SANDAG Active Transportation Project Evaluation Manual

June 2020

SANDAG

TransNet

Prepared by

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Available by Request: Please Email GObyBIKE@sandag.org

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INTRODUCTION

Purpose and Goals

This manual is intended to help SANDAG, local agency staff, consultants, vendors, and stakeholders collect and analyze “before and after” data for active transportation projects. It provides a clear explanation of why each piece of data is collected by tying each data type and metric to one of the SANDAG Bikeways Early Action Program’s official goals.

ACTIVE TRANSPORTATION PROGRAM GOALS

1. **Mobility:** Increase in bike trips and bike mode share for all trip types.
2. **Access:** Improve bicycle, pedestrian, and other micromobility modes[1] connections between communities. Provide direct access to schools, transit, community destinations, and commercial centers.
3. **Safety:** Improve safety for bicyclists, pedestrians, and those riding other micromobility modes of all ages and abilities.
4. **Experience:** Improve perceptions of safety and comfortable experiences, e.g. “low stress.”
5. **Economics:** Encourage local economic activity and support of local businesses.

In the following pages, you will be introduced to the metrics used to evaluate progress toward these goals, the types of data needed to calculate the metrics, examples of how each metric will be reported, and guidance (where necessary) on how to interpret results. The manual also provides detailed guidance on how to select data collection locations, examples of data collection plans that will be prepared, and the resulting forms that will be generated for use by the data collection vendors.

The development of the initial data collection coordination with vendors and process of pre-construction (“pre-project”/” before”/ “baseline”) data is expected to take up to three days (24 hours) of staff time. The level of effort will vary significantly based on the complexity of the project, exposure to unforeseen complications, and level of coordination needed with vendors and other agencies/stakeholders. The post-construction data collection and final reporting process should take up to two days. Data collection before and after project construction should ideally occur as close as possible to May or September six (6) months before construction, and after project completion, respectively. Due to variations in walking and biking activity throughout the year, post-construction data collection is recommended to occur as close to the calendar of the pre-construction data collection as feasible. It is recommended that the initial data collection planning meeting and determination of data collection locations occurs around the time of the 30% design phase. This will ensure that the data collection locations are along the bikeway route that will most likely be constructed and will avoid the need to modify data collection locations for the post-construction data collection if the route alignment changes throughout the planning or early (e.g. before 30%) design process.

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[1] “Other Micromobility Modes” include modes such as kick and motor scooters, trikes, and segways. These modes were collected with bicycle counts beginning in 2018 for most project counts.

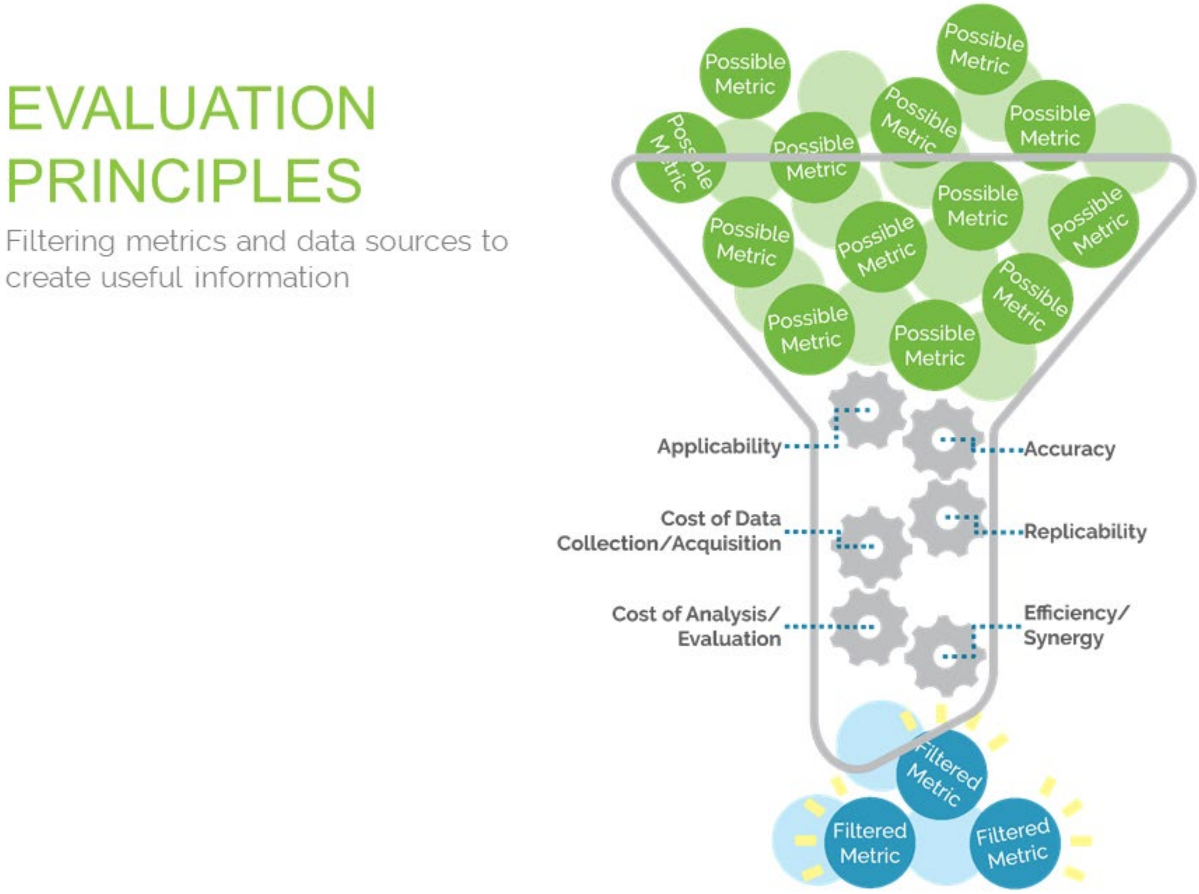
If pedestrian, bicycle, and other micromobility counts are conducted as a part of a traffic or safety assessment associated with the project, these counts could be used to inform the choice of pre-construction data collection locations. However, due to the specific data needed to address the five (5) goals outlined in this document, pedestrian, bicycle, and other micromobility data collected for a separate assessment will not be able to be imported into the SANDAG Active Transportation database or be used to comprehensively and consistently address the program goals.

The entire evaluation process from the initial data collection planning meeting with the SANDAG Project Manager (PM) to completion of the evaluation report will typically take one year and will occur during the "predesign" phase of the project. (See the *SANDAG Regional Bike Plan EAP Program Management Plan* for more information on the "Predesign Project Checklist" identified in the "Procedure" section.)

The "before and after" evaluations resulting from this process will determine how well projects funded by SANDAG have performed against the stated project goals, providing an opportunity to understand what is working, what isn't, and how SANDAG can adjust the project selection and design process to achieve the most beneficial results in the future.

Principles

This manual was developed amidst an unprecedented proliferation of transportation-related data, many of these from untested private sources whose cost structures and longevity were unpredictable at best. The endless combination of data sources and analytical tools being promoted made it difficult to sort out useful strategies from those that were merely interesting, convenient, or successful in attracting attention within the transportation industry. Due to the local and observable nature of questions at hand, the team decided that rather than designing the methodology around available data sources, we would determine what data would be needed to best answer the questions at hand. To this end, Fehr & Peers worked with SANDAG staff to develop a series of guiding principles for the evaluation program. These principles ensure that SANDAG will come away with a resilient methodology that provides a clear understanding of the observable benefits of active transportation investments.



EVALUATION PRINCIPLES

Filtering metrics and data sources to create useful information

Applicability

- Can common project types realistically be expected to "move the needle" using the proposed metric?
- How directly will the metric answer the questions implicit in the project goals?

Replicability

- Will the method be relevant to all (or most) common project types and geographic contexts in San Diego County?

Accuracy

- Is the method/metric able to isolate project-specific outcomes from more general trends? If not, what ancillary data collection and evaluation would be required at comparison locations to achieve this distinction?
- Was the data gathered from direct observation methods or from estimates? As a general rule of thumb, use direct observation methods to evaluate behavior change, rather than estimates.

Cost of Data Collection/Acquisition

- Does it currently exist?
  - If so, how much does it cost?
  - If not, how will it be collected (staff, contractor, third party, automated technology)? And how much will it cost to collect?

Cost of Analysis/Evaluation

- Who will be expected to conduct each method of evaluation (local agencies, SANDAG, consultants), and do they have the capacity to do this consistent with guidelines?
- If local agencies will be expected to conduct evaluations, do they have the capacity and appropriate skillsets to produce consistent evaluations across project types and locations (assuming detailed guidance will be available)?
- What is the level of effort required to collect data and complete analysis?

Efficiency/Synergy

- What combination of metrics provides the most useful information, while keeping the data collection and analysis effort to a sustainable level?
- How many of the goals can be measured and questions answered with this metric and associated data?

Questions

The above goals and principles were used to refine these specific questions, and to select metrics that will help answer them. In doing so, we developed the overall evaluation methodology described in this manual.

In order to understand how a project has performed against each of the above goals, we had to clearly articulate the question(s) implicit in each goal with a strict focus on observed behavior change, rather than individual perceptions about the quality of a project. A high level of specificity is required to pair each question with the best metrics and data sources to arrive at an answer for each project. Some of the program goals were more easily converted into questions with a high level of specificity. For example:

G1. Mobility: Increase bike trips and bike mode share for all trip types.

Q1.1: How has the number of observed bike trips changed after project implementation along:

- *the improved corridor,*
- *parallel routes serving the same destinations, and*
- *control locations with similar characteristics but serving a different set of destinations?*

Q1.2: How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all trips after project implementation along:

- *the improved corridor,*
- *parallel routes serving the same destinations, where applicable, and*
- *control locations with similar characteristics but serving a different set of destinations, where applicable?*

Data should be collected on weekdays (Tuesday-Thursday) for all projects, and weekend data should be collected on a project-by-project basis. When a SANDAG Project Manager is developing the data collection plan, field observations or historic data from permanent automated counters should be reviewed to determine if bicycle peaks occur on weekends. If bicycle usage along the corridor peaks on the weekend, weekend counts should be considered.

The SANDAG Project Manager may choose to use data from one of SANDAG's permanent automated counters or one of the annual *monitoring sites*[2] in place of collecting new data along a parallel corridor or at a *control location*. The SANDAG PM will have to determine whether these alternate data sources are sufficiently reliable and appropriately located to serve this purpose.

Additional information regarding when data collection along a parallel route or *control location* should be conducted is included in the Data Collection Plan Development section.

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[2] SANDAG has identified a series of "*monitoring sites*" where active transportation data is collected on a regular basis and included as part of a larger periodic monitoring program.

Other project goals benefit from a local knowledge of, for example, key regional and local attractors and generators which can then be applied consistently regionwide to best answer a question such as accessibility with quantifiable observations.

> *G2. Access: Improve bicycle, pedestrian, and other micromobility modes connections between communities. Provide direct access to schools, transit, community destinations, and commercial centers.*
>
> *Q2.1: What is the change in the number of observed bike, pedestrian, and other micromobility trips at locations serving key destinations after project implementation?*

The "Safety" goal requires a specific question that can be answered in the evaluation process with a common data source [the Statewide Integrated Traffic Records Systems (SWITRS)] that will be applicable to and available for each project corridor. The "Safety" goal also requires a consistent collision rate be applied to account for the amount of risk or exposure on each corridor, and which can be answered in the evaluation process by using a "filtered metric" from data sources (quantifiable observations) that we already collect for each project (see Goal 1).

> *G3. Safety: Improve safety for bicyclists, pedestrians, and those riding other micromobility modes of all ages and abilities.*
>
> *Q3.1: What is the change in the annual number and rate of reported collisions along the corridor after project implementation?*

Other project goals were more difficult to convert to a question answerable with quantifiable observations. The "Experience" goal required significant discussion to establish a specific question to be answered in the evaluation process, which uses a "filtered metric" from data sources (quantifiable observations) we collect for each project.

> *G4. Experience: Improve perceptions of safety and comfortable experiences, e.g. "low stress."*
>
> *Q4.1: How has route choice in the area been impacted by the addition of higher quality bicycle facilities? (i.e., Have we seen a shift in bike trips from parallel corridors to the improved corridor?)*

The "Economics" goal is so broad, and the project-level data is so specific and difficult to collect that available data drove the formulation of the questions. Because SANDAG has access to vacancy data and sales tax data, the question to be answered was articulated around those data sources.

> *G5. Economics: Encourage local economic activity and support of local businesses.*
>
> *Q5/5.1: How have vacancy rates and/or the level of business patronage (sales tax revenue) changed after project implementation?*

The following sections review each goal, its associated questions, metrics, and data sources, and provide examples from SANDAG EAP Bikeways.

METHODOLOGY

GOALS, QUESTIONS, METRICS, & DATA SOURCES

Goal 1 – Mobility

Increase in bike trips and bike mode share for all trip types

QUESTION 1.1:

How has the number of observed bike trips (weekday and/or weekend[3]) changed after project implementation along the following: the improved corridor, parallel routes serving the same destinations (where applicable), and *control locations* with similar characteristics but serving a different set of destinations?

METRIC 1.1:

Change in the number of observed bike trips (weekday and/or weekend) after project implementation

Data Sources:

- Multimodal intersection counts (24-hour)
- Screenline counts (24-hour bike/ped/other, and vehicle ADT)
- *Control locations*

Location Selection Guidance:

Multimodal Intersection Counts (24-hr)

Multimodal intersection counts should be considered at locations where the bikeway corridor under evaluation intersects: (1) another existing or proposed bike facility; or (2) a street where significant numbers of bikeway users may be expected to enter or exit the bikeway corridor under evaluation in order to access commercial or residential areas. Due to the cost and complexity of multimodal intersection counts, the potential multimodal intersection count locations should be identified first and refined to reflect a reasonable number of locations given the available budget. Counts should be taken for a 24-hour period wherever possible.

Screenline Counts (24-hr bike/ped & vehicle speed/ADT)

Bicycle and pedestrian screenline counts should be collected along roadway segments that will be representative of the different "typical" conditions along each corridor after project implementation. Since multimodal intersection counts can be easily converted to screenlines at each leg of an intersection, screenline counts are ideal for collecting comparable data along parallel corridors. The bike and pedestrian counts are collected using video and are reduced/converted to counts by a single technician with an image resolution that maintains anonymity. Tube counts should also be ordered to collect data on speeds and average daily vehicle traffic (ADT) at each screenline location.

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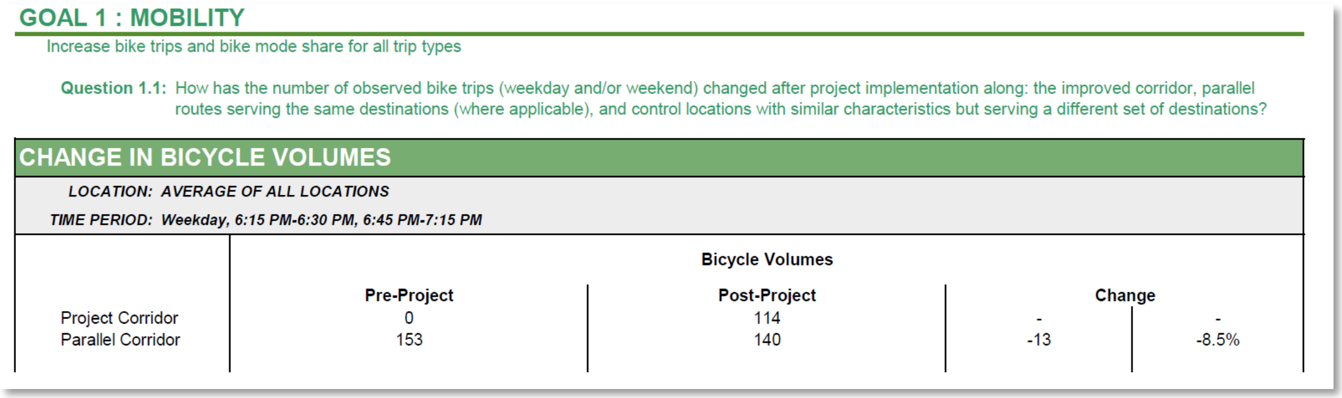
[3] To determine whether weekend counts are warranted for the project or location, see the Questions section above.

Control Locations

Control locations are selected to determine how travel behavior changed during the evaluation period outside the project area in locations that are similar to the project corridor in terms of land use, demographics, roadway network, etc. For each project, select 1-3 automated counters to use as *control locations*. Data should be pulled for the same days that the before and after data was collected, and the percent change in bike (and ped) activity should be reported. Raw numbers are not relevant and may not be representative of actual activity at some locations. If automated counters are not available for the project (i.e. the existing automated counters do not match the project corridor in terms of land use, demographics, or roadway network), other screenline counts can be designated as the project's *control locations*.

