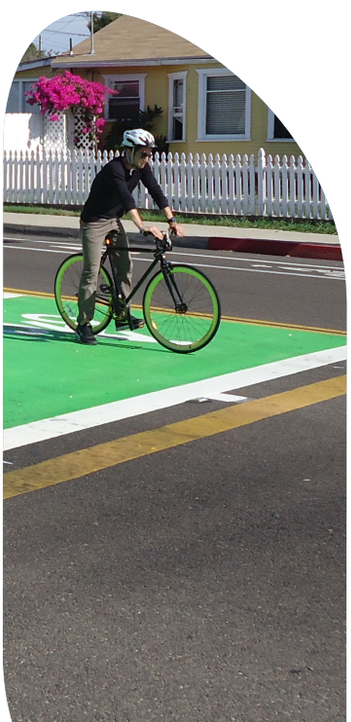
CALIFORNIA
NATIONAL CITY
1887
INCORPORATED

Bike Box
Post-Implementation Report



PREPARED BY

Kimley»Horn

Expect More. Experience Better.

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INTRODUCTION

The *National City General Plan (June 2011)* and the *City of National City Bicycle Master Plan (February 2011)* call for the implementation of a network of community corridors. These community corridors are defined in the General Plan as an "arterial, collector, or local street that are intended to increase the comfort of walking and/or bicycling through traffic calming measures such as on-street parking, bulb-outs, or glorriettas; streetscape improvements such as landscaping, street trees, and medians; pedestrian enhancements such as designated bicycle lanes and bike racks facilities." **Figure 1** displays the General Plan network of community corridors planned for National City. In order to implement and bring to reality this network of community corridors, the City applied for and received two Active Transportation grants from the San Diego Association of Governments (SANDAG) to provide Class II and Class III bicycle facilities, including bicycle detector loops and Bike Boxes at signalized intersections along the three community corridors identified in the plan; D Avenue, 18th Street, and 4th Street. These facilities represent the initial steps from the City to complete the planned bicycle network that would provide multi-modal transportation options to its residents while providing regional connectivity. It is expected that once the bicycle network is complete, a significant mode shift between auto and bicycles will be realized.

The City, working with Kimley-Horn and Associates, submitted a Request for Experimentation to the Federal Highway Administration (FHWA) and the California Traffic Control Devices Committee (CTCDC) to implement the Bike Boxes located along the community corridors. The request for experimentation was approved in December 2013. The objective of the experiment is to evaluate the effectiveness of the two Bike Box designs used within the City, which are illustrated in **Figure 2**. The following was observed and documented:

- Ridership
- Position of Bicyclist
- Bicyclist Demographics
- Helmet Use
- Vehicle Encroachment into Bike Box
- Lateral Position of Turning Vehicles
- Collision Data

The lateral position of turning vehicles was observed for compliance with the California Vehicle Code Section 22100, stating "right-hand turns shall be made as close as practicable to the right-hand curb or edge of roadway."

Figure 3 provides an overview of the community corridors included as part of this study, the location of the bike boxes deployed, and the study intersection locations. Further detail on each community corridor are provided in the subsequent chapters, including improvement plan details, photographs and the results from pre-implementation and post-implementation data collection.

Pre-Implementation data was collected during the last week of June 2013. For the post-implementation data collection, observations took place over two time periods as a result of inclement weather. Initial data was collected the last week of June 2015, and additional supplemental data was collected the first week of July 2015.

Figure 1 - General Plan Community Corridor Network

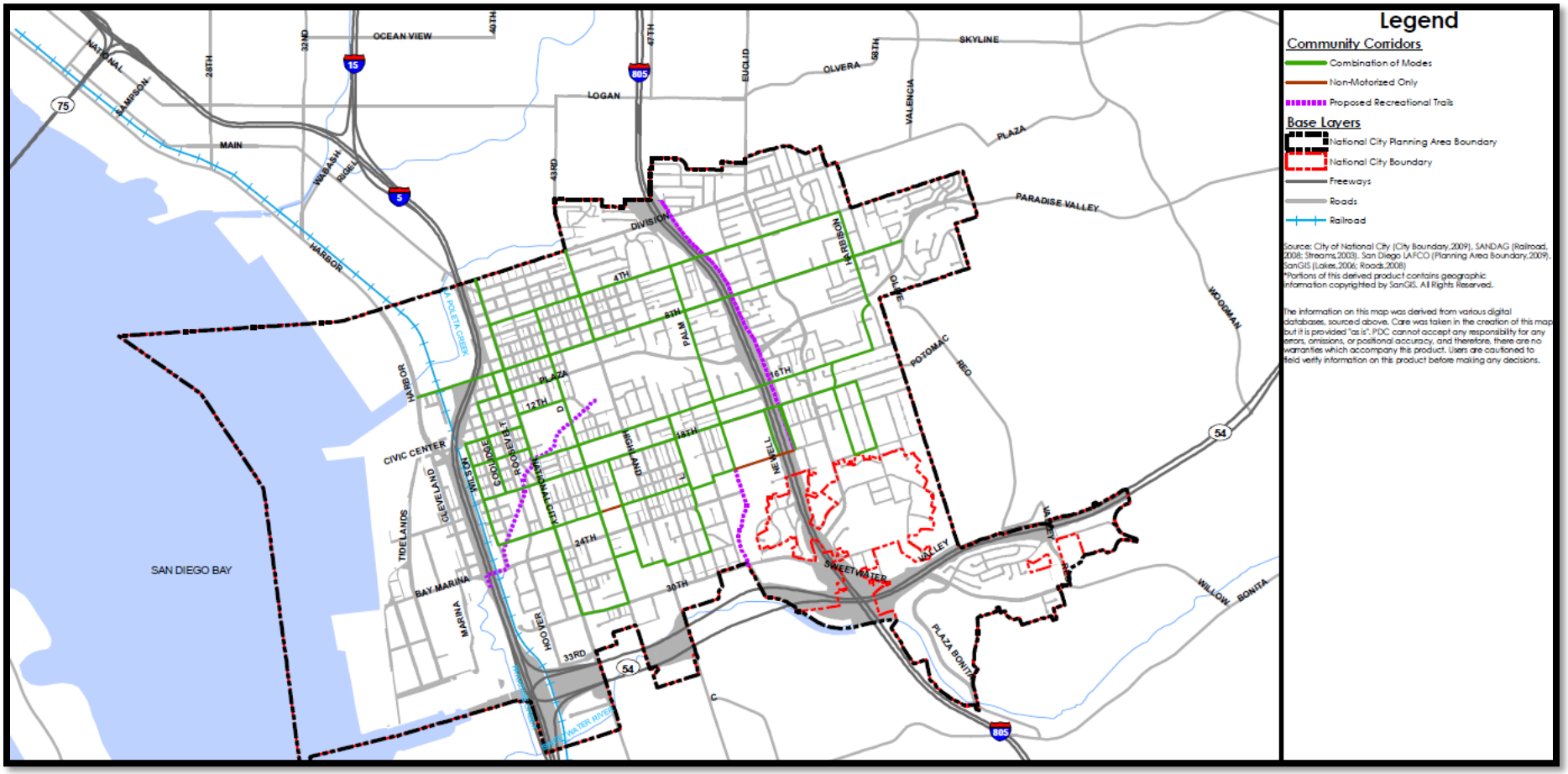
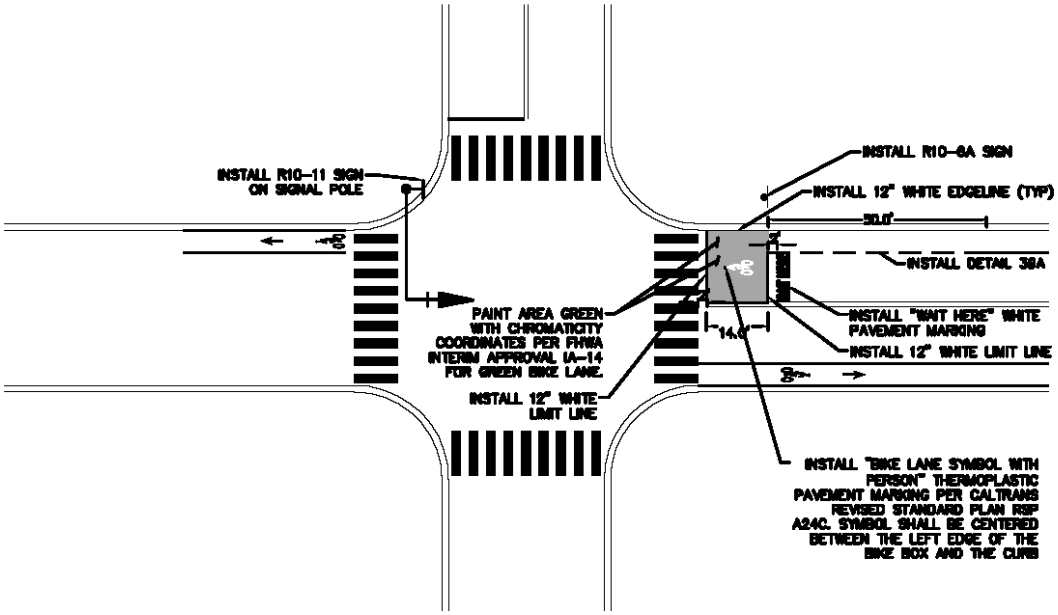


