

# SUNPORT BOULEVARD EXTENSION

## Traffic Operational Analysis Woodward Road

NMDOT Control No. A300160  
Bernalillo County Project No. TS 09-06

Prepared For:



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## **TABLE OF CONTENTS**

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EXECUTIVE SUMMARY .....	ES-1
1.0 INTRODUCTION .....	1
2.0 EXISTING CONDITIONS.....	2
3.0 FUTURE TRAFFIC VOLUMES .....	2
4.0 COLLISION DATA .....	3
5.0 ROADWAY TRAFFIC OPERATION FOR 2015 BUILD SCENARIO.....	3
6.0 ROADWAY TRAFFIC OPERATION FOR 2035 BUILD SCENARIO.....	4
7.0 WOODWARD ROAD TYPICAL CROSS SECTION .....	5
8.0 TRAFFIC SIGNAL WARRANT ANALYSIS — INTERSECTION OF WOODWARD ROAD/2 <sup>ND</sup> STREET.....	10
9.0 INTERSECTION TRAFFIC OPERATION FOR 2015 BUILD SCENARIO/MINIMUM ROADWAY IMPROVEMENTS .....	13
10.0 INTERSECTION TRAFFIC OPERATION FOR 2035 BUILD AND NO BUILD SCENARIOS (SUNPORT/BROADWAY/WOODWARD).....	16
11.0 RECOMMENDATIONS .....	16

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## **LIST OF FIGURES**

---

Figure 1: Study Area.....	1
Figure 2: Woodward Road Typical Sections .....	7
Figure 3a: Ultimate Woodward Road Improvements (4-Lane Major Collector) .....	8
Figure 3b: Ultimate Woodward Road Improvements (4-Lane Major Collector).....	9
Figure 4: Woodward Road/2 <sup>nd</sup> Street – Minimum Intersection Improvements.....	15

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## **LIST OF TABLES**

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Table 1: Projected Traffic Volumes – 2015 Build Scenario.....	3
Table 2: Projected Traffic Volumes – 2035 Build Scenario.....	3
Table 3: Traffic Signal Warrant Screening Based on Projected Future ADT .....	11
Table 4: Traffic Signal Warrant Screening Based on Projected Future ADT .....	12

## **LIST OF APPENDICES**

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- Appendix A Map of Current Roadway Functional Classification (MRCOG)
- Appendix B 2015 and 2035 Forecast Traffic Volumes (AM, PM, Daily) (MRCOG)
- Appendix C Excerpt from Development Process Manual (COA)
- Appendix D Construction Cost Estimates—Woodward Road Ultimate and Minimum Improvements
- Appendix E Intersection Operational Analyses—Synchro Output for Woodward/2<sup>nd</sup> Alternatives (2015 Build)
- Appendix F Intersection Operational Analyses—Synchro Output for Woodward/Broadway/Sunport (2035 Build and 2035 No Build)
- Appendix G Turning Volume Calculations

## **ACRONYMS**

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ADT	Average Daily Traffic
DOT	department of transportation
DPM	<i>Development Process Manual</i>
HCM	<i>Highway Capacity Manual 2010</i>
LOS	level of service
mph	miles per hour
MRCOG	Mid Region of Council of Governments
MTP	Metropolitan Transportation Plan
MUTCD	<i>Manual on Uniform Traffic Control Devices</i>
NMRX	New Mexico Rail Runner Express
PHV	Peak Hour Volume
ROW	right of way
vpd	vehicles per day

## **EXECUTIVE SUMMARY**

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**URS Corporation** has conducted a Traffic Operational Analysis of Woodward Road from Broadway to 2<sup>nd</sup> Street using future forecast traffic volumes provided by the Mid Region Council of Governments (MRCOG) for both 2015 and 2035. Woodward Road, subject to this analysis, is a two-lane undivided roadway extending 0.6 miles west from Broadway and intersecting with 2<sup>nd</sup> Street at its west end in a “T” configuration, with stop control on Woodward Road. 2<sup>nd</sup> Street, like Woodward Road, is also a two-lane roadway with no median or curb and gutter.

Traffic volumes on Woodward Road are forecast to increase when the Sunport Boulevard Extension project between I-25 and Broadway is completed and opened to traffic. The average daily traffic volume forecast on Woodward Road in 2015 with the opening of the Sunport Boulevard Extension, is 11,260 vehicles per day. The average daily traffic volume forecast on Woodward Road in 2035 is 21,720 vehicles per day.

2015 traffic on Woodward Road (and some years beyond 2015) can be accommodated with the existing two-lane roadway section, operating at an acceptable level of service (LOS) D or better. 2035 traffic on Woodward Road will require the widening of Woodward to a four-lane roadway section, in order to operate at a LOS D or better.

The ultimate four-lane typical section for Woodward Road would contain two lanes in each direction, bike lanes and sidewalks in each direction, no median, and can generally be constructed within the existing right of way. Other related improvements to the intersection of Woodward Road and 2<sup>nd</sup> Street would also be needed.

Based on the results of this analysis, a traffic signal should be installed at the intersection of 2<sup>nd</sup> Street and Woodward Road to accommodate 2015 traffic. Although hourly traffic counts are typically used to address and determine if traffic signal warrants are met, various state departments of transportation have adopted daily volume guidelines for warrant consideration. (The New Mexico Department of Transportation (NMDOT) does not have daily volume warrant threshold guidelines.) Based on these other state DOT daily volume threshold numbers, the ‘Minimum Vehicle Volume’ warrant for a traffic signal is satisfied with 2015 traffic forecasts.

