Agenda Date: 01/24/2017
Agenda Item: 5.3

OAKLEY
CALIFORNIA

STAFF REPORT

Approved and Forwarded to City Council:

Bryan H. Montgomery, City Manager

Date: Tuesday, January 24, 2017

To: Bryan H. Montgomery, City Manager

From: Kevin Rohani, P.E. Public Works Director/City Engineer

SUBJECT: Approve the City of Oakley Traffic Model Administrative Report and adopt the Citywide Traffic Model

Background and Analysis

On July 14, 2015, the City Council approved an agreement with TJKM Transportation Consultants for engineering services associated with the creation of the City of Oakley Traffic Model Project. The intent of the project was to create a traffic model that will be used as the foundation for evaluating traffic impacts for future private developments in the City of Oakley, and will show the cumulative traffic impacts to the City's transportation network. This project would develop, calibrate, and validate a Citywide Traffic Model that can assist the City to evaluate the impacts of future developments within the City of Oakley's Sphere of Influence as new developments are processed.

Over the past few months, City staff has worked closely with TJKM Transportation Consultants and collected traffic data at thirty seven selected intersections and used this data to determine the existing Level of Service (LOS) during morning (A.M.) and afternoon (P.M.) peak periods. LOS is a quality measure describing operational conditions within a traffic system and the overall efficiency of an intersection. Generally, it measures delay, speed, travel time, traffic interruptions, comfort and convenience. The LOS of an intersection can range from LOS A to LOS F; with LOS D as the threshold of an acceptable operating condition consistent with the City of Oakley Standard adopted in the General Plan.

The traffic data collected was analyzed using the Vistro traffic software program. Vistro is an interactive computer program that enables planners and engineers to effectively conduct citywide traffic forecasting studies and rapidly forecast the traffic impacts of new developments. Vistro can analyze traffic operations, evaluate new development impacts, and optimize signal timings. It can be used to analyze an intersection, a corridor, or an entire network. The Citywide Traffic Model created in Vistro will be a great asset to have in the City of Oakley to identify and forecast traffic demands in the City's roadway network for many years to come.

The Citywide Traffic Model Administrative Report captures the existing conditions of traffic and the existing transportation network in the City of Oakley as of December 2016. Out of the thirty seven intersections studied, seven were found to be operating below LOS D (one signalized and six un-signalized intersections). These locations are being closely analyzed with two intersections slated for signalization (Main Street/Norcross Lane & Laurel Road/Rose Avenue), while the remaining are prioritized as funding becomes available. The two new signalized intersections will operate at above LOS D.

The Citywide Traffic Model will be updated as projects are approved and constructed. The attached Citywide Traffic Model Update Guideline will help assist development applicants determine what is required for the approval of future developments.

Fiscal Impact

Approval of the resolution will have no impacts to the City's General Fund budget. The Traffic Model will be updated during staff review and the approval process of future private developments.

Recommendation

Staff recommends that the City Council approve the Citywide Traffic Model Administrative Report prepared by TJKM Transportation Consultants and adopt the Citywide Traffic Model to analyze traffic impacts as future private developments are constructed.

Attachments

1) Resolution
2) Citywide Traffic Model Update Guideline
3) Citywide Traffic Model Administrative Report

RESOLUTION NO. __-17

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF OAKLEY APPROVING THE CITYWIDE TRAFFIC MODEL ADMINISTRATIVE REPORT AND ADOPTING THE CITYWIDE TRAFFIC MODEL

WHEREAS, On July 14, 2015, the City Council approved the proposal from TJKM Transportation Consultants for engineering services associated with the City of Oakley Traffic Modeling Project; and

WHEREAS, the Citywide Traffic Model Administrative Report dated November 30, 2016 has been completed and attached; and

WHEREAS, the Citywide Traffic Model has been created using Vistro, a computer software to analyze traffic impacts for future developments in the City of Oakley; and,

WHEREAS, the Citywide Traffic Model Update Guideline will be used as a framework of how to implement updates to the Citywide Traffic Model; and,

WHEREAS, the Citywide Traffic Model will be updated at the discretion of the City Engineer as deemed necessary and the cost to update the model will be included in part of the staff review approval process of the project.

NOW, THEREFORE, BE IT RESOLVED AND ORDERED, by the City Council of the City of Oakley approve the Citywide Traffic Model Administrative Report as complete and adopt the Citywide Traffic Model.

PASSED AND ADOPTED by the City Council of the City of Oakley at a meeting held on the 24th of January, 2017 by the following vote:

AYES:
NOES:
ABSENT:
ABSTENTIONS:

APPROVED:

____
Sue Higgins, Mayor

ATTEST:

____
Libby Vreonis, City Clerk

____
Date

Attachment 2

OAKLEY

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Citywide Traffic Model Update Guideline

January 2017

A proposed project shall be analyzed for the traffic impacts in the City's street network using the following steps:

1. Applicant to submit a Traffic Technical Memorandum prepared by a Traffic Engineer identifying the following:

    a. Determine if proposed project will generate 100 peak hour trips, analyzing both for a.m. or p.m. peak. If fewer than 100 trips and no significant impacts, no further study is conducted and the project is approved. City staff will update the model to include the additional trips identified and add it to the "Existing plus Approved Projects" condition in the Citywide Traffic Model.

    b. Determine peak hour trip generation at selected study intersections as identified by the City Engineer.

    c. Use existing counts and LOS from Citywide Traffic Model – collect new counts as necessary.

2. City staff review of Traffic Technical Memorandum will consist of the following:

    a. Calculate "Existing plus Project" LOS at study intersections using Citywide Traffic Model.

    b. Calculate "Existing plus Approved Projects plus Proposed Project" using Citywide Traffic Model to test project impacts.

3. If the proposed project shows significant impacts, a Traffic Impact Study must be prepared. The Citywide Traffic Model will be updated based on the findings of the approved Traffic Impact Study for the project.

Attachment 3

Citywide Traffic Model
Administrative Report

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TJKM
VISION THAT MOVES YOUR COMMUNITY

Prepared For: City of Oakley
Date: November 30, 2016

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EXECUTIVE SUMMARY

This report presents the results of traffic operations analysis and impact assessment conducted for the proposed residential and commercial developments in the City of Oakley. It also describes the City's travel characteristics, roadway system, pedestrian and bicycle networks, and public transit system.

The City of Oakley is currently evaluating all major and minor development applications and approvals. The traffic impacts and implications of these projects are being evaluated in this document to provide an understanding of the individual and combined potential transportation impacts and required improvements to the City's transportation systems. As a major part of this study, TJKM has created a Vistro traffic model for the City. The Vistro Model examines key intersections in the City, both under existing conditions and with the traffic added from approved projects. This model provides an important analysis tool for the City to evaluate the impacts of future proposed projects and the combined impacts of existing conditions, approved projects, and proposed projects.

To evaluate the impacts on the transportation infrastructure due to the addition of traffic from the previously approved projects, 37 study intersections were evaluated during the weekday a.m. and p.m. peak hours under two study scenarios. The study intersections were evaluated under Existing Conditions and Existing plus Project Conditions. Study intersections were evaluated in accordance with the standards set forth by the level of service (LOS) policies of the City of Oakley. **Figure ES-1** illustrates the study intersections.

This report summarizes the data collection, development of the Citywide Traffic Model, results of traffic operational analysis and transportation assessment relevant to the proposed developments within the City of Oakley Sphere of Influence. A key goal of this report is to incorporate transportation improvements that aim to reduce transportation impacts due to future growth.

Citywide Traffic Model

Citywide Traffic Model using Vistro Software was developed. The model was developed, calibrated and validated based on the data collected, field observations, regional travel demand model and relevant studies completed within the City of Oakley. The Citywide Traffic Model is intended to analyze impacts from proposed development within the City and be an analysis tool for the evaluation of traffic operations at the same time.

Existing Conditions

Under Existing Conditions of the 37 study intersections evaluated, one signalized intersection and six unsignalized intersections operate at LOS E or LOS F during the a.m. and/or p.m. peak hour. Other intersections operate at LOS D or better. The intersections operating at LOS E or LOS F during the a.m. and/or p.m. peak hour are illustrated in **Figure 6** of the report.

Project (Approved Developments) Trip Generation

Based on the approved projects with entitlements as of 2016, it is projected that approximately 4,296 new residential single-family units, 195 multi-family units, and 465,000 square feet of new commercial and office space, which has been approved by the City of Oakley, could be built in the future. Above projections are based on the approved projects as of October 2016 and do not represent full buildout of the General Plan. Based on approval of the above-mentioned projects, approximately 3,869 additional a.m. peak hour vehicle trips and 5,482 additional p.m. peak hour vehicle trips will be added to the existing transportation infrastructure.

Existing plus Project (Approved Developments) Conditions

TJKM gathered the available studies performed in the City for the approved project developments. In particular, TJKM reviewed Environmental Impact Reports (EIRs) such as the *East Cypress Corridor Specific Plan, Downtown Specific Plan,* and other available EIR documents. Available data for approved projects was modeled in the Citywide Traffic Model.

Based on the data collected from various specific plans and approved projects as of October 2016, future buildout traffic volume projections were developed at the selected study intersections under this scenario. The 37 major intersections were selected and included in the traffic model within the City. There may be intersections that will be considered in future updates of the traffic model, as determined by the City of Oakley's City Engineer. Per the City of Oakley General Plan, LOS D or a volume-to-capacity (V/C) ratio of 0.90 is consider acceptable.

Impacts at certain intersections will be prioritized by City of Oakley, as approved projects would move forward with construction.

Model Updates

The Citywide Traffic Model shall be updated in conjunction with the development projects in the City. The following is suggested for updating the model.

- Conduct new peak hour turning movement counts at the study intersections.
- Remove projects from the model, that have progressed from the approval stage to being fully functional as their traffic volumes are now counted at the study intersections.
- Add new study intersections as deemed necessary in the model.
- For new development application, conduct traffic impact study and upon approval of the traffic impact study, enter the information of the approved project in the model.

In addition, it is recommended that the City of Oakley develop procedures on how to include future developments in the Citywide Traffic Model. The Citywide Traffic Model should be updated at the discretion of City Engineer as deemed necessary. Upon the receipt of a project application that has been approved, the City Engineer will determine if an update to the traffic model is required.

