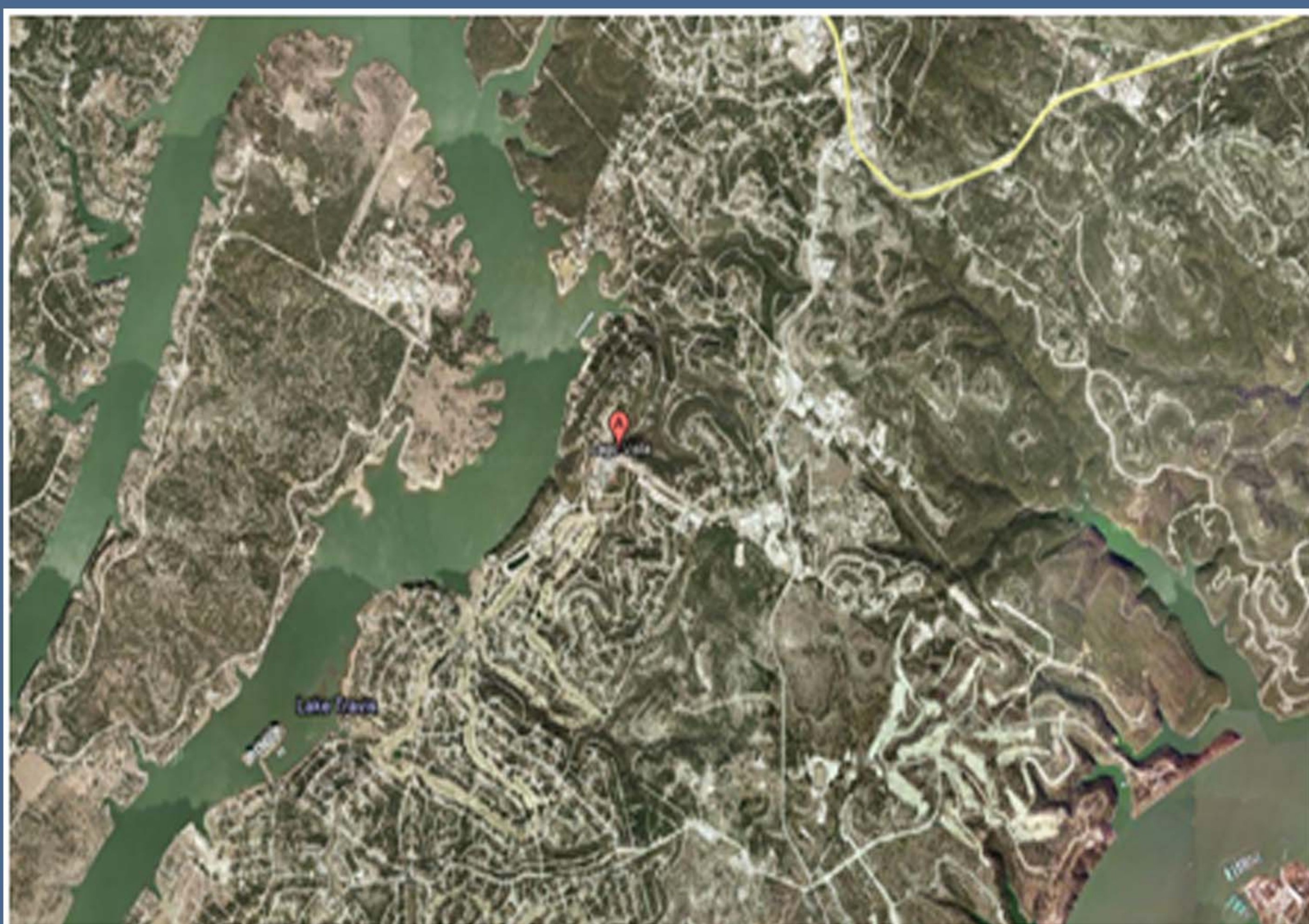
# City of Lago Vista

## *Transportation Plan Evaluation*

## *Final Report*

HDR | WHM One Company | Many Solutions

504 Lavaca Street, Suite 1175 | Austin, TX 78701
Tel 512-904-3700 | Fax 512-904-3773
www.hdrinc.com | www.whmeng.com

July 15, 2009

# CITY OF LAGO VISTA

## < *TRANSPORTATION PLAN ANALYSIS* >

FINAL REPORT

Prepared for

**City of Lago Vista**

5803 Thunderbird Street

Lago Vista, Texas 78645 USA

Prepared by

**HDR Engineering, Inc.**

**Texas P.E. Registration No. F-754**

504 Lavaca Street, Suite 1175

Austin, Texas 78701 USA

Telephone: 512-904-3700

Facsimile: 512-904-3773

STATE OF TEXAS
RASHED TANVIR ISLAM
90183
LICENSED
PROFESSIONAL ENGINEER

7/15/09

July 15, 2009

# TABLE OF CONTENTS

# LIST OF FIGURES

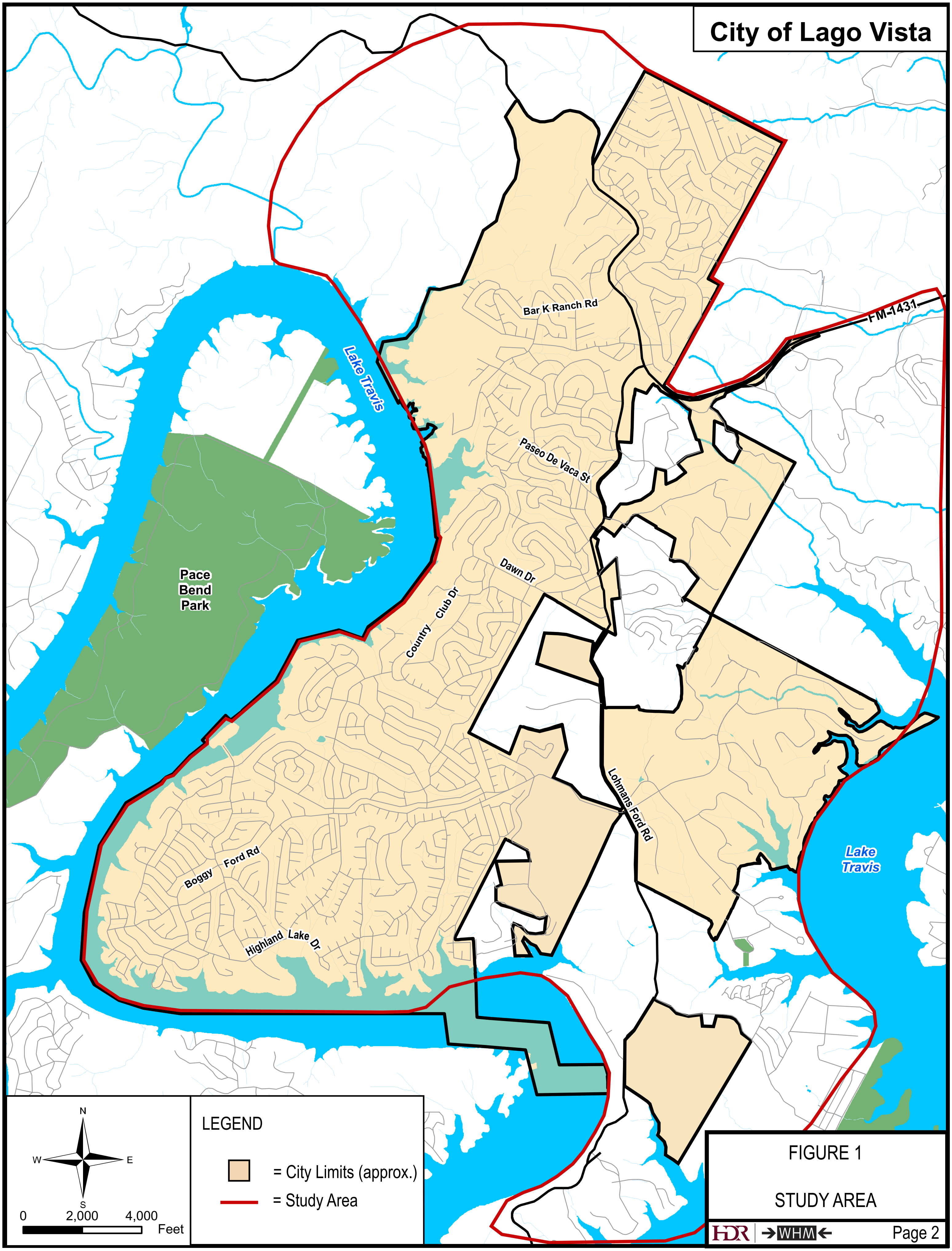
# LIST OF TABLES

## BACKGROUND

The City of Lago Vista has decided to assess its transportation needs as it looks toward a future with significant population growth and increased land development. The purpose of this study is to analyze the City of Lago Vista's current roadway infrastructure and its potential future conditions while accounting for potential increases in traffic growth and changes in land development.


FM 1431 Looking West Through Town

The study area, as shown in Figure 1, includes the current city limits and some surrounding area within the extraterritorial jurisdiction (ETJ). These additional outlying areas were defined in size and land use by City of Lago Vista planning staff.


City of Lago Vista
Bar K Ranch Rd
FM-1431
Lake Travis
Paseo De Vaca St
Pace
Bend
Park
Dawn Dr
Country Club Dr
Lohmans Ford Rd
Boggy Ford Rd
Highland Lake Dr
Lake
Travis
N
W
E
S
0
2,000
4,000
Feet
LEGEND
= City Limits (approx.)
= Study Area
FIGURE 1
STUDY AREA
Page 2

## SCOPE OF WORK

The study area included the geographical area of the City of Lago Vista, from Bison Trail on the west to just east of Lohmans Ford Road along FM 1431 and from just north of FM 1431 to the southern terminus of Lohmans Ford Road. Locations within the city's transportation network to be analyzed were identified based on areas of interest specified by the City of Lago Vista and are shown in Figure 2. The nineteen roadway locations and eight intersections on the existing street network decided upon for evaluation in 2008 and 2030 are listed in Table 1 and Table 2. Base year (2008) counts were conducted in Fall 2008 at each of these locations and are shown in Table 1.

*Table 1.*
*Roadway Traffic Count Locations*

| Loc. # | Analysis Location | 2008 24-Hour Traffic Counts (vehicles per day) |
|---|---|---|
| 1 | FM 1431, north of Bar-K Ranch Road | 2,500 |
| 2 | Bar-K Ranch Road, west of FM 1431 | 1,200 |
| 3 | Bar-K Ranch Road, east of FM 1431 | 300 |
| 4 | FM 1431, south of Bar-K Ranch Road | 5,000 |
| 5 | Dodge Trail, west of FM 1431 | 1,300 |
| 6 | Lohmans Ford Road, west of FM 1431 | 14,300 |
| 7 | FM 1431, south of Lohmans Ford Road | 13,000 |
| 8 | Ridgeview Road, west of Lohmans Ford Road | 900 |
| 9 | Lohmans Ford Road, south of Agarita Drive | 13,300 |
| 10 | Paseo de Vaca Street, west of Lohmans Ford Road | 500 |
| 11 | Lohmans Ford Road, north of Dawn Drive | 12,500 |
| 12 | Dawn Drive, west of Lohmans Ford Road | 4,200 |
| 13 | Lohmans Ford Road, south of Dawn Drive | 8,800 |
| 14 | Lohmans Ford Road, north of Ranch Cielo Court | 8,100 |
| 15 | Lohmans Ford Road, north of Boggy Ford Road | 7,700 |
| 16 | Boggy Ford Road, west of Lohmans Ford Road | 5,300 |
| 17 | Lohmans Ford Road, south of Boggy Ford Road | 3,100 |
| 18 | Boggy Ford Road, west of National Drive | 3,100 |
| 19 | Highland Lake Drive, west of Constitution Drive | 1,200 |

*Table 2.*
*Intersection Traffic Count Locations*

| Loc. # | Analysis Location |
|---|---|
| 1 | FM 1431 and Lohmans Ford Road |
| 2 | FM 1431 and Bar-K Ranch Road |
| 3 | FM 1431 and Dodge Trail |
| 4 | Lohmans Ford Road and Ridgeview Road |
| 5 | Lohmans Ford Road and Paseo de Vaca Street |
| 6 | Lohmans Ford Road and Dawn Drive |
| 7 | Lohmans Ford Road and Boggy Ford Road |
| 8 | Boggy Ford Road and Highland Lake Drive |

Also included in the scope of work was data gathered from field reviews. This information included, but was not limited to, the existing field conditions, traffic flow observations, and the geometrics of all network arterial and collector streets and intersections.