Data Processing & Analysis

When the data collection plan is developed, each location will be tagged as a "project corridor," "parallel corridor," or "control" location. As described above, in some locations, data from a permanent automated counter or one of SANDAG's *monitoring sites* may be used as a "*parallel corridor*" or *"control" location*. The automated reporting tool will aggregate all multimodal, screenline, and automated counter locations and produce a summary report which directly answers Question 1.1. The summary report for Question 1.1 is shown in **Figure 1**.



GOAL 1 : MOBILITY

Increase bike trips and bike mode share for all trip types

Question 1.1: How has the number of observed bike trips (weekday and/or weekend) changed after project implementation along: the improved corridor, parallel routes serving the same destinations (where applicable), and control locations with similar characteristics but serving a different set of destinations?

CHANGE IN BICYCLE VOLUMES

LOCATION: AVERAGE OF ALL LOCATIONS

TIME PERIOD: Weekday, 6:15 PM-6:30 PM, 6:45 PM-7:15 PM

	Bicycle Volumes			
	Pre-Project	**Post-Project**	**Change**	
Project Corridor	0	114	-	-
Parallel Corridor	153	140	-13	-8.5%

Figure 1 - Summary Report from the SR-15 Commuter Bikeway that answers Question 1.1. The SR-15 Commuter Bikeway project did not have control locations included. For projects with control locations, another row would be present under the parallel corridor row shown above. Additionally, this bikeway runs along the SR-15 Freeway, on which bicycles were not allowed before the addition of the separated bikeway. Therefore, bicycle volumes along the project corridor do not exist in the pre-project condition.

Example Location

Mission Hills/Old Town Bikeways

In order to evaluate the change in bicycle volumes for each project, bicycle volumes collected along the project corridor are compared to counts on *parallel corridors* and at *control locations*. Using the Old Town segment of the Uptown Bikeway project as an example, (shown in **Figure 2**), bicycle volume counts taken along the project corridor on Congress Street will be compared to bicycle volume counts recorded along the parallel routes of Juan Street and Pacific Highway. Additionally, bicycle volumes obtained from the automated counts on Pacific Highway and at the San Diego River Trail will also be compared to the project corridor volumes.

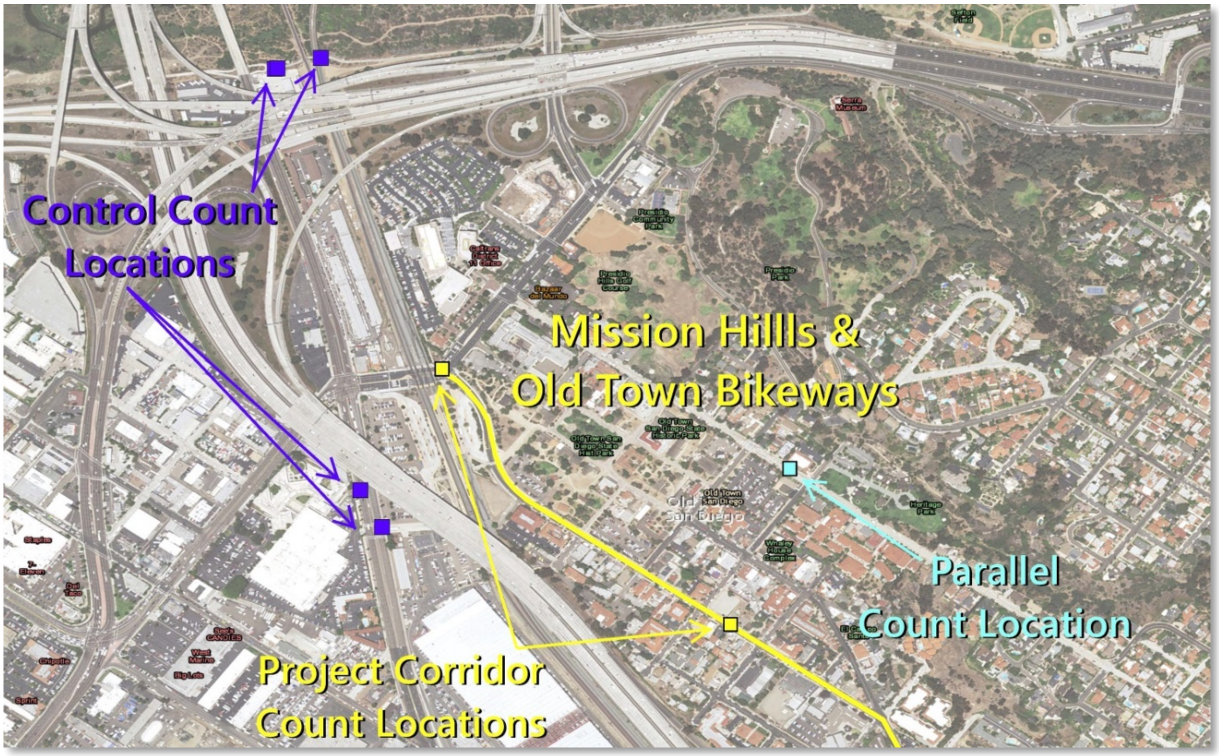


Figure 2 - Example of Bicycle Volume Counts for the Old Town portion of the Uptown Bikeway

QUESTION 1.2:

How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all weekday trips (weekend, if applicable[4]) after project implementation along the improved corridor and parallel routes serving the same destinations (where applicable), as compared to changes in commute mode share over a similar time period at the county level?

METRIC 1.2:

The change in bicycle mode share (at intersection or segment level)

Data Sources

- Multimodal intersection counts (24-hour)
- Screenline counts (24-hour bike/ped, vehicle ADT)
- *Automated Passenger Counter (APC) data* (passenger load for appropriate segments and intersections)
- *Vehicle Occupancy Data*
- *ACS journey to work estimates* 1-year data, county level

Location Selection Guidance

Multimodal Intersection Counts (24-hr)

Locations will be selected using the criteria described under Metric 1.1. Consideration should also be given to

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[4] To determine whether weekend counts are warranted for the project or location, see the Introduction section above.

locations where the bikeway corridor under evaluation intersects a corridor providing bus service and locations where the proposed improvement can be expected to have an impact on overall mode share. For example, locations with significant bicycle and pedestrian improvements as well as traffic calming measures could be expected to generate some shift in mode share away from motor vehicles, along with a corresponding increase in bicycle, pedestrian, and potentially transit mode share at that particular location. The effect at *parallel* or *control locations* will also further inform these findings.

Screenline Counts (24-hour bike/ped & vehicle ADT)

Screenline counts used for Metric 1.2 should be selected using the same criteria as Metric 1.1.

Data Processing & Analysis

The data processing for this metric requires a full accounting of *person throughput* by mode at each location. Because the video-based traffic data cannot determine the number of passengers in transit buses or private vehicles, some additional data will need to be collected or estimated and added to the database. Each of these pieces of data is readily available from SANDAG and the U.S. Census Bureau (see Technical Appendix - Glossary of Terms for more details).

Automated Passenger Counter (APC) Data

APC data will provide the transit passenger load data for each intersection and street segment where multimodal intersection and screenline counts have been taken. This data is available from SANDAG's Ridecheck Plus database. Once the field data has been collected, submit a request for *APC data* covering that time period for the transit lines running along the improved corridor, those intersecting the improved corridor, and at locations where multimodal counts have been collected. In some cases, there may not be sufficient sample size until 3-4 months after the original count has been collected. The SANDAG Passenger Counting Program Project Manager can advise on the reliability of the transit data. The necessary data will be found in the APC database's "SUM_LOAD" field for the bus stops located directly upstream of the target count locations, as shown in **Figure 3**.

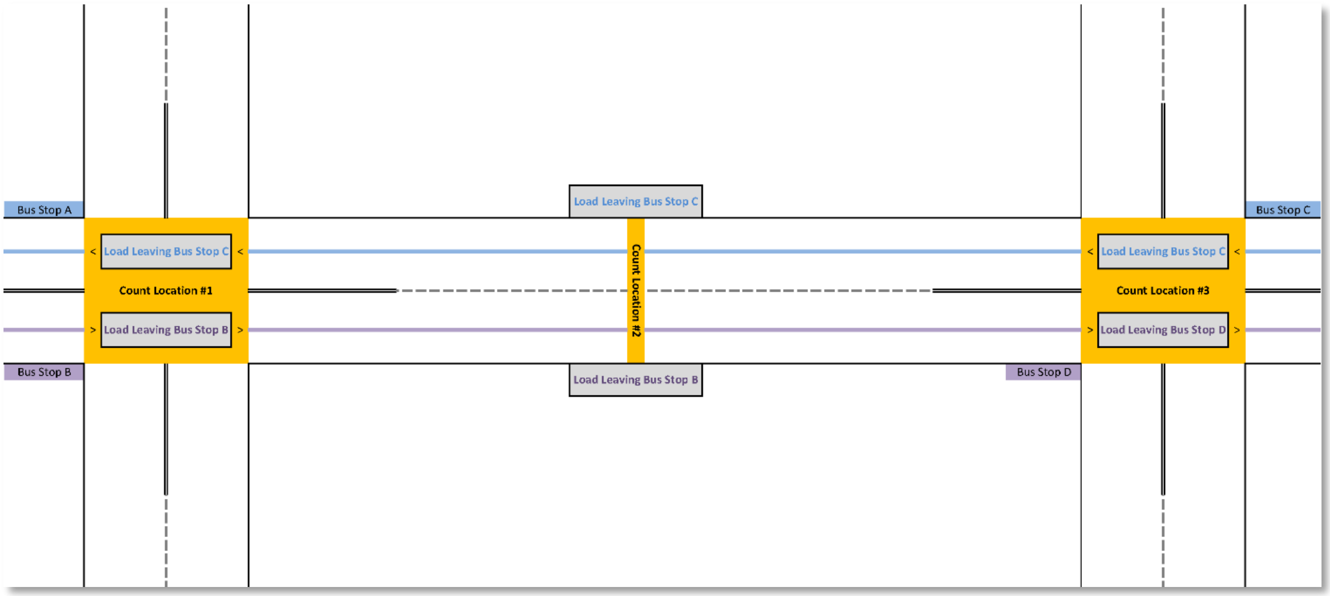
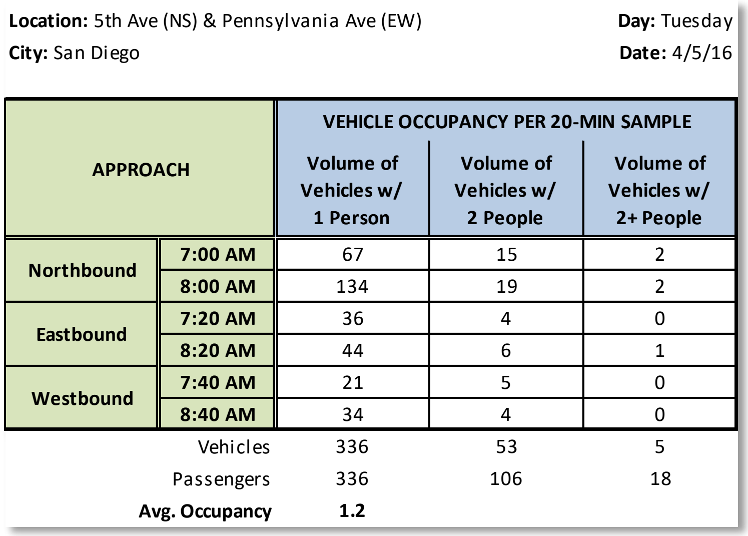


Figure 3 - Example of how Automated Passenger Count (APC) data is used at intersection and midblock locations

Vehicle Occupancy Data

The default *vehicle occupancy* will be based on the latest Regionwide Base Year Average Trips outputs in the Activity-Based Model informed by the San Diego Household Travel Survey. If the project manager believes that estimates differ significantly from actual *vehicle occupancy* at the count locations selected, it can be collected manually on-site at one or more locations along the corridor for one or more brief observation periods, as shown in **Figure 4**.



Location: 5th Ave (NS) & Pennsylvania Ave (EW) **Day:** Tuesday

City: San Diego **Date:** 4/5/16

APPROACH		VEHICLE OCCUPANCY PER 20-MIN SAMPLE		
		Volume of Vehicles w/ 1 Person	Volume of Vehicles w/ 2 People	Volume of Vehicles w/ 2+ People
Northbound	**7:00 AM**	67	15	2
	8:00 AM	134	19	2
Eastbound	**7:20 AM**	36	4	0
	8:20 AM	44	6	1
Westbound	**7:40 AM**	21	5	0
	8:40 AM	34	4	0
	Vehicles	336	53	5
	Passengers	336	106	18
	Avg. Occupancy	**1.2**		

Figure 4 - Example of a manual vehicle occupancy study

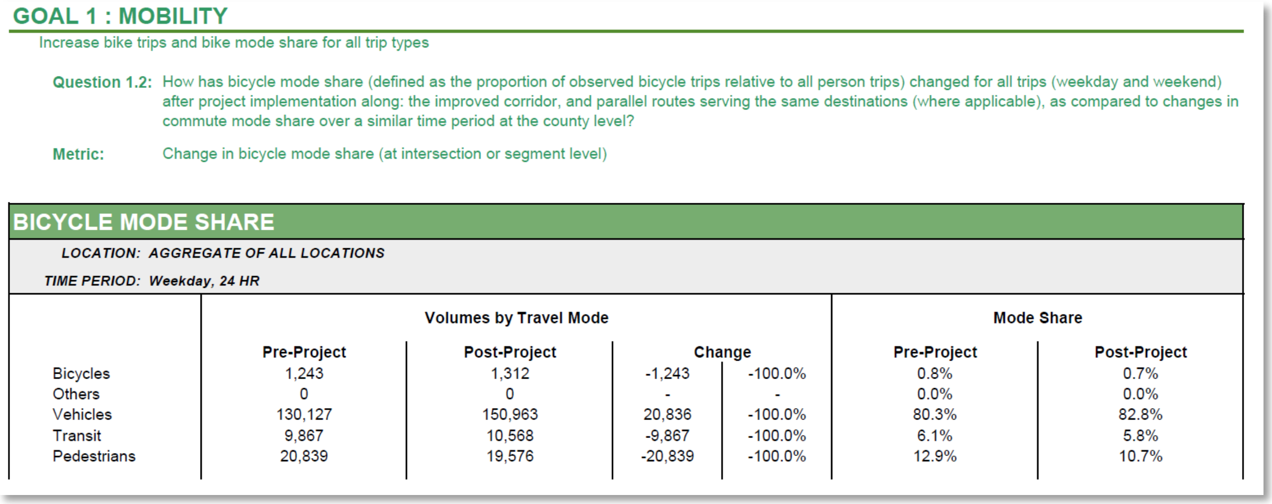
Vehicle occupancy tends to differ by trip type with commute trips generally having lower *vehicle occupancy* than non-commute trips. Therefore, consider collecting *vehicle occupancy* surveys at different times of day or during the PM peak period, when there tends to be a greater mix of trip types.

Data collection companies have been instructed to distinguish between public and private passenger transit vehicles. At locations with large numbers of private buses (e.g. near convention centers and other tourist destinations), an estimate of the number of passengers per private transit vehicle should be multiplied by the number of observed private transit vehicles to generate a more accurate estimate of *person throughput*.

***American Community Survey (ACS) Commuting Mode Share Data*, County Level (Control Area)**

As a point of reference, the change in mode share along the project corridor should be compared to the countywide change in mode share in the first full years immediately preceding the start of construction and immediately following its completion. The *ACS* one-year sample (Table S0801 Commuting Characteristics by Sex) at the county level should be used. The *ACS* is not directly comparable to the data collected along the project corridor because it only includes self-reporting of the travel mode “usually” used for the longest (distance-based) portion of the respondents’ commute during the week preceding the survey. The multimodal intersection counts capture observed activity for all trip types and all trip segments for a single 24-hour period. For example, if a motorist drives through the intersection or across the screenline, parks on the street, and walks back through the intersection to her final destination, both the driven and walked portions of the trip are captured.

The automated reporting tool will assemble all data into an accounting of *person throughput* by mode for each location and aggregate them to produce the summary report which directly answers Question 1.2, shown in **Figure 5**. Other (non-bicycle) modes are also reported in order to provide a complete picture of *person throughput* by mode.



GOAL 1 : MOBILITY

Increase bike trips and bike mode share for all trip types

Question 1.2: How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all trips (weekday and weekend) after project implementation along: the improved corridor, and parallel routes serving the same destinations (where applicable), as compared to changes in commute mode share over a similar time period at the county level?