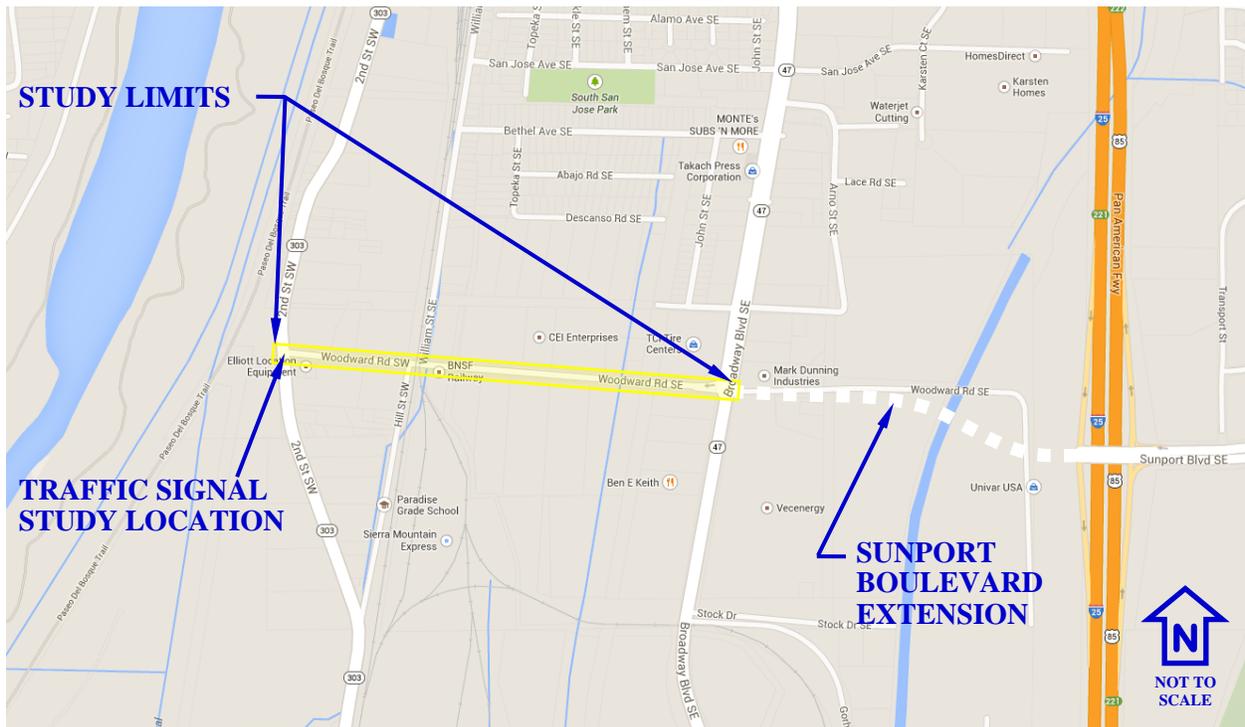
Along with the introduction of a traffic signal at the intersection of Woodward and 2<sup>nd</sup> Street, other intersection geometric improvements are also needed to meet an acceptable operating level of service in 2015. These include the following:

The current westbound approach lane on Woodward to the 2<sup>nd</sup> Street “T” intersection will become a dedicated left turn lane for westbound to southbound traffic. Widening to the right or outside of the westbound approach lane will be necessary approaching the “T” intersection, to add a lane for either left or right turning, providing an effective double left turn from westbound to southbound. Widening of the southbound roadway departing the intersection on 2<sup>nd</sup> Street will also be required for the addition of another lane, in order to receive the two left turning lanes.

## 1.0 INTRODUCTION

The following report addresses a Roadway Capacity and Traffic Operational Analysis study of Woodward Road from 2<sup>nd</sup> Street to Broadway Boulevard in Albuquerque, New Mexico, as part of Bernalillo County’s Sunport Boulevard Extension Project. This study is a planning-level analysis to determine the improvements required on Woodward Road given the forecast increase in traffic volumes on this roadway segment as a result of the extension of Sunport Boulevard from I-25 to Broadway, and the resultant link that is provided between Woodward Road and I-25. Specifically, this study will assess the following: (1) the necessary number of lanes on Woodward Road to accommodate future design traffic volumes, (2) the roadway typical cross section needed on Woodward Road, (3) the need for a traffic signal at the intersection of Woodward Road/2<sup>nd</sup> Street, and (4) the minimum level of roadway improvements needed on Woodward Road to accommodate the initial “opening year” traffic volumes. This study will consider the forecast future 2035 “build scenario” traffic volumes as the basis for laneage, typical section and signalization relative to items 1, 2, and 3. The need for minimum improvements (item 4) and the traffic signal will also be analyzed for the projected 2015 “opening year” traffic volumes.

**Figure 1: Study Area**



## **2.0 EXISTING CONDITIONS**

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The study segment of Woodward Road extends from the STOP controlled “T”-intersection at 2<sup>nd</sup> Street approximately 0.6 mile east on a tangent alignment to the signalized intersection at Broadway Boulevard. This segment lies entirely within the Albuquerque city limits. It currently consists of two 12-foot lanes and variable width shoulders, which are generally paved as part of the several adjacent business frontages. A 125-foot long raised median island exists on Woodward Road at the Broadway Boulevard intersection. Otherwise there is no curb, gutter, median, or storm drainage system on Woodward Road. The regulatory speed is posted at 30 miles per hour (mph) in the westbound direction just west of Broadway Boulevard. No regulatory speed is currently posted on the eastbound direction. 2<sup>nd</sup> Street is posted at 35 mph in both directions. There is currently no street lighting on either street. Based on review of Bernalillo County GIS and assessors data, the apparent right of way (ROW) width on Woodward Road is 80 feet.

