

MWSH Boone Road Master Plan

Traffic Impact Analysis
Salem, Oregon

Date:

March 16, 2022

Prepared by:

Tegan Enloe, PE



CHAPTER 1: INTRODUCTION AND SUMMARY

MWSH Boone Road Property, LLC, is proposing to build a master planned area with a combination of housing, storage, and light industrial business park uses located adjacent to 36th Ave SE in Salem, Oregon. The development would be built in two phases described as follows:

Phase 2 (this submittal):

- 210 units of Multi-Family Mid-Rise (ITE Code 210)
- 62 units of Multi-Family Low-Rise (ITE Code 220)
- 75,000 SQFT of Business Park (ITE Code 770)
- 115,000 SQFT of Industrial Park (ITE Code 130)
- 60,000 SQFT of Mini Warehouse (ITE Code 151)

Phase 3 (future work):

- To be determined amount of Senior Adult Housing Attached (ITE Code 252)
- To be determined amount of General Light Industrial (ITE Code 110)

These will be added to the previously approved Phase 1 work of 210 units of Multi-Family Mid-Rise approved by the City under CU-SPR-ADJ-DAP-DR21-02.

The purpose of this Transportation Impact Analysis (TIA) is to evaluate possible system impacts from the proposed development and, where necessary, recommend mitigation measures on the nearby transportation network. The impact analysis is focused on intersections identified as being in the study area based on City standards and shown in **Figure 1**. These intersections include:

- 1 I-5 SB Ramps/ Kuebler Blvd
- 2 I-5 NB Ramps/ Kuebler Blvd
- 3 Kuebler Blvd/ 36th Ave SE
- 4 32nd Ave SE/ Boone Rd SE (future connection)
- 5 36th Ave SE/ Boone Rd SE
- 6 32nd Ave SE/ Street "A" (future connection)
- 7 32nd Ave SE/ 36th Ave SE (future connection)
- 8 36th Ave SE/Kashmir Way SE

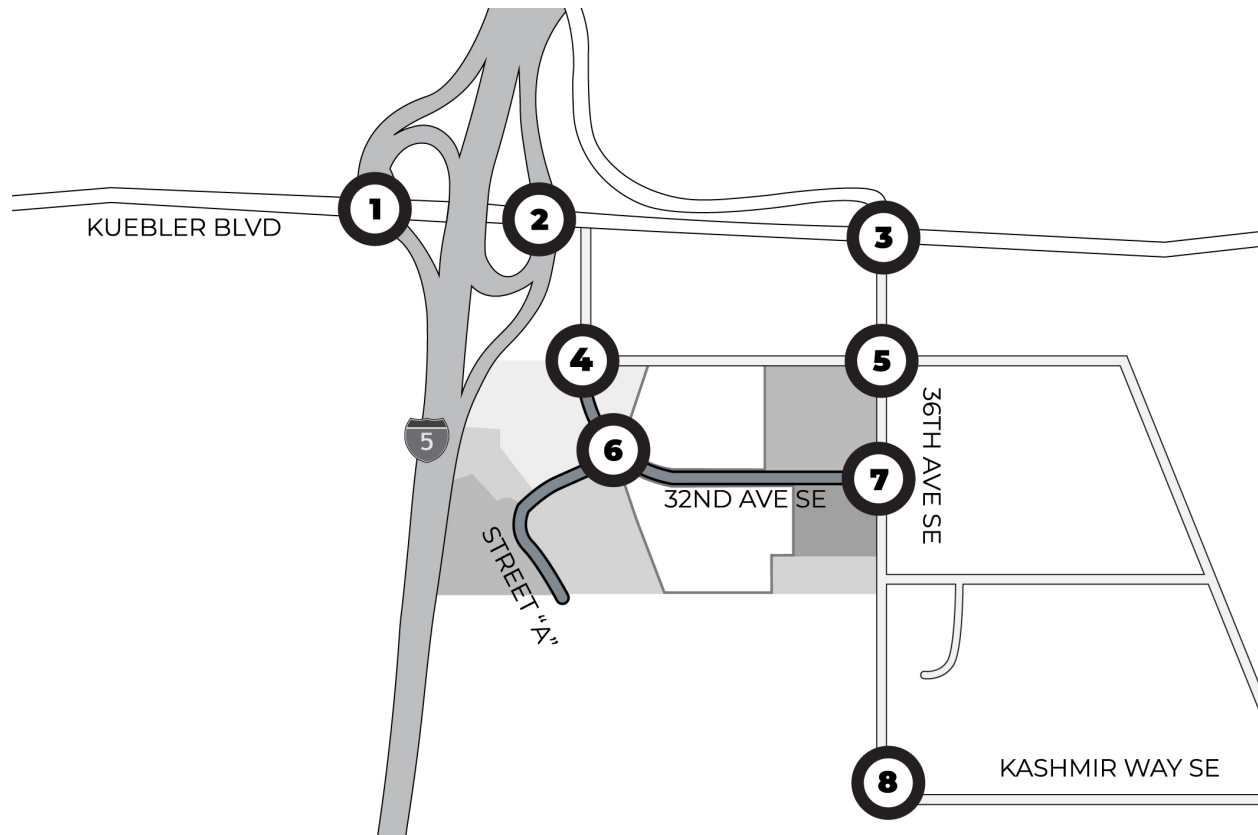


Figure 1: Study Area

Appendix A provides the site plan of the proposed development. **Table 1** lists important characteristics of the study area and proposed project.

Table 1: Key Study Area and Proposed Development Characteristics

Characteristics	Information
Study Area	
Number of Study Intersections	Eight
Analysis Period	Weekday A.M and P.M. Peak Hours
Analysis Scenarios	2021 Existing Conditions, AM Peak Hour 2021 Existing Conditions, PM Peak Hour 2025 Background Traffic, AM Peak Hour 2025 Background Traffic, PM Peak Hour 2025 Total Traffic (Background + Site), AM Peak Hour 2025 Total Traffic (Background + Site), PM Peak Hour
Project Site	
Existing Land Use	Vacant
Proposed Development	210 units of Multi-Family Mid-Rise 62 units of Multi-Family Low-Rise 75,000 SQFT of Business Park 115,000 SQFT of Industrial Park 60,000 SQFT of Mini Warehouse
Project Access	The development will have access via: a new public street, currently referred to as Street "A", an extension of 32 nd Ave SE, a driveway creating a fourth leg at the intersection of 36 th Ave SE/ Kashmir Way SE, and driveways on Boone Rd SE

Existing Conditions and Intersection Operations

Transportation operations for the existing roadway network are evaluated to establish a baseline of performance. The following intersections were identified for existing conditions evaluation:

- 1 I-5 SB Ramps/ Kuebler Blvd
- 2 I-5 NB Ramps/ Kuebler Blvd
- 3 Kuebler Blvd/ 36th Ave SE
- 5 36th Ave SE/ Boone Rd SE
- 8 36th Ave SE/Kashmir Way SE

Table 2 shows the existing intersection operations at the study intersections.

Table 2: 2021 Existing Traffic at Study Intersection Operations

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	V/C 0.89	V/C 0.95
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	V/C 0.96	V/C 0.71
3	Kuebler Blvd/ 36 th Ave SE	Signalized	LOS E, V/C 0.90	LOS F, V/C 1.14	LOS F, V/C 0.94
5	36 th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36 th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement

LOS = Level of Service of Worst Movement

Locations exceeding mobility standards are shown with **bold/italicized**

Project Traffic Impact

Construction of the proposed planned development is expected to begin in 2023 and be completed in 2025. To determine whether the proposed project will result in off-site traffic impacts, future traffic volumes were estimated. **Tables 3 and 4** provide the intersection operations for the future scenarios with and without project traffic.

Table 3: 2025 Background Intersection Operations (Without Project)

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	<i>V/C 0.95</i>	<i>V/C 1.17</i>
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	<i>V/C 1.01</i>	<i>V/C 0.88</i>
3	Kuebler Blvd/ 36 th Ave SE	Signalized	LOS E, V/C 0.90	<i>LOS F, V/C 1.21</i>	<i>LOS F, V/C 1.00</i>
4	32 nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36 th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36 th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

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Table 4: 2025 Total Intersection Operations (With Project)

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	<i>V/C 0.97</i>	<i>V/C 1.18</i>
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	<i>V/C 1.05</i>	<i>V/C 0.88</i>
3	Kuebler Blvd/ 36 th Ave SE	Signalized	LOS E, V/C 0.90	<i>LOS F, V/C 1.28</i>	<i>LOS F, V/C 1.12</i>
4	32 nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36 th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS C (EBL)	LOS D (EBL)
6	32 nd Ave SE/ Street "A"	Unsignalized (Two way stop)	LOS E	LOS A (EBL)	LOS A (EBL)
7	32 nd Ave SE/ 36 th Ave SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS B (EBL)
8	36 th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

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Key Findings

Key findings associated with the proposed development include the following items:

- The proposed development would generate 261 (158 in, 103 out) AM peak hour trips and 299 (125 in, 174 out) PM peak hour vehicle trips.
- All study intersections are expected to operate within mobility standards with the addition of the proposed site for the 2025 opening year, with the exceptions of:
 - I-5 SB Ramps/ Kuebler Blvd
 - I-5 NB Ramps/ Kuebler Blvd
 - Kuebler Blvd/ 36th Ave SE

These intersections fail to meet mobility standards under existing and background conditions as well as with build out of the proposed development.

- At the intersection of Kuebler Blvd/ 36th Ave SE the following movements exceed available storage: NBL, SBL, SBR, EBL, EBR, WBL. It is important to note that these movements fail in both the background (without the development) and total (with development) conditions, and that there is relatively minor changes in the length of queues between the background conditions and with the development. There is also additional queuing that occurs at the intersections of 36th Ave SE with 32nd Ave SE and Boone Rd SE. This results from increased demand on 36th Ave SE.

CHAPTER 2: EXISTING CONDITIONS

This chapter provides documentation of existing study area conditions, including the project site, study area roadway network, and existing traffic volumes and operations.

Project Site

MWSH Boone Road Property, LLC, is proposing to build a master planned area with a combination of housing, storage, and light industrial business park uses located adjacent to 36th Ave SE in Salem, Oregon. The development would be built in two phases described as follows:

Phase 2 (this submittal):

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- 60,000 SQFT of Mini Warehouse (ITE Code 151)

Phase 3 (future work):

- To be determined amount of Senior Adult Housing Attached (ITE Code 252)
- To be determined amount of General Light Industrial (ITE Code 110)

These will be added to the previously approved Phase 1 which includes 210 units of Multi-Family Mid-Rise approved by the City under CU-SPR-ADJ-DAP-DR21-02.

Existing Traffic Volumes and Operations

Existing AM and PM peak hour traffic operations were analyzed at the following study intersections:

- 1 I-5 SB Ramps/ Kuebler Blvd
- 2 I-5 NB Ramps/ Kuebler Blvd
- 3 Kuebler Blvd/ 36th Ave SE
- 5 36th Ave SE/ Boone Rd SE
- 8 36th Ave SE/Kashmir Way SE

Traffic counts used for this study were collected on November 19 and 20, 2019. These are used instead of more current counts because the study area overlaps with current construction on Kuebler Blvd, making data collection problematic. In addition, these counts also have the benefit of being collected prior to the COVID-19 pandemic, which caused a period of unusual traffic patterns. Volumes for the intersection of 36th Ave SE/Kashmir Way SE are based on counts collected on November 9, 2021. The peak hour traffic volumes analyzed under existing conditions are shown in **Figure 2 and Figure 3**, with the detailed traffic counts included in **Appendix B**.

