APPENDIX PP – INTERIM SR 37 INTERCHANGE DESIGN

In the Access Recommendations Memo signed on February 4, 2011 (See Appendix Z, document 2A), INDOT approved an interim interchange design for the I-69/SR 37 interchange. The interchange approved in this FEIS is designed to coincide with the completed project in Section 5. An interim design (which will serve as the terminus of I-69 south of Bloomington until the Section 5 project is constructed) is provided for the following reasons:

- The final design approved in this FEIS does not match existing SR 37. See Appendix R, pp. 59 and 60 (for both the initial and low cost criteria), which shows the footprint of the I-69 SR 37 interchange roadways superimposed upon the existing SR 37 roadway footprint. The alignment of the roadway leaving the interchange is offset by more than 100 feet from the existing SR 37 pavement. The full SR 37 interchange cannot be built until the project in Section 5 (which will match the Section 4 design) is built.
- Therefore, an interim design for the SR 37 interchange is required which will match with the existing SR 37 alignment.

During the Value Engineering process for Section 4 INDOT evaluated one alternative interim interchange design which provides for terminating Section 4 with an at grade signalized T intersection at SR 37 and a second alternative configuration for the final interchange which provides modified flyover ramps. These two alternatives are described in the April 21, 2011 technical memo included in this appendix.

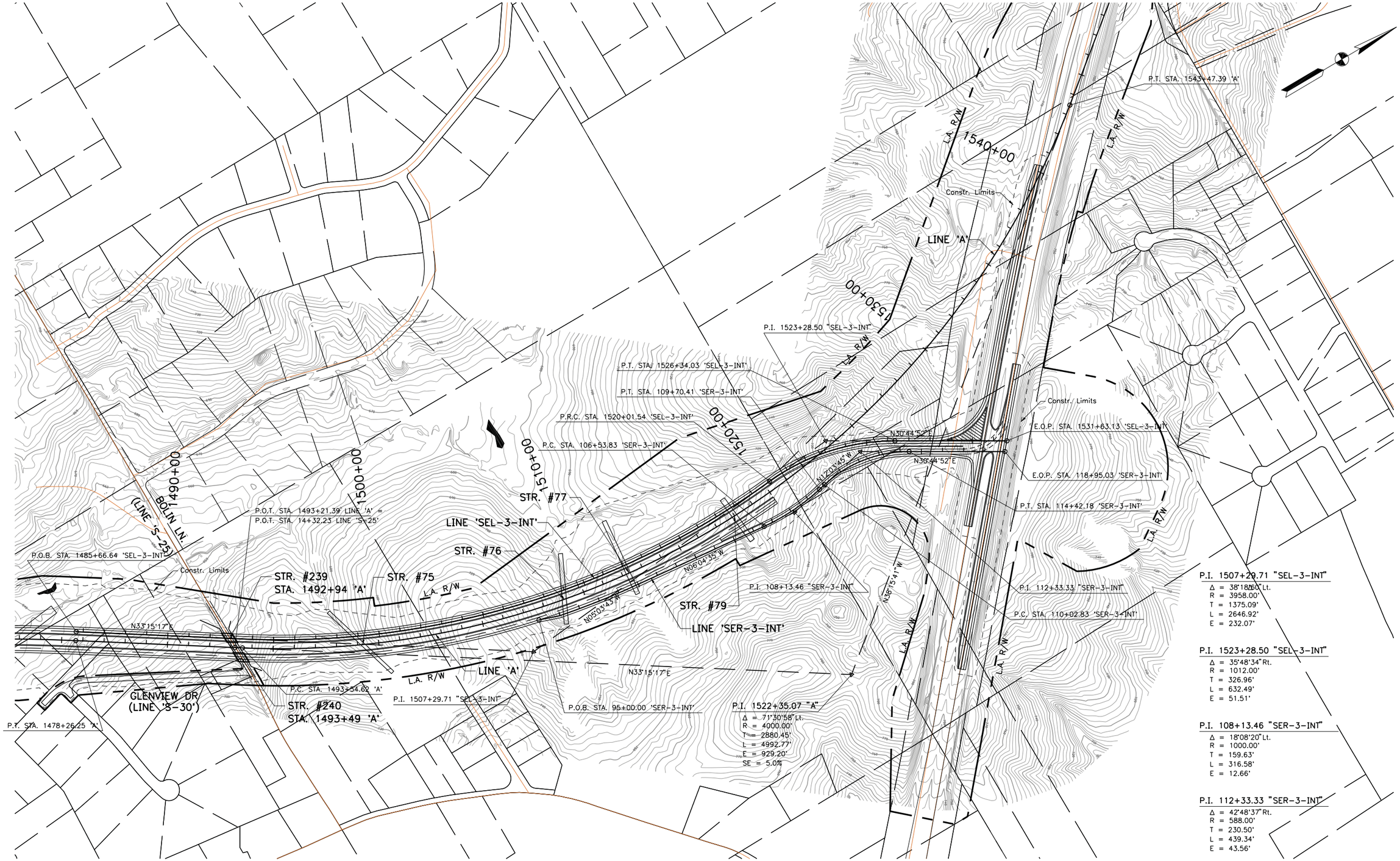
The alternative with modified flyover ramps requires significant right-of-way outside of the right-of-way needed for the interchange, as shown in this FEIS. There would be residential impacts in the northeast quadrant of the interchange which are avoided in the interchange design described in this FEIS. During the finalization of the Value Engineering process this alternative with modified flyover ramps was dismissed from further consideration.

By comparison, the signalized “T” intersection with SR 37 can be built within the existing right-of way. In addition, the technical memo shows that at least 10 years into the future, this “T” intersection design operates at Level of Service (LOS) A or B for all traffic movements.

An interim solution is required to avoid building a full interchange which would require significant rework when Section 5 is constructed. The “T” intersection maintains flexibility for the Section 5 studies while providing a high-functioning solution.

Based upon these considerations of transportation performance and cost, the signalized “T” intersection was selected as the interim interchange design for the northern terminus of Section 4. This appendix includes drawings of this interim interchange under both the initial and low-cost design criteria. This design is contained completely within the footprint of the final design shown in this FEIS, so that its impacts already are disclosed in this document. However, INDOT intends to purchase all right-of-way for the full interchange as described in this FEIS at the same time to protect it from development. As documented in Section 6.4.1.2 of this FEIS, this interim design provides a near-term cost deferral of $19 to $20 million, as compared to the construction of the full SR 37 interchange.

Initial Criteria – Interim Design



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CHECKED: BRL / CHECKED: DJR	SR 37 INTERIM CONNECTION	CONTRACT	PROJECT

RECOMMENDED FOR APPROVAL _____ DESIGN ENGINEER DATE	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 100'	BRIDGE FILE
		VERTICAL SCALE ---	DESIGNATION
DESIGNED: DJR / DRAWN: RAP	INITIAL CRITERIA – REFINED PREFERRED ALT. 2	SURVEY BOOK	SHEETS
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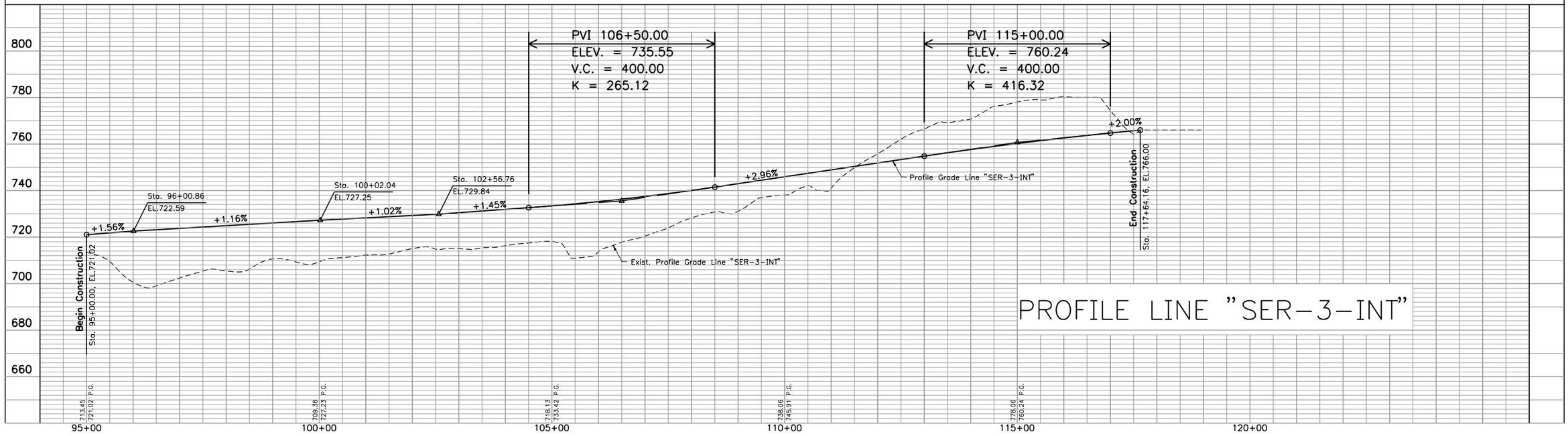

