Annual Data Usage Report for Gunshot Detection Technology
City of San José
January – December 2023

Owning department(s): San José Police Department
Department owner: Deputy Chief, Executive Officer

Context for Annual Usage Reports

The City annually reports on the usage and accuracy of its priority technologies that collect personal information. This document is prepared in coordination with the owning department and the Digital Privacy Officer, and satisfies the required reporting detailed in the relevant Data Usage Protocol.[1]

1) Program Summary

Police officers may utilize gunshot detection systems to enhance their ability to rapidly respond to potential firearm crimes. Gunshot detection systems recognize the typical audio signature of a gunshot and alert Police of the sound. When used with Automated License Plate Readers (ALPR) to capture photos of passing vehicles, gunshot detection systems can identify the time, location, and associated vehicles surrounding a firearm incident. The integrated use of gunshot detection systems and ALPR can increase police officers' capacity to respond to incidents of gun violence.

The City of San José (City) and the San José Police Department will use gunshot detection in conjunction with an ALPR camera. Automated License Plate Readers (ALPRs) use high speed cameras to photograph vehicle license plates. Additional information on Automated License Plate Readers can be found in the Data Usage Protocol for ALPR technology.[2]

2) Updates to Data Usage Protocol and Plans for Future Years

No updates to the Data Usage Protocol were made during the reporting period.

At the time of this report, the Police Department did not have plans to add more Gunshot detection devices or renew the lease of existing ones.

3) Reporting Metrics on Usage and Accuracy

a) Accuracy metric:

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[1] See all published Data Usage Protocols at: https://www.sanjoseca.gov/digitalprivacy
[2] See ALPR and other published Data Usage Protocols at: https://www.sanjoseca.gov/digitalprivacy

In total, there were 270 Gunshot detection incidents. The table below reports the number of false positives, false negatives, true positives, and duplicative positives to evaluate the accuracy of the gunshot detection system. The system was taken down for recalibration and was redeployed after week 19 in the period from July 8, 2023 to December 31, 2023. The top row illustrates accuracy metrics before recalibration, and the second row illustrates accuracy metrics after recalibration.

Date	False Positives	False Negatives	True Positives	Duplicative Positives	Unknown
2/25 - 7/7	42	N/A	61	6	20
7/8 - 12/31	9	N/A	111	4	17
Total	51 (19%)	N/A	172 (64%)	10 (4%)	37 (14%)[3]

Sounds are only recorded as a gunshot if at least 3 detection devices (i.e., 3 gunshot microphones) meet the confidence threshold (85%, then 90%). This means most sounds detected by the devices are not stored and not included in this count.

Detected gunshots are verified by human review for accuracy. This involves a member of the Police Department listening to the recorded audio snippet to determine if the audio clearly matched a gunshot.

- **False positives** are events where the system detected a gunshot, but upon human review was determined to not be a gunshot.
- **False negatives** are events where the system should have detected a gunshot but failed to do so. The detection range of a gunshot detection system varies based on the time and location. For example, a crowded area (with buildings, large moving vehicles, etc.) will dampen the sound of a gunshot and reduce the detection range of the system. Because of this, an exact false negative rate was not calculated.[4]
- **True positives** are events where the system detected a gunshot and was verified by human review. These are events where the gunshot was not otherwise reported. In other words, police would not have been notified of this gunshot without the system. This is exclusive of duplicative positives.
- **Duplicative positives** are events where the system correctly detected a gunshot and Police was notified of the gunshot through another avenue, such as someone calling 911 or police hearing the gunshot. Of the total true positive detected gunshots (182 total), less than 6% were duplicative positives. In other words, over 94% of the true gunshots. detected were gunshots police would not have been made aware of without the tool.

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[3] Does not add up to 100% due to rounding

[4] Upon further analysis of this data, the gunshot detection system has failed to detect a gunshot directly underneath the detection system (i.e., at the intersection where a detector was placed). The system has successfully detected many other nearby gunshots, but it is clear the system is not detecting all gunshots the department would expect.

- **Unknown** are events where the system detected a gunshot but police staff could not determine if the sound was or was not a gunshot.

The graph below visualizes the number of gunshots detected for each zip code, if a gunshot was detected by the system in that zip code. Most gunshots were detected in the 95110, 95116, and 95122 zip codes.
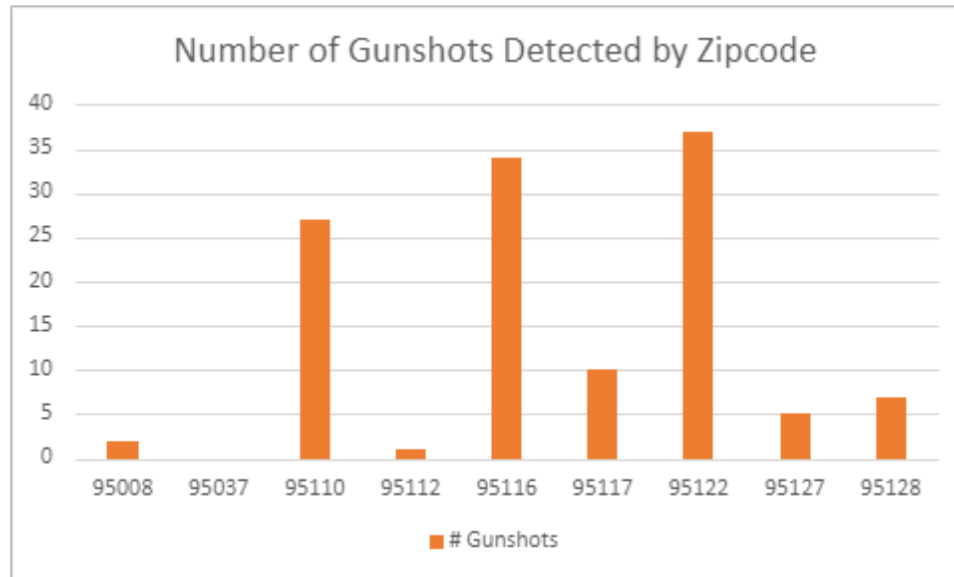
4) Compliance Reporting

After reviewing all access logs, system accuracy, and summary of the program, the Digital Privacy Officer finds the Police Department in compliance with its Data Usage Protocol.

5) Conclusion

The gunshot detection system's accuracy has increased from less than 50% to around 80% following recalibration (this includes true positives and duplicative positives). Over 94% of gunshots detected by the system were not reported to Police through a different channel, meaning the system provided Police with more awareness of gunshots in the City than they did previously.

6) Recommendation:
A) Moving forward, the Police Department should explore options to better evaluate the false positive rate of the gunshot detection system and determine recalibrations that may further improve the system's accuracy.

The Digital Privacy Office commends the Department for testing the pilot and gathering robust data. This practice should continue in the future if the system continues.