Figure 2: 2021 AM Peak Hour Existing Conditions

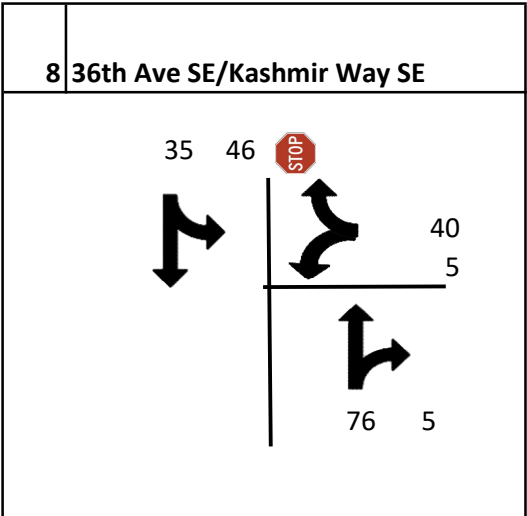
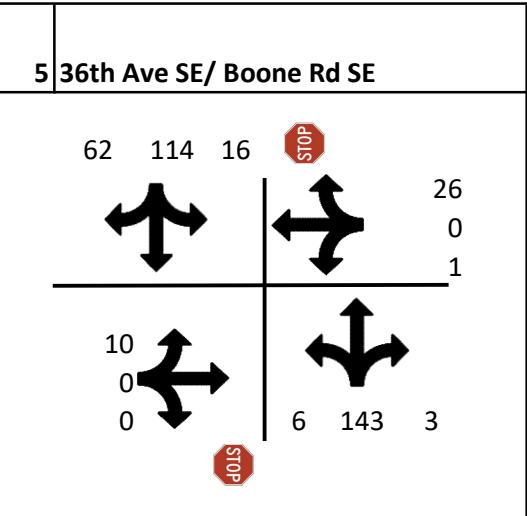
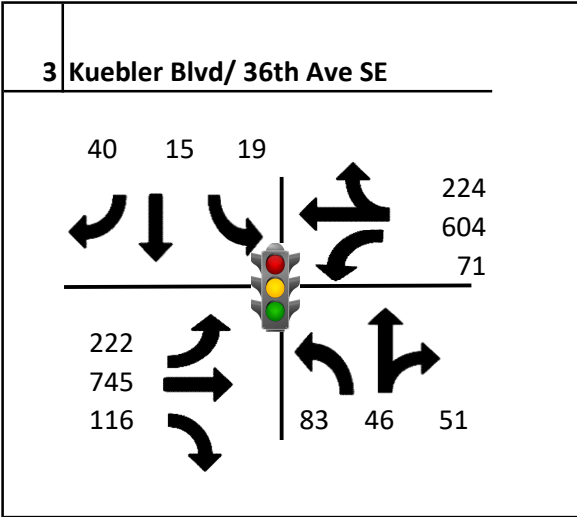
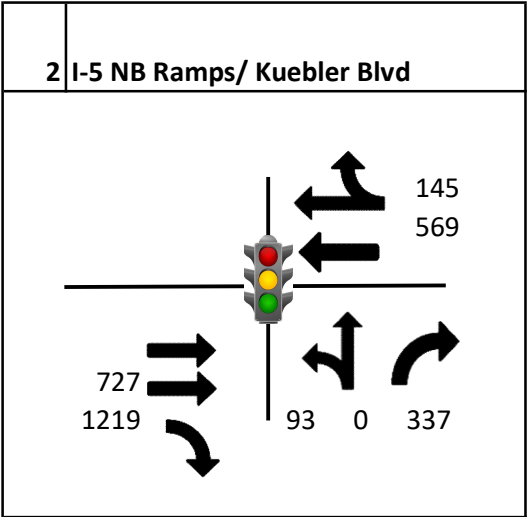
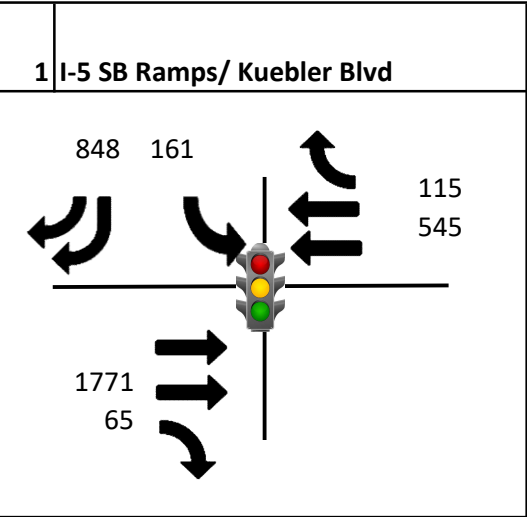
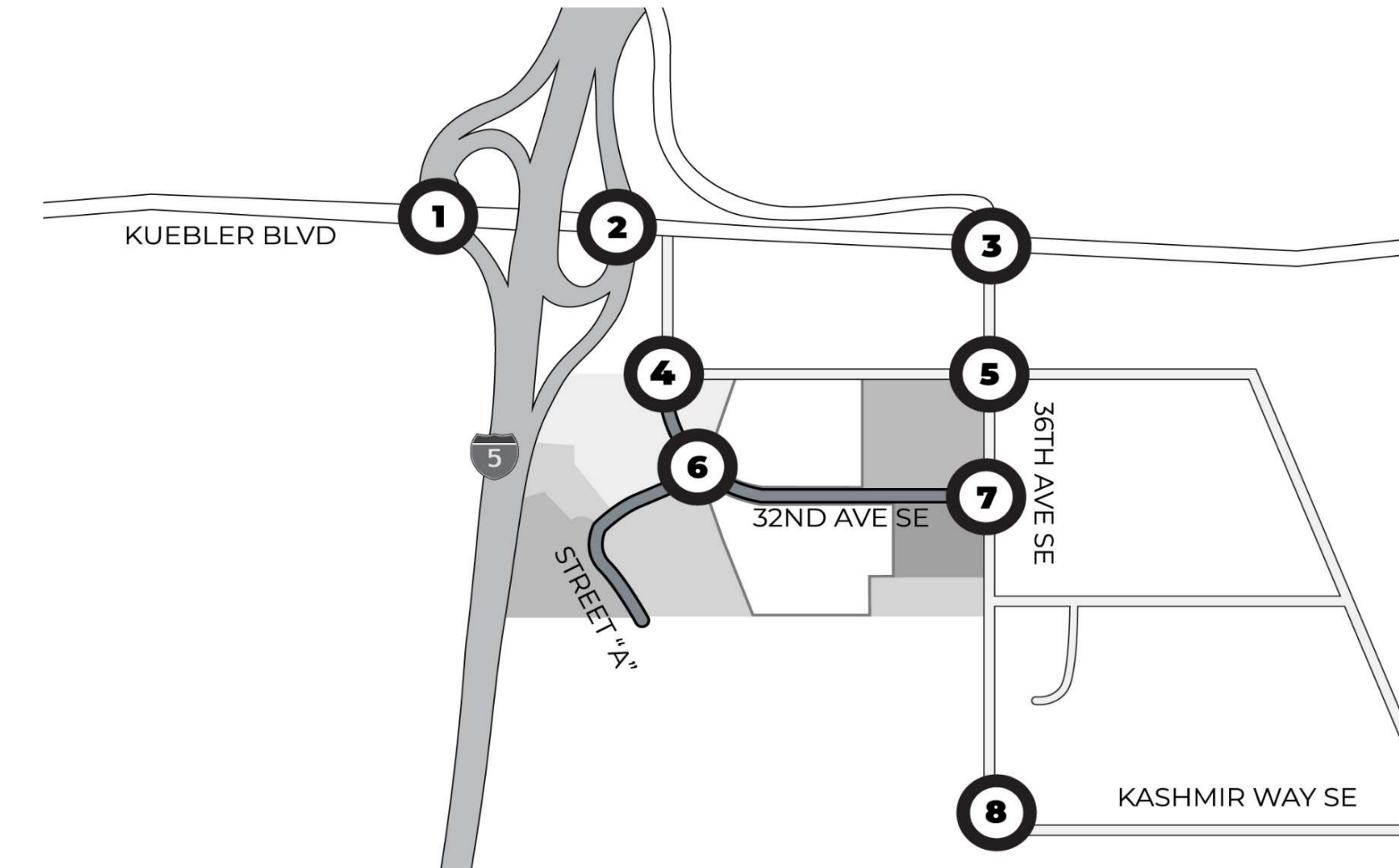
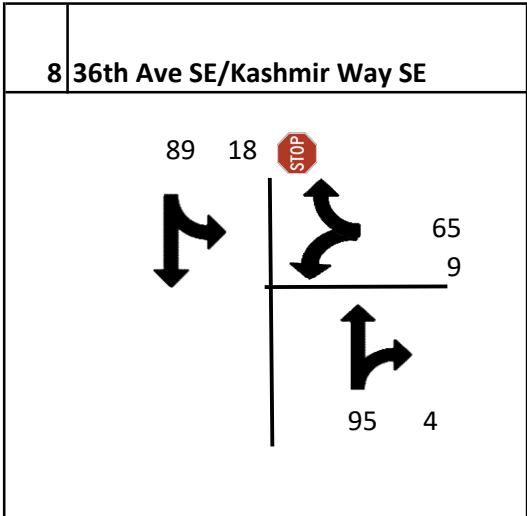
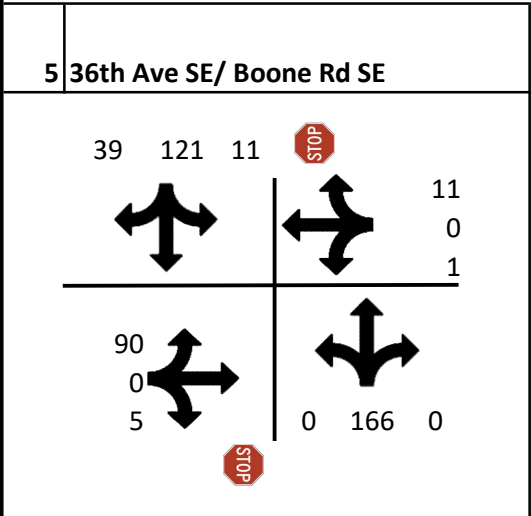
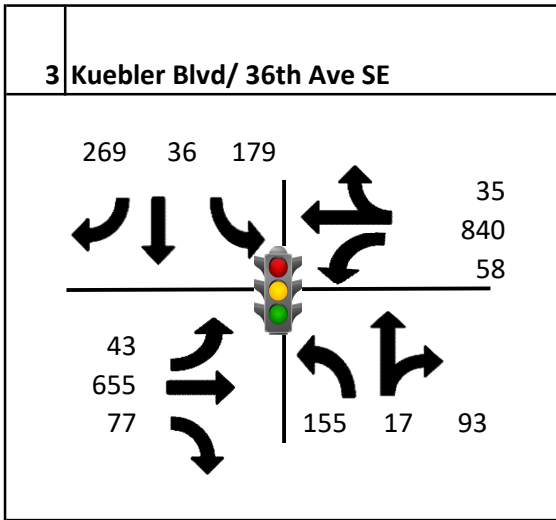
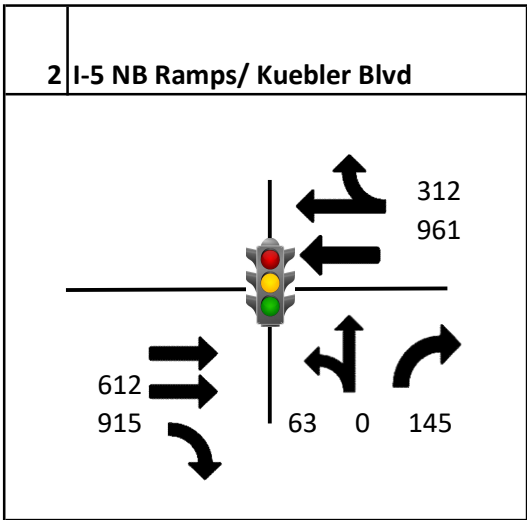
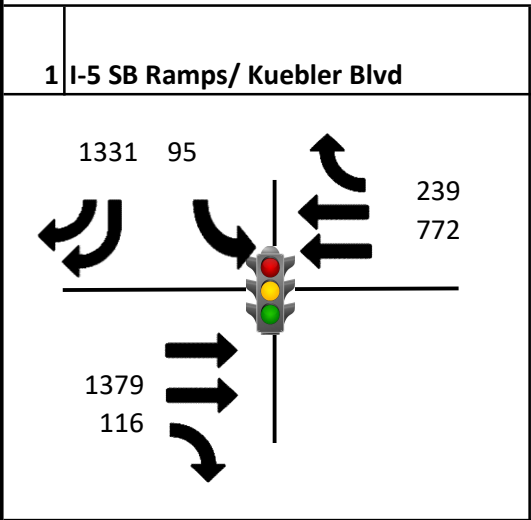
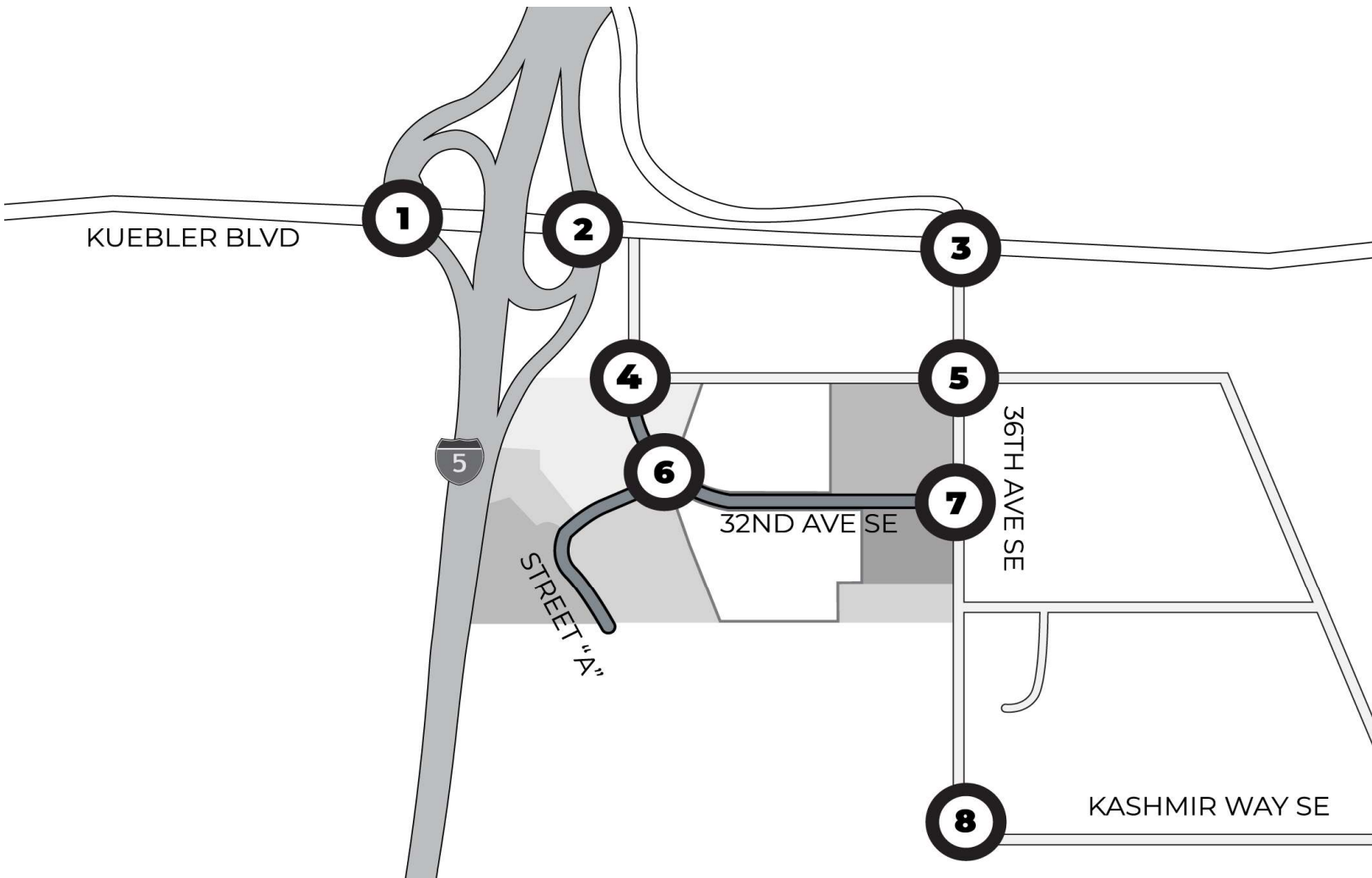


