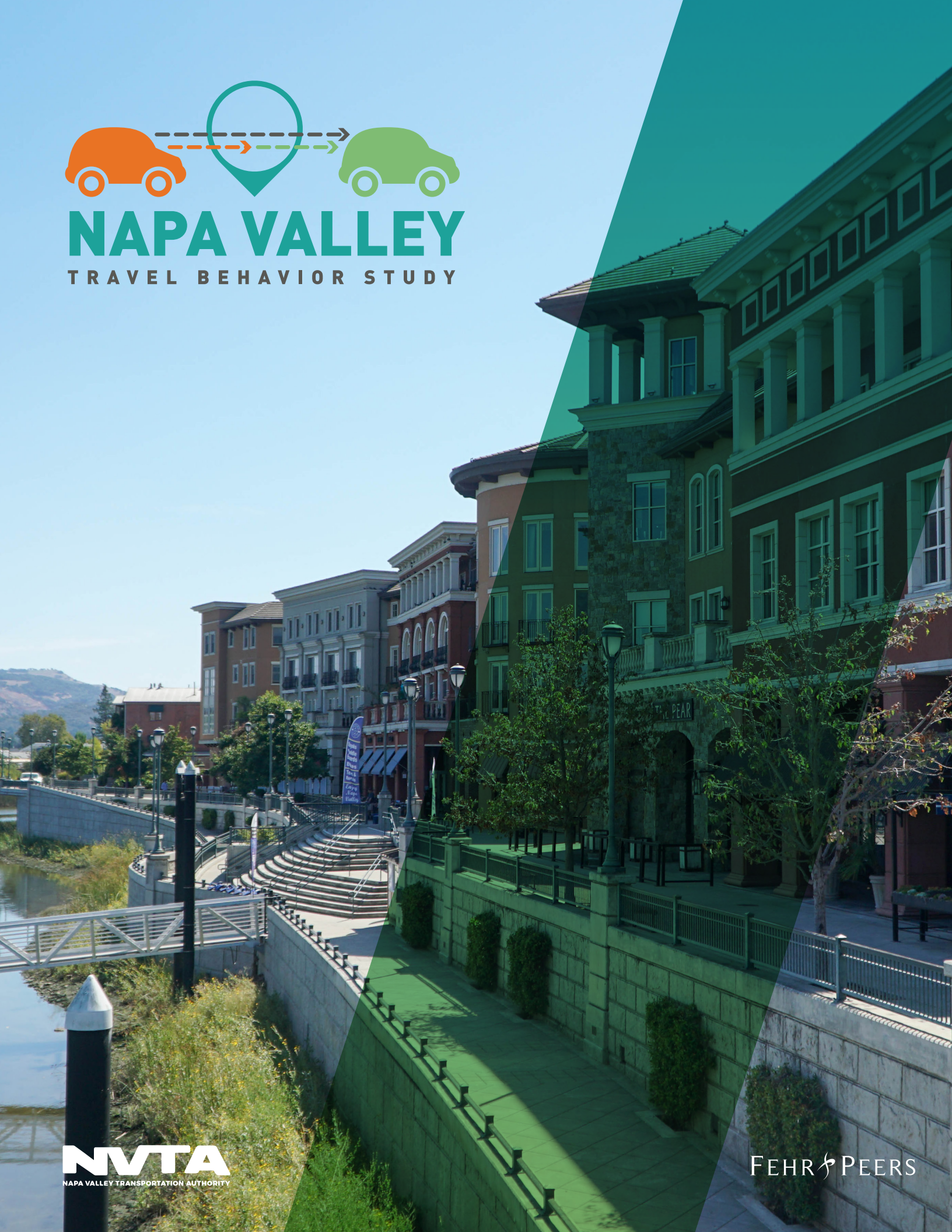
NAPA VALLEY
TRAVEL BEHAVIOR STUDY



NVTA
NAPA VALLEY TRANSPORTATION AUTHORITY

FEHR & PEERS

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1. STUDY PURPOSE

The Napa Valley Travel Behavior Study (TBS) builds on data received from the 2014 TBS using more cost-effective and advanced data collection tools. The TBS focuses on work, school, and other trips in Napa Valley. The study identifies how many trips per day are associated with visitors, residents and employees, where those trips start and end, and the predominant modes and times of travel. The study takes into account seasonal variations, as well as weekday and weekend travel.

Since completing the previous Napa Valley TBS in 2014, Fehr & Peers has utilized similar data collection methods but with enhancements and refinements that minimize the shortcomings of the previous approach. Through coordination with data providers, Fehr & Peers has a better understanding of available data products, including the advantages and limitations of each data source. The goal of this study is to capitalize on new data sources, be more cost-effective, and obtain a more comprehensive dataset specific to the Napa Valley.

This report describes the methodologies used to update and present a summary of the travel patterns and characteristics identified in Napa Valley. The resulting data will provide the basis for multiple planning efforts by the Napa Valley Transportation Authority (NVTA) and jurisdictions within Napa County. Such uses may include but are not limited to the refinement of the Napa Travel Model, the Short Range Transit Plan and the update of the Countywide Transportation Plan. The data is also expected to inform future transit service expansion in Napa County.

Travel surveys are the traditional approach for gathering travel behavior data since the information is more robust than a typical traffic count process. These traditional survey methods are costly and usually result in very small sample sizes. They are also prone to human error during the data collection process as well as from the survey responders who may misinterpret the questions. In order to minimize the shortcomings of traditional approaches, Fehr & Peers evaluated various innovative data collection techniques as well as enhancements to traditional methods for use in this study.

For the TBS update, Fehr & Peers purchased Cuebiq-based origin-destination mobile device data from StreetLight Data[1] given their demonstrated experience and success supporting similar travel behavior studies across California, including the previous Napa Valley TBS. StreetLight Data was also selected because of their InSight Portal which offers a quick, convenient, and flexible method for obtaining data, as well as their ability to provide advanced metrics such as trip lengths, trip purposes, and demographic information based on observed home locations. After obtaining this data, it was scaled using newly collected traffic count data and the results were combined to provide a robust, comprehensive dataset, specific to Napa County.

[1] https://www.streetlightdata.com/

2. KEY FINDINGS

This chapter provides a bulleted summary of key findings from the TBS update and a discussion of the results compared to the 2014 study. Infographics are also presented at the end of this chapter to highlight key findings from the weekday, day of week variation, seasonal variation, and county gateway analysis.

2.1 Traffic Counts

- Weekday traffic counts collected in 2018 at 11 locations totaled roughly 185,000 vehicles
- Friday traffic counts collected in 2018 at 11 locations totaled roughly 188,000 vehicles
- Saturday traffic counts collected in 2018 at 11 locations totaled roughly 160,000 vehicles
- Sunday traffic counts collected in 2018 at 11 locations totaled roughly 153,000 vehicles
- Friday traffic counts collected in 2018 at 11 locations increased on average by 3.5%, or 0.7% per year, compared to Friday traffic counts collected in 2013 before the Jameson Canyon Road widening
  - Jameson Canyon Road increased by 21%
  - SR 121 at the Sonoma/Napa county line increased by 12%
  - SR 29 North of American Canyon Road decreased by 7%

2.2 Mobile Device Data

Findings based on over 25 million data samples and 736,000 mobile devices, the previous study findings were based on 200,000 data samples

2.2.1 Spring 2018 Weekday Travel Patterns

Daily Trip Types

- On an average weekday (Monday to Thursday) in spring 2018 roughly 353,000 vehicle trips interacted with Napa County
- Inter-county travel represents 33% of Napa County trips (32% from previous study)
- Intra-county travel represents 67% of Napa County trips (68% from previous study)
- 3.4% of total Napa County trips pass through the County (3.3% from previous study)
- 10.3 percent of inter-county trips pass through Napa County, up from 9.0% from the previous study
- Roughly 12,000 vehicle trips pass through Napa County on an average weekday (roughly 12,000 from previous study)
- Roughly 353,000 vehicle trips touch Napa County on an average weekday (roughly 345,000 from previous study), up 2.3% or 0.5% per year from the previous study

Imported and Exported Trips

- In the AM peak period 51% (15,600 trips) of inter-county trips are imported, 28% (9,800 trips) of inter-county trips are exported
  - Trips are primarily imported from Solano County (55% or 8,600 trips) and Sonoma County (21% or 2,100 trips)
  - Trips are primarily exported to Solano County (41% or 4,000 trips) and Sonoma County (29% or 2,800 trips)

Key Daily Origin-Destination Pairs

- Roughly 40% of total Napa County trips start AND end in the City of Napa
- 54% of inter-county trips start or end in Solano County
- 20% of inter-county trips start or end in Sonoma County

Top 5 Counties coming into Napa County on a Daily Basis

- Solano County – 28,900 trips or 55% of trips into Napa County
- Sonoma County – 9,900 trips or 19% of trips into Napa County
- Contra Costa County – 4,300 trips or 8% of trips into Napa County
- Alameda County – 2,000 trips or 4% of trips into Napa County
- Sacramento County – 1,700 trips or 3% of trips into Napa County

Top 15 Napa County Daily Trip Origins

1. City of Napa – 187,600 trip origins
2. American Canyon – 33,100 trip origins
3. City of Vallejo – 14,300 trip origins
4. Downtown Napa – 12,800 trip origins
5. St Helena – 11,800 trip origins
6. Napa Bel Aire Plaza – 11,500 trip origins
7. Fairfield – 8,700 trip origins
8. South Napa Market Place – 8,200 trip origins
9. Calistoga – 6,600 trip origins
10. Napa Junction Center (American Canyon) – 5,600 trip origins
11. Napa Middle and High Schools – 5,600 trip origins
12. Yountville – 5,200 trip origins
13. Angwin – 3,600 trip origins
14. Napa Valley College – 3,600 trip origins
15. Queen Medical – 2,600 trip origins

Key Daily Destinations

- Roughly 60% of Napa Junction Center (American Canyon) trips (11,600 daily weekday trips, 3 percent of Napa County trips) are coming from outside Napa County, 45% from City of Vallejo, 31% from American Canyon, 8% from City of Napa
- Roughly 17% of South Napa Market Place trips (16,900 daily weekday trips, 5% of Napa County trips) are coming from outside Napa County, 4% from City of Vallejo, 4% from American Canyon, 85% from City of Napa
- Roughly 19% of Oxbow trips (3,800 daily weekday trips, 1% of Napa County trips) are coming from outside Napa County, 2% from City of Vallejo, 1% from American Canyon, 67% from City of Napa
- Roughly 16% of Bel Aire Plaza trips (23,300 daily weekday trips, 7% of Napa County trips) are coming from outside Napa County, 3% from City of Vallejo, 1% from American Canyon, 76% from City of Napa

2.2.2 Spring 2018 Weekday Travel Characteristics

On an average weekday (Monday to Thursday) in spring 2018 roughly 353,000 vehicle trips interacted with Napa County

Daily Peaking Characteristics

- 4% of trips are generated between midnight and 6 AM
  - 58% of trips generated between midnight and 6 AM are inter-county trips
- 22% of trips are generated between 6 AM and 10 AM
- 34% of trips are generated between 10 AM and 3 PM
- 29% of trips are generated between 3 PM and 7 PM
- 12% of trips are generated between 7 PM and midnight

Daily Trip Purpose Information

- 22% of daily Napa County trips are work-related
- Roughly 40% of AM peak period Napa County trips are work-related

Daily Worker Information

- 106,000 work trips start or end within Napa County on an average weekday
- 46 percent of Napa County work trips are generated by residents who live and work in Napa County
- 25 percent are generated by residents who work outside Napa County
- 29 percent are from Napa County employees who live outside Napa County and commute into Napa County
- 77 percent of Napa County residents live and work within Napa County
- 6.6 percent of Napa County residents commute to Solano County
- 3.6 percent of Napa County residents commute to Sonoma County
- 69 percent of Napa County employees live and work within Napa County
- 16 percent of Napa County employees commute from Solano County
- 6 percent of Napa County employees commute from Sonoma County

Daily Income Information

- 30% of Napa County trips are made by households making more than $100,000 per year

Daily visitor information

- 72,000 or 20% of weekday trips are for social recreation (tourist) purposes
- On an average weekday 38 percent of mobile devices were from outside of Napa County and 43 percent on an average weekend day

Daily VMT Information

- 31% of Napa County trips are less than 2 miles in length
- 63% of Napa County trips are less than 5 miles in length
- 11% of Napa County trips are more than 20 miles in length
- 8.5 miles is the average trip length of Napa County-generated trips
- 37 miles is the average trip length of inter-County trips
- Napa County trips generate roughly 3.9 million vehicle miles traveled
  - 28% of VMT is generated by intra-county trips (comprise 64% of trips)
  - 72% of VMT is generated by inter-county trips (comprise 36% of trips)

Key Daily VMT Generators

- City of Napa to City of Napa trips (139,000 trips) generate roughly 310,000 vehicle miles traveled, an average trip length of 2.2 miles
- Bel Aire Plaza generates 169,000 vehicle miles traveled from 23,300 trips, an average trip length of 7.3 miles
- South Napa Market Place generates 130,000 vehicle miles traveled from 16,900 trips, an average trip length of 7.7 miles

- Oxbow generates 37,000 vehicle miles traveled from 3,800 trips, an average trip length of 9.7 miles
- Napa Junction Center (American Canyon) generates 99,000 vehicle miles traveled from 11,600 trips, an average trip length of 8.5 miles

2.2.3 Weekend and Seasonal Variation

Spring 2018 Weekend Variation

- Roughly 285,000 vehicle trips are generated on an average Saturday in spring (19% lower than on a weekday), and 280,000 on an average Sunday in spring (21% lower than on a weekday)
- Work-related trips reduce from 22% to 10%
- Work-related trips at county gateways reduce from 29% to 10%
- Average trip length increases from 8.5 miles on a weekday to 9.5 miles on Saturday and 9.7 miles on Sunday

Fall 2018 and Summer 2018 Seasonal Variation

- Napa County trips were 22% higher in fall 2018 than in spring 2018
- Napa County trips were 8% higher in summer 2018 than in spring 2018
- Work-related trips reduce from 22% to 17% in summer
- Work-related trips at county gateways reduce from 29% to 25% in summer
- Trips less than 5 miles in length increase from 63% in spring to 66% in fall and summer

2.2.4 Roadway Segment Trips

SR 29 North of American Canyon Road – Daily Conditions

- 23,000 vehicle trips traveled northbound and 24,000 vehicle trips traveled southbound
- 2,500 (5%) of the 47,000 bidirectional vehicle trips are passing through Napa County without stopping
- 64 percent of vehicle trips travelling northbound originate in Solano County, with 46 percent ending in American Canyon and 37 percent ending in the City of Napa
- 48 percent of vehicle trips travelling southbound originate in American Canyon, with 61 percent ending in Solano County and 9 percent ending in Contra Costa County
- Largest northbound origin-destination pair is between Vallejo and American Canyon, accounting for 28 percent of northbound travel on a weekday.
- Largest southbound origin destination pair is between American Canyon and Vallejo, accounting for 26 percent of southbound travel on a weekday.

6.2 SR 29/SR 221 Intersection – Daily Conditions

- 83,600 vehicle trips traveled through the SR 29/SR 121 intersection
- 8,400 (10%) of the 83,600 vehicle trips are passing through Napa County without stopping
- 37 percent of vehicle trips originate in the City of Napa and 26 percent originate in Solano County
- Largest origin-destination pair is between Vallejo and the City of Napa, accounting for 8 percent of travel on a weekday

2.2.5 Truck Trips

- 15,400 truck trips interacted with Napa County
- 700 truck trips passed through Napa County
- Truck trips comprise roughly 4.4 percent of total vehicle trips that interact with Napa County
- 36% percent of Napa County truck trips start or end in unincorporated areas, significant higher than total vehicle trips where only 14 percent start or end in unincorporated areas
- 40% of Napa County inter-county truck trips are from Solano County, significant lower than total vehicle trips where 55% are from Solano County. The data indicates truck trips interact more with Sonoma, Alameda, and Contra Costa counties than total vehicle trips
- 15 miles is the average trip length for Napa County-generated truck trips, roughly 75 percent higher than the average trip length for total vehicle trips
- 49.2 miles is the average trip length for Napa County gateway truck trips, roughly 35 percent higher than the average trip length for total vehicle trips
- 376,000 VMT is generated by truck trips that start or end within Napa County, with an average trip length of 26 miles
- The largest truck VMT generating gateway is SR 12 at the Napa/Solano County Line which generates roughly 181,000 VMT and has an average trip length of 62 miles

2.3 Comparison to 2014 Study

Table 2-1 provides a comparison of 2018 TBS findings to findings from the previous 2014 TBS. Green shading indicates an increase from the previous TBS, red shading indicates a decrease.

Table 2-1: Comparison to 2014 Study

Finding	2018 TBS	2014 TBS	Difference	Discussion
Traffic Count Data				
Total counted vehicles on Friday at all 11 study locations	188,000	181,000	7,000	Traffic counts increased by 3.5%, or 0.7% per year. 2014 TBS traffic counts were collected in 2013 before the Jameson Canyon Road widening.
Total counted vehicles on Friday on Jameson Canyon Rd	38,000	32,000	6,000	Traffic counts increased by 21% or 4.2% per year.
Total counted vehicles on Friday on SR 29 North of American Canyon Rd	49,000	53,000	-4,000	Traffic counts decreased by 7% or 1.4% per year.
Mobile Device Data Samples				
StreetLight Data Samples	25 million	200,000	24.8 million	2018 TBS findings based on 25 million data samples compared to 200,000 for 2014 TBS.
Mobile Device Data Trip Types				
Total weekday trips interacting with Napa County	353,000	345,000	8,000	Total weekday trips increased by 2.3%, or 0.5% per year.
Total weekday inter-Napa County trips (subset of total weekday trips interacting)	127,000	125,000	2,000	Total weekday inter-Napa County trips increased by 1.4%, or 0.3% per year.
Weekday inter-county travel percentage	33%	32%	1%	Remained largely unchanged.
Weekday intra-county travel percentage	67%	68%	-1%	Remained largely unchanged.
Weekday pass-through travel percentage (of total countywide trips)	3.4%	3.3%	0.1%	Remained largely unchanged.
Weekday pass-through travel percentage (of inter-county trips only)	10.3%	9.0%	1.3%	Remained largely unchanged.
Weekday pass-through trips	12,000	12,000	0	Remained largely unchanged.
Percent of weekday pass-through trips that travel between Solano and Sonoma	46%	52%	-6%	The percent of weekday pass-through travel between Solano and Sonoma counties decreased by 6%, but still accounts for roughly half of all countywide pass-through travel.

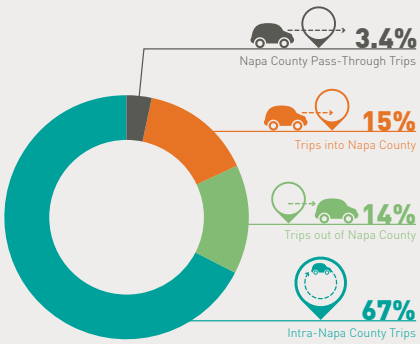
Table 2-1: Comparison to 2014 Study

Finding	2018 TBS	2014 TBS	Difference	Discussion
Mobile Device Data Travel Direction				
Weekday inbound trip percentage	45%	45%	0%	Remained largely unchanged.
Weekday outbound trip percentage	44%	45%	-1%	Remained largely unchanged.
Weekday AM peak period inbound trip percentage	55%	51%	4%	Increase in the percentage of inbound trips in the morning.
Weekday AM peak period outbound trip percentage	34%	39%	-5%	Decrease in the percentage of outbound trips in the morning.
Weekday PM peak period inbound trip percentage	38%	40%	-2%	Slight decrease.
Weekday PM peak period outbound trip percentage	52%	52%	0%	Remained largely unchanged.
Mobile Device Data Worker Information				
Weekday work-related trips at Napa County gateways	29%	41%	-12%	The large differences are likely due to the 2014 TBS results being based on license plate matching, which had a lot of limitations including issues with correctly transcribing license plates, inferencing regarding what constitutes a work-related trip, and lack of origin-destination or home-work information.
Weekday AM peak period work-related trips at Napa County gateways	45%	51%	-6%	
Percent of employees who live in Napa County	69%	71%	-2%	2014 TBS data was based on an employer survey. 2018 TBS data was based on an analysis of home and work location data associated with mobile devices from StreetLight Data.
Mobile Device Data Visitor Information				
Percent of weekday trips made by social recreation visitors to Napa County	20%	17%	3%	2014 TBS data was based on a vehicle intercept survey. 2018 TBS data was based on an analysis of home and work location data associated with mobile devices from StreetLight Data. Both methodologies have their limitations as discussed in Appendix A and the previous TBS report.

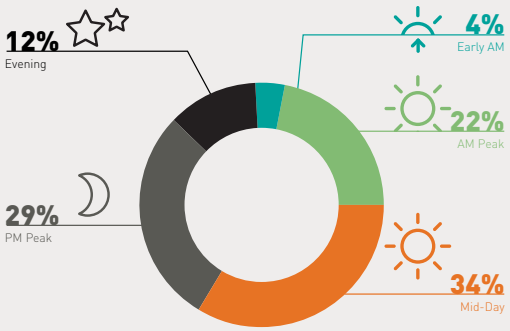
Source: Fehr & Peers

Infographic 2-1: Spring 2018 Weekday Analysis

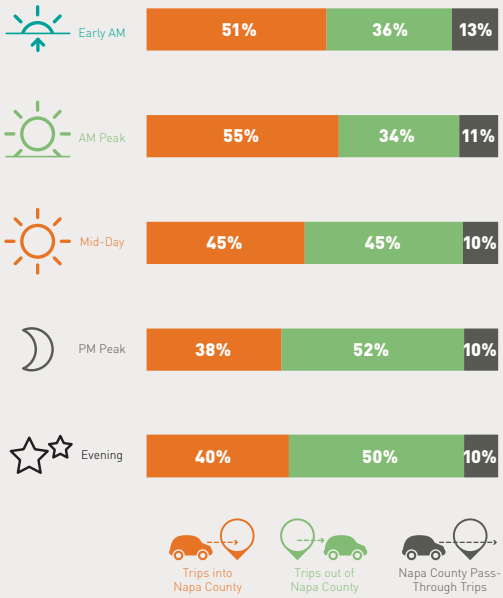
What Types of Trips are Occuring within Napa County on a Weekday?



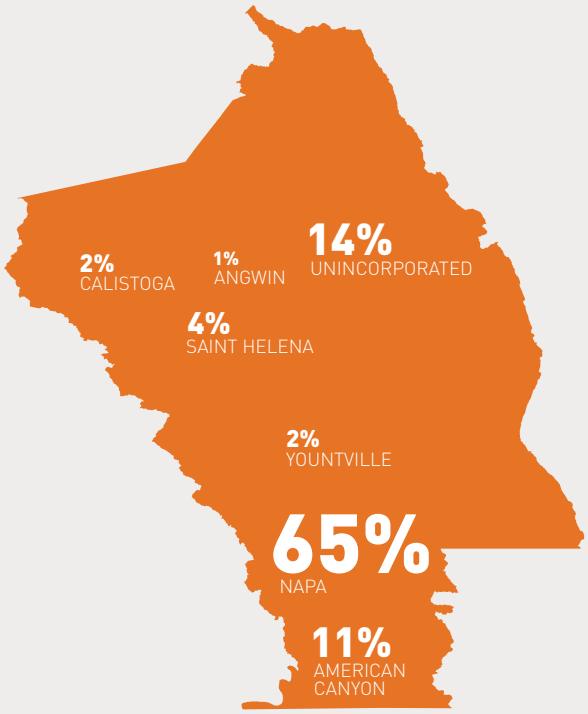
Weekday Peaking Characteristics



Weekday Inter-County Trips

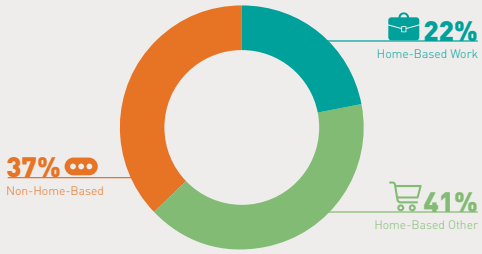


Percent of Weekday Trips by Jurisdiction



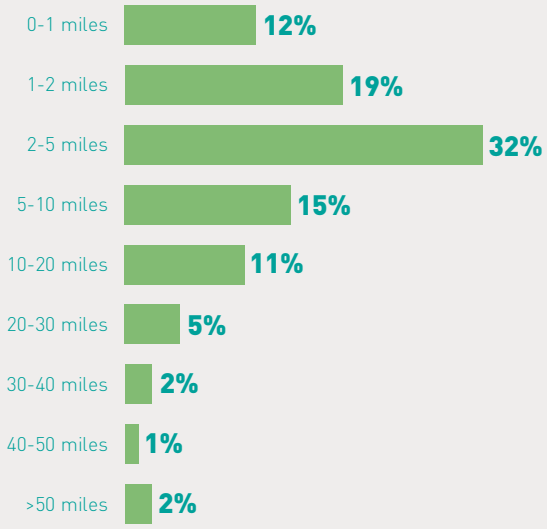
What Types of Inter-County Trips Occur in the Morning?

Average Weekday Trip Purpose

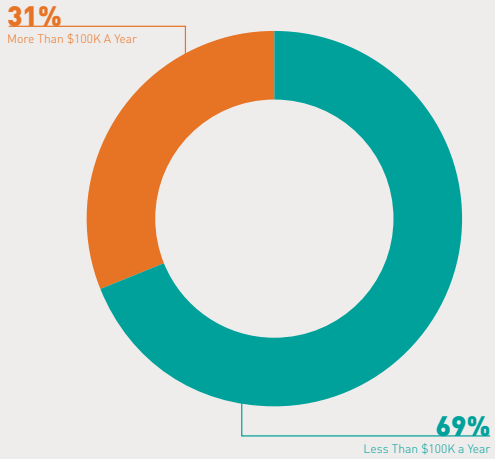


Infographic 2-1: Spring 2018 Weekday Analysis

Average Weekday Trip Length Distribution



Percent of Weekday Trips by Average Household Income



Weekday City-to-City Trips

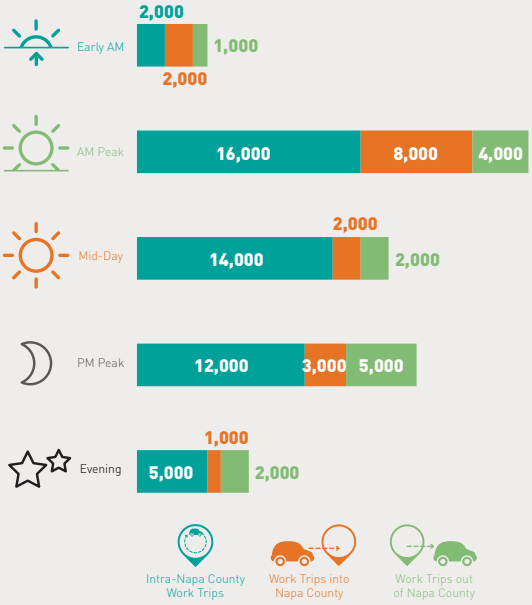
39% NAPA>NAPA
8% GATEWAY>NAPA
8% NAPA>GATEWAY
5% AC>AC
4% UNINC>UNINC
4% UNINC>NAPA
4% NAPA>UNINC

Weekday Pass-Through Trips

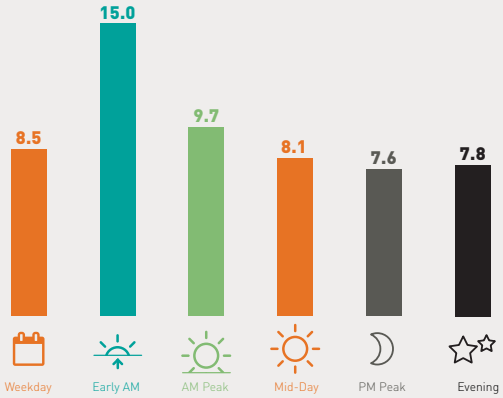
25% SOLANO>SONOMA
21% SONOMA>SOLANO
8% LAKE>SONOMA
7% SONOMA>LAKE
6% SOLANO>SOLANO
5% SONOMA>SACRAMENTO
5% SACRAMENTO>SONOMA
3% CONTRA COSTA>SONOMA
2% YOLO>SONOMA
2% SONOMA>YOLO
2% SONOMA>CONTRA COSTA

Infographic 2-1: Spring 2018 Weekday Analysis

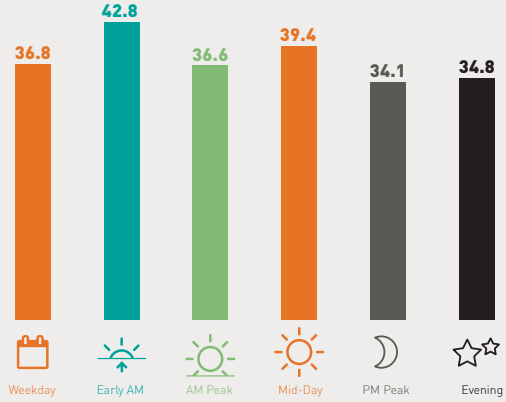
Weekday Work Trip Types



Average Napa County-Generated Trip Length (miles) by Time Period



Average Napa Gateway Trip Length (miles) by Time Period



Weekday All-Day Largest Trip Generators

(Percent of Countywide Trips)

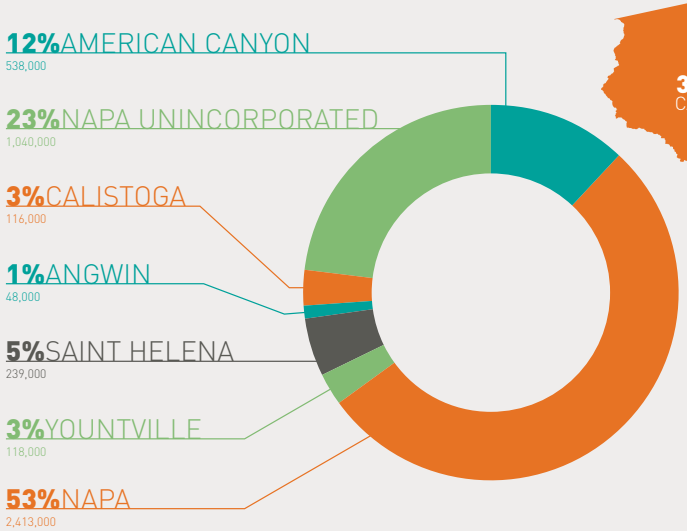
7% NAPA BEL AIRE PLAZA

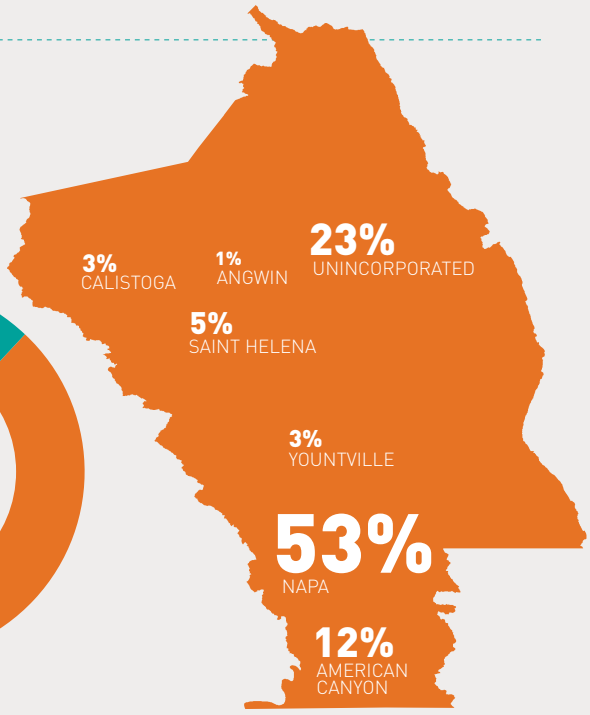
5% SOUTH NAPA MARKET PLACE

3% NAPA JUNCTION CENTER

1% NAPA OXBOW

Total Weekday VMT by Jurisdiction

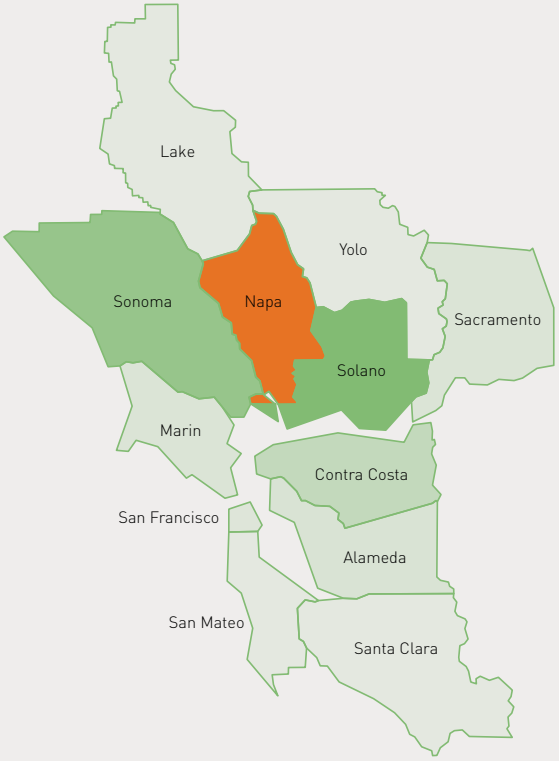




Infographic 2-1: Spring 2018 Weekday Analysis

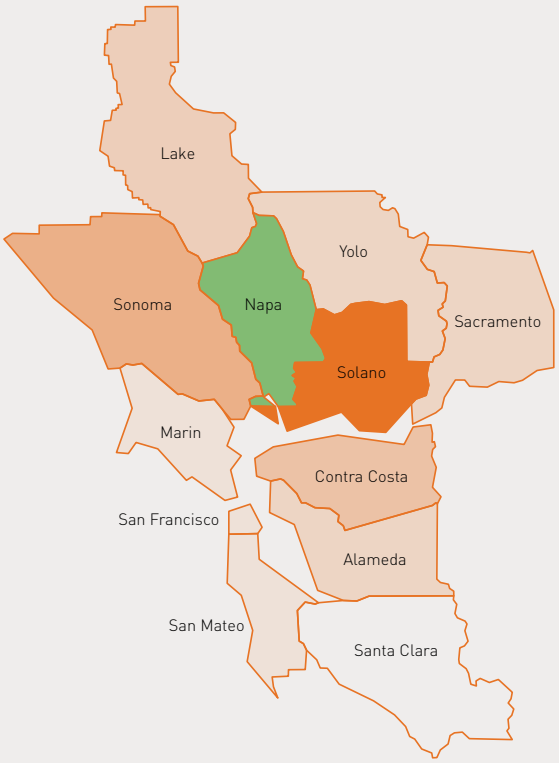
Where are Trips Leaving Napa County Going in the Morning?