Metric: Change in bicycle mode share (at intersection or segment level)

BICYCLE MODE SHARE

LOCATION: AGGREGATE OF ALL LOCATIONS

TIME PERIOD: Weekday, 24 HR

	Volumes by Travel Mode				**Mode Share**	
	Pre-Project	**Post-Project**	**Change**		**Pre-Project**	**Post-Project**
Bicycles	1,243	1,312	-1,243	-100.0%	0.8%	0.7%
Others	0	0	-	-	0.0%	0.0%
Vehicles	130,127	150,963	20,836	-100.0%	80.3%	82.8%
Transit	9,867	10,568	-9,867	-100.0%	6.1%	5.8%
Pedestrians	20,839	19,576	-20,839	-100.0%	12.9%	10.7%

Figure 5 - Summary Report that answers Question 1.2.

Example Locations

Multimodal Intersection Count at Park Boulevard and Morley Field Drive

Multimodal intersection counts are conducted at intersections in locations where the bikeway corridor under evaluation intersects a corridor providing bus service, and at locations where the proposed improvement can be expected to have an impact on overall mode share. The image below shows the intersection of Park Boulevard and Morley Field Drive as an example location. This intersection is located along the Park Boulevard portion of the Uptown Bikeways project and includes high levels of multimodal activity, as it provides a boarding and alighting location to Bus Route 7, which serves the middle school to the west of the intersection and Balboa Park. This intersection is shown in **Figure 6**.

Figure 6 - Example of Multimodal Intersection Count Location at Park Boulevard and Morley Field Drive

Goal 2 – Access

Improve bicycle and pedestrian connections between communities. Provide direct access to schools, transit, community destinations, and commercial centers.

QUESTION 2.1:

How has the number of observed bike, pedestrian, and other micromobility trips (weekday and weekend[5]) changed at locations serving key destinations along the following: the improved corridor, parallel routes serving the same destinations (where applicable), and *control locations*?

METRIC 2.1:

Change in number of observed bike, pedestrian, and other micromobility trips at locations serving key destinations

Data Sources:

- Multimodal intersection counts
- Screenline counts
- *Control locations*

Location Selection Guidance and Examples

Bicycle and Pedestrian Intersection Counts (24-hour)

Bicycle, pedestrian, and other micromobility modes are counted at intersections where a change to the intersection configuration is proposed and anticipated to improve conditions for people both walking and riding. These counts can be cheaper to collect, process, and input than full multimodal counts. As mentioned in Metrics 1.1 and 1.2, intersection counts should be considered at locations where the bikeway corridor under evaluation intersects: (1) another existing or proposed bike facility; (2) a street with significant levels of transit service; or (3) a street where significant numbers of bikeway users may be expected to enter or exit the bikeway corridor under evaluation in order to access commercial or residential areas. In addition to transit stations, locations that provide direct access to traditional attractors (e.g. schools and targeted community destinations/centers) should be selected to evaluate a project's progress toward this goal. See the example location and further description of a bicycle and pedestrian intersection count below and in **Figure 8**.

Bicycle and Pedestrian Screenline Counts (24-hour)

As mentioned in Metric 1.1, the same criteria applies here with additional attention paid toward proximity to specific destinations, as discussed in the bicycle and pedestrian intersection counts paragraph above. As opposed to a multimodal screenline, which counts bicycles, pedestrians, "other micromobility modes," transit, and motor vehicles, a bicycle and pedestrian screenline provides cost savings by removing transit and motor vehicle datacollection in locations where this information is of limited importance. See example location and further description of a bicycle and pedestrian screenline count below and in **Figures 9 and 10**.

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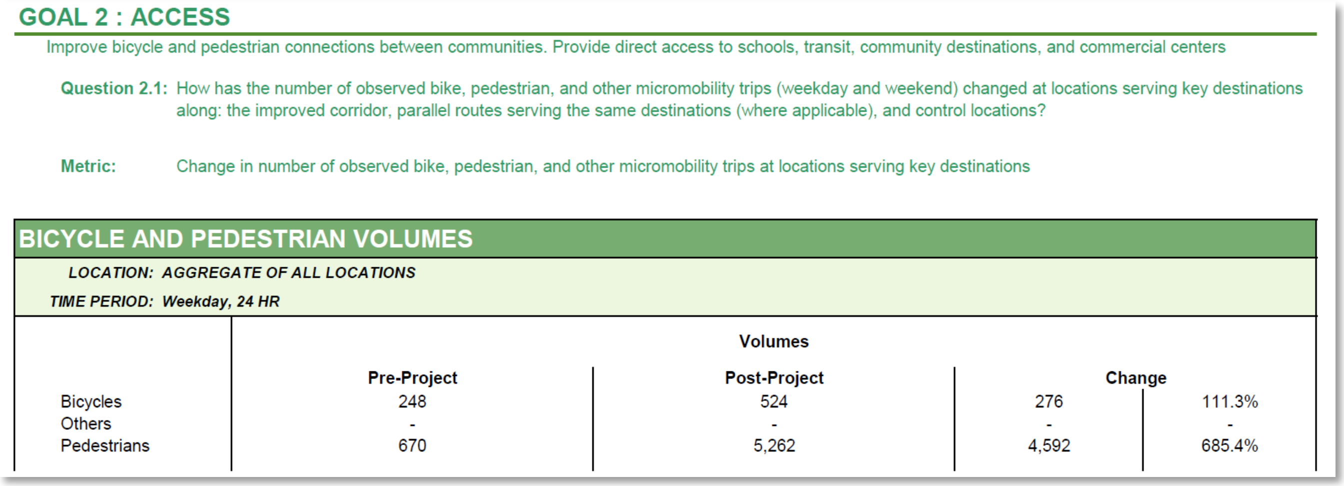
[5] To determine whether weekend counts are warranted for the project or location, see the Introduction section above.

Control Locations

See the description in Metric 1.1. Some automated counter locations may also include pedestrian volumes.

Data Processing/Analysis Guidance & Forms



GOAL 2 : ACCESS

Improve bicycle and pedestrian connections between communities. Provide direct access to schools, transit, community destinations, and commercial centers

Question 2.1: How has the number of observed bike, pedestrian, and other micromobility trips (weekday and weekend) changed at locations serving key destinations along: the improved corridor, parallel routes serving the same destinations (where applicable), and control locations?

Metric: Change in number of observed bike, pedestrian, and other micromobility trips at locations serving key destinations

BICYCLE AND PEDESTRIAN VOLUMES

LOCATION: AGGREGATE OF ALL LOCATIONS

TIME PERIOD: Weekday, 24 HR

	Volumes			
	Pre-Project	Post-Project	Change	
Bicycles	248	524	276	111.3%
Others	-	-	-	-
Pedestrians	670	5,262	4,592	685.4%

Figure 7 - Summary Report from the Bayshore Bikeway that answers Question 2.1. The pre- and post-project counts for the Bayshore Bikeway segment were completed before other micromobility mode volumes were included in the counts.

Example Locations

Bicycle, Pedestrian, and Other Micromobility Modes Intersection: North Park Mid-City Bikeway at Central Avenue and Meade Avenue

Bicycle, pedestrian, and other micromobility counts are conducted at intersections where a change to the intersection configuration is proposed and anticipated to make conditions better for people walking, riding bikes, and riding other micromobility modes. Using the intersection of Central Avenue and Meade Avenue as an example, the project will introduce traditional "bicycle boulevard" facility enhancements, including a neighborhood traffic circle, curb extensions, high-visibility crosswalks, and a mix of Class-II and Class-III bicycle facilities. The bicycle/pedestrian intersection counts will collect pedestrian, bicycle, and other micromobility mode ADT volumes for a 24-hr period, both before and after the project is constructed. The purpose of selecting the following count site to evaluate progress toward this specific goal is its proximity to a key destination, Teralta Park. Note that the following examples are for illustration purposes only and do not reflect the final counts or constructed project (the Central Avenue Bikeway), which is in the final design phase.

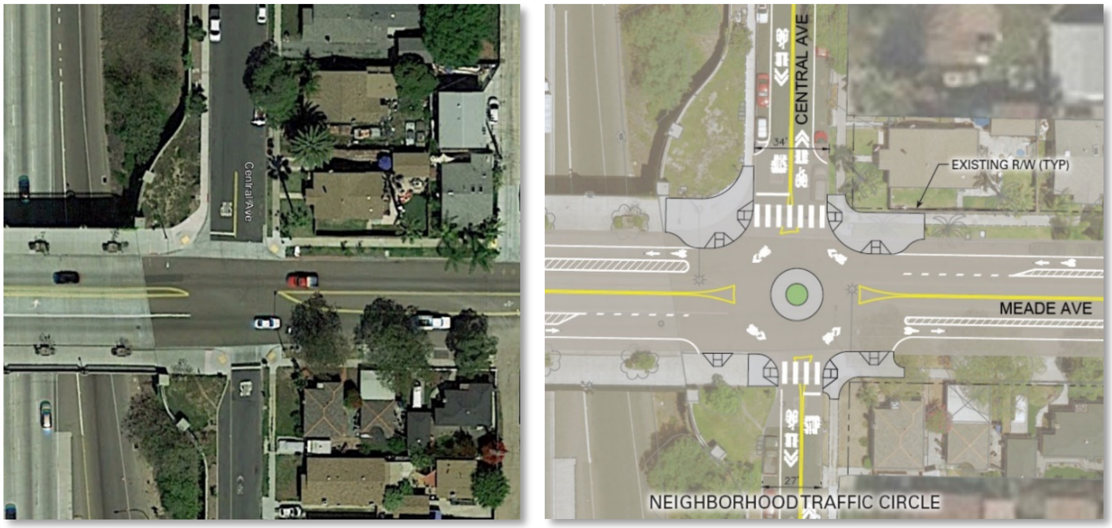


Figure 8 – Example of a bicycle and pedestrian intersection as shown by the existing intersection configuration and the proposed roundabout improvement at Central Avenue and Meade Avenue

The change in bicycle and pedestrian volumes, as collected pre- and post-project, are shown in **Figures 9** and **10**. A general increase in both people riding bikes and people walking through this intersection has occurred.

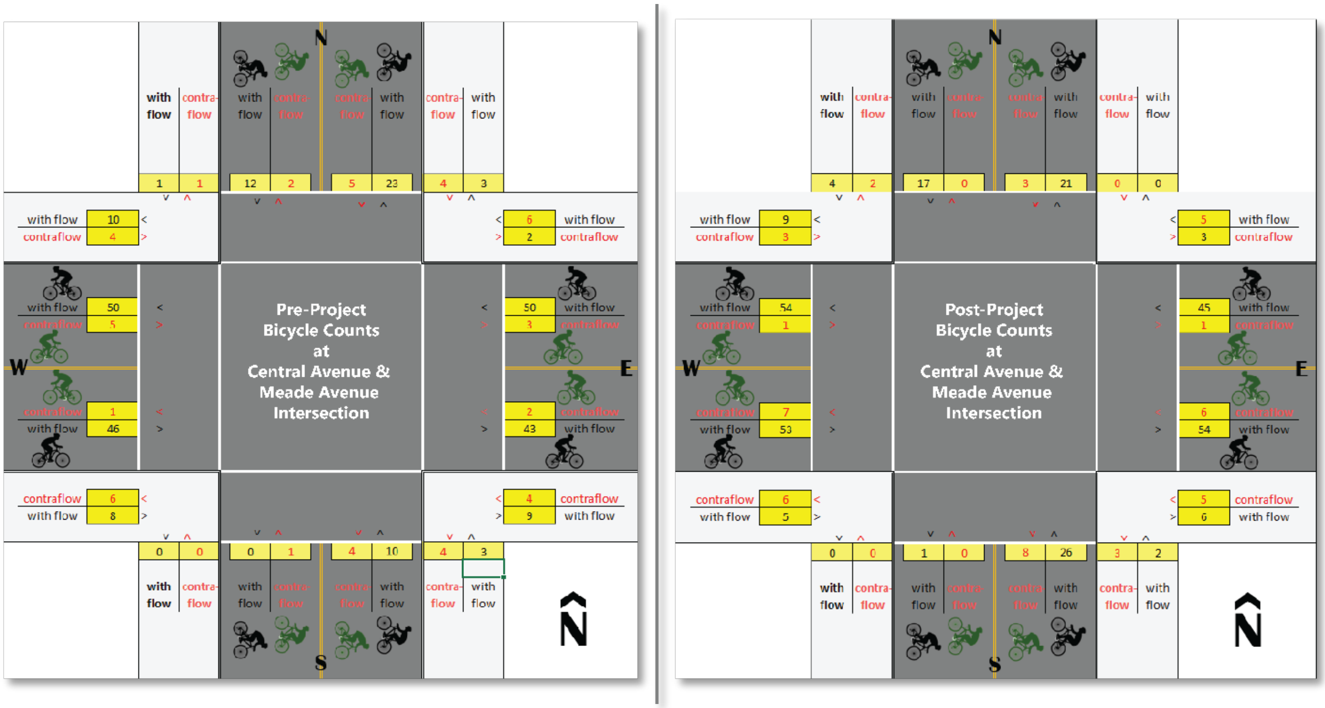


Figure 9 - Pre- and Post-Project Bicycle Counts at Central Avenue and Meade Avenue

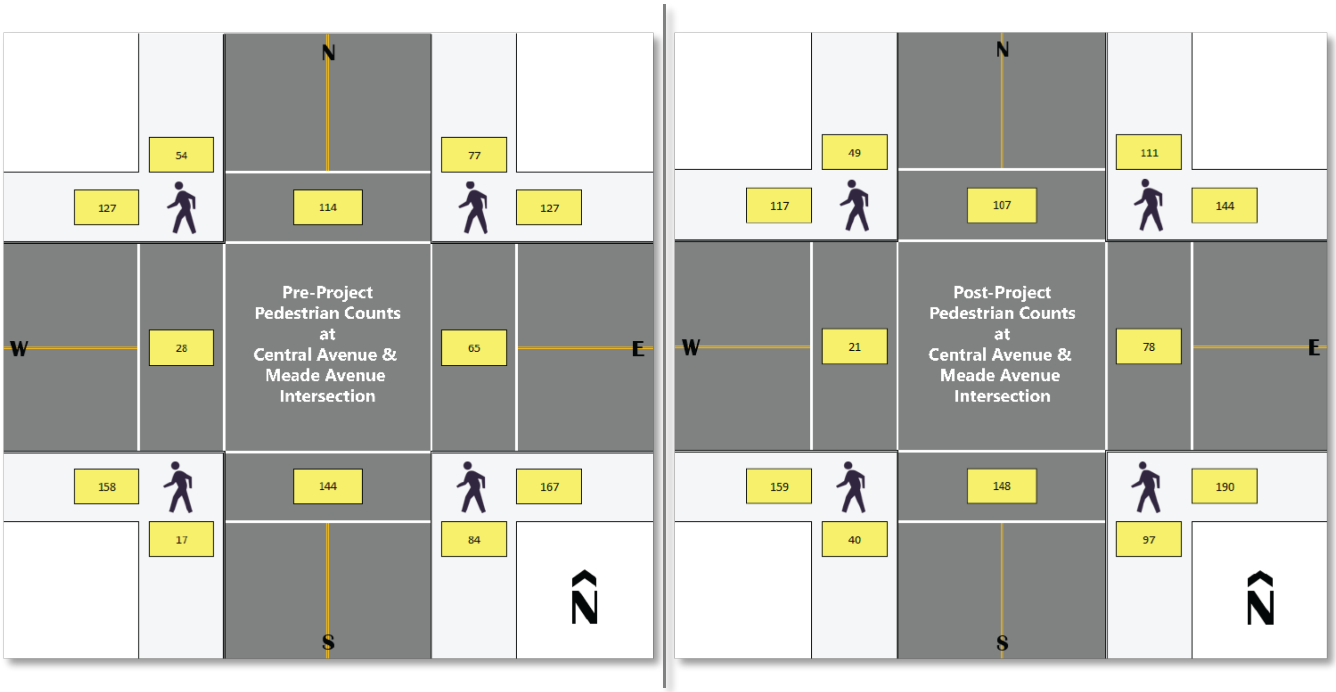


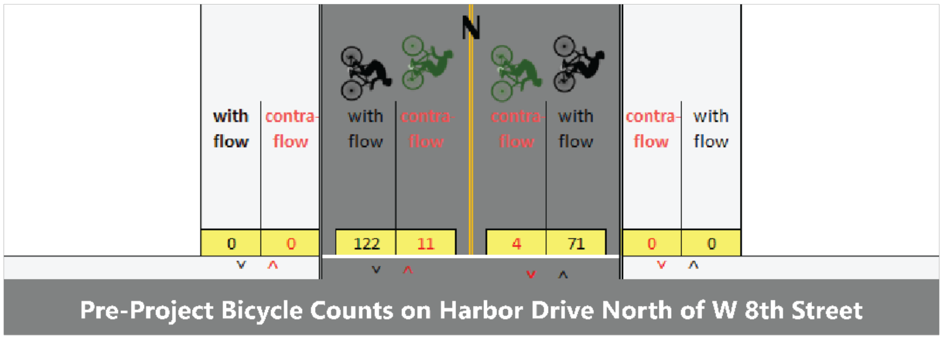
Figure 10 - Pre- and Post- Pedestrian Counts at Central Avenue and Meade Avenue

Bicycle and Pedestrian Screenline Count on the Bayshore Bikeway at Harbor Drive North of W 8th Street.

