



Jefferson Parkway Traffic Modeling Study

Prepared for: Jefferson Parkway Public Highway Authority

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Date: October 2016



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EXECUTIVE SUMMARY

The purpose of this traffic study is to provide 2040 travel demand forecasts for the Jefferson Parkway and key intersections in conformance with the CDOT 1601 process. Consistent with Colorado Department of Transportation (CDOT) Commission Resolution TC-1752, analysis for an additional four intersections outside the Jefferson Parkway Corridor have been included in this study. Information from this study will also be used in connection with the WestConnect PEL process.

MODELING ASSUMPTIONS

The Denver Regional Council of Governments (DRCOG) has recently changed from use of the COMPASS model to use of the new regional activity-based FOCUS model (developed by Cambridge Systematics), which synthesizes individual regional households and persona and forecasts their travel. In addition DRCOG has also introduced the UrbanSim model which interacts with the FOCUS travel model. The intent is that these two models can exchange information and allow for the testing of various alternative transportation plans. The challenge is that DRCOG is continuing to refine both the FOCUS and the UrbanSim applications while the Jefferson Parkway traffic study is progressing concurrently.

For this study, a subarea containing 272 traffic analysis zones (TAZs) was defined. The forecasting process used the FOCUS model as a starting point. The Michael Baker team validated and adjusted the FOCUS model as necessary to calibrate the model for the study subarea. The team verified land use information for years 2015 and 2040, modified data as recommended through local government input, and updated trip matrices from the FOCUS model to reflect changes in land use. The team also examined the sensitivity of demand forecasts to land use prescribed by DRCOG versus any suggested modifications for the Year 2040.

Parkway conceptual design assumptions included the construction of four 12-foot lanes between SH 128 and SH93 with connection at: SH 128, New Simms, SH 72, Candelas, and SH 93. The model is not sensitive to signal versus interchange connections. It is sensitive to laneage, direction of movement and speed. A toll choice model was also incorporated into the study. Michael Baker used a different tolling model than was included by DRCOG as it produced more reasonable results.

EXISTING CONDITIONS

As an additional confirmation of how the model handled the 2015 existing land use and network, Bluetooth technology was used to track real time trips and traditional traffic counts were obtained for various locations within the subarea. Daily counts and a comparison with the CDOT OTIS (Online Transportation Information System) confirmed reasonableness of the Focus 2015 model. Of interest were also the external to external trips (between I-25 north and I-70 west), as it is intuitive that completion of the northwest toll road system would attract a portion of these regional through trips because of significant congestion on I-25 and I-70. The Bluetooth data essentially confirmed what is in the DRCOG model today - approximately 10% of daily through trips follow I-25 north to and from I-70 west. Future attraction of a completed toll road and/or freeway system (via Northwest Parkway, Jefferson Parkway, and connecting to C-470/I-70) will potentially divert through trips to the faster, shorter route. However, until a completed network with sufficient capacity is included in the model, the attraction will not be forecast accurately.



FORECAST CONDITIONS

2040 No Build and 2040 Build volumes and levels of service were estimated for the Jefferson Parkway subarea. County and local government staff were asked to provide population and employment revisions for 2040 subsequent to the CY 2 2015 DRCOG data. Out of a total of 272 TAZs in the study area, changes were identified for 28 TAZs. The most notable changes were increases to household size for some TAZs and higher employment numbers associated with buildout in the Candelas area.

There is on-going discussion regarding the trend for the FOCUS model to have generated lower than expected 2040 volumes. Regardless, the operation of various intersections in the subarea was shown to be at failure, level of service (LOS) F, for the 2040 No-Build. As a part of this traffic study, recommendations for relevant intersection improvements to obtain LOS D or better are included to facilitate the operation of the Jefferson Parkway and its connections to the subarea transportation system. These recommendations involve additional through lanes, turn lanes and signalization in the local network.

SUPPORT FOR CDOT 1601 PROCESS

As a part of this traffic study, the three interchanges necessary to the Jefferson Parkway CDOT 1601 process have been included: SH 128, SH 72 and SH 93. Existing (2015), 2040 No-Build and 2040 Build scenarios were analyzed. Conceptual design elements have been added to maximize the function of the Jefferson Parkway at each of these locations.

#TC-1752 RESOLUTION SUPPORT

On July 23, 2009, the Transportation Commission approved Resolution #1752 with the JPPHA commitment to a level of service “D” at and through the interchanges during morning and evening peak hours. Connections at SH 128, SH 72 and SH 93 were recognized for project level study.

Additionally, the understanding that a more detailed traffic impact study would be conducted at least at those intersection that appeared to have unacceptable levels of service based on the July 20, 2009 *Jefferson Parkway System Level Study*: SH93/Washington, SH 93/SH 72, SH 72/64th, and SH 72/86th. All four of these locations are located outside the jurisdiction of the JPPHA.

Under the 2040 No-Build, assuming no improvements are made at those four intersections, all would be at LOS F without the Parkway Project. **Table E-1** illustrates the current and 2040 build conditions for these locations. Recommendations for improvements by others are included in this report.



Table E-1. 2015 and 2040 System Level Needs and Mitigation Concepts

Intersection ¹	2015 No-Build AM/PM	2040 No-Build AM/PM	2040 Build AM/PM	Mitigation	2040 Build AM/PM with Mitigation
SH 93 / Washington St.	E/F	F/F	F/F	NB/SB 2nd and 3rd Thru Lanes, SB 2nd Left Turn Lane, WB Separate Right Turn Lane	B/D
SH 93 / SH 72	C/E	F/F	F/F	NB/SB 2nd Thru and Left Turn Lanes, EB/WB 2nd Thru Lanes	C/D
SH 72 / 64th St.	B/C	D/F	D/F	EB 2nd Left Turn Lane	C/D
SH 72 / Indiana / 86th St.	D/C	F/F	E/F	NB/SB 2nd and 3rd Thru Lanes, NB 2nd Right Turn Lane, EB/WB 3rd Thru Lane, WB 2nd Left Turn Lane	C/D

CONCLUSIONS

The Traffic Modeling Study supports the need for the Jefferson Parkway project. It is recognized that the FOCUS model is a work in progress and that system-wide refinements will continue to occur. The analysis as presented informs future design choices for the Jefferson Parkway and local connections at each of the three State Highway Interchange areas (SH 128, SH72 and SH 93). The modeling challenges presented strengthen the importance of continued collaboration with local communities as well as county, regional and state government to identify needed network improvements. The Jefferson Parkway provides an important element to the local and regional transportation system connectivity and functionality between the Northwest Parkway in City and County of Broomfield and SH 93 in Jefferson County. In addition to the regional connectivity, the Parkway will provide important links for Interlocken and Candelas Urban Centers and other new developments as well as existing communities.

The modeling process is a useful planning tool and will continue to be further refined including tolling assumptions, land use revisions and the network connections at either end and along the Parkway. As regional traffic congestion increases, and as WestConnect and local plans evolve, the community value of the Jefferson Parkway project will only increase. The Jefferson Parkway will provide reduced travel times and a safe reliable transportation option for the Denver metro region.



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1 INTRODUCTION

Jefferson County, the City and County of Broomfield, and the City of Arvada established the Jefferson Parkway Public Highway Authority (JPPHA) in May 2008. The mission of the JPPHA is to fulfill transportation needs in the area by completing the last remaining unbuilt section of the Denver metropolitan beltway system. The Jefferson Parkway, located predominately in unincorporated Jefferson County, is proposed to be a toll facility from SH 128 near Interlocken Loop to SH 93 near 64th Avenue Parkway (see **Figure 1**).

The Jefferson Parkway was added to the DRCOG fiscally constrained plan Metro Vision 2035 in late 2009 and included the Air Quality Colorado Air Quality Control Commission’s concurrence with conformity determinations for the 2009 Cycle 2 Amendment to the 2035 Regional Transportation Plan and the 2008/2013 Transportation Improvement Program in early 2010. It continues to be included in the Metro Vision plan.

The improvements north of the Jefferson Parkway terminus at SH 128 to 96th Street are within the jurisdiction of the Northwest Parkway Public Highway Authority, and ultimately are necessary to the full functioning of both facilities.

The jurisdiction of the JPPHA extends south from SH 128 to 64th Avenue. Additional improvements on Highway 93 from 64th Avenue to C-470 (US 6 and I-70) are also ultimately necessary to the full functioning of both facilities. These are assets of the Colorado Department of Transportation (CDOT) and are currently under study in the WestConnect project.

The purpose of this traffic study is to provide 2040 travel demand forecasts for the Jefferson Parkway and key intersections in conformance with the CDOT 1601 process. Consistent with CDOT Commission Resolution TC-1752, analysis for four additional intersections outside the Jefferson Parkway Corridor have been included in this study. Information from this study will also be used in connection with the WestConnect PEL process.

Figure 1. Jefferson Parkway Location





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2 MODELING ASSUMPTIONS

2.1 The Model

The Denver Regional Council of Governments (DRCOG) has recently changed from use of the COMPASS model to use of the new regional activity-based FOCUS model (developed by Cambridge Systematics), which synthesizes individual regional households and persons and forecasts their travel. The prior COMPASS model was used for the 2009 *Jefferson Parkway System Level Study*. While it is not the intent of the current analysis to educate readers about the complexities of this change, the following is important to consider. The FOCUS model treats household and employment information differently and provides additional complexity and sensitivity. FOCUS adds the Who and Why trips are taken to households (whereas COMPASS just included the What, Where and How). The old model included home-based work, home-based non-work and non-home-based trips. FOCUS includes work, school, escort, shopping, eat meal, social-recreation and personal business trips separately. FOCUS emphasizes person-trips.

In addition, DRCOG has also introduced the UrbanSim model which interacts with the FOCUS travel model. UrbanSim simulated the interactions between land use, transportation, the economy, and the environment, and helps to better estimate trip generation based on various factors. The intent is that these two models can exchange information and allow for the testing of various alternative transportation plans.

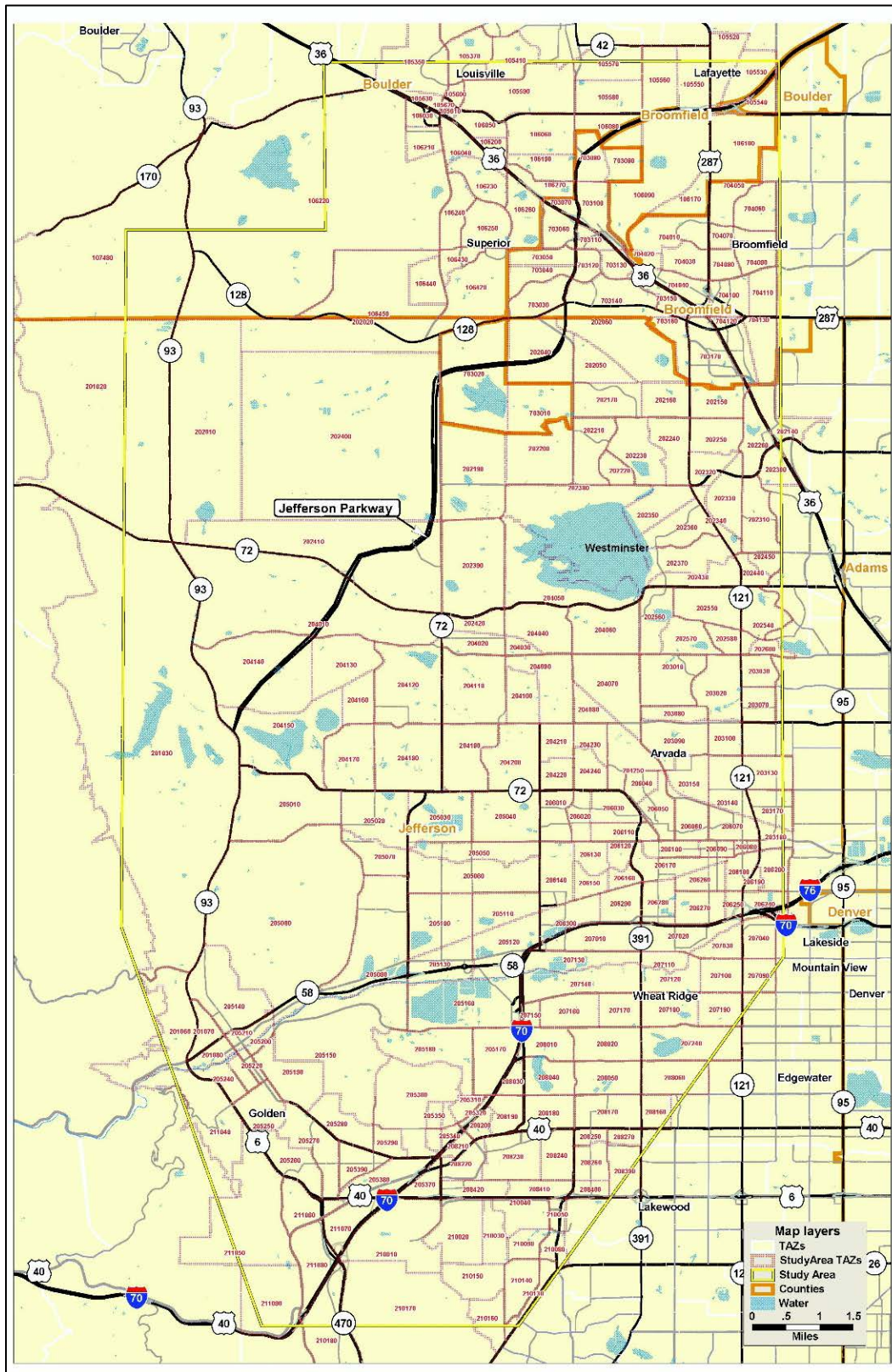
The challenge is that DRCOG is continuing to refine both the FOCUS and the UrbanSim applications while the Jefferson Parkway traffic study is progressing concurrently. This means that volume projections (which are seen as lower than expected in many locations) and output will be subject to change as the model is refined. For example, the 2035 No Build COMPASS model forecast significantly higher volumes on the Northwest Parkway and somewhat higher or similar volumes for SH 128, SH 72 and SH 93 when compared with the 2040 No Build FOCUS model.

For Jefferson Parkway, a study subarea containing 272 traffic analysis zones (TAZs) was defined as shown in **Figure 2**. The forecasting process used the FOCUS model as a starting point. The Michael Baker team validated and adjusted the FOCUS model as necessary to calibrate the model for the study subarea. The team verified land use information for years 2015 and 2040, modified data as recommended through local government input, and updated trip matrices from the FOCUS model to reflect changes in land use. The team also examined the sensitivity of demand forecasts to land use prescribed by DRCOG versus any suggested modifications for the Year 2040.

Michael Baker developed a forecasting tool using the FOCUS model generated trip tables and networks coupled with a toll choice model. The toll choice model was based on a binary logit model developed by the Texas Transportation Institute; with adjusted parameters. This model has been used in a number of applications across the country. It has the advantage that its coefficients are directly linked to travelers' value-of-time so it is easily transferable between regions and purposes by simply updating the parameters to reflect the appropriate value of time. This tolling choice model was run in comparison with the FOCUS model and created more realistic results.

