MARICOPA ASSOCIATION of GOVERNMENTS

MAG Bicycles Count Project

Bicycle Count Data Summary

Sherry Ryan, PhD

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CHEN RYAN

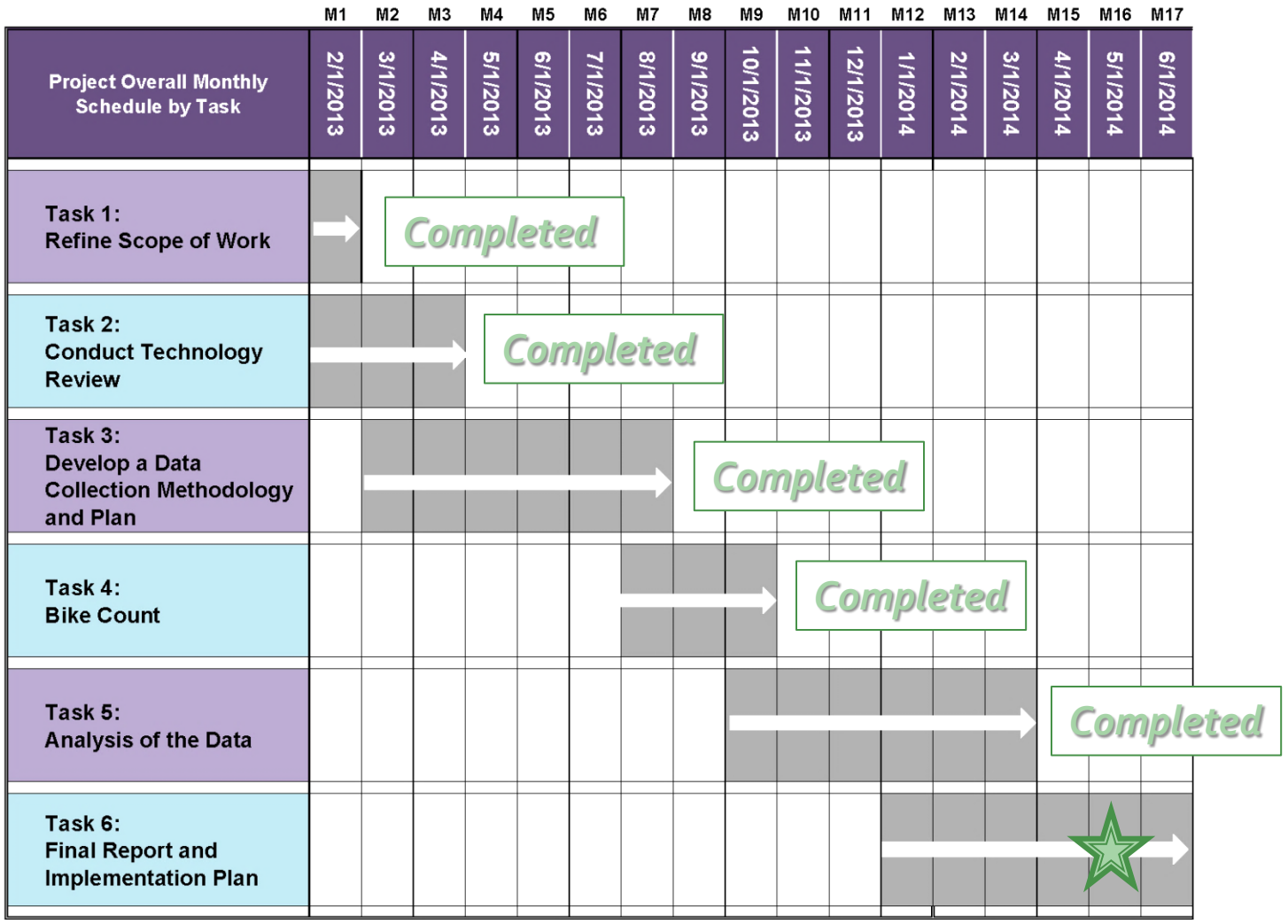
WILSON & COMPANY ENGINEERS & ARCHITECTS

COFFMAN STUDIO PLLC
Landscape Architecture & Planning

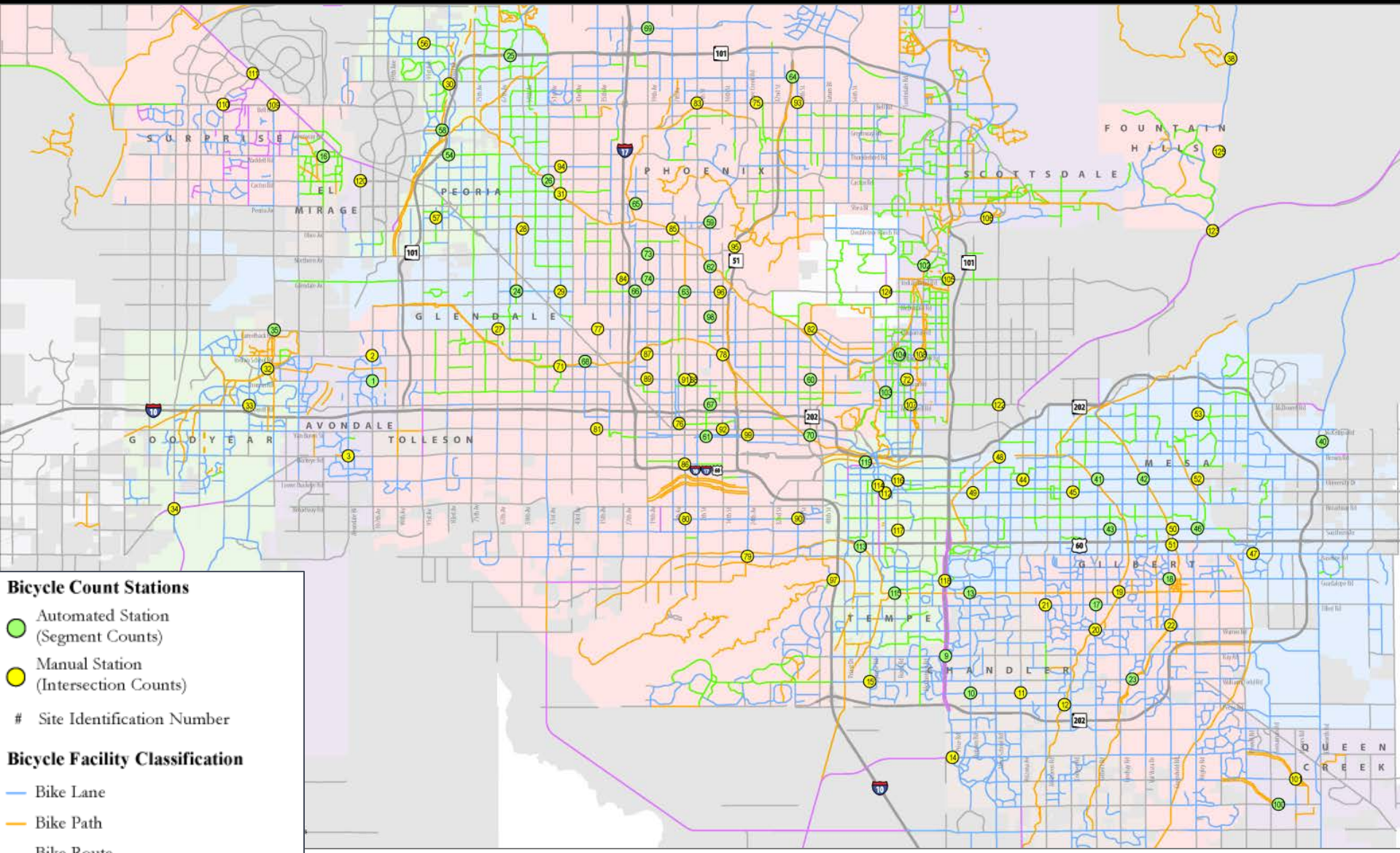
Agenda

- Schedule Overview
- Automated Count Data Cleaning Process
- Extrapolating Manual Counts to Daily Counts
- Developing and Applying Sidewalk Cycling Factors
- Data Summary and Identification of Trends

