San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Technical Evaluation of Sensor Technology (TEST) Program

Dylos Sensor
2022 – 1st 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 January 2022 through March 2022 (2022 – 1st 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.

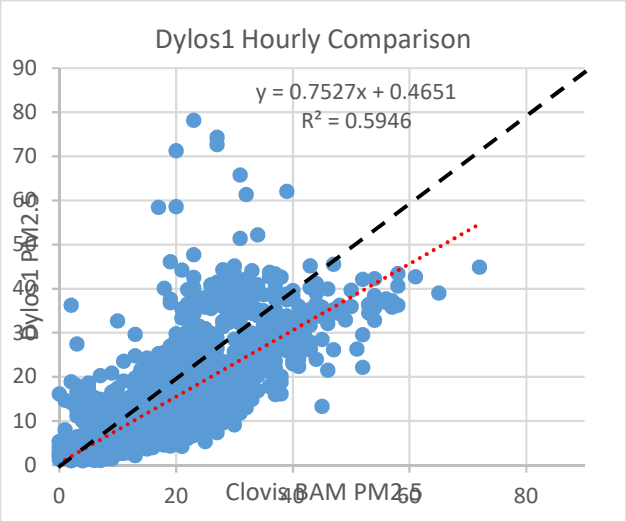
Seasonally, PM2.5 is typically highest during the winter months and lowest during the summer months. Weather systems influence PM2.5 levels by either trapping pollutants near the surface or dispersing them. Generally, California's experiences weather patterns that alternate between high pressure systems and low pressure systems that move through the region every two to four days. January 2022 was characterized primarily by a stable atmosphere and poor dispersion conditions as high pressure patterns dominated the region through most of the month. As such, the lack of dispersion contributed to elevated PM2.5 concentrations through the period. With few exceptions, stable conditions remained prevalent across most of the Valley into mid-February. The long period of high pressure conditions ended on February 15th as alternating weather patterns resumed over the region in a more characteristic pattern for the transition into springtime. Improved dispersion conditions continued through March and helped PM2.5 concentrations decrease across the Valley through the end of the quarter.

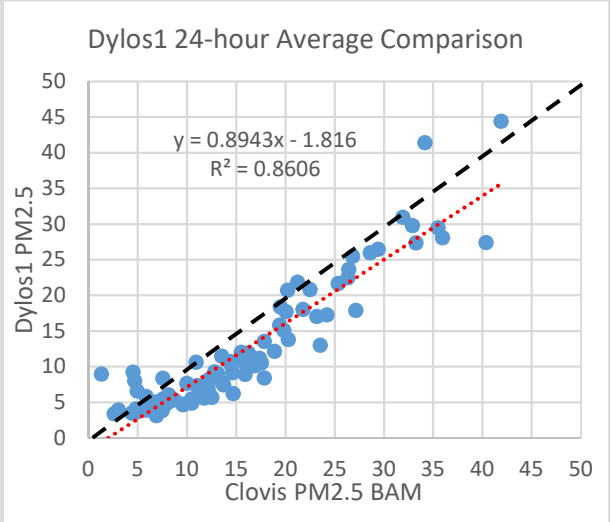
Overall, the Dylos sensors operating during this period had low results compared to the regulatory monitor. The Dylos 1 had a 24-hour bias at -3.5 µg/m^3, while Dylos 2 had a 24-Hr bias of 1.20 µg/m^3.

