San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Technical Evaluation of Sensor Technology (TEST) Program

Dylos Sensor
2022 – 2nd 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 PM2.5 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) PM2.5 analyzer. The data sets analyzed for this report compare PM2.5 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 April 2022 through June 2022 (2022 – 2nd 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.

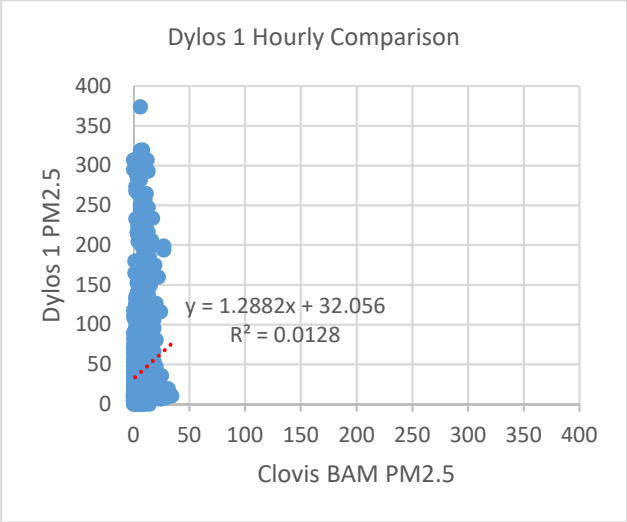
Seasonally, PM2.5 is typically highest during the winter months and lowest during the summer months. Weather systems influence PM2.5 levels by either trapping pollutants near the surface or dispersing them. April was characterized by alternating low pressure systems and high pressure systems. As dry, low pressure systems passed through California, high winds caused elevated PM concentrations on various days throughout the quarter. Beginning near the end of May, temperatures increased and the duration of high pressure systems lengthened. Stable atmospheric conditions remained prevalent across the Valley through June with periods of isolated thunderstorms that caused new wildfire starts and smoke impacts across California.

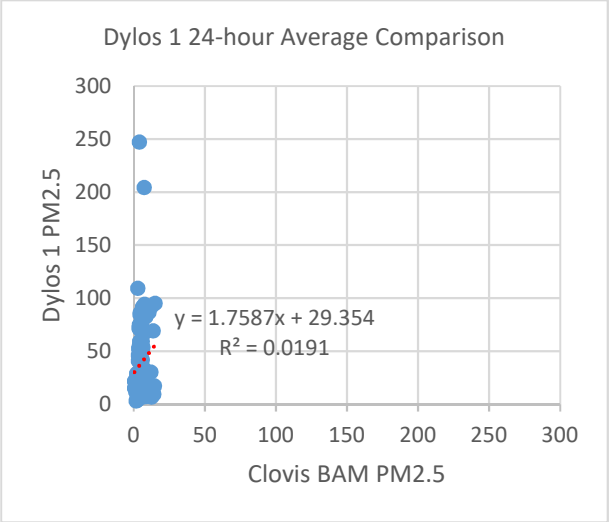
Overall, the Dylos sensors operating during this period had high results compared to the regulatory monitor. The Dylos 1 had a 24-hour bias of 39 $\mu g/m^3$, while Dylos 2 had a 24-Hr bias of 52 $\mu g/m^3$.

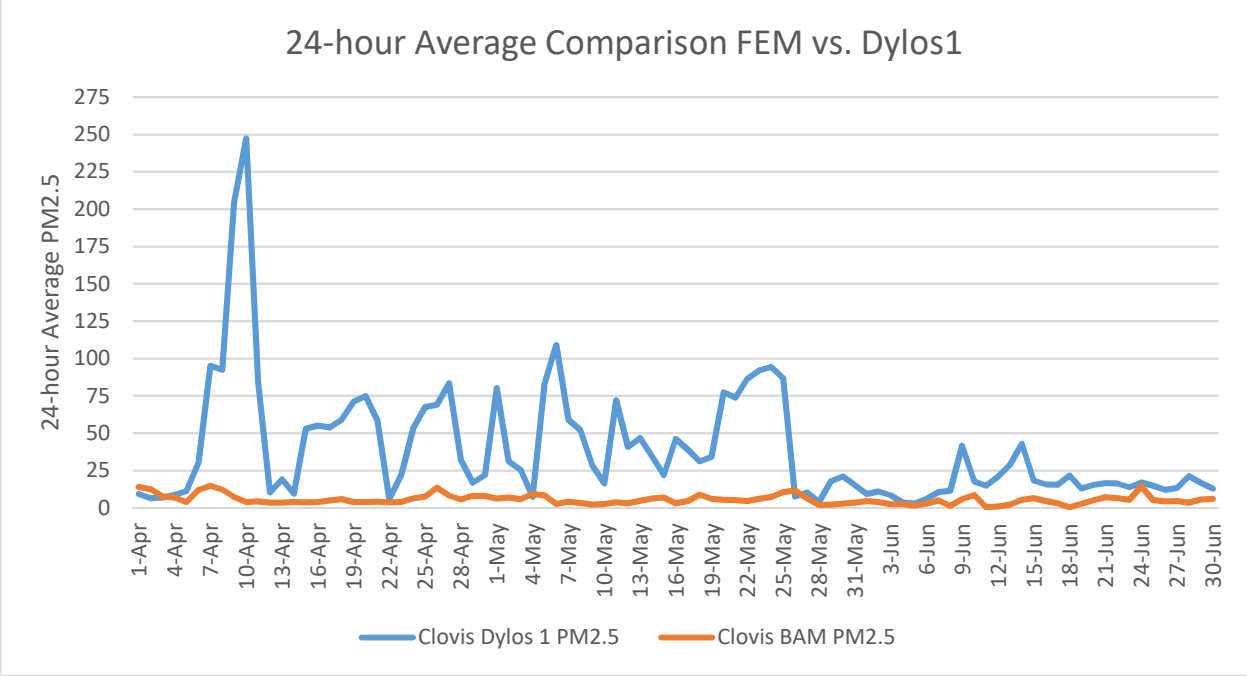
Analysis of Dylos Sensor Performance

Dylos 1

For the 24-hour average, Dylos1 sensor data showed a high bias of 39.2 µg/m^3 and the hourly data showed a high bias of 33.7 µg/m^3 during the April 1, 2022 through June 30, 2022, period.