Four scenarios were identified for analysis: existing conditions, build-out conditions, 2030 no-build, and 2030 planned. The existing conditions scenario analyzed existing traffic volumes on the existing roadway infrastructure to identify any current traffic congestion problems or transportation infrastructure-related issues. The build-out scenario analyzed the forecasted traffic volumes generated based on the full build-out of the land use within the City. The 2030 no-build scenario analyzed the forecasted traffic volumes developed based on expected traffic growth due to normal trends and the expected land development absorption on the existing roadway infrastructure. The 2030 planned scenario expanded the 2030 no-build scenario to include roadway infrastructure improvements identified by City of Lago Vista staff.

The goal for this analysis was to identify the existing network deficiencies and to evaluate the planned future local roadway network to determine if planned transportation infrastructure can accommodate the planned land uses. Recommendations will be developed, highlighting revisions to the planned network that address existing deficiencies and accommodate the potential growth associated with the planned land uses.

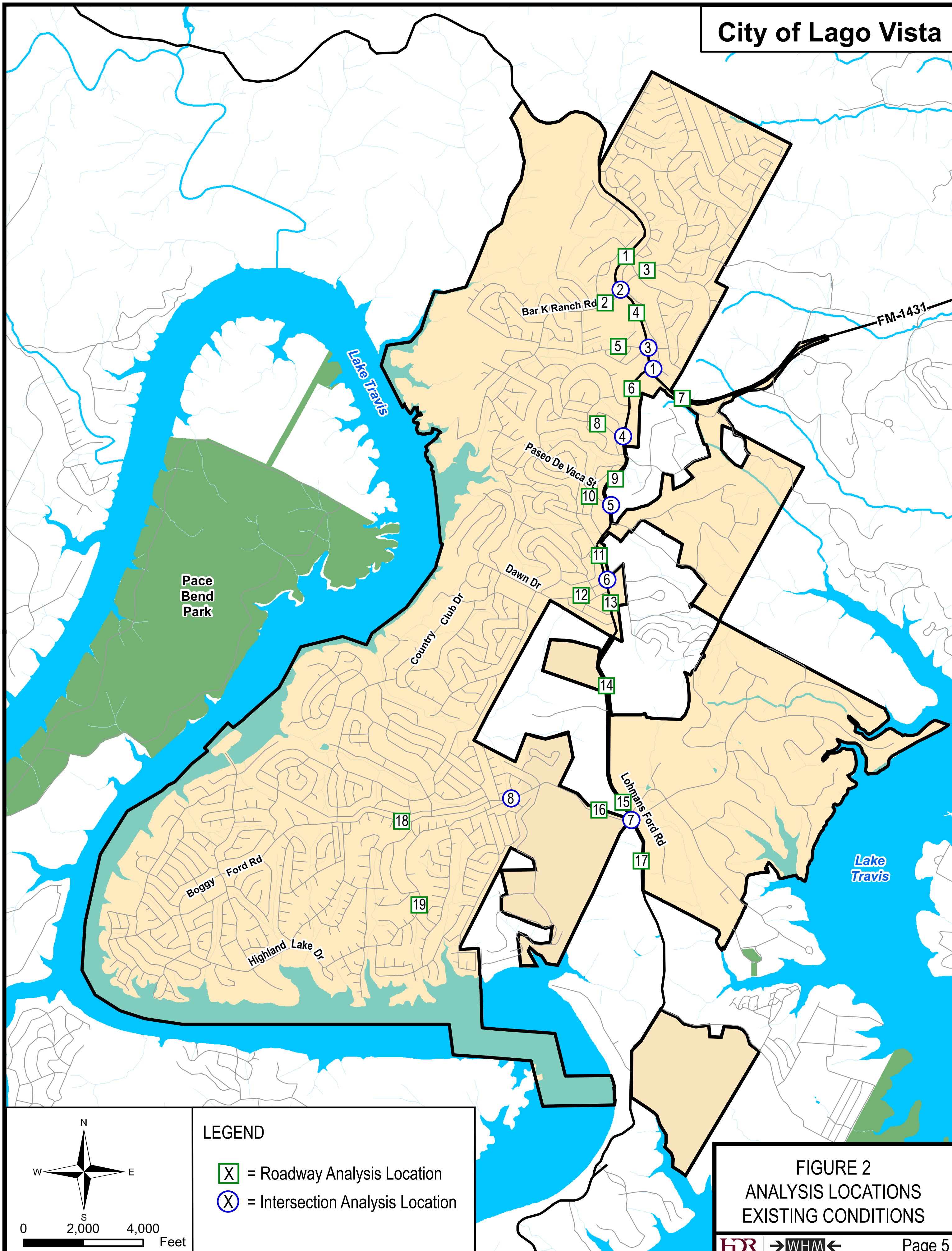



FIGURE 2
ANALYSIS LOCATIONS
EXISTING CONDITIONS

# ANALYSIS APPROACH

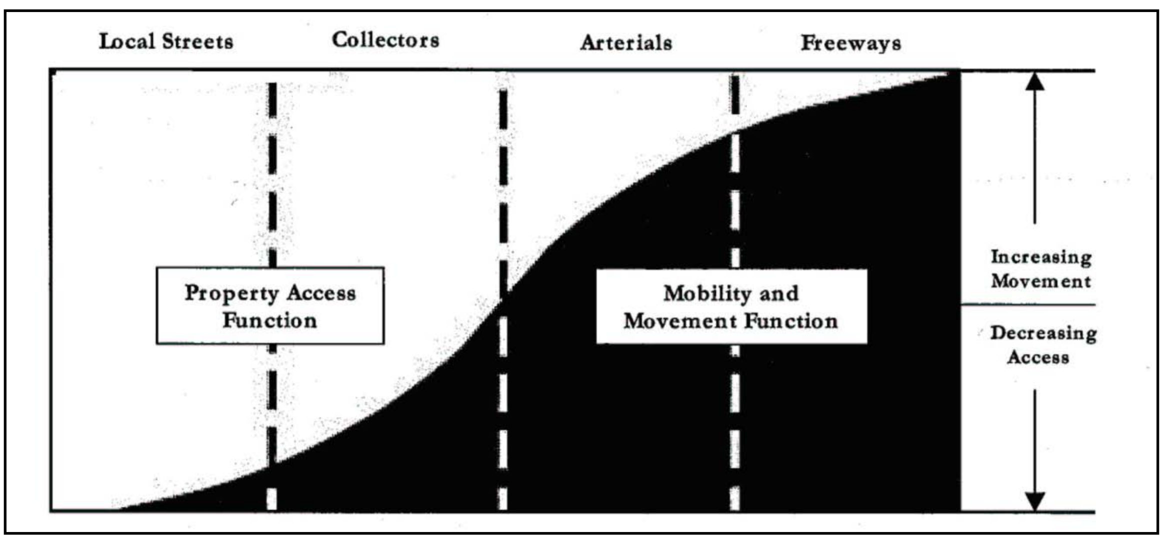
## Functional Classification

The following subsection introduces and defines roadway functional classification and related terminology, as relevant to the analysis of City of Lago Vista's Transportation Plan.

## Roadway Classification

Roadways are classified according to their function. The planning and design of each facility should consider the elements that support the intended function. The classification system is a hierarchy of roadways that facilitates safe and efficient traffic flow throughout the roadway network. There are four (4) classifications of roadways: local, collector, arterial, and freeway. Two key elements of the classification system are the type and amount of traffic the roadway carries. The two ends of the spectrum are local streets, which carry lower traffic volumes and provide high access and low mobility, and freeways, which carry higher traffic volumes and provide low access and high mobility. Figure 3 illustrates access versus mobility in relation to each functional classification.

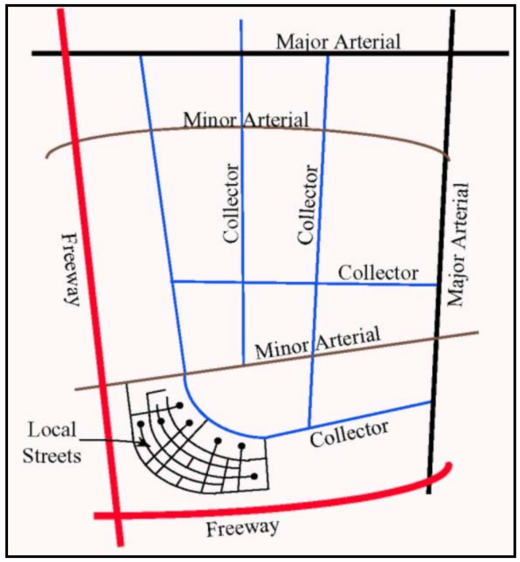
Figure 3
Roadway Functional Classification – Access vs. Mobility




## Functional Characteristics

The following narratives describe the various functional characteristics for each roadway classification. Figure 4 illustrates the connectivity between the various classifications.

Figure 4
Roadway Functional Classification




Local Streets. Local streets provide access to/from land parcels and collect and distribute traffic to/from collector streets. Local streets have minimal through traffic and do not allow for high-speed travel.

Collector Streets. Collector streets collect and distribute traffic between local streets and arterial streets. Collector streets can focus on flow among other collectors, arterials, and freeways, as well as serve more as local streets in non-residential areas by providing access to individual parcels and collecting and feeding traffic to/from collectors and arterials. Boggy Ford Road and Dodge Trail are examples of collector streets.

Arterial Streets. Arterial streets provide limited access and collect and distribute large amounts of through traffic. Arterials accommodate the interaction of traffic between collector streets and other arterials or freeways. There are two (2) levels of arterials are minor to principal, with principal being more regionally focused. FM 1431 is an example of an arterial street.

Freeways. Freeways are divided multi-lane roadways with controlled access via ramps and interchanges. These high-capacity roadways carry through traffic at high speeds and provide regional connections. Currently, no freeways exist within the City's limits.

## Roadway Analysis

The existing conditions in the City of Lago Vista were first considered in the analysis. At the locations indicated in the previous section, 24-hour traffic volumes and peak period turning movement volumes were conducted in October 2008 when school was in session. From field reviews, the roadway geometrics were also obtained at these locations.

The performance of each roadway section was determined by calculating its level of service (LOS), which was based on the roadway's volume-to-capacity (v/c) ratio. For each roadway, directional 24-hour traffic counts were conducted. To calculate the roadway capacity, a per-lane capacity was estimated based on the roadway's functional classification, area type (e.g., suburban), and topography (assumed as rolling for all locations), as outlined in the Capital Area Metropolitan Planning Organization (CAMPO) Mode Choice Model (Ref. 1). The daily capacity of a roadway is calculated by multiplying the total number of lanes on the roadway by the capacity values shown in Table 3. The LOS is determined by calculating the v/c ratio, which is the daily volume on the roadway divided by the total capacity. Based on these ratios, v/c intervals, obtained from CAMPO, were assigned to each LOS. Table 4 shows these assumptions.

*Table 3.*
*Roadway Capacities*

| Area Type | Roadway Classification | Capacity (vehicles/lane/day) |
|---|---|---|
| Urban | Freeway | 22,978 |
| | Principal Arterial Divided | 9,100 |
| | Principal Arterial Undivided | 8,190 |
| | Minor Arterial Divided | 5,460 |
| | Minor Arterial Undivided | 5,005 |
| | Collector | 4,778 |
| Suburban Residential | Freeway | 21,840 |
| | Principal Arterial Divided | 8,418 |
| | Principal Arterial Undivided | 7,508 |
| | Minor Arterial Divided | 5,005 |
| | Minor Arterial Undivided | 4,550 |
| | Collector | 4,095 |
| Rural | Freeway | 13,195 |
| | Principal Arterial Divided | 5,915 |
| | Principal Arterial Undivided | 5,233 |
| | Minor Arterial Divided | 3,640 |
| | Minor Arterial Undivided | 3,185 |
| | Collector | 1,820 |

*Table 4.*
*Volume-to-Capacity Ratio Intervals per LOS*

| LOS | V/C |
|---|---|
| A | < 0.30 |
| B | > 0.30 and < 0.45 |
| C | > 0.45 and < 0.65 |
| D | > 0.65 and < 0.85 |
| E | > 0.85 and < 1.00 |
| F | > 1.00 |

Based on Texas Department of Transportation average annual daily traffic counts on FM 1431, an overall average of two (2) percent annual traffic growth has occurred along FM 1431 since 1995. The historical growth within the City has played a factor in the growth along FM 1431 since it provides the main access route for the City. In developing the forecasts, this relationship was taken into account, and the through trips along FM 1431 were increased by two (2) percent annually. The 2008 traffic counts, forecasted through trips, and land-use-generated trips were combined to create the 2030 trip demand.

## Intersection Analysis

The standard used to evaluate traffic conditions at intersections is intersection LOS, the calculation and definition of which differs from roadway LOS. Intersection LOS is a qualitative measure of the effect of a number of factors such as speed, volume of traffic, geometric features, traffic interruptions, freedom to maneuver, safety, driving comfort, convenience, and operating cost.

Two types of intersections to be evaluated are signalized and unsignalized, which use different criteria for assessment of operating levels. The analysis procedures are described in the following sections.

