Los Diamantes
Traffic Impact Study

Final Report

May 2015

Prepared for:

D. Mark Goodwin & Associate

Prepared by:

LEE ENGINEERING

5/06/2015

Executive Summary

Background

A proposed residential and business park development site is to be located off of Westside Boulevard between Viga Road and 10th Street. The site is within the jurisdiction of the City of Rio Rancho (CoRR), New Mexico.

The site will contain 450 single family dwelling units south of Westside Boulevard and approximately 600,000 SF of Business Park land use on the north side of Westside Boulevard. The site plan is presented in **Figure 2 of this report**.

Area access to and from the project site will be via Western Boulevard and Unser Boulevard to the east and 10th street, Isabel Road and Black Arroyo Boulevard to the south. A vicinity map indicating the proposed development relative to the area street network is shown in **Figure 1 of this report**.

Opening day of the development is anticipated to take place in 2020. Therefore, assessment for the opening year of 2020 was made using peak hour intersection turn movement volumes collected on February 24 and 26, 2015 and volumes from adjacent site developments. Peak hour trips generated by the proposed development were then added to the anticipated 2020 background volumes to assess the impact on the surrounding road network.

Conclusions and Recommendations

Based on the traffic analysis and report findings, the conclusions and recommendations are as follows:
Site Access

- Regional access to the site will mainly be provided via Unser Boulevard. Unser Boulevard provides routing to commercial and residential developments to the north and south of the project site. Additionally, Unser Boulevard provides access to east/west arterials of Southern Boulevard, Northern Boulevard and Paseo del Volcan.
- It should be noted that analyses contained within this study is considered conservative as they are based on interim conditions in which Unser Boulevard and Rio Rancho Boulevard/NM 528 are the only two north/south arterial options for project site trips. Ultimately, there will be additional north/south arterial and collector options including the development of Rainbow Boulevard (Minor Arterial) and a Major Collector Road east of the site as identified by the draft MRCOG 2040 Long Range Roadway Plan, which will better disperse project site trips so they are not concentrated strictly through the Unser Boulevard.
- Project access will be provided via eight street connections to abutting arterial and collector streets. A main Spine Road will provide access to both residential and commercial components via an intersection with Westside Boulevard to be located approximately 840 feet west of the 10th Street alignment.

- An additional access point off of Westside Boulevard will be provided to both residential (and business park (Viga Road to the north) land uses located approximately 1350 feet west of the Spine Road intersection.
- The remainder of project access will be provided via several minor two lane collector streets. These will include the following:
    - 10th Street
    - Isabel Road
    - Viga Road
- A secondary access is proposed via Isabel Road to Black Arroyo Boulevard and McMahon Boulevard. Currently, the Isabel Road alignment is shown to be connecting to Black Arroyo at a very acute skew. It is therefore, recommended that the Isabel Road alignment be curved to the east of the current alignment to form a more perpendicular approach to Black Arroyo Boulevard.
- 10th Street is proposed to terminate at Isabel Road forming a T-intersection approximately 450 feet north of Black Arroyo.
- Based on Table 18.C-1 *Access Spacing Standards for Intersections and Driveways*, the following spacing is required for compliance:
    - Signalized intersection spacing should be no less than 1,760 feet on Westside Boulevard (Urban Minor Arterial 35-40 mph).
    - Unsignalized and full access driveway spacing on Westside Boulevard should be no less than 660 feet
    - Full movement driveways spacing on Viga Road north of Westside Boulevard, 10th Street, and Isabel Road, should be no less than 150 feet for traversable median conditions.
    - The Spine Road and Viga Road south of Westside Boulevard is serves as a local residential street and therefore 18.C-1 does not apply to drive way spacing on local streets.
    - Full movement parcel access on the Spine Road within the Business Park should be spaced no less than 330 feet and partial access no less than 150-feet. Additionally, there should not be any access point on the Spine Road within 250 feet of the signalized Westside Boulevard/Spine Road intersection to avoid interference with any auxiliary storage lane lengths and tapers.
    - The Isabel Road/Black Arroyo Boulevard intersection should be spaced no closer than 150 feet from existing driveways on Black Arroyo Boulevard (Saltillo Street and Caracol Street)
- Based on the latest site plan contained herein, all proposed driveways and access points appear to be in compliance with NMDOT SAMM recommended spacing.
- It is likely that signal control will be warranted at the Westside Boulevard/Spine Road. Therefore, any future signalized intersection to the east or west of this intersection should be located at a minimum 1,760 feet away from the Spine Road intersection.
- Parcel access for Business Park land use is recommended to be taken off of a Spoke Road on either side of the Spine Road located approximately at the mid-point between Viga Road and Westside Boulevard.
- It is recommended that access to residential parcels be configured to produce ADT levels on local residential streets (i.e. with back-out driveways) less than 1,500 vehicles. Review of the latest

proposed site plan indicates that there are no local residential streets that would generate more than 1,500 ADT.

- Initial project access will be provided via Westside Boulevard exclusively, which will be incorporating one through lane in each direction between 10th Street and Unser Boulevard.
- It is estimated that approximately 70% of the total project can be constructed, which translates to the following scenarios at which secondary access to Black Arroyo and McMahon would be needed:
    - 98% of just the Business Park development
    - Phase 1 of Residential (150 Units) and 94% of the Business Park
    - Phase 2 of Residential (300 Units) and 90% of the Business Park
    - Phase 3 Residential (450 units) and 86% of the Business Park
- The proposed Isabel Road access in combination with a two-lane Westside Boulevard would accommodate full build of the project site.

*Existing, Background and Build Out Traffic Demand*s

- Peak hour turning movement counts for all existing study intersections were collected on February 24, 2015 and February 26, 2015. Existing peak hour turning movements are presented in **Figure 3.**
- Per the February 10th scoping meeting with the CoRR, it was determined that background traffic demands for 2020 would be developed based on the following developments:
    - Cabezon Village
    - Pavilion at Presbyterian
    - X Ray Associates

  Resulting 2020 background traffic demands are presented in **Figure 4.**
- Trip generation analysis was performed based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, *9th Edition* and project land use were categorized as ITE land use category 210 (Single-Family Detached Housing) and category 770 (Business Park) and are summarized in **Table 1**.
- A 3% internal capture rate was assumed between the residential and business park land uses. Calculated internal and adjusted external trips are summarized in **Table 2**.
- Offsite primary trip distribution for both AM and PM peak hours are shown in **Figures 5 and 6** for the business park and residential development, respectively.
- On-site distribution are indicated in **Figures 7 and 8** for the business park and residential land use, respectively.
- Total on-site and off-site build out turning movement demands are indicated shown in **Figure 15 and 16.**
- As infill development from other project continue along Black Arroyo Boulevard, there will be an increase in potential cut-through traffic for City of Albuquerque neighborhoods south of Black Arroyo Boulevard for vehicles desiring to access McMahon Boulevard. It is recommended that the City of Albuquerque look at potentially opening the Unser Boulevard/Black Arroyo Boulevard to allow northbound left-turns to help alleviate some of the cut-through potential. Additionally, the City might consider looking at incorporating traffic calming treatments to those cut-through

streets that have direct driveway access including Maraville Drive, Milky Way Street, Dreamy Way Drive and Bandelier Drive.

Signal Warrant, Capacity and Queuing Analysis

- Based on signal peak hour warrant analyses, signal control is recommended for the Westside Boulevard/Spine Road intersection and is expected to be needed at approximately 70% of total build-out.
- Based on capacity and queue analysis, the following lane geometry, traffic control and storage length mitigation is recommended as part of this development:
    - The following improvements were assumed to be in place as they were recommended and the responsibility of previous studies. They include:
        - Westbound dual left-turn lanes at the Unser Boulevard/Cabezon Boulevard
        - Westbound dual left-turn and right-turn lanes at the Unser Boulevard/Westside Boulevard intersection.
        - Southbound dual left-turn lanes at the Unser Boulevard/Westside Boulevard intersection.
    - The existing northbound left-turn lane at the Unser Boulevard/Westside Boulevard intersection should be modified to incorporate dual left-turns. This will require restriping and conversion from a northbound protected-permitted phasing to protected only phasing. Additionally, the receiving lanes on the west leg should incorporate two through lanes, which can be tapered down at approximately the west boundary of the proposed X-Ray site. Per MUTCD, lane reduction tapers should incorporate 320 feet. Currently pavement to accommodate two through lanes exists on Westside as constructed by the X-Ray site and thus restriping and realignment of the intersection will be required.
    - The westbound left-turn lane at Unser Boulevard/Westside Boulevard intersection should be modified to incorporate dual left-turns. This will require median modification and the construction and alignment of the receiving lanes on the east leg. The eastbound protected-permitted phasing should be changed to protected only.
    - Signal undergrounds including conduit and pull boxes are recommended at the Westside Boulevard/Spine Road. Signal control activation should only occur upon the satisfaction of a full warrant study when count data of the intersection is available.

On-Site Street Classification

- Per the 2040 long range roadway map, Westside Boulevard is proposed as a Community Primary arterial that will ultimately incorporate 106 feet of ROW with two through lanes and a bike lane in each direction, a raised median, and a 40 mph speed limit.
- A review of the latest master bike facilities plan indicates no proposed multi-use trail along Westside Boulevard. However, it is noted that an existing multi-use trail existing along the south side Westside Boulevard east of Unser Boulevard, which terminates approximately 680 feet short of the Unser Boulevard/Westside Boulevard.

- For the build-out of this project, Westside Boulevard will incorporate one through lanes in each direction from 10th Street to the proposed Pavilion development located at the southwest corner of the Unser Boulevard/Westside Boulevard intersection.
- Between Viga Road and 10th Street, Westside would be fully improved incorporating the ultimate four-lane cross-section with raised median, bike lanes, curb, gutter and sidewalk.
- Two receiving lanes on Westside Boulevard will be required on the west leg of the Unser Boulevard intersection. The two westbound lanes can then taper (320 feet) to one through lane immediately west of the proposed Pavilion Commercial development.
- There are no existing or planned local transit routes along Westside Boulevard. Therefore transit stops, turnouts etc. are not required as part of this project.
- 10th Street is proposed as a local residential street incorporating 50 feet of ROW and one undivided through lane in each direction with a 25 mph speed limit.
- Isabel Road is proposed as a minor collector incorporating 78 feet of ROW, one undivided through lane in each direction and a 25 mph speed limit.
- Isabel Road is recommended to divert from its current alignment east of 10th Street to provide a intersection with Black Arroyo Boulevard that has no skew.
- Viga Road is proposed as a local residential street incorporating 50 feet of ROW, one undivided through lane in each direction and a 25 mph speed limit. Viga Road will be constructed from Isabel Road to just south of Westside Boulevard and starting on the north side of Westside Boulevard to the north boundary of the business park property. Viga Road will be fully improved south of Westside Boulevard from Isabel Road to just short of Westside Boulevard.
- The north leg of Viga Road is recommended to be aligned with Driveway A (westernmost driveway on Westside Boulevard) and the south alignment of Viga Road will not intersect with Westside Boulevard to avoid placing a stop controlled intersection within curved alignment on Westside Boulevard.
- The Spine Road within the Residential area is proposed to be a public minor collector street to incorporate 68 feet of ROW including one through lane in each direction, a minimum 5-foot sidewalk, curb, gutter, and narrow raised landscape medians. There will be no direct residential driveway access along this roadway. It is anticipated that this road will incorporate a 25 mph speed limit.
- The Spine Road north of Westside Boulevard is proposed to be a public minor collector street to incorporate 98 feet of ROW including one lane of traffic, curb gutter, and sidewalk in each direction. Additionally, due to anticipated traffic intensity and the density of the development, auxiliary lanes are recommended to all future major parcel access points along this alignment. There will likely be raised landscaped medians along this alignment within the business park. It is anticipated that this road will incorporate a 25 mph speed limit.
- A business park access road is to incorporate 50 feet of ROW and provide access for the most commercial parcels to the proposed Spine Road. This access street will terminate in a cul-de-sac at its southwest and northeast termini. It is anticipated that this road will incorporate one undivided lane, curb, gutter, and sidewalk in each direction. No auxiliary turn lanes are anticipated for this alignment. This is recommended to incorporate a 25 mph speed limit.

- All residential parcel access roads are proposed to incorporate 50-feet of ROW including one through lane, curb, gutter and sidewalk in each direction. These residential streets will provide direct access to residential driveways and incorporate a 25 mph speed limit.

Unser Boulevard Coordination Analysis

- A coordination analysis of Unser Boulevard indicates that optimal cycle lengths range from 130 seconds in the AM peak to 150 seconds in PM peak for Background and Build Out traffic demands assuming Unser Boulevard remains a four-lane roadway.
- If Unser Boulevard becomes a six-lane roadway, the optimized cycle length reduces to 120 seconds under Background and Build Out traffic demands.
- If a cycle length change on Unser Boulevard is implemented, the cycle lengths will also have to change on Southern Boulevard to maintain coordination on that corridor. This means that offsets would need to be adjusted on Southern Boulevard as well.
- Unser Boulevard is a lengthy corridor, which traverses both the City of Rio Rancho and City of Albuquerque. In order to provide a consistent and optimal coordinated corridor, both the Cities would need to coordinate timing plans between them.

Crash Analysis

- Crash analyses indicate a high frequency of crashes along Unser Boulevard, especially at Southern Boulevard and McMahon Boulevard. A more detailed safety study of this corridor could shed light on specific safety issues.
- There were two crash fatalities at the Unser Boulevard/Southern Boulevard intersection.
- The majority of the crashes at all the intersections were classified as following too close or driver inattention. This tends to be indicative of congestion issues and usually result in rear-end crashes.
- Many of the congestion caused crashes along this corridor could potentially be reduced when Unser Boulevard becomes a six-lane arterial.

Site Triangles

- Sight distance requirements were calculated based on the 2011 AASHTO “Green Book” Chapter 9.5 and resulting calculations are presented in Appendix k. The sight triangles are shown in figure 17-24 on the report.

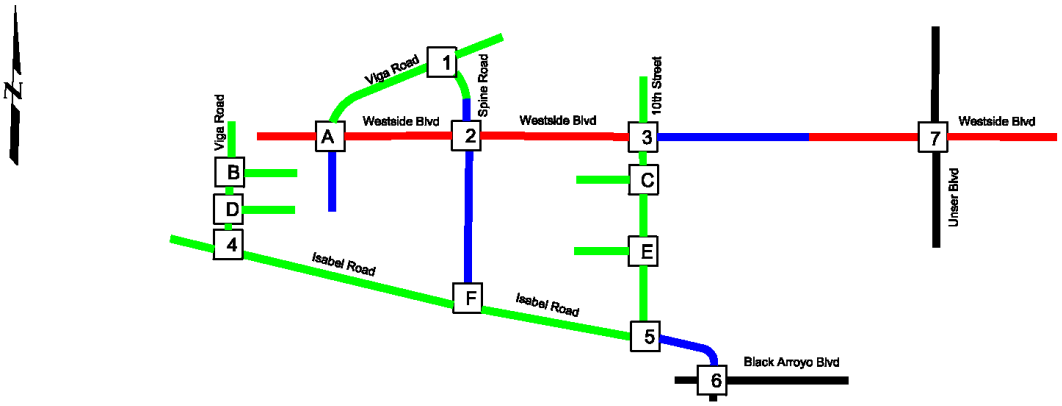
Summary of Street Construction and Mitigation

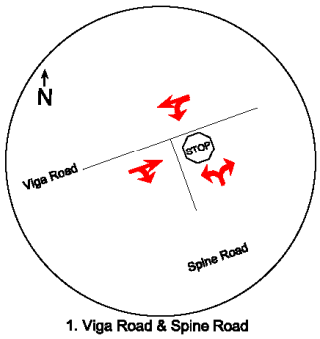
The figure below summarizes the total street construction and mitigation as part of the Los Diamantes development.

As indicated construction and mitigation will included the following:

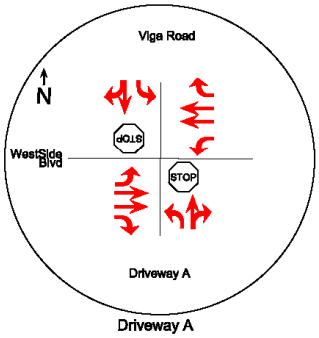
Recommended Street Construction, Traffic Control & Lane Geometry

A. Conceptual Map for Roadway Improvements

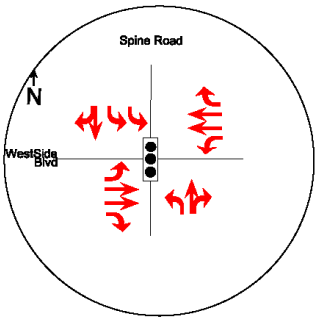




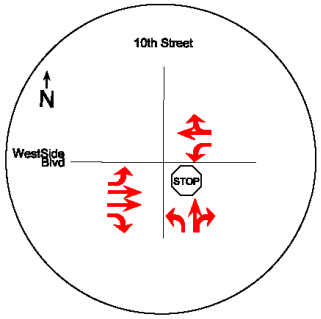
1. Viga Road & Spine Road



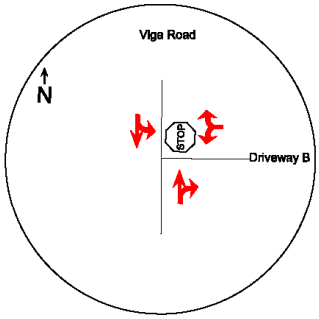
Driveway A



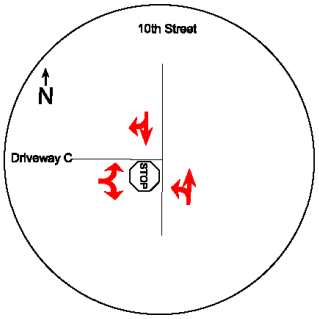
2. Westside Blvd & Spine Road



3. Westside Blvd & 10th Street



Driveway B



Driveway C

LEGEND

XX (XX) - AM(PM) Peak Hour Volume

STOP Stop Control

Signal Control

Existing Roadway

New One lane Road

New Four lane Road

New Two Lane Road

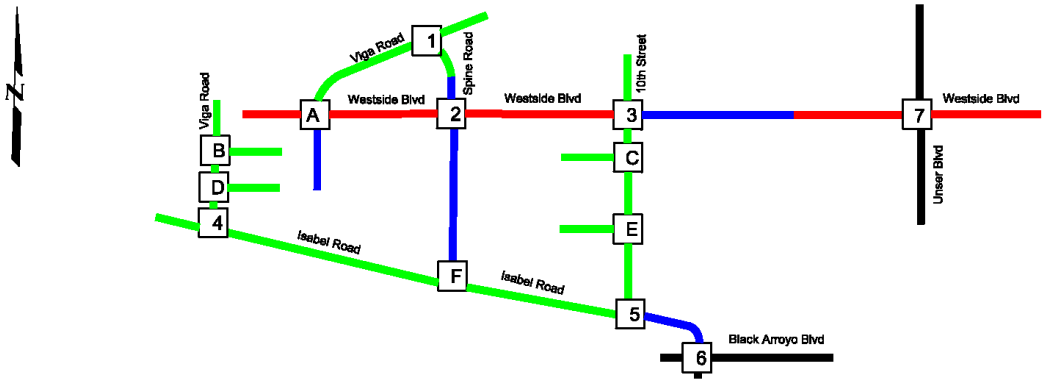
New Lanes Proposed by other Developments

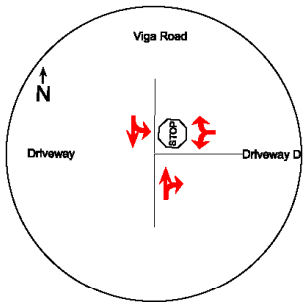
New Lanes proposed by Site Development

Existing Lanes

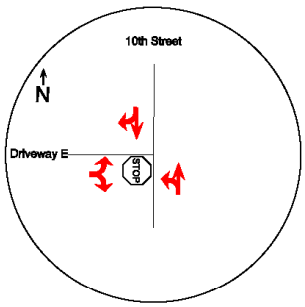
Recommended Street Construction, Traffic Control & Lane Geometry (Continued)

