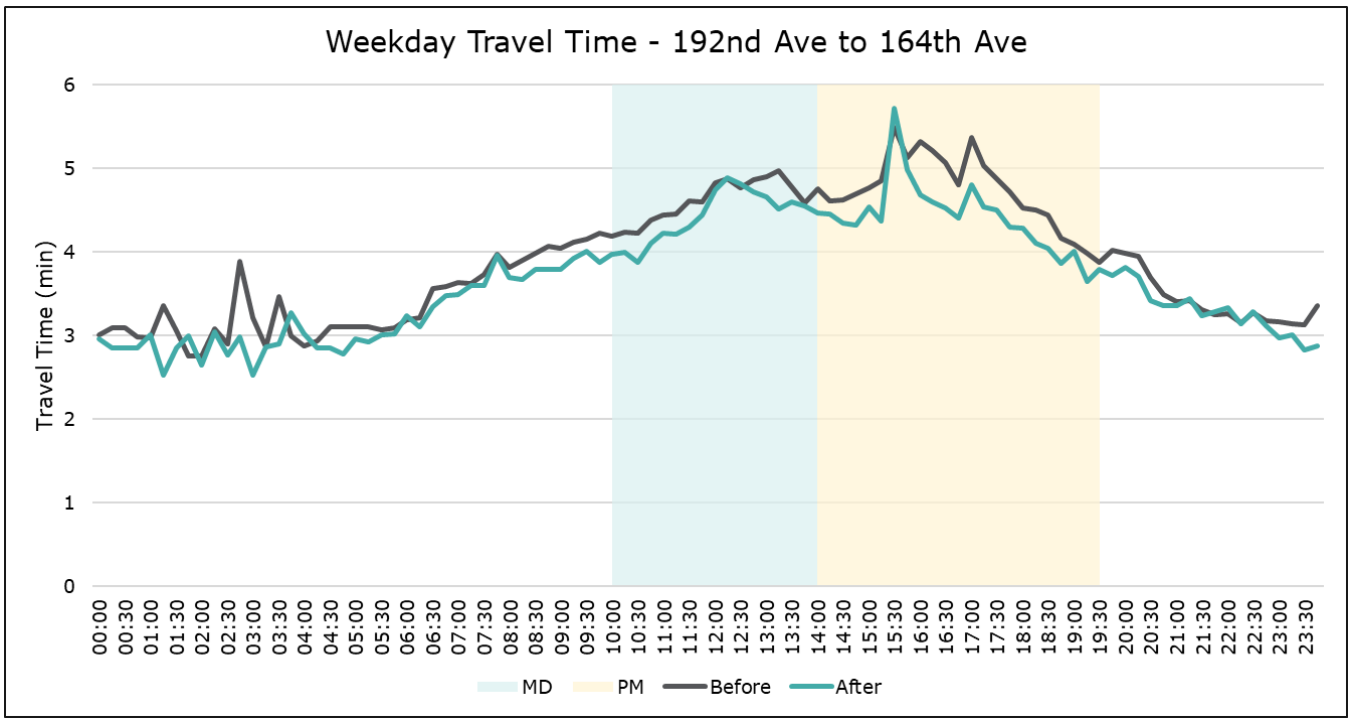

FIGURE 11. TRAVEL TIME COMPARISON FOR SEGMENT 2 (WESTBOUND, WEEKDAY)

