



CITY OF GLENDALE, CALIFORNIA REPORT TO THE CITY COUNCIL

AGENDA ITEM

Report: Citywide Bicycle Detection Technology

1. Motion authorizing the installation of standard video detection system at intersections without bicycle detection and directing staff to pursue funding at the next grant cycle opportunity for additional installations.

COUNCIL ACTION

Item Type: Action Item

Approved for October 25, 2022 **calendar**

EXECUTIVE SUMMARY

Per the City Council's request, staff has prepared a comprehensive assessment of the City's 243 signalized intersections and identified locations without existing bicycle detection. This report will discuss types of bicycle detection at the City's existing intersections and identify alternatives to implement bicycle detections at all signalized intersections.

COUNCIL PRIORITIES

Mobility/Connectivity/Safety: To improve mobility, comfort, and safety for bicyclists citywide.

RECOMMENDATION

Authorize the use of standard video detection system at signalized intersections without bicycle detections, and direct staff to pursue grant funding to expand this technology to intersections currently without bicycle detection.

BACKGROUND

Bicycle detection allows traffic signals to detect the presence of bicyclists at signalized intersections and provide traffic signal sequencing for the bicyclists to cross the intersection. Bicycle detection at signalized intersections have many advantages, including:

- Increases bicycle safety and improves intersection efficiency;
- Reduces delay for bicycle travel;
- Discourages red-light crossing by bicyclists;
- Extended green-time for bicyclists to clear the intersection, and

- Newer technology video detection equipment has the capability of connecting to the Traffic Management Center (TMC), providing bicycle detection data and monitoring the network remotely.

Types of Bicycle Detections

There are several ways to detect bicycles at signalized intersections, including in-pavement inductive loops, bicycle push buttons, microwave radar, and video detection.

Inductive loops: Inductive loops work like a metal detector which are installed in the pavement to detect the presence of metal objects, mainly vehicles and bicycles. Inductive loops are cost efficient, reliable and can be used for both vehicles and bicycles. Inductive loops also work well in cases where there are physical obstructions that impair other forms of detection listed below, and/or horizontal and vertical curves in the roadway. Installation procedures include cutting circular slots in the pavement, installation of wiring within the slotted pavement, installing sealant, and extending the wiring to underground conduits under the pavement. The disadvantages of inductive loops are that they are susceptible to damage from pavement deformities and/or construction excavation activities, installation requires lane closures, once installed the location cannot be changed, they do not detect non-metallic objects (e.g., carbon fiber), and they tend to lose sensitivity throughout time.

Bicycle push-buttons: Bicycle push-buttons are mechanical user-activated devices that actuate traffic signal sequencing for bicycles by pushing a button. Disadvantages are that placement of the push-button posts must be within the sidewalk area and accessibility by bicyclists can only be accommodated in cases where the bike lane runs adjacent to the curb at the intersection. Further disadvantages are that bicycle push-buttons do not provide extended green-time for bicycles.

Microwave Radar: Microwave radar can detect bicycles via transmitting microwave energy toward the roadway. The disadvantages are that they are unable to differentiate between vehicles, bicycles, or lane approaches, they are unable to detect near large steel structures and are difficult to troubleshoot.

Video Detection: Video detection cameras are a reliable option for detecting bicycles at signalized intersections and is the preferred detection method currently in use by the City of Glendale. Video detection systems use image processing to determine the presence of objects in the roadway. Video detection systems consist of one or more cameras, a processor, cables, software and a communication system. The advantages of video detection system are:

- High accuracy;
- Able to detect vehicles and bicycles;
- Newer system can differentiate between bicycles, vehicles, and pedestrians;
- Can distinguish multiple bicycles on an approach;
- Actuation regardless of metal content in bicycles (e.g., carbon fiber);
- Easy to troubleshoot;

- Can count vehicles, bicycles, and pedestrians (newer systems);
- Detection zones can be reconfigured for new roadway traffic-lane configurations, and
- Ability to connect live video feed to the City's TMC.

Disadvantages of video detection are that the image cannot traverse physical obstructions such as hillsides or horizontal and vertical curvature curves in the roadway. In these cases, inductive loop detectors are recommended.

