San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Technical Evaluation of Sensor Technology (TEST) Program

Dylos Sensor
2021 – 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

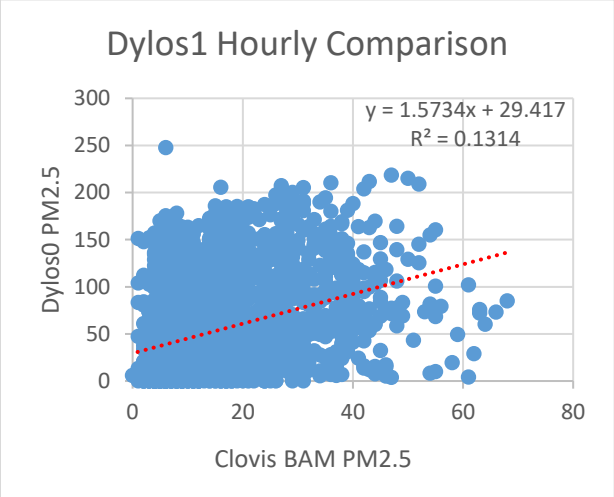
The analysis for this report covers the time period of January 2021 through March 2021 (2021 – 1st quarter). During this period, hourly data was removed from the calculation of bias when either the Dylos sensor or regulatory monitor did not have a valid hourly sample. For the 24-hour averages, only days with 18 or more valid hourly samples (75% or greater completeness) are included.

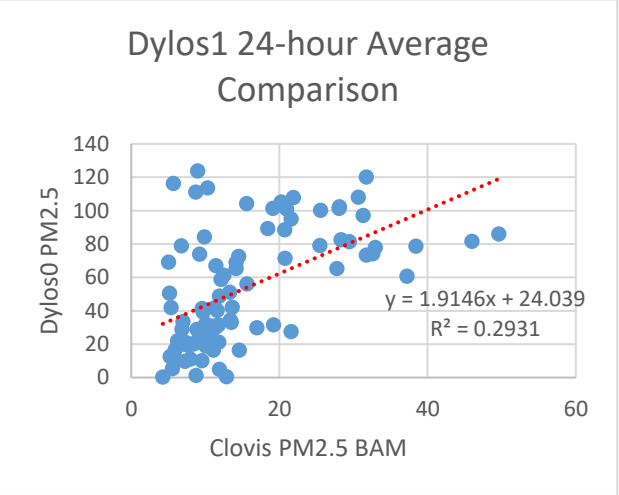
Seasonally, PM2.5 is typically highest during the winter months and lowest during the summer months. Weather systems can influence PM2.5 levels by either trapping pollutants near the surface or dispersing them. Generally, California's weather pattern is characterized by high pressure systems and low pressure systems that move through the region every two to four days in alternating fashion, however the beginning of the quarter did not start out that way. The first 2 ½ weeks of January were dominated by strong high pressure which kept PM2.5 concentrations elevated. By the third week of January, the weather pattern became more active as low pressure systems began making their way into California. With the exception of a four day stretch of stable conditions during early February, an alternating pattern of high and low pressures systems rendered overall better dispersion conditions across the Valley through the end of the quarter. The high pressure systems that developed over the region during February and March were weaker and short-lived compared to those that dominated during January. Thus PM2.5 levels had decreased significantly by the time quarter one ended.