Support data tables and maps for this traffic analysis is contained in the various appendices that follow this report.

Figure 2. Jefferson Parkway Traffic Modeling Study Area (with Traffic Analysis Zones – TAZs)





2.2 Network Assumptions

The following Jefferson Parkway conceptual design assumptions are included: Jefferson Parkway will be constructed with four 12-foot lanes between SH 128 and SH 93. Shoulders will be included as will right-of-way for a bike lanes and a transit envelope. The following connections are assumed in the current modeling study:

Jefferson Parkway/Interlocken Loop and SH 128: The results of the ongoing coordination with the Rocky Mountain Metropolitan Airport and the Federal Aviation Administration (FAA) regarding impacts to the Airport Runway Protection Zone (RPZ) may impact this project northern terminus design. Also, coordination within the City and County of Broomfield for local traffic connections between 96th Street and New Simms will be essential to maximize local connectivity.

- **Elevated Northwest Parkway (NWP) freeway connection.** One lane in each direction that extends the NWP in the vicinity of 96th Street and ties into Jefferson Parkway at SH 128 with a full direction connection is assumed. This is the toll-link between NWP and Jefferson Parkway. As Jefferson Parkway, 4 lanes continue and run within the Rocky Mountain Regional Airport Runway Protection Zone to connect to the New Simms interchange connection. There will not be a freeway to freeway connection between US 36 and the NWP. The current assumption is that there will not be any ramps on or off the elevated section between 96th and SH 128; it will be only for through trips.
- **Arterial connections.** One lane in each direction is assumed with a 35 mph speed and local access. The elevated connection will have off ramps to the arterial in the vicinity of 96th to enable traffic to access US 36 and to access 96th. Coordination with the City and County of Broomfield to maximize local network connectivity in the area between 96th and SH 128 is recommended.

Simms: SH 128 to 112th: Existing Simms will remain as is (T's at SH 128 today). The model includes a relocated 4-lane Simms, with a 35-40 mph speed (ties in to Eldorado Blvd at SH 128) and connects to existing Simms to the south. The 4-lane Jefferson Parkway extends through the RPZ to a folded diamond interchange at New Simms.

Simms: 112th to 100th: Simms is included as four lanes, 35-40 mph speed (per Westminster Plans (2008) Long Range Plans).

Indiana Street: SH 128 to 96th: Indiana is coded as a minor arterial with a speed of 35 mph from Candelas to SH 128, and as a principal arterial with a speed of 45 mph from Candelas to SH 72.

Candelas Intersection: Full movement interchange access.

Indiana Street: 96th to 64th: Candelas is currently conducting a traffic study in proximity to their development and no additional changes to the model are recommended at this time.

Jefferson Parkway/SH 72 Intersection: This is currently proposed to be a folded diamond with a grade separation at the Union Pacific Railroad (near SH 72).

Jefferson Parkway/SH 93 Intersection: Initially it was assumed that the model would leave SH 93 with no improvements south of the SH 93 intersection. However, the demand for travel in the corridor indicated a need for a 4-lane facility. As a result one additional lane per direction was coded for SH 93 south of the Parkway for modeling purposes only.



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3 EXISTING CONDITIONS (2015)

3.1 Land Use

No changes were made to the existing 2015 Land Use data provided for this traffic study. The land use data DRCOG provided for the Jefferson Parkway traffic study was forecast by their UrbanSim model, based on a 2010 base year. DRCOG is in the process of collecting and analyzing 2015 data and plan to move to a 2015 base year (land use and travel calibration) sometime in 2017. The information used for the Jefferson Parkway study is the most current available, and it is acknowledged that DRCOG is making adjustments to the UrbanSim that could affect subarea model outputs beyond the control of the JPPHA at this time. A total of 272 TAZ household and employment data was included in this study.

3.2 Existing Transportation Network and Operations

Daily traffic volumes were collected by All Data Traffic Services in May, 2016. These were used to compare with the DRCOG FOCUS model output for 2015. Additional data is located in **Appendices A1 and A2**.

3.2.1 All Data Traffic Data Bluetooth Count Collection Summary and Application

Bluetooth technology was used to track real time trips between the seven collection locations shown on **Figure 3**. Data was collected on weekdays (Tuesday, Wednesday and Thursday), May 10, 11, and 12, 2016 at seven geographic locations including both NB and SB I-25 and EB and WB I-70 for a total of nine collection points. Of interest for this traffic modeling study was the tracking of external to external trips in the metro area between north I-25 and west I-70. **Table 1** summarizes the results of the Bluetooth survey for those specific weekdays. Southbound trips on I-25 south of SH 66 that were picked up by the Bluetooth and recorded at other recording points were compared with those that were only recorded at both SH 66 and I-70 W of Colfax. Eastbound trips at I70 and Kipling that were picked up by the Bluetooth monitors and recorded at other recording points were compared with those that were only recorded at both I70 E of Kipling and NB I25 south of SH 66.

Table 1. Bluetooth Trip Summary: Total Bluetooth trips between I-25 south of SH 66 to/from I-70 West

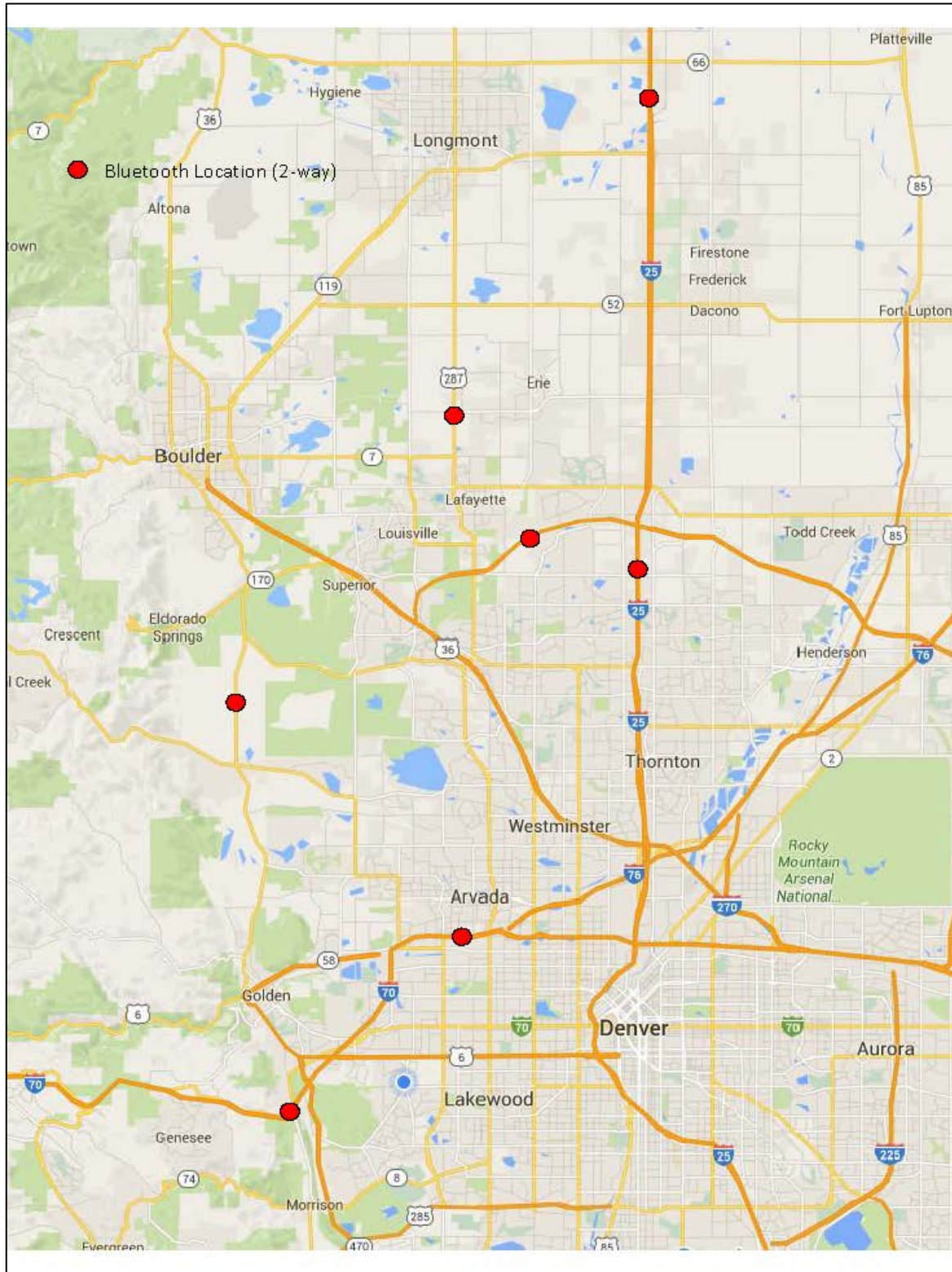
Tuesday – May 10, 2016	I25-I70	totals	% of total
I25 S. of SH 66 to I70 W. of Colfax	87	1460	6.0%
I70 E of Kipling to I25 S. of SH 66	142	903	15.7%
Totals	229	2363	9.7%
Wednesday – May 11, 2016	I25-I70	totals	% of total
I25 S. of SH 66 to I70 W. of Colfax	124	2177	5.7%
I70 E of Kipling to I25 S. of SH 66	171	1091	15.7%
Totals	295	3268	9.0%
Thursday – May 12, 2016	I25-I70	totals	% of total
I25 S. of SH 66 to I70 W. of Colfax	127	2226	5.7%
I70 E of Kipling to I25 S. of SH 66	168	1051	16.0%
Totals	295	3277	9.0%

The DRCOG FOCUS model currently assumed that 10% of

the trips traveling on I-25 south are destined to points west on I-70, and vice-versa, which is slightly higher than the Bluetooth data shown. Total counts for traffic on I-25 and I-70 during the Bluetooth survey were not collected. However, based on CDOT counts on I-25 north of the Northwest Parkway, current daily volumes are estimated at approximately 102,000. Ten percent would be 10,200 vehicles.



Figure 3. Blue Tooth Data Collection Locations





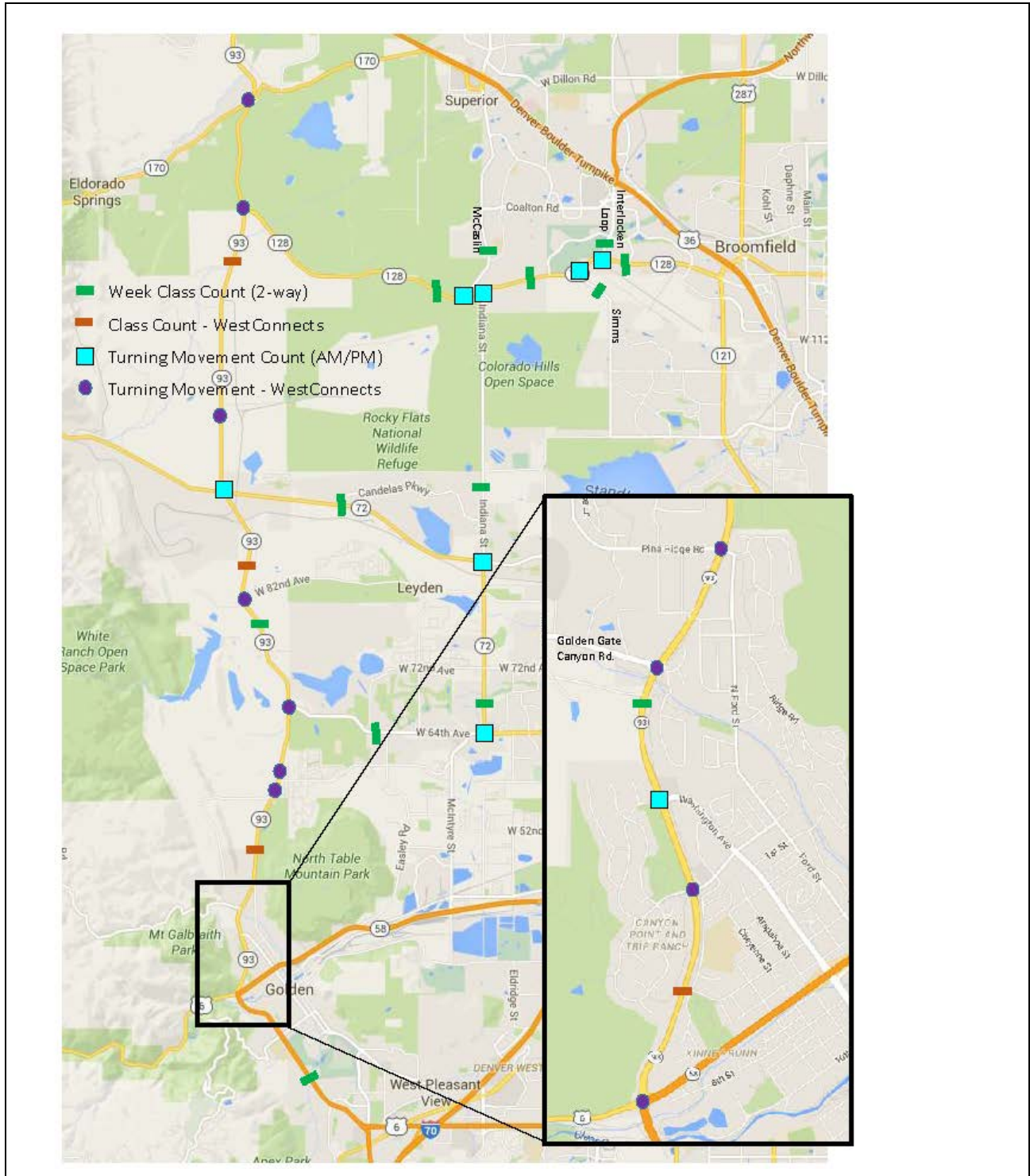
3.2.2 Summary and Application

Two-way counts were obtained by All Traffic Data Services and summarized in Table 2. Counts included all types of vehicles, (including bicycles, not shown on **Table 2**). **Figure 4** includes the twelve (12) week classification count locations. Intersection counts are not shown and are included in **Appendix A1**.