Figure 2 Bike Box Details

BIKE BOX DETAIL FOR 18TH STREET AND D AVENUE CORRIDORS



BIKE BOX DETAIL FOR 4TH STREET CORRIDOR

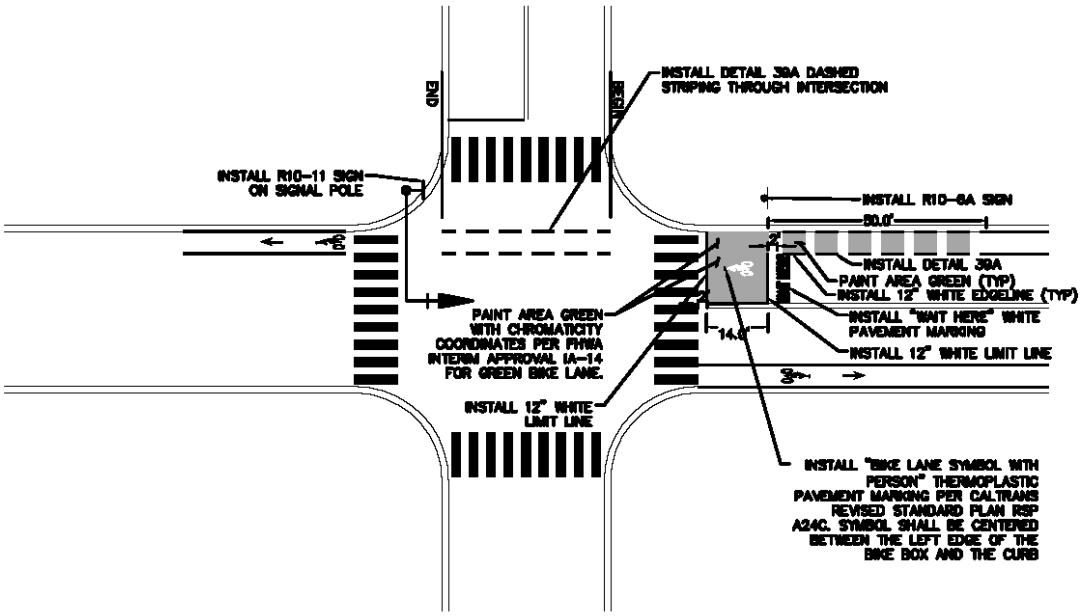
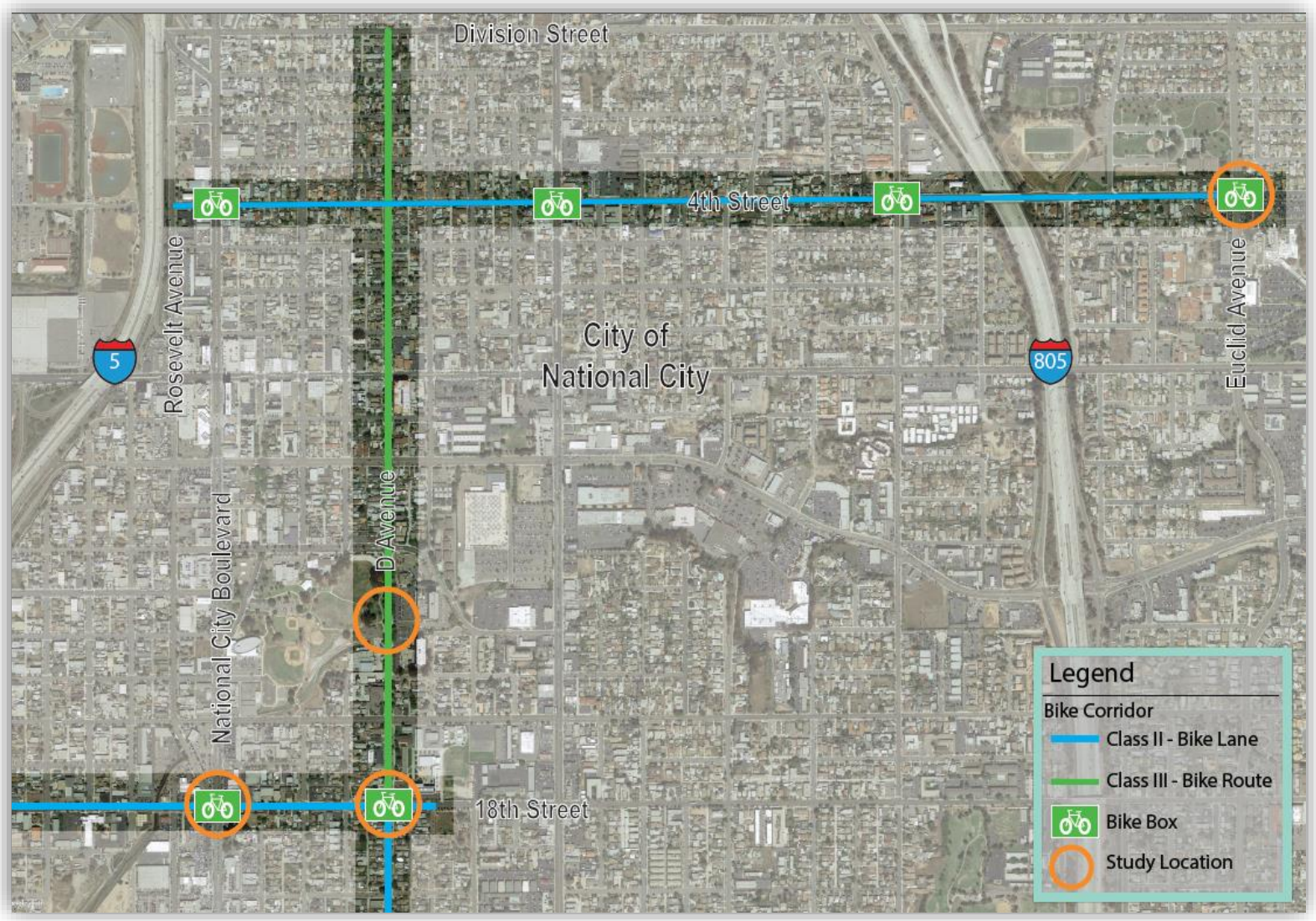


Figure 3 - Study Community Corridor Overview



18TH STREET COMMUNITY CORRIDOR

The following section describes the 18th Street Community Corridor, including a detailed description of the corridor and results of the study.

COMMUNITY CORRIDOR

The National City Bicycle Master Plan describes 18th Street as a two lane east-west collector street with a speed limit of 35 mph and average daily traffic between 5,000 and 10,000. Its proximity to Kimball Elementary, Las Palmas Elementary and Las Palmas Park provide bicycle attractive destinations along this corridor. The plan calls for 18th Street Community Corridor to be an approximately 1.3 mile Class II and III bicycle facility with the following additional bicycle and walking enhancements:

- Raised Crosswalks;
- Curb Extensions;
- High Visibility Crossings; and,
- **Bike Boxes**

Figure 4 displays the implemented Bike Boxes. **Figure 5** shows the 18th Street community corridor improvement plan including the location of improvements along with schools, parks and transit lines.

