

US 550 CORRIDOR IMPROVEMENTS
DETAILED EVALUATION OF
ALTERNATIVES
PHASE 1-B REPORT
CN | PN A301232
APRIL, 2016



SUBMITTED TO:



PREPARED BY:

Bohannon  **Huston**

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APRIL, 2016

PREPARED FOR:



NEW MEXICO DEPARTMENT OF TRANSPORTATION
CENTRAL REGION DESIGN AND DISTRICT 3
7500 PAN AMERICAN FREEWAY NE
ALBUQUERQUE, NM 87109

PREPARED BY:

Bohannon  **Huston**

7500 Jefferson St., NE
Albuquerque, NM 87109






Jeanette Walther, PE, Project Manager

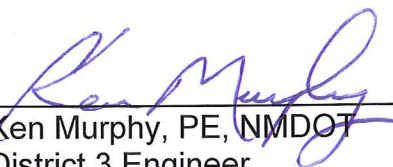
5/31/16
Date

Signature Acknowledgment of Concurrence:




Elias Archuleta, PE, NMDOT
Infrastructure Division, Chief Engineer

6/9/16
Date



Ken Murphy, PE, NMDOT
District 3 Engineer

6/28/16
Date



Priscilla Benavides, PE, NMDOT
Central Region Design Manager

6/9/2016
Date



Joseph Casares, PE, NMDOT
Central Region Design Project Development Engineer

6/1/16
Date

EXECUTIVE SUMMARY

PROJECT BACKGROUND AND OVERVIEW

US 550, from NM 313 to NM 528, is a four-lane roadway that provides the principal east-west travel route through the Town of Bernalillo and is the furthest north river crossing over the Rio Grande in the Albuquerque metropolitan area. The roadway serves local, regional, and statewide transportation functions. As a local roadway, US 550 provides access to Bernalillo's principal retail commercial corridor. An assortment of restaurants, service stations, and stores have frontage along US 550 and depend on the roadway for access and visibility. As a regional roadway, US 550 provides a link between I-25 and residential neighborhoods in Rio Rancho and Corrales. US 550 connects to I-25 which is a key commuter route to employment centers in Albuquerque and Santa Fe. As a statewide transportation route, US 550 is the principal highway between central New Mexico and northwestern New Mexico destinations such as Aztec, Bloomfield, Cuba, Farmington, and the Navajo Nation. US 550, within the study area, crosses several jurisdictions including, the Town of Bernalillo, the City of Rio Rancho, Santa Ana Pueblo, and Sandoval County.

A Phase 1-A - Initial Evaluation of Alternatives Study was completed in September 2014. The purpose of the Phase 1-B Study is to give viable alternatives from the Phase 1-A study a more detailed evaluation in order to develop a preferred alternative that satisfies the purpose and need. In addition to the No-Build, Alternatives for US 550 include:

- A six lane section with a raised median
- A reversible lane section with a center lane used for southbound traffic in the a.m. peak hour and for northbound traffic in the p.m. peak hour.
- A super street section which eliminates several movements at each intersection to allow more green time for through traffic. Signalized median openings are installed to accommodate u-turning traffic.

The three different options considered for the NM 528 Intersection are:

- Continuous Flow Intersection in which left turn movements are removed from the main intersection to an upstream signalized location.
- Super street intersection which eliminates left turn movements at the main intersection. The restricted movements are required to do a U-turn movement 400 – 600' from the main intersection.
- A flyover ramp from northbound US 550 to southbound NM 528.

The three options evaluated for the Rio Grande Bridge include:

- Widening the existing bridge
- Removing and reconstructing the existing bridge
- Building an independent bridge adjacent to the existing bridge

PURPOSE AND NEED

The through volume of traffic of 2000 vehicles per hour in the PM Peak is almost at capacity for a four-lane roadway. With the 2035 projected traffic, all of the signalized intersections will have a level of service of F in the No-Build condition. In addition, the existing pavement is in poor condition and there are few facilities for pedestrians and bicycles. The east end of the corridor is in a developed urban setting with a very dense driveway spacing which adds to the congestion in the corridor. The west end of the corridor has some development on the adjacent lands and is projected to be completely developed in the next twenty years.

US 550 must continue to function for local, commuter, and regional traffic. Improved capacity is needed for the 2035 projected traffic and to enhance the economic development potential in the Town of Bernalillo, Santa Ana Pueblo, Rio Rancho, and the communities in northwest New Mexico. The existing pavement needs to be reconstructed. Facilities are needed for bicycles and pedestrians.

PREFERRED ALTERNATIVE

It was determined during the Phase I-A Study that the NM 528 / US 550 Intersection options could be combined with any of the US 550 mainline alternatives. Similarly, options to widen or replace the existing bridge would work with any of the mainline alternatives. For these reasons, this study was divided into US 550 mainline alternatives, NM 528 intersection options, and Rio Grande (George Renaldi) Bridge options.

Three alternatives were considered for the US 550 mainline, a Six Lanes with Raised Medians Alternative, a Reversible Lane Alternative, and a Super Street Alternative. The preferred alternative is a combination of the Super Street Alternative on the west side of the Rio Grande where the area is still developing and the Six Lane with Raised Medians Alternative on the east side. The study team has worked with Santa Ana Pueblo to ensure that there is good circulation between turnouts outside of US 550. With this circulation, there will be little out of direction travel. The traffic modeling showed that the Super Street Alternative performs much better than the Six Lane Alternative in the PM Peak Hour in the area of the Jemez Dam Intersection. On the east side of the river, the Six Lane with Raised Medians Alternative provides the best local access while meeting the need of the 2035 projected traffic.

Three options were considered for the NM 528 / Tamaya Blvd Intersection, Continuous Flow, Super Street and Flyover. The Continuous Flow Intersection Option is the preferred option. The Continuous Flow operates satisfactorily for both AM and PM peak hours. It requires only a small amount of right-of-way in the intersection corners. It has opportunities for pedestrian refuges and landscaping for visual relief. It has no adverse effects on business access.

Three options were considered for how best to cross the Rio Grande with this project. For each of the options, three criteria were considered – Roadway Geometry, Seismic Capacity, and Life Cycle Costs. The preferred alternative was the Independent Bridge Addition to carry the northbound lanes. The existing bridge will be repurposed to carry the southbound lanes. The new bridge will have a design life of 75 years. If the existing bridges are not rehabilitated and/or retrofitted, they will continue to provide at least 20 more years of the original design life with continued maintenance. The independent addition will be designed according to current specifications with liquefaction and seismic loading being considered.

The additional roadway capacity will provide economic development potential in the Town of Bernalillo, Santa Ana Pueblo, Rio Rancho, and the communities in northwest New Mexico. The combined preferred alternative includes medians which will improve safety by reducing the number of conflict points, act as a pedestrian refuge, and provide a place for landscaping to improve the visual aspect of the corridor. Bicycle lanes and sidewalks will be provided throughout the corridor.

Concurrence with Executive Summary

J. Don Martinez, FHWA Division Administrator

Date

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1	7.3.3	SANTA ANA ROAD	15
1.1	PROJECT AREA AND BACKGROUND	1	7.3.4	SHERIFF’S POSSE ROAD	15
2.0	PURPOSE AND NEED	3	7.3.5	KUAUA ROAD (CORONADO STATE MONUMENT).....	15
2.1	PHYSICAL DEFICIENCIES.....	3	7.3.6	EDMUND ROAD	16
2.2	TRAVEL DEMAND AND CONGESTION.....	3	7.3.7	JEMEZ DAM ROAD	16
2.3	SAFETY	3	7.3.8	NM 528 (PAT D’ARCO HIGHWAY) / TAMAYA BOULEVARD	16
2.4	SYSTEM CONNECTIVITY	3	7.4	BRIDGE STRUCTURES	16
2.5	ACCESS	3	7.4.1	LOAD RATING	16
2.6	ECONOMIC DEVELOPMENT.....	3	7.4.2	SUFFICIENCY RATING	17
2.7	LEGISLATION.....	3	7.4.3	CONDITION RATING	17
3.0	STATEMENT OF PURPOSE AND NEED	4	7.5	DRAINAGE	17
4.0	PUBLIC INVOLVEMENT	4	7.5.1	SUMMARY OF PHASE 1–A REPORT.....	17
4.1	PUBLIC INVOLVEMENT PLAN.....	4	7.5.2	EXISTING OFF-SITE FLOWS.....	18
4.2	PHASE 1–A PUBLIC INFORMATION MEETING	4	7.5.3	EXISTING STORM DRAIN / PONDS EAST OF THE RIO GRANDE	18
4.3	PHASE 1–A STAKEHOLDER MEETINGS.....	4	7.5.4	EXISTING PUMP STATION EVALUATION	19
4.4	PHASE 1–A BUSINESS OWNER MEETINGS	5	7.5.5	RIO GRANDE BRIDGE SCOUR ANALYSIS.....	19
4.5	PHASE 1–B STAKEHOLDER MEETING	5	7.6	UTILITIES	19
4.6	PHASE 1–B PUBLIC INFORMATION MEETING	7	7.6.1	EXISTING UTILITY INFORMATION	19
4.7	WEBSITE AND SOCIAL MEDIA COMMENTS	10	7.6.2	UTILITY ADJUSTMENTS	20
5.0	PREVIOUS STUDIES	12	7.6.3	PLANNED UTILITIES	20
5.1	US 550 FROM PASEO DEL VOLCAN TO NM 313 PHASE 1–A STUDY	12	7.7	LAND USE AND DEVELOPMENT PLANS.....	25
6.0	EXISTING TRANSPORTATION SYSTEM	13	7.8	EXISTING AND NO-BUILD TRAFFIC	26
6.1	PUBLIC TRANSPORTATION SYSTEM	13	7.8.1	EXISTING CONDITIONS CAPACITY ANALYSIS	30
6.2	BICYCLE FACILITIES.....	13	7.8.2	EXISTING CRASH ANALYSIS.....	31
6.3	PEDESTRIAN FACILITIES	13	7.8.3	FUTURE TRAFFIC DEMANDS	33
7.0	EXISTING CONDITIONS	14	8.0	ENVIRONMENTAL.....	35
7.1	TYPICAL SECTION	14	8.1	GEOLOGY	35
7.2	GEOMETRY.....	15	8.2	SOILS.....	35
7.3	INTERSECTIONS	15	8.3	WATER	35
7.3.1	CAMINO DEL PUEBLO.....	15	8.4	VEGETATION	36
7.3.2	CAMINO DON TOMAS	15	8.5	WILDLIFE.....	36
			8.6	PROTECTED SPECIES.....	37
			8.7	CULTURAL RESOURCES.....	38

8.8	AIR QUALITY	38	10.5.3	ENVIRONMENTAL ANALYSIS.....	62
8.9	NOISE.....	38	10.5.4	ADVANTAGES AND DISADVANTAGES	62
8.10	SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE	38	10.6	SUPER STREET ALTERNATIVE.....	63
8.11	LAND USE	39	10.6.1	TRAFFIC ANALYSIS	69
8.12	FARMLAND	40	10.6.2	DRAINAGE ANALYSIS	72
8.13	VISUAL RESOURCES.....	40	10.6.3	ADVANTAGES AND DISADVANTAGES	72
8.14	SECTION 4(F).....	41	10.7	VISSIM MODEL SUMMARY FOR ALL ALTERNATIVES	73
8.15	HAZARDOUS MATERIALS.....	41	10.8	COMPARISON OF US 550 ALTERNATIVES.....	74
9.0	ACCESS MANAGEMENT	42	10.9	EVALUATION OF ALTERNATIVES – RIO GRANDE (NO. 8537 & 8540)	75
9.1	DRIVEWAY SPACING AND ACCESS CONCEPTS.....	42	10.9.1	OPTION ONE – WIDEN THE EXISTING BRIDGE.....	75
9.2	MEDIANS.....	43	10.9.1.1	Roadway Geometry	75
9.3	ADJACENT ROAD NETWORK.....	44	10.9.1.2	Seismic Capacity	75
9.4	ACCESS ALIGNMENT.....	44	10.9.1.3	Life Cycle Costs.....	76
10.0	DETAILED EVALUATION OF ALTERNATIVES.....	44	10.9.2	OPTION TWO – REMOVE AND RECONSTRUCT THE EXISTING BRIDGE	76
10.1	SIMULATION MODELING OF DESIGN ALTERNATIVES.....	44	10.9.2.1	Roadway Geometry	76
10.2	DRAINAGE ANALYSIS.....	45	10.9.2.2	Seismic Capacity	76
10.2.1	EVALUATION OF IMPACTS ON DRAINAGE INFRASTRUCTURE.....	45	10.9.2.3	Life Cycle Costs.....	76
10.2.2	OPTIONS TO ACCOMMODATE POTENTIAL INCREASED FLOWS.....	46	10.9.3	OPTION THREE – INDEPENDENT BRIDGE ADDITION.....	76
10.2.2.1	Surge Ponding.....	46	10.9.3.1	Roadway Geometry	77
10.2.2.2	Underground Detention	46	10.9.3.2	Seismic Capacity	77
10.2.2.3	Pump Station Modifications	46	10.9.3.3	Life Cycle Costs.....	77
10.2.2.4	Parallel Storm Drain	46	10.9.4	COMPARISON OF BRIDGE OPTIONS.....	77
10.2.3	MS4 REQUIREMENTS	46	10.10	NM 528 / TAMAYA BLVD INTERSECTION OPTIONS.....	78
10.2.4	GREEN INFRASTRUCTURE (GI) / LOW IMPACT DEVELOPMENT (LID) OPTIONS.....	47	10.10.1	OPTION 1 CONTINUOUS FLOW INTERSECTION	78
10.3	NO-BUILD.....	47	10.10.1.1	Traffic Analysis	79
10.4	SIX LANE WITH RAISED MEDIANS ALTERNATIVE.....	48	10.10.1.2	Drainage Analysis.....	82
10.4.1	TRAFFIC ANALYSIS	53	10.10.1.3	Environmental Analysis.....	82
10.4.2	DRAINAGE ANALYSIS	54	10.10.1.4	Advantages and Disadvantages	82
10.4.3	ENVIRONMENTAL ANALYSIS	54	10.11	OPTION 2 SUPER STREET INTERSECTION	83
10.4.4	ADVANTAGES AND DISADVANTAGES	55	10.11.1	TRAFFIC ANALYSIS	83
10.5	REVERSIBLE LANE ALTERNATIVE	55	10.11.2	DRAINAGE ANALYSIS	83
10.5.1	TRAFFIC ANALYSIS	55	10.11.3	ENVIRONMENTAL ANALYSIS.....	83
10.5.2	DRAINAGE ANALYSIS	62	10.11.4	ADVANTAGES AND DISADVANTAGES	83

10.11.5	OPTION 3 FLYOVER INTERSECTION.....	85
10.11.5.1	Traffic Analysis	88
10.11.5.2	Drainage Analysis.....	88
10.11.5.3	Environmental Analysis	88
10.11.5.4	Advantages and Disadvantages	88
10.12	COMPARISON OF NM 528 INTERSECTION OPTIONS	88
10.13	ENVIRONMENTAL IMPACTS OF CONSTRUCTION ALTERNATIVES AND OPTIONS...	89
10.13.1	GEOLOGICAL IMPACTS.....	89
10.13.2	SOIL IMPACT	89
10.13.3	WATER IMPACTS	89
10.13.4	VEGETATION IMPACTS	90
10.13.5	WILDLIFE IMPACTS	90
10.13.6	PROTECTED SPECIES IMPACTS	91
10.13.7	CULTURAL RESOURCES IMPACTS	91
10.13.8	AIR QUALITY IMPACTS	92
10.13.9	NOISE IMPACTS.....	92
10.13.10	SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE IMPACTS.....	92
10.13.11	LAND USE IMPACTS	93
10.13.12	FARMLAND IMPACTS.....	93
10.13.13	VISUAL RESOURCE IMPACTS.....	93
10.13.14	SECTION 4(F) IMPACTS	93
10.13.15	HAZARDOUS MATERIALS IMPACTS.....	93
11.0	LANDSCAPE MASTER PLAN.....	94
12.0	CONCLUSIONS AND RECOMMENDATIONS.....	94
13.0	REFERENCES.....	95

TABLE OF FIGURES

FIGURE 1 – LOCATION MAP	1
FIGURE 2 – VICINITY MAP	2
FIGURE 3 – AGENCY JURISDICTION MAP.....	2
FIGURE 4 – EXISTING TYPICAL SECTIONS.....	14
FIGURE 5 – TYPICAL SECTION OF EXISTING BRIDGES	16

FIGURE 6 – EXISTING UTILITIES	21
FIGURE 7 – PROPOSED DEVELOPMENT	25
FIGURE 8 – EXISTING 2013 PEAK HOUR TRAFFIC DEMANDS	27
FIGURE 9 – 2013 COUNT DATA WEST OF JEMEZ DAM RD.....	28
FIGURE 10 – 2013 COUNT DATA AT RIO GRANDE (NO. 8537 & 8540) BRIDGE	28
FIGURE 11 – DRIVEWAY DEMANDS BETWEEN JEMEZ DAM RD AND KUAUA RD	28
FIGURE 12 – DRIVEWAY DEMANDS BETWEEN KUAUA RD AND CAMINO DON TOMAS	29
FIGURE 13 – DRIVEWAY DEMANDS BETWEEN CAMINO DON TOMAS AND NM 313 (CAMINO DEL PUEBLO).....	29
FIGURE 14 – PROJECTED MODIFIED 2035 TRAFFIC DEMANDS (MRCOG MODEL).....	34
FIGURE 15 – FUNCTIONAL AND PHYSICAL AREA OF AN INTERSECTION.....	42
FIGURE 16 – OBSTRUCTED ACCESS DUE TO DRIVEWAY SPACING	42
FIGURE 17 – CRASH RATE VS. ACCESS POINTS PER MILE	43
FIGURE 18 – CRASH PERCENTAGES FOR TURNING MOTORIST TO AND FROM THE DRIVEWAY	43
FIGURE 19 – SIX LANE WITH RAISED MEDIAN TYPICAL SECTION.....	48
FIGURE 20 – SIX LANE WITH RAISED MEDIAN ALTERNATIVE	49
FIGURE 21 – REVERSIBLE LANE TYPICAL SECTION	55
FIGURE 22 – REVERSIBLE LANE ALTERNATIVE.....	57
FIGURE 23 – OVERHEAD LANE UTILIZATION INDICATIONS.....	61
FIGURE 24 – SUPER STREET TYPICAL SECTION EAST OF THE RIO GRANDE	63
FIGURE 25 – SUPER STREET TYPICAL SECTION WEST OF THE RIO GRANDE	63
FIGURE 26 – PEDESTRIAN MOVEMENTS IN A SUPER STREET INTERSECTION.....	63
FIGURE 27 – SUPER STREET U-TURN DETAIL	64
FIGURE 28 – SUPER STREET ALTERNATIVE.....	65
FIGURE 29 – GREEN TIME ALLOTMENT BETWEEN EIGHT-PHASE AND FOUR PHASE SIGNALS.....	70
FIGURE 30 – TRADITIONAL PHASING VS. SUPER STREET PHASING	70
FIGURE 31 – CONFLICT POINT COMPARISONS (TRADITIONAL VS. SUPER STREET).....	71
FIGURE 32 – TRAVEL TIME COMPARISON.....	73
FIGURE 33 – OPTIONS FOR PROPOSED BRIDGE TYPICAL SECTIONS	78
FIGURE 34 – PROPOSED RECONFIGURATION OF EXISTING BRIDGE.....	78
FIGURE 35 – CONTINUOUS FLOW OPERATION	79

FIGURE 36 – PHASING FOR CONTINUOUS FLOW INTERSECTION AT NM 528..... 79
 FIGURE 37 – NM 528 / TAMAYA BLVD CONTINUOUS FLOW INTERSECTION OPTION 80
 FIGURE 38 – LANE UTILIZATION WESTBOUND US 550 BETWEEN NM 528 & JEMEZ DAM 81
 FIGURE 39 – EARLY RELEASE PHASE FOR CONTINUOUS FLOW INTERSECTION..... 81
 FIGURE 40 – PEDESTRIAN HYBRID BEACON OPERATION 82
 FIGURE 41 – NM 528 SUPER STREET INTERSECTION OPTION..... 84
 FIGURE 42 – FLYOVER TYPICAL SECTION 85
 FIGURE 43 – NM 528 FLYOVER INTERSECTION OPTION 86
 FIGURE 44 – NM 528 FLYOVER PROFILE 87

LIST OF TABLES

TABLE 1 – BRIDGE CONDITION RATINGS 17
 TABLE 2 – EXISTING CONDITIONS LOS AND CAPACITY ANALYSIS 30
 TABLE 3 – CRASH HISTORY SUMMARY 2009 TO 2011 32
 TABLE 4 – CRASH HISTORY SUMMARY 2009 TO 2011 32
 TABLE 5 – SOILS AND EROSION RISKS 35
 TABLE 6 – RIO GRANDE STREAMFLOW AT ALAMEDA BRIDGE, YEARS 2006 THROUGH 2012
 36
 TABLE 7 – LISTED SPECIES WITH POTENTIAL TO OCCUR WITHIN THE STUDY AREA..... 37
 TABLE 8 – DEMOGRAPHIC CHARACTERISTICS OF AREAS NEAR US 550 STUDY AREA 39
 TABLE 9 – FARMLAND SOILS 40
 TABLE 10 – EXISTING SIGNALIZED INTERSECTION SPACING 42
 TABLE 11 – CONFLICT POINT COMPARISON BETWEEN DESIGN ALTERNATIVES 43
 TABLE 12 – DRIVEWAY SPACING THRESHOLDS PER NMDOT SMM 44
 TABLE 13 – CAPACITY ANALYSIS SUMMARY FOR NO BUILD ALTERNATIVE 47
 TABLE 14 – CAPACITY ANALYSIS SUMMARY FOR SIX LANE ALTERNATIVE 53
 TABLE 15 – CAPACITY ANALYSIS SUMMARY FOR REVERSIBLE LANE ALTERNATIVE 56
 TABLE 16 – CAPACITY ANALYSIS SUMMARY FOR SUPER STREET ALTERNATIVE..... 69
 TABLE 17 – NETWORK DELAY COMPARISON 74
 TABLE 18 – COMPARISON OF US 550 ALTERNATIVES 74
 TABLE 19 – BRIDGE OPTION MATRIX..... 77
 TABLE 20 – COMPARISON OF NM 528 INTERSECTION OPTIONS..... 88

TABLE 21 – GEOLOGICAL IMPACTS 89
 TABLE 22 – SOIL IMPACTS 89
 TABLE 23 – WATER IMPACTS..... 90
 TABLE 24 – VEGETATION IMPACTS..... 90
 TABLE 25 – WILDLIFE IMPACTS 91
 TABLE 26 – PROTECTED SPECIES IMPACTS 91
 TABLE 27 – CULTURAL RESOURCES IMPACTS 91
 TABLE 28 – AIR QUALITY IMPACTS 92
 TABLE 29 – NOISE IMPACTS 92
 TABLE 30 – BUSINESS ACCESS IMPACTS 93
 TABLE 31 – LAND USE IMPACTS..... 93
 TABLE 32 – VISUAL RESOURCES IMPACTS..... 93

APPENDICES

ON DVD AT BACK OF REPORT

APPENDIX A-MINUTES OF PUBLIC INVOLVEMENT
 APPENDIX B-RIO GRANDE (NO. 8537 & 8540) BRIDGE INSPECTION REPORTS
 APPENDIX C-EXISTING DRAINAGE ANALYSIS
 APPENDIX D-RIO GRANDE (NO. 8537 & 8540) EXISTING BRIDGE SCOUR ANALYSIS
 APPENDIX E-2013 TURNING MOVEMENT COUNTS
 APPENDIX F-US 550 CRASH DIAGRAMS
 APPENDIX G-2035 PROJECTED PEAK HOUR DIRECTIONAL TRAFFIC DEMANDS
 APPENDIX H-2035 PROJECTED TURNING MOVEMENTS
 APPENDIX I-TRIP GENERATION CALCULATIONS
 APPENDIX J-MODIFIED 2035 TRAFFIC PROJECTIONS
 APPENDIX K-VISSIM LEVEL OF SERVICE SUMMARY TABLES
 APPENDIX L-VISSIM QUEUING OUTPUT
 APPENDIX M-CONSTRUCTION COST ESTIMATES
 APPENDIX N-LANDSCAPE MASTER PLAN

1.0 INTRODUCTION

The US 550 Corridor is a significant local, regional, and commuter roadway operated by the New Mexico Department of Transportation (NMDOT). The US 550 Highway begins at Interstate 25 in the Town of Bernalillo which is located in central New Mexico within Sandoval County (See Figure 1). The highway proceeds northwest into the four corners area and eventually into Colorado.

The study limits are from NM 313 on the east end of the corridor through the NM 528 Intersection on the west end as shown in Figure 2. US 550 is a north-south route. However, this portion of US 550 is oriented in the east-west direction. Therefore, vehicles traveling north will be referred to as “westbound” and vehicles traveling south will be referred to as “westbound”.

A Phase 1–A Initial Evaluation of Alternatives Study was completed in September 2014. The purpose of this study is to give viable alternatives from the Phase 1–A study a more detailed evaluation in order to develop a preferred alternative that satisfies the purpose and need.

1.1 PROJECT AREA AND BACKGROUND

US 550 is a four-lane roadway within the study area that provides the principal east-west travel route through the Town of Bernalillo and is the furthest north river crossing over the Rio Grande in the Albuquerque metropolitan area. The roadway serves local, regional, and statewide transportation functions. As a local roadway, US 550 provides access to Bernalillo’s principal retail commercial corridor. An assortment of restaurants, service stations, and stores have frontage along US 550 and depend on the roadway for access and visibility. As a regional roadway, US 550 provides a link between I-25 and residential neighborhoods in Rio Rancho and Corrales. US 550 connects to I-25 which is a key commuter route to employment centers in Albuquerque and Santa Fe. As a statewide transportation route, US 550 is the principal highway between central New Mexico and northwestern New Mexico destinations such as Aztec, Bloomfield, Cuba, Farmington, the Navajo Nation, and many rural communities between Bernalillo and Bloomfield. US 550, within the study area, crosses several jurisdictions including, the Town of Bernalillo, the city of Rio Rancho, Santa Ana Pueblo, and Sandoval County. A jurisdiction map is shown in Figure 3.

US 550 is heavily used because it is one of the few river crossings in the area. The nearest river crossing south of US 550 is Alameda Boulevard, located approximately 9.5 miles south of US 550. The nearest regional roadway with a river crossing north of US 550 is NM 502, which is located approximately 62 miles north of US 550. The lack of an alternative route results in high traffic volumes on US 550 with a significant percentage of trucks.

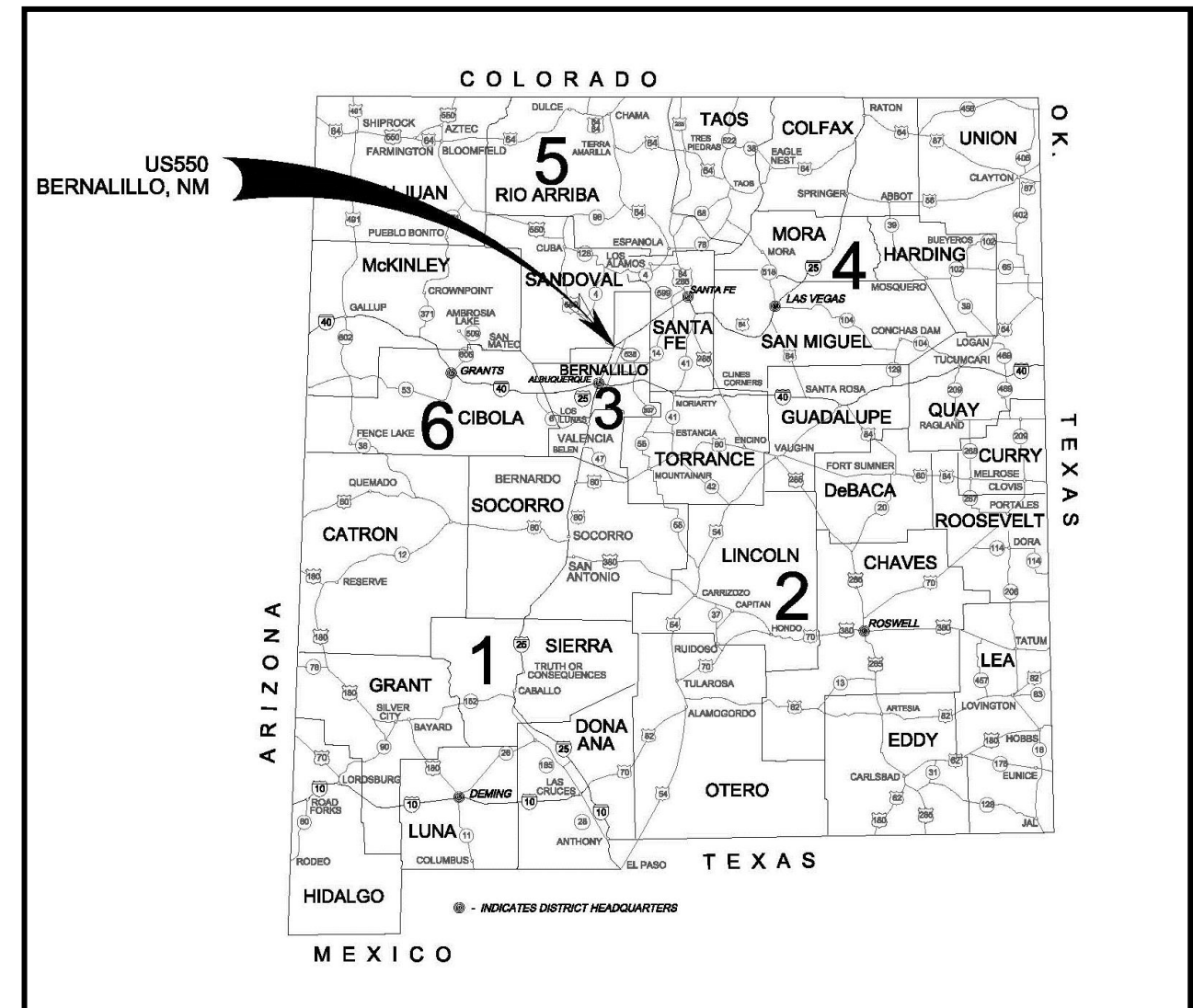


Figure 1 – Location Map

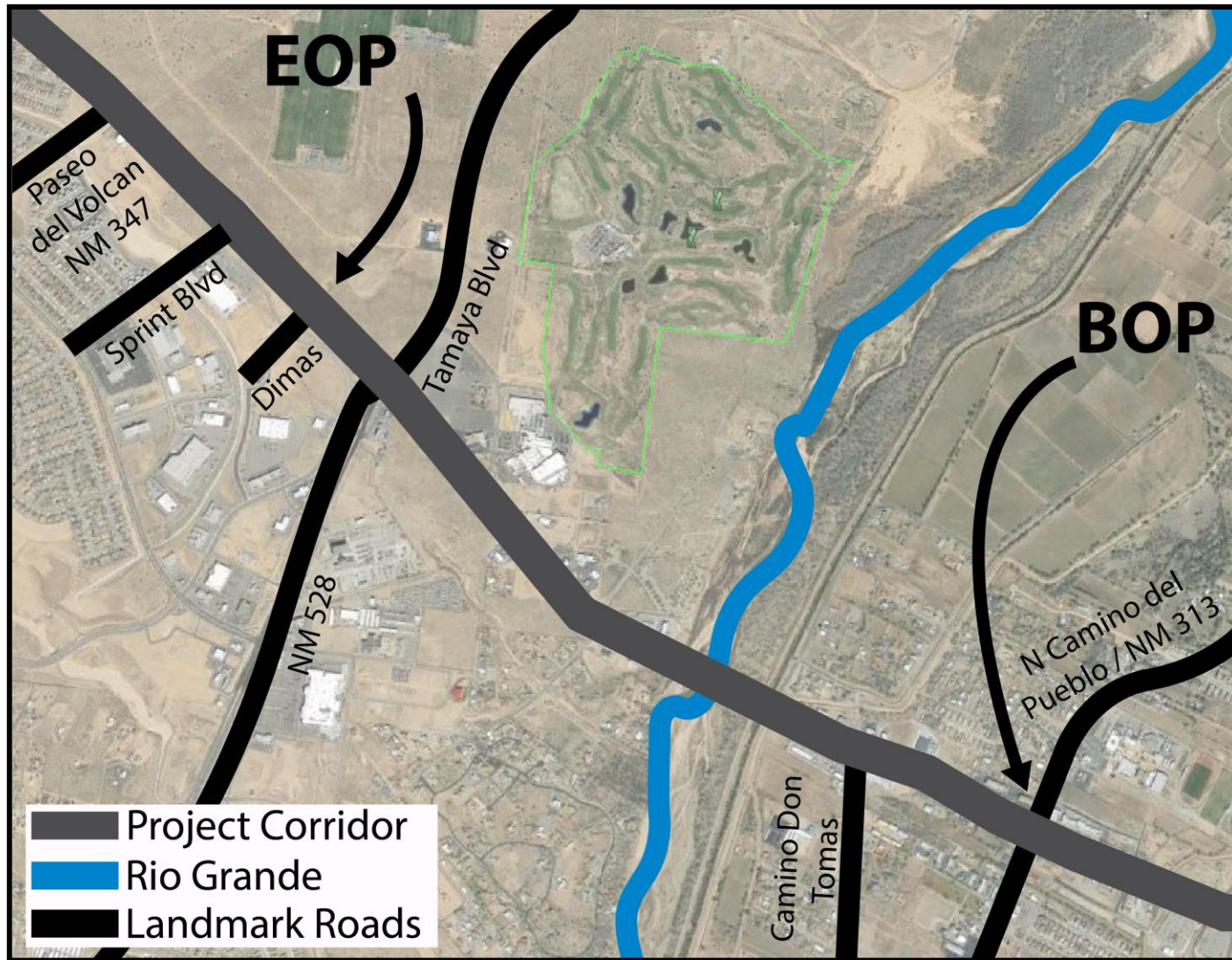


Figure 2 – Vicinity Map

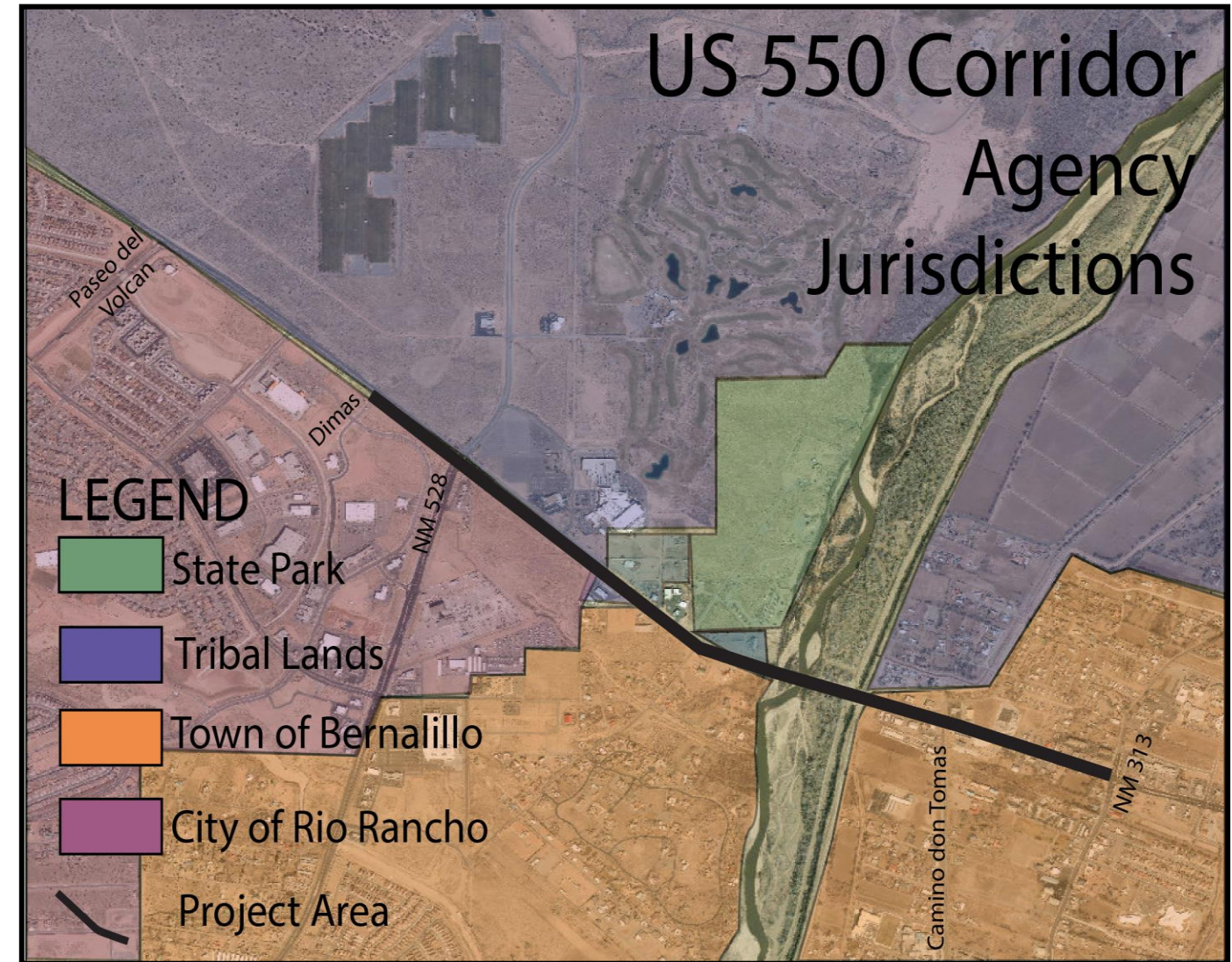


Figure 3 – Agency Jurisdiction Map

2.0 PURPOSE AND NEED

The NMDOT Location Study Procedures identify seven ways in which a project can have purpose and need; physical deficiencies, travel demand and congestion, safety, system connectivity, access, economic development and legislation. Below is a summary of how each of these items applies to the US 550 corridor from NM 313 to NM 528.

2.1 PHYSICAL DEFICIENCIES

The corridor currently has no bicycle facilities and minimal pedestrian facilities even though it is the only river crossing in the area. With the nearest river crossing nine miles away, it would be impractical for bicycles and pedestrians to choose an alternate route. Vehicular counts collected for this project found a total of 68 bicycles per day using US 550.

Another physical deficiency is that US 550 has a very dense driveway spacing east of the river between Santa Ana Road and NM 313 (Camino del Pueblo) which is well beyond that recommended in the State Highway Access Management Manual for an urban area. This driveway spacing leads to additional congestion and lack of capacity during peak periods.

The roadway was recently given a thin overlay to add up to three years of pavement life. The pavement was in failing condition with many potholes and alligator cracking.

2.2 TRAVEL DEMAND AND CONGESTION

All of the signalized intersections operate at an acceptable level of service with existing traffic except for Camino Don Tomas. The northbound left turn movement at that intersection is over capacity and causes the entire intersection to fail. The through volume of traffic of 2000 vehicles per hour in the PM Peak on US 550 is almost at capacity for a two-lane roadway.

With the 2035 projected traffic, all of the signalized intersections will have a level of service of F in the no-build condition.

2.3 SAFETY

A 2009-2011 corridor crash analysis was completed with the Phase 1-A Study. That analysis showed that more than half of the crashes in the corridor were rear end crashes. The most common causes of these crashes were following too close and failure to yield. More than half of the accidents occurred at Camino Don Tomas and Jemez Dam Road. These types of crashes may be reduced by increasing capacity in the corridor and making intersection improvements.

The crash rate for the corridor was determined to be 83.3 per 100 Million Vehicle Miles Traveled (MVMT) in 2011, which was below the statewide crash rate of 167 per 100 MVMT.

2.4 SYSTEM CONNECTIVITY

US 550 is a four-lane roadway that serves local, regional, and statewide transportation functions. US 550 is the principal east-west travel route through the Town of Bernalillo and provides local access to Bernalillo's primary retail commercial corridor and Santa Ana Pueblo. An assortment of restaurants, service stations, and stores, as well as, the Santa Ana Star Casino have frontage along US 550 and depend on the roadway for access and visibility. It is the only river crossing between the Albuquerque Metropolitan Area and Santa Fe. As a regional roadway, US 550 provides a link between I-25, the NM Rail Runner Station, the local park & ride lot located at US 550 and S. Hill Road, and residential neighborhoods in Rio Rancho and Corrales. As such, US 550 is a key commuter route to employment centers in Albuquerque and Santa Fe. As a statewide transportation route, US 550 is the principal highway between central New Mexico and northwestern New Mexico destinations such as Aztec, Bloomfield, Cuba, Farmington, the Navajo Nation, and other rural communities.

2.5 ACCESS

US 550 is one of only nine river crossings in the Albuquerque Metropolitan Area and the only river crossing between Albuquerque and Santa Fe. It provides an important link across the Rio Grande to allow access east and west of the river.

US 550 provides access to large tracts of undeveloped land on the west side of the Rio Grande and access to the commercial center of Bernalillo on the east side of the Rio Grande.

2.6 ECONOMIC DEVELOPMENT

US 550 was widened to four lanes in the late 1990's as part of a program to connect all of the major urbanized areas within the state with a four-lane highway system to promote economic development. Improving the capacity and reducing the congestion on US 550 between I-25 and NM 528 / Tamaya Blvd will enhance the economic development potential in the Town of Bernalillo, Santa Ana Pueblo, Rio Rancho, and the communities in northwest New Mexico.

2.7 LEGISLATION

There are no current legislative mandates that apply to the US 550 corridor.

3.0 STATEMENT OF PURPOSE AND NEED

US 550 must continue to function for local, commuter, and regional traffic. Improved capacity is needed for the 2035 projected traffic and to enhance the economic development potential in the Town of Bernalillo, Santa Ana Pueblo, Rio Rancho, and the communities in northwest New Mexico. The existing roadway needs to be reconstructed. Facilities upgrades are needed for bicycles and pedestrians.

4.0 PUBLIC INVOLVEMENT

The following sections contain a summary of the public involvement in both Phase 1–A and Phase 1–B. In addition to the stakeholder and public involvement meetings, the design team provided information on the alternatives and received comments through the project website, www.keeppmoving550.com. The design team has also been using social media platforms as a way to engage new audiences. The team has utilized Facebook, Twitter, and LinkedIn. All of the profiles are connected to the website and suggest that followers visit the webpage.

4.1 PUBLIC INVOLVEMENT PLAN

Public involvement during Phase 1–A included a public information meeting to identify issues, two stakeholder meetings with local government agencies, and two meetings with local business owners. The public involvement for Phase 1–B included a public information meeting to present the roadway and bridge alternatives, a stakeholder meeting with local government agencies, and a public information meeting to present the preferred alternative.

4.2 PHASE 1–A PUBLIC INFORMATION MEETING

A public meeting was held on November 7, 2013 at the New Mexico Workforce Connection Center in Bernalillo. Thirty-three people attended the meeting. The project team gave a presentation on existing conditions and potential options for resolving transportation issues. The attendees identified the following issues:

- Traffic congestion in general along US 550;
- Plans for the Rio Grande (No. 8537 & 8540) Bridge;
- Signal coordination;
- Concern about Sheriff's Posse Road and Camino Don Tomas intersections;
- Promote alternative transportation modes;
- Percent truck traffic;
- Project schedule;
- Bicycles facilities for commuters;

- Consider 6-foot bicycle lanes throughout corridor;
- Consider a separate bridge for pedestrians, bicyclists, and equestrians;
- Provide a scenic nature connection at river;
- Future gridlock;
- Role of pueblos;
- Need to preserve Bernalillo's small town image;
- Possibility of reversible lanes for commuting traffic;
- Consider a parking lot west of NM 528 for commuters;
- Protect historic areas off of US 550 need protection;
- Vehicle speeds on US 550;
- Consider bus rapid transit; and
- Consider pedestrian crossings with Lightguard technology

4.3 PHASE 1–A STAKEHOLDER MEETINGS

The first project stakeholder meeting was held September 5, 2013. The project management team and stakeholders identified community and social issues important to communities near US 550. Three distinct communities border US 550 within the project area.

- The Pueblo of Santa Ana is a Native American community with a history that predates the arrival of the Spanish in New Mexico.
- Bernalillo was for many years a community that served farmers and travelers in Sandoval County; but in the last 50 years, it has started to resemble a suburban community.
- Rio Rancho is the youngest of the three communities, but it has experienced the fastest growth of any city in New Mexico during the last 30 years.

The Pueblo of Santa Ana, Bernalillo, and Rio Rancho have distinct characteristics and priorities that are being addressed through the project development process. US 550 is a vital transportation artery for all three communities. The Pueblo of Santa Ana, Bernalillo, and Rio Rancho were priority communities for inclusion in public involvement and identification of community and social issues.

A follow-up stakeholder meeting was held May 7, 2014 to give stakeholders a preview of the Phase 1–A Report and the design alternatives that were being assessed. The attendees voiced the following questions, comments and concerns:

- Has an adaptive system been considered?

Response: Yes, adaptive is included in the alternatives. Since, adaptive cannot be efficiently simulated and/or evaluated it is referenced as an option with potential benefits in the 5-10% range.

Since, the capacity issues experienced on US 550 are significantly deficient, adaptive is not considered in the long-term big picture alternatives. Potential exists on this corridor primarily since it has multi-jurisdictional nature and that observation and maintenance crews are not locally present.

- What will be done at Don Tomas?

Response: Due to funding cycles, Don Tomas Highway Safety Improvements are moving forward without the NB capacity improvements.

- What are the assumptions at intersections on through sections?

Response: The 3-lane and 4-lane sections are just in reference to the through traffic lanes.

Intersections will be appropriately sized with auxiliary lanes during the detailed design phase.

- Are the projected number sited using the modified option? (LR)

Response: No. These are the straight 2035 projections. It will be recommended that the detailed design phase consider using the modified projections for the region.

- Preliminary 2040 projected numbers anticipated less growth. The numbers are comparable to 2025 so MRCOG ran 2025 data on the 2035 roadway network. Some numbers change, some don't.

There is opportunity here.

Response: The numbers will likely come down.

- Are we considering other big picture alternatives?

Response: This study is concentrating on the US 550 corridor and will discuss issues and contingencies outside of the study are; however, the goal of the study is to provide direction for the department for the corridor.

- What is the treatment for pedestrians (with the Super Street at intersections)?

Response: Z intersection crossings. This option is more challenging for pedestrians. In many cases, pedestrian crossings are handled outside of the intersection area.

- Flyovers on work on other alternative sections?

Response: Yes, although the combination of alternatives will each have their own challenges both in capacity and right-of-way.

- Demand studies should consider the collection of alternatives.

Response: Agreed within the purview of the study a multi-faceted options will be considered.

However, many of the components of a complete plan are not in the purview of the NMDOT and the study cannot obligate others.

4.4 PHASE 1-A BUSINESS OWNER MEETINGS

Two meetings were held on September 26, 2013 at the New Mexico Workforce Connection Center in Bernalillo and Albuquerque with area business owners. One meeting focused on the issues east of the Rio Grande. The other focused on the issues west of the Rio Grande. Business owner comments, concerns, and questions included the following:

- Business owners were interested in the addition of more pedestrian facilities along the corridor.
- Transit for commuters was indicated as an important aspect of the corridor
- There was interest in where additional signals would be placed along the corridor,
- Some expressed interest in frontage roads.
- Many expressed interest in a separate pedestrian/bicycle facility across the Rio Grande.
- Interest in a signal and realignment of the Sheriff's Posse Road intersection.
- Concern was voiced about sacrificing the sense of community within the Town of Bernalillo versus accommodating commuters.

4.5 PHASE 1-B STAKEHOLDER MEETING

The Phase 1-B stakeholder meeting was held November 18, 2015 for local government agencies. Minutes of the meeting are included Appendix A. The project management team presented the three alternatives, the three options for the NM 528 Intersection, and the four options for the Rio Grande (No. 8537 & 8540) Bridge being evaluated in more detail in Phase 1-B. The environmental process was also described. The following comments, concerns and questions were received during the meeting and as written comment:

- The West Side (HWY 550 west of the River) of the Corridor seems to work well with the Super Street concept. The property at the SE corner of Sherriff's Posse Rd and Hwy 550 only has access via Sheriff's Posse. It is important that access is preserved. Sheriff's Posse Rd. is the only road that connects 550 and NM 528 other than the primary intersection. It is important to recognize that may become more important and capacity of that should be accounted for.

- Were all of these studies conducted within the right-of-way, or do they look at the bigger picture?

Response: It looks at the area of potential impact.

- Have you gotten in contact with the archaeological representatives from the tribes?

Response: Yes, we have done some initial contact, but have not formally started. We have contacted representatives from the offices.

- There is a burial site that needs to be assessed near the northeast corner of NM 528.

Response: That site has been considered. We also understand that the area is out of the right-of-way for this project. Right now the plan is to avoid encroachment on that area.

- Is there an example of another roadway that has a reversible lane? How will it affect traffic? Right now if there is an accident traffic is backed up for a long time.

Response: Yes, there is, we used this strategy on South Eubank going into the Base. There are also examples in Arizona and Texas. There is not a huge increase in accidents, since it controls left turn movements and doesn't allow them during peak times. Most residents are injured by left turn accidents (such as a T-bone etc.). All of the other access points are designed to be right-in right-out with a reversible lane concept.

There is no median which is less safe for pedestrians, since there is no pedestrian refuge. There is also no way to control access, which can cause accidents. This came out of Phase 1-A as a suggested alternative. However, because of access and pedestrian issues we feel this is not the right location for this alternative.

- Can you cross US 550 at Jemez in the afternoon? Is there going to be a signal.

Response: Through traffic will be diverted. In this case a cross movement would take a right turn and then take a U-turn.

- On the Super Street Option, how much time would be required for one complete cycle?

Response: Times could actually be shortened from the current times, even into the 120 second range.

- Santa Ana Road (East side) of the river needs to be looked at because the Pueblo only has two entrances-one off of 313 and the Santa Ana Road. How will ambulances or fire trucks travel?

Response: That is a public, small road that will need access. We will need to look at that.

- There are two MRGCD ditch facilities that need access for maintenance. The levee also needs access for flood management and emergency access. The Army Corps of Engineers, Town of Bernalillo, East SCAFCA and MRGCD are in the process of conducting a study of the levy and it may be raised for flood management.

Response: As we get into the design we will need to talk to MRGCD in more depth.

- Will there be any improvement made on the Old Santa Ana Road?

Response: There are no plans at the moment.

- When you say this alternative is safer for U-turns, is that in terms of fatalities or in terms of accidents?

Response: There is a study from the National Highway Cooperative that talked about this. The summary conclusion says that [a Super Street] where facilities are specifically designed for this the rate of crashes is lower than a traditional left turn system

- Does the analysis take into account the traffic on side streets? It almost looks like 235 or similar routes could become relief routes.

Response: Traffic counts were performed as part of the study.

- Would the whole street have to be shut down to change the structure of the road? Response: One or two lanes in each direction would be maintained during construction.

- Is there any way, on a median or curb, for emergency services to get through the traffic?

Response: For all of these alternatives there is a potential for a bike lane that will continue over the bridge., which could be used by emergency vehicles. Medians will be similar to those out there at the moment so emergency vehicles can jump the curb at slow speeds.

- Are there any plans for lighting? Where are you getting your 2035 projections?

Response: Projections come from MRCOG 2035 projections. This is published every 5 years.

Lighting is under consideration. It will most likely be outside in along the whole corridor. It will comply with the night skies act.

- What is the likelihood of a construction process that will be developed in phases?

Response: The first phase will most likely be bridge construction and will begin next summer. The other phases are uncertain. There is no funding identified for the next phase. However, this is a top priority project.

- Is there a deceleration lane at the turn at Santa Ana?

Response: Right now it has not been decided but it is being studied.

- Does the traffic model account for alternate routes like turns and small roads?

Response: They were taken into account based on traffic counts.

- Turning school buses and Semis have a large turning radius. How do you account for that?

Response: The radius for a turn movement needs to be as large as a truck, so we will design the Super Street U-turns for that.

