



San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Technical Evaluation of Sensor Technology (TEST) Program

*Dylos Sensor
2021 – 3rd Quarter*



Introduction and Sensor Profile

This analysis report is focused on assessing the performance of the Dylos DC1100 sensor as a part of the District's Technical Evaluation of Sensor Technology (TEST) Program. The Dylos sensor uses optical laser-based particle counting methodology to estimate the concentration of PM_{2.5} and PM₁₀. The Dylos sensor counts and measures the size of the individual particles to calculate a mass concentration.

Background and Approach of Evaluation Test

In May 2019, the District installed three Dylos sensors at the Clovis-Villa air monitoring station for the purpose of testing the Dylos sensors in the San Joaquin Valley and comparing the performance of the collocated Dylos sensors to the Federal Equivalent Method (FEM) PM_{2.5} analyzer. The data sets analyzed for this report compare PM_{2.5} data collected from the Dylos sensors and the MetOne BAM-1020 FEM monitor collocated at the regulatory air monitoring site. The scatter plots and time series graphs below show how the datasets compare for both hourly values and the 24-hour average.

Overview of Analysis Findings from Current Period

The analysis for this report covers the time period of July 2021 through September 2021 (2021 – 3rd Quarter). During this period, hourly data was removed from the calculation of bias when either the Dylos sensor or regulatory monitor did not have a valid hourly sample. For the 24-hour averages, only days with 18 or more valid hourly samples (75% or greater completeness) are included.

Of the three Dylos sensors collocated at the Clovis, only Dylos 1 and Dylos 2 sensors captured enough data during the 2021 3rd quarter to complete analysis against the FEM. The Dylos 3 sensor reported intermittent data, which was not enough data to analyze for this report.

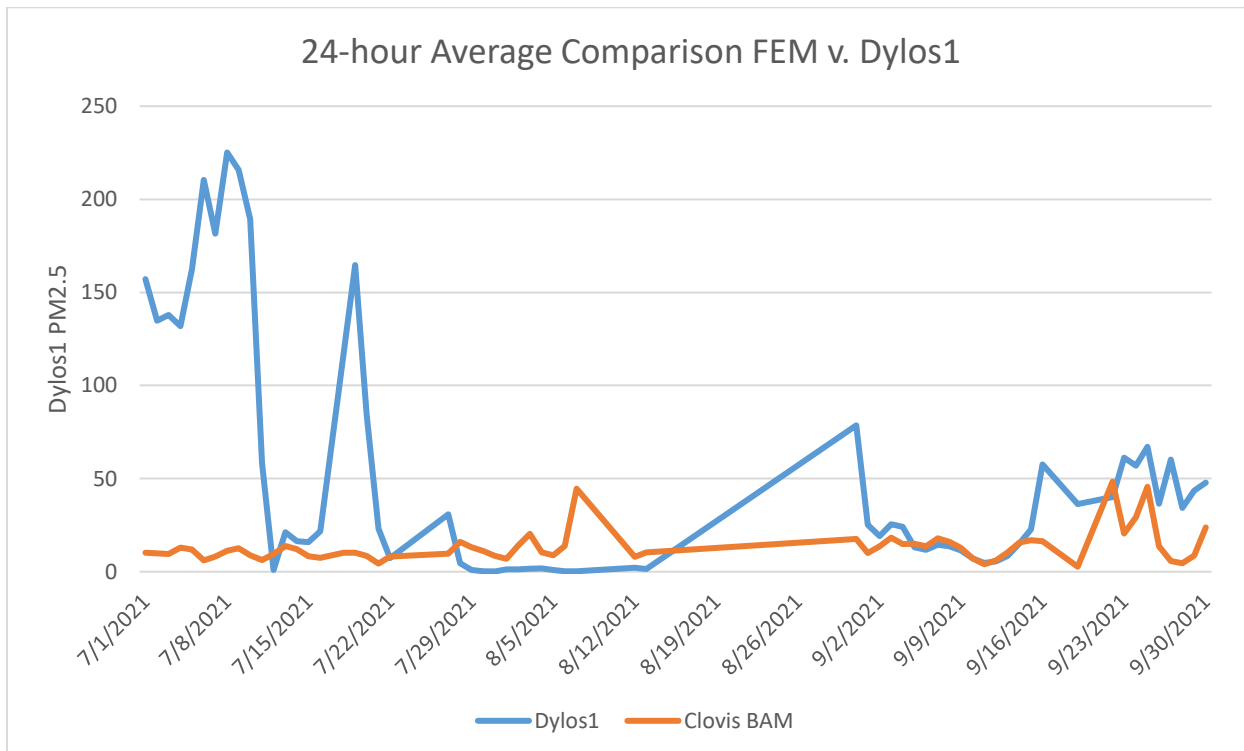
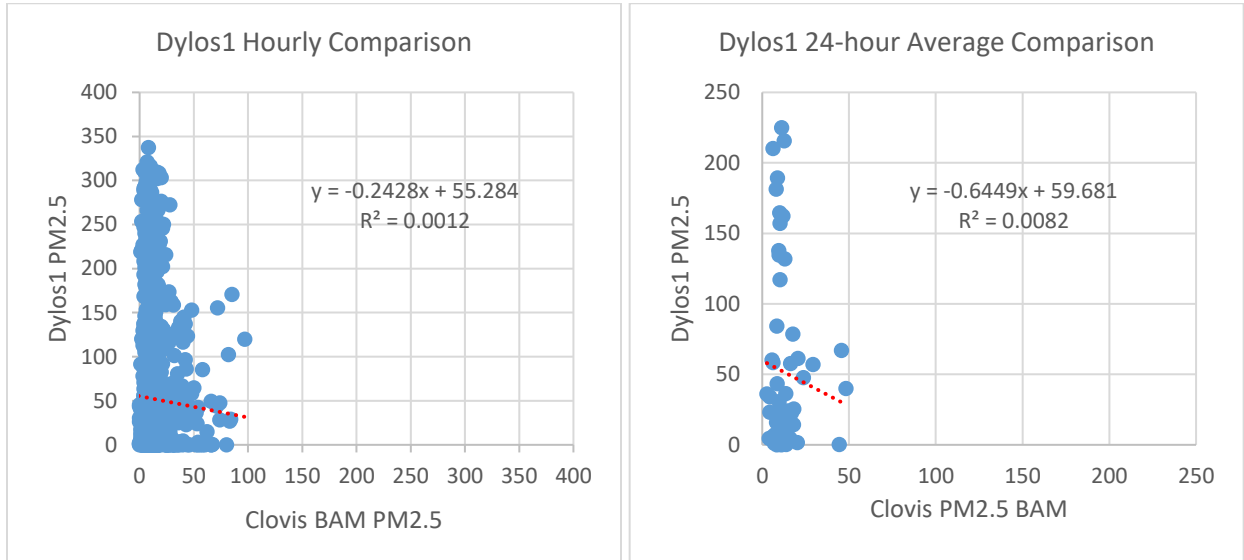
The 3rd quarter of 2021 was essentially dominated by high pressure systems that produced numerous days of triple digit temperatures and poor dispersion across the Valley. Monsoonal moisture also streamed into California producing thunderstorms that caused wildfires in the northern California and Sierra Nevada mountains. Wind flow patterns and strong temperature inversions associated with the high pressure systems exacerbated smoke impacts in the Valley. There were brief periods of cooling and improved dispersion conditions that infiltrated the Valley when low pressure systems moved through the Pacific Northwest during August and September. Overall, the 3rd quarter was characterized by poor dispersion and smoke impacts that led to elevated PM_{2.5} concentrations through the period.

