



TECHNICAL MEMORANDUM

Date: November 14, 2008

To: Guy Bjerke, City of Antioch

From: Rob Rees and Mark Feldman, Fehr & Peers

Subject: *Phillips Lane PSR – Model Validation and Year 2007 and 2035 Forecasts*

WC07-2490

This memorandum summarizes the development of the base year model and the assumptions used to develop future volume forecasts for the Phillips Lane PSR Interchange traffic operations report. Considering the major changes in the regional roadway network and the amount of regional growth expected in the future, the Contra Costa Transportation Authority (CCTA) Decennial Countywide Travel Demand Model was selected as the most appropriate tool to forecast 2035 AM and PM peak hour intersection volumes.

The Decennial Countywide Travel Demand Model (Countywide Model) as produced by CCTA is only available in scenarios that represent years 2000, 2010, 2020, and 2030. Thus, Fehr & Peers developed scenarios for years 2007 and 2035 for this analysis.

The memorandum incorporates comments made by Caltrans (March 25, 2008).

- Caltrans requested that additional effort be expended to improve the local area validation during the AM peak hour. The local area validation was improved for the AM peak hour. The model revisions substantially increase the number of count locations that meet the validation targets, although both the original and the revised 2007 AM peak hour models leave two of the six CCTA peak hour validation criteria not satisfied. These two criteria are the tests related to arterial roadways. The revisions did bring the model significantly closer to passing both criteria. The PM peak hour model continues to meet all the validation targets.
- Caltrans requested that 2035 land use forecasts conform to ABAG land use projections. The land use forecasts were updated to match ABAG projections.

YEAR 2007 MODEL

Fehr & Peers modified the Countywide Model to develop a year 2007 scenario to better reflect current conditions in the area and to establish the baseline conditions for future analysis. Because the SR 4 Bypass will eventually become a freeway serving eastern Contra Costa County, the area for forecast development has been defined to include the cities of Antioch, Brentwood, and Oakley, to reflect the potential regional effects of the SR 4 Bypass.

2007 Roadway Network

The roadway network for the 2007 scenario was based on the 2000 roadway network in the Countywide Model and modified to include roadway improvements within the area that have been completed since 2000. The major roadway improvements included in the 2007 scenario include:

- Completion of segment 2 of the SR 4 Bypass as a two-lane expressway between Lone Tree Way and Balfour Road with an at-grade intersection at Sand Creek Road
- Widening of Lone Tree Way into a four-lane arterial between Hillcrest Avenue and Fairview Avenue
- Extension of Sand Creek Road to the SR 4 Bypass
- Widening of Balfour Road into a four-lane arterial between West Country Club Drive and SR 4 Bypass

Additional network refinements were made in the area, which are detailed in Appendix A.

Land Use

In December of 2007, CCTA completed an update of the land use in the Countywide Model, with input from most of the cities in Contra Costa County. The updates were made to the land use data for the base year of 2000 and for the forecast years: 2010, 2020 and 2030, throughout Contra Costa County and in parts of Alameda County. Land use from the prior version of the Countywide Model was not changed for the seven other Bay Area counties.

Creation of ABAG P07-Based Decennial Year Land Use

We adjusted the following items to reflect the ABAG Projections 2007 totals for 2000, 2010, 2020, and 2030:

1. Total Households
2. Household Population
3. Total Population
4. Employed Residents
5. Retail Jobs
6. Service + Other Jobs
7. Manufacturing, Wholesale and Transportation Jobs
8. Agricultural and Natural Resources Jobs

Within Contra Costa County and the Tri-Valley (Dublin, Pleasanton and Livermore), the above items were adjusted within each city to match ABAG P07 totals for that city. In the rest of the model, the above items were adjusted on a countywide basis to match ABAG P07 totals for the county, including matching the total for Alameda County outside of the Tri-Valley.

In addition, because the Countywide Model results depend on more detailed data than the above items, we adjusted that data to reflect the updates. The following methods were used:

1. The model uses households broken down by dwelling unit type, and broken down by income level. In each of these cases, we adjusted the CCTA model values by the same ratio that we adjusted the total households to match ABAG P07 for each Travel Analysis Zone (TAZ).

2. The model uses population data, including total population and population in certain age brackets, such as ages 5 to 13 to compute school trips. In each of these cases, we adjusted the CCTA model values by the same ratio that we adjusted the total population to match ABAG P07 for each Travel Analysis Zone (TAZ).

Creation of 2007 Intermediate Year Land Use

The land use input data for 2007 was developed in the same way as decennial land uses, matching citywide totals within Contra Costa County and the Tri-Valley, and countywide totals elsewhere, to ABAG P07 land uses interpolated between 2005 and 2010. The adjustments were made to the 2010 land uses in the CCTA data, since 2010 is the closest decennial year to 2007.

Using recent aerial photographs of the area, the land uses were verified and further refined to reflect specific land uses near the project site. Other TAZs within Antioch were adjusted to maintain consistency between the model and ABAG P07 for the city in total. Details of these refinements are included in Appendix B. Note also that TAZ maps of the study area are contained in Appendix C.

Trip generation for highly specialized land uses cannot be accurately forecasted using the standard model inputs; the Countywide Model uses special generators for these uses. Special generators used in this area include the Kaiser Medical Center at the northeast corner of the future Deer Valley Road/Sand Creek Road intersection in Antioch, and the John Muir Medical Center at the northwest corner of the SR 4 Bypass/Balfour Road intersection in Brentwood.

Existing 2007 Traffic Counts

Weekday peak period intersection, ramp and freeway counts were conducted during the morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) during a typical weekday (Tuesday through Thursday) on a clear day in October 2007. This information was supplemented with Caltrans count data for the area. Figure 1 shows the locations that data was collected. The resulting peak hour volumes are presented in Figure 2.

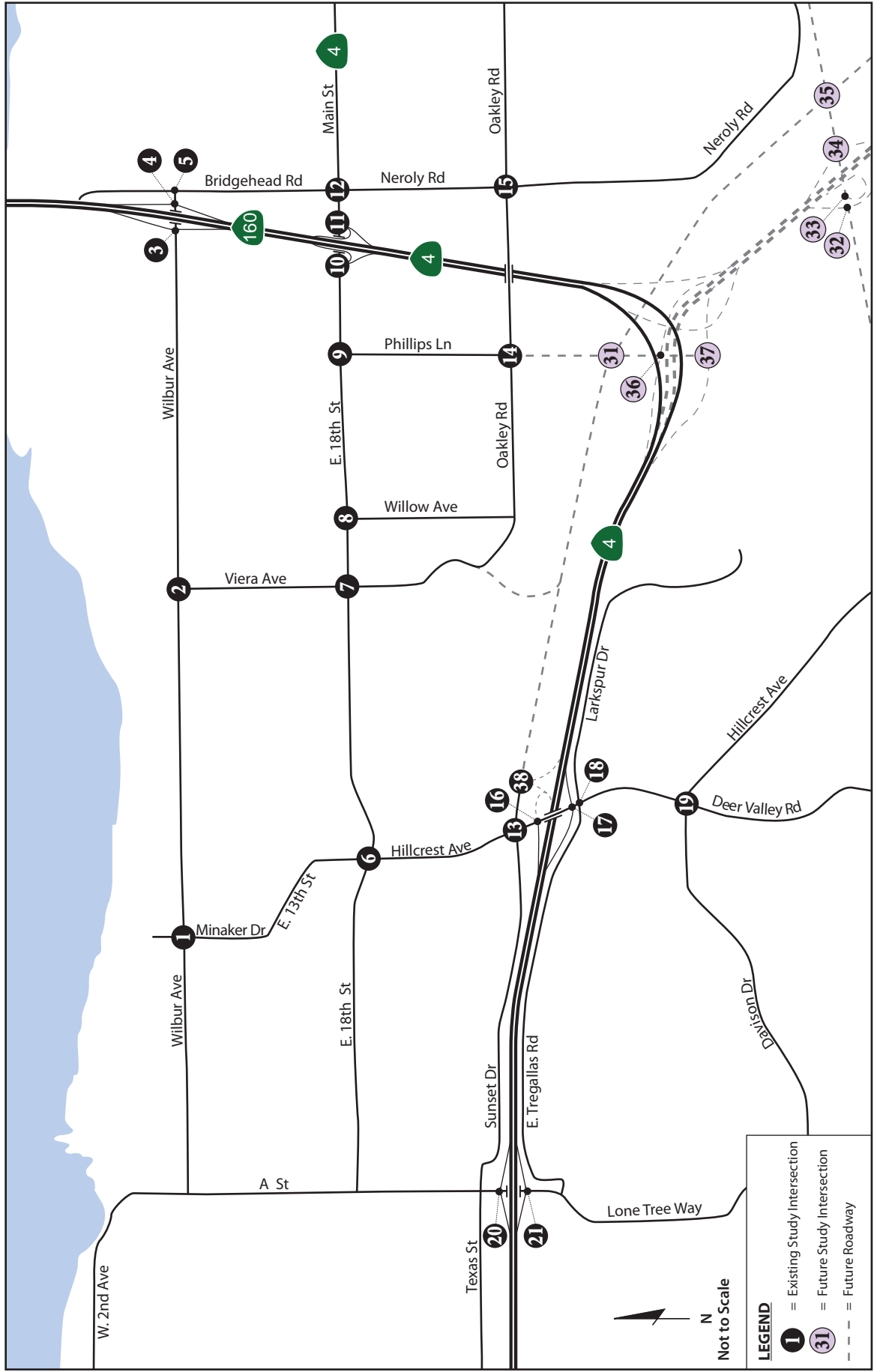
Calibration and Validation

As required by CCTA's *Technical Procedures*, a sub-area model validation exercise was conducted using validation targets specified by CCTA. The 2007 AM and PM peak hour volumes produced by the model were compared with traffic counts collected in the area in 2006 and 2007. Preliminary model validation results were used to guide further adjustments to the model input parameters, such as roadway types and speeds, to better reflect actual conditions.

Table 1 summarizes the validation results for the AM peak hour, while Table 2 shows the validation results for the PM peak hour. Both tables compare the results prior to the land use and network updates ("Original") to the results after the updates ("Revised").

As shown in Table 1, the model revisions substantially increase the number of count locations that meet the validation targets, although both the original and the revised 2007 AM peak hour models leave two of the six CCTA peak hour validation criteria not satisfied. These two criteria are the tests related to arterial roadways. However, the revisions bring the model significantly closer to passing both criteria.

As shown in Table 2, the model revisions applied to the 2007 PM peak hour model result in substantial improvements in the number of count locations meeting the validation targets, and in fact the revised model satisfies all of the CCTA peak hour validation criteria.



