
INTERSTATE 540 IMPROVEMENT STUDY

WASHINGTON COUNTY

AND

BENTON COUNTY

APRIL, 2006



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AND
BENTON COUNTY**



April, 2006

**Prepared by
Parsons Transportation Group Inc.**

**Prepared for
Arkansas State Highway and Transportation Department
Planning and Research Division**

**In Cooperation with:
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EXECUTIVE SUMMARY

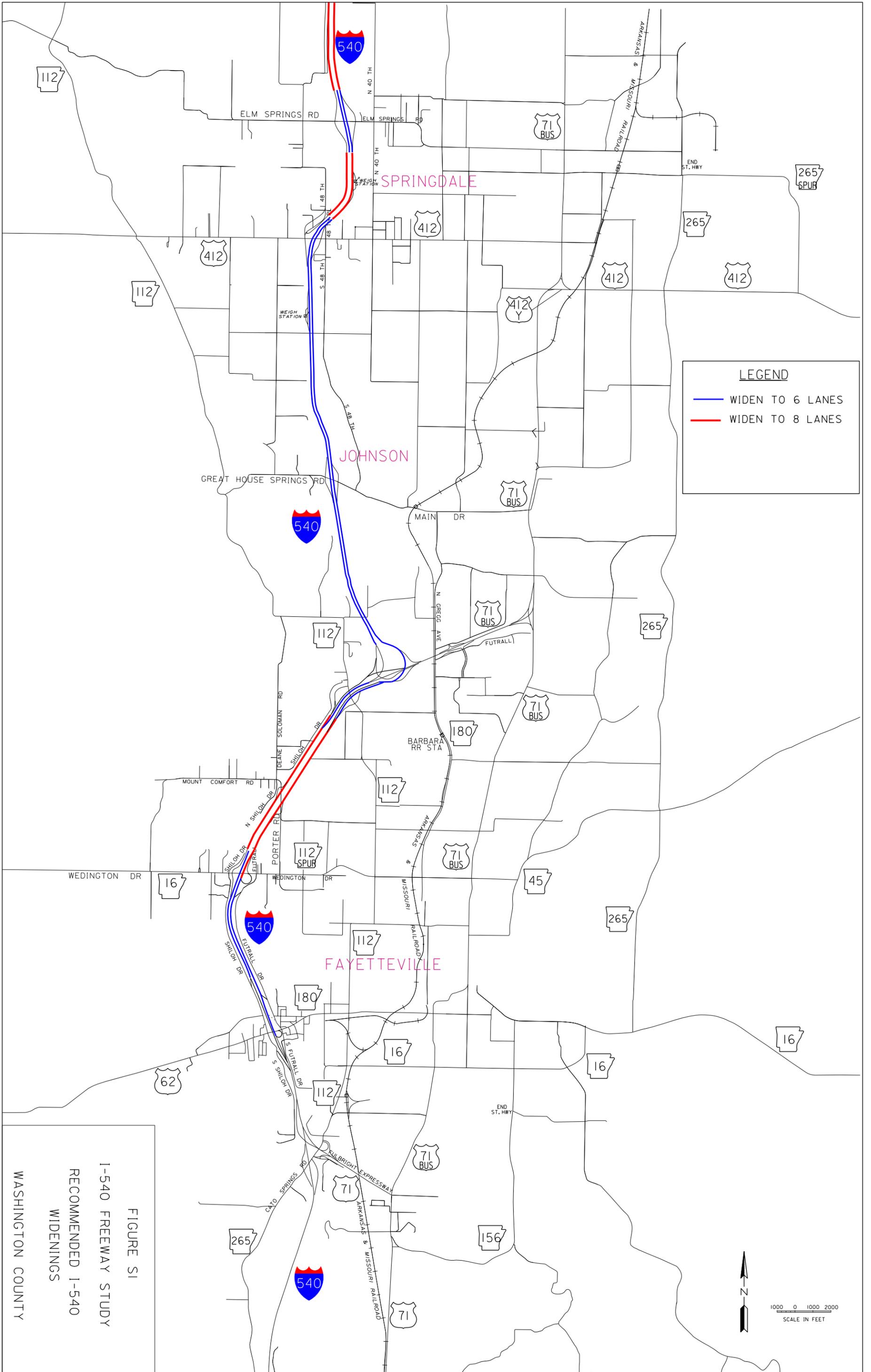
Interstate 540 (I-540) is the transportation spine of the Northwest Arkansas region. Due to the rapid growth that is occurring in the region, traffic volumes have grown to levels that are producing urban traffic congestion. The commercial growth of the region has gravitated to the interchanges on I-540, resulting in queues that back up on Interstate ramps to such an extent that they occasionally interfere with Interstate operations. The travel forecast indicates a need to widen I-540. This study considered the needed Interstate widening, and focused on a study of nineteen interchanges, to recommend short-term, interim and long-term improvements.

The study examined crash data and found some segments of the Interstate that exceed statewide average crash rates. The crash rates for the cross-roads that are state highways were also considered. Crash rates for these were uniformly very high, but this is seen as indicative of the urban congestion in the vicinity of the interchanges, which are not typical of the data used to develop the statewide crash rates for these facilities.

The study examined anticipated traffic flow conditions for the year 2024, and found that severe deficiencies can be expected. Freeway and ramp junction conditions were reviewed. Also, the cross-street at each of the 19 interchanges was examined for anticipated traffic flow conditions. Findings are described for each interchange.

FREEWAY RECOMMENDATIONS

I-540 is recommended to be widened to six lanes from the interchange with Highway 62/ Highway 180 to the interchange with Highway 16/ Highway 112 Spur in Fayetteville. From Highway 16 towards the north, I-540 is recommended to be widened to eight lanes through the interchange with Highway 71 Business in northern Fayetteville. From Fayetteville north to the Highway 412 interchange, I-540 is recommended to be widened to six lanes. I-540 is then recommended to be widened to eight lanes from the interchange with Highway 412 north to the interchange with Highway 102/ Highway 62 in Bentonville, which is the endpoint of I-540. Highway 71 is recommended to be widened to six lanes from I-540 to the interchange with Highway 72 in Bentonville. These recommended I-540 widenings are illustrated on Figures S1 and S2, respectively, for Washington and Benton Counties.



LEGEND

- WIDEN TO 6 LANES
- WIDEN TO 8 LANES

FIGURE S1
 I-540 FREEWAY STUDY
 RECOMMENDED I-540
 WIDENINGS
 WASHINGTON COUNTY

↑ N ↓
 1000 0 1000 2000
 SCALE IN FEET

INTERCHANGE RECOMMENDATIONS

Interchange improvements were considered at 19 interchanges, which includes one interchange on Highway 71 north of I-540. Improvements are recommended at 17 of these interchanges. The extent of the improvements varies greatly from interchange to interchange, and include short-term, interim and long-term improvements. In many cases, improvements are recommended to city streets as a way to relieve general traffic congestion in the vicinity of an interchange. In some cases, the interchange configuration is recommended to be changed by realigning ramps or streets.

Short-term improvements are relatively minor improvements that would help to relieve traffic congestion in the near term, such as installing a traffic signal or adding a short auxiliary lane at a ramp terminal. Long-term improvements are those improvements necessary to relieve existing traffic congestion and accommodate projected 2024 traffic forecasts. Interim improvements are less extensive improvements that would help to extend the service life of an interchange. In general, recommended interim interchange improvements could be constructed independent of Interstate widening and are compatible with the recommended long-term improvements.

Locations of recommended interchange improvements are shown on Figures S3 and S4, respectively, for Washington and Benton Counties.

Exit 45 I-540 at Highway 74

There are no recommended improvements at this interchange for either short-term or long-term conditions.

Exit 53 I-540 at Highway 170

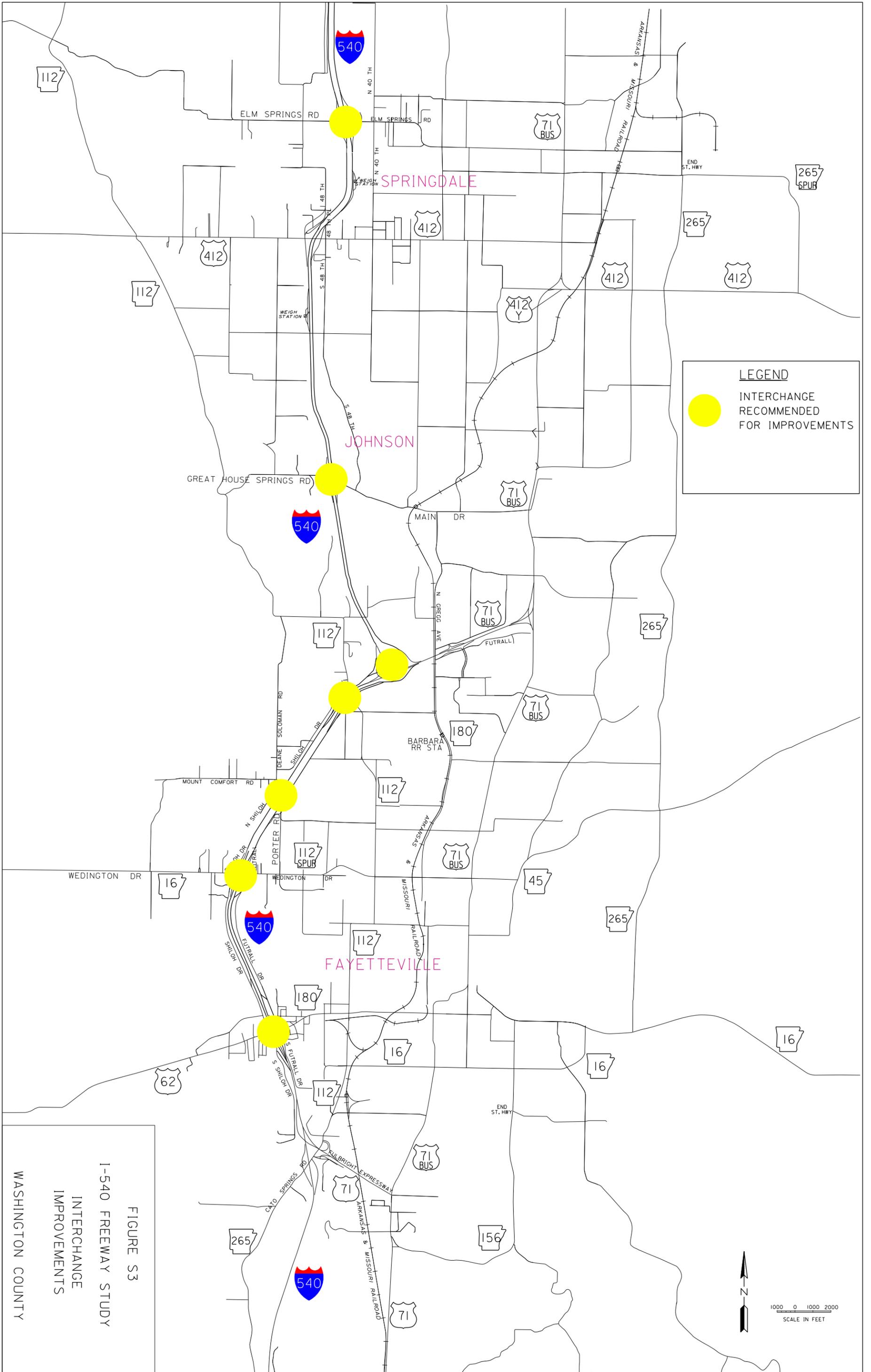
There are no recommended improvements at this interchange for either short-term or long-term conditions.

Exit 58 I-540 at West Wilson Street

There are no recommended short-term improvements at this location. For the long term, it is recommended that the exit ramps be monitored for traffic signal warrants.

Exit 61 I-540 at Highway 71 and Highway 265/ Highway 112

There are no recommended short-term improvements at this location. For the long term, it is recommended that two intersections be monitored for traffic signal warrants: the



LEGEND

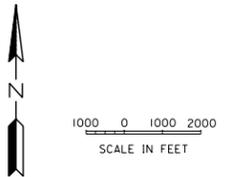
● INTERCHANGE RECOMMENDED FOR IMPROVEMENTS

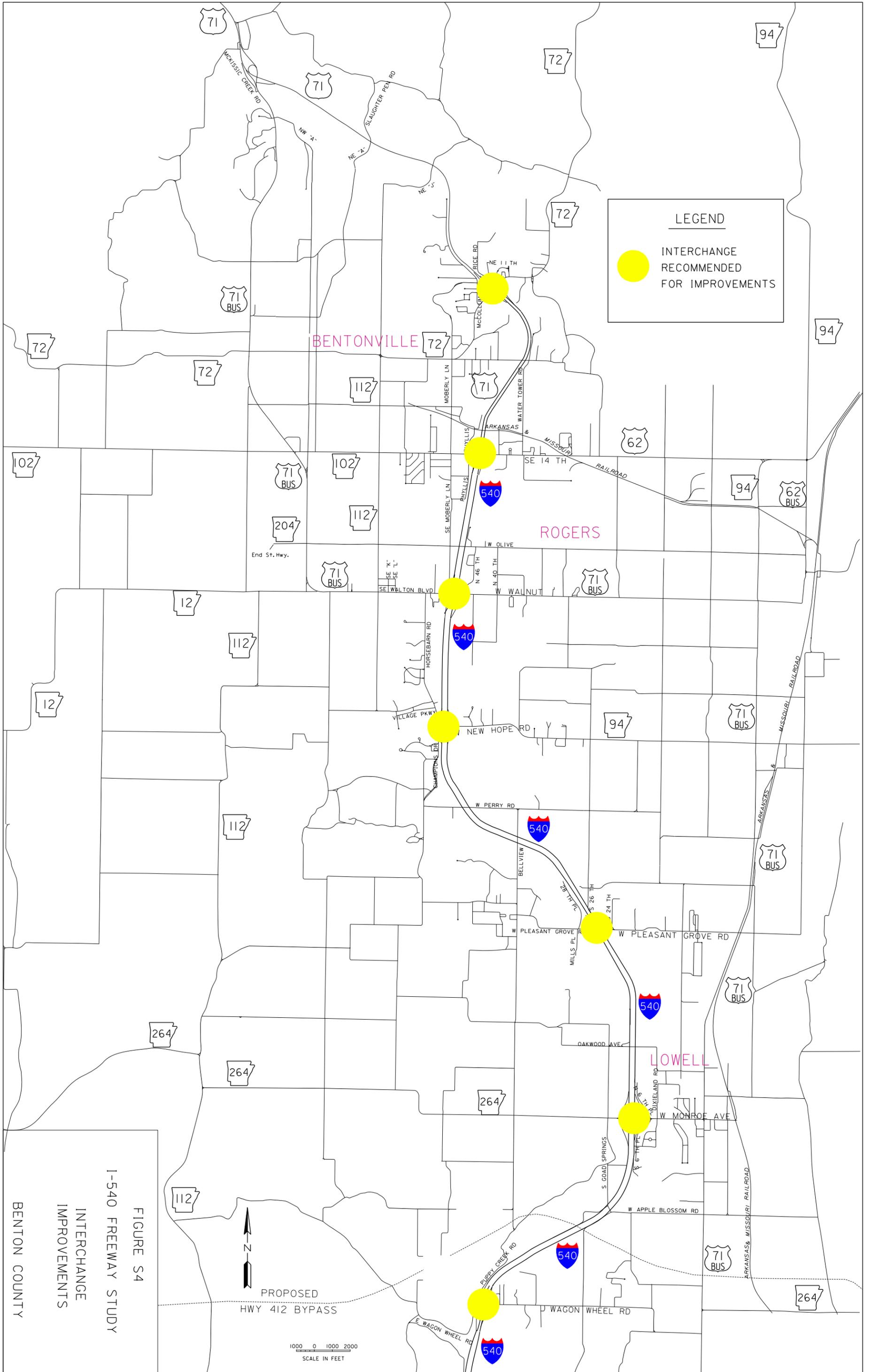
WASHINGTON COUNTY

I-540 FREEWAY STUDY

INTERCHANGE IMPROVEMENTS

FIGURE S3





intersection of Highway 265 with the I-540 southbound ramps, and the intersection of Highway 112 with the Highway 71 northbound ramps.

Exit 62 I-540 at Highway 62/ Highway 180

This interchange already experiences congestion. Extreme traffic congestion is anticipated unless major improvements are made at this location. The short-term recommendations are to add an auxiliary right-turn lane on westbound Highway 180 at Futrall Drive, and to add an auxiliary right-turn lane on eastbound Highway 62 at Shiloh Drive. An interim improvement is recommended, which calls for adding a lane under the existing bridges to provide additional storage for the eastbound left turns at the intersection with Futrall Drive. Also, a through lane should be added for westbound traffic on Highway 62 at the intersection with Shiloh Drive. This lane would need to be extended for a distance of at least 1,200 feet to the west of this intersection.

For the long term, it is recommended that Highway 62/ Highway 180 be widened through the interchange area. In addition to the widening of the cross-street, a reconfiguration of the interchange is proposed, that would feature a two-lane loop ramp in the southeast quadrant, which would require realignment of both I-540 and Futrall Drive. Several auxiliary lanes are recommended on Highway 62/ Highway 180, Shiloh Drive, and Futrall Drive. It is proposed to relocate the southbound entrance ramp and the northbound exit ramp to the south, and to relocate the northbound entrance ramp farther north. The acquisition of substantial right-of-way will be needed at this interchange.

Exit 64 I-540 at Highway 16/ Highway 112 Spur

Several auxiliary lanes are recommended as short-term improvements at this interchange, including added lanes to create southbound dual right turn lanes on the southbound exit ramp and dual northbound left turn lanes on Futrall Drive. Severe traffic congestion is anticipated at this location unless major improvements are made. An interim recommendation is to construct certain features of the long-term recommended improvements.

The long-term recommendation is to reconfigure the interchange to add a two-lane loop ramp in the southeast quadrant, which would require a realignment of Futrall Drive. It is recommended to relocate the northbound exit ramp and make it a slip-ramp onto Futrall Drive, which would create space for the proposed loop ramp and eliminate one traffic signal at Highway 112 Spur. It is recommended to relocate the southbound ramps slightly to the east in order to increase the space between that intersection and the

Highway 16 intersection with Shiloh Drive. It is anticipated that Highway 16 will be widened to the west of the interchange for some distance.

Exit 65 I-540 at Porter Road

The short-term recommendation is to signalize both of the ramp terminal intersections. An interim recommendation is to widen Porter Road through the interchange area and construct auxiliary turn lanes. For the long term, realignment of Shiloh Drive is proposed which would eliminate both of the existing Porter Road intersections with Shiloh Drive and relocate all of that turning traffic to the intersection of Mount Comfort Road/ Porter Road with Deane Solomon Road/ Relocated Shiloh Drive. This intersection should be signalized.

Exit 66 Interstate 540 at Highway 112

This interchange is located very close to the Highway 71B interchange to the north. I-540 curves to the east at Highway 112 and curves north again at Highway 71B. Collector-distributor roads (C-D roads) are proposed to parallel I-540 through this area, which would tie the two interchanges together as a system and eliminate weaving from the I-540 mainline lanes. See the description of Exit 67 for a description of the C-D roads. The short-term recommendation for the Highway 112 interchange is to construct auxiliary right-turn lanes on both of the exit ramps.

The recommendation for the interim before I-540 widening is to construct the proposed southbound C-D road and to add lanes to Highway 112 by restriping the existing bridge. The long-term recommendation is to construct the C-D roads, which will require the replacement of the Highway 112 bridge. This bridge should be constructed for four lanes on Highway 112. Auxiliary lanes are proposed on Highway 112 for right-turn lanes onto both of the entrance ramps. The southbound C-D road should feature a dual-left turn onto Highway 112.

Exit 67 I-540 at Highway 71 Business

This interchange is located very close to the Highway 112 interchange to the south. There are no short-term recommendations for this interchange. The long-term recommendation is to construct C-D roads through the two interchanges, forming a system. The proposed northbound C-D road would begin south of Highway 112. The northbound exit ramp for Highway 112 would diverge from the northbound C-D road, retaining the current configuration of the northbound connection to Highway 112. The proposed northbound C-D road is proposed to pass underneath Highway 112, separated from the northbound lanes of I-540 by a median barrier. The northbound entrance ramp from Highway 112

would merge onto the northbound C-D road, so that motorists wanting to go north on I-540 from Highway 112 would have to weave across traffic on the northbound C-D road. The northbound C-D road would end at a point that would diverge into a northbound entrance ramp to I-540 and a northbound entrance ramp onto Highway 71 Business.

In the southbound direction, new southbound exit ramps would be created from both I-540 and Highway 71 Business, which would be merged into a new southbound C-D road. Two new ramp bridges would be required to carry the proposed ramp from southbound Highway 71 Business to the proposed southbound C-D road. The proposed southbound C-D road would end at Highway 112, replacing the existing southbound exit ramp. In order to construct the proposed northbound C-D road, the Highway 112 bridge over I-540 would have to be replaced and the northbound I-540 bridge over Highway 71 Business would have to be widened. Both of these improvements would be needed for the I-540 widening.

Exit 69 I-540 at Great House Springs Road/ Main Drive

The short-term recommendation at this location is to monitor both ramp terminal intersections for traffic signal warrants. The long-term recommendation is to widen Great House Springs Road/ Main Drive through the interchange area to create an additional eastbound lane and to add auxiliary turn lanes on both exit ramps and both entrance ramps. There is a proposal under consideration by the City of Springdale to extend Johnson Road to intersect Great House Springs Road/ Main Drive a short distance east of the I-540 interchange. The extension of Johnson Road would increase traffic at the interchange but is not included in this study.

Exit 72 I-540 at Highway 412

The short-term recommendation is for improved traffic signal timings and for an investigation of potential improvements to intersections on Highway 412 east of the interchange. There is a proposal under development to construct a bypass of Highway 412 north of Springdale. The travel volumes on Highway 412 are expected to grow until the time that the bypass is completed, after which time travel volumes on the existing Highway 412 are expected to decrease, and then resume an upward trend. Because of the pending bypass construction, there are no recommendations for long-term improvements to this interchange. However, there are interim improvements that could improve traffic flow until the time of the opening of the proposed Highway 412 Bypass. Auxiliary lanes for right turns could be constructed on three approaches to the intersection of Highway 412 with South 48th Street/ 48th Place. The northbound exit ramp could be widened to create a dual-right turn and the ramp terminal intersection could be signalized.

Highway 412 could be widened through the interchange area to create an auxiliary lane so that there could be dual-left turns onto both of the entrance ramps. However, dual turn lanes onto entrance ramps would require widening and extending the entrance ramps. Since both of the existing entrance ramps end near weigh stations, widening and extending them would require relocating both of the weigh stations. There are no current plans to relocate the weigh stations. Also, funding these interim improvements would be difficult considering the on-going efforts to fund the Highway 412 Bypass.

Exit 73 I-540 at Elm Springs Road

There are no short-term improvements recommended for this interchange. In the long term, Elm Springs Road will need to be widened and auxiliary lanes should be constructed on the exit ramps, including the development of a dual-left-turn on the southbound exit ramp. The intersection of Elm Springs Road with the northbound ramps should be monitored for traffic signal warrants.

Exit 76 I-540 at Wagon Wheel Road

No short-term improvements are recommended at this interchange. The long-term recommendations feature an auxiliary lane for right turns from westbound Wagon Wheel Road onto Puppy Creek Road, which would require widening the Wagon Wheel Road overpass over I-540. This intersection should be monitored for traffic signal warrants. Also, a right-turn lane should be constructed on the northbound exit ramp.

Interchange with Proposed Highway 412 Bypass

The proposed Highway 412 Bypass is to have a new interchange with I-540. At this stage of the planning for that project, it appears that the most likely location for the proposed intersection is near milepost 77. The proposed interchange was not included in this study. The travel forecasts used for this study were adjusted to account for the anticipated presence of the interchange proposed for the Highway 412 Bypass.

Exit 78 I-540 at Highway 264

The short-term recommendation is to add a right-turn lane to eastbound Highway 264 at the southbound entrance ramp. The long-term recommendation is to widen Highway 264 through the interchange area and to add auxiliary lanes for turns in several places. A dual-left turn should be provided on the southbound exit ramp. Dual-left and dual-right turn lanes should be provided on the northbound exit ramp. All left turns should be prohibited at the intersection of Highway 264 with Sixth Place. A city street connector road should be developed between North Sixth Place and

North Dixieland Street. Auxiliary lanes should be constructed at the intersection of Highway 264 with Dixieland Street in order to provide dual-left turns for both the eastbound and northbound approaches, and right-turn lanes should be provided for the northbound and southbound approaches.

Exit 81 I-540 at Pleasant Grove Road

The only short-term recommendation at this interchange is to monitor both ramp terminal intersections for traffic signal warrants. An interim recommendation is to add auxiliary lanes on both exit ramps, and for both right-turn and left-turn lanes onto both entrance ramps. The long-term recommendation includes two alternatives that depend upon the availability of right-of-way. The diamond configuration may be retained if Pleasant Grove Road is widened to six through lanes through the interchange area with dual-left turns and dual-right turns from both exit ramps. Also recommended are dual-left turns onto both entrance ramps, which would require widening and extension of both of the entrance ramps. An alternative that would require additional right-of-way in the northeast and southwest quadrants would be to construct loop ramps to serve as exit ramps in both directions from I-540.

Interchange with Proposed Realigned Perry Road

Existing Perry Road in Rogers is proposed to be realigned with a new interchange proposed to connect Perry Road with I-540. This proposal is associated with property development plans in this area. This proposed interchange was not included in this study. The travel forecasts used for this study were adjusted to account for the anticipated presence of this proposed interchange.

Exit 83 I-540 at Highway 94

This interchange is proposed to be improved with a widening of Highway 94 to be accomplished as part of development plans in this area. The proposed improvements were evaluated and generally found to be satisfactory. The long-term recommendation is to implement the project that is currently in development, which includes widening Horsebarn Road / Champions Drive through the interchange area. Also, improvements to the southbound entrance ramp should be provided. These include widening and lengthening the ramp to allow for merging without the development of queues that could extend back onto Highway 94 and Horsebarn Road / Champions Drive.

Exit 85 I-540 at Highway 71 Business

Highway 71 Business is currently under construction for widening from the interchange to the west. This project includes auxiliary lanes for both exit ramps. No further

improvements appear to be needed in the short term. An interim recommendation is to improve the nearby city street intersections on Highway 71 Business. Auxiliary lanes are recommended on both Moberly Lane in Bentonville and North 46th Street in Rogers. Auxiliary lanes are also recommended on Highway 71 Business at these two intersections. An auxiliary lane is also recommended to create a dual-left turn on westbound Highway 71 Business onto the southbound entrance ramp. Implementation of that dual-turn would require widening and extending the ramp. Severe congestion can be expected by the year 2024. The long-term recommendation is for widening Highway 71 Business through the interchange area and a reconfiguration of the interchange as a “single-point urban interchange” (SPUI). A SPUI configuration would realign all four of the diamond ramps to bring them into a single intersection that would be located underneath the I-540 bridge over Highway 71 Business. SPUI interchanges have gained a great deal of popularity in the transportation field in recent years because they provide an efficiency of traffic signal operations that generally increases capacity over a traditional diamond interchange, but they require less right-of-way. It is recommended that the single-point intersection have dual-left turns in three directions. The fourth left turn at that intersection would be the northbound exit ramp, which should be widened to provide a triple-left turn. East of the interchange, improvements are proposed at the intersection of Highway 71 Business with North 46th Street, which would create both a dual-left turn and a dual-right turn onto Highway 71 Business.

Exit 86 I-540 at Highway 102/ Highway 62

This interchange already experiences significant traffic congestion. Recommended short-term improvements consist of adding auxiliary turn lanes at the ramp terminals. An interim improvement is recommended to address congested conditions as soon as possible. The interim improvement includes adding a lane under the existing bridges to provide a dual-left turn lane for the westbound-to-southbound movement at the southbound terminal. This would also require widening and extending the southbound entrance ramp along southbound I-540. These interim improvements would help to alleviate the long westbound queue along Highway 102 / Highway 62 that has become common at this interchange. The long-term recommendation is for widening Highway 102/ Highway 62 through the interchange area and beyond, and for reconfiguration of the interchange as a SPUI. At the single-point intersection, it is recommended that dual-left turns be developed in three approaches. The fourth left turn at that intersection would be at the northbound exit ramp which should be widened to provide a triple-left turn.

Exit 88 Highway 71 at Highway 72

This interchange is not on I-540 but was included in this study. The short-term recommendation is to add auxiliary lanes for right-turns on both exit ramps and on eastbound Highway 72 at the southbound entrance ramp. An interim improvement is recommended, which would require the widening of the existing bridge. The recommendation for the long-term is to widen Highway 72 and to reconfigure the interchange as a half-clover. Loop ramps would be constructed in both the northwest and northeast quadrants of the interchange. The loop ramps would be configured to use one lane of the widened bridge as a weaving lane on westbound Highway 72.

Estimates of Cost

Preliminary planning-level cost estimates were developed for the improvements recommended by this study. These estimates include construction costs, a 15 percent allowance for engineering and other costs, and an allowance for utility relocations and right-of-way costs. These costs are estimated in current dollars with no allowance for inflation. Summary tables of the cost estimates appear in Tables S1 through S4.

Priorities

The study includes many recommendations for the I-540 mainline, the interchange ramps, and the crossroads in the interchange vicinities. The needs and the recommendations were considered from the viewpoints of these parameters:

- freeway volume
- freeway safety
- interchange capacity and delay
- intersection queues
- sequencing issues.

The recommendations were divided into a list of projects, and were recommended as very high-, high-, medium-, and low-priority for implementation. The results appear in Table S5.

Table S1 Cost Summary for Widening Interstate 540

FROM	TO	ESTIMATED COST CONSTRUCT TWO LANES INSIDE	ESTIMATED COST CONSTRUCT TWO LANES OUTSIDE
Exit 62 (Highway 62 / Highway 180)	Exit 66 (Highway 112)	\$13,700,000	\$11,000,000
North of Exit 67 (Highway 71B)	Exit 72 (Highway 412)	\$24,700,000	N/A
Exit 72 (Highway 412)	Proposed 412 Bypass	\$25,200,000	\$21,400,000
Proposed 412 Bypass	Exit 85 (Highway 71B)	\$40,400,000	\$45,800,000
Exit 85 (Highway 71B)	Exit 88 (Highway 71 / Highway 72)	\$19,100,000	\$7,500,000 (1)
	Total Estimated Cost	\$123,100,000	\$85,700,000

(1) For This Segment the Only Outside Lanes Are Auxillary Lanes From Exit 85 To Exit 86.

Table S2 Cost Summary of Short-Term Improvements at I-540 Interchanges

EXIT NO.	LOCATION	ESTIMATED COST
62	I-540 At Highway 62 / Highway 180 (West Sixth Street)	\$220,000
64	I-540 At Highway 16 / Highway 112 Spur (Wedington Drive)	\$710,000
65	I-540 At Porter Road	\$250,000
66 & 67	I-540 At Highway 112 and At Highway 71B (Fulbright Expressway)	\$310,000
78	I-540 At Highway 264 (West Monroe Avenue)	\$130,000
81	I-540 At Pleasant Grove Road	\$120,000
86	I-540 At Highway 62 / Highway 102	\$350,000
88	Highway 71 At Highway 72	\$600,000
	Total Estimated Cost for Short-Term Improvements at Interchanges:	\$2,690,000

Table S3 Cost Summary of Interim Improvements at I-540 Interchanges

EXIT NO.	LOCATION	ESTIMATED COST
62	I-540 At Highway 62 / Highway 180 (West Sixth Street)	\$3,000,000
64	I-540 At Highway 16 / Highway 112 Spur (Wedington Drive)	\$2,400,000
65	I-540 At Porter Road	\$1,700,000
66 & 67	I-540 At Highway 112 and At Highway 71B (Fulbright Expressway)	\$6,100,000
69	I-540 At Great House Springs Road	\$1,000,000
81	I-540 At Pleasant Grove Road	\$2,300,000
85	I-540 At Highway 71 Business	\$4,300,000
86	I-540 At Highway 62 / Highway 102	\$4,200,000
88	Highway 71 At Highway 72	\$3,500,000
Total Estimated Cost for Interim Improvements at Interchanges:		\$28,500,000

Table S4 Cost Summary of Long Term Improvements at I-540 Interchanges

EXIT NO.	LOCATION	ESTIMATED COST
62	I-540 At Highway 62 / Highway 180 (West Sixth Street)	\$22,800,000
64	I-540 At Highway 16 / Highway 112 Spur (Wedington Drive)	\$16,400,000
65	I-540 At Porter Road	\$13,400,000
66 & 67	I-540 At Highway 112 and At Highway 71B (Fulbright Expressway)	\$30,800,000
69	I-540 At Great House Springs Road	\$1,700,000
72	I-540 At Highway 412	\$0
73	I-540 At Elm Springs Road	\$1,100,000
76	I-540 At Wagon Wheel Road	\$300,000
78	I-540 At Highway 264	\$12,600,000
81	I-540 At Pleasant Grove Road	\$17,400,000
83	I-540 At Highway 94	\$6,400,000
85	I-540 At Highway 71 Business	\$15,700,000
86	I-540 At Highway 62 / Highway 102	\$15,200,000
88	Highway 71 At Highway 72	\$6,200,000
Total Estimated Cost for Long-Term Improvements at Interchanges:		\$160,000,000

Table S5 Priorities of Recommended Improvements to I-540 and its Interchanges

Very High Priority	High Priority	Medium Priority	Low Priority
<p>Exit 62 Highway 62 / Highway 180 (Interim improvements)</p> <p>Exit 66 Highway 112 Exit 67 Highway 71 B (Interim improvements)</p> <p>I-540 widen to six lanes from Exit 85 to Exit 86</p> <p>Exit 86 Highway 102 / Highway 62 (Long-term improvements)</p>	<p>All Short-term improvements recommended for all interchanges</p> <p>Exit 62 Highway 62 / Highway 180 (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 62 to Exit 64</p> <p>Exit 64 Highway 16 / Highway 112 Spur (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 64 to Exit 67</p> <p>Exit 65 N. Porter Rd. (Interim improvements)</p> <p>Exit 66 Highway 112 Exit 67 Highway 71 B (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 76 to Exit 78</p> <p>Exit 81 Pleasant Grove Rd. (Interim improvements)</p> <p>Exit 85 Highway 71B (Interim improvements)</p>	<p>Exit 69 Great House Springs Rd. (Interim improvements)</p> <p>I-540 widen to six lanes from Exit 72 to Exit 73</p> <p>Exit 73 Elm Springs Rd. (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 73 to Exit 76</p> <p>Exit 81 Pleasant Grove Rd. (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 78 to Exit 82 (Perry Rd.)</p> <p>I-540 widen to six lanes from Exit 82 to Exit 85</p> <p>Exit 88 Highway 71 / Highway 72 (Interim improvements)</p>	<p>Exit 65 N. Porter Rd. (Long-term improvements)</p> <p>Exit 69 Great House Springs Rd. (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 67 to Exit 72</p> <p>Exit 76 Wagon Wheel Road (Long-term improvements)</p> <p>Exit 78 Highway 264 (Long-term improvements)</p> <p>Exit 83 Highway 94 (Long-term improvements)</p> <p>Exit 85 Highway 71B (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 86 to Exit 88</p> <p>Exit 88 Highway 71 / Highway 72 (Long-term improvements)</p> <p>All recommended widening of I-540 to eight lanes</p>

INTRODUCTION

At the request of the Northwest Arkansas Regional Transportation Study (NARTS) Policy Committee, the Arkansas Highway Commission passed Minute Order 2002-220, authorizing a study to determine the need for and feasibility of improvements to Interstate 540 (I-540) and its interchanges within the NARTS area. This study analyzed areas of traffic congestion along I-540 and its interchanges in Washington and Benton Counties and identified, developed, and analyzed short-term, interim and long-term improvements that will relieve existing congestion and accommodate future traffic forecasts. The study area vicinity is shown in Figure 1.

I-540 serves as the transportation spine of the Northwest Arkansas region. The Northwest Arkansas region has experienced a rapid rate of population increase and property development over the past twenty-five years. The population of the Fayetteville-Springdale-Rogers Metropolitan Statistical Area (MSA) grew 47.5 percent through the 1990s, making it the sixth fastest growing MSA in the United States for the decade (growth of over 100,000 population). The regional economy is strong, and continued growth is expected for the future. Travel volumes grow along with the increases in population and activity. The increased travel has already resulted in traffic congestion in the I-540 corridor. Rapidly growing traffic congestion indicates that the I-540 corridor will need improvements in order to accommodate continued regional growth and development.

I-540 is on the National Highway System (NHS). I-540 ends at the interchange with Highway 102/ Highway 62 in Bentonville. The freeway continues northward from that point on Highway 71, which is also on the NHS. Other routes on the NHS in the study corridor are:

- Highway 112 east of the interchange with I-540 and Highway 71 at Exit 61,
- Highway 412, both to the east and the west, at Exit 72, and
- Highway 62 to the east, at Exit 86.

The study corridor includes all eighteen interchanges on I-540 in Washington and Benton Counties. In addition, north of I-540, the study corridor includes the Highway 71 / Highway 72 interchange.

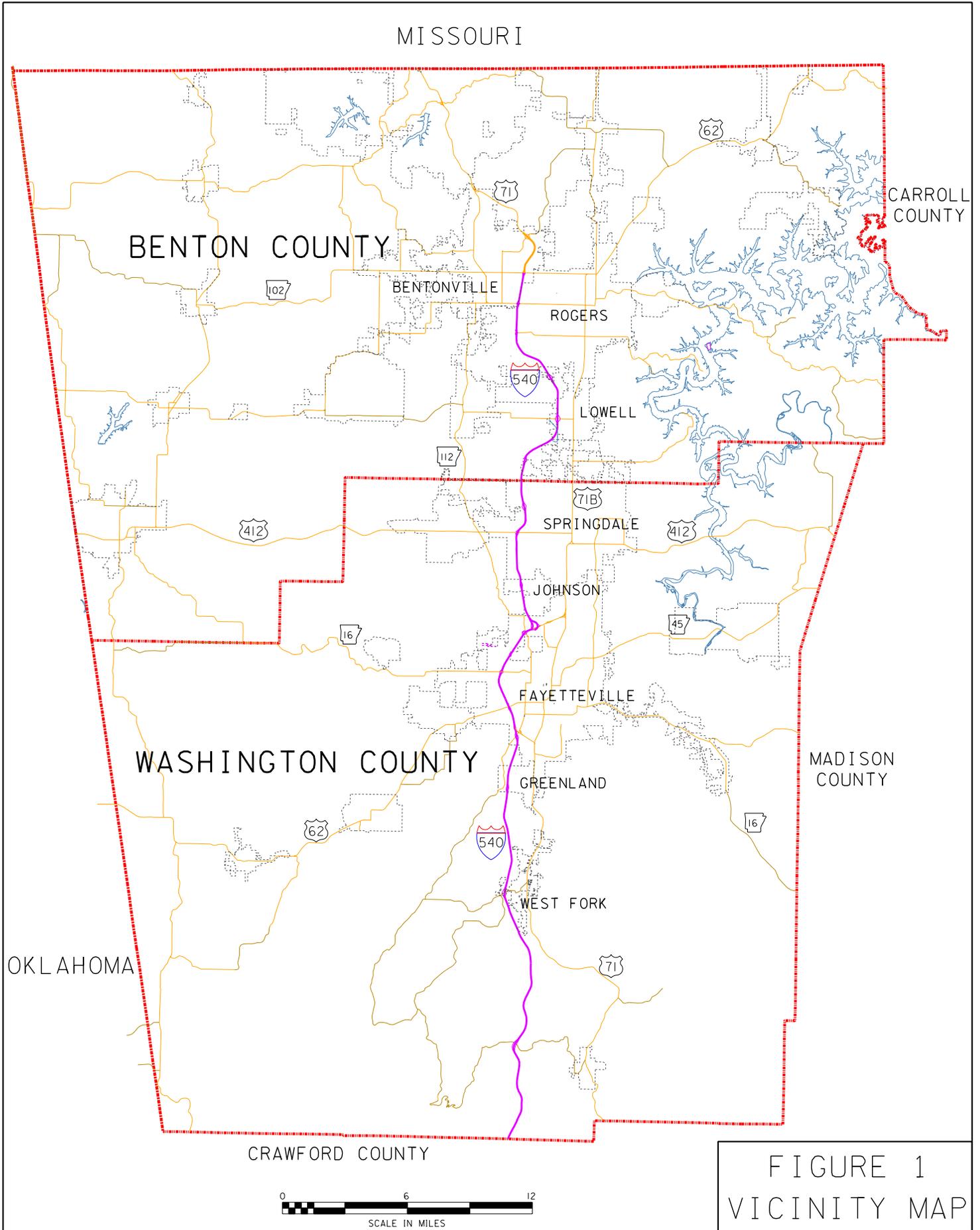


FIGURE 1
VICINITY MAP

PURPOSE AND NEED

The purpose of improvements proposed for I-540 and its interchanges is to relieve existing traffic congestion, to provide increased capacity to accommodate future traffic growth, and to enhance motorist safety.

I-540 has become an important facility in the region, and a vital link for regional growth. The interchanges along I-540 have all become attractive locations for commercial development, which results in traffic congestion on I-540 and all of the crossroads that have interchanges with I-540.

The Northwest Arkansas region is the fastest-growing region in the State, both in terms of population and traffic volumes. Benton County was the fastest-growing Arkansas county through the 1990s (57.3%), and Washington County was the third-fastest growing (39.1%). This compares to a statewide growth rate of 13.7% for Arkansas.

As the regional population continues to grow, the travel demand volumes are expected to create significant traffic congestion on I-540. If current trends continue, I-540 will require widening in order to accommodate the demand without substantial delays. Interstate improvements are needed soon in order to avoid significant traffic congestion that could limit regional growth and lead to safety problems. Also, improvements to ramps and ramp terminal intersections are likely to be needed in order to keep surface street traffic from interfering with Interstate traffic. Interstate planning should accommodate the needs of the interchanges when widening is designed.

LAND USE AND TRAFFIC CONGESTION

For the past twenty years, a relatively high growth rate of three or more percent per year is revealed in traffic volume data maintained by the Arkansas State Highway and Transportation Department (AHTD). Traffic count stations on both I-540 and Highway 71 exhibit similar levels of traffic growth. This history of growth was used to extrapolate forecasts of travel demand on I-540 into the future. This process of extrapolation is explained in Appendix A.

In the Northwest Arkansas region, land development has historically kept to a pattern of radial growth from a series of nodes, with the nodes being the city centers of the various cities and towns and crossroads communities within the region. In addition to this pattern,

sporadic development would spring up in rural areas, and commercial development would occur along major highways. Since the completion of I-540, there has been a shift in the predominant pattern of regional growth. I-540 itself has become the spine of the region, especially for commercial development.

In recent years, a large proportion of the new commercial development in the region has occurred within a mile of an interchange on I-540. This pattern of development has led to the urbanization of the area around many of the interchanges and concentrated traffic flow in the areas of the interchanges. This pattern of development is anticipated to continue for several years. This will result in interchanges that now are in rural settings becoming urbanized, and those interchanges that are already urban in character will experience traffic congestion. Interchanges that already experience traffic congestion include:

- Exit 62 Highway 62/ Highway 180 (Sixth Street), Fayetteville
- Exit 64 Highway 16/ Highway 112 Spur (Wedington Drive), Fayetteville
- Exit 72 Highway 412 (W. Sunset Avenue), Springdale
- Exit 85 Highway 71B (Southeast Walton Blvd./ W. Walnut St.), Bentonville/Rogers
- Exit 86 Highway 102/ Highway 62, Bentonville

The nature of a freeway is that it serves both as a transportation facility and as a barrier to transportation. I-540 serves as the principal facility to carry north-south traffic through the region, but it also serves as a barrier to east-west travel through the region. The result of this is that much of the east-west traffic in the region must cross I-540 by traveling through an interchange. In the urbanized portion of the region beginning south of Fayetteville, there are only eight roads that cross I-540 that do not have interchanges. All of these roads are two-lane roads where they cross the freeway. This leaves the majority of east-west travel to continue to pass through increasingly-congested interchanges in order to complete their trips.

It is for this reason that the emphasis of this study is on interchange congestion.

SAFETY ANALYSIS

The investigation included a review of the history of crashes on I-540 and on intersecting highways (crash data is not readily available for local streets). Crash data was summarized for the three-year period from 2000 through 2002, the three most recent years for which data was available. The findings are summarized in Table 1.

Washington County

In Washington County, I-540 was divided into 17 segments for review. There are four segments in which the number of accidents appears to be disproportionately high. These are the segments that appear to warrant consideration of improvements to address roadway safety. One segment contains the rural diamond interchange with Highway 74, which serves Winslow. An overwhelming majority of these crashes occurred on wet or icy pavement. Two of the problem segments are the segments from the Porter Road interchange through the interchange with Highway 71B (Fulbright Expressway). This is a high-volume portion of I-540 and it includes the merge/ diverge/ weave areas between the interchanges with Highway 112 and Highway 71B. The final segment with a high crash rate includes the interchange with Highway 412 and also includes the Arkansas Highway Police weigh stations. There is a lot of lane changing and merging between closely-spaced ramps in this area.

Benton County

In Benton County, ten segments were considered, including three segments on Highway 71 in the freeway section north of the end of I-540. Only one segment in Benton County appears to have a disproportionately high number of crashes. This is the segment that includes the interchange of I-540/ Highway 71 with Highway 102/ Highway 62. This is the part of the freeway that marks the change in character from rural conditions to the north and urban conditions to the south.

Crossroads

For thirteen of the interchanges in the study area, the crossroad is a state highway. The segments of these state highways that include the interchanges were reviewed for their crash histories. The findings are summarized in Table 2. Of these, the interchange of I-540 with Highway 16/ Highway 112 Spur experienced a relatively low number of crashes. All of the other state highways have crash histories that are expected for urban interchange environs.

Table 1: Crashes on Interstate 540

Dist. (mi.)	Washington County Freeway Segment	ADT	Crashes/ yr			3 - Year Total Crashes	Average Crash Rate 2000-2002	Statewide Rate 2000-2002
			2000	2001	2002			
1.5	Exit 45 From Hwy 74 interchange south to Hwy 74 interchange north	16000	13	13	9	35	1.39	0.51
6.79	From Hwy 74 interchange north to Hwy 170 interchange south	14000	27	22	22	71	0.65	0.52
1.00	Exit 53 From Hwy 170 interchange south to Hwy 170 interchange north	17000	9	4	3	16	0.88	0.52
4.1	From Hwy 170 interchange north to Wilson Rd interchange south	17000	10	11	15	36	0.48	0.52
1	Exit 58 From Wilson Rd interchange south to Wilson interchange north	17000	6	4	7	17	0.93	0.52
1.62	From Wilson Rd interchange north to Hwy 71 south spur interchange south	16000	8	7	2	17	0.57	0.52
1.25	Exit 61 From Hwy 71 south spur interchange south to Hwy 71 south spur interchange north	28000	12	9	7	28	0.83	1.24
1.65	Exit 62 From Hwy 62 interchange south to Hwy 62 interchange north	37000	37	37	38	112	1.54	1.25
1.39	Exit 64 From Hwy 16 interchange south to Hwy 16 interchange north	48000	27	47	39	113	1.59	1.25
1.11	Exit 65 From Porter Rd interchange south to Porter Rd interchange north	49000	34	45	32	111	1.91	1.25
1.11	Exit 66 From Hwy 112 interchange south to Hwy 112 interchange north	49000	30	49	44	123	2.12	1.25
1.92	From Hwy 112 interchange north to Main Dr interchange south	46000	11	24	22	57	0.62	1.25
1	Exit 69 From Main Dr interchange south to Main Dr interchange north	46000	15	25	32	72	1.48	1.25
1.57	From Main Dr interchange north to Hwy 412 interchange south	46000	8	12	16	36	0.47	1.25
1.2	Exit 72 From Hwy 412 interchange south to Hwy 412 interchange north	46000	35	42	40	117	2.01	1.25
1.2	Exit 73 From Elm Springs Rd interchange south to Elm Springs Rd interchange north	55000	19	31	28	78	1.19	1.24
1.31	From Elm Springs Rd interchange north to Wagon Wheel Rd interchange south	55000	5	9	15	29	0.41	1.24

Table 1 (cont.): Crashes on Interstate 540

Route	Dist. (mi.)	Benton County Freeway Segment	ADT	Crashes/ yr			3 - Year Total Crashes	Average Crash Rate 2000-2002	Statewide Rate 2000-2002
			2002	2000	2001	2002			
540	1	Exit 76 From Wagon Wheel Rd interchange south to Wagon Wheel Rd interchange north	50000	4	6	9	19	0.34	1.25
540	1.75	From Wagon Wheel Rd interchange north to Hwy 264 interchange south	50000	3	9	11	23	0.24	1.25
540	1	Exit 78 From Hwy 264 interchange south to Hwy 264 interchange north	47000	11	22	21	54	1.13	1.25
540	2.4	From Hwy 264 interchange north to Pleasant Grove Rd interchange south	49000	7	11	22	40	0.32	1.25
540	1.28	Exit 81 From Pleasant Grove Rd interchange south to Pleasant Grove Rd interchange north	49000	3	9	5	17	0.25	1.25
540	1.5	Exit 83 From Hwy 94 interchange south to Hwy 94 interchange north	37000	7	12	17	36	0.58	1.25
540	1.46	Exit 85 From Hwy 71B interchange south to Hwy 71B interchange north	37000	20	34	29	83	1.38	1.25
540	1.25	Exit 86 From Hwy 102 interchange south to Hwy 102 interchange north	37000	25	43	30	98	1.90	1.25
Hwy 71	1.01	From Hwy 102 interchange north to Hwy 72 interchange south	30000	2	2	1	5	0.16	1.25
Hwy 71	1	Hwy 72 From Hwy 72 interchange south to Hwy 72 interchange north	30000	7	7	14	28	0.89	1.25

Table 2: Crashes on State Highway Cross-Roads

Route	Dist. (mi.)	Segment	ADT	Crashes/ yr			3 - Year Total Crashes
			2002	2000	2001	2002	
72	0.35	Jay Ct to US 71 NB On Ramp	9900	5	4	10	19
102	0.19	Exit 86 500 ft W. of Phyllis to NB ON Ramp	26000	28	42	51	121
94	0.23	Exit 83 Horsebarn Rd to S. 43rd St.	10000	2	9	8	19
264	0.39	Exit 78 SB On Ramp to 100 ft East of 6th St.	13250	5	10	15	30
412	0.38	Exit 72 1700 ft W of 48th st to 390 ft E of 48th St	28000	90	95	119	304
112	0.46	Exit 66 Drake St. to Shiloh Drive	9150	7	7	10	24
16	0.15	Exit 64 Colorado Dr. to 40ft West of N Off Ramp	19750	28	17	29	74
112 Spur	0.19	Exit 64 Shiloh Dr to 20 ft East of West End Drive	17000	8	7	7	22
180	0.18	Exit 62 Shiloh Dr to 700 ft. West of Sang Dr.	27000	19	27	15	61
265	0.21	Exit 61 I-540 to 200 ft. South of Fullbright Expressway	1600	1	3	1	5

Because the segments were short, and because traffic volumes are elevated in the vicinities of the interchanges, the sample sizes appear to be small, so that these results must be considered as relative, and not absolute, indications of traffic safety problems.

FREEWAY STUDY

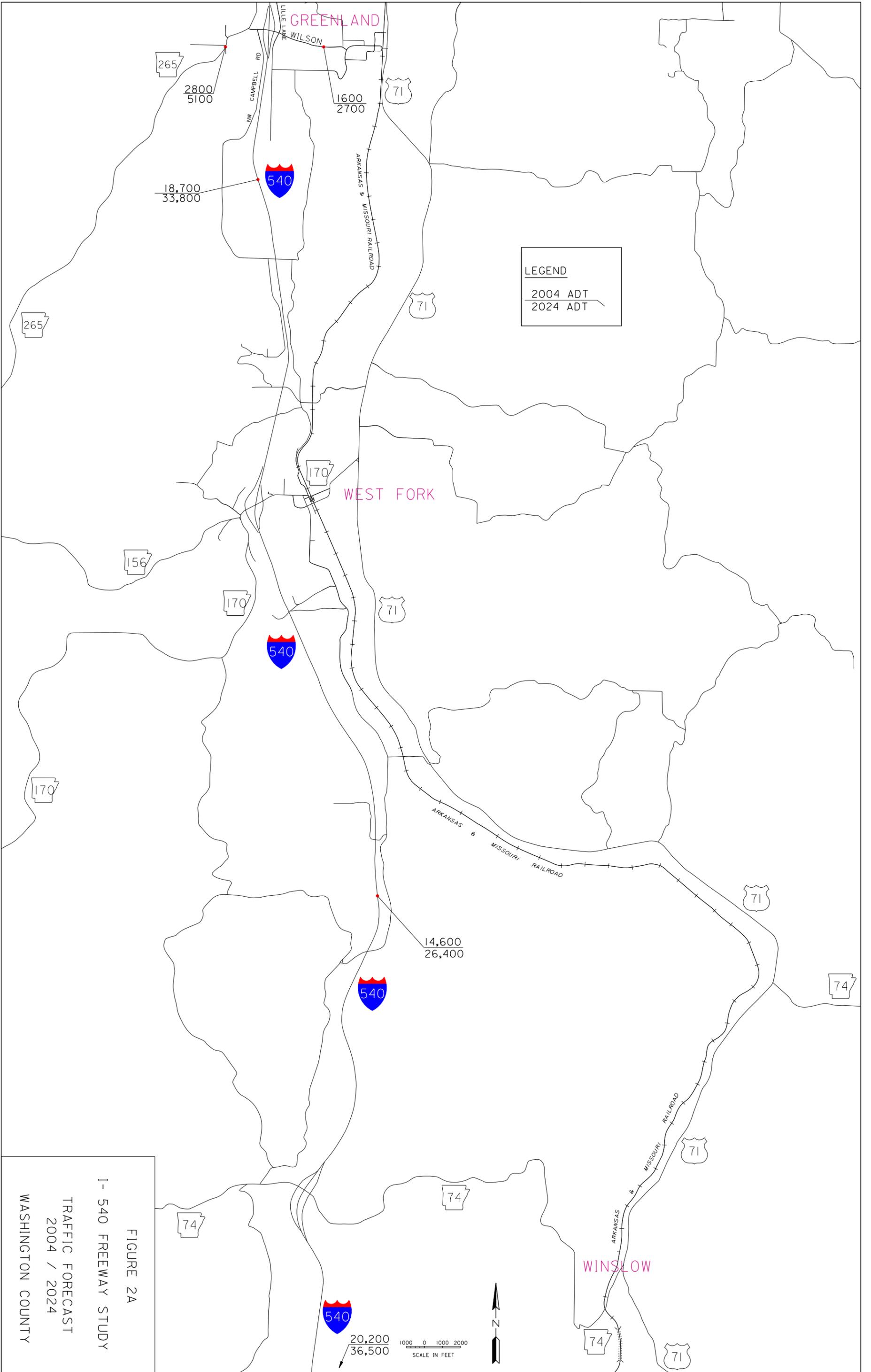
Existing I-540 is a four-lane freeway for its entire length. A review of the basic traffic flow capacity of I-540 was undertaken to identify the anticipated roadway needs for the future. The existing facility was found to have adequate capacity for all current traffic loads. By the year 2024, however, serious deficiencies are expected due to anticipated traffic growth. It is anticipated that additional lanes will be needed on I-540 throughout the urbanized portion of the region.

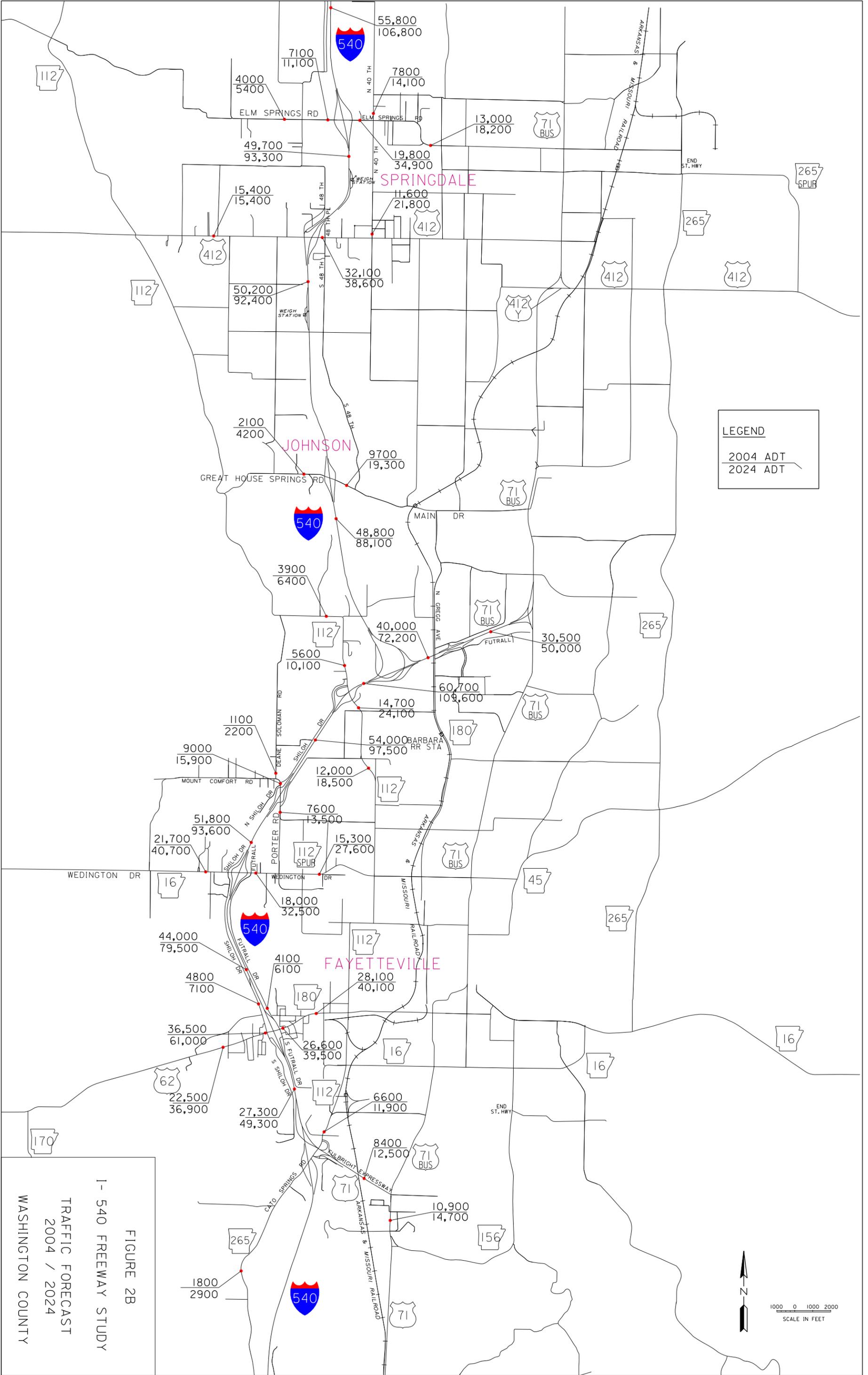
Figures 2A, 2B, and 2C show the 2004 and the projected 2024 traffic volumes on I-540.

Levels of Service

The study procedures used are generally called “capacity analyses.” The findings of capacity analysis are reported in terms of levels of service (abbreviated LOS) which is very much like giving a traffic flow grade to a roadway segment or intersection. The levels of service are A through F, with A representing very good traffic flow and F representing congested traffic flow. In this study, frequently a level of service may be reported as LOS C/B or LOS D/E. These examples indicate a high LOS C (a C-plus), or a low LOS D (a D-minus), respectively. A more detailed description of levels of service is contained in Appendix B. Appendix A contains notes regarding the manner that the capacity analysis study procedures were applied for this study. LOS D is considered to be the appropriate level for design of urban facilities for the year 2024 while LOS C is considered appropriate for rural facilities.

Level of service findings for the I-540 four-lane freeway are presented in Table 3 and Table 4 and are shown in Figures 3A, 3B, and 3C. It is apparent from this summary of findings that the I-540 mainline is expected to become congested in the urban portions of the region and that some of the I-540 mainline will experience extreme congestion unless widened. Additional lanes appear to be needed from the Highway 62 interchange (Exit 62) in Fayetteville to the Highway 72 interchange (Exit 88) in Bentonville.





LEGEND
 2004 ADT
 2024 ADT

1000 0 1000 2000
 SCALE IN FEET

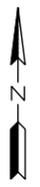


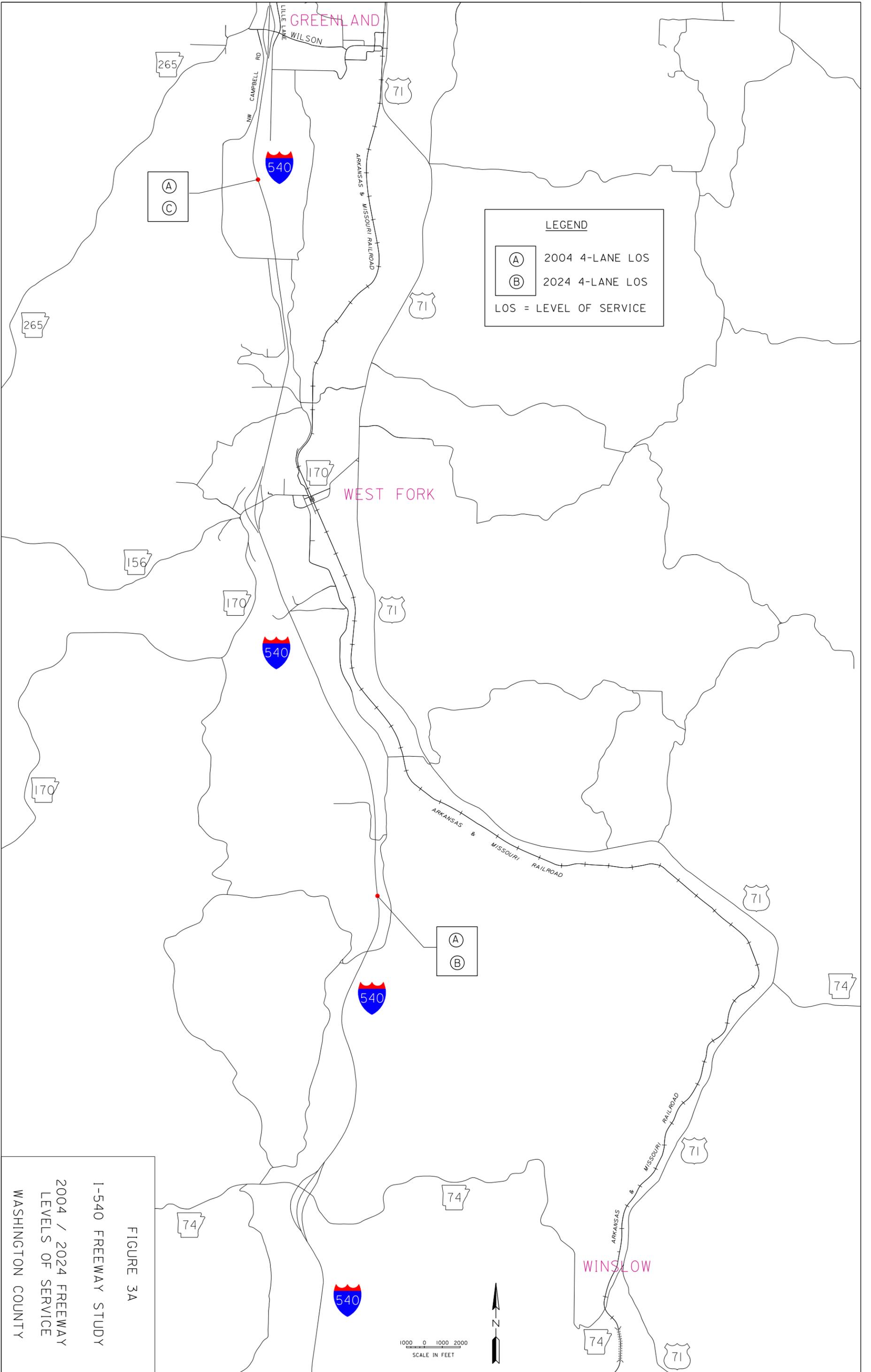
FIGURE 2B
 I-540 FREEWAY STUDY
 TRAFFIC FORECAST
 2004 / 2024
 WASHINGTON COUNTY

Table 3: Freeway Levels of Service for Washington County

I-540 LOCATION	Traffic Volumes 2004	LOS 4 Lanes 2004	Traffic Volumes 2024	LOS 4 Lanes 2024
Exit 45 Hwy 74				
	14,600	A	26,400	B
Exit 53 Hwy 170				
	18,700	A	33,800	C
Exit 58 W. Wilson St.				
	20,200	B	36,600	C
Exit 61 Hwy 265/ Hwy 112				
	27,300	B	49,300	D
Exit 62 Hwy 62 / Hwy 180				
	44,000	C	79,500	F
Exit 64 Hwy 16 / Hwy 112 Spur				
	51,800	D	93,600	F
Exit 65 N. Porter Rd.				
	54,000	D	97,500	F
Exit 66 Hwy 112				
	60,700	D	109,600	F
Exit 67 Hwy 71 Business				
	48,800	D	88,100	F
Exit 69 Great House Springs Rd.				
	50,200	D	92,400	F
Exit 72 Hwy 412				
	49,700	D	93,300	F
Exit 73 Elm Springs Rd.				
	55,800	D	106,800	F

Table 4: Freeway Levels of Service for Benton County

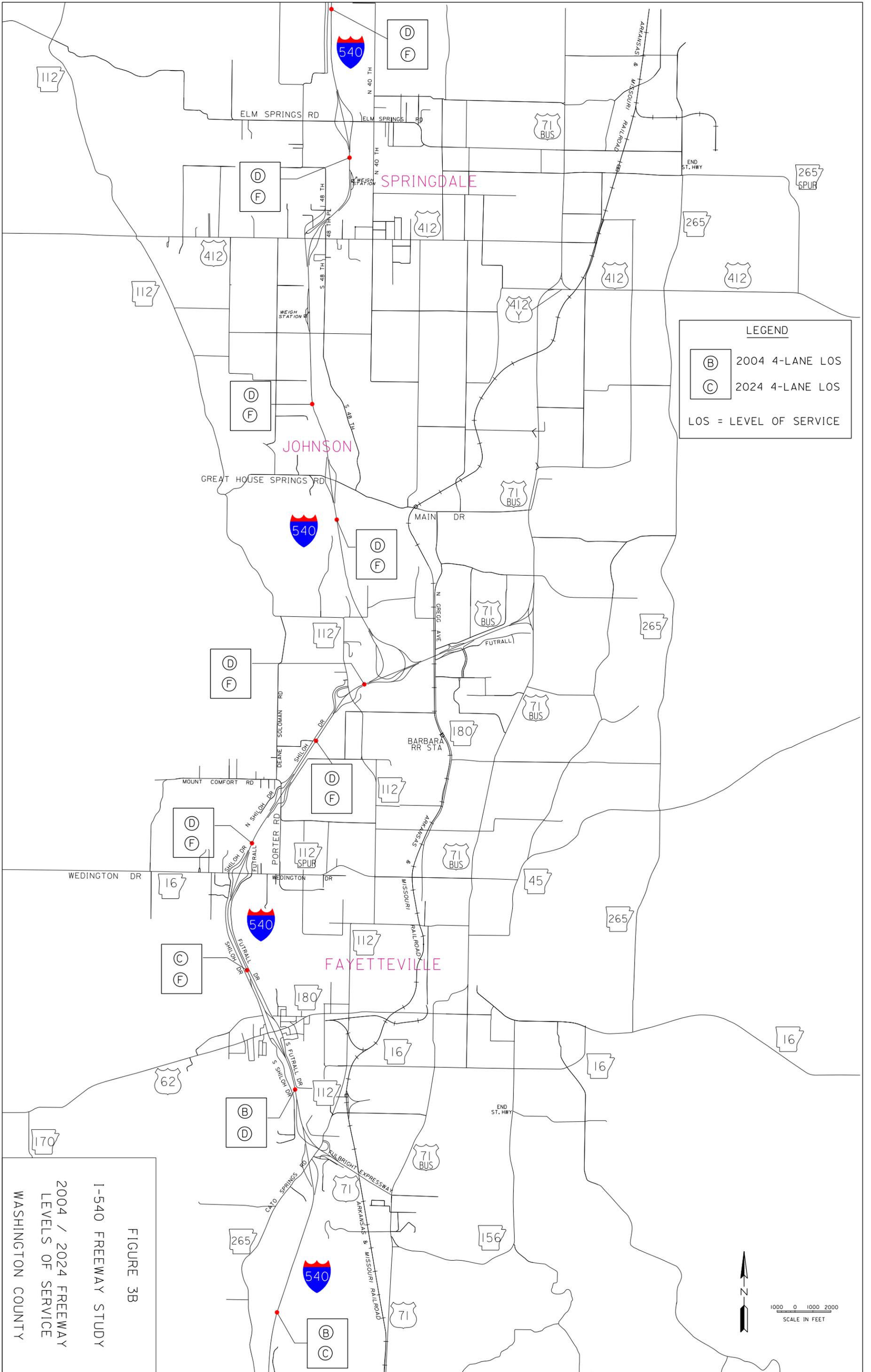
I-540 LOCATION	Traffic Volumes 2004	LOS 4 Lanes 2004	Traffic Volumes 2024	LOS 4 Lanes 2024
Exit 73 Elm Springs Rd.				
	55,800	D	106,800	F
Exit 76 E. Wagon Wheel Rd.				
	55,400	D	108,100	F
Exit 77 Proposed Hwy 412 Bypass				
	55,400	D	110,000	F
Exit 78 Hwy 264				
	51,100	D	101,700	F
Exit 81 Pleasant Grove Rd.				
	52,100	D	103,700	F
Exit 82 Proposed W. Perry Rd.				
	52,100	D	101,500	F
Exit 83 Hwy 94				
	51,700	D	100,900	F
Exit 85 Hwy 71 Business				
	46,200	C	91,900	F
Exit 86 Hwy 102 / Hwy 62				
	33,900	B	68,800	E
Exit 88 Hwy 71 / Hwy 72				
	26,900	B	54,600	D



LEGEND

(A)	2004 4-LANE LOS
(B)	2024 4-LANE LOS
LOS = LEVEL OF SERVICE	

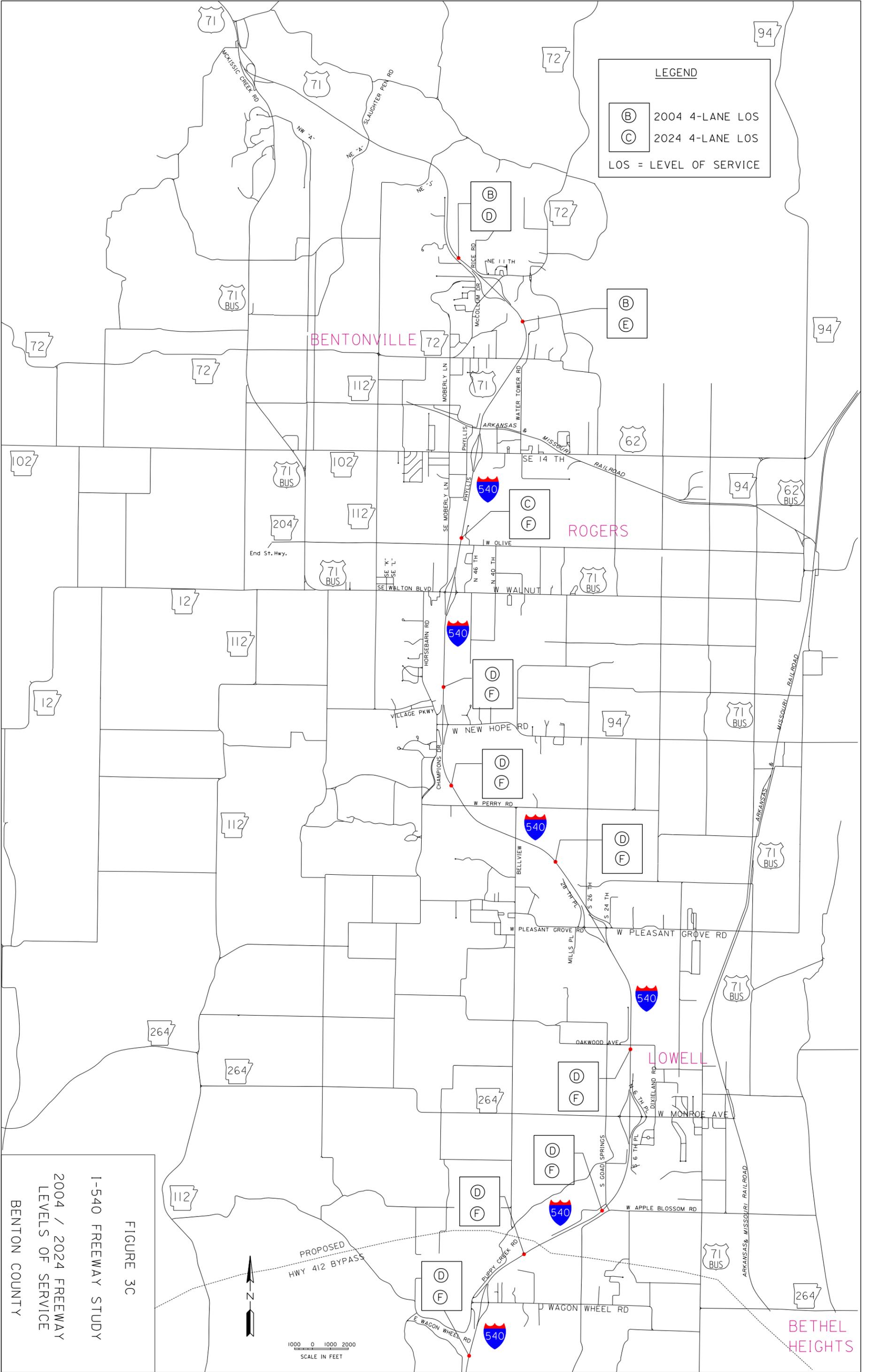
FIGURE 3A
I-540 FREEWAY STUDY
2004 / 2024 FREEWAY
LEVELS OF SERVICE
WASHINGTON COUNTY



LEGEND

(B) 2004 4-LANE LOS
 (C) 2024 4-LANE LOS
 LOS = LEVEL OF SERVICE

FIGURE 3B
 I-540 FREEWAY STUDY
 2004 / 2024 FREEWAY
 LEVELS OF SERVICE
 WASHINGTON COUNTY



INTERCHANGE STUDY

Before undertaking plans to widen I-540, the AHTD sought to understand future needs related to interchange operations. The findings will be used to develop a program of improvements. An effective improvement program will help to achieve a maximum return on the investment required for widening I-540 and improving its interchanges.

A review of interchange operations was conducted, focusing on ramp capacities and the operation of ramp terminal intersections with cross-streets. Each interchange was reviewed using traffic simulation software to examine queues that are anticipated to form due to congestion. All of the I-540 interchanges in Washington County and Benton County were investigated. In addition, one interchange on Highway 71 north of I-540 was included.

The findings regarding existing operations and operational deficiencies of each interchange are discussed in the sections of this report on Interchange Improvements which begin on page 31.

PUBLIC INVOLVEMENT

Meetings with Local Officials

An initial meeting with local officials was conducted at the Northwest Arkansas Regional Planning Commission office in Springdale on October 27, 2003. The purpose of the initial meeting was to brief local officials on the study, obtain early input for the study, and answer questions regarding the study from those present. Several comments were made by the local officials which called attention to specific points of traffic congestion along I-540 and provided useful input for the study.

A second local officials meeting was conducted at the Northwest Arkansas Regional Planning commission office in Springdale on June 6, 2005. At this meeting, results of the study, including recommended long-term and interim improvements to I-540 and its interchanges in Washington and Benton Counties, were presented. Several questions were asked and comments made regarding the recommended improvements.

Memoranda of the two local officials meetings are contained in Appendix C of this report.

Public Meetings

Public meetings were conducted on October 27 and October 28, 2003, respectively, in Fayetteville and Bentonville. The Fayetteville meeting was held at Leverett Elementary School and the meeting in Bentonville was conducted at Northwest Arkansas Community College. The purpose of these meetings was to obtain early public input on needed improvements along I-540 and to provide information about the study to the public. All comment questionnaire respondents expressed the belief that there are needed improvements along I-540 and its interchanges.

A second series of public meetings were conducted on June 6 and June 7, 2005, to present and receive comments on recommended short-term, interim and long-term improvements. The June 6 meeting was held at the Northwest Arkansas Community College in Bentonville. The meeting of June 7 was conducted at the offices of the Northwest Arkansas Regional Planning Commission in Springdale. Written and oral comments on the recommended improvements were received.

Summaries of attendance and comments received at both the initial public meetings conducted in October 2003 and the more recent meetings held in June 2005 are contained in Appendix D.

PROPOSED IMPROVEMENTS

INTERSTATE 540

In the review of the I-540 corridor, the focus of the study is on the interchanges since ramp flows are critical to the overall quality of traffic flow on the freeway and because the interchange areas have become the focus of regional growth. For the freeway mainline, the indication of future congestion is such that widening will be required. Sixteen of the twenty-two segments that were studied on I-540 would be anticipated to decline to LOS F by the year 2024 if there is no widening (see Tables 3 and 4).

Table 5 and Table 6 present findings of anticipated traffic flow conditions if I-540 were to be widened. In many cases, widening from four lanes to six lanes would not be adequate to provide LOS D which is the target for the planning of urban facilities. Widening from four to eight lanes is recommended for twelve segments of I-540 although for four of these segments, the outside lanes are proposed to operate as auxiliary lanes between interchanges without being carried through the interchanges.

For the interchanges, alternative strategies were investigated in order to develop recommendations regarding interchange improvements. These alternatives are discussed below, in detail for each interchange, in the section on Interchange Improvements.

Comment sheets from the two public meetings conducted on June 6 and June 7, 2005, at Bentonville and Springdale, respectively, showed that approximately 76 per cent of respondents favored constructing additional lanes on I-540 between Fayetteville and Bentonville. See Appendix D for summaries of comments received from these two public meetings.

Interstate 540 Improvements

From the results of the investigation, travel demand is expected to exceed the capacity of the existing freeway. Widening of the I-540 main lanes is recommended. The segments that are proposed to be widened are illustrated in Figure 4A, Figure 4B, and Figure 4C.

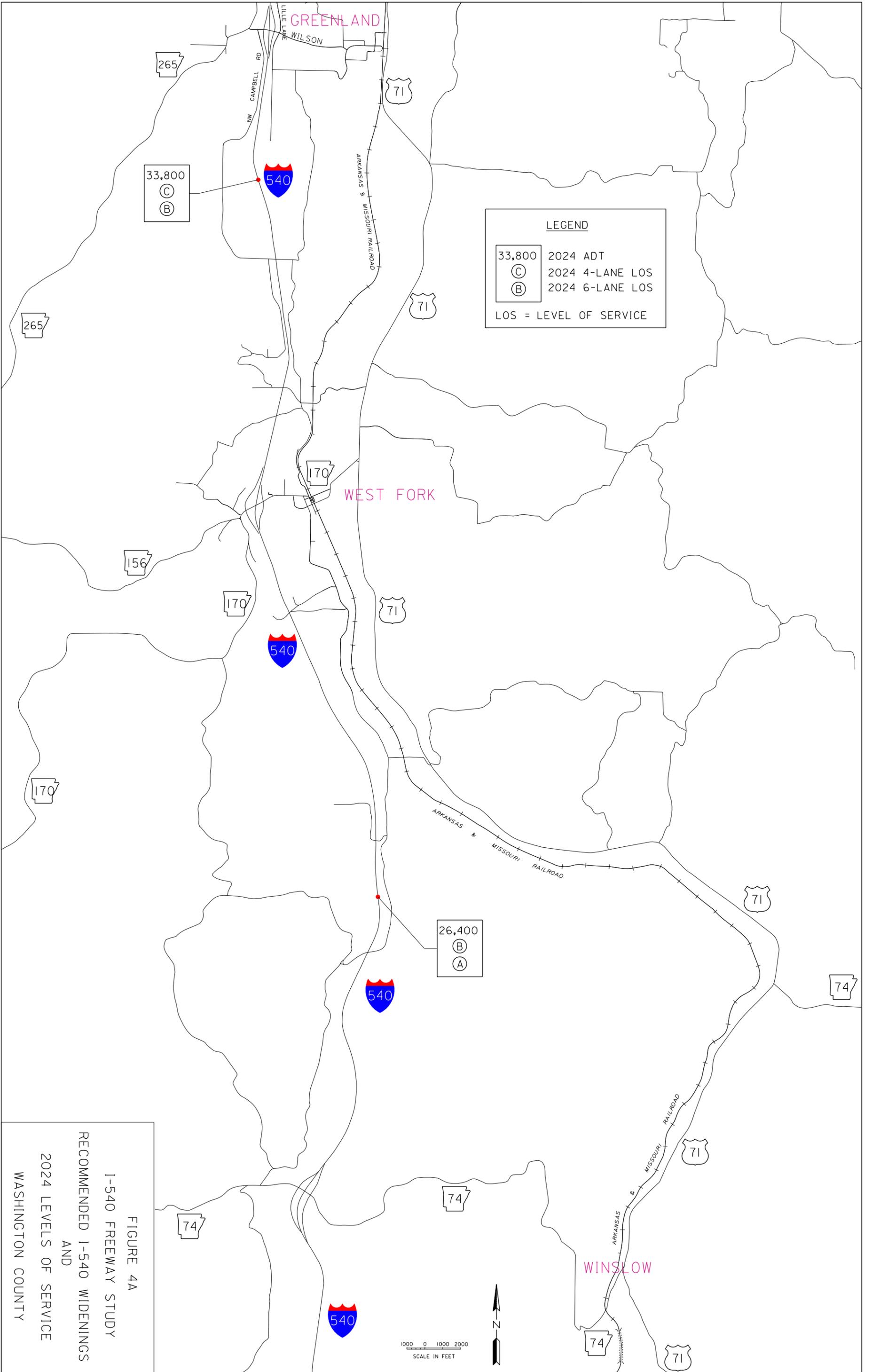
It is proposed that I-540 be widened to six lanes from Exit 62 (Highway 62) to Exit 64 (Highway 16/ Highway 112 Spur). From Exit 64 to Exit 66 (Highway 112), I-540 should be widened to eight lanes. Through the area of Exit 66 and Exit 67 (Highway 71B), a

Table 5: Freeway Levels of Service (LOS) for Washington County

I-540 LOCATION	Traffic Volumes 2004	LOS (4 Lanes) 2004	Traffic Volumes 2024	LOS (4 Lanes) 2024	LOS (6 Lanes) 2024	LOS (8 Lanes) 2024
Exit 45 Hwy 74						
	14,600	A	26,400	B	A	A
Exit 53 Hwy 170						
	18,700	A	33,800	C	B	A
Exit 58 W. Wilson St.						
	20,200	B	36,600	C	B	A
Exit 61 Hwy 265/ Hwy 112						
	27,300	B	49,300	D	C	B
Exit 62 Hwy 62 / Hwy 180						
	44,000	C	79,500	F	D	C
Exit 64 Hwy 16 / Hwy 112 Spur						
	51,800	D	93,600	F	E	C
Exit 65 N. Porter Rd.						
	54,000	D	97,500	F	E	C
Exit 66 Hwy 112						
	60,700	D	109,600	F	F	D
Exit 67 Hwy 71 Business						
	48,800	D	88,100	F	D	C
Exit 69 Great House Springs Rd.						
	50,200	D	92,400	F	E	C
Exit 72 Hwy 412						
	49,700	D	93,300	F	E	D
Exit 73 Elm Springs Rd.						
	55,800	D	106,800	F	F	D

Table 6: Freeway Levels of Service (LOS) for Benton County

I-540 LOCATION	Traffic Volumes 2004	LOS (4 Lanes) 2004	Traffic Volumes 2024	LOS (4 Lanes) 2024	LOS (6 Lanes) 2024	LOS (8 Lanes) 2024
Exit 73 Elm Springs Rd.						
	55,800	D	106,800	F	F	D
Exit 76 E. Wagon Wheel Rd.						
	55,400	D	108,100	F	F	D
Exit 77 Proposed Hwy 412 Bypass						
	55,400	D	110,000	F	F	D
Exit 78 Hwy 264						
	51,100	D	101,700	F	E	C
Exit 81 Pleasant Grove Rd.						
	52,100	D	103,700	F	E	D
Exit 82 Proposed W. Perry Rd.						
	52,100	D	101,500	F	E	C
Exit 83 Hwy 94						
	51,700	D	100,900	F	E	C
Exit 85 Hwy 71 Business						
	46,200	C	91,900	F	D	C
Exit 86 Hwy 102 / Hwy 62						
	33,900	B	68,800	E	C	B
Exit 88 Hwy 71 / Hwy 72						
	26,900	B	54,600	D	B	B

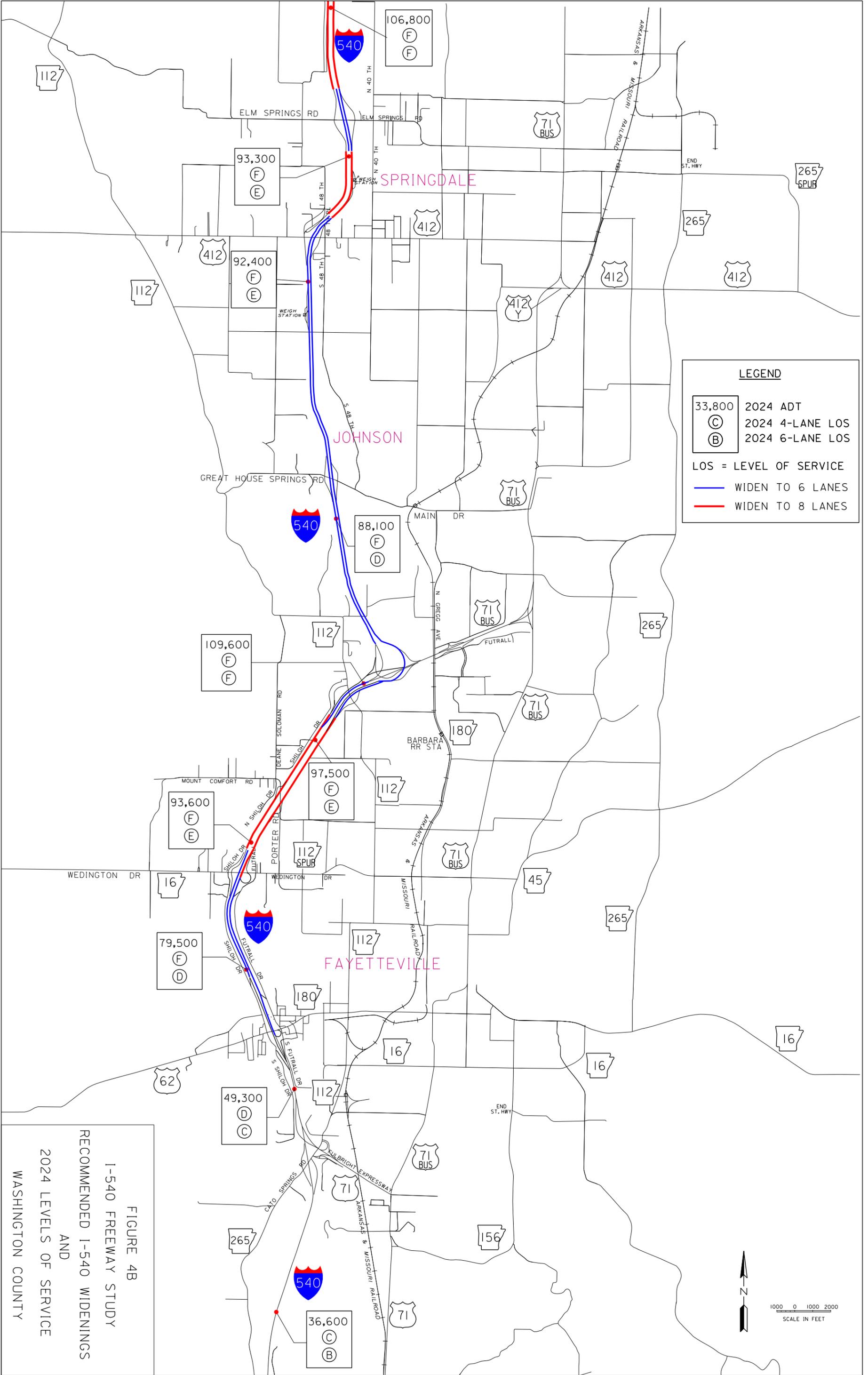


LEGEND

33,800	2024 ADT
(C)	2024 4-LANE LOS
(B)	2024 6-LANE LOS

LOS = LEVEL OF SERVICE

FIGURE 4A
I-540 FREEWAY STUDY
RECOMMENDED I-540 WIDENINGS
AND
2024 LEVELS OF SERVICE
WASHINGTON COUNTY



system of collector-distributor roads should be developed. North of Exit 67, I-540 should be widened to six lanes.