Study Intersections

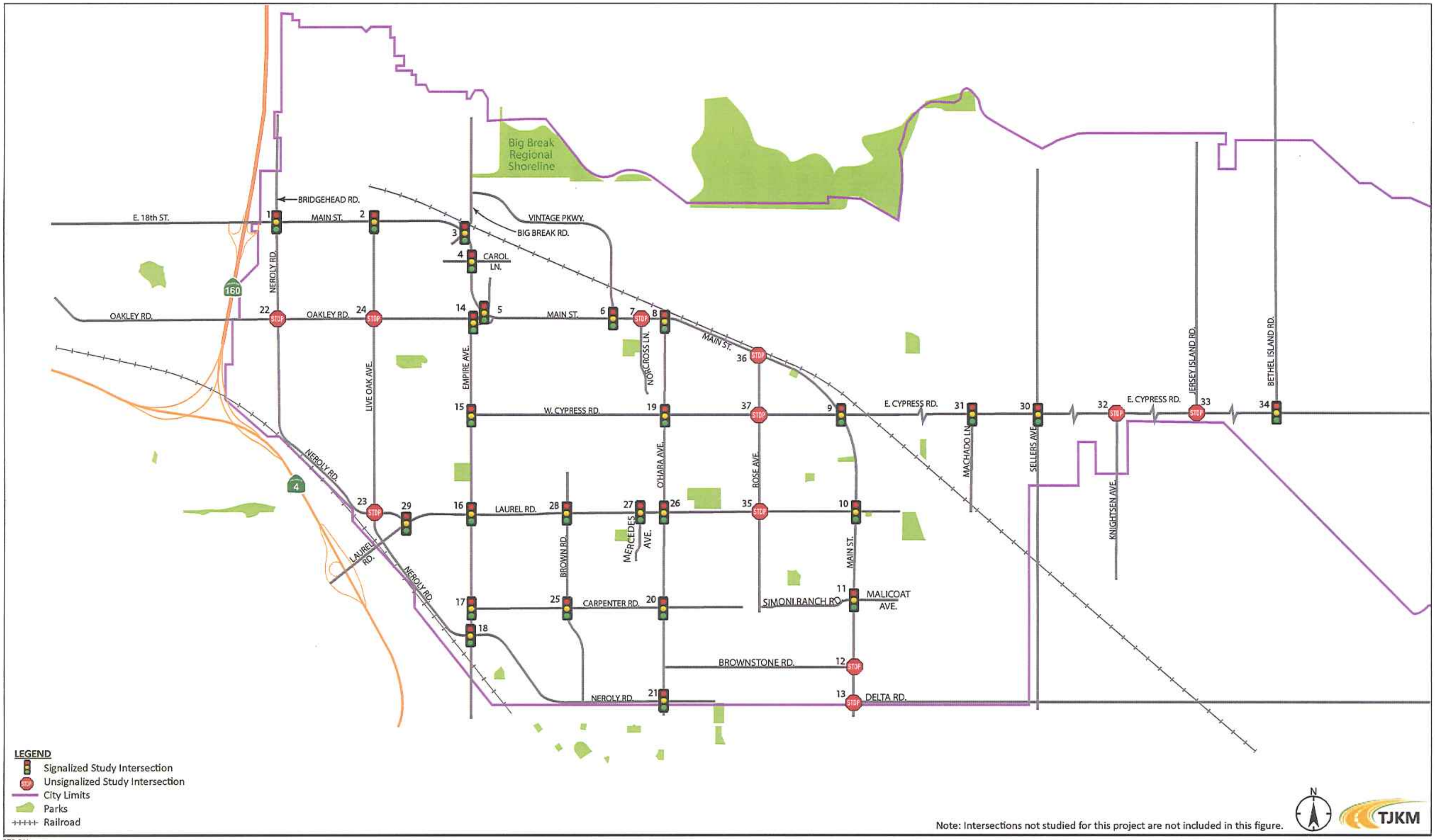

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Figure ES-1

INTRODUCTION

The City of Oakley is a mid-sized, culturally diverse community that is located on the flanks of the San Joaquin River Delta, north and east of the slopes of Mount Diablo and separated from the central and western portions of Contra Costa County.

In cooperation with City staff, TJKM conducted a comprehensive capacity and safety study for 37 of the City's major intersections to identify impacts resulting from proposed developments around and within the City and to develop improvements to mitigate the impacts. A related aspect of the project was to identify potential capacity deficiencies at major intersections, which would assist the City to address and mitigate those traffic impacts resulting from future developments.

This study not only provides a comprehensive analysis of the all-critical transportation facilities specifically within the City of Oakley, but it also addresses the external linkages to important local, regional, and interregional transportation facilities.

PURPOSE OF THE STUDY

Growth and development pressures continue within the City's sphere of influence. A definitive plan to programmatically improve the City's transportation system is necessary to correct existing deficiencies and meet future needs. Additionally, clear coordination needs to be established in order to blend the local needs of the City with the regional needs of Contra Costa County and the statewide needs of Caltrans. This study intends to provide the planning framework necessary for transportation improvements, and a plan to enable the City to grow and develop in an efficient manner with infrastructure that emphasizes safety and multimodal transportation opportunities. This report summarizes the existing and future transportation infrastructure conditions and identifies improvements to enhance operations and safety for all modes of transportation.

STUDY INTERSECTIONS

TJKM evaluated traffic conditions at 37 study intersections: 26 signalized intersections and 11 unsignalized intersections. The study intersections were selected in consultation with City staff. The peak periods observed were between 7:00-9:00 a.m. and 4:00-6:00 p.m. The peak periods were determined based on daily traffic volumes and knowledge of travel patterns within the City of Oakley. The study intersections and associated traffic controls are as follows:

1. Main Street/Bridgehead Road (Signalized)
2. Main Street/Live Oak Road (Signalized)
3. Main Street/Big Break Road (Signalized)
4. Main Street/Carol Lane (Signalized)
5. Main Street/Empire Avenue (Signalized)
6. Main Street/Vintage Parkway (Signalized)
7. Main Street/Norcross Lane (Unsignalized) [To be signalized in 2017]
8. Main Street/O'Hara Avenue (Signalized)
9. Main Street/Cypress Road (Signalized)
10. Main Street/Laurel Road (Signalized)

11. Main Street/Simoni Ranch Road (Signalized)
12. Main Street/Brownstone Road (Unsignalized)
13. Main Street/Delta Road (Unsignalized)
14. Empire Avenue/Oakley Road (Signalized)
15. Empire Avenue/Cypress Road (Signalized)
16. Empire Avenue/Laurel Road (Signalized)
17. Empire Avenue/Carpenter Road (Signalized)
18. Empire Avenue/Neroly Road (Signalized)
19. O'Hara Avenue/West Cypress Road (Signalized)
20. O'Hara Avenue/Carpenter Road (Signalized)
21. O'Hara Avenue/Neroly Road (Signalized)
22. Neroly Road/Oakley Road (Unsignalized)
23. Neroly Road/Live Oak Avenue (Unsignalized)
24. Oakley Road/Live Oak Avenue (Unsignalized)
25. Carpenter Road/Brown Road (Signalized)
26. Laure Road/O'Hara Avenue (Signalized)
27. Laurel Road/Mercedes Avenue (Signalized)
28. Laurel Road/Brown Road (Signalized)
29. Laurel Road/Neroly Road (Signalized)
30. East Cypress Road/Sellers Road (Signalized)
31. East Cypress Road/Machado Lane (Signalized)
32. East Cypress Road/Knightsen Avenue (Unsignalized)
33. East Cypress Road/Jersey Island Road (Unsignalized)
34. East Cypress Road/Bethel Island Road (Unsignalized)
35. Rose Avenue/Laurel Road (Unsignalized)
36. Rose Avenue/Main Street (Unsignalized)
37. Rose Avenue/West Cypress Road (Unsignalized)

Figure 1 illustrates the study intersections and the vicinity map.

STUDY SCENARIOS

This study addresses the following two traffic scenarios:

- **Existing Conditions** – This scenario evaluates intersections based on peak hour traffic volumes, lane geometry, and traffic controls from 2015 and 2016 data collection.
- **Existing plus Project (Approved Projects) Conditions** – This scenario describes the projected peak hour traffic operations based on the net change to travel patterns anticipated from approved (but not yet constructed) or fully/partially occupied developments in the City at the time of the Existing Conditions assessment. This includes additional trips that would be generated if the proposed developments were to operate at full occupancy. The conditions in this scenario were developed using the Vistro Model.

Project Vicinity Map

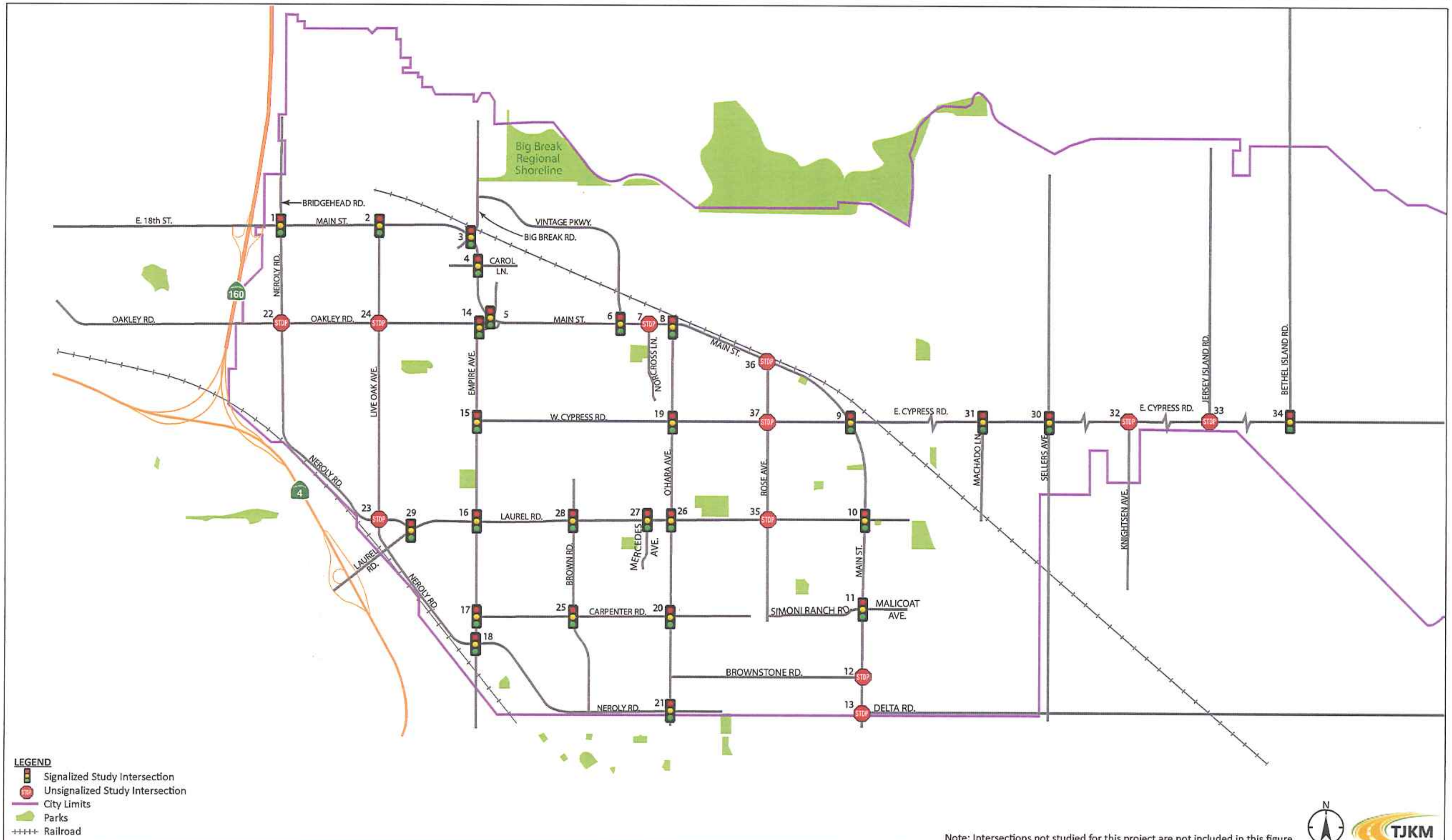

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Figure 1

DATA COLLECTION

This section summarizes the data collection efforts for the City of Oakley Citywide Traffic Model Study. Two primary types of data were collected to support the determination of Existing Conditions: (1) peak hour turning movement volume counts; and (2) signal timings. Intersection LOS analysis was performed using the turning movement data for both the a.m. and p.m. peak hours.