Table 2. 7 Day Traffic Count Totals for May 10-16, 2016

	Location	Weekly Total	Average Daily Total
EB	120TH AVE E/O INTERLOCKEN LOOP	32,061	4,580
WB	120TH AVE E/O INTERLOCKEN LOOP	31,028	4,433
NB	INTERLOCKEN LOOP N/O 120TH AVE	38,529	5,504
SB	INTERLOCKEN LOOP N/O 120TH AVE	36,630	5,234
NB	SIMMS ST S/O 120TH AVE	22,398	3,200
SB	SIMMS ST S/O 120TH AVE	21,770	3,110
EB	120TH AVE W/O SIMMS ST	39,638	5,663
WB	120TH AVE W/O SIMMS ST	37,940	5,420
EB	120TH AVE W/O MCCASLIN BLVD	15,765	2,252
WB	120TH AVE W/O MCCASLIN BLVD	15,225	2,175
NB	MCCASLIN BLVD N/O 120TH AVE	28,059	4,008
SB	MCCASLIN BLVD N/O 120TH AVE	27,902	3,986
NB	INDIANA ST S/O 96TH AVE	49,061	7,009
SB	INDIANA ST S/O 96TH AVE	46,596	6,657
EB	COAL CREEK CAN RD W/O CANDELAS	18,906	2,701
WB	COAL CREEK CAN RD W/O CANDELAS	17,019	2,431
NB	HWY 93 S/O 82ND AVE	77,930	11,133
SB	HWY 93 S/O 82ND AVE	72,667	10,381
EB	64TH AVE E/O VIRGIL WAY	24,360	3,480
WB	64TH AVE E/O VIRGIL WAY	24,547	3,507
NB	INDIANA ST S/O 72ND AVE	58,701	8,386
SB	INDIANA ST S/O 72ND AVE	63,025	9,004
NB	HWY 93 S/O GOLDEN GATE CAN RD	105,297	15,042
SB	HWY 93 S/O GOLDEN GATE CAN RD	101,153	14,450
NB	6TH AVE S/O 19TH ST	133,592	19,085
SB	6TH AVE S/O 19TH ST	127,684	18,241

Figure 4. Traffic Data Collection





3.2.3 Existing Network and Operations (2015)

Weekday AM and PM peak hours are typically the most congested periods on urbanized area roads, and thus weekday peak hour volume data are generally used to assess levels of congestion or levels of service.

Level of service is described by letter designations ranging from A to F, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with excessive congestion and delay. For analysis of a signalized intersection, a LOS rating is calculated for an intersection as a whole. The Synchro© software analysis package and methodology (Albeck and Husch, 2003) was utilized to calculate LOS ratings for key intersections throughout the study area. According to the software documentation, Synchro's© HCM signalized analysis provides a full implementation of the HCM (Transportation Research Board, 2000) Signalized Operations method. However, the Synchro© implementation does calculate the effects of signal progression and actuated signal green times differently than the HCM.

Figures 5 and 6, Existing Traffic and LOS (2015) include daily link volumes (annual average daily traffic or AADT) for key arterial streets and toll roads, AM(PM) peak hour movements and Level of Service at the following intersections: SH 93 and SH 72, Indiana and SH 72, Interlocken Loop and SH 128, SH 93 and Washington and SH 72(Indiana) and 64th. These intersections are associated with the Jefferson Parkway or were identified by the Transportation Commission (Resolution # TC-1752) as of interest for additional impact assessment.

CDOT OTIS data for 2015 was also reviewed as a basic comparison with the FOCUS Model 2015 outputs. **Table 3** compares the two sets of information for 8 locations. Although the numbers vary, all fall within a similar order of magnitude range with the FOCUS output trending higher than the CDOT OTIS data for most of these locations in 2015.

Table 3. Comparison of CDOT OTIS 2015 and FOCUS Model 2015 AADT

Location	CDOT OTIS 2015 AADT	FOCUS 2015 Link Volumes (AADT)
SH 93 S/O Golden Gate Canyon Rd	28,000	Not Shown
SH 93 N/O 64 th Ave	18,000	23,200 (S/O 64 th)
SH 93 S/O SH 72 (Coal Creek Canyon)	17,000	23,500
SH 93 N/O SH 72 (Coal Creek Canyon)	18,000	22,400
SH 72 64 th E/O Indiana	24,000	25,400
SH 72 Indiana N/O 72nd	15,000	22,400
SH 72 Indiana N/O 82nd	21,000	25,300
SH 72 (Coal Creek Canyon E/O SH 93	4,700	7,300
SH 128 Interlocken Loop NE/O Simms	15,000	11,900



Figure 5. Existing Traffic and LOS (2015) – North

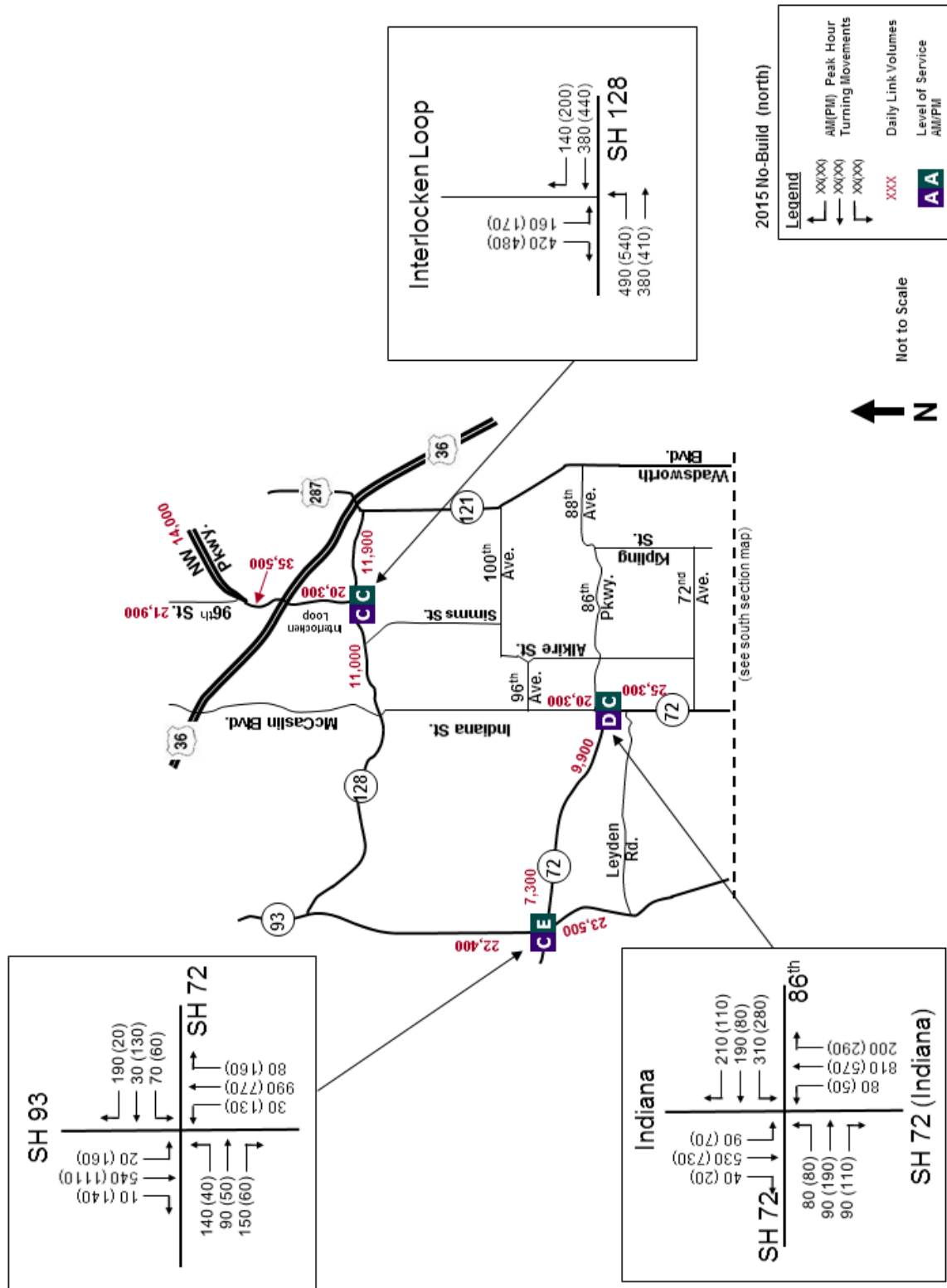
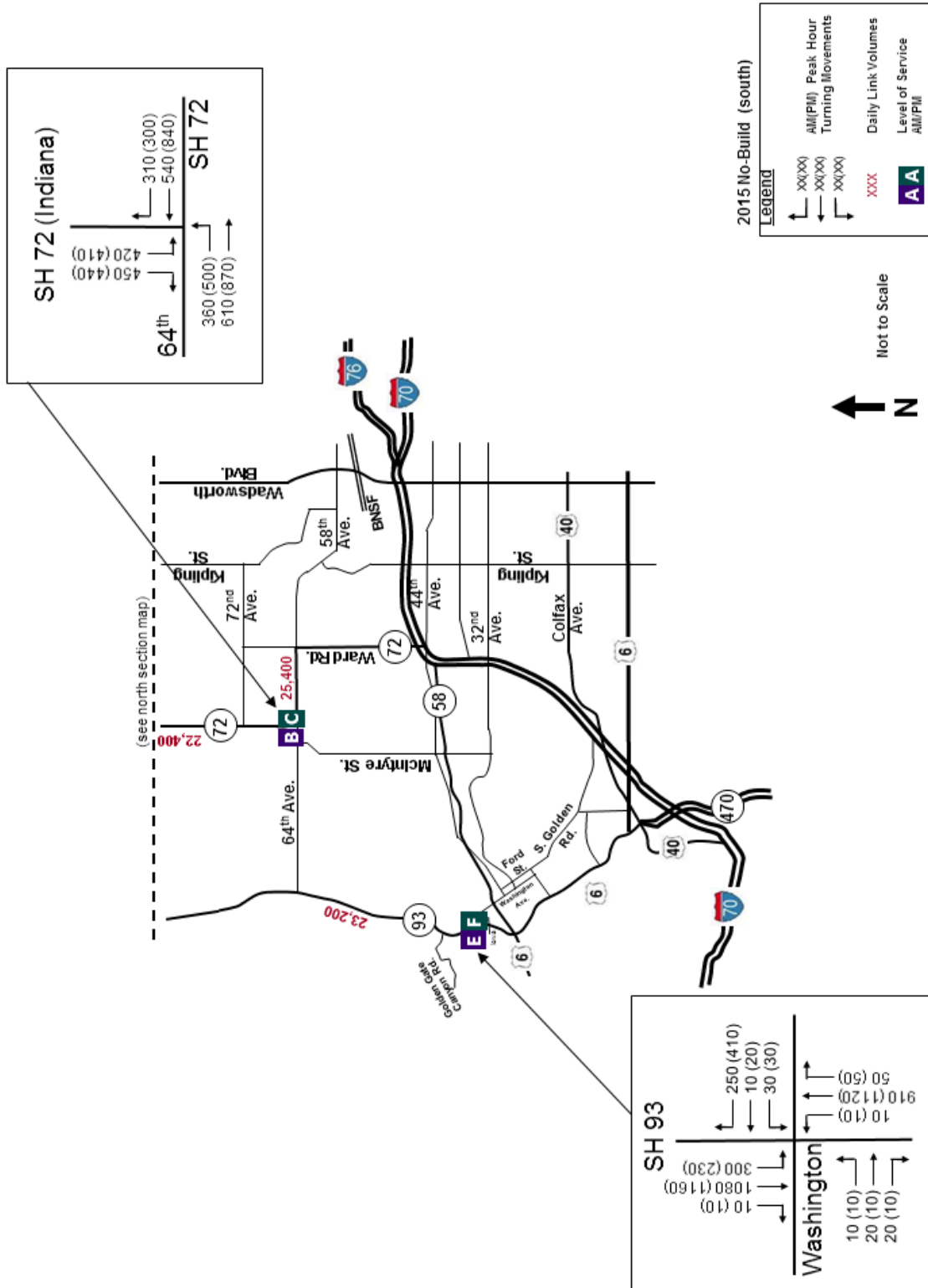




Figure 6. Existing Traffic and LOS (2015) – South





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4 FORECAST CONDITIONS (2040)

4.1 Land Use

As a part of the modelling process, 2040 land use TAZ information (household population and employment data) used by DRCOG for the CY2 2015 FOCUS model was submitted to a number of county and local government staff for a consistency review with their own data. Out of a total of 272 TAZs in the study area, changes have been identified for 28. The following county and local governments were included in this review:

- Boulder County
- City and County of Broomfield
- Jefferson County
- Golden
- Westminster
- Louisville
- Arvada
- Lakewood
- Superior
- Lafayette
- Wheatridge

As a result of these reviews, most reviewers submitted few to no changes. Some submitted minor variations resulting in changes of less than ten percent, others acknowledged that only minor changes were anticipated and chose not to submit. These level of changes were not anticipated to affect the outcome of the traffic modeling and were not included. **Table 4** below details the changes that were identified as significant enough to warrant an adjustment in the FOCUS modeling. Numbers of households were lower than the DRCOG by close to 18% (some of this may be related to changes in household size definitions in some jurisdictions) and employment numbers were higher with service/office employment almost double the DRCOG numbers (related to buildout at Candelas and other area employment development).



Table 4: Land Use (Households and Employment Changes for 28 TAZs) based on Local Government Input

DRCOG 2040 Land Use Data (2015 CY 2)					Revised Data Per Local/County Government Reviews					NOTES
TAZ_ID	HH_POP	EMPLOYMENT			HH_POP	EMPLOYMENT			City_Town	
		PROD_DIST	RETAIL	SERVICE		PROD_DIST	RETAIL	SERVICE		
201030	989	276	30	192	NC	552	64	384	JeffCo	
204010	227	175	0	67	1619	NC	NC	NC	Arvada	(Leyden Rock)
205160	711	9	80	48	600	131	1168	701	Wheatridge	(Clear Creek Crossing)
208010	1197	146	333	606	845	NC	NC	NC	Wheatridge	
207160	2170	19	26	88	1827	NC	NC	NC	Wheatridge	Note: Wheatridge has increased HH size by 20%), resulting in a consistent decrease in number of households.
207010	2769	114	153	767	2424	NC	NC	NC	Wheatridge	
207020	2329	201	172	629	2566	NC	NC	NC	Wheatridge	
207110	646	37	88	158	474	NC	NC	NC	Wheatridge	
206290	120	946	631	394	700	NC	NC	NC	Wheatridge	
206280	2664	373	315	857	1575	NC	NC	NC	Wheatridge	
205080	3275	31	32	84	2212	NC	NC	NC	Golden	(Open Space - no growth 2015)
205100	1026	239	12	236	1200	NC	NC	NC	JeffCo	
205230	3050	30	361	903	1145	NC	NC	NC	Golden	
207180	1508	57	74	356	1297	NC	NC	NC	Wheatridge	
207100	1456	106	192	729	1791	NC	NC	NC	Wheatridge	See Note above on HH size.
202040	155	181	42	120	NC	1055	245	700	Westm/JeffCo	(JeffCo partner w/ developer)
202060	22	100	42	130	NC	221	92	287	JeffCo	(Airport)
106260	5279	12	3	34	3861	262	28	630	Superior	
106270	0	1066	87	679	NC	537	44	341	Louisville	
106190	0	7	0	3	NC	536	43	341	Louisville	
106220	6347	13	26	696	729	253	NC	590	Superior	
106030	9	270	952	391	71	291	1012	412	Superior	
202410	5981	0	0	0	4160	61	430	7360	Arvada	(Candelas)
106240	1693	21	9	66	1389	69	20	160	Superior	
106430	644	3	18	79	794	0	0	0	Superior	
106040	60	54	107	132	3344	493	243	1189	Superior	
106420	3798	32	66	284	3372	0	50	72	Superior	
106250	2206	11	166	228	1736	0	129	44	Superior	
106210	357	11	15	49	461	57	50	133	Superior	
Totals	50688	4540	4032	9005	41358	6992	6033	19914		
Differences					-9330	2452	2001	10909		
Study Area	337138	53124	48685	133990						

4.2 Future Transportation Network and Operations

Figures 7 and 8, 2040 No-Build Traffic and Level of Service include daily link volumes (annual average daily traffic or AADT) for key arterial streets and toll roads, AM(PM) peak hour movements and Level of Service at the following intersections: SH 93 and SH 72, Indiana and SH 72, Interlocken Loop and SH 128, SH 93 and Washington and SH 72(Indiana) and 64th. Intersection Level of Service is also shown on these figures. Note the poor LOS (F) at most of these locations without the Jefferson Parkway.