This screenline count location was selected to determine the degree to which the extension of the Bayshore Bikeway Class I bike path increases the utility of the existing bike path and the bike lanes along Harbor Drive. It also provides data for evaluating the facility-type choice of bikeway users, specifically whether the project encourages a shift in activity from the adjacent bike lanes (attractive to more experienced cyclists) onto the bike path (for all ages and abilities). See **Figures 11** and **12** for the location of the screenline (images show the post-project condition), and **Figure 13** for the pre- and post-project bicycle volumes at this location.

Figure 11 - Example of a Bicycle, Pedestrian, and "Other Micromobility Mode" Screenline Location on Harbor Drive

Figure 12 - Example of Pedestrian and Bicycle Screenline Locations Along Harbor Drive



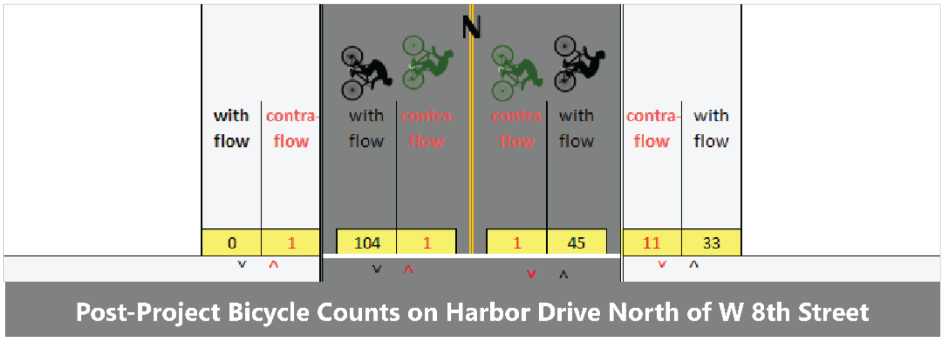


Figure 13 - Pre- and Post-Project Bicycle Counts on Harbor Drive North of W 8th Street. These volumes show a shift from on-street riding to bike path riding following the construction of the two-way bike path on the east side of the road.

QUESTION 2.2:

Has the number of observed bicycles parked around schools, transit stations, and specific community destinations/centers increased after project implementation?

METRIC 2.2:

Change in the number of parked bicycles observed around schools, transit stations, and community destinations

Data Sources:

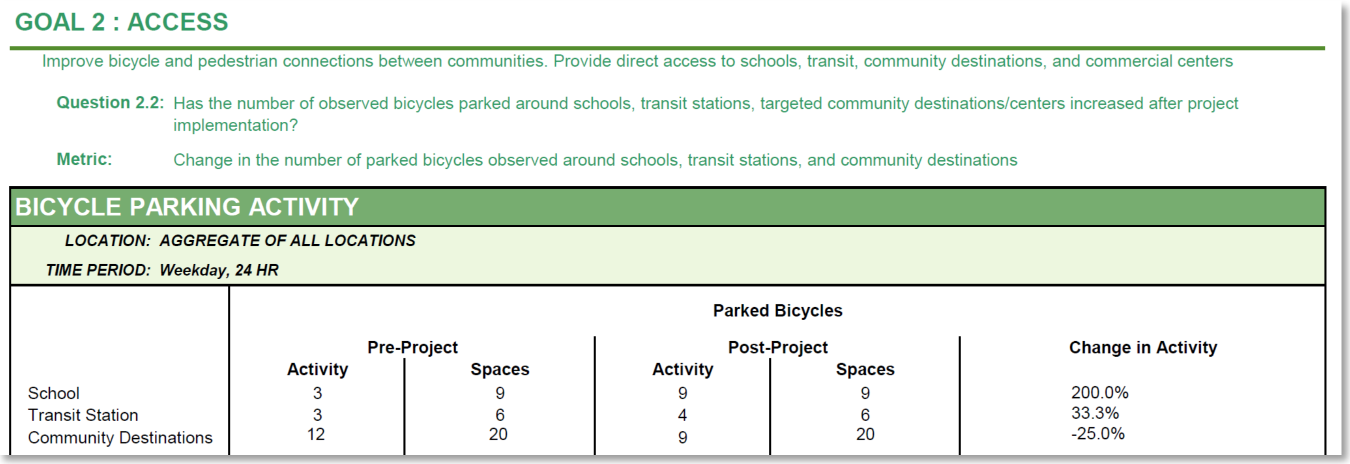
- Bicycle parking occupancy counts
- *Control locations*

Location Selection Guidance

Bicycle parking counts should indicate the number of bikes parked and total parking supply in designated areas, such as bike racks or bike corrals. Bicycle parking counts use video technology to record the number of bikes parked over a 24-hour period in 15-minute increments. The parking counts should be located near schools, transit stations, or community destinations directly along the project corridor. The video is reduced/converted to counts by a single technician playing the video at 4x fast-forward speed, reviewing at an image resolution that maintains anonymity.

Data Processing/Analysis Guidance & Forms

Before and after bicycle parking data will be tagged with the location type (school, transit stop/station, or other community destination). The summary report for Question 2.2 is shown in **Figure 14**.



GOAL 2 : ACCESS

Improve bicycle and pedestrian connections between communities. Provide direct access to schools, transit, community destinations, and commercial centers

Question 2.2: Has the number of observed bicycles parked around schools, transit stations, targeted community destinations/centers increased after project implementation?

Metric: Change in the number of parked bicycles observed around schools, transit stations, and community destinations

BICYCLE PARKING ACTIVITY

LOCATION: AGGREGATE OF ALL LOCATIONS

TIME PERIOD: Weekday, 24 HR

	Parked Bicycles				
	Pre-Project		Post-Project		Change in Activity
	Activity	Spaces	Activity	Spaces	
School	3	9	9	9	200.0%
Transit Station	3	6	4	6	33.3%
Community Destinations	12	20	9	20	-25.0%

Figure 14 - Summary Report that answers Question 2.2

Example Locations

<u>Bicycle Parking Occupancy: Richmond Street South of University Avenue</u>

Bicycle parking occupancy counts are conducted at bike corrals located along or near the proposed project alignment. The bicycle parking occupancy count will record the number of parked bicycles at a specified bike corral. The occupancy counts will be conducted in 1-hour sweeps for a 12-hour period (totaling 12 total occupancy counts per bike corral), both before and after the project is constructed. Bicycle occupancy per location will be defined simply as how many bicycles are parked at the bicycle corral. Dockless bike share bikes parked near the racks were excluded from the counts, as these may have been distributed to these sites by the bike share operator. An example of a bicycle corral is pictured in **Figure 15**.

Figure 15 - Example of Bicycle Corral at Richmond Street South of University Avenue in Hillcrest

Goal 3 – Safety

Improve safety for all users.

QUESTION 3.1:

How have the number and rate of reported collisions changed after project implementation along the improved corridor, or at selected locations (such as schools and along routes to transit) within the project area?

METRIC 3.1:

Change in annual number and rate of reported collisions

Data Sources:

- *SWITRS/TIMS/Local Police Department collision data*
- Multimodal intersection counts

Location Selection Guidance

In most locations, bicycle and pedestrian collisions are infrequent occurrences, and it may not be possible to reliably evaluate a change in collisions for all projects. For on-street bikeway projects, the entire length of the improved corridor should be considered for evaluation, as well as intersecting streets where (1) multi-modal counts have been taken; and (2) constructed improvements, such as curb extensions, striping, pavement markings, warning signs, signal modifications, or other treatments, can be reasonably expected to improve pedestrian and bicyclist safety. For shared use paths (Class I Bikeways), the project team will evaluate collisions on parallel roadways or at improved crossings.

Data Processing & Analysis

As complete *collision data* may not be publicly available until years after it was originally reported, it is not necessary to collect *collision data* until after the project has been completed and post-construction count data has been collected. While a one-year period is preferred for expediency, it may be necessary to extend the evaluation period to capture an average annual number of bicycle and pedestrian collisions greater than zero. For example, the application instructions for the California Statewide Active Transportation Program (ATP) requires applicants to, "enter the total reported pedestrian and/or bicycle collisions using the most recent 5 to 11 years of available data," which is then used to calculate an annual average. One advantage of routinely[6] maintaining the *collision records* for all project corridors/intersections is being prepared for grant application questions, such as those in the ATP grant program.

As a first step, identify all collisions along the improved corridor (and at selected intersecting streets, if applicable) for the 12- and 24-month periods preceding the start of construction.[7] For the project corridor, only include collisions that list the project corridor street name as the "Primary" collision location. For intersecting streets, include all collisions located within 250 feet of the intersection. (This can be accomplished either using GIS

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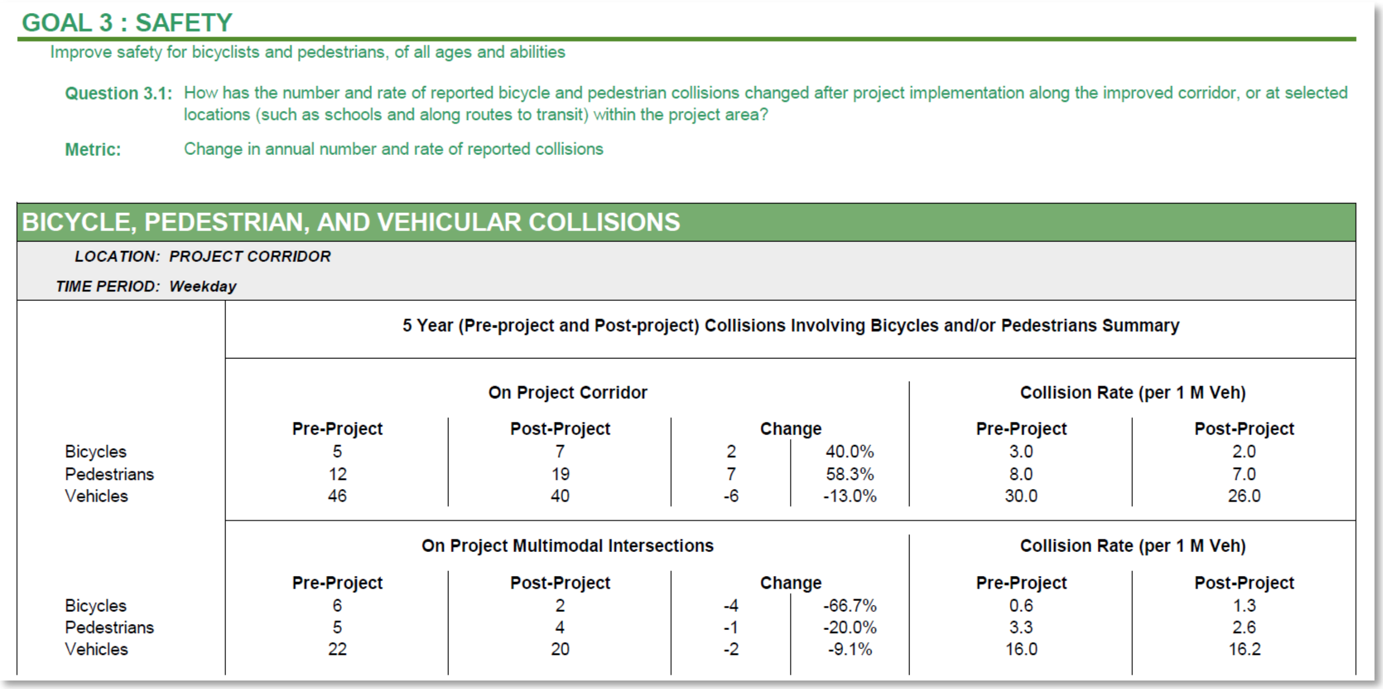
[6] *Collision records* will be routinely maintained at least every two (2) years by SANDAG staff.

[7] A longer time period preceding the start of construction may be needed to calculate an annual average greater than zero. The project team will determine how many years of data need to be considered when reviewing the data.

software or by using the "Offset Distance" field.) SANDAG staff or designated consultants will prepare this data by project in batches using GIS software for consistency across all evaluated projects.

Once the *collision data* is entered in the database, bicycle- and pedestrian-involved and vehicle-only collisions will be identified separately and reported using the form below. The annualized pre- and post-project collisions will be divided by the annualized pre- and post-project bicycle and pedestrian counts or vehicular volumes to come up with a collision rate per 1 million vehicles. A summary of *collision data* is shown in **Figure 16**.



GOAL 3 : SAFETY

Improve safety for bicyclists and pedestrians, of all ages and abilities

Question 3.1: How has the number and rate of reported bicycle and pedestrian collisions changed after project implementation along the improved corridor, or at selected locations (such as schools and along routes to transit) within the project area?

Metric: Change in annual number and rate of reported collisions

BICYCLE, PEDESTRIAN, AND VEHICULAR COLLISIONS

LOCATION: PROJECT CORRIDOR

TIME PERIOD: Weekday

5 Year (Pre-project and Post-project) Collisions Involving Bicycles and/or Pedestrians Summary

	On Project Corridor				Collision Rate (per 1 M Veh)	
	Pre-Project	Post-Project	Change		Pre-Project	Post-Project
Bicycles	5	7	2	40.0%	3.0	2.0
Pedestrians	12	19	7	58.3%	8.0	7.0
Vehicles	46	40	-6	-13.0%	30.0	26.0

	On Project Multimodal Intersections				Collision Rate (per 1 M Veh)	
	Pre-Project	Post-Project	Change		Pre-Project	Post-Project
Bicycles	6	2	-4	-66.7%	0.6	1.3
Pedestrians	5	4	-1	-20.0%	3.3	2.6
Vehicles	22	20	-2	-9.1%	16.0	16.2

Figure 16 - Summary Report that answers Question 3.1

QUESTION 3.2:

How have traffic volumes changed within the corridor after project implementation?

METRIC 3.2:

Change in the number of vehicles traveling the corridor expressed as average daily traffic

Data Sources:

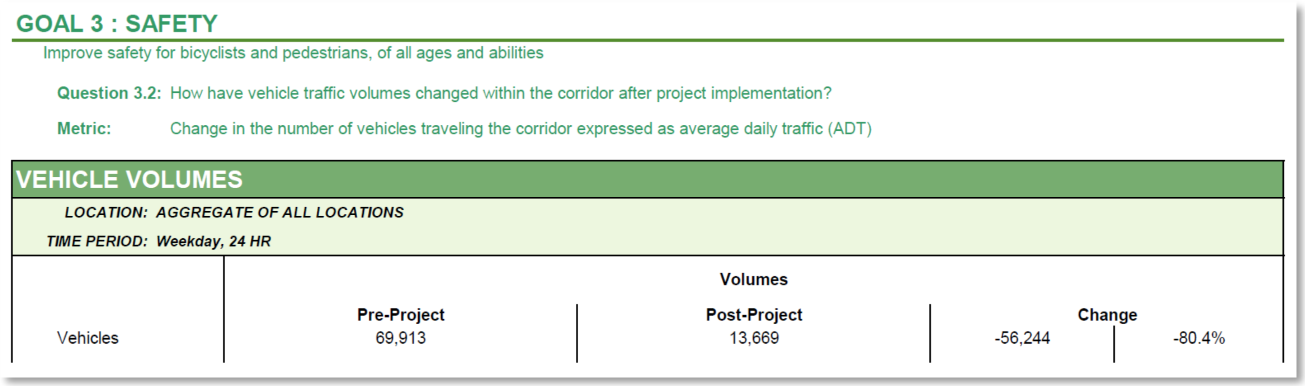
- Tube counts (vehicle ADT)

Location Selection Guidance

Select locations that have typical adjacent land uses along the project corridor and lane configurations representing the predominant cross-sections to most accurately record motor vehicle volumes. Tube counts should generally be taken in conjunction with speed surveys and bicycle/pedestrian screenline counts. Tube counts and speed surveys can be taken simultaneously at low cost using a single piece of equipment (see "Location Selection Guidance" paragraph in Question 3.3 below for more information on speed surveys).

