

Clarendon Avenue, San Francisco

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Velocity Overview

$$K_E = \frac{1}{2}mv^2$$

- **Site:** Clarendon Avenue, San Francisco
- **Primary period (t1):** 2025-06-02 to 2025-06-04
- **Comparison period (t2):** 2026-01-15 to 2026-01-19
- **Total vehicle count:** 5,915

Key Metrics

Metric	Period t1	Period t2	Change
p50 Velocity	30.54 mph	33.02 mph	+8.1%
p85 Velocity	36.94 mph	38.70 mph	+4.8%
p98 Velocity	43.05 mph	44.21 mph	+2.7%
Max Velocity	53.52 mph	53.82 mph	+0.6%
Vehicle Count	3,460	2,455	

Table 1: Key Metrics

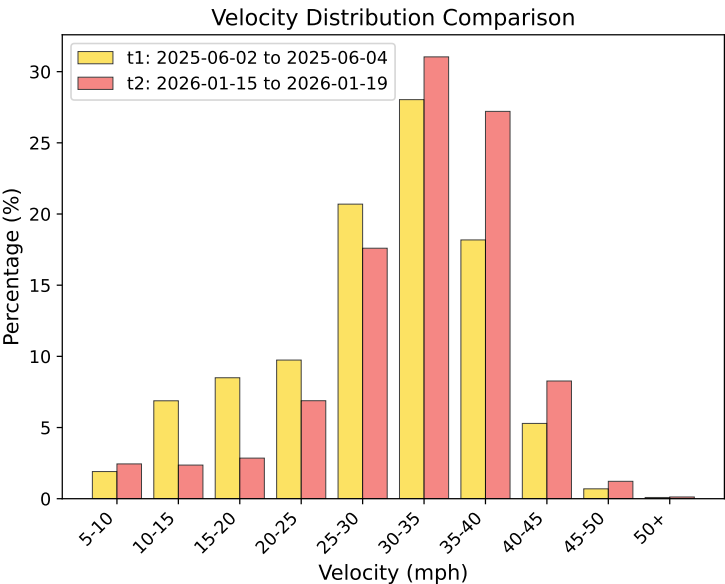


Figure 1: Velocity Distribution Histogram

Site Information

Surveys were conducted from the southbound parking lane outside 500 Clarendon Avenue, directly in front of an elementary school. The observed southbound travel lane is on a downhill grade, which may influence vehicle speeds and braking behavior. Data was collected from the same fixed instrument location on all survey days to ensure consistency. The posted speed limit at this location is 35 mph, reduced to 25 mph during times when school children are present.

Citizen Radar

velocity.report is a citizen radar tool designed to help communities measure vehicle speeds with affordable, privacy-preserving Doppler sensors. It's built on a core physical truth: kinetic energy scales with the square of speed.

where m is the mass and v is the velocity.

A vehicle traveling at 40 mph has four times the crash energy of the same vehicle at 20 mph, posing exponentially greater risk to people outside the car. Even small increases in speed dramatically raise the likelihood of severe injury or death in a collision. By quantifying real-world vehicle speeds, velocity.report produces evidence that exceeds industry standard metrics.

Aggregation and Percentiles

This system uses Doppler radar to measure vehicle speed by detecting frequency shifts in waves reflected from objects in motion. This shift (known as the Doppler effect) is directly proportional to the object's relative velocity. When the sensor is stationary, the Doppler effect reports the true speed of an object moving toward or away from the radar.

To structure this data, the velocity.report application first records individual radar readings, then applies a greedy, local, univariate *Time-Contiguous Speed Clustering* algorithm to group log lines into sessions based on time proximity and speed similarity. Each session, or "transit," represents a short burst of movement consistent with a single passing object. This approach is efficient and reproducible, but in dense traffic or where objects overlap it may undercount vehicles by merging multiple objects into one transit.