B. Conceptual Map for Roadway Improvements

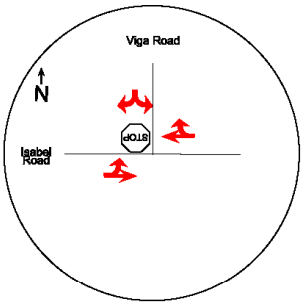




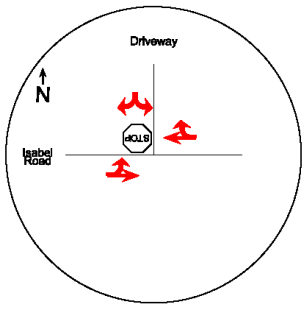
Driveway D



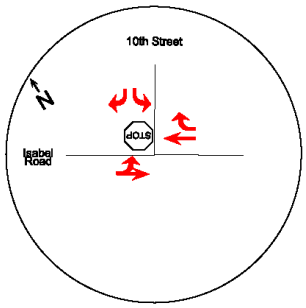
Driveway E



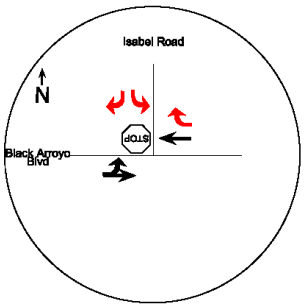
4. Viga Road & Isabel Road



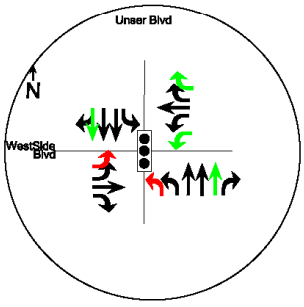
Driveway F



5. Isabel & 10th Street



6. Isabel Road & Black Arroyo Blvd



7. Westside Blvd & Unser Blvd

LEGEND

XX (XX) - AM(PM) Peak Hour Volume

STOP Stop Control

Signal Control

Existing Roadway

New One lane Road

New Four lane Road

New Two Lane Road

New Lanes Proposed by other Developments

New Lanes proposed by Site Development

Existing Lanes

- Westside Boulevard will be constructed as a full four lane section with raised medians from the Viga Road alignment to 10th Street and from the west boundary of the proposed X-Ray development to Unser Boulevard.
- Westside Boulevard will be constructed as a two lane road from 10th Street to the east boundary of the X-Ray development.
- 10th Street will be constructed as a two-lane roadway from Westside Boulevard to Isabel Road.
- Isabel Road will be constructed as a two-lane roadway from Viga Road alignment to Black Arroyo Boulevard.
- Viga Road will be constructed as a two-lane roadway from the north boundary of the business park portion of the development to Westside Boulevard aligning with Driveway A of the residential development. Viga Road will be constructed as a two lane on the south side of Westside Boulevard retaining the Viga Road alignment and terminating at Isabel Road.
- The Spine Road will be constructed as a two lane road from Isabel Road to the Viga Road Alignment north of Westside Boulevard.
- The project will restripe the northbound left-turn lane at the Westside Boulevard/Unser Boulevard intersection to incorporate dual left-turn geometry. The signal should be modified to incorporate protected only phasing on the north and south approaches.
- The project should convert the existing single eastbound left-turn lane at the Westside Boulevard/Unser Boulevard intersection to incorporate dual left-turn geometry. The signal should be modified to include protected only left-turn phasing on the east-west approaches.
- Signal undergrounds including conduit and pull boxes are recommended at the Westside Boulevard/Spine Road. Signal control activation should only occur upon the satisfaction of a full warrant study when count data of the intersection is available.
- The following auxiliary lanes are recommended as part of this project:

Westside Boulevard/10th Street Intersection

- A single 300-foot westbound left-turn lane
- Single 300-foot eastbound left and right-turn lanes
- A single 150-foot Northbound left-turn lane

Westside Boulevard/Spine Road Intersection

- Single 325-foot westbound left and right-turn lanes
- Single 325-foot eastbound left and right-turn lanes
- A single 150-foot northbound left-turn lane
- Southbound 150-foot dual left-turn lanes but striped as a single turn lane until signal control is in place.

Westside Boulevard/Driveway A-Viga Road

- Single 300-foot westbound left and right-turn lanes
- Single 300-foot eastbound left and right-turn lanes

- Single 150-foot northbound and southbound left-turn lanes

Black Arroyo Boulevard/Isabel Road

- A single 175-foot westbound right-turn lane at Isabel Road
- A single 150-foot southbound left-turn lane at Isabel Road

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Introduction

This report summarizes the findings of a Traffic Impact Study (TIS) completed by Lee Engineering for D. Mark Goodwin and Associates for a proposed residential and business park development to be located off of Westside Boulevard between Viga Road and 10th Street, within the City of Rio Rancho (CoRR), NM. **Figure 1** depicts the development site relative to the adjacent highway and identifies the study intersections. As indicated in the Figure, the study area is mostly contained with the CoRR with two study intersections located within the City of Albuquerque (CoA).

This report and the analysis contained were completed in agreement with a scoping meeting occurring on February 10th, 2015 with David Serrano and Joe Norby of the City of Rio Rancho. Meeting notes from that meeting are provided in **Appendix A.** The *ITE Trip Generation Manual 9th Edition, Highway Capacity Manual 2010 Edition, Manual on Uniform Traffic Control Devices 2009 Edition, and the New Mexico State Access Management Manual* were used to develop analysis procedures and concepts for this study.

The development site is proposed to consist of 450 single family dwelling units south of Westside Boulevard and approximately 600,000 SF of Business Park land use on the north side of Westside Boulevard. The current site plan is presented in **Figure 2** indicating access to and from the site.

It is anticipated that the residential portion of the site will be developed in 3 phases of 150 dwelling units and the business park portion will be developed as quickly as tenants sign on to locate at the development. Full build out of this site is planned for late 2020. Therefore traffic analysis will be performed for a build out year of 2020. Traffic capacity and queue analyses will be conducted for the following three scenarios:

1. Existing year 2015
2. Opening year (2020) without the proposed development
3. Opening year (2020) with the proposed development

It should be noted that the City of Rio Rancho identified several adjacent developments that might impact this project including Pavilion at Presbyterian, The Cabezon Village and X-Ray Associates.

Based on scoping efforts with the City of Rio Rancho and City of Albuquerque, the following intersections will be analyzed for this study:

- Unser Boulevard/Southern Boulevard
- Unser Boulevard/Cabezon Boulevard
- Unser Boulevard/Westside Boulevard
- Unser Boulevard/ Black Arroyo Boulevard
- Unser Boulevard/McMahon Boulevard

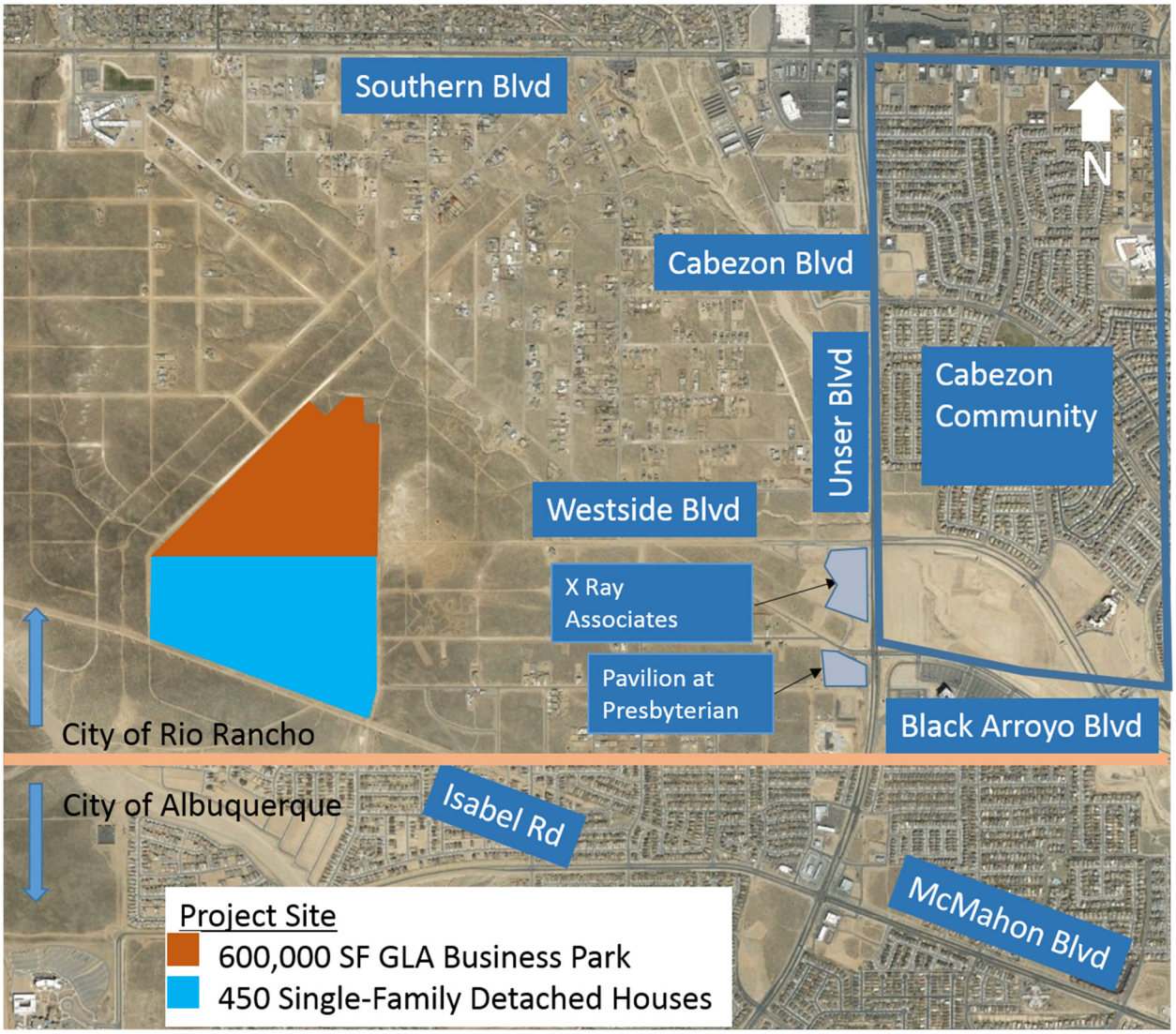

Figure 1. Vicinity Map

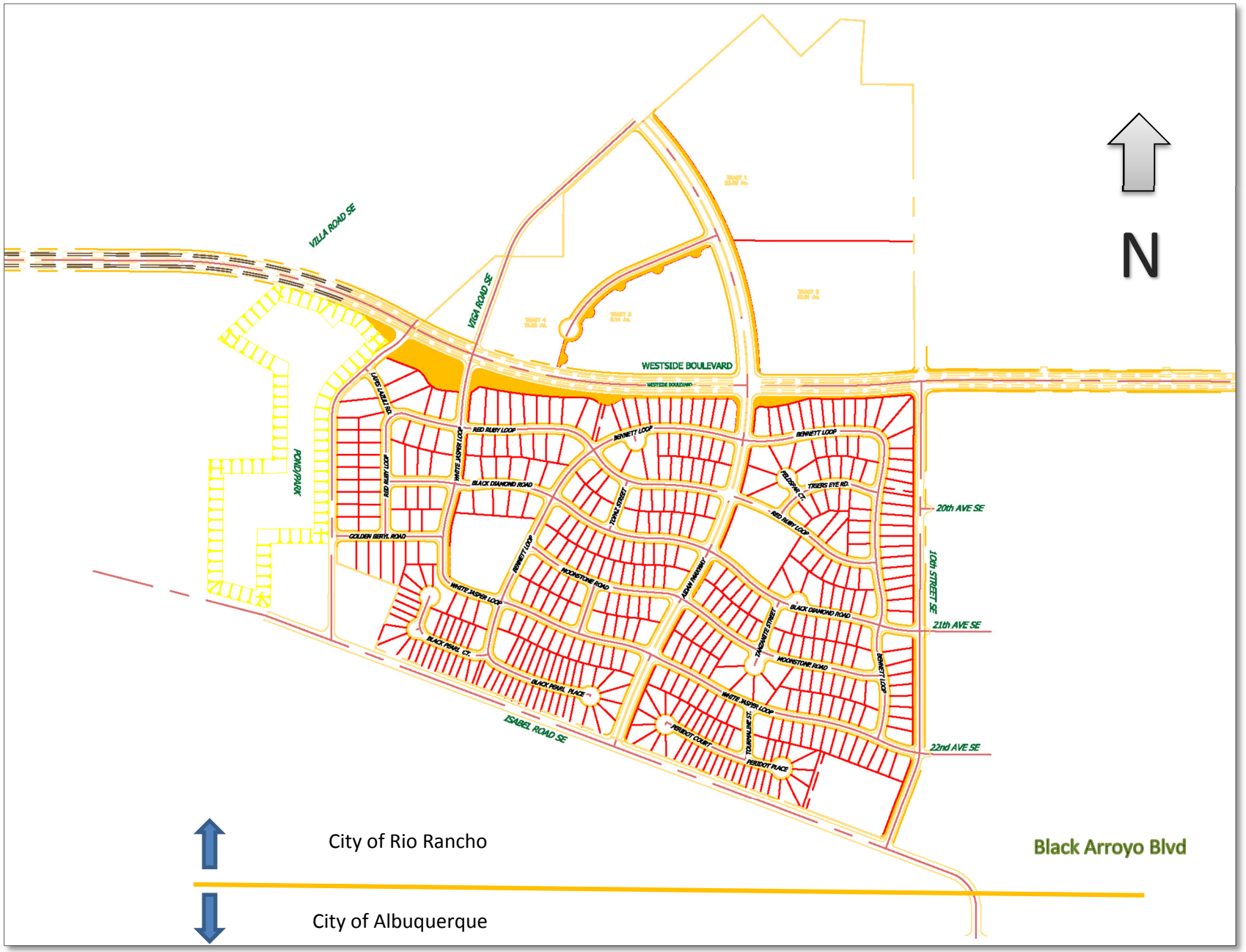

Figure 2. Site Plan

Area Land Use and Streets

The project is generally surrounded by undeveloped parcels mostly zoned for residential land use. Existing adjacent regional land use at the time of this study consists of the following:

- Hospital: Presbyterian Rust Medical Center is located east side of the project area along Black Arroyo Boulevard and Unser Boulevard.
- Business Center: CNM Westside Campus is located south of the proposed project location at McMahon Boulevard and Universe Boulevard to the west of the site.
- Residential Housing: There are sparse housing developments surrounding the project site on the west and north. Most serve farmland and have additional storage for farm equipment.
- Urban Residential Housing: On the East, North and South side of the proposed site there are developed urban residential housing. Along Unser Boulevard and Cabezon Boulevard and Southern Boulevard, the residential development named as Cabezon Community is located. This community has school, hospital, retail stores and park.
- There is some commercial land uses located northeast of the project site on Unser Boulevard near Southern Boulevard.

Based on area land use, it is expected that for the majority of residential trips route to the south on Unser Boulevard where the majority of employment centers are located. The majority of business park trips will be more evenly split between north and south on Unser Boulevard, as there are many existing residential developments in both directions.

The proposed development will access the existing road network primarily via Westside Boulevard and Unser Boulevard. As secondary access will be provided via 10th Street/Isabel Road to Black Arroyo and McMahon Boulevard.

Unser Boulevard is a north/south four lane regional principal arterial street incorporating two through lanes in each direction, a raised median of varying width up to 30 feet, and a 45 mph speed limit. Unser Boulevard maintains a four lane configuration from Paradise Boulevard in the south to Cherry Road to the north at which point Unser Boulevard narrows to a two-lane roadway. There is a multi-use trail facility that runs parallel and adjacent to the roadway on the east side. Ultimately, Unser Boulevard is planned to incorporate three through lanes in each direction. However, at this time it is not known when this widening is to occur.

Southern Boulevard is an east/west four lane community principal arterial street which includes two through lanes in each direction, a 16-foot raised central median and two-way left-turn lane (TWLTL), and sidewalk on the south side, curb and gutter on both sides of the road from 15th Street to Rio Rancho Boulevard/NM 528. West of 15th Street Southern Boulevard narrows to a two-lane roadway with no sidewalks or curb and gutter. Southern Boulevard becomes Meadowlark Lane (a collector road) east of Rio Rancho Boulevard/NM 528 where it narrows to a three lane section incorporating one through lane in each direction, a two way left-turn lane and sidewalk, curb and gutter on both sides of the road. There is an existing multi-use trail that runs parallel to Southern Boulevard on the north side of the corridor. The speed limit is currently signed for 40 mph within the study area.

Cabezon Boulevard is an east/west two lane minor collector road incorporating one through lane and a bike lane in each direction, a 20-foot raised median, curb, gutter, and sidewalk within the study area. There is a multi-use trail running parallel to the road on the north side. Cabezon Boulevard is currently signed for a 25 mph speed limit west of Unser Boulevard and 35 mph east of Unser Bouevard. Cabezon Boulevard terminates at Veranda Drive to the west and turns into 19th Avenue at Golf Corse Road to the east where it becomes a two-lane undivided collector road.

Westside Boulevard is an east-west four-lane community primary arterial roadway incorporating two lanes and bike lane in both directions, a raised median of varying width, curb and gutter from Unser Boulevard to Golf Course Road. Currently, Westside Boulevard is only constructed 1,400 feet west of the Unser Boulevard intersection incorporating just one lane in each direction with partial sidewalk, curb and gutter improvements. Westside Boulevard also narrows to partially improved undivided two-lane roadway east of Golf Course Road terminating at Rio Rancho Boulevard/NM 528 where is aligns with one of the Intel entrances. Westside Boulevard is currently signed for a 25 mph and 45. There is an existing maintenance access road running parallel to Westside Boulevard and the adjacent drainage channel on the south side of the roadway running from just east of the Unser Boulevard intersection to a termination point just south of Wellspring Avenue.

Black Arroyo Boulevard is an east/west undivided two-lane major collector that is fully improved with curb, gutter and sidewalk from Unser Boulevard to 2,000 feet east of the Unser Boulevard intersection. West of the Unser Boulevard intersection, Black Arroyo Boulevard is a partially improved undivided two-lane collector with curb, gutter and sidewalk improvements on the south side. Black Arroyo Boulevard terminates within the Saltillo neighborhood development approximately a mile and a half west of Unser Boulevard.

McMahon Boulevard is east/west four-lane regional principal arterial incorporating two through lanes and a bike lane in each direction, an 18-foot raised median, curb, gutter and sidewalks. An existing multi-use trail runs parallel to McMahon Boulevard on the north side of the roadway. McMahon Boulevard is fully improved for approximately 1 mile to the west where the roadway narrows to a partially improved undivided two-lane finally terminating at Universe Boulevard. McMahon Boulevard continues fully improved to the east where it becomes Ellison Drive at Golf Course Road

Current Adjacent Developments

As previously mentioned, there are some additional developments within the project study area that are anticipated to come on line within the next 5 years. Theses known developments include the following:

- Cabezon Village is a multi-use residential development including 3500 single family dwelling units, 15 acres of office, and 86 acres of retail. This development is to be located east of Unser Boulevard bounded by Southern Boulevard to the north and Westside Boulevard to the south and Golf Course Road to the east. Currently it is estimated that this development is approximately just over 60% developed at the time of this study.
- Pavilion at Presbyterian is a commercial site that is to be located at the southwest corner of Unser Boulevard/Wellspring Ave and was proposed to include a drive through bank, 16,400 SF

of Retail, 2 fast food restaurants, and 20,000 SF of office. Currently Phase 1 of the proposed site has been built, which includes a portion of the commercial land use.

- X-Ray Associates is a proposed mixed use medical office/commercial site to be located at the southwest corner of the UNSER Boulevard/Westside Boulevard intersection.

Site Access

Regional Access

Regional access to the site will mainly be provided via Unser Boulevard. Unser Boulevard provides routing to commercial and residential developments to the north and south of the project site. Additionally, Unser Boulevard provides access to east/west arterials of Southern Boulevard, Northern Boulevard and Paseo del Volcan. To the south, Unser Boulevard connects to Paseo del Norte, which is a regional east/west major arterial for the area. Unser Boulevard does ultimately connect to I-40 approximately 8 miles to the south.

Rio Rancho Boulevard/NM 528 will provide an additional north/south regional access choice via Westside Boulevard, McMahon Boulevard and Sothern Boulevard within the study area. Furthermore, Rio Rancho Boulevard provides access to I-40 and Paseo del Norte to the south and Northern Boulevard and US 550 to the north.

It should be noted that analyses contained within this study is considered conservative as they are based on interim conditions in which Unser Boulevard and Rio Rancho Boulevard/NM 528 are the only two north/south arterial options for project site trips. Ultimately, there will be additional north/south arterial and collector options including the development of Rainbow Boulevard (Minor Arterial) and a Major Collector Road east of the site as identified by the draft MRCOG 2040 Long Range Roadway Plan (See **Appendix B**). Any added north-south connectors as development continues to the west, will better disperse project site trips so they are not concentrated strictly through the Unser Boulevard/Westside Boulevard intersection and ultimately provide some relief for Unser Boulevard and Rio Rancho Boulevard-NM 528. The MRCOG Long Range roadway Plan also indicates a proposed community primary arterial along the Universe Boulevard alignment, which is indicated on the plan to follow the Viga Road and Villa Road alignments just west of the project site. However, this will be dependent on cooperation between the CoA and CoRR, and currently the CoA has no plans to continue Universe Boulevard north of McMahon Boulevard. Therefore at this time a Universe Boulevard primary arterial connecting north south traffic in the region is unlikely.