TURNING MOVEMENT COUNTS

TJKM collected the turning movement counts for 37 study intersections during the a.m. (7:00–9:00 a.m.) and p.m. (4:00–6:00 p.m.) peak periods in September 2015. These counts were collected at each location using manual observation to physically record the number of vehicles that turn left or right or drive through the intersection for each of the intersection approaches. To ensure proper data collection on normal traffic days, each day and time was carefully reviewed and any questionable days/times were eliminated from the data collection schedule. This included identifying school holidays across the City and any events, which occurred during the data collection period. Data were collected only during days and times when no public holidays, construction activity, special events, or unusual weather conditions occurred in order to be representative of normal traffic conditions. **Appendix A** contains the vehicle, pedestrian, and bicycle counts for the study intersections.

For the intersections of Rose Avenue and Laurel Avenue, Rose Avenue and W. Cypress Road, and Rose Avenue and Main Street, intersection turning movement volumes were provided by the City of Oakley. The counts at these intersections were collected in 2016.

SIGNAL TIMING PLANS

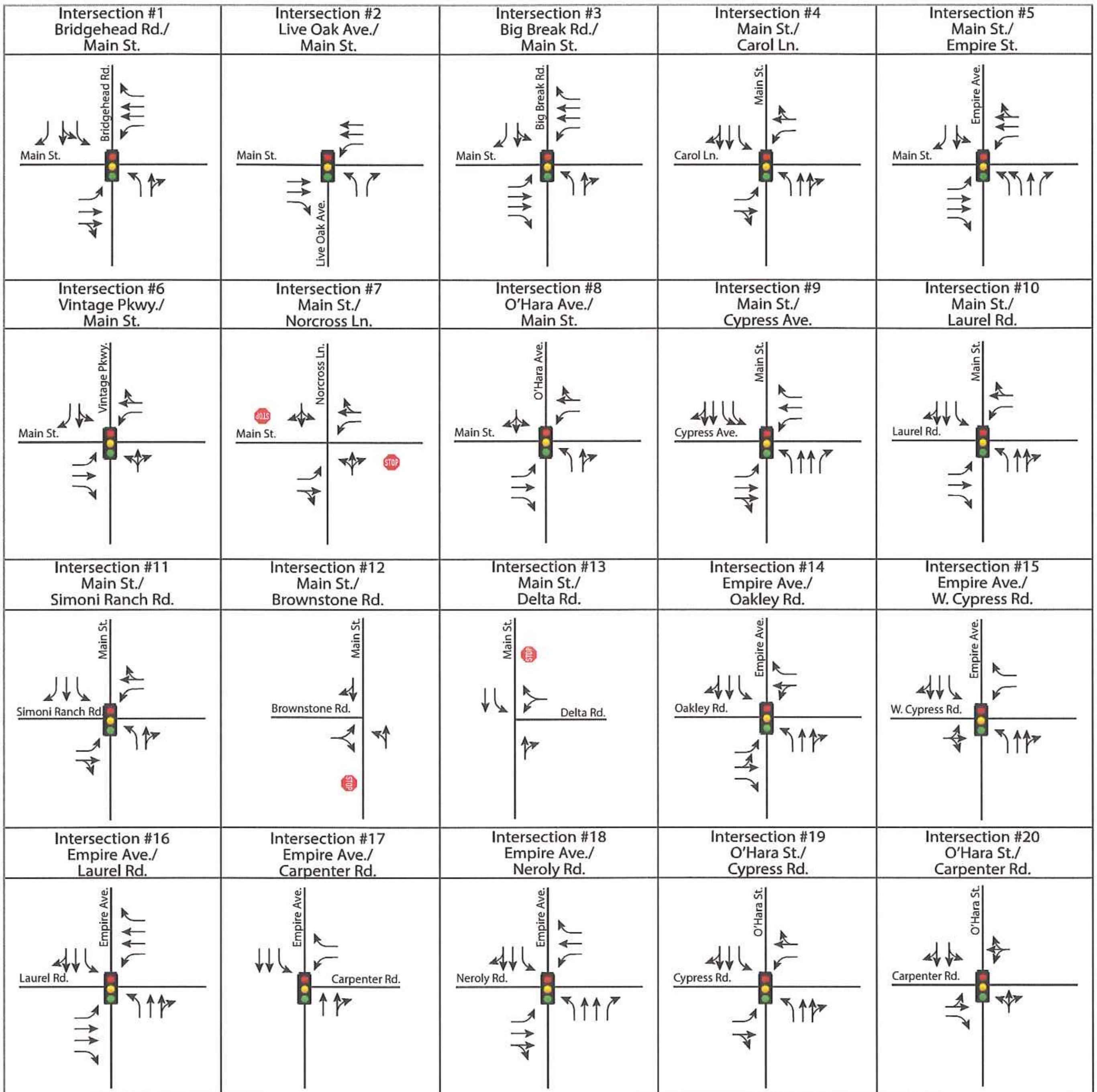
Signal timing plans were obtained from the City for the study signalized intersections. The following key parameters were included in the Vistro analysis for every signalized study intersection to accurately model existing conditions:

- **Walk Time** – The amount of time for a pedestrian walk phase. The pedestrian phase only activates when the phase has pedestrian calls or if the phase has pedestrian recall. The pedestrian recall parameter causes the controller to place a continuous call for pedestrian service on the phase, resulting in the controller timing its walk and flashing don't walk operation.
- **Flashing Don't Walk Time** – The amount of time for a pedestrian Flash Don't Walk Phase.
- **Minimum Green Time** – The shortest time that a phase can display green.
- **Yellow Time** – The amount of time for the yellow interval.
- **Red Time** – Amount of time for the all-red interval that follows the yellow interval. The all-red time should be of sufficient duration to permit the intersection to clear before cross traffic is released.
- **Vehicle Extension Time** – This is also the maximum gap. When a vehicle crosses a detector, it will extend the green time by the vehicle extension time.
- **Minimum Gap Time** – This is the minimum gap that the signal controller will use with volume-density operation.

- **Phasing** – The type of left-turn phasing (protected, split, or permissive) also included in the Vistro model.
- **Offsets** – The offset value represents the number of seconds that the reference phase lags the master reference (or arbitrary reference if no master is specified). The master reference synchronizes the intersections sharing a common cycle length to provide for a coordinated system.

The Existing Conditions intersection lane geometry and controls are illustrated in **Figure 2a** and **Figure 2b**. Existing Conditions intersection turning movement volumes are illustrated in **Figure 3a** and **Figure 3b**.