Phillips Lane PSR

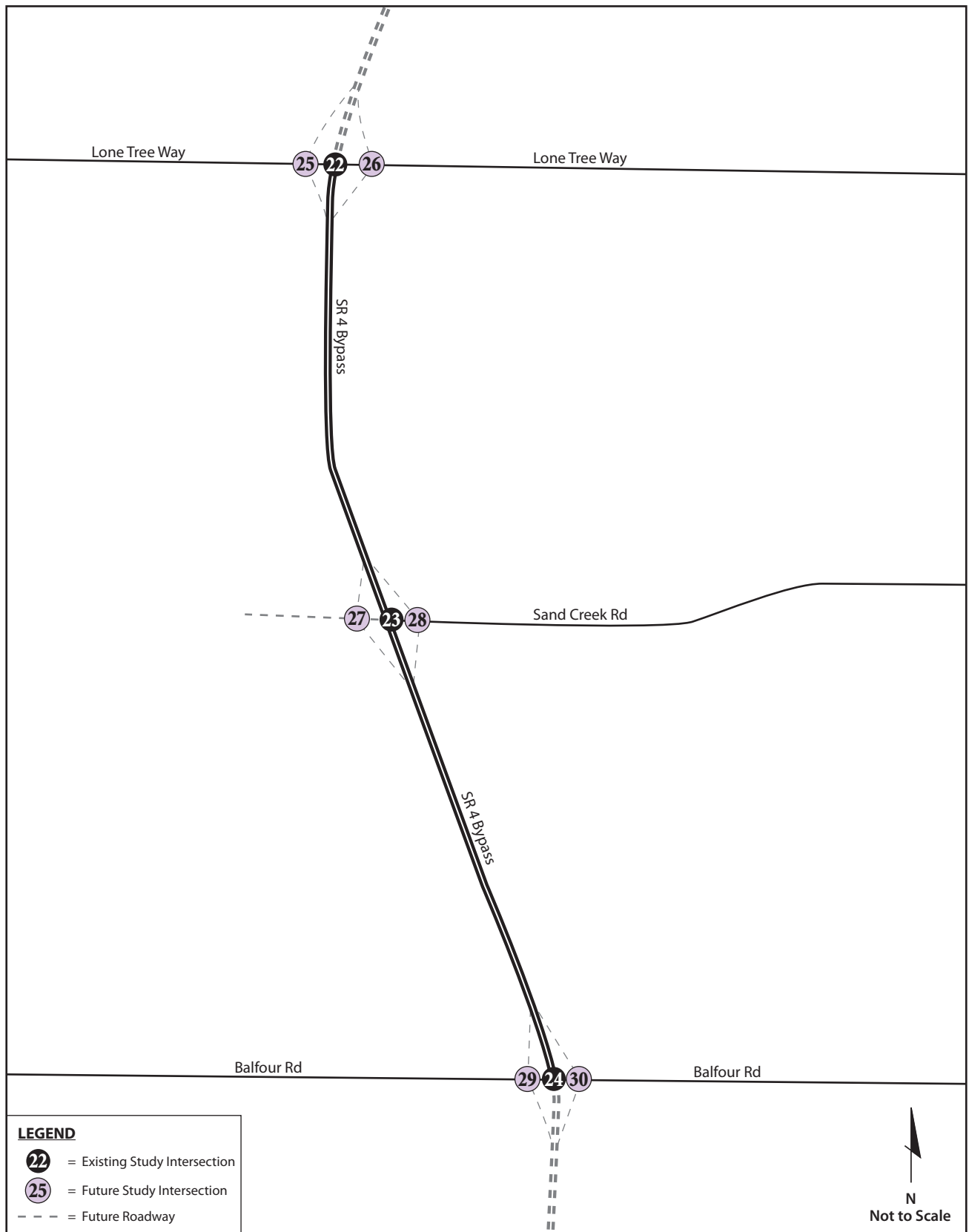
PROJECT STUDY AREA AND INTERSECTION LOCATIONS

Figure 1A



FEHR & PEERS
TRANSPORTATION CONSULTANTS

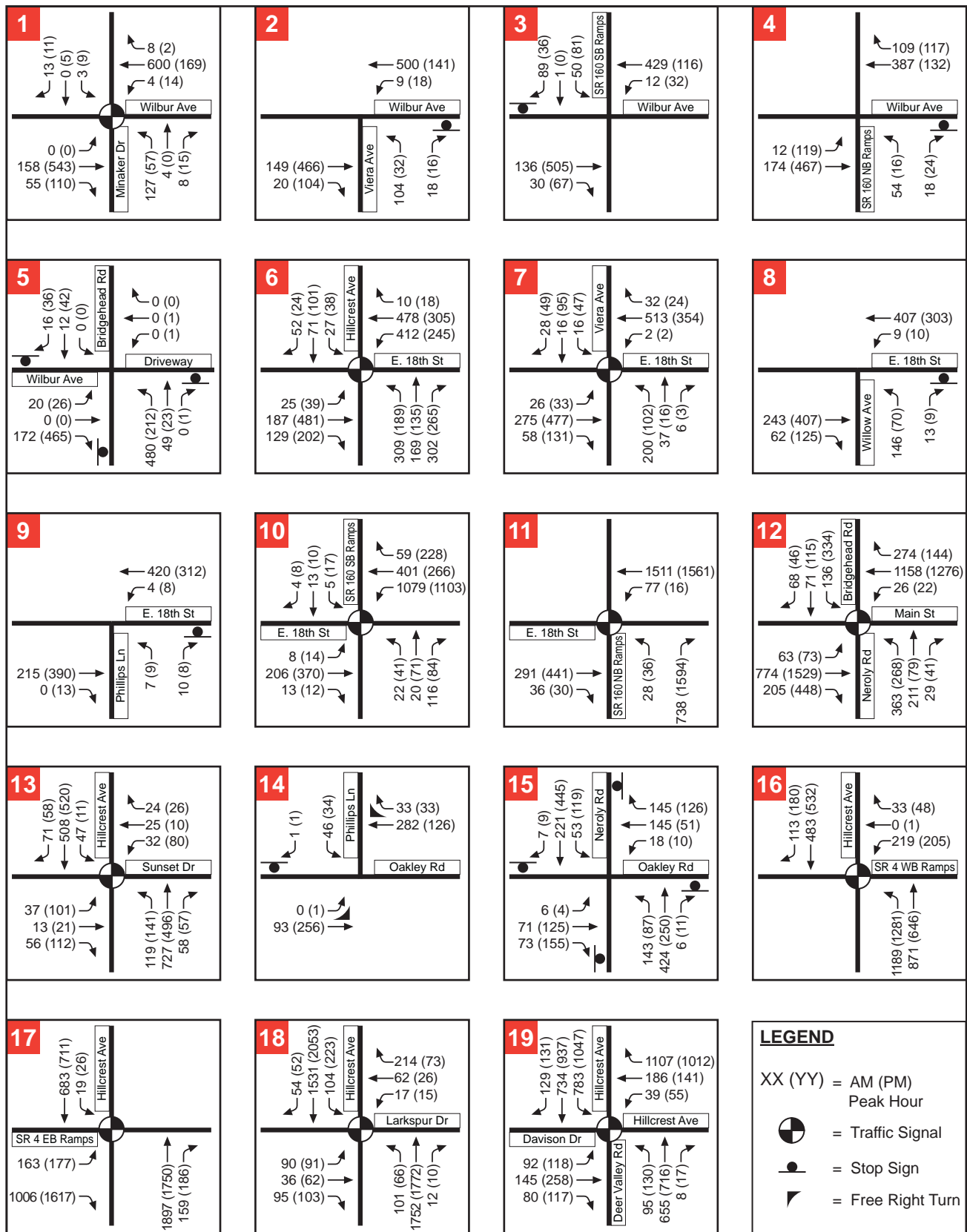
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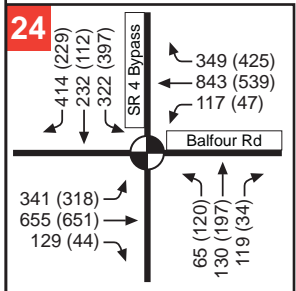
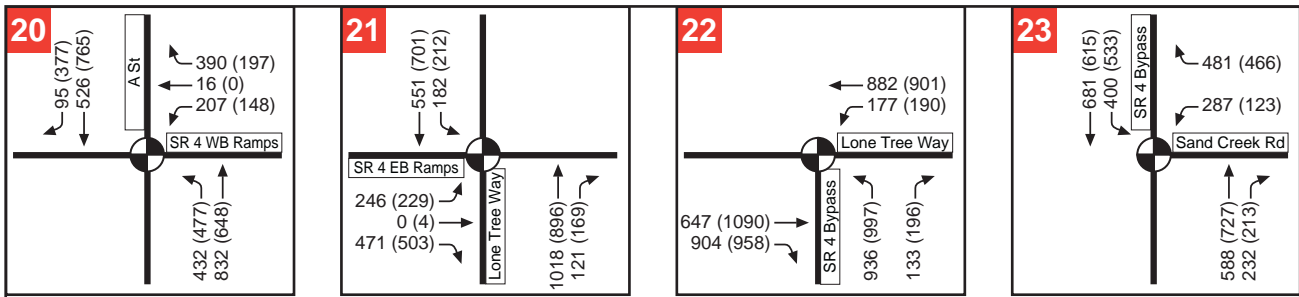
LEGEND
 ● = Existing Study Intersection
 ○ = Future Study Intersection
 - - - = Future Roadway

N
 Not to Scale

Phillips Lane PSR




Phillips Lane PSR



LEGEND

XX (YY) = AM (PM)
Peak Hour

 = Traffic Signal

**TABLE 1
 PHILLIPS LANE PSR SUB-AREA MODEL YEAR 2007 VALIDATION RESULTS
 AM PEAK HOUR**

Validation Test	Number of Counts	Number Meeting Target		Percent Within Target		Validation Target	Is Target Met?	
		Original	Revised	Original	Revised		Original	Revised
Arterials with 500+ Vehicles Within 30%	57	33	39	58%	68%	75%	No	No
Arterials with 500+ Vehicles Within 15%	57	11	23	19%	40%	50%	No	No
Intersections with 1,000+ veh/hr within 20% of Counts	16	11	11	69%	69%	50%	Yes	Yes
Intersections with 500-1,000 veh/hr within 20% of Counts	7	3	5	43%	71%	30%	Yes	Yes
All Intersections within 30% of Counts	24	20	22	83%	92%	75%	Yes	Yes
All Intersections within 15% of Counts	24	14	16	58%	67%	50%	Yes	Yes

Source: Fehr & Peers, 2007.