Figure 4 - 18th Street Bike Box

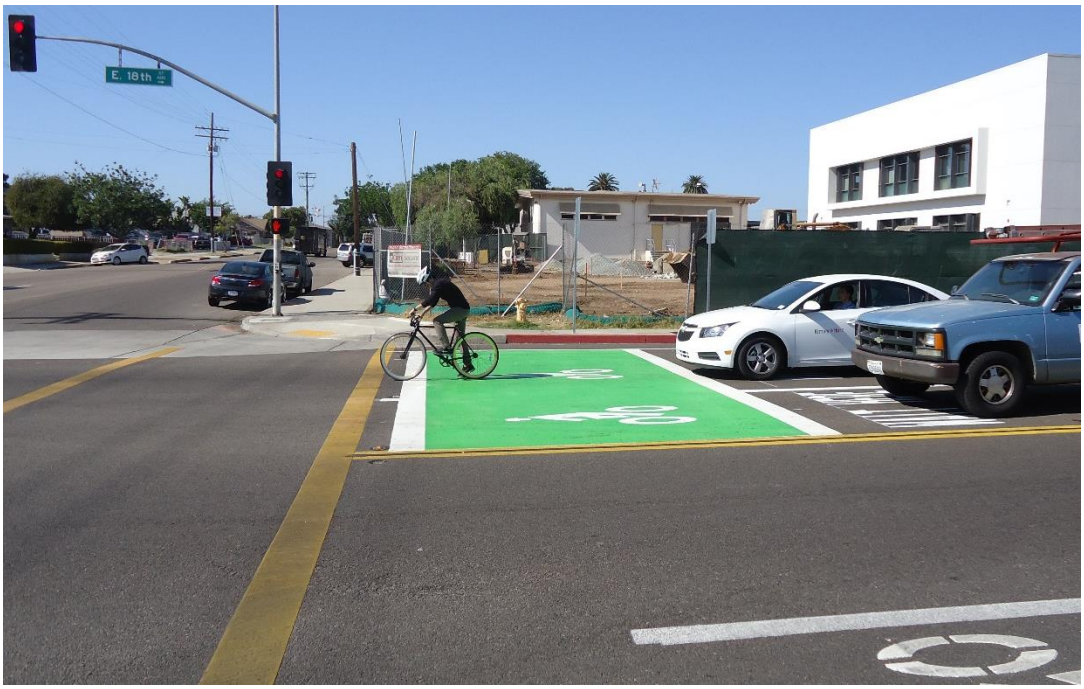


Figure 5 – 18th Street Community Corridor

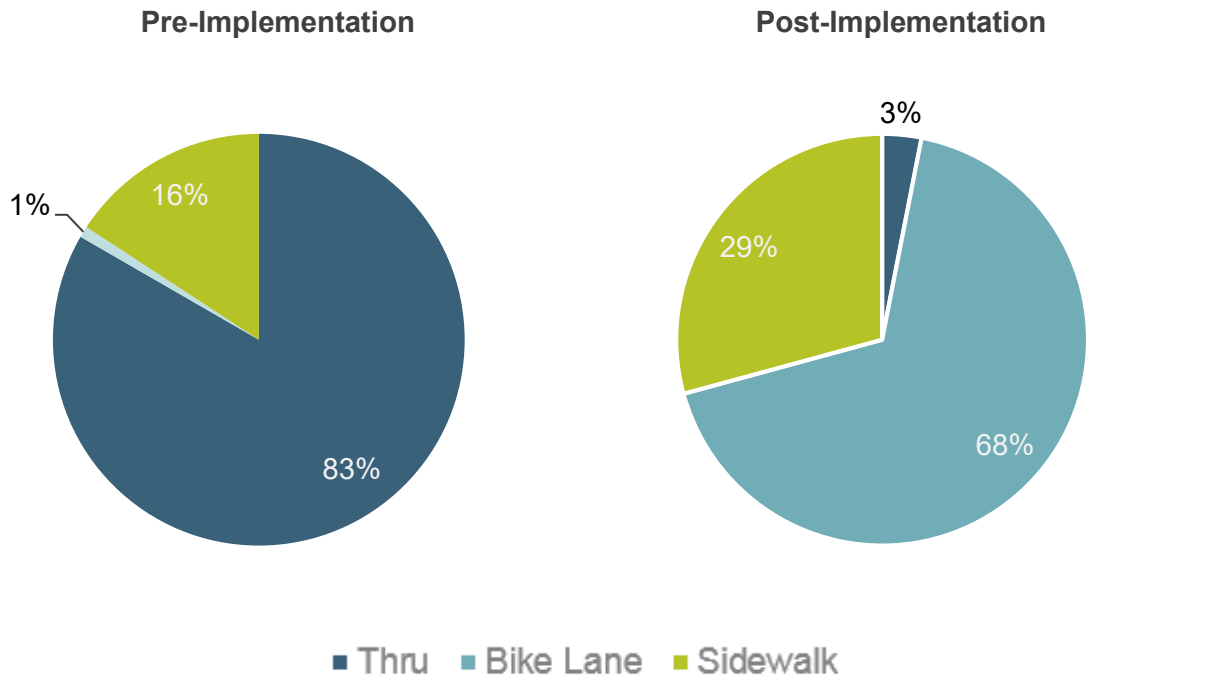
EXPERIMENTATION RESULTS

The following charts demonstrate the pre- and post-implementation results for cyclist position on the corridor, helmet use, gender and approximate age group. Also included are the post-implementation results of vehicle encroachment into the Bike Boxes and lateral position for right-turn movements.

The results of the data collection indicate that the total observed ridership on 18th Street decreased between 2013 and 2015 from 114 to 65. During the post-implementation study most riders had switched from the vehicle through lane to the bike lane, but an increased use of the sidewalk by 13% was also observed. During the two-year span between data collection periods, use of bicycle helmets while riding on 18th Street and National City Boulevard increased by 15%. While there was a reduction in the percent of female bicyclist during the study, there was greater diversity in the age groups observed. A growth of younger and elderly users was observed between 2013 and 2015. Additionally, collision data was reviewed for a two-year period prior to the installation of the bike boxes and post-installation using the Transportation Injury Mapping System (TIMS). During the period reviewed, no crashes involving people biking or walking were reported.

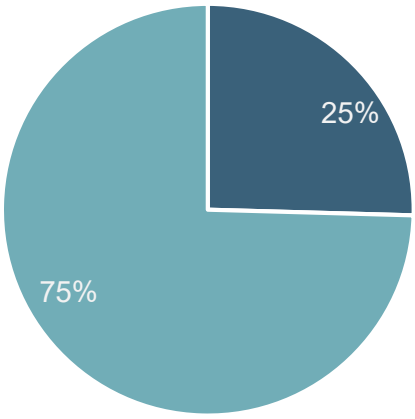
Observations of vehicle compliance with the bike box markings were also observed. At this location, vehicles were observed complying with the bike boxes by stopping completely behind the limit line, and moving towards the curb to turn right in over 70 percent of observations. Only nine percent of vehicles at this location encroached on the bike boxes completely.