In the area of Exit 72 (existing Highway 412), there are problems associated with the Arkansas Highway Police weigh stations that are on either side of this interchange. The weigh stations are very close to the Highway 412 entrance ramps. See the discussion regarding the weigh stations below.

North of Exit 72 (existing Highway 412), I-540 should be widened to six lanes with auxiliary lanes between interchanges. With this widening, the north ramps at Exit 72 would become a lane-add and a lane-drop. At Exit 73 (Elm Springs Road), I-540 would be six lanes underneath the Elm Springs Road bridge and all four ramps would be either a lane-add or a lane-drop, so that I-540 would be eight lanes wide on either side of the interchange, with the outside lanes acting as auxiliary lanes. This same treatment is recommended for the next two interchanges, which are Exit 76 (Wagon Wheel Road) and the proposed interchange of I-540 with the proposed Highway 412 Bypass (Springdale Northern Bypass).

I-540 should be widened to eight lanes from north of the proposed Highway 412 bypass to Exit 85 (Highway 71B). At Highway 71B, the south ramps of the interchange should be a lane-drop and a lane-add. On the north side of this interchange, the north ramps should also be a lane-add and a lane-drop, creating auxiliary lanes that would carry through to Exit 86 (the interchange of I-540/ Highway 71 with Highway 102/ Highway 62). At Exit 86, the south ramps would be a lane-drop and a lane-add.

From Exit 86 to Exit 88 (the interchange of Highway 71 with Highway 72), Highway 71 should be widened to six lanes. North of Exit 88, Highway 71 could continue as a four-lane freeway.

See Figure 5A and Figure 5B for the typical sections that are proposed for the I-540 mainline widening.

North of the study area, the next interchange is the end of the freeway section of Highway 71. Highway 71B rejoins Highway 71 at this point, and Highway 71 continues as a non-access controlled facility through Bella Vista Village to the Missouri state line. There is a proposal for extending the freeway by constructing a Highway 71 Bypass west of Bella Vista Village.

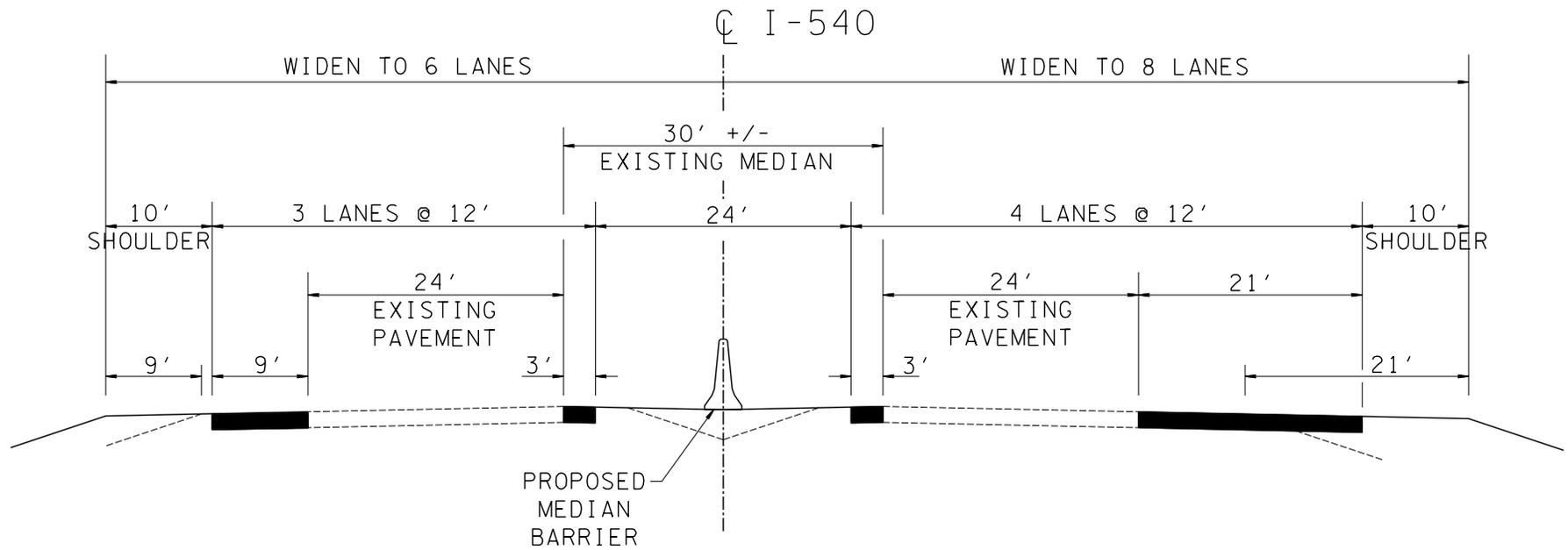


FIGURE 5A
 I-540 IMPROVEMENT STUDY
 TYPICAL SECTION
 WIDENING I-540 SOUTH OF
 HIGHWAY 71B (EXIT 67)

CL I-540

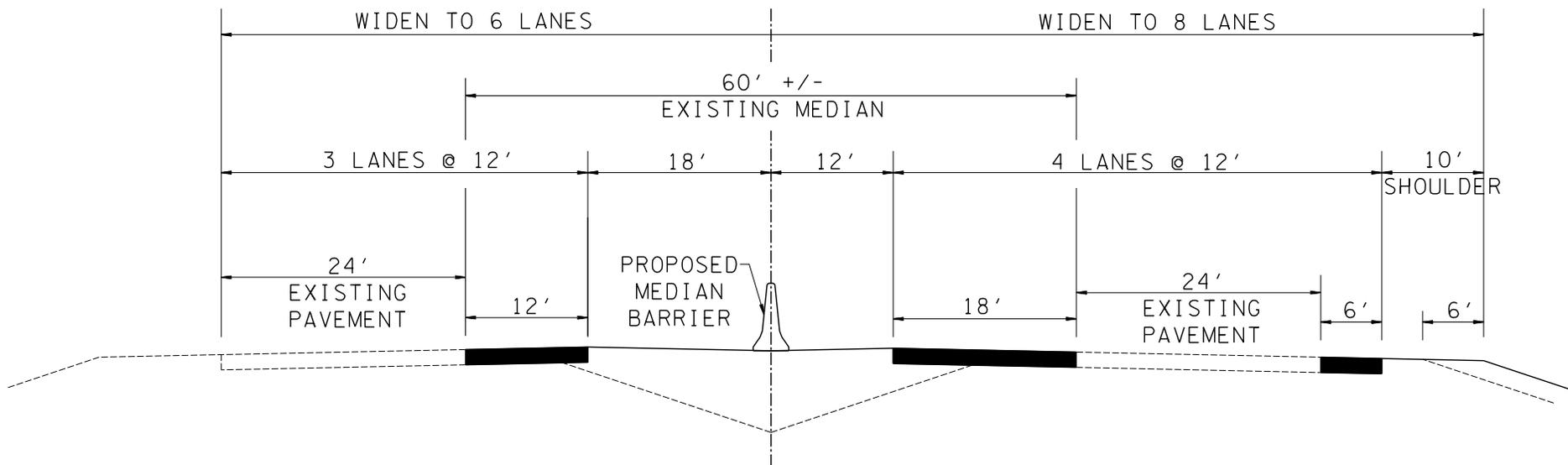


FIGURE 5B

I-540 IMPROVEMENT STUDY

TYPICAL SECTION

WIDENING I-540 NORTH OF
HIGHWAY 71B (EXIT 67)

Intelligent Transportation Systems

The current levels of traffic density on I-540 have reached a point such that, at peak travel times, even the smallest incident, such as a vehicle on the shoulder with a flat tire, can result in relatively major adverse impacts to traffic flow. An incident such as a rear-end crash can be the result of a minor incident, which, in turn, can lead to major traffic blockage. As congestion increases, it will become increasingly important that all incidents on I-540 be cleared as quickly as possible. There are several strategies for improving the practices and procedures for clearing incidents quickly. These strategies are grouped together under the term “Incident Management.”

Incident Management is itself a part of a longer list of strategies intended to improve traffic flow on major urban roadways. The overall umbrella for consideration of these strategies is called Intelligent Transportation Systems (ITS). Some of the ITS strategies require sophisticated technological applications, but several of the strategies may be characterized as “low tech” solutions.

The Northwest Arkansas Regional Transportation Study (NARTS), in conjunction with AHTD, is preparing to undertake the development of a “Regional ITS Architecture,” which will be a selection of the ITS strategies that are most appropriate for the region, and a framework for organizing the development of the selected strategies. NARTS has already identified Incident Management as a high priority for implementation on I-540. Other ITS strategies may be identified for implementation on I-540 as well. Incident Management may be implemented in stages and may be as simple as arranging understandings between neighboring jurisdictions regarding incident responses in order to speed the arrival of emergency vehicles.

Other strategies that may become desirable for I-540 could include roving service vehicle patrols, improved communications for responding agencies such as local police and fire departments, or camera surveillance of interchanges, with sophisticated controls for traffic signals at ramp terminal intersections, or with emergency messages sent to motorists using such technologies as highway advisory radio or dynamic message signs. The current study did not include a review of ITS strategies.

It is recommended that Incident Management and other ITS strategies be considered as soon as possible for applications on I-540.

Weigh Stations

There are weigh stations on I-540 on either side of Exit 72 (Highway 412). The weigh stations are located very close to the existing interchange. In the northbound direction, the weigh station has its exit gore approximately 1600 feet downstream of the Exit 72 northbound entrance ramp. There is an auxiliary lane between the two, which forms a weaving area. The northbound entrance ramp for this weigh station is only slightly over 1200 feet from the northbound exit ramp to Exit 73 (Elm Springs Road). This also is a weaving area.

In the southbound direction, the weigh station is south of Exit 72 (Highway 412), with a weaving area of approximately 1700 feet. All three of these weaving areas are problems at peak traffic times. Measures should be taken to improve or eliminate these weaving areas.

If I-540 is to be widened north of Exit 72 (Highway 412), then the northbound weigh station would require substantial modification. Because this weigh station is located between Exit 72 and Exit 73 (Elm Springs Road), the opportunities to improve this weaving area are limited. The northbound weigh station should be relocated to a site that has greater distances to nearby interchange ramps.

The southbound weigh station has a slightly longer weaving area, and while it is not close to an interchange further south, it is very near a bridge for a cross street (Watkins Road). The widening that is proposed for I-540 south of Highway 412 can be accomplished by working to the inside (see Figure 5B), so that this widening could be accomplished without relocating the weigh station. However, it would be good to relocate this weigh station, if a suitable new location can be found. During the process of widening I-540, locations should be sought so that both of these weigh stations can be relocated.

INTERCHANGE IMPROVEMENTS

The interchanges were studied by applying capacity analysis techniques to the various components, so that ramp merging and ramp terminal intersections became the focus of the investigation.

Brief summaries of findings are presented in this report. At many of these nineteen interchanges, intersection operations are key to interchange operations. In order to investigate the potential for intersection congestion to result in traffic queues that would interfere with ramp operations, many of the interchange investigations include a review of

operations at nearby intersections. A total of 72 intersection turning movement counts were collected by the AHTD for this investigation.

Findings for both existing and future conditions are presented, along with the discussion of the alternatives considered for each interchange, in the following sections. The focus of the reviews of each interchange was to develop long-term recommendations to address anticipated deficiencies. Recommendations are also addressed for short-term improvements at many locations, which chiefly consist of auxiliary turn lanes recommended at ramp terminal intersections. Recommendations also are presented in a few cases that are called “interim improvements.” These are intended to present substantive improvements to operations that would allow improved operations with a lower level of investment than that required for the long-term recommendations.

In some cases, interchange recommendations include proposed improvements to city streets or county roads. A few of the interchanges are anticipated to experience severe congestion, and this is discussed in the summary for each interchange. A summary of findings for the ramp terminal intersections in Washington County appears in Table 7-1 and Table 7-2. A summary of findings for the ramp terminal intersections in Benton County appears in Table 8-1 and Table 8-2.

In the study area there are two proposed interchanges that were not included in this investigation. The AHTD proposes to construct a bypass for existing Highway 412 that has an existing interchange with I-540 in Springdale. The proposed interchange is under study, and the final determination of the proposed bypass alignment is not yet made. For the purposes of this study, the assumption was made that the proposed Highway 412 Bypass would cross I-540 between Wagon Wheel Road and Highway 264. Also, the City of Rogers proposes to realign Perry Road and construct an interchange with I-540 that will be located between the interchange with Pleasant Grove Road and the interchange with Highway 94 (New Hope Road).

Comment sheets from the public meetings conducted on June 6 and June 7, 2005, respectively, at Bentonville and Springdale show that approximately 98 percent of respondents believe that improvements are needed to the interchanges along I-540. The summaries of comments received from these two public meetings can be found in Appendix D.

Table 7-1 Washington County 2004 Ramp Terminal Levels of Service

Interchange	2004 Existing LOS		2004 Proposed LOS	
	AM	PM	AM	PM
Exit 45- Interstate 540 at Highway 74 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	A A	- -	- -	- -
Exit 53- Interstate 540 at Highway 170 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	B B	- -	- -	- -
Exit 58- Interstate 540 at West Wilson St. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	C B	- -	- -	- -
Exit 61- Interstate 540 at Hwy 265 / Hwy112 and Hwy 71 Northbound Exit Ramp Intersection Northbound Entrance Ramp Intersection Southbound Ramp Terminal Intersection	- - -	A C C	- - -	- - -
Exit 62- Interstate 540 at Highway 62 N. Futrall Drive at Hwy 62 N. Shiloh Drive at Hwy 62	B D	D E	B C	B C
Exit 64- Interstate 540 at Highway 16 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	B A	F F	B A	D B
Exit 65- Interstate 540 at Porter Rd. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F C	F F	B A	B B
Exit 66- Interstate 540 at Highway 112 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F D	F E	- -	- -
Exit 69- Interstate 540 at Main Dr. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	C D	C F	- -	- -
Exit 72- Interstate 540 at Highway 412 Northbound Ramp Terminal Intersection S. 48th Street / SB Entrance Ramp at Hwy 412	B F	C B	- -	- -
Exit 73- Interstate 540 at Elm Springs Rd. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F C	F B	- -	- -

LOS = Level of Service

2004 Proposed Level of Service is the LOS that would have been expected if the recommended short-term improvements had been in place.

Table 7-2 Washington County 2024 Ramp Terminal Levels of Service

Interchange	2024 Existing LOS		2024 Proposed LOS	
	AM	PM	AM	PM
Exit 45- Interstate 540 at Highway 74 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	A A	A A	- -	- -
Exit 53- Interstate 540 at Highway 170 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	D C	B C	- -	- -
Exit 58- Interstate 540 at West Wilson St. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F B	C B	C B	- -
Exit 61- Interstate 540 at Hwy 265 / Hwy112 and Hwy 71 Northbound Exit Ramp Intersection Northbound Entrance Ramp Intersection Southbound Ramp Terminal Intersection	C C	B F	C A	B A
Exit 62- Interstate 540 at Highway 62 N. Futrall Drive at Hwy 62 N. Shiloh Drive at Hwy 62	F F	F F	C D	C D
Exit 64- Interstate 540 at Highway 16 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	A C	A D
Exit 65- Interstate 540 at Porter Rd. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	C C	D C
Exit 66- Interstate 540 at Highway 112 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	B C	B C
Exit 69- Interstate 540 at Main Dr. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	C B	C C
Exit 72- Interstate 540 at Highway 412 Northbound Ramp Terminal Intersection S. 48th Street / SB Entrance Ramp at Hwy 412	B B	C D	- -	- -
Exit 73- Interstate 540 at Elm Springs Rd. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	D C	E C

LOS = Level of Service

2024 Proposed Level of Service is the LOS that would be expected if the recommended long-term improvements are implemented.

Table 8-1 Benton County 2004 Ramp Terminal Levels of Service

Interchange	2004 Existing LOS		2004 Proposed LOS	
	AM	PM	AM	PM
Exit 76- Interstate 540 at Wagon Wheel Rd. Northbound Ramp Terminal Intersection Southbound Exit Ramp at Puppy Creek Road	B A	B A	- -	- -
Exit 78- Interstate 540 at Highway 264 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	C E	C D	C D	B C
Exit 81- Interstate 540 at Pleasant Grove Rd. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	C F	C F	- -	- -
Exit 83- Interstate 540 at Highway 94 Northbound Ramp Terminal Intersection Southbound Exit Ramp at Horsebarn Road	F F	F F	- -	- -
Exit 85- Interstate 540 at Highway 71 Bus. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	D C	D E	- -	- -
Exit 86- Interstate 540/ Hwy 71 at Hwy 62/ 102 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	D D	F F	D D	C D
Exit 88- Highway 71 at Highway 72 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	B B	B C

LOS = Level of Service

2004 Proposed Level of Service is the LOS that would have been expected if the recommended short-term improvements had been in place.

Table 8-2 Benton County 2024 Ramp Terminal Levels of Service

Interchange	2024 Existing		2024 Proposed	
	AM	PM	AM	PM
Exit 76- Interstate 540 at Wagon Wheel Rd. Northbound Ramp Terminal Intersection Southbound Exit Ramp at Puppy Creek Road	E B	C B	C B	B B
Exit 78- Interstate 540 at Highway 264 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	B D	B C
Exit 81- Interstate 540 at Pleasant Grove Rd. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	B C	C D
Exit 83- Interstate 540 at Highway 94 Northbound Ramp Terminal Intersection Southbound Exit Ramp at Horsebarn Road	F F	F F	B B	C B
Exit 85- Interstate 540 at Highway 71 Bus. Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	SPUI - D SPUI - D	
Exit 86- Interstate 540/ Hwy 71 at Hwy 62/102 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	SPUI - D SPUI - D	
Exit 88- Highway 71 at Highway 72 Northbound Ramp Terminal Intersection Southbound Ramp Terminal Intersection	F F	F F	A B	C A

LOS = Level of Service

2024 Proposed Level of Service is the LOS that would be expected if the recommended long-term improvements are implemented.

Interchange Study Notes

Eleven of the interchanges are in the traditional diamond configuration, with two intersections on the crossroad that control ramp operations. Only one of the interchanges is a freeway-to-freeway interchange with no intersections (the interchange with Highway 71B (Fulbright Expressway), Exit 67). Since most interchange operations depend on intersection operations, intersection analysis was a central issue for this study. The methods used to investigate intersection operations are called capacity analyses as per the Highway Capacity Manual, which presents study methodology information. These procedures are different from those used to study freeway segments. Appendix A contains a description of study methods with notes on analytical procedures.

On occasion, an intersection level of service may be reported as LOS C/E, in which there is a gap of a level of service between the two levels noted. This is generally an indication of something more complex than a LOS C. In several instances, intersections are very closely spaced, and it was found that the green time available from a traffic signal would have to be apportioned in an unbalanced fashion, in order to prevent traffic queues from one intersection from blocking through another nearby intersection. In this way, some motorists would experience a significantly better level of service on one approach to the intersection than motorists on a different approach at the same intersection. For unsignalized intersections, the level of service reported is for the street that has to stop. See Appendix B for the definitions of levels of service.

Single-Point Urban Interchange (SPUI)

Several of the interchanges in the study were considered as candidates for conversion into Single-Point Urban Interchanges. This configuration, called a "SPUI," is a variation on the traditional diamond interchange configuration. A typical SPUI configuration would realign all four of the diamond ramps to bring them into a single intersection that would be located underneath the Interstate bridge that passes overhead. SPUIs have gained a great deal of popularity in the transportation field in recent years because they provide an efficiency of traffic signal operations that generally increases capacity over a traditional diamond interchange, and they require less right-of-way. Though there are currently none in Arkansas, most major urban centers now have several SPUIs. Two interchanges in Bentonville are recommended to be converted into SPUIs. These are:

- Exit 85 I-540 at Highway 71B
- Exit 86 I-540 at Highway 102/ Highway 62

WASHINGTON COUNTY INTERCHANGES

WASHINGTON COUNTY INTERCHANGES

There are twelve interchanges with I-540 in Washington County. Half of these are in the City of Fayetteville. Eight of these interchanges are with state highways. The following discussion presents a review of the analyses and the recommended short-term and long-term improvements for each of these interchanges.

WASHINGTON COUNTY INTERCHANGES

Exit 45

Interstate 540 at Highway 74

Exit 45 Interstate 540 at Highway 74

This interchange is located in a rural area of southern Washington County near the City of Winslow. Highway 74 is a two-lane road crossing over I-540. The interchange is a diamond and both ramp terminal intersections were studied.

Short-Term Analysis

Both intersections are unsignalized and operate well under current conditions. See Table 45-1 for level of service findings and Figure 45-1 for 2004 traffic volumes. The segment of I-540 that contains this interchange was identified as having a relatively high crash rate. A review of the crash history revealed that a large number of the crashes were related to wet or icy pavement, and that there were several particular winter days with multiple crashes in the same day. The AHTD recently completed a drainage improvement project that is intended to reduce the amount of water that may sheet across the pavement.

Short-Term Improvements

No roadway improvements are currently needed for this interchange. All turning movements at the ramp terminal intersections show LOS A. The AHTD is considering further improvements that may serve to improve roadway safety. One measure that has been discussed is tining the pavement to improve traction and braking characteristics. Another potential measure would be to install additional reflective pavement markers.

Long-Term Analysis

The annual growth rate anticipated for Highway 74 is approximately 2.5 percent per year. Even with this relatively high growth rate, the resulting year 2024 volumes are relatively low. See figure 45-2 for 2024 traffic volume projections. No deficiencies are apparent at this interchange unless high, unexpected growth occurs. The forecast traffic volumes for the year 2024 pose no problems and all intersections are still expected to operate at LOS A. See Figure 45-3 for projected 2024 Levels of Service.

Long-Term Improvements

There are no improvements needed for this interchange with the forecasted traffic volumes. Should large growth occur at the interchange, signalizing the ramp intersections could be required. See Figure 45-1 for the existing ramp terminal intersection geometries.

Table 45-1

Exit 45 -- Levels of Service

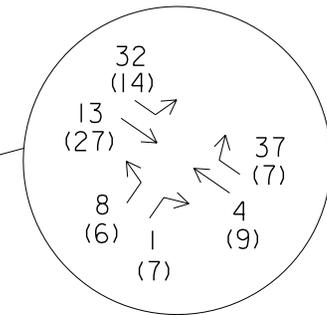
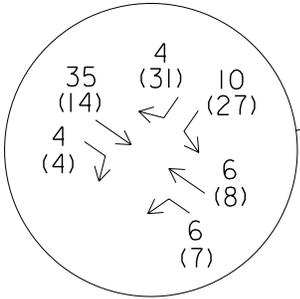
	Southbound Ramps	Northbound Ramps
2004 existing conditions	AM LOS A PM not reviewed	AM LOS A PM not reviewed
2024 existing conditions	AM LOS A PM LOS A	AM LOS A PM LOS A

LOS = Level of Service

HWY 74

SOUTHBOUND EXIT RAMP

I-540



NORTHBOUND EXIT RAMP

HWY 74

FIGURE 45-1

I-540 IMPROVEMENT STUDY

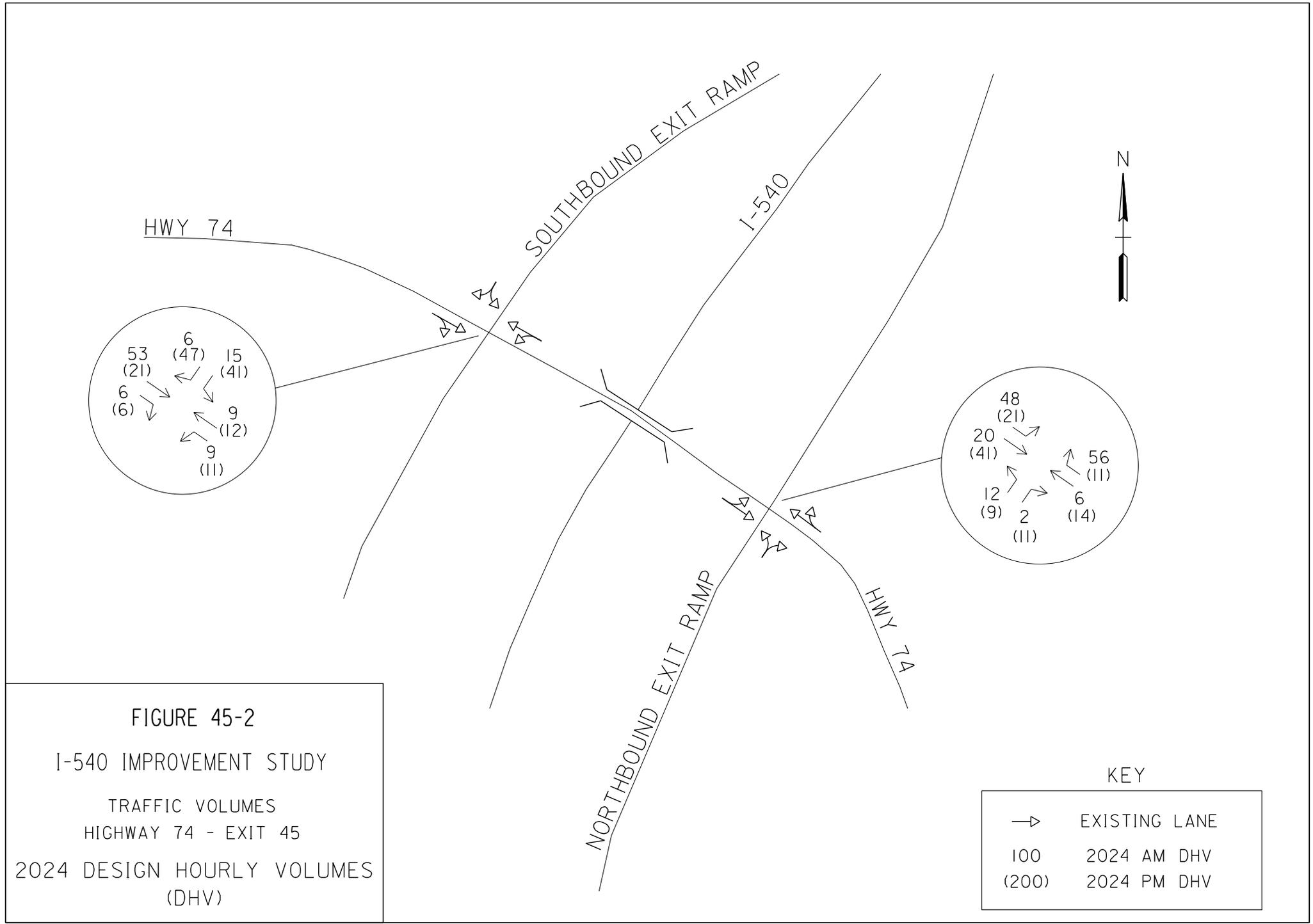
TRAFFIC VOLUMES

HIGHWAY 74 - EXIT 45

2004 DESIGN HOURLY VOLUMES
(DHV)

KEY

-  EXISTING LANE
- 100 2004 AM DHV
- (200) 2004 PM DHV



HWY 74

LOS A

SOUTHBOUND EXIT RAMP

I-540



NORTHBOUND EXIT RAMP

LOS A

HWY 74

FIGURE 45-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
HIGHWAY 74 - EXIT 45

2004 THRU 2024
NO IMPROVEMENTS NEEDED

LANE GEOMETRY KEY



EXISTING LANE

LOS

2024 LEVEL OF SERVICE

WASHINGTON COUNTY INTERCHANGES

Exit 53

Interstate 540 at Highway 170

Exit 53 Interstate 540 at Highway 170

This interchange is located in a rural area of southern Washington County in the City of West Fork. Highway 170 is a two-lane road crossing over I-540. The interchange is a diamond and both ramp terminal intersections were counted, along with the nearby intersection of Highways 156 and 170.

Short-Term Analysis

All three intersections are unsignalized and operate well under current conditions. See Table 53-1 for level of service findings and Figure 53-1 for 2004 traffic volumes.

Short-Term Improvements

There are no improvements that are currently needed for this interchange. Almost all turning movements at the intersections operate at LOS A or LOS B.

Long-Term Analysis

The annual growth rate anticipated for Highway 170 and Highway 156 is approximately 3.2 percent per year. Even with this relatively high growth rate, the resulting year 2024 volumes are relatively low. See Figure 53-2 for 2024 traffic volume projections. No deficiencies are apparent at this interchange unless high, unexpected growth occurs. The forecast traffic volumes for the year 2024 pose no problems and the unsignalized intersections would still operate at acceptable Levels of Service. See Figure 53-3 for projected 2024 Levels of Service.

Long-Term Improvements

There are no improvements needed for this interchange with the forecasted traffic volumes. Should large growth occur at the interchange, signalizing the ramp intersections could be required. See Figure 53-1 for the existing ramp terminal intersections geometries.

Table 53-1

Exit 53 -- Levels of Service

	Hwy 156		Southbound Ramps		Northbound Ramps	
2004 existing conditions	AM PM	LOS B on Hwy 156 not reviewed	AM PM	LOS B on ramp not reviewed	AM PM	LOS B on ramp not reviewed
2024 existing conditions	AM PM	LOS B on Hwy 156 LOS B on Hwy 156	AM PM	LOS C on ramp LOS C on ramp	AM PM	LOS D on ramp LOS B on ramp

LOS = Level of Service

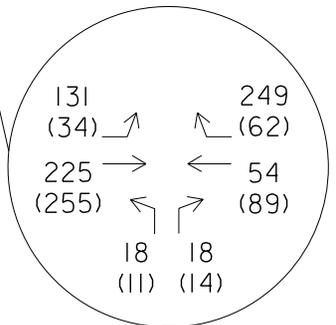
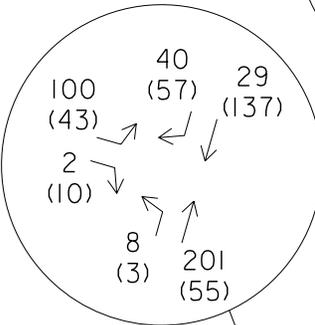
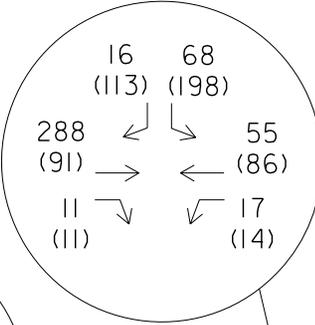
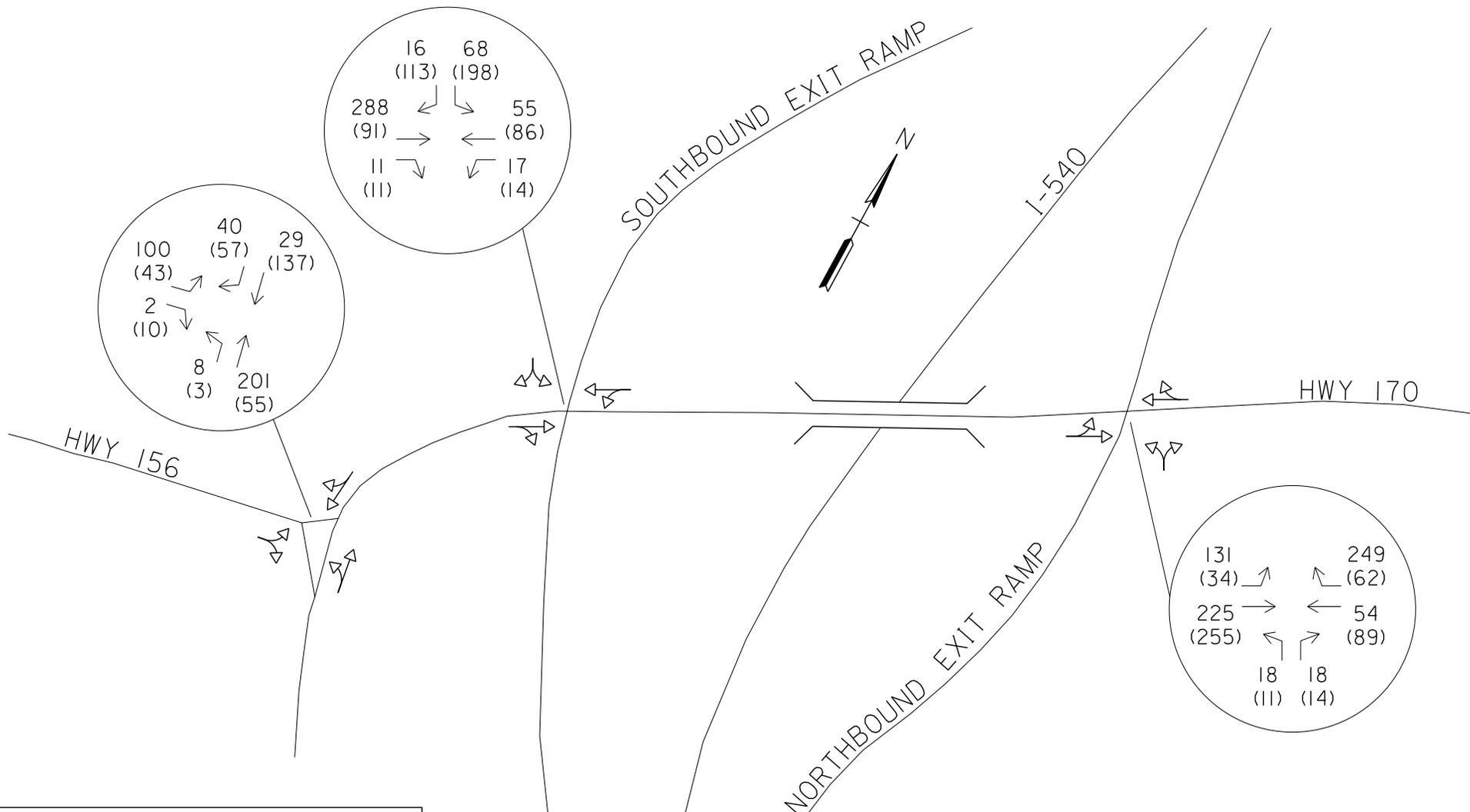


FIGURE 53-1

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 170 - EXIT 53

2004 DESIGN HOURLY VOLUMES
(DHV)

KEY

	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV

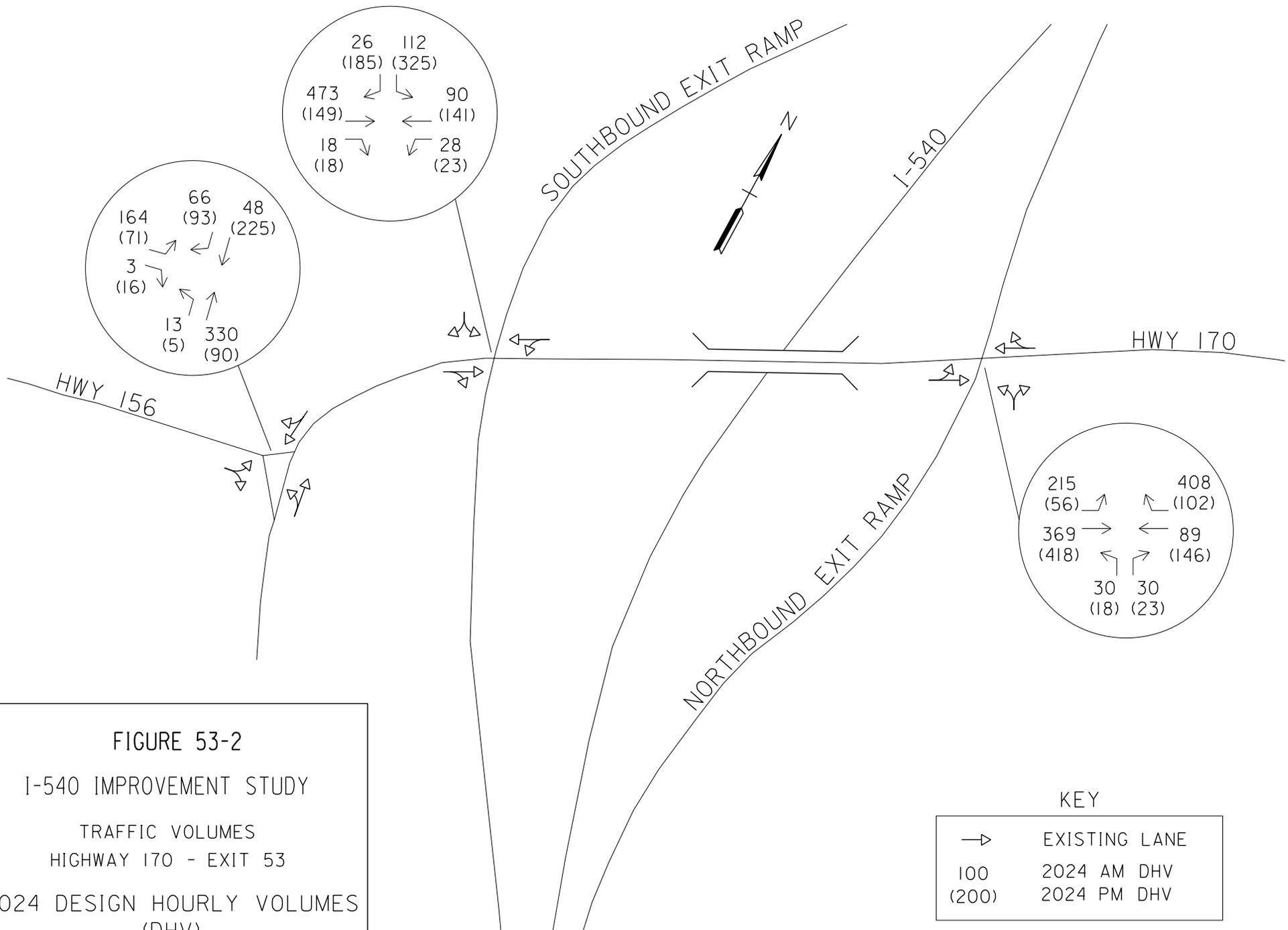


FIGURE 53-2

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 170 - EXIT 53

2024 DESIGN HOURLY VOLUMES
(DHV)

KEY

	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV

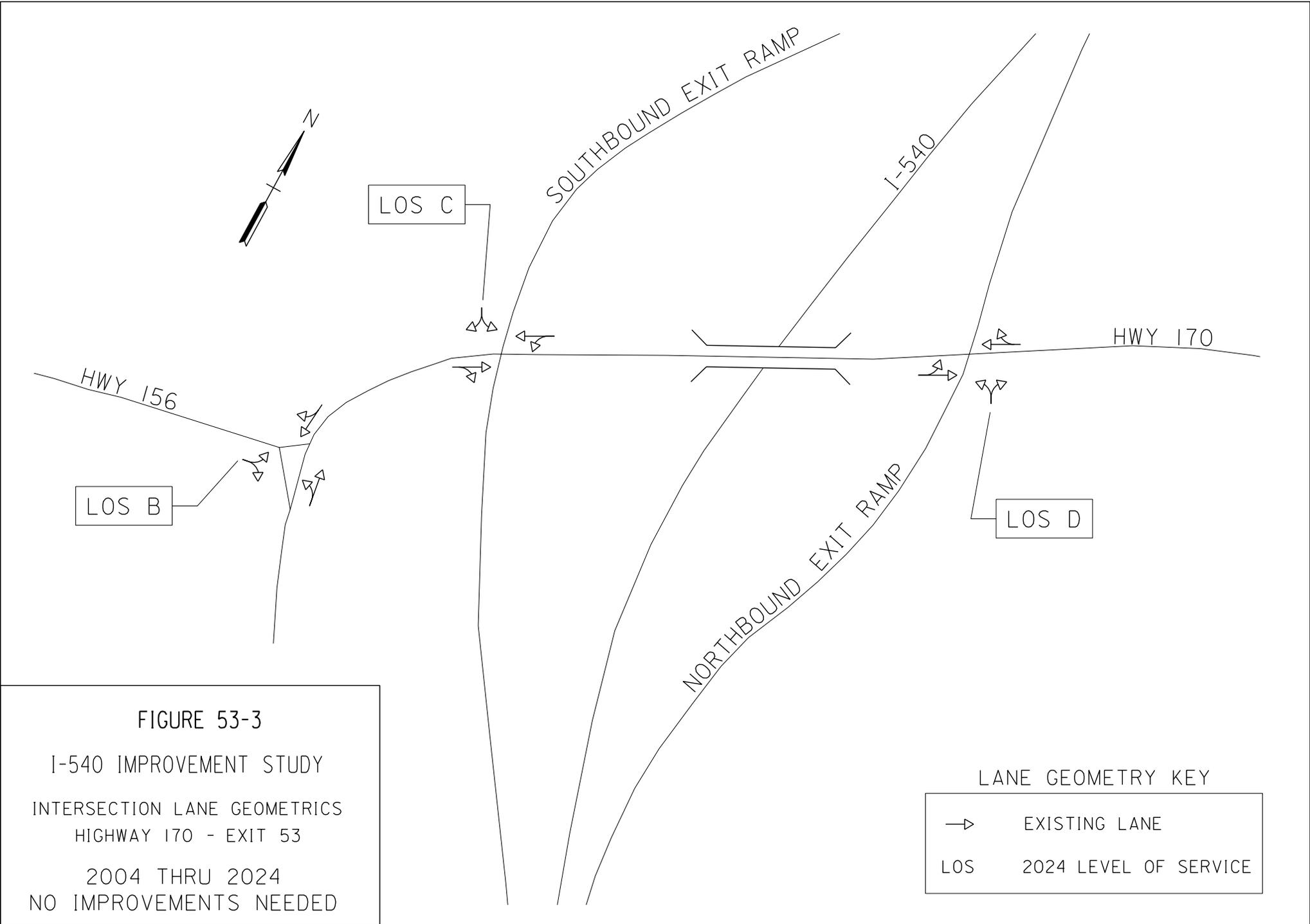


FIGURE 53-3

I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 170 - EXIT 53
 2004 THRU 2024
 NO IMPROVEMENTS NEEDED

LANE GEOMETRY KEY

→	EXISTING LANE
LOS	2024 LEVEL OF SERVICE

WASHINGTON COUNTY INTERCHANGES

Exit 58

Interstate 540 and West Wilson Street

Exit 58 Interstate 540 and West Wilson Street

This interchange is in Washington County at Greenland. West Wilson Street is a two-lane Greenland city street. The interchange is a diamond, with I-540 crossing over West Wilson Street. There are frontage roads on both sides of the interchange, with intersections that are very close to the ramp terminal intersections. A short distance west of the interchange, West Wilson Street ends at an intersection with Highway 265, which runs roughly parallel to I-540 in this area.

Both ramp terminal intersections were counted, along with intersections of the frontage roads, Campbell Road and Lillie Lane, and also the nearby intersection of West Wilson Street with Highway 265.

Short-Term Analysis

All five of these intersections are unsignalized and operate well under current conditions. See Table 58-1 for level of service findings and Figure 58-1 for 2004 traffic volumes.

Short-Term Improvements

There are no improvements that are currently needed for this interchange.

Long-Term Analysis

The growth rate anticipated for West Wilson Street is approximately 2.7 percent per year, and the growth rate anticipated for nearby Highway 265 is approximately three percent per year. Even with these healthy growth rates, the resulting year 2024 volumes are relatively low. See Figure 58-2 for 2024 traffic volume projections.

The only problem found in a review of anticipated morning peak conditions occurs at the intersection of West Wilson Street with the northbound ramps. Ramp traffic is expected to experience LOS F. This anticipated condition was reviewed, and delays of two minutes or more would be expected, but queues would not be expected to extend to an unsafe length. The addition of auxiliary lanes was tested, but not found to reduce the northbound left turn delays below the threshold for LOS F. Traffic signalization was tested for the intersection of West Wilson Street with the northbound ramps, and would be expected to operate at LOS C. However, the northbound exit ramp is not believed to carry enough traffic to meet warrants for signalization. See Figure 58-3 for projected 2024 Levels of Service.

Table 58-1

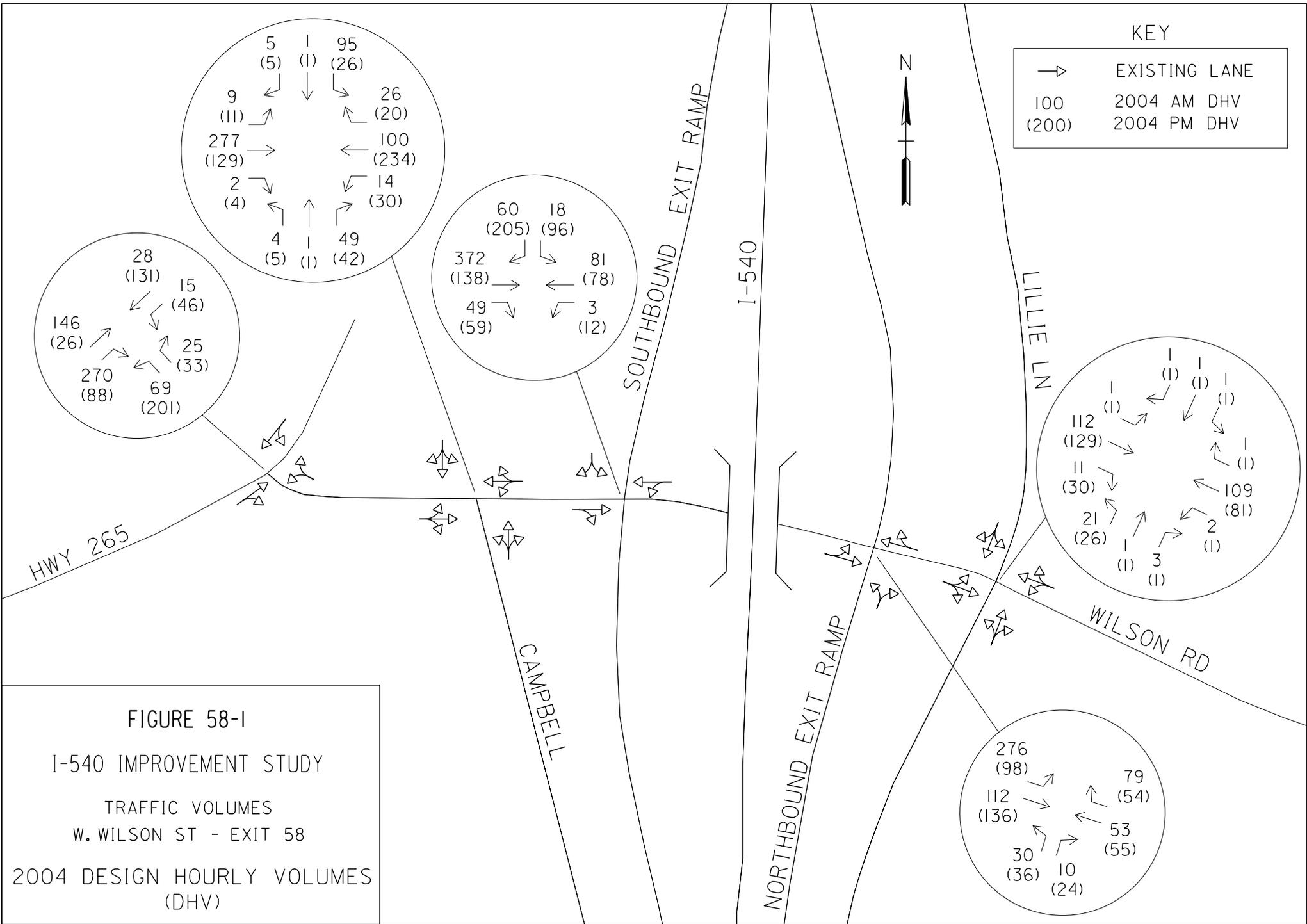
Exit 58 -- Levels of Service

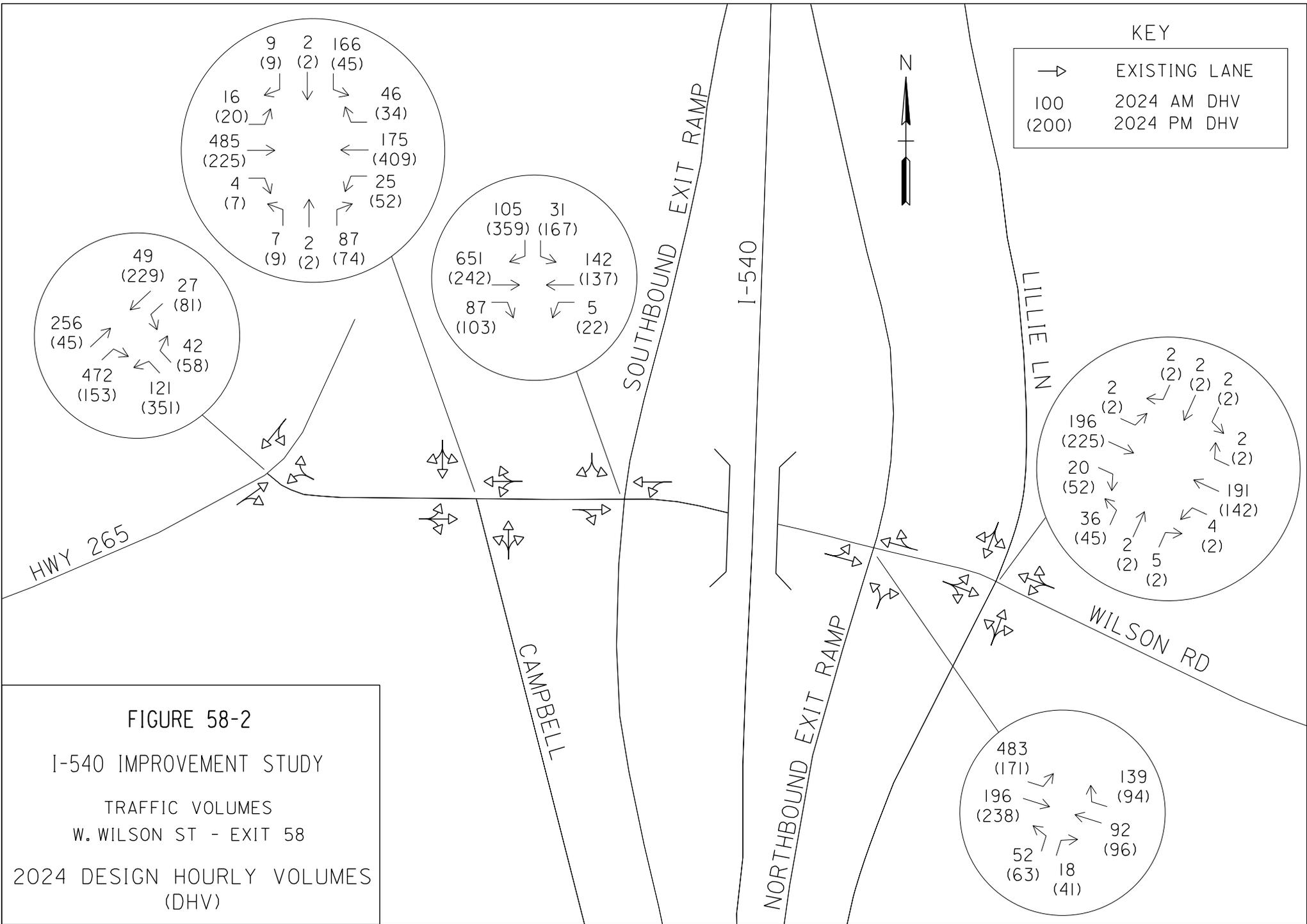
	Southbound Ramps		Northbound Ramps	
2004 existing conditions	AM PM	Unsig.- LOS B on ramp not reviewed	AM PM	Unsig.- LOS C on ramp not reviewed
2024 existing conditions	AM PM	Unsig.- LOS B on ramp Unsig.- LOS B on ramp	AM PM	Unsig.- LOS F on ramp Unsig.- LOS C on ramp
signalize NB ramp	AM PM	Unsig.- LOS B on ramp not reviewed	AM PM	LOS C not reviewed

LOS = Level of Service

Long-Term Improvements

A small amount of widening of the northbound exit ramp would allow the northbound right turning traffic to pass by any queue of left-turning traffic. As traffic continues to increase, this location is likely to warrant a traffic signal in the future. See Figure 58-1 for intersection geometries.





LANE GEOMETRY KEY

- EXISTING LANE
- LOS 2024 LEVEL OF SERVICE

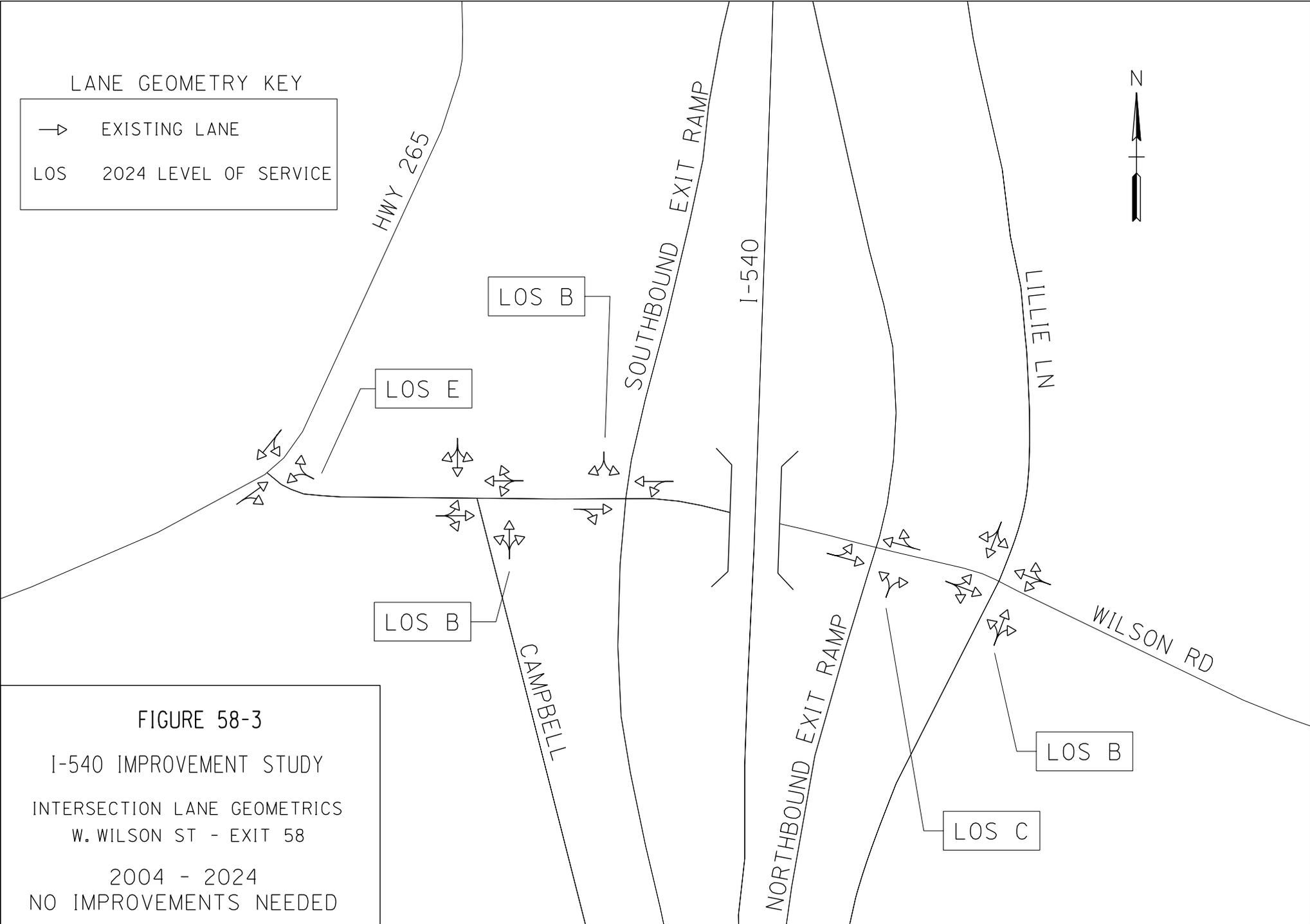


FIGURE 58-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
W. WILSON ST - EXIT 58

2004 - 2024
NO IMPROVEMENTS NEEDED

WASHINGTON COUNTY INTERCHANGES

Exit 61

**Interstate 540 at Highway 71 and at
Highway 265 / Highway 112 (Razorback Road)**

Exit 61 Interstate 540 at Highway 71 and Hwy 265/ Hwy 112 (Razorback Road)

This interchange is in southern Fayetteville. It is a complex interchange comprised of eight merge and diverge ramps that connect three main thoroughfares: I-540, Highway 71 (Fulbright Expressway), and Highway 265/ Highway 112 (Razorback Road). Four intersections along Highway 265/ Highway 112 were reviewed at this interchange:

- the I-540 southbound ramp terminals intersection,
- the I-540 northbound exit ramp intersection,
- the Shiloh Drive (to Highway 71 southbound entrance ramp) intersection, and
- the northbound Highway 71 exit ramp/ I-540 entrance ramp intersection.

I-540 crosses over Highway 265, and Highway 112 crosses over Highway 71. See Figure 61-1 for details. North of the interchange, Highway 112 is on the National Highway System (NHS).

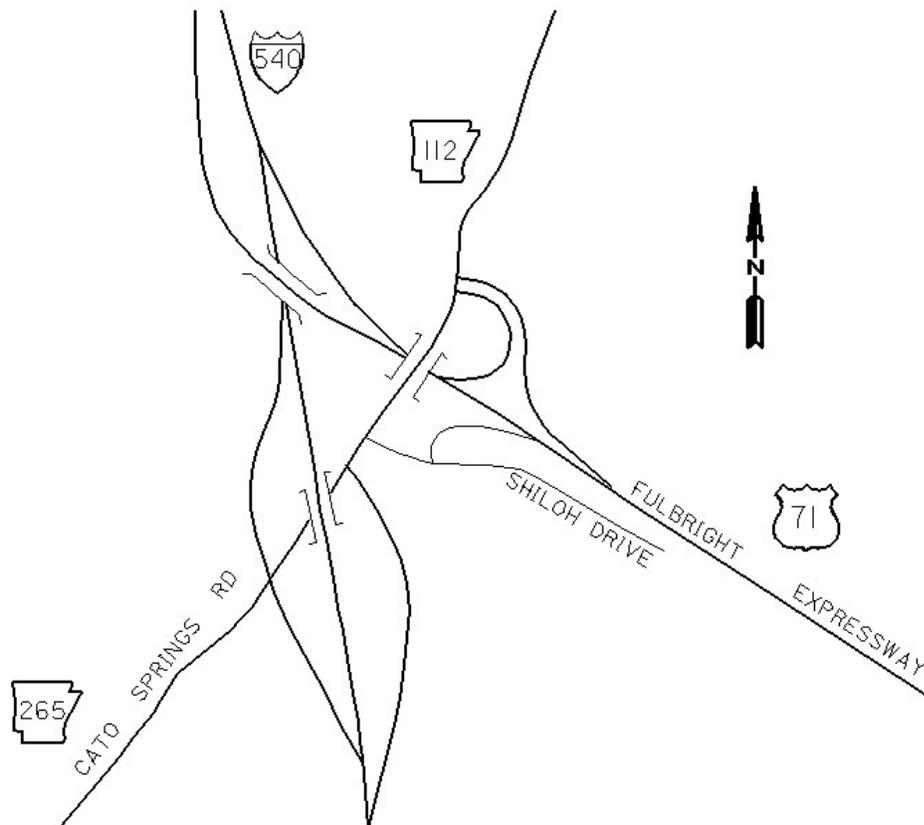


Figure 61-1 — Layout of Exit 61

Short-Term Analysis

The afternoon peak volumes were analyzed for the present year investigation. Traffic volumes were low and traffic seemed to flow easily. All turning movements operated at a LOS C or better. All four of the intersections are unsignalized and operate well under existing conditions. See Table 61-1 for level of service findings and Figure 61-2 for 2004 traffic volumes.

This interchange serves as a major entrance to portion of Fayetteville that contains the main campus of the University of Arkansas. In particular, Razorback football games and other major campus events such as basketball games and concerts can draw large amounts of event traffic. Traffic control at the interchange is monitored or directed by police, and police control is expected to be continued for major events. No analysis of event traffic was conducted.

Short-Term Improvements

There are no improvements that are currently needed for this interchange. See Figure 61-4 for existing intersection geometries.

Long-Term Analysis

An investigation of the merge of Highway 71 northbound onto northbound I-540 was performed using morning peak traffic volumes for year 2024. The capacity analysis showed the merge successfully performing at LOS C.

In the analysis of Highway 265/ Highway 112, both morning and afternoon peak hour volumes were analyzed and the average growth rate for the interchange was estimated to be 3.5 percent per year. Capacity analyses of the 2024 projected forecast volumes revealed several deficiencies if the intersections remain unsignalized. See Figure 61-3 for 2024 traffic volume projections. In the afternoon peak hour, the ramp terminal intersection with the I-540 southbound ramps would be expected to operate at LOS F, with a delay time of 101 seconds. The intersection with the Highway 71 northbound exit ramp and the I-540 northbound entrance ramp also would be expected to operate at LOS F, with a delay of 70 seconds to turn onto Highway 112.

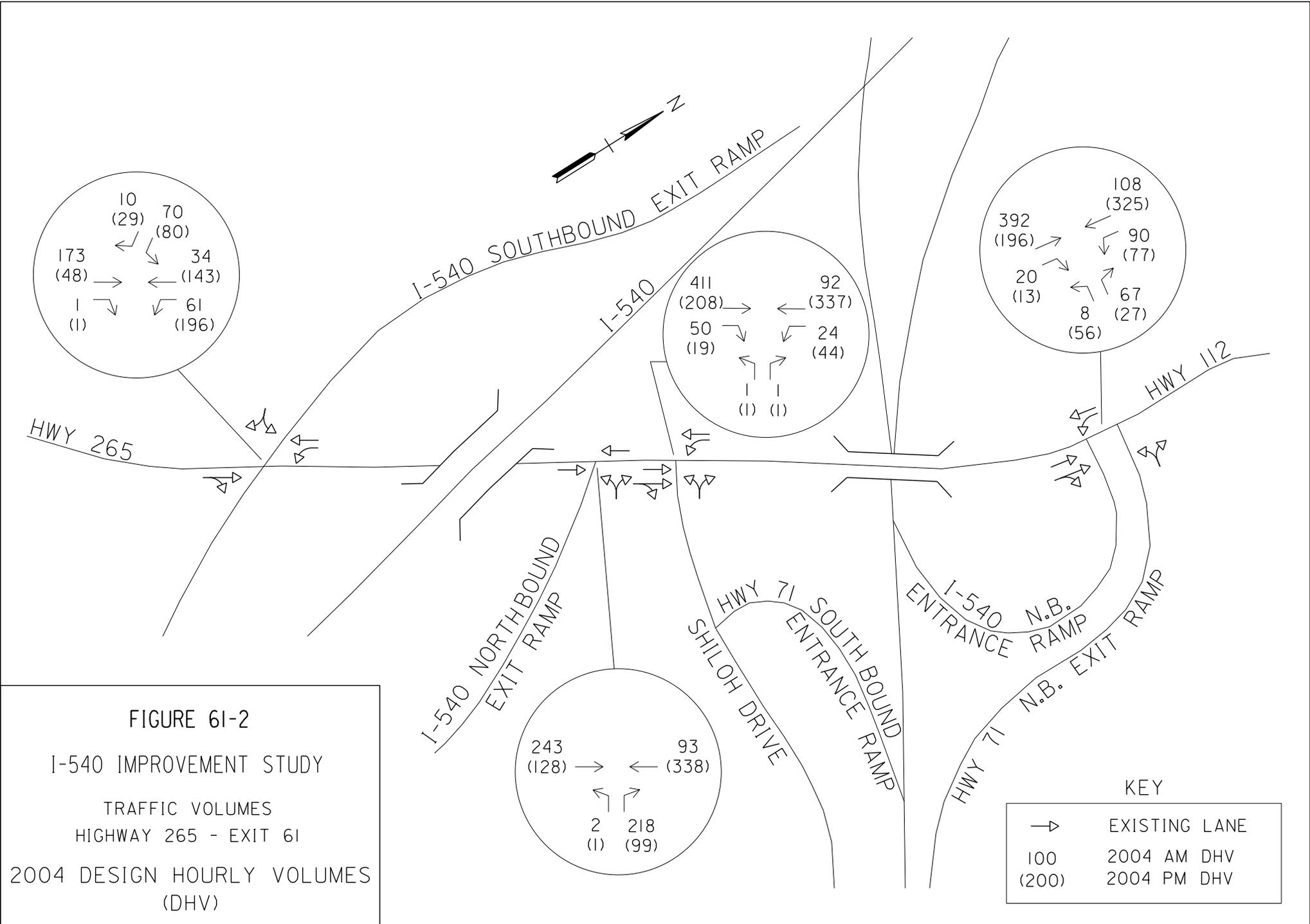
A concern was expressed that the ramp terminal intersection with the I-540 northbound exit ramp is too close to the intersection with Shiloh Drive, at approximately 80 feet. The analysis of expected operations if signals were installed included a review of potential interactions of vehicle queues. The operational analysis did not indicate that this short spacing would present a problem at 2024 forecast volume levels.

Table 61-1

Exit 61 -- Levels of Service

	Southbound I-540 Ramps		Northbound I-540 Exit Ramp		Shiloh Rd and Southbound Hwy 71 Entrance Ramp		Northbound 71 Exit Ramp and Northbound I-540 Entrance Ramp	
2004 existing conditions	AM PM	not reviewed unsig.-LOS C on ramp	AM PM	not reviewed unsig.-LOS A	AM PM	not reviewed unsig.-LOS B on Shiloh	AM PM	not reviewed unsig.-LOS C on ramp
2024 existing conditions	AM PM	unsig.-LOS C on ramp unsig.-LOS F on ramp	AM PM	unsig.-LOS C on ramp unsig.-LOS B on ramp	AM PM	unsig.-LOS C on Shiloh unsig.-LOS C on Shiloh	AM PM	unsig.-LOS C on ramp unsig.-LOS F on ramp
signalize ramp	AM PM	LOS A LOS A	AM PM	unsig.-LOS C on ramp unsig.-LOS B on ramp	AM PM	unsig.-LOS C on Shiloh unsig.-LOS C on Shiloh	AM PM	LOS A LOS A

LOS = Level of Service



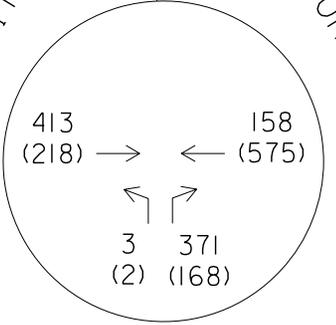
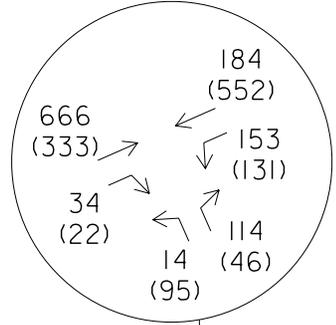
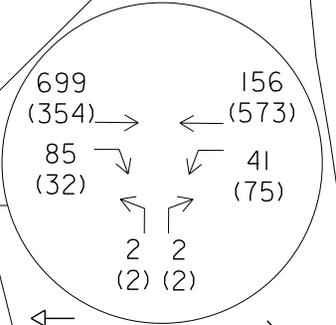
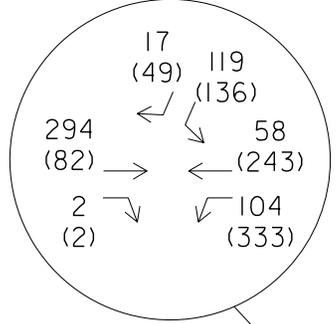
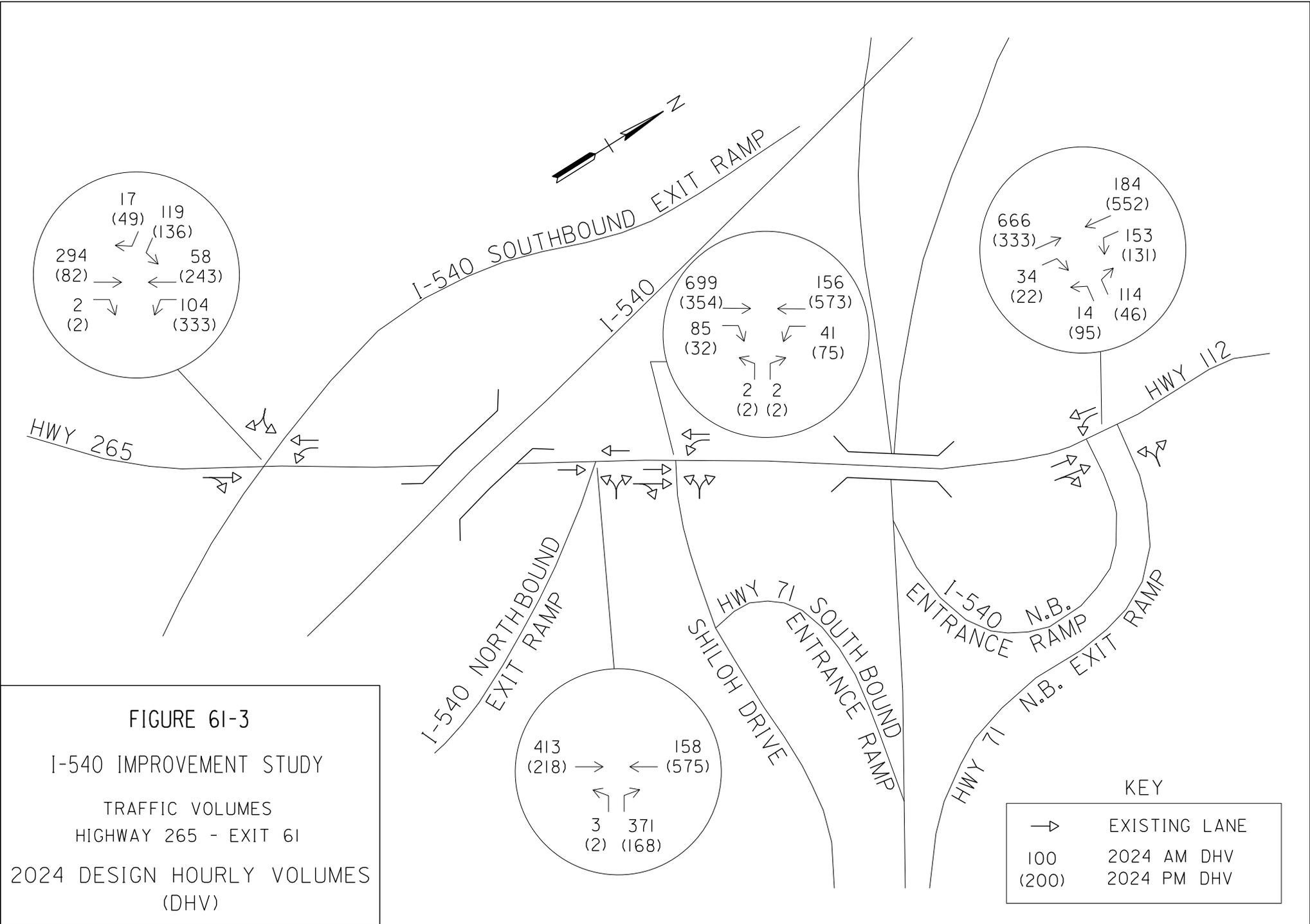


FIGURE 61-3
I-540 IMPROVEMENT STUDY
TRAFFIC VOLUMES
HIGHWAY 265 - EXIT 61
2024 DESIGN HOURLY VOLUMES (DHV)

KEY

→	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV

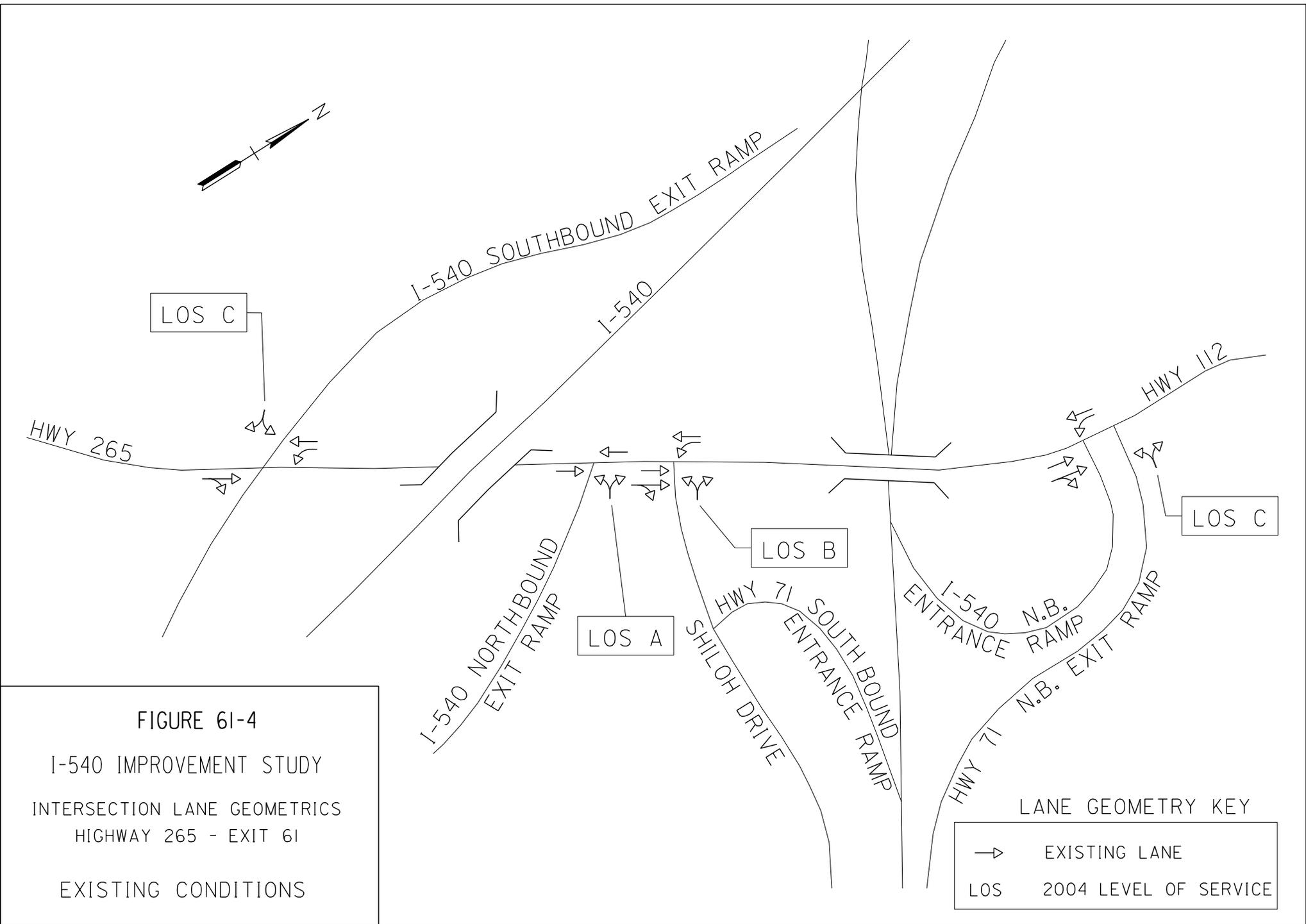


FIGURE 6I-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 265 - EXIT 61

EXISTING CONDITIONS

LANE GEOMETRY KEY

- EXISTING LANE
- LOS 2004 LEVEL OF SERVICE

Long-Term Improvements

The long-term recommended improvement is to signalize the two intersections mentioned above, when needed, to maintain acceptable Levels of Service at Exit 61. See Figure 61-5 for projected 2024 Levels of Service.

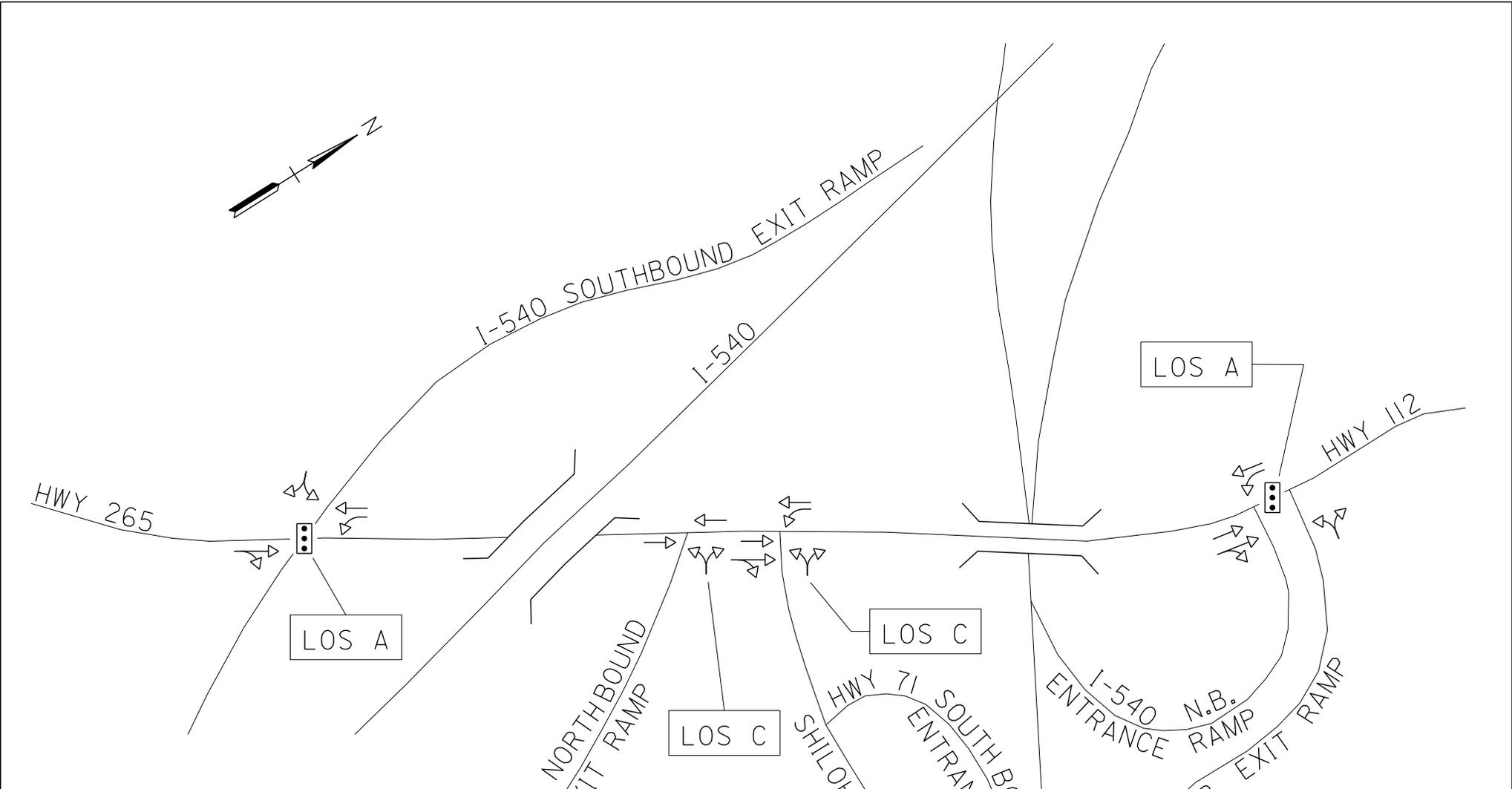


FIGURE 61-5

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 265 - EXIT 61

LONG-TERM IMPROVEMENTS

LANE GEOMETRY KEY

	EXISTING LANE
	PROPOSED TRAFFIC SIGNAL
LOS	2024 LEVEL OF SERVICE

WASHINGTON COUNTY INTERCHANGES

Exit 62

Interstate 540 at Highway 62 / Highway 180

(West Sixth Street)

**Exit 62 Interstate 540 at Highway 62/ Highway 180
(West Sixth Street)**

West Sixth Street in Fayetteville is a major arterial route with two through lanes in each direction and a continuous, two-way, left-turn lane in the area of the interchange. The interchange area is developed as a commercial center.

West Sixth Street is designated as Highway 62 to the west of the interchange, and as Highway 180 to the east. The interchange is configured with frontage roads that parallel I-540. The Interstate crosses over Highway 62/ Highway 180 at a slight skew. The northbound exit ramp turns out, forming a “J-hook” ramp to Futrall Drive, which is a two-way frontage road on the east side of I-540 south of Highway 180. Similarly, the southbound entrance ramp turns out from Shiloh Drive, which is a two-way frontage road on the west side of I-540 south of Highway 62.

North of Highway 62/ Highway 180, both Futrall Drive and Shiloh Drive are one-way streets. Futrall Drive is one-way in the northbound direction. Approximately 600 feet north of Highway 180, the northbound entrance ramp diverges from Futrall Drive onto I-540 Northbound, in a slip ramp configuration. Shiloh Drive is one-way in the southbound direction. The southbound exit ramp merges onto Shiloh Drive from I-540 Southbound approximately 2,700 feet north of Highway 62.

At the Local Officials’ Meeting of October 27, 2003, it was noted that growth in the areas west of Fayetteville is a major contributor to increasing traffic volumes on West Sixth Street (Highway 62/ Highway 180), which impacts I-540 operations.

Short-Term Analyses

Much of the congestion at this interchange is due to a heavy commuter pattern that carries motorists that live in areas served by Highway 62 to the west to employment that is accessed via I-540 to the north. This pattern results in a very heavy eastbound-to-northbound left turn at Highway 180 and Futrall Drive in the mornings, with a heavy return in the southbound-to-westbound right turn from Shiloh Drive onto Highway 62 in the afternoons.

The two intersections of Highway 62/ Highway 180 with the frontage roads are both signalized. Both experience congestion, which results in long queues during peak hours. A queue of over a quarter of a mile in length was observed stretching west from the

intersection of Highway 180 with Futrall Drive. Local motorists have indicated that this is a common occurrence during the morning peak time.