**TABLE 2
 PHILLIPS LANE PSR SUB-AREA MODEL YEAR 2007 VALIDATION RESULTS
 PM PEAK HOUR**

Validation Test	Number of Counts	Number Meeting Target		Percent Within Target		Validation Target	Is Target Met?	
		Original	Revised	Original	Revised		Original	Revised
Arterials with 500+ Vehicles Within 30%	58	40	46	69%	79%	75%	No	Yes
Arterials with 500+ Vehicles Within 15%	58	20	29	34%	50%	50%	No	Yes
Intersections with 1,000+ veh/hr within 20% of Counts	16	15	15	94%	94%	50%	Yes	Yes
Intersections with 500-1,000 veh/hr within 20% of Counts	7	4	6	57%	86%	30%	Yes	Yes
All Intersections within 30% of Counts	24	22	22	92%	92%	75%	Yes	Yes
All Intersections within 15% of Counts	24	13	18	54%	75%	50%	Yes	Yes

Source: Fehr & Peers, 2007.

As recommended in the CCTA *Technical Procedures*, intersection turning movement forecasts will not be taken directly from the model but will be developed using a “Furness”-type process in which the model is used to estimate the amount of change expected over time. This process allows the analyst to account for the fact that the base year model is not a perfect representation of existing conditions.

Because of the “Furness”-type process recommended in the CCTA documentation, as well as the substantial improvements in model performance achieved through the model revision process, Fehr & Peers concludes that the 2007 model developed for this analysis is appropriate for use in developing future volume forecasts. Model parameters adjusted to achieve the 2007 model validation results will be included in the future scenarios to provide consistent results with the validated 2007 results.

YEAR 2035 VOLUME FORECASTS

Fehr & Peers developed a year 2035 model scenario to represent traffic conditions at project buildout. The year 2035 roadway network and land use assumptions followed by the resulting volume forecasts are discussed below.

2035 Roadway Network

Significant roadway network changes are expected in the area in the future. The roadway network for the 2035 scenario is based on the 2030 model roadway network. The year 2030 roadway network included in the Countywide Model was reviewed and updated to include the latest improvements expected to be completed by 2035. Major roadway improvements planned for the future and assumed to be completed for the 2035 scenario include:

- Completion of segment 1 of the SR 4 Bypass as a six-lane freeway between the current SR 4 freeway and Laurel Road, and a four-lane freeway between Laurel Road and Lone Tree Way, with full interchanges at Laurel Road and Lone Tree Way, and a partial interchange at the existing SR 4 freeway with no ramps between SR 160 and the SR 4 Bypass (under construction and design)
- Extension of Laurel Road between its current terminus in Antioch and Empire Avenue in the City of Oakley (Under construction)
- Widening of SR 4 freeway to provide three mixed-flow lanes and one high occupancy vehicle (HOV) lane in each direction west of Hillcrest Avenue (Under design)
- Widening of SR 4 freeway/SR 4 Bypass to provide three mixed-flow lanes in each direction between Hillcrest Avenue and Laurel Road (Under design)
- Widening of segment 2 of the SR 4 Bypass to a four-lane freeway with interchanges at Lone Tree Way, Sand Creek Road and Balfour Road (Under design)
- Completion of segment 3 of the SR 4 Bypass as a two-lane expressway between Balfour Road and Walnut Boulevard with at-grade intersection at Marsh Creek Road (Under construction)
- Widening of the SR 4 Westbound on ramp at Hillcrest Avenue to two lanes
- Extension of Sand Creek Road from its current terminus at SR 4 Bypass west to Deer Valley Road as a four-lane arterial (Sand Creek Area Specific Plan Development)

- Extension of Hillcrest Avenue to Balfour Road (Sand Creek Area Specific Plan Development)
- Extension of John Muir Parkway from its current terminus south of Balfour Road south to Marsh Creek Road, and connection between the extended John Muir Parkway and Concord Avenue (Under design)
- Completion of the connector ramps between SR 4 Bypass and SR 160 (Planned)
- Extension of Slatten Ranch Road from its current terminus just north of Lone Tree Way to be a frontage road along segment 1 of the SR4 Bypass, intersecting with Laurel Road, Phillips Lane, Viera Road, and terminating at the current Hillcrest Avenue / Sunset Drive intersection. Slatten Ranch Road will be a four-lane arterial south of Laurel Road, and a two-lane arterial between Laurel Road and Hillcrest Avenue.
- To represent the 2035 With Project Scenario, Phillips Lane was extended further south to a full interchange with SR 4 and segment 1 of the SR4 Bypass. There will be no access between the Phillips Lane interchange and SR 160. There was no separate network for the No Project Scenario, because the 2035 No Project forecasts were generated as a post-model process, described in the intersection volume forecasts section below.

Additional network refinements were made in our area, which are detailed in Appendix A.

2035 Land Use

The land use input data for the 2035 scenario was developed using similar methods to the 2007 land use. The same steps were used as described in the "Creation of 2007 Intermediate Land Use" section above, with the adjustment made to the CCTA model year 2030 land use to match ABAG P07 totals for 2035.

As in 2007, the land uses for 2035 were verified and further refined to reflect specific land uses near the project site. Other TAZs within Antioch were adjusted to maintain consistency between the model and ABAG P07 for the city in total.

Table 3 and Table 4 compare the number of households and jobs in the original CCTA countywide model (after the spring 2007 year-long update) with the model scenarios as updated for this analysis.

**TABLE 3
 COMPARISON OF NUMBER OF HOUSEHOLDS**

Scenario	Antioch	Brentwood	Oakley	Total
2000 (CCTA Model) ¹	29,588	8,221	7,657	45,466
2007 (Project Model) ²	33,822	15,568	10,070	59,460
2010 (CCTA Model) ¹	34,654	20,967	10,119	65,739
2020 (CCTA Model) ¹	39,215	24,629	11,832	75,676
2030 (CCTA Model) ¹	42,917	24,954	12,822	80,693
2035 (Project Model) ²	43,720	31,180	14,780	89,680

1. Land use data as used in the CCTA Decennial Countywide Travel Demand Model and based on ABAG *Projections 2005*, updated in 2006-7 in cooperation with Antioch, Brentwood, Oakley, and other city staffs throughout Contra Costa County.
 2. Land use data developed for the Phillips Lane PSR Models by Fehr & Peers to match ABAG *Projections 2007*.
 Source: Fehr & Peers, 2008.

**TABLE 4
 COMPARISON OF NUMBER OF JOBS**

Scenario	Antioch	Brentwood	Oakley	Total
2000 (CCTA Model) ¹	17,340	7,353	3,081	27,773
2007 (Project Model) ²	22,178	8,074	3,672	33,924
2010 (CCTA Model) ¹	24,279	8,663	5,572	38,513
2020 (CCTA Model) ¹	32,197	13,448	8,123	53,767
2030 (CCTA Model) ¹	42,385	19,420	12,380	74,185
2035 (Project Model) ²	42,110	19,580	10,610	72,300

1. Land use data as used in the CCTA Decennial Countywide Travel Demand Model and based on ABAG *Projections 2005*, updated in 2006-7 in cooperation with Antioch, Brentwood, Oakley, and other city staffs throughout Contra Costa County.
 2. Land use data developed for the Phillips Lane PSR Models by Fehr & Peers to match ABAG *Projections 2007*.
 Source: Fehr & Peers, 2008.

2035 Intersection and Mainline Volume Forecasts

The 2007 and 2035 models developed as part of the calibration and validation process were used to develop the peak hour demand traffic forecasts. The following four-step process was used to determine Year 2035 AM and PM peak hour turning movement forecasts for the intersections including ramp forecasts.

- **Step 1** - The 2007 CCTA Model was executed to determine the base year model peak hour demand volumes for the intersections.

- **Step 2** - The 2035 CCTA Model was executed to determine the “raw” (i.e., unadjusted) peak hour demand forecasts for the intersections in the With Project Scenario.
- **Step 3a (intersection volumes)** – The raw peak hour demand forecasts were adjusted using the “furness” method presented in the *CCTA Technical Procedures Update* (July 19, 2006). This method is an iterative factoring process that considers model-projected growth and existing turning movements. The furness process corrects for base year model deviation, addressing locations where the model overestimates or underestimates volumes.
- **Step 3b (mainline volumes)** - Mainline volumes at an “anchor point” of SR4 between the Hillcrest ramps were forecast by applying the difference between 2035 and 2007 model volumes to existing counts from Caltrans databases. Volumes on the freeway-to-freeway ramps from the proposed SR4 bypass to SR160 were taken directly from the model, since there were no existing counts to compare to the base model. Ramp volume forecasts were taken from the intersection volume forecasts, and added or subtracted to the points on the mainline to obtain forecasts along the study corridor.
- **Step 4** – As recommended in the *Technical Procedures* the forecasted volumes developed in Step 3 were reviewed for reasonableness. At locations where volumes did not appear reasonable (e.g., future year volumes that were lower than existing counts) adjustments were made to ensure that the forecasted volume was at least equal to the existing count and that volumes were balanced between adjacent intersections.
- **Step 5** – Adjustments to all relevant intersections were made to reflect traffic to/from the proposed eBART station southeast of the intersection of Phillips Lane and Slatten Ranch Road, with the entrance on Slatten Ranch Road. Forecasts for eBART-related traffic levels were provided by Wilbur Smith Associates (WSA).
- **Step 6 (2035 No Project Scenario)** – Select zone analysis was executed on the Project TAZ in the 2035 With Project Scenario to determine the origins and destinations for vehicles entering and exiting the proposed development near the Phillips Lane interchange. The traffic using the Phillips Lane interchange was then reassigned manually to the most likely alternate routes (typically using either the Hillcrest interchange or Slatten Ranch Road), and turn movements and mainline volumes were adjusted accordingly. In addition, adjustments were made to some intersections to reflect a different location of the eBART station; under the No Project Scenario, the station would be on Viera Avenue between Oakley Road and Sunset Drive.

Figures 3 and Figure 4 present the Year 2035 peak hour intersection volumes for the AM and PM peak hours. Figure 3 presents the volumes under the No Project scenario, and Figure 4 presents the volumes under the With Project scenario. Figures 5 and Figure 6 present the Year 2035 peak hour mainline volumes for the AM and PM peak hours. Figure 5 presents the volumes under the No Project scenario, and Figure 6 presents the volumes under the With Project scenario.

CONSISTENCY WITH STATE ROUTE 4 (EAST) WIDENING PROJECT FORECASTS

The *Traffic Analysis Report for the State Route 4 Widening Project Loveridge Road to State Route 160, June 2004* (the traffic operations report supporting the environmental document) contained traffic forecasts for the SR 4 East corridor to the year 2030. The 2030 forecasts were based on land use information from *ABAG Projections '98* while the year 2035 forecasts presented in this study are based on *ABAG Projections '07*. The base year for the 2030 forecasts was the year 2000 while the base year for the 2035 forecasts is year 2007.

Growth anticipated between 2000 and 2030 from *Projections '98* was compared to the anticipated growth between 2000 and 2035 from *Projections '07*. Table 5 shows that the anticipated growth in residential development is very similar between the two Projections series, while the growth in jobs is expected to be much higher in *Projections '07* than was anticipated in the *Projections '98*. The *Projections '07* does represent additional growth than was envisioned in *Projections '98*, which is clustered around the proposed eBART station in the northeast part of the city.