CYCLIST POSITION

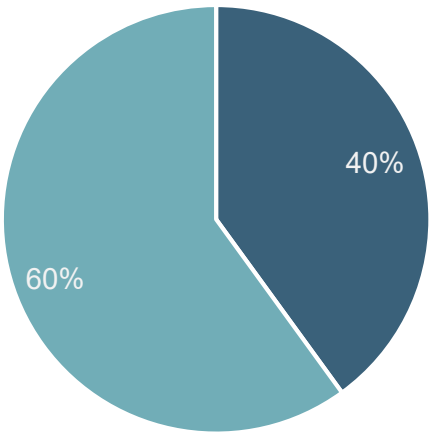


HELMET USE

Pre-Implementation



Post-Implementation



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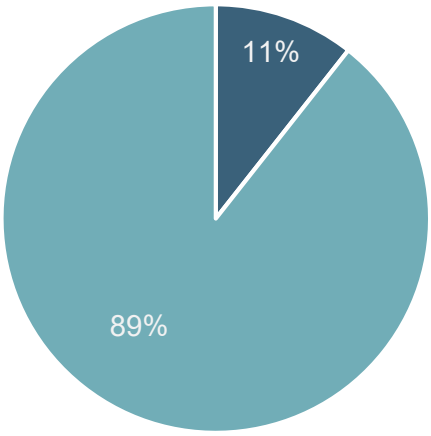
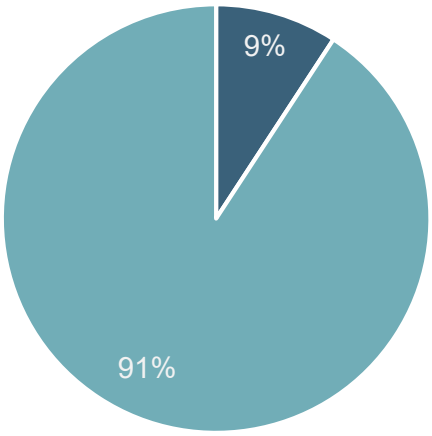
CYCLIST GENDER

Pre-Implementation



Post-Implementation



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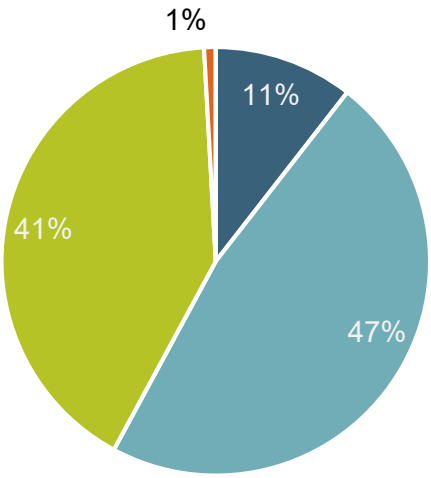
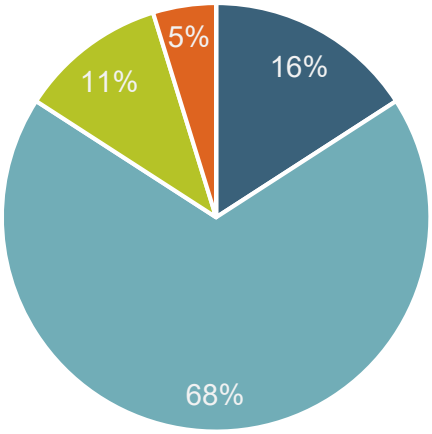
APPROXIMATE AGE GROUP

Pre-Implementation

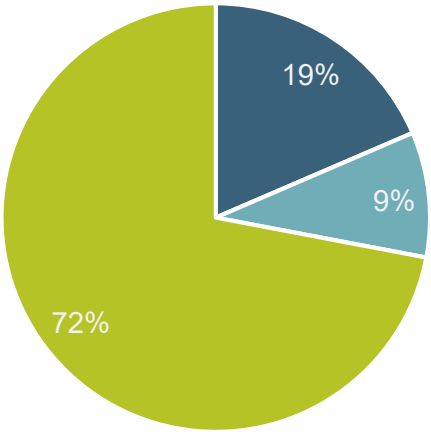


Post-Implementation

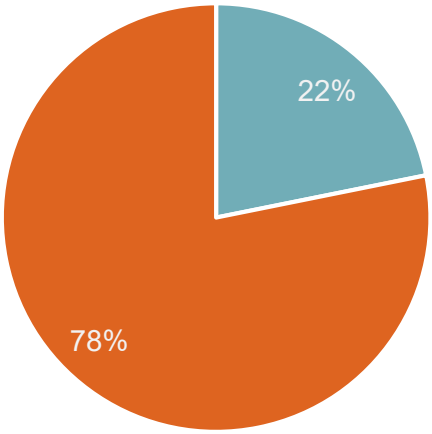


VEHICLE COMPLIANCE- POST IMPLEMENTATION

Bike Box Encroachment



Right-Turn Lateral Position



D AVENUE COMMUNITY CORRIDOR

The following section describes the D Avenue Community Corridor, including a detailed description of the corridor, and results of the study.

COMMUNITY CORRIDOR

The D Avenue Community Corridor is a two lane collector running north to south through National City. It is situated between two major north-south arterials, National City Boulevard and Highland Avenue, and has an ADT between 5,000 and 7,000 vehicles per day. The Bicycle Master Plan calls for D Avenue Community Corridor to be an approximately 1.5 mile Class II and Class III bicycle facility with the following additional enhancements:

- Raised Medians;
- Curb Extensions;
- Roundabout;
- Bicycle Loop Detectors;
- High Visibility Crosswalks;
- Reverse Angle Parking; and,
- **Bike Boxes**

Figure 6 shows the D Avenue Community Corridor improvement plan including the location of improvements along with schools, parks and transit lines.

Figure 6 – D Avenue Community Corridor

EXPERIMENTATION RESULTS

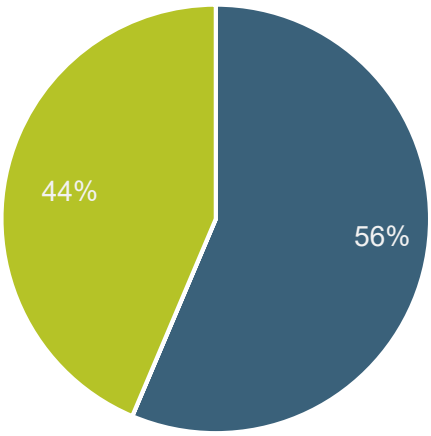
The following charts demonstrate the pre- and post-implementation results for cyclist position on the corridor, helmet use, gender and approximate age group. Vehicle encroachment into the Bike Boxes, and lateral position for right-turn movements was also observed in the post study.

The intersection of D Avenue and 18th Street saw an increase in ridership during the two-year period from 149 to 153. During the pre-implementation observations, a majority of bicyclists rode on the sidewalk (56%). Post-implementation observations in 2015, after the installation of the bike boxes and lanes, witnessed a reduction in the number of people biking on the sidewalk to 30%. The rest of riders were situated in the bike lane or vehicle lane. Observations on the use of helmets on D Avenue show a marginal decrease in use between periods. There was a 12% reduction in female bicyclist observed. Similar to 18th Street, there was a growth of younger and elderly users observed between 2013 and 2015 resulting in a more diverse spread in age among users. Additionally, collision data was reviewed for a two-year period prior to the installation of the bike boxes and post-installation using the Transportation Injury Mapping System (TIMS). There was one reported collision in this time period involving a bicyclist. In December, 2014, after the implementation of the bike box, there was a collision that resulted in an injury when a motorist made a left turn going northbound on D Avenue while the bicyclist proceeded straight through the intersection going east on 18th Street. This collision was a result of one of the parties running the red light, and is independent of the bike box.

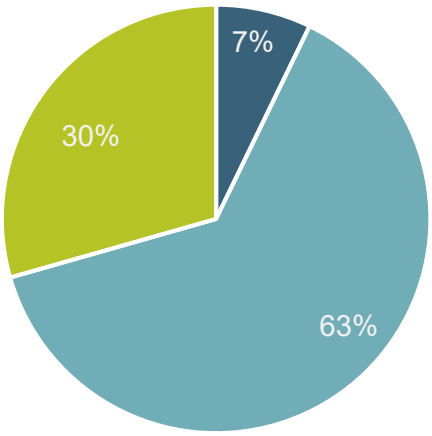
Vehicles were observed complying with the bike boxes by stopping completely behind the limit line in over 70 percent of observations with only five percent of vehicles encroaching the bike boxes completely. Vehicles moved to the curb for right-turns in 81 percent of observations.