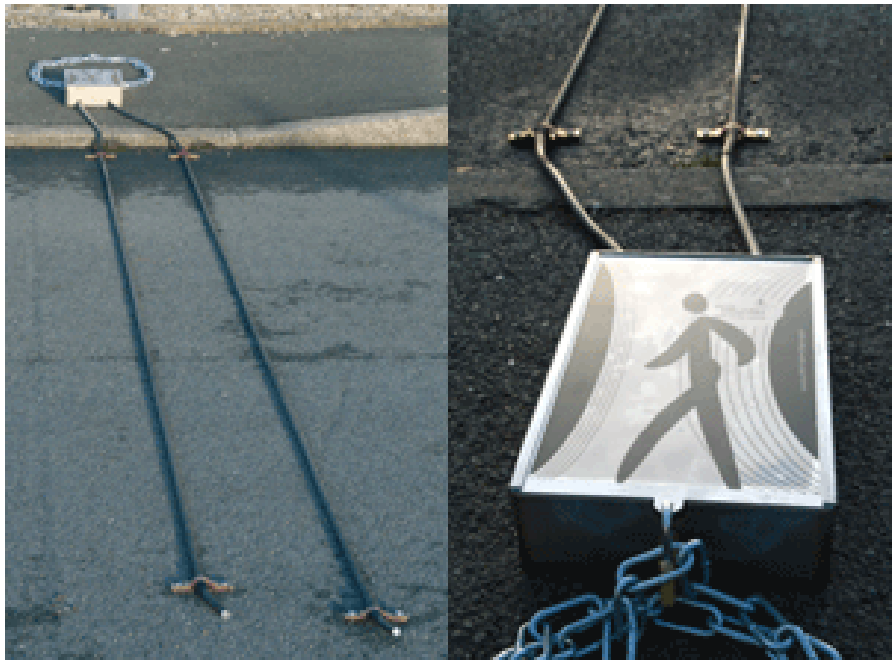
Project Schedule

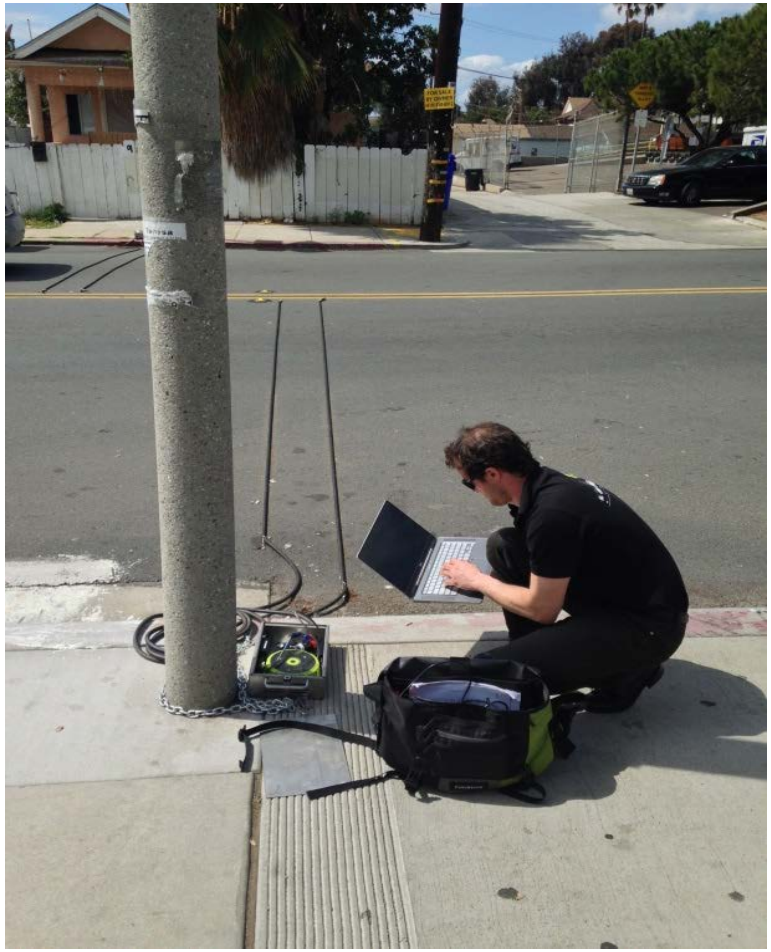


Study Sites


SURPRISE
EL MIRAGE
PEORIA
PHOENIX
SCOTTSDALE
FOUNTAIN HILLS
GLENDALE
AVONDALE
GOODYEAR
TOLLESON
MESA
GILBERT
TEMPE
CHANDLER
QUEEN CREEK
Bicycle Count Stations
Automated Station (Segment Counts)
Manual Station (Intersection Counts)
Site Identification Number
Bicycle Facility Classification
Bike Lane
Bike Path
Bike Route
Paved Shoulder

Temporary Pneumatic Tubes





Counted over eight 2-weeks periods
in Oct and Nov 2013

Data Cleaning Process

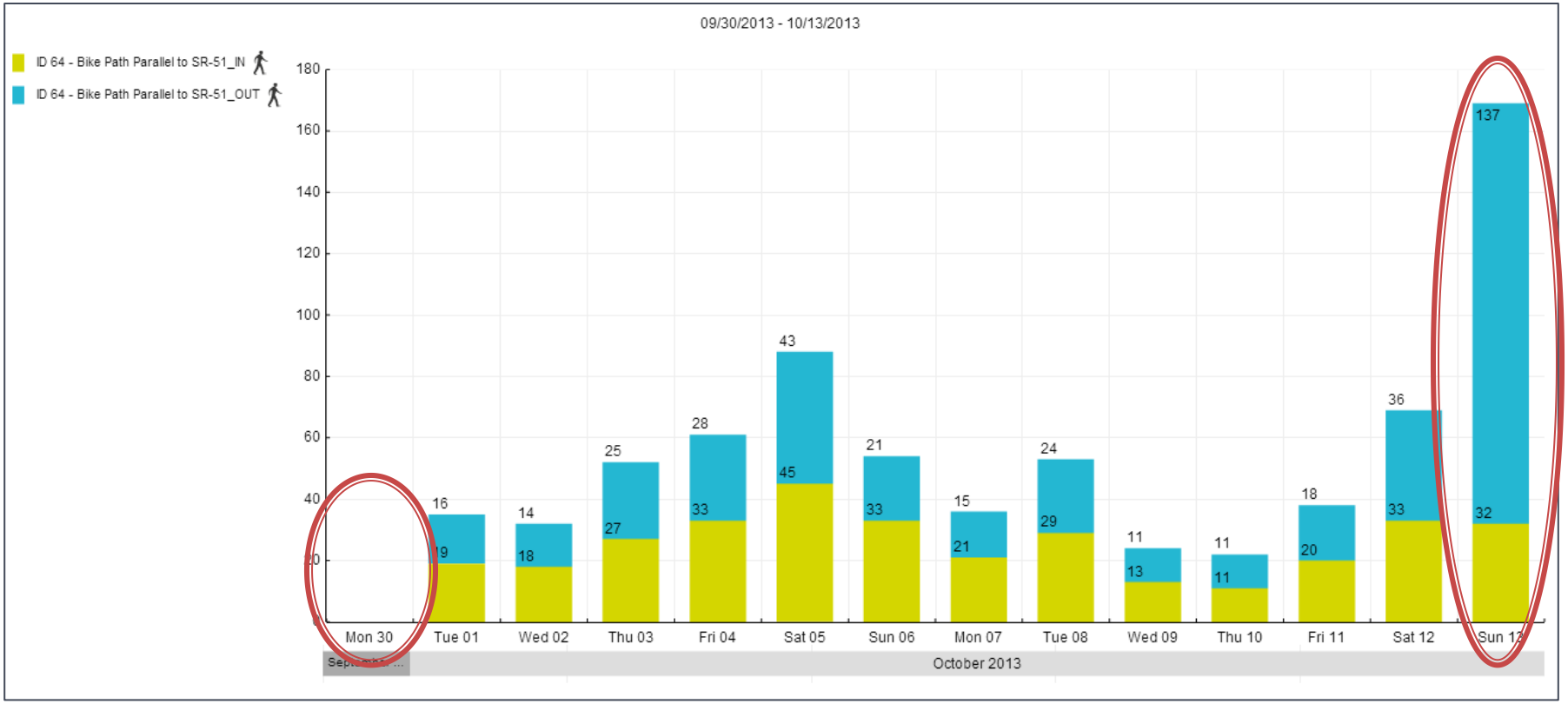
- Identify anomalies in automated count data
- Anomalies result from one of the following:
  1. Install & Uninstall Day – Incomplete data, contains data from two sites.
  2. Count Tube Pulled Up – Counter begins counting vehicles or stops counting

Data Cleaning Process

- In response to the previous two issues the following data cleaning actions were taken:
  1. *Exclude first and last days of each count period (install and uninstall).*
  2. *Exclude days with irregular count volumes. Estimate daily volume to replace excluded values.*
  3. *Exclude all data from seven sites with irregular and difficult to interpret data (Count Site IDs: 6, 9, 17, 23, 60, 70, and 103)*
  4. *Exclude data for a single direction of travel for Count Site IDS 62 and 69*