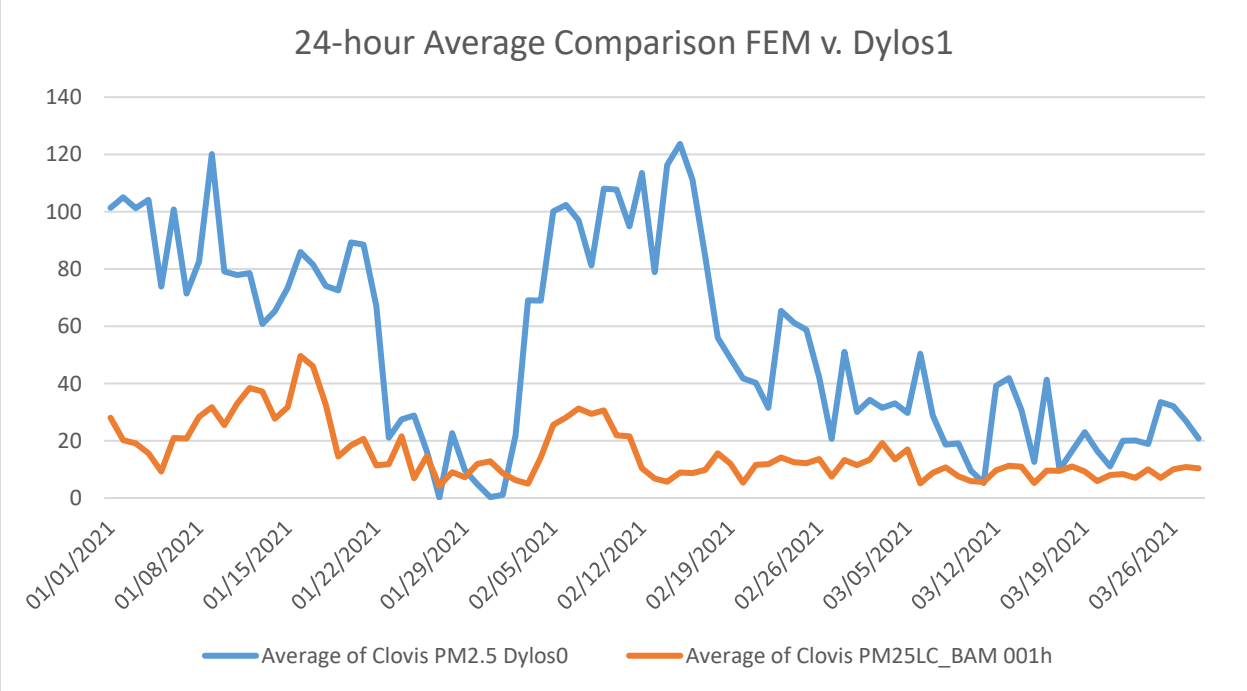
Analysis of Dylos Sensor Performance

Dylos 1

For the 24-hour average, Dylos data had a 38.30 µg/m^3 high bias during the January 2021 through March 2021 period. For the hourly average, Dylos data had a 38.36 µg/m^3 high bias over the same period.