Figure 3: 2021 PM Peak Hour Existing Conditions



Existing Operating Conditions

Existing traffic operations at the study intersections were evaluated for the AM and PM peak hours. The estimated operational results of each study intersection are shown in **Table 5** and is based on the 2000 Highway Capacity Manual¹ methodology for signalized intersections and 2016 Highway Capacity Manual methodology² for unsignalized intersections. **Appendix C** provides detailed reports summarizing these results. Traffic volumes for all study intersections, except 36th Ave SE/ Kashmir Way SE, are developed by applying a one percent annual growth rate to counts from November 19 and 20, 2019. Volumes for 36th Ave SE/Kashmir Way SE are based on counts collected on November 9, 2021. All study intersections meet existing mobility standards except for Kuebler Blvd at the I-5 NB ramps, I-5 SB ramps, and 36th Ave SE.

Table 5: 2021 Existing Intersection Operations

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	V/C 0.89	V/C 0.95
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	V/C 0.96	V/C 0.71
3	Kuebler Blvd/ 36 th Ave SE	Signalized	LOS E, V/C 0.90	LOS F, V/C 1.14	LOS F, V/C 0.94
5	36 th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36 th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement

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Locations exceeding mobility standards are shown with **bold/italicized**

Crash Analysis

The five most recent years of crash records (Jan 1, 2015- Dec 31, 2019) for the study area were obtained from Oregon Department of Transportation (ODOT's) online database. A copy of these records is provided in **Appendix D**. Crashes identified by ODOT as intersectional for the two cross streets were included in the analysis.

Crash rates are calculated for the five existing study intersections and compared with ODOT's 90th percentile crash rates from Exhibit 4-1 of ODOT's Analysis Procedures Manual (APM). All intersections have crash rates below their comparable 90th percentile crash rates except for the intersection of 36th Ave SE/ Boone Rd SE. This indicates that this study intersection experiences more crashes than would be expected when compared to a similar reference population throughout Oregon.

¹ 2000 Highway Capacity Manual, Transportation Research Board, Washington DC, 2000

² Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis, Transportation Research Board, Washington DC, 2016.

Table 6: Crash Rate Analysis

No.	Intersection	AADT	5 Year Crash Total (2015-2019)	Crash Rate	Intersection Type	90 th Percentile Crash Rate
1	I-5 SB Ramps/ Kuebler Blvd	38,560	31	0.44	4SG	0.86
2	I-5 NB Ramps/ Kuebler Blvd	29,490	14	0.32	4SG	0.86
3	Kuebler Blvd/ 36 th Ave SE	24,080	19	0.432	4SG	0.86
5	36 th Ave SE/ Boone Rd SE	4,360	4	<i>0.503</i>	3ST	0.293
8	36 th Ave SE/Kashmir Way SE	2,800	0	0	3ST	0.293

Note: AADT is estimated using the industry standard of practice that the intersection PM Peak Hour traffic is approximately 10% of the AADT. The PM Peak Hour traffic used reflects raw counts.

Locations exceeding 90th percentile crash rate are shown with ***bold/italicized***

** Location does not exist in state database

CHAPTER 3: BACKGROUND TRAFFIC

Construction of the proposed planned development is expected to begin in 2023 and be completed in 2025. To account for traffic growth a 1.0% growth rate was used to forecast the existing traffic volumes to future background traffic volumes on roads within the study area. This is consistent with other TIA's recently completed in the area, including Costco which is located nearby. In process volumes from Phase 1 of the development, which was previously approved and includes 210 units of Multi-Family Mid-Rise approved by the City under CU-SPR-ADJ-DAP-DR21-02, and Costco are included in the background traffic volumes. Background traffic volumes are show in **Figures 4 and 5**.

Background Intersection Operations

Background traffic operations at the study intersections were determined based on the 2016 Highway Capacity Manual methodology³ for unsignalized intersections and the 2000 Highway Capacity Manual methodology for signalized intersections⁴. The estimated operations of each study intersection are shown in **Table 7**. **Appendix E** provides detailed reports summarizing these results. All study intersections meet existing mobility standards except for Kuebler Blvd at the I-5 NB ramps, I-5 SB ramps, and 36th Ave SE.

³ *Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis*, Transportation Research Board, Washington DC, 2016.

⁴ *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010.
Enloe Consulting, LLC

Table 7: 2025 Background Intersection Operations

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	<i>V/C 0.95</i>	<i>V/C 1.17</i>
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	<i>V/C 1.01</i>	<i>V/C 0.88</i>
3	Kuebler Blvd/ 36 th Ave SE	Signalized	LOS E, V/C 0.90	<i>LOS F, V/C 1.21</i>	<i>LOS F, V/C 1.00</i>
4	32 nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36 th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36 th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement

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Figure 4: 2025 AM Peak Hour Background Conditions

