Arizona Department of Transportation

Environmental Planning

Final Air Quality Report

State Route 202L (Santan Freeway) from Val Vista to Interstate 10

Project No. 202L MA 44 F0124 01C
Federal No. 202-C(208)T

November 27, 2023

Submittal Number 1

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FROM VAL VISTA TO INTERSTATE 10

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Prepared for:
Arizona Department of Transportation
Environmental Planning
1611 West Jackson Street, EM02
Phoenix, Arizona 85007

Prepared by:
AZTEC Engineering
501 N 44th Street, Suite 300
Phoenix, AZ 85008

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EXECUTIVE SUMMARY

This air quality technical report has been developed in support of final design for the proposed general purpose (GP) lane widening of the segment of the Santan Freeway, State Route Loop 202 (SR 202L) from Val Vista Drive (Milepost 42.00) to State Route 101 (SR 101) (Milepost 51.00). This project is located in the Arizona Department of Transportation's (ADOT's) Phoenix Construction District within Maricopa County in south-central Arizona, within the City of Chandler and the Town of Gilbert. The purpose of this project is to increase freeway capacity to reduce existing and future traffic congestion and improve traffic conditions to allow motorists to weave into or out of traffic as they enter and exit the freeway.

The National Environmental Policy Act (NEPA) of 1969 and the Clean Air Act (CAA) Amendments of 1990 require air quality impacts to be addressed in the preparation of environmental documents for federal projects. The level of effort utilized to evaluate these impacts varies from a qualitative description analysis to a quantitative modeling analysis. The project area is located in the Phoenix maintenance area for carbon monoxide (CO) and nonattainment area for particulate matter (PM_{10}). CO is one of the six criteria pollutants that were established in the National Ambient Air Quality Standards (NAAQS) in 1970 under the CAA. Through the interagency consultation process, it was determined that CO hot-spot analysis was warranted. In addition, it was also determined that this project required a PM_{10} hot-spot analysis.

Section 176c of the CAA requires that transportation projects conform to the approved air quality State Implementation Plan (SIP) for meeting federal air quality standards. Conformity requirements were made substantially more rigorous in the CAA Amendments. The conformity determinations for federal actions related to transportation projects must meet the requirements of 40 CFR Parts 51 and 93. This project is not likely to cause or contribute to the severity or number of violations of the NAAQS. This project is included in the *Maricopa Association of Governments (MAG) MOMENTUM 2050* Regional Transportation Plan (dated December 1, 2021) as approved by MAG Regional Council on December 1, 2021. In addition, the project is included in the *FY 2022-2025 Transportation Improvement Program* (dated December 1, 2021), as amended.

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LIST OF ACRONYMS

ADEQ	- Arizona Department of Environmental Quality
ADOT	- Arizona Department of Transportation
CAA	- Clean Air Act
CEQ	- Council of Environmental Quality
CFR	- Code of Federal Regulations
CO	- carbon monoxide
COP	- City of Phoenix
EB	- eastbound
EPA	- Environmental Protection Agency
FHWA	- Federal Highway Administration
GPL	- general purpose lane
HOV	- high-occupancy vehicle
LOS	- Level of Service
MAG	- Maricopa Association of Governments
MCAQD	- Maricopa County Air Quality Department
MOVES	- Motor Vehicle Emissions Simulator
MP	- milepost
mph	- miles per hour
MSATs	- Mobile Source Air Toxics
NAAQS	- National Ambient Air Quality Standards
NEPA	- National Environmental Policy Act
NO_2	- nitrogen dioxide
O_3	- ozone
PAH	- polycyclic aromatic hydrocarbon
PM_{10}	- particulate matter
$PM_{2.5}$	- fine particulate matter
POM	- polycyclic organic matter
ppm	- parts per million
ROW	- right-of-way
RTP	- Regional Transportation Plan
SIP	- State Implementation Plan
SO_2	- sulfur dioxide
SR	- State Route
STIP	- State Transportation Improvement Program
TCEs	- temporary construction easements
TI	- traffic interchange
VMT	- vehicle mile traveled
WB	- westbound

1.0 INTRODUCTION

The Arizona Department of Transportation (ADOT), in consultation with Federal Highway Administration (FWHA) is planning to install general purpose lanes (GPL) for the State Route 202 Loop Santan Freeway (SR 202L) between milepost (MP) 50.6 and MP 42.2in the City of Chandler and the Town of Gilbert in Maricopa County, Arizona. Pursuant to 23 U.S.C. 326 and a January 4th, 2021, Memorandum of Understanding and executed by FHWA, all environmental review, consultation, and other required actions applicable to Federal environmental laws will for the Project be conducted by ADOT.

The SR 202L section consisting of the project area is a six-lane divided freeway with one high-occupancy-vehicle (HOV) lane in each direction. As a part of the Phoenix Metropolitan Area's Regional Freeway system, the freeway connects to Interstate 10, serves as the end connection to State Route 101 (SR 101), and connection to the South Mountain Freeway. To address an increase in traffic congestion and peak traffic periods resulting in traffic increases, the purpose of the project is to increase freeway capacity while decreasing existing and future traffic congestion.

The scope of work consists of:

- Construct one GPL to the outside of existing lanes in each direction of SR 202L from Gilbert Road to Val Vista Drive
- Construct two GPL to the outside of existing lanes in each direction of SR 202L between SR 101 and Gilbert Road
- Realign entrance and exit ramps to accommodate new GPLs and modify exits to accommodate 2 lanes (1 auxiliary and 1 option lane)
- Mill and replace the AR-ACFC of the existing roadway
- Widen the following overpass (OP) bridges:
    - Arizona Ave (structure # 2693)
    - SR 202L mainline (structure #s 2678 and 2679) and Ramp C (structure # 2676) over Union Pacific Railroad (UPRR)
    - Consolidated Canal (structure #s 2683 and 2684)
    - Lindsay Rd (structure #s 2789 and 2790)
- Relocate the Arizona Ave Ramp D UPRR OP bridge (structure # 2677)
- Construct retaining walls that will have the same design patterns as the existing walls in the corridor
- Cut back abutment slopes where it is necessary to accommodate new lanes or changes in the ramps
- Relocate catch basins, storm drain and storm drain trunk lines and junction structures
- Reconstruct stormwater channel side-slopes and maintenance paths
- Construct three new sound walls
- Relocate existing sound wall at the Lindsay Rd TI OP
- Reconstruct existing sound wall north of SR 202L east of Cooper
- Restripe the roadway
- Remove, replace, and/or upgrade traffic signs
- Relocate, replace, and/or protect in place existing sign/DMS structures

- Relocate elements of the DMS as necessary due to the mainline and ramp widening
- Relocate and/or construct new ramp metering systems where ramps are being widened or realigned
- Replace existing traffic counters and other detection loops
- Replace existing High Pressure Sodium luminaries with LED luminaries
- Relocate and/or protect in place existing luminary poles
- Reconstruct crash attenuators at ramp gores where gore locations are affected by ramp widenings or realignments
- Restore landscaped areas disturbed by construction to match existing conditions, including replacing irrigation lines
- Repaint base and accent colors on bridges, walls, and other painted features affected by the new construction
- Upgrade sidewalk ramps and signal poles to ADA compliance at TIs, as necessary

The project is located in the Maricopa County (Phoenix) Nonattainment Area for particulates 10-microns in diameter or less (PM_{10}), eight-hour ozone, maintenance area for carbon monoxide. The project is included in the Maricopa Association of Governments 2022-2025 MAG Transportation Improvement Program (TIP) and MOMENTUM 2050 MAG Regional Transportation Plan, and regional conformity analysis (7322) as of May 25, 2022.

Figure 1. Project Location Map

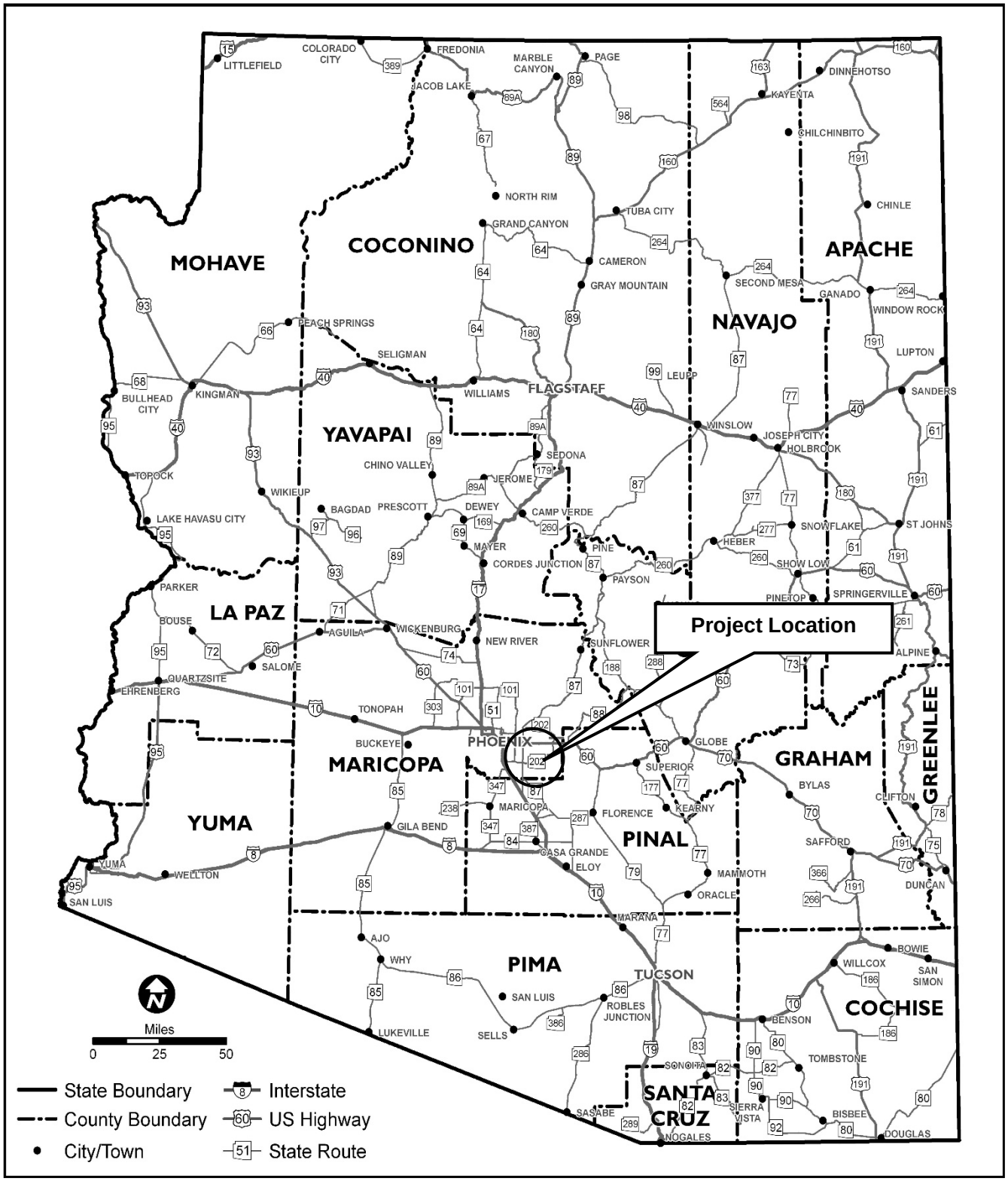
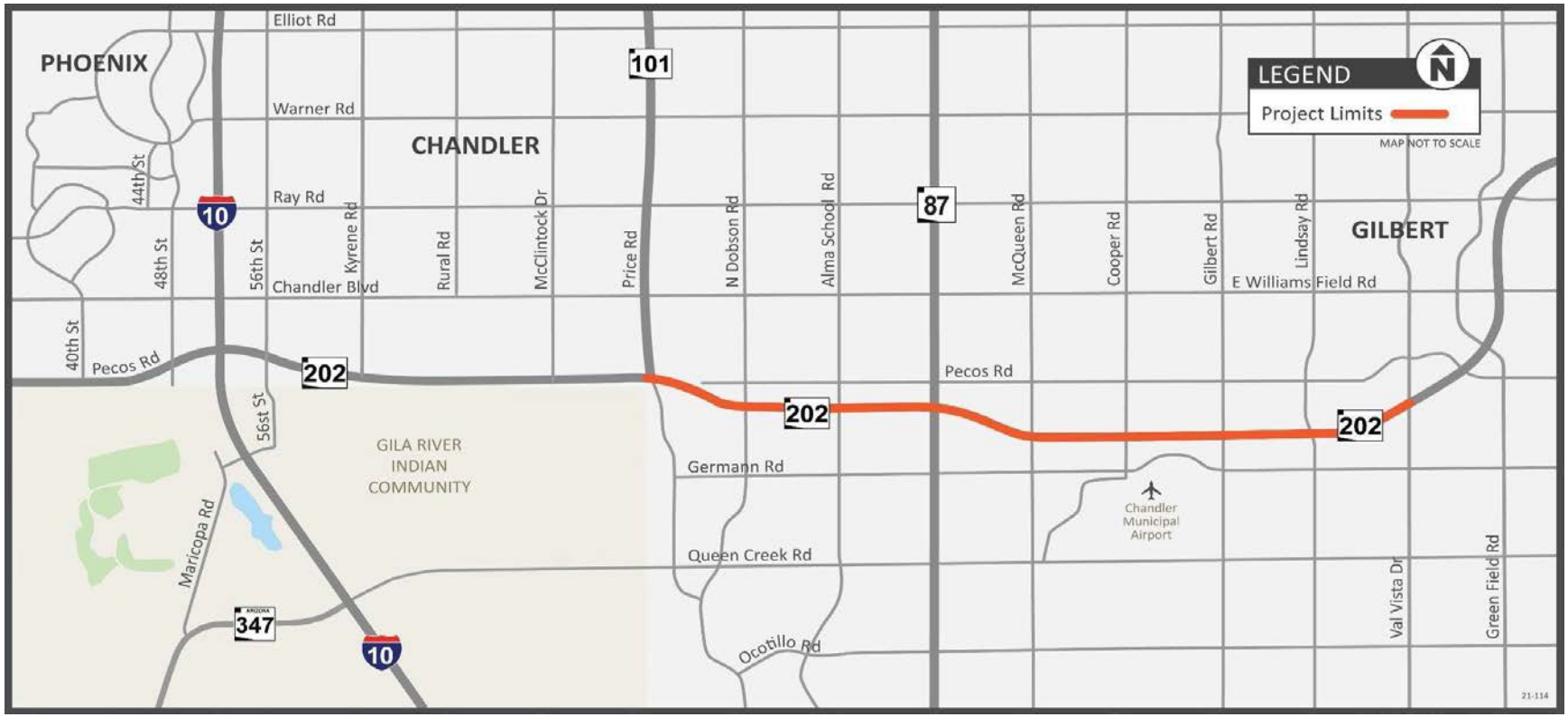


Figure 2. Project Vicinity Map



Source: https://azdot.gov/projects/central-district-projects/loop-202-santan-freeway-loop-101-val-vista-drive

2.0 AFFECTED ENVIRONMENT

2.1 Regional Climatology

The study area elevation is approximately 1,200 feet above sea level. It lies in the Sonoran Desert, with a climate characterized by extremely hot summers, mild winters, and low precipitation. In the winter many days are over 70 degrees Fahrenheit (ºF). The normal high temperature is over 90 ºF from early May through late September, and over 100 ºF from early June through late August. Annual precipitation averages just less than 7 inches and occurs in the form of rain associated with afternoon showers or thunderstorms during the late summer months and with eastward-moving Pacific storms during the winter months. Snowfall is rare. A summary of average monthly temperature and precipitation is presented in Table 1.

Table 1
Climate Data for Phoenix, Arizona (2000–2023)

Month	Temperature (ºF)			Precipitation (inches)
	Average	Avg. Maximum	Avg. Minimum	Average
January	56.9	68.0	45.8	0.72
February	59.7	71.1	48.4	0.75
March	66.5	78.6	54.5	0.68
April	74.1	86.8	61.4	0.17
May	82.6	95.3	69.8	0.09
June	92.5	105.5	79.6	0.05
July	96.3	107.2	85.3	0.82
August	94.4	105.2	83.6	0.92
September	89.7	101.0	78.4	0.53
October	77.5	89.3	65.7	0.58
November	65.6	77.2	54.1	0.44
December	56.1	66.7	45.5	0.71
Annual	76.0	87.6	64.3	6.47
Source: National Weather Service, 2023				

2.2 Air Quality Standards

The federal CAA of 1970 was the first comprehensive legislation aimed at reducing levels of air pollution throughout the United States. Published in 1970, the CAA required the U.S. Environmental Protection Agency (EPA) to establish the NAAQS, which set maximum allowable concentrations for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10})/fine particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead, as shown in Table 2 and briefly described below.

Table 2 National Ambient Air Quality Standards			
Pollutant	Average Time	Primary Standard	Secondary Standard
Carbon monoxide (CO)	1-hour	35 ppm	No standard
	8-hour	9 ppm	No standard
Nitrogen dioxide (NO_2)	1-hour	0.100 ppm	No standard
	Annual	0.053 ppm	0.053 ppm
Ozone (O_3)[a]	8-hour	0.070 ppm[b]	0.070 ppm
Particulate matter (PM_{10})	24-hour	150 µg/m^3	150 µg/m^3
Fine particulate matter ($PM_{2.5}$)	24-hour	35 µg/m^3	35 µg/m^3
	Annual	12 µg/m^3	15 µg/m^3
Sulfur dioxide (SO_2)	1-hour	0.075 ppm	No standard
	3-hour	No standard	0.5 ppm
Lead	Rolling 3-month average	0.15 µg/m^3	0.15 µg/m^3

µg/m^3 – micrograms per cubic meter
ppm – parts per million
Notes:
[a] 1-hour standard revoked June 15, 2005 in Arizona
[b] based on a 3-year average of the 4th highest concentration
Source: EPA, accessed in 2022

- CO is a colorless, odorless gas resulting from the incomplete combustion of carbon-based fuels, including petroleum products. In most areas, vehicle emissions are the primary source of CO. Mobile sources (on-road motor vehicle exhaust) are the primary source of CO in both Maricopa County and in the U.S. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. CO levels are generally highest in the colder months of the year when inversion conditions (where warmer air traps colder air near the ground) are more frequent.

- Ozone (O_3) is a colorless toxic gas and is found in both the Earth's upper and lower atmospheric levels. In the upper atmosphere, O_3 is a naturally occurring gas that helps to prevent the sun's harmful ultraviolet rays from reaching the Earth. In the lower layer of the atmosphere, O_3 is human made. O_3 is produced through a complex chemical reaction in which precursor compounds, such as hydrocarbons and nitrogen oxides, are transformed by sunlight into ozone molecules, which consist of three oxygen atoms. The primary sources for O_3 precursors are vehicular and industrial emissions.

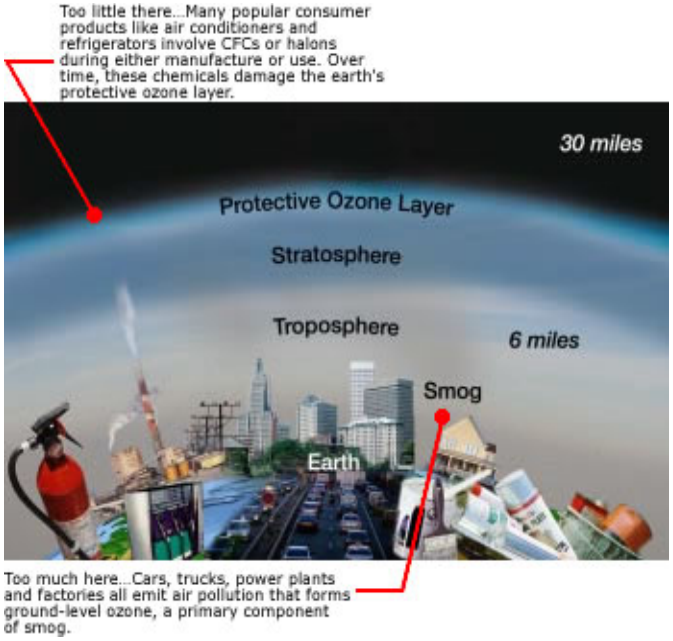
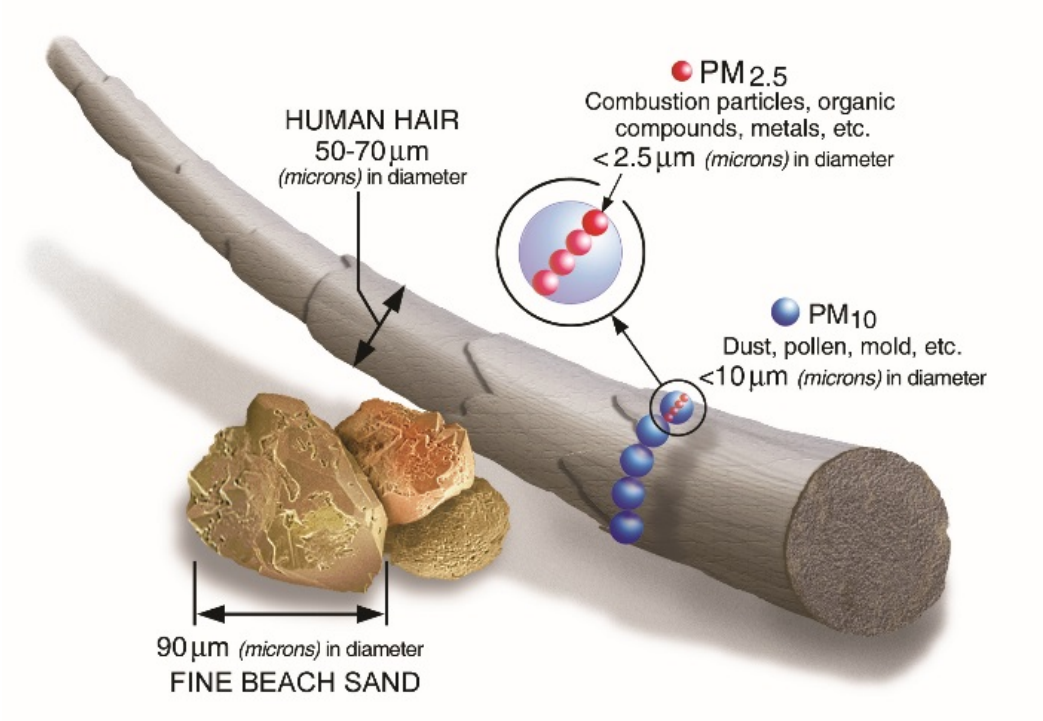


Figure 3. Ozone in the Atmosphere

- NO_2 is a yellowish-orange to reddish-brown gas resulting from high-temperature combustion. Diesel vehicles and power plants are major sources of NO_2.

- PM_{10} and $PM_{2.5}$ consist of suspended dust, fibers, combustion ash, and other fine particles. The major source is industrial emissions, but these pollutants also result from diesel vehicle emissions, unpaved roadways, agricultural activity, and dirt on paved roads kicked up by passing vehicles. PM_{10} is inhalable particles, with diameters that are generally 10 micrometers and smaller; and $PM_{2.5}$ is fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller. Figure 4 shows the sizes of PM_{10} and PM2.5 relative to fine beach sand and human hair.

Figure 4. Size Comparisons for PM Particles



Source: EPA

- SO_2 is a colorless gas with a rotten egg odor that results from the combustion of fuels containing sulfur. Primary sources are coal-fired power plants, industrial plants, and metal smelters, with some emissions from diesel vehicles burning low-grade fuels.

- Lead in the atmosphere results primarily from the burning of leaded fuels. Lead pollution has been drastically reduced in the United States in recent years with the banning of leaded automobile fuels.

Amendments to the CAA were passed in 1977 and 1990. Among many other revisions included in the amendments are requirements for nonattainment areas and State Implementation Plans (SIPs) for areas that do not meet the standards.

For most of the six criteria pollutants, two standards have been established: a primary standard and a secondary standard. Although there is little difference between the two, the primary standard was established with the goal of protecting the public health, while the secondary standard is intended for the protection of the public welfare.

2.3 Mobile Source Air Toxics

In addition to the NAAQS criteria air pollutants , EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of 21 of the 188 air toxics defined by the CAA. The MSATs are compounds that are emitted not only from stationary sources such as power plants, factories, oil refineries, dry cleaners and gas stations, but also from highway vehicles and nonroad equipment. Seven MSATs have been labeled a priority and considered as priority transportation toxics by the FHWA including: acrolein, benzene, 1,3 butadiene, diesel particulate matter plus diesel exhaust organic gases, formaldehyde, naphthalene, and polycyclic organic matter. These seven are currently considered the priority transportation toxics, but the list may be modified in the future.

Acrolein is a nearly clear to yellow liquid that burns easily, is easily volatized, and has a disagreeable odor. Acrolein can be formed from the breakdown of certain pollutants found in outdoor air, tobacco burning, or burning gasoline. Exposure to acrolein causes upper respiratory tract irritation, and congestion in low concentrations, may cause death in high concentrations. Not enough information is available on acrolein to evaluate its carcinogenicity.

Benzene is a volatile, colorless, highly flammable liquid that dissolves easily in water and has sweet odor. Benzene is found in emissions from burning coal and oil, motor vehicle exhaust, evaporation from gasoline service stations, and in industrial solvents. Tobacco smoke contains benzene and accounts for nearly half the national exposure to benzene. Benzene exposure causes drowsiness, dizziness, headaches, unconsciousness, vomiting, convulsions, and irritation to the eyes, skin, and upper respiratory tract. Benzene is a known human carcinogen. Chronic exposure to benzene causes blood disorders and chromosomal aberrations.

1,3-butadiene is a colorless gas with a mild, gasoline-like odor. Sources of 1,3-butadiene in the air include motor vehicle exhaust, manufacturing and processing facilities, forest fires or other combustion sources, and cigarette smoke. Exposure to 1,3-butadiene causes irritation of the eyes, nasal passages, throat, and lungs in low concentrations and blurred vision, fatigue, headache, and vertigo in higher concentrations. 1,3-butadiene has recently been reclassified from a probable human carcinogen to a known human carcinogen.

Diesel particulate matter is a collection of various-sized particles emitted from diesel powered vehicles, including primarily elemental carbon, organic carbon, and sulfate particles, with trace amounts of nitrate, metals, and other particles. Diesel particulate matter of concern for MSAT analyses are those particles sized 10 microns or smaller. Although particulate matter may be derived from a number of sources, diesel particulate matter by definition is derived exclusively

from diesel vehicle exhaust. Exposure to diesel particulate matter results in irritation to the eyes, nose, throat, and lungs, and may exacerbate asthma. Diesel particulate matter is considered a probable human carcinogen.

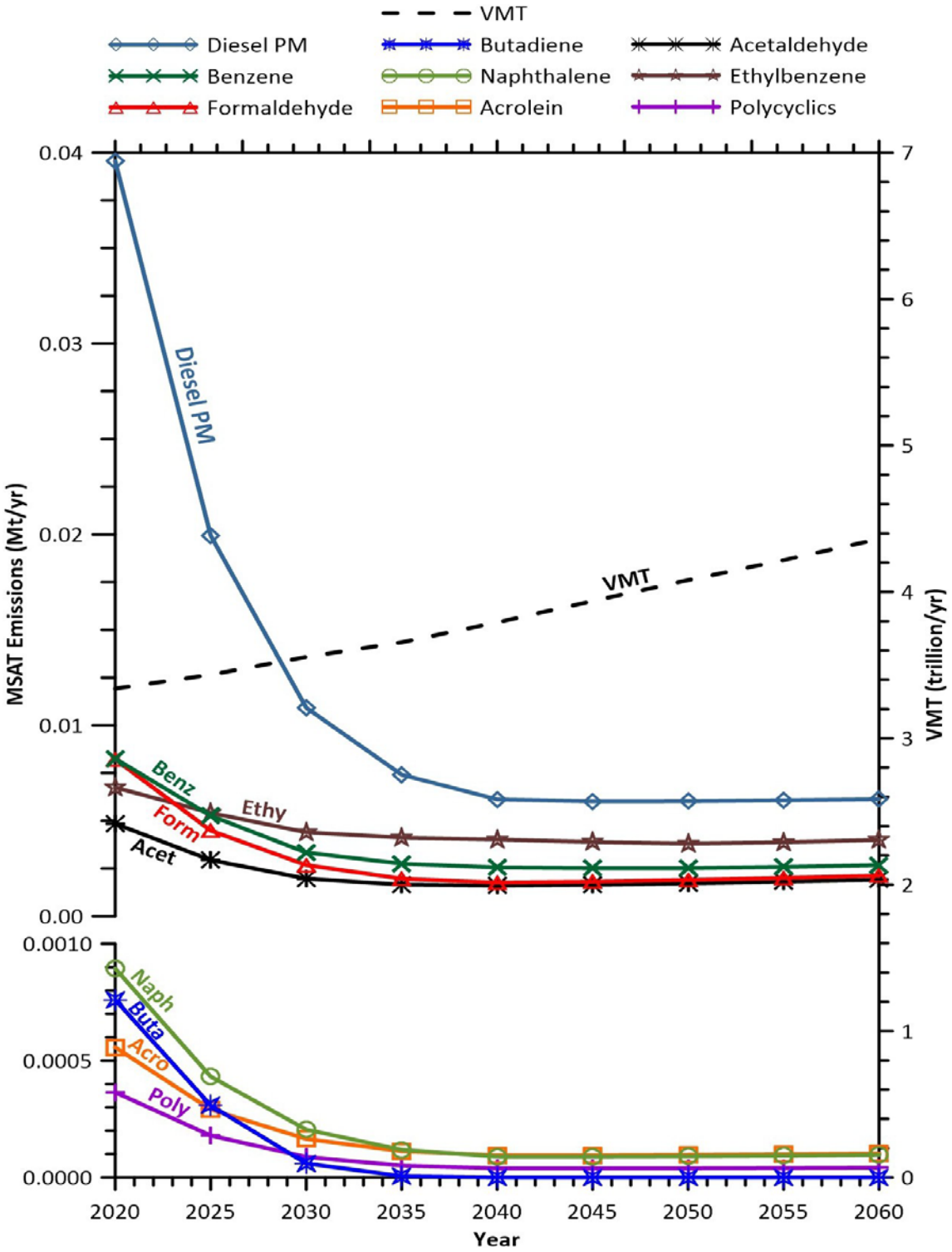
Formaldehyde is a colorless gas with a pungent, suffocating odor that is readily soluble in water. High levels of formaldehyde have been detected in indoor air, where it is released from various consumer products such as building materials and home furnishings. Major sources of outdoor concentrations of formaldehyde include power plants, manufacturing facilities, incinerators, and automobile exhaust emissions. Exposure to formaldehyde results in irritation to the eyes, nose, and throat; coughing; chest pains; and bronchitis. Formaldehyde is classified as a probable human carcinogen.

Polycyclic organic matter (POM) is a class of compounds that includes all organic structures having two or more fused aromatic rings, that have a boiling point greater than that of water, and that are extremely insoluble in water. There are eight major categories of POM, the most common being polycyclic aromatic hydrocarbon compounds (PAHs). POM compounds are formed primarily from combustion and are present in the atmosphere in particulate form. Major sources of POM include cigarette smoke, vehicle exhaust, and wood burning, among others. No information is available on the effects of short-term exposure to POM and PAHs. However, EPA has classified several PAHs as probable human carcinogens, and evidence suggests possible reproductive toxicity, chronic blood and liver effects, and chronic respiratory effects from POM.

Naphthalene is a white solid or powder that is insoluble in water and has a strong, mothball odor. Primary sources of naphthalene in the air include the burning of coal and oil, the use of mothballs, and from cigarette smoke. Exposure to naphthalene results in headache, nausea, vomiting, liver damage, cataracts, neurological damage in infants, and chronic inflammation of the lungs and nasal passages. Naphthalene is classified as a possible human carcinogen.

While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules. According to the EPA's Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), controls are required to dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. Using EPA's MOVES3 model, as shown in Figure 5, FHWA estimates that even if VMT increases by 31 percent from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority MSAT is projected for the same time period.

Figure 5. FHWA Predicted National MSAT trends 2020-2060 for Vehicles Operating on Roadway Using EPA's MOVES3 Model



Source: EPA MOVES3 model runs conducted by FHWA in March 2021: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/fhwa_nepa_msat_memorandum_2023.pdf

2.4 Nonattainment Areas

The CAA amendments of 1977 and 1990 authorized EPA to designate areas that have not met the NAAQS as nonattainment areas and to classify the areas level of non-attainment severity. Each nonattainment area requires a SIP that outlines actions to reduce air pollution to levels that comply with the NAAQS.

The SR202 study area lies within the Phoenix CO maintenance area and nonattainment area for Ozone. In addition, the study area is located in the Phoenix nonattainment area for PM_{10} (see Figure 6). The Phoenix Ozone nonattainment area consists of most of central and eastern Maricopa County, including the Phoenix metropolitan area and a portion of northern Pinal County, including Apache Junction. The Phoenix CO maintenance area is defined as the MAG planning area, which includes the Phoenix metropolitan area but excludes Apache Junction in Pinal County. The Phoenix PM_{10} nonattainment area is defined as an area within eastern Maricopa County, approximately 60 miles long by 48 miles wide, and an additional area within Pinal County, 6 miles by 6 miles in size. The PM_{10} nonattainment area encompasses the Phoenix metropolitan area, including Apache Junction.

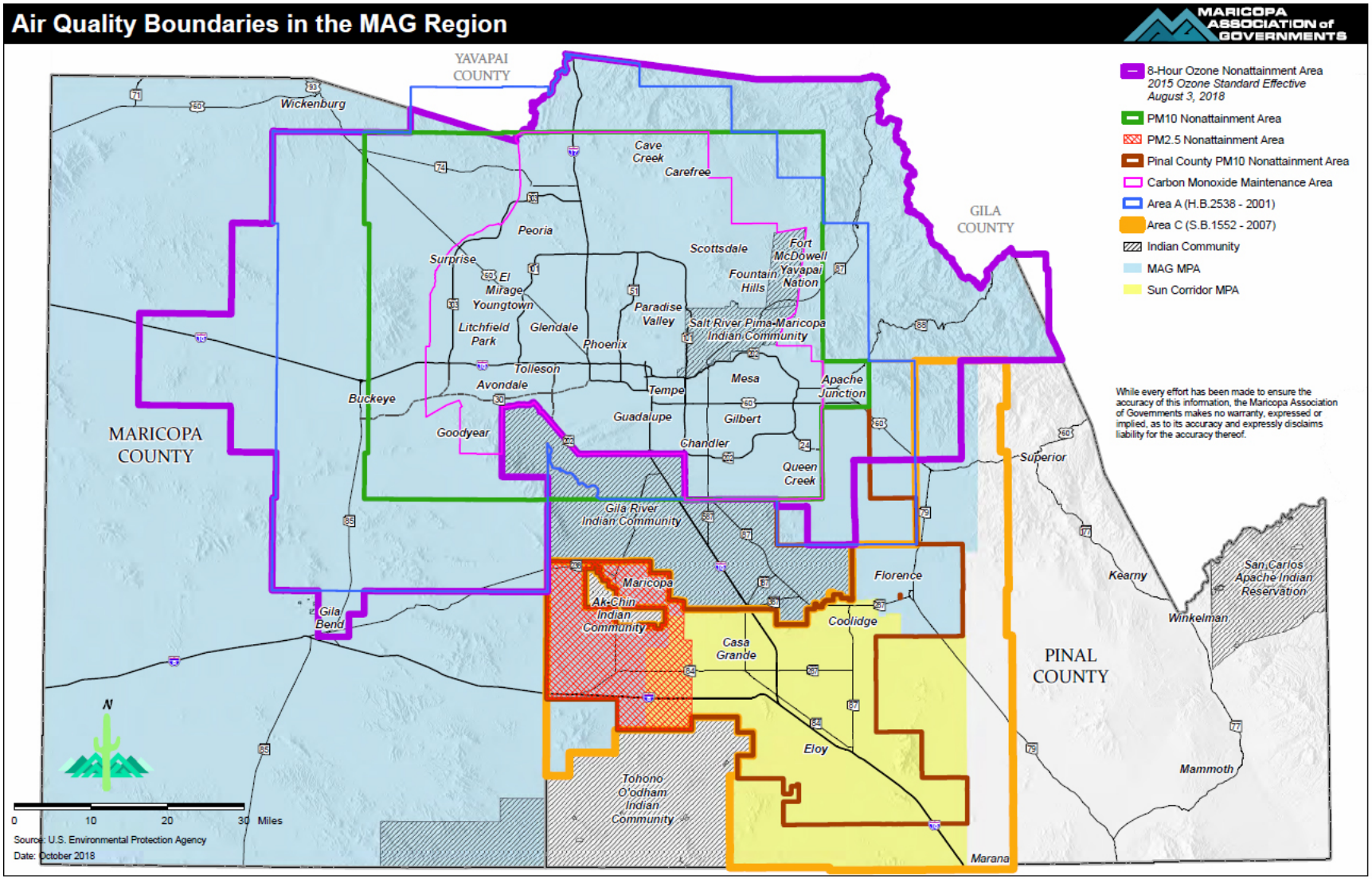
The Phoenix Ozone nonattainment area was originally designated a “moderate” nonattainment area in 1991 for not meeting the 1-hour O_3 NAAQS and was required to reach attainment by November 15, 1996. EPA reclassified the Phoenix area to “serious” nonattainment on February 13, 1998, for failing to attain the 1-hour O_3 standard. The State of Arizona requested attainment redesignation in December 2000, after 3 years had passed with no O_3 violations. On May 15, 2001, EPA determined that the Phoenix area had attained the 1-hour O_3 standard. A maintenance plan and a redesignation request were submitted on April 21, 2004, and the area was redesignated to attainment on June 14, 2005.

The 1-hour standard was revoked on June 15, 2005, and replaced with the 8-hour standard (called the 1997 standard because it was proposed in 1997, but implementation was delayed by litigation). Many of the control measures included in the 1-hour ozone maintenance plan were required to remain in place to ensure progress toward the 8-hour standard. In 2008, EPA revised the eight-hour ozone standard to 0.075 parts per million (from 0.08 ppm). On May 21, 2012, EPA published a final rule to designate the Maricopa nonattainment area as a “marginal” area.

In 2015, based on EPA’s review of the air quality criteria for O_3 and related photochemical oxidants and for O_3, EPA revised the levels of both standards. EPA revised the primary and secondary O_3 standard levels to 0.070 parts per million (ppm), and retained their indicator (O_3), forms (fourth-highest daily maximum, average across three consecutive years) and 8-hour averaging times. On May 4, 2016, EPA published a final rule to determine that the Maricopa Eight-Hour Ozone Nonattainment Area did not attain the 2008 standard and reclassified the area from “marginal” to “moderate.” MAG submitted a 2017 Eight-Hour Ozone Moderate Area Plan to comply with the 2008 ozone standards on January 1, 2017. On June 2, 2020, EPA published a final rule to approve the portions of the MAG 2017 Eight-Hour Ozone Plan addresses emissions inventories requirements, a demonstration of attainment by the applicable attainment date, reasonably available control measures, reasonable further progress, motor vehicle emission budgets for transportation conformity, vehicle inspection and maintenance programs,

new source review rules, and offsets, effective July 2, 2020. The MAG 2020 Eight-Hour Ozone Plan – Submittal of Marginal Area Requirements for the Maricopa Nonattainment Area was submitted to EPA on June 29, 2020. The MAG 2020 Eight-Hour Ozone Plan – Submittal of Marginal Area Requirements defined the 2015 eight-hour ozone standard of 0.070 parts per million. On October 7, 2022 EPA determined that the Phoenix nonattainment area did not obtain the standard by the marginal attainment date of August 3, 2021. As such, EPA reclassified the area to “moderate” nonattainment for the 2015 Ozone NAAQS effective November 7, 2022 (87 FR 60897). In response to this reclassification, a Moderate Area Plan was due to EPA on January 1, 2023, but has not been submitted.

Figure 6. Nonattainment and Maintenance Areas in Maricopa and Pinal Counties



The Phoenix CO maintenance area was originally classified as a “moderate” nonattainment area in November 1990 and attainment was required by December 1995. The Phoenix area did not attain the CO standard by that date, and the area was reclassified as a “serious” nonattainment area on June 10, 1996. The required SIP was submitted on July 8, 1999, with a revised submittal on April 18, 2001. On October 9, 2001, EPA determined that the plan was complete. On September 22, 2003, EPA found that the Phoenix area had attained the CO standard. In October 2004, EPA redesignated the Phoenix area to attainment with a maintenance plan. The maintenance plan requires many of the same restrictions as the SIP for the nonattainment designation and will remain in effect for a period of approximately 10 years to ensure that the NAAQS continue to be met. The MAG 2013 CO maintenance plan for the Maricopa County area was submitted to EPA in April 2013. On March 3, 2016, EPA approved the MAG 2013 CO maintenance plan, effective April 4, 2016.

The Phoenix PM_{10} nonattainment area was originally classified in November 1990 as “moderate.” The area was reclassified in June 1996 to “serious,” requiring attainment by 2001. The State of Arizona submitted a revised plan to achieve attainment and requested a 5-year extension of the attainment deadline for the 24-hour and annual PM_{10} standards for the Phoenix area. On January 10, 2002, EPA announced approval of the plan and granted the extension to December 2006. Despite the Most Stringent Measures and Best Available Control Measures adopted and implemented earlier, the Phoenix area failed to attain the PM_{10} standard by the December 2006 deadline. The failure triggered a special requirement under Section 189(d) of the CAA SIP revisions provide for annual reductions of PM_{10} and PM_{10} precursors of not less than 5 percent of the most recent emissions inventory until the NAAQS is attained. The SIP revision was submitted to EPA in December 2007, demonstrating the necessary 5 percent annual reductions through revisions to county dust control regulations, new agriculture best management practices, and paving unpaved roads and shoulders, among other control measures. On September 9, 2010, EPA proposed to approve in part and disapprove in part the SIP revisions. However, on January 25, 2011, prior to EPA’s final action on the SIP revisions, the State of Arizona withdrew the submitted plan from EPA’s consideration to be able to make improvements on the plan. This withdrawal triggered EPA to find, on February 14, 2011, that Arizona failed to make the required submittal under Section 189(d) of the CAA. The failure triggered an 18-month clock for mandatory application of sanctions (including loss of federal highway funds in 24 months) and a 2-year clock for a federal implementation plan. These sanctions clocks would stop when a new plan is submitted and EPA determines that the new plan is complete. The State of Arizona adopted and submitted the 2012 5% Plans on May 25, 2012, and submitted supplemental information June 22 and July 2, 2012. EPA found the plans complete on July 20, 2012, stopping sanctions clocks. EPA concurred with Exceptional Events flags in letters dated September 6, 2012 and July 1, 2013 and approved fugitive dust statutes for the plans on December 3, 2013. EPA published a Notice of Adequacy of the Motor Vehicle Emissions Budget on December 5, 2013.On June 10, 2014, EPA published the final rule approving the MAG 2012 5% Plan for PM_{10}.

2.5 Ambient Pollutant Levels

The Arizona Department of Environmental Quality (ADEQ) and the Maricopa County Air Quality Department (MCAQD) maintain a network of air monitoring sites throughout the county.

Monitoring sites vary in terms of the number of pollutants monitored, with some sites monitoring one pollutant and others monitoring up to five pollutants. Some monitoring sites operate for the entire year, while others operate for the peak pollutant season only. Most of the monitoring sites are located in the Phoenix metropolitan area. There are two monitoring sites adjacent to the SR202 study area. The adjacent monitoring sites are the West Chandler site (located between Frye Road and Ellis Street) and the Higley site (located between Higley Road and Williams Field Road). These two monitoring sites collect data on concentrations of CO, O_3, and PM_{10}. The averaging time is eight hours for O_3 and 24 hours for $PM_{2.5}$ and PM_{10}. The West Chandler site recorded an exceedance of the PM_{10} standard in 2021. The Glendale site recorded exceedances of the O_3 in 2019 through 2021 and PM_{10} standards in 2020 and 2021. The Higley site recorded an exceedance of the PM_{10} standard in 2021. The PM_{10} exceedances were attributed to atypical events including dust storms and high winds.

The Federal Exceptional Event Rule (EER) set forth in 40 CFR Part 50, §14 applies to the treatment of data showing exceedances or violations of any national ambient air quality standard (NAAQS) for purposes of the types of regulatory determinations by the Administrator as set forth in the EER. In April 2019, the U.S. Environmental Protection Agency (EPA) issued the 'Additional Methods, Determinations, and Analyses to Modify Air Quality Data' memorandum to: a) clarify for which regulatory determinations a request to exclude monitoring data may be made under the EER; b) identify other determinations, actions and analyses that are not covered by the scope of the EER, but for which the exclusion, selection or adjustment of monitoring data may be appropriate and allowable under other section of the Clean Air Act (CCA) and EPA rules or guidance. The exceedances/violations of the NAAQS discussed in this Air Quality Report are not requested for exclusion under the EER, but rather for exclusion as atypical event days from background concentration calculation under 40 CFR Part 51, Appendix W, Section 8.3.2.c.ii. Table 3 summarizes concentrations monitored at these two locations.

Table 3
West Chandler Site and Higley Site Air Quality Data

Monitoring Site	Pollutant	Averaging Time	2019		2020		2021	
			Concentration	No. of Exceedances	Concentration	No. of Exceedances	Concentration	No. of Exceedances
West Chandler (WC)	CO	8-hour	1.0 ppm	0	1.3 ppm	0	1.2 ppm	0
	O_3	8-hour	0.082 ppm	6	0.081 ppm	5	0.081 ppm	8
	PM_{10}	24-hour	76 µg/m^3	0	263* µg/m^3	1	181* µg/m^3	4
Higley (HI)	PM_{10}	24-hour	114 µg/m^3	0	131 µg/m^3	0	219* µg/m^3	2

µg/m^3 – micrograms per cubic meter
ppm – parts per million
* - MCAQD flagged this exceedance as an atypical event in AQS
Source: MCAQD, 2022 Air Monitoring Network Plan Draft

3.0 ENVIRONMENTAL CONSEQUENCES

Project-level air quality analyses for proposed roadways typically focus on vehicle emissions of CO, PM_{10}, and MSATs. Although vehicle emissions include other pollutants, the concentrations of CO, PM_{10}, and MSATs are the most easily assessed and provide a convenient measure of the local air quality impacts from a proposed roadway. Other pollutants, such as O_3, nitrogen oxides, and hydrocarbons, are regional in nature, making a project-level evaluation not applicable. Project-level analyses can be completed using qualitative or quantitative methods, depending on the scale of the project, the level of design information available for the analysis, and the overall purpose of the analysis.

This section describes the methods, impact criteria, and results of air quality analyses for the proposed project. Guidelines and procedures used in the analysis follow applicable air quality analysis protocols from EPA and FHWA. The *Project Level CO Hot-Spot Analysis Questionnaire* and interagency consultation determined that a project level hot-spot analysis was warranted for CO. The *Project Level PM Quantitative Hot-Spot Analysis – Project of Air Quality Concern Questionnaire* and interagency consultation determined that this project is considered project of air quality concern and requires a PM_{10} quantitative analysis. In addition, it is anticipated that this project would not have meaningful potential MSAT effects, and therefore, MSAT quantitative analysis is not necessary.

3.1 CO Hotspot Analysis

Microscale CO air quality modeling was performed using EPA guidance and through the interagency consultation process, as described below.

3.1.1 Methodology

To determine the project's impact on local CO levels, a detailed hotspot analysis was conducted at four intersections (Gilbert Road & eastbound [EB] SR202, Gilbert Rd & westbound [WB] SR202, Lindsay Road & EB SR202, and Lindsay Road & WB SR202). These intersections were chosen from a screening evaluation based upon overall Level of Service (LOS) and traffic volumes. These locations underwent a detailed microscale modeling process using emission factors developed using EPA's MOVES3.1 emission factor program and dispersion modeling using EPA's CAL3QHC program.

MOVES3.1 Emissions Model

EPA's Motor Vehicle Emissions Simulator (MOVES) model version MOVES3.1 was used to estimate CO emissions from the roadway segments included in the CO modeling analysis. MOVES3.1 is the EPA's state-of-the-art tool for estimating emissions from highway vehicles. The model is based on analyses of millions of emission test results and considerable advances in the Agency's understanding of vehicle emissions. Compared to previous tools, MOVES3.1 incorporates the latest emissions data, more sophisticated calculation algorithms, increased user flexibility, new software design, and substantial new capabilities.

MOVES3.1 was used to estimate CO emissions from the roadway segments included in the CO modeling analysis. MOVES input files, consistent with their regional emissions analysis (*Conformity Analysis for the FY 2022-2025 MAG TIP and the Momentum 2050 RTP*), were provided by MAG. MAG data was used to represent regional fleet age distribution and meteorology. For fuel emissions data, default fuel data was used. This default fuel data was exported from MOVES via the Project Data Manager for winter, summer, spring, and fall seasons of the analyzed year. Fuel data included Fuel Supply, Fuel Formulation, Fuel Usage Fraction, and Alternate Vehicle Fuel and Technology (AVFT) Data sources. Link-by-link traffic data was used to develop project-specific input files for each modeled link consisting of the link's average speed and vehicle mix for the worst case build condition.

CAL3QHC Dispersion Model

Mobile source models are the basic analytical tools used to estimate CO concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that comprise the various models attempt to describe an extremely complex physical phenomenon as closely as possible. The dispersion modeling program used in this project for estimating pollutant concentrations near roadway intersections is the CAL3QHC (Version 2.0) dispersion model developed by EPA and first released in 1992.

CAL3QHC is a Gaussian model recommended in the EPA's Guidelines for Modeling Carbon Monoxide from Roadway Intersections (EPA 1992). Gaussian models assume that the dispersion of pollutants downwind of a pollution source follow a normal distribution from the center of the pollution source.

Different emission rates occur when vehicles are stopped (i.e., idling), accelerating, decelerating, and moving at different average speeds. CAL3QHC simplifies these different emission rates into two components:

- Emissions when vehicles are stopped (i.e., idling) during the red phase of a signalized intersection
- Emissions when vehicles are in motion during the green phase of a signalized intersection

The CAL3QHC (Version 2.0) air quality dispersion model has undergone extensive testing by EPA and has been found to provide reliable estimates of inert (i.e., nonreactive) pollutant concentrations resulting from motor vehicle emissions. A complete description of the model is provided in the User's Guide to CAL3QHC (Version 2.0): *A Modeling Methodology for Predicting Pollutant Concentrations near Roadway Intersections (Revised)* (EPA 1992a).

The transport and concentration of pollutants emitted from motor vehicles are influenced by three principal meteorological factors: wind direction, wind speed, and the atmosphere's profile. The values for these meteorological factors were chosen to maximize pollutant concentrations at each prediction site to establish a conservative, reasonable worst-case scenario. The values used for these meteorological factors are:

- Wind Direction: Maximum CO concentrations are typically found when the wind is assumed to blow parallel to a roadway adjacent to a receptor's location. At complex traffic intersections, it is difficult to predict which wind angle will result in maximum concentrations. Therefore, the approximate wind angle resulting in maximum pollutant concentrations at each receptor's location was used in the analysis. All wind angles, from 0 to 360 degrees in 5-degree increments, were considered.

- Wind Speed: CO concentrations are greatest at low wind speeds. A conservative wind speed of one meter per second (2.2 miles per hour) was used to predict CO concentrations during peak traffic periods.

- Profile of the Atmosphere: A "mixing" height (the height in the atmosphere to which pollutants rise) of 1,000 meters, and neutral atmospheric stability (stability class D) conditions were used in estimating microscale CO concentrations. Per EPA Guideline for Modeling CO from Roadway Intersections, the atmospheric stability class that should be used for intersection analyses varies by the urban/rural nature of the area surrounding the intersection. The land use classification shows the project area to be urban, and a stability class "D" which is used for urban areas was chosen for this analysis.

- Per EPA Guideline for Modeling CO from Roadway Intersections, surface roughness lengths (Zo) should be selected dependent on the project areas land use type. For city land use consisting of single-family residential areas, which represents most of the project area, a surface roughness value of 108 was used in the CAL3QHC model.

One-hour average ambient CO concentrations were calculated to estimate the effect during peak-hour traffic conditions. CO concentrations were estimated at a receptor height of 5.9 feet. The CO levels estimated by the model are the maximum concentrations that could be expected to occur at each air quality receptor site analyzed, given the assumed simultaneous occurrence of worst-case conditions such as peak-hour traffic conditions, conservative vehicular operating conditions, low wind speed, low atmospheric temperature, neutral atmospheric conditions, and maximizing wind direction. Conservative vehicular traffic conditions were referenced from 2050 traffic data, which is predicted to be the year of maximum traffic at the project area as 2050 contained the largest intersection delay and longest cycle length.

Predicted Levels

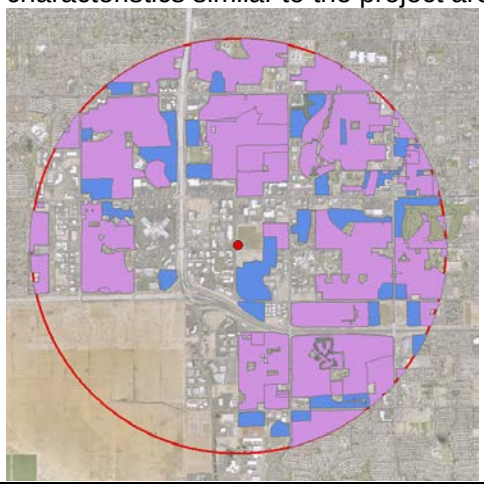
Carbon monoxide concentrations for the worst case build condition were predicted. The worst-case build condition uses the 2026 MOVES emission rates (highest CO emission rates) with the 2050 traffic data (maximum traffic). At each receptor site, maximum one-hour carbon monoxide concentrations were calculated. The one-hour CO levels were predicted for the peak hour of the day period. The 8-hour CO levels were predicted by applying a persistence factor of 0.7 to the 1-hour concentrations, as recommended in the EPA guidance (EPA 1992b).

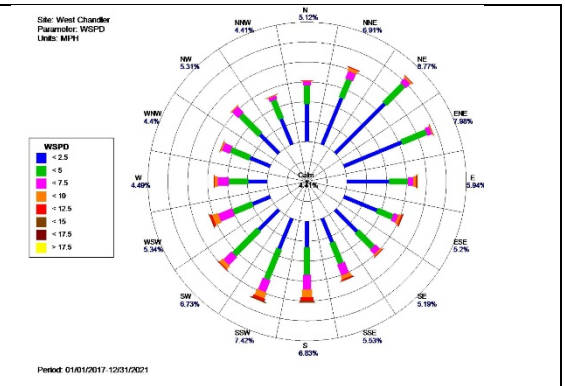
Background Levels

Background levels for the study area were obtained from EPA-monitoring data. The background level is the component of the total concentration that is not accounted for through the microscale modeling analysis. Background concentrations must be added to modeling results to obtain total

pollutant concentrations at receptor locations. Data from the West Chandler CO monitor (WC), approximately 0.5 miles from the project area between Frye Road and Ellis Street, was approved during the interagency consultation process because West Chandler monitor is closest CO station to the project and the station's land use characteristics are similar to the project area's land use (See Table 4 below). Based on the last three years of monitoring data (2019-2021), the one-hour background of 1.9 ppm and the eight-hour background of 1.3 ppm were used for the worst case build condition analysis.

Table 4
West Chandler CO Monitor

Project Area Characteristics and Parameters		West Chandler (WC) AQS ID: 04-013-4004 Address: 275 S Ellis, Chandler 0.5 miles to project
Collection frequency, completeness, and background concentration	N/A	Continuous monitoring Overall CO data completeness is 97.9% in 2021, 96.7% in 2020, and 95.4% in 2019. Three years of monitoring data show a maximum 8-hour value of 1.3 ppm. 1.9 ppm (which is the 8-hour concentration divided by a persistence factor of 0.7) will be added to the maximum modeled hourly concentration for comparison to the NAAQS. 1.3 ppm will be added to the maximum 8-hour modeled concentration.
Land use/terrain	Density (developed area), emission sources (near the traffic interchange), land use (residential area [47%] & vacant and open space [17%] commercial [6%], office [3%], light industrial [4%]), terrain (relative flat).	Density (developed area), emission sources (near the traffic interchange), land use (residential area [47%] & vacant and open space [18%] commercial [6%], office [6%], light industrial [5%]), terrain (relative flat). The West Chandler monitor is located in fringe area away from central Phoenix, characteristics similar to the project area. 
Wind patterns	N/A	Does not show significant upwind patterns to the project area.

		
Nearby sources:	N/A	No nearby sources other than roadways

Comparison to NAAQS

The results from the analysis for the worst case build condition were compared to the NAAQS, to determine the impacts of the proposed project and if the project is in conformance with the guidelines set forth in the New Clean Air Act Amendments of 1990.

3.1.2 Screening Evaluation

An intersection screening analysis based on changes in LOS and overall intersection volumes was performed, as described in EPA guidance (EPA 1992). The intersections evaluated are summarized in the *Project Level CO Hot-Spot Analysis Questionnaire*.

LOS describes the quality of traffic operating conditions, measured as the duration of delay that a driver experiences at a given intersection, with traffic quality ratings ranging from A to F. LOS A represents free-flow movement of traffic and minimal delays to motorists. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in congestion. As part of the procedure for determining critical intersections outlined in the EPA guidance, those intersections at LOS D, E, or F or those that have changed to LOS D, E, or F should be considered for modeling.

The intersections modeled were determined using the EPA guidance. The top three intersections ranked by volume and the top three intersections ranked by LOS and largest delay were selected for further screening evaluation. As a result, four intersections were selected for the CO hot-spot analysis in the 2050 build scenario.

Modeling was performed for the peak hour of the day for the worst case build condition using the 2026 MOVES emission rates (highest CO emission rates) with 2050 traffic data (maximum traffic). It is assumed that if the selected worst-case intersections do not show an exceedance of the NAAQS, none of the intersections will exceed NAAQS.

The *CO Hot-Spot Analysis Questionnaire* and *Consultation form* included in Appendix A has additional details about the model setup and options that were used in this CO hot-spot analysis.

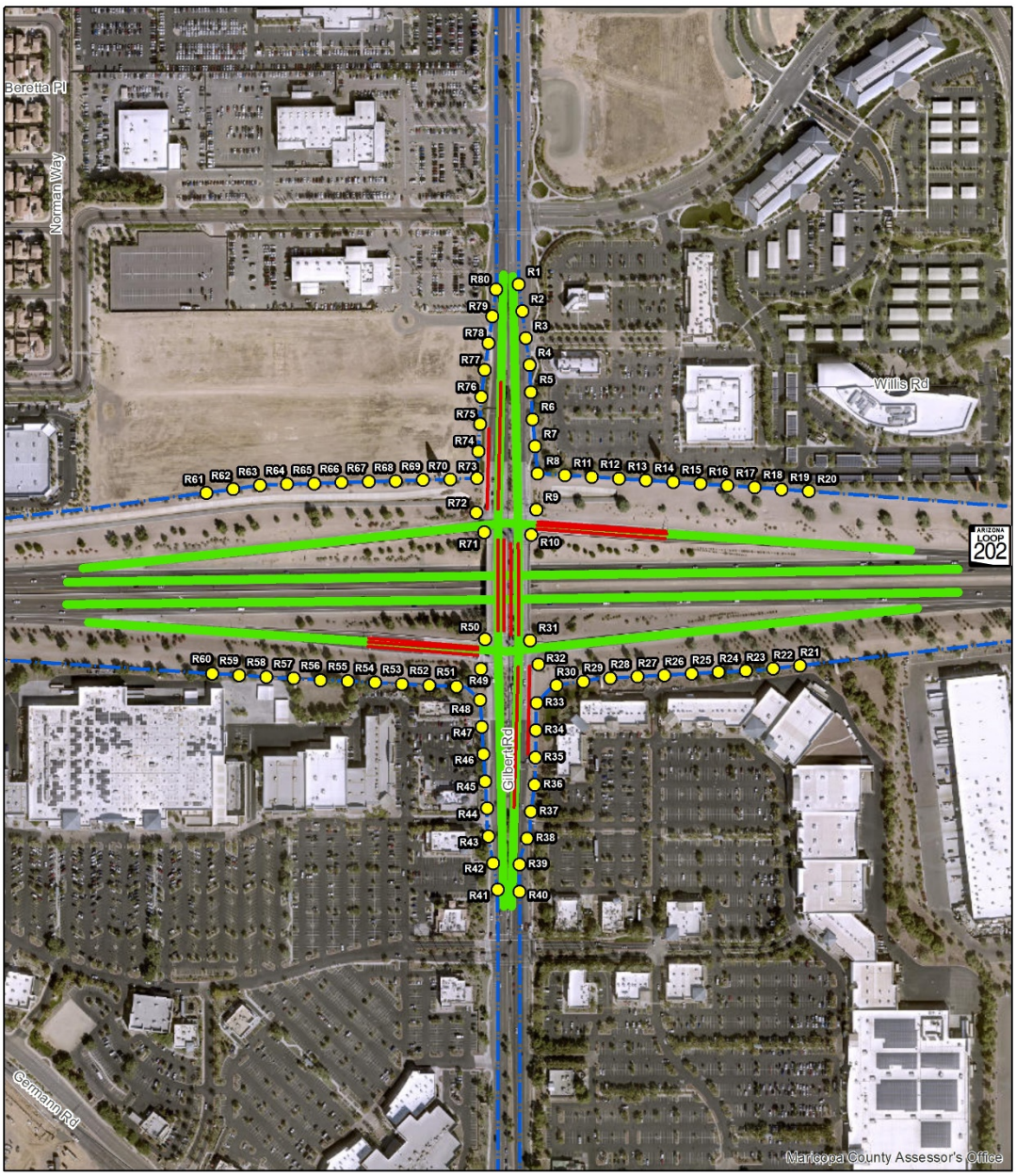
3.1.3 Analysis

Maximum one-hour CO levels were predicted for the worst case build condition at the four selected intersections: Gilbert Road & EB SR202, Gilbert Rd & WB SR202, Lindsay Road & EB SR202, and Lindsay Road & WB SR202. Figures 7 and 8 show CO receptor locations at the intersections. Free flow links and queue links were selected for CO hotspot analysis extending up to 1000 feet from the center of Gilbert Road TI and Lindsay Road TI. 17 separate free flow links and 12 queue links were modeled for Gilbert Road TI, and 22 separate free flow links and 12 queue links were modeled for Lindsay Road TI. Receptors are located along the right-of-way (ROW) line, at sidewalks at the four corners of each intersection, and the mid-block of each of the intersections approach and departure segments where the CO concentrations are likely to be the highest. Receptors were spaced at 25-meter intervals and at a height of 1.8 meters outside of the mixing zone.

Maximum one-hour CO concentrations are shown in Tables 5 and 7 and maximum eight-hour CO concentrations are shown in Tables 6 and 8. The CO levels estimated by the model are the maximum concentrations that could be expected to occur at each air quality receptor site analyzed. This estimation assumes simultaneous occurrence of a number of worst-case traffic and meteorological conditions including peak hour traffic conditions, conservative vehicular operating conditions, low wind speed, low atmospheric temperature, neutral atmospheric conditions, and maximized wind direction. Detailed receptor locations and analysis results are included in Appendix B. Per modeling results, all receptors predicted one-hour and eight-hour CO levels were determined to be below CO NAAQS thresholds.

The CO monitor located at West Chandler Frye Road and Ellis Street in Chandler has a similar environmental setting as the project corridor and was therefore selected for background monitor. The West Chandler CO monitor does not show significant upwind from the project area and winds are strongest from northeast and east-northeast, as shown in the wind rose figure in Appendix A.

Figure 7. CO Receptors and Roadway Links (SR202L and Gilbert Road Intersections)



Source:
AZTEC Engineering (2022);
ADOT ATIS (2013); Maricopa County Aerial (2022)

Map Disclaimer: This map is intended for general siting purposes only.

Legend

Free Flow Link
Queue Link
CO Receptors
R/W Line

Feet
0 190 380

Table 5
Predicted Worst-Case One-Hour CO Concentrations (ppm)
SR202L and Gilbert Road Intersection

Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition
R1	2.7	R2	2.5	R3	2.5
R4	2.4	R5	2.3	R6	2.4
R7	2.4	R8	2.4	R9	2.7
R10	2.7	R11	2.3	R12	2.3
R13	2.3	R14	2.1	R15	2.1
R16	2.1	R17	2.1	R18	2.1
R19	2.1	R20	2.1	R21	2.2
R22	2.2	R23	2.2	R24	2.2
R25	2.2	R26	2.2	R27	2.2
R28	2.4	R29	2.3	R30	2.4
R31	2.7	R32	2.7	R33	2.7
R34	2.7	R35	2.5	R36	2.4
R37	2.4	R38	2.4	R39	2.7
R40	2.8	R41	2.8	R42	2.6
R43	2.5	R44	2.5	R45	2.6
R46	2.5	R47	2.5	R48	2.4
R49	2.6	R50	2.8	R51	2.3
R52	2.3	R53	2.3	R54	2.3
R55	2.2	R56	2.2	R57	2.2
R58	2.2	R59	2.2	R60	2.2
R61	2.1	R62	2.1	R63	2.1
R64	2.1	R65	2.1	R66	2.1
R67	2.1	R68	2.2	R69	2.3
R70	2.2	R71	2.7	R72	2.6
R73	2.4	R74	2.5	R75	2.6
R76	2.4	R77	2.5	R78	2.5
R79	2.7	R80	2.9		
1-hour CO standard	35	1-hour CO standard	35	1-hour CO standard	35

Concentrations = modeled results + 1-hour CO background
1-hour CO background = 1.9 ppm
Abbreviations: CO = carbon monoxide; ppm = parts per million
Highlighted numbers denote the maximum one-hour CO concentrations

Table 6
Predicted Worst-Case Eight-Hour CO Concentrations (ppm)
SR202L and Gilbert Road Intersection

Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition
R1	1.9	R2	1.7	R3	1.7
R4	1.7	R5	1.6	R6	1.7
R7	1.7	R8	1.7	R9	1.9
R10	1.9	R11	1.6	R12	1.6
R13	1.6	R14	1.4	R15	1.4
R16	1.4	R17	1.4	R18	1.4
R19	1.4	R20	1.4	R21	1.5
R22	1.5	R23	1.5	R24	1.5
R25	1.5	R26	1.5	R27	1.5
R28	1.7	R29	1.6	R30	1.7
R31	1.9	R32	1.9	R33	1.9
R34	1.9	R35	1.7	R36	1.7
R37	1.7	R38	1.7	R39	1.9
R40	1.9	R41	1.9	R42	1.8
R43	1.7	R44	1.7	R45	1.8
R46	1.7	R47	1.7	R48	1.7
R49	1.8	R50	1.9	R51	1.6
R52	1.6	R53	1.6	R54	1.6
R55	1.5	R56	1.5	R57	1.5
R58	1.5	R59	1.5	R60	1.5
R61	1.4	R62	1.4	R63	1.4
R64	1.4	R65	1.4	R66	1.4
R67	1.4	R68	1.5	R69	1.6
R70	1.5	R71	1.9	R72	1.8
R73	1.7	R74	1.7	R75	1.8
R76	1.7	R77	1.7	R78	1.7
R79	1.9	R80	2.0		
8-hour CO standard	9	8-hour CO standard	9	8-hour CO standard	9

Concentrations = (modeled results x persistence factor [0.7]) + 8-hour CO background
8-hour CO background = 1.3 ppm
Abbreviations: CO = carbon monoxide; ppm = parts per million
Highlighted numbers denote the maximum eight-hour CO concentrations

Figure 8. CO Receptors and Rodway Links (SR202L and Lindsay Road Intersections)

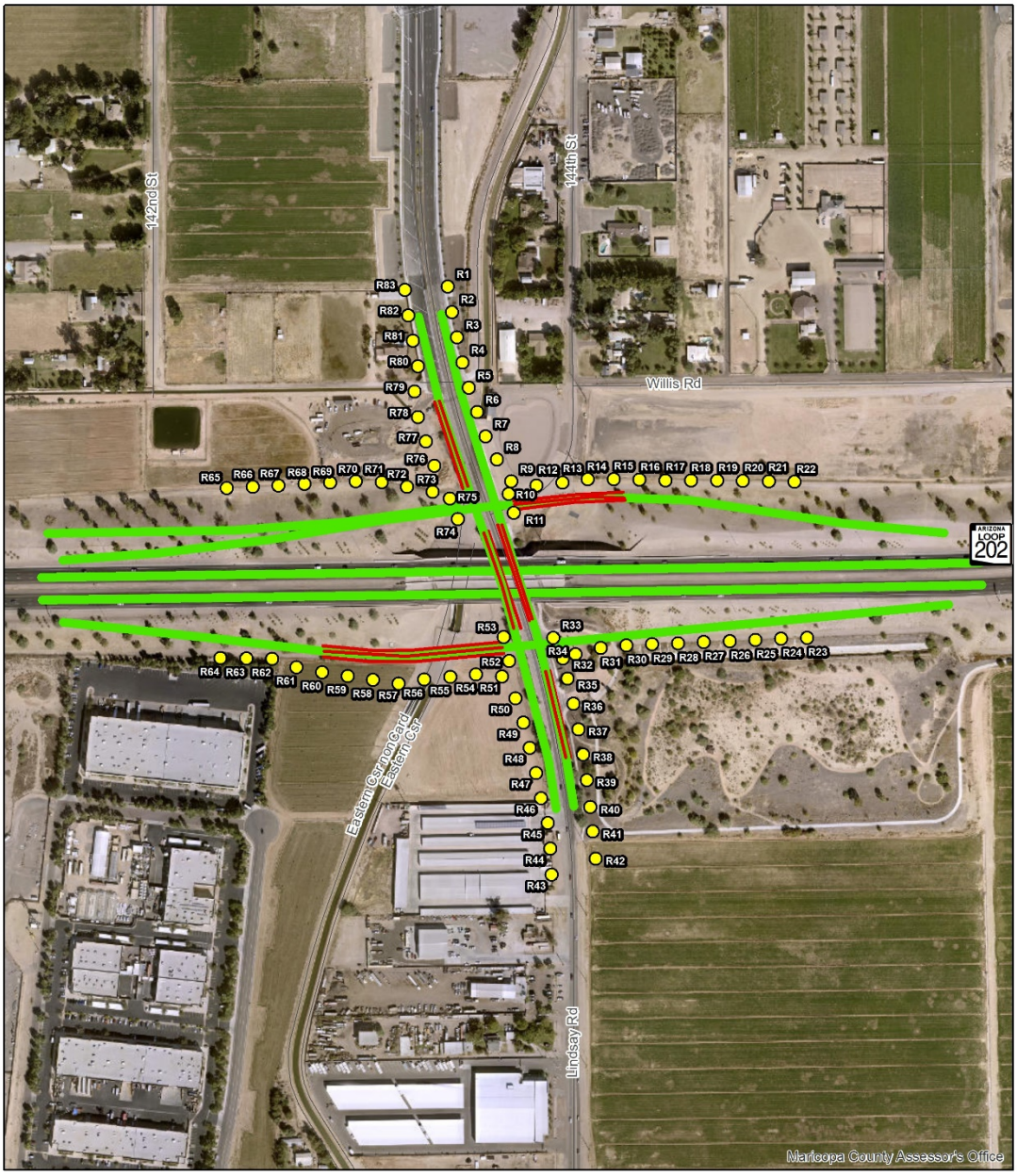


Table 7
Predicted Worst-Case One-Hour CO Concentrations (ppm)
SR202L and Lindsay Road Intersection

Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition
R1	2.1	R2	2.2	R3	2.3
R4	2.3	R5	2.4	R6	2.4
R7	2.5	R8	2.4	R9	2.5
R10	2.5	R11	2.6	R12	2.3
R13	2.3	R14	2.3	R15	2.2
R16	2.1	R17	2.2	R18	2.2
R19	2.2	R20	2.1	R21	2.1
R22	2.1	R23	2.3	R24	2.3
R25	2.3	R26	2.3	R27	2.3
R28	2.4	R29	2.4	R30	2.4
R31	2.5	R32	2.5	R33	2.7
R34	2.5	R35	2.5	R36	2.5
R37	2.4	R38	2.4	R39	2.4
R40	2.5	R41	2.3	R42	2.1
R43	2.1	R44	2.2	R45	2.5
R46	2.6	R47	2.6	R48	2.6
R49	2.6	R50	2.6	R51	2.5
R52	2.9	R53	2.7	R54	2.4
R55	2.4	R56	2.4	R57	2.2
R58	2.3	R59	2.3	R60	2.3
R61	2.4	R62	2.4	R63	2.4
R64	2.4	R65	2.2	R66	2.2
R67	2.2	R68	2.2	R69	2.2
R70	2.2	R71	2.3	R72	2.4
R73	2.5	R74	2.4	R75	2.6
R76	2.4	R77	2.4	R78	2.2
R79	2.2	R80	2.2	R81	2.2
R82	2.3	R83	2.3		
1-hour CO standard	35	1-hour CO standard	35	1-hour CO standard	35

Concentrations = modeled results + 1-hour CO background
1-hour CO background = 1.9 ppm
Abbreviations: CO = carbon monoxide; ppm = parts per million
Highlighted numbers denote the maximum one-hour CO concentrations

Table 8
Predicted Worst-Case Eight-Hour CO Concentrations (ppm)
SR202L and Lindsay Road Intersection

Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition	Receptor ID	Worst Case Build Condition
R1	1.4	R2	1.5	R3	1.6
R4	1.6	R5	1.7	R6	1.7
R7	1.7	R8	1.7	R9	1.7
R10	1.7	R11	1.8	R12	1.6
R13	1.6	R14	1.6	R15	1.5
R16	1.4	R17	1.5	R18	1.5
R19	1.5	R20	1.4	R21	1.4
R22	1.4	R23	1.6	R24	1.6
R25	1.6	R26	1.6	R27	1.6
R28	1.7	R29	1.7	R30	1.7
R31	1.7	R32	1.7	R33	1.9
R34	1.7	R35	1.7	R36	1.7
R37	1.7	R38	1.7	R39	1.7
R40	1.7	R41	1.6	R42	1.4
R43	1.4	R44	1.5	R45	1.7
R46	1.8	R47	1.8	R48	1.8
R49	1.8	R50	1.8	R51	1.7
R52	2.0	R53	1.9	R54	1.7
R55	1.7	R56	1.7	R57	1.5
R58	1.6	R59	1.6	R60	1.6
R61	1.7	R62	1.7	R63	1.7
R64	1.7	R65	1.5	R66	1.5
R67	1.5	R68	1.5	R69	1.5
R70	1.5	R71	1.6	R72	1.7
R73	1.7	R74	1.7	R75	1.8
R76	1.7	R77	1.7	R78	1.5
R79	1.5	R80	1.5	R81	1.5
R82	1.6	R83	1.6		
8-hour CO standard	9	8-hour CO standard	9	8-hour CO standard	9

Concentrations = (modeled results x persistence factor [0.7]) + 8-hour CO background
8-hour CO background = 1.3 ppm
Abbreviations: CO = carbon monoxide; ppm = parts per million
Highlighted numbers denote the maximum eight-hour CO concentrations

3.1.4 Project-Level Conformity

The CO hot-spot analysis demonstrates that the project is not expected to cause or contribute to an exceedance of the NAAQS. Documentation of the interagency consultation process in including specific modeling details and model assumptions can be found in in Appendix A.

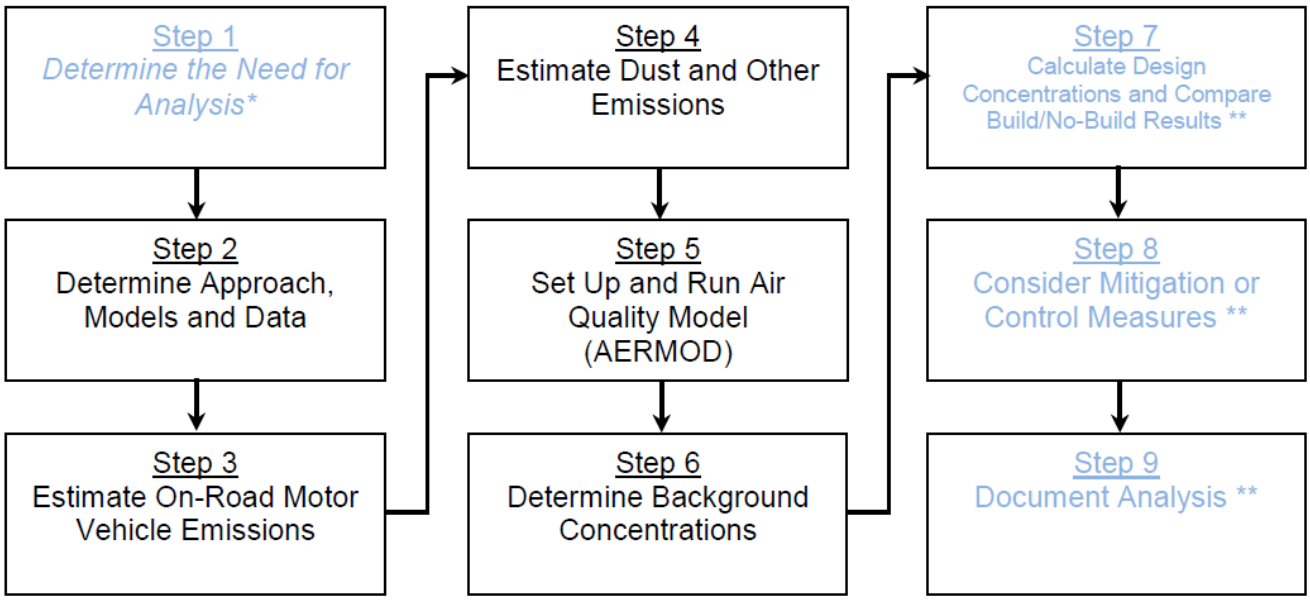
3.2 Project Level Hotspot PM_{10} Analysis

The project study area is located in Maricopa County, Arizona, which is currently classified as a nonattainment area for the PM_{10} 24-hour standard. The SR202 project was presented to the MAG consultation partners, which classified the project as one of air quality concern. As such, a microscale 24-hour PM_{10} hotspot analysis was conducted.

3.2.1 Methodology

The EPA's nine-step process was used for hot-spot PM_{10} analysis, see Figure 9. Each step is described below.

Figure 9. EPA's Nine-step Process for PM10 Analysis



Determine the Need for Analysis

Based on the ADOT PM_{10} interagency consultation process, this project is classified as a project of air quality concern for PM_{10} based on the high volumes of diesel traffic on SR202 projected for 2050. Therefore, a project level hot-spot PM_{10} analysis is warranted.

Determine Approach, Models and Data

The PM_{10} analysis methodology was presented to the interagency consultation partners and finalized in August 2023. Based on the EPA guidance, and in consultation with FHWA, EPA and other agencies, the same Gilbert Road TI intersections and Lindsay Road TI were selected for detailed hot-spot modeling to demonstrate project conformity with NAAQS based on the top intersections ranked by volume and by LOS and delay. Additionally, two other TIs, Alma School Road TI and Arizona Avenue TI were also selected for detailed PM_{10} hot-spot modeling because of the largest SR202 mainline ADT volumes and truck ADT volumes. These four selected TIs have the great potential concentrations of PM_{10} due to congestion and traffic volumes in 2050.

The AERMOD dispersion model requires meteorological data to predict pollutant concentrations at receptors within the project area. Five years of meteorological data files were provided by ADEQ based on observed surface data from Phoenix Sky Harbor International Airport and upper air data from Tucson International Airport for the 5-year period from 2017 through 2021. This meteorological data was determined to be representative of the project area conditions because of its proximity to the project site (10 miles), similarity in land use and terrain, and the data meets the completeness requirements of Section 5.3.2 of EPA's Meteorological Monitoring Guidance for Regulatory Modeling Applications (EPA 2000).

All model inputs and assumptions are included in Appendix A – Consultation Document for Project of Air Quality Concern. Information from ADEQ that describes the processing steps and summarizes completeness determination is included in Attachment A of Appendix A.

Estimate On-Road Motor Vehicle Emissions

On-road vehicle emissions were estimated using MOVES3.1. Age distribution and vehicle mix were provided by MAG consistent with the regional conformity analysis. Default fuel specifications data was used for the model's fuel data inputs. Temperature and relative humidity inputs were derived from the AERMET data provided by ADEQ to use in the dispersion model. Information from ADEQ that describes the preparation of AERMET data is included in Appendix A1. MOVES input relies on link-specific data. Traffic data included link volume, speed, average grade, and elevation. Vehicle mix was assumed to be consistent with the MAG regional vehicle mix. The PM_{10} modeled links and receptors for Gilbert Road TI are shown in Figure 10. The PM_{10} modeled links and receptors for Lindsay Road TI are shown in Figure 11. The PM_{10} modeled links and receptors for Alma School Road TI are shown in Figure 12. The PM_{10} modeled links and receptors for Arizona Avenue TI are shown in Figure 13.

Roadway segments were represented in AERMOD using LINE options. Unique inputs used for each run were based on each link's length (in miles), traffic volume (vehicle per hour), vehicle average speed (miles per hour), and road grade (percent). For Alma School Road TI, a total of 52 LINE sources representing roadway segments and 848 discrete receptors were modeled. For Arizona Avenue TI, a total of 79 LINE sources and 827 discrete receptors were modeled. For Gilbert Road TI, a total of 52 LINE sources representing roadway segments and 770 discrete receptors were modeled. For Lindsay Road TI, a total of 65 LINE sources and 870 discrete receptors were modeled.

No receptors were placed within the freeway ROW because they are restricted public access areas that are fenced off or blocked by privacy walls, such as the triangle area (in red line) as shown in Figure 13.

PM_{10} emissions vary by time of day and time of year. Volume and speed data for each link was obtained from the MAG traffic demand model for A.M. peak, midday, P.M. peak, and overnight traffic conditions. For each analysis site, MOVES was run for each of the four time periods (A.M. peak, midday, P.M. peak, and overnight) for four seasons (January, April, July, and October) for a total of 16 MOVES runs per selected TI. For every link, a set of 16 emission factors in units of grams per mile were developed for the project's analysis year of 2050.

According to EPA's Environmental Justice Screening and Mapping Tool (version 2.2), communities along Arizona Avenue north of Pecos Road and south of Willis Road are considered high demographic indices communities. As a result, additional PM receptors were modeled for these communities.