There is an at-grade mainline railroad crossing on Woodward Road located approximately 900 feet to the east of 2<sup>nd</sup> Street. The four tracks at the crossing include one mainline track operated by the New Mexico Rail Runner Express (NMRX), two siding tracks, and one industrial spur track. There are currently 16 NMRX and two Amtrak train movements at this crossing each day. BNSF also operates some freight trains on these tracks.

The existing (2012) Average Daily Traffic (ADT) volume on Woodward Road is 5,900 vehicles per day (vpd) according to the MRCOG *2012 Traffic Flow Map for the Greater Albuquerque Area*. This same map shows that the existing traffic volumes on 2<sup>nd</sup> Street are 4,600 vpd north of Woodward Road and 8,000 vpd south of Woodward Road. The MRCOG *Current Roadway Functional Classification System for the Albuquerque Metropolitan Planning Area* dated March 25, 2010 classifies Woodward Road as an Urban Collector. 2<sup>nd</sup> Street is classified as an Urban Minor Arterial. (Refer to Appendix A for MRCOG’s map of Current Roadway Functional Classifications.)

There are no sidewalks or bicycle facilities on Woodward Road. Bernalillo County is currently constructing a multi-use ped/bike trail connection just west of the intersection of Woodward Road/2<sup>nd</sup> Street. This trail is expected to be opened later this year (2014) and will provide a direct connection between the north-south Paseo del Bosque Trail and Woodward Road.

## **3.0 FUTURE TRAFFIC VOLUMES**

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Projected future traffic volume information was provided by MRCOG (refer to Appendix B). These data were obtained from MRCOG’s 2035 Metropolitan Transportation Plan (MTP) travel demand model. (Previous traffic analysis work done on the Sunport Boulevard Extension and documented in the *Alignment Study NMDOT Combined Phase A/B Report* [URS, 2010] utilized traffic forecasts for the design year of 2030, based on MRCOG’s 2030 MTP travel demand

model.) Model output data provided by MRCOG included directional AM and PM peak hourly volumes and directional ADT for both the 2015 and 2035 build scenarios as shown in Appendix B and as summarized in Table 1 and Table 2 below.

**Table 1: Projected Traffic Volumes – 2015 Build Scenario**

Roadway Segment	2015 ADT (vpd)		2015 AM Peak Hour Volume (vph)	2015 PM Peak Hour Volume (vph)
	Directional	Total		
<b>2<sup>nd</sup> Street</b> North of Woodward Road	NB	3,150	NB 447 SB 258	NB 413 SB 427
	SB	2,900		
<b>Woodward Road</b> East of 2 <sup>nd</sup> Street	WB	5,370	WB 239 EB 559	WB 552 EB 445
	EB	5,890		
<b>2<sup>nd</sup> Street</b> South of Woodward Road	NB	7,660	NB 818 SB 308	NB 673 SB 795
	SB	6,890		

**Table 2: Projected Traffic Volumes – 2035 Build Scenario**

Roadway Segment	2035 ADT (vpd)		2035 AM Peak Hour Volume (vph)	2035 PM Peak Hour Volume (vph)
	Directional	Total		
<b>2<sup>nd</sup> Street</b> North of Woodward Road	NB	9,240	NB 1,006 SB 239	NB 561 SB 1,009
	SB	8,110		
<b>Woodward Road</b> East of 2 <sup>nd</sup> Street	WB	10,780	WB 378 EB 1,139	WB 1,191 EB 663
	EB	10,940		
<b>2<sup>nd</sup> Street</b> South of Woodward Road	NB	18,400	NB 2,066 SB 539	NB 1,059 SB 2,036
	SB	17,120		

## 4.0 COLLISION DATA

There are no collision data available for analysis. The scope of this analysis has not included a review of crash history or mitigation.

## 5.0 ROADWAY TRAFFIC OPERATION FOR 2015 BUILD SCENARIO

For the purpose of planning-level analyses used to determine the overall laneage of a proposed facility, the Transportation Research Board *Highway Capacity Manual 2010* (HCM) includes a table of generalized daily service volumes for urban street facilities. The tabular ADT values are based on a set of default values for the input variables which would otherwise go into a more precise operational analysis. These default assumptions are discussed in HCM Chapter 16 – Urban Street Facilities, Part 3 – Applications. HCM Exhibit 16-14 gives a set of generalized

daily service volumes for number of lanes and level of service (LOS) based on the inputs of K-factor ('peak hour' factor), D-factor ('directional distribution' factor), and Posted Speed.

Calculation of these factors for Woodward Road using the 2015 Build Scenario projected traffic volumes is as follows:

$$\text{K-factor} = 997 \text{ vph PM Peak Hour Volume (PHV)} / 11,260 \text{ vpd ADT} = 0.09$$

$$\text{D-factor} = 552 \text{ vph PM PHV WB} / 997 \text{ vph PHV} = 0.55$$

$$\text{Posted Speed} = 30 \text{ mph}$$

HCM Exhibit 16-14 ADT thresholds are as follows:

2-lane, LOS C:	5,900 vpd	← 11,260 vpd 2015 ADT
2-lane, LOS D:	15,400 vpd	
2-lane, LOS E:	19,900 vpd	
4-lane, LOS C:	11,300 vpd	← 11,260 vpd 2015 ADT
4-lane, LOS D:	31,400 vpd	
4-lane, LOS E:	37,900 vpd	

Thus the expected LOS for Woodward Road in the 2015 Build Scenario is LOS D as a two-lane facility or LOS C as a four-lane facility. As per the City of Albuquerque *Development Process Manual* (DPM), "The minimum standard level of service shall be LOS D on roadway elements where the level of service is controlled by traffic control devices, e.g. signalized or stop controlled intersections." Therefore the minimum acceptable roadway section would be a two-lane, as currently exists without additional widening for added lanes.