CYCLIST POSITION

Pre-Implementation

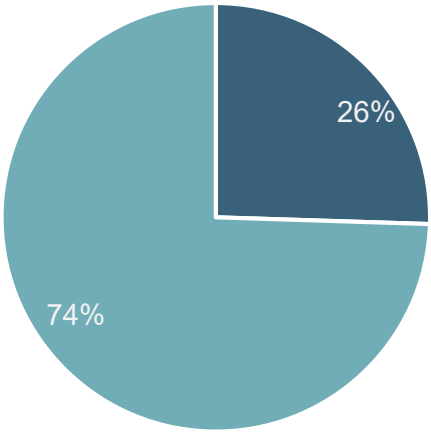


Post-Implementation

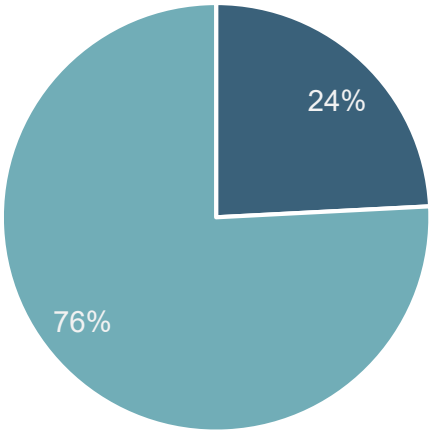


HELMET USE

Pre-Implementation



Post-Implementation



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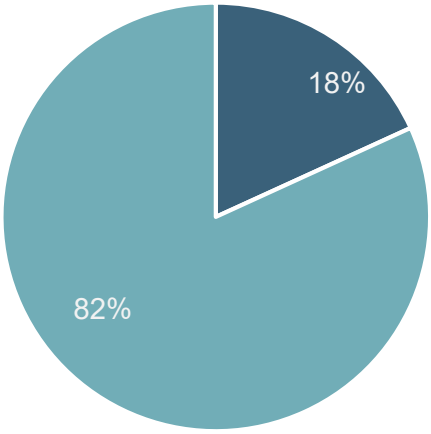
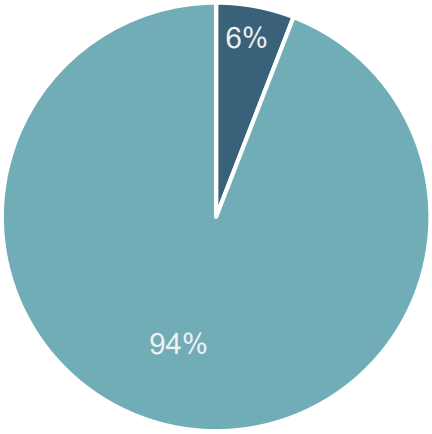
CYCLIST GENDER