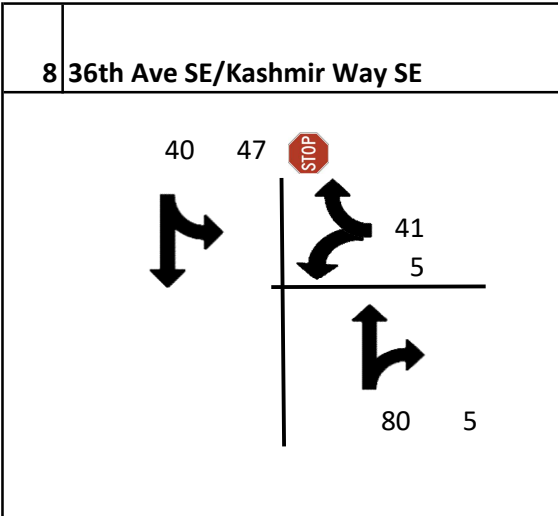
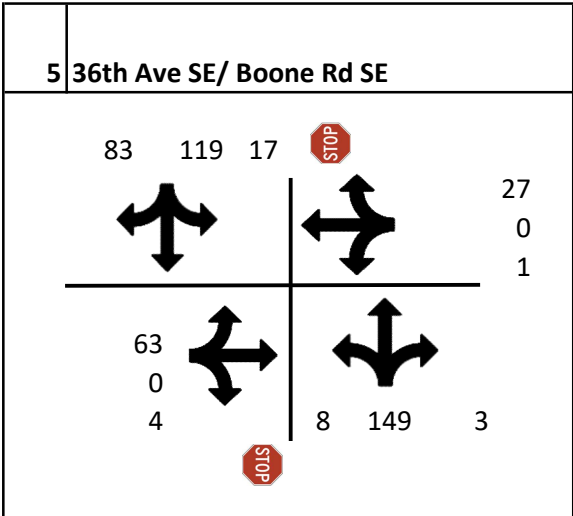
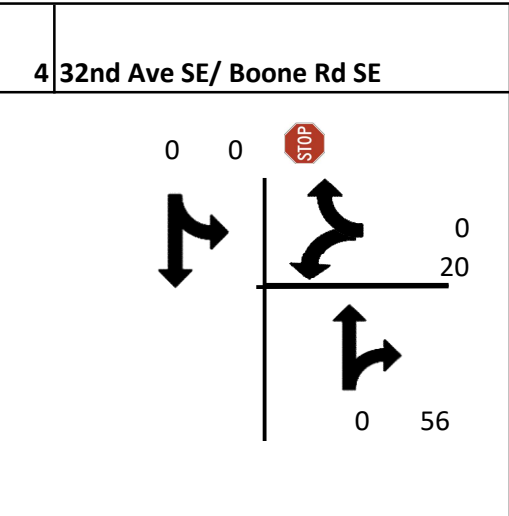
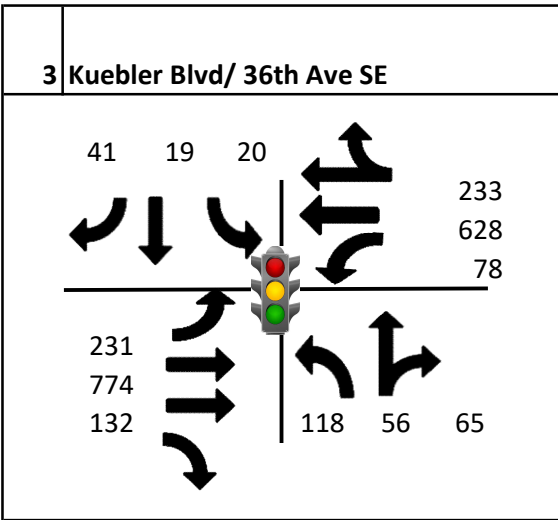
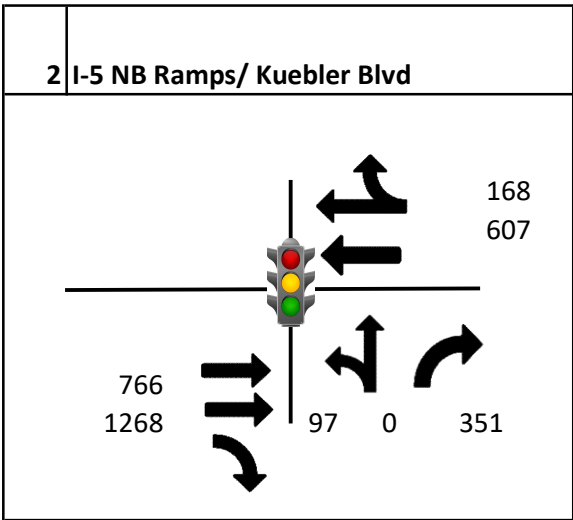
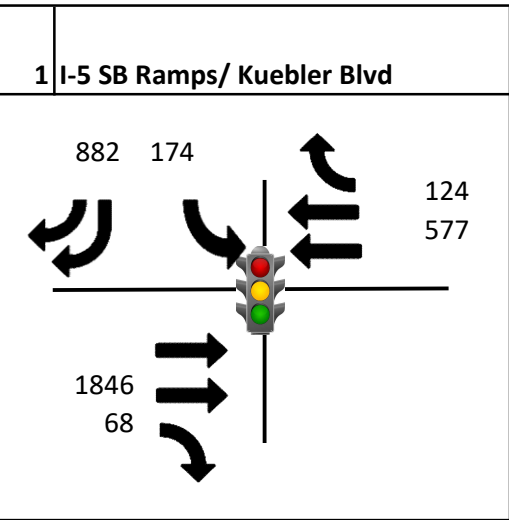
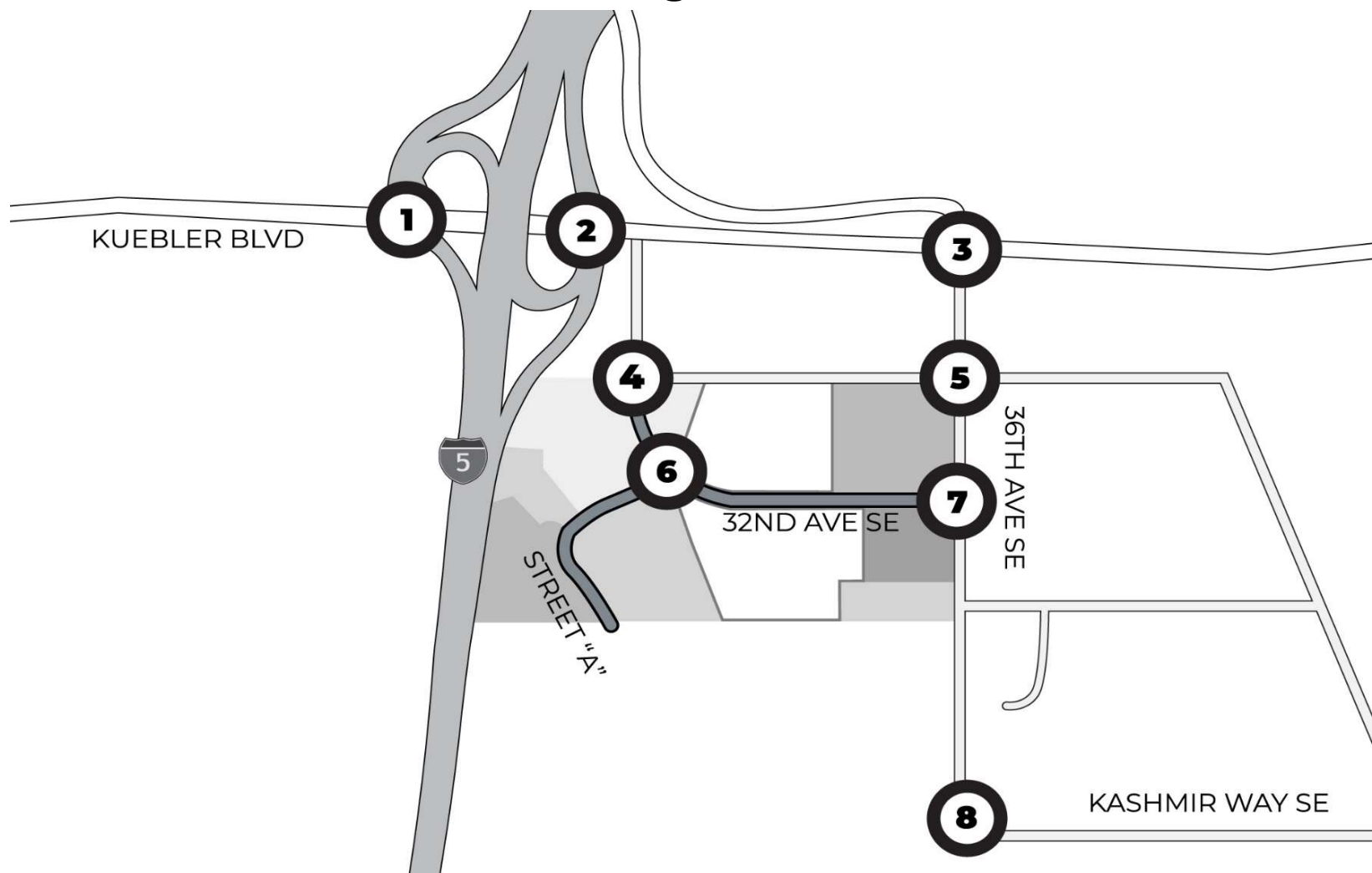
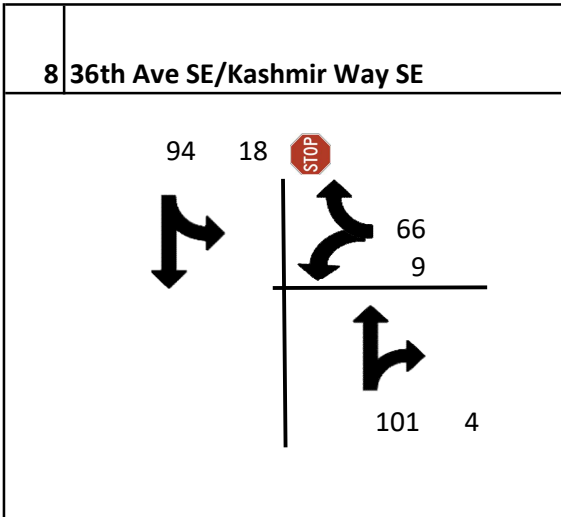
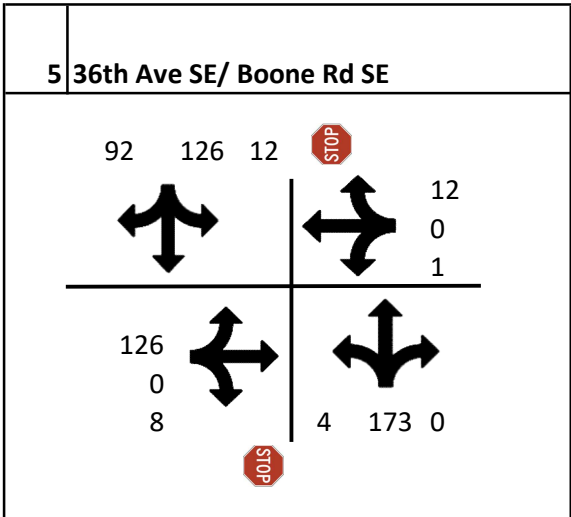
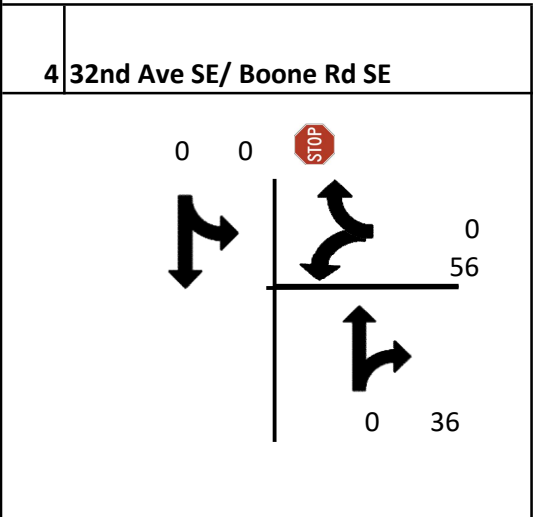
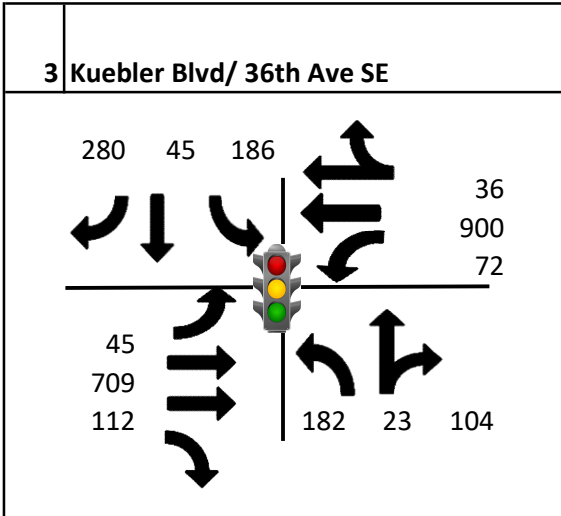
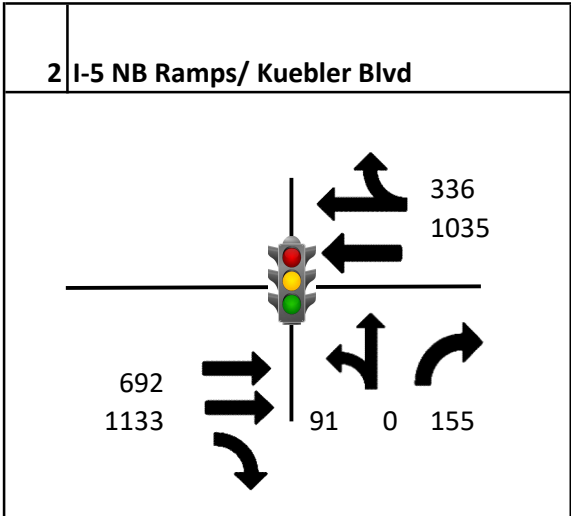
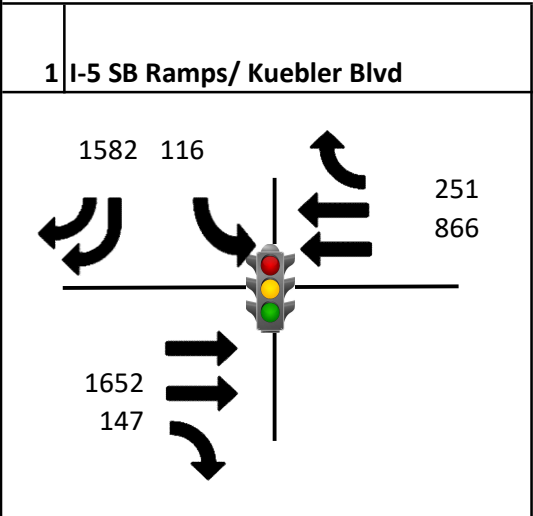
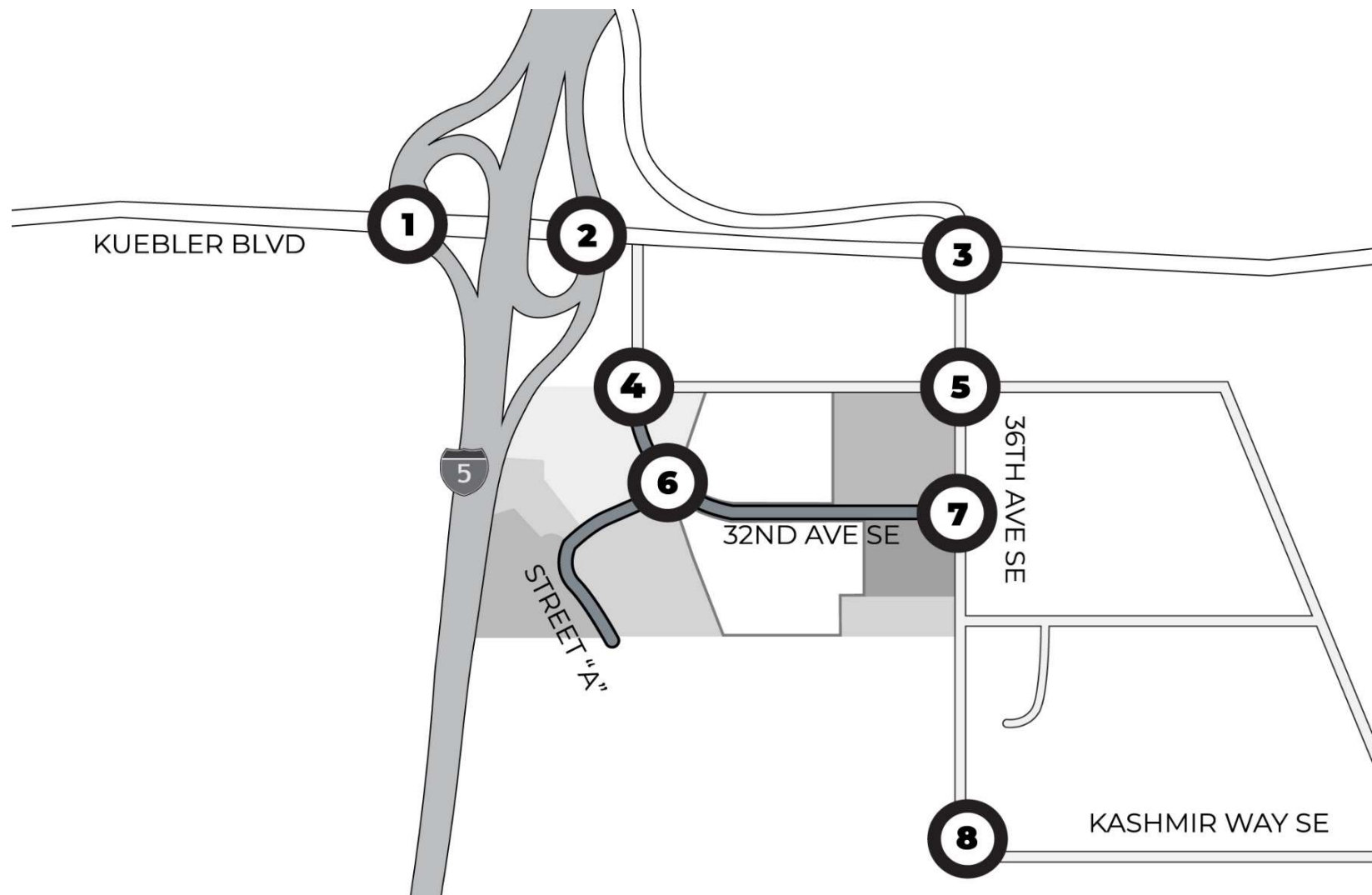