## **6.0 ROADWAY TRAFFIC OPERATION FOR 2035 BUILD SCENARIO**

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Conducting the same HCM planning-level analysis as above for Woodward Road using the 2035 Build Scenario projected traffic volumes is as follows:

$$\text{K-factor} = 1,854 \text{ vph PM PHV} / 21,720 \text{ vpd ADT} = 0.09$$

$$\text{D-factor} = 1,191 \text{ vph PM PHV WB} / 1,854 \text{ vph PHV} = 0.65$$

$$\text{Posted Speed} = 30 \text{ mph}$$

HCM Exhibit 16-14 ADT thresholds are as follows:

2-lane, LOS C:	5,400 vpd	
2-lane, LOS D:	14,100 vpd	
<u>2-lane, LOS E:</u>	<u>18,300 vpd</u>	← 21,720 vpd 2035 ADT
4-lane, LOS C:	10,300 vpd	
4-lane, LOS D:	28,800 vpd	← 21,720 vpd 2035 ADT
4-lane, LOS E:	34,800 vpd	

Thus the expected LOS for Woodward Road in the 2035 Build Scenario is LOS F as a two-lane facility or LOS D as a four-lane facility. Based on this forecast traffic volume and the aforementioned DPM reference, roadway widening from the present two lanes to a four-lane section is necessary to meet the minimum level of service requirement, a LOS D.

## **7.0 WOODWARD ROAD TYPICAL CROSS SECTION**

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Based on the above analysis, Woodward Road should be widened to a four-lane cross section to meet traffic demand forecasts for 2035. The DPM defines the minimum requirements for the roadway cross sectional elements. An excerpt from the DPM is included in Appendix C.

**ROW Width:** For a Collector roadway, the DPM requires 73 feet of ROW, or in cases where the roadway in question is on the City’s bikeway system, an additional width of 12 feet is required for bike lanes in both directions. Since Woodward is included on the bikeway system, this would result in a minimum ROW width of 85 feet. The existing ROW width has been estimated from available mapping obtained from Bernalillo County. Although not definitive, the ROW width appears to be approximately 80 to 82 feet. Since the purchase of sliver strips of ROW for widening from 80 to 85 feet is not cost effective and is problematic relative to acquisition times and project schedules, the existing and future ROW for Woodward Road will be assumed to remain as 80 feet. The actual monumented and surveyed width would have to be verified as part of the development of any future design project.

**Bike Facility:** For a Collector roadway, the DPM requires a 6-foot bike lane or 4-foot paved shoulder bikeway (minimum). Six-foot bike lanes have been included in the conceptual layout for the Woodward Road four-lane Ultimate Configuration typical section (refer to Figure 2).

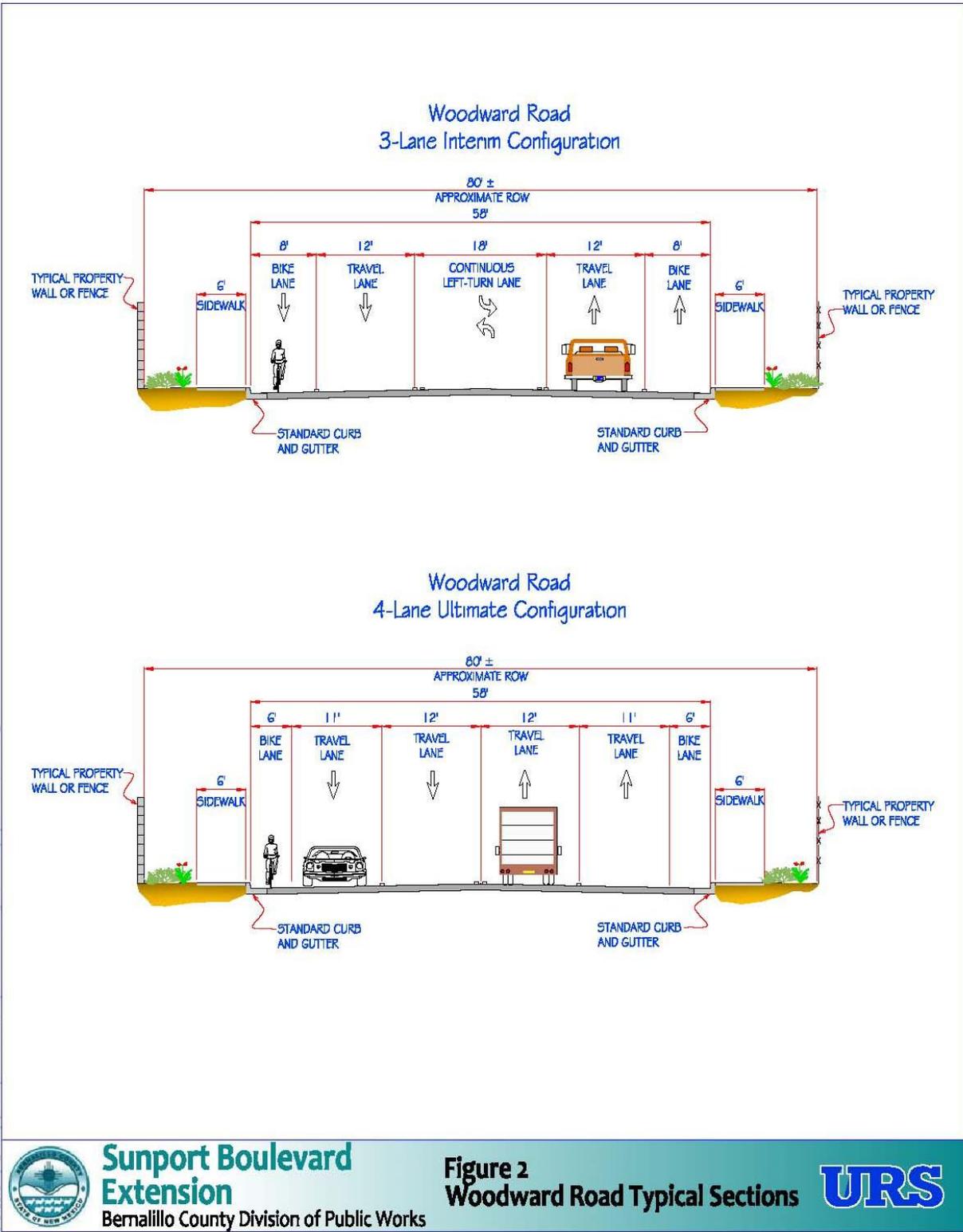
**Minimum Required Sidewalk:** For a Collector roadway, the DPM requires a 6-foot sidewalk with a 6-foot setback from back of curb. Six-foot sidewalks have been included in the conceptual layout for Woodward Road; however, there is inadequate width within the existing 80-foot ROW to provide for a 6-foot buffer. Since the construction of this new roadway section will also require the adjustments (possible reconstruction) of walls and fences along the ROW line, and some tapering of areas behind the sidewalk to blend with existing features and topography, the sidewalk has been shown as adjacent to the roadway curb, buffered from the travel way only by