Base year traffic flow conditions were analyzed to determine levels of service. The intersection of Highway 62 with Shiloh Drive was found to operate at LOS E, and the intersection of Highway 180 with Futrall Drive was found to operate at LOS D. Also, the unsignalized intersection of Shiloh Drive with the southbound entrance ramp was found to operate at LOS A, and the intersection of the northbound exit ramp with Futrall Drive was found to operate at LOS B. See Table 62-1 for level of service findings. See Figure 62-1 for 2004 traffic volumes and Figure 62-3 for existing intersections geometries.

Short-Term Improvements

At the intersection of Highway 180 with Futrall Drive, it would be reasonable to install an auxiliary lane for right turns from westbound Highway 180 onto northbound Futrall Drive. This is a relatively high-volume turn. The provision of this turn lane would allow more green time from the traffic signal to be devoted to serving the very high volumes of eastbound-to-northbound left turns. The expected result would be to raise the level of service from LOS D to LOS C in the afternoon peak.

Similarly, at the intersection of Highway 62 with Shiloh Drive, an auxiliary lane for the eastbound-to-southbound right-turn should be installed. This is a smaller-volume turn, however, and appears to be more difficult to implement, and the payoff (in terms of delay reduction) would be less than for the turn lane proposed at Futrall Drive. Nevertheless, since this intersection is so congested, it would be prudent to take any possible steps to improve capacity. See Figure 62-4 for recommended short-term improvements.

Long-Term Analyses

Very heavy volumes are anticipated for this interchange, based on very high growth rates of travel through the area. See Figure 62-2 for 2024 traffic volume projections. The result is anticipated to be extremely long queues of traffic, with delay times ranging over four minutes per vehicle.

Table 62-1

Exit 62 -- Levels of Service

	Southbound Entrance Ramp @ Shiloh Dr	N. Shiloh Dr @ Hwy 62	N. Futrall Dr @ Hwy 180		Northbound Exit Ramp @ Futrall Dr
2004 existing conditions	AM unsig. - LOS A PM unsig. - LOS A	AM LOS D/E PM LOS E	AM LOS B/D PM LOS D		AM unsig. - LOS B on ramp PM unsig. - LOS B on ramp
2007 Short term Add aux. Lanes	AM LOS A PM LOS A	AM LOS E PM LOS E long queues	AM LOS B/ D PM LOS C		AM unsig. - LOS B on ramp PM unsig. - LOS B on ramp
2014 Interim Improvements Add lane under bridge. Move NB Entrance Ramp to future location	AM LOS A PM LOS A	AM LOS D PM LOS D/E	AM LOS C/D PM LOS C/D		AM unsig. - LOS B on ramp PM unsig. - LOS C on ramp
2024 Existing Conditions	AM LOS A PM LOS A	AM LOS F PM LOS F	AM LOS F PM LOS F		AM LOS C on ramp PM LOS D on ramp
SPUI single-point urban interchange triple-left turn fragile interactions	AM unsig - LOS A PM unsig - LOS A	AM LOS D/ E PM LOS D/ E	AM LOS F PM LOS D/ E	AM LOS D PM LOS B/ D	AM unsig - LOS B PM unsig - LOS B
widen Highway 62 to 6 lanes. Widen to 9 lanes under I-540. Widen Shiloh Dr.; triple-left turn	AM unsig - LOS A PM unsig. - LOS A	AM LOS D/ F PM LOS D/ F		AM LOS D/E PM LOS D/ E	AM unsig - LOS C on ramp PM unsig. - LOS D on ramp
widen Highway 62 to 6 lanes Add loop to SE quad Widen Shiloh Dr. Triple left turn	AM unsig. - LOS A PM unsig. - LOS A	AM LOS D PM LOS D/ E		AM LOS C/ D PM LOS C/ D	AM unsig. - LOS C on ramp PM unsig. - LOS D on ramp

LOS = Level of Service

The future traffic volumes at this interchange are very high, and no strategy was found that would yield satisfactory operations unless the crossroad is also widened. The widening of Highway 62/ Highway 180 is featured in the *Master Street Plan of the Traffic and Transportation Study of the City of Fayetteville* (dated October, 2003, by Bucher, Willis, Ratliff). Several alternative strategies were considered:

- Widen existing roads — The existing interchange configuration was considered with added lanes.
- Single Point Urban Interchange (SPUI) — Conversion of the interchange to a SPUI was considered. Unlike the proposal in the *Traffic and Transportation Study of the City of Fayetteville*, Shiloh Drive and Futrall Drive were left in their current alignments. Road widening was also part of this strategy.
- Add a loop ramp — An interchange configuration was reviewed that would feature a loop ramp in the southeast quadrant, to serve eastbound-to-northbound turns.

Widen Existing Roads

Adding lanes to the existing interchange configuration would require a significant widening in the interchange area. In order to serve the heavy turns noted above, triple turn lanes would be required for the eastbound-to-northbound left turn from Highway 62 onto Futrall Drive. In order to encourage lane utilization of the triple left turn, the northbound entrance ramp would need to be relocated a minimum of 1,500 feet north of its current location and widened to two lanes. The existing northbound entrance ramp is expected to decline in operational character such that it is likely to experience LOS E by the year 2013 and to drop to LOS F by 2021. Futrall Drive would need to be widened to three lanes from Highway 62/ Highway 180 to the northbound entrance ramp.

Southbound Shiloh Drive would need to be widened to five lanes in order to allow triple right turns and triple left turns (using a shared lane). At the Shiloh Drive intersection, the eastbound approach would need to be six lanes wide, in order to reduce the incidences in which queues from the intersection with Futrall Drive back through the intersection with Shiloh Drive. Even with the extreme widening proposed, queues would be expected to develop that would interfere with operations at nearby intersections.

Single-Point Urban Interchange

Creating a single-point interchange would require widening similar to that needed if the existing configuration is retained. However, the efficiency gain that is expected from the traffic signal when SPUI interchanges are typically developed would be negated at this

location, because Shiloh Drive and Futrall Drive are both two-way streets on the south side of Highway 62/ Highway 180. The crossing moves and left turns needed to serve northbound Shiloh Drive and southbound Futrall Drive would require signalization at these two locations. The result would be interlocking queues. After investigating this configuration, it was determined that it should be discarded unless other measures are taken.

The proposed relocation of Shiloh Drive and Futrall Drive, as proposed in the *Traffic and Transportation Study of the City of Fayetteville*, is beyond the scope of this study. Also beyond the scope of this study is the conversion of Shiloh Drive and Futrall Drive into one-way streets south of Highway 62/ Highway 180. This potential strategy could be considered. Either of these strategies would involve substantial modifications to Fayetteville city streets at significant distances from the interchange.

Add Loop Ramp

Because the eastbound-to-northbound left turn at the intersection with Futrall Drive is anticipated to develop into such a high traffic demand, a loop ramp was considered for this turn. Implementation of a loop ramp would have serious consequences in the way of right-of-way needs in the southeast quadrant of the interchange. The proposed loop ramp would need to be developed as a two-lane loop ramp. The projected volume for the proposed loop ramp would be approximately 1,500 vehicles per hour in the morning peak in the year 2024. Over 1,200 of these are eastbound through vehicles at the intersection of Highway 62 with Shiloh Drive. Though this volume could be potentially handled with a single-lane ramp in a freeway situation, this proposed loop ramp would begin at a point approximately 400 feet east of the Shiloh Drive intersection. The traffic signal at the Shiloh Drive intersection will not be able to accommodate the demand volume of 1,200 vehicles per hour in one eastbound through lane. Since two lanes will be needed through the traffic signal, then two lanes must be provided on the ramp, as 400 feet would not be an adequate distance to accommodate all of the merging that would be needed to get this traffic into one lane. The loop ramp should be carried as two lanes completely around the loop, so that the subsequent lane drop taper would not begin until the traffic has traversed the loop and entered into tangent lanes alongside the I-540 northbound lanes. A minimum radius of 230 feet should be used for the ramp, which would allow an approximate ramp speed of 30 mph. On the loop portion of the two-lane loop ramp, the lanes should be widened to at least seventeen feet wide, to provide a better “comfort level” for motorists, and to allow long trucks to traverse the loops without encroaching into the adjacent lane.

The loop ramp would need to be implemented in addition to the proposed widening of Highway 62/ Highway 180 through the interchange area. In order to minimize the needed right-of-way, it is proposed that the I-540 mainline lanes be relocated to the west as they cross Highway 62/ Highway 180. In order to accommodate the westward shift of the mainline lanes, it is proposed to relocate the southbound entrance ramp to the south, so that the ramp terminal intersection will move to a point approximately 1,200 feet south of Highway 62 on Shiloh Drive. In order to make room for the loop, it is proposed to relocate the northbound exit ramp approximately 220 feet southward on Futrall Drive. Futrall Drive would be relocated approximately 200 feet to the east. The proposed loop ramp and Futrall Drive relocation will require substantial acquisition of right-of-way, requiring the relocation of at least three businesses. See Figure 62-5.

In order to make room for the lane drop that must take place on I-540 north of the loop ramp, it is proposed to relocate the northbound entrance ramp further north approximately 800 feet to a point at least 1,500 feet north of Highway 180. This will move the slip ramp exit gore north on Futrall Drive to a point at least 500 feet past the intersection of Futrall Drive with West Old Farmington Road. There is a concern that this would attract traffic onto West Old Farmington Road as a route to access northbound I-540. The reason to be sensitive to traffic growth on West Old Farmington Road is the presence of two schools in the area: Ramay Junior High and West Campus Technical Center. The City of Fayetteville has recently removed a short block of West Old Farmington Road east of its intersection with South Sang Avenue. This geometric change will reduce the attraction of West Old Farmington Road as an alternate route to the northbound entrance ramp. Implementation of the recommended westbound right turn lane for Highway 180 onto Futrall Drive would also reduce the attraction of West Old Farmington Road as a through route. If the traffic growth or speeds do become a problem, then it would be possible for the City of Fayetteville to address the issue by additional traffic calming measures. On Futrall Drive, access control is recommended on the east side of the street opposite the proposed diverge gore area of the relocated northbound entrance ramp for an approximate distance of 500 feet.

The loop ramp option must include widening of Highway 62/ Highway 180 through the interchange area. It would not be adequate to construct the loop ramp without widening the crossroad. Also, the loop ramp primarily addresses traffic congestion that peaks in the morning. In order to address afternoon congestion, it would be necessary to widen Shiloh Drive as it approaches Highway 62 to five lanes.

I-540

North of this interchange, it is proposed to widen I-540 to six lanes. Thus, the northbound entrance ramp should become a lane addition, and the southbound exit ramp should be a lane drop. If a loop ramp is implemented, the loop ramp should be the lane addition.

Improving traffic flow through the intersections on Highway 62/ Highway 180 should result in enhanced traffic flow onto the entrance ramps. For the northbound entrance ramp, it appears that a two-lane ramp will be necessary. The loop ramp option is attractive because it would allow the northbound entrance merge operation to occur in two stages.

Shiloh Drive

Shiloh Drive is proposed to be widened from four to five lanes at the approach to the intersection with Highway 62. North of the intersection approach, Shiloh Drive is a two-lane, one-way street. North of Old Farmington Road, the southbound exit ramp enters Shiloh Drive as a slip ramp. The projected year 2024 volume on the southbound exit ramp is too high to be accommodated in a single lane. It is recommended that the slip ramp be widened to two lanes, and that a lane be added to Shiloh Drive south to the Highway 62 intersection.

Long-Term Improvements

Widening of Highway 62/ Highway 180 will be essential to accommodate the anticipated travel demand through this interchange. Widening will also be required on Shiloh Drive, and on Futrall Drive. It is recommended that the loop ramp option be implemented in the southeast quadrant of the interchange with additional improvements as described above. See Figure 62-5 for the recommended geometry.

Interim Improvements

It would be possible to improve the traffic flow through the interchange area on an interim basis. These improvements are more ambitious than the recommended short-term improvements and would be more expensive, but would be anticipated to extend the period of time for which an acceptable operating character would be expected for the existing interchange configuration. LOS E or better would be anticipated until approximately the year 2019 if these improvements are implemented.

A lane could be added to Highway 62/ Highway 180 underneath the existing I-540 bridges that would be used to provide additional storage for the dual-left turn lanes on eastbound Highway 62/ Highway 180 at Futrall Drive. If the northbound entrance ramp were

relocated as recommended above under Long-Term Improvements with the proposed loop ramp option, the dual left-turn could achieve adequate utilization. The current operation of this dual turn is such that there is very poor utilization of the second left-turn lane because of limited storage capacity and the proximity of the entrance ramp gore which is approximately 600 feet north of the intersection on Futrall Drive. In addition, a westbound through lane could be added to Highway 62 through the Shiloh Drive intersection. In order to achieve adequate utilization of this lane, it would need to be extended along Highway 62 for at least 1,200 feet west of Shiloh Drive before beginning a lane drop taper. These improvements would be expected to preserve LOS D for intersection operations until at least the year 2013. See Figure 62-6 for the suggested Interim Improvements.

I-540 Northbound Entrance Ramp

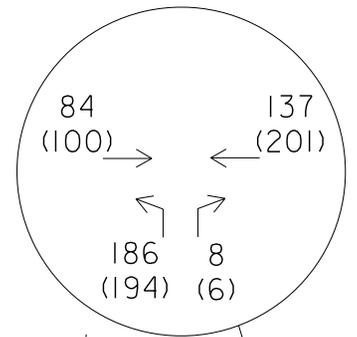
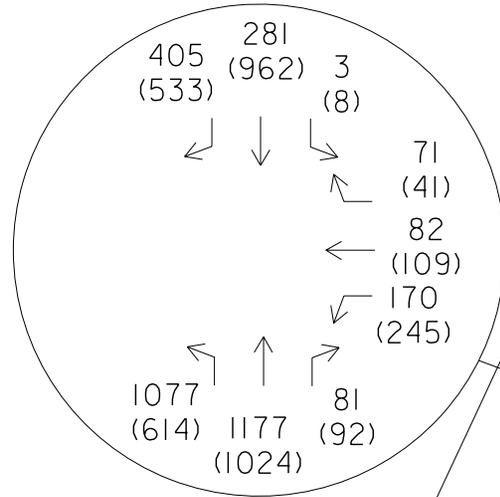
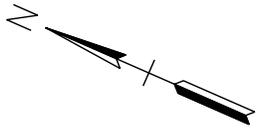
If the suggested Interim Improvements are implemented, then the date of implementation of the recommended loop ramp option could be delayed. During the intervening years, the northbound entrance ramp is expected to experience congestion. Currently, the congestion at the intersections on Highway 62/ Highway 180 limits the flow of traffic that is destined for the ramp. With intersection improvements discussed above, the ramp will become congested. The northbound entrance ramp merge is expected to experience a decline in operational character from LOS C to LOS E in about 2013 and to drop to LOS F by 2021.

Rather than relocating the ramp northwards for the interim improvements, it would be possible to widen the existing ramp into a two-lane ramp. This would accomplish the utilization of the dual left turns at the intersection of Highway 62/ Highway 180 with Futrall Drive. However, if the loop option is selected as the long-range solution for this interchange, then the ramp would eventually need to be relocated anyway, in order to make room along the I-540 northbound lanes for the long ramp runout that would be needed to accommodate the two-lane loop.

Whether the northbound entrance ramp is widened to two lanes or relocated northward, a significant extension of the ramp runout will be required. If possible, the best approach would be to create an auxiliary lane on northbound I-540 that would extend all the way from the Highway 62/ Highway 180 interchange to the northbound exit ramp at the interchange of I-540 with Highway 16/ Highway 112 Spur (Exit 64). This auxiliary lane could serve in the future as the added lane on I-540 that is recommended as part of the mainline widening.

KEY

→	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV



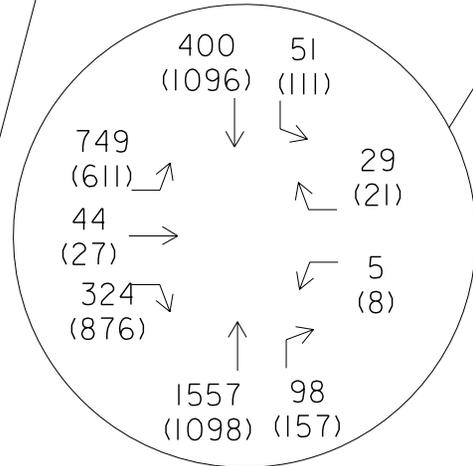
FUTRALL DR

I-540

NORTHBOUND
EXIT RAMP

SHILOH DR

SOUTHBOUND
EXIT RAMP



HWY 62

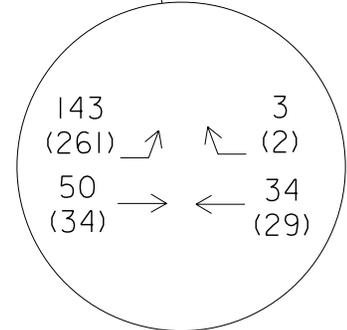


FIGURE 62-1

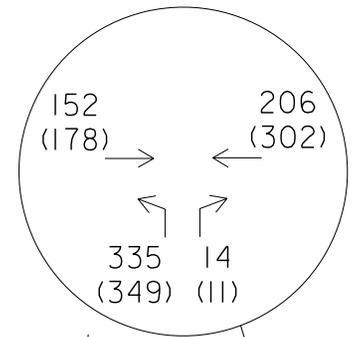
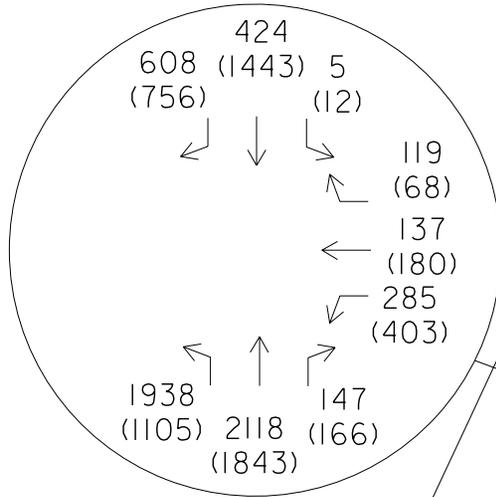
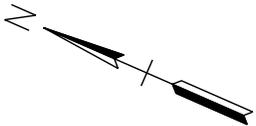
I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 62 - EXIT 62

2004 DESIGN HOURLY VOLUMES
(DHV)

KEY

→	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV



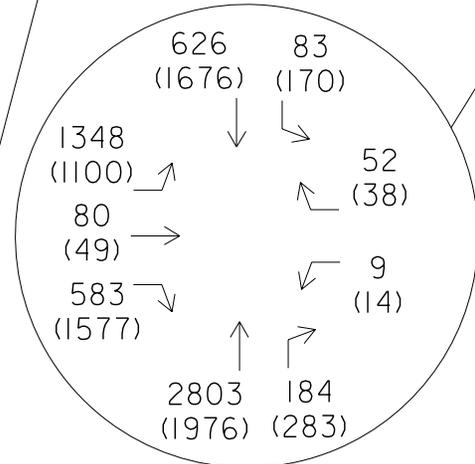
FUTRALL DR

I-540

NORTHBOUND
EXIT RAMP

SHILOH DR

SOUTHBOUND
EXIT RAMP



HWY 62

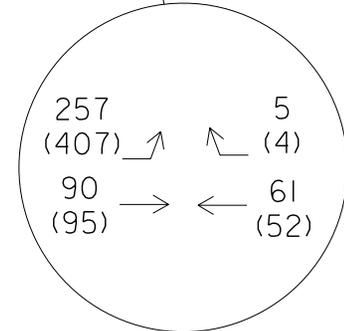


FIGURE 62-2

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 62 - EXIT 62

2024 DESIGN HOURLY VOLUMES
(DHV)

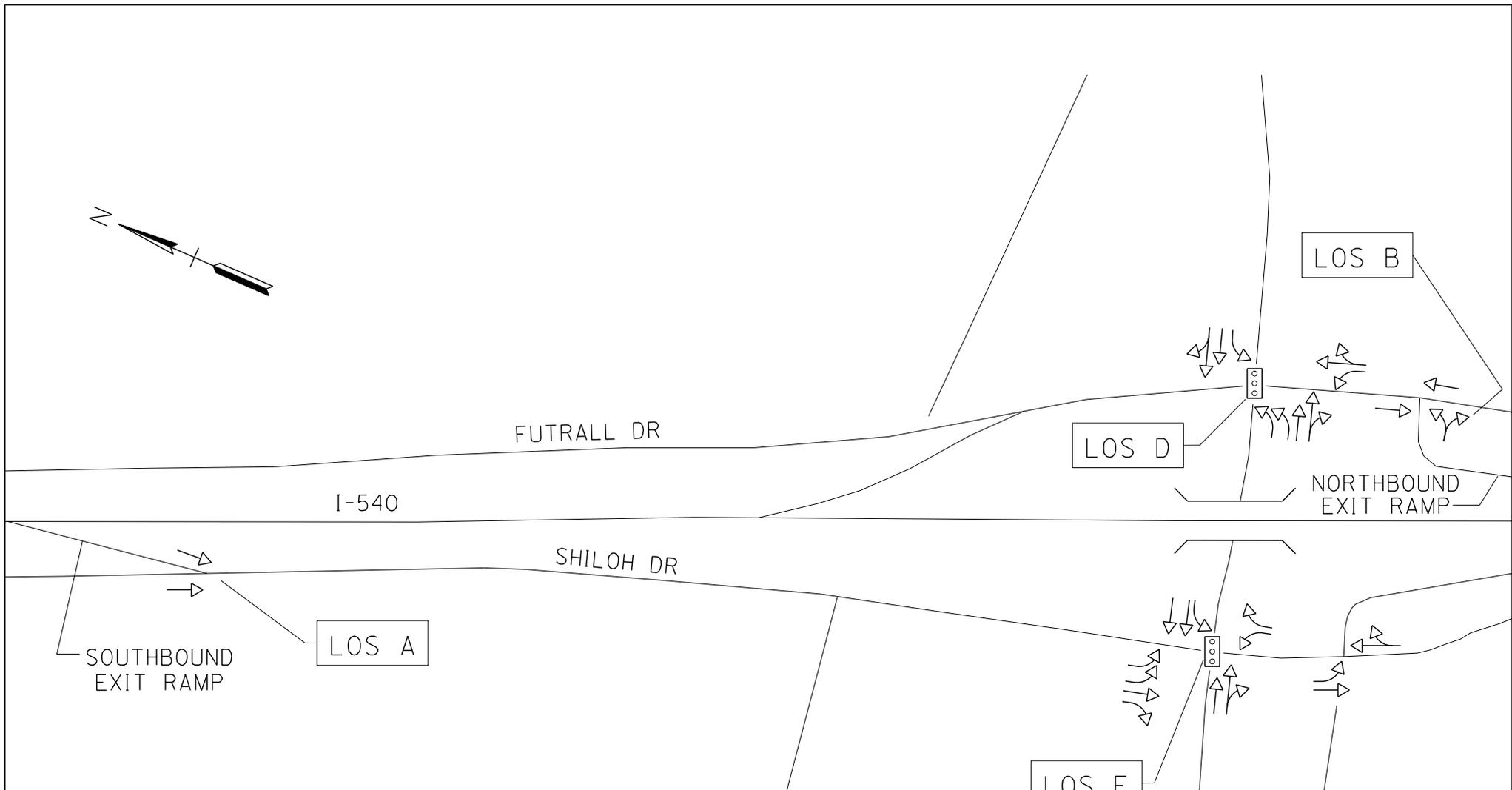
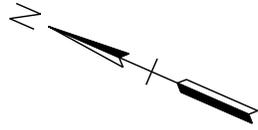


FIGURE 62-3
I-540 IMPROVEMENT STUDY
INTERSECTION LANE GEOMETRICS
HIGHWAY 62 - EXIT 62
EXISTING CONDITIONS

LANE GEOMETRY KEY

	EXISTING LANE
	EXISTING TRAFFIC SIGNAL
LOS	2004 LEVEL OF SERVICE

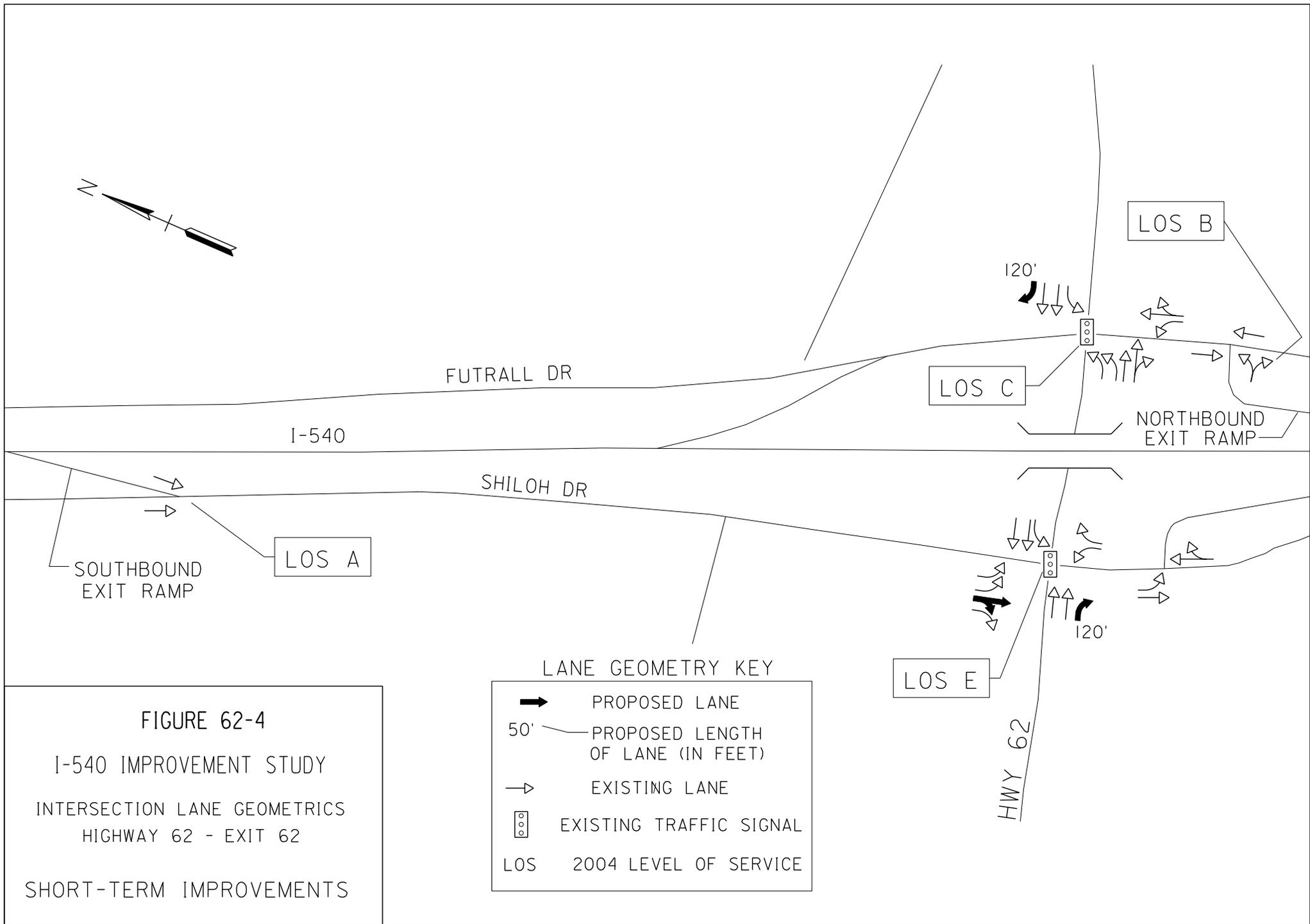
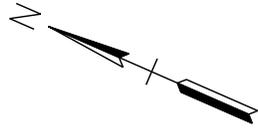


FIGURE 62-4

I-540 IMPROVEMENT STUDY

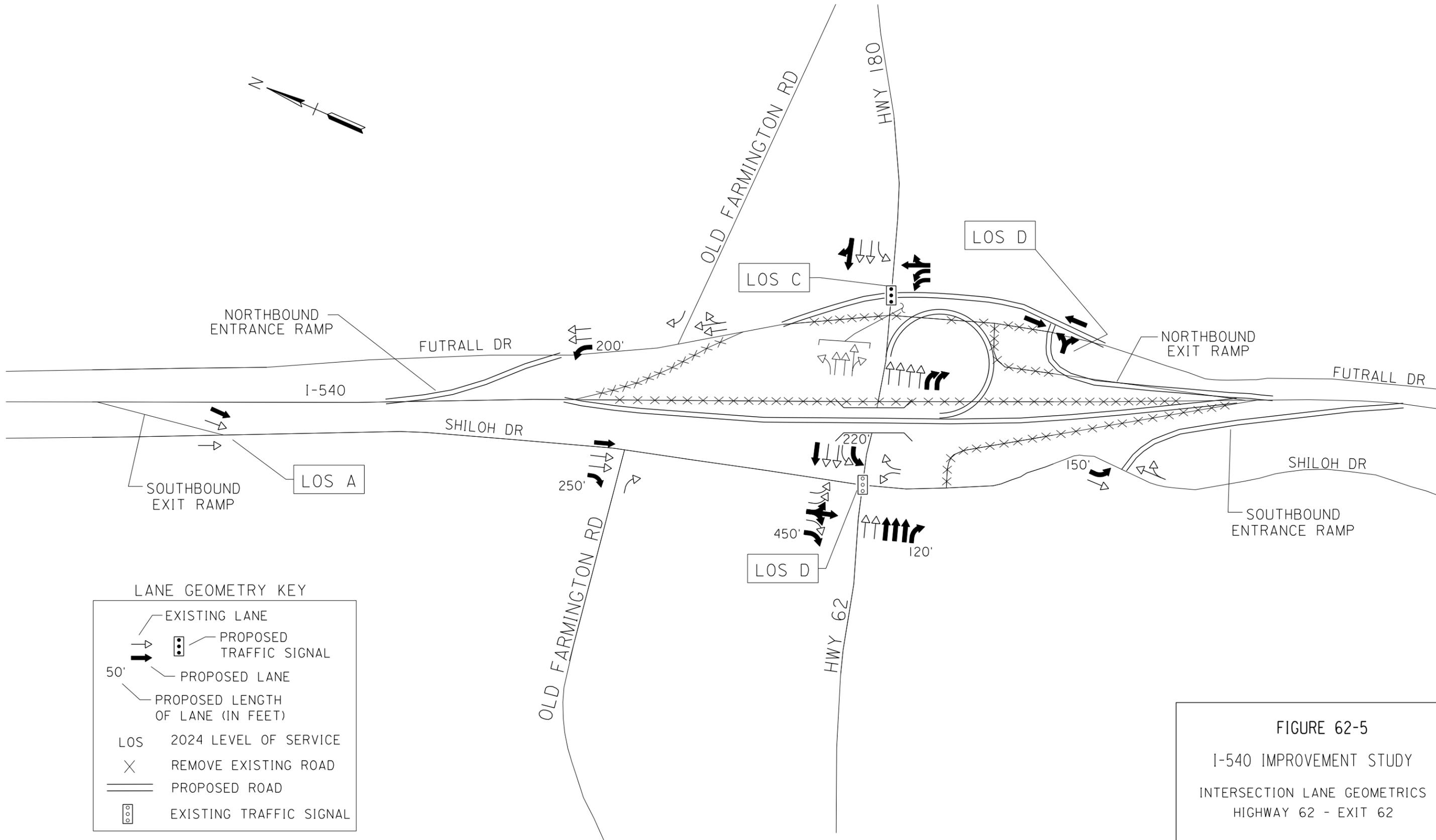
INTERSECTION LANE GEOMETRICS

HIGHWAY 62 - EXIT 62

SHORT-TERM IMPROVEMENTS

LANE GEOMETRY KEY

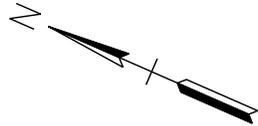
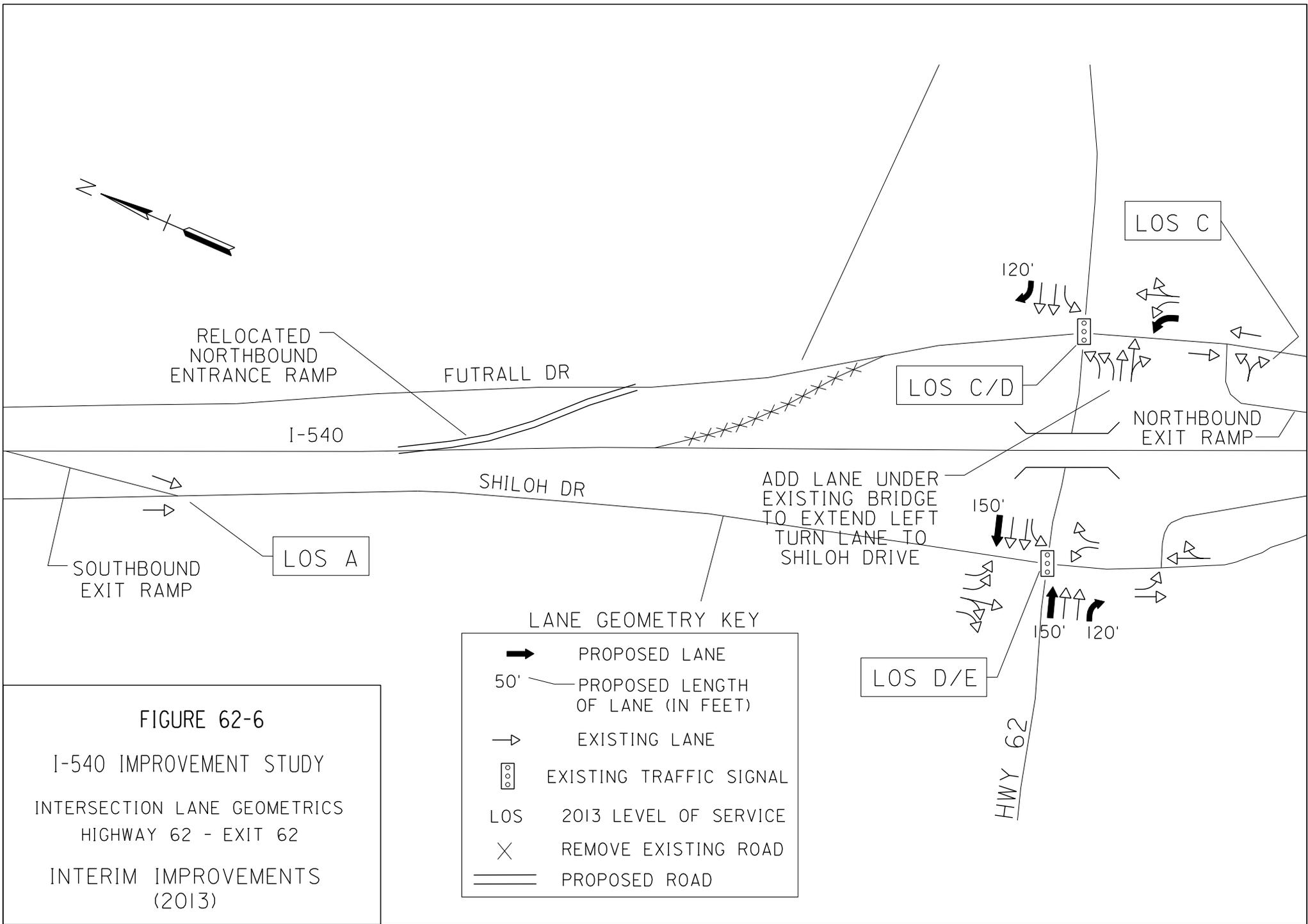
-  PROPOSED LANE
- 50'  PROPOSED LENGTH OF LANE (IN FEET)
-  EXISTING LANE
-  EXISTING TRAFFIC SIGNAL
- LOS 2004 LEVEL OF SERVICE



LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- PROPOSED LENGTH OF LANE (IN FEET)
- PROPOSED TRAFFIC SIGNAL
- EXISTING TRAFFIC SIGNAL
- LOS 2024 LEVEL OF SERVICE
- REMOVE EXISTING ROAD
- PROPOSED ROAD

FIGURE 62-5
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 62 - EXIT 62
 LONG-TERM IMPROVEMENTS



RELOCATED
NORTHBOUND
ENTRANCE RAMP

FUTRALL DR

I-540

SHILOH DR

SOUTHBOUND
EXIT RAMP

LOS A

ADD LANE UNDER
EXISTING BRIDGE
TO EXTEND LEFT
TURN LANE TO
SHILOH DRIVE

LOS C/D

LOS C

NORTHBOUND
EXIT RAMP

120'

150'

150'

120'

LOS D/E

HWY 62

LANE GEOMETRY KEY

	PROPOSED LANE
50'	PROPOSED LENGTH OF LANE (IN FEET)
	EXISTING LANE
	EXISTING TRAFFIC SIGNAL
LOS	2013 LEVEL OF SERVICE
	REMOVE EXISTING ROAD
	PROPOSED ROAD

FIGURE 62-6

I-540 IMPROVEMENT STUDY
INTERSECTION LANE GEOMETRICS
HIGHWAY 62 - EXIT 62
INTERIM IMPROVEMENTS
(2013)

WASHINGTON COUNTY INTERCHANGES

Exit 64

Interstate 540 at Highway 16 / Highway 112 Spur

(Wedington Drive)

Exit 64 Interstate 540 at Highway 16/ Highway 112 Spur (Wedington Drive)

Highway 16/ Highway 112 Spur in Fayetteville is a major arterial route with two through lanes in each direction and a continuous two-way left-turn lane between the ramp terminals. Wedington Drive is designated as Highway 16 to the west, and as Highway 112 Spur to the east.

The interchange is a diamond interchange, with Highway 16/ Highway 112 Spur crossing over I-540. There are frontage roads that parallel I-540. South of Highway 16/ Highway 112 Spur, the frontage roads are one-way streets south to the Highway 62 interchange.

On the west side of I-540, the frontage road is Shiloh Drive. North of Highway 16, Shiloh Drive is a two-way street. On the east side of I-540, the frontage road is Futrall Drive. Futrall Drive is also a two-way street north of Highway 112 Spur, and it reaches a dead end a short distance to the north. On both sides of the interchange, the frontage road intersections are located very close to the ramp terminal intersections. The close spacing of these intersection pairs is a current cause of traffic flow problems because queues of vehicles from one intersection back through the previous intersection.

In the Local Officials' Meeting on October 27th, 2003, it was stated that growth in the areas west of Fayetteville is a major contributor to increasing traffic volumes on Wedington Drive, which impacts I-540 operations.

Short-Term Analyses

Much of the congestion at this interchange is due to a heavy commuter pattern that carries motorists that live in areas served by Highway 16 to the west to employment that is accessed via I-540 to the north. This pattern results in a very heavy eastbound-to-northbound left turn onto the northbound entrance ramp in the mornings, with a heavy return in the southbound-to-westbound right turn at the southbound exit ramp in the afternoons. See Figure 64-1 for 2004 traffic volumes.

All four of the referenced intersections are signalized. In order to better accommodate the heavy southbound-to-westbound right turn, AHTD recently widened the southbound exit ramp to add an auxiliary lane. With this lane in place, the ramp terminal intersection currently experiences LOS E during afternoon peak conditions. All other

approaches yield LOS D conditions or better for peak hours, but there are problems due to the interactions of intersection queues, that occasionally create back-up conditions. The level of service findings are shown in Table 64-1 and existing intersection geometries are shown in Figure 64-3.

Short-Term Improvements

At this interchange, potential auxiliary lanes were investigated to determine which ones would provide the greatest improvement to traffic flow characteristics. The addition of these auxiliary lanes could greatly increase the service life of the existing interchange.

At the intersection of Highway 16 with Shiloh Drive, a southbound left-turn lane and an eastbound right-turn lane are proposed. At the intersection with the southbound ramps, an eastbound right-turn lane is proposed. Also, for the southbound exit ramp, it is proposed to add another auxiliary lane in order to create a dual right-turn, which would then be signalized. This would reduce the efficiency of the southbound right turn during off-peak times, but would increase the capacity of the turn during peak times. It would also facilitate traffic flow if the westbound left-turn lane were changed to a through-left onto the southbound entrance ramp.

At the intersection of Highway 16/ Highway 112 Spur with the northbound ramps, auxiliary lanes are proposed for a northbound right-turn lane and a westbound right-turn lane. At the intersection of Highway 112 Spur with Futrall Drive, an auxiliary lane is proposed which would create a double-left-turn for the northbound approach on Futrall Drive.

These improvements could be staged over time, and would be expected to extend acceptable traffic flow operations to the year 2010 or later. See Figure 64-4 for the short-term recommendation.

Long-Term Analyses

Very heavy volumes are anticipated for this interchange, based on very high growth rates of travel through the area. The result is anticipated to be extremely long queues of traffic, with delay times ranging over three minutes per vehicle. See Figure 64-2 for projected 2024 traffic volumes.

Table 64-1

Exit 64 -- Levels of Service

	N. Shiloh Dr	Southbound Ramps		Northbound Ramps		N. Futrall Dr
2004 existing conditions	AM LOS C PM LOS B/C	AM LOS A/C PM LOS F		AM LOS B PM LOS F		AM LOS B PM LOS C
2010 Short term improvements Add aux. Lanes	AM LOS B/C PM LOS D/C	AM LOS C on ramp PM LOS D on ramp	dbl right SB	AM LOS B PM LOS D		AM LOS B PM LOS C
2014 Interim Improvements Widen Shiloh Dr. Convert NB Exit Ramp and Futrall Dr. to future recommendation.	AM LOS B/C PM LOS D	AM LOS D on ramp PM LOS D	dbl right SB	AM LOS A PM LOS C		AM LOS C PM LOS C
2024 Existing Conditions	AM LOS F PM LOS F	AM LOS F PM LOS F		AM LOS F PM LOS F		AM LOS F PM LOS F
SPUI single-point urban interchange	AM LOS C PM LOS C/D	AM LOS A/D signalize PM LOS B/C triple right SB		SPUI AM LOS B/D PM LOS C/E	AM LOS C at NB off RT PM LOS B at NB off RT	AM LOS B/D PM LOS C/E
widen Highway 16 to 6 lanes. Widen Hwy 16 bridge over I-540 to 8 lanes. Add storage to exit ramps. requires good behavior	AM LOS B/D PM LOS B/D	AM LOS C Double right PM LOS C/E		AM LOS F on ramp PM LOS F on ramp		AM LOS C PM LOS C
Loop for SE quadrant	AM LOS B/C PM LOS B/C	AM LOS C on ramp PM LOS D on ramp		AM LOS A PM LOS A		AM LOS C PM LOS C

LOS = Level of Service

Several alternative strategies for this interchange were considered. The future traffic volumes are very high, and no strategy was found that would yield satisfactory operations unless a widening of Highway 16/ Highway 112 Spur is also implemented through the interchange area.

- Widen Highway 16/ Highway 112 Spur
- Single Point Urban Interchange (SPUI)
- Loop in the southeast quadrant

Widen Highway 16/ Highway 112 Spur

The existing Highway 16/ Highway 112 Spur would need to be widened from four to six lanes through the interchange. Both exit ramps would require double left-turns and double right-turns. One problem with the existing diamond configuration is that a triple left-turn is needed for eastbound traffic on Highway 16 turning onto the northbound entrance ramp. The runout length required for the proposed triple left auxiliary lanes on the ramp would push the entrance ramp north, causing merging traffic to interfere with traffic exiting for the subsequent interchange at Porter Road. Also, retaining the diamond configuration would keep the closely-spaced intersections in their current locations on the east side of the interchange, with continuing problems of queue interferences.

Single Point Urban Interchange (SPUI)

Reconfigure the interchange to bring the ramps all to a single intersection in the middle of the interchange. The SPUI intersection would be signalized, but since it would need only three phases, it should have relatively efficient operations. An additional advantage of the SPUI configuration would be that it would reduce the number of signalized intersections and increase the spacing between intersections. Compared to the SPUI option for the interchange of I-540 with Highway 62/ Highway 180 (Exit 62), the resulting distances between signalized intersections would be greater, by an average of over 100 feet. When investigated, however, the eastbound-to-northbound left turn would need to be a triple-left turn, and the southbound-to-westbound right turn would need to be a triple turn as well. Implementation of a SPUI would be very expensive at this location, since either the ramps would have to intersect on the bridge deck, or the I-540 mainline profile would have to be raised to take the interstate over Highway 16/ Highway 112 Spur.

Loop ramp in the Southeast quadrant

A loop ramp could be implemented in the Southeast quadrant, eliminating a traffic signal at the northbound ramps intersection. In order to make room for the loop ramp, the northbound exit ramp would have to be relocated at least 500 feet to the south, and be

reconfigured as a slip ramp so that it would exit to Futrall Drive, which is a one-way northbound frontage road. The relocated northbound exit ramp would have a merge gore onto Futrall Drive approximately 1,600 feet south of Highway 112 Spur. Access control would be needed on the east side of Futrall Drive opposite the merge gore area of the proposed northbound exit ramp. The northbound exit ramp traffic would be combined with the Futrall Drive traffic. Additional right-of-way would be required in the southeast quadrant to accommodate a realignment of Futrall Drive which would be necessary to make room for loop ramp construction.

As proposed, the loop ramp would be a two-lane ramp, similar to the one proposed at the interchange of I-540 with Highway 62/ Highway 180. The need for two lanes on the loop ramp is driven by the ability to accommodate the projected ramp volume (approximately 1,260 vehicles per hour) in the eastbound through lanes at the upstream intersection. See the discussion of the proposed loop ramp at the section for Exit 62. The two lanes should both continue around the loop, so that the downstream lane drop taper would not begin until the lanes reach a tangent alignment with the northbound lanes of I-540. A minimum radius of 230 feet should be used for the ramp, which would allow an approximate ramp speed of 30 mph. The preliminary layout plan shows a radius of 230 feet. Whatever radius is used, it should match the radius of the two-lane loop ramp that is recommended for the interchange of I-540 with Highway 62/ Highway 180, so that area motorists could become accustomed to similar geometrics at the two similar locations. On the loop portion of the two-lane loop ramp, the lanes should be widened to at least 17 feet to provide a better “comfort level” for motorists, and to allow long trucks to traverse the loops without encroaching into the adjacent lane.

With the loop ramp option, auxiliary lanes would still be required on the crossroad and on the southbound exit ramp as described for the widening option. The southbound ramps should be relocated to intersect Highway 16 at a point closer to the bridge over I-540 in order to increase the distance between this intersection and the intersection with Shiloh Drive. This will increase the space available to store queued vehicles.

I-540

The northbound entrance ramp merge onto northbound I-540 is the critical ramp junction at this interchange. This merge is expected to experience a decline in operational character from LOS D to LOS E in about the year 2008, and to drop to LOS F by 2014. The loop ramp option is attractive in addressing this situation by providing two separate entrance ramps.

Long-Term Improvements

The loop ramp option is recommended. This would reduce the number of traffic signals and permit continuous flow of the high volume turn. If implemented as a two-lane ramp, the loop ramp would reduce the incidences in which queues from the closely spaced intersections interfere with each other. See Figure 64-5 for the recommended geometry.

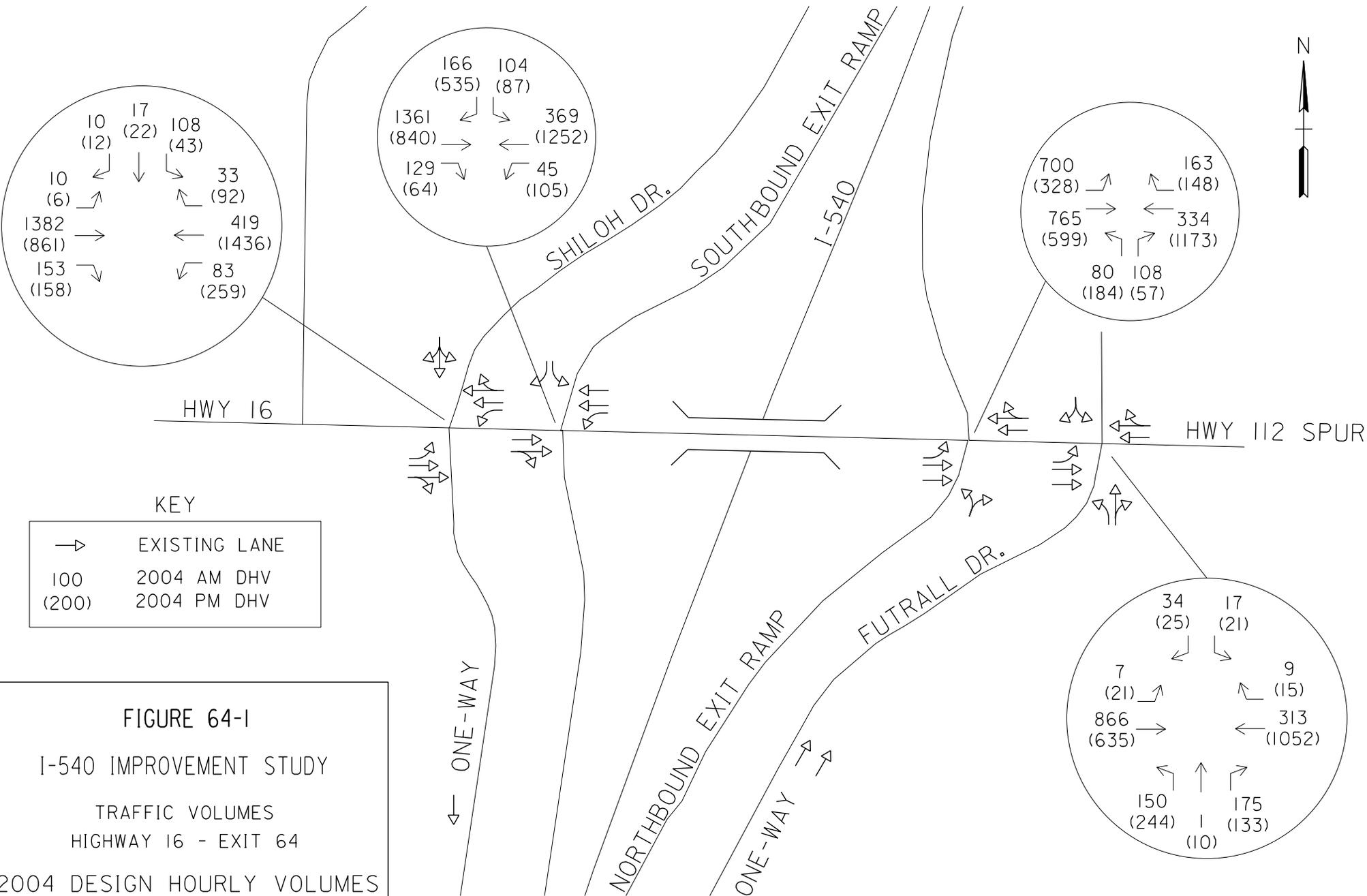
I-540

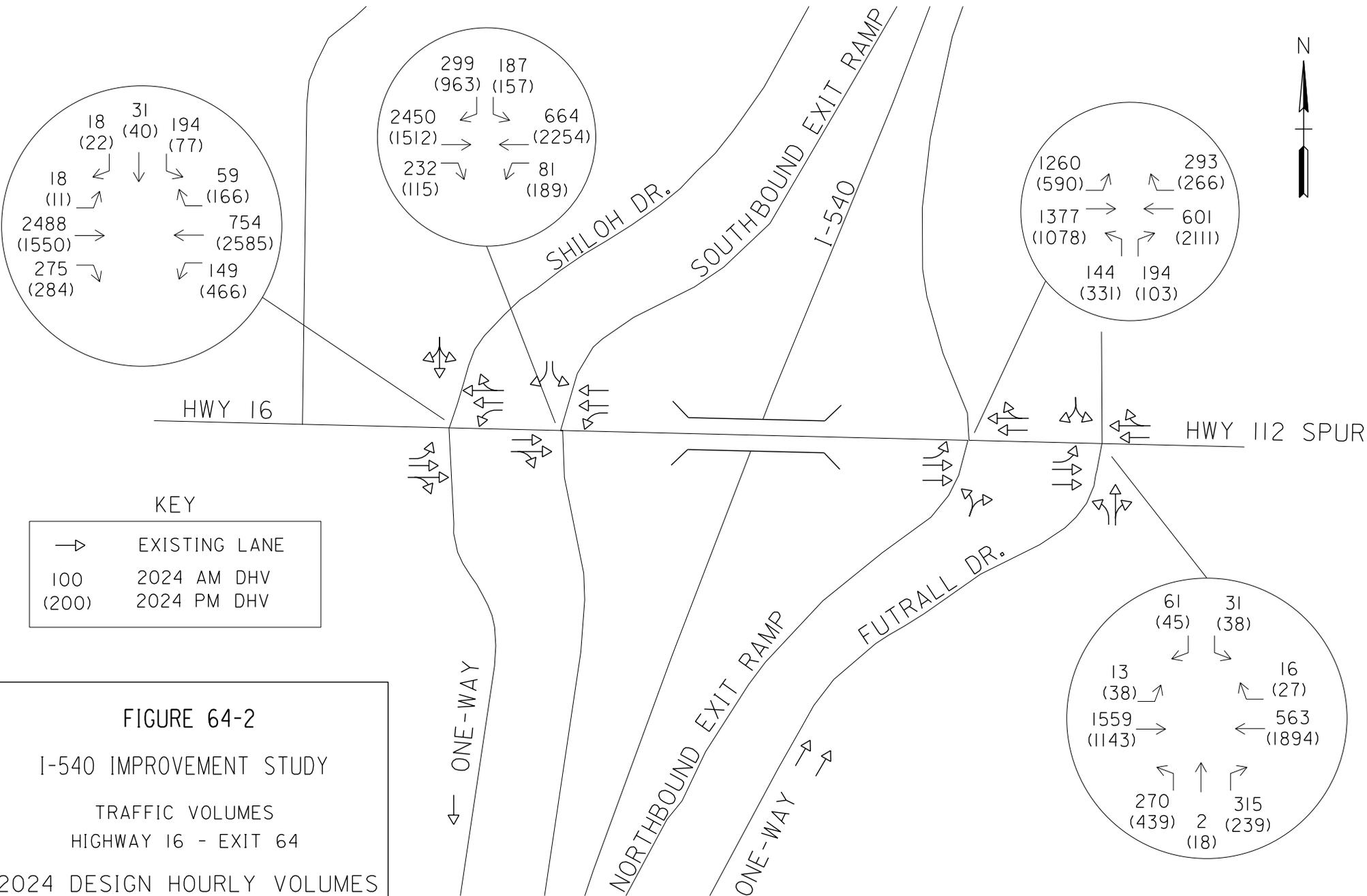
At this interchange, it is proposed that I-540 transition from six lanes to the south to eight lanes north of the interchange. This would allow the proposed loop ramp to become a lane add. Also, the high volume southbound exit ramp would become a lane drop.

Interim Improvements

Improvements could be made to this interchange that would improve traffic flow until the loop ramp proposal is implemented. These improvements would be in addition to the improvements listed above in the recommended short-term improvements. The first of these improvements should be the reconfiguration of the northbound exit ramp. Under the loop ramp proposal, this ramp would be relocated to the south and would become a slip ramp onto northbound Futrall Drive. Futrall Drive would then be relocated in order to make room for the loop. This work could be done in advance of the implementation of the loop. An advantage of this approach is that it simplifies the traffic queue interlocking problem on the east side of the interchange by consolidating all of the northbound traffic into one approach.

In addition, the southbound Shiloh Drive approach to Highway 16 should be widened to the extent proposed in all of the long-range improvement proposals. This would add another auxiliary lane and provide a double-left turn. These improvements would be expected to maintain LOS D operations or better at all four intersections until at least 2014. Beyond that time frame, it is anticipated that queues would begin to form that would lead to safety problems. In particular, the queue on the southbound exit ramp, and the queues between the two intersections on the west side of the interchange would be expected to interfere with operations in ways that would lead to intersection blocking or queues backing up to the southbound I-540 mainline. See Figure 64-6 for the recommended interim improvements.





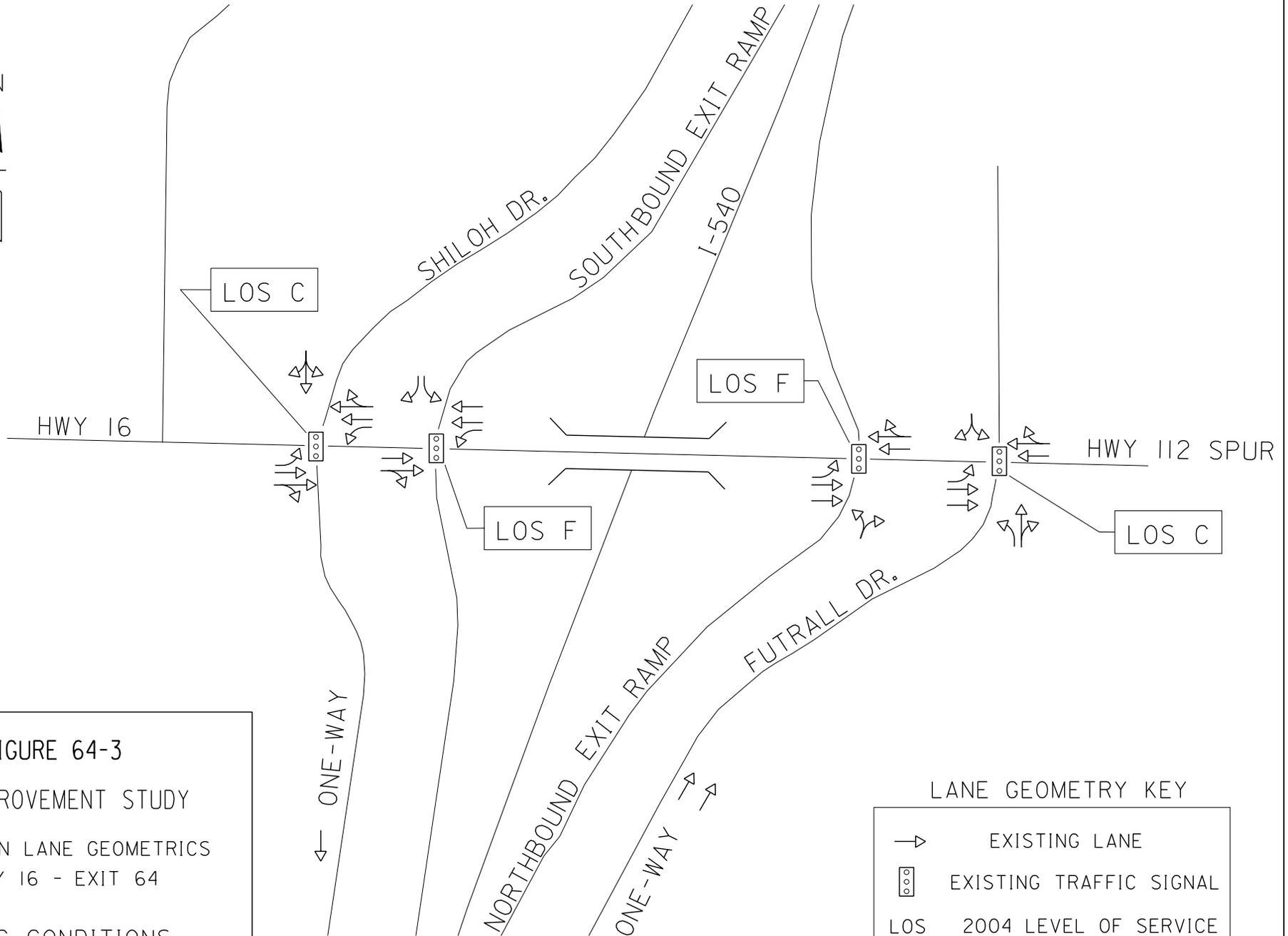


FIGURE 64-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 16 - EXIT 64

EXISTING CONDITIONS

LANE GEOMETRY KEY

- EXISTING LANE
- ◻ (with two circles) EXISTING TRAFFIC SIGNAL
- LOS 2004 LEVEL OF SERVICE

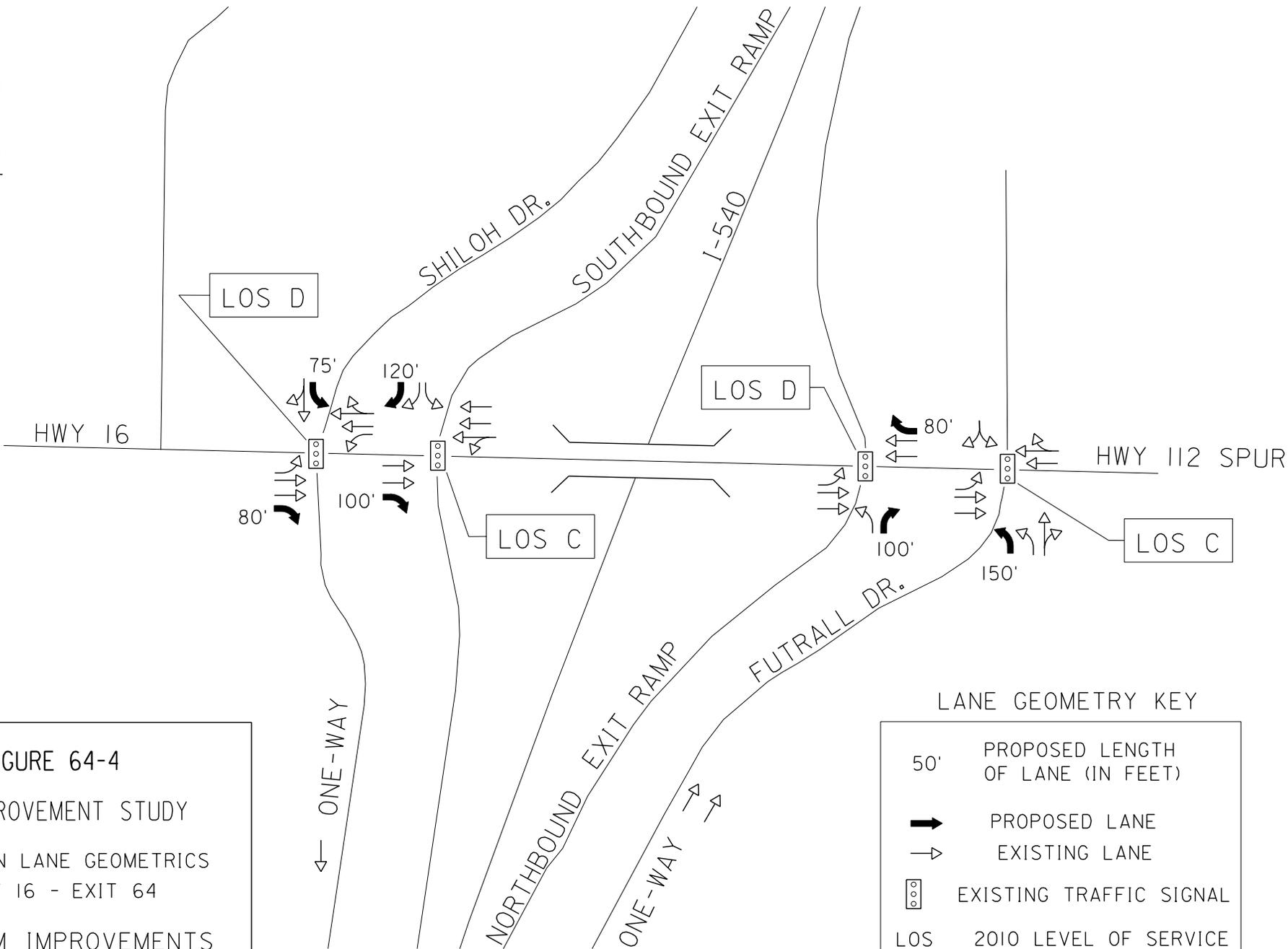


FIGURE 64-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 16 - EXIT 64

SHORT-TERM IMPROVEMENTS

(2010)

LANE GEOMETRY KEY

- 50' PROPOSED LENGTH OF LANE (IN FEET)
- PROPOSED LANE
- EXISTING LANE
- EXISTING TRAFFIC SIGNAL
- LOS 2010 LEVEL OF SERVICE

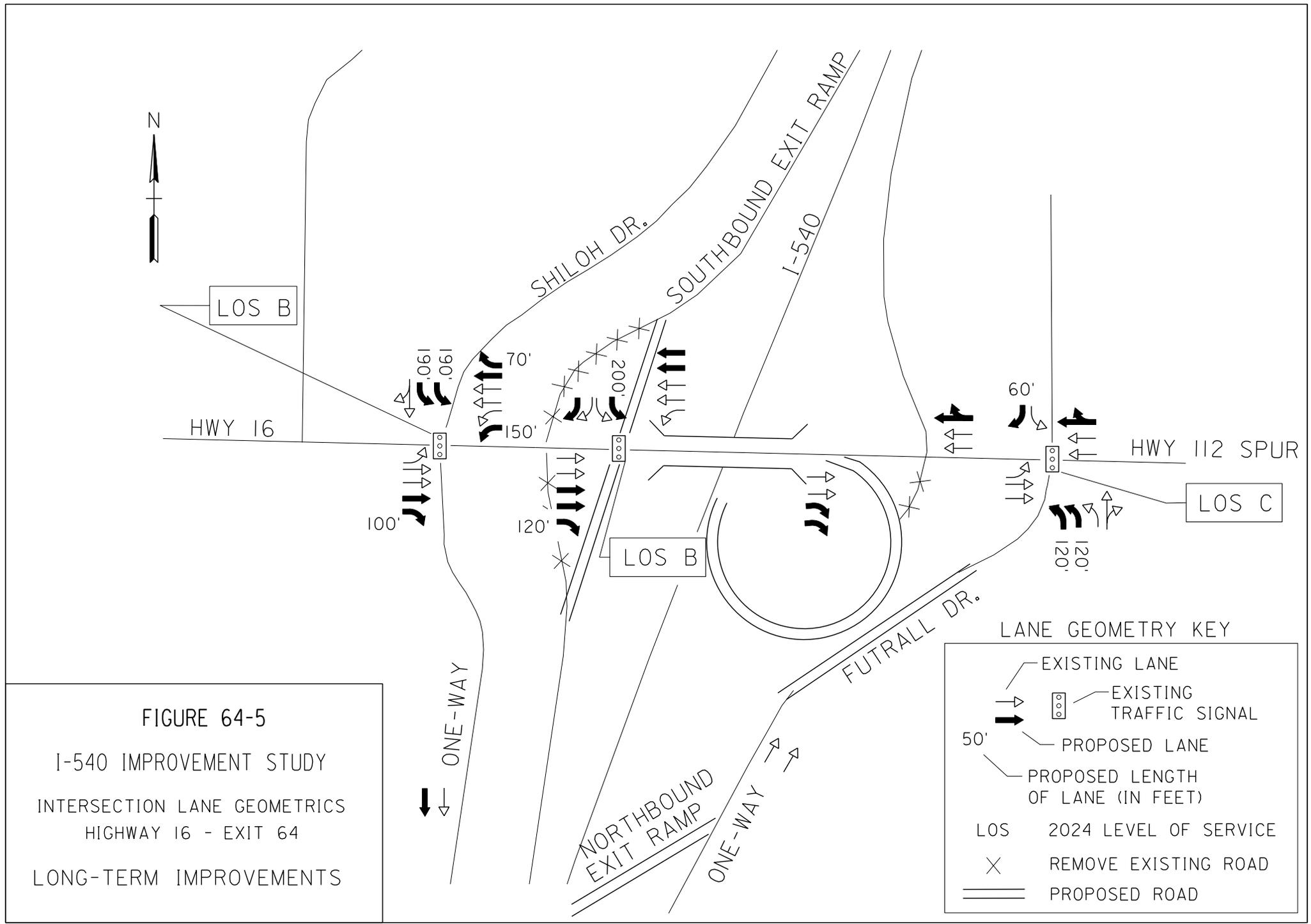


FIGURE 64-5
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 16 - EXIT 64
 LONG-TERM IMPROVEMENTS

LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- PROPOSED LENGTH OF LANE (IN FEET)
- REMOVE EXISTING ROAD
- PROPOSED ROAD

LOS 2024 LEVEL OF SERVICE

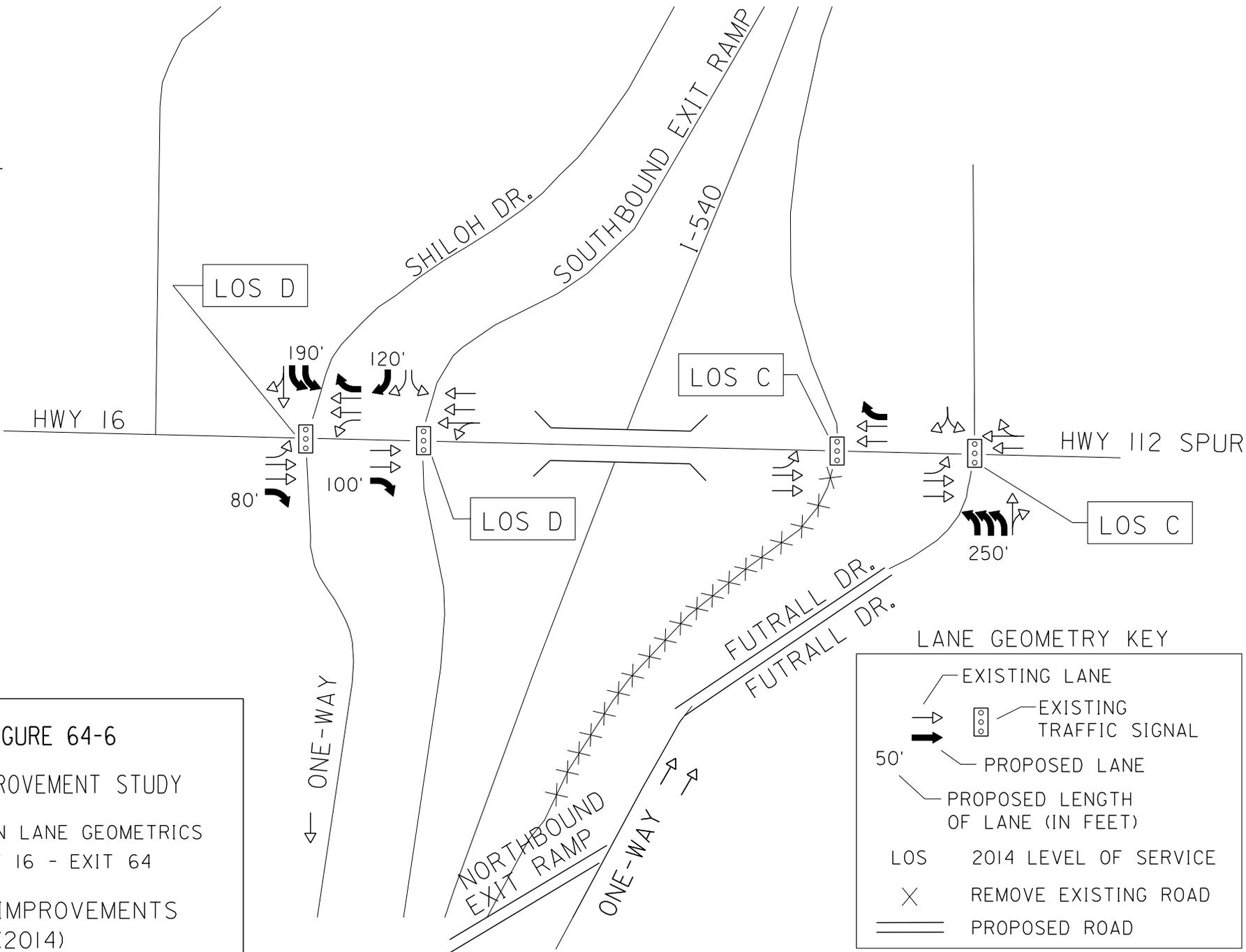


FIGURE 64-6

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 16 - EXIT 64

INTERIM IMPROVEMENTS

(2014)

WASHINGTON COUNTY INTERCHANGES

Exit 65

Interstate 540 at Porter Road

Exit 65 Interstate 540 at Porter Road

This interchange is a diamond interchange in north Fayetteville. Porter Road is a two-lane road, with I-540 crossing over Porter Road at a significant skew. Both ramp terminal intersections on Porter Road were analyzed. Also included in the study were two frontage road intersections of Shiloh Drive and Porter Road and the intersection of Deane Solomon Road and Porter Road. North of the intersections with Shiloh Drive, Porter Road curves to the west and becomes Mount Comfort Road forming one continuous route.

Comments were collected from the open house public meetings. The survey from the meetings held in October, 2003, asked if the respondent experienced traffic congestion while traveling on I-540. The segment of I-540 between Fayetteville and Highway 412 in Springdale which includes the Porter Road interchange was cited as an area having congestion during morning and afternoon rush hours. Also, during the local officials meeting on October, 27th 2003, it was noted that growth in the areas west of Fayetteville is a major contributor to increasing traffic volumes on Porter Road which affects I-540 operations.

Short-Term Analyses

All five intersections are currently unsignalized. Both ramp terminal intersections operate at LOS F for exit ramp traffic in the afternoon peak. The three remaining intersections function at LOS C for crossroad turning movements onto Porter Road. Operational difficulties were observed for trucks trying to turn onto Porter Road from the southbound exit ramp and from the south approach of Shiloh Drive.

Signalization was investigated for the ramp terminal intersections under current conditions. By signalizing, LOS B or better could be achieved at each location. The addition of a turn lane on the northbound and southbound exit ramps did not result in a significant improvement at the intersections for the current traffic volumes. The 2004 traffic volumes are shown in Figure 65-1. The level of service findings are presented in Table 65-1 and existing intersections geometries are shown in Figure 65-3.

Short-Term Improvements

It is believed that traffic signals are needed at both of the ramp terminal intersections and should be implemented. See Figure 65-4.

Table 65-1

Exit 65 -- Levels of Service

	Deane Soloman Road	Shiloh Road(s)	Southbound Ramps	Northbound Ramps
2004 existing conditions	AM Unsig.-LOS C - on D. Soloman PM Unsig.-LOS C - on D. Soloman	AM Unsig.-LOS C - on Shilohs PM Unsig.-LOS C - on Shilohs	AM Unsig.- LOS C - on ramp PM Unsig.- LOS F - on ramp	AM Unsig.- LOS F - on ramp PM Unsig.- LOS F - on ramp
signalize ramps	AM Unsig.-LOS C - on D. Soloman PM Unsig.-LOS C - on D. Soloman	AM Unsig.-LOS C - on Shilohs PM Unsig.-LOS C - on Shilohs	AM LOS A PM LOS B	AM LOS B PM LOS B
2011 Interim Improvements Add turn lanes Improve Ramps	AM Unsig.-LOS E - on D. Soloman PM Unsig.-LOS D - on D. Soloman no queues	AM Unsig.-LOS C - on Shilohs PM Unsig.-LOS C - on Shilohs	AM LOS A PM LOS B	AM LOS B PM LOS B
2024 Existing Conditions	AM Unsig.-LOS F - on D. Soloman PM Unsig.-LOS F - on D. Soloman	AM Unsig.-LOS F - on Shilohs PM Unsig.-LOS F - on Shilohs	AM unsig - LOS F - on ramp PM unsig - LOS F - on ramp	AM unsig - LOS F - on ramp PM unsig - LOS F - on ramp
Signalize ramps and sideroads, add turn lanes and widen. Align Shiloh Drive	AM LOS E - on D. Soloman PM LOS C - on D. Soloman	AM LOS E - on Shiloh PM LOS D - on Shiloh	AM LOS E - on ramp Add turn lane to ramp. PM LOS C/D - on ramp (very long queues)	AM LOS F - on ramp no queue PM LOS D - on ramp Add turn lane on ramp.
Roundabout Option 1 Fayetteville Plan	AM NA PM NA	AM not reviewed PM LOS F	AM not reviewed PM LOS B/ C	AM not reviewed PM LOS C/ D
Roundabout Option 2 Include ramps in roundabout	AM not reviewed PM LOS B long queues	Ambitious roundabout AM not reviewed PM LOS F very long queues		AM not reviewed PM LOS D - on ramp
Realignment Option 1 Fayetteville Plan	Realigned location AM LOS C/ D PM LOS D	Shiloh S. at Mt. Comfort AM unsig-LOS F for Shiloh PM unsig-LOS F for Shiloh	AM LOS C/ E PM LOS C/ D	AM LOS B/D PM LOS C
Relalignment Option 2 Signalize ramps and sideroads, add turn lanes and widen. Eliminate Shiloh Drive at Porter Road intersections	AM LOS D - on D. Soloman PM LOS D - on D. Soloman Add turn lanes on all approaches	AM N/A PM N/A	AM LOS C/D - on ramp PM LOS C/D - on ramp	AM LOS C/D - on ramp Add turn lane on ramp PM LOS D - on ramp and Porter Road

LOS = Level of Service

Long-Term Analyses

The existing interchange configuration was examined using forecast volumes for the year 2024 conditions, and major traffic flow problems were found. See figure 65-2 for 2024 traffic volume projections. All five intersections were estimated to perform at a LOS F due to the high volume of traffic on Porter Road during both the morning and afternoon peak hours. Ramp traffic was estimated to develop long queues interrupting I-540 traffic flow. Three improvement strategies were investigated for anticipated year 2024 traffic demand:

- Signalize and Align - Signalize ramp terminal and cross street intersections, widen ramps and roads to add turn lanes and align Shiloh Drive to eliminate one intersection.
- Roundabout – Two roundabout options were considered. Each option would create a roundabout on the west side of the interchange.
- Relocate and Combine – Two options were considered for this strategy as well. Each option would realign streets on the west side of the interchange. The ramp terminal intersections would be signalized and auxiliary lanes would be added. The intent is to reduce the number of intersections and increase the spacing between intersections.

Signalize and Align

The first strategy would eliminate the Shiloh Drive intersection closest to the southbound ramp terminal intersection. This would require a realignment of Shiloh Drive so that a single intersection would be created. The four remaining intersections would be signalized. Porter Road would be widened from Deane Solomon Road south to the northbound ramp terminal intersection in order for the interchange to accommodate the anticipated traffic demands. The widening would allow additional auxiliary turn lanes on Porter Road, the exit ramps and on Shiloh Drive.

With these improvements in place, each intersection would be expected to perform at an average LOS C or better, except that every intersection has at least one turning movement that would operate at LOS E or LOS F in the morning peak hour. This scenario was reviewed using SimTraffic and the queues would be expected to back up through the adjacent intersections on Mount Comfort Road and on Porter Road underneath I-540. The ramp queues are not expected to interfere with I-540 traffic.

Roundabout

Two roundabout options were considered. The first is one that is described in the *Traffic and Transportation Study* dated October, 2003, that was prepared for the City of Fayetteville by Bucher, Willis, & Ratliff Corporation. This proposal would realign both approaches of Shiloh Drive, and Deane Solomon Road so that they all intersect Mount Comfort Road/ Porter Road at one location. This would result in a roundabout with five approach legs and when reviewed was found to develop long queues. During peak travel hours, traffic from the proposed traffic signal at the intersection of Porter Road with the southbound ramps would form a queue that would back into the circle. (See Figure 65-7.)

A second roundabout option was also considered on the west side of the interchange. This would involve a very large roundabout with six legs. Deane Solomon Road would not be realigned in this option, but both southbound ramps would be tied to the circle. This was analyzed for the afternoon peak hour. One result would be that the southbound exit ramp would queue the entire length of the ramp. It is believed that neither of the roundabout options would be a viable strategy for this interchange.

Relocate and Combine

The first of two relocation options is one that was presented in the *Traffic and Transportation Study*. It calls for the south segment of Shiloh Drive to be realigned westward into a new intersection with Mount Comfort Road that would be slightly less than 400 feet west of the intersection of Mount Comfort Road with Deane Solomon Road. Mount Comfort Road would be extended to the east and curved to meet the north portion of Shiloh Drive. With this geometry, Mount Comfort Road would become continuous with Shiloh Drive to the north instead of continuous with Porter Road. Porter Road would have a tee-intersection with the realigned Mount Comfort Road/ Shiloh Drive. At this intersection, the predominant travel path would be converted from a through movement into an angle turn (eastbound right-turn in the morning and a northbound left-turn in the afternoon). This option would improve the spacing between the intersections. (See Figure 65-8.)

When evaluated, it was determined that all of the resulting intersections would either require signalization or result in LOS F for the minor street. If all of the locations were signalized, this would result in four traffic signals within less than 1,000 feet. If the lowest-volume minor street were left unsignalized, then long queues would result.

The second relocation option would reposition both approaches of Shiloh Drive. The north portion would be curved to the west to a new intersection of Deane Solomon Road with Shiloh Drive. The south portion of Shiloh Drive would be relocated to intersect Mount Comfort Road opposite Deane Solomon Road. This geometry would eliminate both of the existing intersections of Porter Road with Shiloh Drive. On the west side of the interchange, only the two intersections of Mount Comfort Road with Shiloh Drive/ Deane Solomon Road and Porter Road with the southbound ramps would remain. Both of these intersections would be signalized, along with the intersection of Porter Road with the northbound ramps. The following auxiliary lanes were researched and proved to be beneficial:

- A left-turn lane for southbound traffic on Deane Solomon Road heading east, a left-turn lane for eastbound traffic on Mount Comfort Road heading north, an additional lane for eastbound traffic on Mount Comfort Road heading east, a left-turn lane for westbound traffic on Porter Road/ Mount Comfort Road heading south onto the realigned Shiloh Drive, and a right-turn lane for northbound traffic on Shiloh Drive heading east.
- An additional lane for southbound traffic on Porter Road from Deane Solomon Road to the southbound exit ramp. It would end there as a right-turn lane.
- A right-turn lane on the southbound exit ramp.
- Widen Porter Road to three lanes between the northbound and southbound ramp terminal intersections to allow for back-to-back left-turn lanes onto the ramps. In order to accommodate the widening, pedestrian walkways would need to be constructed on the back side of the bridge piers.
- A right-turn lane on the northbound exit ramp, and a right-turn lane for northbound traffic on Porter Road heading east onto the I-540 northbound entrance ramp.

With these improvements in place, traffic would be expected to flow smoothly without any major problems. See Figure 65-6. Both ramp terminal intersections would be expected to operate at LOS C or better. The ramp traffic is not expected to queue significantly. The intersection at Deane Solomon Road/ Realigned Shiloh Drive and Mount Comfort Road/ Porter Road would operate at LOS B with northbound and southbound traffic experiencing a control delay of 70 seconds or less in the afternoon and 50 seconds or less in the morning peak hour.

Long-Term Improvements

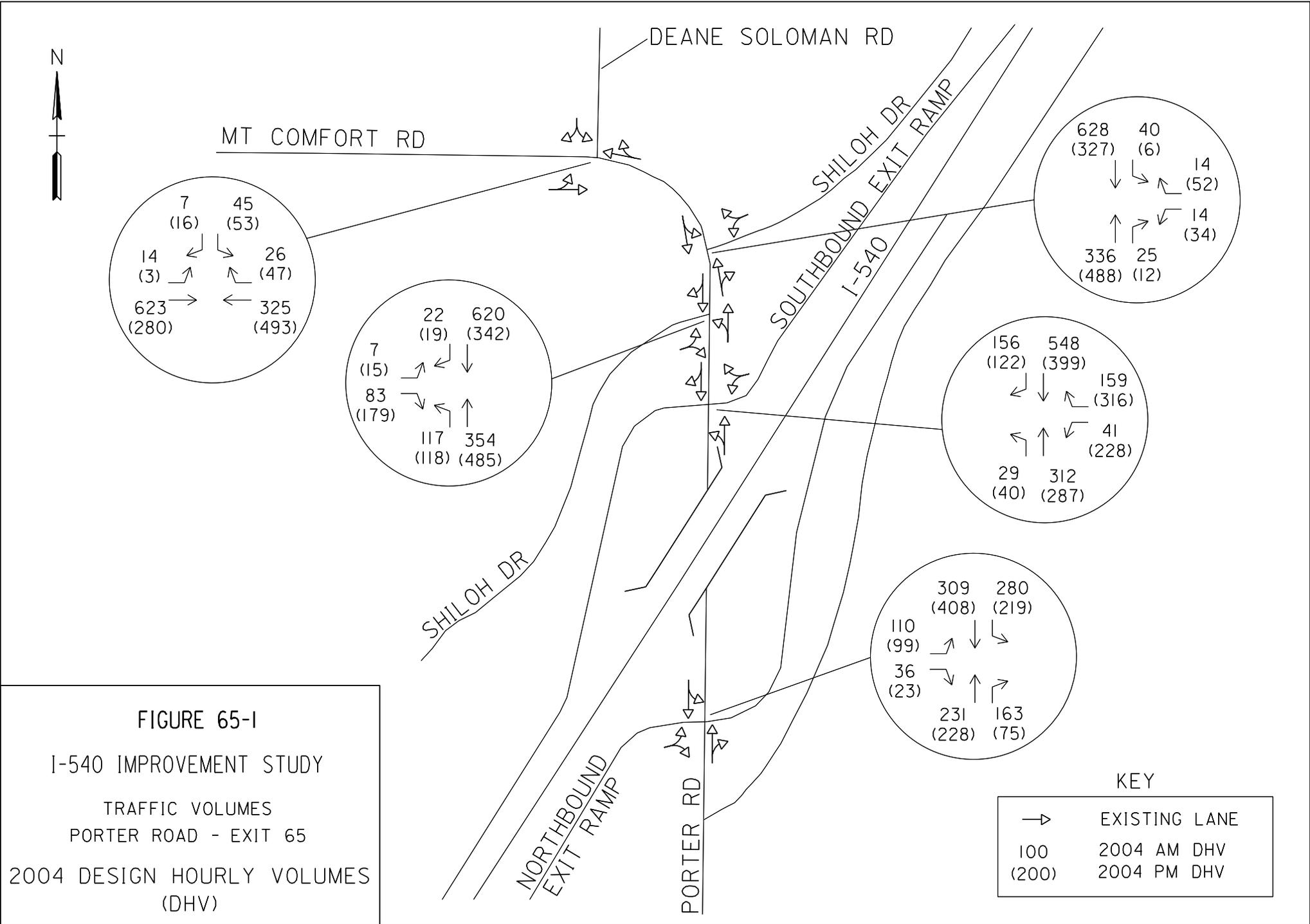
Although several strategies were studied and provided acceptable results, the second option of the relocation strategy appears to offer the greatest promise of accommodating the future traffic growth. This alternative will improve the 2024 forecast traffic flow from I-540 and through the interchange. The auxiliary lanes mentioned above should be implemented. See Figure 65-6.