Data Processing & Analysis

The number of interactions between bicyclists, pedestrians, and motorists is one measure of "exposure" that has been correlated with the likelihood of collisions. It has also been correlated with perceived safety and the level of traffic stress that a bicyclist feels when using a roadway. Traffic volumes before and after project construction will be reported using the form in **Figure 17**.



GOAL 3 : SAFETY

Improve safety for bicyclists and pedestrians, of all ages and abilities

Question 3.2: How have vehicle traffic volumes changed within the corridor after project implementation?

Metric: Change in the number of vehicles traveling the corridor expressed as average daily traffic (ADT)

VEHICLE VOLUMES

LOCATION: AGGREGATE OF ALL LOCATIONS

TIME PERIOD: Weekday, 24 HR

	Volumes			
	Pre-Project	**Post-Project**	**Change**	
Vehicles	69,913	13,669	-56,244	-80.4%

Figure 17 - Summary Report from SR-15 Commuter Bikeway that answers Question 3.2

Example Locations

Vehicular Screenline: Pershing Bikeway on Pershing Drive South of Redwood Street

Using the segment of Pershing Drive south of Redwood Street as an example, shown below, the project will reduce the number of lanes in each direction from two to one. The vehicular screenline will collect vehicle speeds and average daily traffic (ADT) counts for a 24-hour period, both before and after the project is constructed. At this particular location, speeds and volumes will be recorded as Pershing Drive (northbound) approaches the three-way intersection with Redwood Street. The improvements at this location will include traffic calming improvements, as shown in **Figure 18**.

Existing and Proposed Improvement at Pershing Drive South of Redwood Street:

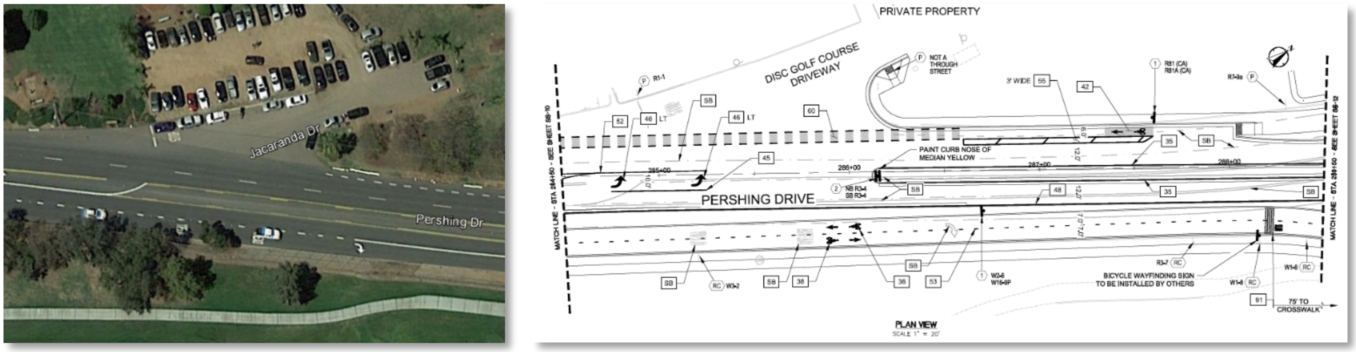


Figure 18 - Existing and Proposed Improvement at Pershing Drive South of Redwood Street

QUESTION 3.3:

How have motor vehicle traffic speeds changed within the corridor after project implementation?

METRIC 3.3:

Change in the mean (average), 85th percentile, and 95th percentile speeds along the project corridor

Data Sources:

- Tube counts (vehicle speed) or radar

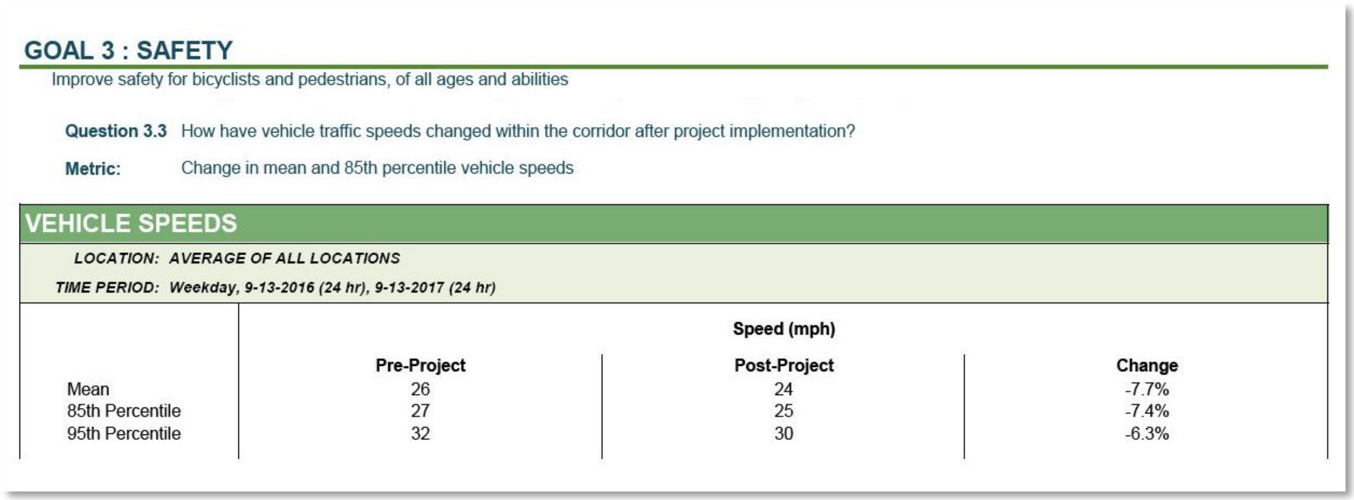
Location Selection Guidance

Select locations with typical adjacent land uses along the project corridor and lane configurations representing the predominant cross-sections to record vehicle speeds. Speed and volume counts should also be considered where different traffic calming treatments or changes to roadway configuration will be implemented (i.e., at roadway segments where there is a proposed road diet and/or presumed vehicular speed concern). Tube counts should generally be taken in conjunction with bicycle and pedestrian screenline counts and speed surveys but may be taken alone as motor vehicle-only locations to reduce costs, as shown in Example Locations in **Figure 20**. Though tube counts and speed surveys can be taken simultaneously at low cost using a single piece of equipment, prices for both do increase when the number of lanes is greater than three (3).

Data Processing & Analysis

The mean (average), 85th percentile, and 95th percentile speeds are evaluated to capture changes at different points along the speed spectrum. For example, the mean (average) travel speed may be expected to change where traffic calming measures such as speed humps are installed, but motorists may compensate by accelerating to higher speeds in other areas. In a section where lane narrowing or a road diet has been implemented, the average speed may not change significantly, but the most unsafe (highest) speeds may be brought down, which will be captured by the 95th percentile speed. The 85th percentile speed is a standard measure used to set posted speed limits. If a significant enough reduction in the 85th percentile speed is achieved, it will be possible to set and enforce a lower speed limit for this section of roadway.

Speed data requires minimal data processing. Once the completed forms (provided by the data collection firm) are added to the project evaluation database, the report in **Figure 19** will be produced.



GOAL 3 : SAFETY

Improve safety for bicyclists and pedestrians, of all ages and abilities

Question 3.3 How have vehicle traffic speeds changed within the corridor after project implementation?

Metric: Change in mean and 85th percentile vehicle speeds

VEHICLE SPEEDS

LOCATION: AVERAGE OF ALL LOCATIONS

TIME PERIOD: Weekday, 9-13-2016 (24 hr), 9-13-2017 (24 hr)

	Speed (mph)		
	Pre-Project	**Post-Project**	**Change**
Mean	26	24	-7.7%
85th Percentile	27	25	-7.4%
95th Percentile	32	30	-6.3%

Figure 19 - Summary Report that answers Question 3.3

Example Locations

Vehicular Screenline: Pershing Drive South of Velodrome Entrance

Conducting vehicular screenline counts at roadway segments where there are proposed road diets and presumed vehicular speed concerns can demonstrate safer outcomes and provide valuable results for future planning. Using the segment of Pershing Drive south of the entrance to the Velodrome/City fleet yard as an example, the project will reduce the number of lanes in each direction from two to one. The vehicular screenline will collect vehicle speeds and average daily traffic (ADT) counts for a 24-hour period, both before and after the project is constructed. At this particular location, where northbound Pershing Drive currently has a posted speed limit of 50 mph, only vehicle speeds and volumes were recorded. See **Figure 20** for an aerial of this location.

Figure 20 - Existing and Proposed Improvement at Pershing Drive South of Velodrome Entrance

QUESTION 3.4:

How has the number and proportion of cyclists and people using other micromobility modes riding against the flow of traffic or on the sidewalk changed within the corridor after project implementation?

METRIC 3.4:

Change in the number of contraflow and sidewalk bike/other micromobility mode riders

Data Sources:

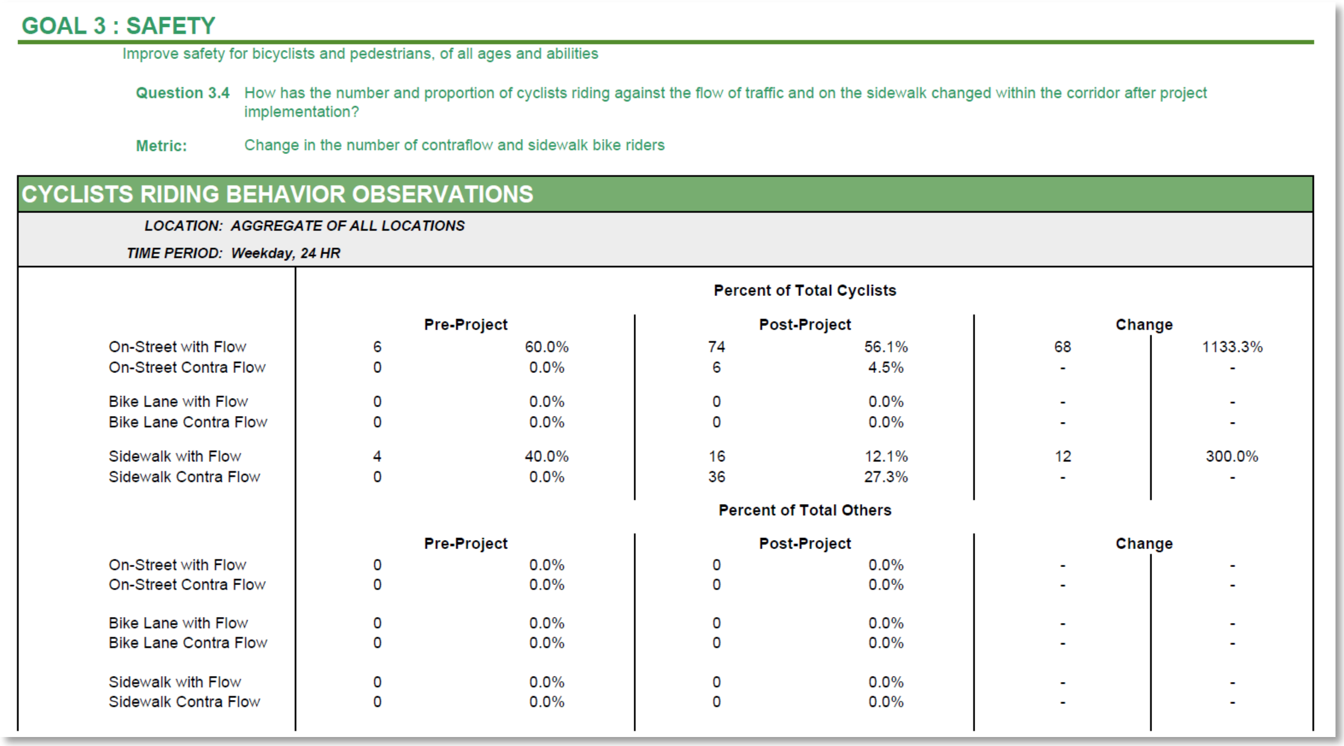
- Multimodal intersection counts

Location Selection Guidance

Locations will be selected using the criteria described under Metrics 1.1 & 1.2. Consideration should also be given to locations where wrong-way and sidewalk riding has been observed. As these behaviors often occur at intersections of one or more major arterials where bike facilities are absent, the selection criteria under Questions 1.1 and 1.2 will often coincide with these unsafe riding behaviors.

Data Processing & Analysis

Sidewalk and wrong-way riding are recorded at intersections on all approaches as shown in the diagram in **Figure 22**. The yellow-highlighted cells indicate cyclist observations by direction of travel, with the red numbers indicating the number of cyclists observed to be riding in the contraflow direction. The before and after data from multimodal intersection counts will then be aggregated to the intersection level and reported as percentages in the form in **Figure 21**.



GOAL 3 : SAFETY

Improve safety for bicyclists and pedestrians, of all ages and abilities

Question 3.4 How has the number and proportion of cyclists riding against the flow of traffic and on the sidewalk changed within the corridor after project implementation?

Metric: Change in the number of contraflow and sidewalk bike riders

CYCLISTS RIDING BEHAVIOR OBSERVATIONS

LOCATION: AGGREGATE OF ALL LOCATIONS

TIME PERIOD: Weekday, 24 HR

Percent of Total Cyclists

	Pre-Project		Post-Project		Change	
On-Street with Flow	6	60.0%	74	56.1%	68	1133.3%
On-Street Contra Flow	0	0.0%	6	4.5%	-	-
Bike Lane with Flow	0	0.0%	0	0.0%	-	-
Bike Lane Contra Flow	0	0.0%	0	0.0%	-	-
Sidewalk with Flow	4	40.0%	16	12.1%	12	300.0%
Sidewalk Contra Flow	0	0.0%	36	27.3%	-	-

Percent of Total Others

	Pre-Project		Post-Project		Change	
On-Street with Flow	0	0.0%	0	0.0%	-	-
On-Street Contra Flow	0	0.0%	0	0.0%	-	-
Bike Lane with Flow	0	0.0%	0	0.0%	-	-
Bike Lane Contra Flow	0	0.0%	0	0.0%	-	-
Sidewalk with Flow	0	0.0%	0	0.0%	-	-
Sidewalk Contra Flow	0	0.0%	0	0.0%	-	-

Figure 21 - Summary Report from SR-15 that answers question 3.4. For this data collection effort, the bicycle path was considered a sidewalk and other micromobility modes were not included.

Riding on-street with the flow of traffic is considered to be the safest behavior in most locations. Riding on-street but against the flow of traffic is considered the most unsafe behavior and is always illegal unless a contraflow bicycle facility has been provided. Sidewalk riding is typically prohibited in central business districts and considered unsafe in general due to potential conflicts with pedestrians, and because cyclists on sidewalks travel more quickly than pedestrians and are not expected by motorists. Bicyclists riding on sidewalks against the flow of adjacent motor vehicle traffic are at even higher risk because they approach from the right, while motorists tend to focus most acutely on motor vehicle traffic approaching from their left.

The diagram shown in **Figure 22** shows contraflow bicycle volumes as red numbers. This diagram illustrates that every possible riding direction is captured through the data collection associated with this project.