Existing Lane Geometry and Traffic Controls



LEGEND

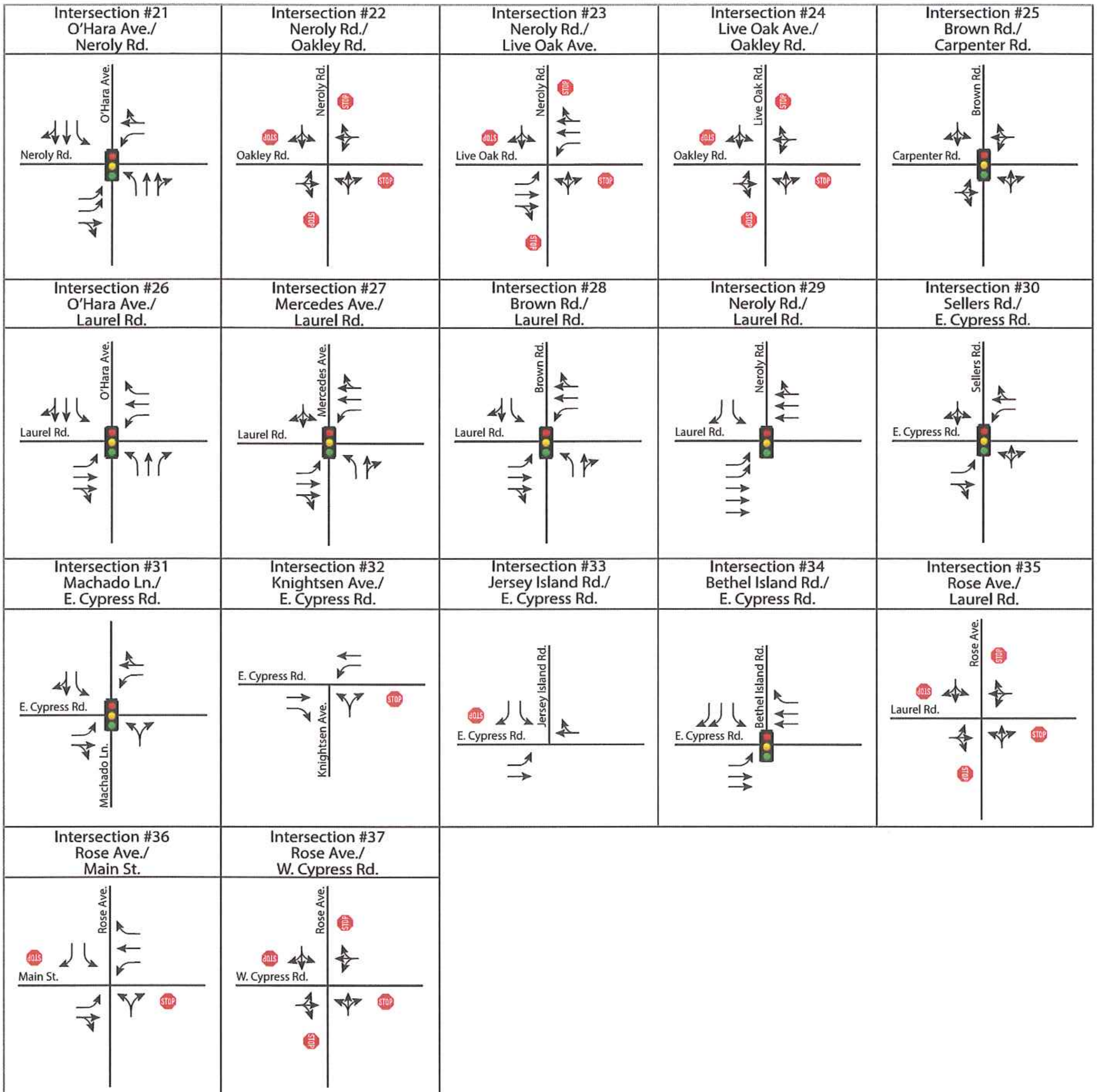
Traffic Signal

Stop Sign

N

TJKM

Existing Lane Geometry and Traffic Controls



LEGEND

Traffic Signal

Stop Sign

N

TJKM

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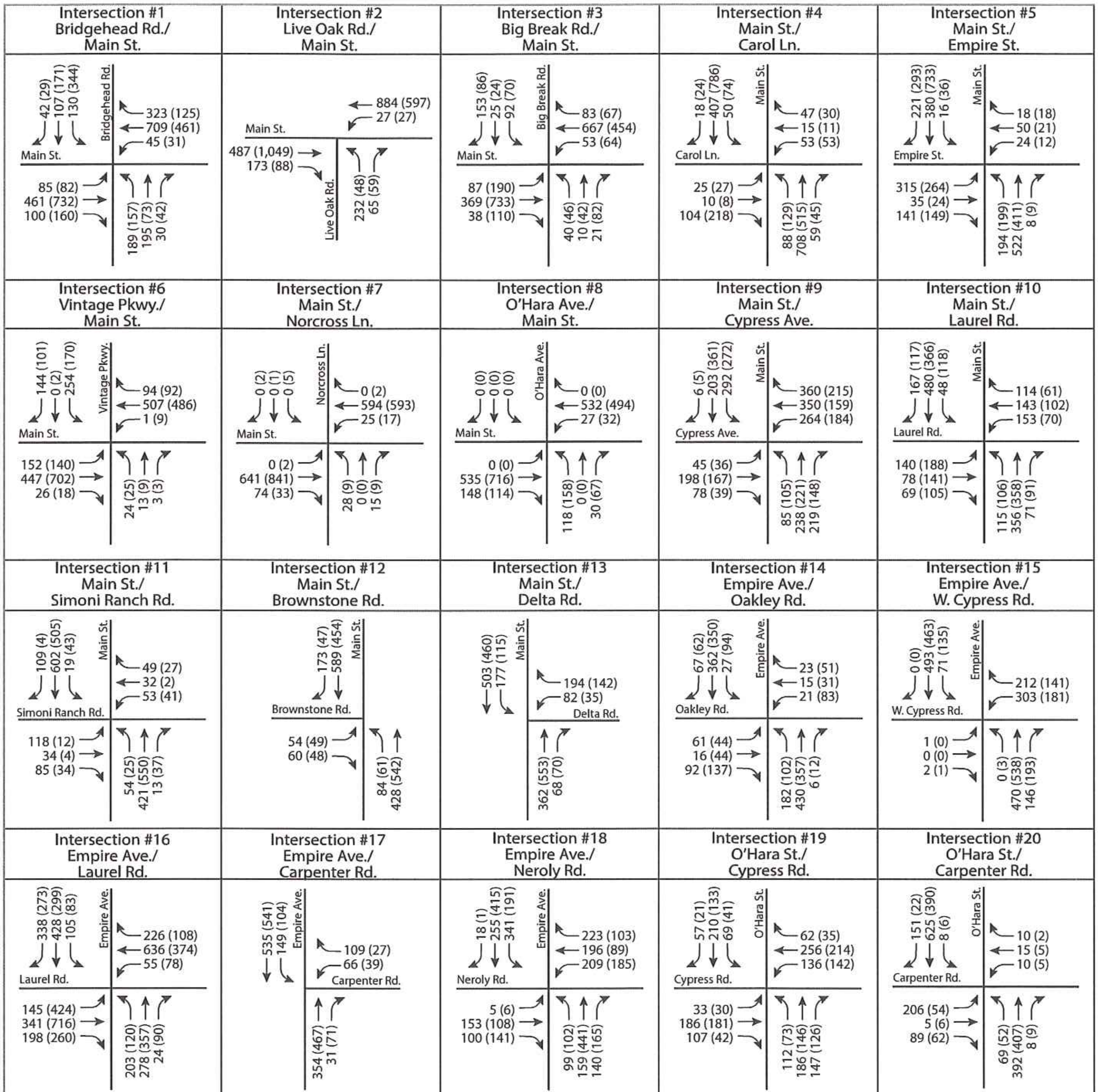
Figure 2b

Existing Conditions Traffic Volumes



LEGEND

XX AM Peak Hour Volumes

(XX) PM Peak Hour Volumes

N

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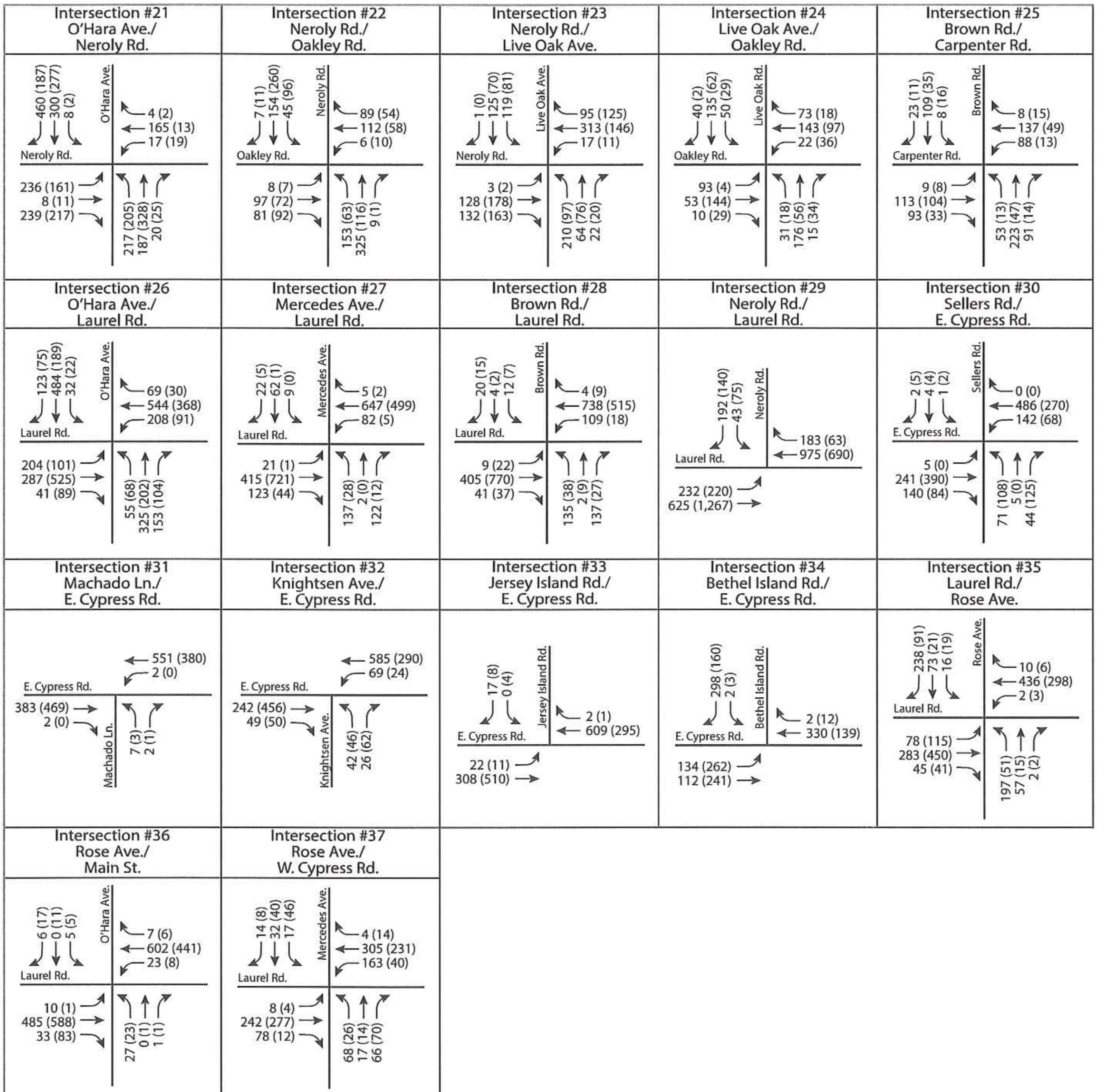
Figure 3a

Existing Conditions Traffic Volumes



LEGEND

XX AM Peak Hour Volumes

(XX) PM Peak Hour Volumes

N

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Figure 3b

CITYWIDE TRAFFIC MODEL

A main objective of the project was to develop, calibrate, and validate a Citywide Traffic Model that can assist the City to evaluate the impacts of future developments within the City of Oakley Sphere of Influence. The Citywide Traffic Model is intended to analyze impacts from proposed development within the City and be an analysis tool for the evaluation of traffic operations at the same time.

CITYWIDE TRAFFIC MODEL DEVELOPMENT

The Citywide Traffic Model was developed in consultation with the City of Oakley staff using Vistro Software. Vistro is an interactive computer program that enables planners and engineers to effectively conduct citywide traffic forecasting studies and rapidly forecast the traffic impacts of new developments. Vistro can analyze traffic operations, evaluate new development impacts, and optimize signal timings. It can be used to analyze an intersection, a corridor, or an entire network. All data in Vistro is stored in a set of individual development zones, critical intersections, and gateways where new traffic enters and leaves the study area. The land uses, trip generation rates, and trip distribution percentages are determined by the user and manually entered for each development zone. The paths that traffic will take moving from each traffic analysis zone to each gateway are drawn on a graphically scaled street network. Vistro then generates the hourly traffic, assigns it to the street system, and reports traffic volumes by link and node. The software model setup requires the input of geometric configurations, traffic flow, traffic control, and signal timings at the study intersections under existing conditions. The operational models were developed for the a.m. and p.m. peak hours based on data collected for this project. The Citywide Traffic Model was developed based on the data collected in the field and from City staff.

A street network system consisting of all major streets within the City of Oakley's sphere of influence, Traffic Analysis Zones (TAZs), gates, intersections, and centroid connectors were developed in Vistro. The model's street network consists of "nodes" and "links". Each node represents an intersection or some other intermediate point on the street system. Each link in the network represents a roadway segment connecting two nodes.

Using an overlay of the TAZ Map on top of the street network, "zones", "gates", and additional links that represent "centroid connectors" were defined within the model. A zone is a logical point within a TAZ where all land development contained within that TAZ is assumed to be concentrated for traffic modeling purposes. The centroid connectors are schematic links that carry traffic, in both directions, between the zone and the adjacent street system. Special zones known as gates were also coded to represent the terminal points for the zones and the external points. In all, the Citywide Traffic Model consists of a total of 42 TAZs and 16 gates. Once the TAZs and gates were developed, trip paths from each TAZs were assigned to the gates based on relevant studies, existing travel patterns and regional travel demand model.

TRAFFIC ANALYSIS ZONES

The various parcels that are anticipated to experience future development in the City of Oakley were first identified and then separated into different TAZs in the Vistro model. The areas are predominantly used for organizational and summary purposes. Each TAZ represents an area that would be expected to have similar travel characteristics and may incorporate one or more separate parcels. Physical barriers or major roadways often define TAZs. Below is a brief geographical description of one TAZ identified in the model with trip generation associated with a specific zone.

East Cypress Avenue Corridor – This area is generally bounded on the south and east by the City limits, and on the north by San Joaquin River. This area includes the majority of vacant land within the City, as well as the bulk of land zoned for residential uses.

A list of development assumptions and trip generation assumptions for each TAZ is provided in **Appendix C**.

VALIDATION AND CALIBRATION

Upon development of model, the model was validated and calibrated to replicate existing conditions based on data collected, field observations, and relevant studies. Under existing conditions, the LOS projected by the model was compared to field conditions and Contra Costa Transportation Authority methodology. The City of Oakley has been conducting traffic analysis based on the guidelines documented within the Contra Costa Transportation Authority Guidelines for traffic analysis.

Calibration factors, including signal-timing parameters, were adjusted to replicate existing conditions and traffic studies completed within the City of Oakley. Some of the key factors that were adjusted during calibration were:

- Vehicle fleet composition (passenger cars, buses, recreational vehicles, and heavy trucks)
- Actuation type for the signalized intersections

As part of the validation process, project-only trips from each TAZs were projected along the transportation network to ensure that the model routes the traffic from each development to the gates, as modeled within the Citywide Traffic Model.

STUDY METHODOLOGY

LEVEL OF SERVICE METHODOLOGY

Level of Service (LOS) is a qualitative measure that describes operational conditions as they relate to the traffic stream and perceptions by motorists and passengers. The LOS generally describes these conditions in terms of speed and travel time, delays, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. The operational levels of service are given letter designations from A to F, with A representing the best operating conditions (free-flow with little or no delay) and F representing the worst conditions (severely congested flow with high delays). Intersections are generally the capacity-controlling locations, with respect to traffic operations, on arterial and collector streets.

SIGNALIZED INTERSECTIONS

The study intersections under traffic signal control were analyzed using Highway Capacity Manual 2010 (HCM 2010) Operations Methodology for Signalized Intersections, as described in Chapter 18. This methodology determines LOS based on overall average control delay per vehicle for the intersection during peak hour operating conditions. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections was calculated using Vistro analysis software and correlated to a LOS designation. **Table 1** presents the HCM 2010 delay and LOS definitions.