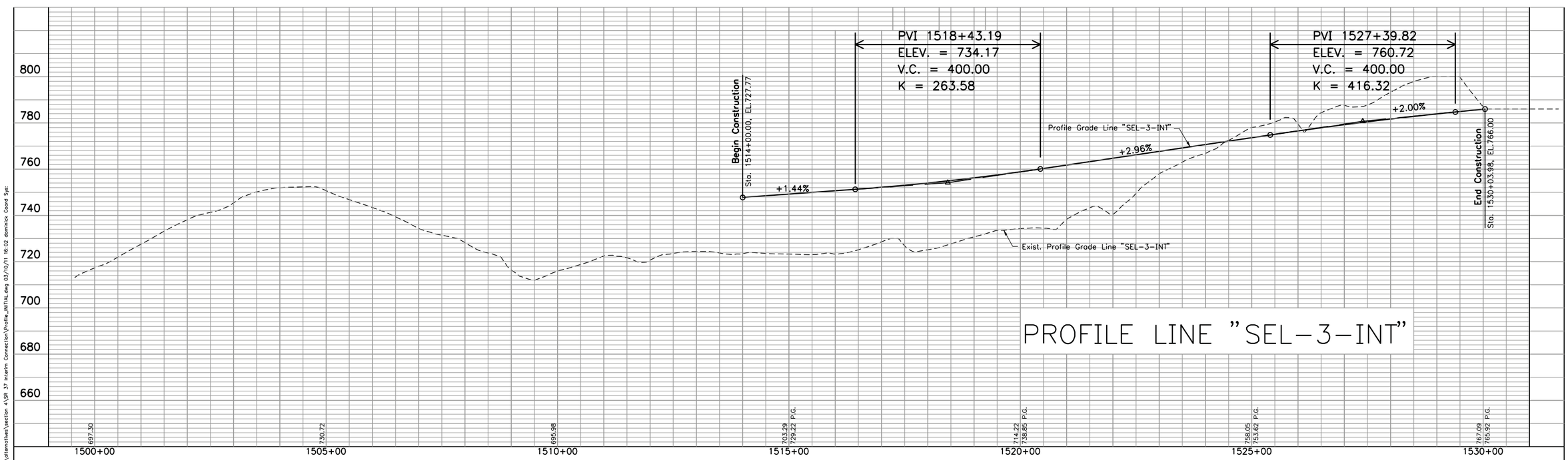

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CHECKED: BRL | CHECKED: DJR

INDIANA DEPARTMENT OF TRANSPORTATION

INITIAL CRITERIA – REFINED PREFERRED ALT. 2

SR 37 INTERIM CONNECTION

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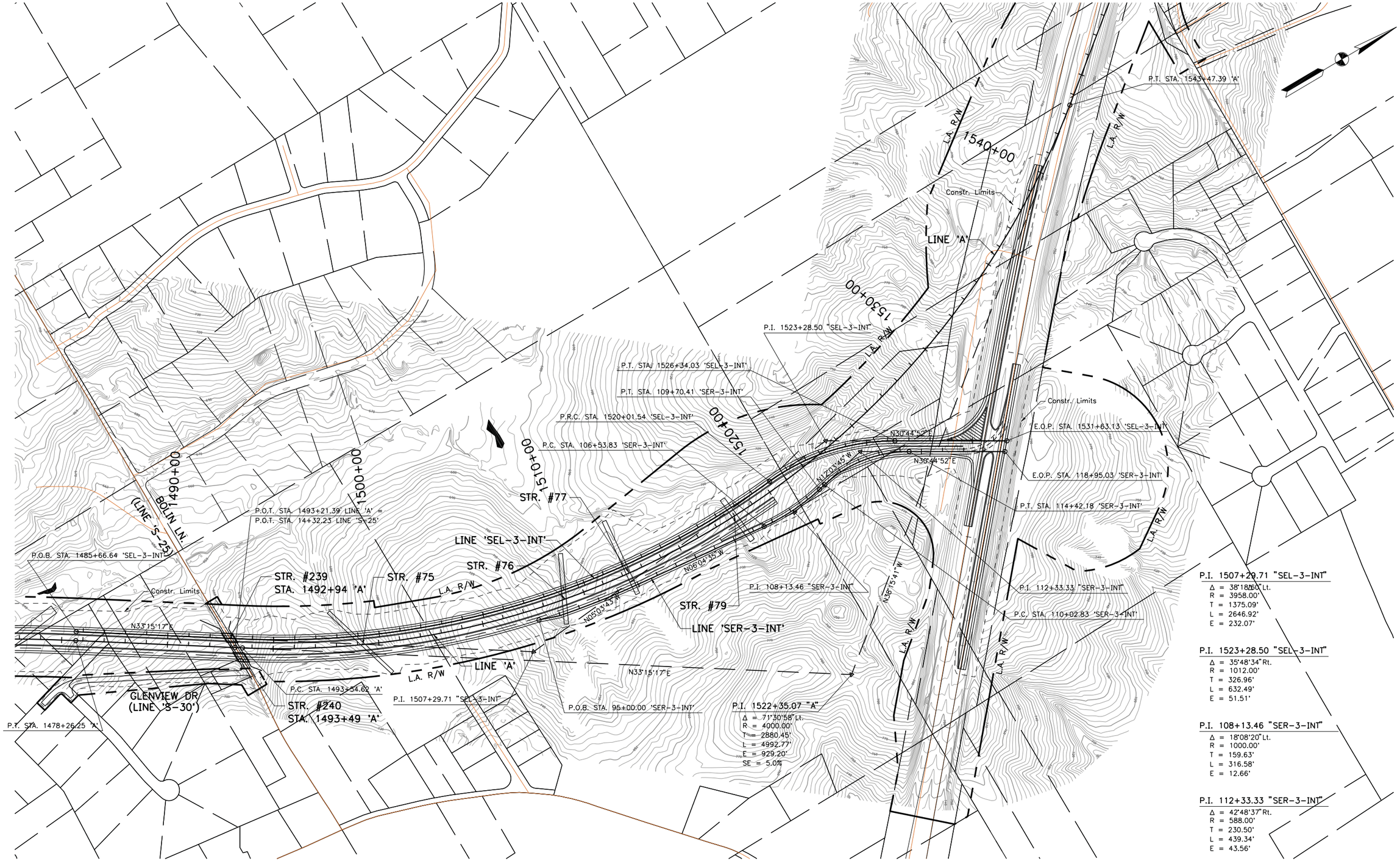
1"=100'	
VERTICAL SCALE	DESIGNATION
1"=20'	
SURVEY BOOK	SHEETS
	of
CONTRACT	PROJECT

Low Cost Criteria – Interim Design



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DESIGNED: DJR DRAWN: RAP

CHECKED: BRL CHECKED: DJR

INDIANA DEPARTMENT OF TRANSPORTATION

LOW COST CRITERIA – REFINED PREFERRED ALT. 2

SR 37 INTERIM CONNECTION

HORIZONTAL SCALE	BRIDGE FILE
1" =200'	
VERTICAL SCALE	DESIGNATION

SURVEY BOOK	SHEETS
	of
CONTRACT	PROJECT

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		VERTICAL SCALE ---	DESIGNATION
DESIGNED: DJR / DRAWN: RAP	LOW COST CRITERIA – REFINED PREFERRED ALT. 2	SURVEY BOOK	SHEETS
CHECKED: BRL / CHECKED: DJR	SR 37 INTERIM CONNECTION	CONTRACT	PROJECT

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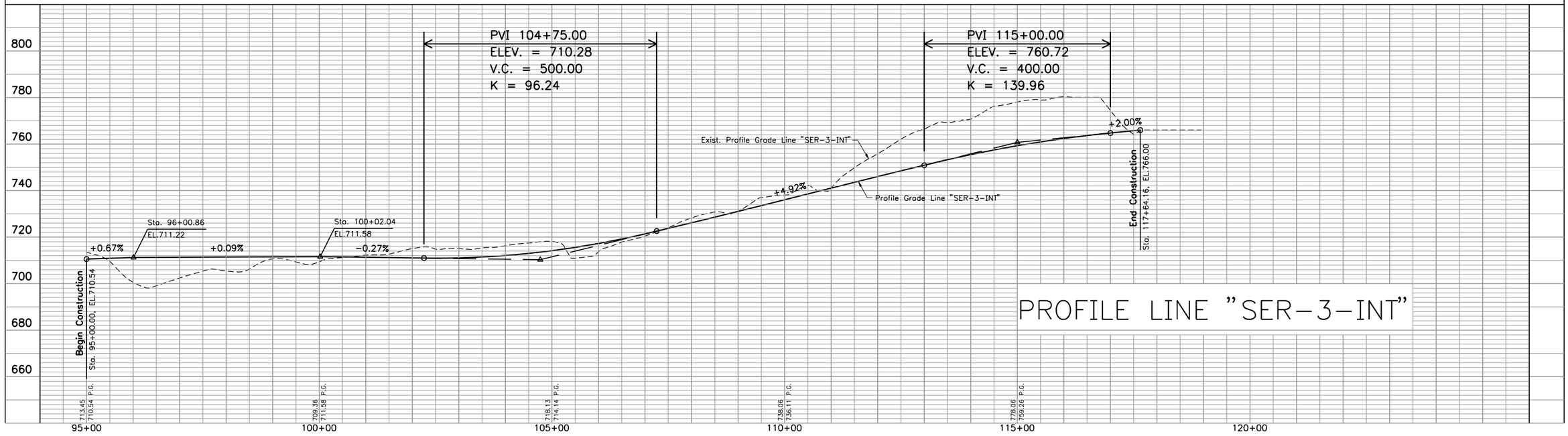

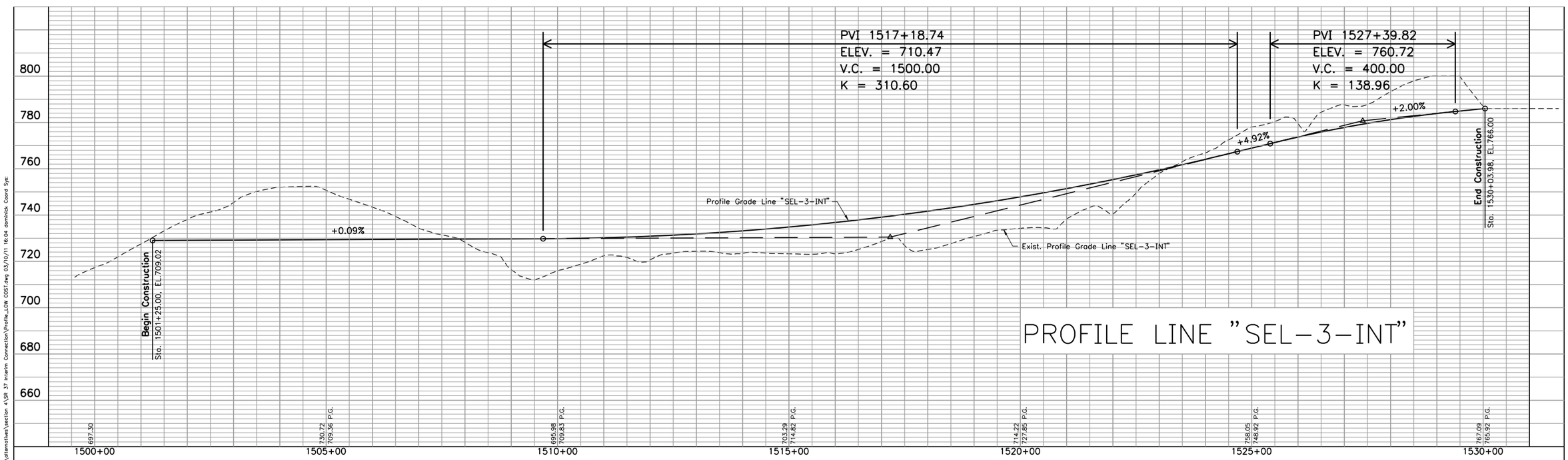

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DESIGNED: DJR | DRAWN: RAP

CHECKED: BRL | CHECKED: DJR

INDIANA DEPARTMENT OF TRANSPORTATION

LOW COST CRITERIA – REFINED PREFERRED ALT. 2

SR 37 INTERIM CONNECTION

HORIZONTAL SCALE 1"=100'	BRIDGE FILE
VERTICAL SCALE 1"=20'	DESIGNATION
SURVEY BOOK	SHEETS of
CONTRACT	PROJECT

April 21, 2011 Technical Memorandum

DATE: April 21, 2011

TO: Indiana Department of Transportation

FROM: Corradino LLC

RE: Traffic Capacity Analysis - Value Engineering Interchange Alternatives

I-69 Section 4 (Crane to Bloomington)

Traffic Capacity Analysis

for

SR 37 Interchange Alternative RJ-6 (Flyover Option 1)

SR 37 Interchange Alternative RJ-6 (Interim Traffic Signal Option)

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Appendices

Appendix A: Traffic Data from I-69 Travel Demand Model
Appendix B: *Synchro* Output for Interim Signal Capacity
Appendix C: *HCS+* Output for Freeway Mainline, Merges, and Diverges
Appendix D: Sketches of Flyover Option 1 and Interim Traffic Signal

1. Summary

SR 37 Interchange Alternative RJ-6 (Flyover Option 1): All movements are forecasted to operate at Level of Service (LOS) A or LOS B for years 2015, 2020, and 2030, except for northbound (NB) and southbound (SB) mainline SR 37, north of the interchange, which are forecasted to operate at LOS C in year 2030.

SR 37 Interchange Alternative RJ-6 (Interim Traffic Signal Option): The Interim Signal is forecasted to operate at a desirable LOS B or better for the overall intersection as well as individual approaches for the AM and PM peaks in years 2015 and 2020. In year 2030, the overall signal is forecasted to operate at an acceptable LOS C for the PM peak and LOS B for the AM peak.

2. Introduction

Two I-69 interchange alternatives at SR 37 were identified. Corradino LLC (Corradino) presents the capacity analysis findings for the following two interchange alternatives in this report. Schematic diagrams for each alternative are contained in Appendix D.

1. SR 37 Interchange Alternative RJ-6 (Flyover Option 1)
2. SR 37 Interchange Alternative RJ-6 (Interim Traffic Signal Option)

Traffic data for this analysis was extracted from the I-69 Travel Demand Model and provided by Bernardin Lochmueller and Associates, Inc. (BLA). It is important to note that travel demand models are better suited for forecasting mainline volumes rather than turning movements at specific locations; however, since these interchanges do not currently exist and they will be constructed on new terrain, the travel demand model is the best available tool for forecasting turning movements. BLA provided vehicular and truck traffic data for AM and PM peak periods for the years 2015, 2020, and 2030 for the future SR 37 interchange, as configured in the Section 4 Draft Environmental Impact Statement (DEIS). Base traffic data is found in Appendix A. Corradino manually re-assigned the turning movement volumes from the preferred DEIS interchange alternatives to fit the alternatives identified in the Value Engineering process.

Two different software packages were used for capacity analysis. Mainline freeway segments and ramp merges and diverges were analyzed using Highway Capacity Software (HCS+). The interim traffic signal at the SR 37 interchange was analyzed using Synchro Studio 7. The primary measure of a facility's capacity is LOS, which ranges from LOS A (free-flow conditions) to LOS F (grid lock conditions). Typically for new construction, it is acceptable to provide LOS C or better. Providing a LOS A many times is not feasible and is considered by many transportation agencies as "overbuild." Average delay, measured in seconds per vehicle, was also investigated for the signalized intersection. The average delay helps put the LOS results into further context.

3. SR 37 Interchange Alternative RJ-6 (Flyover Option 1)

This interchange alternative provides free flow for all movements between I-69 and SR 37. It was assumed that the SB ramp from existing SR 37 (future I-69) to existing SB SR 37 will be a two-lane ramp, as is shown in the DEIS. It was also assumed that the northbound (NB) ramp from existing SR 37 to existing NB SR 37 (future I-69) will be a two-lane ramp, as is shown in the DEIS.

Table 1 summarizes the forecasted capacity for the interchange. All movements are forecasted to achieve LOS B or better through the year 2020. By year 2030, all movements are forecasted to operate at LOS C or better with only the NB and SB mainline existing SR 37 (future I-69), north of the interchange, operating at LOS C. It may be possible to provide only single lane ramps connecting existing SR 37 (future I-69) north of the interchange with SR 37 south of the interchange, and still provide adequate LOS.

Table 1
SR 37 Interchange Alternative RJ-6 (Flyover Option 1)
Level of Service (LOS)

Location	Capacity Analysis Type	Software	Year 2015 (LOS) "Build"		Year 2020 (LOS) "Build"		Year 2030 (LOS) "Build"	
			AM	PM	AM	PM	AM	PM
SB SR 37north of interchange	Mainline	HCS+	A	B	A	B	A	C
SB I-69 at exit ramp to SB SR 37	Diverge	HCS+	A	A	A	A	A	B
SB I-69 within interchange	Mainline	HCS+	A	A	A	A	A	A
SB I-69 at entrance ramp from NB SR 37	Merge	HCS+	A	A	A	A	A	B
SB I-69 south of interchange	Mainline	HCS+	A	A	A	A	A	A
NB I-69 south of interchange	Mainline	HCS+	A	A	A	A	A	A
NB I-69 at exit ramp to SB SR 37	Diverge	HCS+	A	A	A	A	B	B
NB I-69 within interchange	Mainline	HCS+	A	A	A	A	A	A
NB I-69 at entrance ramp from NB SR 37	Merge	HCS+	A	A	A	A	B	B
NB SR 37 north of interchange	Mainline	HCS+	A	A	B	A	C	B
SB SR 37 south of interchange at entrance ramp from NB I-69	Merge	HCS+	A	A	A	B	A	B
NB SR 37 south of interchange at exit ramp to SB I-69	Diverge	HCS+	A	A	A	A	B	A

4. SR 37 Interchange Alternative RJ-6 (Interim Traffic Signal Option)

The forecasted LOS and average delay for the interim traffic signal, as well as the individual approaches that comprise the intersection, are summarized in Table 2 and Table 3. The analysis assumes an intersection geometry of SB SR 37 (2 thru lanes and 1 right turn lane onto I-69), NB SR 37 (1 left turn lane onto I-69 and 2 thru lanes), and EB I-69 (one left turn lane and a shared left/right). The default Synchro setting to minimize overall intersection delay was activated. Green time could be allocated to the intersection approaches in different amounts if desired. The overall intersection delay would likely increase, but this would allow the designer to give preference to specific movements.