- Does the model take into account the change in local traffic? If I were a school bus driver or something like that I might go down NM 313 instead of US 550.

Response: The model has taken this into account. We tried to estimate diversions for each alternative. We looked at each driveway and asked what alternate routes they will take. There were trips apportioned to a variety of scenarios. This model allows for rerouting traffic.

- Will the information from this meeting be available?

Response: Yes. The project has a website and all of the information from this meeting will be on it:

www.keepmoving550.com

- At the end of Camino Don Tomas there are two schools and this could cause a lot of conflict. Right now a lot of people are using it as an alternate route.

Response: This alternative will discourage drivers from using alternate routes because the project will provide more capacity on US 550.

- Will this project include signal control?

Response: Yes, the DOT just installed Adaptive signals throughout the corridor so they will work with this scenario.

- Will the existing bridge only be used by eastbound traffic?
- Response: Yes, it will accommodate eastbound traffic with space for a pedestrian park and a bike lane. The existing bridge is designed to last another 20-30 years.
- Do you have any information on the project for Paseo de Volcan to I-40? Did your analysis include that? Construction funds for the project were identified but the project is not listed in the TIP. If it is not accounted for the numbers for the study will be off.

Response: MRCOG did include that in their model, which is the basis for our model.

- Is there a superstreet concept anywhere near us?

Response: Texas, Alabama and others. Look at www.alternativeintersections.org for examples.

4.6 PHASE 1-B PUBLIC INFORMATION MEETING

The Phase 1-B Public Information Meeting was held December 17, 2015 at the Workforce Solutions Training Center in the Town of Bernalillo. 62 people attended the meeting. The project team presented the US 550 Alternatives and NM 528 Intersection Options. The following questions and comments were received:

- If I am at Jemez Dam Road and I want to turn East, how do I do that (with the six lane alternative)?

Response: You would have to go to NM 528 and turn around.

- What is the average speed?

Response: We are not entirely certain what it would be in the future designs, but it is designed to match existing speed limits. The traffic moves slowly where there is orange in the model.

- Does this design include the new bridge that is planned?

Response: All the alternatives and their projections include the bridge.

- Is there a possibility to walk across the intersection?

Response: There will be a control at the apex of the turn where pedestrians would cross.

- Is there any concern of storage backing up with the through lane as you are coming South?

Response: Yes, that is a concern that was considered in the model. We included a turn signal that prioritizes the left turn with a few extra seconds of time.

- Where are the lights at 313 and 528? Right now we have very little time to turn there. We need more time to accommodate existing conflicts. Why aren't you looking at Sheriff's Posse, since there will be 300 more people added?

Response: This question will be answered later.

- Is there an example of this, or did you make it up?

Response: There are several examples of these. There is one Super Street in Utah. This will be discussed in more detail later.

- According to the image of the Super Street at Sheriff's Posse, which portion is 400 feet? If traffic is moving 40 mph, doesn't that only leave about 40 seconds to get to the U-turn? Will both lights be going? If they are waiting at the light will they have to wait to turn, making it a 45 second wait? What about accounting for backup? You also have to get over past 5 lanes of traffic, that is dangerous.

Response: There will be signage and traffic on US 550 will be stopped. You will transition and stop at the light. There is a partial signal and you would have to wait for the green light to change. There is a stop control delay. The cycles are one to two minutes, which would allow for a free flow of movement.

- Study after study we should be smart by now. 528 and 550 as you go and turn, the symmetry of the intersection slows traffic down, you should address it. The bridge is named the George Renaldi Bridge, please refer to it with that name. We always think about cost, which leads to lots of little fixes. We need to take a serious look and really do something this time. There will be congestion so let's look at it and really fix this, it is our only corridor.

Response: There have been studies and none have found a solution that meet the needs of every user. The project is designed to meet the 2030 MRCOG projections. The Paseo project was designed to be a \$350 million project but was built for \$90 million. Both projects are a challenge and will require ingenuity and creativity to be completed successfully.

- If I am leaving Santa Ana road at the bridge will I be able to take a left? Will I have to cross the bridge to turn around to go to Sonic? Can I do a U-turn at the Tractor Supply store? As a member of the tribal council, I don't believe this will work for us.

Response: That is correct.

- I have to trust the engineering expertise of the project team, because that is why you were chosen. The US 550 project was awful for years, as far as construction is concerned, and the previous engineers are to blame. How can I trust that you won't do that? I have not heard any discussion on mitigation of conflicts to protect businesses, relief roads, local businesses, and residential streets. Finally, isn't the wait time on the corridor with a no-build scenario ten minutes, and the wait for the scenarios six minutes? Isn't that only a reduction of four minutes? Are we spending all of this money for a reduction of four minutes? Finally, is there any communication between the area businesses and the project team.

Response: The first phase of the project will be the river bridge which will not impact existing traffic lanes. Nothing can be guaranteed in the next 15 years, however it is fairly certain that something will happen. The bridge will happen first and access to businesses will be managed. The team will build access during construction in accordance with the New Mexico State Highway Access Management Manual, which will focus on access to the community. Before the project is implemented there will also be an Access Management Plan developed and nearly all of the driveways will be left with access. It will be a reduction of four minutes for each of the 45,000 people that use the corridor a day. This meeting is being held as a means of communicating with the community and area businesses. After this meeting an alternative will be chosen and then the team will begin to reach out to area businesses along the corridor by April, 2016.

- If I am on Don Tomas on a bike, what should I do to take a left turn? What about 528?

Response: You would take the left turn lane if you are an advanced rider. If you are a family rider you would use the pedestrian facilities. NM 528 would be a more complicated situation, so bicyclists would have to use the pedestrian facilities.

- I counted 6 more lights on the Super Street option. That seems more complicated, why would that be more efficient? I am concerned about quality of life in Bernalillo. I live about a mile north of US 550 and traffic has gotten worse. Is there any way to mitigate noise with a wall or berm, either immediately or as part of this project? Is there a preference for the Super St. option?

Response: Signals are paired and work as a system. The center two and outer two lights function as "one brain" that work at the same time. There will be lights at Don Tomas, Kuaua, Twin Warrior and possibly one more, not a large addition to the current lights. As part of the environmental process there will be a noise study conducted on the houses closest to the corridor. If you would like the project team can also do noise readings at your house. However, a noise wall is only effective if it is continuous, cutting off access to area businesses. There is currently no preference between scenarios, however there may be some personal preferences between project members.

- 26-46,000 vehicles go in each direction? Do you have projections for up to 2035? Where is the funding for this project coming from?

Response: MRCOG projects about 70,000 cars at the bridge in 2035. Right now there are about 45,000 vehicles, so that is a large increase. The project will cost between 25 and 35 Million dollars.

- I am concerned that Paseo del Vulcan will be a freeway for dumping traffic onto US 550. Have you considered that?

Response: That is important because it affects this and other corridors. Right now it is not accounted for in the model, since it will not be developed for a long time. If it does happen during project development it will be incorporated into the model. The planned expansion of the bridge will help accommodate that.

- Why was this corridor chosen as a trial location for the Super Street idea? Also, I haven't heard anything about emergency vehicles.

Response: This corridor was chosen for improvements because of congestion. The Super Street concept was considered because it can incorporate more capacity and keep a narrow lane. The Super Street concept would be the first in the State, but not nationally. The medians have a 6-inch curb, so vehicles can jump the curb. The bike lanes on the shoulder can also be used for emergency vehicles. The bridge is tight, so it will be important that vehicles can get on shoulders. Incident management is critical for this area.

- What is wrong with the existing bridge, anyways? I think the noise is caused by cars stopping and going at intersections. Will the noise be affected by the different scenarios?

Response: The bridge is old, but will last for at least another 20 years. The new addition will accommodate projected traffic as well as allow for traffic to be diverted in 20 years when the existing bridge is under construction. A noise analysis had not been conducted, but will be done as part of the environmental process. However, with more capacity there will be reduced delays and less noise from stopping and starting vehicles.

- Comments from the Mayor of Bernalillo-The town has met with consultants with for DOT and they know how important the corridor is to the Town. The Lowest bidder requirement is bad legislation because it requires that the cheapest project is developed, as opposed to the best project. Please let your legislators know this policy is not preferred.

The Town of Bernalillo is not exclusively on the East side of the bridge, there are resident on both sides and the project needs to prioritize the needs of the Town through a comprehensive approach. We also need to take a comprehensive approach towards business access to ensure that access will be taken seriously.

- We also need to look at changing the way people see transportation. What about a pilot project or incentive to encourage carpooling and public transportation? The Town has asked for an economic analysis of how the project will affect our businesses. As far as emergency vehicles are concerned, I am concerned about an accident while traffic is backed up; how will vehicles get around traffic? I would also like to discuss Paseo de Vulcan because I perceive a full-court-press to make the project happen from someone at the City of Albuquerque. It seems foolish not to consider it in the design. From the point-of-view of the town, a no-build option is still on the table. I do want to compliment the team, as they have met with the Town repeatedly. What are the range of costs associated with the project? What are the next steps in this project?

Response: The project will cost between 25 and 35 million dollars. The bridge will cost 7-10 million. The costs do not include environmental mitigation or right-of-way acquisition. Moving forward we will use the funds identified for the bridge. The team is hoping to receive lots of comments from the presentation that can help with choosing an alternative. During the development of an Access Management Plan the team will reach out to businesses. The team will also continue to meet with leaders from the Pueblo, Town and City. There will be another Public Meeting held around April.

- Thanks to everyone for the presentation and for the Town for informing us about the meeting. The Paseo del Vulcan project needs to be considered as part of the project. It would be useless to build this and then find that it is dated. The Super Street concept is confusing because it changes too much. I wish that construction and design were consistent all over the state. The Exit at San Mateo and I-40 is confusing. I hope we are advised about the next meeting.
- Thank you for notifying me of this meeting. I got an email and I have a business on US 550. I have a question about the schedule-last time there was construction it took a very long time and construction went over schedule. How long will this project take? What determines how much funding you receive?

Response: We will have to procure all of the necessary funding for the project. Construction time depends on if the team is able to get all of the funding at once or if the project will have to be done in phases. Please write a comment about anything that was problematic last time and we can try to avoid it this time. The team will try to minimize switching and keep intersections open. Our funding is dependent on politics, so be sure to let legislators know if you support the project.

- Do you have all of the Right-of-way that you will need?

Response: We won't need any right-of-way for the river bridge project. However, we will need to coordinate with the MRGCD.

- A little while ago you mentioned that the Super Street concept has three lights controlled by "one brain." Can all of the light from I-25 to 528 be synchronized to have progressive lighting? Could we utilize that to increase throughput and reduce traffic?

Response: The corridor is already connected by fiber-optic cable and it flows well, accounting for existing volumes. Another tool for the corridor will be incident reporting that will notify drivers if there is an accident so they can avoid US 550.

- Can the next group please have a PR firm that can keep us informed and have it be pleasant? When the airport was having construction there were nice and humorous signs and visiting during that time was a joy. Wasn't the traffic data from 2012 and back? Would that be different from now because of the Paseo Project? Could a no build option be feasible if traffic control were implemented more effectively? Could we do that now?

Response: Using a PR firm is a nice idea. Data from 2012 and back was used because that was the data available when the project began. The alternatives analysis is based on the year 2035, even for the no-build mode. Have there been any improvements to local traffic in the past 6 months? There was signal coordination implemented around then. There is too much traffic on the road and no amount of coordination can fix it.

Written comments received include:

- I live north of 550 and river and noise is currently too disturbing. Some noise abatement needs to be included in planning of new corridor. This is critical. I am willing to have an assessment of noise done at my house which is north of 550.
- We have a Blake's Lotaburger at 297 US 550, Bernalillo. Will this affect our left-in, left-out ingress, egress? We are trying to understand how these changes will affect our traffic flow in regards to our restaurant.
- Need bicycle lanes on both sides of 550 (especially on the Rio Grande Bridge)! The existing bridge is dangerous for a cyclist to cross. Adding bike lanes will make commuting to the RailRunner Station by bike a lot safer. All designs are better than current road. Problem with Super Street alternative is crossing 550 on a bicycle without lights allowing for crossing straight.
- Please consider moving the left out at Warrior 2 to the south side of Jemez Dam partial signal. This change might improve our internal circulation. (Southern Sandoval Investments Ltd.)
- I am a resident of Bernalillo and attended the meeting held last Thursday evening. I was there along with a full house of other interested folks. Thank you for your time, mapping and hospitality. The findings of your studies were very interesting.

4.7 WEBSITE AND SOCIAL MEDIA COMMENTS

The following comments have been received on the project website:

- As a bicycle safety educator, I'm curious: What are your plans to integrate bicycle routes, pedestrian traffic, and other modes of transportation in this project?

Response: <http://www.keepmoving550.com/documents/>

- US 550 Corridor Project The devil is in the details. Yes, you do have bike lanes and sidewalks in all the proposed alternatives. The problem is the crazy traffic patterns you are going to develop that are at well-traveled-by-bicyclists intersections which will ELIMINATE a traditional straight through. Specifically, Don Tomas, but there are concerns at 528 and Sheriff's Posse Road as well. In other words, to get to the other side of the intersection at Don Tomas, your clearly preferred "Super Street" plan is to have bicycles (with motor vehicle traffic) make a right turn, merge left across 2 lanes of traffic into a U-turn bay, then after making the U-turn, merge right across 2 lanes of traffic over to the bike lane, then make a right turn at the intersection.

Currently bicyclists wait for the light and proceed directly across (simple and mostly safe unless someone runs the light). Oh and by the way, one thing most people do not consider when they look at your documents posted on your web page is there is no planned reduction of the current 40mph speed limit (not that anyone observes it now...many go 50mph+). Your proposed and specifically the clearly preferred "Super Street" plan's sole goal is to move traffic as quickly as possible through the corridor. This is NOT friendly to the local businesses in Bernalillo, the folks on the Pueblo, bicyclists or pedestrians.

- People need to be educated about taking the train and more people need to be demanding Rio Metro transit (bike-bus-train option here) on the northern end of Rio Rancho. We have no bus service from this side of town. I have heard it said in public meetings that there is no demand. But there never will be demand as long as we keep building bigger roads and creating traffic patterns to promote motor vehicle usage at high speeds when very often have these vehicles only 1 person in the vehicle, as they blow through town and never spend money in that town.

Response: Thank you for these comments, they will be taken into consideration.

- As a driver who takes 550 up North, my best suggestion would be to build an alternate route for commuters, travelers, and truckers. I know it would cost a lot of money to build an additional bridge over the river. Perhaps that's where the extra lane can come in. I may be mistaken but there appears to be enough land to build a separate roadway.

Response: Thank you for your comment. It has been recorded and will be taken into consideration as the project moves forward.

- Making Hwy 550 3 lanes on each side through Bernalillo is a horrible idea!!! It will be a complete mess and headache and will only make that road that much more congested and dangerous. The construction will cause businesses located on 550 to lose business and I am sure several will go out of business during the long construction! This isn't rocket science people, it is common sense that making Hwy. 550 6 lanes will only make a big problem that much bigger of a problem and during that construction it will make Alameda, Paseo del Norte and Montano that much slower and congested with traffic too.
- When are the city councils of Bernalillo, Rio Rancho and Albuquerque, and Bernalillo and Sandoval counties and NM DOT going to finally get smart and wake up and realize that this area needs another entirely brand new river crossing from I-25 over to the Westside???? Why aren't you all building one? And why aren't these counties, cities and NM DOT taking care of or properly maintaining and repaving our existing roads??? Why aren't you people paying attention to the horrible road conditions that Paseo del Norte West, Unser Blvd (from Southern to King) and most of Southern Blvd are in?

These 3 roads are riddled with cracks and large potholes and they are becoming dangerous roads to drive on because they are not maintained or repaved properly!! Where are all our tax payer's dollars going?? You people need to learn to be intelligent and proactive and not just reactive about our roads, highways and declining infrastructure conditions in Albuquerque, Rio Rancho and Bernalillo.

- The proposed concept would actually carry the two merge lanes onto 550 and gradually drop the lanes at 1,000 foot or so intervals. This concept would work best if the present traffic light at Jemez Dam Road was moved east along with a new casino entrance road, but one of the merge lanes could be carried all the way to the Warrior gas station where it could become right turn only. I note there is plenty of land available on the south side of 550 for a widening in this area. This would be a fairly inexpensive option and greatly reduce wait time. Recheck your traffic calculations, it should be fairly easy to merge onto 550 volumes unless you are counting the turning/merging traffic as through traffic rather than as a separate stream. Somehow you are overstating the through traffic on 550. This is not much different than the merger of the two lanes of 550 eastbound onto I-25 that was recently constructed. That construction actually merges both the two eastbound and westbound lanes of 550 into one lane at I-25 over a limited length of space. On the second concept the grade separation would take the same space widthwise than the flyover concept. You will need to use vertical retaining walls for either concept to work.

Review the recently built intersection of Paseo del Norte with Jefferson for fitting into tight dimensions. Both grade separation and flyover are probably not worth pursuing due to high cost and the capacity will still be limited by the interchange of 550 and 313. Thanks for your reply. Any of the concepts that widens 550 into six lanes in Bernalillo should solve the problem for the next ten years.

- Why does the 528 flyover option not include a continuous flow from NB 528 to EB 550? Two lanes would be sufficient and the two additional lanes could easily merge into the three lanes of 550 over the quarter mile available before Jemez Dam Road is reached. This would be much better than the current alternative of three right turn lanes at a signalized intersection, particularly if you are going to the expense of a flyover in the opposite direction. You should also consider an additional alternative of a grade separation where 550 is elevated and does not stop. Expense is probably comparable to the flyover (bridge is wider but shorter) and makes things simpler for bikes and pedestrians to cross at grade. In general, the six lane or super street alternatives are best. My preference is for a continuous median to prevent left turns except at traffic lights. The reversible lane approach will be screwed up by drivers who will attempt to use it as a left turn lane.

Response: A double right would probably work if it didn't have to be signalized, however, the two lanes would have to merge into one lane before it could merge into US 550. There is too much traffic for that to work. An interchange with a grade separation was considered during the initial evaluation of alternatives. The alternative was eliminated because it required a lot of right-of-way and there is a historical cemetery on the north side that would be impacted. Please see the Phase 1-A report at Keepmoving550.com.

- While I agree something must be done and I agree the 2nd bridge should improve conditions including safety and access for pedestrians to cross the river, the build design that appeared to be the preferred choice ("Super Street") seems not to be bike/ped/multi-modal user friendly. Intersections of major concern to me as a cyclist riding current routes (that many cyclists utilize) are: 313 & 550, Don Tomas & 550, Sheriff's Posse Road & 550, and 528 & 550. Cyclists need to be able to function as vehicles through these intersections in ALL directions. Current Super Street design does not seem to take that into account and forces cyclists to become pedestrians or take potentially extremely dangerous risks UNLESS the current speed limit through the corridor is dropped to about 25MPH. Simply building bike lanes and sidewalks is not truly being bike/pedestrian/multi-modal user friendly. The entire design flow needs to be experienced from each of those perspective IF we truly want to encourage bike/ped/multi-modal transit development.

Additionally, there needs to be clear and demonstrated consideration of the implications of a Paseo Del Volcan connection PRIOR to committing to a design choice.

- A very big problem is ABQ, Bernalillo, Rio Rancho needs another bridge across the Rio Grande. What is being done to add another bridge across the river?

Response: Thank you for your comment. A 2007 study investigated the possibility of another river crossing in or near Bernalillo. Without the cooperation of one of the Pueblos, the only alternative was a connection from Idalia Road to the South Bernalillo Interchange. The idea has not been pursued further because such a connection would take out many houses on both sides of the river

- I represent two bicycle groups in New Mexico; the New Mexico Touring Society and the Sandoval County Cycling Club, as a bicyclist, I am glad to see bike lanes along US 550 in all of the proposed designs.

My biggest concerns are bicycle safety and the ability to cross US 550 in a reasonable manner. My preferences for the new design are to have the "Continuous Flow" design at NM 528 with the ability for bicyclists and pedestrians to cross US 550 safely. The proposed U-turn traffic bays with the "Super Street" design east of the Rio Grande (west of the Sonic and Blake's) cross the bicycle lanes and create an unsafe traffic conflict between motorists and cyclists. Therefore, I would prefer the traditional six lane road design between the river and NM 313.

- I am a resident of Bernalillo and attended the meeting held last Thursday evening. I was there along with a full house of other interested folks. Thank you for your time, mapping and hospitality. The findings of your studies were very interesting.
- Three Options, two of which are including (and not limited to) a new 3 lane bridge, extensive construction requiring additional right-of-way, traffic lights and a huge improved intersection at 528. The colorful slide that pegged Local Bernalillo vehicle movement at roughly 1/3 of total traffic flow on this roadway was informative. If you lived here, you'd have already figured that out. There was a strong focus on time savings for other folks commuting from/to 528 from our Main Street. Evidently either of the two construction options could possibly reduce their commute time by 4 to 10 minutes. These numbers suggested to one astute observer in the audience that either option would only be an accommodation for the many drivers who rush through our Town twice a day. Little or no benefit to the Town of Bernalillo, residents and business owners. Just more noise from stop & go traffic patterns at the lights. I want to re-run another question from the audience that tackled the presenters: "Have you factored in the impact of future Paseo del Vulcan traffic spilling onto Hwy 550?" The response was: "No, It's too far out!" Not so for Mayor Torres, myself and all other concerned long time members of the Community!

Paseo del Vulcan and its impact MUST be included in any and all studies of the 550 corridor! The idea to "improve" 550 is an extremely important issue that will affect the future of the Rio Grande Valley here. It will terrifically impact the nearby Pueblos, everyone's Culture and especially our beloved Historical Community of Bernalillo, her residents and business owners. An important traffic artery such as this must not end up as a quickly made short term Safer Speedway for single-occupant-daily-drivers! I favor Option 1 as presented at this Meeting, "Do Nothing", at least until we figure out a way to build a sensible future for us all!

Response: Thank you for your interest in the US 550 Corridor Study project. It is great to hear that you were able to attend the meeting last week. Your comment is appreciated and has been recorded. Please let us know if you have any more comments or questions.

- I wondered where this process is currently. I read the two reports on line for Phase 1-A but I wasn't clear about the remaining phases. Could you please enlighten me?

Response: Thank you for your interest in the project. I apologize that I am replying so late, but we are just kicking off the public involvement portion of this project. We are currently in Phase 1-B of the project. The purpose of the Phase 1-B Study is to give viable alternatives from that study a more detailed evaluation in order to develop a preferred alternative that satisfies the purpose and need. We will be holding a Public Outreach meeting this week-on Thursday the 17th at the Workforce Solutions building at 301 Railrunner Avenue in Bernalillo. Please refer to the attached flyer for more information. At this meeting we will be giving an in-depth discussion of the project and proposed alternatives.

- Thanks very much for your reply and the information about the upcoming meeting. In looking at the map and title of the project, the project stops at the intersection with US 528. In Phase I-A, I recall seeing information about the Paseo del Volcan intersection as well as others past that intersection. Is that now part of a different plan or phase?

I ask because a major effort is underway to build Paseo del Volcan in Bernalillo County as well, and it is being promoted as a truck by-pass from I-40 to I-25 heading north. Given that effort, shouldn't the 550 project be taking that into consideration?

Response: The Phase 1-A project went past US 550 because there needed to be a transition back to existing. The traffic analysis has shown that only two lanes are needed westbound past NM 528 so not that much transition area is needed. We should be able to tie this project back in by Dimas Way.

5.0 PREVIOUS STUDIES

The corridor has been studied several times in the past including the following:

The Mid Region Council of Governments (MRCOG) and the NMDOT jointly commissioned a 2007 Phase 1-A Initial Connectivity Study focusing on a long term transportation strategy for the greater regional area surrounding the US 550 corridor. This study reviewed potential general design mitigation from a more regional perspective by assessing the feasibility of creating new east-west corridors north and south of US 550 as well as the potential for constructing improvements on US 550. The study recommended improvements on US 550, as well as, the continued development of a southern corridor.

Additionally, transit improvements were recommended for all alternatives. No specific cross-sections and intersection geometry requirements were given. Recommended US 550 improvements also included frontage roads, a pedestrian bridge across the Rio Grande, and parallel access roads.

NMDOT also commissioned a Phase 1-A Operational Improvement study for US 550 from NM 528 to I-25. The scope of this study was to investigate potential corridor improvements that would mitigate congestions and improve safety. Potential mitigation alternatives included I-25 interchange improvements, corridor widening, signal improvements, access management options, and auxiliary lane improvements. A comparison matrix was provided, as well as, cost estimates for each alternative reviewed.

The NMDOT also had an operational analysis conducted on US 550 from NM 528 to Sheriff's Posse Road in 2011. The study included a warrant study for signalized traffic control at Sheriff's Posse Road, and investigated potential frontage road options that would connect Sheriff's Posse Road to the Jemez Dam Road signal. It was determined that the Sheriff's Posse Road intersection did not warrant signal control at that time.

5.1 US 550 FROM PASEO DEL VOLCAN TO NM 313 PHASE 1-A STUDY

The Phase 1-A study was completed in September 2014. The study evaluated five alternatives for US 550 from Paseo del Volcan to NM 313 including a six lane section, an eight lane section, reversible lanes, a double decker section, and a super street.

The six lane section, reversible lanes, and super street alternatives were carried forward to the Phase 1-B study for further evaluation. Five options were also evaluated for the NM 528 Intersection; a four lane section with triple left turns, a continuous flow, a super street, an interchange, and a flyover ramp from northwest bound US 550 to southbound NM 528. Only the continuous flow, super street and flyover ramp were carried forward to the Phase 1-B study.

The Phase 1–A study recommended several corridor improvements in addition to the roadway widening improvements. These improvements will not meet the 2035 capacity needs addressed with the roadway improvements, but they have the potential to improve the system.

- Locate a new park and ride facility on the west side of the Rio Grande. This park and ride could impact modal choice on US 550 thus freeing up additional capacity.
- Install an adaptive signal system to provide up to 5% capacity improvements throughout a typical day. NMDOT did install this system in the Fall of 2015.
- Construct back access roads between NM 313 to just west of Camino Don Tomas and on the west side of the river as the area develops. This alternative will be further investigated with a separate study to develop an Access Management Plan.
- Implement access management to remove significant amounts of mid-block turning demands which can inhibit progression and increase crash risks.

The Six Lane Alternative and the Super Street Alternative both include a raised median to channelize the left turn movements to specific locations. This should reduce the risk of crashes.

6.0 EXISTING TRANSPORTATION SYSTEM

US 550 is a four-lane roadway that provides the principal east-west travel route across Bernalillo and the furthest north river crossing over the Rio Grande in the Albuquerque metropolitan area. The roadway serves local, regional, and statewide transportation functions. As a local roadway, US 550 provides access to Bernalillo’s principal retail commercial corridor. An assortment of restaurants, service stations, and stores have frontage along US 550 and depend on the roadway for access and visibility. As a regional roadway, US 550 provides a link between I-25 and residential neighborhoods in Rio Rancho and Corrales. I-25 is a key commuter route to employment centers in Albuquerque and Santa Fe. As a statewide transportation route, US 550 is the principal highway between central New Mexico and northwestern New Mexico destinations such as Aztec, Bloomfield, Cuba, Farmington, and the Navajo Nation.



6.1 PUBLIC TRANSPORTATION SYSTEM

The New Mexico Rail Runner Express is a commuter rail operating between Belen and Santa Fe with a stop in Bernalillo. There are two stops in the Town of Bernalillo including one stop located just south of US 550 on the east end of the corridor.

Rio Metro runs three bus routes that stop at the Rail Runner Station in Bernalillo. Route 204 serves the communities of Jemez Springs, Jemez Pueblo, Zia Pueblo, and San Ysidro. Route 202 goes from the Rail Runner Station to Santo Domingo and Cochiti Pueblos. Route 201 goes from the Rail Runner Station to various locations in northern Rio Rancho. Route 8 serves Zia Pueblo and Cuba with connections to other lines serving the Rail Runner Express.

6.2 BICYCLE FACILITIES

US 550 and NM 528 are identified as bicycle corridor routes on the NMDOT bicycle facilities map. US 550 is shown on the Mid Region Council of Governments Long Range Bikeway System map as a future bicycle lane. NM 313 (Camino del Pueblo), on the east end of the corridor, is a future bicycle route on the map. According to their Bicycle Master Plan, The City of Rio Rancho is proposing a bike path along Paseo del Volcan, a bike trail that would run parallel to US 550 (The Jager alignment) from Paseo del Volcan to Sprint Boulevard, and proposed bike lanes along Enchanted Hills Boulevard. There is an existing bicycle path that runs along Enchanted Hills Boulevard.



6.3 PEDESTRIAN FACILITIES

Currently, there is a mixture of 4, 5, and 6-foot sidewalks located on both the north and south side of the corridor from the Rio Grande (No. 8537 & 8540) Bridge to NM 313 (Camino del Pueblo).

There are no sidewalk facilities along US 550 from Paseo del Volcan to the Rio Grande (No. 8537 & 8540) Bridge, where the corridor takes on a more rural characteristic incorporating a 10 to 14-foot wide shoulder on both sides of the road. During the field survey, there were several locations (five along the corridor) where street lights have been placed in the sidewalk thus significantly reducing the effective walking width. Effective sidewalk widths were reduced anywhere from 2.5 to 3.5 feet, which is not compliant with current ADA or PROWAG guidelines.

New access ramps have been constructed on the south side of the NM 528 Intersection, on the south side of Don Tomas, and at the NM 313 intersection as part of recent projects.

Additionally, pedestrian facilities at intersections were field-reviewed to make sure that pedestrian ramps were in accordance with the latest Americans with Disabilities Act (ADA) and the more recent (PROWAG) requirements. Several deficiencies have been identified with photographs provided in the Transportation and Operations Report:

- The detectable surface at Sprint Blvd appears damaged.

The pedestrian push buttons on the north side of the NM 528 Intersection are on islands without access ramps.

- There is no landing adjacent to some of the push buttons at the Jemez Dam intersection.
- There are some locations (NE corner of Jemez Dam Rd) where existing pedestrian buttons have been placed on the wrong side of the pole making them less accessible to users.
- Pedestrian ramps at the north corners of Camino Don Tomas do not have a landing area.



- None of the existing pedestrian facilities comply with PROWAG requirements for audible or vibro-tactile pedestrian indications.

7.0 EXISTING CONDITIONS

US 550 is four lanes between NM 313 and NM 528. The speed limit on the east side of the river is 40 mph. The speed limit on the west side of the river is 45 mph. The roadway was recently given a thin overlay to add up to three years of pavement life. The pavement was in failing condition with many potholes and alligator cracking. The following sections describe the existing conditions in more detail.

7.1 TYPICAL SECTION

US 550 east of NM 313 including the Camino del Pueblo intersection was recently reconstructed with the I-25 / US 550 Interchange project. The typical section is three lanes in each direction on the east side of the intersection. US 550 eastbound there is a lane pickup from the northbound NM 313 right-turn bay. US 550 westbound the third lane turns into a right-turn bay.

The typical section of US550 between the NM 313 (Camino del Pueblo) intersection and the Rio Grande crossing generally consists of two lanes in each direction, a 16-ft continuous left-turn lane, no shoulders, curb & gutter and sidewalks left and right. Left and right-turn lanes are developed at intersections and major driveways.

The existing bridge over the river consists of two lanes in each direction, an 18-ft median and 2-ft to 4-ft outside shoulders. There is a 5-ft sidewalk on the north side of the bridge.

West of the river from the bridge to the Jemez Dam Intersection the typical section of US 550 generally consists of two 12-ft lanes in each direction, a 16-ft continuous left-turn lane and 10-ft shoulders. Left and right-turn lanes are developed at intersections and major driveways.

The typical section of US 550 between Jemez Dam Road and Paseo del Volcan generally consists of two 12-ft lanes in each direction, a raised median that varies in width and 10-ft shoulders. Left and right turn lanes, acceleration and deceleration lanes are developed at intersections and major driveways. See Figure 4 for a graphical depiction of the existing typical sections.

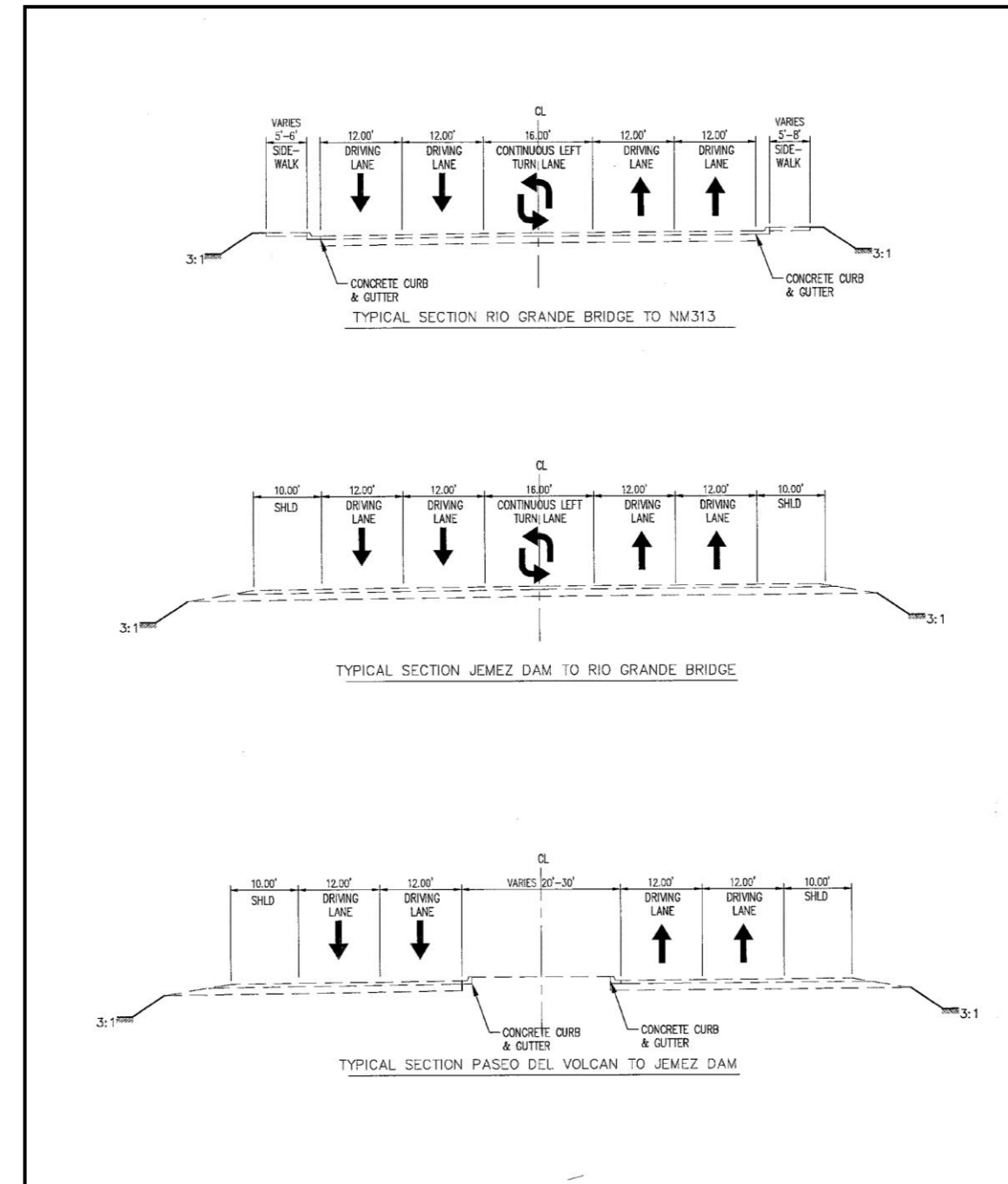


Figure 4 – Existing Typical Sections

7.2 GEOMETRY

Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for the posted speeds.

East of the Rio Grande the posted speed is 40 mph. There is no access control in this section of US550. The functional classification is an urban primary arterial in this section. There is street lighting between the intersections of Camino Don Tomas and NM 313 (Camino del Pueblo).

West of the Rio Grande the posted speed is 45 mph. There is no access control in this section of US 550. The functional classification is a rural primary arterial in this section. Street lighting is limited to select intersections.

7.3 INTERSECTIONS

7.3.1 CAMINO DEL PUEBLO

Camino del Pueblo runs north-south and is the eastern boundary of the study area. The intersection with US 550 is signal controlled. North of US 550, Camino del Pueblo consists of one 12-ft lane in each direction and one-foot paved shoulders. The area between the roadway prism and the right-of-way is level, graded with gravel and free of obstructions. The posted speed limit is 35 mph. The functional classification is a rural primary arterial. NM313(Camino del Pueblo) continues north to Indian Service Road 84 and serves the communities of Los Llanito, Algodones, and Santa Ana Pueblo. South of US 550, NM 313 (Camino del Pueblo) consists of two 12-ft lanes in each direction, a 13-ft continuous left–turn lane, 5-ft shoulders, outside curb & gutter and sidewalk left and right. The functional classification is an urban primary arterial. The posted speed is 35 mph. South of Bernalillo at the intersection of Avenida Bernalillo, NM 313 (Camino del Pueblo) transitions to one lane in each direction and continues south to Albuquerque. It serves the community of Sandia Pueblo and as an alternate north-south connection to Albuquerque. The NM 313 (Camino del Pueblo) intersection currently has parallel right–turn bays in all four quadrants of the intersection. The intersection is skewed approximately 15 degrees. Camino del Pueblo has an HMA pavement section. The intersection was recently reconstructed with the US 550 / I-25 Interchange project. Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for the posted speeds.

7.3.2 CAMINO DON TOMAS

Camino Don Tomas is a local road and runs north-south within the study limits. The roadway immediately north and south of US 550 was reconstructed in 2014. The project included an US 550 eastbound right turn bay and an improved US 550 westbound left turn bay.

The intersection is signal controlled. North of US 550, Camino Don Tomas Road is three lanes with one lane in each direction and a southbound left turn bay. The HMA pavement ends at Ronald Drive. Camino Don Tomas continues for another 250-ft as a gravel road terminating at the drainage ditch. The speed limit is not posted. South of US 550, Camino Don Tomas consists of one 11-ft to 12-ft lane in each direction, a 13-ft continuous left–turn lane, curb & gutter left and right, sidewalk left and a multi-use trail right. The posted speed limit is 35 mph. Left–turn lanes are developed at intersections. Camino Don Tomas transitions to a two lane section at Calle Barrio Nuevo and terminates at Calle Don Francisco and Rotary Parkway. There is street and sidewalk lighting. Camino Don Tomas has an HMA pavement section. Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for the posted speeds.

7.3.3 SANTA ANA ROAD

Santa Ana Road is a local road that forms a “T” intersection with US 550. The intersection with US 550 is stop controlled. North of US 550, Santa Ana Road is 22-ft in width with one lane in each direction. Santa Ana Road provides access to local residents and Santa Ana Pueblo. At Old NM 44, Santa Ana Road is restricted to members of Santa Ana Pueblo. The speed limit is not posted. Santa Ana Road has an HMA pavement section. Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for a low speed roadway.

7.3.4 SHERIFF’S POSSE ROAD

Sheriff’s Posse Road is a local road that forms a “T” intersection with US 550. The intersection with US 550 is stop controlled. South of US 550, Sheriff’s Posse Road has a typical that consists of one 12-ft lane in each direction. The posted speed limit is 25 mph. Sheriff’s Posse Road provides access to local business and residents. Sheriff’s Posse Road dead ends at Venada Plaza Drive. A recently approved housing development south of Venada Plaza Drive will improve the connection to NM 528. Sheriff’s Posse Road has an HMA pavement section. Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for the posted speeds.

7.3.5 KUAAUA ROAD (CORONADO STATE MONUMENT)

Kuaua Road is a local road that forms a “T” intersection with US 550. The intersection with US 550 is stop controlled. North of US 550, Kuaua Road is 22-ft in width with one lane in each direction. The posted speed limit is 25 mph. Kuaua Road provides access to Coronado State Monument and campgrounds. Kuaua Road has an HMA pavement section. Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for the posted speeds.

7.3.6 EDMUND ROAD

Edmund Road is a local road that forms a “T” intersection with US 550. Edmund Road serves a commercial area on the north side of US 550. The intersection with US 550 is stop controlled. there is an uncontrolled commercial driveway on the south side that is almost opposite Edmund Road that shows up on some maps as Homestead Lane. North of US 550, Edmund Road has a northbound through lane, a southbound left turn bay and a southbound through right. There is a right turn bay westbound on US 550. The road is paved for 350-ft.

7.3.7 JEMEZ DAM ROAD

Jemez Dam Road is a local road that forms an intersection with US 550. The south leg of the intersection forms a dead end at the right-of-way fence. North of US 550, Jemez Dam Road has a typical that consists of one 13-ft lane in each direction. The posted speed limit is 15 mph. Jemez Dam Road provides access to Santa Ana Star Casino and commercial development by Santa Ana Pueblo. The intersection with US 550 is signal controlled and has street lighting on the north leg of the intersection. Jemez Dam Road has an HMA pavement section. Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for the posted speeds.

7.3.8 NM 528 (PAT D'ARCO HIGHWAY) / TAMAYA BOULEVARD

South of US 550, NM 528 is an urban primary arterial and has a typical section that consists of three lanes in each direction, 10-ft shoulders and a 1-ft raised median. The posted speed limit is 45 mph.

NM 528 serves Rio Rancho, Corrales and NW Albuquerque. North of US 550, Tamaya Boulevard, is a local road with a typical that consists of two 12-ft lanes in each direction, 6-ft shoulders and a 22-ft raised median. Tamaya Blvd transitions to one lane in each direction north of the access to the soccer fields. The posted speed limit is 40 mph. Tamaya Blvd serves the Tamaya Resort, Bernalillo soccer fields and Santa Ana Pueblo. There is street lighting on all legs of the intersection and it is signalized. NM528 and Tamaya Blvd have an HMA pavement section. The intersection has been resurfaced and the ADA ramps have been reconstructed recently. Existing geometric conditions were evaluated using orthophotography and field observations. The horizontal and vertical alignments are adequate for the posted speeds.

7.4 BRIDGE STRUCTURES

There is a major river crossing located within the study area composed of two adjacent bridges, numbers 8537 and 8540. These bridges carry EB and WB US 550. The existing US 550 bridges over the Rio Grande were built in 1986. The typical section of the two existing bridges is shown in Figure 5. The US 550 eastbound bridge is 35.5-ft wide. The westbound bridge is 44.5-ft wide.

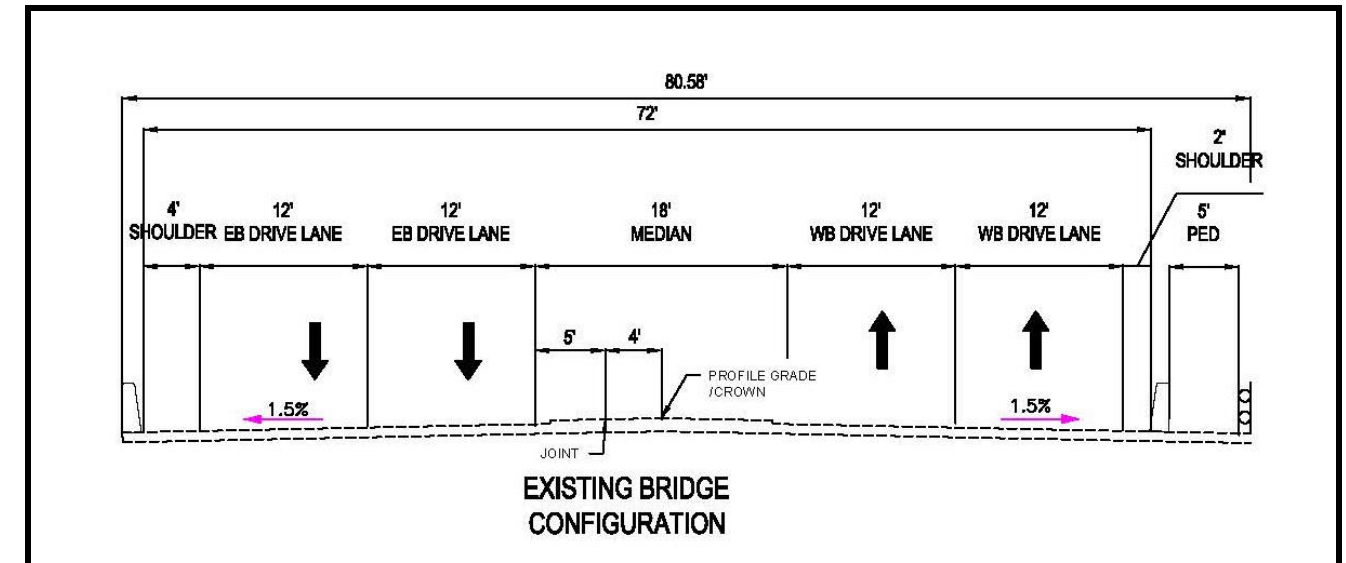


Figure 5 – Typical Section of Existing Bridges

The current bridge condition will be evaluated using three criteria. These criteria are:

- Load Rating
- Sufficiency Rating
- Condition Ratings

7.4.1 LOAD RATING

Bridge Load Ratings are used to determine whether a bridge can carry heavy truck loadings. A minimum inventory rating of HS20 and operating rating of HS33 is typically preferred by the NMDOT.

Current AASHTOWare load ratings are on file with the NMDOT for these bridges. The inventory rating for the bridge is HS22.98 and the operating rating for the bridge is HS36.78. These are sufficient ratings for continued use of the structures.

7.4.2 SUFFICIENCY RATING

Each vehicular bridge is inspected, rated, and assigned a sufficiency rating. The Sufficiency rating is indicative of a bridge’s sufficiency to remain in service. As shown in Table 1, the sufficiency ratings of both bridges are adequate and neither was rated “Structurally Deficient”. The sufficiency rating for the westbound bridge (8540) is 85, which indicates it has adequate deck geometry and vertical clearances and that it does not have any elements in poor condition.

The eastbound bridge (8537) has a lower sufficiency rating of 79 due to its deck geometry appraisal rating. The curb-to-curb width of 29.2-ft is sufficient but is narrow for two lanes of highway traffic.

7.4.3 CONDITION RATING

The overall physical condition of the bridge is noted using condition ratings that characterize the overall existing physical condition of the superstructure, substructure and the deck. The condition rating is a numerical value ranging from zero to nine with a zero representing a failed condition and a nine representing an excellent condition. All the condition ratings for the existing bridges are in the “Satisfactory” to “Good” range. The Condition Ratings for the bridges are presented in Table 1. Complete bridge inspection reports can be found in Appendix B. Both bridges received a deck overlay in 2015.

Bridge No	Facility Carried	Sufficiency Rating	Deficiency Status	Condition				Appraisal
				Deck	Super-structure	Sub-structure	Channel/Channel Protection	Structural Evaluation
8540	US-550 EBL	85	Not Deficient	6	7	6	7	6
8537	US-550 WBL	79	Not Deficient	6	7	6	7	6

7.5.1 SUMMARY OF PHASE 1–A REPORT

Handling existing drainage along US 550 within the Town of Bernalillo, between NM 313 (N. Camino Del Pueblo) and the Rio Grande, is challenging due to the flat grades and limited outfalls in this low laying area. The grades in this area are generally challenging for gravity flow drainage, and coupled with the river levees and irrigation/drain embankments, lift stations are required to outfall storm runoff to the Rio Grande. Dense commercial development along US 550 also complicates drainage conditions and drainage options in this area.

There is an existing storm drain system in this stretch of US 550 providing roadway drainage with an outfall to the Rio Grande via a lift station located just east of the Rio Grande levee. There is a second lift station on NM 313 (S. Camino del Pueblo) south of US 550 which collects and conveys flows to the US 550 storm drain system. As-built plans for the existing storm drain system and pump stations on US 550 and NM 313 have been obtained; however, drainage reports documenting the contributing drainage areas, design criteria (i.e. design storm event) and system’s design have not been located by the Design Team. Without the drainage reports to document this existing conditions infrastructure, there are unknowns related to the existing drainage system as noted below:

- How much, if any of the off-site areas the US 550 storm drain was designed to capture.
- The pump station on NM 313, south of US 550, was built after the storm drain system in US 550. This system collects runoff and pumps it to the north into the US 550 storm drain system. Without an existing drainage design report, it is unknown how much flow this system is adding to the US 550 storm drain. However, it is assumed that the US 550 system capacity was evaluated for this additional flow during previous designs.
- From discussions with NMDOT, historically there have been drainage complaints in the following areas. The intended drainage patterns and function of these areas are unknown:
 - just north of US 550 on Camino Don Tomas (occurs when the US 550 inlets are plugged),
 - and northeast of US the 550 / NM 313 intersection where ponding and localized flooding had historically occurred.

As noted in the Phase 1–A report, “Adjacent businesses to US 550 in this area convey their runoff away from the roadway (US 550) into individual retention ponds.” Therefore, it is assumed that the historic localized flooding concerns north of US 550 on Camino Don Tomas are a result of inadequately maintained inlets on US 550 and off-site ponds.

Furthermore, the potential drainage problems in this area have undoubtedly been improved by two recently constructed developments west of Camino Don Tomas, north of US 550.

7.5 DRAINAGE

The Phase 1–A report included a detailed discussion of overall drainage patterns and a detailed inventory of existing drainage facilities along US 550. An updated inventory is included in Appendix C for reference. A summary of that report is provided below. In accordance with the scope of work for the project this Phase 1–B report will provide some additional analysis of existing conditions off-site flows; discuss the existing storm drain and pond infrastructure east of the river; document the existing pump stations east of the river; and summarize an existing conditions scour analysis of the current Rio Grande Bridge.

The concern with the area northeast of the US 550 / NM 313 intersection was addressed with the recently completed US 550/I-25 Interchange Project as documented in the Phase 1–A report.

Drainage for US 550, west of the Rio Grande, is handled primarily by roadside ditches in existing conditions. The ditch system to the south of US 550 is a wide, well-vegetated, stable ditch for the majority of the project area between Paseo del Volcan and the Rio Grande. However, in the area between Sheriff's Posse Road and the Rio Grande, the ditch becomes less defined, the crossing structures for driveways are in poor repair and likely not functioning, and the flow path less defined, potentially leading to storm water entering the roadway. Improvements in this area are needed to assure the roadway drainage criteria are met and that off-site runoff and sediment do not impact the roadway.

The ditch system north of US 550 between Paseo del Volcan and the Rio Grande is an inconsistent mix of channel sections, materials, and culvert crossings for driveway and access roadways. Vegetation is less established on this side of the roadway and various erosion protection elements have been used, including concrete, asphalt, drop structures, and rip rap. Erosion along the US 550 roadway embankment is a potential problem along this ditch section, especially in the area east of the Santa Ana Star Casino and west of Edmund Road. Improved drainage infrastructure in this area would ensure protection of US 550 from runoff and erosion that may impact the roadway.

The ditches on the west side of the Rio Grande discharge to the river through unimproved ditch sections and unimproved outfalls. The northwest bridge abutment was not inspected for this project; however, review of the NMDOT 2015 Bridge Inspection Report notes that there is undermining in the northwest corner of the bridge abutment. The river thalweg does not currently flow adjacent to this abutment and this undermining could be a function of the US 550 north ditch drainage flowing from the west into the river.

7.5.2 EXISTING OFF-SITE FLOWS

The following excerpt is from the Phase 1–A study and concludes that east of the river, no off-site flows are reaching the US 550 corridor:

“From the beginning of the project at NM 313, the general flow pattern is to the west, toward the river, though the gradient in this area is very flat. Runoff from east of NM 313 does not enter this study area; it is controlled through a series of inlets and retention ponds before reaching NM 313. Adjacent businesses to US 550 in this area (i.e., off-site areas) convey their runoff away from the roadway into individual retention ponds.”

As part of this Phase 1–B study a more thorough investigation of off-site flows east of the Rio Grande was conducted. The conclusion from the Phase 1–A study still generally holds true for a majority of the frontage parcels along US 550.

However, field reconnaissance indicates that some of the older developments along the US 550 frontage likely do drain to US 550. In addition, some of the new developments include retention ponds immediately adjacent to US550. It is unclear what storm events these ponds were sized for, and therefore for purposes of this report the Design team assumes flows entering these retention ponds may overtop and reach US 550. Finally, there are a few parcels that front US 550 that drain to private inlets on the lots. The outfall for these inlets are unknown, and therefore for purposes of this report it is assumed that flow from these parcels may tie to the US 550 storm drain. Appendix C includes a figure and a summary table documenting the drainage patterns of all adjacent lots between NM 313 and the Rio Grande.