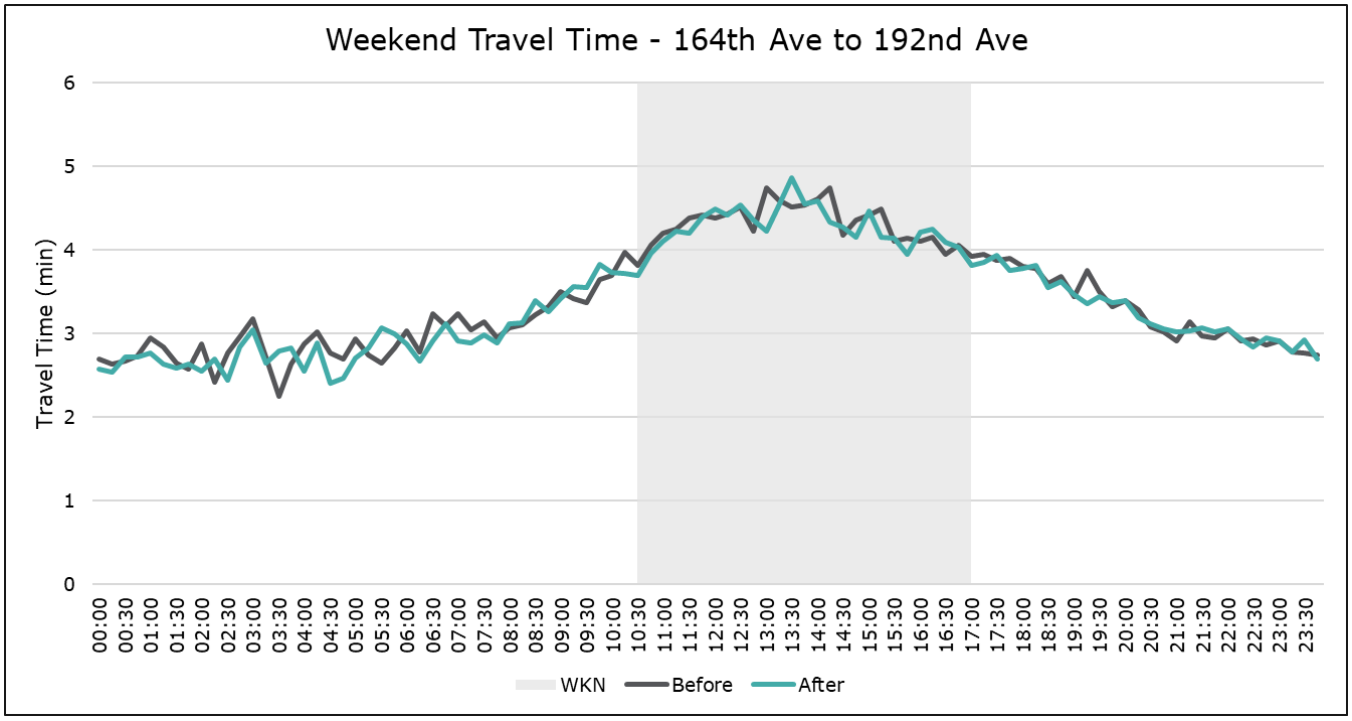

FIGURE 12. TRAVEL TIME COMPARISON FOR SEGMENT 2 (EASTBOUND, WEEKEND)