the bike lane. If during future design surveys, the existing ROW proves to be wider than 80 feet, a buffer may be considered.

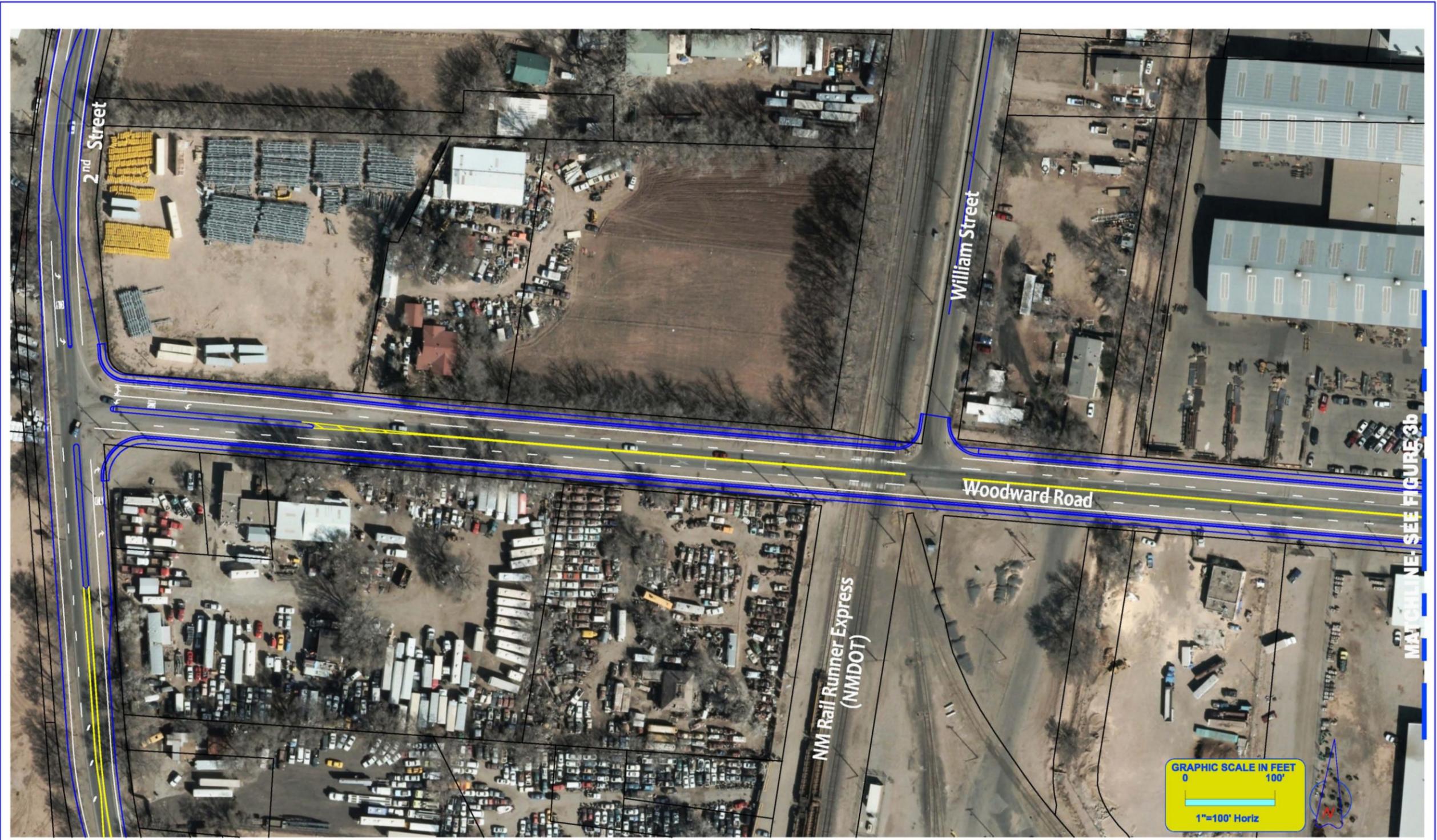
**Required Pavement Width:** For a Collector roadway, the DPM requires 48 feet of pavement width, flowline to flowline. With a four-lane section, two lanes at 11 feet and two lanes at 12 feet, the traveled way width would be 46 feet. With the additional pavement provided for the bike lanes, the overall roadway width, flowline to flowline, included in the conceptual layout is 58 feet.