UNSIGNALIZED INTERSECTIONS

Stop-Control study intersections were analyzed using HCM 2010 Operations Methodology for Unsignalized Intersections, as described in Chapters 19 and 20. LOS ratings for Stop-Control intersections are based on average control delay expressed in seconds per vehicle. At the side street of one-way stop-controlled intersections or two-way stop sign intersections, the control delay is calculated for each movement, not for the intersection as a whole. For approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. The weighted average delay for the entire intersections is presented for all-way stop-controlled (AWSC) intersections. The average control delay for unsignalized intersections was calculated using Vistro analysis software and correlated to a LOS designation. At an unsignalized intersection, most of the major street traffic is not delayed, and by definition has acceptable conditions. The major street left-turn movements and minor street movements are all susceptible to delay of varying degrees. Generally, higher major street traffic volumes are associated with higher delay for minor movements. HCM 2010 definitions for delay and LOS at unsignalized intersections are presented in **Table 1**.

All intersection analyses were conducted using procedures and methodologies consistent with HCM 2010 (Transportation Research Board, 2010). These methodologies were applied using Vistro traffic analysis software.

The analysis methodology described above was used to measure a.m. and p.m. peak hour traffic operations for all study intersections.

Table 1 describes the LOS thresholds from HCM 2010 for intersections. The intersection LOS thresholds differ between signalized and unsignalized intersections. LOS is determined by the average control delay on an intersection-wide basis for signalized and AWSC intersections, and on the movement with the highest delay for minor-street stop-controlled intersections.

Table 1: Level of Service Thresholds Based on Intersection Control Delay

Level of Service	Description	Signalized Intersection Delay (D) (sec)	Unsignalized Intersection Delay (D) (sec)
A	Very low control delay, up to 10 seconds per vehicle. Progression is extremely favorable, and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.	0 ≤ D ≤ 10	0 ≤ D ≤ 10
B	Control delay greater than 10 and up to 20 seconds per vehicle. There is good progression or short cycle lengths or both. More vehicles stop causing higher levels of delay.	10 < D ≤ 20	10 < D ≤ 15
C	Control delay greater than 20 and up to 35 seconds per vehicle. Fair progression or longer cycle lengths, or both cause higher delays. Individual cycle failures may begin to appear. Cycle failure occurs when a given green phase does not serve queued vehicles and overflow occurs. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.	20 < D ≤ 35	15 < D ≤ 25
D	Control delay greater than 35 and up to 55 seconds per vehicle. The influence of congestions becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volumes. Many vehicles stop, the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	35 < D ≤ 55	25 < D ≤ 35
E	Control delay greater than 55 and up to 80 seconds per vehicle. The limit of acceptable delay. High delays usually indicate poor progression, long cycle lengths, and high volumes. Individual cycle failures are frequent.	55 < D ≤ 80	35 < D ≤ 50
F	Control delay in excess of 80 seconds per vehicle. Unacceptable to most drivers. Oversaturation, arrival flow rates exceed the capacity of the intersection. Many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to higher delay.	80 < D	50 < D

Source: HCM 2010 Edition

SIGNIFICANT IMPACT CRITERIA/LEVEL OF SERVICE STANDARDS

All Contra Costa jurisdictions, including the City of Oakley, participate in the *Measure J – Growth Management Program*. The overall goal of this program is to achieve a cooperative process for Growth Management on a countywide basis, while maintaining local authority over land use decisions and the establishment of performance standards. Using a formula based on road miles and population, Contra Costa County Transportation Authority (CCTA) allocates 18 percent of sales tax revenues to local jurisdictions that comply with Growth Management requirements. Oakley participates in the Measure C program as a member of the TRANSPLAN subregional transportation planning committee, which consists of the Cities of Antioch, Oakley, and Pittsburg, and Contra Costa County.

Per the City of Oakley General Plan, LOS D or a volume-to-capacity (V/C) ratio of 0.90 are the thresholds of acceptability for signalized intersections. Any signalized intersection operating worse than LOS D would be considered inconsistent with this standard. For this study, the study intersections were analyzed using HCM 2010 Methodology as per the City's guidance. Average control delay is reported in seconds per vehicle for signalized and all-way-stop-control intersections and critical delay for minor approaches is reported for two-way-stop-control intersections. Signalized intersections or unsignalized intersection operating worse than LOS D are considered inconsistent with the City's standard.

EXISTING CONDITIONS

This section describes the existing circulation system including roadway facilities, bicycle and pedestrian facilities, and available transit service serving the City.

EXISTING ROADWAY NETWORK

State Route (SR) 4 – SR 4 is a major east-west highway that extends through the study area. This roadway serves as a major route connecting Oakley to the greater Bay Area and providing connection between Contra Costa County and San Joaquin County. SR 4 typically has two to three travel lanes in each direction with the posted speed limit of 65 miles per hour (mph).

State Route (SR) 160 – SR 160 is a north-south highway that extends through the study area. This roadway serves as a major route connecting Oakley with Sacramento County to the north, and with SR 4 to the west. SR 160 typically has two lanes in each direction, narrowing to one lane per direction north of the Antioch Bridge toll plaza.

Main Street – Main Street is a two to four lane major arterial roadway. Main Street is currently the major north-south transportation corridor in the City of Oakley. Mixed residential, commercial, and agricultural uses characterize the lands along both sides of Main Street between Rose Avenue and Laurel Avenue. Maximum speeds posted on Main Street are 35 miles per hour (mph) west of Rose Avenue, 45 mph between Rose Avenue and Bernard Road, and 40 mph south of Bernard Road.

Empire Avenue – Empire Avenue is a four-lane, north-south divided arterial roadway. Empire Avenue extends north of Oakley Street and travels beyond Shady Willow Lane to the south. It provides access to local residential and regional commercial areas. The posted speed limit is 40 mph in the southbound direction and 45 mph in the northbound direction.

E. Cypress Road – E. Cypress Road is a two to four east west, residential arterial roadway east of Main Street. E. Cypress Road extends from west of Main Street and terminates at the City limits in the east. This roadway provides local access to residential developments. The posted speed limit is 50 mph.

O'Hara Avenue – O'Hara Avenue is a north-south roadway connecting Oakley and the City of Brentwood. O'Hara Avenue extends from north of Main Street and terminates at Brentwood Boulevard to the south. This roadway provides local access to residential developments and to Downtown Oakley's commercial developments.

Laurel Road – Laurel Road, within the project vicinity, is a four-lane, east-west divided roadway. Laurel Road extends beyond Main Street to the east and terminates at SR 4 to the west. The posted speed limits on Laurel Road are 40 mph and 45 mph.

Oakley Road – Oakley Road is a two-lane, east-west minor arterial that connects the City of Oakley and the City of Antioch. It extends west of SR 160 in Antioch to its eastern terminus at Empire Avenue.

Neroly/Bridgehead Road – Neroly Road/Bridgehead Road is a two-lane, north-south roadway connecting the City of Oakley and the City of Brentwood. This roadway provides local access to residential developments.

Live Oak Avenue – Live Oak Avenue is a two-lane roadway extending from Main Street to the north to Neroly Road to the south. An extension of Live Oak Avenue, as a major arterial, is anticipated to be constructed by 2030 to proposed industrial areas in the north with grade-separated crossings at the railroad tracks.

Big Break Road – Big Break Road is a minor north-south roadway providing access to a large residential development and the Oakley Marina. There is an at-grade railroad crossing just north of Main Street.

W. Cypress Road – W. Cypress Road is a two-lane undivided roadway running in an east-west direction. W. Cypress Road extends from Empire Avenue to the west to Main Street to the east. This roadway provides local access to residential developments. The posted speed limit varies between 30 and 35 mph.

Seller Avenue – Seller Avenue is a two-lane, north-south rural road that extends north from Marsh Creek Road to terminate at East Cypress Avenue. It will extend northerly in the future.

Knightsen Avenue – Knightsen Avenue is a two-lane, north-south rural road that extends north from Eden Plains Road to terminate at East Cypress Road.

Delta Road – Delta Road is a two-lane, east-west rural road that extends east from Main Street providing connection to the north end of the planned Byron Highway.

Brown Road – Brown Road is a two-lane roadway that extends north from Neroly Road and terminates beyond Laurel Road. This roadway provides local access to residential developments and provides direct access to Freedom High School located at the intersection of Brown Road and Neroly Road. The posted speed limit is 35 mph.

Carpenter Road – Carpenter Road is a two-lane roadway that extends from Empire Avenue to O'Hara Avenue. This roadway provides local access to residential developments. The posted speed limit is 40 mph. An extension of Carpenter Road to Rose Avenue is anticipated in the near future.

Brownstone Road – Brownstone Road is a two-lane, east-west roadway that extends between Main Street and O'Hara Avenue. This roadway provides local access to residential developments. The posted speed limit is 40 mph.

Vintage Parkway – Vintage Parkway is a two-lane roadway providing access to a large residential development north of Main Street. Vintage Parkway also provides access to commercial developments in Downtown Oakley.

Rose Avenue – Rose Avenue is a two-lane undivided north-south roadway. Rose Avenue extends north from Main Street and terminates at Simoni Ranch Drive. This roadway provides local access to residential developments. The posted speed limits is 35 mph between Main Street and W. Cypress road and 40 mph between W. Cypress Road and Simoni Ranch Drive.

EXISTING PEDESTRIAN FACILITIES

Walkability is defined as the ability to travel easily and safely between various origins and destinations without having to rely on automobiles or other motorized travel. The ideal "walkable" community includes wide sidewalks, a mix of land uses providing residential, employment, and shopping opportunities, minimal conflict points with vehicle traffic, and access to transit facilities and services.

Pedestrian facilities are comprised of crosswalks, sidewalks, pedestrian signals, and off-street paths, which provide safe and convenient routes for pedestrians to access destinations such as institutions, businesses, public transportation, and recreation facilities.

Figure 4 illustrates the location of crosswalks at the study intersections.

