INTEROFFICE COMMUNICATION

TO: Bob Weaver, P.E, P.S, District 3 Deputy Director
ATTENTION: Scott Ockunzzi, P.E., District 3 Planning Engineer
FROM: Adam Koenig, P.E., Administrator, Office of Roadway Engineering
BY: Mary Bapu-Tamaskar, P.E., Studies Engineer, Office of Roadway Engineering
DATE: September 18, 2023
SUBJECT: LOR-90-10.76 IOS Approval, PID 107714

The Office of Roadway Engineering has reviewed the LOR-90-10.76 Interchange Operations Study. The study formalizes the TSMO project to add mainline capacity along I-90/SR2, resulting in 3-lanes along each direction of travel between the SR2 & I-90 split (on the west side) to the I-90 & SR611 interchange (on the east side). In addition, this study analyzes options to terminate and initiate the 3rd lane on the west side of the project at the SR2 and I-90 split. For the WB I-90 direction, Option #2 is proposed. In the EB direction, the "Alternate EB I-90 Configuration", is proposed; the 3rd EB lane is formed as an add lane from I-90. ORE concurs with the recommendations of the study.

The study meets ODOT requirements for an Interchange Operation Study and is, therefore, approved. If you have any questions, please contact Mary Bapu-Tamaskar at 614-644-7888.

E-SIGNED by Adam Koenig
on 2023-09-18 17:02:03 GMT

AHK: MBT

cc: J. Cichello (D3) – K. Wade (D3)

INTERCHANGE OPERATIONS STUDY

LOR-90-10.76

INTERSTATE 90 AND STATE ROUTE 2 INTERCHANGE

ODOT DISTRICT 3
STUDY PID 107714

AUGUST 30, 2023

PREPARED FOR:

ODOT DISTRICT 3
906 N. CLARK AVENUE
ASHLAND, OHIO 44805

PREPARED BY:

CRAWFORD, MURPHY & TILLY, INC.
8101 N. HIGH STREET
SUITE 150
COLUMBUS, OH 43235

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PROJECT SUMMARY

Location: Interstate 90 and State Route 2 Interchange, Loraine County, Ohio

PID: 107714

Study Sponsor: ODOT District 3

Proposed Work:

In addition to the proposed add-lane project (PID 107714) that converts I-90 into a 6-lane section from the State Route 611 (SR 611) to the State Route 2 (SR 2) interchanges, the following Option 2 configuration as outlined in a previous TSMO study is recommended as the preferred alternative for the WB I-90 at SR-2 interchange. A conceptual layout of the proposed work can be seen in **Figure 1**.

- Right-most (shoulder) lane continues to WB SR-2
- Middle lane is an option lane that can continue to WB SR-2 or exit to WB I-90
- Left-most (median) lane is an exit-only drop lane to WB I-90

The TSMO study assumes that the third EB I-90 lane would be added to the median starting on the bridge over Lake Ave. An alternate configuration is proposed such that EB I-90 ramp forms a third lane on EB I-90. The existing EB SR-2 lanes (2) become the middle and new inside EB lanes on I-90.

STUDY AREA

Both I-90 and SR-2 are east-west routes located in the northern part of Lorain County that connects Erie and Cuyahoga counties, crossing multiple cities and providing access to Ohio Turnpike. The study area is from west of the I-90 and SR-2 interchange to east of the I-90 and SR-611 interchange.

HCS ANALYSIS LOCATIONS

Basic Freeway Analysis

- EB / WB I-90 west of I-90 at SR-2 Interchange
- EB / WB SR-2 west of I-90 at SR-2 Interchange
- EB I-90 between SR-2 and SR-57 Interchanges
- EB / WB I-90 below SR-57
- EB / WB I-90 between SR-57 and SR-254 Interchanges
- EB / WB I-90 below SR-254
- EB / WB I-90 between SR-254 and SR-611 Interchanges
- EB / WB I-90 below SR-611 (2-lane section, No Build)
- EB / WB I-90 below SR-611 (3-lane section)
- EB / WB I-90 east of SR-611

FIGURE 1: I-90 AT SR-2 PREFERRED ALTERNATIVE (OPTION 2 FROM TSMO STUDY)

Note: Graphics courtesy of October 2021 TSMO study

Ramp Analysis

- EB I-90 and EB SR-2 Merge (Merge Analysis)
- EB I-90 exit ramp to SR-57 (Diverge Analysis)
- EB I-90 between SR-2 and SR-57 (Weave Analysis, Build)
- EB I-90 entrance ramp from SR-57 (Merge Analysis)
- EB I-90 exit ramp to SR-254 (Diverge Analysis)
- EB I-90 entrance ramp from SR-254 (Merge Analysis)
- EB I-90 exit ramp to SR-611 (Diverge Analysis)
- EB I-90 entrance ramp from SR-611 (Merge Analysis)
- WB I-90 exit ramp to SR-611 (Diverge Analysis)
- WB I-90 entrance ramp from SR-611 (Merge Analysis)
- WB I-90 exit ramp to SR-254 (Diverge Analysis)
- WB I-90 entrance ramp from SR-254 (Merge Analysis)
- WB I-90 exit ramp to SR-57 (Diverge Analysis)
- WB I-90 between SR-57 and SR-2 (Weave Analysis)

A study area map in **Figure 2** shows the analysis locations above for the study.

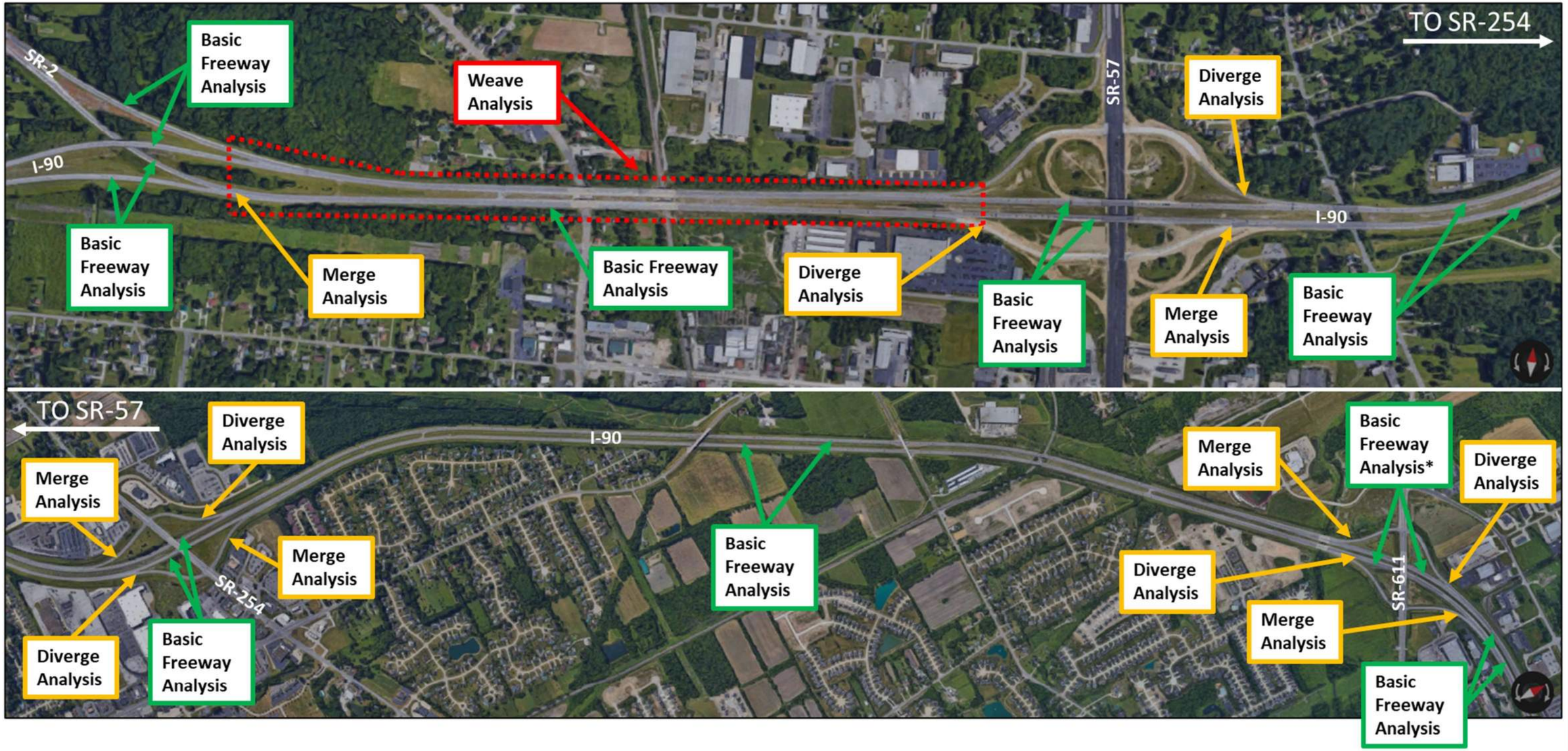
BACKGROUND

The section of I-90 between SR-2 and SR-611 was identified as the highest need freeway segment in District 3 according to the Traffic Operations Assessment Systems Tool (TOAST). The section has a substandard TOAST score between 34.8% and 44.3%. A TSMO study dated October 2021 recommended widening of I-90 to 6-lanes within the project limits. The SR-2 interchange is located on the west end of the proposed add-lane project (PID 107714). The east terminus is where the existing 6-lane section ends/begins at the SR-611 interchange.

The TSMO study assumes that the third EB I-90 lane would be added to the median starting on the bridge over Lake Ave 2,100 ft east of the SR-2 interchange. Three interchange alternatives on WB I-90 at SR-2 interchange were also evaluated in the TSMO study as depicted in **Figure 3**.

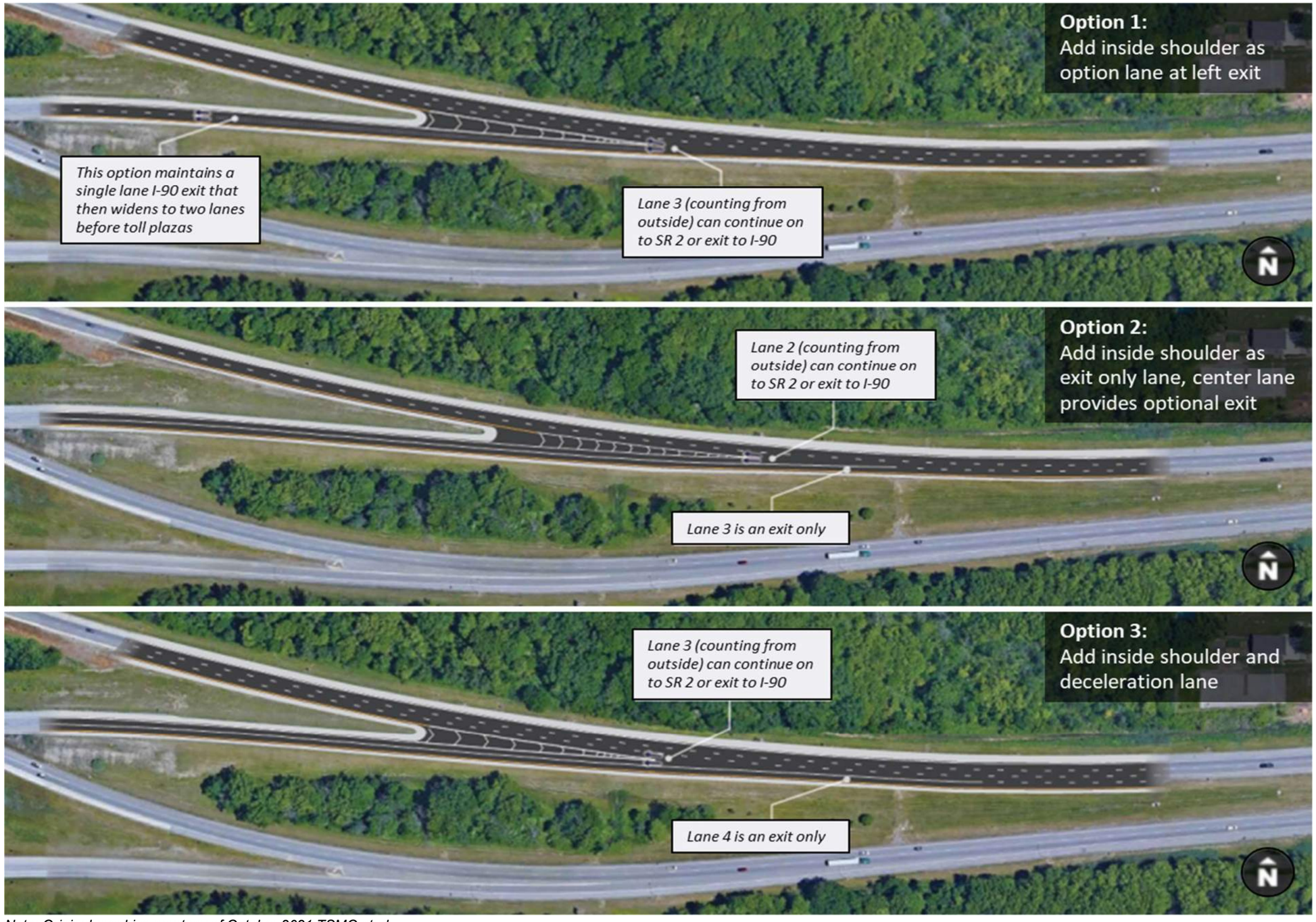
- Option 1: Three lanes on WB I-90 with 3 lanes destined to WB SR-2 and one deceleration lane to WB I-90
- Option 2: Three lanes on WB I-90 with 2 lanes destined to WB SR-2 and 2 lanes destined to WB I-90 (one option lane and a drop lane to WB I-90)
- Option 3: Four lanes on WB I-90 with 3 lanes destined WB SR-2 and 2 lanes destined to WB I-90 (one option lane and a drop lane to WB I-90). The 4th lane is assumed to be an add lane from WB SR-57 entrance ramp.

FIGURE 2: STUDY AREA MAP WITH ANALYSIS POINTS



**Basic freeway analysis performed for both 2-lane and 3-lane sections of I-90 under SR-611 in the No-Build condition*

FIGURE 3: WB I-90 AT SR-2 INTERCHANGE ALTERNATIVES



Note: Original graphics courtesy of October 2021 TSMO study

The goal of this Interchange Operations Study (IOS) is to identify the preferred lane configuration of the I-90 and SR-2 interchange and to document operations of the existing interchanges within the study limits for Build and No-Build conditions at design year 2045. In addition, an IOS is required when changing lane configurations at a ramp intersection approach or when changing the traffic control type at a ramp intersection.

EXISTING CONDITIONS

I-90 within the study area is an urban four-lane divided freeway from the SR-611 interchange to the SR-2 interchange with two lanes in each direction separated by a grass median. The section east of the SR-611 bridge is a six-lane divided freeway also separated by a grass median. The freeway has a posted speed limit of 65 mph and includes other grade-separated interchanges. In the westbound direction, WB I-90 diverges at the west end of the study limits and becomes a toll facility (Ohio Turnpike with I-80. The majority of SR-2 west of the study area is an urban four-lane divided freeway with two lanes in each direction separated by a grass median. The existing lane configuration of the WB I-90 at the SR-2 interchange is as follows:

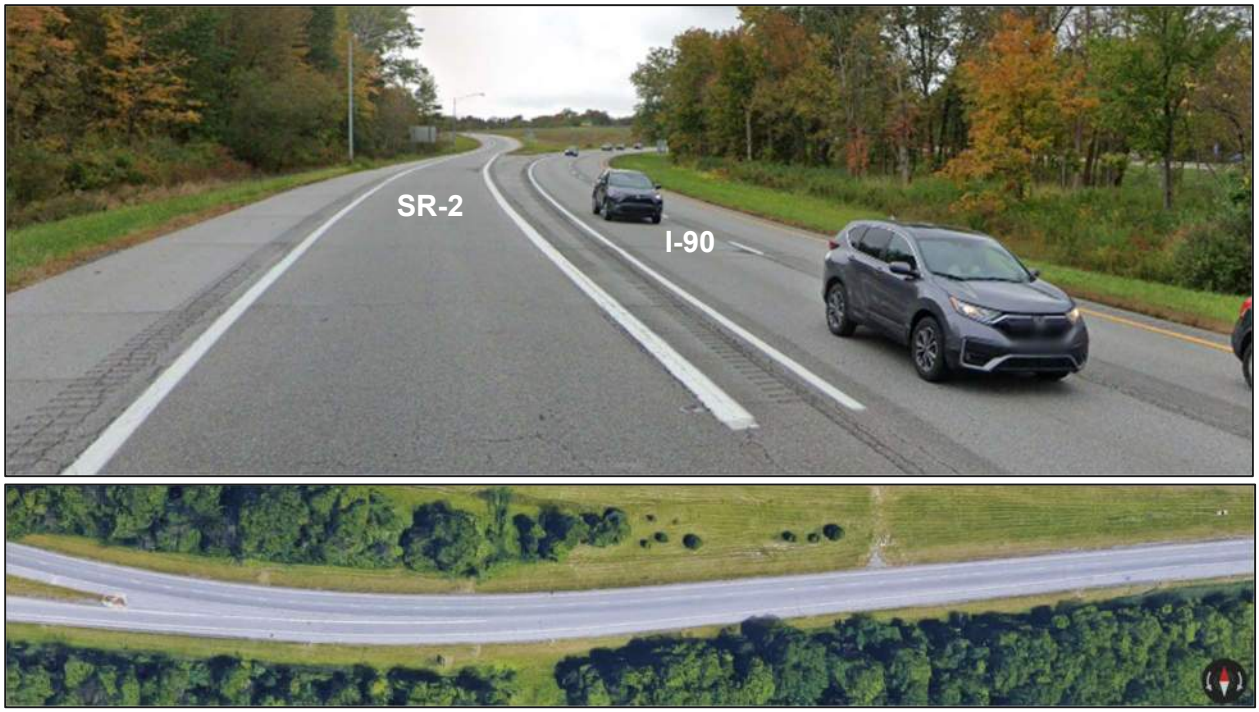
- One lane (right lane) destined to WB SR-2
- An option lane (left lane) to either WB I-90 or to WB SR-2.

Figure 4 shows WB approach in advance of the interchange.

FIGURE 4: WB I-90 / SR-2 EAST OF INTERCHANGE

In the eastbound direction, an EB I-90 lane merges with two EB SR-2 lanes at the west end of the study limits. **Figure 5** shows EB merge section at the interchange.

FIGURE 5: EB I-90 / SR-2 EAST OF INTERCHANGE



A 44 feet wide bridge on WB SR-2 exists over Murray Ridge Rd having two WB lanes and left/right shoulders that is approximately 2,500 feet west of the existing WB I-90 at SR-2 interchange gore. Note the required taper length from a 3-lane to a 2-lane section per OMUTCD Section 3B.02 is calculated at 780 feet, therefore no bridge reconstruction is expected for any of the TSMO alternatives. See **Figure 6** for the bridge location.

FIGURE 6: WB SR-2 BRIDGE LOCATION

TRAFFIC ANALYSES

Options 2 and 3 identified in the October 2021 TSMO study were evaluated due to the option lane offered by both alternatives for two reasons:

- An option lane at the SR-2 interchange reduces weaving of SR-57 traffic destined to I-80.
- Confirm the need for three lanes destined to WB SR-2.

The location for the added third EB I-90 lane assumed in the TSMO study was also evaluated.

TRAFFIC VOLUMES AND ANALYSES

Opening year (2025) and design year (2045) certified traffic Design Hourly Volume (DHV) plates dated January 27th, 2022 developed for the TSMO study were used for analyses. Note that the Build volumes are different and higher than the No-Build volumes. The certified traffic plates can be found in **Appendix A**.

Capacity analyses of the 2045 design year No-Build and Build conditions were performed using the Highway Capacity Manual (HCM) 7th Edition (Transportation Research Board, 2022). Highway Capacity Software 2023 was used for all capacity analyses. **Table 1** shows the HCM level of service (LOS) thresholds for freeway facilities and each corresponding segment (basic, merge/diverge, and weave) included in the study area.

TABLE 1: HCM LOS CRITERIA

Level of Service (LOS)	Urban Freeway Facilities	Basic Freeway Segment	Merge & Diverge Segment	Weave Segment
	Density (pc/mi/ln)	Density (pc/mi/ln)	Density (pc/mi/ln)	Density (pc/mi/ln)
A	0-11	0-11	0-10	0-10
B	>11-18	>11-18	>10-20	>10-20
C	>18-26	>18-26	>20-28	>20-28
D	>26-35	>26-35	>28-35	>28-35
E	>35-45	>35-45	>35	>35-43
F	>45 or V/C ratio > 1.00	>45 or V/C ratio > 1.00	Demand Exceeds Capacity	>43 or Demand Exceeds Capacity

FREEWAY ANALYSIS

HCS 2023 software was utilized to analyze the freeway facility including basic freeway, merge/diverge, and weave segments on I-90 and SR-2. Capacity analysis results for TSMO Options 2 and 3 are the same for EB I-90 since both alternatives share the same improvements. In addition, the operations of I-90 west of the SR-2 interchange in both directions are the same for the No-Build and Build conditions since there are no changes to the existing configuration.