## Signalized Intersection Level of Service

Signalized intersection LOS is defined in terms of control delay, which is a direct and/or indirect measure of driver discomfort, frustration, fuel consumption, and lost travel time. The levels of service have been established based on driver acceptability of various delays. The delay for each approach lane group is calculated based on a number of factors including lane geometrics, percentage of trucks, peak hour factor, number of lanes, signal progression, volume, signal green time to total cycle time ratio, roadway grades, parking conditions, and pedestrian flows.

Because delay is a complex measure, its relationship to capacity is also complex. Analysis was performed using Trafficware's microcomputing program, *Synchro 7* (Ref. 2), which is based on the procedures contained in the *Highway Capacity Manual* (Ref. 3). In general, overall intersection levels of service A to D are typically acceptable, while an overall LOS of E or F is unacceptable.

Table 5 summarizes the levels of service that are appropriate for different levels of average control delay and provides a qualitative description for each. The 2000 *Highway Capacity Manual* uses the criteria of average control delay, which includes initial deceleration, delay, queue move-up time, stopped delay, and final acceleration delay (Ref. 3). The intersection LOS is computed as a weighted average of the vehicle delay; therefore, an intersection may have an overall LOS C or D but have individual movements which are LOS E or F.

*Table 5.*
*Signalized Intersection: Level of Service Measurement and Qualitative Descriptions*

| Level of Service | Control Delay Per Vehicle (sec) | Qualitative Description |
|---|---|---|
| A | ≤ 10 | Good progression and short cycle lengths |
| B | > 10 and ≤ 20 | Good progression or short cycle lengths, more vehicle stops |
| C | > 20 and ≤ 35 | Fair progression and/or longer cycle lengths, some cycle failures |
| D | > 35 and ≤ 55 | Congestion becomes noticeable, high volume-to-capacity ratio |
| E | > 55 and ≤ 80 | Limit of acceptable delay, poor progression, long cycles, and/or high volume |
| F | > 80 | Unacceptable to drivers, volume greater than capacity |

## Unsignalized Intersection Level of Service

Unsignalized intersection LOS is defined in terms of average control delay. Control delay is the portion of total delay attributed to traffic control measures, traffic signals and stop signs. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

The analysis method assumes that major street through traffic is not affected by minor street flows. Major street left-turning traffic and the traffic on the minor approaches are affected by opposing movements. Stop or yield signs are used to assign the right-of-way to the major street. This designation forces drivers on the controlled street to select gaps in the major street flow through which to execute crossing or turning maneuvers. Thus, the capacity of the controlled legs is based upon two factors:

1. The distribution of gaps in the major street traffic stream
2. Driver judgment in selecting gaps through which to execute desired maneuvers

The LOS procedure computes a capacity for each movement based upon the critical time gap required to complete the maneuver and the volume of traffic opposing the movement. The average control delay for any particular movement is calculated as a function of the capacity of the approach and the degree of saturation. The degree of saturation is defined as the volume for a movement divided by the capacity of the movement, both expressed as hourly flow rates. Table 6 shows the relationship between the average control delay and LOS. The LOS for unsignalized intersections is different than that for signalized intersections. This difference is due to the fact that drivers expect different levels of performance from different kinds of transportation facilities. Unsignalized intersections carry less traffic volume than signalized intersections, and delays at unsignalized intersections are variable. For these reasons, control delay is less for an unsignalized intersection than for a signalized intersection (Ref. 3). The overall approach LOS is computed as a weighted average of the vehicle delay for each movement; therefore, an approach may have an overall LOS C or D but have individual movements of LOS E or F.

Analysis was performed using Trafficware's microcomputer program, *Synchro 7* (Ref. 2), which is based on the procedures contained in the Highway *Capacity Manual* (Ref. 3). In general, levels of service of A to D are acceptable.

*Table 6.*
*Unsignalized Intersection: Level of Service Measurement*

| Level of Service | Control Delay per Vehicle (sec) |
|---|---|
| A | ≤ 10 |
| B | > 10 and ≤ 15 |
| C | > 15 and ≤ 25 |
| D | > 25 and ≤ 35 |
| E | > 35 and ≤ 50 |
| F | > 50 |

## Trip Generation

To determine the future traffic conditions in the City of Lago Vista, expected land use types and densities provided by the City of Lago Vista were utilized to calculate trip generation estimates. Traffic Analysis Zones (TAZs) were created throughout the City limits and surrounding areas to account for natural features in an attempt to distribute the traffic evenly and consistent with the existing and future roadway network. In addition, the City provided information on sixteen proposed developments, identified in Table 7, within the study area. Within each TAZ, the currently vacant residential parcels were counted and accounted for in future land use projections for each TAZ. These lots are shown in Table 7 as "Residential Infill." The City provided the land use mix and density to be assumed for each TAZ. Figure 5 shows the TAZ structure that was chosen for use in the rest of the modeling process as well as the locations of the proposed developments.

*Table 7.*
*Locations of Proposed Developments*

| Project Name | Traffic Analysis Zone |
|---|---|
| The Majestic | 9 |
| Keegan's Crossing | 10 |
| 7 Porticos | 10 |
| Tusikanni Cove | 15 |
| Vista Villas | 12 |
| Canyon Oaks | 8 |
| Sunset Harbor | 8 |
| The Falls @ Lake Travis | 16 |
| Montechino | 11 |
| Mahogany/Turnback Ranch | 3 |
| The Peninsula | 12 |
| Shoreline Ranch | 11 |
| Waterford (ETJ) | 16 |
| The Hollows | 7 |
| Rodger's Ranch | 1 |
| The Island | 12 |

To determine future trip generation and how to assign the trips to the network, the planned land use estimates were disaggregated by TAZ by the City. Table 8 shows the land use assuming full build-out of the City, and Table 9 shows the 2030 land use assuming a yearly absorption for each land use type. The assumed uses and densities were provided by the City. For the 2030 analysis, assuming an annual land use build-out of two (2) percent, forty-four percent of the potential full build-out of the planned potential land use for the City was estimated to be complete by 2030. Following this assumption, full build-out of the planned development would occur in approximately 2058. The 2030 land use was taken into account when trips were generated for each zone, based on the Institute of Transportation Engineers' *Trip Generation* (Ref. 4).

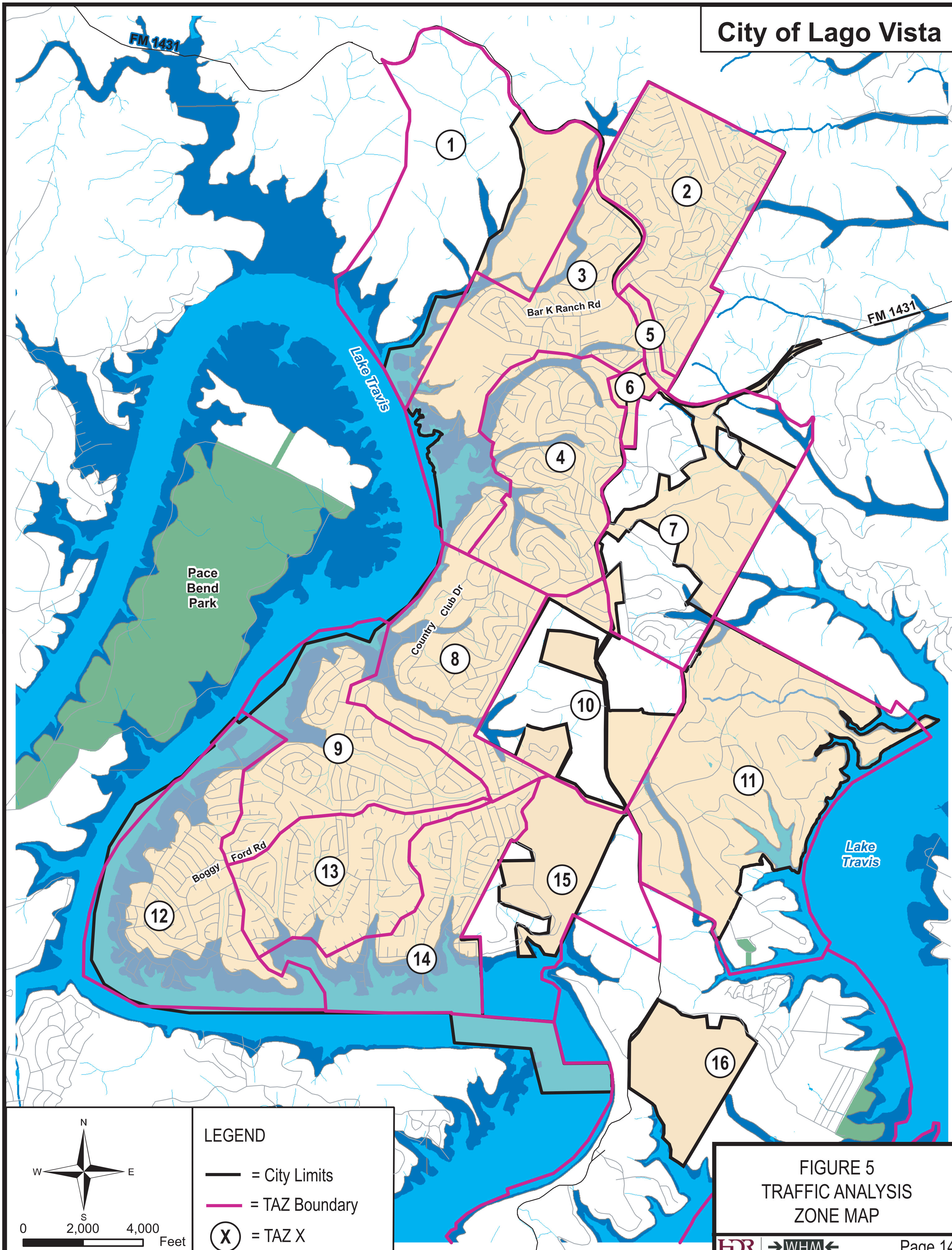



FIGURE 5
TRAFFIC ANALYSIS
ZONE MAP

*Table 8.*
*Planned Build-Out Land Use by TAZ*

| TAZ | Area* | Residential | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Residential Infill | | | Proposed Residential Dev | | Single Family | | | Second Home (Recreational) | | | Condo/Town. (Low-Rise) | | | Apartment (Low-Rise) | | | Total | | | |
| | Acres | Units | Not Constructible | Adjusted Units | Project # | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU |
| 1 | 1,271 | 0 | 0 | 0 | 15 | 1,800 | 0% | 62% | 1,116 | 0% | 10% | 180 | 0% | 20% | 360 | 0% | 8% | 144 | 0% | 100% | 1,800 |
| 2 | 751 | 1,728 | 25% | 1,296 | 0 | 0 | 95% | 0% | 1,231 | 5% | 0% | 65 | 0% | 0% | 0 | 0% | 0% | 0 | 100% | 0% | 1,296 |
| 3 | 826 | 1,045 | 10% | 941 | 10 | 720 | 93% | 70% | 1,379 | 7% | 15% | 174 | 0% | 15% | 108 | 0% | 0% | 0 | 100% | 100% | 1,661 |
| 4 | 712 | 951 | 10% | 856 | 0 | 0 | 93% | 0% | 796 | 7% | 0% | 60 | 0% | 0% | 0 | 0% | 0% | 0 | 100% | 0% | 856 |
| 5 | 65 | 0 | 0% | 0 | 0 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 |
| 6 | 50 | 0 | 0% | 0 | 0 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 |
| 7 | 1,019 | 50 | 0% | 50 | 14 | 532 | 93% | 77% | 456 | 7% | 5% | 30 | 0% | 18% | 96 | 0% | 0% | 0 | 100% | 100% | 582 |
| 8 | 667 | 878 | 10% | 790 | 6, 7 | 132 | 95% | 0% | 751 | 5% | 0% | 40 | 0% | 0% | 0 | 0% | 100% | 132 | 100% | 100% | 922 |
| 9 | 698 | 909 | 9% | 827 | 1 | 74 | 93% | 0% | 769 | 7% | 50% | 95 | 0% | 25% | 19 | 0% | 25% | 19 | 100% | 100% | 901 |
| 10 | 716 | 92 | 0% | 92 | 2, 3 | 171 | 93% | 80% | 222 | 7% | 20% | 41 | 0% | 0% | 0 | 0% | 0% | 0 | 100% | 100% | 263 |
| 11 | 1,419 | 250 | 0% | 250 | 9, 12 | 830 | 93% | 73% | 838 | 7% | 7% | 76 | 0% | 20% | 166 | 0% | 0% | 0 | 100% | 100% | 1,080 |
| 12 | 663 | 1,234 | 5% | 1,172 | 5, 11, 16 | 362 | 93% | 0% | 1,090 | 7% | 50% | 263 | 0% | 50% | 181 | 0% | 0% | 0 | 100% | 100% | 1,534 |
| 13 | 580 | 1,027 | 10% | 924 | 0 | 0 | 86% | 25% | 795 | 7% | 75% | 65 | 5% | 0% | 46 | 2% | 0% | 18 | 100% | 100% | 924 |
| 14 | 448 | 831 | 10% | 748 | 0 | 0 | 91% | 0% | 681 | 7% | 0% | 52 | 2% | 0% | 15 | 0% | 0% | 0 | 100% | 0% | 748 |
| 15 | 608 | 27 | 0% | 27 | 4 | 369 | 90% | 65% | 264 | 10% | 20% | 77 | 0% | 15% | 54 | 0% | 0% | 0 | 100% | 100% | 394 |
| 16 | 2,766 | 262 | 0% | 262 | 8, 13 | 1,220 | 93% | 78% | 1,195 | 7% | 7% | 104 | 0% | 10% | 122 | 0% | 5% | 61 | 100% | 100% | 1,482 |
| Total | 13,259 | 9,284 | | | | 6,210 | | | 11,584 | | | 1,320 | | | 1,166 | | | 374 | | | 14,443 |