Off-site flows reaching US550 west of the Rio Grande were determined. The general topography is from west to east towards the river with only one culvert crossing US550 from south to north. Eleven basins totaling 199.3 acres were delineated adjacent to the roadway. These flows are conveyed in ditches and thorough culverts parallel to the roadway.

7.5.3 EXISTING STORM DRAIN / PONDS EAST OF THE RIO GRANDE

Per as-builts obtained from a 1986 NMDOT project, a storm drain was installed near the center of US 550 from NM 313 to west of Camino Don Tomas. It begins as a 24-inch pipe and approximately 500-ft west of NM 313 becomes a 30-inch pipe. West of Camino Don Tomas the storm drain crosses the eastbound lanes to the south side of US 550 and continues to the west to the pump station built with the same project. The as-builts include design flows for a 50-yr storm event. Due to the lack of drainage reports of the existing storm drain and pump station system it is unclear if the flows entering the system only include the US 550 corridor or also include flows from adjacent offsite properties.

In order to help make that determination, additional field work was recently completed. Appendix C includes Figures and a Table that show and describe the numerous drainage facilities identified near US 550 east of the Rio Grande from the field work. This information indicates that a majority of the properties adjacent to the US 550 corridor contain existing ponds that have been constructed to accommodate the flows from the parcels (e.g. off-site flows from the perspective of the US 550 corridor). Due to the lack of visible outfalls on most of these ponds they are assumed to be retention ponds with the only discharge via evaporation or infiltration.

Several of these ponds are in the back of the lots, physically removed from the US 550 frontage. However, some of them are adjacent to US 550 and there is the potential that off-site runoff may reach the US 550 right-of-way in these locations during larger events if the retention volumes of these ponds are exceeded. This potential condition was previously unknown during the Phase 1–A report and scoping for the Preliminary Drainage Report.

Without this prior knowledge of the potential for off-site flows reaching US 550, and without an existing drainage report documenting the design approach, drainage areas, storm events, etc. for the design of the existing storm drain, pump stations and ponds, it is difficult to determine if the current system meets current NMDOT drainage criteria.

Therefore, through discussions with NMDOT it has been previously agreed that the drainage analysis and the infrastructure improvements constructed with this project east of the river would only address the increased flows from the impervious area added as part of the project (not offsite flows) and would not be required to meet the standard NMDOT design criteria. This conclusion was documented in the minutes of the August 26, 2015 Design Team Meeting. The recent field reconnaissance has led the Design Team to revise the assumptions and conclude that the potential for off-site flows reaching the US 550 corridor will need to be addressed. This changed approach, including how the project will meet DOT criteria, will be included in the Preliminary Drainage Report for the project.

7.5.4 EXISTING PUMP STATION EVALUATION

There are two existing pump stations east of the Rio Grande which were evaluated for this report. A design report was not available for the location near NM 313. However, through discussions with the pump supplier, the Design Team confirmed it consists of a Flygt Model CP3152-622 pump with a 10-inch discharge designed for 1,122 gpm at 21-ft TDH per each pump or about 5 cfs total.

This location has historically not required sediment or trash removal and that maybe a result of the pump which is currently in service. The pump is designed to accommodate up to 4-inch diameter solids. The station has not experienced flooding issues.

It is assumed that flow from this station has been accounted for in the existing US 550 storm drain design based upon a review of as-builts which show the outlet from this station entering the existing SD system in US 550. This NM 313 pump station will not change with the US 550 project.

Similarly, a design report for the US 550 pump station was also not available. However, per the pump supplier, the pump station consists of two Flygt Model CP3355 pumps each with a capacity of 4,500 gpm (10 cfs).

This station is 30-ft deep, 13-ft internal diameter, has a 30-inch storm drain entering from the east (the storm drain system in US 550 to the east), an 18-in storm drain entering from the north (two inlets on US 550 at the lift station), 2-12-inch diameter discharge lines exiting to the west, and one 3-inch diameter sump pump (Flygt Model NP3127-438) discharge exiting to the west.

Modifications in the last few years have replaced the controllers and added a mix flush valve which has helped reduce the sediment issues experienced prior to that modification. The pumps can accommodate up to 4 inch solids. The pump station is located very close to existing sidewalk and roadway.

7.5.5 RIO GRANDE BRIDGE SCOUR ANALYSIS

Appendix D contains a US 550 Rio Grande Bridge (No. 8537 & 8540) Scour Analysis completed in July 2015. That memo details the analysis conducted to determine the extent of anticipated scour at the existing US 550 Bridge and determine if the calculated scour is greater than the bridge design accommodates. The scour analysis calculations performed for the existing US 550 Bridge provided results that are within 10 to 20 percent of the as-built listed scour depth. Therefore, assuming that the existing bridge was correctly built to accommodate the stated scour, the calculations from this analysis show that anticipated scour is within the acceptable range for the existing US 550 Bridge.

As the US 550 project progresses, NMDOT should keep in mind that scour analysis of a new US 550 Bridge will be required. Even if the existing bridge remains, with a new bridge added upstream, a change in hydraulic conditions would warrant a re-evaluation of the scour for the existing bridge. Future scour analysis can be improved with site-specific soil gradation data, through the entire bridge foundation horizon, and the addition of a review of long-term degradation/aggradation scour component at the US 550 Bridge.

7.6 UTILITIES

Subsurface Utility Engineering Level A was conducted during Phase 1–A. Subsurface Utility Engineering Level B and C will be completed during preliminary and final design.

7.6.1 EXISTING UTILITY INFORMATION

The approximate location of the utilities is shown in Figure 6. Known utility owners and facility types within the study area include the following:

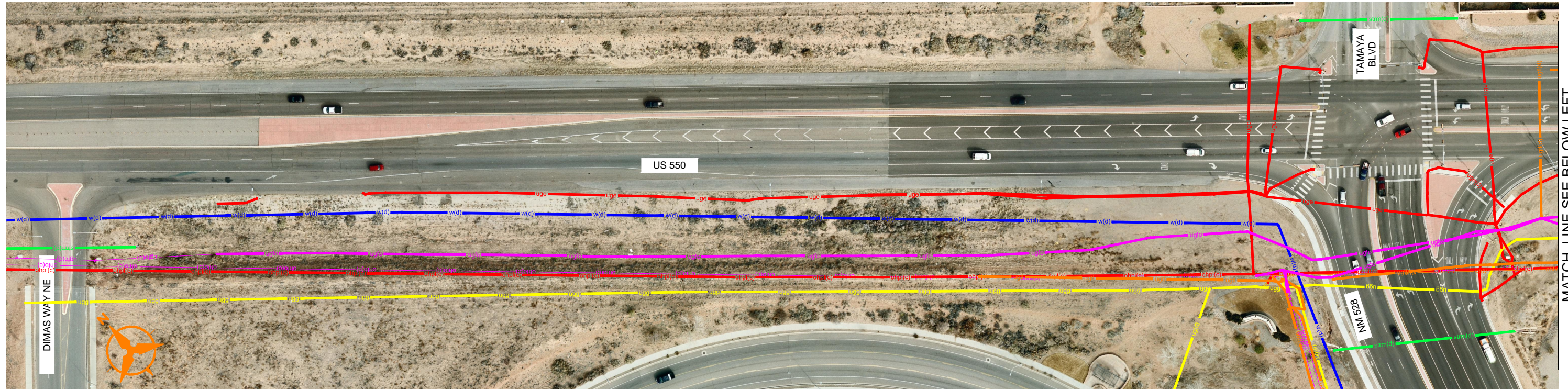
- Telecommunication-Century Link
- Water / Wastewater-City of Rio Rancho (from NM 528 to the west)
- Gas-New Mexico Gas
- Electric Power Distribution and Transmission-PNM
- Cable-Cable One
- Water / Wastewater-Town of Bernalillo
- Intelligent Transportation System (ITS)-NMDO

7.6.2 UTILITY ADJUSTMENTS

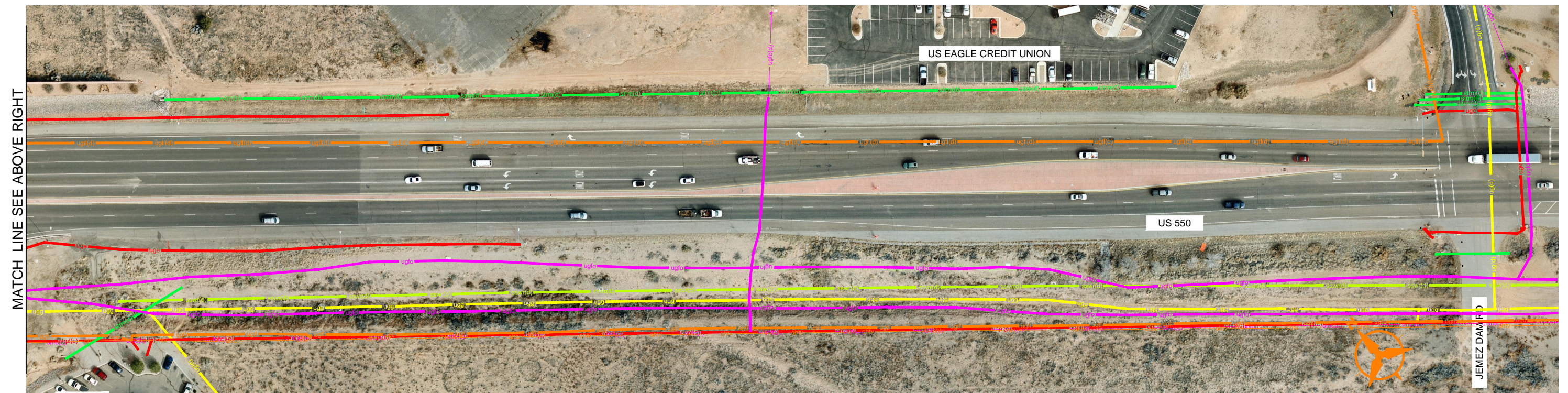
The US 550 / NM 528 / Tamaya Blvd and US 550/NM 313 (Camino del Pueblo) intersections may require some minor utility adjustments (Overhead Electric, Overhead Cable, Natural Gas, Telephone, and Sanitary Sewer) concurrent with the construction activities of this project; however, no major relocations are anticipated at these locations. Utility conflicts with the proposed storm drain system will be analyzed with the preliminary design of the corridor. West of the Rio Grande there are water, gas, and telephone lines on the north side and water, sewer, gas and fiber optic lines on the south side. These lines may need to be moved in order to maintain the roadside ditches. East of the Rio Grande there are water, gas, and telephone lines in the existing roadway. The NMDOT may require these lines to be moved. There is an NMDOT ITS line located on the north side of the existing bridge. This line may have to be relocated when the new bridge is constructed. Overhead Electric may need minor adjustments, but upon preliminary inspection guy wires and other accessories of the overhead electric are well outside of the corridor.

7.6.3 PLANNED UTILITIES

The Pueblo of Santa Ana has requested utility crossings to serve their property located south of US 550 west of the river. They have development plans for properties on both the north and south sides of US 550. The Pueblo will need to coordinate with District 3 to get a permit for any new utility crossings of US 550. If the utility crossings are installed prior to US 550 improvements, the Pueblo will coordinate with the NMDOT for design criteria. If the US 550 improvements project occurs first, the NMDOT will install sleeves under US 550 for the Pueblo to use.

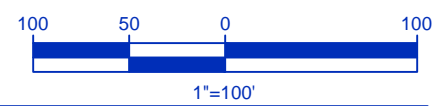


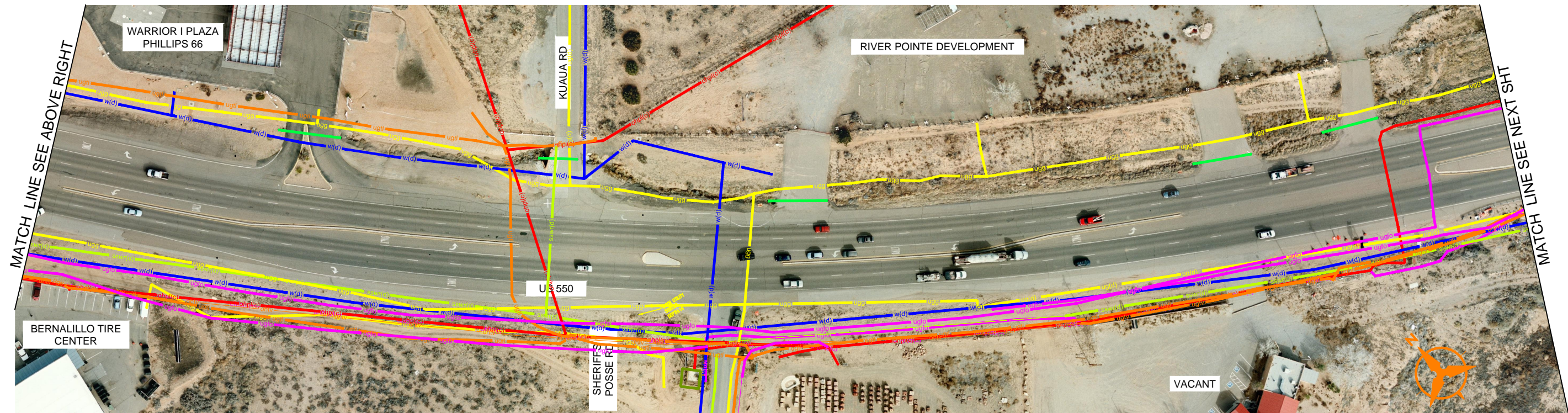
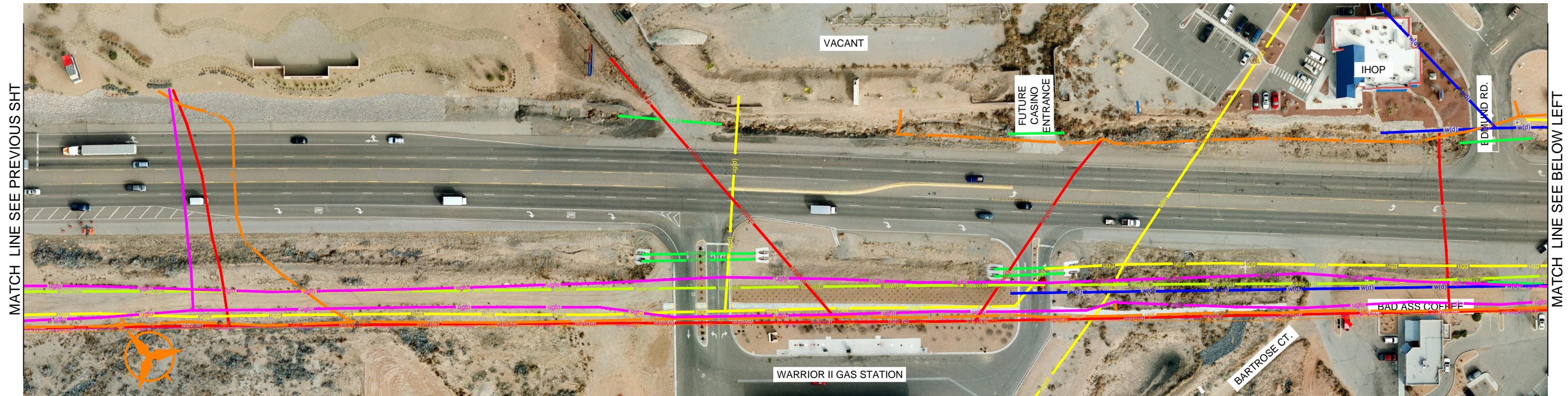
MATCH LINE SEE BELOW LEFT



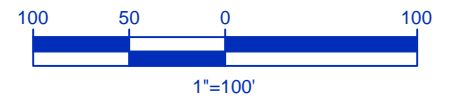
MATCH LINE SEE ABOVE RIGHT

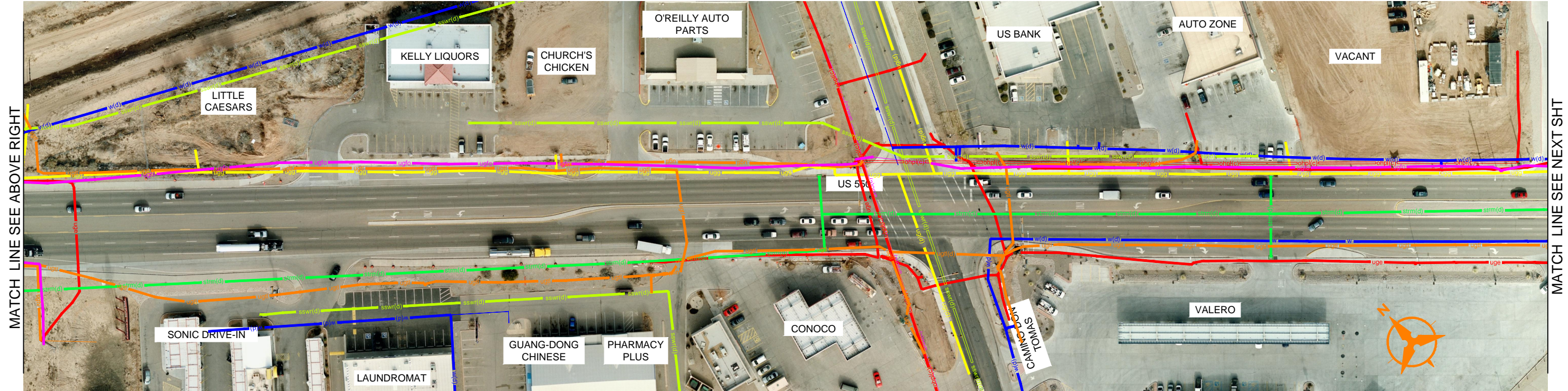
FENCE	FENCE (TYPE)	TELE	LINE-TELEPHONE	UNKN	LINE-UNKNOWN UTILITY	CULV	DRAINAGE-CULVERT
TELE	ugtl(d)	TELE	LINE-TELEPHONE-QLD	UNP	PIPE	UNP	PIPE
ohfo(c)	LINE-OVERHEAD FIBER OPTIC-QLC	FEL	LINE-FIBER OPTIC-QLD	uge(d)	LINE-UNDERGROUND ELECTRIC-QLD	WL	LINE-WATER
ohpl(c)	LINE-OVERHEAD ELECTRIC-QLC	sswr(d)	LINE-SEWER-QLD	chtv	LINE-OVERHEAD CABLE TV-QLD	W	LINE-GAS LINE
W	LINE-WATER-QLD	strm(d)	LINE-STORM-QLD	ugfo	LINE-FIBER OPTIC	ugg	LINE-UNDERGROUND ELECTRIC
		ok	LINE-GAS LINE-QLD	ugtv	LINE-UNDERGROUND CABLE TV-QLD	ug	



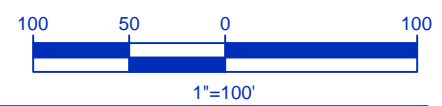


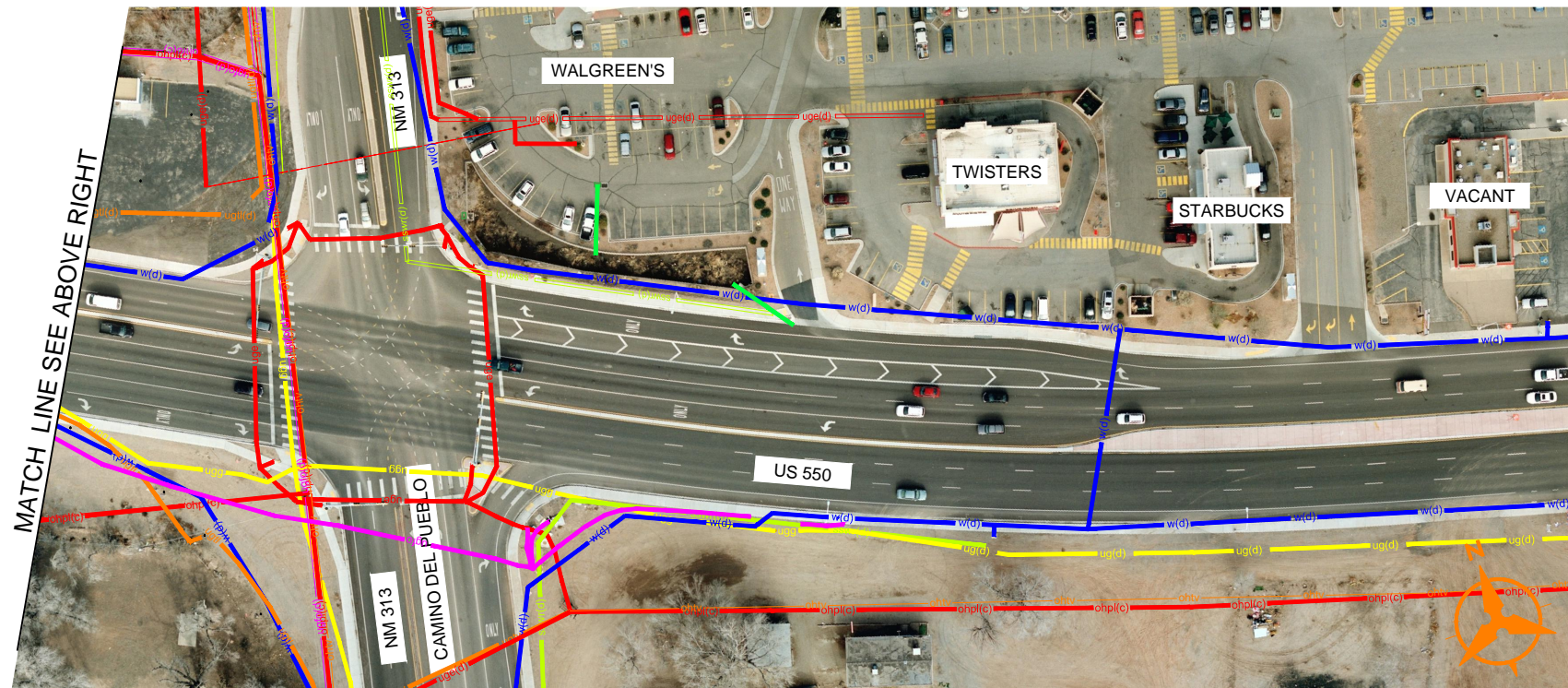
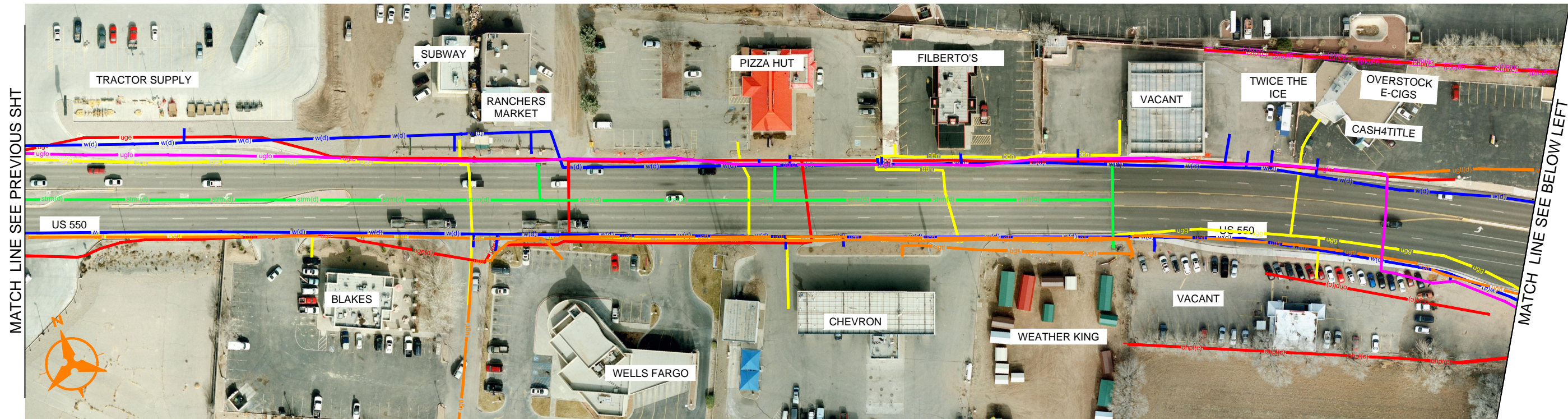
FENCE	FENCE (TYPE)	TELE	LINE-TELEPHONE	UNKN	LINE-UNKNOWN UTILITY	CULV	DRAINAGE-CULVERT
TELE	ugtl(d)	TELE	LINE-TELEPHONE-QLD	UNP	PIPE	UNP	PIPE
ahfo(c)	LINE-OVERHEAD FIBER OPTIC-QLC	FEL	LINE-FIBER OPTIC-QLD	uge(d)	LINE-UNDERGROUND ELECTRIC-QLD	WL	LINE-WATER
ahpl(c)	LINE-OVERHEAD ELECTRIC-QLC	sswr(d)	LINE-SEWER-QLD	chtv	LINE-OVERHEAD CABLE TV-QLD	W	LINE-GAS LINE
W	LINE-WATER-QLD	strm(d)	LINE-STORM-QLD	ugfo	LINE-FIBER OPTIC	ugg	LINE-UNDERGROUND ELECTRIC
		ug(d)	LINE-GAS LINE-QLD	ugtv	LINE-UNDERGROUND CABLE TV-QLD	uge	



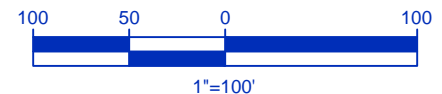


FENCE	FENCE (TYPE)	TELE	LINE-TELEPHONE	UNKN	LINE-UNKNOWN UTILITY	CULV	DRAINAGE-CULVERT
TELE	LINE-TELEPHONE-QLD	FIB	LINE-FIBER OPTIC-QLD	UGE	LINE-UNDERGROUND ELECTRIC-QLD	UNP	PIPE
OHFC	LINE-OVERHEAD FIBER OPTIC-QLC	FIB	LINE-SEWER-QLD	CHTV	LINE-OVERHEAD CABLE TV-QLD	WL	LINE-WATER
OHE	LINE-OVERHEAD ELECTRIC-QLC	FIB	LINE-STORM-QLD	UGFO	LINE-FIBER OPTIC	UGG	LINE-GAS LINE
WL	LINE-WATER-QLD	UGD	LINE-GAS LINE-QLD	UGTV	LINE-UNDERGROUND CABLE TV-QLD	UGE	LINE-UNDERGROUND ELECTRIC





FENCE	—	FENCE (TYPE)	TELE	—	TELE	LINE-TELEPHONE	UNKN	—	UNKN	LINE-UNKNOWN UTILITY	CUV	—	CUV	DRAINAGE-CULVERT
TELE	—	LINE-TELEPHONE-QLD	FBL	—	FBL	LINE-FIBER OPTIC-QLD	UGE	—	UGE	LINE-UNDERGROUND ELECTRIC-QLD	UNP	—	UNP	PIPE
OHFC	—	LINE-OVERHEAD FIBER OPTIC-QLC	SSWR	—	FBL	LINE-SEWER-QLD	CHTV	—	CHTV	LINE-OVERHEAD CABLE TV-QLD	W	—	W	LINE-WATER
USE	—	LINE-OVERHEAD ELECTRIC-QLC	STM	—	FBL	LINE-STORM-QLD	UGFO	—	FBL	LINE-FIBER OPTIC	OK	—	OK	LINE-GAS LINE
WL	—	LINE-WATER-QLD	UGD	—	OK	LINE-GAS LINE-QLD	UGTV	—	UGTV	LINE-UNDERGROUND CABLE TV-QLD	USE	—	USE	LINE-UNDERGROUND ELECTRIC



7.7 LAND USE AND DEVELOPMENT PLANS

Proposed development sites and access roads are shown in Figure 7. Santa Ana Pueblo has submitted a Traffic Impact Study to the NMDOT for their planned development north and south of US 550 within the corridor. There is a planned development adjacent to the Santa Ana Star Casino on the east side. The main entrance to the development is proposed to be at Milepost 2.03. The entrance road ties into the road behind the casino creating a loop around the development. The existing roadway at Milepost 2.08 on the north side will be closed.

The Southern Sandoval Investment (SSI) Corporation is a corporation formed by Santa Ana Pueblo to develop the area south of US 550 between the Warrior II Gas Station and NM 528. Construction of this area is planned for early 2016. The development is proposed to include approximately 290,000 square feet of mixed use retail and commercial space. Access will be via NM 528 and along US 550 across from Jemez Dam Road and at the west entrance to the Warrior II Gas Station. Jemez Dam Road will be connected internally with the west entrance to the Warrior II Gas Station.

Sandoval County has approved a housing development off of Sheriff's Posse Road south of the existing Venada Road connection to NM 528. Venada Road will be improved as part of this development.

The River Pointe Development will be constructed in the northwest quadrant of the river in early 2016. The property will consist of retail stores and a microbrewery.

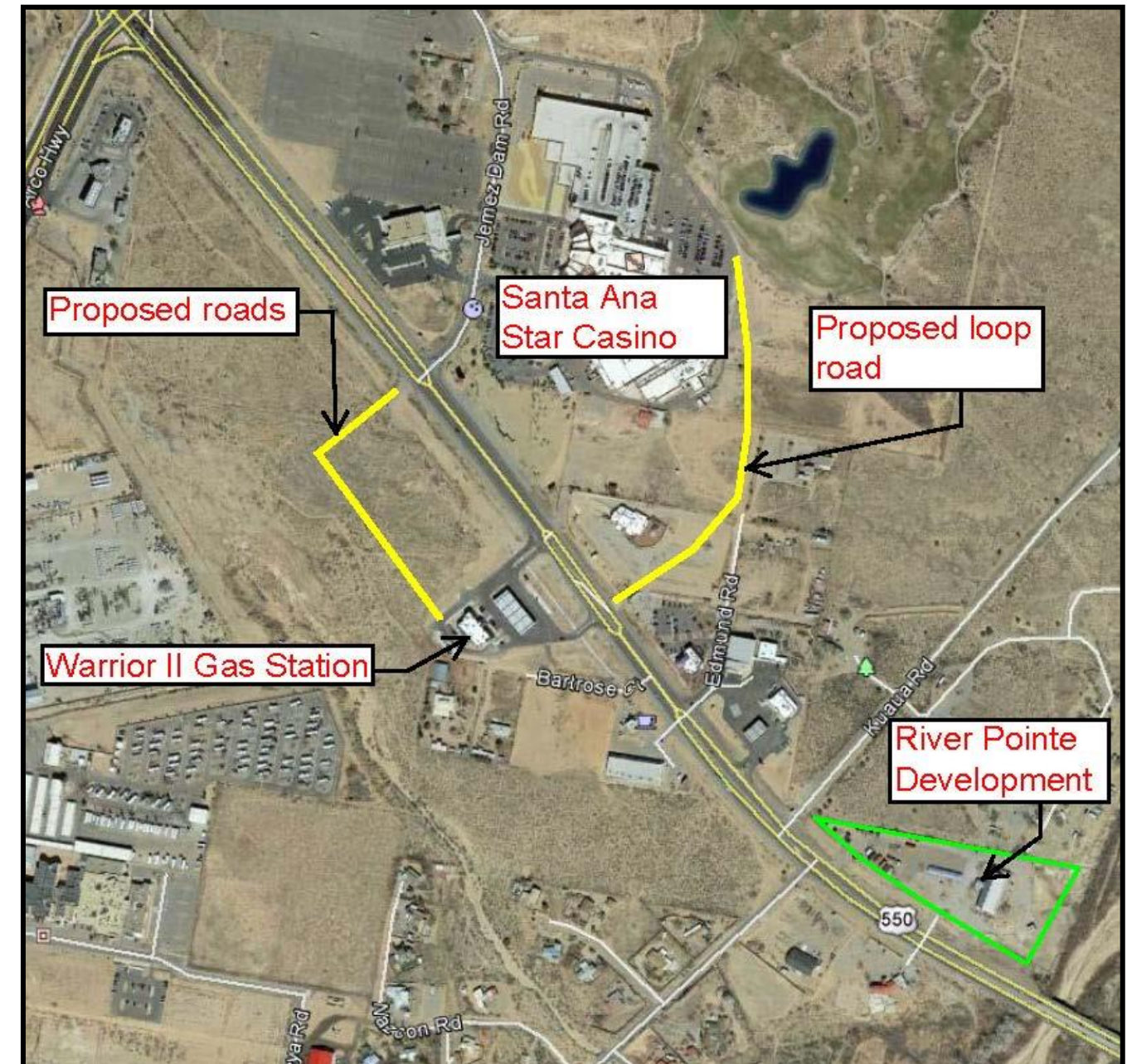


Figure 7 – Proposed Development

7.8 EXISTING AND NO-BUILD TRAFFIC

As part of the Phase 1–A study, Lee Engineering deployed pneumatic tube data collectors on US 550 at four locations collecting 48 hours' worth of data on Wednesday, May 8 and Thursday, May 9, 2013 at Camino Don Tomas. Resulting daily traffic was the following:

West of Jemez Dam Rd	32,292 ADT
At Rio Grande Bridge (No. 8537 & 8540)	32,315 ADT

24-hour tube counts were collected at both Dimas Way and Santa Ana Road with the following results:

Dimas Way	3,258 ADT
Santa Ana Road	959 ADT

Turning movement counts were also collected by Lee Engineering on May 8th and 9th of 2013 for the following study US 550 intersections:

- NM 528 (Pat D'Arco Hwy/Tamaya Boulevard)
- Jemez Dam Road
- Kuaua Road
- Sheriff's Posse Road
- Santa Ana Road
- Camino Don Tomas
- NM 313 (Camino del Pueblo)

For Phase 1-B, additional turning movements were collected April 22 2015 at the Santa Ana intersection, as this location indicated increased activity within the MRCOG 2035 model and therefore it was necessary to see what kind of demands were observed under today's conditions.

Raw data collection sheets for these turning movement counts are included in Appendix E. Figure 8 summarizes the existing counts, lane geometry, and traffic control.

Figure 9 and Figure 10 graphically illustrate the weekday hourly traffic volume data at each count location for a 24-hour period. Shown in the graphs are the westbound, eastbound, and total hourly volume at each count location. As expected, all location directional demands indicate a definite eastbound AM peak and a westbound PM peak. As indicated, these peaks become more defined between the Rio Grande (No. 8537 & 8540) Bridge and NM 313 (Camino del Pueblo). Additionally, traffic demands in general appear to reduce the farther west one is within the study corridor. There is a less defined midday peak demand at all locations.

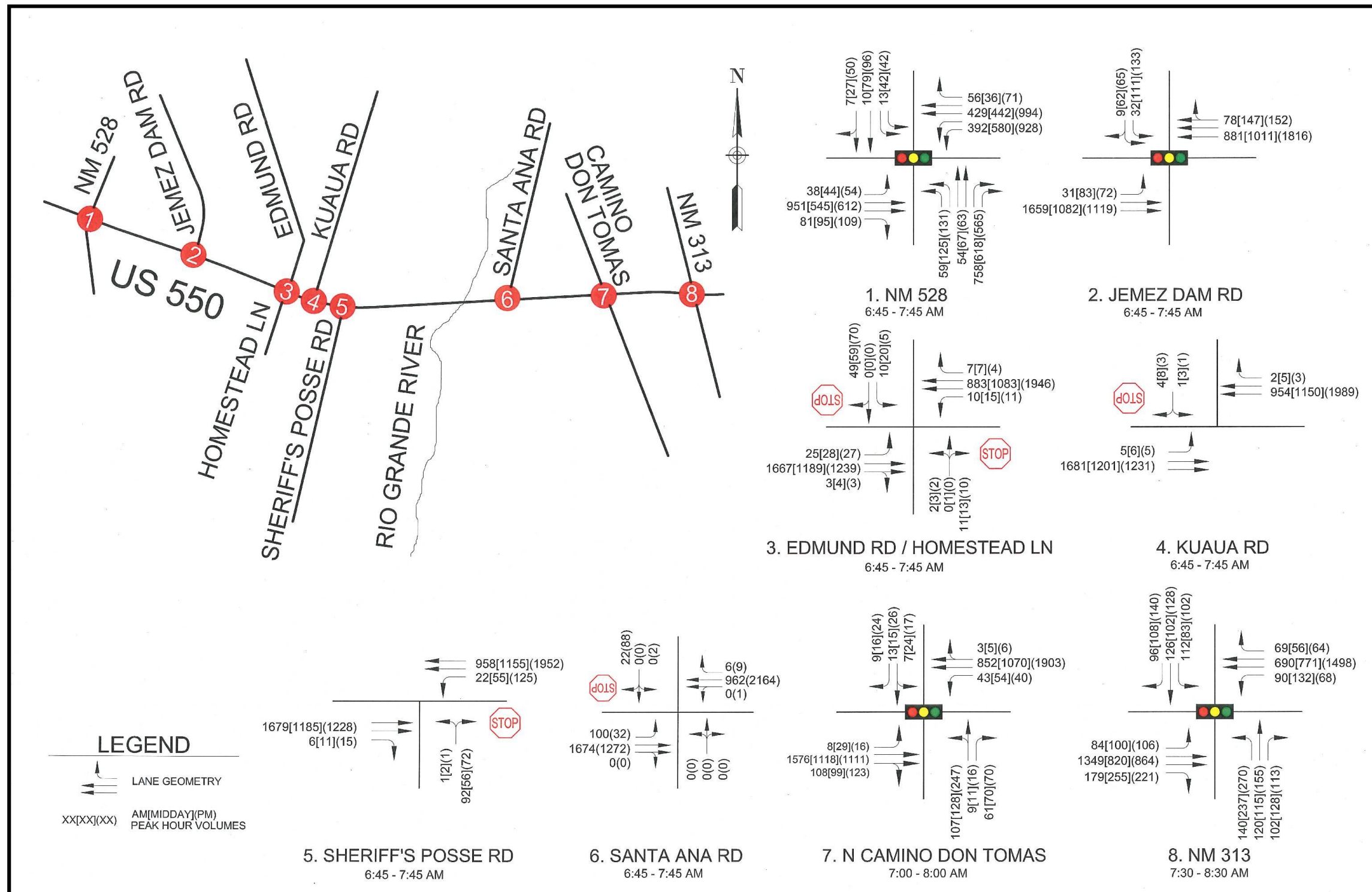


Figure 8 – Existing 2013 Peak Hour Traffic Demands

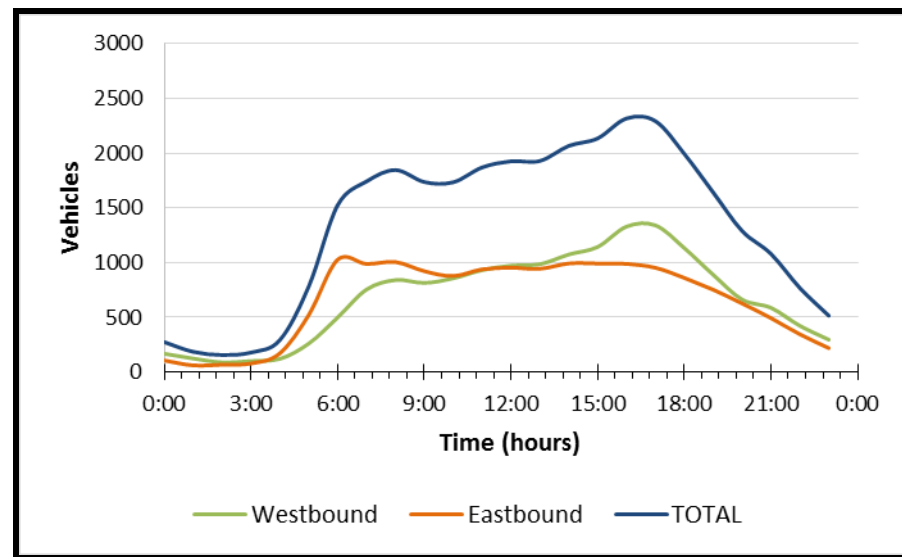


Figure 9 – 2013 Count Data West of Jemez Dam Rd

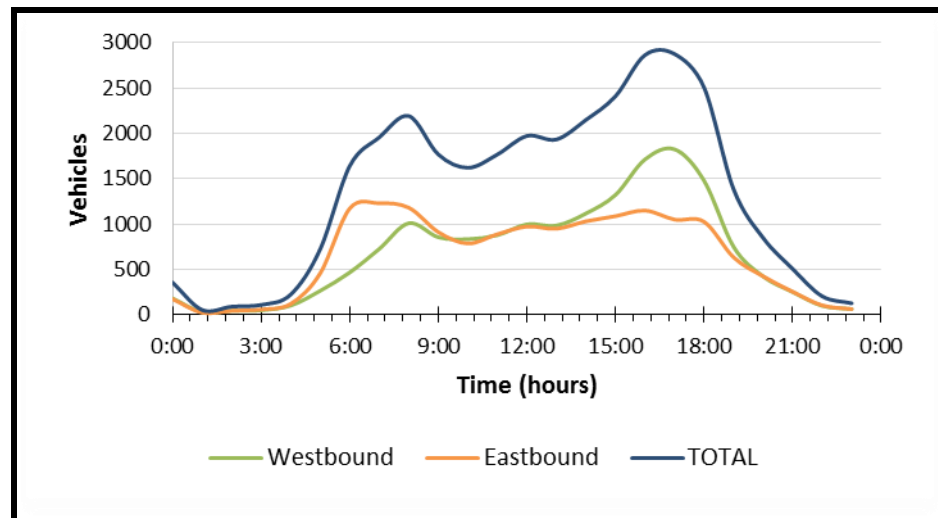


Figure 10 – 2013 Count Data at Rio Grande (No. 8537 & 8540) Bridge

Data was further augmented by the collection of turning movements to and from several private driveways along the corridor, which were collected on April 21st to April 28th 2015. At those driveways that were not counted, trips were generated to and from the site based on land use, the apparent square footage of the building, and the ITE Trip Generation Manual 9th Edition. Collected AM and PM turning movements to and from various private driveways along the corridor are depicted in Figures 11 through 13. Driveways that have been generated are identified with an asterisks. As shown, most driveway demands were relatively light with the busiest driveway observed at the Twin Warriors II gas station located on the south side of NM 550.

Generally, right-turn movements were the heaviest movements when compared to left-turn demands. This is not surprising especially during peak hours in which left-turns from minor street stop approaches are much more difficult due to fewer available gaps in the through traffic on NM 550.

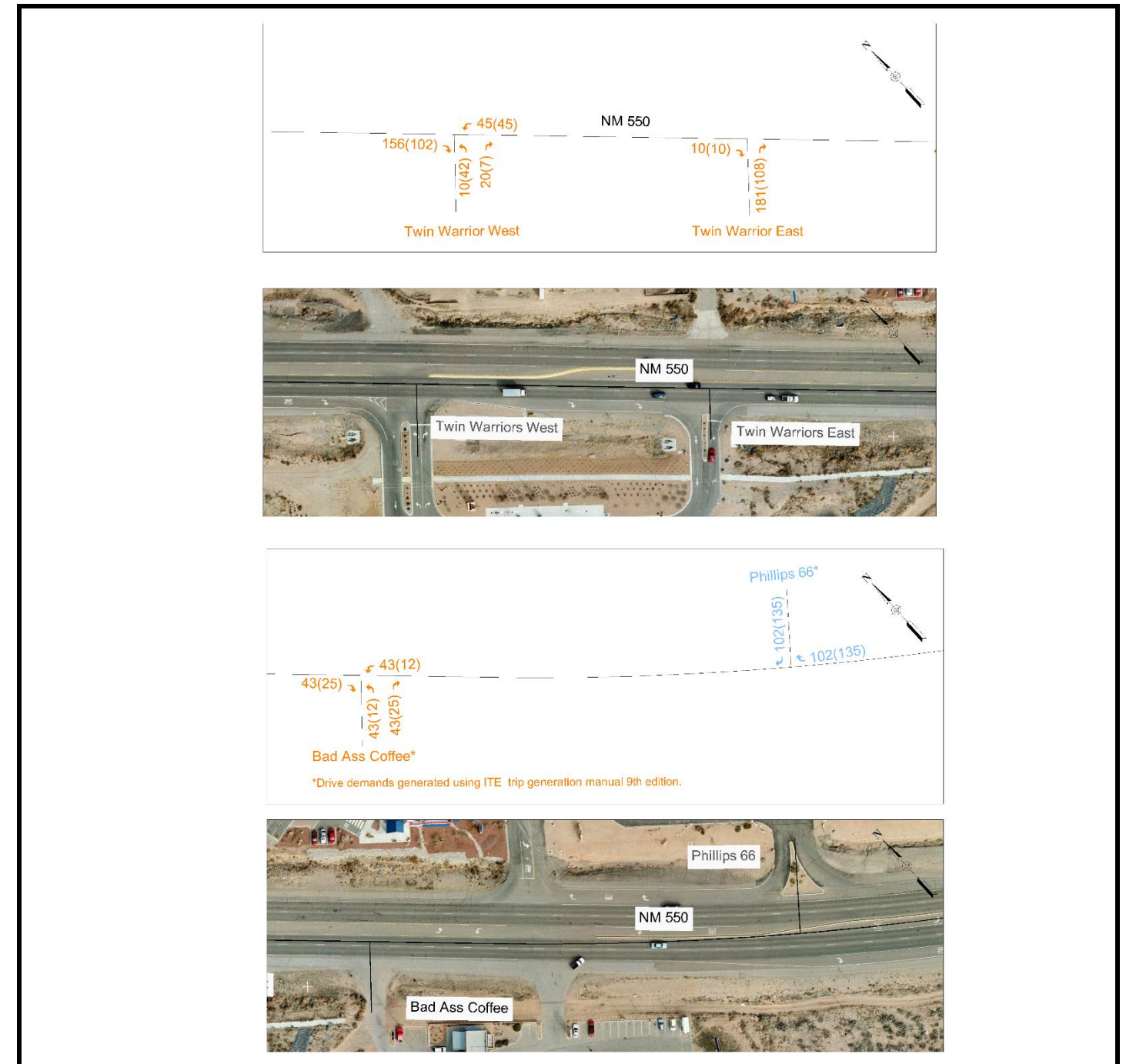


Figure 11 – Driveway Demands between Jemez Dam Rd and Kuaua Rd

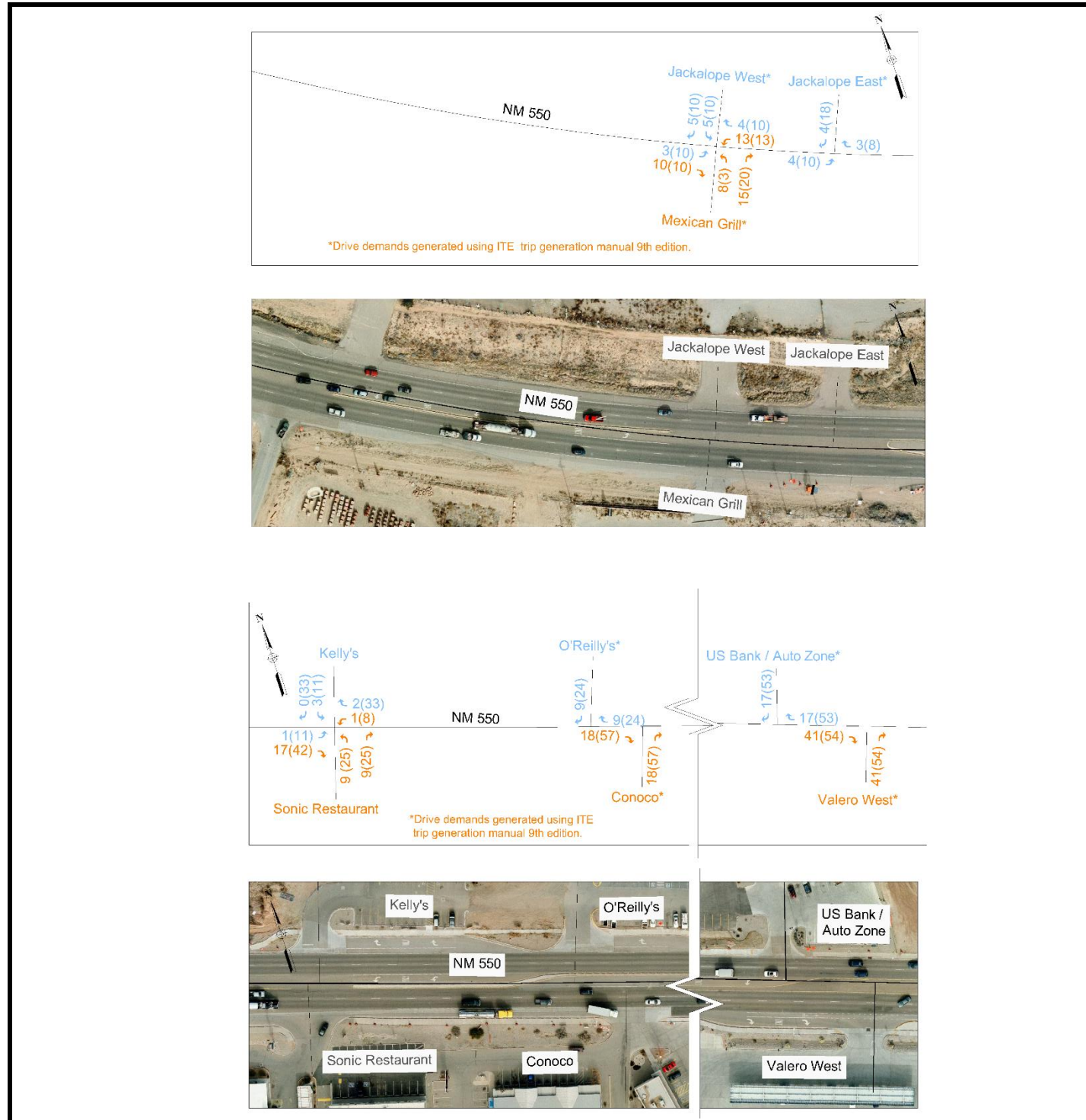


Figure 12 – Driveway Demands between Kuaua Rd and Camino Don Tomas

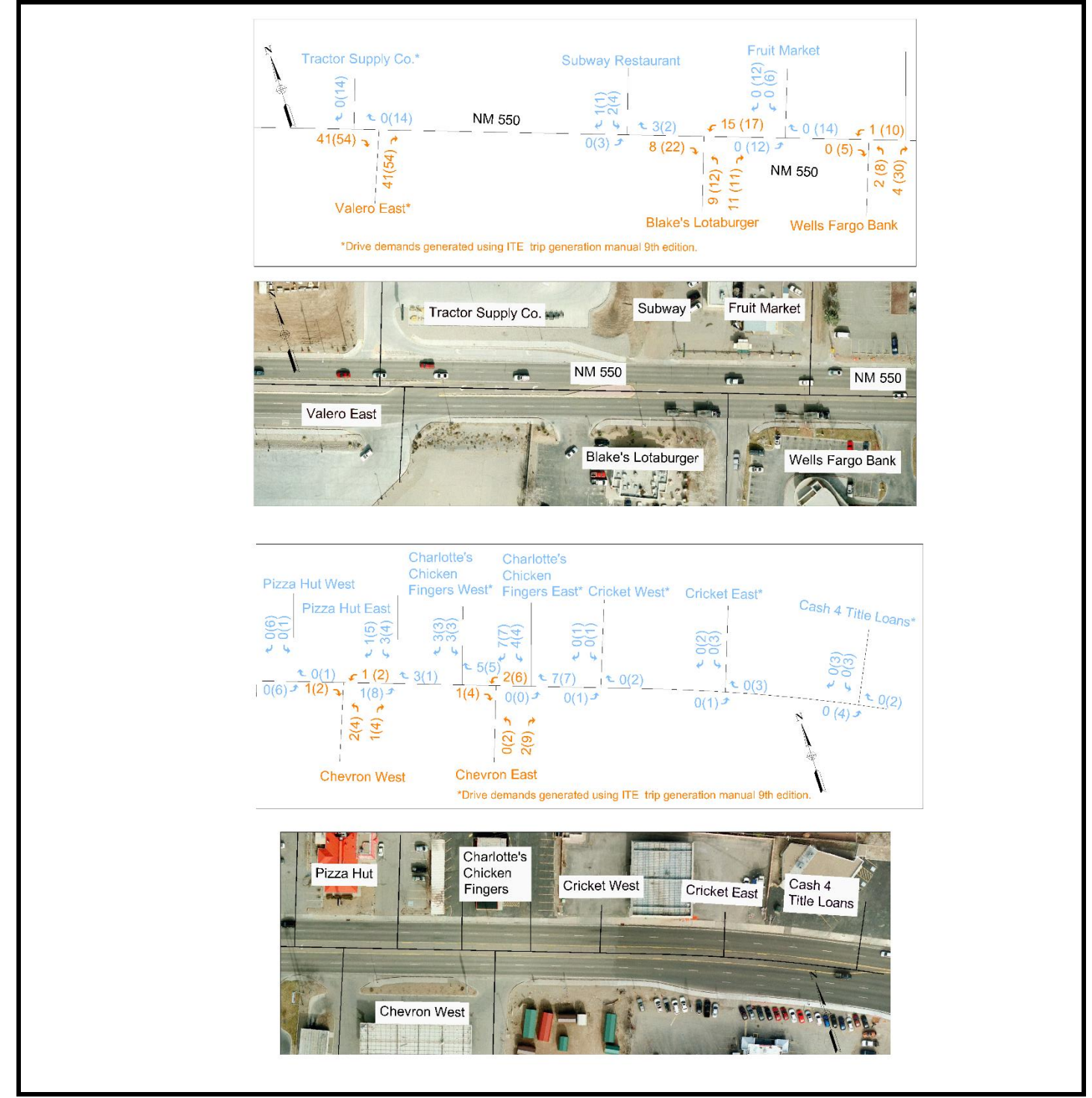


Figure 13 – Driveway Demands between Camino Don Tomas and NM 313 (Camino del Pueblo)

7.8.1 EXISTING CONDITIONS CAPACITY ANALYSIS

Table 2 shows the intersection capacity analysis results under Existing 2013 traffic demand conditions. As indicated, capacity analyses were calculated using Synchro 9.0 (HCM 2010) as well as VISSIM simulation, which will be used for calibration for the alternatives analysis comparisons.