Figure 10. PM Receptors and Rodway Links (SR202L and Gilbert Road Intersections)

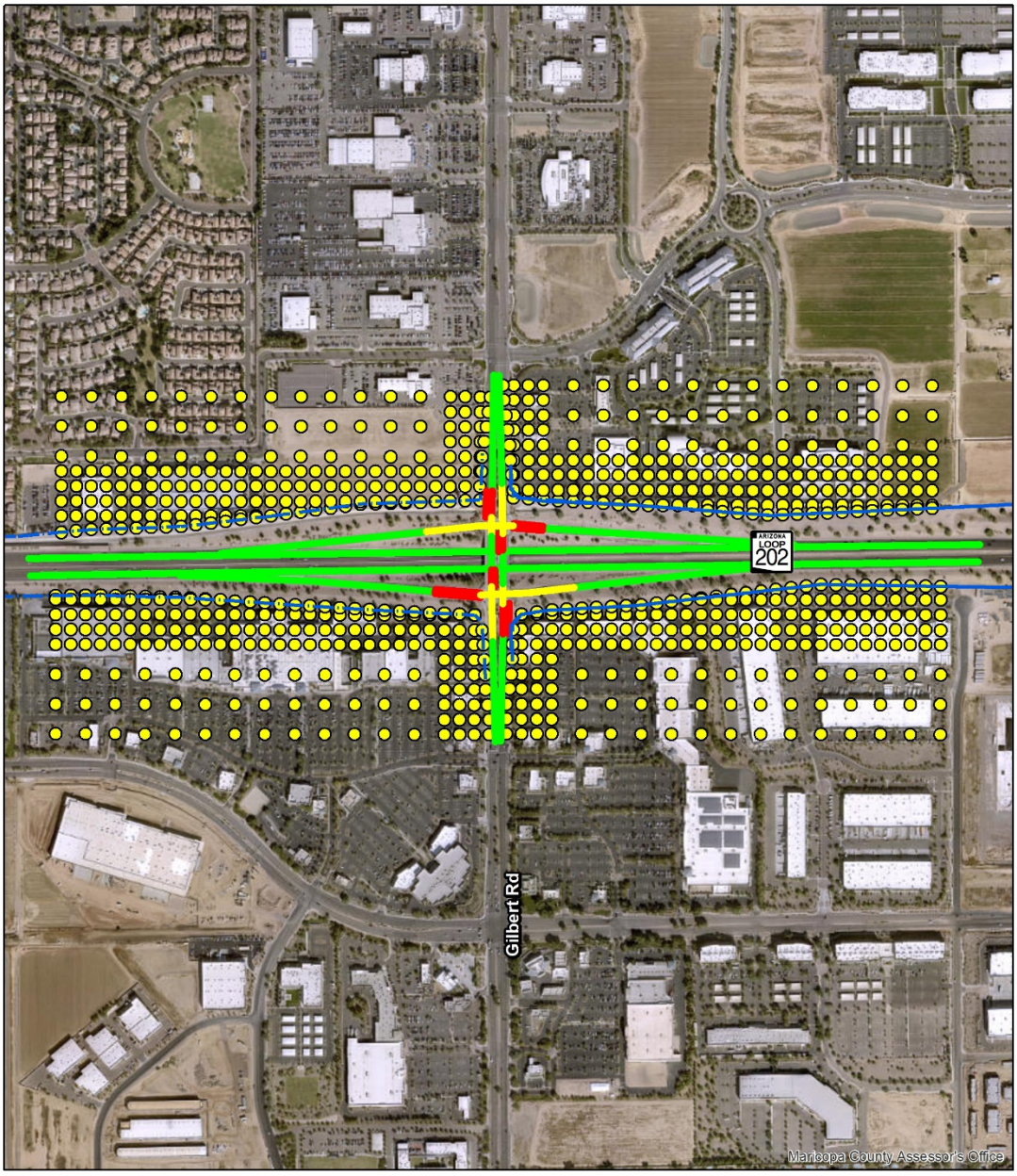


Figure 11. PM Receptors and Rodway Links (SR202L and Lindsay Road Intersections)

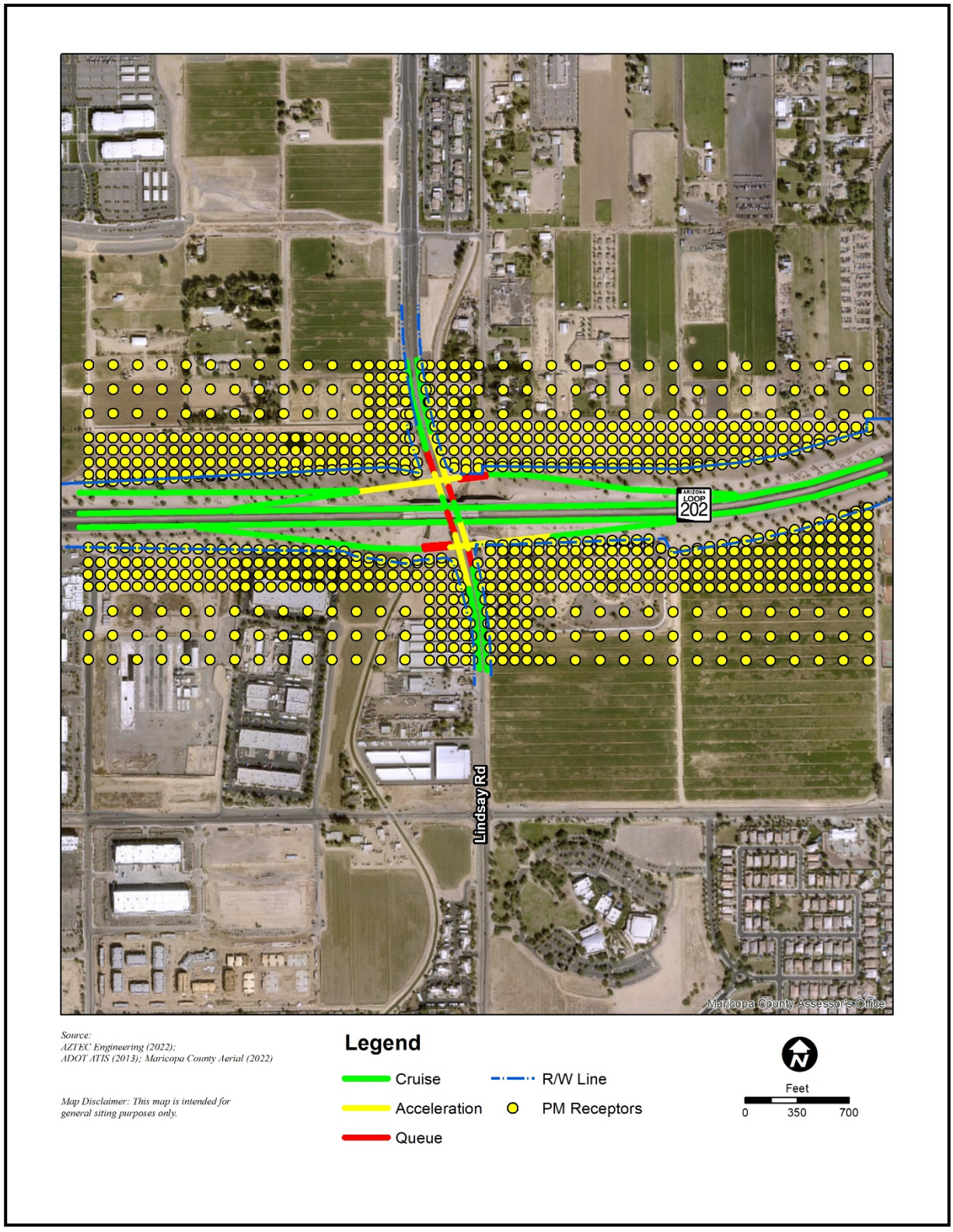


Figure 12. PM Receptors and Rodway Links (SR202L and Alma School Road Intersections)

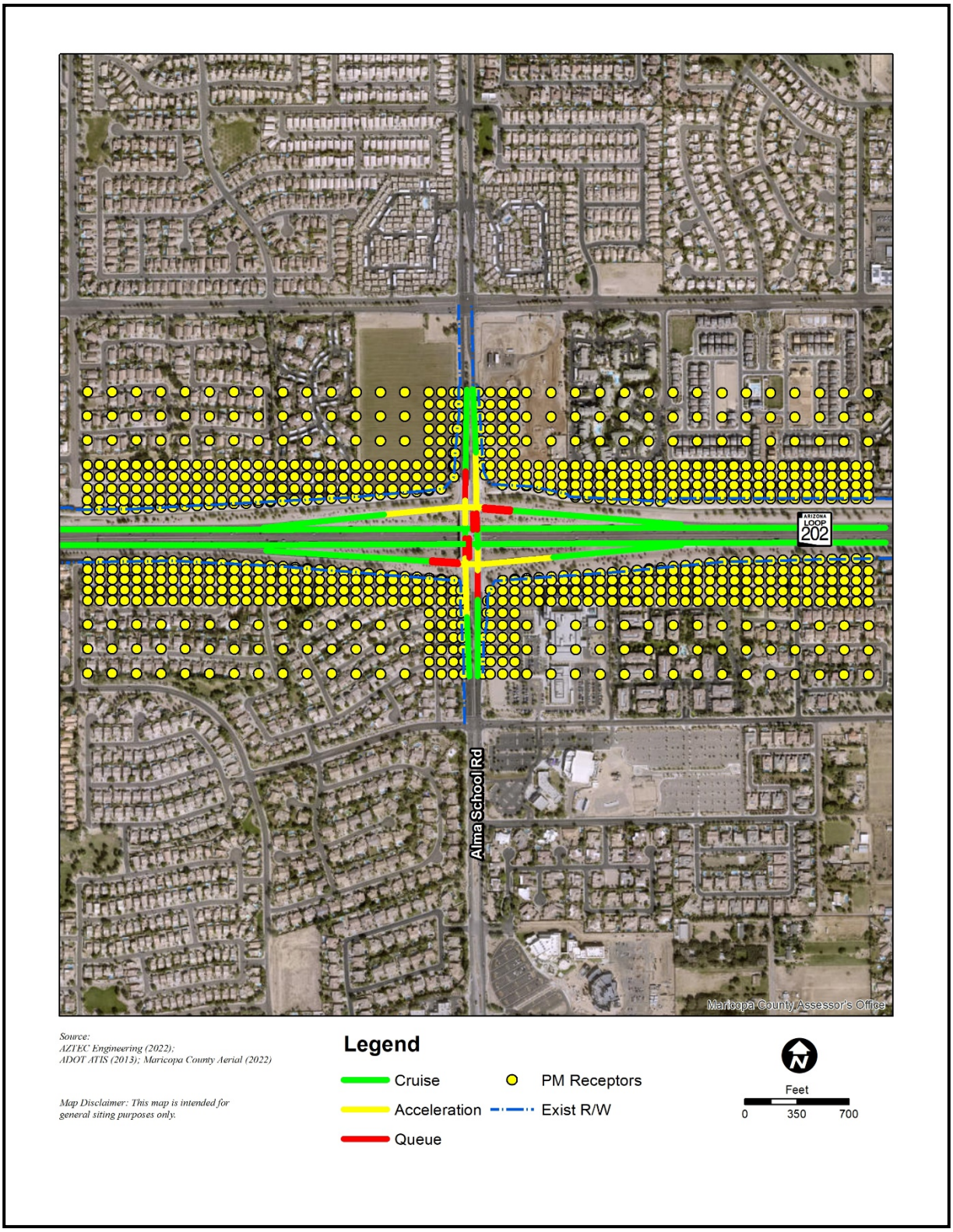
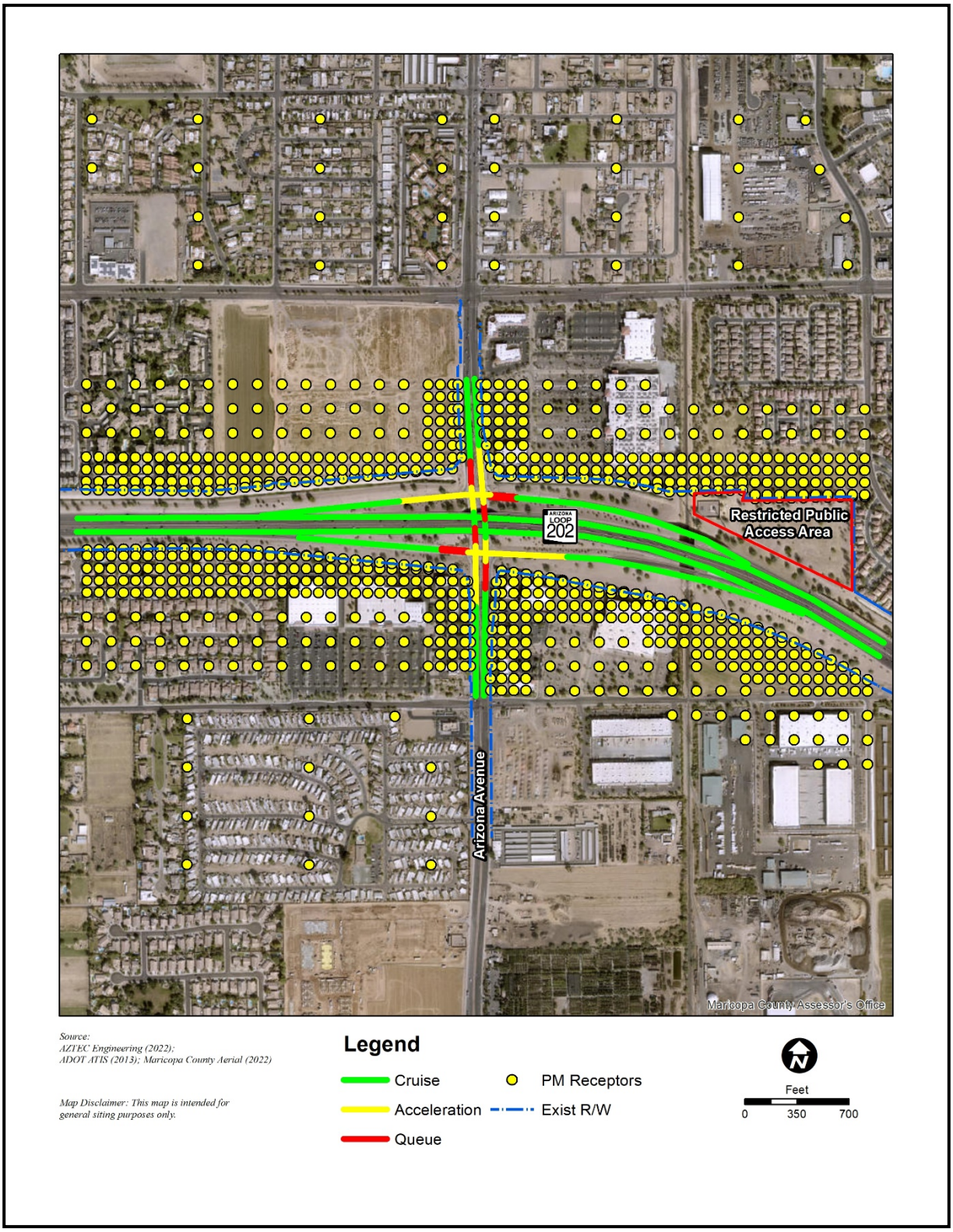


Figure 13. PM Receptors and Rodway Links (SR202L and Arizona Avenue Intersections)



Estimate Dust and Other Emissions

Re-entrained road dust must be included in all PM_{10} hot-spot analyses. Section 13.2.1 of AP-42 provides a method for estimating emissions of re-entrained road dust using local values for precipitation, average vehicle weight, and silt loading.

The estimated road dust emission assumptions from the MAG Conformity Analysis for the analysis year 2050 were used for this PM hot-spot analysis, and the values are summarized in Table 9. Road dust emissions calculations were provided to EPA as part of the air quality conformity review process. The values in Table 9 came from page 58 in the Conformity Analysis for the FY 2022-2025 MAG Transportation Improvement Program and the MOMENTUM 2050 Regional Transportation Plan, dated September 2021.

Table 9
MAG Road Dust Emission Factors

Facility Type	W (tons)	sL (g/m^2)	E (g/VMT)
Freeway	4.08	0.02	0.118583
High Arterial	2.48	0.067	0.21484

Source: MAG 2021.
g/m^2 = grams per square meter, g/VMT = grams per vehicle mile traveled

Emission factors for road dust were added to the emission factors generated for each link by MOVES for use in the AERMOD dispersion model.

Construction emissions were not included because construction will not occur at any individual location for more than five years. EPA guidance requires nearby sources of PM_{10} emissions to be included in air quality modeling when those sources are not appropriately reflected in the background data or would be affected by the project. No additional sources of PM_{10} emissions were identified that would increase as a result of the project. It is assumed that PM_{10} concentrations due to any other nearby emissions sources are included in the ambient monitor values used for background concentrations. In addition, this project is not expected to result in changes to emissions from nearby sources.

Set Up and Run Air Quality Model (AERMOD)

The EPA's AERMOD air dispersion model was used to estimate project operation PM_{10} concentrations. The model uses traffic, emission factor, and meteorological data to estimate ground-level concentrations of PM_{10} at a series of receptors. For each modeled scenario, the model setup included a series of sources representing the roadway segments in the vicinity of the intersections being modeled.

LINE sources were inputted to represent roadway links. Link-specific inputs included source location, source length and width, emission rate, release height, and initial vertical dimension. AERMOD was run for five years of meteorological data based on ADEQ Phoenix AERMET files for a 5-year period from 2017 through 2021.

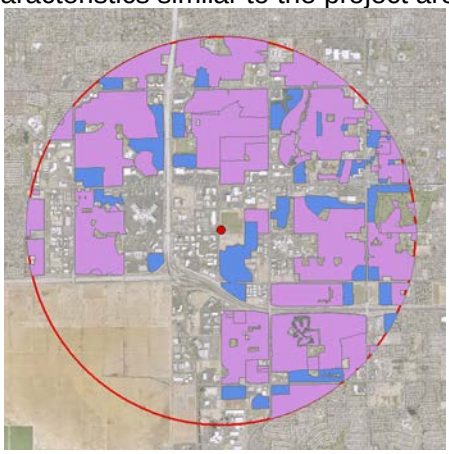
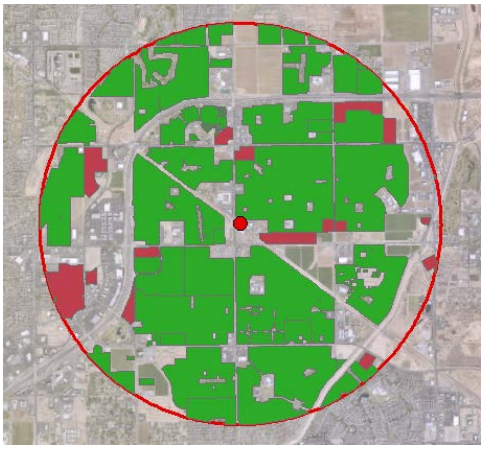
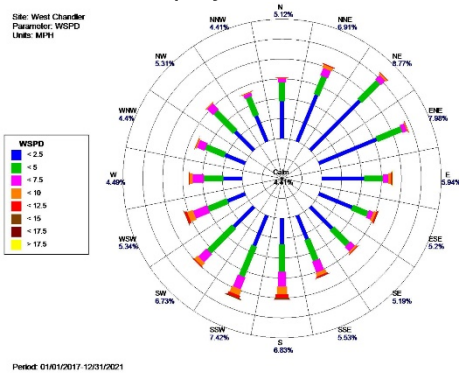
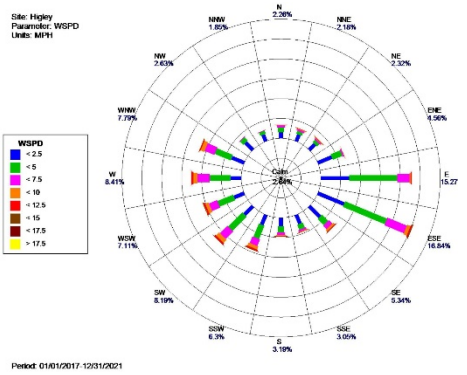
Receptors were placed in order to estimate the highest concentrations of PM_{10}, to determine possible violations of the NAAQS. The highest PM_{10} concentrations are expected to occur near project's areas with the highest-volume roadways and near areas where vehicles are restarting and/or idling. Receptors were placed five meters from the roadways, at a height of 1.8 meters. Receptors were not placed in locations where the public does not have access, as described in the EPA guidance. Areas with no public access include medians, right-of-way access on highways and ramps, locations restricted by fencing, and locations with hazardous terrain. Aerial photos were used to determine locations unlikely to have pedestrian access due to fencing or hazardous terrain.

Determine Background Concentrations

The West Chandler and Higley monitors are the two monitors closest to the project area. Monitoring station information including land use percentage and wind rose data is shown in Table 10 below. Because WC and Higley monitors are the two closest PM stations to the project and the station's land use characteristics are similar to the project area's land use, the WC and Higley Monitors were selected as the PM background monitors. These selected monitors were approved during the interagency consultation process. The 4th highest PM_{10} reading from 2019 through 2021 was identified from each monitoring station, and then used to interpolate the projects PM background concentrations. The 4^{th} highest monitor value over three years from 2019 to 2021 is 89 µg/m³ for West Chandler monitor and 114 µg/m³ for Higley monitor, after removing atypical events data. Using interpolation between the two monitors concentration values, the calculated background concentration is 93.2 µg/m³. Monitor site details, including a figure showing the distance from the project area to each monitor are included in the materials in Appendix A. Appendix C An Atypical Events Report was prepared for the justification of the removal for the three atypical event days for these two monitoring stations during the proposed analysis time frame can be found in Appendix C.

Table 10
West Chandler and Higley Monitors

	Project Area	West Chandler (WC) AQS ID: 04-013-4004 Address: 275 S Ellis, Chandler 0.5 miles to project	Higley (HI) AQS ID: 04-013-4006 Address: 2207 S Higley Rd, Gilbert 2.5 miles to project
Collection frequency, completeness, and background concentration	N/A	Continuous monitoring overall PM data completeness is 96.8% in 2021. Number of complete monitoring days in 2019 to 2021: 1091 4^{th} Highest 24-hour reading after removing atypical events: 89 *µg/m³.*	Continuous monitoring overall PM data completeness is 96.8% in 2021, 97.2% in 2020, and 97.7% in 2019. Number of complete monitoring days in 2019 to 2021: 1086 4^{th} Highest 24-hour reading after removing atypical events: 114 *µg/m³.*
Land use/terrain	Density (developed area), emission sources (near the traffic	Density (developed area), emission sources (near the traffic interchange), land use (residential area [47%] & vacant and open space [18%] commercial [6%], office [6%], light industrial [5%]), terrain (relative flat). The	Density (developed area), emission sources (near the traffic interchange), land use (residential area [58%] & vacant and open space [12%] commercial [7%], terrain (relative flat). The Higley monitor is located in fringe

	interchange), land use (residential area [47%] & vacant and open space [17%] commercial [6%], office [3%], light industrial [4%]), terrain (relative flat).	West Chandler monitor is located in fringe area away from central Phoenix, characteristics similar to the project area. 	area away from central Phoenix, characteristics similar to the project area. 
Wind patterns	N/A	Does not show significant upwind patterns to the project area. 	Does not show significant upwind patterns to the project area. 
Nearby sources:	N/A	No nearby sources other than roadways.	No nearby sources other than roadways.

The approved PM_{10} background value was added to the AERMOD modeled design values for comparison to the PM_{10} NAAQS of 150 µg/m^3. The background values are conservative, because it is expected that ambient PM_{10} concentrations will be lower in future years because of updated SIP's and a general trend of declining vehicle emissions due to technological advances. No obvious nearby sources of emissions other than roadways exist for the project. It is assumed that emissions from other nearby sources, if any, are already included from the ambient monitoring data.

Calculate Design Concentrations and Compare Build/No-Build Results

The model results were added to the PM_{10} background concentrations for the Build alternative to calculate the PM_{10} design values. To determine the 24-hour PM_{10} design value, the following steps were used, as outlined in the guidance:

- From the air quality modeling results from the build scenario, identify the sixth-highest 24-hour concentration for each receptor.

- Identify the receptor with the highest sixth-highest 24-hour concentration.
- Identify the appropriate 24-hour background concentration from the three most recent years of air quality monitoring data. This value is 93.2 µg/m^3, as described above.
- For the receptor identified in Step 2, add the sixth-highest 24-hour modeled concentration to the appropriate 24-hour background concentration (from Step 3).
- Round to the nearest 10 µg/m^3. The result is the highest 24-hour PM_{10} design value in the build scenario. The final results are summarized in Table 11.

Consider Mitigation or Control Measures

If the total concentration of the highest 24-hour PM_{10} design value is greater than PM_{10} NAAQS, mitigation or control measures are needed to be considered to reduce emissions within the project area.

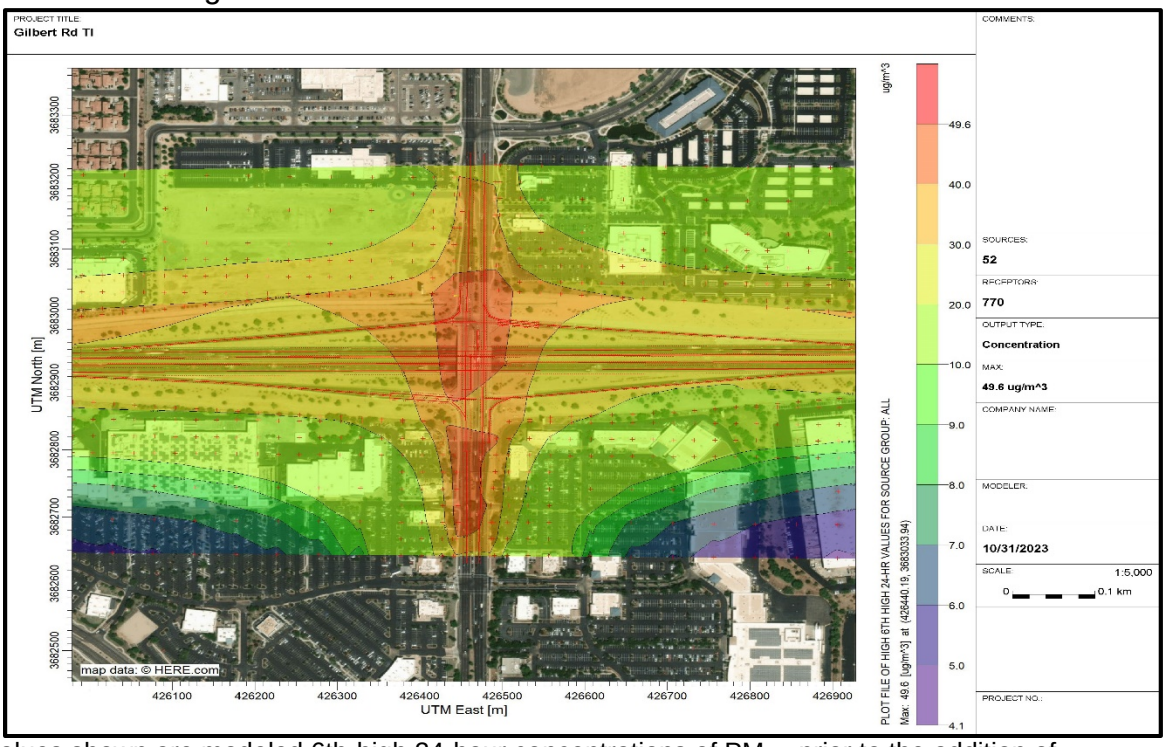
Document Analysis

This Air Quality Technical Report documents the PM hotspot results.

3.2.2 Results

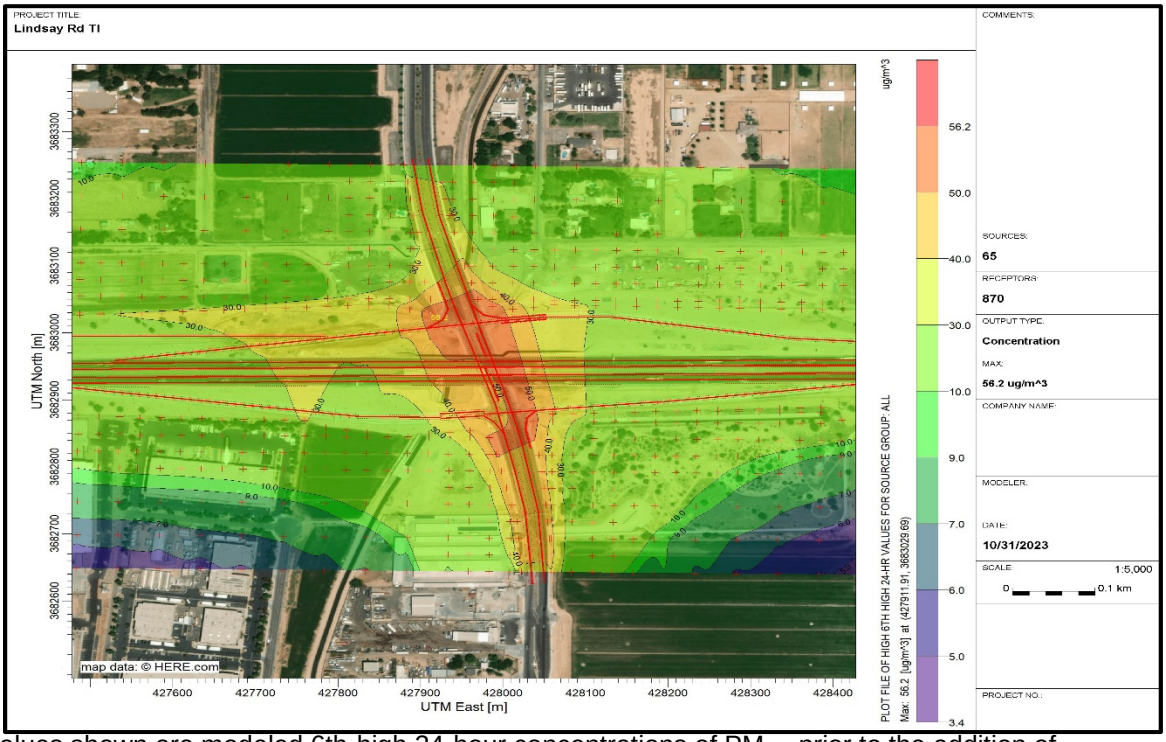
The modeled concentrations, including background concentrations, were compared to the applicable NAAQS. The receptor with the maximum 6th-highest concentration was located on the northwest or northeast quadrants of the freeway. Figures 14 through Figure 17 show the receptor concentrations near the center of the project area with the maximum value shown in red.

Figure 14. SR202L and Gilbert Road PM_{10} Model Results



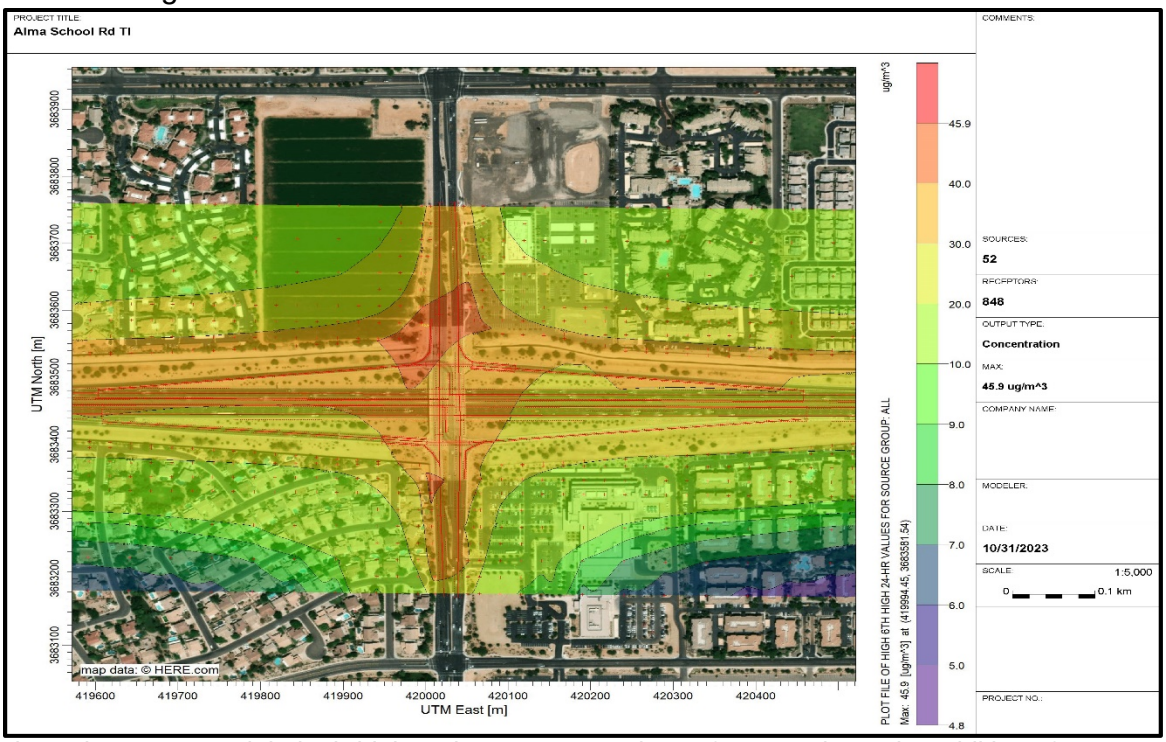
Note: Values shown are modeled 6th-high 24-hour concentrations of PM_{10}, prior to the addition of background concentration. Maximum value shown in yellow.

Figure 15. SR202L and Lindsay Road PM_{10} Model Results



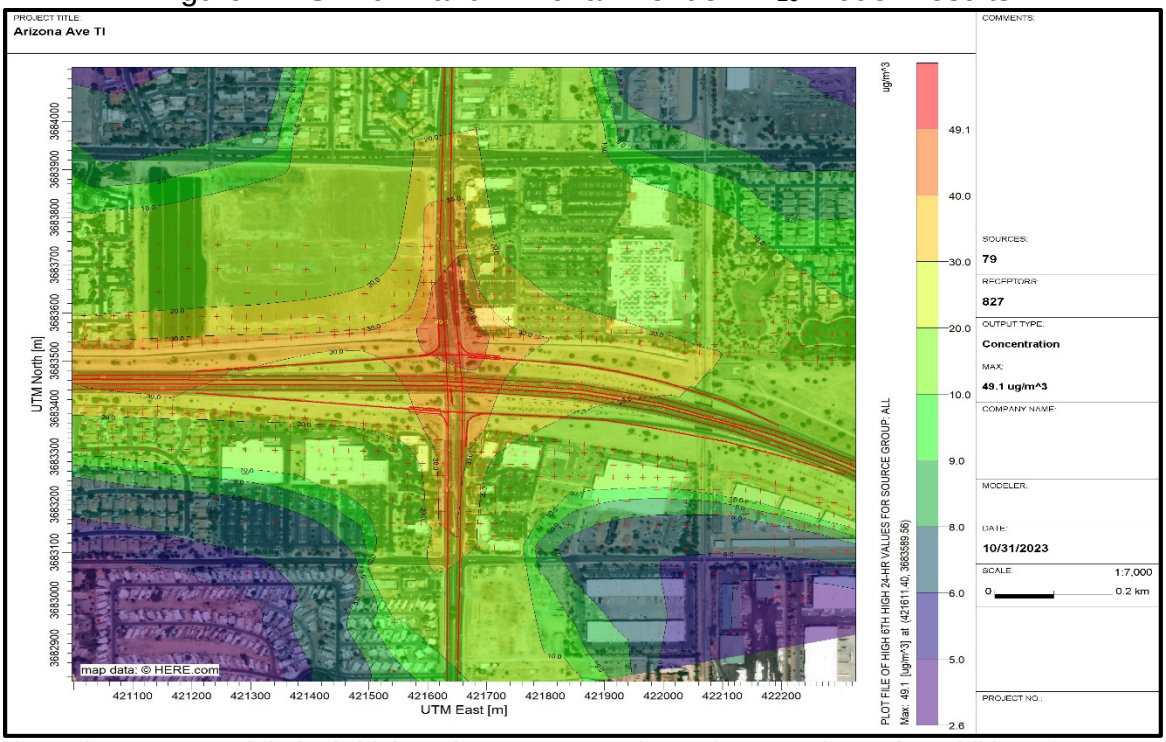
Note: Values shown are modeled 6th-high 24-hour concentrations of PM_{10}, prior to the addition of background concentration. Maximum value shown in yellow.

Figure 16. SR202L and Alma School Road PM_{10} Model Results



Note: Values shown are modeled 6th-high 24-hour concentrations of PM_{10}, prior to the addition of background concentration. Maximum value shown in yellow.

Figure 17. SR202L and Arizona Avenue PM_{10} Model Results



Note: Values shown are modeled 6th-high 24-hour concentrations of PM_{10}, prior to the addition of background concentration. Maximum value shown in yellow.

The result is shown in Table 11 below. Output files exported from AERMOD for each model run indicated zero fatal errors.

Table 11
Predicted 24-Hour PM_{10} Concentration ($\mu g/m^3$)

Location	6th-Highest PM_{10} Value	Background PM_{10} Value	Total Concentration	Total Concentration Rounded to nearest 10 $\mu g/m^3$	PM_{10} NAAQS
Alma School Rd TI	45.9	93.2	139.1	140	150
Arizona Avenue TI	49.1	93.2	142.3	140	150
Gilbert Rd TI	49.6	93.2	142.8	140	150
Lindsay Rd TI	56.2	93.2	149.4	150	150

$\mu g/m^3$ = micrograms per cubic meter

As shown in Table 11, total PM_{10} concentrations for the projects four selected TIs are below PM_{10} NAAQS. Therefore, the project meets conformity requirements and no project emission reduction mitigation or control measures need to be considered by project sponsors.

Due to the large volume of input and output files created for this project's PM hot spot analysis, data is available electronically upon request, as noted in Appendix D.

3.3 Public Involvement

A Draft Air Quality Report was published on ADOT's website on November 3, 2023, with the latest modeling assumptions in force on November 3rd, with no additional modeling change. The opportunity for the Interagency Consultation group and the public to provide comments on the air quality report through November 17, 2023. The Interagency Consultation group was notified by email with a link to the Draft Air Quality Report for their review. Comments from EPA and FHWA during the Interagency Consultation were received. ADOT provided responses to address all EPA and FHWA comments. Two comments were received from the public. One comment was related to the project's scope of work and the other comment supported the findings and recommendations in the document. Neither comment requested changes to the air quality report. Refer to Appendix A.

4.0 CONFORMITY

Section 176c of the CAA requires that transportation projects conform to the approved air quality State Implementation Plan for meeting federal air quality standards. Conformity requirements were made substantially more rigorous in the CAA Amendments. The conformity determinations for federal actions related to transportation projects must meet the requirements of 40 CFR Parts 51 and 93. This project is not likely to cause or contribute to the severity or number of violations of the NAAQS. The project is within the Phoenix PM_{10}, Ozone, and CO maintenance area. The proposed project is included in the *Maricopa Association of Governments (MAG) MOMENTUM 2050* Regional Transportation Plan (dated December 1, 2021) as approved by MAG Regional Council on December 1, 2021. In addition, the project is included in the *FY 2022-2025 Transportation Improvement Program* (dated December 1, 2021), as amended.

REFERENCES

1. Arizona Department of Transportation, 2000. *Standard Specifications for Road and Bridge Construction*. Phoenix.

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Appendix A

INTERAGENCY CONSULTATION DOCUMENTATION

Project Level CO Quantitative Hot-Spot Analysis – Consultation Document

Project Setting and Description

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being carried out by Arizona Department of Transportation (ADOT), pursuant to 23 U.S.C. 326 and a Memorandum of Understanding dated January 4, 2021, and executed by the Federal Highway Administration (FHWA) and ADOT. ADOT is planning to install general purpose lane (GPL) for the State Route 202 Loop Santan Freeway (SR 202L) between approximately milepost (MP) 51.00 and MP 42.00, within the City of Chandler and the Town of Gilbert, Maricopa County, Arizona.

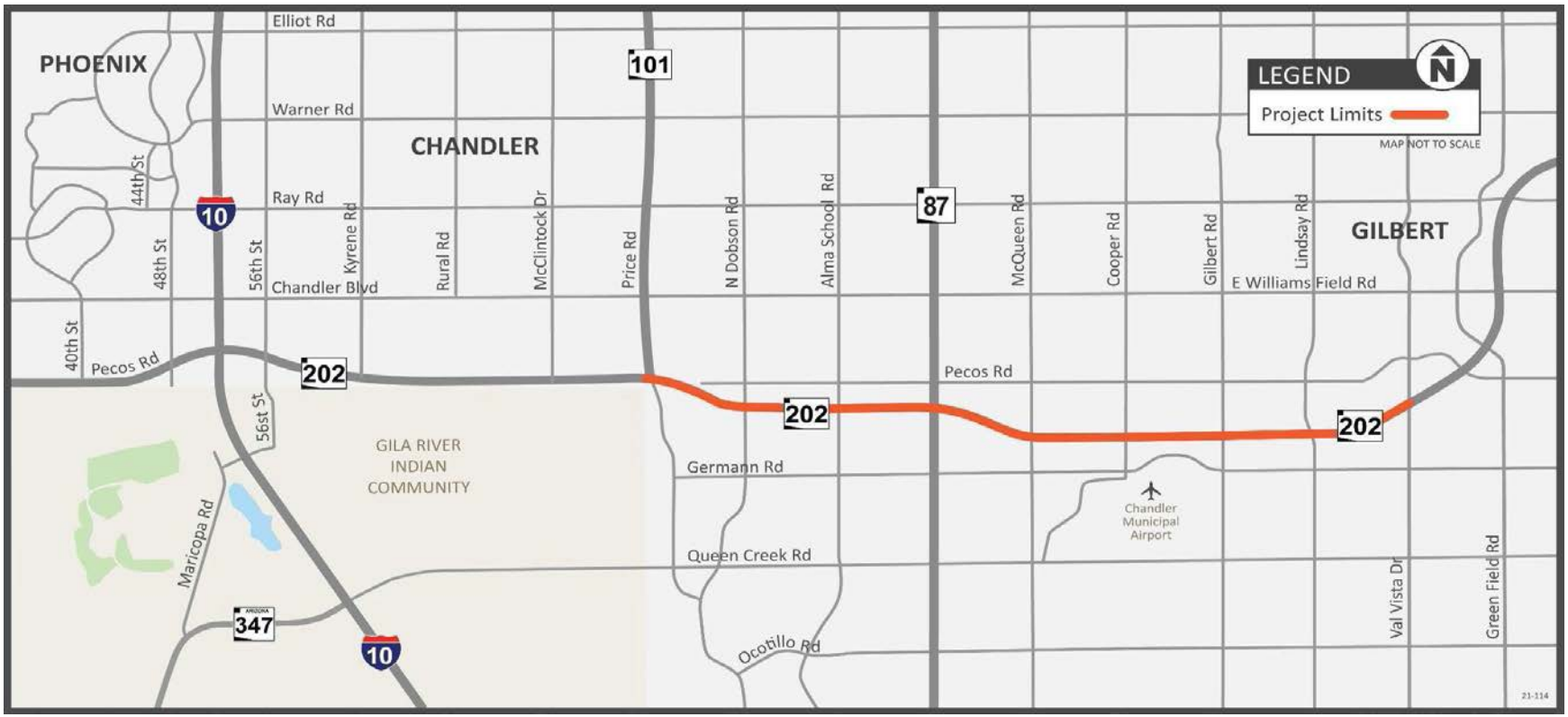
This section of the SR 202L is a six lane divided freeway with a high-occupancy vehicle (HOV) lane in each direction. The freeway is part of the Phoenix Metropolitan Area's Regional Freeway System, with connections to the Interstate 10, serves as the end point of the State Route 101 (SR 101), and will be connected to the South Mountain Freeway currently being constructed. Increased congestion during peak traffic periods and 2040 projections of dramatic traffic increases has created the need for greater capacity along this section of the freeway. The purpose of this project is to increase freeway capacity and decrease existing and future traffic congestion.

The scope of work

- Adding one General Purpose Lane (GPL) to the outside of existing lanes in each direction of SR 202L from Gilbert Road to Val Vista Drive
- Adding two GPL to the outside of existing lanes in each direction of SR 202L between SR 101 and Gilbert Road
- Widening exit ramps to two lanes, and restriping lanes to accommodate additional lanes where feasible
- Widening bridges over the Arizona Avenue, Union Pacific Railroad, Consolidated Canal, and Lindsay Road
- Reconstructing the eastbound on-ramp bridge over Union Pacific Railroad
- Adding noise walls where warranted
- Construct retaining walls that will have the same design patterns as the existing walls in the corridor
- Relocate catch basins, storm drain and storm drain trunk lines and junction structures, and other drainage improvements
- Relocate and/or construct new ramp metering systems where ramps are being widened or realigned and other LED lighting where warranted
- Upgrade sidewalk ramps and signal poles to ADA compliance at TIs, as necessary

The project is located in the Maricopa County (Phoenix) Nonattainment Area for particulates 10-microns in diameter or less (PM10), eight-hour ozone, maintenance area for carbon monoxide. The project is included in the Maricopa Association of Governments 2022-2025 MAG Transportation Improvement Program (TIP) and MOMENTUM 2050 MAG Regional Transportation Plan, and regional conformity analysis (7322) as of February 14, 2023.

Figure 1. Project Vicinity Map



https://azdot.gov/projects/central-district-projects/loop-202-santan-freeway-loop-101-val-vista-drive

Project Assessment – Part A

The following questionnaire is used to compare the proposed project to a list of project types in 40 CFR 93.123(a) requiring a quantitative analysis of local CO emissions (Hot-spots) in nonattainment or maintenance areas, which include:

i) Projects in or affecting locations, areas, or categories of sites which are identified in the applicable implementation plan as sites of violation or possible violation;
ii) Projects affecting intersections that are at Level-of-Service D, E, or F, or those that will change to Level-of-Service D, E, or F because of increased traffic volumes related to the project;
iii) Any project affecting one or more of the top three intersections in the nonattainment or maintenance area with highest traffic volumes, as identified in the applicable implementation plan; and
iv) Any project affecting one or more of the top three intersections in the nonattainment or maintenance area with the worst level of service, as identified in the applicable implementation plan.

If the project matches one of the listed project types in 40 CFR 93.123(a)(1) above, it is considered a project of local air quality concern and the hot-spot demonstration must be based on quantitative analysis methods in accordance to 40 CFR 93.116(a) and the consultation requirements of 40 CFR 93.105(c)(1)(i).

Project type ii) is relevant to this project because this project affects a congested intersection (LOS D or greater) that will change LOS to D or greater because of increased traffic volumes.

Projects Affecting CO Sites of Violation or Possible Violation

Does the project affect locations, areas or categories of sites that are identified in the CO applicable plan or implementation plan submissions, as appropriate, as sites of violation or potential violation?

> **NO.** This project does not affect locations, areas or categories of sites that are identified in the MAG 2013 Carbon Monoxide Maintenance Plan for Maricopa County as sites of violation or potential violation.

Projects with Congested Intersections

Is this a project that affects a congested intersection (LOS D or worse) will change LOS to D or worse because of increased traffic volumes related to the project?

> **YES**. Among the 18 intersections, there are 3 intersections in AM peak hour and 9 intersections in PM peak hour would result in LOS D or worse in the 2050 no build scenario. In the 2050 build scenario, there are 5 intersections in AM peak hour and 10 intersections in PM peak hour that would result in LOS D or worse. While there are improvements in locations, the LOS at 4 intersections would become worse from 2050 no build scenario to 2050 build scenario. ADT volume decrease/increase at intersections range from -5,647 vehicles to 3,790 vehicles. Table 1 is provided to show overall traffic impacts from the regional model, additional project specific traffic study further refined the traffic data as shown in Table 2.

Table 1 – SR202L Mainline ADT and Truck ADT in Existing, No Build and Build Conditions

ADT and Truck Volumes	2018 Existing		2050 No-Build		2050 Build		Difference (Build - No-Build)	
	ADT	Truck (%)	ADT	Truck (%)	ADT	Truck (%)	ADT	Truck ADT
Mainline								
Price Rd to Dobson Rd	158,960	9.5%	213,554	11.8%	242,326	12.3%	28,772	4,736
Dobson Rd to Alma School	182,355	8.9%	242,546	11.0%	279,704	11.4%	37,158	5,330
Alma School Rd to Arizona	171,605	8.6%	229,602	10.7%	271,381	11.2%	41,779	5,740
Arizona Ave to McQueen Rd	161,198	8.0%	217,866	9.8%	241,807	10.6%	23,941	4,151
McQueen Rd to Cooper Rd	155,367	8.3%	217,860	9.6%	259,363	10.2%	41,502	5,463
Cooper Rd to Gilbert Rd	139,935	8.4%	204,147	9.6%	242,460	10.2%	38,313	5,045
Gilbert Rd to Lindsay Rd	120,369	8.3%	193,144	9.9%	230,382	10.4%	37,239	4,749
Lindsay Rd to Val Vista Dr	120,369	8.3%	160,575	9.4%	192,234	9.8%	31,659	3,750
East of Val Vista Dr	100,719	8.1%	138,970	9.0%	166,918	9.6%	27,948	3,482
Intersection								
Price Rd & WB SR 202	51,098	6.3%	64,074	7.2%	65,936	7.4%	1,862	257
Price Rd & EB SR 202	50,896	7.2%	65,559	8.1%	66,415	8.3%	856	186
Dobson Rd & WB SR 202	29,801	3.4%	57,880	3.3%	42,539	3.9%	1,602	158
Dobson Rd & EB SR 202	42,112	2.9%	60,572	3.5%	63,343	3.7%	2,771	263
Alma School Rd & WB SR 202	48,268	3.2%	68,517	3.7%	69,266	3.8%	749	64
Alma School Rd & EB SR 202	51,743	4.0%	70,497	4.4%	72,683	4.4%	2,186	103
Arizona Ave & WB SR 202	53,893	5.4%	68,904	7.2%	70,479	7.2%	1,575	74
Arizona Ave & EB SR 202	51,240	6.5%	67,006	8.2%	68,995	8.3%	1,989	282
McQueen Rd & WB SR 202	40,007	5.7%	54,872	4.9%	53,326	5.4%	-1,545	175
McQueen Rd & EB SR 202	52,306	6.7%	66,727	5.5%	61,080	6.0%	-5,647	25
Cooper Rd & WB SR 202	39,944	4.3%	51,948	3.9%	53,160	4.3%	1,212	233
Cooper Rd & EB SR 202	41,340	4.7%	59,204	4.5%	56,643	4.7%	-2,561	27
Gilbert Rd & WB SR 202	53,642	6.1%	65,088	4.8%	67,528	5.2%	2,441	376
Gilbert Rd & EB SR 202	67,836	5.9%	78,902	5.3%	79,329	5.7%	428	318
Lindsay Rd & WB SR 202	N/A	N/A	72,545	4.8%	74,332	5.4%	1,787	497
Lindsay Rd & EB SR 202	N/A	N/A	87,146	5.8%	90,112	6.5%	2,966	778
Val Vista Dr & WB SR 202	39,027	5.5%	47,583	4.3%	47,162	4.5%	-421	91
Val Vista Dr & EB SR 202	60,130	5.9%	59,699	5.5%	63,490	5.6%	3,790	304

Note: Truck% include heavy truck and medium truck. ADT at intersections include volumes on approach lanes. Source: MAG traffic demand model received from Burgess & Niple on March 28, 2022, revised 2050 No Build model with Lindsay Rd TI included was received from Burgess & Niple on October 31, 2022.

Table 2 – Intersections LOS in the project area

Level of Service (LOS)	2018 Existing		2050 No-Build		2050 Build	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
	LOS (delay)	LOS (delay)	LOS (delay)	LOS (delay)	LOS (delay)	LOS (delay)
Intersection LOS (overall, not for each link)						
Price Rd & WB SR 202	C (21.4)	C (21.5)	C (23.6)	D (44.5)	C (28)	D (42.9)
Price Rd & EB SR 202	B (19.1)	C (25.1)	C (24.9)	D (51.9)	C (23.3)	D (48.5)
Dobson Rd & WB SR 202	B (14.1)	A (8.8)	B (13.2)	B (13.6)	B (14.4)	B (13.4)
Dobson Rd & EB SR 202	A (6.8)	A (3.3)	B (10.6)	A (7.9)	B (11.6)	A (9.4)
Alma School Rd & WB SR 202	B (18.1)	B (17.6)	B (17.3)	C (31.4)	C (30.4)	D (41.6)
Alma School Rd & EB SR 202	B (12.6)	C (25.1)	C (25.6)	E (58.1)	D (40.5)	E (62.4)
Arizona Ave & WB SR 202	B (19.1)	B (17.2)	C (27.4)	C (34.3)	B (17.3)	C (25.7)
Arizona Ave & EB SR 202	B (14)	B (17.6)	B (14.9)	C (20.7)	C (22.6)	B (19.9)
McQueen Rd & WB SR 202	B (16.2)	B (15.2)	B (15.7)	B (16.1)	C (21.2)	C (22.2)
McQueen Rd & EB SR 202	B (15.4)	C (26.6)	C (21.0)	C (27.0)	C (24.4)	C (30.6)
Cooper Rd & WB SR 202	B (14.8)	B (16.3)	B (16.1)	B (19.0)	B (19.7)	C (22.2)
Cooper Rd & EB SR 202	B (18)	B (15.5)	C (20.5)	C (23.1)	C (22.6)	C (29.9)
Gilbert Rd & WB SR 202	B (19.9)	B (16.6)	E (59.3)	F (126.3)	E (68)	F (138)
Gilbert Rd & EB SR 202	B (14.8)	B (17.2)	C (28.6)	F (109.7)	D (40)	F (125.9)
Lindsay Rd & WB SR 202	N/A	N/A	C (33.9)	F (100.9)	C (29.7)	F (116.6)
Lindsay Rd & EB SR 202	N/A	N/A	C (22.5)	F (130.8)	C (23.9)	F (119)
Val Vista Dr & WB SR 202	C (28.6)	C (31.1)	D (54.9)	E (79.0)	E (60.9)	F (102.8)
Val Vista Dr & EB SR 202	C (25.3)	C (26.8)	F (88.0)	F (90.6)	E (65.6)	E (72.9)

Source: LOS data provided by Burgess & Niple. MAG traffic demand model received from Burgess & Niple on March 28, 2022, revised 2050 No Build model with Lindsay Rd TI included was received from Burgess & Niple on October 31, 2022.

Projects Affecting Intersections with Highest Traffic Volumes

Does the project affect one or more of the top three intersections in the CO maintenance area with highest traffic volumes identified in the CO applicable implementation plan?

*Three Highest Intersections in Current Plans

MAG[1]
16th St & Camelback Rd
107th Ave & Grand Ave
Priest Dr & Southern Ave

[1]MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area

NO. This project does not affect one or more of the top three intersection in the carbon monoxide maintenance area with the highest traffic volumes identified in the MAG 2013 Carbon Monoxide Maintenance Plan for Maricopa County.

Projects Affecting Intersections with the Worst Level of Services
Does the project affect one or more of the top three intersections in the CO maintenance area with the worst level of services identified in the CO applicable implementation plan?

*Three Worst LOS Intersections in Current Plans

MAG[1]
7th Ave & Van Buren St
German Rd & Gilbert Rd
Thomas Rd & 27th Ave

[1]Same as above

NO. This project does not affect one or more of the top three intersections with the worst LOS in the MAG 2013 Carbon Monoxide Maintenance Plan for Maricopa County.

Hot-Spot Determination – Part B

Decide which type of hot-spot analysis is required for the project by choosing a category below.

☒ **If answered "Yes" to any of the questions in the Project Assessment – Part A**

- A quantitative CO hot-spot analysis is required under 40 CFR 93.123(a)(1).
  ☒ Check **If** a formal air quality report for conformity is required for this project.
  - The applicable air quality models, data bases, and other requirements specified in 40 CFR part 51, Appendix W (Guideline on Air Quality Models)
  - Or

  Check **If** the project fits the condition of the "**CO Categorical Hot-Spot Finding"**. In the January 24, 2008, Transportation Conformity Rule Amendments, EPA included a provision at 40 CFR 93.123(a)(3) to allow the U.S. DOT, in consultation with EPA, to make categorical hot-spot findings in CO nonattainment and maintenance areas if appropriate modeling showed that a type of highway or transit project would not cause or contribute to a new or worsened air quality violation of the CO NAAQS or delay timely attainment of the NAAQS or required interim milestone(s), as required under 40 CFR 93.116(a)

  Projects Fitting the Condition of the CO Categorical Hot-Spot Finding
  (Updated 2/1/23) If the project's parameters fall within the acceptable range of modeled parameters, use FHWA 2023 CO Categorical Hot-Spot Finding Spreadsheet Tool:

  https://www.fhwa.dot.gov/environment/air_quality/conformity/policy_and_guidan_ce/cmcf_2023/index.cfm

NO – This project's parameters do not fall within the acceptable range of modeling parameters for a CO Categorical Hot-spot Finding.

☐ **If answered "No" to all of the questions in the Project Assessment – Part A**

- A qualitative CO analysis is required under 40 CFR 93.123(a)(2). The demonstrations required by 40 CFR 93.116 Localized CO, PM10, and PM2.5 violations (hot-spots) may be based on either:
- **(i) Quantitative methods that represent reasonable and common professional practice;**
  □ Check **If** an Air Quality Report includes CO modeling for NEPA EA/EIS use this report to satisfy option (i)

- **Or**

- **(ii) A qualitative consideration of local factors, if this can provide a clear demonstration that the requirements of 40 CFR 93.116 are met.**
  □ Check **If** there is an Air Quality Report that does not include CO modeling for NEPA EA/EIS use this report to satisfy (ii)
  □ Check **If** the project is a CE under NEPA that does not require Air Quality Report for NEPA EA/EIS use this Questionnaire to add additional justification to satisfy (ii)

Hot-Spot Determination

This project requires a quantitative hot-spot analysis for carbon monoxide. The intersections to be modeled were determined using EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections (EPA, 1992). The intersections with the highest volumes and longest delays were identified for the 2050 build alternative. The top three intersections ranked by volume are as follows:

- Lindsay Rd & EB SR 202
- Gilbert Rd & EB SR 202
- Lindsay Rd & WB SR 202

The top three intersections ranked by LOS and delay are as follows:

- Gilbert Rd & WB SR 202
- Gilbert Rd & EB SR 202
- Lindsay Rd & EB SR 202

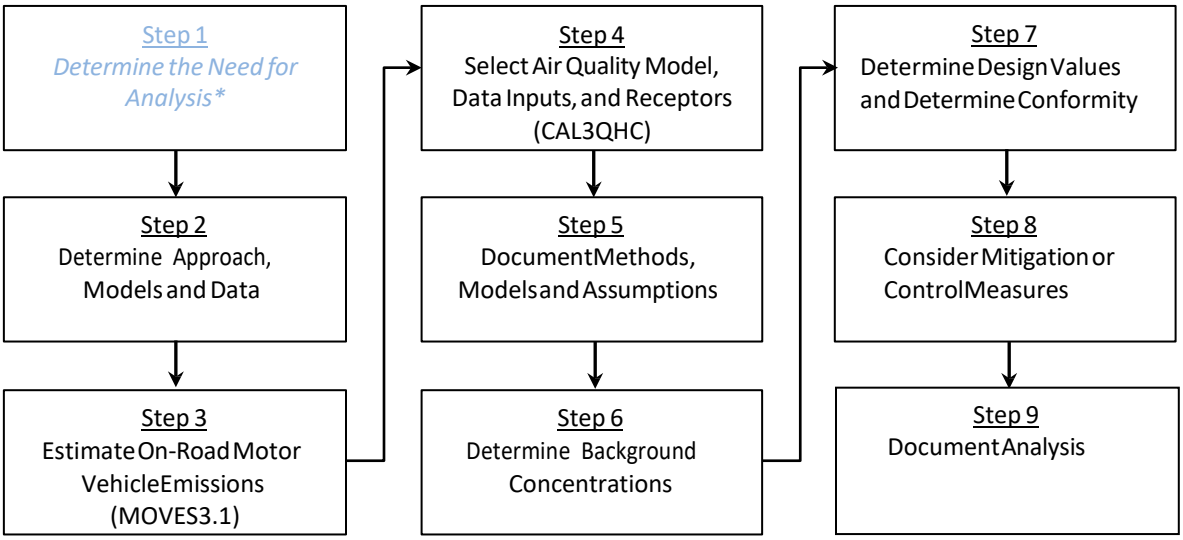
Based on the top intersections ranked by volume and by LOS and delay, the intersection modeling analysis will be performed for the following four intersections' peak hours of the days as highlighted in Table 2:

- Gilbert Rd & EB SR 202, PM Peak
- Gilbert Rd & WB SR 202, PM Peak
- Lindsay Rd & EB SR 202, PM Peak
- Lindsay Rd & WB SR 202, PM Peak

Modeling will be performed under the worst case scenario using the 2026 MOVES emission rates (the highest CO emission rates) with the 2050 traffic data (the maximum traffic volumes). 2026 is selected because it is the opening year. It is assumed that if the selected worst-case intersections do not show an exceedance of the NAAQS, none of the intersections will. Refer to the enclosed supplemental traffic study.

Completing a Carbon Monoxide (CO) Hot-Spot Analysis

The general steps required to complete a quantitative CO hot-spot analysis are outlined below and described in detail in the EPA Office of Transportation and Air Quality guidance document "Using MOVES3.1 in Project-Level Carbon Monoxide Analyses" EPA-420-B-21-047, December 2021, and "Guideline for Modeling Carbon Monoxide from Roadway Intersections" EPA-454/R-92-005, November 1992.



* Described in the previous section.

Table 3. Methods, Models and Assumptions for CO

MOVES3.1 and CAL3QHC Requirements		
Estimate On-Road Motor Vehicle Emissions (Step 3)		
MOVES3.1	**Description**	**Data Source**
Scale	On road, Project, Inventory	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.2
Time Spans	EPA 1992 Guideline conservatively uses a typical peak-hour traffic activity in one MOVES run to generate emission rates of 2026. *The worst case scenario using the January, weekdays, hours of 17:00- 17:59 in 2026 MOVES emission rates (the highest CO emission rates) with the 2050 traffic data (the maximum traffic volumes) will be selected.* According to EPA Guideline for Modeling Carbon Monoxide from Roadway Intersection July 1993, Section 4.7.1 states that as a simple alternative, the average temperature in January may be used.	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.3.
Geographic Bounds	Maricopa County	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.4

Onroad Vehicles	All Fuels and Source Use Types will be selected	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.5
Road Type	Urban Unrestricted access and Urban Restricted access	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.6
Pollutants and Processes	CO Running Exhaust, CO Crankcase Running Exhaust	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.7
Output	Database will be created, Grams, Miles, Distance Traveled, Population will be selected. Emissions process will be selected in the Output Emissions Detail. Emission rates for each process can be appropriately summed to calculate aggregate CO emission rates for each link.	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.8 & 2.3.9
Project Data Manager	Database and MOVES3.1 templates will be created to include local project data and information provided by MPO, e.g., MAG's or PAG's I/M programs, Age Distribution data which are consistent with the regional models. The average temperature and humidity in January for metrology data and the default MOVES fuel data will be used. Links and Link Source Type will be specific to project as provided by the traffic analysis, any missing information will use default MOVES3.1 data. After running MOVES, the MOVES CO_CAL3QHC_EF post-processing script is run.	EPA 1992 Guideline, Section 4.7.1., Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.1, 2.4 for Links; the required data necessary to be consistent with regional emissions analysis (40 CFR 93.123(c)(3)). See Table 2 below for details.
Select Air Quality Model, Data Inputs, and Receptors (Step 4)		
CAL3QHC	**Description**	**Data Source**
Emissions Sources	Emissions Rates in grams/mile will be developed using the inputs described in MOVES3.1 section above. The free flow and queue links defined for modeling with MOVES3.1 will be used as input into CAL3QHC. The emissions sources located in the project area are SR202 mainline, ramps, and cross streets. No nearby emission sources other than the roadway links included in the model run would be affected by the project.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, EPA-454/R-92-005, November 1992. Section 3.2 & 4.2.3.1 of Appendix W to 40 CFR Part 51, CO screening analyses of intersection projects should use the CAL3QHC dispersion model.

Traffic and Geometric Design	Lane Configuration, Lane Width, Signalization, Turning Movements, Median Width, Traffic Volume, Level of Service, Grade, % of Heavy-Duty Trucks, and Peak Hour Average Approach Speed. Figures (page 15 & 16) in this consultation document provide a visual representation of the lane configuration, lane width, and turning movements that will be used to model each intersection. Peak hour traffic volumes, vehicle speeds, and signal timing data were provided by the traffic analysts. These details will be available for review in the CAL3QHC input files provided as part of the Air Quality Report.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.4
Meteorology	Temperature, Wind Speed, Wind Direction, Atmospheric Stability Class, Mixing Heights and Surface Roughness. The average temperature and the average relative humidity used in MOVES runs were obtained from ADEQ AERMET data. The data completeness, their representativeness of meteorology of the project area, and QA/QC were provided by ADEQ document. A worst-case wind speed of 1.0 m/s was used in CAL3QHC model. Every 10^{o} of wind direction from 0 to 350^{o} (a total of 36 directions) was used. A "mixing" height (the height in the atmosphere to which pollutants rise) of 1,000 meters, and neutral atmospheric stability (stability class D) conditions were used in estimating microscale CO concentrations. Surface roughness lengths (Zo) should be selected dependent on the project areas land use type. For city land use consisting of single-family residential areas, which represents most of the project area, a surface roughness value of 108 was used in the CAL3QHC model.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.1
Persistence Factor	EPA's default persistence factor of 0.7 will be used to be conservative. The 1-hour CO concentration data was not available to estimate the persistence factor.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.2
Determine Background Concentrations (Step 6)		

Background Monitor	*The CO monitor located at West Chandler (WC) between Frye Road & Ellis Street in Chandler has similar environment settings as the project corridor. Three years of monitoring data (2019--2021) show a maximum 8-hour value of 1.3 ppm. 1.9 ppm (which is the 8-hour concentration divided by a persistence factor of 0.7) will be added to the maximum modeled hourly concentration for comparison to the NAAQS. 1.3 ppm will be added to the maximum 8-hour modeled concentration. The same background values will be used for all analysis years.* *See pages 17 – 19 for more information.*	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.3

Table 4. Project Data Manager Inputs		
Input	**Level of Detail/notes**	**Possible Data Source**
Meteorology	*Same for build and no-build scenarios. The average temperature and humidity will be determined by averaging all hourly temperature values for January 2019, 2020, and 2021. The average temperature of 55.8 degrees F and the average relative humidity of 46.2% will be used in all MOVES runs, regardless of analysis year or time of day.*	ADEQ, NOAA EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.1
AgeDistribution	*Same for build and no-build scenarios. Data from latest regional CO conformity analysis (Fall 2022 conformity) provided by MAG. Option 1 of using local age distribution will be used.*	ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.2
Fuel	*Same for build and no-build scenarios. MOVES default fuel supply and formulation information will be used.*	MPO, MOVES defaults EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.3
I/M Programs	*Same for build and no-build scenarios. Data from latest regional CO conformity analysis (Fall 2022 conformity) provided by MAG.*	MPO, MOVES defaults EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.4
Retrofit Data	*Not applicable for this project.*	Project specific modeling EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.5
Links	*Four selected intersections (EB SR202L & Gilbert Road, WB SR202L & Gilbert Road, EB SR202L & Lindsay Road, and WB SR202L & Lindsay Road) will be divided into links and each link's length (in miles), traffic volume (vehicle per hour), average speed (miles per hour) and road grade (percent) will be specified.* *Other roadway segments within 1000 feet of the intersection will be included. (See attachment for graphical representation of model setup)*	Project specific modeling, ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.6
Link Source Types	*Option 2 in the EPA's CO MOVES3 Guidance Section 2.4.7 will be used.*	Project specific modeling, ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.7
Link Drive Schedules, Operating Mode Distribution	*Average speed and road type (Option 1) will be used in the Links Importer based on posted speed limits. Data to develop project-specific drive schedules and operating mode distributions is not available.*	Project specific modeling, ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.8, 2.4.9
Off-Network, Hoteling	*Not applicable for this project.*	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.10

Table 5. Construction Emissions *(Only if Applicable)*		
Construction Emissions	*Construction Emissions will be addressed qualitatively because construction is not expected to last longer than 5 years at any individual site. In the context of CO, this is usually excess CO emissions due to traffic delay and/or detours.*	40CFR93.123(c)(5)"Each site which is affected by construction-related activities shall be considered separately, using established "Guideline" methods." If applicable, include analysis as an Appendix to the Air Quality Report.

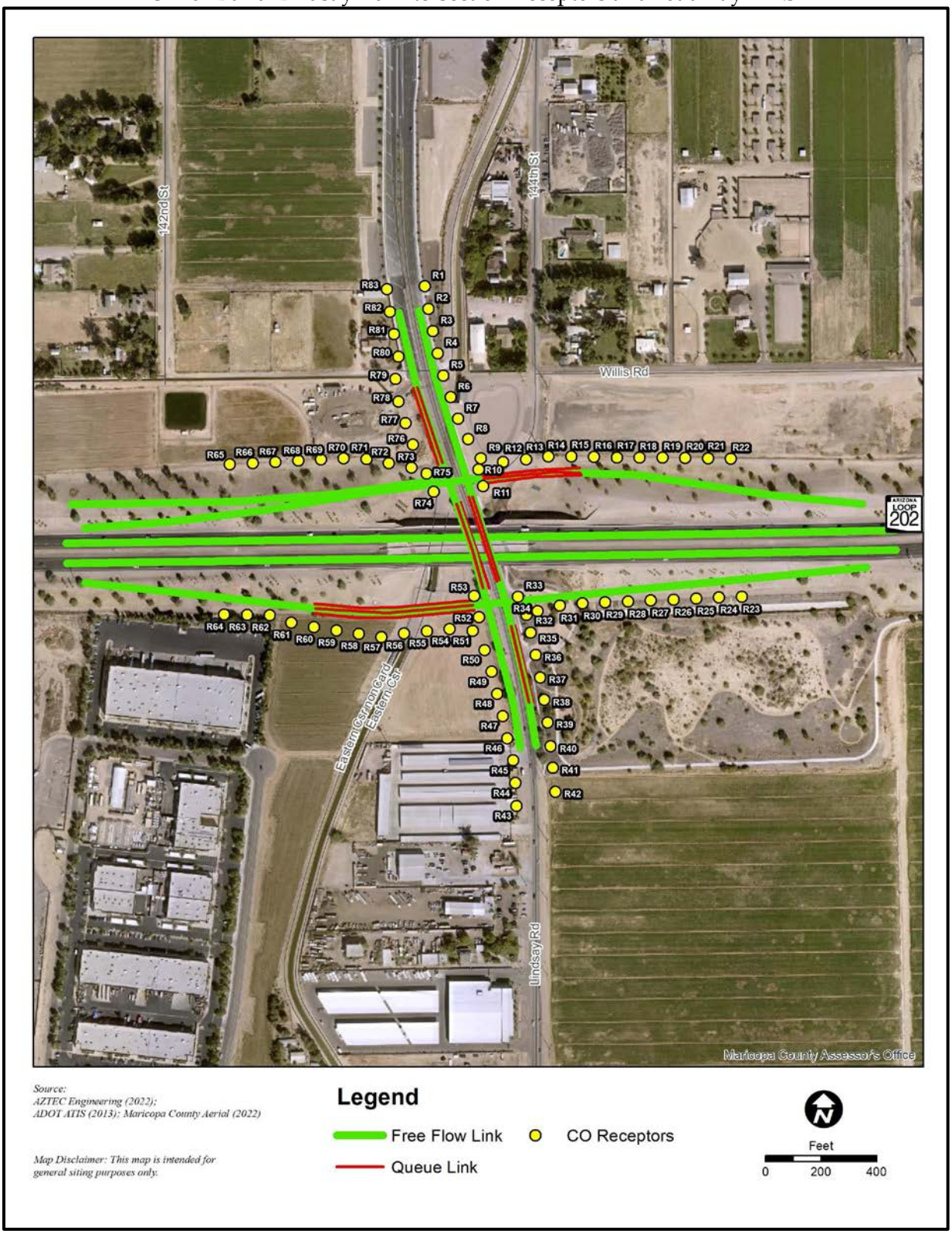
Preliminary Link Configurations and Receptor Placements for CO Hot-Spot Analysis

The following graphics present the preliminary link configurations and receptor placements for the four intersections that will be modeled as part of the CO hot-spot analysis in CAL3QHC. The following applies to all figures:

- Free flow links extend 1000 feet away from center of signalized intersection
- Graphic representation of free flow links includes 10-foot mixing zone
- Traffic activity within 1000 feet from intersections are included
- Yellow circles are receptors located on or adjacent to the existing R/W (more than 10 feet from the edge of roadway).
- Receptors are spaced at 82 feet (25 meter) intervals at the height of 1.8 meters outside of the mixing zone.
- Receptor location coordinates will be provided by a separate file.

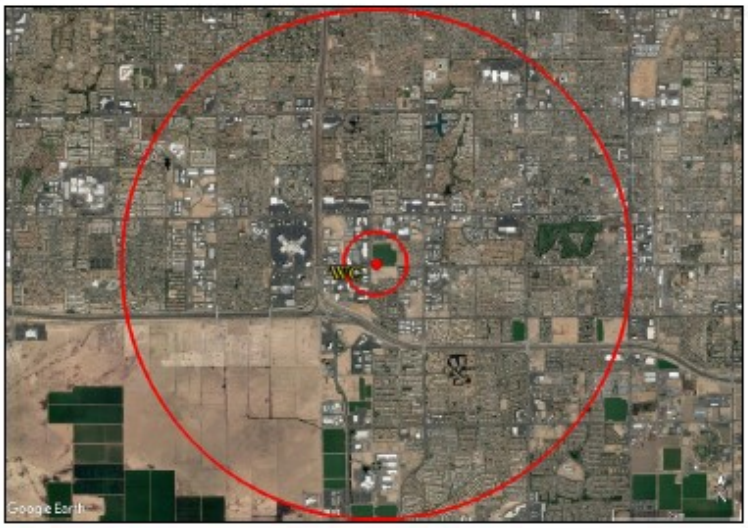
SR202L and Gilbert Road Intersection Receptors and roadway links

SR202L and Lindsay Rd Intersection Receptors and roadway links



Monitor Site and Windrose

West Chandler (WC) (04-013-4004)



Site Location	Frye Rd. & Ellis St., Chandler
Spatial Scale	Neighborhood
Site Type	Population Exposure

Site Description: This site began operating in January 1995, This SLAMS location monitors for CO, O_3, and PM_{10}. Meteorological monitoring includes ambient temperature, barometric pressure, relative humidity, and wind speed/direction.

The site is surrounded by residential, agricultural, and heavy industrial operations, such as semiconductor manufacturing plants and liquid air storage. The PM_{10} monitor's scale of representativeness was first established as middle scale, but it was changed to neighborhood in June 2018 to better reflect land use currently surrounding the site and to match general monitoring requirements found in *40 CFR Part 58 Appendix D, Table D-1.*

Pollutant	Metric	2018	2019	2020
CO	Maximum 8-hr CO Average (ppm)	1.7	1.0	1.3
	Number of 8-hr CO Exceedance Days	0	0	0
O_3	Maximum 8-hr O_3 Average (ppm)	0.075†	0.082†	0.081†‡
	Number of O_3 Exceedance Days	2	6	5
	3-yr 8-hr 4th Highest O_3 Average (ppm)	0.070	0.072#	0.072#
PM_{10}	Maximum 24-hr PM_{10} Average ($\mu g/m^3$)	382†‡	67	263
	Number of 24-hr PM_{10} Exceedance Days	7	0	1
	Annual PM_{10} Average ($\mu g/m^3$)	35.1	24.3	30.7

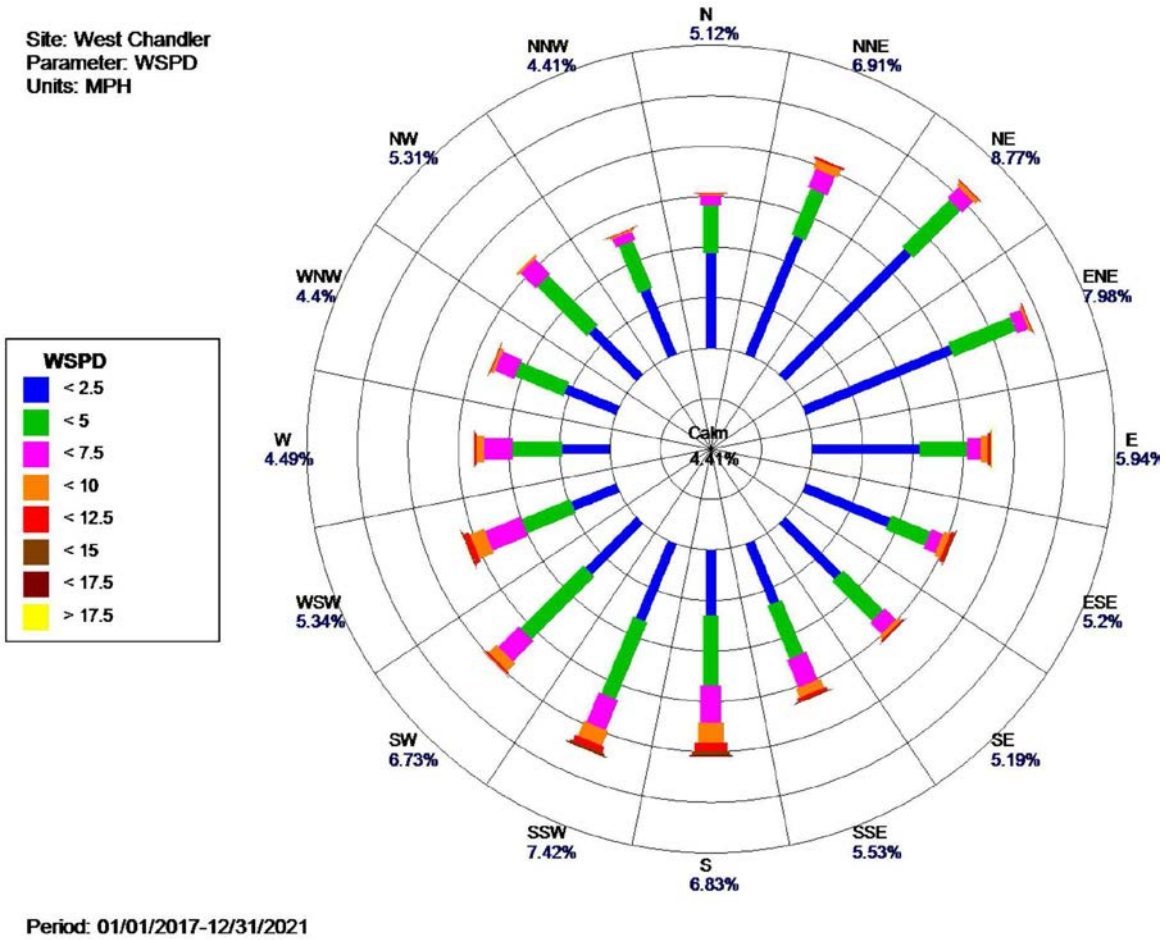
† - Indicates an exceedance of the standard
‡ - Indicates EE submission – listed value is currently the official maximum concentration in AQS
# - Indicates a violation of the standard
Source: EPA AQS database - *2018 – 2020 Quicklook Criteria Report (AMP450)*
MCAQD 2018 - 2020 O_3 and PM_{10} Exceedance Day Reports for Numbers

Table 8. 2021 8-hour CO Average Data Summary

Site	CO 8-hour Average Maximum (ppm)	CO 8-hour Average 2nd Maximum (ppm)
Buckeye	0.6	0.6
Central Phoenix	2.0	2.0
Eastwood	1.0	1.0
Mesa	1.1	1.1
South Phoenix	1.7	1.6
*Thirty-Third	2.3	1.9
West Chandler	1.2	1.1
West Phoenix	3.5	2.6

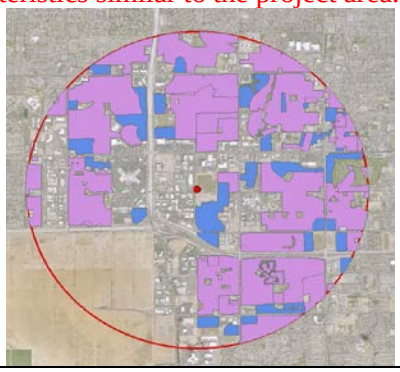
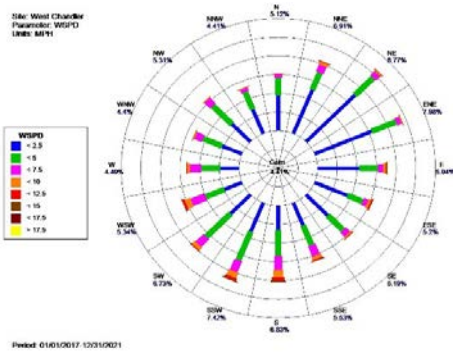
* - Site temporarily monitoring for CO in 2021

Source: EPA AQS database – *2021 Quicklook Criteria Report (AMP450)*



Source: email from Ron Pope (AQD) Thu, Dec 1, 2022

Percentages were added to the land use/terrain row below. Wind rose figures were added in the Wind pattern row below, which include the wind speed in each direction and wind percentages for each wind direction.

	Project Area	West Chandler (WC) AQS ID: 04-013-4004 Address: 275 S Ellis, Chandler 0.5 miles to project
Collection frequency, completeness, and background concentration	N/A	Continuous monitoring overall CO data completeness is 97.9% in 2021, 96.7% in 2020, and 95.4% in 2019. Three years of monitoring data show a maximum 8-hour value of 1.3 ppm. 1.9 ppm (which is the 8-hour concentration divided by a persistence factor of 0.7) will be added to the maximum modeled hourly concentration for comparison to the NAAQS. 1.3 ppm will be added to the maximum 8-hour modeled
Land use/terrain	Density (developed area), emission sources (near the traffic interchange), land use (residential area [47%] & vacant and open space [17%] commercial [6%], office [3%], light industrial [4%]), terrain (relative flat).	Density (developed area), emission sources (near the traffic interchange), land use (residential area [47%] & vacant and open space [18%] commercial [6%], office [6%], light industrial [5%]), terrain (relative flat). The West Chandler monitor is located in fringe area away from central Phoenix, characteristics similar to the project area. 
Wind patterns	N/A	Does not show significant upwind patterns to the project area. 
Nearby sources:	N/A	No nearby sources other than roadways

West Chandler monitor is the closest CO monitor to the project area (approximately 0.5 mile). Other CO monitors in the valley are more than 10 miles away from the project area. The distance from the CO monitor to the project area is a primary consideration in selecting background CO monitor for the project. In addition, the land use and terrain characteristics are similar between the West Chandler monitor and the project vicinity, as a result, West Chandler monitor is preferable over the other monitors and was selected as CO background monitor for the project.

Project Level PM Quantitative Hot-Spot Analysis Consultation

Project Setting and Description

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being carried out by Arizona Department of Transportation (ADOT), pursuant to 23 U.S.C. 326 and a Memorandum of Understanding dated January 4, 2021, and executed by the Federal Highway Administration (FHWA) and ADOT. ADOT is planning to install general purpose lane (GPL) for the State Route 202 Loop Santan Freeway (SR 202L) between approximately milepost (MP) 51.00 and MP 42.00, within the City of Chandler and the Town of Gilbert, Maricopa County, Arizona.

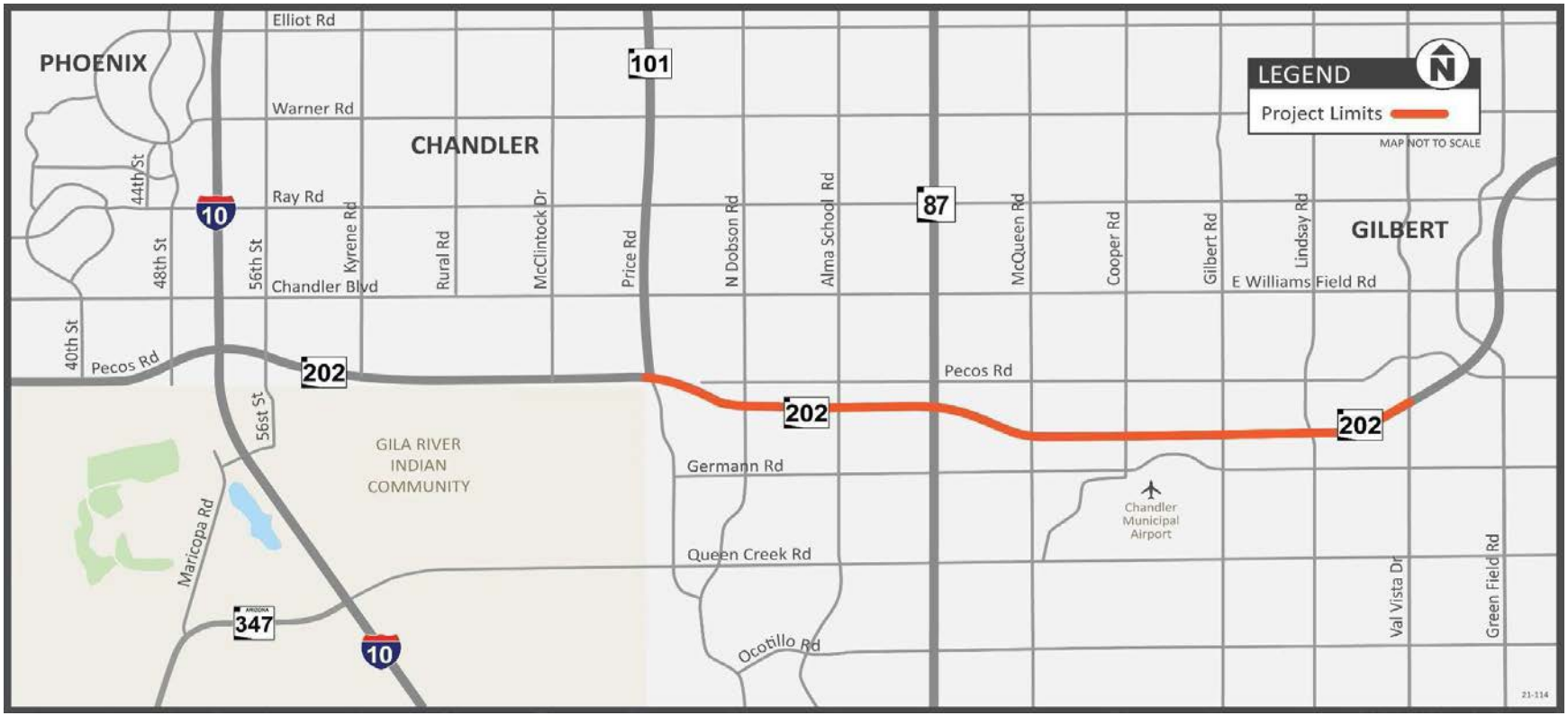
This section of the SR 202L is a six lane divided freeway with a high-occupancy vehicle (HOV) lane in each direction. The freeway is part of the Phoenix Metropolitan Area's Regional Freeway System, with connections to the Interstate 10, serves as the end point of the State Route 101 (SR 101), and will be connected to the South Mountain Freeway currently being constructed. Increased congestion during peak traffic periods and 2040 projections of dramatic traffic increases has created the need for greater capacity along this section of the freeway. The purpose of this project is to increase freeway capacity and decrease existing and future traffic congestion.

The scope of work

- Adding one General Purpose Lane (GPL) to the outside of existing lanes in each direction of SR 202L from Gilbert Road to Val Vista Drive
- Adding two GPL to the outside of existing lanes in each direction of SR 202L between SR 101 and Gilbert Road
- Widening exit ramps to two lanes, and restriping lanes to accommodate additional lanes where feasible
- Widening bridges over the Arizona Avenue, Union Pacific Railroad, Consolidated Canal, and Lindsay Road
- Reconstructing the eastbound on-ramp bridge over Union Pacific Railroad
- Adding noise walls where warranted
- Construct retaining walls that will have the same design patterns as the existing walls in the corridor
- Relocate catch basins, storm drain and storm drain trunk lines and junction structures, and other drainage improvements
- Relocate and/or construct new ramp metering systems where ramps are being widened or realigned and other LED lighting where warranted
- Upgrade sidewalk ramps and signal poles to ADA compliance at TIs, as necessary

The project is located in the Maricopa County (Phoenix) Nonattainment Area for particulates 10-microns in diameter or less (PM10), eight-hour ozone, maintenance area for carbon monoxide. The project is included in the Maricopa Association of Governments 2022-2025 MAG Transportation Improvement Program (TIP) and MOMENTUM 2050 MAG Regional Transportation Plan, and regional conformity analysis (7322) as of February 14, 2023.

Figure 1. Project Vicinity Map



https://azdot.gov/projects/central-district-projects/loop-202-santan-freeway-loop-101-val-vista-drive

Project Assessment

The following questionnaire is used to compare the proposed project to a list of project types in 40 CFR 93.123(b) requiring a quantitative analysis of local particulate emissions (Hot-spots) in nonattainment or maintenance areas, which include:

i) New highway projects that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles;
ii) Projects affecting intersections that are at Level-of-Service D, E, or F with a significant number of diesel vehicles, or those that will change to Level-of-Service D, E, or F because of an increase in traffic volumes from a significant number of diesel vehicles related to the project;
iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;
iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and
v) Projects in or affecting locations, areas, or categories of sites which are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

If the project matches one of the listed project types in 40 CFR 123(b)(1) above, it is considered a project of local air quality concern and the hot-spot demonstration must be based on quantitative analysis methods in accordance to 40 CFR 93.116(a) and the consultation requirements of 40 CFR 93.105(c)(1)(i). If the project does not require a PM hot- spot analysis, a qualitative assessment will be developed that demonstrates that the project will not contribute to any new localized violations, increase the frequency of severity of any existing violations, or delay the timely attainment of any NAAQS or any required emission reductions or milestones in any nonattainment or maintenance area.

On March 10, 2006, EPA published *PM2.5 and PM10 Hot-Spot Analyses in Project-Level Transportation Conformity Determinations for the New PM2.5 and Existing PM10 National Ambient Air Quality Standards; Final Rule* describing the types of projects that would be considered a project of air quality concern and that require a hot-spot analysis (71 FR 12468- 12511). Specifically on page 12491, EPA provides the following clarification: "Some examples of *projects of air quality concern* that would be covered by § 93.123(b)(1)(i) and (ii) are: A project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 annual average daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic;" .." Expansion of an existing highway or other facility that affects a congested intersection (operated at Level-of-Service D, E, or F) that has a significant increase in the number of diesel trucks;" These examples will be considered as extreme cases for determining if the project is a project of air quality concern.

New Highway Capacity

Is this a new highway project that has a significant number of diesel vehicles? *Example: total traffic volumes ≥125,000 annual average daily traffic (AADT) and truck volumes ≥10,000 diesel trucks per day (8% of total traffic).*

NO – This project is not a new highway project.

Expanded Highway Capacity

Is this an expanded highway projects that have a significant increase in the number of diesel vehicles? *Example: the build scenario of the expanded highway or expressway causes a significant increase in the number of diesel trucks compared with the no-build scenario, truck volumes > 8% of the total traffic.*

YES – This highway project has a significant increase in the number of diesel vehicles. The ADT and truck percentage for the Build alternative were compared to the No Build alternative on 9 mainline sections and 18 intersections along the project corridor, as summarized in Table 1. The percentage increase in the medium and heavy trucks ranges from a -0.4% to 0.7% on mainline and from -0.1% to 0.7% at the intersections, and the total increase in medium and heavy truck ranging from 3,482 to 5,740 vehicles on mainline and from 25 to 778 vehicles at the intersections.

Table 1 – SR202L Mainline ADT and Truck ADT in Existing, No Build and Build Conditions

ADT and Truck Volumes	2018 Existing		2050 No-Build		2050 Build		Difference (Build - No-Build)		
	ADT	Truck (%)	ADT	Truck (%)	ADT	Truck (%)	ADT	Truck ADT	Truck (%)
Mainline									
Price Rd to Dobson Rd	158,960	9.5%	213,554	11.8%	242,326	12.3%	28,772	4,736	0.6%
Dobson Rd to Alma School Rd	182,355	8.9%	242,546	11.0%	279,704	11.4%	37,158	5,330	0.4%
Alma School Rd to Arizona Ave	171,605	8.6%	229,602	10.7%	271,381	11.2%	41,779	5,740	0.5%
Arizona Ave to McQueen Rd	161,198	8.0%	217,866	9.8%	241,807	10.6%	23,941	4,151	0.7%
McQueen Rd to Cooper Rd	155,367	8.3%	217,860	9.6%	259,363	10.2%	41,502	5,463	0.6%
Cooper Rd to Gilbert Rd	139,935	8.4%	204,147	9.6%	242,460	10.2%	38,313	5,045	0.6%
Gilbert Rd to Lindsay Rd	120,369	8.3%	193,144	9.9%	230,382	10.4%	37,239	4,749	0.5%
Lindsay Rd to Val Vista Dr	120,369	8.3%	160,575	9.4%	192,234	9.8%	31,659	3,750	0.4%
East of Val Vista Dr	100,719	8.1%	138,970	9.0%	166,918	9.6%	27,948	3,482	0.6%
Intersection									
Price Rd & WB SR 202	51,098	6.3%	64,074	7.2%	65,936	7.4%	1,862	257	0.2%
Price Rd & EB SR 202	50,896	7.2%	65,559	8.1%	66,415	8.3%	856	186	0.2%
Dobson Rd & WB SR 202	29,801	3.4%	57,880	3.3%	42,539	3.9%	1,602	158	0.2%
Dobson Rd & EB SR 202	42,112	2.9%	60,572	3.5%	63,343	3.7%	2,771	263	0.3%
Alma School Rd & WB SR 202	48,268	3.2%	68,517	3.7%	69,266	3.8%	749	64	0.1%
Alma School Rd & EB SR 202	51,743	4.0%	70,497	4.4%	72,683	4.4%	2,186	103	0.0%
Arizona Ave & WB SR 202	53,893	5.4%	68,904	7.2%	70,479	7.2%	1,575	74	-0.1%
Arizona Ave & EB SR 202	51,240	6.5%	67,006	8.2%	68,995	8.3%	1,989	282	0.2%
McQueen Rd & WB SR 202	40,007	5.7%	54,872	4.9%	53,326	5.4%	-1,545	175	0.5%
McQueen Rd & EB SR 202	52,306	6.7%	66,727	5.5%	61,080	6.0%	-5,647	25	0.5%
Cooper Rd & WB SR 202	39,944	4.3%	51,948	3.9%	53,160	4.3%	1,212	233	0.3%
Cooper Rd & EB SR 202	41,340	4.7%	59,204	4.5%	56,643	4.7%	-2,561	27	0.3%
Gilbert Rd & WB SR 202	53,642	6.1%	65,088	4.8%	67,528	5.2%	2,441	376	0.4%
Gilbert Rd & EB SR 202	67,836	5.9%	78,902	5.3%	79,329	5.7%	428	318	0.4%
Lindsay Rd & WB SR 202	N/A	N/A	72,545	4.8%	74,332	5.4%	1,787	497	0.6%
Lindsay Rd & EB SR 202	N/A	N/A	87,146	5.8%	90,112	6.5%	2,966	778	0.7%
Val Vista Dr & WB SR 202	39,027	5.5%	47,583	4.3%	47,162	4.5%	-421	91	0.2%
Val Vista Dr & EB SR 202	60,130	5.9%	59,699	5.5%	63,490	5.6%	3,790	304	0.2%

Note: Truck% include heavy truck and medium truck. ADT at intersections include volumes on approach lanes.
Source: MAG traffic demand model received from Burgess & Niple on March 28, 2022, revised 2050 No Build model with Lindsay Rd TI included was received from Burgess & Niple on October 31, 2022.

Projects with Congested Intersections

Is this a project that affects a congested intersection (LOS D or greater) that has a significant number of diesel trucks, OR will change LOS to D or greater because of an increase in traffic volumes from a significant number of diesel trucks related to the project?

YES. This is a project that affects a congested intersection of LOS D or will change LOS to D or greater which has a significant number of diesel trucks, see Table 2. The intersection operation analysis shows 10 intersections have a LOS of D, E, or F, and the number of trucks ranges between 1659 vehicles and 5857 vehicles at the intersection in 2050 Build, as shown in previous Table 1.