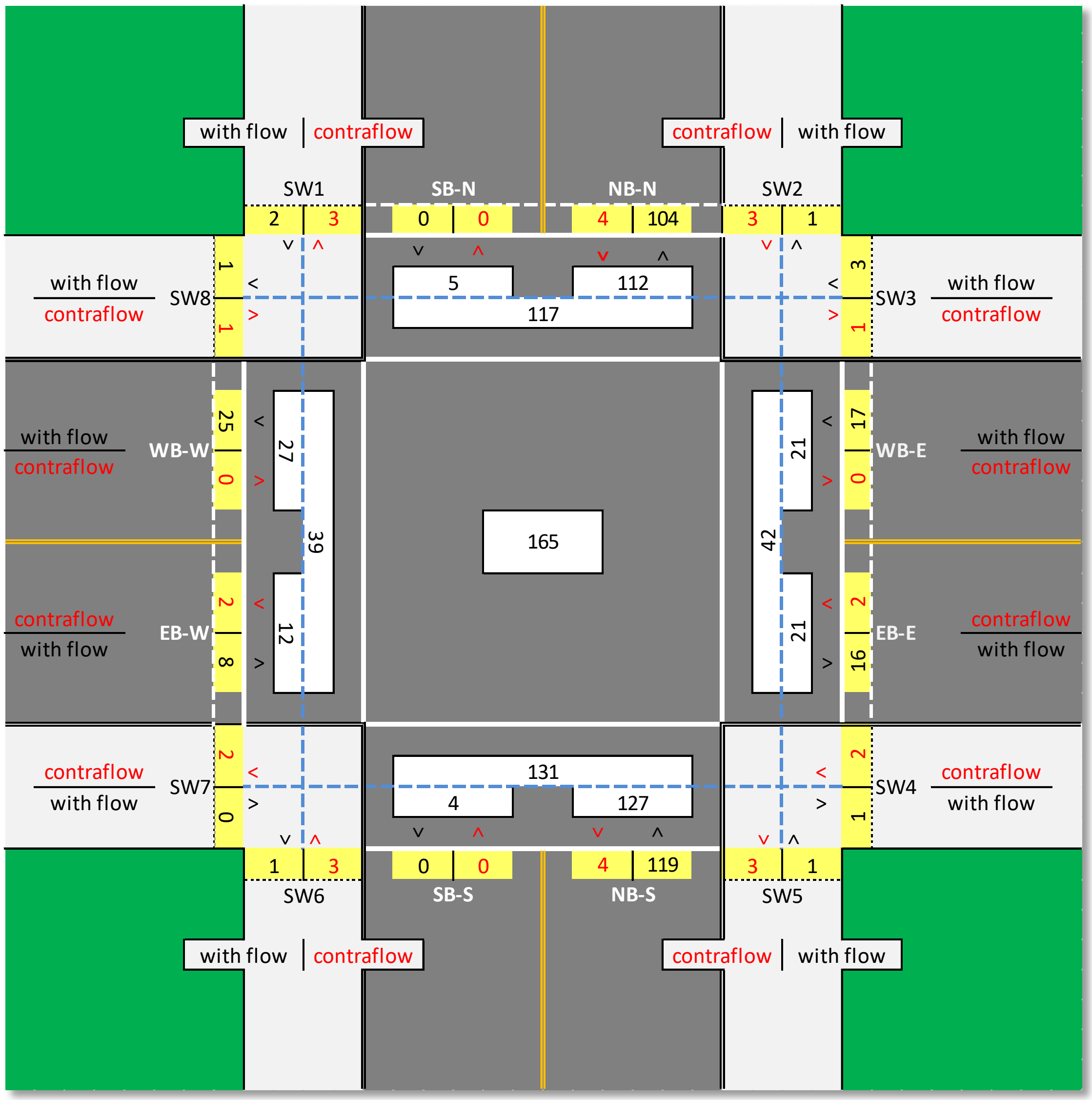


Figure 22 - Diagram showing with flow and contraflow bicycle counts.

QUESTION 3.5:

How has the yielding behavior of motorists at unsignalized crossings changed before and after project implementation?

METRIC 3.5:

Change in the percentage of motorists yielding at unsignalized pedestrian crossings

Data Sources:

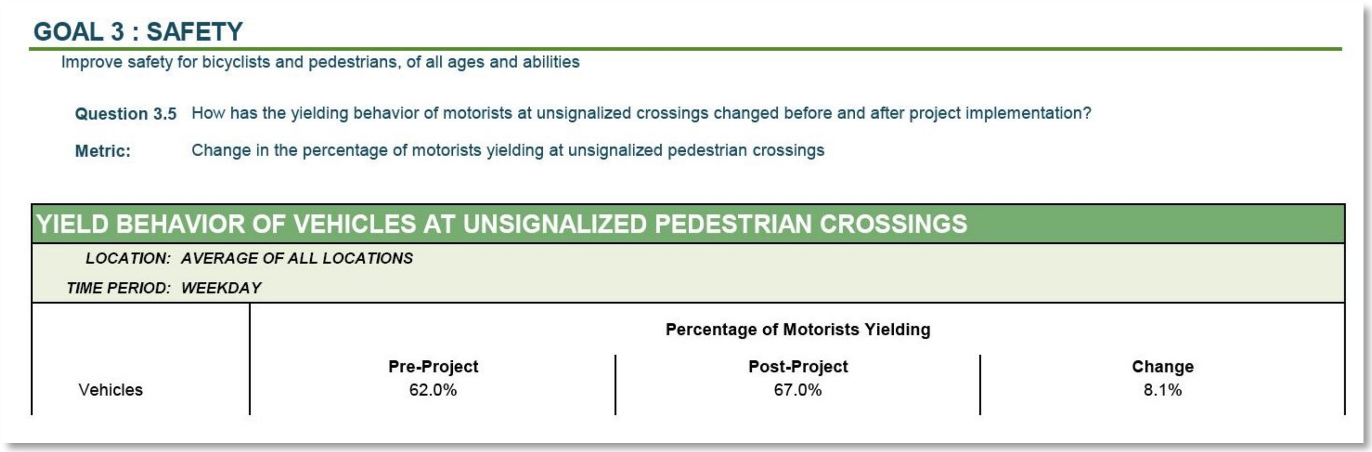
- Vehicle yielding study

Location Selection Guidance

Vehicle yield studies should be considered at intersections and mid-block locations where pedestrian crossing improvements will be constructed as part of the project under evaluation.

Data Processing & Analysis

The vehicle yield study will record observations of the number of vehicles that yield, or fail to yield, to pedestrians at the identified leg of the crosswalk for a 24-hr period, both before and after the project is constructed. Yielding is defined as the motorist stopping or slowing to allow a pedestrian to cross. Not yielding is scored as the motorist passing in front of the pedestrian even though the vehicle would have been able to stop safely when the pedestrian was in the crosswalk. The results will be presented in **Figure 23** as a percent change.



GOAL 3 : SAFETY

Improve safety for bicyclists and pedestrians, of all ages and abilities

Question 3.5 How has the yielding behavior of motorists at unsignalized crossings changed before and after project implementation?

Metric: Change in the percentage of motorists yielding at unsignalized pedestrian crossings

YIELD BEHAVIOR OF VEHICLES AT UNSIGNALIZED PEDESTRIAN CROSSINGS

LOCATION: AVERAGE OF ALL LOCATIONS

TIME PERIOD: WEEKDAY

	Percentage of Motorists Yielding		
	Pre-Project	**Post-Project**	**Change**
Vehicles	62.0%	67.0%	8.1%

Figure 23 - Summary Report that answers Question 3.5.

Example Location

<u>Vehicle Yield Study: Landis Street and 45th Street</u>

Vehicle yield studies are conducted at intersection and mid-block locations where pedestrian crossing improvements are proposed. Using the intersection of 45th Street and Landis Street as an example, shown below, the Landis Bikeway project will construct a raised crosswalk at the west leg of the intersection. The vehicle yield study will record observations of the number of vehicles that yield, or fail to yield, to pedestrians at the west leg crosswalk for a 24-hr period, both before and after the project is constructed. A vehicle yielding behavior study will determine if motorist yielding behavior measurably improves after project implementation.

Figure 24 - Existing and Proposed Improvements at Landis Street and 45th Street

Goal 4 – Experience

Improve perceptions of safety and create low-stress, comfortable experiences.

QUESTION 4.1:

How has route choice in the project area been impacted by the addition of higher quality bicycle facilities? (i.e. Have we seen bike trips shifting from *parallel corridors* to the improved corridor?)

METRIC 4.1:

Change in the percentage of bicyclists using the improved corridor (number of bicyclists on improved corridor divided by the total number of bicyclists using the improved corridor and parallel routes as percent change, pre- and post-project).

Note: This should only be used on projects with *parallel corridors* serving the same destinations (i.e. a typical urban street grid or bike path with parallel roadways serving similar destinations). Metrics 1.1, 1.2, 2.1, 2.2, 3.3, and 3.4 can all serve as standard proxies for measuring progress toward this goal.

Data Sources:

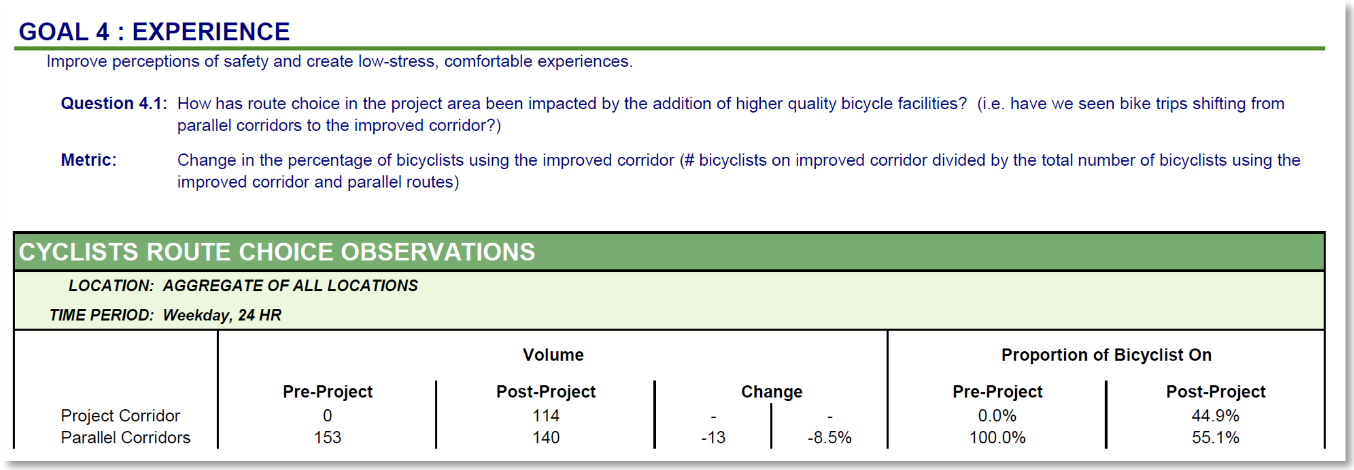
- Screenline bicycle counts
- Multimodal intersection counts (extracting bicycle data as screenlines)

Location Selection Guidance

Once all screenline and multimodal counts have been selected along the project corridor, identify locations for screenline counts at a smaller number of corresponding locations along *parallel corridors*.

Data Processing & Analysis

Once data for the project and *parallel corridors* have been tagged and added to the evaluation database, the report shown in **Figure 25** will be produced. If the proportion of bicyclists on the project corridor has increased, it would suggest that the perceived safety and comfort of that corridor was improved by the project. **Figure 26** shows example count locations where *parallel corridors* were considered.



GOAL 4 : EXPERIENCE

Improve perceptions of safety and create low-stress, comfortable experiences.

Question 4.1: How has route choice in the project area been impacted by the addition of higher quality bicycle facilities? (i.e. have we seen bike trips shifting from parallel corridors to the improved corridor?)

Metric: Change in the percentage of bicyclists using the improved corridor (# bicyclists on improved corridor divided by the total number of bicyclists using the improved corridor and parallel routes)

CYCLISTS ROUTE CHOICE OBSERVATIONS

LOCATION: AGGREGATE OF ALL LOCATIONS

TIME PERIOD: Weekday, 24 HR

	Volume				Proportion of Bicyclist On	
	Pre-Project	Post-Project	Change		Pre-Project	Post-Project
Project Corridor	0	114	-	-	0.0%	44.9%
Parallel Corridors	153	140	-13	-8.5%	100.0%	55.1%

Figure 25 - Summary Report that answers Question 4.1

Figure 26 – Example of count locations from the Uptown Bikeways: Fourth and Fifth Avenue show the pre-project condition. Route choice will be determined from counts at locations on the project corridors (2) (shown as thick yellow lines) and parallel corridors (2) conducted pre- and post-project.

Goal 5 – Economics

Encourage local economic activity and support of project-area businesses

QUESTION 5.1:

How have vacancy rates and/or the level of business patronage changed after project implementation?

METRIC 5.1 (OPTIONAL):

Using the change in total available buildings and the total inventory square footage listed as vacant, and the change in cumulative *sales tax* revenue along the project corridor (or selected commercial blocks), expressed as a percent change (+ or -) to evaluate a project corridor before and after implementation

Note: This should only be used on projects that propose a major redesign of an urban roadway that can be reasonably expected to impact real estate and retail sales.

Data Source:

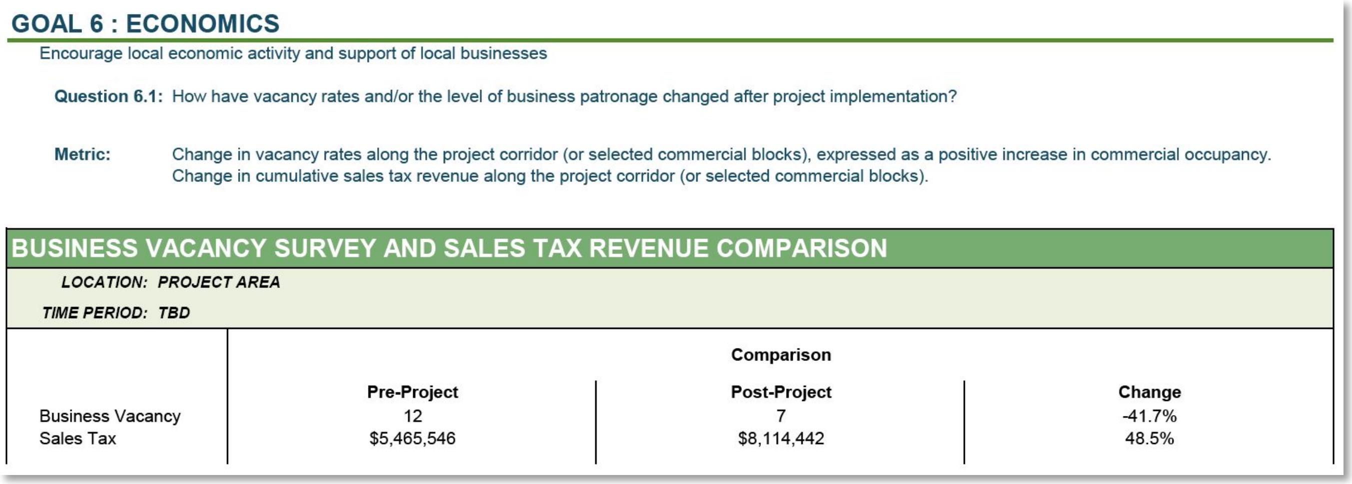
- Commercial vacancy rates – *CoStar* Property Listings Database (subscription required)
- Local *sales tax data* – SANDAG accesses data aggregated by MuniServices

Location Selection Guidance

All SANDAG EAP Bikeway Projects' alignments have been used to draw boundaries (buffers) extending one block in each direction from the alignment's centerline feature, for analyzing business sites and property parcels within each corridor.

Data Processing & Analysis

See Technical Appendix – "Econometrics" for description of the data products referenced above, and a description of the Interrupted Time Series (ITS) econometric technique. The report in **Figure 27** shows the summary of economic data.



GOAL 6 : ECONOMICS

Encourage local economic activity and support of local businesses

Question 6.1: How have vacancy rates and/or the level of business patronage changed after project implementation?

Metric: Change in vacancy rates along the project corridor (or selected commercial blocks), expressed as a positive increase in commercial occupancy.
Change in cumulative sales tax revenue along the project corridor (or selected commercial blocks).