Because East County is currently a predominantly residential area with limited employment opportunities, the dominant direction of travel along the SR 4 East corridor is westbound in the morning, as people travel from their homes in East County to jobs in central Contra Costa County, Alameda County, San Francisco and elsewhere, and eastbound in the evening as people return to their homes. The 2030 projections from *Projections '98* showed substantial growth in East County jobs, but the amount of residential development still outweighed the increased employment so the current directional travel patterns generally remained.

Table 6 highlights the SR 4 corridor traffic forecasts west of the Hillcrest Avenue interchange. The job growth contained in the *Projections '07* has a measurable effect primarily on the AM peak hour westbound traffic flow on SR 4, where the *Projections '07* forecasts show lower volumes than the *Projections '98* forecasts. This is because the increased jobs in East County mean that more East County residents would work locally and would not need to commute outside the region. The two sets of forecasts are very similar for all other directions and time periods.

Table 5 Comparison Of Land Use Projections – City Of Antioch								
	Projections '98				Projections '07			
	2000	2030	Growth	% Growth	2000	2035	Growth	% Growth
Total Households	29,300	42,940	13,640	46%	29,650	43,720	14,070	47%
Total Jobs	18,590	32,690	14,100	76%	20,440	42,110	21,670	106%

Source: Fehr & Peers (2008)

Table 6 SR 4 Mainline Traffic Forecasts – West Of Hillcrest Avenue Interchange				
	2030 Traffic Forecasts ¹ (based on ABAG Projections '98)		2035 Traffic Forecasts ² (based on ABAG Projections '07)	
	AM	PM	AM	PM
SR 4 West of Hillcrest Avenue				
Eastbound	4,010	7,390	3,770	7,370
Westbound	7,430	5,290	6,450	5,560

1. Traffic Analysis Report for the State Route 4 Widening Project Loveridge Road to State Route 160, (Fehr & Peers June 2004)
 2. Traffic forecasts developed for this study
 Source: Fehr & Peers, 2008.

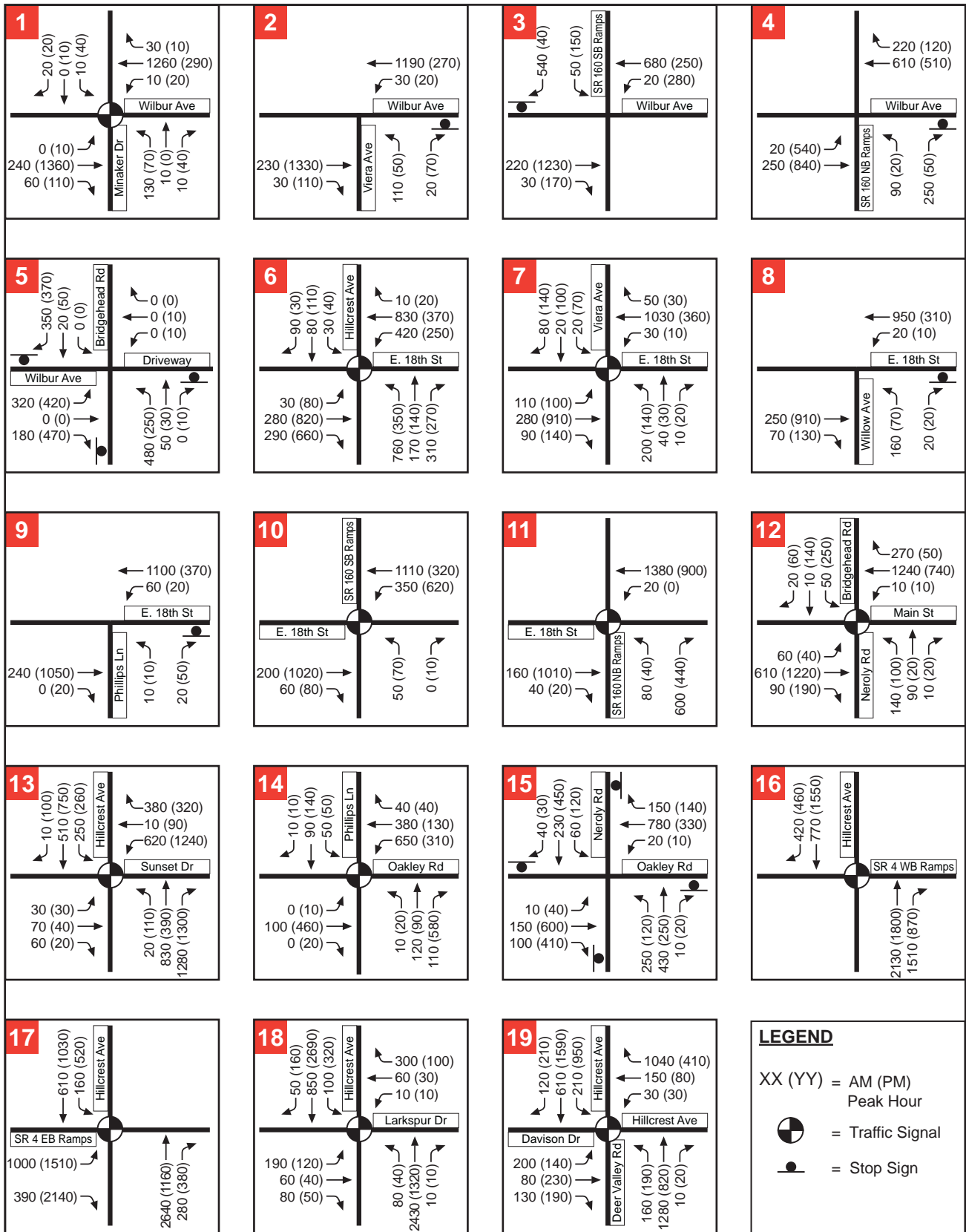
The two sets of traffic forecasts did yield substantially different forecasted volumes to and from the Hillcrest Avenue interchange. The 2030 traffic forecasts based on *Projections '98* did not consider the level of transit-oriented-development that is now being contemplated in northeast Antioch around the proposed eBART station, while the 2035 traffic forecasts based on *Projections '07* do account for this higher level of development.

Table 7 summarizes the two-way traffic volumes on Hillcrest Avenue south of the interchange area and north of the interchange area. The peak hour traffic volumes on Hillcrest Avenue south of the interchange area remain very similar between the two sets of forecasts. North of the interchange, however, traffic volumes on Hillcrest Avenue are more than 50% higher with the 2035 traffic forecasts compared to the 2030 traffic forecasts. The higher traffic forecasts are directly related to the substantial level of development assumed in northeast Antioch with the 2035 forecasts.

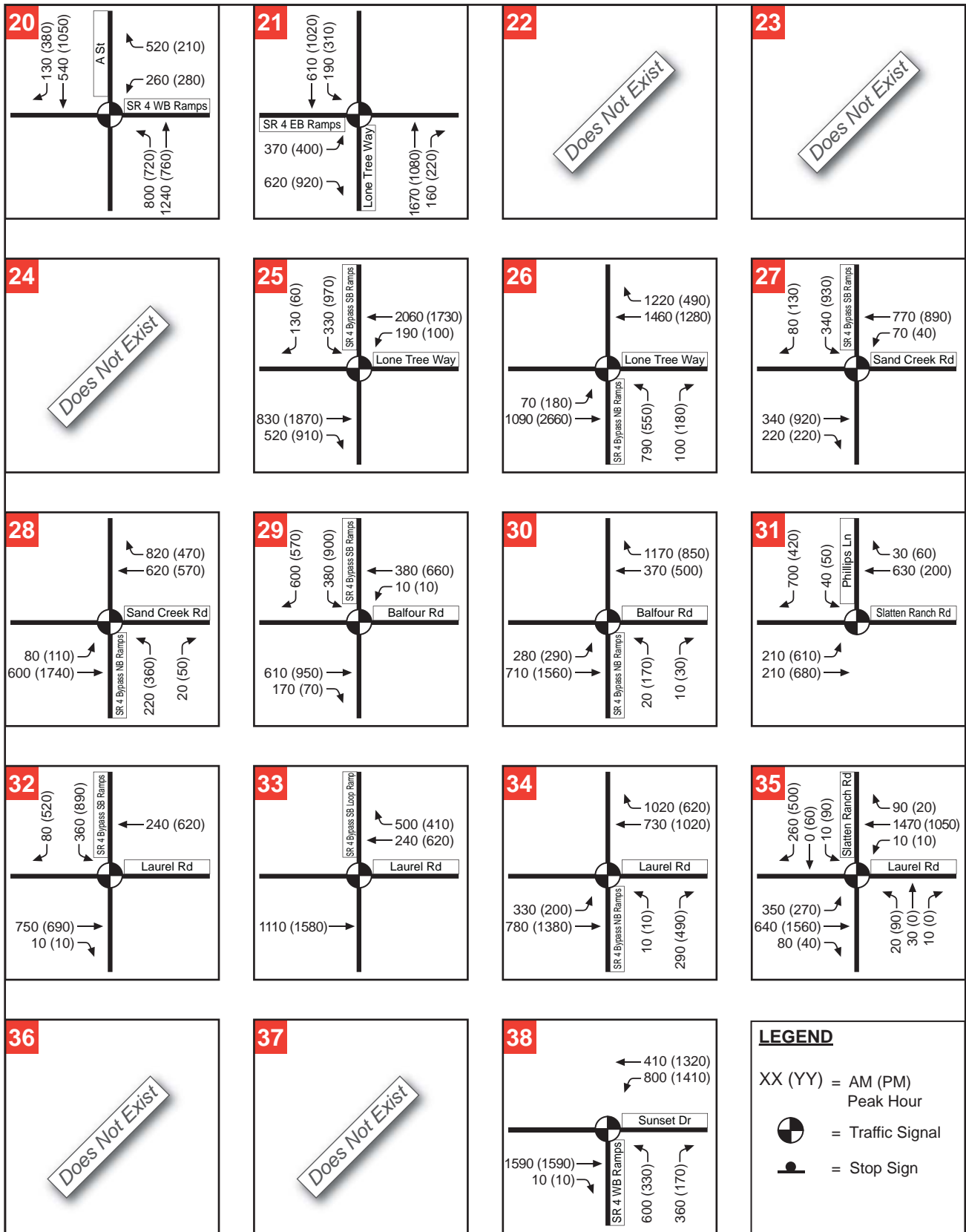
In summary, the two sets of traffic forecasts examined here are quite similar in most respects. The one major difference is in the traffic volumes along Hillcrest Avenue north of the interchange area, in which the high levels of transit-oriented development now envisioned around the proposed eBART station lead to higher traffic volumes than were estimated in the 2030 forecasts.