Figure 7. 2040 No-Build Traffic and LOS – North

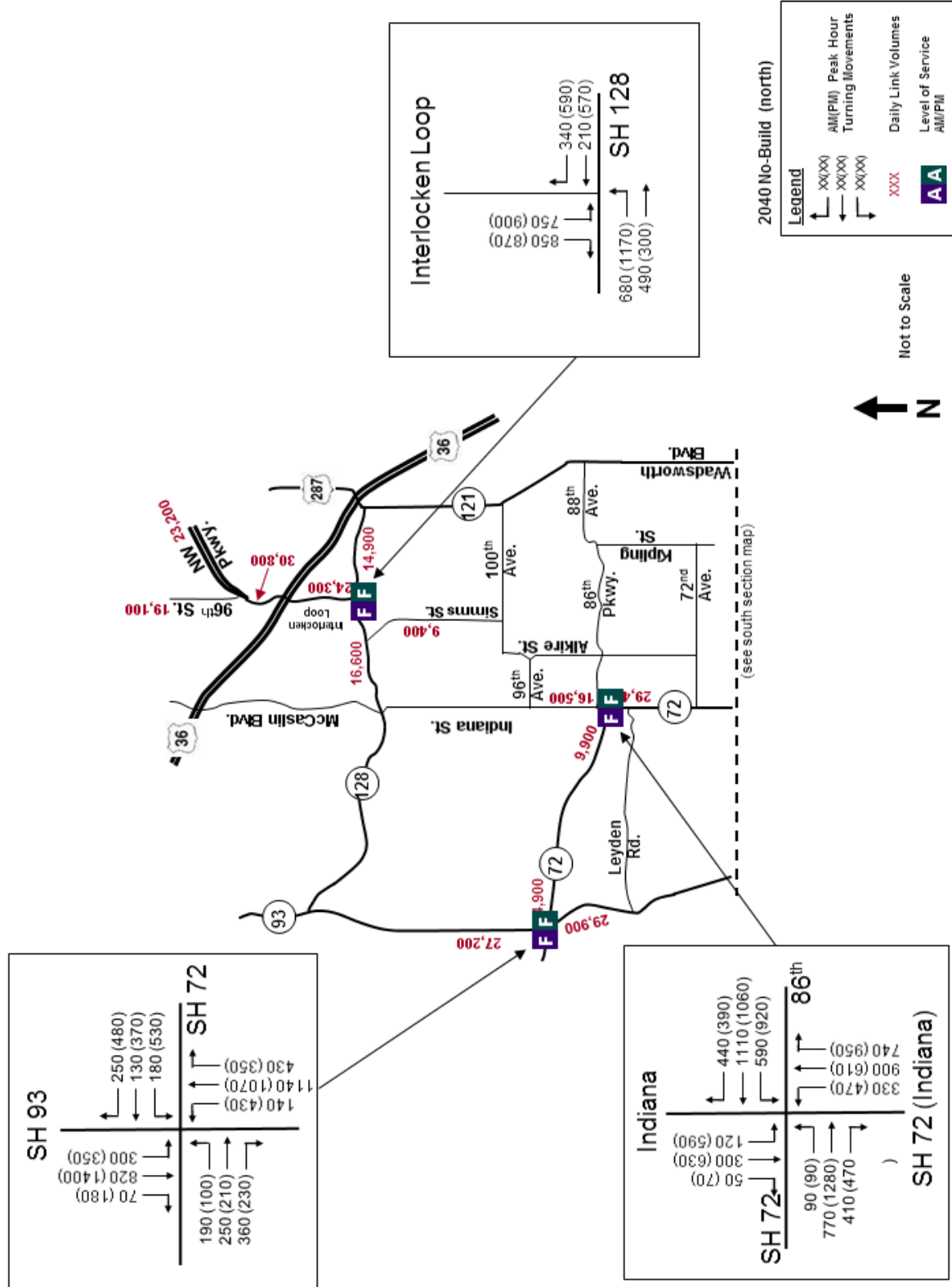
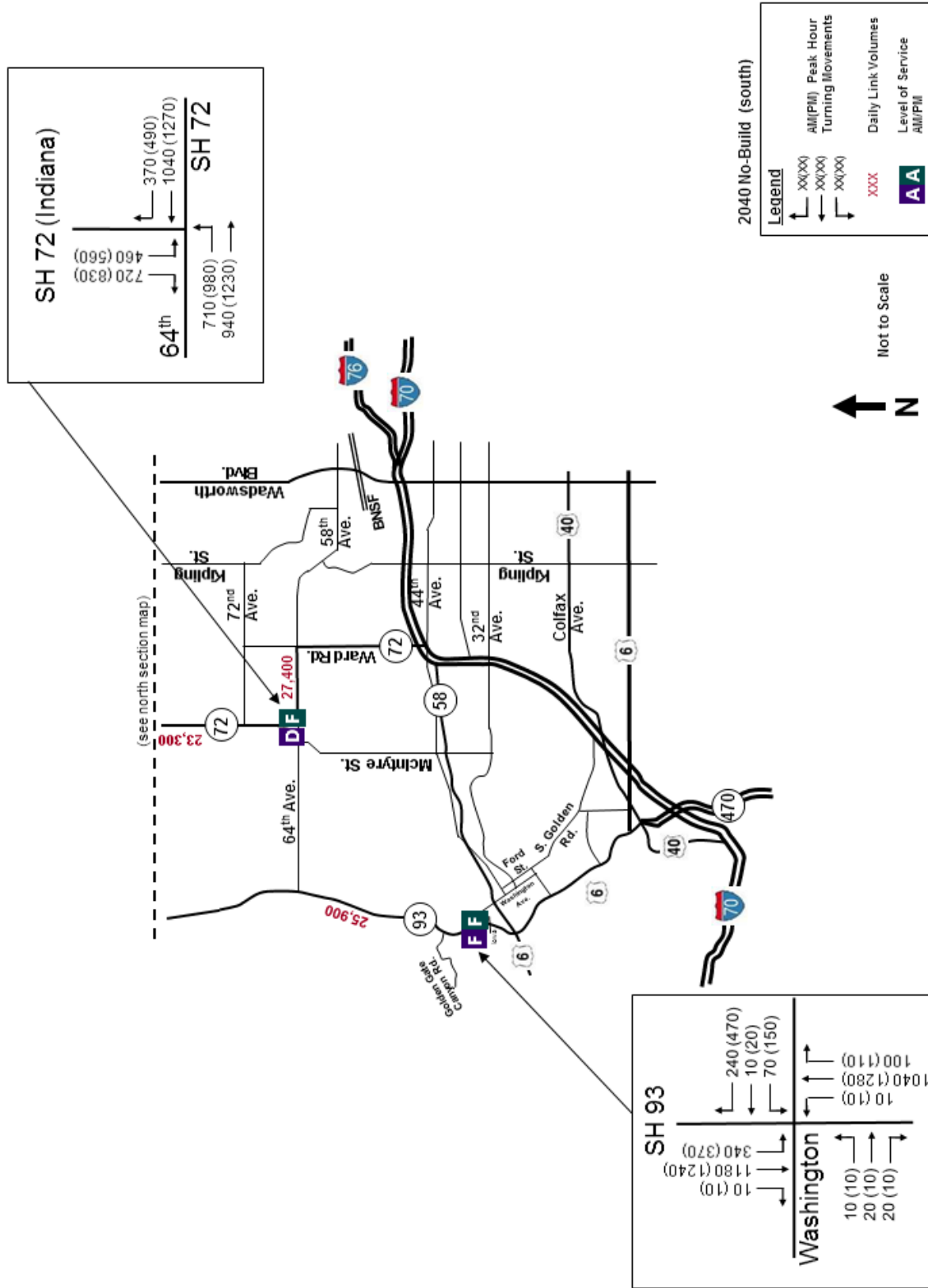




Figure 8. 2040 No-Build Traffic and LOS – South





CDOT OTIS data for 2040 was also reviewed as a basic comparison with the FOCUS Model 2040 No Build outputs. **Table 5** compares the two sets of information for 8 locations. For 2040, the FOCUS numbers are noticeably higher than the CDOT OTIS forecasts in most cases.

Table 5. Comparison of CDOT OTIS 2040 and FOCUS Model 2040 No Build AADT

Location	CDOT OTIS 2040 AADT	FOCUS 2040 Link Volumes (AADT)
SH 93 S/O Golden Gate Canyon Rd	36,400	Not Shown
SH 93 N/O 64 th Ave	20,700	25,900 (S/O 64 th)
SH 93 S/O SH 72 (Coal Creek Canyon)	21,675	29,900
SH 93 N/O SH 72 (Coal Creek Canyon)	21,600	27,200
SH 72 64 th E/O Indiana	31,200	27,400
SH 72 Indiana N/O 72nd	20,063	23,300
SH 72 Indiana N/O 82nd	32,813	29,400
SH 72 (Coal Creek Canyon E/O SH 93)	5,405	14,900
SH 128 Interlocken Loop NE/O Simms	30,000	14,900

Figures 9 and 10, 2040 Build Traffic and LOS include daily link volumes (annual average daily traffic or AADT) for key arterial streets and toll roads, AM/PM peak hour movements and Level of Service at the following intersections: Jefferson Parkway at SH 128, Jefferson Parkway at SH 72, Jefferson Parkway at SH 93, SH 93 and SH 72, Indiana and SH 72, SH 93 and Washington and SH 72 (Indiana) and 64th. Conceptual Jefferson Parkway interchange layouts are also included. The LOS shown here assume a series of improvements associated with the Build Alternative. **Table 5** describes the suggested improvements and the mitigated LOS. **Figures 11 and 12** illustrate the geometry needed to achieve LOS D or better as described in **Table 6**. Responsibility for local improvements will be the subject of future discussion.



Table 6. Jefferson Parkway 2040 Level of Service for SH 128, SH 72 and SH 93 Interchanges

Intersection	AM/PM Level of Service			Improvements Recommended to Obtain LOS D or Better
	2015 No-Build	2040 No-Build	2040 Build	
SH 128 / Interlocken Loop	C/C	F/F	-	-
SH 128 / Jefferson Parkway Southbound Ramps	-	-	B/D	EB 2nd Thru Lane, WB Left Turn Lane, SB Left, Thru, Shared Thru/Right and Right Turn Lane, Signal
SH 128 / Jefferson Parkway Northbound Ramps	-	-	B/D	EB Two Left Turn Lanes, WB Right Turn Lane, NB Left, Two Thru, and Right Turn Lane, Signal
Jefferson Parkway / New Simms Southbound Ramps	-	-	B/B	EB Right Turn Lane, WB Left Turn Lane, NB Left and Right Turn Lanes, Signal
Jefferson Parkway / New Simms Northbound Ramps	-	-	B/A	WB Left Turn Lane, NB Left and Right Turn Lanes, Signal
Jefferson Parkway / SH 72 Southbound Ramps	-	-	B/B	2nd EB/WB Thru Lanes, Separate EB Right Turn Lane, Separate WB Left Turn Lane, 2nd NB Left Turn Lane, Signal
Jefferson Parkway / SH 72 Northbound Ramps	-	-	B/B	2nd EB/WB Thru Lanes, Separate EB Right Turn Lane, Separate WB Left Turn Lane, NB Left Turn Lane, Signal
Jefferson Parkway / SH 93	-	-	A/C A/A	Option 1. 2nd and 3rd NB/SB Thru Lanes, NB Right Turn Lane, WB Three Left Turn Lanes, Right Turn Lane, Signal. Option 2: 2nd NB/SB Thru Lanes, NB Right Turn Lane, WB Right Turn Lane with a Flyover for WB Left Turns, No Signal.