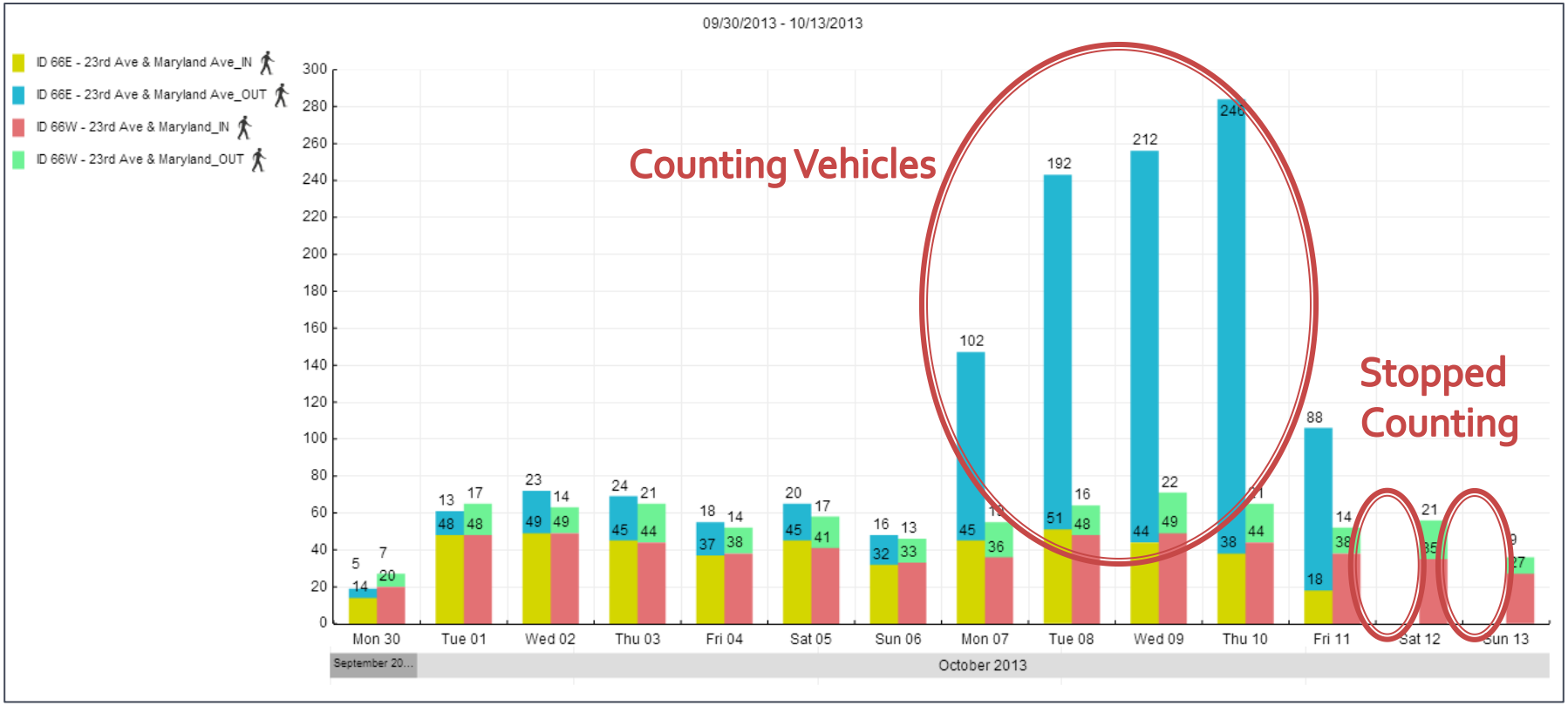
Data Cleaning Process

1. Install & Uninstall Day – Incomplete data, can contain data from two sites.



Data Cleaning Process

2. Count Tube Pulled Up – Causing counter to begin counting vehicles or stop counting completely



Data Cleaning Process

- Process for estimating volumes for excluded days
  - *Median weekday and median weekend volumes were calculated for individual sites using valid count days.*
  - *Median volume (weekend or weekday) used to replace excluded volumes (weekend or weekday).*

Data Cleaning Process

- Example of estimating volumes of excluded days:

Irregular weekday volumes

Remaining weekday volumes used to calculate median weekday volume and replace excluded volumes

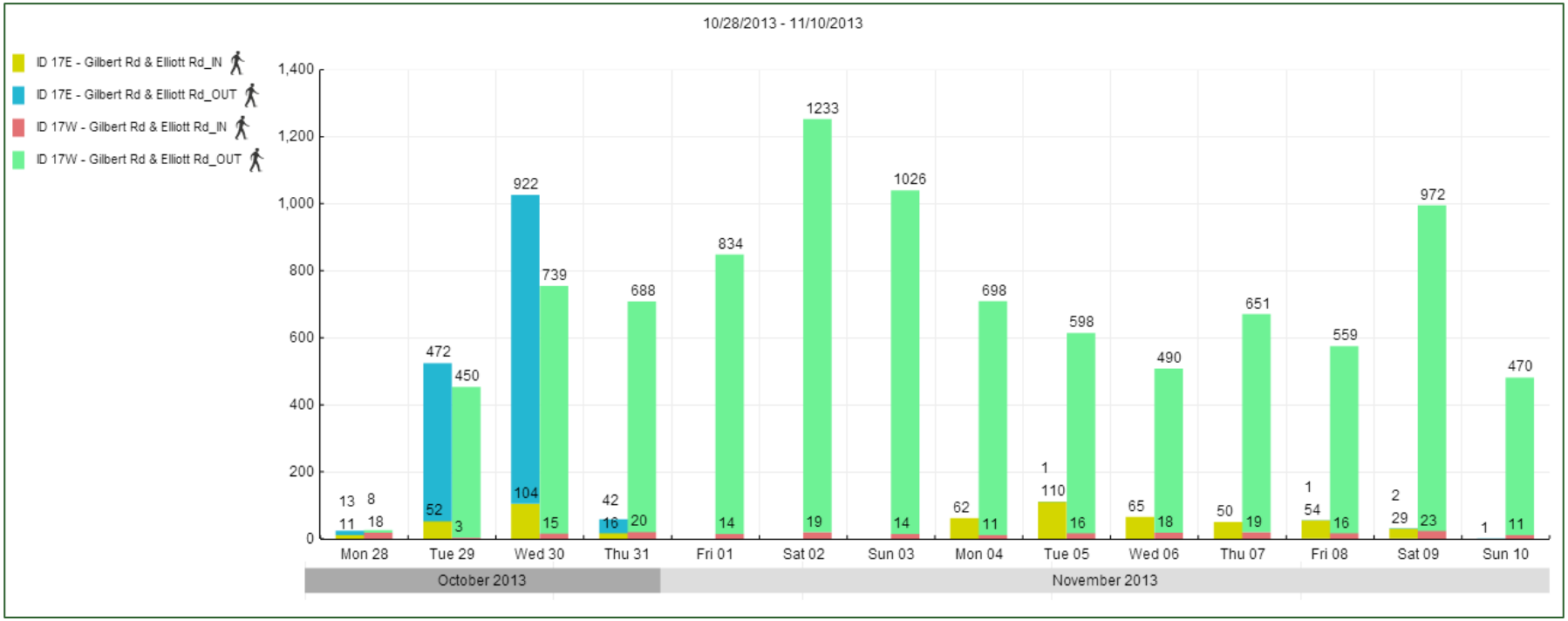
Count Site ID 73

Date	ID 73N IN (westbound)	ID 73N OUT (eastbound)	ID 73S IN (eastbound)	ID 73S OUT (westbound)
Tue, Oct 1, 2013[1]	24	12	256	149
Wed, Oct 2, 2013	80	58	58	39
Thu, Oct 3, 2013	69	46	46	30
Fri, Oct 4, 2013	93	54	54	50
Sat, Oct 5, 2013	77	60	60	34
Sun, Oct 6, 2013	53	48	48	26
Mon, Oct 7, 2013	57	40	40	55
Tue, Oct 8, 2013	17	13	51	48
Wed, Oct 9, 2013	0	0	45	50
Thu, Oct 10, 2013	17	21	46	46
Fri, Oct 11, 2013	64	71	70	55
Sat, Oct 12, 2013	60	52	48	39
Median Bicycle Count Value[2]	**66.5**	**53**	**49.5**	**39**