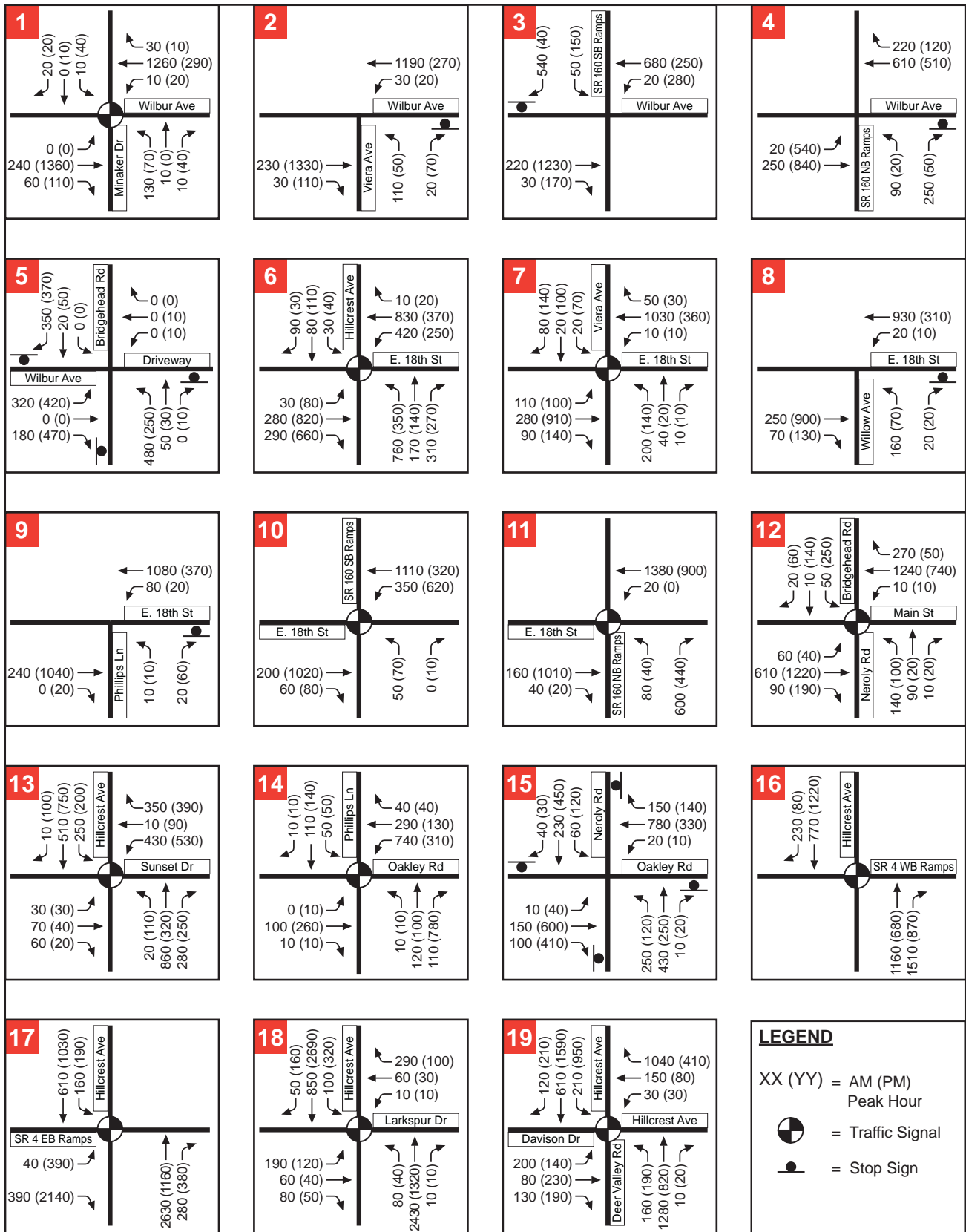
Table 7 Hillcrest Avenue Traffic Forecasts – Two-Way Traffic				
	2030 Traffic Forecasts ¹ (based on ABAG Projections '98)		2035 Traffic Forecasts ² (based on ABAG Projections '07)	
	AM	PM	AM	PM
South of Larkspur Avenue (south of interchange)	3,420	4,380	3,480	4,120
South of Sunset Drive (north of interchange)	2,020	2,260	3,320	3,810

1. *Traffic Analysis Report for the State Route 4 Widening Project Loveridge Road to State Route 160*, (Fehr & Peers June 2004)
 2. Traffic forecasts developed for this study
 Source: Fehr & Peers, 2008.

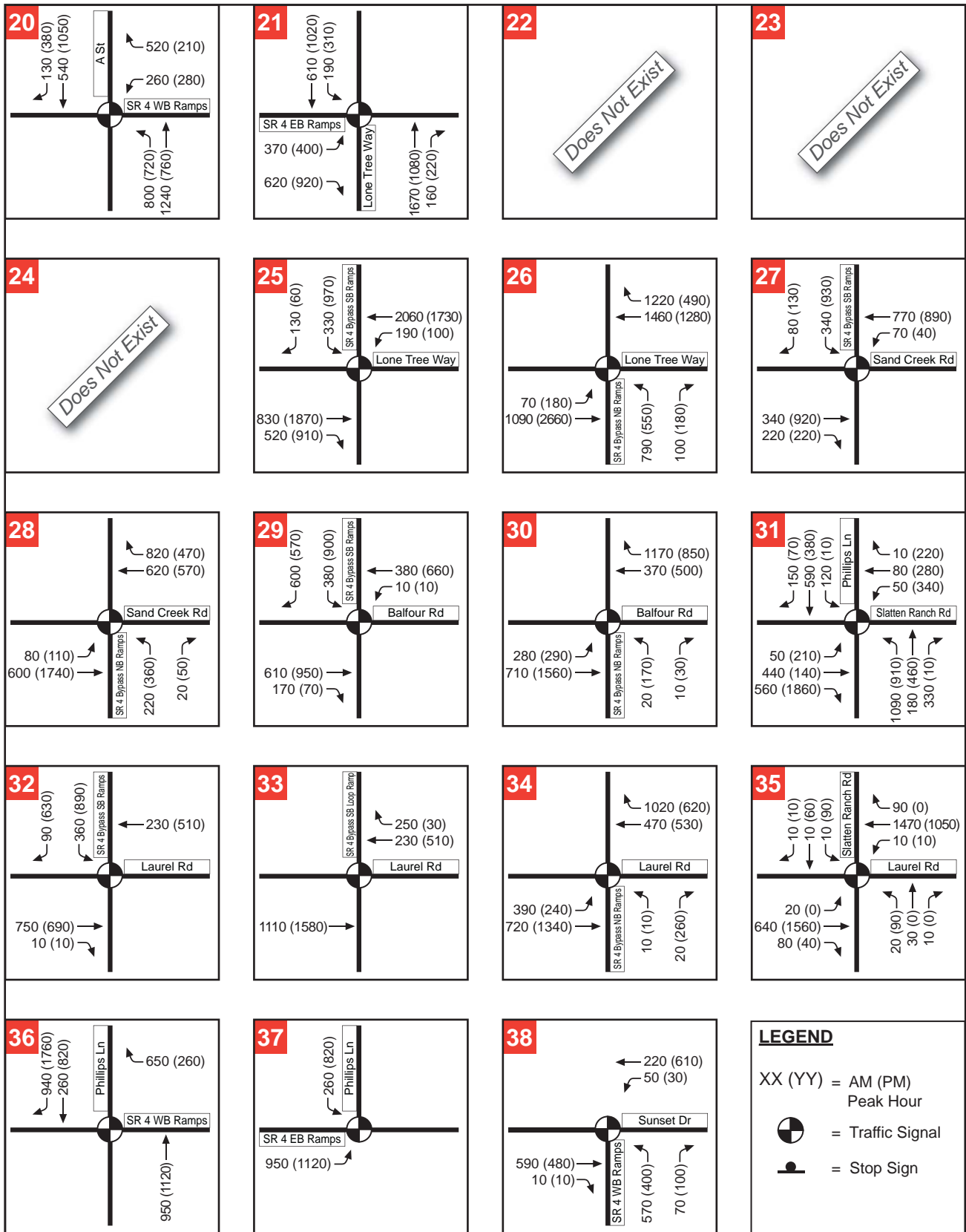


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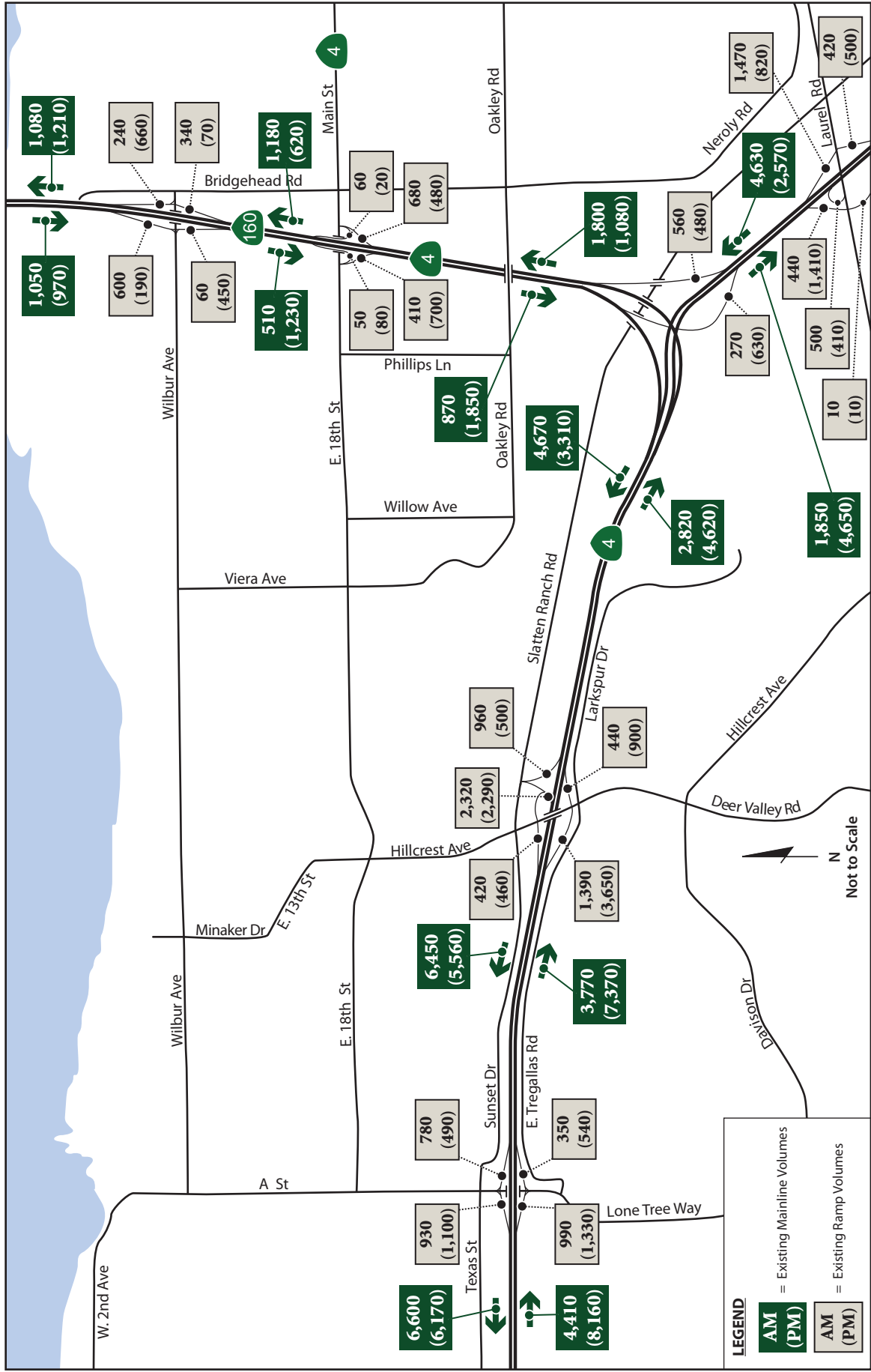