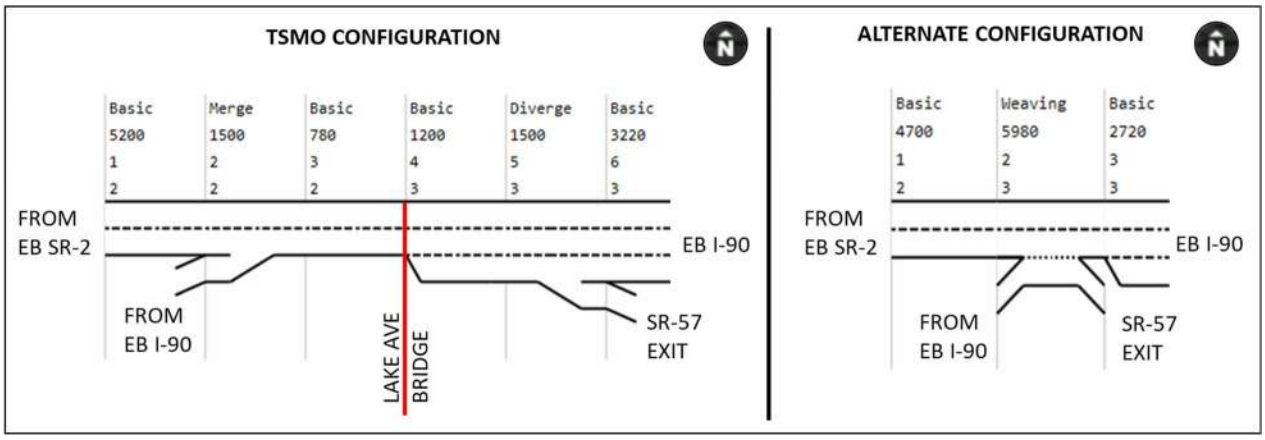
EB I-90 configuration between the SR-2 interchange and the SR-57 interchange assumed in the TSMO study was analyzed such that the 3-lane section starts on the bridge over Lake Ave, resulting in a 780 ft 2-lane basic segment east of the I-90 and SR-2 merge segment, followed by a 1,200 ft 3-lane basic segment. An alternate configuration is analyzed such that the EB I-90 ramp forms a third lane on EB I-90. The existing EB SR-2 lanes (2) become the middle and new inside EB lanes on I-90. This alternate configuration would avoid a merge condition but introduces a potential weave area between the SR-2 interchange and the SR-57 interchange. Therefore, this segment was analyzed as a 5,980 ft weave segment despite not meeting the HCM definition of a weave segment. A schematic of the alternate configuration is shown in **Figure 7**. The following assumptions were applied to the Alternate EB I-90 weave segment due to the limitations of HCS:

- Weave segment analyzed as having 2 EB I-90 lanes and 1 auxiliary lane connecting I-90 entrance ramp and SR-57 exit ramp.
- Minimum 1-lane ramp-to-freeway weave is assumed. Doing so inherently assumes all of I-90 entrance ramp traffic moves from the right EB I-90 lane to the middle EB I-90 lane.

HCS segment diagrams for the TSMO study and alternate configuration are shown in **Figure 8**. Operations of EB I-90 segments east of SR-57 are the same between the TSMO and Alternate configurations since the two alternatives share the same improvements (convert 2-lane to 3-lane) at these locations.

FIGURE 7: ALTERNATE EB I-90 CONFIGURATION SCHEMATIC

FIGURE 8: TSMO AND ALTERNATE EB I-90 HCS SEGMENT DIAGRAMS

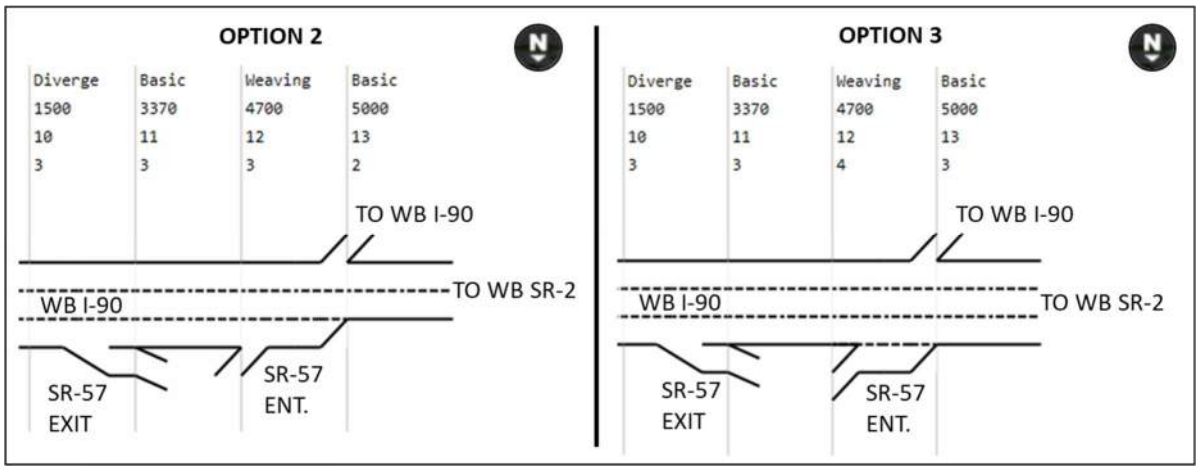


The WB I-90 segment between the SR-2 interchange and the SR-57 interchange is a conventional merge (SR-57) followed by a basic segment and a major diverge (SR-2). Although WB I-90 between these interchanges does not meet the HCM definition of a weave segment, it is analyzed as a 5,300 ft weave for the No-Build, Option 2, and Option 3 conditions to verify any potential problems caused by weaving type movements from SR-57 to the SR-2 / I-90 split. The following assumptions were applied to the capacity analyses due to the limitations of HCS:

- The option lane in Options 2 and 3 is not modeled in the analyses.
- Option 2 analyzed as having a minimum 1-lane ramp-to-ramp weave. Doing so inherently assumes that all of traffic coming from SR-57 uses the option lane to travel to WB I-90.
- Option 3 analyzed as having a minimum 2-lane ramp-to-ramp weave. Doing so inherently assumes that all of traffic coming from SR-57 uses the option lane to travel to WB I-90.

HCS segment diagrams for Options 2 and 3 are shown in **Figure 9**. Note that the minimum number of ramp-to-ramp lanes modeled in HCS is not graphically shown in the segment diagrams. Operations of WB I-90 segments east of SR-57 are the same between Options 2 and 3 since the two alternatives share the same improvements (convert 2-lane to 3-lane) at these locations.

FIGURE 9: TSMO OPTION 2 AND OPTION 3 WB I-90 HCS SEGMENT DIAGRAMS



The free flow speed of 70 mph (speed limit +5 mph) is assumed on I-90 and SR-2 based on guidance from OATS Section 4.6. A ramp free flow speed of 55 mph is assumed. Per guidance on OATS Section 5.1 level terrain is assumed since the steepest observed grade is 2.7% and occurs less than ½ mile on I-90 west of the SR-57 interchange.

Because Peak Hour Factors (PHF) are not provided in the certified traffic plates, PHF of 0.94 was applied to both freeway and ramp approaches following OATS Section 5.2 guidance. Truck percentages presented in the certified traffic plates were used. The results of the HCS analyses are summarized in **Table 2** and **Table 3**.

TABLE 2: 2045 NO-BUILD AND BUILD FREEWAY FACILITIES ANALYSIS SUMMARY

I-90 EB	2045 AM			2045 PM		
	NO BUILD	TSMO	ALTERNATE	NO BUILD	TSMO	ALTERNATE
Faciltity Length, mi	9.01	9.01	9.01	9.01	9.01	9.01
Space Mean Speed, mi/h	63.10	66.80	65.20	65.40	67.80	66.10
Avg. Density, pc/mil/ln	29.20	22.20	22.30	25.60	19.80	19.90
Avg. Density, veh/mi/ln	26.30	20.00	20.10	23.10	17.90	18.00
Avg. Travel Time, min	8.60	8.10	8.30	8.30	8.00	8.20
LOS	D	C	C	C	C	C
I-90 WB	**2045 AM**			**2045 PM**		
	NO BUILD	OPTION 2	OPTION 3	NO BUILD	OPTION 2	OPTION 3
Faciltity Length, mi	8.99	8.99	8.99	8.99	8.99	8.99
Space Mean Speed, mi/h	67.60	68.50	68.60	56.60	65.30	66.00
Avg. Density, pc/mil/ln	19.00	14.90	13.90	34.20	25.90	23.90
Avg. Density, veh/mi/ln	17.30	13.60	12.60	31.40	23.60	21.70
Avg. Travel Time, min	8.00	7.90	7.90	9.50	8.30	8.20
LOS	C	B	B	F	C	C

Supplemental TransModeler analysis for the WB I-90 segment between the SR-2 interchange and the SR-57 interchange Option 2 was performed by ODOT District 3 to verify for any potential weaving problems. The analysis shows acceptable operations (LOS C or better) in the segment. HCS reports for all freeway capacity analyses on I-90 and SR-2 can be found in **Appendix B**, and the supplemental TransModeler reports in **Appendix C**.

TABLE 3: 2045 NO-BUILD AND BUILD FREEWAY SEGMENTS ANALYSIS SUMMARY

Segment (EB)	Analysis Type	2045 AM												2045 PM											
		NO BUILD				TSMO				ALTERNATE				NO BUILD				TSMO				ALTERNATE			
		LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*
I-90 West of I-90/SR-2 Merge	Basic	A	5.6	0.16	-	C	23.8	0.68	-	C	23.8	0.68	-	A	10.5	0.31	-	B	13.3	0.39	-	B	13.3	0.39	-
SR-2 West of I-90/SR-2 Merge	Basic	C	20.8	0.60	-	C	22.1	0.63	-	C	22.1	0.63	-	C	22.3	0.64		C	23.7	0.67	-	C	23.7	0.67	-
I-90/SR-2 b/w SR-2 and SR-57 (Weave)	Weave	N/A								D	28.2	0.97	-	N/A								C	25.0	0.79	-
I-90 at SR-2 Merge	Merge	D	33.4	0.90	0.65	E	35.9	0.97	0.74	N/A				D	30.1	0.81	0.36	D	32.4	0.87	0.42	N/A			
I-90/SR-2 b/w SR-2 and SR-57 (2-lane section)	Basic	E	36.6	0.90	-	E	42.1	0.97	-					D	31.5	0.83	-	D	29.1	0.78	-				
I-90/SR-2 b/w SR-2 and SR-57 (3-lane section)	Basic	N/A				C	22.6	0.65	-					N/A				C	20.4	0.59	-				
I-90 Exit Ramp to SR-57	Diverge	E	36.1	0.90	0.51	C	26.6	0.65	0.54					D	33.0	0.83	0.52	C	26.6	0.59	0.55				
I-90 below SR-57	Basic	C	22.8	0.65	-	B	16.1	0.47	-	SEE OPTION 2				C	19.8	0.57	-	B	14.1	0.41	-	SEE OPTION 2			
I-90 Entrance Ramp from SR-57	Merge	D	31.3	0.82	0.37	C	23.1	0.59	0.39					D	28.6	0.75	0.38	C	21.3	0.53	0.40				
I-90 b/w SR-57 and SR-254	Basic	D	31.8	0.83	-	C	20.7	0.60	-					D	27.8	0.76	-	C	18.6	0.54	-				
I-90 Exit Ramp to SR-254	Diverge	D	34.0	0.83	0.28	C	24.8	0.60	0.29					D	31.0	0.76	0.30	C	23.0	0.54	0.32				
I-90 below SR-254	Basic	C	24.7	0.69	-	B	17.2	0.50	-					C	21.1	0.61	-	B	15.0	0.44	-				
I-90 Entrance Ramp from SR-254	Merge	D	32.7	0.87	0.38	C	23.9	0.62	0.40					D	29.1	0.77	0.36	C	21.5	0.55	0.38				
I-90 b/w SR-254 and SR-611	Basic	D	33.9	0.86	-	C	21.5	0.62	-					D	28.3	0.77	-	C	18.9	0.55	-				
I-90 Exit Ramp to SR-611	Diverge	E	35.3	0.86	0.32	C	25.7	0.62	0.34					D	31.4	0.77	0.26	C	23.2	0.55	0.28				
I-90 below SR-611 (2-lane section)	Basic	C	25.7	0.72	-	N/A								C	22.7	0.65	-	N/A							
I-90 below SR-611 (3-lane section)	Basic	B	16.4	0.48	-	B	17.7	0.52	-					B	14.8	0.43	-	B	16.0	0.47	-				
I-90 Entrance Ramp from SR-611	Merge	C	26.7	0.68	0.67	D	30.3	0.73	0.71					C	22.8	0.59	0.52	C	26.1	0.64	0.55				
I-90 east of SR-611	Basic	C	24.8	0.70	-	D	27.3	0.75	-					C	20.9	0.60	-	C	22.7	0.65	-				

Segment (WB)	Analysis Type	2045 AM												2045 PM											
		NO BUILD				OPTION 2				OPTION 3				NO BUILD				OPTION 2				OPTION 3			
		LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*	LOS	Density (pc/mi/ln)	d/c F*	d/c R*
I-90 east of SR-611	Basic	B	15.0	0.44	-	B	16.1	0.47	-	SEE OPTION 2				D	28.4	0.77	-	D	31.7	0.83	-	SEE OPTION 2			
I-90 Exit Ramp to SR-611	Diverge	B	18.9	0.44	0.36	C	20.2	0.47	0.38					F	30.7	0.77	0.67	D	32.9	0.83	0.72				
I-90 below SR-611 (3-lane section)	Basic	B	11.1	0.32	-	B	11.9	0.35	-					F	69.6	0.56	-	C	20.7	0.60	-				
I-90 below SR-611 (2-lane section)	Basic	B	16.6	0.48	-	N/A								F	75.5	0.83	-	N/A							
I-90 Entrance Ramp from SR-611	Merge	C	22.3	0.59	0.22	B	16.2	0.42	0.24					F	35.1	1.01	0.38	C	27.2	0.72	0.40				
I-90 b/w SR-611 and SR-254	Basic	C	21.0	0.61	-	B	14.9	0.43	-					F	38.8	1.04	-	D	27.1	0.74	-				
I-90 Exit Ramp to SR-254	Diverge	C	24.7	0.61	0.27	B	19.2	0.43	0.28					F	38.2	1.04	0.54	D	30.7	0.74	0.58				
I-90 below SR-254	Basic	B	16.2	0.47	-	B	11.7	0.34	-					C	24.2	0.77	-	C	19.0	0.55	-				
I-90 Entrance Ramp from SR-254	Merge	C	21.1	0.56	0.19	B	15.1	0.40	0.20					D	31.3	0.92	0.34	C	24.8	0.66	0.36				
I-90 b/w SR-254 and SR-57	Basic	C	18.9	0.55	-	B	13.6	0.40	-					D	32.2	0.91	-	C	22.8	0.65	-				
I-90 Exit Ramp to SR-57	Diverge	C	22.7	0.55	0.23	B	17.7	0.40	0.24					D	34.5	0.91	0.37	C	27.2	0.65	0.39				
I-90 below SR-57	Basic	B	15.2	0.44	-	A	10.9	0.32	-					F	23.3	0.73	-	C	18.1	0.53	-				
I-90 b/w SR-57 and SR-2 Weave	Weave	C	25.6	0.70	-	B	17.7	0.50	-	B	13.1	0.37	-	F	35.8	1.08	-	D	29.0	0.77	-	C	21.3	0.58	-
SR-2 West of I-90/SR-2 Diverge	Basic	B	17.5	0.51	-	C	18.8	0.55	-	B	12.5	0.37	-	C	22.3	0.75	-	D	30.2	0.80	-	C	18.4	0.54	-
I-90 West of I-90/SR-2 Diverge	Basic	A	5.6	0.16	-	SEE NO BUILD CONDITION								A	10.5	0.31	-	SEE NO BUILD CONDITION							

CONCLUSIONS

Capacity analyses results in **Table 2 and Table 3** show that the EB I-90 configuration assumed in the TSMO study yields poor levels of service (LOS E) at the I-90 and SR-2 merge section and the downstream 2-lane section prior to the added lane in the critical AM peak period during the design year. Conversely, the alternate EB I-90 configuration yields acceptable levels of service (LOS D or better) in both peak periods. Therefore, the alternate EB I-90 configuration is recommended despite the marginally lower average speed (2 MPH slower than TSMO) and longer travel time (12 seconds longer than TSMO) in the freeway facility.

Table 2 and Table 3 also show that WB I-90 Option 2 and Option 3 yields acceptable levels of service (LOS D or better) in both peak periods during the design year. While Option 3 technically performs better in terms of speed, density, and travel time, Option 2 is recommended as the preferred alternative for the following reasons:

- Acceptable levels of service can be achieved without constructing three lanes destined for SR-2.
- WB SR-2 in Option 3 would have to taper back to a 2-lane section prior to the Murray Ridge Rd bridge, which means that the resulting LOS C (2045 PM) for WB SR-2 basic freeway segment west of the I-90/SR-2 interchange would only be applicable for at most 1,700 feet before eventually transitioning to the LOS D shown for Option 2.
- In Option 3 traffic from SR-57 that is travelling to I-90 would need to weave an additional lane.

Note the basic freeway segment on WB SR-2 west of the interchange in the 2045 PM No-Build condition yields LOS C, which is better than the LOS D in Option 2 despite both conditions having 2 lanes. This is due to the algorithm in Freeway Facilities module in HCS that takes into account the “metering” effect of traffic due to bottleneck or overcapacity issues at upstream segments (i.e., LOS F at WB I-90 between SR-57 and SR-2 for the No Build condition).

This report finds that the widening of I-90 to be a 6-lane section and implementing Option 2 identified in the TSMO study are recommended to improve traffic operations within the study area. Adding the new EB I-90 lane based on the alternate configuration in lieu of the TSMO study is recommended to achieve acceptable levels of service.

INTERCHANGE OPERATIONS STUDY
LOR-90-10.76

APPENDIX A: CERTIFIED TRAFFIC VOLUMES

CMT

INTER-OFFICE COMMUNICATION

TO: **Scott Ockunzzi, District 3**

FROM: Bryan Raderstorf, Transportation Engineer, Division of Statewide Planning & Research, Modeling & Forecasting Section

SUBJECT: **LOR-90-10.76, PID 107714**

DATE: January 27, 2022

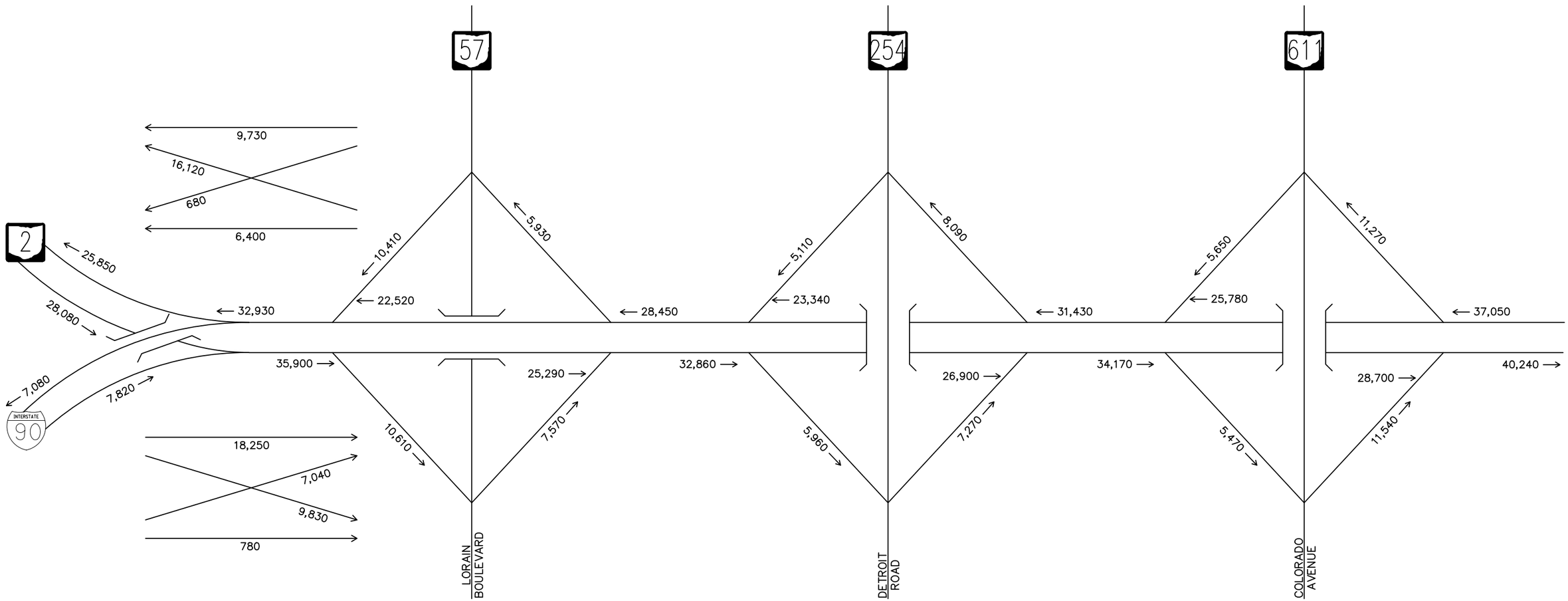
In reply to a request dated January 10, 2022, the plates submitted by GPD Group Inc. have been reviewed and are reasonable for use. Attached are plates showing existing (2020) and opening and design year (2025/2045) volumes for ADT, AM DHV, PM DHV for 4 and 6 lane configurations, as well as existing truck factors. K and D factors can be calculated from plates.

Thanks!

If you have any questions, please contact me at (614) 752-5736.

N

N.T.S.



NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

PLATE 1

EXISTING YEAR 2020
ADT

MARCH 2021 (REV. JANUARY 2022)

Drawing File: G:\2020\2020089 ODOT D12-D3 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\4-Lane Volumes\PLATE 1 - 2020 ADT.dwg Layout: PLATE 1
Date: Jan 07, 2022 Time: 2:06 pm Twist: 0
Technician: bferrell

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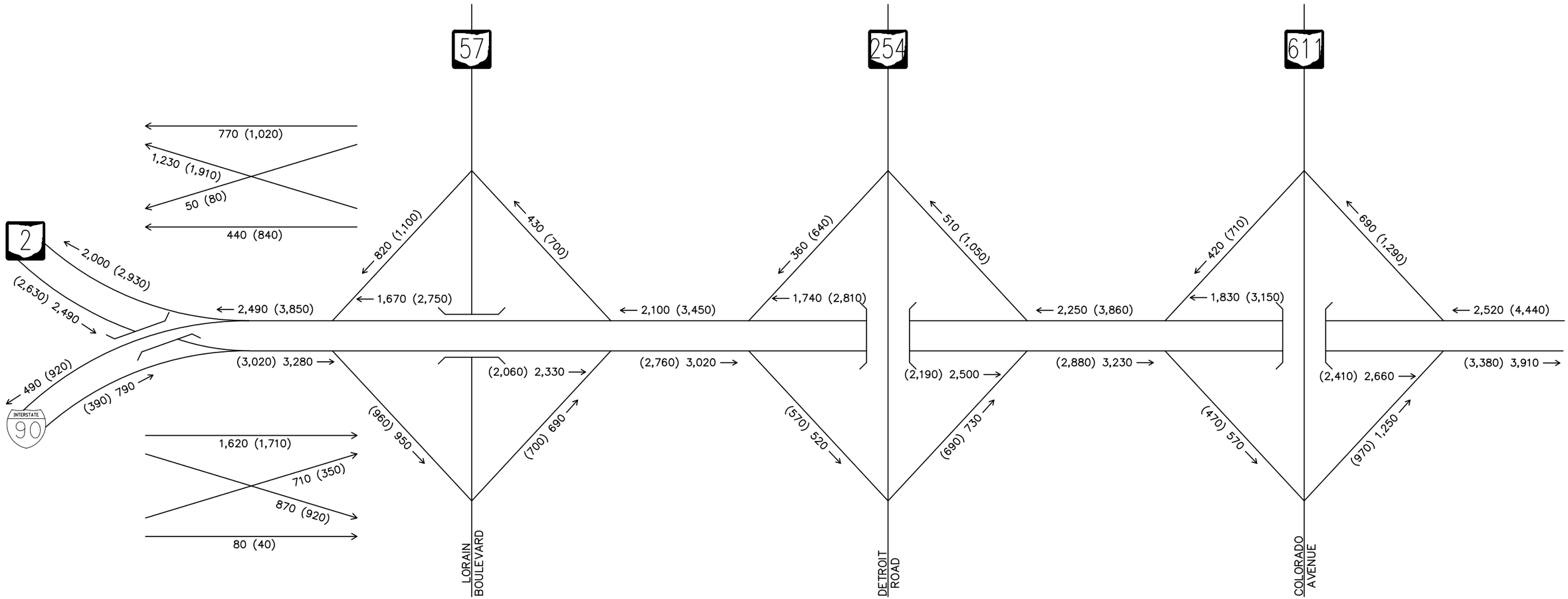
N.T.S.



NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

- AM DHV
(##) - PM DHV

PLATE 2

EXISTING YEAR 2020
AM / PM DHV

MARCH 2021 (REV. JANUARY 2022)

N

N.T.S.

57

254

611

2

INTERSTATE 90

9,830 (10,220)

16,480 (17,920)

680 (710)

6,550 (7,120)

← 26,310 (28,140)

(28,880) 28,260 →

← 7,230 (7,830)

(10,320) 8,290 →

← 10,510 (10,930)

← 5,990 (6,230)

← 5,160 (5,370)

← 8,170 (8,490)

← 5,710 (5,930)

← 11,380 (11,830)

← 33,540 (35,970)

← 23,030 (25,040)

← 29,020 (31,270)

← 23,860 (25,900)

← 32,030 (34,390)

← 26,320 (28,460)

← 37,700 (40,290)

(39,200) 36,550 →

(28,060) 25,830 →

(36,010) 33,480 →

(29,750) 27,460 →

(37,380) 34,800 →

(31,640) 29,280 →

(43,760) 40,940 →

(11,140) 10,720 →

(7,950) 7,650 →

(6,260) 6,020 →

(7,630) 7,340 →

(5,740) 5,520 →

(12,120) 11,660 →

18,370 (18,770)

7,460 (9,290)

9,890 (10,110)

830 (1,030)

LORAIN BOULEVARD

DETROIT ROAD

COLORADO AVENUE

NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

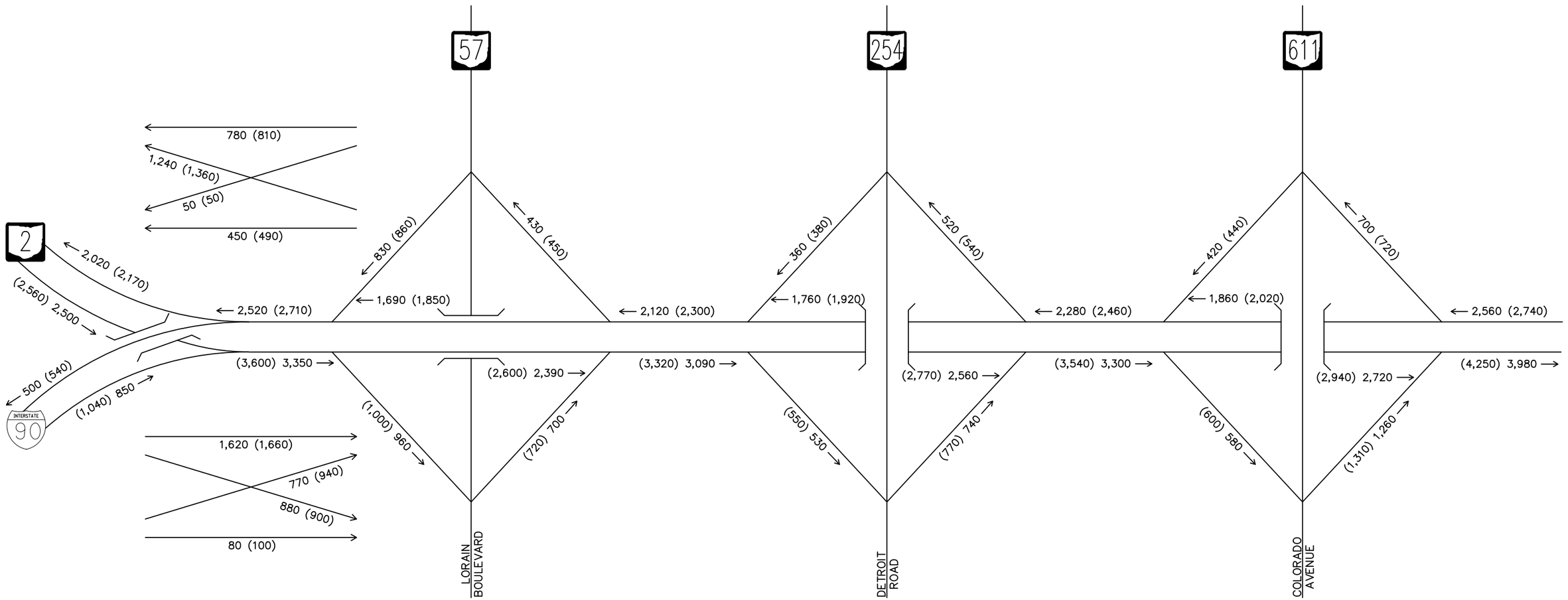
- YEAR 2025 VOLUME
(##) - YEAR 2045 VOLUME

PLATE 3

YEAR 2025 / YEAR 2045
ADT
4 LANES

MARCH 2021 (REV. JANUARY 2022)

Drawing File: G:\2020\2020089 ODOT D12-D3 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\4-Lane Volumes\PLATE 3 - 2025 & 2045 ADT.dwg Layout: PLATE 3
Date: Jan 07, 2022 Time: 2:19 pm Tablet: 0
Technician: bferrell



NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

- YEAR 2025 VOLUME
(##) - YEAR 2045 VOLUME

PLATE 4

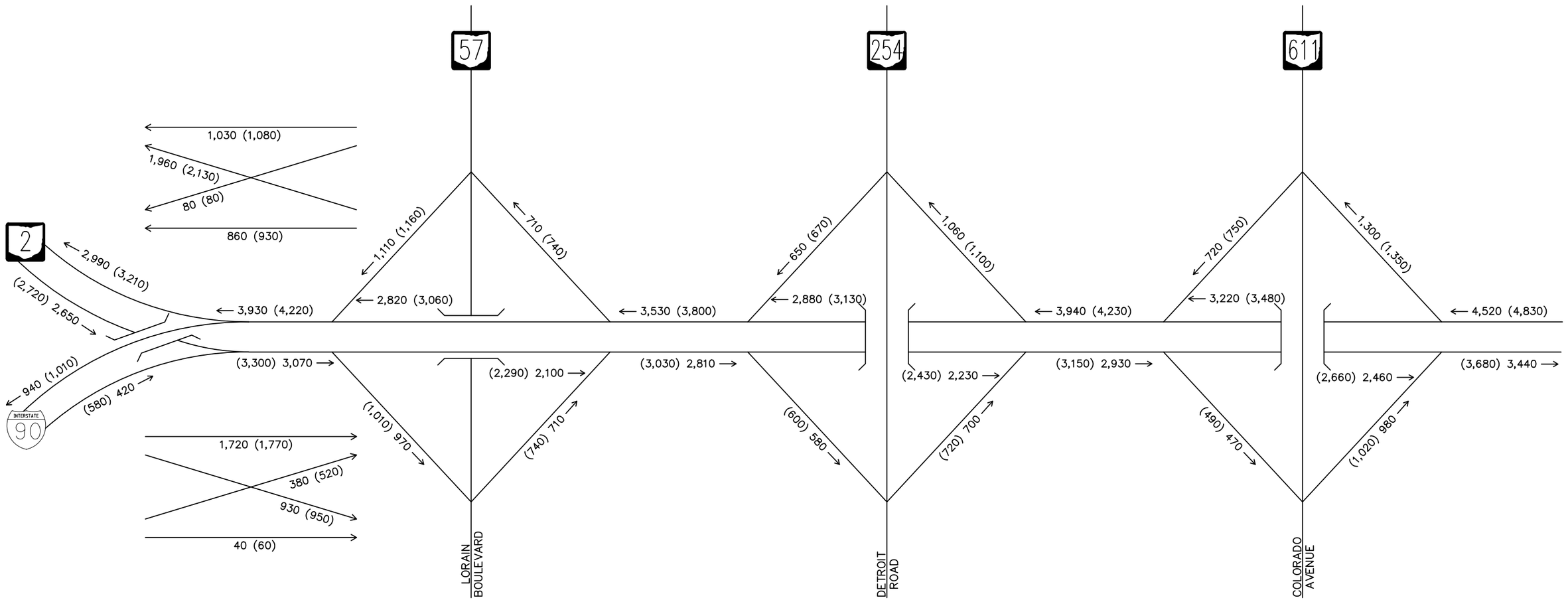
YEAR 2025 / YEAR 2045
AM DHV
4 LANES

MARCH 2021 (REV. JANUARY 2022)

Drawing File: G:\2020\2020089 ODOT D12-D3 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\4-Lane Volumes\PLATE 4 - 2025 & 2045 AM DHV.dwg Layout: PLATE 4
Date: Jan 07, 2022 Time: 2:28 pm Twist: 0
Technician: bferrell

N

N.T.S.



NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

- YEAR 2025 VOLUME
(##) - YEAR 2045 VOLUME

PLATE 5

YEAR 2025 / YEAR 2045
PM DHV
4 LANES

MARCH 2021 (REV. JANUARY 2022)

Drawing File: G:\2020\2020089 ODOT D12-D3 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\4-Lane Volumes\PLATE 5 - 2025 & 2045 PM DHV.dwg Layout: PLATE 5
Date: Jan 07, 2022 Time: 2:30 pm Twist: 0
Technician: bferrell

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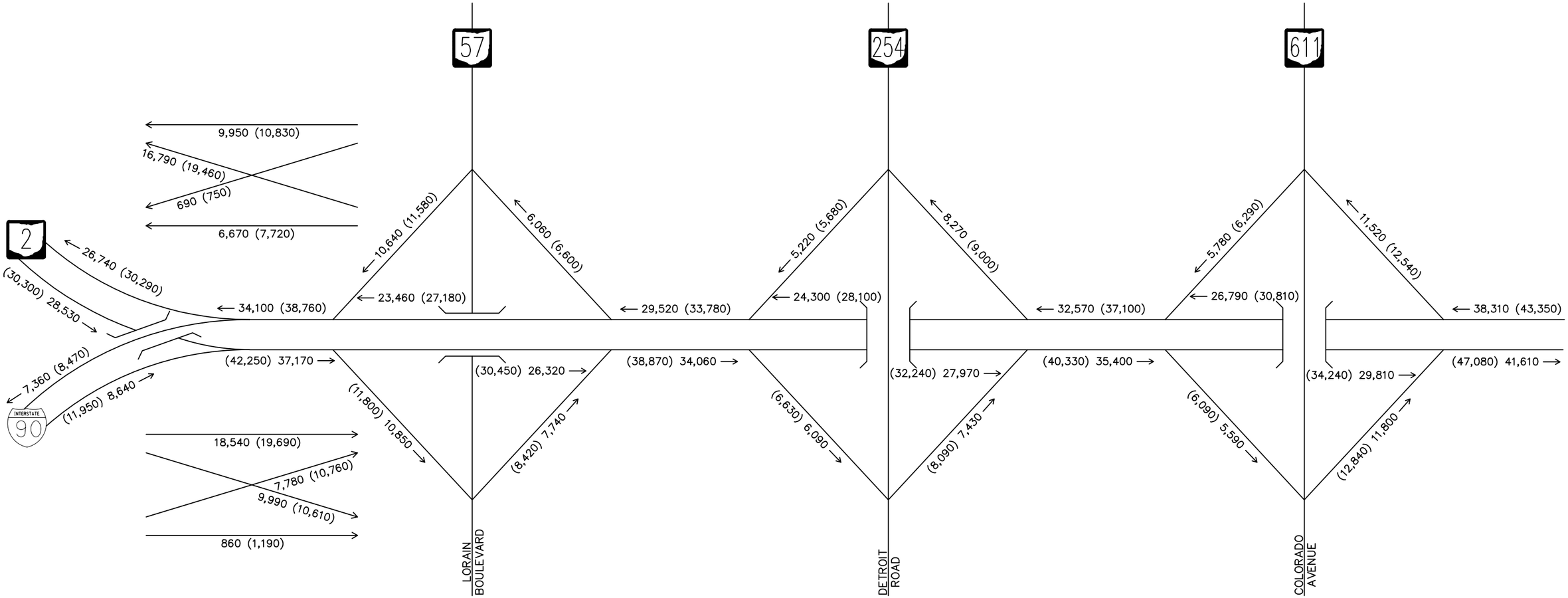

NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

- YEAR 2025 VOLUME
(##) - YEAR 2045 VOLUME

PLATE 6

YEAR 2025 / YEAR 2045
ADT
6 LANES

JANUARY 2022

Drawing File: Q:\2020\2020089 ODOT D12-D3 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\6-Lane Volumes\PLATE 6 - 2025 & 2045 ADT.dwg Layout: PLATE 6
Date: Jan 10, 2022 Time: 9:20 am Tablet: 0
Technician: bferrell

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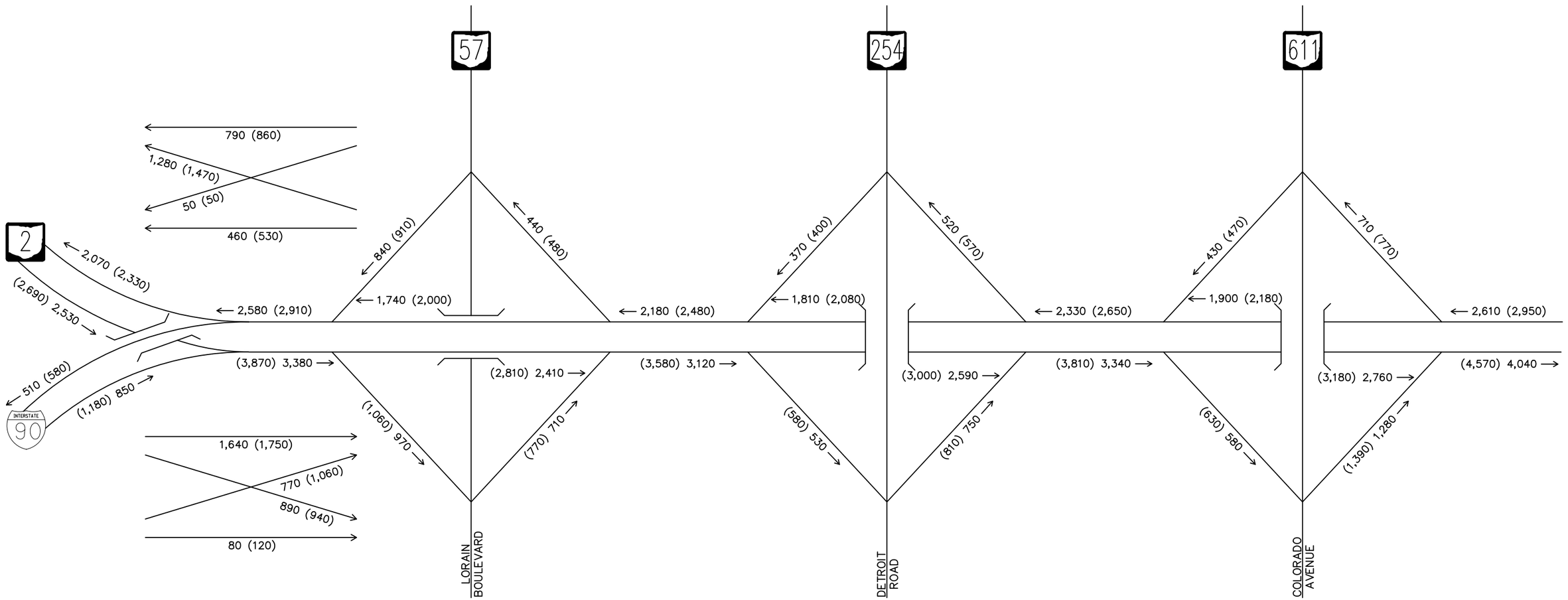

NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

- YEAR 2025 VOLUME
(##) - YEAR 2045 VOLUME

PLATE 7

YEAR 2025 / YEAR 2045
AM DHV
6 LANES

JANUARY 2022

Drawing File: G:\2020\2020089 ODOT D12-D3 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\6-Lane Volumes\PLATE 7 - 2025 & 2045 AM DHV.dwg Layout: PLATE 7
Date: Jan 10, 2022 Time: 9:25 am Tablet: 0
Technician: bferrell

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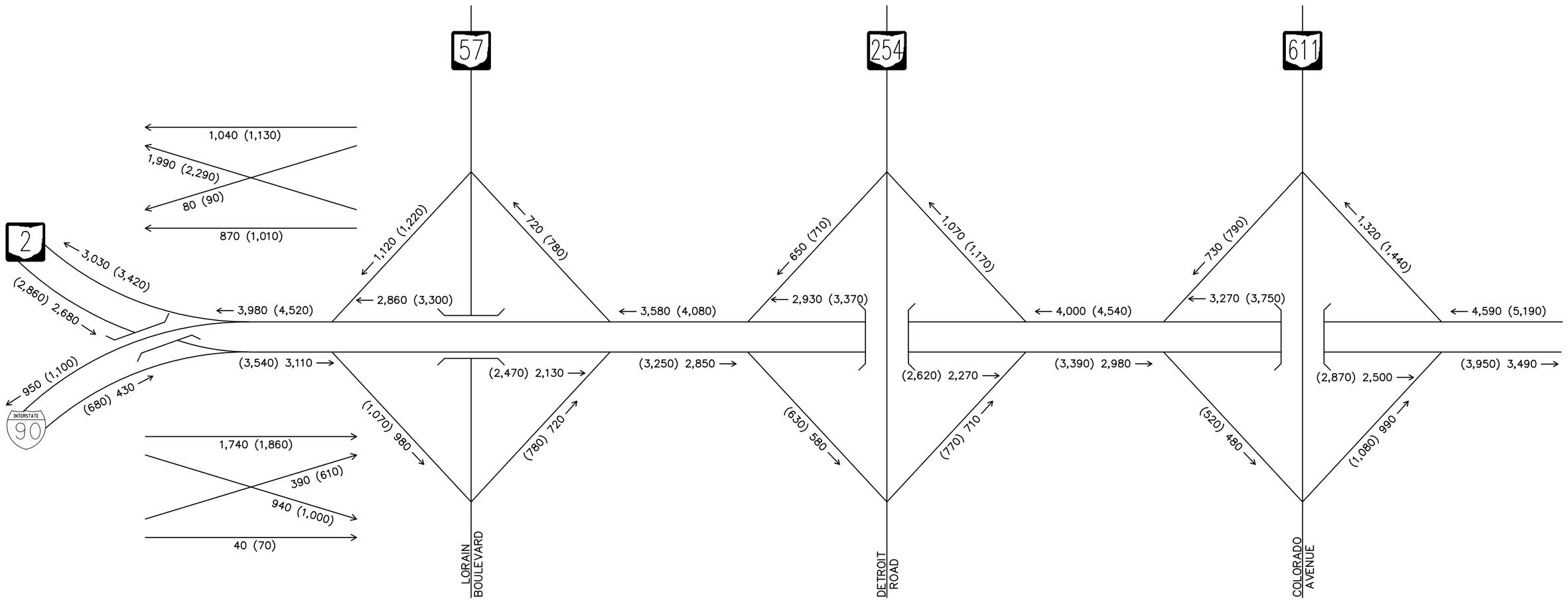
N.T.S.



NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

- YEAR 2025 VOLUME
(##) - YEAR 2045 VOLUME

PLATE 8

YEAR 2025 / YEAR 2045
PM DHV
6 LANES

JANUARY 2022

Drawing File: G:\2020\2020089 ODOT D12-D3 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\6-Lane Volumes\PLATE 8 - 2025 & 2045 PM DHV.dwg Layout: PLATE 8
Date: Jan 10, 2022 Time: 9:28 am Tablet: 0
Technician: bferrell

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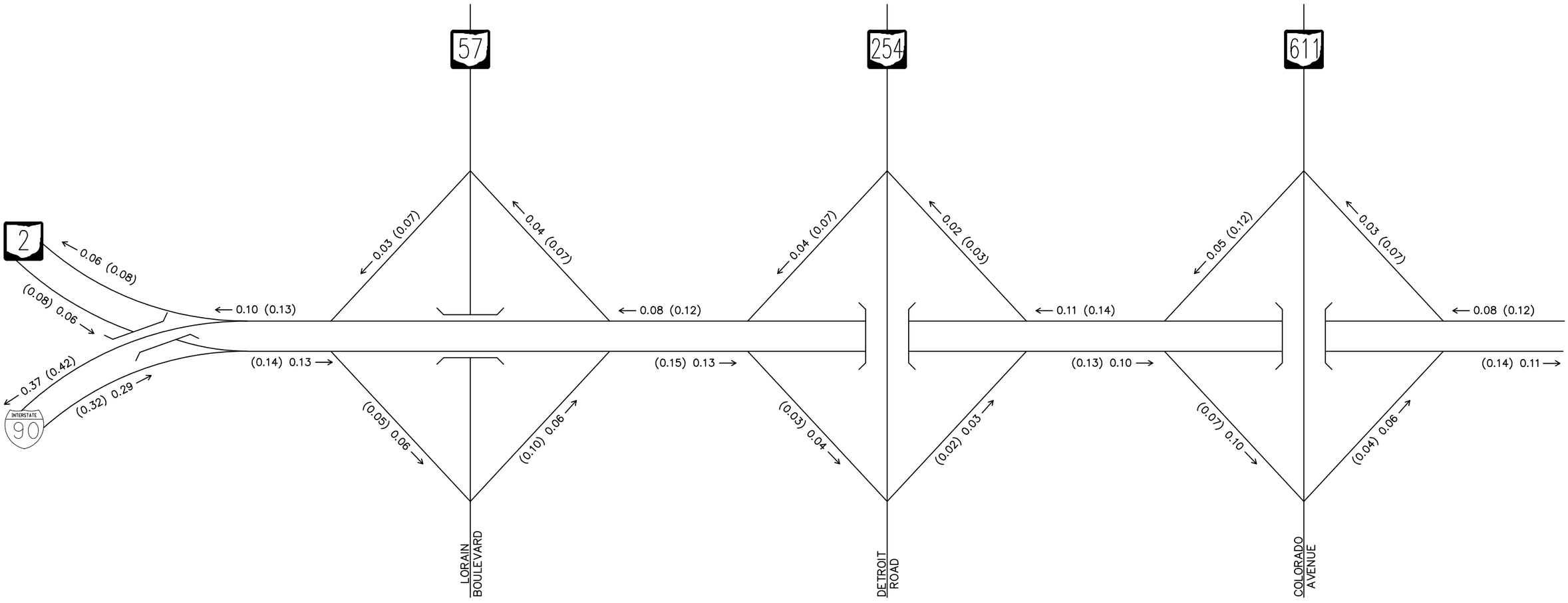


NOTE:
COUNTS COLLECTED DURING COVID-19 PANDEMIC AND FACTORED PER ODOT MODELING AND FORECASTING GUIDANCE.

LEGEND

- TD
(##) - T24

ATTACHMENT H

TD & T24 VALUES

MARCH 2021

Drawing File: C:\2020\2020089 ODOT D12-03 Traffic TO\03-01 LOR-90 Certified Traffic\Design\Traffic\Study\Figures\Attachment H - TD & T24 Values.dwg Layout: PLATE 4
Date: Jan 04, 2022 Time: 9:17 am Twist: 0
Technician: bferrell

INTERCHANGE OPERATIONS STUDY
LOR-90-10.76

APPENDIX B: HCS CAPACITY ANALYSIS

CMT

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Facility Name	I-90 EB NO BUILD	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	16
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	9.01		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SR-2 West of I-90/SR-2 Merge	5200	2
2	Merge	Merge	I-90 at SR-2 Merge	1500	2
3	Basic	Basic	I-90/SR-2 b/w SR-2 and SR-57	1980	2
4	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	2
5	Basic	Basic	I-90 below SR-57	3220	2
6	Merge	Merge	I-90 Entrance Ramp from SR-57	1500	2
7	Basic	Basic	I-90 b/w SR-57 and SR-254	7240	2
8	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	2
9	Basic	Basic	I-90 below SR-254	2330	2
10	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	2
11	Basic	Basic	I-90 b/w SR-254 and SR-611	11310	2
12	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	2
13	Basic	Basic	I-90 below SR-611 (2-lane section)	850	2
14	Basic	Basic	I-90 below SR-611 (3-lane section)	1710	3
15	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
16	Basic	Basic	I-90 east of SR-611	3230	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	2888	4800	0.60	69.3	20.8	C

Segment 2: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	

1	0.94	0.94	0.943	0.775	4316	1428	4800	2200	0.90	0.65	55.4	55.4	39.0	33.4	D

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	4327	4800	0.90	59.2	36.6	E

Segment 4: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	4327	1128	4800	2200	0.90	0.51	62.4	62.4	34.7	36.1	E

Segment 5: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3125	4800	0.65	68.5	22.8	C

Segment 6: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	3937	812	4800	2200	0.82	0.37	57.7	57.7	34.1	31.3	D

Segment 7: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3991	4800	0.83	62.7	31.8	D

Segment 8: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.962	3991	608	4800	2200	0.83	0.28	63.8	63.8	31.3	34.0	D

Segment 9: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3330	4800	0.69	67.5	24.7	C

Segment 10: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.971	4174	844	4800	2200	0.87	0.38	56.4	56.4	37.0	32.7	D

Segment 11: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	4143	4800	0.86	61.2	33.9	D

Segment 12: Diverge

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.909	4143	702	4800	2200	0.86	0.32	63.5	63.5	32.6	35.3	E

Segment 13: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3441	4800	0.72	66.9	25.7	C

Segment 14: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3441	7200	0.48	69.6	16.4	B

Segment 15: Merge

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.943	4919	1478	7200	2200	0.68	0.67	61.8	60.1	26.5	26.7	C

Segment 16: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.901	5018	7200	0.70	67.4	24.8	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	7981	7225	12.54	313.43	63.1	29.2	26.3	8.60	D

Facility Overall Results

Space Mean Speed, mi/h	63.1	Average Density, veh/mi/ln	26.3
Average Travel Time, min	8.60	Average Density, pc/mi/ln	29.2
Total VMT, veh-mi	7981	Total VHD, veh-h	12.54
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	313.43

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	E	E	C	D	D	D	C	D	D	E
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	C	C								

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	69.3	55.4	59.2	62.4	68.5	57.7	62.7	63.8	67.5	56.4	61.2	63.5
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	66.9	69.6	61.8	67.4								

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	20.8	39.0	36.6	34.7	22.8	34.1	31.8	31.3	24.7	37.0	33.9	32.6
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	25.7	16.4	26.5	24.8								

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.60	0.90	0.90	0.90	0.65	0.82	0.83	0.83	0.69	0.87	0.86	0.86
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	0.72	0.48	0.68	0.70								

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	19.6	36.8	32.4	30.7	20.2	30.2	28.1	27.7	21.9	32.7	30.8	29.6
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	23.4	14.9	24.1	22.3								

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	33.4	-	36.1	-	31.3	-	34.0	-	32.7	-	35.3
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	-	-	26.7	-								

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	E	E	C	D	D	D	C	D	D	E
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	C	C								

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13	Seg 14	Seg 15	Seg 16								

AP 1	-	-	-	-

Volume - Capacity Ratio (V/C)												
	Seg 1	**Seg 2**	**Seg 3**	**Seg 4**	**Seg 5**	**Seg 6**	**Seg 7**	**Seg 8**	**Seg 9**	**Seg 10**	**Seg 11**	**Seg 12**
AP 1	0.60	0.90	0.90	0.90	0.65	0.82	0.83	0.83	0.69	0.87	0.86	0.86

	Seg 13	**Seg 14**	**Seg 15**	**Seg 16**
AP 1	0.72	0.48	0.68	0.70

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	SR-2 West of I-90/SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5200	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2560	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1444
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.60

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	2	Segment Name	I-90 at SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2560	1040
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	6.00	29.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	0.775
Flow Rate (v_i), pc/h	2888	1428
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.90	0.65

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	55.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	2888	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	4316	Ramp Junction Speed (S), mi/h	55.4
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	39.0
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	33.4

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90/SR-2 b/w SR-2 and SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	1980	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3600	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	2164
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.90

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	59.2
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	36.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	4	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3600	1000
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	4327	1128
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.90	0.51

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	62.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	4327	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	62.4
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	34.7
Level of Service (LOS)	E	Density in Ramp Influence Area (D_R), pc/mi/ln	36.1

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	3220	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2600	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1562
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.65

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	6	Segment Name	I-90 Entrance Ramp from SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	730
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2600	720
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	3125	812
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.82	0.37

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	57.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	3125	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3937	Ramp Junction Speed (S), mi/h	57.7
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	34.1
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	31.3

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 b/w SR-57 and SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	7240	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3320	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1996
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.83

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	62.7
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	31.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	8	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3320	550
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.962
Flow Rate (v_i), pc/h	3991	608
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.83	0.28

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	3991	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	63.8
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	31.3
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	34.0

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	2330	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2770	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1665
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.69

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	24.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	10	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2770	770
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.971
Flow Rate (v_i), pc/h	3330	844
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.87	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	56.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	3330	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	4174	Ramp Junction Speed (S), mi/h	56.4
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	37.0
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	32.7

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 b/w SR-254 and SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	11310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3540	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	2072
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.86

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	61.2
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	33.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	12	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3540	600
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	4143	702
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.86	0.32

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.5
Flow in Lanes 1 and 2 (v_{12}), pc/h	4143	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	63.5
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	32.6
Level of Service (LOS)	E	Density in Ramp Influence Area (D_R), pc/mi/ln	35.3

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	I-90 below SR-611 (2-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	850	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2940	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1720
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.72

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	66.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	25.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Segment Number	14	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	1710	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.67
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2940	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1147
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.48

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.6
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	15	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	940
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2940	1310
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.943
Flow Rate (v_i), pc/h	3441	1478
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.68	0.67

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1944.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1363
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	60.1
Flow in Lanes 1 and 2 (v_{12}), pc/h	2078	Outer Lanes Freeway Speed (S_O), mi/h	66.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3556	Ramp Junction Speed (S), mi/h	61.8
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	26.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	26.7

HCS Basic Freeway Report

Project Information

Segment Number	16	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3230	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4250	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1673
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.70

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.4
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	24.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2080	Heavy Vehicle Adjustment Factor (f_{HV})	0.775
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1428
Total Trucks, %	29.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.59

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.4
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Facility Name	I-90 EB NO BUILD	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	16
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	9.01		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SR-2 West of I-90/SR-2 Merge	5200	2
2	Merge	Merge	I-90 at SR-2 Merge	1500	2
3	Basic	Basic	I-90/SR-2 b/w SR-2 and SR-57	1980	2
4	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	2
5	Basic	Basic	I-90 below SR-57	3220	2
6	Merge	Merge	I-90 Entrance Ramp from SR-57	1500	2
7	Basic	Basic	I-90 b/w SR-57 and SR-254	7240	2
8	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	2
9	Basic	Basic	I-90 below SR-254	2330	2
10	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	2
11	Basic	Basic	I-90 b/w SR-254 and SR-611	11310	2
12	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	2
13	Basic	Basic	I-90 below SR-611 (2-lane section)	850	2
14	Basic	Basic	I-90 below SR-611 (3-lane section)	1710	3
15	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
16	Basic	Basic	I-90 east of SR-611	3230	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3069	4800	0.64	68.7	22.3	C

Segment 2: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	

1	0.94	0.94	0.943	0.775	3865	796	4800	2200	0.81	0.36	58.4	58.4	33.1	30.1	D

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3967	4800	0.83	62.9	31.5	D

Segment 4: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	3967	1139	4800	2200	0.83	0.52	62.4	62.4	31.8	33.0	D

Segment 5: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	2753	4800	0.57	69.6	19.8	C

Segment 6: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	3588	835	4800	2200	0.75	0.38	59.3	59.3	30.3	28.6	D

Segment 7: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3642	4800	0.76	65.5	27.8	D

Segment 8: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.962	3642	664	4800	2200	0.76	0.30	63.6	63.6	28.6	31.0	D

Segment 9: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	2921	4800	0.61	69.2	21.1	C

Segment 10: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.971	3710	789	4800	2200	0.77	0.36	59.0	59.0	31.4	29.1	D

Segment 11: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3687	4800	0.77	65.2	28.3	D

Segment 12: Diverge

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.909	3687	573	4800	2200	0.77	0.26	63.8	63.8	28.9	31.4	D

Segment 13: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3113	4800	0.65	68.5	22.7	C

Segment 14: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3113	7200	0.43	69.8	14.8	B

Segment 15: Merge

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.943	4264	1151	7200	2200	0.59	0.52	63.2	61.7	22.5	22.8	C

Segment 16: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.901	4345	7200	0.60	69.3	20.9	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	7248	6598	7.36	183.92	65.4	25.6	23.1	8.30	C

Facility Overall Results

Space Mean Speed, mi/h	65.4	Average Density, veh/mi/ln	23.1
Average Travel Time, min	8.30	Average Density, pc/mi/ln	25.6
Total VMT, veh-mi	7248	Total VHD, veh-h	7.36
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	183.92

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	D	D	C	D	D	D	C	D	D	D
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	C	C								

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	68.7	58.4	62.9	62.4	69.6	59.3	65.5	63.6	69.2	59.0	65.2	63.8
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	68.5	69.8	63.2	69.3								

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	22.3	33.1	31.5	31.8	19.8	30.3	27.8	28.6	21.1	31.4	28.3	28.9
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	22.7	14.8	22.5	20.9								

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.64	0.81	0.83	0.83	0.57	0.75	0.76	0.76	0.61	0.77	0.77	0.77
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	0.65	0.43	0.59	0.60								

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	21.0	31.2	27.9	28.1	17.5	26.8	24.6	25.3	18.7	27.8	25.7	26.3
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	20.6	13.5	20.5	18.8								

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	30.1	-	33.0	-	28.6	-	31.0	-	29.1	-	31.4
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	-	-	22.8	-								

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	D	D	C	D	D	D	C	D	D	D
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	C	C								

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13	Seg 14	Seg 15	Seg 16								

AP 1	-	-	-	-

Volume - Capacity Ratio (V/C)												
	Seg 1	**Seg 2**	**Seg 3**	**Seg 4**	**Seg 5**	**Seg 6**	**Seg 7**	**Seg 8**	**Seg 9**	**Seg 10**	**Seg 11**	**Seg 12**
AP 1	0.64	0.81	0.83	0.83	0.57	0.75	0.76	0.76	0.61	0.77	0.77	0.77

	Seg 13	**Seg 14**	**Seg 15**	**Seg 16**
AP 1	0.65	0.43	0.59	0.60

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	SR-2 West of I-90/SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5200	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2720	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1534
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.64

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.7
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	2	Segment Name	I-90 at SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2720	580
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	6.00	29.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	0.775
Flow Rate (v_i), pc/h	3069	796
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.81	0.36

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	58.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	3069	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3865	Ramp Junction Speed (S), mi/h	58.4
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	33.1
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	30.1

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90/SR-2 b/w SR-2 and SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	1980	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3300	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1984
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.83

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	62.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	31.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	4	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3300	1010
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	3967	1139
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.83	0.52

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	62.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	3967	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	62.4
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	31.8
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	33.0

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	3220	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2290	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1376
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.57

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.6
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	19.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	6	Segment Name	I-90 Entrance Ramp from SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	730
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2290	740
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	2753	835
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.75	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	2753	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3588	Ramp Junction Speed (S), mi/h	59.3
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	30.3
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	28.6

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 b/w SR-57 and SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	7240	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3030	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1821
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.76

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	65.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	27.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	8	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3030	600
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.962
Flow Rate (v_i), pc/h	3642	664
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.76	0.30

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.6
Flow in Lanes 1 and 2 (v_{12}), pc/h	3642	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	63.6
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	28.6
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	31.0

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	2330	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2430	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1460
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.61

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.2
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	21.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	10	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2430	720
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.971
Flow Rate (v_i), pc/h	2921	789
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.77	0.36

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2921	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3710	Ramp Junction Speed (S), mi/h	59.0
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	31.4
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	29.1

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 b/w SR-254 and SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	11310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3150	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1844
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.77

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	65.2
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	28.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	12	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3150	490
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	3687	573
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.77	0.26

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	3687	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	63.8
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	28.9
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	31.4

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	I-90 below SR-611 (2-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	850	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2660	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1556
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.65

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Segment Number	14	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	1710	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.67
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2660	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1038
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.43

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	14.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	15	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	940
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2660	1020
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.943
Flow Rate (v_i), pc/h	3113	1151
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.59	0.52

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1804.5	Flow Outer Lanes (v_{OA}), pc/h/ln	1233
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	1880	Outer Lanes Freeway Speed (S_O), mi/h	67.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3031	Ramp Junction Speed (S), mi/h	63.2
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	22.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	22.8

HCS Basic Freeway Report

Project Information

Segment Number	16	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3230	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3680	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1448
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.60

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1160	Heavy Vehicle Adjustment Factor (f_{HV})	0.775
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	796
Total Trucks, %	29.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.33

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Facility Name	I-90 WB NO BUILD	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	14
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	8.99		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	I-90 east of SR-611	3860	3
2	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
3	Basic	Basic	I-90 below SR-611 (3-lane section)	1140	3
4	Basic	Basic	I-90 below SR-611 (2-lane section)	1170	2
5	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	2
6	Basic	Basic	I-90 b/w SR-611 and SR-254	11410	2
7	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	2
8	Basic	Basic	I-90 below SR-254	2790	2
9	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	2
10	Basic	Basic	I-90 b/w SR-254 and SR-57	6450	2
11	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	2
12	Basic	Basic	I-90 below SR-57	2870	2
13	Weaving	Weaving	I-90 b/w SR-57 and SR-2 Weave	5300	2
14	Basic	Basic	SR-2 West of I-90/SR-2 Diverge	5000	2

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.926	3148	7200	0.44	70.0	15.0	B

Segment 2: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.971	3148	789	7200	2200	0.44	0.36	66.4	63.3	15.8	18.9	B

Segment 3: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.926		2321		7200		0.32		69.6		11.1		B

Segment 4: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.926		2321		4800		0.48		69.9		16.6		B

Segment 5: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.952	2813	492	4800	2200	0.59	0.22	61.6	61.6	22.8	22.3	C

Segment 6: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.901		2905		4800		0.61		69.3		21.0		C

Segment 7: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.901	0.980	2905	586	4800	2200	0.61	0.27	63.8	63.8	22.8	24.7	C

Segment 8: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.901		2267		4800		0.47		69.8		16.2		B

Segment 9: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.901	0.962	2687	420	4800	2200	0.56	0.19	62.0	62.0	21.7	21.1	C

Segment 10: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.926		2642		4800		0.55		69.8		18.9		C

Segment 11: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.962	2642	498	4800	2200	0.55	0.23	64.0	64.0	20.6	22.7	C

Segment 12: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.926		2125		4800		0.44		69.8		15.2		B

Segment 13: Weaving

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3172	4554	0.70	62.0	25.6	C

Segment 14: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	2448	4800	0.51	70.0	17.5	B

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	5659	5049	2.93	73.22	67.6	19.0	17.3	8.00	C

Facility Overall Results

Space Mean Speed, mi/h	67.6	Average Density, veh/mi/ln	17.3
Average Travel Time, min	8.00	Average Density, pc/mi/ln	19.0
Total VMT, veh-mi	5659	Total VHD, veh-h	2.93
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	73.22

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	B	B	B	B	C	C	C	B	C	C	C	B
	Seg 13	Seg 14										
AP 1	C	B										

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	70.0	66.4	69.6	69.9	61.6	69.3	63.8	69.8	62.0	69.8	64.0	69.8
	Seg 13	Seg 14										
AP 1	62.0	70.0										

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	15.0	15.8	11.1	16.6	22.8	21.0	22.8	16.2	21.7	18.9	20.6	15.2
	Seg 13	Seg 14										
AP 1	25.6	17.5										

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.44	0.44	0.32	0.48	0.59	0.61	0.61	0.47	0.56	0.55	0.55	0.44
	Seg 13	Seg 14										
AP 1	0.70	0.51										

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	13.9	14.6	10.3	15.4	21.1	18.9	20.5	14.6	19.6	17.5	19.1	14.1
	Seg 13	Seg 14										
AP 1	21.9	16.5										

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	18.9	-	-	22.3	-	24.7	-	21.1	-	22.7	-
	Seg 13	Seg 14										
AP 1	-	-										

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	B	B	B	B	C	C	C	B	C	C	C	B
	Seg 13	Seg 14										
AP 1	C	B										

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13	Seg 14										

AP 1	-	-

Volume - Capacity Ratio (V/C)												
	Seg 1	**Seg 2**	**Seg 3**	**Seg 4**	**Seg 5**	**Seg 6**	**Seg 7**	**Seg 8**	**Seg 9**	**Seg 10**	**Seg 11**	**Seg 12**
AP 1	0.44	0.44	0.32	0.48	0.59	0.61	0.61	0.47	0.56	0.55	0.55	0.44