Table 2 – Intersections LOS in the project area

Level of Service (LOS)	2018 Existing		2050 No-Build		2050 Build	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
	LOS (delay)	LOS (delay)	LOS (delay)	LOS (delay)	LOS (delay)	LOS (delay)
Intersection LOS (overall, not for each link)						
Price Rd & WB SR 202	C (21.4)	C (21.5)	C (23.6)	D (44.5)	C (28)	D (42.9)
Price Rd & EB SR 202	B (19.1)	C (25.1)	C (24.9)	D (51.9)	C (23.3)	D (48.5)
Dobson Rd & WB SR 202	B (14.1)	A (8.8)	B (13.2)	B (13.6)	B (14.4)	B (13.4)
Dobson Rd & EB SR 202	A (6.8)	A (3.3)	B (10.6)	A (7.9)	B (11.6)	A (9.4)
Alma School Rd & WB SR 202	B (18.1)	B (17.6)	B (17.3)	C (31.4)	C (30.4)	D (41.6)
Alma School Rd & EB SR 202	B (12.6)	C (25.1)	C (25.6)	E (58.1)	D (40.5)	E (62.4)
Arizona Ave & WB SR 202	B (19.1)	B (17.2)	C (27.4)	C (34.3)	B (17.3)	C (25.7)
Arizona Ave & EB SR 202	B (14)	B (17.6)	B (14.9)	C (20.7)	C (22.6)	B (19.9)
McQueen Rd & WB SR 202	B (16.2)	B (15.2)	B (15.7)	B (16.1)	C (21.2)	C (22.2)
McQueen Rd & EB SR 202	B (15.4)	C (26.6)	C (21.0)	C (27.0)	C (24.4)	C (30.6)
Cooper Rd & WB SR 202	B (14.8)	B (16.3)	B (16.1)	B (19.0)	B (19.7)	C (22.2)
Cooper Rd & EB SR 202	B (18)	B (15.5)	C (20.5)	C (23.1)	C (22.6)	C (29.9)
Gilbert Rd & WB SR 202	B (19.9)	B (16.6)	E (59.3)	F (126.3)	E (68)	F (138)
Gilbert Rd & EB SR 202	B (14.8)	B (17.2)	C (28.6)	F (109.7)	D (40)	F (125.9)
Lindsay Rd & WB SR 202	N/A	N/A	C (33.9)	F (100.9)	C (29.7)	F (116.6)
Lindsay Rd & EB SR 202	N/A	N/A	C (22.5)	F (130.8)	C (23.9)	F (119)
Val Vista Dr & WB SR 202	C (28.6)	C (31.1)	D (54.9)	E (79.0)	E (60.9)	F (102.8)
Val Vista Dr & EB SR 202	C (25.3)	C (26.8)	F (88.0)	F (90.6)	E (65.6)	E (72.9)

Notes: Source: LOS data provided by Burgess & Niple. MAG traffic demand model received from Burgess & Niple on March 28, 2022, revised 2050 No Build model with Lindsay Rd TI included was received from Burgess & Niple on October 31, 2022.

New Bus and Rail Terminals

Does the project involve construction of a new bus or intermodal terminal that accommodates a significant number of diesel vehicles?

NO – This project does not construct any new bus or rail terminals.

Expanded Bus and Rail Terminals

Does the project involve an existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses (or trains) increases by 50% or more, as measured by arrivals?

NO – This project does not expand any bus or rail terminals.

Projects Affecting PM Sites of Violation or Possible Violation

Does the project affect locations, areas or categories of sites that are identified in the PM_{10} or $PM_{2.5}$ applicable plan or implementation plan submissions, as appropriate, as sites of violation or potential violation?

NO – The project location is not listed in MAG's 2012 SIP as a site of violation or potential violation.

Project Determination

This project is an expanded highway project was determined in prior consultation to be treated as a project that has a significant increase in the number of diesel vehicles on mainline and significant number of trucks at intersections. Therefore, ADOT is presenting this project for interagency consultation in accordance with 40 CFR93.105 as a Project that is of Air Quality Concern and thereby will require a PM hot-spot analysis.

The top three intersections ranked by volume are as follows:

- Lindsay Rd & EB SR 202
- Gilbert Rd & EB SR 202
- Lindsay Rd & WB SR 202

The top three intersections ranked by LOS and delay are as follows:

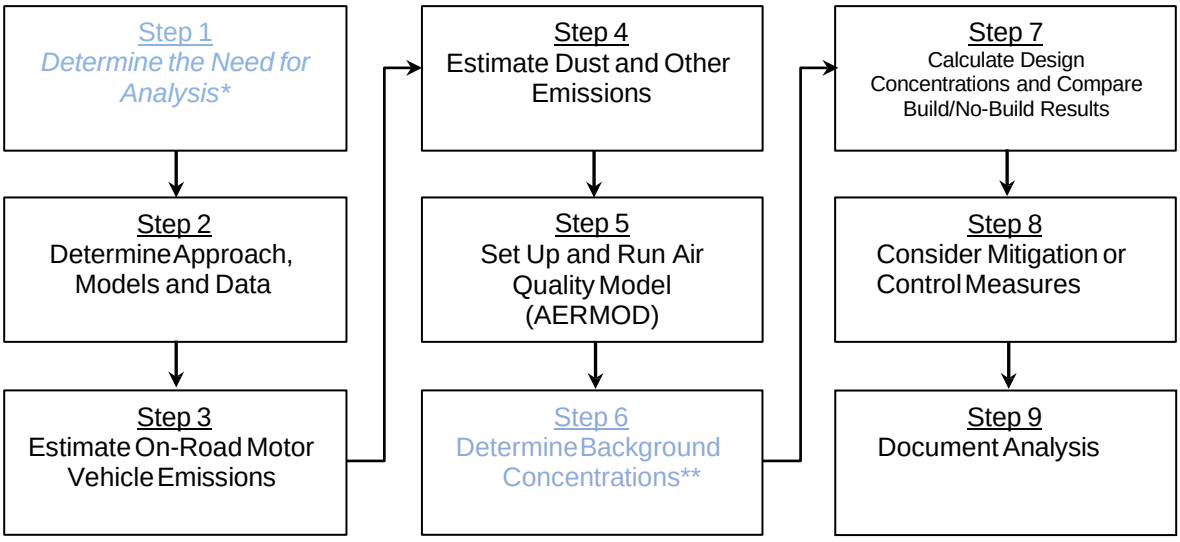
- Gilbert Rd & WB SR 202
- Gilbert Rd & EB SR 202
- Lindsay Rd & EB SR 202

Based on the top intersections ranked by volume and by LOS and delay, the intersection modeling analysis will be performed for the above four intersections. In addition, Alma School Rd & EB SR 202, Alma School Rd & WB SR 202, Arizona Ave & EB SR 202, and Arizona Ave & WB SR 202 intersections will be analyzed because of the largest SR 202 mainline ADT volumes and truck ADT volumes. Other intersections are not selected because of less intersection volumes or better LOS.

Project Level PM Quantitative Hot-Spot Analysis Modeling Assumptions

Completing a Particulate Matter (PM) Hot-Spot Analysis

The general steps required to complete a quantitative PM hot-spot analysis are outlined below and described in detail in the EPA Office of Transportation and Air Quality guidance document "Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas" EPA-420-B-15-084, November 2015.



* Described in the previous section.
** These Steps will be described and documented in Atypical Event Documentation.

Table 3. Proposed Inputs, Parameters and Data Sources

Estimate On-Road Motor Vehicle Emissions (Step 3)		
MOVES3.1	**Input**	**Data Source/Detail**
Scale	*Onroad, Project Scale and Inventory*	*MAG Regional Conformity Data (July, 2022)*
Time Spans	*2050, 16 runs* *PM_{10} emission factors were developed for an analysis year of 2050, which represents the year peak emissions from the project are expected. Vehicle emissions of PM10 are a combination of vehicle exhaust, brakewear, tirewear, and road dust. Road dust is the largest contributor to the overall emissions. Because road dust is highly dependent on vehicle volumes, the analysis year of 2050 was selected as the year of peak emissions because it was the year with the greatest vehicle volumes. This has been reflected in the 2021 MAG Conformity Analysis budget test, which resulted in highest PM10 emissions in 2050 due to largest VMT and the most surrounding PM emissions.*	*4 seasons (Jan, Apr, July & Oct) x 4 weekday time periods (6-9AM, 9AM-4PM, 4-7PM & 7PM-6AM)*
Geographic Bounds	*Maricopa County*	*EPA Hot Spot Guidance Section 4.4.4*

Onroad Vehicles	*All Fuels and Source Use Types*	*EPA Hot Spot Guidance Section 4.4.5*
Road Type	*Urban Restricted and Urban Unrestricted access*	*EPA Hot Spot Guidance Section 4.4.6*
Pollutants and Processes	*Primary Exhaust PM10-Total(for Running Exhaust and Crankcase Running Exhaust), Break Wear Particulate, Tire Wear Particulate*	*EPA Hot Spot Guidance Sections 2.5, 4.4.7*
General Output and Output Emissions Detail	*Output Database TBD*	*EPA Hot Spot Guidance Section 4.4.8, 4.4.9 & 4.6*
Create Input Database	*Input database will be created and modified for Project level using required Regional Inputs from latest Regional Conformity Analysis.*	*MAG Regional Conformity Data (July, 2022)*
Project Data Manager	*Database will be created and MOVES3.1 templates will be created to include local project data and information provided by MAG, e.g., Fuel, Age Distribution, Meteorology Data, to be consistent with the regional model. Links and Link Source Type will be specific to project as provided by the traffic study, any missing information will use default MOVES3.1 data.*	*EPA Hot Spot Guidance Sections 4.5 &Appendix D*
Meteorology	*MAG local specific data*	*MAG Regional Conformity Data (July, 2022)*
Age Distribution	*MAG local specific data*	*MAG Regional Conformity Data (July, 2022)*
Fuel	*MOVES default*	*EPA Hot Spot Guidance Section 4.5.3*
I/M Programs	*MAG local specific data*	*MAG Regional Conformity Data (July, 2022)*
Retrofit Data	*Not used*	
Links	*Please see attached the link maps.*	
Link Source Types	*Option 2 in the EPA's PM Hot- spot Guidance Section 4.5.7 will be used.*	*MAG Regional Conformity Data (July, 2022)*
Link Drive Schedules, Operating Mode Distribution	*Options 1 in the EPA's PM Hot-spot Guidance Section 4.5.8 will be used. Average speeds and road types through the Links Importer will be used.*	
Off-Network, Hoteling	*Not used*	
Estimate Dust and Other Emissions (Step 4)		
AP-42, Fifth Edition, 2011	**Parameter**	**Data Source/Detail**
Average Weight Vehicles	*Freeways 3.83 tons in 2025, 3.87 tons in 2030, 3.97 tons in 2040, and 4.08 tons in 2050. Arterials 2.48 tons in 2025, 2.49 tons in 2030, 2.48 tons in 2040, and 2.48 tons in 2050*	*Conformity Analysis for the FY 2022-2025 MAG TIP and the Momentum 2050 RTP, dated December, 2021.*

Silt Loading	*Section 13.2.1 Paved Roads from AP 42 will be used, consistent with the Regional analysis from MAG. Emission factors for road and construction dust should be added to the emission factors generated for each link by MOVES. Ex. Silt loading – Freeways .02 g/m^2, Arterials >10,000 ADT .067g/m^2, Low traffic roads <10,000 ADT .23g/m^2.*	*EPA Hot Spot Guidance Section 6, When estimating emissions of re-entrained road dust from paved road s, site-specific silt loading data must be consistent with the data used for the project's county in the regional emissions analysis (40 CFR 93.123(c)(3)).*
Construction Dust	*Construction Emissions will not be addressed because the construction of this project is not expected to last longer than 5 years. There are no other sources (e.g., locomotives) that need to be considered for most projects.*	EPA Hot Spot Guidance Section 6.5
Precipitation	*In 2008-2012 SIP/Regional Conformity used average of 32 days with at least .01 inch of precipitation County.*	*The MAG 2012 Five Percent Plan fo r PM-10 (used for the Conformity Analysis for the FY 2022-2025 MA G TIP and the Momentum 2050 RTP, dated December, 2021).*
Set Up and Run Air Quality Model (AERMOD) (Step 5)		
AERMOD v.22112	**Parameter**	**Data Source/Detail**
Model Setup (CO Pathway)		*EPA Hot Spot Guidance Section 7.1, 7.2 & Appendix J, AERMOD User's Guide Section 2. 3.2 & 3.2*
TITLEONE	*TBD*	
MODELOPT	*CONC FLAT. Initial modeling will be done with all sources and receptors at grade.*	*Modeling Concentrations and Flat Terrain*
AVERTIME	*24*	*Average across each 24-hour period from the available met data*
URBANOPT	*280,000*	*Population of Chandler AZ https://www.census.gov/quickfacts/fact/table/ cha*
FLAGPOLE	*Receptor height in meter, 1.8*	
POLLUTID	*PM10*	
Source Types and Characters (SO Pathway)		
LOCATION	*Srcid Srctyp (LINE)*	
SRCPARAM	*Srcid Lnemis Relhgt Width Szinit*	*LINE Source parameters See EPA Hot Spot Guidance Appendix J.3.1*
URBANSRC	*ALL*	*All urban source*

EMISFACT	*Emission rate=1, Use SEASHR (season by hour-of-day)* *As directed by the PM Hot Spot Guidance, emissions were input in a manner to reflect changes in emission factors and vehicle volumes throughout the day. This was represented in AERMOD by specifying an emission rate of 1 g/s/m² with the variable variable emission rate option to specify the emission rate of 96 emission factors (4 seasons/24 hours per day) for each emission source. Excel files that outline this process are included with MOVES and AERMOD modeling files for agency review.*	*Total 16 MOVES run=4 seasons x 4 time periods to 96 factors (4 seasons/24 hours)* *See PM hot-spot training slides (FHWA, 2022)*
SRCGROUP	*ALL*	
Meteorological Data (ME Pathway)		
SURFFILE	*Phoenix2017-2021.sfc* *ADOT followed up with ADEQ on the AERMET files- the Phoenix Sky Harbor Airport dataset. ~~that was also used for F0123 project.~~ ADEQ provided a document detailing the AERMET data completeness, their representativeness of meteorology of the project area, and QA/QC.*	*ADEQ Phoenix AERMET files*
PROFFILE	*Phoenix2017-2021.pfl* *ADOT followed up with ADEQ on the AERMET files- the Phoenix Sky Harbor Airport dataset. ~~that was also used for F0123 project.~~ ADEQ provided a document detailing the AERMET data completeness, their representativeness of meteorology of the project area, and QA/QC.*	*ADEQ Phoenix AERMET files*
SURFDATA	*23183 2017*	*ADEQ Phoenix AERMET files*
UAIRDATA	*23160 2017*	*ADEQ Phoenix AERMET files*
PROFBASE	*0*	*ADEQ Phoenix AERMET files*
Run Met Pre-Processor	*Not used*	

Urban or Rural Sources	*Specifications for URBANSRC (SO Pathway). The emission sources are SR202 mainlines, ramps, and cross streets. No nearby emission sources other than the roadway links included in the model run would be affected by the project. All emission sources used URBANOPT to specify urban dispersion coefficients. The PM Hot-spot Guidance recommends "in urban areas, sources should generally be treated as urban." Appendix W recommends multiple procedures to identify an area as urban. Using the Auer land use procedure described in Section 7.2.1.1(b)(i), based on aerial maps, greater than 80% of the land use within a 2-miles buffer around the project area includes industrial, commercial, dense single/multi-family, and multi-family two-story land use types. Therefore, the use of urban dispersion coefficients is appropriate for the project area.*	*EPA Hot Spot Guidance Section 7.5.5 & Appendix J.4, AERMOD Implementation Guide, Section 7.2.3 of Appendix W to 40 CFR Part 51*
Receptors (RE Pathway)	*Please see attached receptor maps on pages 17 to 20. Alma School Road TI, Arizona Avenue TI, Gilbert Road TI, and Lindsay Road TI were selected for PM hotspot analysis that were ranked by ADT volumes on mainline and at intersections, and LOS and delay at intersections. The receptor placement is consistent with the guidance. Receptors were placed along and outside the ADOT ROW. Additional receptors were placed at 25 meters for several front rows near the roadway sources per comment* ***(additional 305 receptors for Alma School Rd TI, additional 261 receptors for Arizona Ave TI, additional 272 receptors for Gilbert Rd TI, and additional 312 receptors for Lindsay Rd TI).*** *The highest PM concentration would normally occur at receptors near the roadway sources. The PM concentrations would decrease further away from the roadway sources, and receptor placements further away from the source would not affect the highest PM concentration design value for the intersection and analysis results.*	*EPA Hot Spot Guidance Section 7.6, AERMOD User's Guide Section 2.3.4 & 3.4, Section 7.2.2 of Appendix W to 40 CFR Part 51, See PM hot-spot training slides*

DISCCART	*X Y (Z)*	*Z is optional if FLAGPOLE is already defined in CO Pathway.*
GRIDCART	*Not used*	
Output (OU Pathway)		
RECTABLE	*24 6th*	*Since PM should be one or less exceedance per year, with 5 years of met data, the 6th highest concentration at each receptor*
PLOTFILE	*Not used*	
POSTFILE	*Not used*	
Model Runs		
Determine Background Concentrations (Step 6)		
Source Type	**Description**	**Data Source/Detail**
Nearby Sources	*There are no nearby emission sources that are expected to change as a result of the project. It is assumed that emissions from other nearby sources are already included in the ambient monitoring data.*	
Other Sources (Ambient Monitoring Data)	*Please see the selected monitor's location map and monitoring data with wind rose information. West Chandler monitor (WC) and Higley (HI) monitor were selected and a combination of two monitors will be used, especially given the significant difference in background DVs.* *The background concentration data of these two monitors are representative for the project area because:* *1. Similar characteristics between the monitor location and project area including density, mix of emission sources, land use, terrain, etc.* *2. Distance of monitor from the project area. These two monitors are closer to the project and have concentration most similar to the project area.* *3. Wind patterns between the monitor and the project area. The two monitors do not show significant upwind patterns.* ***Pending approval of ADOT's Atypical Events Report that includes detailed monitor data, calculations, and resulting recommended background concentrations.*** *For the design concentration, the highest sixth-highest value among all receptors should be added to the fourth highest background monitor value (Section 9.3.4 of PM Hot-spot Guidance). The design concentration will then be compared to NAAQS threshold for conformity determination.*	*EPA Hot Spot Guidance Section 8.3, PM hot-spot training slides Module 5 & 6*

Figure 1. PM Links and Receptors Placement for Air Quality Modeling
(Alma School Rd & SR202 TI)

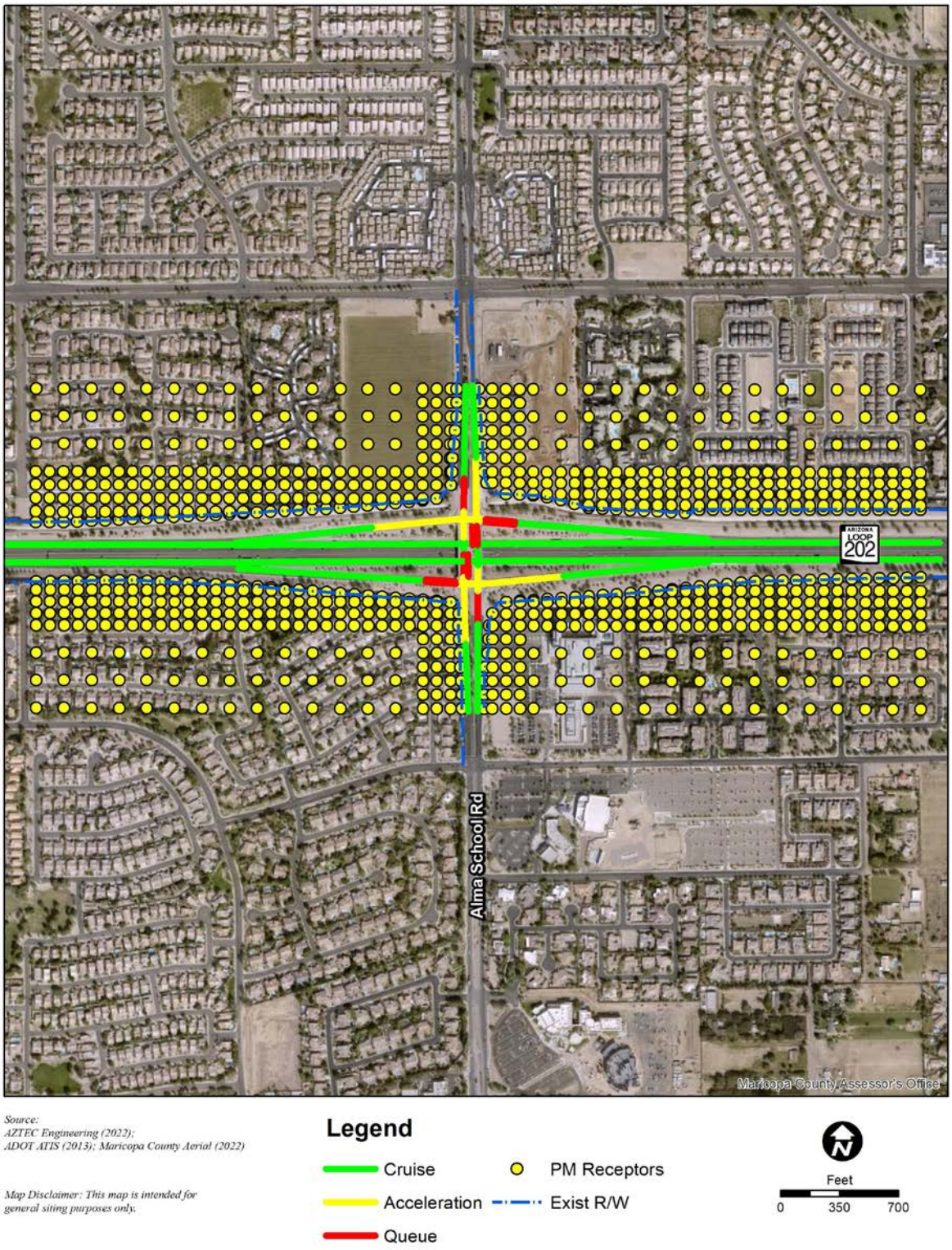
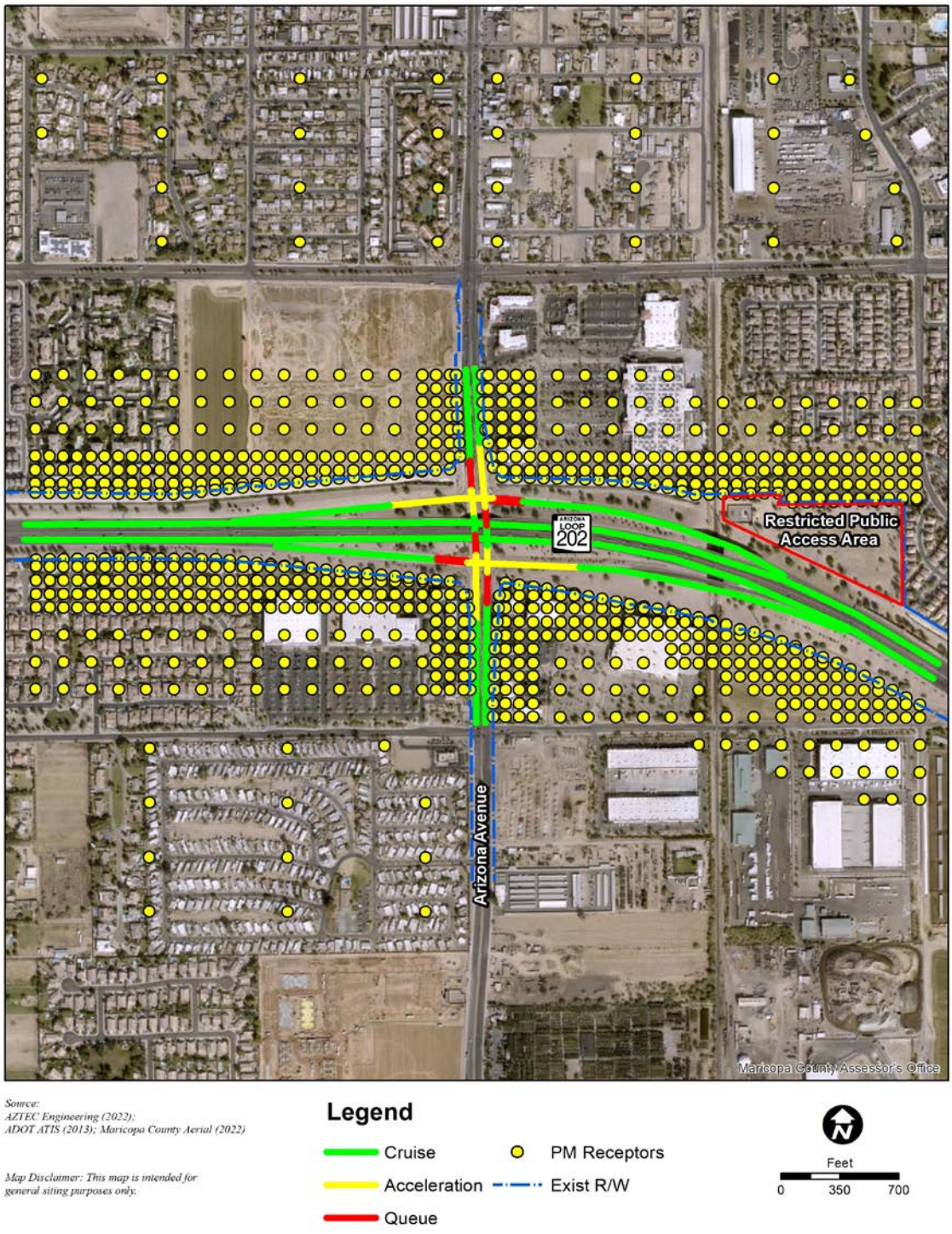


Figure 2. PM Links and Receptors Placement for Air Quality Modeling
(Arizona Avenue & SR202 TI)



No receptors were placed within the freeway ROW because they are restricted public access areas that are fenced off or blocked by privacy walls, such as the triangle area (in red line) as shown in Figure below.

Figure 3. PM Links and Receptors Placement for Air Quality Modeling
(Gilbert Road & SR202 TI)

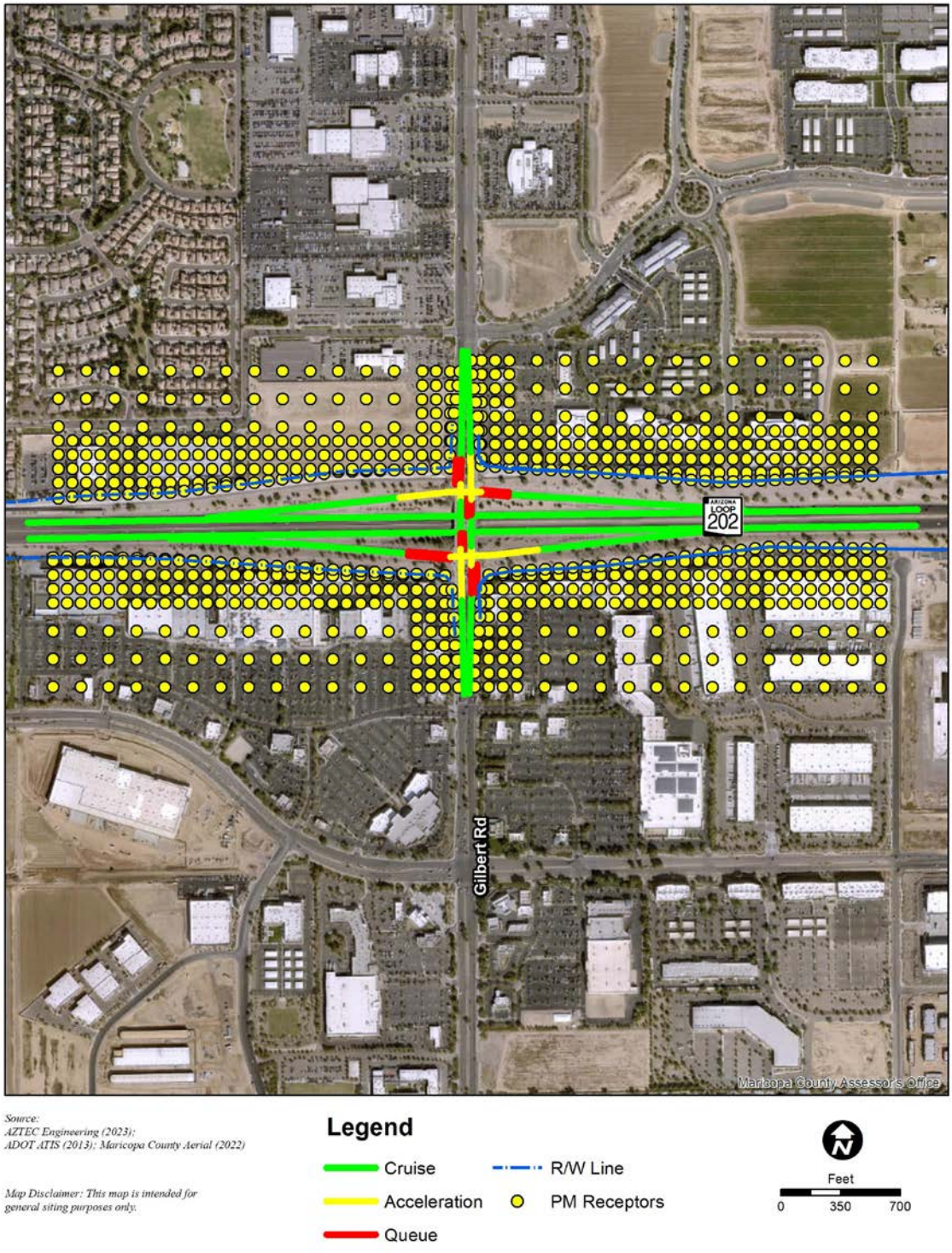


Figure 4. PM Links and Receptors Placement for Air Quality Modeling
(Lindsay Road & SR202 TI)

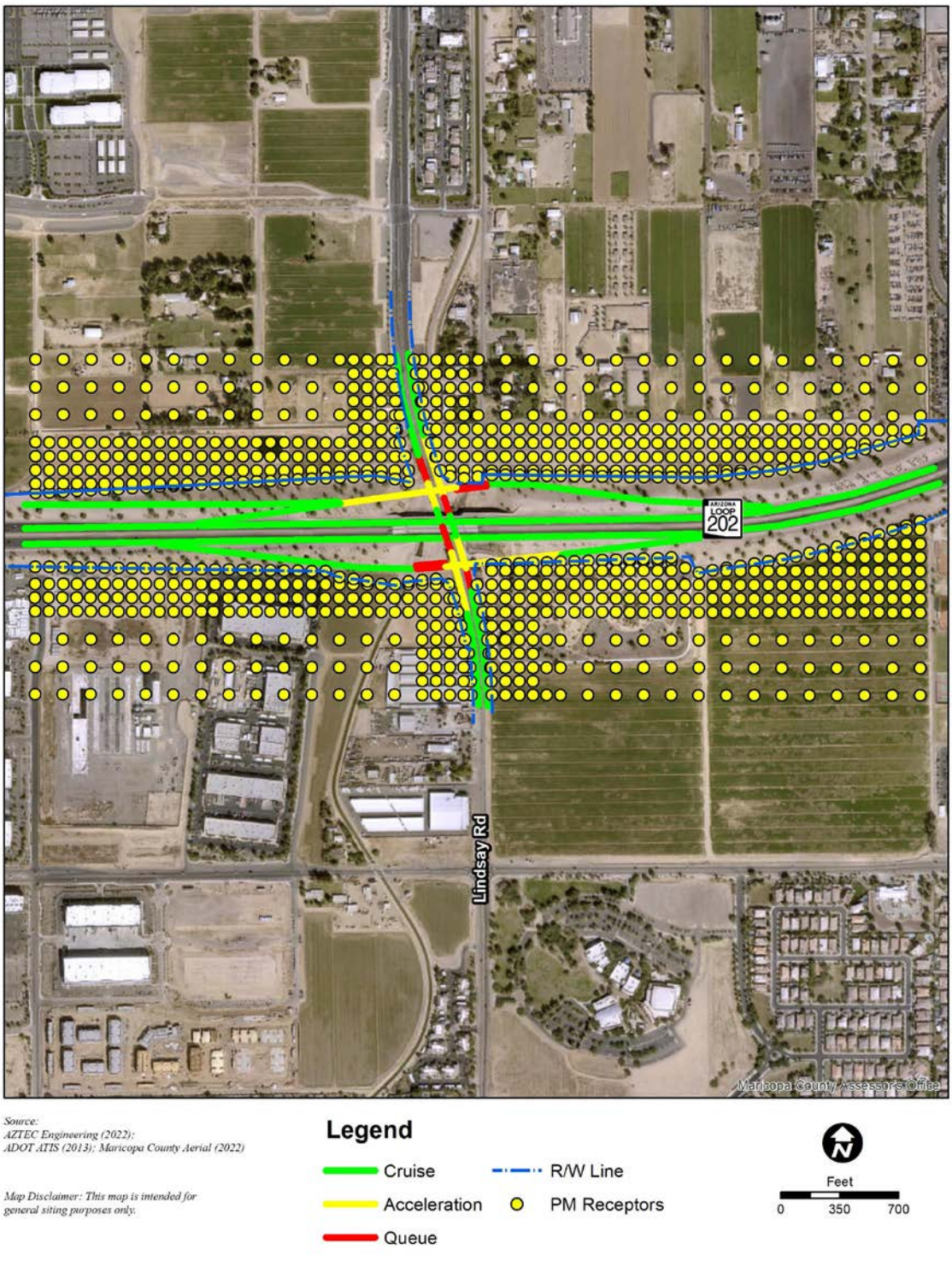
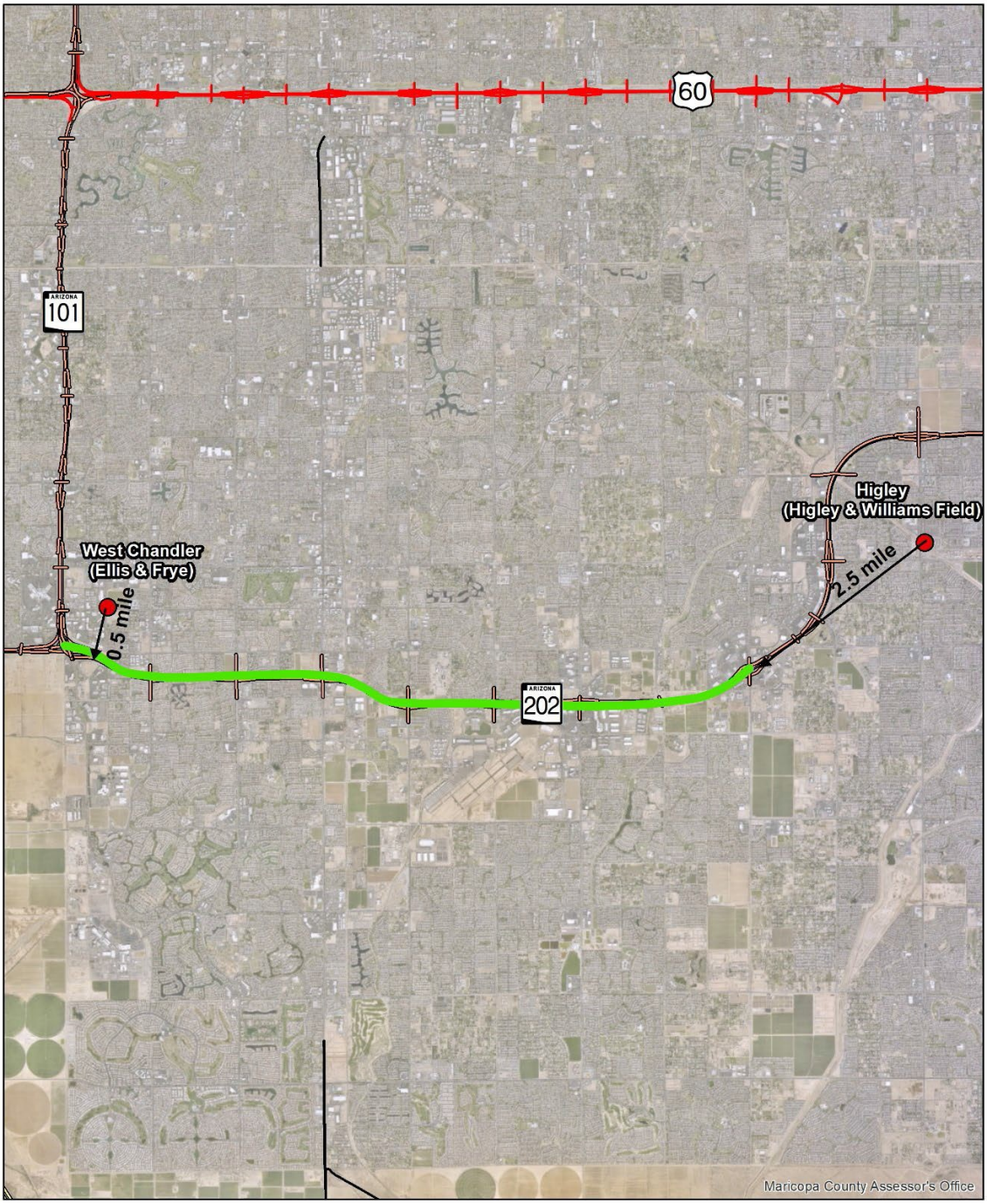
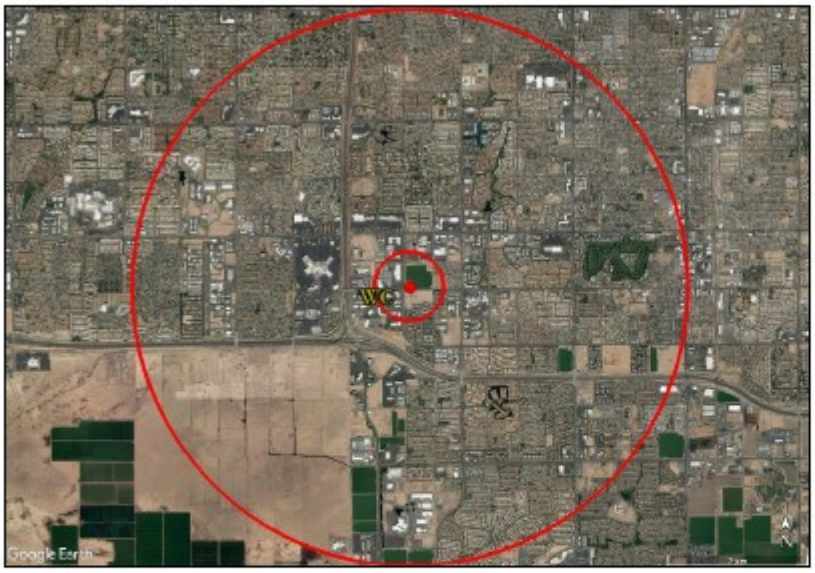


Figure 5. PM Monitoring Sites adjacent to the Project Area



West Chandler (WC) (04-013-4004)



Site Location	Frye Rd. & Ellis St., Chandler
Spatial Scale	Neighborhood
Site Type	Population Exposure

Site Description: This site began operating in January 1995, This SLAMS location monitors for CO, O_3, and PM_{10}. Meteorological monitoring includes ambient temperature, barometric pressure, relative humidity, and wind speed/direction.

The site is surrounded by residential, agricultural, and heavy industrial operations, such as semiconductor manufacturing plants and liquid air storage. The PM_{10} monitor's scale of representativeness was first established as middle scale, but it was changed to neighborhood in June 2019 to better reflect land use currently surrounding the site and to match general monitoring requirements found in *40 CFR Part 58 Appendix D, Table D-1.*

Number of complete monitoring days at West Chandler:

2019	2020	2021	Total
365	362	364	1091

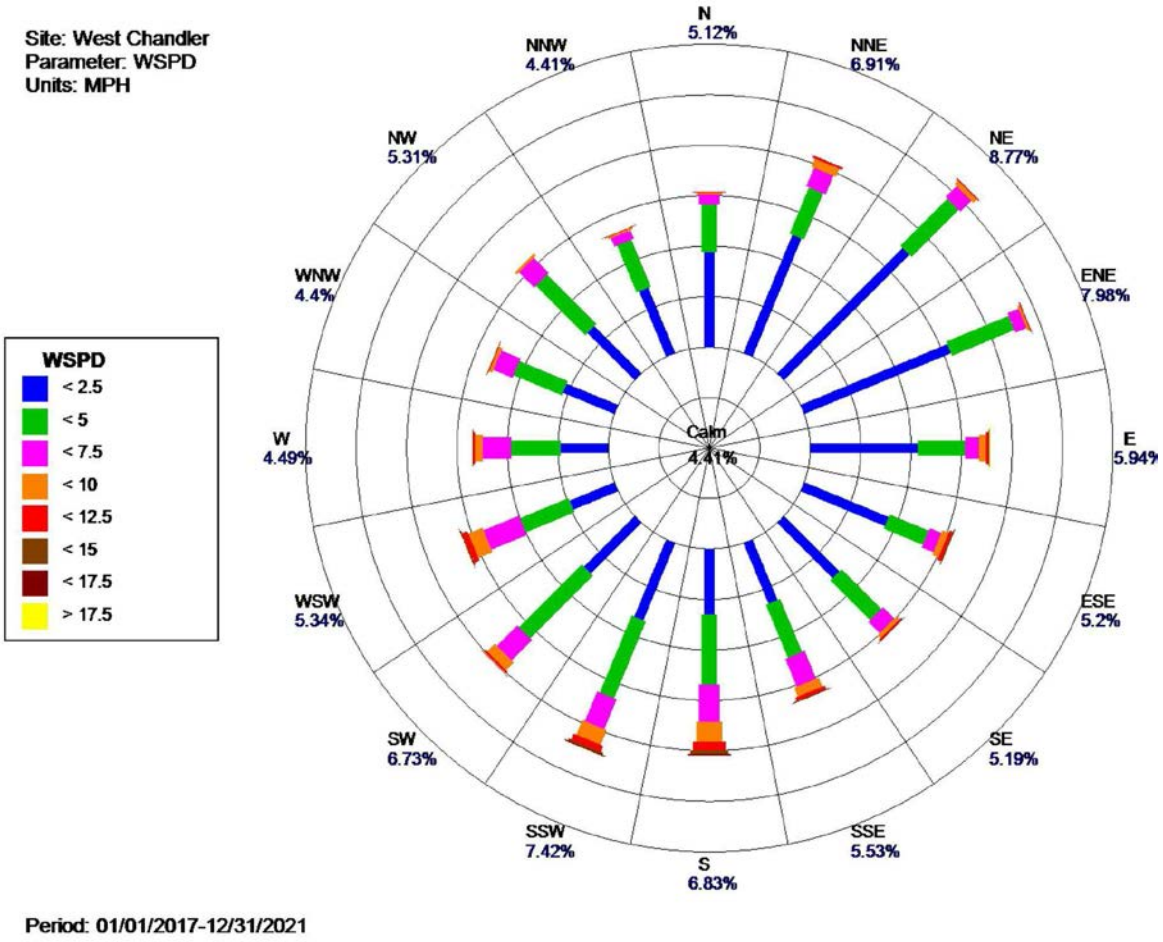
Highest 24-hour readings at West Chandler **Without** removing atypical events:

	2019	2020	2021
1	76	263	181
2	71	89	165
3	67	80	160
4	66	74	153

4th Highest 24-hour readings at West Chandler after removing atypical events. Pending EPA approval.

	2019	2020	2021
1	76	263	181
2	71	89	122
3	67	80	**89**
4	66	74	76

Source: https://www.epa.gov/outdoor-air-quality-data/download-daily-data



Source: email from Ron Pope (AQD) Thu, Dec 1, 2022

Higley (HI) (04-013-4006)

Site Location	Higley Rd. & Williams Field Rd., Gilbert
Spatial Scale	Neighborhood
Site Type	Population Exposure

Site Description: Originally, ADEQ began monitoring at this site in 1994 to measure background particulate concentrations near the urban limits of Maricopa County. The MCAQD assumed operating this site in July 2000. This SLAMS location monitors for PM_{10}. Meteorological monitoring includes ambient temperature, barometric pressure, and wind speed/direction.

The site is in a suburban area near homes, strip malls, and schools with limited agricultural operations nearby.

Number of complete monitoring days at Higley:

2019	2020	2021	Total
365	364	357	1086

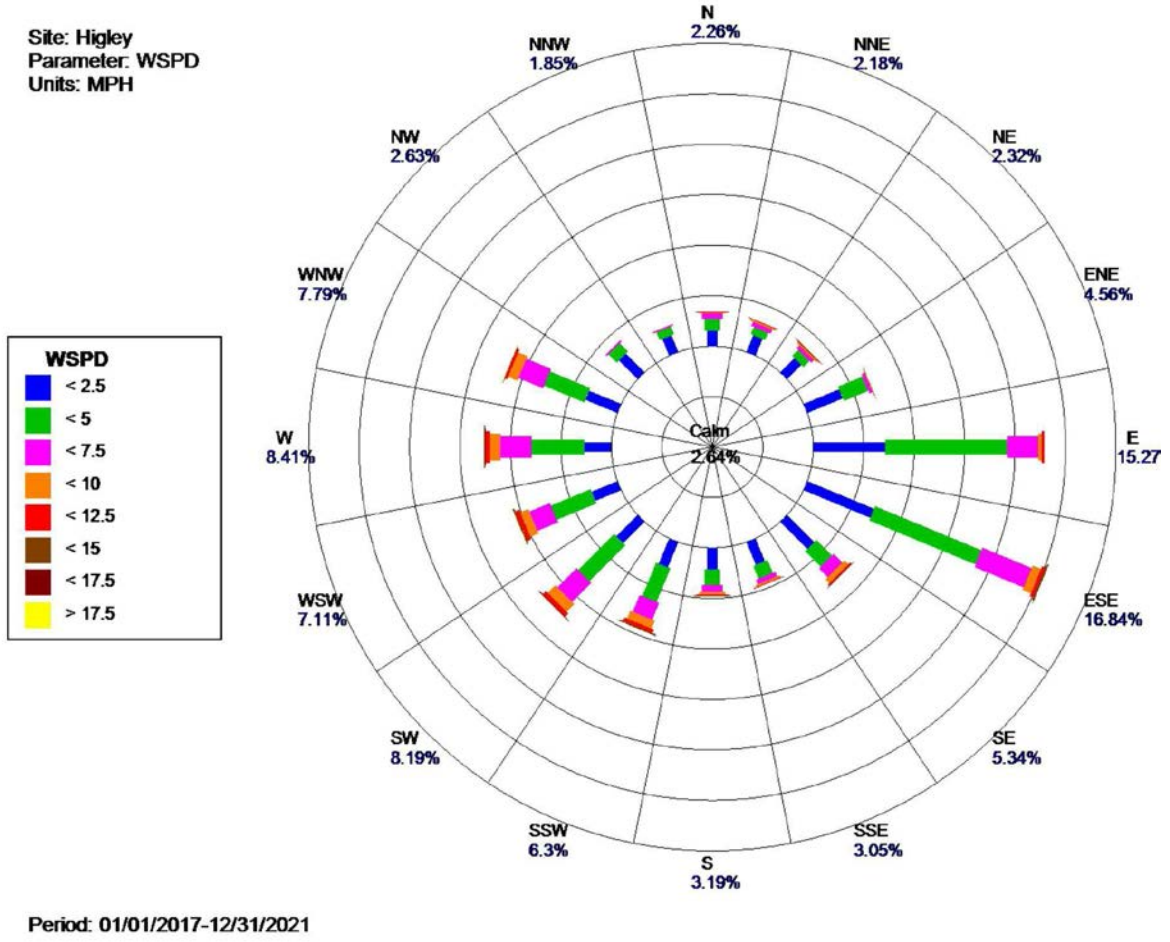
Highest 24-hour readings at Higley **Without** removing atypical events:

	2019	2020	2021
1	114	131	219
2	91	107	207
3	91	106	134
4	89	92	130

4th Highest 24-hour readings at Higley after removing atypical events. Pending EPA approval

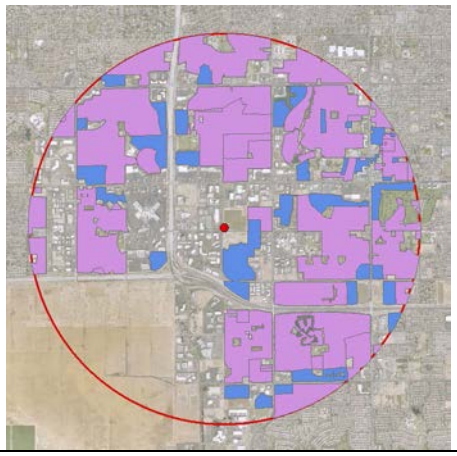
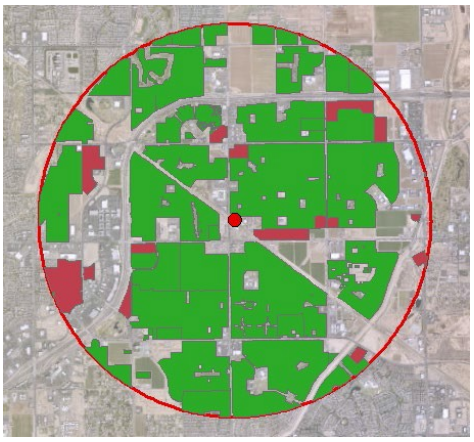
	2019	2020	2021
1	**114**	131	219
2	91	107	116
3	91	106	108
4	89	92	93

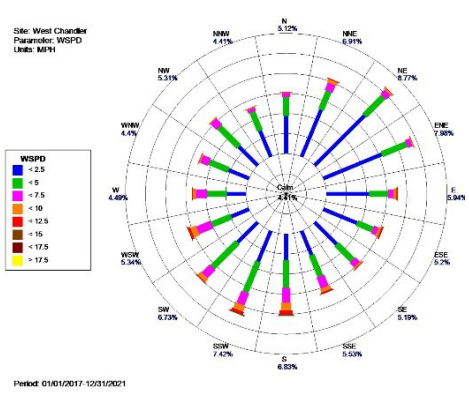
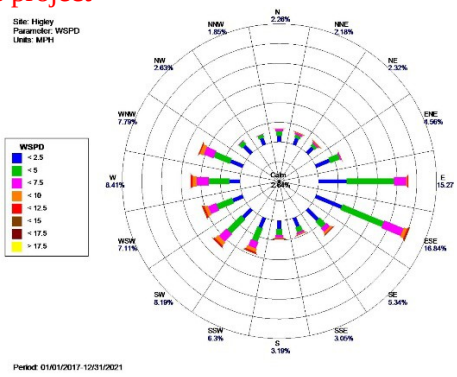
Source: https://www.epa.gov/outdoor-air-quality-data/download-daily-data



Source: email from Ron Pope (AQD) Thu, Dec 1, 2022

Percentages were added to the land use/terrain row below. Wind rose figures were added in the Wind pattern row below, which include the wind speed in each direction and wind percentages for each wind direction.

	Project Area	West Chandler (WC) AQS ID: 04-013-4004 Address: 275 S Ellis, Chandler 0.5 miles to project	Higley (HI) AQS ID: 04-013-4006 Address: 2207 S Higley Rd, Gilbert 2.5 miles to project
Collection frequency, completeness, and background concentration	N/A	Continuous monitoring overall PM data completeness is 96.8% in 2021 Number of complete monitoring days in 2019 to 2021: 1091 4th Highest 24-hour reading after removing atypical events: 89 $\mu g/m^3$.	Continuous monitoring overall PM data completeness is 96.8% in 2021 Number of complete monitoring days in 2019 to 2021: 1086 4th Highest 24-hour reading after removing atypical events: 114 $\mu g/m^3$.
Land use/terrain	Density (developed area), emission sources (near the traffic interchange), land use (residential area [47%] & vacant and open space [17%] commercial [6%], office [3%], light industrial [4%]), terrain (relative flat).	Density (developed area), emission sources (near the traffic interchange), land use (residential area [47%] & vacant and open space [18%] commercial [6%], office [6%], light industrial [5%]), terrain (relative flat). The West Chandler monitor is located in fringe area away from central Phoenix, characteristics similar to the project area. 	Density (developed area), emission sources (near the traffic interchange), land use (residential area [58%] & vacant and open space [12%] commercial [7%], terrain (relative flat). The Higley monitor is located in fringe area away from central Phoenix, characteristics similar to the project area. 

Wind patterns	N/A	Does not show significant upwind patterns to the project area 	Does not show significant upwind patterns to the project  area
Nearby sources:	N/A	No nearby sources other than roadways	No nearby sources other than roadways

BACKGROUND CENCENTRATION CALCULATION

Using Interpolating between Two Monitors (See page 106 of 143 at link below)
Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas (EPA-420-B-10-040, December 2010)

The West Chandler PM monitor is 0.5 mile from the project and Higley PM monitor is 2.5 miles from the project. See Figure 5.

Per EPA PM quantitative hot-spot analysis guidance, the weighting of data from West Chandler monitor is:

Weight (West Chandler) = (1/0.5)/(1/0.5+1/2.5) = 0.83
The weighting for Higley monitor is:
Weight (Higley) = (1/2.5)/(1/0.5+1/2.5)=0.17

For WC monitor, three years of monitoring data (2019-2021) using the 4th highest readings is 89 µg/m^3 (after removing atypical events pending for EPA approval of the Atypical Events Report). For HI monitor, three years of monitoring data (2019-2021) using the 4th highest readings is 114 µg/m^3 (after removing atypical events pending for EPA approval).

The predicted background concentration of the project is:
0.83 x 89 + 0.17 x 114 = 93.2 µg/m^3

References

PM Hot-spot guidance, EPA-420-B-21-037, October 2021.

User's Guide for the AMS/EPA Regulatory Model (AERMOD), EPA-454/B-21-001, April 2021.

AERMOD Implementation Guide, EPA-454/B-21-006, July 2021.

User's Guide for the AERMOD Meteorological Preprocessor (AERMET), EPA-454/B-22-006, June 2022. Completing Quantitative PM Hot-spot Analyses: 3-Day Course, FHWA, October 2022.

Attachment A – Meteorological Data Processing Details

The Arizona Department of Environmental Quality (ADEQ) has compiled pre-processed AERMET meteorological data files that could be used for air quality permit applications for sources located in Arizona under ADEQ jurisdiction. Currently pre-processed AERMET meteorological data files are available for 11 National Weather Service (NWS) meteorological stations across Arizona. The following document provides an overview of the dataset specifically tailored to Phoenix Sky Harbor International Airport, hereinafter referred to as "Sky Harbor Airport."

Meteorological Data

The AERMET meteorological preprocessor requires input of hourly observations of wind speed, wind direction, cloud cover, and ambient temperature. A full morning upper air sounding (rawinsonde) is also required in order to calculate the convective mixing height throughout the day.

In the Phoenix metropolitan area, there are several NWS stations; however, among them, Sky Harbor Airport is the sole Automated Surface Observing Stations (ASOS) station that provides 1-minute or 5-minute wind data. This data is especially valuable because the EPA's AERMINUTE meteorological processor can process 1-minute and 5-minute wind data to reduce the occurrences of calms and missing wind observations. As such, the data from Sky Harbor Airport is considered the most comprehensive and dependable source of surface observations within the Phoenix metropolitan area.

AERMET utilizes upper air data sourced from the NWS Rawinsonde Network. In Arizona, there are two rawinsonde stations, Tucson and Flagstaff. The Tucson rawinsonde station is located in a similar climatic region and is most representative of upper air conditions at the Phoenix metropolitan area.

ADEQ obtained standard hourly weather observations from the National Centers for Environmental Information (NCEI) websites:

NCEI's Integrated Surface Hourly Data (ISHD) TD-3505
ftp://ftp.ncdc.noaa.gov/pub/data/noaa/
NCEI's 1-Minute ASOS Wind Data
ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/

Upper air data are available at the Earth System Research Laboratory Global Systems Divisions web site:
http://esrl.noaa.gov/gsd

Completeness of Meteorological Data

Section 5.3.2 of "Meteorological Monitoring Guidance for Regulatory Modeling Applications" states that, to be acceptable for use in regulatory dispersion modeling, a meteorological dataset must be 90% complete on a quarterly basis. The 90% requirement applies to wind direction, wind speed, and temperature. The data completeness for each year of processed data for input to AERMOD is presented in Table 1.

Table 1 Meteorological Data Completeness

Year	Quarter	Wind Direction	Wind Speed	Temperature	Cloud Cover
2017	1	99.72%	100.00%	100.00%	100.00%
2017	2	99.86%	99.91%	100.00%	100.00%
2017	3	99.82%	100.00%	100.00%	100.00%
2017	4	99.82%	99.86%	99.68%	99.68%
2018	1	99.68%	100.00%	100.00%	100.00%
2018	2	99.95%	99.95%	100.00%	100.00%
2018	3	98.60%	100.00%	100.00%	100.00%
2018	4	99.68%	99.86%	99.68%	99.68%
2019	1	97.50%	100.00%	99.95%	100.00%
2019	2	99.50%	100.00%	100.00%	100.00%
2019	3	99.46%	99.95%	100.00%	100.00%
2019	4	99.50%	99.91%	99.64%	99.68%
2020	1	100.00%	100.00%	100.00%	100.00%
2020	2	99.91%	100.00%	100.00%	100.00%
2020	3	99.73%	100.00%	100.00%	100.00%
2020	4	99.41%	99.73%	99.68%	99.68%
2021	1	99.77%	100.00%	100.00%	100.00%
2021	2	99.36%	100.00%	100.00%	100.00%
2021	3	99.50%	100.00%	100.00%	100.00%
2021	4	99.59%	99.86%	99.68%	99.68%

Due to the missing data both in surface and upper air observations, the entire model-ready meteorological dataset (PFL and SFC files) has a completeness of 99.15%, which meets the completeness requirements for regulatory modeling purposes.

Meteorological Data Processing

ADEQ used AERMET (version 22112) and AERMINUTE (version 15272) to process five years (2017-2021) of surface meteorological data obtained from Sky Harbor Airport along with concurrent upper air radiosonde data obtained from Tucson. ADEQ also used the EPA's AERSURFACE tool (version 20060) to calculate surface characteristic parameters (albedo, Bowen ration and surface roughness) required by AERMET.

There are two stages of data processing in AERMET. Stage 1 extracts the meteorological data from the input data files (the NWS surface file and the upper air data file), processes the data through various quality assessment checks, and creates intermediate files in a standardized AERMET format. The second stage reads the output from Stage 1, calculates the boundary layer parameters required by AERMOD, and generates two AERMOD-ready meteorological data files. AERMINUTE processes 1-minute ASOS wind data to generate hourly average winds for input to AERMET in Stage 2. Based on the EPA's guidance for AERMINUTE, ADEQ applied a minimum wind speed threshold of 0.5 m/s to the hourly averaged wind speeds provided by AERMINUTE.

Stage 2 also requires the input of surface characteristic data that are used to estimate boundary layer parameters. National Land Cover Data 2016 (NLCD 2016) obtained from the U.S. Geological Survey was input to AERSURFACE. In addition to the NLCD 2016 data, the following inputs were used:

Method for determining surface roughness length – ZORAD;
Study radius for surface roughness (km) – 1 kilometer;
Number of sectors – 12;
Temporal resolution – Monthly;
Continuous snow cover most of the winter? – No;
Meteorological tower at an airport? – Yes;
Arid Region? – Yes;
Surface Moisture? - [Dry, Average or Wet, ***see below****]*
Month/Season assignments - User-specified
Transitional spring (partial green coverage, short annuals): 2 3 4 5 6
Midsummer with lush vegetation: 7 8 9 10
Autumn with unharvested cropland: 1 11 12

ADEQ determined the surface moisture inputs by comparing annual precipitation for a specific year to the 30-year climatological record of annual precipitation for Sky Harbor Airport. Per the EPA guidance for AERSURFACE, "Dry" is applied if the precipitation is below the 30th percentile of the 30-year climate record, "Wet" is applied if the precipitation is above the 70th percentile of the 30-year climate record, and "Average" is used if the precipitation is between the 30th and 70th percentiles. The resulting surface moisture inputs, as determined by this methodology, are summarized in Table 2.

Table 2 Surface Moisture Inputs

Year	Surface Moisture Inputs
2017	Dry
2018	Wet
2019	Average
2020	Dry
2021	Average

To address issues with model overprediction due to underprediction of the surface friction velocity (u*) during light wind/stable conditions, EPA has integrated the ADJ_U* option into the AERMET. Based on the EPA's evaluations, using the ADJ_U* option is appropriate when standard NWS data are used. Therefore, ADEQ incorporated the ADJ_U* option as a regulatory option in the data processing.

The Loop 202 (Loop 101 to Val Vista Drive) widening project air quality report available for public review and comment
Public comments accepted through Nov. 17, 2023

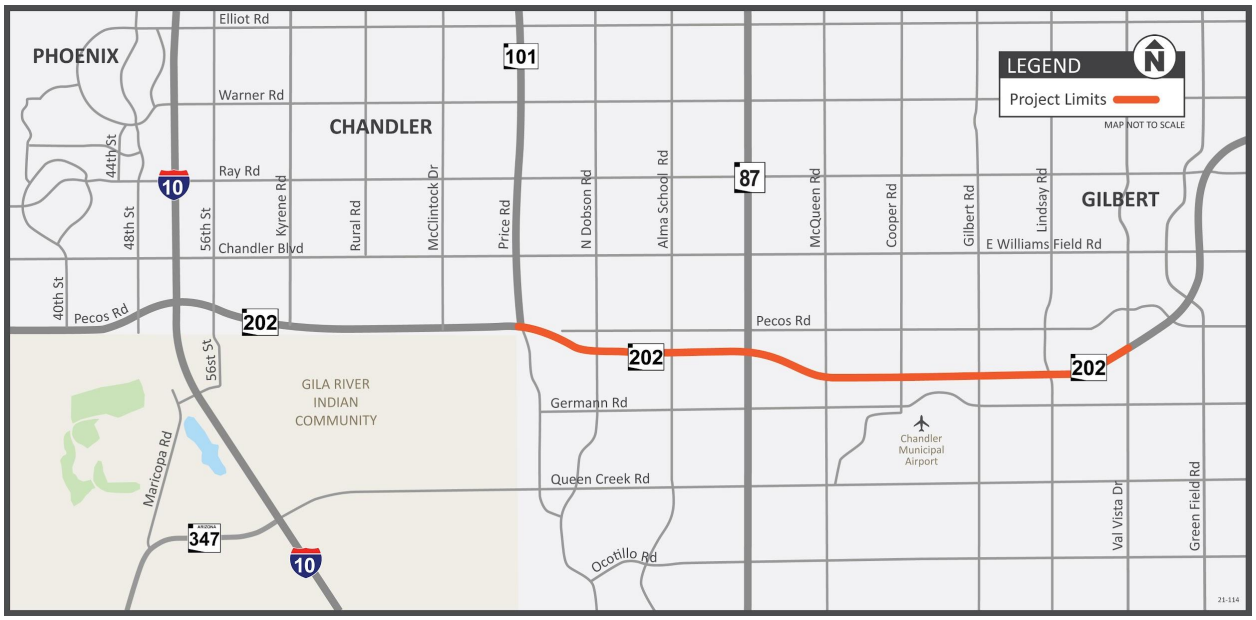
The Arizona Department of Transportation has released the draft Air Quality Report in support of final design for the Loop 202 (Santan Freeway) “Loop 101 to Val Vista Drive” widening project. The Air Quality Report is available for review on the project website at https://azdot.gov/L202-L101-to-ValVista.

The report found that this future project is not likely to cause or contribute to the severity or number of violations of the National Ambient Air Quality Standards (NAAQS).

The public can comment on the report **through Nov. 17, 2023**, in the following ways:

- Submit online through our comment form: https://azdot.gov/L202ValVistaL101air
- Call ADOT’s project information line at 855.712.8530
- Email: adotairnoise@azdot.gov
- Mail: ADOT Community Relations, ATTN: Loop 202: Loop 101 to Val Vista Drive Environmental Report, 1655 W. Jackson Street, MD126F, Phoenix AZ 85007.

All comments must be received by November 17, 2023, to be included in the public record.



Civil Rights/ADA
Pursuant to Title VI of the Civil Rights Act of 1964, the Americans with Disabilities Act (ADA) and other nondiscrimination laws and authorities, ADOT does not discriminate on the basis of race, color, national origin, sex, age, or disability. Persons that require a reasonable accommodation based on language or disability should contact Carolynn Ludington at

CLudington@azdot.gov or 480-594-6206. Requests should be made as early as possible to ensure the state has an opportunity to address the accommodation.

Derechos Civiles/ADA
De acuerdo con el Título VI de la Ley de Derechos Civiles de 1964, la Ley de Estadounidenses con Discapacidades (ADA por sus siglas en inglés) y otras normas y leyes antidiscriminatorias, el Departamento de Transporte de Arizona (ADOT) no discrimina por motivos de raza, color, origen nacional, sexo, edad o discapacidad. Las personas que requieran asistencia (dentro de lo razonable) ya sea por el idioma o discapacidad deben ponerse en contacto en Carolynn Ludington con CLudington@azdot.gov o 855.712.8530. Las solicitudes deben hacerse lo más antes posible para asegurar que el Estado tenga la oportunidad de hacer los arreglos necesarios.

F0124, Air Quality Report Public Comments and ADOT Responses

Timestamp	Email Address	Name/Nombre	Agency or firm/Agencia	Pulic Comments	ADOT Response
11/4/2023 7:04:05	1firebob@protonmail.com	Robert LaPlante	Homeowner	Why not widen the Loop 202 from Gilbert to Val Vista Rd to a full two lanes since the Air Quality Report shows no significant increase air quality problems.	Thank you for your interest in the Loop 202: Loop 101 to Val Vista Drive project. The improvements for this section of freeway will accommodate the future anticipated traffic volumes through 2040. There is a future project planned that will widen Loop 202 between Val Vista Drive and Main Street/Apache Trail in Mesa. That project will include HOV lanes from Gilbert Road to Broadway Road, thereby completing the HOV lane system for the entire 78-mile length of Loop 202. The future project is included in the Regional Transportation Plan (RTP), also known as MOMENTUM (https://www.ourmomentumplan.com/), which identifies new freeway projects to the year 2050. It is planned to be constructed in a late phase of the RTP. A portion of the funding is assumed to come from the extension of Proposition 400, the dedicated half-cent transportation sales tax in Maricopa County.
11/6/2023 10:35:53	ghostlightmater@yahoo.com	Jackson Hurst	n/a	I have reviewed the draft air quality report for ADOT's Loop 202, Loop 101 to Val Vista Drive Project and I support the findings and recommendations in the document.	Thank you for your interest and support.

EPA Comments on ADOT Air Quality Report for Project No. 202L MA 44 F0124 01C, Federal No. 202-C(208)S

Page 11: Section 2.4, Paragraph 2, sentence 1:

> "The SR202 study area lies within the Phoenix CO maintenance area O and O and nonattainment area for Ozone."

The two "O"s in this sentence are most likely a typo, please delete.

Response: The two "O"s in this sentence were removed on page 11 section 2.4, paragraph 2, sentence 1. Thanks!

Page 15: Section 2.5, Paragraph 3, sentences 3-4:

> "In 2019, the U.S. Environmental Protection Agency (EPA) issued the Additional Methods, Determinations, and Analyses to Modify Air Quality Data memorandum acknowledging certain EPA determinations and analyses that utilize ambient air quality data that are not subject to the EER, but still are related to an exceptional event meteorological and PM10 exceedance qualification criteria. These exceptional event related days are considered atypical event days."

This paragraph is misleading. The days are still *subject* to the EER, and the days could have been excluded using the EER through the Exceptional Events demonstration and concurrence process. However, they were not, either due to resource or time constraints, not being regulatorily significant, etc.

The event days being request for exclusion are not being requested for exclusion under the EER, but rather under EPA's 2019 memo which provides for exclusion for atypical event days

Instead, we recommend that ADOT replaces this paragraph with the following:

> "The Federal Exceptional Event Rule (EER) set forth in 40 CFR Part 50, §14 applies to the treatment of data showing exceedances or violations of any national ambient air quality standard (NAAQS) for purposes of the types of regulatory determinations by the Administrator as set forth in the EER. In April 2019, the U.S. Environmental Protection Agency (EPA) issued the 'Additional Methods, Determinations, and Analyses to Modify Air Quality Data' memorandum to: a) clarify for which regulatory determinations a request to exclude monitoring data may be made under the EER; b) identify other determinations, actions and analyses that are not covered by the scope of the EER, but for which the exclusion, selection or adjustment of monitoring data may be appropriate and allowable under other section of the Clean Air Act (CCA) and EPA rules or guidance. The exceedances/violations of the NAAQS discussed in this Air Quality Report are not requested for exclusion under the EER, but rather for exclusion as atypical event days from background concentration calculation under 40 CFR Part 51, Appendix W, Section 8.3.2.c.ii. Table 3 summarizes concentrations monitored at these two locations."

"

Response: The original paragraph was removed and the EPA recommended paragraph above was added.

Page 15: Section 2.5, Paragraph 3, sentence 5:

> "An atypical event is an uncontrollable event that was caused by natural sources of pollution or an event that is not expected to recur at a given location. Table 3 summarizes concentrations monitored at these two locations."

Please more closely adhere to the definition of an atypical event as provided in 40 CFR 51, Appendix W, section 8.3.2.c.ii.

Response: Revised the definition of an atypical event below that adheres to the definition of an atypical event as provided in 40 CFR 51, Appendix W, section 8.3.2.c.ii.

An "atypical event" refers to uncontrollable circumstances resulting from natural sources of pollution or events that are not anticipated to happen again at a specific location. These situations necessitate adjustments to the standard ambient data record, which could involve data removal, scaling, or adjustments to enhance the representativeness of monitored background concentrations for regulatory assessment purposes.

Page 16: Section 3.1, Paragraph 1, sentence 1:

> "Microscale CO air quality modeling was performed using EPA guidance and interagency consultation, as described below."

Please change to "Microscale CO air quality modeling was performed using EPA guidance and through the interagency consultation process, as described below." This identifies interagency consultation as a process, rather than a reference.

Response: changed to "Microscale CO air quality modeling was performed using EPA guidance and through the interagency consultation process, as described below."

Page 36: Section 3.2.1, Determine Background Concentrations, Paragraph 1, sentence 5:

> "The 4th highest PM10 reading from 2019 through 2021 was identified from each monitoring station, and then used to interpolate the projects PM background concentrations"

Please add a period after this sentence.

Response: added a period after this sentence.

EPA Comments on ADOT Draft Final Air Quality Report for Project No. 202L MA 44 F0124 01C, Federal No. 202-C(208)S, November 13, 2023

Page 15: Section 2.5, Paragraph 3:

> *"The Federal Exceptional Event Rule (EER) set forth in 40 CFR Part 50, §14 applies to the treatment of data showing exceedances or violations of any national ambient air quality standard NAAQS) for purposes of the types of regulatory determinations by the Administrator as set forth in the EER. In April 2019, the U.S. Environmental Protection Agency (EPA) issued the 'Additional Methods, Determinations, and Analyses to Modify Air Quality Data' memorandum to: a) clarify for which regulatory determinations a request to exclude monitoring data may be made under the EER; b) identify other determinations, actions and analyses that are not covered by the scope of the EER, but for which the exclusion, selection or adjustment of monitoring data may be appropriate and allowable under other section of the Clean Air Act (CCA) and EPA rules or guidance. The exceedances/violations of the NAAQS discussed in this Air Quality Report are not requested for exclusion under the EER, but rather for exclusion as atypical event days from background concentration calculation under 40 CFR Part 51, Appendix W, Section 8.3.2.c.ii. Table 3 summarizes concentrations monitored at these two locations. ~~An "atypical event" refers to uncontrollable circumstances resulting from natural sources of pollution or events that are not anticipated to happen again at a specific location. These situations necessitate adjustments to the standard ambient data record, which could involve data removal, scaling, or adjustments to enhance the representativeness of monitored background concentrations for regulatory assessment purposes. Table 3 summarizes concentrations monitored at these two locations."~~*

Please delete the strikethrough portion of this paragraph. The references to Appendix W and the data modification memo earlier in the paragraph are sufficient.

Response: will delete the strikethrough portion of this paragraph as shown above per EPA comment.

ADOT Responses to FHWA PM10 Hotspot Modeling Comments on September 28, 2023

- All of the links are being modeled in MOVES at 0% grade. Is this accurate? There appear to be roads with positive and negative grade – these should be defined in the links table.

This is accurate that all of the links are being modeled in MOVES at 0% grade. Overall, the project area is relatively flat and in most cases the positive or negative 1% grade cancel out each other. In most cases, the roadway grade in one direction would be a 1%, while the other direction would be a -1%, thus the vehicle PM emission rate increase in one roadway direction would be offset by the vehicle PM emission rate decrease in the other roadway direction. We understand that changing the roadway grade slightly would change the emission rates in MOVES, however, we believe the differences in overall emission rates are pretty minor. This is because changing the roadway grade slightly would only affect the vehicle tailpipe emission rate, it would not affect the road dust emission rate. As we know, road dust emission is the largest PM10 emission of overall emissions. A test run was conducted in MOVES specsfile for Lindsay Rd TI with changing all roadway link grade from 0% to 1%, the overall PM emission rates in grams per hour (vehicle emission rate + road dust emission rate) only changed from 1% to 8%, with average of 4% under this extreme condition. Based on the above reasons, ADOT believes that modeling the links at 0% grade would have minimal impact to the overall results and suggests to leave the grade as is due to the tight project schedule.

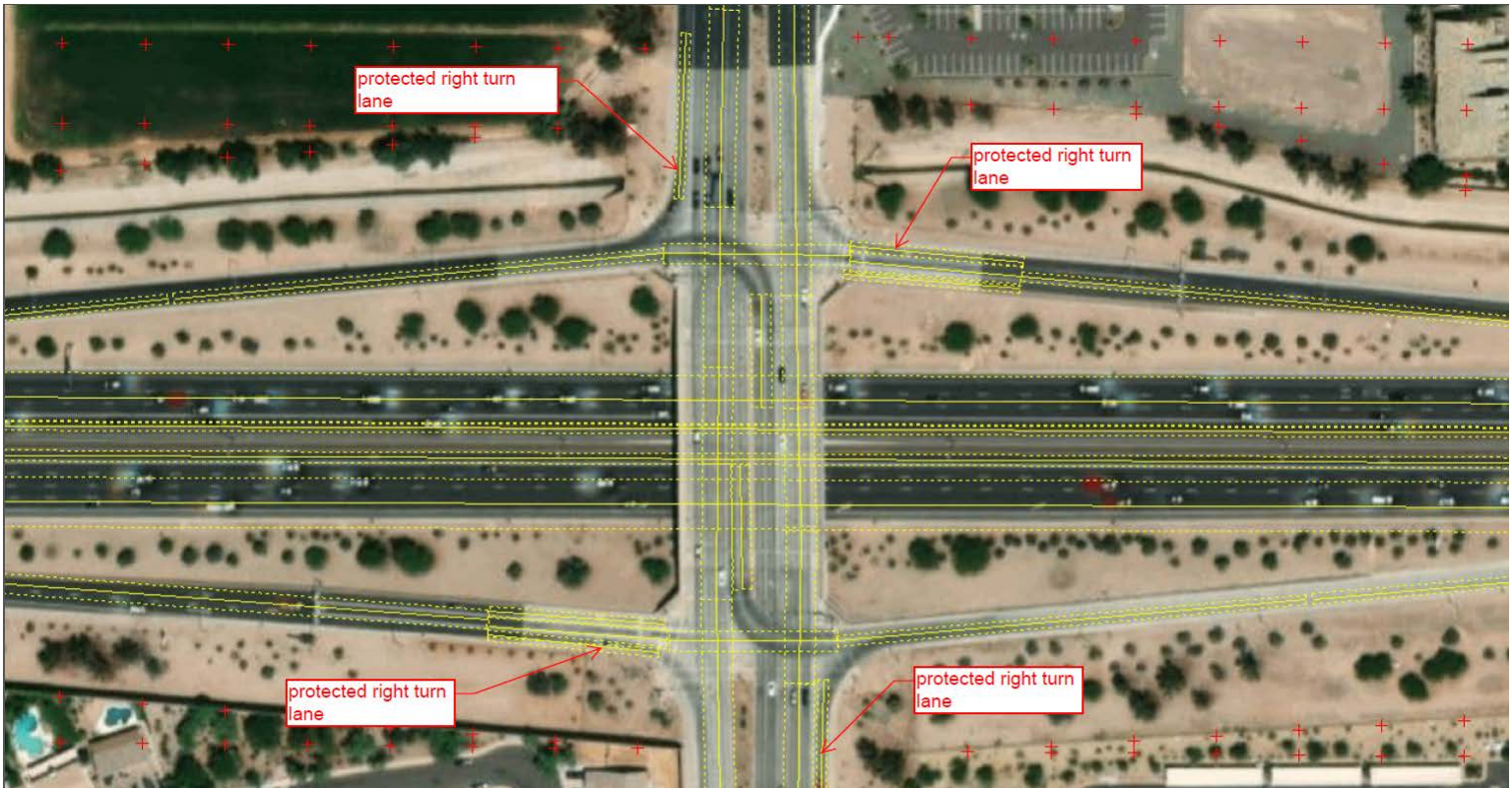
FHWA: ADOT needs to re-model the MOVES links with the correct grade. (PM hot-spot guidance 4.5.6)

Will re-model the MOVES links with the correct grade per FHWA.

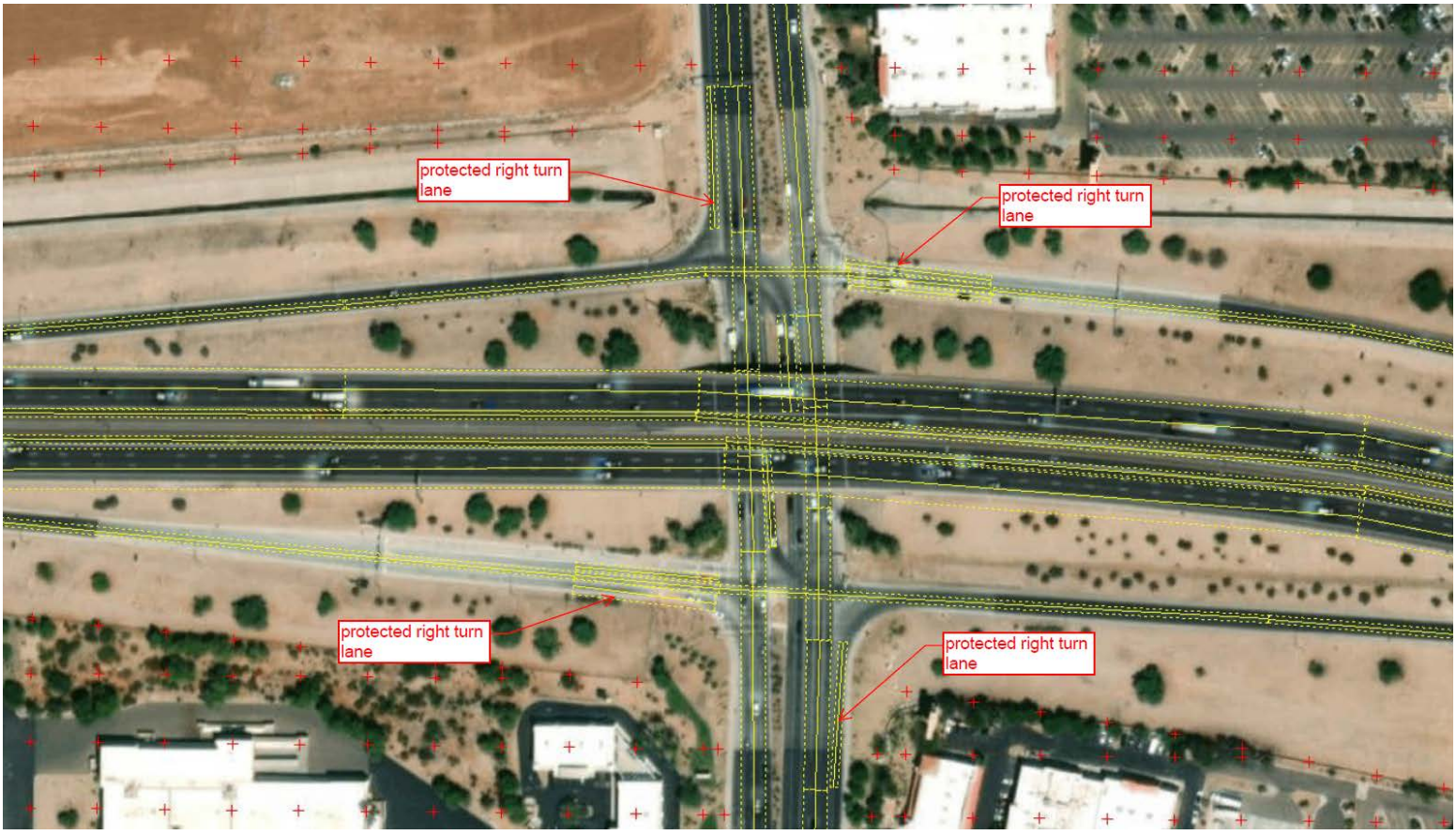
- Add AERMOD sources for protected right turn lanes.

AERMOD sources for protected right turn lanes were modeled, please see screenshots below with protected right turn lane labels for each TI.

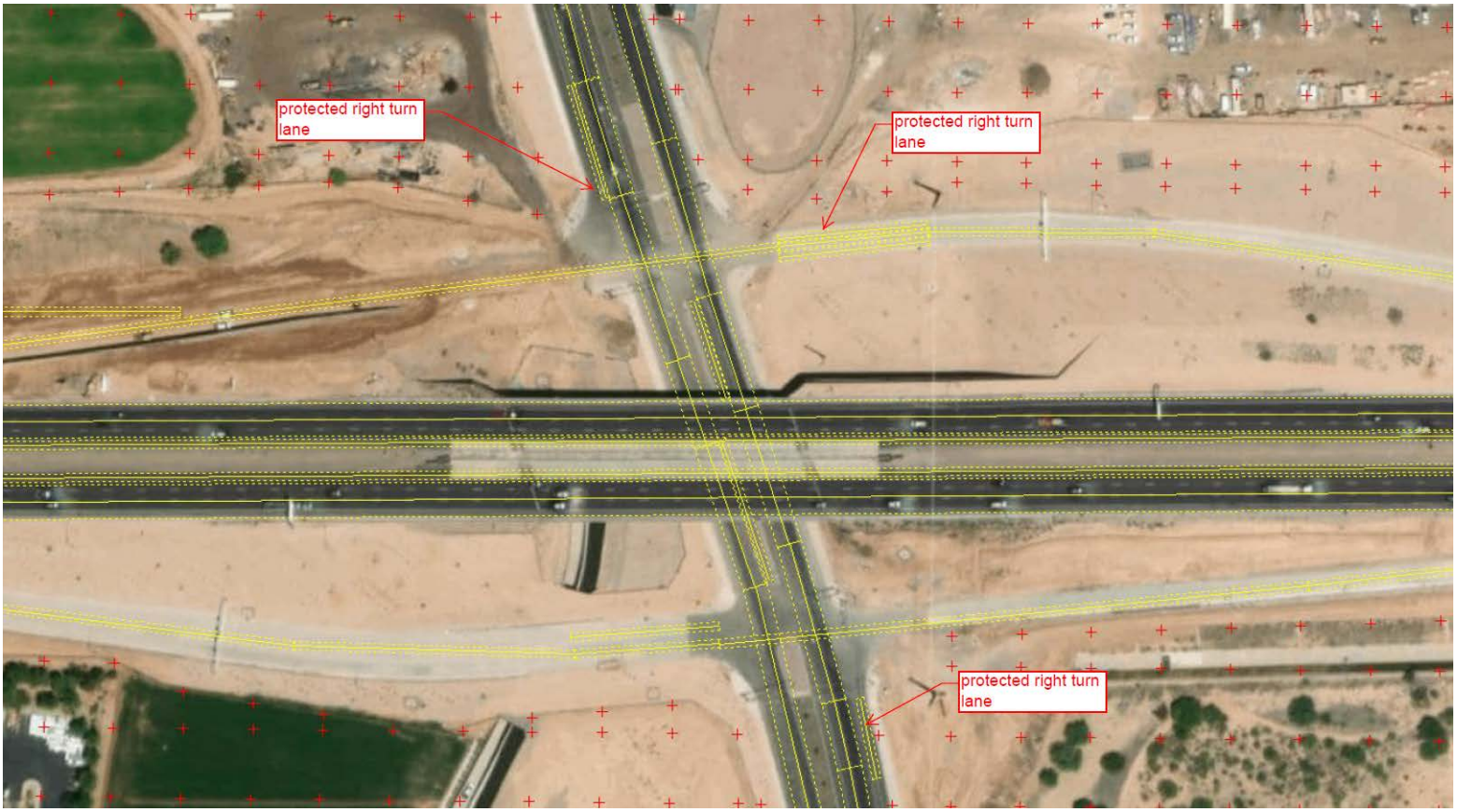
Alma School Rd TI



Arizona Ave TI



Lindsay Rd TI



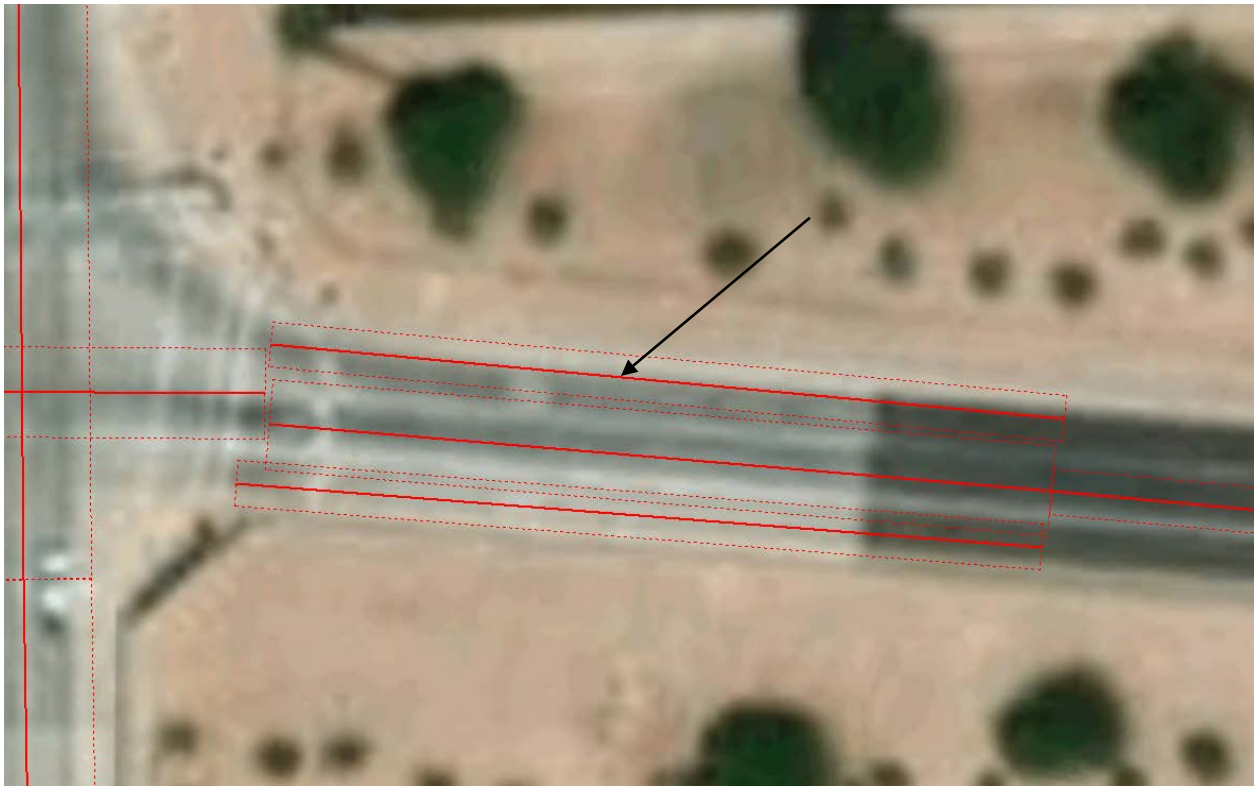
FHWA: Our comment was related to the geospatial location of the protected right turn lanes. They appear to be modeled in the wrong locations in AERMOD (on top of the through lane rather than as a separated turn lane.) Remodel in the correct locations. (PM hot-spot guidance J.3.2)

Modified protected right turn lane locations and made sure the protected right turn lane location will not be placed on top of the through lane. Please see zoom-in screen shots below for each movement.