Figure 9. 2040 Build Traffic and LOS – North

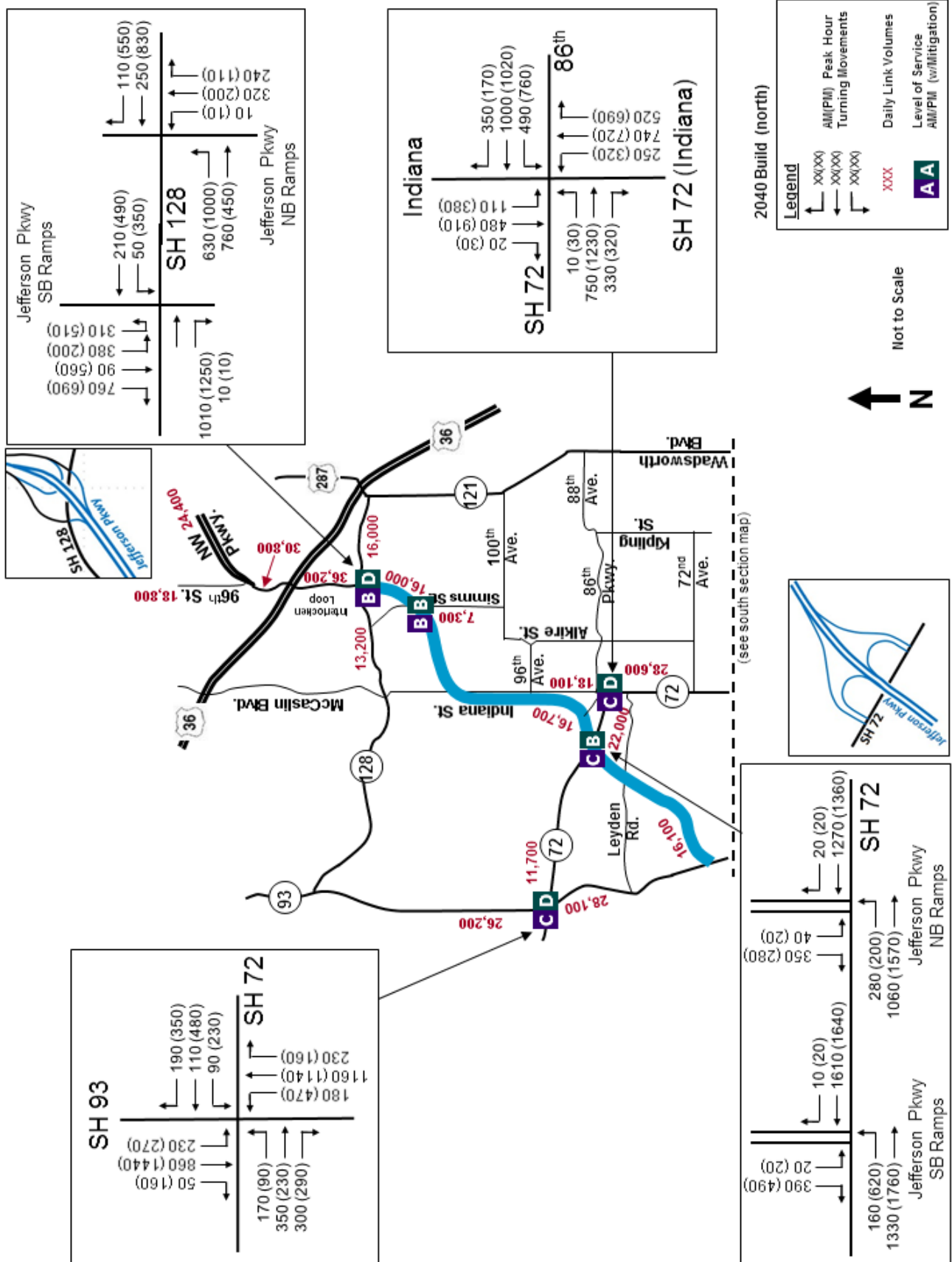




Figure 10. 2040 Build Traffic and LOS – South

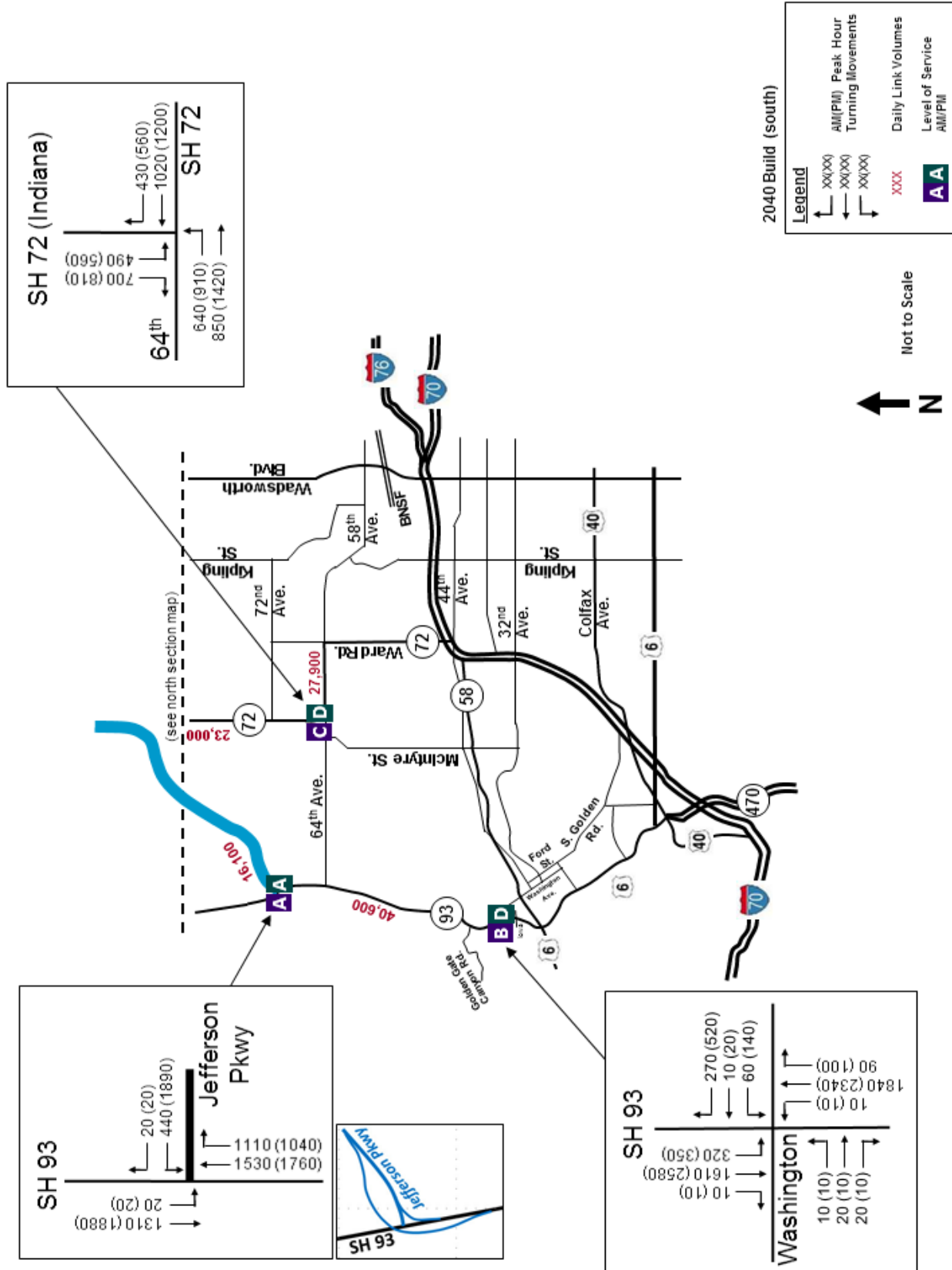




Figure 11. 2040 Build (North) Geometry Needed to Achieve LOS "D" or Better

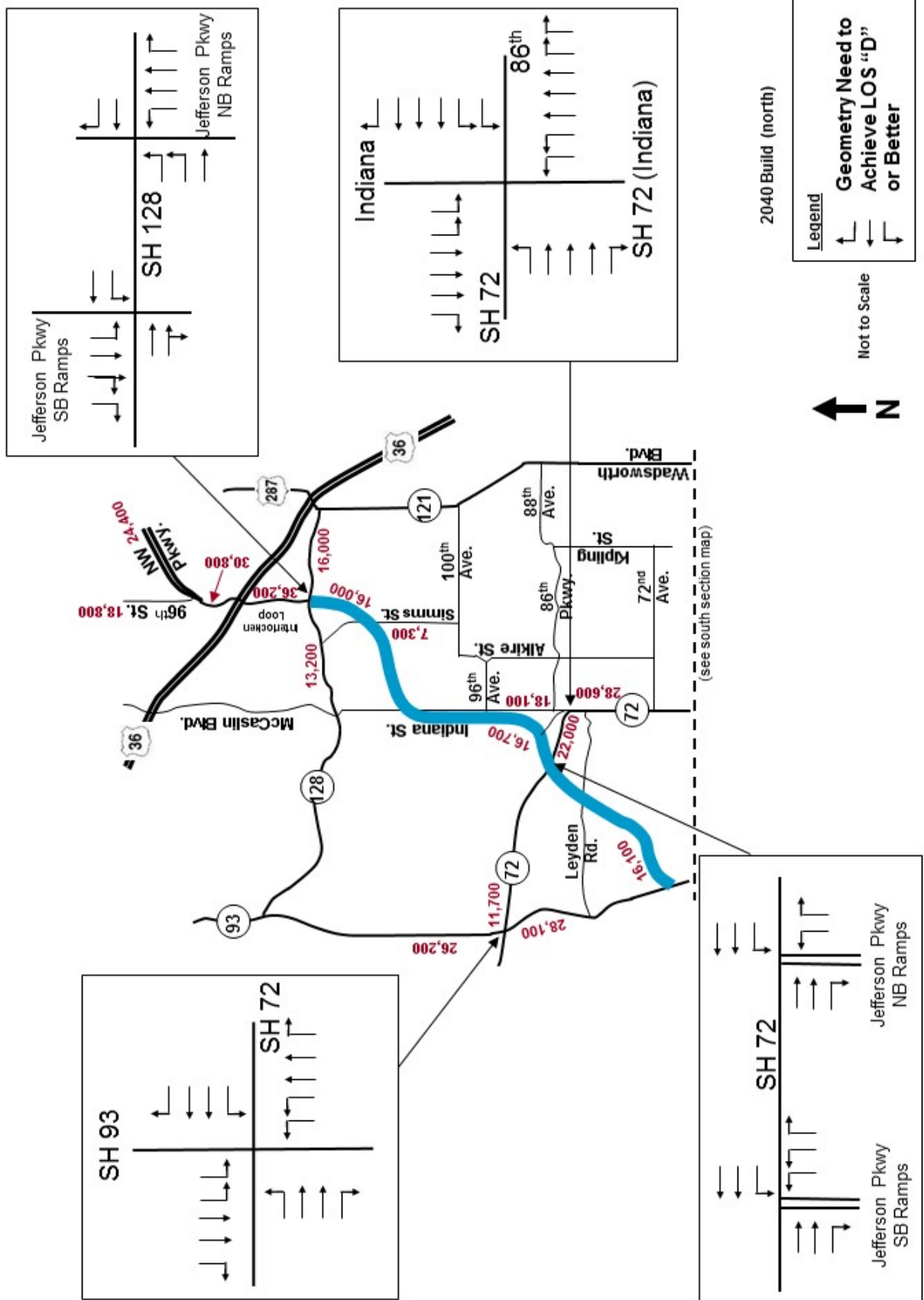
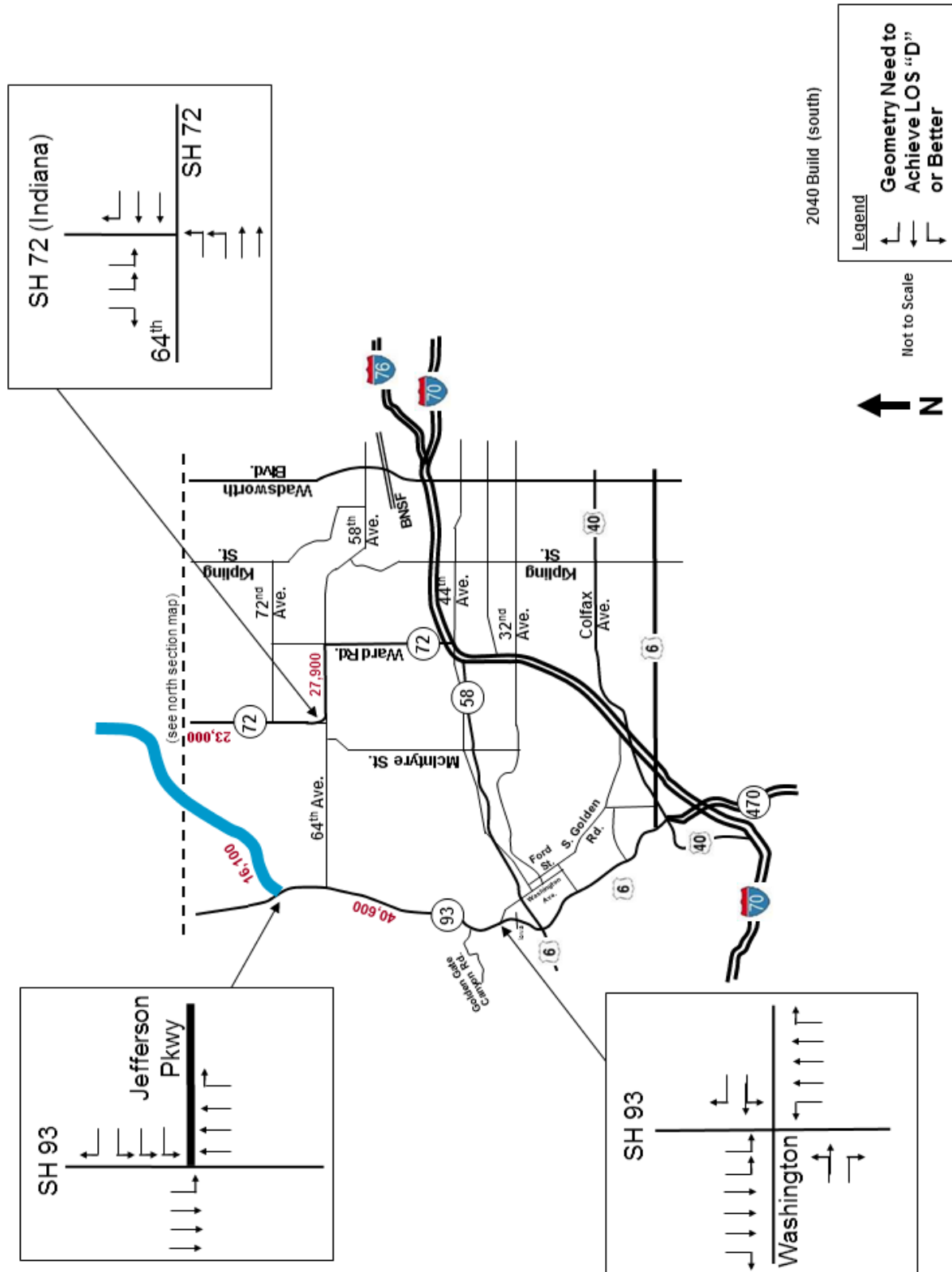




Figure 12. 2040 Build (South) Geometry Needed to Achieve LOS "D" or Better





5 Support for CDOT 1601 Process

This information is provided to support CDOT required 1601 Project Level studies for Jefferson Parkway connections at SH 128, SH 72 and SH 93. Some of this is duplicative of data presented in the previous chapters. Each section that follows is intended to focus on the specific state highway connection indicated.

5.1 Jefferson Parkway/Interlocken Loop and SH 128

The results of the ongoing coordination with the Rocky Mountain Metropolitan Airport and the Federal Aviation Administration (FAA) regarding impacts to the Airport Runway Protection Zone (RPZ) may impact this project terminus design. Also, coordination within the City and County of Broomfield for local traffic connections between 96th Street and New Simms will be essential to maximize local connectivity. The descriptions that follow were the assumptions built into the 2040 FOCUS model by the subarea study.

- **Elevated Northwest Parkway (NWP) freeway connection.** One lane in each direction that extends the NWP in the vicinity of 96th Street and ties into Jefferson Parkway at SH 128 with a full direction connection is assumed. This is the toll-link between NWP and Jefferson Parkway. As Jefferson Parkway, 4 lanes continue and run under the Rocky Mountain Regional Airport RPZ to connect to the New Simms interchange connection. There will not be a freeway to freeway connection between US 36 and the NWP. The current assumption is that there won't be any ramps on or off the elevated section between 96th and SH 128; it will be only for through trips.
- **Arterial connections.** One lane in each direction is assumed with a 35 mph speed and local access. The elevated connection will have off ramps to the arterial in the vicinity of 96th to enable traffic to access US 36 and to access 96th. Coordination with the City and County of Broomfield to maximize local network connectivity in the area between 96th and SH 128 is recommended.