Undercounting can bias percentile metrics (like p85 and p98) downward, since fewer sessions can give disproportionate weight to slower vehicles. All reported statistics in this report are derived from these sessionised transits.

Percentiles offer a structured way to interpret speed behaviour. The 85th percentile (p85) indicates the speed at or below which 85% of vehicles traveled. The 98th percentile (p98) exceeds this industry-standard measure by capturing the fastest 2% of vehicle speeds, providing a more robust view into trends among top speeders. By extending beyond p85, p98 identifies an additional 13% of data that would otherwise be missed when trimming the top 15%, offering clearer insight into high-risk driving patterns without letting single anomalous readings dominate.

However, percentile metrics can be unstable in periods with low sample counts. To reflect this, our charts flag low-sample segments in orange and suppress percentile points when counts fall below reliability thresholds (fewer than 50 samples per roll-up period).

Hardware Configuration

Radar Sensor:	OmniPreSense OPS243-A
Firmware version:	v1.2.3
Transmit Frequency:	24.125 GHz
Sample Rate:	20 kSPS
Velocity Resolution:	0.272 mph
Azimuth Field of View:	20°
Elevation Field of View:	24°

Survey Parameters

Units:	mph
Minimum speed (cutoff):	5.0 mph
Roll-up Period:	1h
Timezone:	America/Los_Angeles
Start time (t1):	2025-06-02T00:00:00-07:00
End time (t1):	2025-06-04T23:59:59-07:00
Start time (t2):	2026-01-15T00:00:00-08:00
End time (t2):	2026-01-19T23:59:59-08:00
Cosine Error Angle (t1):	21.0°
Cosine Error Factor (t1):	1.071145
Cosine Error Angle (t2):	21.0°
Cosine Error Factor (t2):	1.071145

Note: speeds have been corrected to account for sensor angle.

Detailed Data Tables

Bucket (mph)	t1 Count	t1 Percent	t2 Count	t2 Percent	Delta
5-10	66	1.9%	60	2.4%	+0.5%
10-15	238	6.9%	58	2.4%	-4.5%
15-20	294	8.5%	70	2.9%	-5.6%
20-25	337	9.7%	169	6.9%	-2.9%
25-30	716	20.7%	432	17.6%	-3.1%
30-35	970	28.0%	762	31.0%	+3.0%
35-40	629	18.2%	668	27.2%	+9.0%
40-45	183	5.3%	203	8.3%	+3.0%
45-50	24	0.7%	30	1.2%	+0.5%
50+	3	0.1%	3	0.1%	+0.0%

Table 2: Velocity Distribution (mph)

Start Time	Count	p50 (mph)	p85 (mph)	p98 (mph)	Max (mph)
6/2 00:00	889	30.54	37.23	43.92	51.19
6/3 00:00	1311	30.54	36.36	41.60	53.52
6/4 00:00	1260	30.54	37.23	42.76	53.52
1/15 00:00	987	32.13	38.10	44.21	51.49
1/16 00:00	716	31.84	37.52	43.20	53.82
1/19 00:00	752	35.05	39.85	44.50	49.17

Table 3: Daily Percentile Summary (Comparison)

Start Time	Count	p50 (mph)	p85 (mph)	p98 (mph)	Max (mph)
6/2 08:00	109	23.43	35.72	43.78	46.47
6/2 09:00	152	30.54	37.52	42.47	46.83
6/2 10:00	162	34.32	40.14	45.96	51.19
6/2 11:00	140	32.87	37.81	44.21	46.25
6/2 12:00	179	30.83	36.36	43.34	44.21
6/2 13:00	147	25.02	32.87	40.72	48.29
6/3 09:00	73	27.92	35.20	40.72	40.72
6/3 10:00	190	28.80	35.20	43.63	48.87
6/3 11:00	181	28.80	35.49	41.30	53.52
6/3 12:00	188	32.58	36.94	41.60	43.92
6/3 13:00	145	32.00	38.69	42.47	44.21
6/3 14:00	186	30.83	36.94	43.34	47.12
6/3 15:00	215	29.38	34.91	39.85	45.67
6/3 16:00	133	31.41	37.52	41.60	45.38
6/4 09:00	254	21.52	31.71	36.36	40.72
6/4 10:00	140	31.12	37.23	42.76	46.54