Overall, the sensors operating during this period had high results compared to the regulatory monitors. The Dylos 1 had a 24-hour bias at 37.79 $\mu\text{g}/\text{m}^3$, while sensor 2 had a 24-Hr bias of 32.43 $\mu\text{g}/\text{m}^3$.

Analysis of Dylos Sensor Performance

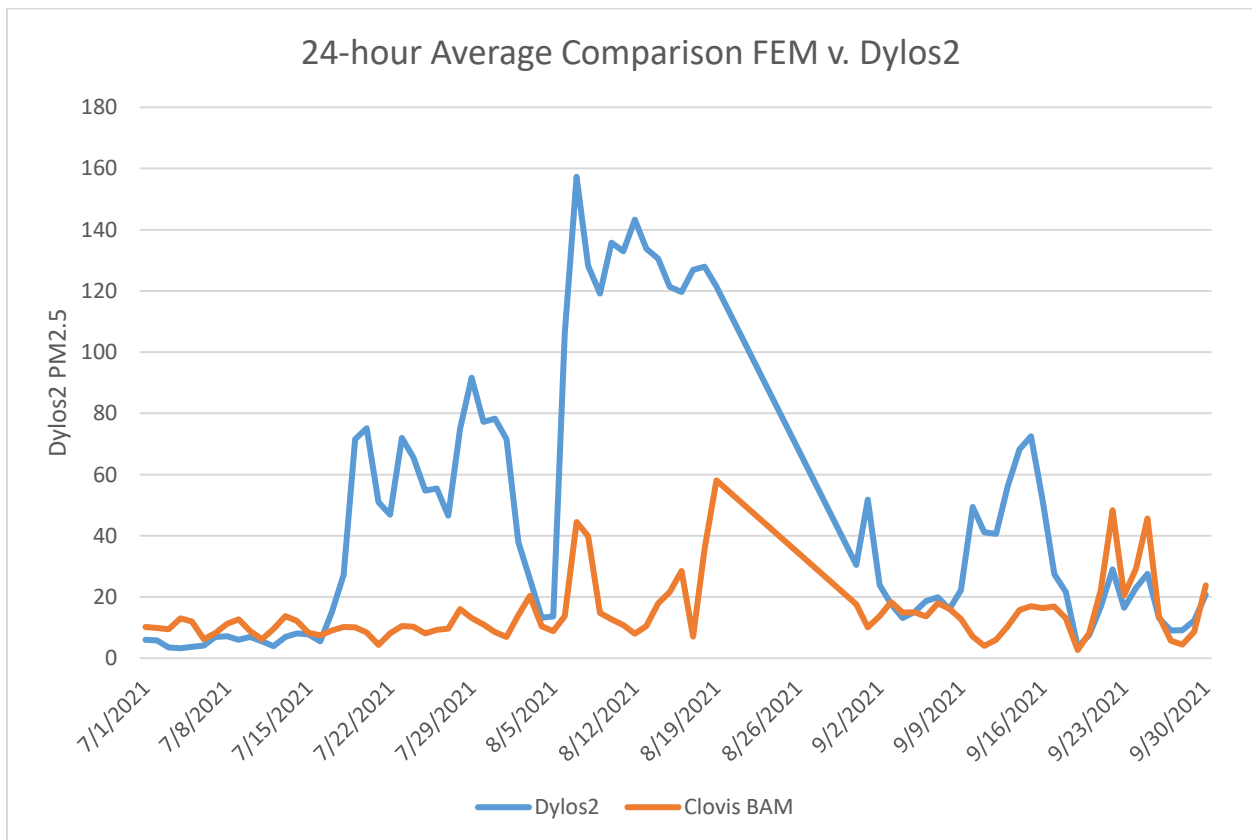
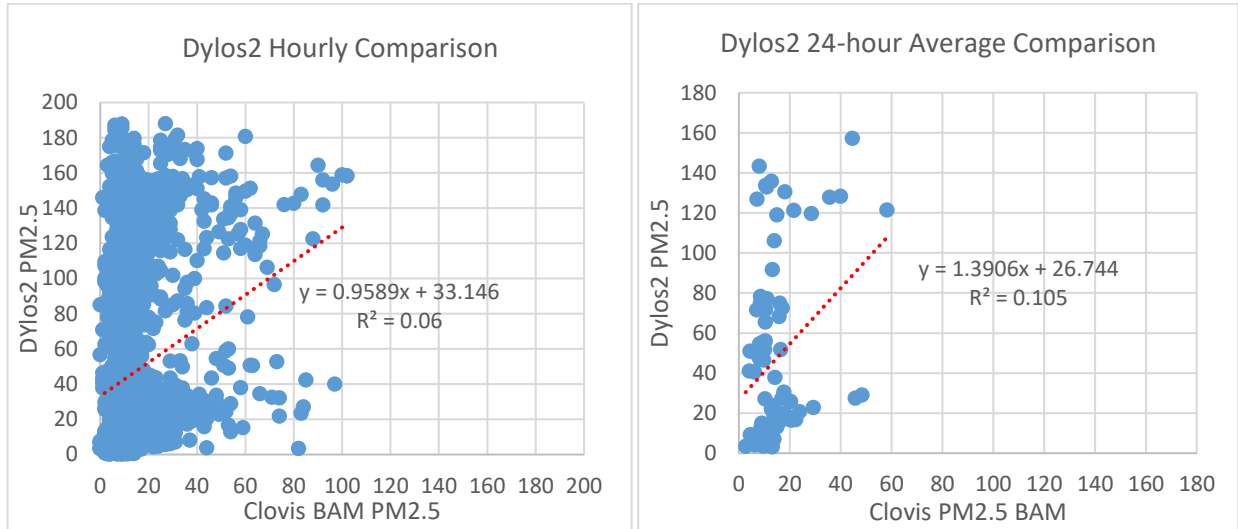
Dylos 1

For the 24-hour average, Dylos data had a 37.79 $\mu\text{g}/\text{m}^3$ high bias during the July 2021 through September 2021 period. For the hourly average, Dylos data had a 37.19 $\mu\text{g}/\text{m}^3$ high bias over the same period.



Dylos 2

For the 24-hour average, Dylos data had a 32.43 $\mu\text{g}/\text{m}^3$ high bias during July 2021 through September 2021 period. For the hourly average, Dylos data had a 32.41 $\mu\text{g}/\text{m}^3$ high bias over the same period.



Dylos 3

There were intermittent measurements from Dylos 3 sensors during this period. When data becomes more consistent, the sensor will be included in future reports.

Statistical Summary

The following table provides a statistical summary of the PM2.5 data collected during the analysis period of this report.

Clovis-Villa	Average 24-hr	Max 1-hr	Max 24-hr	1-hr R2	1-hr Slope	1-hr Intercept	24-hr R2	24-hr Slope	24-hr Intercept
Dylos 1	51.10	337.48	225.15	0.00	-0.24	55.28	0.01	-0.64	59.68
Dylos 2	46.99	188.09	157.31	0.06	0.96	33.15	0.11	1.39	26.74
FEM	16.58	102.00	61.13						