Table 2 – Existing Conditions LOS and Capacity Analysis

Intersection	Software	AM Peak			PM Peak		
	Tool	v/c	Delay ¹	LOS ²	v/c	Delay	LOS
NM 528/US 550	Existing (Vissim)	-	22.5	C	-	34.3	C
	Existing (Synchro)	1.13	68.8	E	1.38	87.1	F
Jemez Dam Rd/US 550	Existing (Vissim)	-	5.9	A	-	12.6	B
	Existing (Synchro)	0.78	2	A	0.77	20	B
Homestead Ln-Edmund Rd/US 550	Existing (Vissim)	-	9.9	A	-	4.1	A
	Existing (Synchro)	1.98	8.5	A	0.46	18.8	B
Kuaua Rd/US 550	Existing (Vissim)	-	-	-	-	-	-
	Existing (Synchro)	0.07	8.5	A	0.07	6.8	A
Sheriff's Posse Rd/US 550	Existing (Vissim)	-	8.5	A	-	7	A
	Existing (Synchro)	1.11	7.9	A	0.3	22.9	C
Camino Don Tomas/US 550	Existing (Vissim)	-	21.6	C	-	21.9	C
	Existing (Synchro)	1.27	45	D	1.6	10.1	B
NM 313/US 550	Existing (Vissim)	-	31	C	-	29.1	C
	Existing (Synchro)	0.84	26.8	C	0.71	23.3	C
¹ Volume to capacity ratio (Observed from Synchro Only)							
² Level of Service							

Based on the summary, the following 2013 observations and conclusions are made:

- Based on the Synchro analysis, all US 550 study intersections are operating at LOS C or better except at Edmund Road, Kuaua Rd, and Camino Don Tomas which all have movements which are LOS F.
- Left–turn movements from the minor street stop control intersections of Edmund Road and Kuaua Road both operate at an LOS of F with the Homestead Lane-Edmund Road intersection operating over capacity.
- The north to east left–turn movement at the Camino Don Tomas intersection is operating at LOS F and over capacity and thereby causing the entire intersection to operate at LOS F and over capacity.
- It should be noted that the maximum through volumes observed on US 550 occurs westbound during the PM peak at just under 2,000 vehicles. This is just at the threshold for two lane capacity with approximately half mile to mile signal spacing. Therefore, the need for three through lanes on US 550 is a near term need rather than long term.
- Although Jemez Dam Road currently operates at an acceptable level of service overall, eastbound demands are such that dual left–turn lanes will need to be maintained if development occurs to the south and the south leg becomes operational. 2013 demands were analyzed under both minor mitigation scenarios and under a six lane section scenario. All signalized intersections are projected to operate at an acceptable level of service.
- Generally, the VISSIM results are consistent with those observed using the Synchro analyses except for the following:
 - The Synchro output indicates much greater delay and a lower LOS E & F at the NM 528 Intersection for AM and PM peak respectively.
 - While overall LOS at Homestead and Kuaua are LOS A both models indicate worst case movements that are LOS F. These are generally minor street movements under stop control and were low demand.
 - The noticeable difference in LOS at Is due to the fact under existing conditions this intersection is unsignalized, but was simulated as a signalized intersection. This was due to the fact that Phase 1–A indicated this intersection warrants signal control provided a connection remains between Sheriff's Posse Road and NM 528 / Tamaya Blvd. As will be discussed in the analysis section of this report, this signal will not be feasible under the six–lane and reversible lane scenarios due to signal spacing issues.

- Synchro delays at Camino Don Tomas indicates a LOS D and greater delay than VISSIM calculations during the PM peak with some of the lower demands movements over capacity. VISSIM also indicated some of the lower demand movements at LOS E. The PM peak also indicates lower demand movements over capacity in the Synchro model and the VISSIM model indicates that those movements at LOS D.

7.8.2 EXISTING CRASH ANALYSIS

Table 3 on the next page presents a summary of the crashes determined to have occurred within the study corridor. Additionally, crash diagrams for all study intersections were created and included in Appendix F. Review of the information suggests a few comments/conclusions:

- Collected crash data includes 2009 through 2011, as 2011 crash data was the latest available from the NMDOT Data Management Bureau. The most crashes occurred during the 2010 calendar year.
- Generally, observed crashes occurred at both the Camino Don Tomas and Jemez Dam Road intersections at over half of the observed crashes for the whole corridor. Another third of the observed crashes appear to occur at NM 528 / Tamaya Blvd, and NM 313 (Camino del Pueblo).
- The most common crash type by far was rear-end crashes, which tends to indicate congested conditions combined with vehicles traveling too fast. Additionally, most of these crashes occurred at the Camino Don Tomas and Jemez Dam Road intersections. Camino Don Tomas currently does not have right-turn lanes on either the east or west legs of the intersection, but a new right-turn lane is being added on the west lane and a right-turn lane is recommended for the east leg. With the addition of these lanes, the risk for rear-end crashes should be reduced.
- There were two observed fatal crashes within the study area with one occurring at Edmund Road and one at Sprint Boulevard. The fatal crash at Edmund Road was an angle crash involving a motorcycle and was caused due to a driver failing to yield right-of-way. The crash report says that the vehicle was turning from Edmund Road, and turned in front of the on-coming motorcycle. The crash at Sprint Blvd was a rear-end crash in which an eastbound vehicle traveling well over the speed limit crashed into the back of another eastbound vehicle, stopped at the red light. Excessive speed was cited as the cause of the crash.
- Night time crashes accounted for approximately 19% of all crashes. Even though this appears to be a minority of total crashes, it must be mentioned that the corridor is lit in advance of Camino Don Tomas to I-25 and at NM 528 / Tamaya Blvd. There are street lights on the signal poles at Jemez Dam Rd. Street lighting is generally absent between Jemez Dam Road and Camino Don Tomas.

Full street lights throughout the corridor could significantly reduce (up 20% for all types of crashes) night-time crashes with relatively less construction costs.

- Similar to Camino Don Tomas, there was a large majority of rear-end crashes occurring at Jemez Dam Rd. One potential cause for these crashes is due to the westbound add-through-right lane at the intersection and westbound acceleration lane downstream which drops to a forced right-turn lane at NM 528 / Tamaya Blvd. Vehicles turning right from the north leg could easily mistake the upstream added through-right pocket as a right-turn lane only and therefore turn in front of westbound through movements, thinking they are turning right.

The most common reason given for crashes was following too close at 41%. Again, this is consistent with the fact that the most common type of crash is rear-end collisions on a congested corridor. The second most common reason was failure to yield at 19%. Driver inattention was a close third at 16%.

Table 3 – Crash History Summary 2009 to 2011

US 550 Intersection with:		Hwy 313	Camino Don Tomas	Sheriff's Posse	Edmund RD	Jemez Dam	NM 528	Total	
Total Crashes		21	37	1	9	41	22	131	
by Year	2009	20	16	1	2	10	7	56	
	2010	1	12		6	22	13	54	
	2011		9		1	9	2	21	
by Crash Type	Rear-End	14	25	1	3	32	17	92	
	Angle	3	7		3	6	2	21	
	Sideswipe	3	4		2	3	2	14	
	Fixed Object	1	1		1		1	4	
	% Angle	14%	19%	0%	33%	15%	9%	16%	
	% Rear-End	67%	68%	100%	33%	78%	77%	70%	
by Severity	PDO	15	24		8	34	14	95	
	Injury	6	13	1		7	8	35	
	Fatality				1			2	
	% Injury	29%	35%	100%	0%	0%	36%	27%	
by Time of Day	Day	17	29	1	8	33	13	101	
	Night	4	6		1	8	9	28	
	Dawn/Dusk		1					1	
	Raining		1					1	
	AM / PM Peak Periods^	9	16	1	1	6	6	39	
	% Night	43%	16%	0%	11%	20%	41%	21%	
by Cause	Alcohol Involved	1	1			2	2	6	
	Driver Inattention	1	5		1	8	4	19	
	Failure to Yield	5	6		5	4	2	22	
	Red Light-Running					3	2	5	
	Following Too Close	12	18	1	1	21	8	61	
	Improper Lane Change		4		1		2	7	
	Skid-No Braking							0	
	Left of Center					1	1	2	
	Avoid Pedestrian				1			1	
	Avoid Vehicle		1			1		2	
	None	1	1			1	1	4	
	Made Improper Turn	1	1					2	
	% Following Too Close								47%
	% Failure to Yield								17%

Using the 2010 Highway Safety Manual (HSM), predicted yearly crash rates for each intersection and roadway sections were calculated based on existing conditions and traffic demands and then compared to historical crash rates as summarized in Table 4. As indicated, the intersections at Jemez Dam Road and Camino Don Tomas are identified as locations with much higher than expected crash rates.

Table 4 – Crash History Summary 2009 to 2011		
US 505 Intersection with:	HSM Predicted Crash Rate	Observed Crash Rate
NM 313	6.10	7.00
Camino Don Tomas	7.10	12.33
Sherriff's Posse	2.10	0.30
Kuaua Road	1.60	0.00
Homestead Road	2.20	3.00
Jemez Dam	4.20	13.67
NM 528	6.90	7.33

Based on the crash data and analysis, the following improvements could reduce crashes along the US 550 corridor:

- As mentioned, an eastbound right-turn lane will be added at Camino Don Tomas. HSM predicts that this will reduce rear-end crashes and overall crashes by 8%. However, there were many observed crashes westbound as well. Therefore, a westbound right-turn lane could mitigate some of these crashes, but is not recommended at this time due to low westbound right-turn demands.
- Per the 2010 HSM, removing skew from an intersection can reduce crash rates by as much as 23%. Although, removing a skew will mainly impact angle crashes rather than rear end crashes.
- Improvement of corridor progression with adjustments to signal timing and offsets can also reduce rear end crashes especially since the most common reason for crashes was "Following Too Close". Propose signal improvements are discussed in the previous section.
- There was a disproportionate amount of night-time crashes at NM 528 / Tamaya Blvd. Currently the intersection is lit with streetlights on the signal poles, and on three approaches (East, West, and South).
- Replacement of all TWLTL sections with raised median is have been observed to reduce crashes of all types on a corridor anywhere from 5% to 50% within the section of roadway in which TWLTL are being removed.
- The consolidation of ten driveways to two between Camino Don Tomas and NM 313 (Camino del Pueblo) is predicted to result in an 8% reduction of overall crashes within that segment of roadway.

- Simply adding a right–turn only lane on US 550 at westbound Jemez Dam Road could reduce overall crashes by 5% and rear-end crashes by 4%. This does not account for the additional benefit of removing a potentially confusing maneuver for eastbound right–turn vehicles and therefore rear-end crashes reductions would be expected to be much greater by simply restriping and possibly signal modifications. However, LOS and capacity analysis indicates that three through lanes are required at this approach during the PM peak. Therefore, the best recommendation to reduce crashes at this location would be to construct the third through lane from the corridor and add an exclusive right–turn lane at the west leg of Jemez Dam Rd.

7.8.3 FUTURE TRAFFIC DEMANDS

Based on MRCOG provided data, future growth trends of several models were reviewed. Generally, within the Town of Bernalillo significant growth is not expected. Additionally, the MRCOG 2035 regional model (used in Phase 1-A) has been modified to reflect the economic downturn that occurred around 2010, with many locations throughout the region showing a significant reduction in projected trips for 2035. The 2035 Metropolitan Model, an Alternative Option (Modified 2035) projected peak hour directional traffic demands for the study area were obtained from the MRCOG with raw data provided in Appendix G. The 2035 directional demands were converted to intersection turning movements using the existing entering and exiting traffic demands for all approaches at an intersection, and as algorithm known as the “Fratar” or “Furness” method. This algorithm maintains 2035 entering and exiting demands and finds a unique algebraic solution for left, through, and right–turn movements on each approach that match existing turning proportions as closely as possible. For this study, the “TurnsW32” program was used to develop 2035 turning demands at major study intersections. Calculation sheets indicating input and output at each intersection are provided in Appendix H.

Future Commercial Retail Development-Several parcels of undeveloped land are currently located at three of the four quadrants of the NM 528 / Tamaya Blvd intersection. A retail commercial development is planned for the southeast corner of the US 550/NM 528 / Tamaya Blvd intersection. Additionally, expansion of existing commercial developments located on the north of US 550 between NM 528 / Tamaya Blvd and Jemez Dam Road is in the planning stages and will likely include additional retail and office spaces. However, the anticipated intensity of additional development does not appear to be represented in the 2035 modified model demands at the NM 528 / Tamaya Blvd intersection. Therefore, an approximate 20% Floor to Area Ratio (FAR) was assumed so that trips could be generated and overlaid onto 2035 modified traffic volume projections.

Based on a 20% FAR, the following land use intensities are assumed:

North Development

- 184.5 KSF of Retail
- 1,073.7 KSF of Office

• South Development

- 314.5 KSF Retail
- 40 KSF High Turnover Restaurant
- 25 KSF Fast Food w/ Drive Through

Trip generation rates taken from the ITE published ITE Trip Generation Manual 9th Edition were applied for each land use type. Trip generation calculations are provided in Appendix I. Per a discussion with MRCOG it was decided that the above generate trips would be assigned to the north side of US 550, but would not add an overall net gain of through demand on US 550. This is due to the fact that the assumed commercial development was already accounted for and assigned to NM 528 south of US 550. Therefore, the number of trips assigned to and from the north side of US 550 at Tamaya Blvd, Jemez Dam Rd, and Edmund Road were subtracted from the total traveling to and from NM 528 Intersection. These adjustments, along with additional post processing of the 2035 modified demands, are documented in greater detail in Appendix J.

Resulting Modified 2035 AM and PM peak hour projected turning movement demands are depicted in Figure 14.

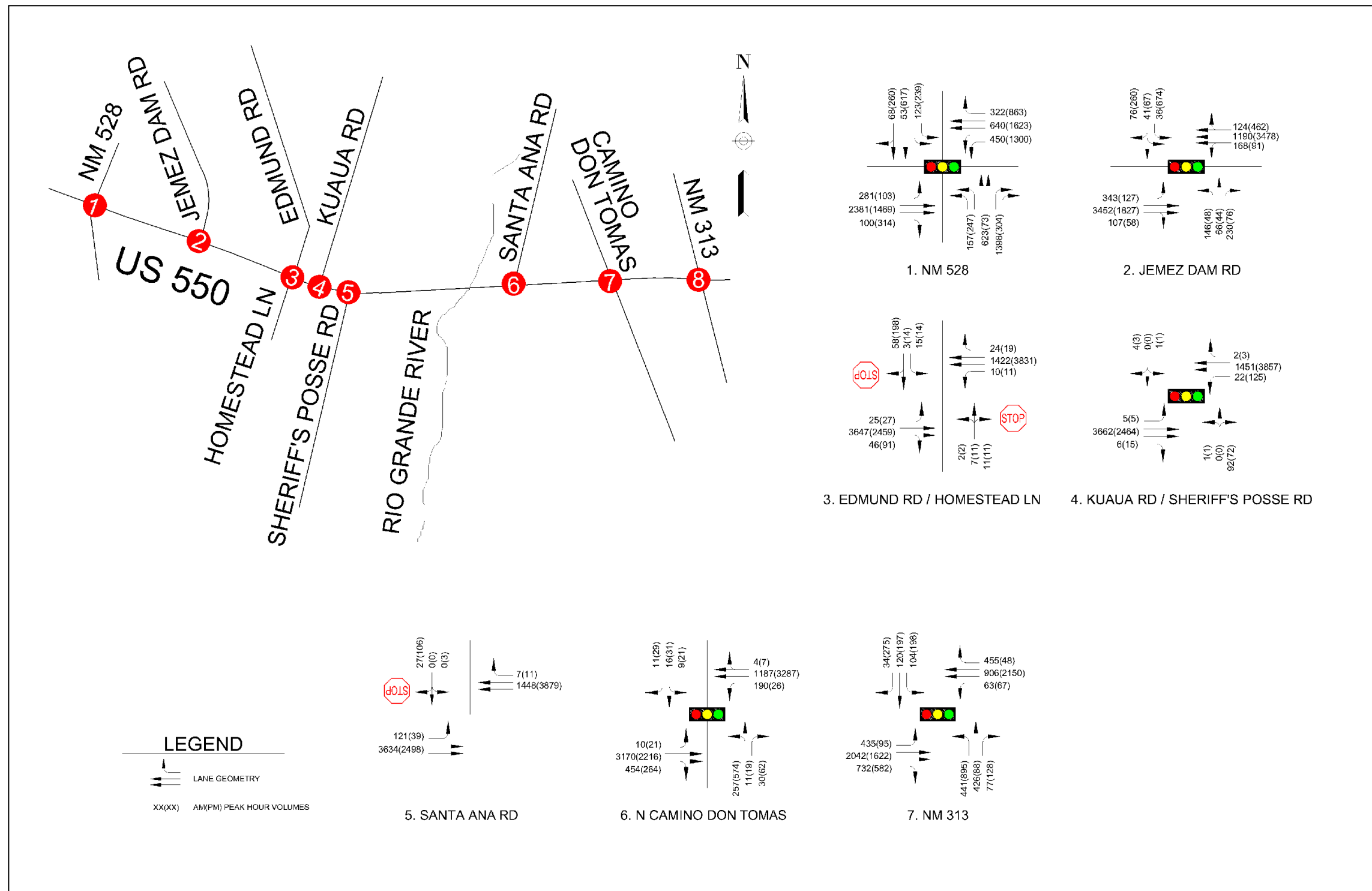


Figure 14 – Projected Modified 2035 Traffic Demands (MRCOG Model)

The following observations are noted based on the final adjusted 2035 turning movements depicted:

- Based on current land use, the total projected traffic traveling to and from Santa Ana Pueblo between Santa Ana Road and NM 313 does not appear realistic. Especially considering that the demands appear to indicate that the primary developments would be work-based trips meaning that it is expected that large commercial developments will occur in this area. However, currently this is where the Pueblo residential area is located and would not likely change in zoning category. Therefore, analyses for movements to and from this area as well as analysis of the Santa Ana Road, Camino Don Tomas and NM 313 will be very conservative.
- Based on the most current Transportation Management Plan, Camino Don Tomas and NM 313 south of US 550 are not identified for expansion to additional lanes. Furthermore, it is unlikely that these corridors would be considered for widening as Camino Don Tomas provides local access to adjacent neighborhoods, a park and a school and NM 313 serves as the main street for the Town of Bernalillo’s historic downtown area. However, the 2035 AM and PM peak demands are projecting traffic much greater than current capacity can handle on both Camino Don Tomas and NM 313 and thus will indicate that both these corridors will be highly congested and may not be able to accommodate projected demands.
- Demands on Sheriff’s Posse could reduce if connection between NM 528 via Ventana Plaza Drive is not maintained.

8.0 ENVIRONMENTAL

8.1 GEOLOGY

The US 550 study area is located in central New Mexico in the bottomland of the Rio Grande Valley and sloping lands to the west. This area is part of the Mexican Highland Section of the Basin and Range Physiographic Province (Williams, 1986). The surface geology consists of Quaternary alluvium and Quaternary piedmont alluvial deposits (New Mexico Bureau of Geology and Mineral Resources, 2003). The western part of the study area slopes downward to the southeast with elevations ranging from 5270 feet above mean sea level (amsl) at Paseo del Volcan to 5050 feet at the Rio Grande (No. 8537 & 8540) Bridge. The eastern part of the study area from the bridge to NM 313 (Camino del Pueblo) is relatively level with elevations ranging from 5050 to 5060 feet.

8.2 SOILS

Five soil mapping units are located in the US 550 study area. Sheppard loamy fine sand (3-8% slopes) occupies 69% of the study area (Table 5). The soils have a moderate-high risk of water and wind erosion.

Soil Mapping Unit	Percent of Study Area	Water Erosion Risk ¹	Wind Erosion Risk ²
Gilco clay loam, 0-1% slopes	2%	.32	4L
Gilco loam, 1-4% slopes	4%	.37	4L
Sheppard loamy fine sand, 3-8% slopes	69%	.20	2
Trail fine sandy loam, 3-8% slopes	8%	.28	3
Trail silty clay loam, 0-1% slopes	15%	.37	4L
Rio Grande channel	2%	--	--

¹K values range from 0.02 to 0.68—the higher the value, the more susceptible the soil is to sheet and rill erosion by water.
²Wind erodibility group values range from 1 to 8—the higher the value, the least susceptible the soil is to wind erosion
 Source: *Natural Resources Conservation Service*, 2014.

8.3 WATER

The Rio Grande is a defining natural element along US 550. The river and adjoining areas retain their natural character. It is a perennial stream. In recent years, average annual stream flow ranged from 643.4 cubic feet per second (cfs) in 2012 to 1,571 cfs in 2008 (see Table 6). Peak steam flows are affected by water releases from upstream dams. The peaks commonly occur during the late spring and early summer in the irrigation season (May through July). Peak steam flows ranged from 3,790 cfs in December 2010 to 5,920 cfs in May 2010 (U.S. Geological Survey, 2014).

Table 6 – Rio Grande Streamflow at Alameda Bridge, Years 2006 through 2012

Water Year	Average Annual Streamflow	Peak Streamflow	Date of Peak Streamflow
2006	729.1 cfs	5,400 cfs	July 8, 2006
2007	988.6 cfs	4,430 cfs	July 31, 2007
2008	1,571 cfs	5,370 cfs	June 10, 2008
2009	1,161 cfs	5,330 cfs	May 13, 2009
2010	1,147 cfs	5,920 cfs	May 24, 2010
2011	696.9 cfs	3,790 cfs	December 18, 2010*
2012	643.4 cfs	4,470 cfs	August 17, 2012

cfs—cubic feet per second

** Statistics based on water year; thus, peak flow for water year 2011 occurred during December 2010.*

Source: U.S. Geological Survey, 2014

The NMED lists the Rio Grande from the US 550 Bridge to the Alameda Blvd Bridge as an Impaired Surface Water. The causes include polychlorinated biphenyls (PCBs), gross alpha particles, E. coli, and dissolved oxygen. The probable sources include municipal point source discharges, waterfowl, septic systems, pet wastes, municipal sources, runoff from impervious surfaces, and unknown sources (NMED, 2014a). NMED (2002) prepared a Total Maximum Daily Load (TMDLs) for fecal coliform. The TMDLs apply to the Middle Rio Grande, which includes the US 550 river crossing. The Middle Rio Grande Conservancy District manages irrigation channels along the Rio Grande. The Albuquerque Main Canal and Bernalillo Riverside Drain extend along the east side of the Rio Grande and pass under US 550.

The depth to groundwater ranges from 1 to 300 feet near the study area. The average depth to groundwater for area wells is 31 feet (New Mexico Office of the State Engineer, 2014). Water is obtained from an alluvial aquifer associated with the Rio Grande.

Floodplains occur in two parts of the study area. A large 100-year floodplain extends from approximately 600 feet west of the NM 313 (Camino del Pueblo) intersection to the Bernalillo Riverside Drain. A second 100-year floodplain/floodway is located along the Rio Grande Channel under the bridge. The study area west of the Rio Grande is upland and does not contain a 100-year floodplain (Federal Emergency Management Agency, 2008).

8.4 VEGETATION

Natural vegetation communities occur along certain portions of US 550. Plains-mesa sand scrub vegetation, based on Dick-Peddie's (1993) classification occurs along the north side of US 550 from Paseo del Volcan to NM 528 / Tamaya Blvd. It is also found in dispersed areas between Paseo del Volcan and the Rio Grande where vegetation disturbance has been limited. Sand sagebrush is the dominant shrub in this vegetation type. It grows in association with grasses such blue grama, hairy grama, sideoats grama, alkali sakaton, and Mesa dropseed. Broom snakeweed and fringed sage are two forbs commonly found in plains-mesa sand scrub vegetation.

Along the Rio Grande, disturbed riparian woodland vegetation is present. A canopy of Rio Grande cottonwood trees is the distinguishing feature of this vegetation type. Common plants include coyote willow, New Mexico olive, Russian olive, salt cedar, Siberian elm, summer cypress, sand sage, four-wing saltbush, and tansy aster. Class C noxious weeds growing in the study area near the Rio Grande include Russian olive, Siberian elm, salt cedar, and cheatgrass. No treatment is recommended for Class C noxious weeds.

Remaining areas have been cleared of native vegetation. Most disturbed areas have asphalt, concrete, gravel, or bare soil cover. Some areas are planted in ornamental trees and low-growing plants.

8.5 WILDLIFE

The most important fish and wildlife habitat is near the Rio Grande. Common animals include raccoon, skunk, mallard, American crows, common raven, mourning dove, turkey vulture, barn swallow, black-chinned hummingbird, cliff swallow, and black phoebe. The US 550 Rio Grande (No. 8537 & 8540) Bridge provides shelter for a large maternal bat colony. Cottonwoods and willows along the Rio Grande provide nesting sites for birds and define much of the riparian habitat.

The Rio Grande and adjoining riparian areas are an important migration corridor. Cranes fly south along the corridor during late October and early November and fly north during March. In a region of limited water, fish depend on the Rio Grande waters for their survival.

Plains-mesa sand scrub vegetation provides suitable habitat for a variety of reptile, bird, and mammal species. Examples of common species include black-tailed jackrabbit, coyote, desert cottontail, Say's phoebe, scaled quail, and white-crowned sparrow.

8.6 PROTECTED SPECIES

Table 7 lists species potentially occurring in the study area. Most species are associated with the Rio Grande and adjoining riparian areas. Designated critical habitat for the Rio Grande silvery minnow (federal endangered) and proposed critical habitat for the yellow-billed cuckoo (federal threatened) occurs within the project area. Additionally, potential habitat for the southwestern willow flycatcher (federal endangered) also occurs in the area. Although the riparian area along the Rio Grande contains some elements of New Mexico meadow jumping mouse (federal endangered) habitat it lacked key constituents and consequently suitable habitat for this species was not present. Bald eagle (Bald and Golden eagle protection Act) is known to winter in the general area. Several species with state threatened or endangered status also had potential habitat in the project area. These are the paper pondshell, black hawk, and spotted bat. General surveys and protocol surveys completed in 2015 for the geotechnical investigations found that neither southwestern willow flycatcher or yellow-billed cuckoo were present. The black hawk was also not found in the area.

Bald eagles are known to winter within the Bernalillo to Albuquerque reach of the Rio Grande and could roost near the project area.

Data collected in February, April and May of 2015 documented that the Rio Grande silvery minnow is present at the US 550 bridge. All four of the proposed bridge options would construct within a small active flow channel lateral to the west of the main channel of the river. Option 1 would also require construction within the main channel of the Rio Grande thereby impacting both the main and lateral channel of the river and occupied Rio Grande silvery minnow habitat at two locations.

Migratory bird nests were found within the project area. These included a raptor nest in a cottonwood tree in the project area, as well as a colony of swallows on the existing bridge and other small migratory bird nests under the existing bridge. The alignments of all four bridges are similar and would likely have similar impacts upon migratory birds.

A maternal bat colony occurs beneath the existing US 550 bridge within the main joint between the east bound and west bound lanes. Because of the height of the bridge the colony was not accessible but similar roosts on bridges along the river were most frequently occupied by Mexican free-tailed bats.

The paper pondshell is known to occur within the Rio Grande near Rio Rancho and could be in the general project area but was not noted during the surveys of the area.

Table 7 – Listed Species with Potential to Occur within the Study Area				
Group	Common/Scientific Name	Agency County Status	Habitat/Distribution	Present/Absent During Survey
Plants				
	La Jolla prairie clover (<i>Dalea scariosa</i>)	NMRPTC	Sandy areas-often along roadsides	A-Not present in project area
Invertebrates				
	Paper pondshell (<i>Utterbackia imbecillis</i>)	NMDGF E	Mud, sand, and gravel substrates of lakes and rivers. Observed in middle Rio Grande near Rio Rancho	Unknown-Potential suitable habitat present
Group	Common/Scientific Name	Agency County Status	Habitat/Distribution	Present/Absent During Survey
Fishes				
	Rio Grande silvery minnow (<i>Hybognathus amarus</i>)	USFWS E NMDGF E	Rio Grande from Cochiti Reservoir south	P-Suitable and occupied critical habitat present in Rio Grande
Amphibians				
Reptiles				
Birds				
	Southwestern willow flycatcher (<i>Empidonax traillii extimus</i>)	USFWS E NMDGF E	Willow / cottonwood riparian and wetland habitat	A-Potential suitable habitat present within project area/vicinity
	Western yellow-billed cuckoo (<i>Coccyzus americanus</i>)	USFWS T	Nests in riparian woodlands	A-Potential suitable habitat present within project area/vicinity
	Bald eagle (<i>Haliaeetus leucocephalus alascanus</i>)	BGEPA NMDGF T	Nests along large lakes and rivers, winters in Bosque along Rio Grande	Unknown-suitable winter roost habitat present
	Common black-hawk (<i>Buteogallus anthracinus anthracinus</i>)	NMDGF T	Nests in cottonwood overstory in Riparian woodlands	A-Not observed. Marginal potentially suitable habitat present
Mammals				
	New Mexico meadow jumping mouse (<i>Zapus hudsonius luteus</i>)	USFWS E NMDGF E	Grassy, riparian meadows and wetlands	A-Marginal suitable habitat present in vicinity
	Spotted bat (<i>Euderma maculatum</i>)	NMDGF T	Roosts in caves or cavellike structures	Unknown-Suitable hunting and roost habitat present

E-Endangered, T-Threatened, C-Candidate, P-Proposed, BGEPA-Bald and Golden Eagle Protection Act, NMRPTC-New Mexico Rare Plant Technical Council.

8.7 CULTURAL RESOURCES

A cultural resource file search was conducted for the US 550 study area. Cultural resource data was obtained from the New Mexico Cultural Resources Information System (NMCRIS) managed by the Archaeological Resource Management Section (ARMS) of the New Mexico Historic Preservation Division (HPD) for a 0.5-kilometer (0.3-mile) search radius around the study area.

A total of 62 sites are located within the 0.5 kilometer (0.3 mile) radius. There is a high site density in the project area.

The listings of the National Register of Historic Places (NRHP) and the State Register of Cultural Properties (SRCP) were reviewed and four listed properties are in the vicinity of the study area. The Abenicio Salazar National Register Historic District is adjacent to the study area, but not within the study area. The other three registered properties are clearly outside the study area. Also, the entrance into the Coronado Historic Site is within the study area.

In addition to the cultural resources discussed above, 11 recorded historic buildings, the Burlington Northern and Santa Fe (BNSF) railroad, and an acequia have been previously recorded onto Historic Cultural Properties Inventory (HCPI) forms, and are within 0.5 km (0.3 mi) of the study area. The 11 historic buildings are located within the study area and will be updated during the survey. The BNSF railroad and acequia are outside the study area. Finally, 66 cultural resource surveys have been previously conducted within a 0.5 kilometer (0.3 mile) radius of the study area. The surveys were conducted from 1976 to 2013.

8.8 AIR QUALITY

Bernalillo has an arid climate with limited and sporadic rainfall. Based on 1981 to 2010 climate data, Bernalillo receives an average of 7.00 inches of precipitation. More than 1.0 inch of monthly precipitation was received on average during August, September, and October. Maximum temperatures range from 95.5 degrees Fahrenheit (°F) in July to 49.0 °F in December. Minimum temperatures range from 60.2°F in June to 20.4°F in December (Western Regional Climate Center, 2015).

Air quality is good near the study area because surrounding lands have low-density development, air emissions sources are dispersed, and the open terrain allows for wind dispersal of pollutants. Sandoval County is in attainment with the Clean Air Act (New Mexico Environment Department [NMED], 2014b; U.S. Environmental Protection Agency [USEPA], 2014).

8.9 NOISE

Traffic is steady and is the main noise source in the study area. Vehicles travel at speeds of 30 to 45 miles per hour, which result in traffic noise levels typically found in urban areas. No residential receptors are located adjacent to US 550. Residences are located near the western end of the study corridor near Sheriff's Posse Road and are located 0.1 mile from the corridor through much of Bernalillo.

8.10 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The study area is located within Bernalillo, Rio Rancho, and the Pueblo of Santa Ana, all within Sandoval County. Based on the 2010 Census, Sandoval County had a population of 131,561 (see Table 8). Sandoval County is experiencing strong growth with a projected growth rate of 2.70 percent for the years 2015-2020.

Four Census Tracts provide local socioeconomic data for the study area and show the diverse socioeconomic conditions near the study area. Census Tract 105.03 includes northern Bernalillo east of the Rio Grande. Tract 105.03 has a population with a median age of 39.6 years and a large Hispanic/Latino population (72.4%). Census Tract 107.02 includes portions of Bernalillo and Rio Rancho on the south side of US 550 between NM 528 / Tamaya Blvd and the Rio Grande. Tract 107.02 has a median age of 45.3 years and slightly smaller than average Hispanic/Latino population (31.0%). Census Tract 107.17 includes northern Rio Rancho on the south side of US 550 west of NM 528 / Tamaya Blvd. Tract 107.17 has median age of 33.7 years and a typical proportion of Hispanic/Latino residents (44.0%) for New Mexico. Census Tract 110 covers Santa Ana Pueblo including areas north of US 550 and west of the Rio Grande. Tract 110 has a median age of 43.4 years and a large Native American population (41.9%).

Tracts 105.03 and 110 have relatively low incomes and high poverty rates when compared with the state median family income (\$53,956) and state family poverty rate (14.4%). In Tract 105.03, the median family income is \$49,539 and the poverty rate is 18.5%. In Tract 110, the median family income is \$51,731 and the poverty rate is 15.4%. Based on these statistics and their minority representation, Tract 105.03 in northern Bernalillo and Tract 110 in the Pueblo of Santa Ana should be considered communities of concern for environmental justice evaluation.

Table 8 – Demographic Characteristics of Areas Near US 550 Study Area

Characteristics	New Mexico	Sandoval County	Census Tract 105.03	Census Tract 107.02	Census Tract 107.17	Census Tract 110
Location Description	Statewide	Countywide	Northern Bernalillo East of Rio Grande	South of US 550 Between Rio Grande and NM 528	South of US 550 West of NM 528	Pueblo of Santa Ana-North of US 550 and West of Rio Grande
2010 Population:						
-Total Population	2,059,179	131,561	3,425	6,522	8,996	1,963
-Median Age—years	36.7	37.9	39.6	45.3	33.7	43.4
-Percent Under 18	25.2%	26.7%	24.6%	19.7%	31.3%	23.6%
-Percent Over 64	13.2%	12.1%	14.1%	16.0%	6.9%	17.4%
-Percent Population Growth 2010-2015	1.34%	3.02%	--	--	--	--
-Percent Population Growth 2015-2020	1.26%	2.70%	--	--	--	--
2010 Race Status:						
-White	68.3%	68.0%	70.7%	79.8%	71.8%	32.3%
-Black/African American	2.1%	2.1%	0.7%	2.8%	3.1%	0.6%
-Native American	9.4%	12.9%	4.8%	3.1%	5.3%	41.9%
-Asian	1.4%	1.5%	0.3%	1.8%	1.7%	0.4%
-Hawaiian / Pacific Islander	0.1%	0.1%	0.0%	0.1%	0.3%	0.1%
-Some other race	15.0%	11.5%	21.5%	8.8%	13.5%	21.0%
-Two or more races	3.7%	3.9%	2.0%	3.6%	4.3%	3.8%
2010 Hispanic / Latino	46.3%	35.1%	72.4%	31.0%	44.0%	32.0%
2010 Housing Units:						
-Owner-occupied Units	68.5%	81.0%	72.8%	89.4%	75.8%	85.2%
-Renter-occupied Units	31.5%	19.0%	27.2%	10.6%	24.2%	14.8%
2007-2011 Income and Poverty:						
-Median Family Income	\$53,956	\$67,050	\$49,539	\$82,336	\$85,539	\$51,731
-Family Poverty Rate	14.4%	9.3%	18.5%	5.2%	4.6%	15.4%
-Per Capita Income	\$23,537	\$26,757	\$21,279	\$34,404	\$29,130	\$24,308
-Per Capita Poverty Rate	19.0%	12.4%	22.3%	4.7%	4.2%	18.6%

Sources: Bureau of Business and Economic Research (2012); U.S. Census Bureau (2013)

The Albuquerque metropolitan area is New Mexico’s largest economic center. A variety of employment opportunities are provided in the region. The largest employers include Sandia National Laboratories, Kirtland Air Force Base, Intel, Albuquerque Public Schools, City of Albuquerque, and Bernalillo County. State agencies in Santa Fe also employ Albuquerque area residents. These employers are commuter destinations for workers living in Bernalillo and Rio Rancho. Worker commuter traffic uses US 550 on a daily basis. US 550 also provides a truck route for regional and statewide freight traffic. Sandoval County had a civilian labor force of 60,639 with an unemployment rate of 6.5 percent as of February 2015.

Sandoval County’s unemployment rate was slightly higher than the state unemployment rate of 6.3 percent (New Mexico Department of Workforce Solutions, 2015). Areas near the study area have vibrant economic activity. Santa Ana Star Casino is the largest business along the corridor. A variety of restaurants and retail establishments operate along US 550 including a Giant service station, Chevron service station, Subway, I-Hop, Tractor Supply, Home Depot, Auto Zone auto parts, O’Reilly auto parts, U.S. Bank, Wells Fargo Bank, Wicked Auto Sales, a laundromat, and other establishments.

8.11 LAND USE

Three distinct communities border US 550. The Pueblo of Santa Ana is a Native American community with a history that predates the arrival of the Spanish in New Mexico. Bernalillo was for many years a community that served farmers and travelers in Sandoval County; but in the last 50 years, it has started to resemble a suburban community. Rio Rancho is the youngest of the three communities, but it has experienced the fastest growth of any city in New Mexico during the last 30 years.

Lands near the study area have a long history of human occupation. The Village of Kuaua was located on the north side of the Rio Grande at the current location of the Coronado Historic Site. The Pueblo of Santa Ana, also known as Tamaya, was established by the 16th Century. After participating in the 1680 pueblo revolt, the residents of Santa Ana abandoned the pueblo and moved to the Jemez Mountains. They reestablished the pueblo in 1693. Since Bernalillo and Pueblo of Santa Ana are located near the Rio Grande, early Spanish explorers passed through the area. Coronado’s expedition crossed the study area in 1540, near Coronado State Park north of US 550, followed by the Oñate expedition in 1598. Historians attribute the name Bernalillo to the Gonzales-Bernal family. There were settlements in the area by 1680, and Las Cocinitas neighborhood, west of downtown Bernalillo, was established by the 1690s.

In contrast, Rio Rancho is a much newer community. In 1962, Rio Rancho Estates began developing residential lots on open land in southern Sandoval County. The City of Rio Rancho was incorporated in 1981.

By the 2010 Census, Rio Rancho had become the third largest city in New Mexico, increasing in population by 67 percent during the 2000-2010 decade (Bureau of Business and Economic Research, 2011; Julyan, 1998; and Pritzker, 2000).

US 550 is mostly a commercial corridor. The Town of Bernalillo manages development through the town's Planning and Zoning Department. Town of Bernalillo lands along US 550 are zoned for commercial use except for two areas on the north side of US 550 zoned as special use (Mid-Region Council of Governments [MRCOG], 2005; Town of Bernalillo, 2013). The commercial uses consist of restaurants, service stations, and retail establishments.

The Pueblo of Santa Ana manages development through its Planning and Building Services Department (Pueblo of Santa Ana, 2013). The pueblo's principal development along US 550 is the Santa Ana Star Casino complex on the north side of US 550 east of Tamaya Boulevard. Pueblo lands on the north side of US 550 west of Tamaya Blvd are undeveloped rangeland.

The City of Rio Rancho manages development through the city's Development Services Department. According to the Rio Rancho Comprehensive Plan, the southwest corner of US 550 and NM 528 is planned for office and mixed-use commercial use; and lands to the west of this area on the south side of US 550 are planned for low-and medium-density residential use. The comprehensive plans contain two land use policies related to transportation (City of Rio Rancho, 2010):

- Policy L-3: Promote and support development that supports walkability.
- Policy L-4: Encourage adequate pedestrian connections to future transit facilities in all residential site development.

8.12 FARMLAND

Farmers in the Rio Grande valley depend on Rio Grande waters for successful harvests. Irrigated agriculture has a long history in the valley and retains an important role in the economy and culture. The Albuquerque Main Canal is located on the east side of the Rio Grande and provides water to many farmers in the Middle Rio Grande Valley. All but one of the soil mapping units in the study area are classified as "not prime farmland" (see Table 9). The only farmland soil mapping unit is Gilco clay loam (0-1% slopes), which is classified as "prime farmland if irrigated." The extent of Gilco clay loam is limited to the south and east sides of the US 550/NM 313 (Camino del Pueblo) intersection. None of this area is currently cultivated or irrigated.

Soil Mapping Unit	Farmland Classification
Gilco clay loam, 0-1% slopes	Prime farmland if irrigated
Gilco loam, 1-4% slopes	Not prime farmland
Sheppard loamy fine sand, 3-8% slopes	Not prime farmland
Trail fine sandy loam, 3-8% slopes	Not prime farmland
Trail silty clay loam, 0-1% slopes	Not prime farmland

Source: Natural Resources Conservation Service, 2014

8.13 VISUAL RESOURCES

The views near the study area consist of an urban landscape. From US 550, the Sandia Mountains are visible to the east and provide a scenic background (see Photo 1). To the west of NM 528 / Tamaya Blvd, rolling hills are visible to the north. Trees and river views are present at the Rio Grande (No. 8537 & 8540) Bridge. The corridor mostly consists of an urban area streetscape (see Photo 2 and Photo 3). Near NM 528 / Tamaya Blvd, one-story commercial buildings and adjoining parking lots are the predominant view. Scenic riparian forest areas are located along the Rio Grande (see Photo 4).

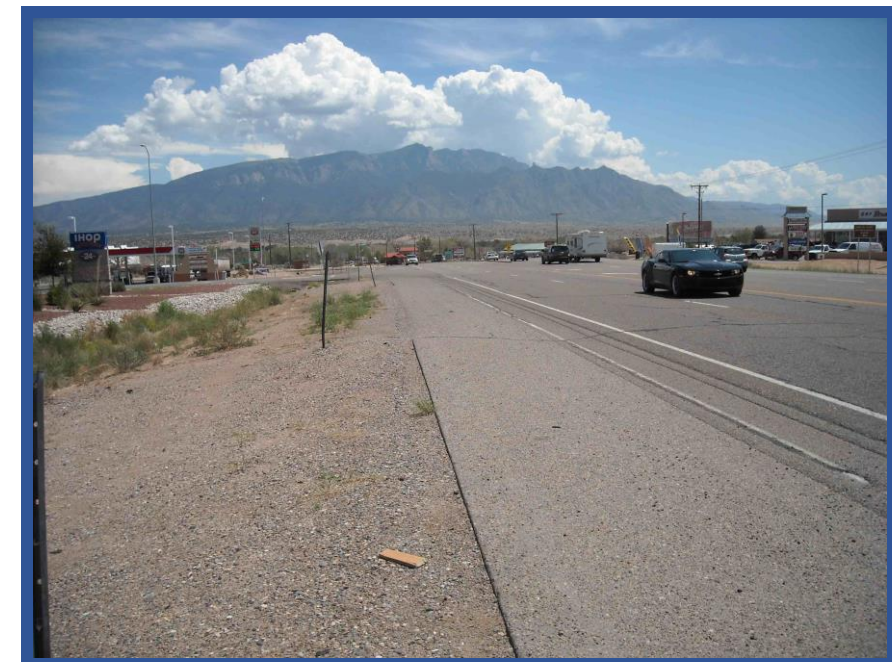


Photo 1 – US 550 looking east between NM 528 and the Rio Grande

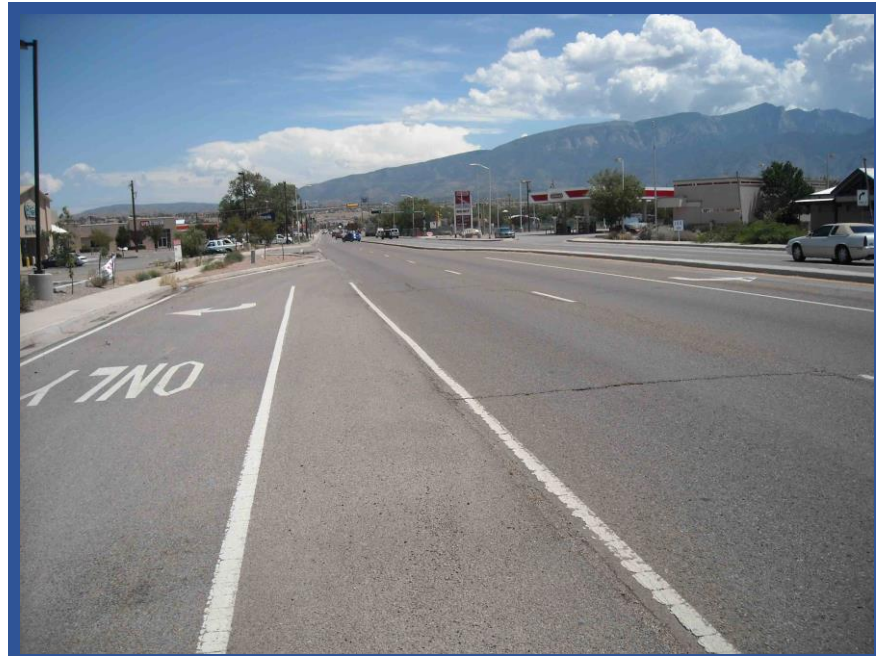


Photo 2 – US 550 looking east from west of Camino Don Tomas



Photo 3 – US 550 looking east between Camino Don Tomas and NM 313 (Camino del Pueblo)



Photo 4 – Riparian forest north of US 550 Rio Grande (No. 8537 & 8540) Bridge

8.14 SECTION 4(F)

As part of the Section 4(f) requirements, FHWA evaluates projects for impacts on public parks, recreation areas, wildlife and waterfowl refuges, and historic sites. FHWA projects are required to avoid such properties unless there is no prudent and feasible alternative to using that property. If a 4(f) property is used, the project must take steps to minimize harm to that property. No parks, recreation areas, or wildlife/waterfowl refuges are located within the study area. Coronado Historical Site is located north of the study area on Kuaua Road. Kuaua Road will need to remain in its present location to avoid Section 4(f) impacts. Several of the historic properties may qualify as Section 4(f) properties. Further investigation will be needed to determine if any of the historic properties qualify as Section 4(f) properties.

8.15 HAZARDOUS MATERIALS

Based on a preliminary review, hazardous materials sites along the corridor are associated with leaking underground storage tanks at service stations. Historical leaking underground storage tanks occurred near the NM 313 (Camino del Pueblo) intersection, along the US 550 section from 0.1 to 0.4 miles west of NM 313 (Camino del Pueblo), and on the southwest corner of the Camino Don Tomas intersection. An Initial Site Assessment (ISA) will be conducted in a subsequent project phase to identify recognized environmental conditions.

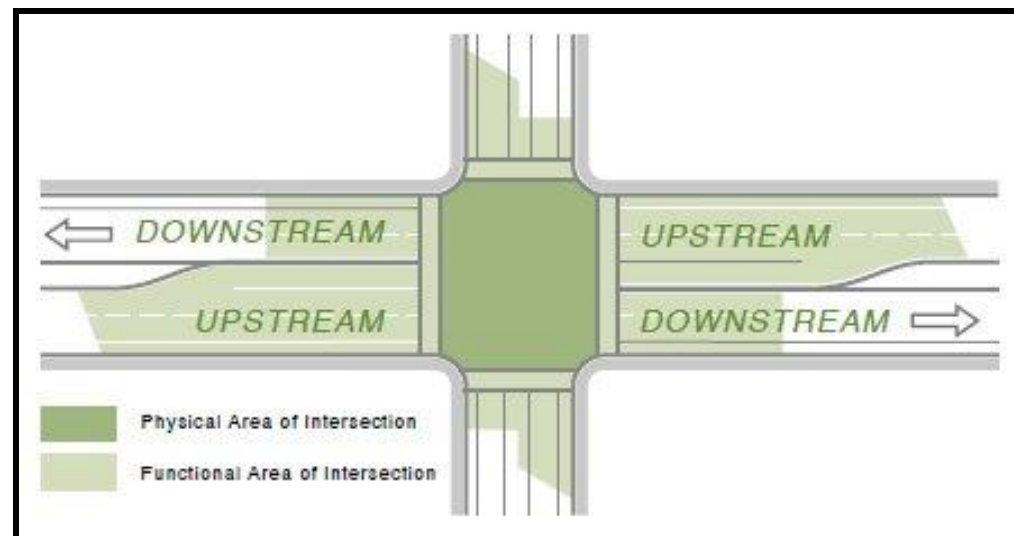
9.0 ACCESS MANAGEMENT

US 550 is an Urban Principal Arterial in the town of Bernalillo. The posted speed limit is 40 mph east and 45 mph west of the river. The minimum spacing of signalized intersections given in the State Highway Access Management Requirements Manual is ½ mile. The minimum spacing of full access unsignalized intersections is ¼ mile which also represents the allowable spacing between median openings. The minimum spacing of partial access points is 325 feet. The existing spacing of signalized intersections is shown in Table 10. The table indicates that it would be possible to add another signal between Jemez Dam Road and Camino Don Tomas.