| TAZ | Commercial/Industrial | | | | | | | | | | | | | School Enrollment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Shopping Center | Conv/ Gas | High Turnover Restaurant | Fast-Food Restaurant (Drive-Thru) | Comm. Center | City Park | Golf Course | Marina | Fitness Center | Office | **Auto Repair** | **Industrial (General Light)** | **Hotel** | **Middle/ High School** | **Elem School** |
| | SF | Pumps | SF | SF | SF | Acres | Holes | Acres | SF | SF | **SF** | **SF** | **Rms** | **Stud**** | **Stud**** |
| 1 | 50,000 | 12 | 5,000 | 4,000 | 5,000 | 0 | 0 | 0 | 0 | 20,000 | 2,000 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20,000 | 0 | 0 | 0 |
| 3 | 10,000 | 0 | 5,000 | 5,000 | 0 | 0 | 0 | 0 | 0 | 20,000 | 0 | 0 | 100 | 424 | 0 |
| 4 | 50,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30,000 | 10,000 | 0 | 0 | 0 | 0 |
| 5 | 60,000 | 12 | 10,000 | 5,000 | 0 | 0 | 0 | 0 | 5,000 | 30,000 | 0 | 0 | 0 | 0 | 0 |
| 6 | 32,000 | 12 | 10,000 | 5,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 50,000 | 12 | 7,000 | 0 | 2,000 | 0 | 0 | 0 | 0 | 5,000 | 0 | 25,000 | 0 | 0 | 0 |
| 8 | 0 | 0 | 5,000 | 0 | 2,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 5,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 42,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 358 |
| 11 | 50,000 | 0 | 5,000 | 0 | 0 | 5 | 18 | 0 | 5,000 | 50,000 | 0 | 0 | 0 | 0 | 0 |
| 12 | 5,000 | 0 | 5,000 | 0 | 3,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 30,000 | 0 | 0 | 5,000 | 0 | 0 | 0 | 0 | 0 | 20,000 | 0 | 0 | 0 | 0 | 0 |
| 16 | 20,000 | 12 | 0 | 0 | 0 | 25 | 0 | 5 | 0 | 5,000 | 0 | 0 | 0 | 0 | 0 |
| Total | 404,000 | 60 | 52,000 | 24,000 | 12,000 | 30 | 18 | 5 | 10,000 | 180,000 | 12,000 | 45,000 | 100 | 424 | 358 |

* All zone areas are approximate land area, making them smaller than they may appear on a land use map including water area.
** Includes only new students.

*Table 9.*
*Planned 2030 Land Use by TAZ*

| TAZ | Residential | | | | | | | | | | | | | | | | | | | Commercial/Industrial | | | | | | | | | | | | | School Enrollment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Residential Infill | | Proposed Residential Dev | | Single Family | | | Second Home (Recreational) | | | Condo/Town. (Low-Rise) | | | Apartment (Low-Rise) | | | Total | | | Shopping Center | Conv/Gas | High Turnover Restaurant | Fast-Food Restaurant (Drive-Thru) | Comm. Center | City Park | Golf Course | Marina | Fitness Center | Office | Auto Repair | Industrial (General Light) | Hotel | Middle/ High School | Elem School |
| | Units | Type | Project # | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU | % Infill | % Dev. | DU | SF | Pumps | SF | SF | SF | Acres | Holes | Acres | SF | SF | SF | SF | Rms | Stud* | Stud* |
| 1 | 0 | | 15 | 792 | 0% | 62% | 491 | 0% | 10% | 79 | 0% | 20% | 158 | 0% | 8% | 63 | 0% | 100% | 792 | 22,000 | 5 | 2,200 | 1,760 | 2,200 | 0 | 0 | 0 | 0 | 8,800 | 880 | 0 | 0 | 0 | 0 |
| 2 | 760 | SF | 0 | 0 | 95% | 0% | 722 | 5% | 0% | 38 | 0% | 0% | 0 | 0% | 0% | 0 | 100% | 0% | 760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8,800 | 0 | 0 | 0 |
| 3 | 460 | SF | 10 | 317 | 93% | 70% | 649 | 7% | 15% | 80 | 0% | 15% | 48 | 0% | 0% | 0 | 100% | 100% | 777 | 4,400 | 0 | 2,200 | 2,200 | 0 | 0 | 0 | 0 | 0 | 8,800 | 0 | 0 | 44 | 186 | 0 |
| 4 | 418 | SF | 0 | 0 | 93% | 0% | 389 | 7% | 0% | 29 | 0% | 0% | 0 | 0% | 0% | 0 | 100% | 0% | 418 | 22,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13,200 | 4,400 | 0 | 0 | 0 | 0 |
| 5 | 0 | | 0 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 26,400 | 5 | 4,400 | 2,200 | 0 | 0 | 0 | 0 | 2,200 | 13,200 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | | 0 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 14,080 | 5 | 4,400 | 2,200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 22 | SF | 14 | 234 | 93% | 77% | 201 | 7% | 5% | 13 | 0% | 18% | 42 | 0% | 0% | 0 | 100% | 100% | 256 | 22,000 | 5 | 3,080 | 0 | 880 | 0 | 0 | 0 | 0 | 2,200 | 0 | 11,000 | 0 | 0 | 0 |
| 8 | 386 | SF | 6, 7 | 58 | 95% | 0% | 367 | 5% | 0% | 19 | 0% | 0% | 0 | 0% | 100% | 58 | 100% | 100% | 444 | 0 | 0 | 2,200 | 0 | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 400 | SF | 1 | 33 | 93% | 0% | 372 | 7% | 50% | 44 | 0% | 25% | 8 | 0% | 25% | 8 | 100% | 100% | 433 | 2,200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 40 | SF | 2, 3 | 75 | 93% | 80% | 98 | 7% | 20% | 18 | 0% | 0% | 0 | 0% | 0% | 0 | 100% | 100% | 116 | 18,480 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 157 |
| 11 | 110 | SF | 9, 12 | 365 | 93% | 73% | 369 | 7% | 7% | 33 | 0% | 20% | 73 | 0% | 0% | 0 | 100% | 100% | 475 | 22,000 | 0 | 2,200 | 0 | 0 | 2 | 8 | 0 | 2,200 | 22,000 | 0 | 0 | 0 | 0 | 0 |
| 12 | 543 | SF & SH | 5, 11, 16 | 159 | 93% | 0% | 505 | 7% | 50% | 118 | 0% | 50% | 80 | 0% | 0% | 0 | 100% | 100% | 702 | 2,200 | 0 | 2,200 | 0 | 1,320 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 452 | SF | 0 | 0 | 86% | 25% | 389 | 7% | 75% | 32 | 5% | 0% | 23 | 2% | 0% | 9 | 100% | 100% | 452 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 366 | SF & SH | 0 | 0 | 91% | 0% | 333 | 7% | 0% | 26 | 2% | 0% | 7 | 0% | 0% | 0 | 100% | 0% | 366 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 12 | SF | 4 | 162 | 90% | 65% | 116 | 10% | 20% | 34 | 0% | 15% | 24 | 0% | 0% | 0 | 100% | 100% | 173 | 13,200 | 0 | 0 | 2,200 | 0 | 0 | 0 | 0 | 0 | 8,800 | 0 | 0 | 0 | 0 | 0 |
| 16 | 115 | SF & SH | 8, 13 | 537 | 93% | 78% | 526 | 7% | 7% | 46 | 0% | 10% | 54 | 0% | 5% | 27 | 100% | 100% | 652 | 8,800 | 5 | 0 | 0 | 0 | 11 | 0 | 2 | 0 | 2,200 | 0 | 0 | 0 | 0 | 0 |
| Total | 4,085 | | | 2,732 | | | 5,527 | | | 608 | | | 516 | | | 165 | | | 6,817 | 177,760 | 26 | 22,880 | 10,560 | 5,280 | 13 | 8 | 2 | 4,400 | 79,200 | 5,280 | 19,800 | 44 | 186 | 157 |

* Includes only new students

Infill Type:
SF = single family
SH = second home

## Trip Reduction Measures

The location, mix, and density of land uses all impact the potential for trip-chaining, or reducing the overall number of trips by having different land uses next to each other and allowing multi-purpose trips. The location of the retail uses along FM 1431 lends itself to absorbing pass-by trips, which are trips already on the road and diverting into the retail area to shop and then proceed on FM 1431 in the same direction as before it diverted. The classic example is someone stopping to shop on the way home from work. A pass-by reduction of 30 percent, a conservative estimate based on the Institute of Transportation Engineers' *Trip Generation Handbook* (Ref. 5), was applied to the FM 1431 retail uses (Zones 1, 3, 5, 6, and 7) as shown in Tables 8 and 9.

The mix of uses can affect the internal synergy of a zone and study area. According to the *Trip Generation Handbook* (Ref. 5), a well balanced mix of uses, such as retail, residential and office included in a zone will have higher internal interaction or synergy than a zone with just office and/or residential. This interaction accounts for any non-auto travel and chained trips within a zone. Applying this methodology, the internal reduction by zone will range from zero to 30 percent.

According to recommendations and survey data contained in *Trip Generation* (Ref. 4), the proposed land uses for the build-out and 2030 study year will generate approximately 221,248 and 107,363 unadjusted vehicles per day (vpd), respectively. This traffic production is directly related to the planned land uses given by the City. Assuming the pass-by reduction and internal capture discussed previously are applied, the overall vehicle trip reduction for the study area will be approximately 22 percent. As a result, the adjusted daily trips generated by the planned land use for build-out and the 2030 study year will be 173,725 and 83,841 vpd, respectively. The 2030 study year trip generation is shown in Table 10.

*Table 10.*
*2030 Twenty-Four Hour Trip Generation Before and After Trip Reductions (vpd)*

| TAZ | Middle/ High School | Elementary School | Hotel | Office/ Comm/ Industrial | Residential | Retail | Total Before Reduction | % Internal Capture | % Pass-By | Total After Reduction |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 102 | 6,417 | 6,570 | 13,139 | 21.4 | 30 | 8,779 |
| 2 | 0 | 0 | 0 | 0 | 6,532 | 0 | 6,532 | 0.0 | 0 | 6,532 |
| 3 | 319 | 0 | 767 | 102 | 6,402 | 2,263 | 9,852 | 11.4 | 30 | 8,131 |
| 4 | 0 | 0 | 0 | 153 | 3,722 | 2,608 | 6,483 | 19.0 | 0 | 5,253 |
| 5 | 0 | 0 | 0 | 153 | 0 | 7,588 | 7,741 | 20.7 | 30 | 4,385 |
| 6 | 0 | 0 | 0 | 0 | 0 | 6,415 | 6,415 | 20.0 | 30 | 3,592 |
| 7 | 0 | 0 | 0 | 25 | 2,319 | 5,795 | 8,159 | 29.5 | 30 | 4,525 |
| 8 | 0 | 0 | 0 | 0 | 4,185 | 280 | 4,485 | 2.6 | 0 | 4,370 |
| 9 | 0 | 0 | 0 | 0 | 4,123 | 568 | 4,692 | 5.0 | 0 | 4,459 |
| 10 | 0 | 203 | 0 | 0 | 1,076 | 2,266 | 3,545 | 27.8 | 0 | 2,559 |
| 11 | 0 | 0 | 0 | 255 | 4,050 | 3,316 | 7,624 | 21.3 | 0 | 5,996 |
| 12 | 0 | 0 | 0 | 0 | 5,512 | 848 | 6,390 | 5.5 | 0 | 6,041 |
| 13 | 0 | 0 | 0 | 0 | 4,335 | 0 | 4,335 | 0.0 | 0 | 4,335 |
| 14 | 0 | 0 | 0 | 0 | 3,289 | 0 | 3,289 | 0.0 | 0 | 3,289 |
| 15 | 0 | 0 | 0 | 102 | 1,483 | 2,912 | 4,497 | 28.9 | 0 | 3,196 |
| 16 | 0 | 0 | 0 | 25 | 5,832 | 4,264 | 10,185 | 17.5 | 0 | 8,399 |
| Total | 319 | 203 | 767 | 917 | 59,277 | 45,693 | 107,363 | | | 83,841 |

## Trip Distribution and Assignment

The traffic generated by the planned land use was distributed throughout the roadway network assuming a traffic distribution that was based on the percentage of the total traffic entering and exiting the study area from each external access point. For example, since the existing traffic counts show that approximately 84 percent of the total traffic entered/exited the study area by traveling to/from the east of the study area via FM 1431, then 84 percent of the calculated trip generation was distributed to enter/exit the study area by traveling to or from the east via FM 1431. This overall distribution of entering and exiting traffic is summarized in Table 11. Each TAZ was analyzed to determine the most efficient way to enter and exit the zone based on estimated travel times.