41% SOLANO
29% SONOMA
11% CONTRA COSTA
5% ALAMEDA
4% SACRAMENTO
4% MARIN
2% SAN FRANCISCO
1% SANTA CLARA
1% SAN MATEO
1% LAKE
1% YOLO

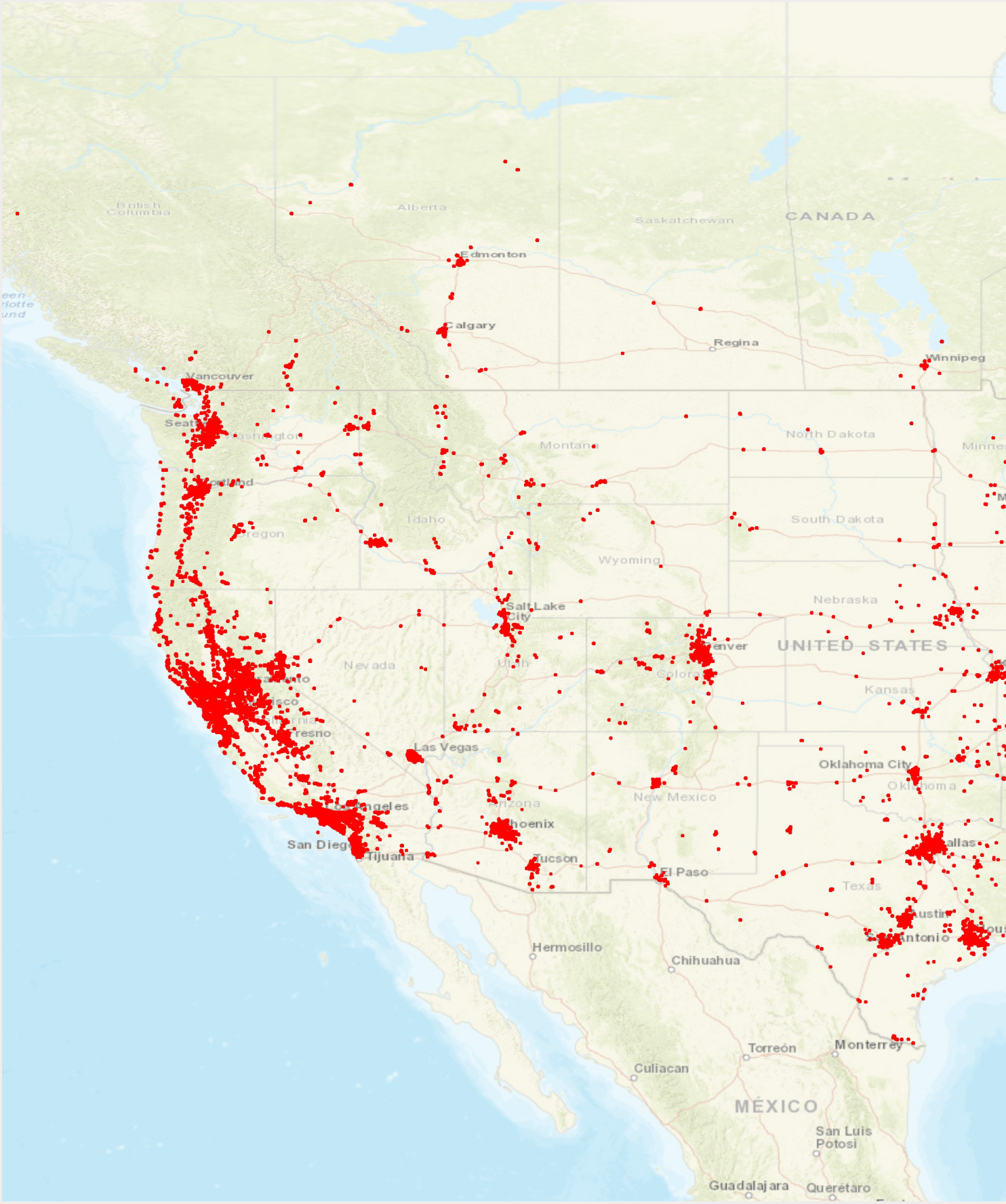


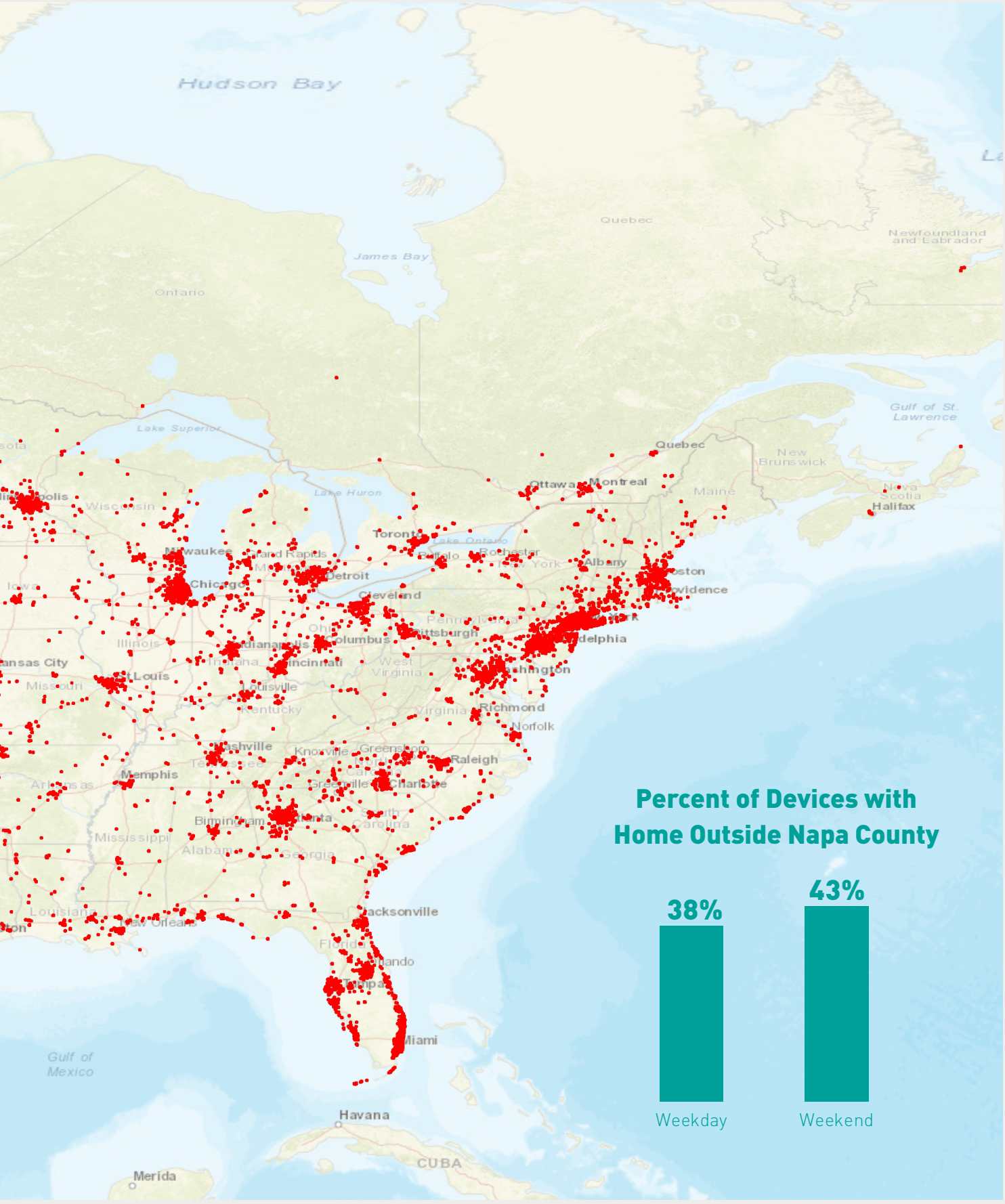
Where are Trips Entering Napa County Coming from in the Morning?

55% SOLANO
21% SONOMA
8% CONTRA COSTA
4% LAKE
3% SACRAMENTO
3% ALAMEDA
3% YOLO
1% SAN FRANCISCO
1% SAN MATEO
1% MARIN
0% SANTA CLARA



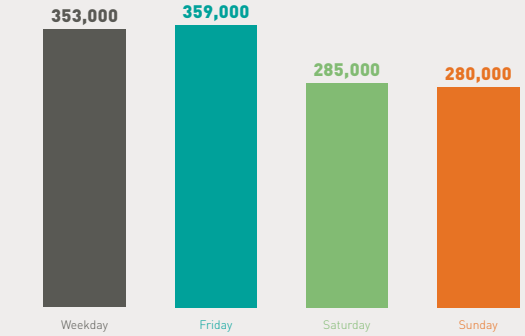
Infographic 2-2: Spring 2018 Visitor Analysis




Hudson Bay
James Bay
Quebec
Ontario
Lake Superior
Lake Huron
Gulf of St. Lawrence
Newfoundland and Labrador
New Brunswick
Maine
Nova Scotia
Halifax
Ottawa
Montreal
Toronto
Lake Ontario
Rochester
Albany
Boston
Providence
Detroit
Cleveland
Chicago
Milwaukee
Grand Rapids
Pittsburgh
Philadelphia
Columbus
Cincinnati
Indianapolis
Illinois
Missouri
St. Louis
Louisville
Kentucky
West Virginia
Virginia
Richmond
Norfolk
Washington
Nashville
Knoxville
Greensboro
Raleigh
Charlotte
Memphis
Arkansas
Mississippi
Alabama
Georgia
South Carolina
Birmingham
Atlanta
Louisiana
New Orleans
Jacksonville
Florida
Orlando
Tampa
Miami
Gulf of Mexico
Havana
CUBA
Merida
Percent of Devices with Home Outside Napa County
38%
43%
Weekday
Weekend

Infographic 2-3: Day of Week Variation

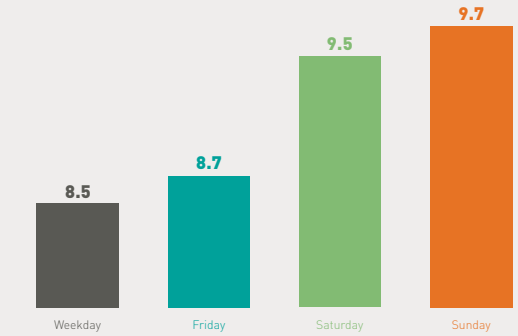
Day of Week Total Napa County Trip Variation



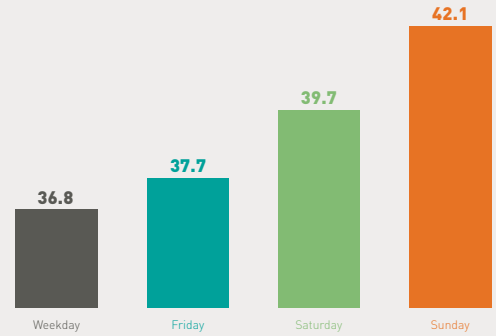
Work-Related Trips by Day of Week

22% WEEKDAY
19% FRIDAY
10% SATURDAY
10% SUNDAY

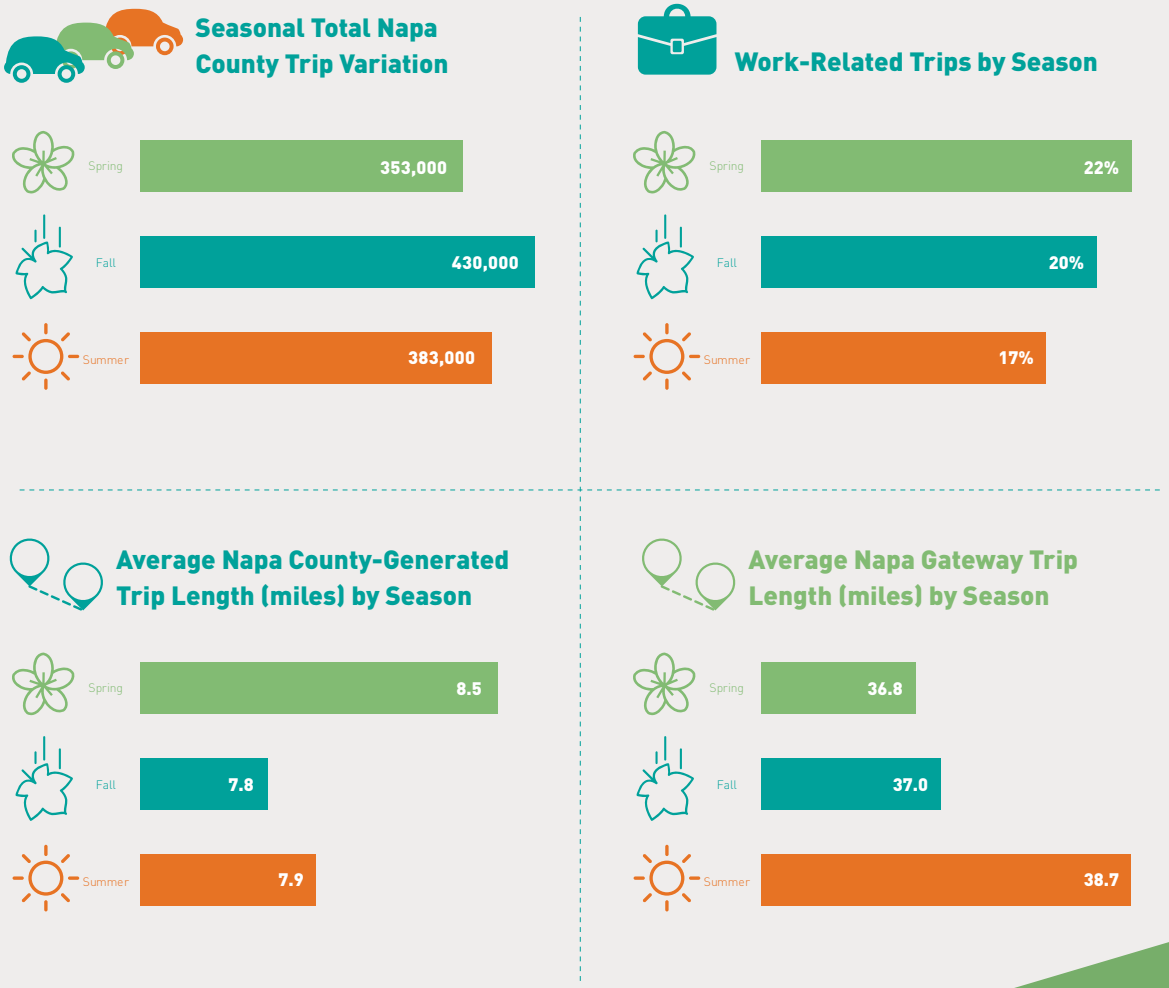
Average Napa County-Generated Trip Length (miles) by Day of Week



Average Napa Gateway Trip Length (miles) by Day of Week



Infographic 2-4: Seasonal Variation



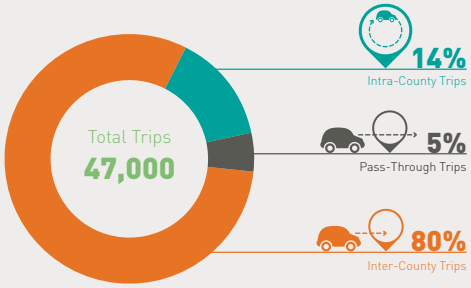
Infographic 2-5: County Gateway Analysis

SR 29 at Napa/Solano County Line

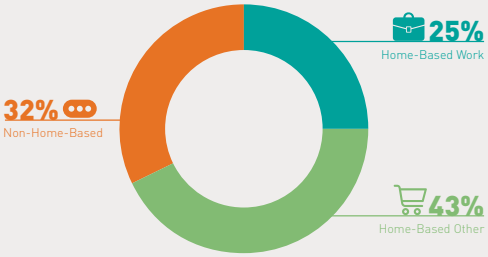
Where are Trips into Napa County Coming From?

68% SOLANO
11% SONOMA
8% CONTRA COSTA
5% ALAMEDA
4% SAN FRANCISCO
2% SAN MATEO
1% MARIN
0% LAKE
0% SACRAMENTO
0% SANTA CLARA
0% YOLO

What Types of Trips are Occuring at Napa County Gateways?



Average Weekday Trip Purpose



Infographic 2-5: County Gateway Analysis

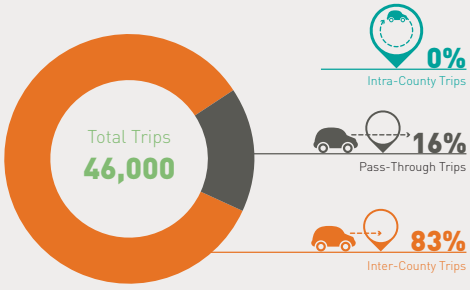
SR 12 at Napa/Solano County Line

Where are Trips into Napa County Coming From?

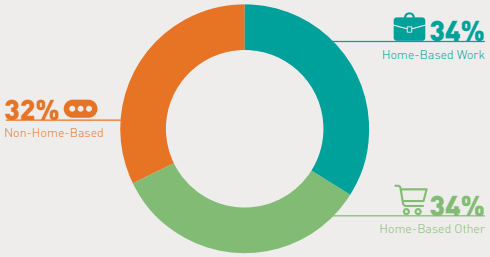
73% SOLANO
13% SONOMA
6% CONTRA COSTA
4% SACRAMENTO
2% YOLO
1% ALAMEDA
1% SANTA CLARA
0% LAKE
0% MARIN
0% SAN FRANCISCO
0% SAN MATEO

Average Trip Length
45 miles

What Types of Trips are Occuring at Napa County Gateways?



Average Weekday Trip Purpose



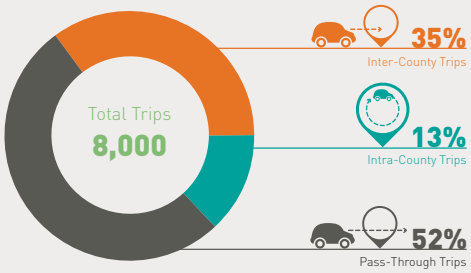
Infographic 2-5: County Gateway Analysis

SR 29 at Napa/Lake County Line

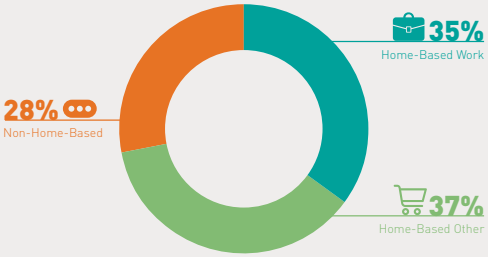
Where are Trips into Napa County Coming From?

50% LAKE
46% SONOMA
1% MARIN
1% SOLANO
1% SACRAMENTO
1% ALAMEDA
1% SAN FRANCISCO
0% YOLO
0% CONTRA COSTA
0% SAN MATEO
0% SANTA CLARA

What Types of Trips are Occuring at Napa County Gateways?



Average Weekday Trip Purpose



Infographic 2-5: County Gateway Analysis

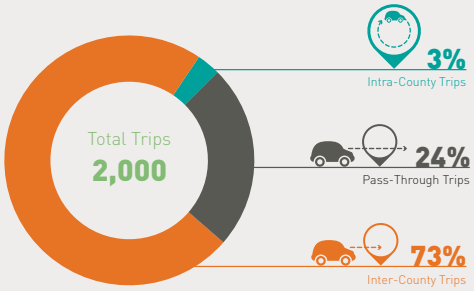
SR 128 at Napa/Sonoma County Line

Where are Trips into Napa County Coming From?

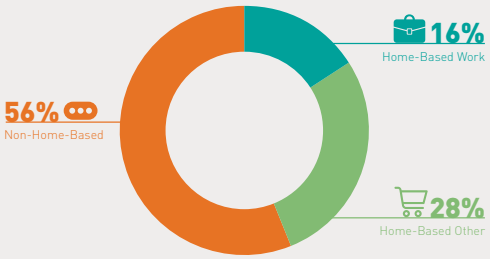
99% SONOMA

1% MARIN
0% LAKE
0% SOLANO
0% YOLO
0% SACRAMENTO
0% ALAMEDA
0% CONTRA COSTA
0% SAN FRANCISCO
0% SAN MATEO
0% SANTA CLARA

What Types of Trips are Occuring at Napa County Gateways?



Average Weekday Trip Purpose



Infographic 2-5: County Gateway Analysis

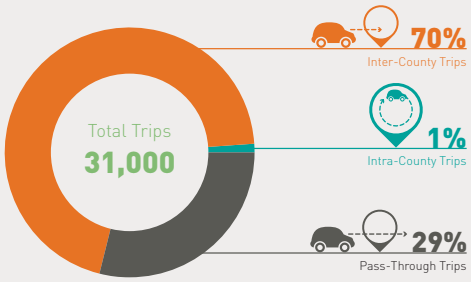
SR 12 at Napa/Sonoma County Line

Where are Trips into Napa County Coming From?

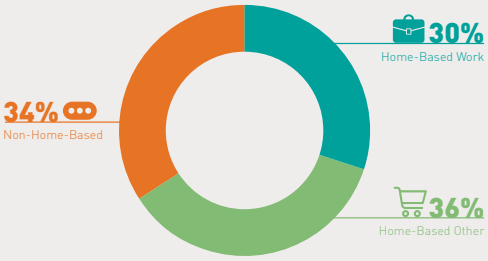
42% SOLANO
41% SONOMA
8% ALAMEDA
6% MARIN
2% SAN FRANCISCO
0% LAKE
0% YOLO
0% SACRAMENTO
0% CONTRA COSTA
0% SAN MATEO
0% SANTA CLARA

Average Trip Length
43 miles

What Types of Trips are Occuring at Napa County Gateways?



Average Weekday Trip Purpose



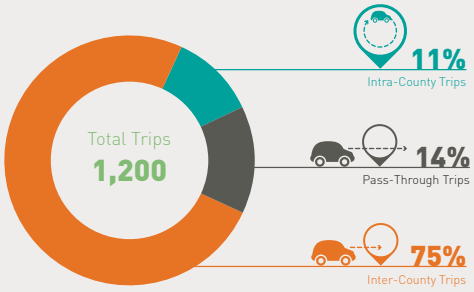
Infographic 2-5: County Gateway Analysis

SR 128 at Napa/Solano County Line

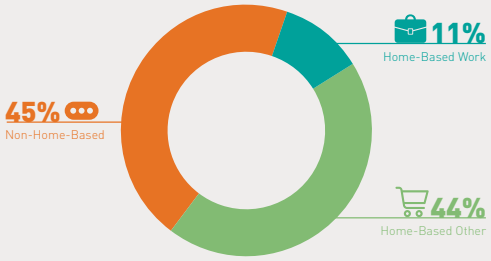
Where are Trips into Napa County Coming From?

44% SOLANO
26% YOLO
10% SONOMA
10% SACRAMENTO
10% ALAMEDA
0% LAKE
0% MARIN
0% CONTRA COSTA
0% SAN FRANCISCO
0% SAN MATEO
0% SANTA CLARA

What Types of Trips are Occuring at Napa County Gateways?



Average Weekday Trip Purpose



Infographic 2-5: County Gateway Analysis

Spring Mountain Road at Napa/Sonoma County Line

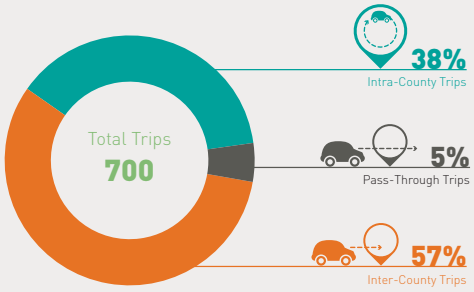
Where are Trips into Napa County Coming From?

50% SONOMA
50% SAN FRANCISCO

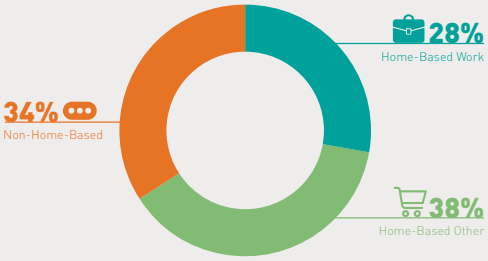
0% LAKE
0% MARIN
0% SOLANO
0% YOLO
0% SACRAMENTO
0% ALAMEDA
0% CONTRA COSTA
0% SAN MATEO
0% SANTA CLARA

Average Trip Length
22 miles

What Types of Trips are Occuring at Napa County Gateways?



Average Weekday Trip Purpose



3. STUDY METHODOLOGY

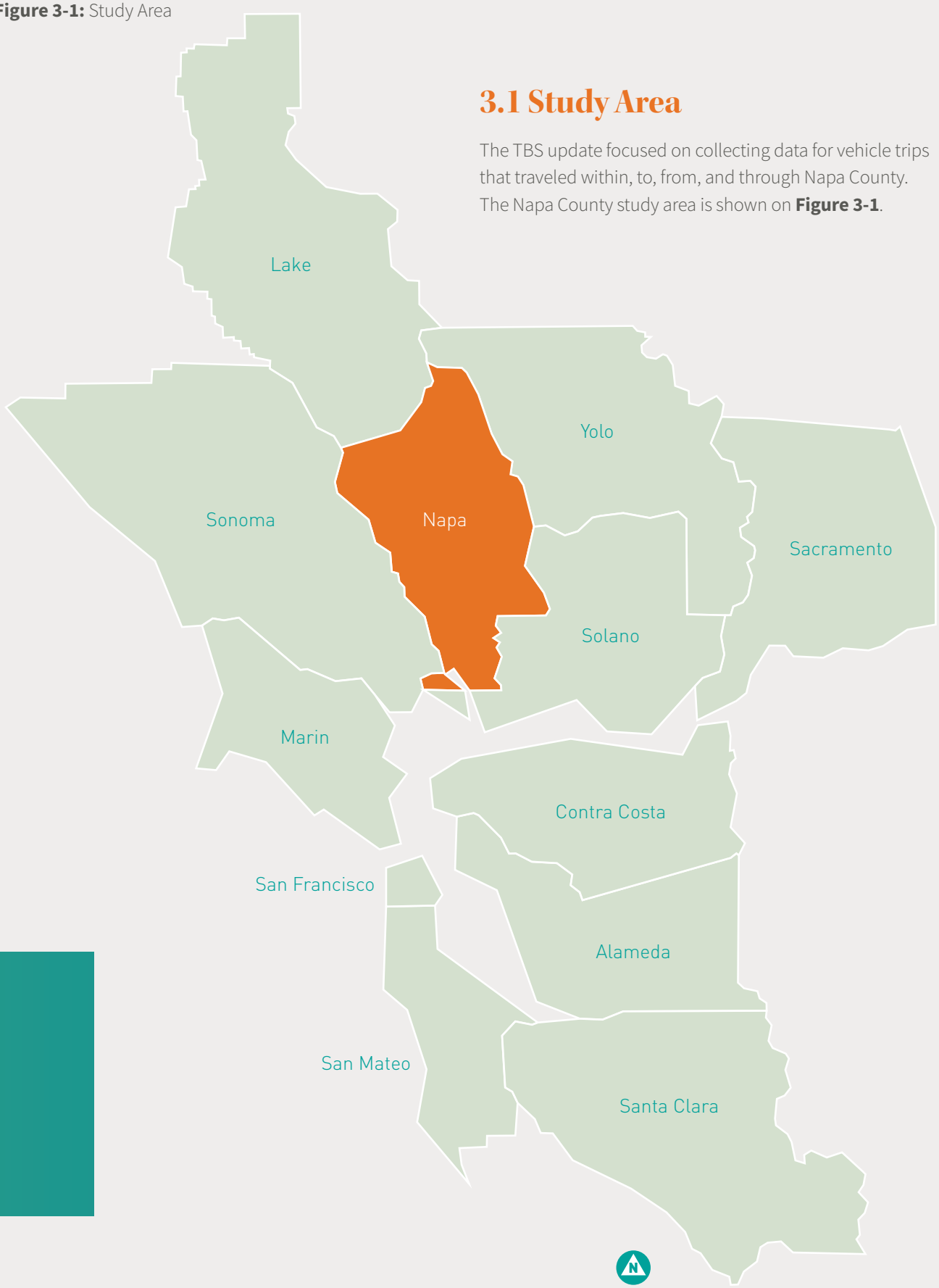
Fehr & Peers collected Napa County-specific data from a variety of sources to gain a robust understanding of travel behavior within Napa Valley. Data from the various sources were combined and analyzed to identify and quantify vehicle travel demands and the origin-destination and demographic characteristics of vehicle travelers within the county. The analysis is intended to provide NVTA and the public with an updated and more robust understanding of travel behavior in Napa Valley.


EAT
OPEN TILL 9:00 PM
OXBOW
PUBLIC
MARKET
OXBOW DISTRICT
ROADS
FRIES • SEAFOO
SALADS • SANDWICHES • BEER • WINE

Figure 3-1: Study Area

3.1 Study Area

The TBS update focused on collecting data for vehicle trips that traveled within, to, from, and through Napa County. The Napa County study area is shown on **Figure 3-1**.



3.2 Data Collection

Fehr & Peers collected and analyzed data from two primary data sources. Traffic count data was collected and analyzed to determine the absolute amount of vehicle travel at county gateways and select roadways within Napa County, and mobile device data was collected and analyzed to determine the origins and destinations of trips interacting with Napa County. Home and work information was also obtained from the mobile device data in order to obtain trip making and demographic characteristics.

3.2.1 Traffic Count Data

Traffic counts play a pivotal role in any TBS as they provide the total directional traffic volume by desired time period at the survey data locations that can be used as a control total to refine data collected via other methods.

For the TBS update, traffic count data was collected at the same 11 survey data locations where traffic counts were collected in 2013 for the previous TBS. Traffic count data was collected the first week of December 2018 (December 2-8) when school was in session. Traffic count data was originally scheduled to be collected in October 2018 but was delayed due to the Northern California fires and rainy weather throughout fall 2018. A more detailed traffic count data summary is provided in **Appendix A** along with the raw traffic count data sheets.

Traffic count data was collected for the following periods of the day:

- Early AM (12 AM to 6 AM)
- AM peak period (6 AM to 10 AM)
- Mid-Day (10 AM to 3 PM)
- PM peak period (3 PM to 7 PM)
- Late Night (7 PM to 12 AM)
- Daily 24-Hour

Traffic count data was collected for the following days of the week.

- Average Weekday (average of Tuesday, Wednesday, and Thursday)
- Friday (traffic count data collection period from previous NVTBS)
- Saturday
- Sunday

Friday traffic count data is presented in **Table 3-1** along with the percent change in total traffic when compared to traffic count data collection for the previous TBS in 2013.