Cross Street	Milepost	Distance SE to next signal	Distance NW to next signal
NM 313	0.75	0.60	0.42
Don Tomas	1.17	0.42	1.01
Jemez Dam	2.18	1.01	0.31
NM 528	2.49	0.31	0.51

9.1 DRIVEWAY SPACING AND ACCESS CONCEPTS

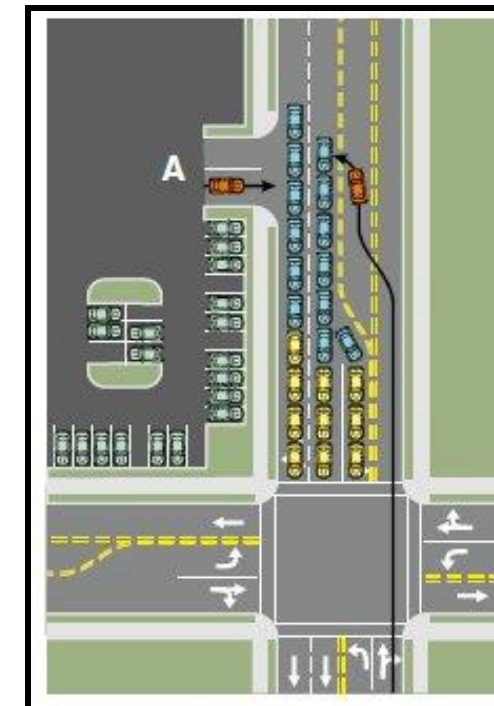
The inherent danger of frequent and closely spaced driveways on a corridor is that each driveway will tend to disrupt the functional and physical areas of the adjacent intersection or driveways. Per the FHWA publication “Access Management in the Vicinity of Intersections”, an intersection’s functional area goes beyond just the physical area of the intersection. This is depicted in the FHWA exhibit shown Figure 15.



Source: FHWA Access Management in the Vicinity of Intersections
Figure 15 – Functional and Physical Area of an Intersection

The functional area of an intersection is dependent on approach speeds and can range from 125 feet for an unsignalized intersection with 30 mph speed approaches up to 735 feet for a signalized intersection with 50 mph approaches.

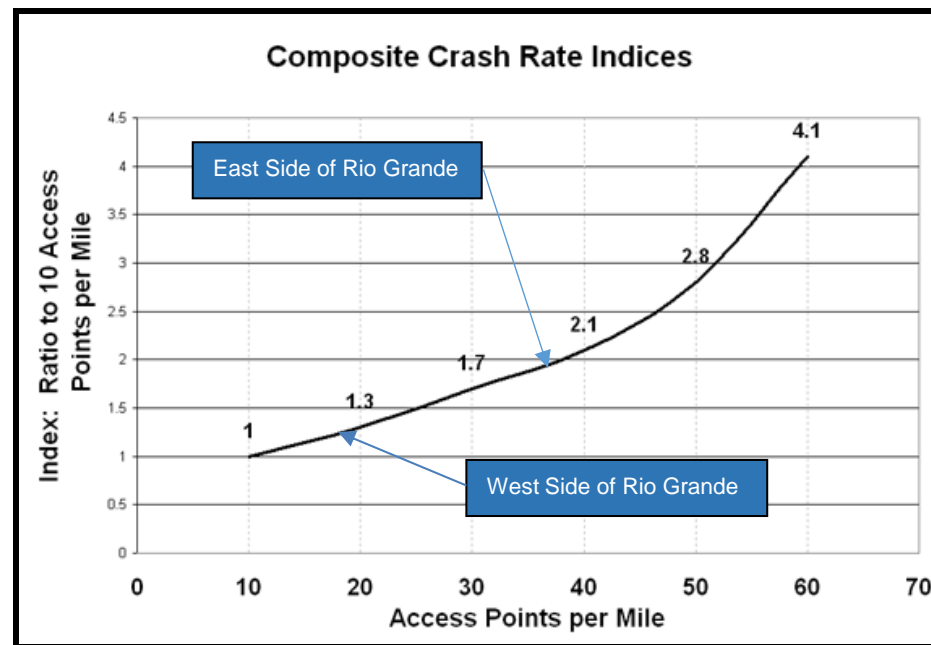
Many times driveways and access movements that are allowed too close to an intersection become ineffective and can't even be fully utilized especially during peak hours. This is effectively depicted in the FHWA provided in Figure 16.



Source: FHWA Access Management in the Vicinity of Intersections

Figure 16 – Obstructed Access Due to Driveway Spacing

Furthermore, national research indicates a distinct relationship between access density per mile of roadway and crash rates. Figure 17 is a graphic from the TXDOT access management manual showing how crash rates tend to exponential increase with greater access points per mile provided on a roadway.



Source: TXDOT Access Management Manual

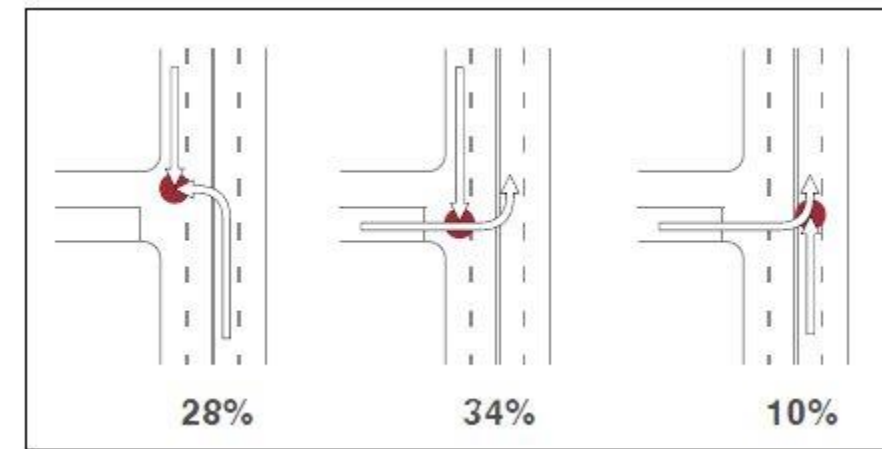
Figure 17 – Crash Rate vs. Access Points Per Mile

Current conditions are identified on the table for US 550 on the east side and west side of the river. As indicated, the east side has much greater potential for crash occurrences and any opportunities to promote access consolidation could reduce the risk for crash occurrences. Additionally, if driveway density were to increase in the west side of the Rio Grande, crash rates would likely increase.

9.2 MEDIANS

The most effective method of traffic control is the implementation of raised medians to restrict a very dense area of full movement driveways to right-in right-out only. This will remove one of the most unsafe movements within the corridor, which is the minor street left-out movement.

Per the FHWA's Access Management in the Vicinity of Intersections movements associated with the greatest crash percentage are left-turn movement to/from a minor street approach (See Figure 18).



Source: FHWA Access Management in the Vicinity of Intersections

Figure 18 – Crash Percentages for Turning Motorist to and from the Driveway

As indicated left turns from a minor street approach will account for almost half of all crashes at a given driveway (44%) and an uncontrolled left-turn to a minor street approach accounts for 28% of all crashes. Furthermore, as traffic demands on US 550 increase and a third through lane has been added, these maneuvers will be increasingly less safe. In an attempt to still provide left-in access for those poorly spaced and aligned driveways between NM 313 and Camino Don Tomas, one or two left-in only median openings can be provided with adjacent properties sharing access at these points. Therefore, it is encouraged that parcels share driveways where possible or take access off of the side street as opposed to directly off of US 550. Conflict points were compared between all design alternatives and are summarized in Table 11.

Table 11 – Conflict Point Comparison between Design Alternatives

Alternative	Conflict Points			
	Crossing	Merging	Diverging	Total
Existing	336	124	119	579
Six-Lane	217	50	42	309
Reversible Lane	245	99	77	421
Super Street	168	55	38	261

As indicated, all design alternatives offer some conflict point reduction with the reversible and six lane options with more modest reductions and the super street alternative offering the greatest conflict point reduction. It should also be noted that with the reversible lane option, many of the conflict points cannot be reduced to/from side-street as there is no raised median to enforce movement restrictions as part of this design alternative.

Driveway spacing should attempt to comply with the NMDOT State Access Management Manual for an Urban Primary Arterial with speed limits of 40 to 45 mph. Table 12 below summarizes spacing requirements for both partial, full movement and signal access

Access Category	Posted Speed (mph)	SAMM Recommended Intersection Spacing		SAMM Recommended Driveway Spacing	
		Signal	Unsignalized	Full Movement	Partial Movement
Urban Primary Arterial	40 mph	2,640 feet	1,320 feet	1,320 feet	325 feet
	45 mph	2,640 feet	1,320 feet	1,320 feet	450 feet

Source: NMDOT State Access Management Manual

9.4 ACCESS ALIGNMENT

There are several locations, especially between Camino Don Tomas and NM 313 where driveways are not aligned across from each other. Misaligned driveways can create opposing left–turn conflicts with the existing two–way left–turn lane and violate driver expectation, which can lead to increased crash risk. To mitigate this situation, shared access points have been proposed that will allow left–in only movements that will access adjacent commercial properties.

Both Sheriff's Posse Road and Kuaua Road are proposed to be aligned in the six lane alternative. Not only will this simplify access to and from these roads, but will also facilitate a much less complicated, safe shared median opening and signalized intersection when warranted. As previously mentioned, the alignment of these two streets would not be required for the Super Street design alternative.

10.0 DETAILED EVALUATION OF ALTERNATIVES

Alternatives are divided into mainline alternatives and options for the NM 528 / Tamaya Blvd intersection. Any of the intersection options could be combined with the mainline alternatives. Alternatives that have been carried forward from the Phase 1–A Study include No-Build, a Six Lane with Raised Medians Alternative, a Six Lane with a Reversible Lane alternative, and a Super Street alternative. NM 528 / Tamaya Blvd intersections options that have been carried forward include a Continuous Flow Intersection, a Super Street Intersection and a Flyover Intersection.

10.1 SIMULATION MODELING OF DESIGN ALTERNATIVES

Using the simulation software tool, VISSIM (Version 9.0), projected AM and PM 2035 modified traffic peak hour demands were applied to a simulation model for the design alternatives.

In order to calibrate VISSIM modelling, an existing conditions model was created incorporating 2013 AM and PM peak hour data (collected for Phase 1-A) and signal timing and lane geometry that were in place at that time. The model was then run with the following metrics taken from both AM and PM peak hour models and averaged over 10 simulation runs:

- Model Observed Volume Demands-Observed turning movement demands at all study intersections and driveways were collected and then compared to the 2013 data collection to ensure that the model was replicating field observed turning movement demands.
- Average Delay and LOS at Study Intersections-Observed delay and LOS were compared to HCM 2010 calculations to make sure that the modeled numbers are close to HCM predicted values.
- Travel Time-A pilot test installing blue tooth devices that would calculate travel time through the corridor was used to compare VISSIM predicted travel time to observed travel times.

9.3 ADJACENT ROAD NETWORK

Even with the benefits of added capacity offered by any of the design alternatives, improvements on US 550 will not solve all of the corridor's connectivity and access issues. Even the best planned arterial streets also need an adjacent road network with good connectivity. Currently US 550 lacks good collectors east-west on either side of the study corridor. Regardless of what improvements are ultimately constructed on US 550, an adjacent east-west road network needs to be developed to provide not only additional access for adjacent land uses, but also will provide capacity relief for US-550. Additionally, with additional east-west connectivity north or south of US 550, accommodation for less safe left–turns from minor street approach on US 550 becomes less necessary thus providing safer operation throughout the arterial corridor.

Based on 10 simulation runs, observed volume demands were generally within 10% of existing traffic count demands, average delays were such that similar levels of service were observed at most intersections, and travel time was observed to be within 10% for all directions and peaks except for eastbound during the AM which was within approximately 20%, it was determined that both the AM and PM models were sufficiently calibrated per the software recommended thresholds. Actual calibration numbers and comparisons are provided in Appendix K of this report.

Initially all alternative design models were reviewed visually in order to identify locations of congestion and excessive queuing. Feasible adjustments were made to signal timing and lane geometry for each model in an attempt to provide the best performing model for a given design alternative. Once all models were optimized, each model and peak period (1 hour) was simulated ten (10) times to reflect average observed delays, Levels of Service, and travel times throughout the corridor.

With the existing conditions properly modeled, VISSIM base models were then created for all the design alternatives for both projected 2035 AM and PM peak hours.

10.2 DRAINAGE ANALYSIS

Per the NMDOT Location Study Procedures and the scope of work for this Phase 1-B report the information below will identify potential drainage improvements needed to accommodate each alternative, including high level conceptual sizing of drainage infrastructure. The in-depth, detailed hydrologic and hydraulic analysis of the selected drainage facilities will be documented in a Preliminary Drainage Report.

The sections below discuss:

- an evaluation of impacts of the project on existing drainage infrastructure;
- some conceptual options to address the potential increase in on-site flows east of the river resulting from the right-of-way takes required for the roadway alternatives;
- options to incorporate MS4 requirements and GI / LID into the project; and
- an update of the initial on-site roadway hydrology prepared for the Phase 1-A and potential drainage infrastructure required to accommodate those flows for the proposed alternatives (included under each alternative heading);

A review of the impacts of the project on utilities will be performed using Level C SUE utility mapping during preliminary design. A complete summary of the proposed conditions drainage infrastructure will be documented in a Preliminary Drainage Report for the project.

10.2.1 EVALUATION OF IMPACTS ON DRAINAGE INFRASTRUCTURE

East of the Rio Grande, the mainline alternatives will impact two parallel existing MRGCD crossings of US 550 on the east side of the river. Exact quantification of the impacts will be determined during design. However, at this time it is anticipated that all alternatives will require extension of the 3 barrel 8-ft x 6-ft CBC conveying the Albuquerque Main Canal (on the east) and the 11-ft diameter multiplate pipe conveying the Bernalillo Riverside Drain (between the Albuquerque Main Canal and the levee) under US 550.

Additionally, all the mainline alternatives will require widening between NM 313 and the river. This widening will impact existing inlets (and associated slotted drains). It is anticipated that these inlets will be relocated to the new flow line and the connection to the storm drain extended as needed. Existing manholes in the area will also require adjustment to new road grades.

The mainline alternatives also require right-of-way takes. As described in the existing drainage conditions section, some of the parcels adjacent to US 550 in this area contain retention ponds that may be impacted by the takes.

Appendix C contains a Drainage Patterns and Basin Map that shows the location of existing ponds and inlets in the area. In order to anticipate the potential impacts of this project on the existing ponds, a detailed field reconnaissance was performed. Appendix C contains a summary table that documents the flow patterns on each adjacent lot and generally describes the ponds and other drainage infrastructure. The table also qualitatively illustrates how the drainage patterns and infrastructure may be altered by the right-of-way takes. The information was classified into three conditions: parcels whose drainage patterns are not anticipated to be affected by the right-of-way takes; parcels that may be impacted, and parcels that will likely be affected by the right-of-way takes. A detailed evaluation of the impacts will be performed for the chosen alternative and the impacts to drainage will need to be addressed with the design. The initial evaluation indicated that drainage infrastructure and patterns for 23 of the 29 lots adjacent to US 550 between NM 313 and the river will not be impacted; 4 of the parcels may be impacted; and 2 are likely to be impacted.

Potential design options to address the impacts may include using vertical walls at the edge of the right-of-way take to minimize the impacts. With that approach, currently the Design Team feels that the impacts to any ponds may be minimal (e.g. reduce retention pond volumes by 10-20%). Although not initially identified during scoping, a more thorough drainage analysis may be required during preliminary design to quantify these impacts. For example, if a given parcel has a retention pond, but the volume of the pond may be reduced by the project, an analysis of the existing drainage system could be performed assuming the retention pond does not exist, and any off-site runoff from the lot simply reaches US 550.

This would be conservative, and if the existing system performs under this condition, then the project impact of reducing the pond volume could be considered negligible.

As described in the existing conditions, west of the Rio Grande the existing drainage infrastructure is limited to roadside ditches and driveway culverts. Therefore, impacts of the project on the drainage patterns west of the Rio Grande are more straightforward. With the additional lanes, shoulders, multi-modal facilities and addition of curb and gutter, the footprint will be widened. As a result, all mainline alternatives will impact and reduce the capacity of existing roadside ditches. South of the US 550 corridor, these impacts will likely require relocation of the ditches further south. But it is anticipated that they can continue to function similar to existing conditions. North of the corridor, due to tight right-of-way limitations, the roadside ditch will be replaced by a storm drain system to convey the flows. The overall approach will likely still include some smaller roadside ditches to collect the off-site runoff, however the runoff will be discharged to an underground storm drain via area inlets.

Additionally, all mainline alternatives west of the river will require relocation of driveway culverts, approximately 10 on the north side and 7 on the south side. With the addition of curb and gutter in this section the on-site flows will become contained in an urban section. It is anticipated that a separate storm drain system will be required for the EB lanes to collect and convey this on-site runoff to the river. The on-site flows on the WB lanes may be able to discharge to the storm drain described above that will also serve to convey the off-site flows from the north.

10.2.2 OPTIONS TO ACCOMMODATE POTENTIAL INCREASED FLOWS

All the of the mainline alternatives require widening of the existing roadway. This widening will add to the on-site flows developed within the corridor. This is especially impactful on the east side of the river due to limited right-of-way and essentially fully developed adjacent lands. Some conceptual options to address these increased flows are discussed below.

10.2.2.1 Surge Ponding

One option maybe to collect the flows and discharge them into a new surge pond. The pond could help to reduce the peak flow from the additional on-site flows. The 50-year, 24-hour storm has a volume of 2.42 inches or 0.2-ft. The increase in impervious area east of the Rio Grande is 2.3 acres so the increase in volume is about 0.5 acre-feet. A pond 5-ft deep would need to be approximately 80-ft by 80-ft in size. There will likely be some parcel acquisition near NM 313 with any of the alternatives. While these areas could serve a ponding areas, their location at the upstream end of the project, as well as their history of land usage makes them less than desirable for surge ponds. However other sites along the corridor could be investigated.

10.2.2.2 Underground Detention

Due to the limited undeveloped properties in the area, another option to accommodate the anticipated increase in on-site flows would be the through the use of an underground detention facility. To accommodate the increase of approximately 0.5 acre-feet of runoff in an underground detention system of 6-ft diameter CMP pipes, approximately 700-ft would be required. This could be placed in existing right-of-way assuming a sufficient location – free of utility conflicts – can be identified near the downstream end of the project.

10.2.2.3 Pump Station Modifications

Given that a design report is not available for the existing pump station, the capacity of the existing system is unknown. However, it is possible that increased flows resulting from the project could be accommodated at the existing pump stations by retrofitting or replacing one of the existing pumps.

10.2.2.4 Parallel Storm Drain

A more thorough analysis of the options listed above will be performed during design. If none of the above options are deemed feasible, a parallel storm drain system may be required to enhance the capacity of the existing system.

A detailed analysis of the preferred roadway alternative and the associated drainage concept to accommodate the impacts of that alternative will be addressed in Preliminary Drainage Report.

10.2.3 MS4 REQUIREMENTS

The EPA Municipal Separate Storm Sewer Systems (MS4) Watershed Based Permit was officially enacted December 14, 2014. While the NMDOT has issued NOI and other documents acknowledging their willingness to meet the requirements, procedurally, the implementation of the requirements of that permit are still being flushed out.

Some portions of the document imply that owners must 'evaluate' MS4 treatment options, other areas prescribe specific treatment requirements. The portion of the permit that prescribes treatment incorporates a quantitative stormwater quality design standard. That standard manages on-site the 90th percentile storm event discharge volume associated with new development sites and the 80th percentile storm event discharge volume (0.48") associated with redevelopment sites (such as this project) within the Middle Rio Grande Urban Area (UA). The UA includes US 550 east of the river, however west of the river it only includes a limited area adjacent to the river. The quantitative standard only applies to the increased impervious areas.

Ideally the new impervious areas would drain to a sedimentation basin before discharging flows. For areas with limited right-of-way such as US 550 simple roadside ditches (on the west side) may suffice.

If project is unable to treat the volume of runoff from the increased impervious area (due to right-of-way limitations, cost, etc.) then the intent could possibly be met with the inclusion of WQ MH's or WQ inlets in new construction. Other alternatives could include simple modifications to existing facilities, such as adding a trash rack to the existing pump station outfall. For purposes of the US 550 project, the increased impervious area will be relatively small. Therefore, it is anticipated that the requirements can be met with the linear roadside ditches to be constructed north and south of US 550 west of the river.

10.2.4 GREEN INFRASTRUCTURE (GI) / LOW IMPACT DEVELOPMENT (LID) OPTIONS

Evaluating GI/LID for the US 550 project also ensures compliance with the existing EPA Municipal Separate Storm Sewer Systems (MS4) Watershed Based Permit. The MS4 Permit requires evaluation of GI/LID/sustainable practices in site development plans, minimizing the directly connected impervious areas at the watershed and site development levels, and constructing water quality facilities to control floatables, pollutants, and sediment. The MS4 Permit contends that the incorporation of GI/LID elements is important for protecting water quality in the Middle Rio Grande Watershed.

There are several Green Infrastructure (GI) and Low Impact Development (LID) options suitable for the US 550 roadway. Selection of specific GI/LID elements will be considered during the design phase of the selected final roadway option.

Storm drain systems designed for US 550 may be designed to include water quality manholes or water quality inlets. Water quality manholes are used to remove debris, trash, and sediment from the stormwater prior to discharge into the Rio Grande. Water quality inlets consist of one or more chambers that promote the settling of coarse sediment and capture floatable debris from the stormwater.

Surge ponds or water quality ponds may be a part of the final roadway drainage system. If ponds are utilized, water quality structures or structural Best Management Practices (BMPs) may be a part of these ponds and would function to remove floatables and reduce sediment and other pollutants in the stormwater. Options for pond BMPs include: inverted ported riser outlets, media filter settling basins, or baffle/weir wall debris removal structures.

Fence, screens, or other debris removal structures may be incorporated into drainage improvement designs to prevent debris from entering the drainage system. These water quality improvements are typically economical, easy to install, and easy to maintain. For US 550, screens may be placed at the outfall of future storm drain systems into ponds, roadside ditches, or the Rio Grande Bosque. Fencing around ponds or rundowns may also be used to prevent debris from entering the drainage system.

10.3 NO-BUILD

The No-Build Alternative would mean not making any physical changes to US 550. No right-of-way would be required and no costs would be associated with this alternative.

Not surprisingly, the No Build alternative is the worst performing model for both AM and PM peak hours under 2035 demands. A summary of average delay and LOS for all study intersections during the AM and PM peak hours is summarized in Table 13.

Table 13 – Capacity Analysis Summary for No Build Alternative

Intersection											
NM 528				Jemez Dam Road				Edmund/Homestead			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
144	F	103.9	F	39.5	D	99.5	F	2.7	D	33.3	C
Intersection											
Kuaua/Sheriff's Posse				Camino Don Tomas				NM 313			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
3.7	A	41.25	D	48.1	D	81.6	F	45	D	201.8	F

As indicated, most study intersections are expected to operate at LOS F. Furthermore, intersection delays shown are likely understated as the model is only able to populate 52% of the projected 2035 demands for some of the heavier movements during both AM and PM peaks.

Observations of the model visually indicates, heavy congestions throughout the corridor with extensive queuing, cycle failures, and ultimately gridlock throughout much of the study area. Most side streets are also congested with long queues due to congestion observed on US 550 and thus no room for vehicles to access US 550 even when indication are green. Resulting travel times range from 582 seconds in the AM Peak to 604 seconds in the PM, which are the longest observed average corridor travel times among all design alternatives. Finally, total network delays totaled 1958.3 hours allowing 8,272 vehicles on the network during the AM peak and 1,763 hours allowing 7,462 vehicles onto the network during PM, which was the worst performance of any alternative.

Based on these model observations, a No Build design alternative is not a viable option if projected 2035 traffic demands are to be accommodated.

In addition, there would continue to be no bicycle facilities and limited facilities for pedestrians. Economic development would suffer with the limited capacity. For these reasons, the No-Build is eliminated from further consideration.

10.4 SIX LANE WITH RAISED MEDIANS ALTERNATIVE

The Six Lane Alternative is to widen US 550 to three through lanes in each direction with 6-ft bike lanes, curb and gutter, and 5-ft sidewalks on both sides. An 18-ft raised median would be used to control access. On the west side of the river where there is more existing right-of-way, the bicycle lane can be widened to 8-ft to accommodate emergency vehicles. The proposed typical section is shown in Figure 19.

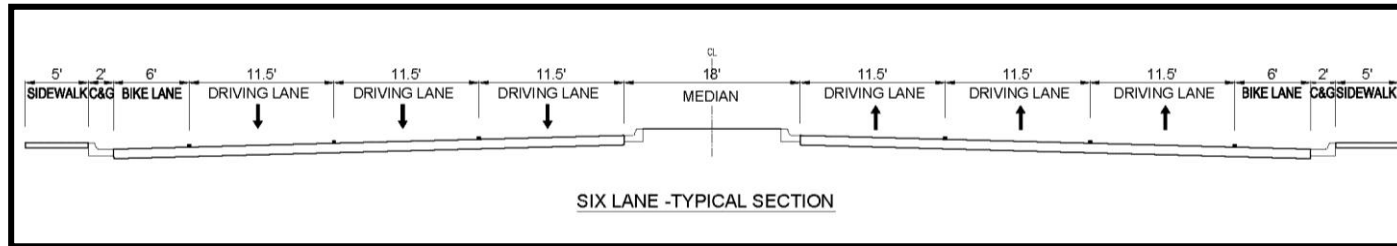


Figure 19 – Six Lane with Raised Median Typical Section

A plan view of the Six Lane Alternative is shown in Figure 20. This alternative was analyzed with a traffic signal at W. Jemez Road. The traffic analysis below shows that operations would be improved if the signal was relocated to the east to provide better signal spacing, more balanced lane utilization, and less interference with the operation of the NM 528 Intersection and queueing. Therefore, Figure 20 shows the signal moved to the east in the area of the Warrior II Gas Station. Other signalized intersections would be located at Camino Don Tomas and NM 313.

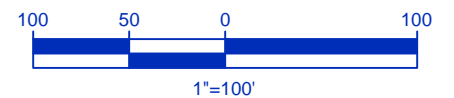
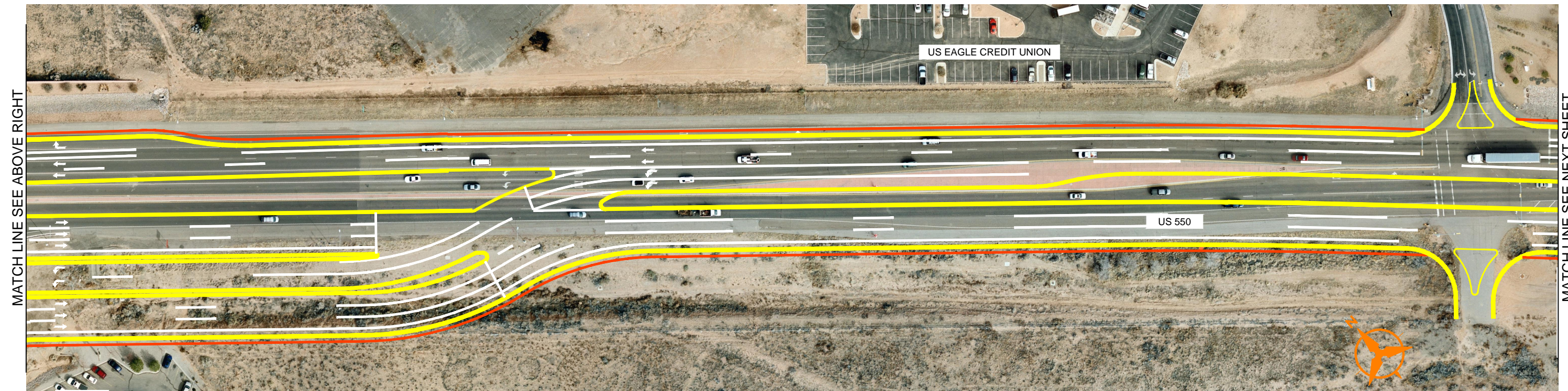
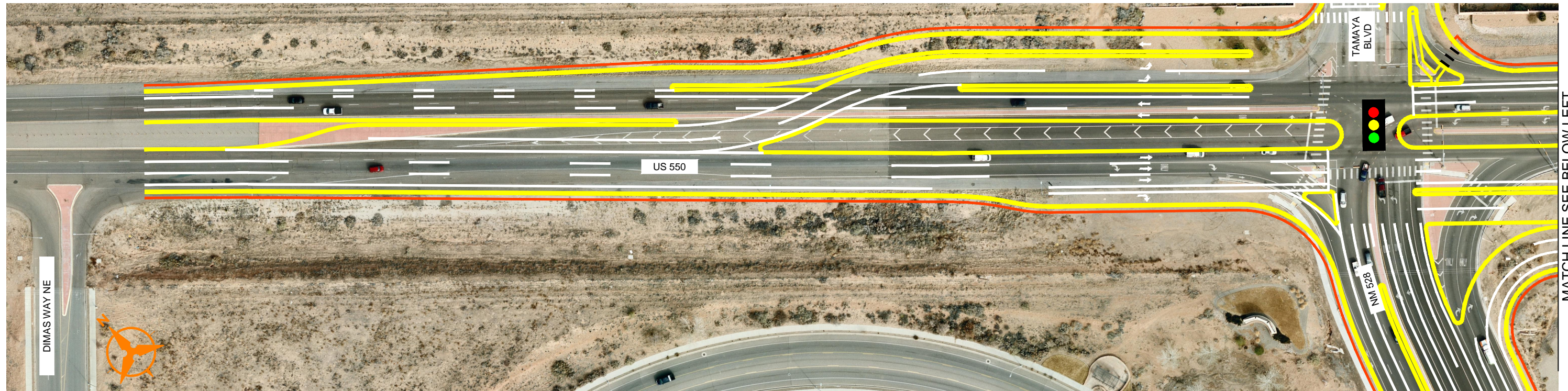
Unsignalized full access intersections would be located in between NM 313 and Camino Don Tomas, at Santa Ana Road, and at Sheriff's Posse Road / Kuaua Road. This would require Sheriff's Posse Road to be realigned with Kuaua Road as shown in the figure.

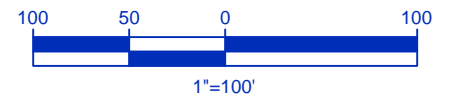
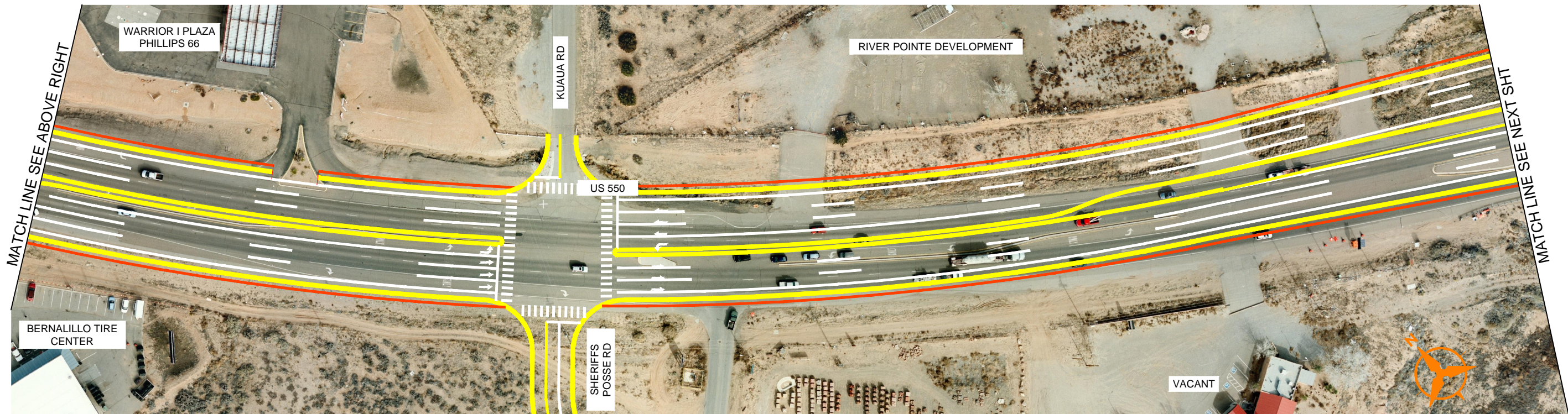
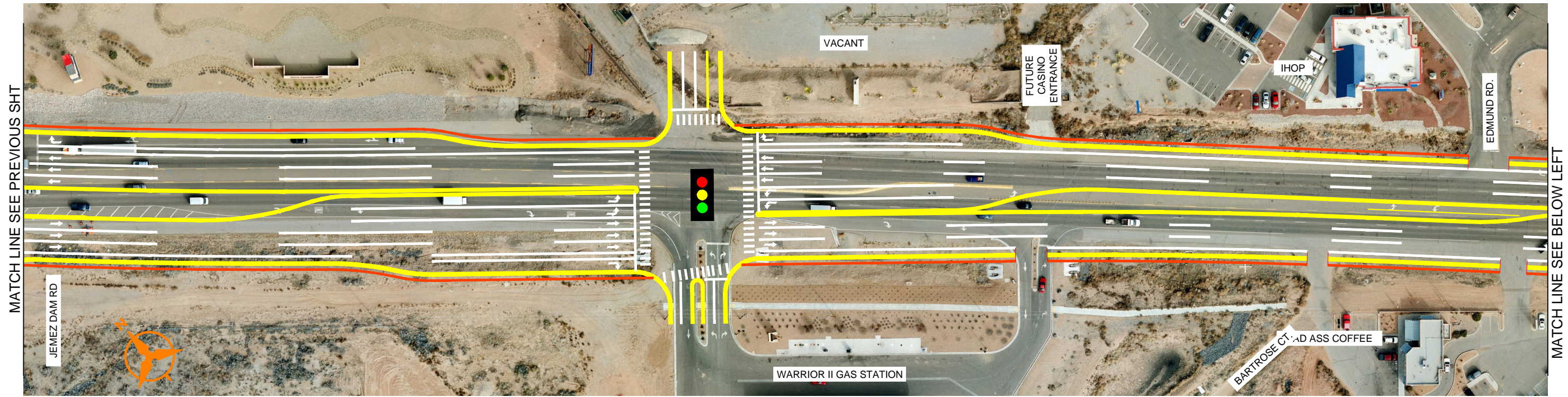
The NM 313 Intersection traffic volumes indicate that double left turn bays and a right turn bay southeast to south from US 550. This does not match the geometry on the east side of the intersection which has a single left turn bay and which was just reconstructed with the US 550 / I-25 Interchange Project. Therefore, a single left turn bay was used for the traffic analysis. The geometry on northbound and southbound NM 313 would not change.

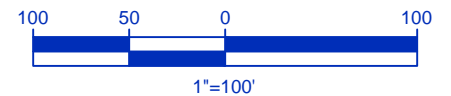
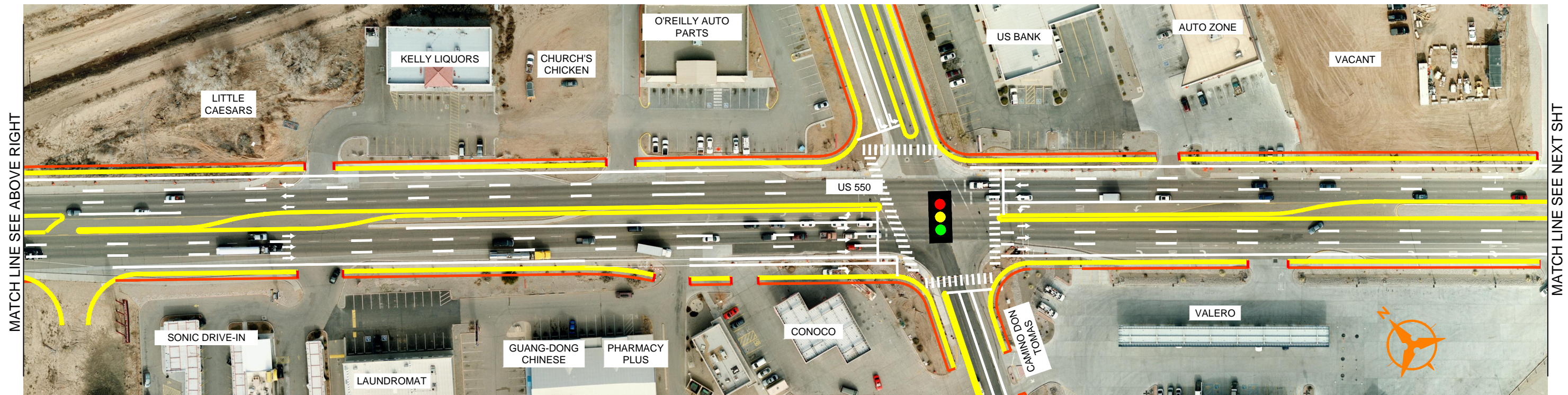
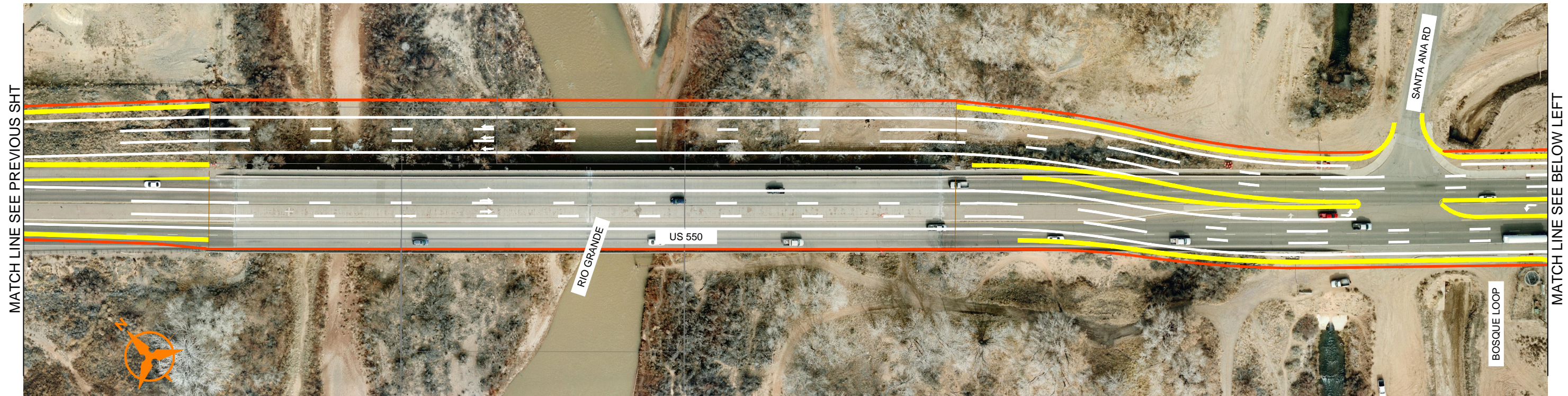
Camino Don Tomas traffic volumes indicate a double left turn bay is needed on the south leg (north to west movement). A single southeast to north left turn bay from US 550 was included because right-of-way limitations preclude a double left turn bay. If right-of-way was obtained for a double left turn bay, then the Conoco Gas Station on the south side of the intersection and the O'Reilly's Auto Parts and US Bank on the north side would be severely impacted.

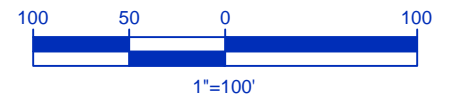
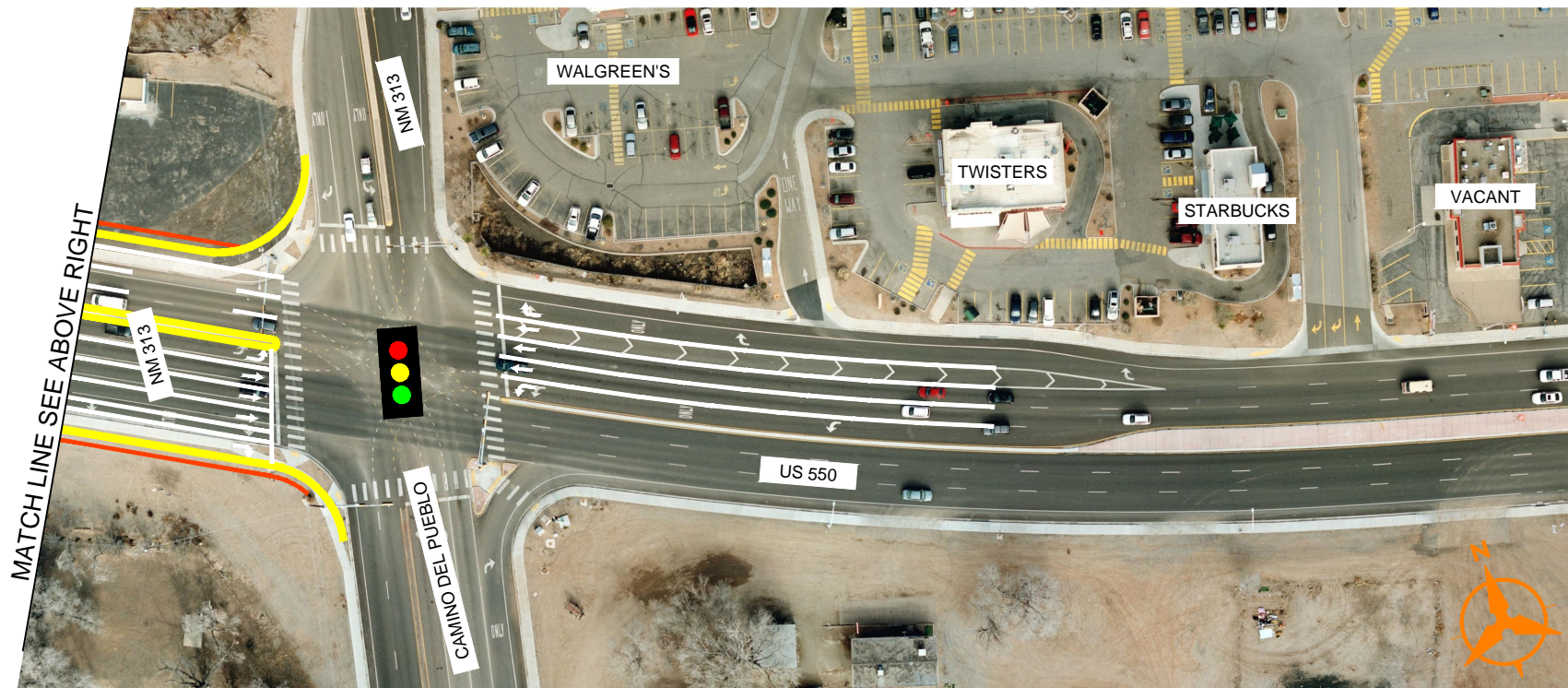
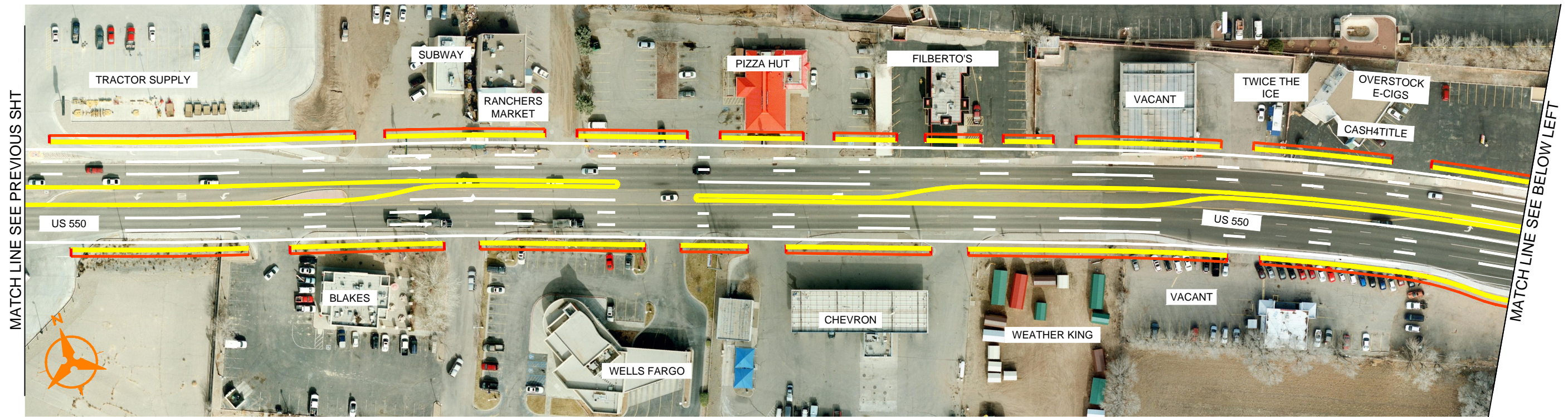
Sheriff's Posse Road would include single left turn bays northbound on Sherriff's Posse Road, eastbound and westbound on US 550. Kuaua Road is the entrance to Coronado State Monument so no growth is predicted on the north leg which will remain as a single lane in each direction.

The Warrior II Intersection would need a single left turn bay westbound and a double left turn bay eastbound to accommodate all of the traffic volume in the 2035 traffic model. However, the Traffic Impact Analysis prepared by the developer shows double left turn bays in both directions, so the intersection was revised. Double left turn bays would be used in both directions on US 550.









10.4.1 TRAFFIC ANALYSIS

In general, the Six Lane with Raised Median Alternative appears to be the lowest performing build alternative for both AM and PM 2035 demands. A summary of the average delay and LOS for all study intersections during the AM and PM peak hours is provided in Table 14.

Table 14 – Capacity Analysis Summary for Six Lane Alternative

Intersection											
NM 528				Jemez Dam Road				Edmund/Homestead			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
66.9	E	35.9	D	47.3	D	36.9	D	2.5	A	39.1	D
Intersection											
Kuaua/Sheriff's Posse				Santa Ana Road				Camino Don Tomas			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
5.1	A	49.2	D	10.4	A	26.8	D	22.7	D	55.8	E
Intersection											
NM 313											
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
52.8	D	81	F								

Based on the above summary, the following observations are made:

- Most intersections are operating within the D and E range for both AM and PM peak hours.
- Based on visual inspection of the simulation, as well as, network delay and travel time output, LOS during the PM peak appears to be higher than expected, especially at Jemez Dam Road. The reason intersection delays and LOS are better than expected could be due to the fact that the six lane is not serving the same amount of network vehicles as the other design alternatives.
- It should be noted that some side street improvements are operating at LOS F including the following:
 - Movements from Jemez Dam Road during the AM and PM peak hours.
 - Movements from Camino Don Tomas during the AM peak hour.
 - Movements northbound at Edmund during the PM peak hour.
 - Movements from NM 313 during the AM and PM peak hours.

Visual observations indicate that the AM peak appears to flow with periods of congestion eastbound at the Don Tomas signalized intersection. The PM peak is much more congested with an observed bottleneck westbound at the Jemez Dam signalized intersection, which causes westbound queuing on US 550 to stretch beyond the Rio Grande (No. 8537 & 8540) Bridge 30 minutes into the hour long simulation. Additionally, there appears to be significant side street queuing observed during the PM peak at the south leg of Don Tomas, the north and south leg of NM 313, and the north leg of Jemez Dam. It is not anticipated that Don Tomas south of US 550 would be widened from its current two-lane cross-section especially considering that it currently is designed for local access to neighborhoods and schools. Therefore, only a proportion of the projected 2035 demands accessing US 550 via Camino Don Tomas are feasible as it is limited by the maximum capacity a two-lane cross-section can provide. This fact will be true for all build alternatives. Travel times between NM 528 and NM 313 were observed to be the greatest among the build alternatives for both travel directions during the AM and PM peak hours. Observed travel times for this design alternative were 439 seconds eastbound and 335 seconds westbound in the AM peak and were 353 seconds eastbound and 536 seconds westbound in the PM peak. Finally, total network delays totaled 456.1 hours for 10,500 vehicles allowed on the network during the AM peak and 890.4 hours for 11,394 vehicles allowed on the network during PM, which was the worst performance of any alternative.

Operational Pros

- Signal operation will be typical eight-phase signal control and thereby will be familiar to the driving population.
- Access to and from Jemez Dam and Camino Don Tomas would be more direct compared to the Super Street or Reversible Lane Alternative.
- Additional capacity is provided by the proposed third through lane in each direction.

Operational Cons

- Significant congestion is observed westbound during the PM peak hour at the east leg of the Jemez Dam intersection. Meaning that the third through lane may not be enough under traditional intersection configurations.
- The Eight-Phase signal configuration requires that green times be divided amongst more movements taking green time away from US 550.
- Close spacing of a full movement signal at Jemez Dam appears to interfere with signal operations at NM 528. Therefore, this signal would have to move eastward if this alternative is to be used.

- Per model results, total network vehicles being served by this alternative within the peak hour time period are generally lower than the other build alternatives thus network capacity appears to be less.

Other Design Considerations

- Realign Sherriff's Posse Road with Kuaua Road.
- Operations may be improved if the Jemez Dam Signal was relocated to the east to provide better signal spacing, more balanced lane utilization, and less interference with the operation of the NM 528 intersection and queue storage. Jemez Dam would then become a right-in/right-out access only. However, westbound congestion will still exist west of the Rio Grande.
- Final yellow, red, and pedestrian clearance times should be adjusted when final design is completed to account for new intersection dimensions.
- Average and 95th Percentile Queue lengths will need to be accommodated. VISSIM queuing output for auxiliary lanes within the six-lane alternative is summarized in Appendix L.

From an operational standpoint, this design alternative, while offering some additional capacity, does not provide enough additional capacity to accommodate 2035 traffic demands, especially westbound PM peak demands west of the Rio Grande (No. 8537 & 8540) Bridge. It does appear that this option operates better on the east side of the Rio Grande River during the AM peak period at congestion points like Camino Don Tomas.

10.4.2 DRAINAGE ANALYSIS

In order to size the required drainage infrastructure for this alternative the total amount of impervious area was determined based on the typical roadway section plus any turn lanes. West of the Rio Grande, drainage from approximately 19.5 acres of impervious roadway area from the entire roadway section (on-site flows) will generate 100 cfs of 50-year peak flow. If all the runoff were to be captured and conveyed through a single storm drain system it would require 1,300 feet of 24-inch pipe and 5,200 feet of 36-inch pipe, as well as inlets, manholes, and laterals to convey the flow through the storm drain system. The storm drain system for this alternative is sized to carry the 50-year flow generated along the impervious roadway, and discharge to the Rio Grande.

It is possible that these flows will be separated into two storm drain systems; one on the north side of US 550 conveying both off-site flows and flows from the north half of the urban (on-site) section; and a separate system conveying the south half of the urban (on-site) section. The sizes of these individual storm drains will be finalized during design.

East of the Rio Grande, the existing impervious roadway area from NM 313 to the river is 8.2 acres and generates 44 cfs of 50-year peak flow. With this Six-lane with Raised Median Alternative the entire roadway section is approximately 10.5 acres and will generate 55 cfs of 50-year peak flow.

For the section a detailed reconnaissance was performed and identified offsite areas totaling 5.5 acres which may drain to the roadway under existing conditions as shown Appendix C.

This off-site area would generate an additional approximately 29 cfs. For the purposes of the Phase 1-B storm sizing listed below, it was assumed that 4.3 acres of offsite flow would be conveyed in the storm drain along with the roadway flow for each alternative (1.2 acres of the existing offsite area would be included in the widened typical section). Ignoring the capacity of the existing system, a storm drain designed to accommodate the entire 14.8 acres (78 cfs) would require a 48-inch pipe as well as inlets, manholes, and laterals to convey the flow through the storm drain system.

During design the capacity of the existing storm drain and pump stations could be analyzed and any new drainage capacity requirements east of the river based on this alternative could be reduced accordingly.

The assumptions used for the analysis of this alternative ignore the existing ponds in sizing the storm drain. Roadway runoff was assumed to be 5.3 cfs per acre as an average value from the I-25/US 550 Interchange Reconstruction Final Drainage Report, Vector Engineering, LLC and North Sound Consulting, Inc., July 2012. Pipe sizes were determined using InRoads Drainage Structure Analyzer assuming RCP pipe and a pipe slope equal to the average slope along the roadway. Inlets were spaced with 5 cfs capacity or approximately an inlet per acre of impervious area. Lateral pipe was assumed to be 75 feet of 24-inch pipe per inlet. Manholes were spaced every 450 feet per NMDOT criteria. In total, this alternative would require 1,300 feet of 24-inch pipe, 5,200 feet of 36-inch pipe, 3,900 feet of 48-inch pipe, 37 inlets, 24 manholes, and 2,775 feet of 24-inch lateral pipe.