Figure 5: 2025 PM Peak Hour Background Conditions



CHAPTER 4: PROJECT IMPACTS

This chapter reviews the impacts that the proposed development would have on the study area transportation system. The focus of the impact analysis is on the following study intersections:

- 1 I-5 SB Ramps/ Kuebler Blvd
- 2 I-5 NB Ramps/ Kuebler Blvd
- 3 Kuebler Blvd/ 36th Ave SE
- 4 32nd Ave SE/ Boone Rd SE (future connection)
- 5 36th Ave SE/ Boone Rd SE
- 6 32nd Ave SE/ Street "A" (future connection)
- 7 32nd Ave SE/ 36th Ave SE (future connection)
- 8 36th Ave SE/Kashmir Way SE

Trip Generation

Trip generation is used to estimate the number of vehicle trips added to the roadway network by a development during a specified period. In this case, the AM and PM peak hour periods are studied. Trip generation estimates are established using data and methodology provided by the Institute of Transportation Engineers (ITE).⁵

Trip generation values for the proposed development are estimated using the ITE Trip Generation Manual, 10th Edition. Multi-Family Mid-Rise (221) is used to estimate trips for the planned apartments. Multi-Family Low-Rise is used to estimate trips for the planned townhomes. The development will also include a mix of Business Park (770) and Industrial Park (130), and Self-Storage (Mini Warehouse [151]). Trip generation values are provided in **Table 8**.

⁵ *Trip Generation, 10th Edition*, Institute of Transportation Engineers, 2017.
Enloe Consulting, LLC

Table 8: Trip Generation Summary

Land Use	Unit of Measure	Time Period	Peak Hour Trips		
			In	Out	Total
Multi-Family Mid-Rise (221)	210 Dwelling Units	AM Peak	18	52	71
Multi-Family Low-Rise (220)	62 Dwelling Units	AM Peak	7	23	30
Business Park (770)	75,000 SQFT	AM Peak	92	16	108
Industrial Park (130)	115,000 SQFT	AM Peak	37	9	46
Mini Warehouse (151)	60,000 SQFT	AM Peak	4	2	6
AM PEAK HOUR TRIPS			158	103	261
Multi-Family Mid-Rise (221)	210 Dwelling Units	PM Peak	55	35	90
Multi-Family Low-Rise (220)	62 Dwelling Units	PM Peak	25	14	39
Business Park (770)	75,000 SQFT	PM Peak	30	84	114
Industrial Park (130)	115,000 SQFT	AM Peak	10	36	46
Mini Warehouse (151)	60,000 SQFT	PM Peak	5	5	10
TOTAL PM PEAK HOUR			125	174	299

Trip Cap Analysis

The project site area has a trip cap associated with it from a previous zone change. The zone change trip cap is compared to approved development and proposed development for the project site in **Table 9**.

Table 9: Project Site Trip Cap Summary

Scenario	Land Use Summary	Daily Trips	AM Peak Hour Trips	PM Peak Hour Trips
Zone Change Trip Cap		12,916	N/A	1,314
Phase 1	210 units of Multi-Family Mid-Rise (ITE Code 210)	1,142	76	92
Phase 2	210 units of Multi-Family Mid-Rise (ITE Code 210) 62 units of Multi-Family Low-Rise (ITE Code 220) 75,000 SQFT of Business Park (ITE Code 770) 115,000 SQFT of Industrial Park (ITE Code 130) 60,000 SQFT of Mini Warehouse (ITE Code 151)	3,561	261	299
Residual Trips for Future Development		8,213	N/A	923

Trip Distribution

Trip distribution provides an estimation of where trips from the development originate and end on the study area network. This is represented as percentages where large portions of the trips generated enter and exit the project study area. The trip distribution percentages are based off travel demand model outputs from MWCOCG. These include:

- 40% north on I-5
- 34% south on I-5
- 12% west on Kuebler Blvd
- 8% east on Kuebler Blvd
- 4% north on 36th Ave SE
- 2% south on 36th Ave SE

Site generated trips are distributed on the network as shown in **Figures 6 and 7**.