Project Access

Project access will be provided via eight street connections to abutting arterial and collector streets. A main Spine Road will provide access to both residential and commercial components via an intersection with Westside Boulevard to be located approximately 840 feet west of the 10th Street alignment. As will be shown in the access management section of this report, this main driveway is recommended to incorporate both left-turn and right-turn auxiliary lanes for both directions from Westside Boulevard. Single left-turn lanes are initially recommended on both northbound and southbound approaches to this intersection. Ultimately, when this intersection becomes signalized, duals will be required on the north leg. Specific queue lengths will be discussed in the Capacity Analysis section of this report. Initially, this intersection will incorporate two-way stop control on the north and south legs and uncontrolled on the Westside Boulevard approaches. It is likely that this intersection will eventually incorporate signal control.

An additional access point off of Westside Boulevard will be provided to both residential and business park land uses located approximately 1,350 feet west of the Spine Road intersection. This intersection is anticipated to accommodate full movements and incorporate stop control on the north and south legs. The north leg is proposed to align with the Viga Road alignment. This intersection is proposed in lieu of a current Viga Road alignment intersection with Westside Boulevard due to the fact that this alignment falls within an s-curve which will limit available site distance and increase safety risks for potential traffic demands turning from Viga Road onto Westside Boulevard. The proposed intersection is to be located within more of a tangential section of Westside, which is more desirable from a safety perspective.

The remainder of project access will be provided via several minor two lane collector streets. These will include the following:

- 10th Street
- Isabel Road
- Viga Road

Two minor residential T-driveways are proposed on 10th Street with the northernmost and southernmost driveways located approximately 1,210 feet and 1,780 feet south of the Westside Boulevard/10th Street intersection, respectively. The north driveway is proposed to align with the existing 21st Avenue alignment to the east and the south driveway is proposed to align with the 22nd Avenue alignment. Both of these driveways will incorporate stop control on the west leg only with the north and south legs uncontrolled.

The Spine Road forms another minor residential T-driveway off of Isabel Road, located approximately mid-block between the current Viga Road and 10th Street alignments. Stop control is proposed for the north leg of the T-intersection with uncontrolled approaches on Isabel Road.

There is an additional driveway access proposed for the business park via Viga Road located approximately 1,570 feet north of Westside Boulevard. This access initially will be minimally utilized as most trips to and from the business park will be routing to the east and south via the Spine Road intersection with Westside Boulevard. However, as development and thus trip generators and attractors are placed to the west, this driveway will take a greater portion of trips from the Westside Boulevard access, especially for trips to and from the site that ultimately are routing to the west and north when development occurs. Stop control will be implemented on the southeast leg only with Viga Road incorporating uncontrolled approaches.

While, Westside Boulevard will provide access for the majority of the site, a secondary access is proposed via Isabel Road to Black Arroyo Boulevard and McMahon Boulevard. Currently, the Isabel Road alignment is shown to be connecting to Black Arroyo at a very acute skew. From a traffic safety and operational perspective this is not a desirable intersection. It is therefore, recommended that the Isabel Road alignment be curved to the east of the current alignment to form a more perpendicular approach to Black Arroyo Boulevard. 10th Street would thus terminate at Isabel Road forming a T-intersection approximately 450 feet north of Black Arroyo.

The New Mexico Department of Transportation (NMDOT) State Access Management Manual (SAMM) provides guidance for signalized, unsignalized, and driveway spacing on various road classifications. Based on Table 18.C-1 *Access Spacing Standards for Intersections and Driveways*, the following spacing is required for compliance:

- Signalized intersection spacing should be no less than 1,760 feet on Westside Boulevard (Urban Minor Arterial 35-40 mph).
- Unsignalized and full access driveway spacing on Westside Boulevard should be no less than 660 feet
- Full movement driveways spacing on Viga Road, 10th Street, Isabel Road, and Spine Road should be no less than 150 feet.
- The Isabel Road/Black Arroyo Boulevard intersection should be spaced no closer than 150 feet from existing driveways on Black Arroyo Boulevard (Saltillo Street and Caracol Street)

A review of all project proposed site driveways and intersections appear to be in compliance with NMDOT SAMM. It is likely that signal control will be warranted at the Westside Boulevard/Spine Road. Therefore, any future signalized intersection to the east or west of this intersection should be located at a minimum 1,760 feet away from the Spine Road intersection.

Parcel Access

Parcel access for Business Park land use is recommended to be taken off of a Spoke Road on either side of the Spine Road located approximately at the mid-point between Viga Road and Westside Boulevard. Full movement parcel access on the Spine Road within the Business Park should be spaced no less than 330 feet and partial access no less than 150-feet. Additionally, there should not be any access point on the Spine Road within 250 feet of the signalized Westside Boulevard/Spine Road intersection.

Access to individual residential parcels should be designed to produce low traffic demands on local residential streets which provide access to fronting residential properties. *Consistent with Residential Subdivision Street Design* a recommended practice of the Institute of Transportation Engineers (ITE), it is recommended that access to residential parcels be configured to produce ADT levels on local residential streets (i.e. with back-out driveways) less than 1,500 vehicles. The ASCE publication, *Residential Streets 3rd Edition* echoes this practice. Therefore, local residential streets with residential driveway access should not exclusively serve more than 161 single family dwelling units. Review of the latest proposed site plan indicates that there are no local residential streets that would generate more than 1,500 ADT.

Phased Access

Initial project development is planned to occur in the northeastern portion of the residential developments with commercial development occurring as tenants are signed on. Therefore initial project access will be provided via Westside Boulevard exclusively, which will be incorporating one through lane in each direction between 10th Street and Unser Boulevard. Based on *2010 Highway Capacity Manual* generalized daily service volumes for urban street facilities (**See Exhibit 16-14 Appendix C**), and interpolating for an anticipated speed limit of 40 mph, two lane street capacity at LOS D or greater is 14,480 ADT. Assuming a typical 10% peak hour and 60-40 directional flow this ADT design demand translates to an average 869 peak hour directional trip demand capacity. It is therefore estimated that approximately 70% of the total project can be constructed, which translates to the following scenarios at which secondary access to Black Arroyo and McMahon would be needed:

1. 98% of just the Business Park development
2. Phase 1 of Residential (150 Units) and 94% of the Business Park
3. Phase 2 of Residential (300 Units) and 90% of the Business Park

4. Phase 3 Residential (450 units) and 86% of the Business Park

The proposed Isabel Road access in combination with a two-lane Westside Boulevard would accommodate full build of the project site.

Existing Traffic and Future Traffic Projections

Existing Traffic in 2015

Peak hour turning movement counts for all existing study intersections on Unser Boulevard with Southern Boulevard, Cabezon Boulevard and Westside Boulevard were collected on February 24, 2015. Peak hour turning movement counts for the study intersections of Unser Boulevard with Black Arroyo Boulevard, McMahon Boulevard were collected on February 26, 2015. All data was collected between 6:30 AM and 6:30 PM for 12 hours in total to capture the conditions of the morning, mid-day, and evening peak hours for a typical weekday. All collected traffic volumes are provided in **Appendix D**. Review of the 12 hour count data shows a typical arterial distribution throughout the day with observable AM and PM commuter peak hour periods. Existing peak hour turning movements are presented in **Figure 3.**

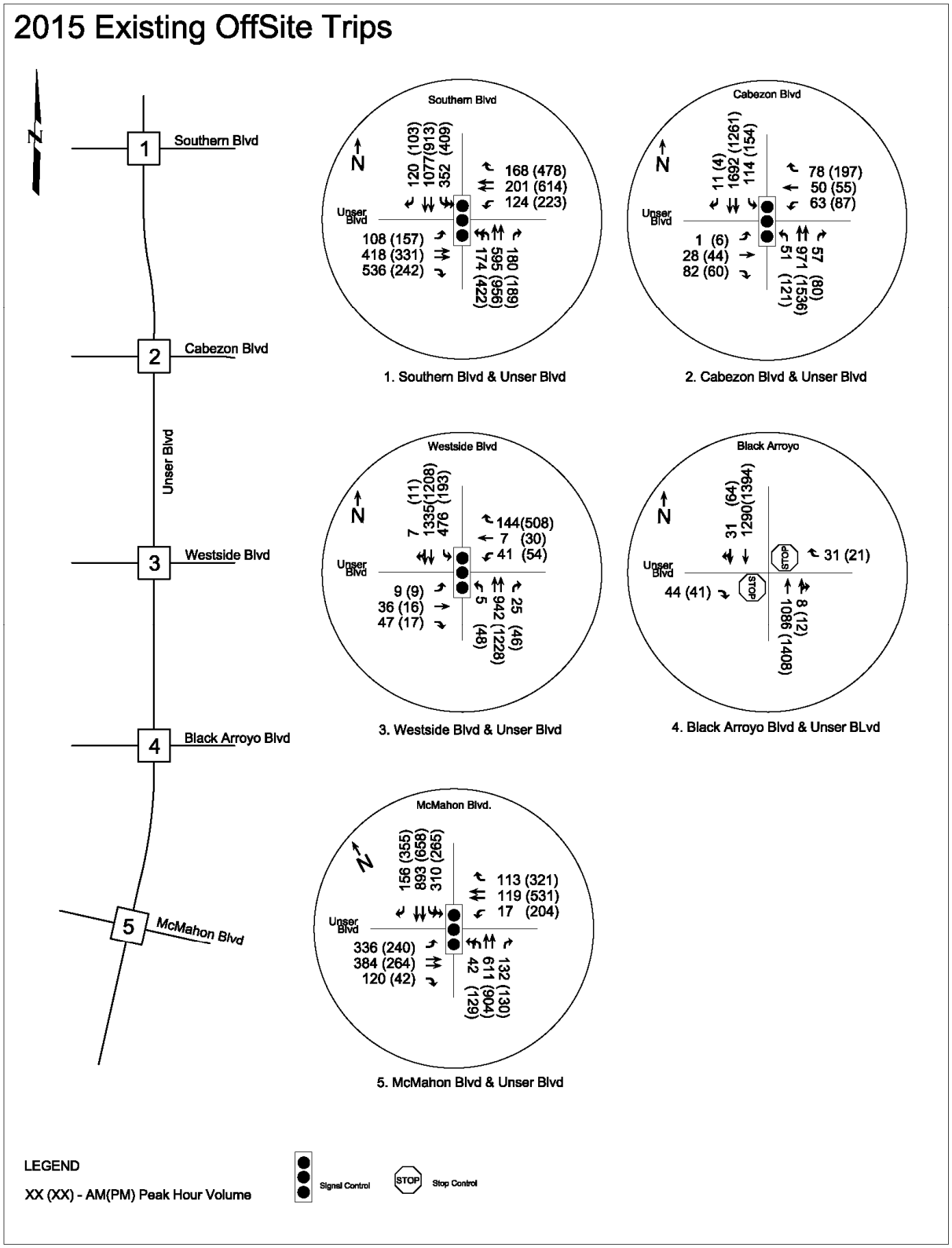

Figure 3. 2014 Existing Traffic Demands

Traffic Projections for Background Traffic Volumes (Opening Day, 2020)

Opening Year 2020

Per the February 10th scoping meeting with the CoRR, it was determined that background traffic demands for 2020 would be developed based on known developments in the area that have completed traffic impacted analyses on record with CoRR. These include the following developments:

- Cabezon Village
- Pavilion at Presbyterian
- X Ray Associates

Resulting primary trip generation from the above developments were then taken and overlaid onto existing 2015 traffic demands to develop 2020 background traffic demands.

Among these developments, most of the Cabezon Community is already developed with approximately 40% remaining to reach full build out. Therefore, 60% of Cabezon demands are already accounted for within existing traffic counts and the added trip generation was adjusted down to avoid double counting. Currently, Pavilion at Presbyterian has constructed up to phase I hence the trips generated in that study for phase II is accounted for in background traffic. X Ray Associates is not build at all so the entire trips were used for background traffic. A detailed table demonstrating how many trips from each development are contributing to each study intersection as well as excerpt trip generation study exhibits are provided in **Appendix E**. Resulting 2020 background traffic demands are presented in **Figure 4.**

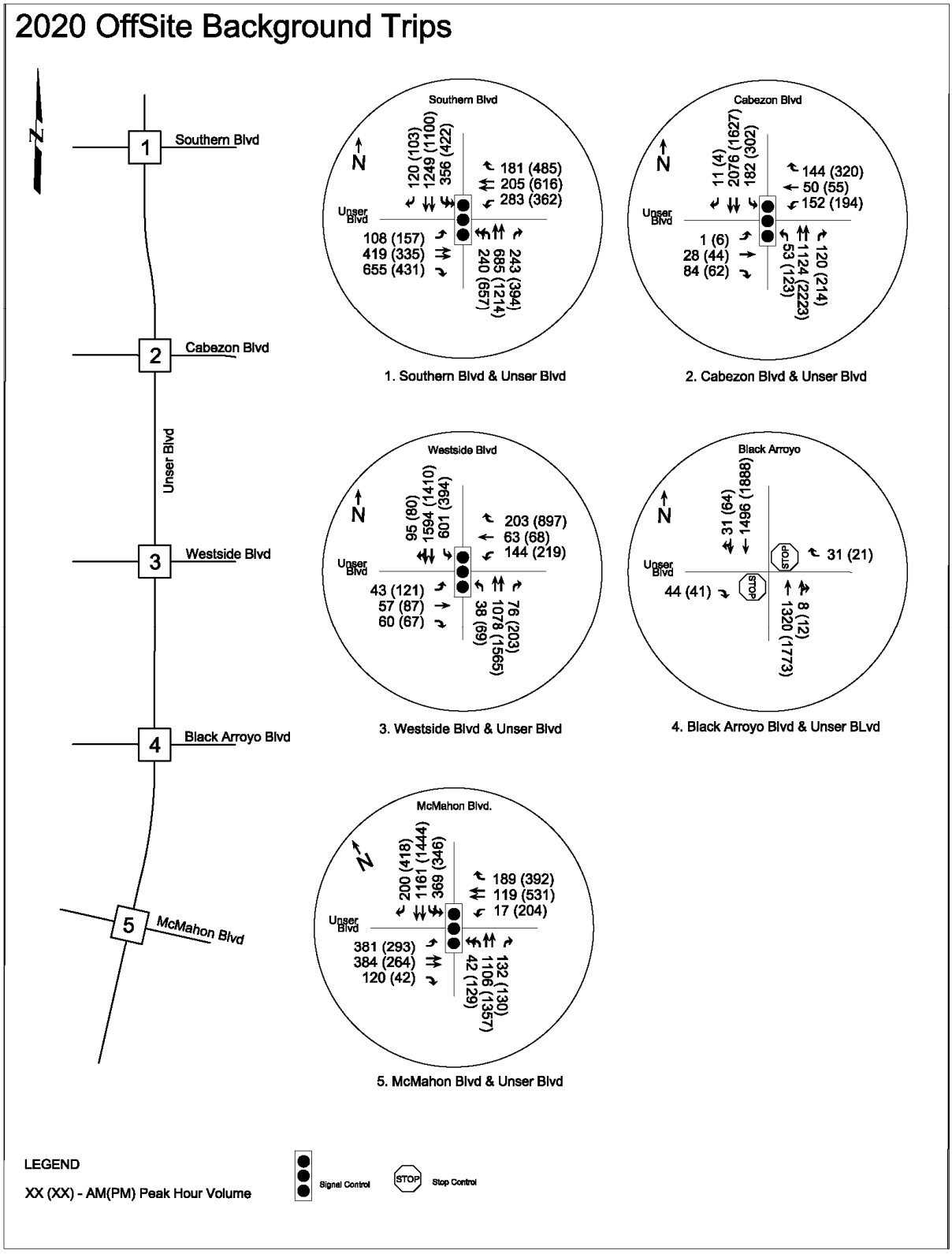

Figure 4. 2015 Background Traffic Volumes

Trip Generation

Trip generation analysis was performed based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, *9th Edition* and project land use were categorized as ITE land use category 210 (Single-Family Detached Housing) and category 770 (Business Park). Project trips were calculated using the equation rate for the peak hour of adjacent street. **Table 1** presents the total site trips generated. Based on the proposed land use, it is expected that no pass-by trip generated.

Table 1. Project Trip Generation

Use	Units	TRIP GENERATION							TRIPS				
		Daily Rate	AM Peak			PM Peak			Daily	AM Peak		PM Peak	
			Rate	Enter	Exit	Rate	Enter	Exit		In	Out	In	Out
Single Family Detached Housing (210)	450	9.31	0.72	25%	75%	0.9	63%	37%	4190	81	244	256	151
Business Park (770)	600 KSF	11.81	1.35	85%	15%	1.23	26%	74%	7088	687	121	192	548
Total	-	-	-	-	-	-	-	-	11278	768	365	448	699

Notes:

Single Family Detached Housing
Daily Rate: Ln (T)= 0.92 Ln (X)+2.72
AM Rate: T=0.70(X)+9.74
PM Rate: Ln (T)= 0.90 Ln (X)+0.51
Business Park
Daily Rate: T=10.62(X)+715.61
AM Rate: Ln (T)= 0.97 Ln (X)+0.49
PM Rate: Ln (T)= 0.90 Ln (X)+0.85

Typically there is some degree of interaction between business park and residential land uses. Therefore, based on Tables 7.1 and 7.2 (**See Appendix F**) of the *Trip Generation Manual Volume 1: User's Guide and Handbook*, it can be expected that as much as a 3% internal capture rate can be expected between the two land uses. Calculated internal and adjusted external trips are summarized in **Table 2**.

Table 2. Summary of Calculated Internal and Adjusted External Trips

Internal Trips				External Trips			
AM Peak		PM Peak		AM Peak		PM Peak	
In	Out	In	Out	In	Out	In	Out
4	21	16	6	77	223	240	145
21	4	6	16	666	117	186	532

As indicated, internal trips have been subtracted from project trip generation indicated in **Table 1** to produce adjusted external trips that will be distributed and assigned off-site.

Trip Distribution and Assignment

Trip Distribution of external trips was determined utilizing existing intersection demand characteristics and reviewing aerial maps indicating the locations of existing residential roof tops and employment centers. Since trip characteristics between business park and residential land uses are significantly different due land use origin and destination differences, trip distribution and assignment was calculated separately for the business park and residential land uses. Offsite primary trip distribution for both AM and PM peak hours are shown in **Figures 5 and 6** for the business park and residential development, respectively. As indicated, site trips for the business park have been distributed more evenly between north and south, with the south still the majority. This is due to the fact that while the majority of development in the area is to the south, there are several existing significant residential developments to the north as well. The majority of residential trips have been sent to the south on Unser Boulevard, as there are relatively fewer employment centers to the north and it is expected that most residences will be employed within developments south of the project site. On-site distribution are indicated in **Figures 7 and 8** for the business park and residential land use, respectively. Internally captured trips were assigned exclusively to the Westside Boulevard/Spine Road. Resulting offsite external and onsite project site trip demands are summarized in **Figures 9 through 12** for business park and residential land use. Internal trip demands between the residential and business park component have been distributed exclusively north-south at the Spine Road intersection as this is the easiest and most direct path between the two land uses. Resulting internal trip distribution and assignment are indicated in **Figure 13**. Total site trip demands between business park, residential and internal capture were compiled with the resulting total off-site and on-site trip demands depicted in **Figure 14 and 15**, respectively. The total site trip demands were then overlaid on 2020 background traffic to develop off-site build out opening year 2020 turning movement demands, which are shown in **Figure 16.** Since there is no background demand for on-site **Figure 15** will represent on-site build out opening year 2020 turning movement demands.