6/4 11:00	149	33.74	38.69	45.67	47.41
6/4 12:00	141	33.16	39.56	45.67	47.12
6/4 13:00	170	32.29	38.11	42.76	45.67
6/4 14:00	198	28.22	34.61	41.30	42.18
6/4 15:00	208	32.58	38.69	43.63	53.52
1/15 10:00	107	33.31	37.38	44.78	46.82
1/15 11:00	149	34.02	40.13	45.96	47.56
1/15 12:00	158	34.17	38.10	43.63	48.86
1/15 13:00	180	32.13	37.67	44.21	45.81
1/15 14:00	206	29.66	35.20	40.57	46.53
1/15 15:00	187	30.98	37.81	45.53	51.49
1/16 12:00	121	33.45	38.70	44.21	53.82
1/16 13:00	127	33.74	38.39	43.20	47.56
1/16 14:00	173	32.73	38.24	44.64	50.17
1/16 15:00	213	29.95	35.05	40.71	43.06
1/16 16:00	82	31.99	36.49	42.03	42.91
1/19 11:00	113	34.77	38.70	44.21	44.64
1/19 12:00	163	35.77	40.42	44.21	47.13
1/19 13:00	163	34.48	38.84	43.92	46.53
1/19 14:00	191	35.34	41.31	45.96	49.17
1/19 15:00	122	33.59	38.84	43.78	47.85

Table 4: Granular Percentile Breakdown (Comparison)