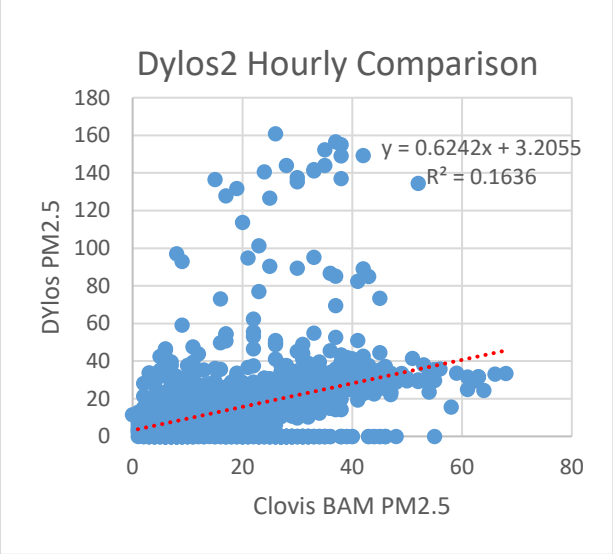


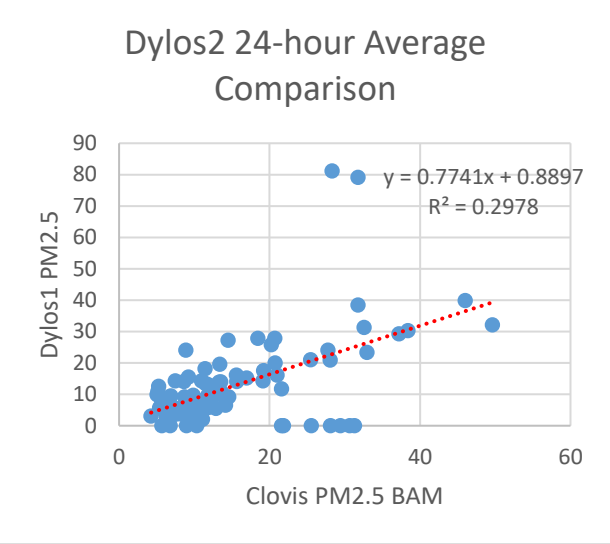


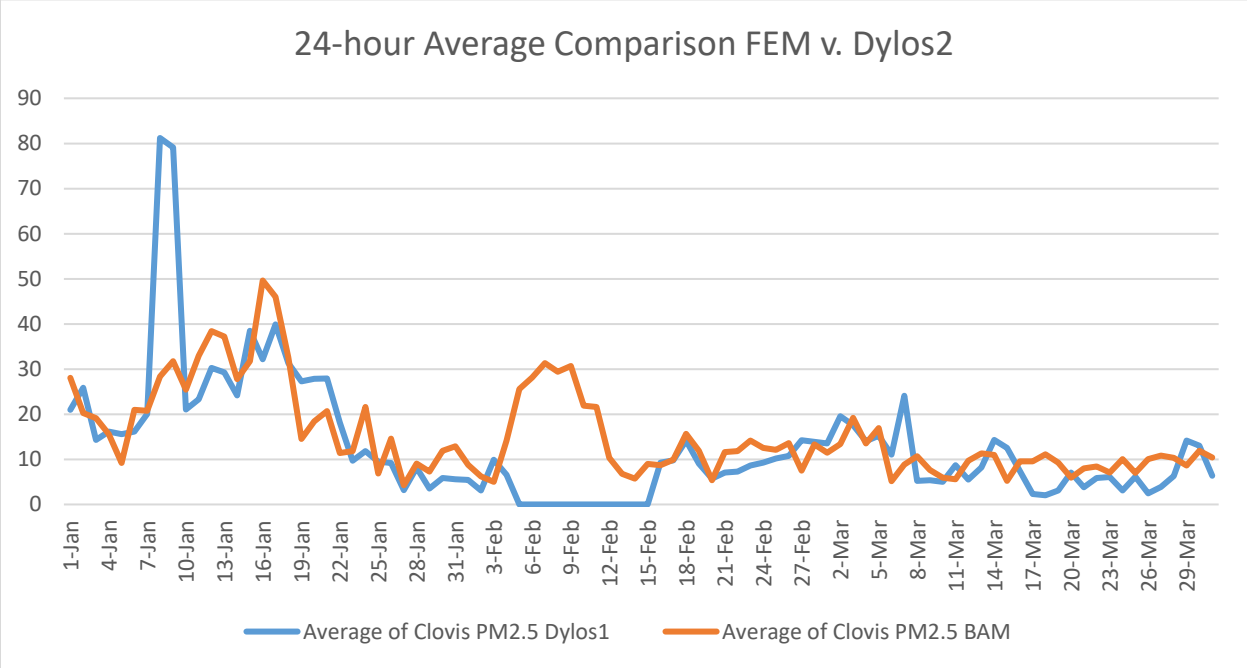


Dylos 2

For the 24-hour average, Dylos data had a -2.59 µg/m^3 low bias during the January 2021 through March 2021 period. For the hourly average, Dylos data had a -2.61 µg/m^3 low bias over the same period.







Non-Reporting Sites

Dylos3

The Dylos 3 sensor reported intermittent data, which was not enough data to analyze for this report. This sensor will be included in future analysis reports if reliable data becomes available.

Non-Reporting Analyzers

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	53.89	247.62	123.66	0.13	1.57	29.42	0.29	1.91	24.04
Dylos 2	12.82	160.88	81.20	0.16	0.62	3.21	0.30	0.77	0.89
FEM	15.37	68.00	49.63						