

Evaluation Report for Gridsmart Bell Camera

California Department of Transportation (Caltrans)



Electrical Quality Assurance and Source Inspection (EQASI)



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1. INTRODUCTION

Bell Camera

This document is provided to assist in the evaluation of proposed solutions that support the goals of this project and outlines the proposed process and testing approach. The goal is to be able to measure and confirm the technology's ability to meet Caltrans' desired features and expected performance metrics, helping establish both feature capabilities as well as accuracy of the detection. This includes assessment of product(s) to monitor and record vehicular data with a focus on:

- Traffic statistics, volume by lane

These products have been submitted to Caltrans' Product Evaluation Program (PEP). The PEP is dedicated to evaluating new products to add to the Authorized Materials List (AML). These products are being held to the standards of the AML that Caltrans provides publicly, as well as the applicable Caltrans specifications and Non-Standard Special Provisions (NSSPs).

Section 1 introduces the background information about the experiment by describing the objective of the experiment, reviewing the test sites and setting up for each different test performed, information regarding the testing equipment, included documentation sent by each vendor upon arrival of the product, and a brief overview of the conclusion.

Section 2 focuses on the experiment itself. It describes each test the camera underwent over the testing period and evaluates how each vendor does in identical conditions. It also addresses how well the dashboard interface works with the device itself, as well as discuss some of its available features.

Section 3 concludes the experiment by giving an overall description of the device's performance throughout the experiment. It includes any additional notes that the observers may have found important, as well as a cost analysis for the product.

Section 4 provides a summary of the results of the experiment. It includes the recommendations for usage of the product based on the data provided.

1.1 - OBJECTIVE

The scope of work was limited to conducting the described below and providing a report of the results. Testing was completed in April 2025. **The goal of this test was to determine whether these products would be listed on the AML or not.**

1.2 - TEST SITES AND SETUP

67th St & Folsom Blvd

To test the accuracy of the counts and classification of the camera, **we counted live!**

- An observer was stationed at the test site and counted the number of objects that appeared in a lane during a fifteen-minute period. This was repeated seven times, evaluating six motorist lanes and one pedestrian crossing. These values were used as the manual volume counts, which the camera's volume counts were compared against.

Figure 1-1

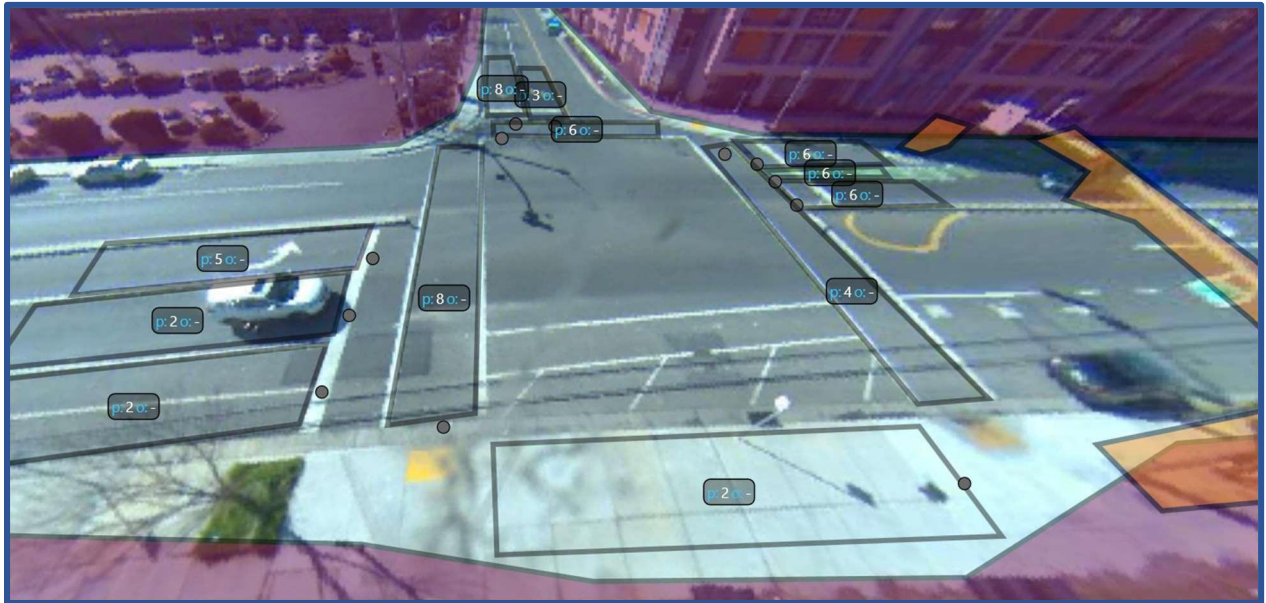


Figure 1-1 gives the view from the camera.