Alma School EB offramp

Alma School NB

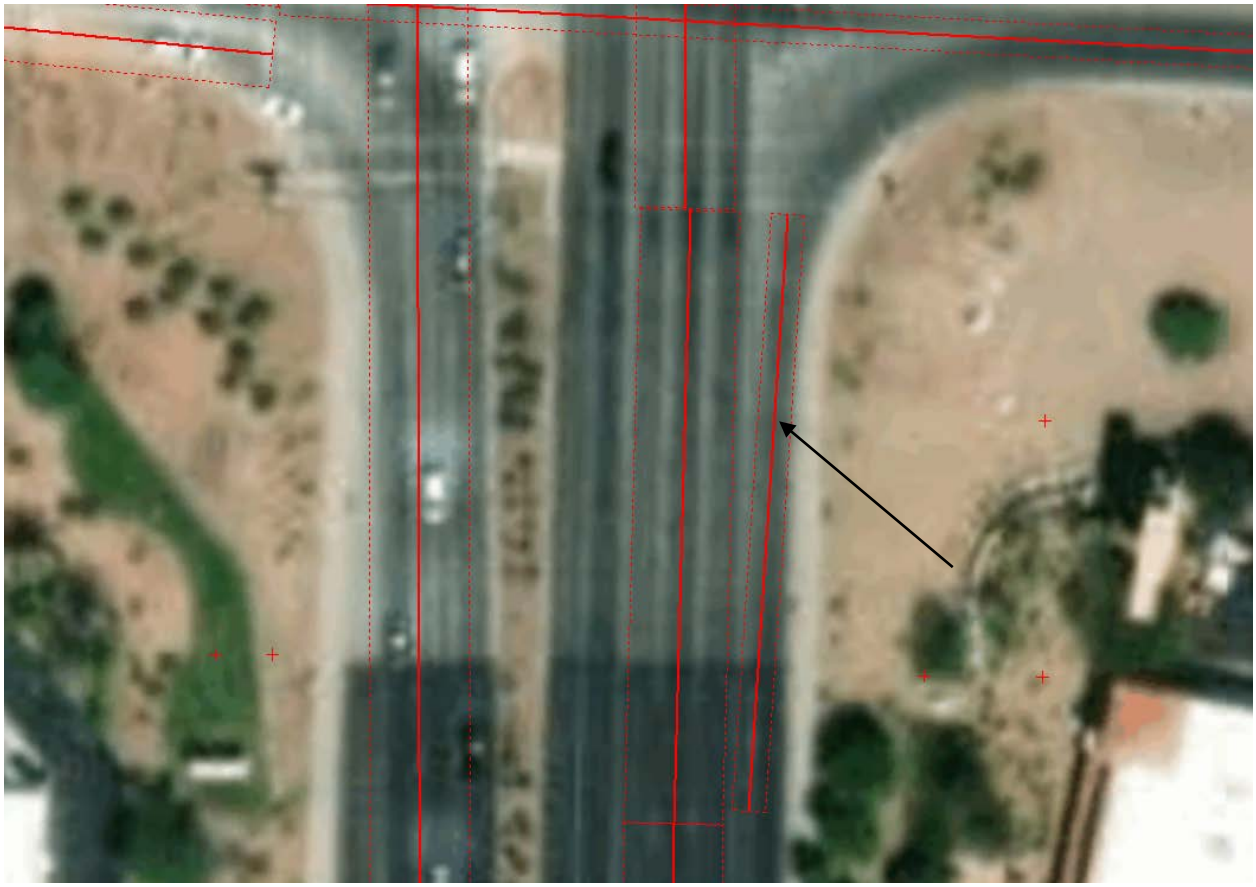
Alma School WB offramp



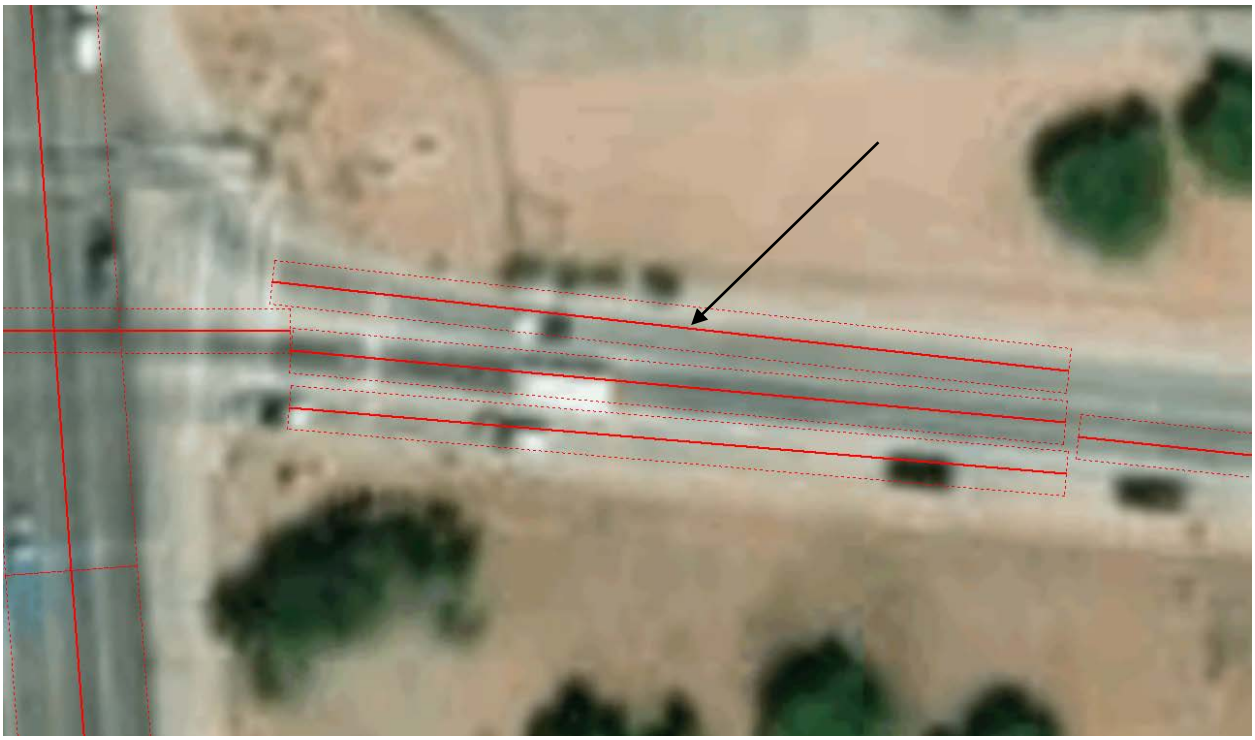
Alma School SB

Arizona Ave EB offramp

Arizona Ave NB



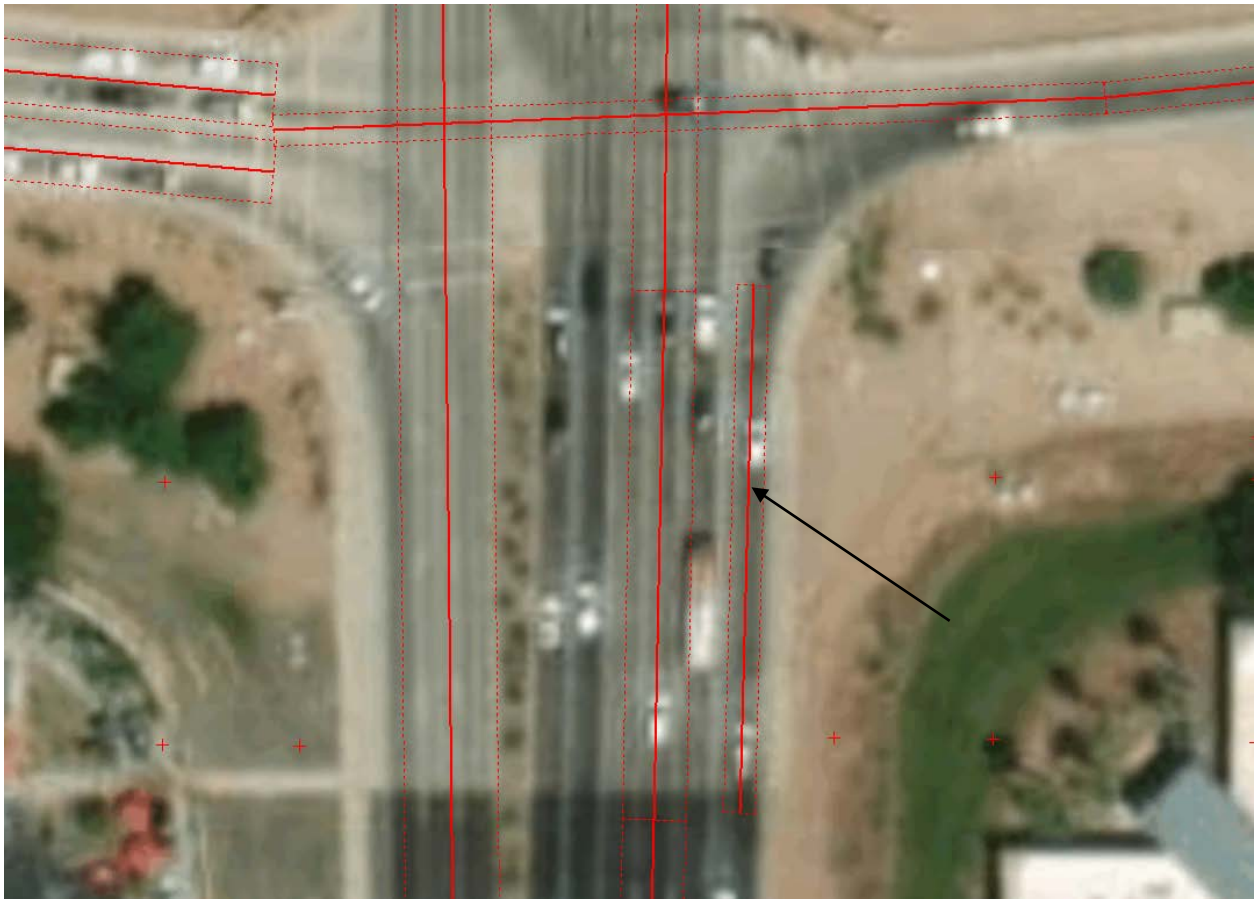
Arizona Ave WB offramp



Arizona Ave SB

Gilbert Rd EB offramp

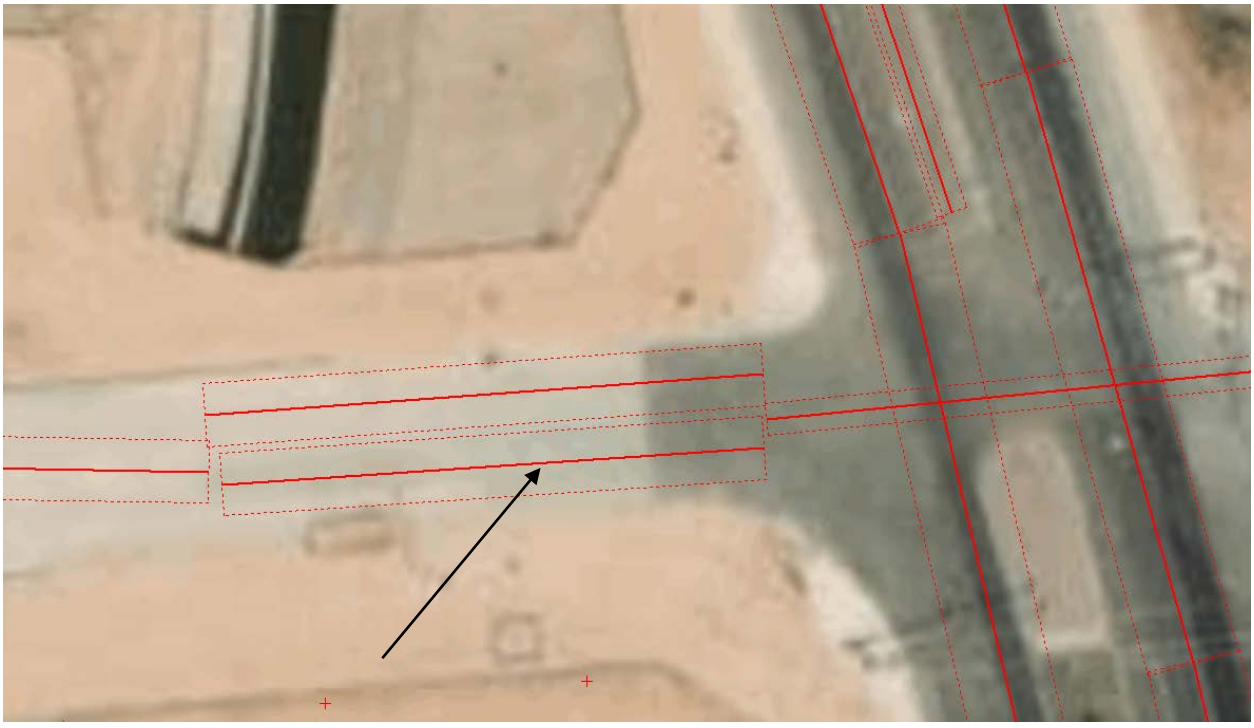
Gilbert Rd NB



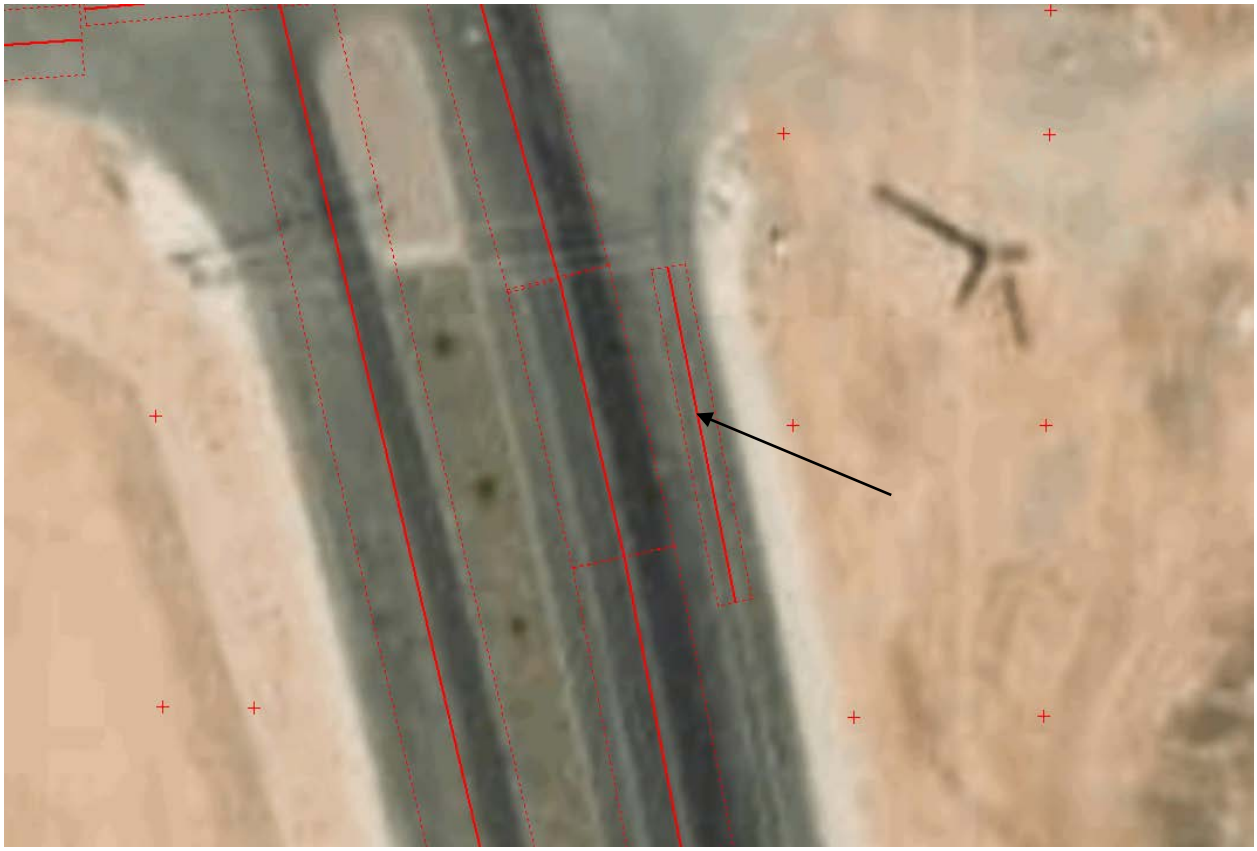
Gilbert Rd WB offramp

Gilbert Rd SB

Lindsay Rd WB offramp

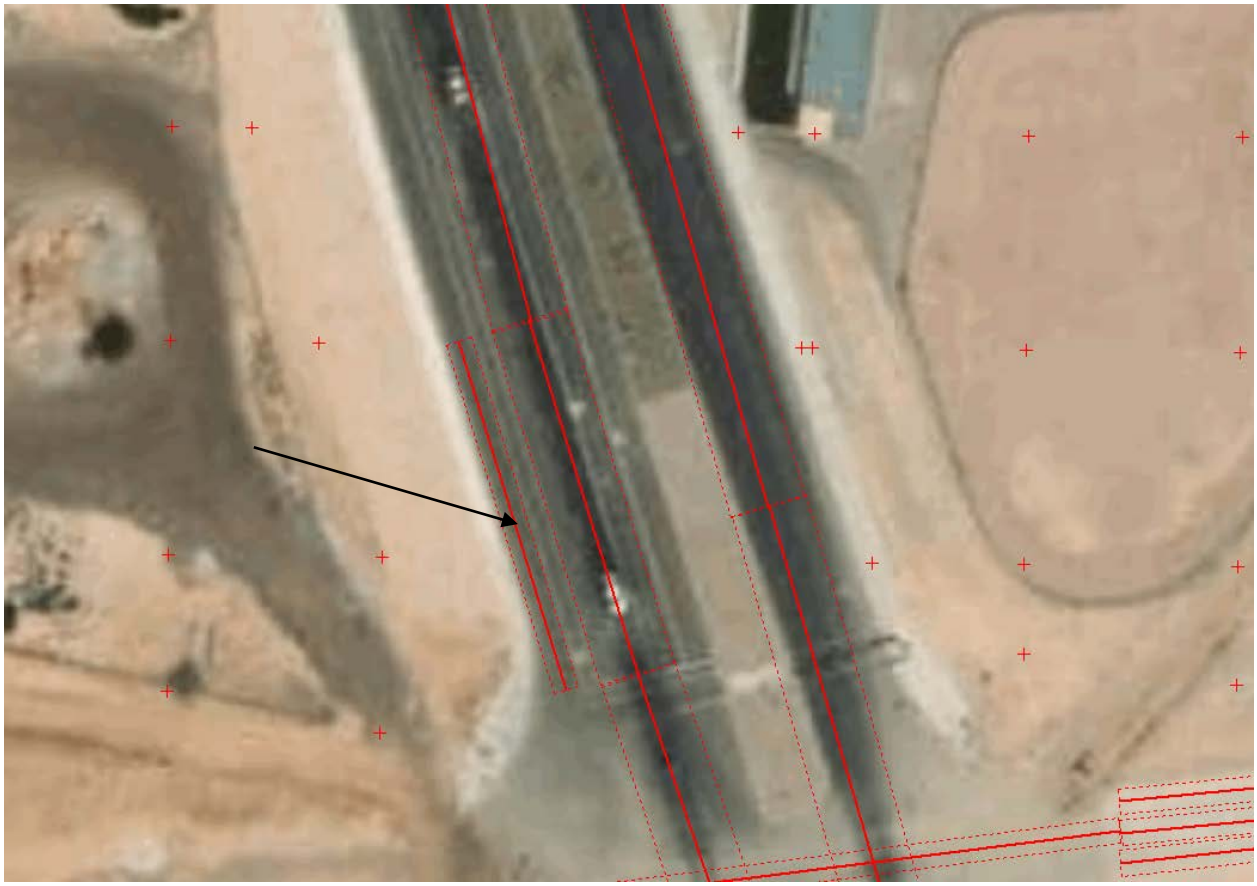


Lindsay Rd NB



Lindsay Rd WB offramp

Lindsay Rd SB



- Ratio of passenger cars to passenger trucks is very different than national trend. We understand this is based on MAG mapping, but consider using MOVES defaults since these fractions are incorrect and will likely be revised in the next regional conformity determination (based on EPA and FHWA comments to MAG).

MAG data from the latest regional emissions analysis was used. When consultation first started back in August 2021 using the MAG 2045 data, FHWA requested to update the data with the new MAG 2050 model that was coming out in the late fall 2021, thus we had to put the air quality analysis on hold until that new data was provided. In January 2022, we requested updated traffic volumes and a new traffic report was completed. Once the 2050 data was provided, both EPA and FHWA concurred with this data and we moved forward with the analysis. In addition, EPA and FHWA had no comments during March consultation documents review period requesting to change the data source. ADOT will continue to use the MAG data as previously requested due to the tight project schedule.

- FHWA was not provided the spreadsheet/script used to map MOVES links to AERMOD sources and how the EMISFACT tables were developed. We cannot confirm emission rates used in the AERMOD EMISFACT table are correct.

Those spreadsheets/script used to map MOVES links to AERMOD sources and how the EMISFACT tables were developed were provided in the previous submittal (also attached below).

AlmaSchool_EF_v2.xls Arizona_EF_v2.xls Gilbert_EF_v2.xls Lindsay_EF_v2.xls

The mapping between the MOVES links to AERMOD sources are shown in "link" tab of each spreadsheet, screenshot is provided below.

MOVES LinkID	AERMOD Source ID	Description	Area (m^2)	Width(m)		Length (mile
1	1	EB ML GP (west of offramp Cruise)	7011.3	15		0.290441
2	2	EB ML HOV (west of offramp Cruise)	1401.9	3		0.290367
3	3	EB ML GP (bridge section Cruise)	12809.3	15		0.530622
4	4	EB ML HOV (bridge section Cruise)	2559.9	3		0.530216
5	5	EB ML GP (east of onramp Cruise)	6234.4	15		0.258258
6	6	EB ML HOV (east of onramp Cruise)	1245.1	3		0.25789
7	7	WB ML GP (west of onramp Cruise)	6933.1	15		0.287202
8	8	WB ML HOV (west of onramp Cruise)	1379.4	3		0.285706
9	9	WB ML GP (bridge section Cruise)	12814.6	15		0.530841
10	10	WB ML HOV (bridge section Cruise)	2570.8	3		0.532474
11	11	WB ML GP (east of offramp Cruise)	6280.6	15		0.260172
12	12	WB ML HOV (east of offramp Cruise)	1253.9	3		0.259712
13	13	EB offramp (upstream Cruise)	2034.8	6		0.210728
14	14	EB offramp (RT Queue)	155.9	3		0.032291
15	15	EB offramp (TH Queue)	324.2	6		0.033575
16	16	EB offramp (LT Queue)	159.4	3		0.033016
17	17	EB onramp (downstream Cruise)	790.8	3		0.163793
18	18	EB onramp (upstream Acceleration)	305.3	6		0.031617
19	18A	EB onramp (upstream Acceleration)	426.8	3		0.0884
20	19	WB offramp (upstream Cruise)	1052	3		0.217894
21	20	WB offramp (RT Queue)	158.5	3		0.032829
22	21	WB offramp (TH Queue)	311.9	6		0.032301
23	22	WB offramp (LT Queue)	160.6	3		0.033264
24	23	WB onramp (downstream Cruise)	744.1	3		0.154121
25	24	WB onramp (upstream Acceleration)	337.2	6		0.034921
26	24A	WB onramp (upstream Acceleration)	446.2	3		0.092419
27	25	SB Alma (north upstream Cruise)	1504.4	9		0.103866
28	26	SB Alma (north RT Queue)	150.8	3		0.031234
29	27	SB Alma (north TH Queue)	537.4	9		0.037103
30	28	SB Alma (bridge upstream Acceleration)	437.4	9		0.030199
31	29	SB Alma (bridge upstream Cruise)	262.8	9		0.018144
32	30	SB Alma (bridge TH Queue)	369.9	9		0.025538

EMISFACT | Link | Jan_6am | Jan_12pm | Jan_6pm | Jan_12am | Apr_6am | Apr_12pm | Apr_6pm

The EMISFACT table were developed/calculated using formulas developed from 2022 FHWA Denver hotspot training materials. The formula used to calculate SEASHR factors (g/s/m2) is:

SERSHR factor (g/s/m^2) = EF (MOVES EF + Road dust EF in g/hour) / 3600 (s/hour) /source area (m^2)

Take linkID 1 at Alma School Rd TI as an example (MOVES linkID is also the same as AERMOD source ID). The EF (MOVES EF + Road dust EF) at 12 am in Winter is 312.2611812 g/hour, as shown below.

movesRunId	yearId	monthId	hourId	linkId	pollutant	gramsPerHour	roadTypeII	linkVolume	MOVES EF + Road Dust EF
1	2050	1	1	1	Total PM10	53.05045076	4	7526	312.2611812

MOVES LinkID	AERMOD Source ID	Description	Area (m^2)	Width(m)	Length (mile)
1	1	EB ML GP (west of offramp Cruise)	7011.3	15	0.290441
2	2	EB ML HOV (west of offramp Cruise)	1401.9	3	0.290367
3	3	EB ML GP (bridge section Cruise)	12809.3	15	0.530622

The linkID 1 area is 7011.3 m^2, as shown below.

MOVES LinkID	AERMOD Source ID	Description	Area (m^2)	Width(m)	Length (mile)
1	1	EB ML GP (west of offramp Cruise)	7011.3	15	0.290441

The SERSHR factor (g/s/m^2) is = 312.2611812/3600/7011.3=0.0000123713, same as the calculated SERSHR factor below in red box.

SO EMISFACT 1 SEASHR	6*0.0000123713	3*0.0000093016	5*0.0000101318	4*0.000022809	6*0.0000123713
SO EMISFACT 1 SEASHR	6*0.0000123759	3*0.00000930526	5*0.0000101356	4*0.0000228159	6*0.0000123759
SO EMISFACT 1 SEASHR	6*0.0000123807	3*0.00000930912	5*0.0000101397	4*0.0000228232	6*0.0000123807
SO EMISFACT 1 SEASHR	6*0.0000123759	3*0.00000930526	5*0.0000101356	4*0.0000228159	6*0.0000123759
SO EMISFACT 2 SEASHR	6*0.00000826191	3*0.00000464711	5*0.00000669954	4*0.0000115864	6*0.00000826191
SO EMISFACT 2 SEASHR	6*0.00000826501	3*0.00000464916	5*0.00000670222	4*0.0000115906	6*0.00000826501
SO EMISFACT 2 SEASHR	6*0.00000826827	3*0.00000465133	5*0.00000670505	4*0.000011595	6*0.00000826827
SO EMISFACT 2 SEASHR	6*0.00000826501	3*0.00000464916	5*0.00000670222	4*0.0000115906	6*0.00000826501
SO EMISFACT 3 SEASHR	6*0.0000100906	3*0.00000801921	5*0.00000861304	4*0.0000166615	6*0.0000100906
SO EMISFACT 3 SEASHR	6*0.0000100944	3*0.00000802255	5*0.00000861654	4*0.0000166672	6*0.0000100944
SO EMISFACT 3 SEASHR	6*0.0000100985	3*0.00000802608	5*0.00000862024	4*0.0000166732	6*0.0000100985
SO EMISFACT 3 SEASHR	6*0.0000100944	3*0.00000802255	5*0.00000861654	4*0.0000166672	6*0.0000100944
SO EMISFACT 4 SEASHR	6*0.00000826191	3*0.00000464711	5*0.00000669954	4*0.0000115864	6*0.00000826191
SO EMISFACT 4 SEASHR	6*0.00000826501	3*0.00000464916	5*0.00000670222	4*0.0000115906	6*0.00000826501
SO EMISFACT 4 SEASHR	6*0.00000826827	3*0.00000465133	5*0.00000670505	4*0.000011595	6*0.00000826827
SO EMISFACT 4 SEASHR	6*0.00000826501	3*0.00000464916	5*0.00000670222	4*0.0000115906	6*0.00000826501
SO EMISFACT 5 SEASHR	6*0.0000116076	3*0.00000939229	5*0.00000978055	4*0.0000209268	6*0.0000116076
SO EMISFACT 5 SEASHR	6*0.0000116119	3*0.00000939596	5*0.0000097843	4*0.0000209333	6*0.0000116119
SO EMISFACT 5 SEASHR	6*0.0000116164	3*0.00000939985	5*0.00000978827	4*0.0000209401	6*0.0000116164
SO EMISFACT 5 SEASHR	6*0.0000116119	3*0.00000939596	5*0.0000097843	4*0.0000209333	6*0.0000116119
SO EMISFACT 6 SEASHR	6*0.00000826191	3*0.00000464711	5*0.00000669954	4*0.0000115864	6*0.00000826191
SO EMISFACT 6 SEASHR	6*0.000008265	3*0.00000464916	5*0.00000670222	4*0.0000115906	6*0.000008265
SO EMISFACT 6 SEASHR	6*0.00000826827	3*0.00000465133	5*0.00000670505	4*0.000011595	6*0.00000826827
SO EMISFACT 6 SEASHR	6*0.000008265	3*0.00000464916	5*0.00000670222	4*0.0000115906	6*0.000008265
SO EMISFACT 7 SEASHR	6*0.00000957875	3*0.0000227187	5*0.0000115931	4*0.0000120142	6*0.00000957875
SO EMISFACT 7 SEASHR	6*0.00000958246	3*0.0000227255	5*0.0000115974	4*0.0000120187	6*0.00000958246
SO EMISFACT 7 SEASHR	6*0.00000958639	3*0.0000227328	5*0.0000116019	4*0.0000120234	6*0.00000958639
SO EMISFACT 7 SEASHR	6*0.00000958246	3*0.0000227255	5*0.0000115974	4*0.0000120187	6*0.00000958246
SO EMISFACT 8 SEASHR	6*0.00000637416	3*0.0000113673	5*0.00000771197	4*0.00000656246	6*0.00000637416
SO EMISFACT 8 SEASHR	6*0.00000637675	3*0.0000113714	5*0.00000771489	4*0.0000065651	6*0.00000637675
SO EMISFACT 8 SEASHR	6*0.00000637949	3*0.0000113758	5*0.00000771799	4*0.00000656789	6*0.00000637949
SO EMISFACT 8 SEASHR	6*0.00000637675	3*0.0000113714	5*0.00000771489	4*0.0000065651	6*0.00000637675
SO EMISFACT 9 SEASHR	6*0.00000816551	3*0.0000174043	5*0.00000949696	4*0.00000963598	6*0.00000816551

EMISFACT | Link | Jan_6am | Jan_12pm | Jan_6pm | Jan_12am | Apr_6am | Apr_12pm

- Looks like the same AERMOD initial source parameters were assumed for all road types. Typically, these will be different on highways vs. arterials since the fleet mix is different. Please develop roadway specific AERMOD source parameters based on mix of LD vs. HD (this will influence the size of the initial plume).

Worst case truck percentage on freeway mainline is 12% from PM questionnaire Table 1 traffic table. Per FHWA training materials, release height may be estimated from the midpoint of the initial vertical dimensions. For moving light-duty vehicles, the release height is 1.3 meters. For moving heavy-duty vehicles, the release height is 3.5 meters. Release height of mixed fleets may be estimated using an emissions-weighted average:

--- Emission-weighted average:
Light-duty = 88% of emissions,
Heavy-duty =12% of emissions,
Source release height = (0.88 * 1.3) + (0.12 * 3.4) = 1.55 meter
Initial vertical dimension = 1.55 * 2 =3.1 meter

This is what were used for all road types in AERMOD for worst case condition. The resulting 6th PM concentration is 52.1 ug/m^3, as shown below.

Results Summary

Lindsay Rd TI

PM10 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	6TH	52.13953		427986.95	3683038.88	0.00	1.80	0.00	12/5/2019, 24

The worst case truck percentage on arterials at intersections is 8% from PM questionnaire Table 1 traffic table. The release height of mixed fleets on arterials would be:

Source release height = (0.92 * 1.3) + (0.08 * 3.4) = 1.47 meter
Initial vertical dimension = 1.55 * 2 =2.94 meter

We believe the small difference (5%) of the release height and initial vertical dimension between the highways vs. arterials would have minimal impact on resulted predicted PM concentrations. To confirm that, an AERMOD test run was conducted with two different release height and initial vertical dimension as mentioned above were assigned to highways and arterials. The resulting 6th PM concentration is 52.7 ug/m^3, as shown below, which only increase 1% compared to original analysis. And the total concentration rounded to nearest 10 ug/m^3 with background PM10 value added would be 150, same as the original analysis. Based on the above reasons, ADOT confirmed that the 6th high PM concentration change would be minimal when assigning two different release height and initial vertical dimension to highways and arterials. Therefore, ADOT suggests to leave the original parameters as is due to tight project schedule.

Results Summary

Lindsay Rd TI

PM10 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	6TH	52.65660	ug/m^3	427986.95	3683038.88	0.00	1.80	0.00	12/5/2019, 24

FHWA: The initial source characteristics should be specific to the fleet operating on each roadway type. A "worst-case" heavy-duty vehicle percentage assumption is not an option for this input. At a minimum, highways should have a different release heigh/initial sigma z value vs. local/arterial/collector roads. Calculate initial source values for highway and non-highway road types and re-model in AERMOD. (PM hot-spot guidance J.3.1)

Will use the different truck % at each TI per Table 1 in the consultation document to calculate the release height/initial sigma z value for highways vs. local/arterials/collector roads. The following truck % data was used for the calculation.

- Alma School TI freeway mainline: 11.2%
  Alma School TI local/arterials/ramps/collector roads: 4.1%
- Arizona Ave TI freeway mainline: 10.6%
  Arizona Ave TI local/arterials/ramps/collector roads: 7.8%
- Gilbert Rd TI freeway mainline: 10.4%
  Gilbert Rd TI local/arterials/ramps/collector roads: 5.5%
- Lindsay Rd TI freeway mainline: 9.8%
  Lindsay Rd TI local/arterials/ramps/collector roads: 6.0%

- Aside from the passenger car/passenger truck splits mentioned earlier, we note some additional odd trends in your fleet mix (linksourcetype input). The majority of HD vehicles on the highway links are modeled as source type 52 (single unit short haul truck) – representing 8% of the fleet; vs. less than 3% for combination long haul trucks. Please confirm these splits are correct and document why this trend is accurate for the project area. This is quite different than the HD trends seen on most urban highways.

The linksourcetypes input was developed from MAG regional conformity MOVES data per EPA as stated in the PM hotspot consultation document, and have been concurred by EPA and FHWA during the interagency consultation in March.

- Files did not include MOVES runspecs.

The zipped runspecs files is re-attached below for reference.

Run Specs.zip

- Was there a meeting where the IAC group discussed source and receptor placement? If so, please provide the documentation/notes.

The source and receptor placement have been discussed with EPA and FHWA during the IAC, all EPA comments were addressed and EPA does not have additional source and receptor placement comments. The documentations are shown below.

- Is this documentation to confirm the modeling assumptions and the final report will be much more comprehensive?

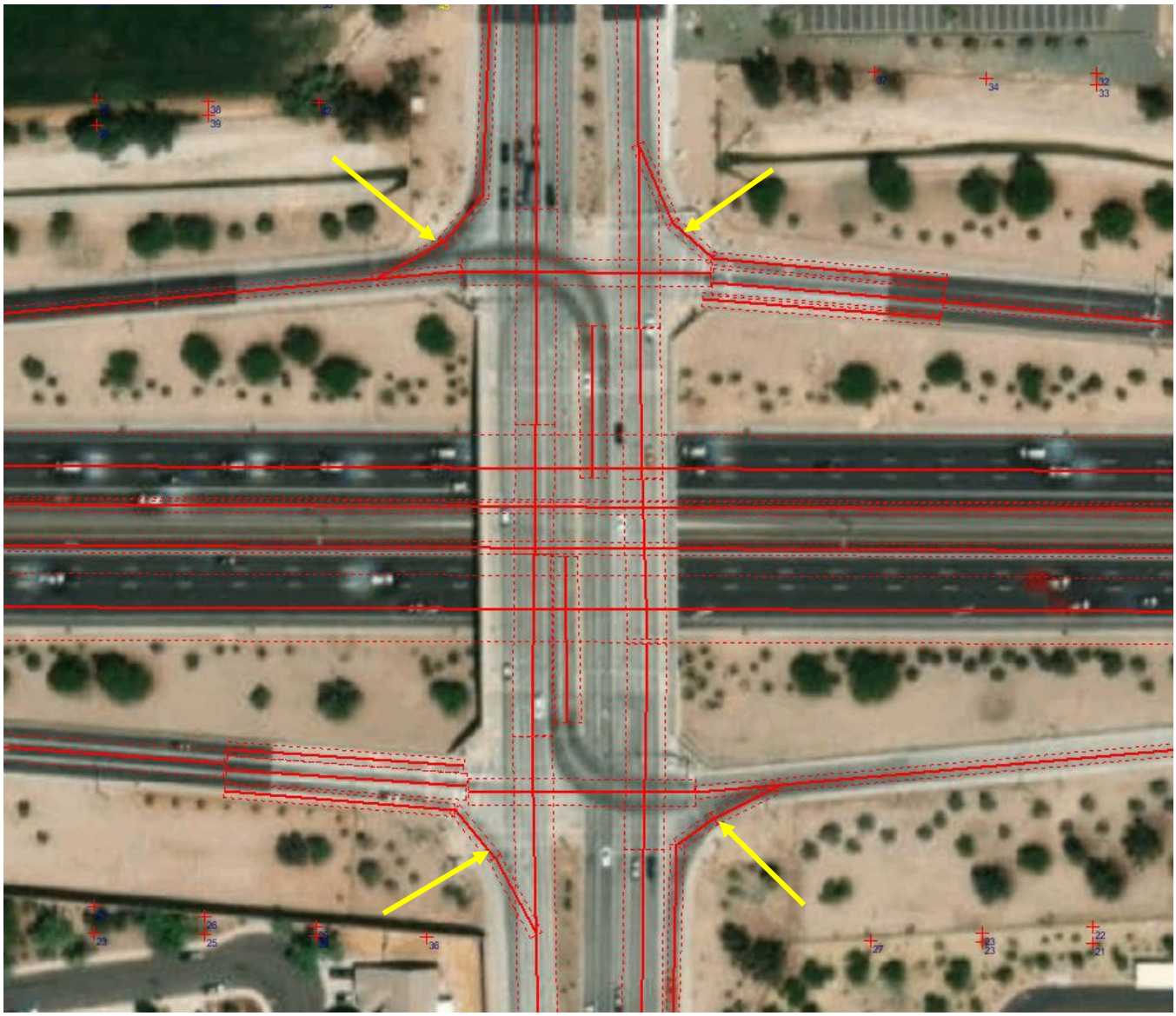
The final report will be updated and appended with additional info to address all EPA and FHWA comments. The report will be written per current ADOT, FHWA, and EPA standards.

ADOT Responses to FHWA PM10 Hotspot Modeling Comments on October 24, 2023

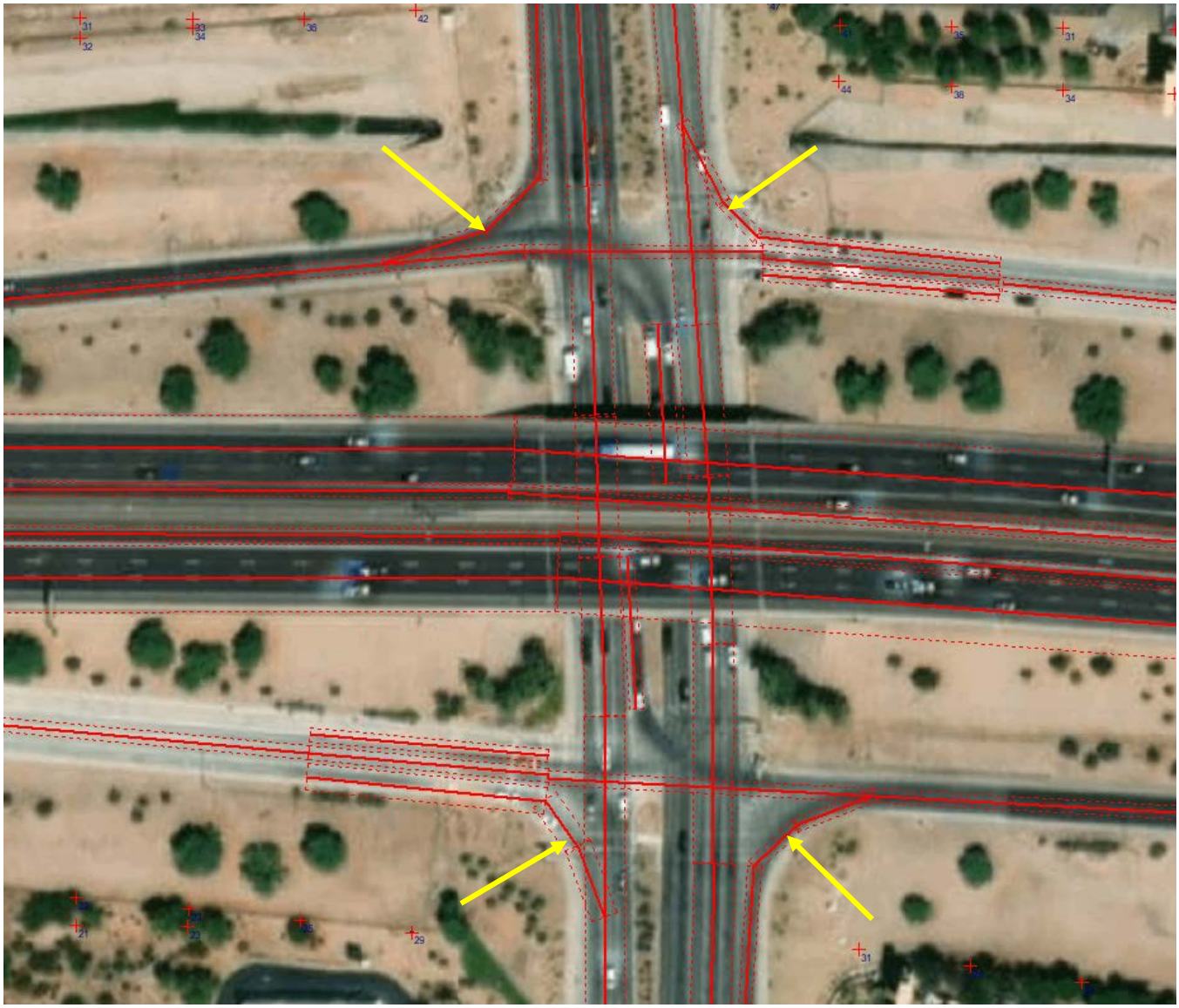
FHWA comment: Add additional AERMOD sources for protected right turn lanes at intersection curb radius.

Response: Two AERMOD line sources were modeled for protected right turn lanes at each intersection curb radius, please see screenshots below for the line sources at intersection curb radius (yellow arrows) for each TI.

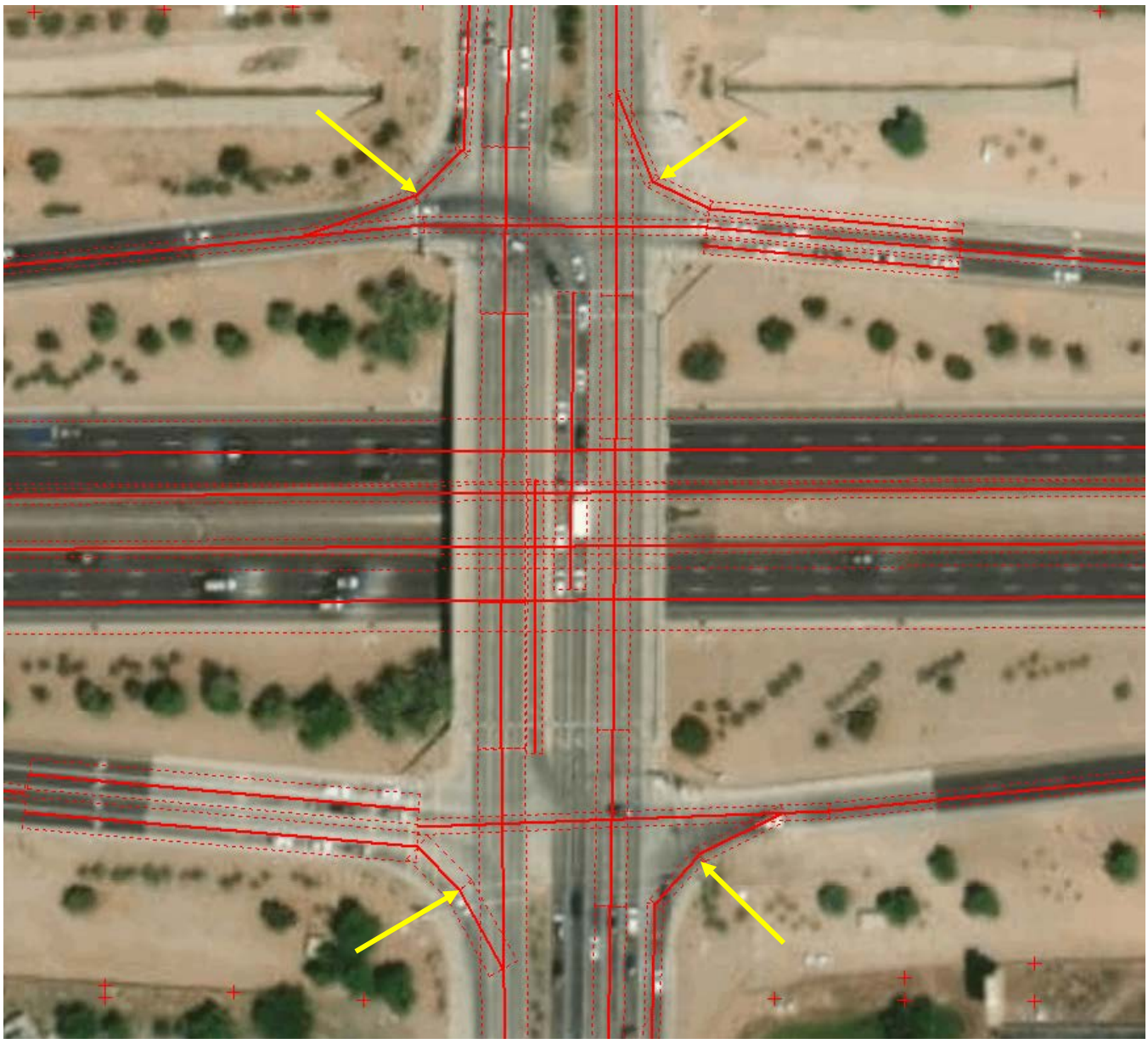
Alma School Rd TI



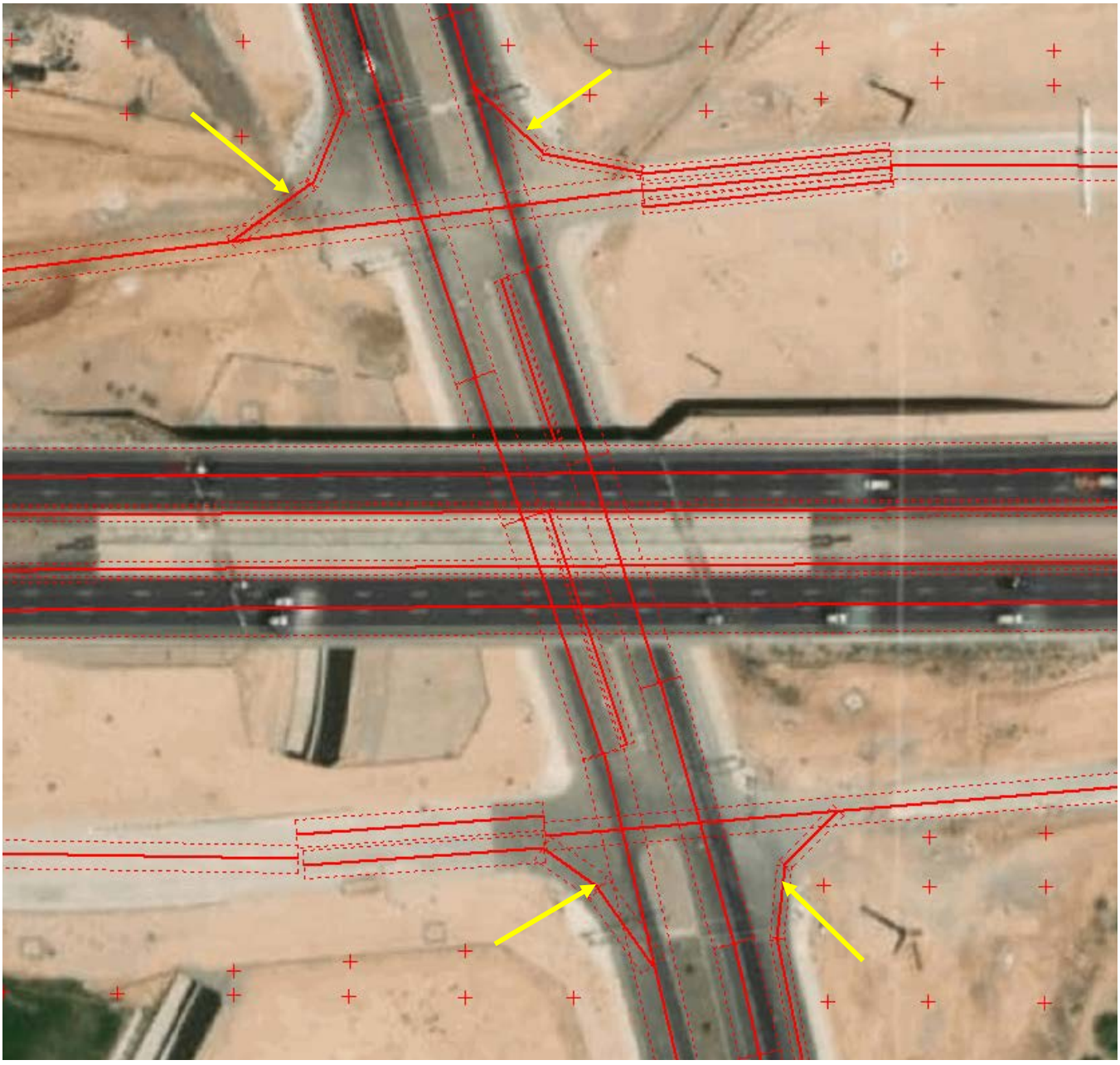
Arizona Ave TI



Gilbert Rd TI



Lindsay Rd TI



Appendix B

CO MOVES AND CAL3QHC MODELING INPUT FILES

(CO MOVES and CAL3QHC Modeling Files are Available Upon Request and Can be Found in the Project Folder)

Appendix C

ATYPICAL EVENTS REPORT

Arizona Department of Transportation

Environmental Planning

Final
Atypical Events Report

State Route 202L (Santan Freeway)
from Val Vista to Interstate 10

Project No. 202L MA 44 F0124 01C
Federal No. 202-C(208)S

September 19, 2023

Submittal Number 2

Contents

Introduction

This report aims to provide the United States Environmental Protection Agency (U.S. EPA) with a robust rationale for the exclusion of three specific dates from the State Route 202 Loop Santan Freeway Project (SR 202L) background particulate matter (PM) concentration data. These dates stand out as atypical when compared to the air quality levels and meteorological conditions of the project site. Consequently, the U.S. EPA seeks justification for categorizing these dates as atypical events that warrant their removal from the background concentration analysis.

This report demonstrates that these dates and their instances of exceeding the National Ambient Air Quality Standards (NAAQS) for 24-hour particulates measuring 10 microns or less (PM_{10}) should be disregarded in the projects PM_{10} background concentration calculations and the projects assessments of NAAQS exceedance or violations. This recommendation is made due to the dates' air quality characteristics being unique and uncontrollable due to meteorological conditions, which distinguishes them from typical conditions at the project site. This report provides an introductory summary of the project and the regulatory purpose of the report, the projects calculated PM_{10}background concentrations before and after removing the dates considered atypical to that of standard air quality conditions, and a description of the dates meteorological and air quality conditions that occurred and resulted in 24-hour PM_{10} NAAQS exceedance.

1.0 Project Description

The Arizona Department of Transportation (ADOT), in consultation with Federal Highway Administration (FWHA) is planning to install general purpose lanes (GPL) for the State Route 202 Loop Santan Freeway (SR 202L) between milepost (MP) 50.6 and MP 42.2 in the City of Chandler and the Town of Gilbert in Maricopa County, Arizona. Pursuant to 23 U.S.C. 326 and a January 4th, 2021, Memorandum of Understanding and executed by FHWA, all environmental review, consultation, and other required actions applicable to Federal environmental laws will for the Project be conducted by ADOT. The project is included in the Maricopa Association of Governments (MAG) 2022 – 2023 MAG Transportation Improvement Program (TIP) and MOMENTUM 2050 MAG Regional Transportation Plan, and regional conformity analysis 7322. The project is in the Maricopa County Nonattainment Area for particulates 10-microns in diameter or less (PM_{10}), eight-hour ozone (O_3), and a maintenance area for carbon monoxide.

The SR 202L section consisting of the project area is a six-lane divided freeway with one high-occupancy-vehicle (HOV) lane in each direction. As a part of the Phoenix Metropolitan Area's Regional Freeway system, the freeway connects to Interstate 10, serves as the end connection to State Route 101 (SR 101), and connection to the South Mountain Freeway. To address an increase in traffic congestion and peak traffic periods resulting in traffic increases, the purpose of the project is to increase freeway capacity while decreasing existing and future traffic congestion.

The scope of work consists of:

- Construct one GPL to the outside of existing lanes in each direction of SR 202L from Gilbert Road to Val Vista Drive
- Construct two GPL to the outside of existing lanes in each direction of SR 202L between SR 101 and Gilbert Road
- Realign entrance and exit ramps to accommodate new GPLs and modify exits to accommodate 2 lanes (1 auxiliary and 1 option lane)
- Mill and replace the AR-ACFC of the existing roadway
- Widen the following overpass (OP) bridges:
    - Arizona Ave (structure # 2693)
    - SR 202L mainline (structure #s 2678 and 2679) and Ramp C (structure # 2676) over Union Pacific Railroad (UPRR)
    - Consolidated Canal (structure #s 2683 and 2684)
    - Lindsay Rd (structure #s 2789 and 2790)
- Relocate the Arizona Ave Ramp D UPRR OP bridge (structure # 2677)
- Construct retaining walls that will have the same design patterns as the existing walls in the corridor
- Cut back abutment slopes where it is necessary to accommodate new lanes or changes in the ramps
- Relocate catch basins, storm drain and storm drain trunk lines and junction structures
- Reconstruct stormwater channel side-slopes and maintenance paths
- Construct three new sound walls
- Relocate existing sound wall at the Lindsay Rd TI OP
- Reconstruct existing sound wall north of SR 202L east of Cooper
- Restripe the roadway
- Remove, replace, and/or upgrade traffic signs
- Relocate, replace, and/or protect in place existing sign/DMS structures
- Relocate elements of the DMS as necessary due to the mainline and ramp widening

- Relocate and/or construct new ramp metering systems where ramps are being widened or realigned
- Replace existing traffic counters and other detection loops
- Replace existing High Pressure Sodium luminaries with LED luminaries
- Relocate and/or protect in place existing luminary poles
- Reconstruct crash attenuators at ramp gores where gore locations are affected by ramp widenings or realignments
- Restore landscaped areas disturbed by construction to match existing conditions, including replacing irrigation lines
- Repaint base and accent colors on bridges, walls, and other painted features affected by the new construction
- Upgrade sidewalk ramps and signal poles to ADA compliance at TIs, as necessary

2.0 Regulatory Standards

Per U.S. EPA guidelines, specific transportation projects now necessitate a quantitative assessment of PM_{10} impacts in proximity to roadways. This PM hotspot evaluation entails estimating the background PM_{10} concentration levels associated with the project. This estimation involves using a 3-year dataset of historical air quality information to establish the PM_{10} background value. This calculated background value is then added to the project's PM_{10} value to determine if the project's emissions might result in exceeding the National Ambient Air Quality Standards (NAAQS). Should the background concentration surpass the NAAQS, a build versus no-build project analysis becomes necessary.

The data used to determine the background concentration includes 24-hour average pollutant levels and annual means, excluding atypical air quality events. If the chosen 3-year period for determining the project's background concentration encompasses atypical air quality events, those events can be excluded from the analysis. This is done to mitigate the influence of outliers in air quality data stemming from uncontrollable air quality events, which could lead to NAAQS exceedances.

The U.S. EPA defines exceptional events as "events are unusual or naturally occurring events that can affect air quality but are not reasonably controllable using techniques that tribal, state or local air agencies may implement in order to attain and maintain the National Ambient Air Quality Standards (NAAQS)[1]." These events may include wildfires, high wind dust events (dust storms), prescribed fires, stratospheric ozone intrusions, and volcanic and seismic activities. In 2016, the U.S. EPA finalized the Exceptional Events Rule (EER) to establish regulations and procedures for determining if air quality data has been influenced by exceptional events. The EER ensures air quality measurements and analysis are properly evaluated regarding their cause to avoid imposing unreasonable planning or air quality NAAQS permitting requirements on air quality agencies and municipalities due to atypical events.

If the air quality data indicates an exceptional, extreme, or unrepresentative air quality event that is not influenced by relevant regulatory determinations, it falls outside the scope of the EER. In 2019, the U.S. Environmental Protection Agency (EPA) issued the Additional Methods, Determinations, and Analyses to Modify Air Quality Data memorandum acknowledging certain EPA determinations and analyses that utilize ambient air quality data that are not subject to the EER, but still are related to an exceptional event meteorological and PM_{10} exceedance qualification criteria. The EPA memorandum outlines data modification analysis of air quality event types not encompassed by or subject to determinations by the EER but fall within EPA's Guideline on Air Quality Models in 40 CFR Part 51, Appendix W including preparation of required "hot spot" analysis for particulate matter concerning transportation conformity assessments for specific projects under 40 CFR Part 93[2].

40 CFR 51 Appendix W Guideline to Air Quality Models provides modeling techniques and guidelines for State Implementation Plan (SIP) submittals and revisions, and to New Source Review (NSR), including new or modifying sources under Prevention of Significant Deterioration (PSD),1 2 3. Section 8.3.2 of 40 CFR 51 was developed to clarify and reaffirm that Appendix W still applies to atypical events, and it is not necessary to go through the exceptional event determination process to qualify an atypical event. Specifically, Appendix W states that there may be circumstances which necessitate modifications to PM_{10} background concentrations that include the removal of data from specific days or hours when a monitor

[1] U.S. EPA, *Treatment of Air Quality Data Influenced by Exceptional Events*, Accessed August 16th, 2023. https://www.epa.gov/air-quality-analysis/treatment-air-quality-data-influenced-exceptional-events-homepage-exceptional

[2] U.S. EPA, *Additional Methods, Determinations, and Analyses to Modify Air Quality Data Beyond Exceptional Events Memo*, 2019. Accessed August 19th, 2023. https://www.epa.gov/sites/default/files/2019-04/documents/clarification_memo_on_data_modification_methods.pdf

is affected by air quality activities that are not typical or not expected to reoccur in the future[3]. These adjustments would make the monitored background concentrations more spatially and temporally representative of areas around the new and modified source from project activity, for use in regulatory air quality assessments including this projects transportation conformity assessment.

EPA Region 9 recommends examining several criteria for determining whether an event is appropriate to exclude from a project's background concentrations:

1. Hourly and 24-hour average PM_{10} exceedances at multiple air monitors in the specified areas indicating it's a regional air quality event.
2. Windspeed conditions greater than 25 mph consistent with an increase in hourly PM_{10}
3. Reduced visibility to less than 10 miles consistent with increases in hourly PM10 concentrations.
4. National Weather Service (NWS) wind/dust advisories consistent with an increase in hourly PM_{10} concentrations.
5. Summaries of dust complaints and/or notices of PM_{10} violations; if dust complaints are received, or dust complaints do not involve anthropogenic source(s) located upwind of an exceeding monitor.

Data integrated into this procedure, which is deemed irregular compared to standard conditions and not eligible for EER regulatory determinations, is eligible for modification regarding the area's baseline concentrations. This modification process involves making necessary adjustments to monitored baseline concentrations to represent the spatial and temporal air quality conditions of the area more accurately. Consequently, this document regards the three requested days as atypical in their meteorological and PM_{10} characteristics and proposes their removal from the PM "hot spot" baseline analysis for the project. The goal is to enhance the accuracy of the projects area's baseline concentrations by excluding these days from consideration, without going through a formal EER determination process.

The Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division's Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021 report (MCAQD Atypical Events Report) provides detailed information about what days had the highest 24-hour average PM_{10} concentrations at the Higley and West Chandler Air Monitoring Sites. The days identified are proposed to be considered atypical events, due to the occurrence of high wind conditions and dust storms. As such, Maricopa County justifies that it is inappropriate to consider these days when calculating the project's hot spot analysis background PM_{10} concentrations. To provide justification for these dates exclusion, the report discusses air pollution forecasts issued by Arizona Department of Environmental Quality (ADEQ), NWS historical weather forecasts, National Oceanic and Atmospheric Association (NOAA) weather station data, and 24-hour average PM_{10} concentrations for air quality monitoring stations in the general Phoenix metropolitan area (Phoenix area).

MCAQD, as the designated air quality reporting agency for the SR 202L project, has furnished a Maricopa County Atypical Events Report, accessible in **Appendix A**. MCAQD's Atypical Events Report has been utilized as a point of reference for the dates under consideration as atypical in this summary report. Furthermore, MCAQD's report contains supplementary data on additional dates that also had atypical event characteristics during the three-year evaluation period scrutinized for the PM_{10} background concentration calculations of the Project. However, for the purpose of identifying atypical event days in this report, per EPA Region 9 criteria, only three dates are discussed from the MCAQD Atypical Events Report including: March 3rd, 2021, July 9th, 2021, and October 11th, 2021. Details on these three dates are provided in Section 4.0.

[3] U.S. EPA, Guidelines on Air Quality Models, 40 CFR Appendix-W-to-Part-51 8.08.3.2.

3.0 Project PM_{10} Background Concentrations, Without Removing Atypical Events

There are two monitors in the vicinity of the project site. The West Chandler PM monitor (West Chandler) is 0.5 miles from the project and Higley PM monitor (Higley) is 2.5 miles from the project. **Figure 1** identifies the project location below.

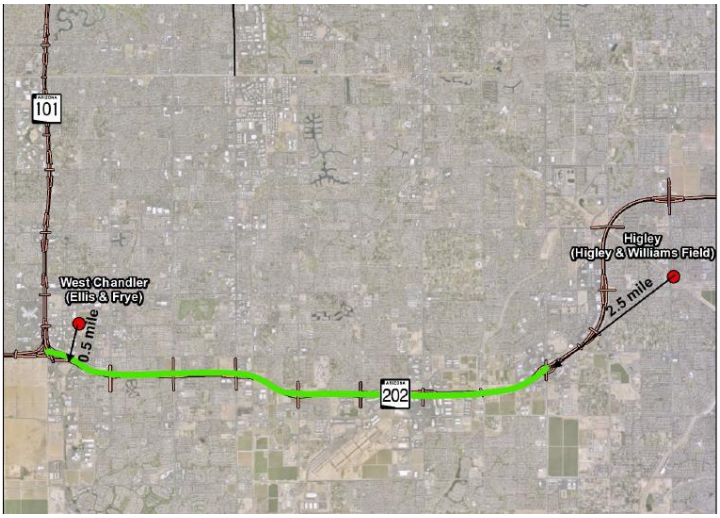


Figure 1: Project location map and proximity to West Chandler and Higley monitoring stations.

Using the U.S. EPA's Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas, the project's background PM_{10} levels were calculated by interpolating 2019 through 2021 PM_{10} concentrations between the two nearest monitoring stations (West Chandler and Higley). The 4th highest PM_{10} reading from 2019 through 2021 was identified from each monitoring station, and then used to interpolate the projects PM_{10} background concentrations. **Table 1** shows the number of completed monitoring days and highest 24-hour typical readings for 2019 through 2021 for the West Chandler and Higley Stations.

Table 1: Project Monitoring station Highest 24-hour PM_{10} Readings, Without Removing Atypical Events

West Chandler Station			
Data Year	**2019**	**2020**	**2021**
Number of Readings	365	362	364
1st	76	263	181
2nd	71	89	165
3rd	67	80	160*
4th	66	74	153
Higley Station			
Data Year	**2019**	**2020**	**2021**
Number of Readings	365	364	357
1st	114	131*	219
2nd	91	107	207
3rd	91	106	134
4th	89	92	130

Source: https: U.S. EPA Outdoor Air Quality Data, Download Daily Air Quality Data, https://www.epa.gov/outdoor-air-quality-data/download-daily-data
Note: *4th highest 24-hour readings are highlighted in red, without removing atypical events.

Table 1 shows that without considering atypical events, the West Chandler monitor's 4th highest value over three years (2019-2021) is 160 µg/m^3. This comes from a total of 1091 days of sampling. For the Higley monitor, over the same three-year period, the 4th highest value is 131 µg/m^3 from 1086 days of sampling.

The predicted background concentration, without removing atypical events, of the project is:

$$0.83 \times 160 + 0.17 \times 131 = \mathbf{155.1}\ \mu g/m^3$$

Per 40 CFR 50, Appendix K, the Maricopa County NAAQS threshold for PM_{10} 24-hour average concentration threshold is 150 µg/m^3. As such, the predicted PM_{10} background concentration exceeds the PM_{10} NAAQs threshold. **Table 2** compares the background concentration to the PM_{10}NAAQS threshold.

Table 2: PM_{10} NAAQS Threshold & Projects Calculated Background PM_{10} Concentrations

West Chandler Station			
4th Highest 24-hour Average PM_{10} Concentration without Atypical Event Data Exclusion (µg/m^3)	PM_{10} National Ambient Air Quality Standards (NAAQS)	Difference (µg/m^3)	Exceeds Threshold?
160	150	10	Yes
Higley Station			
4th Highest 24-hour Average PM_{10} Concentration without Atypical Event Data Exclusion (µg/m^3)	PM_{10} National Ambient Air Quality Standards (NAAQS)	Difference (µg/m^3)	Exceeds Threshold?
131	150	19	No
Project PM_{10} Background Concentration Levels			
Background PM_{10} Concentration without Atypical Event Data Exclusion (µg/m^3)	PM_{10} National Ambient Air Quality Standards (NAAQS)	Difference (µg/m^3)	Exceeds Threshold?
155.1	150	5.1	Yes

As shown in **Table 2**, the interpolated project PM_{10} background concentrations are higher than PM_{10} NAAQS threshold, without removing atypical event day data from the analysis. This can be attributed to several days within the three-year evaluation period being classified as atypical events. As such, the background concentration levels that include atypical event data are unrepresentative of the projects standard average PM_{10} background concentrations and should not be considered during the projects PM_{10} background concentration calculations.

4.0 Atypical Event Days

Hourly and daily PM_{10} data for the years 2019 through 2021 was obtained for the selected West Chandler and Higley monitors from the EPA AirData website to be evaluated for the projects PM_{10} background concentration calculations. Within these three years of data, the following dates are being proposed to be considered as atypical events:

- March 3rd, 2021
- July 7th, 2021,
- October 11th, 2021

The dates above are being proposed to be excluded from the projects PM_{10} background concentration calculations per guidelines listed in 40 CFR Part 51, Appendix W, Section 8.3.2.c.ii for the 40 CFR Part 53 transportation conformity portion of the project. Monitoring data for these three days proposed to being removed was obtained from MCAQD's Atypical Events Report and checked to ensure that it meets the EPA's 75% data completeness criteria[4]. **Table 3** summarizes the days recommended for exclusion due to atypical-type events.

The three days proposed for removal from the background concentration analysis are considered atypical in nature because they fit the EPA Region 9's 5-criteria for the data background modification of atypical events (Section 2.0). For the three days proposed, the West Chandler and Higley monitoring sites showed hourly and 24-hour average PM_{10} exceedances and the Phoenix area's windspeed conditions were recorded to be greater than 25 mph. These records coincide with an increase in hourly PM_{10} concentrations throughout the Arizona region consistent with reduced visibility to less than 10 miles identified in NWS and ADEQ pollution reports, wind dust advisories, dust complaints received, and notices of PM_{10} violations.

Table 3: Higley and West Chandler Monitoring stations PM_{10} NAAQS Atypical Events Days Data

Station	Date	24-hour Average PM_{10} Concentration ($\mu g/m^3$)	PM_{10} NAAQS Exceedances flagged as an Atypical Event	Identified as an Atypical Event
Higley	3/3/2021	208*	Yes	Yes
	7/9/2021	131.2	No	Yes
	10/11/2021	134.7	No	Yes
West Chandler	3/3/2021	154.3	Yes	Yes
	7/9/2021	166.4*	Yes	Yes
	10/11/2021	160.9	Yes	Yes

Source: U.S. EPA Outdoor Air Quality Data, Download Daily Air Quality Data, https://www.epa.gov/outdoor-air-quality-data/download-daily-data
Notes: *Highest 24-Hr average PM_{10} concentration reading identified during 3-year period's atypical events days.

Data from nearby monitors, identified in **Appendix A**, were also flagged for high PM_{10} concentrations on the atypical events days, indicating that the atypical air quality events were widespread and regional in nature. Windspeed data was collected from the NOAA Phoenix Sky Harbor Airport Weather Station to

[4] U.S. EPA, Office of Air Quality Planning and Standards, Guideline on Data Handling Conventions for the PM NAAQS, April 1999, Table 8-1. Accessed September 17th, 2023. https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19990401_oaqps_epa-454_r-99-009_guideline_data_handling_pm_naaqs.pdf

justify that atypical events were regional in nature and affected the Phoenix area as whole, rather than just the project area. Although windspeed's at the West Chandler and Higley monitoring stations did not exceed 25 mph for some of the proposed atypical event days, windspeed data at the NOAA Phoenix Sky Harbor Airport Weather Station was referenced to demonstrate there were sustained windspeeds of greater than 25 mph in the Phoenix area.

The MCAQD Atypical Events Report provided in Appendix **A's** Appendix II includes maximum hourly sustained windspeed and wind gust data for the three days being proposed as atypical. However, it does not list the maximum 24-hour sustained windspeed and wind gust measurements for July 9th and October 11th, 2021, as recorded measurements fell between the hourly data points. On March 3rd, 2021, the maximum hourly windspeed and wind gust data align with the 24-hour maximum windspeed and wind gust values, as they represent the same maximum 24-hour measurements. As such, to demonstrate that all three days meet the atypical event criteria of windspeeds exceeding 25 mph, **Table 4** presents the three days maximum sustained windspeeds and gust speeds from the NOAA Phoenix Sky Harbor Airport Weather Station's monitoring data. For more detailed NOAA Phoenix Sky Harbor Airport Weather Station data referenced in Table 4, please refer to **Appendix B**.

Table 4: NOAA Phoenix Sky Harbor Airport Weather Station (WBAN:23183) Windspeed for Atypical Events Days

Date	Max Wind Gust Speed (mph)	Time Recorded	Max Sustained Windspeed (mph)	Time Recorded	Windspeed Qualifies in an Atypical Event? (> 25 mph)
3/3/2021	47	4:51 P.M.	30	3:51 P.M.	Yes
7/9/2021	46	10:45 P.M., 10:49 P.M., & 10:51 P.M.	30	10:45 P.M.	Yes
10/11/2021	46	10:44 P.M.	28	10:44 P.M.	Yes

Source: U.S. Department of Commerce National Centers for Environmental Information National Oceanic & Atmospheric Administration, *National Environmental Satellite, Data, and Information Service for Phoenix Airport Station, AZ US WBAN:23183 (ICAO:KPHX), Local Climatological Data - Hourly Observations for 03/03/21, 07/09/21 & 10/11/21*. https://www.ncdc.noaa.gov/cdo-web/datasets/LCD/stations/WBAN:23183/detail

For more details on windspeed data for the proposed atypical event days at the West Chandler, Higley Stations, and nearby monitoring stations please refer to **Appendix A**.

Meteorological conditions, beyond control, like high temperatures, low precipitation, atmospheric pressure changes, along with wildfires and strong winds, can lead to emissions spikes. Consequently, the dates discussed in this summary report are marked by a combination of meteorological conditions, strong winds, and fire occurrences resulting in naturally occurring, uncontrollably higher than average regional and project PM_{10} background concentrations. As such, these days are subject to atypical event review per 40 CFR Part 51, Appendix W, Section 8.3.2.c.ii.

March 3rd, 2021, Atypical Event

A high-wind event due to a low-pressure system moving through the state occurred on this date, with wind gusts reaching up to 45 mph at the NOAA Phoenix Sky Harbor Airport Weather Station (**Table 5**). This caused widespread blowing dust throughout the region. Nine monitoring sites, in both Maricopa and Pinal counties, exceeded the 24-hour PM_{10} NAAQS due to this storm. For more details on all monitoring sites that exceeded the 24-hour PM_{10} NAAQS during this atypical event date besides West Chandler and Higley, please refer to **Appendix A.**

According to ADEQ's pollution forecast for March 3rd, 2021, winds between 20 and 30 mph were forecasted with possible chances for precipitation and the NWS issued a Red Flag Warning in effect from 11:00 A.M. to 6:00 P.M[5]. Red Flag Warning weather conditions consist of warm temperatures, low humidity, and strong winds which can increase the risk of fire danger.[6] On March 3rd, 2021, these conditions resulted in a high wind event and elevated PM_{10} concentrations. **Table 5** shows the windspeed levels and the highest PM_{10} concentration recorded for March 3rd, 2021, at the West Chandler and Higley Stations.

Table 5: Windspeed and PM_{10} Data for March 3rd, 2021

Site	24-hour average PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Windspeed (MPH)	Time	Max Wind Gust (MPH)	Time
West Chandler	153*	20.8	4:00 P.M.	42.9	4:00 P.M.
Higley	207*	22.3	4:00 P.M.	45.3	5:00 P.M.

Source: Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021*, March 3rd, 2021, Atypical Event, **Table 6, Page 20**.
Notes: *Measurement exceeds PM_{10} NAAQS.

Gusty winds, with maximum hourly average windspeeds slightly lower than 25 mph, were recorded at the West Chandler and Higley monitors on March 3rd, 2021. Both the West Chandler and Higley Stations experienced wind gusts of over 25 mph on March 3rd, 2021, with West Chandlers' maximum wind gust speed being 42.9 mph and Higley's being 45.3 mph[7]. Per NOAA Phoenix Sky Harbor Airport Weather Station data, the highest windspeed for March 3rd, 2021, recorded was 30 mph at 3:51 P.M. Additionally, throughout the Phoenix area, wind gust speeds were recorded over 25 mph and nine PM monitors recorded PM_{10} concentrations over NAAQS thresholds, including West Chandler. For more details on these additional monitors please refer to **Appendix A**. High PM_{10} concentrations observed on March 3rd, 2021, coincided with windy conditions in the project area (maximum wind gust speeds of 42.9 mph at the West Chandler and 45.3 mph at Higley Stations) as shown in **Figures 2** and **3** below. 5-minute windspeed and PM_{10} concentration data from the MCAQD Atypical Events Report for the West Chandler and Higley stations is plotted in **Figures 2** and **3**.

[5] Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021*, March 3rd, 2021, Atypical Event, **Pages 19-27**. Accessed September 18th, 2023.
[6] National Weather Service, *Red Flag Warning*. Accessed August 17th, 2023. https://www.weather.gov/mqt/redflagtips
[7] Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021, March 3rd, 2021, Atypical Event*, **Table 6, Page 20.** Accessed September 18th, 2023.

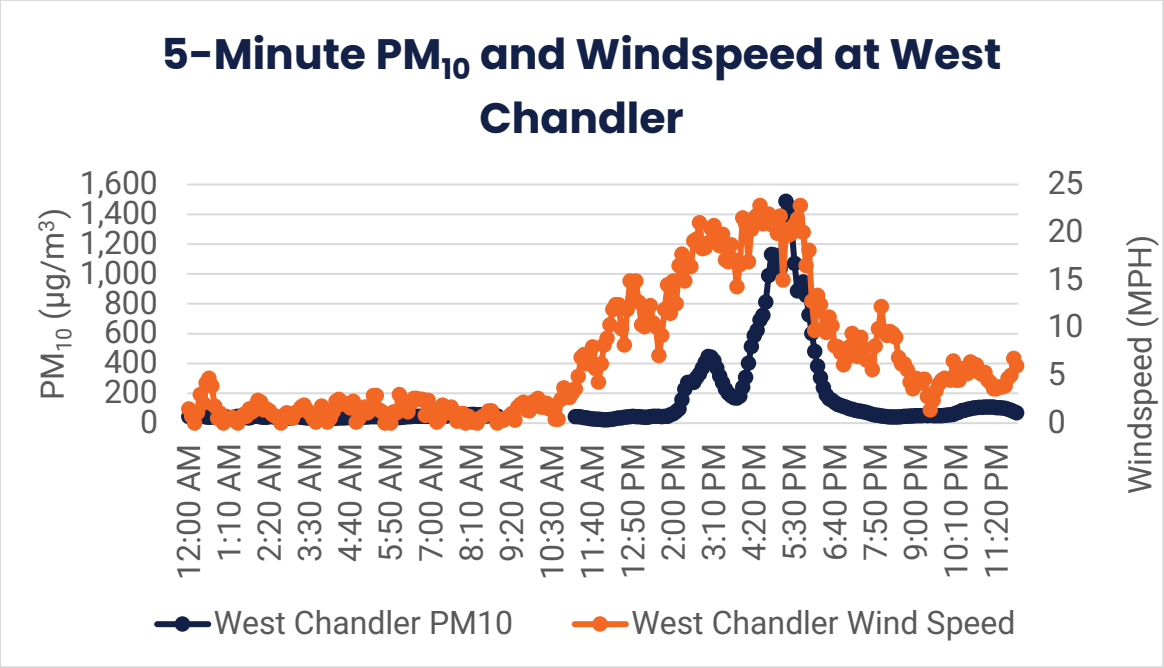


Figure 2: 5-Minute PM_{10} concentrations ($\mu g/m^3$) and windspeed (mph) at West Chandler monitoring station on March 3rd, 2021.

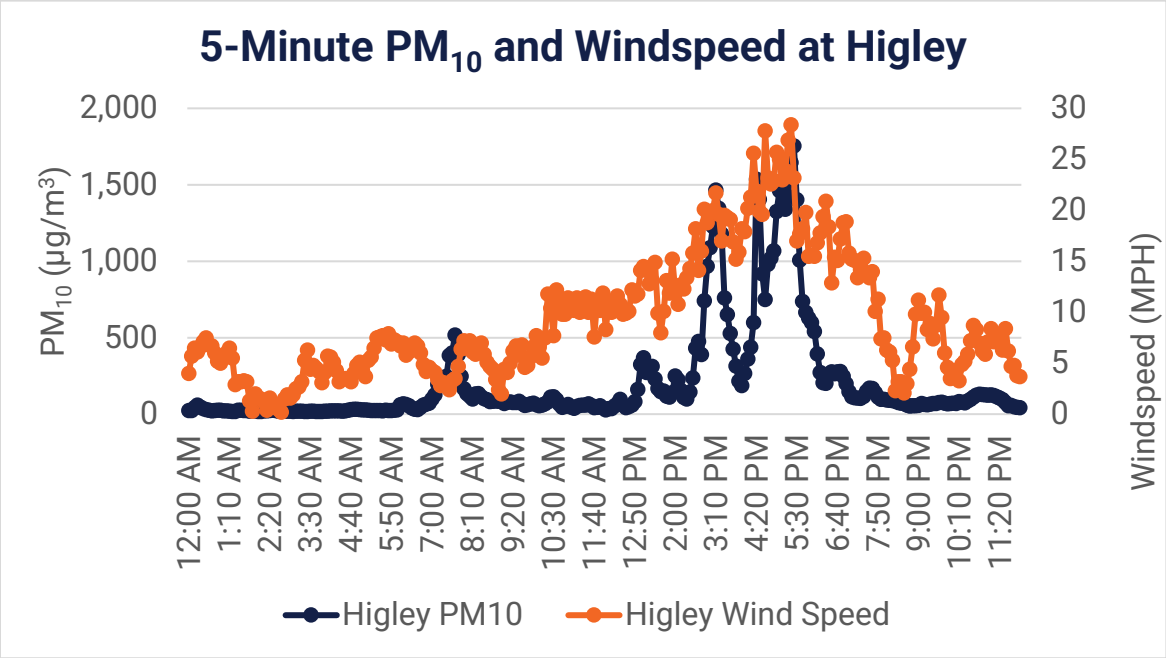


Figure 3: 5-Minute PM_{10} concentrations ($\mu g/m^3$) and windspeed (mph) at Higley monitoring station on March 3rd, 2021.

Figures 2 and **3** show that as windspeeds increased on March 3rd, 2021, at the Higley and West Chandler stations, 5-Minute PM_{10} concentrations rose relatively as well to over 1,000 µg/m^3, indicating dust storm activity[8]. 5-Minute windspeeds at West Chandler and Higley are greater than 25 mph, peaking around 27 mph between 4:20 P.M. and 5:30 P.M. At the peak of these high winds PM_{10} concentrations were the highest, with 24-hour average concentrations being recorded as 153 µg/m^3 at West Chandler and 207 µg/m^3 at Higley, and at 4:00 P.M. both stations' PM_{10} concentrations exceeded NAAQS.

An evaluation of all air quality inspections and complaints between February 28th, 2021, and March 6th, 2021, indicates no evidence of unusual anthropogenic PM_{10} emissions. During the 7-day period, 58 air quality related events were received, with 50 of them related to windblow dust or PM_{10}. For more details on these complaints, please refer to **Appendix A**.

Blowing dust, haze, and dust storms were reported on March 3rd, 2021, along with reduced visibilities throughout the Phoenix area. The pictures below show ADEQ's Visibility Camera Historical Archive photos of the Phoenix area at the time prior to and during the dust storm on March 3rd, 2021. The pictures on the left show the area prior to the storm and the pictures on the right show the area with reduced visibility during the storm. Note the storm hit the Phoenix area around 12:00 P.M and was at its peak at 4:00 P.M.

South Mountain Camera, 12:00 P.M.

South Mountain Camera, 4:45 P.M.

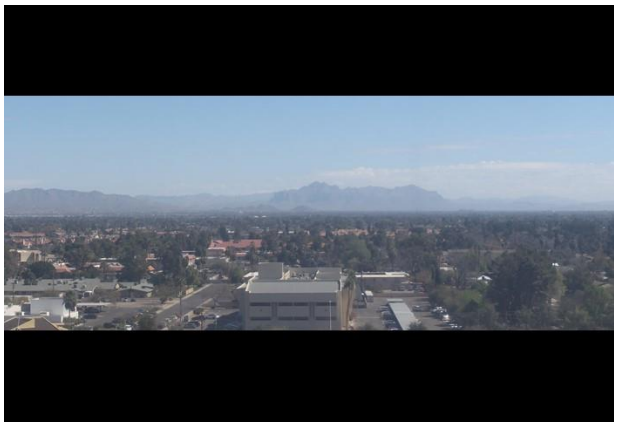
Camelback Mountain Camera, 1:00 P.M.

Camelback Mountain Camera, 3:45 P.M.

Superstition Mountains Camera, 12:00 P.M.

Superstition Mountains Camera, 5:00 P.M.

[8] Maricopa County Air Quality Department, *Maricopa County Air Quality Status Map – 1-Hour PM_{10} and Windspeed Historical Data for West Chandler and Higley Monitoring Stations*, March 3rd, 2021, **Page 26**. Accessed August 16th, 2023. https://maricopaco.agilaire.com/AirVision/



July 9th, 2021, Atypical Event

Summer monsoon storm activity resulting in a high wind event consisting of a widespread blowing dust throughout the Phoenix Area occurred on July 9th, 2021, with wind gusts reaching up to 63 mph at the NOAA Phoenix Sky Harbor Airport Weather Station (**Table 6**). Five monitoring sites in Maricopa County exceeded the 24-hour PM_{10} NAAQS on this date, including the West Chandler Monitoring station. For more details on all monitoring sites besides West Chandler that exceeded the 24-hour PM_{10} NAAQS during this atypical event, please refer to **Appendix A.**

According to ADEQ's pollution forecast for July 9th, 2021, storms occurred across the northern and eastern portions of the Phoenix Valley, with a high chance of outflow winds in the east and northeast and resulting in isolated pockets of dust[9]. On July 9th, 2021, these stormy conditions caused high winds, isolated dust storms, and elevated PM_{10} concentrations at the West Chandler and Higley monitoring stations. According to the NWS forecast discussion for the July 9th, 2021, favorable atmospheric conditions for convection were observed, and an increase in temperature caused mixing of the inversion layer. These atmospheric changes, including convection and alterations in atmospheric pressure, contributed to the occurrence of storms in the Phoenix Valley. These storms produced localized phenomena such as strong 40 to 60 mph wind gusts, outflow winds, and heavy rainfall. **Table 6** shows the windspeed levels and the highest PM_{10} concentrations recorded for July 9th, 2021, at the West Chandler and Higley monitoring stations.

Table 6: Windspeed and PM_{10} Data for July 9th, 2021

Site	24-hour average PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Windspeed (MPH)	Time	Max Wind Gust (MPH)	Time
West Chandler	165*	13.0	10:00 P.M.	47.5	10:00 P.M.
Higley	130	21.1	10:00 P.M.	63.8	10:00 P.M.

Source: Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021*, July 9th, 2021, Atypical Event**, Table 10, Page 37**.
Notes: *Measurement exceeds PM_{10} NAAQS.

[9] Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021,* July 9th, 2021, Atypical Event, **Pages 36 – 43**. Accessed September 18th, 2023.

Gusty winds were recorded at the West Chandler and Higley monitors on July 9th, 2021. Throughout the Phoenix area, wind gusts were recorded over 25 mph and five PM monitors recorded PM_{10} concentrations over NAAQS thresholds. The West Chandler and Higley stations recorded wind gusts surpassing 25 mph, with maximum wind gust speeds of 47.5 mph at West Chandler and 63.8 mph at Higley[10]. Per NOAA Phoenix Sky Harbor Airport Weather Station data, the highest windspeed for July 9th, 2021, recorded was 30 mph at 10:45 P.M. Increases in PM_{10} concentrations observed on July 9th, 2021, coincided with these high wind conditions (maximum wind gust speeds over 63 mph at Higley Station) in the project area as shown in **Figures 4** and **5** below. 5-Minute windspeed and PM_{10} concentration data from the MCAQD Atypical Events Report for the West Chandler and Higley stations is plotted in **Figures 4** and **5**.

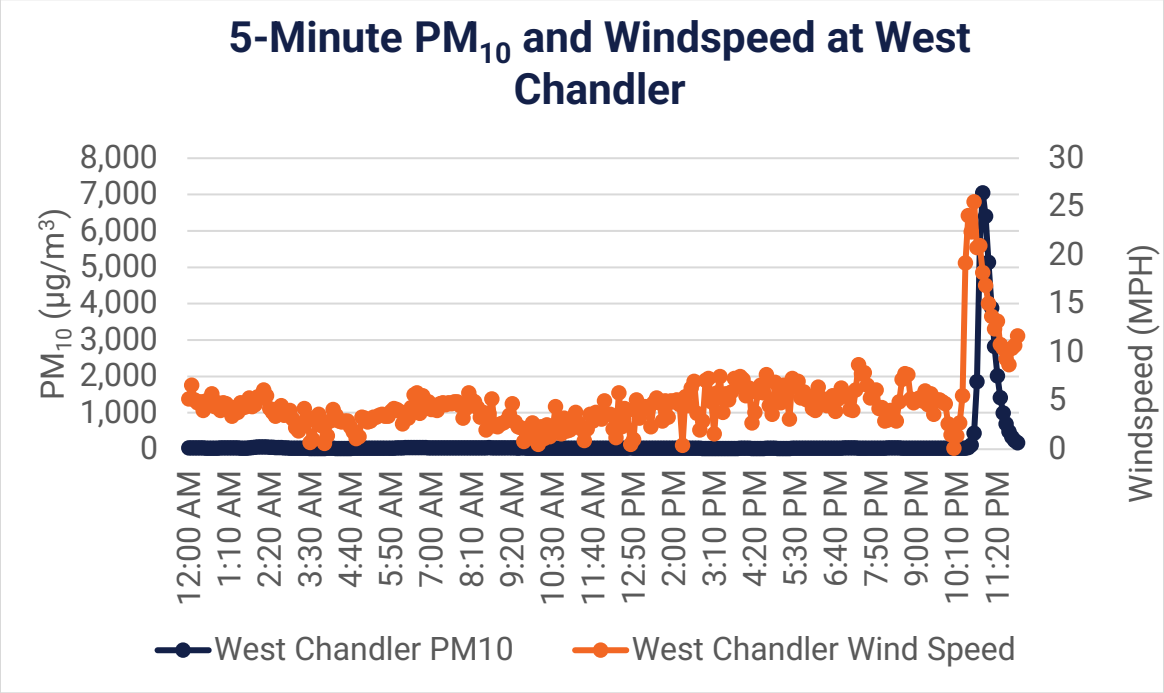


Figure 4: 5-Minute PM_{10} concentrations ($\mu g/m^3$) and windspeed (mph) at West Chandler monitoring station on July 9th, 2021.

[10] Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021*, July 9th, 2021, Atypical Event, **Table 10, Pages 37-38**. Accessed August 16th, 2023.