Pre-Implementation



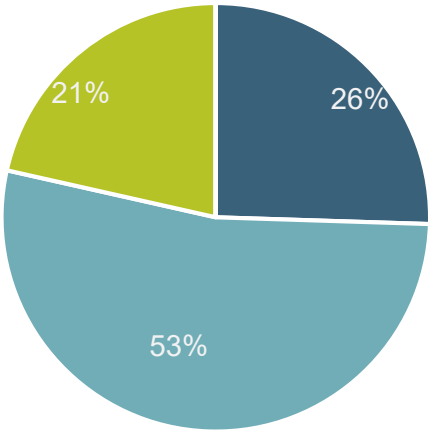
Post-Implementation



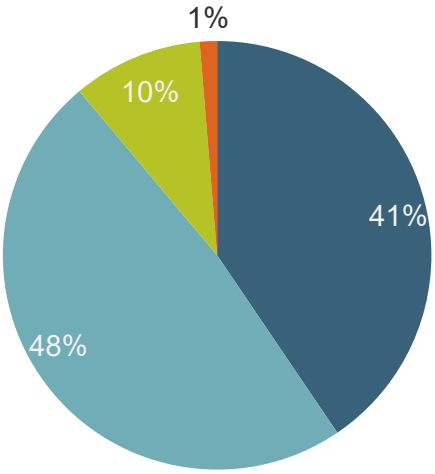
F M

APPROXIMATE AGE GROUP

Pre-Implementation

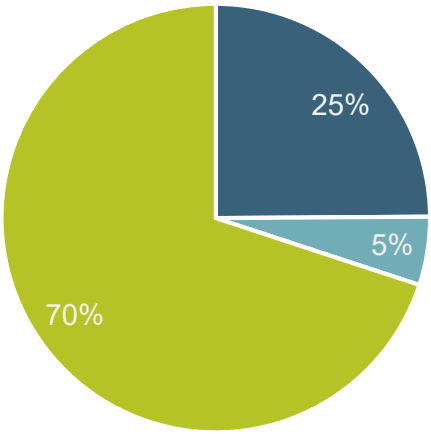


Post-Implementation

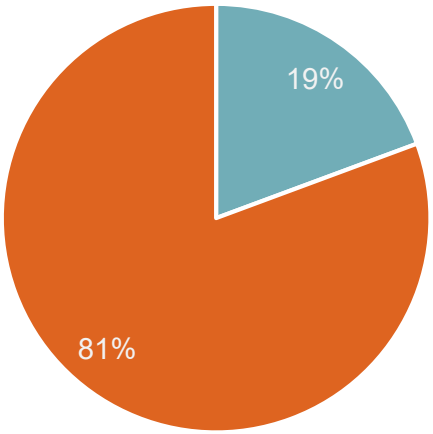


VEHICLE COMPLIANCE- POST IMPLEMENTATION

Bike Box Encroachment



Right-Turn Lateral Position

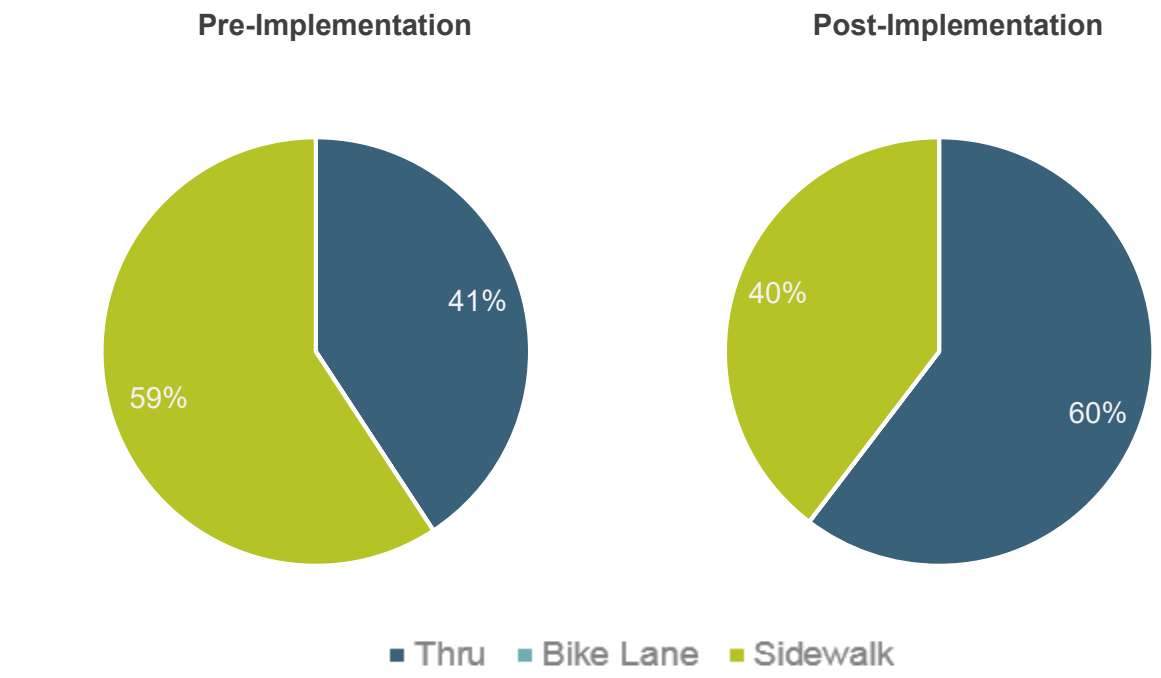


CONTROL LOCATION RESULTS

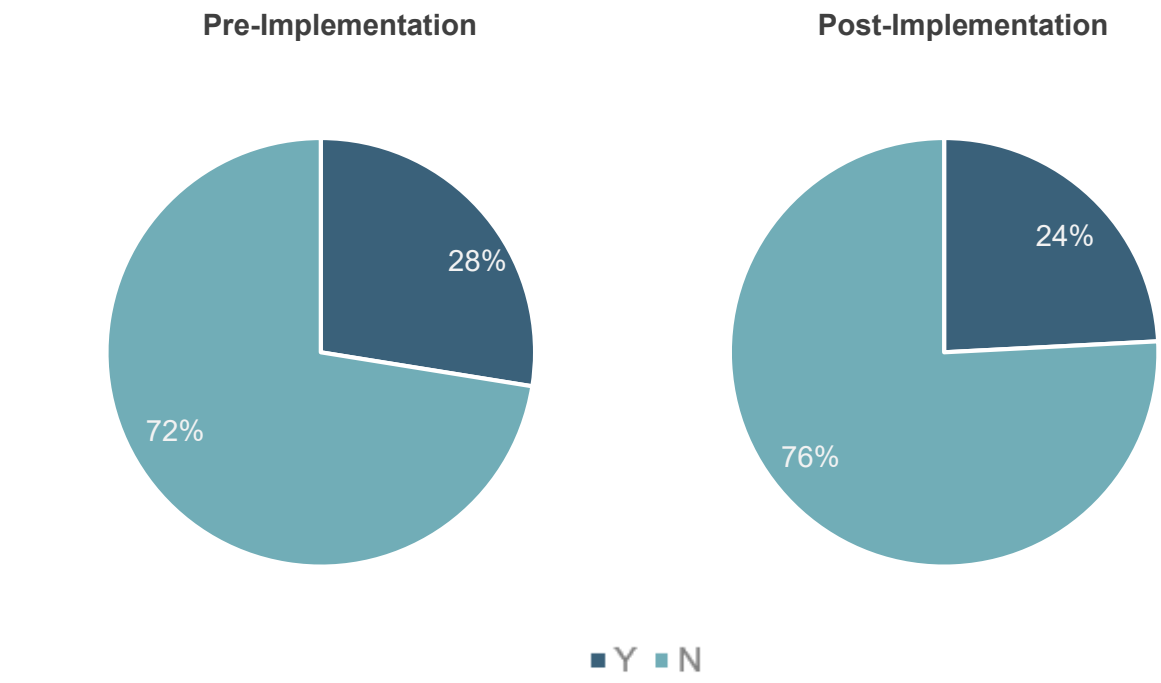
The following charts demonstrate the pre- and post-implementation results for cyclist position on the corridor, helmet use, gender and approximate age group at a mid-block location along D Avenue. This location provides a control for general changes in the bicycle habits in National City.

The results of the data collection indicate that the total observed ridership at the mid-block crossing location on D Avenue decreased from 346 to 265. Similar to other locations, the mid-block location on D Avenue also observed a decrease of users riding on the sidewalk, and female users. Alternatively, there was a decrease in the use of helmets at this location. There was minimal fluctuation in the age differences observed, except for a minor increase in the 0-17 year-old group. There were no reported collisions during the time period of June 2012 to December, 2015.

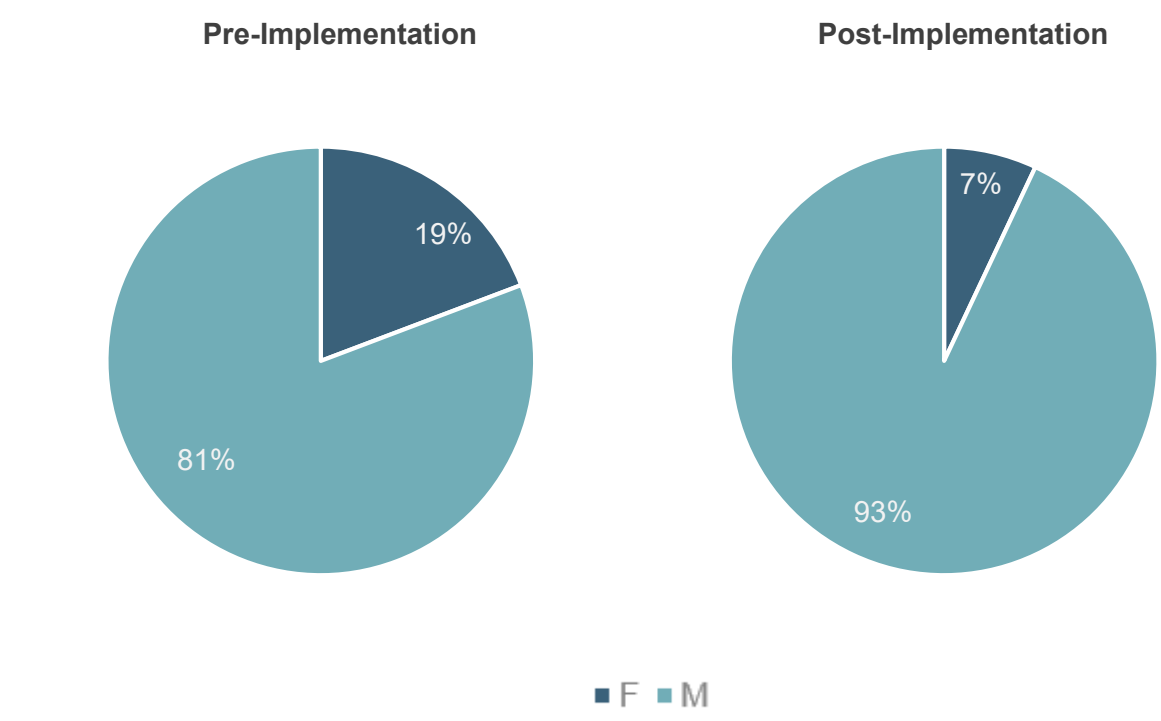
CYCLIST POSITION



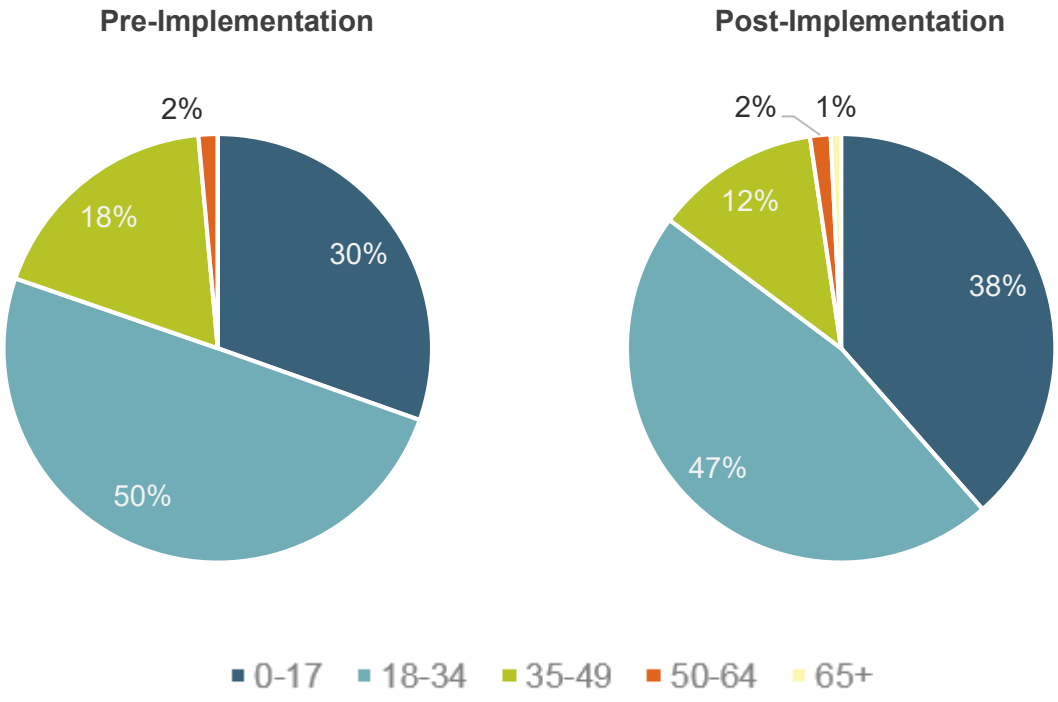
HELMET USE



CYCLIST GENDER



APPROXIMATE AGE GROUP



4TH STREET COMMUNITY CORRIDOR

The following section describes the 4th Street Community Corridor, including a detailed description of the corridor, and results of the study.