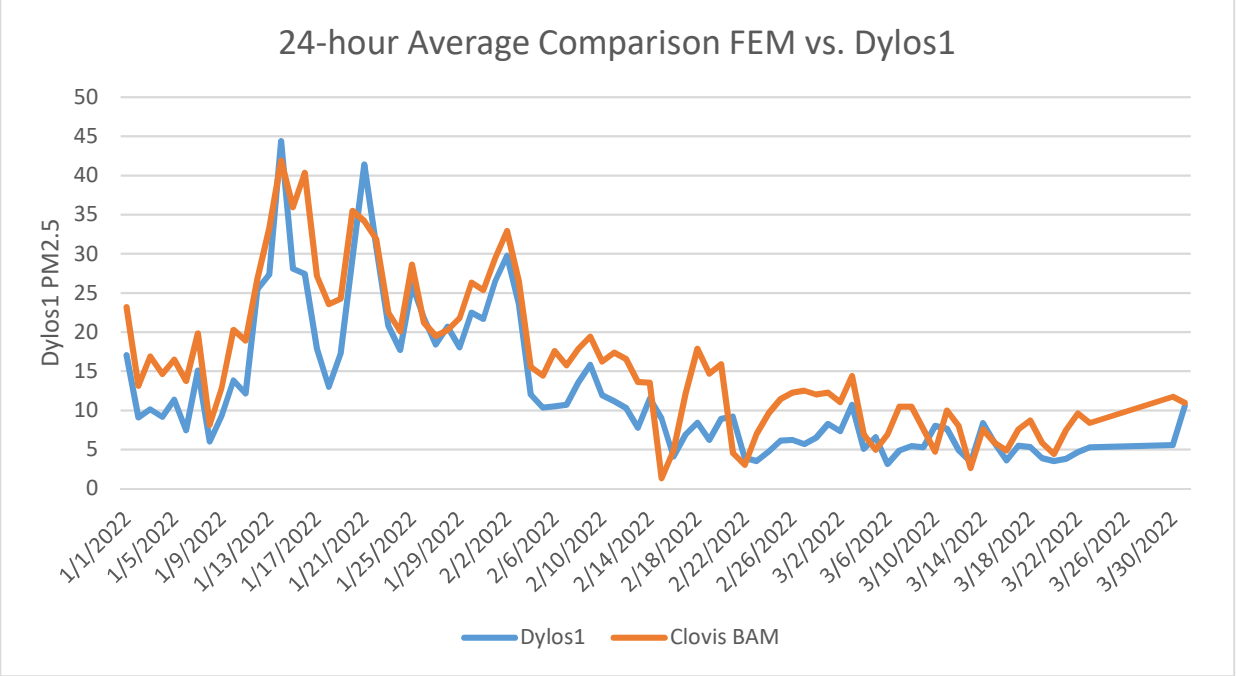
Analysis of Dylos Sensor Performance

Dylos 1

For the hourly and 24-hour averages, Dylos data had a -3.5 µg/m^3 low bias during the January 2022 through March 2022 period.