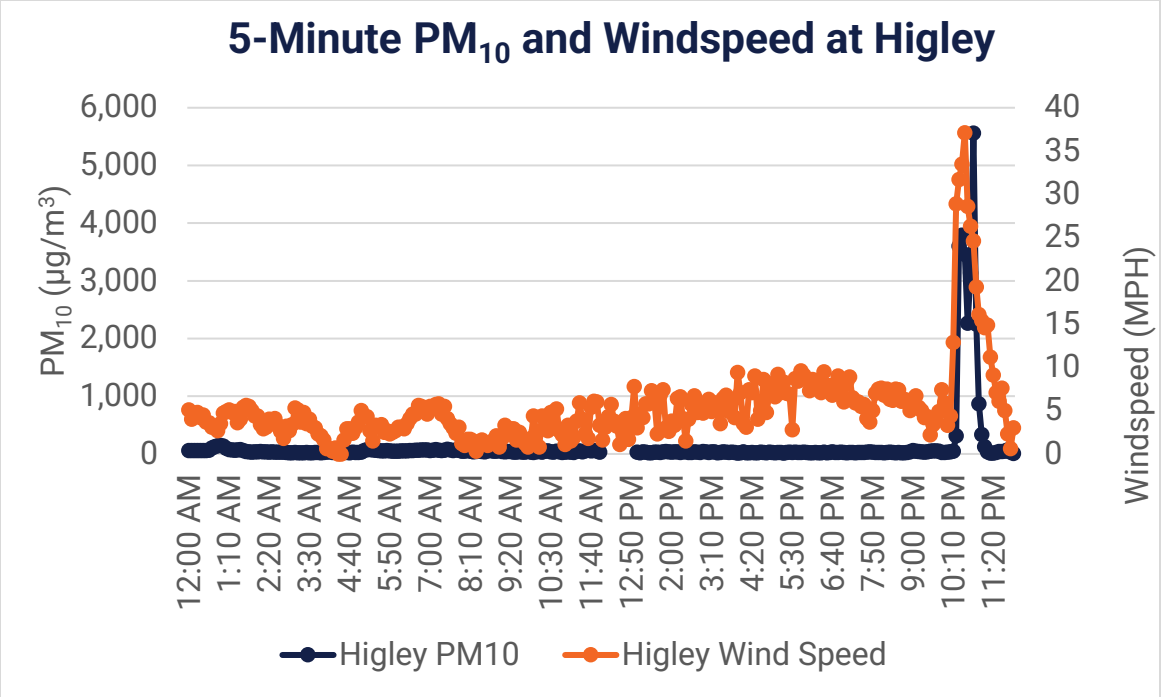


Figure 5: 5-MinutePM_{10} concentrations (µg/m^3) and windspeed (mph) at Higley monitoring station on July 9th, 2021.

Figures 4 and **5** show that as windspeeds increased on July 9th, 2021, at the Higley and West Chandler stations, 5-Minute PM_{10} concentrations rose relatively as well to over 2,000 µg/m^3, indicating dust storm activity[11]. 5-Minute windspeeds at West Chandler and Higley are greater than 25 mph, peaking around 37 mph at 10:10 PM. At the peak of these high winds PM_{10} concentrations were the highest, with 24-hour average concentrations being recorded as 165 µg/m^3 at West Chandler and 130 µg/m^3 at Higley[12], and at 10:00 P.M. West Chandler's PM_{10} concentration exceeded NAAQS.

An evaluation of all air quality inspections and complaints between July 6th, 2021, and July 12th, 2021, indicates no evidence of unusual anthropogenic PM_{10} emissions. During the 6-day period, 23 air quality related events were received, with 22 related to windblown dust or PM_{10}. For more details on these complaints, please review **Appendix A**.

Blowing dust haze, and dust storms along with reduced visibilities were reported on July 9th, 2021, throughout the Phoenix area. The pictures below show ADEQ's Visibility Camera Historical Archive photos of the Phoenix area at the time prior to and during the dust storm on July 9th, 2021. The pictures on the left show the area prior to the storm, and the pictures on the right show the area with reduced visibility during the storm. Note the storm hit the Phoenix area around 10:00 P.M.

[11] Maricopa County Air Quality Department, *Maricopa County Air Quality Status Map – 1-Hour PM_{10} and Windspeed Historical Data for West Chandler and Higley Monitoring Stations*, July 9th, 2021. Accessed August 16th, 2023. https://maricopaco.agilaire.com/AirVision/

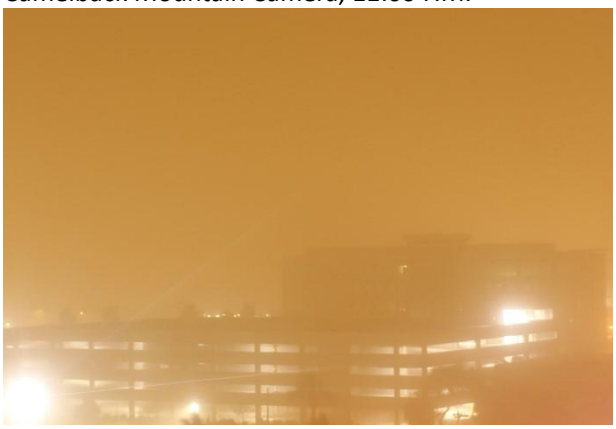
[12] Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021*, July 9th, 2021, Atypical Event, **Table 10**, **Page 37**. Accessed August 17th, 2023.

South Mountain Camera, 10:30 P.M.

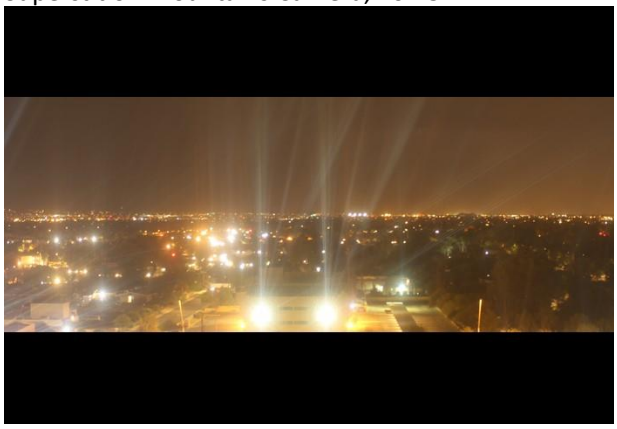
South Mountain Camera, 11:15 P.M.

Camelback Mountain Camera, 10:00 P.M.

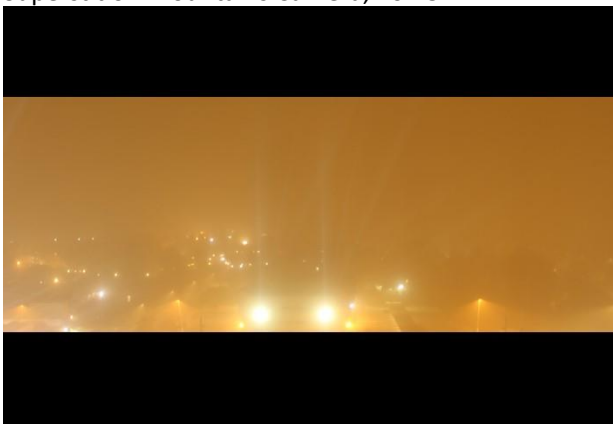
Camelback Mountain Camera, 11:00 P.M.



Superstition Mountains Camera, 10:15 P.M.



Superstition Mountains Camera, 10:45 P.M.



October 11th, 2021, Atypical Event

A high-wind event from monsoon storm activity occurred on October 11th, 2021, causing widespread blowing dust throughout Arizona. Wind gusts were recorded to reach up to 46 mph at the NOAA Phoenix Airport Weather Station (**Table 7**) Five monitoring sites in both Maricopa and Pinal counties, including West Chandler, exceeded the 24-hour PM_{10} NAAQS. For more details on all monitoring sites besides West Chandler that exceeded the 24-hour PM_{10} NAAQS during this atypical event date, please refer to **Appendix A.**

According to the ADEQ pollution forecast for October 11th and 12th, two strong low-pressure fronts hit the Southwest United States region. The first low pressure front resulted in breezy westerly winds and potential pockets of dust on October 9th and 10th, and the second low pressure front on October 11th brought stronger southwestern winds with elevated PM_{10} levels due to a combination of fall seasonally dependent high winds and PM_{10} concentration volatility. On October 11th, 2021, the NWS Phoenix Area Forecast Discussion reported that a low-pressure front had advanced southward through the Sierra Nevada and Central California. In response to this tightening low-pressure gradient, winds intensified. Satellite imagery confirmed the presence of blowing dust near the Salton Sea. This blowing dust propagated eastward into the Phoenix area during the evening of October 11th, 2021. Consequently, a Blowing Dust Advisory was issued for the lower desert areas of Arizona[13]. On October 12th around 12:00 A.M., due to strong winds and cooler temperatures because of October 11th's low-pressure front and westerly winds, PM_{10} levels rose again significantly. On October 11th and 12th, 2021, PM_{10} levels exceeded health standards and resulted in a High Pollution Advisory for PM_{10} in the Phoenix area being placed on October 12th, 2021[14].

With winds over 25 mph throughout the Phoenix area and due to meteorological conditions and a high wind event, high PM_{10} concentrations occurred on October 11th and 12th, 2021. The majority of the elevated PM_{10} concentrations occurred between October 11th, 2021, and 9:00 P.M. and October 12th, 2021, at 3:00 A.M. However, October 11th is the day being analyzed for atypical event consideration, as the initial low-pressure front causing high winds, blowing dust, and PM_{10} exceedances initiated on October 11th, 2021.

Table 7 shows the windspeed levels and highest PM_{10} concentrations recorded for October 11th, 2021, at the West Chandler and Higley Stations.

Table 7: Windspeed and PM_{10} Data for October 11th, 2021

Site	Date	24-hour average PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Windspeed (MPH)	Time	Max Wind Gust (MPH)	Time
West Chandler	10/11/2021	160*	19.9	9:00 P.M.	45.6	10:00 P.M.
Higley	10/11/2021	134	18.4	7:00 P.M.	36.2	7:00 P.M.

Source: Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021*, July 9th, 2021, Atypical Event, **Table 12, Page 45**.
Notes: *Measurement exceeds PM_{10} NAAQS.

[14] Valley Metro, *High Pollution Advisory Dates*, 2021. Accessed August 17th, 2023. https://www.valleymetro.org/commute-solutions/high-pollution-advisory

High winds, with max hourly windspeeds slightly less than 25 mph, were recorded at West Chandler and Higley on October 11th, 2021. Throughout the Phoenix area, wind gusts over 25 mph were recorded and five PM monitors including West Chandler recorded PM_{10} concentrations over NAAQS thresholds. For more details on these five monitors besides West Chandler please refer to **Appendix A**. The West Chandler and Higley stations both recorded wind gust speeds surpassing 25 mph at a maximum of 45.6 mph at West Chandler and 36.2 mph at Higley15. Per NOAA Phoenix Sky Harbor Airport Weather Station data, the highest windspeed recorded for October 11th, 2021, was 28 mph at 10:44 P.M. Increased PM_{10} concentrations observed on October 11th, 2021, coincided with these high wind conditions (maximum wind gust speeds over 45 mph at West Chandler Station) in the project area as shown in **Figures 6** and **7** below (referenced from MCAQD's Atypical Events Report, Appendix A).

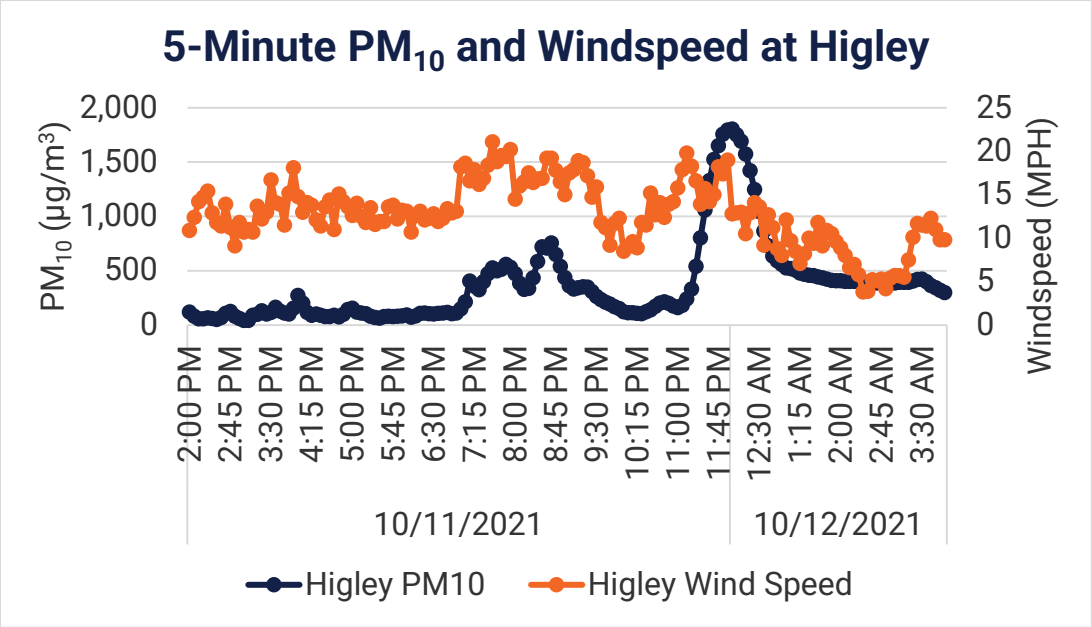


Figure 6: 5-Minute PM_{10} concentrations ($\mu g/m^3$) and windspeed (mph) at Higley monitoring station on October 11th and 12th, 2021.

[15] Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021,* July 9th, 2021, Atypical Event, **Table 12, Page 45**. Accessed September 18th, 2023.

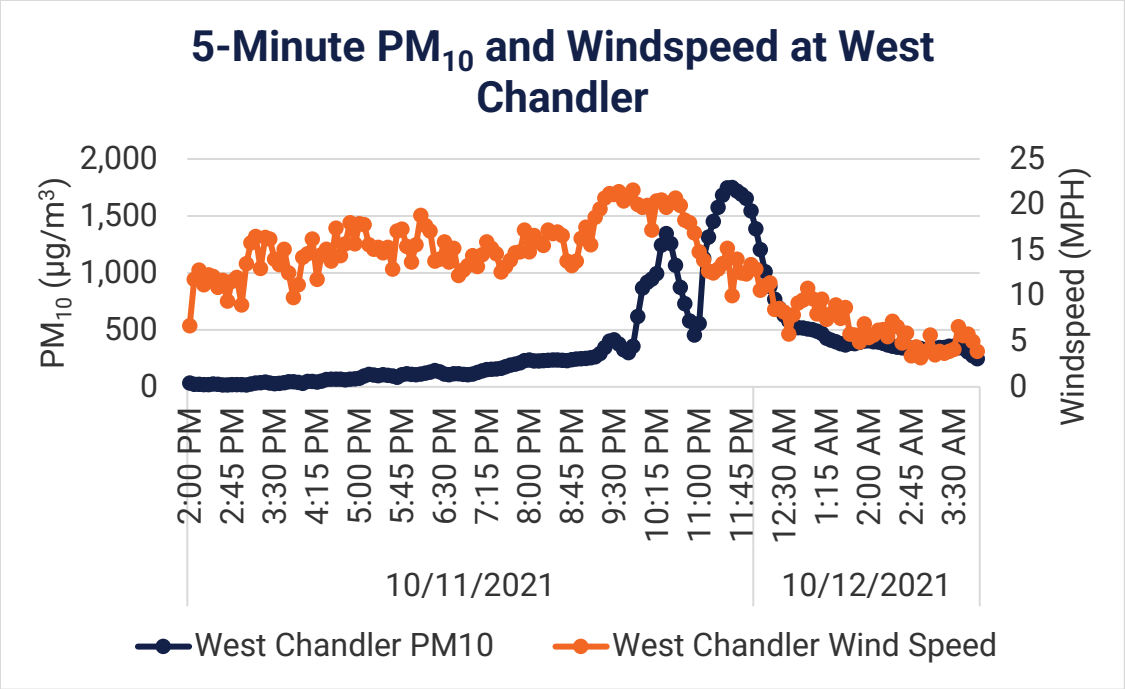


Figure 7: 5-Minute PM_{10} concentrations ($\mu g/m^3$) and windspeed (mph) at West Chandler monitoring station on October 11th and 12th, 2021.

Figures 6 and **7** illustrate high windspeeds at the Higley and West Chandler monitoring stations on October 11th, 2021, with sustained high windspeeds increasing as the storm progressed. Coinciding with the peak windspeeds, beginning around 7:00 P.M. on October 11th and extending to 12:00 A.M. on October 12th, 2021, 5-minute PM_{10} concentrations notably rose to greater than 1,000 $\mu g/m^3$ at both the Higley and West Chandler monitoring stations indicating dust storm activity. As a result, the West Chandler monitoring station exceeded PM_{10} NAAQS on both October 11th and 12th. The Higley monitoring station did not go over PM_{10} NAAQS thresholds on October 11th, 2021, but did exceed 3 hours later (24-hour average of 219 $\mu g/m^3$) at 12:00 A.M. on October 12th, 2021[16].

An evaluation of all air quality inspections and complaints between October 8th, 2021, and October 12th, 2021, indicates no evidence of unusual anthropogenic PM_{10} emissions. During the 4-day period, 25 air quality related events were received, with 17 related to windblow dust or PM_{10}. For more details on these complaints, please refer to **Appendix A**.

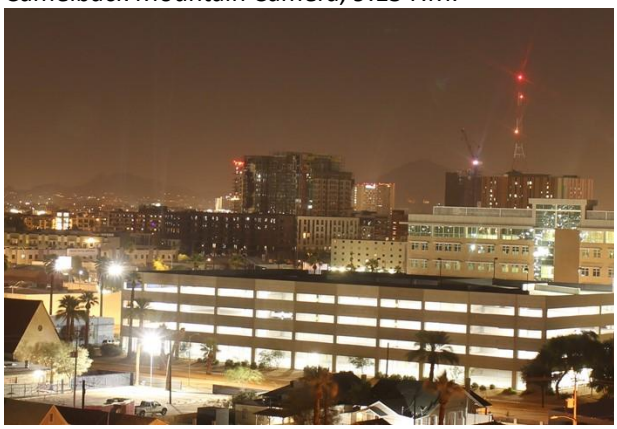
Blowing dust, haze, and dust storms along with reduced visibilities were reported on October 11th, 2021, in the Phoenix area. The pictures below show ADEQ's Visibility Camera Historical Archive photos of the Phoenix area at the time prior to and during the dust storm with reduced visibility on October 11th, 2021. Note the first low pressure wave of the storm hit the Phoenix area around 9:00 P.M.

[16] Maricopa County Air Quality Departments (MCAQD) Air Quality Planning & Analysis Division, *Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021,* July 9th, 2021, Atypical Event, **Table 12, Page 45**. Accessed September 18th, 2023.

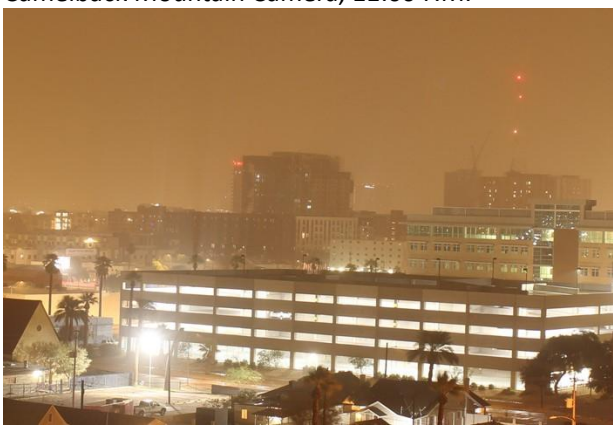
South Mountain Camera, 4:30 P.M.

Note: There are no images available in the archive for South Mountain camera after 4:30 P.M. on October 11, 2021

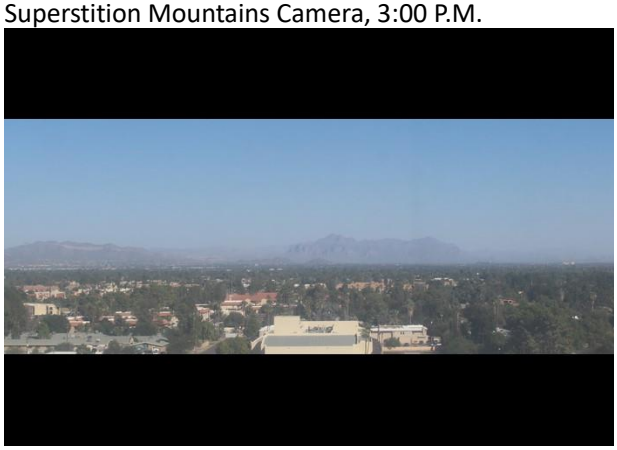
Camelback Mountain Camera, 9:15 P.M.



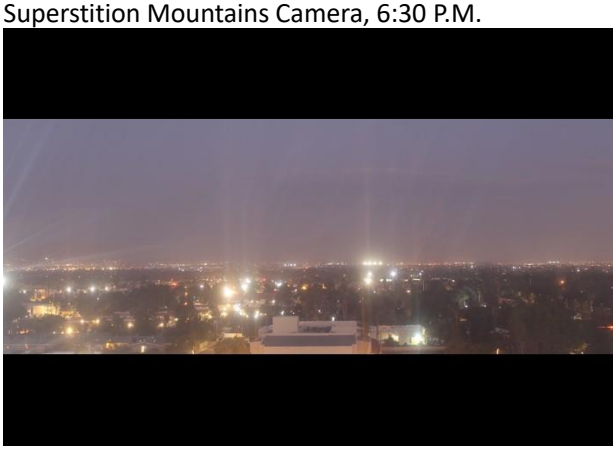
Camelback Mountain Camera, 11:00 P.M.



Superstition Mountains Camera, 3:00 P.M.



Superstition Mountains Camera, 6:30 P.M.



Note: There are no images available in the archive for Superstion Mountains Camera after 6:30 P.M.on October 11, 2021

5.0 Project PM_{10} Background Concentrations, Removing Atypical Events

In summary, three days are being proposed to be excluded from the project's background concentration analysis excluded because they were flagged by MCAQD as having been affected by an atypical air quality event. These days were removed from the original West Chandler and Higley 2019 through 2021 PM_{10} data set due to the atypical-type nature of the local conditions when the high PM_{10} values were observed (e.g., windblown dust, high winds, haze). Once removed, the remaining data was used to calculate a PM_{10} background concentration of 93.2 µg/m^3. Please note that the days being considered for removal in this report are distinct from those detailed in MCAQD's Atypical Events Report. Additionally, the PM_{10} analysis for this project encompasses data from 2019 to 2021, while MCAQD's report provides data from 2020 to 2021. Consequently, the 4th highest PM_{10} concentration in this report is more conservative than the one in MCAQD's Atypical Events Report and should be regarded as the project's proposed adjusted PM_{10} background concentration. **Table 8** shows the West Chandler and Higley monitoring station data's 4 highest PM_{10} readings, after removing atypical event data.

Table 8: Project Monitoring station Highest 24-hour PM10 Readings, Removing Atypical Events

West Chandler Station			
Data Year	**2019**	**2020**	**2021**
Number of Readings	365	362	361
1st	76	263	181
2nd	71	89	122
3rd	67	80	89*
4th	66	74	76
Higley Station			
Data Year	**2019**	**2020**	**2021**
Number of Readings	365	364	354
1st	114*	131	219
2nd	91	107	116
3rd	91	106	108
4th	89	92	93

Source: U.S. EPA Outdoor Air Quality Data, Download Daily Air Quality Data, https://www.epa.gov/outdoor-air-quality-data/download-daily-data
Note: *4th highest 24-hour readings are highlighted in red, removing atypical events.

Table8 shows that with removing atypical events, the West Chandler monitor's 4th highest value over three years (2019-2021) is 89 µg/m^3. This comes from the 4th highest reading out of a total of 1088 days of sampling. For the Higley monitor, over the same three-year period, the 4th highest value is 114 µg/m3 from 1083 days of sampling. Both stations are under the PM_{10} NAAQS threshold.

The predicted background concentration, removing data for atypical events, of the project is:

$$0.83 \times 89 + 0.17 \times 114 = \mathbf{93.2}\ \mu g/m^3$$

Per 40 CFR 50, Appendix K, the Maricopa County NAAQS threshold for PM_{10} 24-hour average concentration threshold is 150 ug/m3. As such, the predicted background concentration when removing atypical event data does not exceed the NAAQs threshold. **Table 9** compares the background concentration, once removing the three atypical events, to the PM_{10} NAAQS threshold.

Table 9: PM_{10} NAAQS Thresholds and Projects Calculated Background PM_{10} Concentrations			
West Chandler Station			
4th Highest 24-hour Average Concentration with Atypical Event Data Exclusion (µg/ m^3)	PM_{10} National Ambient Air Quality Standards (NAAQS)	Difference (µg/m^3)	Exceeds Threshold?
89	150	61	No
Higley Station			
4th Highest 24-hour Average Concentration with Atypical Event Data Exclusion (µg/m^3)	PM_{10} National Ambient Air Quality Standards (NAAQS)	Difference (µg/ m^3)	Exceeds Threshold?
114	150	36	No
Project Background Concentration Levels			
Background Concentration with Atypical Event Data Exclusion (µg/m^3)	PM_{10} National Ambient Air Quality Standards (NAAQS)	Difference (µg/ m^3)	Exceeds Threshold?
93.2	150	56.8	No

Days in which an atypical event, i.e., a dust storm or high wind event, occurred in the region and impacting Higley or West Chandler PM monitoring stations and the project area have been identified. Because regional atypical events were occurring on these days, it is inappropriate to consider these days when calculating background PM_{10} concentrations for the projects hot spot analyses. Finally, after removing days in which an atypical event occurred, the 24-hour PM_{10} background concentration identified for 2019 through 2021 is 93.2 µg/m^3. This concentration is suitable for use as a reasonable background concentration for the project site, as it is more representative of typical background concentrations for the project site excluding atypical events.

Appendix A: Maricopa County Air Quality Department Planning & Analysis Division - Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021

September 2023

Atypical Event Identification at Higley and West Chandler Sites for 2020 and 2021

Maricopa County
Air Quality Department
Planning & Analysis Division

Table of Contents

Summary

This report examines the days in 2020 and 2021 which had the highest 24-hour average concentrations of particulate matter less than 10 microns in diameter (PM_{10}) at the Higley and West Chandler air monitoring sites. Days in which atypical events, i.e., dust storms, were occurring in the region and impacting Higley or West Chandler are identified. Because regional atypical events were occurring on these days, it is inappropriate to consider these days when calculating background PM_{10} concentrations for hot spot analyses.

Information regarding each atypical event includes:

- Air pollution forecasts issued by the Arizona Department of Environmental Quality (ADEQ)
- National Weather Service's (NWS) historical Area Forecast Discussions (AFD)
- An analysis of hourly averaged and maximum gust wind speed at the monitoring site
- 24-hour average PM_{10} concentrations at air monitors in the region
- Wind and pollution roses for the Higley and West Chandler sites
- A six-hour Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) back-trajectory analysis
- List of the nearest and farthest PM_{10} exceeding site from the Higley and West Chandler sites
- The $PM_{10}/PM_{2.5}$ ratio and coarse particulate matter (PM_c) concentrations in the region
- Visibility pictures for the region. These pictures come from the ADEQ's visibility network cameras. Cameras used for this report were:
    - South Mountain—The view is from North Mountain looking toward the Phoenix downtown skyline with the South Mountains in the distance.
    - Camelback— The view is from the Capital Mall area of downtown Phoenix looking northeast toward Camelback Mountain.
    - Superstition Mountain— The view is looking east from downtown Mesa with the community of Apache Junction between the camera and the mountain vista.
- Information about facility inspections and dust citizen complaint responses, and any associated enforcement actions, in the vicinity of the Higley and West Chandler sites
- The Appendix includes charts of 5-minute and hourly PM_{10} and wind data for the Higley and West Chandler sites, as well as any sites that exceeded the 24-hour PM_{10} National Ambient Air Quality Standards (NAAQS) for all events listed in this report

Finally, after removing days in which an atypical event occurred, the fourth highest 24-hour PM_{10} concentration is identified for the period of 2020 through 2021 (see Table 2 and Table 3). This concentration is suitable for use as a reasonable background concentration for the site.

The fourth highest PM_{10} concentrations identified by this report for each site are:

- Higley: 94.0 $\mu g/m^3$ on August 6, 2021
- West Chandler: 80.8 $\mu g/m^3$ on August 11, 2020

PM_{10} Air Monitoring Sites

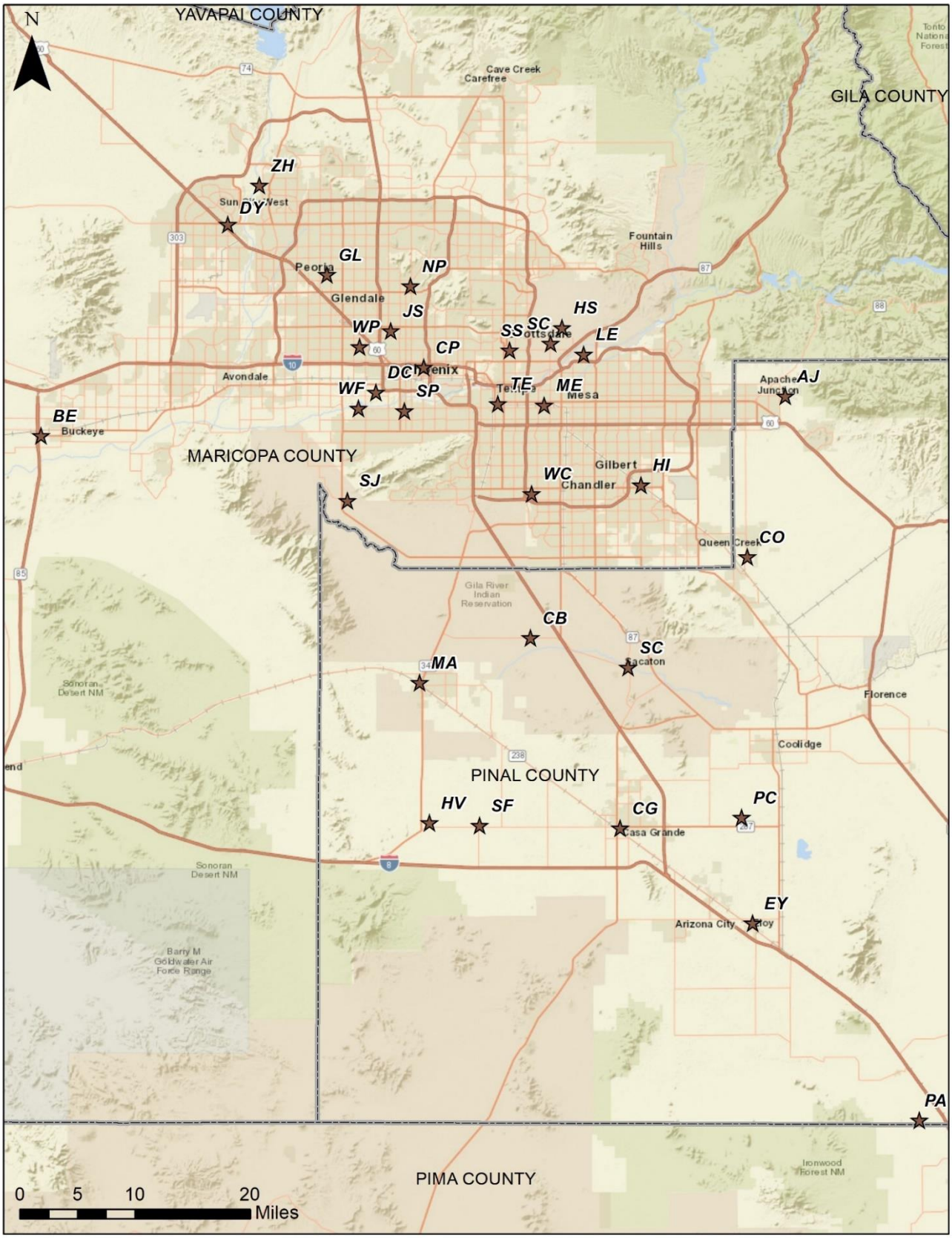
Table 1 lists the PM air monitoring sites that were operating in 2020 and 2021 within Maricopa and Pinal counties. Information on which agency operated the site, the type of PM monitoring instruments at the site (i.e., PM_{10} or $PM_{2.5}$), and the availability of site wind data in the U.S. Environmental Protection Agency (EPA) Air Quality System (AQS) database is listed. Figure 1 is a map of the region which shows the locations of these sites. Agencies operating monitoring sites include ADEQ, Gila River Indian Community (GRIC), Maricopa County Air Quality Department (MCAQD), Pinal County Air Quality Department (PCAQD), and Salt River Pima-Maricopa Indian Community (SRPMIC).

Table 1. PM monitoring sites in Maricopa and Pinal counties.

AQS Number	Local Site Name	Site Acronym	Agency	PM Monitoring Instruments	Wind Data (In AQS)
04-013-0019	West Phoenix	WP	MCAQD	PM_{10}, $PM_{2.5}$	Speed/Direction
04-013-1003	Mesa	ME	MCAQD	PM_{10}, $PM_{2.5}$	Speed/Direction
04-013-1004	North Phoenix	NP	MCAQD	PM_{10}, $PM_{2.5}$	Speed/Direction
04-013-2001	Glendale	GL	MCAQD	PM_{10}, $PM_{2.5}$	Speed/Direction
04-013-3002	Central Phoenix	CP	MCAQD	PM_{10}	Speed/Direction
04-013-3003	South Scottsdale	SS	MCAQD	PM_{10}	Speed/Direction
04-013-4003	South Phoenix	SP	MCAQD	PM_{10}, $PM_{2.5}$	Speed/Direction
04-013-4004	West Chandler	WC	MCAQD	PM_{10}	Speed/Direction
04-013-4005	Tempe	TE	MCAQD	PM_{10}, $PM_{2.5}$	Speed/Direction
04-013-4006	Higley	HI	MCAQD	PM_{10}	Speed/Direction
04-013-4009	West 43rd Avenue	WF	MCAQD	PM_{10}	Speed/Direction
04-013-4010	Dysart	DY	MCAQD	PM_{10}	Speed/Direction
04-013-4011	Buckeye	BE	MCAQD	PM_{10}	Speed/Direction
04-013-4016	Zuni Hills	ZH	MCAQD	PM_{10}	Speed/Direction

AQS Number	Local Site Name	Site Acronym	Agency	PM Monitoring Instruments	Wind Data (In AQS)
04-013-7003	St Johns	SJ	GRIC	PM_{10}	
04-013-7020	Senior Center	SC	SRPMIC	PM_{10}, $PM_{2.5}$	
04-013-7022	Lehi	LE	SRPMIC	PM_{10}	
04-013-7024	High School	HS	SRPMIC	PM_{10}	
04-013-9812	Durango Complex	DC	MCAQD	PM_{10}, $PM_{2.5}$	Speed/Direction
04-013-9997	JLG Supersite	JS	ADEQ	PM_{10}, $PM_{2.5}$	Speed/Direction
04-021-0001	Casa Grande Downtown	CG	PCAQD	PM_{10}, $PM_{2.5}$	
04-021-3002	AJ Fire Station	AJ	PCAQD	PM_{10}, $PM_{2.5}$	
04-021-3007	Pinal Air Park	PA	PCAQD	PM_{10}	
04-021-3008	Stanfield	SF	PCAQD	PM_{10}	
04-021-3009	Combs	CO	PCAQD	PM_{10}	
04-021-3011	Pinal County Housing	PC	PCAQD	PM_{10}	
04-021-3014	Eloy	EY	PCAQD	PM_{10}	
04-021-3015	Hidden Valley	HV	PCAQD	PM_{10}, $PM_{2.5}$	
04-021-3016	Maricopa 1405	MA	PCAQD	PM_{10}	
04-021-7001	Sacaton	SC	GRIC	PM_{10}	
04-021-7004	Casa Blanca	CB	GRIC	PM_{10}	

Figure 1. PM monitoring sites in Maricopa and Pinal counties. Acronyms for site names are listed in Table 1.



Compliance and Enforcement Summary

MCAQD is prepared to proactively respond to high wind events and protect human health and well-being. MCAQD's approach consists of two primary components: routine proactive inspections, as well as surveillance inspections, conducted both during and after significant events. MCAQD routinely inspects sites operating under dust control permits, and sites permitted to disturb more than ten acres are inspected more frequently. Nonmetallic mineral processing facilities, which are subject to Rule 316 (Nonmetallic Mineral Processing), are inspected five times every year. Maricopa County also responds to the majority of citizen complaints about air quality within 24 hours.

MCAQD monitors the ADEQ Dust Control Forecast to identify the potential for elevated PM_{10} pollution levels due to high winds or stagnant conditions. When a High Pollution Advisory (HPA) is issued for Maricopa County, MCAQD conducts additional increased surveillance before, during, and after the forecast event(s). MCAQD also conducts event surveillance and post-event activities after an exceptional event that had not been forecast (i.e., those instances in which an HPA had not been issued).

Pre-event surveillance consists of surveying high-risk areas for any dust-generating activities, educating sources of the impending HPA event, and issuing violations for failure to comply with local, state, or federal regulations. During the event, MCAQD inspectors survey high-risk areas to confirm that control measures are in place, document any violations, and contact other regulatory agencies if necessary. Post-event activities include continued surveys of high-risk areas, re-inspecting sources within two business days of receiving a violation, and an internal MCAQD debriefing of event activities.

Currently, a total of 15 MCAQD air monitoring sites are equipped to allow the automatic reporting of monitored readings at 5-minute intervals. The real-time data reporting system includes a mechanism to alert MCAQD inspectors when PM_{10} concentrations are elevated. The system allows MCAQD inspectors to review concentrations at the monitor and to consult the National Weather Service website to check for weather event activity. This capability allows the MCAQD responder to identify regional events and monitor specific issues. If necessary, the MCAQD responders can inform nearby stakeholders and local governments of the elevated PM_{10} concentrations.

A summary of inspection and enforcement activity is provided for each atypical event day listed in this report. This summary will cover a period three days before and three days after the atypical event day. If any enforcement activity during this seven-day period occurred within a four-mile radius of the Higley or West Chandler monitoring sites, that will be noted. Complaint activity, inspections, and findings will also be listed for this seven-day period. Any complaints focused on an area within four miles of the Higley or West Chandler monitoring sites will be described in greater detail.

Higley Atypical Events

Table 2. Identification of the ten highest 24-hour average PM_{10} concentrations at the Higley air monitoring site in 2020 and 2021.

Date	24-hour Average PM_{10} Concentration ($\mu g/m^3$)	Number of Sites in Maricopa and Pinal Counties Exceeding PM_{10} NAAQS	PM_{10} NAAQS Exceedances flagged as an Exceptional Event	Identified as an Atypical Event	Nearest Exceeding Site (from Higley)	Farthest Exceeding Site (from Higley)
10/12/2021	219.8	22	✓	✓	West Chandler (9.5 miles away)	Pinal Air Park (60 miles away)
03/03/2021	208.0	8	✓	✓	Casa Blanca (16 miles away)	Eloy (39.2 miles away)
10/11/2021	134.7	5	✓	✓	West Chandler (9.5 miles away)	Buckeye (52.3 miles away)
08/16/2020	131.5	11	✓	✓	West Chandler (9.5 miles away)	Eloy (39.2 miles away)
07/09/2021	131.2	5	✓	✓	West Chandler (9.5 miles away)	St. Johns (25.5 miles away)
04/21/2021	117.1	3	✓	✓	Pinal County Housing (30.1 miles away)	Eloy (39.2 miles away)
07/22/2021	108.5	0				
09/29/2020	107.6	0				
08/11/2020	107.3	1	✓		Stanfield (32.7 miles away)	Stanfield (32.7 miles away)
8/06/2021	94.0	0				

West Chandler Atypical Events

Table 3. Identification of the ten highest 24-hour average PM_{10} concentrations at the West Chandler air monitoring site in 2020 and 2021.

Date	24-hour Average PM_{10} Concentration ($\mu g/m^3$)	Number of Sites in Maricopa and Pinal Counties Exceeding PM_{10} NAAQS	PM_{10} NAAQS Exceedances flagged as an Exceptional Event	Identified as an Atypical Event	Nearest Exceeding Site (from West Chandler)	Farthest Exceeding Site (from West Chandler)
08/16/2020	263.9	11	✓	✓	Casa Blanca (12.5 miles away)	Eloy (42 miles away)
10/12/2021	181.5	22	✓	✓	Mesa (7.8 miles away)	Pinal Air Park (64 miles away)
07/09/2021	166.4	5	✓	✓	Mesa (7.8 miles away)	St. Johns (16 miles away)
10/11/2021	160.9	5	✓	✓	Casa Blanca (12.5 miles away)	Buckeye (43 miles away)
03/03/2021	154.3	8	✓	✓	Casa Blanca (12.5 miles away)	Eloy (42 miles away)
07/22/2021	122.5	0				
09/29/2020	89.9	0				
07/13/2021	89.6	0				
08/11/2020	80.8	1	✓		Stanfield (29 miles away)	Stanfield (29 miles away)
11/19/2021	76.8	0				

Atypical Event: August 16, 2020

A high-wind event from monsoon storm activity occurred on this date and caused widespread blowing dust throughout the region. Eleven monitoring sites, in both Maricopa and Pinal counties, exceeded the 24-hour PM_{10} NAAQS on this date.

ADEQ Pollution Forecast

Note that ADEQ forecasts are not done on the weekends, so an archived forecast for Sunday, August 16, 2020, is not available. The following selected portion of the forecast was made on Friday, August 14, 2020, and includes anticipated conditions for the weekend.

> "Ozone levels continue to stay in the upper Moderate AQI range and we don't expect a lot of change. We forecast slight improvement over the coming days with better mid-level winds, but nothing significant. PM_{10} may end up being the more interesting story this weekend. The ridge over the region is forecast to push north, which is looking a little more monsoon-like. Right now it looks like there is a chance of thunderstorm outflows to affect the Phoenix area Sunday evening. As a result, we are forecasting blowing dust to move through the area causing elevated PM_{10} concentrations for a few hours Sunday evening. The rest of the forecast period isn't expected to have any major dust issues, just the more typical upper Good/lower Moderate AQI range. $PM_{2.5}$ is forecast to remain in the Good AQI range through the forecast period."

NWS Area Forecast Discussion

The following selected portions of the Area Forecast Discussion are from the National Weather Service office in Phoenix, AZ, for 2:30 p.m. MST Sunday August 16, 2020.

> Synopsis:
>
> "Strong high pressure will remain situated across the southwestern U.S. through at least the middle of the week keeping hot conditions in place. High temperatures across the lower deserts will approach or exceed 115 degrees through at least the middle of the week. Isolated thunderstorms and areas of blowing dust will be possible this afternoon and evening across south-central Arizona. A slightly more favorable monsoon pattern develops as the week progresses. "
>
> Selected portions of the discussion:
>
> "One of the days that does show more promise for significant storms/dust storms into the central deserts will be today. Most of the CAMS as well as HREF guidance depict a rather organized line of convection to move across eastern Arizona and into the central deserts late this afternoon through the evening.

Gusty outflow wind from these storms will likely move into portion of the low desert and the Phoenix area this evening stirring up patchy dense blowing dust."

Environmental Conditions at Air Monitoring Sites

Table 4. PM_{10} and wind data for air monitoring sites in Maricopa and Pinal counties on August 16, 2020.

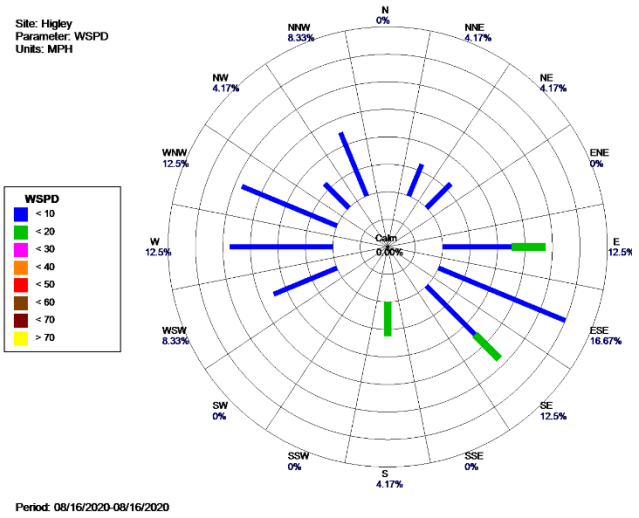
Site	24-hour average PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
West Phoenix	120	7.p2	3:00 p.m.	24.1	6:00 p.m.
Mesa	129	10.2	6:00 p.m.	25.7	12:00 a.m.
North Phoenix	116	5.9	10:00 p.m.	25.5	6:00 p.m.
Glendale	76	9.1	6:00 p.m.	30.2	6:00 p.m.
Central Phoenix	214#	8.0	2:00 p.m.	21.6	3:00 p.m.
South Scottsdale	192#	10.4	12:00 a.m.	27.1	6:00 p.m.
South Phoenix	98	6.6	3:00 p.m.	18.7	3:00 p.m.
West Chandler	263#	13.6	6:00 p.m.	31.6	6:00 p.m.
Tempe	134	7.2	12:00 a.m.	20.4	6:00 p.m.
Higley	131	12.9	6:00 p.m.	31.1	5:00 p.m.
West 43rd Avenue	199#	8.7	3:00 p.m.	23.0	6:00 p.m.
Dysart	136	14.1	6:00 p.m.	48.8	6:00 p.m.
Buckeye	127	10.7	12:00 a.m.	31.3	6:00 p.m.
Zuni Hills	111	14.6	6:00 p.m.	44.9	5:00 p.m.
St Johns	195#	*	*	*	*
Senior Center	168#	*	*	*	*
Lehi	186#	*	*	*	*

Site	24-hour average PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
High School	191#	*	*	*	*
Durango Complex	141	8.9	3:00 p.m.	20.9	2:00 p.m.
JLG Supersite	139	5.1	6:00 p.m.	*	
Casa Grande Downtown	118	*	*	*	*
AJ Fire Station	33	19.6	5:00 p.m.	24.5	5:00 p.m.
Pinal Air Park	58	*	*	*	*
Stanfield	75	17.0	6:00 p.m.	31.9	6:00 p.m.
Combs	90	*	*	*	*
Pinal County Housing	50	27.4	5:00 p.m.	56.8	5:00 p.m.
Eloy	1228#	*	*	*	*
Hidden Valley	97	20.1	6:00 p.m.	45.5	5:00 p.m.
Maricopa 1405	57	*	*	*	*
Sacaton	200#	*	*	*	*
Casa Blanca	221#	*	*	*	*

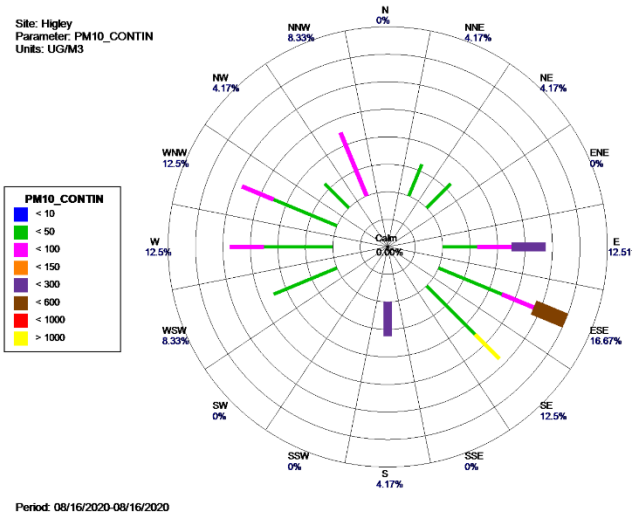
*Not available
#Exceedance of the 24-hour PM_{10} NAAQS

Pollution and Wind Roses for Higley and West Chandler Sites on August 16, 2020

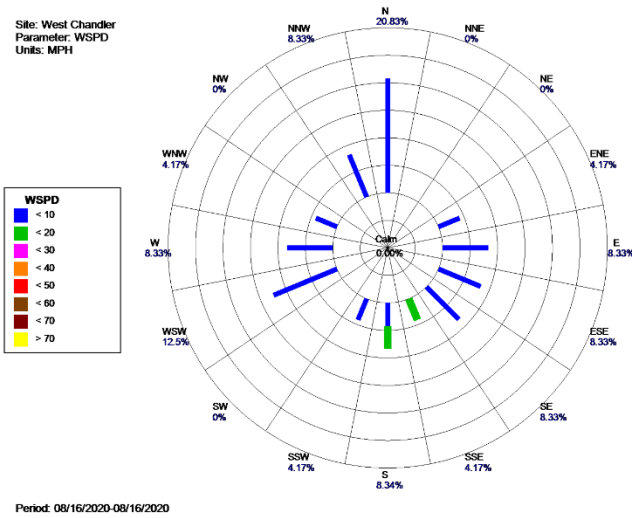
Higley Wind Rose



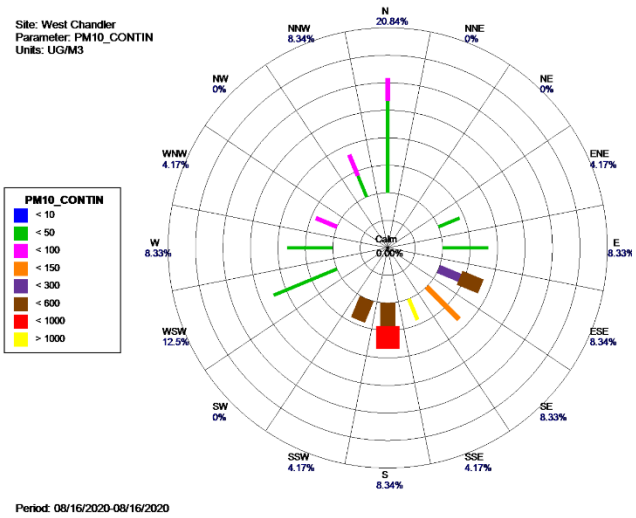
Higley PM_{10} Rose



West Chandler Wind Rose

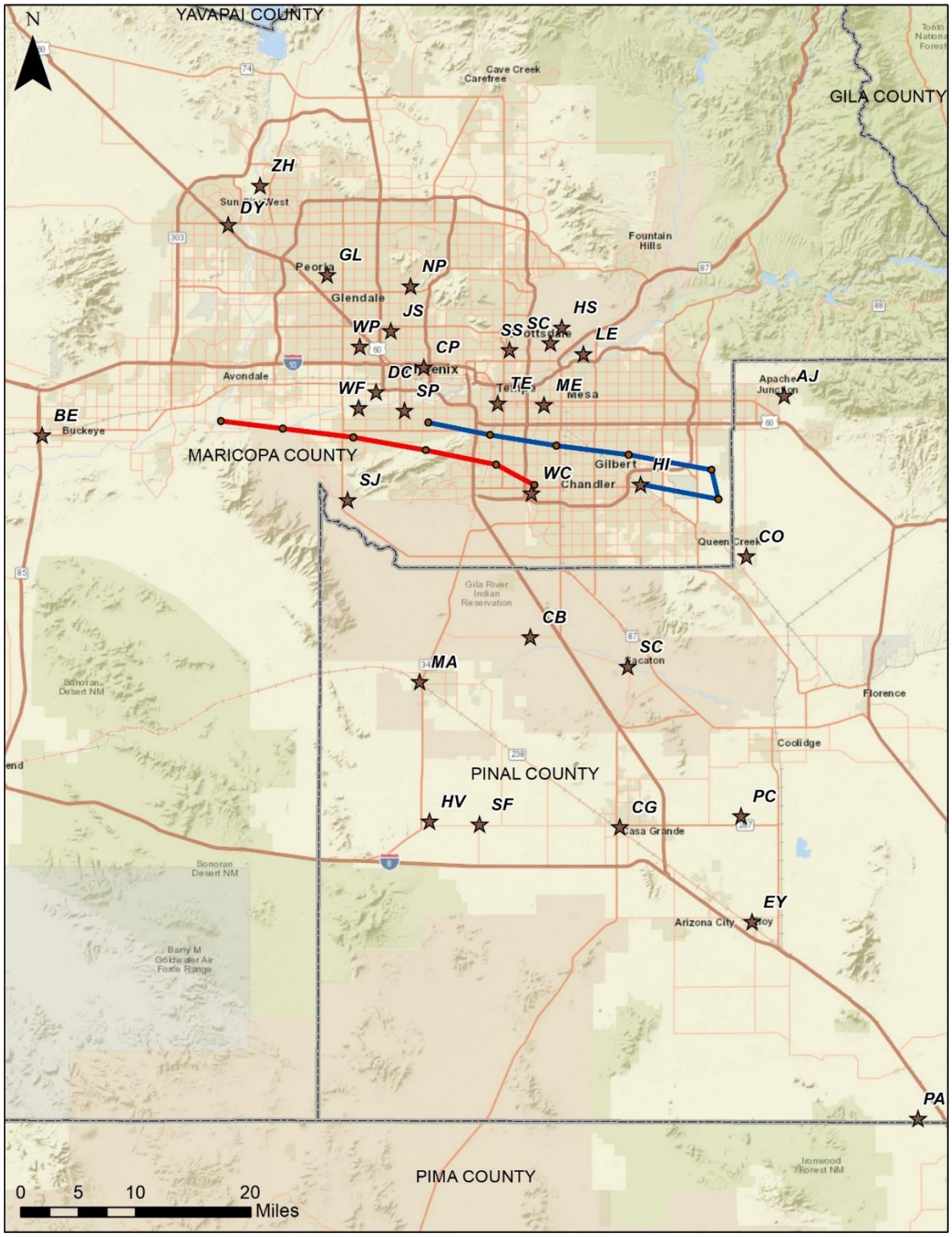


West Chandler PM_{10} Rose



HYSPLIT Back-Trajectory Analyses

Figure 2. HYSPLIT 6-hour back-trajectory ending at 6:00 p.m. on August 16, 2020, at both the Higley and West Chandler sites. Elevation at end time is 100 meters above ground level (m AGL).



Proximity of Other Exceeding Sites to West Chandler and Higley

Note that the Higley monitor did not exceed the 24-hour PM_{10} NAAQS on this date.

- Higley
  - Closest exceeding site: West Chandler (9.5 miles away)
  - Farthest exceeding site: Eloy (39.2 miles away)
- West Chandler
  - Closest exceeding site: Casa Blanca (12.5 miles away)
  - Farthest exceeding site: Eloy (42 miles away)

$PM_{10}/PM_{2.5}$ Ratios for Regional Air Monitors

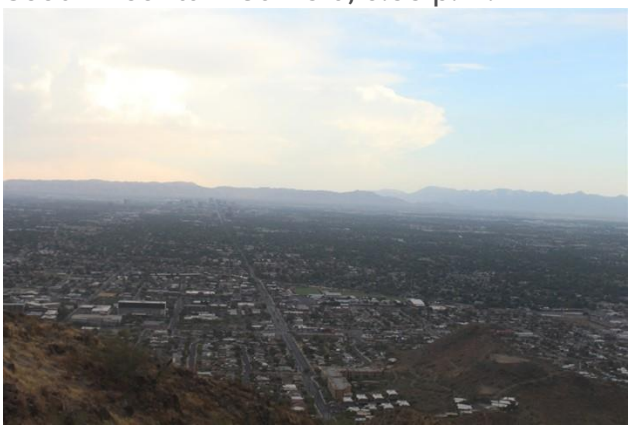
Table 5. Hourly-averaged PM_{10}, $PM_{2.5}$, and PM_C for sites in Maricopa and Pinal counties having a continuous $PM_{2.5}$ monitor. Note that time reflects the hour of highest PM_{10} concentration on August 16, 2020.

Site	Time	PM_{10}	$PM_{2.5}$	PM_C	Ratio $PM_{2.5}/PM_{10}$
West Phoenix	8:00 p.m.	694.0	82.4	611.4	0.12
Mesa	7:00 p.m.	896.3	90.8	805.2	0.10
North Phoenix	8:00 p.m.	624.8	71.2	555.3	0.11
Glendale	11:00 p.m.	233.5	24.3	208.9	0.10
South Phoenix	9:00 p.m.	349.1	33.8	315.2	0.10
Tempe	7:00 p.m.	1332.4	117.9	1215.6	0.09
Durango Complex	7:00 p.m.	1079.8	93.9	985.1	0.09
JLG Supersite	7:00 p.m.	694	80	614	0.12
Casa Grande Downtown	6:00 p.m.	1625	53	1572	0.03
Hidden Valley	8:00 p.m.	564	78	486	0.14

ADEQ Visibility Camera Historical Archive

Archived photos from ADEQ's Visibility Camera Historical Archive for August 16, 2020. The image on the left reflects a time before the dust storm occurred and on the right during or after the storm's passage. The storm hit the Phoenix area at approximately 6:00-7:00 p.m.

South Mountain Camera, 6:00 p.m.

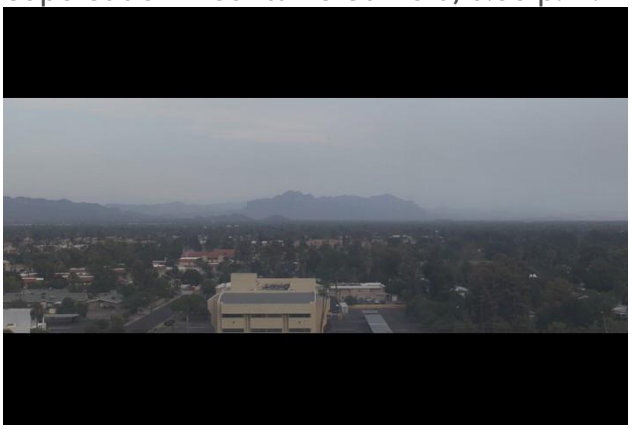


South Mountain Camera, 6:15 p.m.

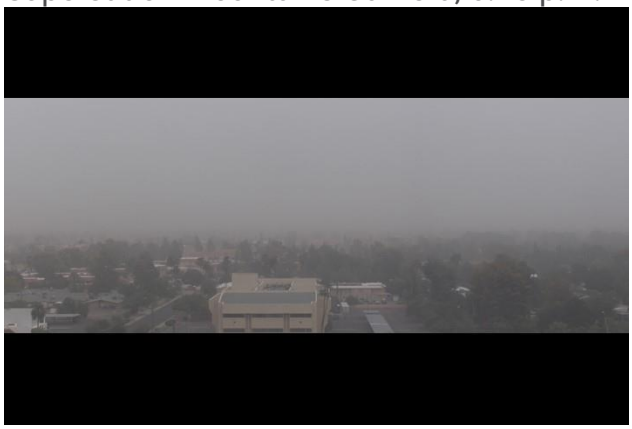
Camelback Mountain Camera, 6:15 p.m.

Camelback Mountain Camera, 6:30 p.m.

Superstition Mountains Camera, 6:30 p.m.



Superstition Mountains Camera, 6:45 p.m.



Compliance and Enforcement Activities

An evaluation of all inspections and air quality complaints indicates no evidence of unusual anthropogenic PM_{10} emissions during the time period of August 13 through 19, 2020.

During this seven-day period the following activity took place:

- Number of inspections of permitted facilities: 112
    - Number of those facilities that were fugitive dust sources: 88
- Number of inspections that resulted in an enforcement action for PM_{10} and non-PM_{10}-related violations: 20
    - Number of enforcement actions that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 0
- Number of complaints received: 40
    - Number of those complaints that were windblown dust or PM_{10} related: 28
    - Number of those complaints that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 2
    - Details on complaints within four-mile radius: One complaint was regarding leaf-blowing activity and the other was regarding dirt roads. No violations were noted during complaint responses.

Atypical Event: March 3, 2021

A high-wind event due to a low-pressure system moving through the state occurred on this date. This caused widespread blowing dust throughout the region. Nine monitoring sites, in both Maricopa and Pinal counties, exceeded the 24-hour PM_{10} NAAQS due to this storm.

ADEQ Pollution Forecast

The following selected portion of the ADEQ forecast was made for Wednesday March 3, 2021.

> "The low-pressure system we've been discussing all week will be arriving in our region this afternoon. Winds between 20 and 30 mph are in the forecast, with even higher gusts possible. The possible chance of precipitation associated with this system will take place in the overnight hours into tomorrow morning. Parts of the valley could see a few sprinkles but nothing very exciting. With the warm temperatures, recent dry conditions, and high winds, the National Weather Service has issued a Red Flag Warning in effect from 11 am today to 6 pm tonight."

NWS Area Forecast Discussion

The following selected portions of the Area Forecast Discussion are from the National Weather Service office in Phoenix, AZ, for 1:10 p.m. MST Wednesday March 3, 2021.

> "Meanwhile, further east, the tightening pressure gradient due to the approaching low is increasing the southerly wind flow across the forecast area. The short-term forecast concerns related to this system are for wind and blowing dust potential, fire weather, and a chance of showers or an isolated thunderstorm this evening.
>
> Considering the wind, wind speeds are rapidly increasing as the low-level stable layer has eroded and high winds from aloft are now mixing throughout the depth of the boundary layer. Wind gusts are exceeding 30 mph near Yuma, with 20-30 mph over much of the rest of the forecast area. Wind speeds at 850 hPa are expected to increase to 40-50 kts across the area this afternoon as the cold front approaches. Because this will coincide with peak heating, very efficient mixing will allow for wind gusts to continue to increase the next few hours, which is consistent with the forecast message over the last few days. Accordingly, the wind advisory will remain in effect with widespread wind gusts of 35-40 mph, with a few locations reaching up to 50 mph west of the Phoenix area. Blowing dust is not typically a huge concern this time of year, but with such strong wind speeds isolated corridors of blowing dust will be possible, which may locally lower visibilities wherever it occurs. Some visibility reduction near Yuma has already been noted, with a few observations showing 4-7mi visibilities. Wind speeds are also increasing in southwest Imperial County, where westerly wind gusts will increase to 50-55mph behind the cold front this afternoon."

Environmental Conditions at Air Monitoring Sites

Table 6. PM_{10} and wind data for PM air monitoring sites in Maricopa and Pinal counties on March 3, 2021.

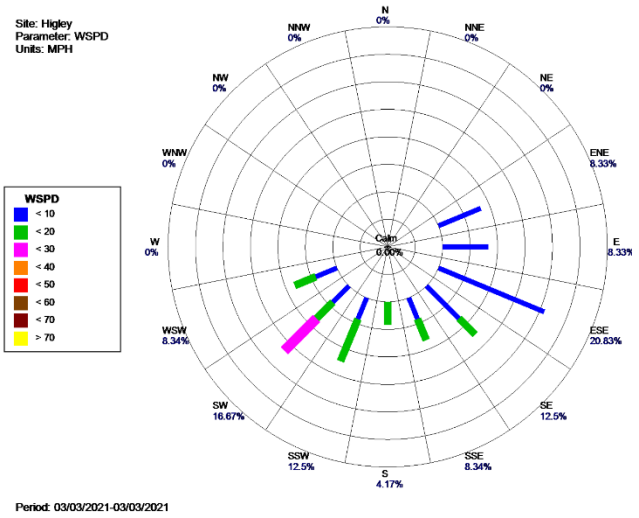
Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
West Phoenix	ND	18.2	5:00 p.m.	42.1	4:00 p.m.
Mesa	62	19.0	4:00 p.m.	42.5	5:00 p.m.
North Phoenix	43	15.6	3:00 p.m.	41.2	3:00 p.m.
Glendale	ND	25.1	5:00 p.m.	45.6	5:00 p.m.
Central Phoenix	97	19.4	3:00 p.m.	44.3	3:00 p.m.
South Scottsdale	71	19.9	4:00 p.m.	44.8	4:00 p.m.
South Phoenix	58	13.2	4:00 p.m.	35.9	3:00 p.m.
West Chandler	153	20.8	4:00 p.m.	42.9	4:00 p.m.
Tempe	58	16.1	4:00 p.m.	37.6	4:00 p.m.
Higley	207#	22.3	4:00 p.m.	45.3	5:00 p.m.
West 43rd Avenue	177#	18.7	3:00 p.m.	39.0	5:00 p.m.
Dysart	68	20.5	4:00 p.m.	45.8	4:00 p.m.
Buckeye	81	19.1	4:00 p.m.	44.0	4:00 p.m.
Zuni Hills	61	26.0	4:00 p.m.	44.7	4:00 p.m.
St Johns	61	*	*	*	*
Senior Center	133	*	*	*	*
Lehi	84	*	*	*	*
High School	103	*	*	*	*

Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
Durango Complex	90	15.9	3:00 p.m.	38.8	3:00 p.m.
JLG Supersite	75	18.0	3:00 p.m.	*	*
Casa Grande Downtown	171#	*	*	*	*
AJ Fire Station	89	*	*	*	*
Pinal Air Park	113	*	*	*	*
Stanfield	225#	22.1	4:00 p.m.	42.9	5:00 p.m.
Combs	131	*	*	*	*
Pinal County Housing	169#	26.2	2:00 p.m.	42.7	5:00 p.m.
Eloy	170	*	*	*	*
Hidden Valley	134	*	*	*	*
Maricopa 1405	184#	*	*	*	*
Sacaton	96	*	*	*	*
Casa Blanca	165#	*	*	*	*

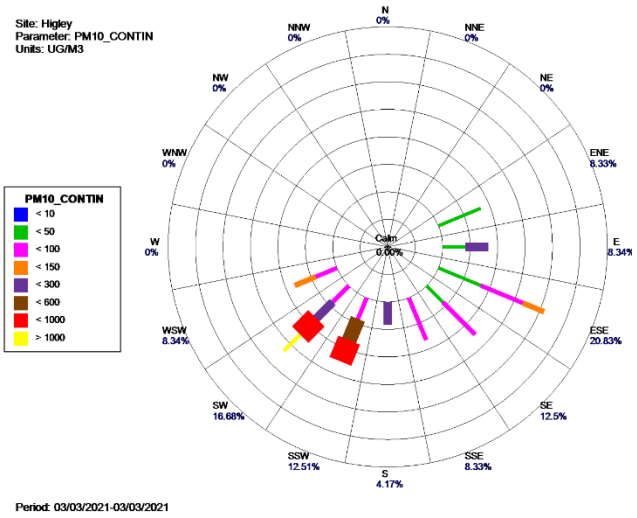
*Not available
#Exceedance of the 24-hour PM_{10} NAAQS
ND: No data available in AQS for this day

Pollution and Wind Roses for Higley and West Chandler Sites on March 3, 2021

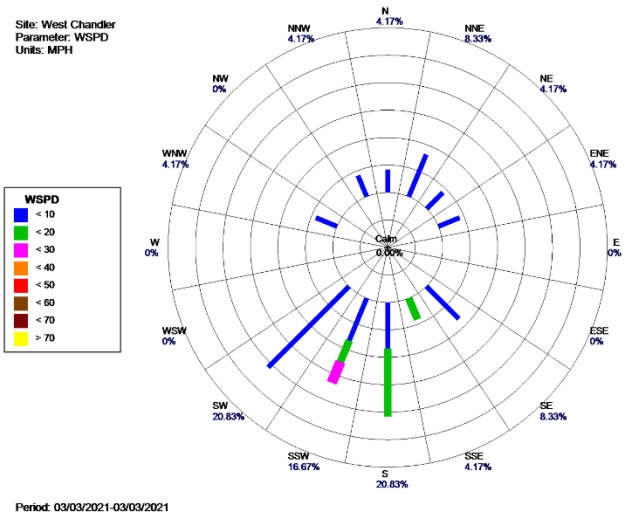
Higley Wind Rose



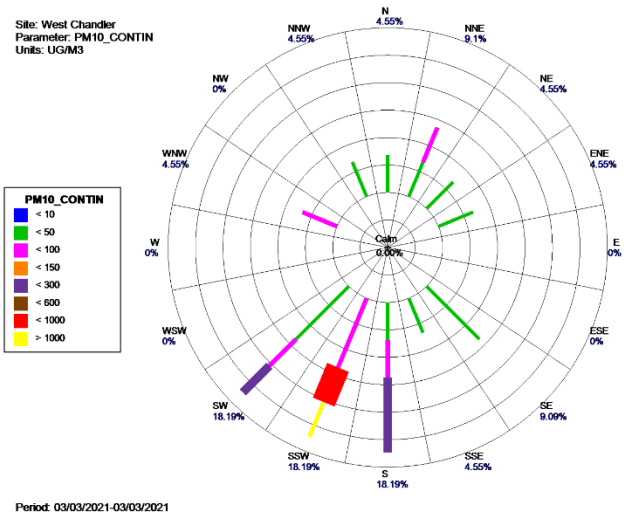
Higley PM_{10} Rose



West Chandler Wind Rose

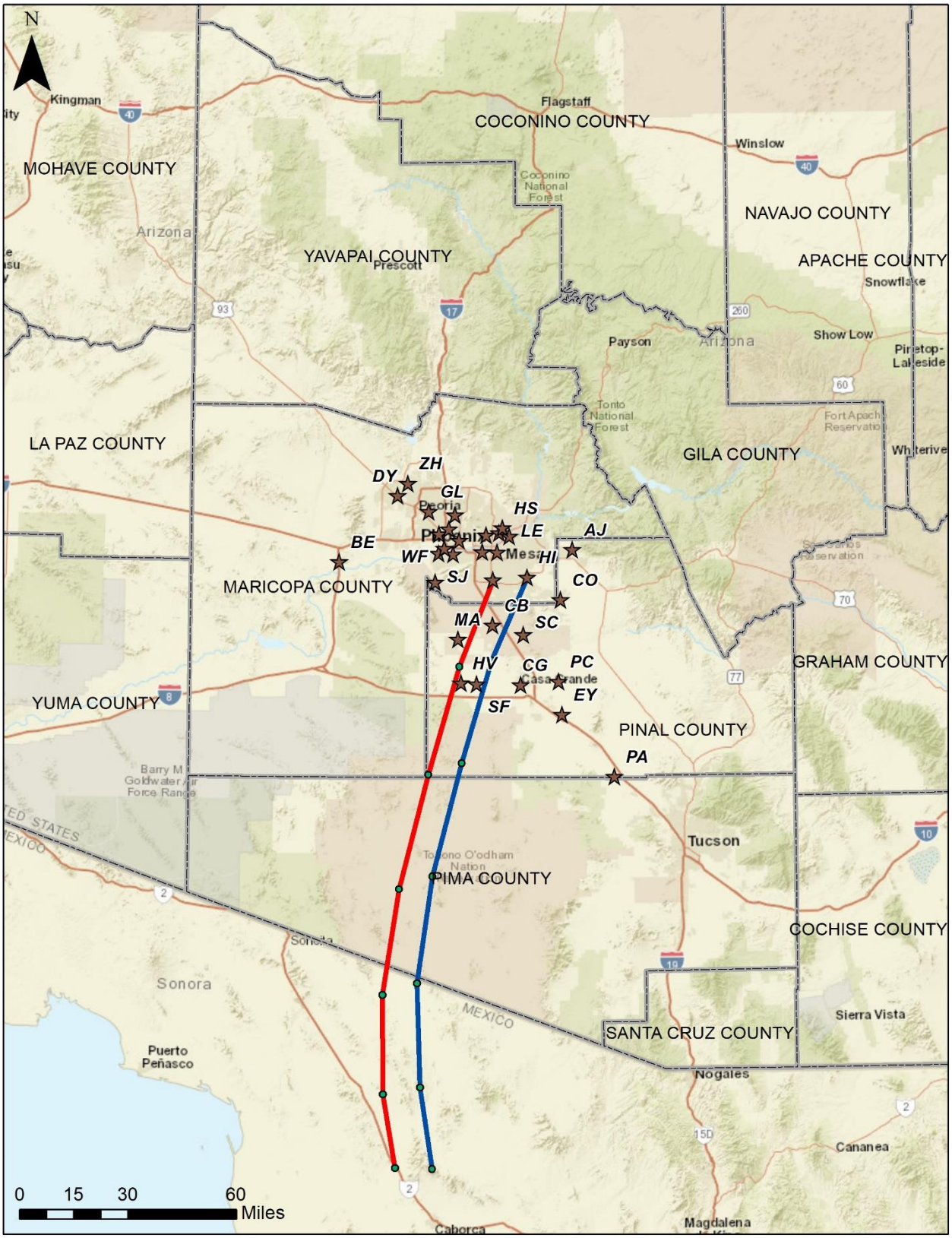


West Chandler PM_{10} Rose



HYSPLIT Back-Trajectory Analyses

Figure 3. HYSPLIT 6-hour back-trajectory ending at 4:00 p.m. on March 3, 2021, at both the Higley and West Chandler sites. Elevation at end time is 100 m AGL.



Proximity of Other Exceeding Sites to West Chandler and Higley

Note that Higley exceeded the 24-hour PM_{10} NAAQS on this date.

- Higley
  - Closest exceeding site: Casa Blanca (16 miles away)
  - Farthest exceeding site: Eloy (39.2 miles away)
- West Chandler
  - Closest exceeding site: Casa Blanca (12.5 miles away)
  - Farthest exceeding site: Eloy (42 miles away)

$PM_{10}/PM_{2.5}$ Ratios for Regional Air Monitors

Table 7. Hourly-averaged PM_{10}, $PM_{2.5}$, and PM_C for sites in Maricopa and Pinal counties having a continuous $PM_{2.5}$ monitor. Note that time reflects the hour of highest PM_{10} concentration on March 3, 2021.

Site	Time	PM_{10}	$PM_{2.5}$	PM_C	Ratio $PM_{2.5}/PM_{10}$
West Phoenix	ND	ND	ND	ND	ND
Mesa	5:00 p.m.	358.0	28.7	329.2	0.08
North Phoenix	5:00 p.m.	167.8	14.6	153.1	0.09
Glendale	ND	ND	ND	ND	ND
South Phoenix	4:00 p.m.	318.3	16.9	301.1	0.05
Tempe	5:00 p.m.	257.3	15.1	252.5	0.06
Durango Complex	3:00 p.m.	339.1	12.2	326.4	0.04
JLG Supersite	3:00 p.m.	543	27	516	0.05
Casa Grande Downtown	4:00 p.m.	889	45	844	0.05
Hidden Valley	4:00 p.m.	469	ND	ND	ND

ND: No data available in AQS for this day

ADEQ Visibility Camera Historical Archive

Archived photos from ADEQ's Visibility Camera Historical Archive for March 3, 2021. The image on the left reflects a time before the dust storm occurred and on the right during or after the storm's passage. The storm hit the Phoenix area at approximately 3:00-5:00 p.m.

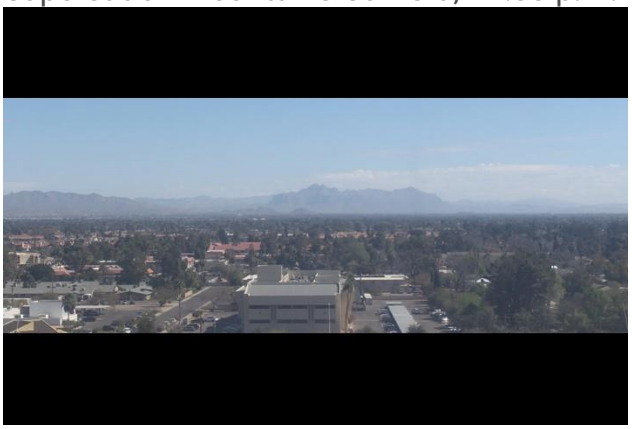
South Mountain Camera, 12:00 p.m.

South Mountain Camera, 4:45 p.m.

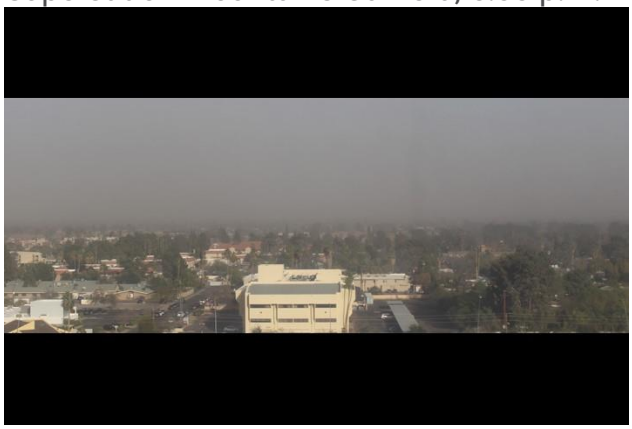
Camelback Mountain Camera, 1:00 p.m.

Camelback Mountain Camera, 3:45 p.m.

Superstition Mountains Camera, 12:00 p.m.



Superstition Mountains Camera, 5:00 p.m.



Compliance and Enforcement Activities

An evaluation of all inspections and air quality complaints indicates no evidence of unusual anthropogenic PM_{10} emissions during the time period of February 28 through March 6, 2021.

During this seven-day period the following activity took place:

- Number of inspections of permitted facilities: 289
    - Number of those facilities that were fugitive dust sources: 232
- Number of inspections that resulted in an enforcement action for PM_{10} and non-PM_{10}-related violations: 43
    - Number of enforcement actions that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 5
    - Details on enforcement actions: Four of the five violations that were noted during these inspections were for recordkeeping errors. The fifth violation was for excessive trackout at a construction site, which was required to be cleaned up immediately. Visible emissions of dust were not noted during any of these inspections.
- Number of complaints received: 58
    - Number of those complaints that were windblown dust or PM_{10} related: 50
    - Number of those complaints that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 1
    - Details on complaints within four-mile radius: Complaint was regarding earthmoving at a facility. No violations were noted during complaint inspections.

Atypical Event: April 21,2021

A high-wind event due to a low-pressure system moving through the state occurred on this date. Three monitoring sites in Pinal County exceeded the 24-hour PM_{10} NAAQS due to this storm.

ADEQ Pollution Forecast

The following selected portion of the forecast was made on Wednesday, April 21, 2021.

> "A low pressure wave positioned over the California/Nevada area this morning will gradually advance eastward into Arizona today. This wave will result in windy conditions across Arizona, including Maricopa and Pinal Counties. Winds are expected to be relatively strong this afternoon, around 20-30 mph at least, with higher gusts too. Therefore, the main concern for Phoenix's air quality today will be blowing dust.
>
> Blowing dust in the Valley could include both dust from local desert areas as well as dust brought in from the south/south-southwest. Already this morning, local dust-prone areas have seen elevated PM_{10} (dust) levels. PM_{10} could end up in the Moderate Air Quality Index (AQI) category at multiple monitors in the Valley today."

NWS Area Forecast Discussion

The following selected portions of the Area Forecast Discussion are from the National Weather Service office in Phoenix, AZ, for 2:27 p.m. MST Wednesday April 21, 2021.

> "Objective analysis shows a shortwave centered over southern Nevada with a moderate pressure gradient stepping over into Arizona. Analysis also shows a strong southerly 30-45 kt 850 mb jet that stretches from northern Sonora northward into south-central AZ. There have already been several wind gusts the 30-40 mph range and localized areas of blowing dust south and southwest of the Valley. Meanwhile, temperatures have already warmed up to mid to upper 80s under mostly sunny skies which will mix down those aforementioned stronger 850 mb winds to the surface this afternoon and evening.
>
> Wind gusts of 25 to 35 mph are anticipated to become more common this afternoon and evening across south-central AZ. The threat for new areas of blowing dust could grow this afternoon as long as the wind speeds remain this strong. A broad brush Blowing Dust Advisory has been issued for the areas south of the Phoenix metro where proximity to open desert and/or fallow fields is most prone to blowing dust Farther west, stronger winds of 40 to 50 mph will continue in the Mountain Springs area but there is about a 50% chance for sundowner wind gusts of 30 to 40 mph to reach the Imperial Valley between 6 pm and 10 pm this evening. With conditions generally dry and the fire danger high, these winds

will exacerbate fire weather concerns with conditions reaching critical thresholds for numerous areas. Fortunately, these strong winds are expected to subside a few hours after sunset."

Environmental Conditions at Air Monitoring Sites

Table 8. PM_{10} and wind data for PM air monitoring sites in Maricopa and Pinal counties on April 21, 2021.

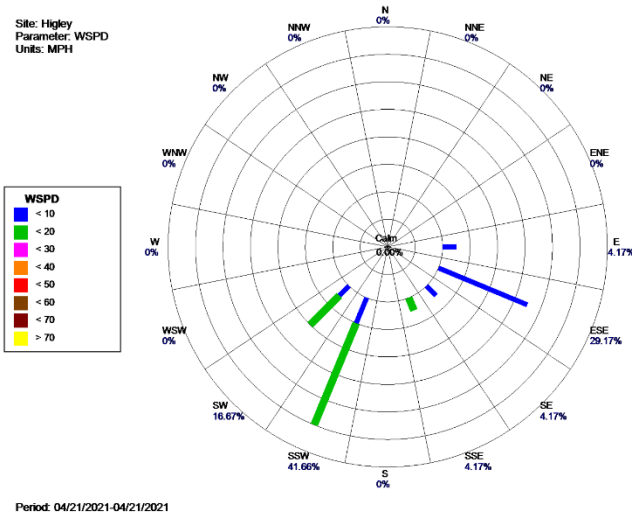
Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
West Phoenix	43	15.8	5:00 p.m.	32.1	5:00 p.m.
Mesa	33	13.6	10:00 a.m.	32.6	3:00 p.m.
North Phoenix	42	13.2	4:00 p.m.	38.7	5:00 p.m.
Glendale	44	20.6	4:00 p.m.	37.7	4:00 p.m.
Central Phoenix	67	17.2	5:00 p.m.	35.2	5:00 p.m.
South Scottsdale	47	15.4	5:00 p.m.	31.4	12:00 p.m.
South Phoenix	50	11.5	400 p.m.	26.3	5:00 p.m.
West Chandler	65	16.8	10:00 a.m.	35.8	2:00 p.m.
Tempe	39	9.1	5:00 p.m.	25.7	10:00 a.m.
Higley	116	17.1	4:00 p.m.	35.7	4:00 p.m.
West 43rd Avenue	118	16.7	5:00 p.m.	33.2	4:00 p.m.
Dysart	55	14.5	5:00 p.m.	33.0	4:00 p.m.
Buckeye	85	16.8	5:00 p.m.	38.0	3:00 p.m.
Zuni Hills	48	22.2	4:00 p.m.	37.3	4:00 p.m.
St Johns	39	*	*	*	*
Senior Center	58	*	*	*	*

Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
Lehi	58	*	*	*	*
High School	81	*	*	*	*
Durango Complex	48	13.4	5:00 p.m.	28.5	5:00 p.m.
JLG Supersite	43	9.3	4:00 p.m.	*	*
Casa Grande Downtown	106	*	*	*	*
AJ Fire Station	49	21.3	10:00 a.m.	23.7	10:00 a.m.
Pinal Air Park	97	*	*	*	*
Stanfield	202	19.9	1:00 p.m.	32.9	1:00 p.m.
Combs	93	*	*	*	*
Pinal County Housing	206#	*	*	*	*
Eloy	233#	*	*	*	*
Hidden Valley	108	22.8	12:00 p.m. & 3:00 p.m.	42.3	11:00 a.m.
Maricopa 1405	129	*	*	*	*
Sacaton	65	*	*	*	*
Casa Blanca	90	*	*	*	*

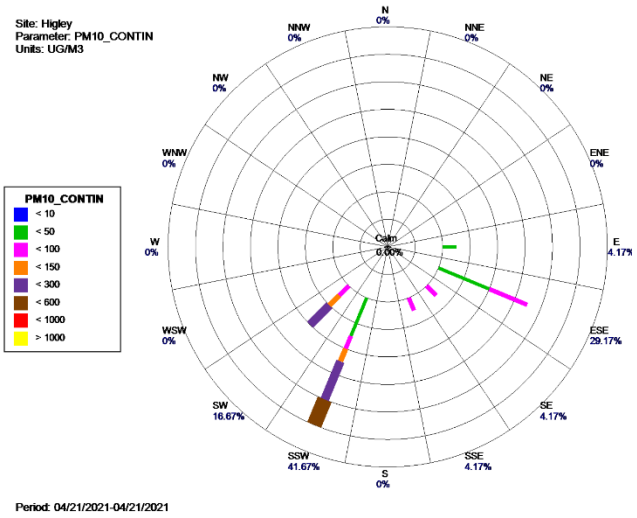
*Not available
#Exceedance of the 24-hour PM_{10} NAAQS

Pollution and Wind Roses for Higley and West Chandler Sites on April 21, 2021

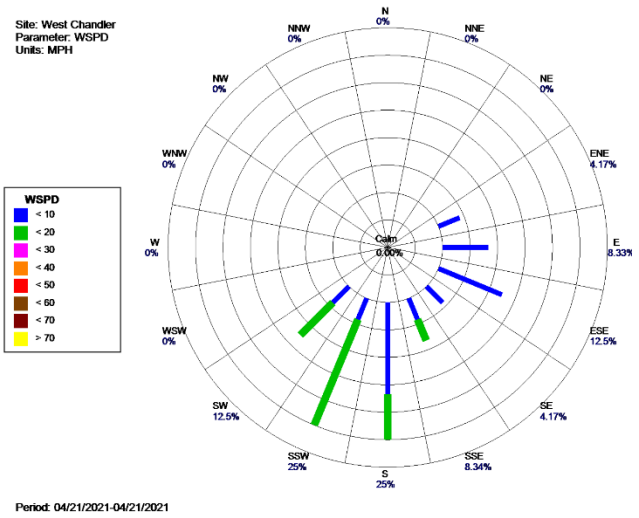
Higley Wind Rose



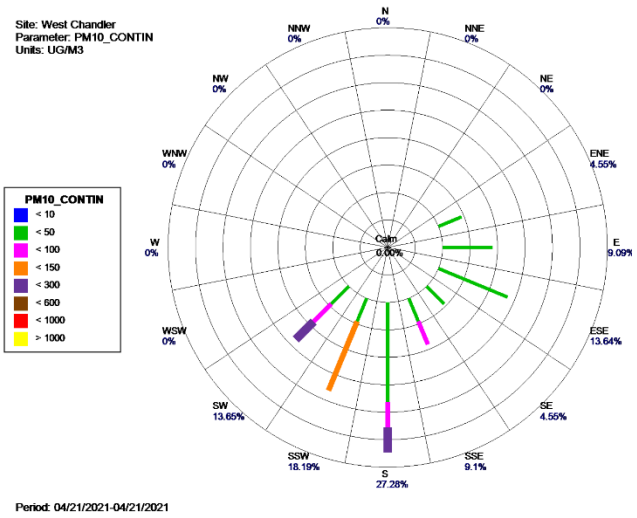
Higley PM_{10} Rose



West Chandler Wind Rose

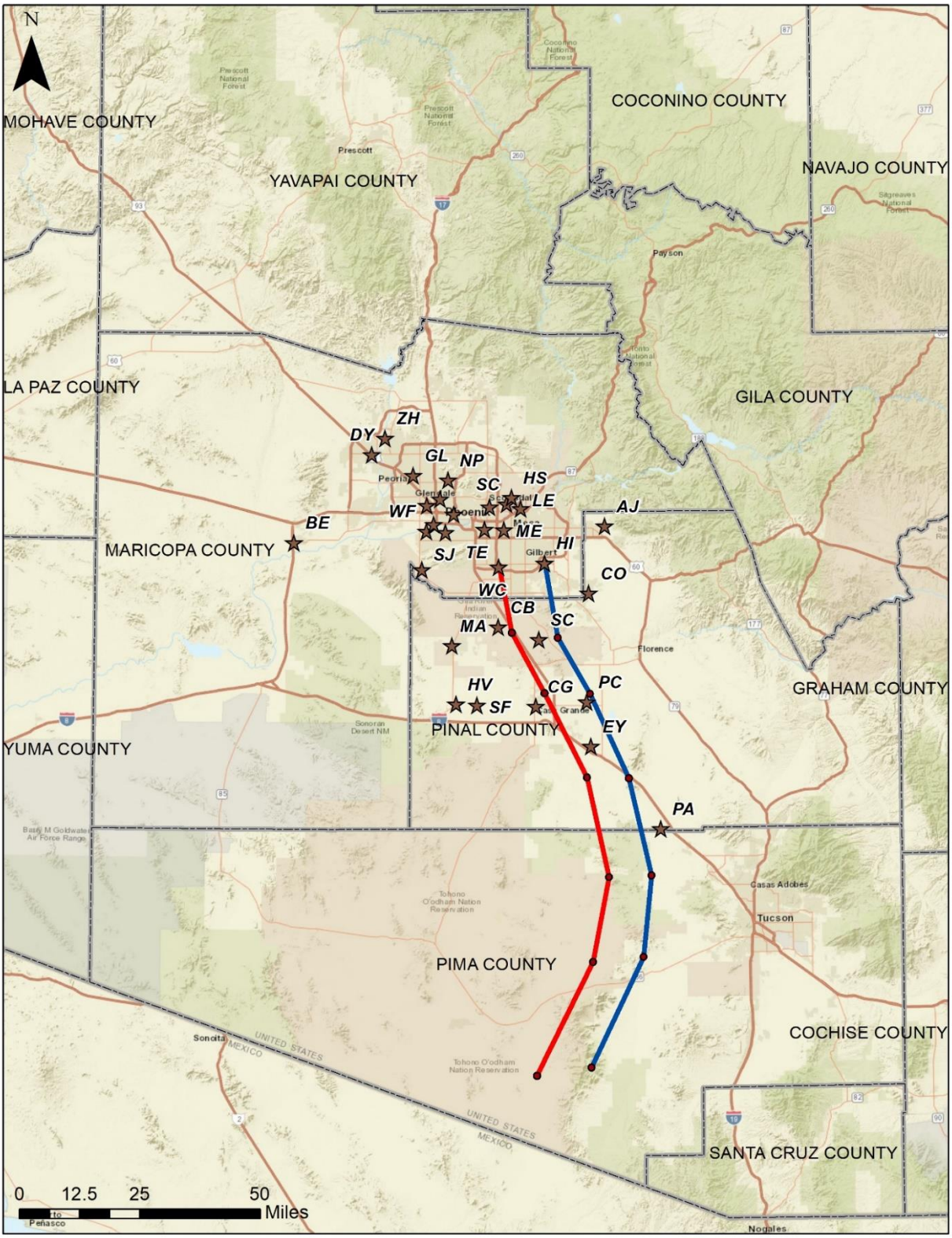


West Chandler PM_{10} Rose



HYSPLIT Back-Trajectory Analyses

Figure 4. HYSPLIT 6-hour back-trajectory ending at 10:00 a.m. on April 21, 2021, at both the Higley and West Chandler sites. Elevation at end time is 100 m AGL.