	Seg 13	**Seg 14**
AP 1	0.70	0.51

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3860	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2740	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1049
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.44

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	15.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	2	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	580
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2740	720
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.971
Flow Rate (v_i), pc/h	3148	789
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.44	0.36

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	837
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	2311	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.4
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	15.8
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	18.9

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	1140	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.67
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2020	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	774
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.32

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.6
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Segment Number	4	Segment Name	I-90 below SR-611 (2-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	1170	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2020	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1160
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.48

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	5	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	790
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2020	440
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	5.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.952
Flow Rate (v_i), pc/h	2321	492
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.59	0.22

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.6
Flow in Lanes 1 and 2 (v_{12}), pc/h	2321	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2813	Ramp Junction Speed (S), mi/h	61.6
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	22.8
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	22.3

HCS Basic Freeway Report

Project Information

Segment Number	6	Segment Name	I-90 b/w SR-611 and SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	11410	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2460	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1452
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.61

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	21.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	7	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2460	540
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	2.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.980
Flow Rate (v_i), pc/h	2905	586
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.61	0.27

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2905	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	63.8
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	22.8
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	24.7

HCS Basic Freeway Report

Project Information

Segment Number	8	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	2790	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1920	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1134
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.47

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	9	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1920	380
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.962
Flow Rate (v_i), pc/h	2267	420
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.56	0.19

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	62.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2267	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2687	Ramp Junction Speed (S), mi/h	62.0
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	21.7
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	21.1

HCS Basic Freeway Report

Project Information

Segment Number	10	Segment Name	I-90 b/w SR-254 and SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	6450	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2300	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1321
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.55

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	11	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	480
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2300	450
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.962
Flow Rate (v_i), pc/h	2642	498
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.55	0.23

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	64.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2642	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	64.0
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	20.6
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	22.7

HCS Basic Freeway Report

Project Information

Segment Number	12	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	2870	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1850	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1062
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.44

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	15.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	13	Segment Name	I-90 b/w SR-57 and SR-2 Weave
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Segment Type	Freeway
Segment Length (L_S), ft	4300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	1
Interchange Density (ID), int/mi	0.67	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1360	810	50	490
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	10.00	10.00	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909	0.909	0.909
Flow Rate (v_i), pc/h	1592	948	59	573
Weaving Flow Rate (v_w), pc/h	59	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	3113	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		4140
Total Flow Rate (v), pc/h	3172	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.019	Weaving Area Capacity (c_W), veh/h		4140
Minimum Lane Change Rate (LC_{MIN}), lc/h	59	Adjusted Weaving Area Capacity (c_{WA}), veh/h		4140
Maximum Weaving Length (L_{MAX}), ft	5903	Volume-to-Capacity Ratio (v/c)		0.70

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	897	Average Weaving Speed (S_W), mi/h	62.7
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2383	Average Non-Weaving Speed (S_{NW}), mi/h	62.0
Weaving Lane Change Rate (LC_W), lc/h	208	Average Speed (S), mi/h	62.0
Weaving Lane Change Rate (LC_{All}), lc/h	2591	Density (D), pc/mi/ln	25.6
Weaving Intensity Factor (W)	0.152	Level of Service (LOS)	C

HCS Basic Freeway Report

Project Information

Segment Number	14	Segment Name	SR-2 West of I-90/SR-2 Diverge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5000	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2170	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1224
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.51

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	17.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	540	Heavy Vehicle Adjustment Factor (f_{HV})	0.730
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	394
Total Trucks, %	37.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.16

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	5.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Facility Name	I-90 WB NO BUILD	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	14
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	8.99		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	I-90 east of SR-611	3860	3
2	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
3	Basic	Basic	I-90 below SR-611 (3-lane section)	1140	3
4	Basic	Basic	I-90 below SR-611 (2-lane section)	1170	2
5	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	2
6	Basic	Basic	I-90 b/w SR-611 and SR-254	11410	2
7	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	2
8	Basic	Basic	I-90 below SR-254	2790	2
9	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	2
10	Basic	Basic	I-90 b/w SR-254 and SR-57	6450	2
11	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	2
12	Basic	Basic	I-90 below SR-57	2870	2
13	Weaving	Weaving	I-90 b/w SR-57 and SR-2 Weave	5300	2
14	Basic	Basic	SR-2 West of I-90/SR-2 Diverge	5000	2

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.926	5549	7200	0.77	65.1	28.4	D

Segment 2: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.971	5450	1479	7200	2200	0.77	0.67	65.1	61.6	27.9	30.7	F

Segment 3: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.926		3718		7200		0.56		17.8		69.6		F
Segment 4: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.926		3632		4800		0.83		24.0		75.5		F
Segment 5: Merge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.952	4470	838	4800	2200	1.01	0.38	53.9	53.9	41.5	35.1	F
Segment 6: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.901		4470		4800		1.04		57.6		38.8		F
Segment 7: Diverge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.980	4470	1194	4800	2200	1.04	0.54	62.3	62.3	35.9	38.2	F
Segment 8: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.901		3276		4800		0.77		67.8		24.2		C
Segment 9: Merge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.962	4017	741	4800	2200	0.92	0.34	57.5	57.5	34.9	31.3	D
Segment 10: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.926		4017		4800		0.91		62.4		32.2		D
Segment 11: Diverge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.962	4017	818	4800	2200	0.91	0.37	63.2	63.2	31.8	34.5	D
Segment 12: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.926		3177		4800		0.73		68.3		23.3		F
Segment 13: Weaving															

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	4241	4554	1.08	59.2	35.8	F

Segment 14: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3058	4800	0.75	68.7	22.3	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	8682	8449	29.35	733.66	56.6	34.2	31.4	9.50	F

Facility Overall Results

Space Mean Speed, mi/h	56.6	Average Density, veh/mi/ln	31.4
Average Travel Time, min	9.50	Average Density, pc/mi/ln	34.2
Total VMT, veh-mi	8682	Total VHD, veh-h	29.35
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	733.66

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	D	F	F	F	F	F	F	C	D	D	D	F
	Seg 13	Seg 14										
AP 1	F	C										

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	65.1	65.1	17.8	24.0	53.9	57.6	62.3	67.8	57.5	62.4	63.2	68.3
	Seg 13	Seg 14										
AP 1	59.2	68.7										

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	28.4	27.9	69.6	75.5	41.5	38.8	35.9	24.2	34.9	32.2	31.8	23.3
	Seg 13	Seg 14										
AP 1	35.8	22.3										

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.77	0.77	0.56	0.83	1.01	1.04	1.04	0.77	0.92	0.91	0.91	0.73
	Seg 13	Seg 14										
AP 1	1.08	0.75										

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	26.3	25.8	64.5	70.0	38.4	35.0	32.3	21.8	31.4	29.8	29.4	21.5
	Seg 13	Seg 14										
AP 1	32.5	21.0										

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	30.7	-	-	35.1	-	38.2	-	31.3	-	34.5	-
	Seg 13	Seg 14										
AP 1	-	-										

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	D	D	F	F	E	E	E	C	D	D	D	C
	Seg 13	Seg 14										
AP 1	E	C										

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	F	F	F	-	-	-	-	-
	Seg 13	Seg 14										

AP 1	F	-

Volume - Capacity Ratio (V/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.77	0.76	0.52	0.76	0.93	0.93	0.93	0.68	0.84	0.84	0.84	0.66

	Seg 13	Seg 14
AP 1	0.93	0.64

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3860	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4830	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1850
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.77

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	65.1
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	28.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	2	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	580
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	4830	1350
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.971
Flow Rate (v_i), pc/h	5549	1479
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.76	0.67

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	1763
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	61.6
Flow in Lanes 1 and 2 (v_{12}), pc/h	3687	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	65.1
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	27.9
Level of Service (LOS)	F	Density in Ramp Influence Area (D_R), pc/mi/ln	30.7

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	1140	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.67
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3480	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1333
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.52

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	17.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	69.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	F
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Segment Number	4	Segment Name	I-90 below SR-611 (2-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	1170	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3480	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1999
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.76

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	24.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	75.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	F
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	5	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	790
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3480	750
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	5.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.952
Flow Rate (v_i), pc/h	3998	838
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.93	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	53.9
Flow in Lanes 1 and 2 (v_{12}), pc/h	3632	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	4470	Ramp Junction Speed (S), mi/h	53.9
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	41.5
Level of Service (LOS)	F	Density in Ramp Influence Area (D_R), pc/mi/ln	35.1

HCS Basic Freeway Report

Project Information

Segment Number	6	Segment Name	I-90 b/w SR-611 and SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	11410	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4230	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	2235
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.93

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	57.6
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	38.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	F
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	7	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	4230	1100
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	2.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.980
Flow Rate (v_i), pc/h	4994	1194
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.93	0.54

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	62.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	4470	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	62.3
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	35.9
Level of Service (LOS)	F	Density in Ramp Influence Area (D_R), pc/mi/ln	38.2

HCS Basic Freeway Report

Project Information

Segment Number	8	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	2790	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3130	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1638
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.68

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	24.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	9	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3130	670
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.962
Flow Rate (v_i), pc/h	3696	741
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.84	0.34

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	57.5
Flow in Lanes 1 and 2 (v_{12}), pc/h	3276	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	4017	Ramp Junction Speed (S), mi/h	57.5
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	34.9
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	31.3

HCS Basic Freeway Report

Project Information

Segment Number	10	Segment Name	I-90 b/w SR-254 and SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	6450	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3800	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	2009
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.84

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	62.4
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	32.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	11	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	480
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3800	740
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.962
Flow Rate (v_i), pc/h	4366	818
Capacity (c_{md}), pc/h	4800	2200
Initial Adjusted Capacity (c_{mda}), pc/h	4800	-
Final Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.84	0.37

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	4017	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	63.2
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	31.8
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	34.5

HCS Basic Freeway Report

Project Information

Segment Number	12	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	2870	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3060	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1589
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.66

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	23.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	F
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	13	Segment Name	I-90 b/w SR-57 and SR-2 Weave
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Segment Type	Freeway
Segment Length (L_S), ft	4300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	1
Interchange Density (ID), int/mi	0.67	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	2130	1080	80	930
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	10.00	10.00	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909	0.909	0.909
Flow Rate (v_i), pc/h	2212	970	94	965
Weaving Flow Rate (v_W), pc/h	94	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	4147	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		4140
Total Flow Rate (v), pc/h	4241	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.019	Weaving Area Capacity (c_W), veh/h		4140
Minimum Lane Change Rate (LC_{MIN}), lc/h	94	Adjusted Weaving Area Capacity (c_{WA}), veh/h		4140
Maximum Weaving Length (L_{MAX}), ft	5903	Volume-to-Capacity Ratio (v/c)		0.93

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	1195	Average Weaving Speed (S_W), mi/h	62.3
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2614	Average Non-Weaving Speed (S_{NW}), mi/h	59.1
Weaving Lane Change Rate (LC_W), lc/h	243	Average Speed (S), mi/h	59.2
Weaving Lane Change Rate (LC_{All}), lc/h	2857	Density (D), pc/mi/ln	35.8
Weaving Intensity Factor (W)	0.164	Level of Service (LOS)	F

HCS Basic Freeway Report

Project Information

Segment Number	14	Segment Name	SR-2 West of I-90/SR-2 Diverge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5000	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3210	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1529
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.64

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.7
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1010	Heavy Vehicle Adjustment Factor (f_{HV})	0.730
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	736
Total Trucks, %	37.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.31

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	10.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

EASTBOUND I-90 / SR-2
TSMO BUILD CONFIGURATION

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Facility Name	I-90 EB BUILD OPTIONS 2 AND 3	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	16
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	9.01		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SR-2 West of I-90/SR-2 Merge	5200	2
2	Merge	Merge	I-90 at SR-2 Merge	1500	2
3	Basic	Basic	I-90/SR-2 b/w SR-2 and SR-57 (2-Lane)	780	2
4	Basic	Basic	I-90/SR-2 b/w SR-2 and SR-57 (3-Lane)	1200	3
5	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	3
6	Basic	Basic	I-90 below SR-57	3220	3
7	Merge	Merge	I-90 Entrance Ramp from SR-57	1500	3
8	Basic	Basic	I-90 b/w SR-57 and SR-254	7240	3
9	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
10	Basic	Basic	I-90 below SR-254	2330	3
11	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
12	Basic	Basic	I-90 b/w SR-254 and SR-611	11310	3
13	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
14	Basic	Basic	I-90 below SR-611 (3-lane section)	2560	3
15	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
16	Basic	Basic	I-90 east of SR-611	3230	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3035	4800	0.63	68.8	22.1	C

Segment 2: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	

1	0.94	0.94	0.943	0.775	4655	1620	4800	2200	0.97	0.74	52.7	52.7	44.2	35.9	E

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	4652	4800	0.97	55.3	42.1	E

Segment 4: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	4652	7200	0.65	67.0	22.6	C

Segment 5: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	4652	1196	7200	2200	0.65	0.54	65.7	62.3	23.6	26.6	C

Segment 6: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3378	7200	0.47	69.9	16.1	B

Segment 7: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	4247	869	7200	2200	0.59	0.39	63.0	61.3	22.5	23.1	C

Segment 8: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	4303	7200	0.60	69.4	20.7	C

Segment 9: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.962	4303	641	7200	2200	0.60	0.29	67.0	63.7	21.4	24.8	C

Segment 10: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3606	7200	0.50	69.9	17.2	B

Segment 11: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.971	4493	887	7200	2200	0.62	0.40	62.8	61.2	23.8	23.9	C

Segment 12: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

1	0.94		0.909		4459		7200		0.62		69.1		21.5		C

Segment 13: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.909	4459	737	7200	2200	0.62	0.34	66.7	63.4	22.3	25.7	C

Segment 14: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3722	7200	0.52	69.9	17.7	B

Segment 15: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.943	5290	1568	7200	2200	0.73	0.71	60.3	58.2	29.2	30.3	D

Segment 16: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.901	5396	7200	0.75	65.8	27.3	D

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	8581	7766	5.96	148.89	66.8	22.2	20.0	8.10	C

Facility Overall Results

Space Mean Speed, mi/h	66.8	Average Density, veh/mi/ln	20.0
Average Travel Time, min	8.10	Average Density, pc/mi/ln	22.2
Total VMT, veh-mi	8581	Total VHD, veh-h	5.96
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	148.89

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	E	E	C	C	B	C	C	C	B	C	C
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	D	D								

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	68.8	52.7	55.3	67.0	65.7	69.9	63.0	69.4	67.0	69.9	62.8	69.1
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	66.7	69.9	60.3	65.8								

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	22.1	44.2	42.1	22.6	23.6	16.1	22.5	20.7	21.4	17.2	23.8	21.5
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	22.3	17.7	29.2	27.3								

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.63	0.97	0.97	0.65	0.65	0.47	0.59	0.60	0.60	0.50	0.62	0.62
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	0.62	0.52	0.73	0.75								

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	20.8	41.7	37.3	20.0	20.9	14.2	19.9	18.3	18.9	15.2	21.1	19.5
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	20.3	16.1	26.5	24.6								

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	35.9	-	-	26.6	-	23.1	-	24.8	-	23.9	-
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	25.7	-	30.3	-								

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	E	E	C	C	B	C	C	C	B	C	C
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	D	D								

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13	Seg 14	Seg 15	Seg 16								

AP 1	-	-	-	-

Volume - Capacity Ratio (V/C)												
	Seg 1	**Seg 2**	**Seg 3**	**Seg 4**	**Seg 5**	**Seg 6**	**Seg 7**	**Seg 8**	**Seg 9**	**Seg 10**	**Seg 11**	**Seg 12**
AP 1	0.63	0.97	0.97	0.65	0.65	0.47	0.59	0.60	0.60	0.50	0.62	0.62

	Seg 13	**Seg 14**	**Seg 15**	**Seg 16**
AP 1	0.62	0.52	0.73	0.75

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	SR-2 West of I-90/SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5200	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2690	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1518
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.63

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	2	Segment Name	I-90 at SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2690	1180
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	6.00	29.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	0.775
Flow Rate (v_i), pc/h	3035	1620
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.97	0.74

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	52.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	3035	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	4655	Ramp Junction Speed (S), mi/h	52.7
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	44.2
Level of Service (LOS)	E	Density in Ramp Influence Area (D_R), pc/mi/ln	35.9

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90/SR-2 b/w SR-2 and SR-57 (2-Lane)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	780	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.67
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3870	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	2326
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.97

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	55.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	42.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Segment Number	4	Segment Name	I-90/SR-2 b/w SR-2 and SR-57 (3-Lane)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	1200	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3870	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1551
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.65

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	5	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3870	1060
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	4652	1196
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.65	0.54

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	18587.8	Flow Outer Lanes (v_{OA}), pc/h/ln	1420
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	62.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	3232	Outer Lanes Freeway Speed (S_O), mi/h	75.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	65.7
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	23.6
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	26.6

HCS Basic Freeway Report

Project Information

Segment Number	6	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3220	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2810	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1126
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.47

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	7	Segment Name	I-90 Entrance Ramp from SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	730
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2810	770
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	3378	869
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.59	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1707.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1358
Downstream Equilibrium Distance (L_{EQ}), ft	3420.2	On-Ramp Influence Area Speed (S_R), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	2020	Outer Lanes Freeway Speed (S_O), mi/h	66.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2889	Ramp Junction Speed (S), mi/h	63.0
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	22.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.1

HCS Basic Freeway Report

Project Information

Segment Number	8	Segment Name	I-90 b/w SR-57 and SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	7240	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3580	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1434
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.60

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.4
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	9	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3580	580
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.962
Flow Rate (v_i), pc/h	4303	641
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.60	0.29

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	7158.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1381
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	2922	Outer Lanes Freeway Speed (S_O), mi/h	75.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	67.0
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	21.4
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	24.8

HCS Basic Freeway Report

Project Information

Segment Number	10	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2330	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3000	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1202
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.50

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	17.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	11	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3000	810
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.971
Flow Rate (v_i), pc/h	3606	887
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.62	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1791.3	Flow Outer Lanes (v_{OA}), pc/h/ln	1442
Downstream Equilibrium Distance (L_{EQ}), ft	3775.6	On-Ramp Influence Area Speed (S_R), mi/h	61.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	2164	Outer Lanes Freeway Speed (S_O), mi/h	66.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3051	Ramp Junction Speed (S), mi/h	62.8
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	23.8
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.9

HCS Basic Freeway Report

Project Information

Segment Number	12	Segment Name	I-90 b/w SR-254 and SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3810	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1486
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.62

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.1
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	21.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	13	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3810	630
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	4459	737
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.62	0.34

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	7554.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1433
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	3026	Outer Lanes Freeway Speed (S_O), mi/h	75.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.7
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	22.3
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	25.7

HCS Basic Freeway Report

Project Information

Segment Number	14	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2560	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3180	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1241
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.52

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	17.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	15	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3180	1390
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.943
Flow Rate (v_i), pc/h	3722	1568
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.73	0.71

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1890.8	Flow Outer Lanes (v_{OA}), pc/h/ln	1507
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	58.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	2215	Outer Lanes Freeway Speed (S_O), mi/h	66.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3783	Ramp Junction Speed (S), mi/h	60.3
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	29.2
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	30.3

HCS Basic Freeway Report

Project Information

Segment Number	16	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3230	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4570	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1799
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.75

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	65.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	27.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Facility Name	I-90 EB OPTIONS 2 AND 3	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	16
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	9.01		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SR-2 West of I-90/SR-2 Merge	5200	2
2	Merge	Merge	I-90 at SR-2 Merge	1500	2
3	Basic	Basic	I-90/SR-2 b/w SR-2 and SR-57 (2-Lane)	780	2
4	Basic	Basic	I-90/SR-2 b/w SR-2 and SR-57 (3-Lane)	1200	3
5	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	3
6	Basic	Basic	I-90 below SR-57	3220	3
7	Merge	Merge	I-90 Entrance Ramp from SR-57	1500	3
8	Basic	Basic	I-90 b/w SR-57 and SR-254	7240	3
9	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
10	Basic	Basic	I-90 below SR-254	2330	3
11	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
12	Basic	Basic	I-90 b/w SR-254 and SR-611	11310	3
13	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
14	Basic	Basic	I-90 below SR-611 (3-lane section)	2560	3
15	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
16	Basic	Basic	I-90 east of SR-611	3230	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3226	4800	0.67	68.0	23.7	C

Segment 2: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	

1	0.94	0.94	0.943	0.775	4159	933	4800	2200	0.87	0.42	56.6	56.6	36.7	32.4	D
Segment 3: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		1.000		3766		4800		0.78		64.6		29.1		D
Segment 4: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.885		4255		7200		0.59		68.9		20.4		C
Segment 5: Diverge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.885	0.943	4255	1207	7200	2200	0.59	0.55	65.2	62.2	21.8	26.6	C
Segment 6: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.885		2969		7200		0.41		69.9		14.1		B
Segment 7: Merge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.885	0.943	3849	880	7200	2200	0.53	0.40	63.4	61.7	20.2	21.3	C
Segment 8: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.885		3907		7200		0.54		69.9		18.6		C
Segment 9: Diverge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.885	0.962	3907	697	7200	2200	0.54	0.32	66.9	63.5	19.5	23.0	C
Segment 10: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.885		3149		7200		0.44		69.9		15.0		B
Segment 11: Merge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.885	0.971	3993	844	7200	2200	0.55	0.38	63.4	61.8	21.0	21.5	C
Segment 12: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**

1	0.94		0.909		3967		7200		0.55		69.8		18.9		C

Segment 13: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.909	3967	609	7200	2200	0.55	0.28	67.1	63.8	19.7	23.2	C