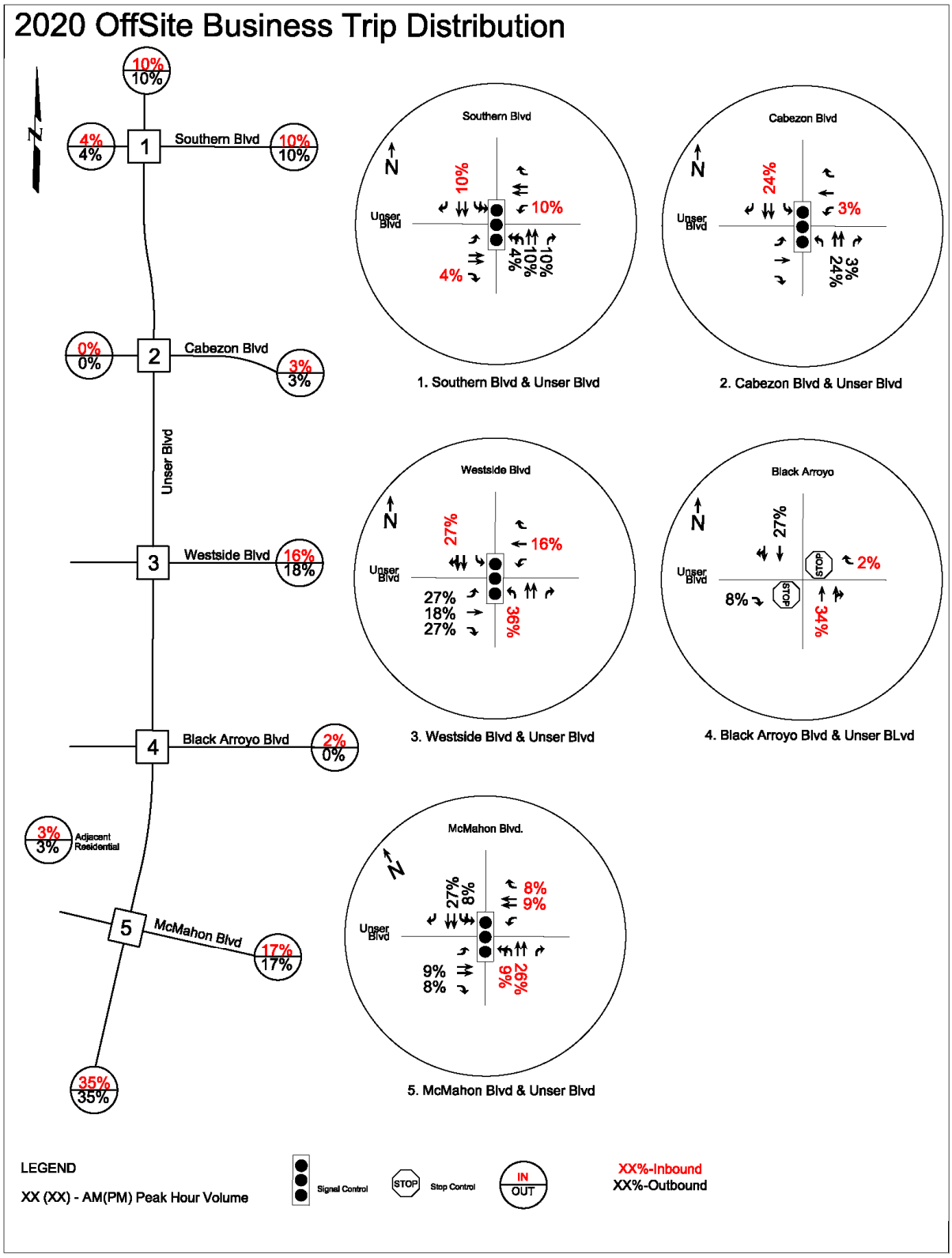

Figure 5. Off-Site Primary Trip Distribution for Business Development

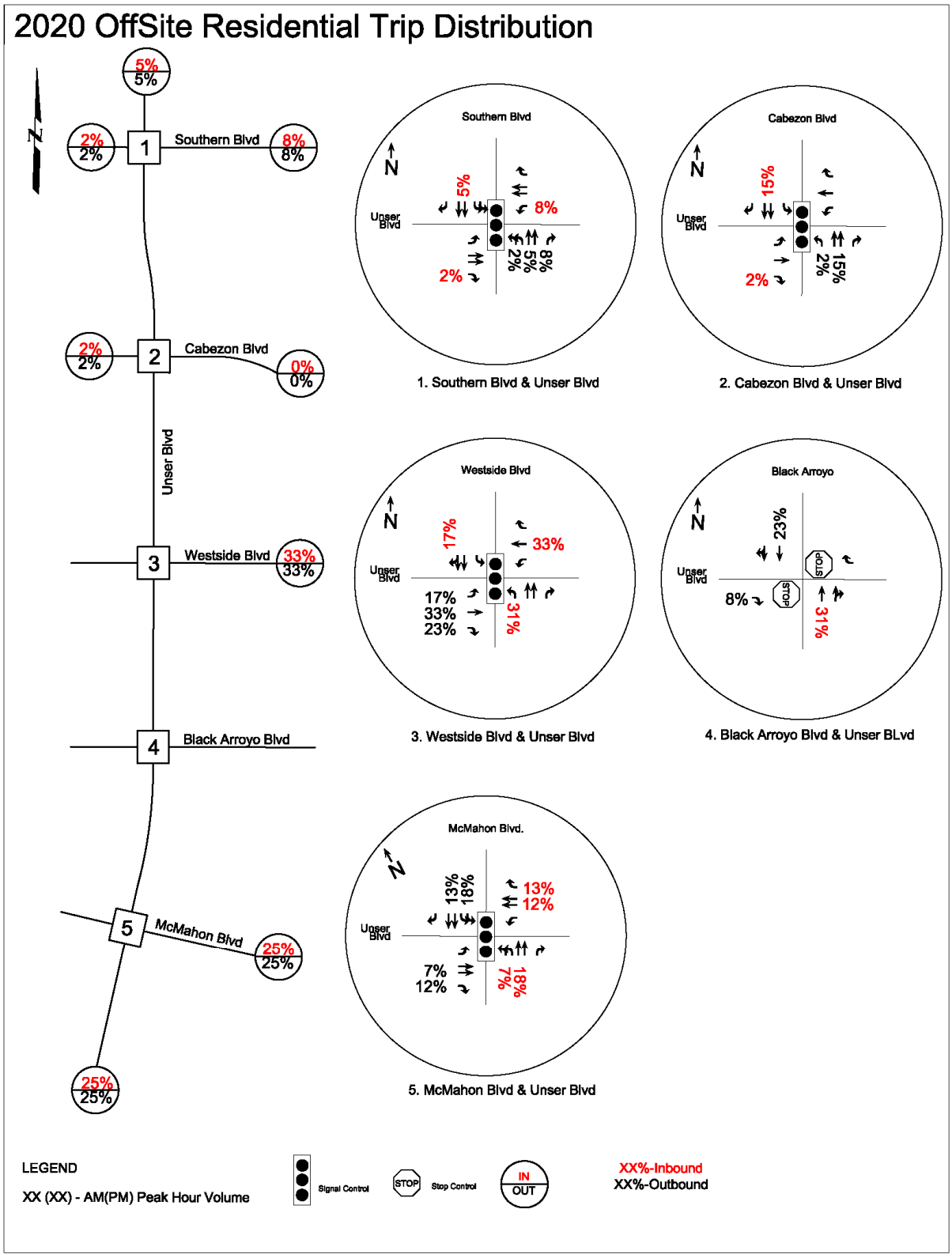

Figure 6. Off-Site Primary Trip Distribution for Residential Development

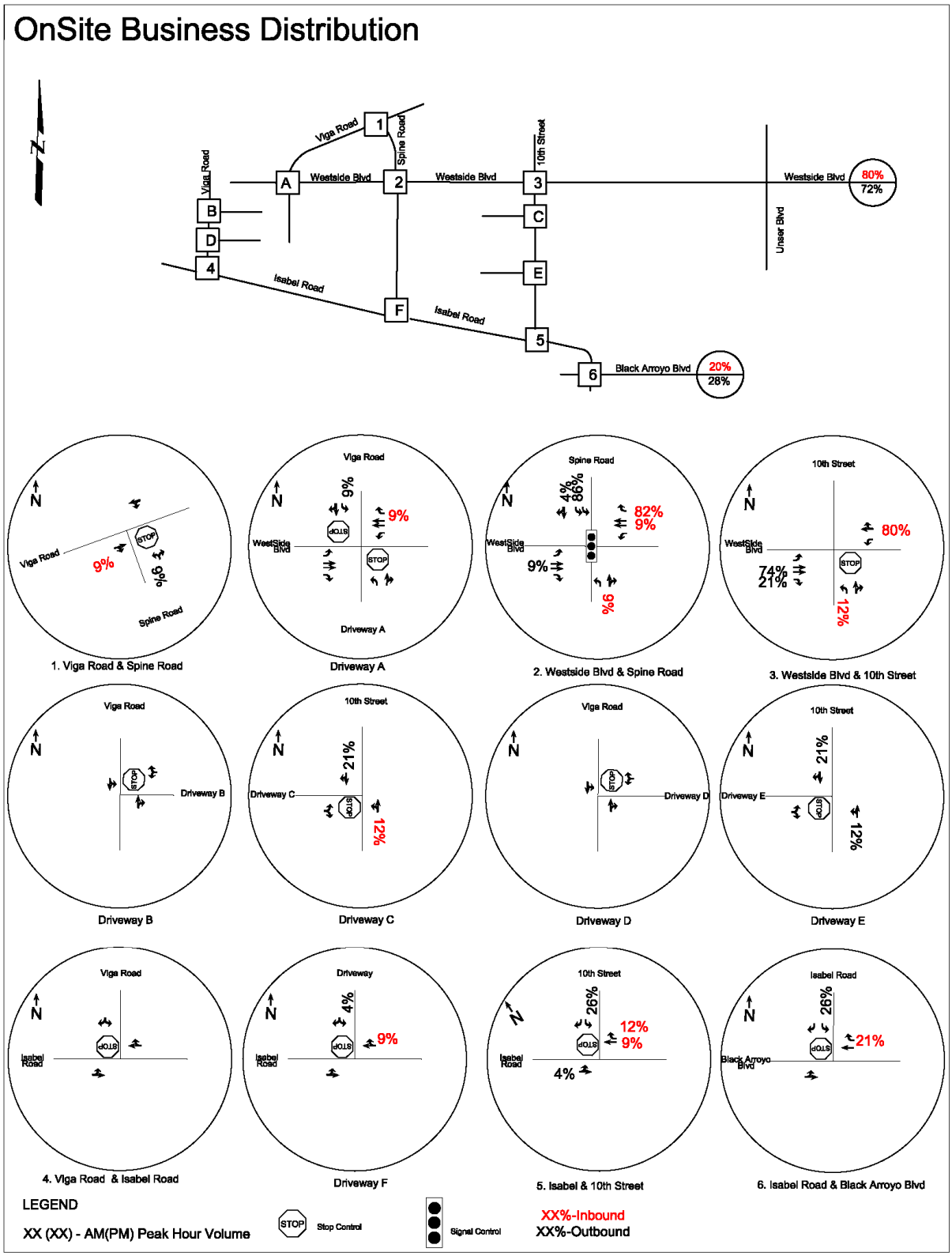

Figure 7. On-Site Primary Trip Distribution for Business Development

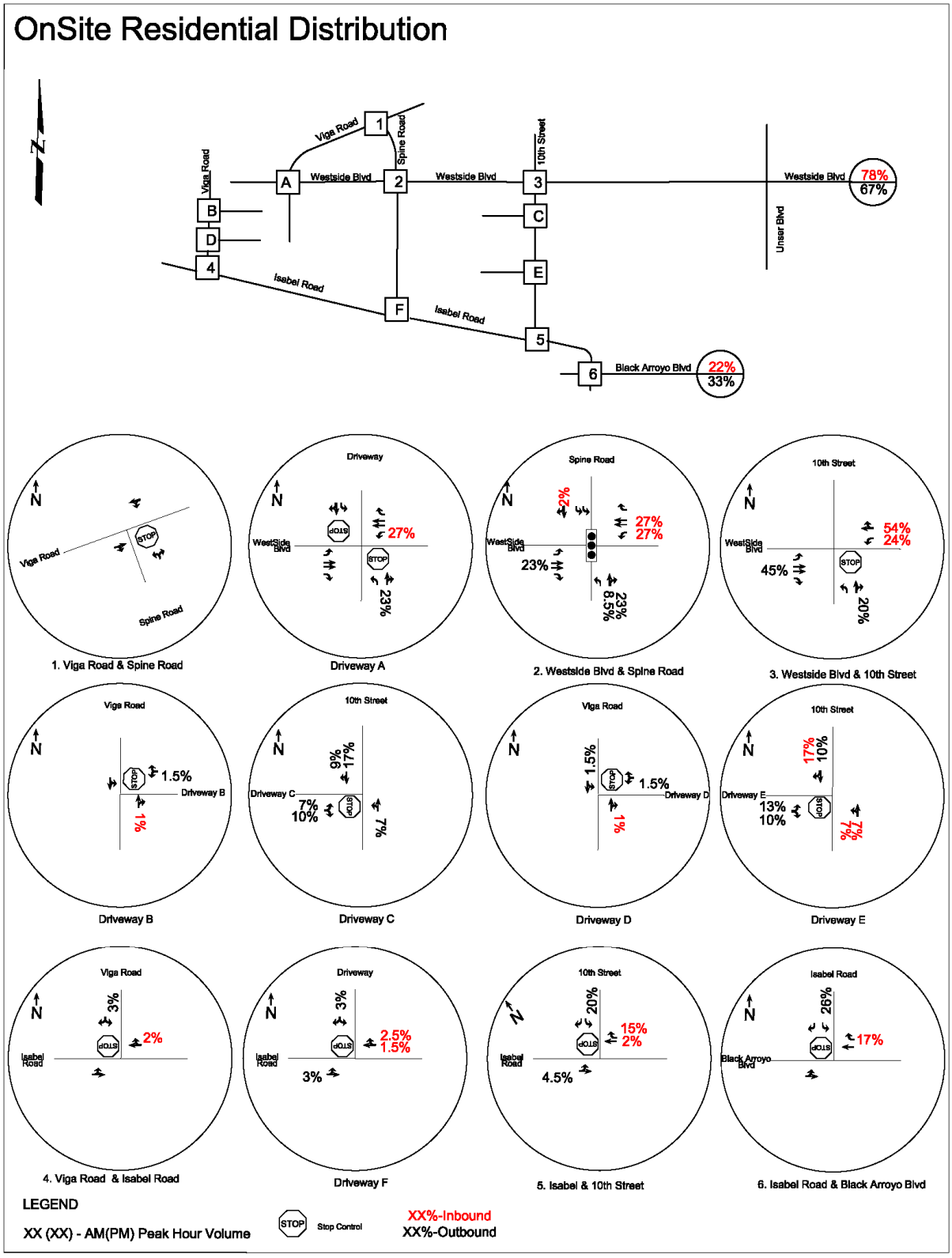

Figure 8. On-Site Primary Trip Distribution for Residential Development

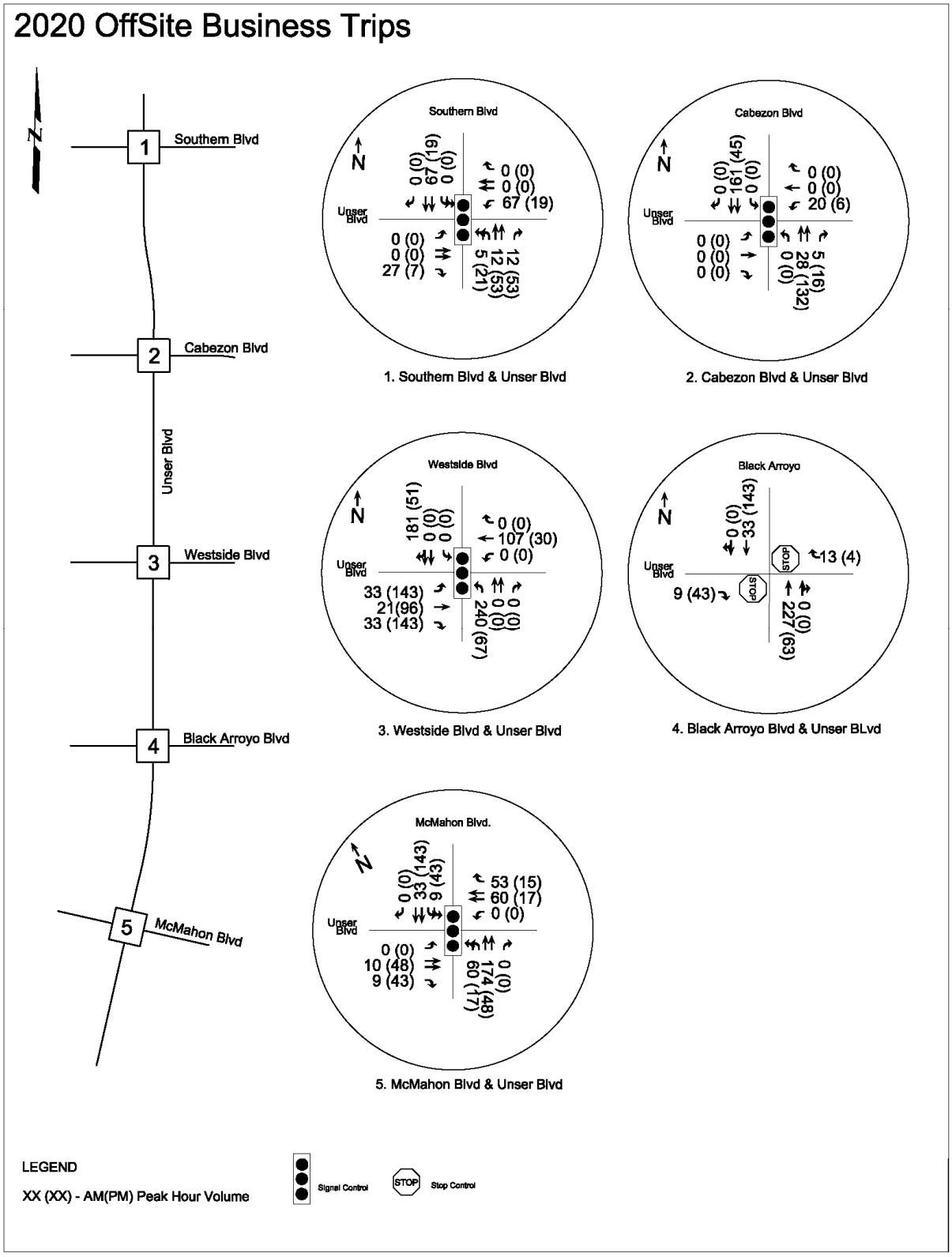

Figure 9. Off-Site Primary Trips Added to Network for Business Development

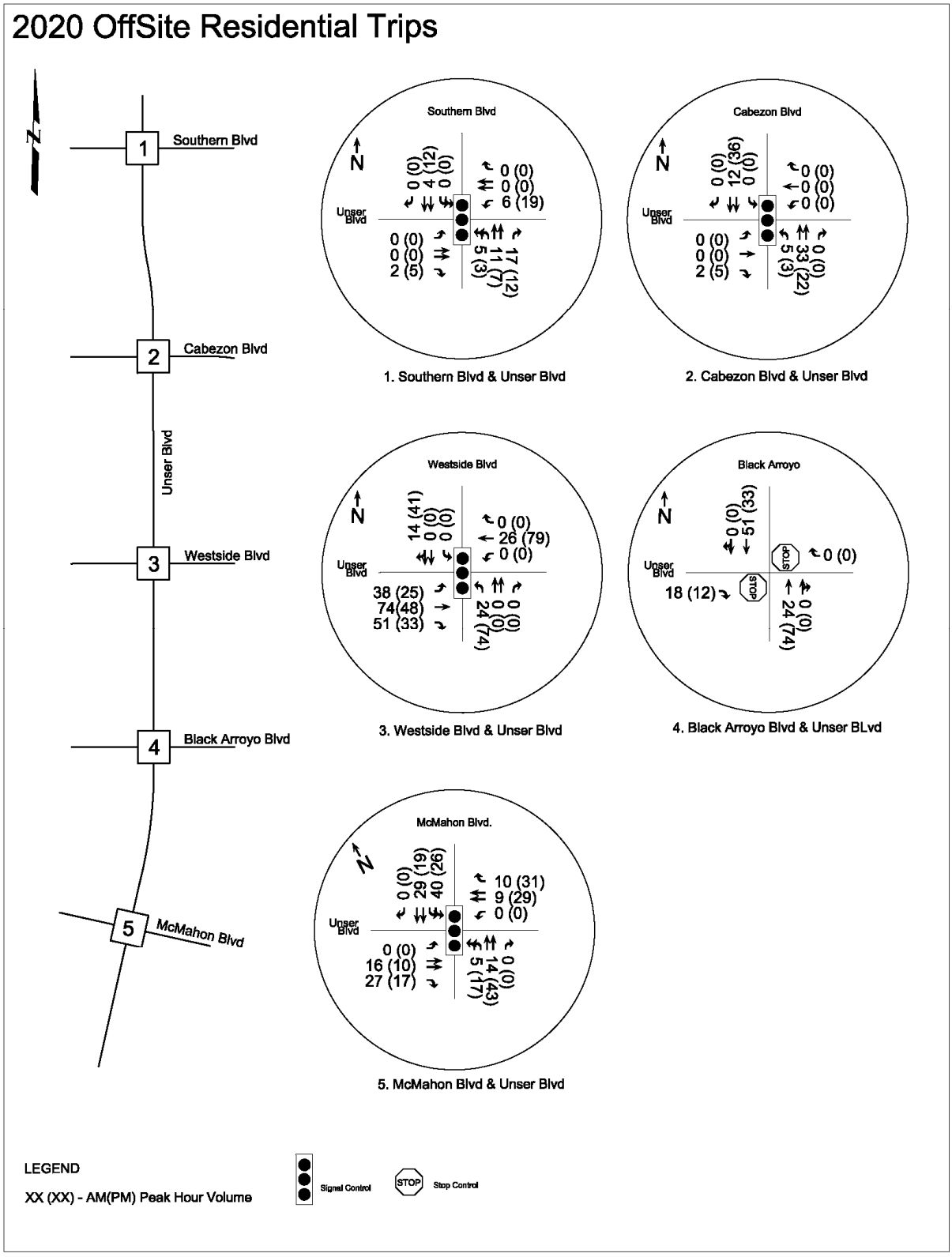

Figure 10. Off-Site Primary Trips Added to Network for Residential Development

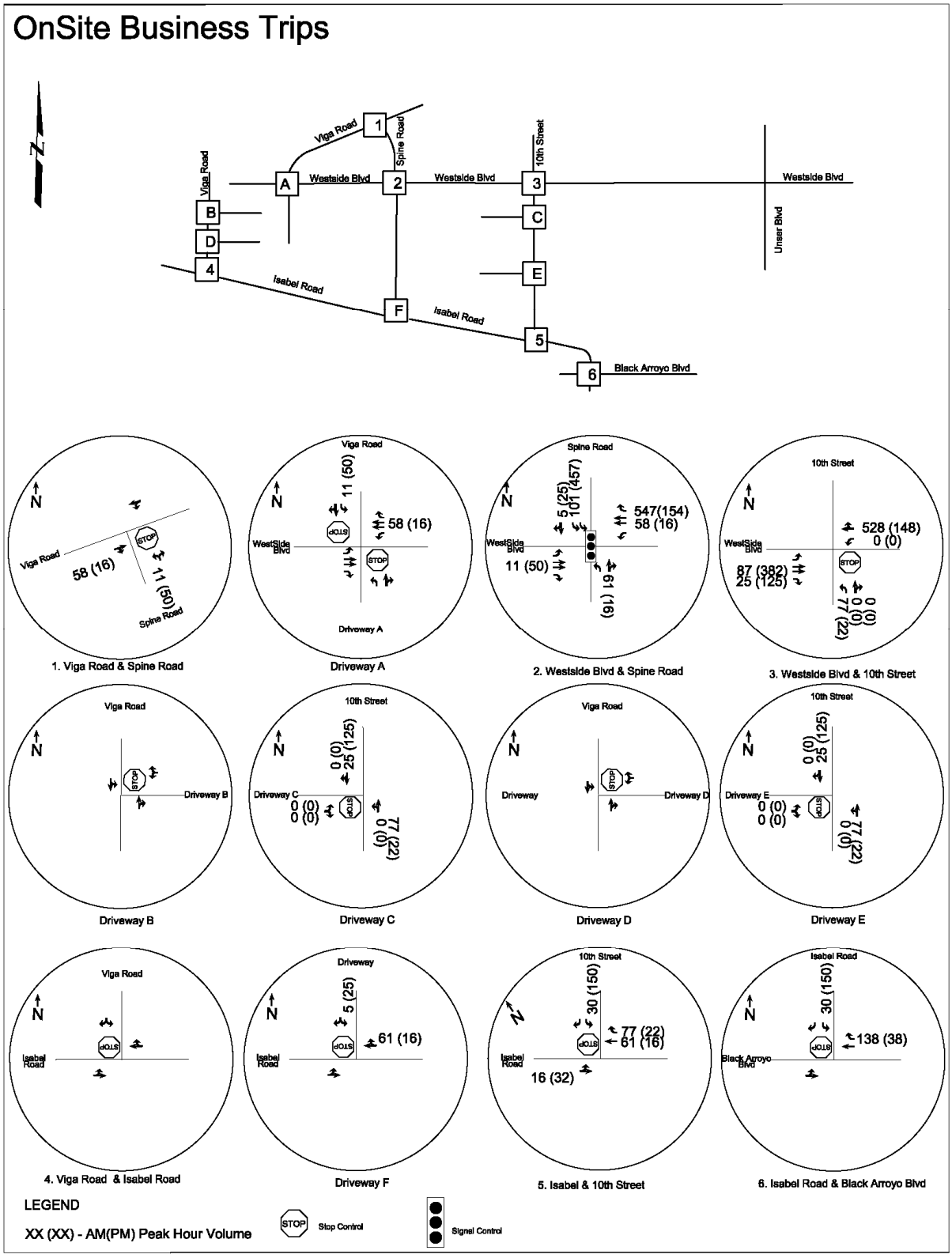

Figure 11. On-Site Primary Trips Added to Network for Business Development

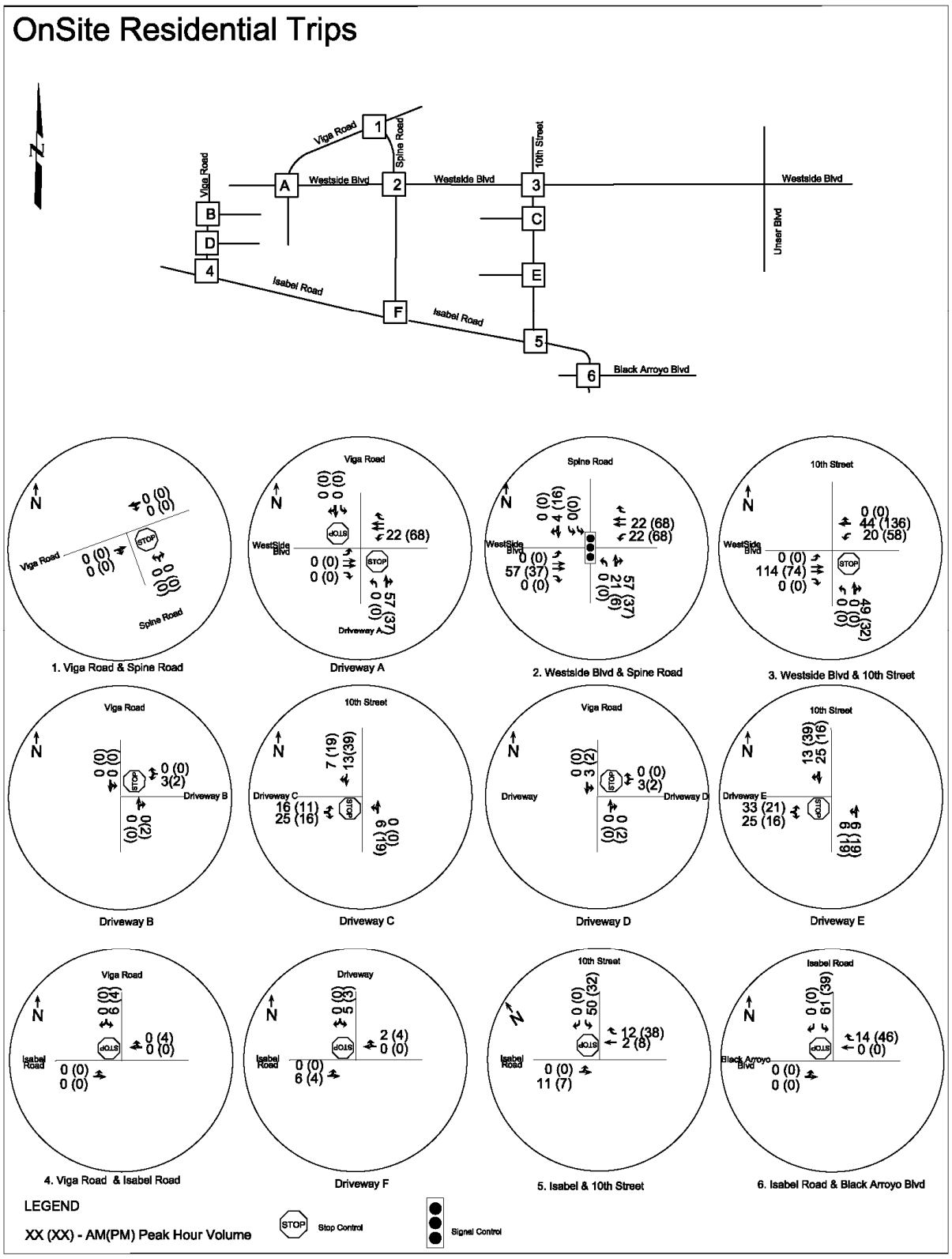

Figure 12. On-Site Primary Trips Added to Network for Residential Development

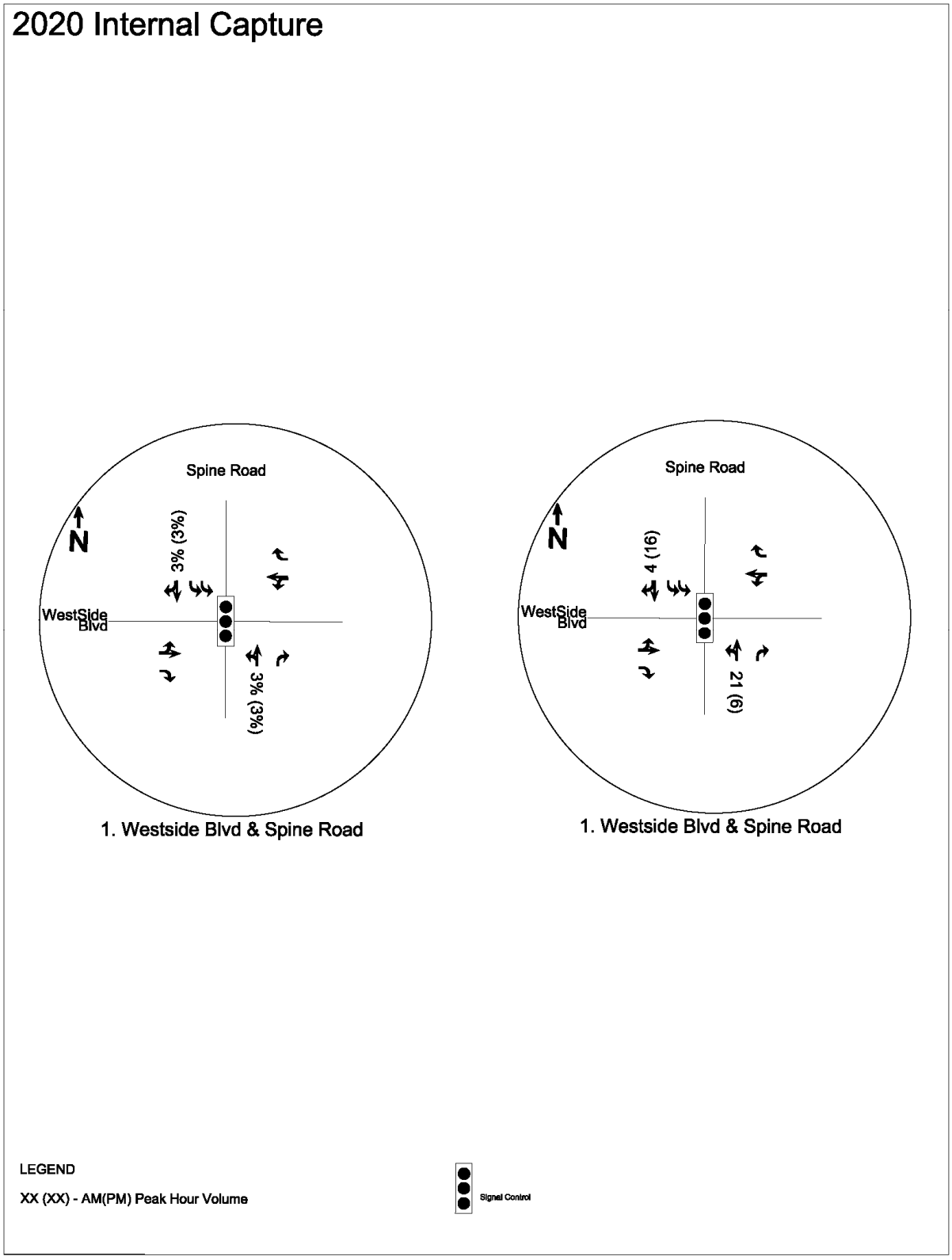

Figure 13. Internal Capture

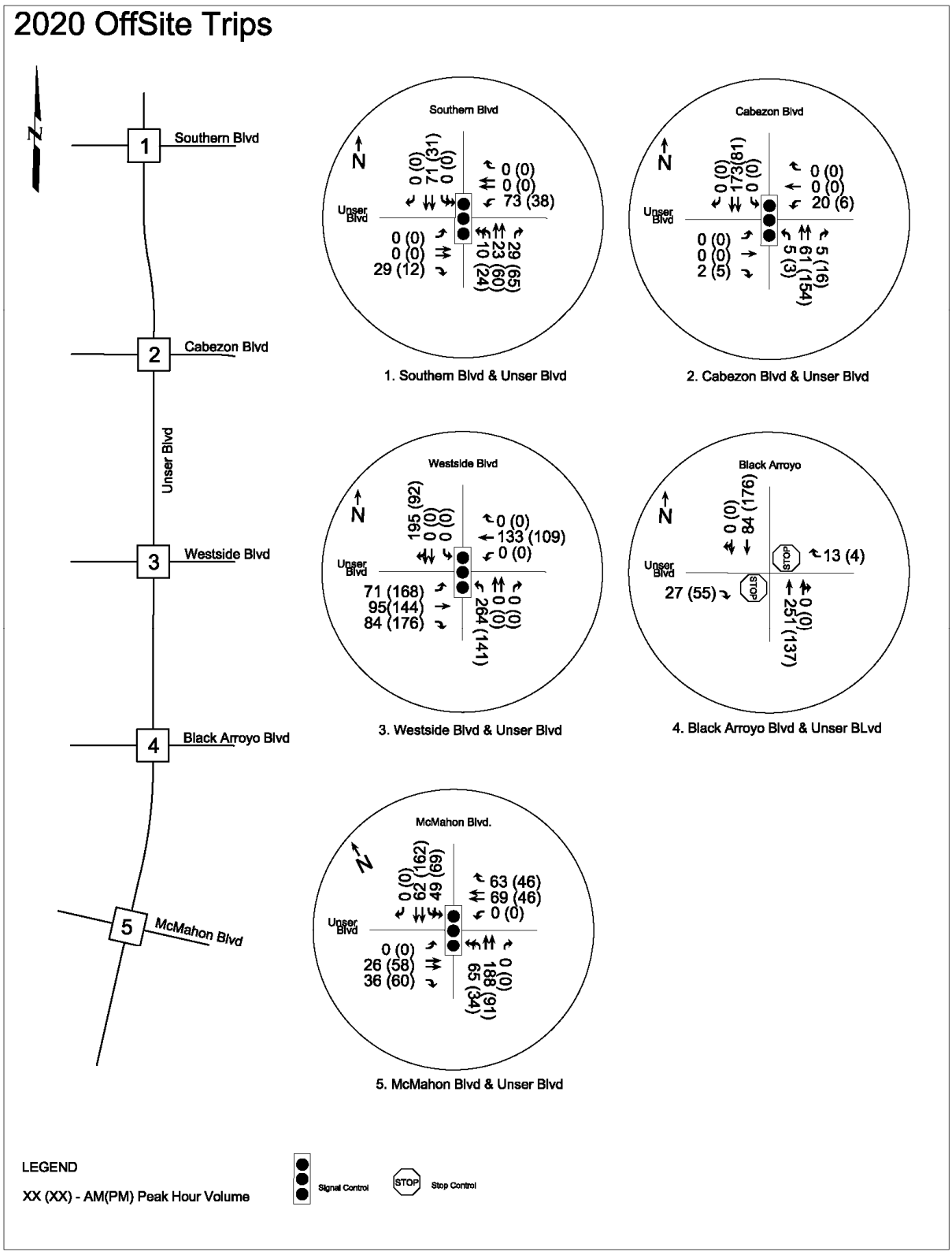

Figure 14. Primary Trips for Off-Site Distributions

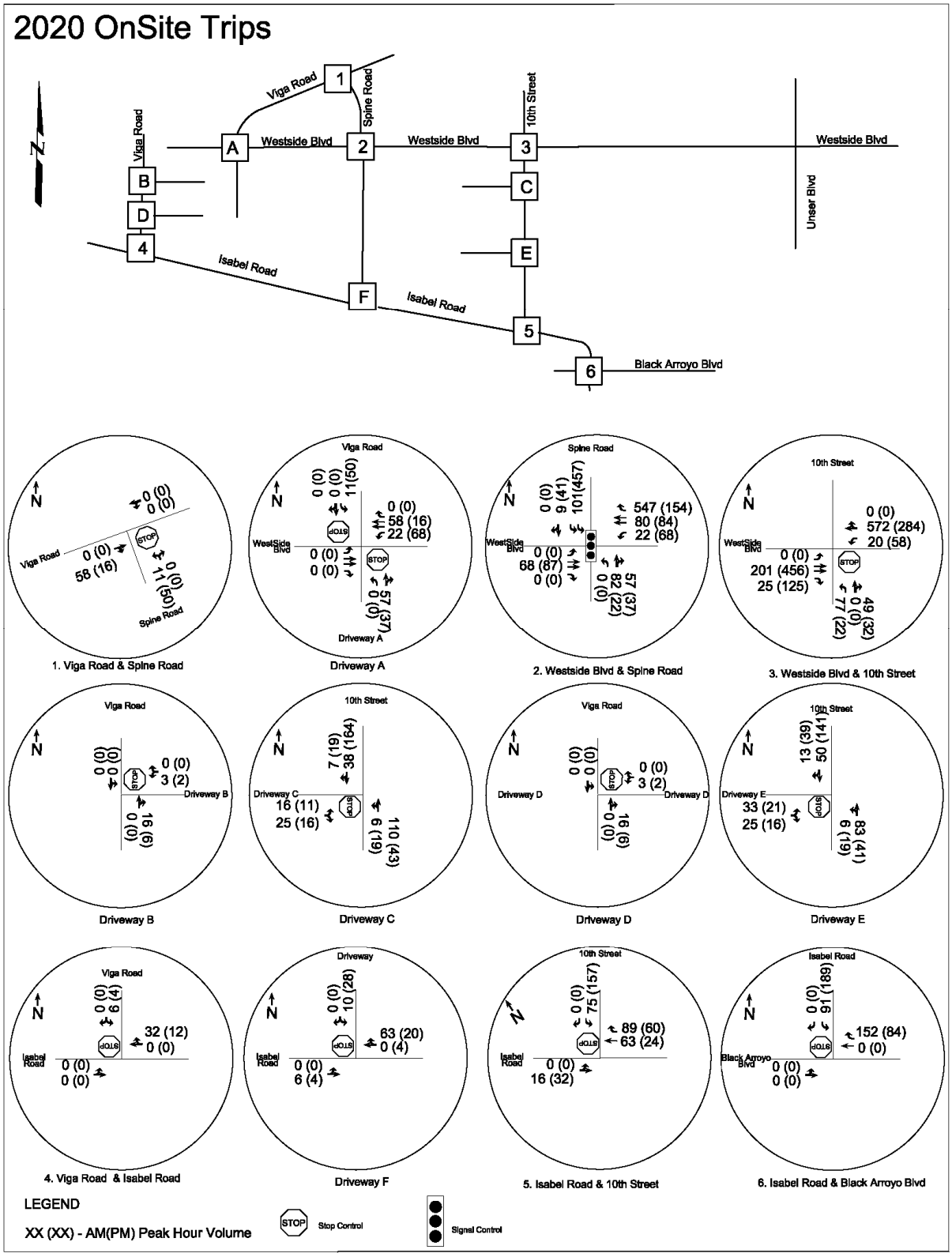

Figure 15. Primary Trips for On-Site Distributions

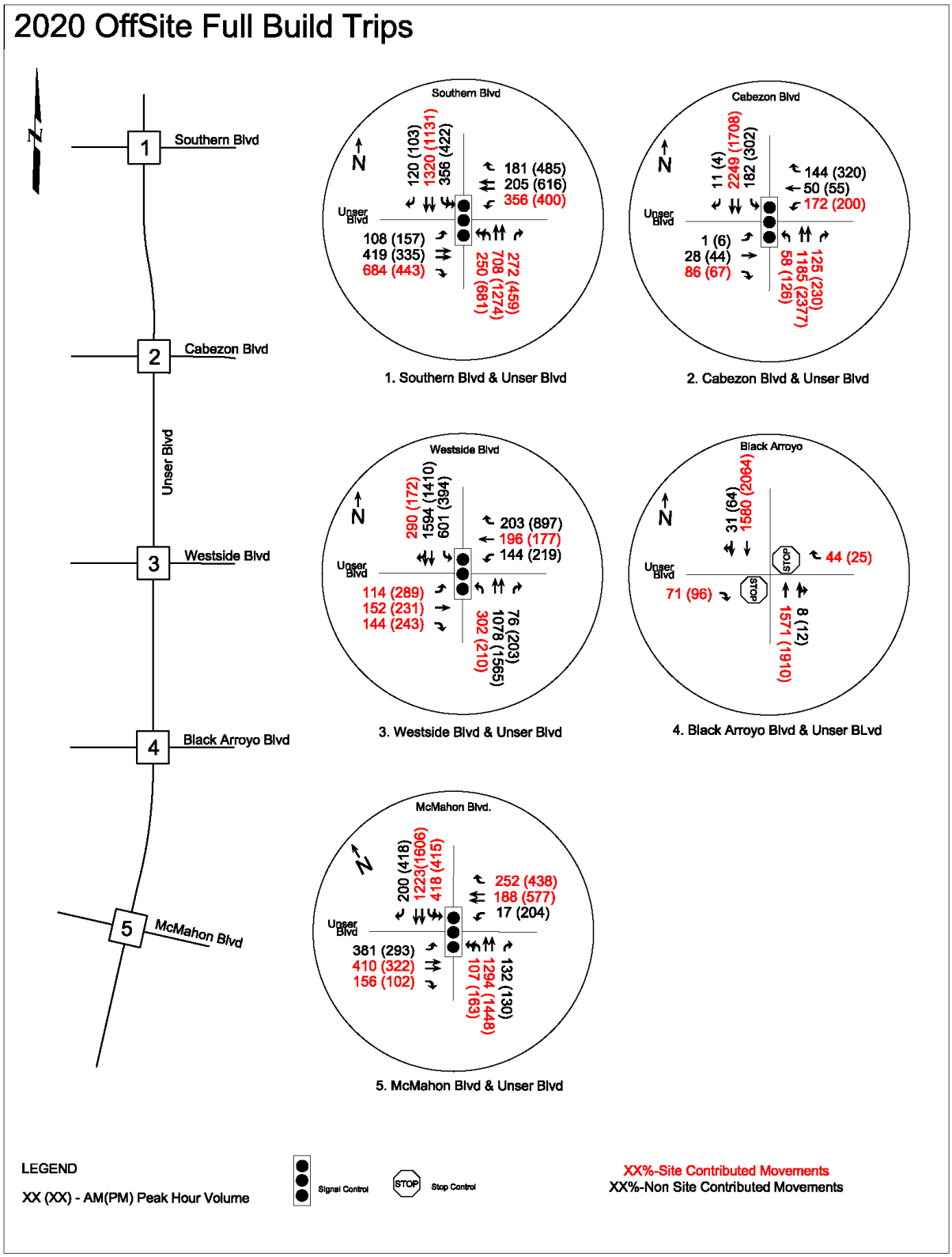

Figure 16. Opening Year (2020) Build Out (Background plus Site Demands)

Operational and Safety Analyses

Warrant Analysis

Peak hour Warrant 3 analyses were calculated for the intersection of Westside Boulevard/Spine Road with calculation sheets provided in **Appendix G** of this report. The analysis assumed a major street speed of 40 mph or greater, a single lane on the minor street approach and multi lanes on the major street approaches, and projected 2020 build out traffic demands. A single lane on the minor street approach was assumed due to the fact the majority of turning movements on the north leg are expected to be left-turns. The left-turn movement is large enough to require dual left-turn lanes from the business park and thus from an operations stand point, signalization would be needed. Based on analysis and anticipated operations at build out, projected traffic demands are expected to satisfy Warrant 3 as well as require signalized dual left-turn movements on the north leg. Therefore signal control should be planned for at this intersection. It was further determined that Warrant 3 thresholds would be satisfied at approximately 70% of build out. It should be mentioned that the satisfaction of this warrant is for planning purposes only and that prior to signalization of the intersection, 12-hour traffic data should be calculated and analyzed for compliance against Warrants 1 and 2.

Warrant analyses was also reviewed for Westside Boulevard at 10th Street as well. The results indicate that this intersection is not expected to satisfy Warrant 3. Additionally, a signalized corridor operates most efficiently when signal spacing is no less than a quarter mile and preferably a half a mile. NMDOT As signal at Westside Boulevard and 10th Street would put it less than 1,760 feet to a proposed signal at Spine Road and a likely signal at 11th Street if 11th Street becomes a major collector road.

Intersection Capacity and LOS

Intersection capacity and Level of Service (LOS) analysis was conducted using procedures outlined in the 2010 Highway Capacity Manual. Synchro 9.0 software was used to perform the analysis with detailed output sheets included in the **Appendix H**. **Table 3** summarizes the LOS and capacity values for AM and PM peak hours for offsite study intersections under the following four scenarios: Existing (2015), Background (2020), Build Out (2020), Build Out w/ Unser Boulevard @ six lanes. Assumed lane configurations and traffic control for Build Out traffic demands are presented in **Figure 16**.

Table 3. Off-Site (Unser Boulevard) Traffic Capacity Analysis Summary

Study Intersection	Scenario	Intersection LOS			
		AM		PM	
		Delay[1]	LOS[2]	Delay[1]	LOS[2]
Unser / Southern	Existing (2015)	45.5	D	80.7	F
	Background (2020) 116s	56.0	E	158.6	F
	Background (2020)	74.6	E	90.1	F
	Buildout (2020)	59.5	E	95.4	F
	Buildout 6 Lanes (2020)	49.3	D	63.5	E
Unser / Cabezon	Existing (2015)	25.5	C	26.7	C
	Background (2020) 116s	44.9	D	109.0	F
	Background (2020)	31.6	C	100.1	F
	Buildout (2020)	81.3	F	103.4	F
	Buildout 6 Lanes (2020)	27.4	C	37.9	D
Unser / Westside	Existing (2015)	31.1	C	117.6	F
	Background (2020) 116s	65.9	E	344.8	F
	Background (2020)	42.7	D	230.0	F
	Buildout (2020)	70.3	E	136.9	F
	Buildout 6 Lanes (2020)	26.0	C	43.3	D
Unser / Black Arroyo	Existing (2015)	16.1	C	17.5	C
	Background (2020) 116s	18.6	C	25.5	D
	Background (2020)	18.6	C	25.5	D
	Buildout (2020)	21.7	C	44.9	E
	Buildout 6 Lanes (2020)	25.6	D	59.8	F
Unser / McMahon	Existing (2015)	38.0	D	43.1	D
	Background (2020) 116s	85.2	F	125.8	F
	Background (2020)	30.8	C	51.2	D
	Buildout (2020)	53.5	D	63.2	E
	Buildout 6 Lanes (2020)	39.1	D	42.2	D

[1]Average delay in seconds per vehicle.

[2]LOS stands for Level of Service.

[3]Average delay and LOS for highest delay movement is reported for unsignalized intersections.

Based on the summarized results, the following conclusions are noted:

- All off-site study intersections currently are operating at LOS D or better except at Southern Boulevard and Westside Boulevard, which both are operating at LOS F during the PM peak hour.
- The westbound left-turn at the Southern Boulevard intersection is operating at LOS F and appears to be deficient in accommodating current demands. Dual left-turn lanes would be warranted at this approach, but current intersection geometry will not accommodate this modification.
- Almost all study intersections are expected to operate at LOS F during the PM peak hour under projected background traffic demands except for Black Arroyo Boulevard. This is background demands with no project site trips added. The AM peak is anticipated to operate slightly better with ranging from LOS C at Cabezon Boulevard, Black Arroyo Boulevard, and McMahon Boulevard to LOS E at Southern Boulevard and Westside Boulevard.
- Unser Boulevard would require a six-lane cross-section under background traffic demands.
- Under build out traffic demands and a four-lane cross-section on Unser Boulevard, all study intersections are still at LOS F for PM peak hours. AM peak hour LOS now ranges from LOS C at Black Arroyo to LOS E and F at Southern Boulevard, Cabezon Boulevard, Westside Boulevard and McMahon Boulevard.
- Unser Boulevard is ultimately planned to incorporate an additional through lane in each direction. Therefore Build Out traffic demands were also analyzed with a six-lane incorporated on Unser Boulevard. As indicated, LOS at all signalized study intersection are significantly improved. Resulting LOS are anticipated to range from LOS C and D at Cabezon Boulevard and Westside Boulevard to LOS D and E at Southern Boulevard and McMahon Boulevard.