Interim Improvements

An additional analysis was performed for intermediate years to consider appropriate improvements without realignment of roadways. The recommendation could be staged over time. The implementation of the improvements would be:

1. Add turn lanes to the exit ramps and signalize the ramp terminal intersections.
2. Widen Porter Road from Deane Solomon Road to the northbound ramps.

These improvements were developed to optimize the capacity of the interchange in the period while the existing bridges are retained and would suffice until 2011. See Figure 65-5.



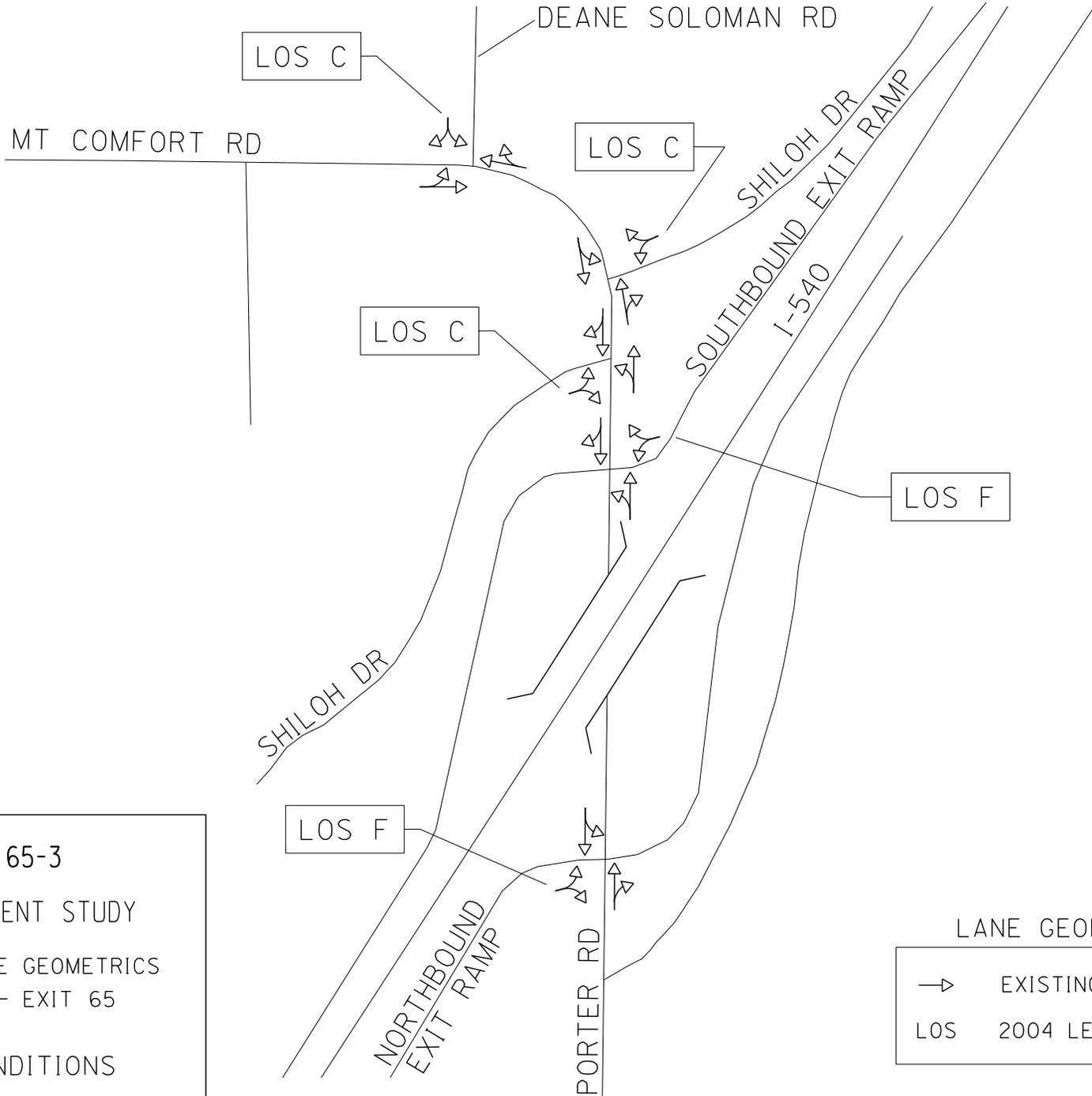


FIGURE 65-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

PORTER ROAD - EXIT 65

EXISTING CONDITIONS

LANE GEOMETRY KEY

→ EXISTING LANE

LOS 2004 LEVEL OF SERVICE

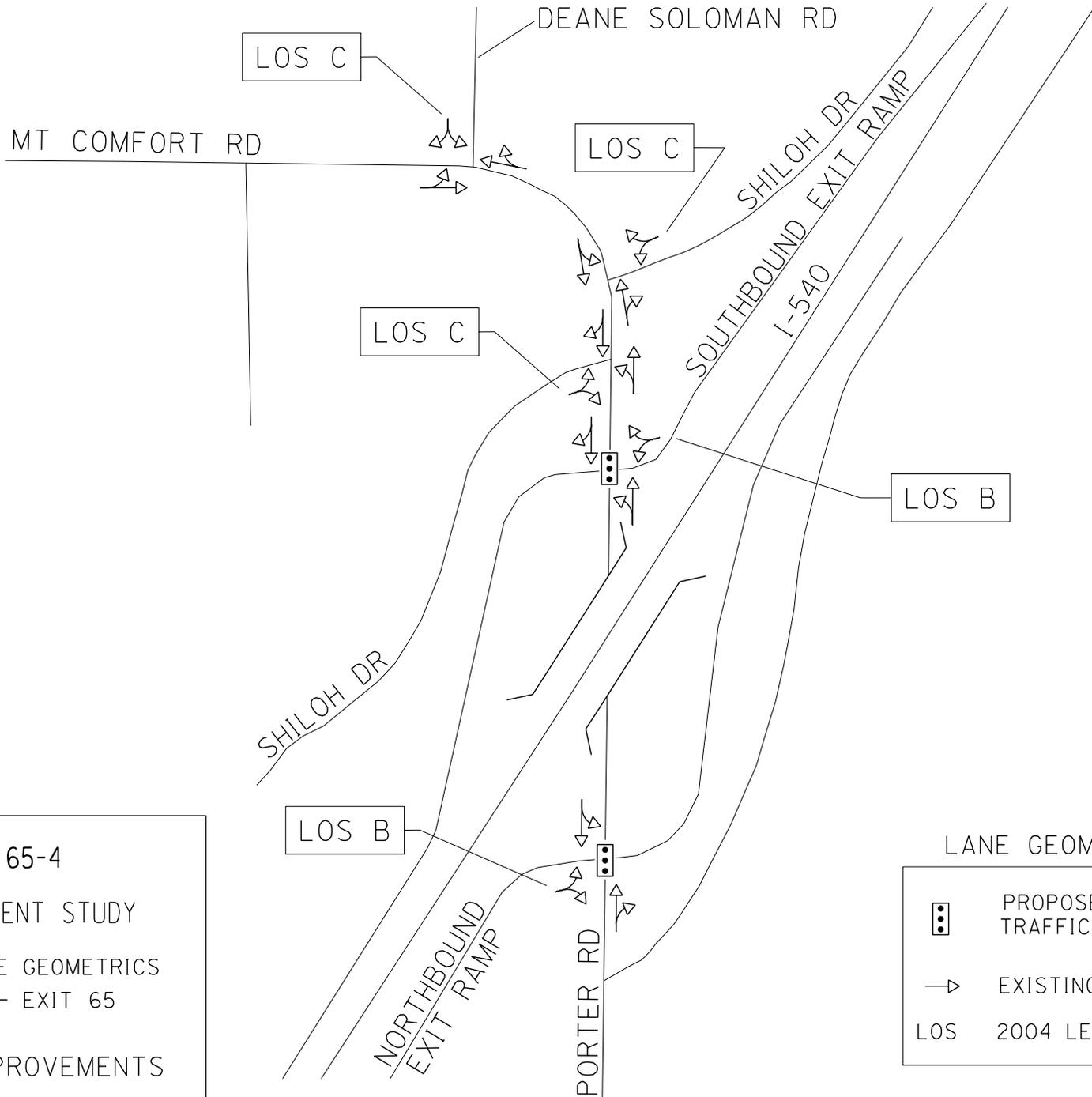


FIGURE 65-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

PORTER ROAD - EXIT 65

SHORT-TERM IMPROVEMENTS

LANE GEOMETRY KEY



PROPOSED
TRAFFIC SIGNAL



EXISTING LANE

LOS

2004 LEVEL OF SERVICE

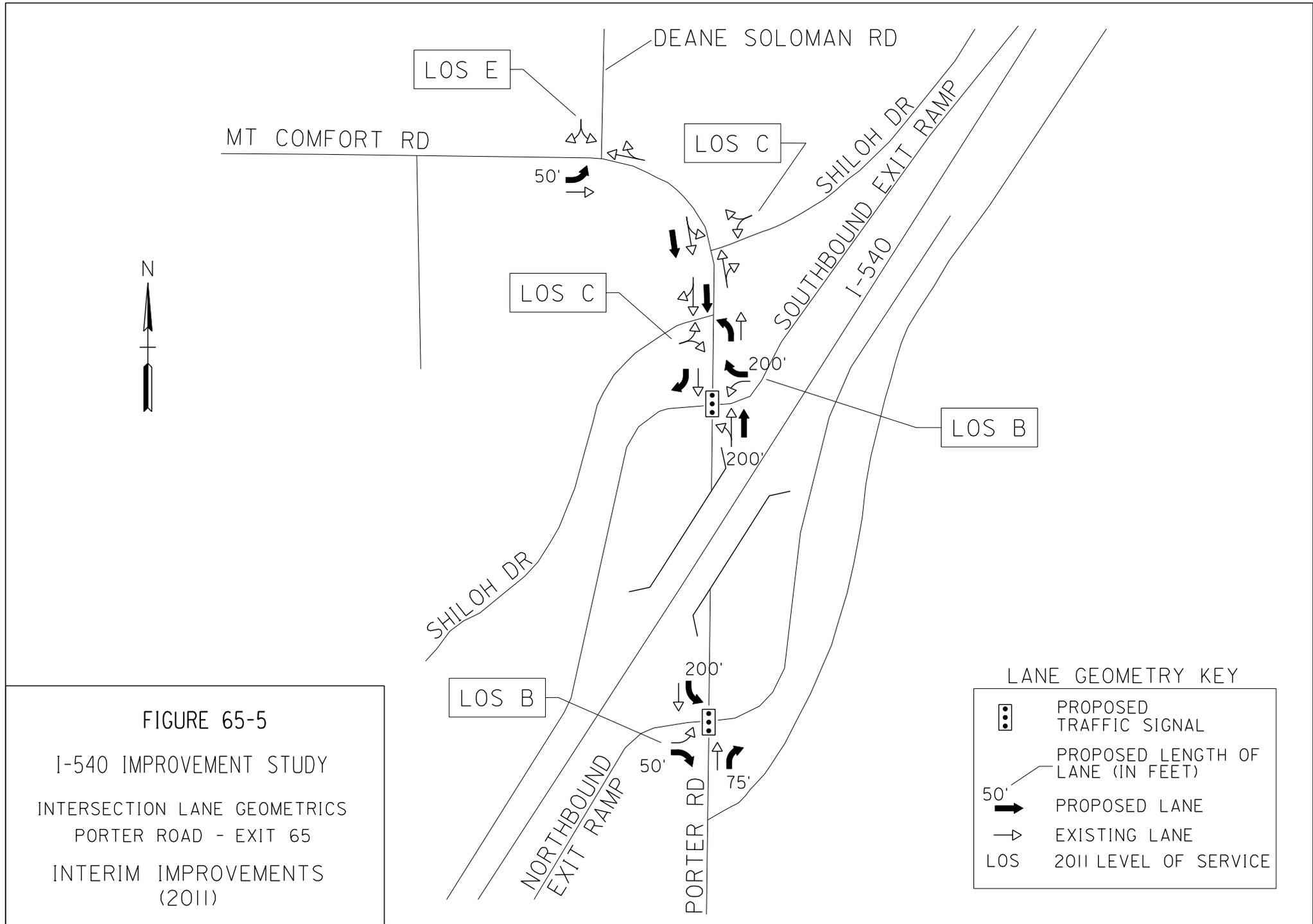


FIGURE 65-5

I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 PORTER ROAD - EXIT 65
 INTERIM IMPROVEMENTS
 (2011)

LANE GEOMETRY KEY

-  PROPOSED TRAFFIC SIGNAL
-  PROPOSED LENGTH OF LANE (IN FEET)
-  PROPOSED LANE
-  EXISTING LANE
- LOS 2011 LEVEL OF SERVICE

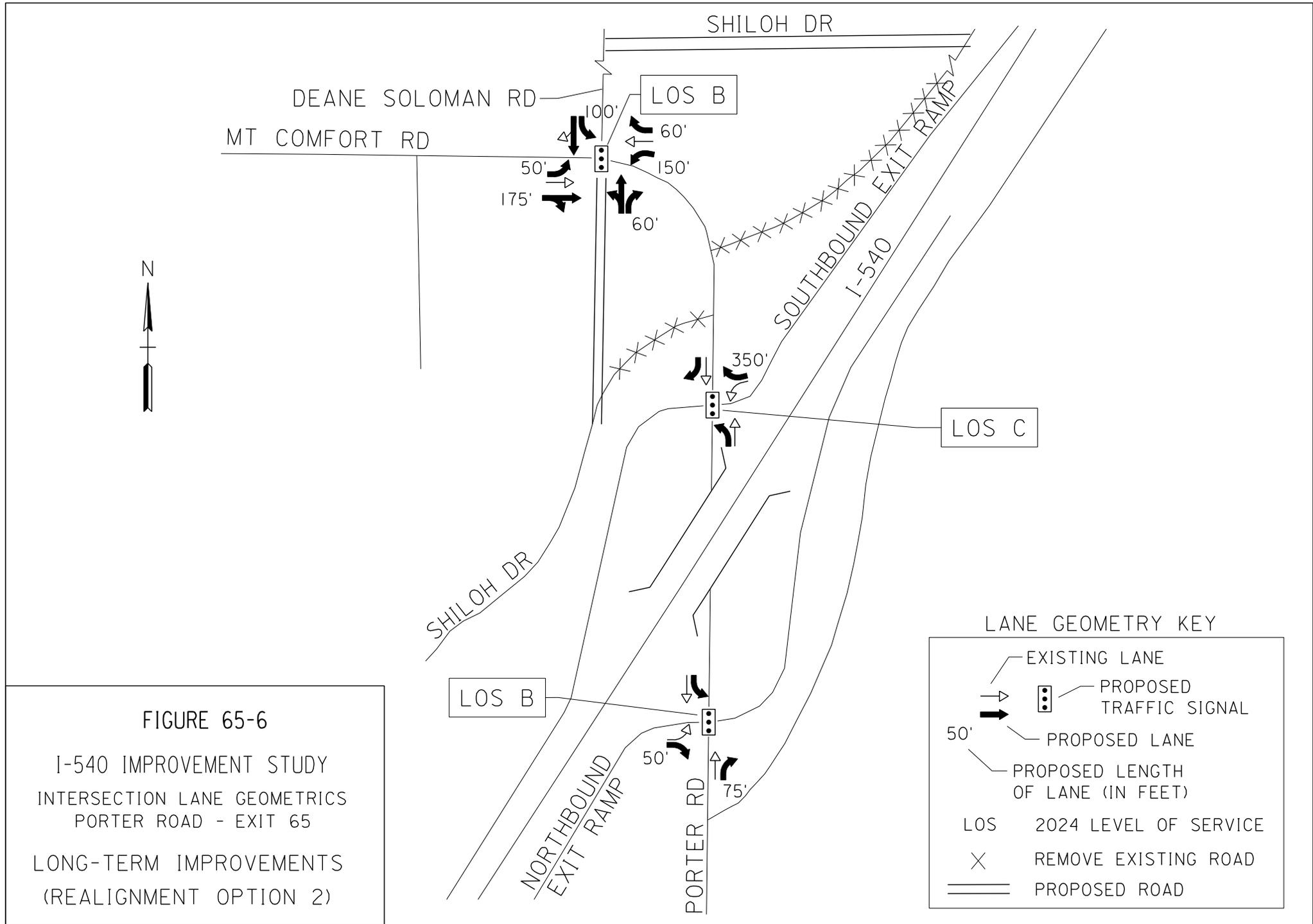


FIGURE 65-6

I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 PORTER ROAD - EXIT 65
 LONG-TERM IMPROVEMENTS
 (REALIGNMENT OPTION 2)

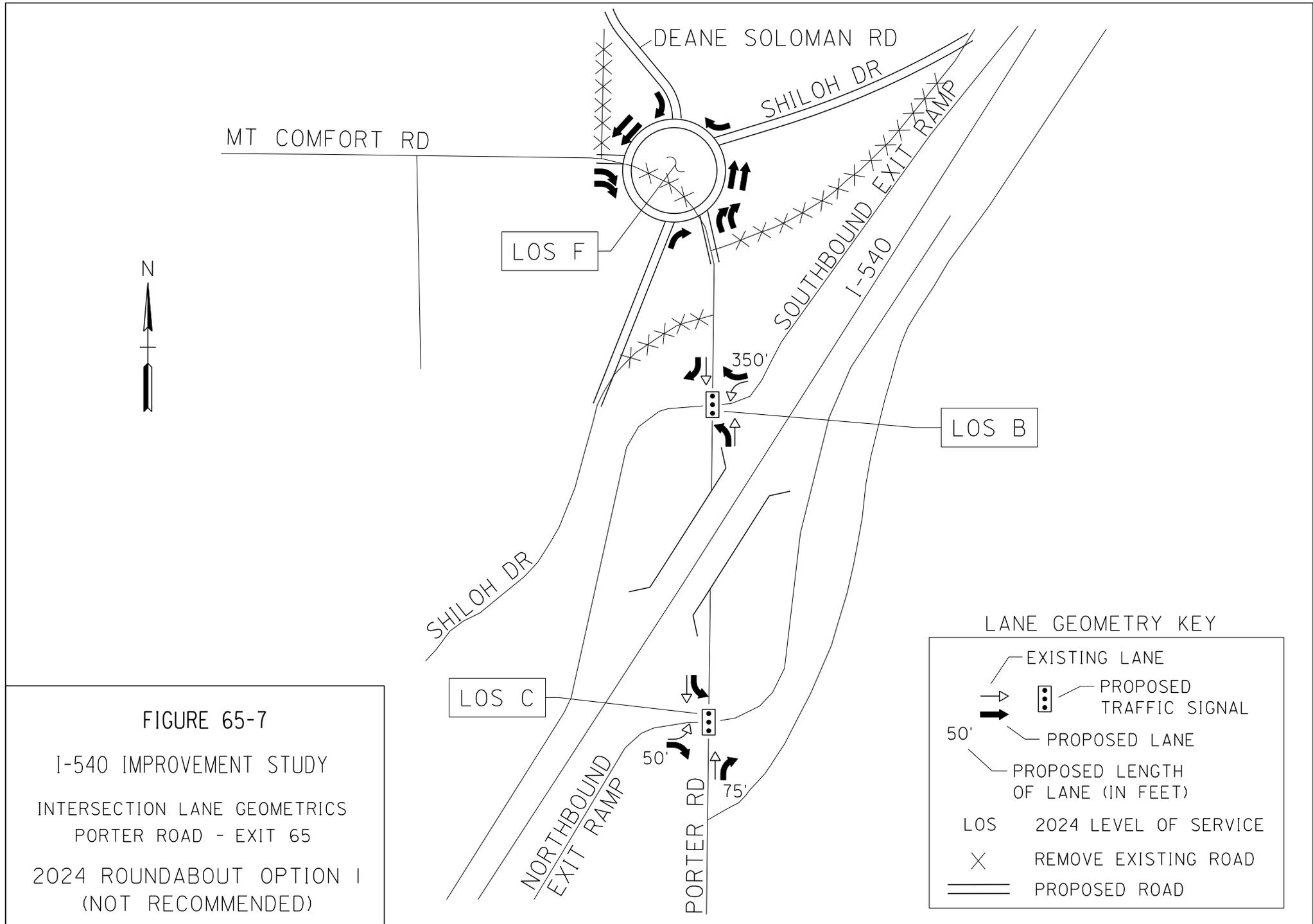


FIGURE 65-7
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 PORTER ROAD - EXIT 65
 2024 ROUNDABOUT OPTION I
 (NOT RECOMMENDED)

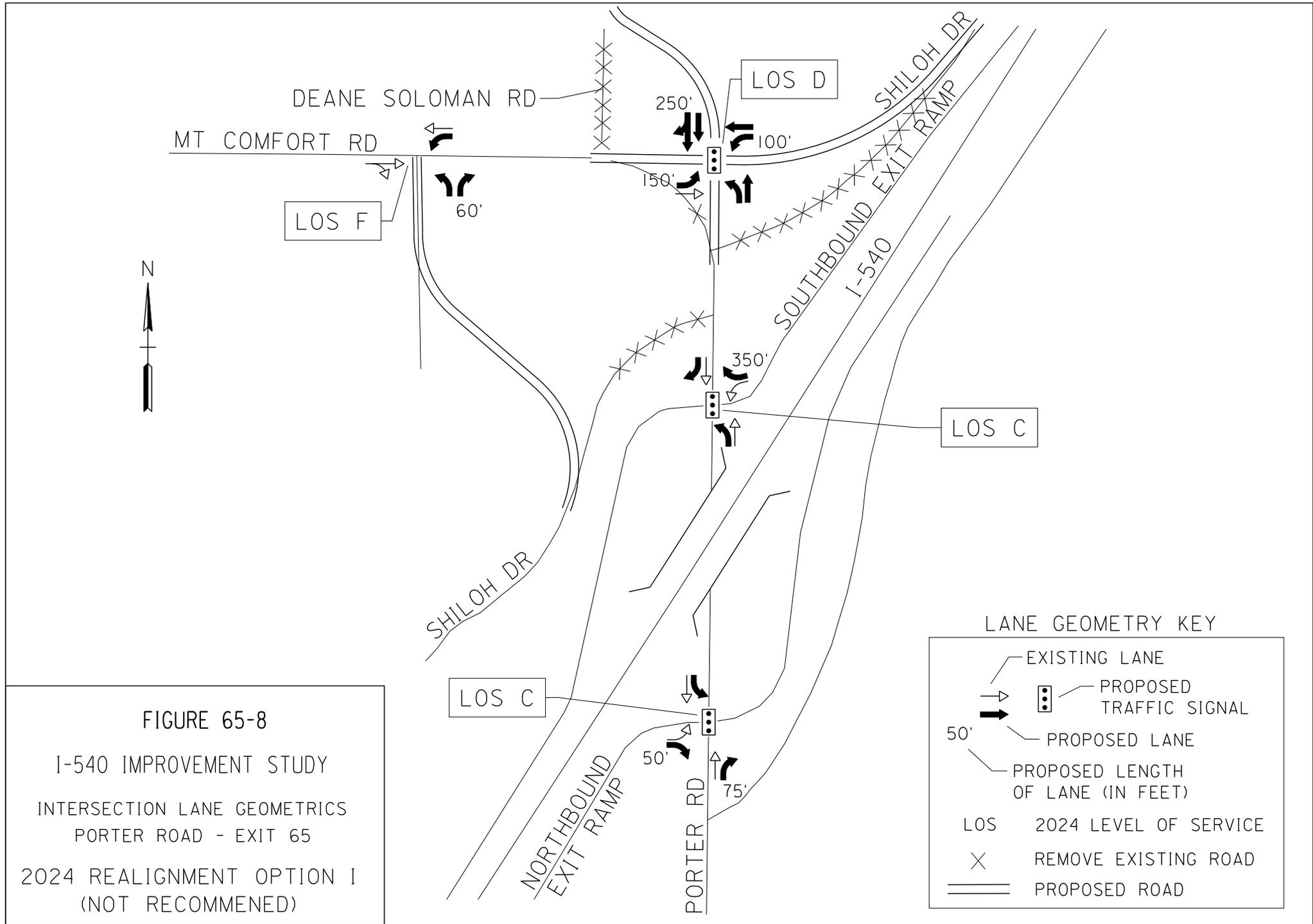


FIGURE 65-8

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

PORTER ROAD - EXIT 65

2024 REALIGNMENT OPTION I

(NOT RECOMMENDED)

LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- 50' — PROPOSED LENGTH OF LANE (IN FEET)
- LOS 2024 LEVEL OF SERVICE
- X REMOVE EXISTING ROAD
- == PROPOSED ROAD
- ⋮ PROPOSED TRAFFIC SIGNAL

WASHINGTON COUNTY INTERCHANGES

Exit 66

Interstate 540 at Highway 112

(Garland Avenue)

and

Exit 67

Interstate 540 at Highway 71 Business

(Fulbright Expressway)

Exit 66 Interstate 540 at Highway 112 (Garland Avenue)

Exit 67 Interstate 540 at Highway 71 Business (Fulbright Expressway)

These two Fayetteville interchanges are spaced closely together, and are analyzed here as one system.

In this area, I-540 curves to the east. Highway 112 is a north-south route that crosses over I-540 at a skew of approximately 22 degrees (I-540 is in a curve as it passes underneath). Highway 112 is a two-lane highway. South of the interchange it is named Garland Avenue. The ramp terminal intersections are unsignalized.

Highway 71 Business (Highway 71B) is a four-lane freeway that connects I-540 with Highway 71B to the east. There is approximately 1,700 feet between the Highway 112 northbound entrance ramp and the Highway 71B northbound exit ramp. In the southbound direction, the distance between the Highway 71B southbound entrance ramp and the Highway 112 southbound exit ramp is approximately 1,600 feet. This relatively short distance presents an acute weaving problem in the southbound direction due to the lane configuration in this area. The Highway 71B southbound entrance ramp enters I-540 from the left. Motorists from Highway 71B that wish to exit to Highway 112 must make two lane changes to complete this difficult weave. Also, the I-540 southbound outside lane becomes a lane drop onto the Highway 112 southbound exit ramp, and the Highway 71B southbound entrance ramp is a lane addition which results in excessive lane changing within this short weaving area. See Figure 66/ 67-1 for an illustration of the general layout.

Comments were collected at the open house public meetings. The survey from the public meetings held in October, 2003, asked if the respondent experienced traffic congestion while traveling on I-540. The vicinity of Exit 66 Highway 112 Interchange and Exit 67 Highway 71B Interchange was cited as an area along I-540 that often experiences traffic congestion. Respondents were asked in the following question if they often experienced difficulty getting on or off I-540. Several people replied that the I-540/ Highway 71B Interchange in Fayetteville was a troublesome location to exit and enter during peak traffic hours. Comments were also received noting traffic congestion at the diverge for the northbound exit ramp to Highway 71B, and noting difficulty in the southbound weaving section between these two interchanges due to the proximity of Exit 66 to Exit 67. The southbound weave was also noted as congested in comments from the local officials meeting conducted in October, 2003.

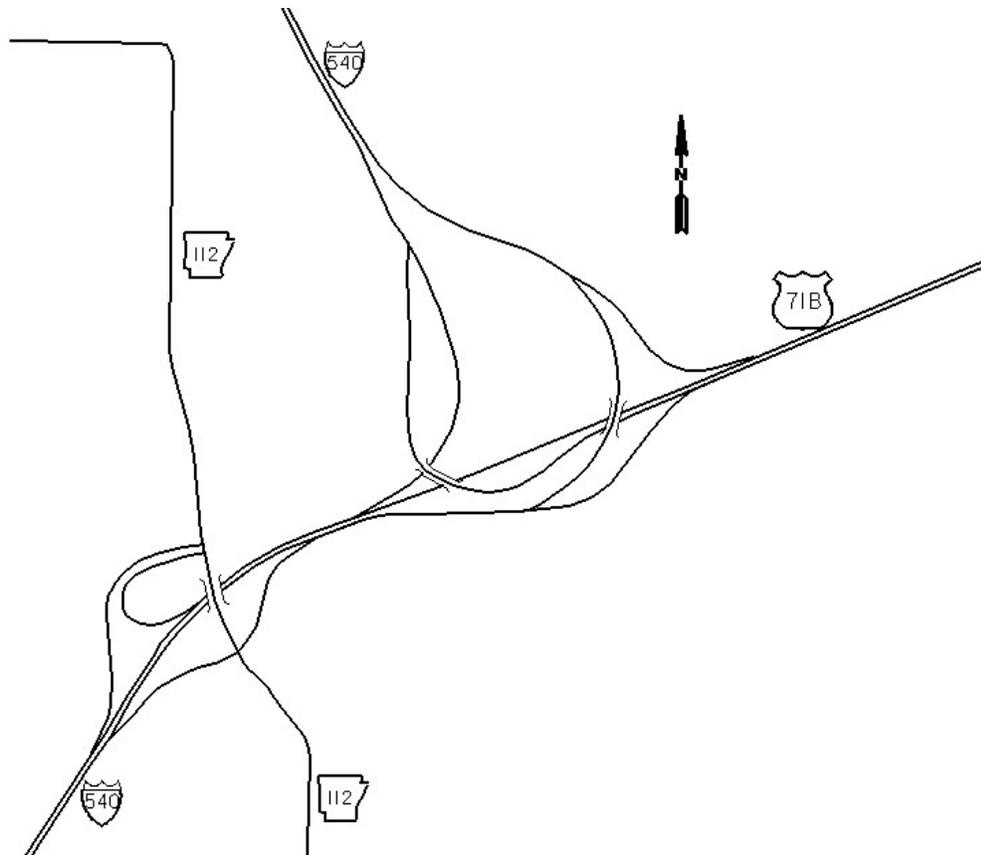


Figure 66/ 67-1 — Existing Layout of Exits 66 and 67

Short-Term Analyses

Both ramp terminal intersections on Highway 112 are currently unsignalized. Both ramp terminal intersections operate at LOS E or LOS F for exit ramp traffic in the afternoon peak. See Table 66-1 for intersection levels of service on Highway 112. 2004 traffic volumes are shown in Figure 66-1 and existing intersection geometries are shown in Figure 66-3.

With the installation of auxiliary lanes for turning traffic and the installation of traffic signals, acceptable traffic flow operations could be maintained on Highway 112 for several years.

Table 66-1

Exit 66 -- Levels of Service

	N. Shiloh Dr.		Southbound I-540 Ramps		Northbound I-540 Ramps	
2004 existing conditions	AM PM	Unsig.-LOS B on Shiloh Unsig.-LOS C on Shiloh	AM PM	Unsig.-LOS D on ramp Unsig.-LOS E on ramp	AM PM	Unsig.-LOS F on ramp Unsig.-LOS F on ramp
2016 Interim Improvements signalize and add aux. lanes Relocate SB Exit Ramp	AM PM	Unsig.-LOS D on Shiloh Unsig.-LOS D on Shiloh	AM PM	LOS C signalize LOS D/ E	AM PM	LOS B signalize LOS C on ramp
2024 existing conditions	AM PM	LOS E on Shiloh LOS F on Shiloh	AM PM	LOS F on ramp LOS F on ramp	AM PM	LOS F on ramp LOS F on ramp
signalize ramps, restripe bridge for two SB lanes	AM PM	LOS F for Shiloh Left turns LOS F for Shiloh	AM PM	LOS C signalize LOS C	AM PM	LOS B signalize LOS B

LOS = Level of Service

At Highway 71B, the I-540 mainline is in a curve through the interchange area. The curve radius is only approximately 1,000 feet for both the northbound and southbound lanes. This is less than the curvature found elsewhere along I-540. The speed limit has been reduced to 60 mph in this segment, which serves to improve ramp operations by reducing the speed differential between mainline and ramp traffic. It especially aids the southbound weave to have the mainline traffic slowed by the roadway geometry just as they enter the weaving area.

Short-Term Improvements

An auxiliary lane for right turns should be constructed on each of the exit ramps to Highway 112. Both intersections should be monitored for traffic signal warrants. See Figure 66-4 for short-term improvements.

No short-term improvements are recommended for the interchange at Highway 71B and I-540.

Long-Term Analyses

The existing configuration was investigated for levels of service associated with ramp merging, diverging, and weaving activity using projected 2024 traffic volumes. See Table 67-1 for the findings of ramp merge and diverge operational conditions. See Table 67-2 for findings related to the weaving levels of service. For the southbound weave even with the provision of five lanes in the weaving area, LOS E would be expected. Since this configuration would require the weaving vehicles to make at least three lane changes within approximately 1,600 feet, it is anticipated that this weaving area would become a safety concern.

TABLE 67-1 Exit 66-67 Ramp Merge and Diverge Analysis -- Existing Configuration

Junction	Ramp	Direction of I-540	Peak Hour	Year	Lanes on Freeway	Lanes on Ramps	LOS
Hwy 112	Exit	Northbound	AM	2004	2	1	D
Hwy 112	Entrance	Northbound	AM	2004	2	1	E
Hwy 71B Spur	Exit	Northbound	AM	2004	2	1	D
Hwy 71B Spur	Entrance	Northbound	AM	2004	2	1	C
Hwy 112	Exit	Northbound	AM	2014	3	1	D
Hwy 112	Entrance	Northbound	AM	2014	3	1	F
Hwy 71B Spur	Exit	Northbound	AM	2014	3	1	F
Hwy 71B Spur	Entrance	Northbound	AM	2014	3	1	C
Hwy 112	Exit	Northbound	AM	2024	4	1	D
Hwy 112	Entrance	Northbound	AM	2024	4	1	C
Hwy 71B Spur	Exit	Northbound	AM	2024	4	1	F
Hwy 71B Spur	Entrance	Northbound	AM	2024	4	1	B
Hwy 71B Spur	Exit	Southbound	PM	2004	2	1	C
Hwy 112	Entrance	Southbound	PM	2004	2	1	D
Hwy 71B Spur	Exit	Southbound	PM	2014	3	1	C
Hwy 112	Entrance	Southbound	PM	2014	3	1	D

TABLE 67-2 Exit 66-67 Weaving Analysis

Southbound Weave in Existing Configuration	
Year	LOS
2004	D
Northbound Weave in CD-Road Configuration	
Year	LOS
2024	D

Collector-Distributor Roads

Because of the problems caused by the close spacing of these two interchanges, alternative geometric approaches to the I-540 ramps were considered. Collector-distributor roads (C-D roads) are proposed to allow ramp weaving to be removed from the I-540 through traffic. At Highway 112, the basic interchange configuration could remain unchanged; however, it is proposed that the southbound exit to Highway 112 be reconfigured. The bridge over I-540 would have to be replaced in order to accommodate the proposed northbound C-D road. See Figure 66/67-2 for an illustration of the proposed configuration.

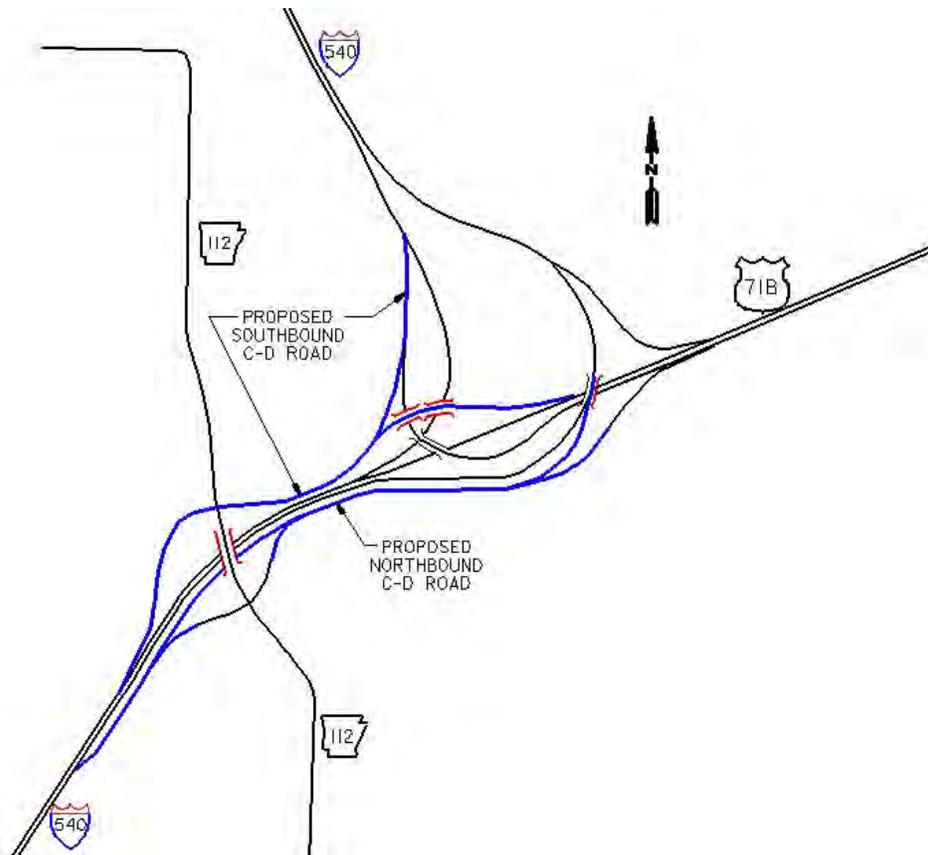


Figure 66/ 67-2 — Proposed Configuration of Exits 66 and 67

The change of configuration of the southbound exit ramp to Highway 112 that is shown in Figure 66/67-2 is discussed in the section below on suggested interim improvements.

The analyses of the merges and diverges for the C-D Roads geometry is presented in Table 67-3. Implementation of the proposed southbound C-D road would eliminate weaving in the southbound direction. Implementation of the proposed northbound C-D road would introduce weaving. The new weave would be the northbound traffic from Highway 112, which would have to weave across the traffic exiting northbound I-540 to go north on Highway 71B. This northbound weave would take place on the proposed northbound C-D road, so that mainline I-540 traffic would be unaffected by the weave. The northbound weave is anticipated to operate at a low LOS D in the peak hour in 2024.

Long-Term Improvements

The C-D roads system is recommended. This approach would eliminate weaving on the southbound I-540 mainline lanes. As proposed, it would introduce weaving in the northbound direction, but this would occur on the C-D road rather than on the mainline and is anticipated to perform at LOS D.

The intersection improvements recommended for Highway 112 are shown in Figure 66-5. The Highway 112 bridge over I-540 will have to be replaced in order to accommodate the proposed widening of I-540 and the northbound C-D road. On Highway 112, the bridge is proposed to have a five-lane deck, which would handle the future traffic needs, and connect to an anticipated five lane section to the south. The *Traffic and Transportation Study* of the City of Fayetteville shows this road to be widened to five lanes in the section on long range improvements.

Interim Improvements

The addition of auxiliary lanes on Highway 112 and the ramps at Exit 66 are recommended to be accomplished by the year 2016. These are shown in Figure 66-6.

On the I-540 mainline, the weave between the two interchanges in the southbound direction is anticipated to decline to LOS F by 2010. It would not be feasible to improve this weaving operation by adding lanes in the weaving area. Though an additional lane would reduce the traffic density in each of the lanes in the weaving area, it would introduce an additional lane change to the required weaving maneuver.

TABLE 67-3 Exit 66-67 Ramp Merge and Diverge Analysis -- Proposed C-D Roads

Junction	Ramp	Direction of I-540	Peak Hour	Year	Lanes on Freeway	Lanes on Ramps	LOS
I-540 / C-D	LEG 3	Northbound	AM	2014	2	n/a	C
I-540 / C-D	LEG 1	Northbound	AM	2014	4	n/a	C
I-540 / C-D	LEG 2	Northbound	AM	2014	2	n/a	C
Hwy 71B	Entrance	Northbound	AM	2014	3	1	C
I-540 / C-D	LEG 3	Northbound	AM	2024	2	n/a	D
I-540 / C-D	LEG 1	Northbound	AM	2024	4	n/a	D
I-540 / C-D	LEG 2	Northbound	AM	2024	2	n/a	D
Hwy 71B	Entrance	Northbound	AM	2024	3	1	C
I-540 / Hwy 71B Entrance-ramp	LEG 2	Southbound	PM	2014	2	n/a	B
I-540 / Hwy 71B Entrance-ramp	LEG 1	Southbound	PM	2014	2	n/a	C
I-540 / Hwy 71B Entrance-ramp	LEG 3	Southbound	PM	2014	4	n/a	C
Hwy 112	Entrance	Southbound	PM	2014	4	1	B
I-540 / Hwy 71B Entrance-ramp	LEG 2	Southbound	PM	2024	2	n/a	C
I-540 / Hwy 71B Entrance-ramp	LEG 1	Southbound	PM	2024	2	n/a	D
I-540 / Hwy 71B Entrance-ramp	LEG 3	Southbound	PM	2024	4	n/a	C
Hwy 112	Entrance	Southbound	PM	2024	4	1	C

The LOS for the southbound weave could be improved by constructing the southbound C-D road. This could be done in advance of the proposed widening on I-540 and could precede the construction of the proposed northbound C-D road. By changing the ramp configuration of the southbound exit ramp to Highway 112, the southbound C-D road could be constructed without requiring the proposed replacement of the Highway 112 bridge over I-540. The reconfiguration would change the Exit 66 configuration to a more traditional diamond interchange. Constructing the proposed southbound C-D road would also provide the additional benefit of extending the runout for the lane drop in the southbound direction which would improve the merge of the southbound entrance ramp from Highway 71B. See Figure 66/67-3 for an illustration of the proposed interim improvements.

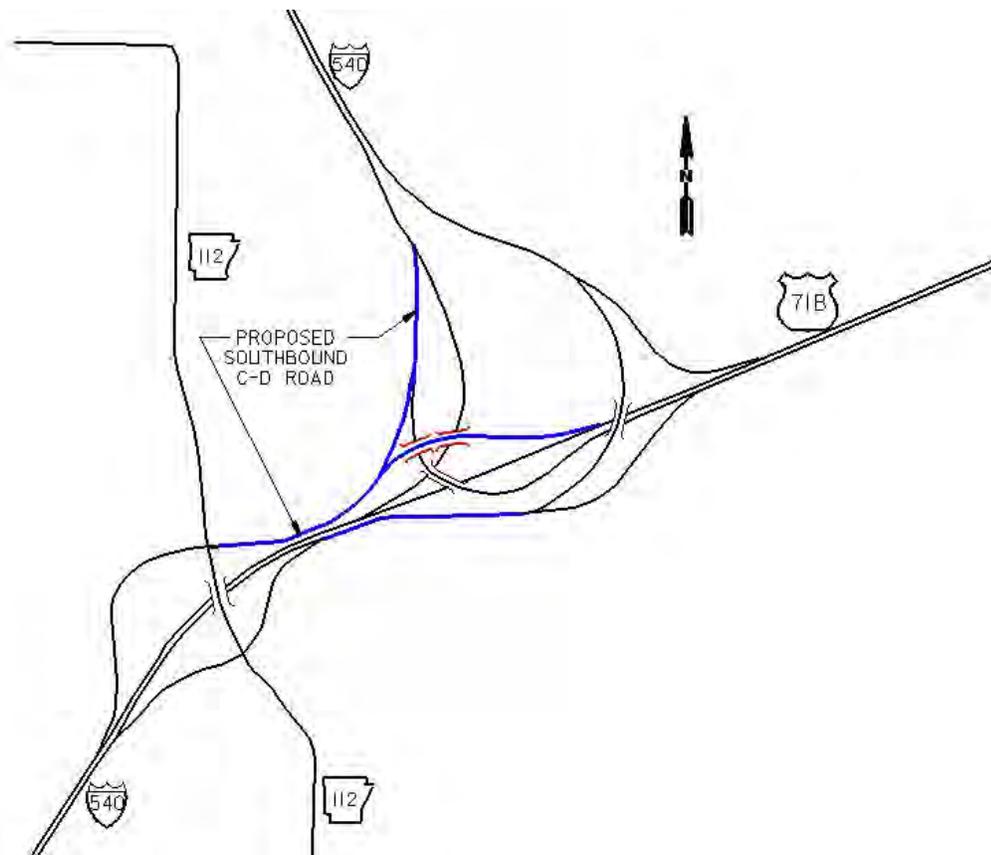


Figure 66/ 67-3 — Proposed Interim Improvements for Exits 66 and 67

It is estimated that the service life of the recommended interim improvements would be 10 to 12 years for acceptable levels of service on Highway 112. That time frame could be extended by restriping the existing bridge for two lanes southbound and one lane northbound with road widening on Highway 112 on either side of the bridge as shown in Figure 66-3. Two southbound lanes on the bridge would accommodate a double right-turn off the existing southbound exit ramp, or a double left-turn from the proposed southbound C-D road. The trade-off would be that there would not be adequate space to provide a left-turn lane onto the southbound entrance ramp, but this move can be adequately accommodated by traffic signalization at this intersection, which will be needed in order to accommodate the proposed double turn lanes. Beyond this time frame (approximately 2014-2016), traffic congestion on the I-540 mainline is likely to result in the need to widen I-540. The I-540 widening would result in the existing Highway 112 bridge becoming functionally obsolete, because it is not long enough to span the proposed interstate lanes and the proposed northbound C-D road. A bridge replacement for the Highway 112 bridge over I-540 should trigger the long term improvements proposed on Highway 112.

In the northbound direction on I-540, the merging traffic on the northbound entrance ramp from Highway 112 is already experiencing congestion at LOS E. This is expected to decline to LOS F conditions within the next two years. Because this ramp is only a short distance upstream of the northbound exit ramp to Highway 71B, an auxiliary lane was considered that would create a weaving lane between these two ramps. The weave, if installed now, would be expected to operate at LOS D. However, due to increasing traffic volumes, it would be expected to decline to LOS F by approximately 2009. By 2012, the congestion would be anticipated to be such that it would result in unsafe motorist behavior. Implementing a weave for the northbound lanes is an option that could extend the life of this interchange area but only for a short time. It is included in the proposed interim improvements.

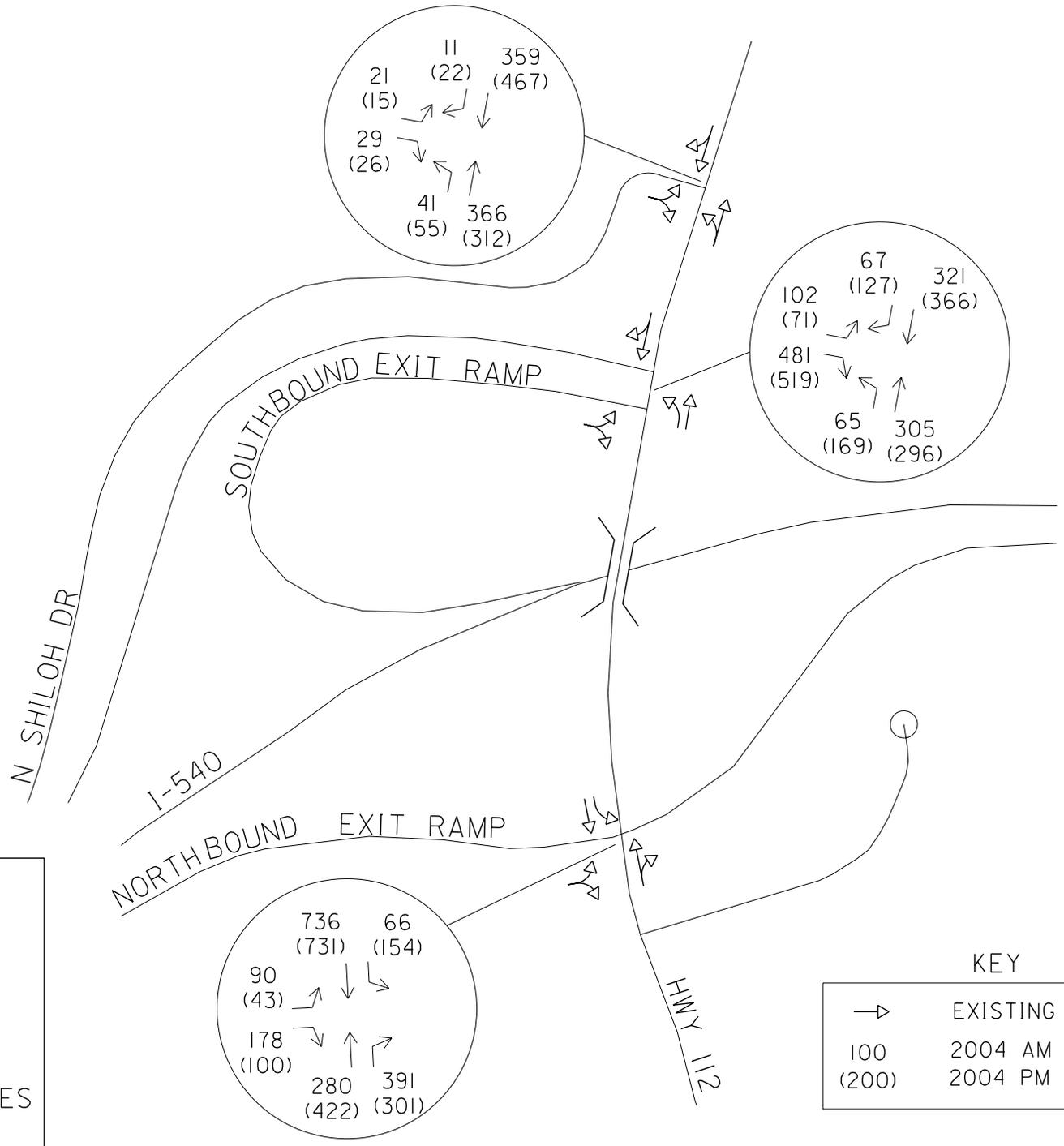


FIGURE 66-1

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 112 - EXIT 66

2004 DESIGN HOURLY VOLUMES
(DHV)

KEY

→	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV

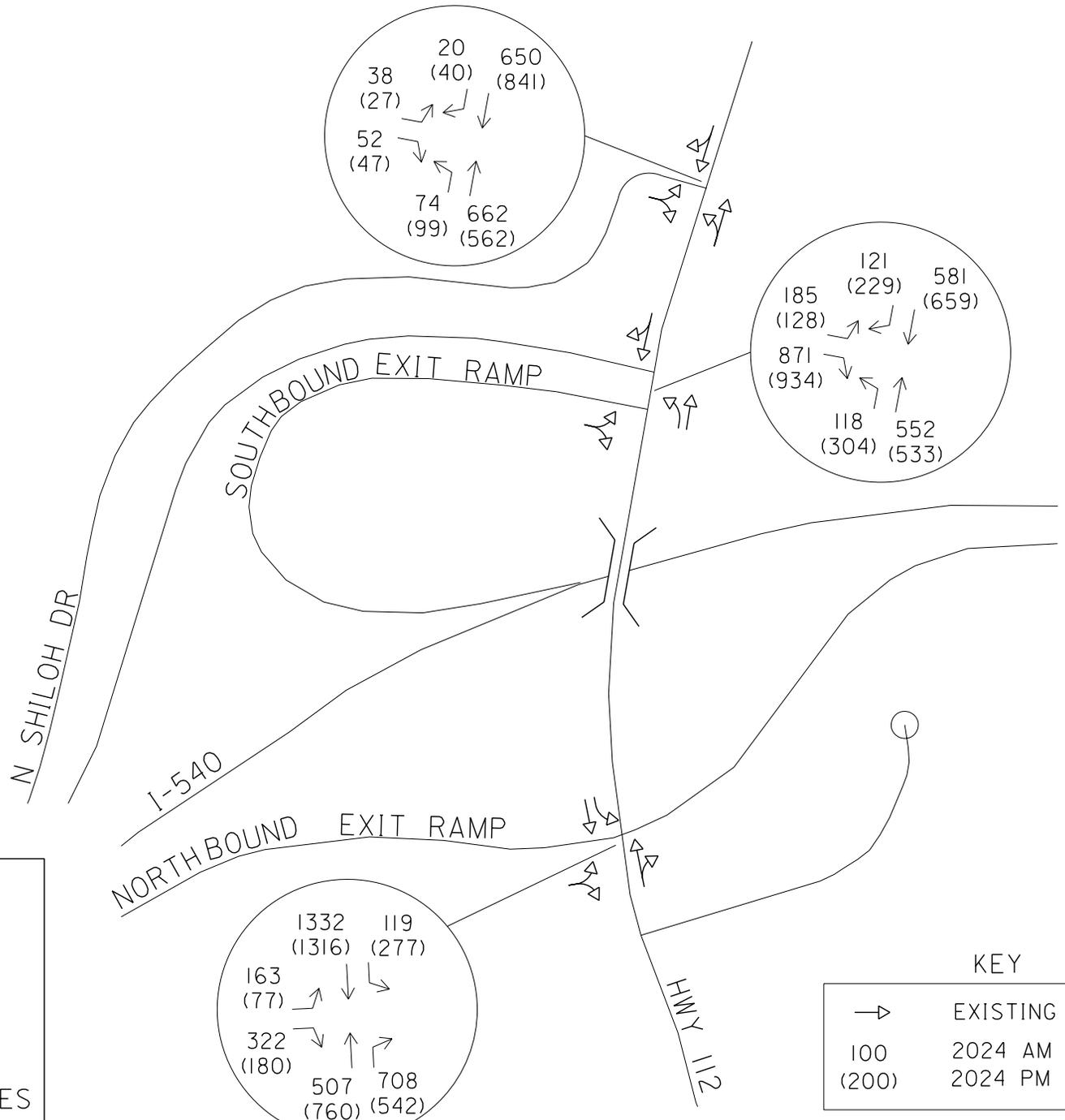


FIGURE 66-2

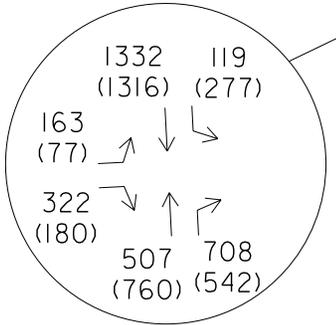
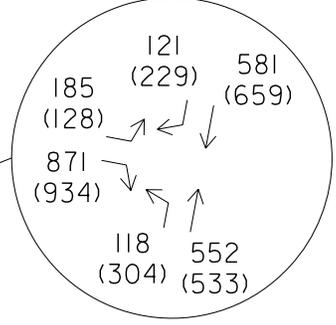
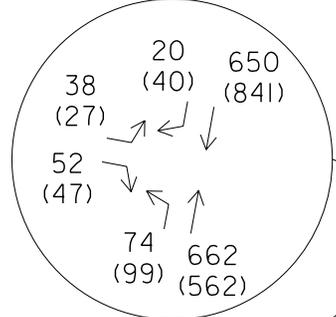
I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 112 - EXIT 66

2024 DESIGN HOURLY VOLUMES
(DHV)

KEY

	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV



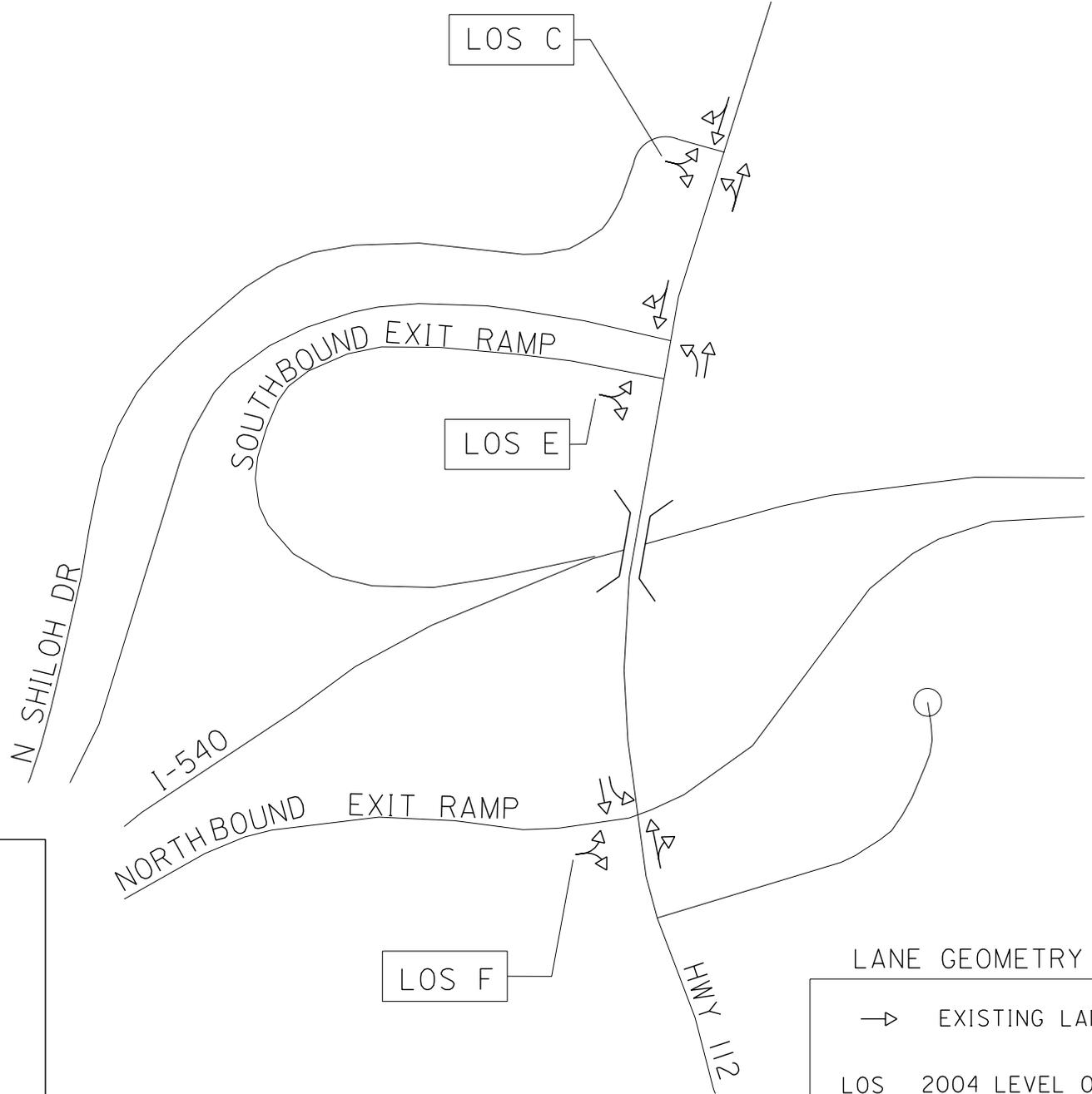


FIGURE 66-3

I-540 IMPROVEMENT STUDY
INTERSECTION LANE GEOMETRICS
HIGHWAY 112 - EXIT 66
EXISTING CONDITIONS

LANE GEOMETRY KEY

- EXISTING LANE
- LOS 2004 LEVEL OF SERVICE

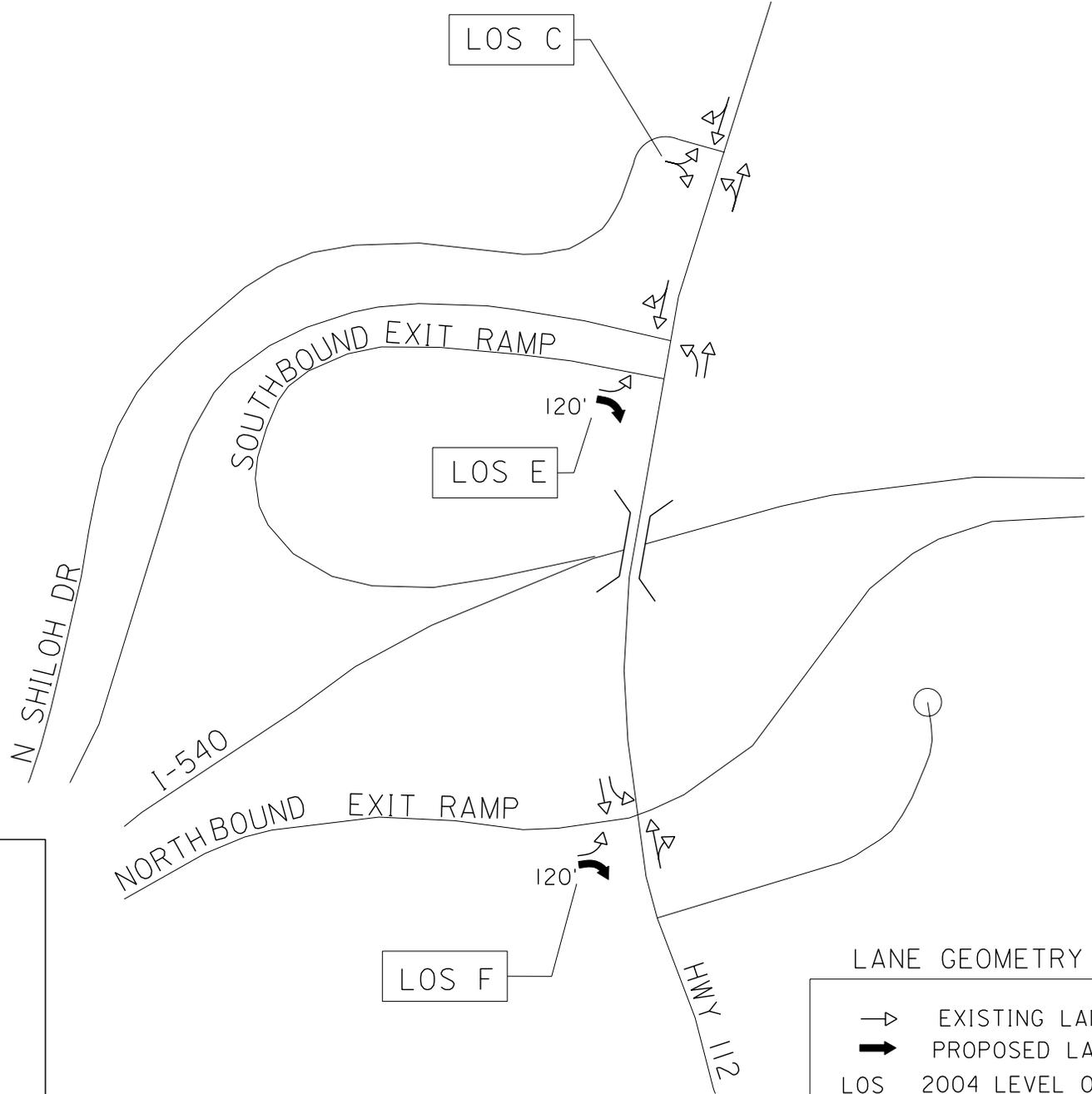


FIGURE 66-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 112 - EXIT 66

SHORT-TERM IMPROVEMENTS

LANE GEOMETRY KEY

-  EXISTING LANE
-  PROPOSED LANE
- LOS 2004 LEVEL OF SERVICE

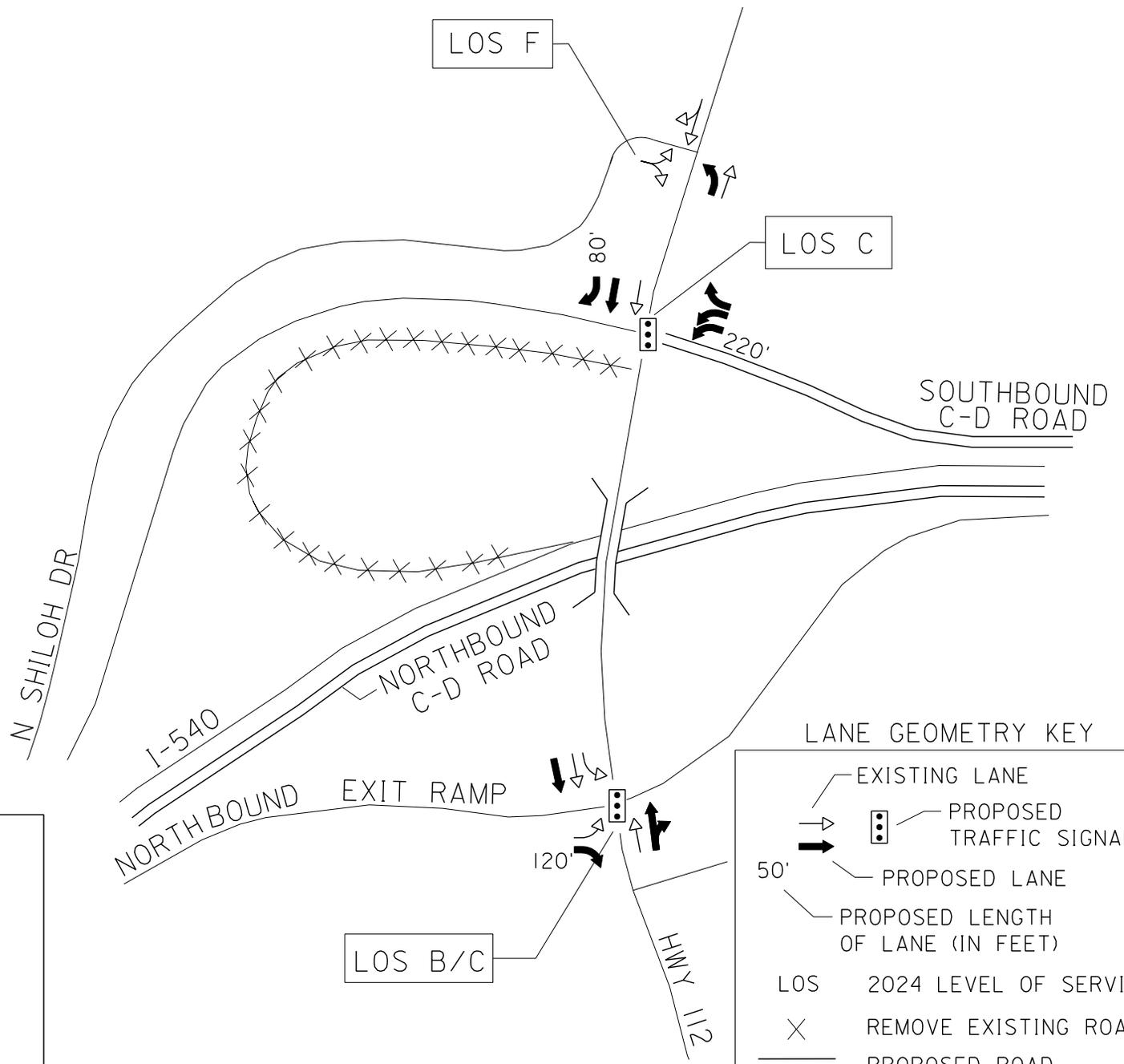


FIGURE 66-5

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
HIGHWAY 112 - EXIT 66

LONG-TERM IMPROVEMENTS

LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- PROPOSED LENGTH OF LANE (IN FEET)
- LOS 2024 LEVEL OF SERVICE
- REMOVE EXISTING ROAD
- PROPOSED ROAD
- PROPOSED TRAFFIC SIGNAL

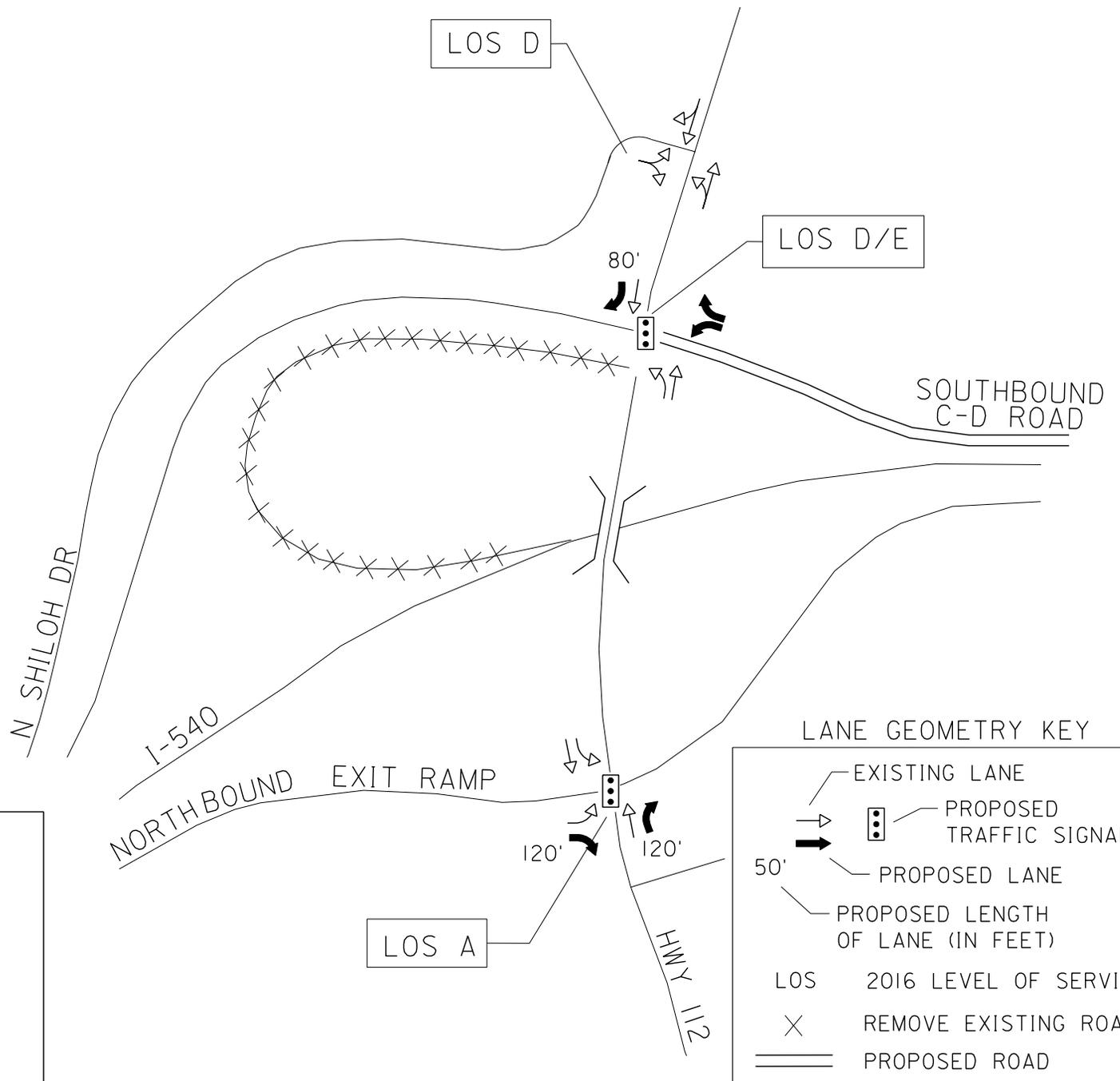


FIGURE 66-6

I-540 IMPROVEMENT STUDY
INTERSECTION LANE GEOMETRICS
HIGHWAY 112 - EXIT 66
INTERIM IMPROVEMENTS
(2016)

LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- PROPOSED LENGTH OF LANE (IN FEET)
- PROPOSED TRAFFIC SIGNAL
- 2016 LEVEL OF SERVICE
- REMOVE EXISTING ROAD
- PROPOSED ROAD

WASHINGTON COUNTY INTERCHANGES

Exit 69

Interstate 540 at Great House Springs Road/ Main Drive

Exit 69 Interstate 540 at Great House Springs Road/ Main Drive

This interchange is in the City of Johnson. Great House Springs Road is a two-lane road that runs under I-540. East of the interchange, Great House Springs Road ties into Main Drive through the City of Johnson. The interchange is a diamond interchange with both intersections currently unsignalized. The northbound and southbound ramp terminal intersections were analyzed at this interchange. Both ramps have one-lane approaches to the intersections.

Comments were collected from the open house public meeting surveys. The survey from the public meeting held on October 27, 2003, asked if the respondent experienced traffic congestion while traveling on I-540. The segment of I-540 between Fayetteville and Highway 412, which includes Exit 69, was cited as an area having congestion during morning and afternoon rush hours. One respondent submitted a letter with an aerial photograph showing a proposed connection between Shiloh Drive and South 48th Street at Main Drive. If constructed, it would provide a route from Highway 412 to the Northwest Arkansas Mall area. The respondent believes that the proposed route would relieve traffic congestion in Johnson and divert traffic from I-540.

East of the interchange, in Springdale to the north, there is a proposal by the City of Springdale to widen and extend Johnson Road so that it would tie directly into Great House Springs Road/ Main Drive. This proposed project was identified by the Northwest Arkansas Council as one of five high-priority projects in their October, 2003, report titled *Northwest Arkansas Transportation Needs*. If constructed, the proposed Johnson Road project would provide a direct link into Springdale, to Highway 412 and to the Tyson Corporation World Headquarters.

Short-Term Analysis

Existing morning and afternoon peak conditions were analyzed. The intersection of Great House Springs Road with the southbound ramps was found to operate at LOS F on the southbound exit ramp in the afternoon. Queues were estimated at lengths of over 600 feet, but this is not long enough to interfere with I-540 traffic flow. The intersection on Great House Springs Road/ Main Drive with the northbound ramps was found to operate at LOS C on the ramp. Observations at this location in the morning found no concerns with short queues and delays. See Table 69-1 for level of service findings. 2004 traffic volumes are shown in Figure 69-1.

Tabel 69-1

Exit 69 -- Levels of Service

	Southbound Ramps		Northbound Ramps	
2004 existing conditions	AM PM	unsig.-LOS D on ramp unsig.-LOS F on ramp* *no queue	AM PM	unsig.-LOS C on ramp unsig.-LOS C on ramp
2017 Interim Improvements Add auxilliary lanes signalize ramps	AM PM	LOS B LOS D/E	AM PM	LOS B LOS B
2024 existing conditions	AM PM	LOS F on ramp LOS F on ramp	AM PM	LOS F on ramp LOS F on ramp
Improvements signalize ramps right turn lanes	AM PM	LOS B LOS E	AM PM	LOS B on ramp LOS C on ramp
Widen to 4 lanes under bridge signalize and add aux. Lanes	AM PM	LOS B LOS D Double left off ramp	AM PM	LOS D LOS B/C

LOS = Level of Service

Short-Term Improvements

It is believed that the intersections do not need improvements based on current conditions. Although the southbound exit ramp is estimated to perform at LOS F, traffic flow is continuous without long queues or delays. When warranted in the future, the installation of traffic signals will help to maintain acceptable levels of service. See Figure 69-3 for the existing conditions at the ramp terminal intersections.

Long-Term Analysis

The growth rate anticipated for the Great House Springs Road/ Main Drive area is a relatively high five percent per year. When reviewed using 2024 forecast volumes, several deficiencies were apparent at this interchange. Both southbound and northbound exit ramps are expected to experience long delays and develop queues that interfere with I-540 traffic flow in the morning peak hour. The southbound exit ramp is expected to experience similar delays and queues for the afternoon peak hour. Traffic on Great House Springs Road/ Main Drive is predicted to be heavy and consistent and if the intersections remain unsignalized, motorists will have difficulty turning onto the ramps which will result in longer queues and long delays. Both ramp terminal intersections are estimated to perform at LOS F if they remain unsignalized. See Figure 69-2 for projected 2024 traffic volumes.

Three separate improvements were investigated to improve the interchange.

- Widening the southbound and northbound exit ramps would allow the right-turning traffic to pass by left-turning traffic queues.
- Signalizing both intersections would facilitate the efficient movement of ramp traffic through the interchange.
- An auxiliary lane on the southbound exit ramp would facilitate a double left-turn.

Signalization will aid in facilitating the ramp traffic through the interchange provided the necessary auxiliary lanes are implemented.

Widening the northbound and southbound exit ramps for right-turn lanes will improve the flow and reduce the delay time and queues on the ramps, but the southbound ramp traffic will still interfere with I-540 traffic. A double left-turn from the southbound exit ramp will allow the ramp to clear quickly each cycle. This will allow more cycle time for westbound traffic turning south onto the entrance ramp and should prevent the westbound traffic from queuing and blocking the northbound ramp terminal. Great House Springs Road/ Main Drive will need to be widened under the Interstate to provide two eastbound lanes to accommodate traffic from the southbound exit ramp. This

widening should continue east of the northbound ramp terminal to ensure good lane utilization.

As noted below, interim improvements are recommended at this interchange because the widening for double-turn lanes can be postponed by these measures. Though the result would be intersection operations at acceptable levels of service in 2024, the long-term improvements are recommended to include the double-turn lanes in order to prevent the backing up of queues from the ramp terminal intersection onto southbound I-540.

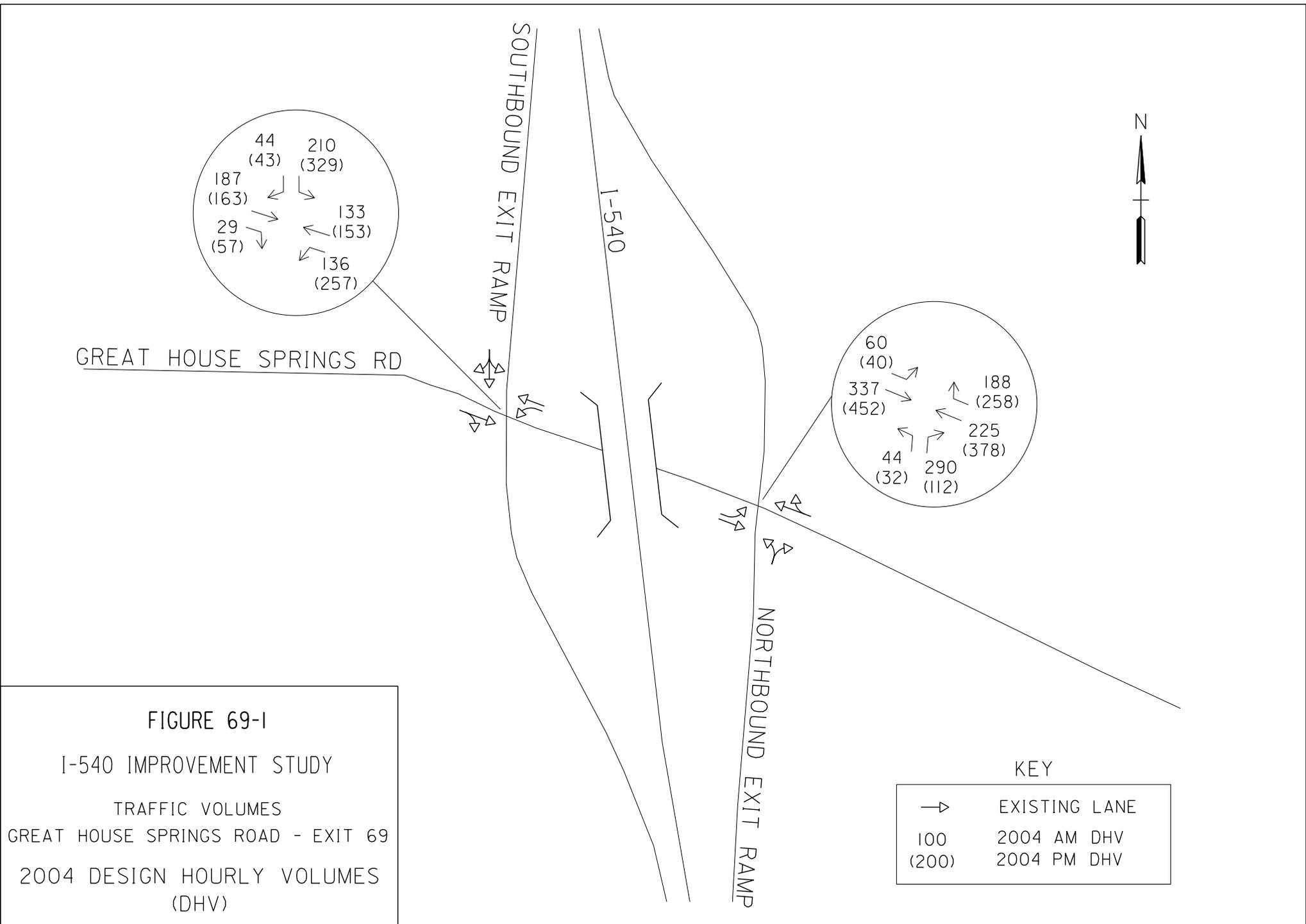
Long-Term Improvements

Great House Springs Road/ Main Drive will need to be widened to provide four lanes under the bridge. Auxiliary lanes as described above will be needed to prevent traffic from interfering with mainline traffic. With these improvements in place, LOS C or better can be expected in the year 2024 while retaining the basic diamond configuration of the interchange. See Figure 69-4 for recommended intersection geometries.

If the proposed Johnson Road project is undertaken, then additional improvements to the interchange would be expected. These should be studied as a part of the development of that project.

Interim Improvements

Improvements could be made to this interchange to postpone the date when the widening of Great House Springs Road/ Main Drive will be needed to accommodate the double-left turn from the southbound exit ramp that is proposed in the long term improvements. To keep traffic flowing as efficient as LOS D through the year 2017, the auxiliary lanes mentioned in the long term improvements could be constructed with the exception of the additional left turn lane for the southbound exit ramp. Both ramp intersections must be signalized for operations to run smoothly. See Figure 69-5 for interim improvements.