Figure 1-2

Figure 1-2 shows the mounting of the camera.

Figure 2-3

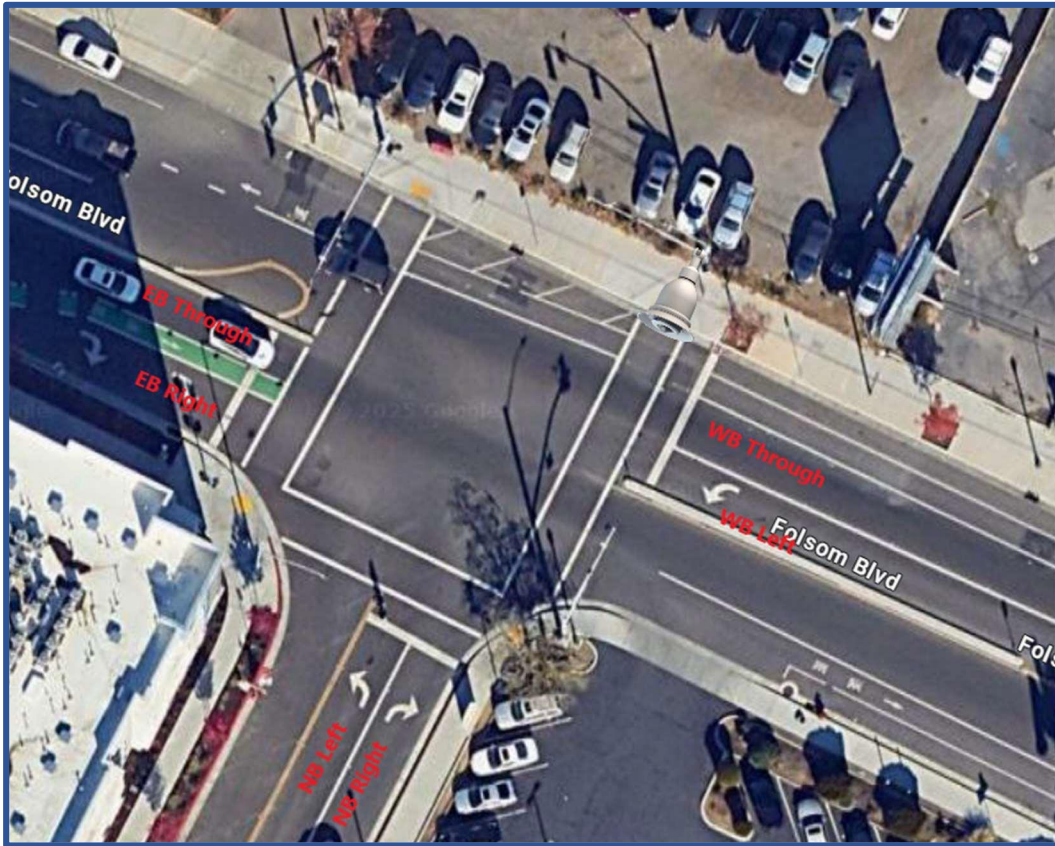


Figure 1-3 represents the area that the camera captures.

Figure 1-4

Maintenance and Part Replacement Documentation	
Troubleshooting Guide and Information	
Warranty: - Replacement against defective or failed material from date of installation - Covers all expenses for replacement of parts, technical support, and shipping - Must show Caltrans as owner - Delivery replacement parts to 5900 Folsom Blvd, Sacramento, CA 95819	
Certificate of Compliance and Manufacturer QC Test Data	

Table 1-4 describes if the required documentation from the vendor to Caltrans for testing was provided.

1.4 - CONCLUSIONS

Count Accuracy

After completion of the testing and review of the results, the Gridsmart Bell Camera has been deemed acceptable and added to the Caltrans Authorized Material List.

2. VENDOR SPECIFICATIONS AND EXPECTED PERFORMANCE

To develop the test plan for evaluation of the products, vendors and evaluation personnel communicated to decide what should be expected from the product. After discussion, these were the expected capabilities of each device:

Bell Camera and Expectations

1. Counts for vehicles

Accuracy levels for each device can change based on sample size. The vendor has provided an expected level of accuracy from prior experiences before this evaluation.