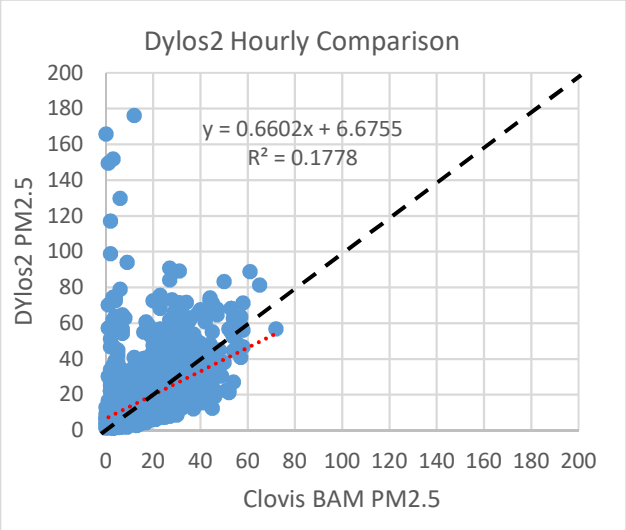


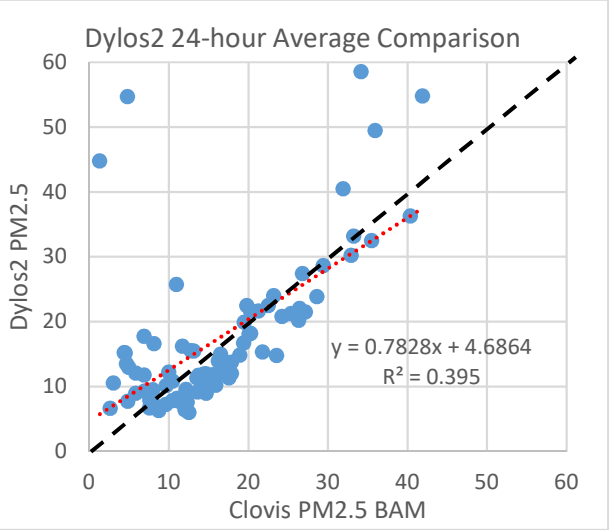


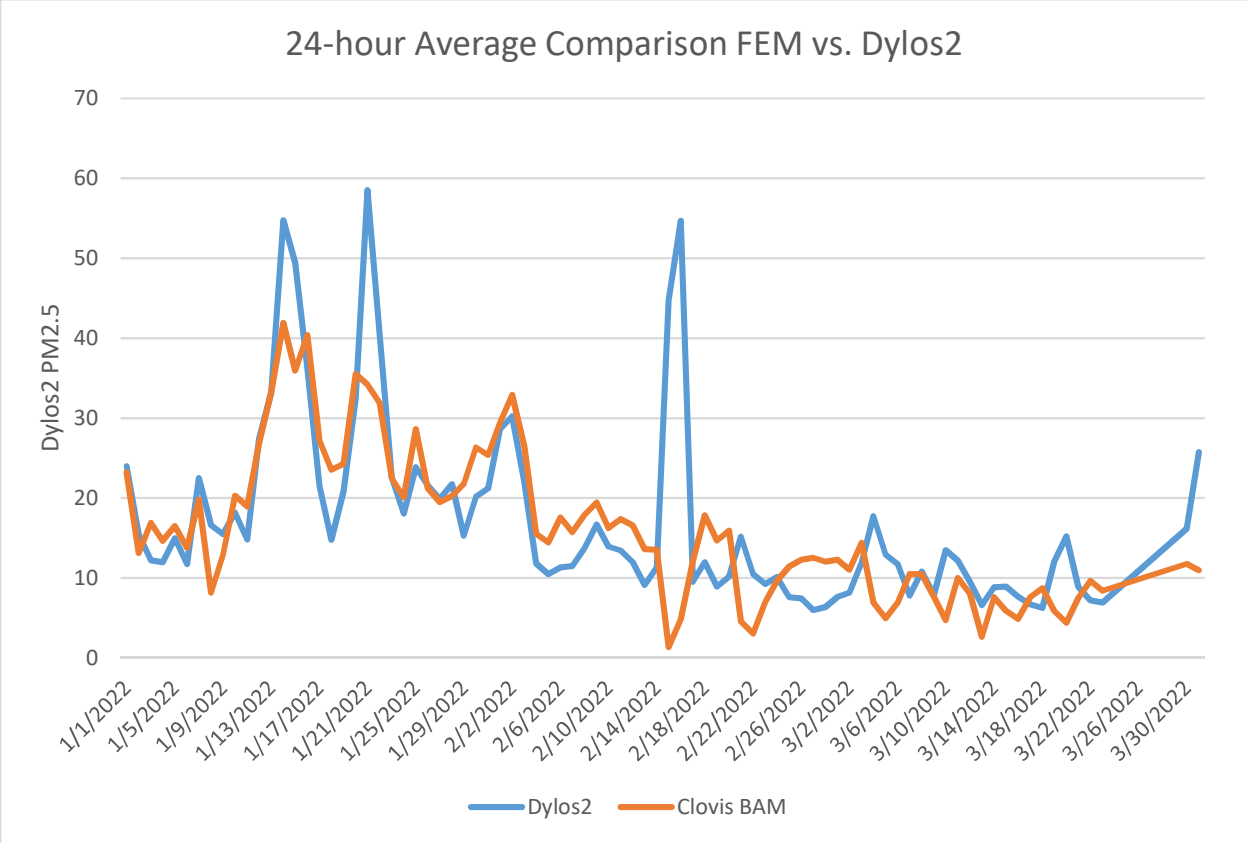


Dylos 2

For the hourly and 24-hour averages, Dylos data had a 1.20 µg/m^3 high bias during January 2022 through March 2022 period.







Non-Reporting Sites

Dylos 3

Data from this sensors was not available for the January 1, 2022 through March 31, 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	12.54	78.19	44.41	0.59	0.75	0.47	0.86	0.89	-1.82
Dylos 2	17.25	176.18	58.52	0.18	0.66	6.68	0.40	0.78	4.69
FEM	16.06	72.00	41.92						