- The eastbound right-turn movement at Black Arroyo Boulevard is anticipated to operate at LOS F under the Buildout with six-lane Unser Boulevard. However, as the 2010 Highway Capacity Manual recognizes, it is not uncommon to observe LOS F at unsignnalized minor street movements with major arterials. Additionally, the v/c ratio is only 0.64 with a 95^{th} percentile queue of 4 vehicles, which does not indicate operational problems.
- The following geometry improvements were assumed based on previous traffic study:
    - Westbound dual left-turns at Cabezon Boulevard (Project site contributes 200 vph in PM peak hour)
    - Southbound dual left-turn lanes at Westside Boulevard (No project trip demand contribution). Current intersection geometry will accommodate dual left-turn lanes with restriping.
    - Northbound dual left-turn lanes at Westside Boulevard (Project site contributes 264 vph in the AM peak hour). Current intersection geometry will accommodate dual left-turn lanes with restriping.
    - Eastbound dual left-turn lanes at Westside Boulevard (Project site contributes 289 vph in the AM peak hour). Current median would require some modification to accommodate.

- Westbound dual left-turn lanes at Westside Boulevard (No project trip demand contribution). Alignment across the intersection would need to be adjusted to accommodate this mitigation.
- Westbound dual right-turn lanes at Westside Boulevard under protected plus overlap phasing (No project trip demand contribution) Current intersection geometry does not accommodate this modification.

LOS capacity analysis was also conducted for all onsite intersections under build out conditions only as these intersections do not currently exist. The analysis was conducted under proposed intersection control and lane geometry as indicated in **Figure 15**. **Table 4** summarizes the results.

As shown, all study intersections are expected to operate at a satisfactory LOS under proposed traffic control and lane geometry. As mentioned, the Westside Boulevard/Spine Road intersection is expected to satisfy MUTCD signal warrants. Therefore this intersection was analyzed under signal control. Additionally, based on discussion in the queue analysis of this report and the large left-turn demands anticipated, dual left-turn lanes were assumed on the southbound approach of this intersection. All other intersection were assumed to incorporate two-way stop control.

Table 4. On-Site Traffic Capacity Analysis Summary

Study Intersection	Intersection Control	Worst Case Movement	Intersection LOS		Worst Case Movement	Intersection LOS	
			AM			PM	
			Delay[1]	LOS[2]		Delay[1]	LOS[2]
Viga Road & Spine Road	Stop	NW	8.7	A	NB	8.8	A
Driveway A	Stop	EB	0.0	A	EB	0.0	A
Westside Blvd & Spine Road	Signalized	SB	12.3	B	WB	7.8	A
Westside Blvd & 10th Streeet	Stop	NB	19.1	C	NB	15.9	C
Driveway B	Stop	WB	8.6	A	WB	8.5	A
Driveway C	Stop	EB	9.0	A	EB	9.7	A
Driveway D	Stop	WB	8.6	A	WB	8.5	A
Driveway E	Stop	EB	9.2	A	EB	9.6	A
Viga Road & Isabel Road	Stop	SB	8.4	A	SB	8.6	A
Driveway F	Stop	SB	8.7	A	SB	8.7	A
10th Street & Isabel Road	Stop	SB	9.6	A	SB	9.9	A
Black Arroyo Blvd & Isabel Road	Stop	SB	9.4	A	SB	9.7	A

[1]Average delay in seconds per vehicle.

[2]LOS stands for Level of Service.

[3]Average delay and LOS for highest delay movement is reported for unsignalized intersections.

Queue Storage and Auxiliary Lane Analyses

Auxiliary Lane Warrants

NMDOT auxiliary lane warrants were reviewed for the study driveways and on site intersections. Westside Boulevard is classified as an urban multi-lane highway and therefore table 17.B-2 of the *NMDOT Access Manual* was used to determine left and right turn auxiliary lane requirements. An excerpt indicating this table is provided in **Appendix I.** Based on the warrant review, the following warranted auxiliary lanes are identified:

Westside Boulevard

- Westbound left turn lane at 10th Street
- Eastbound right turn lane at 10th Street
- Northbound right turn lane at 10th Street
- Westbound left and right-turn at Spine Road
- Westbound left and right-turn lane at Driveway A-Viga Road

Isabel Road

- Southbound left-turn lane at Black Arroyo

Black Arroyo

- Westbound right-turn lane at Isabel Road

It should be noted that due to the lack of development to the west of the project site, most eastbound auxiliary lanes do not currently satisfy SAMM warrants. However, development will continue to the west thus increasing eastbound traffic demands through the project site on Westside Boulevard. Additionally, based on the intersection capacity analysis, several approaches will need auxiliary lanes from an operational standpoint. Additional recommended auxiliary turn lanes include the following:

Westside Boulevard

- Eastbound left-turn lane at 10th Street
- Eastbound left and right-turn at Spine Road
- Eastbound right-turn lane at Driveway A
- Eastbound left-turn lane at Viga Road

10th Street

- Northbound left-turn lane at Westside Boulevard

Spine Road

- Northbound left-turn lane at Westside Boulevard
- Southbound dual left-turn lanes to accommodate 457 peak hour left-turns. This is recommended to go to duals when signal control is put into place at the Westside

Boulevard/Spine Road intersection. In the interim, while stop control is in place, the second left-turn lane can be striped out with chevrons until the need for the duals.

Viga Road

- Northbound left-turn lane at Westside Boulevard
- Southbound left-turn lane at Westside Boulevard

Cut-Through Potential for City of Albuquerque Neighborhoods

It should be noted that the neighborhoods built south of Black Arroyo and west of Unser Boulevard, provide a total of four connections between Black Arroyo Boulevard and McMahon Boulevard (Maravillas Drive, Milky Way Street, Sweet Dreams Drive, and Dreamy Way Drive-Bandelier Drive). Although most of these appear to be intended as local residential streets with driveways fronting all connections (except Sweet Dreams Drive), their connectivity between a major collector (Black Arroyo Boulevard) and a major arterial (McMahon Boulevard) will mean that theses streets will be used as collectors. As development continues to in-fill on the north side of Black Arroyo Boulevard the cut-through potential will continue to increase especially in light of the fact that Black Arroyo Boulevard has been limited to right-in right-out access on Unser Boulevard in spite of its Major Collector Status. The Diamantes Site could potentially contribute over 100 inbound trips in the AM and over 80 outbound trips in the PM to one of four of these cut-through opportunities. As development continues along Black Arroyo Boulevard, the City of Albuquerque might consider opening left-in access to Black Arroyo Boulevard from Unser Boulevard to relieve some of this potential cut-through. For those streets with direct residential driveway access, traffic calming treatments could also be looked at such as chicanes, speed bumps, dividers etc. to encourage more use of Sweet Dreams Drive, which does not have direct driveway access.