For the device, there is an expected accuracy of at least 90% for all tests.

3. DATA COLLECTION

3.1 - SAMPLE IDENTIFICATION

Table 3-1

Device	Model / Part Number	Serial Number	Test Conducted
One (1) Gridsmart Bell Camera			Count Accuracy

The results of this test apply only to the units identified in this Engineering Report by device identifier and model/ part number, or serial number.

3.2 - TIME FRAMES

There are four time periods used to test counts, each spanning fifteen minutes long. These time periods consist of:

1. 10:50 AM – 11:05 AM
2. 11:25 AM – 11:40 AM
3. 11:45 AM – 12:00 PM
4. 12:15 PM – 12:30 PM

3.3 - COUNT ACCURACY EVALUATION

Purpose: Show that the unit can meet Caltrans NSSP for accuracy percentage on individual lane counts.

Brief test description: To test this, a camera was mounted directly below the camera on a pole that covered a section of the freeway that had no entries or exits. With this camera, several fifteen-minute video clips were recorded. This was used for a manual count of the number of cars in each lane of the freeway (not including on or off ramps). These counts represent the ground truth value (GTV) for each lane. The camera has their own count of the number of vehicles that appeared in each lane for the fifteen-minute interval. These counts represent the detection value (DTV) for each lane. Using the ground truth and detection values collected, the absolute error (AE) was calculated through the formula:

$$AE = | GTV - DTV |$$

This represents the difference between the ground truth value collected and the detection value collected. Using the absolute error, the % accuracy for each lane was calculated using the formula:

$$\% \text{ Accuracy} = \left(1 - \frac{AE}{GTV} \right) * 100$$

For volume-based evaluations of the camera, the % accuracy should be at least 90%.

Table 3-3

Timeframe	Lane	Manual	Gridsmart Bell	Difference (Absolute Error)	% Accuracy
11:45 AM - 12:00 PM	WB Through	127	122	5	96 %
11:45 AM - 12:00 PM	WB Left Turn	17	16	1	94 %
11:25 AM - 11:40 AM	EB Through	154	139	15	90 %
11:25 AM - 11:40 AM	EB Right Turn	9	12	3	66 %
10:50 AM - 11:05 AM	NB Right Turn	35	30	5	85 %
10:50 AM - 11:05 AM	NB Left Turn	9	9	0	100 %

Pedestrians

Timeframe	Lane	Manual	Gridsmart Bell	Difference (Absolute Error)	% Accuracy
12:15 PM - 12:30 PM	Phase 4 Pedestrian	6	4	2	66 %

3.5 - SOFTWARE DEMONSTRATION AND DASHBOARD EVALUATION

Table 3-10 (Dashboard Navigation and Reports Results)

Demonstration	Meets Expectations? Camera
Programming, traffic data retrieval, and remote access software must be compatible with current version of Microsoft Windows OS	
System setup and configuration process can be performed remotely or locally by any third-party trained technician	
System capable of recovering from errors, such as through a system reset able to be done remotely	
Accessible online through either application or web browser	

Provides time that system is set to verify that it has accurate date and time	
Configure and detect at least 12 lanes from the dashboard	
Collect raw data from dashboard and export them to third-party programs (such as Excel)	

4. SUMMARY

4.1 - COUNTS

This is my summary

4.2 - DASHBOARD AND INTERFACE

Lane Configuration

-

Data Collection

- **ability to pull data as low as 5-minute bins up to 1-hour bins**
- **report can be pulled as an xls or pdf**
- **zone labeling carries over into the report and data is classified per the user's zones created**

4.3 – CONCLUDING IDEAS

Table 4-1

Pros	Cons
	- Delay in time from when the data is filtered through the cloud & accessible on the Gridsmart application

Cost Analysis:

Recommendation:

5. APPENDIX

5.1 - DIRECT INTERACTION

Points of note for direct interaction:

Vendor was responsive and cooperative. They provided suggestions for setup and modifications to improve accuracy of the camera after initial testing.

Vendor came out to the test site to help configure the camera. This included providing recommendations from the original set-up and verifying configuration once the camera had created the zones for each lane.

5.2 - CHALLENGES/ISSUES

- Limited timeframes to evaluate the camera against due to lack of access to a recording unit for that intersection. Different light conditions, weather, and traffic volume could impact the results.
- Test site was a three-way intersection with the bell camera mounted on the luminaire arm on the crosswalk with no motorist lanes. Performance for motorist lanes directly below the camera was not tested.
- Low pedestrian volume may affect the accuracy of the device.