10.4.3 ENVIRONMENTAL ANALYSIS

A comparison of the environmental impacts of the alternatives can be found in Section 9.10. The Six Lane Alternative would have moderate effects on geology due to earth moving activities. There would be moderate effects on soils erosion during construction that would be reduced once construction is completed and disturbed areas are reseeded. There would be low effects from storm water if pollution prevention devices are installed during construction. Temporary impacts to vegetation would be mitigated by reseeding disturbed areas. Wildlife habitat is low in the corridor so any impacts to wildlife or protected species during construction would be low. Known cultural resource sites would be avoided. Air quality and noise levels are directly related to traffic operational LOS and therefore will initially improve, but will degrade as traffic congestion increases as demands approach projected 2035 demands.

A noise study will be conducted for the preferred alternative to determine if noise mitigation measures are required and feasible. Initial review indicates that noise mitigation will not be required. This alternative is not expected to have a disproportionate environmental justice impacts on low income or minority communities. This alternative is compatible with the existing commercial land use. Impacts to the visual resources along the corridor would be mitigated with landscape treatments. No Section 4(f) impacts are anticipated.

10.4.4 ADVANTAGES AND DISADVANTAGES

The Six Lane Alternative would improve the safety of the existing roadway because the raised islands would channelize left turn movements to a few locations and minimize the number of potential conflict points associated with the existing continuous left turn lane. There would be an improvement in capacity of US 550 compared to the No Build Alternative. Capacity is still an issue on US 550 westbound at the Jemez Dam Intersection and at Camino Don Tomas in the PM Peak Hour. The Jemez Dam Intersection interferes with the operation of the NM 528 / Tamaya Blvd signal. The alternative would work better if the signalized intersection is moved to the east and the Jemez Dam Intersection is converted to right-in, right-out. This solution would eliminate some direct access to the front of the Santa Ana Star Casino.

The addition of medians would provide improved safety for pedestrians crossing US 550. These medians could also be landscaped to provide visual relief from the broad expanses of paving and the visual clutter of adjacent commercial development.

This alternative would require 4.2 acres of right-of-way, mostly on the east side of the Rio Grande. The patio of the former Charlotte’s Chicken Fingers Restaurant would be impacted and could be a total take. The awning of the former Cricket store would be impacted and could be a total take. and the Overstock E-cigs store would be total takes.

The engineer’s opinion of probable construction cost estimate is \$16,475,000 including New Mexico Gross Receipts Tax (NMGRT) of 7.0625% and 3% Engineering and Contingencies. The cost estimate does not include the NM 528 Intersection or the Rio Grande Bridge Improvements. The cost estimate can be found in Appendix M. The preliminary pavement typical section has not yet been prepared, so a hot mix surface course of \$50 per square yard was assumed. The construction costs of the NM 528 Intersection Options are shown separately in the following sections.

10.5 REVERSIBLE LANE ALTERNATIVE

The Reversible Lane Alternative differs from the Six Lane Alternative in that instead of a raised median, a lane is included in the center of US 550 to carry an additional lane eastbound during the morning peak hours and an additional lane westbound during the afternoon peak hours. While the lane is operating as a through lane, left turn movements would not be allowed. During non-peak hours the lane would operate as a continuous left turn lane. The proposed typical section is shown in Figure 21. On the west side of the river where there is more existing right-of-way, the bicycle lane can be widened to 8-ft to accommodate emergency vehicles.

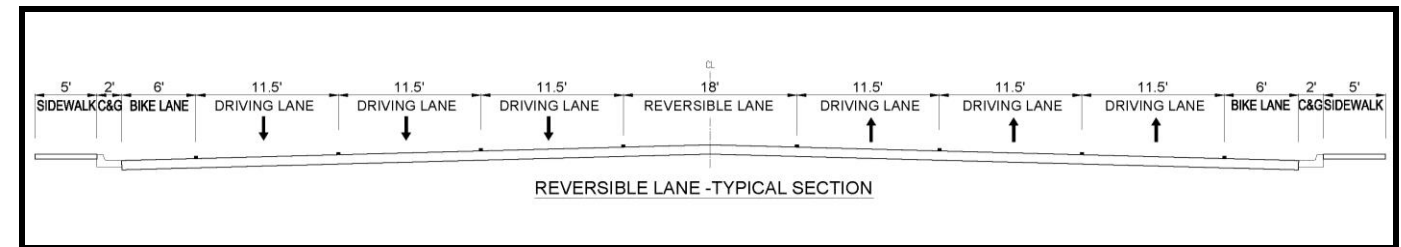


Figure 21 – Reversible Lane Typical Section

A plan view of the Reversible Lane Alternative is shown in Figure 22. Signalized intersections would be located at NM 528, Jemez Dam Road, Sheriff’s Posse Road / Kuaua Road, Camino Don Tomas, and NM 313. Signaling Sheriff’s Posse Road / Kuaua Road would require the realignment of Sherriff’s Posse Road as shown in the figure.

10.5.1 TRAFFIC ANALYSIS

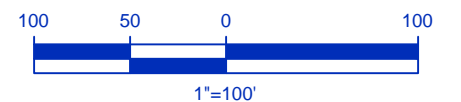
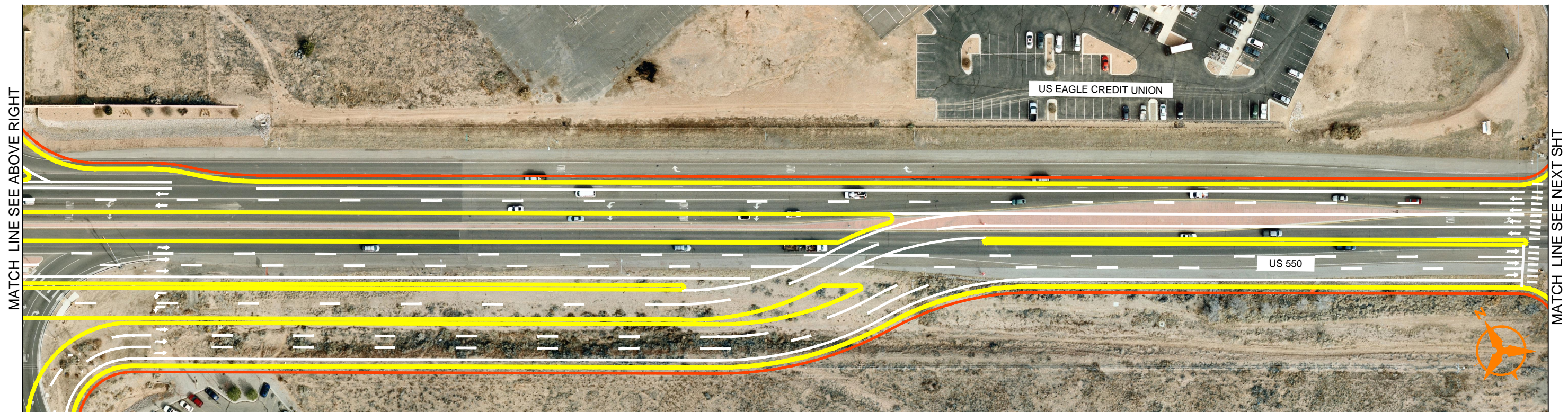
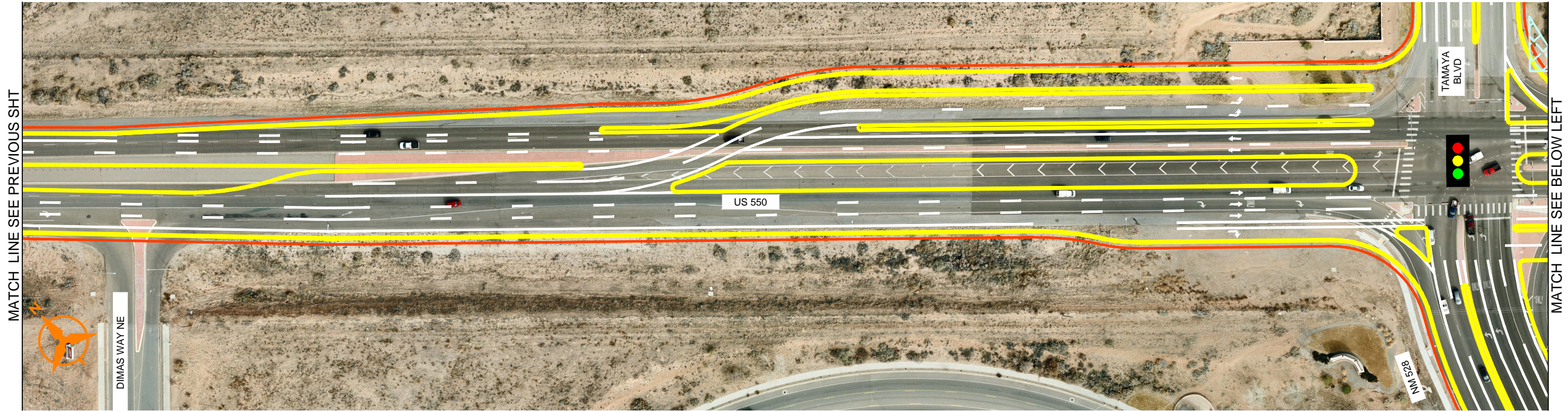
Both 2035 AM and PM peak models appear to operate best from a traffic capacity perspective under this design alternative. Both intersection delay and travel time runs are lower than the other two “build” alternatives. This is due to the additional “fourth” lane provided for the heavier direction of travel depending on the time of day. A summary of the average delay and LOS for all study intersections during the AM and PM peak hours is provided as shown in Table 15.

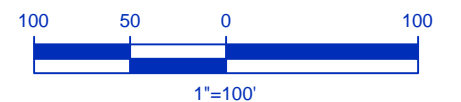
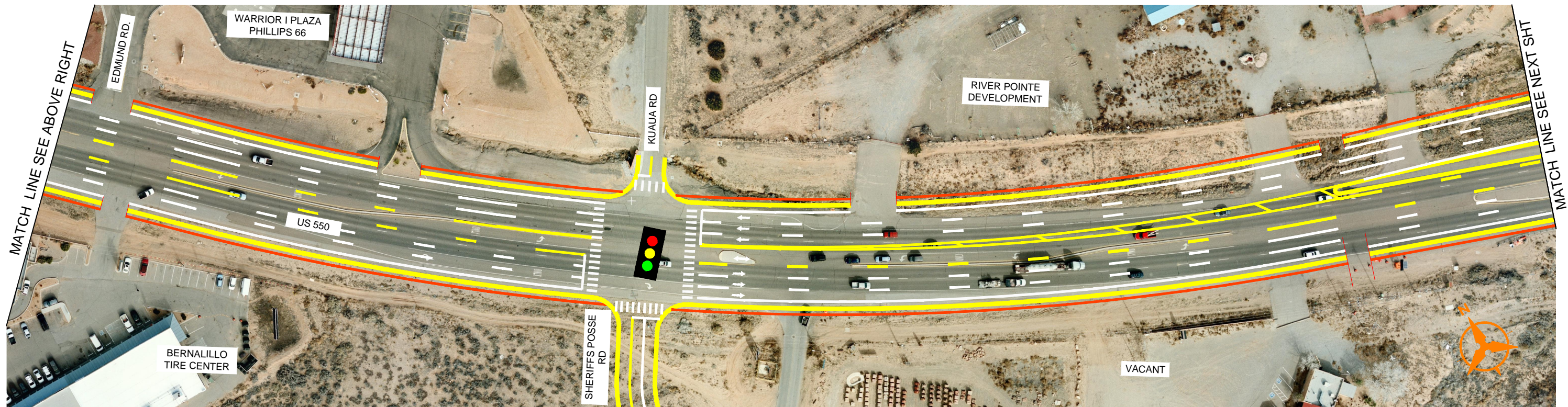
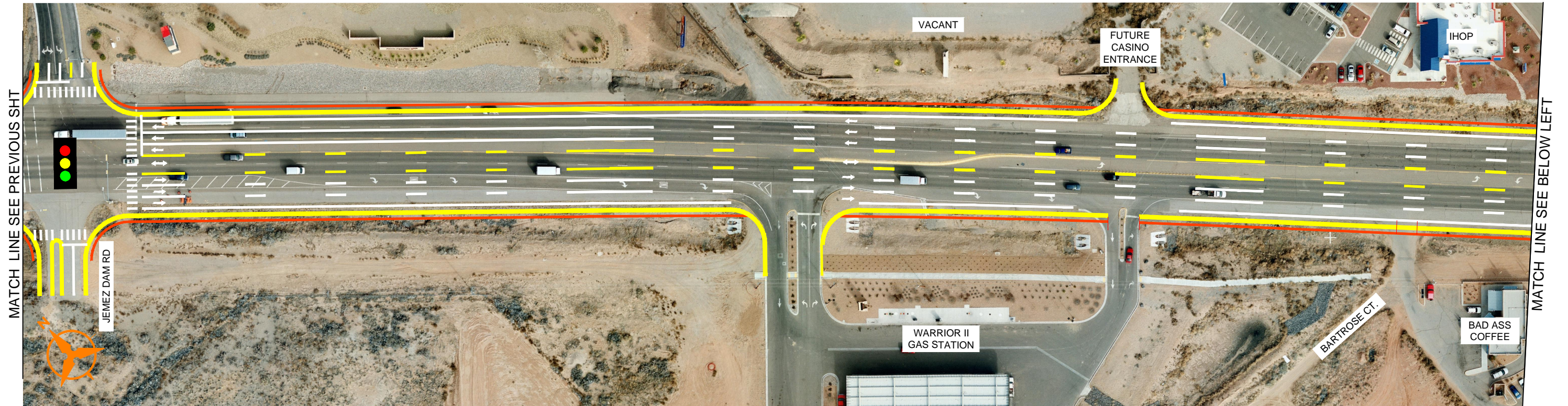
Table 15 – Capacity Analysis Summary for Reversible Lane Alternative

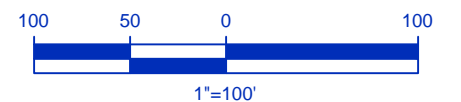
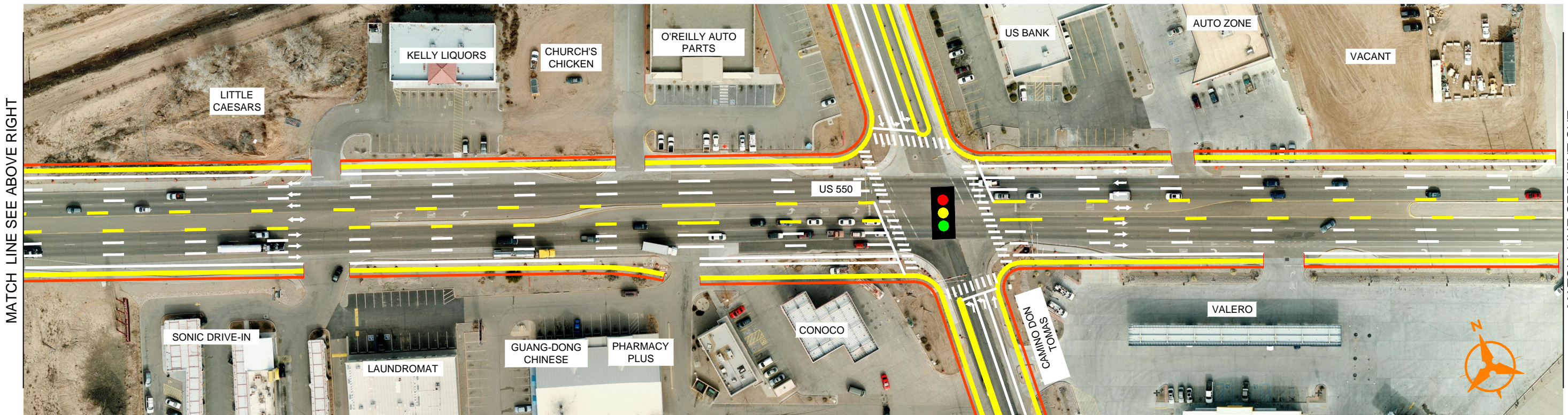
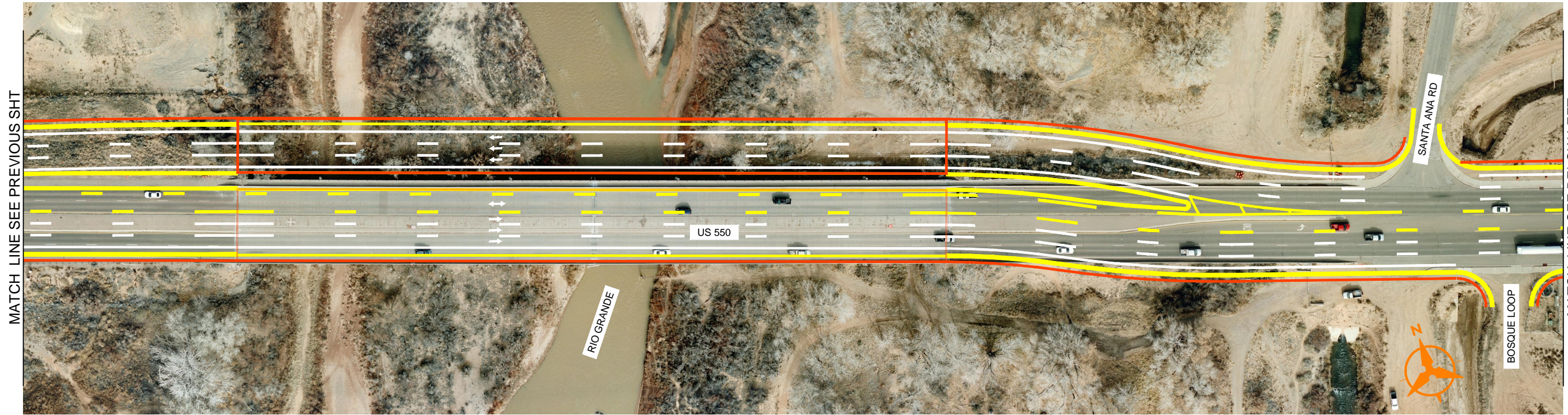
Intersection											
NM 528				Jemez Dam Road				Edmund/Homestead			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
33.1	C	38.2	D	34.3	C	46.7	D	0.9	A	5.6	A
Intersection											
Kuaaua/Sheriff's Posse				Santa Ana Road				Camino Don Tomas			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
1.2	A	3.6	A	1.3	A	1.8	A	11.6	B	15.9	B
Intersection											
NM 313											
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
45.2	D	43.1	D								

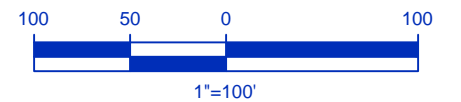
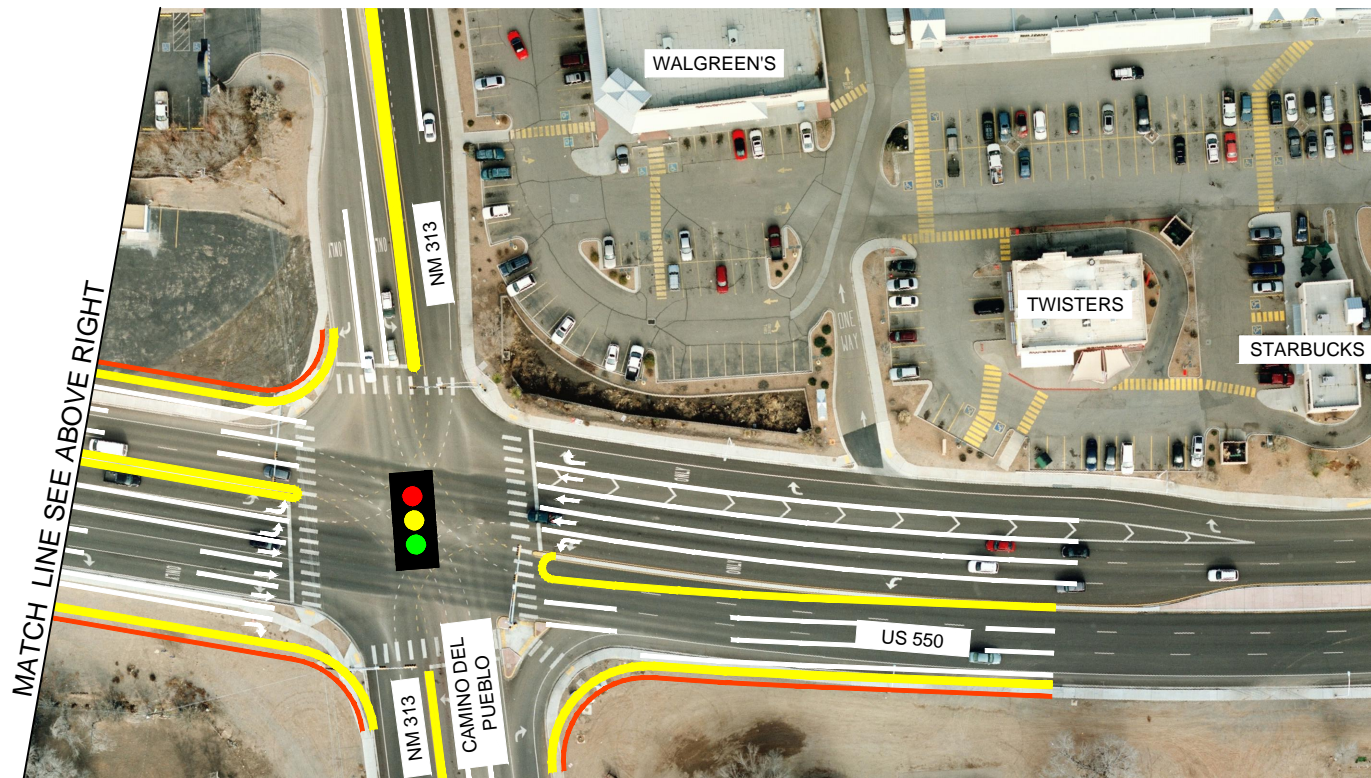
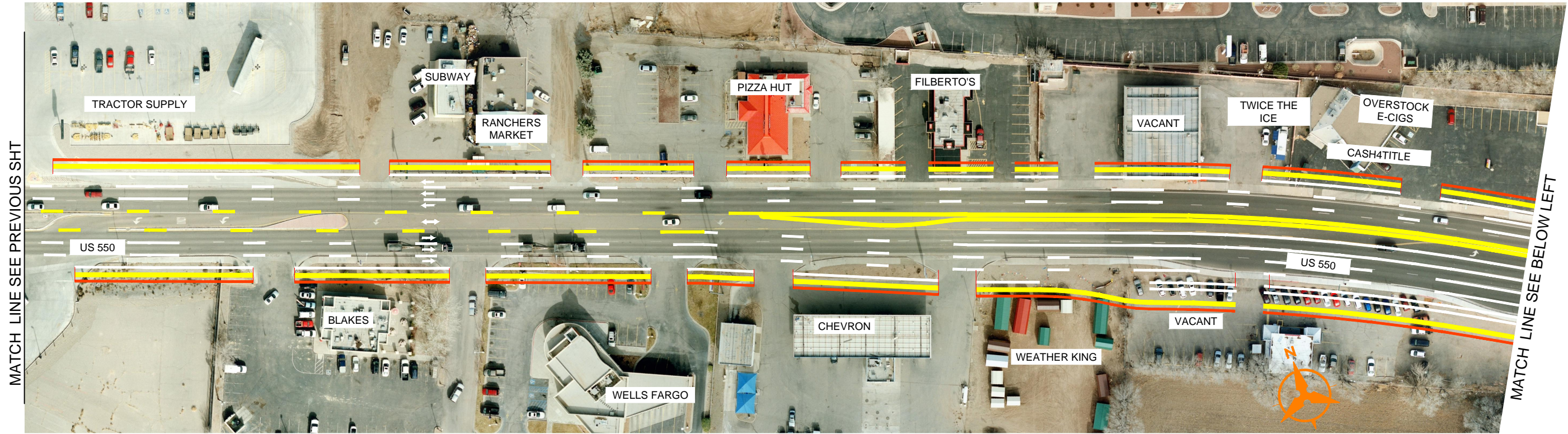
Based on the above summary, the following observations are made:

- Most of the study intersections are operating at LOS C to D, which is the best performance among all design alternatives.
- There was some operational degradation at NM 313 due to the increase in U–turn movements that must divert to NM 313 because no left-turns from US 550 are allowed with this design alternative.
- It should be noted that some side street improvements are operating at LOS F including the following:
 - Movements from Jemez Dam Road during the AM and PM peak hours.
 - Movements from NM 313 during the AM and PM peak hours.









Visual observations of the model indicate that traffic appears to be moving more freely with relatively less congestion for both US 550 eastbound and westbound movements. However, there is still some congestion observed during the PM peak for westbound traffic at the Jemez Dam Intersection. With the elimination of US 550 left-turn phasing at Jemez Dam, Sheriff's Posse, and Don Tomas, more green time is available for US 550 through movements and side street traffic. Observed travel times for this design alternative were 303 seconds eastbound and 281 seconds westbound in the AM peak and were 289 seconds eastbound and 344 seconds westbound in the PM peak. Finally, total network delay indicated 331.1 hours of total delay allowing a total of 10,755 network vehicles on the network in the AM peak and 346.3 hours and allowing 12,084 network vehicles in the PM peak. This again was the best performance of any alternative.

Operational Pros

- This design alternative provides the most lane capacity of all three “build” alternatives.
- The reversible lane alternative provides the shortest delay and travel times amongst all three “build” alternatives. Although this does not consider some of the re-routing of trips that can no longer make a left-turn from US 550 between NM 528 and NM 313.
- Elimination of left-turn movements from US 550 at intersections between NM 528 and NM 313 provide the opportunity to add more green time to through traffic on US 550 and side streets.
- Greater green bands for coordination of US 550 through movements will be available due to the elimination of US 550 left-turn phases.
- This alternative exhibited the greatest number of vehicles appearing in the network, which suggests that the Reversible Lane alternative provides the greatest capacity amongst the design alternatives

Operational Cons

- Access, especially for origins and destinations at the mid-point of the corridor will be severely impacted. Vehicles attempting to access sites between NM 528 and NM 313 would have to route long distances out of their way to get to their destinations.
- With no left-turns from US 550 between NM 528 and NM 313, all left-turn movements from US 550 will now have to occur eastbound at NM 313 and, at peak times, potentially over load this movement.
- The relative close spacing of the Jemez Dam signal to NM 528 still appears to be negatively impacting operations on the east leg of NM 528, albeit less severely than the six-lane option.
- Due to lack of reversible lane type operations within the region, drivers initially will not be familiar with how a reversible lane corridor works.

- With a reversible lane option, raised medians are not feasible and thereby access management is less enforceable and thus there are greater conflict points and opportunities for vehicle crashes to occur.
- Additionally, with no opportunity for medians within the corridor, pedestrian refuges for US 550 crossings are not feasible and thus means more exposure for pedestrian to vehicle conflicts. Additionally, pedestrian clearance times do not have the option to be shortened that pedestrian refuges can offer with median placed pedestrian push buttons.

Other Design Considerations

- Due to the required larger foot-print at NM 528 and its existing close proximity, the Jemez Dam Signal should be relocated to the east to provide better signal spacing, more balanced lane utilization, and less interference with the operation of the NM 528 intersection and queue storage. Jemez Dam would then become a right-in/right-out access only.
- Final yellow, red, and pedestrian clearance times should be adjusted when final design is completed to account for new intersection dimensions.
- Average and 95th Percentile Queue length need to be accommodated. VISSIM queuing output for auxiliary lanes within the reversible lane alternative is summarized in Appendix L.
- There is a significant amount of additional overhead signing and signalization associated with this option. Specifically, there would be a need for overhead lane utilization signal indications showing which direction is appropriate for the reversible lane. An example of these overhead indications are shown in Figure 23:



Source: Deseret News 5400 South Salt Lake City, Utah

Figure 23 – Overhead Lane Utilization Indications

- Plans will also need to be created determining when lanes will reverse, as well as, how long transition timing will be between directional changes.

10.5.2 DRAINAGE ANALYSIS

The Reversible Lane Alternative consists of the same roadway footprint and impervious area and generates the same amount of 50-year peak flow as the Raised Median Alternative. There are no significant drainage differences between the two alternatives. The same recommendations of 1,300 feet of 24-inch pipe, 5,200 feet of 36-inch pipe, 3,900 feet of 48-inch pipe, 37 inlets, 24 manholes, and 2,775 feet of 24-inch lateral pipe are advised with either alternative.

10.5.3 ENVIRONMENTAL ANALYSIS

A comparison of the environmental impacts of the alternatives can be found in Section 9.10. The Reversible Lane Alternative would have moderate effects on geology due to earth moving activities. There would be moderate effects on soils erosion during construction that would be reduced once construction is completed and disturbed areas are reseeded. There would be low effects from storm water if pollution prevention devices are installed during construction. Temporary impacts to vegetation would be mitigated by reseeding disturbed areas. Wildlife habitat is low in the corridor so any impacts to wildlife or protected species during construction would be low. Known cultural resource sites would be avoided. Air quality and noise levels are directly related to traffic operational LOS and therefore will initially improve, but will degrade as traffic congestion increases as demands approach projected 2035 demands. A noise study will be conducted for the preferred alternative to determine if noise mitigation measures are required and feasible. Initial review indicates that noise mitigation will not be required. This alternative is not expected to have a disproportionate environmental justice impacts on low income or minority communities. This alternative severely restricts access so it is detrimental to the existing commercial land use. Impacts to the visual resources along the corridor would be mitigated with landscape treatments. Since there are few medians, there are less opportunities for landscaping than with the other alternatives. No Section 4(f) impacts are anticipated.

10.5.4 ADVANTAGES AND DISADVANTAGES

The advantage of the Reversible Lane Alternative is that it has the highest capacity of all of the alternatives. The reversible lane alternative provides the shortest delay and travel times amongst all three “build” alternatives. Although this does not consider some of the re-routing of trips that can no longer make a left-turn from US 550 between NM 528 and NM 313.

Elimination of left-turn movements from US 550 at intersections between NM 528 and NM 313 provide the opportunity to add more green time to through traffic on US 550 and side streets. Greater green bands for coordination of US 550 through movements will be available due to the elimination of US 550 left-turn phases. However, constraints at NM 313 and the I-25 Interchange, which was reconstructed in 2014, would negate the gains in travel time unless the geometry at the intersection and interchange are revised.

The biggest disadvantage of Reversible Lane Alternative is that it would eliminate most left turn movements during the peak hours in order to gain capacity. This would result in a large number of U-turns on either end of the corridor. No parallel system of roads exists to provide business access. Access, especially for origins and destinations at the mid-point of the corridor will be severely impacted. Vehicles attempting to access sites between NM 528 and NM 313 would have to route long distances out of their way to get to their destinations. With no left-turns from US 550 between NM 528 and NM 313, all left-turn movements from US 550 will now have to occur at NM 313 and, at peak times, potentially over load this movement.

The relative close spacing of the Jemez Dam signal to NM 528 still appears to be negatively impacting operations on the east leg of NM 528, albeit less severely than the six-lane option.

Due to lack of reversible lane type operations within the region, drivers initially will not be familiar with how a reversible lane corridor works. Media campaigns through local newspapers, television, and public meetings should be used to explain the concept to the public.

The lack of medians will make crossing US 550 more dangerous for pedestrians. In addition, there would be few opportunities to provide landscaping to improve the visual impact of the project.

This alternative would require 4.2 acres of right-of-way, mostly on the east side of the Rio Grande. The former Charlotte’s Chicken Fingers Restaurant, the Cricket store, and the Overstock E-cigs store would be total takes.

The engineer’s opinion of probable construction cost estimate is \$16,495,000 including New Mexico Gross Receipts Tax (NMGRT) of 7.0625% and 3% Engineering and Contingencies. The cost estimate can be found in Appendix M. The preliminary pavement typical section has not yet been prepared, so a hot mix surface course of \$50 per square yard was assumed. The construction costs of the NM 528 Intersection Options are shown separately in the following sections.

10.6 SUPER STREET ALTERNATIVE

The Super Street Alternative differs from the Six Lane with Raised Median Alternative in that instead of intersections with full movements, several movements are eliminated at each intersection to allow more green time for through traffic. Through movements are not allowed from cross street approaches. To accommodate these movements, the super street requires drivers to turn right onto the main road and then make a U-turn maneuver at a one-way median opening. Left turn movements are split so that the lefts from the mainline are separated from the lefts onto the mainline from the side streets. This requires efficient circulation on both sides of the roadway so that motorists can reach their destinations without having to go far out of direction. The signalized intersections only require two phases which can minimize the loss time at the intersection. Efficient progression can be provided in both directions. The U-turn movements work best with a wider median. For this reason, a wider median is used west of the river where there is more right-of-way. West of the river where there is existing right-of-way available, the bike lane is increased to 8-ft to provide emergency vehicle access. East of the Rio Grande where the area is more developed and the right-of-way is limited; the median is only 18-ft wide. The proposed typical section on the east side of the river is shown in Figure 24. The proposed typical section on the east side of the Rio Grande is shown in Figure 25.

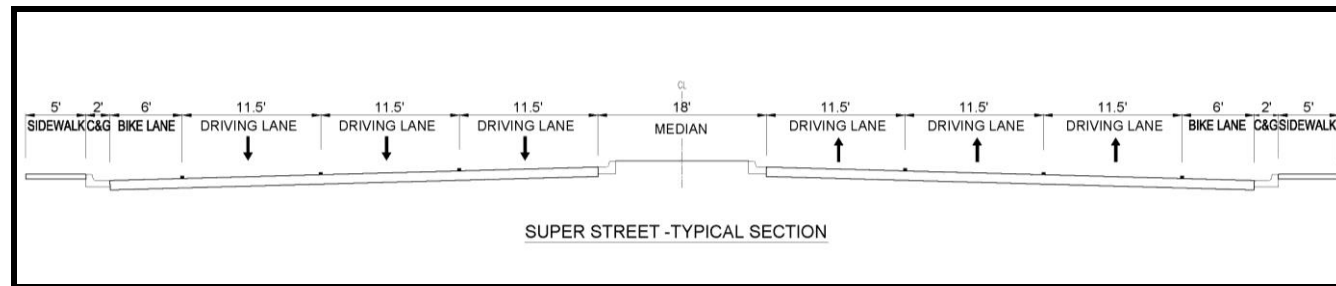


Figure 24 – Super Street Typical Section East of the Rio Grande

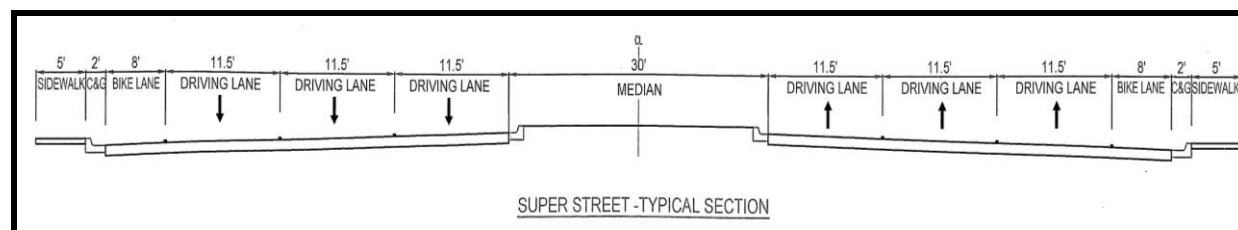


Figure 25 – Super Street Typical Section West of the Rio Grande

The Super Street is safer for pedestrians because it reduces the number of conflict points for a pedestrian compared to a conventional intersection. Pedestrian are also able to use a larger portion of the signal cycle. Pedestrian movements will be protected by medians in the middle of US 550. Some pedestrian movement will be longer than at a conventional intersection. Pedestrians may be required to cross US 550 in two stages. The following figure shows a “Z” shaped crossing treatment. (Source: Restricted Crossing U-turn Intersection Informational Guide.)

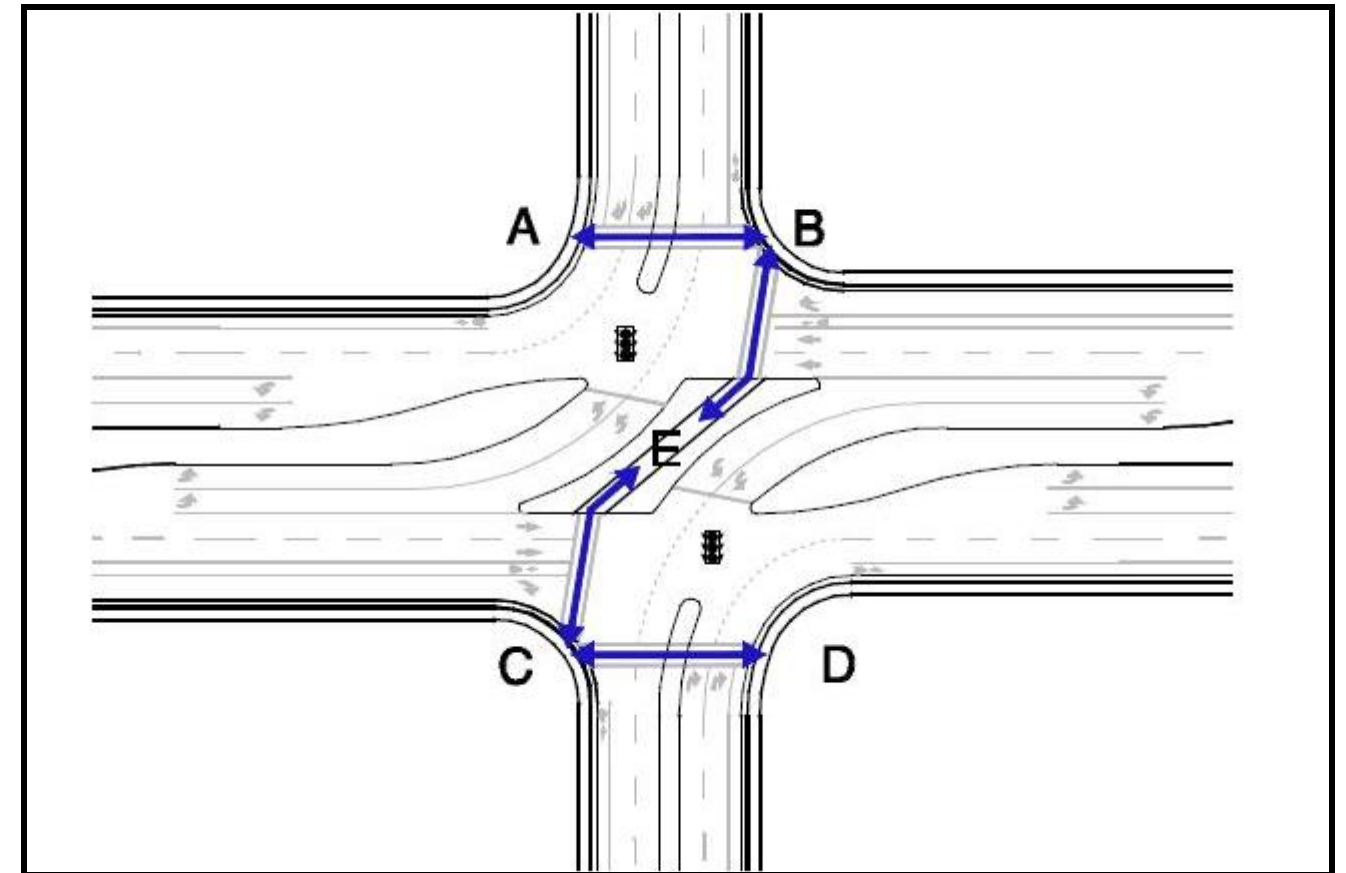


Figure 26 – Pedestrian Movements in a Super Street Intersection

The Super Street Alternative can accommodate more signals than a conventional intersection corridor, while still producing lower vehicle delays and better mainline capacity, due to the efficient progression of the signalized intersections. The U-turns, called “loons”, of the Super Street Alternative will be design for large vehicles. The corridor has a large portion of the traffic that goes and comes from the interstate. A detail of the loon areas is shown in Figure 27.

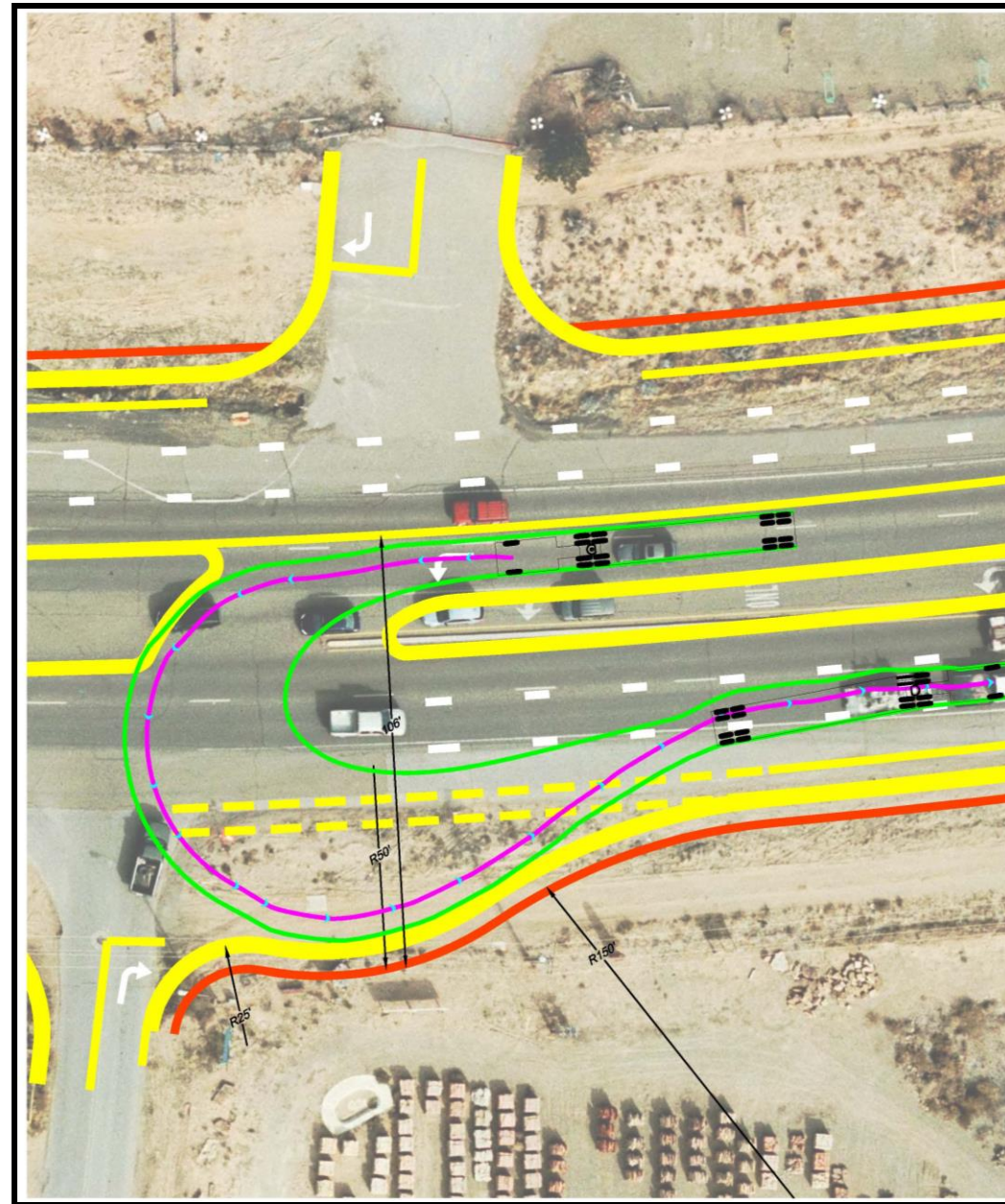


Figure 27 – Super Street U-turn Detail

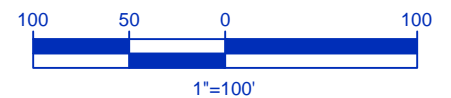
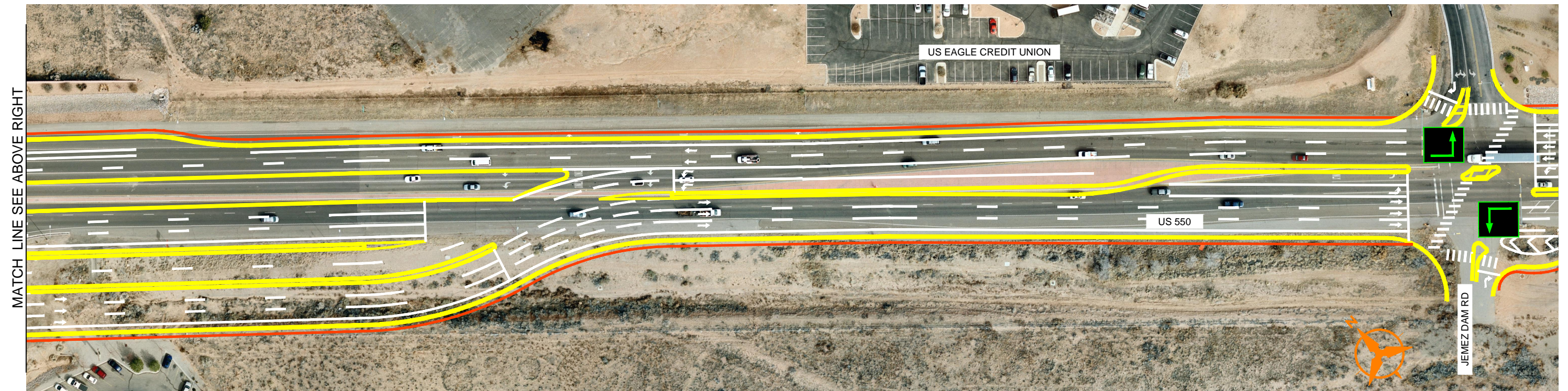
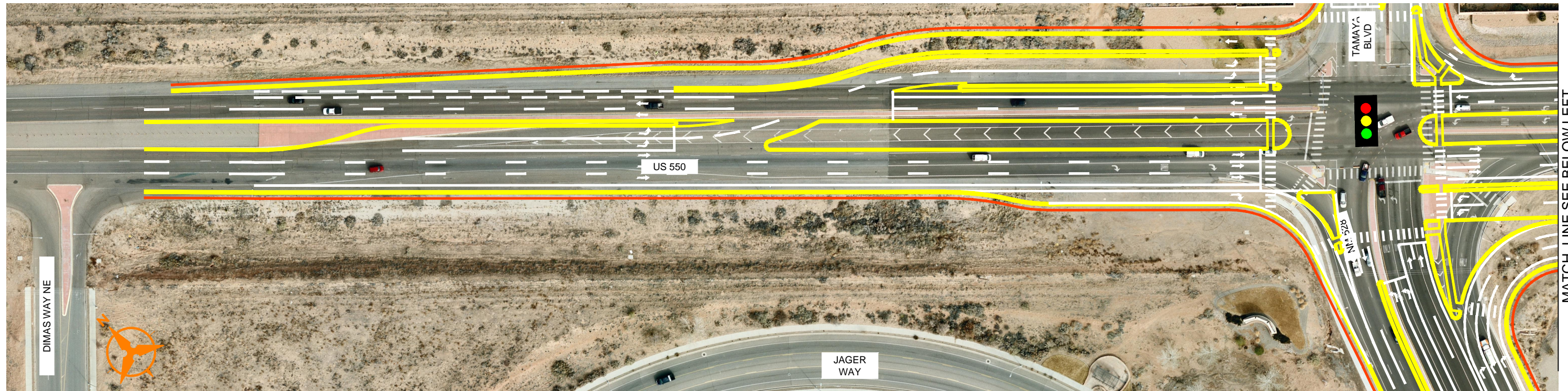
A plan view of the Super Street Alternative is shown in Figure 28. On the west side of the river, signalized intersections are located at Jemez Dam Road, the west entrance to the Warrior II gas station, the new hotel entrance, Kuaua Road, and Sheriff's Posse Road. Based on proposed on-site circulation for the casino expansion and the new commercial development proposed for the southeast quadrant of the NM 528 Intersection, the movements allowed or restricted have been chosen to take full advantage of the anticipated on-site connectivity. Left-turns out will be accommodated for the south side at the easternmost Twin Warrior's station driveway and on the north side approximately across from the westernmost Twin Warriors driveway. To accommodate access on the south side of US 550 and just west of the bridge, a U-turn pocket is placed just east of Homestead Lane.

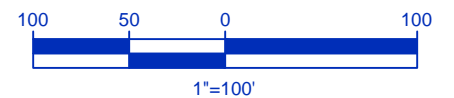
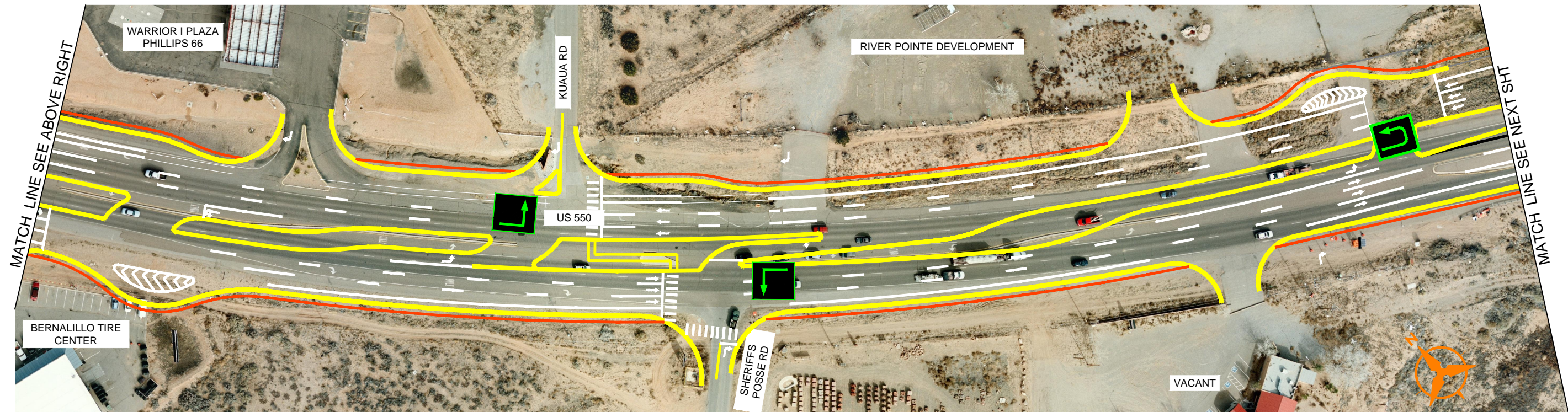
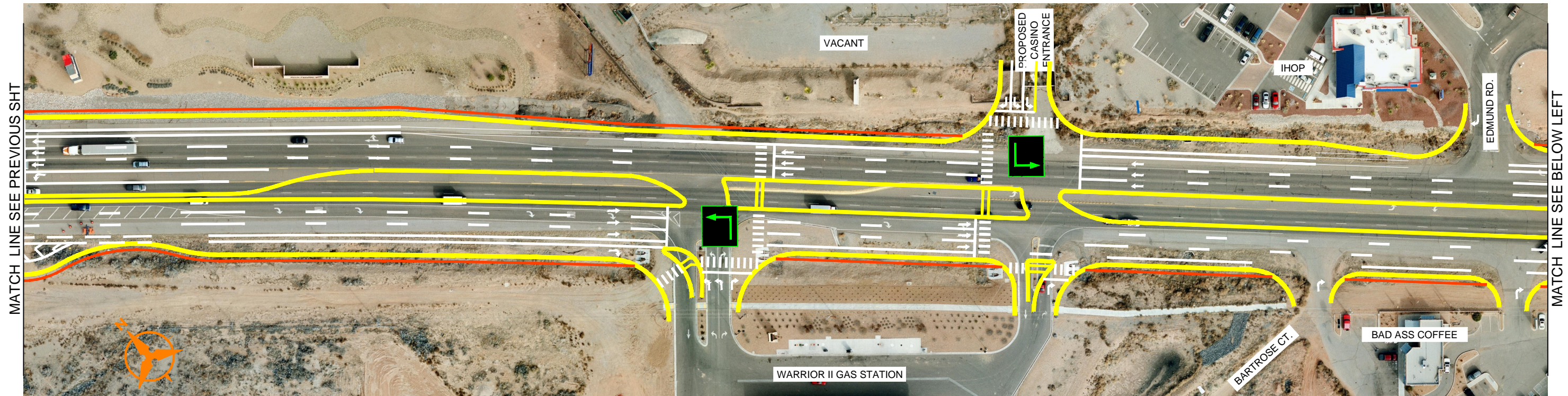
Partial signals are proposed for Kuaua Road and Sheriff's Posse and will allow left-turns in/right-ins/right-outs only. Left-turn out demands were much lower at these locations.