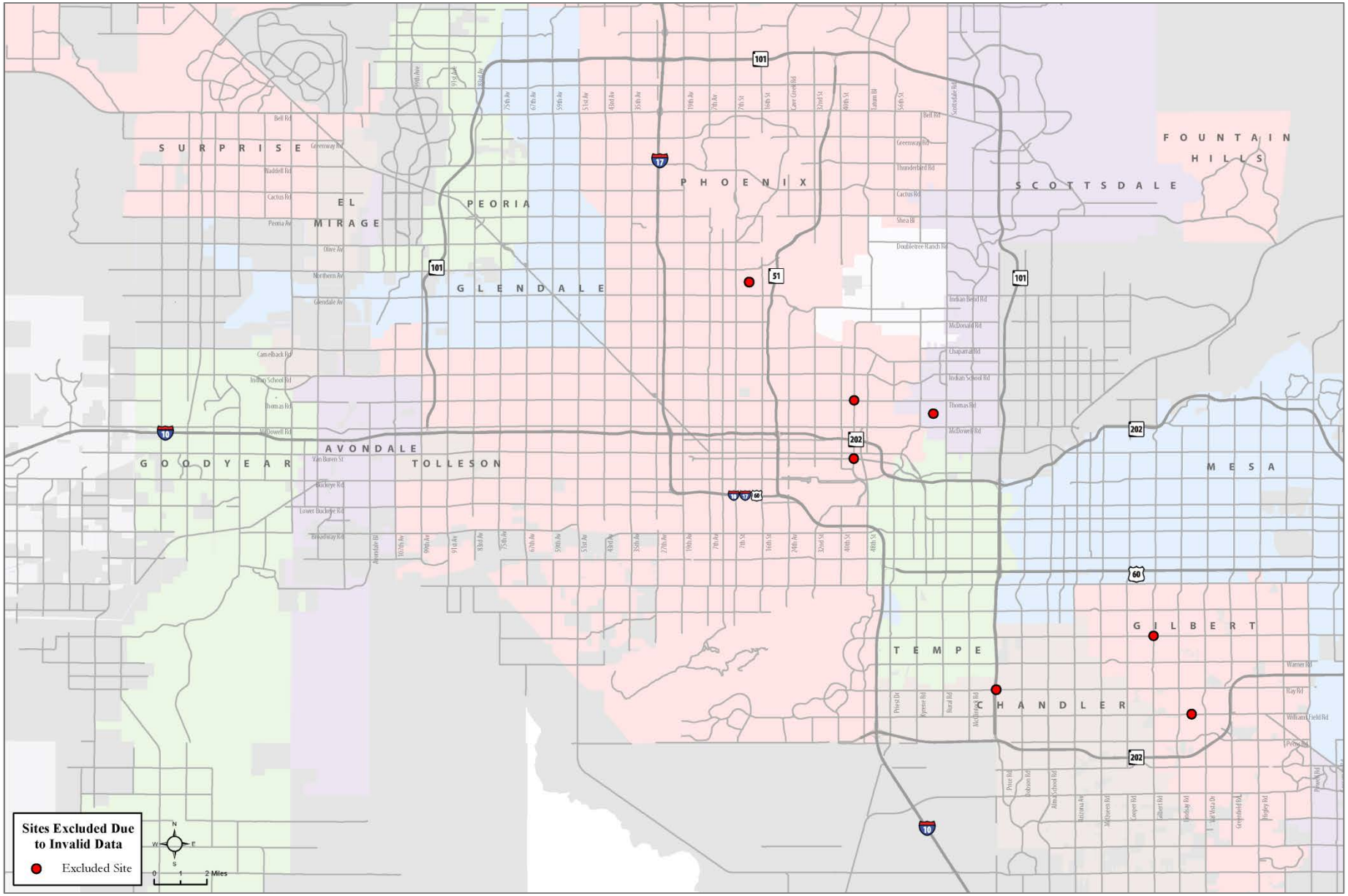
Data Cleaning Process

3. Seven count sites were identified as completely irregular or unreliable data: Count Site IDs 6, 9, 17, 23, 60, 70, 103

Example: Count Site ID 17



Excluded Automated Count Sites



Extrapolate Manual Counts into Estimated Daily Volumes

- Continuous 14-day, 24-hour **automated counts** conducted at **44 sites**
- **Manual Peak Period** counts conducted at **84 additional sites**
  - 56 weekday evening peak period (4:00PM – 6:00PM)
  - 28 weekend peak period (Saturday from 10:00AM – 12:00PM)

Need to extrapolate manual counts into estimated daily volumes

Extrapolate Manual Counts into Estimated Daily Volumes

- Process used to extrapolate volumes:

1. Calculate percentage of cyclists recorded during **weekday and weekend peak periods** from **automated count sites.**

2. Use automated count site peak period percentages to grow the manual volumes.

Extrapolate Manual Counts into Estimated Daily Volumes

1. Calculate percentage of cyclists recorded during **weekday and weekend peak periods** from **automated count sites.**

Summary Statistic	Weekday Peak Period (4PM-6PM) Percentage of Total Daily Bicycle Travel	Weekend Peak Period (10AM – 12noon) Percentage of Total Daily Bicycle Travel
Mean	16.8%	17.8%
Median	16.5%	16.1%
Minimum Value	9.6%	8.3%
Maximum Value	28.6%	33.3%

Extrapolate Manual Counts into Estimated Daily Volumes

- Peak period percentages were compared to results from San Diego County

	22 Sites in San Diego County	44 Sites in Maricopa County	Difference
Weekday Mean	16.5%	16.8%	0.3%
Weekday Median	16.2%	16.5%	0.3%
Weekend Mean	21.2%	17.8%	3.4%
Weekend Median	21.2%	16.1%	5.1%

Extrapolate Manual Counts into Estimated Daily Volumes

2. Use automated count site peak period percentages to **grow the manual volumes**.

Equation 1:

$$\frac{Weekday\ Manual\ Count\ Volume}{x} = \frac{16.8}{100}$$

Equation 2:

$$\frac{Weekend\ Manual\ Count\ Volume}{x} = \frac{17.8}{100}$$

Develop and Apply Sidewalk Factors

- The need for sidewalk factors:
  - Casual observation indicates a **large number of cyclists** in the MAG region **ride along the sidewalk** rather than travel lanes or bike lanes.
  - Count tubes are installed to record cyclists on travel lanes or bike lanes, not sidewalks.
- Response:
  - Collect sidewalk cycling counts during the manual counts to support development of a “sidewalk cycling factor.”

Develop and Apply Sidewalk Factors

- Manual count sites were categorized based on the following roadway characteristics:
  1. Number of travel lanes;
  2. Presence of bike lane; and
  3. Presence of right-turn-only lane.

Develop and Apply Sidewalk Factors

Sidewalk Factors – 12 Roadway Types

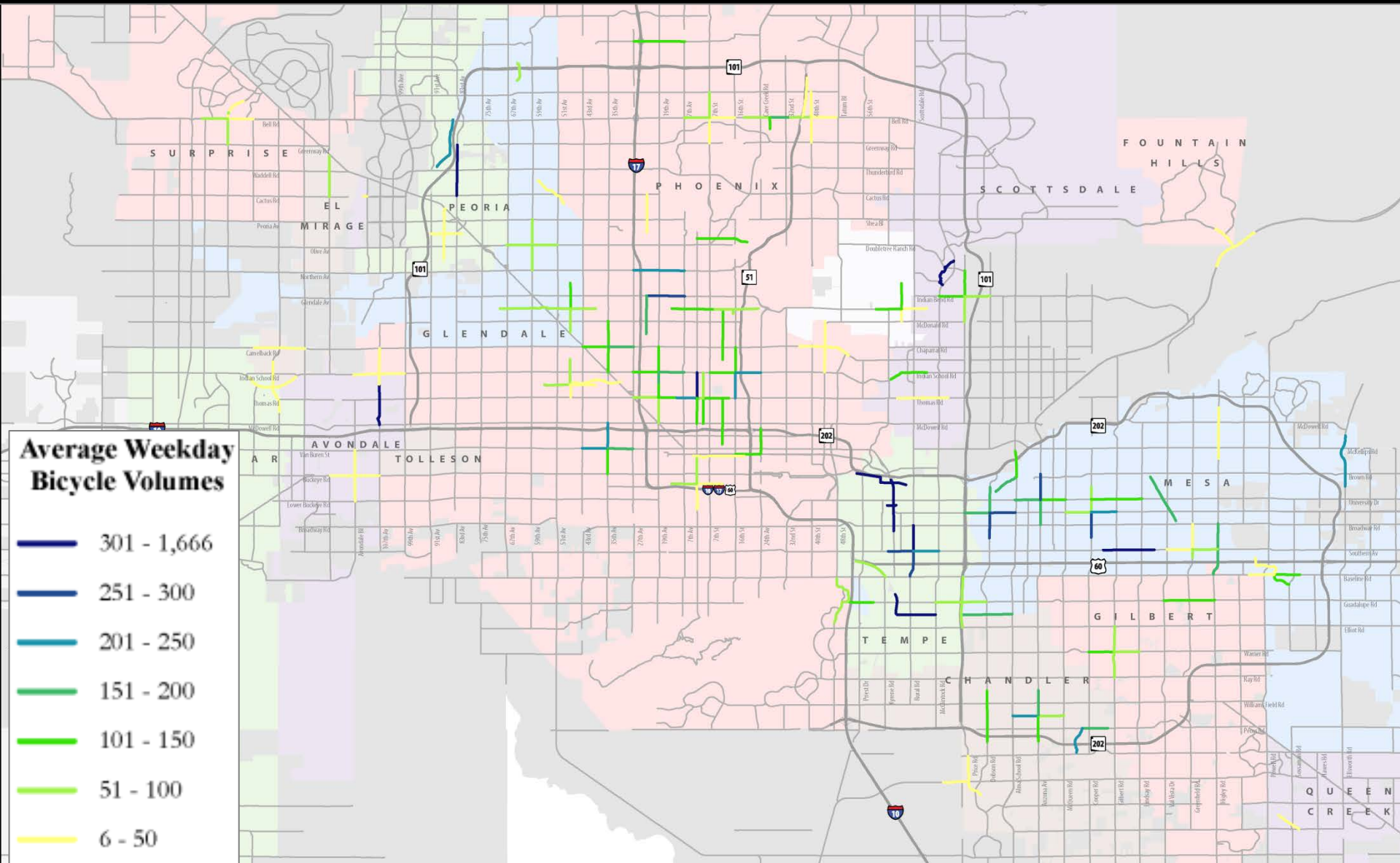
Roadway Type ID Number	With Bike Lane	With Right Turn Only Lane	Number of Manual Count Stations	Sidewalk Bike Trips	Total Bike Trips	Sidewalk Cycling Percentage
2-Lane Roadway Sidewalk Factors						
1	No	No	52	123	388	**31.7%**
2	No	Yes	11	11	20	**55.0%**
3	Yes	No	53	199	669	**29.7%**
4	Yes	Yes	12	89	248	**35.9%**
4-Lane Roadway Sidewalk Factors						
5	No	No	89	460	514	**89.5%**
6	No	Yes	36	254	287	**88.5%**
7	Yes	No	59	247	437	**56.5%**
8	Yes	Yes	35	297	415	**71.6%**
6-Lane Roadway Sidewalk Factors						
9	No	No	71	662	738	**89.7%**
10	No	Yes	41	361	384	**94.0%**
11	Yes	No	41	128	272	**47.1%**
12	Yes	Yes	25	32	97	**33.0%**