Subsequent to the model results, additional improvement to the local network were described. The following **Figures 13, 14 and 15** provide a detailed traffic and layout information for the Existing 2015 conditions, 2040 No Build and 2040 Build.

The SH 128 and Interlocken Loop intersection is shown to operate at LOS F under the 2040 No Build. The traffic shown for SH 128 in 2040 may be underestimated by the FOCUS Model, as the CDOT OTIS (**Table 4**) forecast shows a much higher volume for that location. This implies that the LOS F will be reached far in advance of the 2040 model year. Coordination with CDOT and City and County of Broomfield as the Jefferson Parkway project progresses will be essential to creating network improvements to both the state and local roadway system.

Improvements identified for the 2040 Build scenario (to obtain LOS D or better) include:

- **SH 128/Jefferson Parkway SB Ramps:** EB 2nd thru lane, WB left turn Lane, SB left, thru, shared thru/right and right turn lane, signal
- **SH 128/Jefferson Parkway NB Ramps:** EB two left turn lanes, WB right turn lane, NB left, two thru, and right turn lane, signal
- **Jefferson Parkway/New Simms SB Ramps:** EB right turn lane, WB left turn lane, NB left and right turn lanes, signal



- **Jefferson Parkway / New Simms NB Ramps:** WB left turn lane, NB left and right turn lanes, signal

The 2040 Build illustrates the relationship of the Jefferson Parkway connections at SH 128 and a relocated Simms Street. This layout includes the touchdown of elevated lanes carrying through traffic from the Northwest Parkway directly to the Jefferson Parkway as well as local connections to Interlocken Loop, SH 128 and a proposed relocated Simms Street. **Appendix B4** includes a detailed package of support information provided to the Parkway Authority on the area surrounding the SH 128/Jefferson Parkway interchange and related intersections. This was provided to support on-going coordination with the Rocky Mountain Metropolitan Airport and the FAA regarding the relationship of the Jefferson Parkway alignment with the airport's runway protection zones.



Figure 13. Existing SH 128: Eldorado Blvd to Interlocken Loop

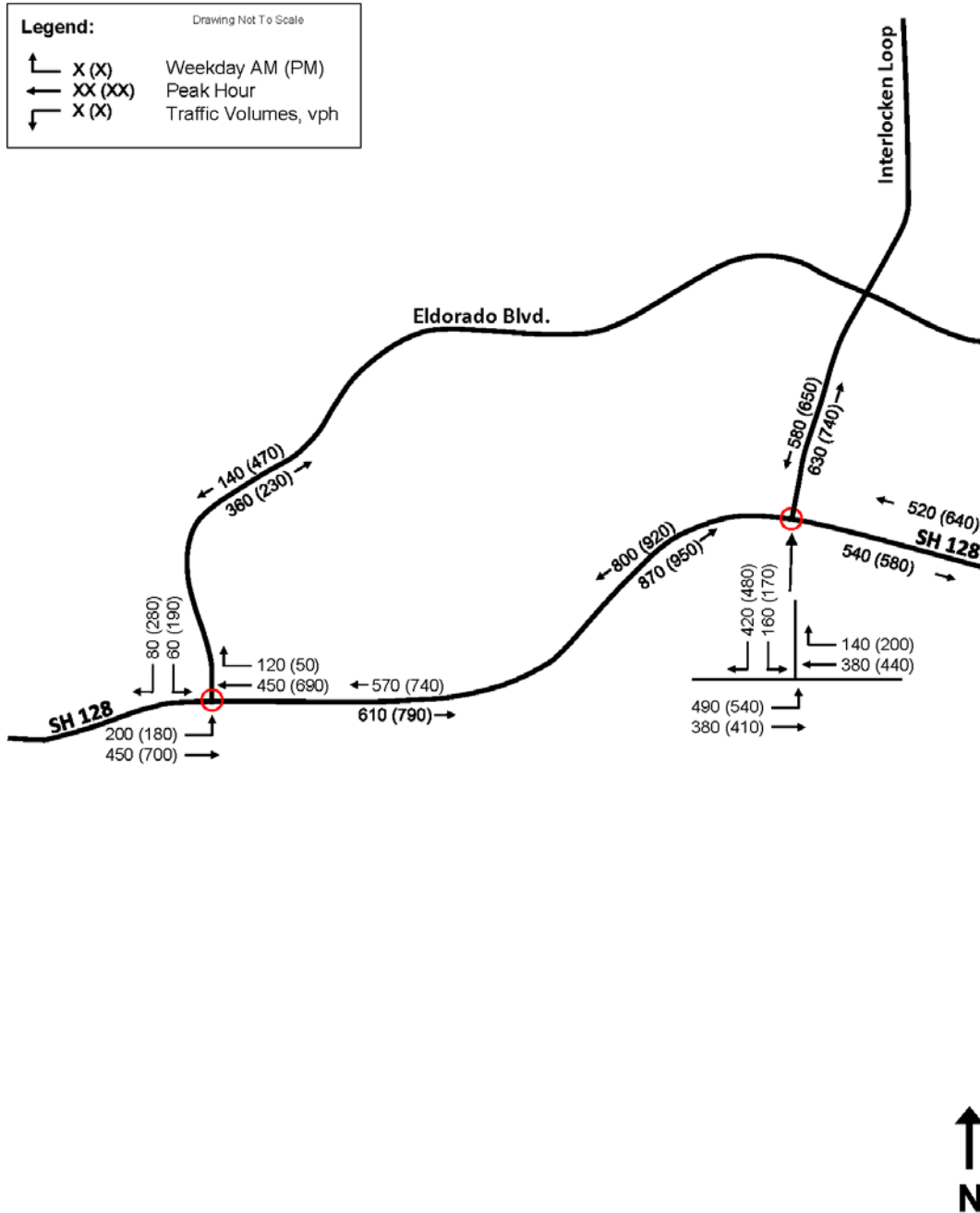




Figure 14. SH 128: Eldorado Blvd to Interlocken Loop 2040 No Build

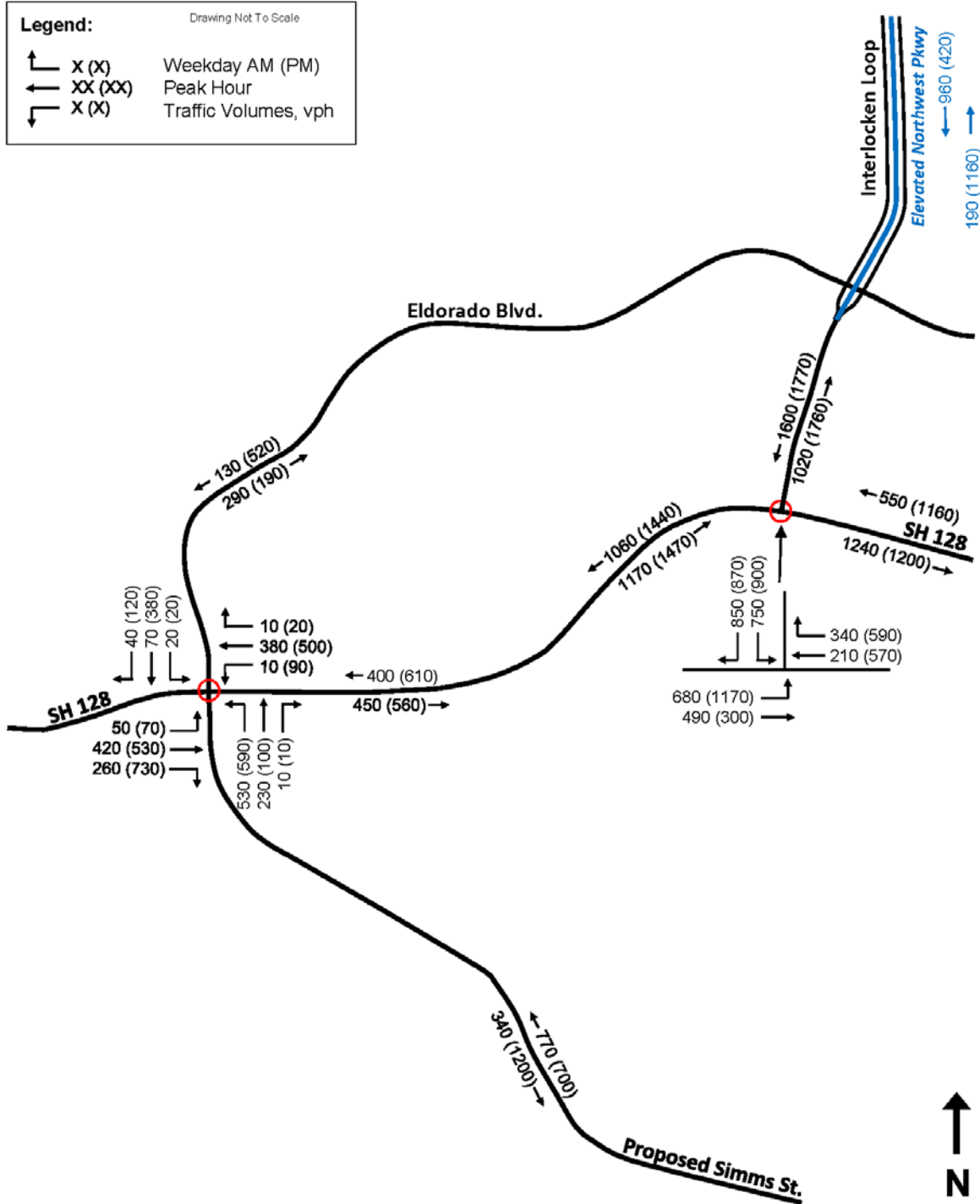
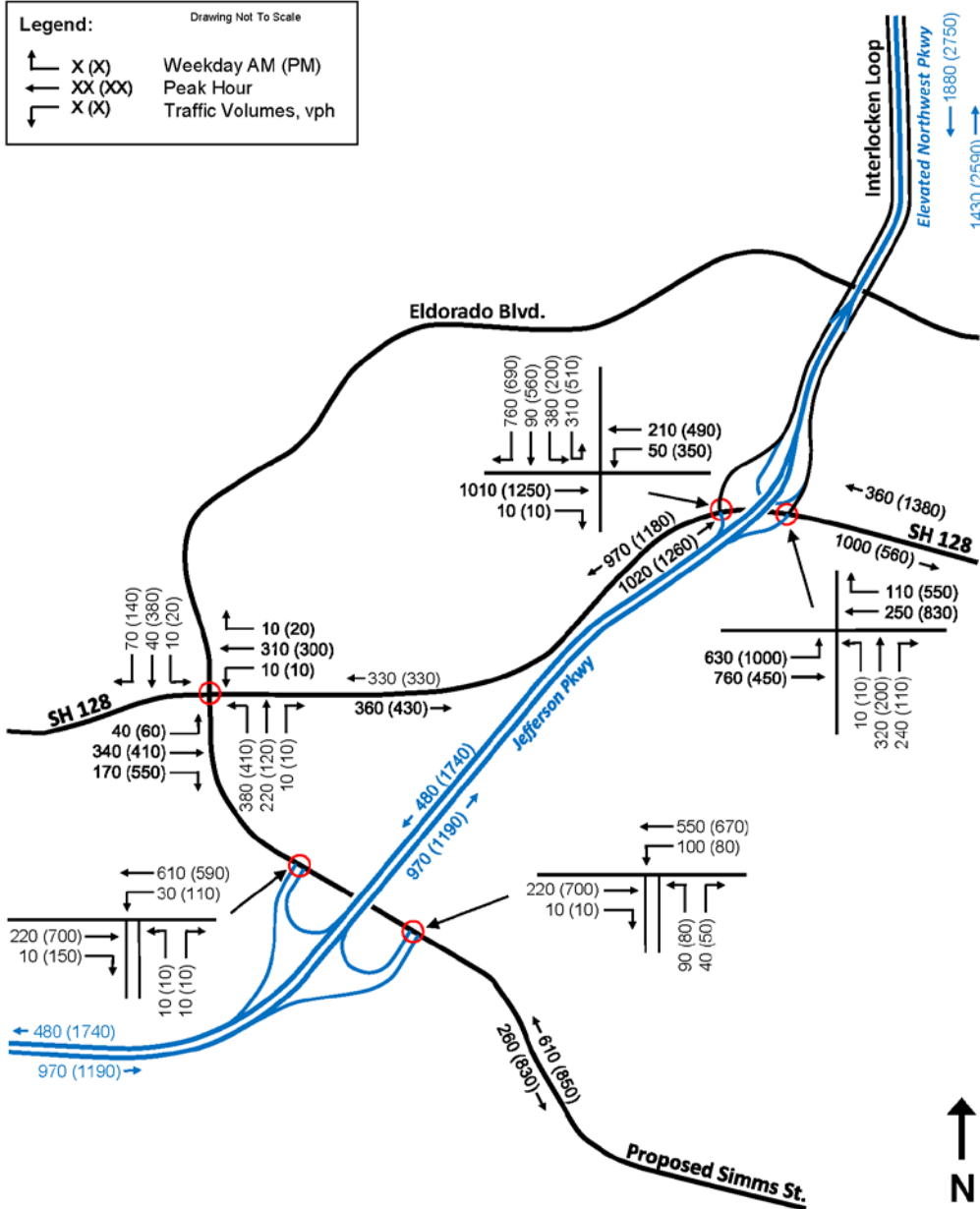




Figure 15. Jefferson Parkway at SH 128: 2040 Build Traffic Volumes and Layout Details





5.2 Jefferson Parkway and SH 72

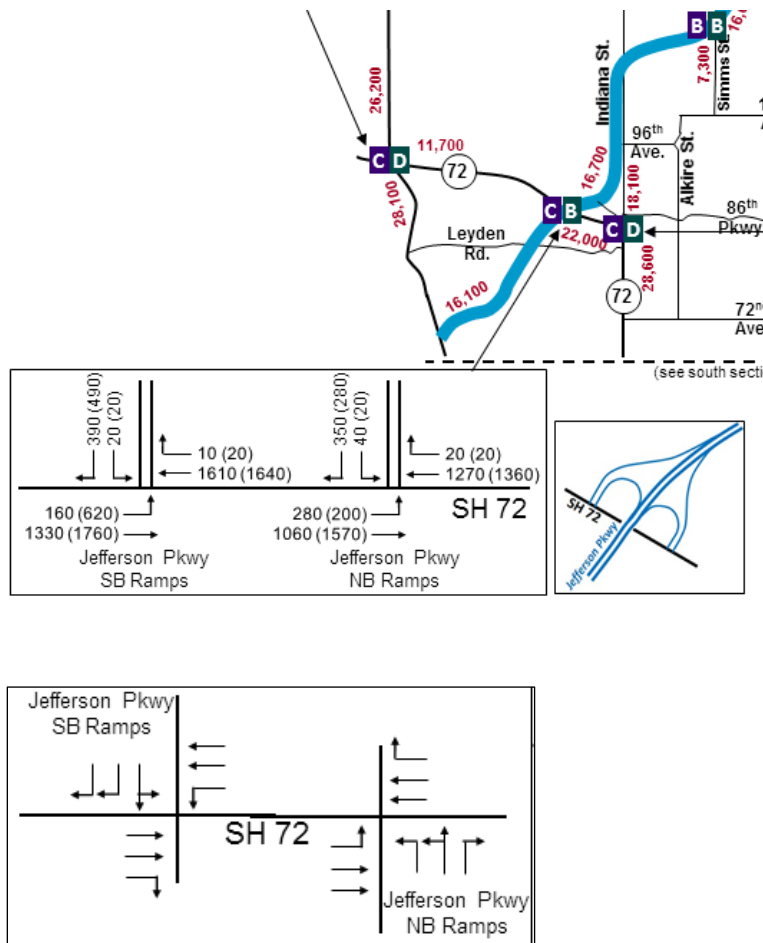
Although a folded diamond has been suggested for the interchange of Jefferson Parkway with SH 72, the traffic flows and volumes identified for the traffic study are applicable for various interchange configurations. A grade separation for the Union Pacific Railroad is assumed. See **Figure 16**.