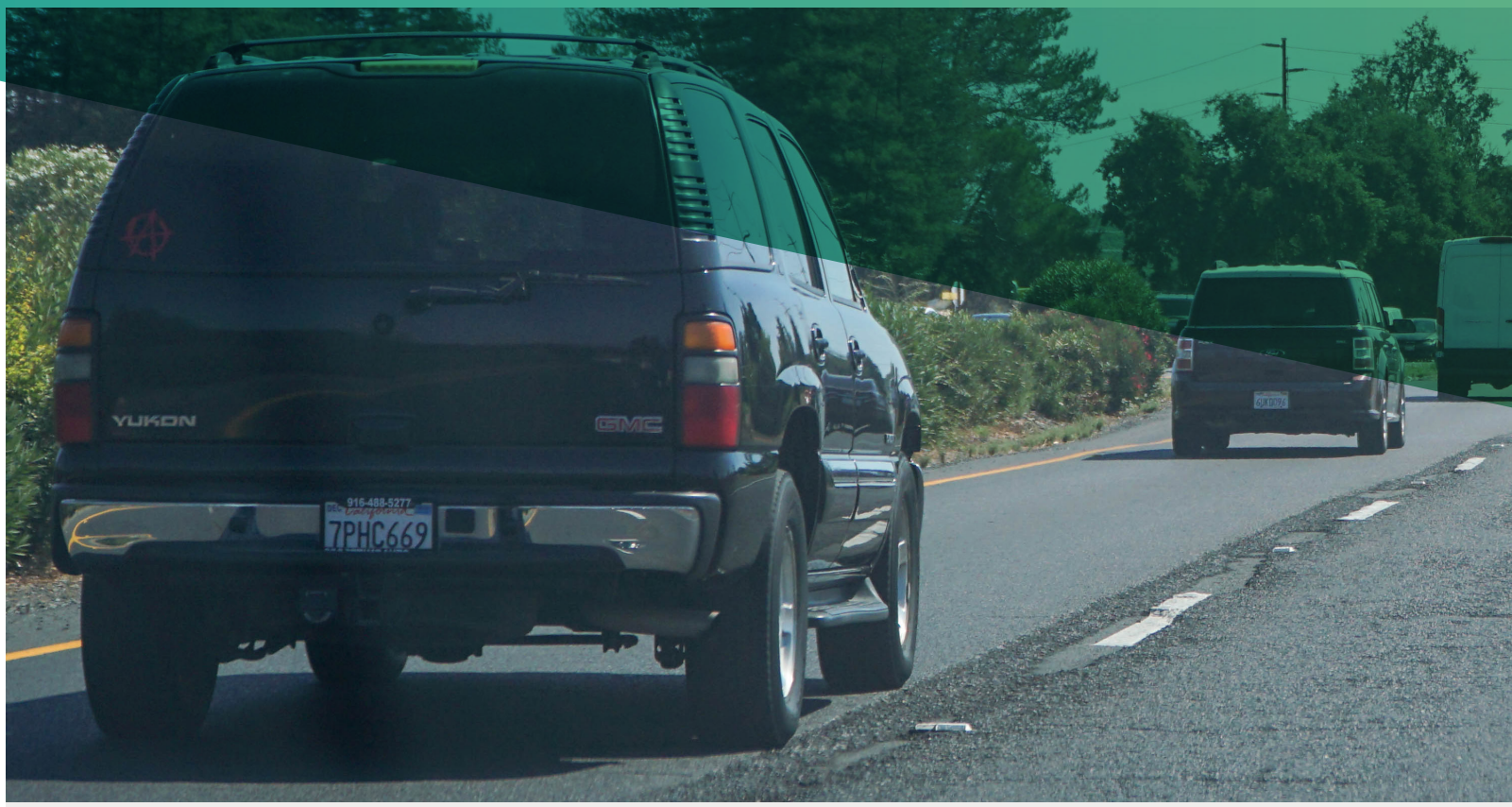
Table 3-1: Friday Traffic Count Data

Survey Data Location	Early AM	AM Peak	Mid-Day	PM Peak	Late Night	Daily	Change from 2013
SR 29 – North of American Canyon Rd	3,981	9,662	15,021	12,588	8,156	49,408	-6.6%
SR 12 - Napa/Solano County Line	1,948	6,357	13,731	10,388	5,848	38,272	21.0%
SR 29 – Southeast of Adams St in St. Helena	554	3,813	5,216	3,753	2,092	15,428	-3.0%
SR 29 – Southeast of SR 128 in Calistoga	428	3,281	3,976	3,605	1,396	12,686	-3.0%
SR 29 – Napa/Lake County Line	563	1,998	2,255	2,814	1,241	8,871	11.1%
SR 128 – Sonoma/Napa County Line	59	508	685	674	168	2,094	-3.2%
SR 121 – Sonoma/Napa County Line	1,814	8,910	10,082	9,390	3,679	33,875	12.2%
SR 128 - East of SR 121	40	331	333	560	72	1,336	19.0%
Spring Mountain Rd - Napa/Sonoma County Line	5	203	202	255	48	713	-7.0%
Howell Mountain Road - South of Cold Springs Road	135	1,308	1,708	1,553	678	5,382	4.3%
First St - West of SR 29	570	4,339	5,942	6,156	2,542	19,549	-4.4%
Total of All 11 Locations	**10,097**	**40,710**	**59,151**	**51,736**	**25,920**	**187,614**	**3.5%**
% of Total of All 11 Locations	**5%**	**22%**	**32%**	**28%**	**14%**	**100%**	

Source: Fehr & Peers

As shown in **Table 3-1**, Friday traffic counts collected in 2018 at 11 locations totaled roughly 188,000 vehicles and grew on average by 3.5%, or 0.7% per year, compared to Friday traffic counts collected in 2013 before the Jameson Canyon Road widening.

Additionally, Jameson Canyon Road grew by roughly 21%, SR 121 at the Sonoma/Napa county line grew by roughly 12%, and SR 29 North of American Canyon Road decreased by roughly 7%.



Weekday (average of Tuesday, Wednesday, and Thursday) traffic count data is presented in **Table 3-2**.

Table 3-2: Weekday Traffic Count Data

Survey Data Location	Early AM	AM Peak	Mid-Day	PM Peak	Late Night	Daily
SR 29 – North of American Canyon Rd	3,592	9,878	14,300	12,345	6,726	46,841
SR 12 - Napa/Solano County Line	3,825	11,203	13,770	11,781	5,990	46,569
SR 29 – Southeast of Adams St in St. Helena	553	3,766	5,074	3,590	1,214	14,197
SR 29 – Southeast of SR 128 in Calistoga	426	3,337	3,757	3,365	833	11,718
SR 29 – Napa/Lake County Line	579	2,208	2,079	2,506	781	8,153
SR 128 – Sonoma/Napa County Line	60	532	594	609	85	1,880
SR 121 – Sonoma/Napa County Line	1,879	9,043	8,707	8,440	2,460	30,529
SR 128 - East of SR 121	45	354	310	452	46	1,207
Spring Mountain Rd - Napa/Sonoma County Line	5	181	202	242	23	653
Howell Mountain Road - South of Cold Springs Road	155	1,356	1,468	1,395	494	4,868
First St - West of SR 29	571	4,327	5,551	6,026	2,231	18,706
Total of All 11 Locations	**11,690**	**46,185**	**55,812**	**50,751**	**20,883**	**185,321**
% of Total of All 11 Locations	**6%**	**25%**	**30%**	**27%**	**11%**	**100%**

Source: Fehr & Peers

As shown in **Table 3-2**, weekday traffic counts collected in 2018 at 11 locations totaled roughly 185,000 vehicles, 1.2% lower than Friday traffic counts collected in 2018.

Saturday traffic count data is presented in **Table 3-3**.

Table 3-3: Saturday Traffic Count Data

Survey Data Location	Early AM	AM Peak	Mid-Day	PM Peak	Late Night	Daily
SR 29 – North of American Canyon Rd	2,977	6,965	15,787	12,149	7,852	45,730
SR 12 - Napa/Solano County Line	1,459	4,721	13,834	9,829	4,565	34,408
SR 29 – Southeast of Adams St in St. Helena	461	2,136	4,359	3,694	2,410	13,060
SR 29 – Southeast of SR 128 in Calistoga	339	1,597	3,803	3,477	2,274	11,490
SR 29 – Napa/Lake County Line	389	1,242	2,274	2,104	1,334	7,343
SR 128 – Sonoma/Napa County Line	51	238	668	602	292	1,851
SR 121 – Sonoma/Napa County Line	1,013	4,229	9,343	7,387	3,675	25,647
SR 128 - East of SR 121	18	127	357	298	68	868
Spring Mountain Rd - Napa/Sonoma County Line	5	62	189	164	36	456
Howell Mountain Road - South of Cold Springs Road	138	630	1,387	1,108	756	4,019
First St - West of SR 29	539	2,365	5,908	4,364	2,443	15,619
Total of All 11 Locations	**7,389**	**24,312**	**57,909**	**45,176**	**25,705**	**160,491**
% of Total of All 11 Locations	**5%**	**15%**	**36%**	**28%**	**16%**	**100%**

Source: Fehr & Peers

As shown in **Table 3-3**, Saturday traffic counts collected in 2018 at 11 locations totaled roughly 160,000 vehicles, 13.4% lower than weekday traffic counts collected in 2018.

Sunday traffic count data is presented in **Table 3-4**.

Table 3-4: Sunday Traffic Count Data

Survey Data Location	Early AM	AM Peak	Mid-Day	PM Peak	Late Night	Daily
SR 29 – North of American Canyon Rd	2,977	6,965	15,787	12,149	7,852	45,730
SR 12 - Napa/Solano County Line	1,459	4,721	13,834	9,829	4,565	34,408
SR 29 – Southeast of Adams St in St. Helena	461	2,136	4,359	3,694	2,410	13,060
SR 29 – Southeast of SR 128 in Calistoga	339	1,597	3,803	3,477	2,274	11,490
SR 29 – Napa/Lake County Line	389	1,242	2,274	2,104	1,334	7,343
SR 128 – Sonoma/Napa County Line	51	238	668	602	292	1,851
SR 121 – Sonoma/Napa County Line	1,013	4,229	9,343	7,387	3,675	25,647
SR 128 - East of SR 121	18	127	357	298	68	868
Spring Mountain Rd - Napa/Sonoma County Line	5	62	189	164	36	456
Howell Mountain Road - South of Cold Springs Road	138	630	1,387	1,108	756	4,019
First St - West of SR 29	539	2,365	5,908	4,364	2,443	15,619
Total of All 11 Locations	**7,389**	**24,312**	**57,909**	**45,176**	**25,705**	**160,491**
% of Total of All 11 Locations	**5%**	**15%**	**36%**	**28%**	**16%**	**100%**

Source: Fehr & Peers

As shown in **Table 3-4**, Sunday traffic counts collected in 2018 at 11 locations totaled roughly 153,000 vehicles, 17.4% lower than weekday traffic counts collected in 2018.lower than weekday traffic counts collected in 2018.

3.2.2 Mobile Device Data

For the previous TBS in 2013, Fehr & Peers evaluated two mobile device data providers:

Airsage cellular-based data was determined to lack the necessary spatial resolution which was exacerbated by Napa Valley's topography. The data had the benefit of a very large, relatively unbiased sample size but had a spatial resolution of around two kilometers, which was insufficient for the level of analysis conducted.

The second data source evaluated and ultimately selected was StreetLight Data GPS-based data which had a spatial resolution of around ten meters but provided data for a smaller sample of the population (one to two percent of vehicle trips), was generally limited to vehicular sources of travel, and had inherent biases towards higher income persons. This data source was selected largely because of the previous study's focus on inter-county automobile travel and desire for better spatial resolution. The sample size issues were then addressed through the collection of multiple months of data and the income biases were noted in the report.

Since the previous TBS, StreetLight Data partnered with a new data provider Cuebiq, a next generation location intelligence company, and as a result of this partnership StreetLight Data's total device sample size increased to more than 60 million devices, representing roughly 15 to 20 percent of the adult US population. Cuebiq's data is generated by mobile applications that use Location-Based Services (LBS) and is best suited for measuring people's activities over a given period of time, including times when their device is at rest, which complements the GPS-based data that only measures when a device is in motion.

LBS data allows StreetLight Data to ascertain complex activity-based metrics such as classifying devices into residents, workers, and visitors to a geographic area and the determination of each device's home and work location as well as the purpose of their trips. This is made possible by the ability to geographically tag the devices to land use or places in addition to roadway segments. The spatial resolution and geographic tagging makes the data not only suitable for understanding users of a specific roadway segments but for capturing zone to zone travel patterns, trip purposes, home and work locations, and census information associated with home location. For the TBS update, **Fehr & Peers utilized StreetLight Data's new Cuebiq-based data** to quantify both inter- and intra-Napa Valley travel as it afforded a greatly increased sample size and similar spatial resolution with greatly reduced biases towards vehicle trips and higher income persons.

3.2.2.1 Zone System

Origin-destination data purchased from StreetLight Data was tagged to a geographic layer of 201 zones shown on **Figure 3-2**. The zone system was coordinated with the TAZ system from the Napa Travel Model for comparison and future/alternative forecasting purposes and was designed to capture all trips that interact within Napa County.

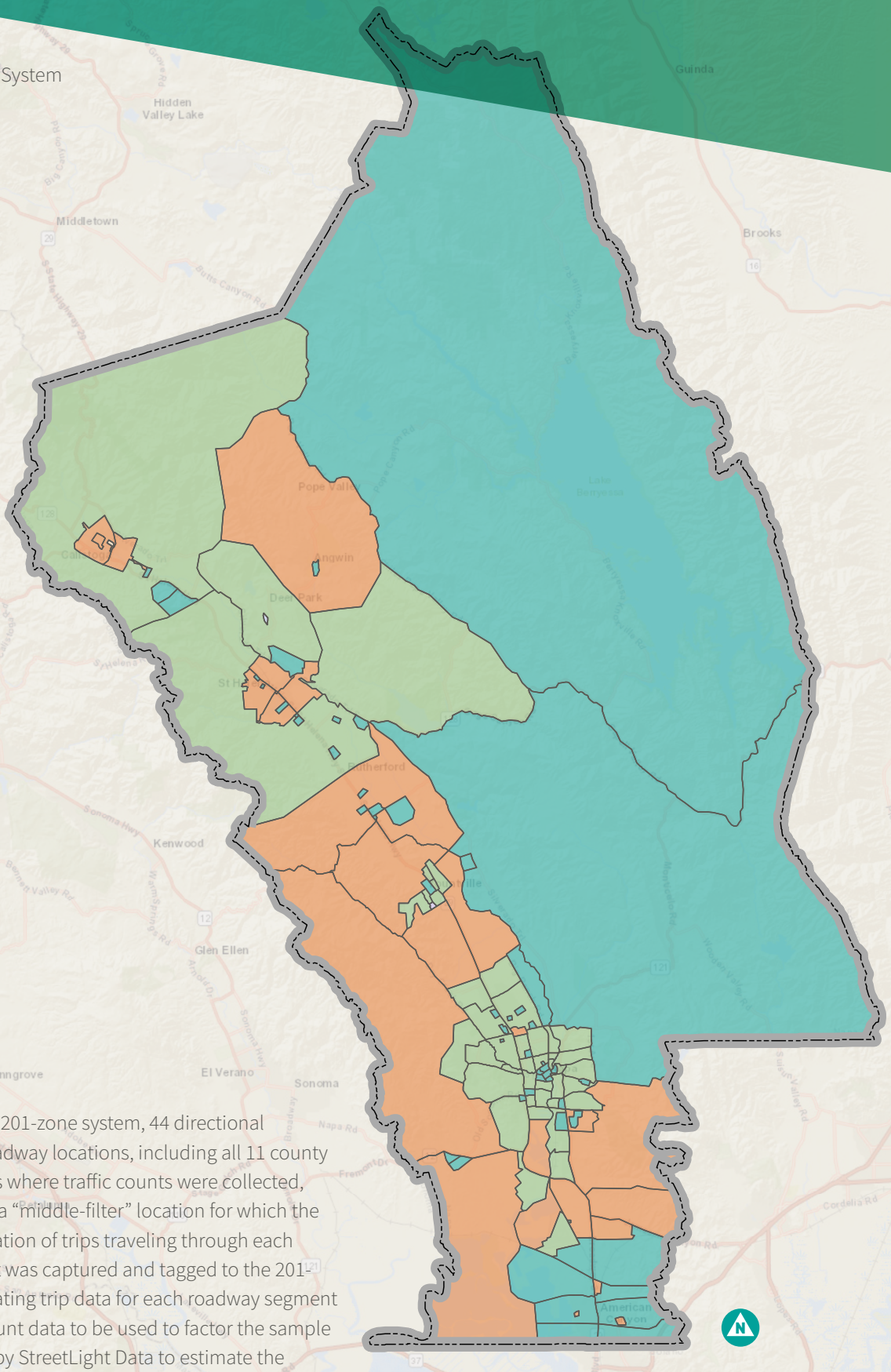
The zone system includes zones covering the entirety of the 11 counties list below.

- San Francisco
- San Mateo
- Santa Clara
- Alameda
- Contra Costa
- Solano
- Sacramento
- Yolo
- Lake
- Sonoma
- Marin

The zone system includes 128 zones within Napa County. The number of zones included for specific areas of Napa County are listed below.

- American Canyon – 11 zones
- City of Napa – 53 zones
- Yountville – 7 zones
- Saint Helena – 8 zones
- Calistoga – 5 zones
- Angwin – 2 zones
- Unincorporated Areas – 42 zones (includes individual zones for 19 specific wineries)

Figure 3-2: Zone System



In addition to the 201-zone system, 44 directional "middle-filter" roadway locations, including all 11 county gateway locations where traffic counts were collected, were included as a "middle-filter" location for which the origin and destination of trips traveling through each roadway segment was captured and tagged to the 201-zone system. Isolating trip data for each roadway segment allowed traffic count data to be used to factor the sample of trips provided by StreetLight Data to estimate the absolute demand for each origin-destination pair. The 44 directional "middle-filter" roadway locations are shown on **Figure 3-3**.

Figure 3-3: Middle Filter Roadway Locations

The final 201-zone system and 44 "middle-filter" roadway locations were provided to StreetLight Data. StreetLight Data tagged "origin-destination points" to the geographic layers and provided origin destination trip tables based on mobile devices that provide the number of device trips for each zone-to-zone origin-destination pair for all trip purposes that occur within the study area, including visitor and pass-through trips.

Trip tables were generated that indexed the number of trips between each zone that traveled through each "middle-filter" roadway location. A separate trip table was provided for each "middle-filter" zone, effectively providing three points of travel for each origin-destination zone pair (the origin location, the roadway segment the device trip traveled through, and the destination location). The data was provided in a format nearly identical to that produced by a travel demand model which will allow for comparison and refinement with the Napa Travel Model.

3.2.2.2 Data Periods

For the TBS update, StreetLight Data's Cuebiq-based LBS data was purchased for the following three data periods.

- Spring 2018 (March to May 2018) - the primary study period selected for the TBS update, representing three months in 2018 when school was in session. All-day data for an average weekday (Tuesday to Thursday) during this three-month period served as the focus of the travel behavior study update and the time period for which data from other months, days of the week, and times of day was compared to illustrate temporal differences in travel behavior in Napa County. This also ensured the data was consistent with the Napa Travel Model outputs as travel demand models are typically developed to forecast an average day when school is in session from a specified year.
- Fall 2018 (August to November 2018) – a secondary study period selected for the TBS update to understand seasonal differences in travel behavior in Napa County.
- Summer 2018 (June to August 2018) – a secondary study period selected for the TBS update to understand seasonal differences in travel behavior in Napa County.

3.2.2.3 Data Products

Fehr & Peers carefully reviewed the Scope of Work and conclusions NVTA wished to draw for the TBS update and purchased from StreetLight Data the following three Cuebiq-based LBS data products, which provide a very large sample of true origin-destination data passively and anonymously:

- Cuebiq-based origin and destination data for each of the 201 zones
- Cuebiq-based home and work place distribution for each of the 201 zones
- Cuebiq-based origin and destination "middle-filter" data for each of the 44 roadway locations

The data was stratified as described below, consistent with the traffic count data collection described in **Section 3.2.1.**

- Day Type – average weekday (Tuesday to Thursday), Friday, Saturday, and Sunday
- Day Part - Early AM, AM Peak Period (6 AM to 10 AM), Mid-Day, PM peak period (3 PM to 7 PM), Late-Night, and Daily 24-Hour

Premium trip and traveler metrics were also obtained for the Cuebiq-based data, providing trip length, trip time, trip purpose, and demographic data based on 2010 American Community Survey (ACS) data.

3.2.2.4 Data Sample Size

The data purchased from StreetLight Data, which was analyzed to provide the travel patterns and travel characteristics discussed in Chapter 4 and Chapter 5, respectively, included **over 25 million data samples and 736,000 mobile devices.** The previous TBS study findings were based on 200,000 data samples.

3.2.2.5 Data Scaling

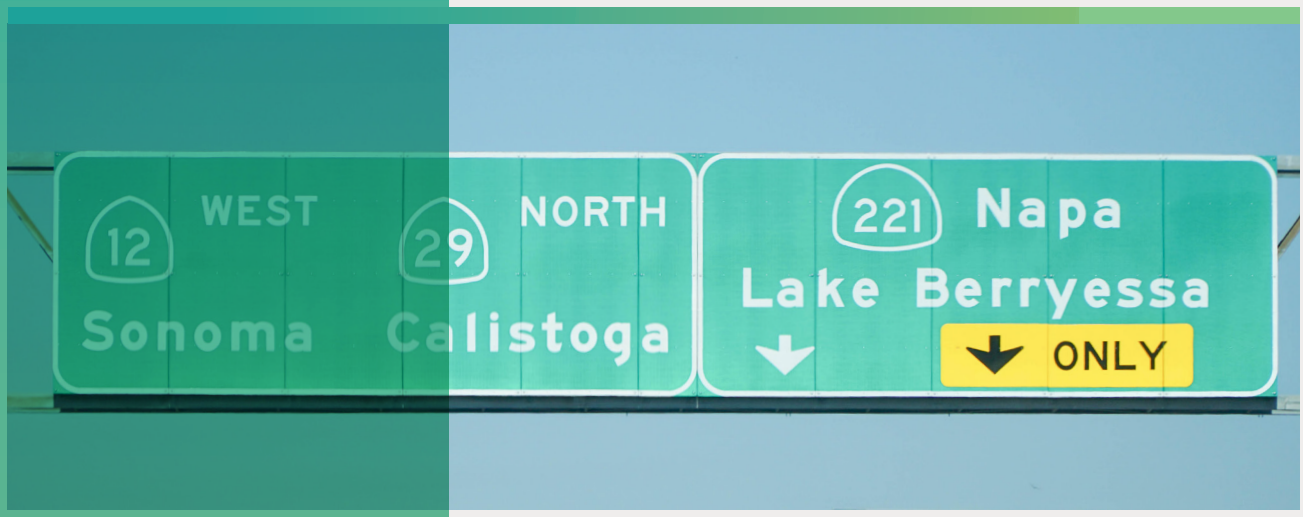
Due to privacy concerns and sample rates, the indexed trip values in the origin-destination trip tables provided by StreetLight Data represent "relative" rather than "absolute" trips. In other words, the tables do not provide the total number of trips that occur on a daily basis but provide the relative relationship of trips from each zone to every other zone in the geographic layer. Therefore, the mobile device data origin-destination trip tables are used as a starting point due to their large sample size and high level of confidence in the origin-destination data and refined using traffic count data to factor the relative trip data to represent a single period of absolute data.

Fehr & Peers analyzed the mobile device data and utilized the traffic count data obtained for the same data periods as the mobile device data to scale "relative" travel patterns to an "absolute" measure of trips.

3.2.2.6 Data Limitations

Limitations of mobile device data are largely due to federal regulations over privacy concerns, sampling rates, and the reliance on computer algorithms, which lead to potential biases in the data. A detailed discussion of mobile device data limitations and potential biases is provided in **Appendix B**.

4. TRAVEL PATTERNS



This chapter presents a summary of the TBS travel pattern findings. The findings are organized by key questions the study sought to reach conclusions regarding. Findings are first presented for the primary study period (spring 2018) followed by comparisons to data collected for the two additional study periods (fall 2018 and summer 2018) to illustrate seasonal differences in travel behavior in Napa County. Weekday AM and PM peak period, Friday, and Weekend data is also presented. Detailed data for all data periods, day types, and day parts is provided in **Appendix C**.

As discussed in Chapter 3, Cuebiq-based origin and destination data was analyzed and scaled using the traffic count data presented in Section 3.2.1 to determine the travel patterns of trips to, from, within, and passing through Napa County. The following tables and figures summarize the travel pattern findings. Detailed data for all 201 zones and 44 “middle-filter” roadway locations is in **Appendix C**.

4.1 Primary Study Period

The primary study period selected for the travel behavior study update was March 2018 through May 2018, representing three spring months in 2018 when school was in session. All-day data for an average weekday (Tuesday to Thursday) during this three-month period served as the focus of the travel behavior study update and the time period for which data from other months, days of the week, and times of day were compared to illustrate temporal differences in travel behavior in Napa County.

4.1.1 Weekday All-Day Conditions

The following section presents key study findings from an analysis of all-day data collected for an average weekday (Tuesday to Thursday) in spring 2018.

What types of trips are occurring within Napa County?

Table 4-1 provides a summary of total daily trips that interact with Napa County, stratified by the following four trip types.

- Intra-Napa County Trips - trips that start and end in Napa County
- Trips into Napa County – trips that start outside Napa County and end in Napa County
- Trips out of Napa County – trips that start in Napa County and end outside Napa County
- Napa County Pass-Through Trips – trips that do not start or end in Napa County but travel through Napa County gateways

Table 4-1: Weekday All-Day Trip Types

Trip Type	Trips	Previous TBS Trips	Percent	Previous TBS Percentage
Intra-Napa County Trips	238,000	238,000	67%	68%
Trips into Napa County	52,000	48,000	15%	14%
Trips out of Napa County	51,000	47,000	15%	14%
Napa County Pass-Through Trips	12,000	12,000	3.4%	3.3%
Total Trips Interacting with Napa County	**353,000**	**345,000**	**100%**	**100%**

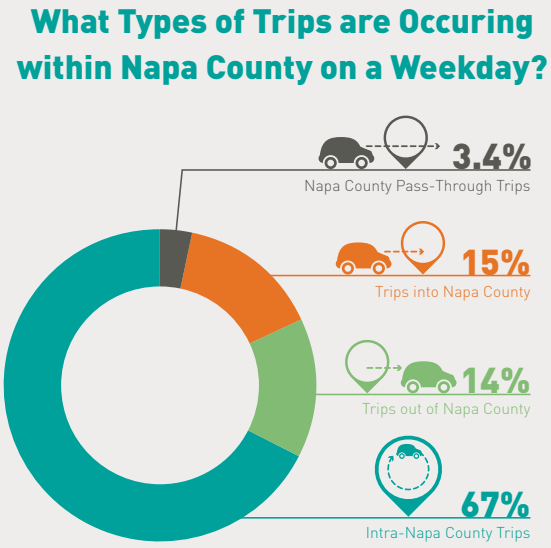
Source: Fehr & Peers

As shown in **Table 4-1**, on an average weekday in spring 2018 roughly **353,000 vehicle trips interacted with Napa County**. Additionally, approximately 238,000 (67 percent) vehicle trips started and ended within Napa County while 115,000 (33 percent) vehicle trips started or ended outside Napa County.

Table 4-1 also indicates that **roughly 12,000 vehicle trips passed through Napa County without stopping**, representing 3.4 percent of total trips interacting with Napa County and 10.3 percent of trips at Napa County gateways (inter-Napa County trips).

Weekday all-day trip type findings were generally consistent with the previous TBS, with **total trips interacting with Napa County increasing by 2.3 percent or 0.5 percent per year**.

The chart below illustrate the types of trips occurring within Napa County on a weekday in spring 2018.



What types of inter-county trips are occurring at Napa County gateways?

Table 4-2 provides a summary of total daily trips that travel through Napa County gateways, stratified by trips into Napa County, trips out of Napa County, and Napa County pass-through trips.

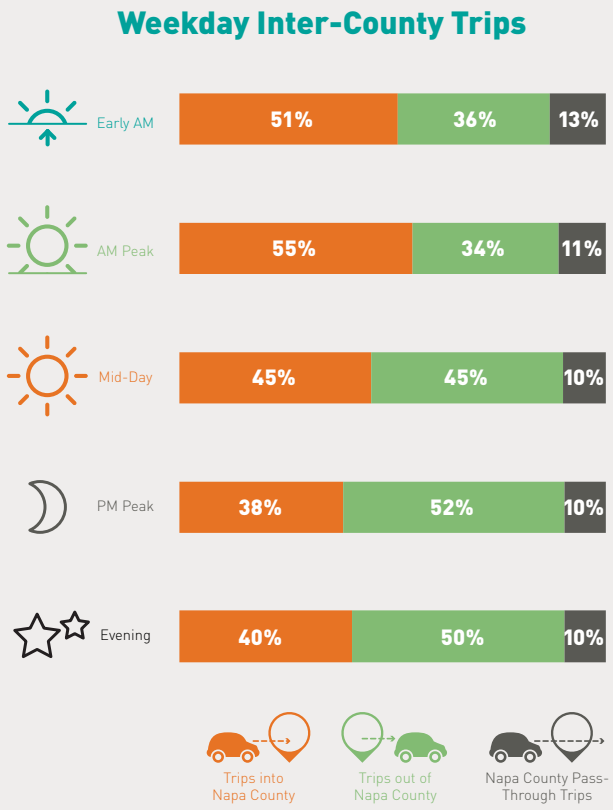
Table 4-2: Weekday All-Day Gateway Trip Types

Napa County Gateway	Total Trips	Napa County Pass-Through Trips	Trips into Napa County	Trips out of Napa County
SR 29 at Napa/Solano County Line - Northbound	23,000	4%	82%	1%
SR 29 at Napa/Solano County Line - Southbound	24,000	6%	2%	76%
SR 12 at Napa/Solano County Line - Westbound	24,000	16%	83%	0%
SR 12 at Napa/Solano County Line - Eastbound	22,000	16%	0%	84%
SR 29 at Napa/Lake County Line - Southbound	4,000	56%	27%	6%
SR 29 at Napa/Lake County Line - Northbound	4,000	48%	10%	27%
SR 128 at Napa/Sonoma County Line - Eastbound	1,000	22%	76%	0%
SR 128 at Napa/Sonoma County Line - Westbound	1,000	26%	0%	70%
SR 12 at Napa/Sonoma County Line - Westbound	16,000	29%	0%	70%
SR 12 at Napa/Sonoma County Line - Eastbound	15,000	29%	70%	0%
SR 128 at Napa/Solano County Line - Westbound	600	17%	69%	6%
SR 128 at Napa/Solano County Line - Eastbound	600	11%	6%	69%
SMR at Napa/Sonoma County Line - Westbound	400	3%	3%	60%
SMR at Napa/Sonoma County Line - Eastbound	300	7%	50%	0%
All Napa County Gateway Trips	**124,000**	**10%**	**42%**	**41%**

Source: Fehr & Peers

As shown in **Table 4-2**, on an average weekday in spring 2018 roughly **124,000 vehicle trips interacted with Napa County gateways**. Of those, 10 percent were passing through Napa County, 42 percent were traveling into Napa County, and 41 percent were traveling out of Napa County. The remaining 7 percent of trips were intra-Napa County trips resulting from the placement of traffic count and middle filter locations not directly on the Napa County Line for logistical reasons.

The chart to the right illustrates the types of inter-county trips occurring at Napa County gateways on a weekday in spring 2018.



Where are trips starting and ending within Napa County?

Table 4-3 provides a summary of trip destinations within Napa County for the top five generators of inbound trips to Napa County.

Table 4-3: Weekday All-Day Top Five Generators of Inbound Trips

Destination	Vallejo		Fairfield		Santa Rosa Area		Vacaville		City of Sonoma	
	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent
Calistoga	6,600	2%	35	0%	149	3%	9	0%	4	0%
Angwin	3,600	1%	0	0%	7	0%	0	0%	4	0%
Saint Helena	11,900	4%	207	3%	189	4%	126	4%	66	3%
Yountville	5,400	2%	75	1%	26	1%	107	3%	105	5%
Napa	186,500	64%	4,384	59%	3,131	60%	2,005	59%	1,290	67%
American Canyon	33,400	12%	1,449	20%	326	6%	412	12%	154	8%
Unincorpo-rated	43,000	15%	1,271	17%	1,350	26%	762	22%	303	16%
Total	**290,300**		**7,421**		**5,178**		**3,420**		**1,925**	

Source: Fehr & Peers

As shown in **Table 4-3**, the **City of Vallejo is the largest generator of inbound trips to Napa County**, generating over 13,000 daily vehicle trips. Additionally, 49 percent of those trips have a destination in American Canyon and 39 percent have a destination in the City of Napa.

Where are trips starting and ending within Napa County?

Table 4-4 provides a summary of total trips starting and ending within each Napa County incorporated area. Bold indicates the high origin/destination city.

Table 4-4: Weekday All-Day Origins and Destinations by City

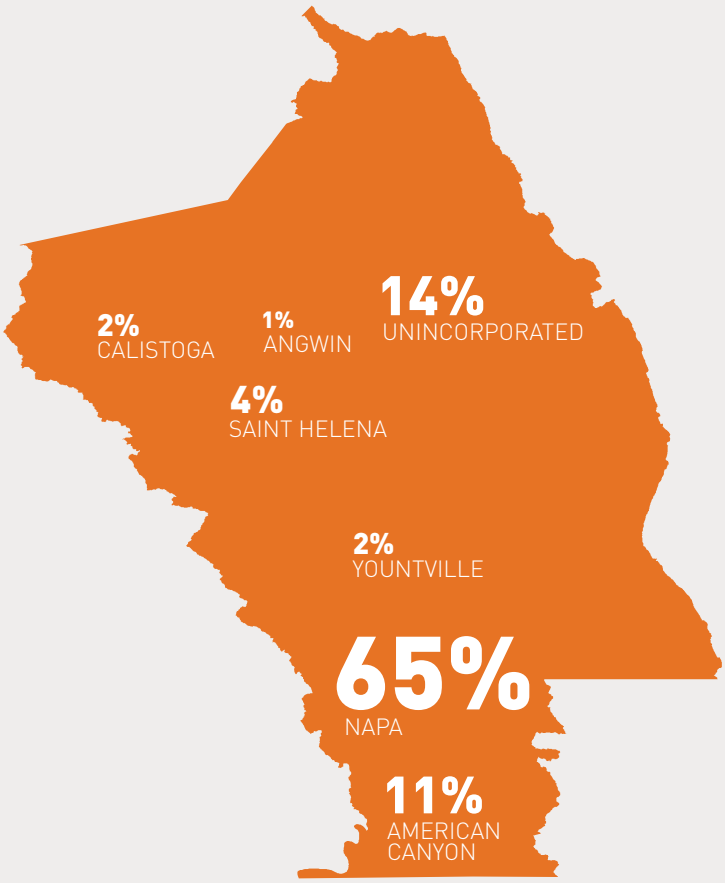
Trip Origins		City	Trip Destinations	
Trips	Percent		Trips	Percent
6,600	2%	Calistoga	6,600	2%
3,600	1%	Angwin	3,600	1%
11,800	4%	Saint Helena	11,900	4%
5,200	2%	Yountville	5,400	2%
187,600	**65%**	**Napa**	**186,500**	**64%**
33,100	11%	American Canyon	33,400	12%
41,000	14%	Unincorporated	43,000	15%
289,100	**100%**	**Total**	**290,300**	**100%**

Source: Fehr & Peers

As shown in **Table 4-4, roughly 65 percent of Napa County vehicle trips start or end within the City of Napa** while **roughly 15 percent of vehicle trips start or end within unincorporated areas.**

The chart below illustrates the percent of weekday trips generated by each jurisdiction on a weekday in spring 2018.

Percent of Weekday Trips by Jurisdiction



What do origin-destination patterns look like within Napa County?

Table 4-5 provides a summary of city-to-city origin-destination pairs for vehicle trips interacting with Napa County. Bold indicates the highest origin-destination city-to-city pair.