BUSINESS VACANCY SURVEY AND SALES TAX REVENUE COMPARISON

LOCATION: PROJECT AREA

TIME PERIOD: TBD

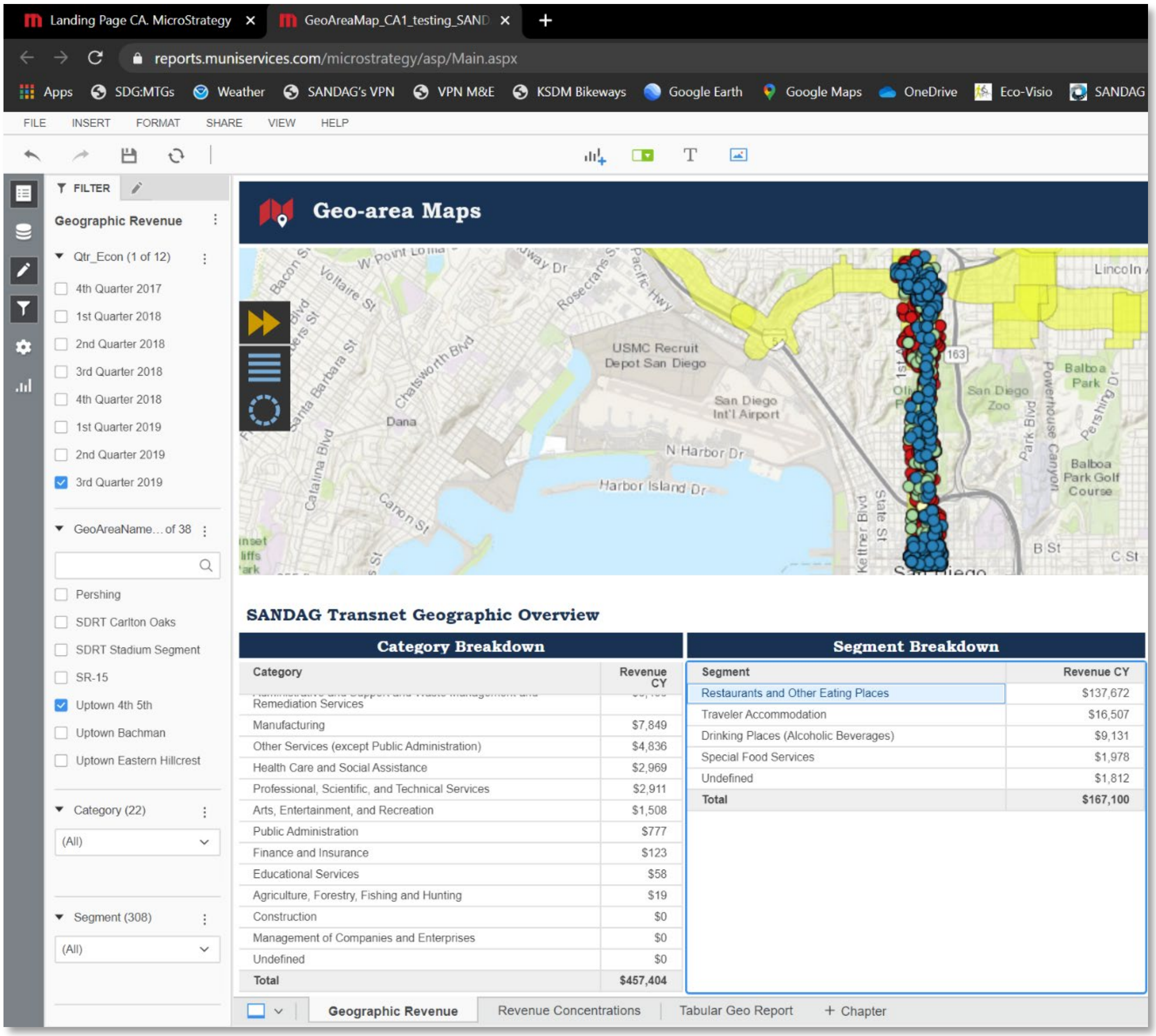
	Comparison		
	Pre-Project	**Post-Project**	**Change**
Business Vacancy	12	7	-41.7%
Sales Tax	$5,465,546	$8,114,442	48.5%

Figure 27 - Summary Report that answers Question 5.1

Example Locations

Commercial Vacancy Rates and Local Sales Tax Data – Uptown Bikeways: Fourth & Fifth Avenues

Local *sales tax data* is collected for the Uptown Bikeways: Fourth and Fifth Avenue projects to compare the impact the bikeways have on local businesses. **Figure 28** shows the interface from which the *sales tax data* is gathered and how the information is portrayed for the area surrounding the Fourth and Fifth Avenue Avenue Bikeways.



Geographic Revenue

Qtr_Econ (1 of 12)

- ☐ 4th Quarter 2017
- ☐ 1st Quarter 2018
- ☐ 2nd Quarter 2018
- ☐ 3rd Quarter 2018
- ☐ 4th Quarter 2018
- ☐ 1st Quarter 2019
- ☐ 2nd Quarter 2019
- ☑ 3rd Quarter 2019

GeoAreaName... of 38

- ☐ Pershing
- ☐ SDRT Carlton Oaks
- ☐ SDRT Stadium Segment
- ☐ SR-15
- ☑ Uptown 4th 5th
- ☐ Uptown Bachman
- ☐ Uptown Eastern Hillcrest

Category (22): (All)

Segment (308): (All)

SANDAG Transnet Geographic Overview

Category Breakdown

Category	Revenue CY
Remediation Services	
Manufacturing	$7,849
Other Services (except Public Administration)	$4,836
Health Care and Social Assistance	$2,969
Professional, Scientific, and Technical Services	$2,911
Arts, Entertainment, and Recreation	$1,508
Public Administration	$777
Finance and Insurance	$123
Educational Services	$58
Agriculture, Forestry, Fishing and Hunting	$19
Construction	$0
Management of Companies and Enterprises	$0
Undefined	$0
Total	**$457,404**

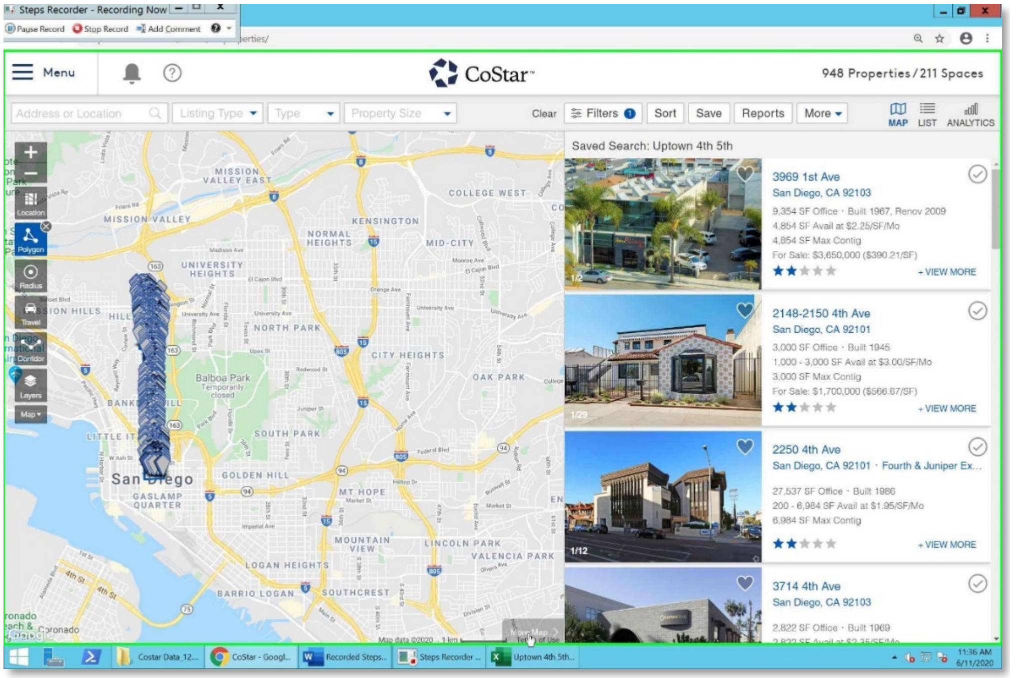
Segment Breakdown

Segment	Revenue CY
Restaurants and Other Eating Places	$137,672
Traveler Accommodation	$16,507
Drinking Places (Alcoholic Beverages)	$9,131
Special Food Services	$1,978
Undefined	$1,812
Total	**$167,100**

Geographic Revenue | Revenue Concentrations | Tabular Geo Report | + Chapter

Figure 28 - MuniServices Interface While Gathering Local Sales Tax Data for the Uptown 4th and 5th Avenue Bikeways

Local vacancy data was gathered for the Uptown Bikeways: Fourth and Fifth Avenue projects to compare the impact these bikeways have on local properties. **Figures 29 and 30** show the interface from which the vacancy data is gathered and how the information is portrayed for the area surrounding the Fourth and Fifth Avenue bikeways.



Saved Search: Uptown 4th 5th

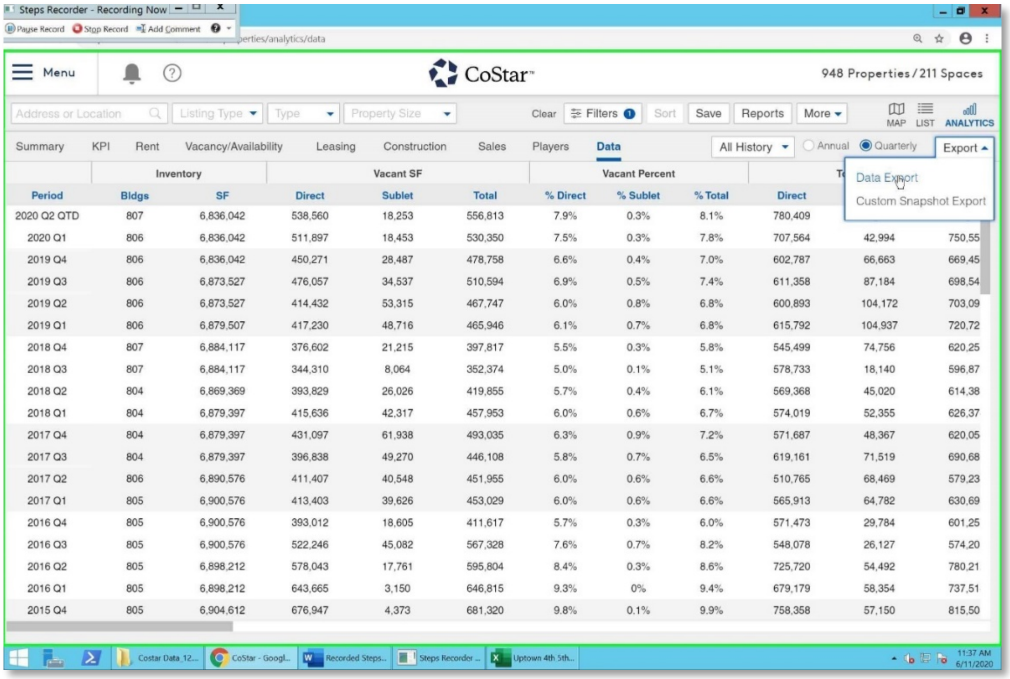
3969 1st Ave
San Diego, CA 92103
9,354 SF Office · Built 1967, Renov 2009
4,854 SF Avail at $2.25/SF/Mo
4,854 SF Max Contig
For Sale: $3,650,000 ($390.21/SF)
★★☆☆☆ + VIEW MORE

2148-2150 4th Ave
San Diego, CA 92101
3,000 SF Office · Built 1945
1,000 - 3,000 SF Avail at $3.00/SF/Mo
3,000 SF Max Contig
For Sale: $1,700,000 ($566.67/SF)
★★☆☆☆ + VIEW MORE

2250 4th Ave
San Diego, CA 92101 · Fourth & Juniper Ex...
27,537 SF Office · Built 1986
200 - 6,984 SF Avail at $1.95/SF/Mo
6,984 SF Max Contig
★★☆☆☆ + VIEW MORE

3714 4th Ave
San Diego, CA 92103
2,822 SF Office · Built 1969

Figure 29 - CoStar Interface while gathering local vacancy data for the Uptown Fourth and Fifth Avenue Bikeways.



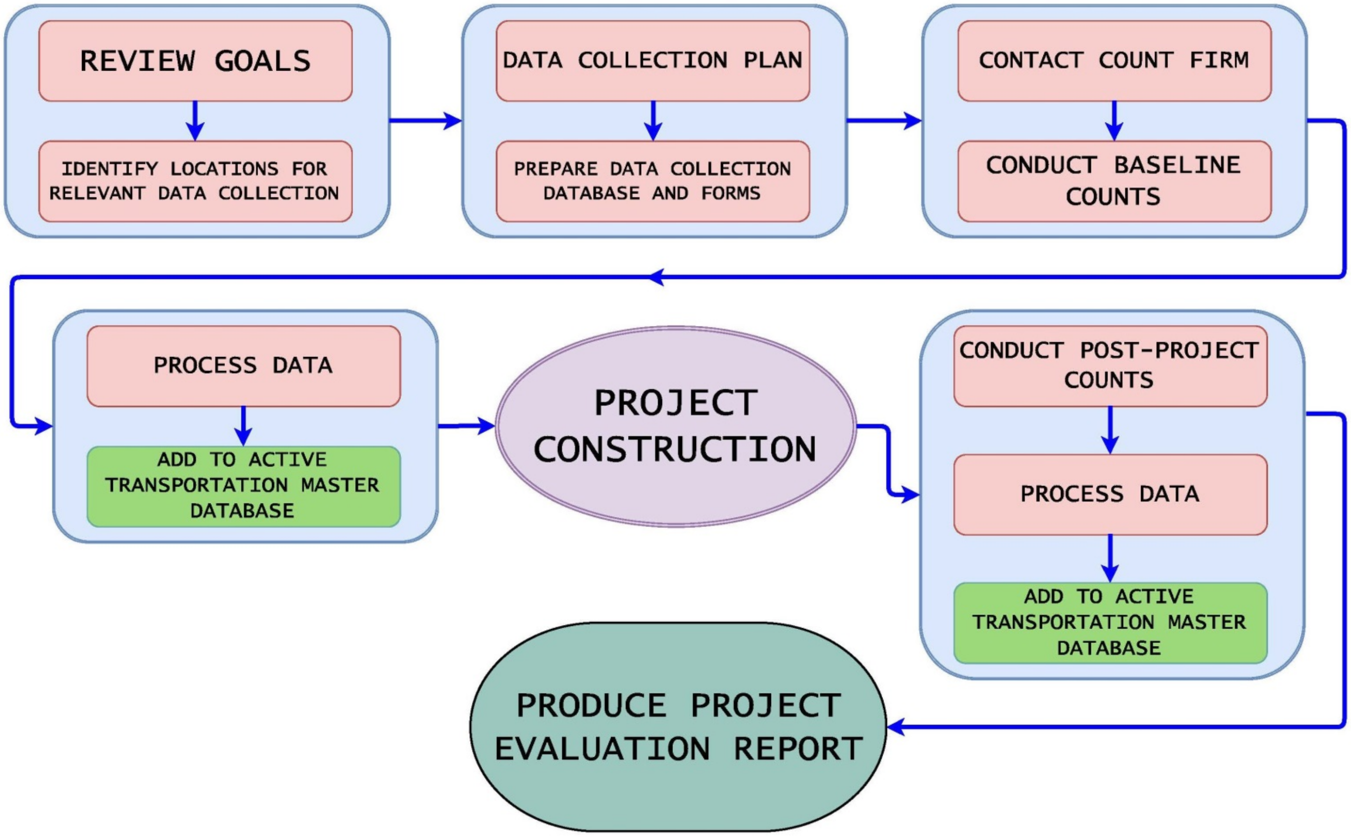
	Inventory		Vacant SF			Vacant Percent			T		
Period	Bldgs	SF	Direct	Sublet	Total	% Direct	% Sublet	% Total	Direct		
2020 Q2 QTD	807	6,836,042	538,560	18,253	556,813	7.9%	0.3%	8.1%	780,409		
2020 Q1	806	6,836,042	511,897	18,453	530,350	7.5%	0.3%	7.8%	707,564	42,994	750,55
2019 Q4	806	6,836,042	450,271	28,487	478,758	6.6%	0.4%	7.0%	602,787	66,663	669,45
2019 Q3	806	6,873,527	476,057	34,537	510,594	6.9%	0.5%	7.4%	611,358	87,184	698,54
2019 Q2	806	6,873,527	414,432	53,315	467,747	6.0%	0.8%	6.8%	600,893	104,172	703,09
2019 Q1	806	6,879,507	417,230	48,716	465,946	6.1%	0.7%	6.8%	615,792	104,937	720,72
2018 Q4	807	6,884,117	376,602	21,215	397,817	5.5%	0.3%	5.8%	545,499	74,756	620,25
2018 Q3	807	6,884,117	344,310	8,064	352,374	5.0%	0.1%	5.1%	578,733	18,140	596,87
2018 Q2	804	6,869,369	393,829	26,026	419,855	5.7%	0.4%	6.1%	569,368	45,020	614,38
2018 Q1	804	6,879,397	415,636	42,317	457,953	6.0%	0.6%	6.7%	574,019	52,355	626,37
2017 Q4	804	6,879,397	431,097	61,938	493,035	6.3%	0.9%	7.2%	571,687	48,367	620,05
2017 Q3	804	6,879,397	396,838	49,270	446,108	5.8%	0.7%	6.5%	619,161	71,519	690,68
2017 Q2	806	6,890,576	411,407	40,548	451,955	6.0%	0.6%	6.6%	510,765	68,469	579,23
2017 Q1	805	6,900,576	413,403	39,626	453,029	6.0%	0.6%	6.6%	565,913	64,782	630,69
2016 Q4	805	6,900,576	393,012	18,605	411,617	5.7%	0.3%	6.0%	571,473	29,784	601,25
2016 Q3	805	6,900,576	522,246	45,082	567,328	7.6%	0.7%	8.2%	548,078	26,127	574,20
2016 Q2	805	6,898,212	578,043	17,761	595,804	8.4%	0.3%	8.6%	725,720	54,492	780,21
2016 Q1	805	6,898,212	643,665	3,150	646,815	9.3%	0%	9.4%	679,179	58,354	737,51
2015 Q4	805	6,904,612	676,947	4,373	681,320	9.8%	0.1%	9.9%	758,358	57,150	815,50

Figure 30 – *Exporting CoStar Vacancy Data for the Uptown Fourth and Fifth Avenue Bikeways*

EVALUATION PROCESS

The following section will describe the major steps required to implement the evaluation process from the development of a data collection plan through the development of a project evaluation report.