The 2040 No Build volumes shown for SH 72 indicate LOS F at both SH 93 and at Indiana. Also note that higher volumes in this area will be related to the levels of buildout of the Candelas and other area developments for the Build scenario. The land use was significantly adjusted for the subarea model run to indicate employment associated with the build out at Candelas resulting in significantly higher forecasts than shown for the CDOT OTIS 2040 data.

Improvements identified for the 2040 Build scenario (to obtain LOS D or better) include:

- **Jefferson Parkway/SH 72 SB Ramps:** 2nd EB/WB thru lanes, separate EB right turn lane, 2nd SB right turn lane, signal
- **Jefferson Parkway/SH 72 NB Ramps:** 2nd EB/WB thru lanes, separate WB right turn lane, 2nd NB left turn lane, signal

Figure 16. Jefferson Parkway at SH 72: 2040 Build Traffic Volumes and Layout Details





5.3 Jefferson Parkway and SH 93

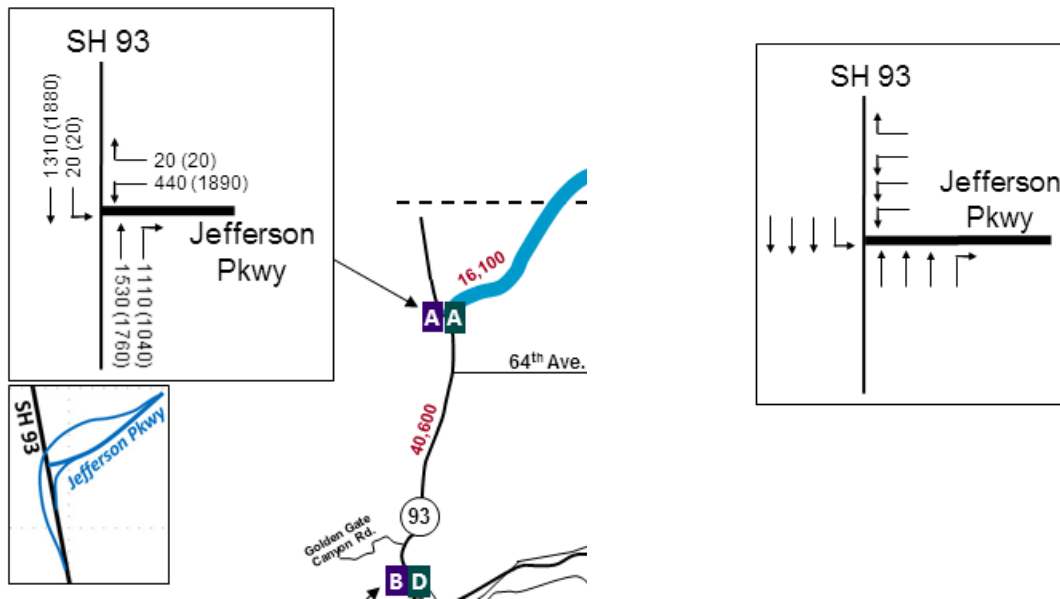
Preliminary studies indicated that a signalized intersection or a roundabout could provide an acceptable LOS for the intersection of the Jefferson Parkway with SH 93 in 2040 with an upgrade to a full interchange at some future date after 2040. And, initially it was also assumed that the model would leave SH 93 with no improvements south of the SH 93 intersection. However, demand in the corridor indicated a need for 4-lanes on SH 93. As a result, two additional lanes were coded for SH 93 south of the Parkway for modeling purposes only.

CDOT OTIS data for both 2015 and 2040 for various portions of SH 93 are noticeably lower than the FOCUS subarea model results.

The following two options for improvements have been identified for the 2040 Build scenario (to obtain LOS D or better):

- **Option 1.** 2nd and 3rd NB/SB thru lanes, NB right turn lane, WB three left turn lanes, right turn lane, signal.
- **Option 2.** 2nd NB/SB thru lanes, NB right turn lane, WB right turn lane with a flyover for WB Left turns, no signal.

Figure 17. Jefferson Parkway at SH 93: 2040 Build Traffic Volumes and Layout Options





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6 #TC-1752 RESOLUTION SUPPORT

On July 23, 2009, the Transportation Commission approved Resolution #1752 with the JPPHA commitment to a level of service “D” at and through the interchanges during morning and evening peak hours. Connections at SH 128, SH 72 and SH 93 (4th, 5th and 6th whereas clauses) were recognized for additional project level study. In addition, four other intersections were identified in the Resolution for further study; specifically, SH93/Washington, SH 93/SH 72, SH 72/64th, and SH 72/86th. All four of these locations are located outside the jurisdiction of the JPPHA. At the time of the System Level Study, a different set of Jefferson Parkway assumptions were included (such as a 2015 phased project and full build-out/ultimate project by 2035). The following table includes data taken from the System Level Study (Tables 3- 2 and 3-3) and indicated the forecasted conditions at that time. Quoting from the System Level Study:

“The Phased Project, planned to be opened by 2015, includes construction of Jefferson Parkway with at-grade signalized intersections at project termini (SH 128 and SH 93 north of 64th Avenue Parkway) and half interchanges leading to and from the north at SH 72 and Cimarron Parkway. An analysis was conducted to identify when these intersections and those adjacent to the proposed Jefferson Parkway would require significant improvement to the 2015 interim road network in order to function at a Level of Service D or better.

“Failure “choke points” will occur along the SH93 corridor regardless of whether or not the Jefferson Parkway is built. The SH 93 corridor is in need of improvements to handle the existing and the expected traffic. If the Parkway is built before other improvements are made in the corridor, choke points will occur sooner along the unimproved sections of SH 93 because the existence of the Jefferson Parkway will attract through trips off of local streets in the surrounding network. The analysis indicates that attracting through trips onto a road that is designed to accommodate the trips, the Parkway, will relieve congestion and improve safety on local adjacent streets.

“The LOS of an intersection ranges from A to F, characterizing the operational conditions of the traffic flow. Intersection LOS is based on vehicle seconds of delay. LOS A represents the best, free-flow conditions where vehicles experience delays of 10 seconds or less. LOS F indicates the worst-case “failing” scenario with high congestion, a complete breakdown of traffic flow and high vehicular delays exceeding 80 seconds for signalized intersections. For the purposes of this assessment, LOS F, representing the worst condition, was considered the point where traffic delays are unacceptable and significant improvements would be required.

“The assessment began with an analysis of the proposed 2015 Phased Project facility using 2015 land use assumptions. Some intersections would already operate at LOS F by 2015 with the opening of the Phased Project. A second analysis was conducted using the DRCOG 2035 land use assumptions with the 2015 Phased Project facility. Additional intersections dropped to LOS F with the 2035 land use, while some intersections that were “fixed” with improvements under the 2015 land use assumptions would fail again with the 2035 land use assumptions.”

Four intersections provided the basis for the Transportation Commission’s resolution items 2, bullet 2. Two of the intersections: SH 93/Washington and SH 72/86th were shown with failing LOS with the



implementation of the phased Jefferson Parkway project by 2015. Mitigation for 2015 sufficed and did not require additional fixes in 2035. Two of the intersections: SH 93/SH 72 and SH 72/64th Avenue were shown with failing LOS with implementation of the phased Jefferson Parkway project by 2015 and again (even with 2015 mitigation) in 2035 with the ultimate project. None of these intersections are located within the jurisdiction of the Jefferson Parkway Public Highway Authority. **Table 7** summarizes these findings.

Table 7. 2015 and 2035 System Level Needs and Mitigation Concepts

Intersection ¹	2015 No Build LOS	2015 Phased LOS	Improvement (to LOS D) for 2015 Phased	2035 LOS ⁴	Approximate Failure Year
SH 93 / Washington St.	C	E	EB left turn lane WB right turn lane	-	-
SH 93/SH 72 ²	E	F	NB/SB 2nd thru lanes	F	2032
SH 72 / 64 th Ave. ³	D	F	EB 2 nd left turn lane	F	2027
SH 72/86 th Ave.	E	F	NB/SB 2 nd thru lanes EB/WB/NB 2 nd left turn lanes	-	-
Source: 2009 <i>Jefferson Parkway System Level Study</i>					
¹ These intersections are outside of JPPHA jurisdiction					
² Additional improvements for 2035 – NB 2 nd left turn lane					
³ Additional improvements for 2035 – EB 3 rd left turn lane SB 2 nd right turn lane					
⁴ includes 2015 improvements					



Table 8 illustrates the current and 2040 build conditions for these locations.

Table 8. New 2015 and 2040 System Level Needs and Mitigation Concepts

Intersection ¹	2015 No-Build AM/PM	2040 No-Build AM/PM	2040 Build AM/PM	Mitigation	2040 Build AM/PM with Mitigation
SH 93 / Washington St.	E/F	F/F	F/F	NB/SB 2nd and 3rd Thru Lanes, SB 2nd Left Turn Lane, WB Separate Right Turn Lane	B/D
SH 93 / SH 72	C/E	F/F	F/F	NB/SB 2nd Thru and Left Turn Lanes, EB/WB 2nd Thru Lanes	C/D
SH 72 / 64th St.	B/C	D/F	D/F	EB 2nd Left Turn Lane	C/D
SH 72 / Indiana / 86th St.	D/C	F/F	E/F	NB/SB 2nd and 3rd Thru Lanes, NB 2nd Right Turn Lane, EB/WB 3rd Thru Lane, WB 2nd Left Turn Lane	C/D

¹These intersections are outside of JPPHA jurisdiction.



6.1 Existing Traffic (2015) and Operations

Figures 18 – 21 provide Existing Traffic (2015) intersection diagrams volumes and LOS: [AM(PM) Peak Hour and Turning Movements] and [AM/PM Peak Hour Signalized Intersection LOS] for the four subject intersections.

Figure 18. Existing Traffic and LOS (2015) for SH 93 and Washington

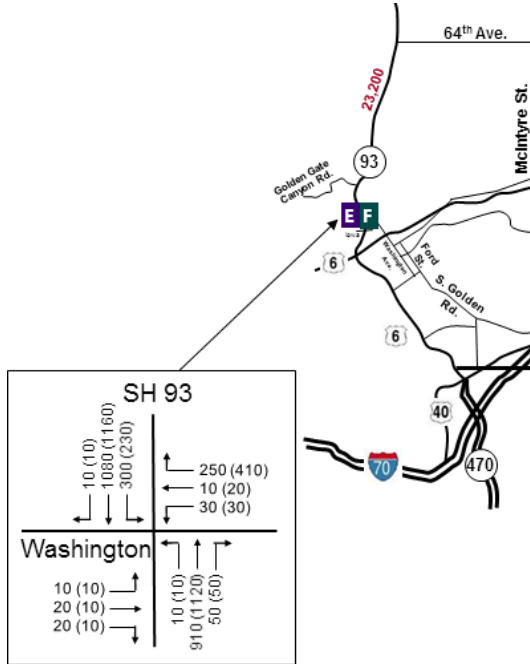


Figure 19. Existing Traffic and LOS (2015) for SH 93 and SH 72

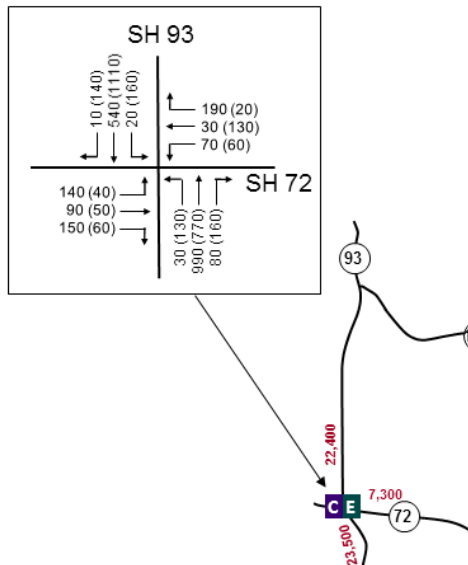


Figure 20. Existing Traffic and LOS (2015) for SH 72 and 64th Avenue

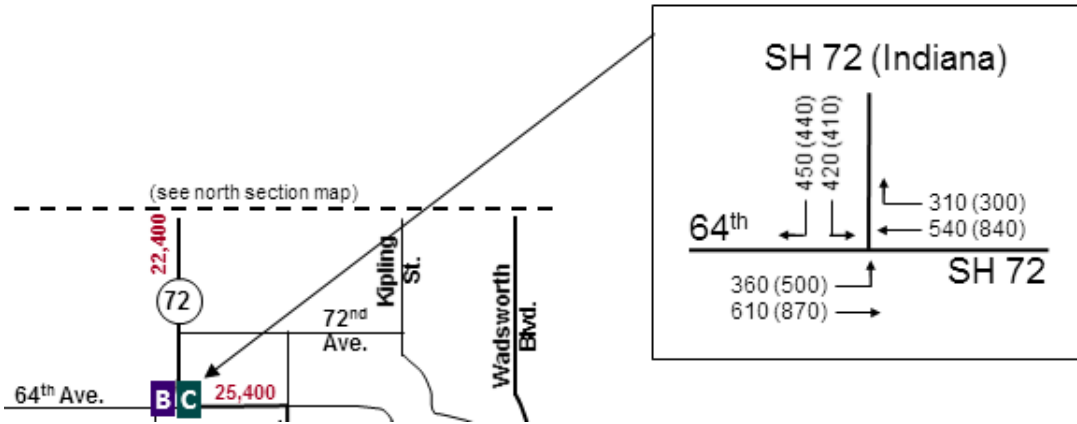
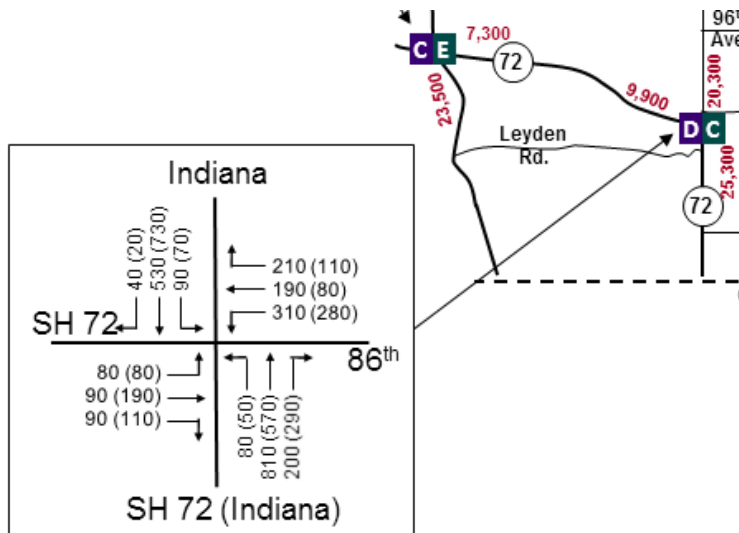


Figure 21. Existing Traffic and LOS (2015) for SH 72 and 86th



6.2 Future Conditions (2040) No Build Traffic and Operations

Figures 22-25 provide intersection diagrams volumes and LOS: [AM(PM) Peak Hour and Turning Movements] and [AM/PM Peak Hour Signalized Intersection LOS] for four subject intersections. All four of these intersections are expected to operate at LOS F by 2040 without the Jefferson Parkway project.