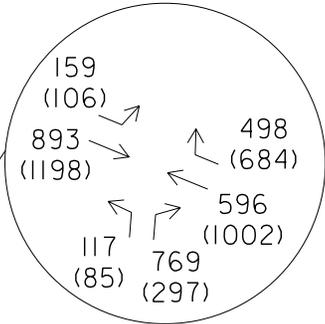
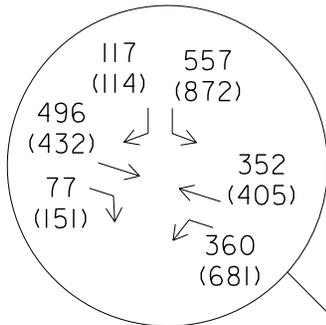
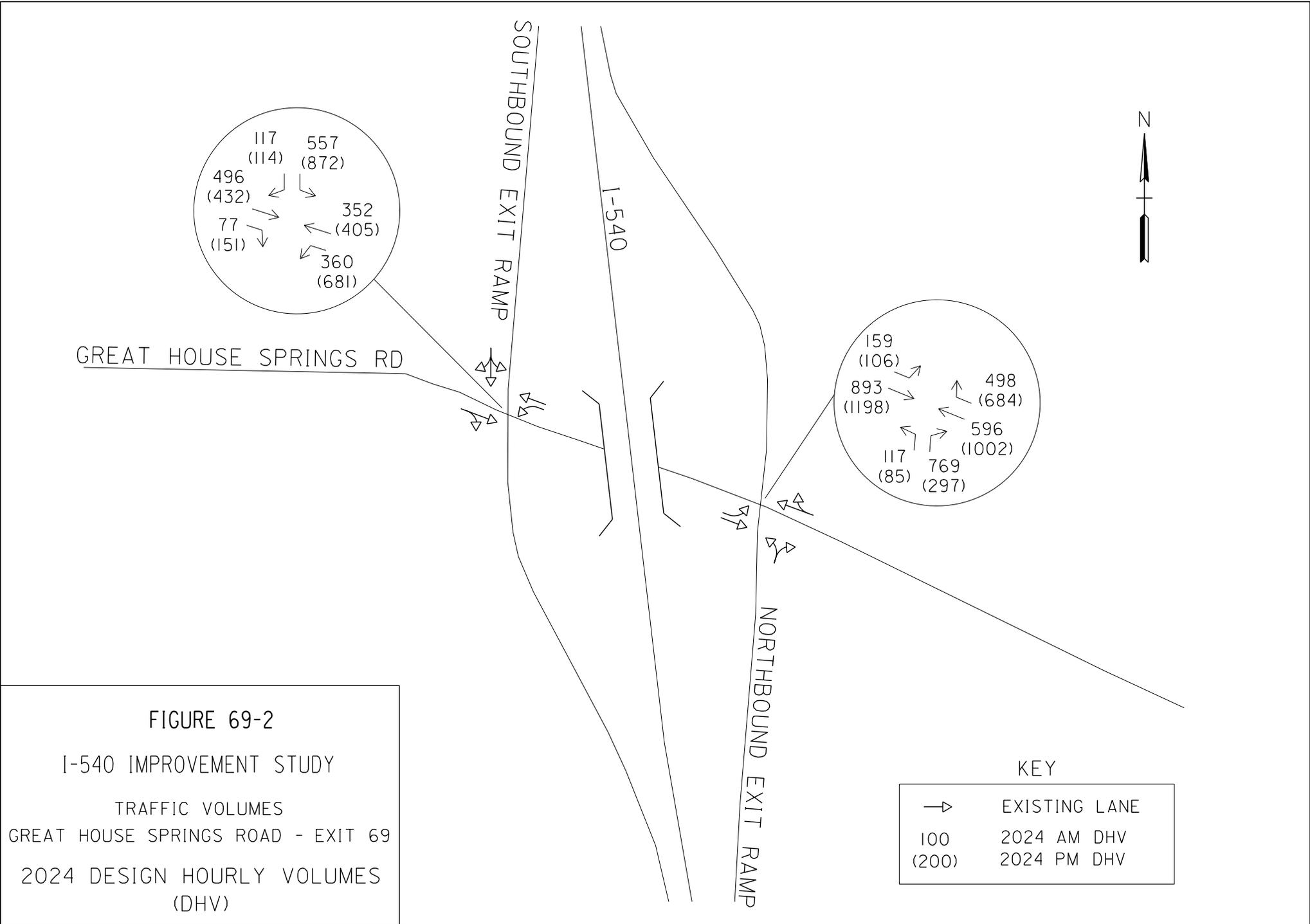


FIGURE 69-2

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES

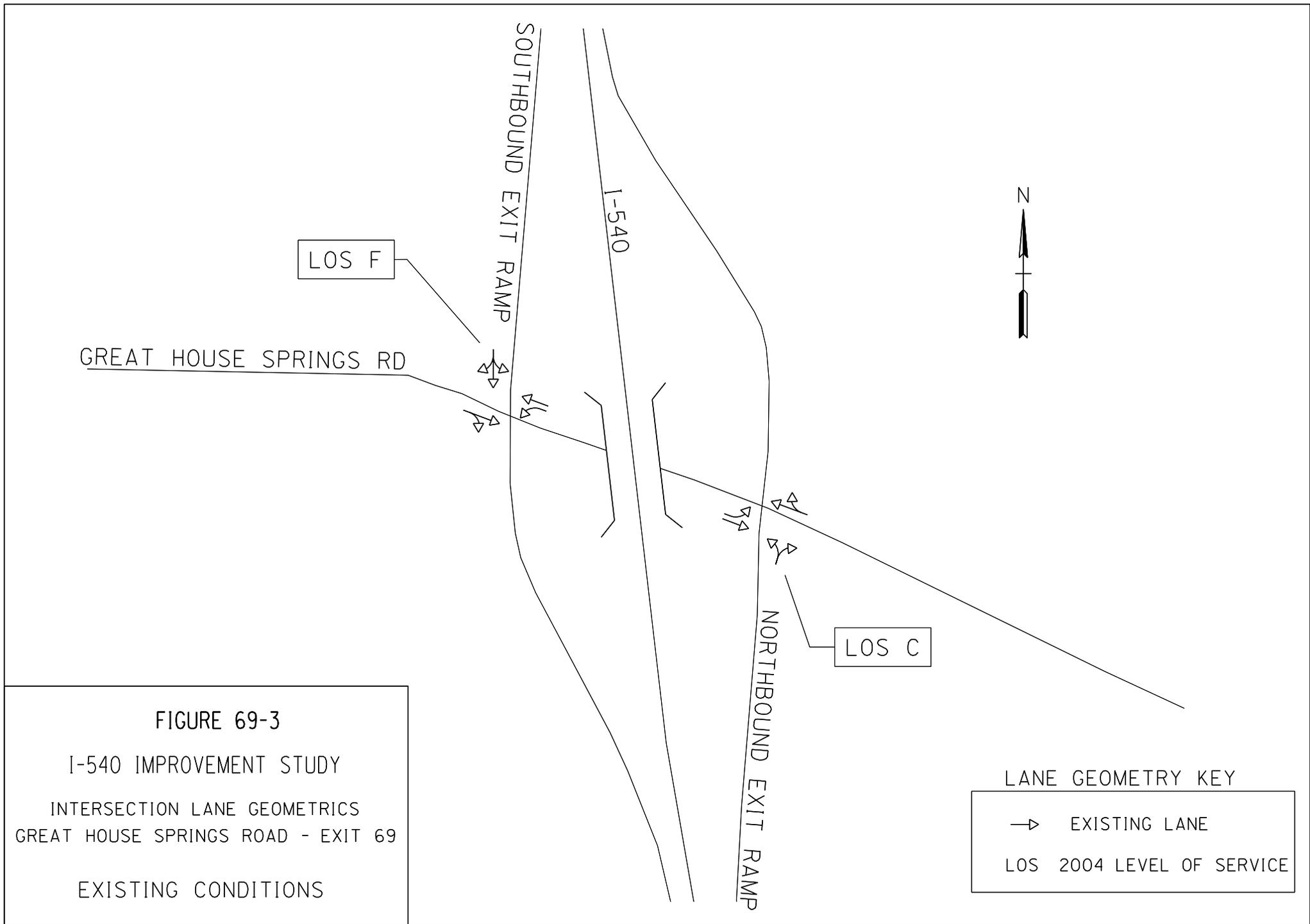
GREAT HOUSE SPRINGS ROAD - EXIT 69

2024 DESIGN HOURLY VOLUMES

(DHV)

KEY

→	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV



LOS F

GREAT HOUSE SPRINGS RD

SOUTHBOUND EXIT RAMP

I-540



NORTHBOUND EXIT RAMP

LOS C

FIGURE 69-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
GREAT HOUSE SPRINGS ROAD - EXIT 69

EXISTING CONDITIONS

LANE GEOMETRY KEY

→ EXISTING LANE

LOS 2004 LEVEL OF SERVICE

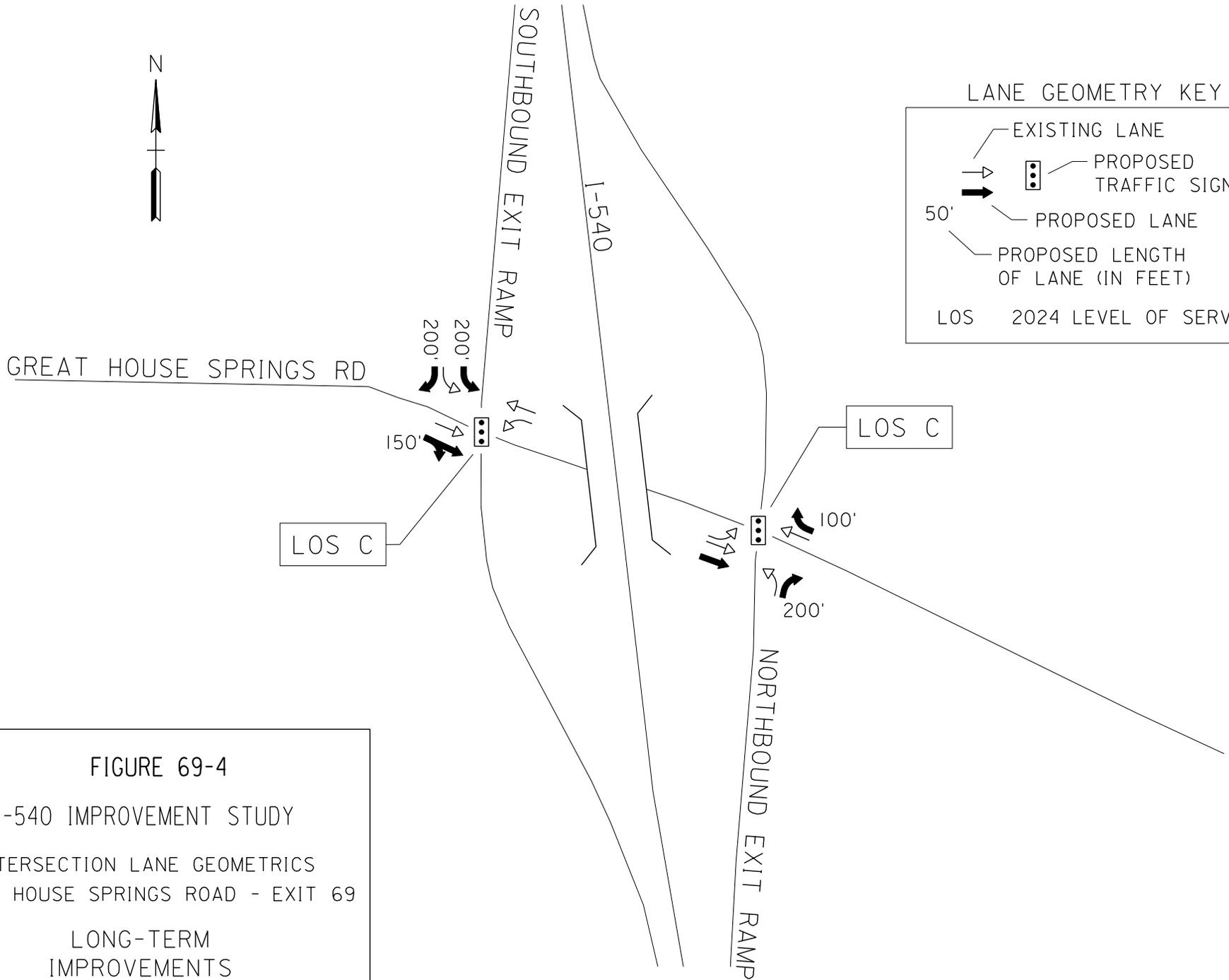
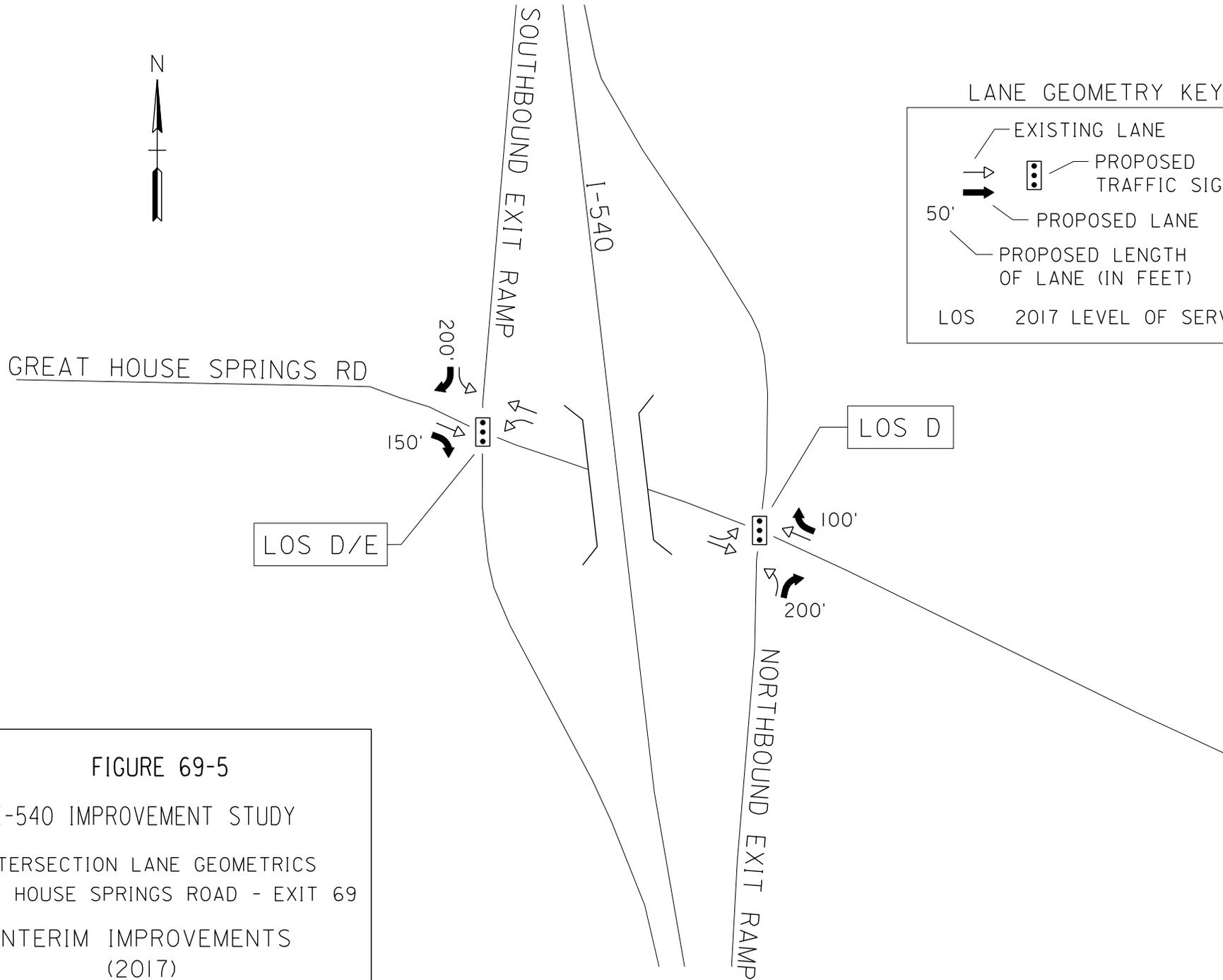


FIGURE 69-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
GREAT HOUSE SPRINGS ROAD - EXIT 69

LONG-TERM
IMPROVEMENTS



LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- PROPOSED LENGTH OF LANE (IN FEET)
- PROPOSED TRAFFIC SIGNAL
- LOS 2017 LEVEL OF SERVICE

LOS D/E

LOS D

FIGURE 69-5
I-540 IMPROVEMENT STUDY
INTERSECTION LANE GEOMETRICS
GREAT HOUSE SPRINGS ROAD - EXIT 69
INTERIM IMPROVEMENTS
(2017)

WASHINGTON COUNTY INTERCHANGES

Exit 72

Interstate 540 at Highway 412

(West Sunset Avenue)

Exit 72 Interstate 540 at Highway 412 (West Sunset Avenue)

This interchange is located in a commercially developed area of southwest Springdale in Washington County. Highway 412 is a four-lane highway, with I-540 crossing over Highway 412. Highway 412 is on the National Highway System (NHS).

The I-540 exit ramps were recently widened to allow adequate turning lanes, and Highway 412 was widened to create pass-by left-turn lanes through the interchange. Except for the southbound exit ramp, the interchange is a diamond configuration. This exit ramp is a J-hook ramp terminating at South 48th Street which serves as a frontage road. Turning movement counts were taken at the Highway 412 intersections with South 48th Street/ southbound entrance ramp and with the northbound ramps. Counts were also taken for the intersection of the southbound exit ramp with South 48th Street and the nearby intersection of Highway 412 with South 48th Street/ South 48th Place.

Comments were collected from the open house public meeting surveys and the meeting with local officials. In the public meetings on October 27th and 28th, 2003, the survey asked if the respondent experienced traffic congestion while traveling on I-540. All twenty-six respondents said yes, and Highway 412 was cited as having congestion during both the a.m. and p.m. rush hours. The survey asked if the respondent experienced difficulty getting on and off I-540 due to traffic congestion on ramps and at intersecting cross streets. Twenty-five respondents replied yes, and Highway 412 was listed as an interchange experiencing congestion on ramps or cross streets during both the morning and afternoon rush hour. One respondent enclosed a letter with an aerial photograph showing a proposed connection between Shiloh Drive and South 48th Street at Main Drive. If constructed, this would provide a route from Highway 412 to the Northwest Arkansas Mall area. In the meeting on October 27, 2003 with local officials, Highway 412 was cited as an example that should have high priority since it is currently experiencing operational problems.

The Northwest Arkansas Council presented a report to the Arkansas Highway and Transportation Department (AHTD) titled *Northwest Arkansas Transportation Needs* (October, 2003), in which this interchange is identified as one of five interchanges that are high priority for improvements. The reason for this is the growth in the region and the resulting increase in transportation demands, the anticipated congestion and a \$13.7 million annual cost of delay directly related to severe congestion and the need to improve safety and efficiently move traffic between I-540 and Highway 412.

Short-Term Analysis

Existing peak conditions were analyzed for 2004 traffic. The percentage of heavy vehicles is a relatively high six percent during peak hours. All four of the intersections that are currently signalized were determined to function at LOS C or better when analyzed with the traffic volumes provided. The eastbound motorists turning left at the northbound ramp intersection experienced the longest delay (less than 60 seconds in the afternoon peak). Morning peak volumes were similar or less than afternoon volumes. The analysis indicates traffic flowing easily without developing troublesome queues. The level of service findings are presented in Table 72-1. Traffic volumes for 2004 are shown in Figure 72-1.

Short-Term Improvements

Observations indicated that queues from upstream traffic signals east of the interchange back up on Highway 412 and interfere with interchange operations. Recent improvements to traffic signal timing appear to have reduced the queues of vehicles that have been observed through this interchange, especially for morning peak conditions. See Figure 72-3 for existing intersection geometries.

Long-Term Analysis

Growth rates were determined by taking into account a Draft Environmental Impact Statement for a new Highway 412 Bypass that would alleviate congestion on existing Highway 412 once completed. It was estimated that traffic volumes on the existing Highway 412 would increase until the completion of the bypass. Once the proposed Highway 412 Bypass is opened, it is expected that a large share of the travel demand will move to the new facility. Existing Highway 412 would be expected to experience a dramatic decline in traffic volumes, including a large number of trucks, due to diverted traffic. Subsequently, traffic volumes on existing Highway 412 would be expected to slowly rise back to the current levels. A growth rate of 2.5 percent per year was estimated for the 48th Place / South 48th Street frontage road to the east. Interim improvements may be necessary or appropriate until the Highway 412 Bypass is completed. Traffic volumes projected for the year 2024 are shown in Figure 72-2.

Anticipated interchange operations were reviewed using the 2024 forecast volumes for both morning and afternoon peak conditions. The intersections are expected to perform quite well under morning conditions. In the afternoon peak, the northbound

Table 72-1

Exit 72 -- Levels of Service

	Southbound Exit Ramp at S. 48th St.	S. 48th St / SB Entrance Ramp at Highway 412	Northbound Ramps at Highway 412	S. 48th St./ S. 48th Place at Highway 412
2004 existing conditions	AM LOS B/ C PM LOS B	AM LOS F PM LOS B	AM LOS B/ C PM LOS C/ D	AM LOS B/ E PM LOS D/ F
2010 existing conditions	AM LOS C PM LOS B	AM LOS D/ E PM LOS D/ F	AM LOS C/ E PM LOS D/ F	AM LOS F PM LOS F
interim option	AM LOS C PM LOS B	AM LOS C/ D WB dbl.left PM LOS D	AM LOS B/ C EB dbl. Left PM LOS C/ D NB dbl. Right	AM LOS D/ E EB right lane PM LOS F NB right lane SB right lane
2024 existing conditions	AM LOS B/ C PM LOS B	AM LOS B/ C PM LOS D	AM LOS B/ C PM LOS C/ D	AM LOS B/ E PM LOS C/ E

LOS = Level of Service

South 48th Street traffic would be expected to experience delays. Delay in achieving access onto Highway 412 is expected to continue to be common at many intersections east of the interchange as well.

Long-Term Improvements

Signal coordination that would improve traffic flow along Highway 412 may be required in future recommendations at this interchange. Using 2024 forecast volumes, the intersections all perform at LOS D or better. Signal coordination would lead to LOS C or better. See Figure 72-4 for anticipated 2024 levels of service.

Interim Analysis

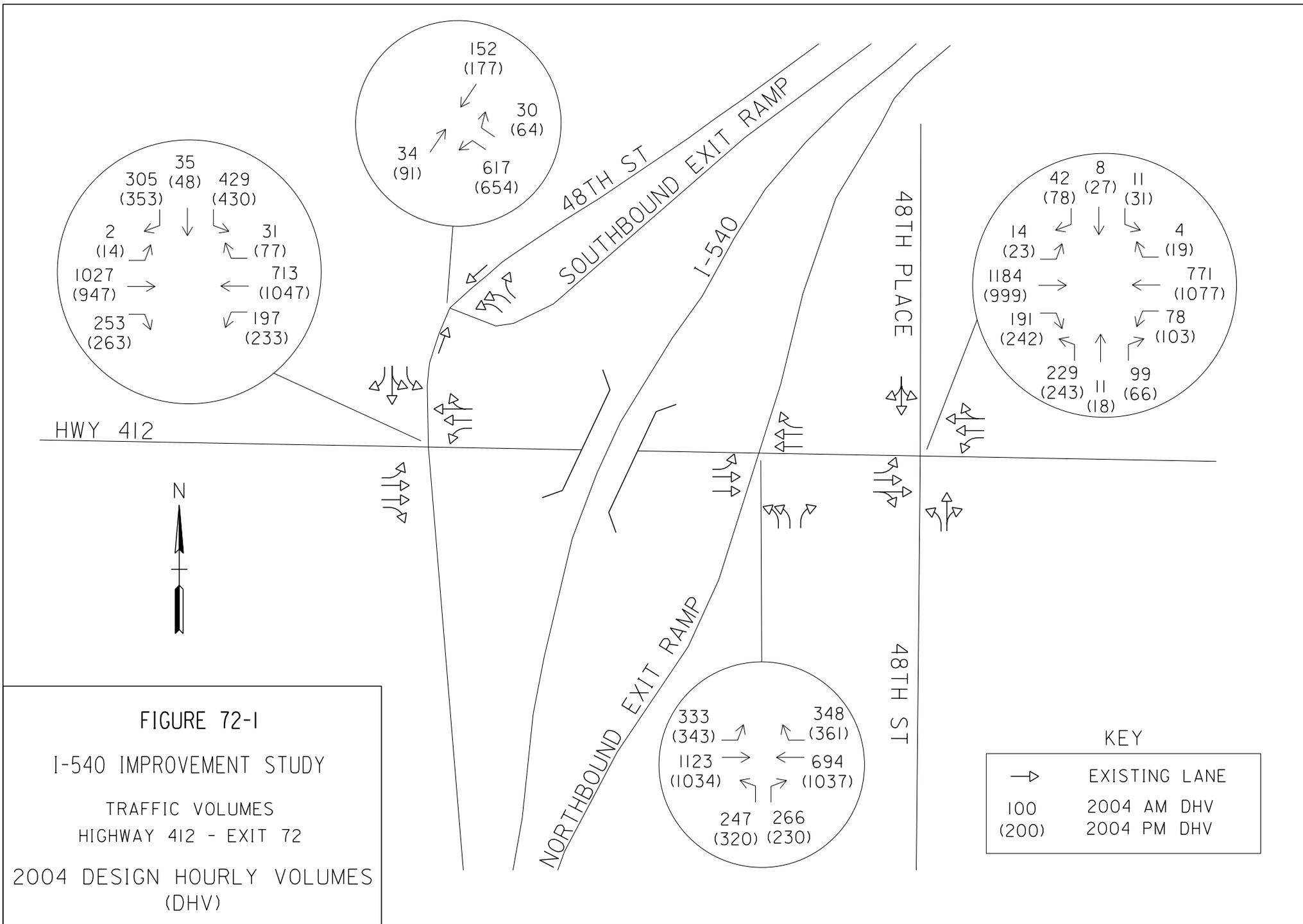
The 2024 traffic forecast took into consideration completion of the proposed Highway 412 Bypass. The traffic volumes on existing Highway 412 are expected to continually increase until the bypass is constructed. If the proposed Highway 412 Bypass were to be opened in 2011, traffic volumes at the existing interchange would be expected to grow to levels approximately twenty percent higher than current volumes. The existing interchange was reviewed for anticipated year 2010 conditions to evaluate the anticipated congestion that would be expected during the period of development of the proposed bypass.

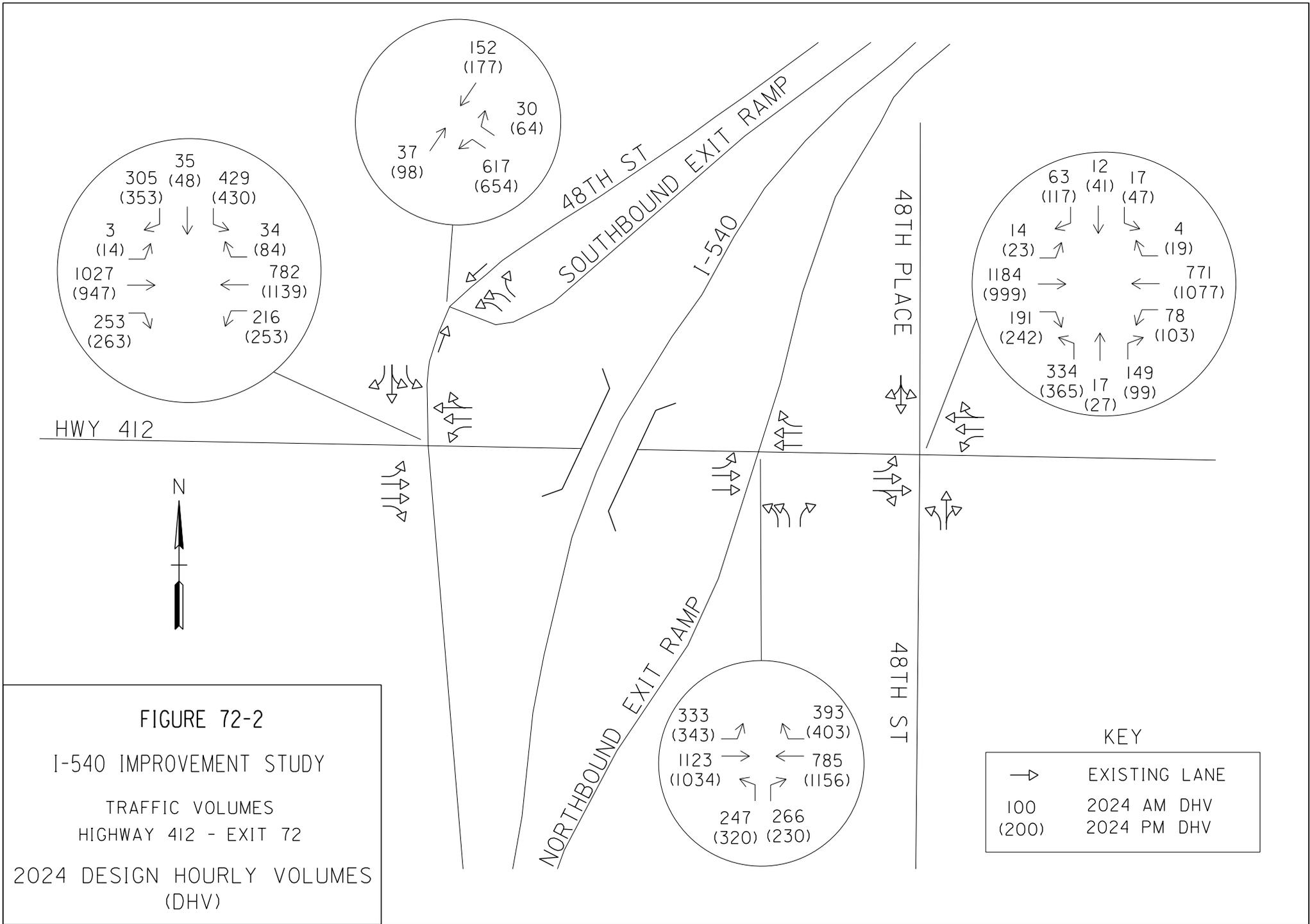
Both morning and afternoon peak conditions were evaluated. The intersection of the southbound exit ramp and South 48th Street would be expected to continue with good operations. However, all three of the intersections on Highway 412 would be expected to experience LOS E or LOS F with queues that would interfere with upstream intersections.

Improvements were sought that would allow the interchange area to function with an acceptable level of service in 2010. These suggested improvements would achieve that goal:

- Widen Highway 412 to develop double-left turn lanes onto both entrance ramps. This would require widening each of the entrance ramps and extending the entrance ramps along I-540.
- Add right-turn lanes for eastbound Highway 412 at South 48th Street/South 48th Place, and for northbound South 48th Street at Highway 412, and for southbound South 48th Place onto Highway 412.
- Add a right-turn lane on the northbound exit ramp, creating a double-right turn which would then have to be signalized.

See Figure 72-5 for an illustration of these proposed auxiliary lanes. However, these recommended improvements present difficulties. In order to widen and extend the entrance ramps to accommodate the double-left turns, both weigh stations located along I-540 in proximity to the interchange would have to be relocated. Also, funding these improvements will be a difficult issue considering the on-going effort to fund the proposed Highway 412 Bypass.





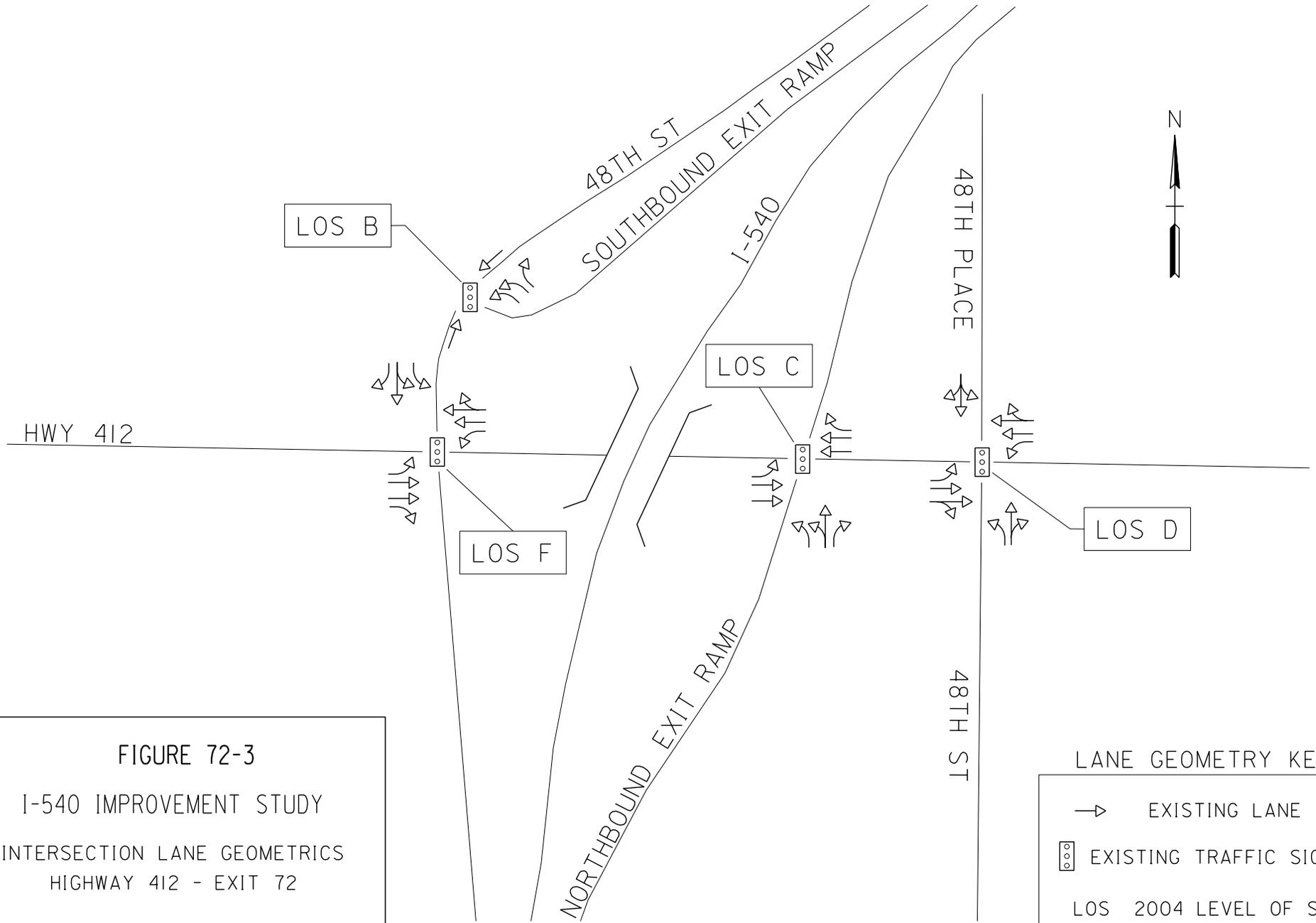


FIGURE 72-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 412 - EXIT 72

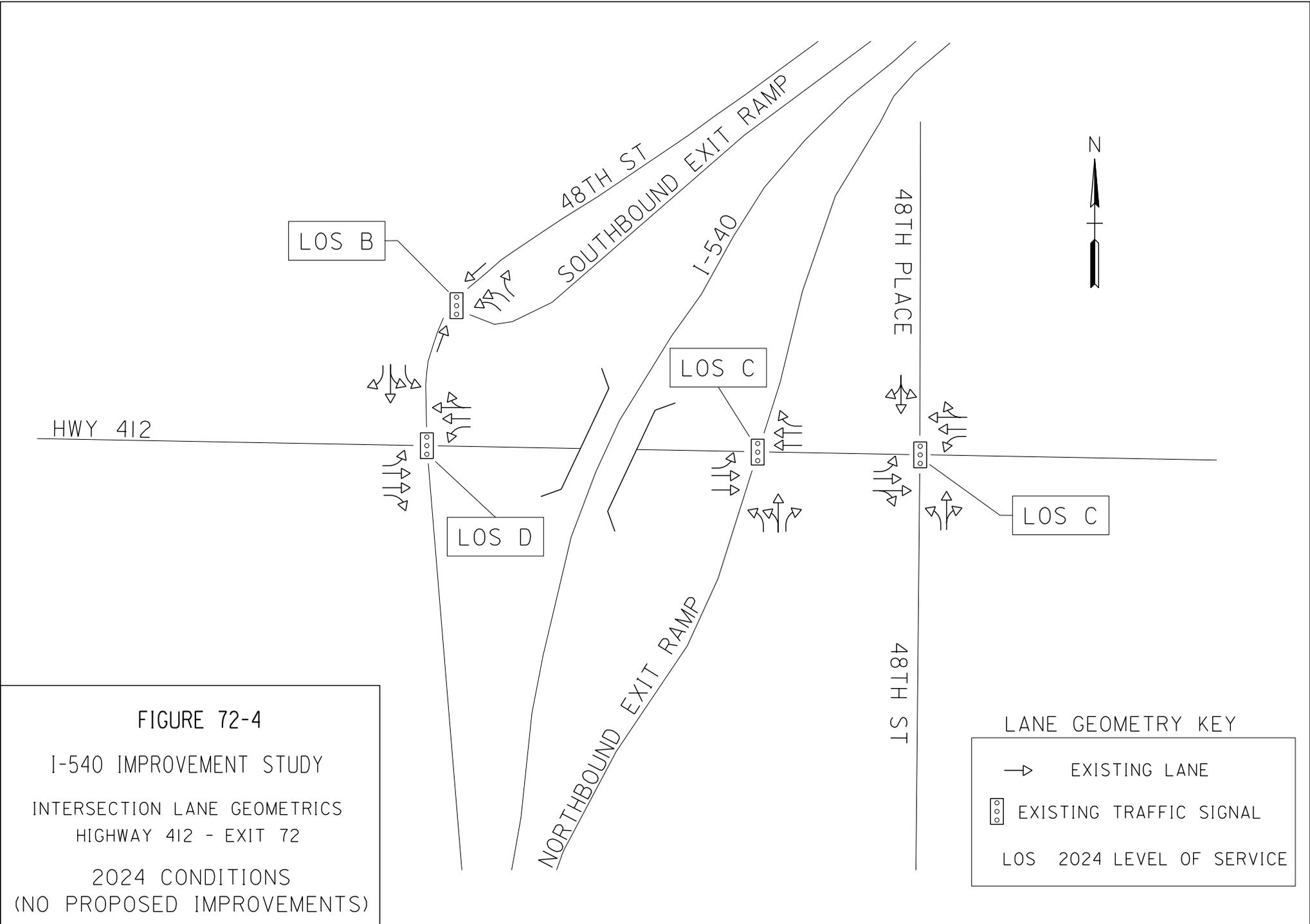
EXISTING CONDITIONS

LANE GEOMETRY KEY

→ EXISTING LANE

◻ EXISTING TRAFFIC SIGNAL

LOS 2004 LEVEL OF SERVICE



LOS B

LOS C

LOS D

LOS C

FIGURE 72-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 412 - EXIT 72

2024 CONDITIONS

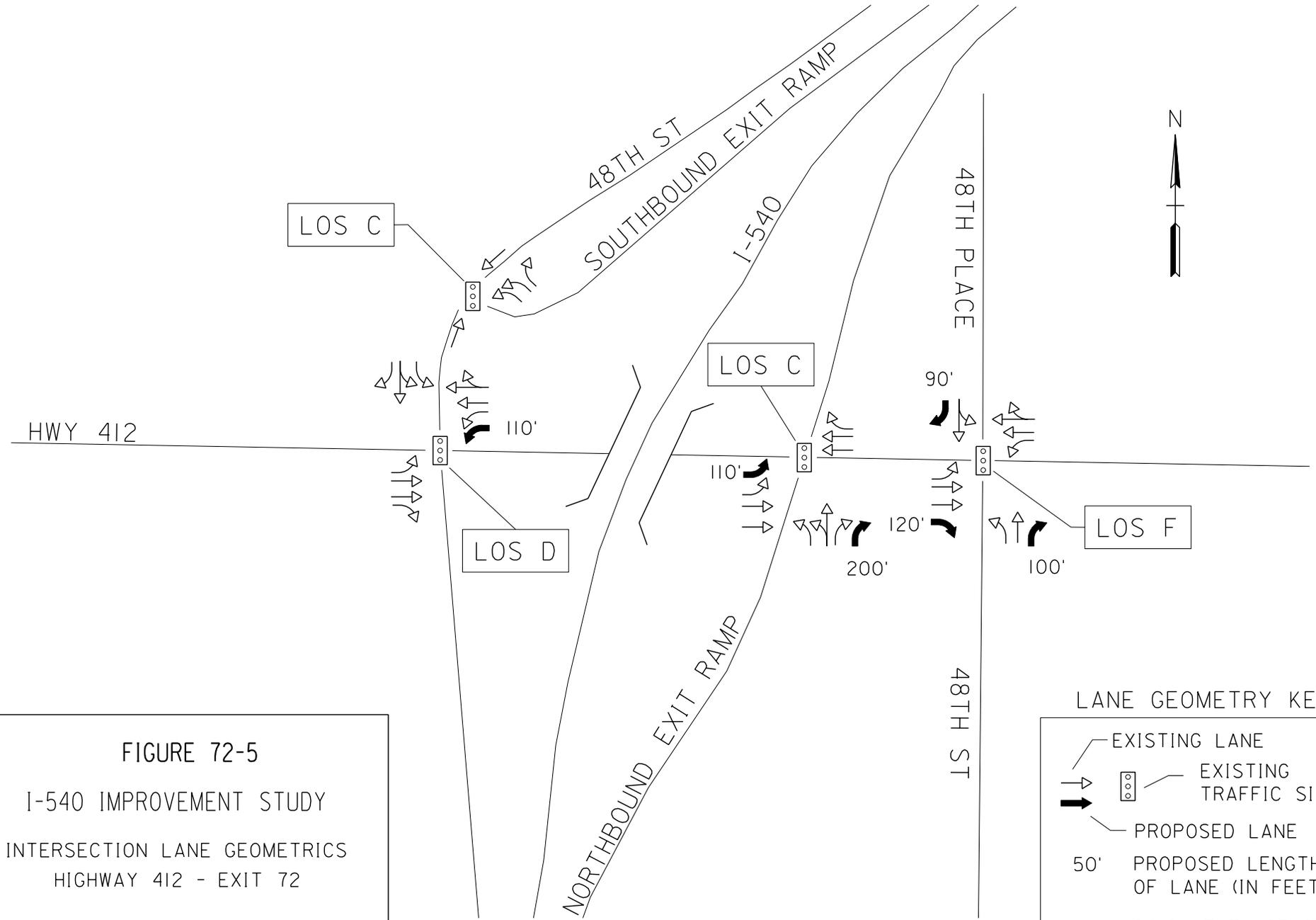
(NO PROPOSED IMPROVEMENTS)

LANE GEOMETRY KEY

→ EXISTING LANE

◻ EXISTING TRAFFIC SIGNAL

LOS 2024 LEVEL OF SERVICE



LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- EXISTING TRAFFIC SIGNAL
- PROPOSED LENGTH OF LANE (IN FEET)
- LOS 2010 LEVEL OF SERVICE

FIGURE 72-5
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 412 - EXIT 72
 INTERIM OPTION

WASHINGTON COUNTY INTERCHANGES

Exit 73

Interstate 540 at Elm Springs Road

Exit 73 Interstate 540 at Elm Springs Road

This interchange is located in the City of Springdale in Washington County. Elm Springs Road is a two-lane highway west of I-540 which transitions to a three-lane highway with a center turn lane for left-turns in each direction over I-540. East of I-540, Elm Springs Road is a four-lane highway divided by a continuous, two-way, left-turn lane. The interchange is a common diamond interchange. Both northbound and southbound ramp terminal intersections were analyzed.

Comments were collected from the open house public meetings and the local officials meeting. In the public meetings in October, 2003, a survey question asked if the respondent experienced traffic congestion while traveling on I-540. All 26 respondents said yes, and I-540 at Elm Springs Road was cited as having congestion during both the morning and afternoon rush hours. A following question asked if the respondent experienced difficulty getting on and off I-540 due to traffic congestion on ramps and at intersecting cross streets. Twenty-five respondents replied yes and Elm Springs Road was listed as an interchange experiencing congestion on ramps or cross streets during both the morning and afternoon rush hour. At the October 27, 2003, meeting with local officials, it was noted that the City of Springdale has sanitary sewer extensions programmed within the next two years for areas near I-540 along Elm Springs Road. It was noted that the northbound exit ramp traffic at Elm Springs Road interchange backs up past the weigh station on I-540. The source of the problem appears to be the absence of a traffic signal at the northbound ramp terminal intersection. It was also suggested that construction of a northbound auxiliary lane be investigated. It was also noted that growth in Northwest Arkansas has typically been underestimated. The City of Springdale is planning roadway improvements to Elm Springs Road between the interchange with I-540 and Highway 71B.

Short-Term Analysis

Existing morning and afternoon peak conditions were analyzed. The southbound ramp terminal intersection that is currently signalized was found to function at LOS C or better. However, turning movements in the morning peak were found to be LOS D for the westbound left-turn from Elm Springs Road and the southbound left-turn from the exit ramp. The unsignalized northbound terminal intersection performs at LOS F for the northbound exit ramp. Using simulation software, SimTraffic, no substantial queues or delays were shown at either ramp terminal intersection. See Table 73-1 for the level of service findings. See Figure 73-1 for 2004 traffic volumes.

Table 73-1

Exit 73 -- Levels of Service

	Southbound Ramps	Northbound Ramps
2004 existing conditions	AM LOS C PM LOS B	AM LOS F on ramp * PM LOS F on ramp * *no queue,no problems
2024 existing conditions	AM LOS F PM LOS F	AM LOS F on ramp PM LOS F on ramp
Signal added & adjusted SB Double left turn lane Widen exit ramps for aux. lanes Double EB thru lane	AM LOS C PM LOS C	AM LOS D PM LOS E ** **long queues for WB approach

LOS = Level of Service

Short-Term Improvements

There are no short-term improvements recommended for this interchange. See Figure 73-3 for the intersection geometries and findings.

Long-Term Analysis

A growth rate of three percent per year was estimated for Elm Springs Road. The 2024 forecast volumes were reviewed for both morning and afternoon peak conditions. These volumes appear in Figure 73-2. Both intersections appear insufficient to accommodate future traffic volumes.

The intersection of Elm Springs Road with the southbound ramps is anticipated to perform at LOS F with delays for ramp and eastbound traffic. Westbound traffic turning onto the southbound entrance ramp is also expected to operate at LOS F, developing a queue that will exceed the storage length and block through traffic. The analysis suggested that double left-turn lanes will be needed on the southbound exit ramp. This will necessitate two eastbound through lanes between the ramp terminal intersections. The right-turn lane on the southbound exit ramp should be lengthened, and an auxiliary lane for eastbound through traffic will be needed west of the intersection. With those improvements in place the southbound ramp terminal intersection is expected to perform at LOS C in 2024. All vehicles should experience less than 55 seconds of delay.

Two eastbound lanes would be needed to accommodate anticipated year 2024 southbound exit ramp traffic volumes. The bridge could be re-striped to accommodate four lanes of traffic, but the shoulders would be eliminated. This would result in unsafe conditions for pedestrians crossing the bridge. The existing bridge could be widened over I-540 or a cantilevered pedestrian walkway could be added. An alternative to these two options would be to re-stripe for one westbound lane and two eastbound lanes on the bridge and widen Elm Springs Road off the bridge to accommodate a left-turn lane with storage at both ramp terminal intersections.

The northbound ramp terminal intersection is also expected to fail under 2024 traffic. The high volume of traffic on Elm Springs Road restricts left turns from the northbound exit ramp, creating a queue on the ramp that interferes with traffic on I-540. Signalization, a second lane for eastbound traffic, and lengthening the right-turn lane on the northbound exit ramp were investigated for this intersection. With these improvements in place, the intersection can be expected to operate at LOS E in the afternoon peak hour. Westbound through traffic could experience average peak delays of

over two minutes per vehicle. An additional westbound lane could be a supplementary improvement, but would require widening the bridge over I-540.

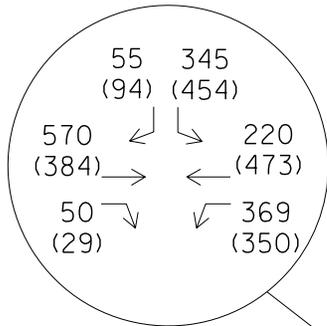
Long-Term Improvements

Traffic Signals should be installed at the northbound ramp terminal intersection. The right-turn lanes on the northbound and southbound exit ramps should be a minimum of 200 feet in length. It is recommended that an auxiliary left-turn lane with a minimum storage length of 200 feet be constructed on the southbound exit ramp to provide a double left-turn. With the double left-turn from southbound exit ramp, two eastbound lanes will be needed on Elm Springs Road through the northbound ramp terminal intersection. An auxiliary through lane, a minimum of 300 feet in length, is recommended for eastbound traffic on Elm Springs Road on the west approach to the southbound ramp terminal intersection. The bridge over I-540 will need to be re-striped to accommodate one westbound lane and two eastbound lanes. Between the ramp terminal intersections, Elm Springs Road, excluding the bridge over I-540 would be widened to provide storage for the left-turn lanes. See Figure 73-4 for an illustration of these recommended auxiliary lanes.



KEY

→	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV



ELM SPRINGS RD

SOUTHBOUND EXIT RAMP

I-540

NORTHBOUND EXIT RAMP

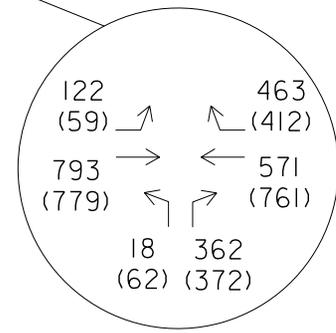


FIGURE 73-1

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES

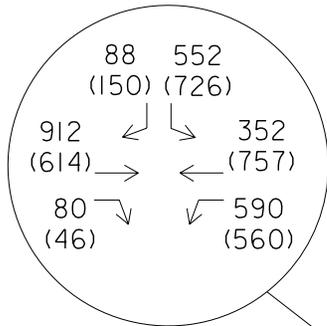
ELM SPRINGS ROAD - EXIT 73

2004 DESIGN HOURLY VOLUMES
(DHV)



KEY

→	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV



ELM SPRINGS RD

SOUTHBOUND EXIT RAMP

I-540

NORTHBOUND EXIT RAMP

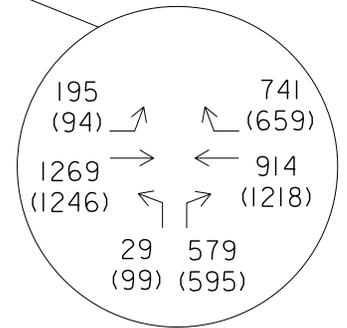


FIGURE 73-2

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES

ELM SPRINGS ROAD - EXIT 73

2024 DESIGN HOURLY VOLUMES
(DHV)



ELM SPRINGS RD

SOUTHBOUND EXIT RAMP

I-540

NORTHBOUND EXIT RAMP

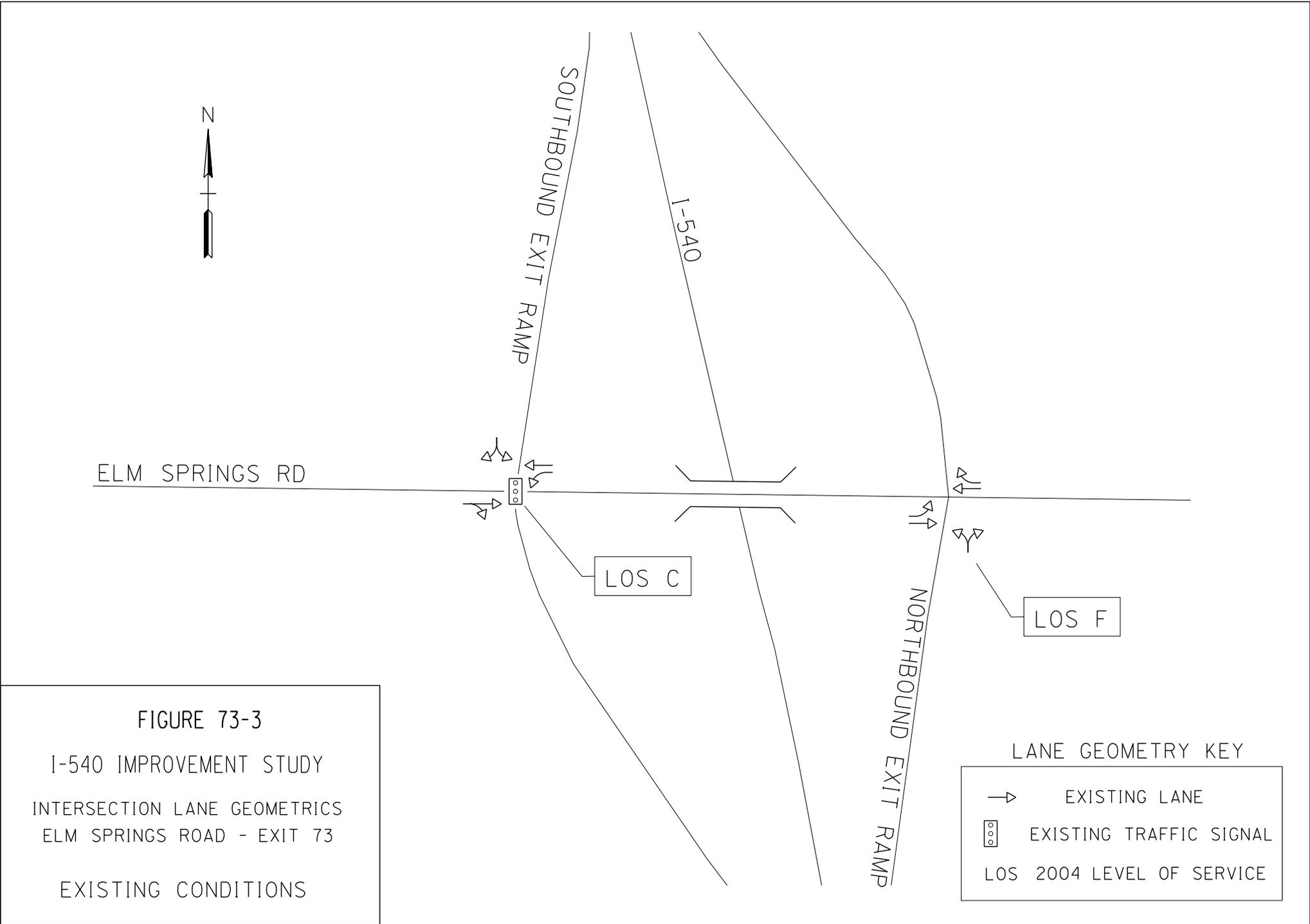
LOS C

LOS F

FIGURE 73-3
I-540 IMPROVEMENT STUDY
INTERSECTION LANE GEOMETRICS
ELM SPRINGS ROAD - EXIT 73
EXISTING CONDITIONS

LANE GEOMETRY KEY

	EXISTING LANE
	EXISTING TRAFFIC SIGNAL
LOS	2004 LEVEL OF SERVICE



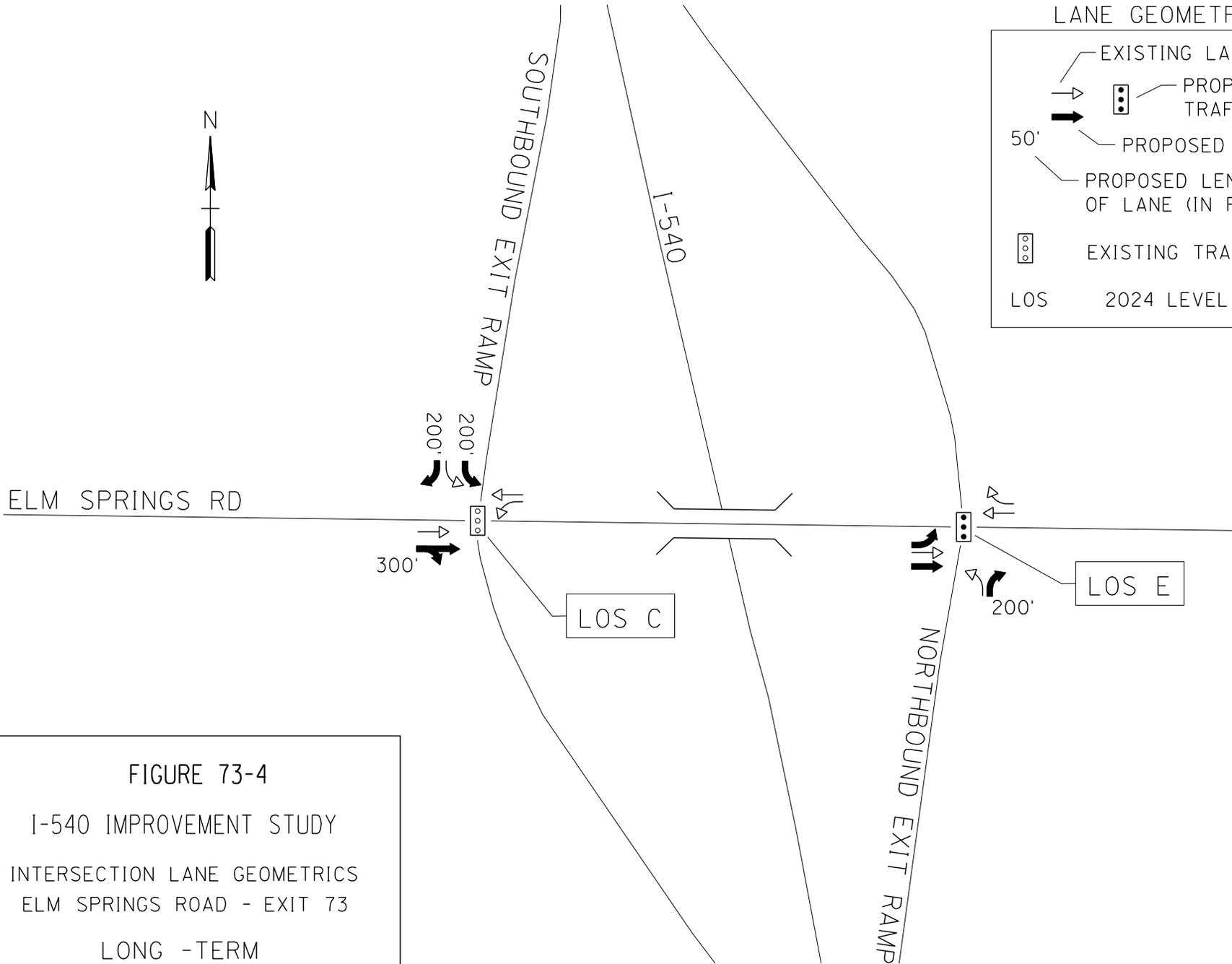
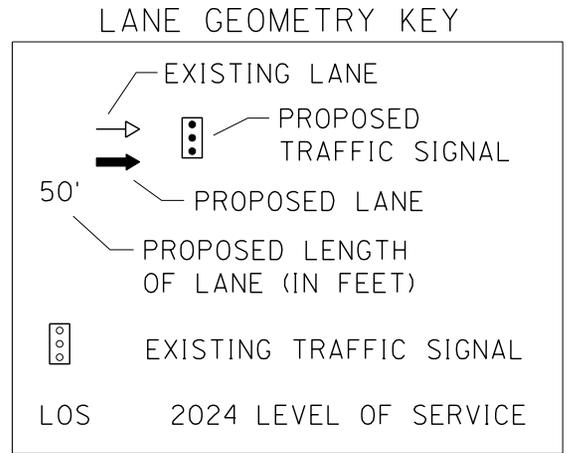


FIGURE 73-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

ELM SPRINGS ROAD - EXIT 73

LONG -TERM
IMPROVEMENTS

BENTON COUNTY INTERCHANGES

BENTON COUNTY INTERCHANGES

There are six interchanges on I-540 in Benton County. Four of these interchanges are with state highways.

There are two proposed interchanges for I-540 in Benton County. A freeway-to-freeway interchange is proposed with the proposed Highway 412 Bypass. This new interchange would be located south of the interchange with Highway 264 near I-540 milepost 77. A new interchange is proposed with Perry Road near I-540 milepost 82. Neither of these proposed interchanges is included in this study. However, the projected traffic for these two interchanges were considered in developing traffic forecasts for adjacent interchanges.

I-540 ends at the interchange with Highway 102/ Highway 62 in Bentonville (Exit 85). North of this interchange, the freeway continues to the north as Highway 71. One interchange on Highway 71 was included in the study. This is the interchange with Highway 72 in Bentonville.

The following discussion presents a review of the analyses and the recommended short-term and long-term improvements for each of these interchanges.

BENTON COUNTY INTERCHANGES

Exit 76

Interstate 540 at Wagon Wheel Road

Exit 76 Interstate 540 at Wagon Wheel Road

This interchange is north of Springdale city limits in a rural area of southern Benton County. Wagon Wheel Road is a two-lane road that passes over I-540 and intersects Puppy Creek Road to the west. The northbound ramps form a partial diamond interchange and the southbound ramps are J-hook ramps that intersect with Puppy Creek Road and southbound East Wagon Wheel Road. The analyzed intersections include the northbound ramp terminal on Wagon Wheel Road, Wagon Wheel Road and Puppy Creek Road, the southbound exit ramp with Puppy Creek Road and the southbound entrance ramp with East Wagon Wheel Road. All four intersections are currently unsignalized. The existing Wagon Wheel Road bridge over I-540 is narrow with no shoulders or sidewalk.

Comments were collected from the two open house public meetings that were held in October, 2003. The survey asked if the respondent experienced traffic congestion while traveling on I-540. The vicinity of the Wagon Wheel Road interchange was cited as an area along I-540 that often or sometimes experiences traffic congestion. At the meeting in October, 2003, with local officials, it was noted that the City of Springdale has sanitary sewer extensions programmed within the next two years for areas near Wagon Wheel Road implying significant growth in the area. The City of Springdale is also planning roadway improvements to Wagon Wheel Road between the interchange with I-540 and Highway 71B.

Short-Term Analysis

Both morning and afternoon peak conditions were analyzed. Traffic volumes were low and the heavy vehicle percentage is high, due to the nearby quarry located just west of the interchange. All turning movements operate at LOS A or LOS B except for the westbound traffic in the afternoon peak hour at the Wagon Wheel Road / Puppy Creek Road intersection which operates at LOS C. On average, delays are expected to be 20 seconds or less. See Table 76-1 for level of service findings and Figure 76-3 for existing intersection geometries.

Short-Term Improvements

All four unsignalized intersections seem to function at a satisfactory level-of-service. It is believed that the intersections do not need improvements based on current conditions. See Figure 76-1 for 2004 traffic volumes.

Table 76-1

Exit 76 -- Levels of Service

	Southbound Exit Ramp	Southbound Entrance Ramp	Puppy Creek Rd at Wagon Wheel Rd	Northbound Ramps
2004 existing conditions	AM Unsig.-LOS A on ramp PM Unsig.-LOS A on ramp	AM Unsig.-LOS A on ramp PM Unsig.-LOS A on ramp	AM Unsig.-LOS B on Wagon Wheel RD PM Unsig.-LOS C on Wagon Wheel RD	AM Unsig.-LOS C on ramp PM Unsig.-LOS B on ramp
2024 existing conditions	AM Unsig.-LOS B on ramp PM Unsig.-LOS B on ramp	AM Unsig.-LOS A on ramp PM Unsig.-LOS A on ramp	AM Unsig.-LOS E on Wagon Wheel RD PM Unsig.-LOS F on Wagon Wheel RD	AM Unsig.-LOS E on ramp PM Unsig.-LOS B on ramp
right-turn lane on Wagon Wheel Rd at Puppy Creek	AM Unsig.-LOS B on ramp PM Unsig.-LOS B on ramp	AM Unsig.-LOS A on ramp PM Unsig.-LOS A on ramp	AM Unsig.-LOS D on Wagon Wheel RD PM Unsig.-LOS F on Wagon Wheel RD	AM Unsig.-LOS C on ramp PM Unsig.-LOS B on ramp
signal placed at Wagon Wheel Rd at Puppy Creek add turn lane	AM Unsig.-LOS B on ramp PM Unsig.-LOS B on ramp	AM Unsig.-LOS A on ramp PM Unsig.-LOS A on ramp	AM LOS B PM LOS B	AM Unsig.-LOS C on ramp PM Unsig.-LOS B on ramp

LOS = Level of Service

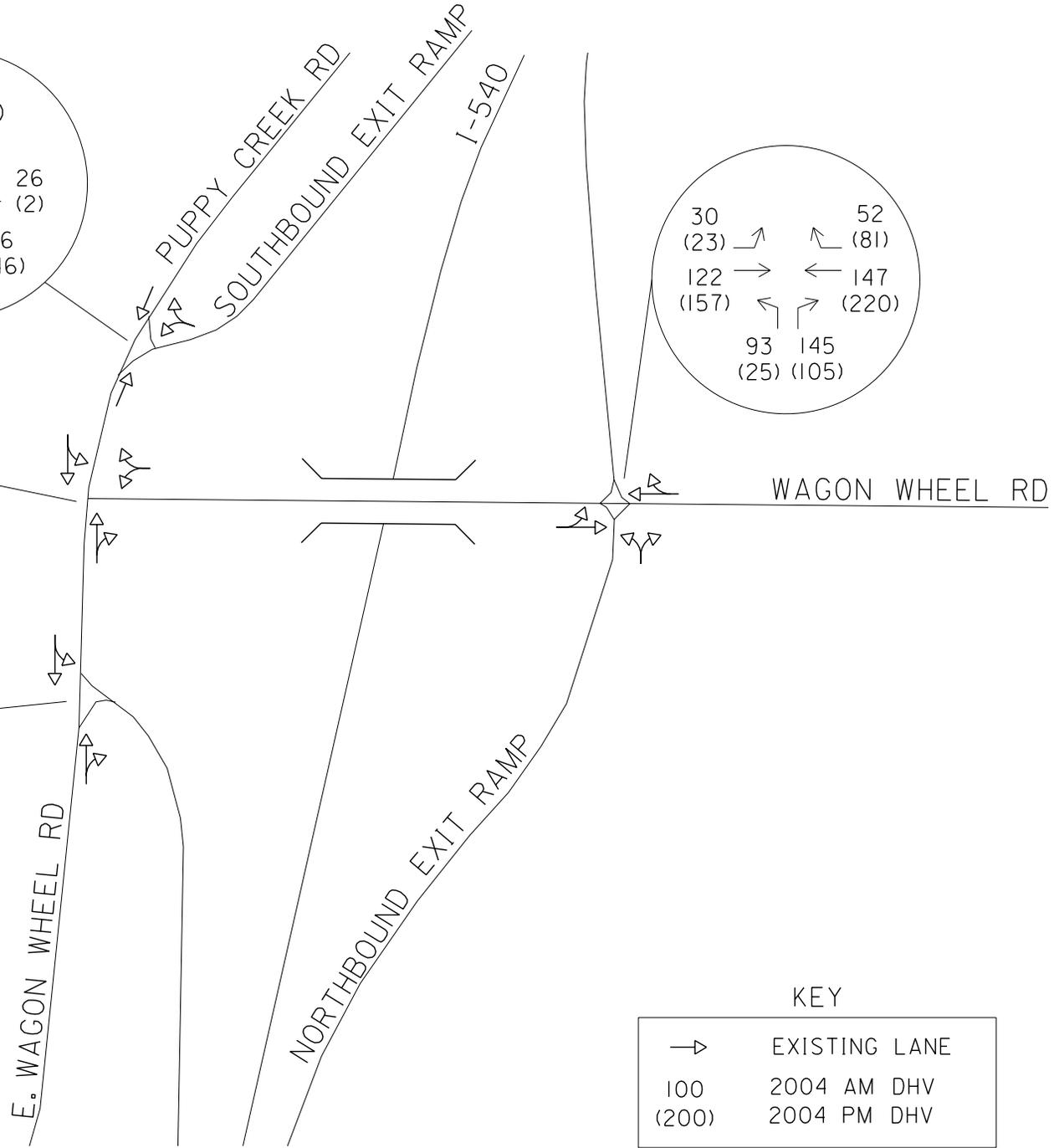
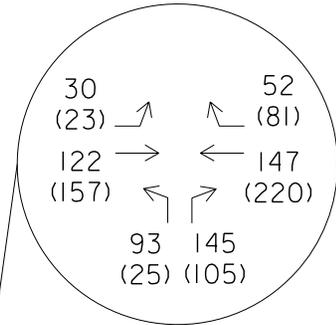
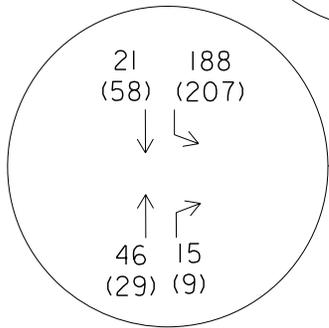
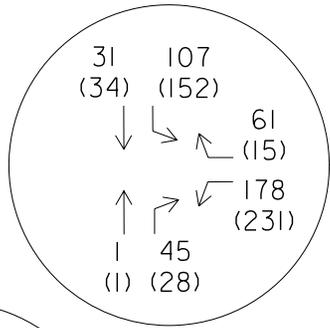
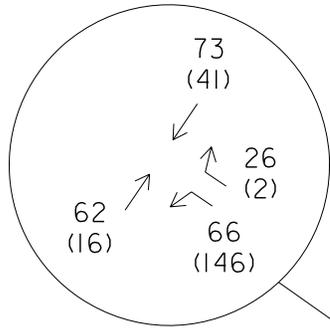
Long-Term Analysis

The growth rate anticipated for the Wagon Wheel Road interchange is four percent per year. Even with this high growth rate, the resulting volumes projected for the year 2024 are relatively low. At the intersection of Wagon Wheel Road and Puppy Creek Road, LOS E was expected for westbound traffic with delays of 50 seconds. All other turning movements are expected to operate at a LOS A or LOS B. The same deficiency was apparent in the review of the afternoon peak conditions. Westbound traffic is expected to experience long delays and queues at the intersection of Wagon Wheel Road and Puppy Creek Road which is estimated to operate at LOS F. At the intersection of the northbound ramps with Wagon Wheel Road the northbound exit ramp traffic is expected to experience LOS E in the morning peak. There is no indication that the existing interchange configuration will need to be changed. The projected year 2024 traffic volumes are shown in Figure 76-2.

Long-Term Improvements

An auxiliary right-turn lane of 200 feet minimum length should be implemented at the intersection of Wagon Wheel Road and Puppy Creek Road for the westbound traffic. This would allow right-turning traffic to pass by the left-turning traffic queue resulting in LOS D for the turning movements in the morning peak hour, but LOS F during the afternoon peak conditions. The intersection should be signalized as warranted in the future in order to maintain an acceptable level of service. See Figure 76-4 for the recommended intersection geometries.

Morning peak congestion indicates the need for a right-turn lane on the northbound exit ramp, which would improve expected operations from LOS E to LOS C. (The intersection of Wagon Wheel Road with the northbound ramps should also be signalized when warranted to maintain an acceptable level of service.)



I-540 IMPROVEMENT STUDY

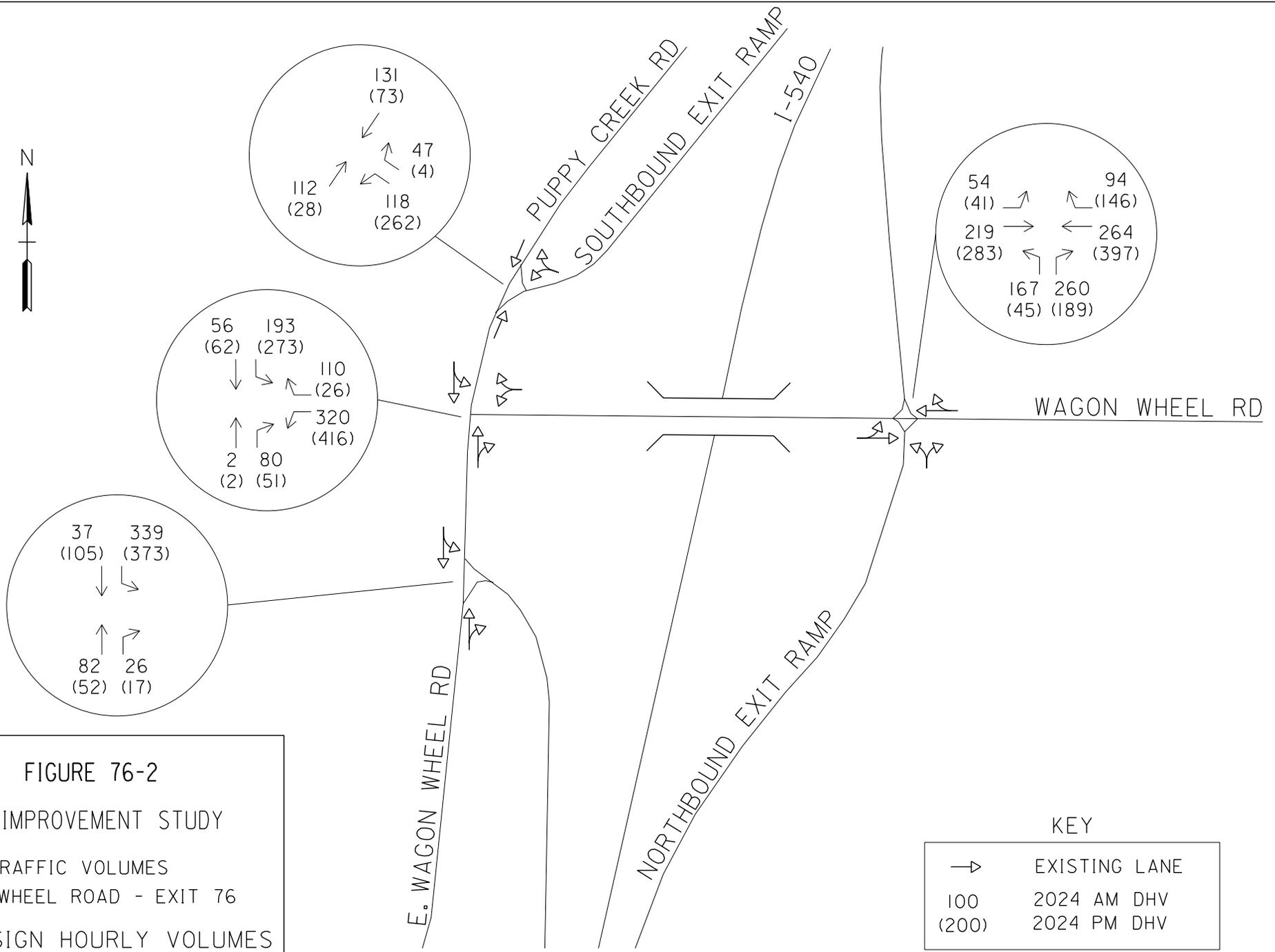
TRAFFIC VOLUMES

WAGON WHEEL ROAD - EXIT 76

2004 DESIGN HOURLY VOLUMES (DHV)

KEY

→	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV



131 (73)
 47 (4)
 118 (262)
 112 (28)

56 (62) 193 (273)
 110 (26)
 320 (416)
 2 (2) 80 (51)

37 (105) 339 (373)
 82 (52) 26 (17)

54 (41) 94 (146)
 219 (283) 264 (397)
 167 (45) 260 (189)

FIGURE 76-2

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES

WAGON WHEEL ROAD - EXIT 76

2024 DESIGN HOURLY VOLUMES (DHV)

KEY

→	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV

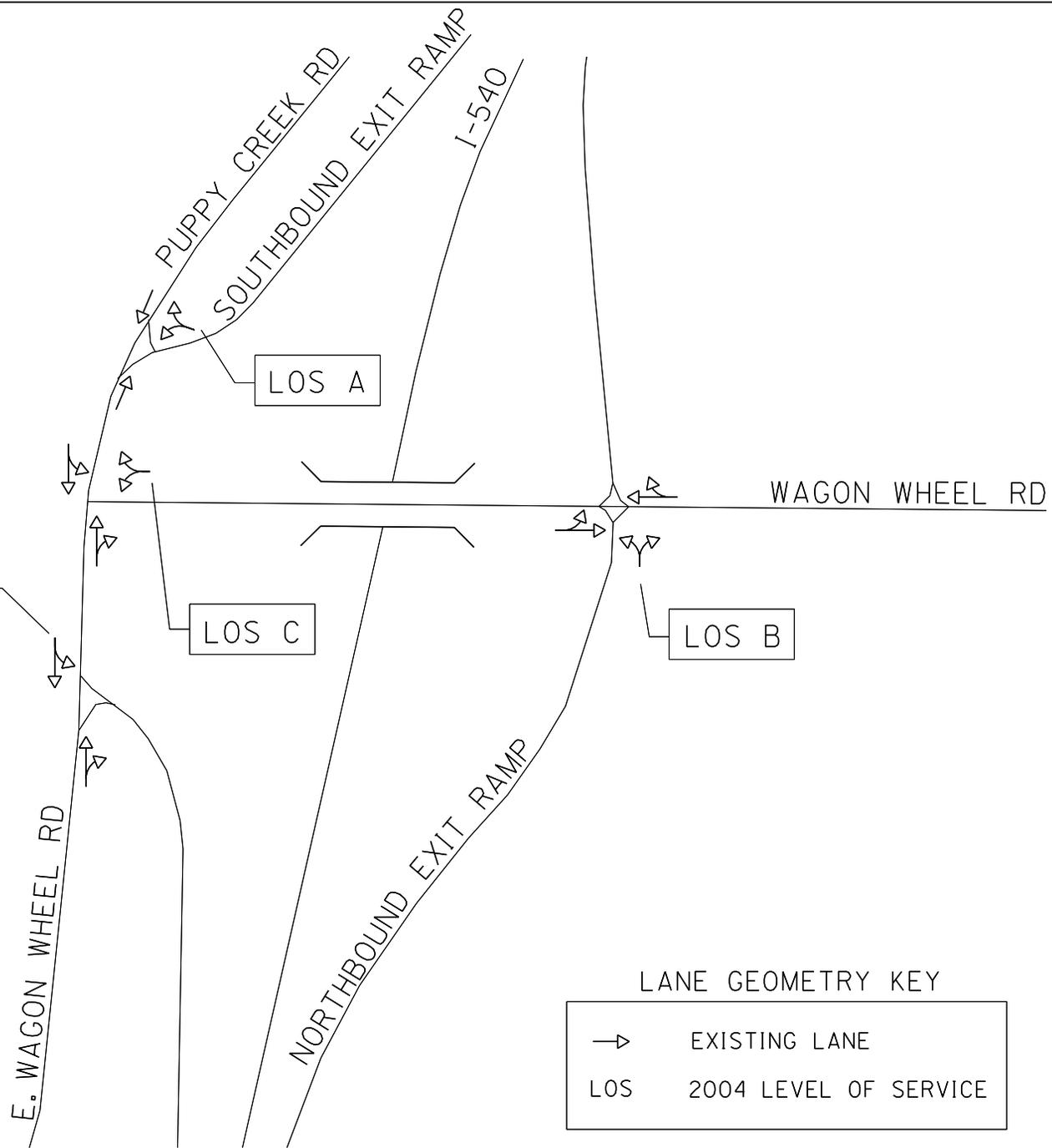


FIGURE 76-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
WAGON WHEEL ROAD - EXIT 76

EXISTING CONDITIONS

LANE GEOMETRY KEY

- | | |
|-----|-----------------------|
| → | EXISTING LANE |
| LOS | 2004 LEVEL OF SERVICE |

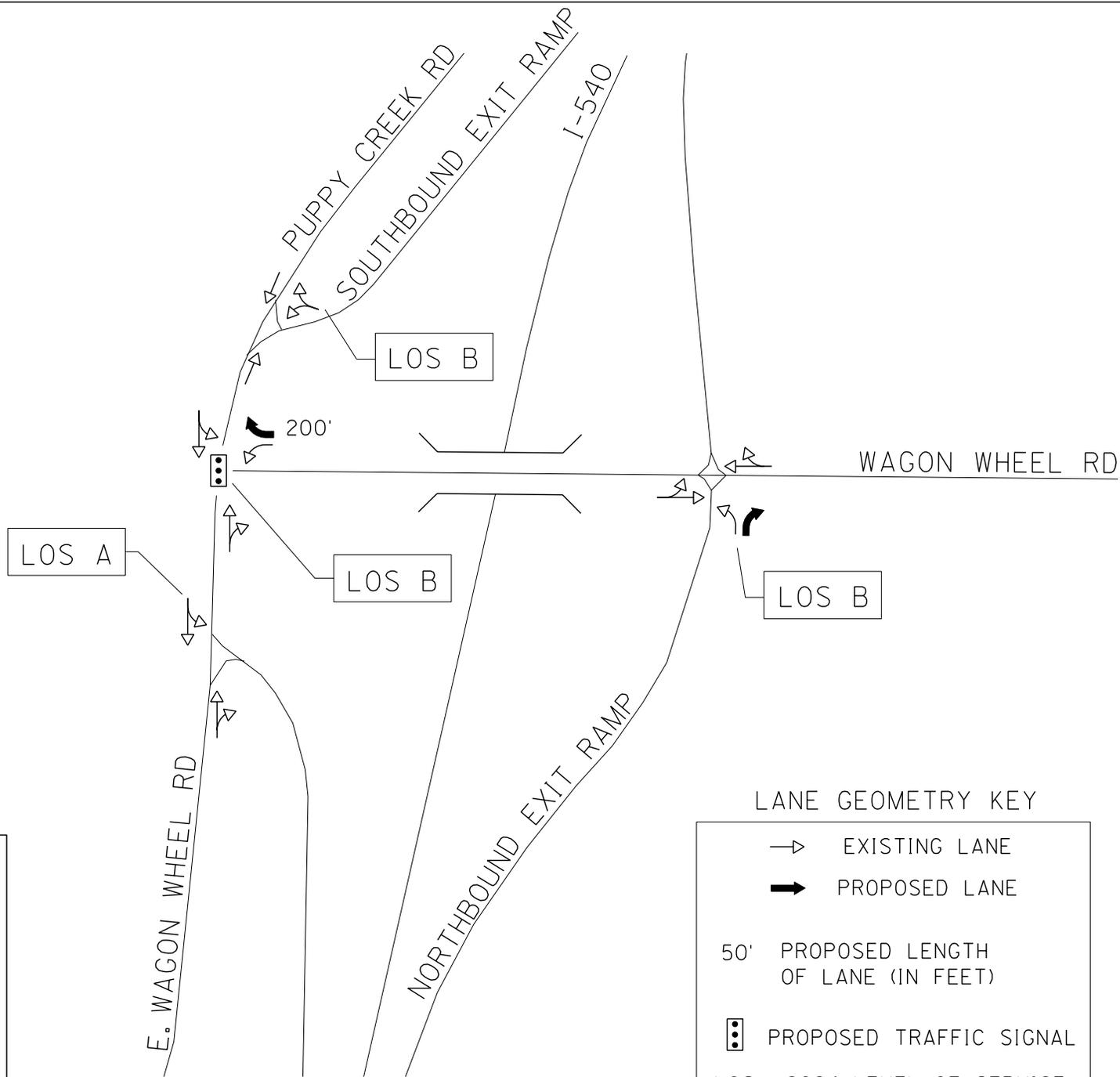


FIGURE 76-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
WAGON WHEEL ROAD - EXIT 76

LONG-TERM IMPROVEMENTS

LANE GEOMETRY KEY

→ EXISTING LANE

➔ PROPOSED LANE

50' PROPOSED LENGTH
OF LANE (IN FEET)

☐ PROPOSED TRAFFIC SIGNAL

LOS 2024 LEVEL OF SERVICE

BENTON COUNTY INTERCHANGES

Exit 78

Interstate 540 at Highway 264

(West Monroe Avenue)

Exit 78 Interstate 540 at Highway 264 (West Monroe Avenue)

This interchange is in a rapidly developing area in the City of Lowell. It is a traditional diamond interchange with Highway 264 crossing over I-540. Highway 264 is a two-lane road west of the signalized southbound ramp terminal intersection. Approximately 750 feet west of the southbound ramps intersection, Highway 264 is intersected by Goad Springs Road which is a two-lane road with a rural section. This intersection is unsignalized.

East of that intersection, Highway 264 has three lanes across the I-540 overpass with the center lane functioning as a continuous two-way, left-turn lane. East of the interchange, Highway 264 changes to a five-lane road. The center lane continues eastward as a continuous two-way, left-turn lane. In the westbound direction, the outside through lane becomes a lane drop onto the northbound entrance ramp. Just east of the northbound ramps intersection, there is a lane-addition in the eastbound direction at the intersection with Sixth Place. Sixth Place functions as a frontage road, and the Sixth Place intersection is only approximately 200 feet east of the northbound ramps intersection. The northbound approach on Sixth Street was recently posted as a no-left-turn onto westbound Highway 264 to address traffic congestion and safety problems.

Approximately 450 feet east of the Sixth Place intersection, Highway 264 is intersected by Dixieland Road. The Dixieland Road intersection is signalized.

The Highway 264 intersections with the northbound and southbound ramps, as well as the three nearby cross-streets, were all analyzed for this study.

The southeast quadrant of the interchange is a commercial park that includes the headquarters of the J.B. Hunt Corporation. Dixieland Road north of Highway 264 provides access to a golf-course community of apartments. The northeast quadrant of the interchange is developing commercially. West of the interchange, it is anticipated that most future development will consist of residential neighborhoods.

Highway 264 serves as the primary access route between I-540 and the City of Cave Springs, as well as the Northwest Arkansas Regional Airport which is located approximately nine miles west of the interchange.

Comments were collected from the open house public meeting surveys. The survey from the public meetings held in October, 2003, asked if the respondent experienced traffic

congestion while traveling on I-540. The segment of I-540 between Fayetteville and Rogers, which contains this interchange, was mentioned as a congested area. Also, the segment of I-540 between Lowell and Rogers and the segment between Lowell and the Elm Springs Road interchange were specifically mentioned.

Short-Term Analysis

Existing morning and afternoon peak conditions were analyzed. The intersection of Highway 264 with the southbound ramps was found to operate at LOS E during the morning rush hour and at LOS D during the afternoon rush hour. Long queues develop but clear quickly and do not interfere with I-540 traffic flow. The intersection of Highway 264 with the northbound ramps was found to operate at LOS C during the morning and afternoon peak hours. The intersections with Goad Springs Road, Dixieland Road, and Sixth Place currently operate at LOS C or better.

See Table 78-1 for the level of service findings. See Figure 78-1 for 2004 traffic volumes and Figure 78-3 for existing intersection geometries.

Short-Term Improvements

An auxiliary right-turn lane should be added to the eastbound approach of Highway 264 at the southbound ramps intersection. This addition would significantly shorten queues in the eastbound through-lane on Highway 264. This is the only proposed improvement for current volumes. The new right-turn lane should be approximately 150 feet long. See Figure 78-4 for intersections geometries.

Long-Term Analysis

When analyzed using 2024 forecast volumes, the existing intersections are overwhelmed, yielding LOS F at every intersection within the study area with the exception of Dixieland Road which is projected to operate at LOS D. Modifications to the interchange would significantly increase capacity and make the intersections along Highway 264 better equipped to handle the large increase in daily traffic. The traffic forecast for 2024 is shown in Figure 78-2.

Table 78-1

Exit 78 -- Levels of Service

	Goad Springs St.	Southbound Ramps	Northbound Ramps	6th Place	Dixieland
2004 existing conditions	AM unsig. - LOS C PM unsig. - LOS B on Goad Springs	AM LOS E PM LOS D	AM LOS C PM LOS C	AM unsig. - LOS C on 6th Pl. PM unsig. - LOS C on 6th Pl.	AM LOS B PM LOS C
Add Auxialary lane	AM unsig. - LOS C PM unsig. - LOS B on Goad Springs	AM LOS D moderate queues PM LOS C Add right turn lane on Hwy 264	AM LOS C PM LOS B on ramp	AM unsig. - LOS C on 6th Pl. PM unsig. - LOS C on 6th Pl.	AM LOS B PM LOS B
2024 Existing Conditions	AM unsig - LOS F on Goad PM unsig - LOS F on Goad	AM LOS F PM LOS F	AM LOS F PM LOS F	AM unsig - LOS F on 6th PM unsig - LOS F on 6th	AM LOS D PM LOS E
Widen HWY 264 bridge to 5 lanes. SB off Dbl left w/ storage NB exit Dbl right w/storage Eliminate 6th Pl left turns	AM LOS D PM LOS D signalize	AM LOS D PM LOS C	AM LOS B PM LOS B	AM unsig. LOS C on 6th PM unsig. LOS C on 6th	AM LOS C PM LOS C

LOS = Level of Service

Highway 264

Highway 264 should be widened to five lanes across the interchange, including two through lanes in each direction and a center turn lane. This would require widening the bridge over I-540. The five-lane section should be continued west of the southbound ramps intersection at least to Goad Springs Road. The intersection with Goad Springs Road needs to be signalized to allow through traffic an opportunity to cross and turn onto Highway 264. East of the northbound ramps, Highway 264 already has a five-lane cross section. It should be widened to accommodate a double left-turn onto northbound Dixieland Road. See the discussion of Dixieland Road below.