SAMM Deceleration Lengths Guidance

Table 18.K-1 from the *NMDOT Access Manual* was used to determine deceleration and taper lengths for warranted and recommended auxiliary right turn lanes and left turn lanes.

Assuming a posted speed limit of 40 mph slowing to 15 mph to make a turn, the NMDOT recommended deceleration distance for Westside Boulevard was found to be at a minimum of 300 feet with a taper length of 125 feet. If slowing to stop condition from 40 mph, the recommended deceleration length is 325 feet. Both conditions assume the left and right-turn lane is incorporating a 12-foot width measured from the through lane to the edge of pavement.

Based on a 30 mph speed limit slowing to a 15 mph turning speed, the recommended SAMM deceleration distance on Black Arroyo Boulevard was found to be 175 feet with a taper length of 75 feet assuming a 12-foot wide turn lane.

Any auxiliary lanes proposed the remaining minor collectors (10th Street, Isabel Road, Viga Road, and Spine Road) would require a minimum of 130-foot pocket length with a taper length of 50 feet Assuming a 25 mph speed limit slowing to 15 mph to make a turn. If slowing to a stop conditions from 25 mph, the pocket length requirement increases to 150 feet with the same 50-foot taper length. Again a 12-foot turn lane width is assumed.

Queue Length Analysis

Analysis of auxiliary turn demands and storage lane lengths based on a 50th and 95th percentile confidence levels at all off-site study intersection movements in which the project contributes demand are summarized in **Table 5**.

Table 5. Off-Site Queue Demand Analysis Summary

Intersection	Movement	Existing				Background				Buildout				6 Lane Buildout				Storage Length Present (ft)	Recommended Storage Length (ft)
		AM		PM		AM		PM		AM		PM		AM		PM			
		50th Percentile (ft)	95th Percentile (ft)	50th Percentile (ft)	95th Percentile (ft)	50th Percentile (ft)	95th Percentile (ft)	50th Percentile (ft)	95th Percentile (ft)	50th Percentile (ft)	95th Percentile (ft)	50th Percentile (ft)	95th Percentile (ft)	50th Percentile (ft)	95th Percentile (ft)	50th Percentile (ft)	95th Percentile (ft)		
Unser / Southern	EBR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	450	Maintain Existing
	WBL	74	114	121	156	298	443	385	603	376	554	562	759	277	445	264	393	290	Maintain Existing
	NBL[1]	77	100	188	310	94	126	381	284	119	204	420	265	115	201	447	493	520	Maintain Existing
	NBR	5	38	34	60	6	68	130	78	164	256	196	86	29	123	62	166	330	Maintain Existing
Unser / Cabezon	EBR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	145	Maintain Existing
	WBL	44	84	69	126	119	208	193	350	157	242	215	385	75	136	87	154	150	Maintain Existing
	NBL	4	12	28	42	7	18	63	42	60	66	187	132	35	68	115	135	235	Maintain Existing
	NBR	0	0	5	11	1	8	24	9	0	0	42	22	0	30	24	41	250	Maintain Existing
Unser / Westside	EBL	6	21	5	19	32	64	91	134	93	155	249	372	73	124	190	292	305	Dual Left Turn Lanes
	EBR	0	0	0	0	0	0	0	0	0	48	36	126	0	55	82	145	200	Maintain Existing
	NBL	2	10	14	29	17	20	37	38	387	447	106	106	115	201	147	159	250	Dual Left Turn Lanes
Unser / McMahon	EBR	0	39	0	0	0	49	0	0	0	55	0	47	0	52	0	24	160	Maintain Existing
	WBR	0	33	24	106	37	79	238	364	107	94	289	492	50	95	159	243	170	Maintain Existing
	NBL[1]	17	36	54	86	19	39	64	101	52	85	90	161	44	76	69	107	285	Maintain Existing
	SBL[1]	118	163	111	154	168	202	179	260	207	209	260	298	156	195	185	269	300	Maintain Existing

1. Existing Dual Turn Lanes

Based on the summarized results the following observations and recommendations are given:

- Existing storage lengths that are expected to accommodate projected 95th percentile queue demands are coded in green and storage lengths that are currently or are expected to be deficient are coded in red.
- As indicated most existing storage lengths are anticipated to accommodate the worst case left-turn demands.
- As mentioned, the westbound left-turn lane at the Unser Boulevard/Southern Boulevard intersection is currently over capacity. Therefore even though the analysis indicates that 95th percentile queue demands are accommodated under existing conditions, it is possible that during commuter peak hours, the existing turn pocket is exceeded. Analysis indicates that if the existing storage is not exceeded today it will be under background traffic demands for both 50th and 95th percentile demands. Unfortunately, there is no additional room to extend this pocket due to an existing adjacent left-turn pocket east entering the Sandia Plaza commercial center. Additionally, as the Unser Boulevard/Southern Boulevard intersection has been fully constructed without accommodation for dual lane geometry. Therefore no mitigation can be implemented at this time.
- The existing storage length provided for the westbound left-turn lane at the Unser Boulevard/Cabezon Boulevard intersection is expected to be exceeded under Background traffic demands for both 50th and 95th percentile conditions. Again, no additional storage length can be gained from lengthening the pocket as it is restricted by an adjacent east left-turn pocket turning into the commercial site on the northeast corner of the Cabezon Boulevard intersection. Dual left-turn lanes were recommended by the Cabezon traffic study. However, this recommendation does not appear to have been implemented. Dual left-turns could be accommodated by converting the right-turn only lane to a right-through lane and striping the through lane as another left-turn. This would actually improve lane alignment across the intersection. However, it does not appear that both eastbound and westbound left-turning paths could be accommodated simultaneously with this geometry. If duals were to be implemented at this approach, turning templates would need to be reviewed and potentially median adjustments made and construction should be the responsibility of the Cabezon project as it was originally recommended as part of that construction.
- Existing eastbound left-turn lane storage capacity at the Westside Boulevard intersection is anticipated to be exceeded by 95th percentile queue demands under build out conditions in the PM peak period. The eastbound approach currently has room to accommodate dual left-turn lanes to accommodate greater queue demands, but would require median/approach modifications including completing and aligning the receiving lanes on the west leg. It is therefore recommended that the eastbound left-turn movement be restriped to accommodate dual left-turn lanes at approximately 85% of the development. It should be noted that with the introduction of dual left-turn lanes, the movement should be converted from its existing

protected-permitted phasing to protected only. This will result in a slight increases in delay for this movement.