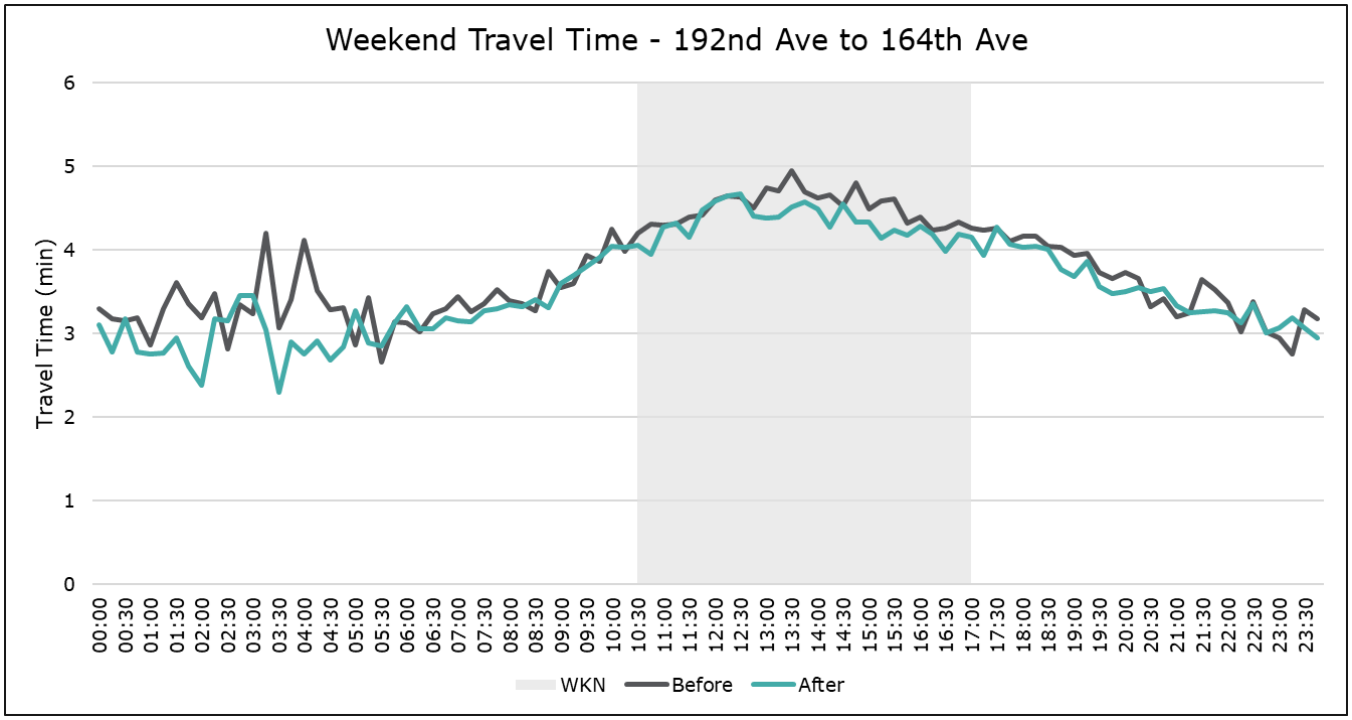

FIGURE 13. TRAVEL TIME COMPARISON FOR SEGMENT 2 (WESTBOUND, WEEKEND)

Segment 2 covers the eastern portion of the project corridor between 164th Avenue and 192nd Avenue. Overall, travel time trends in this segment are consistent with the full corridor, except for the weekday p.m. peak, where the improvements are more significant. Without the influence of the I-205 Ramps in this segment, the p.m. peak shows approximately 10 percent of travel time savings in both directions, highlighting the effectiveness of the coordination plan during the period with highest volume.

During the a.m. period, where the intersections operate in free mode, minor travel time reductions were still observed, suggesting that the optimized signal timing provided some benefit even without coordination. In the midday and weekend periods, travel time savings were also minimal. This is likely due to lower side street volumes, which allow more green time to be allocated to the mainline directions for relatively uninterrupted flow, performing similarly compared to signals in free mode.

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[1], as of 2024, approximately 4 percent of residential vehicles in Clark County were hybrids and 2 percent were electric. 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 5 shows the performance measures for the updated signal timing plans for the full project corridor, including 164th Avenue and 192nd Avenue.

TABLE 5. SYNCHRO PERFORMANCE MEASURES FOR THE FULL PROJECT CORRIDOR

CORRIDOR PERFORMANCE MEASURES	BEFORE				AFTER			
	AM	MD	PM	WKN	AM	MD	PM	WKN
TOTAL DELAY (HOURS)	205	285	361	303	202 (-1.5%)	281 (-1.4%)	360 (-0.3%)	310 (+2.3%)
TOTAL STOPS (STOPS)	22341	29768	34645	29799	19435 (-13.0%)	27064 (-9.1%)	31096 (-10.2%)	27121 (-9.0%)
FUEL CONSUMED (GAL)	674	872	1023	902	646 (-4.2%)	843 (-3.3%)	988 (-3.4%)	882 (-2.2%)
CO EMISSIONS (KG)	47.1	60.93	71.48	63.02	45.14 (-4.2%)	58.96 (-3.2%)	69.04 (-3.4%)	61.68 (-2.1%)
NO_x EMISSIONS (KG)	9.16	11.85	13.91	12.26	8.78 (-4.1%)	11.47 (-3.2%)	13.43 (-3.5%)	12 (-2.1%)

Overall, the updated timing plans resulted in reductions across most measures during the analysis periods:

- Total delay reduced slightly by 0.3 to 1.5 percent.

[1] https://data.wa.gov/

- Total stops reduced by up to 13 percent, suggesting improvement of progression and fewer interruptions.
- Fuel consumption, CO emissions, and NO_X emissions were reduced by 3 to 4 percent.

The reductions indicated that the updated plans improve corridor efficiency by providing smoother flow and reducing vehicle idling during the peak periods. However, a slight increase of 2.3 percent in the weekend 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 reductions in total stops, 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 Mill Plain east 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 $184,299, while the fuel consumption savings in dollars is $380,322, resulting in a combined annual benefit of $564,621, with an estimated three-year total of $1,693,863 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,

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

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. 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.