Southbound Exit Ramp

Without improvements, traffic on the southbound exit ramp will form queues the full length of the ramp and backup onto the southbound lanes of I-540. To better accommodate traffic forecasts for 2024, it is recommended that auxiliary lanes be constructed on each side of the southbound exit ramp. This includes a 350-foot auxiliary left-turn lane which would provide for a double left onto Highway 264. Also, a 300-foot auxiliary right-turn lane would be provided. With these improvements, the ramp should accommodate forecasted 2024 traffic volumes during both the morning and evening peak periods.

Northbound Exit Ramp

Similar to the southbound exit ramp, forecasted 2024 peak traffic volumes will result in queues on the northbound exit ramp that backup onto the northbound lanes of I-540. Preventing this from happening will require double turns from the ramp onto westbound and eastbound Highway 264. This would involve constructing an auxiliary left-turn lane at least 250 feet long and two auxiliary right-turn lanes at least 300 feet long. With these improvements, the ramp should accommodate forecasted 2024 traffic for both the morning and afternoon peak periods.

Sixth Place

Because of the short distance (220 feet) from the Sixth Place intersection with Highway 264 to the intersection with the northbound ramps, this intersection should remain unsignalized. When considered as a location for signals, queue interactions result that would interfere with the operation of both this intersection and the intersection with the northbound ramps resulting in long queues on all approaches.

Dixieland Road

To accommodate the expected increase in traffic demand, significant improvements will be required to Dixieland Road. The northbound approach to the Highway 264 intersection should be widened to provide a double left-turn lane with a minimum 350 feet of storage. An auxiliary right-turn lane with a minimum 60 feet of storage will be needed as well. On the southbound approach to the Highway 264 intersection, an auxiliary right-turn lane will be needed. This lane should be a minimum of 80 feet long. Further, Dixieland Road should be widened north of Highway 264 a distance of approximately 650 feet to accommodate a double left-turn from eastbound Highway 264 to northbound Dixieland Road.

I-540

I-540 will require widening to accommodate the anticipated year 2024 travel demand. Eight lanes are recommended from Exit 76, through the Exit 78 interchange, and north to Exit 81 to accommodate the 2024 traffic forecast. The existing Oakwood Avenue overpass, which is located approximately 3,900 feet north of Highway 264, is long enough to accommodate the widening of I-540 to eight lanes if protection is provided for the outside piers.

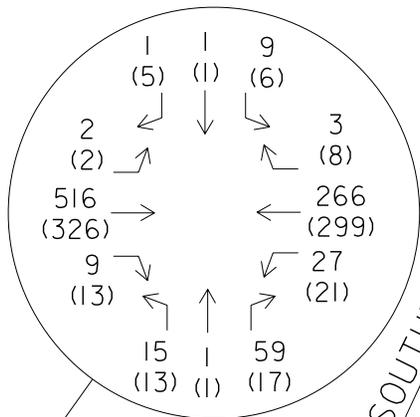
Long-Term Improvements

Highway 264 should be widened to five lanes. The exit ramps and cross streets should be widened as suggested in the long-term analysis to maintain acceptable levels of service. See Figure 78-5 for the recommended geometry.

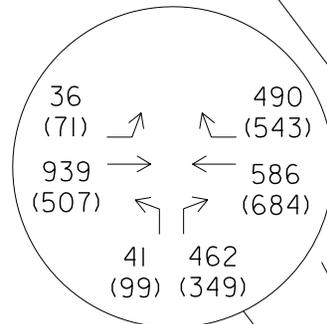
The current prohibition on northbound left turns at the Highway 264 intersection with Sixth Place should be extended, so that both approaches of Sixth Place become right-in, right-out only with all other moves prohibited. Without signalization, accommodating all moves at this intersection will result in excessive queues and delays at design year peak traffic volumes. It is believed that the best course of action is to prohibit the left turns and through movements on Sixth Place in both directions and leave the intersection unsignalized. Left turns from Highway 264 onto Sixth Place should be prohibited in both directions as well. An alternate outlet for traffic currently turning left from the southbound approach of Sixth Place should be constructed. This outlet should tie Sixth Place to Dixieland Road in the same manner that a similar outlet ties Sixth Place to Dixieland Road approximately 1,800 feet south of Highway 264.



GOAD SPRINGS RD

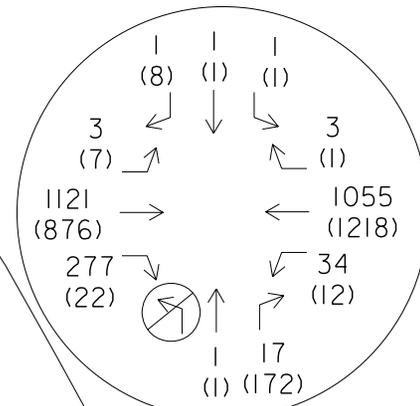


SOUTHBOUND EXIT RAMP

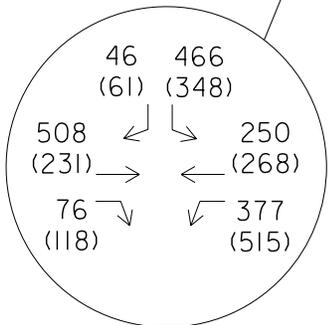


HWY 264

I-540



DIXIELAND RD



NORTHBOUND EXIT RAMP

6TH PL

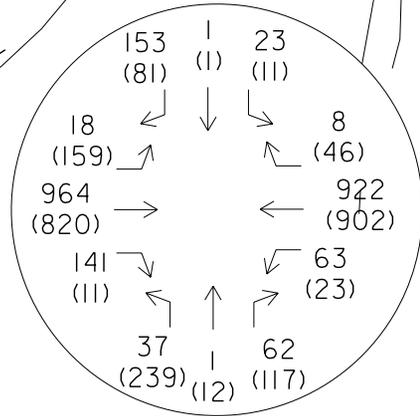


FIGURE 78-1

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 264 - EXIT 78

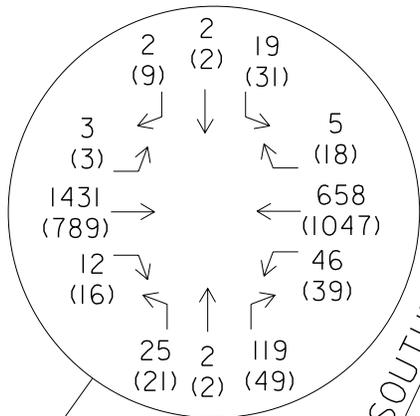
2004 DESIGN HOURLY VOLUMES
(DHV)

KEY

→	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV

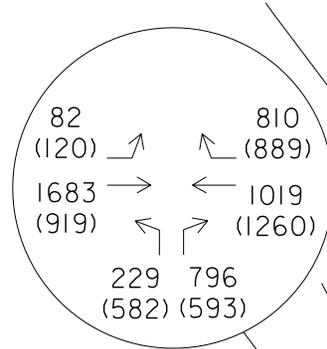


GOAD SPRINGS RD

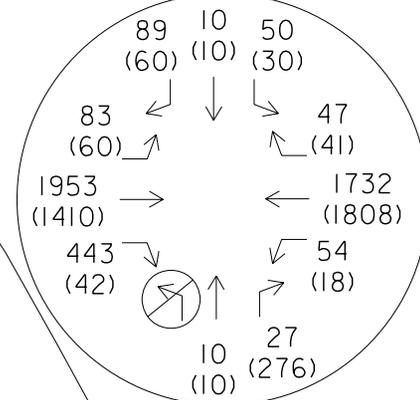


SOUTHBOUND EXIT RAMP

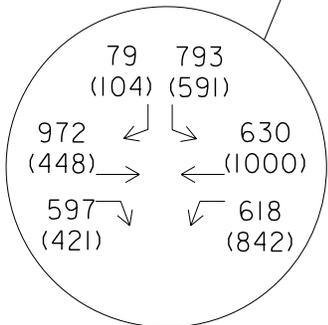
I-540



HWY 264



DIXIELAND RD



6TH PL

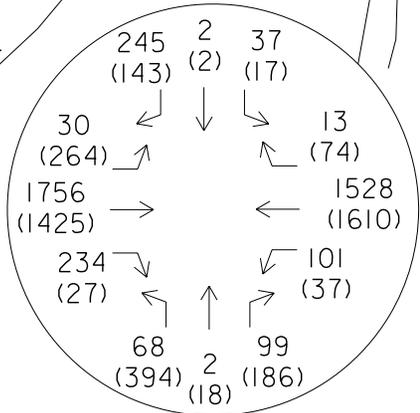


FIGURE 78-2

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES
HIGHWAY 264 - EXIT 78

2024 DESIGN HOURLY VOLUMES
(DHV)

KEY

→	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV

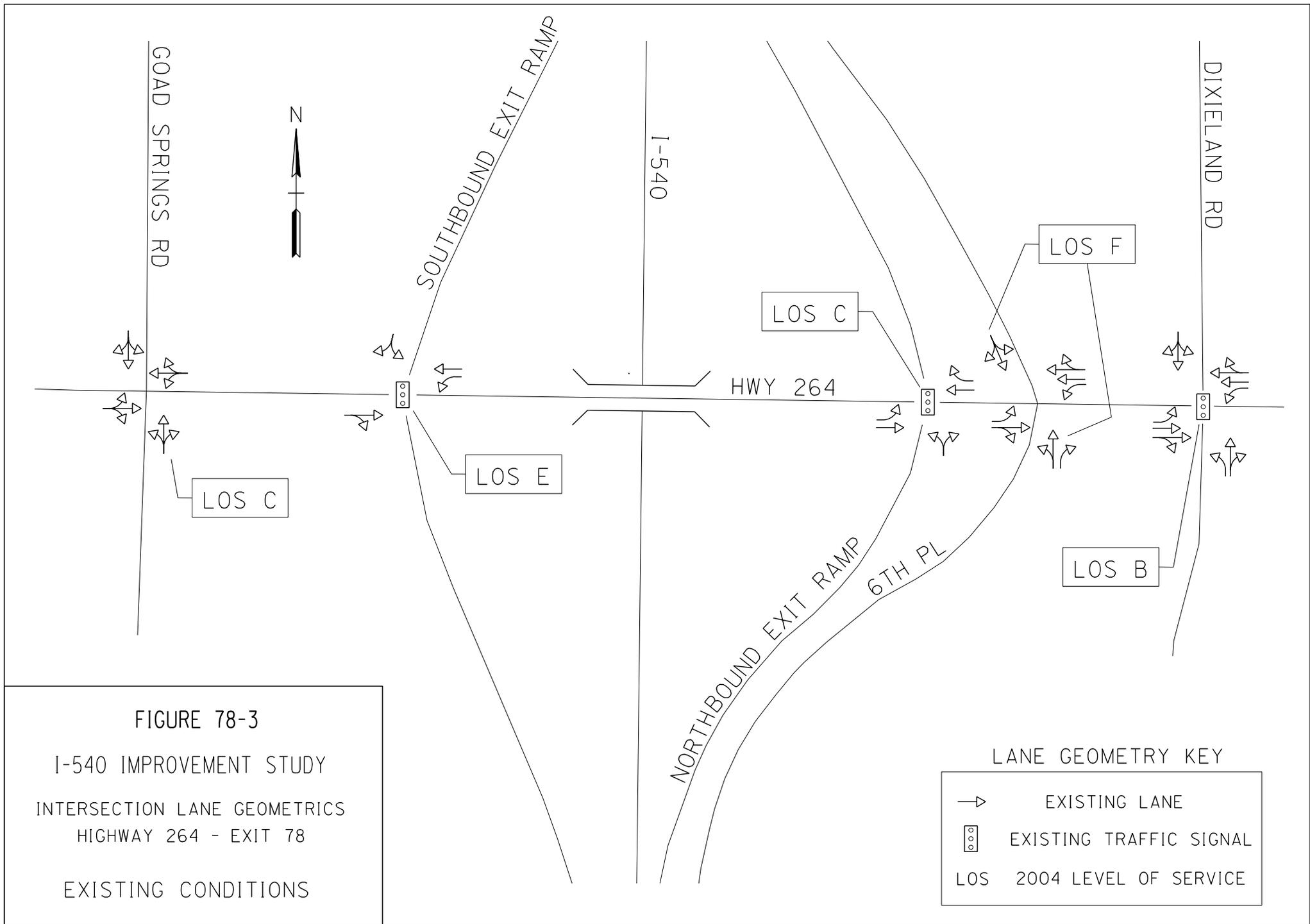


FIGURE 78-3

I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 264 - EXIT 78
 EXISTING CONDITIONS

LANE GEOMETRY KEY

→	EXISTING LANE
⊞	EXISTING TRAFFIC SIGNAL
LOS	2004 LEVEL OF SERVICE

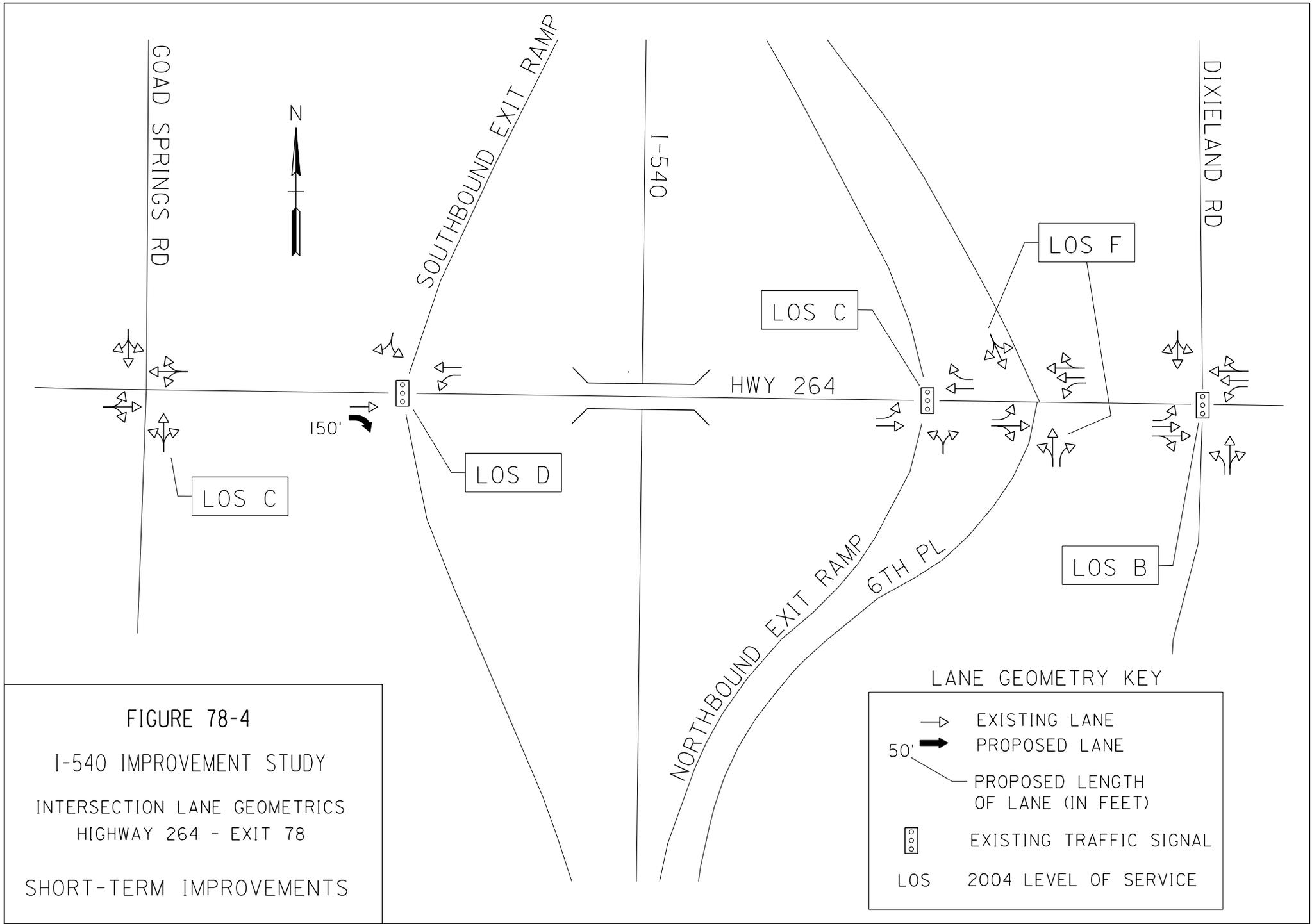


FIGURE 78-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 264 - EXIT 78

SHORT-TERM IMPROVEMENTS

LANE GEOMETRY KEY

-  EXISTING LANE
-  PROPOSED LANE
-  PROPOSED LENGTH OF LANE (IN FEET)
-  EXISTING TRAFFIC SIGNAL
- LOS 2004 LEVEL OF SERVICE

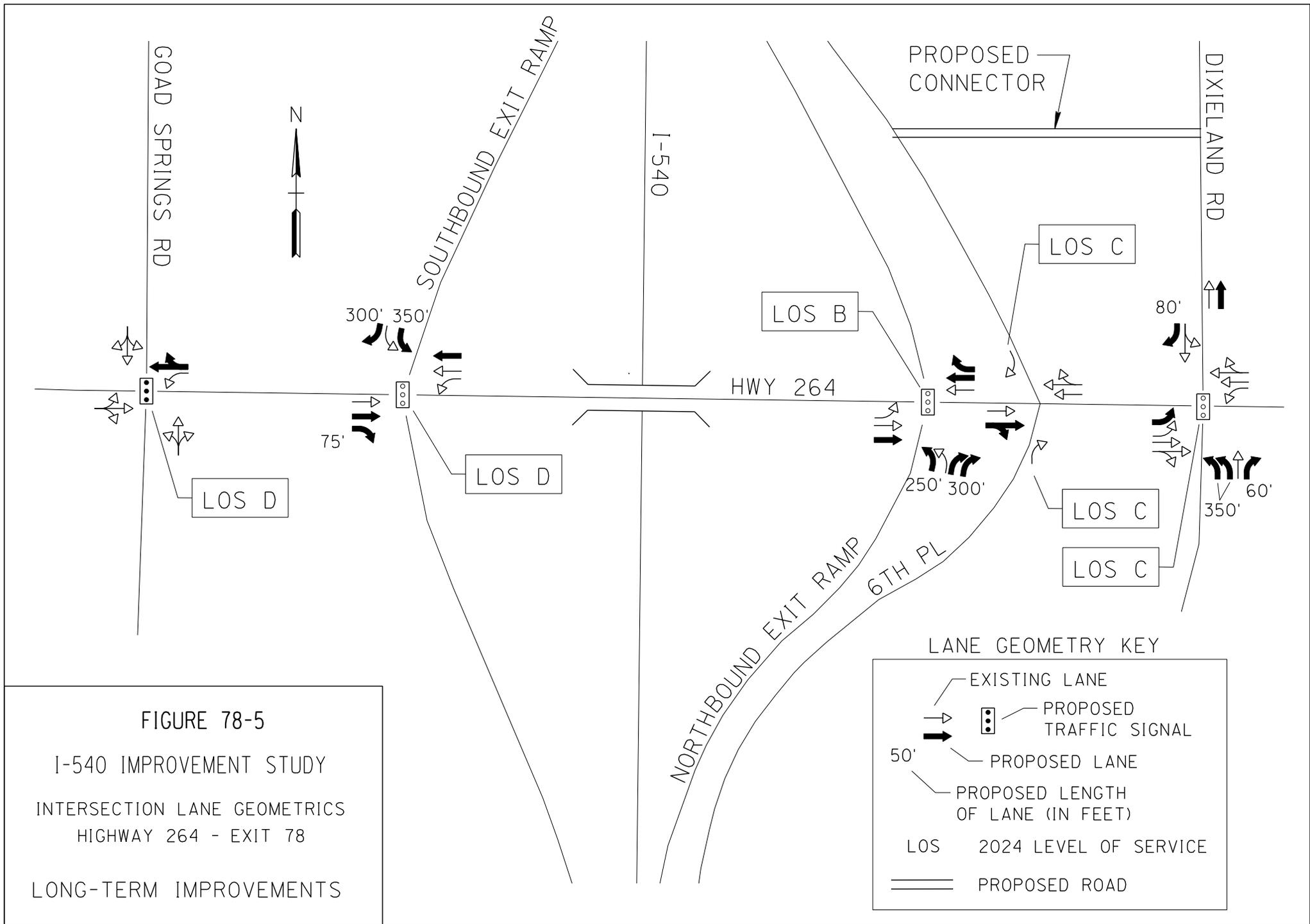


FIGURE 78-5

I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 264 - EXIT 78
 LONG-TERM IMPROVEMENTS

BENTON COUNTY INTERCHANGES

Exit 81

Interstate 540 at Pleasant Grove Road

Exit 81 Interstate 540 at Pleasant Grove Road

This interchange is a diamond interchange in the City of Rogers. Pleasant Grove Road is a two-lane road crossing over I-540. Both ramp terminal intersections on Pleasant Grove Road were analyzed. Also included in the study were the intersections of Pleasant Grove with 28th Place to the west and with South 26th Street to the east. These two streets serve as frontage roads to I-540 and are located very close to the ramp terminal intersections. Pleasant Grove Road is currently being widened and realigned to five lanes east of South 26th Street.

Comments were collected from the open house public meetings conducted in October, 2003. There were no direct comments regarding traffic congestion on Pleasant Grove Road, although respondents did mention congestion on I-540 between Rogers and Lowell. In the local officials' meeting in October, 2003, it was noted that a large mall is planned near the Pleasant Grove Road interchange.

The Northwest Arkansas Council presented a report to the AHTD titled *Northwest Arkansas Transportation Needs* (October, 2003), in which this interchange is identified as one of five interchanges that are high priority for improvements. The reason for this is the substantial development that is planned for the area served by this interchange. The various development proposals were summarized in that report as consisting of:

- over 1.5 million square feet of retail space, plus some restaurants,
- nearly 400,000 square feet of office space, and
- nearly 9,000 single family houses, plus 240 townhouse units.

Short-Term Analyses

All four intersections are currently unsignalized. The southbound ramp terminal intersection operates at LOS F for exiting traffic in the morning and afternoon peak, although delay and queuing are both minimal. Presently, there are low traffic volumes on 28th Place, allowing the intersection to remain unsignalized and achieve LOS A. The northbound exit ramp traffic experiences no queues or delays in the morning or afternoon peak hour and operates at LOS C or better. The entrance for the development in the southeast quadrant of the interchange is located directly across from the South 26th Street intersection. Traffic volumes are low and queues remain minimal. See Table 81-1 for level of service findings. See Figure 81-1 for 2004 traffic volumes.

Table 81-1

Exit 81 -- Levels of Service

	28th Place	Southbound Ramps	Northbound Ramps	S. 26th Street
2004 existing conditions	AM unsig - LOS A PM unsig - LOS A	AM unsig - LOS F on ramp* PM unsig - LOS F on ramp* * no queue	AM Unsig - LOS C on ramp PM Unsig - LOS C on ramp	AM unsig - LOS F on S. 26th St* PM Unsig - LOS E/F on S. 26th St * no queue
Add right turn lane to SB Exit ramp	AM unsig - LOS A PM unsig - LOS A	AM unsig - LOS F on ramp* PM unsig - LOS F on ramp* * no queue	AM unsig - LOS C on ramp PM unsig - LOS C on ramp	AM unsig - LOS F on S. 26th St* PM Unsig - LOS E/F on S. 26th St * no queue
2018 Interim Improvements signalize ramps and S. 26th St. Add turn lanes On Pleasant Grove and widen east of NB ramp. Improve Ramps	AM Unsig - LOS C on 28th PL PM Unsig - LOS C on 28th PL	AM LOS D PM LOS B Add turn lanes	AM LOS B PM LOS D on ramp Dbl. Right turn off of ramp	AM LOS D on S. 26th St PM LOS D on S. 26th St Add turn lanes
2024 Existing Conditions	AM Unsig - LOS D on 28th PL PM Unsig - LOS C on 28th PL	AM Unsig - LOS F PM Unsig - LOS F on ramp	AM Unsig - LOS F PM Unsig - LOS F on ramp	AM Unsig - LOS F on S. 26th St PM Unsig - LOS F on S. 26th St
Widen Pleasant Grove bridge to 8 lanes. Widen Pleasant Grove Road to 7 lanes east of I-540 and to 6 lanes west of I-540. Widen all NB and SB ramps.	AM unsig - LOS E on 28th PL PM unsig - LOS F on 28th PL	AM LOS C PM LOS D Dbl Right turn off of ramp and	AM LOS B PM LOS C/D Dbl Left turn off of ramp and	AM LOS B/D PM LOS C/E
Widen Pleasant Grove Road to 6 lanes. Add loops to NE and SW quads. Widen Bridge to 8 lanes.	AM unsig - LOS E on 28th PL PM unsig - LOS F on 28th PL	AM LOS B PM LOS C Dbl Right turn off of ramp	AM LOS B PM LOS C Dbl Right turn off of ramp	AM LOS B PM LOS C

LOS = Level of Service

Short-Term Improvements

There is only one recommended short-term improvement for this interchange. This is an auxiliary lane for right turns from the southbound exit ramp. Though this intersection would be likely to continue to operate at LOS F, the anticipated delay would only be approximately 63 seconds per vehicle which would be a reduction of one-fourth of the estimated delay time at this location. This improvement could postpone the installation of a traffic signal at this intersection.

The rapid pace of development in the area suggests that the intersections should be monitored for traffic signal warrants to maintain acceptable levels of service. See Figure 81-3 for existing intersections geometries and Figure 81-4 for the short-term recommendation.

Long-Term Analyses

The existing interchange configuration was examined using forecast volumes for 2024. Major traffic flow problems were found. A growth rate of 2.8 percent per year was used in forecasting future traffic volumes for the Pleasant Grove Road interchange. This rate allows for anticipated background traffic growth. In addition to the extrapolation growth, trip generation was used to include traffic anticipated due to major development projects in the area. Figure 81-2 shows the 2024 traffic forecast volumes.

Three of the four intersections were estimated to perform at a LOS F due to the high volume of traffic on Pleasant Grove Road during both the morning and afternoon peak hours. Ramp traffic was estimated to develop long queues backing onto I-540.

Interim Improvements

The diamond interchange could accommodate much larger volumes of traffic if a number of auxiliary lanes were added. Construction of the recommended auxiliary lanes could postpone, until an estimated year of 2018, the replacement of the bridge that carries Pleasant Grove Road over I-540. See Figure 81-5 for an illustration of the recommended interim improvements.

Long-Term Improvements

Pleasant Grove Road will require major widening in order to serve anticipated travel demands. Six through lanes plus auxiliary lanes will be required through the interchange area. Signalization will be required for both ramp terminal intersections. Two options were evaluated for handling the heavy exit ramp traffic demand. The first option suggests that both exit ramps be widened for double left-turn lanes and double right-turn lanes.

The second option eliminates left turns from the exit ramps altogether through the construction of loop ramps in the northeast and southwest quadrants. However, double right-turn lanes would still be needed to accommodate the heavy right turn movements. Double left-turn lanes are recommended onto both entrance ramps. For the westbound left-turn onto the southbound entrance ramp, it is recommended that both left-turn lanes extend across the bridge and through the intersection of Pleasant Grove Road with the northbound ramps. This would improve the capacity at the intersection with the northbound ramps and reduce instances of westbound afternoon traffic queuing back through the adjacent upstream intersection. The option of keeping the diamond configuration is shown in Figure 81-6. The option of construction of loop ramps is shown in Figure 81-7.

Loop ramps were not considered for the opposite quadrants. Loop ramps in the northwest and southeast quadrants would require much more right-of-way than the proposed loop ramps, because of the skew of the interchange. There would be gains in intersection capacity at the ramp terminal intersections, but not as much as with loop ramps for the exit ramps. Full cloverleaf configuration (with loop ramps in all four quadrants) was not considered for any interchanges, because of the safety problems that are associated with cloverleaf weaving on freeways. In order to implement loop ramps for the exit ramps, collector-distributor roads would be developed, so that all exiting traffic would leave I-540 at a single exit gore location, and then diverge onto two ramps.

I-540 should be widened to eight lanes through this area. All four ramps will need adequate run-out lengths. Keeping the traditional diamond configuration or modifying the geometry to add loop ramps in the northeast and southwest quadrants are both viable options for this interchange. Both are capable of handling the projected traffic demands, and each offers its own benefits. The cost of constructing the loop ramps would likely be greater than that of improving the diamond, but eliminating left turns from the exit ramps would result in reduced delays for through traffic on Pleasant Grove Road, shorter queues on the exit ramps, and improved levels of service.

It should be noted that the City of Rogers is currently preparing plans to improve the Pleasant Grove Road interchange. The proposed improvements essentially concur with the long-term improvements recommended herein.

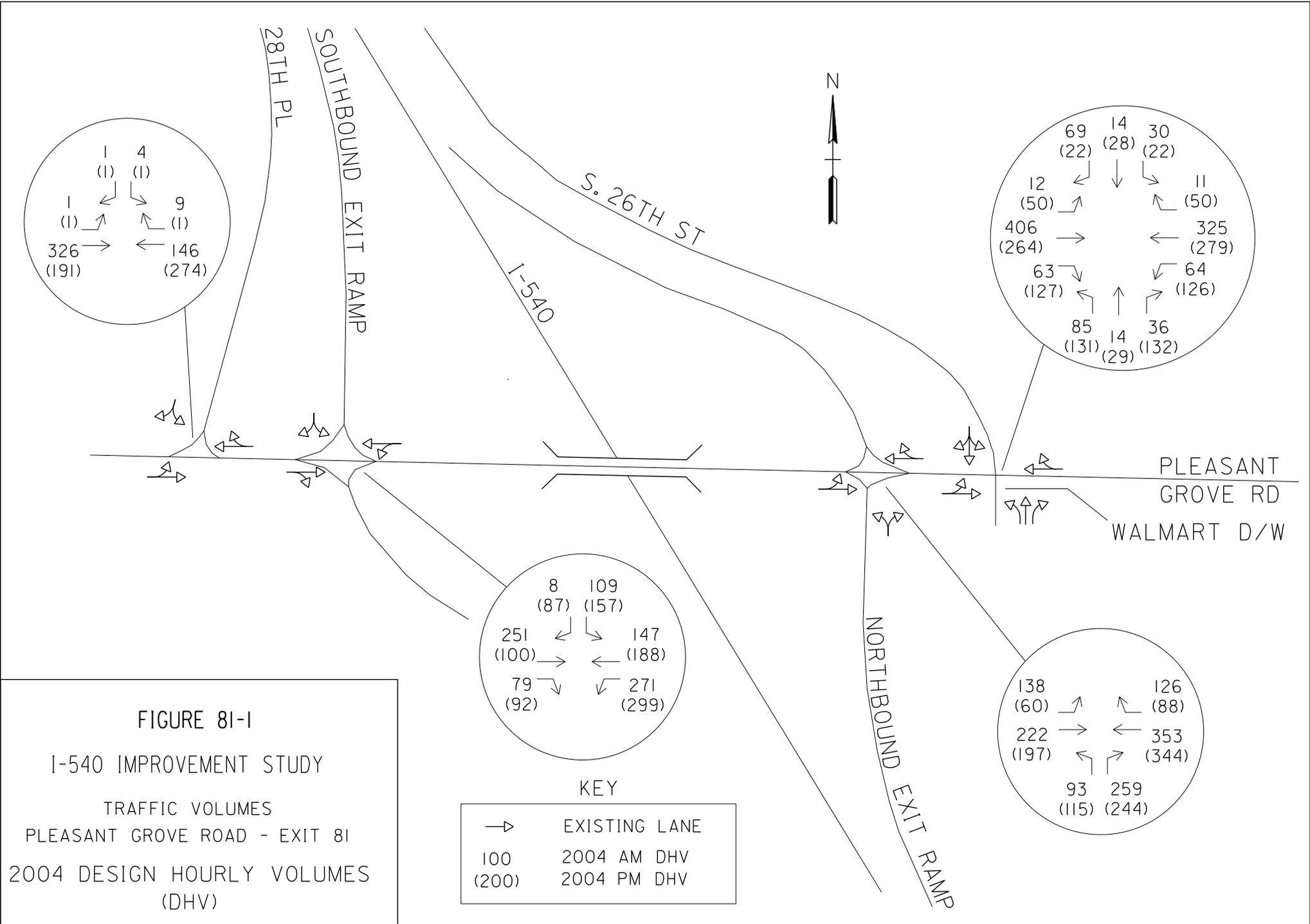


FIGURE 81-1
I-540 IMPROVEMENT STUDY
TRAFFIC VOLUMES
PLEASANT GROVE ROAD - EXIT 81
2004 DESIGN HOURLY VOLUMES
(DHV)

KEY

→	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV

Callout 1 (Left):

1	4
(1)	(1)
1	9
(1)	(1)
326	146
(191)	(274)

Callout 2 (Top Right):

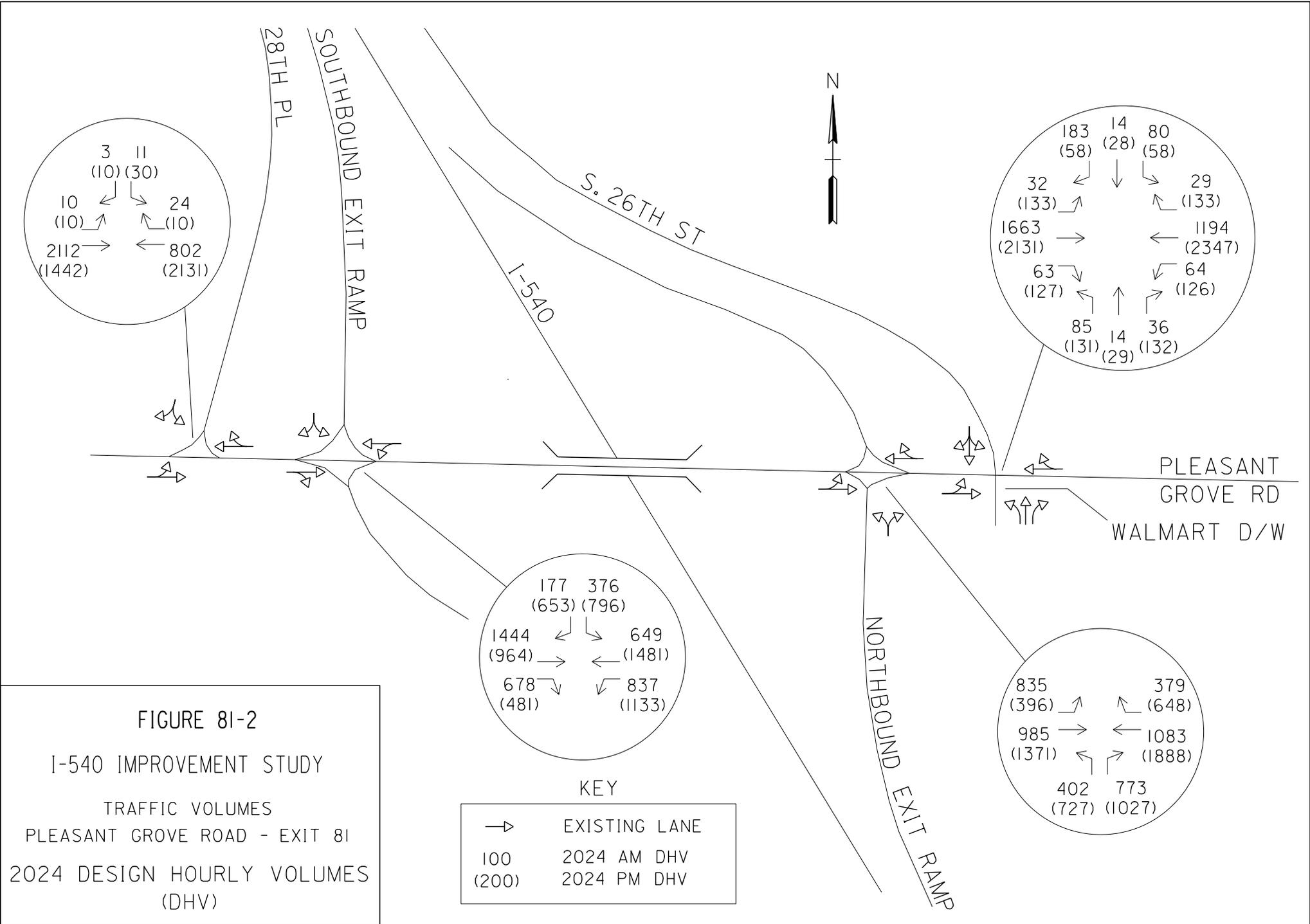
69	14	30
(22)	(28)	(22)
12		11
(50)		(50)
406		325
(264)		(279)
63		64
(127)		(126)
85	14	36
(131)	(29)	(132)

Callout 3 (Bottom Center):

8	109
(87)	(157)
251	147
(100)	(188)
79	271
(92)	(299)

Callout 4 (Bottom Right):

138	126
(60)	(88)
222	353
(197)	(344)
93	259
(115)	(244)



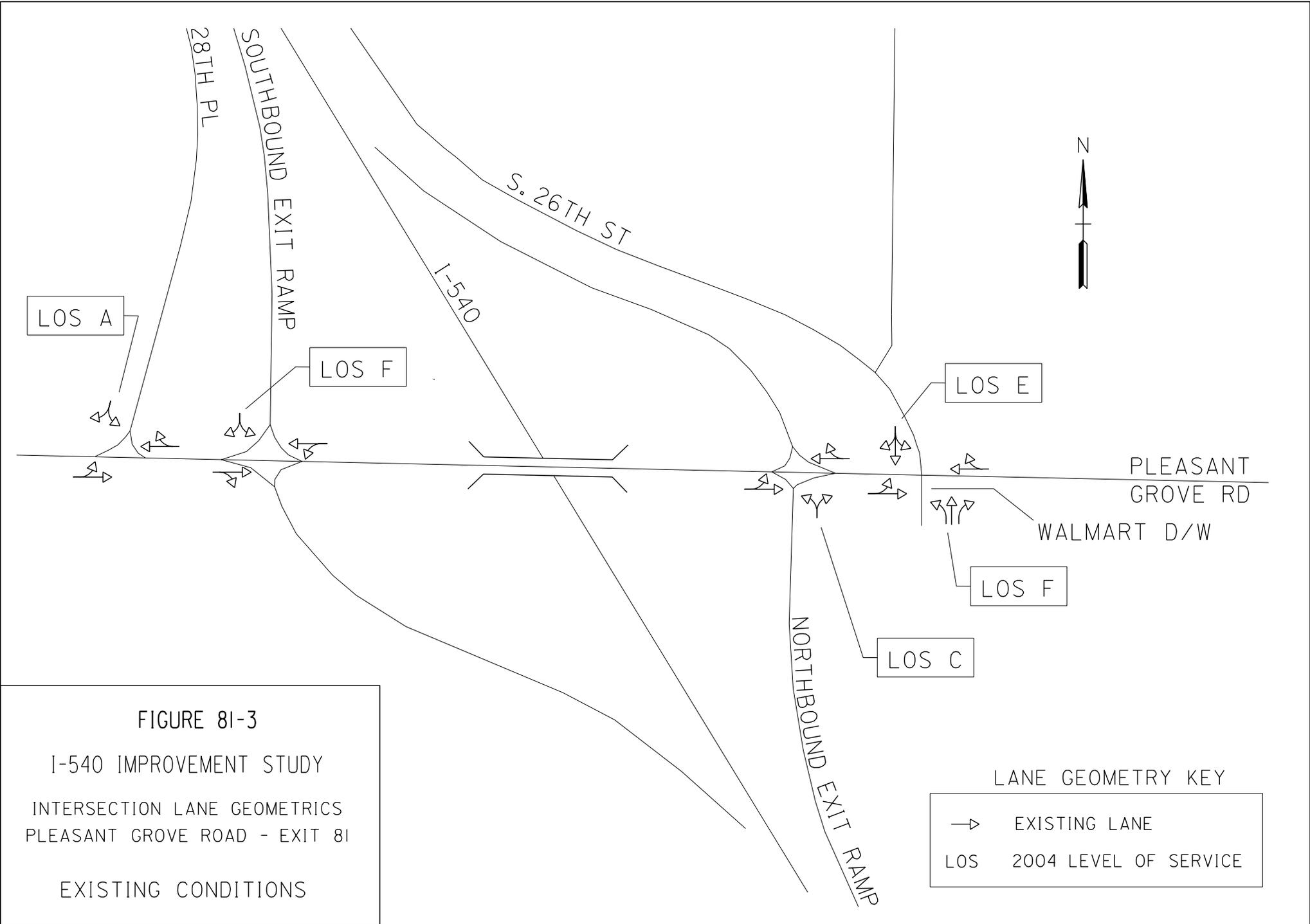
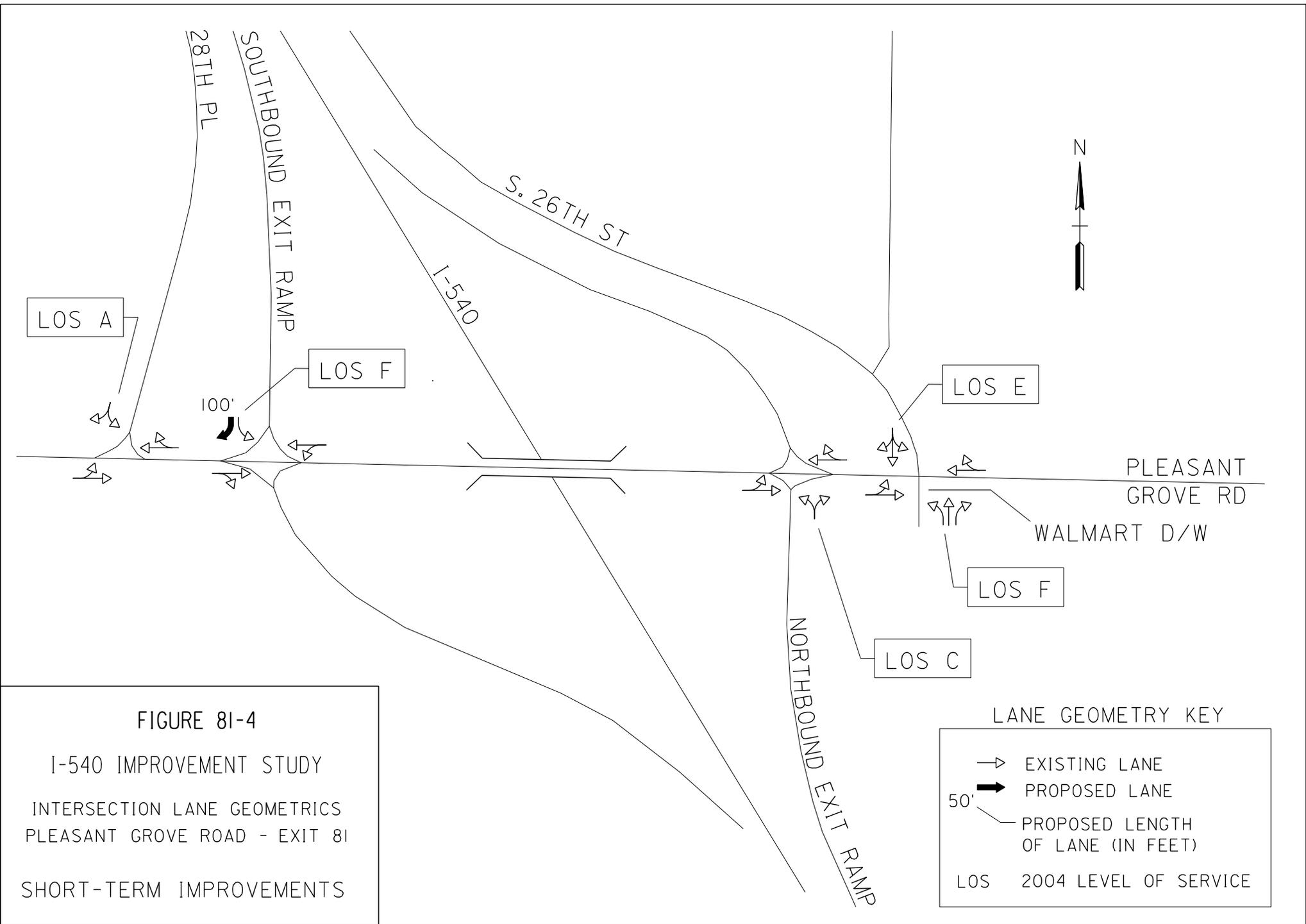


FIGURE 8I-3
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 PLEASANT GROVE ROAD - EXIT 81
 EXISTING CONDITIONS

LANE GEOMETRY KEY

→	EXISTING LANE
LOS	2004 LEVEL OF SERVICE



LOS A

LOS F

LOS E

LOS F

LOS C

FIGURE 81-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
PLEASANT GROVE ROAD - EXIT 81

SHORT-TERM IMPROVEMENTS

LANE GEOMETRY KEY

- EXISTING LANE
- ➔ PROPOSED LANE
- 50' — PROPOSED LENGTH OF LANE (IN FEET)
- LOS 2004 LEVEL OF SERVICE



28TH PL

SOUTHBOUND EXIT RAMP

S. 26TH ST

I-540

PLEASANT GROVE RD

WALMART D/W

NORTHBOUND EXIT RAMP

100'

50'

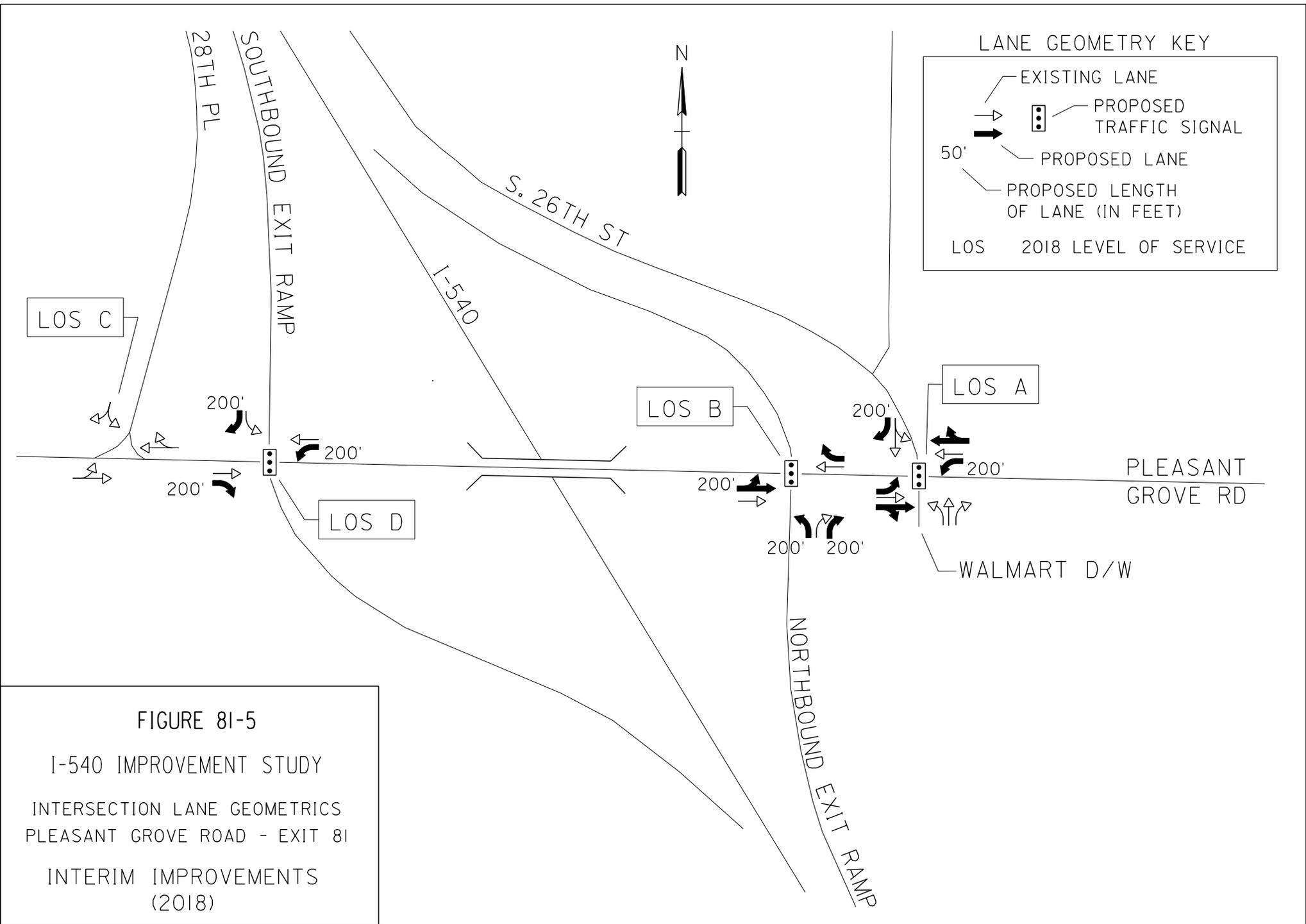


FIGURE 8I-5

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
PLEASANT GROVE ROAD - EXIT 81

INTERIM IMPROVEMENTS
(2018)

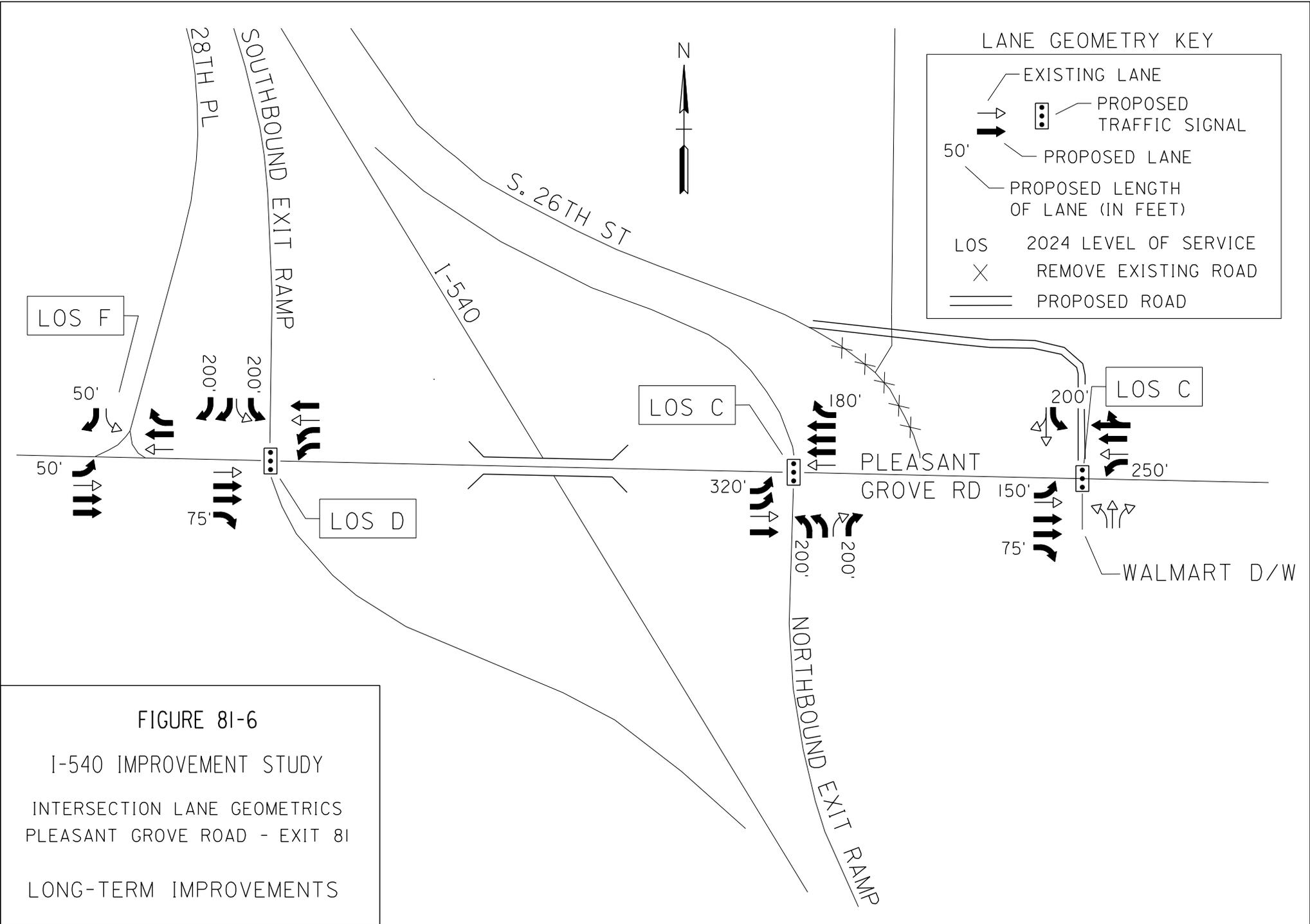
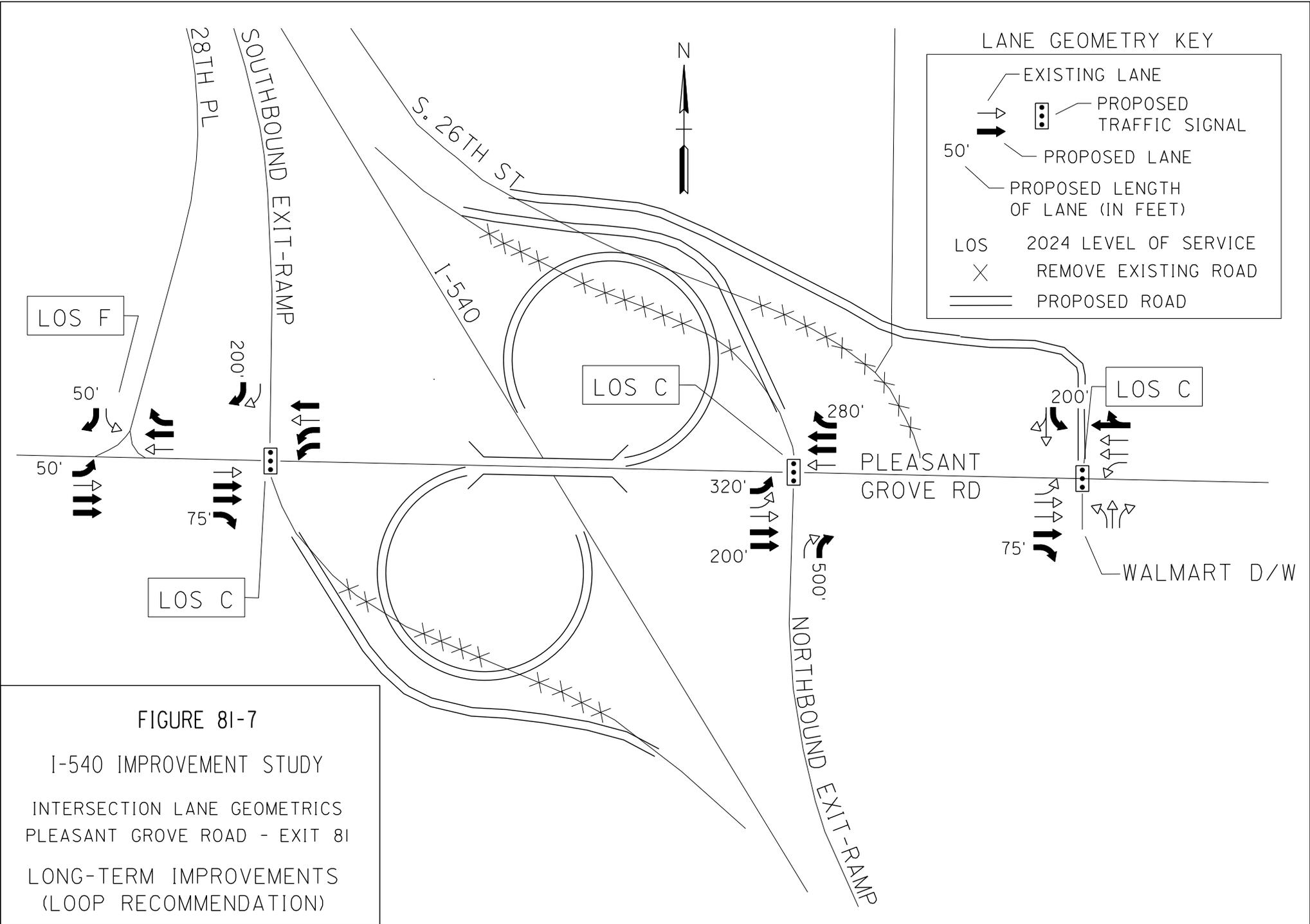


FIGURE 8I-6
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 PLEASANT GROVE ROAD - EXIT 8I
 LONG-TERM IMPROVEMENTS



LANE GEOMETRY KEY

	EXISTING LANE
	PROPOSED LANE
50'	PROPOSED LENGTH OF LANE (IN FEET)
	PROPOSED TRAFFIC SIGNAL
LOS	2024 LEVEL OF SERVICE
X	REMOVE EXISTING ROAD
	PROPOSED ROAD

FIGURE 8I-7

I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 PLEASANT GROVE ROAD - EXIT 8I
 LONG-TERM IMPROVEMENTS
 (LOOP RECOMMENDATION)

BENTON COUNTY INTERCHANGES

Exit 83

Interstate 540 at Highway 94

(New Hope Road and Horsebarn Road / Champions Drive)

Exit 83 Interstate 540 at Highway 94 (New Hope Road and Horsebarn Road/ Champions Drive)

This interchange is in a rapidly developing area in western Rogers. I-540 crosses over Highway 94 (New Hope Road). Immediately west of the interchange, Highway 94 ends at an intersection with a north-south road that parallels I-540. North of Highway 94, the road is Horsebarn Road, while south of Highway 94, the road is Champions Drive. The southbound exit ramp intersects Horsebarn Road approximately 500 feet north of the intersection with Highway 94. A field review found that recent construction on the southbound exit ramp produced a right-turn lane with storage length of approximately 200 feet. The southbound entrance ramp intersects Champions Drive approximately 260 feet south of the intersection with Highway 94. Both of the southbound ramps are J-hook ramps. The northbound ramps form half of a traditional diamond configuration, with a ramp terminal intersection on Highway 94. See Figure 83-1 for the existing intersections geometries, and the base year traffic volumes.

The interchange is built over Osage Creek, so there are bridges over this creek on Horsebarn Road and the northbound entrance ramp, as well as on I-540.

East of the interchange, Highway 94 is currently being widened to five lanes. This is one of a series of developments and improvements planned for this area. East of the interchange, a new north-south road is planned from Highway 94 south to Perry Road. A hospital is planned along the proposed road. There is a proposal to realign Perry Road and construct an interchange with I-540. A large regional-scale retail complex is planned for the area around the Perry Road interchange.

All three ramp terminal intersections were analyzed and are currently unsignalized. The signalized intersection of Highway 94 with Horsebarn Road/ Champions Drive was also analyzed.

Comments were collected from the open house public meeting surveys. The survey from the public meetings held in October, 2003, asked if the respondent experienced traffic congestion while traveling on I-540. The segment of I-540 between Highway 102/ 62 and Highway 94 was cited as an area that often or sometimes experiences traffic congestion. Another question asked respondents if they often experienced difficulty getting on or getting off I-540 because of traffic congestion. It was stated that the I-540/ Highway 94 Interchange (Exit 83) is a location where it is difficult to enter or exit I-540 during rush hour.

In conjunction with the current project to widen Highway 94 to five lanes east of the interchange, construction is also underway on improvements to the Highway 94 interchange (Job No. 009985). These improvements include widening Highway 94 through the interchange area to provide two eastbound lanes and three westbound lanes. One of the westbound lanes will be a left-turn lane to access the southbound entrance ramp. Also included are signalizing and widening the northbound exit ramp to provide double left-turn lanes onto the westbound lanes of Highway 94. Minor improvements to Horsebarn Road are included. A subsequent project (Job No. 090165) will widen Horsebarn Road and Champions Drive through the interchange area and will provide a traffic signal at the southbound exit ramp.

Short-Term Analysis

Existing morning and afternoon peak conditions were analyzed. The southbound exit ramp was found to be marginally functional with a three-way stop at Horsebarn Road. Ramp traffic queues in the afternoon peak hour and does clear promptly enough to avoid interference with I-540 traffic. The northbound ramps intersection with Highway 94 was found to operate at LOS F in both the morning and afternoon peak hours, as shown in Table 83-1. Because this intersection is unsignalized, slight queues develop on the ramp in the morning peak, but do not interfere with I-540 traffic. At the signalized intersection of Highway 94 and Horsebarn Road/ Champions Drive, southbound traffic turning onto the southbound entrance ramp backs up in the afternoon peak hour preventing traffic from utilizing the full green time allowed, and causing long queues on Horsebarn Road and Highway 94. See Figure 83-1 for 2004 traffic volumes and Figure 83-3 for existing intersection geometries.

Short-Term Improvements

No short-term improvements beyond those presently under construction appear to be needed at this location.

Long-Term Analysis

When reviewed using 2024 forecast volumes, severe deficiencies are apparent at this interchange with the existing configuration. The forecast volumes for the year 2024 overwhelm the existing interchange. However, with the interchange improvements that are under construction, acceptable levels of service are achieved with 2024 traffic volumes applied. It is also believed that additional widening of Horsebarn Road and Champions Drive, over and above that currently being implemented, will be needed in the long term.

Table 83-1

Exit 83 -- Levels of Service

	Southbound Exit Ramp	Champions Drive at Highway 94	Southbound Entrance Ramp	Northbound Ramp
2004 existing conditions	AM Unsig.-LOS C PM Unsig.-LOS F (long queues on Horsebarn)	AM LOS C PM LOS D (long queues on Horsebarn)	AM Unsig. LOS A PM Unsig. LOS A	AM Unsig. LOS F on NB ramp PM Unsig. LOS F on NB ramp
2024 existing conditions	AM Unsig.-LOS F (long queues on Horsebarn) PM Unsig.-LOS F (long queues on SB off-ramp)	AM LOS F PM LOS D/E (long queues on Horsebarn)	AM Unsig. LOS A PM Unsig. LOS F on SB left	AM Unsig. LOS F on ramp PM Unsig. LOS F on ramp (queues block intersection)
signalize SB ramps and widen Horsebarn and Champions	AM LOS B PM LOS B signalize	AM LOS C PM LOS B/C	AM LOS A PM LOS A signalize	AM LOS B PM LOS C

LOS = Level of Service

Long-Term Improvements

In addition to improvements to the Highway 94 interchange that are now under construction, additional long-term improvements are recommended. These include additional widening on Champions Drive to provide dual right-turn lanes from northbound Champions Drive onto eastbound Highway 94. The reason for dual right-turn lanes for northbound is that this turn should be posted to prohibit right turns on red, since these turns will conflict with the proposed westbound left turn onto the southbound entrance ramp. Also, to provide an adequate merge for traffic entering from Highway 94 and Horsebarn Road/ Champions Drive, it is recommended that the southbound entrance ramp be widened to two lanes. This will require extending the ramp runout farther south along I-540.

See Figure 83-4 for an illustration of recommended lane improvements in the interchange vicinity. Figure 83-4 includes the improvements that are under construction, as well as the additional recommended improvements.

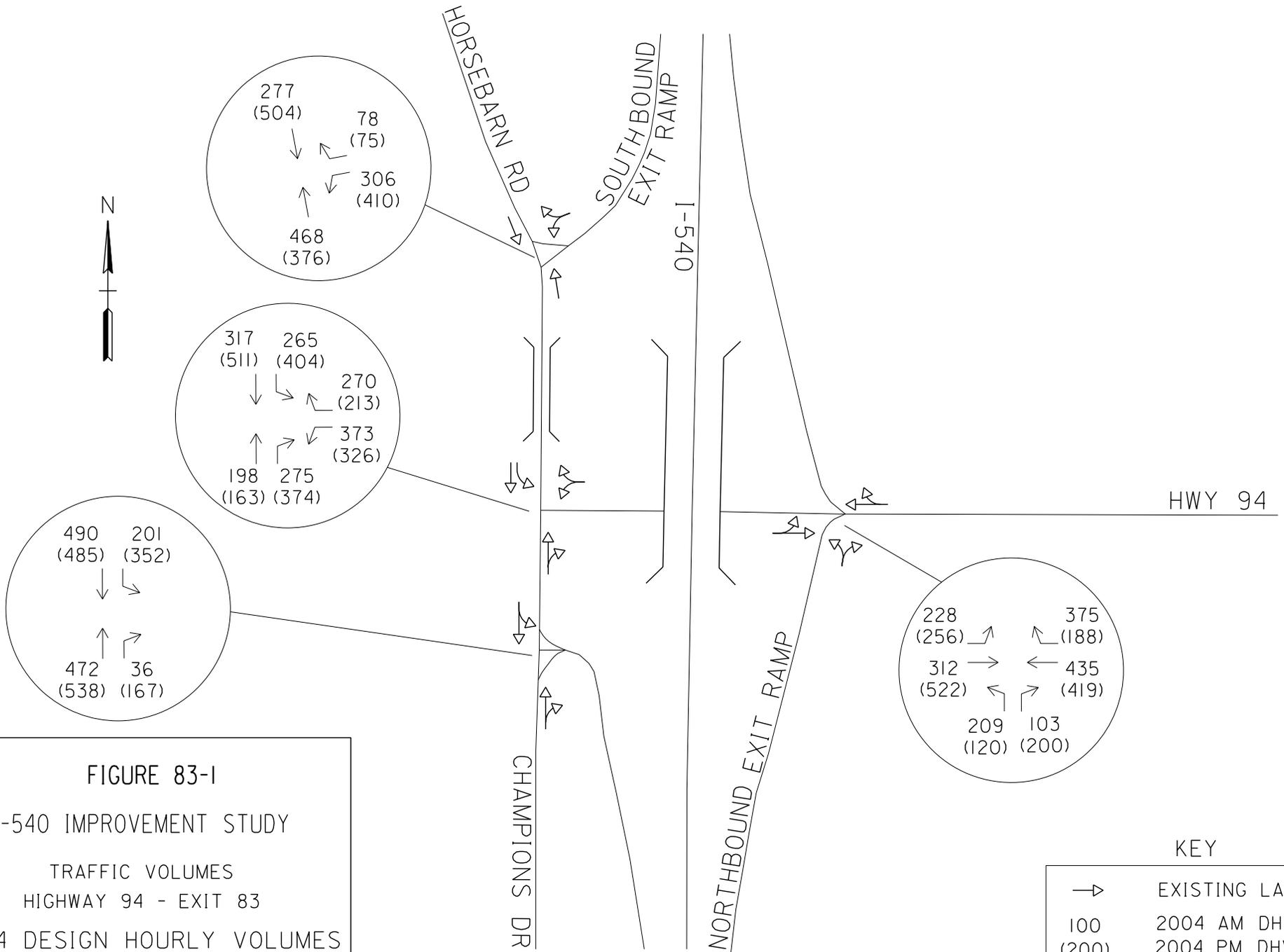


FIGURE 83-1

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES

HIGHWAY 94 - EXIT 83

2004 DESIGN HOURLY VOLUMES (DHV)

KEY

	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV

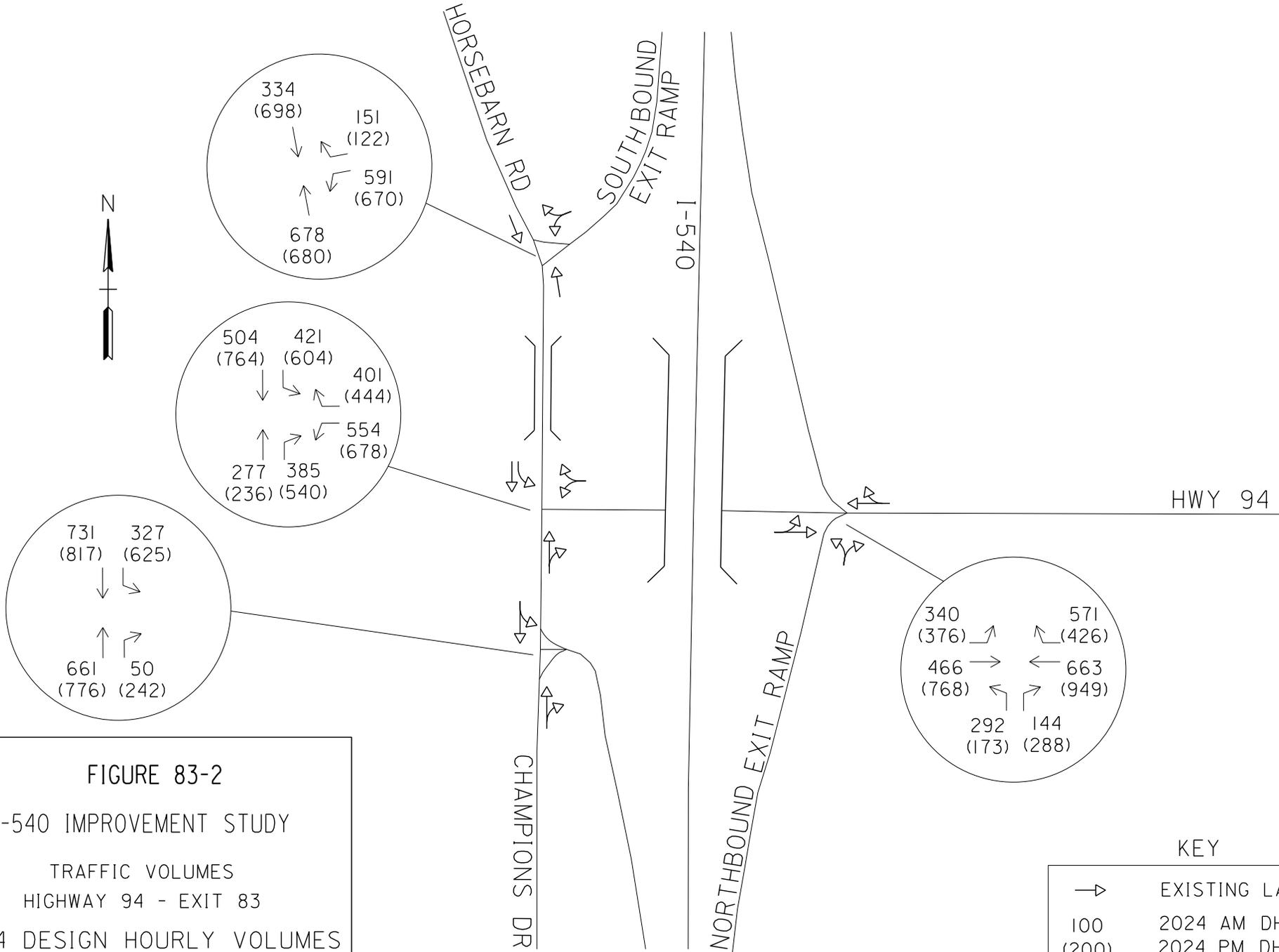


FIGURE 83-2

I-540 IMPROVEMENT STUDY

TRAFFIC VOLUMES

HIGHWAY 94 - EXIT 83

2024 DESIGN HOURLY VOLUMES (DHV)

KEY

	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV

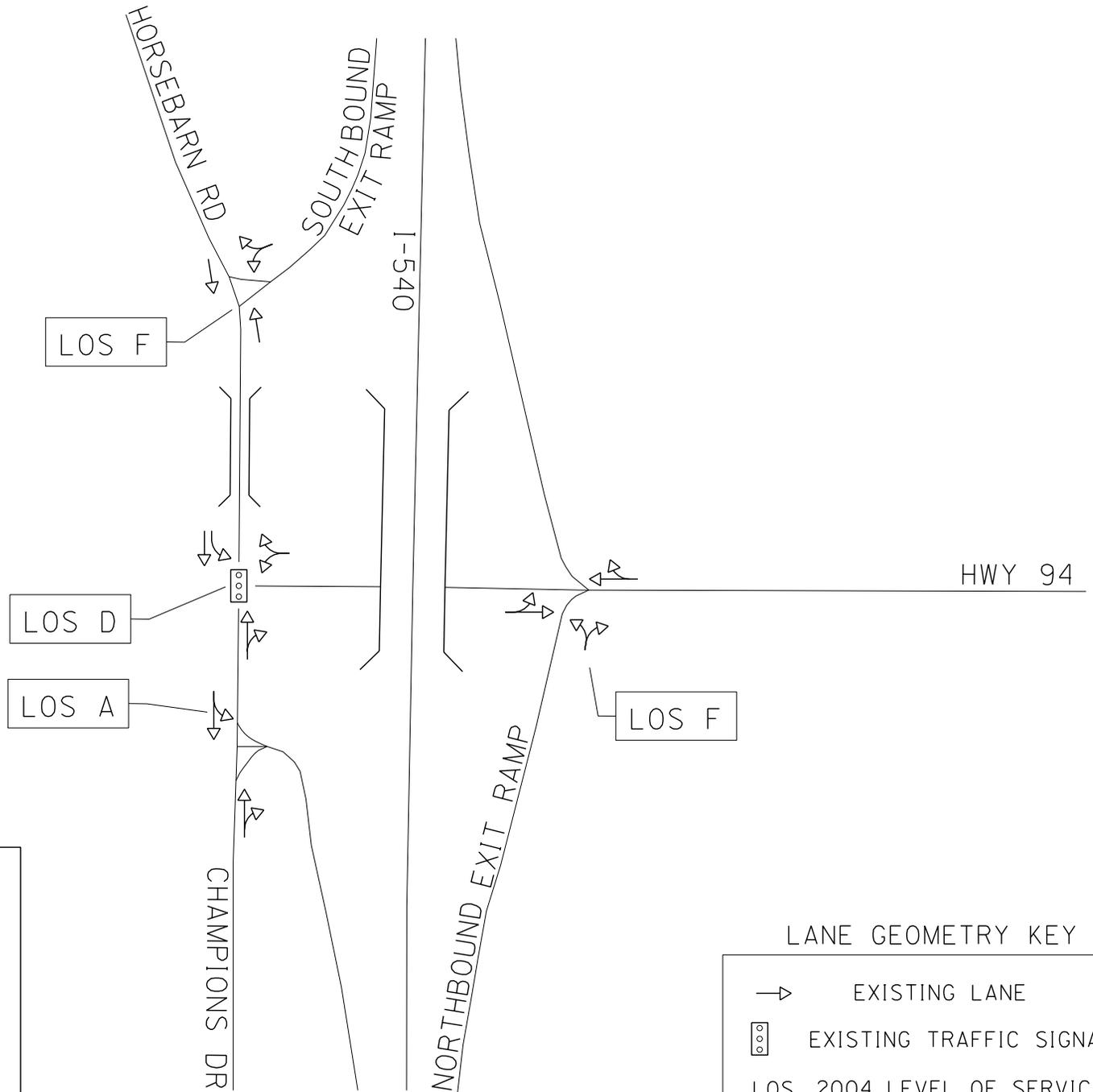


FIGURE 83-3

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 94 - EXIT 83

EXISTING CONDITIONS

LANE GEOMETRY KEY



EXISTING LANE



EXISTING TRAFFIC SIGNAL

LOS 2004 LEVEL OF SERVICE

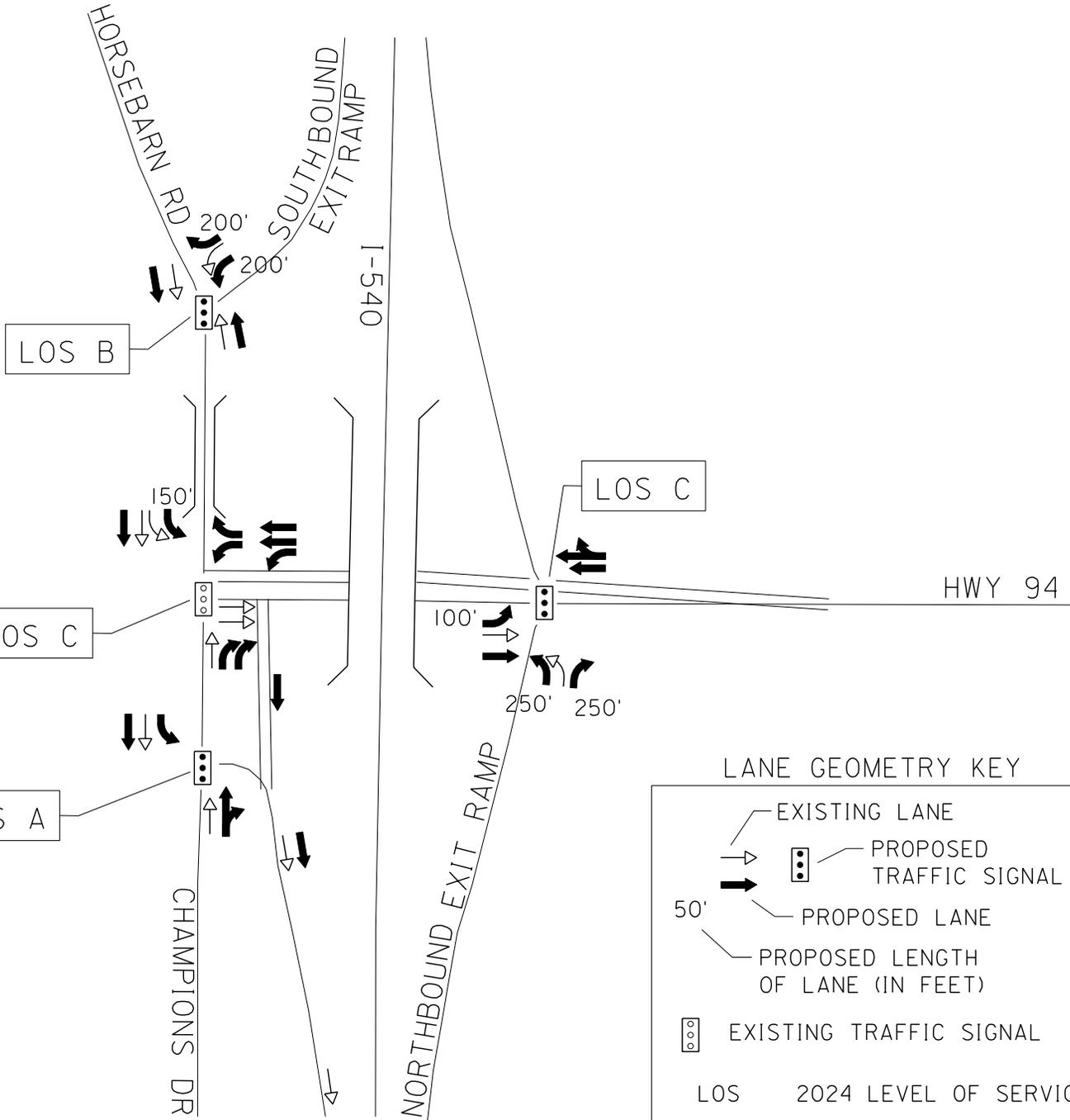


FIGURE 83-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS

HIGHWAY 94 - EXIT 83

LONG-TERM IMPROVEMENTS

LANE GEOMETRY KEY

- EXISTING LANE
- PROPOSED LANE
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- PROPOSED LENGTH OF LANE (IN FEET)
- EXISTING TRAFFIC SIGNAL
- 2024 LEVEL OF SERVICE (LOS)
- PROPOSED ROAD

BENTON COUNTY INTERCHANGES

Exit 85

Interstate 540 at Highway 71 Business

(Southeast Walton Boulevard / West Walnut Street)

**Exit 85 Interstate 540 at Highway 71 Business
(Southeast Walton Boulevard / West Walnut Street)**

This interchange is in a congested area on the municipal boundary between Bentonville and Rogers. Highway 71 Business (Highway 71B) is Southeast Walton Boulevard in Bentonville west of the interchange, and is currently being widened to five lanes. East of the interchange, Highway 71B is West Walnut Street in Rogers. All four quadrants of the interchange are developed commercially. This interchange is a center of retail activity for the area.

The interchange is a diamond interchange with I-540 crossing over Highway 71B. There are traffic signals at both ramp terminal intersections. Both ramp terminal intersections were analyzed, along with the nearby intersection of Highway 71B with Moberly Lane in Bentonville, and the intersection of Highway 71B with North 46th Street in Rogers. See Figure 85-1.

Both exit ramps are being widened as a part of the widening project on Highway 71B.

Comments were collected from the open house public meeting surveys. The survey from the public meeting held in October, 2003, asked if the respondent experienced traffic congestion while traveling on I-540. The segment of I-540 between Highway 94 (Exit 83) and Highway 102/ 62 (Exit 86), which includes this interchange, was cited as an area experiencing congestion. Two respondents suggested that the congestion was due to traffic backing up from the northbound exit ramp at the adjacent Highway 102/ Highway 62 interchange. The survey also asked if the respondent experienced difficulty getting on or off I-540 because of traffic congestion on interchange ramps or intersecting cross streets. Thirteen respondents listed this interchange as a difficult interchange to negotiate and cited either crossroad congestion or northbound exit ramp queues as the reason for the difficulty. Congestion was reported at times other than the commuter peak morning and afternoon rush hours.

Short-Term Analysis

Existing morning peak conditions were analyzed. See Figure 85-1 for 2004 traffic volumes. The intersection of Highway 71B with the southbound ramps was found to operate at LOS E in the afternoon peak, and the intersection with the northbound ramps was found to operate at LOS D. See Table 85-1 for level of service findings. Long queues that develop on the northbound exit ramp will be addressed

Table 85-1

Exit 85 -- Levels of Service

	Moberly Lane	Southbound Ramps	SPUI	Northbound Ramps	N. 46th St
2003 existing conditions	AM unsig - LOS F on Moberly* PM unsig - LOS F on Moberly * No Queue	AM LOS C PM LOS E/ F Queue	AM N/A PM N/A	AM LOS D/ E PM LOS D/ E Queue	AM LOS C/ D PM LOS D
2004 Double turns on ramps	AM unsig - LOS F on Moberly PM unsig - LOS F on Moberly	AM LOS C on ramp PM LOS E	AM N/A PM N/A	AM LOS D on ramp PM LOS D on ramp	AM LOS C PM LOS D
2015 Interim Improvements widen Moberly, N. 46th St. and 71B. Signalize Moberly Additional lane under bridge	AM LOS D on Moberly PM LOS B/ D Add left turn lane on Moberly	AM LOS B PM LOS C/ D Dbl. Left for 71B Southbound	AM N/A PM N/A	AM LOS C PM LOS C/ D Add Rt turn lane on 71B	AM LOS C PM LOS D SB Double left
2024 existing conditions	AM unsig - LOS F PM unsig - LOS F	AM LOS F PM LOS F	AM N/A PM N/A	AM LOS F PM LOS F	AM LOS F PM LOS F
Widen 71 B Keep Diamond Configuration 9 lanes under bridge	AM LOS A/ D PM LOS B/ D Double left	AM LOS B/ E PM LOS C/ D Triple left exit ramp	AM N/A PM N/A	AM LOS C/ D PM LOS C/ D Triple left exit ramp	AM LOS D PM LOS D/ E
SPUI add double right on N 46th and double left on Hwy71b at N. 46th St.	AM LOS B/ F PM LOS B/ D Dbl left off of N. Moberly	AM unsig.-LOS B at SB right PM unsig.-LOS B at SB right	AM LOS D PM LOS D	AM LOS A for NB off RT PM LOS A for NB off RT	AM LOS C/ D PM LOS D/ E
SPUI Widen 71B	AM LOS B/ F PM LOS B/ D	AM LOS B at SB off RT PM LOS B at SB off RT	AM LOS D PM LOS D	AM LOS A at NB off RT PM LOS A at NB off RT	AM LOS C/ D PM LOS D/ E

LOS = Level of Service

by the widening that is currently in progress, as shown in Figure 85-4. However, anticipated growth rates suggest that queues will begin to form on the ramps again within just a few years.

Short-Term Improvements

No improvements beyond those in progress appear to be immediately needed at this location.

Long-Term Analysis

When reviewed using 2024 forecast volumes, severe deficiencies are apparent at this interchange. The forecast volumes for the year 2024 overwhelm the roadway, and unless traffic growth trends are significantly abated, Highway 71B will need widening by 2024. See Figure 85-2 for 2024 traffic volume projections. It appears that interchange operations could be greatly improved over current operating characteristics.

In an effort to develop an interchange with a higher capacity, two strategies were considered:

- Widen Highway 71B, and
- Reconfigure the interchange as a Single-Point Urban Interchange (SPUI).

Loop ramps were not considered as a strategy for this interchange due to right-of-way constraints.

Widen Highway 71 Business

Highway 71B could be widened through the interchange to six through lanes plus a double left-turn lane. This would require replacement of the existing bridges. To achieve full utilization of the additional lanes, the widening would need to extend through the nearest adjacent signalized intersections east and the west of the interchange. Widening to three through lanes in each direction would permit widening both exit ramps to provide triple left-turn lanes. Other auxiliary lanes would be required as well, including double turn lanes onto the entrance ramps, Moberly Lane and North 46th Street. These improvements would yield reasonable overall levels of service, presuming that traffic signal greentimes would be allocated in an unbalanced fashion. This means that exit ramps would have less greentime than ordinarily expected so that more greentime could be allocated for clearing queues of vehicles from the interior space between the ramp intersections and adjacent street intersections. With this provision, Highway 71B would experience LOS C or LOS B, but the exit ramps would experience LOS D. Even with triple left-turns, the southbound exit ramp would be anticipated to operate at LOS E during morning peak.

Also, even with unbalanced signal timing that allocates more green time for through traffic, interlocking queues would still result on occasion because of the close intersection spacings.