The conceptual Ultimate Configuration typical section shown in Figure 2 therefore meets the general intent of the DPM, but diverges from it in minor ways considered as acceptable and appropriate in the consideration that this is a reconstructed rather than new section, is located in a developed area, and it avoids the need for additional ROW acquisition. Since traffic volumes at the time of the Sunport Boulevard construction (refer to 2015 traffic volumes shown in Table 1) do not yet warrant the ultimate four-lane section, an alternative three-lane Interim Configuration has also been depicted for information. This three-lane section consists of an initial approach to the pavement marking that would utilize the ultimate constructed widths for the four-lane section. The three-lane section would have a continuous median left turn lane for local access, and wider bike lanes, while being constructed to the same roadway width, 58 feet, as needed for the Ultimate four-lane section.

A plan view layout depicting the four-lane widening of Woodward Road is included in Figure 3. A construction cost estimate of the four-lane widening of Woodward Road has been developed and is included in Appendix D.



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Figure 3a  
Ultimate Woodward Road Improvements (4-Lane Major Collector)



## **8.0 TRAFFIC SIGNAL WARRANT ANALYSIS — INTERSECTION OF WOODWARD ROAD/2<sup>ND</sup> STREET**

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The 2009 Federal Highway Administration *Manual on Uniform Traffic Control Devices* (MUTCD) defines nine *Warrants* for determining whether the installation of a traffic signal is justified at a particular location. The first of these warrants, Warrant 1 – Eight Hour Vehicular Volume, considers the highest eight traffic volume hours of an average day, based on *counts of existing* vehicular traffic volume. However, for the Woodward Road / 2<sup>nd</sup> Street intersection, while the future ADTs and peak hour volumes have been forecast, the actual volume numbers cannot be counted at this time since the present traffic volumes, before the opening of the Sunport Boulevard Extension, are not expected to be close to the warrant threshold numbers. Therefore, the hourly distribution of traffic volumes is unknown.

Neither the City of Albuquerque *Development Process Manual* nor the New Mexico *State Access Management Manual* offer guidelines for assessing future-year traffic signal warrants based on ADT projections. However, several other state departments of transportation (DOTs) do have criteria for the purpose of assessing signal Warrant 1 based on projected future ADT. The following Tables 3 and 4 compare the projected ADTs for the 2<sup>nd</sup> Street / Woodward Road intersection versus the criteria collected from several states.

The laneage assumed at the intersection includes both the existing two-lane section and the future four-lane section on Woodward Road (defined as the minor street) as supported by the analysis above. 2<sup>nd</sup> Street (classified as the major street) is also assumed to be improved to two lanes in each direction on each approach. This is consistent with the MRCOG 2035 MTP, which includes widening of 2<sup>nd</sup> Street south of Woodward Road from two to four lanes. The warrant volumes in the following tables can also be viewed in the current condition, with the single approach lanes as well.

**Table 3: Traffic Signal Warrant Screening Based on Projected Future ADT**

Condition A: Minimum Vehicular Volume							
Number of Approach Lanes		Minimum Required EADT (Urban)		Intersection Volumes			
				2015 BUILD		2035 BUILD	
Major Street	Minor Street	Major Street (both approaches)	Minor Street (highest approach)	Major Street (both approaches)	Minor Street (highest approach)	Major Street (both approaches)	Minor Street (highest approach)
1	1	8,000 (CA) 8,000 (VA) 8,300 (IN) 8,850 (OR) 10,000 (PA)	2,400 (CA) 2,400 (VA) 2,300 (IN) 2,650 (OR) 3,000 (PA)				
2 +	1	9,600 (CA) 9,600 (VA) 10,000 (IN) 10,600 (OR) 12,000 (PA)	2,400 (CA) 2,400 (VA) 2,300 (IN) 2,650 (OR) 3,000 (PA)				
2 +	2 +	9,600 (CA) 9,600 (VA) 10,000 (IN) 10,600 (OR) 12,000 (PA)	3,200 (CA) 3,200 (VA) 3,000 (IN) 3,550 (OR) 4,000 (PA)	10,560 (Criteria met except for PA)	5,370 (Criteria met)	26,510 (Criteria met)	10,780 (Criteria met)
1	2 +	8,000 (CA) 8,000 (VA) 8,300 (IN) 8,850 (OR) 10,000 (PA)	3,200 (CA) 3,200 (VA) 3,000 (IN) 3,550 (OR) 4,000 (PA)				

**Legend of State DOT Criteria Presented in Table**

- CA:** CA-MUTCD Fig. 4C-103 (CA), January 13, 2012
- VA:** Virginia Supplement to the 2009 MUTCD, Table 4C-V1, May 2011
- IN:** Indiana 2011 MUTCD Revision 1, Table 4C-2, November 2011  
*(Guideline in the Indiana MUTCD is based on both approaches on the Minor Street. As the study intersection is a T-intersection, these tables show one half of the volume criteria for the Minor Street.)*
- OR:** Oregon DOT PSW Form, February 2009
- PA:** Pennsylvania Code §212.302. Traffic-Control Signals