Figure 6: AM Peak Hour Site Generated Volumes

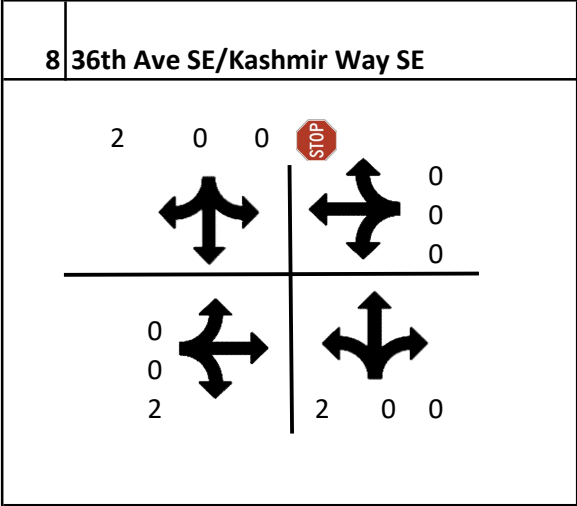
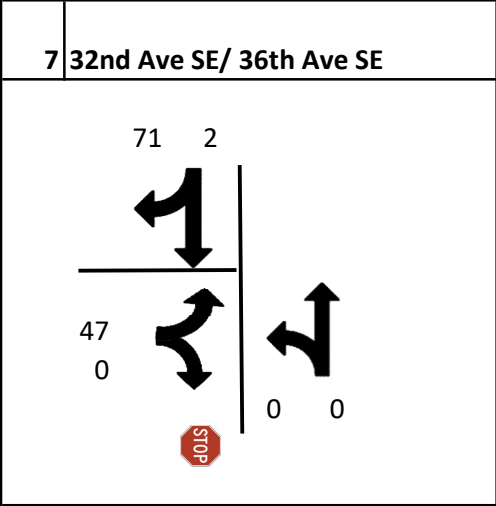
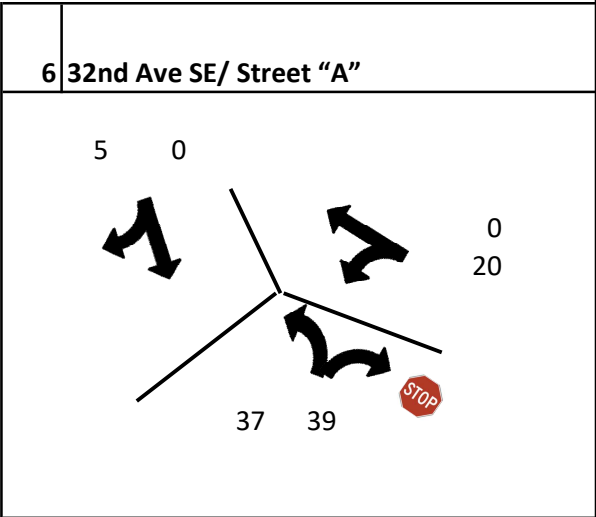
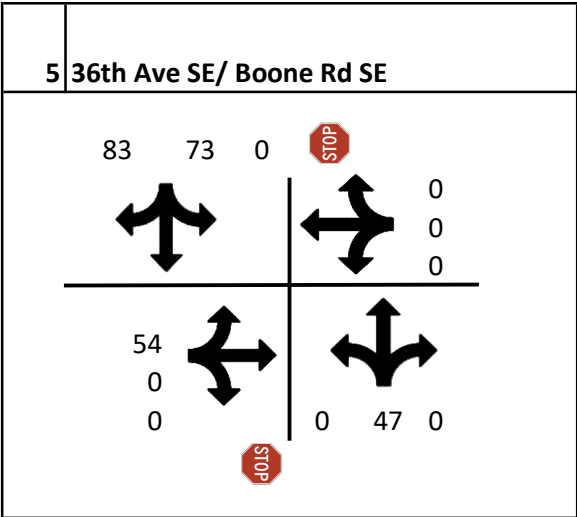
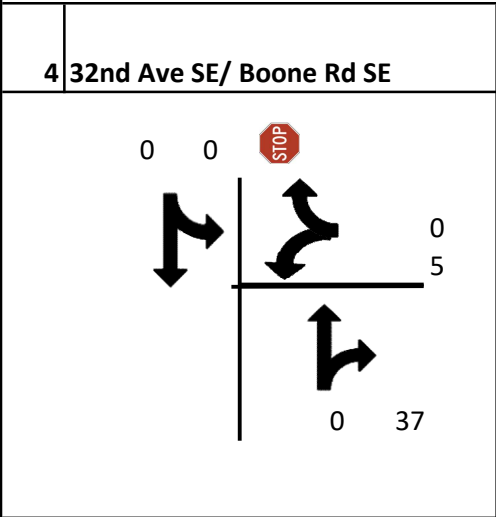
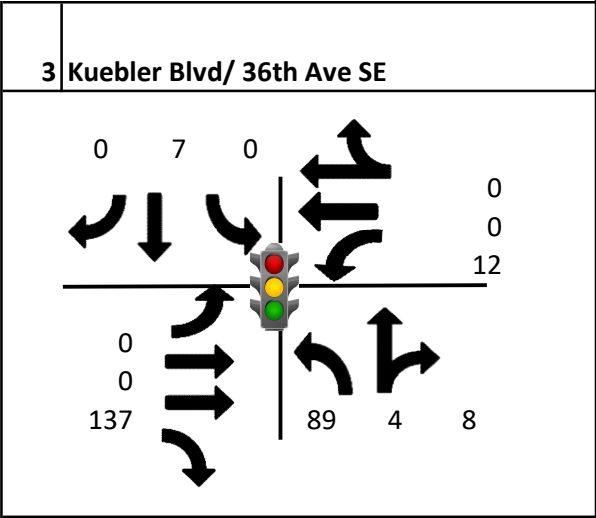
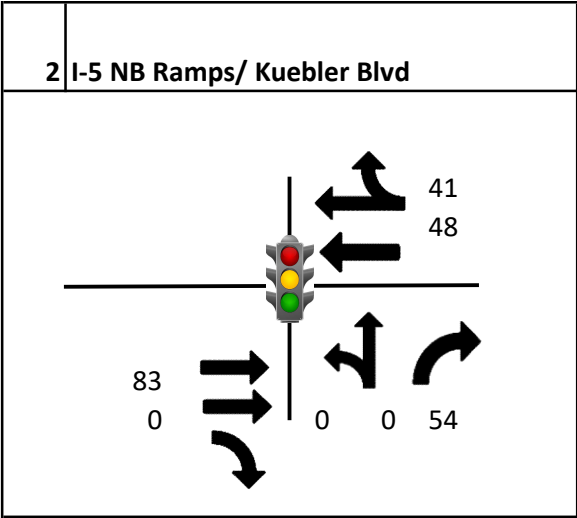
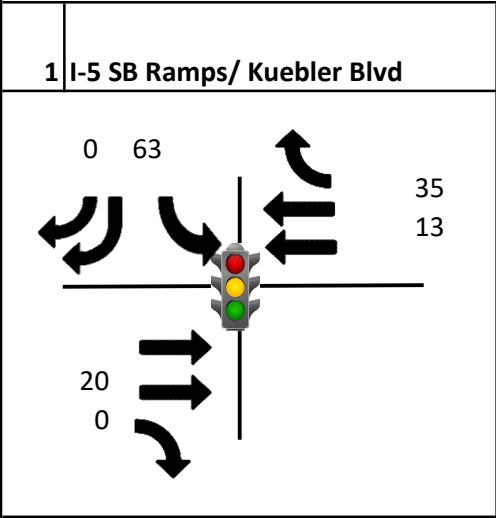
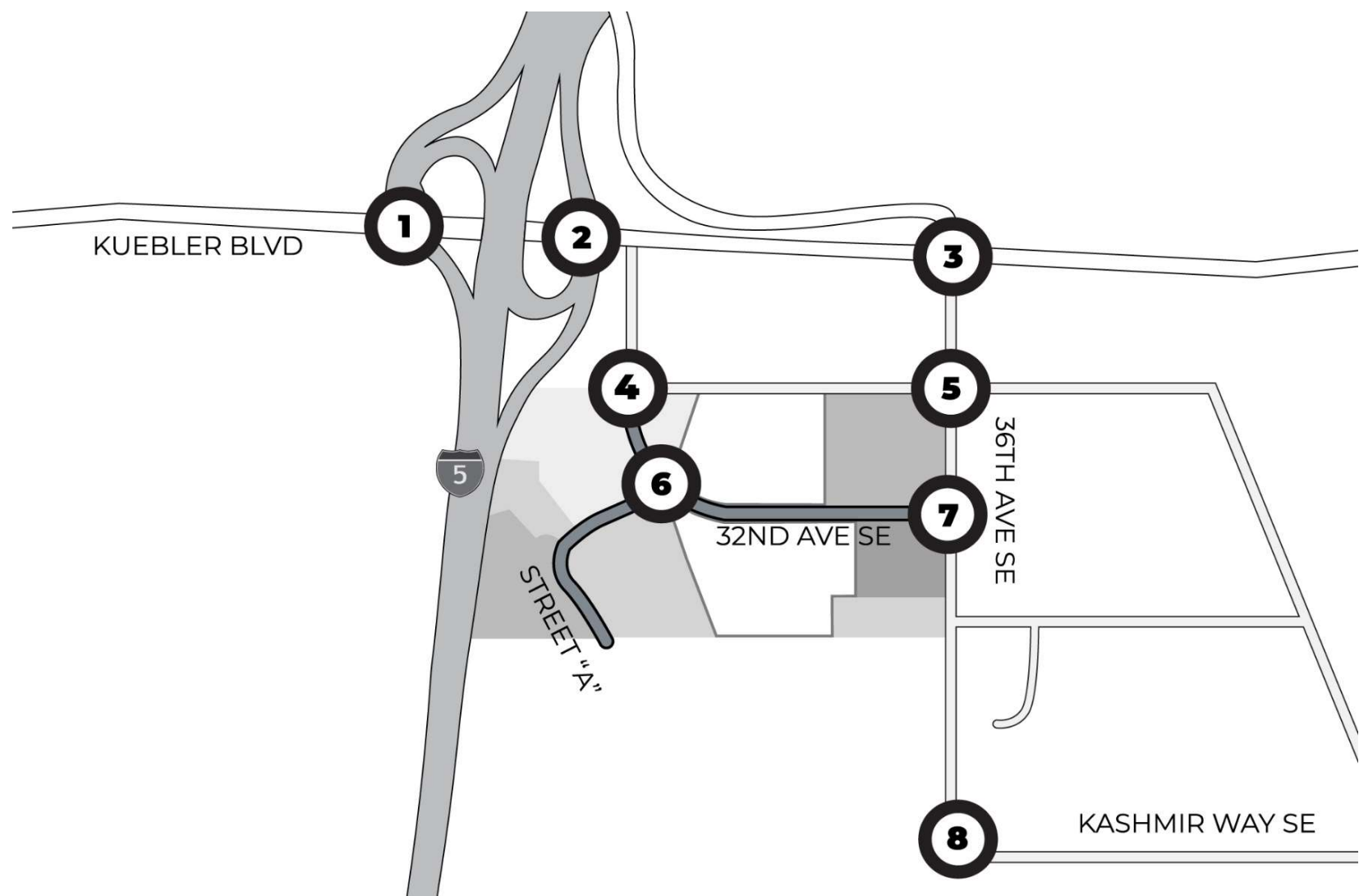
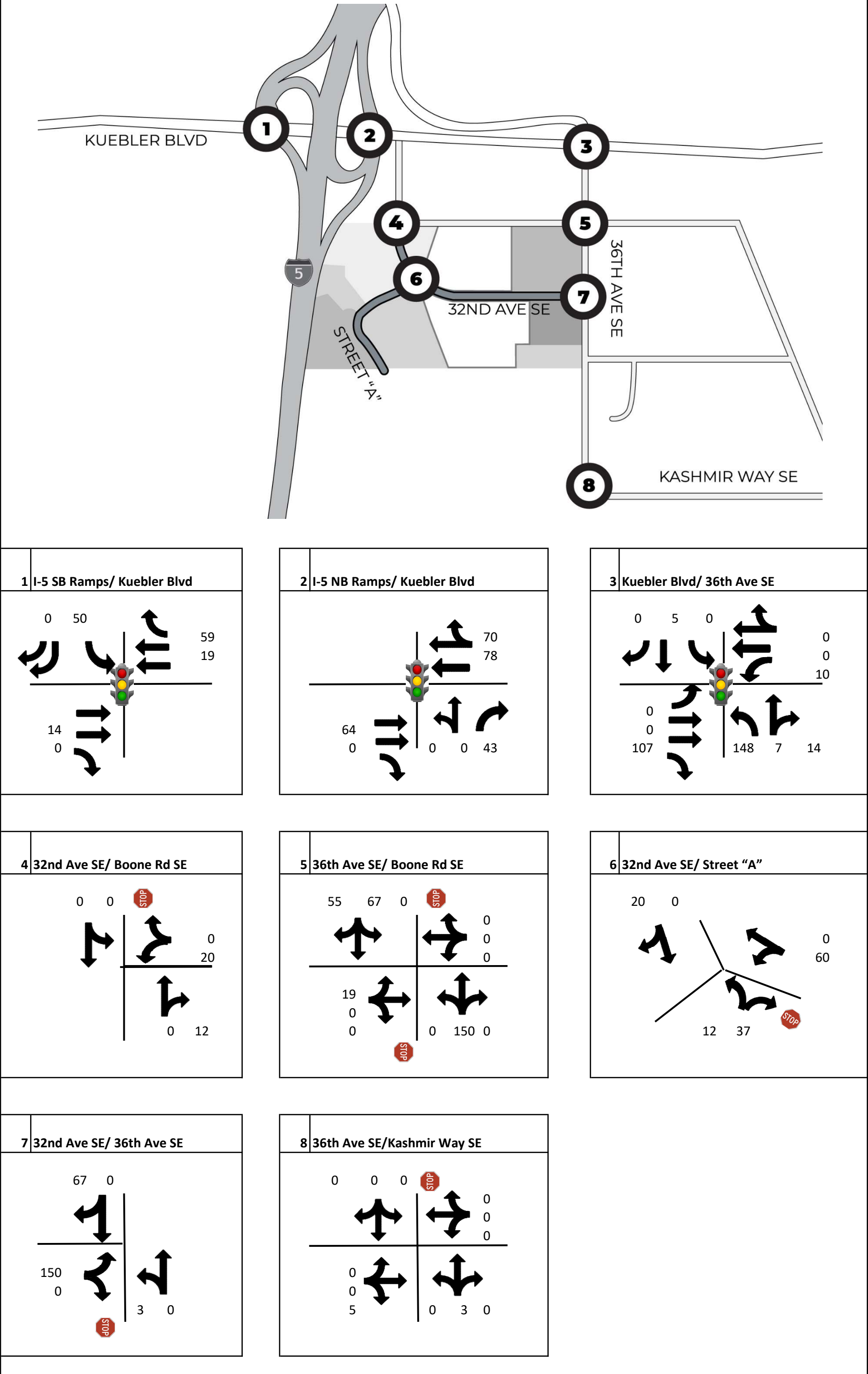


Figure 7: PM Peak Hour Site Generated Volumes



Future Traffic Volumes with the Proposed Development

The estimated trips associated with the proposed development are added to the background volumes to estimate the total traffic scenario traffic volumes. **Figure 8 and Figure 9** show the 2025 total traffic volumes used for the opening year analysis.

Table 10 lists the study intersection total traffic operating conditions for the AM and PM peak hours. Traffic operations at the study intersections were determined for the peak hours based on the 2016 Highway Capacity Manual methodology⁶ for unsignalized intersections and the 2000 Highway Capacity Manual methodology for signalized intersections⁷. **Appendix F** provides detailed reports for the operational results. All study intersections meet existing mobility standards except for Kuebler Blvd at the I-5 NB ramps, I-5 SB ramps, and 36th Ave SE.

Table 10: 2025 Total Intersection Operations (with Project)

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	V/C 0.97	V/C 1.18
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	V/C 1.05	V/C 0.88
3	Kuebler Blvd/ 36 th Ave SE	Signalized	LOS E, V/C 0.90	LOS F, V/C 1.28	LOS F, V/C 1.12
4	32 nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36 th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS C (EBL)	LOS D (EBL)
6	32 nd Ave SE/ Street "A"	Unsignalized (Two way stop)	LOS E	LOS A (EBL)	LOS A (EBL)
7	32 nd Ave SE/ 36 th Ave SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS B (EBL)
8	36 th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement

LOS = Level of Service of Worst Movement

Locations exceeding mobility standards are shown with **bold/italicized**

⁶ Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis, Transportation Research Board, Washington DC, 2016.

⁷ 2000 Highway Capacity Manual, Transportation Research Board, Washington DC, 2010.

Mitigation Considerations

Three intersections are expected to fail target mobility standards in the 2025 AM and PM total traffic scenarios. These include:

- 1) I-5 SB Ramps/ Kuebler Blvd
- 2) I-5 NB Ramps/ Kuebler Blvd
- 3) Kuebler Blvd/ 36th Ave SE

Table 11 summarizes intersection operations at locations not meeting mobility standards.

Table 11: Summary of Intersections Not Meeting Mobility Standards

No.	Intersection	Operating Standard	AM Peak Hour		P.M. Peak Hour	
			Background	Total	Background	Total
1	I-5 SB Ramps/ Kuebler Blvd	V/C 0.85	<i>V/C 0.95</i>	<i>V/C 0.97</i>	<i>V/C 1.17</i>	<i>V/C 1.18</i>
2	I-5 NB Ramps/ Kuebler Blvd	V/C 0.85	<i>V/C 1.01</i>	<i>V/C 1.05</i>	<i>V/C 0.88</i>	<i>V/C 0.88</i>
3	Kuebler Blvd/ 36 th Ave SE	LOS E, V/C 0.90	<i>LOS F, V/C 1.21</i>	<i>LOS F, V/C 1.28</i>	<i>LOS F, V/C 1.00</i>	<i>LOS F, V/C 1.12</i>

V/C = Volume-to-Capacity Ratio of Worst Movement

LOS = Level of Service of Worst Movement

Locations exceeding mobility standards are shown with ***bold/italicized***

Proportional share is calculated based on site generated trips added to the critical movement(s)

Kuebler Blvd/ I-5 Ramps

In the AM scenarios, the SBR and the EBT through are both critical movements for the SB Ramp intersection. The SBR is the critical movement in the PM scenarios. For the intersection with the I-5 NB Ramp, the EBR and NBR are the critical movements in the AM scenarios. In the PM scenarios, the EBR is the critical movement and the NBR does not see as much demand. Additional mitigations could be done to add operational benefits, like adding a WBR turn lane at the intersection with the NB Ramps, but it would not bring the intersection back to background conditions mobility levels.

Kuebler Blvd/ 36th Ave SE

The intersection of Kuebler Blvd/ 36th Ave SE fails to meet mobility standards in both the background and total traffic conditions. The addition of a northbound left turn lane (converting the approach to a dual left) would bring the intersection much closer to background mobility levels. **Table 12** outlines the operational results with the addition of dual NBL turn lanes. This improvement would also include the addition of a second receiving lane for westbound traffic. **Appendix F** provides detailed reports for the mitigation operational results.