Table 4-5: Weekday All-Day City-to-City Origin-Destination Pairs

	Calistoga	Angwin	Saint Helena	Yountville	Napa	American Canyon	Unincor-porated	Gateway
Calistoga	3,501	67	590	26	273	59	1,351	688
Angwin	63	2,264	578	6	203	8	380	148
Saint Helena	551	533	4,508	226	1,589	81	2,771	1,588
Yountville	39	6	248	1,455	1,833	120	952	584
Napa	328	230	1,548	1,859	**138,998**	3,717	13,838	27,128
American Canyon	96	8	63	130	3,554	15,871	1,227	12,159
Unincorporated	1,357	332	2,763	867	12,758	1,558	12,646	8,752
Gateway	671	114	1,553	827	27,301	12,016	9,824	11,890

Source: Fehr & Peers

As shown in **Table 4-5**, roughly **139,000 (39 percent of total Napa County trips) vehicle trips start and end within the City of Napa on an average weekday.**

What are the largest trip generators in Napa County?

Table 4-6 provides a list of selected trip generators within Napa County for which trip generation was estimated using Cuebiq-based origin and destination data scaled based on traffic count data. The estimated number of average weekday trips are provided along with the corresponding percentage of total countywide trips. Estimated trip generation data for all 128 Napa County zones are provided in **Appendix C**.

Table 4-6: Weekday All-Day Largest Trip Generators

#	Selected Trip Generator	Trips	Percent
1	Napa Bel Aire Plaza	23,300	7%
2	South Napa Market Place	16,900	5%
3	Downtown Napa	16,100	5%
4	Napa Junction Center (American Canyon)	11,600	3%
5	Napa Valley College	7,000	2%
6	Napa Queen Medical	5,000	1%
7	Napa Oxbow	3,800	1%
8	Napa Department of State Hospitals	3,600	1%
9	Napa County Services	2,300	<1%
10	Saint Helena Hospital	2,000	<1%
11	Angwin Pacific Union College	1,600	<1%
12	Yountville VA Hospital	1,100	<1%
13	Napa County Airport	900	<1%
14	Napa County Airport	900	<1%

Source: Fehr & Peers

As shown in **Table 4-5**, the five largest trip generators within Napa County were Downtown Napa, the Napa Bel Aire Plaza, South Napa Market Place, Napa Junction Center (American Canyon), and Napa Valley College. **Together they account for roughly 77,000 or 25 percent of daily vehicle trips generated within Napa County.** The data also indicates that Napa Bel Aire Plaza generates almost as many daily trips as Downtown Napa.

Where are the origins of the largest trip generators?

Table 4-7 provides a summary of the origins of Napa County's largest weekday trip generators in spring 2018. Green shading indicates the highest trip origin percentages.

Table 4-7: Weekday All-Day Origin of Trips to Largest Trip Generators

Jurisdiction	Napa Junction Center (American Canyon)	South Napa Market Place	Oxbow	Napa Bel Aire Plaza
City of Sonoma	1%	2%	1%	1%
Vallejo	45%	3%	1%	3%
Fairfield	3%	2%	2%	2%
City of Napa	8%	72%	67%	76%
American Canyon	28%	3%	1%	1%
Unincorporated Napa County	4%	8%	11%	6%
Total Trips	**11,600**	**16,900**	**3,800**	**23,300**

Source: Fehr & Peers

Weekday All-Day Largest Trip Generators

(Percent of Countywide Trips)

7% NAPA BEL AIRE PLAZA

5% SOUTH NAPA MARKET PLACE

3% NAPA JUNCTION CENTER

1% NAPA OXBOW

Below is a summary of key takeaways from **Table 4-6.**

Napa Junction Center (American Canyon)

The Napa Junction Center (American Canyon) generates roughly 11,600 daily weekday trips, which represents 3 percent of total Napa County trips. Roughly, 60 percent of Napa Junction Center trips are coming from outside Napa County with 45 percent coming from the City of Vallejo. Of the 40 percent coming from within Napa County, 31 percent come from American Canyon and 8 percent come from the City of Napa.

Oxbow

Oxbow generates roughly 3,800 daily weekday trips, which represents 1 percent of total Napa County trips. Roughly, 19 percent of Oxbow trips are coming from outside Napa County with 2 percent coming from the City of Vallejo. Of the 81 percent coming from within Napa County, 1 percent come from American Canyon and 67 percent come from the City of Napa.

South Napa Market Place

The South Napa Market Place generates roughly 16,900 daily weekday trips, which represents 5 percent of total Napa County trips. Roughly, 17 percent of South Napa Market Place trips are coming from outside Napa County with 4 percent coming from the City of Vallejo. Of the 83 percent coming from within Napa County, 4 percent come from American Canyon and 85 percent come from the City of Napa.

Napa Bel Aire Plaza

Napa Bel Aire Plaza generates roughly 23,300 daily weekday trips, which represents 7 percent of total Napa County trips. Roughly, 16 percent of Napa Bel Aire Plaza trips are coming from outside Napa County with 3 percent coming from the City of Vallejo. Of the 84 percent coming from within Napa County, 1 percent come from American Canyon and 76 percent come from the City of Napa.

Where are the trips in Napa County going to and coming from?

Table 4-8 provides a summary of the county of origin for trips coming into Napa County and the destination of trips leaving Napa County. Bold indicates the two highest origin/destination counties for each trip type.

Table 4-8: Weekday All-Day Inter-County Trips

Origin of Trips into Napa County		City	Destination of Trips out of Napa County	
Trips	Percent		Trips	Percent
1,100	2%	Lake	1,100	2%
9,900	**19%**	**Sonoma**	**10,400**	**20%**
1,300	3%	Marin	1,400	3%
28,900	**55%**	**Solano**	**27,100**	**53%**
1,100	2%	Yolo	900	2%
1,700	3%	Sacramento	1,700	3%
2,000	4%	Alameda	2,000	4%
4,300	8%	Contra Costa	4,400	9%
1,000	2%	San Francisco	1,000	2%
600	1%	San Mateo	600	1%
300	1%	Santa Clara	500	1%
52,300	**100%**	**Total**	**51,000**	**100%**

Source: Fehr & Peers

As shown in **Table 4-8**, **roughly 55 percent of Napa County inter-county trips are to or from Solano County** while **roughly 20 percent of Napa County inter-county trips are to or from Sonoma County on an average weekday**.

Figure 4-1: Napa Bel Aire Plaza

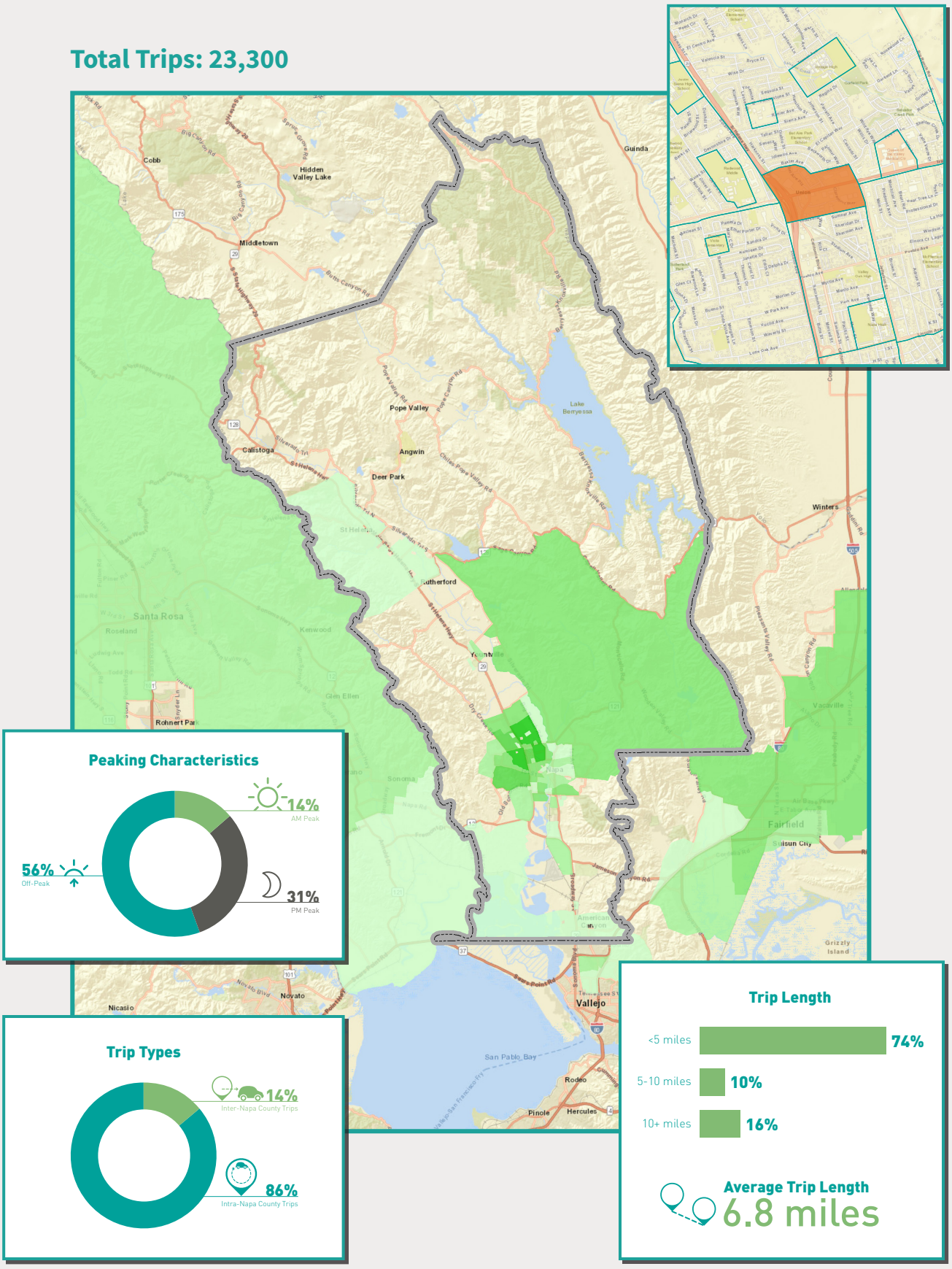


Figure 4-2: South Napa Market Place

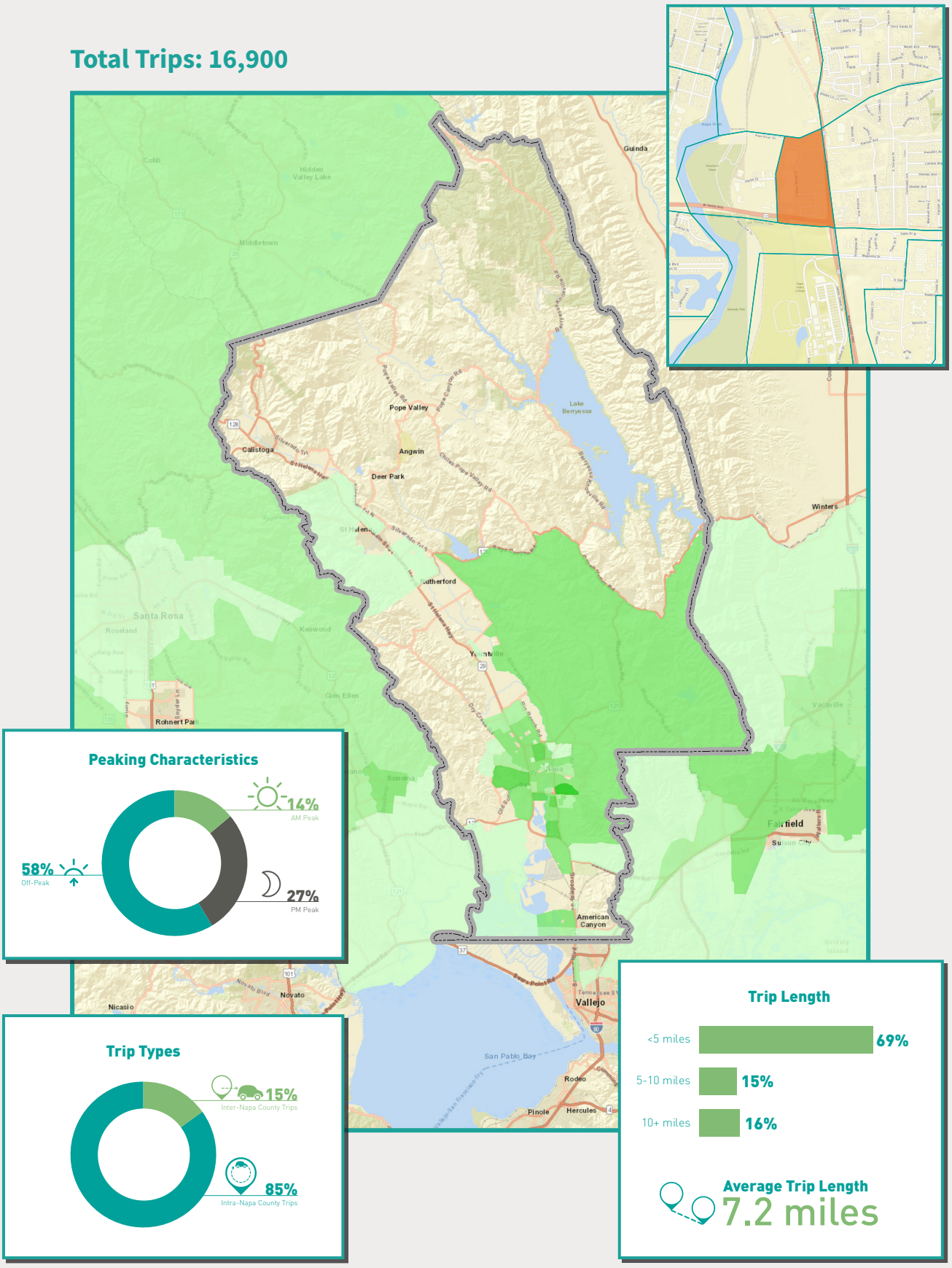


Figure 4-3: Downtown Napa

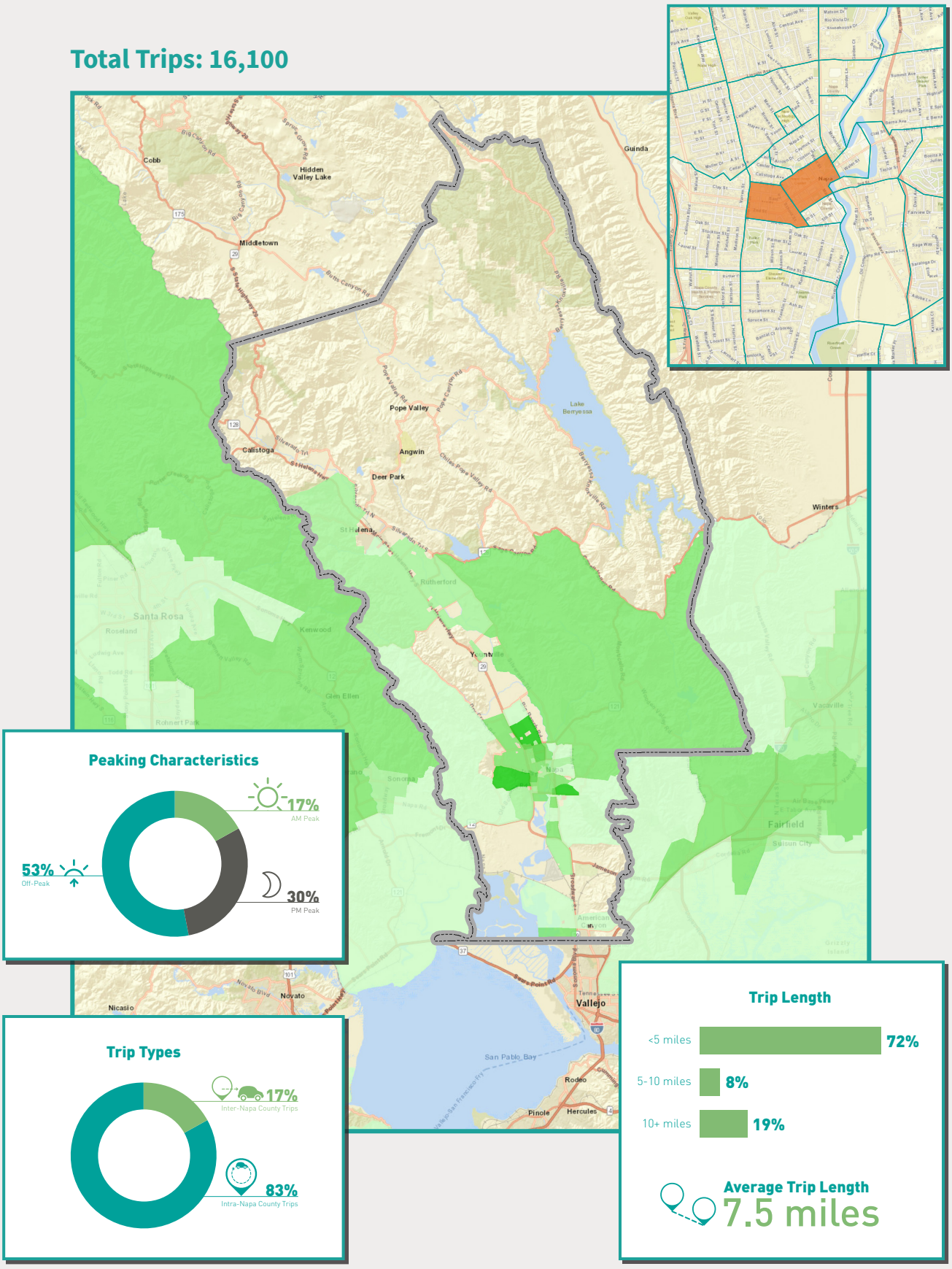


Figure 4-4: Napa Junction Center (American Canyon)

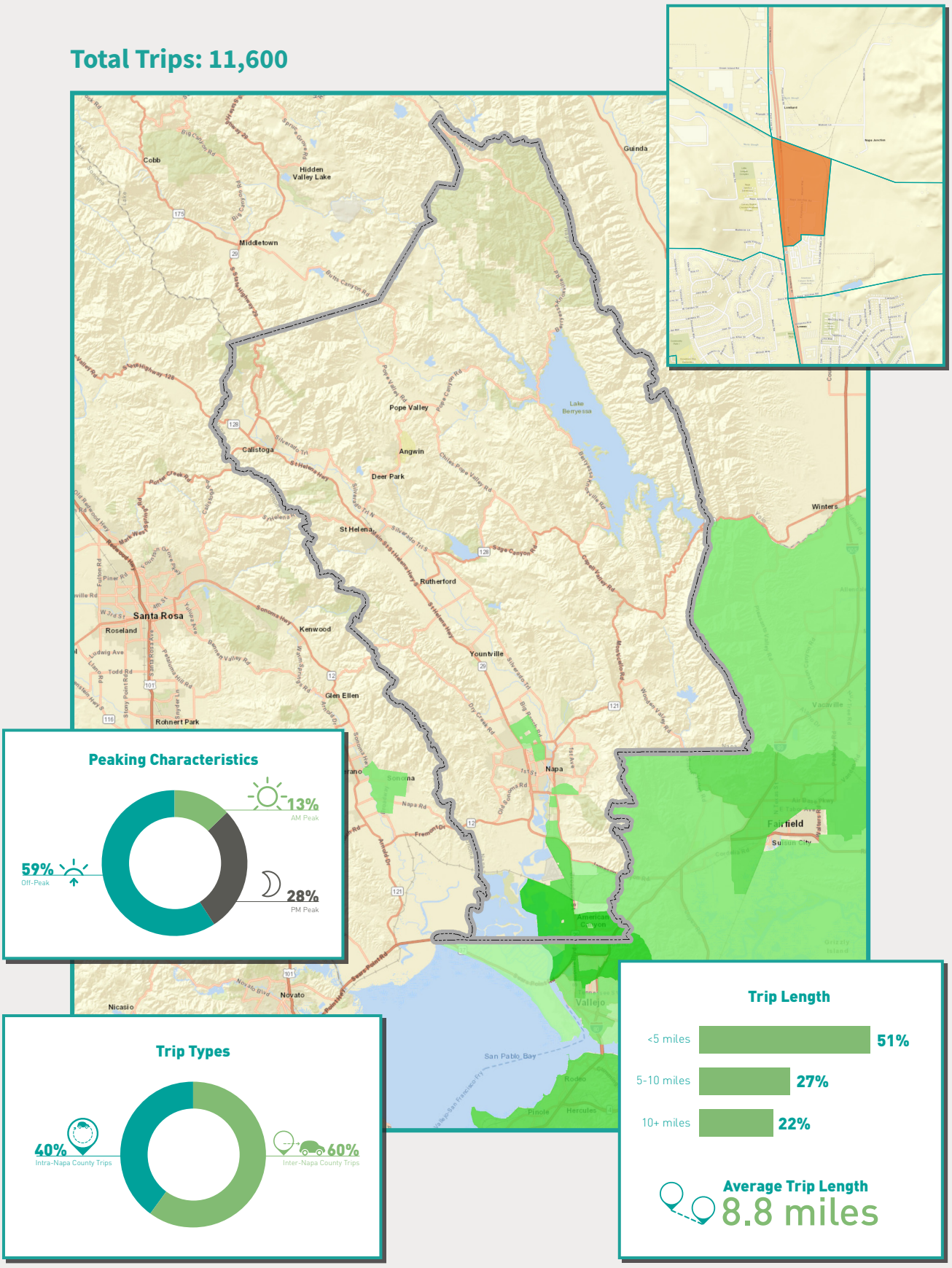
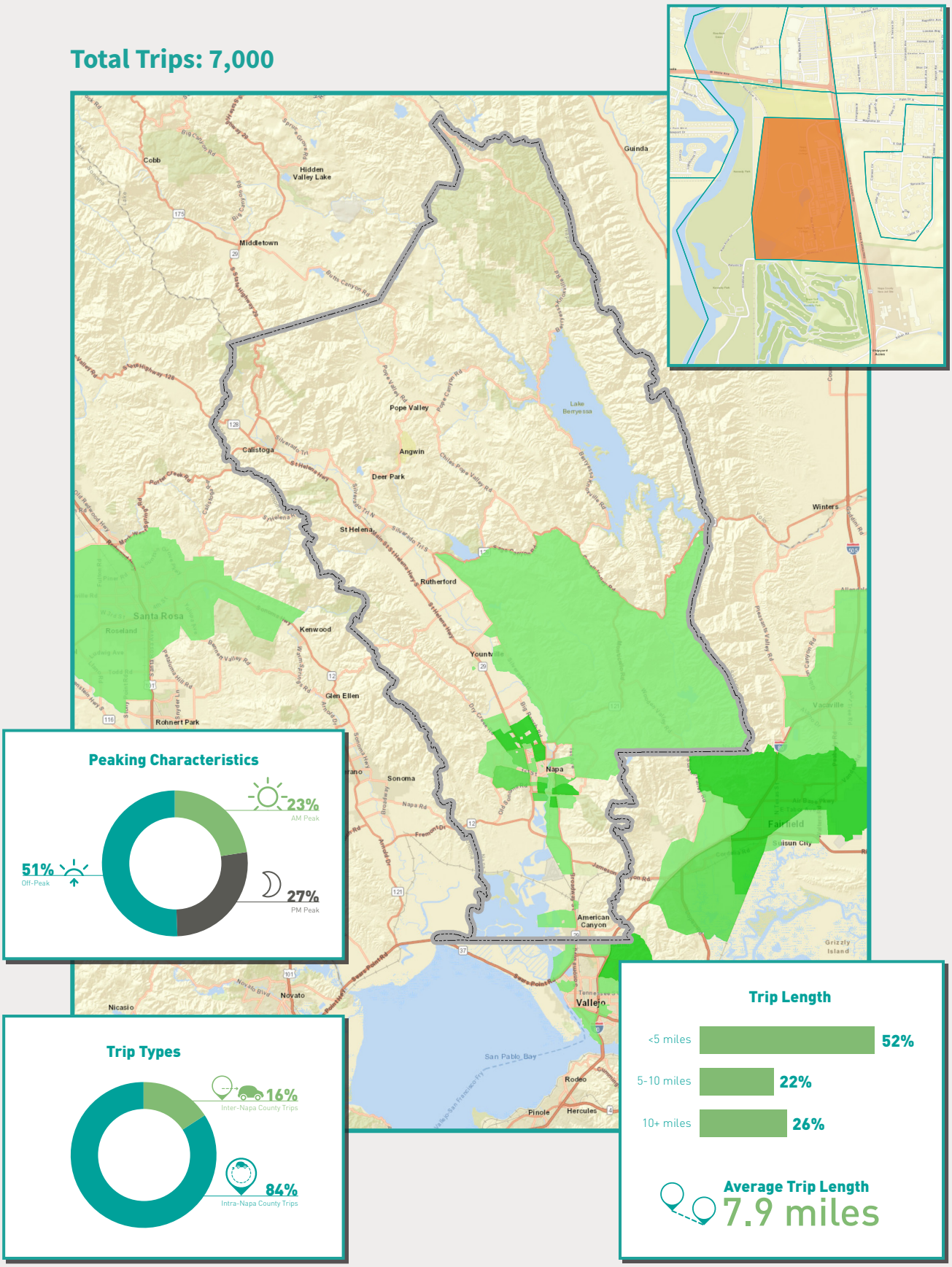


Figure 4-5: Napa Valley College



Where are pass through trips coming from and where are they going?

Table 4-9 provides a summary of the originating county of trips passing through Napa County and the destination county of trips passing through Napa County. Bold indicates the two highest origin/destination counties.

Table 4-9: Weekday All-Day Pass-Through Trip Origins and Destinations

Origin of Trips Passing Through Napa County		City	Destination of Trips Passing Through Napa County	
Trips	**Percent**		**Trips**	**Percent**
1,295	11%	Lake	1,086	9%
4,756	**40%**	**Sonoma**	**5,288**	**44%**
120	1%	Marin	69	1%
3,950	**33%**	**Solano**	**3,505**	**29%**
277	2%	Yolo	284	2%
656	6%	Sacramento	695	6%
153	1%	Alameda	226	2%
451	4%	Contra Costa	423	4%
155	1%	San Francisco	205	2%
49	0%	San Mateo	42	0%
28	0%	Santa Clara	67	1%
11,890	**100%**	**Total**	**11,890**	**100%**

Source: Fehr & Peers

As shown in **Table 4-7**, roughly **40 percent of trips passing through Napa County originate in Sonoma County** while **roughly 30 percent of trips passing through Napa County have a destination in Solano County**.

Table 4-10 provides a summary of county-to-county origin-destination pairs for vehicle trips passing through Napa County. Bold indicates the two highest origin-destination county-to-county pairs.

Table 4-10: Weekday All-Day Pass-Through Trip Origins-Destination Pairs

Origin County	Destination County: Lake	Sonoma	Marin	Solano	Yolo	Sac	Alameda	CC	SF	SM	SC
Lake	5	939	16	66	0	0	43	77	124	10	15
Sonoma	837	157	16	**2,484**	260	610	111	206	18	13	44
Marin	23	2	2	64	0	19	4	5	1	0	0
Solano	50	**2,986**	20	723	4	30	32	74	27	4	0
Yolo	0	231	10	19	5	6	0	6	0	0	0
Sac	22	579	3	20	4	11	4	1	9	1	2
Alameda	30	54	0	20	3	2	17	18	4	2	3
CC	69	303	0	39	0	0	8	26	3	3	0
SF	36	21	2	48	4	11	2	9	15	7	0
SM	4	10	0	15	0	6	4	1	4	2	3
SC	10	6	0	7	4	0	1	0	0	0	0

Source: Fehr & Peers

As shown in **Table 4-10**, the **largest Napa County pass-through movement is between Sonoma and Solano counties**, representing roughly 5,500 vehicle trips or **46 percent of traffic passing through Napa County** and **1.5 percent of total traffic interacting with Napa County**.

Weekday Pass-Through Trips

25%SOLANO>SONOMA
21%SONOMA>SOLANO
8%LAKE>SONOMA
7%SONOMA>LAKE
6%SOLANO>SOLANO
5%SONOMA>SACRAMENTO
5%SACRAMENTO>SONOMA
3%CONTRA COSTA>SONOMA
2%YOLO>SONOMA
2%SONOMA>YOLO
2%SONOMA>CONTRA COSTA

4.1.2 Weekday AM Peak Period Conditions

The following section presents key study findings from an analysis of AM peak period (6 AM to 10 AM) data collected for an average weekday (Tuesday to Thursday) in spring 2018. A comparison to all-day data for an average weekday (Tuesday to Thursday) in spring 2018 is also presented for select data points.

What types of trips are occurring within Napa County?

Table 4-11 provides a summary of total daily trips that interact with Napa County, stratified by intra-Napa County trips, trips into Napa County, trips out of Napa County, and Napa County pass-through trips.

Table 4-11: Gateway Weekday AM Peak Period Trip Types

Trip Type	Trips	Percent
Intra-Napa County Trips	47,600	63%
Trips into Napa County	15,600	20%
Trips out of Napa County	9,800	13%
Napa County Pass-Through Trips	3,100	**4%**
Total Trips Interacting with Napa County	76,200	100%

Source: Fehr & Peers

As shown in **Table 4-11**, in the AM peak period on an average weekday in spring 2018 roughly **76,000 vehicle trips interacted with Napa County**, accounting for roughly 22 percent of the 353,000 daily vehicle trips. Additionally, approximately 47,600 (63 percent) vehicle trips started and ended within Napa County while 28,500 (37 percent) vehicle trips started or ended outside Napa County, of which **3,100 (4 percent of total trips interacting with Napa County) passed through Napa County** without stopping.

The data also indicates that **Napa County imported 5,800 more vehicle trips in the AM peak period than it exported** (15,600 imported trips vs. 9,800 exported trips) to other counties, suggesting Napa County is an importer of workers given the high percentage of work-related trips that occur in the morning. This is evaluated further in **Chapter 5** where the analysis of trip characteristics such as trip purpose is presented.

The graphic below illustrates the morning inter-country trips types for a weekday in spring 2018.

What Types of Inter-County Trips Occur in the Morning?

21%

Trips into Napa County

13%

Trips out of Napa County

4%

Napa County Pass-Through Trips

Where are trips into Napa County coming from?

Table 4-12 provides a summary of trip destinations within Napa County for the top five generators of inbound trips to Napa County.

Table 4-12: Weekday AM Peak Period Top Five Generators of Inbound Trips

Destination	Vallejo		Fairfield		Santa Rosa area		Vacaville		City of Sonoma	
	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent
Calistoga	7	0%	14	1%	27	1%	0	0%	0	0%
Angwin	3	0%	0	0%	0	0%	0	0%	4	1%
Saint Helena	25	1%	32	1%	76	4%	22	2%	13	3%
Yountville	33	1%	20	1%	8	0%	57	5%	13	3%
Napa	1,663	47%	1,222	54%	1,303	71%	630	52%	297	71%
American Canyon	1,214	34%	473	21%	70	4%	161	13%	4	1%
Unincorpo-rated	617	17%	482	22%	353	19%	348	29%	88	21%
Total	**3,562**		**2,243**		**1,837**		**1,217**		**418**	

Source: Fehr & Peers

As shown in **Table 4-12**, the **City of Vallejo is the largest generator of inbound trips to Napa County**, generating over 3,500 AM peak period vehicle trips. Additionally, 47 percent of those trips have a destination in the City of Napa and 34 percent have a destination in American Canyon. Under daily conditions only 39 percent have their destination in the City of Napa and 49 percent in American Canyon, indicating different travel patterns from Vallejo in the morning than over the entire day. This flipping of travel destinations suggests that Vallejo residents are primarily traveling to jobs in the City of Napa in the morning and are primarily traveling to American Canyon other times of the day for discretionary purposes.

Where are trips starting and ending within Napa County?

Table 4-13 provides a summary of total trips starting and ending within each Napa County incorporated area. Bold indicates the high origin/destination city.

Table 4-13: Weekday AM Peak Period Origins and Destinations by City

Trip Origins		City	Trip Destinations	
Trips	Percent		Trips	Percent
1,466	3%	Calistoga	1,398	2%
1,112	2%	Angwin	750	1%
1,927	3%	Saint Helena	2,935	5%
903	2%	Yountville	1,303	2%
37,904	**66%**	**Napa**	**37,768**	**60%**
7,041	12%	American Canyon	6,919	11%
7,112	12%	Unincorporated	12,210	19%
57,500	**100%**	**Total**	**63,300**	**100%**

Source: Fehr & Peers

As shown in **Table 4-13**, **roughly 66 percent of Napa County vehicle trips start within the City of Napa while roughly 19 percent of trips end within unincorporated areas.**

A comparison to all-day data indicates that all AM peak period trip origin and destination percentages are within roughly one percent of daily values with the exception of trip destinations in unincorporated areas, which increased from 15 percent to 19 percent, further **suggesting that Napa County is an importer of workers especially to unincorporated areas.**

What do origin-destination patterns look like within Napa County?

Table 4-14 provides a summary of city-to-city origin-destination pairs for vehicle trips interacting with Napa County. Bold indicates the highest origin-destination city-to-city pair.

Table 4-14: Weekday AM Peak Period City-to-City Origin-Destination Pairs

	Calistoga	Angwin	Saint Helena	Yountville	Napa	American Canyon	Unincor-porated	Gateway
Calistoga	831	8	142	8	43	2	315	118
Angwin	20	623	248	0	69	2	102	49
Saint Helena	53	53	820	37	206	26	456	275
Yountville	12	0	55	277	242	20	220	78
Napa	79	16	588	584	**25,821**	733	4,218	5,866
American Canyon	61	2	16	31	1,134	3,265	370	2,162
Unincorporated	161	37	539	130	2,109	195	2,665	1,275
Gateway	181	11	529	236	8,144	2,677	3,864	3,127

Source: Fehr & Peers

As shown in **Table 4-14**, roughly **26,000 (34 percent of total Napa County trips) vehicle trips start and end within the City of Napa on an average weekday in the AM peak period**, accounting for roughly 19 percent of the 139,000 daily vehicle trips that start and end within the City of Napa.