Table 2
SR 37 Interchange Alternative RJ-6 (Interim Traffic Signal Option)
Level of Service (LOS)

Location	Capacity Analysis Type	Software	Year 2015 (LOS) "Build"		Year 2020 (LOS) "Build"		Year 2030 (LOS) "Build"	
			AM	PM	AM	PM	AM	PM
SB SR 37Approach to Intersection	Signal	Synchro	A	A	A	A	A	C
NB SR 37 Approach to Intersection	Signal	Synchro	A	A	A	A	C	B
EB I-69 Approach to Intersection	Signal	Synchro	B	B	B	B	C	D
Overall Signalized Intersection	Signal	Synchro	A	A	A	B	B	C

Table 3
SR 37 Interchange Alternative RJ-6 (Interim Traffic Signal Option)
Average Delay (seconds per vehicle)

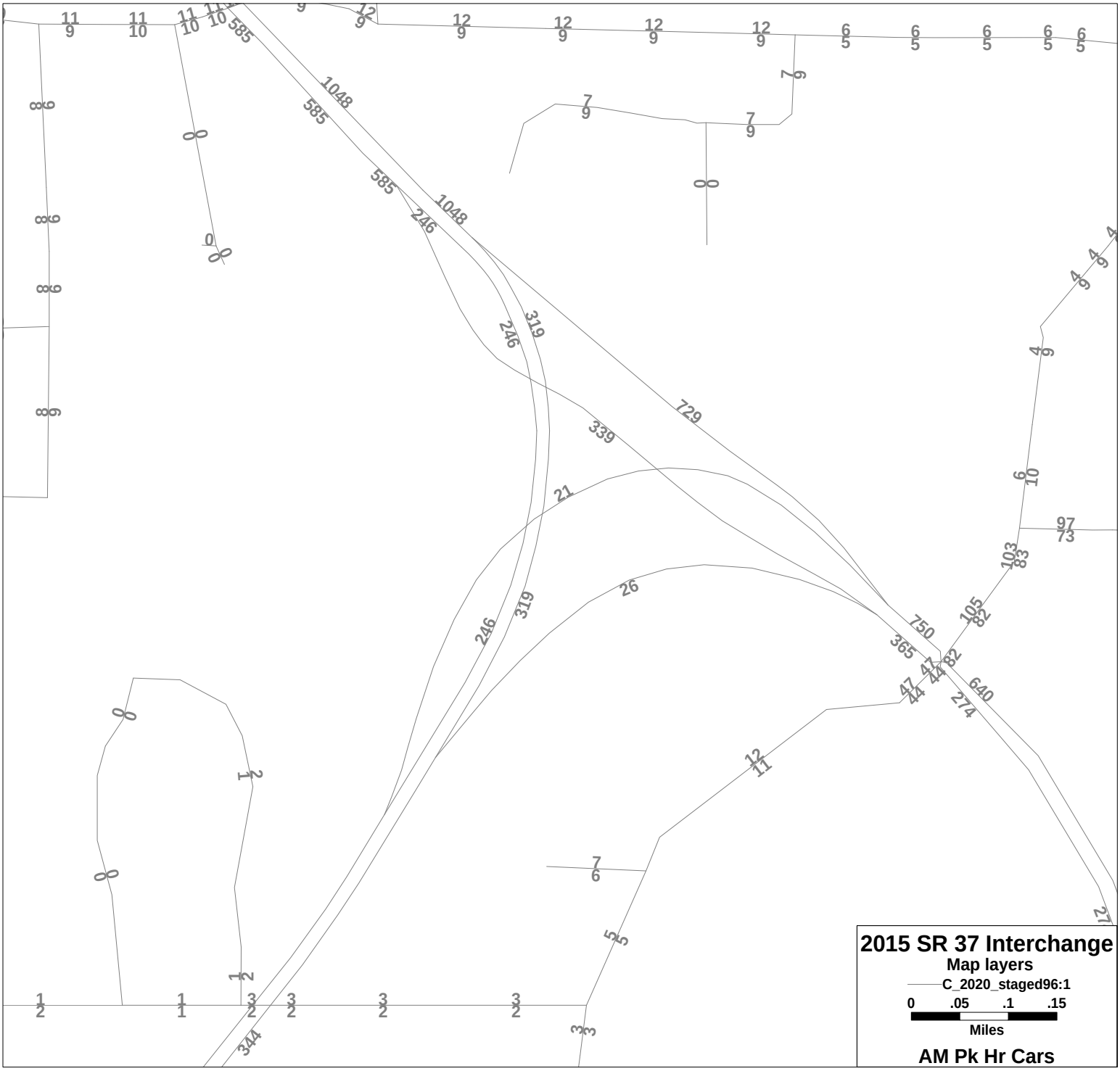
Location	Capacity Analysis Type	Software	Year 2015 (delay) "Build"		Year 2020 (delay) "Build"		Year 2030 (delay) "Build"	
			AM	PM	AM	PM	AM	PM
SB SR 37Approach to Intersection	Signal	Synchro	3.8	5.3	4.8	7.1	9.1	33.3
NB SR 37 Approach to Intersection	Signal	Synchro	6.9	6.1	8.4	7.7	20.6	12.8
EB I-69 Approach to Intersection	Signal	Synchro	16.0	16.0	19.3	19.8	30.2	35.4
Overall Signalized Intersection	Signal	Synchro	7.6	7.4	9.7	10.2	19.0	30.2

The Interim Signal appears to operate at a very desirable LOS B or better for the overall intersection as well as individual approaches for the AM and PM peaks in years 2015 and 2020. Even in year 2030, the overall signal is forecasted to still operate at an acceptable LOS C for the PM peak and a desirable LOS B for the AM peak. A typical approach to analyzing LOS for intersections is to allow for individual approaches to operate at one LOS worse than the overall signal, and for an individual movement to operate at one LOS worse than its approach. For example, if an overall signal is forecasted to operate at an acceptable LOS C, then individual approaches could operate at LOS D, and individual movements within those approaches could operate at LOS E. Forecasted average delays are minimal, especially up to year 2020 with an average overall intersection delay of 10.2 seconds per vehicle for the PM peak period.

There are a couple of low cost options to improve the capacity of the interim signalized intersection even more. These include adding a second SB SR 37 to SB I-69 right turn lane and a separate NB I-69 to SB SR 37 right turn lane. It was assumed that I-69 would be reduce down to one lane in each direction as it approaches SR 37 and that turn lanes would be developed at the intersection. Reducing down to one lane in each direction replicates a ramp-like configuration so the driver feels that he/she is exiting the interstate, which could be critical as motorists approach the signal. If a second SB SR 37 to SB I-69 right turn lane were added, SB I-69 would require two receiving lanes. This may not be an issue because these lanes would be travelling away from the signal and not toward it.