Develop and Apply Sidewalk Factors

- Applying sidewalk factors to automated count sites
  - Assign each automated count site a roadway category based on presence of bike lane and presence of right-turn-only lane.
  - The more conservative factors from the 2-lane roadways were then assigned and applied to the automated count volumes.

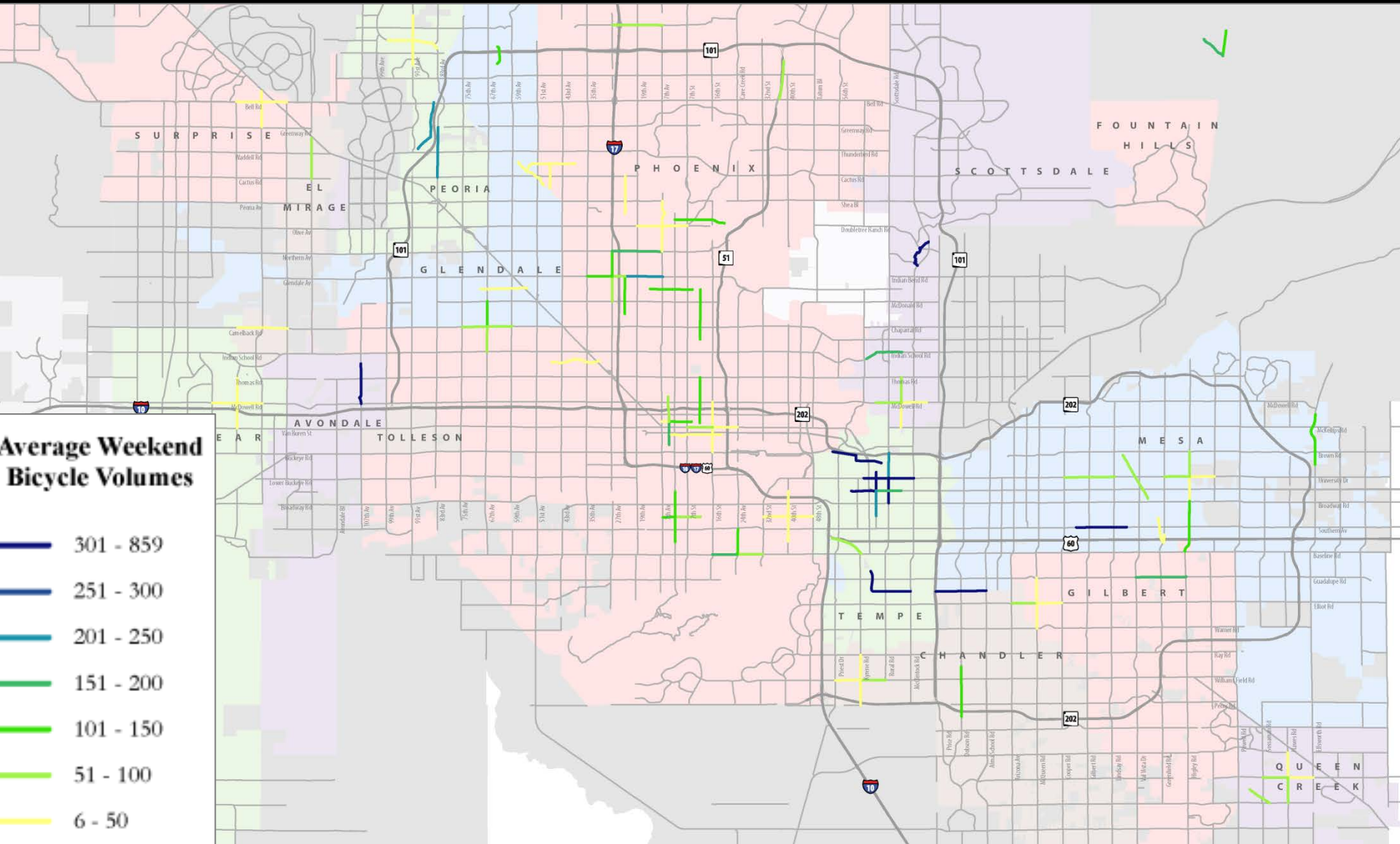
Data Summary

Average Daily Weekday Bicycle Volume