- The existing northbound left-turn lane storage at the Westside Boulevard intersection is expected to be to be exceeded by both 50th and 95th percentile queue demands under AM peak Build out conditions. Current northbound geometry will accommodate dual left-turn lanes and is therefore recommended to accommodate anticipated queue and operation demands. This will require that the downstream side of the west leg of the Westside Boulevard intersection should incorporate two receiving lanes until the boundary of the proposed X-Ray site and then taper down to one westbound lane on Westside Boulevard. Tapers should incorporate 320 feet per 2009 MUTCD assuming a 12-foot wide lane and a 40 mph speed limit.
- The eastbound right-turn lane at the McMahon Boulevard intersection is expected to be exceeded for both 50th and 95th percentile queue demands under background demands for both peak periods. Currently, the potential for increasing the storage length for this movement is limited by the entrance to the adjacent Walgreens currently located at the northeast corner of the McMahon Boulevard intersection. The pocket could be lengthened by a maximum of only 75-feet, which would put the pocket taper right at the Walgreen's entrance curb return, which is not desirable. Since it is expected that the existing lane length is exceeded under background traffic demands, no mitigation of this turn pocket is recommended as part of Los Diamantes improvements.

On-site auxiliary turn lanes were also analyzed for 50th and 95th percentile confidence levels and are summarized as **Table 6**.

Table 6. On-Site Queue Demand Analysis Summary

Intersection	Movement	Buildout				Recommended Storage Length (ft)
		AM		PM		
		50th Percentile Queue (ft)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	95th Percentile Queue (ft)	
Driveway A	WBL	0	0	0	0	300
Westside Blvd & Spine Road	WBL	2	9	8	30	325
	WBR	0	32	0	25	325
	SBL	4	21	22	53	150 [1]
Westside Blvd & 10th Streeet	WBL	0	0	0	4	300
	EBL	0	0	0	0	300
	NBL	0	26	0	6	150
Black Arroyo Blvd & Isabel Road	SBL	0	0	0	0	150
	WBR	0	0	0	0	75

[1] Dual Left Turn Lane Length

Based on the summarized results the following observations and recommendations are given:

- In most cases, queue demands are low enough that NMDOT SAMM deceleration requirements would control pocket length rather than storage needs.
- Many locations showed a 50th and 95th percentile queue of zero due to the fact that these movements are uncontrolled approaches.
- As mentioned in the capacity analysis section of this report dual left-turn lanes are proposed at the southbound approach to the Westside Boulevard from the Spine Road when the intersection becomes signalized. It is anticipated that that eventually this proposed signal will be coordinated along Westside Boulevard and thus longer cycle lengths than the initial 100 second cycle length assumed in the table would be applied. A quick analysis of potential queue length demands under a 150 second cycle length indicates 95th percentile queues of over 100 feet. Therefore a 150-foot storage length was recommended, which is consistent with deceleration needs on a 25 mph road (Spine Road).

On-Site Street Classifications

Westside Boulevard – Per the 2040 long range roadway map, Westside Boulevard is proposed as a Community Primary arterial that will ultimately incorporate 106 feet of ROW with two through lanes and a bike lane in each direction, a raised median, and a 40 mph speed limit. A review of the latest master bike facilities plan indicates no proposed multi-use trail along Westside Boulevard. However, it is noted that an existing multi-use trail existing along the south side Westside Boulevard east of Unser Boulevard, which terminates approximately 680 feet short of the Unser Boulevard/Westside Boulevard. For the build-out of this project, Westside Boulevard will incorporate one through lanes in each direction from 10th Street to middle driveway of the proposed Pavilion development located at the southwest corner of the Unser Boulevard/Westside Boulevard intersection.

As discussed in the Phased Access section of this report, a two lane section on Westside Boulevard is anticipated to accommodate project build out trip demands. Between Viga Road and 10th Street, Westside would be fully improved incorporating the ultimate four-lane cross-section with raised median, bike lanes, curb, gutter and sidewalk. Based on this report's capacity analyses, it is expected that dual left-turn lanes would be required for north too west movements from Unser Boulevard. Therefore, two receiving lanes on Westside Boulevard will be required on the west leg of the Unser Boulevard intersection and thus Westside Boulevard is recommended to incorporate a four-lane section between the X-ray development to Unser Boulevard. Currently, Westside Boulevard has sufficient pavement to accommodate two through lanes as constructed by the X-Ray development and thus restriping would be needed.

As future infill development continues along Westside Boulevard, the ultimate cross section for this roadway will be a four-lane section with raised medians.

Currently, there are only two ABQ Ride transit routes within the study area. These include Route 96 and 155 on Unser Boulevard and Routes 251 and 551 on Southern Boulevard. There are no existing or planned local transit routes along Westside Boulevard. Therefore transit stops, turnouts etc. are not required as part of this project.

10th Street – 10th Street is proposed as a local residential road incorporating 50 feet of ROW and one undivided through lane in each direction with a 25 mph speed limit. As mentioned, a new 10th Street T-intersection with Isabel Road is proposed. Anticipated build out ADT for this roadway is 7,730, which is well below the LOS D threshold (11,180 ADT) for a two-lane roadway per the 2010 HCM Exhibit 16-4.

Isabel Road – Isabel Road is proposed as a minor collector incorporating 78 feet of ROW, one undivided through lane in each direction and a 25 mph speed limit. Full improvements including curb, gutter and sidewalks will be constructed along the project frontage (north side only) from Viga Road to 10th Street. Isabel Road is recommended to divert from its current alignment east of 10th Street to provide a intersection with Black Arroyo Boulevard that has no skew. Safety research has shown significant increases crash risks of all types at intersection with skew. According to the 2010 Highway Safety Manual (HSM), crash occurrence will increase by 1% for every 2 degrees less-more than 90 at intersections. Anticipated build out ADT for this roadway is 1,890, which is well below the LOS D threshold (11,180 ADT) for a two-lane roadway per the 2010 HCM Exhibit 16-4.

Viga Road – Viga Road is proposed as a local road incorporating 50 feet of ROW, one undivided through lane in each direction and a 25 mph speed limit. Only the business park is proposed to take access off of Viga Road and no residential access is planned south of Westside Boulevard. Viga Road will be constructed from Isabel Road to just south of Westside Boulevard and starting on the north side of Westside Boulevard to the north boundary of the business park property with full improvements of sidewalk, curb and gutter on the southeast side abutting the project site. The north leg of Viga Road is recommended to be aligned with Driveway A (westernmost driveway on Westside Boulevard). Anticipated build out ADT for this roadway is 580, which is well below the LOS D threshold (11,180 ADT) for a two-lane roadway per the 2010 HCM Exhibit 16-4.

Spine Road (Residential) – The Spine Road within the Residential area is proposed to be a public local residential street to incorporate 68 feet of ROW including one through lane in each direction, a minimum 5-foot sidewalk, curb, gutter, and narrow raised landscape medians. Based on anticipated residential traffic, auxiliary lanes are not recommended within the residential portion of the development and in fact could reinforce the fact that this spine road is a residential street and not a major collector road or connector. There will be no direct residential driveway access along this roadway. It is anticipated that this road will incorporate a 25 mph speed limit.

Spine Road (Business Park) – The Spine Road north of Westside Boulevard is proposed to be a public local street to incorporate 98 feet of ROW including one lane of traffic, curb gutter, and sidewalk in each direction. Additionally, due to anticipated traffic intensity and the density of the development, auxiliary lanes are recommended to all future major parcel access points along this alignment. There will likely be raised landscaped medians along this alignment within the business park. It is anticipated that this road will incorporate a 25 mph speed limit. Anticipated build out ADT for this roadway is 7,170, which is well below the LOS D threshold (11,180 ADT) for a two-lane roadway per the 2010 HCM Exhibit 16-4.

Cul-de-Sac Road (Business Park) – This proposed access road is to incorporate 50 feet of ROW and provide access for the most commercial parcels to the proposed Spine Road. This access street will terminate in a cul-de-sac at its southwest and northeast termini. It is anticipated that this road will incorporate one undivided lane, curb, gutter, and sidewalk in each direction. No auxiliary turn lanes are anticipated for this alignment. This is recommended to incorporate a 25 mph speed limit.

Local Residential Streets – All residential parcel access roads are proposed to incorporate 50-feet of ROW including one through lane, curb, gutter and sidewalk in each direction. These residential streets will provide direct access to residential driveways and incorporate a 25 mph speed limit.

Unser Boulevard Coordination Analysis

Per the agreed upon scope with City of Rio Rancho, a coordination analysis of Unser Boulevard was required. Existing signal timings and coordination plans were requested from both the CoRR and CoA. Currently, the corridor is coordinated from Southern Boulevard to Westside Boulevard incorporating a 116 second cycle length for the AM and PM plans. It should be noted that McMahon Boulevard is a CoA maintained signal, which is coordinated with Unser Boulevard intersections to the south, but is not coordinated with CoRR maintained signals.

Subsequently, several Synchro models of the Unser Boulevard study corridor from Southern Boulevard to McMahon Boulevard was created for the following scenarios:

- **Existing Conditions** – For this scenario existing timings including splits, pedestrian times, cycle lengths and offsets were maintained under existing traffic control and lane geometry. No optimization was conducted for this option and will be used a baseline comparison with the other scenarios.
- **Background (2020) with Existing Cycle Lengths** - This scenario maintained existing cycle lengths, but green splits and offsets were optimized under projected 2020 background traffic demands and proposed lane geometry.
- **Background (2020) with Optimized Cycle Lengths** – This scenario is identical to the previous one, but with cycle lengths optimized. It should be noted that Synchro analysis indicates that the optimized cycle length was 150 seconds as this is the natural cycle length at the Southern Boulevard intersection due to heavy traffic demands from all directions. This cycle length is extremely long and would tend to increase queue lengths as well as incur much longer wait times on minor street approaches. It was therefore decided that a shorter cycle length that performed similarly would be chosen.
- **Build Out (2020) –** This scenario applies project build out demands under proposed lane geometry to the model. Signal cycle lengths, green splits, and offsets were then optimized. Cycle optimization approach was the same as the previous scenario.
- **Build Out (2020) with Six Lane Unser Boulevard** - This scenario assumes that Unser Boulevard has widened to a six-lane arterial. Green splits, offsets and cycle lengths were then optimized under project build out traffic demands and proposed lane geometry.

A summary of the assumed cycle lengths for each scenario for the AM and PM peak plan are summarized in **Table 6**. It should be mentioned that no midday nor intermediate plans were modeled as trip generation rates are specifically for AM and PM commuter peak periods. There is no trip generation data for midday generation.

Table 6. Assumed Cycle Length Summary

Scenario	Cycle Length (s)	
	AM	PM
Existing (2015)	116.0	116.0
Background (2020) 116s	116.0	116.0
Background (2020)	130.0	140.0
Buildout (2020)	140.0	150.0
Buildout 6 Lanes (2020)	120.0	120.0

To compare scenario performance, arterial level of service was reported for each timing scenario. Arterial level of service (LOS) assigns a letter grad from A to F based on travel time, speed, and delay. Arterial LOS are summarized for each scenario in **Table 7**.

Table 7. Arterial Capacity Analysis Summary

Scenario	NB						SB					
	AM			PM			AM			PM		
	Travel Time (s)	Speed (MPH)	LOS	Travel Time (s)	Speed (MPH)	LOS	Travel Time (s	Speed (MPH)	LOS	Travel Time (s)	Speed (MPH)	LOS
Existing (2015)	235.1	29.3	B	286.0	28.1	B	212.2	30.6	B	208.2	31.2	B
Background (2020) 116s	417.8	18.7	D	648.9	14.0	E	249.3	26.0	C	335.8	19.3	D
Background (2020)	253.8	30.8	B	480.9	18.8	D	227.9	28.5	B	248.1	26.2	C
Buildout (2020)	243.8	25.7	C	515.3	14.4	E	242.7	26.7	C	254.3	25.5	C
Buildout 6 Lanes (2020)	224.6	29.2	B	249.3	26.3	C	190.8	34.0	B	203.4	31.9	B

Based on the above table, the following observations and conclusions are made:

- Currently, Unser Boulevard corridor is operating at a LOS B northbound and LOS B southbound, indicating for both peak periods under existing conditions.
- Unser Boulevard coordination worsens significantly if the current cycle length is maintained under projected 2020 background demands dropping from LOS B to LOS D and E for northbound AM and PM.
- If cycle length is lengthened to 130 to 140 seconds, some improvements are realized in travel time and delay improving most directions to LOS B with northbound PM operating at LOS D. It should be noted that some movements queue length demand will increase and minor street movements will experience increased delay due to increased cycle lengths.
- Arterial LOS reduces slightly when project site trips are added to the background.

- Unsurprisingly, when Unser Boulevard becomes a six lane arterial, corridor operation improves significantly due to capacity improvements. Additionally, with the added capacity the optimized cycle length is shortened. This will improve queue lengths and side street wait times.
- If a cycle length change on Unser Boulevard is implemented, the cycle lengths will also have to change on Southern Boulevard to maintain coordination on that corridor. This means that offsets would need to be adjusted on Southern Boulevard as well.
- Unser Boulevard is a lengthy corridor, which traverses both the City of Rio Rancho and City of Albuquerque. In order to provide a consistent and optimal coordinated corridor, both the Cities would need to coordinate timing plans between them.

Crash Analysis

Crash data for the years 2012 to 2014 were collected from the CoRR for Unser Boulevard intersections with Southern Boulevard, Cabezon Boulevard, and Westside Boulevard and from MRCOG for the Black Arroyo Boulevard and McMahon Boulevard intersections. In general, direction of travel, crash classification and in many cases an identified crash cause is not identified in the data provided. Therefore the approach, lane, vehicle movements and in some cases what type of crash occurred could not determine. A summary of the crash data is provided in **Tables 8 through 10** with raw crash data provided in **Appendix J.**

Table8. Crash Summary for City of Rio Rancho Intersections

		Unser Blvd/Southern Blvd	Unser Blvd/Cabezon Blvd	Unser Blvd/Westside Blvd
Total Crashes		**106**	**41**	**51**
by Year	2012	34	14	17
	2013	39	9	10
	2014	33	17	24
by Severity	PDO	70	22	33
	Injury	34	19	18
	Fatality	2	0	0
	% Injury	*32%*	*46%*	*35%*
by Time	Daytime	86	30	42
	Nighttime	20	11	9
	% Night	*19%*	*27%*	*18%*

Table 9. Crash Summary for City of Albuquerque Intersections

		Unser Blvd/Black Arroyo Blvd	Unser Blvd/McMahon Blvd
Total Crashes		**11**	**71**
by Year	2010	4	21
	2011	6	22
	2012	1	28
by Severity	PDO	10	55
	Injury	1	16
	Fatality	0	0
	% Injury	*9%*	*23%*
by Time	Daytime	11	52
	Nighttime	0	19
	% Night	*0%*	*27%*

Table 10. Crash Type Summary

		Unser Blvd/Southern Blvd	Unser Blvd/ Cabezon Blvd	Unser Blvd/ Westside Blvd	Unser Blvd/ Black Arroyo Blvd	Unser Blvd/ Mcmahon Blvd
by Type	Alcohol	5	1	5	0	3
	Excessive Speed	0	1	0	0	1
	Speed too Fast for Conditions	2	0	1	0	0
	Following Too Close	14	10	11	1	10
	Defective Tires	0	0	0	0	0
	Driver Inattention	19	5	8	2	27
	Avoid no Contact-other	0	0	0	0	0
	Failed to yield	11	6	3	4	9
	Improper Lane Change	4	2	2	1	0
	Improper Turn	3	1	0	0	1
	Poor Driving	1	1	1	0	1
	Unknown	3	0	0	0	0
	None	6	0	0	0	6
	Avoid no Contact-Vehicle	1	2	0	0	4
	Improper overtaking	0	0	2	0	2
	Mechanical Defect	0	1	2	0	2
	Improper Backing	1	0	0	1	0
	Passed Stop Sign	1	0	0	1	0
	Pedestrian Error	0	0	0	0	1
	Red light running	4	2	2	0	2
	% Driver Inattention	*25%*	*16%*	*22%*	*20%*	*39%*
	% Following too Close	*19%*	*31%*	*30%*	*10%*	*14%*

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

- The greatest observed crash occurrences were seen at Southern Boulevard and McMahon Boulevard with 106 and 71 within a three year period.
- There were two fatalities occurring at Unser Boulevard/Southern Boulevard intersection. The data does not indicate crash classification or cause.
- Most observed crashes occurred in the daytime and were property damage only.
- From 2010-2012, Driver Inattention and Following too close was the most common type of crash, which can be indicative of corridor congestion resulting in rear-end crashes.

Sight Distance Analysis

Sight distance requirements were calculated based on the 2011 AASHTO "Green Book" Chapter 9.5. Two sight distance cases were used for analysis.

Case B1 – A stopped vehicle turning left from a minor street approach onto a major road

Case B2 – A stopped vehicle turning right from a minor street approach on to a major road

Required intersection sight distance along Westside Boulevard and 10th Street for Case B1 was calculated based on a passenger car (Predominantly residential driveways) and combination truck (Predominantly business park driveways) as the design vehicle crossing two lanes of divided roadway into the first lane of traffic. Required sight distance time gap for case B2 was calculated based on a passenger car and combined truck s the design vehicle crossing into the first lane of roadway. Sight distance calculations are included in **Appendix K** of this report and are summarized below:

For Combination truck:
Case B1 – 840 feet

Case B2 – 620 feet

For Passenger car:
Case B1 – 610 feet

Case B2 – 390 feet

Required intersection sight distance at Site Driveways for Case B1 was calculated based on a combination truck as the design vehicle crossing one lanes of divided roadway into the first lane of traffic. Required sight distance time gap for case B2 was calculated based on a truck trailer as the design vehicle crossing into the first lane of roadway. Sight distance calculations are included in **Appendix K** of this report and are summarized below:

Case B1 – 310 feet

Case B2 – 240 feet

Sight triangle dimensions were then drawn and are shown in **Figure 17-24**. The decision point was assumed to be 14.5 feet back from the edge of the shoulder and midway between the outbound drive-way lanes. The sight triangles are indicated with hatching. The dimensions are shown. The construction and placement of obstructions should not be within the identified sight triangles in order to maintain appropriate sight distance for this driveway.