Existing Pedestrian Facilities

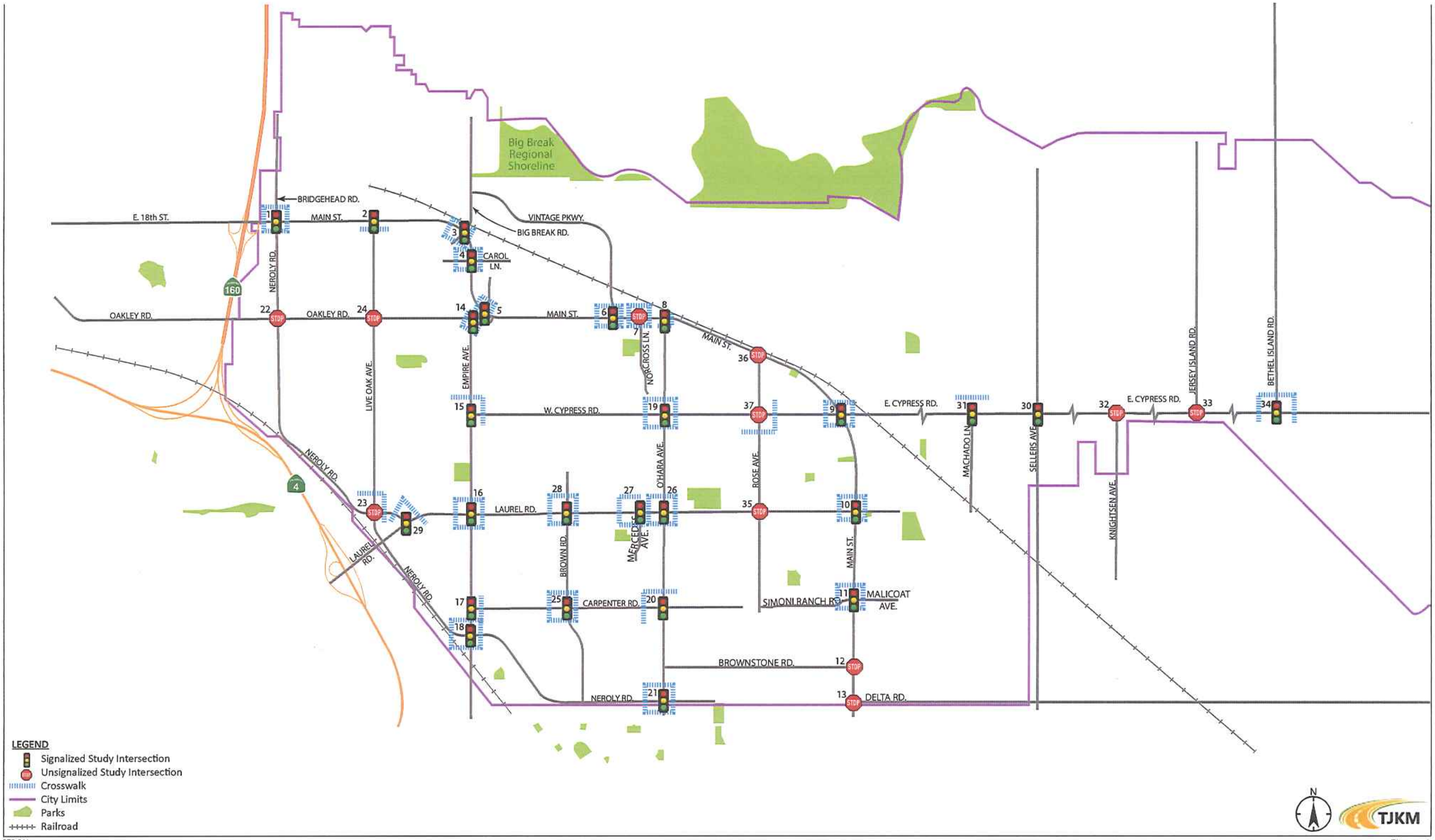

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Figure 4

EXISTING BICYCLE FACILITIES

Bicycle facilities include the following:

- **Multi-Use Paths (Class I)** – A path physically separated from motor vehicle traffic by an open space or barrier, and either within a highway or an independent right-of-way (ROW), used by bicyclists, pedestrians, joggers, skaters, and other non-motorized travelers. Class I paths are the most popular type of facility. Because the availability of uninterrupted ROW is limited, this type of facility may be difficult to locate and expensive to build, relative to other types of bicycle facilities, but inexpensive compared to new roadways. Ideal locations for bike paths are areas such as powerline easements, utility easements, canal banks, river levees, drainage easements, railroad or highway ROW, or regional community parks.
- **Bike Lanes (Class II)** – A portion of a roadway designated by striping and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes are intended to promote an orderly flow of bicycle and vehicle traffic. This type of facility is established by using the appropriate striping, pavement legends, and signs.
- **Bike Routes (Class III)** – Bike routes are shared facilities between bicycle and motor vehicle traffic. They provide for specific bicycle demand and may be used to connect discontinuous segments of bike lanes. In addition, bike routes are located on residential streets and rural roads. If the pavement width is sufficient, and traffic volume/speeds warrant, an edge line may be painted to further delineate the bike route. Bike routes are signed with the G-93 Bike Route marker but no striping or legends are required.

The City of Oakley General Plan (September 2002), City of Oakley Parks, Recreation, and Trails Master Plan (Summer 2007), and the Contra Costa County Bicycle and Pedestrian Plan (October 2009) propose that several new bicycle facilities be constructed in the future.

EXISTING TRANSIT FACILITIES

Tri-Delta Transit provides transit services in the City of Oakley, with three lines connecting Brentwood and the Pittsburg/Bay Point Bay Area Rapid Transit (BART) station.

Route 300, the Pittsburg BART/Brentwood Park & Ride route, is a weekday express route connecting Brentwood to the Pittsburg/Bay Point BART station via Oakley and Antioch. This bus travels along Main Street, operating from 4:15 a.m. to approximately 10:00 p.m. with 15 to 30-minute headways.

Route 383, the Oakley/Antioch/Freedom High School route, connects Oakley to Antioch and Freedom High School in Oakley. This route, in both clockwise and counterclockwise directions, provides only weekday service. The counterclockwise route runs with approximate one-hour headways, and the clockwise route runs twice during the a.m. peak hour period only.

Route 391, the BART/Pittsburg/Antioch/Oakley/Brentwood route, provides weekday service to most East County Cities. The route operates from 4:00 a.m. to 1:15 a.m. with 30 to 60-minute headways.

Route 392, the BART/Pittsburg/Antioch/Oakley/Brentwood route, provides weekend service to Route 391. The route operates from 5:20 a.m. to 2:00 a.m. with approximately 60-minute headways.

Table 2 summarizes the services and frequency during the weekday and on weekends for transit in the City of Oakley.

Table 2: Existing Transit Facilities

Route	From	To	Weekdays		Saturday		Sunday	
			Hours	Headway (min)	Hours	Headway (min)	Hours	Headway (min)
300	Pittsburg/ Bay Point BART Station	Brentwood Park & Ride	6:25 a.m. - 10.00 p.m.	10-30	....	....	....	....
383	Antioch Park & Ride	Antioch Park & Ride 1	7:12 a.m. - 5:26 p.m.	60-120	....	....	....	....
391	Pittsburg/ Bay Point BART Station	Brentwood Park & Ride	4:03 a.m. - 1:14 a.m.	30-60	....	....	....	....
393	Pacifica & Mariners Cove	Brentwood Park & Ride	....	....	5:22 a.m. - 1:39 a.m.	60	6:24 a.m. - 1:49 a.m.	60

Source: www.trideltatransit.com

TRUCK ROUTE

Two major truck routes serve the City of Oakley. Main Street provides the primary route for regional goods movement within the City. Additional truck routes include East Cypress Road and Bethel Island Road. Secondary truck routes include all the arterials in the City. **Figure 5** illustrates the existing truck routes.

Existing Truck Routes

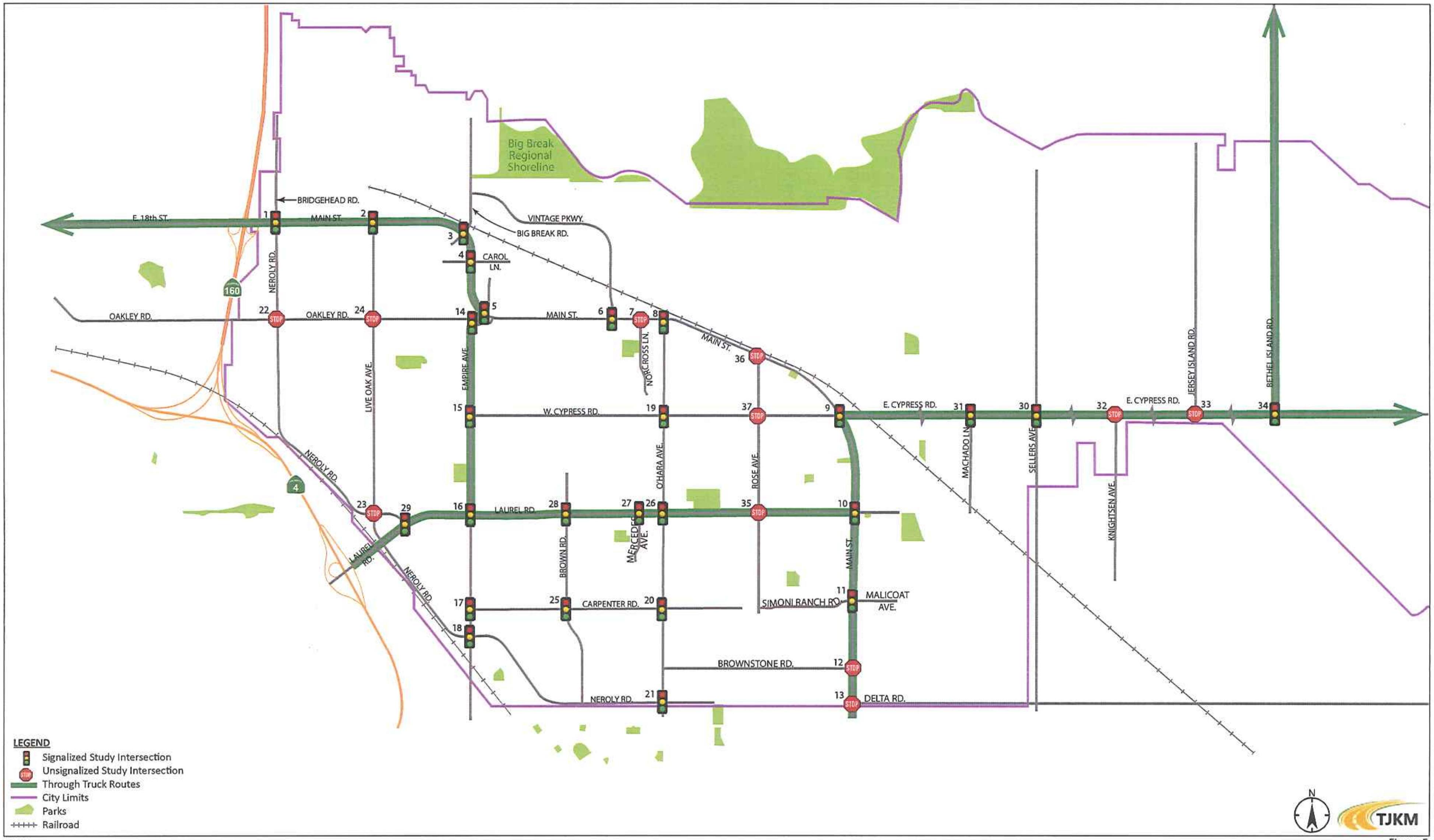

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Figure 5

EXISTING TRAFFIC CONDITIONS

During the a.m. peak hour, the primary direction of traffic on the major corridors in the City of Oakley was observed to be in the westbound direction as residents use SR 4 and other roadways to travel to work in the Bay Area. During the p.m. peak hour, the primary direction of traffic is in the eastbound direction along the major corridors as residents return home. Main Street is currently used as the primary route to travel to the nearest freeway (SR 4).

INTERSECTION LEVEL OF SERVICE – EXISTING CONDITIONS

Existing intersection lane configurations, signal timings, and peak hour turning movement volumes were used to calculate LOS for the study intersections during each peak hour using the calibrated and validated Citywide Traffic Model. Peak hour factors based on the counts collected were used at all study intersections for the Existing Conditions analysis. Study intersections were evaluated based on HCM 2010 LOS analysis methodology.

Table 3 summarizes the results of the analysis for the a.m. and p.m. peak hours. LOS worksheets are provided in **Appendix B**.