[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

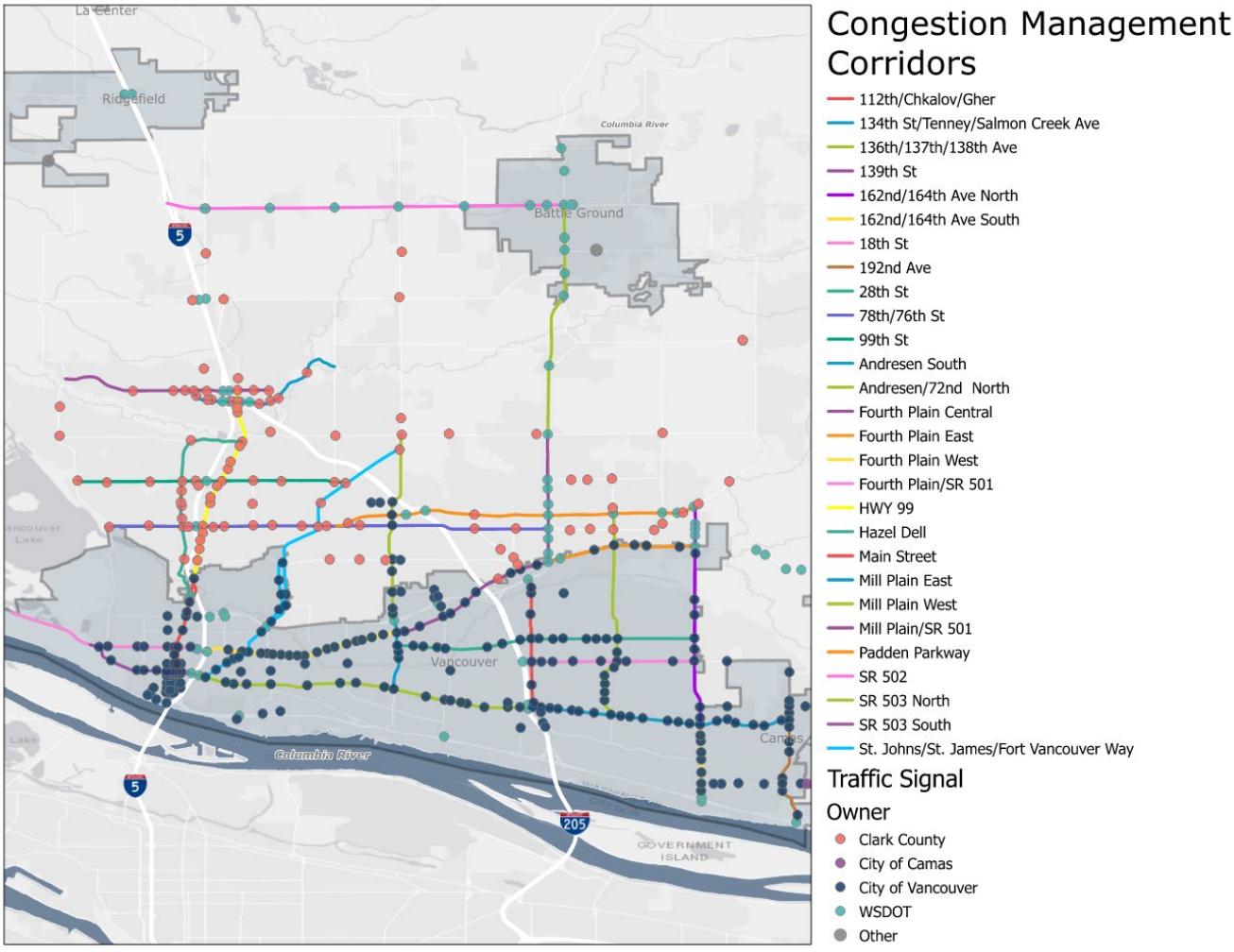

Table 1 lists the 28 CMP corridors identified for prioritization by the VAST/TSMO Steering Committee. The corridors are arranged in alphabetical order.

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 - FINAL

DATE: October 23, 2024

TO: Judith Perez Keniston | RTC

FROM: Eileen Chai, EIT; Ilana Burstein, P.E.; Pam O'Brien, P.E., PTOE | DKS Associates

SUBJECT: SWRTC Regional Signal Timing Plans
Mill Plain Boulevard East Existing Conditions

Project #24070-000

This memorandum highlights the existing conditions, the data used, and traffic operation observations along Corridor 2: Mill Plain Boulevard East from 104th Avenue to 192nd Avenue, including 23 study intersections.