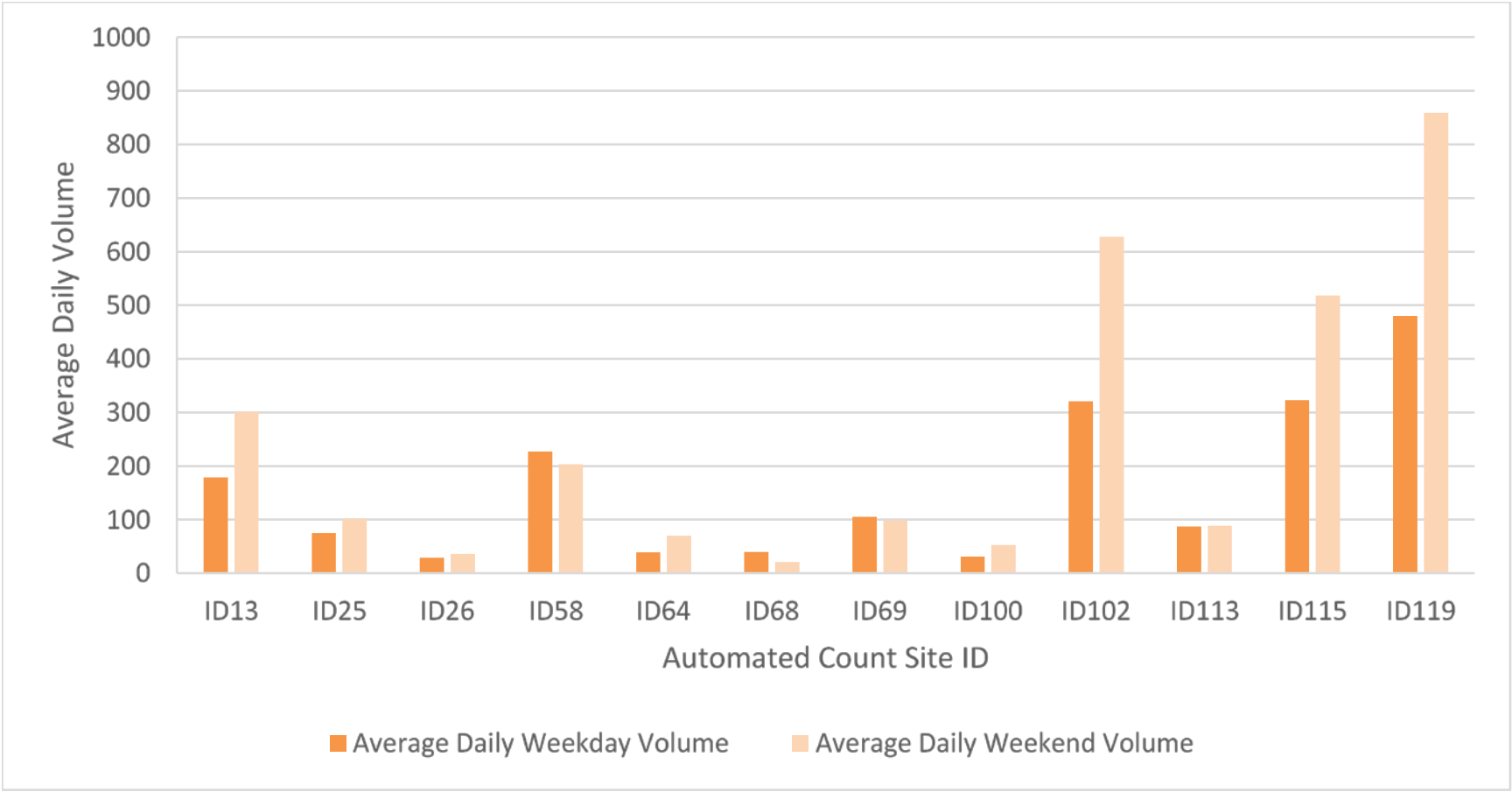
Data Summary

Average Daily Weekend Bicycle Volume



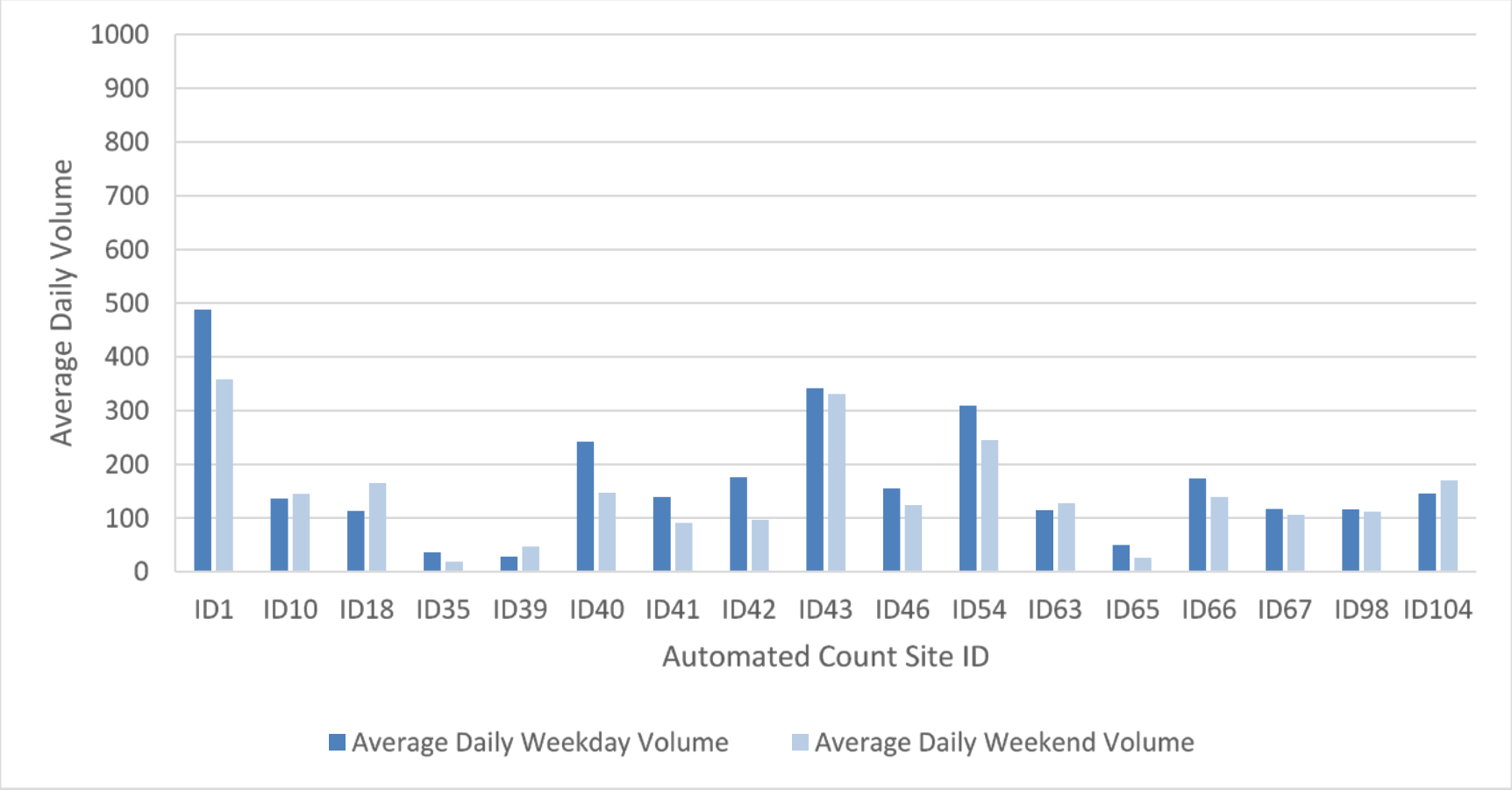
Data Summary

Chart 4-1: Average Daily Bicycle Volumes for Weekdays & Weekends by Automated Count Sites along Bike Paths



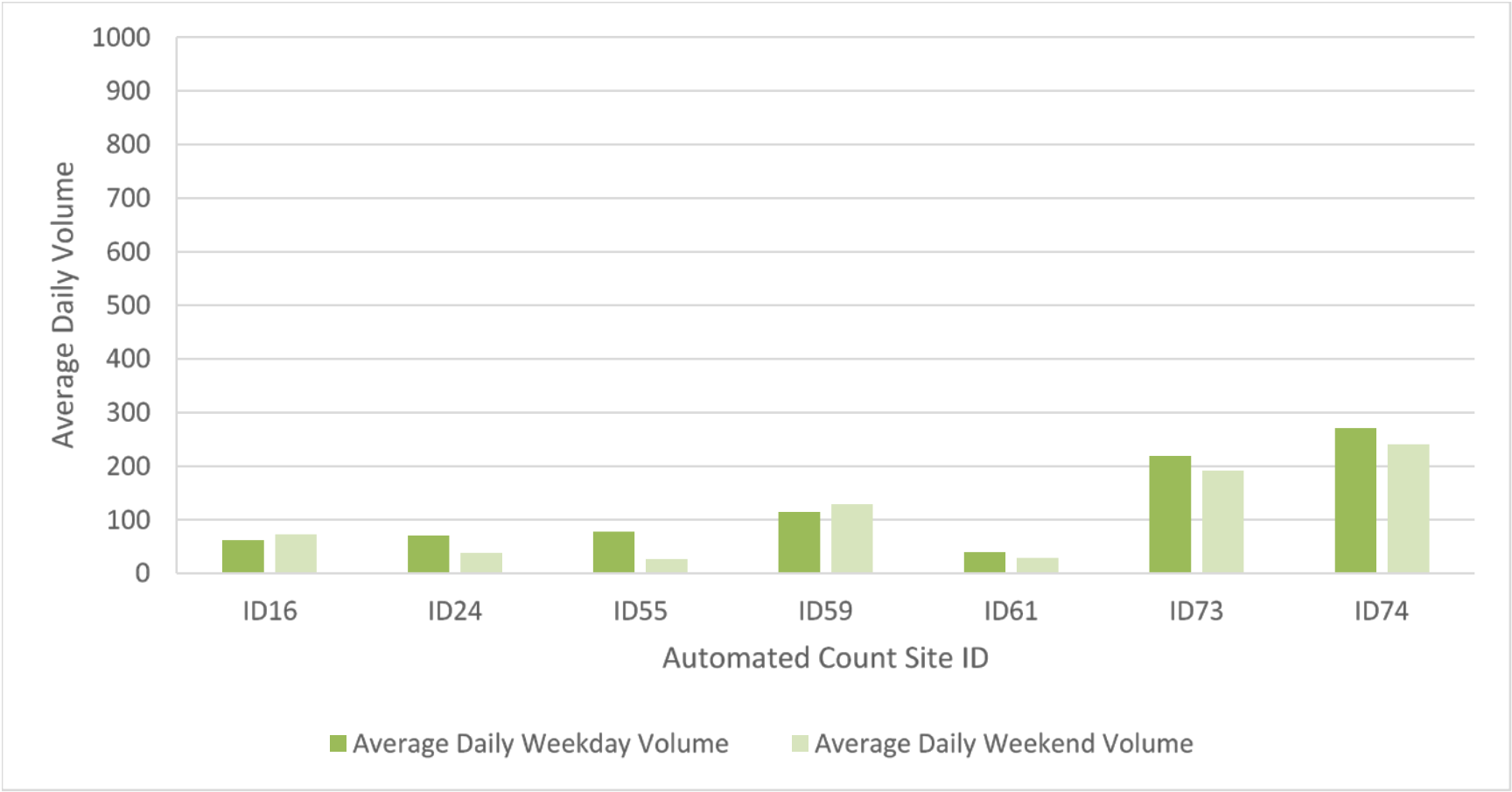
Data Summary

Chart 4-2: Average Daily Bicycle Volumes for Weekdays & Weekends by Automated Count Sites along Bike Lanes