Phillips Lane PSR

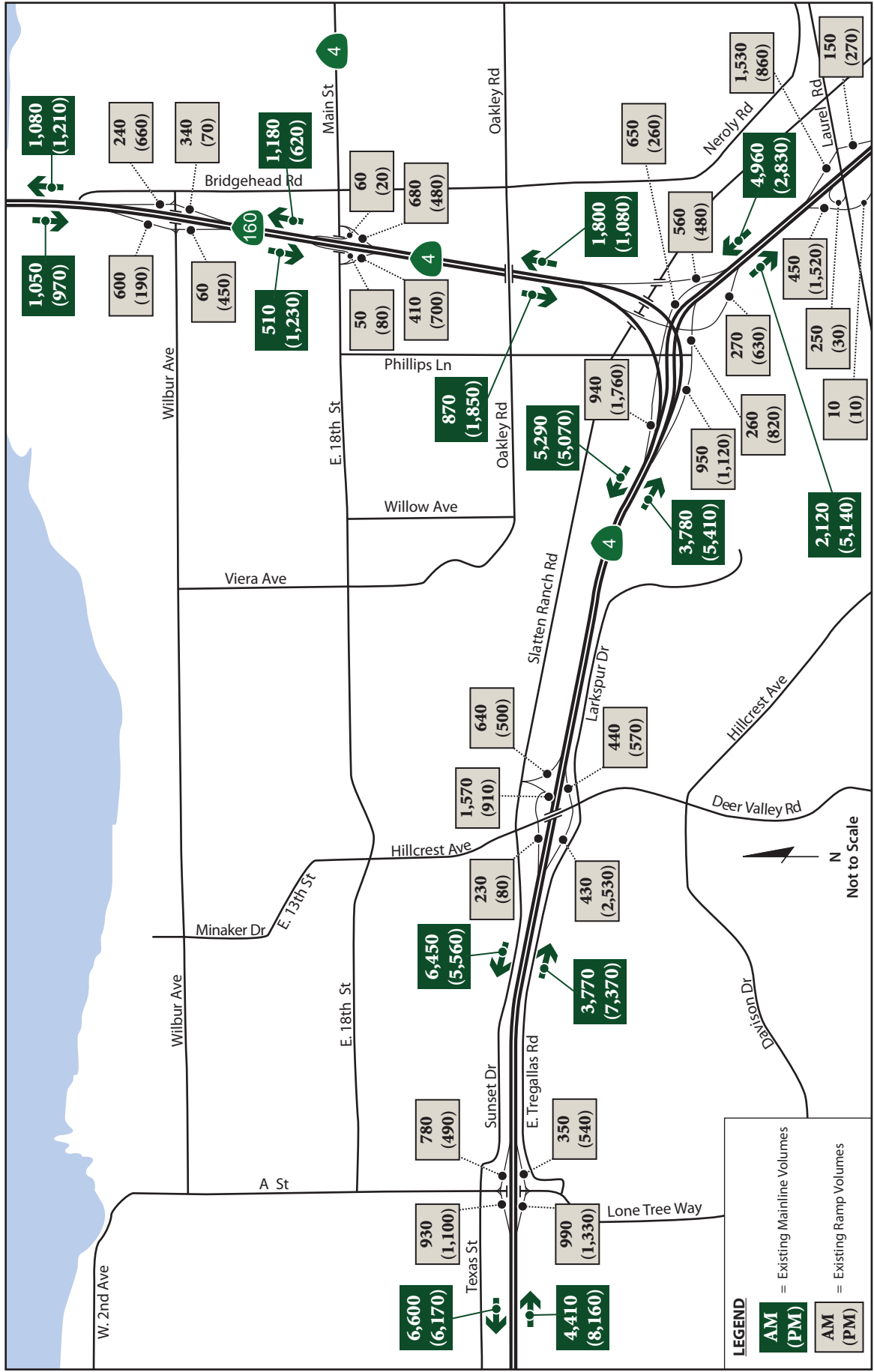


Phillips Lane PSR



2035 NO PROJECT MAINLINE AND RAMP WEEKDAY PEAK HOUR VOLUMES

Figure 5



APPENDIX A – NETWORK MODIFICATIONS

The following network changes were made to help the network better reflect the circulation and access characteristics of the existing roadway system:

- Shady Willow Lane in Brentwood was extended north of Grant Street up to Lone Tree Way in the base year (the original model only had this extension in future years)
- Sand Creek Road was realigned from the location of the rural Old Sand Creek Road to the location of the newer arterial. The parallel arterial San Jose Avenue was modified to connect to the new Sand Creek road in future years.
- The following zones were split and/or combined:
 - Zone 30146 (bounded by Hillcrest Avenue, East 18th Street, Viera Road, and Slatten Ranch Road / Sunset Drive) was split into the developed and undeveloped areas. The developed section remained zone 30146, and land use was held constant at existing levels in future years. The undeveloped section, which will be the site of the Hillcrest eBART station and mixed use TOD, was given zone number 30602 with a connector only to Slatten Ranch Road.
 - Zone 30145 (bounded by Viera Road, East 18th Street, SR 160 and the future Slatten Ranch Road) was split north / south along Oakley Road. The section north of Oakley Road remained zone 30145, and the section south of Oakley Road was given zone number 30056. The job growth in the original zone 30145 was assigned entirely to zone 30056, with a connector only to Oakley Road. Housing was shifted from zone 30146 into zone 30145, as shown in Appendix B.
 - Zones 30359 and 30360 (bounded by Concord Avenue, Balfour Road, Fairview Avenue and Kent Drive) were combined into one zone, which was given number 30360. Zones 30185 and 30437 (an area bounded by the future Hillcrest Avenue extension, San Jose Avenue, SR4 Bypass and Balfour Road) were split into three zones which better reflected access points. The new zone in the northeast corner, with access to San Jose Avenue, was given zone number 30359. Housing was shifted from zone 30437 into zone 30185 as shown in Appendix B.
- In addition to providing the necessary connectors at the split / combined zones above, changes were made to centroid connectors at the following zones:
 - Zone 30145 – provided access to Willow Road
 - Zone 30245 – moved access from Old Sand Creek Road to Shady Willow Lane and Empire Avenue
 - Zone 30437 – moved access to Balfour Road from West of John Muir Parkway to across from John Muir Parkway, so that the connector is a proxy for Cortona Way
 - Zone 30343 – moved access from Balfour Road to Central Boulevard
 - Zone 30367 (Heritage High School) – eliminated access to Deer Valley Road
- Speeds were changed on the following roads:
 - Phillips Lane was reduced from 35 MPH to 25 MPH in the base year and 30 MPH in 2035. The section near the interchange in the “With Project” scenario was kept at 35 MPH.
 - Sunset Drive was reduced from 35 MPH to 30 MPH.
 - Oakley Road west of Phillips lane was increased from 25 MPH to 30 MPH.

APPENDIX B – LAND USE MODIFICATIONS WITHIN ANTIOCH

This appendix documents the differences between the land use derived by the methods described in the main body of this memorandum (the “Orig” columns) and the land use that was used in the Phillips Lane PSR (the “New” columns). Only the total households and total jobs are shown for both the base year (2007) and the forecast year (2035), but other data in the CCTA model land use files was also adjusted to reflect these refinements. The refinements took into account the zone spitting and combining described in Appendix A, inspection of aeriels, and knowledge of specific developments projected to occur in the area (such as the Hillcrest eBART TOD). TAZs in bold are those near the project site that were modified to reflect specific land use, existing and/or anticipated. Other TAZs were adjusted to make the totals for the city match ABAG P07. TAZ 30056 represents the proposed development near the Phillips lane interchange.

Note also that the “Orig” columns do not indicate land uses in either the original CCTA model or in the LUIS06-based updates – rather, they indicate land uses that one would arrive at using the methods described in this memorandum without the project-specific refinements.

Zone	2007				2035			
	Households		Jobs		Households		Jobs	
	Orig	New	Orig	New	Orig	New	Orig	New
30056	0	0	0	0	0	1130	0	6169
30076	192	192	91	113	778	770	420	467
30080	146	146	457	564	330	326	786	810
30081	17	17	822	980	17	16	2077	1744
30083	379	379	251	290	384	380	387	337
30084	409	409	2235	2354	497	491	2799	2415
30085	0	0	939	983	0	0	1190	1012
30086	864	864	61	65	864	855	61	49
30087	48	48	22	26	49	48	110	119
30088	272	272	0	0	491	486	0	0
30090	264	264	13	15	266	263	15	12
30091	683	683	0	0	708	701	0	0
30092	730	730	123	128	749	742	170	145
30093	492	492	149	164	514	508	142	106
30094	451	451	0	0	451	447	0	0
30095	374	374	280	291	374	370	272	228
30096	355	355	60	65	382	378	64	50
30097	1039	1040	42	44	1041	1030	149	132
30098	335	335	149	172	334	331	207	193
30099	244	244	363	408	818	809	352	317
30100	273	273	240	292	561	556	440	446
30101	283	283	80	87	283	280	79	64
30102	110	110	19	21	109	108	19	15
30103	380	380	212	229	452	448	317	245
30104	387	388	268	289	388	384	261	223
30105	862	862	575	629	860	852	555	449
30106	786	786	268	309	788	780	297	271
30107	411	411	109	119	466	461	135	119