Segment 14: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3359	7200	0.47	69.9	16.0	B

Segment 15: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.943	4577	1218	7200	2200	0.64	0.55	62.1	60.3	24.6	26.1	C

Segment 16: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.901	4664	7200	0.65	68.5	22.7	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	7775	7075	3.67	91.82	67.8	19.8	17.9	8.00	C

Facility Overall Results

Space Mean Speed, mi/h	67.8	Average Density, veh/mi/ln	17.9
Average Travel Time, min	8.00	Average Density, pc/mi/ln	19.8
Total VMT, veh-mi	7775	Total VHD, veh-h	3.67
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	91.82

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	D	C	C	B	C	C	C	B	C	C
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	C	C								

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	68.0	56.6	64.6	68.9	65.2	69.9	63.4	69.9	66.9	69.9	63.4	69.8
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	67.1	69.9	62.1	68.5								

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	23.7	36.7	29.1	20.4	21.8	14.1	20.2	18.6	19.5	15.0	21.0	18.9
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	19.7	16.0	24.6	22.7								

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.67	0.87	0.78	0.59	0.59	0.41	0.53	0.54	0.54	0.44	0.55	0.55
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	0.55	0.47	0.64	0.65								

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	22.3	34.6	29.1	18.1	19.3	12.5	17.9	16.5	17.3	13.3	18.6	17.2
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	17.9	14.5	22.4	20.5								

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	32.4	-	-	26.6	-	21.3	-	23.0	-	21.5	-
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	23.2	-	26.1	-								

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	D	C	C	B	C	C	C	B	C	C
	Seg 13	Seg 14	Seg 15	Seg 16								
AP 1	C	B	C	C								

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13	Seg 14	Seg 15	Seg 16								

AP 1	-	-	-	-

Volume - Capacity Ratio (V/C)												
	Seg 1	**Seg 2**	**Seg 3**	**Seg 4**	**Seg 5**	**Seg 6**	**Seg 7**	**Seg 8**	**Seg 9**	**Seg 10**	**Seg 11**	**Seg 12**
AP 1	0.67	0.87	0.78	0.59	0.59	0.41	0.53	0.54	0.54	0.44	0.55	0.55

	Seg 13	**Seg 14**	**Seg 15**	**Seg 16**
AP 1	0.55	0.47	0.64	0.65

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	SR-2 West of I-90/SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5200	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2860	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1613
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.67

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	23.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	2	Segment Name	I-90 at SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2860	680
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	6.00	29.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	0.775
Flow Rate (v_i), pc/h	3226	933
Capacity (c_{md}), pc/h	4800	2200
Adjusted Capacity (c_{mda}), pc/h	4800	2200
Volume-to-Capacity Ratio (v/c)	0.87	0.42

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	56.6
Flow in Lanes 1 and 2 (v_{12}), pc/h	3226	Outer Lanes Freeway Speed (S_O), mi/h	70.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	4159	Ramp Junction Speed (S), mi/h	56.6
Number of Outer Lanes on Freeway (N_O), ln	0	Average Density (D), pc/mi/ln	36.7
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	32.4

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90/SR-2 b/w SR-2 and SR-57 (2-Lane)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	780	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.67
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3540	Heavy Vehicle Adjustment Factor (f_{HV})	1.000
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1883
Total Trucks, %	0.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.78

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	64.6
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	29.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Segment Number	4	Segment Name	I-90/SR-2 b/w SR-2 and SR-57 (3-Lane)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	1200	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3540	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1418
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.59

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	5	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3540	1070
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	4255	1207
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.59	0.55

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	12096.0	Flow Outer Lanes (v_{OA}), pc/h/ln	1024
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	62.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	3231	Outer Lanes Freeway Speed (S_O), mi/h	76.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	65.2
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	21.8
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	26.6

HCS Basic Freeway Report

Project Information

Segment Number	6	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3220	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2470	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	990
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.41

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	14.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	7	Segment Name	I-90 Entrance Ramp from SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	730
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2470	780
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	2969	880
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.53	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1622.4	Flow Outer Lanes (v_{OA}), pc/h/ln	1194
Downstream Equilibrium Distance (L_{EQ}), ft	3713.2	On-Ramp Influence Area Speed (S_R), mi/h	61.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	1775	Outer Lanes Freeway Speed (S_O), mi/h	67.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2655	Ramp Junction Speed (S), mi/h	63.4
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	20.2
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	21.3

HCS Basic Freeway Report

Project Information

Segment Number	8	Segment Name	I-90 b/w SR-57 and SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	7240	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3250	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1302
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.54

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	9	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3250	630
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.962
Flow Rate (v_i), pc/h	3907	697
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.54	0.32

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	8156.5	Flow Outer Lanes (v_{OA}), pc/h/ln	1188
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.5
Flow in Lanes 1 and 2 (v_{12}), pc/h	2719	Outer Lanes Freeway Speed (S_O), mi/h	76.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.9
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	19.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.0

HCS Basic Freeway Report

Project Information

Segment Number	10	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2330	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2620	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1050
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.44

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	15.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	11	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2620	770
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.971
Flow Rate (v_i), pc/h	3149	844
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.55	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1684.3	Flow Outer Lanes (v_{OA}), pc/h/ln	1260
Downstream Equilibrium Distance (L_{EQ}), ft	3119.9	On-Ramp Influence Area Speed (S_R), mi/h	61.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1889	Outer Lanes Freeway Speed (S_O), mi/h	67.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2733	Ramp Junction Speed (S), mi/h	63.4
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	21.0
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	21.5

HCS Basic Freeway Report

Project Information

Segment Number	12	Segment Name	I-90 b/w SR-254 and SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3390	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1322
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.55

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	13	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3390	520
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	3967	609
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.55	0.28

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	7278.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1232
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2735	Outer Lanes Freeway Speed (S_O), mi/h	75.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	67.1
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	19.7
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.2

HCS Basic Freeway Report

Project Information

Segment Number	14	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2560	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2870	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1120
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.47

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	15	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2870	1080
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.943
Flow Rate (v_i), pc/h	3359	1218
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.64	0.55

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1738.2	Flow Outer Lanes (v_{OA}), pc/h/ln	1360
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	60.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	1999	Outer Lanes Freeway Speed (S_O), mi/h	66.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3217	Ramp Junction Speed (S), mi/h	62.1
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	24.6
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	26.1

HCS Basic Freeway Report

Project Information

Segment Number	16	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3230	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3950	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1555
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.65

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

EASTBOUND I-90 / SR-2
ALTERNATE BUILD CONFIGURATION

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Facility Name	I-90 EB BUILD OPTIONS 2 AND 3	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	13
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	9.01		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SR-2 West of I-90/SR-2 Merge	4700	2
2	Weaving	Weaving	I-90 b/w SR-2 and SR-57	5980	3
3	Basic	Basic	I-90 below SR-57	2720	3
4	Merge	Merge	I-90 Entrance Ramp from SR-57	1500	3
5	Basic	Basic	I-90 b/w SR-57 and SR-254	7240	3
6	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
7	Basic	Basic	I-90 below SR-254	2330	3
8	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
9	Basic	Basic	I-90 b/w SR-254 and SR-611	11310	3
10	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
11	Basic	Basic	I-90 below SR-611 (3-lane section)	2560	3
12	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
13	Basic	Basic	I-90 east of SR-611	3230	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3035	4800	0.63	68.8	22.1	C

Segment 2: Weaving

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4435	4580	0.97	52.5	28.2	D

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

1	0.94		0.885		3378		7200		0.47		70.0		16.1		B

Segment 4: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	4247	869	7200	2200	0.59	0.39	63.0	61.3	22.5	23.1	C

Segment 5: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	4303	7200	0.60	69.4	20.7	C

Segment 6: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.962	4303	641	7200	2200	0.60	0.29	67.0	63.7	21.4	24.8	C

Segment 7: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3606	7200	0.50	69.9	17.2	B

Segment 8: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.971	4493	887	7200	2200	0.62	0.40	62.8	61.2	23.8	23.9	C

Segment 9: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	4459	7200	0.62	69.1	21.5	C

Segment 10: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.909	4459	737	7200	2200	0.62	0.34	66.7	63.4	22.3	25.7	C

Segment 11: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3722	7200	0.52	69.9	17.7	B

Segment 12: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.943	5290	1568	7200	2200	0.73	0.71	60.3	58.2	29.2	30.3	D

Segment 13: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.901	5396	7200	0.75	65.8	27.3	D

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	8618	7568	9.02	225.54	65.2	22.3	20.1	8.30	C

Facility Overall Results

Space Mean Speed, mi/h	65.2	Average Density, veh/mi/ln	20.1
Average Travel Time, min	8.30	Average Density, pc/mi/ln	22.3
Total VMT, veh-mi	8618	Total VHD, veh-h	9.02
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	225.54

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	B	C	C	C	B	C	C	C	B	D
	Seg 13											
AP 1	D											

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	68.8	52.5	70.0	63.0	69.4	67.0	69.9	62.8	69.1	66.7	69.9	60.3
	Seg 13											
AP 1	65.8											

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	22.1	28.2	16.1	22.5	20.7	21.4	17.2	23.8	21.5	22.3	17.7	29.2
	Seg 13											
AP 1	27.3											

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.63	0.97	0.47	0.59	0.60	0.60	0.50	0.62	0.62	0.62	0.52	0.73
	Seg 13											
AP 1	0.75											

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	20.8	25.0	14.2	19.9	18.3	18.9	15.2	21.1	19.5	20.3	16.1	26.5
	Seg 13											
AP 1	24.6											

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	23.1	-	24.8	-	23.9	-	25.7	-	30.3
	Seg 13											
AP 1	-											

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	D	B	C	C	C	B	C	C	C	B	D
	Seg 13											
AP 1	D											

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13											

AP 1	-

Volume - Capacity Ratio (V/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.63	0.97	0.47	0.59	0.60	0.60	0.50	0.62	0.62	0.62	0.52	0.73

	Seg 13
AP 1	0.75

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	SR-2 West of I-90/SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	4700	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2690	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1518
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.63

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	2	Segment Name	I-90 b/w SR-2 and SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Segment Length (L_S), ft	4980	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	1.00	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1750	1060	120	940
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	6.00	6.00	6.00	13.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	0.943	0.943	0.885
Flow Rate (v_i), pc/h	1974	1196	135	1130
Weaving Flow Rate (v_W), pc/h	2326	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	2109	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		6018
Total Flow Rate (v), pc/h	4435	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		4251
Volume Ratio (VR)	0.524	Weaving Area Capacity (c_W), veh/h		4251
Minimum Lane Change Rate (LC_{MIN}), lc/h	2326	Adjusted Weaving Area Capacity (c_{WA}), veh/h		4251
Maximum Weaving Length (L_{MAX}), ft	8108	Volume-to-Capacity Ratio (v/c)		0.97

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	1050	Average Weaving Speed (S_W), mi/h	60.0
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2159	Average Non-Weaving Speed (S_{NW}), mi/h	46.2
Weaving Lane Change Rate (LC_W), lc/h	2744	Average Speed (S), mi/h	52.5
Weaving Lane Change Rate (LC_{All}), lc/h	4903	Density (D), pc/mi/ln	28.2
Weaving Intensity Factor (W)	0.223	Level of Service (LOS)	D

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2720	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2810	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1126
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.47

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	4	Segment Name	I-90 Entrance Ramp from SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	730
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2810	770
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	3378	869
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.59	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	1358
Downstream Equilibrium Distance (L_{EQ}), ft	3420.2	On-Ramp Influence Area Speed (S_R), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	2020	Outer Lanes Freeway Speed (S_O), mi/h	66.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2889	Ramp Junction Speed (S), mi/h	63.0
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	22.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.1

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 b/w SR-57 and SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	7240	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3580	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1434
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.60

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.4
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	6	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3580	580
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.962
Flow Rate (v_i), pc/h	4303	641
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.60	0.29

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	7158.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1381
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	2922	Outer Lanes Freeway Speed (S_O), mi/h	75.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	67.0
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	21.4
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	24.8

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2330	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3000	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1202
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.50

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	17.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	8	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3000	810
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.971
Flow Rate (v_i), pc/h	3606	887
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.62	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1791.3	Flow Outer Lanes (v_{OA}), pc/h/ln	1442
Downstream Equilibrium Distance (L_{EQ}), ft	3775.6	On-Ramp Influence Area Speed (S_R), mi/h	61.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	2164	Outer Lanes Freeway Speed (S_O), mi/h	66.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3051	Ramp Junction Speed (S), mi/h	62.8
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	23.8
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.9

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 b/w SR-254 and SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3810	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1486
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.62

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.1
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	21.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	10	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3810	630
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	4459	737
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.62	0.34

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	7554.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1433
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	3026	Outer Lanes Freeway Speed (S_O), mi/h	75.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.7
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	22.3
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	25.7

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2560	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3180	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1241
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.52

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	17.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	12	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3180	1390
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.943
Flow Rate (v_i), pc/h	3722	1568
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.73	0.71

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1890.8	Flow Outer Lanes (v_{OA}), pc/h/ln	1507
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	58.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	2215	Outer Lanes Freeway Speed (S_O), mi/h	66.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3783	Ramp Junction Speed (S), mi/h	60.3
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	29.2
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	30.3

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3230	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4570	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1799
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.75

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	65.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	27.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Facility Name	I-90 EB OPTIONS 2 AND 3	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	13
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	9.01		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SR-2 West of I-90/SR-2 Merge	4700	2
2	Weaving	Weaving	I-90 b/w SR-2 and SR-57	5980	3
3	Basic	Basic	I-90 below SR-57	2720	3
4	Merge	Merge	I-90 Entrance Ramp from SR-57	1500	3
5	Basic	Basic	I-90 b/w SR-57 and SR-254	7240	3
6	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
7	Basic	Basic	I-90 below SR-254	2330	3
8	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
9	Basic	Basic	I-90 b/w SR-254 and SR-611	11310	3
10	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
11	Basic	Basic	I-90 below SR-611 (3-lane section)	2560	3
12	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
13	Basic	Basic	I-90 east of SR-611	3230	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3226	4800	0.67	68.0	23.7	C

Segment 2: Weaving

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4067	5162	0.79	54.3	25.0	C

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	2969	7200	0.41	70.0	14.1	B

Segment 4: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.943	3849	880	7200	2200	0.53	0.40	63.4	61.7	20.2	21.3	C

Segment 5: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3907	7200	0.54	69.9	18.6	C

Segment 6: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.962	3907	697	7200	2200	0.54	0.32	66.9	63.5	19.5	23.0	C

Segment 7: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.885	3149	7200	0.44	69.9	15.0	B

Segment 8: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.885	0.971	3993	844	7200	2200	0.55	0.38	63.4	61.8	21.0	21.5	C

Segment 9: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3967	7200	0.55	69.8	18.9	C

Segment 10: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.909	3967	609	7200	2200	0.55	0.28	67.1	63.8	19.7	23.2	C

Segment 11: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.909	3359	7200	0.47	69.9	16.0	B

Segment 12: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.909	0.943	4577	1218	7200	2200	0.64	0.55	62.1	60.3	24.6	26.1	C

Segment 13: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

1	0.94	0.901	4664	7200	0.65	68.5	22.7	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	7808	6972	6.60	165.04	66.1	19.9	18.0	8.20	C

Facility Overall Results

Space Mean Speed, mi/h	66.1	Average Density, veh/mi/ln	18.0
Average Travel Time, min	8.20	Average Density, pc/mi/ln	19.9
Total VMT, veh-mi	7808	Total VHD, veh-h	6.60
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	165.04

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	C	B	C	C	C	B	C	C	C	B	C
	Seg 13											
AP 1	C											

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	68.0	54.3	70.0	63.4	69.9	66.9	69.9	63.4	69.8	67.1	69.9	62.1
	Seg 13											
AP 1	68.5											

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	23.7	25.0	14.1	20.2	18.6	19.5	15.0	21.0	18.9	19.7	16.0	24.6
	Seg 13											
AP 1	22.7											

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.67	0.79	0.41	0.53	0.54	0.54	0.44	0.55	0.55	0.55	0.47	0.64
	Seg 13											
AP 1	0.65											

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	22.3	22.2	12.5	17.9	16.5	17.3	13.3	18.6	17.2	17.9	14.5	22.4
	Seg 13											
AP 1	20.5											

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	21.3	-	23.0	-	21.5	-	23.2	-	26.1
	Seg 13											
AP 1	-											

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	C	C	B	C	C	C	B	C	C	C	B	C
	Seg 13											
AP 1	C											

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13											

AP 1	-

Volume - Capacity Ratio (V/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.67	0.79	0.41	0.53	0.54	0.54	0.44	0.55	0.55	0.55	0.47	0.64

	Seg 13
AP 1	0.65

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/23
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	SR-2 West of I-90/SR-2 Merge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	4700	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2860	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1613
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.67

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	23.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	2	Segment Name	I-90 b/w SR-2 and SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Segment Length (L_S), ft	4980	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	1.00	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1860	610	70	1000
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	6.00	6.00	6.00	13.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	0.943	0.943	0.885
Flow Rate (v_i), pc/h	2098	688	79	1202
Weaving Flow Rate (v_w), pc/h	1890	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	2177	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		6147
Total Flow Rate (v), pc/h	4067	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		4779
Volume Ratio (VR)	0.465	Weaving Area Capacity (c_W), veh/h		4779
Minimum Lane Change Rate (LC_{MIN}), lc/h	1890	Adjusted Weaving Area Capacity (c_{WA}), veh/h		4779
Maximum Weaving Length (L_{MAX}), ft	7420	Volume-to-Capacity Ratio (v/c)		0.79

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	1084	Average Weaving Speed (S_W), mi/h	60.5
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2174	Average Non-Weaving Speed (S_{NW}), mi/h	49.9
Weaving Lane Change Rate (LC_W), lc/h	2308	Average Speed (S), mi/h	54.3
Weaving Lane Change Rate (LC_{All}), lc/h	4482	Density (D), pc/mi/ln	25.0
Weaving Intensity Factor (W)	0.208	Level of Service (LOS)	C

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2720	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2470	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	990
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.41

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	14.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	4	Segment Name	I-90 Entrance Ramp from SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	730
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2470	780
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.943
Flow Rate (v_i), pc/h	2969	880
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.53	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	1194
Downstream Equilibrium Distance (L_{EQ}), ft	3713.2	On-Ramp Influence Area Speed (S_R), mi/h	61.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	1775	Outer Lanes Freeway Speed (S_O), mi/h	67.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2655	Ramp Junction Speed (S), mi/h	63.4
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	20.2
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	21.3

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 b/w SR-57 and SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	7240	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3250	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1302
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.54

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	6	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3250	630
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.962
Flow Rate (v_i), pc/h	3907	697
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.54	0.32

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	8156.5	Flow Outer Lanes (v_{OA}), pc/h/ln	1188
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.5
Flow in Lanes 1 and 2 (v_{12}), pc/h	2719	Outer Lanes Freeway Speed (S_O), mi/h	76.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.9
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	19.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.0

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2330	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2620	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1050
Total Trucks, %	13.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.44

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	15.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	8	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2620	770
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	13.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.971
Flow Rate (v_i), pc/h	3149	844
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.55	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1684.3	Flow Outer Lanes (v_{OA}), pc/h/ln	1260
Downstream Equilibrium Distance (L_{EQ}), ft	3119.9	On-Ramp Influence Area Speed (S_R), mi/h	61.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1889	Outer Lanes Freeway Speed (S_O), mi/h	67.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2733	Ramp Junction Speed (S), mi/h	63.4
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	21.0
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	21.5

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 b/w SR-254 and SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3390	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1322
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.55

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	10	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	510
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3390	520
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	3967	609
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.55	0.28

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	7278.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1232
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2735	Outer Lanes Freeway Speed (S_O), mi/h	75.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	67.1
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	19.7
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	23.2

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2560	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2870	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1120
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.47

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	12	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2870	1080
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	10.00	6.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.943
Flow Rate (v_i), pc/h	3359	1218
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.64	0.55

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1738.2	Flow Outer Lanes (v_{OA}), pc/h/ln	1360
Downstream Equilibrium Distance (L_{EQ}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	60.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	1999	Outer Lanes Freeway Speed (S_O), mi/h	66.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3217	Ramp Junction Speed (S), mi/h	62.1
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	24.6
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	26.1

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3230	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3950	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1555
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.65

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2360	Heavy Vehicle Adjustment Factor (f_{HV})	0.775
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1620
Total Trucks, %	29.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.68

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	23.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1360	Heavy Vehicle Adjustment Factor (f_{HV})	0.775
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	934
Total Trucks, %	29.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.39

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	13.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Facility Name	I-90 WB OPTION 2	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	13
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	8.99		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	I-90 east of SR-611	3860	3
2	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
3	Basic	Basic	I-90 below SR-611 (3-lane section)	2310	3
4	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
5	Basic	Basic	I-90 b/w SR-611 and SR-254	11410	3
6	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
7	Basic	Basic	I-90 below SR-254	2790	3
8	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
9	Basic	Basic	I-90 b/w SR-254 and SR-57	6450	3
10	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	3
11	Basic	Basic	I-90 below SR-57	2870	3
12	Weaving	Weaving	I-90 b/w SR-57 and SR-2 Weave	5300	3
13	Basic	Basic	SR-2 West of I-90/SR-2 Diverge	5000	2

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.926	3389	7200	0.47	70.0	16.1	B

Segment 2: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.971	3389	844	7200	2200	0.47	0.38	66.4	63.2	17.0	20.2	C

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

1	0.94		0.926		2504		7200		0.35		69.8		11.9		B

Segment 4: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.952	3029	525	7200	2200	0.42	0.24	64.3	62.6	15.7	16.2	B

Segment 5: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.901		3129		7200		0.43		70.0		14.9		B

Segment 6: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.901	0.980	3129	619	7200	2200	0.43	0.28	66.9	63.7	15.6	19.2	B