EXISTING CONDITIONS

The traffic signals along Mill Plain Boulevard (excluding the I-205 ramps) are owned and operated by City of Vancouver (City). The traffic signals at the I-205 northbound ramps and I-205 southbound ramps are owned and operated by the Washington Department of Transportation (WSDOT). Traffic signals owned by the City use Q-Free MaxTime local software and are connected to the City's MaxView central system via their communications network. The I-205 ramps, owned by WSDOT, use Trafficware local software and are connected to the WSDOT ATMS.now central system.

Of the 23 study intersections, eight operate in free mode, with the rest operating in coordination mode. Figure 1 to Figure 3 below summarize the timing plans according to the weekday and weekend Time of Day (TOD) schedule.

DATA

Historical Turning Movement Counts (TMCs) collected in 2021 and 2023 were provided by Parametrix and local agencies for five study intersections. 2024 TMCs were collected for the remaining study intersections. Signal as-build, phasing plans and signal timings were provided by City and WSDOT. Special signal strategies, such as Leading Pedestrian Interval (LPI), Transit Signal Priority (TSP), and queue jumps, are implemented at intersections along the study corridor. Table 1 lists the intersections where these strategies are applied.

FIGURE 1. MILL PLAIN BOULEVARD EAST WEEKDAY TIMING PLAN SCHEDULE

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	19:30	20:00	20:30	21:00	21:30	23:59
SE 104th Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
I-205 SB Ramps	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
I-205 NB Ramps	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE Chkalov Dr	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 117th Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 120th Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 123rd Ave/SE 124th Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 126th Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 131st Ave /SE Park Plaza Dr	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 136th Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 139th Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE Olympia Dr	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE Hearthwood Blvd/SE Park Crest Ave	F	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	1	1	1	1	F	F
SE 155th Ave	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	F	F	F	F	F
SE 160th Ave	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	F	F	F	F	F
SE 164th Ave	F	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	F	F	F	F	F
SE 168th Ave	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	F	F	F	F	F
SE 172nd Ave /Tech Center Dr	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	F	F	F	F	F
SE 177th Ave	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	F	F	F	F	F
SE 180th Ave	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	F	F	F	F	F
SE 184th Ave	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	F	F	F	F	F
SE 190th Ave	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	F	F	F	F	F
SE 192nd Ave	F	F	8	8	F	F	F	F	F/9	9	9	9	9	9	9	9	9	9/F	F	10	10/F	F	10	10	10	10	9	9	9	9	9	9	F	F
	Free	AM Plan								MD Plan									PM Plan										Off-Peak Plan				Free	

Plan 1 = 110 sec Plan 2 = 110 sec Plan 3 = 120 sec Plan 4 = 120 sec Plan 5 = 120 sec Plan 6 = 120 sec Plan 7 = 120 sec Plan 8 = 100 sec Plan 9 = 100 sec Plan 10 = 100 sec

FIGURE 2. MILL PLAIN BOULEVARD EAST SATURDAY TIMING PLAN SCHEDULE

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	19:30	20:00	20:30	21:00	21:30	23:59
SE 104th Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
I-205 SB Ramps	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
I-205 NB Ramps	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE Chkalov Dr	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 117th Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 120th Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 123rd Ave/SE 124th Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 126th Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 131st Ave /SE Park Plaza Dr	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 136th Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 139th Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE Olympia Dr	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE Hearthwood Blvd/SE Park Crest Ave	F	F	F	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	F	F	F	F	F
SE 155th Ave	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	F	F	F	F	F
SE 160th Ave	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	F	F	F	F	F
SE 164th Ave	F	F	F	F	F	F	F	F	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	F	F	F	F	F	F	F
SE 168th Ave	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	F	F	F	F	F
SE 172nd Ave /Tech Center Dr	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	F	F	F	F	F
SE 177th Ave	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	F	F	F	F	F
SE 180th Ave	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	F	F	F	F	F
SE 184th Ave	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	F	F	F	F	F
SE 190th Ave	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	F	F	F	F	F
SE 192nd Ave	F	F	F	F	F	F	F	F	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	F	F	F
	Free			Off-Peak Plan							Saturday Plan													Off-Peak Plan						Free					