Proximity of Other Exceeding Sites to West Chandler and Higley

- Higley
  - Closest exceeding site: Pinal County Housing (30.1 miles away)
  - Farthest exceeding site: Eloy (39.2 miles away)
- West Chandler
  - Closest exceeding site: Stanfield (29.1 miles away)
  - Farthest exceeding site: Eloy (42 miles away)

$PM_{10}/PM_{2.5}$ Ratios for Regional Air Monitors

Table 9. Hourly-averaged PM_{10}, $PM_{2.5}$, and PM_C for sites in Maricopa and Pinal counties having a continuous $PM_{2.5}$ monitor. Note that time reflects the hour of highest PM_{10} concentration on April 21, 2021.

Site	Time	PM_{10}	$PM_{2.5}$	PM_C	Ratio $PM_{2.5}/PM_{10}$
West Phoenix	5:00 p.m.	211.6	22.9	188.6	0.11
Mesa	11:00 a.m.	85.9	7.7	78.1	0.09
North Phoenix	5:00 p.m.	204.2	21.3	182.8	0.10
Glendale	4:00 p.m.	216.2	19.2	196.9	0.09
South Phoenix	3:00 p.m.	137.4	13.7	123.4	0.10
Tempe	11:00 a.m.	114.6	9.3	105.2	0.08
Durango Complex	5:00 p.m.	138.1	13.0	124.9	0.09
JLG Supersite	5:00 p.m.	186	17	169	0.09
Casa Grande Downtown	11:00 a.m.	346	26	320	0.08
Hidden Valley	8:00 a.m.	428	27	401	0.06

ADEQ Visibility Camera Historical Archive

Archived photos from ADEQ's Visibility Camera Historical Archive for April 21, 2021. The image on the left reflects a time before the dust storm occurred and on the right during or after the storm's passage. The main storm hit the Phoenix area at approximately 4:00-5:00 p.m.

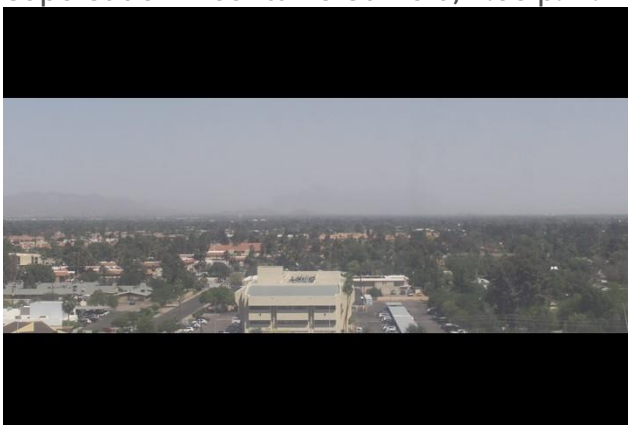
South Mountain Camera, 1:00 p.m.

South Mountain Camera, 4:30 p.m.

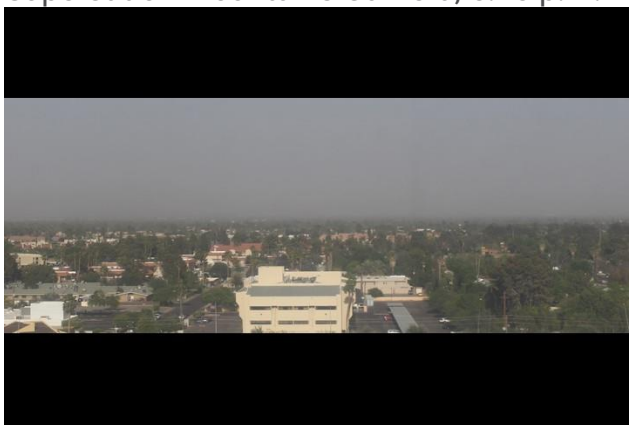
Camelback Mountain Camera, 12:00 p.m.

Camelback Mountain Camera, 4:45 p.m.

Superstition Mountains Camera, 2:00 p.m.



Superstition Mountains Camera, 5:15 p.m.



Compliance and Enforcement Activities

An evaluation of all inspections and air quality complaints indicates no evidence of unusual anthropogenic PM_{10} emissions during the time period of April 18 through April 24, 2021.

During this seven-day period the following activity took place:

- Number of inspections of permitted facilities: 239
    - Number of those facilities that were fugitive dust sources: 179
- Number of inspections that resulted in an enforcement action for PM_{10} and non-PM_{10}-related violations: 47
    - Number of enforcement actions that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 3
    - Details on enforcement actions: The three violations that were noted during inspections were for recordkeeping errors. Visible emissions of dust were not noted during any of these inspections.
- Number of complaints received: 58
    - Number of those complaints that were windblown dust or PM_{10} related: 47
    - Number of those complaints that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 3
    - Details on complaints within four-mile radius: One complaint was regarding residential construction activity and the other two were regarding construction activity at the same existing facility. No violations were noted during the complaint inspections.

Atypical Event: July 9, 2021

This high-wind event was due to summer monsoon storm activity which caused widespread blowing dust throughout the region. Five monitoring sites in Maricopa County exceeded the 24-hour PM_{10} NAAQS on this date.

ADEQ Pollution Forecast

The following selected portion of the forecast was made on Friday, July 9, 2021.

> "Strong to severe thunderstorms formed in the higher terrain northeast/east of Phoenix yesterday afternoon, but they quickly fell apart as they moved west/southwest off the higher terrain. So what will happen today?
>
> Latest water vapor satellite shows high pressure is now elongated along the Arizona/Utah border, which is providing an east/northeast flow over eastern and central Arizona. This is a good pattern to bring storms that develop along the rim down into the Valley if storms can survive off the higher terrain. For the most part, today looks like it will be very similar to the storm activity we saw yesterday. The best chance of storms this afternoon will be across the northern and eastern portion of the Valley, with a better chance of gusty outflows winds across the entire Valley. As was the case yesterday, with outflows winds coming from the east/northeast, not expecting widespread dust, but there could certainly be isolated pockets of dust, so use caution traveling."

NWS Area Forecast Discussion

The following selected portions of the Area Forecast Discussion are from the National Weather Service office in Phoenix, AZ, for 2:32 p.m. MST Friday, July 9, 2021.

> "Yesterday's forecast went as expected through the early evening with fairly strong storms propagating off the Rim and White Mountains into southern Gila and eastern Maricopa Counties. However, upper level support and outflow boundary interactions needed for lower desert storms did not pan out. Favorable parameters for convection, as discussed yesterday, are generally still in play for today. Storm chances and/or impacts more likely over the higher terrain compared to the lower desert. Warming temperatures will again mix through a deep boundary layer, eradicating a low level inversion, and further eating into the stronger midlevel inversion. The latest HREF indicates better potential for storms pushing through southern Yavapai County that could send strong outflows into northwestern Maricopa County. This activity is better situated to impact the Wickenburg area but could stretch as far east as the northwest Valley. Overall, storm chances in the Valley (or anywhere in the lower desert) are still low, around 10-20%. Any storms that do develop, whether in Gila County or elsewhere, will be capable of producing strong localized wind gusts of 40-60 mph, outflow winds, and locally heavy rain."

Environmental Conditions at Air Monitoring Sites

Table 10. PM_{10} and wind data for PM air monitoring sites in Maricopa and Pinal counties on July 9, 2021.

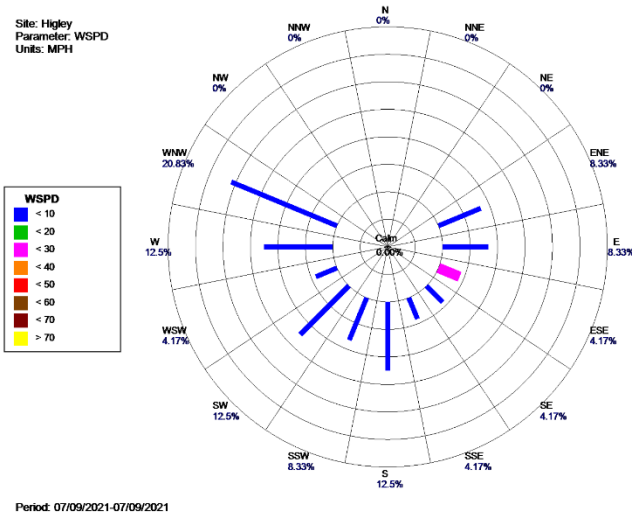
Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
West Phoenix	126	9.8	11:00 p.m.	32.6	10:00 p.m.
Mesa	199#	10.3	10:00 p.m.	41.9	10:00 p.m.
North Phoenix	98	9.3	11:00 p.m.	36.9	10:00 p.m.
Glendale	107	15.2	11:00 p.m.	32.5	11:00 p.m.
Central Phoenix	122	11.3	1:00 a.m.	33.6	10:00 p.m.
South Scottsdale	188#	9.5	12:00 a.m.	36.1	10:00 p.m.
South Phoenix	90	9.1	11:00 p.m.	34.9	10:00 p.m.
West Chandler	165#	13.0	10:00 p.m.	47.5	10:00 p.m.
Tempe	208#	7.8	11:00 p.m.	34.5	10:00 p.m.
Higley	130	21.1	10:00 p.m.	63.8	10:00 p.m.
West 43rd Avenue	143	11.0	11:00 p.m.	39.6	10:00 p.m.
Dysart	111	12.2	11:00 p.m.	29.4	11:00 p.m.
Buckeye	35	11.5	9:00 p.m.	28.3	11:00 p.m.
Zuni Hills	84	13.8	6:00 p.m.	31.8	11:00 p.m.
St Johns	182#	*	*	*	*
Senior Center	51	*	*	*	*
Lehi	39	*	*	*	*
High School	51	*	*	*	*

Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
Durango Complex	131	10.5	11:00 p.m.	29.4	10:00 p.m.
JLG Supersite	116	8.4	11:00 p.m.	*	*
Casa Grande Downtown	76	*	*	*	*
AJ Fire Station	33	*	*	*	*
Pinal Air Park	46	*	*	*	*
Stanfield	60	*	*	*	*
Combs	32	*	*	*	*
Pinal County Housing	53	*	*	*	*
Eloy	93	*	*	*	*
Hidden Valley	107	*	*	*	*
Maricopa 1405	37	*	*	*	*
Sacaton	30	*	*	*	*
Casa Blanca	49	*	*	*	*

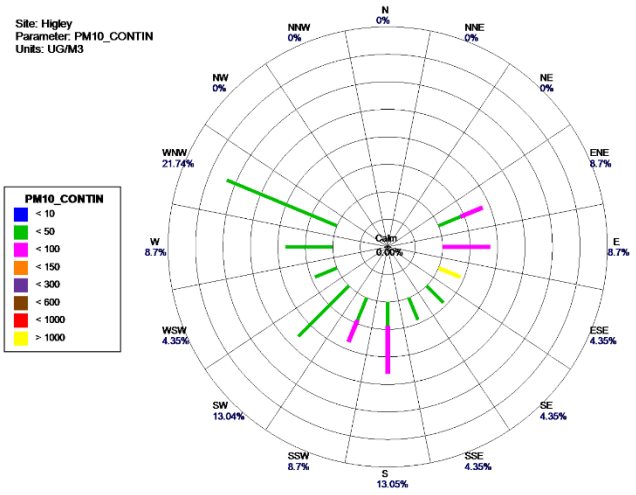
*Not available
#Exceedance of the 24-hour PM_{10} NAAQS

Pollution and Wind Roses for Higley and West Chandler Sites on July 9, 2021

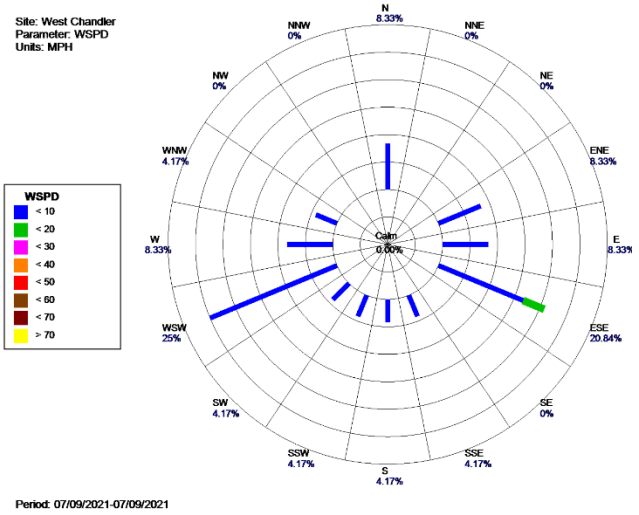
Higley Wind Rose



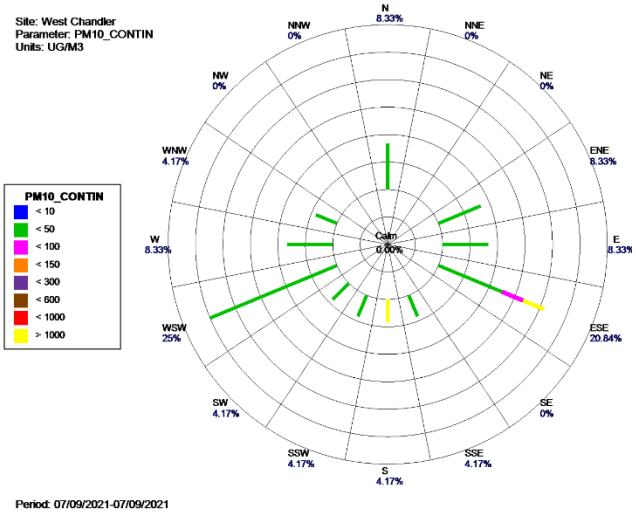
Higley PM_{10} Rose



West Chandler Wind Rose

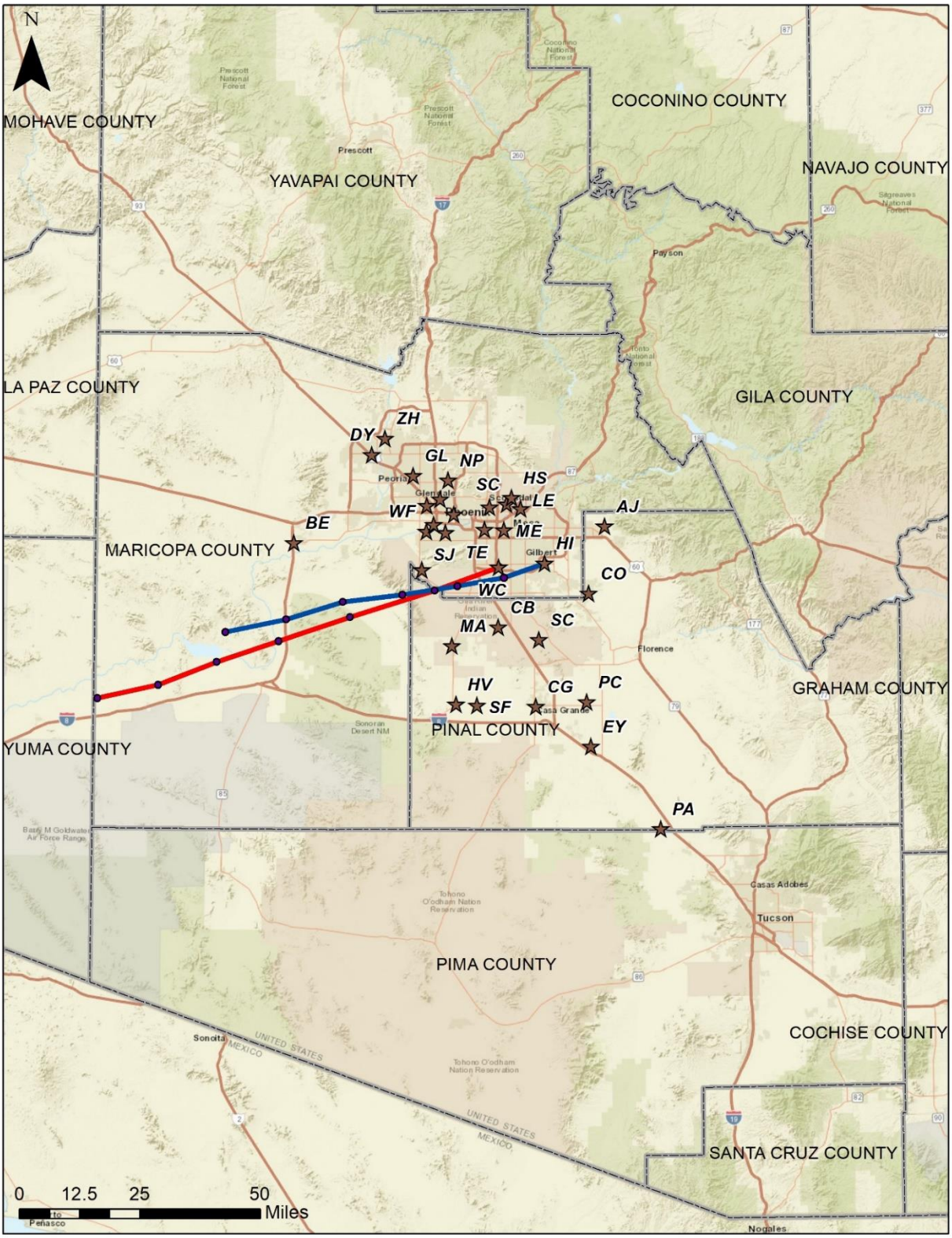


West Chandler PM_{10} Rose



HYSPLIT Back-Trajectory Analyses

Figure 5. HYSPLIT 6-hour back-trajectory ending at 10:00 p.m. on July 9, 2021, at both the Higley and West Chandler sites. Elevation at end time is 100 m AGL.



Proximity of Other Exceeding Sites to West Chandler and Higley

Note that West Chandler exceeded the 24-hour PM_{10} NAAQS on this date.

- Higley
  - Closest exceeding site: West Chandler (9.5 miles away)
  - Farthest exceeding site: St. Johns (25.5 miles away)
- West Chandler
  - Closest exceeding site: Mesa (7.8 miles away)
  - Farthest exceeding site: St. Johns (16 miles away)

$PM_{10}/PM_{2.5}$ Ratios for Regional Air Monitors

Table 11. Hourly-averaged PM_{10}, $PM_{2.5}$, and PM_C for sites in Maricopa and Pinal counties having a continuous $PM_{2.5}$ monitor. Note that time reflects the hour of highest PM_{10} concentration on July 9, 2021.

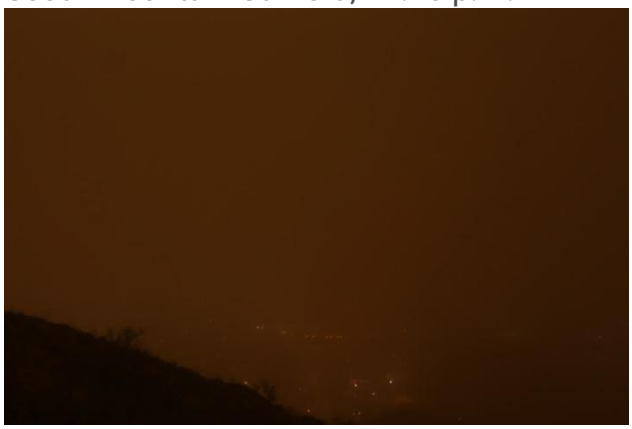
Site	Time	PM_{10}	$PM_{2.5}$	PM_C	Ratio $PM_{2.5}/PM_{10}$
West Phoenix	11:00 p.m.	2669.0	197.8	2470.0	0.07
Mesa	11:00 p.m.	3741.1	333.7	3407.3	0.09
North Phoenix	11:00 p.m.	2007.8	152.3	1855.7	0.08
Glendale	11:00 p.m.	2132.6	187.0	1945.2	0.09
South Phoenix	11:00 p.m.	1584.5	126.9	1465.9	0.08
Tempe	11:00 p.m.	3957.5	179.5	3777.2	0.05
Durango Complex	11:00 p.m.	2644.9	202.8	2439.2	0.08
JLG Supersite	11:00 p.m.	2305	178	2127	0.08
Casa Grande Downtown	10:00 p.m.	1118	143	975	0.13
Hidden Valley	10:00 p.m.	1017	72	945	0.07

ADEQ Visibility Camera Historical Archive

Archived photos from ADEQ's Visibility Camera Historical Archive July 9, 2021. The image on the left reflects a time before the dust storm occurred and on the right during or after the storm's passage. The storm hit the Phoenix area at approximately 10:00 p.m.

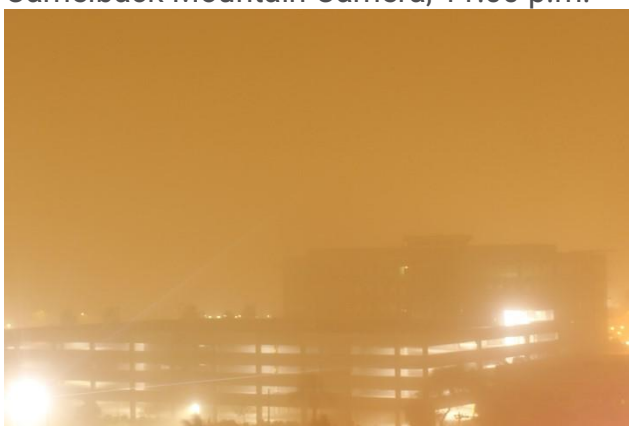
South Mountain Camera, 10:30 p.m.

South Mountain Camera, 11:15 p.m.

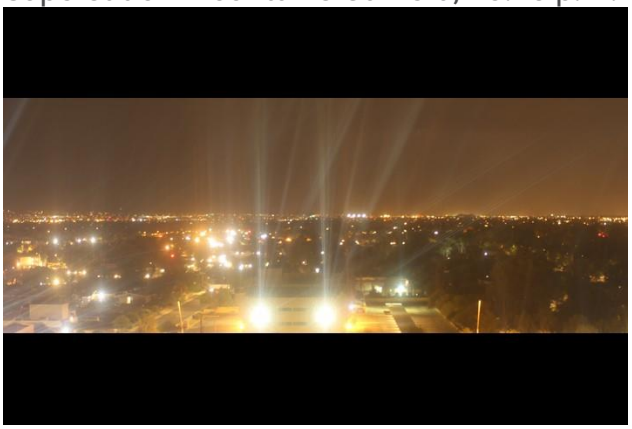


Camelback Mountain Camera, 10:00 p.m.

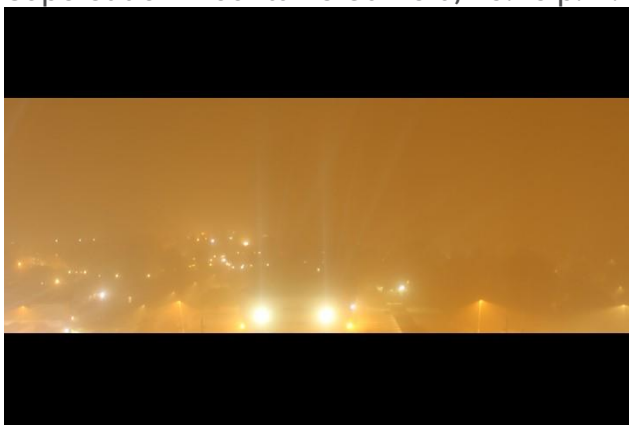
Camelback Mountain Camera, 11:00 p.m.



Superstition Mountains Camera, 10:15 p.m.



Superstition Mountains Camera, 10:45 p.m.



Compliance and Enforcement Activities

An evaluation of all inspections and air quality complaints indicates no evidence of unusual anthropogenic PM_{10} emissions during the time period of July 6 through July 12, 2021.

During this seven-day period the following activity took place:

- Number of inspections of permitted facilities: 179
    - Number of those facilities that were fugitive dust sources: 174
- Number of inspections that resulted in an enforcement action for PM_{10} and non-PM_{10}-related violations: 12
    - Number of enforcement actions that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 1
    - Details on enforcement actions: The one violation that was noted during this inspection was for a recordkeeping error. Visible emissions of dust were not noted during this inspection.
- Number of complaints received: 23
    - Number of those complaints that were windblown dust or PM_{10} related: 22
    - Number of those complaints that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 0

Atypical Event: October 11, 2021

A high-wind event due to a low-pressure system moving through the state occurred on this date and caused widespread blowing dust throughout the region. The storm occurred late evening on October 11 and continued into October 12. Five monitoring sites, in both Maricopa and Pinal counties, exceeded the 24-hour PM_{10} NAAQS on October 11.

ADEQ Pollution Forecast

The following selected portions of the forecast was made on Friday, October 8, 2021, and includes anticipated conditions for the entire weekend.

> "…Two fairly strong low pressure troughs (waves) will batter the Southwest during this forecast period…"
>
> "…However, in regards to PM_{10} (dust), average PM_{10} levels are a little more volatile during this time of year. This is because PM_{10} levels generally rise and fall with the low pressure troughs that are common during this season.
>
> The first wave in line to affect the Southwest during this forecast period will result in breezy westerly winds in the afternoons today and Saturday. Pockets of dust may be possible. But the second wave, set to move in by Monday, will bring stronger winds out of the southwest (10-20 mph with higher gusts). Winds will then shift to out of the northwest on Tuesday. Elevated PM_{10} levels will be possible on both Monday and Tuesday."

NWS Area Forecast Discussion

The following selected portions of the Area Forecast Discussion are from the National Weather Service office in Phoenix, AZ, for 2:10 p.m. MST Monday, October 11, 2021.

> "The low pressure system responsible for the windy conditions continues to plunge southward through the Sierra Nevada of central California. The well-defined vort max evident on water vapor will blast through southeastern California this afternoon and winds will then increase in response to a tightening pressure gradient. Latest visible satellite imagery already reveals areas of blowing dust near the Salton Sea. The dust is expected to expand rapidly eastward this afternoon and this evening, and a Blowing Dust Advisory has been issued for the lower deserts.
>
> Latest deterministic models continue to trend even stronger with the wind fields 850 mb and below. Wind gusts will be maximized later this afternoon across southeastern California, and this evening across central Arizona just ahead of the eastward advancing cold front. Latest forecast soundings and HREF ensemble maxes suggest peak gusts to 55 mph will not be out of the question across the western deserts. Peak gusts could also reach up to 45 mph in the Phoenix area, which will certainly be strong

enough to send decorations airborne. Wind gusts up to 70 will also be possible along I-8 in extreme southwestern Imperial County."

Environmental Conditions at Air Monitoring Sites

Table 12. PM_{10} and wind data for PM air monitoring sites in Maricopa and Pinal counties on October 11, 2021.

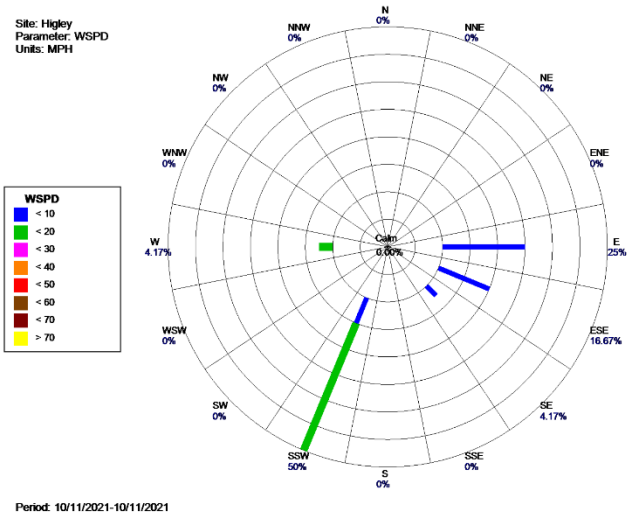
Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
West Phoenix	59	12.8	8:00 p.m.	43.2	10:00 p.m.
Mesa	74	15.3	9:00 p.m.	36.2	10:00 p.m.
North Phoenix	47	11.6	9:00 p.m.	39.4	10:00 p.m.
Glendale	61	20.3	8:00 p.m.	46.0	10:00 p.m.
Central Phoenix	94	16.7	8:00 p.m.	56.3	10:00 p.m.
South Scottsdale	88	14.5	10:00 p.m.	44.7	10:00 p.m.
South Phoenix	69	14.4	8:00 p.m.	44.7	10:00 p.m.
West Chandler	160#	19.9	9:00 p.m.	45.6	10:00 p.m.
Tempe	83	10.3	9:00 p.m.	41.1	10:00 p.m.
Higley	134	18.4	7:00 p.m.	36.2	7:00 p.m.
West 43rd Avenue	110	14.6	8:00 p.m.	38.5	9:00 p.m.
Dysart	155#	15.4	10:00 p.m.	36.9	9:00 p.m.
Buckeye	258#	22.9	10:00 p.m.	46.1	10:00 p.m.
Zuni Hills	122	19.2	9:00 p.m.	55.1	10:00 p.m.
St Johns	134	*	*	*	*
Senior Center	115	*	*	*	*
Lehi	ND	*	*	*	*

Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
High School	101	*	*	*	*
Durango Complex	79	15.0	8:00 p.m.	38.1	10:00 p.m.
JLG Supersite	79	11.3	9:00 p.m.	*	*
Casa Grande Downtown	112	*	*	*	*
AJ Fire Station	59	21.3	10:00 p.m.	24.0	10:00 p.m.
Pinal Air Park	36	*	*	*	*
Stanfield	150	20.1	11:00 p.m.	38.3	11:00 p.m.
Combs	79	*	*	*	*
Pinal County Housing	143	25.5	11:00 p.m.	42.7	10:00 p.m.
Eloy	129	*	*	*	*
Hidden Valley	184#	30.2	9:00 p.m.	48.3	10:00 p.m.
Maricopa 1405	106	*	*	*	*
Sacaton	87	*	*	*	*
Casa Blanca	158#	*	*	*	*

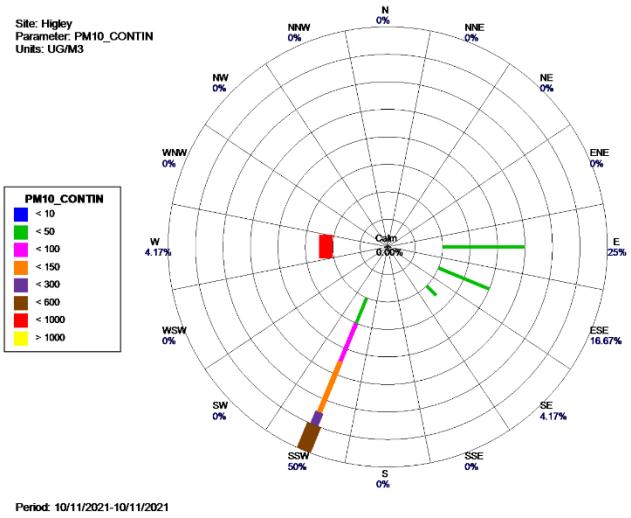
*Not available
#Exceedance of the 24-hour PM_{10} NAAQS
ND: No data available in AQS for this day

Pollution and Wind Roses for Higley and West Chandler Sites on October 11, 2021

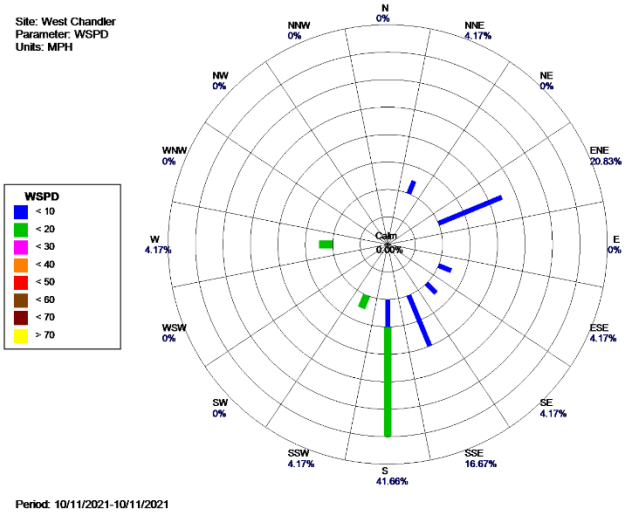
Higley Wind Rose



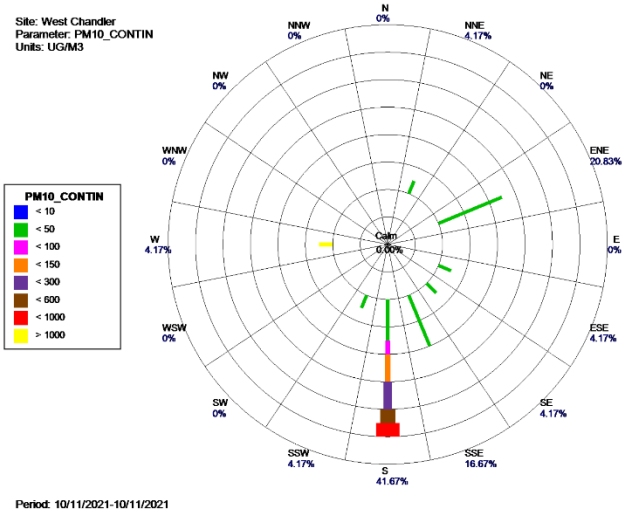
Higley PM_{10} Rose



West Chandler Wind Rose

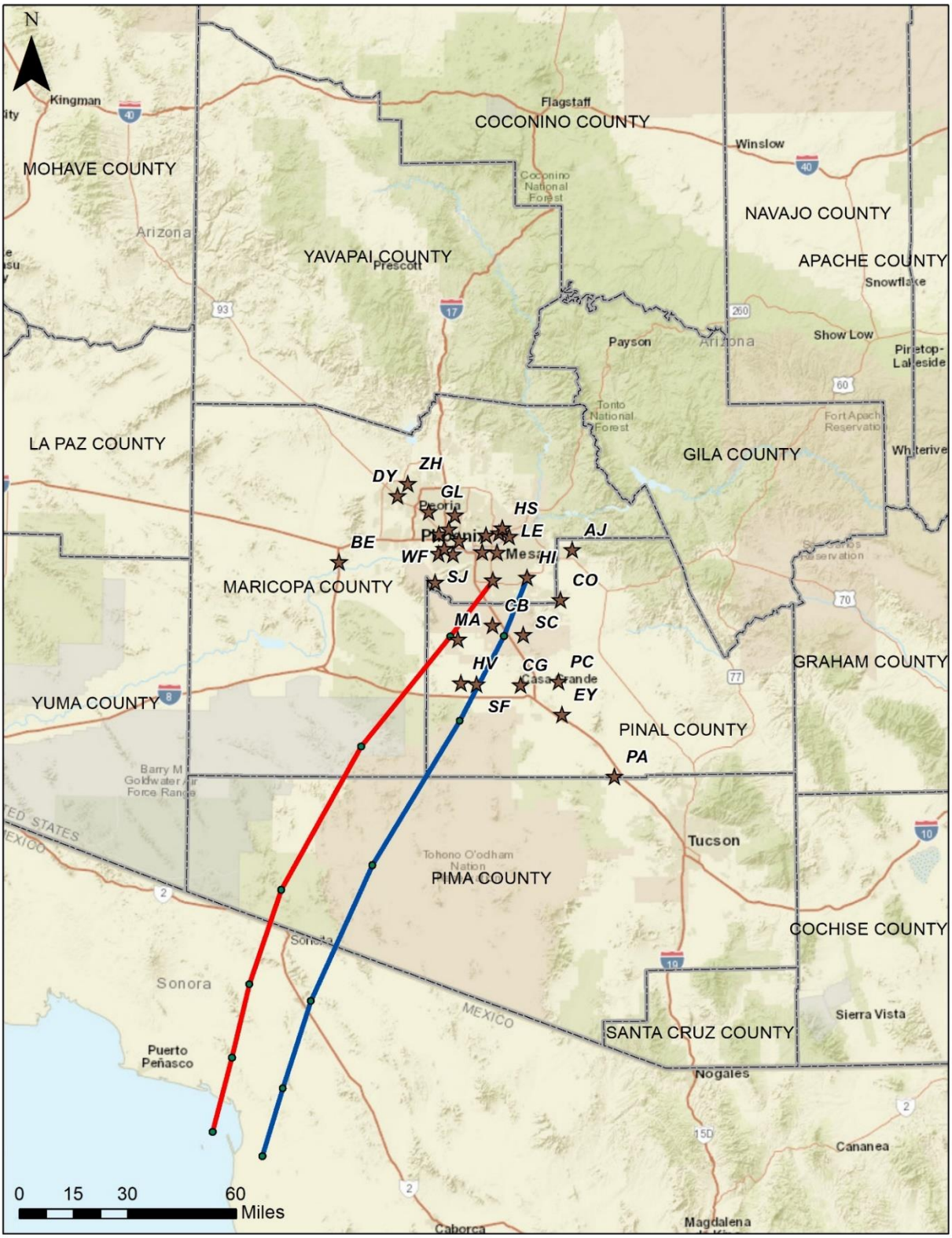


West Chandler PM_{10} Rose



HYSPLIT Back-Trajectory Analyses

Figure 6. HYSPLIT 6-hour back-trajectory ending at 11:00 p.m. on October 11, 2021, at both the Higley and West Chandler sites. Elevation at end time is 100 m AGL.



Proximity of Other Exceeding Sites to West Chandler and Higley

Note that West Chandler exceeded the 24-hour PM_{10} NAAQS on this date.

- Higley
  - Closest exceeding site: West Chandler (9.5 miles away)
  - Farthest exceeding site: Buckeye (52.3 miles away)
- West Chandler
  - Closest exceeding site: Casa Blanca (12.5 miles away)
  - Farthest exceeding site: Buckeye (43 miles away)

$PM_{10}/PM_{2.5}$ Ratios for Regional Air Monitors

Table 13. Hourly-averaged PM_{10}, $PM_{2.5}$ and PM_C for sites in Maricopa and Pinal counties having a continuous $PM_{2.5}$ monitor. Note that time reflects the hour of highest PM_{10} concentration on October 11, 2021.

Site	Time	PM_{10}	$PM_{2.5}$	PM_C	Ratio $PM_{2.5}/PM_{10}$
West Phoenix	11:00 p.m.	560.0	71.9	487.7	0.13
Mesa	11:00 p.m.	657.3	85.5	571.6	0.13
North Phoenix	11:00 p.m.	505.6	71.9	433.6	0.14
Glendale	11:00 p.m.	609.2	91.4	517.5	0.15
South Phoenix	11:00 p.m.	809.0	107.2	706.9	0.13
Tempe	11:00 p.m.	686.5	102.6	583.2	0.15
Durango Complex	11:00 p.m.	820.0	102.3	717.1	0.12
JLG Supersite	11:00 p.m.	925	111	814	0.12
Casa Grande Downtown	11:00 p.m.	825	47	778	0.06
Hidden Valley	11:00 p.m.	540	61	479	0.11

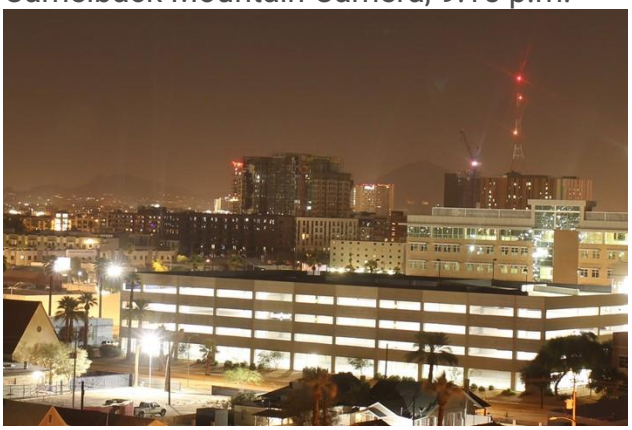
ADEQ Visibility Camera Historical Archive

Archived photos from ADEQ's Visibility Camera Historical Archive for October 11, 2021. The image on the left reflects a time before the dust storm occurred and on the right during or after the storm's passage. The storm hit the Phoenix area at approximately 9:00-10:00 p.m.

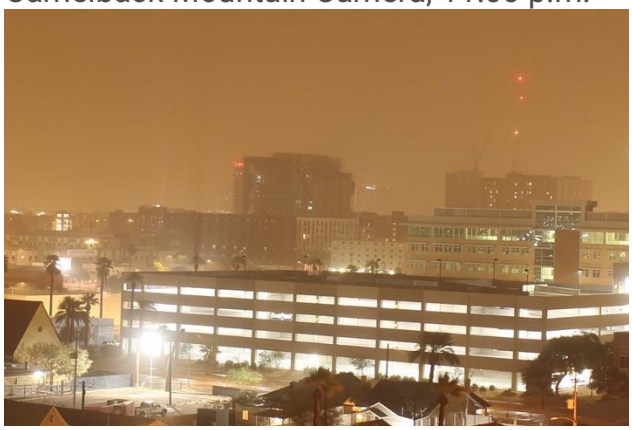
South Mountain Camera, 4:30 p.m.

Note: There are no images available in the archive for South Mountain camera after 4:30 p.m. on October 11, 2021

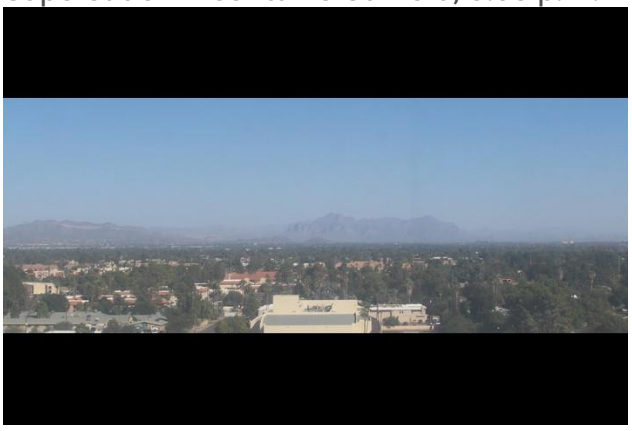
Camelback Mountain Camera, 9:15 p.m.



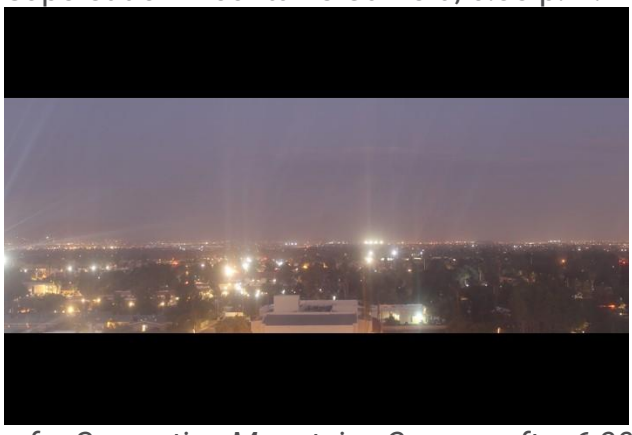
Camelback Mountain Camera, 11:00 p.m.



Superstition Mountains Camera, 3:00 p.m.



Superstition Mountains Camera, 6:30 p.m.



Note: There are no images available in the archive for Superstion Mountains Camera after 6:30 p.m.on October 11, 2021

Compliance and Enforcement Activities

An evaluation of all inspection reports and air quality complaints indicates no evidence of unusual anthropogenic PM_{10} emissions during the time period of October 8 through October 14, 2021.

During this seven-day period the following activity took place:

- Number of inspections of permitted facilities: 205
    - Number of those facilities that were fugitive dust sources: 157
- Number of inspections that resulted in an enforcement action taken for PM_{10} and non-PM_{10}-related violations: 35
    - Number of enforcement actions that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 1
    - Details on enforcement actions: The one violation that was noted during this inspection was for a recordkeeping error. Visible emissions of dust were not noted during this inspection.
- Number of complaints received: 25
    - Number of those complaints that were windblown dust or PM_{10} related: 17
    - Number of those complaints that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 0

Atypical Event: October 12, 2021

A high-wind event due to a low-pressure system moving through the state occurred on this date. This caused widespread blowing dust throughout the region. The storm occurred late evening on October 11 and continued into October 12. Twenty-one monitoring sites, in both Maricopa and Pinal counties, exceeded the 24-hour PM_{10} NAAQS on October 12, 2021.

ADEQ Pollution Forecast

The following selected portion of forecast was made for Tuesday, October 12, 2021.

> "Valley residents have woken up to a cool, hazy morning, thanks to a strong low pressure system over the region and its cold front that swept through Arizona last night. Both PM_{10} (dust) and $PM_{2.5}$ (smoke) reached significant levels around midnight and are still elevated from West Valley to East Valley (as of 8 a.m.).
>
> Looking ahead, today will be the coolest day of the week, with highs only forecast to max out around 70°F--maybe even lower. Winds will also increase out of the west in the afternoon, but they won't be near as strong as yesterday's winds. Daytime heating and winds should help to disperse this morning's high PM_{10} and $PM_{2.5}$ levels. But the damage has already been done, and PM_{10} will most likely exceed the health standard today because of the morning levels. Therefore, we've issued a PM_{10} High Pollution Advisory. $PM_{2.5}$ will easily reach the Moderate Air Quality Index (AQI) category."

NWS Area Forecast Discussion

The following selected portions of the Area Forecast Discussion are from the National Weather Service office in Phoenix, AZ, for 4:54 a.m. MST Tuesday, October 12, 2021. Note that the storm hit the Phoenix area on October 11 before 11:59 p.m. The storm was forecasted on October 11 and the following post-storm discussion was issued early in the morning on October 12.

> "An anomalously cold upper level low continues to track across the Desert Southwest early this morning with the low center across northern Arizona. The associated cold front has already swept through most of Arizona with winds diminishing fairly quickly behind the front. Gusty winds to around 30-40 mph across eastern Arizona will remain an issue through around sunrise, but winds will continue to decrease through the rest of the morning as the system continues to track to northeast."

Environmental Conditions at Air Monitoring Sites

Table 14. PM_{10} and wind data for PM air monitoring sites in Maricopa and Pinal counties on October 12, 2021.

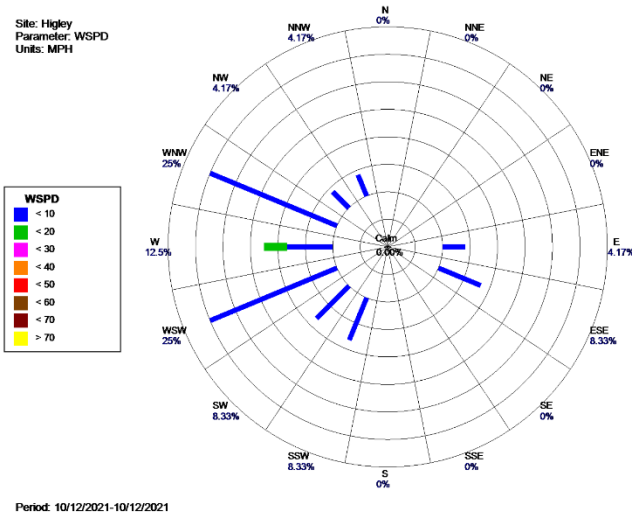
Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
West Phoenix	141	11.5	12:00 a.m.	32.7	3:00 p.m.
Mesa	170#	8.3	12:00 a.m.	28.5	12:00 a.m.
North Phoenix	143	7.9	1:00 a.m.	22.8	1:00 a.m.
Glendale	140	12.5	1:00 a.m.	23.0	12:00 a.m.
Central Phoenix	170#	17.4	12:00 a.m.	34.8	12:00 a.m.
South Scottsdale	180#	14.2	1:00 a.m.	32.9	1:00 a.m.
South Phoenix	144	12.3	12:00 a.m.	30.3	12:00 a.m.
West Chandler	181#	9.4	12:00 a.m.	28.1	12:00 a.m.
Tempe	158#	6.8	12:00 a.m.	26.3	12:00 a.m.
Higley	219#	11.6	12:00 a.m.	30.1	12:00 a.m.
West 43rd Avenue	166#	11.2	12:00 a.m.	27.4	12:00 a.m.
Dysart	137	6.5	1:00 a.m.	19.8	1:00 a.m.
Buckeye	149	10.1	1:00 a.m.	31.0	1:00 a.m.
Zuni Hills	142	10.5	2:00 a.m.	25.1	1:00 a.m.
St Johns	142	*	*	*	*
Senior Center	174#	*	*	*	*

Site	24-hour PM_{10} ($\mu g/m^3$)	Max Hourly-Averaged Wind Speed (MPH)	Time	Max Wind Gust (MPH)	Time
Lehi	ND	*	*	*	*
High School	156#	*	*	*	*
Durango Complex	163#	13.6	12:00 a.m.	33.5	12:00 p.m.
JLG Supersite	144	7.3	1:00 a.m.	*	*
Casa Grande Downtown	264#	*	*	*	*
AJ Fire Station	179#	14.4	1:00 a.m.	17.3	1:00 a.m.
Pinal Air Park	180#	*	*	*	*
Stanfield	235#	18.4	12:00 a.m. & 1:00 a.m.	29.5	12:00 a.m.
Combs	242#	*	*	*	*
Pinal County Housing	263#	18.7	2:00 a.m.	36.5	12:00 a.m.
Eloy	219#	*	*	*	*
Hidden Valley	222#	17.4	1:00 a.m.	35.3	2:00 a.m.
Maricopa 1405	217#	*	*	*	*
Sacaton	285#	*	*	*	*
Casa Blanca	259#	*	*	*	*

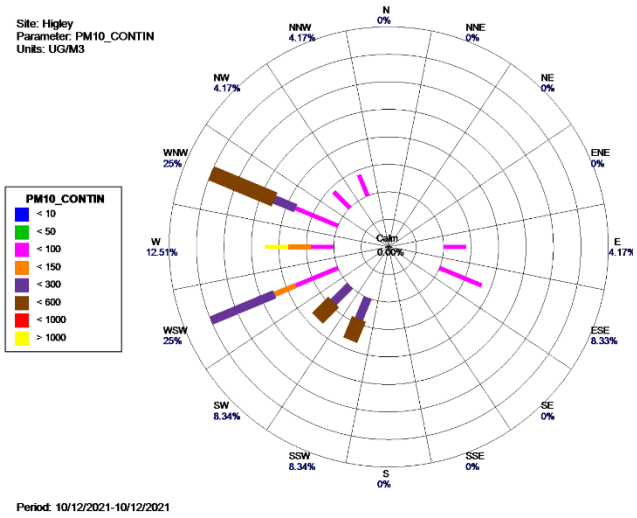
*Not available
#Exceedance of the 24-hour PM_{10} NAAQS
ND: No data available in AQS for this day

Pollution and Wind Roses for Higley and West Chandler Sites on October 12, 2021

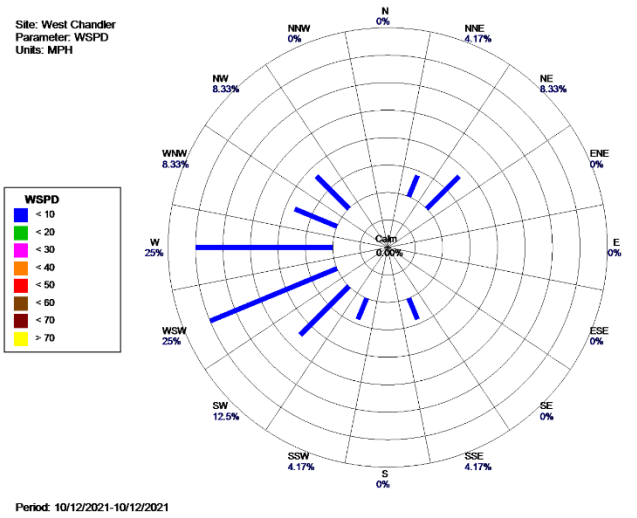
Higley Wind Rose



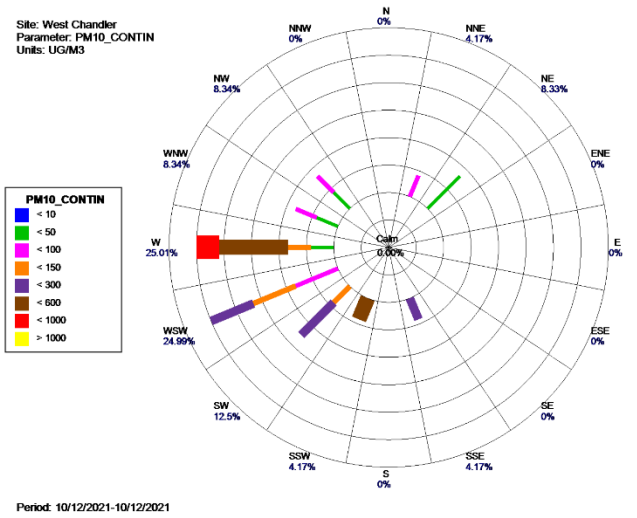
Higley PM_{10} Rose



West Chandler Wind Rose

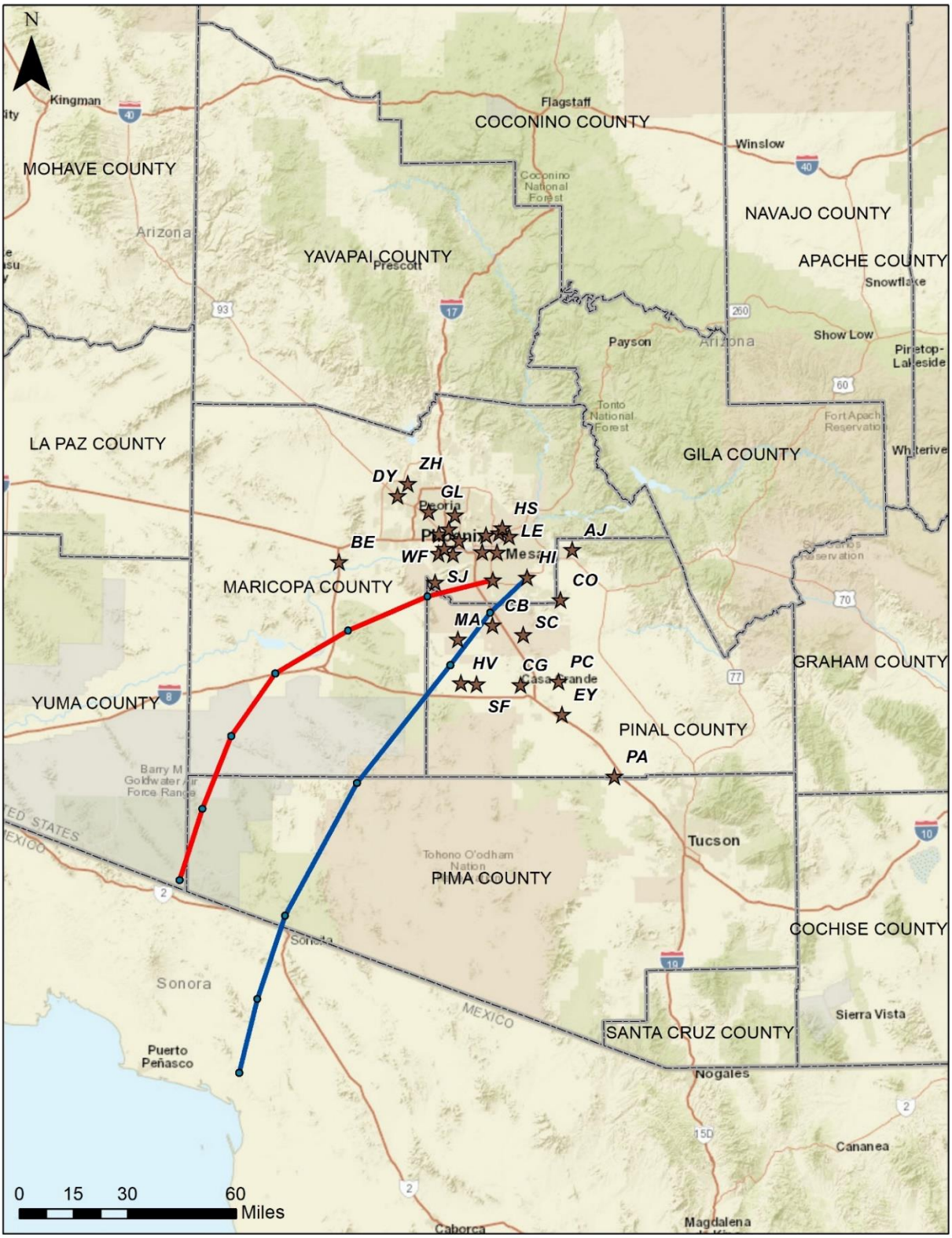


West Chandler PM_{10} Rose



HYSPLIT Back-Trajectory Analyses

Figure 7. HYSPLIT 6-hour back-trajectory ending at 12:00 a.m. on October 12, 2021, at both the Higley and West Chandler sites. Elevation at end time is 100 m AGL.



Proximity of Other Exceeding Sites to West Chandler and Higley

Note that both West Chandler and Higley exceeded the 24-hour PM_{10} NAAQS on this date.

- Higley
  - Closest exceeding site: West Chandler (9.5 miles away)
  - Farthest exceeding site: Pinal Air Park (60 miles away)
- West Chandler
  - Closest exceeding site: Mesa (7.8 miles away)
  - Farthest exceeding site: Eloy Pinal Air Park (64 miles away)

$PM_{10}/PM_{2.5}$ Ratios for Regional Air Monitors

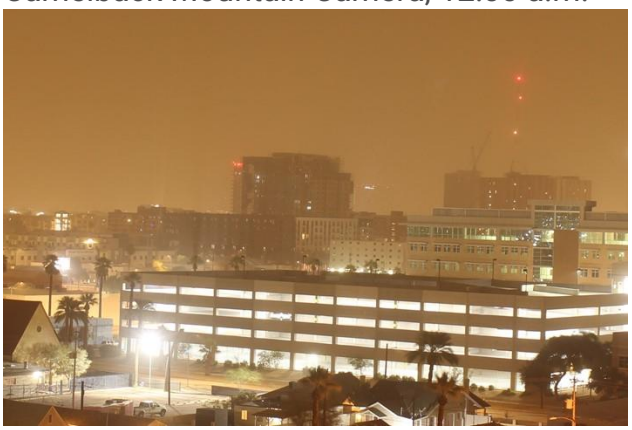
Table 15. Hourly-averaged PM_{10}, $PM_{2.5}$ and PM_C for sites in Maricopa and Pinal counties having a $PM_{2.5}$ monitor. Note that time reflects the hour of highest PM_{10} concentration on October 12, 2021.

Site	Time	PM_{10}	$PM_{2.5}$	PM_C	Ratio $PM_{2.5}/PM_{10}$
West Phoenix	12:00 a.m.	699.1	95.5	603.3	0.14
Mesa	12:00 a.m.	1018.0	144.4	872.9	0.14
North Phoenix	12:00 a.m.	738.6	96.4	641.9	0.13
Glendale	12:00 a.m.	710.6	106.0	604.6	0.15
South Phoenix	12:00 a.m.	857.4	106.6	744.9	0.12
Tempe	12:00 a.m.	953.8	160.0	793.6	0.17
Durango Complex	12:00 a.m.	914.7	102.6	811.6	0.11
JLG Supersite	12:00 a.m.	563	58	505	0.10
Casa Grande Downtown	12:00 a.m.	1836	198	1638	0.11
Hidden Valley	12:00 a.m.	1307	165	1142	0.13

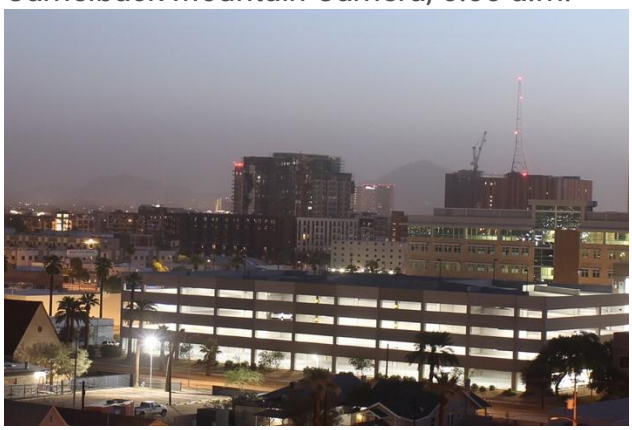
ADEQ Visibility Camera Historical Archive

Archived photos from ADEQ's Visibility Camera Historical Archive for October 12, 2021. The storm on this date began on October 11 before midnight, so the image on the left is at midnight during the storm and on the right is in the morning; the storm has passed, but dust is still lingering. Note: There are no images available in the archive for South Mountain or Superstition Mountain cameras on October 12, 2021.

Camelback Mountain Camera, 12:00 a.m.



Camelback Mountain Camera, 6:00 a.m.



Compliance and Enforcement Activities

An evaluation of all inspection reports and air quality complaints indicates no evidence of unusual anthropogenic PM_{10} emissions during the time period of October 9 through October 15, 2021.

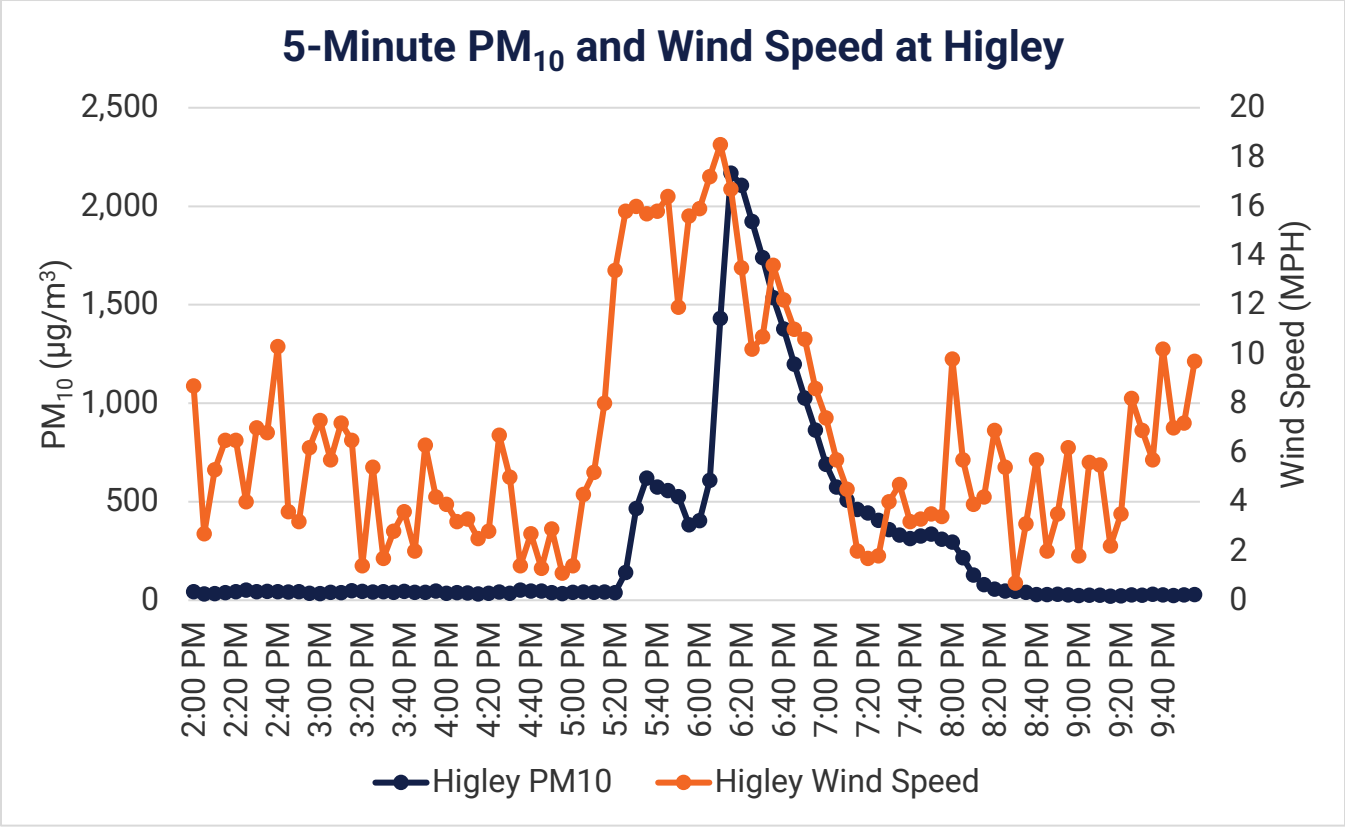
During this seven-day period the following activity took place:

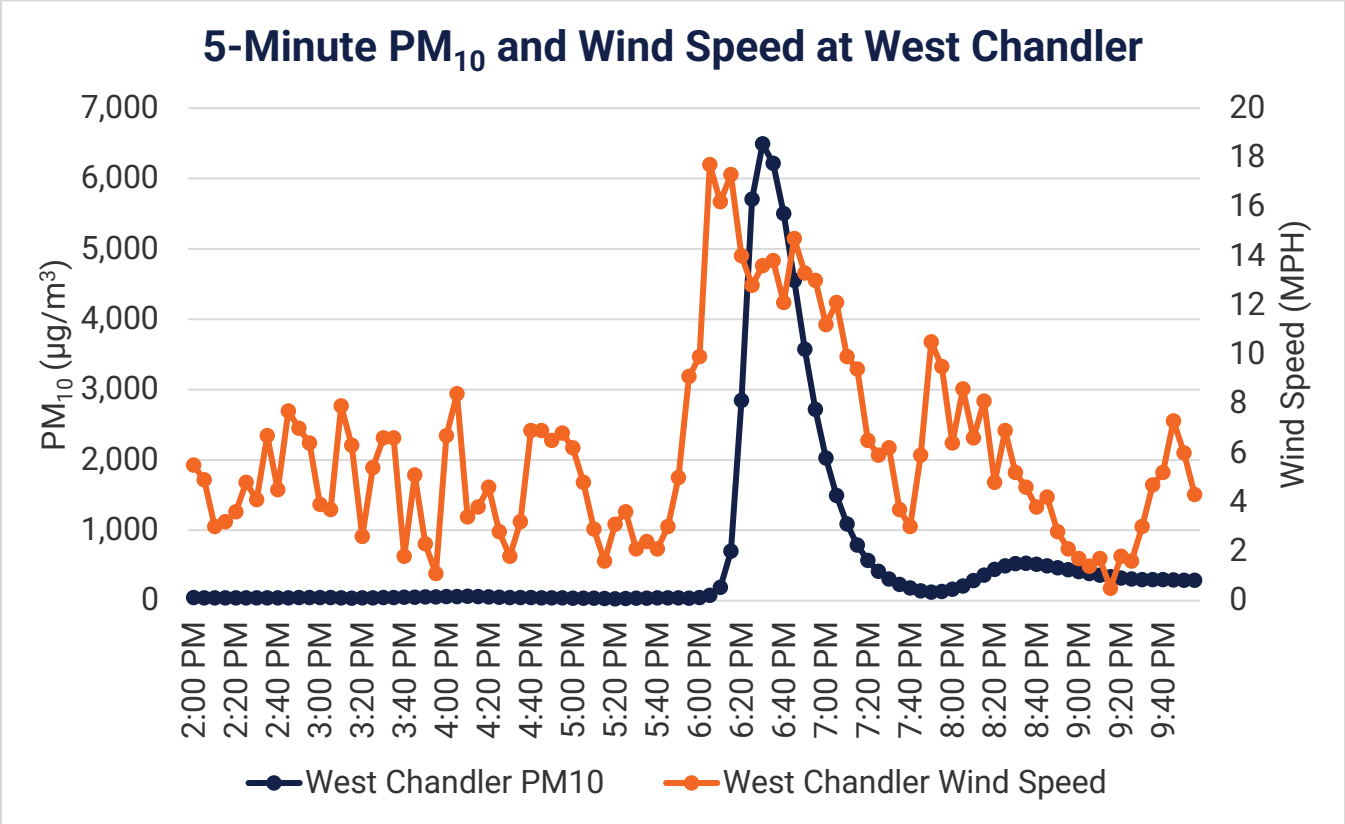
- Number of inspections of permitted facilities: 178
    - Number of those facilities that were fugitive dust sources: 132
- Number of inspections that resulted in an enforcement action taken for PM_{10} and non-PM_{10}-related violations: 31
    - Number of enforcement actions that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 1
    - Details on enforcement actions: The one violation that was noted during this inspection was for a recordkeeping error. Visible emissions of dust were not noted during this inspection.
- Number of complaints received: 22
    - Number of those complaints that were windblown dust or PM_{10} related: 14
    - Number of those complaints that occurred at facilities within a four-mile radius of the Higley or West Chandler monitoring sites: 0

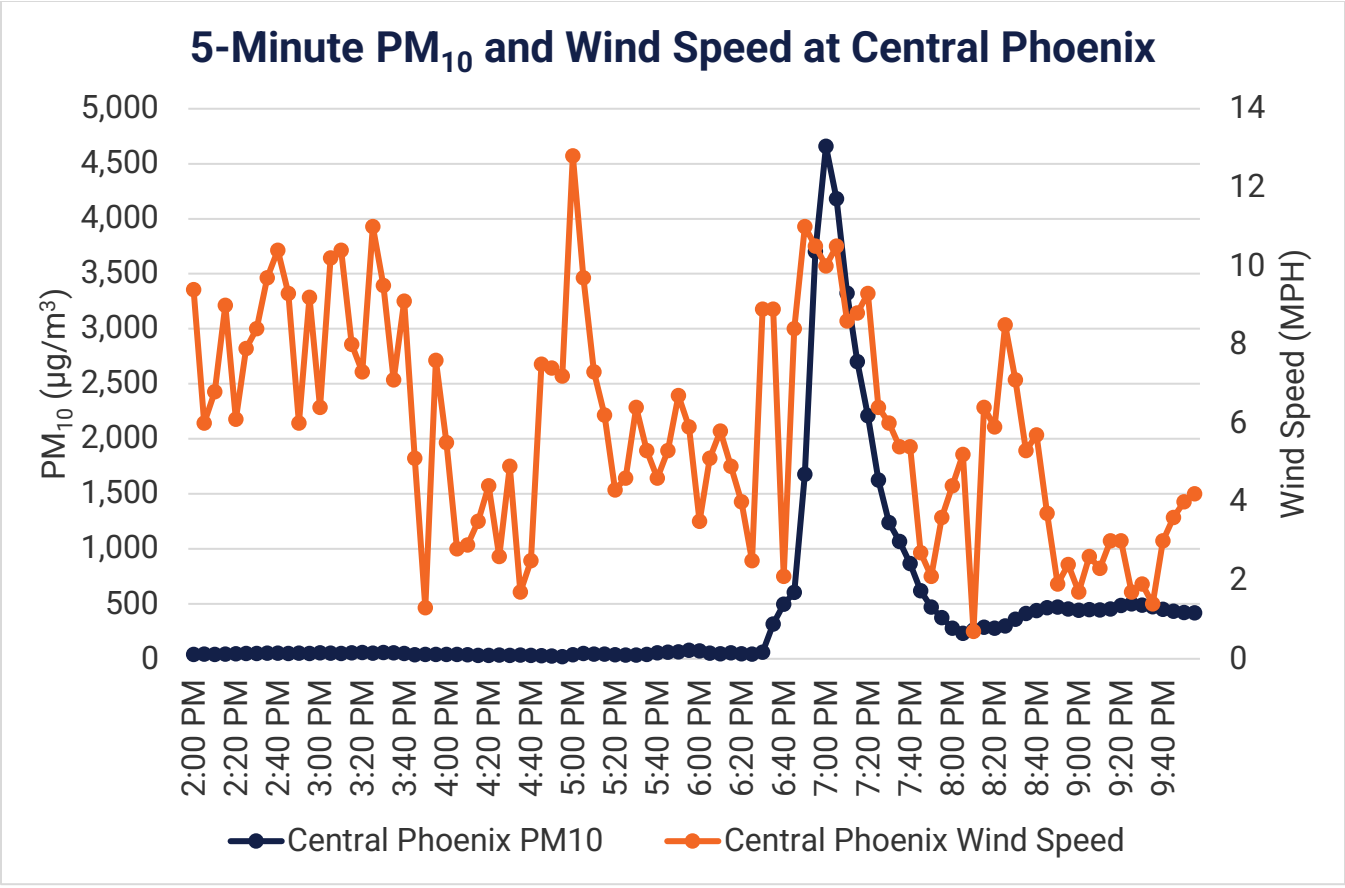
Appendix I

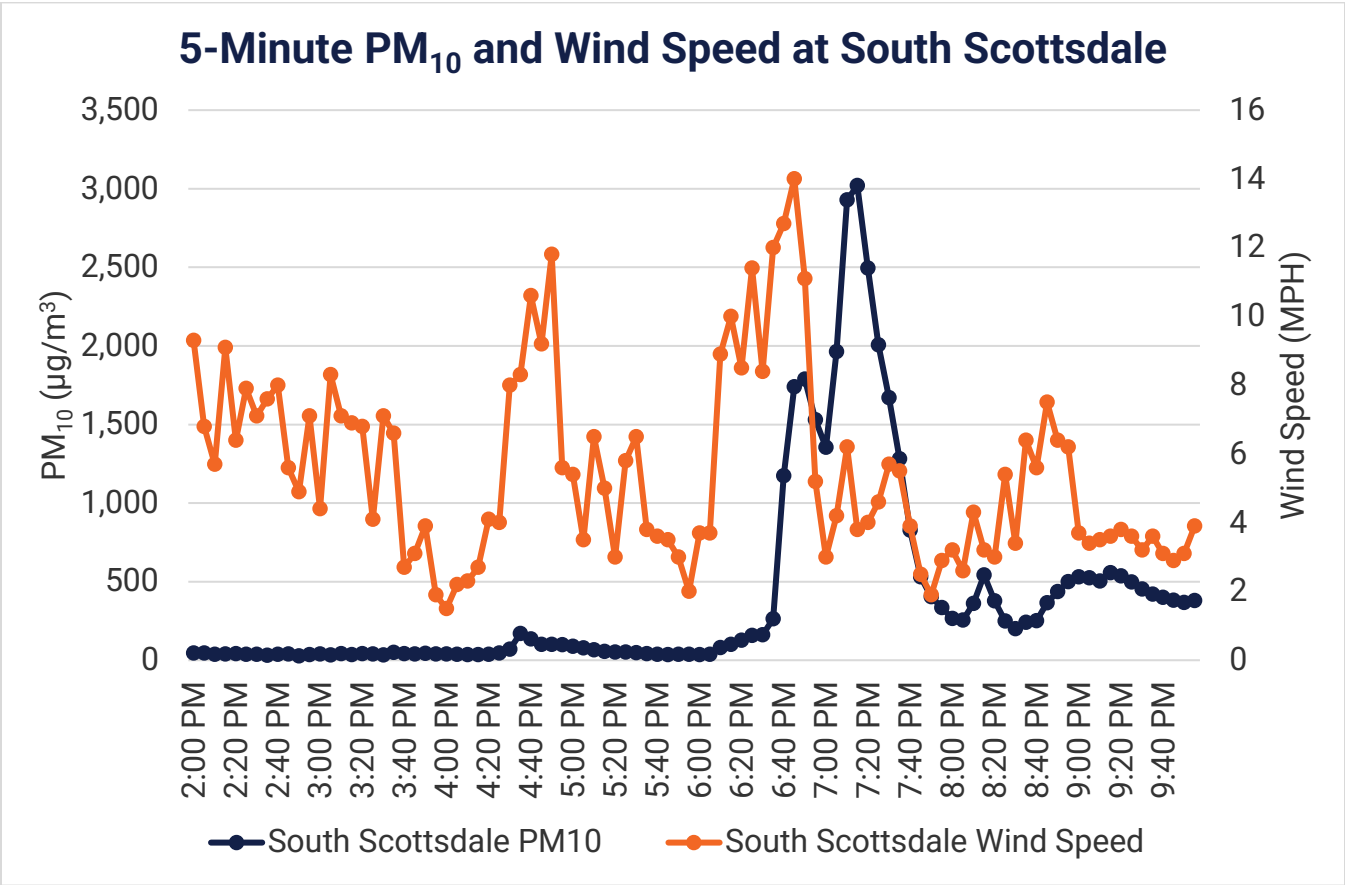
Charts of 5-minute and hourly PM_{10}, wind speed, and maximum wind gust for all atypical events listed in this report. Charts include the Higley and West Chandler sites as well as any sites that exceeded the 24-hour PM_{10} NAAQS for those dates.

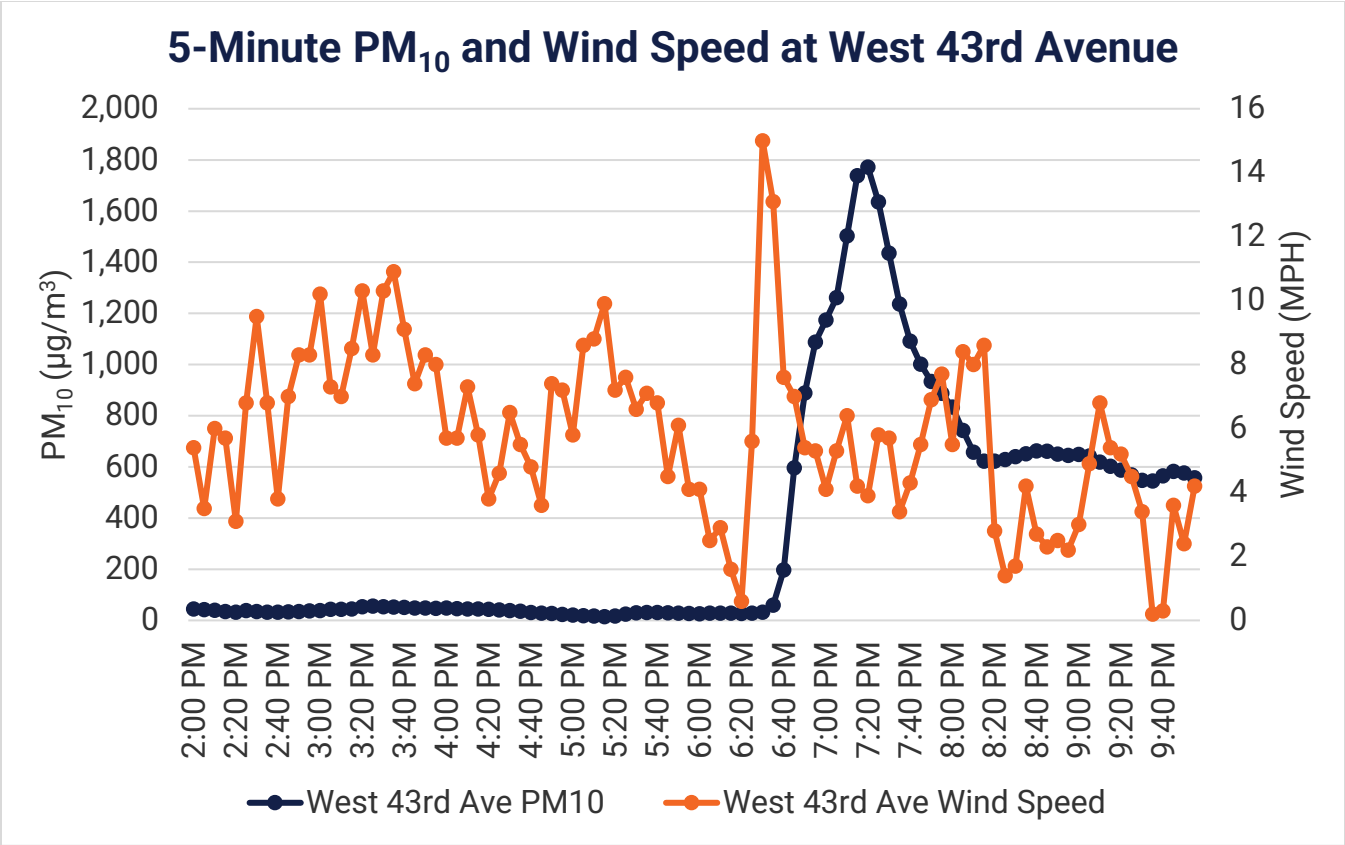
August 16, 2020

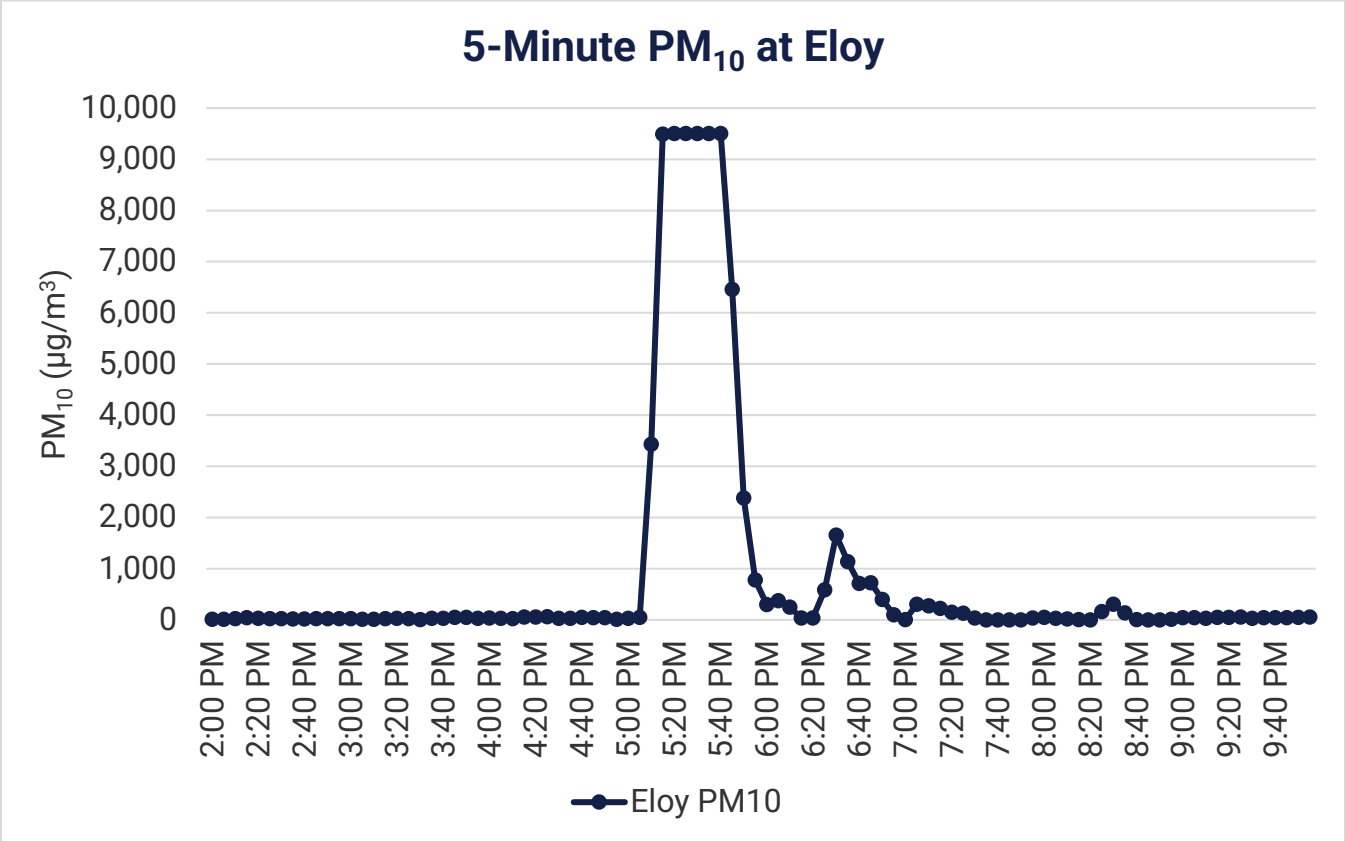




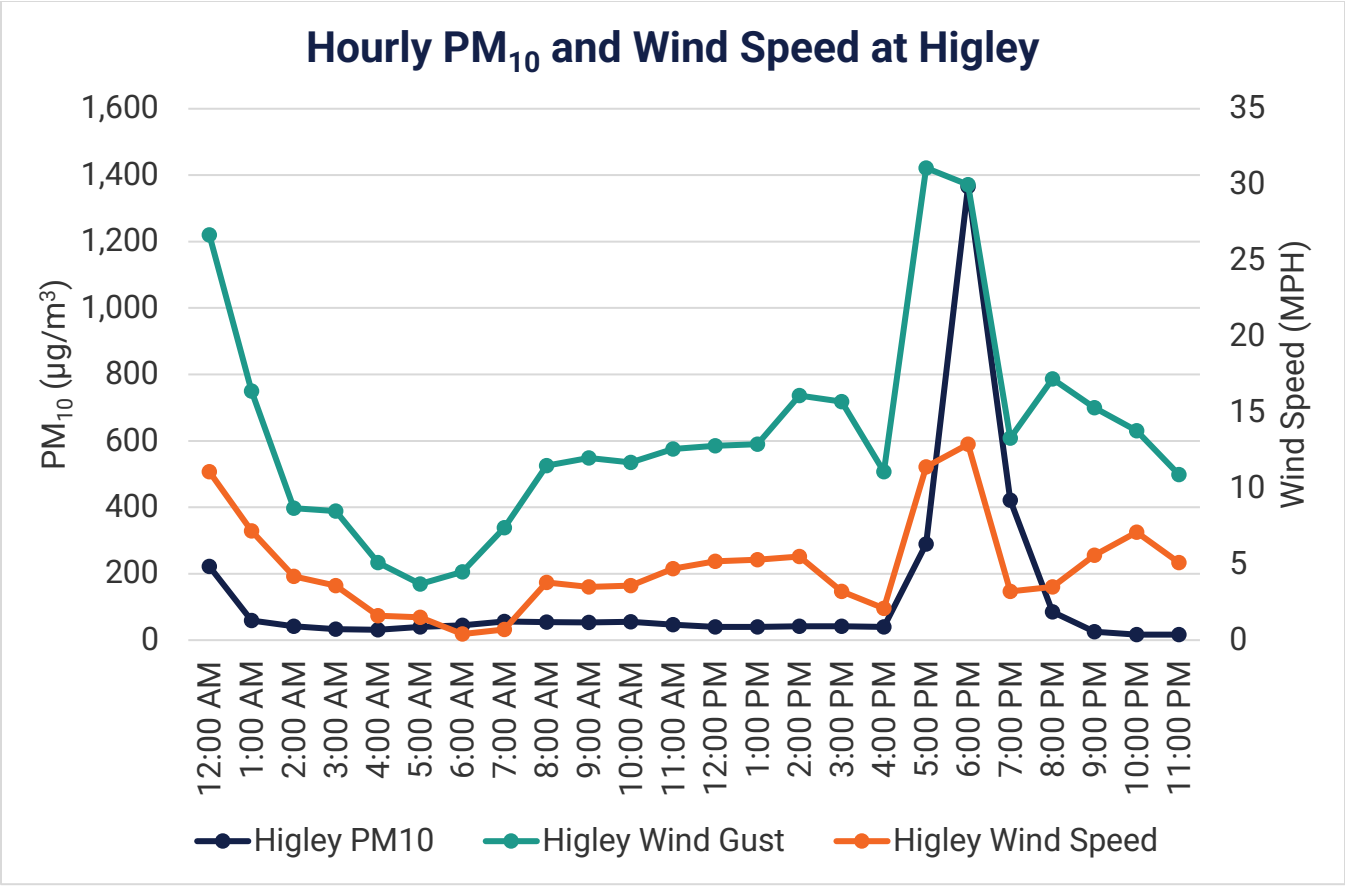

5-Minute PM10 and Wind Speed at Central Phoenix
PM10 (µg/m3)
Wind Speed (MPH)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
14
12
10
8
6
4
2
0
2:00 PM
2:20 PM
2:40 PM
3:00 PM
3:20 PM
3:40 PM
4:00 PM
4:20 PM
4:40 PM
5:00 PM
5:20 PM
5:40 PM
6:00 PM
6:20 PM
6:40 PM
7:00 PM
7:20 PM
7:40 PM
8:00 PM
8:20 PM
8:40 PM
9:00 PM
9:20 PM
9:40 PM
Central Phoenix PM10
Central Phoenix Wind Speed


5-Minute PM10 and Wind Speed at South Scottsdale
PM10 (µg/m3)
Wind Speed (MPH)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
16
14
12
10
8
6
4
2
0
2:00 PM
2:20 PM
2:40 PM
3:00 PM
3:20 PM
3:40 PM
4:00 PM
4:20 PM
4:40 PM
5:00 PM
5:20 PM
5:40 PM
6:00 PM
6:20 PM
6:40 PM
7:00 PM
7:20 PM
7:40 PM
8:00 PM
8:20 PM
8:40 PM
9:00 PM
9:20 PM
9:40 PM
South Scottsdale PM10
South Scottsdale Wind Speed





Note: Hourly average at Eloy for 5:00 p.m. on August 16, 2020, was 28,161 µg/m^3; 5-minute readings appear to be machine limited to 9504 µg/m^3.