Appendix A

Traffic Data from I-69 Travel Demand Model


2015 SR 37 Interchange
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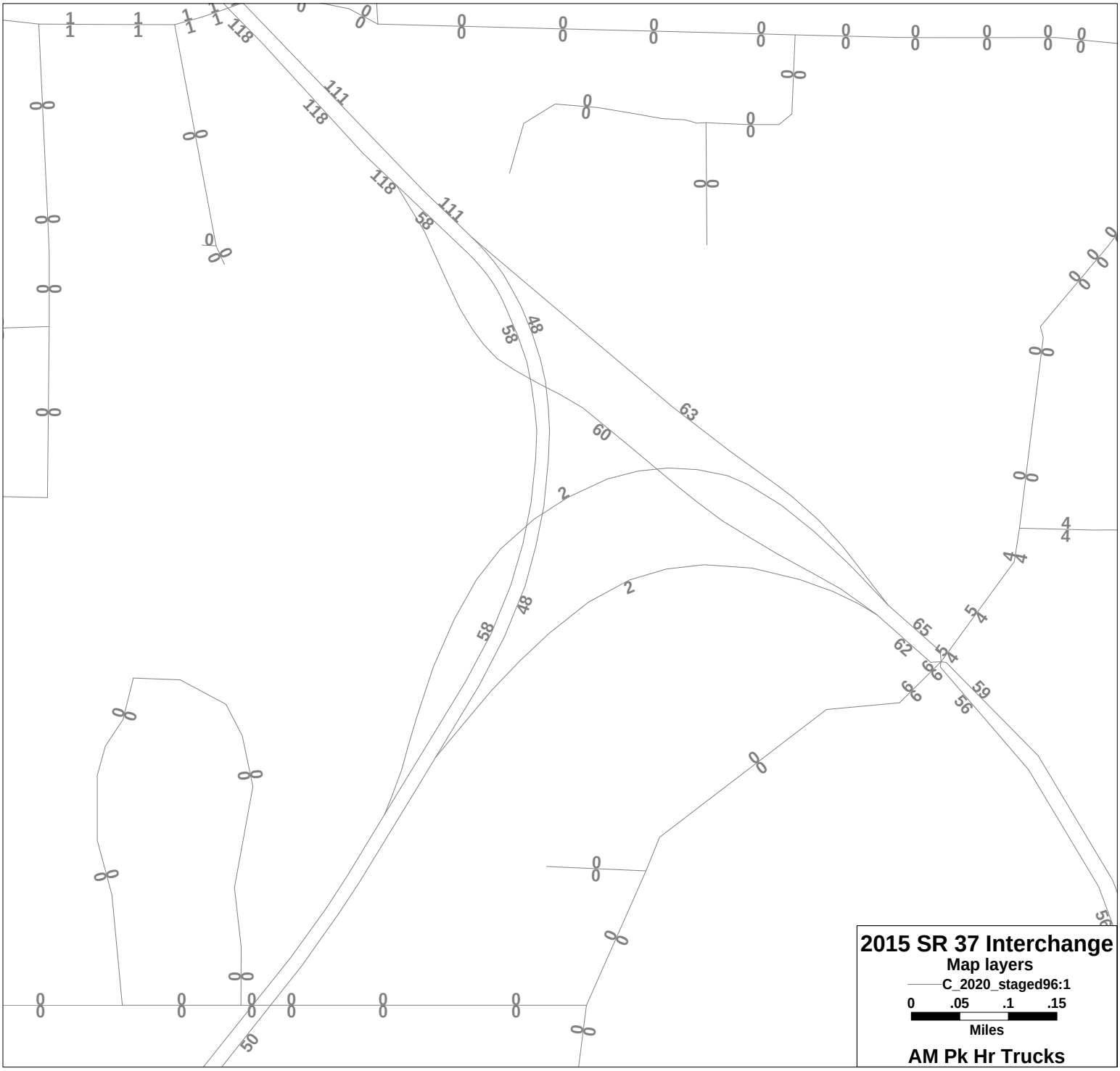
Miles
AM Pk Hr Cars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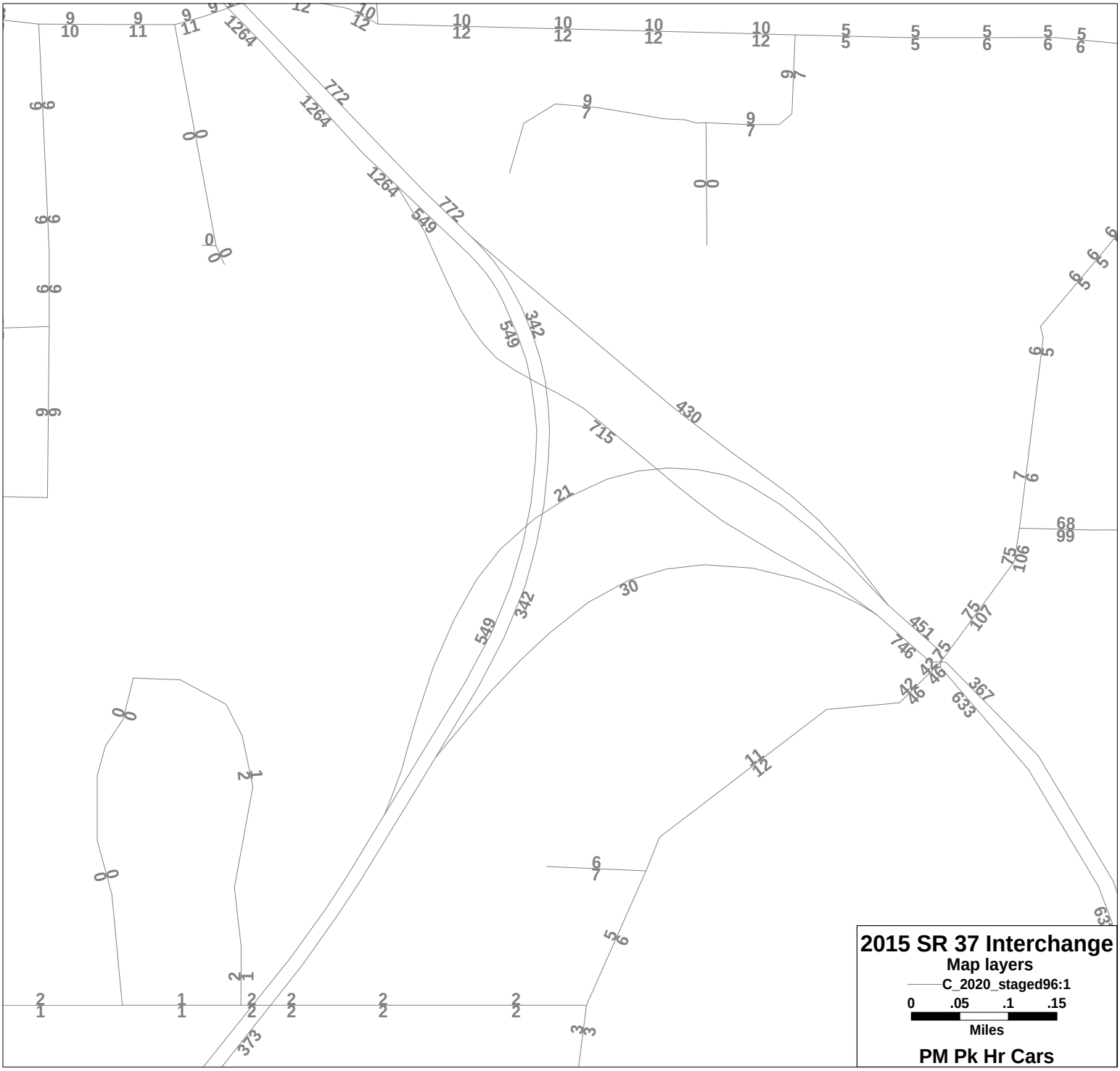
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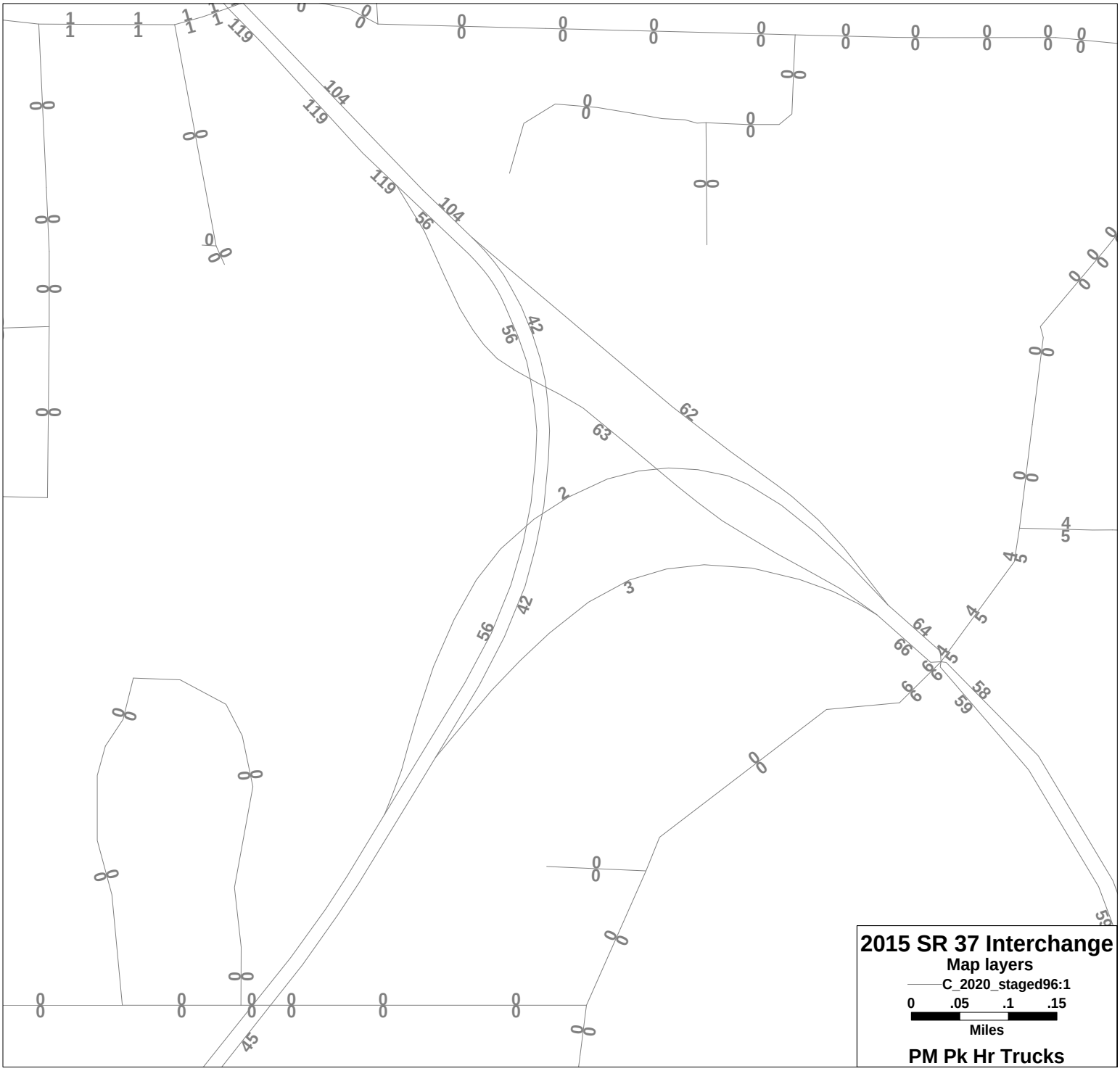
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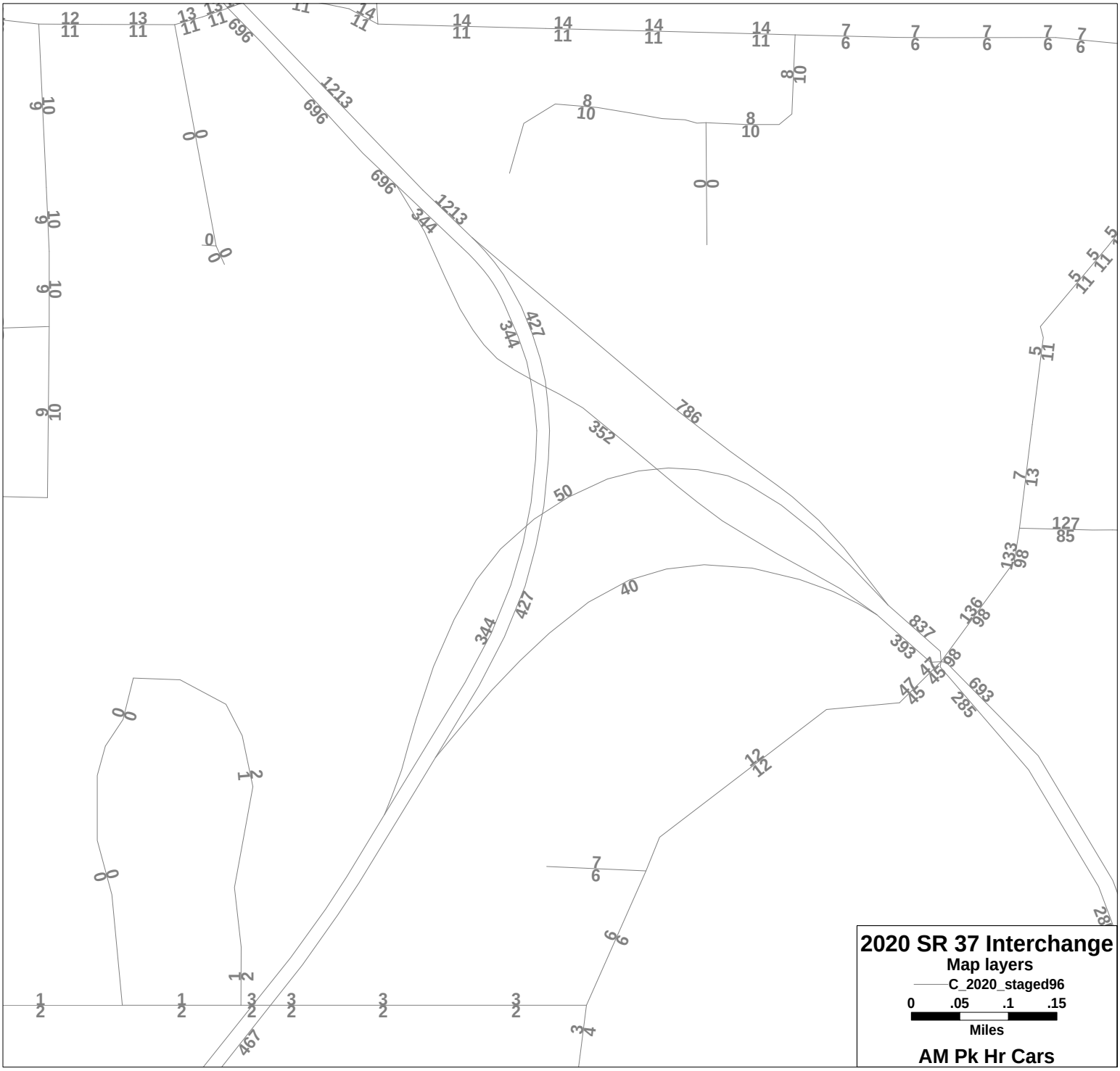
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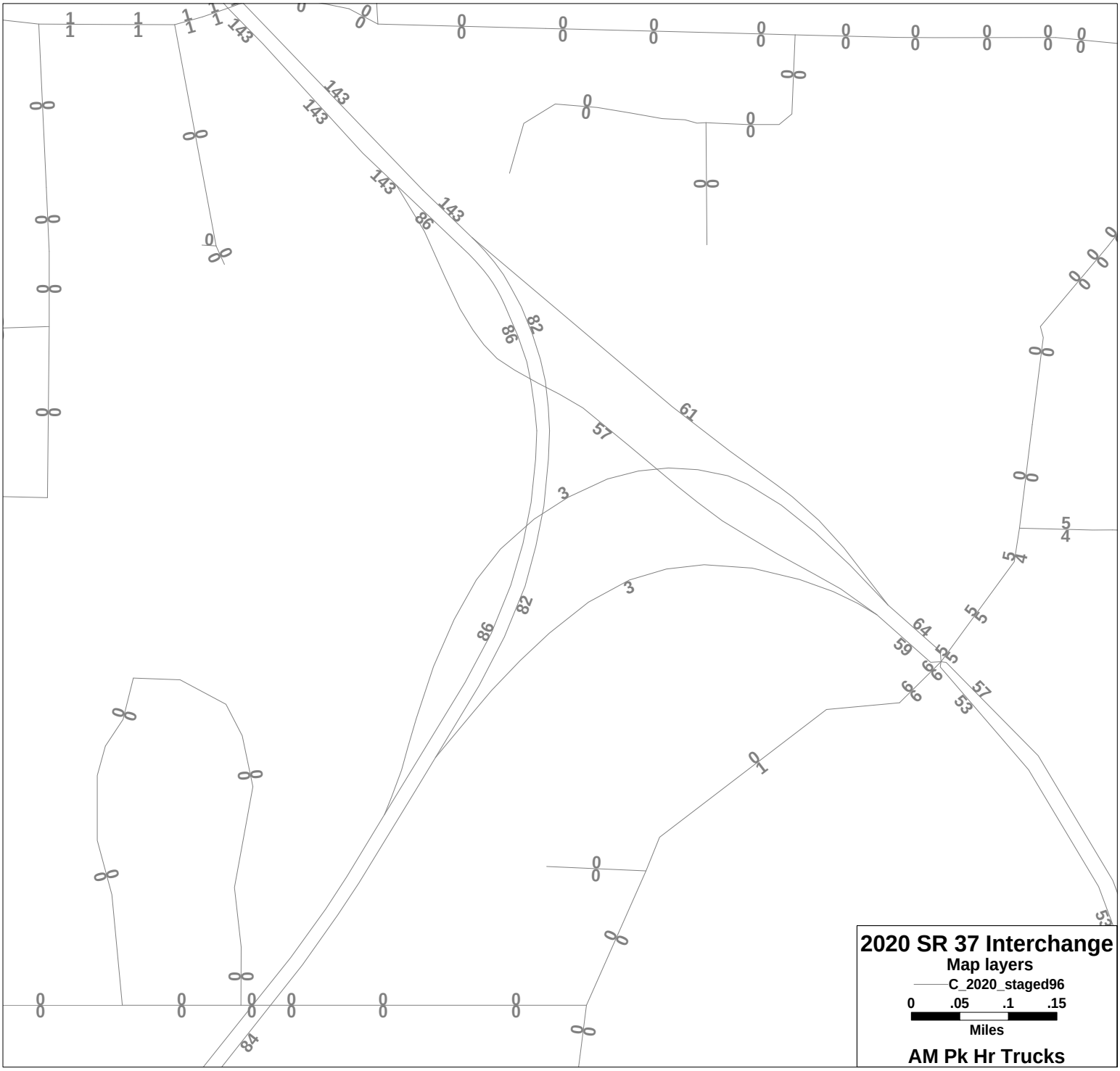