Active Transportation Project Evaluation Process:



Data Collection Plan Development

MEETING WITH SANDAG AND/OR LOCAL AGENCY PROJECT MANAGERS

This initial meeting with the agency staff overseeing the project to be evaluated is an important first step in understanding the scope of the project and context of the project area. The person charged with developing the data collection plan should review all relevant plans and design documents in advance of the meeting. In some cases (for example, where an approved set of plans is available), it may be appropriate to develop a preliminary draft data collection plan in advance of this meeting. Otherwise, the process will be initiated at this meeting through the following steps:

- Share an example
- Share general cost expectations based on the budget and/or the size of the project to be evaluated

- Determine data collection locations and time periods
- Select metrics to be used at each location (considering issues and improvements being implemented)
- Prepare data collection plan

Summary Table of Metrics and Data Sources

Goals: Metrics	Data Sources
Standard Metrics *(Applied to all relevant project types.)*	
Change in the number of observed bike trips (project area + *control locations*) after project implementation	• Multimodal intersection counts • Screenline counts • Automated counters
Change in bicycle mode share (at intersection or segment level)	• Multimodal intersection counts • Screenline counts • *APC data* • *Vehicle occupancy data* • *ACS journey to work estimates*
Change in number of observed bike & pedestrian trips	• Multimodal intersection counts • Screenline counts • Automated counters
Change in number of parked bicycles around schools, transit stations, and community destinations	• Bicycle parking occupancy counts • Automated counters
Change in annual number and rate of reported motor vehicle, bicycle, and pedestrian-involved collisions	• *SWITRS/TIMS collision data* • Multimodal intersection counts
Change in the number of vehicles traveling the corridor expressed as average daily traffic (ADT)	• Tube counts
Change in the mean (average), 85th percentile, and 95th percentile speeds along the project corridor	• Tube counts • Vehicle speed surveys
Change in the number of contraflow and sidewalk bike riders	• Multimodal intersection counts
Change in the percentage of motorists yielding at unsignalized pedestrian crossings	• Vehicle yield study
Optional Metrics *(Prescribed for project types, as-necessary)*	
Change in vacancy rates along the project corridor (or selected commercial blocks). Change in cumulative sales tax revenue along the project corridors (or selected commercial blocks)	• Vacancy rates • *Local sales tax data*
Change in the percentage of bicyclists using the improved corridor (number of bicyclists on improved corridor divided by the total number of bicyclists using the improved corridor and parallel routes)	• Screenline bicycle counts • Multimodal intersection counts

GLOSSARY OF TERMS

ACS JOURNEY TO WORK ESTIMATES

The American Community Survey (ACS) journey to work estimates provide estimates of how many Americans use which transportation modes to commute to and from work. This piece of information can be used to check the validity of mode share calculations performed to answer Question 1.2: *How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all weekday trips (weekend, if applicable) after project implementation along the improved corridor and parallel routes serving the same destinations (where applicable), as compared to changes in commute mode share over a similar time period at the county level?*

This information can also be used as a point of comparison to illustrate the effect of the improved bikeway project on overall mode share.

APC DATA

Automated Passenger Counter data is gathered from APCs on board Metropolitan Transit System (MTS) and North County Transit District (NCTD) buses, trolleys, and trains. APCs are on most buses, trolleys, and trains and provide a count of the number of passengers on a given bus, trolley, or train at a given time or location, as well as how many passengers board and alight at each transit stop.

The *transit load data* from the APCs are available for SANDAG Project Managers through SANDAG's Ridecheck Plus database. This database provides the transit passenger load data for intersections and street segments. SANDAG Project Managers and/or consultants will review the APC data and assign it to the appropriate legs of each multimodal intersection or project roadway segment. This data is then uploaded to the SANDAG Active Transportation Evaluation database, and the *transit load* is assigned to the project and used to calculate the mode split between bicycle, pedestrian, other micromobilty modes, transit, and vehicular modes of transportation.

APC data represents the average load over the course of a booking period, so it can take 3-4 months to get average data from a booking period. In some cases, there may not be a sufficient APC sample size until 4-6 weeks after the original project count has been collected: this preliminary data is subject to change. The SANDAG Passenger Counting Program Project Manager can advise on the reliability of the transit data. Once the APC database has been delivered, the necessary data will be found in the "SUM_LOAD" field for the bus stops located directly upstream of the target count locations as shown in **Figure 31**.

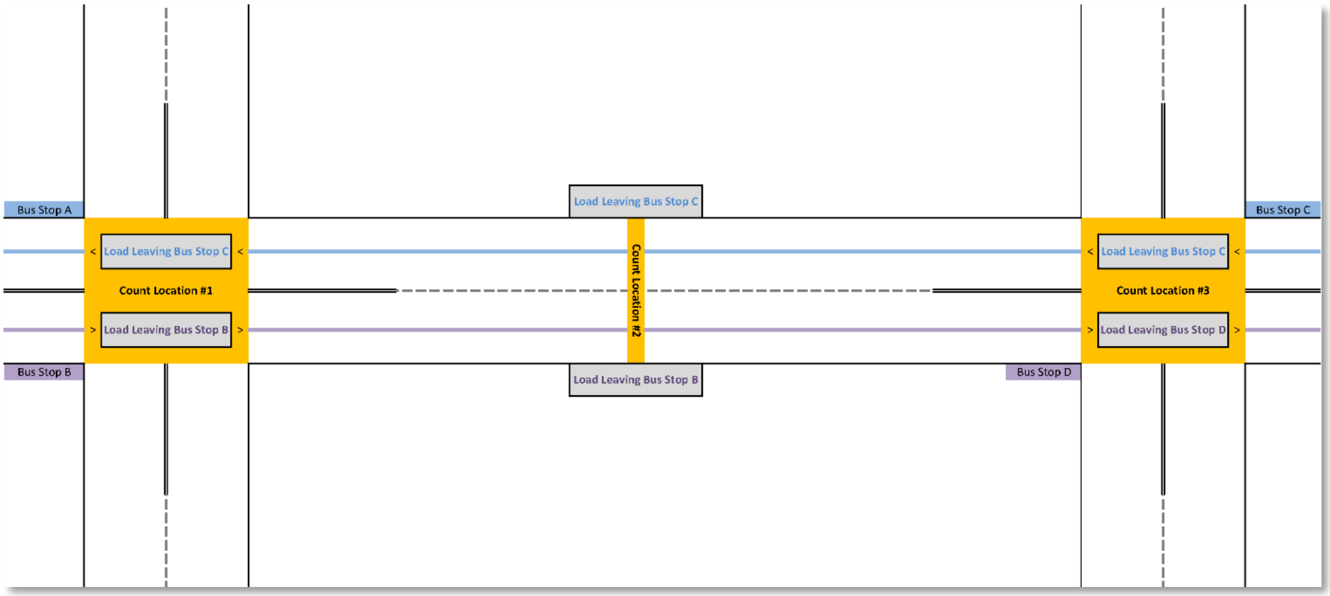


Figure 31 - Example of how Automated Passenger Count (APC) is used at intersection and midblock locations

APC data is used to answer Question 1.2: *How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all weekday trips (weekend, if applicable) after project implementation along the improved corridor and parallel routes serving the same destinations (where applicable), as compared to changes in commute mode share over a similar time period at the county level?*

COLLISION DATA

Collision data is gathered from the Statewide Integrated Traffic Records System (SWITRS), which is compiled and geocoded through the Transportation Injury Mapping System (TIMS) maintained by researchers at the University of California, Berkeley. All collision data, including pedestrian-involved incidents, bicycle-involved incidents, and automobile-involved incidents, are considered for the SANDAG Active Transportation Evaluation database.

The SANDAG Project Manager and/or consultant will use a geographic buffer and/or tabular query to collect all collisions along a project's street segments and around project intersections. This is then imported into the database and assigned to the appropriate project and count locations. Collision data is refreshed in the database at least every two (2) years.

Collision data is used to answer Question 3.1: *How has the number and rate of reported collisions changed after project implementation along the improved corridor or at selected locations (such as schools and along routes to transit) within the project area?*

CONTROL LOCATIONS

Control Locations are count locations that are not a part of the project and are not expected to be improved during the project's planning, design, and construction process. Control locations can be manual count locations or automated counters and are selected in order to determine how travel behavior changed during the evaluation period outside the project area in locations that are similar to the project corridor in terms of land use, demographics, roadway network, etc. Control locations are used for most goals and questions and at least one (1) control location is assigned to most projects.

COSTAR DATA

CoStar is a company that provides commercial real estate information for customers that subscribe to their service. Included in the datasets they provide are property vacancy rates throughout San Diego County. SANDAG staff may select aggregated data for all properties within the extents of a defined project corridor. CoStar data provides an aggregated average vacancy (square footage listed as "Vacant") as a proportion of the available "Inventory" square footage for the selected area.

CoStar data is used to answer Questions 5.1: *How have vacancy rates and/or the level of business patronage changed after project implementation?*

MONITORING LOCATIONS/SITES

Monitoring locations or sites are count locations where manual counts are conducted on a regular basis to determine general walking and biking trends throughout San Diego County. These sites are included as part of a larger periodic monitoring program.

These locations may be assigned to a certain project but may also be locations that are the confluence of popular bicycle routes that are not necessarily SANDAG projects. Monitoring sites may be used as a control location (see control location definition) or a parallel corridor count location (see parallel corridor definition) for a project.

PARALLEL CORRIDOR

A Parallel corridor or route is one that serves generally the same destinations as the project corridor. Count sites along a parallel corridor can indicate the shift of bicycles from the parallel route to the project route following project improvements and can determine the effect that the project improvements have on route choice.

Parallel corridors are the easiest to determine when the project is located within an area with streets that generally follow a grid pattern and can be more difficult to determine in areas without grid pattern streets or for off-road projects. In some cases, an existing parallel corridor may not exist.

Monitoring sites (see Monitoring Locations/Sites definition) can be used as parallel corridor count sites.

PERSON THROUGHPUT

Person throughput is a way to normalize vehicular, pedestrian, bicycle, and transit information to determine the number of people passing through a particular intersection or traveling along a certain street segment. Person throughput is especially important to consider when calculating mode split or mode share in order to consider each person in an "apples to apples" comparison, regardless of whether they are riding a bicycle, a scooter, in a wheelchair, walking, or traveling as a passenger in a car or a bus.

Vehicle occupancy data is used to convert the number of vehicles or private buses to the number of people traveling in vehicles or private buses (see vehicle occupancy data definition). APC data is used to convert the number of public buses or other forms of public transit to the number of people traveling in buses or other forms of public transit (see APC data definition).

Person throughput adjustments are used to answer Question 1.2: *How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all weekday trips (weekend, if applicable) after project implementation along the improved corridor and parallel routes serving the same destinations (where applicable), as compared to changes in commute mode share over a similar time period at the county level?*

SALES TAX DATA

Sales tax data is obtained from MuniServices. The data consists of the amount of sales or use tax reported by registered retailers and includes the "Economic Quarter," the quarter in which the underlying sales transaction occurred. For example, if a sale occurs in May, it is typically reported in the return for the second quarter (Apr-Jun) and is paid to the State in July, and then the payment is disbursed to SANDAG in either August or September. By using the Economic Quarter rather than the disbursement quarter, the data gives a more accurate picture of when the sales activity occurred. MuniServices is a company that aggregates and enriches sales tax data obtained from the California Department of Tax and Fee Administration (CDTFA), and then provides that information to SANDAG via its web-interface: Clearview Analytics. The information is compared to raw data after aggregation to ensure that the sales tax information provided by the CDTFA is properly preserved and represented. In this specific case, authorized SANDAG staff access the data using a map formed from three key components: sales tax payments by retailers who have registered with the State of California; attributed data such as NAICS codes, business name, the address, and the Economic Quarter; and geo-attributes (latitude, longitude—both of which are obtained using the ESRI geo-coding service—and the spatial relationship between the latitude/longitude point and the shapefile of each project corridor as provided by SANDAG). SANDAG staff may select aggregated data for all registered retailers within the extent of a defined project corridor. The data set also provides slices of the data at the NAICS Sector (Category) and Industry Group (Segment) and allows for tracking the sales tax reported from businesses in the project corridor both before and after the project completion. Only the aggregated data may be publicly shared. Under California Revenue and Taxation Code section 7056, access to the individual business reports is confidential and limited to authorized SANDAG staff.

Sales tax data is used to answer Question 5.1: *How have vacancy rates and/or the level of business patronage changed after project implementation?*

TRANSIT LOAD

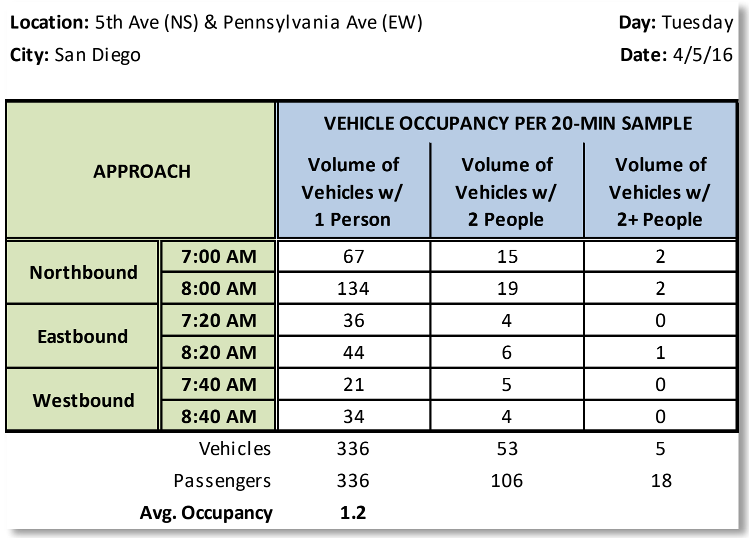
The transit load of a bus, trolley, train, or other form of transit is the number of people on the bus, trolley, or train at any given time. The transit load is collected through Automated Passenger Counter (APC) data (see APC data). On any given street segment, the transit load considers the number of people that boarded and alighted at the upstream (previous) stops.

Transit load information is used to answer Question 1.2: *How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all weekday trips (weekend, if applicable) after project implementation along the improved corridor and parallel routes serving the same destinations (where applicable), as compared to changes in commute mode share over a similar time period at the county level?*

VEHICLE OCCUPANCY DATA

Vehicle occupancy is the average number of people in a vehicle that is observed on a certain street or at a certain intersection. Vehicle occupancy can also be considered at a regional level and is the average number of people in each vehicle trip taken within the region.

For this project, the default vehicle occupancy is based on the latest Regionwide Base Year Average Trips outputs in the Activity-Based Model informed by the San Diego Household Travel Survey. If the project manager believes that estimates differ significantly from actual vehicle occupancy at the count locations selected, vehicle occupancy for the specific site can be collected manually on site at one or more locations along the corridor for one or more brief observation periods as shown in **Figure 32**.



Location: 5th Ave (NS) & Pennsylvania Ave (EW)
City: San Diego
Day: Tuesday
Date: 4/5/16

APPROACH		VEHICLE OCCUPANCY PER 20-MIN SAMPLE		
		Volume of Vehicles w/ 1 Person	**Volume of Vehicles w/ 2 People**	**Volume of Vehicles w/ 2+ People**
Northbound	**7:00 AM**	67	15	2
	8:00 AM	134	19	2
Eastbound	**7:20 AM**	36	4	0
	8:20 AM	44	6	1
Westbound	**7:40 AM**	21	5	0
	8:40 AM	34	4	0
	Vehicles	336	53	5
	Passengers	336	106	18
	Avg. Occupancy	**1.2**		

Figure 32 - Example of a manual vehicle occupancy study

Vehicle occupancy tends to differ by trip type with commute trips generally having lower vehicle occupancy than non-commute trips. Therefore, it is recommended that vehicle occupancy surveys are conducted at different times of day or during the PM peak period when there tends to be a greater mix of trip types.

Average vehicle occupancy estimates are used for private buses at locations with large numbers of these buses (e.g., near convention centers and other tourist destinations), and APC data (see APC data definition) is used to determine average vehicle occupancy for public buses or other forms of transit.

Vehicle occupancy data is used to answer Question 1.2: *How has bicycle mode share (defined as the proportion of observed bicycle trips relative to all person trips) changed for all weekday trips (weekend, if applicable) after project implementation along the improved corridor and parallel routes serving the same destinations (where applicable), as compared to changes in commute mode share over a similar time period at the county level*

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