The data also indicates that roughly 19,300 vehicle trips start or end in unincorporated areas. This accounts for 23 percent of the 84,000 daily vehicle trips that start or end in unincorporated areas. 31,700 vehicle trips start or end at county gateways, accounting for roughly 25 percent of the 127,100 daily county gateway vehicle trips. This data suggests that **trip activity in the AM peak period is focused around imported workers at county gateways and unincorporated areas** as opposed to service areas.

What are the largest trip generators in Napa County?

Table 4-15 provides a list of selected trip generators within Napa County for which trip generation was estimated using Cuebiq-based origin and destination data scaled based on traffic count data. The estimated number of average weekday trips in the AM peak period are provided along with the corresponding percentage of total countywide trips. Estimated trip generation data for all 128 Napa County zones are provided in **Appendix C**.

Table 4-15: Weekday AM Peak Period Largest Trip Generators

#	Selected Trip Generator	Trips	Percent
1	Napa Bel Aire Plaza	3,200	4%
2	Downtown Napa	2,600	3%
3	South Napa Market Place	2,400	3%
4	Napa Junction Center (American Canyon)	1,500	2%
5	Napa Valley College	1,600	2%
6	Napa Queen Medical	1,200	2%
7	Napa Oxbow	400	1%
8	Napa Department of State Hospitals	900	1%
9	Napa County Services	400	1%
10	Saint Helena Hospital	600	1%
11	Angwin Pacific Union College	400	1%
12	Yountville VA Hospital	300	<1%
13	Napa County Airport	200	<1%
14	Napa County Airport	900	<1%

Source: Fehr & Peers

As shown in **Table 4-15**, the five largest daily trip generators within Napa County remain largely unchanged. However, **together the five largest daily trip generators only account for roughly 13,100 or 18 percent of AM peak period vehicle trips generated within Napa County**, a 7 percent decrease from their accounting for 25 percent of daily vehicle trips generated. This decrease is not unexpected given the service nature of the land uses in the top five generators, and further suggests that **trip activity in the AM peak period is focused around employment centers and unincorporated areas** as opposed to service areas.

Where are Napa County trips going to and coming from?

Table 4-16 provides a summary of the originating county of trips coming in to Napa County and the destination county of trips leaving Napa County. Bold indicates the two highest origin/destination counties for each trip type.

Table 4-16: Weekday AM Peak Period Inter-County Trips

Origin of Trips into Napa County		County	Destination of Trips out of Napa County	
Trips	Percent		Trips	Percent
586	4%	Lake	77	1%
3,208	**21%**	**Sonoma**	**2,823**	**29%**
211	1%	Marin	438	4%
8,619	**55%**	**Solano**	**3,987**	**41%**
450	3%	Yolo	127	1%
440	3%	Sacramento	366	4%
490	3%	Alameda	507	5%
1,238	8%	Contra Costa	1,078	11%
206	1%	San Francisco	195	2%
142	1%	San Mateo	133	1%
52	0%	Santa Clara	90	1%
15,600	**100%**	**Total**	**9,800**	**100%**

Source: Fehr & Peers

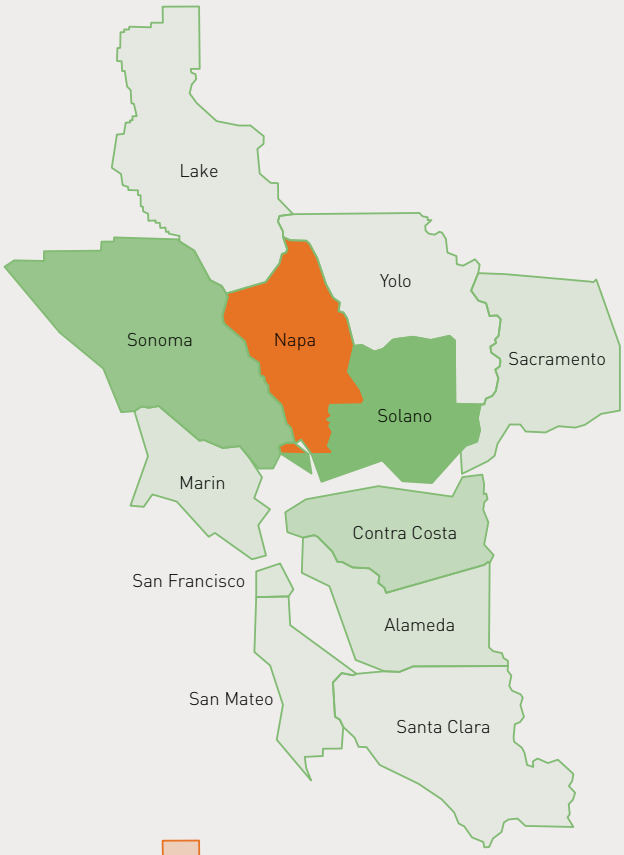
As shown in **Table 4-16**, **roughly 55 percent of trips in to Napa County originate in Solano County** while **roughly 41 percent of trips out of Napa County have a destination in Solano County** in the AM peak period. This data indicates that **Napa County predominantly imports trips, and likely workers, from Solano County**, while also exporting roughly half as many trips to Solano County as it imports from Solano County.

The data also indicates that in the AM peak period **Napa County exports roughly as many trips to Sonoma County as it imports from Sonoma County.**

The graphics below illustrate the origins and destination of Napa County inter-county trips on a weekday morning in spring 2018.

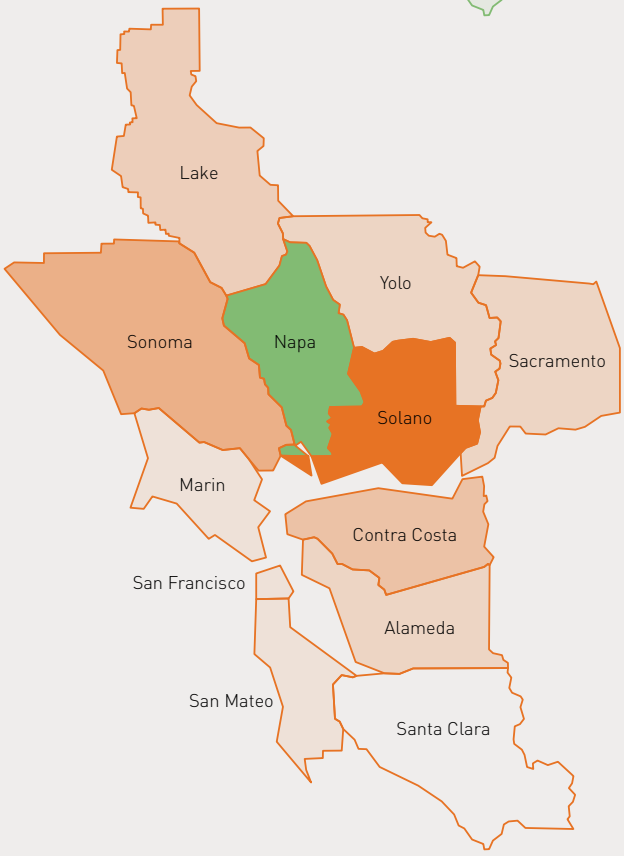
Where are Trips Leaving Napa County Going in the Morning?

41% SOLANO
29% SONOMA
11% CONTRA COSTA
5% ALAMEDA
4% SACRAMENTO
4% MARIN
2% SAN FRANCISCO
1% SANTA CLARA
1% SAN MATEO
1% LAKE
1% YOLO



Where are Trips Entering Napa County Coming from in the Morning?

55% SOLANO
21% SONOMA
8% CONTRA COSTA
4% LAKE
3% SACRAMENTO
3% ALAMEDA
3% YOLO
1% SAN FRANCISCO
1% SAN MATEO
1% MARIN
0% SANTA CLARA



Where are trips passing through Napa County going to and coming from?

Table 4-17 provides a summary of the originating county of trips passing through Napa County and the destination county of trips passing through Napa County. Bold indicates the two highest origin/destination counties.

Table 4-17: Weekday AM Peak Period Pass-Through Trip Origins and Destinations

Origin of Trips Passing Through Napa County		County	Destination of Trips Passing Through Napa County	
Trips	Percent		Trips	Percent
498	16%	Lake	83	3%
772	**25%**	**Sonoma**	**2,018**	**65%**
5	0%	Marin	22	1%
1,389	**44%**	**Solano**	**612**	**20%**
87	3%	Yolo	35	1%
188	6%	Sacramento	160	5%
22	1%	Alameda	38	1%
142	5%	Contra Costa	91	3%
21	1%	San Francisco	60	2%
3	0%	San Mateo	1	0%
0	0%	Santa Clara	7	0%
3,127	**100%**	**Total**	**3,127**	**100%**

Source: Fehr & Peers

As shown in **Table 4-17**, **roughly 44 percent of trips passing through Napa County originate in Solano County** while **roughly 65 percent of trips passing through Napa County have a destination in Sonoma County** in the AM peak period.

This data indicates that in the AM peak period vehicles are primarily passing through Napa County to reach Sonoma County destinations.

Table 4-10 provides a summary of county-to-county origin-destination pairs for vehicle trips passing through Napa County. Bold indicates the two highest origin-destination county-to-county pairs.

Table 4-10: Weekday AM Peak Period Pass-Through Trip Origins-Destination Pairs

Origin County \ Destination County	Lake	Sonoma	Marin	Solano	Yolo	Sac	Alameda	CC	SF	SM	SC
Lake	3	384	5	5	0	0	12	38	48	0	3
Sonoma	69	31	0	**2,484**	34	151	17	33	0	0	4
Marin	4	0	0	1	0	0	0	0	0	0	0
Solano	4	**2,986**	12	149	0	6	4	15	3	0	0
Yolo	0	71	5	8	0	3	0	0	0	0	0
Sac	0	184	0	1	0	0	2	0	0	1	0
Alameda	3	10	0	5	1	0	0	2	1	0	0
CC	0	126	0	7	0	0	3	3	3	0	0
SF	0	14	0	2	0	0	0	0	5	0	0
SM	0	2	0	1	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	0

Source: Fehr & Peers

As shown in **Table 4-10**, **the largest Napa County pass-through movement is between Sonoma and Solano Counties**, representing roughly 1,200 vehicle trips or **46 percent of traffic passing through Napa County** and **1.5 percent of total traffic interacting with Napa County** in the AM peak period.

The data also indicates that Solano County exports roughly three times as many trips to Sonoma County as it imports from Sonoma County. Furthermore, the data suggests that Solano and Lake counties export trips, and likely workers, to Sonoma County.

4.1.3 Weekday PM Peak Period Conditions

The following section presents key study findings from an analysis of PM peak period (3 PM to 7 PM) data collected for an average weekday (Tuesday to Thursday) in spring 2018. A comparison to all-day and AM peak period data for an average weekday (Tuesday to Thursday) in spring 2018 is also presented for select data points.

What types of trips are occurring within Napa County?

Table 4-19 provides a summary of total daily trips that interact with Napa County, stratified by intra-Napa County trips, trips in to Napa County, trips out of Napa County, and Napa County pass-through trips.

Table 4-19: Weekday PM Peak Period Trip Types

Trip Type	Trips	Percent
Intra-Napa County Trips	72,100	70%
Trips into Napa County	11,800	11%
Trips out of Napa County	16,100	16%
Napa County Pass-Through Trips	2,900	3%
Total Trips Interacting with Napa County	103,000	100%

Source: Fehr & Peers

As shown in **Table 4-19**, in the PM peak period on an average weekday in spring 2018 roughly **103,000 vehicle trips interacted with Napa County**, accounting for roughly 29 percent of the 353,000 daily vehicle trips. Additionally, approximately 72,100 (70 percent) vehicle trips started and ended within Napa County while 30,800 (30 percent) vehicle trips started or ended outside Napa County, of which **2,900 (3 percent of total trips interacting with Napa County) passed through Napa County.**

The data also indicates that 4,300 more vehicle trips leave Napa County in the PM peak period than enter Napa County in the PM peak period, consistent with the finding that in the AM peak period Napa County imported 5,800 more vehicle trips than it exported. The PM peak period data indicating a reversal of the AM peak period pattern **further suggests the imported trips are in fact workers**. This is evaluated further in Chapter 5 where the analysis of trip characteristics such as trip purpose is presented.

Where are trips starting and ending within Napa County?

Table 4-20 provides a summary of total trips starting and ending within each Napa County incorporated area. Bold indicates the high origin/destination city.

Table 4-20: Weekday PM Peak Period Origins and Destinations by City

Trip Origins		City	Trip Destinations	
Trips	Percent		Trips	Percent
1,886	2%	Calistoga	2,010	2%
935	1%	Angwin	1,166	1%
3,996	5%	Saint Helena	3,173	4%
1,387	2%	Yountville	1,194	1%
55,879	**63%**	**Napa**	**57,373**	**68%**
9,705	11%	American Canyon	9,571	11%
14,400	16%	Unincorporated	9,400	11%
88,200	**100%**	**Total**	**83,900**	**100%**

Source: Fehr & Peers

As shown in **Table 4-20**, **roughly 63 percent of Napa County vehicle trips start within the City of Napa while roughly 11 percent of trips end within American Canyon and unincorporated areas**.

A comparison to all-day data indicates that all PM peak period trip origin and destination percentages are within roughly one percent of daily values with the exception of trip destinations in unincorporated areas, which decreased from 15 percent to 11 percent. A comparison to AM peak period data indicates a reversal of travel patterns as in the morning roughly 5,000 more vehicles have destinations in unincorporated areas, while the opposite is true in the PM peak period with 5,000 more vehicles having origins in unincorporated areas. The PM peak period data indicating a reversal of the AM peak period pattern **further suggests that Napa County is an importer of workers especially to unincorporated areas**.

What do origin-destination patterns look like within Napa County?

Table 4-21 provides a summary of city-to-city origin-destination pairs for vehicle trips interacting with Napa County. Bold indicates the highest origin-destination city-to-city pair.

Table 4-21: Weekday PM Peak Period City-to-City Origin-Destination Pairs

	Calistoga	Angwin	Saint Helena	Yountville	Napa	American Canyon	Unincor-porated	Gateway
Calistoga	1,094	18	178	8	89	30	279	190
Angwin	20	592	127	2	63	0	89	41
Saint Helena	176	273	1,452	75	638	14	842	525
Yountville	2	0	61	309	626	14	157	218
Napa	59	117	355	355	**43,221**	1,175	3,208	7,390
American Canyon	10	4	8	26	858	4,967	147	3,685
Unincorporated	487	107	767	277	4,987	575	3,125	4,076
Gateway	161	54	225	142	6,891	2,797	1,554	2,949

Source: Fehr & Peers

As shown in **Table 4-21**, **roughly 43,000 (42 percent of total Napa County trips) vehicle trips start and end within the City of Napa on an average weekday in the PM peak period**, accounting for roughly 31 percent of the 139,000 daily vehicle trips that start and end within the City of Napa.

The data also indicates that roughly 23,800 vehicle trips start or end in unincorporated areas, accounting for roughly 28 percent of the 84,000 daily vehicle trips that start or end in unincorporated areas, while 33,800 vehicle trips start or end at county gateways, accounting for roughly 27 percent of the 127,100 daily vehicle trips that start or end at county gateways. This data suggests that **trip activity in the PM peak period is focused around service areas** as opposed to imported workers at county gateways and unincorporated areas.

What are the largest trip generators in Napa County?

Table 4-22 provides a list of selected trip generators within Napa County for which trip generation was estimated using Cuebiq-based origin and destination data scaled based on traffic count data. The estimated number of average weekday trips in the PM peak period are provided along with the corresponding percentage of total countywide trips. Estimated trip generation data for all 128 Napa County zones are provided in **Appendix C**.

Table 4-22: Weekday PM Peak Period Largest Trip Generators

#	Selected Trip Generator	Trips	Percent
1	Napa Bel Aire Plaza	7,100	7%
2	Downtown Napa	4,800	5%
3	South Napa Market Place	4,600	5%
4	Napa Junction Center (American Canyon)	3,300	3%
5	Napa Valley College	1,900	2%
6	Napa Queen Medical	1,200	1%
7	Napa Oxbow	1,300	1%
8	Napa Department of State Hospitals	800	1%
9	Napa County Services	800	1%
10	Saint Helena Hospital	500	<1%
11	Angwin Pacific Union College	400	<1%
12	Yountville VA Hospital	200	<1%
13	Napa County Airport	200	<1%
14	Napa County Airport	900	<1%

Source: Fehr & Peers

As shown in **Table 4-22**, the five largest daily trip generators within Napa County remain largely unchanged, **together accounting for roughly 24,600 or 25 percent of PM peak period vehicle trips generated within Napa County**, a similar value from their accounting for 25 percent of daily vehicle trips generated. This further suggests that **trip activity in the PM peak period is more focused around retail and service areas than employment centers and unincorporated areas**.

Where are Napa County trips going to and coming from?

Table 4-23 provides a summary of the originating county of trips coming in to Napa County and the destination county of trips leaving Napa County. Bold indicates the two highest origin/destination counties for each trip type.

Table 4-23: Weekday AM Peak Period Inter-County Trips

Origin of Trips into Napa County		County	Destination of Trips out of Napa County	
Trips	Percent		Trips	Percent
143	1%	Lake	660	4%
2,958	**25%**	**Sonoma**	**3,193**	**20%**
364	3%	Marin	239	1%
6,013	**51%**	**Solano**	**8,962**	**56%**
143	1%	Yolo	258	2%
348	3%	Sacramento	397	2%
325	3%	Alameda	462	3%
1,240	10%	Contra Costa	1,419	9%
200	2%	San Francisco	283	2%
65	1%	San Mateo	150	1%
25	0%	Santa Clara	101	1%
11,800	**100%**	**Total**	**16,100**	**100%**

Source: Fehr & Peers

As shown in **Table 4-23**, **roughly 51 percent of trips in to Napa County originate in Solano County while roughly 56 percent of trips out of Napa County have a destination in Solano County** in the PM peak period. This data is a reversal of the AM peak period pattern, further suggesting that Napa County predominantly imports trips, and likely workers, from Solano County. The PM peak period trips into Napa County being roughly 67 percent of trips out of Napa County, compared to a 50 percent reversal in the AM peak period, suggests that **Solano residents travel to Napa County in the afternoon for services**.

The data also indicates that in the PM peak period roughly as many vehicles travel from Napa County to Sonoma County as travel from Sonoma County to Napa County, consistent with the AM peak period finding that **Napa County imports as many trips as it exports to Sonoma County**. Furthermore, the equal pattern in both the AM and PM peak periods suggests that **Sonoma residents generally do not travel to Napa County in the afternoon for services**.

Where are trips passing through Napa County going to and coming from?

Table 4-24 provides a summary of the originating county of trips passing through Napa County and the destination county of trips passing through Napa County. Bold indicates the two highest origin/destination counties.

Table 4-24: Weekday PM Peak Period Pass-Through Trip Origins and Destinations

Origin of Trips Passing Through Napa County		County	Destination of Trips Passing Through Napa County	
Trips	Percent		Trips	Percent
167	6%	Lake	528	18%
1,672	**57%**	**Sonoma**	**866**	**29%**
36	1%	Marin	13	0%
741	**25%**	**Solano**	**1113**	**38%**
33	1%	Yolo	79	3%
117	4%	Sacramento	191	6%
19	1%	Alameda	31	1%
99	3%	Contra Costa	83	3%
53	2%	San Francisco	24	1%
6	0%	San Mateo	12	0%
6	0%	Santa Clara	9	0%
2,949	**100%**	**Total**	**2,949**	**100%**

Source: Fehr & Peers

As shown in **Table 4-24**, **roughly 57 percent of trips passing through Napa County originate in Sonoma County** while **roughly 38 percent of trips passing through Napa County have a destination in Solano County** in the PM peak period.

This data indicates that in the PM peak period vehicles are primarily passing through Napa County to reach both Sonoma County and Solano County destinations.

Table 4-25 provides a summary of county-to-county origin-destination pairs for vehicle trips passing through Napa County. Bold indicates the two highest origin-destination county-to-county pairs.

Table 4-25: Weekday PM Peak Period Pass-Through Trip Origins-Destination Pairs

		Destination County										
		Lake	Sonoma	Marin	Solano	Yolo	Sac	Alameda	CC	SF	SM	SC
Origin County	**Lake**	0	129	6	9	0	0	9	1	4	6	3
	Sonoma	412	41	0	**880**	72	172	19	53	13	4	6
	Marin	6	0	0	23	0	6	1	0	0	0	0
	Solano	35	**519**	1	169	0	4	0	12	1	0	0
	Yolo	0	25	4	1	0	0	0	3	0	0	0
	Sac	0	107	0	4	2	4	0	0	0	0	0
	Alameda	6	8	0	1	0	0	0	1	3	0	0
	CC	47	32	0	12	0	0	0	8	0	0	0
	SF	22	5	2	8	2	3	1	5	3	2	0
	SM	0	0	0	3	0	2	1	0	0	0	0
	SC	0	0	0	3	3	0	0	0	0	0	0

Source: Fehr & Peers

As shown in **Table 4-25**, the **largest Napa County pass-through movement is from Sonoma County to Solano County**, representing roughly 880 vehicle trips or **30 percent of traffic passing through Napa County** and **0.9 percent of total traffic interacting with Napa County** in the PM peak period.

The PM peak period data is consistent with the AM peak period finding that Solano County exports more trips to Sonoma County than it imports from Sonoma County as it indicates a reversal of patterns. Similarly, a pattern reversal can also be seen that is consistent with the AM peak period finding that Solano and Lake counties export trips, and likely workers, to Sonoma County.

4.1.4 Friday and Weekend Conditions

The following section presents key study findings from an analysis of Friday and Weekend travel pattern data collected in spring 2018. A comparison to all-day data for an average weekday (Tuesday to Thursday) in spring 2018 is also presented.

What types of trips are occurring within Napa County?

Table 4-26 provides a summary of total daily trips that interact with Napa County, stratified by intra-Napa County trips, trips into Napa County, trips out of Napa County, and Napa County pass-through trips. Bold indicates the highest number of trips for each trip type.

Table 4-26: Friday and Weekend Trip Types

Trip Type	Weekday		Friday		Saturday		Sunday	
	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent
Intra-Napa County Trips	238,000	67%	**246,000**	69%	188,000	66%	182,000	65%
Percent of Weekday			103%		79%		76%	
Trips into Napa County	**52,000**	15%	51,000	14%	43,000	15%	45,000	16%
Percent of Weekday			98%		83%		87%	
Trips out of Napa County	**51,000**	14%	50,000	14%	43,000	15%	44,000	16%
Percent of Weekday			98%		84%		86%	
Napa County Pass-Through Trips	**12,000**	3%	**12,000**	3%	10,500	4%	10,000	4%
Percent of Weekday			100%		89%		82%	
Total Trips Interacting with Napa County	353,000	100%	**359,000**	100%	285,000	100%	280,000	100%
Percent of Weekday			102%		81%		79%	

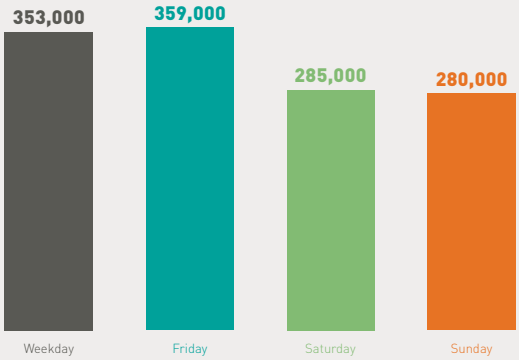
Source: Fehr & Peers

Below is a bulleted summary of key findings from **Table 4-26**. The data generally indicates that **20 percent fewer trips interact with Napa County on weekend days**. Additionally, the data indicates that fewer vehicles enter Napa County on Fridays and weekend days, likely resulting in a portion of the observed decrease in intra-county trips. Furthermore, trip purpose data indicates a significant reduction in work-related inter-county trips on the weekend (roughly 30 percent to 10 percent), **suggesting that average weekday commuters into Napa County greatly exceed weekend visitors.**

- The largest number of intra-county trips occurred on Friday, roughly 3 percent higher than on an average weekday, 24 percent higher than on Saturday, and 27 percent higher than on Sunday, likely due to increased visitor activity coupled with similar commute levels.
- The largest number of trips into Napa County occurred on an average weekday, roughly 2 percent higher than on Friday, 17 percent higher than on Saturday, and 13 percent higher than on Sunday, suggesting that average weekday commute levels exceed weekend visitor travel.
- The largest number of trips out of Napa County occurred on an average weekday, roughly 2 percent higher than on Friday, 16 percent higher than on Saturday, and 14 percent higher than on Sunday, further suggesting that average weekday commute levels exceed weekend visitor travel.
- The largest number of Napa County pass-through trips occurred on an average weekday and on Friday, roughly 11 percent higher than on Saturday, and 18 percent higher than on Sunday, suggesting that average weekday commuter pass-through traffic levels greatly exceed weekend visitor pass-through travel.
- **Roughly 359,000 vehicle trips interact with Napa County on a Friday in spring, roughly 2 percent higher than on an average weekday,**
- **Roughly 285,000 vehicle trips interact with Napa County on a Saturday in spring, roughly 19 percent lower than on an average weekday.**
- **Roughly 280,000 vehicle trips interact with Napa County on a Sunday in spring, roughly 21 percent lower than on a weekday.**

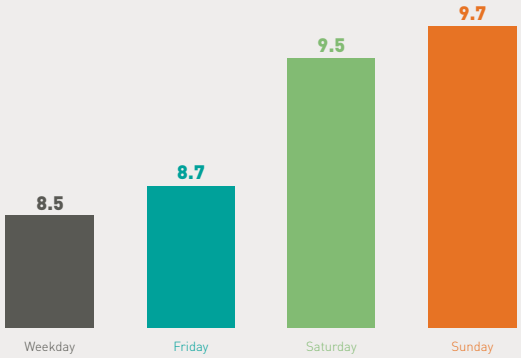
The graphic below illustrates Napa County total trip variation by day of week in spring 2018.

Day of Week Total Napa County Trip Variation



The graphic below illustrates the average Napa County-generated trip length by day of week in spring 2018.

Average Napa County-Generated Trip Length (miles) by Day of Week



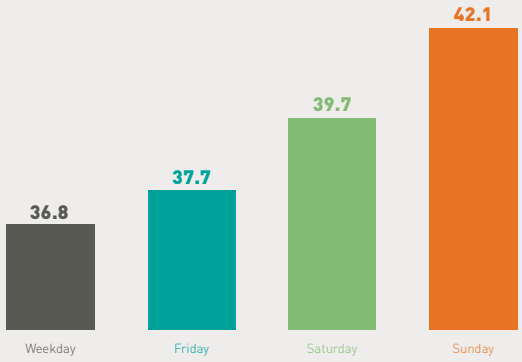
The graphic below illustrates Napa County work-related trip variation by day of week in spring 2018.

Work-Related Trips by Day of Week

22% WEEKDAY
19% FRIDAY
10% SATURDAY
10% SUNDAY

The graphic below illustrates the average Napa County gateway trip length by day of week in spring 2018.

Average Napa Gateway Trip Length (miles) by Day of Week



4.2 Fall 2018 and Summer 2018 Conditions

The following section presents key study findings from an analysis of Fall 2018 and Summer 2018 travel pattern data. A comparison to all-day data for an average weekday (Tuesday to Thursday) in spring 2018 is also presented.

What types of trips are occurring within Napa County?

Table 4-27 provides a summary of total daily trips that interact with Napa County, stratified by intra-Napa County trips, trips in to Napa County, trips out of Napa County, and Napa County pass-through trips. Bold indicates the highest number of trips for each trip type.

Table 4-27: Fall 2018 and Summer 2018 Trip Types

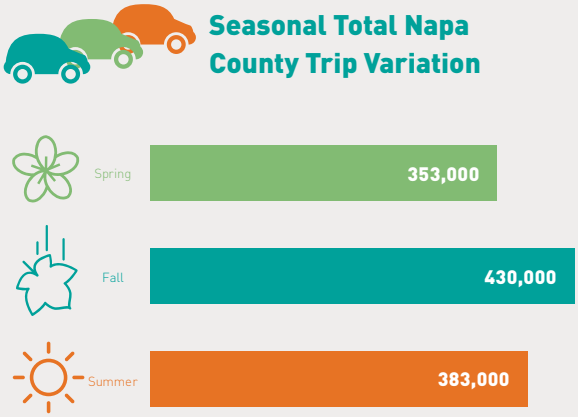
Trip Type	Spring 2018 Weekday		Fall 2018 Weekday		Summer 2018 Weekday	
	Trips	Percent	Trips	Percent	Trips	Percent
Intra-Napa County Trips	238,000	67%	**301,000**	70%	268,000	70%
Percent of Weekday			126%		113%	
Trips into Napa County	52,000	15%	**58,000**	14%	52,000	14%
Percent of Weekday			112%		100%	
Trips out of Napa County	51,000	14%	**57,000**	13%	51,000	13%
Percent of Weekday			112%		100%	
Napa County Pass-Through Trips	12,000	3%	**13,000**	3%	12,500	3%
Percent of Weekday			108%		104%	
Total Trips Interacting with Napa County	353,000	100%	**430,000**	100%	383,000	100%
Percent of Weekday			122%		108%	

Source: Fehr & Peers

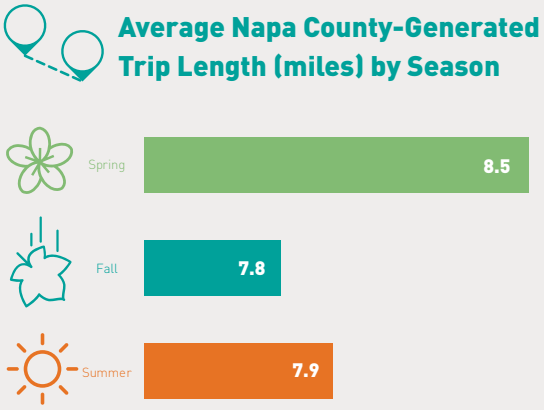
Below is a bulleted summary of key findings from **Table 4-27**. The data generally indicates that **22 percent more vehicle trips interact with Napa County in fall than in spring, and 8 percent more vehicle trips interact with Napa County in summer than in spring**. Additionally, the data indicates that roughly 12 percent more vehicles enter Napa County in fall, likely resulting in a portion of the observed increase in intra-county trips. Furthermore, trip purpose data indicates a reduction in work-related inter-county trips in fall (roughly 30 percent to 27 percent), **suggesting that the increase in inter-county trips are likely from visitors as opposed to commuters**.

- The largest number of intra-county trips occurred in fall, roughly 26 percent higher than in spring, likely due to increased visitor activity during the crush season.
- The largest number of trips into Napa County occurred in fall, roughly 12 percent higher than in spring, likely due to increased visitor activity during the crush season.
- The largest number of trips out of Napa County occurred in fall, roughly 12 percent higher than in spring, likely due to increased visitor activity during the crush season.
- The largest number of Napa County pass-through trips occurred in fall, roughly 8 percent higher than in spring, **indicating that pass-through trips also increase during the crush season**.

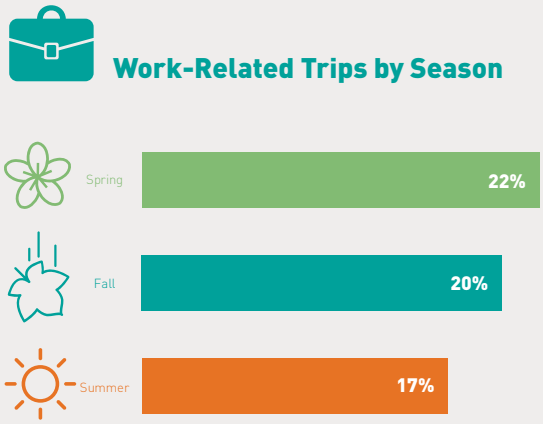
The graphic below illustrates Napa County total trip variation by season in 2018.



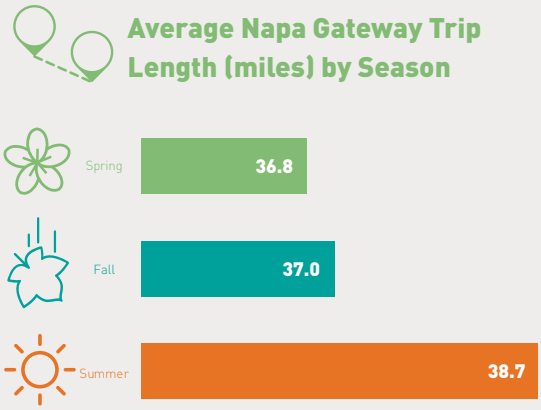
The graphic below illustrates the average Napa County-generated trip length by season in 2018.