Plan 1 = 110 sec Plan 3 = 120 sec Plan 7 = 120 sec Plan 9 = 100 sec

FIGURE 3. MILL PLAIN BOULEVARD EAST SUNDAY TIMING PLAN SCHEDULE

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	19:30	20:00	20:30	21:00	21:30	23:59
SE 104th Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
I-205 SB Ramps	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
I-205 NB Ramps	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE Chkalov Dr	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 117th Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 120th Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 123rd Ave/SE 124th Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 126th Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 131st Ave /SE Park Plaza Dr	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 136th Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 139th Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE Olympia Dr	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE Hearthwood Blvd/SE Park Crest Ave	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	F	F	F	F	F	F	F
SE 155th Ave	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	F	F	F	F	F
SE 160th Ave	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	F	F	F	F	F
SE 164th Ave	F	F	F	F	F	F	F	F	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	F	F	F	F	F	F	F
SE 168th Ave	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	F	F	F	F	F
SE 172nd Ave /Tech Center Dr	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	F	F	F	F	F
SE 177th Ave	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	F	F	F	F	F
SE 180th Ave	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	F	F	F	F	F
SE 184th Ave	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	F	F	F	F	F
SE 190th Ave	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	F	F	F	F	F
SE 192nd Ave	F	F	F	F	F	F	F	F	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	F	F	F
	Free					Sunday Plan																Off-Peak Plan						Free						

Plan 1 = 110 sec Plan 2 = 110 sec Plan 7 = 120 sec Plan 9 = 100 sec

TABLE 1. SPECIAL SIGNAL OPERATION STRATEGIES

CROSS STREET	LPI (PHASE)	LPI DURATION	TSP (PHASE)	OTHERS
SE 104TH AVE			2,6	
SE CHKALOV DR	2,4,6,8	5 seconds	2,6	
SE 117TH AVE	4,8	5 seconds	2,6	
SE 120TH AVE			2,6	
SE 123RD AVE			2,6	
SE 126TH AVE	4,8	5 seconds	2,6	
SE 131ST AVE	4,8	5 seconds	2,6	
SE 136TH AVE	2	5 seconds		Queue Jump (EB)
SE 139TH AVE			2,6	
SE OLYMPIA DR			2,6	
SE HEARTHWOOD BLVD			2,6	
SE 155TH AVE	4,8	4 seconds	2,6*	
SE 160TH AVE	4,8	5 seconds	2,6*	
SE 164TH AVE			2,6	Left-turn phase reservice (NB and SB)
SE 168TH AVE	4,8	5 seconds	2,6*	
SE 172ND AVE			2,6*	
SE 177TH AVE			2,6*	
SE 180TH AVE			2,6*	
SE 184TH AVE			2,8*	

*TSP Parameters programmed, but signal does not operate in coordination – assume TSP not operational in field.

OBSERVED TRAFFIC ISSUES

DKS conducted field observations of traffic conditions along the Mill Plain Boulevard East study corridor in July of 2024, during weekday peak periods. It should be noted that the intersection of Mill Plain Boulevard and SE 104th Avenue was added to the study scope after the field observation period, therefore, information was based on feedback from the local agencies.

The following sections summarize the observed issues. 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.

The following section summarizes the notable observed characteristics of each intersection and input from the City.

MILL PLAIN BOULEVARD & SE 104TH AVENUE

- According to the City, the intersection experiences heavy southbound left-turn traffic.

MILL PLAIN BOULEVARD & I-205 SB RAMPS

- This intersection is coordinated under an east-west coordination plan.
- During the AM peak, the intersection experiences minimal congestion eastbound and westbound. The southbound exit ramp sees a moderate buildup of 10 to 15 vehicles, which typically clears within the cycle.
- Slight congestion is present during the midday peak, especially for eastbound traffic where queues are formed while the southbound signal is active. Westbound traffic experiences a stop-and-go pattern. The southbound exit ramp queues are manageable and typically clears within the cycle.
- During the PM peak, eastbound traffic experiences heavy congestion as queues spilling back from I-205 NB ramps. Westbound continues to function without significant issues. The southbound exit ramp sees similar congestion level as the AM peak with 10 to 15 vehicles and manages to clear during the green phase.