Table 12: Kuebler Blvd/ 36th Ave SE Mitigations

Scenario	AM Peak Hour	P.M. Peak Hour
2025 Background	LOS F, V/C 1.21	LOS F, V/C 1.00
2025 Total	LOS F, V/C 1.28	LOS F, V/C 1.12
NBL Turn Lane	LOS F, V/C 1.20	LOS F, V/C 1.02

Figure 8: 2025 AM Peak Hour Total Conditions

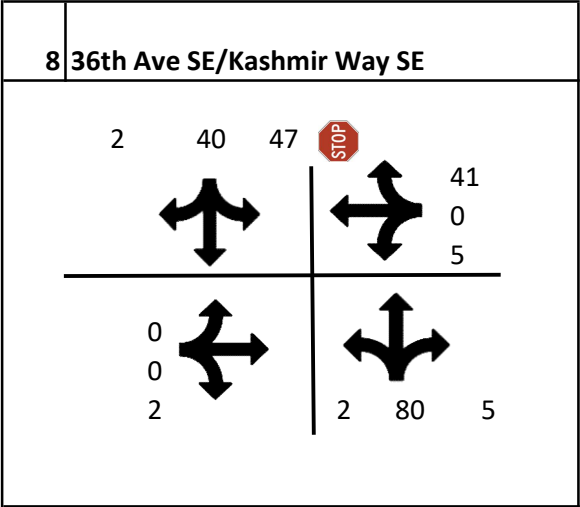
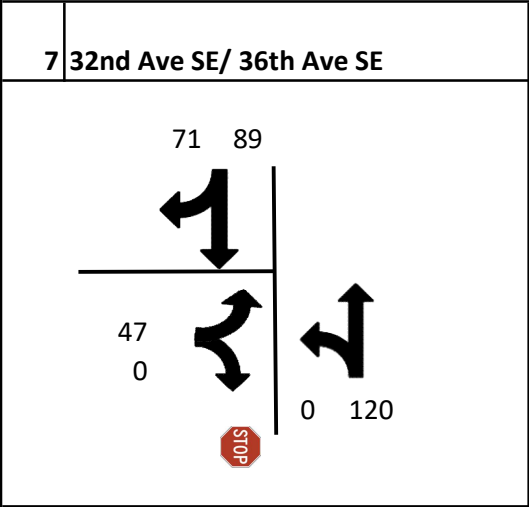
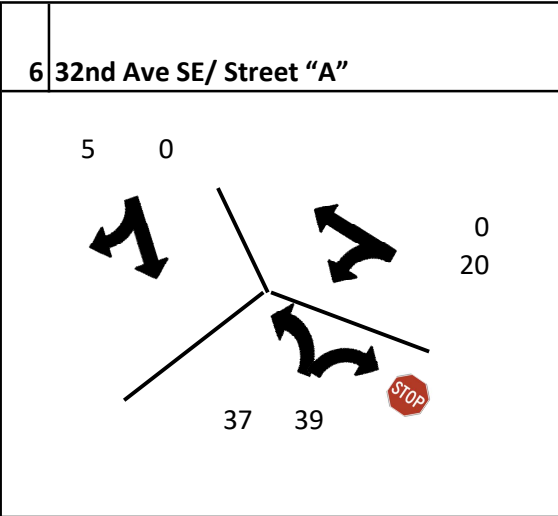
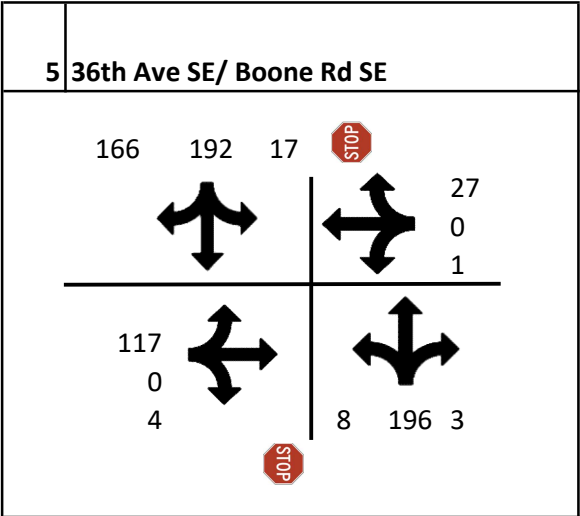
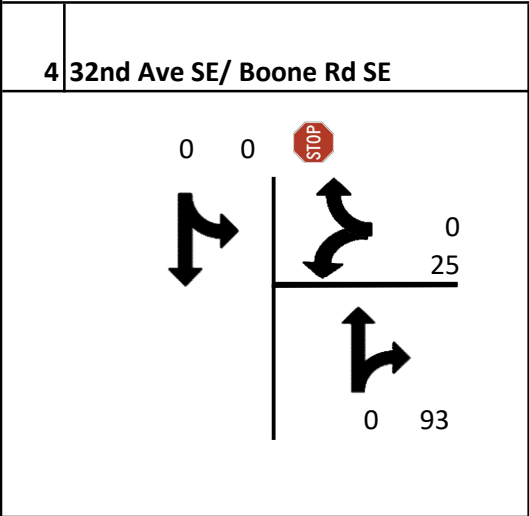
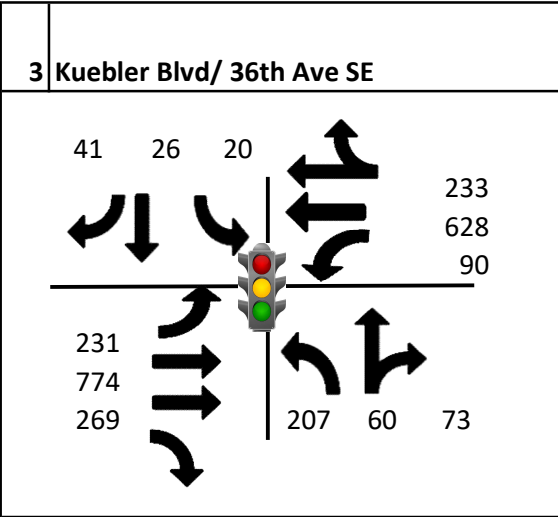
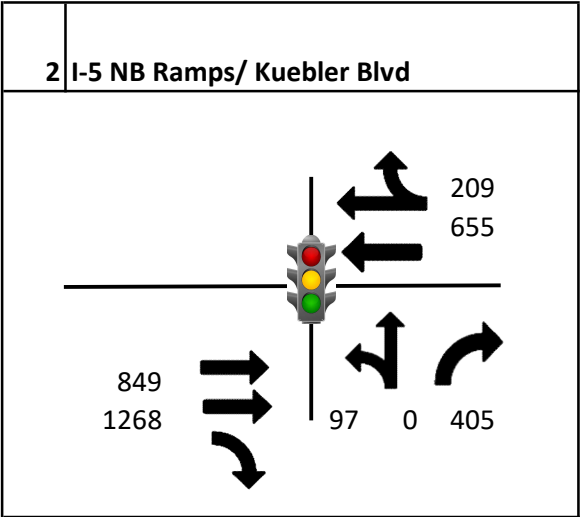
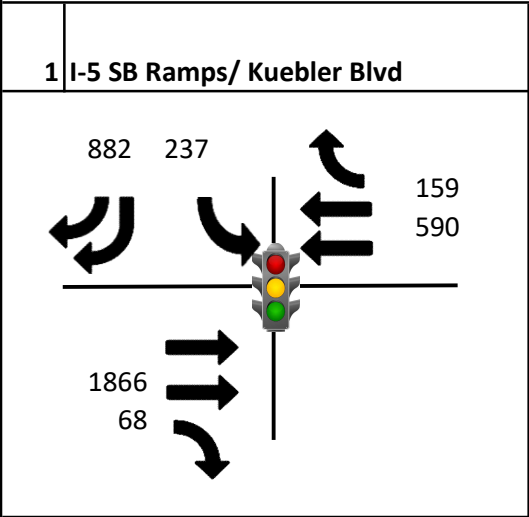
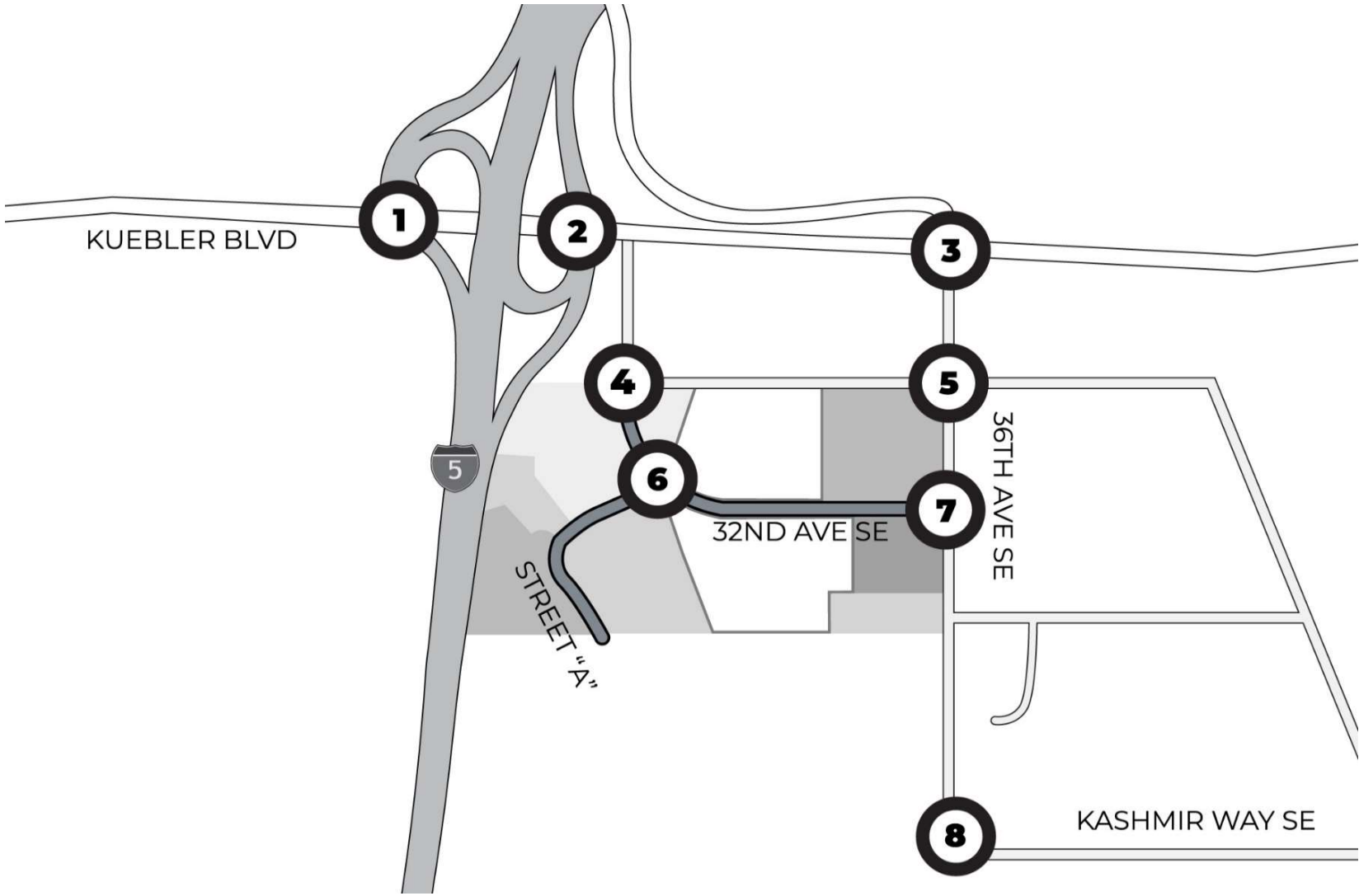
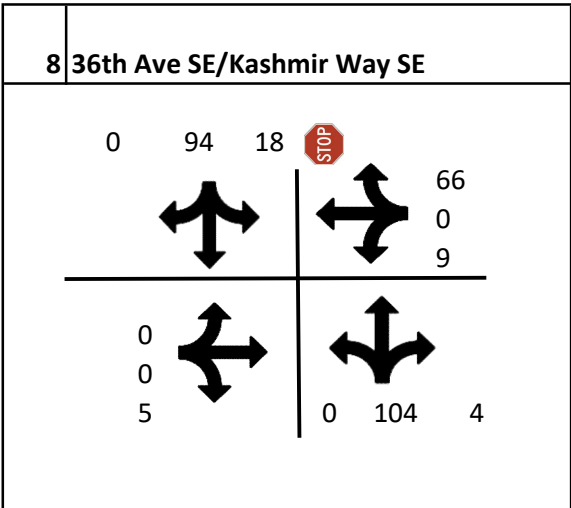
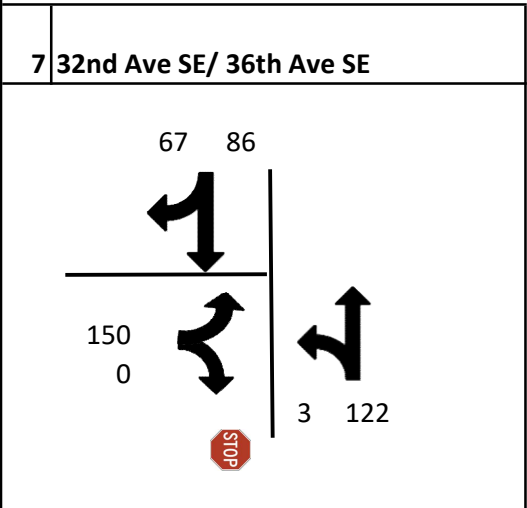
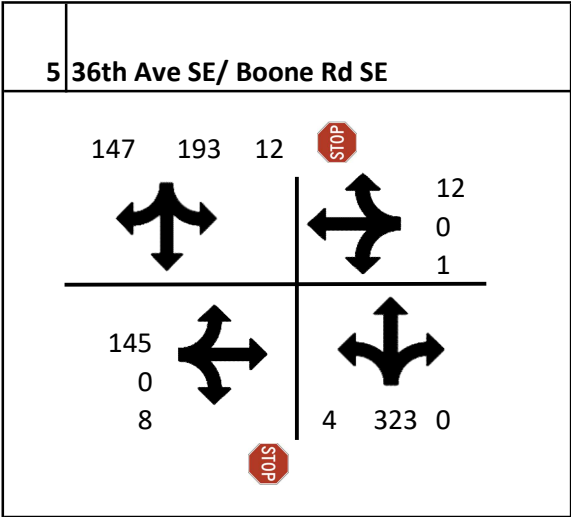
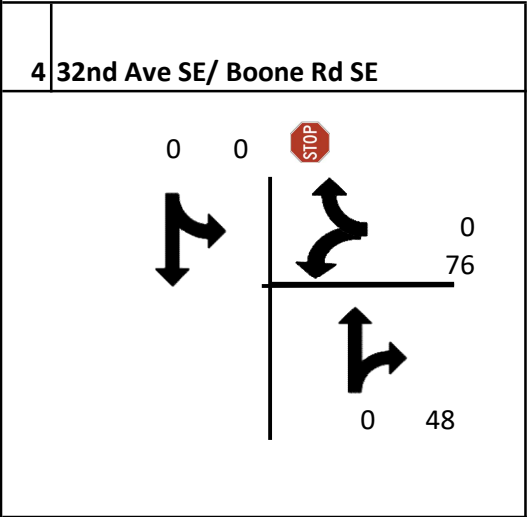
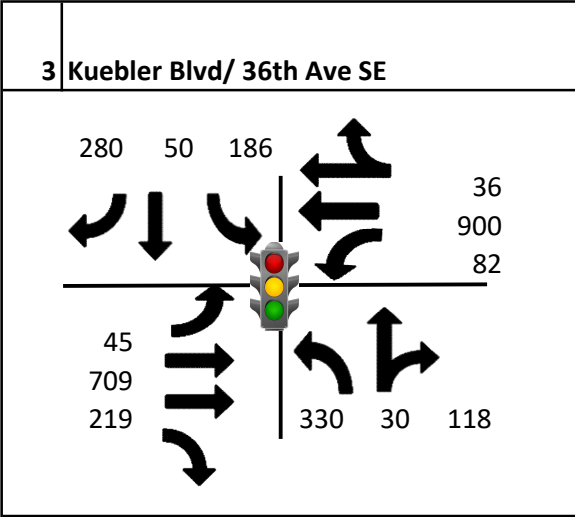
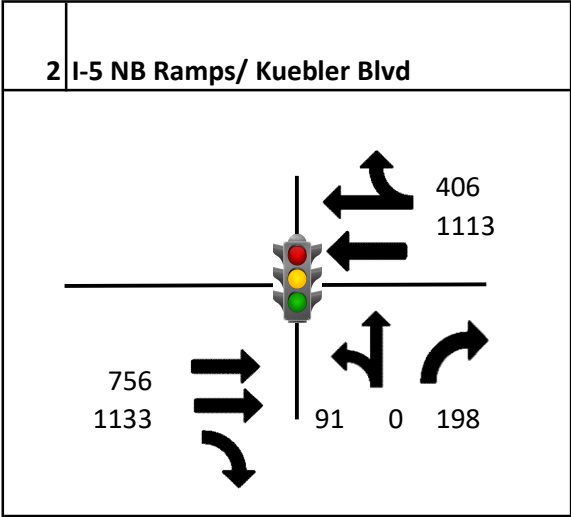
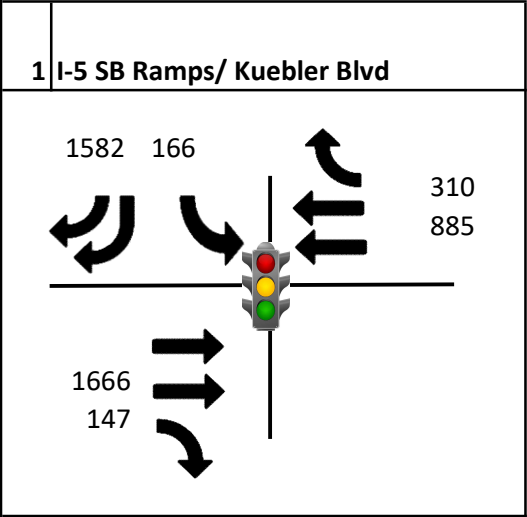
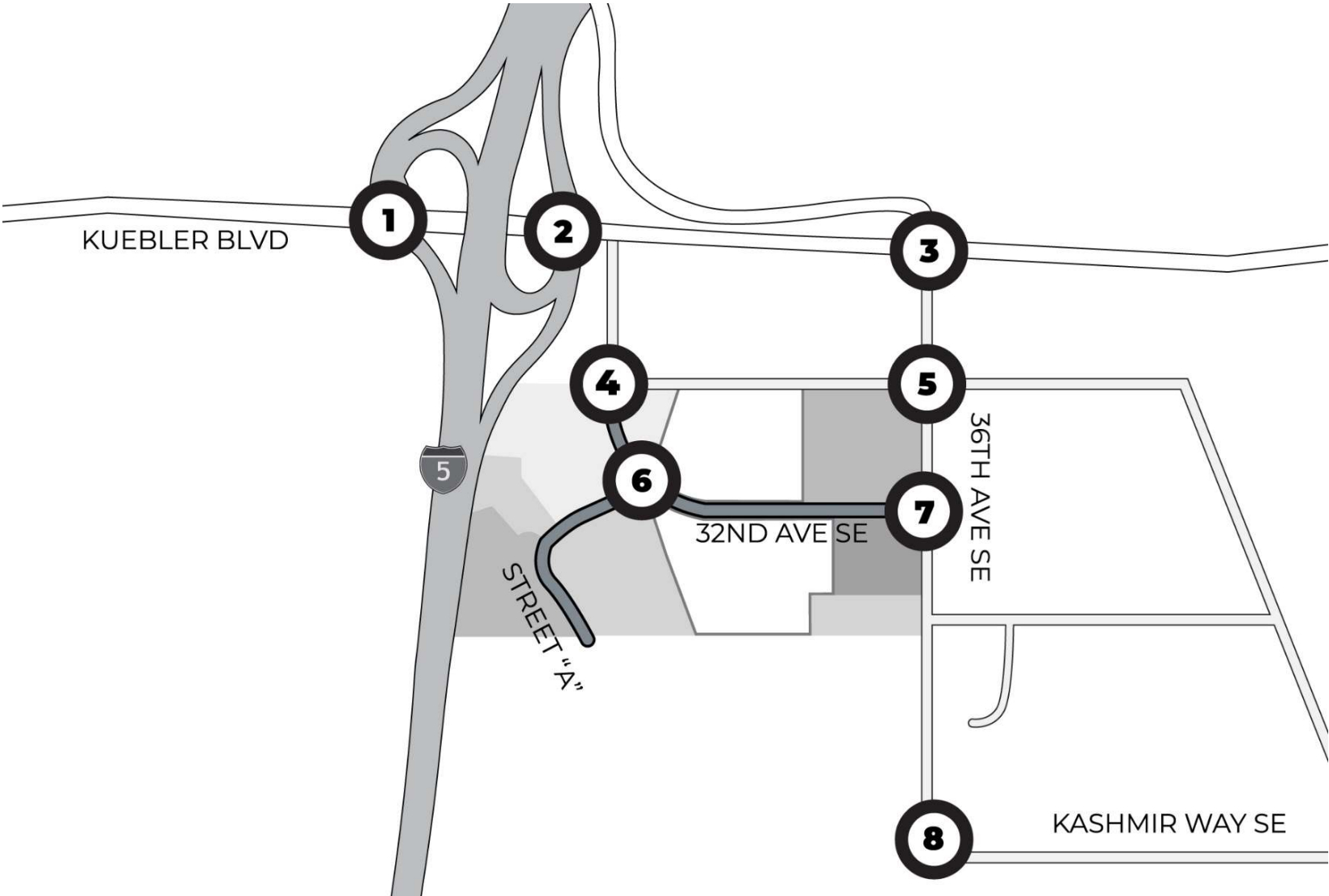