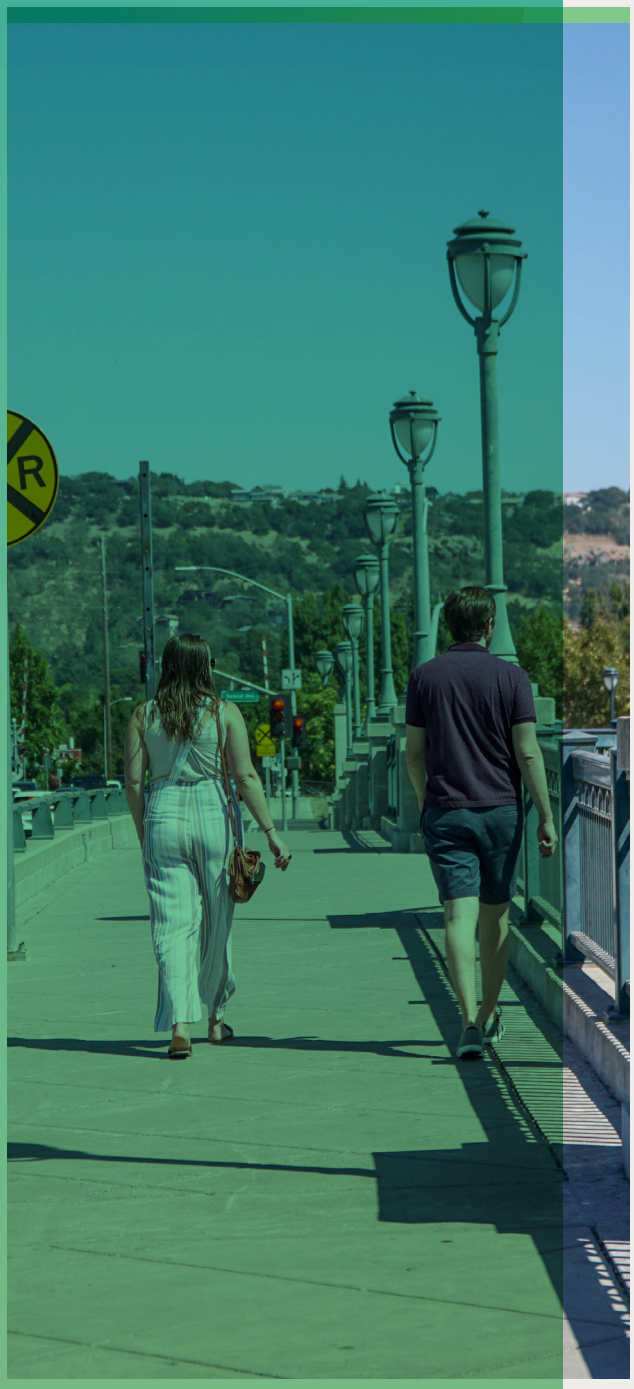
The graphic below illustrates Napa County work-related trip variation by season in 2018.



The graphic below illustrates the average Napa County gateway trip length by season in 2018.



5. TRAVEL CHARACTERISTICS



This chapter presents a summary of the travel behavior study travel characteristic findings. The findings are organized by advanced metric category provided by StreetLight Data. Findings are presented for the primary study period (spring 2018) as well as for the two additional study periods (fall 2018 and summer 2018) to illustrate seasonal differences in travel behavior in Napa County. Weekday AM and PM peak period, Friday, and weekend data is also presented for the primary study period. Detailed data for all study periods and time periods is provided in **Appendix C**.

As discussed in Chapter 3, Cuebiq-based origin and destination data was analyzed and scaled using the traffic count data presented in Section 3.2.1. Travel characteristics such as trip purpose, demographic information, trip length, and trip time were derived from advanced metric data provided by StreetLight Data for all 128 Napa County zones and 44 middle filter locations and applied to the scaled travel pattern data.

Travel characteristic data is summarized and presented in this chapter for an aggregation of all 128 Napa County zones to present an **average for all Napa County trips** and for an aggregation of all 14 “middle-filter” gateway locations to present an **average for all Napa County inter-county trips**. The following tables and figures summarize the travel pattern findings. Detailed data for all 201 zones and 44 “middle-filter” roadway locations is also provided in **Appendix C**.

5.1 Weekday Peaking Characteristics

What are the weekday peaking characteristics within Napa County?

Table 5-1 provides a summary of vehicle trip data for trip types that interact with Napa County.

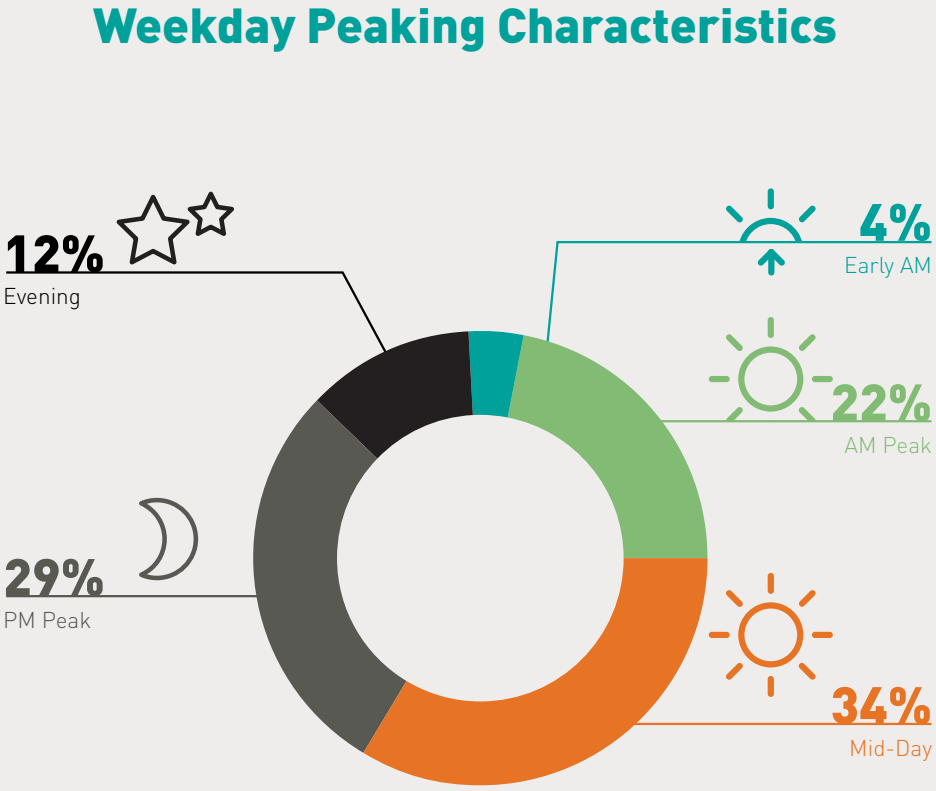
Table 5-1: Weekday Peaking Characteristics

Trip Type	Daily	Early AM	AM Peak	Mid-Day	PM Peak	Evening
Intra-Napa County Trips	238,000	6,000	47,600	87,100	72,100	27,700
Trips into Napa County	52,000	4,300	15,600	15,200	11,800	5,400
Trips out of Napa County	51,000	3,000	9,800	15,300	16,100	6,700
Napa County Pass-Through Trips	12,000	1,100	3,100	3,300	2,900	1,300
Total Trips Interacting with Napa County	**353,000**	**14,500**	**76,200**	**121,000**	**103,000**	**41,200**
Percent of Total Trips	**100%**	**4%**	**22%**	**34%**	**29%**	**12%**

Source: Fehr & Peers

As shown in **Table 5-1**, roughly 22 percent of trips are generated between 6 AM and 10 AM and roughly 29 percent of trips are generated between 3 PM and 7 PM. Additionally, roughly 4 percent of trips are generated between midnight and 6 AM, with 58 percent of those trips being inter-county trips.

The graphic below illustrates the weekday peaking characteristics for a weekday in spring 2018.

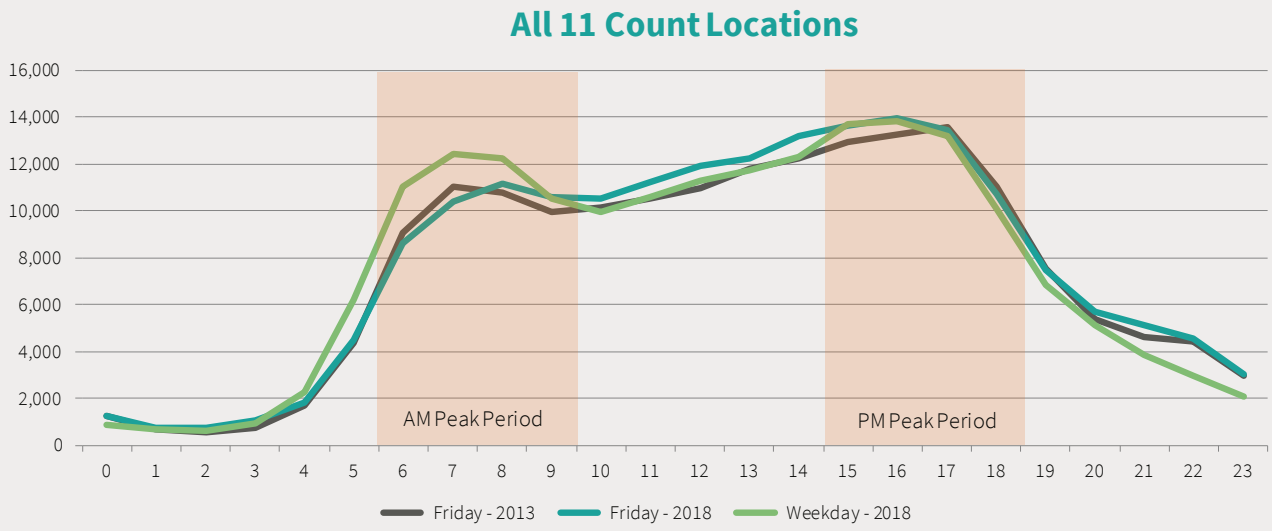


Have the hourly peaking characteristics changed since 2014?

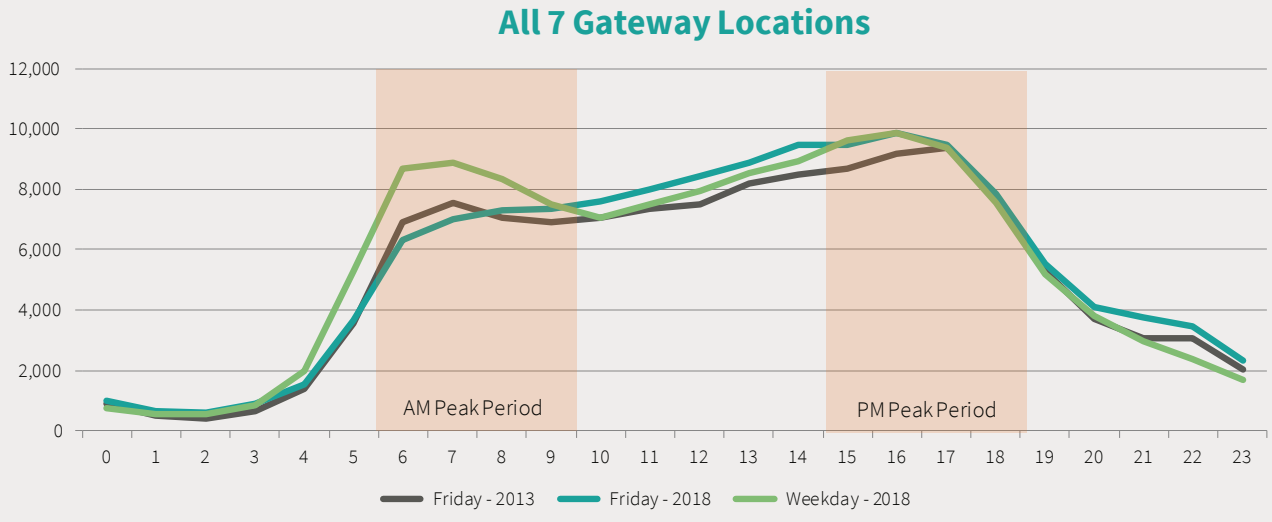
This section presents a comparison of hourly traffic volumes collected in 2018 to hourly traffic volumes collected for the previous TBS in 2014. Due to the high cost of license plate collection, traffic volumes were only collected on a Friday in 2014. Therefore, a differential comparison is only presented for Friday conditions. Weekday 2018 data is provided for comparison purposes to Friday 2018 data. A goal of this analysis was to determine if hourly peaking characteristics, especially in the PM peak period, have changed since 2014.

An additional goal of this analysis was to determine whether Napa County peak periods are consistent with Bay Area-wide peak periods, which are generally considered to occur 6 AM to 10 AM and 3 PM to 7 PM for the morning and afternoon peak periods, respectively. Given the levels of congestion along SR 29 and the amount of agricultural work in Napa County, it was believed that peak periods may possibly occur earlier (around 5 AM in the morning and around 2 PM in the afternoon).

The chart below illustrates the hourly peaking characteristics based on the traffic counts collected at eleven roadway segments within Napa County, including all seven Napa County gateway locations. The Bay Area wide peak periods are highlighted in yellow.



The chart below illustrates the hourly peaking characteristics based on the traffic counts collected at all seven Napa County gateway locations. The Bay Area-wide peak periods are highlighted in yellow.



The charts above generally indicate that peaking characteristics between the three periods are similar and that growth in traffic has occurred between 2014 and 2018. The charts also indicate that hourly traffic volumes generally start increasing around 9 AM or 10 AM and continually increase until their peak around 4 PM. Furthermore, the peak hour for all three time periods appears to occur between 4 PM and 6 PM, consistent with Bay Area-wide peaking characteristics. However, the charts also indicate a significant decline in traffic volumes after 6 PM, inconsistent with Bay Area-wide peak characteristics, suggesting that **the 4 hour PM peak period likely occurs from 2 PM to 6 PM**.

In addition to looking at a summation of traffic volumes across multiple count locations, an analysis of traffic count data on SR 29 in South County was performed. **Table 5-2** provides a summary of hourly traffic count data on SR 29 North of American Canyon Road in the northbound direction between 10 AM and 7 PM. Bold indicates the highest volume for each analysis period.

Table 5-2: SR 29 North of American Canyon Road (Northbound) Peaking Characteristics

Analysis Period	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM
Weekday – 2018	1,250	1,357	1,410	**1,477**	1,410	1,365	1,301	1,254	1,079
Friday – 2018	1,392	1,399	1,441	1,529	**1,583**	1,360	1,460	1,315	1,267
Friday – 2014	1,594	1,585	1,702	**1,779**	1,737	1,571	1,774	1,568	1,270

Source: Fehr & Peers

As shown in **Table 5-2**, peak hourly traffic volumes occur between 1 PM and 3 PM, outside the Bay Area-wide peak periods, further suggesting that the 4 hour PM peak period likely occurs from 2 PM to 6 PM.

Table 5-3 provides a summary of hourly traffic count data on SR 29 North of American Canyon Road in the southbound direction between 10 AM and 7 PM. Bold indicates the highest volume for each analysis period.

Table 5-3: SR 29 North of American Canyon Road (Southbound) Peaking Characteristics

Analysis Period	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM
Weekday – 2018	1,198	1,337	1,559	1,585	1,717	1,832	1,817	**1,918**	1,779
Friday – 2018	1,266	1,410	1,526	1,627	1,848	1,726	1,811	**1,855**	1,794
Friday – 2014	1,388	1,450	1,622	1,667	1,862	1,884	1,831	1,830	**1,890**

Source: Fehr & Peers

As shown in **Table 5-3**, peak hourly traffic volumes occur between 5 PM and 7 PM, consistent with the Bay Area-wide peak periods. Furthermore, Weekday 2018 data indicates that 2 PM to 3 PM is 6 percent lower 3 PM to 4 PM. However, Friday 2018 data indicates that 2 PM to 3 PM is roughly 7 percent higher than 3 PM to 4 PM. These two conflicting data points indicate geographical and directional difference exist when determining hourly peaking characteristics for Napa County.

5.2 Trip Purpose Information

What types of trips occur within Napa County?

Table 5-4 provides a summary of trip purpose information for all Napa County-generated vehicle trips for the following three trip purposes.

- Home-based work (HBW) trips are trips that are made between a home and work location.
- Home-based other (HBO) trips are trips that are made between a home and non-work location such as a grocery store, restaurant, or school.
- Non-home-based (NHB) trips are trips that are made between two non-home locations such as trips made between two retail stores or between a work location and a restaurant.

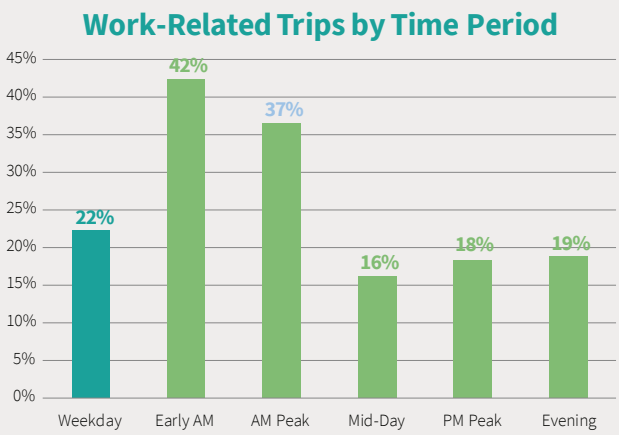
Table 5-4: Napa County Trip Purpose Information

Analysis Period	HBW Percent	HBO Percent	NHB Percent	HBW Trips	HBO Trips	NHB Trips
Spring 2018 – Average Weekday Daily	22%	41%	37%	128,000	235,000	216,000
Spring 2018 – Average Weekday AM Peak	37%	36%	28%	44,000	43,000	34,000
Spring 2018 – Average Weekday PM Peak	18%	44%	38%	31,000	75,000	65,000
Spring 2018 – Friday Daily	19%	42%	39%	112,000	247,000	234,000
Spring 2018 – Saturday Daily	10%	50%	40%	45,000	229,000	188,000
Spring 2018 – Sunday Daily	10%	53%	38%	44,000	236,000	173,000
Fall 2018 – Average Weekday Daily	20%	40%	39%	144,000	288,000	285,000
Summer 2018 – Average Weekday Daily	17%	42%	41%	109,000	266,000	263,000

Source: Fehr & Peers

As shown in **Table 5-4**, **roughly 22 percent of spring 2018 average weekday Napa County vehicle trips are work-related** and **roughly 40 percent of AM peak period Napa County vehicle trips are work-related**. Additionally, work-related trips reduce from 22 percent to 10 percent on the weekends and work-related trips reduce from 22 percent to 17 percent in summer.

The graphic below illustrates the percentage of trips that were work-related by time period in spring 2018.



The graphic below illustrates the average weekday trip purpose percentages in spring 2018.

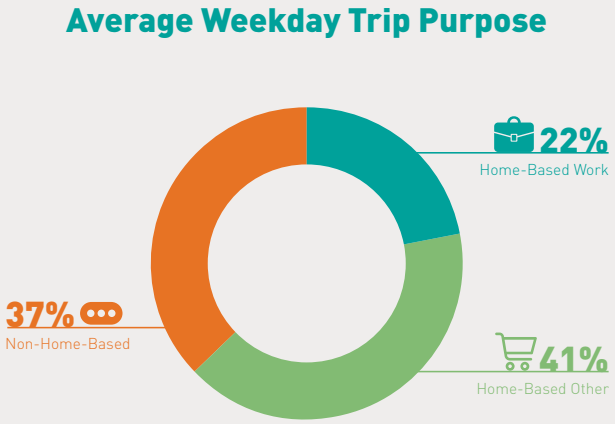


Table 5-5 provides a summary of trip purpose information for Napa County gateway vehicle trips for HBW, HBO, and NHB trips.

Table 5-5: Napa County Gateway Trip Purpose Information

Analysis Period	HBW Percent	HBO Percent	NHB Percent	HBW Trips	HBO Trips	NHB Trips
Spring 2018 – Average Weekday Daily	29%	38%	32%	41,000	51,000	44,000
Spring 2018 – Average Weekday AM Peak	**45%**	32%	22%	15,000	11,000	8,000
Spring 2018 – Average Weekday PM Peak	25%	38%	**37%**	9,000	14,000	14,000
Spring 2018 – Friday Daily	25%	41%	34%	33,000	55,000	46,000
Spring 2018 – Saturday Daily	11%	54%	35%	12,000	63,000	41,000
Spring 2018 – Sunday Daily	10%	**56%**	34%	11,000	**65,000**	40,000
Fall 2018 – Average Weekday Daily	27%	38%	35%	**42,000**	56,000	**54,000**
Summer 2018 – Average Weekday Daily	25%	39%	36%	34,000	52,000	50,000

Source: Fehr & Peers

Below is a bulleted summary of key findings from **Table 5-3**.

- **29 percent of spring 2018 average weekday Napa County vehicle trips at county gateways are work-related**.
- 45 percent of AM peak period Napa County vehicle trips at county gateways are work-related.
- Work-related trips at county gateways reduce from 29 percent to 10 percent on the weekends, and work-related trips at county gateways reduce from 29 percent to 25 percent in summer.
- The highest number (42,000) of home-based work trips occur on an average weekday in fall.
- The highest number (65,000) of home-based other trips occur on a Sunday in spring.
- The highest number (54,000) of non-home-based trips occur on an average weekday in fall.

5.3 Worker Information

How many work trips does Napa County import and export?

To estimate how many workers Napa County imports and exports on a daily basis, Fehr & Peers used advanced metric data provided by StreetLight in combination with ABAG Plan Bay Area 2040[2] 2018 land use data\

ABAG estimates that **in 2018 there were 74,533 employed residents and 80,125 jobs in Napa County**, a ratio of roughly 1.08 jobs per employed resident. Advanced metric data provided by StreetLight Data indicated that **roughly 66 percent of Napa County employed residents both lived and worked within Napa County**. When applied to the ABAG estimate of employed residents this resulted in roughly 49,000 residents who lived and worked in Napa County, representing an internal work trip. It was then assumed that the remaining 26,000 employed residents in Napa County traveled outside of Napa County for work, representing an exported work trip. It was also assumed that the remaining 31,000 jobs in Napa County were occupied by workers from outside Napa County, representing imported work trips.

[2] https://www.planbayarea.org/

Table 5-6 provides a summary of work trip type data for Napa County internal, imported, and exported work trips. The data presented only includes the travel to work portion of home-based work trips, and does not include the trip home from work in order to illustrate imported vs. exported workers.

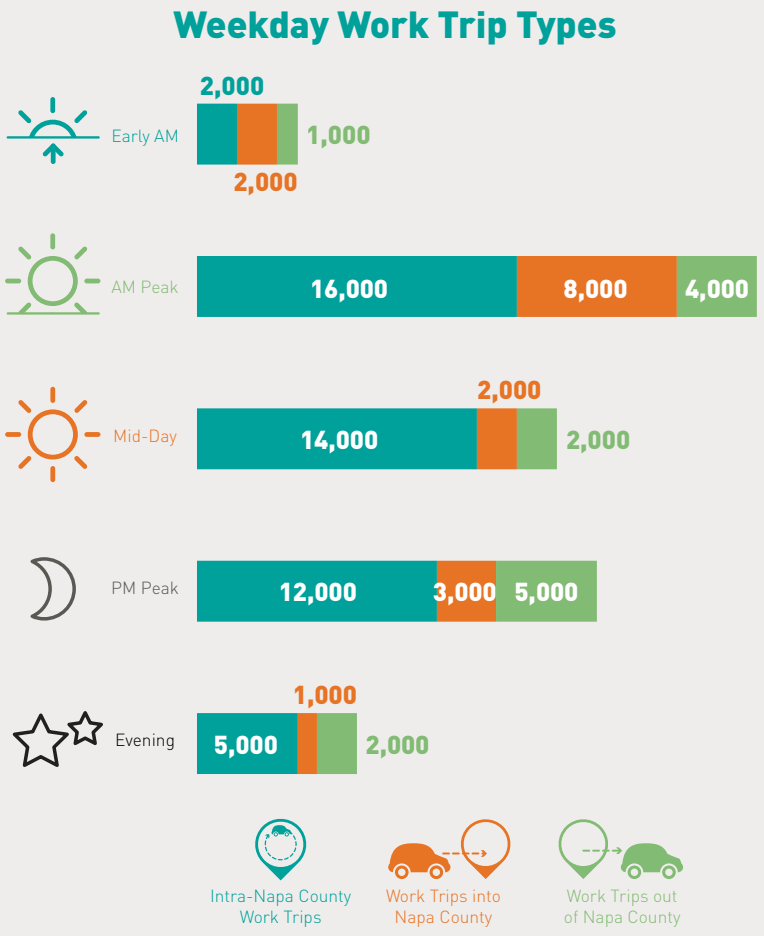
Table 5-6: Weekday Imported and Exported Workers

Work Trip Type	Daily	Daily %	Early AM	AM Peak	Mid-Day	PM Peak	Evening
Internal Work Trips	49,000	46%	2,000	16,000	14,000	12,000	5,000
Imported Work Trips	31,000	29%	6,000	16,000	6,000	2,000	1,000
Exported Work Trips	26,000	25%	5,000	10,000	6,000	3,000	2,000
Total Work Trips	**106,000**	**100%**	**13,000**	**42,000**	**26,000**	**17,000**	**8,000**
Percent of Total Work Trips	**100%**		**12%**	**40%**	**25%**	**16%**	**8%**

Source: Fehr & Peers

As shown in **Table 5-6**, roughly 46 percent of Napa County work trips are generated by residents who live and work in Napa County, 25 percent are generated by residents who work outside Napa County, and 29 percent are from Napa County employees who live outside Napa County and commute into Napa County.

The graphic below illustrates the number of internal, imported, and exported work trips on a weekday in spring 2018.



Where do Napa County residents work?

Table 5-7 provides a summary of the county in which Napa County residents work. This information was derived based on an analysis of Cuebiq-based home and work place distribution and 2011-2015 5-Year American Community Survey Commuting Flows[3] data.

Table 5-7: Where do Napa County Residents Work?

	#	Work County	Work Trips	Percent
	1	Napa County	57,800	77%
Exported Work Trip	2	Solano County	5,000	6.6%
	3	Sonoma County	2,700	3.6%
	4	Contra Costa County	2,100	2.8%
	5	San Francisco County	2,000	2.7%
	6	Marin County	1,500	2.0%
	7	Alameda County	1,200	1.6%
	8	San Mateo County	600	0.8%
	9	Santa Clara County	500	0.7%
	10	Sacramento County	500	0.6%

Source: Fehr & Peers

As shown in **Table 5-7**, **77 percent of Napa County residents live and work within Napa County**. Residents who work outside Napa County primarily commute to Solano (6.6 percent) and Sonoma (3.6 percent) counties.

Where do Napa County employees live?

Table 5-8 provides a summary of the county in which Napa County employees live. This information was derived based on an analysis of Cuebiq-based home and work place distribution and 2011-2015 5-Year American Community Survey Commuting Flows[4] data.

Table 5-8: Where do Napa County Employees Live?

	#	Work County	Work Trips	Percent
	1	Napa County	55,200	69%
Exported Work Trip	2	Solano County	12,800	16%
	3	Sonoma County	4,800	6.0%
	4	Lake County	1,800	2.3%
	5	Contra Costa County	1,800	2.2%
	6	Marin County	500	0.6%
	7	San Joaquin County	300	0.4%
	8	San Francisco County	300	0.4%
	9	Sacramento County	300	0.4%
	10	Alameda County	300	0.4%

Source: Fehr & Peers

As shown in **Table 5-8**, **69 percent of Napa County employees live and work within Napa County**. Employees who live outside Napa County primarily commute from Solano (16 percent) and Sonoma (6 percent) counties.

[3] https://www.census.gov/topics/employment/commuting/data/tables.html

[4] https://www.census.gov/topics/employment/commuting/data/tables.html

5.4 Trip Demographic Information

What are the demographics of Napa County vehicle trips?

Table 5-9 provides a summary of trip demographic information for all Napa County-generated vehicle trips based on average household income from 2010 ACS data.

Table 5-9: Napa County Trip Demographic Information

Analysis Period	Income Less Than $20K	Income $20K to $35K	Income $35K to $50K	Income $50K to $75K	Income $75K to $100K	Income $100K to $125K	Income $125K to $150K	Income $150K to $200K	Income More Than $200K
Spring 2018 – Average Weekday Daily	13%	12%	13%	18%	14%	11%	6%	7%	6%
Spring 2018 – Average Weekday AM Peak	13%	12%	13%	18%	14%	11%	6%	7%	6%
Spring 2018 – Average Weekday PM Peak	13%	12%	13%	18%	14%	11%	6%	7%	6%
Spring 2018 – Friday Daily	12%	12%	13%	18%	14%	11%	6%	7%	7%
Spring 2018 – Saturday Daily	12%	12%	12%	18%	14%	11%	6%	8%	7%
Spring 2018 – Sunday Daily	12%	12%	12%	18%	14%	11%	6%	7%	7%
Fall 2018 – Average Weekday Daily	13%	12%	13%	18%	14%	11%	6%	7%	7%
Summer 2018 – Average Weekday Daily	13%	12%	13%	18%	14%	11%	6%	7%	7%

Source: Fehr & Peers

As shown in **Table 5-9**, roughly **30% of Spring 2018 average weekday Napa County vehicle trips are made by households making more than $100,000 per year**. Additionally, the data indicates very little household income variation between analysis periods.

The graphic to the right illustrates the percentage of weekday trips made by households making more and less than $100,000 per year. For reference, the median household income for the entire Bay Area is roughly $99,000.

Percent of Weekday Trips by Average Household Income

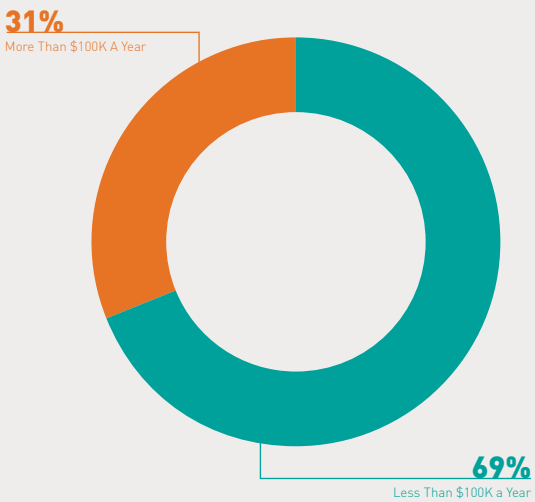


Table 5-10 provides a summary of trip demographic information for Napa County gateway vehicle trips based on average household income from 2010 ACS data.

Table 5-10: Napa County Gateway Trip Demographic Information

Analysis Period	Income Less Than $20K	Income $20K to $35K	Income $35K to $50K	Income $50K to $75K	Income $75K to $100K	Income $100K to $125K	Income $125K to $150K	Income $150K to $200K	Income More Than $200K
Spring 2018 – Average Weekday Daily	13%	12%	12%	19%	14%	11%	6%	7%	5%
Spring 2018 – Average Weekday AM Peak	13%	12%	13%	19%	14%	11%	6%	7%	5%
Spring 2018 – Average Weekday PM Peak	13%	12%	12%	19%	14%	11%	7%	7%	5%
Spring 2018 – Friday Daily	13%	12%	12%	19%	14%	11%	6%	7%	6%
Spring 2018 – Saturday Daily	13%	12%	12%	18%	14%	11%	7%	8%	6%
Spring 2018 – Sunday Daily	13%	12%	12%	18%	14%	11%	7%	7%	6%
Fall 2018 – Average Weekday Daily	13%	12%	12%	19%	14%	11%	6%	7%	6%
Summer 2018 – Average Weekday Daily	13%	12%	12%	19%	14%	11%	6%	7%	6%

Source: Fehr & Peers

As shown in **Table 5-10**, roughly **30% of Spring 2018 average weekday Napa County vehicle trips at county gateways are made by households making more than $100,000 per year**. Additionally, the data indicates very little household income variation between analysis periods.

5.5 Visitor Information

Where do visitors to Napa County come from?

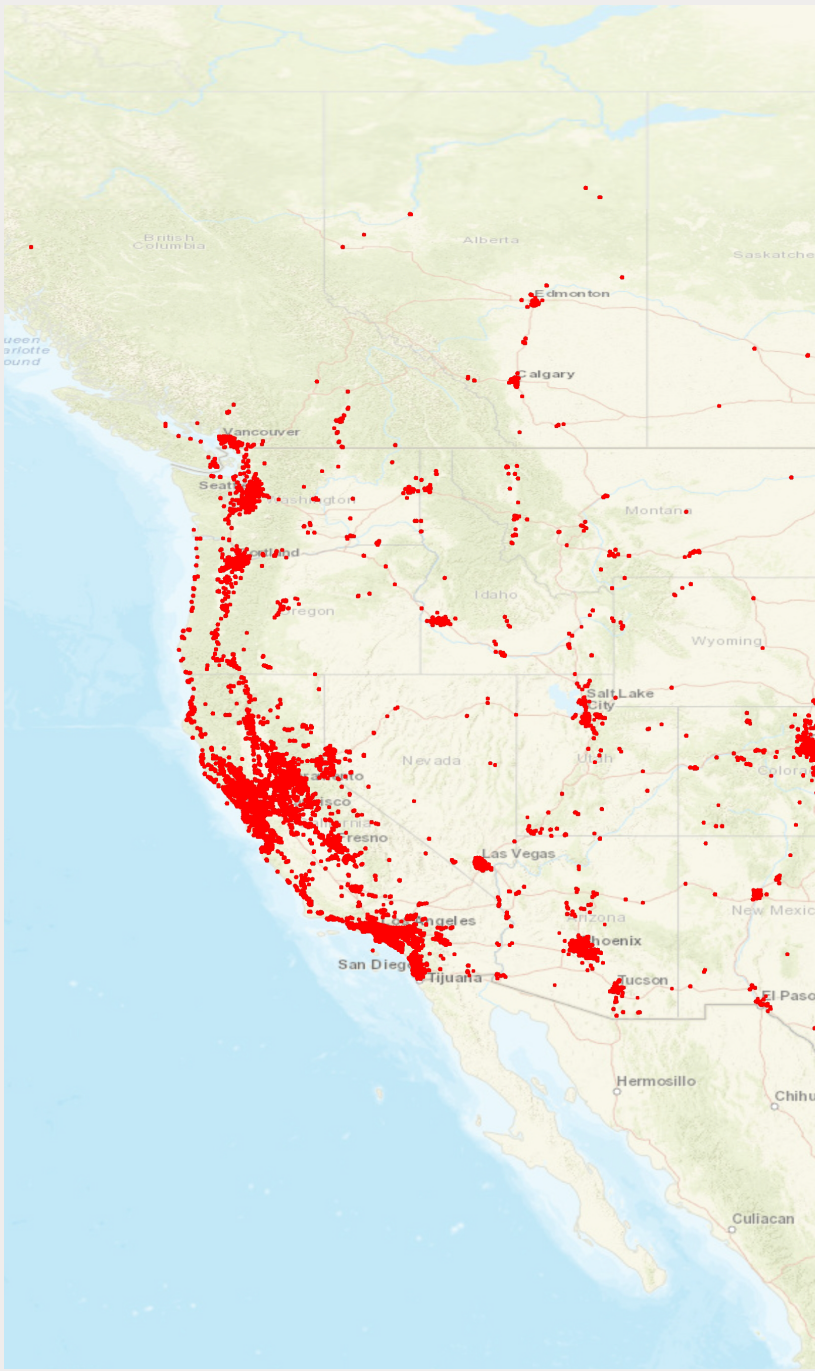
Visitor home and work advanced metric data provided by StreetLight Data was used to determine where visitors to Napa County come from. The visitor home and work analysis is first based on the determination of the home location for each mobile device that touched (traveled to, from, or through) Napa County during the spring 2018 data period. The home locations were then aggregated to Metropolitan Statistical Areas (MSAs) for reporting purposes. **Figure 5-1** illustrates the home locations of all mobile devices that touched Napa County in spring 2018.