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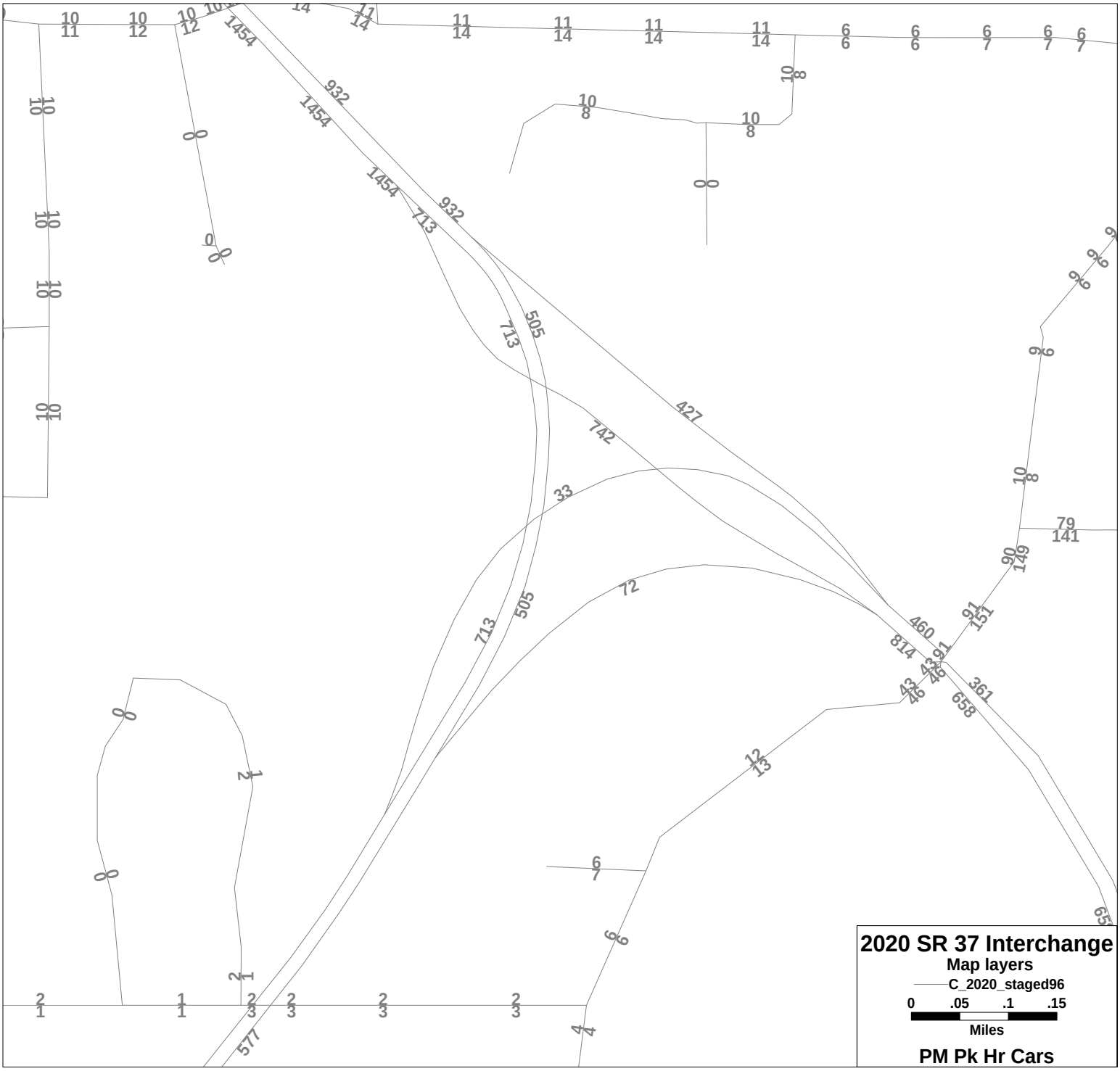
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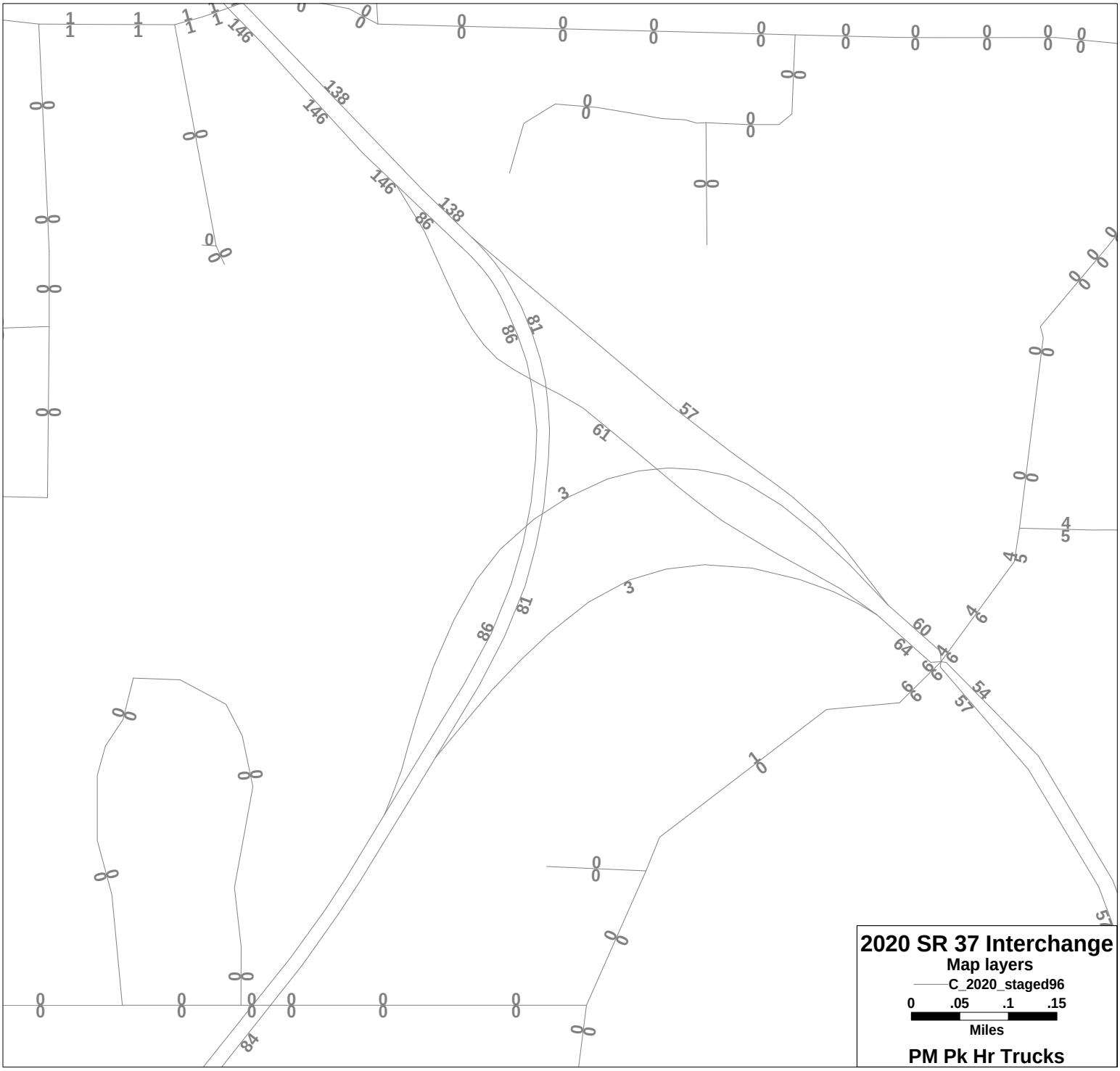
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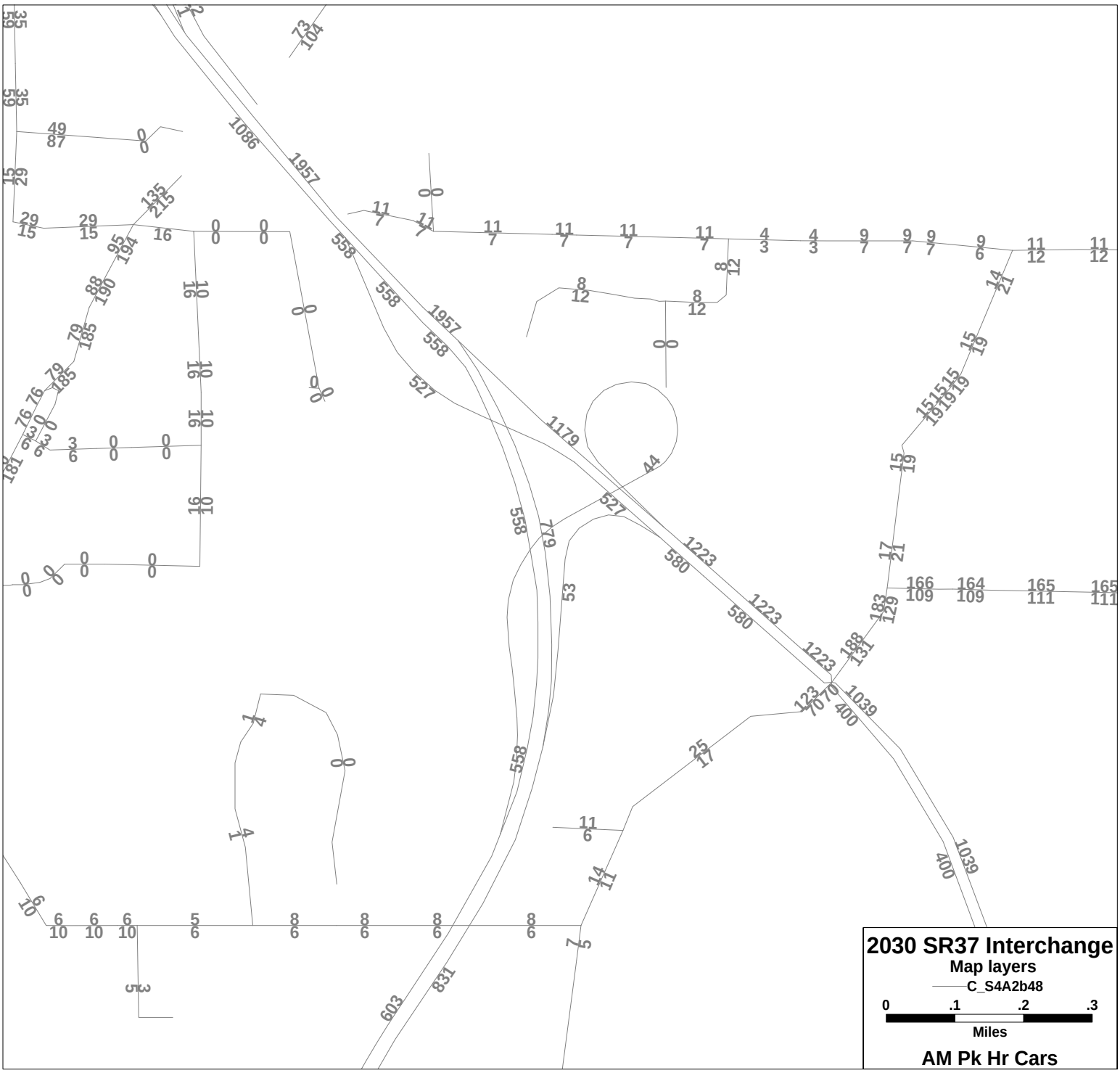
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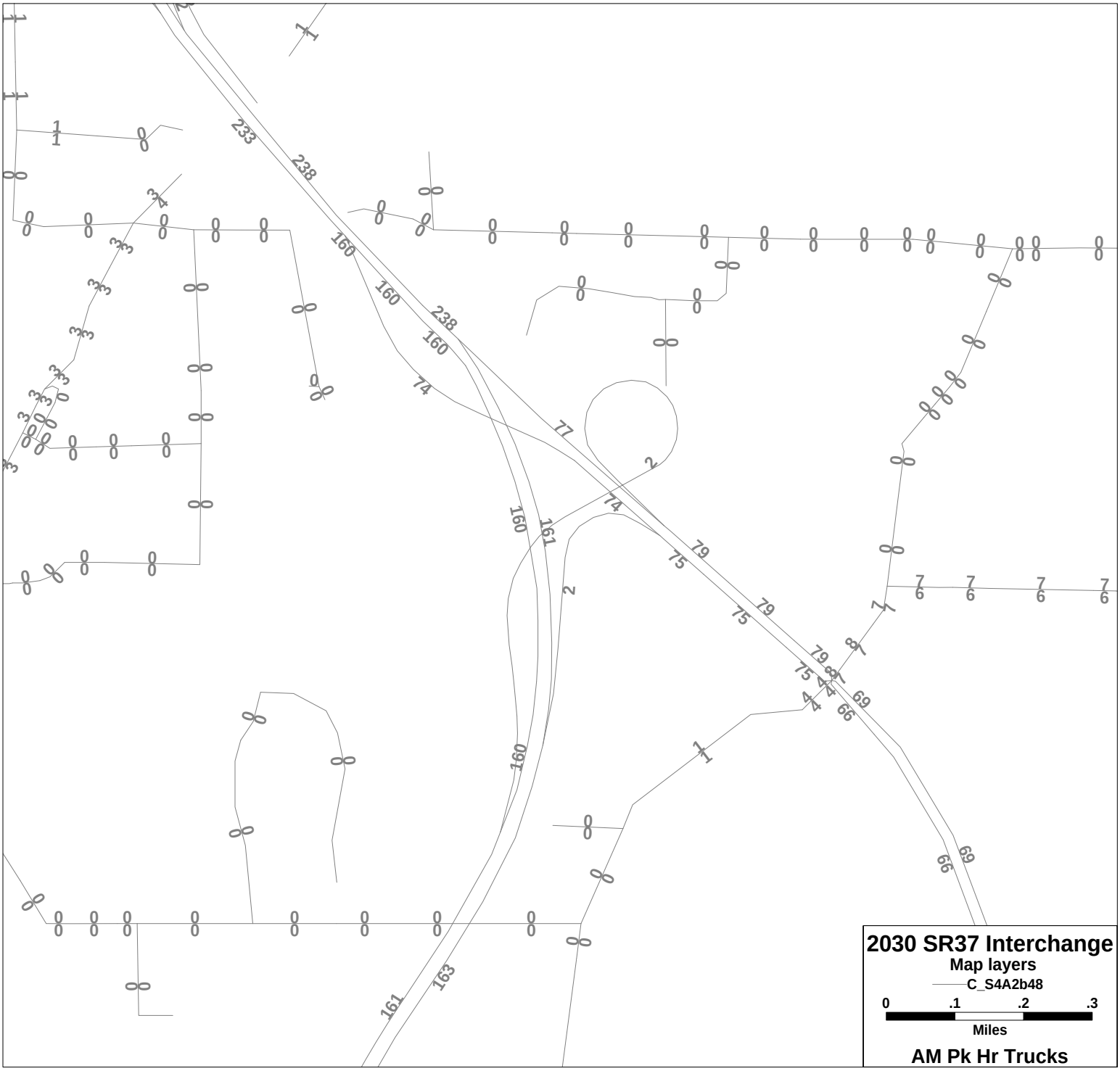
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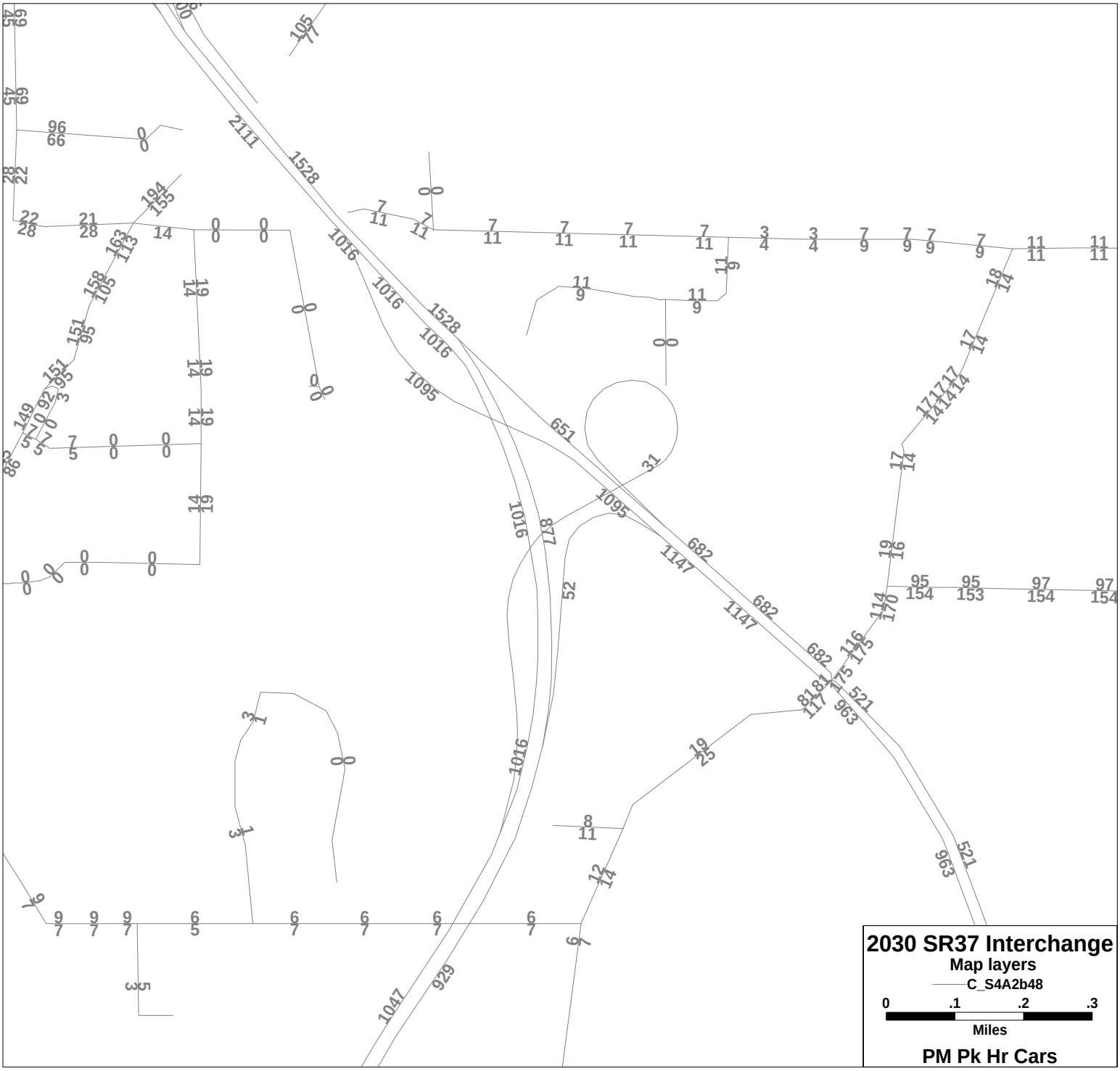
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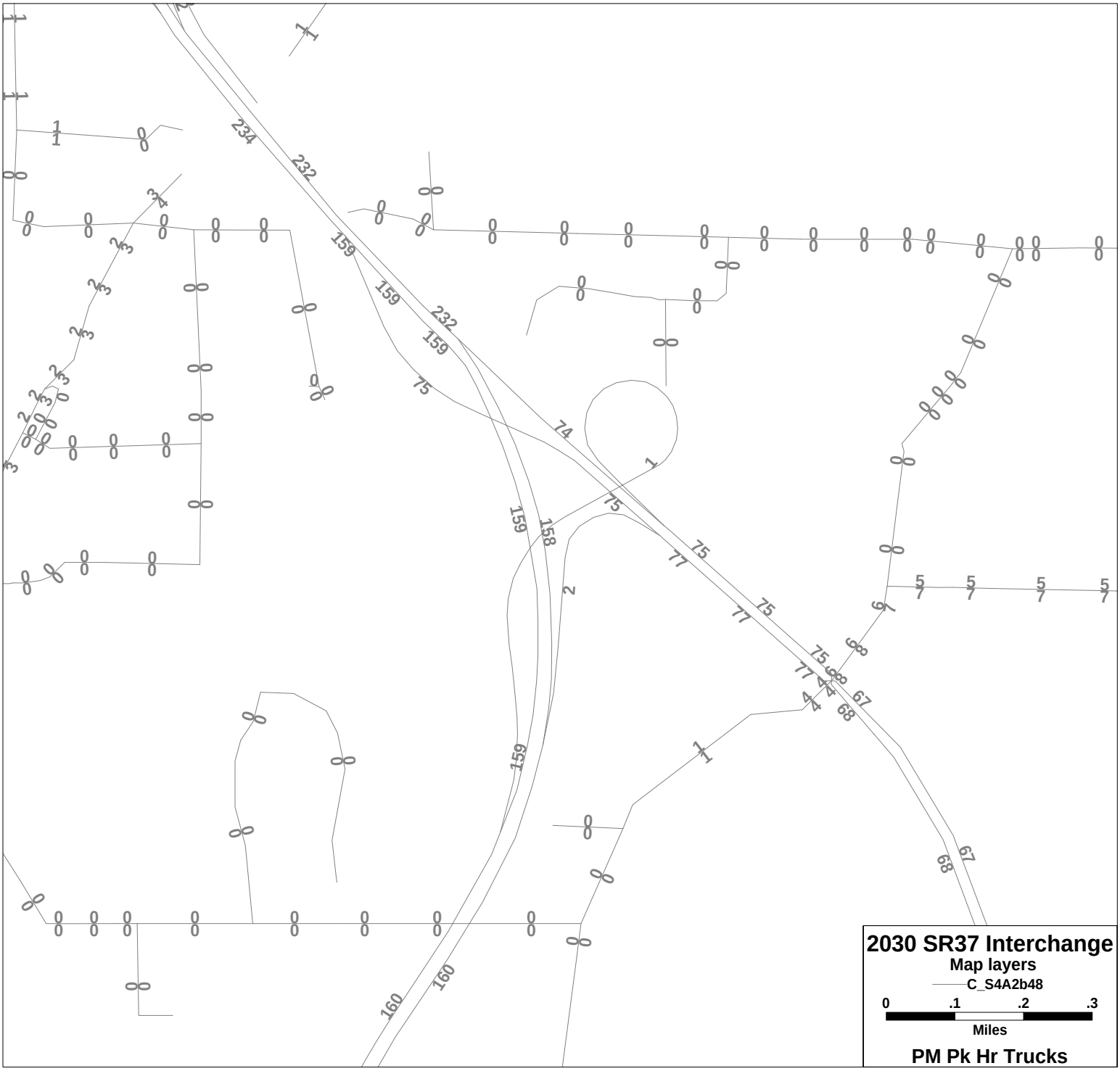
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Miles
PM Pk Hr Trucks