Figure 22. 2040 No Build and LOS for SH 93 and Washington

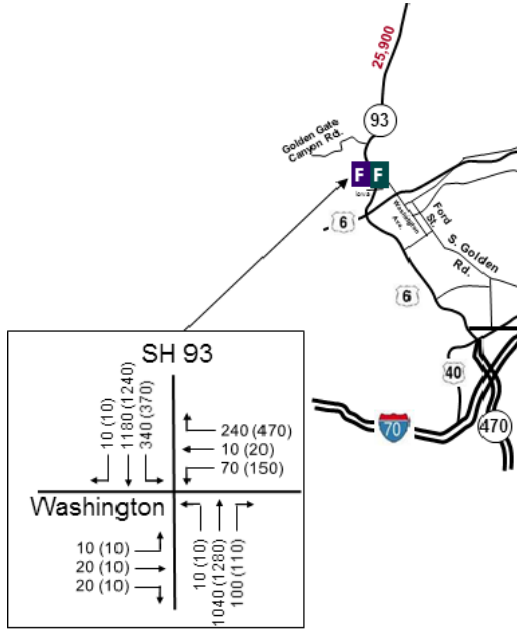


Figure 23. 2040 No Build and LOS for SH 93 and SH 72

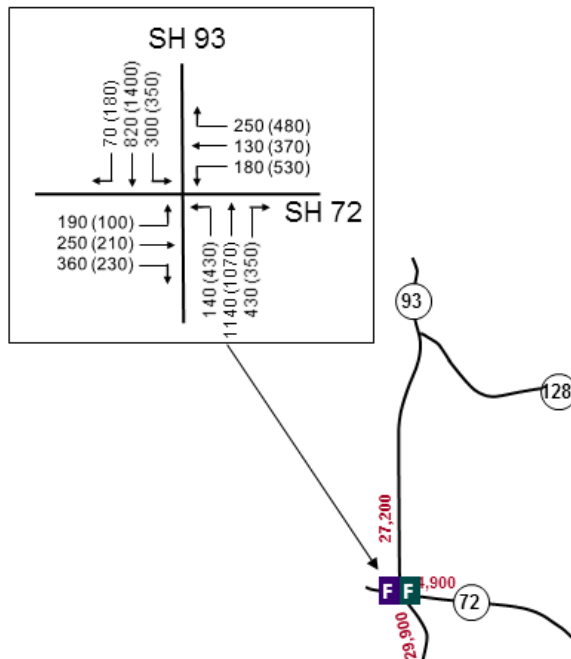




Figure 24. 2040 No Build and LOS for SH 72 and 64th

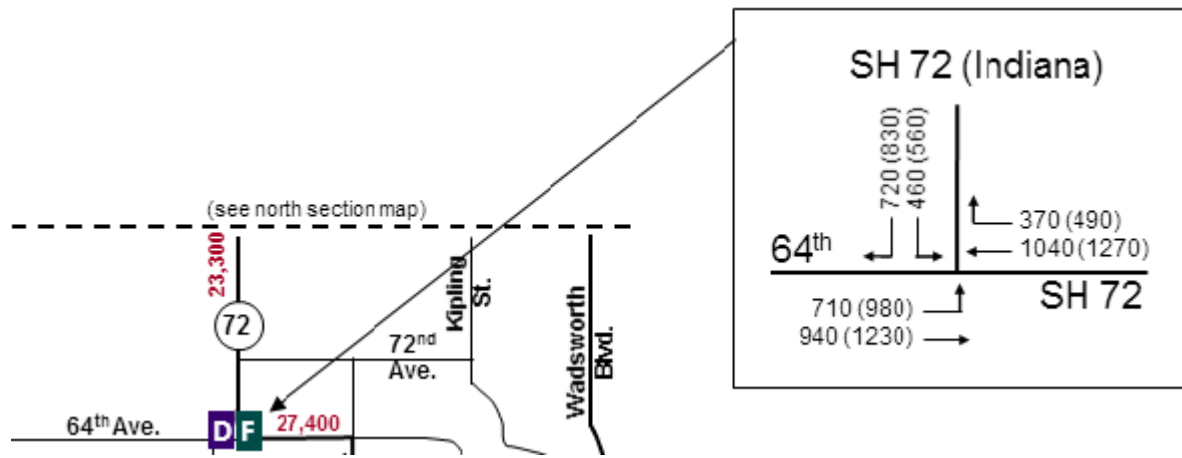
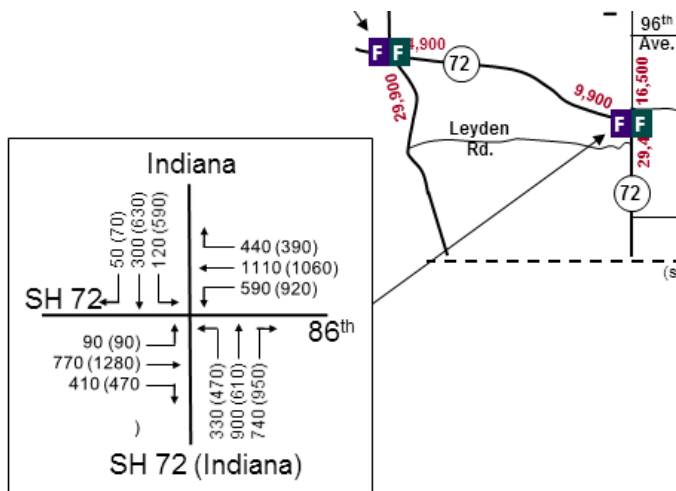


Figure 25. 2040 No Build and LOS for SH 72 and 86th





6.3 Future Conditions (2040) Build and Operations

Figures 26-29 provide intersection diagrams volumes and LOS: [AM(PM) Peak Hour and Turning Movements] and [AM/PM Peak Hour Signalized Intersection LOS]. Although the Jefferson Parkway 2040 traffic does not create the choke points/LOS failures for any of these intersections, the following recommendations are made to remedy the poor LOS. These solutions would not be within the jurisdiction of the JPPHA and would be at the discretion of others.

- **SH 93 and Washington St.:** NB/SB 2nd and 3rd thru Lanes, SB 2nd left turn lane, WB separate right turn lane.
- **SH 93 and SH 72:** NB/SB 2nd thru and left turn lanes, EB/WB 2nd thru lanes
- **SH 72 and 64th St.:** EB 2nd left turn lane
- **SH 72 and Indiana/86th St.:** NB/SB 2nd and 3rd thru lanes, SB 2nd left turn lane, WB separate right turn lane

Figure 26. 2040 Build and LOS for SH 93 and Washington

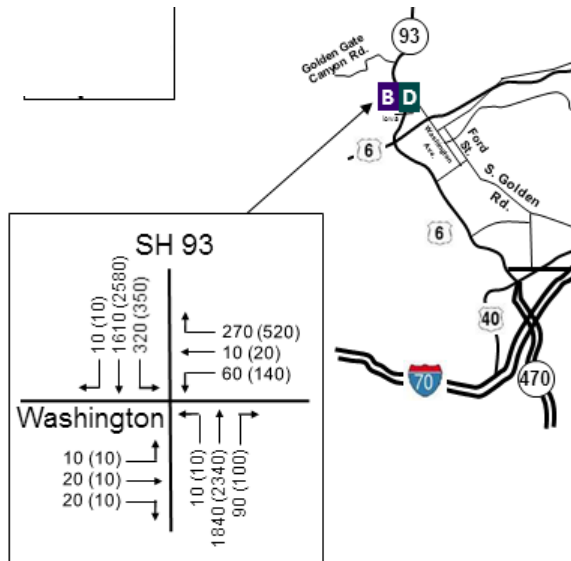


Figure 27. 2040 Build and LOS for SH 72 and SH 93

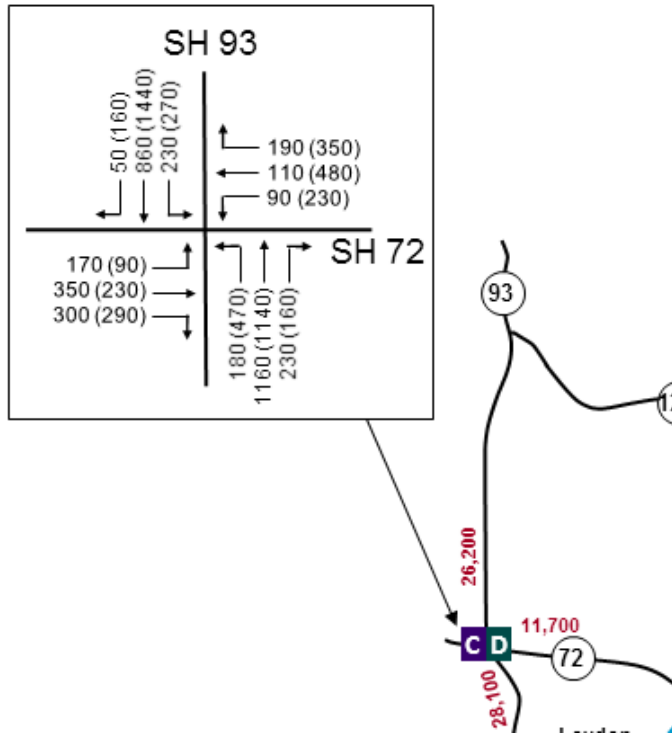


Figure 28. 2040 Build and LOS for SH 72 and 64th

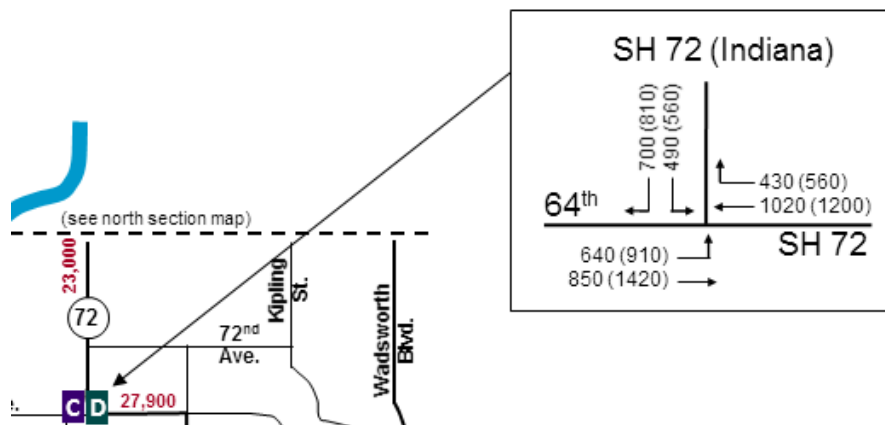
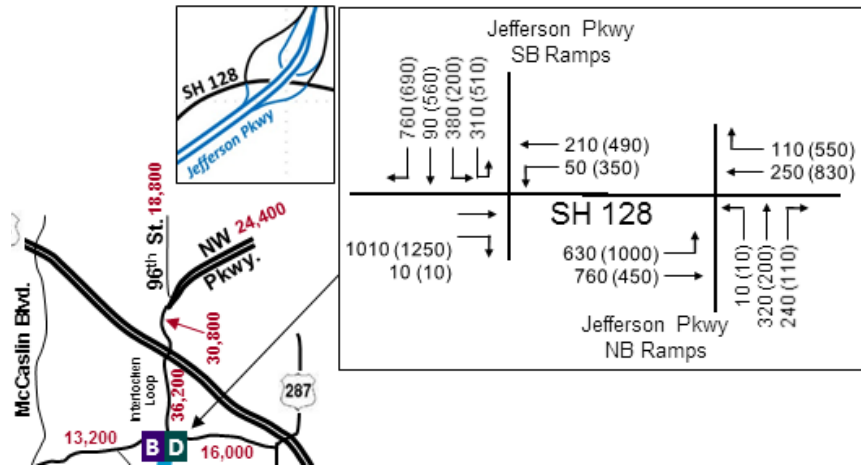




Figure 29. 2040 Build and LOS for SH 72 and 86th





7 SUMMARY AND CONCLUSIONS

The Traffic Modeling Study supports the need for the Jefferson Parkway project. It is recognized that the FOCUS model is a work in progress and that system-wide refinements will continue to occur. The analysis as presented informs future design choices for the Jefferson Parkway and local connections at each of the three State Highway Interchange areas (SH 128, SH72 and SH 93). The modeling challenges presented strengthen the importance of continued collaboration with local communities as well as county, regional and state government to identify needed network improvements. The Jefferson Parkway provides an important element to the local and regional transportation system connectivity and functionality between the Northwest Parkway in City and County of Broomfield and SH 93 in Jefferson County. In addition to the regional connectivity, the Parkway will provide important links for Interlocken and Candelas Urban Centers and other new developments as well as existing communities.

The modeling process is a useful planning tool and will continue to be further refined including tolling assumptions, land use revisions and the network connections at either end and along the Parkway. As regional traffic congestion grows, the WestConnect and local plans evolve, the community value of the Jefferson Parkway project can only increase. The Jefferson Parkway will provide reduced travel times and a safe reliable transportation option for the Denver metro region.



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APPENDICES (on CD)

A – Existing Conditions

A1 – All Traffic Data

A2– Blue Tooth Data

A3 – Land Use

A4 - 2015 FOCUS

A4 – 2015 SYNCHRO

B – Forecast Conditions 2040

B1 – Land Use Data

B2 – SYNCHRO

B3 – FOCUS

B4 – FAA Support Files