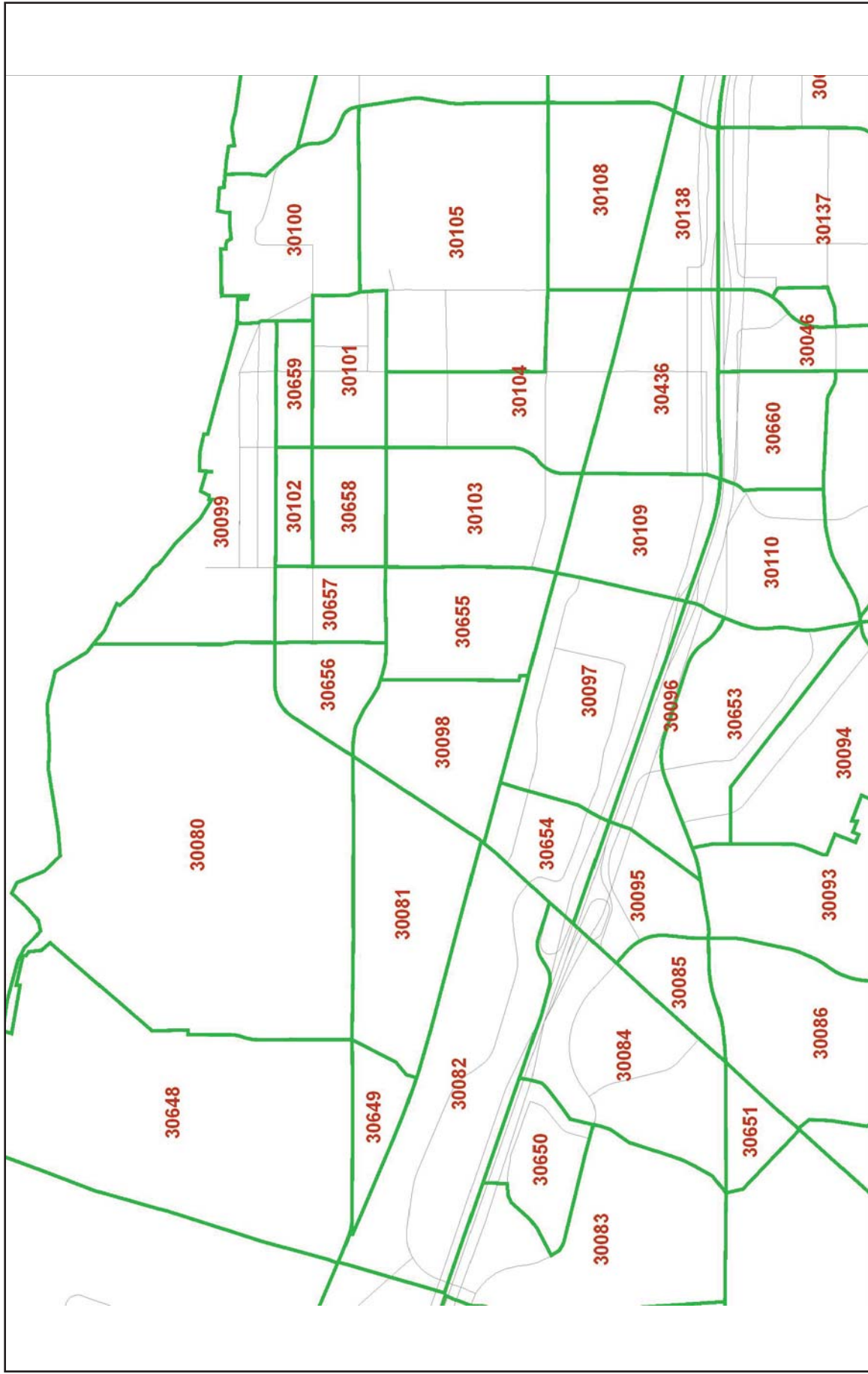
Zone	2007				2035			
	Households		Jobs		Households		Jobs	
	Orig	New	Orig	New	Orig	New	Orig	New
30108	475	475	274	298	477	472	347	283
30109	405	405	23	25	442	437	21	17
30110	257	257	72	75	257	254	70	59
30111	447	447	206	222	446	442	288	249
30112	878	879	8	9	940	930	39	38
30113	29	29	0	0	36	35	0	0
30114	348	349	0	0	547	541	0	0
30116	286	286	0	0	482	477	0	0
30117	436	436	0	0	608	602	0	0
30118	617	617	0	0	682	675	0	0
30119	466	466	1	1	581	575	10	8
30120	53	53	122	128	81	80	118	99
30121	45	45	378	396	75	74	365	307
30122	126	126	143	165	136	134	518	396
30123	17	17	20	23	17	16	70	54
30124	792	792	5	5	887	878	15	14
30125	98	98	113	131	232	230	403	305
30126	31	31	29	31	31	31	27	23
30127	308	308	0	0	325	321	0	0
30128	479	479	9	11	727	720	13	11
30129	344	344	351	408	343	339	872	727
30130	608	608	9	10	721	713	31	24
30131	619	619	3	3	619	613	5	6
30132	1	1	91	101	1	1	312	301
30133	18	18	91	95	18	17	199	181
30134	5	5	320	334	5	5	388	334
30135	494	494	9	11	494	489	48	46
30136	411	411	461	510	410	406	443	330
30137	594	595	210	229	699	692	314	273
30138	188	188	62	66	196	194	61	50
30139	18	18	281	310	18	17	269	247
30140	7	0	274	0	7	0	773	0
30141	27	27	121	127	27	27	148	126
30142	705	705	0	0	772	765	0	0
30143	289	289	44	47	414	410	49	47
30144	0	0	0	0	0	0	0	0
30145	383	533	483	483	538	688	1991	483
30146	557	407	579	56	1186	407	788	56
30147	429	429	469	469	503	429	778	469
30148	60	60	930	334	76	76	2062	2162
30149	2	2	274	369	2	2	490	507
30150	9	9	320	430	9	9	619	663
30151	3	3	206	277	3	3	398	433
30152	61	61	105	134	61	60	407	377
30153	35	35	73	85	35	35	549	515

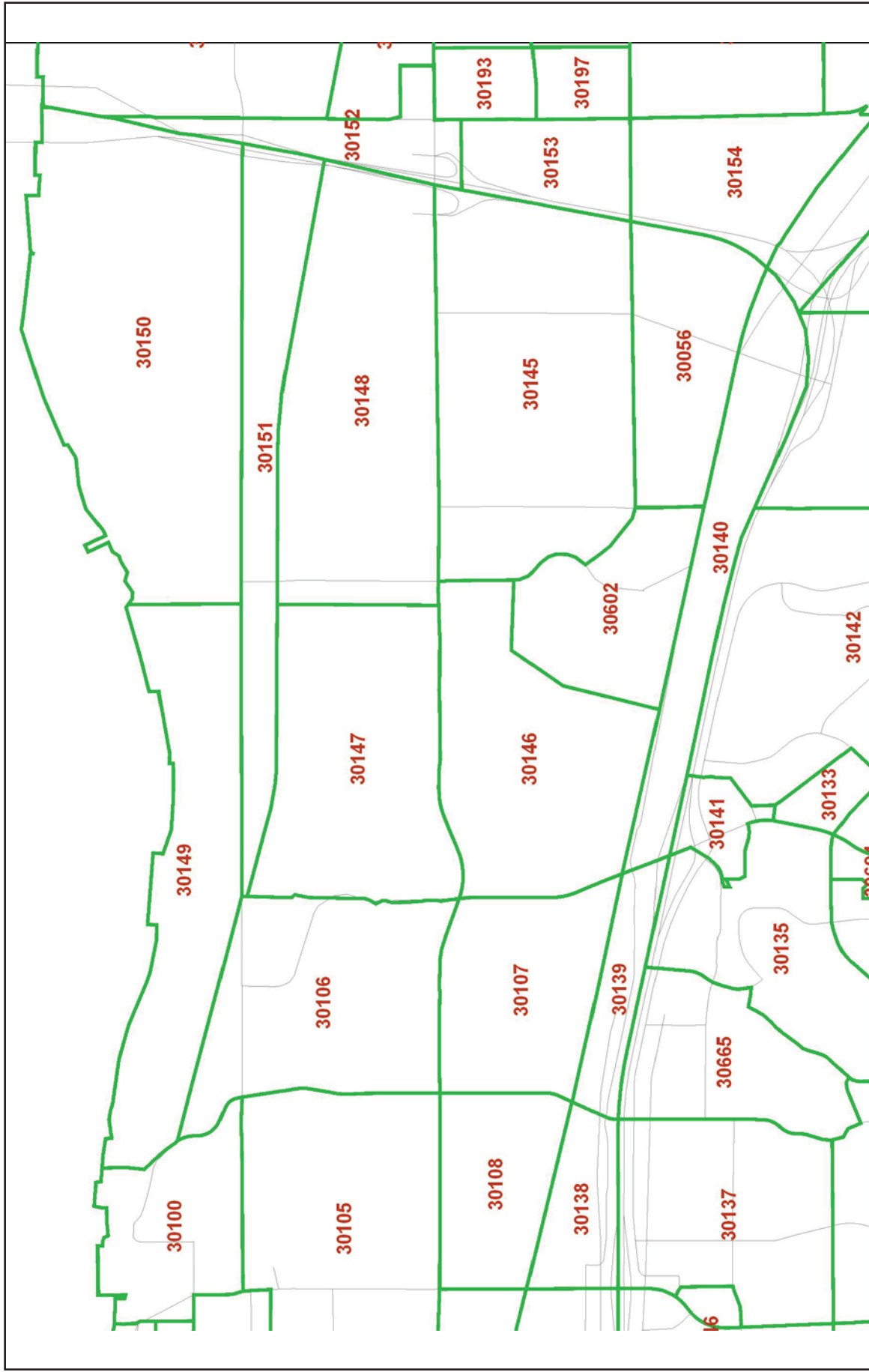
Zone	2007				2035			
	Households		Jobs		Households		Jobs	
	Orig	New	Orig	New	Orig	New	Orig	New
30154	72	72	21	26	159	158	21	18
30155	0	0	69	79	0	0	202	200
30156	127	127	5	6	244	242	5	5
30157	61	61	0	0	102	101	0	0
30158	98	98	16	20	757	749	184	194
30160	51	51	320	322	172	171	314	289
30161	561	561	2	2	586	580	2	2
30163	101	101	228	263	100	99	221	193
30164	396	396	0	0	396	392	0	0
30165	10	10	2	2	10	10	1	1
30167	493	493	2	2	493	488	6	7
30168	400	400	0	0	399	395	0	0
30169	200	200	0	0	200	198	0	0
30170	186	186	4	4	237	235	8	9
30171	732	732	77	89	773	765	243	200
30172	150	150	35	40	188	187	126	96
30173	35	35	314	339	35	35	564	454
30174	77	77	226	242	103	101	258	161
30175	123	123	0	0	128	127	5	5
30176	304	304	7	9	338	334	76	80
30177	56	56	0	0	57	56	0	0
30178	469	470	0	0	574	568	4	4
30179	163	163	1	1	176	174	15	17
30181	199	199	0	0	329	326	0	0
30184	12	12	46	54	49	48	45	40
30186	6	6	672	67	6	6	2574	2574
30187	5	5	480	6	5	5	2092	2092
30191	1	1	222	295	1	1	835	745
30429	128	128	135	148	128	127	266	231
30432	124	124	4	4	495	490	8	9
30433	5	5	0	0	256	254	0	0
30434	20	20	2	2	146	145	15	17
30436	522	522	24	26	527	522	22	17
30602	0	0	0	0	0	0	0	0
30650	180	180	0	0	181	179	0	0
30651	10	10	11	12	24	24	98	95
30652	74	74	6	8	74	73	30	33
30653	395	395	24	26	394	390	22	16
30654	390	390	360	376	390	386	386	326
30655	29	29	12	12	991	981	65	57
30656	64	64	254	273	64	64	275	236
30657	191	191	21	24	190	188	23	20
30658	310	310	147	161	310	306	144	116
30659	131	131	27	30	130	129	27	22
30660	283	283	0	0	282	279	0	0