*Table 11.*
*External Trip Distribution*

| External Link | Total Traffic |
|---|---|
| East FM 1431 | 84% |
| West FM 1431 | 16% |

Only a portion of the proposed traffic generated will travel to and from external zones each day, with a majority of the generated trips traveling to and from other zones within the study area. The portion of vehicles leaving the study area varies greatly depending on whether the trips are home-based (originated from or destined for a residential area) or non-home-based (all other trips). As seen in Table 12, a much smaller proportion of home-based trips will remain within the study area because it was assumed that many of the residents in the area would be commuting out of the study area. It was also assumed that approximately half of the non-home based trips would be external to the study area.

*Table 12.*
*Total Trips Distributed Externally*

| External Link | Total Traffic |
|---|---|
| Home Based (Residential) | 80% |
| Non-Home Based (Non-Residential) | 50% |

## EXISTING THOROUGHFARE SYSTEM

To determine the roadway LOS, the area types and roadway classifications were first identified. All roadways in the study area were assumed to be in suburban residential areas except for FM 1431, which was assumed to operate in a rural area setting. Figure 6 shows the roadway classifications identified for the existing network.

### Arterials

FM 1431 – FM 1431 is a four-lane principal arterial undivided in most places with two-way left-turn lanes on some stretches that serves as the main thoroughfare through Lago Vista. The 2008 daily traffic volumes on FM 1431 varied from 2,500 to 13,000 vpd, with volumes at their maximum at the segment east of Lohmans Ford Road.

Lohmans Ford Road – Lohmans Ford Road serves as a principal arterial undivided through Lago Vista, providing access to FM 1431 from the residential areas. It is currently four lanes wide north of Dawn Drive and two lanes wide south of Dawn Drive. The 2008 daily traffic volumes along Lohmans Ford Road varied from 14,300 vpd just south of FM 1431 to 3,100 vpd south of Boggy Ford Road/Shoreline Ranch Drive.

### Collectors

Bar-K Ranch Road – Bar-K Road is a two-lane collector that connects to FM 1431. The 2008 daily traffic volume along Bar-K Road was 1,200 vpd south of FM 1431 and 300 vpd north of FM 1431.

Dodge Trail – Dodge Trail is a two-lane collector that connects to FM 1431. The 2008 daily traffic volume along Dodge Trail south of FM 1431 was 1,300 vpd.

Ridgeview Road – Ridgeview Road is a two-lane collector that connects residences to Lohmans Ford Road. The 2008 daily traffic volume along Ridgeview Road west of Lohmans Ford Road was 900 vpd.

Paseo de Vaca Street – Paseo de Vaca Street is a two-lane collector that connects residences to Lohmans Ford Road. The 2008 traffic volume along Paseo de Vaca Street west of Lohmans Ford Road was 500 vpd.

Dawn Drive – Dawn Drive is a four-lane collector that connects to Lohmans Ford Road. The 2008 traffic volume along Dawn Drive west of Lohmans Ford Road was 4,200 vpd.

Boggy Ford Road – Boggy Ford Road is a two-lane minor arterial undivided and collector that connects residences to Lohmans Ford Road. The 2008 traffic volumes along Boggy Ford Road were 5,300 vpd west of Lohmans Ford Road and 3,100 vpd west of National Drive.

Highland Lake Drive – Highland Lake Drive is a two-lane divided/undivided collector that connects residences to Boggy Ford Road. The 2008 traffic volume along Highland Lake Drive was 1,200 vpd west of Constitution Drive.

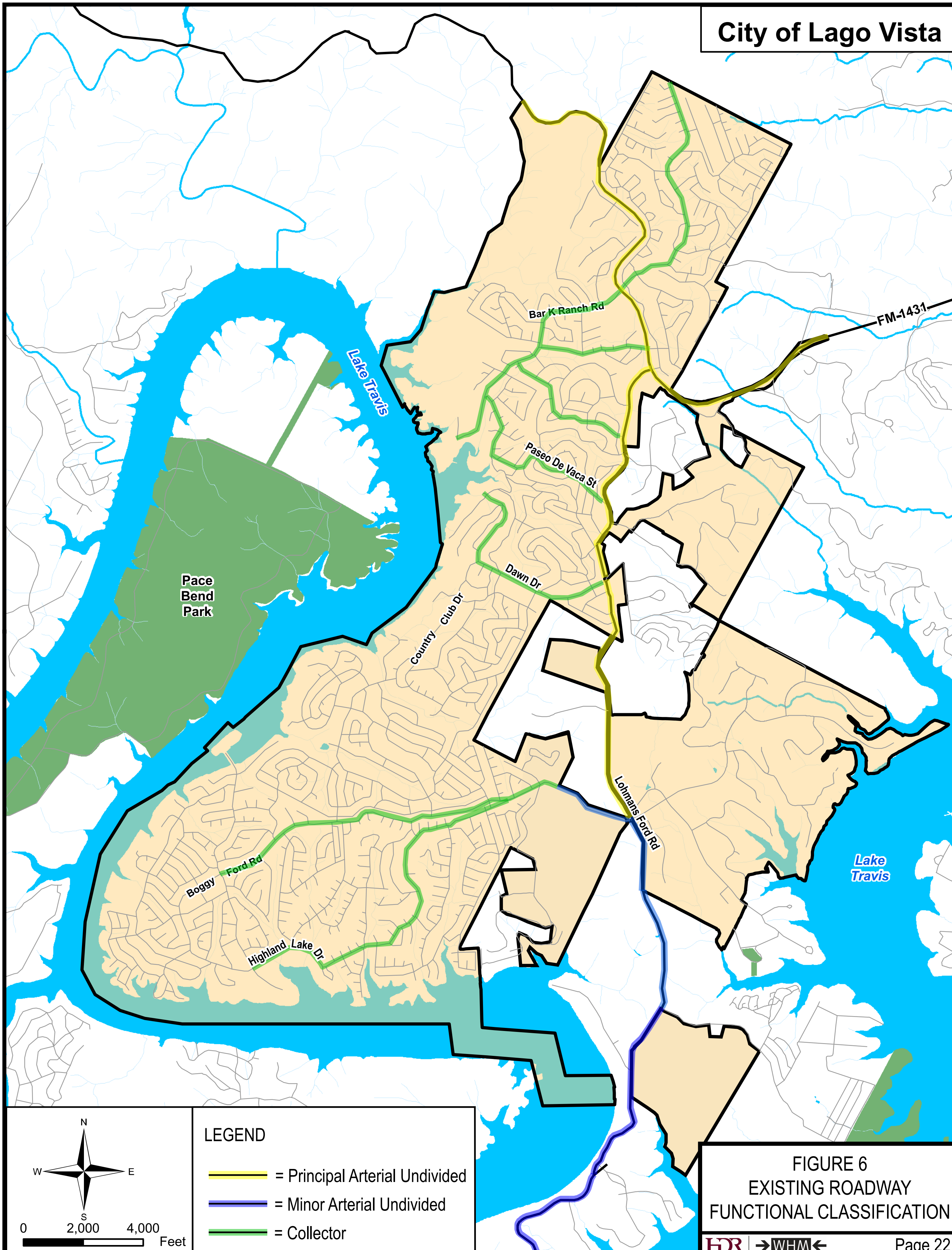



FIGURE 6
EXISTING ROADWAY
FUNCTIONAL CLASSIFICATION

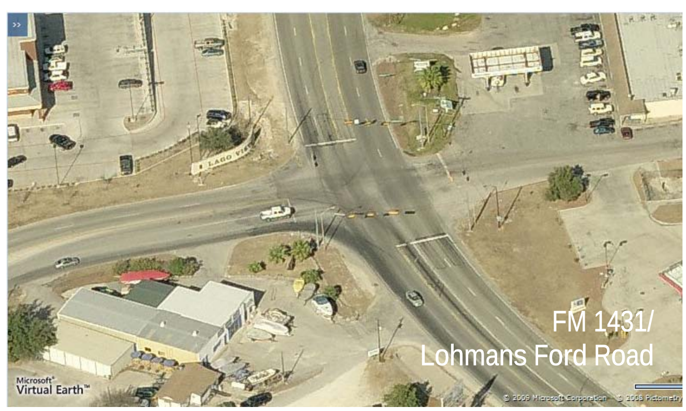
## Intersections

FM 1431/Bar-K Ranch Road – The intersection of FM 1431 and Bar-K Ranch Road is a stop-controlled intersection, with Bar-K Ranch Road serving as the stop-controlled approaches. The northbound and southbound approaches of Bar-K Ranch Road each provide one left-turn/through/right-turn shared lane.


The eastbound and westbound approaches of FM 1431 each provide one left-turn lane, one through lane, and one through/right-turn shared lane.

FM 1431/Dodge Trail – The intersection of FM 1431 and Dodge Trail is a stop-controlled intersection, with Dodge Trail serving as the stop-controlled approaches. The northbound and southbound approaches of FM 1431 each provide one left-turn/through shared lane and one through/right-turn shared lane. The eastbound and westbound approaches of Dodge Trail each provide one left-turn/through/right-turn shared lane.


FM 1431/Lohmans Ford Road – The intersection of FM 1431 and Lohmans Ford Road is a signalized intersection. The northbound and southbound approaches of FM 1431 each provide one left-turn lane, one through lane, and one through/right-turn shared lane. The eastbound approach of Lohmans Ford Road provides one left-turn lane, one through lane, and one



right-turn lane, while the westbound approach provides one left-turn/through shared lane and one through/right-turn shared lane.

Lohmans Ford Road/Ridgeview Road – The intersection of Lohmans Ford Road and Ridgeview Road is a stop-controlled intersection, with Ridgeview Road serving as the stop-controlled approach. The northbound approach of Lohmans Ford Road provides one left-turn/through shared lane and one through lane, while the southbound approach provides one through lane and one through/right-turn shared lane. The eastbound approach of Ridgeview Road provides one left-turn/right-turn shared lane.


Lohmans Ford Road/Paseo de Vaca Street – The intersection of Lohmans Ford Road and Paseo de Vaca Street is a stop-controlled intersection, with Paseo de Vaca Street serving as the stop-controlled approach. The northbound approach of Lohmans Ford Road provides one left-turn/through shared lane and one through lane, while the southbound approach provides one through lane and one through/right-turn shared lane. The eastbound approach of Paseo de Vaca Street provides one left-turn/right-turn shared lane.


Lohmans Ford Road/Dawn Drive – The intersection of Lohmans Ford Road and Dawn Drive is a stop-controlled intersection, with Dawn Drive serving as the stop-controlled approach. The northbound approach of Lohmans Ford Road provides one

left-turn lane and one through/right-turn shared lane, while the southbound approach provides one left-turn lane, one through lane, and one right-turn lane. The eastbound approach of Dawn Drive provides one left-turn/through shared lane and one right-turn lane, while the westbound approach provides one left-turn/through/right-turn shared lane.

Lohmans Ford Road/Boggy Ford Road – The intersection of Lohmans Ford Road and Boggy Ford Road is a stop-controlled intersection, with Boggy Ford Road serving as the stop-controlled approach. The northbound approach of Lohmans Ford Road provides one left-turn/through/right-turn shared lane, while the southbound approach provides one left-turn/through shared lane and one right-turn lane. The eastbound approach of Boggy Ford Road provides one left-turn/through/right-turn shared lane. The westbound approach has been recently constructed and provides one left-turn/through shared land and one right-turn lane.


Boggy Ford Road/Highland Lake Drive – The intersection of Boggy Ford Road and Highland Lake Drive is a stop-controlled intersection, with Highland Lake Drive serving as the stop-controlled approach. The eastbound approach of Boggy Ford Road provides one through lane, while the westbound approach provides one left-turn lane and one through lane. The eastbound approach of Highland Lake Drive provides one right-turn lane.