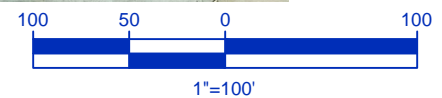
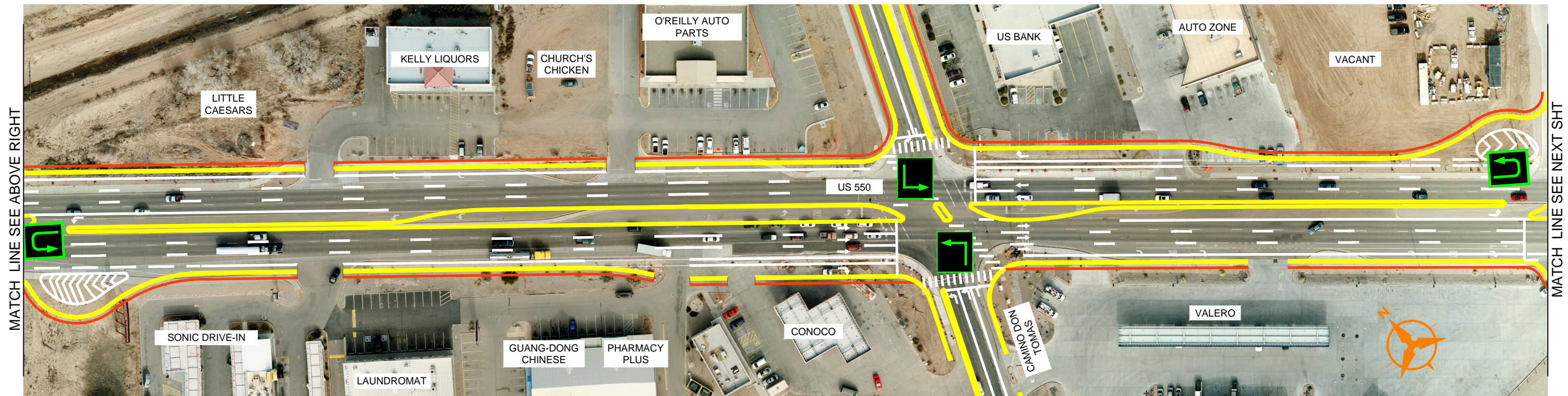
A U-turn is located eastbound prior to the Rio Grande to prevent drivers from having to go long distances out of direction. On the east side of the river, signalized intersections are located at Santa Ana Road, Camino Don Tomas, and NM 313. NM 313 will remain a conventional intersection.

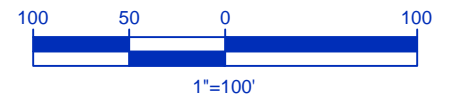
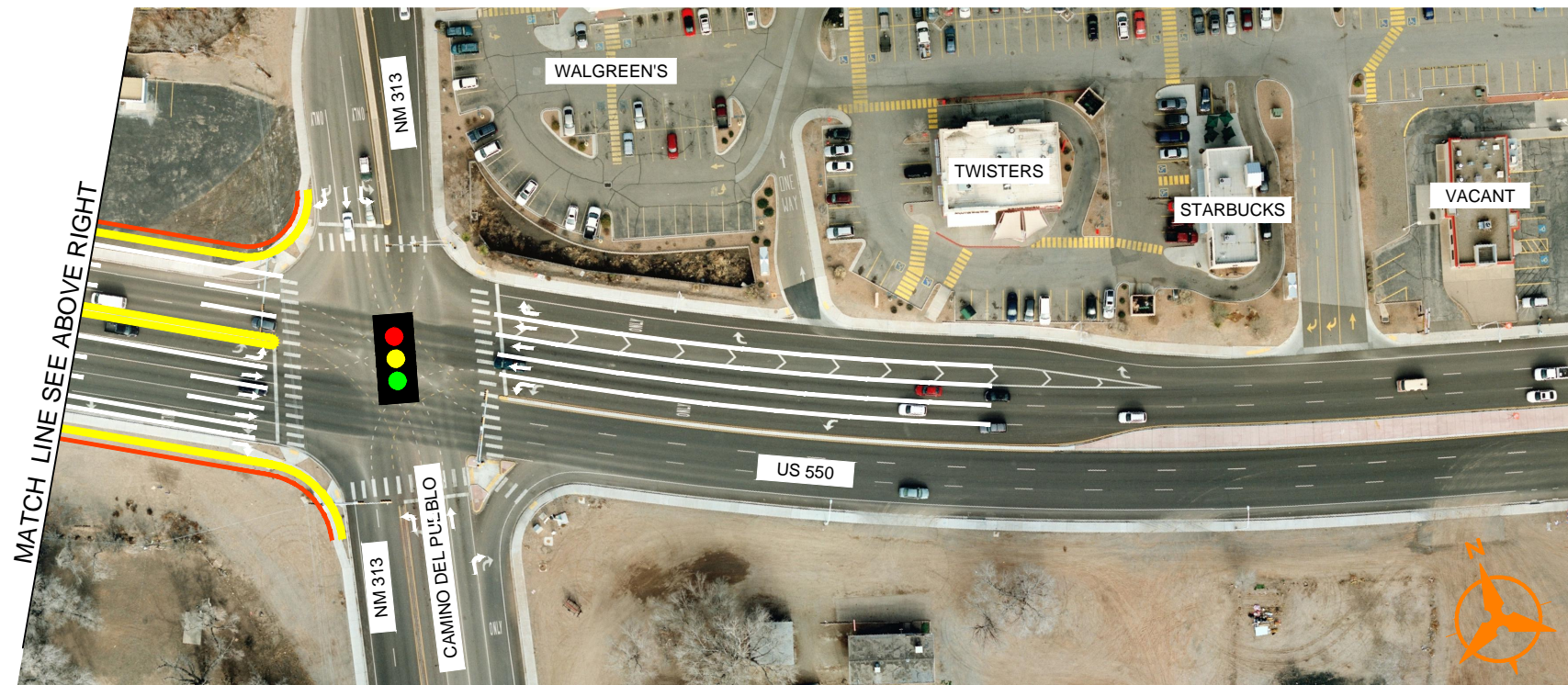
Emergency vehicles operating along US 550 are not expected to experience any additional delay, however, there will be an increase in delay if responding from a side street and needing to make a left turn. The Bernalillo Fire and Police Departments are located along NM 313 so there will be no additional delay responding from the stations. The Sandoval County Fire Department has a station southeast of the project corridor between S. Hill Road and the railroad tracks so it will not be impacted. The Sandoval County Sheriff's Department is located along NM 528 south of the project area. Delay should be greatly reduced from this station once the project is constructed.

The Super Street Alternative will improve safety by reducing the potential for turning and angle crashes. The Super Street Alternative will reduce crash potential by controlling access through raised medians. The Super Street also reduces crash potential at intersections due the reduced number of movements. The number of sideswipe crashes, which are not as severe, could increase because driver's wishing to make a left turn from unsignalized driveways will have to turn right and then merge across three lanes of traffic to make a U-turn. The spacing of signals along the project will cause gaps to be created in the traffic flow to allow for these movements.









10.6.1 TRAFFIC ANALYSIS

The Super Street Alternative appears to operate better than the Six Lane Alternative but slightly worse than the Reversible Lane Alternative. However, the Super Street Alternative does perform best out of all alternatives for the westbound direction during both the AM and PM peak hours. This alternative provides more capacity along the corridor due to the fact that many of the signals would operate as a four phases versus the traditional eight phase signal. A summary of the average delay and LOS for all study intersections during the AM and PM peak hours is provided as shown in Table 16.

Table 16 – Capacity Analysis Summary for Super Street Alternative

Intersection											
Edmund/Homestead				Kuaua Road				Sheriff's Posse Road			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
7.62	A	14.9	B	1.6	A	11.5	B	2.4	A	19.2	B
Intersection											
Santa Ana Road				Camino Don Tomas				Camino Don Tomas (East U-Turn)			
AM		PM		AM		PM		AM		PM	
Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS	Delay s/v	LOS
11.5	B	15.2	B	9.2	A	12.3	B	8.4	A	12.3	B
Intersection											
NM 313											
AM				PM							
Delay s/v	LOS	Delay s/v	LOS								
39	D	44.6	D								

Based on the above summary, the following observations are made:

- Generally, LOS ranges from D at some intersections up to LOS A at some of the more minor intersections.
- The Super Street is the best performing design alternative during the PM peak hour.
- It should be noted that some side street improvements are operating at LOS F including the following:
 - Movements from Twin Warrior, and Kuaua during the AM peak hour
 - Movements for southbound Jemez Dam Road during the PM peak.
 - Movements from Sheriff's Posse during the AM peak hour.
 - Movements from NM 313 during the PM peak hour.

Visual observations of the model indicate that traffic flows at the Jemez Dam intersection during the PM peak better than any other build design alternative. It should be noted that queues westbound do eventually start building, but not until much later in the PM peak hour (approximately 50 minutes into the simulation) when compared to other model alternatives. The AM peak appears to be less successful for eastbound traffic when compared to the Reversible and Six Lane Alternatives with congestion observed eastbound at the Santa Ana and Don Tomas intersections. Due to this congestion, eastbound queues begin to build beyond the Rio Grande (No. 8537 & 8540) Bridge occurring approximately 25 to 30 minutes into the AM peak hour simulation. Observed travel times for this design alternative were 424 seconds eastbound and 280 seconds westbound in the AM peak and were 341 seconds eastbound and 375 seconds westbound in the PM peak. Finally, total network delay indicated 457.7 hours of total delay allowing a total of 10,649 vehicles on the network during the AM peak and 435.9 hours of total delay serving a total of 11,944 vehicles on the network during the PM peak. The PM peak was the second best performing alternative while the AM peak performance was similar to the Six Lane Alternative.

Operational Pros

- This design alternative provides more capacity on US 550 with the same cross – section as the Six Lane Alternative. This is specifically due to the fact that the number of phases at many of the signalized intersections within the study corridor can be reduce by a half when compared to a typical eight-phase signal. The elimination of phases can be realized because through movements and some left-turn movements are limited at each intersection. With this reduction in the number of phases, more green time can be allotted to each movement. A graphic indicating this concept is depicted as shown in Figure 29.

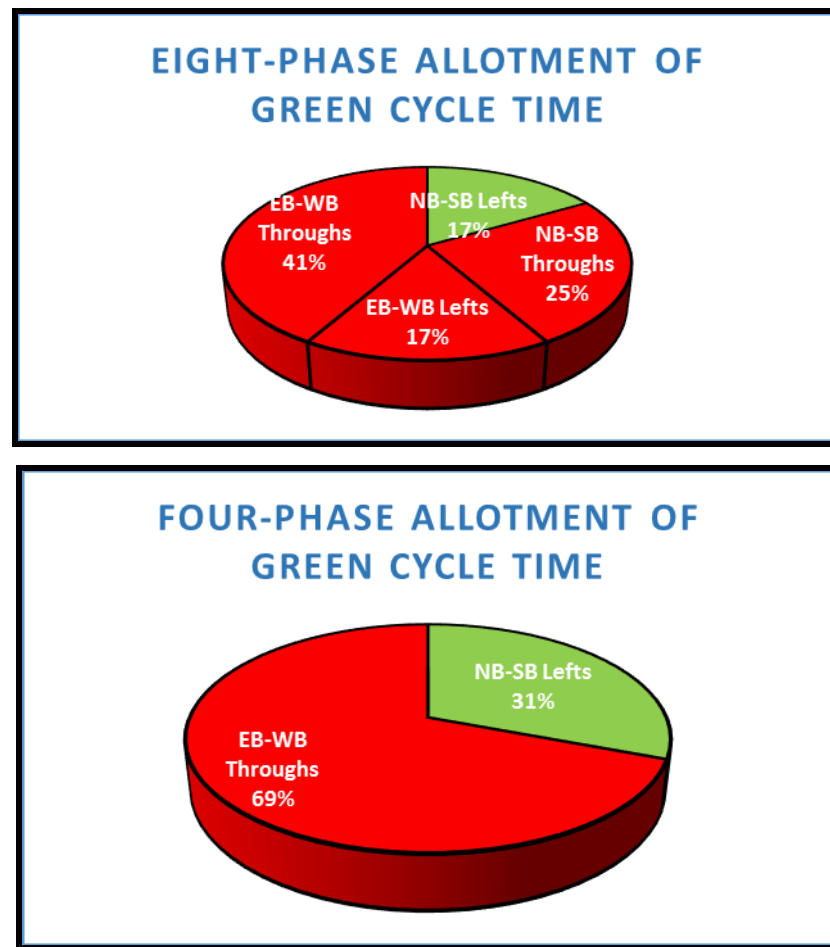


Figure 29 – Green Time Allotment Between Eight-Phase and Four Phase Signals

As shown, both the US 550 westbound/eastbound left turns and the westbound/eastbound through movements can get a significantly larger percentage of the cycle when the cycle is sub – divided by fewer portions or in this case phases.

By stretching out a traditional eight-phase signalized intersection into three separate four phase signals, more movements will be able to operate at the same time as depicted in Figure 30.

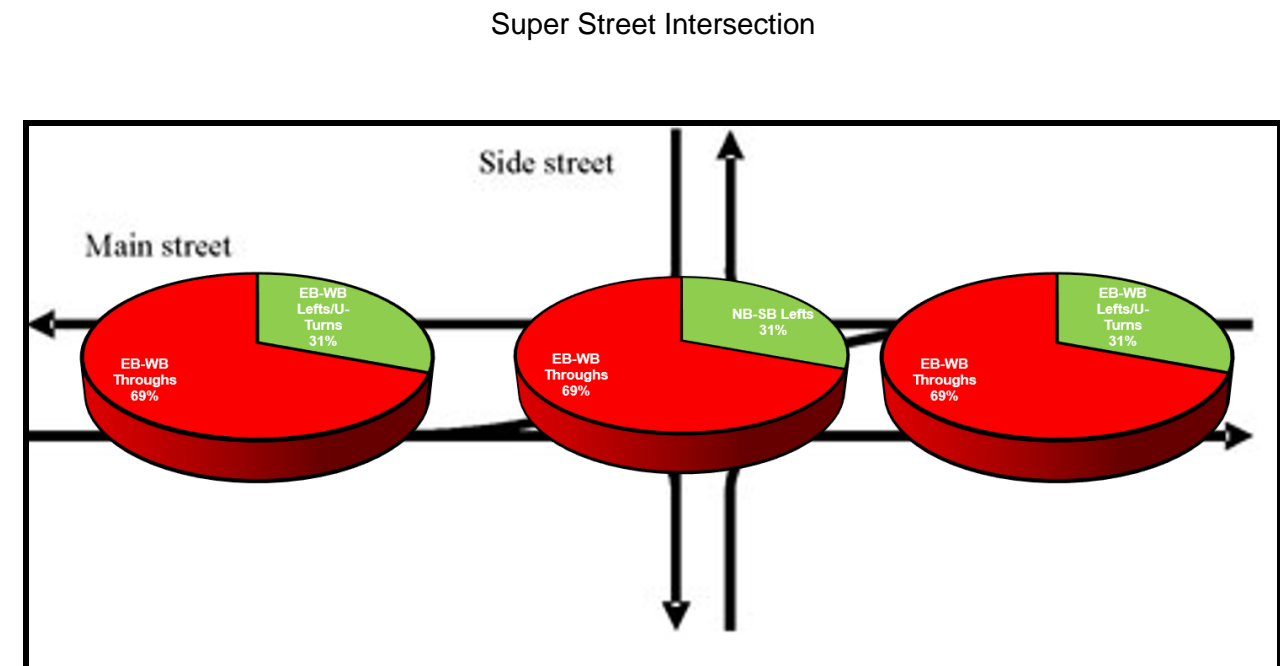
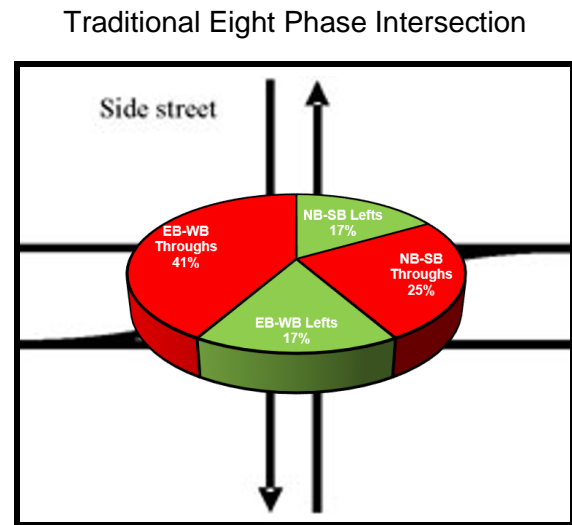


Figure 30 – Traditional Phasing Vs. Super Street Phasing

As indicated in the figure, only two phases can operate at the same time in a traditional eight – phase signal while in a super street configuration, six phases can operate at the same time because they are now occurring at three separate locations and do not conflict. This provides greater efficiency in getting traffic on and off of US 550.

Although the Super Street Alternative generally performs less successfully than the Reversible Lane Alternative, the super street offers more access to adjacent land use within the study area than the extremely limited access provided by the Reversible Lane Alternative. Generally, a left-turn movement need only complete U-turn maneuver 600 to 800 feet away compared to several thousand feet for the Reversible Lane Alternative.

The Super Street Alternative offers many safety benefits including the reduction of conflict points compared to the Six Lane and Reversible Lane Alternatives. National Cooperative Highway Research Program (NCHRP) Report 524 concluded that incidents of crashes associated with U-turn movements were much lower than traditional left-turn maneuvers. Furthermore, even locations that were specifically design for U-turns and thus had a much greater U-turn demands exhibited lower rates of crash incidents when compared to traditional left-turn movements and this research was limited to unsignalized U-turns. Many of the U-turn movements with the Super Street Alternative will actually be signalized thus offering even further safety benefit.

Since super street intersections stretch out the intersection and restrict through movements, access points on the north and south side of US 550 do not necessarily need to be aligned. An example of this would be Kuaua Road and Sheriff's Posse Road. These roads would need to be aligned for the Six Lane and Reversible Lane Alternatives to enhance safety. However, with reduced movements and conflict points, the super street can operate just as safely with Kuaua Road and Sheriff's Posse Road remaining in their current alignments.

The super street configuration provides for raised medians throughout the corridor, which creates plenty of opportunities for pedestrian refuge points and therefore could reduce pedestrian crossing phase times.

As mentioned, the super street geometry tends to reduce conflict points, but more importantly it significantly reduces the riskiest crossing conflict points, which can lead to more serious crashes. This is summarized in Figure 31 indicating a reduction of 4 over all conflict points, but more importantly, a reduction of 14 crossing conflict points.

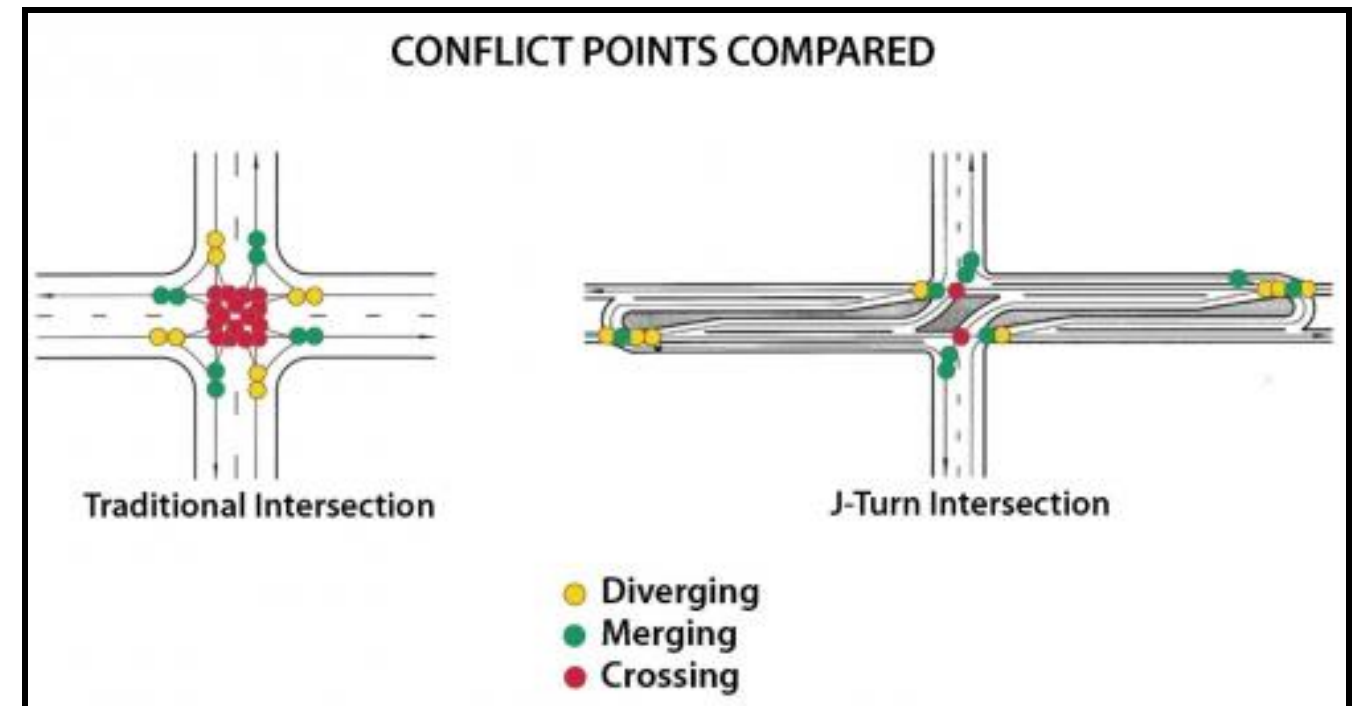


Figure 31 – Conflict Point Comparisons (Traditional Vs. Super Street)

Operational Cons

- Many routes will not be initially intuitive to drivers, especially when U-turn movements are required. It will take time for drivers to become acquainted with the operation of a super street.
- Some movements, such as through and certain left turns, will have to go slightly out of their way to get to their destination by completing a U-turn movement at an adjacent median opening.
- Performing U-turn movements can be uncomfortable for some drivers.
- U-turn movements tend to take slightly longer to complete than normal left turns and can decrease movement capacity during peak demands. However, this slightly longer operation can be offset by the reduction in signal phases discussed previously.
- To take advantage of additional capacity of a four-phase signal, right-turn only movements at the super street intersections would have to operate under channelized yield control, which is not as pedestrian friendly. Although it should be noted that most conventional signalized right turns allow right-turn on red, which can lead to pedestrian conflicts.

Other Design Considerations

- Pedestrian crossings could be handled without providing a special pedestrian phase. Pedestrians could cross diagonally while the left-turn phase is active. An example of such pedestrian treatment is indicated in Figure 26.
- Final yellow, red, and pedestrian clearance times should be adjusted when final design is completed to account for new intersection dimensions.
- Average and 95th Percentile Queue length need to be accommodated. VISSIM queuing output for auxiliary lanes within the Super Street Alternative is summarized in Appendix L.
- In order to accommodate U-turn movements, especially from trucks, additional pavement would be provided where U-turns are planned to take place. This additional pavement is known as a “loam” and has been incorporated into the design of the Super Street Alternative.

10.6.2 DRAINAGE ANALYSIS

West of the Rio Grande the Super Street Alternative consists of the same roadway footprint as the Raised Median and Reversible Lane Alternatives with the addition of a wider median to accommodate the turning radius for commercial vehicles at the U-turns.

The increase in the impervious area necessitates additional inlets and some larger storm drain pipe (from a 36-in to a 42-in) west of the Rio Grande.

East of the Rio Grande the Super Street Alternative consists of the same roadway footprint and impervious area and generates the same amount of 50-year peak flow as the Raised Median and Reversible Lane Alternatives. There are no significant drainage differences between the alternatives. The same recommendations for culvert sizing, inlets, and manholes are advised with any alternative east of the Rio Grande.

In total, this alternative would require 1,300 feet of 24-inch pipe, 5,200 feet of 42-inch pipe, 3,900 feet of 48-inch pipe, 38 inlets, 24 manholes, and 2,850 feet of 24-inch lateral pipe. Environmental Analysis

A comparison of the environmental impacts of the alternatives can be found in Section 9.10. The Super Street Alternative would have moderate effects on geology due to earth moving activities. There would be moderate effects on soils erosion during construction that would be reduced once construction is completed and disturbed areas are reseeded. There would be low effects from storm water if pollution prevention devices are installed during construction. Temporary impacts to vegetation would be mitigated by reseeded disturbed areas. Wildlife habitat is low in the corridor so any impacts to wildlife or protected species during construction would be low. Known cultural resource sites would be avoided.

The Super Street Alternative has more traffic congestion than the Reversible Lane so air quality impacts would be greater but still improved over the No Build. Air quality and noise levels are directly related to traffic operational LOS and therefore will initially improve, but will degrade as traffic congestion increases as demands approach projected 2035 demands. A noise study will be conducted for the preferred alternative to determine if noise mitigation measures are required and feasible. Initial review indicates that noise mitigation will not be required. This alternative is not expected to have a disproportionate environmental justice impacts on low income or minority communities. This alternative is compatible with the existing commercial land use, however, access will be less direct than with the Six-Lane Alternative. Impacts to the visual resources along the corridor would be mitigated with landscape treatments. No Section 4(f) impacts are anticipated VISSIM Model Summary for All Alternatives

10.6.3 ADVANTAGES AND DISADVANTAGES

One disadvantage of the Super Street Alternative is that it is unfamiliar to most motorists. Media campaigns through local newspapers, television, and public meetings should be used to explain the concept to the public. Another disadvantage is that landowners will not have driveways with direct left turns out of their properties. The alternative requires additional right-of-way for wider medians and U-turns. There would be more maintenance than a comparable conventional intersection because there are more signal controllers and cabinets, more signs and more pavement in the U-turns and crossovers.

On the west side of the river, large parcels are currently being developed which allows for circulation to be put in place outside of the road right-of-way. NMDOT has coordinated with the Santa Ana Star hotel development and the Southern Sandoval Investments, Ltd. development so that this circulation can be incorporated. On the east side of the river, US 550 through the Town of Bernalillo is mostly developed. There is some opportunity for backage roads but there is little existing circulation. The nearest connection between Camino Don Tomas and NM 313 is 1.25 miles from US 550.

If left turns are prohibited from Santa Ana Road, then vehicles turning left will need to use Old Hwy 44 to reach NM 313. There is no connection to Camino Don Tomas. Old Hwy 44 is a narrow two lane roadway with a rural cross section. Santa Ana Pueblo has expressed concern that there are currently only two ways out of the Pueblo housing area, Dove Road to NM 313 and Santa Ana Road to US 550. In an emergency situation existing egress is limited. It would be even more limited in the Super Street Alternative. Vehicles would need to travel 0.4 miles out of direction to make a U-turn and travel 0.4 miles back to where they would have been with a conventional intersection.

The addition of medians would provide improved safety for pedestrians crossing US 550. These medians could also be landscaped to provide visual relief from the broad expanses of paving and the visual clutter of adjacent commercial development.

This alternative would require 4.9 acres of right-of-way, mostly on the east side of the Rio Grande. The former Charlotte's Chicken Fingers Restaurant, the Cricket store, and the Overstock E-cigs store would be total takes.

The engineer's opinion of probable construction cost estimate is \$17,555,000 including New Mexico Gross Receipts Tax (NMGR) of 7.0625% and 3% Engineering and Contingencies. The cost estimate can be found in Appendix M. The preliminary pavement typical section has not yet been prepared, so a hot mix surface course of \$50 per square yard was assumed. The construction costs of the NM 528 Intersection Options are shown separately in the following sections.

10.7 VISSIM MODEL SUMMARY FOR ALL ALTERNATIVES

All design alternative simulation travel times for both eastbound and westbound directions of travel between NM 528 and NM 313 are summarized in Figure 32 for the AM and PM peak hour, respectively.

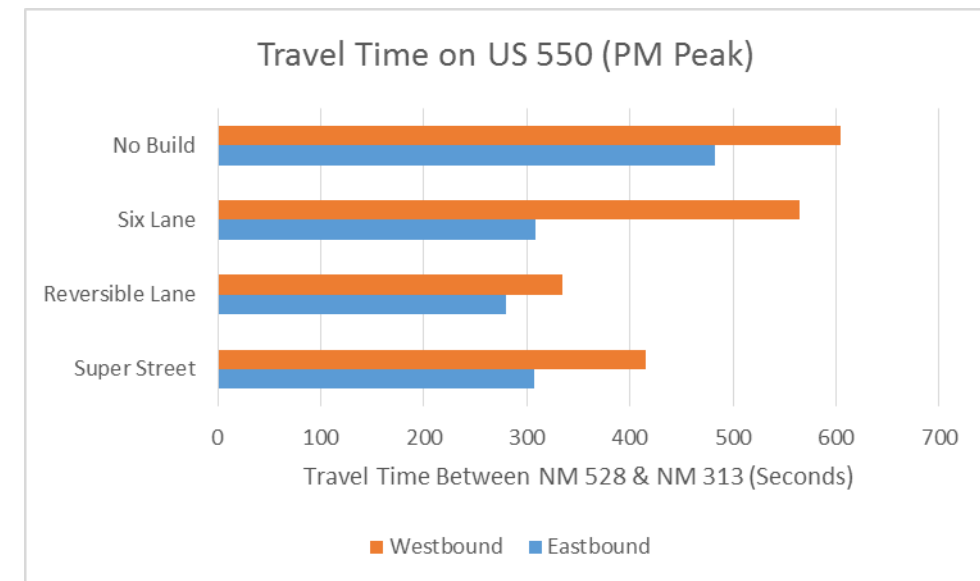
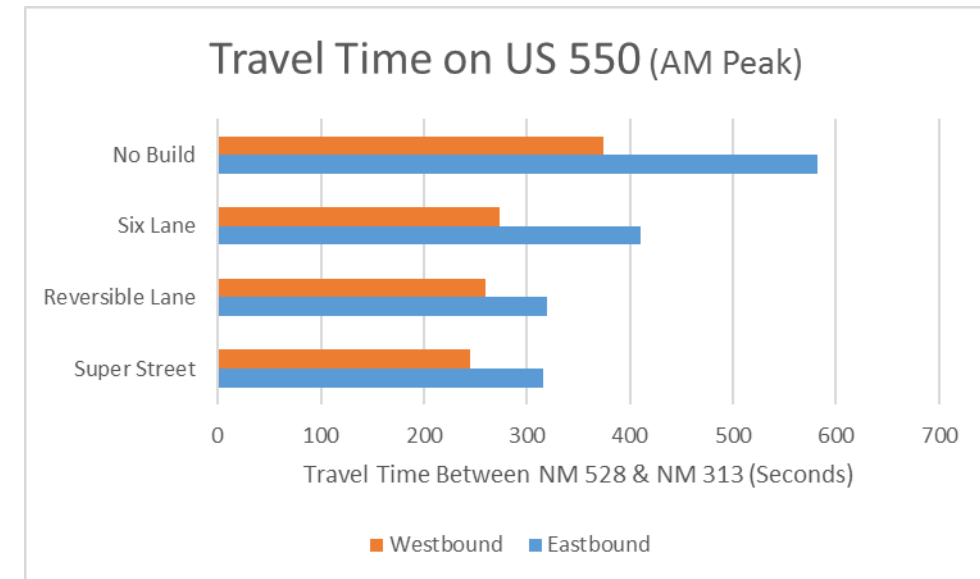


Figure 32 – Travel Time Comparison

As indicated the Reversible Lane alternative is the best performer in both the AM and PM peak hours. The six lane alternative performs second best for both AM and PM peaks. Although the six lane alternative is more competitive with the super street during the AM peak hour.

Finally, overall delays for the entire network for each design alternative was calculated using the VISSIM software. Network delay not only includes delay experienced by vehicles that were allowed onto the network but also those vehicles that were not allowed to enter the network (known as latent delay). Additionally, the total number of vehicles that were allowed onto and through the network was reported as well. All network delay and number of vehicles served are summarized for all design alternatives in Table 17.

Table 17 – Network Delay Comparison

Design Alternative	AM Peak				
	Network Delay (Hours)	Network Vehicles	Average Delay per Vehicle (s/v)	Latent Delay (Hours)	Total Delay (Hours)
No Build	439	8,272	191.1	1519.3	1958.3
Six Lane	390.6	10,155	138.5	19.4	410.0
Reversible Lane	244.2	10,578	83.1	4.7	248.9
Super Street	263.2	10,401	91.1	5.1	268.3
Design Alternative	PM Peak				
	Network Delay (Hours)	Network Vehicles	Average Delay per Vehicle (s/v)	Latent Delay (Hours)	Total Delay (Hours)
No Build	904.1	9,054	359.5	1561.9	2466.0
Six Lane	725.7	11,224	232.8	201.1	926.8
Reversible Lane	337.2	11,779	103.1	7.1	344.3
Super Street	408.4	11,912	123.4	8.9	417.3

The above table indicates that the reversible lane alternative had the best performances for both AM and PM peak hours, and the super street was second best performer during AM and PM peak hours. The six lane was more competitive during the AM peak hour.

10.8 COMPARISON OF US 550 ALTERNATIVES

Three alternatives were considered for the US 550 mainline, a Six Lane Alternative, a Reversible Lane Alternative, and a Super Street Alternative. A comparison of the alternatives is shown in Table 18.

Table 18 – Comparison of US 550 Alternatives

Alternative	Construction Cost	Right-of-Way	Landscaping Opportunities	Pedestrian Refuges	Less Crash Potential	US 550 Capacity	Business Access
Six Lane	\$16,475,000	4.2 Acres	Yes	Yes	Yes	Low	High
Reversible	\$16,495,000	4.2 Acres	No	No	No	High	Low
Super Street	\$17,555,000	4.9 Acres	Yes	Yes	Yes	Medium	Medium

The construction costs do not include the Rio Grande (No. 8537 & 8540) Bridge cost or the NM 528 Intersection cost. Of the three alternatives, the Super Street Alternative has the highest construction cost because it has more signal equipment and more pavement in the “loons”. The “loons” are also the reason that there is more right-of-way required. The construction cost and right-of-way requirements for the Six Lane Alternative and the Reversible Lane are very comparable.

The Reversible Lane Alternative does not provide medians which can act as pedestrian refuge islands and a place for landscaping to improve the visual impact of the corridor. The medians also reduce the number of conflict points which will reduce the potential for accidents. The Six Lane Alternative and the Super Street Alternative do provide the benefit of medians.

The Reversible Lane Alternative provides the most capacity on US 550. The Super Street Alternative does not provide as much capacity as the Reversible Lane Alternative but it does perform best out of all alternatives for the westbound direction during both the AM and PM peak hours. For the Six Lane Alternative the AM peak flows with periods of congestion eastbound at the Don Tomas signalized intersection. The PM peak is much more congested with an observed bottleneck westbound at the Jemez Dam signalized intersection, which causes westbound queuing on US 550 to stretch beyond the Rio Grande (No. 8537 & 8540) Bridge.

Additionally, there appears to be significant side street queuing observed during the PM peak at the south leg of Don Tomas, the north and south leg of NM 313, and the north leg of Jemez Dam. The Six Lane Section has the most access for businesses.

The Super Street has less business access because through movements are not allowed on the cross streets. The Reversible Lane has poor access since left turns are not allowed except on either end of the corridor during the peak hours.

The Super Street is the preferred alternative on the west side of the Rio Grande where the area is still developing. The study team has worked with Santa Ana Pueblo to ensure that there is good circulation between turnouts outside of US 550. With this circulation, there will be little out of direction travel. The traffic modeling showed that the Super Street Alternative performs much better than the Six Lane Alternative in the PM Peak Hour in the area of the Jemez Dam Intersection. The Six Lane with Raised Medians Alternative is the preferred alternative on the east side of the river where the area is already developed. This alternative provides the best local access while meeting the need of the 2035 projected traffic.

10.9 EVALUATION OF ALTERNATIVES – RIO GRANDE (NO. 8537 & 8540)

The existing Rio Grande (No. 8537 & 8540) Bridge was evaluated to determine the best alternative to provide passage across the river for the roadway alternatives. This section will evaluate how the new roadway layouts will be accommodated at the US 550 / Rio Grande Bridge Crossing based on the overall structural needs at this location. Three options will be considered:

- Widen the existing bridge
- Remove and reconstruct the existing bridge
- Keep the existing bridge in place and provide an independent structure adjacent to the existing bridge to provide additional roadway width.

The bridge option that is best suited to this location will be further analyzed in a separate Bridge Type Selection Report which will be provided to discuss the specific layout and bridge type based on the recommendations of this study.

Three factors will be considered in the evaluation of structural alternatives for this crossing. These factors include:

- Compatibility with Roadway Geometry
- Seismic Considerations
- Life Cycle Costs

Various roadway alternatives exist for the proposed improvements; however, each of the alternatives provides the same cross section at the bridge. The chosen bridge option will accommodate US 550 traffic with an additional (3) driving lanes, a bicycle lane, and shoulders.

Both the north and south side of the existing bridges were considered for locating the additional bridge width, but it was determined that widening to the south would conflict with an existing pump station; therefore, the widening and/or new bridge widths will occur to the north for any of the three bridge alternatives.

10.9.1 OPTION ONE – WIDEN THE EXISTING BRIDGE

Widening the existing bridge is the first alternative considered for the crossing. This would involve keeping the existing structure in place and constructing additional bridge width integral with the existing bridge. The deck would be tied to the new bridge with continuous reinforcing and cast-in-place concrete and the substructure would be tied to the existing in a similar manner.

10.9.1.1 Roadway Geometry

As previously noted, the additional width required for the bridge widening to the north is approximately 43.5 feet. The existing bridge in conjunction with the new widening will be reconfigured to provide protected pedestrian access on both sides, 10-ft outside and 8-ft inside shoulders and three driving lanes for both eastbound and westbound traffic. The total bridge width would be approximately 124 feet.

10.9.1.2 Seismic Capacity

The NMDOT Bridge Procedures and Design Guide specifies the use of the current edition of the AASHTO LRFD Bridge Design Specifications as the standard for bridge design in New Mexico. Under certain circumstances, such as the widening of an existing older bridge, use of the AASHTO Standard Specifications (AASHTO LFD) may be allowed. Per these requirements, BHI will be following AASHTO Standard Specifications as appropriate when designing any US 550 Bridge widening elements. Both of these specifications require seismic design and detailing provisions be followed to minimize possible damage from earthquakes.

New bridges and bridge widenings designed according to AASHTO LFD are assigned a Seismic Performance Category (SPC). The SPC is dependent on the Acceleration Coefficient and the Importance Classification. The Acceleration Coefficient is based on the geographical location of the bridge. The Importance Classification is determined by the owning agencies. In this case, because they cross the Rio Grande, the bridges are considered to have an Importance Classification of "I".

Based on these two criteria, this bridge is in SPC B. In the AASHTO LFD Specifications, bridges in this category require seismic design capacity checks for lateral seismic load and special seismic detailing.

The project's geotechnical engineer, Terracon, has reviewed the soil layers at this location and has determined that liquefiable soil layers are present. The existing bridge piles are only embedded about 40 feet into the soil.

Therefore, a relatively small area of liquefiable soil could result in a significant reduction in vertical capacity from skin friction, causing large vertical and horizontal displacement and ultimately instability of the bridge.

For a widened bridge to meet either the LFD or LRFD Specifications, it would have to be detailed and designed for seismic loading. The widened portion of the bridge would need to withstand the entire transverse foundation load and provide an increase in vertical capacity. Additionally, rehabilitation of the abutment and pier diaphragms to transfer these horizontal and vertical seismic loads from the superstructure to the foundation would need to be completed.

The design issues that would require remedy if the structure is designed to withstand earthquake loads were reviewed. New piles would have to be battered transverse to the bridge. Battering piles to resist seismic loading is strongly opposed in the LRFD Specifications. If battered piles were used despite this, the stiffness of the battered pile would change the period of the bridge and attract more load to the piers. The existing pile caps and connections were not designed for this additional load, nor were the beam seats or the bridge's pier columns. It is highly possible that retrofits would not be sufficient to provide the code-required seismic capacity and would be extremely cost prohibitive and environmentally intrusive. Therefore, widening the existing bridge is not the most cost effective alternative if the bridge is to meet seismic code as required.

10.9.1.3 Life Cycle Costs

The existing US 550 bridge over the Rio Grande was designed according to the 1982 AASHTO Standard Specifications and built in 1986. Bridges designed with these specifications are typically considered to have a 50-year design life. Therefore, the current remaining design life of the existing bridge is approximately 20 years. The exact remaining design life is dependent on proper maintenance and may be extended with upgrades and repairs.

Conventional bridge widening would not significantly extend the design life of the existing bridge. Therefore, the widened bridge would likely need to be replaced in approximately 20 years. It is possible that this option would require a lower current monetary investment, but money would have to be set aside for full replacement of the entire bridge width (including the existing and widened portion of the bridge) in approximately 20 years. The approximate construction cost estimate is \$5.3 million.

10.9.2 OPTION TWO – REMOVE AND RECONSTRUCT THE EXISTING BRIDGE

The second alternative considered for the bridge crossing is full replacement of the existing bridge. This would consist of removing the existing bridge and providing a new bridge that will convey all traffic across the river in both directions.

10.9.2.1 Roadway Geometry

The new bridge will provide protected pedestrian access on both sides, 10-ft outside and 8-ft inside shoulders and three driving lanes for both eastbound and westbound traffic. The total bridge width would be approximately 124 feet, with the centerline of the new bridge shifted toward the north as previously noted, due to conflicts on the south side. This option obviously requires additional construction costs and phasing to build while maintaining traffic during construction.

10.9.2.2 Seismic Capacity

If the existing bridge is replaced entirely, then seismic capacity is not a concern because the new bridge would be designed in accordance with the current codes.

BHI has evaluated the new bridge's seismic parameters by reviewing the criteria in the current AASHTO LRFD Specifications and the LRFD Seismic Design Guide. The project's geotechnical engineer, Terracon, provided a site-specific shear wave analysis for use in evaluating this site for the new bridge. This analysis determined that a Seismic Design Category of A (SDC A) should be used for the new bridge structure. Typically, very little specific detailing is required for bridges in this design category. However, liquefaction can still occur even in locations where the SDC is lower. As previously noted, Terracon's analysis determined that layers of liquefiable soils exist and should be considered during design as necessary.

The AASHTO Seismic Guide Specifications may require detailing and design per a higher design category when a structure could become unstable due to liquefaction in a seismic event. Therefore, the new bridge structure and its foundations would be designed for these issues as necessary.

10.9.2.3 Life Cycle Costs

Upon replacing the existing bridge, the new bridge would be designed with a design life of 75 years. This option would require that the most money be spent on the bridges right now, but would not require any additional money be spent on replacement for approximately 75 years with proper maintenance. The approximate construction cost of the new bridge would be \$13.7 million.

10.9.3 OPTION THREE – INDEPENDENT BRIDGE ADDITION

The last alternative considered for the bridge crossing is an adjacent, independent bridge addition. The existing bridge would remain in place and continue to provide service for eastbound traffic and a new independent bridge structure would be added to the north, adjacent to the existing structure to provide additional width for westbound traffic as needed.

10.9.3.1 Roadway Geometry

The new westbound bridge will provide protected pedestrian and bicycle access on the north side, 10-ft outside and 8-ft inside shoulders and three driving lanes. The bridge width for the new bridge would be approximately 68 feet. The existing bridge and its barriers would be reconfigured to provide eastbound traffic with a similar layout. This option has obvious benefits during construction as it allows the new bridge to be built while the existing bridge continues to serve eastbound and westbound traffic. This provides for some cost and schedule savings during construction.

10.9.3.2 Seismic Capacity

Seismic capacity would not be a concern for Option Three’s independent bridge addition. The existing bridge would not be altered; therefore, they would not require seismic retrofit to meet current AASHTO seismic requirements. The new independent bridge and its foundation would be designed per current code as discussed in Option Two.

10.9.3.3 Life Cycle Costs

An independent bridge addition would be designed with a 75-year design life. The current investment would be less than what is required for a full bridge replacement and would be possibly more than is required for a conventional bridge widening not considering the widening’s costs and issues associated with seismic retrofit. Money would have to be set aside for replacement of the existing bridge in approximately 20 years, but the independent addition would not have to be replaced, so less would be spent than if the bridges were conventionally widened. Unlike the bridge replacement option, this would allow the existing bridge to see its full design life and for the new adjacent bridge to be used during construction phasing when replacing the existing bridge in 20 years. The approximate construction cost of the independent bridge is \$7 million.

10.9.4 COMPARISON OF BRIDGE OPTIONS

Three options were considered for how best to cross the Rio Grande with this project. For each of the options, three criteria were considered – Roadway Geometry, Seismic Capacity, and Life Cycle Costs. A matrix was compiled with ratings for each of the options in these three categories as shown in Table 19. The option with the highest total will be moved forward into Bridge Type Selection. Each bridge was rated on a scale from 1-3 for each category, with 1 being the least attractive option for this criteria and 3 being the most attractive option. As a result, Option Three (Independent Bridge Addition) is recommended to be moved forward into a Bridge Type Selection.

Option One (Existing Bridge Widening) scored low in the categories of both Seismic Capacity and Life Cycle Costs. Significant retrofits would be required to bring the existing bridge up to code and the entire bridge would need to be replaced in about 20 years when the existing bridge nears the end of its design life. Widening and rehabilitating the existing bridges is not recommended due to the cost of retrofitting the bridges to ensure it meets current seismic standards.

Option Two (Full Replacement) scored lower on the life cycle costs. This option does not allow for the existing bridge to be utilized for the remainder of its design life and therefore significant upfront bridge costs would be required.

Option Three (Independent Bridge Addition) scored best on all three categories. If the existing bridges are not rehabilitated and/or retrofitted, they will continue to provide at least 20 more years of the original design life with continued maintenance. Any new bridges required for the corridor alternatives (including an independent addition) will be designed according to current specifications with liquefaction and seismic loading being considered.

Table 19 – Bridge Option Matrix

Evaluation Criteria		Roadway Geometry	Seismic Capacity	Life Cycle Costs	Total
		Rating	Rating	Rating	
Bridge Option	Option One - Widen the Existing Bridge	3.0	1.0	1.0	5.0
	Option Two - Replace the Existing Bridge	3.0	3.0	2.0	8.0
	Option Three - Independent Bridge Addition	3.0	3.0	3.0	9.0

Once it was determined that an Independent Bridge should be constructed north of the existing bridge, two options, shown in Figure 33, were considered for the bridge typical section. Both options have three 11.5-ft driving lanes, an 8-ft inside shoulder to provide refuge for a vehicle that breaks down in the inside lanes, a 10-ft outside shoulder to provide emergency vehicle access across the bridge, and a 5-ft sidewalk. The 62.25-ft wide option utilizes the outside shoulder for a bicycle lane. The 67.25-ft option is 5-ft wider with a bicycle lane in addition to the outside shoulder. The advantage of the wider bridge option is additional safety for bicyclists crossing the bridge as they would be behind a concrete wall barrier.

The disadvantages of the wider bridge are that the additional width costs approximately \$600,000 more and it is more difficult to remain within the right-of-way on the north side of the bridge just west of the Rio Grande. Since the bicycle lane combined with the outside shoulder would be a safer condition than the bicycle lane adjacent to the roadway outside of the bridge area, NMDOT District 3 chose the 62.5-ft wide bridge option. Option One (widening the existing bridge) will adequately support this chosen roadway option for the bridge crossing.

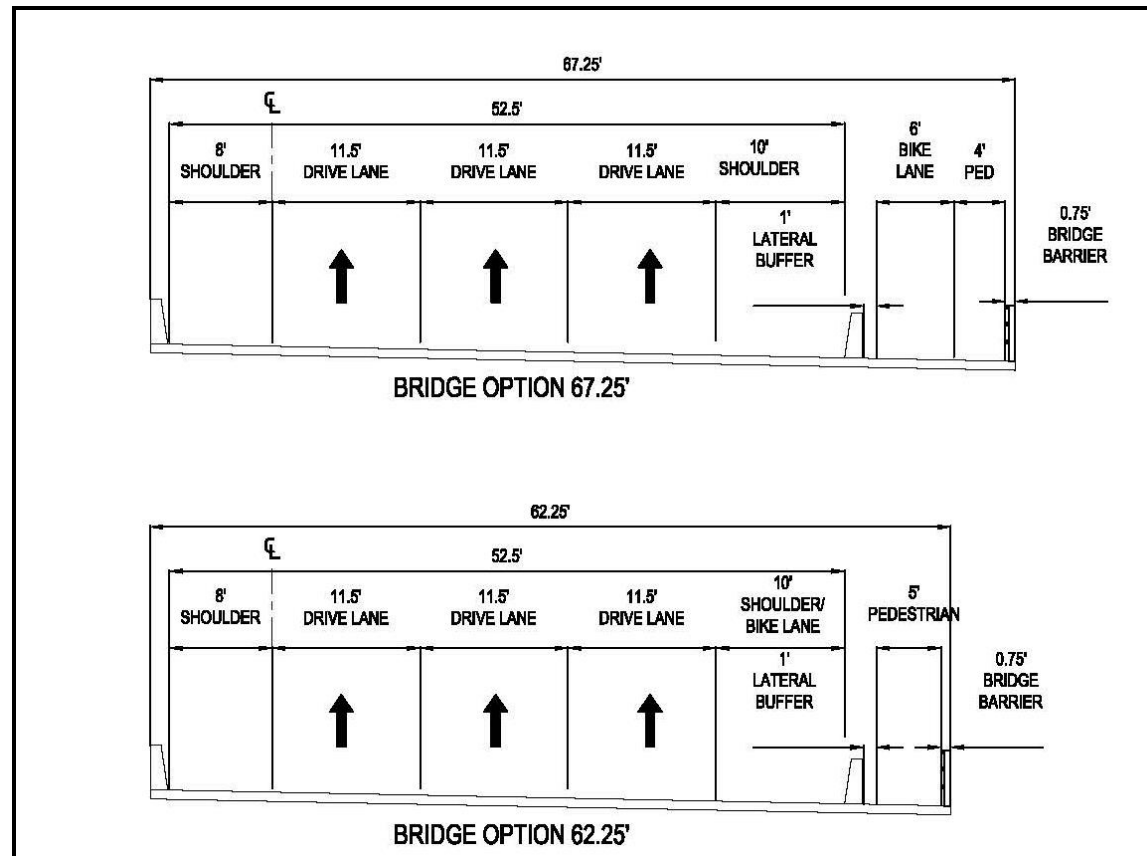


Figure 33 – Options for Proposed Bridge Typical Sections

The existing bridge and its barriers would be reconfigured to provide eastbound traffic with a similar layout. The existing bridges could be repurposed as shown in Figure 34. This option has obvious benefits during construction as it allows the new bridge to be built while the existing bridge continues to serve eastbound and westbound traffic. This provides for some cost and schedule savings during construction.