**Table 4: Traffic Signal Warrant Screening Based on Projected Future ADT**

Condition B: Interruption of Continuous Traffic							
Number of Approach Lanes		Minimum Required EADT (Urban)		Intersection Volumes			
				2015 BUILD		2035 BUILD	
Major Street	Minor Street	Major Street (both approaches)	Minor Street (highest approach)	Major Street (both approaches)	Minor Street (highest approach)	Major Street (both approaches)	Minor Street (highest approach)
1	1	12,000 (CA) 12,000 (VA) 12,500 (IN) 13,300 (OR) 15,000 (PA)	1,200 (CA) 1,200 (VA) 1,150 (IN) 1,350 (OR) 1,500 (PA)				
2 +	1	14,400 (CA) 14,400 (VA) 15,000 (IN) 15,900 (OR) 18,000 (PA)	1,200 (CA) 1,200 (VA) 1,150 (IN) 1,350 (OR) 1,500 (PA)				
2 +	2 +	14,400 (CA) 14,400 (VA) 15,000 (IN) 15,900 (OR) 18,000 (PA)	1,600 (CA) 1,600 (VA) 1,550 (IN) 1,750 (OR) 2,000 (PA)	10,560 (Not met)	5,370 (Criteria met)	26,510 (Criteria met)	10,780 (Criteria met)
1	2 +	12,000 (CA) 12,000 (VA) 12,500 (IN) 13,300 (OR) 15,000 (PA)	1,600 (CA) 1,600 (VA) 1,550 (IN) 1,750 (OR) 2,000 (PA)				

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*(Guideline in the Indiana MUTCD is based on both approaches on the Minor Street. As the study intersection is a T-intersection, these tables show one half of the volume criteria for the Minor Street.)*
- OR:** Oregon DOT PSW Form, February 2009
- PA:** Pennsylvania Code §212.302. Traffic-Control Signals

Based on the above analysis, the projected future traffic volumes at the Woodward Road/2<sup>nd</sup> Street intersection under the 2035 Build Scenario will meet the MUTCD Warrant 1, Eight Hour Vehicular Volume, for both Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic. Under the 2015 Build Scenario, this planning-level analysis shows that the MUTCD Warrant 1, Eight Hour Vehicular Volume, Condition A – Minimum Vehicular Volume is also satisfied (with the exception of Pennsylvania DOT’s criteria) for two-lane approaches. It should be noted that the warrants have been highlighted above with assumptions of two-lane approaches in all directions; with one-lane approaches (as existing), the warrant thresholds are greatly exceeded.

## **9.0 INTERSECTION TRAFFIC OPERATION FOR 2015 BUILD SCENARIO/ MINIMUM ROADWAY IMPROVEMENTS**

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Traffic volumes using the intersection of Woodward Road/2<sup>nd</sup> Street in the Build scenario in 2015 have been forecast by MRCOG and are shown in Table 1. Bernalillo County has requested that the minimum required improvements to Woodward Road be identified in addition to the ultimate improvements. In order to accommodate these forecast traffic volumes with an acceptable level of service, i.e., at least a LOS D, the following minimum geometric improvements are needed at the intersection, in addition to the traffic signal:

- The current westbound approach lane on Woodward to this “T” intersection will become a dedicated left turn lane for westbound to southbound traffic. In the PM Peak, this movement consists of the heaviest volume (452 vph) of any approach leg or direction.
- Widening to the right or outside of the westbound approach lane will be necessary approaching the “T”-intersection, to add a lane for either left or right turning, providing an effective double left turn from westbound to southbound. (This configuration, widening to the outside or north side of existing Woodward, will provide a more direct westbound to southbound movement to accommodate the heaviest intersection movement.)
- Widening of the southbound roadway departing the intersection on 2<sup>nd</sup> Street for the addition of another lane, in order to receive the two left turning lanes. This will enhance intersection operation, but will require a southbound merge at the end of the dual southbound lanes.
- With the widening of the southbound departing roadway described above, the north side leg of the intersection, i.e. for the southbound approach, would also be widened in order to accommodate the proper alignment of thru lanes across the intersection. With this widening, a southbound to eastbound left turn lane can be developed, separating left turning traffic from the thru traffic in the southbound direction.

With the above improvements, the overall intersection has been analyzed to operate at a LOS B. Output from the *Synchro 8* software analyses are included in Appendix E. (Refer to ‘2015 PM Peak\_Build Option 4 in Appendix E.) A review of the operation of each individual leg of the intersection shows the worst leg being the westbound left turn, operating at LOS C. Other legs operate at LOS A or LOS B. It should be noted that this level of operation is representative of a two-phase traffic signal operation. In other words, the southbound left turn (88 vph in the PM Peak Hour) would not be allocated a separate left turning phase. Left turning traffic would have to turn when gaps are present in the northbound traffic. This situation is best observed over time as traffic volumes develop and increase in the future. At some point in the future, an additional southbound left turn phase would be warranted. With the introduction of this third phase, taking time away from the other phases, the overall level of service will deteriorate to a LOS C (still considered to be a good operating condition). The geometric improvements described above are illustrated on Figure 4.