Single-Point Urban Interchange (SPUI)

The existing bridges could be replaced, and the ramps realigned, to create a SPUI interchange. This would replace both ramp terminal intersections with a single central intersection, called the single-point intersection. See the discussion of SPUI interchanges on page 27. Conversion to a SPUI configuration would allow the left turns from the ramps to be made simultaneously (without interlocking), and would reduce the problem of intersection queues interfering with each other. This appears to be the most promising option for this interchange. LOS F would be expected, however, unless widening of Highway 71B were part of the SPUI strategy.

Both widening and SPUI

With Highway 71B widened to six through lanes plus double left-turn lanes, the SPUI configuration would offer significant advantages. It would have the capacity to move the 2024 traffic volumes that are forecasted for this area, and it would increase the spacing between intersections. At the single-point intersection, the northbound left-turn could be developed as a triple left-turn.

In order to keep the heavy eastbound-to-southbound right-turn from backing up a considerable distance on Highway 71B, the eastbound-to-southbound entrance ramp would need to be signalized at its intersection with the westbound-to-southbound entrance ramp. This proposed signal on the southbound entrance ramp would be a two-phase signal and could be operated as a “slave” to the traffic signal at the single-point intersection, so that the westbound-to-southbound left turn would always have progression through both locations. This would prevent the development of queue interferences.

Moberly Lane

There is an adjacent intersection on Highway 71B just west of the interchange. This is the unsignalized intersection with Moberly Lane. To the north, Moberly Lane serves as a minor arterial route for the City of Bentonville. This intersection is shown as a location for a future traffic signal in the *Capital Improvements Program of the City of Bentonville*, and is approximately 300 feet west of the existing southbound ramps intersection. If signalized, Moberly Lane will require auxiliary lanes at the intersection in order to preserve adequate green time for Highway 71B traffic.

North 46th Street

On Highway 71B east of the interchange is a signalized intersection with North 46th Street. North of Highway 71B, North 46th Street serves a busy commercial district. Traffic volumes have grown rapidly in recent years, and traffic congestion is expected to increase at this intersection. The intersection is approximately 450 feet east of the existing intersection of Highway 71B and the northbound ramps. Traffic delays for eastbound motorists at the intersection with North 46th Street could cause queues to form that could interfere with operations at the ramp intersection. In order to maintain an acceptable level of service at this intersection, both Highway 71B and North 46th Street will need to be widened. It is recommended that the southbound approach on North 46th Street be widened to four lanes to allow double turn lanes for both left turns and right turns onto Highway 71B. Also, the commercial driveway that is opposite North 46th Street on the south side of Highway 71B (Office Depot) should be widened to add an auxiliary lane for right turns.

I-540

I-540 will require mainline widening in order to provide adequate traffic capacity for the anticipated travel demand. South of this interchange, it is recommended that eight lanes be constructed for through traffic. The mainline should be widened to six lanes through this interchange. Also, auxiliary lanes should be constructed along I-540 from this interchange north to the next interchange (Highway 102/ Highway 62). The additional lanes will allow the exit ramps to be developed as lane drops, and the entrance ramps to be developed as lane adds. The West Olive Street Bridge over I-540, which is located approximately 2,700 feet north of Highway 71B, is long enough to accommodate eight lanes on I-540 provided pier protection is installed for the outside piers.

Both entrance ramps are proposed to be widened to two lanes in order to receive double-turns through the single point intersection. Both entrance ramps will need to be extended along I-540 to allow adequate space downstream of the traffic signals to accommodate the needed lane drop tapers and to permit full utilization of the double-turn lanes.

Interim Recommendation

It appears that one lane could be added to Highway 71B under the existing bridge. If implemented, this could be used to create a double left-turn onto the southbound entrance ramp. This would greatly improve interchange operations, but the intersection of Highway 71B with the southbound ramps would still be anticipated to operate at LOS F in

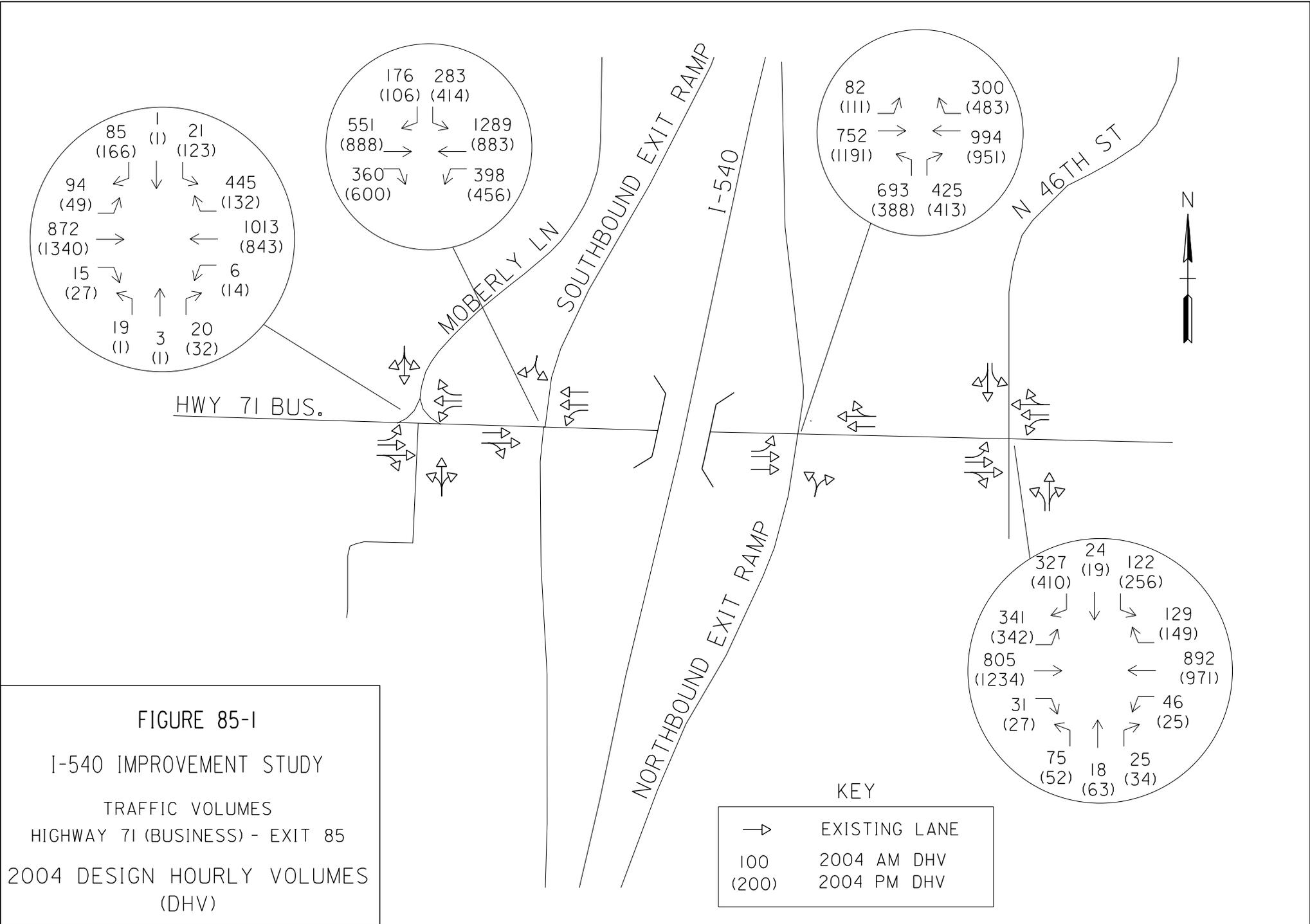
2024. In order to implement a double turn, the entrance ramp would need to be widened and extended along I-540. These improvements would be expected to result in LOS D operations at the interchange until 2015. An extension of the service life of the interchange could be achieved until the year 2018 (approximately) by improving the intersection with North 46th Street. This would require adequate widening of Highway 71B on both sides of the intersection to implement a double left-turn from eastbound Highway 71B onto northbound North 46th Street. Also, North 46th Street would need to be widened to create a double right-turn for southbound traffic. This would still leave operations at the North 46th Street intersection at LOS F, but the queues would not be expected to prevent the northbound exit ramp from clearing. See Figure 85-5 for an illustration of the recommended interim improvements.

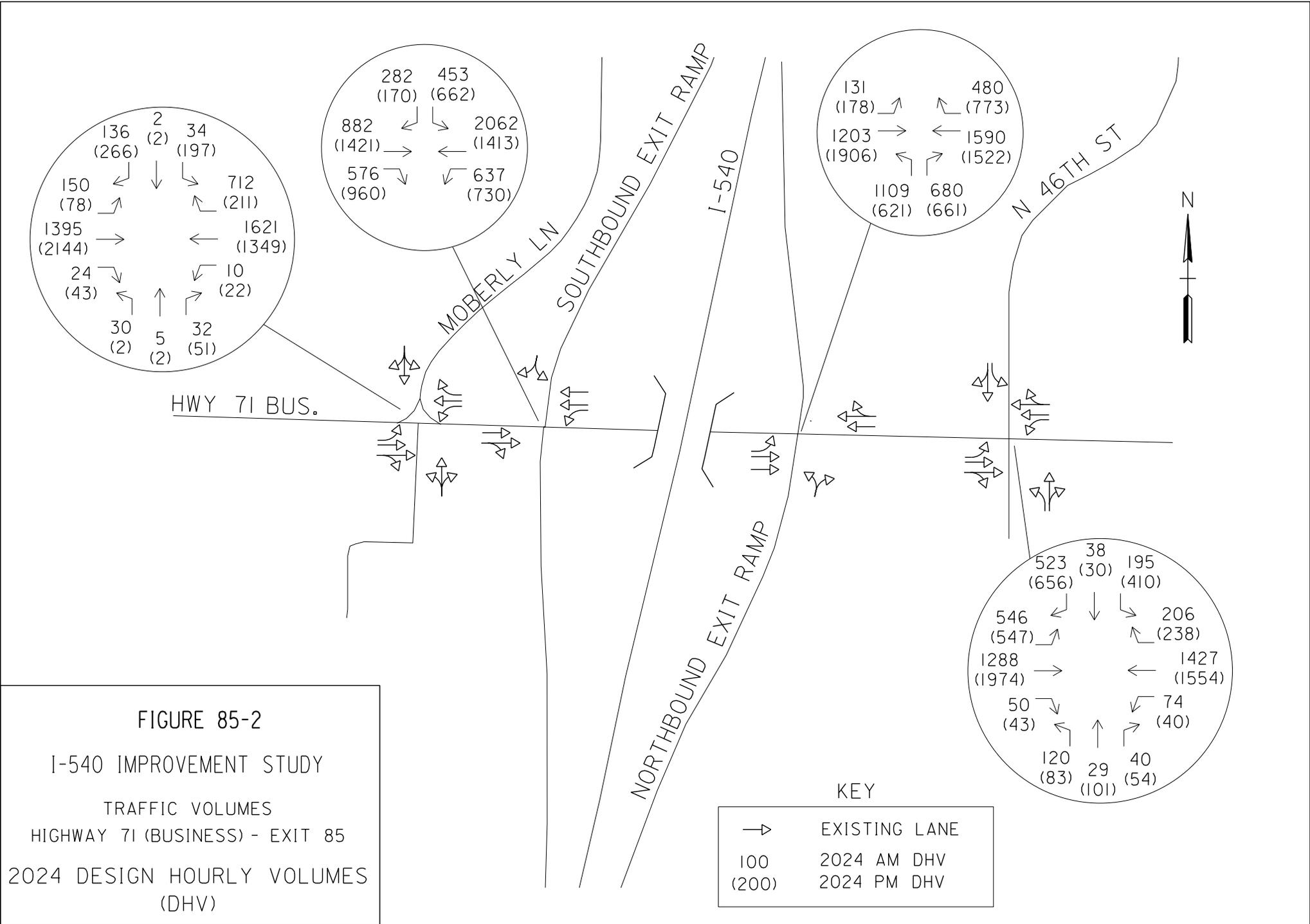
Long-Term Improvements

Highway 71B should be widened to six through lanes. A study of Highway 71B should be conducted to determine the needed extent of this proposed widening to the east and west of the interchange vicinity.

In the area of the interchange, the highway should be further widened to permit auxiliary lanes adequate for double turns. This interchange should be converted to a SPUI configuration. The southbound exit ramp should feature a double left-turn at the SPUI intersection, and the northbound exit ramp should feature a triple left-turn at the SPUI intersection. Both entrance ramps will need to be widened to two lanes in order to receive double-turns. The southbound entrance ramp should be signalized at the confluence of the two flows of traffic. See Figure 85-6.

Auxiliary lanes should be constructed both on Moberly Lane in Bentonville and on North 46th Street in Rogers as described above.





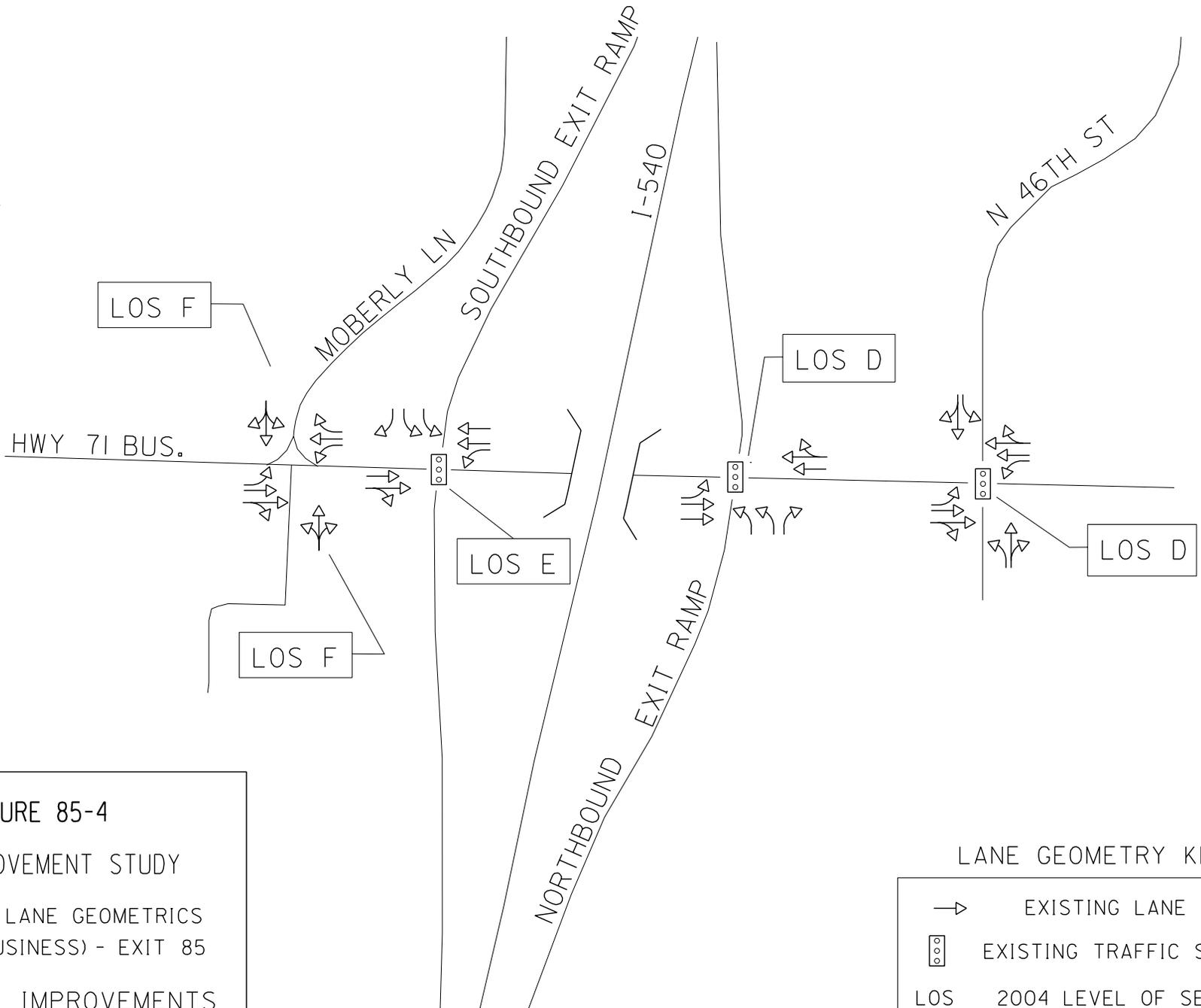


FIGURE 85-4

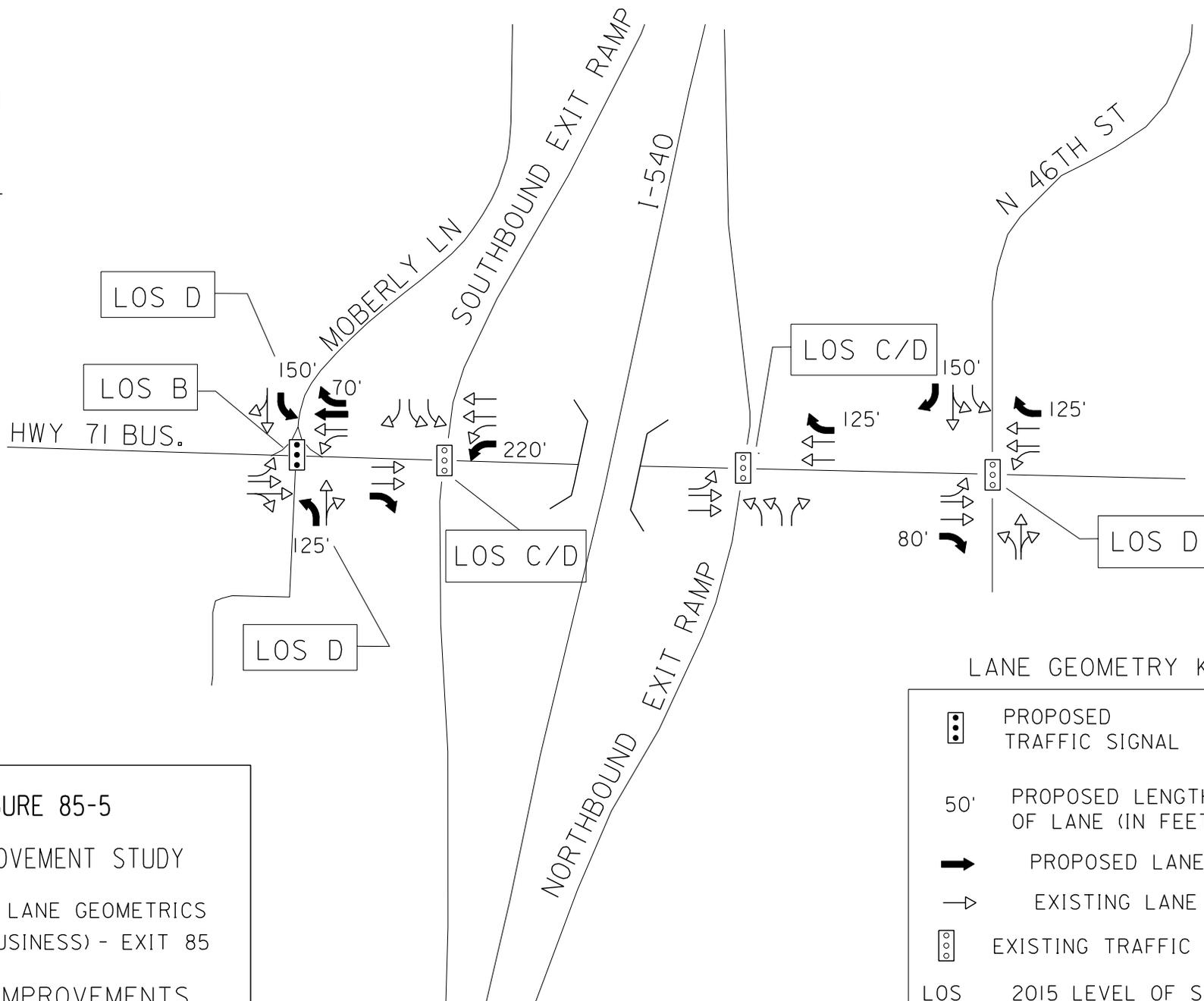
I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
HIGHWAY 71 (BUSINESS) - EXIT 85

SHORT-TERM IMPROVEMENTS

LANE GEOMETRY KEY

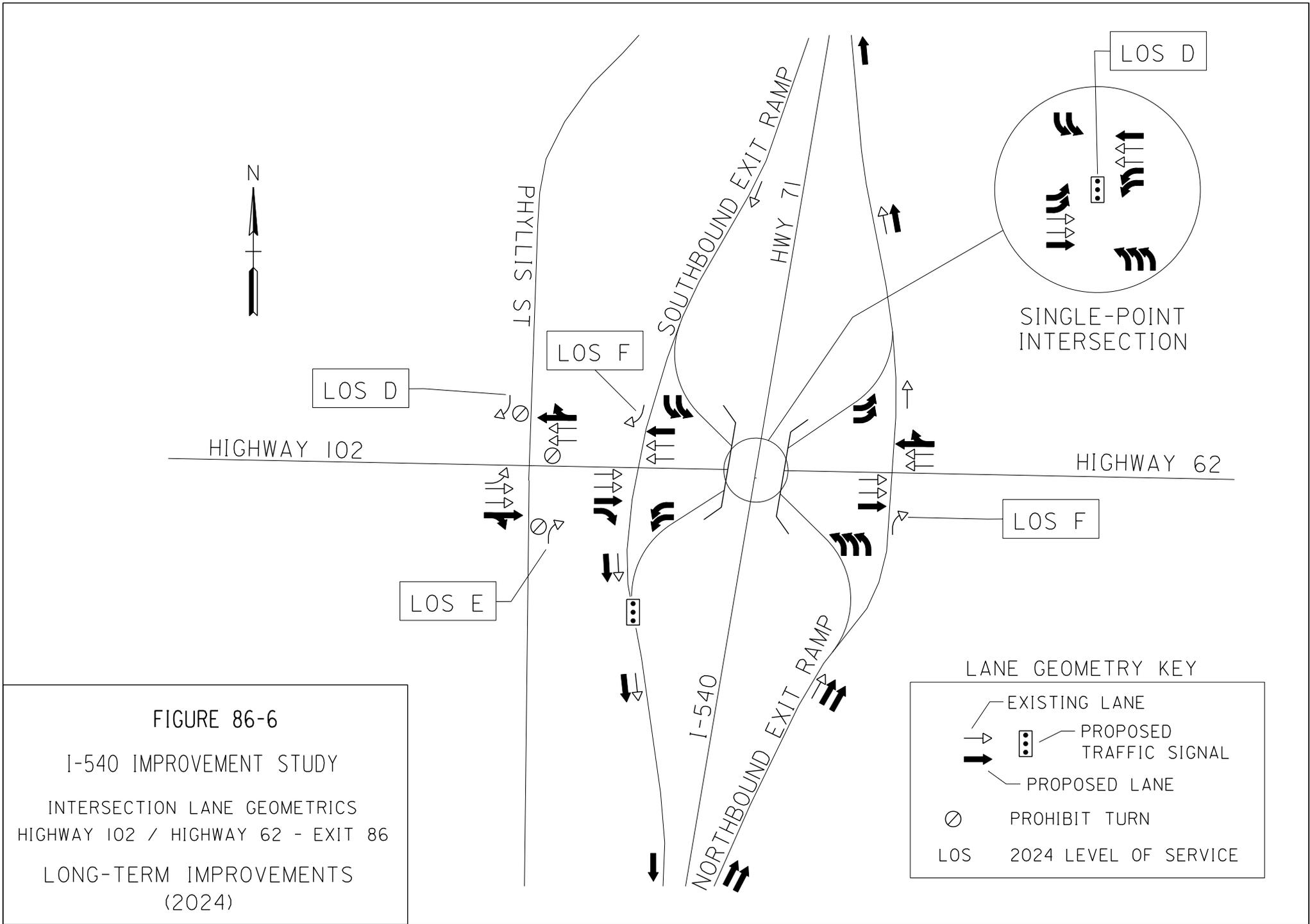
→	EXISTING LANE
☐	EXISTING TRAFFIC SIGNAL
LOS	2004 LEVEL OF SERVICE



LANE GEOMETRY KEY

	PROPOSED TRAFFIC SIGNAL
50'	PROPOSED LENGTH OF LANE (IN FEET)
	PROPOSED LANE
	EXISTING LANE
	EXISTING TRAFFIC SIGNAL
LOS	2015 LEVEL OF SERVICE

FIGURE 85-5
I-540 IMPROVEMENT STUDY
INTERSECTION LANE GEOMETRICS
HIGHWAY 71 (BUSINESS) - EXIT 85
INTERIM IMPROVEMENTS
(2015)



PHYLLIS ST

SOUTHBOUND EXIT RAMP
 HWY 71

NORTHBOUND EXIT RAMP
 I-540

HIGHWAY 102

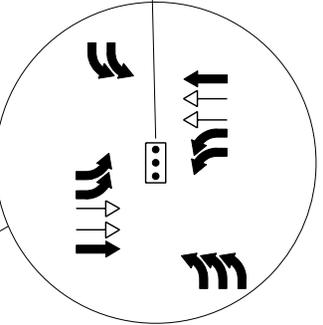
HIGHWAY 62

LOS D

LOS F

LOS E

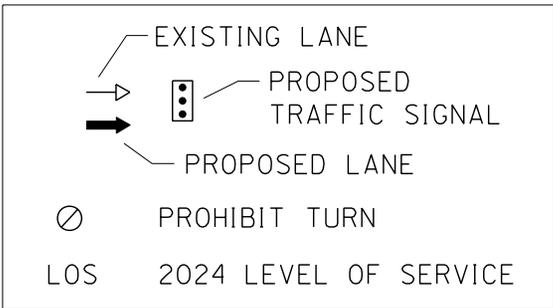
LOS D



SINGLE-POINT INTERSECTION

LOS F

LANE GEOMETRY KEY



BENTON COUNTY INTERCHANGES

Exit 86

Interstate 540 / Highway 71 at Highway 102 / Highway 62

(Southeast 14th Street)

**Exit 86 Interstate 540 / Highway 71 at Highway 102 / Highway 62
(Southeast 14th Street)**

I-540 terminates at Highway 102/ Highway 62 in Bentonville. North of this location, the freeway continues; however, it is designated as Highway 71 and not as an Interstate highway. The Highway 71 freeway is built to interstate standards to the north end of Bentonville at an interchange with Highway 71B. Highway 71 north of the Highway 102/ Highway 62 interchange is designated as part of the National Highway System (NHS). Highway 62 east of the interchange is also on the NHS.

This interchange is in a congested area of Bentonville near Rogers. Highway 102 is Southeast 14th Street west of the interchange in Bentonville and is five lanes wide. East of the interchange, Southeast 14th Street is designated as Highway 62. The Mercy Health Center Hospital is located in the northeast quadrant of the interchange. Directly east of the hospital is Northwest Arkansas Community College. The other three quadrants contain commercial development.

The interchange is a diamond interchange with I-540/ Highway 71 crossing over Highway 102/ Highway 62. There are traffic signals at both ramp terminal intersections. Both ramp terminal intersections were analyzed, as was the nearby intersection of Highway 102 with Phyllis Drive.

Comments were collected from the open house public meeting surveys. The survey from the public meetings in October 2003 asked if the respondent experienced traffic congestion while traveling on I-540. The segment of I-540 between Highway 94 and Highway 102/ Highway 62 was cited as an area experiencing congestion in the morning and afternoon rush hours. Two respondents suggested that the congestion was due to traffic backing up from the northbound exit ramp at Highway 102/ Highway 62. The survey also asked if the respondent experienced difficulty getting on or off I-540 because of traffic congestion on interchange ramps or intersecting cross streets. The Highway 102/ Highway 62 interchange was cited as a location that experiences congestion on the crossroads during morning and afternoon rush hours and also at off peak hour traffic. At the local officials meeting, it was cited that the new Wal-Mart Information Systems Center and Northwest Arkansas Community College and heavy truck traffic were major contributors to traffic congestion at this interchange.

The Northwest Arkansas Council presented a report to the AHTD titled *Northwest Arkansas Transportation Needs* (October, 2003) in which this interchange is identified as

one of five interchanges that are high priority for improvements. The reason for this is the I-540/ Highway 71 interchange with Highway 102/ Highway 62 is one of the primary access and egress points for the City of Bentonville and also serves much of Rogers. According to the report, the interchange is severely congested due to the 16,000 employees who work for Wal-Mart Stores, Inc., and the 1,332 tractor trailer units that daily serve the Wal-Mart Distribution Centers.

Short-Term Analysis

Existing morning peak conditions were analyzed. Both of the intersections of Highway 102/ Highway 62 with the ramps were found to operate at LOS D in the morning peak and at LOS F during the afternoon peak. See Table 86-1. The 2004 traffic volumes are illustrated in Figure 86-1. Observations at this location in the afternoon found that long queues form. Especially troublesome was a very long queue that extended eastward on Highway 102/ Highway 62 from the left-turn onto the southbound entrance ramp during the afternoon peak. This queue extended into Rogers and persisted through much of the peak period. Figure 86-3 shows existing intersection geometries for this interchange.

Short-Term Improvements

Auxiliary lanes could be added that would improve operating conditions immediately. A right-turn lane could be added on Highway 102 for turns onto the southbound entrance ramp. A right-turn lane could be added on Highway 62 for turns onto the northbound entrance ramp. A right-turn lane could also be added to the southbound exit ramp for turns onto westbound Highway 102. These auxiliary lanes would relieve some of the congestion but would not relieve the largest source of the traffic delays. Interim improvements are recommended to be accomplished as soon as possible at this location.

Interim Improvements

It appears that one lane could be added to Highway 102/ Highway 62 under the existing bridge. If implemented, this could be used to create a double-left turn for the westbound-to-southbound movement at the intersection with the southbound ramps as shown in Figure 86-4. The long queue observed on Highway 102/ Highway 62 would be directly addressed by this change. This would greatly improve interchange operations, but the intersection with the southbound ramps would be anticipated to drop back to LOS F by the year 2008 or 2009. The delays would still be substantially reduced, and the queues would not back up so far. In order to implement a double-turn, the southbound entrance ramp would need to be widened to two lanes and extended along southbound I-540.

Table 86-1

Exit 86 -- Levels of Service

	Southbound Ramps	Northbound Ramps
2004 existing conditions	AM LOS D PM LOS F	AM LOS D PM LOS F
Short-Term Improvements improve ramps Add Auxiliary lanes	AM LOS D Add turn lane on ramp PM LOS D/E Dbl left on Hwy 102 westbound	AM LOS D Extend turn lane on ramp PM LOS C/D
2006 Interim Improvements Add lane under bridge. Add Auxiliary lanes	AM LOS D PM LOS D/E	AM LOS D PM LOS C/D
2024 existing conditions	AM LOS F PM LOS F	AM LOS F PM LOS F
Diamond widen to 6 lanes double turns	AM LOS B/D PM LOS D/F	AM LOS C PM LOS C
Loop Add 1 lane under bridge	AM LOS F Dbl. Left and Dbl. Right PM LOS F on ramp.	AM LOS F Construct loop in NE PM LOS F quadrant. Shock waves
SPUI Single-Point Urban Interchange widen to 6 lanes	Replace bridge to create Single-point intersection, and realign ramps.	AM LOS D Dbl. turns all ways. PM LOS D Manageable long queues.

LOS = Level of Service

Long-Term Analysis

When reviewed using 2024 forecast volumes, severe deficiencies are apparent at this interchange. Three strategies were considered:

- Widen Highway 102/ Highway 62, keeping the existing diamond configuration.
- Add a loop ramp for the northbound-to-westbound movement.
- Reconfigure the interchange as a Single-Point Urban Interchange (SPUI).

Widen Highway 102/ Highway 62

Highway 102/ Highway 62 could be widened to six lanes in order to better accommodate the through traffic between Bentonville and Rogers. This would require replacement of the bridge and widening to, at least, the next signalized intersection on either side of the interchange. This widening should feature double left-turn lanes for turns onto both entrance ramps, which would require the widening and extension of both entrance ramps. Highway 102/ Highway 62 would have nine lanes under the I-540 bridge. This strategy would greatly improve capacity; however, queues would still be expected to become long enough for the ramp terminal intersections to occasionally block each other.

Add a loop ramp.

By widening the I-540 bridge to add one lane in the northbound direction, a loop ramp could be constructed in the northeast quadrant of the interchange. This would require the acquisition of additional right-of-way from the Mercy Health Center which is adjacent to the existing northbound entrance ramp. The addition of the proposed loop ramp would relieve the congestion that is due to the operation of the intersection of Highway 102/ Highway 62 with the northbound ramps; however, it would not relieve the congestion at the intersection with the southbound ramps. Highway 102/ Highway 62 would require widening as part of the loop ramp alternative. A loop ramp in the northwest quadrant of the interchange was not considered due to extreme right-of-way constraints.

Single-Point Urban Interchange.

The existing bridge could be replaced and the ramps realigned to form a SPUI configuration. This would replace both ramp terminal intersections with a single central intersection. This would allow left turns from both exit ramps to be made simultaneously, eliminating the problem of intersection queues interfering with each other. See the discussion of SPUI interchanges on page 27.

Conversion to a SPUI configuration appears to be a promising strategy for this interchange. LOS F would continue to be expected unless the widening of

Highway 102/ Highway 62 is included in the SPUI strategy. Combined with the widening of Highway 102/ Highway 62, the SPUI strategy is the most attractive solution. The queues would not as long as they would be for either the widening strategy alone or the loop ramp strategy.

With Highway 102/ Highway 62 widened to six lanes, the SPUI offers significant advantages. It has the capacity to move forecasted traffic volumes, and it increases the spacing between adjacent intersections. At the single-point intersection, the northbound-to-westbound left-turn could be developed as a triple left-turn. To prevent the heavy eastbound-to-southbound right-turn traffic from backing up a considerable distance on Highway 102, the eastbound-to-southbound entrance ramp would need to be signalized at the intersection with the westbound-to-southbound entrance ramp. These features are similar to those proposed for the interchange of I-540 with Highway 71B (Exit 85). See Figure 86-5.

Phyllis Street.

Just west of the interchange, there is an unsignalized intersection with Phyllis Street. This intersection is currently operating at LOS F for peak conditions. The westbound left-turn onto southbound Phyllis currently operates at LOS B in the morning and LOS D in the afternoon. However, in future years, it appears that the westbound left-turn will decline to LOS F, and the queue will extend far enough to block a lane of westbound through traffic. The left turn for westbound Highway 102 should be prohibited at Phyllis Street once this queue begins to block through traffic. Also, anticipated traffic volumes indicate that it will become very difficult for a motorist on Phyllis Street to make a left turn onto Highway 102. Both northbound and southbound left turns from Phyllis Street should be prohibited during peak hours.

General Congestion.

The forecast volumes for 2024 overwhelm the roadway at this interchange. Unless traffic growth trends change dramatically, Highway 102/ Highway 62 will need widening by the year 2024. See Figure 86-2 for 2024 traffic volume projections. It appears that interchange operations could be greatly improved over current operating characteristics. However, it also appears that queues from other nearby intersections that were not included in this study will become impediments to efficient operation. In particular, an investigation into the potential for improvements at the intersection of Highway 102 and Moberly Lane is recommended.

I-540 / Highway 71

I-540 / Highway 71 will require mainline widening in order to provide adequate traffic flow characteristics for the anticipated travel demand. The mainline should be widened to six lanes through this interchange. Also, auxiliary lanes should be constructed along I-540 from this interchange south to the interchange of I-540 and Highway 71B. This will result in the I-540 mainline being eight lanes wide between Exit 85 and Exit 86. The addition of the auxiliary lanes will allow the northbound exit ramp to be developed as a lane drop and the southbound entrance ramp to be developed as a lane addition.

Highway 71 should be widened to six lanes north to the interchange of Highway 71 with Highway 72. The southbound exit ramp and the northbound entrance ramp should both be extended, to allow full utilization of the double turn lanes that are proposed on Highway 102/ Highway 62. The runout lengths of both of these ramps will extend across the twin bridges that carry Highway 71 over the Arkansas Missouri Railroad. These bridges are approximately 1,200 feet north of the bridges that carry I-540/ Highway 71 over Highway 102/ Highway 62 and both will require widening. In the southbound direction, it is recommended that an additional through lane be added to the inside, and an exit lane be added to the outside. In the northbound direction, it is recommended that a through lane be added to the inside.

Long-Term Improvements

Highway 102/ Highway 62 should be widened to six lanes. This widening should extend from Moberly Lane to Watertower Road. Further study would be needed to determine if widening beyond those limits will be needed. In the area of the interchange, the highway should be further widened to permit auxiliary lanes adequate for double turns. It is recommended that Highway 102/ Highway 62 be studied for the feasibility of widening further than just in the interchange area; the study should include an area that would stretch from west of Moberly Lane to east into Rogers.

This interchange should be converted to a single-point urban interchange configuration. The southbound exit ramp should feature a double-left turn at the single-point intersection. The northbound exit ramp should include a triple-left turn at the single-point intersection. Both entrance ramps will need to be widened to two lanes and extended in order to accommodate double-turn lanes from Highway 102/ Highway 62. See Figure 86-5 for recommended intersection geometries.

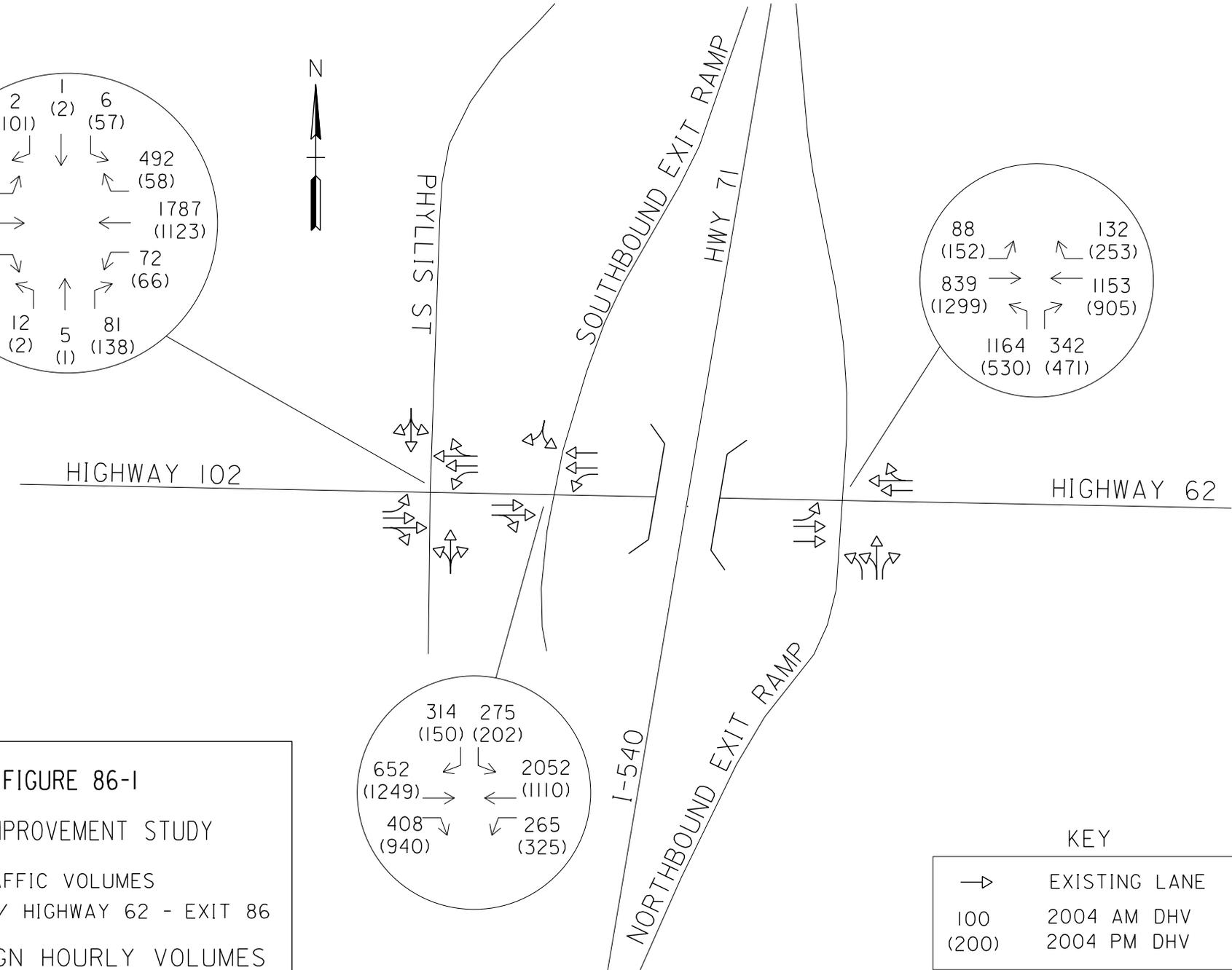
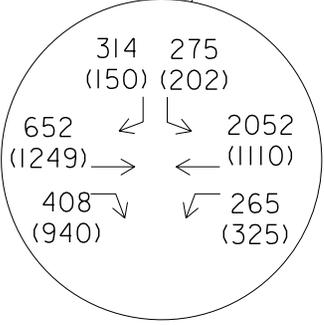
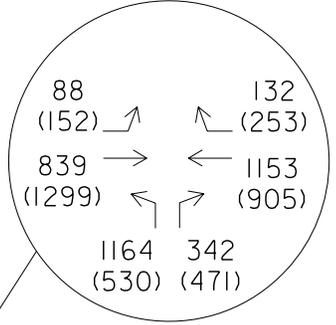
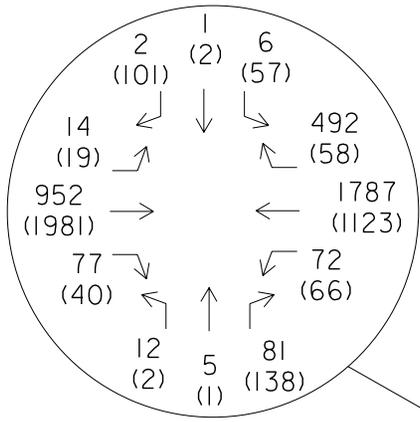


FIGURE 86-1

I-540 IMPROVEMENT STUDY

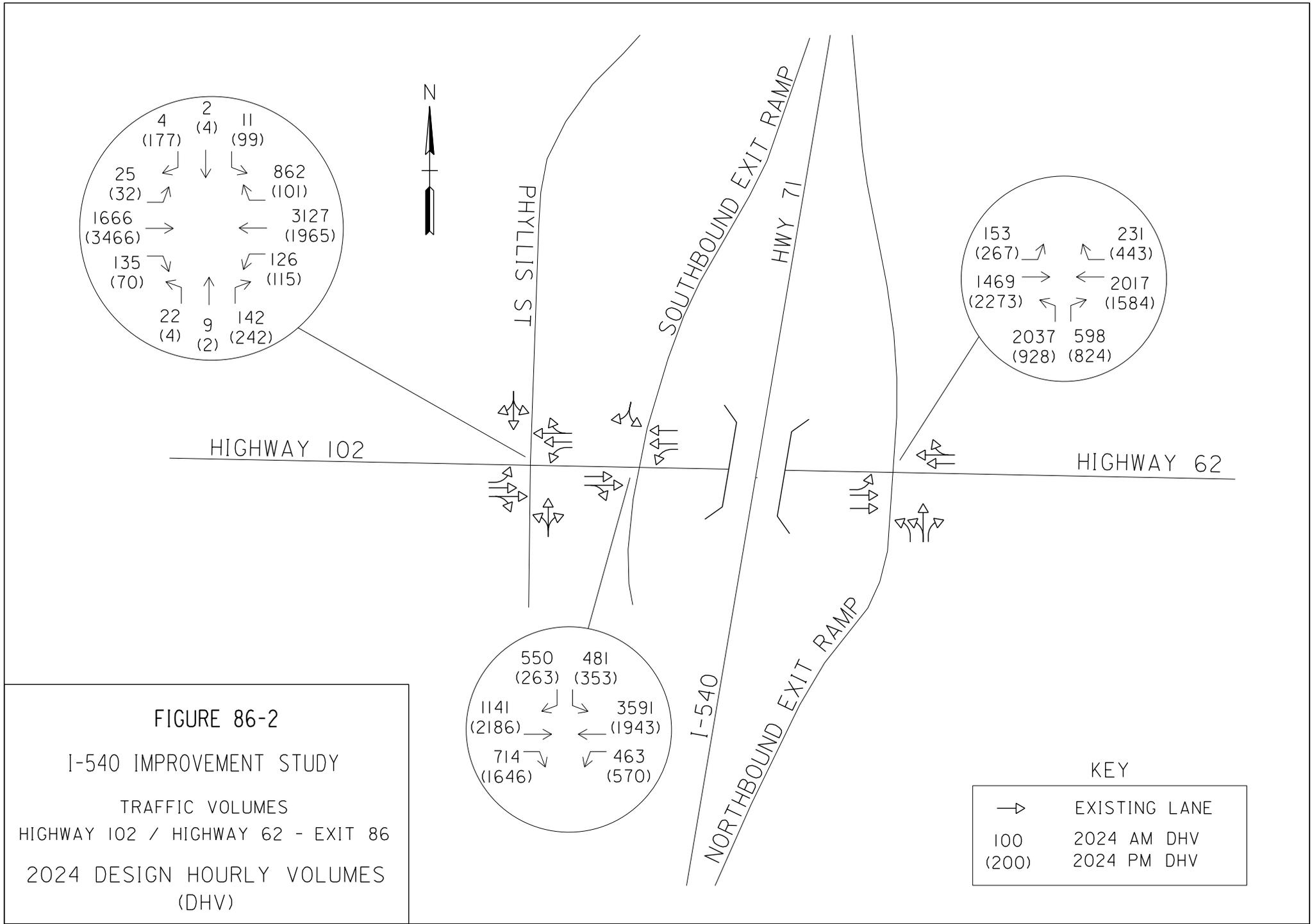
TRAFFIC VOLUMES

HIGHWAY 102 / HIGHWAY 62 - EXIT 86

2004 DESIGN HOURLY VOLUMES (DHV)

KEY

→	EXISTING LANE
100	2004 AM DHV
(200)	2004 PM DHV



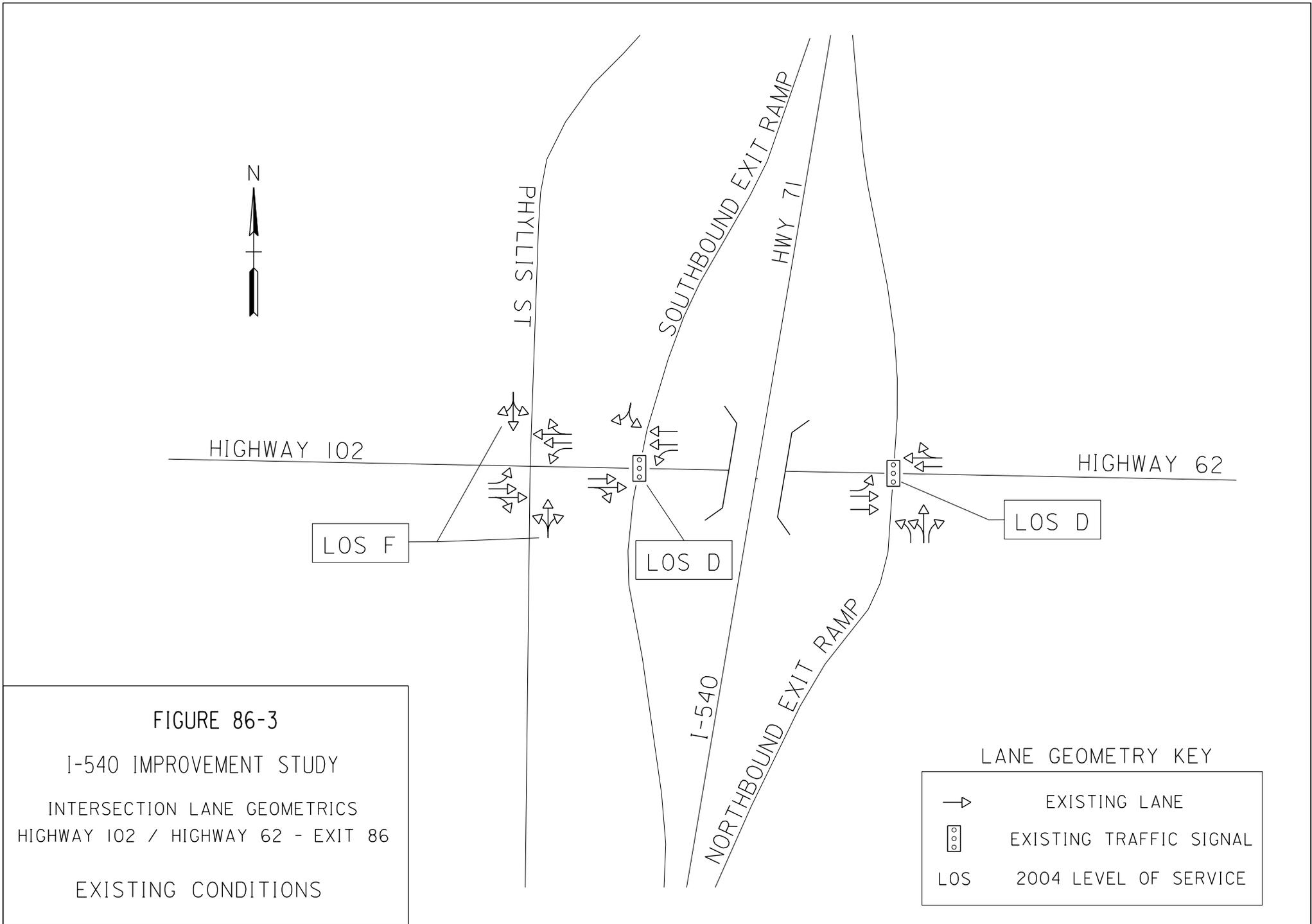


FIGURE 86-3

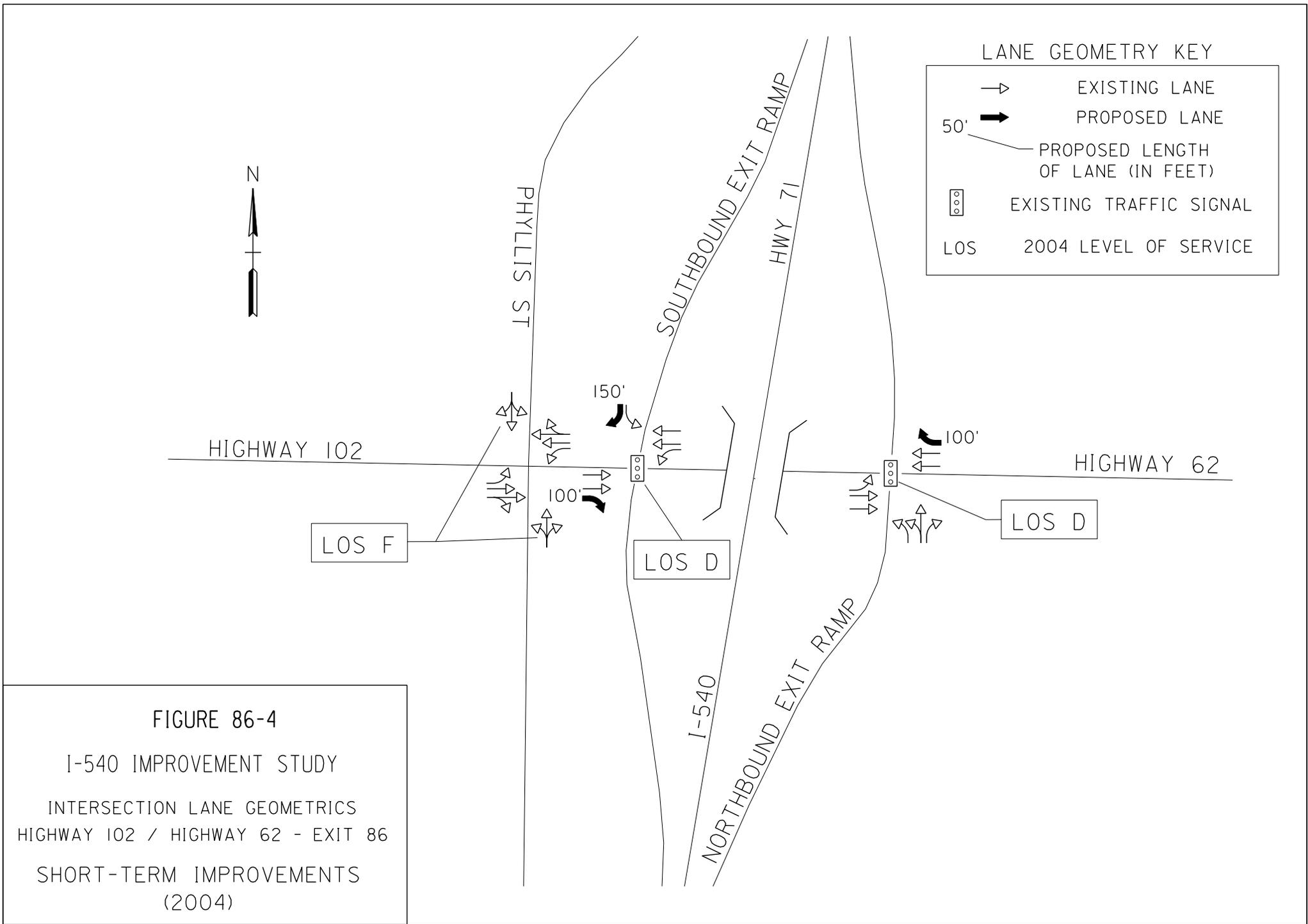
I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
HIGHWAY 102 / HIGHWAY 62 - EXIT 86

EXISTING CONDITIONS

LANE GEOMETRY KEY

→	EXISTING LANE
⊞	EXISTING TRAFFIC SIGNAL
LOS	2004 LEVEL OF SERVICE



LANE GEOMETRY KEY

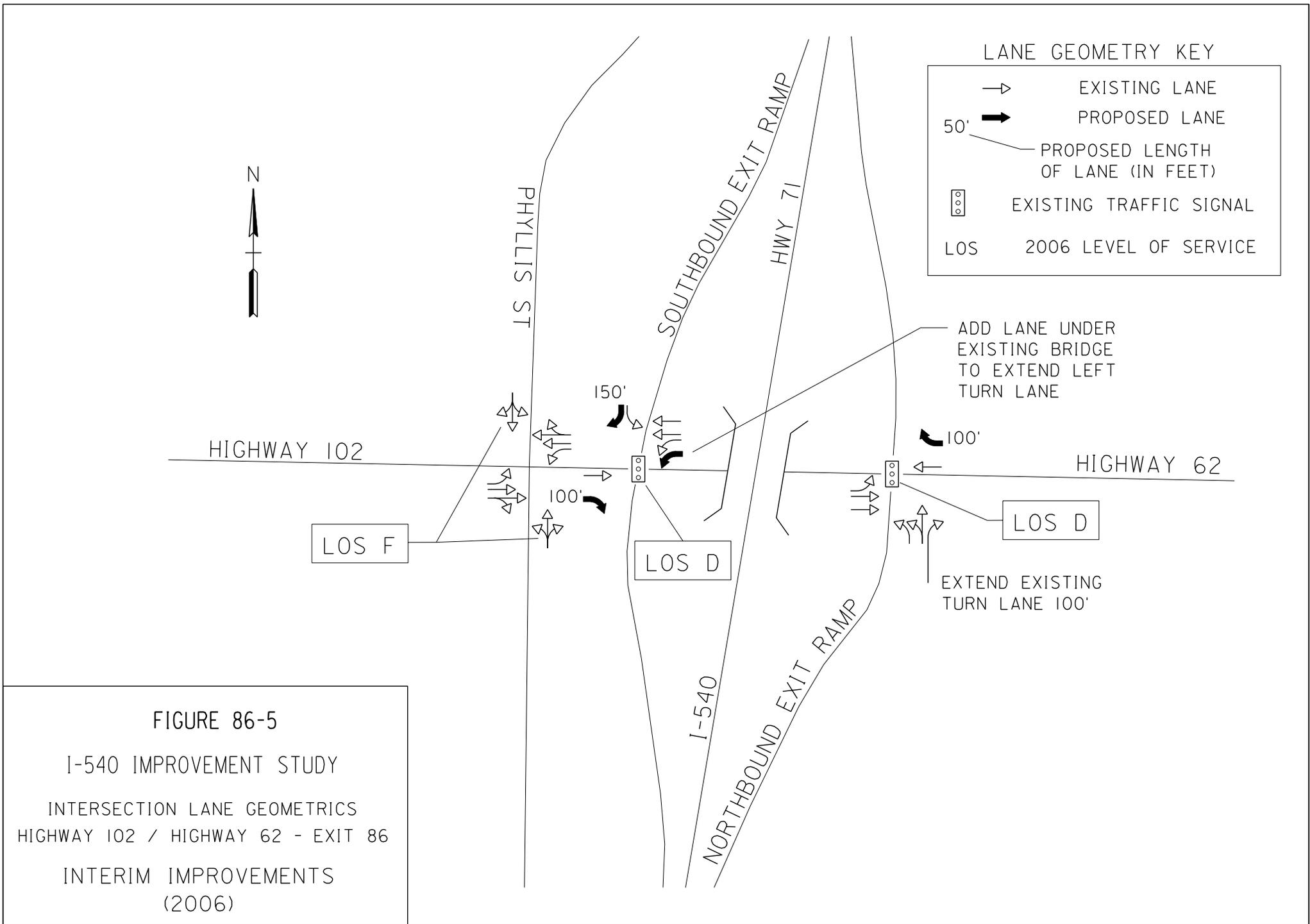
	EXISTING LANE
	PROPOSED LANE
50'	PROPOSED LENGTH OF LANE (IN FEET)
	EXISTING TRAFFIC SIGNAL
LOS	2004 LEVEL OF SERVICE

FIGURE 86-4

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
HIGHWAY 102 / HIGHWAY 62 - EXIT 86

SHORT-TERM IMPROVEMENTS
(2004)



LANE GEOMETRY KEY

- EXISTING LANE
- 50' → PROPOSED LANE
- 50' → PROPOSED LENGTH OF LANE (IN FEET)
- ◻ EXISTING TRAFFIC SIGNAL
- LOS 2006 LEVEL OF SERVICE



ADD LANE UNDER EXISTING BRIDGE TO EXTEND LEFT TURN LANE

100'

HIGHWAY 62

LOS D

EXTEND EXISTING TURN LANE 100'

LOS D

LOS F

HIGHWAY 102

PHYLLIS ST

SOUTHBOUND EXIT RAMP

HWY 71

I-540

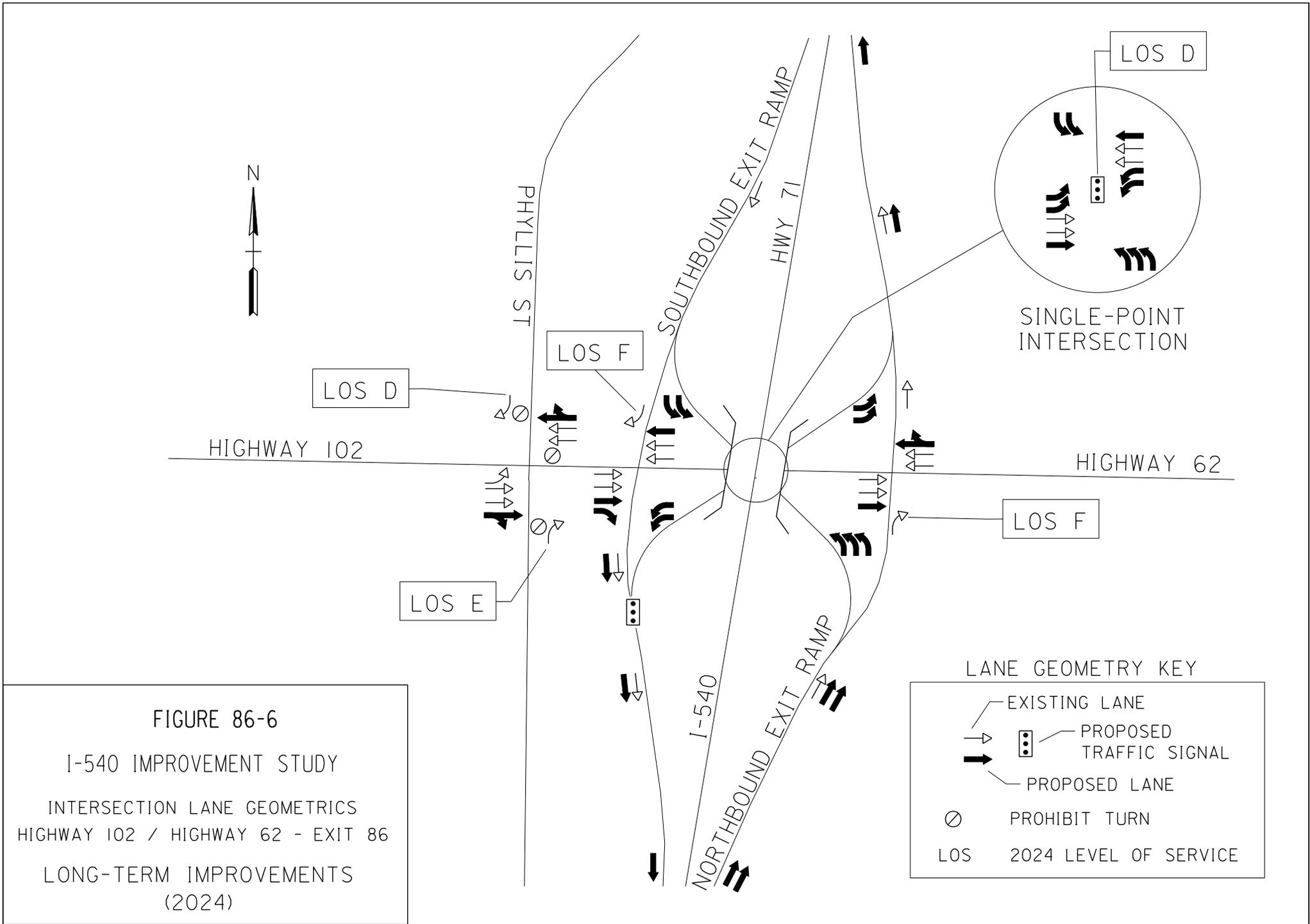
NORTHBOUND EXIT RAMP

FIGURE 86-5

I-540 IMPROVEMENT STUDY

INTERSECTION LANE GEOMETRICS
HIGHWAY 102 / HIGHWAY 62 - EXIT 86

INTERIM IMPROVEMENTS
(2006)



BENTON COUNTY INTERCHANGES

Exit 88

Highway 71 at Highway 72

Exit 88 Highway 71 at Highway 72

North of the end of I-540, the freeway continues as Highway 71 to the north side of Bentonville. The first Highway 71 interchange is included in this study.

This interchange is in a rapidly developing area of northeast Bentonville. It is a diamond interchange with Highway 72 crossing over Highway 71. Both ramp terminal intersections on Highway 72 were reviewed. Also reviewed were the frontage road intersections of McCollum Drive on the west and Rice Road to the east.

Short-Term Analyses

All four intersections are unsignalized. Both of the ramp terminal intersections operate at LOS F for exit ramp traffic in the afternoon peak. See Figure 88-1 for the 2004 traffic volumes and Figure 88-3 for existing intersection geometries.

Signalization was investigated for the ramp terminal intersections for current conditions. LOS C or better could be achieved at that location by adding a turn lane on the northbound exit ramp and signalizing. See Table 88-1 for a summary of capacity analysis findings. At the intersection of Highway 72 with the southbound exit ramp, similar improvements alone would not be adequate to provide an acceptable level of service. It is proposed that Highway 72 be widened to allow the westbound left-turn to have two lanes as shown in Figure 88-4.

Short-Term Improvements

It is believed that traffic signals are warranted at both of the ramp terminal intersections and these signals should be implemented. A right-turn lane with a minimum length of 100 feet should be added to the northbound exit ramp. A right-turn lane with a minimum length of 150 feet should be added to the southbound exit ramp. On eastbound Highway 72, a right-turn lane should be added at the southbound entrance ramp.

It is estimated that these improvements would accommodate travel demand until approximately the year 2009. By that time, the queues from the two traffic signals will begin to interfere with each other and with other nearby intersections.

Table 88-1

Exit 88 -- Levels of Service

	Southbound Ramps			Northbound Ramps			
2004 existing conditions	AM PM	Unsig.- Unsig.-	LOS F on ramp LOS F on ramp	AM PM	Unsig.- Unsig.-	LOS F on ramp LOS F on ramp	
signalize ramps	AM PM	LOS B LOS D	Add turn lane	AM PM	LOS B LOS C/ E	Add turn lane on ramp.	
2014 Interim Improvements Add auxillary lanes	AM PM	LOS C LOS C/D		AM PM	LOS B LOS C		
2024 existing conditions	AM PM	Unsig.- Unsig.-	LOS F LOS F	AM PM	Unsig.- Unsig.-	LOS F LOS F	
signalize ramps	AM PM	LOS F LOS F	(Very long queues.)	AM PM	LOS F LOS F	(Very long queues.)	
Widen Highway 72.	AM PM	LOS C* LOS B*	Dbl. turn lanes for WB Lt.	AM PM	LOS D/E* LOS C*	Dbl. turn lanes for NB Lt. and EB Lt.	
SPUI (No Hwy 72 widening)	AM PM	LOS F LOS C	Create Single-Point intersection with double-turns onto SB ramp.	AM PM	LOS E LOS D	AM PM	LOS F LOS D
SPUI Widen Hwy 72	AM PM	LOS C LOS B	Create Single-Point intersection with double-turns onto SB ramp.	AM PM	LOS B LOS D	AM PM	LOS B LOS B/ D
Half-clover Widen Hwy 72	AM PM	LOS B LOS A	Westbound weave	AM PM	LOS C LOS B	AM PM	LOS A LOS C

LOS = Level of Service

* Level of Service could be improved by using a 16-phase controller.

Long-Term Analyses

The existing interchange configuration was examined using forecast volumes for estimated year 2024 conditions, and significant traffic flow problems were found. The forecast volumes are shown in Figure 88-2. Three strategies were investigated:

- Widen Highway 72
- Reconfigure interchange as a SPUI.
- Reconfigure as a half-cloverleaf.

Widen Highway 72

It appears that Highway 72 will need to be widened in order for this interchange to accommodate the anticipated traffic demands. Highway 72 is proposed to be widened east of the interchange in the *2025 Constrained Plan of the Northwest Arkansas Regional Transportation Study*. It is also proposed to be widened west of the interchange in the *Bentonville Transportation Plan*. Even with widening, additional auxiliary lanes will be needed on the ramps. Double turn lanes would be needed for both of the left-turns off Highway 72 onto the entrance ramps, and double turn lanes would be needed for the left-turn from the northbound exit ramp. Both entrance ramps would need to be widened in order to receive the double turns, and the runout for these ramps would need to be extended along Highway 71. With these improvements, operation of the northbound ramp terminal intersection would still be expected to operate at LOS E for morning peak conditions. This scenario was reviewed using SimTraffic and the queues did not appear to be a problem unless they were compounded by nearby traffic signals.

Single-Point Urban Interchange

A reconfiguration of the interchange as a SPUI was considered. If Highway 72 were not widened, this would offer a reasonable way to improve interchange operations. If implemented, a double left-turn from westbound Highway 72 onto the southbound entrance ramp would be needed. The southbound entrance ramp would need to be widened to two lanes in order to receive the double turn, and the ramp would need to be extended to a longer runout for southbound traffic merging onto southbound Highway 71. LOS E would be anticipated for both morning and afternoon peak conditions. A drawback to the SPUI configuration would be the expense of constructing a large structure in order to have the single-point intersection on the top of the interchange.

Half-Cloverleaf Interchange

The existing diamond interchange ramps are set far enough away from the mainline to allow the implementation of loop ramps in the existing interchange infield. The two ramp terminal intersections are approximately 1,150 feet apart. It would be possible to add loop

ramps in the northwest and northeast quadrants. The loop ramps could have radii of approximately 175 feet. Realigning the northbound entrance ramp and the southbound exit ramp could increase the loop ramp radii. The intersections of Highway 72 with the two exit ramps would require signalization in order to allow the ramps to clear.

This would eliminate the left-turn problems at the ramp terminal intersections, but would introduce an approximately 500-foot weaving section on westbound Highway 72 on the bridge. This weave was examined and is anticipated to operate at LOS C during peak hour conditions in the year 2024. The presence of the traffic signal at the northbound exit ramp intersection would create gaps in westbound traffic on Highway 72 which would help weaving operations.

There is a high volume of residents in the area that commute to employment further south in the region. Locating the loop ramps in the north quadrants would accommodate the two largest left-turn volumes in the interchange.

Highway 72 will still require widening as a condition of this strategy. Since Highway 71 is projected to require widening to this location, the added lanes should be terminated into the proposed loop ramps as a lane addition and a lane drop.

No consideration should be given to loop ramps in the southeast or southwest quadrants, as implementation of such loop ramps would result in weaving sections on Highway 71.

Long-Term Improvements

Highway 72 should be widened through the interchange area. The interchange should be improved by the addition of the loop ramps described above and shown in Figure 88-5.

Nearby intersections on Highway 72

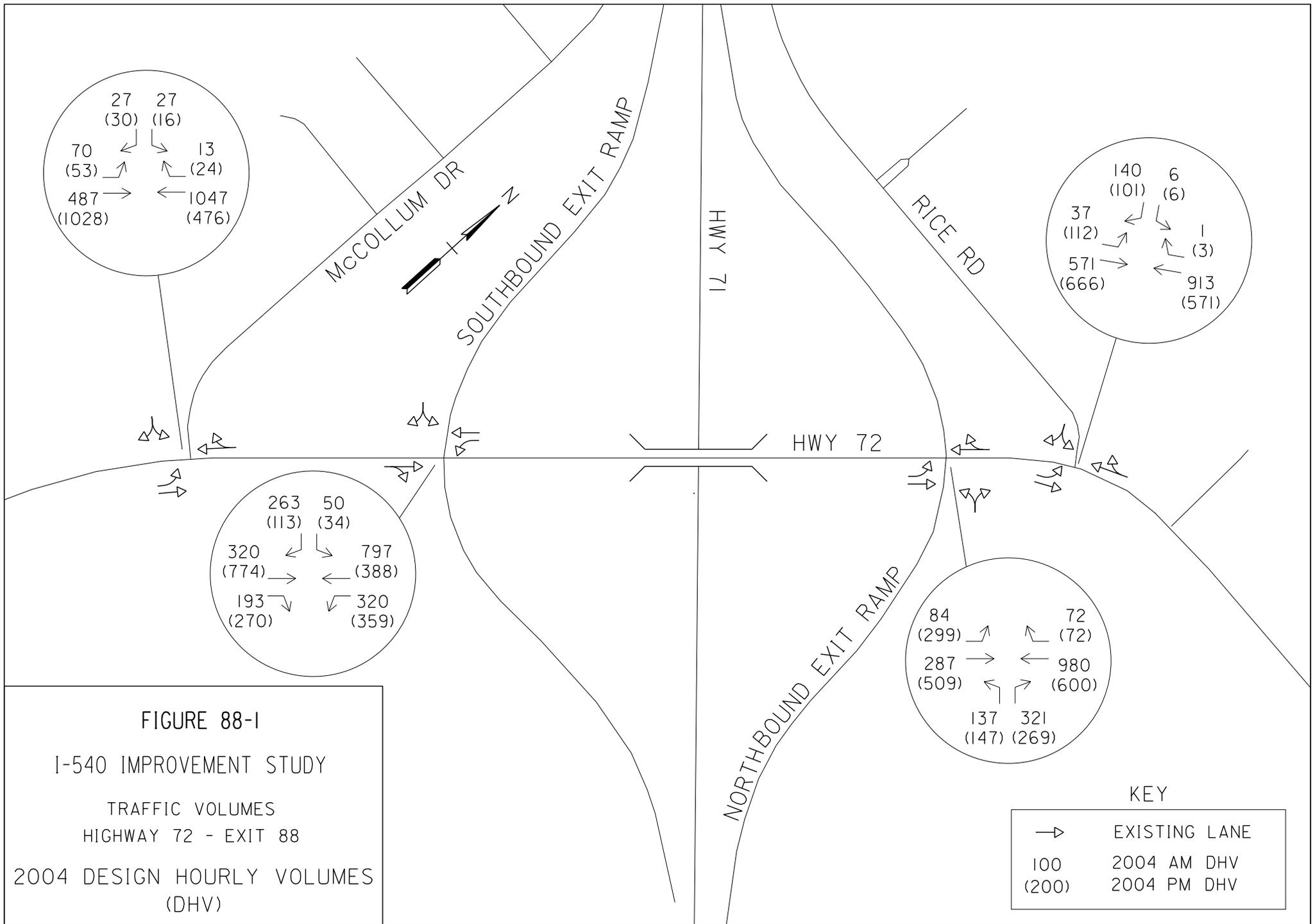
Adjacent to the east of the interchange is an intersection of Highway 72 with Rice Road. Queues were observed on this road, therefore signalization was checked at this location, and found to be a reasonable choice for traffic control under the future conditions. Consideration should be strongly considered for a realignment of McClain Road to intersect Highway 72 opposite Rice Road.

On the west side of the interchange there is an intersection with McCollum Drive. This crossroad also exhibited queues, and LOS F, as an unsignalized intersection in 2024. However, if signalized, it will introduce an element of delay for westbound traffic. In the morning peak, the westbound traffic on Highway 72 would be expected to form a queue

that would lead to traffic backing up on the southbound exit ramp, all the way out to the Highway 71 southbound lanes. In order to avoid this, double-right-turn lanes could be installed for the southbound exit ramp.

Interim Improvements

Several interim improvements could be made in advance of the long term improvements that would be beneficial to interchange operations and prolong the need for constructing the half clover. Both ramps should be signalized. The bridge over Highway 71 should be widened to its ultimate configuration. This would create four useable lanes for traffic, and one extra lane on the westbound side to be connected to the loop ramps in the future. The two inside lanes of the bridge could then be converted to left turn only lanes, with the remaining lanes serving through traffic in each direction. An additional through-lane should then be added to Highway 72 in the eastbound direction from McCollum Drive to the southbound ramps intersection. Likewise an extra through-lane should be added in the westbound direction from Rice Road to the northbound ramps intersection. The extra lanes would help handle the large volumes of traffic coming from each direction, and since there are almost as many motorists making left turns onto Highway 71 as there are going through at each of the ramp intersections, these extra lanes would get excellent utilization. These interim improvements coupled with the auxiliary lanes suggested in the short term improvements would keep operations from declining past LOS D until 2014. After then, ramp queues begin reaching unacceptable lengths. The proposed interim improvements are shown in Figure 88-6.



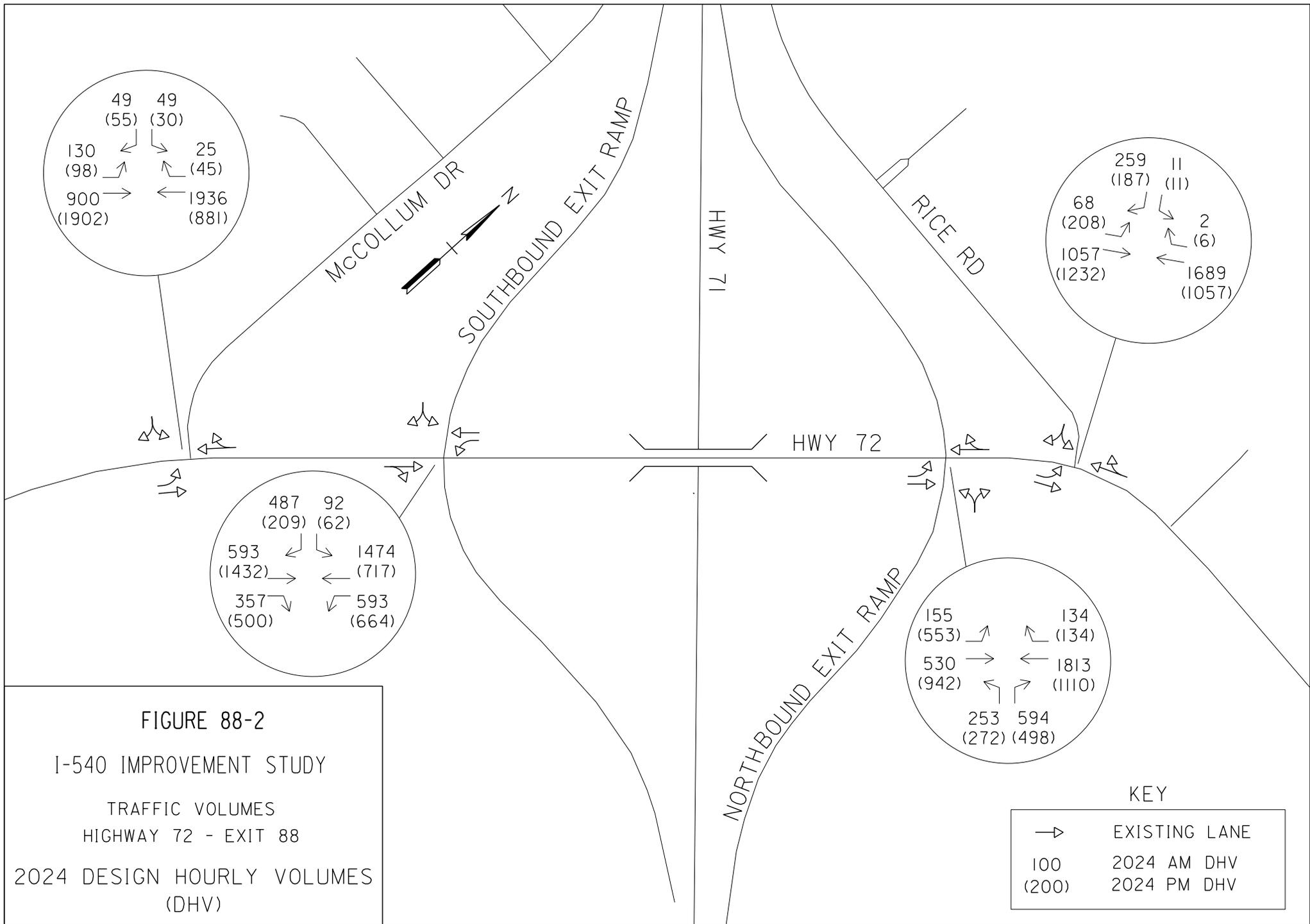


FIGURE 88-2

I-540 IMPROVEMENT STUDY

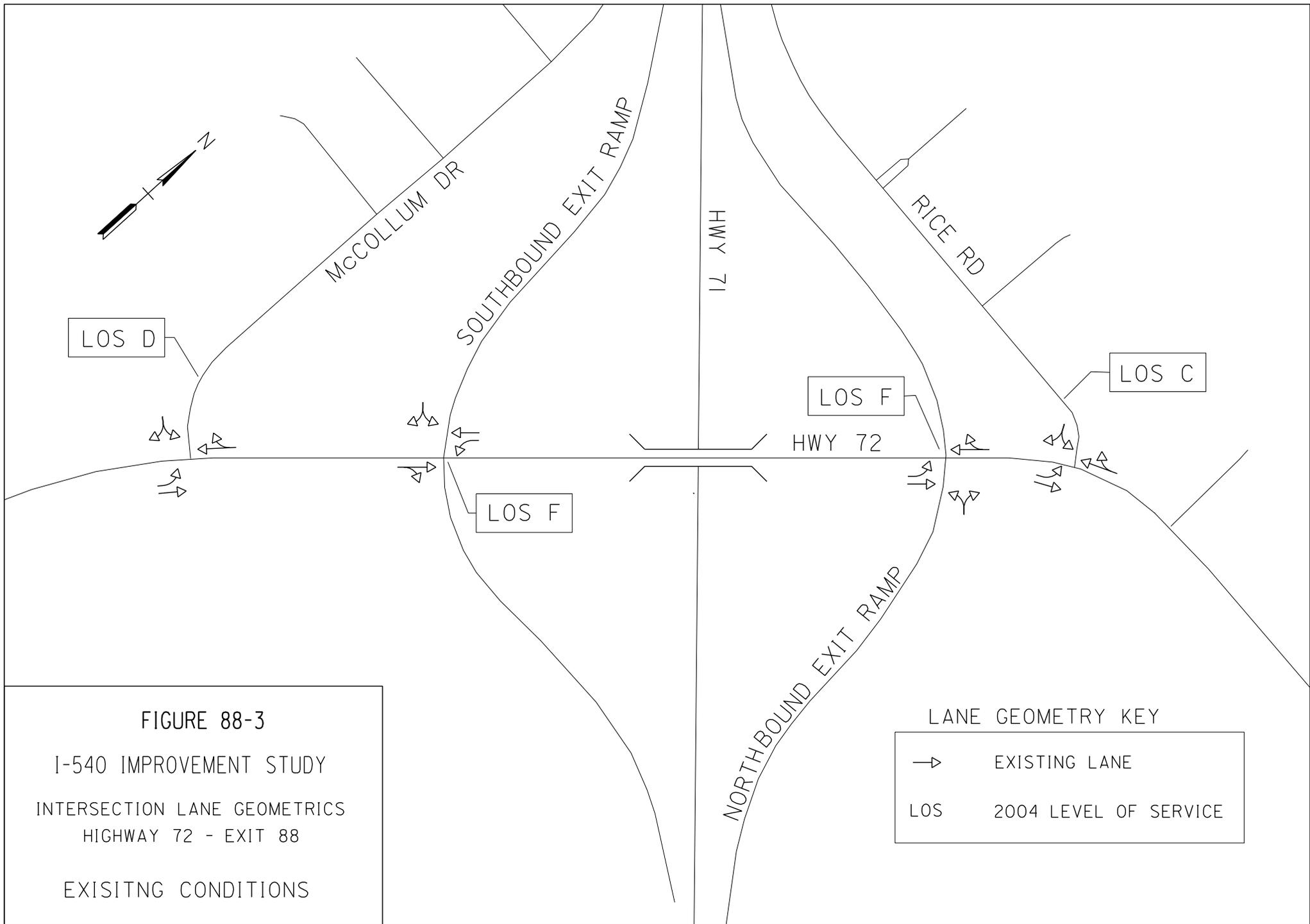
TRAFFIC VOLUMES

HIGHWAY 72 - EXIT 88

2024 DESIGN HOURLY VOLUMES (DHV)

KEY

→	EXISTING LANE
100	2024 AM DHV
(200)	2024 PM DHV



LOS D

LOS F

LOS F

LOS C

FIGURE 88-3

I-540 IMPROVEMENT STUDY

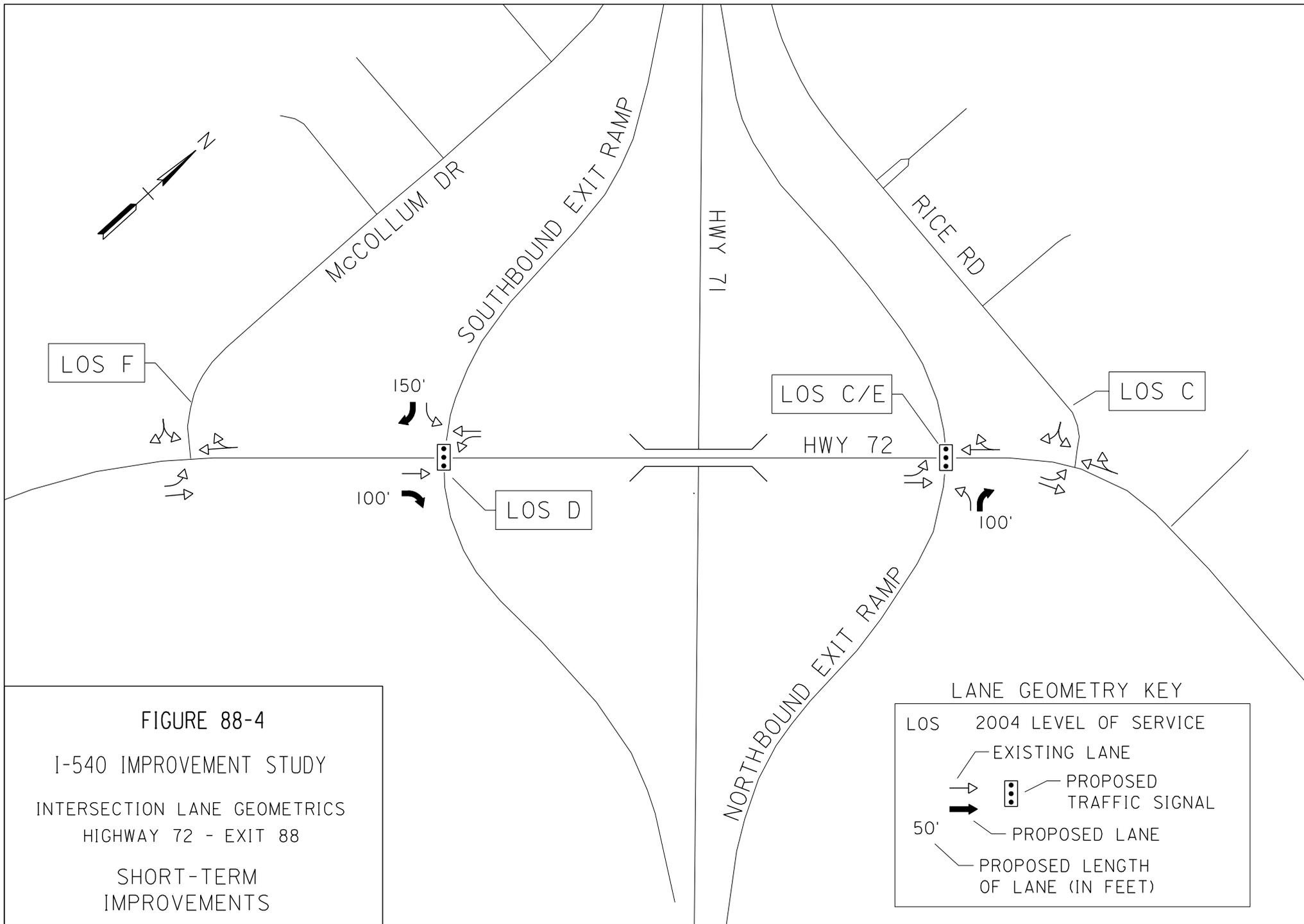
INTERSECTION LANE GEOMETRICS

HIGHWAY 72 - EXIT 88

EXISTING CONDITIONS

LANE GEOMETRY KEY

→	EXISTING LANE
LOS	2004 LEVEL OF SERVICE



LOS F

McCOLLUM DR

SOUTHBOUND EXIT RAMP

HWY 71

RICE RD

LOS C/E

LOS C

HWY 72

LOS D

100'

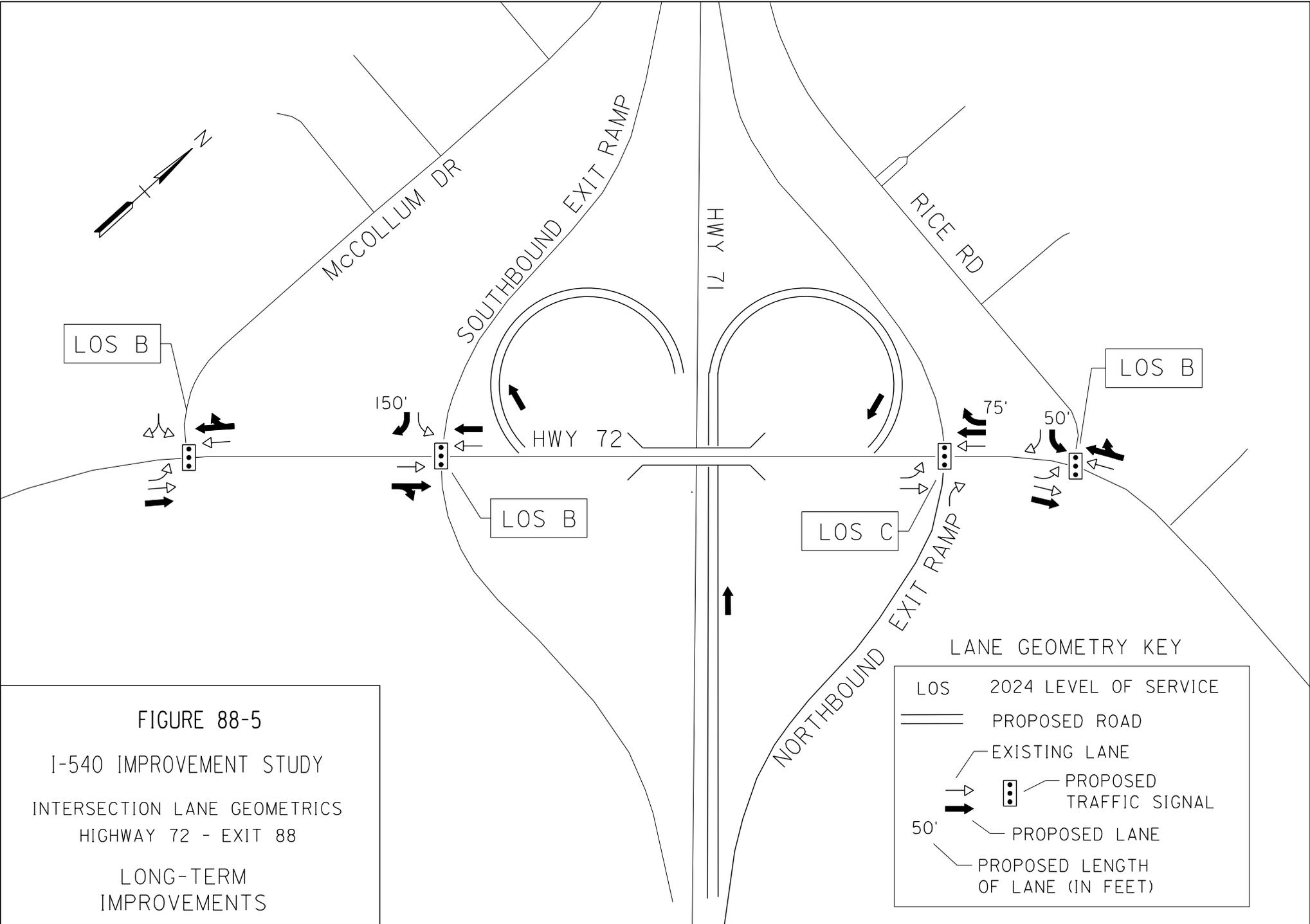
FIGURE 88-4

I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 72 - EXIT 88

SHORT-TERM
 IMPROVEMENTS

LANE GEOMETRY KEY

- LOS 2004 LEVEL OF SERVICE
- EXISTING LANE
- PROPOSED TRAFFIC SIGNAL
- 50' PROPOSED LANE
- PROPOSED LENGTH OF LANE (IN FEET)



LOS B

LOS B

LOS B

LOS C

FIGURE 88-5
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 72 - EXIT 88
 LONG-TERM
 IMPROVEMENTS

LANE GEOMETRY KEY

LOS	2024 LEVEL OF SERVICE
====	PROPOSED ROAD
—	EXISTING LANE
→	PROPOSED TRAFFIC SIGNAL
50'	PROPOSED LANE
—	PROPOSED LENGTH OF LANE (IN FEET)

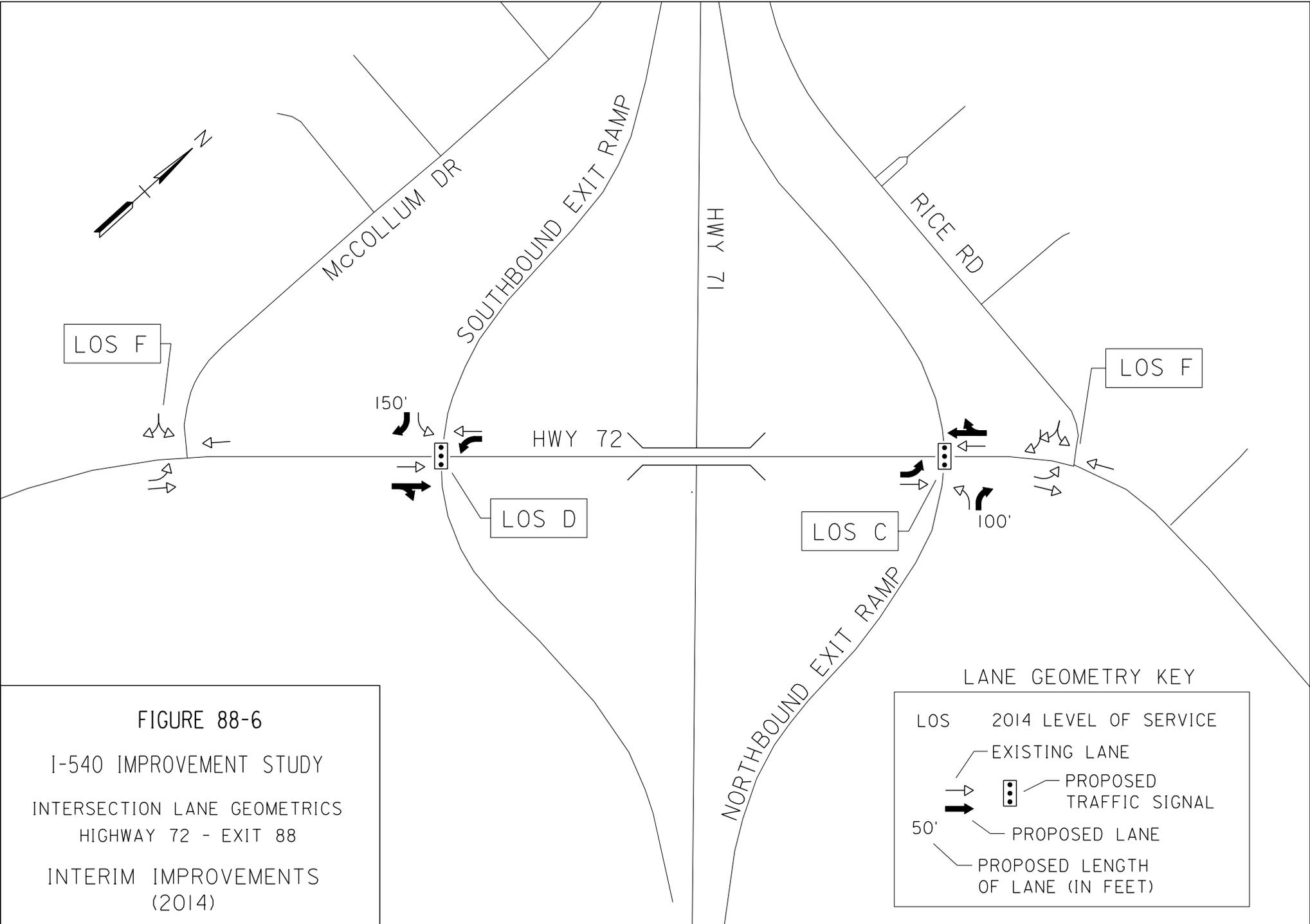


FIGURE 88-6
 I-540 IMPROVEMENT STUDY
 INTERSECTION LANE GEOMETRICS
 HIGHWAY 72 - EXIT 88
 INTERIM IMPROVEMENTS
 (2014)

LANE GEOMETRY KEY

LOS	2014 LEVEL OF SERVICE
	EXISTING LANE
	PROPOSED LANE
50'	PROPOSED LENGTH OF LANE (IN FEET)
	PROPOSED TRAFFIC SIGNAL

ESTIMATES OF COST

ESTIMATES OF COST

Preliminary planning-level cost estimates were developed for the improvements recommended by this study. These estimates include construction costs, a 15 percent allowance for engineering and other costs, and an allowance for utility relocations and right-of-way costs. These costs are estimated in current dollars, with no allowance for inflation.