As shown in the graphic to the right, the visitor home analysis indicated that on an average weekday 38 percent of mobile devices were from outside of Napa County and 43 percent on an average weekend day. It is important to note that this data considers a visitor to Napa County to be a device that does not have a home location in Napa County. Furthermore, the device could be traveling into Napa County for work or social recreation, or could be traveling through the county, making it difficult to estimate the number of vehicle trips made by devices visiting for social recreation (tourists).

However, this information can be combined with trip type, worker, and trip purpose information from previous sections of the report to estimate the number of devices visiting Napa County for social recreation (tourist) purposes. The following information from previous sections of the report were used to estimate that **roughly 72,000 or 20% of weekday trips are for social recreation (tourist) purposes**.

- Roughly 360,000 weekday trips interact with Napa County
- 38 percent of mobile devices were from outside of Napa County, it was assumed that these devices also account for 38 percent of trips interacting with Napa County
- Napa county has roughly 12,000 pass-through trips
- Napa County imports 31,000 work trips
- On average about 70 percent of work trips make a non-home-based trip on their way to or form work or directly from work

Figure 5-1: Visitor Home Locations



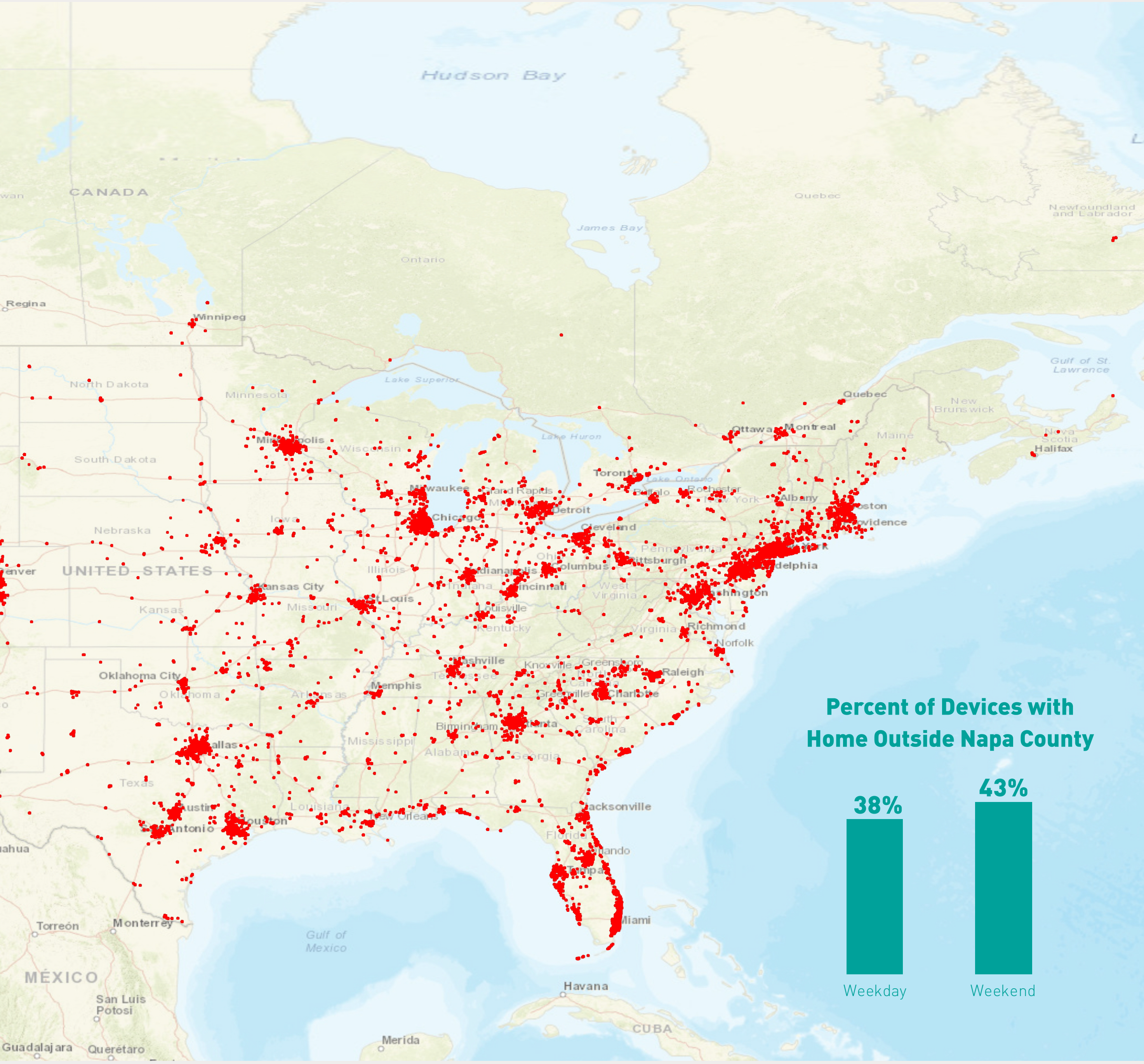

Hudson Bay
CANADA
James Bay
Ontario
Quebec
Newfoundland and Labrador
Regina
Winnipeg
North Dakota
Minnesota
Lake Superior
South Dakota
Gulf of St. Lawrence
Quebec
New Brunswick
Nova Scotia
Halifax
Ottawa
Montreal
Maine
Lake Huron
Toronto
Rochester
Albany
Boston
Nebraska
Iowa
Chicago
Detroit
Cleveland
UNITED STATES
Illinois
Columbus
Pittsburgh
Kansas City
Kansas
Missouri
St. Louis
Louisville
Kentucky
Virginia
Richmond
Norfolk
Oklahoma City
Nashville
Knoxville
Raleigh
Memphis
Charlotte
Birmingham
Atlanta
Mississippi
Alabama
Georgia
Texas
Austin
San Antonio
Houston
New Orleans
Jacksonville
Florida
Miami
Torreón
Monterrey
Gulf of Mexico
MÉXICO
San Luis Potosí
Havana
CUBA
Mérida
Guadalajara
Querétaro
Percent of Devices with Home Outside Napa County
38%
43%
Weekday
Weekend

Table 5-11 provides a list of the top ten metro areas with visitors to Napa County on an average weekday and on an average weekend day.

Table 5-11: Metro Areas with Visitors to Napa County

#	Average Weekend Day		Average Weekday	
1	Vallejo-Fairfield, CA	33%	Vallejo-Fairfield, CA	39%
2	San Francisco-Oakland-Fremont, CA	24%	San Francisco-Oakland-Fremont, CA	19%
3	Santa Rosa-Petaluma, CA	11%	Santa Rosa-Petaluma, CA	13%
4	Sacramento--Arden-Arcade--Roseville, CA	8%	Sacramento--Arden-Arcade--Roseville, CA	8%
5	Los Angeles-Long Beach-Santa Ana, CA	3%	Los Angeles-Long Beach-Santa Ana, CA	3%
6	San Jose-Sunnyvale-Santa Clara, CA	3%	Clearlake, CA	2%
7	Clearlake, CA	2%	San Jose-Sunnyvale-Santa Clara, CA	2%
8	Stockton, CA	1.5%	Stockton, CA	2%
9	New York-Northern New Jersey-Long Island, NY-NJ-PA	1.0%	New York-Northern New Jersey-Long Island, NY-NJ-PA	0.9%
10	San Diego-Carlsbad-San Marcos, CA	0.9%	Chicago-Joliet-Naperville, IL-IN-WI	0.8%

Source: Fehr & Peers

As shown in **Table 5-11**, roughly 33 percent of Napa County visitors are from the Vallejo-Fairfield MSA on an average weekend day while 24 percent are from the San Francisco-Oakland-Fremont MSA. Furthermore, the Vallejo-Fairfield average weekday percentage goes down by roughly 6 percent on the weekends, likely due to a large percentage of the trips being work-related, while the San Francisco-Oakland-Fremont percentage increases by roughly 5 percent on the weekends, suggesting a high percentage of weekend visitors from San Francisco, Oakland, and Fremont.

5.6 Trip Length Information

What is the length of Napa County vehicle trips?

Table 5-12 provides a summary of trip length information for all Napa County-generated vehicle trips based on Cuebiq-based LBS data from StreetLight Data.

Table 5-12: Napa County Trip Length Information

Analysis Period	Average Trip Length	0 to 1 miles	1 to 2 miles	2 to 5 miles	5 to 10 miles	10 to 20 miles	20 to 30 miles	30 to 40 miles	More than 40 miles
Spring 2018 – Average Weekday Daily	8.5	12%	19%	32%	15%	11%	5%	2%	4%
Spring 2018 – Average Weekday AM Peak	9.7	11%	17%	31%	16%	12%	7%	3%	4%
Spring 2018 – Average Weekday PM Peak	7.6	12%	20%	32%	16%	10%	5%	2%	3%
Spring 2018 – Friday Daily	8.7	13%	19%	31%	15%	11%	5%	2%	4%
Spring 2018 – Saturday Daily	9.5	12%	19%	30%	15%	11%	5%	2%	5%
Spring 2018 – Sunday Daily	9.7	12%	20%	30%	14%	10%	5%	2%	5%
Fall 2018 – Average Weekday Daily	7.8	13%	21%	32%	14%	10%	4%	2%	3%
Summer 2018 – Average Weekday Daily	7.9	13%	21%	32%	14%	10%	4%	2%	3%

Source: Fehr & Peers

As shown in **Table 5-12**, roughly 31 percent of Spring 2018 average weekday Napa County vehicle trips are less than 2 miles in length, 63 percent are less than 5 miles in length, and 11 percent are more than 20 miles in length. Additionally, **8.5 miles is the average trip length of Napa County-generated vehicle trips**.

Furthermore, the **average trip length increases from 8.5 miles on a weekday to 9.5 miles on Saturday and 9.7 miles on Sunday** and trips less than 5 miles in length increase from 63 percent in spring 2018 to 66 percent in fall 2018 and summer 2018.

The graphic to the right illustrates the average weekday Napa County-generated trip length distribution.

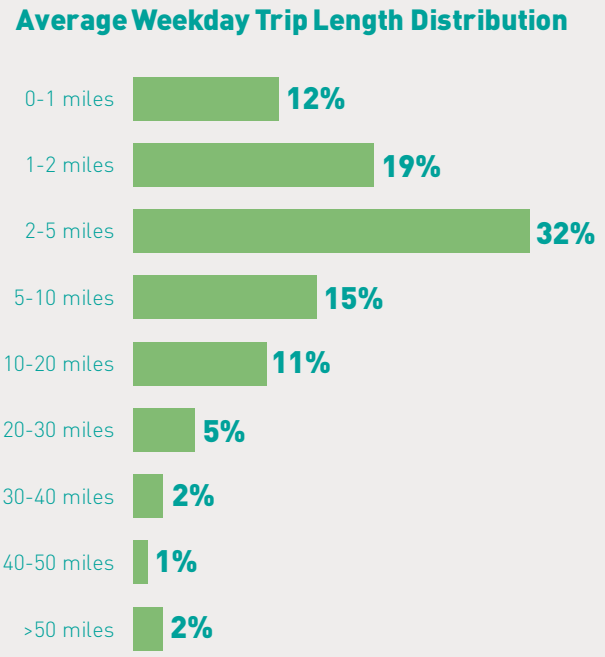


Table 5-13 provides a summary of trip length information for Napa County gateway vehicle trips based on Cuebiq-based LBS data from StreetLight Data.

Table 5-13: Napa County Gateway Trip Length Information

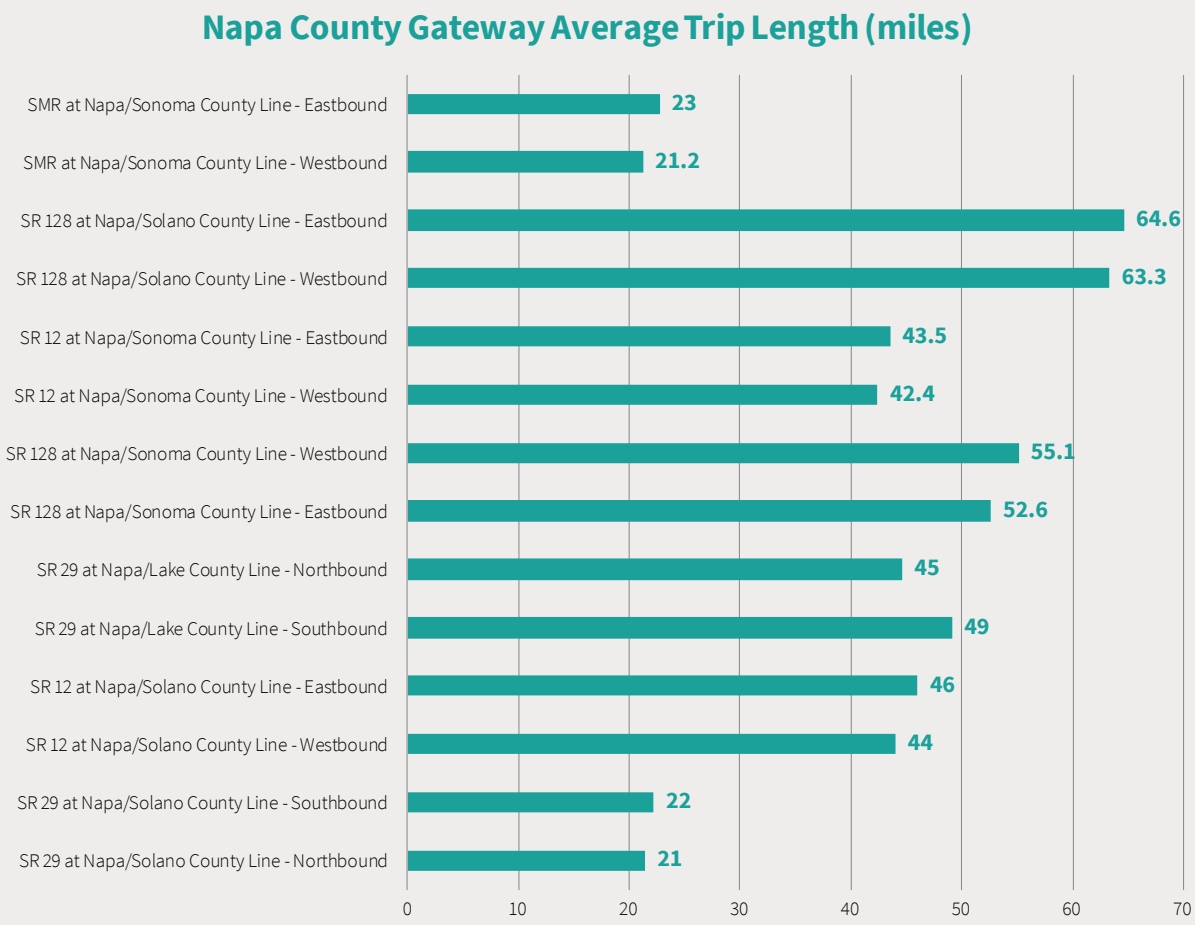
Analysis Period	Average Trip Length	0 to 1 miles	1 to 2 miles	2 to 5 miles	5 to 10 miles	10 to 20 miles	20 to 30 miles	30 to 40 miles	More than 40 miles
Spring 2018 – Average Weekday Daily	36.8	0%	1%	6%	8%	23%	18%	13%	31%
Spring 2018 – Average Weekday AM Peak	36.6	0%	1%	4%	6%	23%	20%	15%	31%
Spring 2018 – Average Weekday PM Peak	34.1	0%	1%	7%	9%	23%	18%	14%	28%
Spring 2018 – Friday Daily	37.7	0%	1%	6%	8%	23%	16%	13%	33%
Spring 2018 – Saturday Daily	39.7	0%	2%	6%	8%	20%	15%	12%	37%
Spring 2018 – Sunday Daily	42.1	0%	1%	6%	8%	20%	14%	11%	40%
Fall 2018 – Average Weekday Daily	37.0	0%	2%	6%	8%	22%	17%	12%	32%
Summer 2018 – Average Weekday Daily	38.7	0%	1%	6%	8%	22%	16%	12%	34%

Source: Fehr & Peers

As shown in **Table 5-13**, roughly 31 percent of Spring 2018 average weekday Napa County vehicle trips at county gateways are more than 40 miles in length, 62 percent are more than 20 miles in length, and 85 percent are more than 10 miles in length. Additionally, **roughly 37 miles is the average trip length of Napa County vehicle trips at county gateways**.

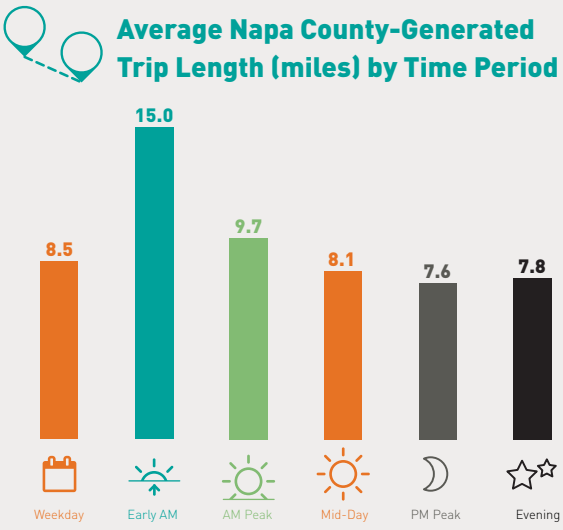
Furthermore, the **average trip length increases from 37 miles on a weekday to roughly 40 miles on Saturday and 42 miles on Sunday** and trips more than 40 miles in length increase from 31 percent in Spring 2018 to 32 percent in fall 2018 and 34 percent in summer 2018.

The chart below illustrates the average weekday trip length at each Napa County Gateway in spring 2018.

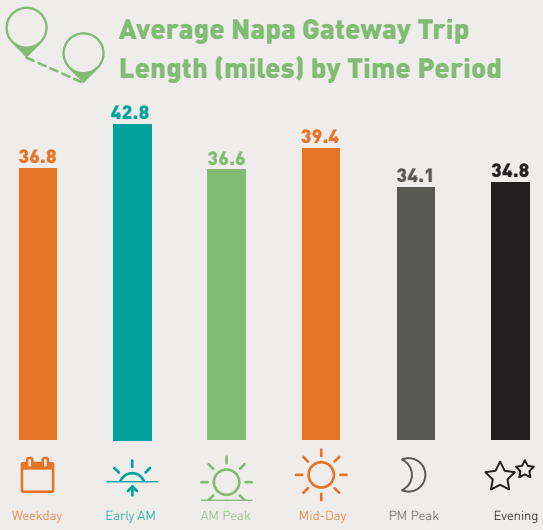


How do Napa County trip lengths vary by weekday time period?

The graphic below illustrates the average Napa County-generated trip length by weekday time period in spring 2018.



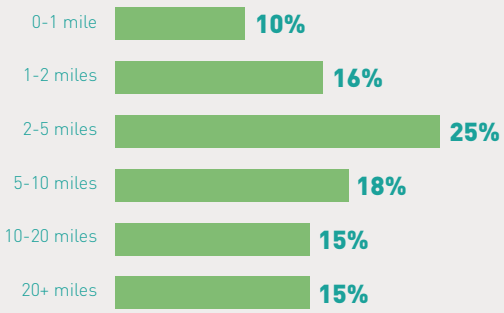
The graphic below illustrates the average Napa County gateway trip length by weekday time period in spring 2018.



How do Napa County trip lengths vary by jurisdiction?

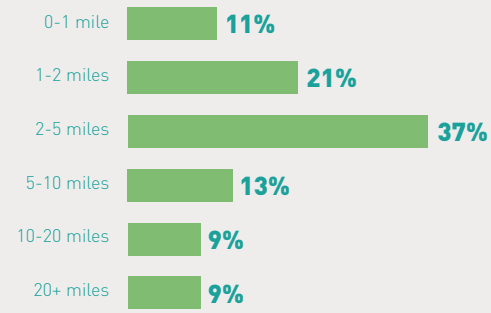
The graphics below illustrate the trip length distribution for Napa County jurisdictions on a weekday in spring 2018.

American Canyon



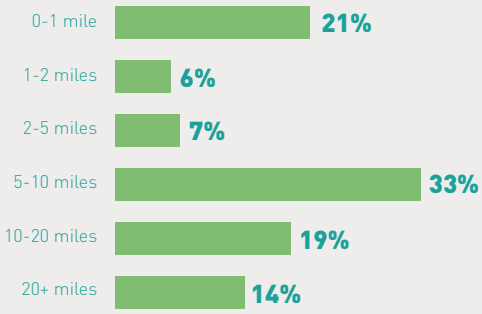
Average Trip Length
10.3 miles

City of Napa



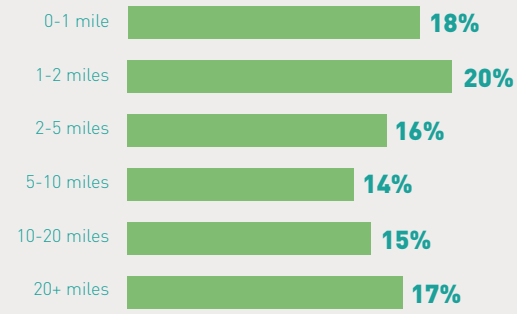
Average Trip Length
7.1 miles

Yountville



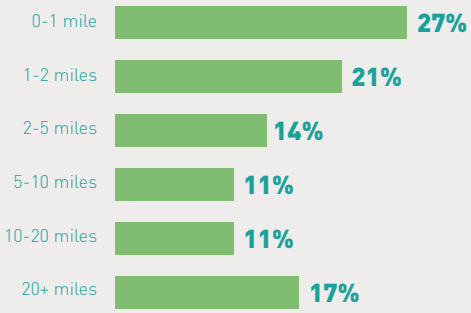
Average Trip Length
10.7 miles

St Helena



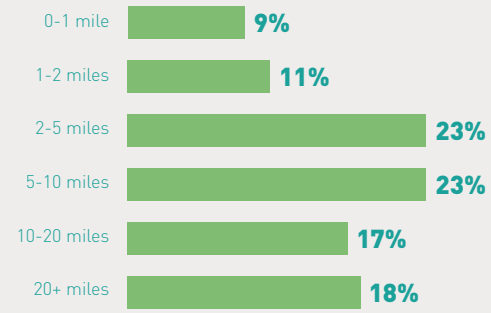
Average Trip Length
10.9 miles

Calistoga



Average Trip Length
10.1 miles

Unincorporated Napa County



Average Trip Length
11.8 miles


STOP

5.7 Vehicle Miles Traveled Information

How much VMT is generated by Napa County and the different types of trips that occur within Napa County?

Table 5-14 provides a summary of daily vehicle miles traveled (VMT) information for all Napa County-generated vehicle trips based on scaled Cuebiq-based LBS data from StreetLight Data.

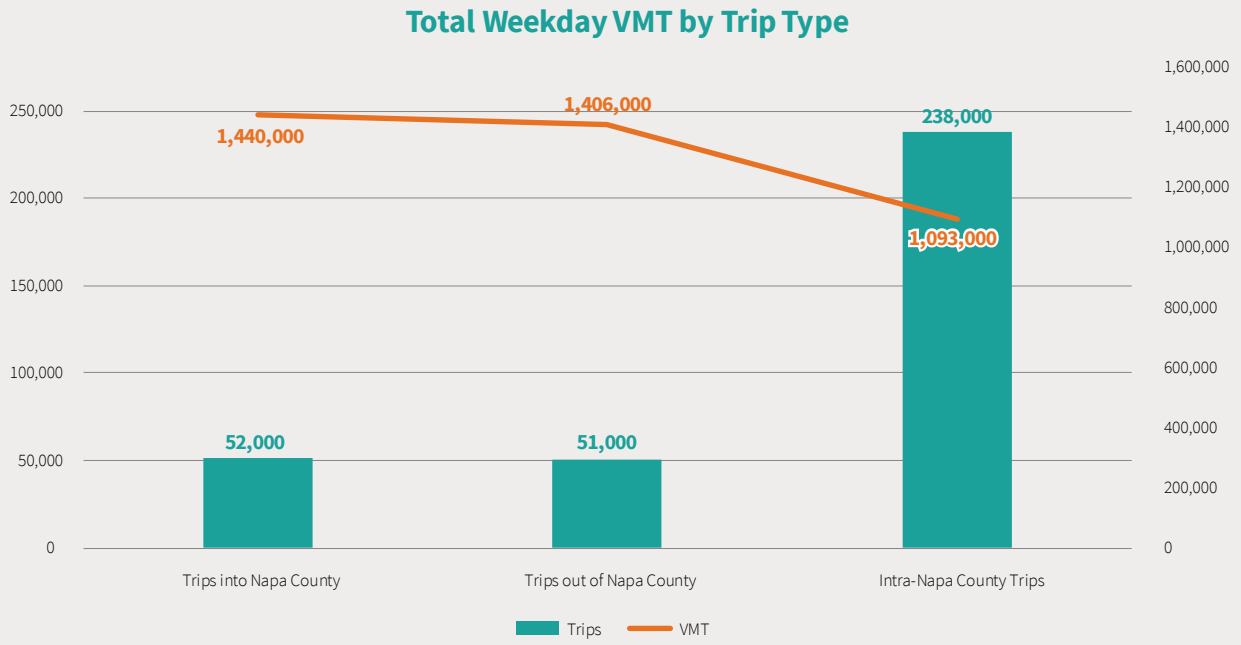
Table 5-14: Daily Vehicle Miles Traveled Information

Trip Type	Spring 2018 Weekday	Fall 2018 Weekday	Summer 2018 Weekday	2015 MTC Travel Model One	2015 MTC Travel Model Two	2015 Napa Travel Model
Daily Vehicle Miles Traveled						
Intra-Napa County Trips	1,093,000	1,338,000	1,170,000	1,391,000	1,472,000	
Trips into Napa County	1,440,000	1,622,000	1,454,000	1,850,000	1,479,000	
Trips out of Napa County	1,406,000	1,586,00	1,424,000	1,838,000	1,528,000	
Total Napa County Trips	**3,939,000**	**4,547,000**	**4,048,000**	**5,079,000**	**4,479,000**	
Percent of Spring 2018		**115%**	**103%**	**129%**	**114%**	
Daily Vehicle Trips						
Intra-Napa County Trips	238,000	301,000	268,000	344,000	343,000	
Trips into Napa County	52,000	58,000	52,000	89,000	69,000	
Trips out of Napa County	51,000	57,000	51,000	89,000	69,000	
Total Napa County Trips	**341,000**	**417,000**	**370,000**	**522,000**	**481,000**	
Percent of Spring 2018		**122%**	**109%**	**153%**	**141%**	
Daily Average Trips Length (miles)						
Intra-Napa County Trips	4.6	4.4	4.4	4.0	4.5	
Trips into Napa County	27.5	28.0	28.2	20.7	21.4	
Trips out of Napa County	27.5	27.8	27.9	20.6	21.4	
Total Napa County Trips	**11.5**	**10.9**	**10.9**	**9.7**	**9.3**	
Percent of Spring 2018		**95%**	**95%**	**84%**	**81%**	

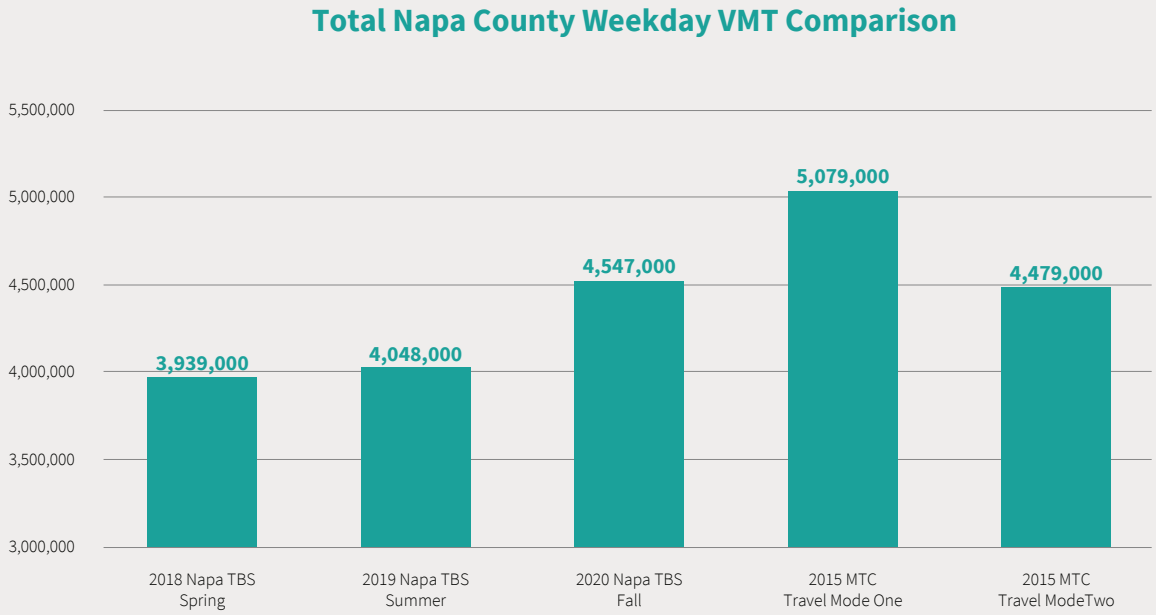
Source: Fehr & Peers

As shown in **Table 5-14**, **on an average weekday in Spring 2018 roughly 341,000 Napa County vehicle trips generate roughly 3.9 million VMT, with an average trip length of 11.5 miles**. Additionally, 28 percent of the VMT is generated by intra-county trips (comprise 64% of trips) and 72 percent of the VMT is generated by inter-county trips (comprise 36% of trips).

The chart below illustrates the number of daily vehicle trips generated by Napa County (shown in blue) compared to the total VMT generated by Napa County trips (shown in orange) on a weekday in spring 2018. As shown below, trips into and out of Napa County generate significantly more VMT than intra-Napa County trips despite comprising only roughly one-third of total weekday trips.



The graphic below illustrates the seasonal and MTC Travel Model VMT comparison.



How much VMT is generated by Napa County jurisdictions?

Table 5-15 provides a summary of daily VMT generated by each jurisdiction in Napa County.

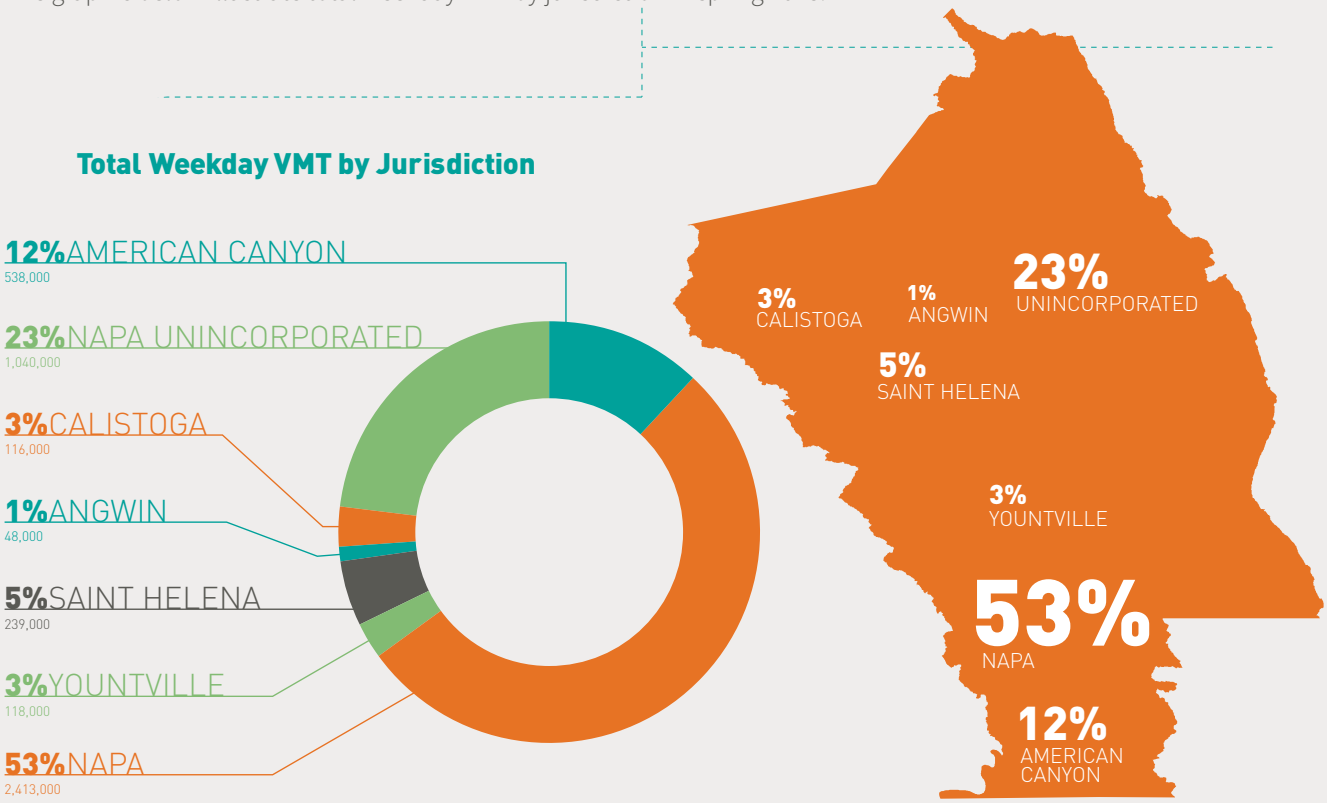
Table 5-15: Daily Vehicle Miles Traveled Information by Jurisdiction

Jurisdiction	Spring 2018 Weekday			Fall 2018 Weekday			Summer 2018 Weekday		
	VMT	Trips	Average Trip Length	VMT	Trips	Average Trip Length	VMT	Trips	Average Trip Length
American Canyon	538,000	51,000	10.5	570,000	61,000	9.3	495,000	61,000	8.1
Napa	2,413,000	232,000	10.4	2,765,000	281,000	9.8	2,466,000	281,000	8.8
Yountville	118,000	9,000	13.1	162,000	11,000	14.7	144,000	11,000	13.1
Saint Helena	239,000	18,000	13.3	277,000	22,000	12.6	244,000	22,000	11.1
Calistoga	116,000	10,000	11.6	152,000	13,000	11.7	120,000	13,000	9.2
Angwin	48,000	5,000	9.6	59,000	5,000	11.8	38,000	5,000	7.6
Unincorporated	1,040,000	77,000	13.5	1,232,000	96,000	12.8	1,128,000	96,000	11.8

Source: Fehr & Peers

As shown in **Table 5-15**, **on an average weekday in Spring 2018 the City of Napa generates roughly 2.4 million VMT with an average trip length of 10.4 miles**.