# OPERATIONAL ANALYSIS

The impact of the planned land use on existing and future roadways was analyzed, assuming four (4) travel scenarios:

1. 2008 Existing Scenario
2. 2030 No-Build Scenario (With Growth, Planned/Potential Land Use, and Existing Network)
3. 2030 Build Scenario (With Growth, Planned/Potential Land Use, and Network Improvements)
4. Build-Out Scenario (With Growth, Planned/Potential Land Use, and Network Improvements)

Roadway segments on streets that carry a significant proportion of the overall traffic within the study area were considered as the locations of principal concern. The standard used to evaluate traffic conditions for a roadway segment is LOS, taken as a qualitative measure of the volume of traffic compared to its capacity. Table 4 shows the values of volume over capacity represented by each LOS. In general, an overall level of service A to D is typically deemed acceptable, while an overall LOS of E or F is unacceptable.

## 2008 Existing Scenario

The 2008 Existing Scenario utilized the 24-hour counts and peak hour turning movement counts to determine LOS for the critical roadways and intersections. A field review was completed to document existing roadway conditions, which included the number of lanes, speed limit, existence of any shoulders or ditches, and current function of the roadway within the network. Intersection geometry information was also obtained.

Using this field data and the values in Table 3, capacities were determined for each roadway segment. Then, the v/c ratio was calculated, and an LOS at each study location was determined based on the criteria in Table 4. The resulting LOS for each roadway is shown in Table 13. Intersection LOS was calculated using *Synchro* (Ref. 2), the results of which are shown in Table 14.

Figure 7 illustrates the LOS for each of the analyzed roadway segments and intersections for the 2008 Existing Scenario. The study area network overall currently operates at LOS of D or better.

*Table 13.*
*24-Hour Roadway Levels of Service*

| Forecast Location | Roadway Segment | Scenario | | | |
|---|---|---|---|---|---|
| | | 2008 Existing | 2030 No-Build | 2030 Build* | Build-Out** |
| 1 | FM 1431, north of Bar-K Ranch Road | A | F | D | D |
| 2 | Bar-K Ranch Road, west of FM 1431 | A | B | B | D |
| 3 | Bar-K Ranch Road, east of FM 1431 | A | D | D | E |
| 4 | FM 1431, south of Bar-K Ranch Road | A | E | E | F |
| 5 | Dodge Trail, west of FM 1431 | A | A | A | A |
| 6 | Lohmans Ford Road, west of FM 1431 | C | F | F | C |
| 7 | FM 1431, south of Lohmans Ford Road | C | F | F | C |
| 8 | Ridgeview Road, west of Lohmans Ford Road | A | B | B | D |
| 9 | Lohmans Ford Road, south of Burdock Drive | B | F | E | C |
| 10 | Paseo de Vaca Street, west of Lohmans Ford Road | A | B | B | D |
| 11 | Lohmans Ford Road, north of Dawn Drive | B | F | E | C |
| 12 | Dawn Drive, west of Lohmans Ford Road | A | D | D | F |
| 13 | Lohmans Ford Road, south of Dawn Drive | C | F | D | F |
| 14 | Lohmans Ford Road, north of Ranch Cielo Court | C | F | D | F |
| 15 | Lohmans Ford Road, north of Boggy Ford Road | C | F | D | E |
| 16 | Boggy Ford Road, west of Lohmans Ford Road | C | F | F | F |
| 17 | Lohmans Ford Road, south of Boggy Ford Road | A | D | D | C |
| 18 | Boggy Ford Road, west of National Drive | B | F | D | F |
| 19 | Highland Lake Drive, west of Constitution Drive | A | F | F | F |
| 20 | Rodger's Road West# | - | B | B | D |
| 21 | Rodger's Road East# | - | C | C | F |
| 22 | Destination Way# | - | C | C | C |
| 23 | Dawn-Lohmans Ford Connector## | - | - | A | A |
| 24 | Shoreline Drive# | - | E | E | C |
| 25 | The Falls Rd.# | - | F | F | D |
| 26 | Alfalfa Dr.# | - | A | A | C |
| 27 | Dodge Trail Extension# | - | A | A | C |
| 28 | Tusikanni Cove Rd# | - | B | B | D |

** Level of service reflects improvements identified in Figure 12.*
*** Level of service reflects improvements identified in Figure 13.*
*# Roadways included in proposed developments.*
*## City-planned roadway*

*Table 14.*
*Peak Hour Intersection Levels of Service*

| Analysis Location | Intersection | Scenario | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2008 Existing | | 2030 No-Build | | 2030 Build | |
| | | AM | PM | AM | PM | AM | PM |
| 1 | FM 1431/Lohmans Ford Road | B | C | F | F | F | F |
| 2 | FM 1431/Bar-K Ranch Road | A | A | F | F | C | B |
| 3 | FM 1431/Dodge Trail | A | A | F | F | C | B |
| 4 | Lohmans Ford Road/Ridgeview Road | A | A | F | F | B | A |
| 5 | Lohmans Ford Road/Paseo de Vaca Street | A | A | F | F | B | A |
| 6 | Lohmans Ford Road/Dawn Drive | C | A | F | F | C | B |
| 7 | Lohmans Ford Road/Boggy Ford Road | A | A | F | F | B | B |
| 8 | Boggy Ford Road/Highland Lake Drive | A | A | F | A | C | A |

# City of Lago Vista


FIGURE 7
LEVEL OF SERVICE
EXISTING CONDITIONS

2030 No-Build Scenario

The 2030 No-Build Scenario assumed no improvements will be made to existing roadways and intersections between now and 2030, but that all planned land use shown in Table 9 will be developed. The traffic forecasts at each study location were derived from the following:

- Existing twenty-four-hour and peak period turning movement counts
- Twenty-two years of through traffic growth on FM 1431
- Traffic from each of the TAZs generated by the planned land use

Eight new analysis locations were assumed for the 2030 No-Build Scenario. These locations are or will be associated with the proposed development projects previously identified, and all new roadways were assumed to operate as two-lane collectors. Figure 8 shows the analysis locations on these roadways and the remaining analysis locations under the 2030 No-Build Scenario.

Combining this traffic to calculate the 2030 traffic conditions without improving the street network will result in drastically worse LOS for most of the analyzed roadway segments, shown in Table 13. Figure 9 illustrates the LOS of each of the analyzed roadway segments and intersections for the 2030 No-Build Scenario.

The traffic from the planned development will overload the existing network and create an unacceptable level of congestion at the following locations:

Roadways:

- FM 1431
- Lohmans Ford Road (north of Boggy Ford Road)
- Boggy Ford Road
- Highland Lake Drive
- Shoreline Ranch Drive
- The Falls Road

Intersections:

- FM 1431/Bar-K Ranch Road
- FM 1431/Dodge Trail
- FM 1431/Lohmans Ford Road
- Lohmans Ford Road/Ridgeview Road
- Lohmans Ford Road/Paseo de Vaca Street
- Lohmans Ford Road/Dawn Drive
- Lohmans Ford Road/Boggy Ford Road
- Boggy Ford Road/Highland Lake Drive (AM Peak only)