The widening that is recommended for the I-540 mainline was divided into five segments. Four of these segments include portions of I-540 for which it is recommended that the widening extend to from four lanes to eight lanes. It is anticipated that such a widening would be accomplished in stages. The first stage would be likely to widen towards the inside, paving the median and installing a barrier in the center. The second stage, in those areas recommended to be widened to eight lanes, would be to widen to the outside. Table 9 contains the summary of the costs estimated for widening I-540.

The interchange improvements were recommended in stages of development. Short-term and long-term improvements are recommended. For some interchanges, interim improvements are recommended as a way to stage needed long-term improvements, or as a way to postpone the date of long-term improvements. The interchange improvements include elements that should be the responsibility of local jurisdictions, but these costs were not kept separate in the planning estimates. The cost estimates for the interim interchange improvements are summarized in Table 10. Estimates for the long-term interchange improvements are summarized in Table 11.

In addition, at some interchanges there are minor improvements that were thought to be relatively easy to implement and which would yield immediate benefits to traffic flow. The cost estimates for these short-term improvements appear in Table 12.

Table 9 Cost Summary for Widening Interstate 540.

FROM	TO	ESTIMATED COST CONSTRUCT TWO LANES INSIDE	ESTIMATED COST CONSTRUCT TWO LANES OUTSIDE
Exit 62 (Highway 62 / Highway 180)	Exit 66 (Highway 112)	\$13,700,000	\$11,000,000
North of Exit 67 (Highway 71B)	Exit 72 (Highway 412)	\$24,700,000	N/A
Exit 72 (Highway 412)	Proposed 412 Bypass	\$25,200,000	\$21,400,000
Proposed 412 Bypass	Exit 85 (Highway 71B)	\$40,400,000	\$45,800,000
Exit 85 (Highway 71B)	Exit 88 (Highway 71 / Highway 72)	\$19,100,000	\$7,500,000 (1)
	Total Estimated Cost	\$123,100,000	\$85,700,000

(1) For This Segment the Only Outside Lanes Are Auxillary Lanes From Exit 85 To Exit 86.

Table 10 Cost Summary of Interim Improvements at I-540 Interchanges

EXIT NO.	LOCATION	ESTIMATED COST
62	I-540 At Highway 62 / Highway 180 (West Sixth Street)	\$3,000,000
64	I-540 At Highway 16 / Highway 112 Spur (Wedington Drive)	\$2,400,000
65	I-540 At Porter Road	\$1,700,000
66 & 67	I-540 At Highway 112 and At Highway 71B (Fulbright Expressway)	\$6,100,000
69	I-540 At Great House Springs Road	\$1,000,000
81	I-540 At Pleasant Grove Road	\$2,300,000
85	I-540 At Highway 71 Business	\$4,300,000
86	I-540 At Highway 62 / Highway 102	\$4,200,000
88	Highway 71 At Highway 72	\$3,500,000
	Total Estimated Cost for Interim Improvements at Interchanges:	\$28,500,000

Table 11 Cost Summary of Long Term Improvements at I-540 Interchanges

EXIT NO.	LOCATION	ESTIMATED COST
62	I-540 At Highway 62 / Highway 180 (West Sixth Street)	\$22,800,000
64	I-540 At Highway 16 / Highway 112 Spur (Wedington Drive)	\$16,400,000
65	I-540 At Porter Road	\$13,400,000
66 & 67	I-540 At Highway 112 and At Highway 71B (Fulbright Expressway)	\$30,800,000
69	I-540 At Great House Springs Road	\$1,700,000
72	I-540 At Highway 412	\$0
73	I-540 At Elm Springs Road	\$1,100,000
76	I-540 At Wagon Wheel Road	\$300,000
78	I-540 At Highway 264	\$12,600,000
81	I-540 At Pleasant Grove Road	\$17,400,000
83	I-540 At Highway 94	\$6,400,000
85	I-540 At Highway 71 Business	\$15,700,000
86	I-540 At Highway 62 / Highway 102	\$15,200,000
88	Highway 71 At Highway 72	\$6,200,000
	Total Estimated Cost for Long-Term Improvements at Interchanges:	\$160,000,000

Table 12 Cost Summary of Short-Term Improvements at I-540 Interchanges

EXIT NO.	LOCATION	ESTIMATED COST
62	I-540 At Highway 62 / Highway 180 (West Sixth Street)	\$220,000
64	I-540 At Highway 16 / Highway 112 Spur (Wedington Drive)	\$710,000
65	I-540 At Porter Road	\$250,000
66 & 67	I-540 At Highway 112 and At Highway 71B (Fulbright Expressway)	\$310,000
78	I-540 At Highway 264 (West Monroe Avenue)	\$130,000
81	I-540 At Pleasant Grove Road	\$120,000
86	I-540 At Highway 62 / Highway 102	\$350,000
88	Highway 71 At Highway 72	\$600,000
	Total Estimated Cost for Short-Term Improvements at Interchanges:	\$2,690,000

PRIORITIES

PRIORITIES

The purpose of this section of the report is to consider the relative priorities of the various recommendations for improvements to I-540 and its interchanges. Though all of the recommendations will be needed if the projected travel volumes materialize, some of the identified needs are more urgent than others. The total of all of the recommendations amounts to a very large cost. The recommendations will be undertaken as part of a program of improvements that will be developed as a series of projects that will take several years to complete.

The primary focus is on the I-540 mainline, the interchange ramps, and the crossroads in the vicinity of the interchanges. Recommendations are contained in this study that apply to crossroads that are city streets. These are included for consideration by the various municipalities. In most cases, it would be appropriate for the municipalities to work in cooperation with the AHTD to develop joint projects or to coordinate project sequences.

The sections below present criteria that should be considered in developing a prioritization of the recommended improvements. Consideration was given to:

- freeway volume
- freeway safety
- interchange capacity and delay
- intersection queues
- sequencing issues

FREEWAY SEGMENTS

I-540 is a four-lane freeway for the entire study area. The study recommendations are for various segments to be widened to six or eight lanes. Two approaches were considered for determining the relative priorities for widening these segments of I-540. First, a review of the existing and projected traffic volumes indicates those segments that are anticipated to decline to poor levels of service sooner rather than later. Second, crash rates indicate some segments that may need improvements to improve roadway safety.

Traffic Volumes

South of Exit 62 (Highway 62/ Highway 180), I-540 is not recommended for widening. Also, the segment of Highway 71 north of Exit 88 (Highway 72) is not recommended for widening. In between, I-540 is recommended for widening for approximately 26 miles. Some of the widening is recommended to be to six lanes but a majority of the recommendation is to widen to eight lanes.

In general, freeway segments should not be prioritized for widening by ranking them solely by volume with no consideration of logical project limits. However, in order to gauge the areas of greatest need, the roadway segments are ranked according to volume in Table 13. The table is divided into high-, medium-, and low-volume segments with those segments that are not recommended for widening included for comparison.

Note the traffic volumes between Exit 72, Highway 412, and Exit 77, Proposed Highway 412 Bypass. These are some of the highest-volume segments. It is anticipated that the volumes in these segments will decline upon the opening of the proposed bypass and then resume strong annual growth.

Traffic Safety

In the urban portions of I-540, where widening is recommended, one particular segment stands out as in need of mainline improvements to improve roadway safety. This is the segment between Exit 66 (Highway 112) and Exit 67 (Highway 71 Business). This segment had a crash rate that was 70 percent higher than the comparable statewide average crash rate. There are mainline curvature issues, the ramp gores are closely spaced, and there is an unusual weaving configuration in the southbound direction. Since this is also the highest-volume I-540 segment, this segment should be considered an extremely high priority for improvement.

The urban segment that exhibits the second-highest crash rate is the segment that includes Exit 72 (Highway 412). This segment includes the weigh stations and the weaving areas between the interchange and the weigh stations.

There are two other urban segments with relatively high crash rates, which include these interchanges:

- Exit 65 (Porter Road)
- Exit 86 (Highway 102/ Highway 62)

Table 13: Freeway Segments Sorted by 2004 ADT Volume

I-540 LOCATION		Traffic Volumes 2004	LOS 4 Lanes 2004	Traffic Volumes 2024	LOS 4 Lanes 2024	LOS (6 Lanes) 2024	LOS (8 Lanes) 2024
from	to						
Exit 66 Highway 112	High	Exit 67 Highway 71 Business	60700	D	109600	F	D
Exit 73 Elm Springs Rd. Exit 76 E. Wagon Wheel Road		Exit 76 Wagon Wheel Road Exit 77 Proposed Highway 412 Bypass	55800 55400	D D	106800 108100	F F	D D
Exit 77 Proposed Highway 412 Bypass Exit 65 N. Porter Rd.		Exit 78 Highway 264 Exit 66 Highway 112	55400 54000	D D	110000 97500	F F	D C
Exit 81 Pleasant Grove Rd. Exit 82 Proposed W. Perry Road		Exit 82 Proposed W. Perry Road Exit 83 Highway 94	52100 52100	D D	103700 101500	F F	D C
Exit 64 Highway 16 / Highway 112 Spur Exit 83 Highway 94 Exit 78 Highway 264	Medium	Exit 65 N. Porter Rd. Exit 85 Highway 71 Business	51800 51700	D D	93600 100900	F F	C C
Exit 69 Great House Springs Road Exit 72 Highway 412		Exit 81 Pleasant Grove Rd.	51100	D	101700	F	C
Exit 67 Highway 71 Business Exit 85 Highway 71 Business	Low	Exit 72 Highway 412 Exit 73 Elm Springs Rd.	50200 49700	D D	92400 93300	F F	C D
Exit 62 Highway 62 / Highway 180 Exit 86 Highway 102 / Highway 62		Exit 69 Great House Springs Road Exit 86 Highway 102 / Highway 62	48800 46200	D C	88100 91900	F F	C C
Exit 62 Highway 62 / Highway 180 Exit 86 Highway 102 / Highway 62		Exit 64 Highway 16 / Highway 112 Spur Exit 88 Highway 71 / Highway 72	44000 33900	C B	79500 68800	F E	C B
Exit 61 Highway 265/ Highway 112 and Highway 71 Exit 88 Highway 71 / Highway 72 Exit 58 W. Wilson St.	No Widening	Exit 62 Highway 62 / Highway 180 Exit 92 Highway 71 / Highway 71 Bus.	27300 26900	B B	49300 54600	D D	B B
Exit 53 Highway 170 Exit 45 Highway 74		Exit 61 Highway 265/ Highway 112 and Highway 71 Exit 58 W. Wilson St.	20200 18700	B A	36600 33800	C C	A A
		Exit 53 Highway 170	14600	A	26400	B	A

ADT = Average Daily Traffic

INTERCHANGES AND INTERSECTIONS

The investigations into interchange operations indicated that several of the interchanges are already experiencing traffic congestion and that traffic congestion is expected to continue to grow. The review of crashes (Table 1) indicates that the crashes on I-540 are concentrated around interchange ramps. Since interchange congestion is directly related to the safe operation of I-540, interchange improvements will be key to a satisfactory long-range program to improve I-540.

Consideration of prioritizing interchange improvements focused on intersection operations. The key intersections at each interchange, in terms of importance to I-540 operations, are the ramp terminal intersections with exit ramps. If these intersections are congested, then there is the potential that queues of vehicles will back up onto the exit ramps and potentially onto the main lanes of I-540. There are at least three locations where this is already happening during peak traffic times. See the review of queues below.

Capacity Analyses

The ramp terminal intersections that are signalized and currently experience LOS E or LOS F were reviewed. The anticipated traffic delay and the volume/ capacity ratio were determined for each intersection. These indicate intersections that are urgently in need of improvement. This review is shown in Table 14. The interchanges that include these intersections should be considered high priority for improvements.

There are several additional locations where ramp terminal intersections experience LOS E or LOS F but are not currently signalized. In general, it is believed that the installation of a traffic signal at these locations may be adequate to prevent queues from building up on exit ramps. These locations are not necessarily in immediate need of major improvements but should be monitored for unsafe queues and for traffic signal warrants:

- Exit 65, Porter Road, northbound ramps,
- Exit 65, Porter Road, southbound ramps,
- Exit 66, Highway 112, northbound ramps,
- Exit 66, Highway 112, southbound ramps,
- Exit 69, Great House Springs Road, southbound ramps,
- Exit 81, Pleasant Grove Road, southbound ramps,
- Exit 88, Highway 71 at Highway 72, southbound ramps.

Table 14 2004 Ramp Terminal Intersection Delays

Interchange	Intersection Delay		V/ C Ratio	
	AM	PM	AM	PM
Exit 62- Interstate 540 at Highway 62				
N. Futrall Drive at Highway 62/ Highway 180	25	40	1.0	1.0
N. Shiloh Drive at Highway 62/ Highway 180	66	73	1.1	1.3
Exit 64- Interstate 540 at Highway 16				
Northbound Ramp Terminal Intersection	14	23	0.9	0.9
Southbound Ramp Terminal Intersection	0.5	25	0.7	0.9
Exit 72- Interstate 540 at Highway 412				
Northbound Ramp Terminal Intersection	16	21	0.9	1.0
S. 48th Street / SB Entrance Ramp at Highway 412	21	26	0.9	0.9
Exit 78- Interstate 540 at Highway 264				
Northbound Ramp Terminal Intersection	26	22	1.0	1.0
Southbound Ramp Terminal Intersection	58	40	1.2	1.0
Exit 85- Interstate 540 at Highway 71 Bus.				
Northbound Ramp Terminal Intersection	40	40	1.0	1.0
Southbound Ramp Terminal Intersection	21	74	0.9	1.2
Exit 86- Interstate 540/ Hwy 71 at Hwy 62/ 102				
Northbound Ramp Terminal Intersection	38	26	1.0	0.9
Southbound Ramp Terminal Intersection	38	72	1.0	1.2

Delay in seconds per average vehicle.

V/ C = Volume/ Capacity

In addition to the intersections listed above, there are four locations for which new traffic signal installations are already programmed:

- Exit 73, Elm Springs Road, northbound ramps,
- Exit 83, Highway 94, northbound ramps,
- Exit 83, Highway 94, southbound exit ramp intersection with Horsebarn Road,
- Exit 88, Highway 71 at Highway 72, northbound ramps,

These four locations all indicate LOS F for unsignalized conditions during one of the peak periods. It is anticipated that the signalizations that are planned or under construction will improve the character of traffic flow so that they will not operate at LOS F for some number of years.

Review of Queues

Capacity analysis methodologies for intersection investigation are focused on one intersection at a time. They do not consider downstream queues and upstream bottlenecks. Because of this limitation, a particular intersection may show a favorable level of service even though its operation is seriously affected by queues from adjacent intersections. Therefore, as a part of the interchange investigations, each interchange was simulated for peak hour operations for both morning and afternoon peak conditions. The simulation software allowed observations to be made of the accumulations of queued vehicles at ramp terminal intersections as well as nearby side street intersections. These simulations were verified by observations in the field.

In most cases, the observed queues did not affect intersection operations or capacity analysis findings. However, in other instances these queues had a dramatic adverse impact on overall interchange operations that was not reflected in capacity analysis results. This was evident at the following four interchanges.

Exit 62 Highway 62/ Highway 180 (Sixth Street)

At this interchange during morning peak conditions, the eastbound left turn from Highway 62/ Highway 180 onto Futrall Drive is a dual turn that does not achieve a full utilization, for reasons explained in the section on interchange analyses. The queue from this turn extends upstream through the intersection of Highway 62/ Highway 180 with Shiloh Drive.

Exit 64 Highway 16/ Highway 112 Spur (Wedington Drive)

At this interchange the closely-spaced intersections result in some queue interlocking. In the morning peak hour this problem exists in the eastbound

direction on Highway 16. In the afternoon peak the problem exists in the westbound direction, resulting in a queue that backs up onto the southbound exit ramp.

Exit 72 Highway 412 (W. Sunset Avenue)

At this interchange, the southbound left turn from 48th Street onto eastbound Highway 412 backs through the intersection of the southbound exit ramp with 48th Street and onto the southbound exit ramp. This happens at both morning and afternoon peak hours.

Exit 86 Highway 102/ Highway 62

At this interchange, the westbound left turn onto the southbound entrance ramp backs through the intersection of Highway 102/ Highway 62 with the northbound ramps. This queue extends for a long distance back on westbound Highway 62 in the afternoon peak hour. The queue also blocks a through westbound lane in the morning peak hour. This results in a low utilization of the double turn lanes for the northbound left turn from the northbound exit ramp onto westbound Highway 102. As a result, a queue forms that backs up along the northbound exit ramp.

SEQUENCING ISSUES

The improvements that are recommended to I-540 and its interchanges will not be undertaken as a single grand project but will be pursued as a series of projects. The potential prioritization of any portion of the recommended improvements should include consideration of the surrounding segments of the roadway. Improvements should be sequenced to facilitate traffic operations and safety.

For example, significant improvements are proposed for the interchange at Exit 62 (Highway 62/ Highway 180). If the long-range improvements were to be constructed before I-540 widening to the north the result would be to relocate a bottleneck from Highway 62 eastbound onto I-540 northbound. This would increase traffic congestion and diminish travel safety on the Interstate facility. Similar limitations should govern the sequence of other recommended projects:

- In Fayetteville, the recommended widening of I-540 should begin with improvements between Exit 66 and Exit 67. Other segments should be widened in order from north to south from that location.

- From Springdale to Bentonville, widening that is recommended from Exit 72 to Exit 85 should be undertaken beginning with the new interchange that will be constructed for the Proposed Highway 412 Bypass. Widening should occur in segments proceeding from that location in both the north and south directions.
- In Bentonville, widening is recommended between Exit 85 and Exit 86. This could initially be accomplished in the form of auxiliary lanes between the interchanges, until segments to the south are widened.

RECOMMENDED PRIORITIES

The recommended improvements to I-540 and its interchanges were divided into projects, and categorized as very high-, high-, medium-, or low-priority for implementation. The priorities listing is presented in Table 15. In Table 15, within each priority group, projects are listed in order from south to north (not in relative priority order).

Many of the projects of recommended interchange improvements could be undertaken in stages. The prioritization does not include relative priorities of portions of recommended improvements.

Table 15. Priorities of Recommended Improvements to I-540 and its Interchanges

Very High Priority	High Priority	Medium Priority	Low Priority
<p>Exit 62 Highway 62 / Highway 180 (Interim improvements)</p> <p>Exit 66 Highway 112 Exit 67 Highway 71 B (Interim improvements)</p> <p>I-540 widen to six lanes from Exit 85 to Exit 86</p> <p>Exit 86 Highway 102 / Highway 62 (Long-term improvements)</p>	<p>All Short-term improvements recommended for all interchanges</p> <p>Exit 62 Highway 62 / Highway 180 (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 62 to Exit 64</p> <p>Exit 64 Highway 16 / Highway 112 Spur (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 64 to Exit 67</p> <p>Exit 65 N. Porter Rd. (Interim improvements)</p> <p>Exit 66 Highway 112 Exit 67 Highway 71 B (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 76 to Exit 78</p> <p>Exit 81 Pleasant Grove Rd. (Interim improvements)</p> <p>Exit 85 Highway 71B (Interim improvements)</p>	<p>Exit 69 Great House Springs Rd. (Interim improvements)</p> <p>I-540 widen to six lanes from Exit 72 to Exit 73</p> <p>Exit 73 Elm Springs Rd. (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 73 to Exit 76</p> <p>Exit 81 Pleasant Grove Rd. (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 78 to Exit 82 (Perry Rd.)</p> <p>I-540 widen to six lanes from Exit 82 to Exit 85</p> <p>Exit 88 Highway 71 / Highway 72 (Interim improvements)</p>	<p>Exit 65 N. Porter Rd. (Long-term improvements)</p> <p>Exit 69 Great House Springs Rd. (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 67 to Exit 72</p> <p>Exit 76 Wagon Wheel Road (Long-term improvements)</p> <p>Exit 78 Highway 264 (Long-term improvements)</p> <p>Exit 83 Highway 94 (Long-term improvements)</p> <p>Exit 85 Highway 71B (Long-term improvements)</p> <p>I-540 widen to six lanes from Exit 86 to Exit 88</p> <p>Exit 88 Highway 71 / Highway 72 (Long-term improvements)</p> <p>All recommended widening of I-540 to eight lanes</p>

INTERSTATE 540 IMPROVEMENT STUDY

APPENDIX A

Study Methodologies

1. Memo to Elizabeth Mayfield-Hart dated October 18, 2004, regarding travel forecasts.
2. Notes on Capacity Analysis Study Methods

The growth rates for the Fayetteville portion of Interstate 540 are consistent with each other and are based on a longer history of count data. The recommended travel growth rates for Interstate 540 use the three percent growth rate as an underlying trend. The recommended rates going north from Fayetteville are projected to increase, with a progressive increase going north. The top rate of 3.6 is recommended in the Bentonville area, to indicate that high growth is anticipated in that area, just not quite so rapidly paced as it has been for the past eight years.

For the cross-road at each interchange, a similar review was not possible, since only two or three count stations are typically available in the interchange areas. Also, it is believed that commercial growth on any of the cross-roads is likely to be attracted to the interchange vicinity, so that growth rates may be anticipated to be higher within an interchange area than for locations on cross-roads that are distant from Interstate 540 by even a short distance. An attempt was made to consider each interchange in context. If, for example, a cross-road had a high growth rate, but has had a great deal of commercial building activity in recent years, it was projected that the high growth rate would be likely to moderate in future years. If an undeveloped interchange had a low growth rate, it was projected to increase in activity, since it is believed that every interchange in the study area has some attraction as a location for future commercial development. For the purpose of this review, a growth rate of three percent per year was considered to be the median growth rate for the region in general.

The extrapolations and forecasts for Interstate 540 are summarized in Table A-1 and Table A-2.

In two portions of the study area, the travel forecast was adjusted to account for proposed interchanges. A new interchange will be constructed for the proposed Highway 412 Bypass, which is expected to divert traffic onto the new Bypass that now travels on existing Highway 412. Additionally, traffic is expected to be diverted onto the Highway 412 Bypass from other roadways. The amount of travel that is anticipated to be diverted from any of the existing roadways was developed subjectively, with the intent that the diversions would be modest in order to maintain conservative values of travel forecast for the existing interchanges. These diversions are presented in Table A-3.

Elizabeth Mayfield-Hart memo, October 18, 2004, p. 3.

A second portion of the study area was also adjusted, for the proposed Perry Road interchange. Adjustments to extrapolation values were made based on the travel forecasts made for the Interchange Access Request. These adjustments are presented in Table A-4.

The resulting travel forecast is illustrated in Figure 1-A and Figure 1-B for Washington County, and in Figure 1-C for Benton County.

Table A - 1: I-540 Travel Forecasts for Washington County

Count Stations	1935	367	242	241	240	239	238	237	236	110	109	1683
2001 ADTs:	51000	44000	46000	45000	56000	49000	48000	42000	23000	17000	15000	16000
Extrapolations:												
2004	55800	49700	50200	48800	60700	54000	51800	44000	27300	18700	14600	20200
2024	110200	95100	95100	91700	108800	96500	93600	78500	47200	32700	16000	54200
Extrapolation Rates:												
natural growth rate	3.5	3.3	3.2	3.2	3.0	3.0	3.0	2.9	2.8	2.8	0.4	5.1
adjusted growth rate	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2024 Projection:	106800	93300	92400	88100	109600	97500	93600	79500	49300	33800	26400	36500

Table A - 2: I-540 Travel Forecasts for Benton County

Count Stations	Hwy 71 88	Hwy 71 112	251	432	70	86	90	509
2001 ADTs:	35000	22000	28000	41000	46000	48000	43000	49000
Extrapolations:								
2004	36000	26900	33900	46200	51700	52100	51100	55400
2024	66700	58600	73100	101900	99400	104500	103100	111000
Extrapolation Rates:								
natural growth rate	3.1	4.0	3.9	4.0	3.3	3.5	3.6	3.5
adjusted growth rate	3.5	3.6	3.6	3.5	3.4	3.5	3.5	3.4
2024 Projection:	71600	54600	68800	91900	100900	103700	101700	108100

Table A - 3: Forecast Adjustments for Proposed Highway 412 Bypass

Changes to Extrapolation-based forecast to reflect proposed Hwy 412 Bypass												
Route	West of I-540			Diverted onto Proposed 412 Bypass			East of I-540			Diverted onto Proposed 412 Bypass		
	count	Forecast	Adjusted	volume	percent	Volume	count	Forecast	Adjusted	volume	percent	Volume
	sta.						sta.					
Hwy 264	104	13300	4800	36.1%	8500	103	41700	4200	10.1%	37500		
Wagon Wheel Rd.	524	1700	100	5.9%	1600	521	9900	800	8.1%	9100		
Elm Springs Rd.	103	5900	500	8.5%	5400	64	20500	2300	11.2%	18200		
	63	11600	500	4.3%	11100	393	37200	2300	6.2%	34900		
Hwy 412	219	20700	7500	36.2%	13200	220	52600	14000	26.6%	38600		
Net reduction			<u>12900</u>					<u>21300</u>				

Table A - 4: Forecast Adjustments for Proposed Perry Road Interchange

Changes to Extrapolation-based forecast to reflect proposed Perry Road Interchange						
Route	count sta	Extrapolated Forecast	volume change	percent	Adjusted Volume	
W. Pleasant Grove	481	9800	0	0.0%	9800	
	483	14300	0	0.0%	14300	
W. Perry Road	487	2200	7700	350.0%	9900	
Hwy 94	434	20400	-4400	-21.6%	16000	

INTERSTATE 540 FEASIBILITY STUDY

NOTES ON CAPACITY ANALYSIS STUDY METHODS

FREEWAY STUDY

Traffic Volume Forecast Adjustments

The forecast was developed first as average daily traffic volumes for the year 2024. This was converted into peak period traffic estimates for use in the study. A directional distribution factor, called a “D-factor,” was derived from the count data to indicate the percentage of the volume traveling in the peak direction during peak periods.

The capacity analysis methods are geared for application to peak periods. The traditional benchmark for roadway design is the “design hour.” Capacity analysis procedures are intended to review the peak period within the peak hour; the intent is to model the highest fifteen-minute period of the day. In order to apply the capacity analysis methods to the projected future year 2024 conditions, the ADT forecasts needed to be converted into design hour forecasts. This is done using a “K-factor,” which is a multiplier that indicates the percentage of daily travel that is estimated to occur in the peak hour. For the Interstate 540 Feasibility Study, this was done separately for morning and afternoon peak conditions, because the directionality of travel has a great affect on traffic flow characteristics. In order to convert the peak hour estimates into peak-fifteen-minute periods, a factor derived from count data was applied, which is called a “peak-hour-factor,” or PHF. The average factor was applied for the general area and facility type, so that the resulting peak period estimates would be consistent with each other.

Traffic Forecasts for Interchanges

In the vicinity of each interchange, turning movement counts were obtained at all ramp terminal intersections and at selected intersections in the proximity of the interchange. From the adjusted forecast volumes on the Interstate 540 mainline and on the cross-streets, growth rates were derived. These growth rates were applied to the turning movement counts. In this way, the local traffic patterns counted at each interchange were preserved. This information was chiefly used in intersection analyses. It was also occasionally used to adjust ramp volumes for ramp junction analyses.

Capacity Manual

The traffic study relied on the capacity analysis procedures contained in the *Highway Capacity Manual 2000*. This is the industry standard for traffic investigations. It is published by the Transportation Research Board, which is a branch of the National Academy of Sciences. Most of the research that was used in the development of the *Highway Capacity Manual 2000* was either sponsored or subsidized by the Federal Highway Administration.

The *Highway Capacity Manual 2000* outlines capacity analysis procedures for various kinds of transportation facilities. Each type of facility has a unique set of parameters that are used to perform capacity analyses. Freeway mainline segments, ramp merge and diverge locations, weaving, signalized intersections and unsignalized intersections are the facility types that were investigated in the course of the Interstate 540 Feasibility Study.

Levels of Service

Capacity analysis results are reported as Levels of Service for a given condition. See Appendix A for a discussion of Levels of Service.

Freeway, Ramp, and Weave Analyses

The tool used to implement many of the capacity analysis study procedures is a suite of programs called the “Highway Capacity Software.” This collection of software tools was initially developed for the Federal Highway Administration. The software is now developed and distributed by the McTrans Center at the University of Florida, under contract to the Federal Highway Administration. McTrans maintains a website at: <http://mctrans.ce.ufl.edu/>. The Highway Capacity Software was used for all analyses of freeway mainline segments, ramp junctions, and weaving areas.

Freeway Mainline Segments

The parameter that determines the Level of Service of a freeway segment is the traffic density. This is an estimate of the number of vehicles per hour occupy a set distance of the freeway as they travel, and uses vehicles per mile per lane as the unit of measure. This requires an estimate of travel speed. The major parameters used are:

- Estimate of base freeflow speed,

- Number of lanes,
- The spacing distance between interchanges,
- Volume estimate,
- Peak-Hour Factor,
- Percentage of heavy vehicles (trucks).

Selected input parameters for the freeway segments on Interstate 540 are presented in Table A-1.

Ramp Junctions

Density is also the determining parameter for the Level of Service for ramp junctions. Separate procedures are given for merging at on-ramps or diverging at off-ramps. These procedures also incorporate a comparison of ramp and freeway traffic. The parameters are the same as used for freeway segments, with the addition of the lengths of the ramp runout distances.

Weaving

Weaving areas also use traffic density as the determining parameter. Weaving areas are divided into three types, depending on the number of lane changes needed to complete the weaving maneuvers. The method incorporates a comparison of the speeds of weaving and non-weaving traffic in the weaving area. The length of the weaving zone is used, along with the parameters noted above for freeway segments analysis.

Intersections Analyses

Synchro and SimTraffic are companion programs that are owned by the Trafficware Corporation of Berkeley, California. Trafficware maintains a website at: <http://www.trafficware.com/>. Synchro is an intersection study program. It has a methodology that mimics the procedures that are outlined in the *Highway Capacity Manual 2000*. Synchro includes an alternative method of intersection analysis to the *Highway Capacity Manual 2000*, however, it allows the user to toggle to a procedure that more closely resembles the *Highway Capacity Manual 2000* procedures. The differences are chiefly contained in the delay equations and the queue calculations, which Synchro does incrementally. The Interstate 540 Feasibility Study was performed using the *Highway Capacity Manual 2000* emulation procedures in Synchro.

Synchro has features that make it preferable to the Highway Capacity Software. The chief of these is the ability to review traffic signal progression through a series of intersections. Also key to the use of Synchro is the ability to simulate Synchro files using SimTraffic, which is a program that allows an animation view of the conditions, in order to view the interactions between queues of nearby intersections.

Signalized Intersections

The parameter for the determination of a Level of Service for a signalized intersection is the delay that is attributable to the traffic signal. This delay is a pro-rated average delay for all vehicles passing through the intersection during the study period. The methodology considers each approach to the intersection, and subdivides each approach into “lane groups” for detailed study. The parameters used include:

- Estimates of through and turning volumes
- Number of lanes,
- Peak Hour Factor,
- Arrival Type,
- Approach speed,
- Traffic signal cycle length and phasing, and
- Green, Yellow, and Red times associated with each signal phase.

Unsignalized Intersections

Unsignalized intersections Level of Service determinations are based on estimates of delay that is experienced by those motorists that must yield to other streams of traffic. There are three kinds of unsignalized intersections: two-way stop, multi-way stop, and roundabout. The procedure for multi-way stop control is based on empirically-derived charts. For both two-way stop and roundabouts, the procedures are based on a gap-acceptance theory process that has been calibrated based on field data.

Queue Analyses

The use of SimTraffic made it convenient to review queues that form in interchange areas. A number of locations were identified in which capacity calculations give an unrealistic assessment of the true traffic flow character of an interchange. This is because the capacity analysis methodology considers intersection performance as isolated for each intersection. However, there are a number of instances in which the interaction of closely-spaced intersections results in queues that are unrecognized in the capacity analyses. This results in computations of delay values that are lower than the actual experience of motorists that get caught in the unrecognized queues.

In the interchange study sections, there is a table for each interchange that summarizes the Level of Service findings from the capacity analysis of the various options discussed. These are presented using the unaltered capacity analysis findings. However, these findings were altered for presentation in the Interchange Improvements chapter. Table 5 and Table 6 contain summaries of Levels of Service for existing conditions and anticipated conditions for the recommendations of the study. Levels of Service that were identified as providing unreasonable assessments of intersection performance were overwritten for these summary tables with Level of Service F for certain problem locations identified in the queue analysis. The interchanges that have a modified Level of Service are:

- Exit 62 Highway 62/ Highway 180 (Sixth Street)
- Exit 64 Highway 16/ Highway 112 Spur (Wedington Drive)
- Exit 72 Highway 412 (W. Sunset Avenue)
- Exit 86 Highway 102/ Highway 62

Table A - 5: Freeway Capacity Input Data

I-540 LOCATION	Base Free Flow Speed	Urban or Rural (U or R)	K factor (in %)	D factor (in %)	Peak Hour Factor	Percent Trucks	Number of Interchanges per mile	Free-Flow Speed Reduction	Flat, Rolling or Mountainous Terrain F=1, R=2, or M=3
Exit 45 Hwy 74									
	75	R	10.0	65	0.90	12.00	0.000	0.0	2
Exit 53 Hwy 170									
	75	R	10.0	65	0.91	12.00	0.333	0.0	2
Exit 58 W. Wilson St.									
	75	R	10.0	65	0.92	12.00	0.500	0.0	2
Exit 61 Hwy 265									
	70	U	10.0	65	0.93	10.00	0.500	0.0	2
Exit 62 Hwy 62 / Hwy 16 / Hwy 180									
	70	U	10.0	62	0.94	8.00	0.833	1.7	2
Exit 64 Hwy 16 / Hwy 112 Spur									
	70	U	10.5	60	0.94	6.00	0.833	1.7	1
Exit 65 N. Porter Rd.									
	70	U	10.5	60	0.95	5.00	0.833	1.7	1
Exit 66 Hwy 112									
	70	U	10.5	60	0.95	5.00	0.833	1.7	1
Exit 67 Hwy 71 Business									
Northbound I-540	70	U	11.0	60	0.95	5.00	0.667	0.9	1
Southbound I-540	70	U	11.0	60	0.95	5.00	0.833	1.7	1
Exit 69 Main Drive									
	70	U	11.0	60	0.95	5.00	0.667	0.9	2
Exit 72 Hwy 412									
Exit 72 Hwy 412	70	U	11.0	60	0.95	5.00	0.667	0.9	2
Exit 73 Elm Springs Rd.									
Exit 73 Elm Springs Rd.									

Table A - 5: Freeway Capacity Input Data

I-540 LOCATION	Base Free Flow Speed	Urban or Rural (U or R)	K factor (in %)	D factor (in %)	Peak Hour Factor	Percent Trucks	Number of Interchanges per mile	Free-Flow Speed Reduction	Flat, Rolling or Mountainous Terrain F=1, R=2, or M=3
	70	U	10.5	60	0.95	5.00	0.833	1.7	2
Exit 76 E. Wagon Wheel Road									
	70	U	10.5	60	0.95	5.00	0.667	0.9	2
Exit 77 Proposed Hwy 412 Bypass									
	70	U	10.5	60	0.95	5.00	0.667	0.9	2
Exit 78 Hwy 264									
	70	U	10.0	60	0.95	5.00	0.667	0.9	2
Exit 81 Pleasant Grove Rd.									
	70	U	10.0	60	0.95	5.00	0.667	0.9	2
Exit 82 Proposed W. Perry Road									
	70	U	10.0	60	0.95	5.00	0.667	0.9	2
Exit 83 Hwy 94									
	70	U	10.0	60	0.95	5.00	0.667	0.9	1
Exit 85 Hwy 71 Business									
	70	U	10.0	60	0.94	5.00	0.667	0.9	1
Exit 86 Hwy 62 / Hwy 102									
	75	R	10.0	60	0.93	5.00	0.500	0.0	2
Interchange of Hwy 71 / Hwy 72									
	75	R	10.0	62	0.92	5.00	0.333	0.0	2
Interchange of Hwy 71 / Hwy 71 Bus.									

INTERSTATE 540 IMPROVEMENT STUDY

APPENDIX B

Definitions of Levels of Service

DEFINITIONS OF LEVELS OF SERVICE

Level of Service for freeways is based on an estimate of the “density” of traffic. Density is expressed as vehicles per mile per lane. The Level of Service is a designation that is similar to giving a segment of roadway a grade for performance. In this way, Level of Service A indicates very good traffic flow. Levels of Service B, C, and D indicate declining levels of motorist comfort when driving the roadway segment. Level of Service F indicates congested traffic flow. See Table 1-1 for a step-by-step description of Levels of Service.

Table A-1. Levels of Service Descriptions

LEVELS OF SERVICE (LOS)	TRAFFIC FLOW CONDITIONS
A	Free flow operations. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The general level of physical and psychological comfort provided the driver is high.
B	Reasonably free flow operations. The ability to maneuver within the traffic stream is only slightly restricted and the general level of physical and psychological comfort provided to the driver is high.
C	Flow with speeds at or near free flow. Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more vigilance on the part of the driver. The driver notices an increase in tension because of additional vigilance required for safe operations.
D	Speeds decline with increasing traffic. Freedom to maneuver within the traffic stream is noticeably limited. The driver experiences reduced physical and psychological comfort levels.
E	At the lower boundary, the facility is at capacity. Operations are volatile because there are virtually no gaps in the traffic stream. There is little or no room to maneuver. The driver experiences poor levels of physical and psychological comfort.
F	Breakdowns in traffic flow. The number of vehicles entering the highway section exceeded the capacity, or ability of the highway to accommodate that number of vehicles. There is little or no room to maneuver. The driver experiences poor levels of physical and psychological comfort.

Source: Transportation Research Board, 1994.

Levels of Service were determined for each segment of I-540 in the corridor. On occasion, when values are near the threshold of the next Level of Service, both Levels of Service are given. In this way Level of Service B/A indicates a high Level of Service B

(a “B-plus”), while Level of Service D/E indicates a low Level of Service D (a “D-minus”).

For intersections, rather than traffic density, the parameter that determines the Level of Service is delay. At unsignalized intersections, the delay of waiting for a gap in traffic is estimated. In this report, we have only reported the Level of Service that is determined for the side street approaches. (It is also possible to obtain a Level of Service for those motorists that turn left off of the main street, but these Levels of Service are always better than the side street results, so we are reporting the worst case.)

At signalized intersections, the delay due to waiting at the signal is averaged for all vehicles that pass through the intersection during the peak period. As with the freeway Levels of Service, a low Level of Service C may be reported as “LOS C/D,” generally indicating that the average for the intersection is Level of Service C, but that some motorists (usually making left turns) will experience Level of Service D.

On occasion, an intersection Level of Service may be reported as “LOS C/E,” in which there is a gap of a Level of Service between the two Levels noted. This is an indication of something more complex than a low Level of Service C. In several instances, intersections are very closely spaced, and it was found that the greentime available from a traffic signal would have to be apportioned in an unbalanced fashion, in order to prevent traffic queues from one intersection from blocking through another nearby intersection. In this way, some motorists would experience a significantly better Level of Service at the intersection than motorists on a different approach at the same intersection.

INTERSTATE 540 IMPROVEMENT STUDY

APPENDIX C

Memoranda of Local Officials' Meetings

MEMORANDUM

Date: November 25, 2003
To: See Distribution
From: Ed Cain, Parsons Transportation Group
Subject: I-540 Feasibility Study, Job No. 001971, FAP No. SPR-3000(3)
Task Order No. 1

A meeting with local officials was conducted at the Northwest Arkansas Regional Planning Commission office in Springdale on October 27, 2003. The following were in attendance (a copy of the sign-in roster is attached):

Mayor Jerre M. Van Hoose	City of Springdale
Mayor Richard Long	City of Johnson
Mayor Thekla Wallis	City of Cave Springs
Mayor Sonny Hudson	City of Prairie Grove
Mayor Phil Biggers	City of Lowell
Mayor Jane Waters	City of Elm Springs
Mayor Dan Watson	City of Tontitown
J. Travis Harp	Benton County
Tim Conklin	City of Fayetteville
Patsy Cristie	City of Springdale
Mike Churchwell	City of Bentonville
Phil Swope	City of Lowell
Harold Beaver	AHTD
Scott Bennett	AHTD
Jeff Hawkins	NWARPC
John McLarty	NWARPC
Elizabeth Mayfield-Hart	AHTD
David Foster	AHTD
Dennis Birge	AHTD
Ed Cain	PTG
Mike Brugge	PTG

Scott Bennett began the meeting by welcoming those in attendance and explaining that the 18-month study will address potential improvements to I-540 and its interchanges in Washington and Benton Counties. He explained that the purpose of the meeting was to brief local officials on the study and to obtain their comments and early input for the study. Many of those in attendance had recently participated in a driving tour of the area with members of the Arkansas Highway Commission during which they had an opportunity to discuss local transportation needs

with the Commissioners. Mr. Bennett mentioned that in addition to voicing concerns directly to the Commission, it was important that local officials provide input to the study team for the I-540 Feasibility Study. He noted that the AHTD had retained a consultant, Parsons Transportation Group, to perform the I-540 Feasibility Study and introduced Ed Cain, PTG's Project Manager for the study.

Cain stated that the study would investigate the need for and feasibility of various improvements to I-540 and its interchanges that would relieve existing traffic congestion and provide additional capacity for future traffic volumes. He noted that the study began in September and was still in the initial phase of gathering information, including current traffic counts. Cain mentioned that in addition to the Local Officials Meeting, Public Meetings were scheduled from 4:00 to 7:00 p.m. at the Leverett Elementary School Cafeteria in Fayetteville on October 27, and at the Shewmaker Center on the campus of Northwest Arkansas Community College at Bentonville on October 28.

Once data collection is completed, 2004 and 2024 traffic will be developed and used in capacity analyses to determine problem areas along I-540 and its interchanges. Short-term and long-term improvements that would alleviate current and future anticipated traffic congestion will then be developed and investigated. Types of improvements that will be investigated include, but are not limited to, adding through and auxiliary lanes to I-540, adding turn lanes at ramp terminals, installing traffic signals at ramp terminals, widening interchange ramps, widening cross streets within interchange areas, and reconfiguring interchanges. Cain stated that Public Officials will be given an opportunity to review and comment on the proposed improvements once they have been developed. A second series of Public Meetings will also be scheduled to afford the public an opportunity to review and comment on the proposed improvements. It is anticipated that these meetings will be conducted by late summer of 2004. The study and final report is to be completed by February 1, 2005.

Cain mentioned studies and projects that are in various stages of development that will be considered in the conduct of the I-540 Feasibility Study. These include the City of Fayetteville study for street and intersection improvements, including possible modifications to the I-540/West 6th Street Interchange, the Highway 412 Bypass in Springdale and the proposed interchange at I-540 and Perry Road in Rogers. He stressed the importance to the study of having knowledge of other roadway improvements being planned in the vicinity of I-540 by local entities.

Cain then opened the meeting for questions and comments. The following represents a summary of questions asked and comments expressed.

1. Noting existing traffic congestion and continued growth and development in the area, Mr. Harp of Benton County asked about the interim period between 2004 and 2024. Cain explained that using 2024 traffic for the analysis does not mean that the study will target only improvements that are needed in 2024. The study will identify improvements that will be needed throughout the 20-year design period.

2. In response to a question from Mayor Van Hoose of Springdale regarding capacity of existing I-540, Scott Bennett replied that, in general, a four-lane interstate highway will accommodate approximately 60,000 vehicles per day. Presently, there are locations along I-540 where traffic volumes approach 50,000 vehicles per day. However, Mr. Bennett cautioned that this criteria reflects only mainline capacity and does not address the capacity of the interchanges located along the interstate. It is believed that much of the existing congestion along I-540 is associated with the interchanges.
3. In response to a question from Mr. Churchwell of Bentonville regarding the type of information needed, Cain replied that it is important to know locations along I-540 and its interchanges where existing traffic congestion occurs on a regular basis. Mr. Churchwell replied that the entire corridor experienced congestion, especially the I-540/Highway 102 interchange area. He cited traffic generated by the new Wal-Mart Information Systems Center and Northwest Arkansas Community College, and heavy truck traffic as contributing to traffic congestion at this location.
4. Mayor Van Hoose asked if the study would address problems at cross-road intersections near the interchanges. Cain responded that it would.
5. Mr. Conklin stated that the consultant who is performing the street improvement study for the City of Fayetteville had found that widening cross-roads located beneath interchange bridges would require reconstruction or major modifications to the existing bridges. He also believed that frontage roads and their proximity to ramp terminals must be considered in interchange reviews. Citing a current ADT of 18,000 on Highway 62 west of Wal-Mart, Mr. Conklin also stated that growth in the areas west of Fayetteville is a major contributor to increasing traffic volumes on West 6th Street, Wedington Drive and Porter Road, which also impact I-540 traffic operations. He expressed concerns about the traffic forecasts being adequate and also the high volume of truck traffic.
6. Mr. Harp stated that traffic forecasts are already exceeded. He noted that a large mall is planned near the Pleasant Grove Road interchange and that nearly every interchange along I-540 presently experiences operational problems or has development planned in its vicinity.
7. Mr. Churchwell asked if signal timing and coordination of existing traffic signals at ramp terminals and abutting frontage roads would be examined as part of this study. Mr. Cain replied that it is anticipated that this would be reviewed at some locations.
8. Mayor Waters of Elm Springs mentioned that the Northwest Arkansas Regional Airport is a major traffic generator of traffic for I-540.
9. Mayor Van Hoose stated that the City of Springdale has sanitary sewer extensions programmed within the next two years for areas near I-540 along Elm Springs Road and Wagon Wheel Road.
10. It was noted that the northbound off-ramp traffic at the I-540/Elm Springs Road interchange backs up past the weigh station on I-540. The source of this problem appears to be the lack

of a traffic signal at the northbound ramp terminal on Elm Springs Road. It was also suggested that construction of a northbound auxiliary lane be investigated.

11. Mayor Van Hoose stated that, typically, growth in Northwest Arkansas has been underestimated. He cited proliferation of rural water systems as a reason for increased development in rural areas. Mayor Waters stated that 250 homes have been constructed in Elm Springs this year.
12. Mr. Conklin asked if new interchange locations and proposed grade separations across I-540 would be considered. Ms. Mayfield-Hart responded that they would and that each city or county would need to submit such locations for consideration in the study. Also, current zoning, land use plans, street plans and related studies would also be appreciated. All such information should be submitted to Ms. Mayfield-Hart who will then pass it on to the consultant for use and consideration in the study.
13. Mayor Biggers of Lowell believes that access to and from I-540 is a major problem. He requested that priority be given to interchanges that are now experiencing operational problems. He cited the interchange at Highway 412 in Springdale as an example of one that should have high priority. Mayor Biggers also asked if replacing existing interchanges with new interchange configurations would be considered in the study. He was told that in certain instances new interchange configurations would be considered. It was suggested that one new interchange configuration that could be considered is the Single Point Urban Interchange (SPUI). It was noted that there are no SPUIs in Arkansas.
14. Mayor Biggers also asked if the I-540 Feasibility Study would explore financing options. Mr. Bennett responded that the means of financing the recommend improvements would be covered in a later phase of project development. This study is to identify the problem areas and how to fix them. Mayor Biggers suggested that the needs would probably exceed funding. Mr. Bennett responded that a state-wide needs study recently completed by the AHTD showed that \$15 Billion is needed for highway improvements over the next ten years, but only \$4 Billion is available.
15. Mayor Biggers asked about the process of pursuing toll roads to finance needed highway improvements. It was noted that this is a matter of public policy and would require enabling state legislation. General acceptance of toll roads by the motoring public, the relative tolerance of motorists to congestion versus the cost of traveling on toll roads, and travel demand are primary indicators of the feasibility of using tolls to finance highway construction. The experience of other states such as Oklahoma is a good source of information on the construction of toll roads.

Distribution: Scott Bennett
Harold Beaver
David Foster
Elizabeth Mayfield-Hart
Jeff Hawkins
John McLarty
David Hopkins
Mike Brugge

MEMORANDUM

Date: July 21, 2005
To: See Distribution
From: Ed Cain, Parsons Transportation Group
Subject: I-540 Improvement Study, Job No. 001971, FAP No. SPR-3000(3)
Task Order No. 1

A meeting with local officials was conducted at the Northwest Arkansas Regional Planning Commission office in Springdale on June 6, 2005. The following were in attendance (a copy of the sign-in roster is attached):

Senator Jim Holt	District 35
Mayor Thekla Wallis	City of Cave Springs
Mayor Virgil Blackmon	City of West Fork
Mayor Steve Womack	City of Rogers
Mayor Dan Coody	City of Fayetteville
Mayor Terry Coberly	City of Bentonville
Mayor Jackie Crabtree	City of Pea Ridge
Judge Gary Black	Benton County
J. Travis Harp	Benton County
John Gibson	Washington County
Ron Petrie	City of Fayetteville
Kevin Santos	City of Fayetteville
Patsy Cristie	City of Springdale
Steve Glass	City of Rogers
Gary Dumas	City of Fayetteville
Ty Galloway	City of Bentonville
Brenda Frazier	City of Highfill
Ben Rhodes	City of Siloam Springs
Allen Turner	City of Lowell
Uvalde Lindsey	NWAR Council
Christine Kefauver	NWAR Council
Jeff Hawkins	NWARPC
John McLarty	NWARPC
Celia Scott-Silkwood	NWARPC
Ralph Fulton	AHTD District 9
Joe Shipman	AHTD District 4
Randy Ort	AHTD
Steve Mitchell	AHTD

In attendance continued:

Jessie Jones	AHTD
Andrew Brewer	AHTD
Ed Cain	PTG
Mike Brugge	PTG
Tori Goessling	PTG
Kevin Abel	PTG
Robert Smith	<i>Arkansas Democrat-Gazette</i>
John Anderson	<i>The Morning News</i>
Adam Wallworth	<i>Northwest Arkansas Times</i>
Jason Schultz	<i>Arkansas Democrat-Gazette</i>

Using slides, Mike Brugge presented and led a discussion on improvements, as recommended in the Initial Draft Report, to I-540 and its interchanges in Washington and Benton Counties. The following items were discussed:

1. The scope of this study is limited to analyzing and developing improvements to I-540 and its existing interchanges in Washington and Benton Counties, and does not address new interchanges nor specific proposals for additional overpasses between interchanges. The report does point out that, in general, additional I-540 overpasses on local streets would help in reducing through traffic volumes on interchange cross roads, and encourages cities in the I-540 corridor to include such improvements in their respective street plans.
2. In response to a question concerning proposed improvements to the interchange at I-540 and Highway 71B in Rogers, it was explained that the proposal by the City of Rogers to widen and improve 40th Street south to New Hope Road was not considered in forecasting traffic and developing improvements for this interchange. It is believed that the auxiliary lanes proposed on 46th Street north of Highway 71B will be needed in 2024, even with the widening of 40th Street. It was noted that the proposed Highway 412 Bypass interchange and the interchange proposed at Perry Road were considered in the 2024 traffic forecasts.
3. Concern was expressed that the study did not extend to include Highway 71 in Bella Vista where traffic routinely backs up at the traffic signals along Highway 71. It was noted that the study only covers the existing freeway system.
4. It was asked if a “Texas Type U-Turn” frontage road configuration had been considered at any of the interchanges. Brugge responded that this configuration had been investigated for the Highway 62/Highway 180 interchange in Fayetteville. This would have connected Shiloh Drive and Futrall Drive allowing direct connecting traffic between these two frontage roads. However, it was determined that this configuration would not decrease traffic an amount sufficient to reduce the laneage on Highway 62/Highway 180 required without the frontage roads connection. Also, this configuration would have resulted in additional structure costs due to the additional length of bridge required to span the connection.

5. A single point urban interchange (SPUI) is proposed at Highway 71B in Rogers. Brugge was asked to compare this configuration with a full cloverleaf at this location. He responded that a cloverleaf would require additional right-of-way. In contrast, the SPUI could be constructed primarily within the existing right-of-way resulting in less impacts to existing development. Also, a full cloverleaf would result in traffic weaves on I-540. No full cloverleaf interchange configurations were considered in this study because of their associated weaving problems.
6. Mayor Womack asked if the study included investigating a western bypass as an alternative to making extensive improvements to I-540 and its interchanges. Brugge explained that the scope of the I-540 Improvement Study did not include investigating a western bypass; however, this does not mean that AHTD is opposed to the idea of a western bypass. Future studies could investigate a bypass and compare its benefits and costs to that of implementing improvements to I-540. Also, the I-540 study could be considered the first step in determining the best overall transportation plan for the region. Project development for a western bypass would require a comparison of benefits and costs of the bypass with the benefits and costs of improving existing I-540. The I-540 Improvement Study could be used for that purpose. John McLarty noted that the MPO Technical Advisory Committee has already begun the process of including a western bypass in the Long Range Transportation Plan.
7. It was asked if the implementation of mass transit was considered in the study. It was explained that mass transit alternatives were beyond the scope of the I-540 Improvement Study. However, this was not meant to imply that mass transit should not be considered for future transportation needs of the corridor.
8. The estimated costs for the improvements recommended in the Initial Draft Report are approximately \$350 million. This includes approximately \$200 million for adding lanes to I-540 and approximately \$150 million for long-term interchange improvements. Short-term and interim interchange improvements are estimated to cost approximately \$2.5 million and \$27 million, respectively, and are included in the estimated \$150 million long-term improvement cost. Depending on the improvements implemented, the estimated cost of the improvements recommended in the Initial Draft Report could range from \$2.5 million to \$350 million. Ed Cain emphasized that these are planning level estimates and include right-of-way and utility adjustment costs, as well as engineering costs. The estimates are also based on current prices with no allowance for future inflation.
9. Responding to a question, Mike Brugge noted that right-of-way impacts for recommended interchange improvements at Highway 62/Highway 180 in Fayetteville would include the taking of a motel, a convenience store and a branch bank.
10. One attendee expressed concern that level of service improvements shown in the Initial Draft Report were, in some instances, not very significant considering the estimated cost of the recommended improvements.

11. Responding to a question concerning a prioritizing of recommended improvements, Ed Cain noted that improvements were not prioritized in the Initial Draft Report, but would be included in the final report.
12. An attendee asked if there were Single Point Urban Interchanges (SPUIs) in nearby cities that could be observed. There are no SPUIs in Arkansas, but as Mike Brugge pointed out, there are SPUIs in Memphis, Kansas City and St. Louis. There is also an up top SPUI on I-55 just north of Jackson, Mississippi, and on I-55 in Herculaneum south of St. Louis.
13. In response to a question concerning safety, Mike Brugge explained that safety for the traveling public was a primary factor in determining the need for and development of improvements included in the Initial Draft Report.
14. It was believed by some in attendance that the study should include investigating the need for new interchanges on I-540 and for additional overpasses over I-540 on local streets between interchanges.

Distribution:

Alan Meadors
Joe Shipman
Ralph Fulton
Jessie Jones
Steve Mitchell
Jeff Hawkins
John McLarty
Mike Brugge

INTERSTATE 540 IMPROVEMENT STUDY

APPENDIX D

Summaries of Public Meetings

**SUMMARY
OF
OPEN HOUSE PUBLIC MEETING
FOR JOB 001971
I-540 FREEWAY STUDY
CONDUCTED
ON
OCTOBER 27, 2003 FROM 4:00 TO 7:00 P.M.
AT LEVERETT ELEMENTARY SCHOOL
IN
FAYETTEVILLE, ARKANSAS**

Number in Attendance Per Sign-In Sheet - Eleven (11), Including five (5) AHTD staff, three (3) consultant staff, two (2) media representatives and one (1) citizen.

Comments: No comment sheets were completed and turned in at the meeting. Five (5) comment sheets were completed and mailed to AHTD subsequent to the meeting. One of these was from a respondent who also addressed concerns in a letter to the District 4 Engineer, a copy of which was attached to the comment sheet. In addition a letter containing comments was received from a sixth respondent. A summary of comment sheet responses is shown below.

Question No. 1: Do you believe there is a need for improvements to I-540 and its interchanges in Washington and Benton Counties?

Direct Responses to Question No. 1: Yes - 5
No - 0

In written comments, improved side road access at all interchanges and adding a third lane each way on I-540 were cited as needed improvements. The proximity of Exit 66 (Highway 112) to Exit 67 (71 Business) was also listed as a source of traffic congestion.

Question No. 2: Do you often experience traffic congestion while traveling on I-540. If so, please indicate locations and the times of day here and on the map on the back.

Direct Responses to Question No. 2: Yes - 5
No - 0

In written comments to Question No. 2, I-540 at Elm Springs Road, Highway 412 and Highway 112 during both a.m. and p.m. rush hours were cited as areas and times of day along I-540 where traffic congestion is experienced. The segments of I-540 between New Hope Road (Exit 83) and Highway 62 (Exit 86) and between Fayetteville and Highway 412 (Exit 72) were also noted as areas that are congested during morning and afternoon rush hour traffic. I-540 between Highway 112 (Exit 66) and Highway 71 Business (Exit 67) was cited as a location where traffic congestion occurs from 7:30 to 8:00 a.m. and from 5:00 to 5:30 p.m.

Question No. 3: Do you often experience difficulty in getting on or getting off I-540 because of traffic congestion on interchange ramps or intersecting cross streets? If so please indicate locations and times of day here and the map on the back.

Direct Responses to Question No. 2: Yes - 5
No - 0

In written responses to Question No. 3, Elm Springs Road, Highway 412, Highway 112 and Highway 71 Business in Fayetteville were listed as interchanges experiencing congestion on ramps or cross streets during a.m. and p.m. rush hour traffic. The Walnut Street (Highway 71 Business in Rogers) interchange and the Highway 62 interchange were cited as locations that experience congestion at all times during the day, and the New Hope Road interchange was cited as experiencing congestion during the p.m. rush hour.

Question No. 4: Do you know of any environmental constraints such as historical sites, family cemeteries, archaeological sites, endangered species, hazardous waste sites, existing or former landfills, or parks and public lands in the vicinity of the I-540 corridor? Please note and discuss with AHTD staff.

There was only one “yes” response to this question which noted “cave fish recharge area”, but gave no specific location.

In a letter attached to one of the comment sheets and addressed to the District 4 Engineer, the respondent cited problems exiting I-540 northbound at the Highway 71 Business interchange (Exit 67) in Fayetteville during the a.m. rush hour. It was noted that traffic backs up past the Highway 112 interchange (Exit 66), accidents are common at this location, and the distance between the two interchanges is inadequate to provide properly for weaving movements associated with the two interchanges. The respondent believes that adding a lane to the northbound off ramp at Exit 67 would alleviate some of traffic congestion at this location.

Enclosed with another letter was an aerial photograph showing a proposed connection between Shiloh Drive in Fayetteville and South 48th Street at Main Drive in Johnson. According to the respondent, his company has been pursuing this proposal for the past two years which has been presented to the cities of Fayetteville and Johnson, and also discussed with AHTD officials. If constructed, this connection would provide an alternative route for traffic to and from the NWA Mall and would provide, via its connection with South 48th Street, a route which parallels I-540 from the NWA Mall area all the way to Highway 412 in Springdale. The respondent believes that this proposed route would relieve traffic congestion in Johnson and also divert traffic from I-540.

**SUMMARY
OF
OPEN HOUSE PUBLIC MEETING
FOR JOB 001971
I-540 FREEWAY STUDY
CONDUCTED
ON
OCTOBER 28, 2003 FROM 4:00 TO 7:00 P.M.
AT NORTHWEST ARKANSAS COMMUNITY COLLEGE
IN
BENTONVILLE, ARKANSAS**

Number in Attendance Per Sign-In Sheets – Thirty-one (31), Including seven (7) AHTD staff, three (3) consultant staff, one (1) FHWA representative, three (3) media representatives and seventeen (17) citizens.

Comments: Sixteen (16) comment sheets were completed and turned in at the meeting. Five (5) comment sheets were completed and mailed to AHTD subsequent to the meeting. A summary of comment sheet responses is included below.

Question No. 1: Do you believe there is a need for improvements to I-540 and its interchanges in Washington and Benton Counties?

Direct Responses to Question No. 1: Yes - 21
No - 0

In written comments, improved side road access, two-lane exit ramps with right-turn lanes, longer ramps, improved terminal geometry, additional lanes on I-540, improved signal timing and new interchange configurations were cited as needed improvements to I-540 and its interchanges.

Question No. 2: Do you often experience traffic congestion while traveling on I-540. If so, please indicate locations and the times of day here and on the map on the back.

Direct Responses to Question No. 2: Yes - 20
No - 1

In written comments to Question No. 2, segments of I-540 between the Highway 62/102 Interchange (Exit 86) and Highway 94 Interchange (Exit 83), from Fayetteville to Rogers, between Rogers and Lowell, between Lowell and Elm Springs, in the vicinity of the Highway 412 Interchange in Springdale and the Wagon Wheel Road Interchange, and in the vicinity of the Highway 71 Business Interchange (Exit 67) in Fayetteville were cited as areas along I-540 that often or sometimes experience traffic congestion. Two respondents believed that congestion between Exits 83 and 86 is due to traffic backing up on the northbound off ramp at Exit 86.

Question No. 3: Do you often experience difficulty in getting on or getting off I-540 because of traffic congestion on interchange ramps or intersecting cross streets? If so please indicate locations and times of day here and the map on the back.

Direct Responses to Question No. 2: Yes - 20
No - 1

In written responses to Question No. 3, thirteen (13) respondents listed traffic congestion at the Highway 71 Business Interchange in Rogers (Exit 85), and eight respondents noted congestion at the Highway 62/102 Interchange (Exit 86). Some cited congestion on the cross roads while others noted traffic backing up on the northbound exit ramps at these locations. The proximity of the 46th Street/Highway 62 intersection to the I-540/Highway 62 ramp terminal was listed by some respondents as a cause for congestion at this interchange. Some stated that congestion occurred at these two locations during the a.m. and p.m. rush hours while others cited congestion at off peak hour traffic. The New Hope Road/I-540 Interchange (Exit 83) was also listed as a location where it is difficult to enter or exit I-540 during rush hour. The I-540/Highway 71 Business Interchange (Exit 67) in Fayetteville was also listed as a troublesome location to exit and enter I-540 during rush hour.

Question No. 4: Do you know of any environmental constraints such as historical sites, family cemeteries, archaeological sites, endangered species, hazardous waste sites, existing or former landfills, or parks and public lands in the vicinity of the I-540 corridor? Please note and discuss with AHTD staff.

There were four “yes” responses to this question. One noted “cave fish recharge area”, but gave no specific location. A second listed Wilson Springs. The other two did not name specific resources, but requested that all the resources named in the question “be respected”.

One respondent included printed information on Personal Rapid Transit and suggested that this, as well as other mass transit systems be considered for part of the long term solution to traffic congestion in the I-540 corridor.

**SUMMARY
OF
OPEN HOUSE PUBLIC MEETING
FOR JOB 001971
CONDUCTED
ON
MONDAY, JUNE 6, 2005
AT NORTHWEST ARKANSAS COMMUNITY COLLEGE
IN
BENTONVILLE, ARKANSAS**

Number in Attendance Per Sign-In Sheets – Sixty-Four (64), Including ten (10) AHTD staff, four (4) consultant staff, four (4) media representatives and forty-six (46) citizens.

Comments: Eighteen (18) comment sheets were completed and turned in at the meeting. Ten (10) comment sheets were completed and mailed to AHTD subsequent to the meeting. A summary of comments is included below.

A. From the Comment Sheets

Question No. 1: Do you support the construction of additional lanes on I-540 between Fayetteville and Bentonville? Which section will need additional lanes the most? Comments?

Direct Responses to Question No. 1: Yes - 24
No - 5

(One respondent marked both yes and no)

The following sections were mentioned in response to which section of I-540 will need additional lanes the most, preceded by the number commenting.

- 5 - All sections from Fayetteville to Bentonville
- 3 - All sections from Lowell to Bentonville
- 2 - Section from Highway 412 (Exit 72) to Highway 62/102 (Exit 86)
- 1 - From Exit 72 (Highway 412) to Exit 88 (Highway 72)
- 1 - Section from the Benton County Line to Highway 62/102 (Exit 86)
- 1 - From Exit 83 (Highway 94) through Exit 86 (Highway 62/102)
- 1 - Near interchanges
- 1 - At all major intersections
- 1 - In both directions

Question No. 2: Are interchange improvements along I-540 needed to enhance the traffic flow at the interchange? Comments?

Direct Responses to Question No. 2: Yes - 27
No - 1

Written comments received for Question No. 2 include the following:

- 1- suggested that appropriate turn lanes be added to relieve congestion.
- 1- thought that traffic signals should be added and interchange designs should be improved.
- 1- believed that traffic signals should be removed and replaced by “traffic circles”.
- 2 - expressed satisfaction with the Single Point Urban Interchange (SPUI) configuration.
- 1 - believed that cross roads in the vicinity of interchanges should be widened.
- 2 - noted that during rush hour, traffic backs up onto I-540 at the Highway 71B and Highway 62/102 interchanges causing dangerous conditions.
- 2 - commented that the Pleasant Grove Road (Exit 81) and New Hope Road (Exit 83) interchanges would need to be improved soon.

Respondents were asked to check the interchange or interchanges on the list that they believe need improvements and to comment on the types of improvements needed. The following is a summary of these responses.

- 1 - Exit 61 (Highway 265/112)
- 3 - Exit 62 (Highway 62/108). Suggested that the long-range improvements be implemented as soon as possible.
- 3 - Exit 66 (Highway 112)
- 7 - Exit 67 (Fulbright Expressway). Comments included:
 - focus on making the northbound merge safer.
- 8 - Exit 72 (Highway 412)
- 4 - Exit 73 (Elms Spring Road). Comments included:
 - Concerned with development
- 2 - Exit 76(Wagon Wheel Road)
- 7 - Exit 78 (Highway 264). Suggested improvements included:
 - Additional lanes on southbound ramps
- 14 - Exit 81(Pleasant Grove Road). Suggested improvements and comments included:
 - Widen bridge over I-540
 - Install traffic signals
 - Improvements are needed as soon as possible
- 13 - Exit 83 (Highway 94). Suggested improvements included:
 - Merging the lanes on the west side of the interchange into a two-lane roundabout
 - Implementing the proposed improvements as soon as possible.

- 20 - Exit 85(Highway 71B). Suggested comments included:
 - Improve ramps
 - Add lanes to Highway 71B
 - Add lanes to exit ramps
 - Construct SPUI
- 22 - Exit 86 (Highway 62/102). Comments and suggested improvements included:
 - 1 - stated that it takes an average of 10 minutes to get through the intersection daily.
 - Add additional lanes
 - Ramp improvements
 - Construct SPUI or a fly-over ramp.
- 11 - Exit 88 (Highway 72). Suggested improvements included:
 - 2 - suggested traffic signals be installed.
 - 1 - recommended a roundabout or a traffic signal at McCollum Road.

Question No. 3: Do you know of any cultural or environmental constraints such as historical sites, family cemeteries, archaeological sites, endangered species, hazardous waste sites, existing or former landfills, or parks and public lands in the vicinity of the I-540 corridor?

There were two “yes” responses to this question. One noted Cave Springs – blind cavefish recharge area, but gave no specific location.

Other written general comments at the bottom of the comment sheets included the following:

- 1 - suggested that retaining walls and plantings be provided between the northbound and southbound lanes of I-540 for screening and aesthetic purposes.
- 1- recommended the straightening and widening of Highway 112 from Highway 12 in Bentonville to Fayetteville to provide a west side north-south travel alternative to I-540. This respondent also suggested improving Highway 265 from New Hope Road to Highway 264 in a like manner to provide an additional continuous north-south route east of I-540.
- 1 - believed that traffic signals should be coordinated to facilitate travel through an interchange and a new bypass to the west would alleviate congestion on I-540.

B. Verbal Comments Received at the Meeting

1. Some attendees expressed support for a western bypass.
2. Some attendees were disappointed that the Bella Vista Bypass was not addressed in the study.
3. One attendee was concerned about an increase in noise levels due to the recommended improvements.
4. One attendee expressed support for a light rail transit system to help in alleviating traffic congestion in the I-540 corridor.

5. Some asked if the recently announced Walton Art Museum was considered in the conduct of the study.

**SUMMARY
OF
OPEN HOUSE PUBLIC MEETING
FOR JOB 001971
CONDUCTED
ON
TUESDAY, JUNE 7, 2005
AT THE NORTHWEST ARKANSAS REGIONAL
PLANNING COMMISSION OFFICES
IN
SPRINGDALE, ARKANSAS**

Number in Attendance Per Sign-In Sheets – Sixty (60), Including five (5) AHTD staff, four (4) consultant staff, three (3) media representatives and forty-eight (48) citizens.

Comments: Nineteen (19) comment sheets were completed and turned in at the meeting. Six (6) comment sheets were completed and mailed to AHTD subsequent to the meeting. A summary of comments is included below.

A. From the Comment Sheets

Question No. 1: Do you support the construction of additional lanes on I-540 between Fayetteville and Bentonville? Which section will need additional lanes the most? Comments?

Direct Responses to Question No. 1: Yes- 17
No - 6
No Response - 2

The following sections were mentioned in response to which section will need additional lanes the most, preceded by the number commenting.

- 2 - Highway 412 (Exit 72) to Highway 62/102 (Exit 86)
- 4 - entire segment from Fayetteville to Bentonville
- 1 - Highway 112 (Exit 66) to Highway 62/102 (Exit 86)
- 1 - Greathouse Spring Road (Exit 69) to Highway 62/102 (Exit 86)
- 1 - New Hope Road (Exit 83) to Highway 62/102 (Exit 86)
- 2 - improving public transportation in the corridor with improved local street network
- 1 - improved public transportation.
- 1 - HOV lanes only

Question No. 2: Are interchange improvements along I-540 needed to enhance the traffic flow at the interchange? Comments?

Direct Responses to Question No. 2: Yes - 25
No - 0

Written comments received for Question No. 2 include the following:

- 1 - recommended a cloverleaf design at Highway 72 (Exit 88) and another opposed adding traffic signals.
- 1 - the proposed improvements for the Highway 62 interchange (Exit 62) in Fayetteville were not feasible, but believed that interim improvements are needed at Highway 112 (Exit 66).
- 1 - a new interchange is needed at Oaklawn rather than just an overpass.
- 1 - favored more traffic lanes and fewer traffic signals.
- 1 - additional turn lanes are needed at ramp terminals.
- 3 - interchange improvements are needed, but think that the recommended improvements shown at the meeting are too massive and over designed.
- 1 - traffic now backs up during peak flows at the Highway 412 (Exit 72) and Elm Springs Road (Exit 73) interchanges.
- 1 - favor for “another Interstate” west of I-540.
- 1 - Exit 66 (Highway 112) as “very dangerous”.

Respondents were asked to check the interchange or interchanges on the list that they believe need improvements and to comment on the types of improvements they believe are needed. The following is a summary of these responses.

- 0 - Exit 45 (Highway 74), Exit 53 (Highway 170), Exit 58 (West Wilson Street), or Exit 76 (Wagon Wheel Road)
- 2 - Exit 61 (Highway 71/265)
- 10 - Exit 62 (Highway 62/180). Suggested improvements at this location included:
 - a full cloverleaf configuration
 - longer slip ramps
 - auxiliary turn lanes
 - turn around loops under the bridge
 - Other comments included:
 - confining improvements to the existing right-of-way
 - converting Shiloh Drive and Futrall Drive to two-way frontage roads between Highway 16 and Highway 62/180 in order to benefit commercial development
- 7 - Exit 64 (Highway 16/112 Spur). Suggested improvements included:
 - auxiliary turn lanes
 - longer slip-ramps

- 3 - Exit 65 (Porter Road) Suggested improvements included:
 - installing traffic signals
 - realigning the local streets to improve sight distance
- 6- Exit 66 (Highway 112) Suggested improvements included:
 - Adding traffic signals at the ramp terminals
 - Adding through lanes and merge lanes on Highway 112
- 7 - Exit 67 (Fulbright Expressway) Suggested improvements included:
 - Improving the mainline curvature to make it safer
 - Enhance access to existing retail development.
 - One person suggested a direct northbound exit ramp connection to Gregg Avenue in order to improve access to retail development.
- 1- Exit 69 (Greathouse Spring Road) Suggested improvements included:
 - relocating 48th Street or installing a traffic signal.
- 8 - Exit 72 (Highway 412). Some were concerned that no improvements are recommended at this interchange because of anticipated construction of the Highway 412 Bypass. Their concern is for the interim period before the bypass is completed which could be several years. Suggested improvements included:
 - auxiliary turn lanes
 - longer ramps.
 - Constructing new interchanges at Watkins Street and Oaklawn
- 1 - Exit 73 (Elm Springs Road)
- 1 - Exit 78 (Highway 264)
- 2 - Exit 81 (Pleasant Grove Road) Suggested improvements included:
 - a full cloverleaf interchange at this location to accommodate traffic from the new Wal-Mart and other development in this area
- 4 - Exit 83 (Highway 94). Suggested improvements included:
 - auxiliary turn lanes
 - longer ramps
- 4 - Exit 85 (Highway 71B) and Exit 86 Highway 62/102)
Suggested improvements at these two interchanges included:
 - exit/entrance ramp improvements and widening of the cross streets.
- 2 - Exit 88 (Highway 72). Suggested improvements included:
 - a full cloverleaf configuration without traffic signals.

Question No. 3: Do you know of any cultural or environmental constraints such as historical sites, family cemeteries, archaeological sites, endangered species, hazardous waste sites, existing or former landfills, or parks and public lands in the vicinity of the I-540 corridor?

There were two “yes” responses to this question although no one stated any specific information or locations.

Other general written comments at the bottom of the comment sheets included the following:

- 1 - an additional connection from I-540 to the NWA Mall area.
- 1 - light rail transit and a western bypass would eliminate the need for a majority of improvements recommended in the study.
- 1 - improved mass transit, good land-use planning, and a network of improved and widen local roads would be a better solution than implementing major improvements to I-540 and its interchanges.
- 1 - widening existing highways do not solve long-term regional traffic woes. This person believes that a better solution would be to construct a railroad along I-540 for rail travel from Fayetteville to Bella Vista, and to construct connecting rail service for each of the cities along the corridor.
- 1 - a western bypass needs to be in the plans, and if necessary, as a toll facility.
- 1 - HOV lanes be implemented along I-540
- 1 - more context sensitive designs and solutions should be considered for meeting travel demands in the corridor.
- 1 - traffic signals do not solve traffic problems but instead cause gridlock.
- 1 - the Highway 412 Bypass should be included in improvements recommended in the study to perhaps facilitate connecting to the planned road to the NW Arkansas Regional Airport at Highfill.
- 1 - the improvements should be prioritized
- 1 - additional interchanges should be provided for Springdale.

B. Verbal Comments Received at the Meeting

1. Some attendees thought that I-540 should be widened to eight lanes from Fayetteville to Bentonville.
2. Some attendees expressed that exit ramps should be constructed at some of the existing overpasses over I-540.
3. Two attendees expressed that a full cloverleaf interchange should be implemented at Highway 72 (Exit 88) and that there should be no traffic signals along Highway 72.
4. One person believes that the northbound exit ramp at the Fulbright Expressway should provide a direct at-grade connection to Gregg Avenue, even though this would entail an at-grade crossing of the Arkansas & Missouri Railroad track just west of Gregg. This person believes that this would provide better access to retail development in the area, and doesn't believe the at-grade rail crossing would be a problem because of the minimal rail traffic that uses this line.
5. Another attendee believes that Shiloh Drive and Futrall Drive should be converted to two-way frontage roads between Highway 16 and Highway 62/180 to enhance commercial development.