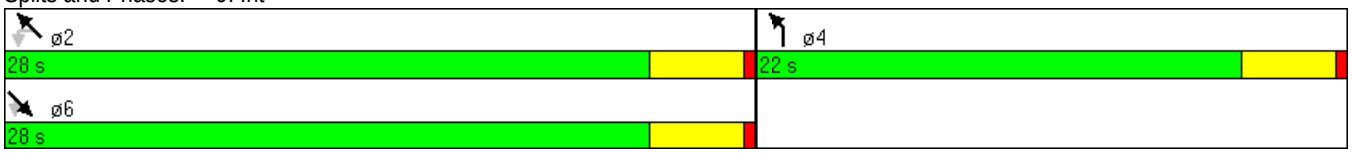
Appendix B

Synchro Output for Interim Signal Capacity

Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	367	28	304	399	23	792
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	500		750	500	
Storage Lanes	2	1		1	1	
Taper Length (ft)	25	25		25	25	
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	0.95
Frt	0.990			0.850		
Flt Protected	0.956				0.950	
Satd. Flow (prot)	3099	0	3034	1404	1656	3343
Flt Permitted	0.956				0.553	
Satd. Flow (perm)	3099	0	3034	1404	964	3343
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	18			434		
Link Speed (mph)	30		30			30
Link Distance (ft)	924		2136			922
Travel Time (s)	21.0		48.5			21.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	13%	7%	19%	15%	9%	8%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	429	0	330	434	25	861
Turn Type				Perm	Perm	
Protected Phases	4		6			2
Permitted Phases				6	2	
Total Split (s)	22.0	0.0	28.0	28.0	28.0	28.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Act Effct Green (s)	10.8		24.5	24.5	24.5	24.5
Actuated g/C Ratio	0.25		0.56	0.56	0.56	0.56
v/c Ratio	0.54		0.19	0.44	0.05	0.46
Control Delay	16.0		5.5	2.5	5.4	7.0
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	16.0		5.5	2.5	5.4	7.0
LOS	B		A	A	A	A
Approach Delay	16.0		3.8			6.9
Approach LOS	B		A			A

Intersection Summary	
Area Type: Other	
Cycle Length: 50	
Actuated Cycle Length: 43.4	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.54	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 39.9%	ICU Level of Service A
Analysis Period (min) 15	

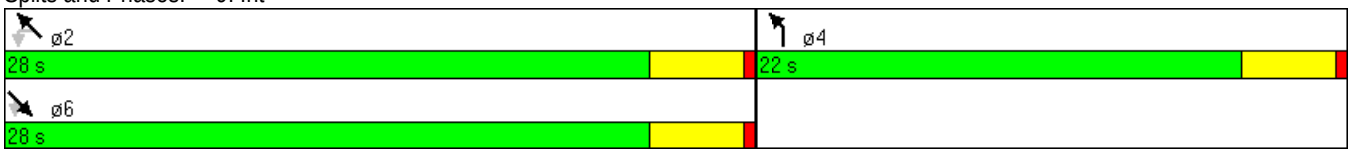
Splits and Phases: 9: Int



Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	384	33	605	778	23	492
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	500		1000	500	
Storage Lanes	2	0		1	1	
Taper Length (ft)	25	25		25	25	
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	0.95
Frt	0.988			0.850		
Flt Protected	0.956				0.950	
Satd. Flow (prot)	3141	0	3312	1495	1656	3195
Flt Permitted	0.956				0.393	
Satd. Flow (perm)	3141	0	3312	1495	685	3195
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	20			846		
Link Speed (mph)	30		30			30
Link Distance (ft)	924		2136			922
Travel Time (s)	21.0		48.5			21.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	9%	9%	8%	9%	13%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	453	0	658	846	25	535
Turn Type				Perm	Perm	
Protected Phases	4		6			2
Permitted Phases				6	2	
Total Split (s)	22.0	0.0	28.0	28.0	28.0	28.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Act Effct Green (s)	11.1		24.4	24.4	24.4	24.4
Actuated g/C Ratio	0.26		0.56	0.56	0.56	0.56
v/c Ratio	0.55		0.35	0.70	0.07	0.30
Control Delay	16.0		6.4	4.4	5.9	6.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	16.0		6.4	4.4	5.9	6.1
LOS	B		A	A	A	A
Approach Delay	16.0		5.3			6.1
Approach LOS	B		A			A