Table 3: Level of Service and Delay for Existing Conditions

ID	Intersection Name	Control Type	Existing Conditions			
			AM Peak		PM Peak	
			Delay (sec)[1]	LOS[2]	Delay (sec)[1]	LOS[2]
1	Bridgehead Road/Main Street	Signalized	21.1	C	23.2	C
2	Live Oak Road/Main Street	Signalized	14.8	B	9.9	A
3	Big Break Road/Main Street	Signalized	11.5	B	14.1	B
4	Main Street/Carol Lane	Signalized	10.8	B	13.5	B
5	Main Street/Empire Avenue	Signalized	19.0	B	19.4	B
6	Vintage Parkway/Main Street	Signalized	41.9	D	30.5	C
7	**Main Street/Norcross Lane**	Two-way Stop	**77.1**	**F**	**63.5**	**F**
8	O'Hara Avenue/Main Street	Signalized	11.7	B	17.6	B
9	Main Street/Cypress Avenue	Signalized	34.9	C	22.0	C
10	Main Street/Laurel Road	Signalized	26.1	C	17.9	B
11	Main Street/Simoni Ranch Road	Signalized	20.9	C	8.9	A
12	**Main Street/Brownstone Road**	Two-way Stop	**>50.0**	**F**	**38.9**	**E**
13	**Main Street/Delta Road**	Two-way Stop	**>50.0**	**F**	**49.4**	**E**
14	Empire Avenue/Oakley Road	Signalized	28.6	C	31.4	C
15	Empire Avenue/W Cypress Road	Signalized	16.6	B	14.4	B
16	Empire Avenue/Laurel Road	Signalized	47.3	D	29.7	C
17	Empire Avenue/Carpenter Road	Signalized	9.4	A	6.9	A
18	Empire Avenue/Neroly Road	Signalized	30.0	C	18.6	B
19	O'Hara Avenue/W Cypress Road	Signalized	26.3	C	21.0	C
20	O'Hara Street/Carpenter Road	Signalized	29.0	C	4.8	A

ID	Intersection Name	Control Type	Existing Conditions			
			AM Peak		PM Peak	
			Delay (sec)[1]	LOS[2]	Delay (sec)[1]	LOS[2]
21	**O'Hara Avenue/Neroly Road**	Signalized	**72.8**	**E**	18.5	B
22	Neroly Road/Oakley Road	All-way Stop	31.1	D	14.7	B
23	Neroly Road/Live Oak Avenue	All-way Stop	23.5	C	13.8	B
24	Live Oak Avenue/Oakley Road	All-way Stop	15.3	C	9.3	A
25	Brown Road/Carpenter Road	Signalized	11.4	B	5.6	A
26	O'Hara Avenue/Laurel Road	Signalized	25.5	C	14.6	B
27	Mercedes Avenue/Laurel Road	Signalized	20.8	C	9.8	A
28	Brown Road/Laurel Road	Signalized	16.3	B	11.1	B
29	Neroly Road/Laurel Road	Signalized	11.6	B	8.3	A
30	Sellers Road/E Cypress Road	Signalized	16.3	B	17.9	B
31	Machado Lane/E Cypress Road	Signalized	8.7	A	7.6	A
32	**Knightsen Avenue/E Cypress Road**	Two-way Stop	**44.7**	**E**	21.6	C
33	Jersey Island Road/E Cypress Road	Two-way Stop	28.1	D	17.6	C
34	Bethel Island Road/E Cypress Road	Signalized	13.8	B	9.0	A
35	**Rose Avenue/Laurel Avenue**	All-way Stop	**>50.0**	**F**	**>50.0**	**F**
36	**Rose Avenue/Main Street**	Two-way Stop	33.1	**D**	**41.1**	**E**
37	Rose Avenue/W Cypress Rd	All-way Stop	29.5	D	24.7	C

Notes:
[1]Delay: Average control delay in seconds per vehicle, reported values are overall for signalized and all-way-stop-control intersections; and critical minor approaches for two-way- stop-control intersections.
[2]LOS: Level of Service.
Bold text indicates unacceptable intersection operations.

Under Existing Conditions, one signalized intersection and six unsignalized intersections operate at LOS E or LOS F during the a.m. peak hour and/or p.m. peak hour. The remaining 30 intersections operate at LOS D or better.

As shown in **Table 3** above, six unsignalized intersections operate at LOS E or worse during either the a.m. or the p.m. peak hour. At many of these intersections, the number of vehicles on the side street is very small, but heavy volumes on the major street prohibit sufficient gaps for them to turn onto, or cross the street, which results in long delays for side street vehicles. In the context of overall intersection performance, the average vehicle delay is low due to the greater number of vehicles able to pass freely through the intersection, although the vehicles using the side streets experience poor levels of operation. This scenario occurs at most of the unsignalized study intersections.

LOS at the study intersections during both peak hours (a.m. and p.m.) is illustrated in **Figure 6**.

Existing Conditions Intersection Level of Service

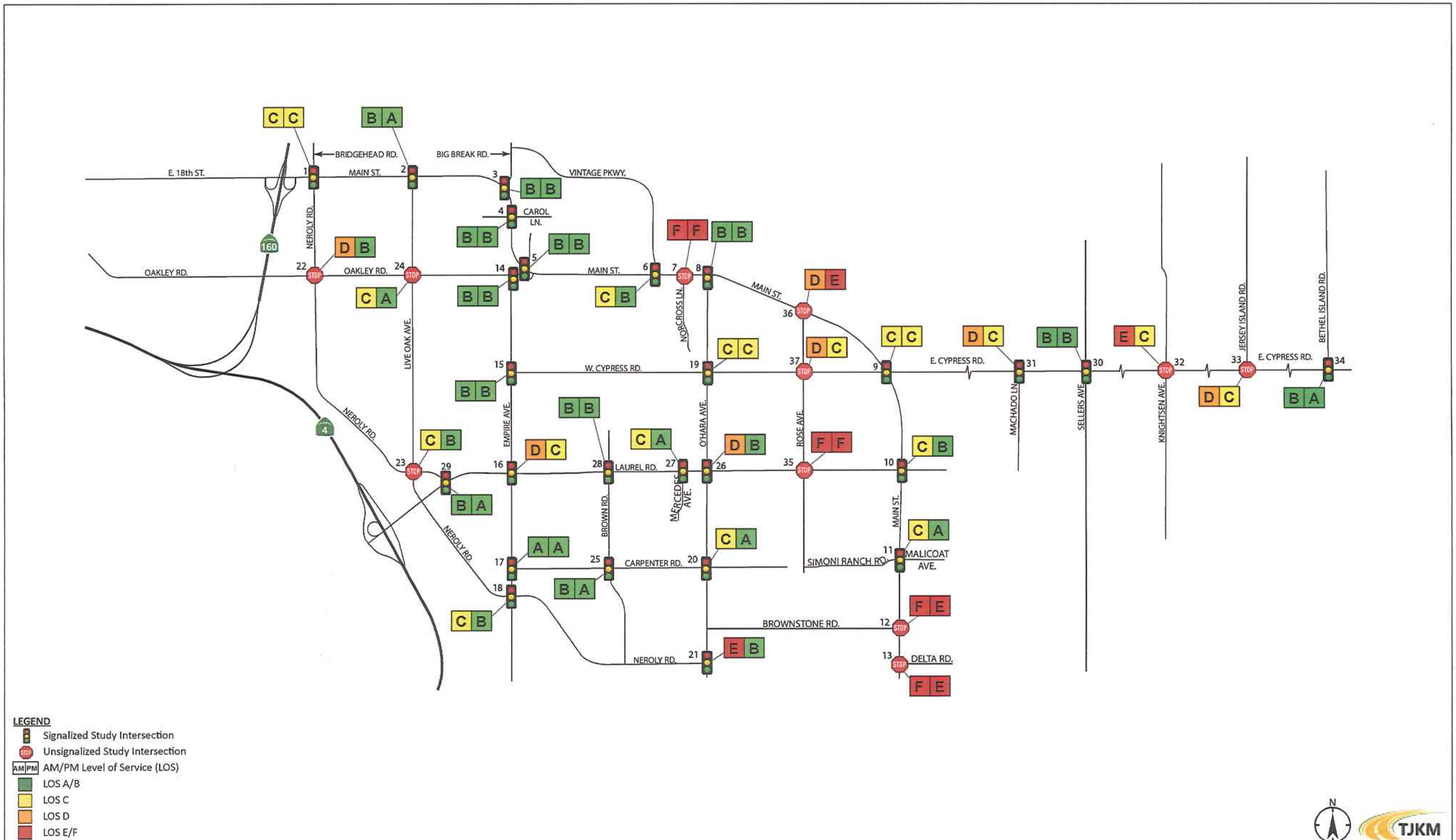

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Figure 6

EXISTING PLUS PROJECT (APPROVED DEVELOPMENTS) CONDITIONS

This chapter summarizes the methodology used to estimate approved project-generated traffic and documents project trip generation, distribution, and assignment characteristics. This scenario also presents the impacts of proposed developments at the study intersections and to the surrounding roadway system. This scenario is similar to existing conditions, but with the addition of traffic from proposed or approved projects in the City of Oakley.

TRAFFIC VOLUME PROJECTIONS

Using the calibrated and validated Citywide Traffic Model, additional traffic projected to be generated from approved developments was forecasted.

Residential and commercial land use information were collected from various specific plans and approved projects completed within the City of Oakley as of October 2016. This information was used to determine trip generation. The number of acres, building square footage, or number of residential units identified the estimated development potential of each land use. Based on the information collected, approximately 4,296 new residential single-family units, 195 multi-family units, and 465,000 square feet of new commercial and office space has been approved by the City and could be built in the future. A condensed summary of the land use assumptions is shown in **Table 4**.

Table 4: Summary of Approved Future Development

Land Use	Units
Single-family dwellings	4,246
Multi-family dwellings	195
Schools	24.352 ksf
Commercial uses	455.254 ksf
Office uses	10.024 ksf

Note:
Ksf = Thousand sq.-ft

Above projections are based on the approved projects as of October 2016 and do not represent full buildout of the General Plan. It should be noted that, the City of Oakley would prioritize approval of projects and the City would also prioritize impacts at certain intersections as projects move forward with construction.

VEHICLE TRIP GENERATION

The Institute of Transportation Engineers (ITE) has compiled the results of trip generation research from over 5,500 individual land use studies throughout the United States and Canada. The *Trip Generation Manual, 9th Edition* contains trip generation rates for 172 different land use codes. Trip generation rates for the proposed approved developments are based on data published in this reference manual. ITE Land Use Codes were used for the trip generation calculation.

Approximately 3,869 new a.m. peak hour vehicle trips and 5,482 new p.m. peak hour vehicle trips are projected to be added to the City's street network from projects that have been approved within the City of Oakley. These vehicle trips were assigned to the street network and added to existing traffic volumes in order to project the Existing plus Project (Approved Developments) Conditions. The trip generation estimates for this scenario were manually coded into Vistro.

The breakdown of trips generated by each of the approved project is attached in **Appendix C**.

TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution is a process that determines what proportion of vehicles would be expected to travel between the project site and various destinations outside the project study area. Assignment determines the various routes that vehicles would take from the project site to each destination using the calculated trip distribution.

Trip distribution assumptions for the proposed residential and commercial projects were developed based on existing travel patterns, TJKM's knowledge of the study area, other traffic studies conducted within the City, and consultation with City staff.