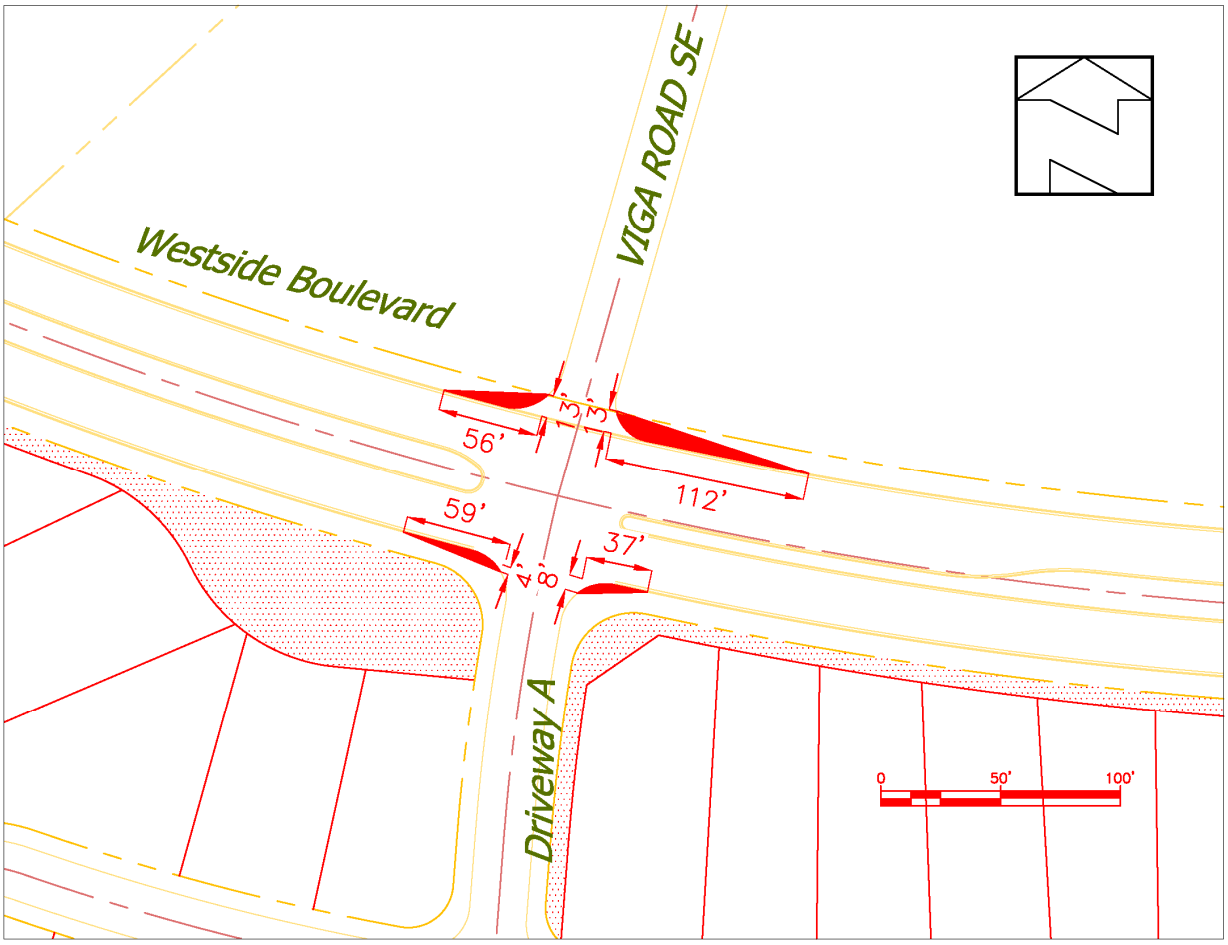

Figure 17. Sight Distance Layout for Driveway A and Viga Road

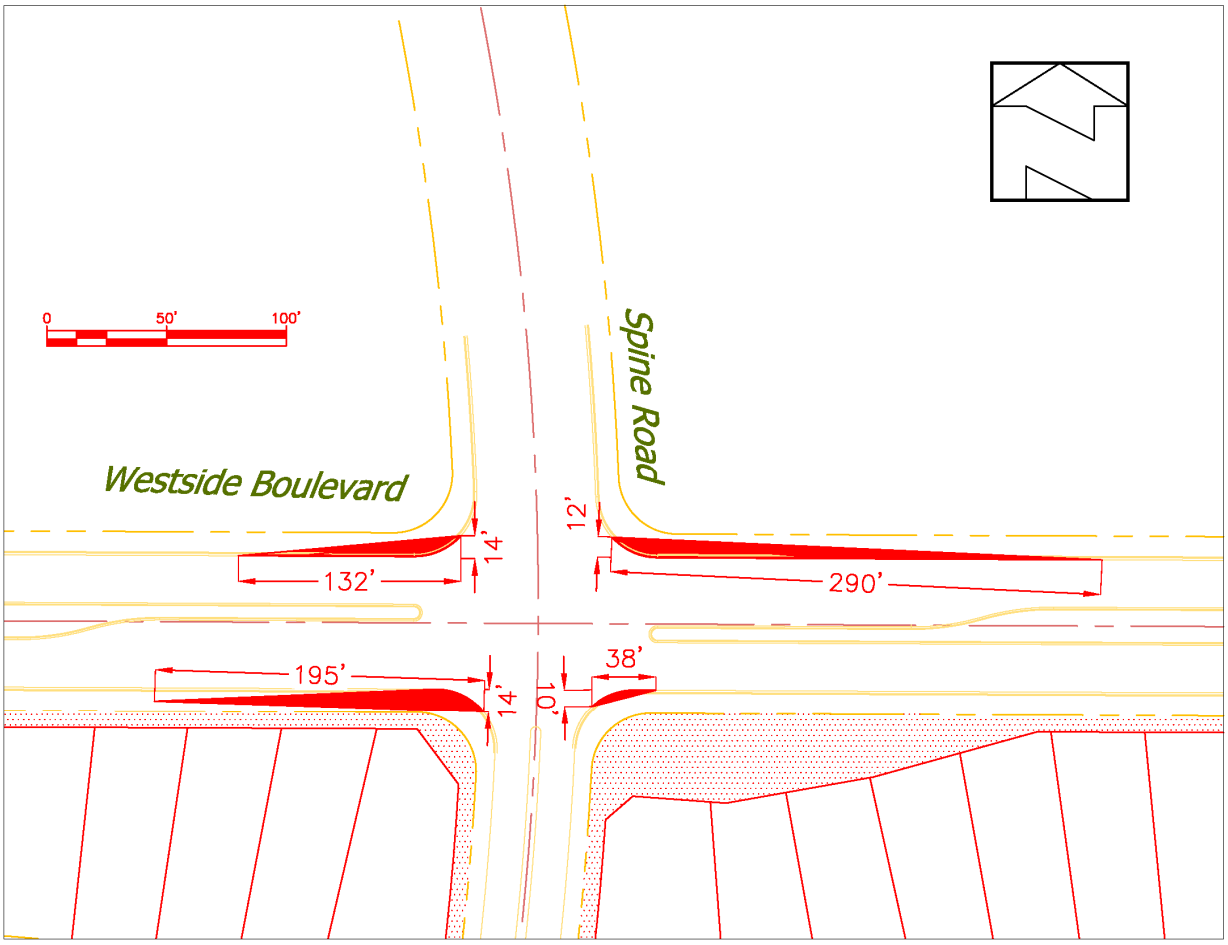

Figure 18. Sight Distance Layout for Westside Blvd and Spine Road

Figure 19. Sight Distance Layout for Driveway E

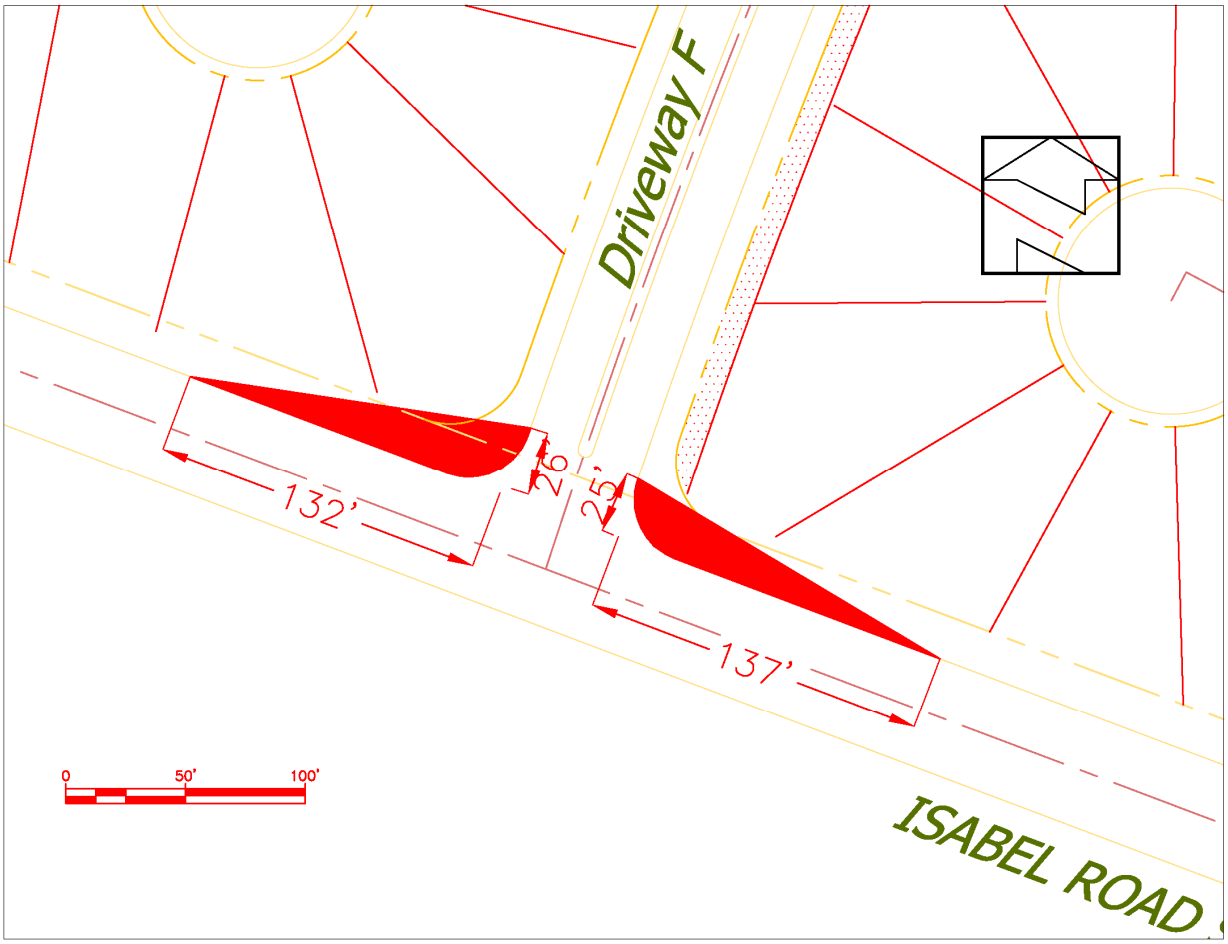

Figure 20. Sight Distance Layout for Driveway F

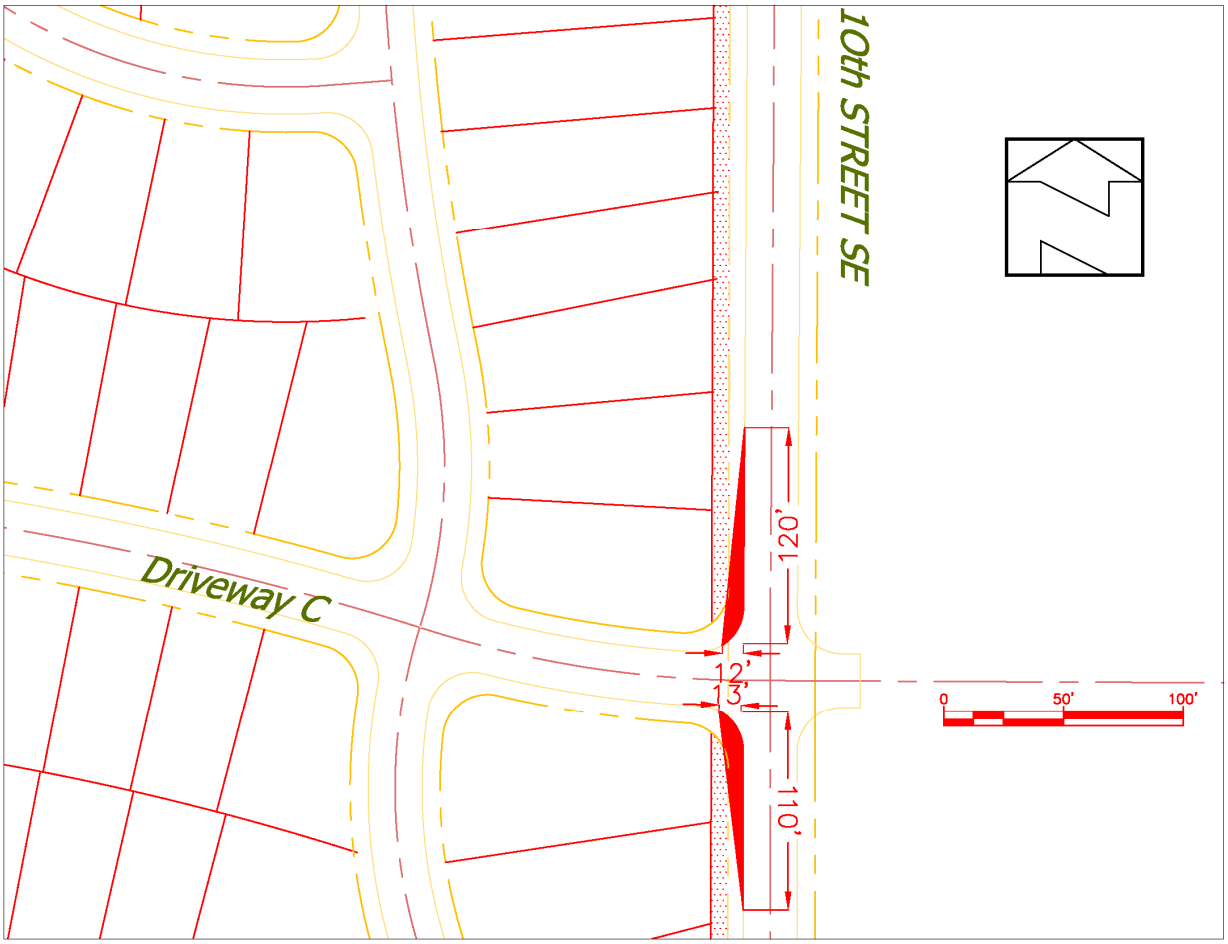

Figure 21. Sight Distance Layout for Driveway C

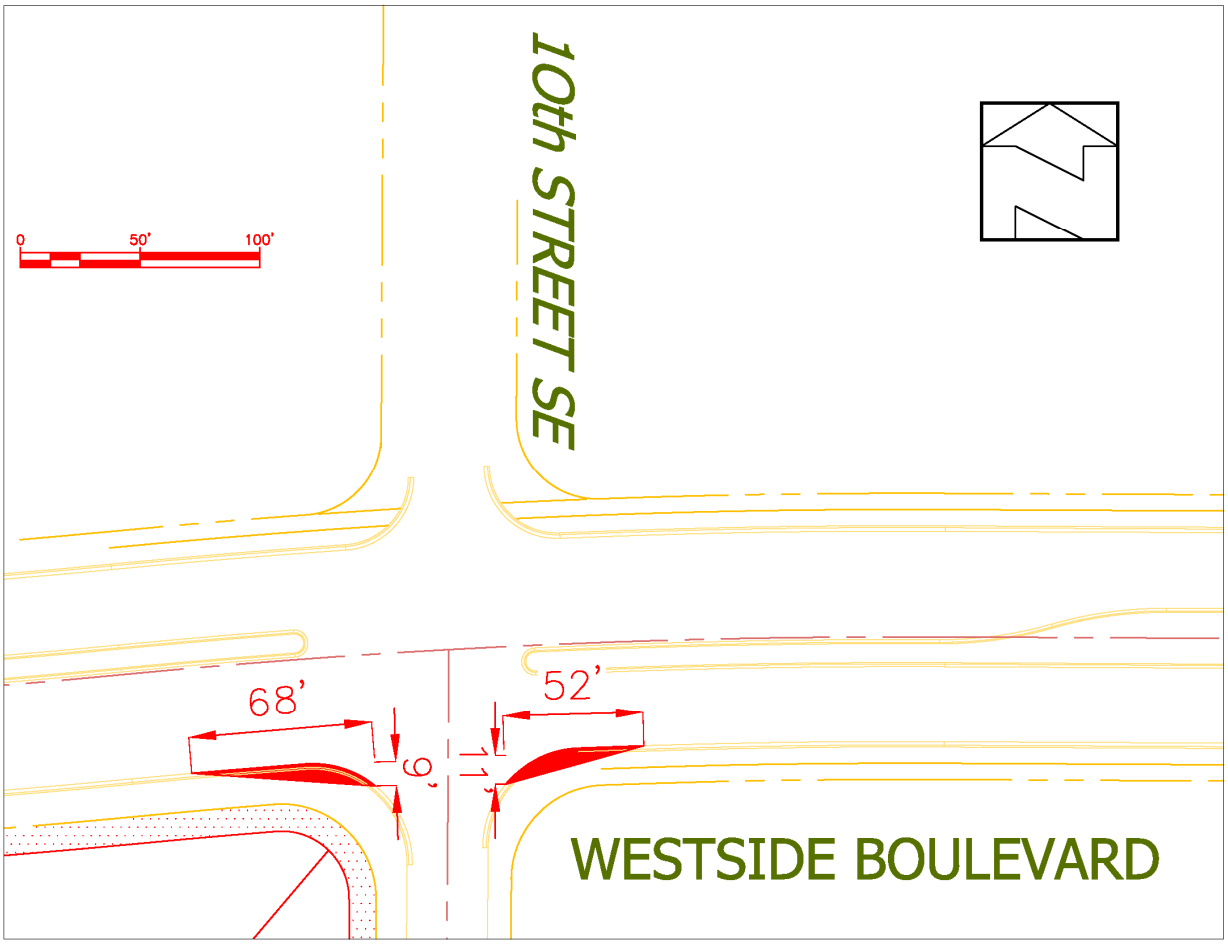

Figure 22. Sight Distance Layout for Westside Boulevard and 10th Street

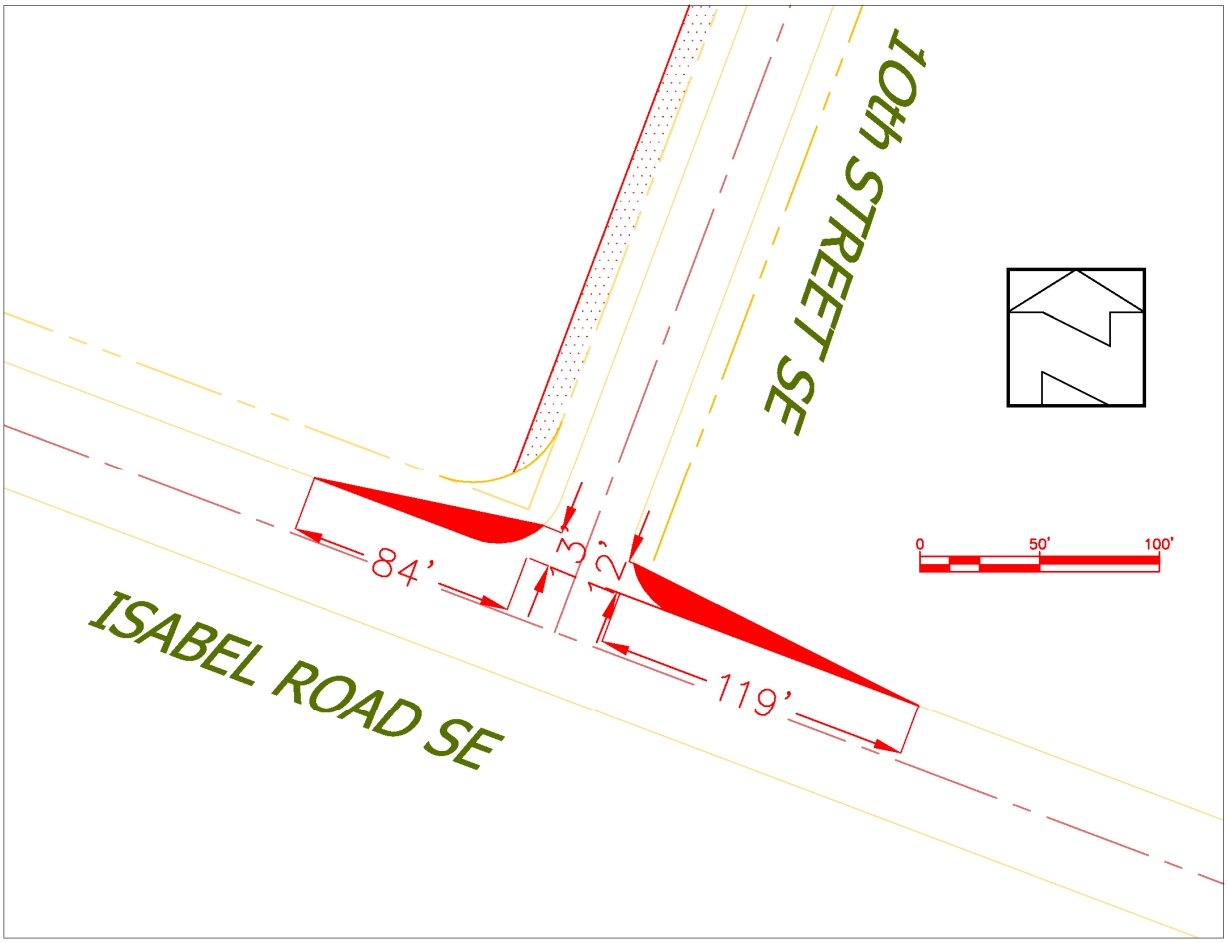

Figure 23. Sight Distance Layout for Isabel Boulevard and 10th Street