Intersection Summary	
Area Type: Other	
Cycle Length: 50	
Actuated Cycle Length: 43.5	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 7.4	Intersection LOS: A
Intersection Capacity Utilization 58.2%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: Int

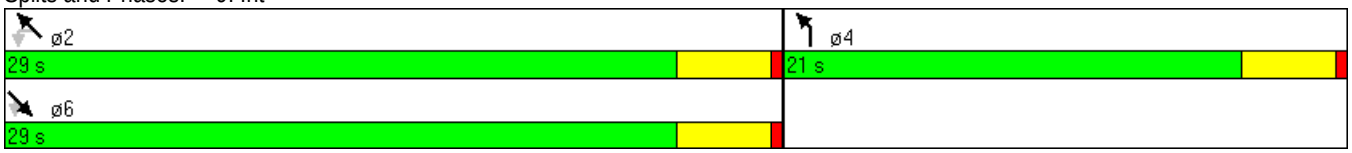


Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	509	43	409	430	53	847
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	500		1000	500	
Storage Lanes	2	0		1	1	
Taper Length (ft)	25	25		25	25	
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	0.95
Frt	0.988			0.850		
Flt Protected	0.956				0.950	
Satd. Flow (prot)	3020	0	3167	1346	1703	3374
Flt Permitted	0.956				0.494	
Satd. Flow (perm)	3020	0	3167	1346	885	3374
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	20			467		
Link Speed (mph)	30		30			30
Link Distance (ft)	924		2136			922
Travel Time (s)	21.0		48.5			21.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	16%	7%	14%	20%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	600	0	445	467	58	921
Turn Type				Perm	Perm	
Protected Phases	4		6			2
Permitted Phases				6	2	
Total Split (s)	21.0	0.0	29.0	29.0	29.0	29.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Act Effct Green (s)	14.3		27.7	27.7	27.7	27.7
Actuated g/C Ratio	0.29		0.55	0.55	0.55	0.55
v/c Ratio	0.68		0.25	0.49	0.12	0.49
Control Delay	19.3		6.8	2.9	7.1	8.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	19.3		6.8	2.9	7.1	8.5
LOS	B		A	A	A	A
Approach Delay	19.3		4.8			8.4
Approach LOS	B		A			A

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SET, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 9.7 Intersection LOS: A
Intersection Capacity Utilization 45.9% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 9: Int

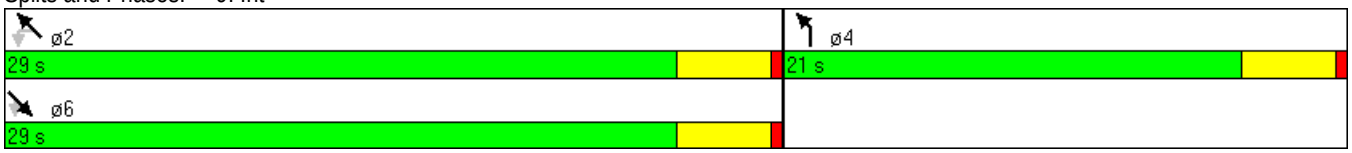


Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	586	75	799	803	36	484
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500	0		1000	500	
Storage Lanes	2	0		1	1	
Taper Length (ft)	25	25		25	25	
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	0.95
Frt	0.983			0.850		
Flt Protected	0.958				0.950	
Satd. Flow (prot)	3076	0	3252	1495	1656	3223
Flt Permitted	0.958				0.278	
Satd. Flow (perm)	3076	0	3252	1495	485	3223
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	31			873		
Link Speed (mph)	30		30			30
Link Distance (ft)	924		2136			922
Travel Time (s)	21.0		48.5			21.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	14%	4%	11%	8%	9%	12%
Adj. Flow (vph)	637	82	868	873	39	526
Shared Lane Traffic (%)						
Lane Group Flow (vph)	719	0	868	873	39	526
Turn Type				Perm	Perm	
Protected Phases	4		6			2
Permitted Phases				6	2	
Total Split (s)	21.0	0.0	29.0	29.0	29.0	29.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Act Effct Green (s)	15.4		26.6	26.6	26.6	26.6
Actuated g/C Ratio	0.31		0.53	0.53	0.53	0.53
v/c Ratio	0.74		0.50	0.73	0.15	0.31
Control Delay	19.8		9.2	5.1	8.6	7.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	19.8		9.2	5.1	8.6	7.6
LOS	B		A	A	A	A
Approach Delay	19.8		7.1			7.7
Approach LOS	B		A			A

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SET, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 10.2 Intersection LOS: B
Intersection Capacity Utilization 59.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 9: Int

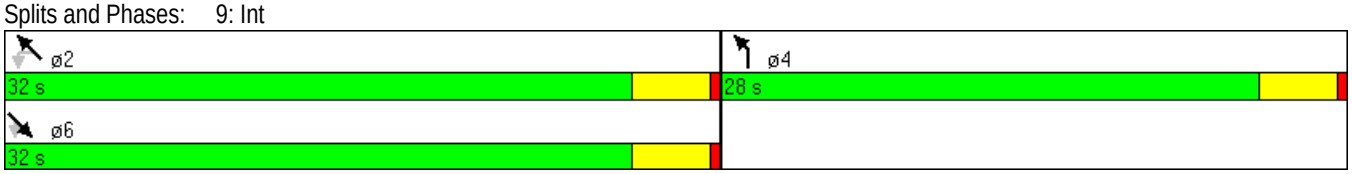


Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	940	55	606	718	46	1256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	0.95
Frt	0.992			0.850		
Flt Protected	0.955				0.950	
Satd. Flow (prot)	3003	0	3195	1324	1736	3406
Flt Permitted	0.955				0.351	
Satd. Flow (perm)	3003	0	3195	1324	641	3406
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	12			780		
Link Speed (mph)	30		30			30
Link Distance (ft)	924		2136			922
Travel Time (s)	21.0		48.5			21.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	17%	4%	13%	22%	4%	6%
Adj. Flow (vph)	1022	60	659	780	50	1365
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1082	0	659	780	50	1365
Turn Type				Perm	Perm	
Protected Phases	4		6			2
Permitted Phases				6	2	
Total Split (s)	28.0	0.0	32.0	32.0	32.0	32.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Act Effct Green (s)	23.4		28.0	28.0	28.0	28.0
Actuated g/C Ratio	0.39		0.47	0.47	0.47	0.47
v/c Ratio	0.91		0.44	0.75	0.17	0.85
Control Delay	30.2		11.8	6.8	11.1	21.0
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	30.2		11.8	6.8	11.1	21.0
LOS	C		B	A	B	C
Approach Delay	30.2		9.1			20.6
Approach LOS	C		A			C

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 59.4
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 19.0 — Intersection LOS: B
Intersection Capacity Utilization 69.9% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 9: Int

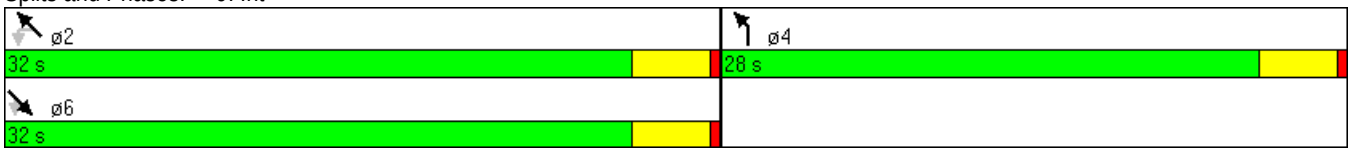


Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	1035	54	1170	1175	32	725
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	500		750	500	
Storage Lanes	2	1		1	1	
Taper Length (ft)	25	25		25	25	
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt	0.993			0.850		
Flt Protected	0.955				0.950	
Satd. Flow (prot)	3102	0	3034	1404	1656	3343
Flt Permitted	0.955				0.143	
Satd. Flow (perm)	3102	0	3034	1404	249	3343
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	11			1091		
Link Speed (mph)	45		45			45
Link Distance (ft)	924		2136			922
Travel Time (s)	14.0		32.4			14.0
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	13%	7%	19%	15%	9%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1184	0	1272	1277	35	788
Turn Type				Perm	Perm	
Protected Phases	4		6			2
Permitted Phases				6	2	
Total Split (s)	28.0	0.0	32.0	32.0	32.0	32.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Act Effct Green (s)	24.0		28.0	28.0	28.0	28.0
Actuated g/C Ratio	0.40		0.47	0.47	0.47	0.47
v/c Ratio	0.95		0.90	1.03	0.30	0.51
Control Delay	35.4		25.6	41.0	18.6	12.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	35.4		25.6	41.0	18.6	12.6
LOS	D		C	D	B	B
Approach Delay	35.4		33.3			12.8
Approach LOS	D		C			B

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60	
Control Type: Semi Act-Uncoord	

Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 30.2	Intersection LOS: C
Intersection Capacity Utilization 82.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 9: Int



Appendix C

HCS+ Output for Freeway Mainline, Merges, and Diverges

HCS+: Basic Freeway Segments Release 5.5

Phone:
E-mail:

Fax:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	NB Mainline Downstream
From/To:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Flow Inputs and Adjustments

Volume, V	2188	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	595	v
Trucks and buses	17	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.922	
Driver population factor, fp	1.00	
Flow rate, vp	2580	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	2580	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	18.4	pc/mi/ln
Level of service	C	

HCS+: Basic Freeway Segments Release 5.5

Phone:
E-mail:
Fax:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	NB Mainline
From/To:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Flow Inputs and Adjustments

Volume, V	940	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	255	v
Trucks and buses	15	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1098	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	1098	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	7.8	pc/mi/ln
Level of service	A	

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	
From/To:	NB Mainline Upstream
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Flow Inputs and Adjustments

Volume, V	995	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	270	v
Trucks and buses	17	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.922	
Driver population factor, fp	1.00	
Flow rate, vp	1173	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	1173	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	8.4	pc/mi/ln
Level of service	A	

Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.5

Phone:
E-mail:
Fax:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	SB Mainline Downstream
From/To:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Flow Inputs and Adjustments

Volume, V	764	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	208	v
Trucks and buses	22	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.901	
Driver population factor, fp	1.00	
Flow rate, vp	922	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	922	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	6.6	pc/mi/ln
Level of service	A	

Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	SB Mainline
From/To:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Flow Inputs and Adjustments

Volume, V	718	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	195	v
Trucks and buses	22	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.901	
Driver population factor, fp	1.00	
Flow rate, vp	866	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	866	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	6.2	pc/mi/ln
Level of service	A	

Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	SB Mainline upstream
From/To:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Flow Inputs and Adjustments

Volume, V	1324	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	360	v
Trucks and buses		%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1540	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	1540	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	11.0	pc/mi/ln
Level of service	A	

Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.5

Phone:
E-mail:
Fax:

Diverge Analysis

Analyst:	SHoch
Agency/Co.:	Corradino
Date performed:	12/15/2010
Analysis time period:	
Freeway/Dir of Travel:	I-69 SB
Junction:	SR 37
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1324	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	606	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	46	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	3500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1324		606		46		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	368		168		13		v
Trucks and buses	22		13		4		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.901		0.939		0.980		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	1633		717		52		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	SHoch
Agency/Co.:	Corradino
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	SB I-69 Merge
Junction:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	718	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	46	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	606	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	3500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	718	46	606	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	199	13	168	v
Trucks and buses	22	4	15	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.901	0.980	0.930	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	886	52	724	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

HCS+: Ramps and Ramp Junctions Release 5.21

Phone:
E-mail:
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Diverge Analysis

Analyst:	SHoch
Agency/Co.:	Corradino
Date performed:	12/15/2010
Analysis time period:	
Freeway/Dir of Travel:	I-69 NB
Junction:	SR 37
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	995	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	55	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1256	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	995		55		1256		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	276		15		349		v
Trucks and buses	17		4		6		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.922		0.980		0.971		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	1200		62		1437		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{--} = 1.000 Using Equation 0

HCS+: Ramps and Ramp Junctions Release 5.5

Phone:
E-mail:
Fax:

Merge Analysis

Analyst:	SHoch
Agency/Co.:	Corradino
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	NB I-69 Merge
Junction:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	940	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	60.0	mph
Volume on ramp	1256	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	55	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	940	1256	55	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	261	349	15	v
Trucks and buses	17	6	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.922	0.971	0.980	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1133	1437	62	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	SHoch
Agency/Co.:	
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	SR 37 NB Diverge
Junction:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1302	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	46	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1302		46			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	362		13			v
Trucks and buses	6		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.971		0.980			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	1490		52			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

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Phone: Fax:
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Merge Analysis

Analyst:	SHoch
Agency/Co.:	
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	SR 37 SB Merge
Junction:	
Jurisdiction:	
Analysis Year:	2030 AM
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	606	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	55	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	606	55		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	168	15		v
Trucks and buses	13	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.939	0.980		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	717	62		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