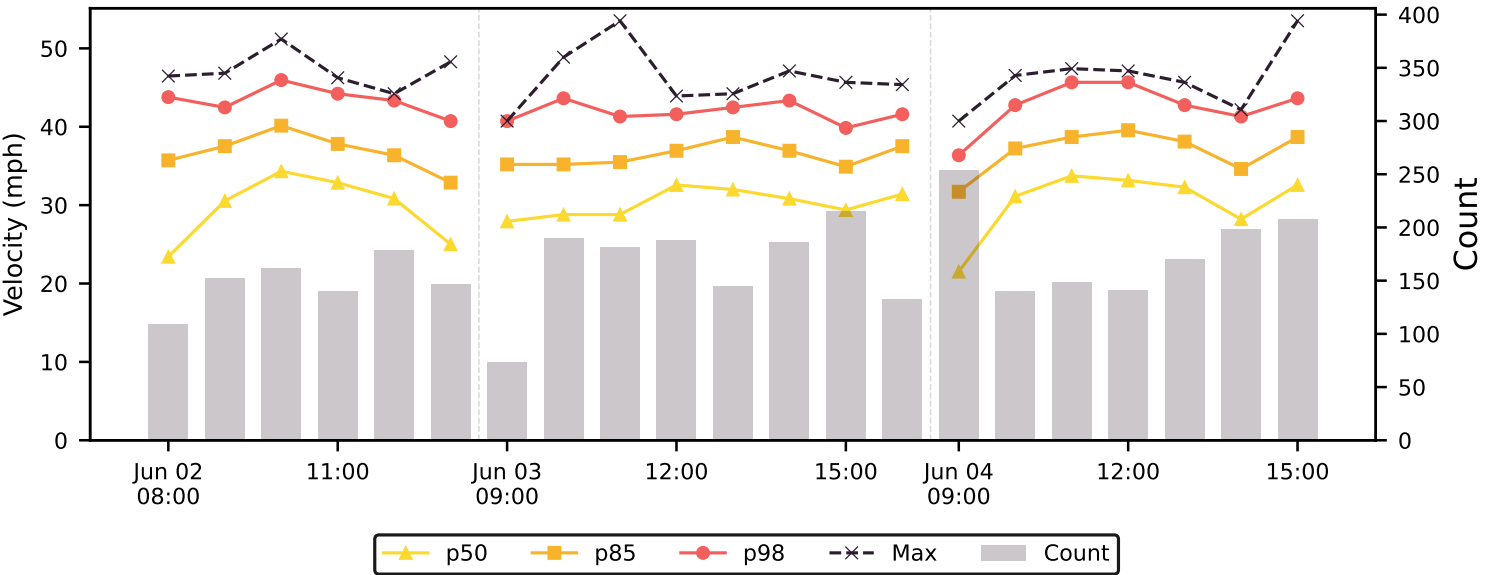


Figure 2: Velocity over time (t1: 2025-06-02 to 2025-06-04)

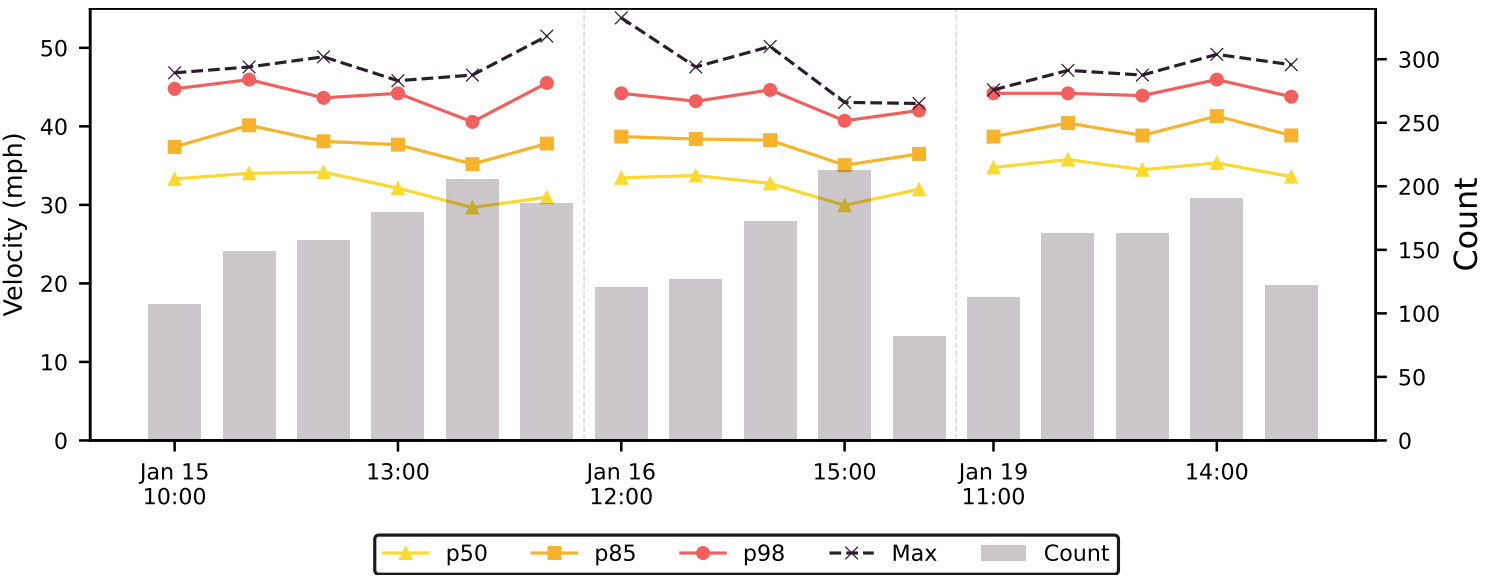


Figure 3: Velocity over time (t2: 2026-01-15 to 2026-01-19)



Figure 4: Site Location Map with radar location (circle) and coverage area (red triangle)