Figure 9: 2025 PM Peak Hour Total Conditions



Vehicle Queuing Analysis

The City of Salem requires a queuing analysis be included in any traffic impact analysis to account for queuing on the roadway network. **Table 12** lists the anticipated queuing at the study intersections. Queues are reported at the 95th percentile using Synchro SimTraffic. The model is calibrated using the ODOT Analysis Procedures Manual (APM) SimTraffic guidance.

The queuing analysis shows the intersection of Kuebler Blvd/ 36th Ave SE available storage for the following movements:

- Northbound left
- Southbound left
- Southbound right
- Eastbound left
- Eastbound right
- Westbound left

These turning movements exceed their available storage in both the 2025 Background and 2025 Total conditions. In addition, there is relatively minor change in the length of queues between the 2025 Background and 2025 Total conditions.

The intersections of 36th Ave SE/ Boone Rd SE and 36th Ave SE/ 32nd Ave SE also see additional queuing on the minor approaches with the build out of the proposed development. This occurs from increased demand along SE 36th Ave.

Table 13: Vehicle Queuing Analysis

No.	Intersection	Movement	Available Storage (ft)	95 th Percentile Queue (ft) (AM/PM)	
				2025 Background	2025 Total Traffic
1	I-5 SB Ramps/ Kuebler Blvd	SBL	>1,000	260/520	390/585
		SBR	>1,000	305/520	305/525
2	I-5 NB Ramps/ Kuebler Blvd	NBR	200	185/160	175/175
3	Kuebler Blvd/ 36 th Ave SE	NBL	200	230/215	200/205
		SBL	125	70/180	65/170
		SBR	125	65/195	65/195
		EBL	375	440/385	420/280
		EBR	>1,000	2,270/2,130	2,170/2,135
		WBL	250	265/240	275/250
4	32 nd Ave SE/ Boone Rd SE	WBL/T/R	>1,000	40/55	40/55
5	36 th Ave SE/ Boone Rd SE	EBL/T/R	>1,000	60/1,020	1,300/1,834
		WBL/T/R	>1,000	60/85	165/325
6	32 nd Ave SE/ Street "A"	EBL/R	100	N/A	55/55
7	32 nd Ave SE/ 36 th Ave SE	EBL/T/R	>1,000	N/A	60/1,060
8	36 th Ave SE/Kashmir Way SE	WBL/T/R	>1,000	70/50	75/55

Locations exceeding available storage by more than 10 feet are shown with ***bold/italicized***
 Values are rounded to the nearest increment of 5

Key Findings

Key findings associated with the proposed development include the following items:

- The proposed development would generate 261 (158 in, 103 out) AM peak hour trips and 299 (125 in, 174 out) PM peak hour vehicle trips.
- All study intersections are expected to operate within mobility standards with the addition of the proposed site for the 2025 opening year, with the exceptions of:
 - I-5 SB Ramps/ Kuebler Blvd
 - I-5 NB Ramps/ Kuebler Blvd
 - Kuebler Blvd/ 36th Ave SE

These intersections fail to meet mobility standards under existing and background conditions as well as with build out of the proposed development.

- At the intersection of Kuebler Blvd/ 36th Ave SE the following movements exceed available storage: NBL, SBL, SBR, EBL, EBR, WBL. It is important to note that these movements fail in both the background (without the development) and total (with development) conditions, and that there is relatively minor changes in the length of queues between the background conditions and with the development. There is also additional queuing that occurs at the intersections of 36th Ave SE with 32nd Ave SE and Boone Rd SE. This results from increased demand on 36th Ave SE.