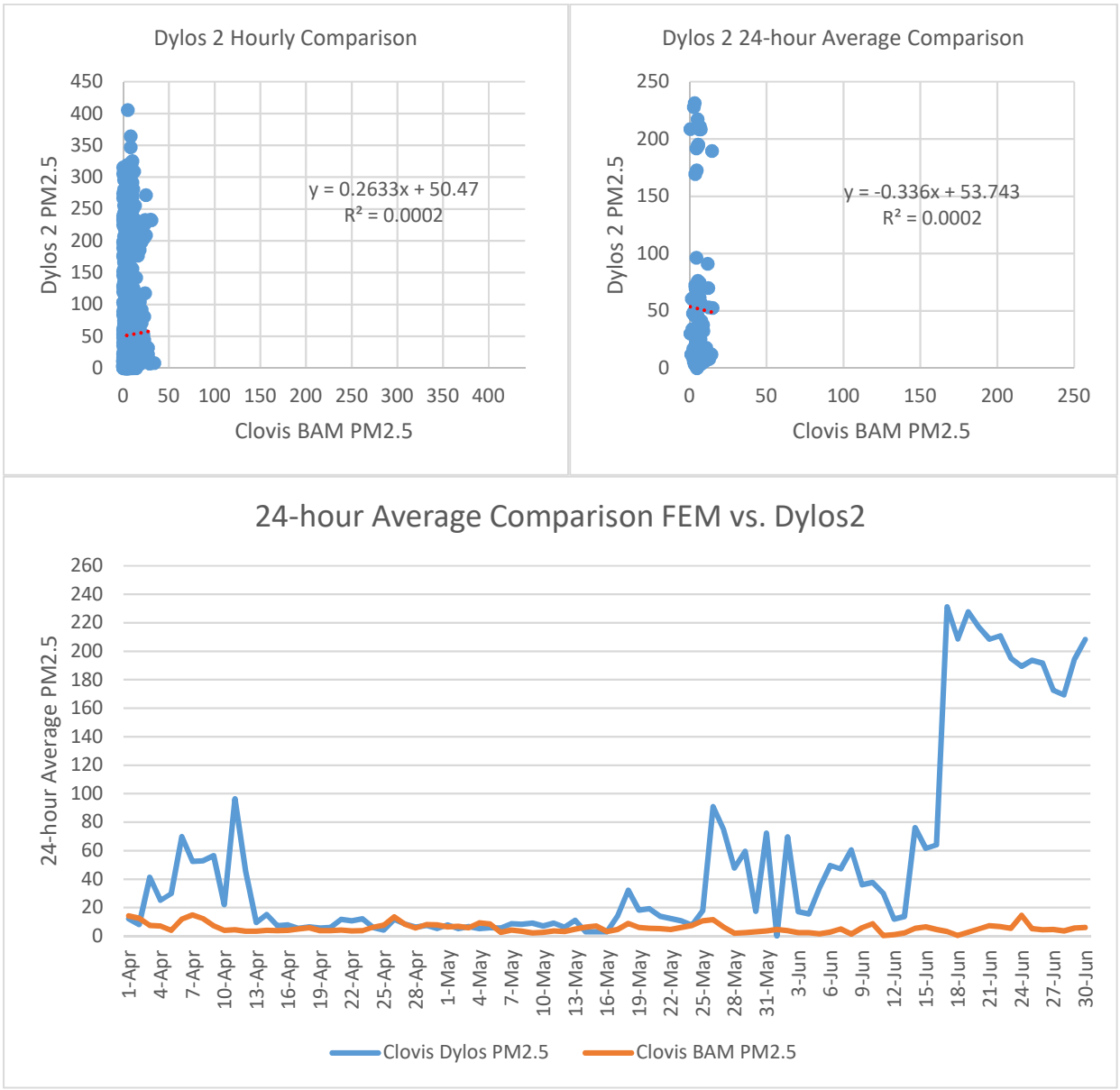






Dylos 2

For the 24-hour average, Dylos1 sensor data showed a high bias of 51.9 µg/m^3 and the hourly data showed a high bias of 46.3 µg/m^3 during the April 1, 2022 through June 30, 2022, period.



Non-Reporting Sites

Dylos 3

Data from this sensors was not available for the April 1, 2022 through June 30, 2022 period. The sensor stopped reporting data on July 20th, 2021.

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 R^2	1-hr Slope	1-hr Intercept	24-hr R^2	24-hr Slope	24-hr Intercept
Dylos 1	39.19	374.14	247.46	0.0128	1.2882	32.056	0.0191	1.7587	29.354
Dylos 2	51.86	405.38	231.21	0.0002	0.2633	50.47	0.0002	-0.336	53.743
FEM	6	34	15						