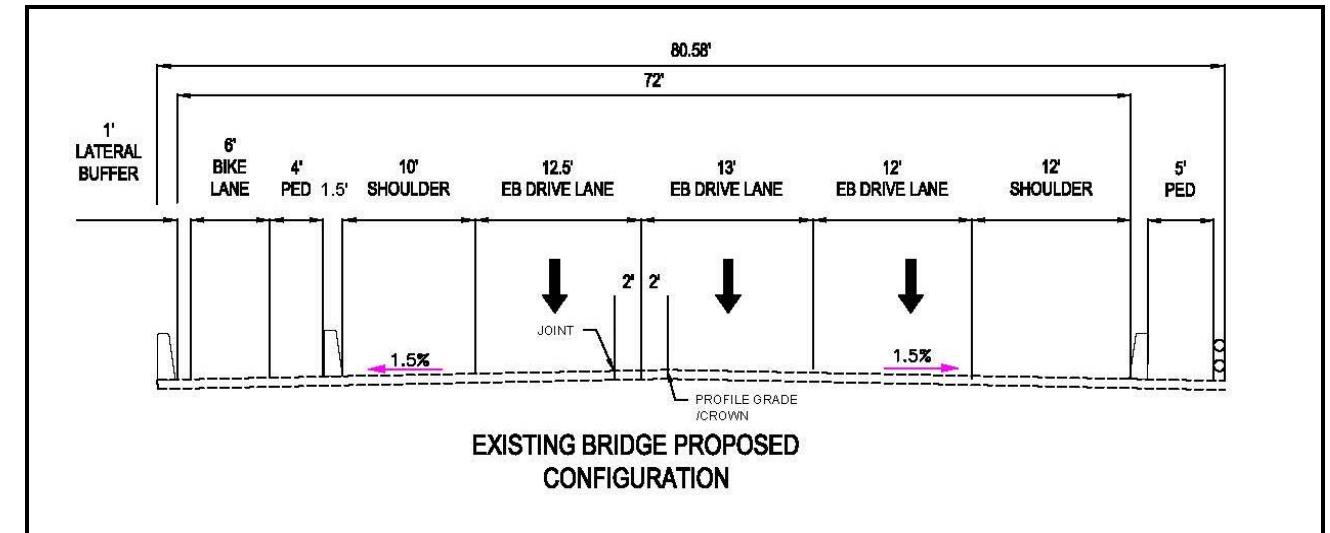


Figure 34 – Proposed Reconfiguration of Existing Bridge

10.10 NM 528 / TAMAYA BLVD INTERSECTION OPTIONS

Three options for the NM 528 Intersection were advanced from the Phase 1–A Report for a more detailed evaluation; Option 1 the Continuous Flow, Option 2 the Super Street, and Option 3 with a westbound US 550 to southbound NM 528 Flyover Ramp. It was determined during the Phase 1-A study that the three intersection options could be used in combination with any of the US 550 alternatives. For this reason, the intersection options were evaluated independently. These options will be described in the following sections.

10.10.1 OPTION 1 CONTINUOUS FLOW INTERSECTION

The Continuous Flow Intersection Option removes left–turn movements from the main intersection to an upstream signalized location. Traffic that would turn left at the main intersection in a conventional design now crosses opposing through lanes at a signal-controlled intersection several hundred feet upstream and then travels on a new roadway parallel to the opposing lanes. This traffic is now able to execute the left turn simultaneously with the through traffic at the main intersection. Traffic signals at the left-turn crossovers and the main intersection are operated in a coordinated mode so that vehicles do not stop multiple times in the intersection area. The NM 528 / Tamaya Blvd Continuous Flow Intersection is shown in Figure 37. In this option, only the US 550 left turn movements are displaced. NM 528 left turns continue to operate like a conventional intersection.

10.10.1.1 Traffic Analysis

A continuous flow intersection would relocate US 550 westbound to NM 528 southbound left-turn movements to the other side of the opposing roadway, which eliminates left-turn phases from US 550. This requires that signalized crossover intersections be constructed on the US 550 eastbound and westbound approaches to the NM 528 intersection. A schematic indicating this operation is shown in Figure 35 below.

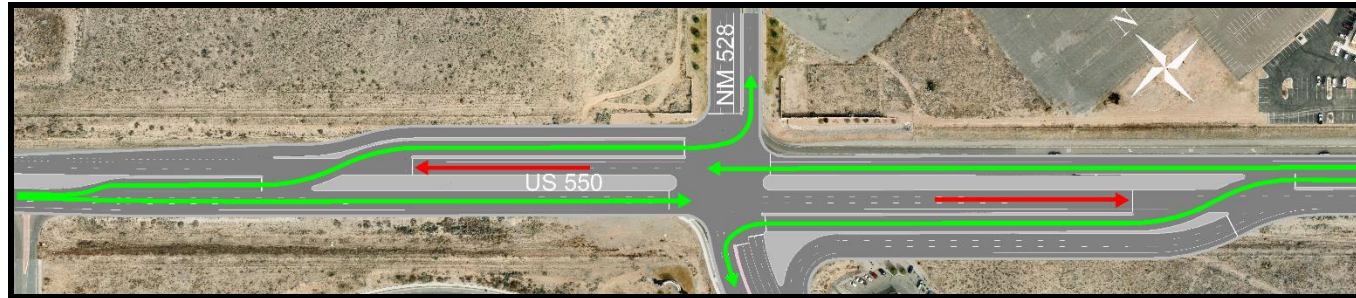


Figure 35 – Continuous Flow Operation

The continuous flow option was simulated with VISSIM simulation software for projected 2035 AM and PM peak hours assuming the following:

- All three signalized intersections, including the left-turn cross-over intersection were simulated with one controller.

The following phasing, shown in Figure 36, was assumed for the operation of the continuous flow intersection.

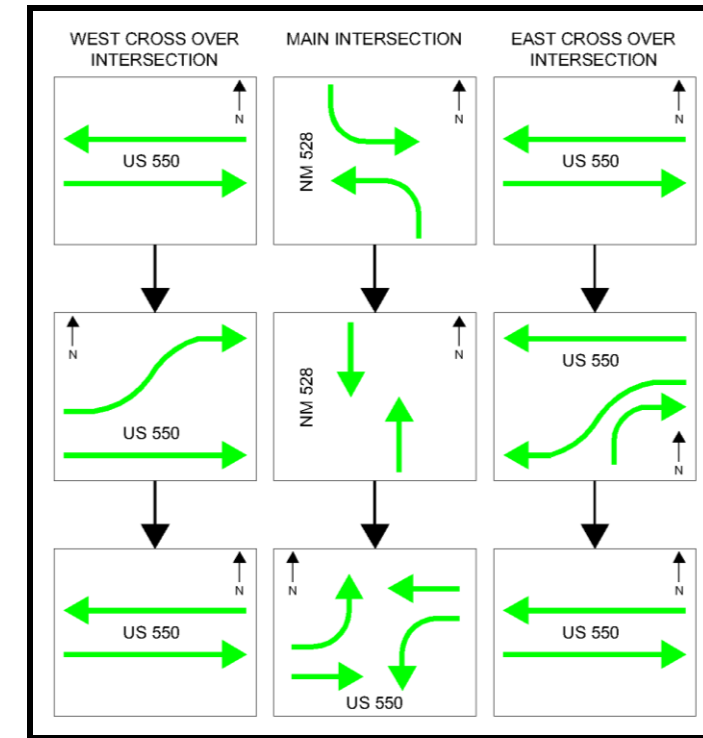
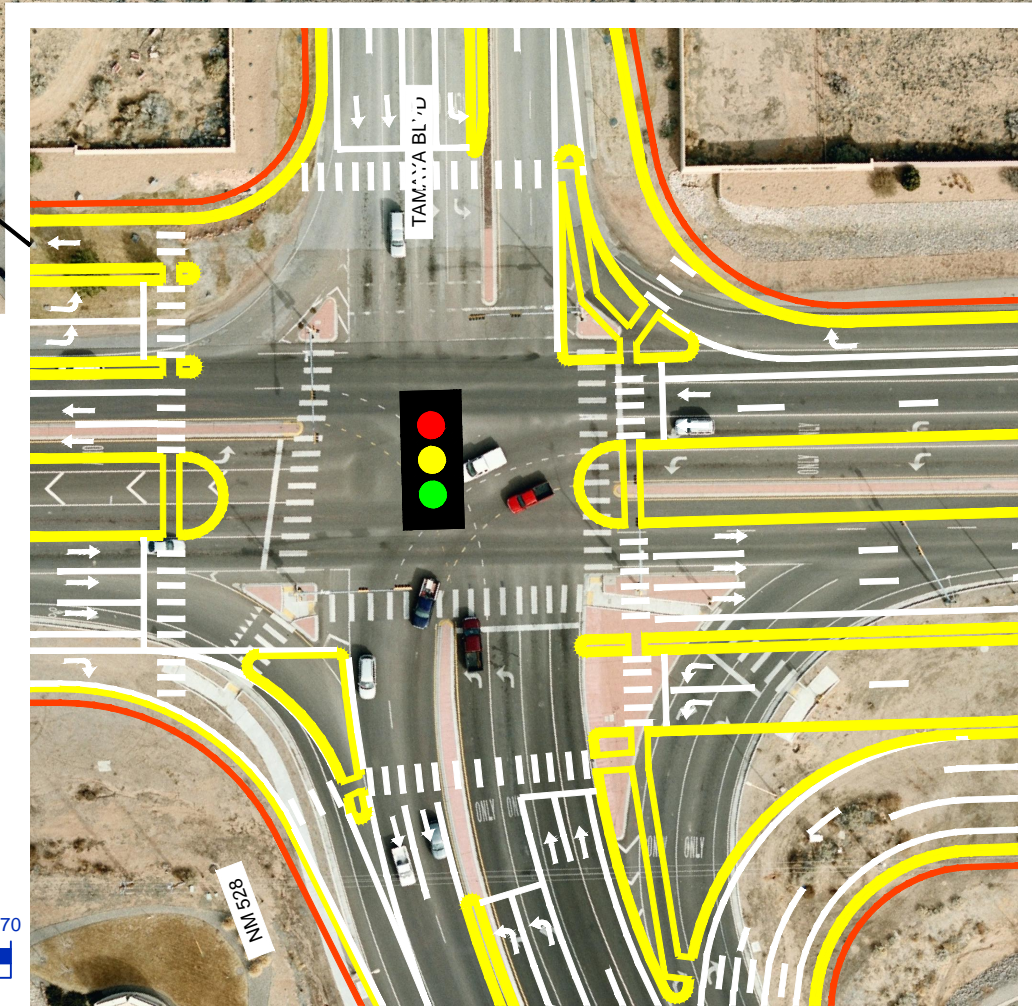
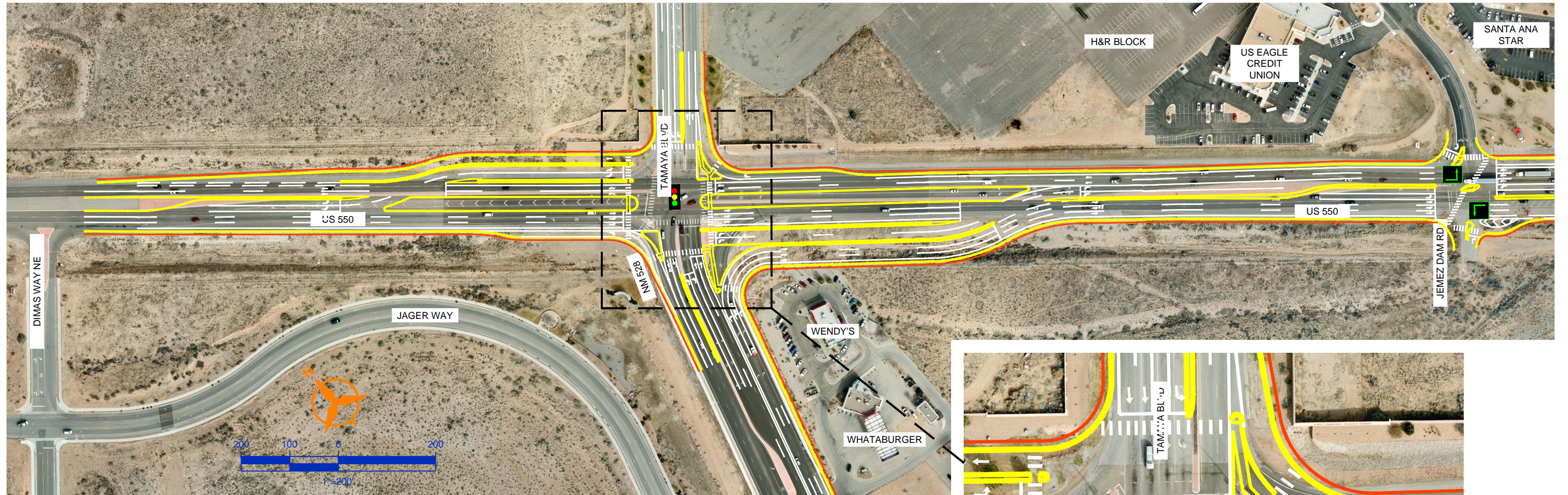


Figure 36 – Phasing for Continuous Flow Intersection at NM 528

- The eastbound right-turn movement was simulated to operate as a yield controlled movement. The NM 528 northbound triple right-turn movement was simulated as a signalized movement, which as shown in the above phasing diagram, would operate when the US 550 westbound left-turn cross-over green phase occurs.



Simulation Results

Visual observations of the simulations indicate that the continuous flow intersection could accommodate both 2035 AM and PM peak hour traffic demands due to the reduced number of phases. During the AM peak hour, there is slower moving traffic with some congestion observed for US 550 eastbound traffic just east of the intersection as NM 528 northbound right-turn movements are added to US 550 eastbound through movements as these movements are the heaviest during the AM peak. The continuous flow appears to handle the large US 550 westbound left-turn demands during the AM peak with controlled queues. During the course of simulation, it was necessary to incorporate the following geometry configurations westbound between Jemez Dam and the left-turn cross-over intersection, depending on the design alternative employed on US 550 between Jemez Dam and NM 528.

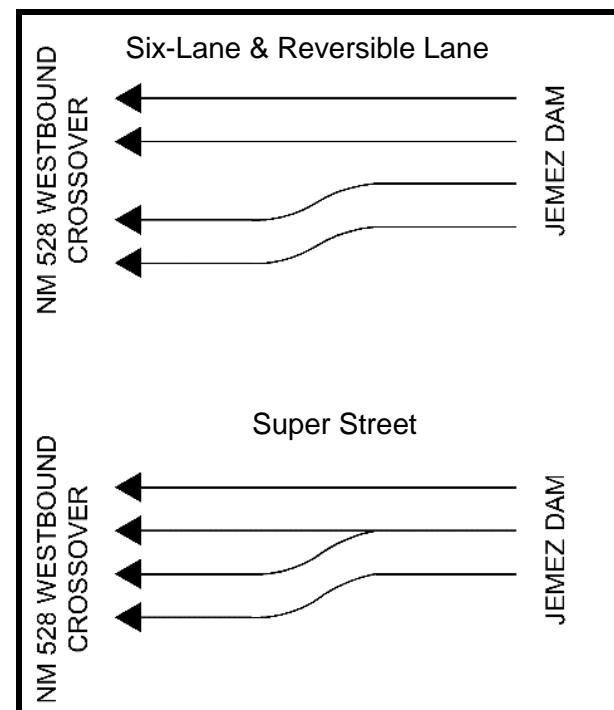


Figure 38 – Lane Utilization Westbound US 550 Between NM 528 & Jemez Dam

The above configurations, shown in Figure 38, were used to mitigate queuing issues observed in early simulation runs. To further mitigate potential westbound queuing during the PM peak hour, an additional early westbound phase was added to get westbound left-turn and crossover movements to clear prior to the arrival of additional traffic. This means that the westbound through green is delayed by 10 to 20 seconds to allow westbound left, through and left-turn cross. This operation concept is illustrated in Figure 39.

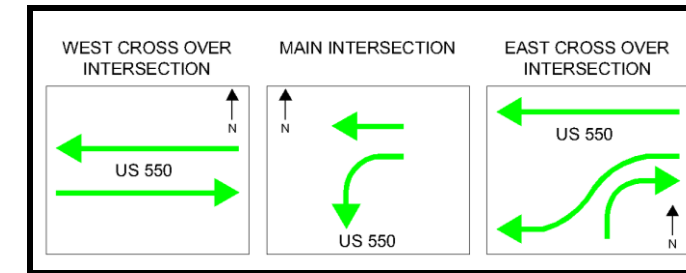


Figure 39 – Early Release Phase for Continuous Flow Intersection

Overall, the continuous flow intersection appears to operate satisfactorily for both AM and PM peak hours. The continuous flow intersection is expected to operate anywhere from LOS E to LOS C in the AM peak hour and LOS C to LOS D in the PM peak hour.

Operational Pros

- This continuous flow intersection option provides more capacity than a traditional eight-phase intersection on US 550 with the same cross-section due to the fact that the number of phases at the main intersection of NM 528 have been reduced by two. The elimination of phases can be realized because US 550 north-south through and left-turn movements can operate at the same time. With this reduction in the number of phases, more green time can be allotted to each movement.
- The large NM 528 northbound right-turn movement during the AM peak can only be accommodated by triple right-turns, which for safety reasons must be signalized. The US 550 westbound cross-over phase provides an opportunity to operate this right-turn phase during those cross-over movements.
- It is the best at-grade intersection concept in accommodating projected 2035 AM and PM peak hour demands at the NM 528 intersection.
- The geometry offers opportunities to provide median refuges for pedestrians.

Operational Cons

- There are no continuous flow intersections in operation in New Mexico and therefore the operation would be new and unfamiliar to local drivers.
- During extreme movement peaks there could be queue length challenges for demands between Jemez Dam and NM 528. Signal coordination and the operation of all NM 528 signals on one controller will be crucial to mitigating queue issues.
- This option, due to its unique operation and large footprint, presents challenges to pedestrians. Specifically, it will take much longer for pedestrians to navigate across the intersection.

Additionally, there will be a challenge in providing a crossing phase for pedestrians crossing the northbound triple right-turn movement without some compromise to operational capacity.

Other Design Considerations

- Pedestrian crossings will be unconventional with pedestrians crossing NM 528 while the offset left-turn and through movements are occurring. Additionally, pedestrians will be required to cross US 550 a half at a time, stopping within a provided median refuge to call for another pedestrian phase to cross the rest of the way.

The best way to both accommodate pedestrian crossings of the NM 528 northbound triple right-turn movement and still provide maximum movement capacity would be to incorporate a pedestrian hybrid beacon. This beacon would only be activated when a pedestrian pushes a button at which time the following operation, shown in Figure 40, would occur.

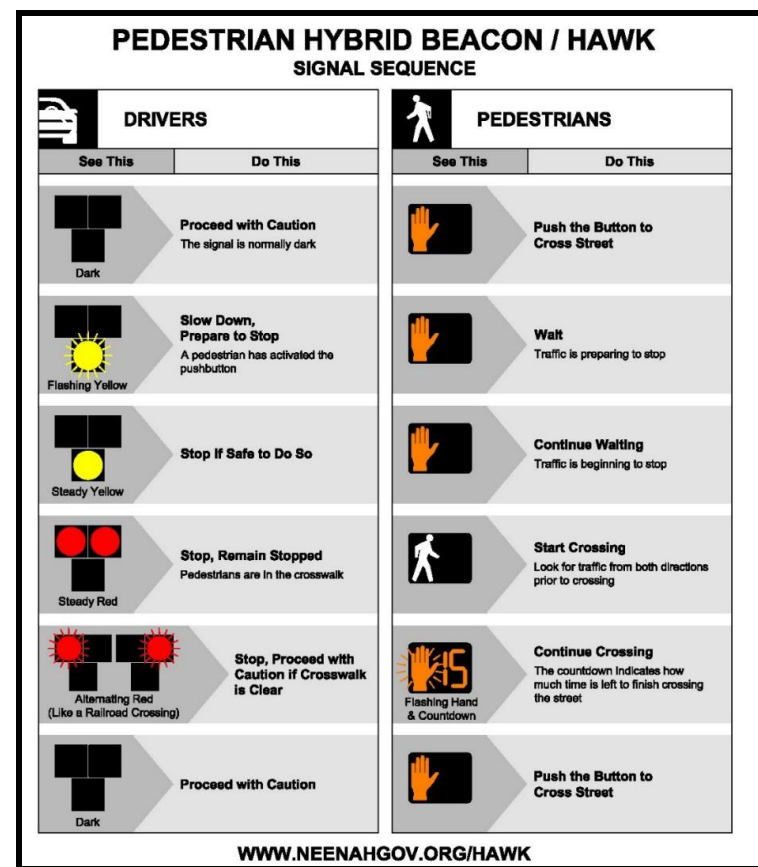


Figure 40 – Pedestrian Hybrid Beacon Operation

Source: City of Neenah, Wisconsin

As shown, the signal indications are dark if not activated. Once pedestrian activation occurs, the signal will initially flash yellow, then solid yellow, then hold a solid red, and finally flashing yellow before going dark again until the next pedestrian activation. The pedestrian hybrid beacon should be placed on the upstream side of the north to east channelizing island to insure the best visibility between pedestrian and vehicle.

10.10.1.2 Drainage Analysis

NM 528 Intersection Option 1, with continuous left turn lanes, increases impervious area and would impact the existing drainage ditch east of NM 528 on the south side of US 550. Drainage infrastructure improvements including increased capacity needs and replacement drainage infrastructure to off-set the impacts on the existing roadside ditch would be required for this intersection option.

10.10.1.3 Environmental Analysis

The NM 528 Continuous Flow Intersection Option would have moderate effects on geology due to earth moving activities. There would be moderate effects on soils erosion during construction that would be reduced once construction is completed and disturbed areas are reseeded. There would be low effects from storm water if pollution prevention devices are installed during construction. Temporary impacts to vegetation would also be mitigated by reseeding disturbed areas. Wildlife habitat is low in the corridor so any impacts to wildlife or protected species during construction would be low. Known cultural resource sites would be avoided. Air quality and noise levels are directly related to traffic operational LOS and therefore will initially improve, but will degrade as traffic congestion increases as demands approach projected 2035 demands. A noise study will be conducted for the preferred alternative to determine if noise mitigation measures are required and feasible. This option is not expected to have a disproportionate environmental justice impacts on low income or minority communities. This option is compatible with the existing commercial land use. Impacts to the visual resources along the corridor would be mitigated with landscape treatments. No Section 4(f) impacts are anticipated.

10.10.1.4 Advantages and Disadvantages

The primary benefit of the Continuous Flow Intersection Option is the reduction in the number of traffic signal phases and conflict points with consequent improvements in operations and safety. This allows the intersection to handle the project 2035 traffic demand.

The geometry offers opportunities to provide median refuges for pedestrians and for landscaping. The intersection will have improved safety because there are fewer conflict points in the intersection.

The engineer's opinion of probable construction cost estimate is \$7,100,000 including New Mexico Gross Receipts Tax (NMGRT) of 7.0625% and 3% Engineering and Contingencies. The cost estimate includes US 550 from west of NM 528 to Jemez Dam Road. The cost estimate can be found in Appendix M. The preliminary pavement typical section has not yet been prepared, so a hot mix surface course of \$50 per square yard was assumed.

10.11 OPTION 2 SUPER STREET INTERSECTION

The NM 528 / Tamaya Blvd Super Street Intersection is shown in Figure 41. Through and left turn movements would not be allowed from NM 528 and Tamaya Blvd to US 550. Vehicles would turn right onto US 550 and then make a U-turn maneuver at a one-way median opening. These U-turn movements would be signalized.

10.11.1 TRAFFIC ANALYSIS

The super street option would limit either US 550 left-turns or NM 528 left-turns and through movements at the main NM 528 Intersection. The restricted movements would be required to do a U-turn at two signalized U-turn intersections on either side of the main intersection. Initially, the feasibility of this option was analyzed by determining how many left-turns from either US 550 or from NM 528 would need to be redirected to U-turn movements. If left-turns were to be diverted from US 550 to U-turn pockets, the PM peak would be diverting 1,300 westbound left-turns plus over 600 through demands for a total of nearly 2,000 U-turn movements. This diverted demand would easily overwhelm (LOS F and over capacity) even a dual U-turn configuration. Therefore, eliminating left-turn movements from US 550 would not be feasible. If left-turns and through movements from NM 528 were diverted, nearly 800 AM peak northbound left-turn and through movements would have to then divert to a right-turn movement that already is near capacity with three lanes at a 1,398 AM peak hour demand. This would put the triple right-turn under further stress with over 2,000 AM peak hour right-turns, which would again easily overwhelm the movement with LOS F operational delays and over capacity. Due to these significantly large diverted demands, it was determined that a Super Street configuration at NM 528 would not be feasible and therefore this option was not simulated with the VISSIM simulation software.

10.11.2 DRAINAGE ANALYSIS

Impervious area does not increase significantly with Intersection Option 2. Drainage costs for this option are included in the costs associated with US 550 alternatives described above.

10.11.3 ENVIRONMENTAL ANALYSIS

The NM 528 Super Street Intersection Option would have moderate effects on geology due to earth moving activities. There would be moderate effects on soils erosion during construction that would be reduced once construction is completed and disturbed areas are reseeded.

There would be low effects from storm water if pollution prevention devices are installed during construction. Temporary impacts to vegetation would also be mitigated by reseeding disturbed areas. Wildlife habitat is low in the corridor so any impacts to wildlife or protected species during construction would be low. Known cultural resource sites would be avoided. Air quality and noise levels are directly related to traffic operational LOS and therefore will initially improve, but will degrade as traffic congestion increases as demands approach projected 2035 demands.

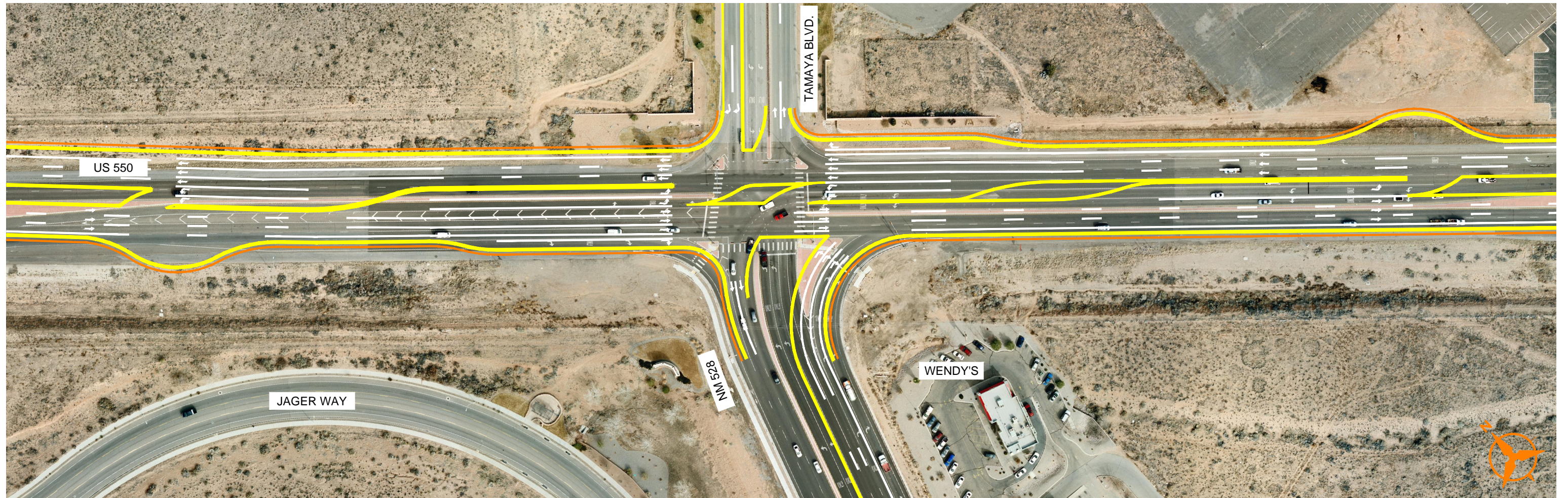
A noise study will be conducted for the preferred alternative to determine if noise mitigation measures are required and feasible. This option is not expected to have a disproportionate environmental justice impacts on low income or minority communities. This option is compatible with the existing commercial land use. Impacts to the visual resources along the corridor would be mitigated with landscape treatments. No Section 4(f) impacts are anticipated.

10.11.4 ADVANTAGES AND DISADVANTAGES

The Super Street Intersection Option was found to not have enough capacity for the northbound to US 550 eastbound right turn movement. The projected right turn movement is almost 1,400 vehicles in the AM Peak Hour. The Super Street Option adds the northbound left turn movements to the right turn movements. This would put the triple right-turn under further stress with over 2,000 AM peak hour which would again easily overwhelm the movement with LOS F operational delays.

The Super Street Intersection Option can be constructed without additional right-of-way by shifting the alignment in the existing right-of-way.

The engineer's opinion of probable construction cost estimate is \$4,850,000 including New Mexico Gross Receipts Tax (NMGRT) of 7.0625% and 3% Engineering and Contingencies. The cost estimate includes US 550 from west of NM 528 to Jemez Dam Road. The cost estimate can be found in Appendix M. The preliminary pavement typical section has not yet been prepared, so a hot mix surface course of \$50 per square yard was assumed.



10.11.5 OPTION 3 FLYOVER INTERSECTION

This option would include a westbound to southbound flyover from US 550 to NM 528. The heaviest movements in the intersection are the northbound NM 528 to eastbound US 550 in the AM Peak Hour and westbound US 550 to southbound NM 528 in the PM Peak Hour. The flyover ramp would take the afternoon left turn movements out of the signal and allow it to operate more efficiently. The flyover provides a free-flow movement for the left turns. The flyover would be two lanes wide as shown in Figure 42. The proposed NM 528 / Tamaya Blvd Flyover Intersection is shown in Figure 43. The design speed for the flyover is 40 mph.

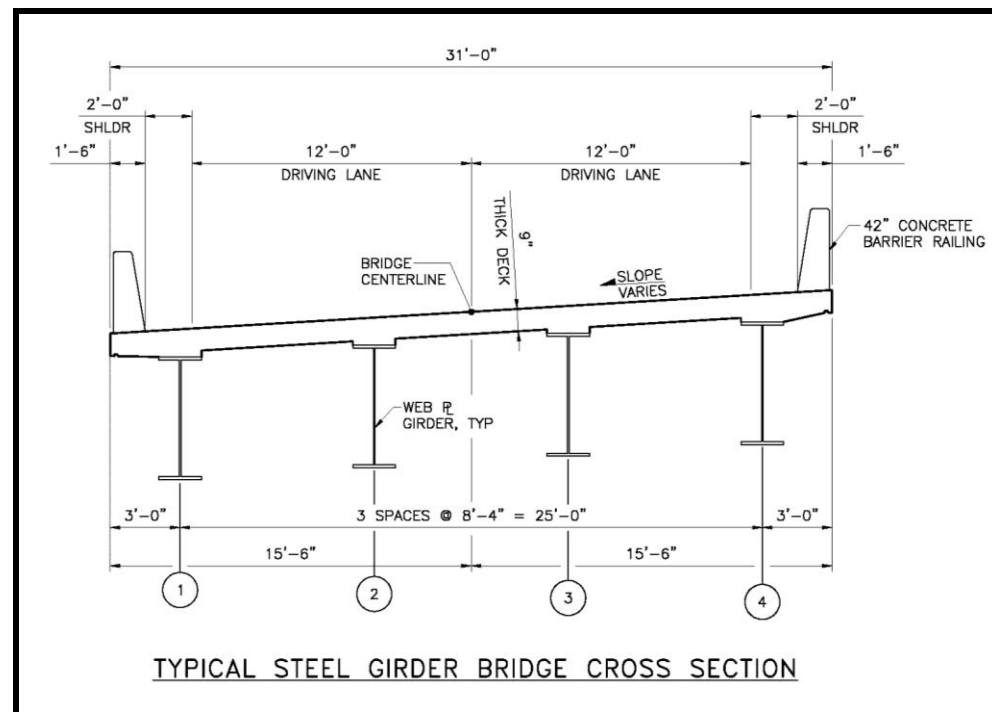
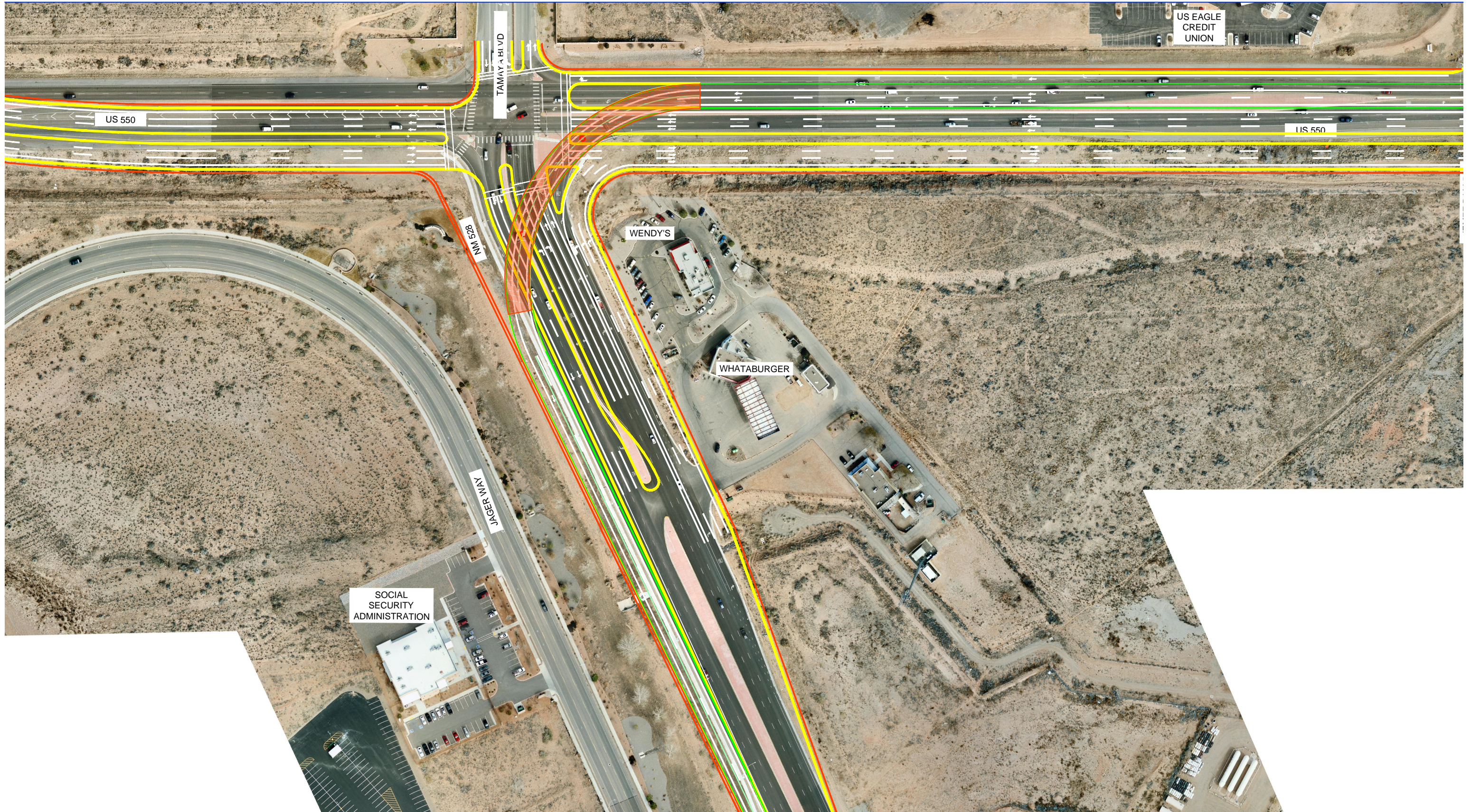


Figure 42 – Flyover Typical Section

The flyover bridge would be three 200-ft spans. The bridge is assumed to have steel girders due to the curvature of the roadway. Piers can be placed in the US 550 median and in the NM 528 median. The remainder of the flyover can be on fill.

A 20-ft vertical clearance is needed to accommodate oversized loads. The anticipated bridge superstructure depth is 7.5-ft. The pier caps will overhang the roadway so an estimated 9-ft was added to the superstructure depth to determine the required clearance. A profile of the flyover using this criterion is shown in Figure 44.



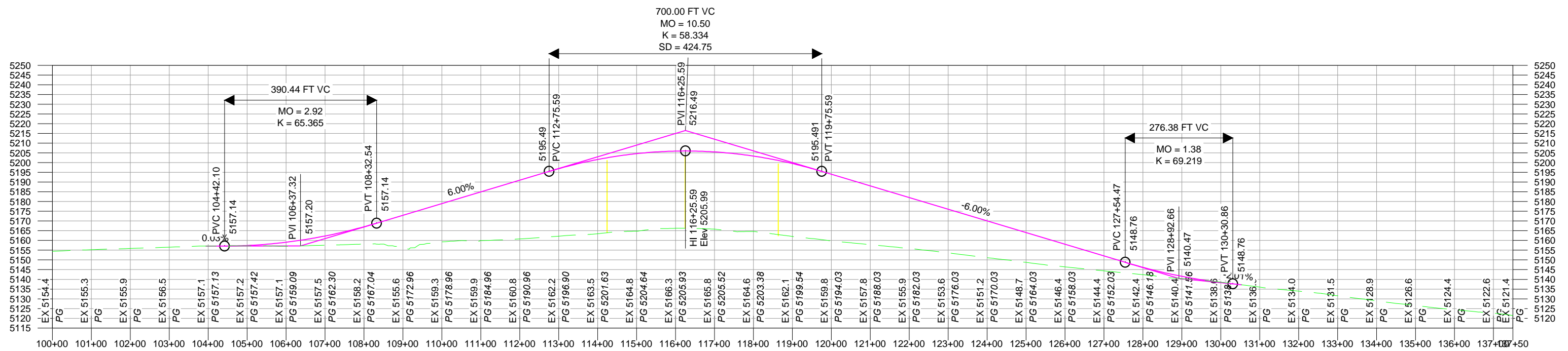


Figure 44
Fly Over Profile
PAGE 88

10.11.5.1 Traffic Analysis

As indicated in the Phase 1-A report, a flyover would likely provide the best overall performance from a traffic operations perspective, as the westbound left-turn and northbound right-turn movements would operate under free flow conditions. However, due to constructability issues previously discussed, including right-of-way impacts, accessibility of adjacent properties, and a large construction cost, this option is not considered a viable option. Therefore, this option was not simulated with the VISSIM simulation software.

10.11.5.2 Drainage Analysis

Impervious area does not increase significantly with Intersection Option 3. Drainage costs for this option are included in the costs associated with US 550 alternatives described above.

10.11.5.3 Environmental Analysis

The NM 528 Flyover Intersection Option would have moderate effects on geology due to earth moving activities. There would be moderate effects on soils erosion during construction that would be reduced once construction is completed and disturbed areas are reseeded. There would be low effects from storm water if pollution prevention devices are installed during construction. Temporary impacts to vegetation would also be mitigated by reseeded disturbed areas. Wildlife habitat is low in the corridor so any impacts to wildlife or protected species during construction would be low. Known cultural resource sites would be avoided. Air quality and noise levels are directly related to traffic operational LOS and therefore will initially improve, but will degrade as traffic congestion increases as demands approach projected 2035 demands. The flyover will have higher noise levels than the other intersection options since traffic is raised up in the air. A noise study will be conducted for the preferred alternative to determine if noise mitigation measures are required and feasible. This option is not expected to have a disproportionate environmental justice impacts on low income or minority communities. However, the flyover would have more access impacts to the Santa Ana Star Casino which is owned by Santa Ana Pueblo, a minority community. This alternative is compatible with the existing commercial land use. Impacts to the visual resources along the corridor would be mitigated with landscape treatments. The flyover could also have visual impacts to the Santa Ana Star Casino by blocking views of the casino to drive by traffic. No Section 4(f) impacts are anticipated.

10.11.5.4 Advantages and Disadvantages

The Flyover Option would have the highest construction cost by far of the intersection options. The engineer's opinion of probable construction cost estimate is \$15,570,000 including New Mexico Gross Receipts Tax (NMGRT) of 7.0625% and 3% Engineering and Contingencies. The cost estimate includes US 550 from west of NM 528 to Jemez Dam Road. The cost estimate can be found in Appendix M. The preliminary pavement typical section has not yet been prepared, so a hot mix surface course of \$50 per square yard was assumed.

The Flyover would require a small amount of right-of-way of .01 acres in the southeast quadrant of the intersection. The Flyover provides the best intersection capacity but it limits accessibility to adjacent properties.

10.12 COMPARISON OF NM 528 INTERSECTION OPTIONS

Three options were considered for the NM 528 / Tamaya Blvd Intersection, Continuous Flow, Super Street and Flyover. A comparison of the options is shown in Table 20.

NM 528 Intersection Option	Construction Cost	Right of Way	Landscaping Opportunities	Pedestrian Refuges	Less Crash Potential	Intersection Capacity	Business Access
Continuous Flow	\$7,100,000	0.21 Acres	Yes	Yes	Yes	High	High
Super Street	\$4,850,000	None	Yes	Yes	Yes	Low	Low
Flyover	\$15,570,000	0.01 Acres	Yes	Yes	Yes	High	Low

The Flyover Intersection Option at NM 528 provides good capacity but it is very expensive compared to the other alternatives. It also has some constraints that limit direct access in the intersection area, so the flyover was eliminated from further consideration.

The Super Street Intersection Option is limited to the number of right turn and U-turn movements that can happen during the peak hour.

If left-turns and through movements from NM 528 were diverted, nearly 800 AM peak northbound left-turn and through movements would have to then divert to a right-turn movement that already is near capacity with three lanes at a 1,398 AM peak hour demand.

This would put the triple right-turn under further stress with over 2,000 AM peak hour right-turns, which would again easily overwhelm the movement with LOS F operational delays and over capacity. Due to these significantly large diverted demands, it was determined that a Super Street configuration at NM 528 would not be feasible.

The Continuous Flow Intersection Option is the preferred option. The Continuous Flow operates satisfactorily for both AM and PM peak hours. It requires only a small amount of right-of-way in the intersection corners. It has opportunities for pedestrian refuges and landscaping for visual relief. It has no adverse effects on business access.

10.13 ENVIRONMENTAL IMPACTS OF CONSTRUCTION ALTERNATIVES AND OPTIONS

All of the roadway and bridge options are feasible, without any major environmental impacts. The sections below compare the relative impacts of each alternative, intersection option, and bridge option.

10.13.1 GEOLOGICAL IMPACTS

The roadway alternatives and bridge options would have moderate effects on geology (see Table 21). This is mostly related to earth moving and excavation. The NM 528 options would have low effects.

Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.2 SOIL IMPACT

The roadway alternatives and bridge options would have moderate effects on soils (see Table 22). There would be increased potential for soil erosion until construction is finished. The NM 528 options would have low effects. Soil effects would be reduced once hard surfaces are constructed and reseeded vegetation is established.

Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.3 WATER IMPACTS

The roadway alternatives would have low effects on water (see Table 23). In terms of surface water, storm water flows would create a potential for increased erosion and sediment transport. Use of best management practices would reduce these effects. NM 528 options would have low effects related to storm water flows. At the Rio Grande, bridge option effects are a function of the number of piers and construction activity within flowing or ponded surface water. The option to build a new bridge for westbound lanes has moderate effects with four piers and less construction impacts. Widening the existing bridge or reconstructing the existing bridge options would have high effects because of more piers and more construction impacts. A Section 404 permit from the U.S. Army Corps of Engineers would be required for the temporary or permanent placement of fill materials below the ordinary high watermark (OHWM) of the Rio Grande. No groundwater impacts are expected.

Table 23 – Water Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

Table 24 – Vegetation Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.4 VEGETATION IMPACTS

The Roadway Alternatives would have low effects (see Table 24). Temporary vegetation impacts would occur during construction. Disturbed areas would be reseeded at the end of construction. The bridge options would have moderate effects because of loss of riparian vegetation cover. As a mitigation measure, cottonwood trees would be replaced at a 2:1 ratio, which is a standard practice that assumes one of three cottonwood planted would survive to maturity based on experience with other revegetation efforts. At the NM 528 Intersection, temporary vegetation impacts would also occur during construction, but this would be mitigated by reseeded disturbed areas. The continuous flow option has the largest footprint so its impact will be greater than the Super Street or Flyover Options.

10.13.5 WILDLIFE IMPACTS

The roadway alternatives would have minimal impacts on wildlife (see Table 25). Except at the bridge, wildlife habitat quality is low, and most impacts would be temporary during construction. At the bridge, wildlife impacts would be a function of the number of piers. Fish would be most impacted. The new bridge for westbound lanes option has minimal impact, and widening the existing bridge option has moderate impacts. Reconstruct existing bridge option has high impacts. Mitigation measures would need to be developed, especially for construction activities in flowing water. On the bridge structure, the primary concerns are impacts to roosting bats and nesting swallows. The NM 528 Intersection options would have minimal impacts on wildlife since little quality wildlife habitat is present.

Table 25 – Wildlife Impacts				
Alternative	No Impact	Minimal Impacts	Moderate Impacts	High Impacts
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

Table 26 – Protected Species Impacts				
Alternative	No Impact	Minimal Impacts	Moderate Impacts	High Impacts
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.6 PROTECTED SPECIES IMPACTS

The roadway alternatives would have minimal impacts on federally listed threatened and endangered and state protected species (see Table 26). As with wildlife impacts, protected species impacts would be a function of the number of piers. The Rio Grande silvery minnow is a federally listed endangered and state protected species that could be impacted since it occurs in the Rio Grande. The new bridge for westbound lanes and widening the existing bridge options have moderate impacts. Reconstruct existing bridge option has high impacts. Mitigation measures would need to be developed, especially for construction activities in flowing water. The NM 528 Intersection options would have minimal impacts since little quality protected species habitat is present.

10.13.7 CULTURAL RESOURCES IMPACTS

Cultural resource impacts would be low with all alternatives and options (see Table 27). Few cultural resources are present. Known resources, such as the cemetery and irrigation ditches, can be avoided. The entrance road to Coronado Historic Site will not be affected, and it will remain at its currently location.

Table 27 – Cultural Resources Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.8 AIR QUALITY IMPACTS

Air quality impacts are a function of traffic flow (see Table 28). The Reversible Roadway Alternative has the most improved traffic flow and the least effects on air quality. The 3 Lanes in Each Direction has the least improved traffic flow and the most effects on air quality. The bridge options do not differ in air quality impacts since they do not change traffic flow. At NM 528, the Continuous Left Option has low effects on air quality because of improved traffic flow.

Table 28 – Air Quality Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.9 NOISE IMPACTS

In general, no residential areas or schools adjoin US 550, and noise impacts on residential areas and schools will be limited. Noise impacts are also a function of traffic flow (see Table 29). Stop and go traffic would have higher noise levels, than continuous traffic flow. The Reversible Roadway Alternative has the most improved traffic flow and the least noise effects. The 3 Lanes in Each Direction has the least improved traffic flow and the most noise effects. The bridge options do not differ in noise impacts since they do not change traffic flow. At NM 528, the Options have low effects on noise because of improved traffic flow, however, the Flyover would have an increase in noise from the bridge area.

Table 29 – Noise Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.10 SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE IMPACTS

No major socioeconomics or environmental justice impacts are expected under any of the alternatives or options. The alternatives and options would modify an existing roadway that is part of the community. No large-scale migrations or changes in social patterns would occur. No disproportionate environmental justice impacts on low income or minority communities would occur. The principal effect would be modifications of access to businesses along US 550. The Reversible Alternative would have high effects on adjoining businesses, primarily because of the loss of left turn opportunities (see Table 30).

The Super Street would have moderate effects on access because some left turns would be eliminated. The 6 Lane with Raised Median Alternative would have low effects because more left turn opportunities would be available. The improved US 550 would benefit area residents and communities by reducing traffic congestion and time lost in slow moving traffic. The flyover has the highest effects on noise, visual aesthetics, and business access which could have detrimental effects on minority communities.

Table 30 – Business Access Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.11 LAND USE IMPACTS

The roadway alternatives, bridge options, and NM 528 options would have a low effect on land use (see Table 31). No changes in land use are expected. Land uses along NM 528 would remain primarily commercial. The project would be compatible with existing land use plans.

Table 31 – Land Use Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.12 FARMLAND IMPACTS

The roadway alternatives, bridge options, and NM 528 options would have a low effect on farmland (see Table 31). No farmland would be converted for the improved US 550 roadway.

10.13.13 VISUAL RESOURCE IMPACTS

The roadway alternatives and NM 528 options would have moderated effects on visual resources (see Table 32). The landscape would be modified with a wider roadway. Landscaping treatments would mitigate this impact. The NM 528 Flyover would block some visibility of the Santa Ana Star Casino to drive by traffic. The bridge options would not change visual resources substantially.

Table 32 – Visual Resources Impacts				
Alternative	No Effect	Low Effects	Moderate Effects	High Effects
Roadway Alternatives				
No Build				
6 Lane with Raised Median				
Reversible Lane				
Super Street				
Bridge Options				
Widen Existing Bridge				
Reconstruct Existing Bridge				
Build New Bridge for Westbound Lanes				
NM 528 Options				
Continuous Left				
Super Street				
Flyover				

10.13.14 SECTION 4(F) IMPACTS

No Section 4(f) impacts are anticipated at present. Irrigation ditches, a cemetery, and the Coronado Historic Site will be avoided. If the cultural resource survey identifies a Section 4(f), options for avoidance will be identified.

10.13.15 HAZARDOUS MATERIALS IMPACTS

Hazardous materials impacts will be identified in the Initial Site Assessment (ISA) that is being prepared for this project.

11.0 LANDSCAPE MASTER PLAN

There are opportunities for site and landscape improvements with all of the alternatives. The Six Lane Alternative and the Super Street Alternative have medians that could be landscaped. The Reversible Lane (excluding NM 528) does not have any medians but it does have a limited number of areas adjacent to the corridor that could be landscaped. All three of the NM 528 Intersection Options have large islands that could be landscaped. Proposed roadway improvements include wayfinding and signage, bridge improvements and planting in existing medians, at intersections and along the sides of the roadway where there is existing right-of-way.

The preferred alternative for the Rio Grande (No. 8537 & 8540) Bridge is to construct a new westbound bridge north of the existing bridges. Eastbound traffic will be placed on the north side of the existing bridges. New bridge barrier rails and/or pedestrian fencing on the outside of the bridge could have designs that will mitigate the visual impacts caused by constructing a new bridge with 42-inch barrier rails which will eliminate views of the river for most vehicles.

A landscape master plan has been prepared for the project and is included in Appendix N.

12.0 CONCLUSIONS AND RECOMMENDATIONS

It was determined during the Phase I-A Study that the NM 528 / US 550 Intersection options could be combined with any of the US 550 mainline alternatives. Similarly, options to widen or replace the existing bridge would work with any of the mainline alternatives. For these reasons, this study was divided into US 550 mainline alternatives, NM 528 intersection options, and Rio Grande (No. 8537 & 8540) Bridge options.

Three alternatives were considered for the US 550 mainline, a Six Lanes with Raised Medians Alternative, a Reversible Lane Alternative, and a Super Street Alternative. The preferred alternative is a combination of the Super Street Alternative on the west side of the Rio Grande where the area is still developing and the Six Lane with Raised Medians Alternative on the east side. The study team has worked with Santa Ana Pueblo to ensure that there is good circulation between turnouts outside of US 550. With this circulation, there will be little out of direction travel. The traffic modeling showed that the Super Street Alternative performs much better than the Six Lane Alternative in the PM Peak Hour in the area of the Jemez Dam Intersection. On the east side of the river, the Six Lane with Raised Medians Alternative provides the best local access while meeting the need of the 2035 projected traffic.

Three options were considered for the NM 528 / Tamaya Blvd Intersection, Continuous Flow, Super Street and Flyover. The Continuous Flow Intersection Option is the preferred option. The Continuous Flow operates satisfactorily for both AM and PM peak hours. It requires only a small amount of right-of-way in

the intersection corners. It has opportunities for pedestrian refuges and landscaping for visual relief. It has no adverse effects on business access.

Three options were considered for how best to cross the Rio Grande with this project. For each of the options, three criteria were considered – Roadway Geometry, Seismic Capacity, and Life Cycle Costs. The preferred alternative was the Independent Bridge Addition to carry the westbound lanes. The existing bridge will be repurposed to carry the eastbound lanes. The new bridge will have a design life of 75 years. If the existing bridges are not rehabilitated and/or retrofitted, they will continue to provide at least 20 more years of the original design life with continued maintenance. The independent addition will be designed according to current specifications with liquefaction and seismic loading being considered.

The additional roadway capacity will provide economic development potential in the Town of Bernalillo, Santa Ana Pueblo, Rio Rancho, and the communities in northwest New Mexico. The combined preferred alternative includes medians which will improve safety by reducing the number of conflict points, act as a pedestrian refuge, and provide a place for landscaping to improve the visual aspect of the corridor. Bicycle lanes and sidewalks will be provided throughout the corridor.

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