Prior to arriving at the above conclusions, other lesser alternatives were also analyzed for this location. The introduction of a traffic signal alone was considered with the existing roadway laneage remaining as is. With the heavy volume of westbound to southbound left turning traffic (452 vph PM Peak), this movement is at capacity without geometric improvements. The overall intersection operates at LOS D; however, the left turn movement operates at LOS E (volume / capacity = 1.0). (Refer to '2015 PM Peak\_Build Option 1' *Synchro* output in Appendix E for analysis details.)

In addition, another alternative was also considered, that of adding a right turn lane for westbound to northbound traffic, thus separating the left turning traffic and the right turning traffic. Although this addition was found to improve the situation and the overall intersection operates at LOS C, the westbound to southbound movement continues to operate at LOS E, considered unacceptable since LOS D is the DPM's minimum design level. (Refer to '2015 PM Peak\_Build Option 2' *Synchro* output in Appendix E for analysis details.)

Another scenario for the operation of the Woodward / 2<sup>nd</sup> Street Intersection was also modeled with 2015 traffic volumes. The scenario, labeled as '2015 PM Peak\_Build Option 3', consists of the same general layout as described above as the Option 4 scenario, but without developing the southbound to eastbound separate left turn lane. In this scenario, left turning traffic remains mixed with the thru traffic. An overall LOS B is achieved, with all approach movements at LOS B or C, therefore the southbound left turn lane could be considered as optional or unnecessary, however, as stated above, the widening of the median area is required regardless, for the alignment of the thru lanes.

For comparison purposes, a scenario labeled as '2015 PM Peak\_Build\_Option 4 with SB Left Turn Phase' has also been modeled, to test the operation of the recommended concept with the addition of the third signal phase. With this added phase, the overall intersection level of service drops from B to C. This is also a good operating condition, and this phasing could be considered for initial implementation.

A construction cost estimate of these improvements, i.e., the minimum geometric improvements, has been developed and is included in Appendix D, along with the construction cost estimate for the Ultimate four-lane configuration the right or outside westbound approach lane on Woodward.

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Reconfigured Intersection and New Traffic Signal for Improved Capacity, Safety and Efficiency



Figure 4  
Woodward Road/2<sup>nd</sup> Street - Minimum Intersection Improvements

## **10.0 INTERSECTION TRAFFIC OPERATION FOR 2035 BUILD AND NO BUILD SCENARIOS (SUNPORT/BROADWAY/WOODWARD)**

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Intersection traffic operations have also been modeled using *Synchro* software for the intersection of Sunport Boulevard / Broadway Boulevard / Woodward Road for purposes of air quality “hot spot” analysis. For this air quality impact assessment being developed by others, both the Build and No Build scenarios, with future forecast 2035 traffic volumes, have been modeled. The Build scenario represents the future intersection as carrying two through lanes in each direction (each intersecting roadway being a four-lane roadway), and double left turn lanes in the westbound to southbound, northbound to westbound, and southbound to eastbound directions. The No Build scenario represents the continuation of existing geometric configuration of the intersection, with future 2035 traffic on the existing laneage.

The overall intersection level of service with 2035 forecast traffic volumes and the No Build configuration (as currently exists) is LOS D. Within this overall operation, there are some failing movements however. The eastbound thru lane operates at a LOS F, the northbound to westbound left turn lane also operates at a LOS F, while the southbound thru lane on Broadway operates at a LOS E.

In the future Build configuration with 2035 forecast traffic volumes, the intersection operates at a LOS D overall. Within this overall operation, there remain some less than desired movements operating at LOS E. A key assumption in this analysis has included 11% trucks with the mix of traffic. This high percentage trucks does have a significant impact on operation, since a default value of 2% trucks was also investigated, resulting in no movement being less than LOS D. A general update to design traffic volumes, including obtaining existing vehicle counts, should be considered during the final design of this intersection, with consideration for traffic type and classification, intersection geometry, and signal timing and progression. Results of this modeling are shown in Appendix F.

## **11.0 RECOMMENDATIONS**

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Based on the results of this Traffic Operational Analysis, MRCOG’s future traffic volume forecasts, field observations, and engineering judgment, the following improvements for Woodward Road are recommended:

1. In order to address the immediate impact of traffic volume increase that is forecast in the theoretical “opening year” (2015) of the Sunport Boulevard Extension, certain minimum improvements are required to facilitate acceptable levels of service. Although the existing two-lane roadway is adequate to accommodate the forecast volumes for 2015, the intersection of Woodward Road/2<sup>nd</sup> Street is inadequate. Improvements to the intersection are necessary. These improvements would consist of signalization and widening of the westbound approach and the southbound exit (and southbound entrance) from the intersection as described previously.

2. As the 2035 projected future volumes will clearly warrant a traffic signal at the intersection of Woodward Road/2<sup>nd</sup> Street, but the satisfaction of MUTCD warrants are *probable but should be confirmed* for the 2015 opening year, design should proceed for a traffic signal at this location. The intersection improvements constructed should include the infrastructure for the traffic signal (conduits and foundations, poles and mastarms). Once the Sunport Boulevard extension is opened to traffic, new traffic counts at Woodward Road and 2<sup>nd</sup> Street should be collected to determine if and when the MUTCD traffic signal warrants are satisfied and the signal should be activated and put into operation. The traffic counts for the detailed warrant analysis should include trucks, bicycles, and pedestrians. Signal phasing can also be determined, with regard to the benefits of including the third phase for the southbound to eastbound movement.
3. When funding for longer term improvements to address 20-year design volumes becomes available, design and construction of Woodward Road from 2<sup>nd</sup> Street to Broadway should proceed in order to implement the ultimate four-lane roadway section that would provide at least LOS D in the 2035 design year.