MILL PLAIN BOULEVARD & I-205 NB RAMPS

- This intersection is coordinated under an east-west coordination plan.
- During the AM peak, eastbound left-turn queues remain within the storage length but do not fully clear within the available green time. Westbound is congested, forming minor spillbacks. The northbound exit ramp forms a manageable queue of approximately eight to 10 vehicles, which clears within the cycle.
- During the midday peak, eastbound traffic and northbound exit ramp traffic experience some congestion but can clear within the cycle. Westbound is congested and causes spillback when the upstream signal (SE Chkalov Dr) turns green. Adjusting the coordination offset could potentially improve performance.
- During the PM peak, eastbound-through traffic sees heavy congestion and is unable to proceed during green indication due to queues spilling back from the downstream intersection (SE

Chkalov Dr). Additionally, the right-most through lane is not fully utilized, as drivers might prefer the left-most-through lane for future left-turn movements. Westbound remains congested but no significant spillback is observed. The northbound exit ramp forms a queue of approximately 10 to 15 vehicles and is unable to fully clear the right-turn traffic due to spillback from the downstream intersection (SE Chkalov Dr).

MILL PLAIN BOULEVARD & SE CHKALOV DRIVE

- This intersection is coordinated under an east-west coordination plan.
- The intersection experiences minimal congestion during the AM peak, with the northbound left-turn queue accumulating approximately six to eight vehicles, but is able to clear within the cycle.
- During the midday peak, eastbound traffic sees moderate congestion, with queues almost spilling back to the upstream intersection (I-205 NB Ramps). Westbound experiences significant congestion due to queue spillback from the downstream intersection (I-205 NB Ramps), particularly for vehicles merging into I-205, which then causes westbound queues to spill back to the upstream intersection (SE 117th Ave).
- During the PM peak, eastbound traffic becomes heavily congested, with the left-most through lane spilling back significantly, impacting the upstream intersection (I-205 NB Ramps). It should be noted that the eastbound right-most through lane is not utilized. Westbound is also congested, affecting the upstream intersection (SE 117th Ave). Additionally, while northbound and southbound through movements can clear within the cycle, left-turn traffic does not fully clear.

MILL PLAIN BOULEVARD & SE 117TH AVENUE

- This intersection is coordinated under an east-west coordination plan.
- Northbound and southbound experience minimal congestion during all observation peak periods.
- Eastbound queueing occurs during the AM peak while waiting for the side street phases, but these queues clear quickly. During the midday peak and PM peak, eastbound traffic is not congested.
- Westbound experiences heavy congestion across all peak periods. In the AM peak, queues nearly spill back to the upstream intersection (SE 120th Avenue). During the midday peak, spillback occurs from the downstream intersection, mainly in the right-most through lane, which provides access to the I-205 ramps. By the PM peak, westbound congestion worsens, affecting not only the right-most through lane but also the middle lane, while the left-most through lane remains underutilized.

MILL PLAIN BOULEVARD & SE 120TH AVENUE

- This intersection is coordinated under an east-west coordination plan.
- Northbound, southbound, and eastbound experience minimal congestion during all observation peak periods.
- Westbound experiences minimal congestion during the AM peak. In the midday peak, the westbound platoon from the upstream intersection builds up and encounters a stop-and go

pattern. During the PM peak, the westbound platoon arrives, causing the right-most through lane spillback to the upstream intersection (SE 124th Avenue/123rd Avenue), primarily due to vehicles accessing I-205.

MILL PLAIN BOULEVARD & SE 123RD AVENUE/124TH AVENUE

- This intersection is coordinated under an east-west coordination plan.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 126TH AVENUE

- This intersection is coordinated under an east-west coordination plan.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 131ST AVENUE/PARK PLAZA DRIVE

- This intersection is coordinated under an east-west coordination plan.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 136TH AVENUE

- This intersection is coordinated under an east-west coordination plan.
- The intersection has minimal congestion during all observation periods.

MILL PLAIN BOULEVARD & SE 139TH AVENUE

- This intersection is coordinated under an east-west coordination plan.
- The intersection has minimal congestion during all observation peak periods.
- The intersection is a T-intersection, with a future north leg.