Hourly PM10 and Wind Speed at Higley
PM10 (µg/m3)
Wind Speed (MPH)
1,600
1,400
1,200
1,000
800
600
400
200
0
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
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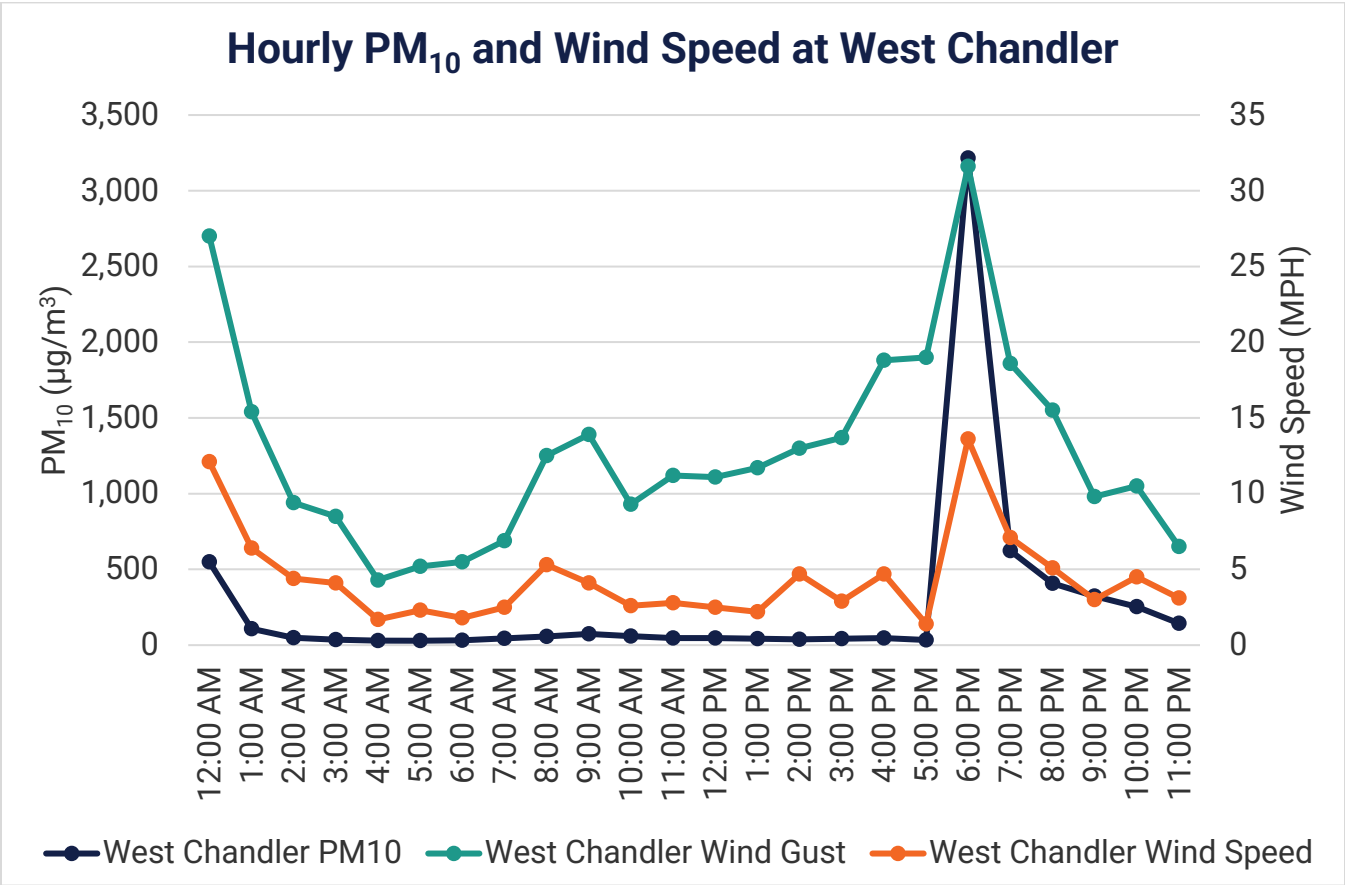
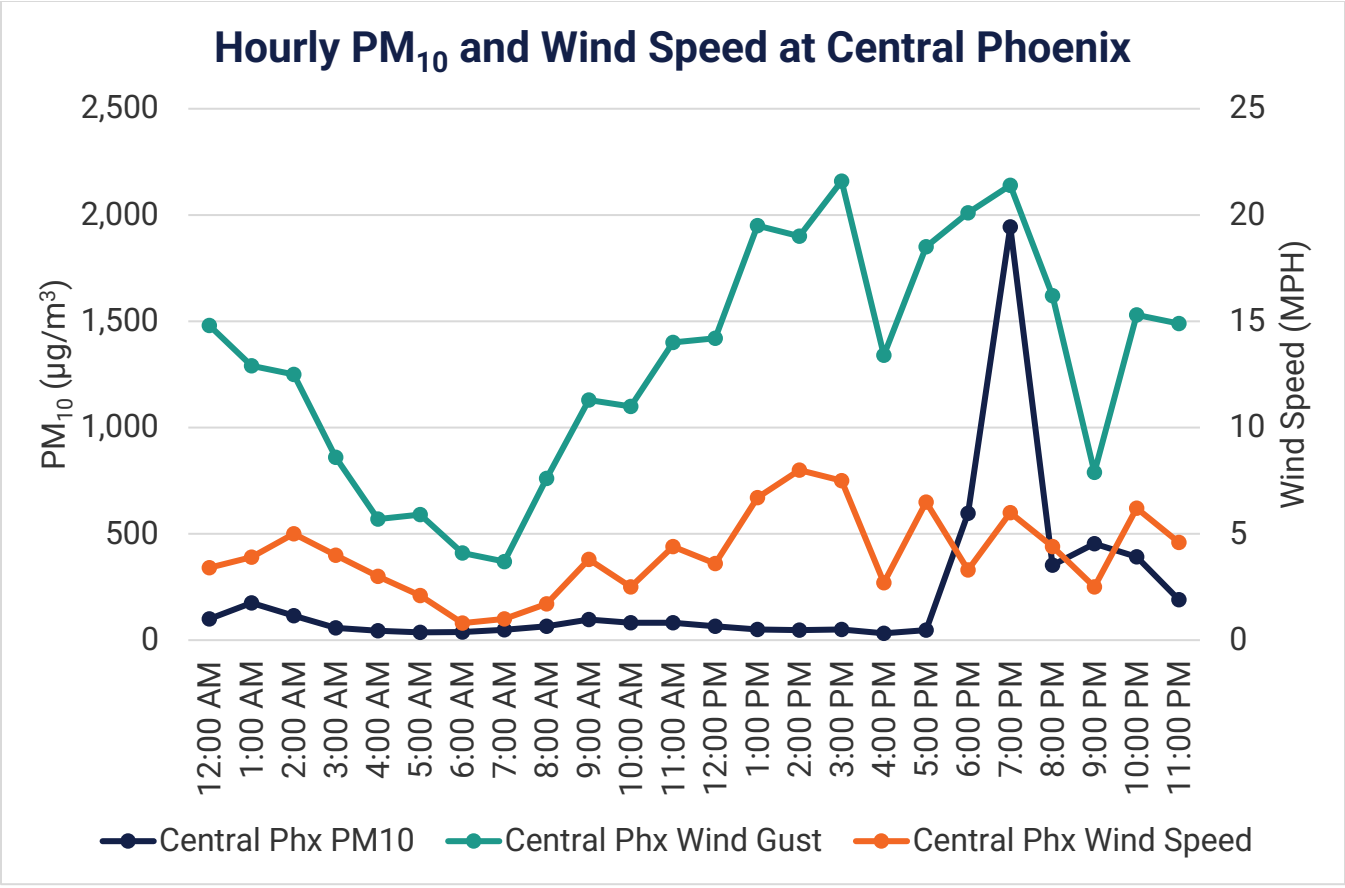
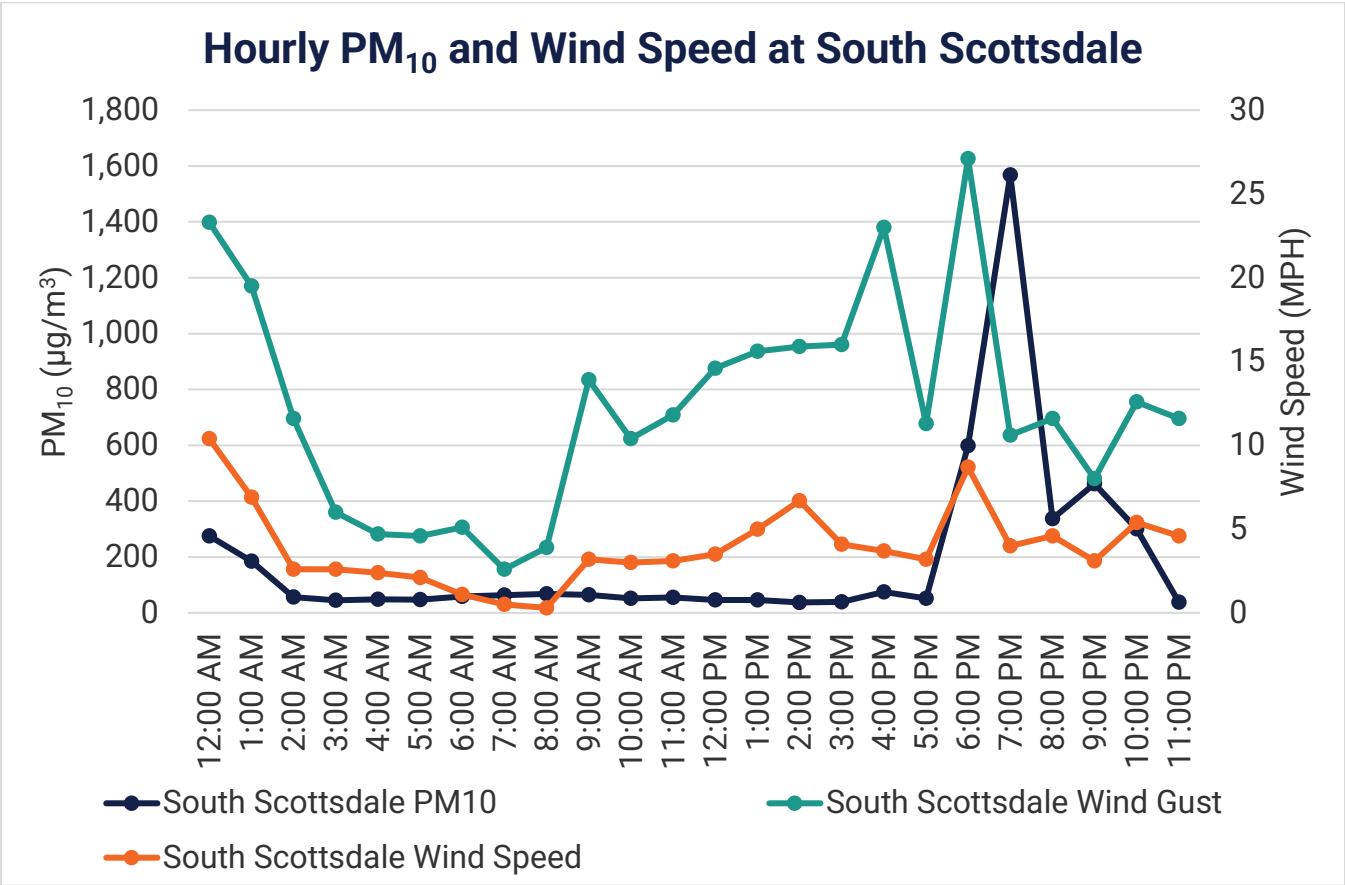
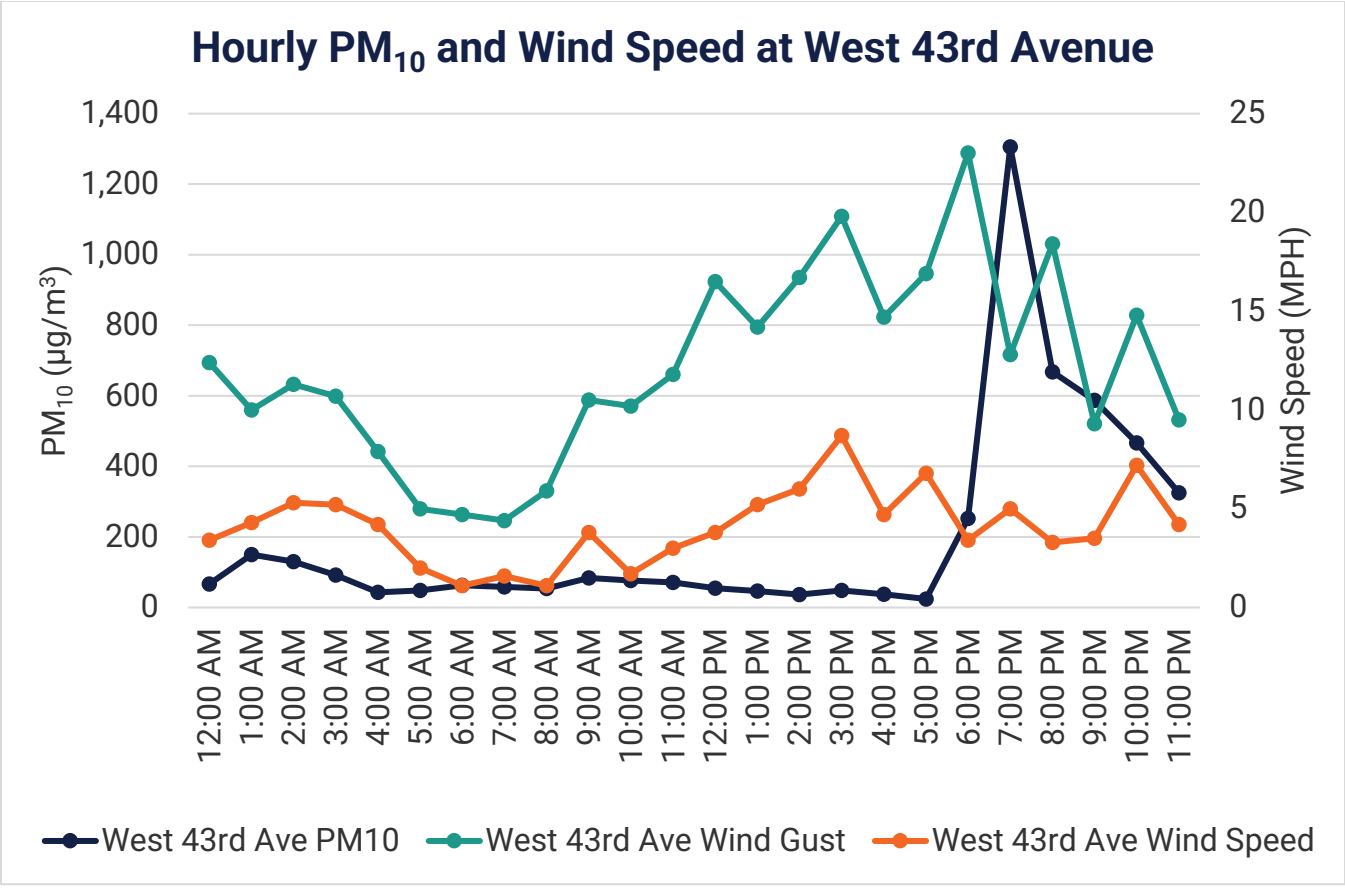
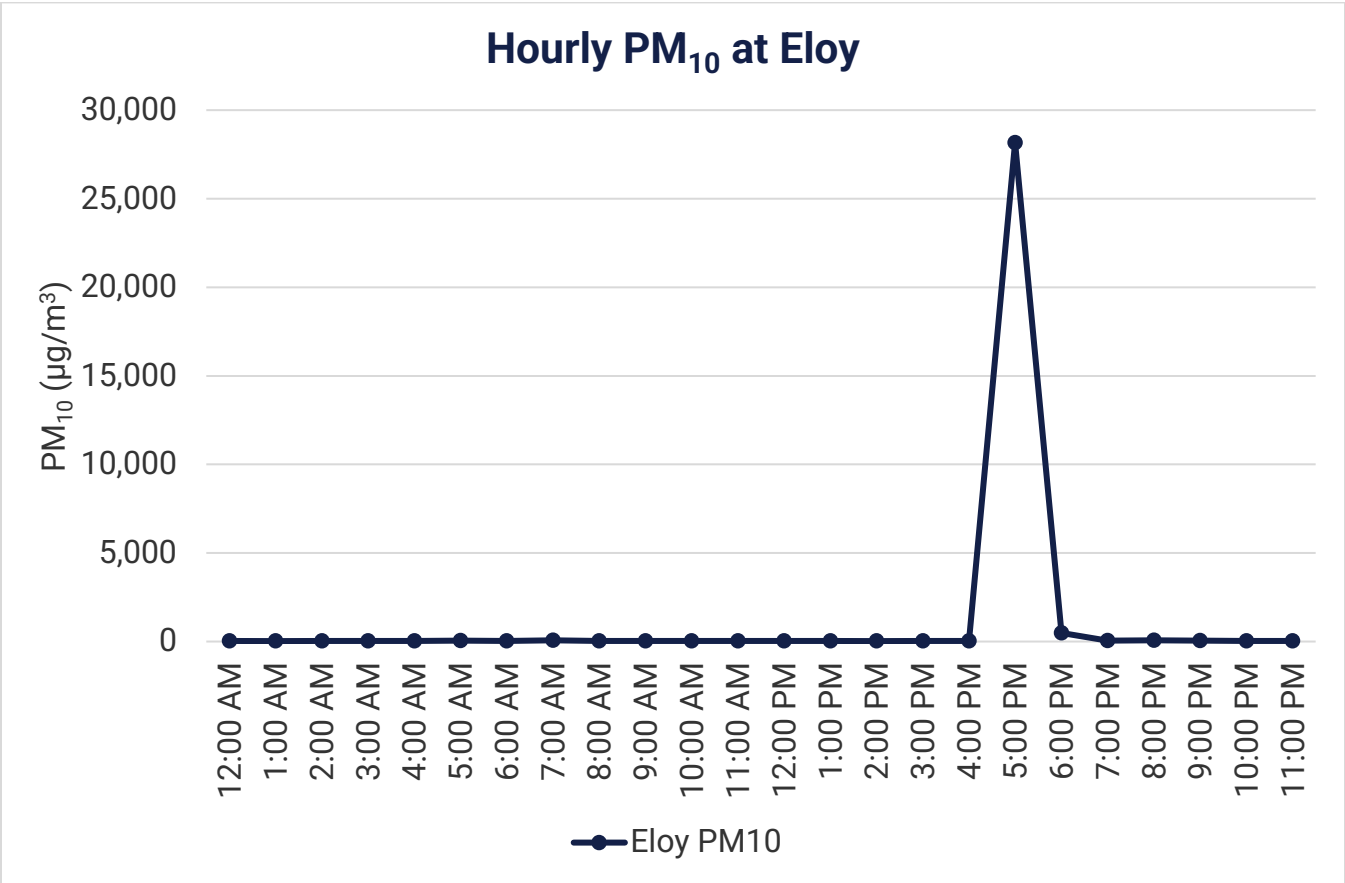
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Higley PM10
Higley Wind Gust
Higley Wind Speed


Hourly PM10 and Wind Speed at West Chandler
PM10 (µg/m3)
Wind Speed (MPH)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
West Chandler PM10
West Chandler Wind Gust
West Chandler Wind Speed

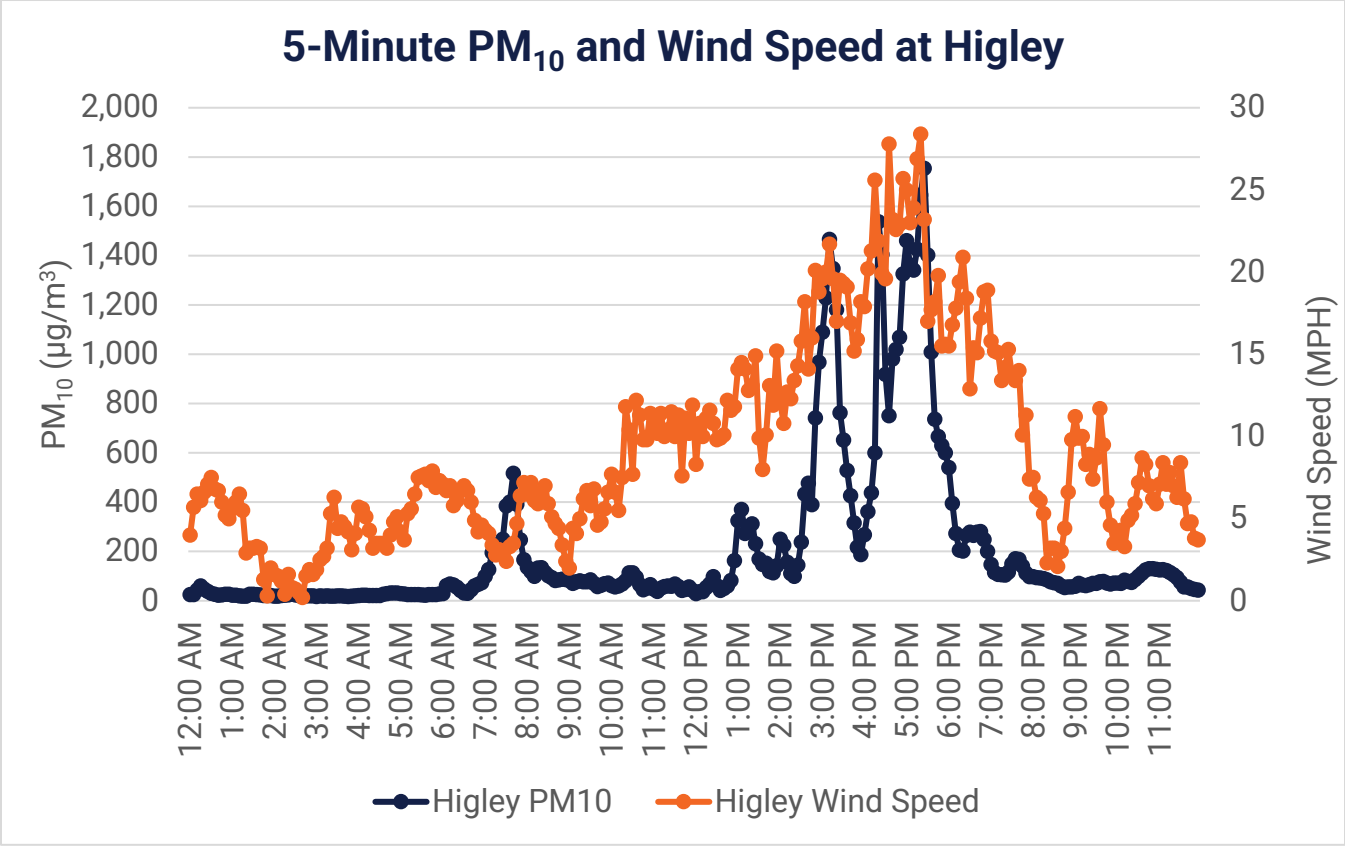

Hourly PM10 and Wind Speed at Central Phoenix
2,500
2,000
1,500
1,000
500
0
PM10 (µg/m3)
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Central Phx PM10
Central Phx Wind Gust
Central Phx Wind Speed

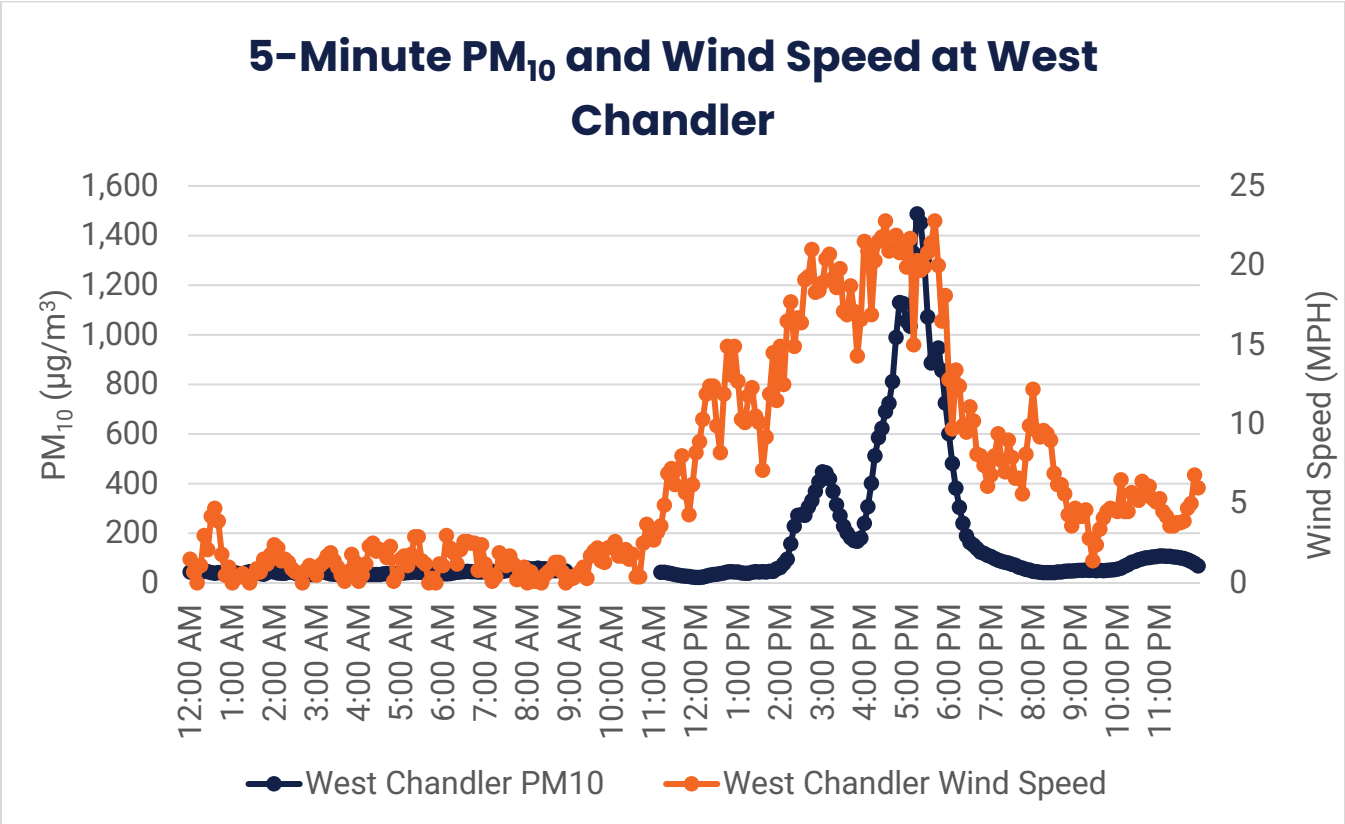

Hourly PM10 and Wind Speed at South Scottsdale
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
South Scottsdale PM10
South Scottsdale Wind Gust
South Scottsdale Wind Speed

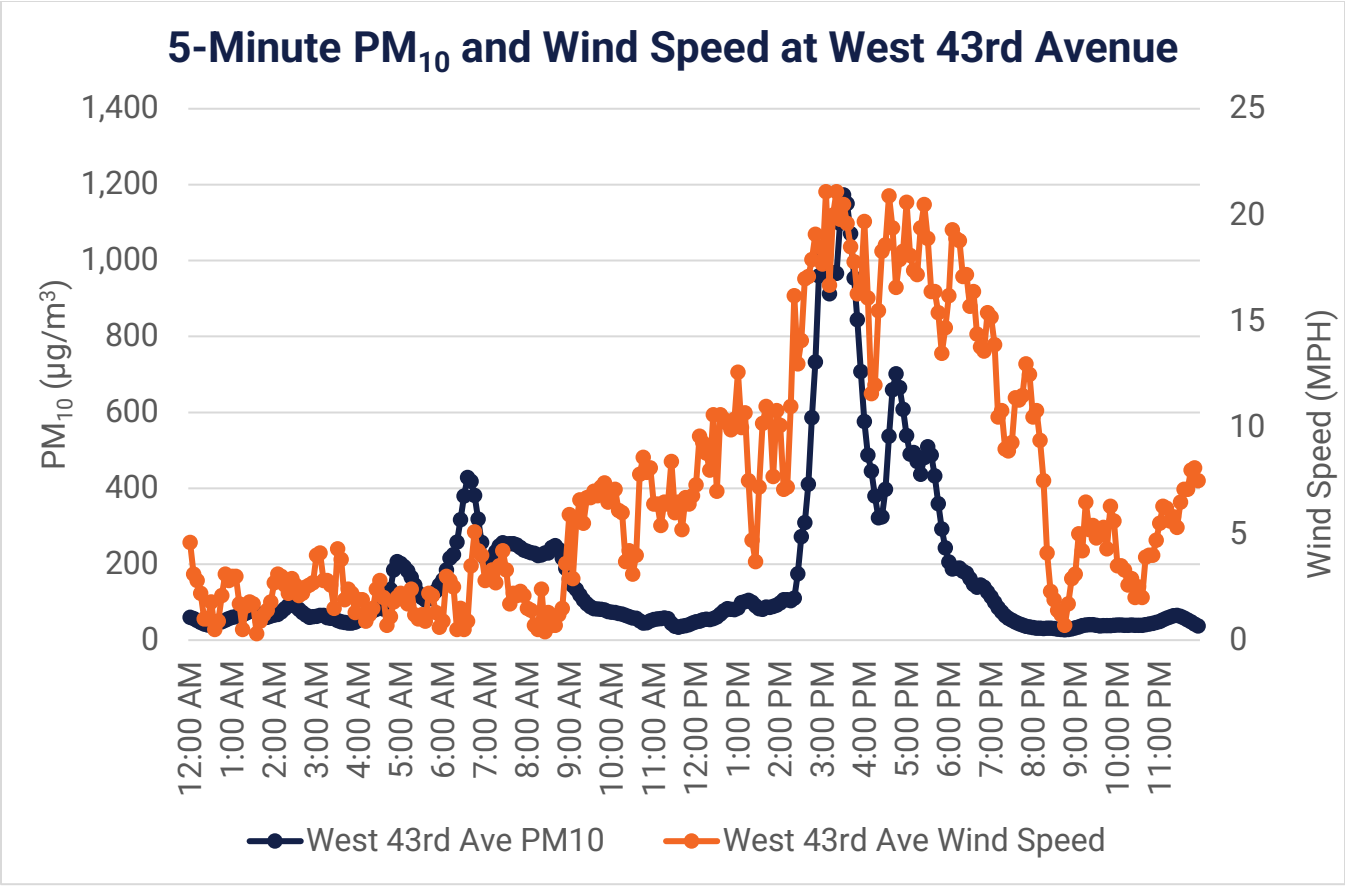

Hourly PM10 and Wind Speed at West 43rd Avenue
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
West 43rd Ave PM10
West 43rd Ave Wind Gust
West 43rd Ave Wind Speed

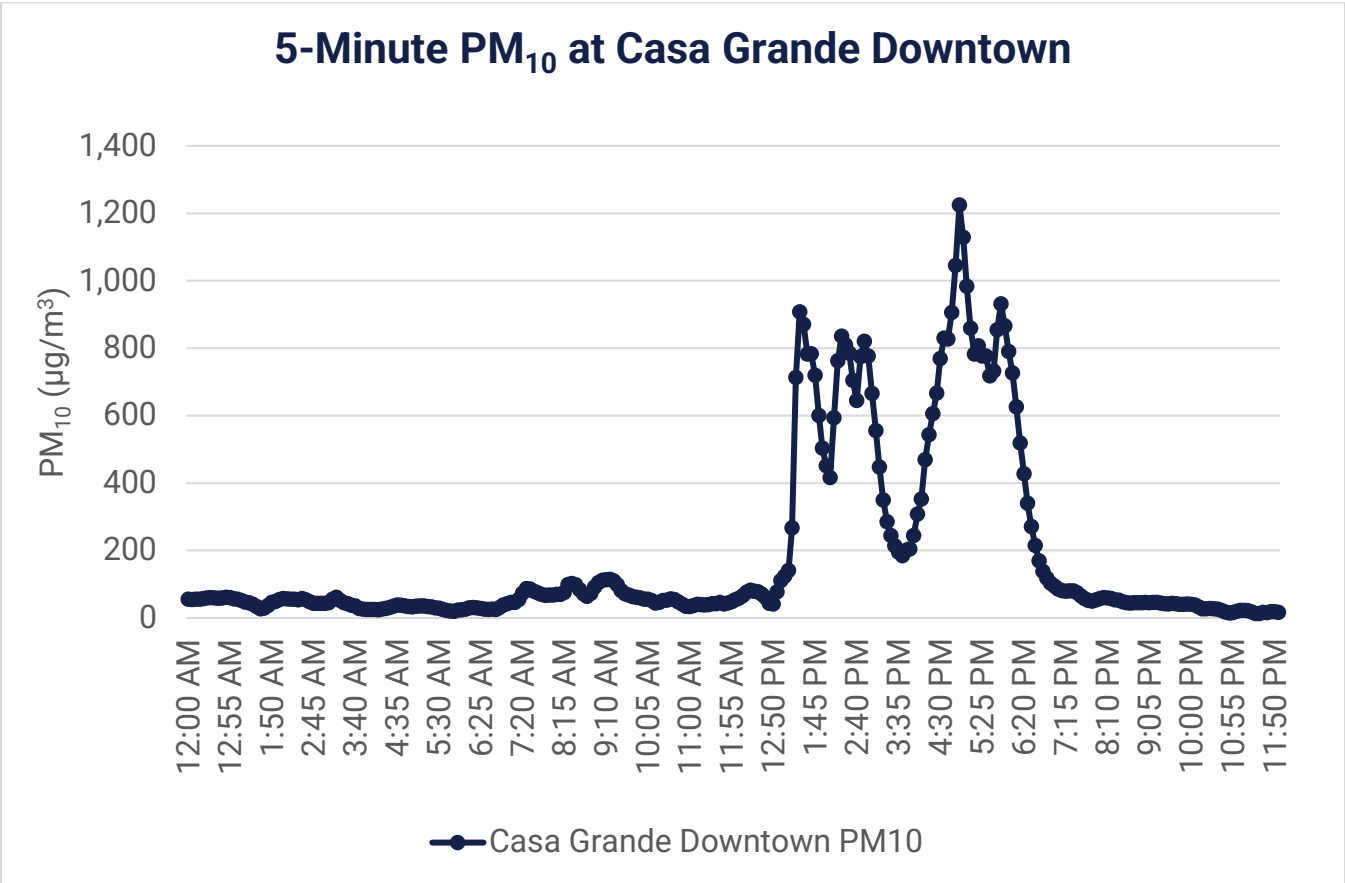

Hourly PM10 at Eloy
30,000
25,000
20,000
15,000
10,000
5,000
0
PM10 (µg/m3)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Eloy PM10

March 3, 2021

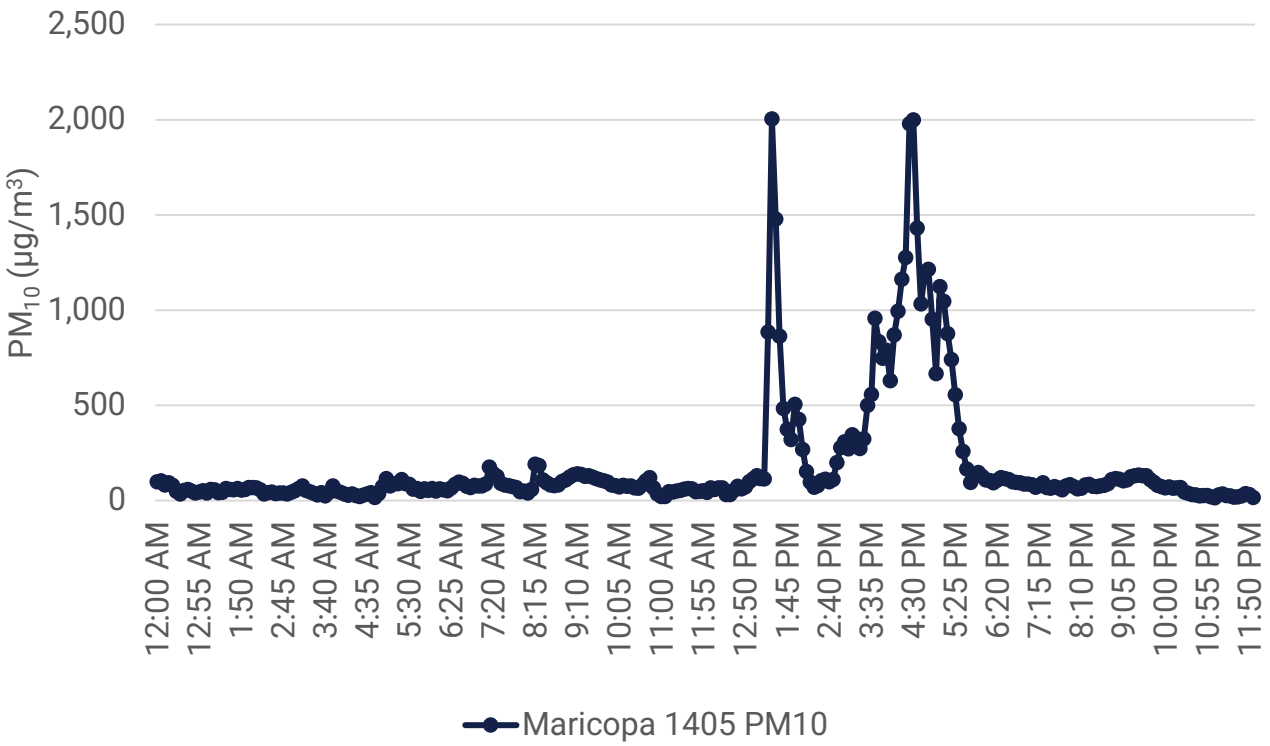

5-Minute PM10 and Wind Speed at Higley
PM10 (µg/m3)
Wind Speed (MPH)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Higley PM10
Higley Wind Speed


5-Minute PM10 and Wind Speed at West Chandler
PM10 (µg/m3)
Wind Speed (MPH)
1,600
1,400
1,200
1,000
800
600
400
200
0
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
West Chandler PM10
West Chandler Wind Speed

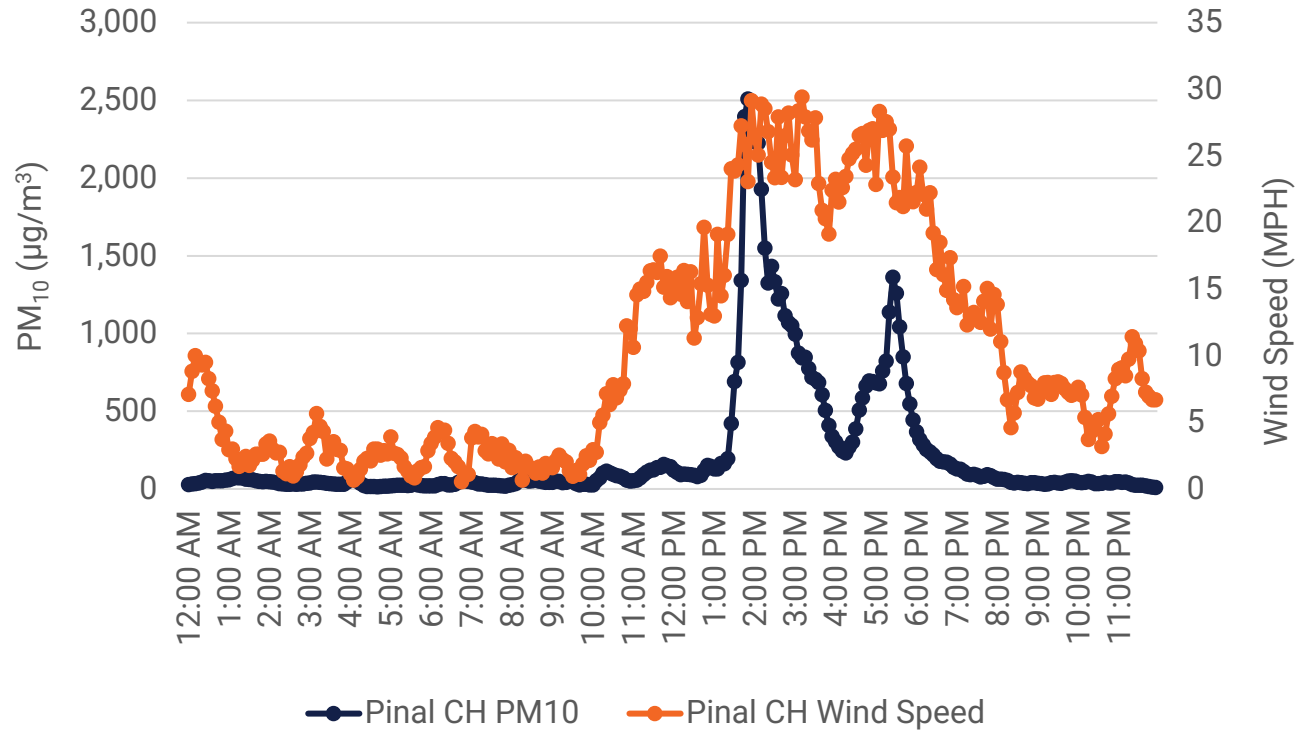

5-Minute PM10 and Wind Speed at West 43rd Avenue
PM10 (µg/m3)
Wind Speed (MPH)
1,400
1,200
1,000
800
600
400
200
0
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
West 43rd Ave PM10
West 43rd Ave Wind Speed

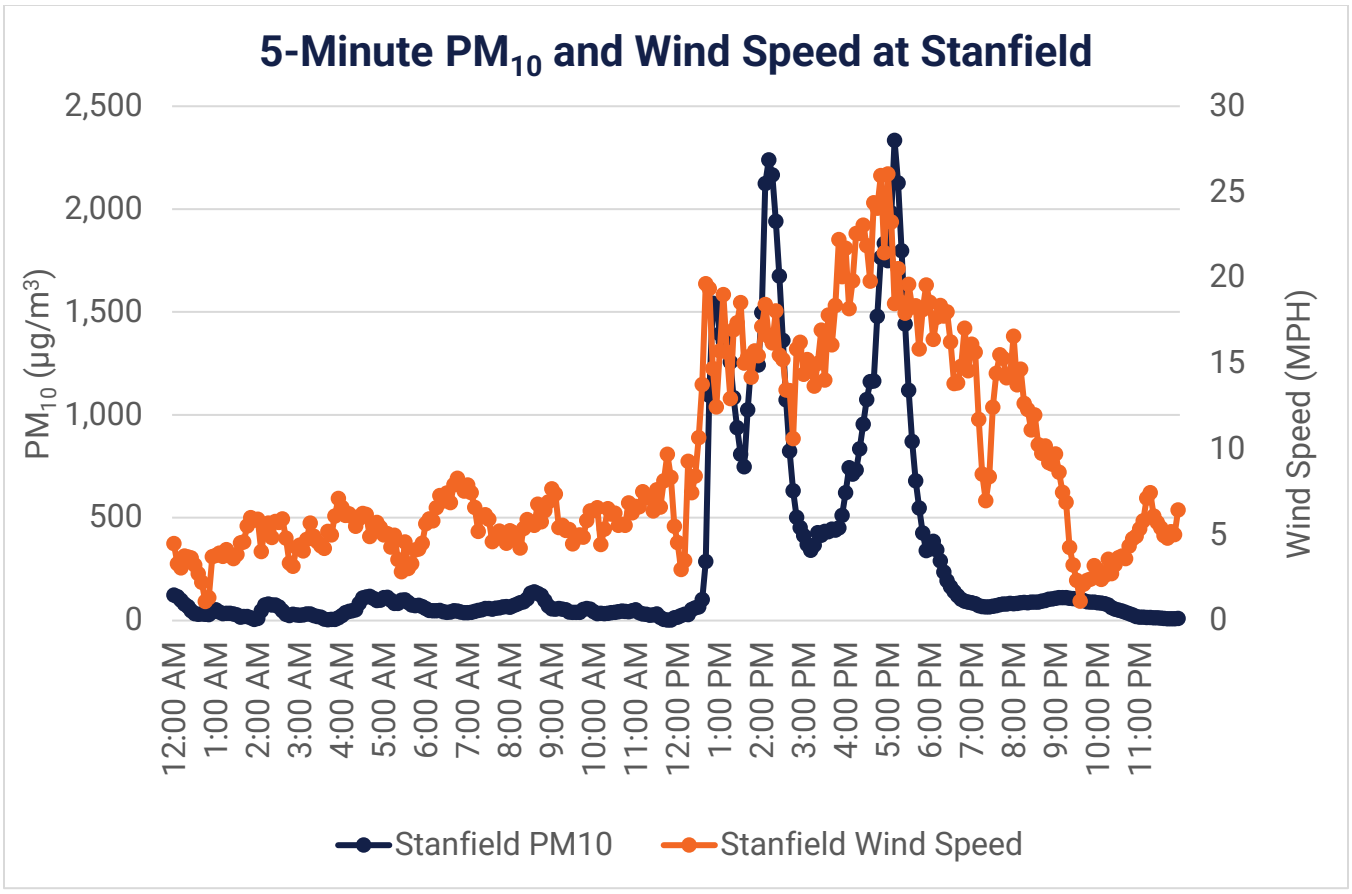

5-Minute PM10 at Casa Grande Downtown
PM10 (µg/m3)
1,400
1,200
1,000
800
600
400
200
0
12:00 AM
12:55 AM
1:50 AM
2:45 AM
3:40 AM
4:35 AM
5:30 AM
6:25 AM
7:20 AM
8:15 AM
9:10 AM
10:05 AM
11:00 AM
11:55 AM
12:50 PM
1:45 PM
2:40 PM
3:35 PM
4:30 PM
5:25 PM
6:20 PM
7:15 PM
8:10 PM
9:05 PM
10:00 PM
10:55 PM
11:50 PM
Casa Grande Downtown PM10

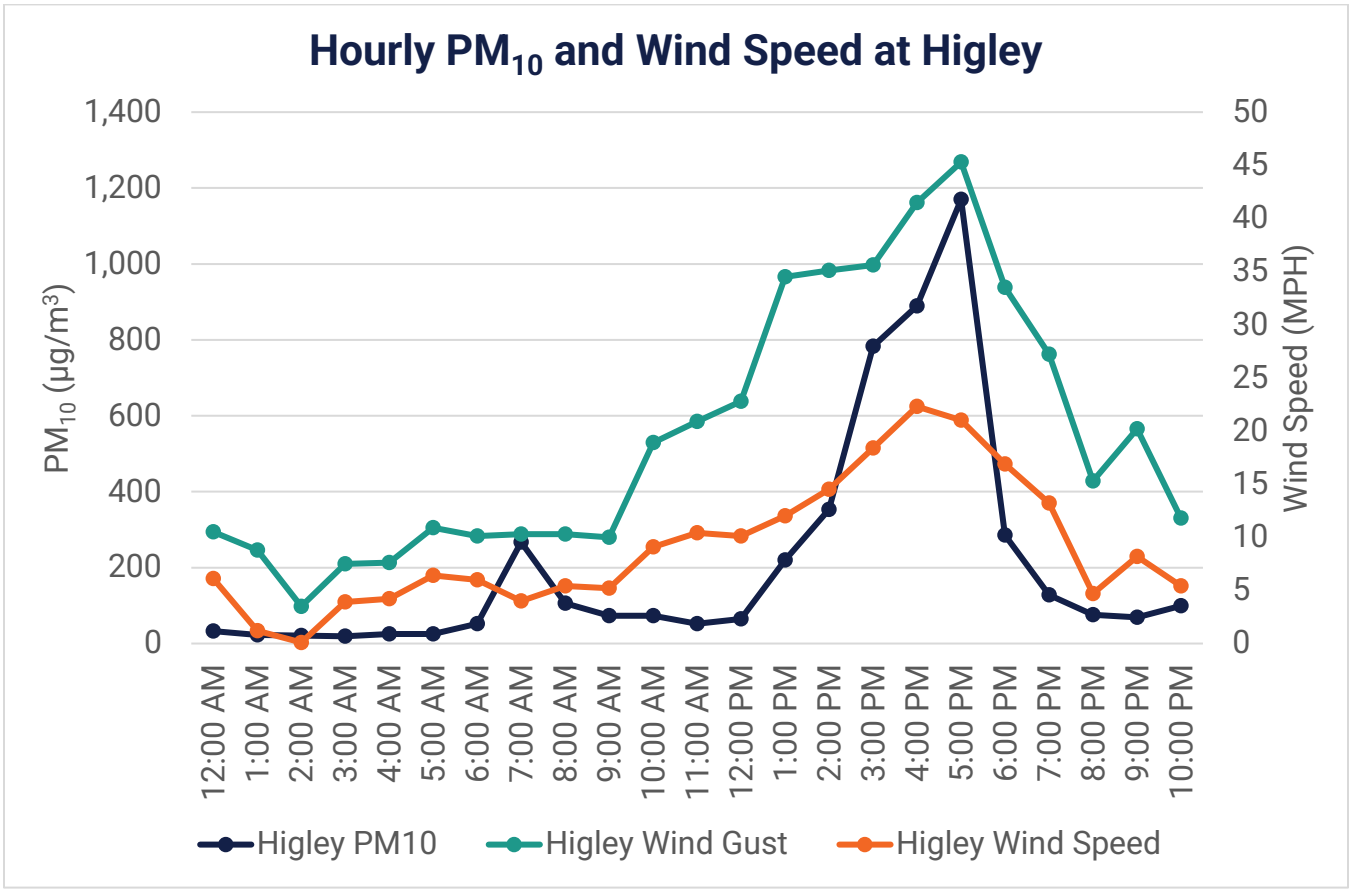
5-Minute PM_{10} at Maricopa 1405

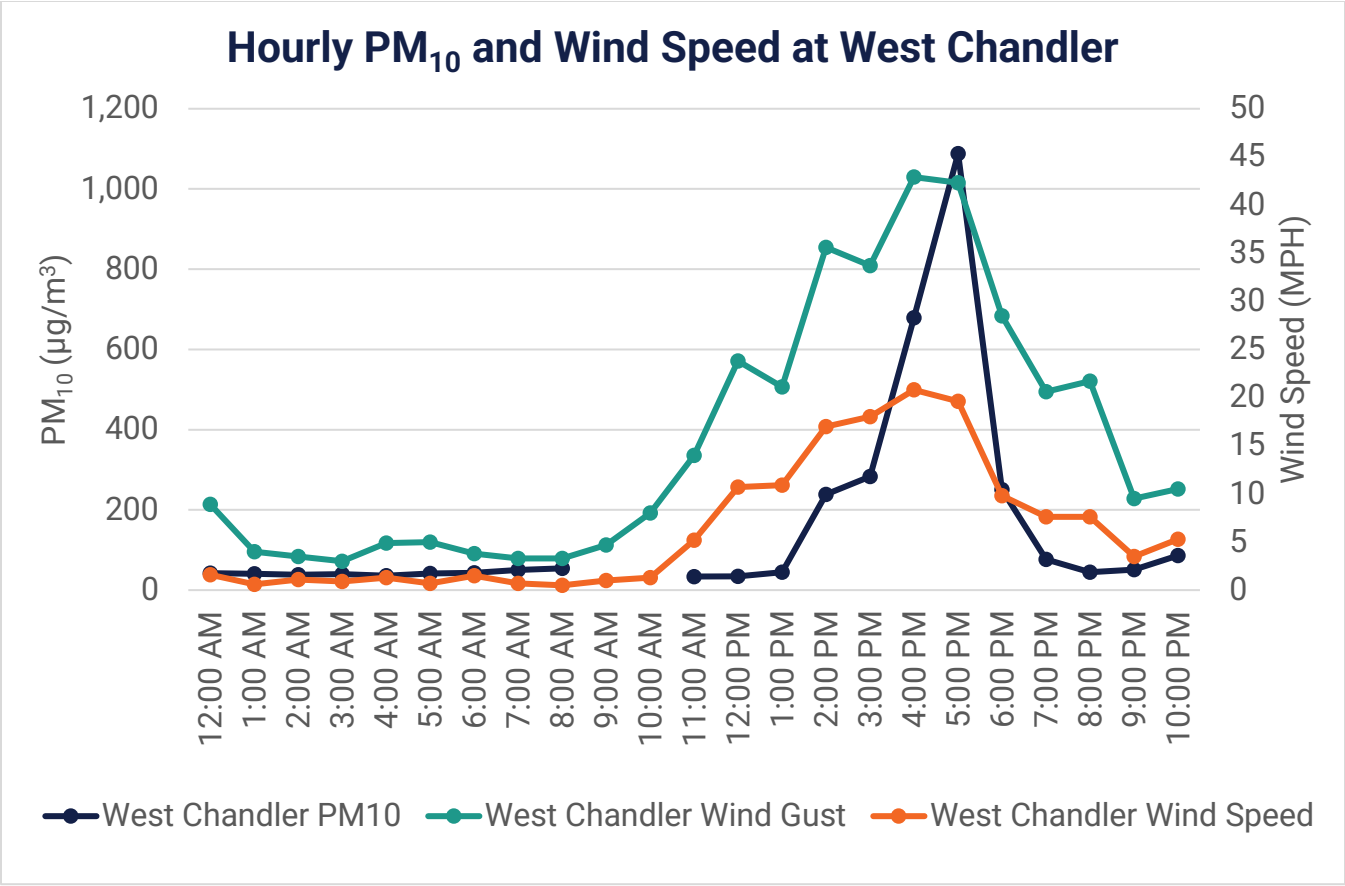


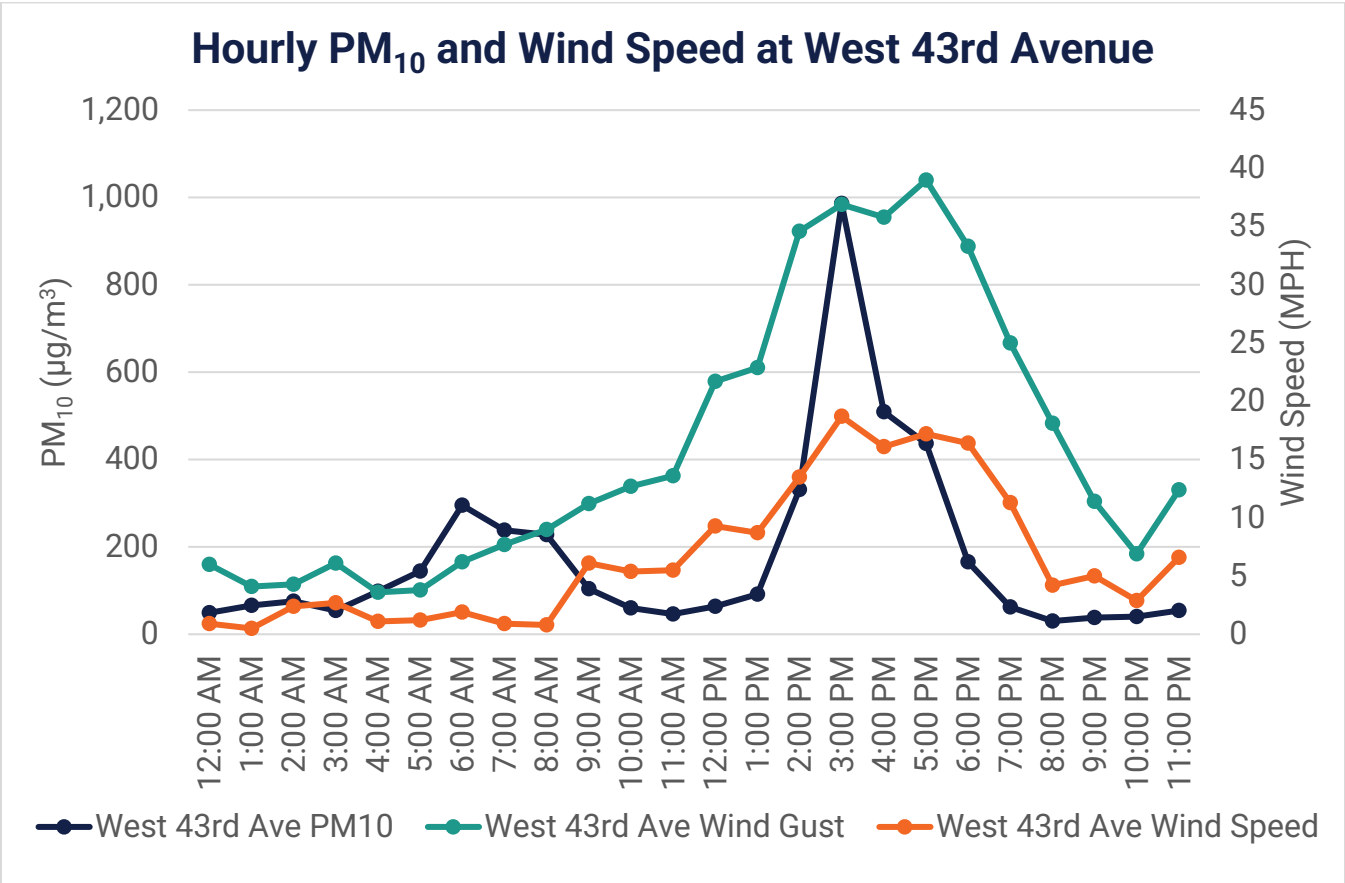
5-Minute PM_{10} and Wind Speed at Pinal County Housing

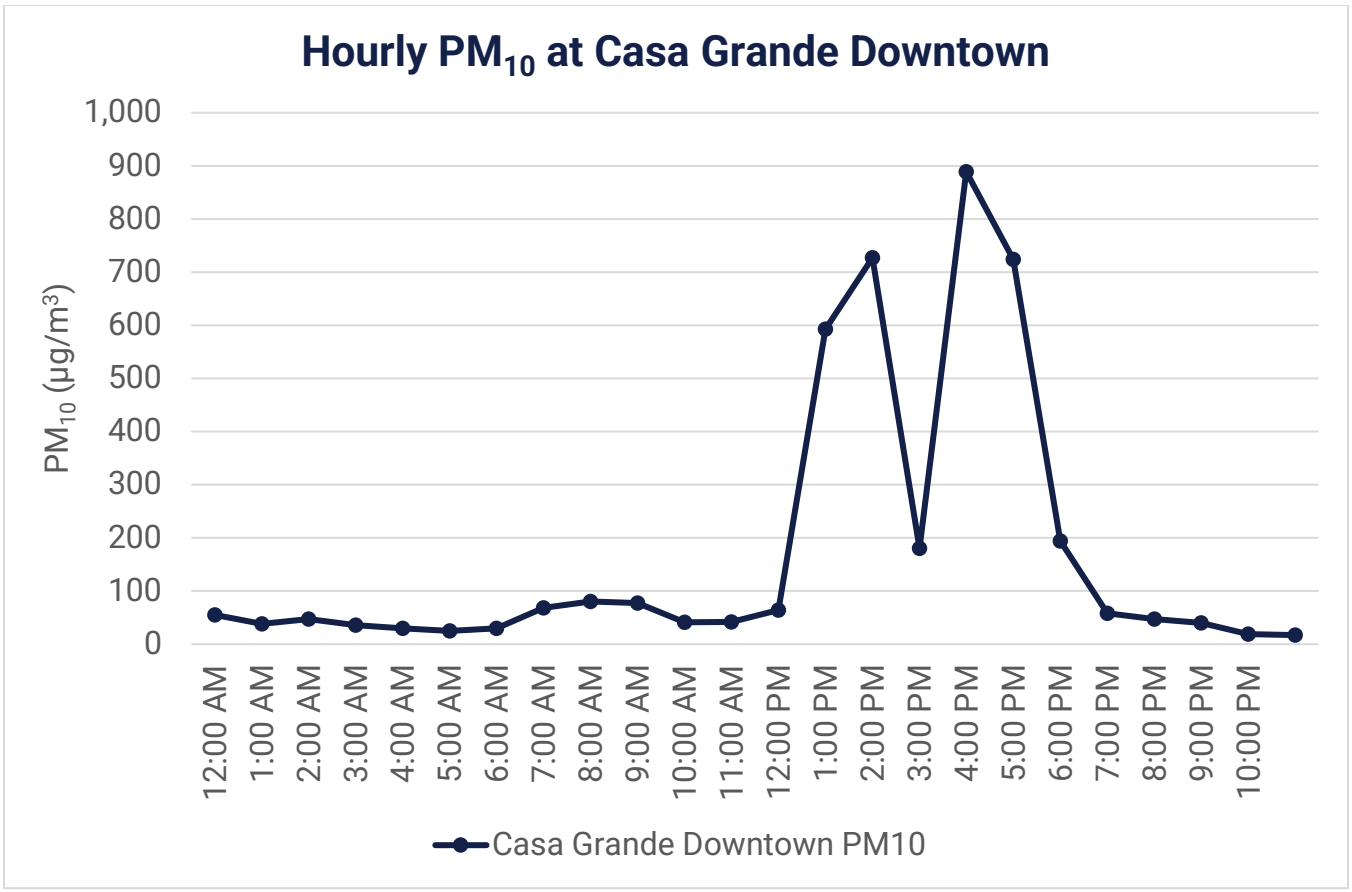


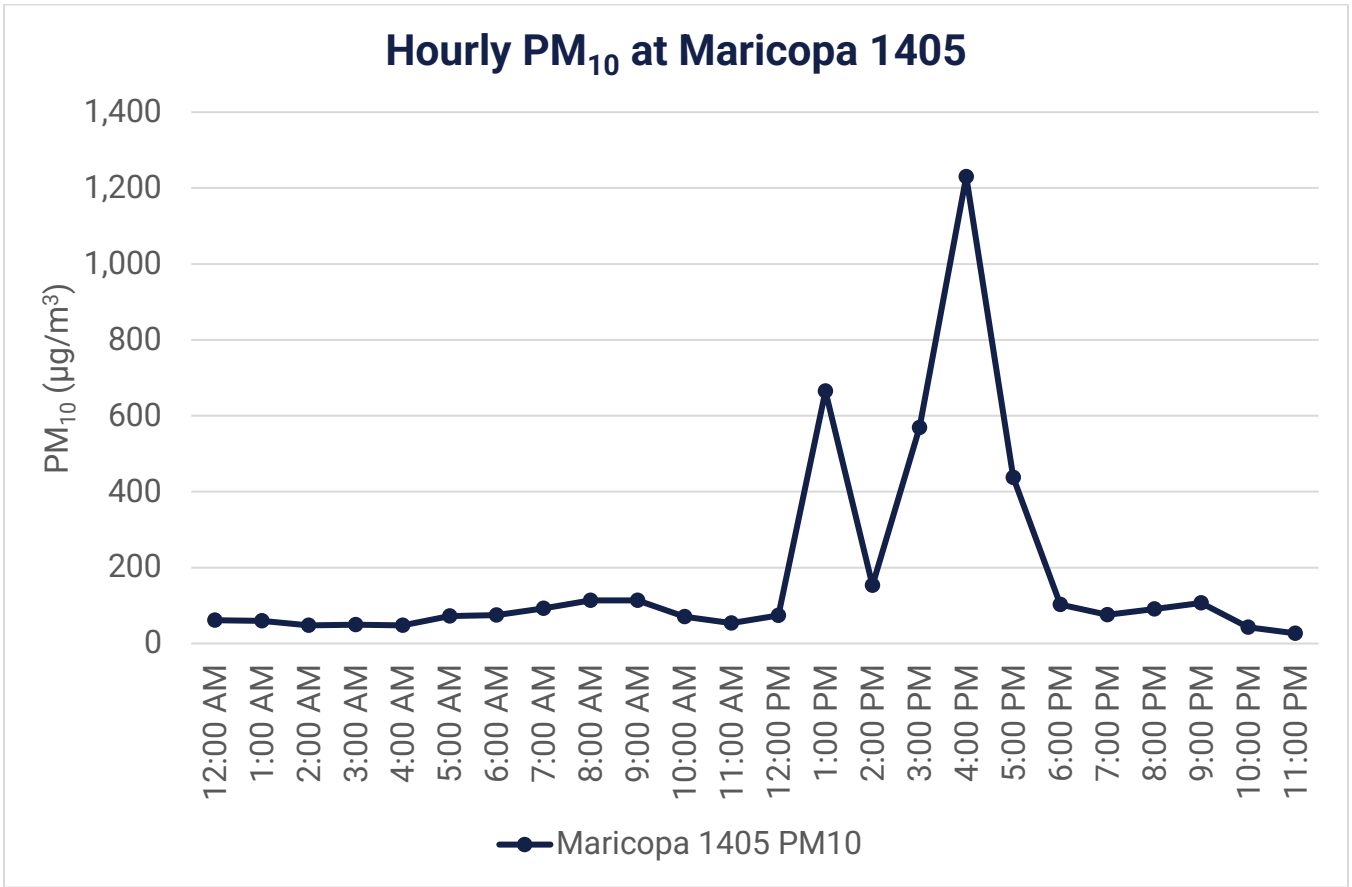

5-Minute PM10 and Wind Speed at Stanfield
2,500
2,000
1,500
1,000
500
0
PM10 (µg/m3)
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Stanfield PM10
Stanfield Wind Speed

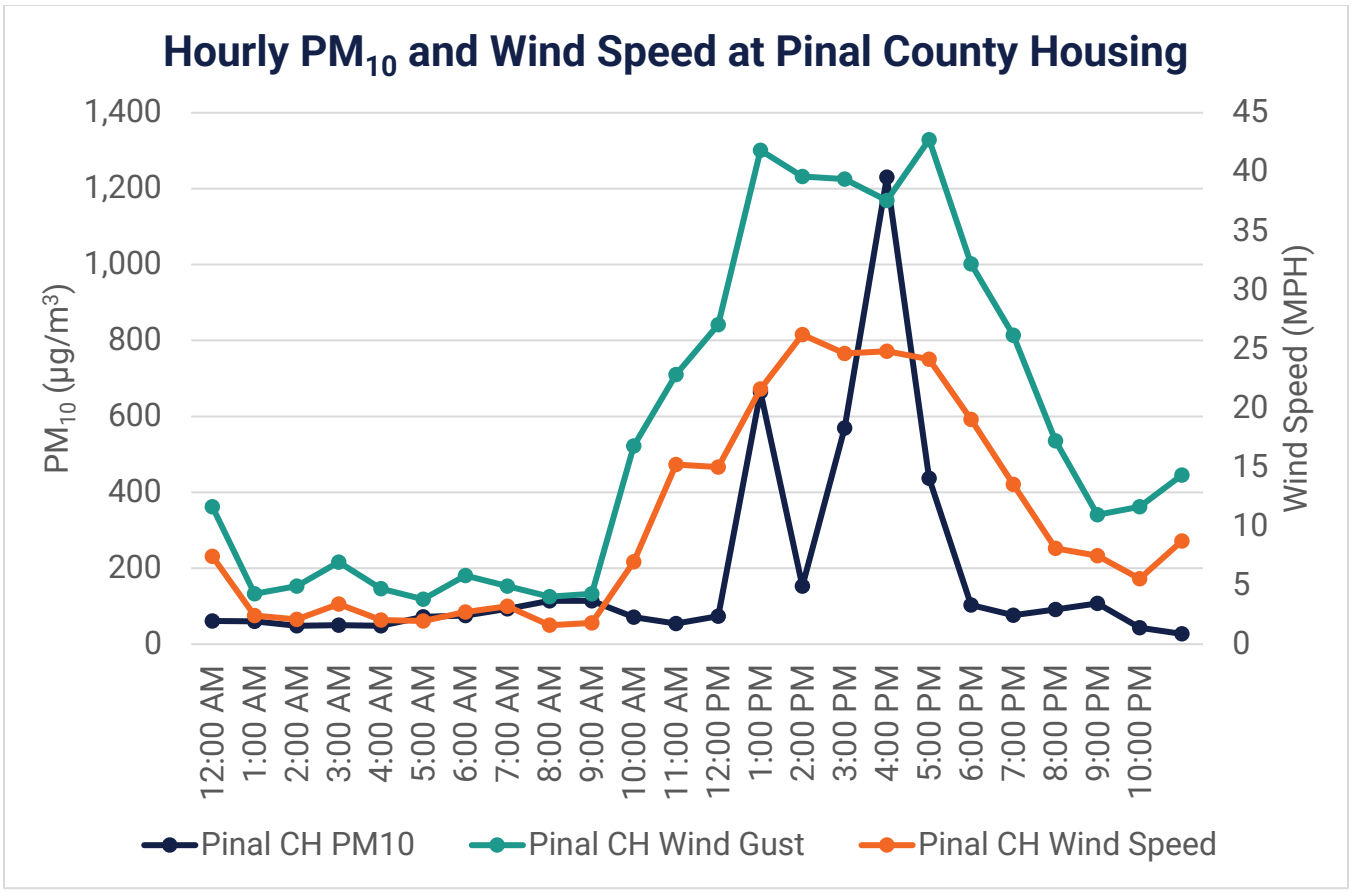

Hourly PM10 and Wind Speed at Higley
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
50
45
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
Higley PM10
Higley Wind Gust
Higley Wind Speed

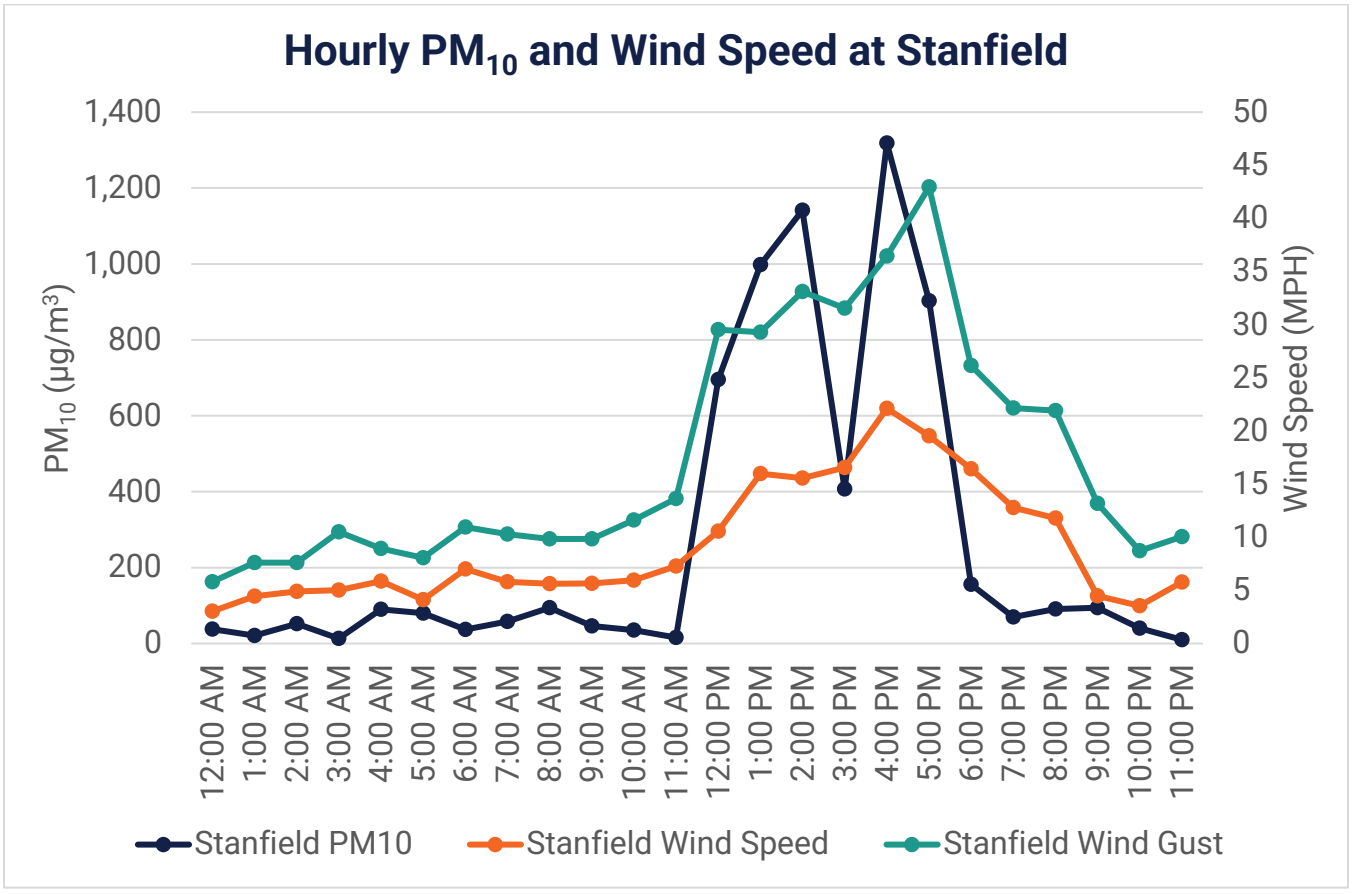

Hourly PM10 and Wind Speed at West Chandler
PM10 (µg/m3)
Wind Speed (MPH)
1,200
1,000
800
600
400
200
0
50
45
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
West Chandler PM10
West Chandler Wind Gust
West Chandler Wind Speed


Hourly PM10 and Wind Speed at West 43rd Avenue
PM10 (µg/m3)
Wind Speed (MPH)
1,200
1,000
800
600
400
200
0
45
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
West 43rd Ave PM10
West 43rd Ave Wind Gust
West 43rd Ave Wind Speed

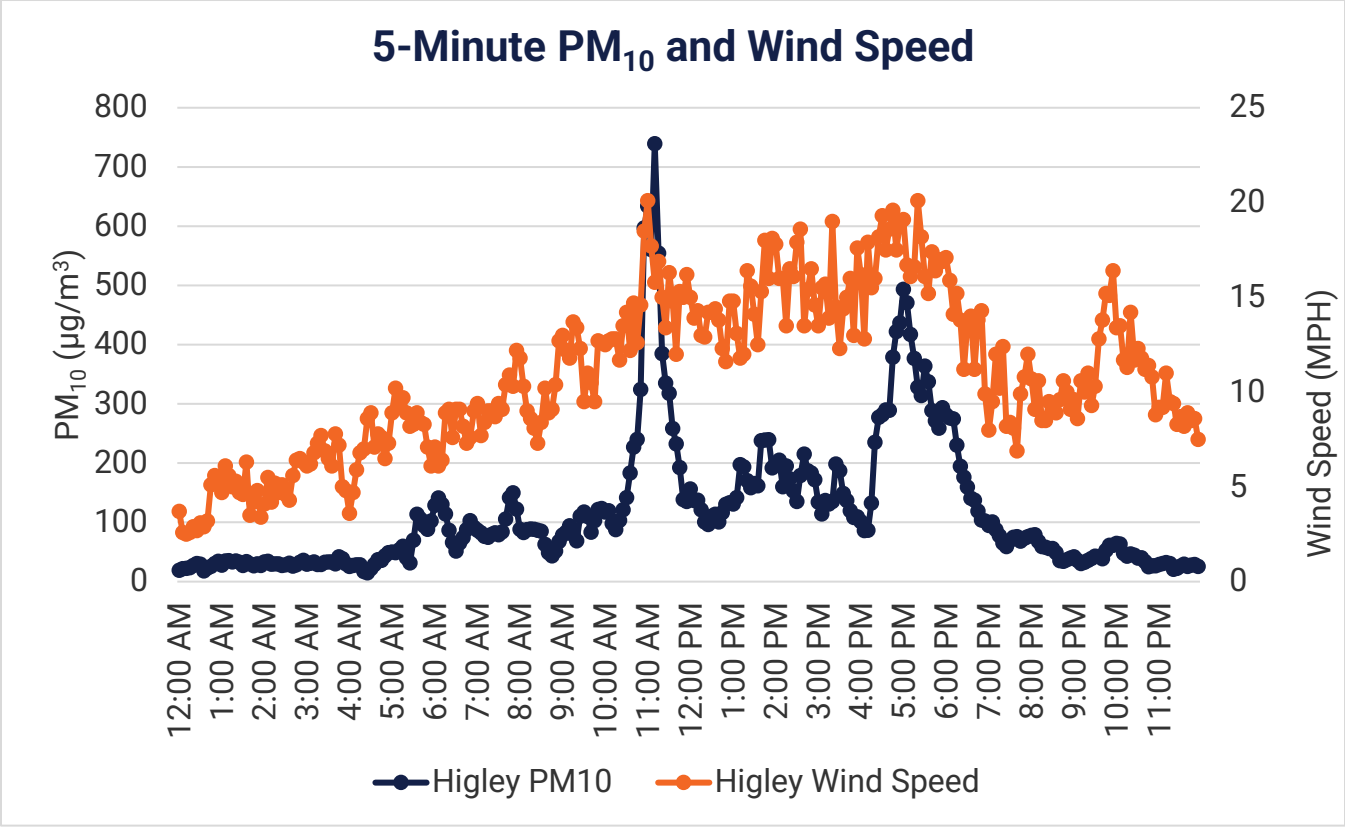

Hourly PM10 at Casa Grande Downtown
1,000
900
800
700
600
500
400
300
200
100
0
PM10 (µg/m3)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
Casa Grande Downtown PM10

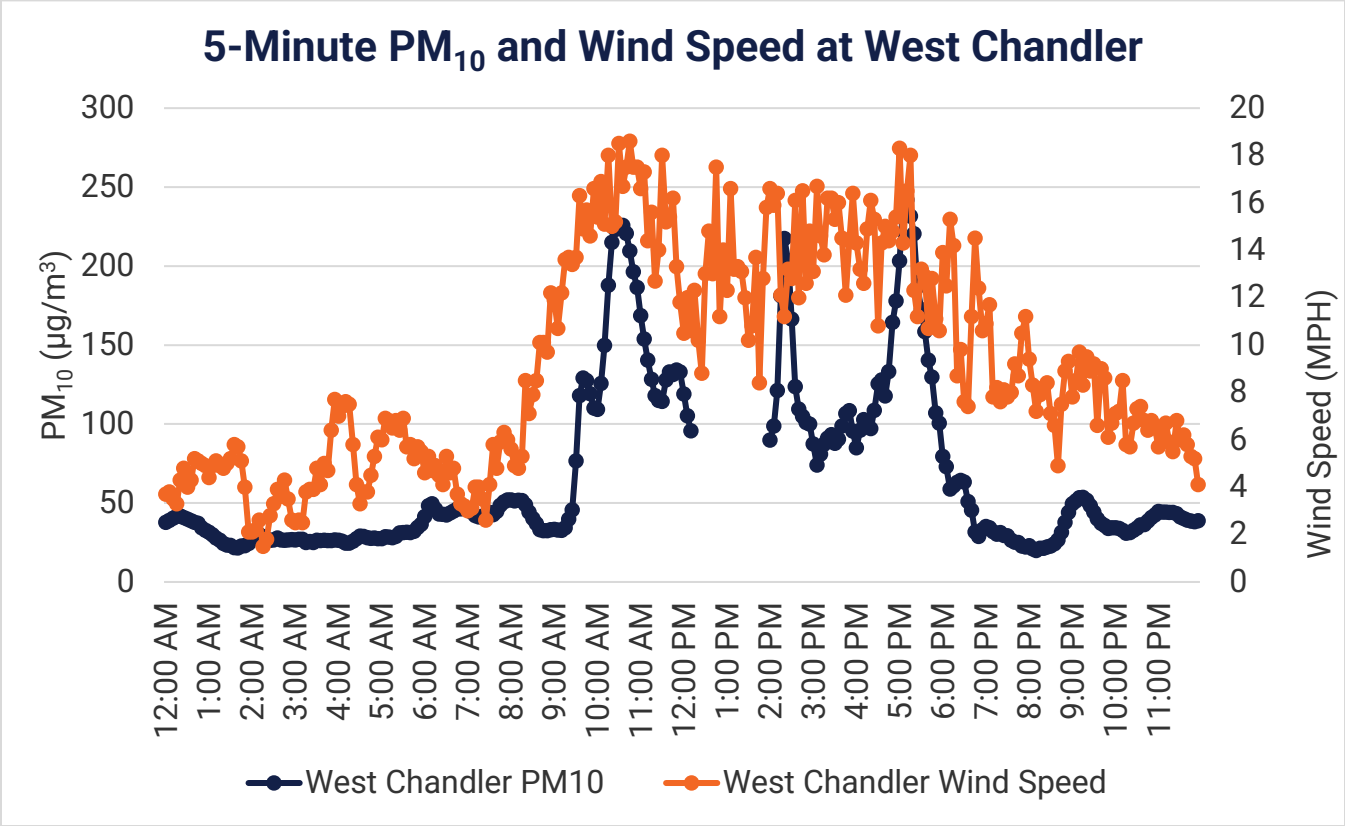

Hourly PM10 at Maricopa 1405
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Maricopa 1405 PM10

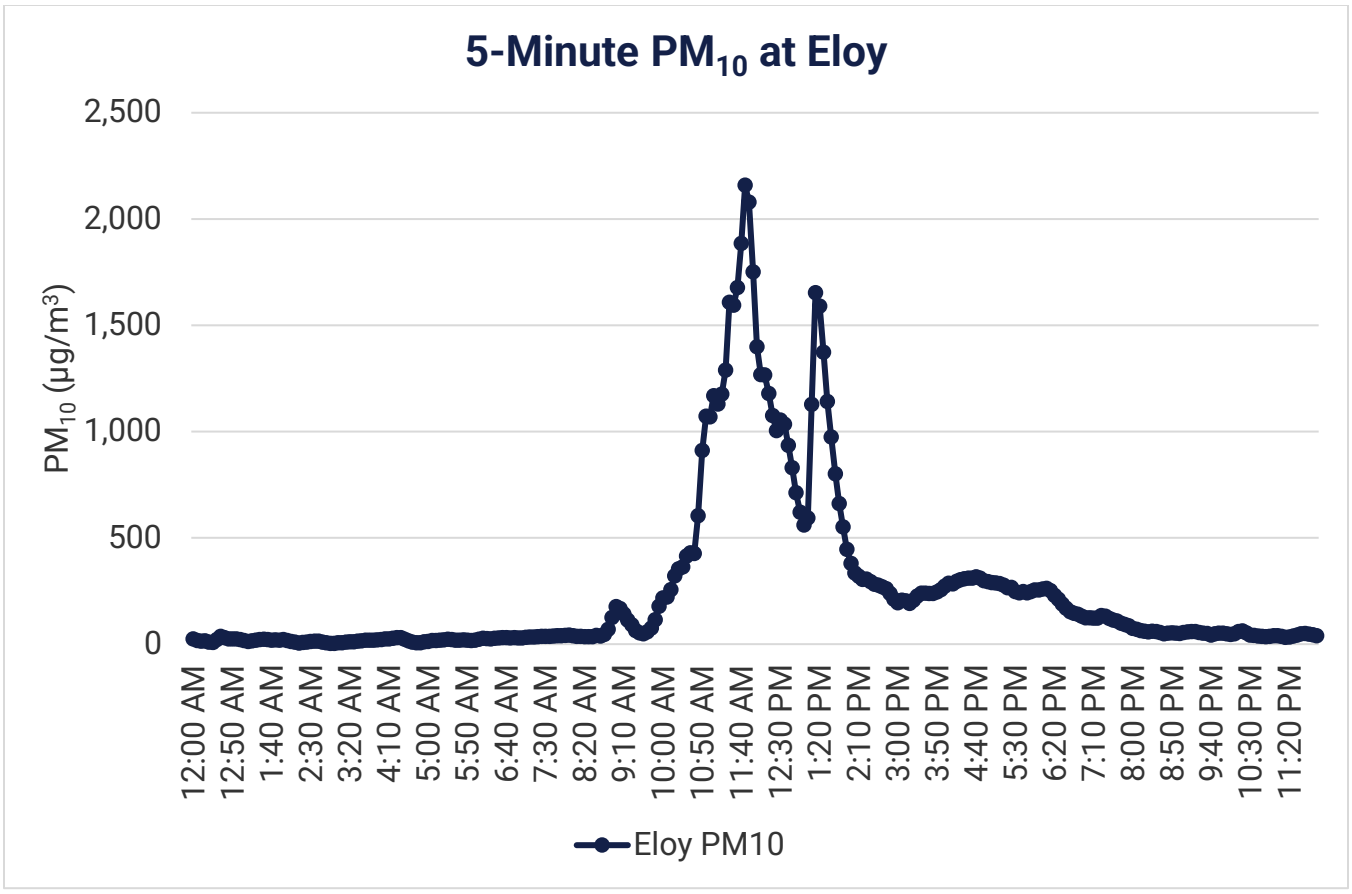

Hourly PM10 and Wind Speed at Pinal County Housing
PM10 (µg/m3)
Wind Speed (MPH)
1,400
1,200
1,000
800
600
400
200
0
45
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
Pinal CH PM10
Pinal CH Wind Gust
Pinal CH Wind Speed

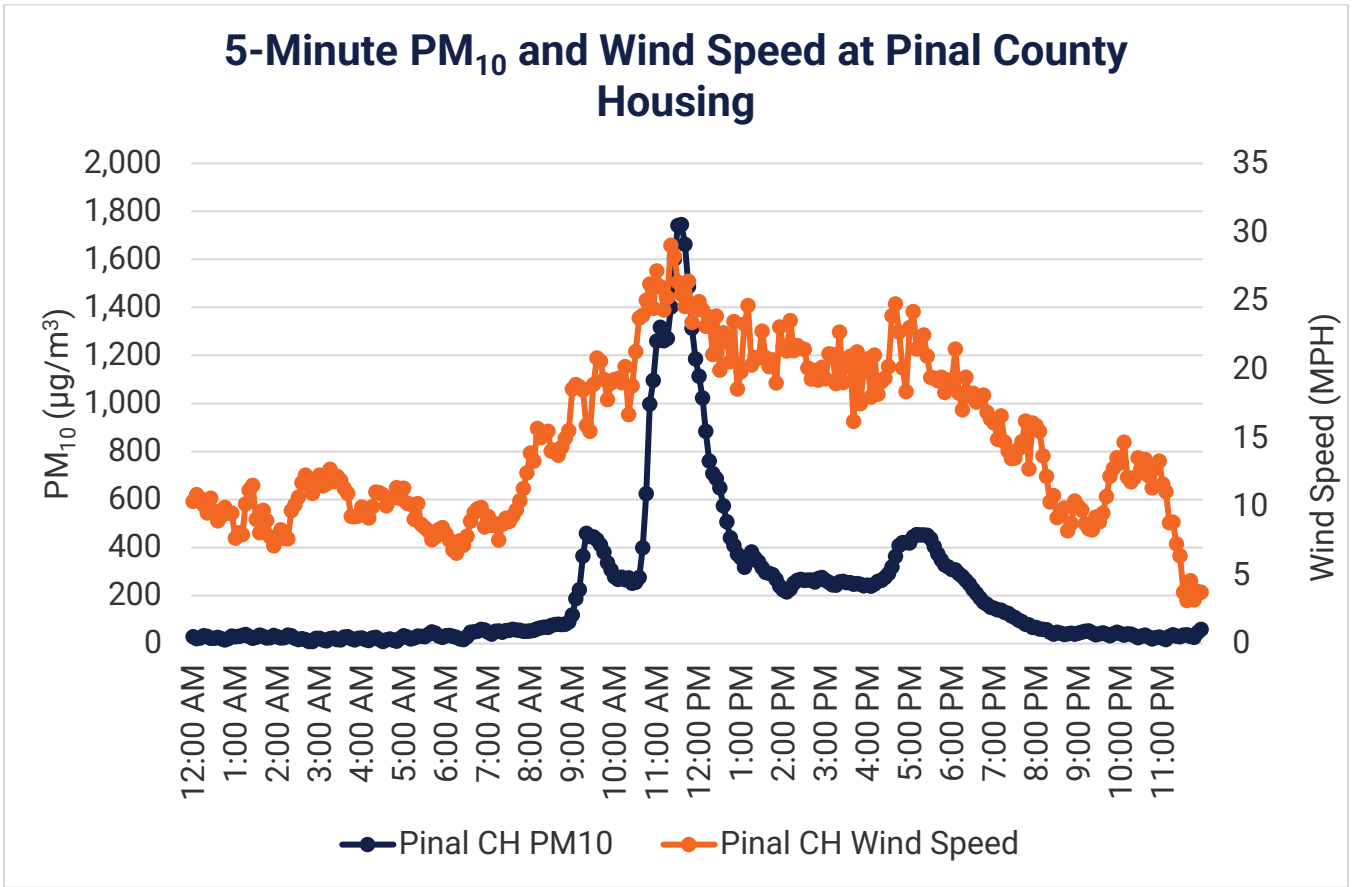

Hourly PM10 and Wind Speed at Stanfield
PM10 (µg/m3)
Wind Speed (MPH)
1,400
1,200
1,000
800
600
400
200
0
50
45
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Stanfield PM10
Stanfield Wind Speed
Stanfield Wind Gust