COMMUNITY CORRIDOR

4th Street is a wide two lane collector running east-west with an average daily traffic between 5,000 and 10,000 vehicles per day. The streets extra width allowed Class II bike lanes along the length of the corridor without impacts to existing parking. The corridor provides important access to El Toyon Park, Paradise Valley Hospital and a new senior housing development. The 4th Street Community Corridor is an approximately 2-mile Class II bicycle facility with the following additional bicycle and walking enhancements:

- Curb Extensions;
- Raised Median;
- High Visibility Crosswalk;
- Reverse Angle Parking;
- Bicycle Loop Detectors; and,
- **Bike Boxes**

Figure 7 displays the implemented Bike Boxes. **Figure 8** shows the 4th Street Community Corridor improvement plan including the location of improvements along with schools, parks and transit lines.

Figure 7 - 4th Street Bike Box

Figure 8 - 4th Street Community Corridor

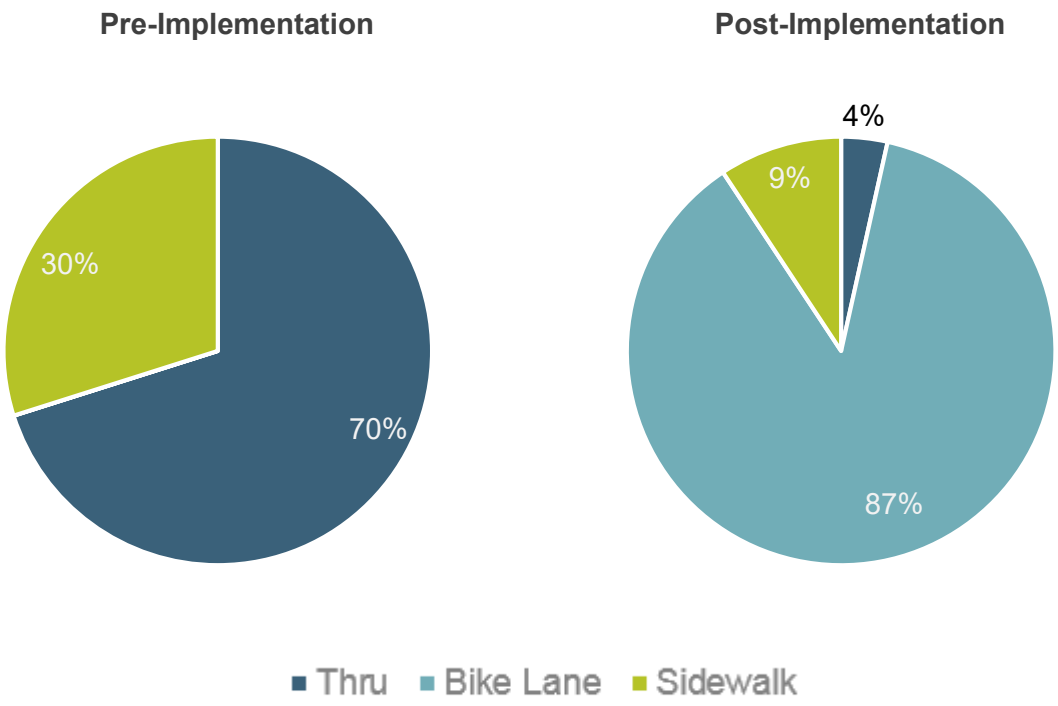
EXPERIMENTATIONRESULTS

The following charts demonstrate the pre- and post-implementation results for cyclist position on the corridor, helmet use, gender and approximate age group. Also included are the post-implementation results of vehicle encroachment into the Bike Boxes, and lateral position for right-turn movements.

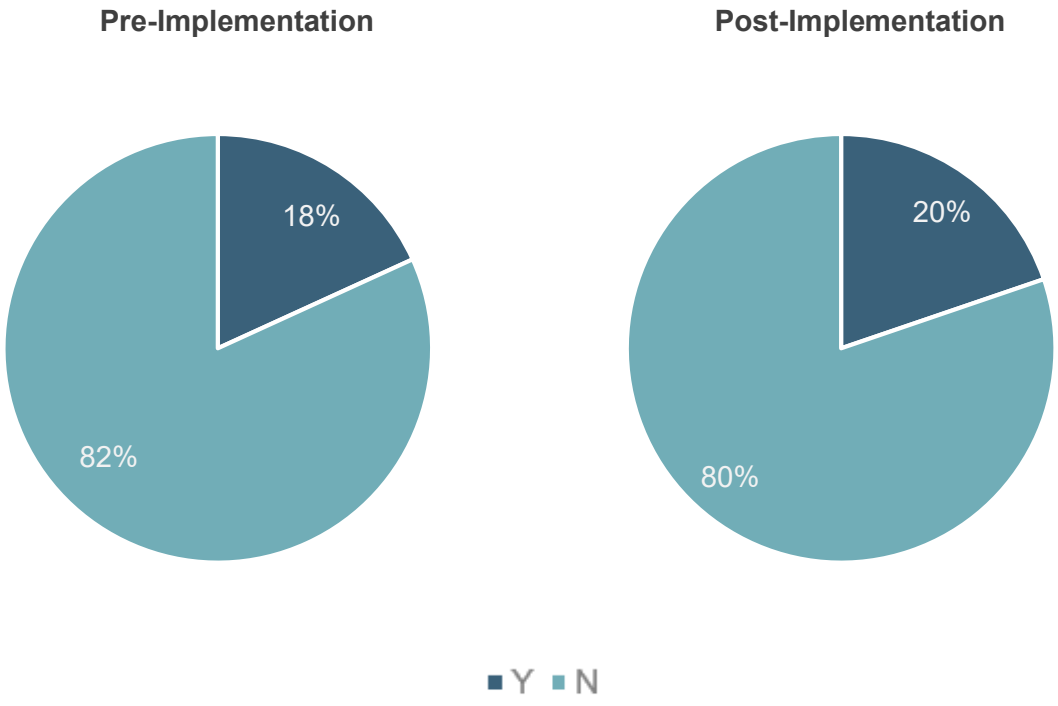
Ridership at the 4th Street study location remained almost unchanged between the study periods, with 87 in 2013, and 86 in 2015. Riding on the sidewalk on 4th Street and Euclid Avenue was reduced to 9% from 30% resulting in the highest percent of bike lane and vehicle through lane use. There was also a minimal observed increase in helmet use and no observed change in the gender of riders, which remained extremely low with just 2% female bicyclist. Again, a growth in the number of users falling within the 0-17 and 18-34 age groups was observed. A review of reported collisions in the TIMS systems returned no collisions reported at the intersection between June, 2012 to December, 2015.

Observations of vehicle compliance with the bike box markings were also observed. At this location, vehicles were observed complying with the bike boxes by stopping completely behind the limit line 69 percent of the time, with 21 percent of drivers partially encroaching, and 10 percent fully encroaching on the bike box. For right turns, 89 percent of drivers moved towards the curb.