Zone	2007				2035			
	Households		Jobs		Households		Jobs	
	Orig	New	Orig	New	Orig	New	Orig	New
30661	27	27	78	81	32	32	81	69
30662	21	21	189	197	21	21	226	196
30663	153	153	0	0	155	153	0	0
30664	24	24	525	599	24	24	625	486
30665	301	301	0	0	301	298	1	1
30666	460	460	3	3	459	454	15	15
30668	28	28	9	10	42	42	9	7
30669	24	24	0	0	39	39	0	0
30670	120	120	0	0	203	201	0	0
30671	10	10	0	0	46	46	0	0
30673	95	95	0	0	228	226	0	0
30674	73	73	2	2	73	72	11	12
30675	20	20	0	0	49	48	0	0
30676	61	62	1	1	117	116	2	2
30677	15	15	0	0	20	19	4	4
30678	20	21	0	0	171	169	4	4
30679	210	210	2	2	488	483	18	19
30681	33	33	5	5	176	174	9	9
30682	0	0	1370	1679	0	0	1922	1873
30683	15	15	15	18	20	19	280	272
30684	102	103	4	4	165	163	8	8
30685	79	79	6	8	122	120	11	10
30686	78	78	5	5	537	532	9	8
30687	15	15	30	35	24	24	884	730
30690	0	0	913	1202	0	0	898	977
30691	0	0	183	238	0	0	2210	2381
30692	147	147	0	0	173	172	0	0
30693	331	331	10	12	432	428	40	44
30694	23	23	57	59	23	23	56	47
30695	148	148	0	0	262	260	0	0
City of Antioch Total	33822	33822	22178	22178	43720	43720	42110	42110

APPENDIX C – TAZ MAPS

The following five figures show TAZ maps of the study area. Figure 7a shows eastern Pittsburg and northwestern Antioch, figure 7b shows northeastern Antioch (including the location of the proposed Phillips Lane interchange), figure 7c shows Oakley, figure 7d shows southeastern Antioch and segment 2 of SR4, and figure 7e shows western Brentwood and segment 3 of SR4.





Phillips Lane PSR

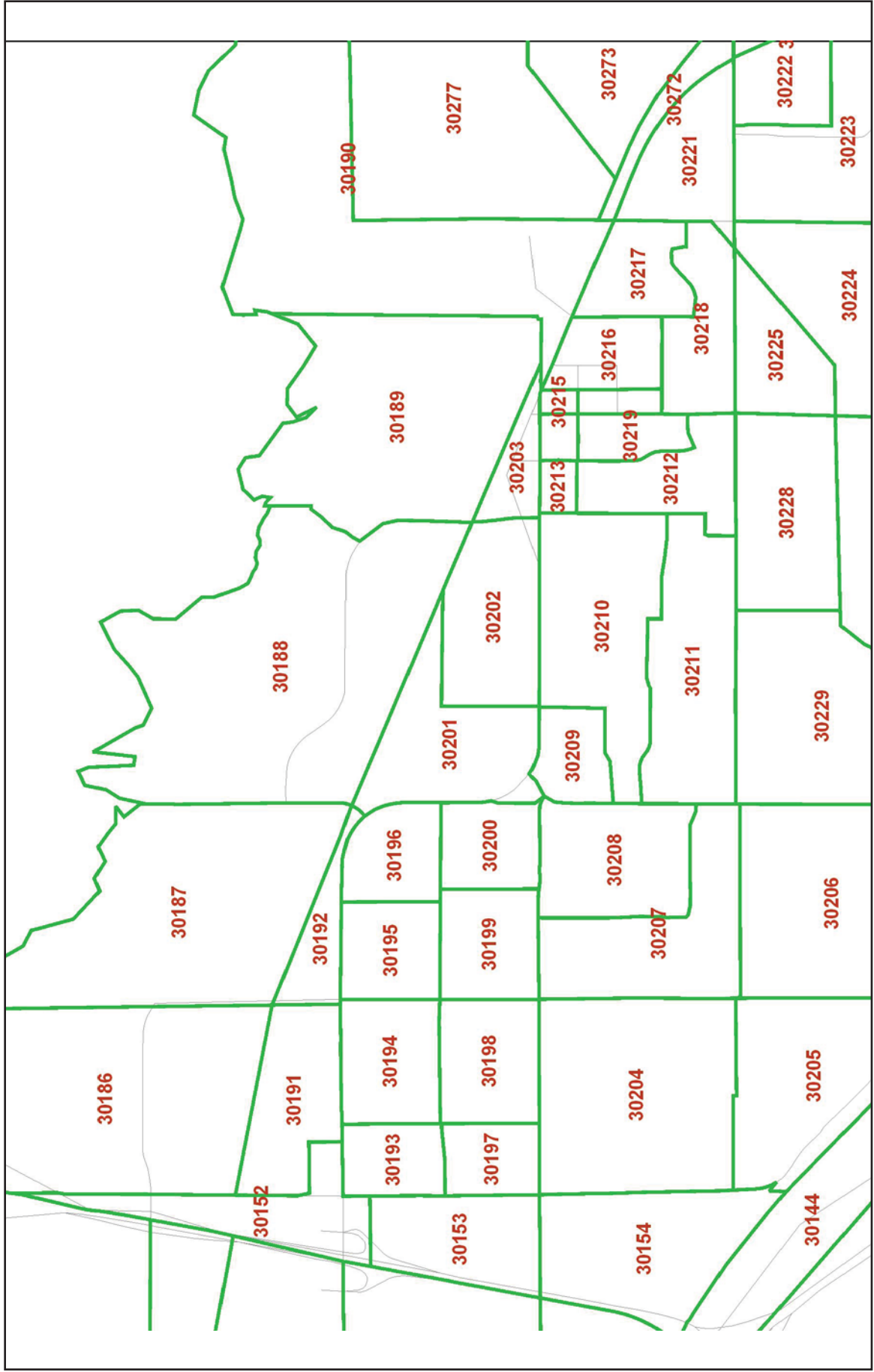


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September 2008
WC07-2490_7B

TAZ MAP OF STUDY AREA

Figure 7B



TAZ MAP OF STUDY AREA

Figure 7C

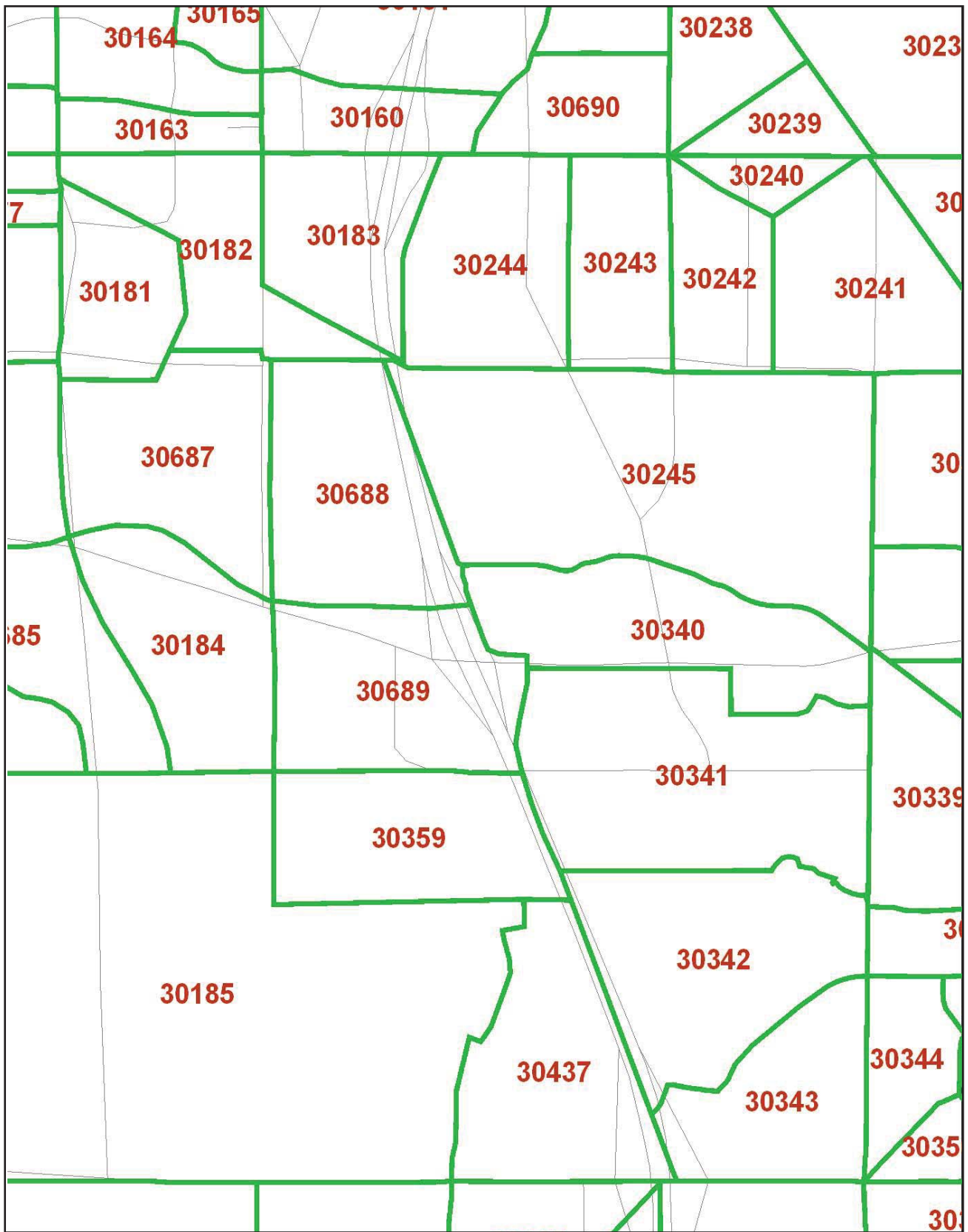


Phillips Lane PSR



TAZ MAP OF STUDY AREA

Figure 7D



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Phillips Lane PSR

TAZ MAP OF STUDY AREA

Figure 7E