MILL PLAIN BOULEVARD & SE OLPYMPIA DRIVE

- This intersection is coordinated under an east-west coordination plan.
- Eastbound and westbound accumulate some queues while waiting for the side street phases during the PM peak period but clear quickly. Overall, the intersection has minimal congestion during all observation peak periods.
- During the PM peak period, the eastbound platoon arrives at the end of the red indication, resulting in a short queue that clears within the cycle. Westbound experiences a similar pattern.

MILL PLAIN BOULEVARD & SE HEARTHWOOD BOULEVARD/SE PARK CREST AVENUE

- This intersection is coordinated under an east-west coordination plan.
- Westbound accumulates some queues while waiting for side street phases during the PM peak period but clear quickly. Overall, the intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 155TH AVENUE

- This intersection operates free at all peak periods.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 160TH AVENUE

- This intersection operates free at all peak periods.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 164TH AVENUE

- This intersection is coordinated under a north-south coordination plan.
- During the AM peak, the northbound left-turn movement experiences some congestion and does not fully clear within the cycle; more time may be needed.
- During the midday peak, the eastbound and westbound movements accumulate some queues while waiting for the main street phases but clear quickly.
- During the PM peak, the northbound and westbound movements accumulate some queues while waiting for other phases and clear quickly. Eastbound movements experience heavy congestion and the queues nearly spill back to the upstream intersection.

MILL PLAIN BOULEVARD & SE 168TH AVENUE

- This intersection operates free at all peak periods.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 172ND AVENUE/TECH CENTER DRIVE

- This intersection operates free at peak times.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 177TH AVENUE

- This intersection operates free at all peak periods.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 180TH AVENUE

- This intersection operates free at all peak periods.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 184TH AVENUE

- This intersection operates free at all peak periods.
- The intersection has minimal congestion during all observation peak periods.

MILL PLAIN BOULEVARD & SE 190TH AVENUE

- This intersection operates free at all peak periods.
- The intersection has minimal congestion during the AM peak period.
- During the midday peak, the eastbound left-most lane cannot move forward due to spillback from the left-turn queue at the downstream intersection (SE 192nd Avenue).
- During the PM peak, eastbound left-turn traffic (access to shopping area) is heavy but does not cause spillback.

MILL PLAIN BOULEVARD & SE 192ND AVENUE

- This intersection is coordinated under a north-south coordination plan.
- The intersection has minimal congestion during the AM peak period.
- During the midday peak, the eastbound left-turn experiences heavy congestion, with the queue unable to fully clear within a cycle, leading queues to spillback to the upstream intersection (SE 190th Avenue).
- During the PM peak, the eastbound left-turn also sees heavy congestion, with the queue nearly spilling back to upstream intersection (SE 190th Avenue).
- The City changed the detection at the intersection (as of July 2024) and is running free for the foreseeable future due to the construction closure on 1st Street.

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

- SE 104th Avenue north of Mill Plain Boulevard includes significant retail establishment (i.e., Walmart), along with lodging and service businesses (e.g., gas station, restaurants, etc.). This development generates substantial southbound traffic, especially for southbound-left movements accessing the I-205 ramps.
- The segment from I-205 SB ramps to SE Chkalov Drive experiences congestion, with Mill Plain Boulevard and SE Chkalov Drive acting as a bottleneck. There have been complaints about congestion for northbound left-turn movements at SE Chkalov Drive. The City suggests testing free operation at Chkalov Drive to accommodate the heavy eastbound and westbound traffic. Additionally, an update to the lane configurations between SE Chkalov Drive and the I-205 ramps is anticipated in the near future.
- SE 136th Avenue eastbound includes a queue jump phase to accommodate BRT buses, which can be activated at the beginning, end, or both parts of the phase, depending on bus arrival times. This queue jump operation has resulted in compliance issues (bus drivers not waiting for the signal). The variability in the queue jump phase timing can also affect signal progression and disrupt the flow of traffic in coordination settings.
- The City recommends not coordinating the HAWK signal at SE 157th Avenue to prevent unsafe crossing decisions by pedestrians not wanting to wait for the cycle or running towards the bus stop.
- The section along 1st Street between SE 177th Avenue and SE 192nd Avenue is under construction, with traffic diverted to Mill Plain Boulevard. This diversion has led to unusual traffic

patterns, prompting the City to operate Mill Plain Boulevard and SE 192nd Avenue in free mode. However, this should not affect the analysis of this study.

- The City advises keeping cycle lengths as short as possible to minimize delays and reduce driver distraction.