Two different trip distribution patterns were established for the project-generated trips based on the understanding of existing residential and commercial land uses. The overall trip distribution assumptions for residential developments are as follows:

- Five percent to/from Fairfield, Sacramento, and other regions via SR 160
- 1.8 percent to/from Antioch via Main Street
- 45 percent to/from Concord, Oakland, San Francisco, and other regions via SR 4
- 15 percent to/from Brentwood via SR 4
- Five percent to/from Brentwood via Empire Avenue
- Five percent to/from Brentwood via Main Street
- Two percent to/from Brentwood via O'Hara Avenue
- One percent to/from Brentwood via Sellers Lane
- 0.1 percent to/from via Jersey Island
- 0.1 percent to/from via Bethel Island
- 20 percent Internal Circulation

The overall trip distribution assumptions for commercial developments is as follows:

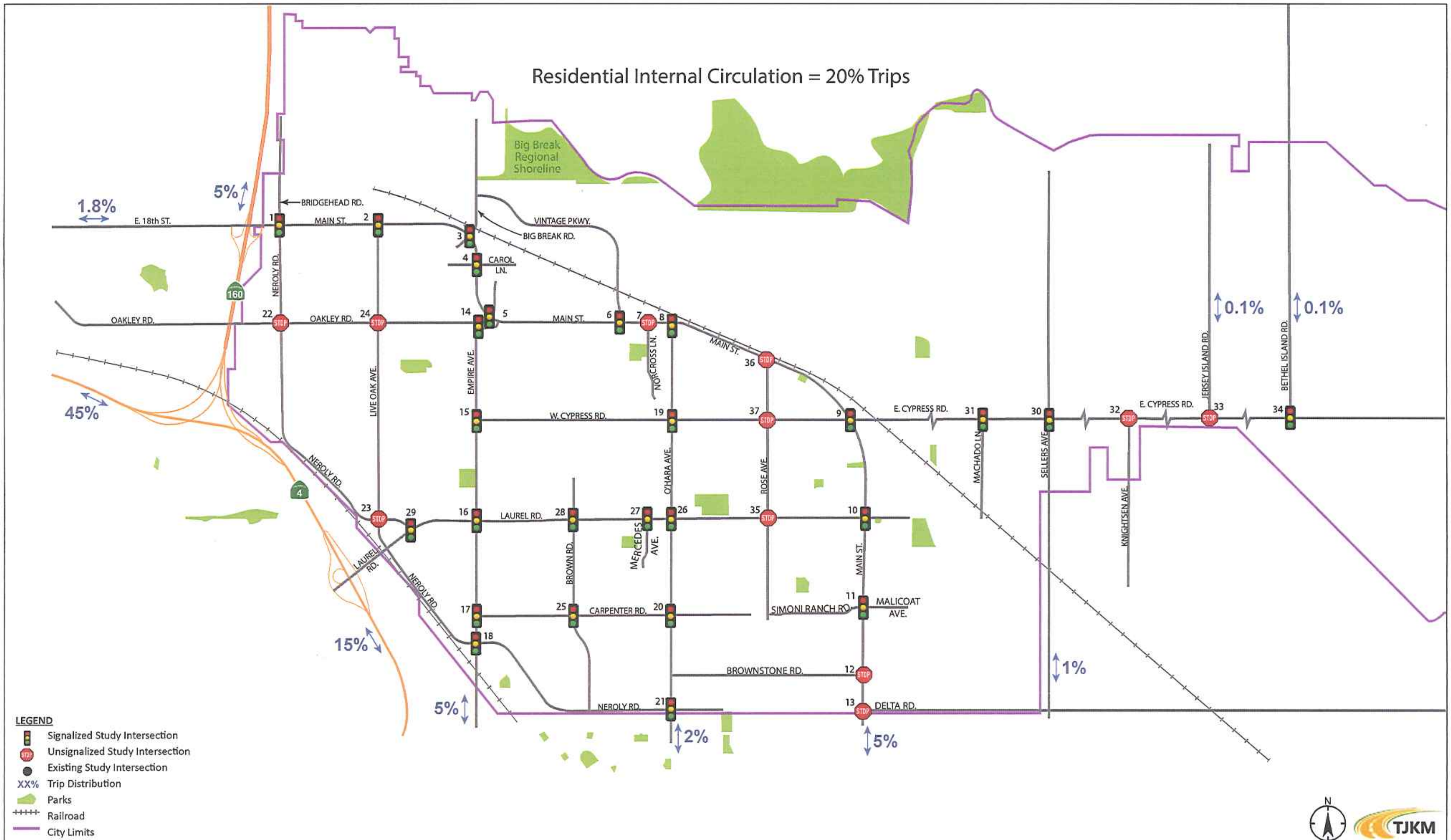
- 100 percent Internal Circulation

Based on the proposed commercial developments within the City of Oakley, commercial projects were anticipated to attract more trips from within, and fewer trips from outside the City. Hence, for conservative analysis purposes, 100 percent internal trip distribution was assumed for commercial projects.

Trips generated from approved projects were distributed onto the roadway system to and from each project site, based on its location, density, and proximity to major routes that serve the project areas. Trip distribution for each zone was manually coded into Vistro. The assigned project trips were then added to traffic volumes under Existing Conditions to generate Existing plus Project Conditions traffic volumes. The routing of trips from each region to a destination was based on the shortest travel time.

Trip distribution percentages for residential developments are shown in **Figure 7** and trip distribution percentages for commercial developments are shown in **Figure 8**. The Projects Trip Distribution summary is attached in **Appendix D**.

Residential Trip Distribution



Commercial Trip Distribution

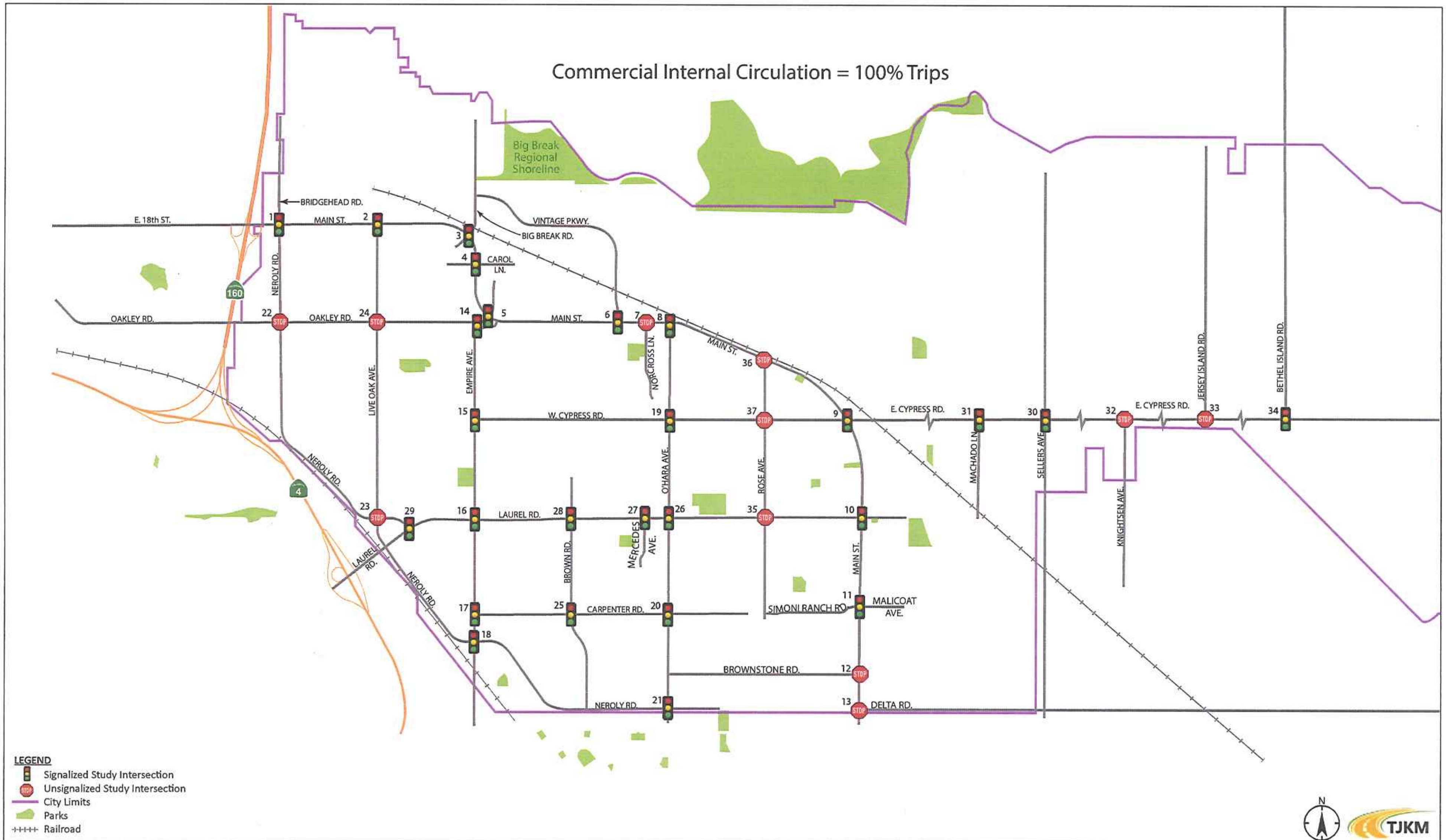


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Figure 8

CONCLUSION

Planning for a multimodal transportation system that provides safe, efficient, and affordable means of travel, alleviates existing traffic congestion, and supports future development within the City of Oakley is the primary focus of this study. In 2015, the City of Oakley contracted with TJKM to prepare a comprehensive Citywide Traffic Study addressing existing and long-range future traffic conditions within the City's Sphere of Influence. Long-range traffic conditions assumes buildout of all approved developments in the City. As part of the effort, TJKM prepared a Citywide Traffic Model capable of evaluating a variety of traffic analysis scenarios and provides the City with an analysis tool for the evaluation of traffic operations.

One of the goals of the Citywide Traffic Model and the study is to provide the City with direction and context for future circulation planning decision-making and, in correlation with the Land Use Element, to express the City's vision of the form and function of the City of Oakley.

Using the Citywide Traffic Model, TJKM evaluated 37-selected study intersections throughout the City during the weekday a.m. and p.m. peak hours, calculating the operating LOS of the intersections based on the delay-based Highway Capacity Manual (HCM) analysis methodology. There may be intersections that will be considered in future updates of the traffic model as determined by the City Engineer.

Existing Conditions

Of the 37 study intersections evaluated, one signalized intersection and six unsignalized intersections under Existing Conditions operate at LOS E or LOS F during the a.m. peak hour and/or p.m. peak hour. The remaining 30 intersections operate at LOS D or better.

Project (Approved Developments) Trip Generation

Based on the approved projects with entitlements as of 2016, it is projected that approximately 4,296 new residential single-family units, 195 multi-family units, and 465,000 square feet of new commercial and office space, which has been approved by the City of Oakley, could be built in the future. Above projections are not full buildout of the General Plan and represent only a percentage of it. Based on approval of the above-mentioned projects, approximately 3,869 additional a.m. peak hour vehicle trips and 5,482 additional p.m. peak hour vehicle trips will be added to the existing transportation infrastructure.

Based on the review of the Citywide Traffic Model, and the analysis conducted at study intersections under existing conditions, it is concluded that the model is calibrated and validated to existing conditions. In addition, the model is coded with potential approved developments within the City of Oakley Sphere of Influence. The model is good to be used as an analysis tool for the evaluation of traffic operations and impacts from the proposed development. Impacts at certain intersections will be prioritize by City of Oakley, as approved projects would move forward with construction.

Model Updates

The Citywide Traffic Model shall be updated in conjunction with the development projects in the City. The following is suggested for updating the model.

- Conduct new peak hour turning movement counts at the study intersections.
- Remove projects from the model, that have progressed from the approval stage to being fully functional as their traffic volumes are now counted at the study intersections.
- Add new study intersections as deemed necessary in the model.
- For new development application, conduct traffic impact study and upon approval of the traffic impact study, enter the information of the approved project in the model.

In addition, it is recommended that the City of Oakley develop procedures on how to include future developments in the Citywide Traffic Model. The Citywide Traffic Model should be updated at the discretion of City Engineer as deemed necessary. Upon the receipt of a project application that has been approved, the City Engineer will determine if an update to the traffic model is required.