Existing Intersections with/without Bicycle Detections

The City has improved and expanded its bicycle infrastructure, including detection of bicycles at signalized intersections, on new traffic signal modification projects. Traffic signals currently employ a combination of inductive loop detectors and video detectors to detect vehicles, bicycles, and actuate respective traffic signal sequencing. All traffic signal projects that include upgrades in vehicle detection are now designed and equipped with video detection cameras with capabilities of bicycle detection. Many signalized intersections in Glendale have a combination of one or both systems, however, some older signalized intersections may have existing vehicle detectors that have not been upgraded to detect bicycles.

ANALYSIS

Recommended Option

As part of this exercise staff studied three options for potential implementation of bicycle detection citywide at all 243 signalized intersections, as follows:

Option I – Upgrade inductive loops to detect bicycles at locations without specialized bicycle detectors: This option proposes the design and installation of specialized bicycle detectors that strengthen the inductive magnetic field in the center of the detector and allow for detection of smaller metallic objects, such as bicycles. Installation at locations without existing vehicle detection also require construction of underground conduits and cable to accommodate the new bicycle detectors.

Option II – Install standard Video Detection Systems (VDS) at locations without bicycle detections that has the following capabilities:

- Detects vehicles and bicycles but does not differentiate (also does not count or detect pedestrians);
- Ability to provide video feed to TMC, and
- Detects non-metallic bicycles (Carbon fiber).

Option III – Install state-of-the-art Vantage Next (VN) Video Detection System at locations without existing bicycle detections. VN is an advanced video detection platform that utilizes the latest technology and enhances the capability of detecting and counting bicycles and pedestrians with the following capabilities:

- Mobility Intelligence (counting bikes, pedestrians and vehicles);
- Turning movement counts;

- Ability to provide video feed to TMC;
- Detection of non-metallic bicycles (Carbon fiber);
- Traffic & incident Data collection, and
- Traffic Analytics Software that provides:
 - graphs and charts of vehicle, bicycle, and pedestrian data,
 - stores data in the cloud,
 - provides percentage red and green light arrival, and vehicle classifications, and
 - provides travel time information.

Traffic signals are designed to ensure an orderly movement of traffic and manage right-of-way at intersections, and create the orderly movement of traffic and prevent excessive delay. Traffic signals have moved away from simple timers to on-demand systems that detect all road users to optimize the operation and efficiency of the signal system. New technology will protect vulnerable road users including pedestrians and bicycles through improving detection accuracy, enhancing nighttime detection, and utilizing higher data resolution at signalized intersections.

Staff has prepared an engineer’s estimate for the City’s 243 existing signalized intersections with partial bicycle detection that are proposed for upgrades to provide bicycle detection for all directions. Alternatives are listed in Table 1 below.

Table 1- Options for Bicycle Detection Improvement		
Options	Construction Cost	Design and Construction Management Cost
I. Inductive loops	\$1M	\$300K
II. Standard Video Detection System (VDS)	\$2.1M	\$300K
III. Vantage Next (VN) System	\$3.5M	\$300K

Currently Public Works Department utilizes Option II with good success at some of the existing intersections. It is therefore our recommendation to continue utilizing this system for all locations without existing bicycle detection on the roadway approaches.

STAKEHOLDERS/OUTREACH

Potential stakeholders have not been identified and/or contacted.

FISCAL IMPACT

The recommended bicycle detection technology improvement will cost about \$2.4 M and was not included as a part of the FY 2022-23 budget. Staff has not identified funding sources for these alternatives at this time.

Based on the direction of Council, staff will seek out grant opportunities, such as Measure R Subregional Funds and Active Transportation Program (ATP) funds and submit applications for bicycle detection improvements at the next respective grant cycle request opportunity.

ENVIRONMENTAL REVIEW

Proposed alternatives are Categorically Exempt under the provisions of the California Environmental Quality Act as a Class 1 Exemption pursuant to the California Code of Regulations, Title 14, Section 1530.

ALTERNATIVES

- Alternative 1: Approve the motion authorizing the installation of bicycle detection technology Option II at intersections without bicycle detection and direct staff to pursue funding at the next grant cycle opportunity.
- Alternative 2: Do not approve the motion for making improvements to bicycle detection. Staff will continue to include bicycle detection upgrades on traffic signal modification projects only.
- Alternative 3: The City Council may consider any other alternative not proposed by staff.

ADMINISTRATIVE ACTION

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EXHIBITS

N/A