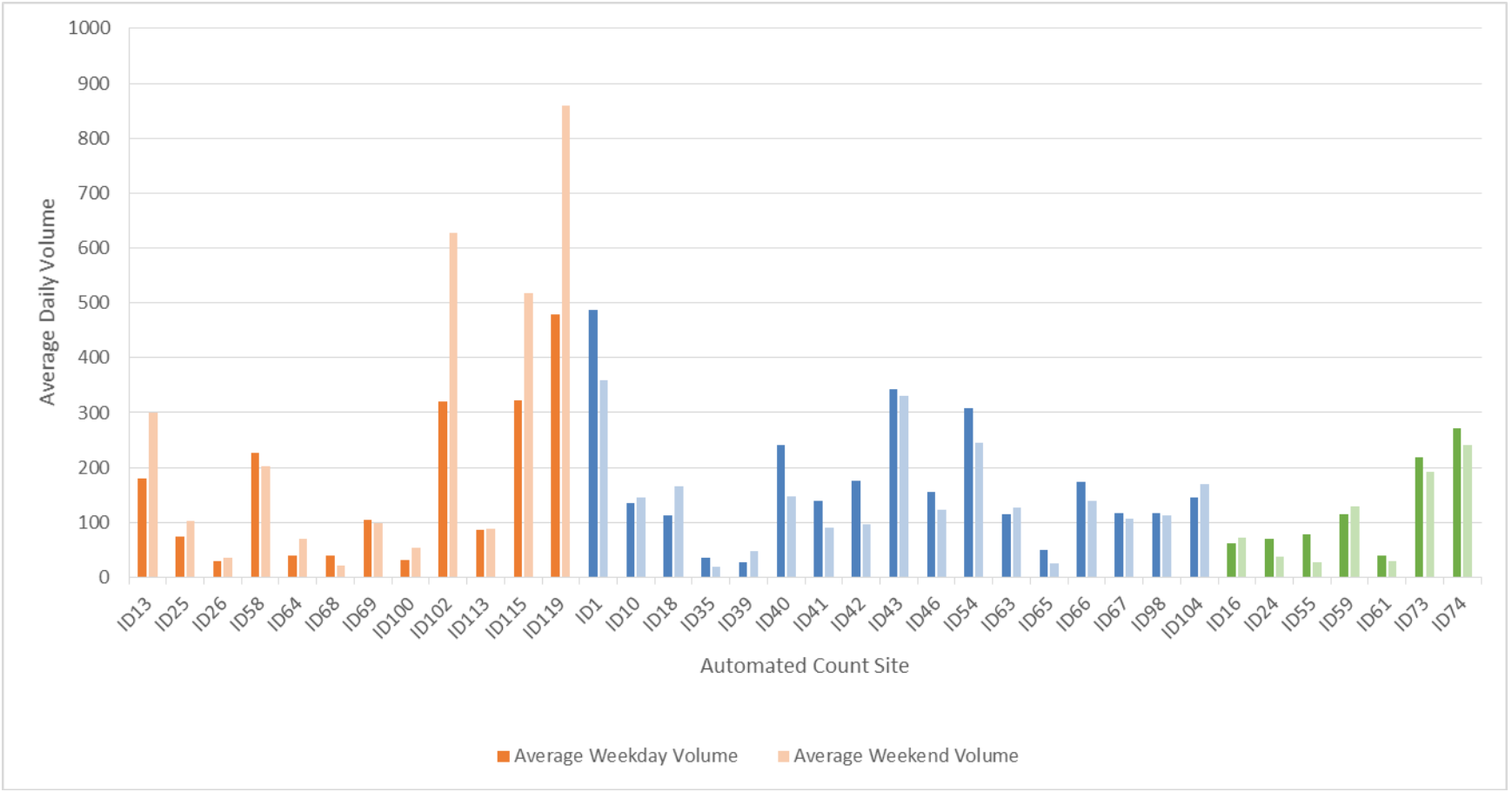
Data Summary

Chart 4-3: Average Daily Bicycle Volumes for Weekdays & Weekends by Automated Count Sites without Bicycle Facility



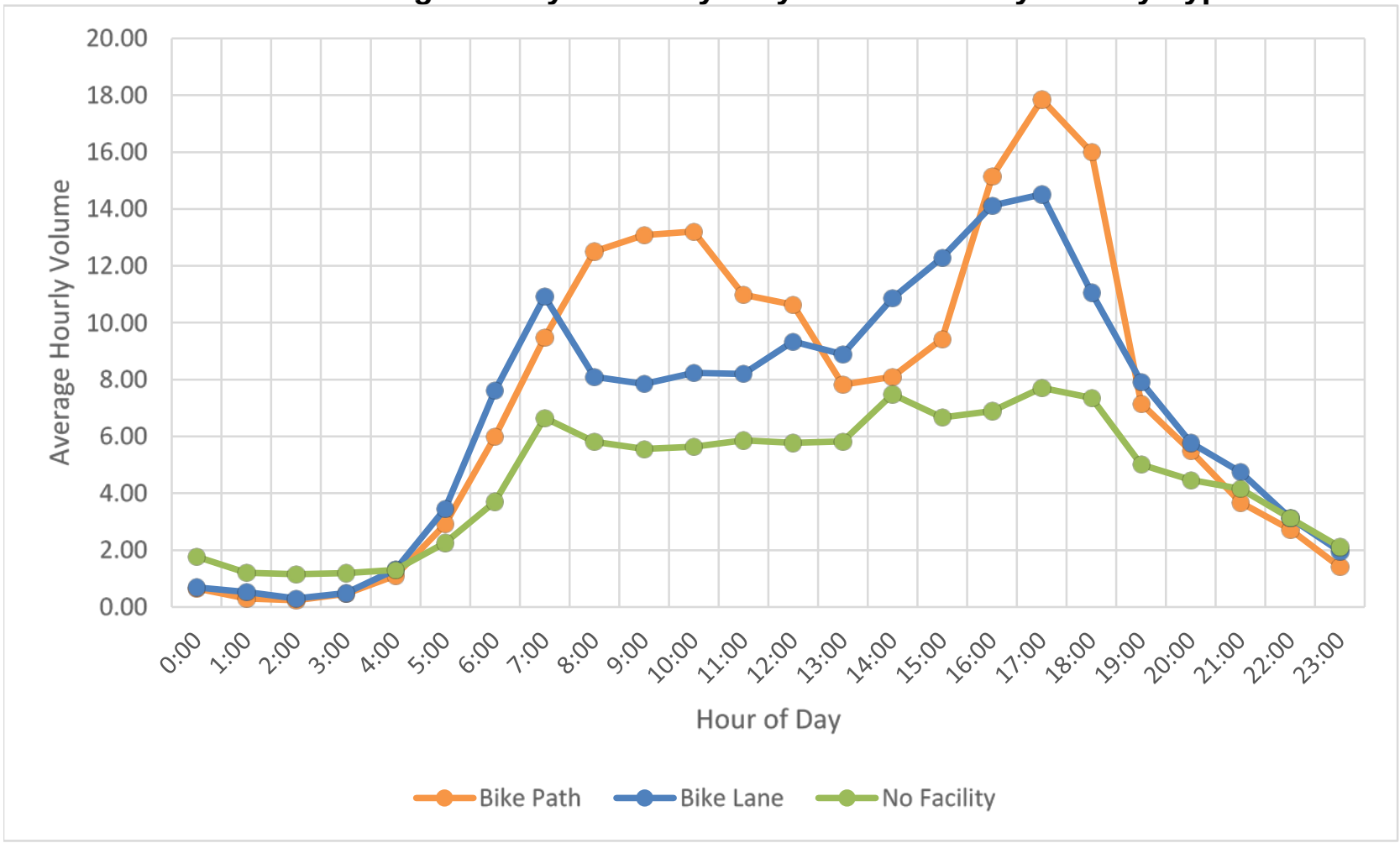
Data Summary

Chart 4-4: Average Daily Bicycle Volumes for Weekdays & Weekends by Facility Type