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Phone: Fax:
E-mail:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	NB Mainline Downstream
From/To:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Flow Inputs and Adjustments

Volume, V	1760	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	478	v
Trucks and buses	15	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	2057	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	2057	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	14.7	pc/mi/ln
Level of service	B	

Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

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Phone:
E-mail:
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Merge Analysis

Analyst:	SHoch
Agency/Co.:	Corradino
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	
Junction:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1035	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	60.0	mph
Volume on ramp	725	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	54	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1035	725	54	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	288	201	15	v
Trucks and buses	15	10	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.952	0.980	
Driver population factor, fP	1.00	1.00	1.00	

Flow rate, vp	1236	846	61	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1236 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2082	4800	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1236		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2082	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 11.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.172	
Space mean speed in ramp influence area,	S_R = 65.2	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 65.2	mph

HCS+: Basic Freeway Segments Release 5.5

Phone:
E-mail:

Fax:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	SB Mainline Downstream
From/To:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Flow Inputs and Adjustments

Volume, V	1207	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	328	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1404	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	1404	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	10.0	pc/mi/ln
Level of service	A	

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	
From/To:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Flow Inputs and Adjustments

Volume, V	2345	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	637	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	2727	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	2727	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	19.5	pc/mi/ln
Level of service	C	

Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	SHoch
Agency/Co.:	Corradino
Date performed:	12/15/2010
Analysis time period:	
Freeway/Dir of Travel:	I-69 NB
Junction:	SR 37
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1089	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	54	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	725	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1089		54		725		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	303		15		201		v
Trucks and buses	15		4		10		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.930		0.980		0.952		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	1301		61		846		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1301 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1301	4800	No
$v_{FO} = v_F - v_R$	1240	4800	No
v_R	61	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 $v_{12}/2$		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1301	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 10.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.433

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Phone: Fax:
E-mail:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	NB Mainline
From/To:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Flow Inputs and Adjustments

Volume, V	1035	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	281	v
Trucks and buses	15	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1209	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Desired level of service	C	
Design flow rate, vp	1209	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	8.6	pc/mi/ln
Level of service	A	

Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.5

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	SHoch
Agency/Co.:	
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	SR 37 NB Diverge
Junction:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	725	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	32	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	725		32			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	201		9			v
Trucks and buses	6		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.971		0.980			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	830		36			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 830 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	830	4600	No
$v_{FO} = v_F - v_R$	794	4600	No
v_R	36	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 830		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	830	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.301

HCS+: Ramps and Ramp Junctions Release 5.5

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	SHoch
Agency/Co.:	
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	SR 37 SB Merge
Junction:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1170	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	54	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1170	54		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	325	15		v
Trucks and buses	13	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.939	0.980		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	1385	61		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1385 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1446	4500	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1385		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1446	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 13.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.306	
Space mean speed in ramp influence area,	S_R = 51.0	mph
Space mean speed in outer lanes,	S_O = N/A	mph

into (from 37)

HCS+: Ramps and Ramp Junctions Release 5.5

Phone:
E-mail:
Fax:

Merge Analysis

Analyst:	SHoch
Agency/Co.:	Corradino
Date performed:	12/16/2010
Analysis time period:	
Freeway/Dir of Travel:	
Junction:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1175	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	32	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1170	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	3500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1175	32	1170	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	326	9	325	v
Trucks and buses	14	3	6	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.935	0.985	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1397	36	1339	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1397 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1433	4800	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1397		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1433	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 13.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.292
Space mean speed in ramp influence area,	S_R = 61.8 mph
Space mean speed in outer lanes,	S_O = N/A mph

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Design Analysis

Analyst:	SHoch
Agency or Company:	
Date Performed:	12/16/2010
Analysis Time Period:	
Freeway/Direction:	SB Mainline
From/To:	
Jurisdiction:	
Analysis Year:	2030 PM
Description:	

Flow Inputs and Adjustments

Volume, V	1175	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	319	v
Trucks and buses	14	%
Recreational vehicles	0	%
Terrain Type	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicles PCE, ER	1.2	
Heavy vehicles adjustment, fHV	0.935	
Driver population factor, fp	1.00	
Flow rate, vp	1367	pc/h
Desired level of service	C	

Speed Inputs and Adjustments

Lane width, LW	12.0	ft
Right-shoulder lateral clearance, LC	6.0	ft
Interchange density, ID	0.50	interchange/mi
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

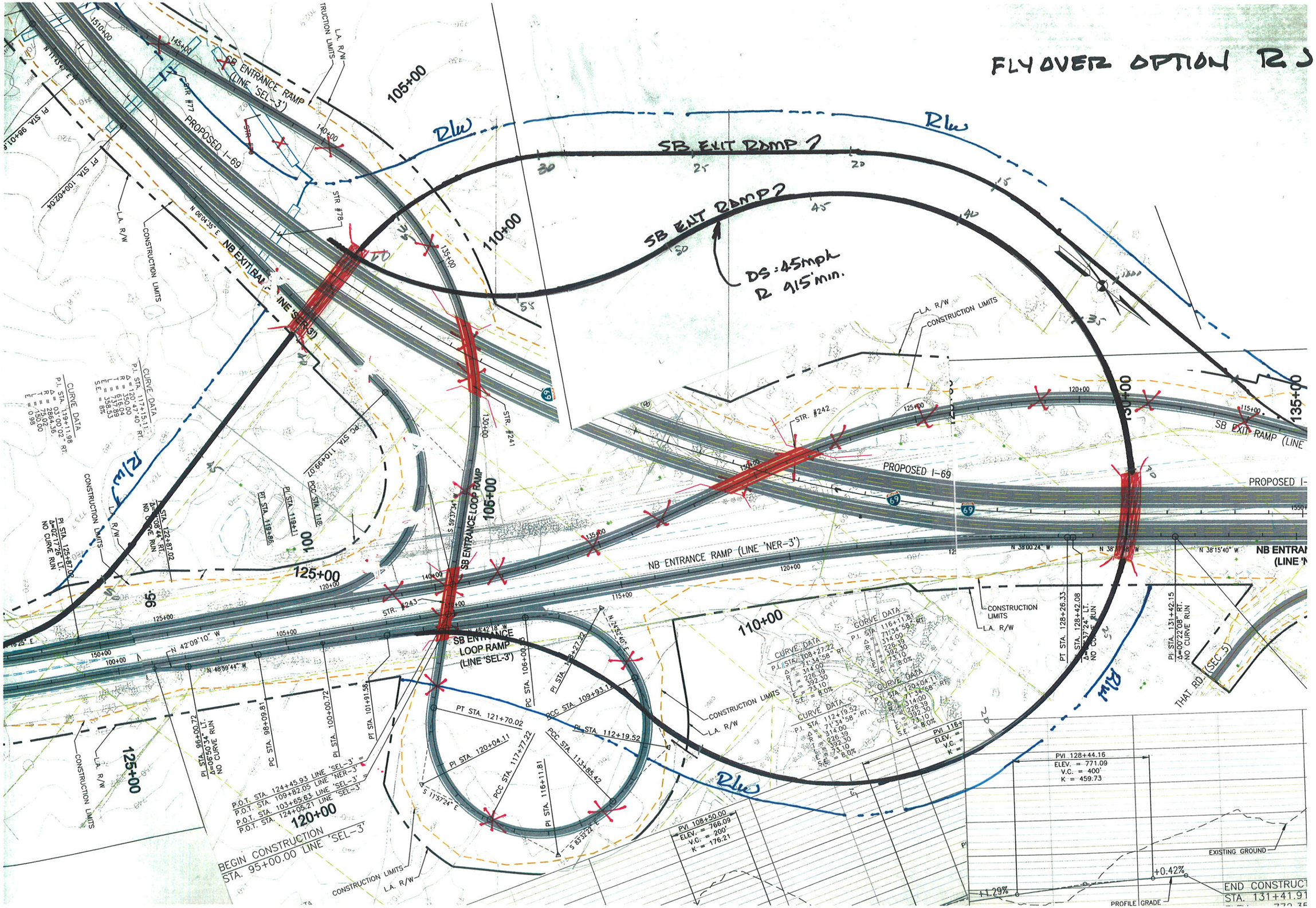
Desired level of service	C	
Design flow rate, vp	1367	pc/h
Design free-flow speed, FFS	70.0	mi/h
Number of lanes required, N	2	
Average passenger-car speed, S	70.0	mi/h
Density, D	9.8	pc/mi/ln
Level of service	A	

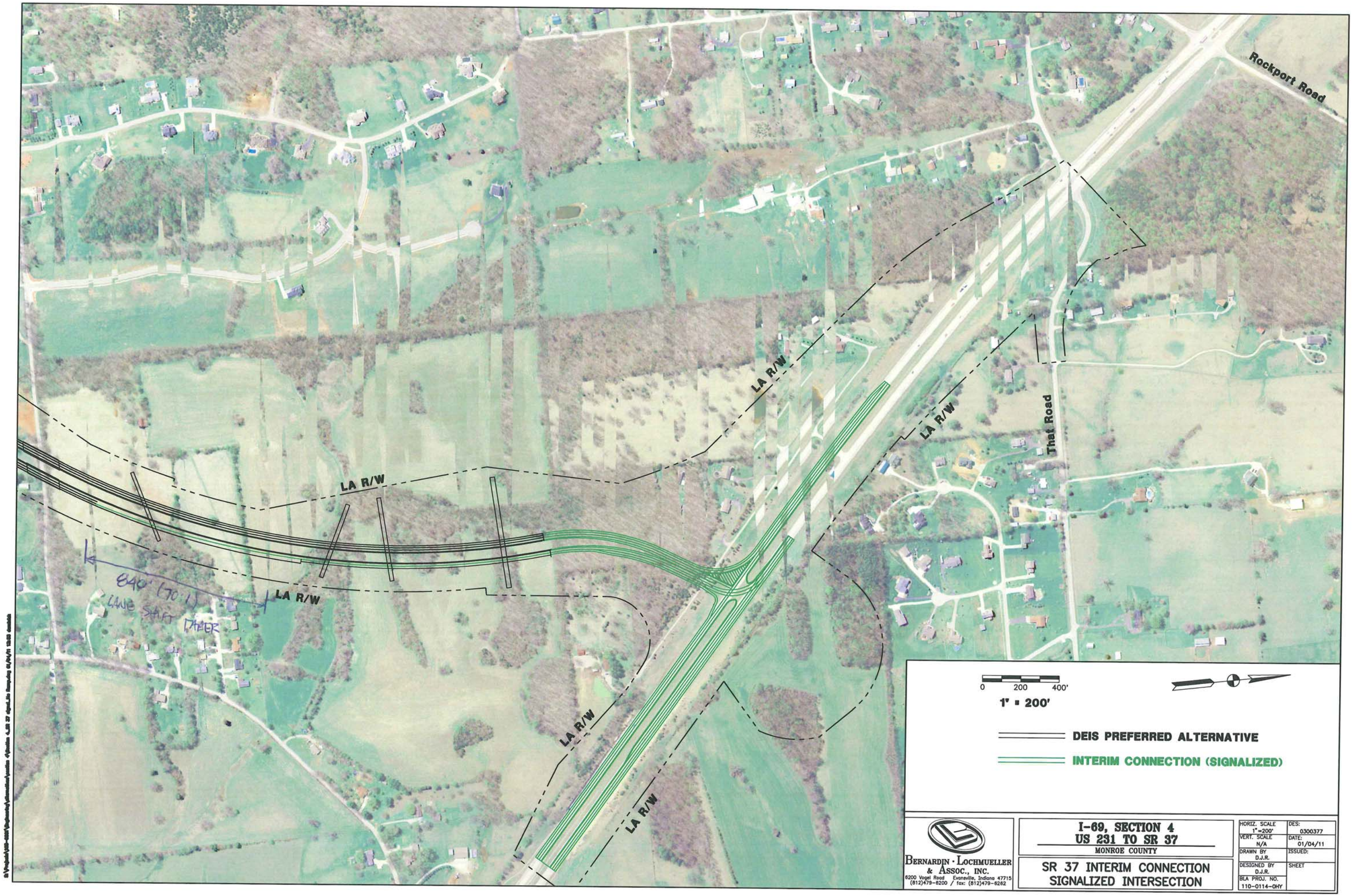
Fewer number of lanes required will not produce the desired LOS.
Overall results are not computed when free-flow speed is less than 55 mph.

Appendix D

Sketches of Flyover Option 1 and Interim Traffic Signal

FLYOVER OPTION R J-6




Rockport Road
That Road
LA R/W
LA R/W
LA R/W
LA R/W
LA R/W
LA R/W
840' (70:1)
LANE START TAPER
0 200 400'
1" = 200'
DEIS PREFERRED ALTERNATIVE
INTERIM CONNECTION (SIGNALIZED)
BERNARDIN · LOCHMUELLER & ASSOC., INC.
6200 Vogel Road Evansville, Indiana 47715
(812)479-6200 / fax: (812)479-6262
I-69, SECTION 4
US 231 TO SR 37
MONROE COUNTY
SR 37 INTERIM CONNECTION
SIGNALIZED INTERSECTION
HORIZ. SCALE 1"=200'
VERT. SCALE N/A
DRAWN BY D.J.R.
DESIGNED BY D.J.R.
BLA PROJ. NO. 110-0114-OHY
DES: 0300377
DATE: 01/04/11
ISSUED:
SHEET