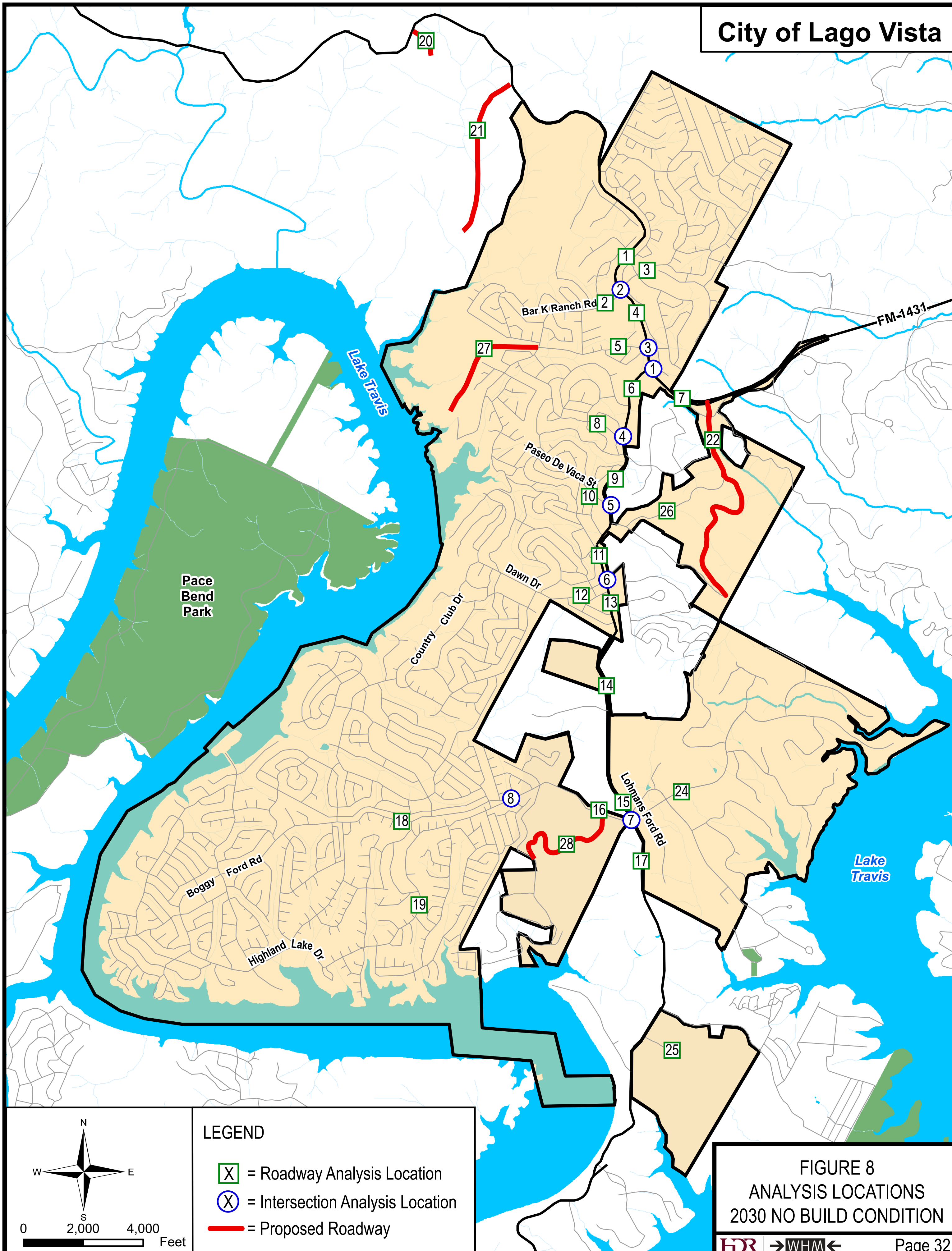



FIGURE 8
ANALYSIS LOCATIONS
2030 NO BUILD CONDITION

# City of Lago Vista

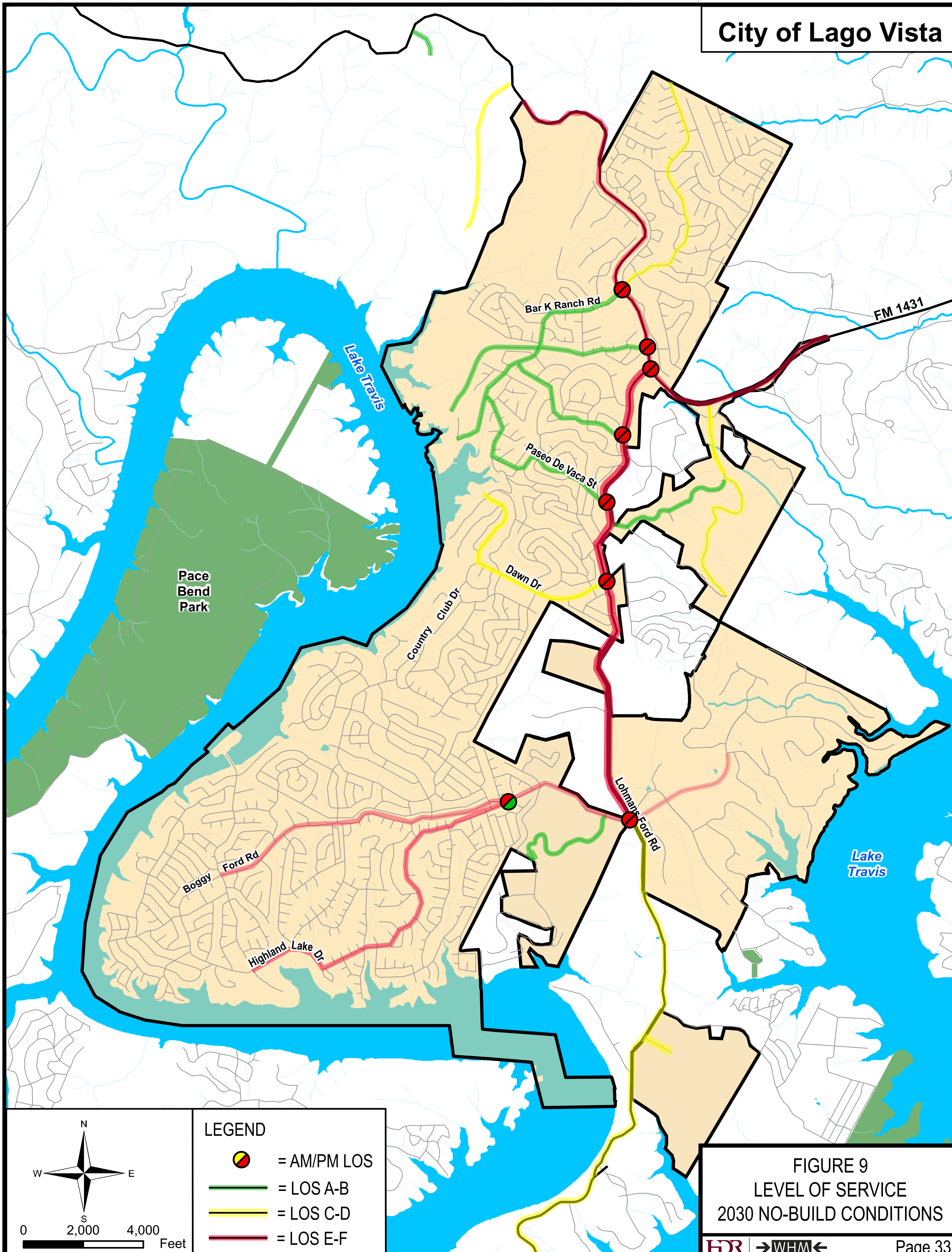



FIGURE 9
LEVEL OF SERVICE
2030 NO-BUILD CONDITIONS

## PLANNED THOROUGHFARE SYSTEM

### 2030 Build Scenario

To create the recommended thoroughfare plan, one (1) planned roadway location, as identified by City planning staff, was assumed. Figure 10 illustrates the planned roadway along with the 2030 Build Scenario analysis locations. Improvements to the existing roadway network were also assumed at locations that displayed unacceptable LOS under the 2030 No-Build Scenario. The 2030 Build Scenario assumes the generated traffic from the No-Build Scenario, but distributes this traffic onto the recommended thoroughfare plan shown in Figure 11.

*New Roadway*

Dawn-Lohmans Ford Connector – Dawn-Lohmans Ford Connector is planned and will serve as a collecting roadway, located between Dawn Drive and Lohmans Ford Road. The roadway should be constructed as a two-lane rural collector.

*Existing Roadways*

Assigning the 2030 traffic to the planned network resulted in some improvements to roadway LOS compared to the 2030 No-Build Scenario. The resulting LOS for the twenty-eight analysis segments are shown in Table 13. Figure 12 illustrates the LOS for each roadway segment.

The roadway improvements recommended for 2030 include the expansion of numerous existing roadways:

- FM 1431, from Lohmans Ford Road eastward to Jonestown, should be widened to a six-lane divided roadway. The projected 2030 volumes on FM 1431 to the east will be approximately 53,600 vpd. This volume level is very similar to Parmer Lane east of Mopac, which is a six-lane divided principal arterial with approximately 50,000 vpd (2007).
- Lohmans Ford Road, between FM 1431 and Boggy Ford Road, should be widened to a six-lane divided roadway.
- Boggy Ford Road, between Lohmans Ford Road and Highland Lake Drive, should be widened to a four-lane divided roadway.
- Boggy Ford Road, between Highland Lake Drive and American Drive, should be widened to a four-lane undivided roadway

Despite these recommended improvements, the following locations will operate at an unacceptable LOS:

- FM 1431 (south of Bar K Ranch Road)
- Lohmans Ford Road (north of Dawn Drive)
- Boggy Ford Road (east of National Drive)
- Highland Lake Drive
- Shoreline Ranch Drive
- The Falls Road

As the narrative describes, a number of roadways are recommended to be improved to divided cross sections. These cross sections may consist of a continuous center turn lane or a physical median that may consist of grass or concrete.

*Intersections*

All analyzed intersections in the study area will need to be signalized and the following intersection improvements will also be needed:

FM 1431/Lohmans Ford Road – In addition to FM 1431 being widened to six lanes east of Lohmans Ford Road, dual left-turn lanes should be provided on the eastbound Lohmans Ford Road and northbound FM 1431 approaches. Dual right-turn lanes should be added on the southbound FM 1431 approach, and an additional right-turn lane should be added on the eastbound Lohmans Ford Road.

FM 1431/Bar K Ranch Road – One left-turn lane should be added on the northbound and southbound approaches of Bar K Ranch Road.

FM 1431/Dodge Trail – Dual left-turn lanes should be constructed at the westbound approach of Dodge Trail, and one right-turn lane should be constructed at the northbound FM 1431 approach. One left-turn lane should be provided in both directions along FM 1431.

Lohmans Ford Road/Ridgeview Road – In addition to Lohmans Ford Road being widened to six lanes, a left-turn lane should be constructed at the northbound approach of Lohmans Ford Road. The eastbound approach of Ridgeview Road should include a shared left/right-turn lane.

Lohmans Ford Road/Paseo de Vaca Street – In addition to Lohmans Ford Road being widened to six lanes, a left-turn lane should be constructed at the eastbound approach of Paseo de Vaca Street and the northbound approach of Lohmans Ford Road.

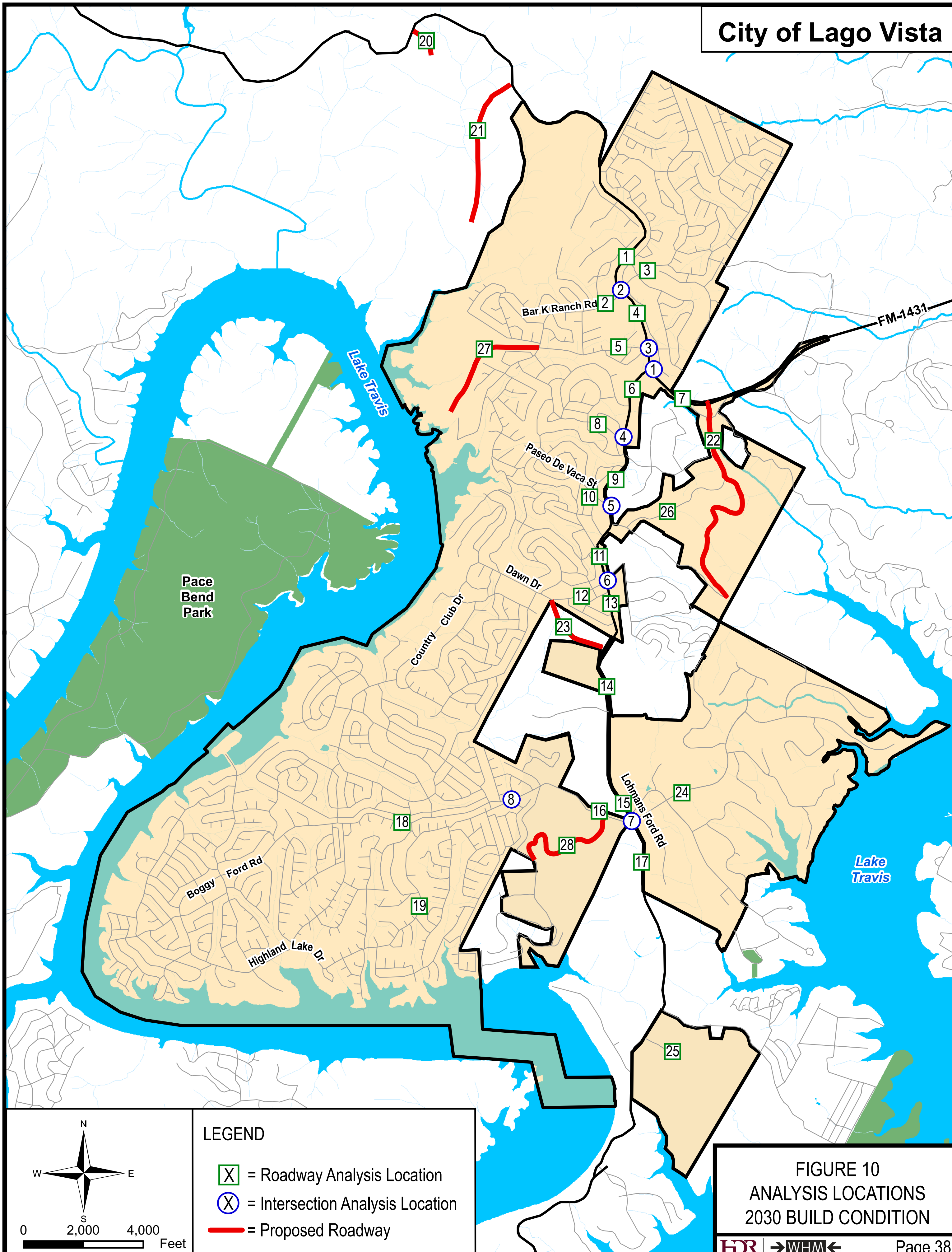
Lohmans Ford Road/Dawn Drive – In addition to Lohmans Ford Road being widened to six lanes, dual left-turn lanes should be constructed on the eastbound approach of Dawn Drive, and one left-turn lane should be constructed on the westbound approach of Dawn Drive. Additionally, a left-turn lane should be constructed on each approach of Lohmans Ford Road, and one right-turn lane should be provided on the southbound approach.

Lohmans Ford Road/Boggy Ford Road/Shoreline Ranch Drive – The northbound Lohmans Ford Road approach should provide one left-turn lane and one shared through/right-turn lane, and the southbound approach should include one left-turn lane, one through lane, and one right-turn lane. The eastbound Boggy Ford Road approach should provide dual left-turn lanes and one through/right-turn lane. The westbound approach of Shoreline Ranch Drive should provide one shared left-turn/through lane and one right-turn lane.

Boggy Ford Road/Highland Lake Drive – The eastbound Boggy Ford Road approach should provide one through lane and one through/right-turn shared lane, and the westbound approach should provide two through lanes and one left-turn lane.

The addition of exclusive turn lanes was based in part on the criteria set forth in *Highway Capacity Manual 2000* (Ref. 3). As a planning rule of thumb, it states that a single exclusive left-turn lane is probably required if an approach experiences left-turn volumes of at least 100 vehicles per hour. A configuration with dual left-turn lanes is probably required if an approach experiences more than 300 left-turning vehicles per hour. An exclusive right-turn lane should be considered if an approach experiences more than 300 right-turning vehicles per hour with adjacent mainline volume of more than 300 vehicles per hour per lane.  These criteria could be applied to future analyses by City of Lago Vista planning staff.

# City of Lago Vista




LEGEND

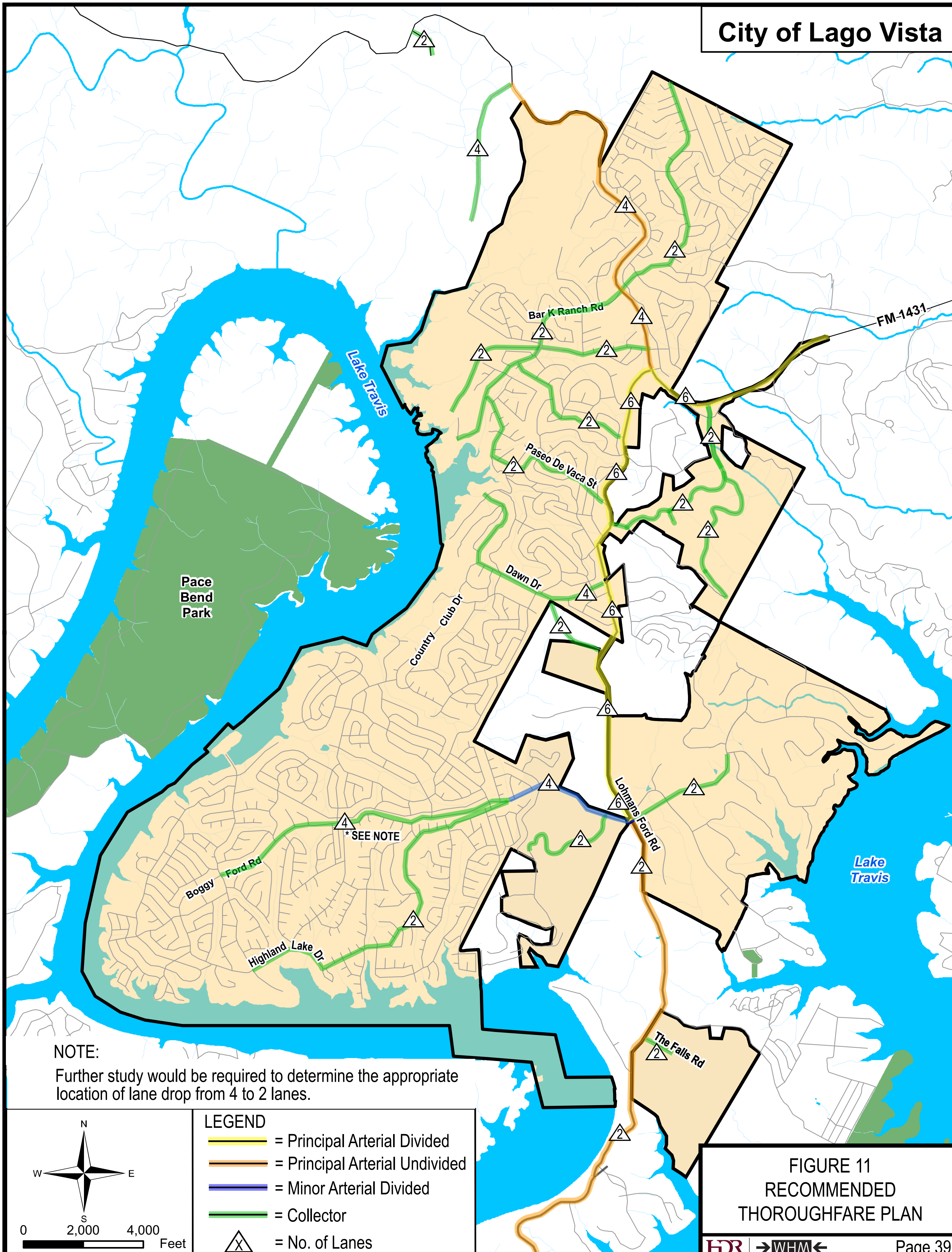
X = Roadway Analysis Location

X = Intersection Analysis Location

= Proposed Roadway

FIGURE 10
ANALYSIS LOCATIONS
2030 BUILD CONDITION

# City of Lago Vista




NOTE:

Further study would be required to determine the appropriate location of lane drop from 4 to 2 lanes.