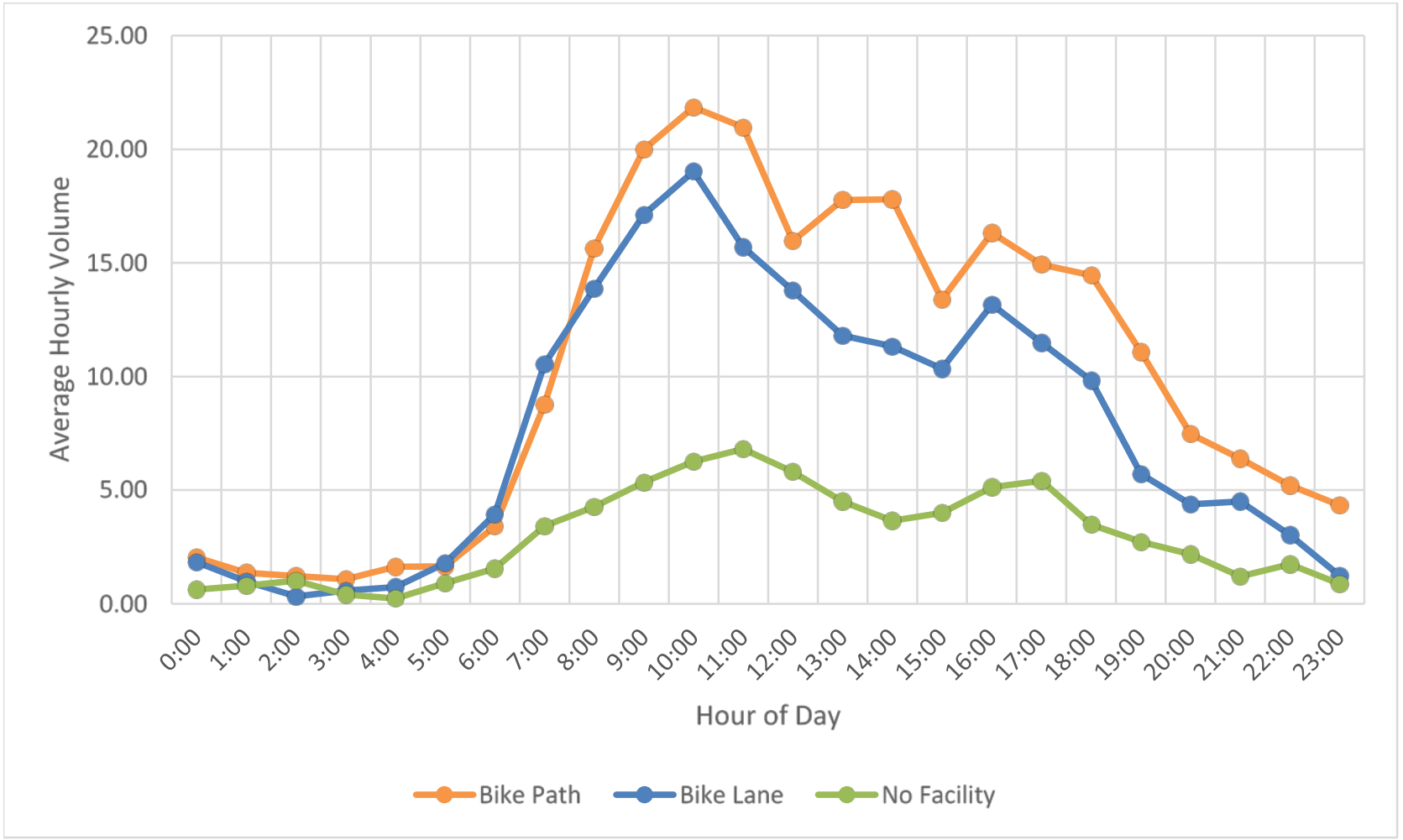
Data Summary

Chart 4-5: Average Hourly Weekday Bicycle Volumes by Facility Type



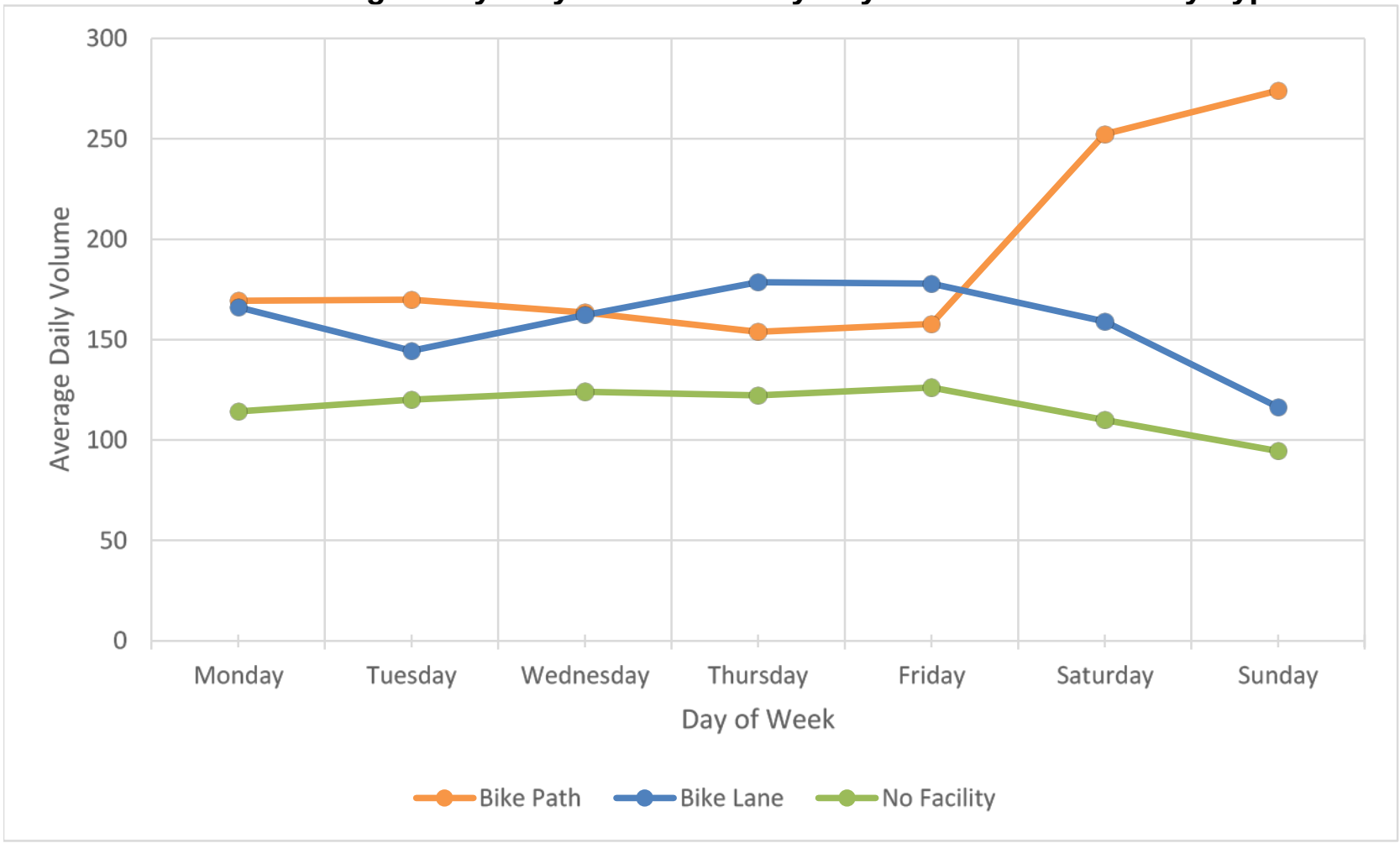
Data Summary

Chart 4-6: Average Hourly Weekend Bicycle Volumes by Facility Type



Data Summary

Chart 4-7: Average Daily Bicycle Volumes by Day of Week and Facility Type



Data Summary

Table 4-7: Comparing Maricopa County Average Daily Bicycle Volumes to Other US Regions

	Maricopa County	Minneapolis	Portland	San Diego	San Francisco
Population of Region or City	3,817,117	382,578	583,776	3,095,313	805,235
Land Area of Region or City (sq. miles)	9,200.14	53.97	133.43	4,206.63	48.87
Population Density (persons/acre)	0.65	11.07	6.83	1.15	25.74
Three Sites with the Highest Average Daily Bicycle Volumes	**2,244** (Mill Ave & 10th St)	**7,370** (Washington Ave SE Bridge)	**4,105** (N Vancouver & Russell)	**754** (Harbor Drive Bike Path)	**1,365** (Market & Valencia)
	560 (Rural Rd & Southern Ave)	**4,330** (15th Ave, north of University)	**3,995** (Interstate/ Lloyd/ Oregon)	**599** (Coronado Bayshore Bkwy)	**1,337** (17th & Valencia)
	488 (107th Ave & Thomas Rd)	**4,110** (Midtown Greenway, west of Cedar Ave)	**3,600** (SE Harrison & Ladd)	**447** (Chula Vista Bayshore Bkwy)	**1,267** (5th & Market)
Three Sites with the Lowest Average Daily Bicycle Volumes	**6** (Cotton Lane & MC 85)	**170** (7th St N over I-94)	**45** (SW Hamilton & 45th)	**29** (Palm Ave, west of Sea Coast Dr)	**11** (San Bruno and Paul)
	6 (SR-85 & Martin Ave)	**260** (E 42nd St east of Minnehaha Ave)	**45** (N Willis & Woolsey)	**46** (Vista Village Dr, east of Indiana)	**12** (Ortega and 24th Ave)
	12 (7th St & Carefree Highway)	**260** (Glenwood Ave N west of Royalston)	**50** (SW Arnold & 35th)	**48** (30th Street, north of Upas St)	**30** (Sloat and 34th Ave)

Next Steps

- Prepare Final Bicycle Count Report in mid-June 2014.
- Present Findings at Conference or in Publications

- Thank You -

Sherry Ryan, PhD
Chen Ryan Associates
858-349-5330
syran@chenryanmobility.com

MAG Bicycles Count Project