The graphic below illustrate total weekday VMT by jurisdiction in spring 2018.



How much VMT is generated by key VMT generators in Napa County?

Below is a bulleted summary of VMT generated on an average weekday in spring 2018 by key VMT generators in Napa County.

- City of Napa to City of Napa trips (139,000 trips) generate roughly 310,000 vehicle miles traveled, an average trip length of 2.2 miles.
- Bel Aire Plaza generates 169,000 vehicle miles traveled from 23,300 trips, an average trip length of 7.3 miles.
- South Napa Market Place generates 130,000 vehicle miles traveled from 16,900 trips, an average trip length of 7.7 miles.
- Oxbow generates 37,000 vehicle miles traveled from 3,800 trips, an average trip length of 9.7 miles.
- Napa Junction Center (American Canyon) generates 99,000 vehicle miles traveled from 11,600 trips, an average trip length of 8.5 miles.

6. ROADWAY SEGMENTS

This chapter presents a summary of the travel behavior study findings for specific roadway segments within Napa County. Detailed data for all data periods, day types, and day parts is provided for all 44 “middle filter” roadway locations in **Appendix C**.

6.1 SR 29 North of American Canyon Road

What types of trips are occurring on SR 29 north of American Canyon Road?

Table 6-1 provides a summary of daily, AM peak period, and PM peak period vehicle trips on SR 29 north of American Canyon Road on an average weekday in spring 2018, stratified by the four trip types discussed in **Chapter 4**. Data is presented separately for the northbound and southbound directions.

Table 6-1: Weekday Trip Types on SR 29 north of American Canyon Road

Trip Type	Daily		AM Peak Period		PM Peak Period	
Northbound						
Intra-Napa County Trips	3,100	14%	600	10%	800	15%
Trips into Napa County	18,700	82%	4,900	84%	4,000	81%
Trips out of Napa County	100	0%	100	1%	0	0%
Napa County Pass-Through Trips	1,000	4%	300	5%	200	4%
Total Trips Interacting with Napa County	**22,900**	**100%**	**5,900**	**100%**	**5,000**	100%
Southbound						
Intra-Napa County Trips	3,700	15%	400	10%	1,200	16%
Trips into Napa County	400	2%	100	2%	100	2%
Trips out of Napa County	18,300	77%	3,200	80%	5,700	78%
Napa County Pass-Through Trips	1,500	6%	300	8%	300	4%
Total Trips Interacting with Napa County	**23,900**	**100%**	**4,000**	**100%**	**7,300**	100%

Source: Fehr & Peers

As shown in **Table 6-1**, on an average weekday in spring 2018 **roughly 23,000 vehicle trips traveled northbound and roughly 24,000 vehicle trips traveled southbound on SR 29 north of American Canyon Road**. The data also indicates that 1,900 more vehicles travel northbound in the AM peak period than travel southbound in the AM peak period (5,900 compared to 4,000 vehicles), while 2,300 more vehicles travel southbound in the PM peak period than travel northbound in the PM peak period (7,300 compared to 5,000 vehicles).

Table 6-1 also indicates that roughly 2,500 of the 47,000 bidirectional vehicle trips are passing through Napa County without stopping, representing roughly 5 percent of daily trips on SR 29 north of American Canyon Road.

Where are trips starting and ending that travel on SR 29 north of American Canyon Road?

Table 6-2 provides a summary of weekday all-day origins and destinations of vehicle trips that travel northbound on SR 29 north of American Canyon Road. Green shading indicates magnitude of travel.

Table 6-2: Weekday All-Day Origins and Destinations of Vehicle Trips that Travel Northbound on SR 29 North of American Canyon Road

Trip Origins		Area	Trip Destinations	
Total Vehicle Trips	Percentage of Trips		Total Vehicle Trips	Percentage of Trips
0	0%	Calistoga	60	0%
0	0%	Angwin	70	0%
10	0%	Saint Helena	230	1%
0	0%	Yountville	290	1%
40	0%	City of Napa	8,450	37%
3,200	14%	American Canyon	10,490	46%
0	0%	Unincorporated	2,200	10%
110	0%	Lake/Sonoma County	700	3%
110	0%	Marin County	10	0%
14,720	64%	Solano County	320	1%
50	0%	Yolo/Sac County	20	0%
1,570	7%	Alameda County	20	0%
1,920	8%	Contra Costa County	30	0%
1,180	5%	Peninsula Counties	20	0%
22,900	**100%**	**Total**	**22,900**	**100%**

Source: Fehr & Peers

As shown in **Table 6-2**, **64 percent of vehicle trips traveling northbound on SR 29 at American Canyon Road originate in Solano County, with 46 percent ending in American Canyon and 37 percent ending in the City of Napa**. Additionally, 14 percent of vehicle trips start in American Canyon, likely representing residents who live south of American Canyon Road traveling north to access services and jobs further north.

Table 6-3 provides a summary of weekday all-day origins and destinations of vehicle trips that travel southbound on SR 29 north of American Canyon Road. Green shading indicates magnitude of travel.

Table 6-3: Weekday All-Day Origins and Destinations of Vehicle Trips that Travel Southbound on SR 29 North of American Canyon Road

Trip Origins		Area	Trip Destinations	
Total Vehicle Trips	Percentage of Trips		Total Vehicle Trips	Percentage of Trips
70	0%	Calistoga	0	0%
60	0%	Angwin	0	0%
230	1%	Saint Helena	0	0%
200	1%	Yountville	0	0%
8,050	34%	City of Napa	160	1%
11,420	48%	American Canyon	3,930	16%
1,980	8%	Unincorporated	30	0%
550	2%	Lake/Sonoma County	150	1%
30	0%	Marin County	180	1%
1,030	4%	Solano County	14,620	61%
40	0%	Yolo/Sac County	90	0%
60	0%	Alameda County	1,520	6%
100	0%	Contra Costa County	2,070	9%
100	0%	Peninsula Counties	1,180	5%
23,900	**100%**	**Total**	**23,900**	**100%**

Source: Fehr & Peers

As shown in **Table 6-3**, **48 percent of vehicle trips traveling southbound on SR 29 at American Canyon Road originate in American Canyon, with 61 percent ending in Solano County and 9 percent ending in Contra Costa County**. Additionally, 16 percent of vehicle trips end in American Canyon, likely representing residents who live south of American Canyon Road traveling back home after accessing services and jobs further north.

Table 6-4 provides a summary of weekday AM peak period origins and destinations of vehicle trips that travel northbound on SR 29 north of American Canyon Road. Green shading indicates magnitude of travel.

Table 6-4: Weekday AM Peak Period Origins and Destinations of Vehicle Trips that Travel Northbound on SR 29 North of American Canyon Road

Trip Origins		Area	Trip Destinations	
Total Vehicle Trips	Percentage of Trips		Total Vehicle Trips	Percentage of Trips
0	0%	Calistoga	10	0%
0	0%	Angwin	0	0%
0	0%	Saint Helena	60	1%
0	0%	Yountville	120	2%
0	0%	City of Napa	2,500	42%
680	12%	American Canyon	1,910	32%
0	0%	Unincorporated	920	16%
10	0%	Lake/Sonoma County	290	5%
10	0%	Marin County	0	0%
3,910	66%	Solano County	30	1%
10	0%	Yolo/Sac County	10	0%
410	7%	Alameda County	0	0%
580	10%	Contra Costa County	10	0%
260	4%	Peninsula Counties	10	0%
5,900	**100%**	**Total**	**5,900**	**100%**

Source: Fehr & Peers

As shown in **Table 6-4**, **66 percent of vehicle trips traveling northbound on SR 29 at American Canyon Road originate in Solano County, with 42 percent ending in the City of Napa and 32 percent ending in American Canyon**. Additionally, 12 percent of vehicle trips start in American Canyon, likely representing residents who live south of American Canyon Road traveling north to access services and jobs in American Canyon and the City of Napa.

Table 6-5 provides a summary of weekday AM peak period origins and destinations of vehicle trips that travel southbound on SR 29 north of American Canyon Road. Green shading indicates magnitude of travel

Table 6-5: Weekday AM Peak Period Origins and Destinations of Vehicle Trips that Travel Southbound on SR 29 North of American Canyon Road

Trip Origins		Area	Trip Destinations	
Total Vehicle Trips	Percentage of Trips		Total Vehicle Trips	Percentage of Trips
10	0%	Calistoga	0	0%
40	1%	Angwin	0	0%
70	2%	Saint Helena	0	0%
10	0%	Yountville	0	0%
1,440	36%	City of Napa	40	1%
1,820	46%	American Canyon	440	11%
220	6%	Unincorporated	10	0%
110	3%	Lake/Sonoma County	10	0%
0	0%	Marin County	30	1%
250	6%	Solano County	2,270	57%
10	0%	Yolo/Sac County	20	1%
10	0%	Alameda County	400	10%
20	1%	Contra Costa County	570	14%
10	0%	Peninsula Counties	220	6%
4,000	**100%**	**Total**	**4,000**	**100%**

Source: Fehr & Peers

As shown in **Table 6-5**, **46 percent of vehicle trips traveling southbound on SR 29 at American Canyon Road originate in American Canyon, with 57 percent ending in Solano County and 14 percent ending in Contra Costa County**. Additionally, 11 percent of vehicle trips end in American Canyon, likely representing residents who live south of American Canyon Road traveling back home after accessing services and jobs farther north.

What are the largest origin-destination pairs for vehicle trips on SR 29 North of American Canyon Road?

Table 6-6 provides a list of the largest weekday all-day origin-destination pairs for vehicle trips on SR 29 North of American Canyon Road. Data is presented separately for the northbound and southbound directions. Green shading indicates magnitude of travel. American Canyon origin/destination includes Napa Junction Center.

Table 6-6: Weekday All-Day Largest Origin-Destination pairs for Vehicle Trips that Travel on SR 29 North of American Canyon Road

#	Origin	Destination	Vehicle Trips	Percent of Total Vehicle Trips
		Northbound		
1	Vallejo	American Canyon	6,350	28%
2	Vallejo	City of Napa	4,960	22%
3	Vallejo	Napa Junction Center (American Canyon)	2,670	12%
4	Vallejo	Unincorporated Napa	1,230	5%
5	Vallejo	Napa Valley College	470	2%
		Southbound		
1	American Canyon	Vallejo	6,340	26%
2	City of Napa	Vallejo	4,420	18%
3	Napa Junction Center (American Canyon)	Vallejo	2,560	11%
4	Unincorporated Napa	Vallejo	960	4%
5	City of Napa	Contra Costa County	690	3%
6	City of Napa	Alameda County	660	3%
7	American Canyon	Contra Costa County	580	2%
8	Napa Valley College	Vallejo	350	1%
9	American Canyon	Alameda County	310	1%

Source: Fehr & Peers

As shown in **Table 6-6**, the largest northbound origin-destination pair is between Vallejo and American Canyon, accounting for 28 percent of northbound travel on a weekday. The largest southbound origin destination pair is between American Canyon and Vallejo, accounting for 26 percent of southbound travel on a weekday.

Table 6-7 provides a list of the largest weekday AM peak period origin-destination pairs for vehicle trips on SR 29 North of American Canyon Road. Data is presented separately for the northbound and southbound directions. Green shading indicates magnitude of travel. Daily magnitude order is maintained for comparison purposes. American Canyon origin/destination includes Napa Junction Center.

Table 6-7: Weekday AM Peak Period Largest Origin-Destination pairs for Vehicle Trips that Travel on SR 29 North of American Canyon Road

#	Origin	Destination	Vehicle Trips	Percent of Total Vehicle Trips
		Northbound		
1	Vallejo	American Canyon	1,170	20%
2	Vallejo	City of Napa	1,550	26%
3	Vallejo	Napa Junction Center (American Canyon)	310	5%
4	Vallejo	Unincorporated Napa	590	10%
5	Vallejo	Napa Valley College	300	5%
		Southbound		
1	American Canyon	Vallejo	950	24%
2	City of Napa	Vallejo	710	18%
3	Napa Junction Center (American Canyon)	Vallejo	260	7%
4	Unincorporated Napa	Vallejo	110	3%
5	City of Napa	Contra Costa County	210	5%
6	City of Napa	Alameda County	190	5%
7	American Canyon	Contra Costa County	230	6%
8	Napa Valley College	Vallejo	10	0%
9	American Canyon	Alameda County	90	2%

Source: Fehr & Peers

As shown in **Table 6-7**, the largest northbound origin-destination pair is between Vallejo and the City of Napa, accounting for 26 percent of northbound travel on a weekday. The largest southbound origin destination pair is between American Canyon and Vallejo, accounting for 24 percent of southbound travel on a weekday.

6.2 SR 29/SR 221 Intersection

What types of trips are occurring at the SR 29/SR 221 intersection?

Table 6-8 provides a summary of daily, AM peak period, and PM peak period vehicle trips at the SR 29/SR 221 intersection on an average weekday in spring 2018, stratified by the four trip types discussed in **Chapter 4**. Data is presented for all allowable directions of travel through the intersection.

Table 6-8: Weekday Trip Types at the SR 29/SR 221 Intersection

Trip Type	Daily		AM Peak Period		PM Peak Period	
Intra-Napa County Trips	22,000	26%	5,200	25%	6,500	32%
Trips into Napa County	28,000	34%	9,200	43%	5,000	25%
Trips out of Napa County	25,200	30%	4,600	21%	7,100	34%
Napa County Pass-Through Trips	8,400	10%	2,300	11%	1,900	9%
Total Trips Interacting with Napa County	**83,600**	**100%**	**21,300**	**100%**	**20,500**	100%

Source: Fehr & Peers

As shown in **Table 6-8**, on an average weekday in spring 2018 **roughly 83,600 vehicle trips traveled through the SR 29/SR 121 intersection**. The data also indicates that 4,600 more vehicles travel into Napa County in the AM peak period than travel out of Napa County in the AM peak period (9,200 compared to 4,600 vehicles), while 2,100 more vehicles travel out of Napa County in the PM peak period than travel in to Napa County in the PM peak period (7,100 compared to 5,000 vehicles).

Table 6-8 also indicates that roughly 8,400 of the 83,600 vehicle trips are passing through Napa County without stopping, representing roughly 10 percent of daily trips at the SR 29/SR 221 intersection.

Where are trips starting and ending that travel through the SR 29/SR 221 intersection?

Table 6-9 provides a summary of weekday all-day origins and destinations of vehicle trips that travel through the SR 29/SR 221 intersection. Green shading indicates magnitude of travel.

Table 6-9: Weekday All-Day Origins and Destinations of Vehicle Trips that Travel through the SR 29/SR 221 Intersection

Trip Origins		Area	Trip Destinations	
Total Vehicle Trips	Percentage of Trips		Total Vehicle Trips	Percentage of Trips
360	0%	Calistoga	420	1%
120	0%	Angwin	110	0%
1,040	1%	Saint Helena	1,160	1%
600	1%	Yountville	880	1%
31,100	37%	City of Napa	32,080	38%
6,790	8%	American Canyon	6,740	8%
7,120	9%	Unincorporated	8,640	10%
4,790	6%	Lake/Sonoma County	5,330	6%
190	0%	Marin County	160	0%
21,910	26%	Solano County	18,810	23%
2,690	3%	Yolo/Sac County	2,370	3%
1,730	2%	Alameda County	1,900	2%
3,770	5%	Contra Costa County	3,530	4%
1,380	2%	Peninsula Counties	1,440	2%
83,600	**100%**	**Total**	**83,600**	**100%**

Source: Fehr & Peers

As shown in **Table 6-9**, **37 percent of vehicle trips traveling through the SR 29/SR 221 intersection originate in the City of Napa and 26 percent originate in Solano County**. Additionally, 9 percent of vehicle trips originate in unincorporated areas of Napa County while 8 percent originate in American Canyon.

Table 6-10 provides a summary of weekday AM peak period origins and destinations of vehicle trips that travel through the SR 29/SR 221 intersection. Green shading indicates magnitude of travel.

Table 6-10: Weekday AM Peak Period Origins and Destinations of Vehicle Trips that Travel through the SR 29/SR 221 Intersection

Trip Origins		Area	Trip Destinations	
Total Vehicle Trips	Percentage of Trips		Total Vehicle Trips	Percentage of Trips
40	0%	Calistoga	160	1%
50	0%	Angwin	10	0%
270	1%	Saint Helena	280	1%
50	0%	Yountville	310	1%
5,930	28%	City of Napa	9,810	46%
2,170	10%	American Canyon	1,180	6%
1,320	6%	Unincorporated	2,750	13%
1,030	5%	Lake/Sonoma County	1,860	9%
30	0%	Marin County	50	0%
7,950	37%	Solano County	2,970	14%
780	4%	Yolo/Sac County	500	2%
390	2%	Alameda County	420	2%
1,120	5%	Contra Costa County	810	4%
210	1%	Peninsula Counties	220	1%
21,300	**100%**	**Total**	**21,300**	**100%**

Source: Fehr & Peers

As shown in **Table 6-10**, **37 percent of vehicle trips traveling through the SR 29/SR 221 intersection originate in Solano County and 28 percent originate in the City of Napa, with 46 percent of vehicle trips ending in the City of Napa and 14 percent ending in Solano County.**

What are the largest origin-destination pairs for vehicle trips that travel through the SR 29/SR 221 intersection?

Table 6-11 provides a list of the largest weekday all-day origin-destination pairs for vehicle trips that travel through the SR 29/SR 221 intersection. Green shading indicates magnitude of travel.

Table 6-11: Weekday All-Day Largest Origin-Destination pairs for Vehicle Trips that Travel through the SR 29/SR 221 Intersection

#	Origin	Destination	Vehicle Trips	Percent of Total Vehicle Trips
1	Vallejo	City of Napa	6,500	8%
2	City of Napa	Vallejo	6,100	7%
3	American Canyon	City of Napa	5,100	6%
4	City of Napa	American Canyon	5,100	6%
5	Fairfield	City of Napa	4,300	5%
6	City of Napa	Unincorporated Napa	3,700	4%
7	City of Napa	Fairfield	3,400	4%
8	Contra Costa County	City of Napa	2,600	3%
9	City of Napa	Contra Costa County	2,600	3%
10	Vacaville	City of Napa	2,000	2%

Source: Fehr & Peers

As shown in **Table 6-11**, the largest origin-destination pair is between Vallejo and the City of Napa, accounting for 8 percent of travel on a weekday. The second largest origin destination pair is between City of Napa and Vallejo, accounting for 7 percent of travel on a weekday.

Table 6-12 provides a list of the largest weekday AM peak period origin-destination pairs for vehicle trips that travel through the SR 29/SR 221 intersection. Green shading indicates magnitude of travel. Daily magnitude order is maintained for comparison purposes.

Table 6-12: Weekday AM Peak Period Largest Origin-Destination pairs for Vehicle Trips that Travel through the SR 29/SR 221 Intersection

#	Origin	Destination	Vehicle Trips	Percent of Total Vehicle Trips
1	Vallejo	City of Napa	2,200	10%
2	City of Napa	Vallejo	900	4%
3	American Canyon	City of Napa	1,500	7%
4	City of Napa	American Canyon	900	4%
5	Fairfield	City of Napa	1,500	7%
6	City of Napa	Unincorporated Napa	1,100	5%
7	City of Napa	Fairfield	600	3%
8	Contra Costa County	City of Napa	800	4%
9	City of Napa	Contra Costa County	600	3%
10	Vacaville	City of Napa	700	3%

Source: Fehr & Peers

As shown in **Table 6-11**, the largest origin-destination pair is between Vallejo and the City of Napa, accounting for 8 percent of travel on a weekday. The second largest origin destination pair is between City of Napa and Vallejo, accounting for 7 percent of travel on a weekday.

7. COMMERCIAL VEHICLES

This chapter presents a summary of the travel behavior study commercial vehicle findings based on an analysis of StreetLight Data's commercial vehicle GPS-based data product.[5]

[5] https://www.streetlightdata.com/accurately-measure-truck-traffic/

What types of truck trips are occurring within Napa County?

Table 7-1 provides a summary of total daily truck trips that interact with Napa County, stratified by the four trip types discussed in **Chapter 4**. A comparison to data for all vehicle types is also presented.

Table 7-1: Weekday All-Day Truck Trip Types

Trip Type	Total Vehicle Trips	Truck Trips	Percent of Total Vehicle Trips	2015 Napa Travel Model Truck Trips
Intra-Napa County Trips	238,000	9,000	3.8%	236
Trips into Napa County	52,000	2,700	5.2%	506
Trips out of Napa County	51,000	3,000	5.9%	506
Napa County Pass-Through Trips	12,000	700	5.8%	--
Total Trips Interacting with Napa County	**353,000**	**15,400**	**4.4%**	**1,248**

Source: Fehr & Peers

As shown in **Table 7-1**, on an average weekday in spring 2018 roughly **15,400 truck trips interacted with Napa County**, comprising roughly 4.4 percent of total vehicle trips. Additionally, approximately 9,000 (58 percent) truck trips started and ended within Napa County while 6,400 (42 percent) truck trips started or ended outside Napa County. **Table 4-1** also indicates that **roughly 700 truck trips passed through Napa County without stopping**, representing 4.5 percent of total truck trips interacting with Napa County and 10.9 percent of trips at Napa County gateways (inter-Napa County trips).

Weekday all-day truck trip type findings were generally consistent with the previous TBS, which estimated roughly 16,900 truck trips interacting with Napa County and 600 truck trips passing through Napa County. Truck trip data from the TBS was also compared to medium and large truck trip tables from the 2015 Napa Activity-Based Model and found to be inconsistent. The travel model forecasted roughly 1,200 truck trips starting or ending in Napa County, compared to 14,700 from the TBS.

What are the peaking characteristics of Napa County truck trips?

Table 7-2 provides a summary of the peaking characteristics of truck trips within Napa County and truck trips at Napa County gateways. The table provides the percentage of total truck trips that occur during each of the five analysis time periods along with a comparison to data for all vehicle trips that interact with Napa County. Bold indicates the time period with the highest percent of trips.

Table 7-2: Weekday Truck Peaking Characteristics

Truck Trip Type	Early AM	AM Peak	Mid-Day	PM Peak	Evening
Trucks Traveling within Napa County	7%	33%	**43%**	14%	3%
Trucks Traveling Through Napa County Gateways	9%	26%	**45%**	16%	5%
All Vehicle Trips that Interact with Napa County	4%	22%	**34%**	29%	12%

Source: Fehr & Peers

As shown in **Table 7-2**, roughly **45 percent of Napa County truck trips occur during the mid-day (10 AM to 3 PM) time period**. A comparison to data for all vehicle trips that interact with Napa County indicates that a higher percentage of truck trips occur in the morning and mid-day time periods and a lower percentage of trucks trips occur during the afternoon and evening time periods.

Where are truck trips starting and ending within Napa County?

Table 7-3 provides a summary of total truck trips starting and ending within each Napa County incorporated area. Bold indicates the high origin/destination city and orange shading indicates large differences between total vehicle trip and truck trip percentages.

Table 7-3: Weekday All-Day Truck Origins and Destinations by City

Trip Origins		City	Trip Destinations	
Total Vehicle Trips	Truck Trips		Total Vehicle Trips	Truck Trips
2%	3%	Calistoga	2%	3%
1%	1%	Angwin	1%	1%
4%	5%	Saint Helena	4%	5%
2%	1%	Yountville	2%	1%
65%	**40%**	**Napa**	**64%**	**40%**
11%	14%	American Canyon	12%	13%
14%	36%	Unincorporated	15%	36%
289,100	**100%**	**Total**	**290,300**	**100%**

Source: Fehr & Peers

As shown in **Table 7-3**, **roughly 40 percent of Napa County truck trips start or end within the City of Napa**, a significant decrease when compared to total vehicle trip percentages. Additionally, r**oughly 36 percent of Napa County truck trips start or end in unincorporated areas**, a significant increase when compared to total vehicle trip percentages likely due to the winery and agricultural nature of unincorporated areas.

What other counties do Napa County trucks interact with?

Table 7-4 provides a summary of the originating county of truck trips coming into Napa County and the destination county of truck trips leaving Napa County. Bold indicates the two highest origin/destination counties for each trip type and orange shading indicates large differences between total vehicle trip and truck trip percentages.

Table 7-4: Weekday All-Day Inter-County Truck Trips

Origin of Trips into Napa County		County	Destination of Trips out of Napa County	
Total Vehicle Trips	Truck Trips		Total Vehicle Trips	Truck Trips
2%	1%	Lake	2%	1%
19%	**23%**	**Sonoma**	**20%**	**22%**
3%	3%	Marin	3%	3%
55%	**40%**	**Solano**	**53%**	**43%**
2%	3%	Yolo	2%	4%
3%	4%	Sacramento	3%	4%
4%	8%	Alameda	4%	8%
8%	11%	Contra Costa	9%	10%
2%	3%	San Francisco	2%	2%
1%	2%	San Mateo	1%	1%
1%	2%	Santa Clara	1%	2%
100%	**100%**	**Total**	**100%**	**100%**

Source: Fehr & Peers

As shown in **Table 7-4**, **roughly 40 percent of Napa County inter-county truck trips are from Solano County**, a significant decrease when compared to total vehicle trip percentages. The data indicates that truck trips interact more with Sonoma, Alameda, and Contra Costa counties compared to counties total vehicle trips interact with.

What is the length of Napa County truck trips?

Table 7-5 provides a summary of trip length information for all Napa County-generated and Napa County gateway truck trips. Orange shading indicates the largest difference between total vehicle trip and truck trip percentages.

Table 7-5: Napa County Truck Trip Length Information

Analysis Period	Average Trip Length	0 to 1 miles	1 to 2 miles	2 to 5 miles	5 to 10 miles	10 to 20 miles	20 to 30 miles	30 to 40 miles	More than 40 miles
Napa County-Generated Total Vehicle Trips	8.5	12%	19%	32%	15%	11%	5%	2%	4%
Napa County-Generated Truck Trips	15.0	11%	13%	22%	15%	16%	8%	5%	10%
Napa County Gateway Total Vehicle Trips	36.8	0%	1%	6%	8%	23%	18%	13%	31%
Napa County Gateway Truck Trips	49.2	0%	0%	1%	4%	19%	13%	13%	49%

Source: Fehr & Peers

As shown in **Table 7-5**, the **average trip length for Napa County-generated truck trips is 15 miles**, roughly 75 percent higher than the average trip length for total vehicle trips. Additionally, the **average trip length for Napa County gateway truck trips is 49.2 miles**, roughly 35 percent higher than the average trip length for total vehicle trips. Furthermore, roughly 50 percent of Napa County gateway truck trips are more than 40 miles long.

How much VMT is generated by Napa County truck trips?

Table 7-6 provides a summary of daily VMT generated by all truck trips that start or end within Napa County and by truck trips that interact with each Napa County gateway. Bold indicates the highest VMT, trips, and average trip length for the Napa County gateways.

Table 7-6: Daily Truck Vehicle Miles Traveled Information

Napa County Gateway	Spring 2018 Weekday		
	VMT	Trips	Average
Trip Length	238,000	67%	
All Truck Trips that Start or End within Napa County	376,000	14,600	26
SR 29 at Napa/Solano County Line	78,000	2,300	35
SR 12 at Napa/Solano County Line	**181,000**	**2,900**	62
SR 29 at Napa/Lake County Line	13,000	300	44
SR 128 at Napa/Sonoma County Line	3,000	100	42
SR 12 at Napa/Sonoma County Line	86,000	1,800	49
SR 128 at Napa/Solano County Line	3,000	50	**63**
Spring Mountain Road at Napa/Sonoma County Line	500	25	20

Source: Fehr & Peers

As shown in **Table 7-6**, all **truck trips that start or end within Napa County generate roughly 376,000 VMT and have an average trip length of 26 miles**. Additionally, the largest truck VMT generating gateway is SR 12 at the Napa/Solano County Line, which generates roughly 181,000 VMT and has an average trip length of 62 miles.

8. CONCLUSIONS

The Napa Valley Travel Behavior Study provides NVTA with several data sets. The resulting data will provide NVTA and its member jurisdictions the basis for future planning efforts. Such uses may include but are not limited to the refinement of the Napa Travel Model, the Short Range Transit Plan and the update of the Countywide Transportation Plan. The data put forth in this study is to provide a data set for specific plans or projects that need baseline data. The TBS utilized data from a new data provider Cuebiq, which afforded a much larger sample size with reduced biases towards higher income households and vehicle trips, and the ability to determine each device's home and work location to which census information could be associated. The previous study relied on a very small sample of vehicle intercept survey data to determine home, work, and demographic information of observed trips.

New traffic counts were collected as part of the TBS to factor the relative sample of mobile device data to represent a single period of absolute data. Traffic counts indicated that traffic volumes increased by 3.5 percent or 0.7 percent per year since 2014.

A comparison of mobile device data indicated that origin-destination patterns remained largely unchanged, including pass-through travel, which remained roughly 10 percent of total countywide trips and predominantly between Solano and Sonoma counties. The directionality of trips also remained largely unchanged, with a slight increase in the percentage of inbound trips in the morning, indicating that Napa County is importing more trips today than it was in 2014.

The percentage of Napa County employees who live within the county also decreased by two percent, consistent with the increase in inbound trips in the morning to fill the jobs. The percentage of weekday trips made by social recreation visitors to Napa County increased by 3 percent, also consistent with the increase in inbound trips.

The new data source also allowed the TBS to better answer questions that were left unanswered in the previous TBS. Home and work location information allowed the study to determine that 106,000 work trips start or end within Napa County on an average work day and that roughly half of total work trips are from residents who live and work within Napa County. Trip length information allowed the study to determine that 31 percent of Napa County trips are less than 2 miles in length and 63% are less than 5 miles in length, representing trips that could shift to active modes of travel. Data provided on trip length and the top trip generators is particularly useful for NVTA and its jurisdictions, indicating places that further alternative transportation investments may be warranted.


PUBLIC MARKET
FIELDWORK
BREWING

APPENDIX A

TRAFFIC COUNT DATA

APPENDIX B

MOBILE DEVICE DATA LIMITATIONS AND POTENTIAL BIASES

Below is a discussion of mobile device data limitations and potential biases.

- Due to privacy concerns and sample rates, the indexed trip values in the origin-destination trip tables provided by StreetLight Data represent "relative" rather than "absolute" trips. In other words, the tables do not provide the total number of trips that occur on a daily basis but provide the relative relationship of trips from each zone to every other zone in the geographic layer. Therefore, the mobile device data origin-destination trip tables are used as a starting point due to their large sample size and high level of confidence in the origin-destination data and refined using traffic count data to factor the relative trip data to represent a single period of absolute data.
- Analysis of mobile device data and determination of origin-destination points relies on computer algorithms to determine where a trip starts and ends rather than direct user input. Current algorithm parameters define the end of a trip and determine a trip's destination if the mobile device travels no more than five meters for a five minute period of time.
- App-based mobile device data has a minimal potential bias towards higher income persons as a majority of the population now owns an app-enabled device and studies have shown that low income persons are preferring to get their internet from a cell phone as opposed to a residential provider. However, locational information is derived from a combination of cellular, GPS, and Wi Fi sources, reducing the spatial resolution and accuracy to roughly 20 to 30 meters when compared with GPS data alone which has a spatial resolution of rough 3 to 5 meters.
- App-based mobile device data typically represent persons traveling as the algorithms are currently not sophisticated enough to differentiate mode of travel. For instance, a typical transit trip may consist of a drive trip to a transit station, wait time for a train, stops at stations along the way, and a walk trip to the destination. Auto trips are usually much less complex as people generally drive directly from their origin to their destination.
- Mobile device data has a potential bias towards trips made by persons over the age of 16 due to privacy regulations requiring the non-inclusion of data associated with mobile devices registered to persons under the age of 16.
- Mobile device data has a potential bias towards non-school-related trips made by persons over the age of 16. Home and work location data analysis will ignore school-related trips as the algorithms only track the inferred "home" and "work" location of mobile devices. Origin-destination trip table data analysis may miss school drop-off trips as the algorithms determine a trip to end only when the mobile device has moved less than five meters in five minutes. However, school-related trips associated with students who drive themselves to school will likely be captured as the mobile device will remain relatively stationary while at school.
- Mobile device data has a potential bias towards traditional "9 to 5" workers as the home and work location algorithms assign work locations based on where the device is at rest between 11 AM and 4 PM and home locations based on where the device is at rest between 7 PM and 8 AM.

APPENDIX C
ORIGIN AND DESTINATION DATA

NAPA VALLEY
TRAVEL BEHAVIOR STUDY

NVTA
NAPA VALLEY TRANSPORTATION AUTHORITY

FEHR & PEERS