LEGEND

- = Principal Arterial Divided
- = Principal Arterial Undivided
- = Minor Arterial Divided
- = Collector
- X = No. of Lanes

FIGURE 11
RECOMMENDED
THOROUGHFARE PLAN

# City of Lago Vista

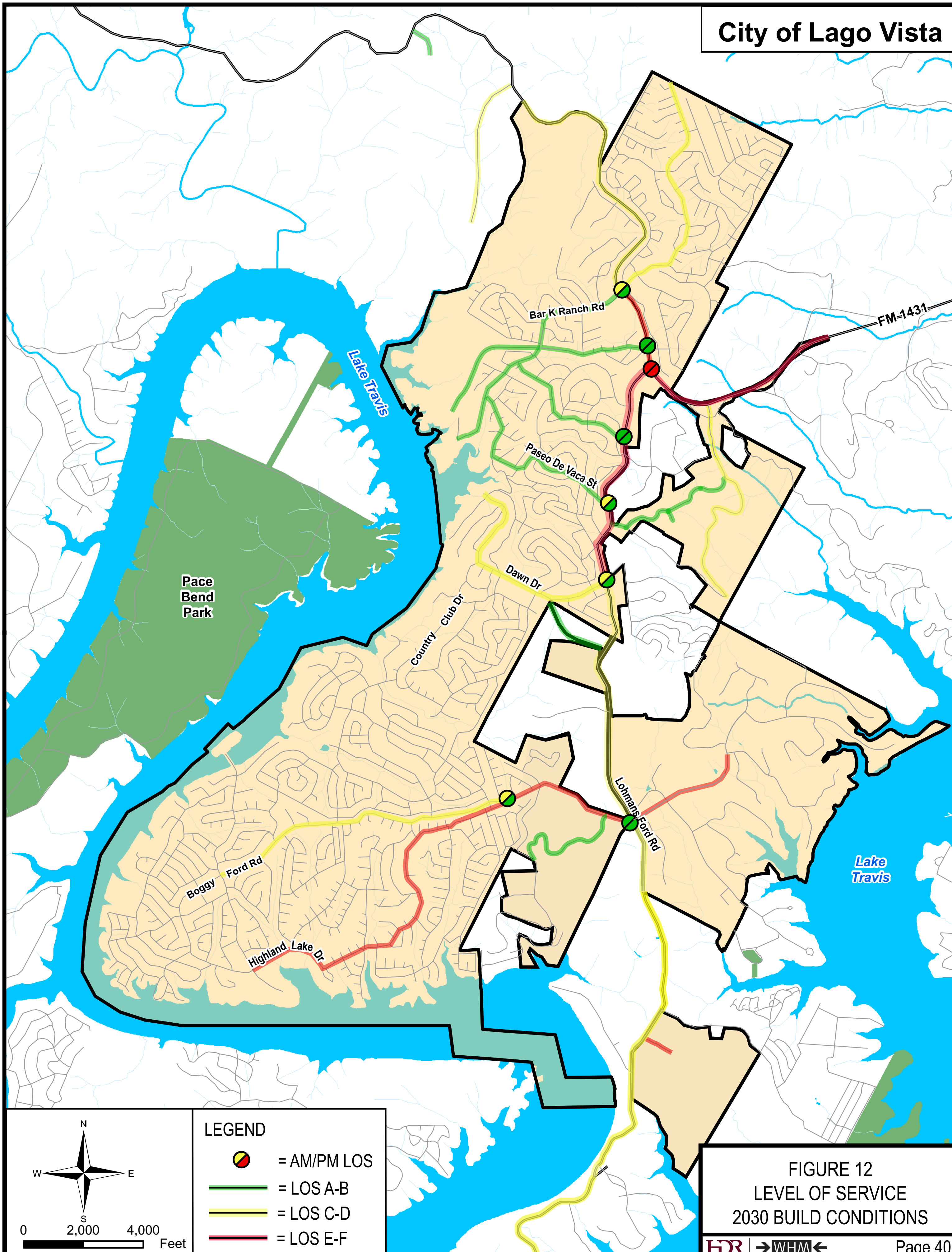



FIGURE 12
LEVEL OF SERVICE
2030 BUILD CONDITIONS

HDR | WHM

Build-Out Scenario

This scenario was evaluated to illustrate the overall impacts of the construction of the full build-out of the planned land use for the City of Lago Vista. Based on a two-percent per year growth, it is projected that the build-out of the City would occur approximately the year of 2058. As discussed previously, the projected build-out of the City's land use plan will generate approximately 221,248 unadjusted new vehicles per day (vpd) based on ITE's *Trip Generation* (Ref. 4). Assuming the pass-by reduction and internal capture discussed previously are applied, the overall vehicle trip reduction for the study area will be 21 percent, and would result in the adjusted daily trips generated by the planned land use to be approximately 173,725 vpd.

Without transportation demand and/or land use management policies/strategies in place, the impact on the City's street network will be significant. Figure 13 illustrates the thoroughfare network that would be required to accommodate the build-out condition. The network shown is not realistic and would be next to impossible to implement because of the overall the cost as well as the environmental impacts. If the City were to develop based on the current trends, the roadway network would become so congested and the desire to live in the area may reduce as a result slow if not stop the development within certain areas of the City. The critical roadways are FM 1431 east of the City and Lohmans Ford Road, and these roadways may act as a choking point that would restrict the overall growth of the City. These roadways would be handling traffic similar to Mopac Expressway north of US 183, and that section of roadway is a freeway with frontage roads. In order to alleviate the congestion, both FM 1431 and Lohmans Ford Road would require a freeway cross section, which would include four (4) main line lanes and four (4) frontage road lanes.

Land Use and Transportation Management Strategies

Some examples of management strategies that the City could implement to help alleviate the congestion may include but are not limited to land use rezoning and/or downzoning, car and van pooling, and commuter bus service. Typically, cities will reevaluate their land use mix to implement a mix that increases local trips and non-motorized trips, resulting in few longer trips. However, based on the City's current plan, the local trips would still need to use Lohmans Ford Road to access the non-residential uses along FM 1431, which seems to be the focus within the City. To lessen the need for using Lohmans Ford Road, the City could shift the town center focus to the south along Lohmans Ford Road. This would shorten the local trips and lessen the impact along Lohmans Ford Road.

Also, access management strategies should be considered as the step in improving the capacity of a roadway. These strategies could be corridor-wide via stand-alone projects or part of a roadway widening project, or they are applied on an individual case by case basis. Some examples of access control are:

- Requiring shared access points
- Constructing a raised median
- Providing inter-parcel access

# City of Lago Vista

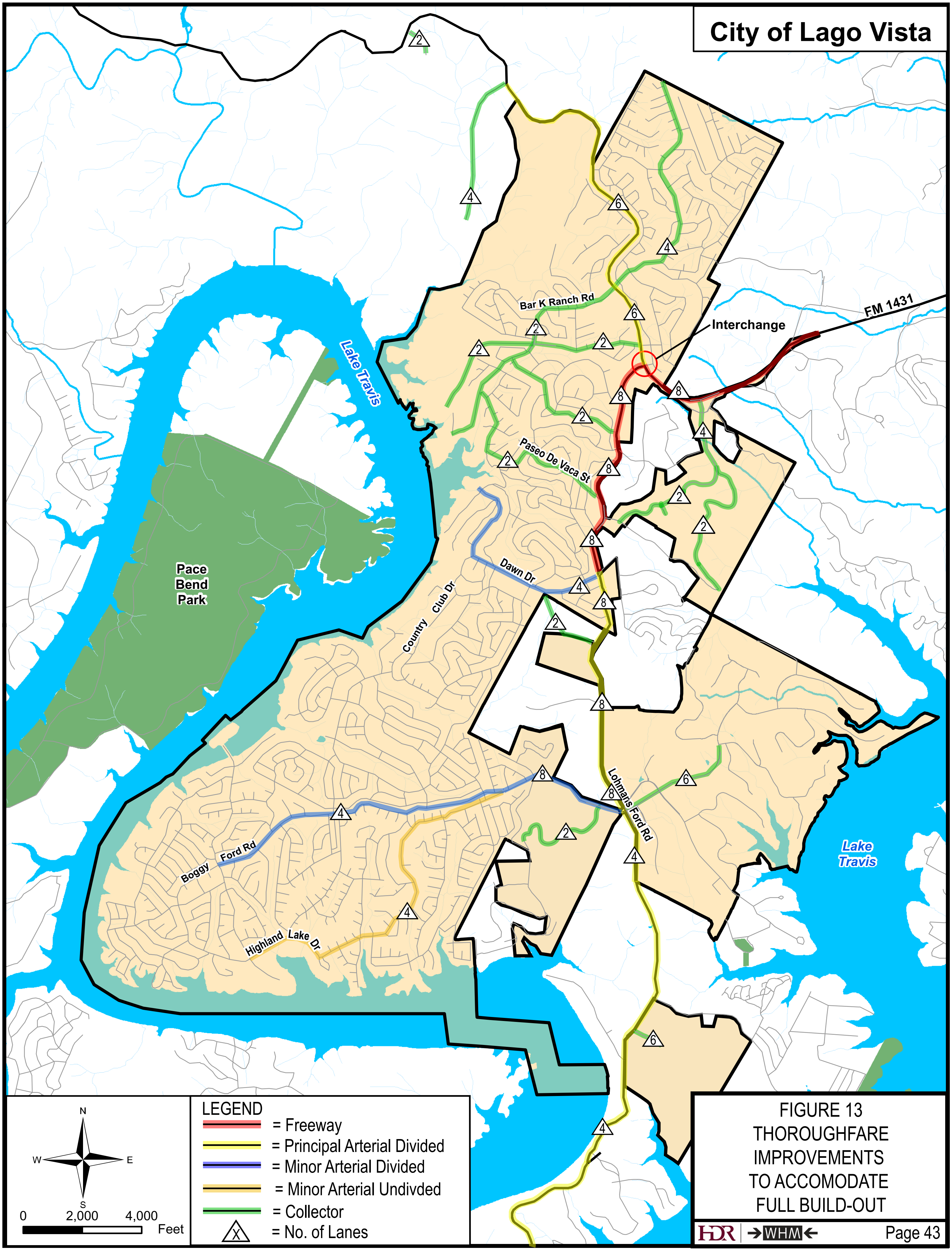



FIGURE 13
THOROUGHFARE
IMPROVEMENTS
TO ACCOMODATE
FULL BUILD-OUT

## REFERENCES


1. *CAMPO Mode Choice Model Application*, Capital Area Metropolitan Planning Organization, Austin, Texas, March 2002.
2. David Husch, John Albeck, *Synchro plus SimTraffic 7*, Trafficware, Albany, California, 2007.
3. *Highway Capacity Manual*, (SR 209), Transportation Research Board, Washington, D.C., 2000.
4. *Trip Generation: An ITE Informational Report*, 8th Ed., Institute of Transportation Engineers, Washington, DC, 2008.
5. *Trip Generation Handbook*, An ITE Proposed Recommended Practice, Institute of Transportation Engineers, Washington, D.C., March 2001.