Segment 7: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.901		2456		7200		0.34		69.9		11.7		B

Segment 8: Merge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.901	0.962	2898	442	7200	2200	0.40	0.20	64.6	62.8	15.0	15.1	B

Segment 9: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.926		2849		7200		0.40		70.0		13.6		B

Segment 10: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.962	2849	531	7200	2200	0.40	0.24	67.1	64.0	14.2	17.7	B

Segment 11: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.926		2298		7200		0.32		69.9		10.9		A

Segment 12: Weaving

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.94		0.909		3405		6837		0.50		64.1		17.7		B

Segment 13: Basic

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS

1	0.94	0.943	2629	4800	0.55	69.8	18.8	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	6096	5443	1.96	49.02	68.5	14.9	13.6	7.90	B

Facility Overall Results

Space Mean Speed, mi/h	68.5	Average Density, veh/mi/ln	13.6
Average Travel Time, min	7.90	Average Density, pc/mi/ln	14.9
Total VMT, veh-mi	6096	Total VHD, veh-h	1.96
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	49.02

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	B	C	B	B	B	B	B	B	B	B	A	B
	Seg 13											
AP 1	C											

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	70.0	66.4	69.8	64.3	70.0	66.9	69.9	64.6	70.0	67.1	69.9	64.1
	Seg 13											
AP 1	69.8											

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	16.1	17.0	11.9	15.7	14.9	15.6	11.7	15.0	13.6	14.2	10.9	17.7
	Seg 13											
AP 1	18.8											

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.47	0.47	0.35	0.42	0.43	0.43	0.34	0.40	0.40	0.40	0.32	0.50
	Seg 13											
AP 1	0.55											

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	14.9	15.7	11.0	14.5	13.4	14.1	10.5	13.5	12.6	13.1	10.1	15.1
	Seg 13											
AP 1	17.7											

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	20.2	-	16.2	-	19.2	-	15.1	-	17.7	-	-
	Seg 13											
AP 1	-											

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	B	C	B	B	B	B	B	B	B	B	A	B
	Seg 13											
AP 1	C											

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13											

AP 1	-

Volume - Capacity Ratio (V/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.47	0.47	0.35	0.42	0.43	0.43	0.34	0.40	0.40	0.40	0.32	0.50

	Seg 13
AP 1	0.55

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3860	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2950	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1130
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.47

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	2	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	580
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2950	770
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.971
Flow Rate (v_i), pc/h	3389	844
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.47	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	926
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	2463	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.4
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	17.0
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	20.2

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2180	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	835
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.35

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	4	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	790
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2180	470
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	5.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.952
Flow Rate (v_i), pc/h	2504	525
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.42	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1473.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1002
Downstream Equilibrium Distance (L_{EQ}), ft	3188.6	On-Ramp Influence Area Speed (S_R), mi/h	62.6
Flow in Lanes 1 and 2 (v_{12}), pc/h	1502	Outer Lanes Freeway Speed (S_O), mi/h	68.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2027	Ramp Junction Speed (S), mi/h	64.3
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	15.7
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	16.2

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 b/w SR-611 and SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11410	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2650	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1043
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.43

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	14.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	6	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2650	570
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	2.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.980
Flow Rate (v_i), pc/h	3129	619
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.43	0.28

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	5473.1	Flow Outer Lanes (v_{OA}), pc/h/ln	871
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	2258	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.9
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	15.6
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	19.2

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2790	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2080	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	819
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.34

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	8	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2080	400
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.962
Flow Rate (v_i), pc/h	2456	442
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.40	0.20

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1463.3	Flow Outer Lanes (v_{OA}), pc/h/ln	980
Downstream Equilibrium Distance (L_{EQ}), ft	2676.3	On-Ramp Influence Area Speed (S_R), mi/h	62.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1476	Outer Lanes Freeway Speed (S_O), mi/h	68.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1918	Ramp Junction Speed (S), mi/h	64.6
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	15.0
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	15.1

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 b/w SR-254 and SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	6450	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2480	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	950
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.40

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	13.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	10	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	480
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2480	480
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.962
Flow Rate (v_i), pc/h	2849	531
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.40	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	4606.4	Flow Outer Lanes (v_{OA}), pc/h/ln	779
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	64.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2070	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	67.1
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	14.2
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	17.7

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2870	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2000	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	766
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.32

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	10.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	12	Segment Name	I-90 b/w SR-57 and SR-2 Weave
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Segment Length (L_S), ft	4300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	1
Interchange Density (ID), int/mi	0.67	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1470	860	50	530
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	10.00	10.00	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909	0.909	0.909
Flow Rate (v_i), pc/h	1720	1006	59	620
Weaving Flow Rate (v_w), pc/h	59	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	3346	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		6215
Total Flow Rate (v), pc/h	3405	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.017	Weaving Area Capacity (c_W), veh/h		6215
Minimum Lane Change Rate (LC_{MIN}), lc/h	59	Adjusted Weaving Area Capacity (c_{WA}), veh/h		6215
Maximum Weaving Length (L_{MAX}), ft	5885	Volume-to-Capacity Ratio (v/c)		0.50

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	964	Average Weaving Speed (S_W), mi/h	62.3
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2435	Average Non-Weaving Speed (S_{NW}), mi/h	64.1
Weaving Lane Change Rate (LC_W), lc/h	394	Average Speed (S), mi/h	64.1
Weaving Lane Change Rate (LC_{All}), lc/h	2829	Density (D), pc/mi/ln	17.7
Weaving Intensity Factor (W)	0.162	Level of Service (LOS)	B

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	SR-2 West of I-90/SR-2 Diverge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5000	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2330	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1314
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.55

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Facility Name	I-90 WB OPTION 2	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	13
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	8.99		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	I-90 east of SR-611	3860	3
2	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
3	Basic	Basic	I-90 below SR-611 (3-lane section)	2310	3
4	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
5	Basic	Basic	I-90 b/w SR-611 and SR-254	11410	3
6	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
7	Basic	Basic	I-90 below SR-254	2790	3
8	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
9	Basic	Basic	I-90 b/w SR-254 and SR-57	6450	3
10	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	3
11	Basic	Basic	I-90 below SR-57	2870	3
12	Weaving	Weaving	I-90 b/w SR-57 and SR-2 Weave	5300	3
13	Basic	Basic	SR-2 West of I-90/SR-2 Diverge	5000	2

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.926	5963	7200	0.83	62.8	31.7	D

Segment 2: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.971	5963	1578	7200	2200	0.83	0.72	64.8	61.3	30.7	32.9	D

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

1	0.94		0.926		4308		7200		0.60		69.4		20.7	C
Segment 4: Merge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.952	5191	883	7200	2200	0.72	0.40	61.7	59.9	28.0	27.2	C
Segment 5: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.901		5360		7200		0.74		66.0		27.1	D
Segment 6: Diverge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.980	5360	1270	7200	2200	0.74	0.58	65.5	62.1	27.3	30.7	D
Segment 7: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.901		3979		7200		0.55		69.8		19.0	C
Segment 8: Merge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.962	4764	785	7200	2200	0.66	0.36	62.6	61.0	25.4	24.8	C
Segment 9: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.926		4687		7200		0.65		68.5		22.8	C
Segment 10: Diverge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.962	4687	863	7200	2200	0.65	0.39	66.5	63.1	23.5	27.2	C
Segment 11: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.926		3791		7200		0.53		69.9		18.1	C
Segment 12: Weaving														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.909		5289		6831		0.77		60.8		29.0	D
Segment 13: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**

1	0.94	0.943	3858	4800	0.80	63.8	30.2	D

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	10088	9075	10.40	260.06	65.3	25.9	23.6	8.30	C

Facility Overall Results

Space Mean Speed, mi/h	65.3	Average Density, veh/mi/ln	23.6
Average Travel Time, min	8.30	Average Density, pc/mi/ln	25.9
Total VMT, veh-mi	10088	Total VHD, veh-h	10.40
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	260.06

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	D	D	C	C	D	D	C	C	C	C	C	D
	Seg 13											
AP 1	D											

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	62.8	64.8	69.4	61.7	66.0	65.5	69.8	62.6	68.5	66.5	69.9	60.8
	Seg 13											
AP 1	63.8											

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	31.7	30.7	20.7	28.0	27.1	27.3	19.0	25.4	22.8	23.5	18.1	29.0
	Seg 13											
AP 1	30.2											

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.83	0.83	0.60	0.72	0.74	0.74	0.55	0.66	0.65	0.65	0.53	0.77
	Seg 13											
AP 1	0.80											

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	29.4	28.4	19.2	25.9	24.4	24.6	17.1	22.9	21.1	21.8	16.8	24.8
	Seg 13											
AP 1	28.5											

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	32.9	-	27.2	-	30.7	-	24.8	-	27.2	-	-
	Seg 13											
AP 1	-											

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	D	D	C	C	D	D	C	C	C	C	C	D
	Seg 13											
AP 1	D											

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13											

AP 1	-

Volume - Capacity Ratio (V/C)												
	Seg 1	**Seg 2**	**Seg 3**	**Seg 4**	**Seg 5**	**Seg 6**	**Seg 7**	**Seg 8**	**Seg 9**	**Seg 10**	**Seg 11**	**Seg 12**
AP 1	0.83	0.83	0.60	0.72	0.74	0.74	0.55	0.66	0.65	0.65	0.53	0.77

	Seg 13
AP 1	0.80

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3860	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	5190	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1988
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.83

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	62.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	31.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	2	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	580
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	5190	1440
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.971
Flow Rate (v_i), pc/h	5963	1578
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.83	0.72

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	2026
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	3937	Outer Lanes Freeway Speed (S_O), mi/h	72.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	64.8
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	30.7
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	32.9

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3750	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1436
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.60

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.4
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	4	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	790
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3750	790
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	5.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.952
Flow Rate (v_i), pc/h	4308	883
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.72	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1936.2	Flow Outer Lanes (v_{OA}), pc/h/ln	1723
Downstream Equilibrium Distance (L_{EQ}), ft	6542.0	On-Ramp Influence Area Speed (S_R), mi/h	59.9
Flow in Lanes 1 and 2 (v_{12}), pc/h	2585	Outer Lanes Freeway Speed (S_O), mi/h	65.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3468	Ramp Junction Speed (S), mi/h	61.7
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	28.0
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	27.2

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 b/w SR-611 and SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11410	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4540	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1787
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.74

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	66.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	27.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	6	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	4540	1170
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	2.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.980
Flow Rate (v_i), pc/h	5360	1270
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.74	0.58

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	9022.1	Flow Outer Lanes (v_{OA}), pc/h/ln	1767
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	62.1
Flow in Lanes 1 and 2 (v_{12}), pc/h	3593	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	65.5
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	27.3
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	30.7

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2790	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3370	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1326
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.55

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	19.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	8	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3370	710
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.962
Flow Rate (v_i), pc/h	3979	785
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.66	0.36

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1862.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1588
Downstream Equilibrium Distance (L_{EQ}), ft	4349.6	On-Ramp Influence Area Speed (S_R), mi/h	61.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2391	Outer Lanes Freeway Speed (S_O), mi/h	66.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3176	Ramp Junction Speed (S), mi/h	62.6
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	25.4
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	24.8

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 b/w SR-254 and SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	6450	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4080	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1562
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.65

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	10	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	480
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	4080	780
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.962
Flow Rate (v_i), pc/h	4687	863
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.65	0.39

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	6942.7	Flow Outer Lanes (v_{OA}), pc/h/ln	1518
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.1
Flow in Lanes 1 and 2 (v_{12}), pc/h	3169	Outer Lanes Freeway Speed (S_O), mi/h	74.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.5
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	23.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	27.2

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2870	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3300	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1264
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.53

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	12	Segment Name	I-90 b/w SR-57 and SR-2 Weave
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Segment Length (L_S), ft	4300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	1
Interchange Density (ID), int/mi	0.67	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	2290	1130	90	1010
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	10.00	10.00	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909	0.909	0.909
Flow Rate (v_i), pc/h	2680	1322	105	1182
Weaving Flow Rate (v_w), pc/h	105	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	5184	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		6209
Total Flow Rate (v), pc/h	5289	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.020	Weaving Area Capacity (c_W), veh/h		6209
Minimum Lane Change Rate (LC_{MIN}), lc/h	105	Adjusted Weaving Area Capacity (c_{WA}), veh/h		6209
Maximum Weaving Length (L_{MAX}), ft	5912	Volume-to-Capacity Ratio (v/c)		0.77

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	1494	Average Weaving Speed (S_W), mi/h	61.5
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2828	Average Non-Weaving Speed (S_{NW}), mi/h	60.8
Weaving Lane Change Rate (LC_W), lc/h	440	Average Speed (S), mi/h	60.8
Weaving Lane Change Rate (LC_{All}), lc/h	3268	Density (D), pc/mi/ln	29.0
Weaving Intensity Factor (W)	0.182	Level of Service (LOS)	D

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	SR-2 West of I-90/SR-2 Diverge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	5000	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3420	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1929
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.80

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	63.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	30.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Facility Name	I-90 WB OPTION 3	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	13
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	8.99		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	I-90 east of SR-611	3860	3
2	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
3	Basic	Basic	I-90 below SR-611 (3-lane section)	2310	3
4	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
5	Basic	Basic	I-90 b/w SR-611 and SR-254	11410	3
6	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
7	Basic	Basic	I-90 below SR-254	2790	3
8	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
9	Basic	Basic	I-90 b/w SR-254 and SR-57	6450	3
10	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	3
11	Basic	Basic	I-90 below SR-57	2870	3
12	Weaving	Weaving	I-90 b/w SR-57 and SR-2 Weave	5300	4
13	Basic	Basic	SR-2 West of I-90/SR-2 Diverge	5000	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.926	3389	7200	0.47	70.0	16.1	B

Segment 2: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.971	3389	844	7200	2200	0.47	0.38	66.4	63.2	17.0	20.2	C

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

1	0.94		0.926		2504		7200		0.35		69.8		11.9		B
Segment 4: Merge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.952	3029	525	7200	2200	0.42	0.24	64.3	62.6	15.7	16.2	B
Segment 5: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.901		3129		7200		0.43		70.0		14.9		B
Segment 6: Diverge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.980	3129	619	7200	2200	0.43	0.28	66.9	63.7	15.6	19.2	B
Segment 7: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.901		2456		7200		0.34		69.9		11.7		B
Segment 8: Merge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.962	2898	442	7200	2200	0.40	0.20	64.6	62.8	15.0	15.1	B
Segment 9: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.926		2849		7200		0.40		70.0		13.6		B
Segment 10: Diverge															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.962	2849	531	7200	2200	0.40	0.24	67.1	64.0	14.2	17.7	B
Segment 11: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.926		2298		7200		0.32		69.9		10.9		A
Segment 12: Weaving															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**
1	0.94		0.909		3405		9116		0.37		65.0		13.1		B
Segment 13: Basic															
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**		**LOS**

1	0.94	0.943	2629	7200	0.37	70.0	12.5	B

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	6096	5443	1.77	44.23	68.6	13.9	12.6	7.90	B

Facility Overall Results

Space Mean Speed, mi/h	68.6	Average Density, veh/mi/ln	12.6
Average Travel Time, min	7.90	Average Density, pc/mi/ln	13.9
Total VMT, veh-mi	6096	Total VHD, veh-h	1.77
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	44.23

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	B	C	B	B	B	B	B	B	B	B	A	B
	Seg 13											
AP 1	B											

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	70.0	66.4	69.8	64.3	70.0	66.9	69.9	64.6	70.0	67.1	69.9	65.0
	Seg 13											
AP 1	70.0											

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	16.1	17.0	11.9	15.7	14.9	15.6	11.7	15.0	13.6	14.2	10.9	13.1
	Seg 13											
AP 1	12.5											

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.47	0.47	0.35	0.42	0.43	0.43	0.34	0.40	0.40	0.40	0.32	0.37
	Seg 13											
AP 1	0.37											

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	14.9	15.7	11.0	14.5	13.4	14.1	10.5	13.5	12.6	13.1	10.1	11.2
	Seg 13											
AP 1	11.8											

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	20.2	-	16.2	-	19.2	-	15.1	-	17.7	-	-
	Seg 13											
AP 1	-											

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	B	C	B	B	B	B	B	B	B	B	A	B
	Seg 13											
AP 1	B											

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13											

AP 1	-

Volume - Capacity Ratio (V/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.47	0.47	0.35	0.42	0.43	0.43	0.34	0.40	0.40	0.40	0.32	0.37

	Seg 13
AP 1	0.37

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3860	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2950	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1130
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.47

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	16.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	2	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	580
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2950	770
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.971
Flow Rate (v_i), pc/h	3389	844
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.47	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	926
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.2
Flow in Lanes 1 and 2 (v_{12}), pc/h	2463	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.4
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	17.0
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	20.2

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2180	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	835
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.35

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	4	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	790
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2180	470
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	5.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.952
Flow Rate (v_i), pc/h	2504	525
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.42	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1473.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1002
Downstream Equilibrium Distance (L_{EQ}), ft	3188.6	On-Ramp Influence Area Speed (S_R), mi/h	62.6
Flow in Lanes 1 and 2 (v_{12}), pc/h	1502	Outer Lanes Freeway Speed (S_O), mi/h	68.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2027	Ramp Junction Speed (S), mi/h	64.3
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	15.7
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	16.2

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 b/w SR-611 and SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11410	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2650	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1043
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.43

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	14.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	6	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2650	570
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	2.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.980
Flow Rate (v_i), pc/h	3129	619
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.43	0.28

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	5473.1	Flow Outer Lanes (v_{OA}), pc/h/ln	871
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	2258	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.9
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	15.6
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	19.2

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2790	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2080	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	819
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.34

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	8	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2080	400
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.962
Flow Rate (v_i), pc/h	2456	442
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.40	0.20

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1463.3	Flow Outer Lanes (v_{OA}), pc/h/ln	980
Downstream Equilibrium Distance (L_{EQ}), ft	2676.3	On-Ramp Influence Area Speed (S_R), mi/h	62.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1476	Outer Lanes Freeway Speed (S_O), mi/h	68.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1918	Ramp Junction Speed (S), mi/h	64.6
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	15.0
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	15.1

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 b/w SR-254 and SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	6450	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2480	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	950
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.40

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	13.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	10	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	480
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2480	480
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.962
Flow Rate (v_i), pc/h	2849	531
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.40	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	4606.4	Flow Outer Lanes (v_{OA}), pc/h/ln	779
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	64.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2070	Outer Lanes Freeway Speed (S_O), mi/h	76.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	67.1
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	14.2
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	17.7

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2870	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2000	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	766
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.32

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	10.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	12	Segment Name	I-90 b/w SR-57 and SR-2 Weave
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	4	Segment Type	Freeway
Segment Length (L_S), ft	4300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	2
Interchange Density (ID), int/mi	0.67	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1470	860	50	530
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	10.00	10.00	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909	0.909	0.909
Flow Rate (v_i), pc/h	1720	1006	59	620
Weaving Flow Rate (v_w), pc/h	59	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	3346	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		8286
Total Flow Rate (v), pc/h	3405	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.017	Weaving Area Capacity (c_W), veh/h		8286
Minimum Lane Change Rate (LC_{MIN}), lc/h	118	Adjusted Weaving Area Capacity (c_{WA}), veh/h		8286
Maximum Weaving Length (L_{MAX}), ft	5885	Volume-to-Capacity Ratio (v/c)		0.37

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	964	Average Weaving Speed (S_W), mi/h	62.1
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2249	Average Non-Weaving Speed (S_{NW}), mi/h	65.1
Weaving Lane Change Rate (LC_W), lc/h	713	Average Speed (S), mi/h	65.0
Weaving Lane Change Rate (LC_{All}), lc/h	2962	Density (D), pc/mi/ln	13.1
Weaving Intensity Factor (W)	0.168	Level of Service (LOS)	B

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	SR-2 West of I-90/SR-2 Diverge
Analysis Period Number	1	Segment Analysis Period	08:00-08:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	5000	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	2330	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	876
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.37

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	12.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Facilities Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Facility Name	I-90 WB OPTION 3	Units	U.S. Customary
Project Description	PID 107714 LOR-90-10.76		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	13
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	8.99		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	I-90 east of SR-611	3860	3
2	Diverge	Diverge	I-90 Exit Ramp to SR-611	1500	3
3	Basic	Basic	I-90 below SR-611 (3-lane section)	2310	3
4	Merge	Merge	I-90 Entrance Ramp from SR-611	1500	3
5	Basic	Basic	I-90 b/w SR-611 and SR-254	11410	3
6	Diverge	Diverge	I-90 Exit Ramp to SR-254	1500	3
7	Basic	Basic	I-90 below SR-254	2790	3
8	Merge	Merge	I-90 Entrance Ramp from SR-254	1500	3
9	Basic	Basic	I-90 b/w SR-254 and SR-57	6450	3
10	Diverge	Diverge	I-90 Exit Ramp to SR-57	1500	3
11	Basic	Basic	I-90 below SR-57	2870	3
12	Weaving	Weaving	I-90 b/w SR-57 and SR-2 Weave	5300	4
13	Basic	Basic	SR-2 West of I-90/SR-2 Diverge	5000	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.926	5963	7200	0.83	62.8	31.7	D

Segment 2: Diverge

AP	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.926	0.971	5963	1578	7200	2200	0.83	0.72	64.8	61.3	30.7	32.9	D