CYCLIST POSITION



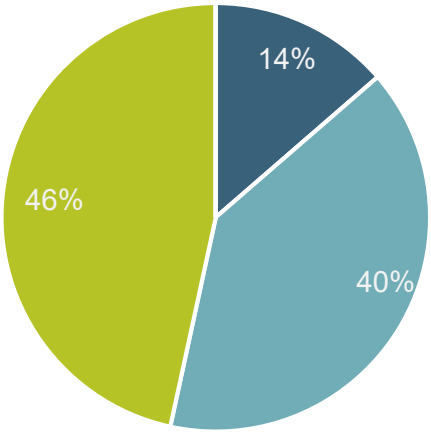
HELMET USE



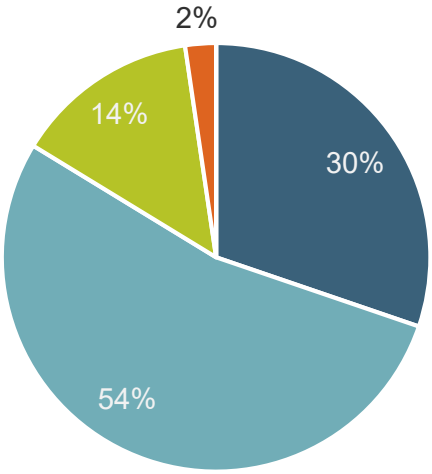
CYCLIST GENDER

APPROXIMATE AGE GROUP

Pre-Implementation

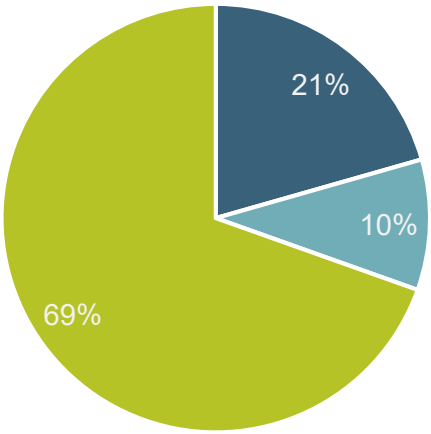


Post-Implementation

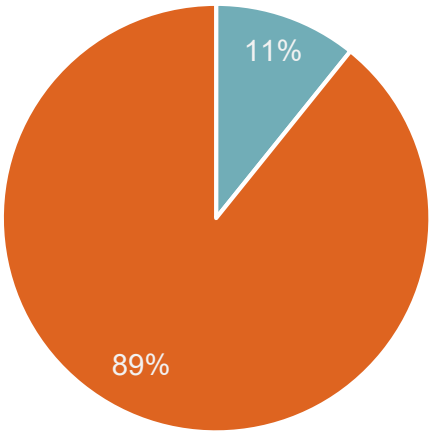


VEHICLE COMPLIANCE- POST IMPLEMENTATION

Bike Box Encroachment



Right-Turn Lateral Position



FINDINGS AND CONCLUSIONS

The following section provides a summary of the key findings.

SUMMARY OF RESULTS

After the implementation of the 18th Street, D Avenue and 4th Street Community Corridor project, the City of National City received positive feedback and recognition from the local residents and members of the local transportation industry. Most of the recognition has been given for the City's willingness to implement innovative corridor improvements, providing members of the community with viable active transportation options.

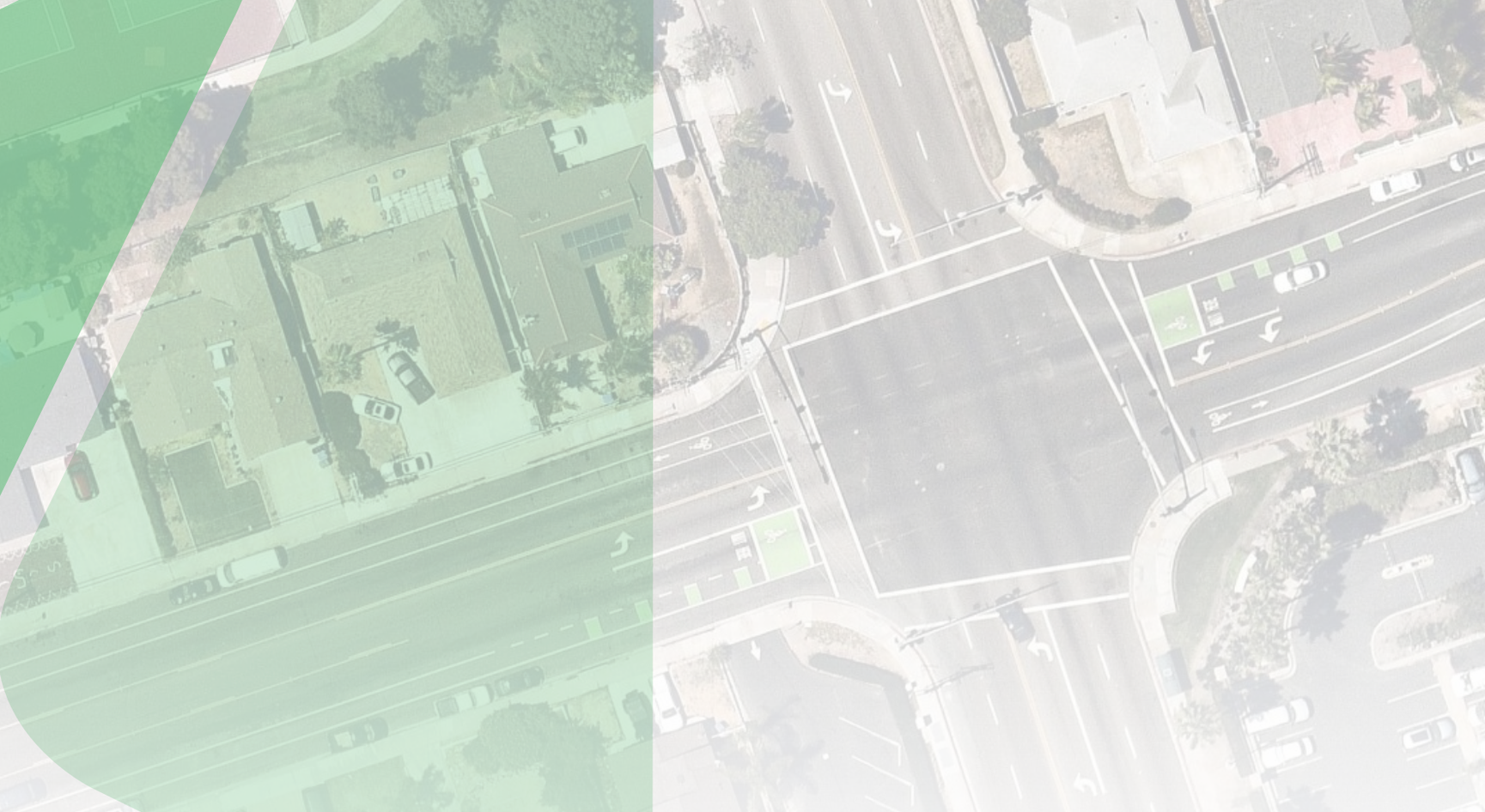
The results of the data collection observed during the analysis, provided an interesting insight on the type of bicycle users in National City and their ridership behavior. The study also collected data regarding helmet use and gender, which seemed to stay relatively consistent between the pre- and post-implementation, with an approximately 80 percent of helmet use, and a significantly larger male population of ridership (between 80 and 98%) than the female population.

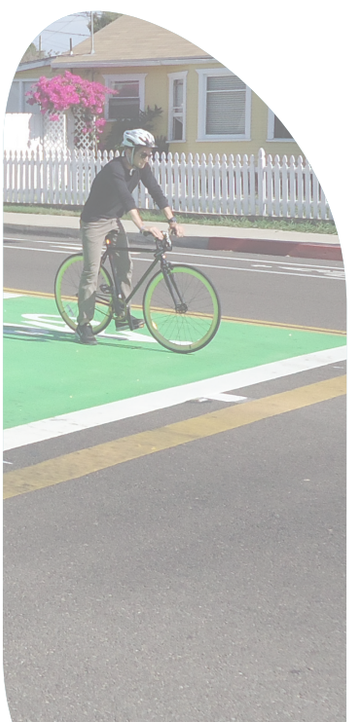
In terms of the bike boxes and their implementation, the study showed a high level of compliance for vehicles approaching the bike box, with approximately a 70% compliance with the signs and markings of the bike box. For vehicles turning right, between 71 and 80 percent of the vehicles would position themselves next to the curb, as required by the California Vehicle Code, instead of waiting behind the stop bar, as it could be expected with the implementation of the bike box.

The collision data shows no change between the pre- and post-implementation of the bike boxes.

A point to note regarding the implementation of bicycle boxes within the City of National City is that the "No Right-Turn on Red" requirement is not included. The "No Right-Turn on Red" signs were installed as part of the original implementation but removed soon after due to complains from the residents and City Officials. The data shows no impact of the removal of the "No Right-Turn on Red" signs to the effectives of the bike boxes.

In summary, the implementation of the bike boxes, and the new bicycle facilities have had a very positive impact through the City by encouraging bicycling as a preferred mode of transportation. With the completion of remaining segments of the City's bicycle network, it is expected that bike ridership within the City will increase over time.





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