Segment 3: Basic

AP	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS

1	0.94		0.926		4308		7200		0.60		69.4		20.7	C
Segment 4: Merge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.952	5191	883	7200	2200	0.72	0.40	61.7	59.9	28.0	27.2	C
Segment 5: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.901		5360		7200		0.74		66.0		27.1	D
Segment 6: Diverge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.980	5360	1270	7200	2200	0.74	0.58	65.5	62.1	27.3	30.7	D
Segment 7: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.901		3979		7200		0.55		69.8		19.0	C
Segment 8: Merge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.901	0.962	4764	785	7200	2200	0.66	0.36	62.6	61.0	25.4	24.8	C
Segment 9: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.926		4687		7200		0.65		68.5		22.8	C
Segment 10: Diverge														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
	F	**R**	**F**	**R**	**Freeway**	**Ramp**	**Freeway**	**Ramp**	**F**	**R**	**F**	**R Infl.**	**F**	**R Infl.**	
1	0.94	0.94	0.926	0.962	4687	863	7200	2200	0.65	0.39	66.5	63.1	23.5	27.2	C
Segment 11: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.926		3791		7200		0.53		69.9		18.1	C
Segment 12: Weaving														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**
1	0.94		0.909		5289		9108		0.58		62.1		21.3	C
Segment 13: Basic														
AP	**PHF**		**fHV**		**Flow Rate (pc/h)**		**Capacity (pc/h)**		**d/c Ratio**		**Speed (mi/h)**		**Density (pc/mi/ln)**	**LOS**

1	0.94	0.943	3858	7200	0.54	69.9	18.4	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost $/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	10088	9075	8.81	220.22	66.0	23.9	21.7	8.20	C

Facility Overall Results

Space Mean Speed, mi/h	66.0	Average Density, veh/mi/ln	21.7
Average Travel Time, min	8.20	Average Density, pc/mi/ln	23.9
Total VMT, veh-mi	10088	Total VHD, veh-h	8.81
Vehicle Value of Time (VOT), $/h	25.00	Total Delay Cost, $	220.22

LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	D	D	C	C	D	D	C	C	C	C	C	C
	Seg 13											
AP 1	C											

Speed (mi/h)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	62.8	64.8	69.4	61.7	66.0	65.5	69.8	62.6	68.5	66.5	69.9	62.1
	Seg 13											
AP 1	69.9											

Density (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	31.7	30.7	20.7	28.0	27.1	27.3	19.0	25.4	22.8	23.5	18.1	21.3
	Seg 13											
AP 1	18.4											

Demand - Capacity Ratio (D/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.83	0.83	0.60	0.72	0.74	0.74	0.55	0.66	0.65	0.65	0.53	0.58
	Seg 13											
AP 1	0.54											

Density (veh/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	29.4	28.4	19.2	25.9	24.4	24.6	17.1	22.9	21.1	21.8	16.8	18.2
	Seg 13											
AP 1	17.4											

Density in Ramp Influence Area (pc/mi/ln)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	32.9	-	27.2	-	30.7	-	24.8	-	27.2	-	-
	Seg 13											
AP 1	-											

Density-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	D	D	C	C	D	D	C	C	C	C	C	C
	Seg 13											
AP 1	C											

Demand-Based LOS												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	-	-	-	-	-	-	-	-	-	-	-	-
	Seg 13											

AP 1	-

Volume - Capacity Ratio (V/C)												
	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12
AP 1	0.83	0.83	0.60	0.72	0.74	0.74	0.55	0.66	0.65	0.65	0.53	0.58

	Seg 13
AP 1	0.54

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary
Segment Number	1	Segment Name	I-90 east of SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	3860	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	5190	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1988
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.83

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	62.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	31.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	2	Segment Name	I-90 Exit Ramp to SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	580
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	5190	1440
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	3.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.971
Flow Rate (v_i), pc/h	5963	1578
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.83	0.72

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	2026
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	3937	Outer Lanes Freeway Speed (S_O), mi/h	72.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	64.8
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	30.7
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	32.9

HCS Basic Freeway Report

Project Information

Segment Number	3	Segment Name	I-90 below SR-611 (3-lane section)
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2310	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3750	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1436
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.60

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.4
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	4	Segment Name	I-90 Entrance Ramp from SR-611
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	790
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3750	790
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	5.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.952
Flow Rate (v_i), pc/h	4308	883
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.72	0.40

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1936.2	Flow Outer Lanes (v_{OA}), pc/h/ln	1723
Downstream Equilibrium Distance (L_{EQ}), ft	6542.0	On-Ramp Influence Area Speed (S_R), mi/h	59.9
Flow in Lanes 1 and 2 (v_{12}), pc/h	2585	Outer Lanes Freeway Speed (S_O), mi/h	65.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3468	Ramp Junction Speed (S), mi/h	61.7
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	28.0
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	27.2

HCS Basic Freeway Report

Project Information

Segment Number	5	Segment Name	I-90 b/w SR-611 and SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	11410	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4540	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1787
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.74

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	66.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	27.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	6	Segment Name	I-90 Exit Ramp to SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	4540	1170
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	2.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.980
Flow Rate (v_i), pc/h	5360	1270
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.74	0.58

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	9022.1	Flow Outer Lanes (v_{OA}), pc/h/ln	1767
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	62.1
Flow in Lanes 1 and 2 (v_{12}), pc/h	3593	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	65.5
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	27.3
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	30.7

HCS Basic Freeway Report

Project Information

Segment Number	7	Segment Name	I-90 below SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2790	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3370	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1326
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.55

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.8
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	19.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Merge Report

Project Information

Segment Number	8	Segment Name	I-90 Entrance Ramp from SR-254
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Acceleration Length (LA), ft	1500	830
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	3370	710
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	11.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.901	0.962
Flow Rate (v_i), pc/h	3979	785
Capacity (c_{md}), pc/h	7200	2200
Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.66	0.36

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	1862.6	Flow Outer Lanes (v_{OA}), pc/h/ln	1588
Downstream Equilibrium Distance (L_{EQ}), ft	4349.6	On-Ramp Influence Area Speed (S_R), mi/h	61.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2391	Outer Lanes Freeway Speed (S_O), mi/h	66.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3176	Ramp Junction Speed (S), mi/h	62.6
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	25.4
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	24.8

HCS Basic Freeway Report

Project Information

Segment Number	9	Segment Name	I-90 b/w SR-254 and SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	6450	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	4080	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1562
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.65

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	68.5
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	22.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Diverge Report

Project Information

Segment Number	10	Segment Name	I-90 Exit Ramp to SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	70.0	55.0
Segment Length (L) / Deceleration Length (LD), ft	1500	480
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	4080	780
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	8.00	4.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.926	0.962
Flow Rate (v_i), pc/h	4687	863
Capacity (c_{md}), pc/h	7200	2200
Initial Adjusted Capacity (c_{mda}), pc/h	7200	-
Final Adjusted Capacity (c_{mda}), pc/h	7200	2200
Volume-to-Capacity Ratio (v/c)	0.65	0.39

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	6942.7	Flow Outer Lanes (v_{OA}), pc/h/ln	1518
Downstream Equilibrium Distance (L_{EQ}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	63.1
Flow in Lanes 1 and 2 (v_{12}), pc/h	3169	Outer Lanes Freeway Speed (S_O), mi/h	74.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Ramp Junction Speed (S), mi/h	66.5
Number of Outer Lanes on Freeway (N_O), ln	1	Average Density (D), pc/mi/ln	23.5
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	27.2

HCS Basic Freeway Report

Project Information

Segment Number	11	Segment Name	I-90 below SR-57
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	2870	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.17
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3300	Heavy Vehicle Adjustment Factor (f_{HV})	0.926
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1264
Total Trucks, %	8.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.53

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Freeway Weaving Report

Project Information

Segment Number	12	Segment Name	I-90 b/w SR-57 and SR-2 Weave
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	4	Segment Type	Freeway
Segment Length (L_S), ft	4300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	2
Interchange Density (ID), int/mi	0.67	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	2290	1130	90	1010
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	10.00	10.00	10.00	10.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909	0.909	0.909
Flow Rate (v_i), pc/h	2680	1322	105	1182
Weaving Flow Rate (v_w), pc/h	105	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2400
Non-Weaving Flow Rate (v_{NW}), pc/h	5184	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		8279
Total Flow Rate (v), pc/h	5289	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.020	Weaving Area Capacity (c_W), veh/h		8279
Minimum Lane Change Rate (LC_{MIN}), lc/h	210	Adjusted Weaving Area Capacity (c_{WA}), veh/h		8279
Maximum Weaving Length (L_{MAX}), ft	5912	Volume-to-Capacity Ratio (v/c)		0.58

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	1494	Average Weaving Speed (S_W), mi/h	61.1
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	2693	Average Non-Weaving Speed (S_{NW}), mi/h	62.1
Weaving Lane Change Rate (LC_W), lc/h	805	Average Speed (S), mi/h	62.1
Weaving Lane Change Rate (LC_{All}), lc/h	3498	Density (D), pc/mi/ln	21.3
Weaving Intensity Factor (W)	0.192	Level of Service (LOS)	C

HCS Basic Freeway Report

Project Information

Segment Number	13	Segment Name	SR-2 West of I-90/SR-2 Diverge
Analysis Period Number	1	Segment Analysis Period	16:00-16:15

Geometric Data

Number of Lanes (N), ln	3	Terrain Type	Level
Segment Length (L), ft	5000	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	3420	Heavy Vehicle Adjustment Factor (f_{HV})	0.943
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	1286
Total Trucks, %	6.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.54

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	69.9
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	AM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	580	Heavy Vehicle Adjustment Factor (f_{HV})	0.730
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	422
Total Trucks, %	37.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.18

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	6.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

HCS Basic Freeway Report

Project Information

Analyst	GSH	Date	2/17/2023
Agency	CMT	Analysis Year	2045
Jurisdiction	ODOT District 3	Time Analyzed	PM DHV
Project Description	PID 107714 LOR-90-10.76	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	-	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	70.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1100	Heavy Vehicle Adjustment Factor (f_{HV})	0.730
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	802
Total Trucks, %	37.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2400
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.33

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	70.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	70.0		

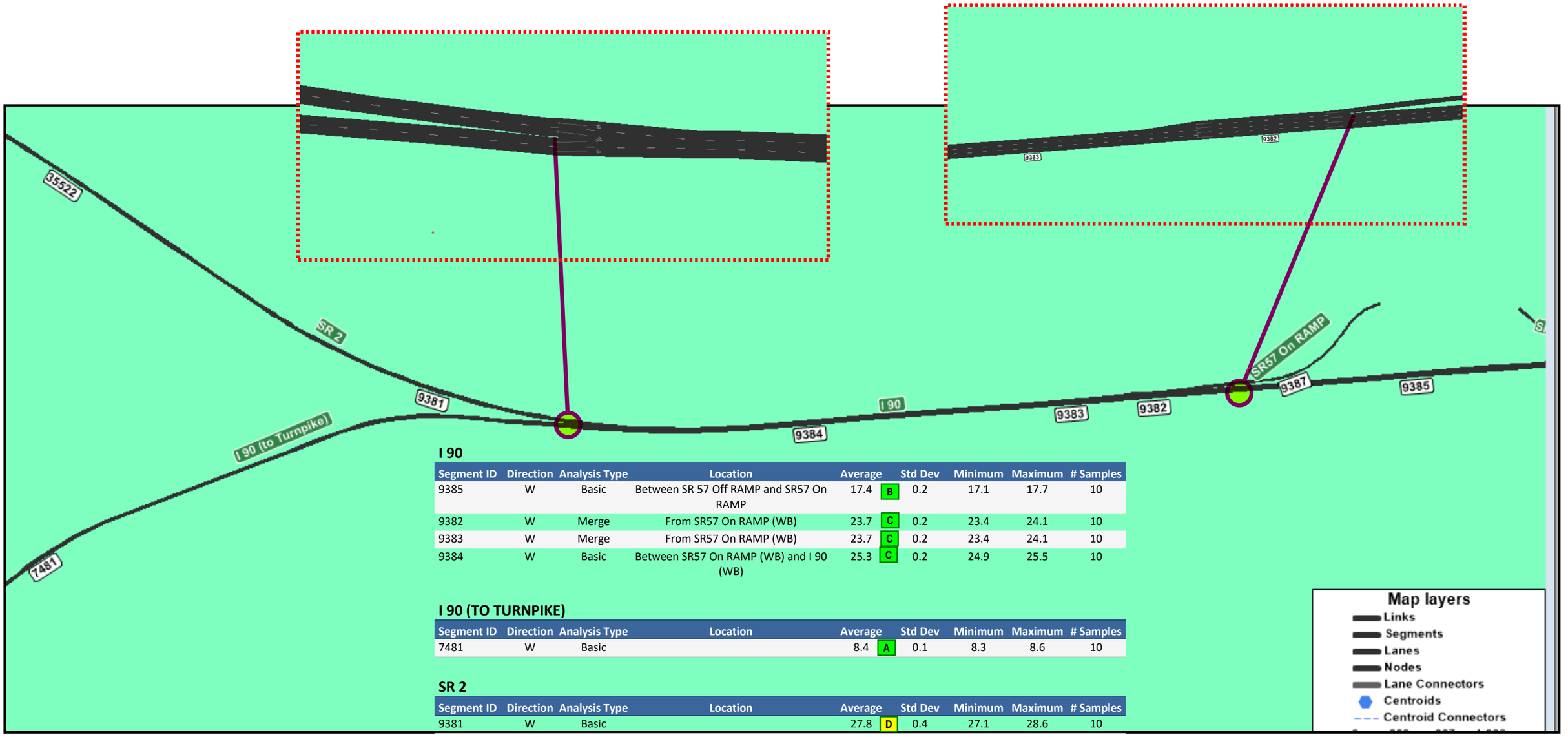
INTERCHANGE OPERATIONS STUDY
LOR-90-10.76

APPENDIX C: TRANSMODELER CAPACITY ANALYSIS

CMT

I-90 WB "weaving movement" between SR57 merge & I-90/SR major diverge

TransModeler was run to verify operations between the proposed lane configuration for the section of I-90WB, between the SR57 Entrance Ramp and the Major diverge of SR2 and I-90. TransModeler shows acceptable operations.



I 90

Segment ID	Direction	Analysis Type	Location	Average		Std Dev	Minimum	Maximum	# Samples
9385	W	Basic	Between SR 57 Off RAMP and SR57 On RAMP	17.4	B	0.2	17.1	17.7	10
9382	W	Merge	From SR57 On RAMP (WB)	23.7	C	0.2	23.4	24.1	10
9383	W	Merge	From SR57 On RAMP (WB)	23.7	C	0.2	23.4	24.1	10
9384	W	Basic	Between SR57 On RAMP (WB) and I 90 (WB)	25.3	C	0.2	24.9	25.5	10

I 90 (TO TURNPIKE)

Segment ID	Direction	Analysis Type	Location	Average		Std Dev	Minimum	Maximum	# Samples
7481	W	Basic		8.4	A	0.1	8.3	8.6	10

SR 2

Segment ID	Direction	Analysis Type	Location	Average		Std Dev	Minimum	Maximum	# Samples
9381	W	Basic		27.8	D	0.4	27.1	28.6	10

Project: Elyria
Scenario: 2045 PM Build
Run(s): Batch (10 runs)
Simulated: Various
Time: 17:00:00 - 18:00:00
Interval: Summary
Selection: Weave -WB SR2/I-90 E. of SR57 t

Freeway Segment Level of Service - Overview

I 90

Run	Density (pc/mi/ln)	Over Capacity	Level of Service
Basic - Between SR 57 Off RAMP and SR57 On RAMP - WB			**Segment: 9385**
1	17.1	No	B
2	17.6	No	B
3	17.4	No	B
4	17.7	No	B
5	17.3	No	B
6	17.1	No	B
7	17.5	No	B
8	17.4	No	B
9	17.7	No	B
10	17.6	No	B
Average:	**17.4**	**No**	**B**
Merge - From SR57 On RAMP (WB) - WB			**Segment: 9382**
1	24.1	No	C
2	23.5	No	C
3	23.9	No	C
4	23.4	No	C
5	23.6	No	C
6	23.8	No	C
7	23.6	No	C
8	23.8	No	C
9	23.5	No	C
10	23.4	No	C
Average:	**23.7**	**No**	**C**
Merge - From SR57 On RAMP (WB) - WB			**Segment: 9383**
1	24.1	No	C
2	23.5	No	C
3	23.9	No	C
4	23.4	No	C
5	23.6	No	C
6	23.8	No	C
7	23.6	No	C
8	23.8	No	C
9	23.5	No	C

I 90

	Run	Density (pc/mi/ln)	Over Capacity	Level of Service
Merge - From SR57 On RAMP (WB) - WB				**Segment: 9383**
	10	23.4	No	C
	Average:	**23.7**	**No**	**C**
Basic - Between SR57 On RAMP (WB) and I 90 (WB) - WB				**Segment: 9384**
	1	25.4	No	C
	2	25.5	No	C
	3	25.1	No	C
	4	25.4	No	C
	5	24.9	No	C
	6	25.4	No	C
	7	25.2	No	C
	8	24.9	No	C
	9	25.4	No	C
	10	25.5	No	C
	Average:	**25.3**	**No**	**C**

I 90 (TO TURNPIKE)

	Run	Density (pc/mi/ln)	Over Capacity	Level of Service
Basic - WB				**Segment: 7481**
	1	8.5	No	A
	2	8.4	No	A
	3	8.4	No	A
	4	8.6	No	A
	5	8.5	No	A
	6	8.4	No	A
	7	8.3	No	A
	8	8.4	No	A
	9	8.4	No	A
	10	8.3	No	A
	Average:	**8.4**	**No**	**A**

SR 2

	Run	Density (pc/mi/ln)	Over Capacity	Level of Service
Basic - WB				**Segment: 9381**
	1	27.8	No	D
	2	28.0	No	D
	3	28.6	No	D
	4	27.1	No	D
	5	28.2	No	D
	6	27.9	No	D
	7	27.9	No	D
	8	27.9	No	D

SR 2

	Run	Density (pc/mi/ln)	Over Capacity	Level of Service
Basic - WB				**Segment: 9381**
	9	27.7	No	D
	10	27.2	No	D
	Average:	**27.8**	**No**	**D**

ABOUT FREEWAY LOS
The LOS determination based on density will be overridden with LOS F when demand exceeds capacity (i.e., Over Capacity = Yes).

Project: Elyria
Scenario: 2045 PM Build
Run(s): Batch (10 runs)
Simulated: Various
Time: 17:00:00 - 18:00:00
Interval: Summary
Selection: Weave -WB SR2/I-90 E. of SR57 t

Freeway Segment Level of Service - Density

I 90

Segment ID	Direction	Analysis Type	Location	Average		Std Dev	Minimum	Maximum	# Samples
9385	W	Basic	Between SR 57 Off RAMP and SR57 On RAMP	17.4	B	0.2	17.1	17.7	10
9382	W	Merge	From SR57 On RAMP (WB)	23.7	C	0.2	23.4	24.1	10
9383	W	Merge	From SR57 On RAMP (WB)	23.7	C	0.2	23.4	24.1	10
9384	W	Basic	Between SR57 On RAMP (WB) and I 90 (WB)	25.3	C	0.2	24.9	25.5	10

I 90 (TO TURNPIKE)

Segment ID	Direction	Analysis Type	Location	Average		Std Dev	Minimum	Maximum	# Samples
7481	W	Basic		8.4	A	0.1	8.3	8.6	10

SR 2

Segment ID	Direction	Analysis Type	Location	Average		Std Dev	Minimum	Maximum	# Samples
9381	W	Basic		27.8	D	0.4	27.1	28.6	10

Project: Elyria
Scenario: 2045 PM Build
Run(s): Batch (10 runs)
Simulated: Various
Time: 17:00:00 - 18:00:00
Interval: Summary
Selection: Weave -WB SR2/I-90 E. of SR57 t

Freeway Segment Level of Service - VgtC

I 90

Segment ID	Direction	Analysis Type	Location	Average	Std Dev	Minimum	Maximum	# Samples
9385	W	Basic	Between SR 57 Off RAMP and SR57 On RAMP	0.0	0.0	0.0	0.0	10
9382	W	Merge	From SR57 On RAMP (WB)	0.0	0.0	0.0	0.0	10
9383	W	Merge	From SR57 On RAMP (WB)	0.0	0.0	0.0	0.0	10
9384	W	Basic	Between SR57 On RAMP (WB) and I 90 (WB)	0.0	0.0	0.0	0.0	10

I 90 (TO TURNPIKE)

Segment ID	Direction	Analysis Type	Location	Average	Std Dev	Minimum	Maximum	# Samples
7481	W	Basic		0.0	0.0	0.0	0.0	10

SR 2

Segment ID	Direction	Analysis Type	Location	Average	Std Dev	Minimum	Maximum	# Samples
9381	W	Basic		0.0	0.0	0.0	0.0	10

Project: Elyria
Scenario: 2045 PM Build
Run(s): Batch (10 runs)
Simulated: Various
Time: 17:00:00 - 18:00:00
Interval: Summary
Selection: Weave -WB SR2/I-90 E. of SR57 t

Freeway Segment Level of Service - Over Capacity

I 90

Segment ID	Direction	Analysis Type	Location	Average	Std Dev	Minimum	Maximum	# Samples
9385	W	Basic	Between SR 57 Off RAMP and SR57 On RAMP	0.0	0.0	0.0	0.0	10
9382	W	Merge	From SR57 On RAMP (WB)	0.0	0.0	0.0	0.0	10
9383	W	Merge	From SR57 On RAMP (WB)	0.0	0.0	0.0	0.0	10
9384	W	Basic	Between SR57 On RAMP (WB) and I 90 (WB)	0.0	0.0	0.0	0.0	10

I 90 (TO TURNPIKE)

Segment ID	Direction	Analysis Type	Location	Average	Std Dev	Minimum	Maximum	# Samples
7481	W	Basic		0.0	0.0	0.0	0.0	10

SR 2

Segment ID	Direction	Analysis Type	Location	Average	Std Dev	Minimum	Maximum	# Samples
9381	W	Basic		0.0	0.0	0.0	0.0	10