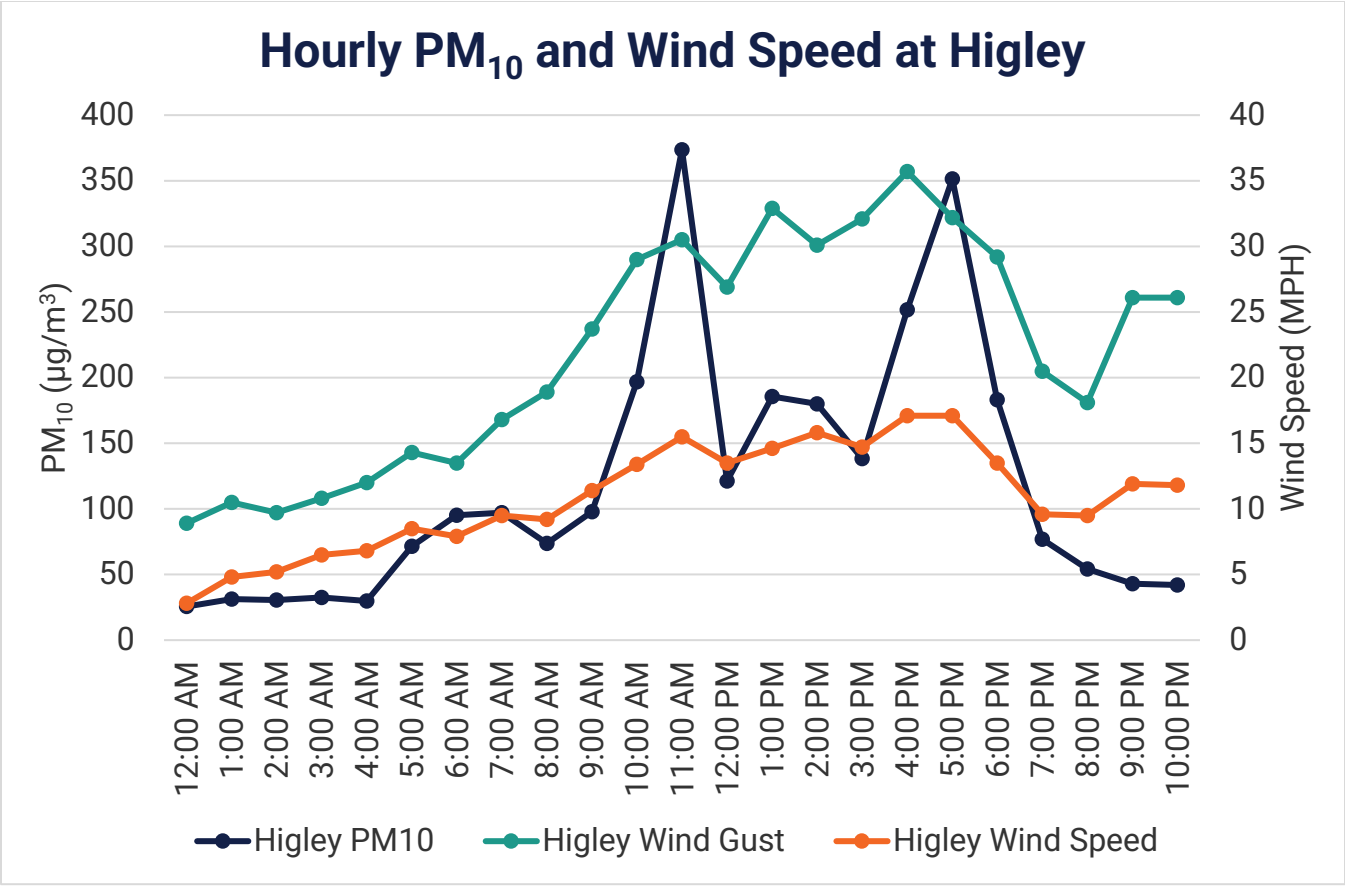
April 21, 2021

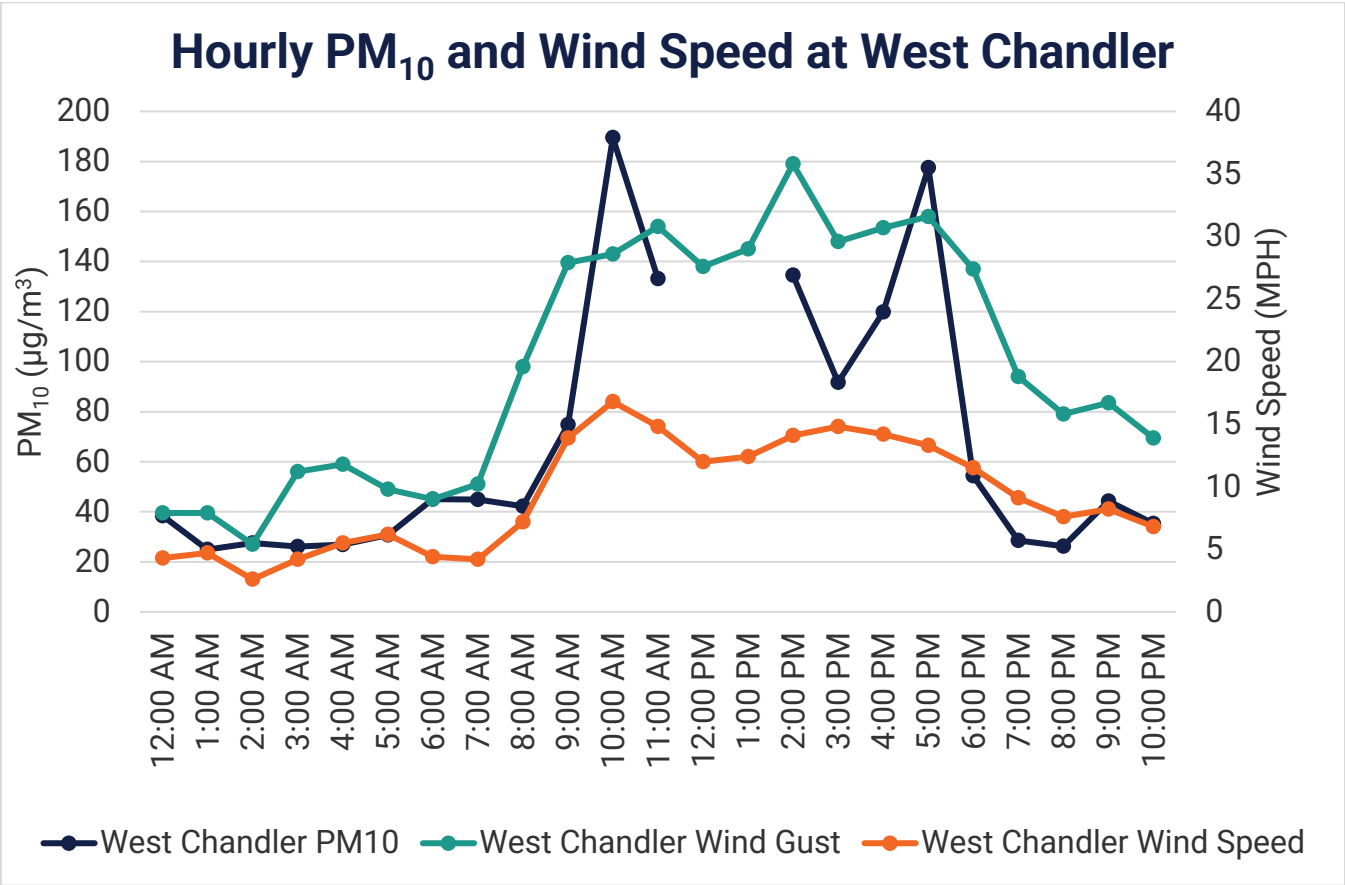


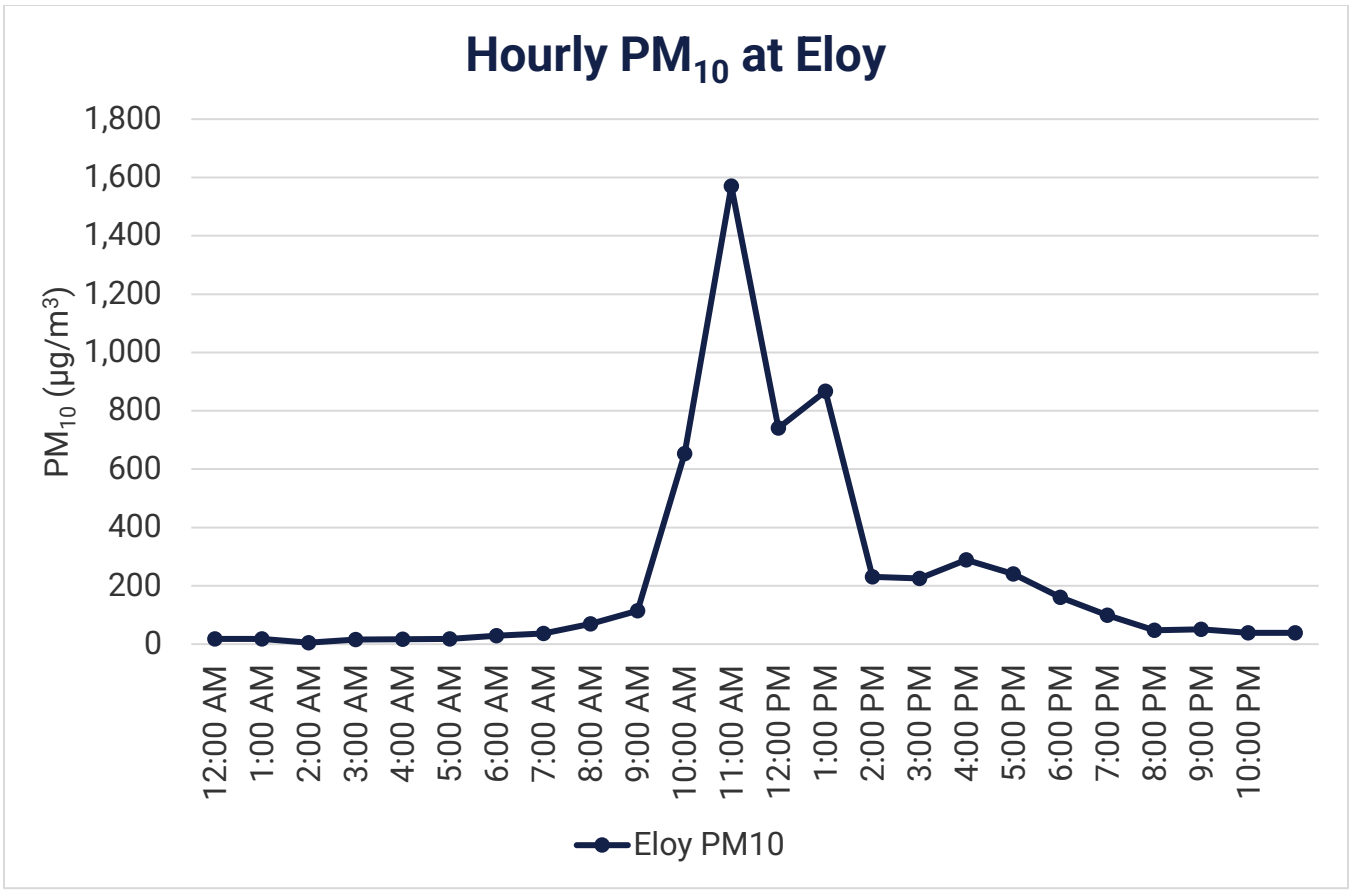


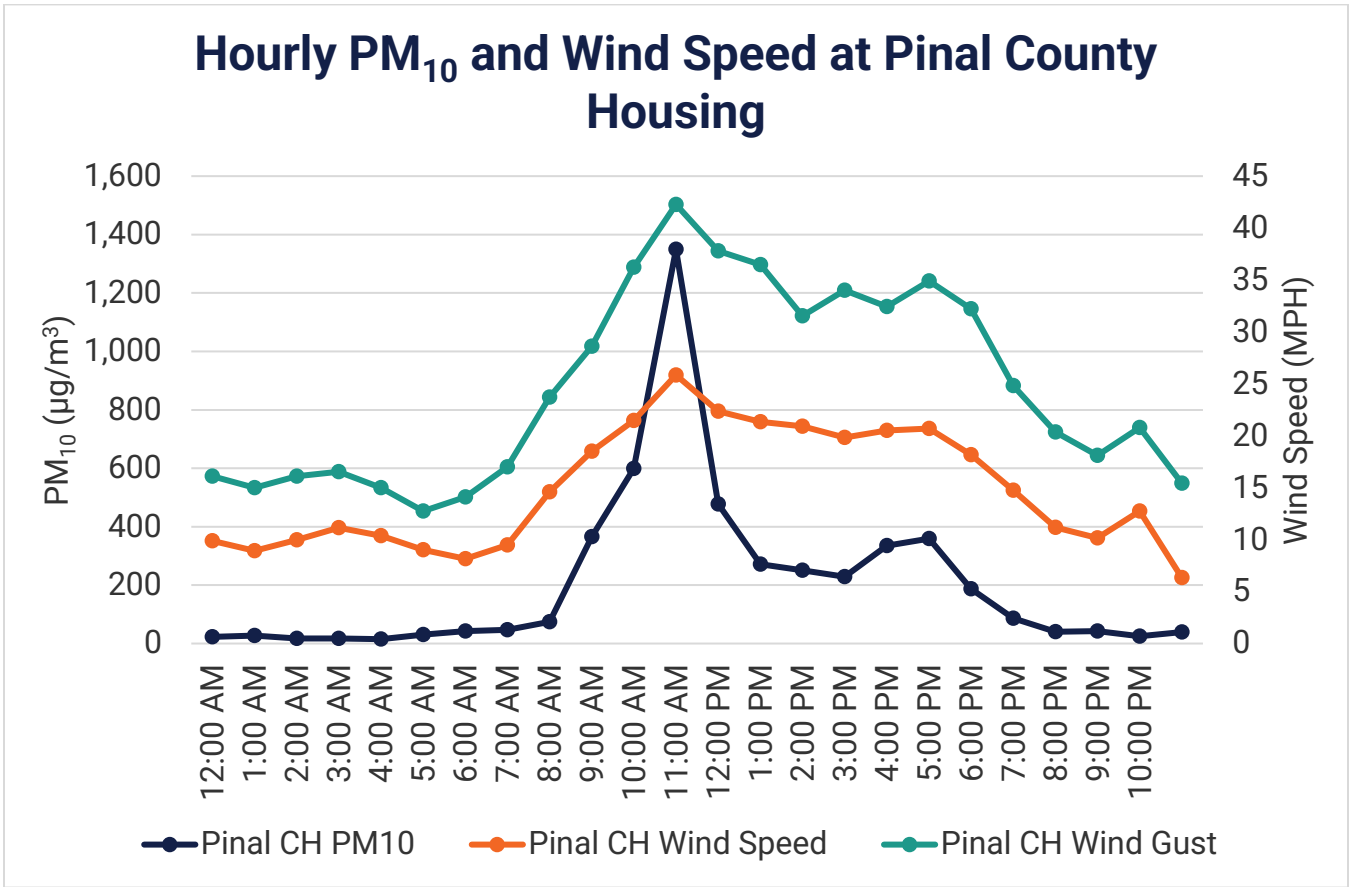

5-Minute PM10 at Eloy
2,500
2,000
1,500
1,000
500
0
PM10 (µg/m3)
12:00 AM
12:50 AM
1:40 AM
2:30 AM
3:20 AM
4:10 AM
5:00 AM
5:50 AM
6:40 AM
7:30 AM
8:20 AM
9:10 AM
10:00 AM
10:50 AM
11:40 AM
12:30 PM
1:20 PM
2:10 PM
3:00 PM
3:50 PM
4:40 PM
5:30 PM
6:20 PM
7:10 PM
8:00 PM
8:50 PM
9:40 PM
10:30 PM
11:20 PM
Eloy PM10


5-Minute PM10 and Wind Speed at Pinal County Housing
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Pinal CH PM10
Pinal CH Wind Speed

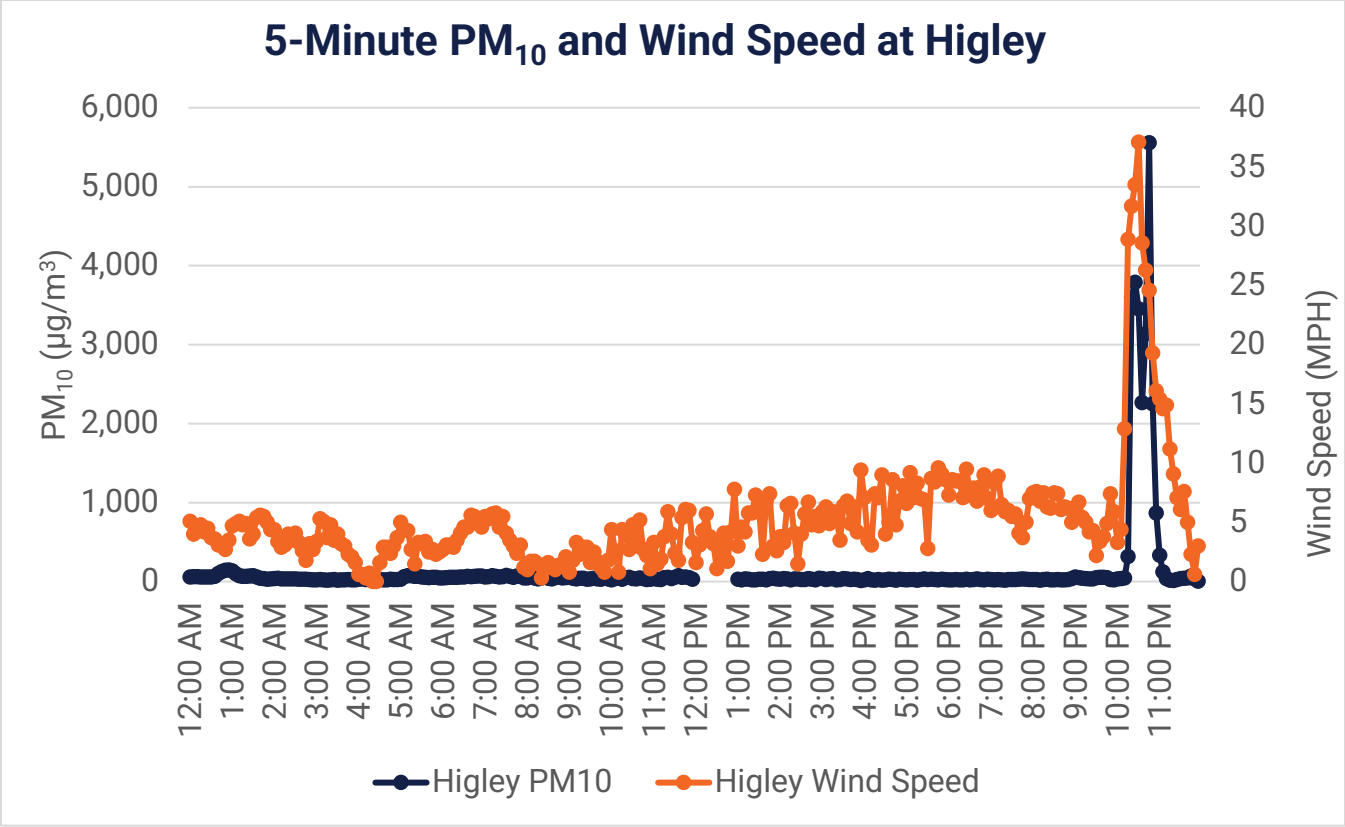

Hourly PM10 and Wind Speed at Higley
PM10 (µg/m3)
Wind Speed (MPH)
400
350
300
250
200
150
100
50
0
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
Higley PM10
Higley Wind Gust
Higley Wind Speed

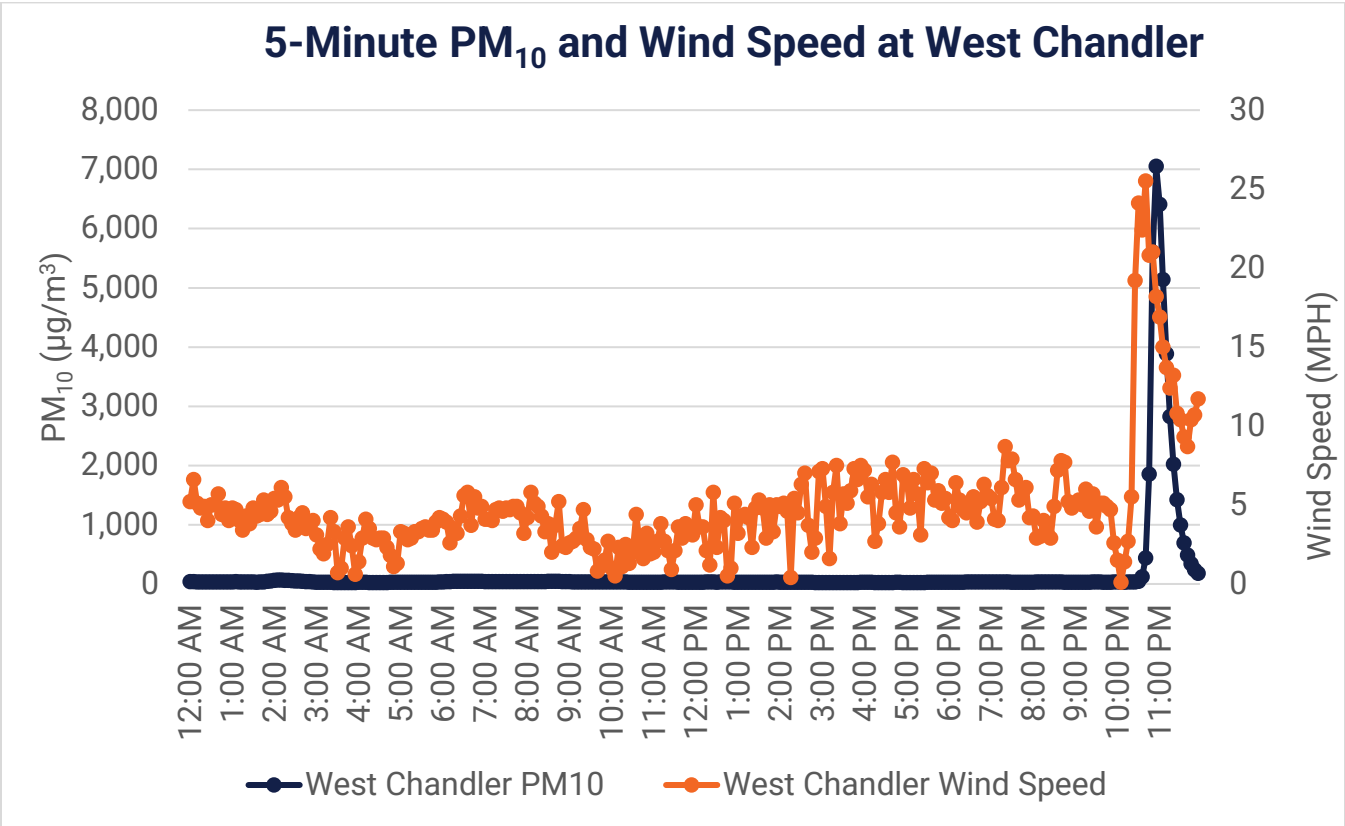

Hourly PM10 and Wind Speed at West Chandler
PM10 (µg/m3)
Wind Speed (MPH)
200
180
160
140
120
100
80
60
40
20
0
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
West Chandler PM10
West Chandler Wind Gust
West Chandler Wind Speed

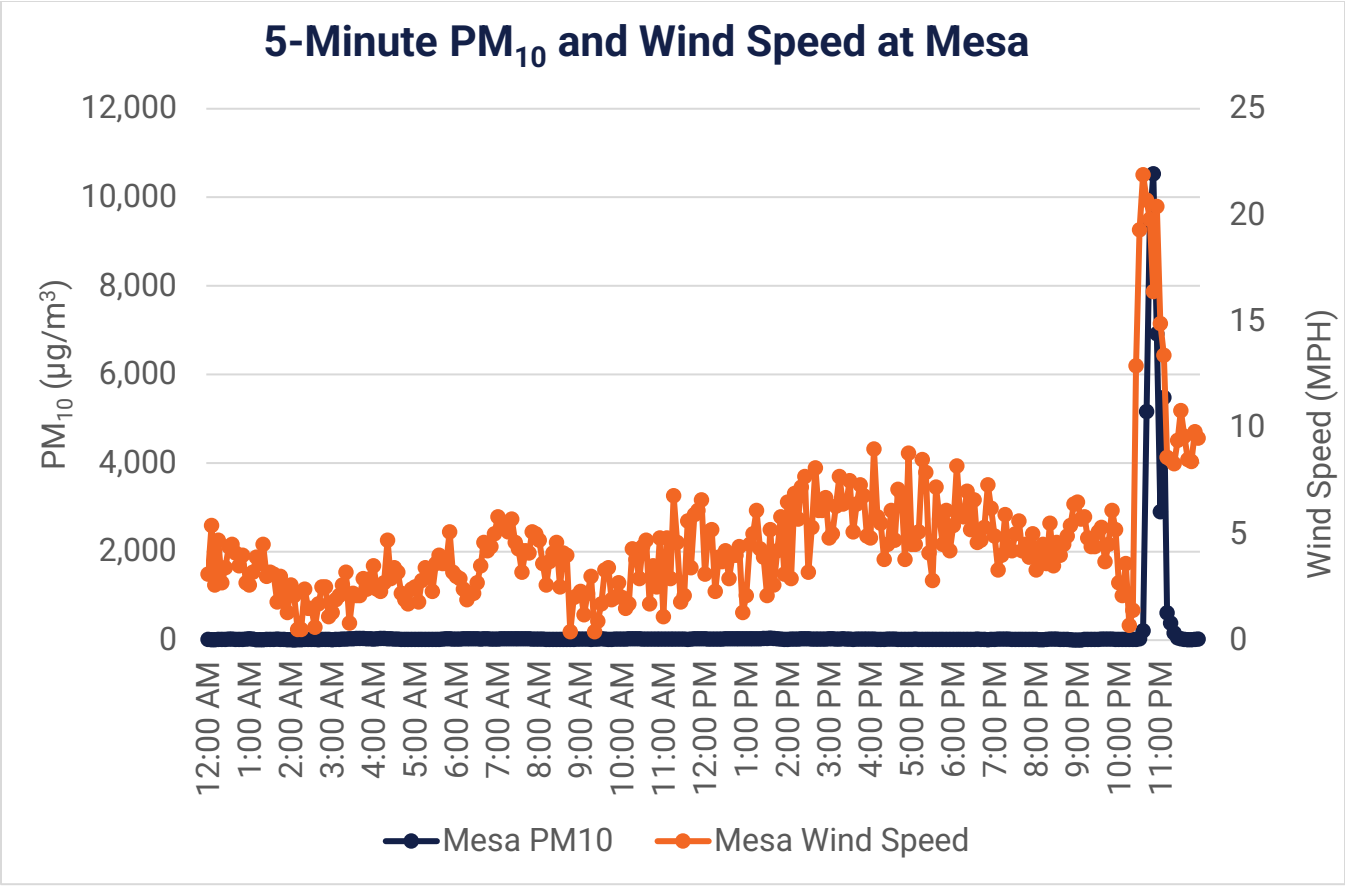

Hourly PM10 at Eloy
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
Eloy PM10

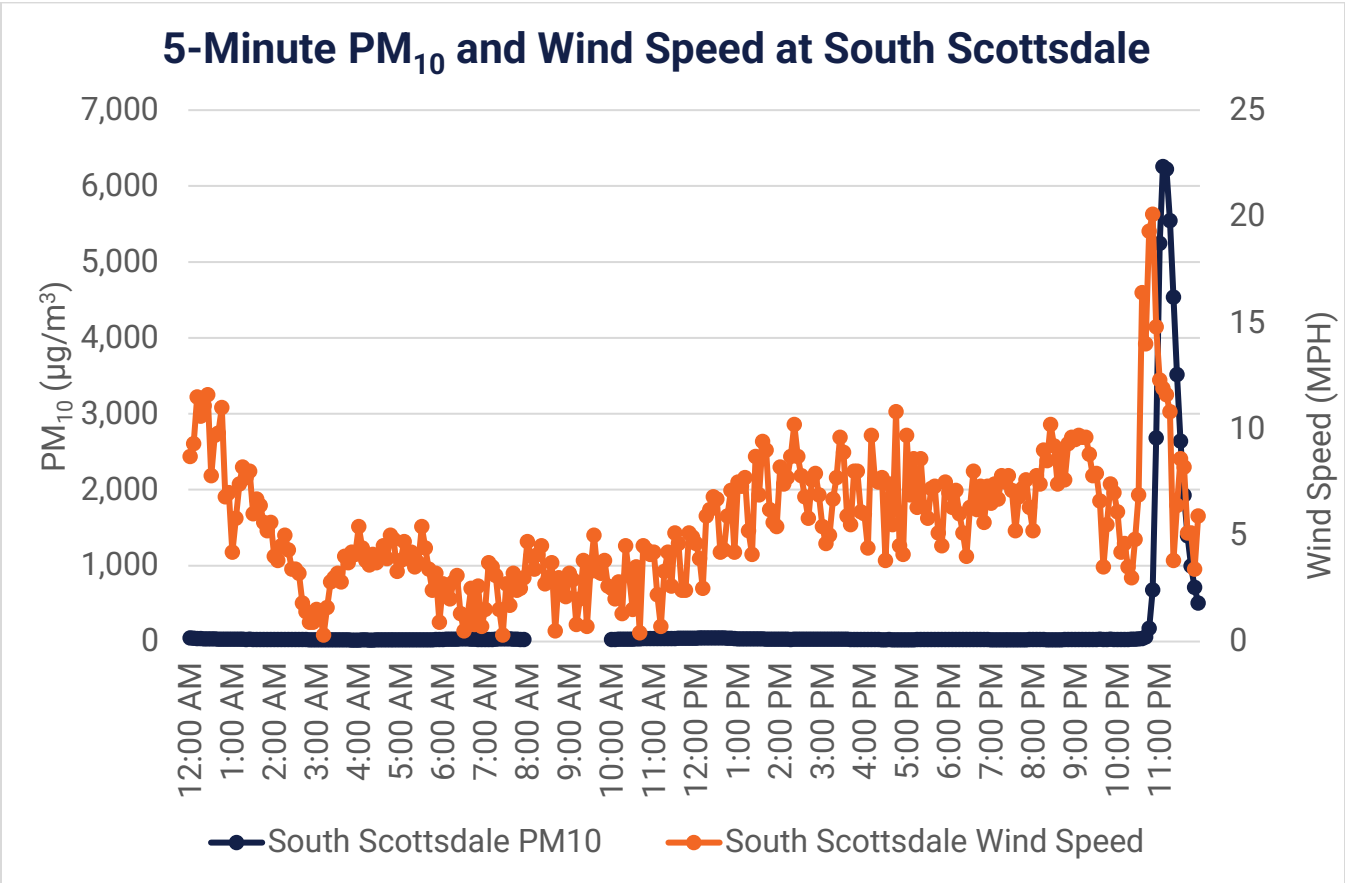

Hourly PM10 and Wind Speed at Pinal County Housing
1,600
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
45
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
Pinal CH PM10
Pinal CH Wind Speed
Pinal CH Wind Gust

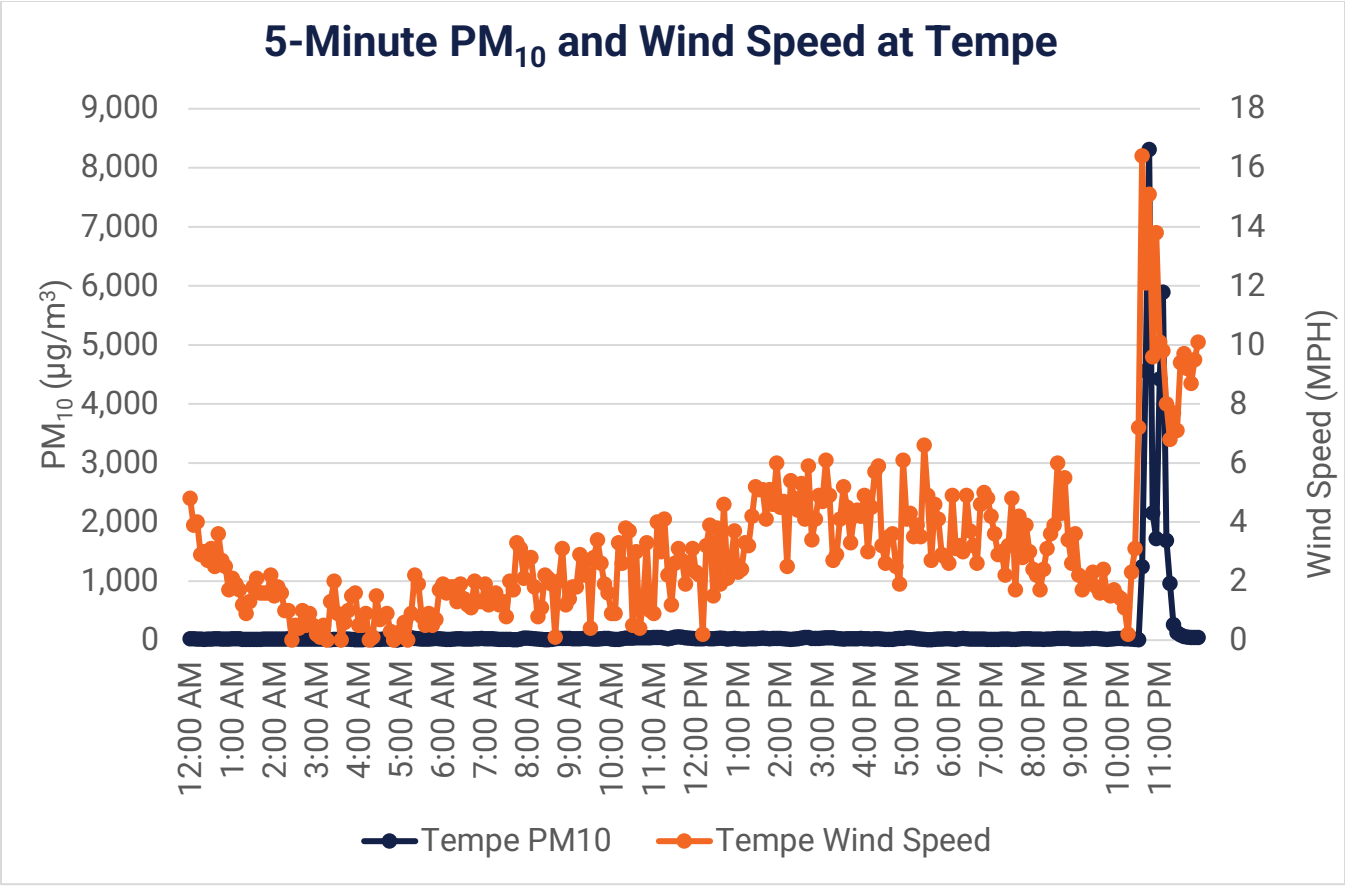
July 9, 2021

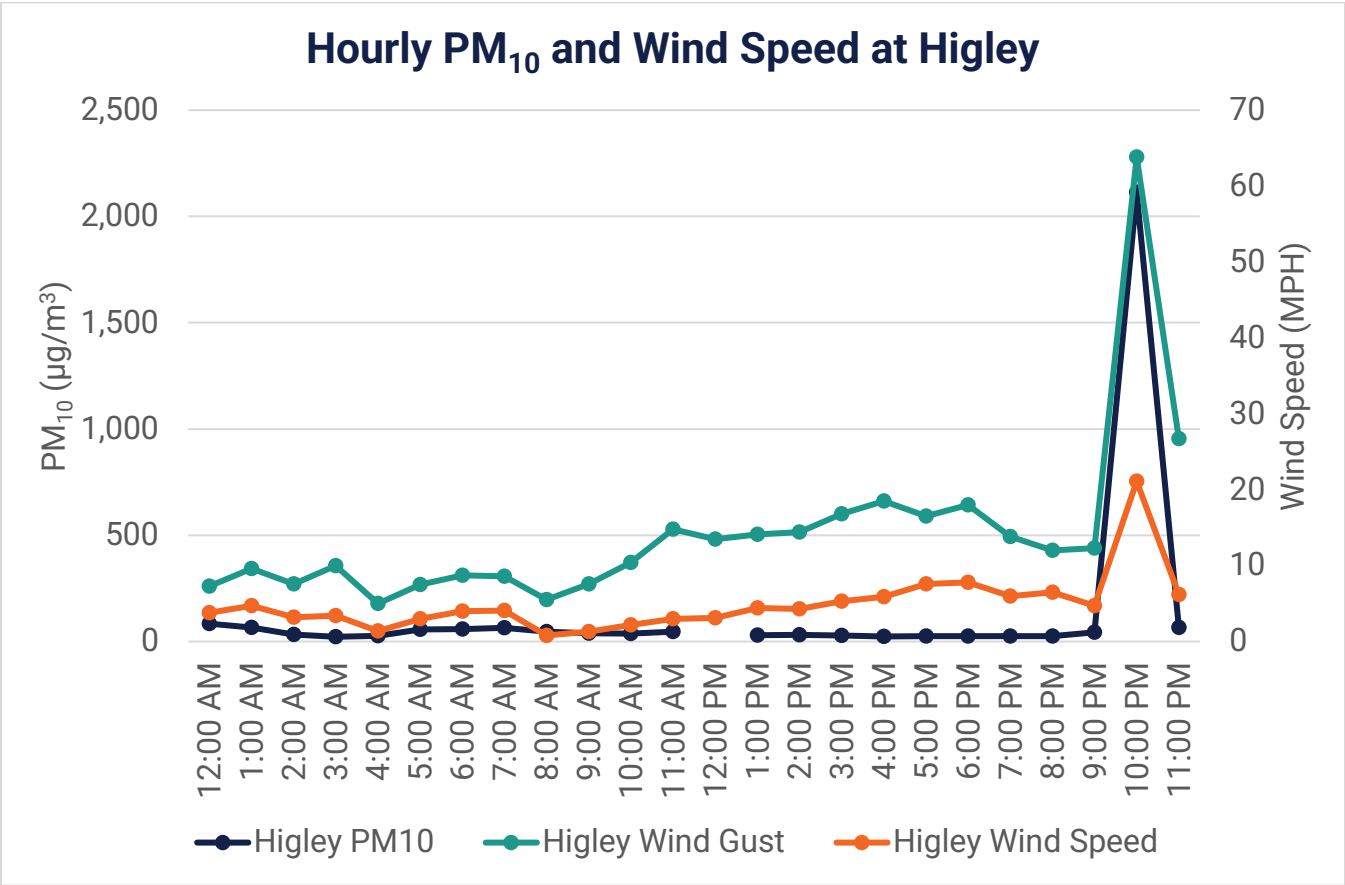

5-Minute PM10 and Wind Speed at Higley
PM10 (µg/m3)
Wind Speed (MPH)
6,000
5,000
4,000
3,000
2,000
1,000
0
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Higley PM10
Higley Wind Speed

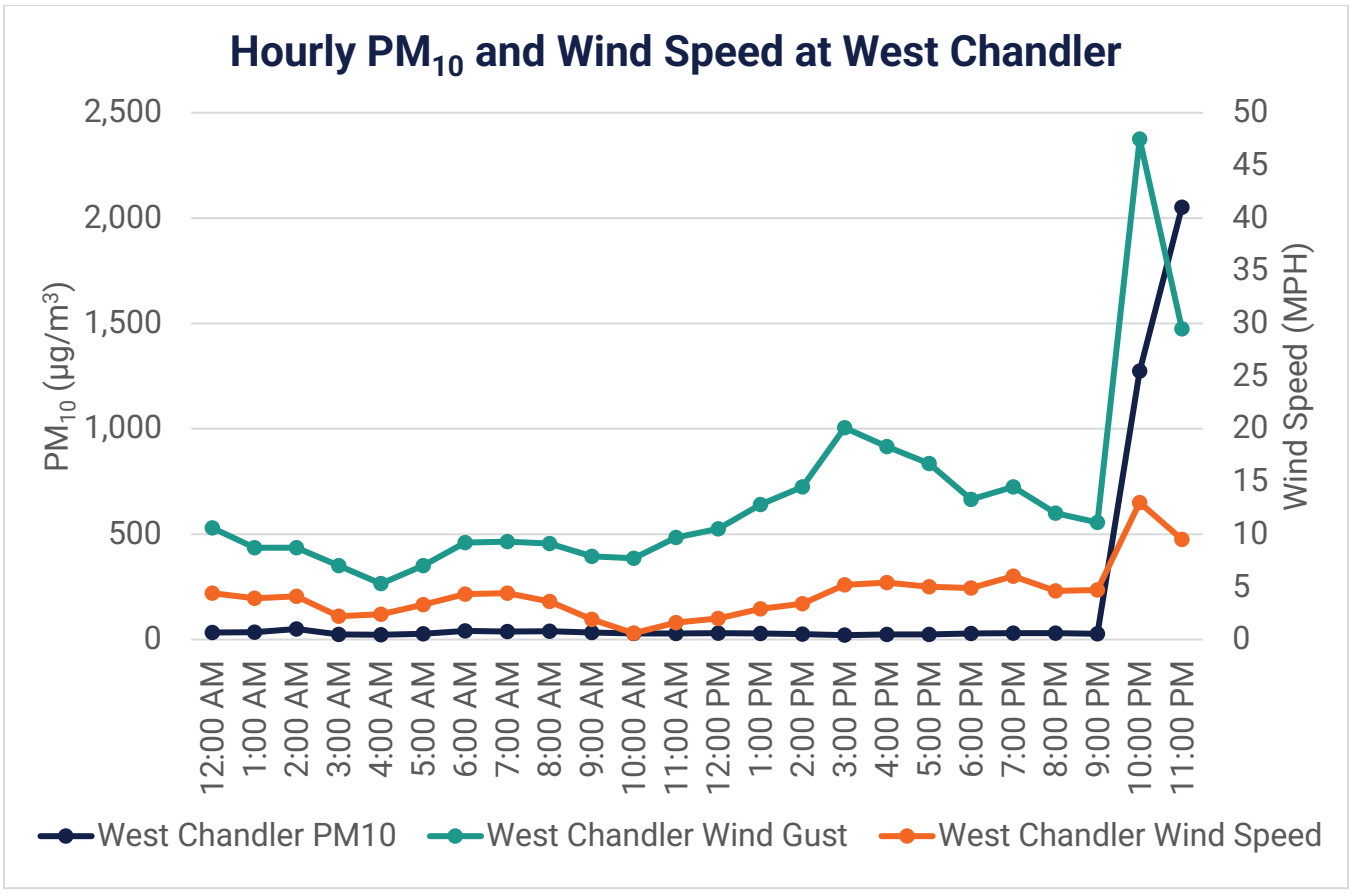

5-Minute PM10 and Wind Speed at West Chandler
PM10 (µg/m3)
Wind Speed (MPH)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
West Chandler PM10
West Chandler Wind Speed

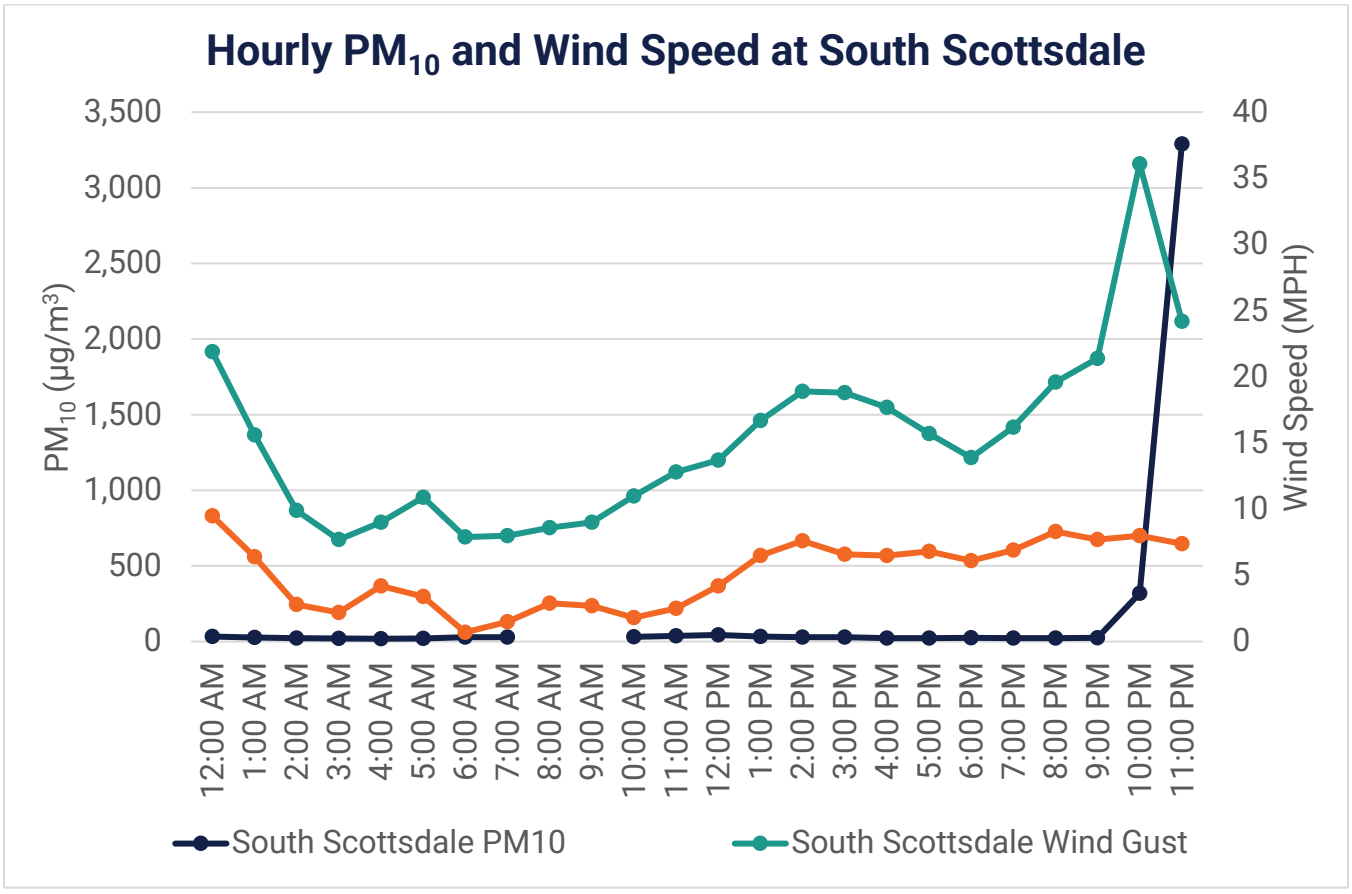

5-Minute PM10 and Wind Speed at Mesa
12,000
10,000
8,000
6,000
4,000
2,000
0
PM10 (µg/m3)
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Mesa PM10
Mesa Wind Speed

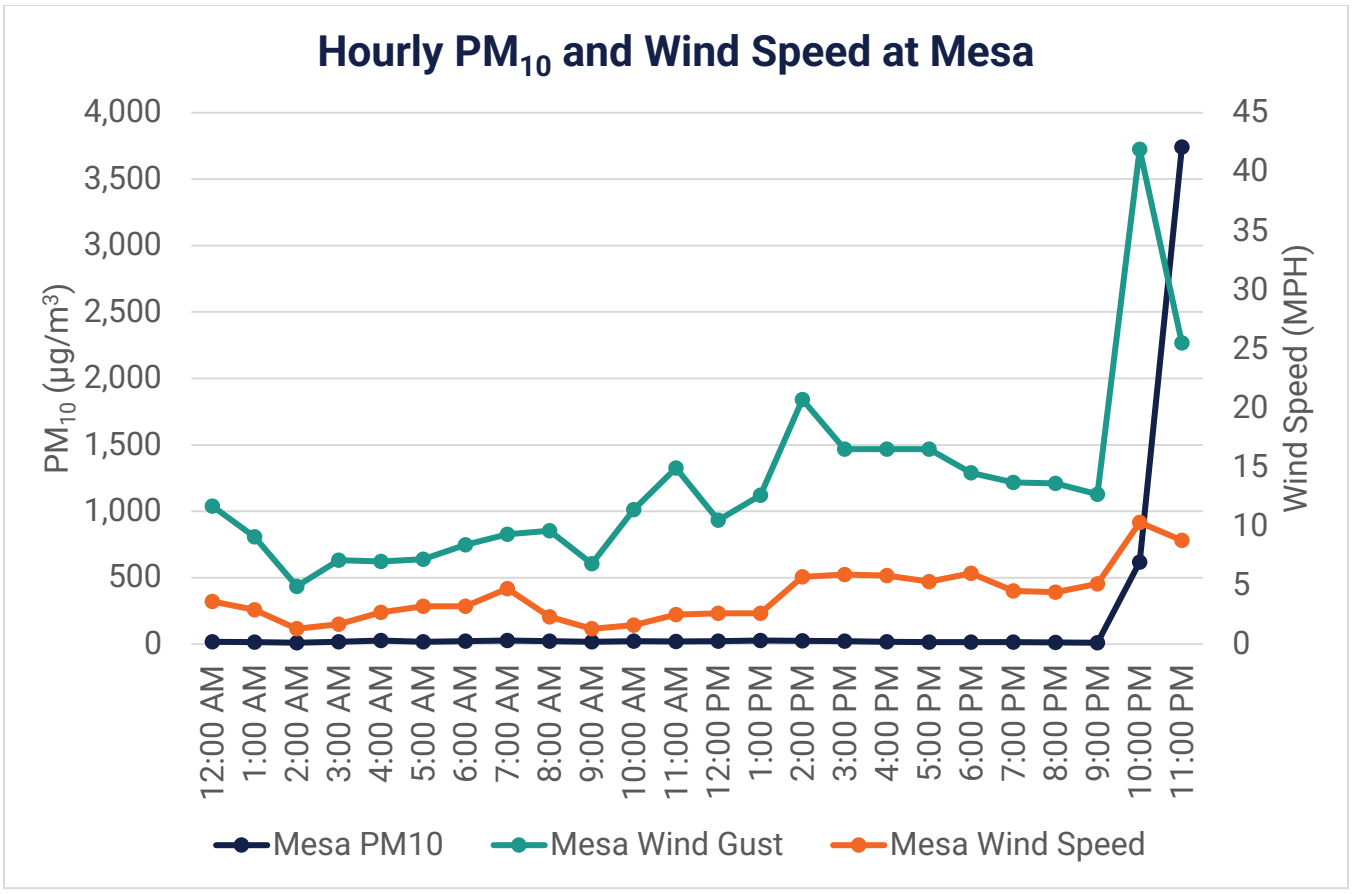

5-Minute PM10 and Wind Speed at South Scottsdale
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
PM10 (µg/m3)
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
South Scottsdale PM10
South Scottsdale Wind Speed

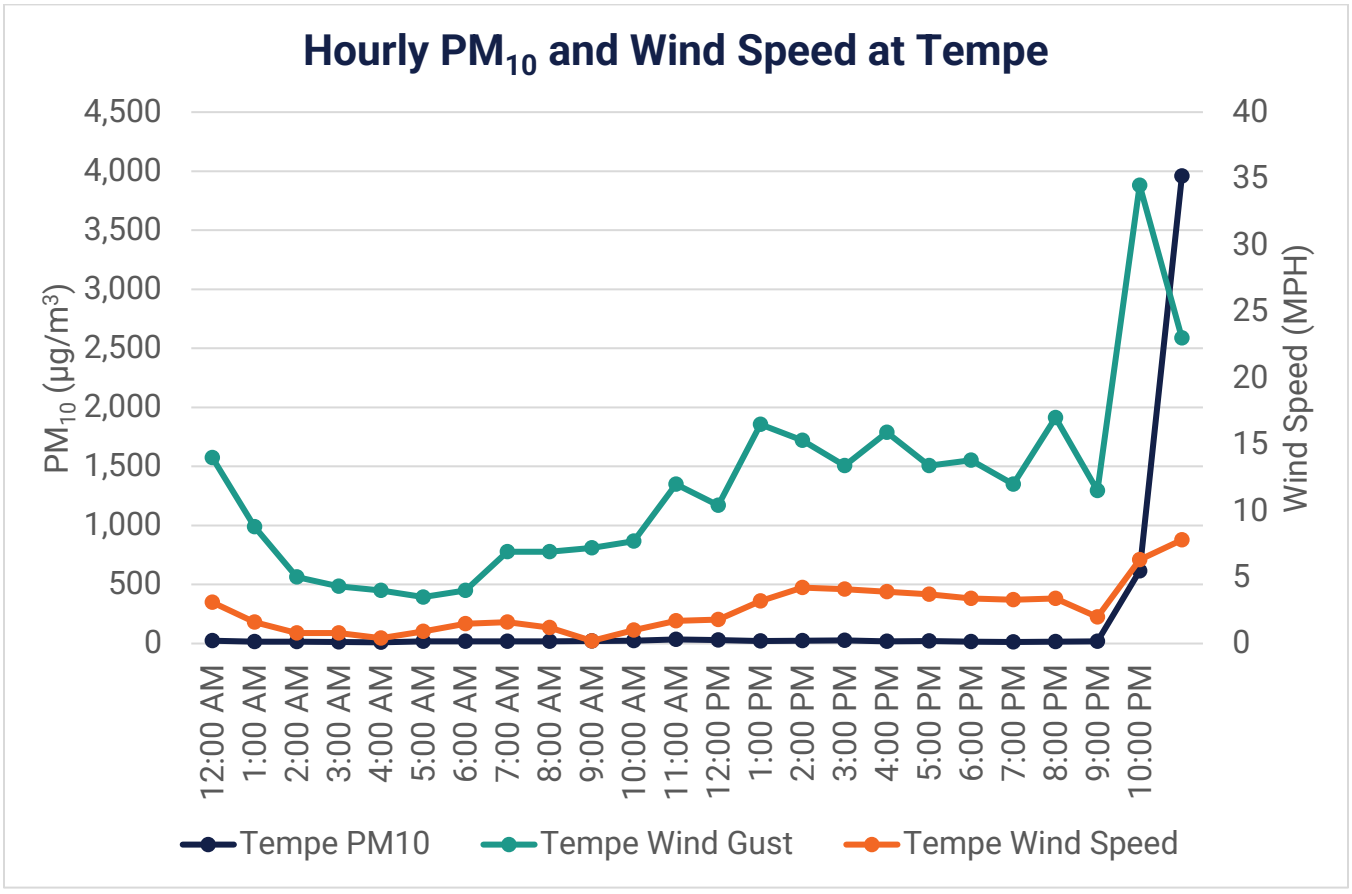

5-Minute PM10 and Wind Speed at Tempe
PM10 (µg/m3)
Wind Speed (MPH)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
18
16
14
12
10
8
6
4
2
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Tempe PM10
Tempe Wind Speed


Hourly PM10 and Wind Speed at Higley
PM10 (µg/m3)
Wind Speed (MPH)
2,500
2,000
1,500
1,000
500
0
70
60
50
40
30
20
10
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Higley PM10
Higley Wind Gust
Higley Wind Speed

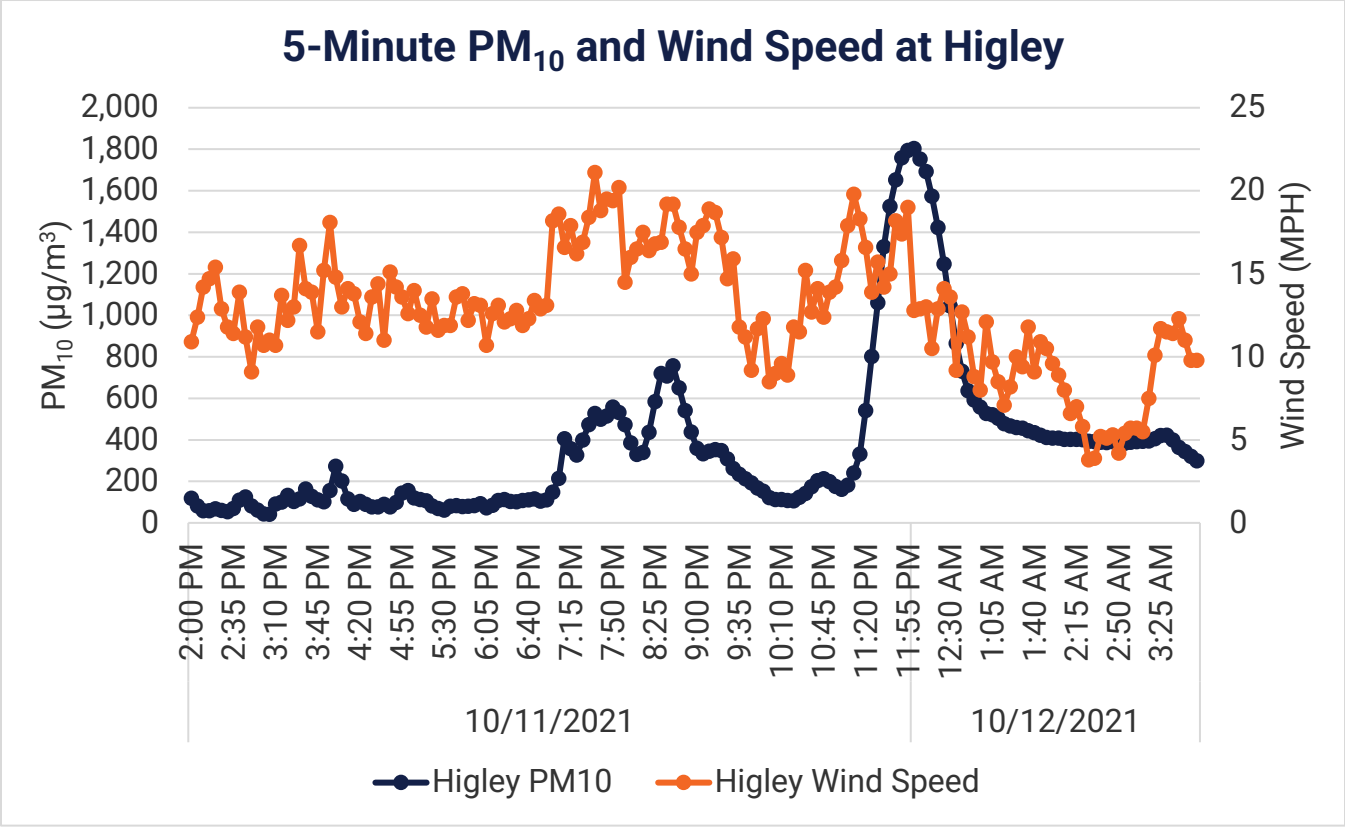

Hourly PM10 and Wind Speed at West Chandler
2,500
2,000
1,500
1,000
500
0
PM10 (µg/m3)
50
45
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
West Chandler PM10
West Chandler Wind Gust
West Chandler Wind Speed

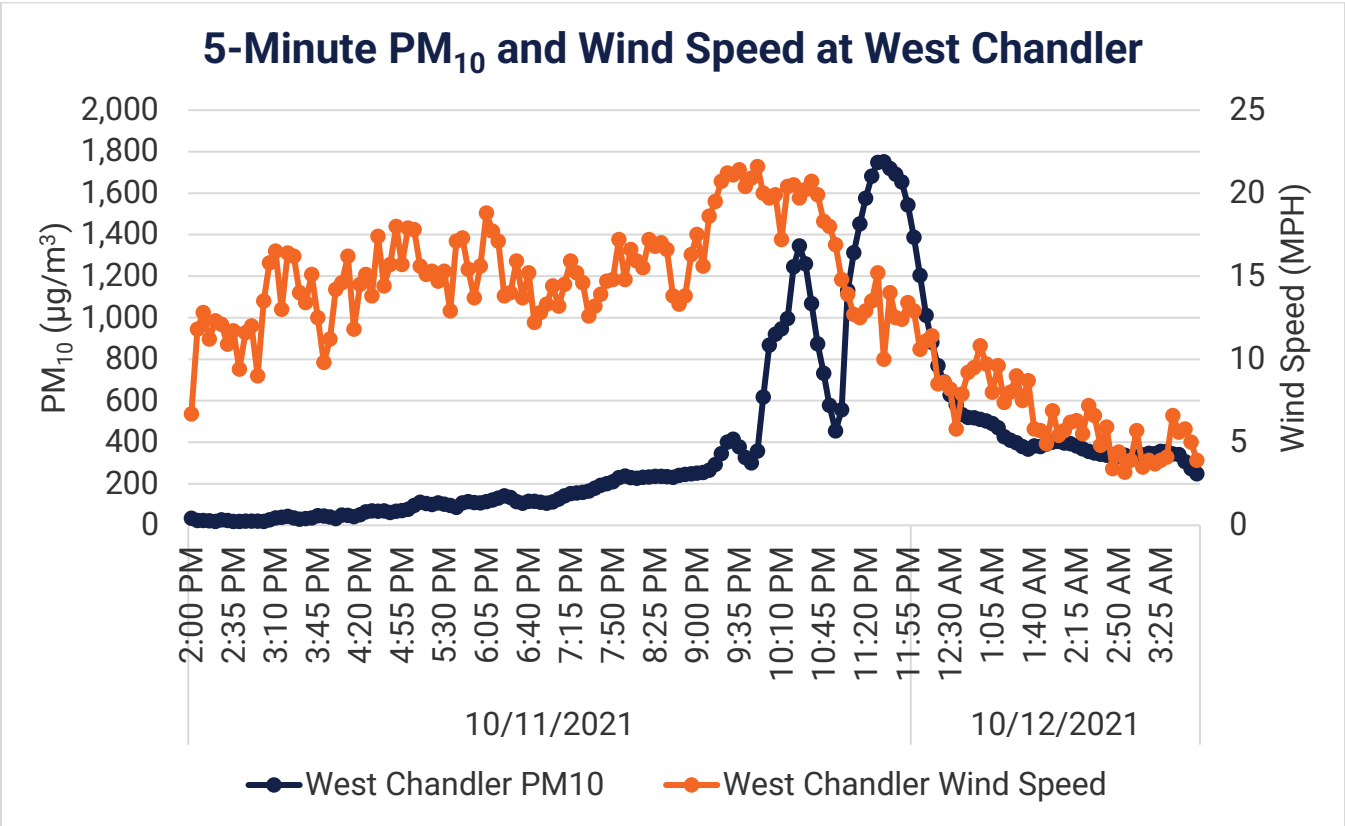

Hourly PM10 and Wind Speed at South Scottsdale
3,500
3,000
2,500
2,000
1,500
1,000
500
0
PM10 (µg/m3)
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
South Scottsdale PM10
South Scottsdale Wind Gust

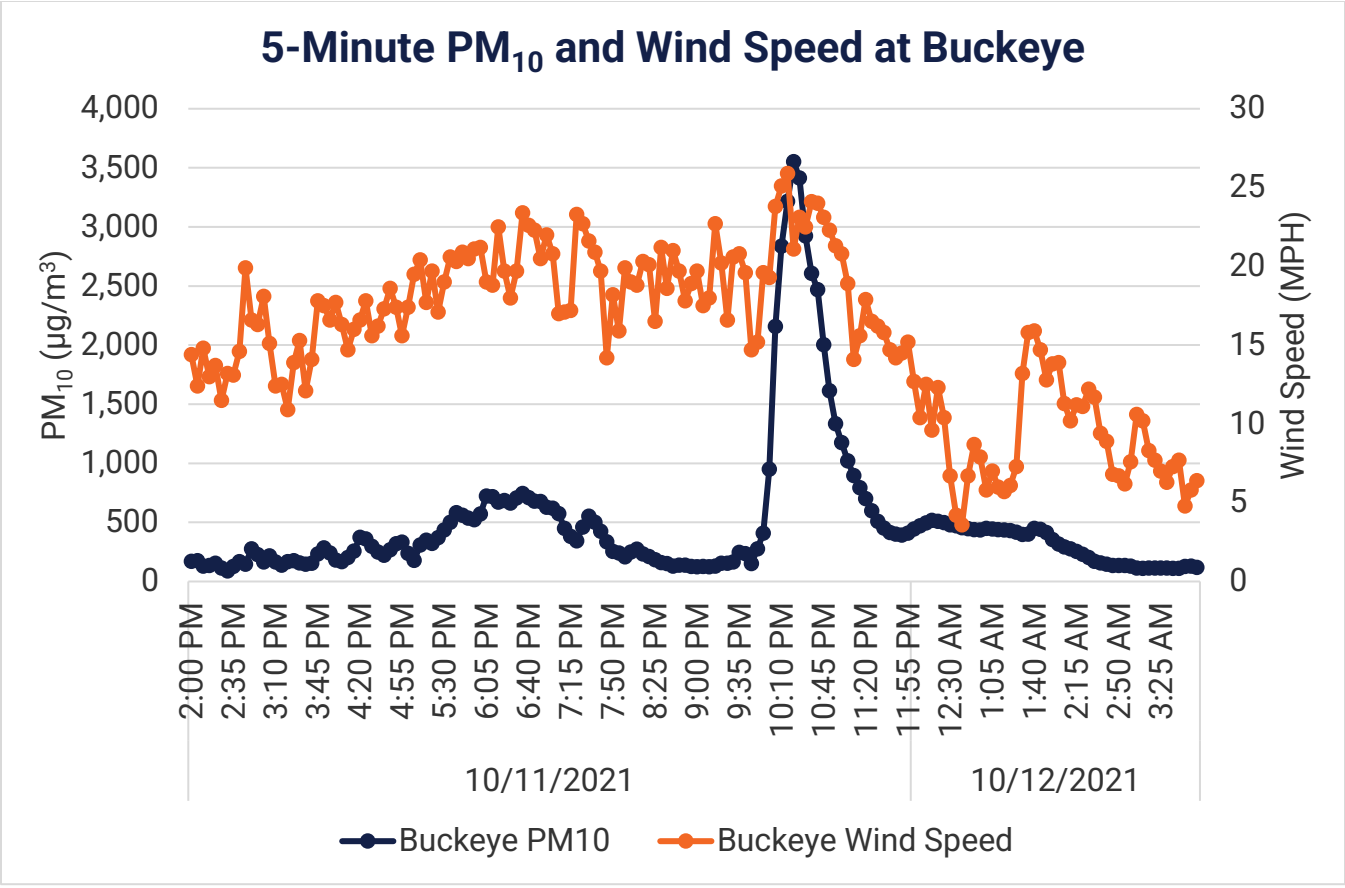

Hourly PM10 and Wind Speed at Mesa
PM10 (µg/m3)
Wind Speed (MPH)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
45
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Mesa PM10
Mesa Wind Gust
Mesa Wind Speed

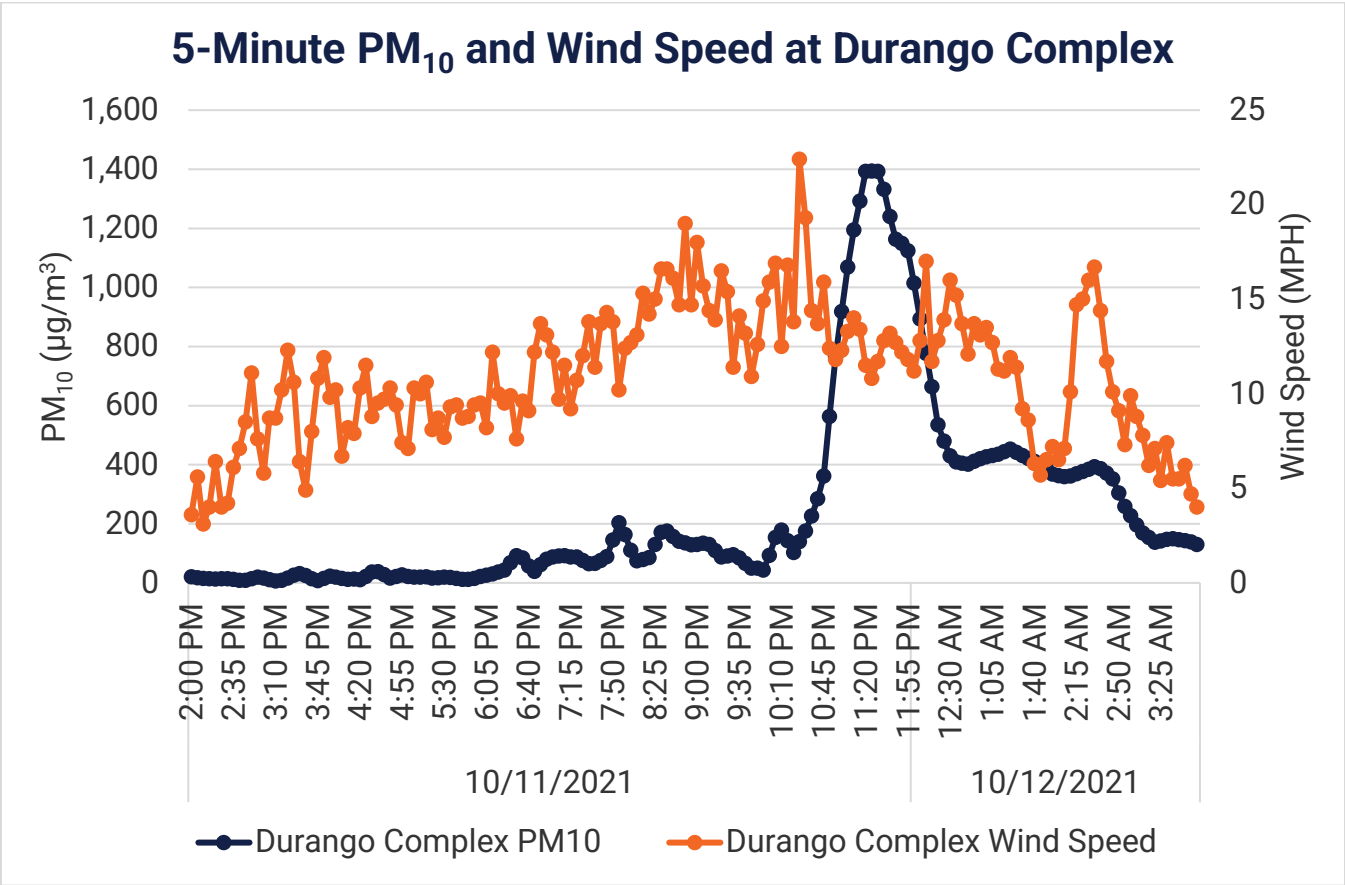

Hourly PM10 and Wind Speed at Tempe
PM10 (µg/m3)
Wind Speed (MPH)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
40
35
30
25
20
15
10
5
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
Tempe PM10
Tempe Wind Gust
Tempe Wind Speed

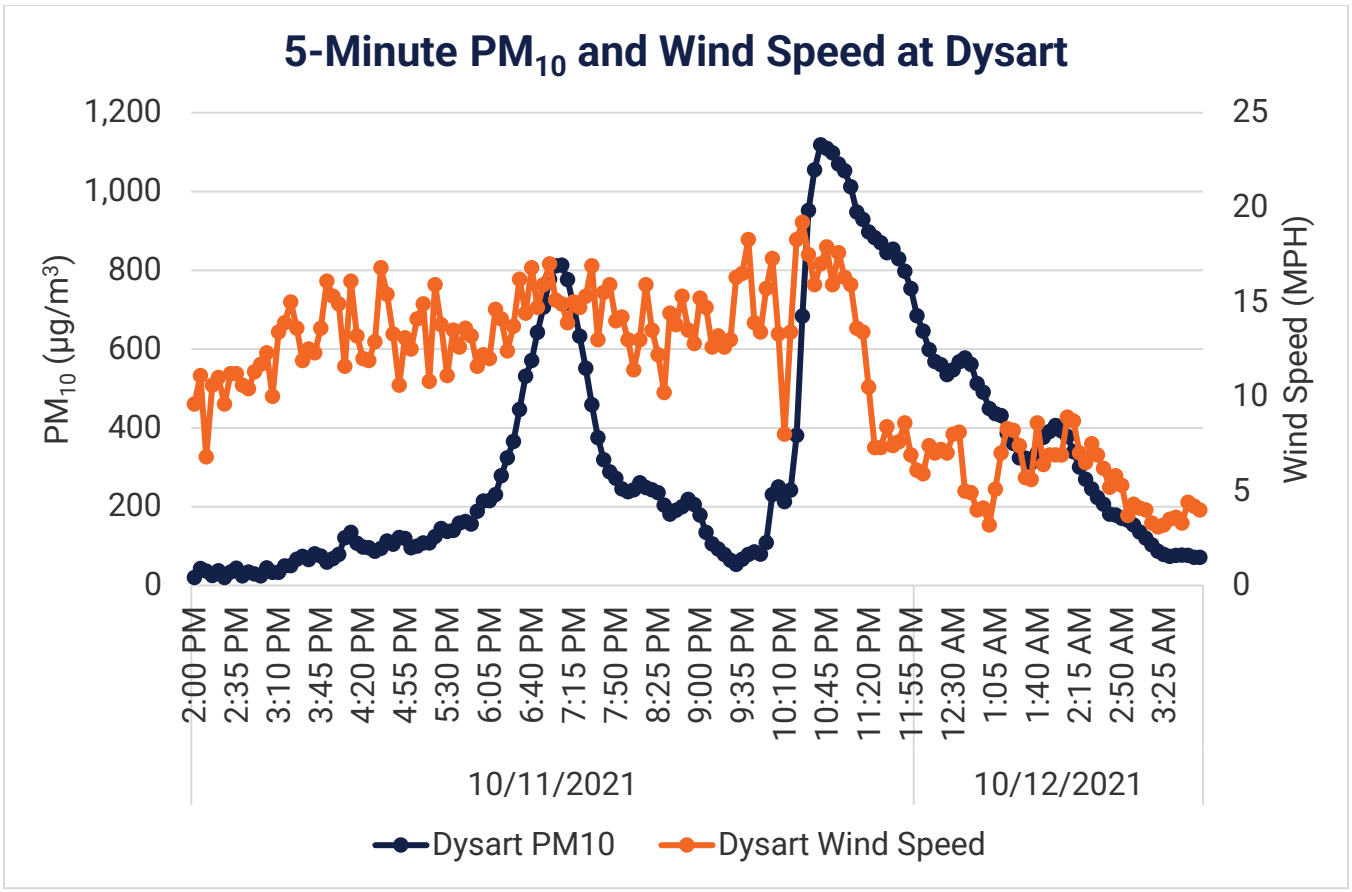
October 11-12, 2021

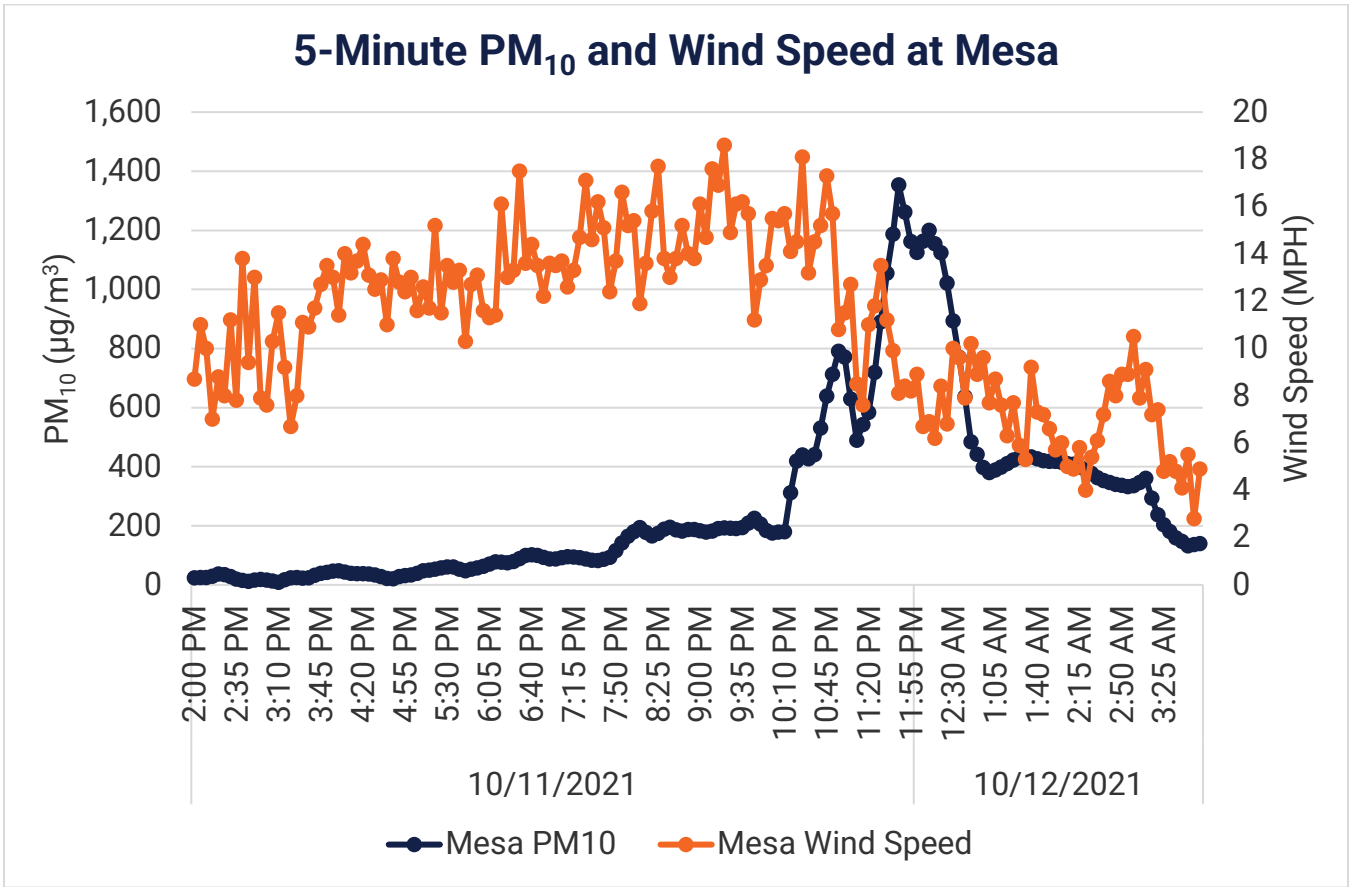


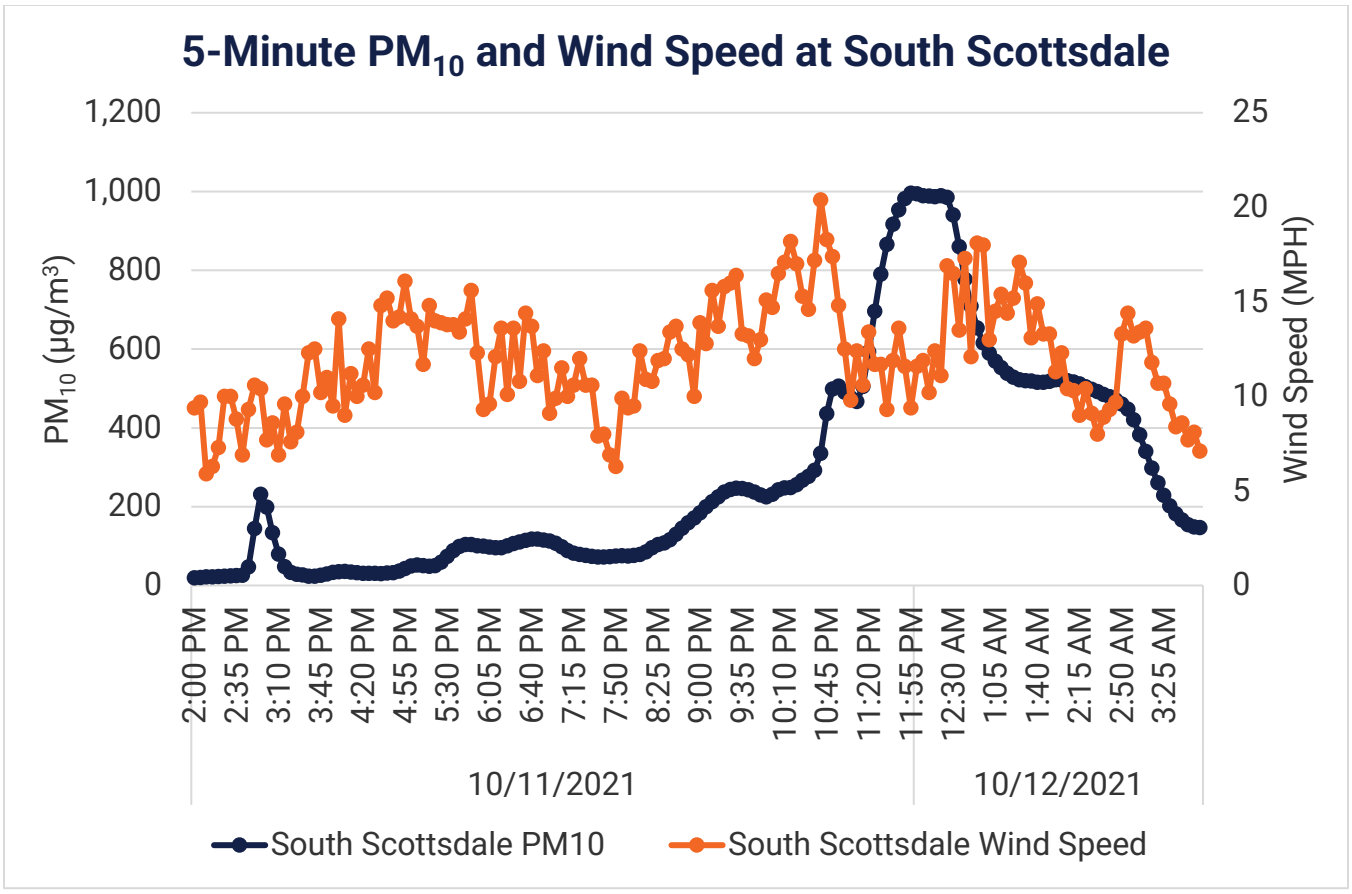


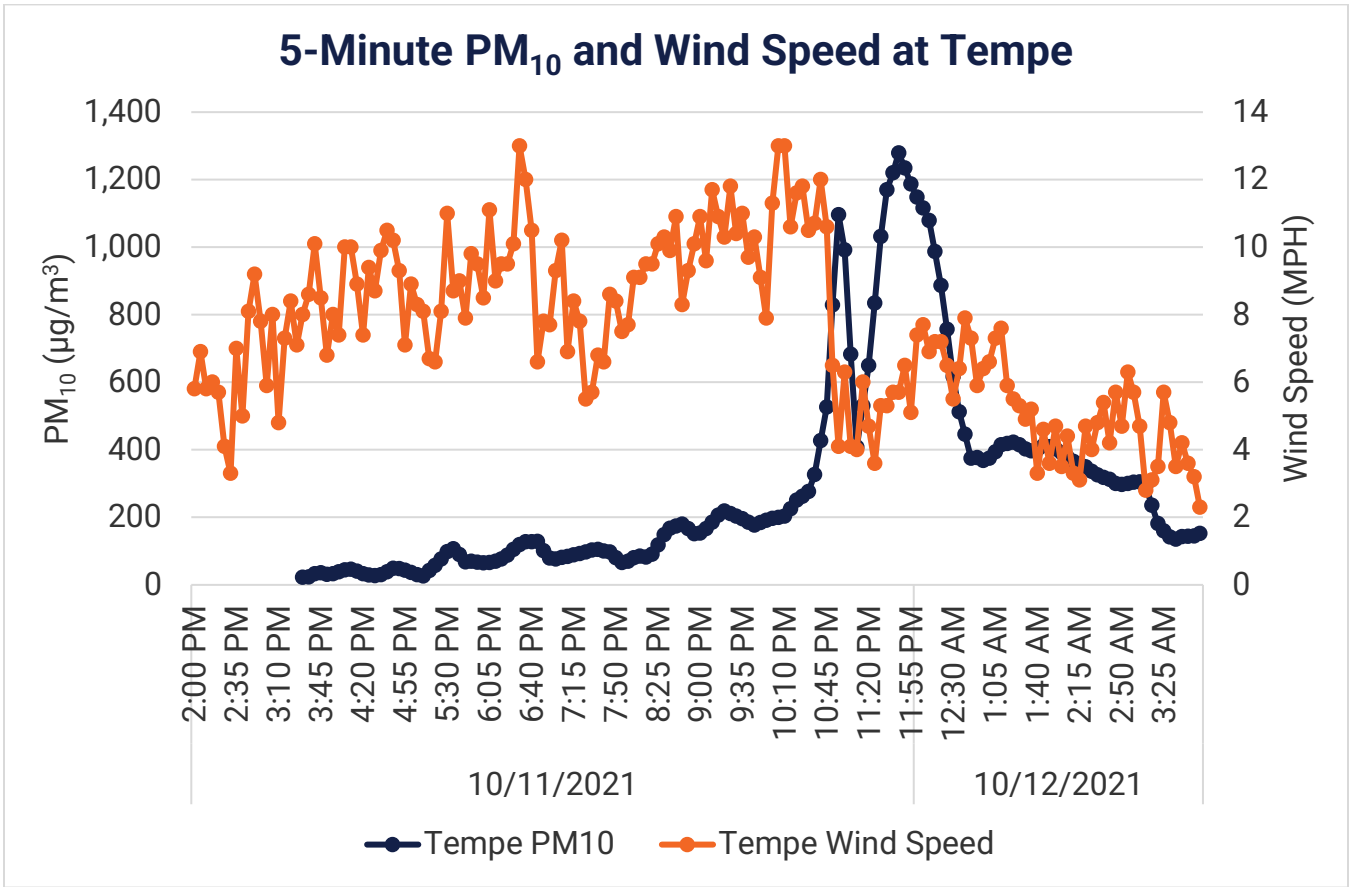

5-Minute PM10 and Wind Speed at Buckeye
PM10 (µg/m3)
Wind Speed (MPH)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
30
25
20
15
10
5
0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Buckeye PM10
Buckeye Wind Speed

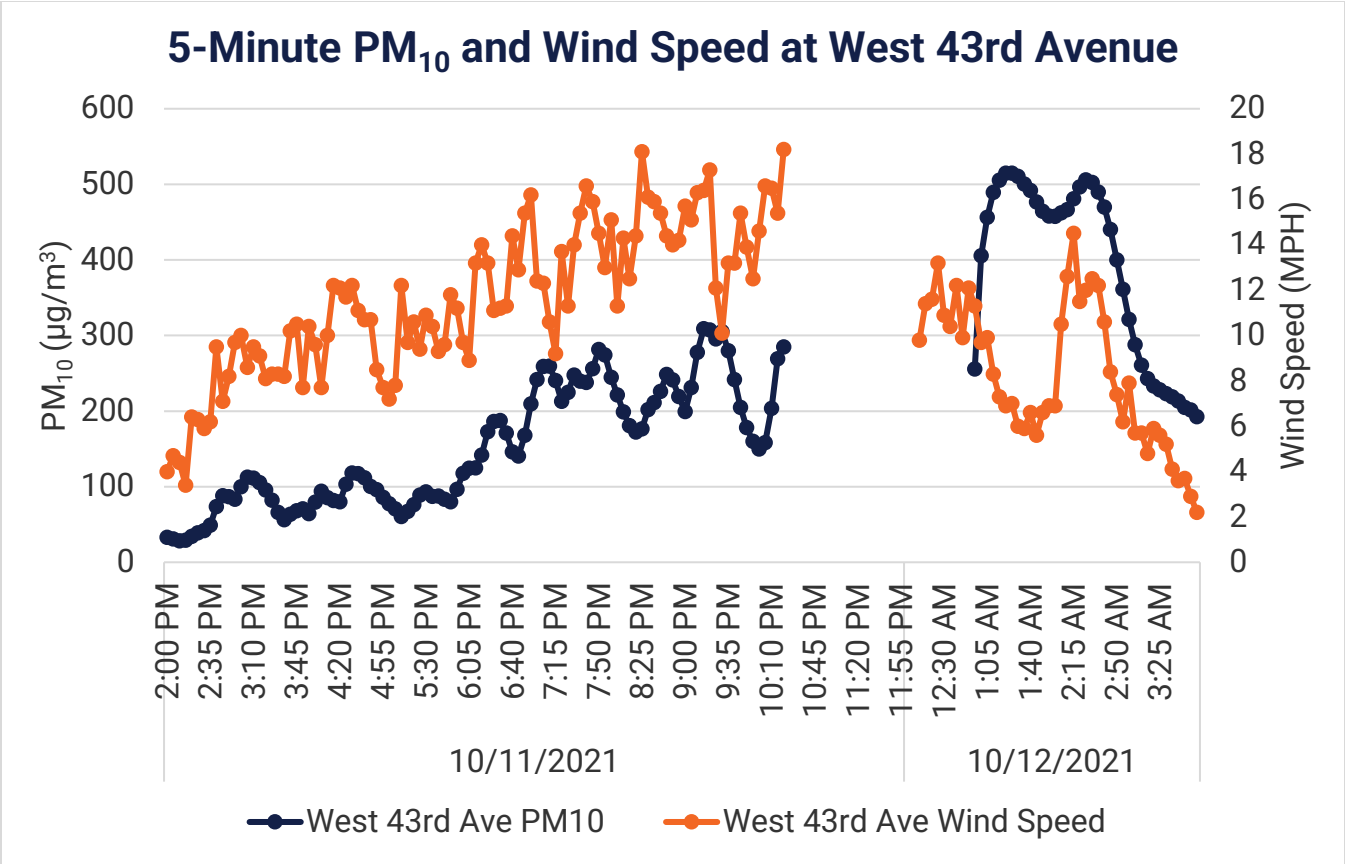

5-Minute PM10 and Wind Speed at Durango Complex
PM10 (µg/m3)
Wind Speed (MPH)
1,600
1,400
1,200
1,000
800
600
400
200
0
25
20
15
10
5
0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Durango Complex PM10
Durango Complex Wind Speed

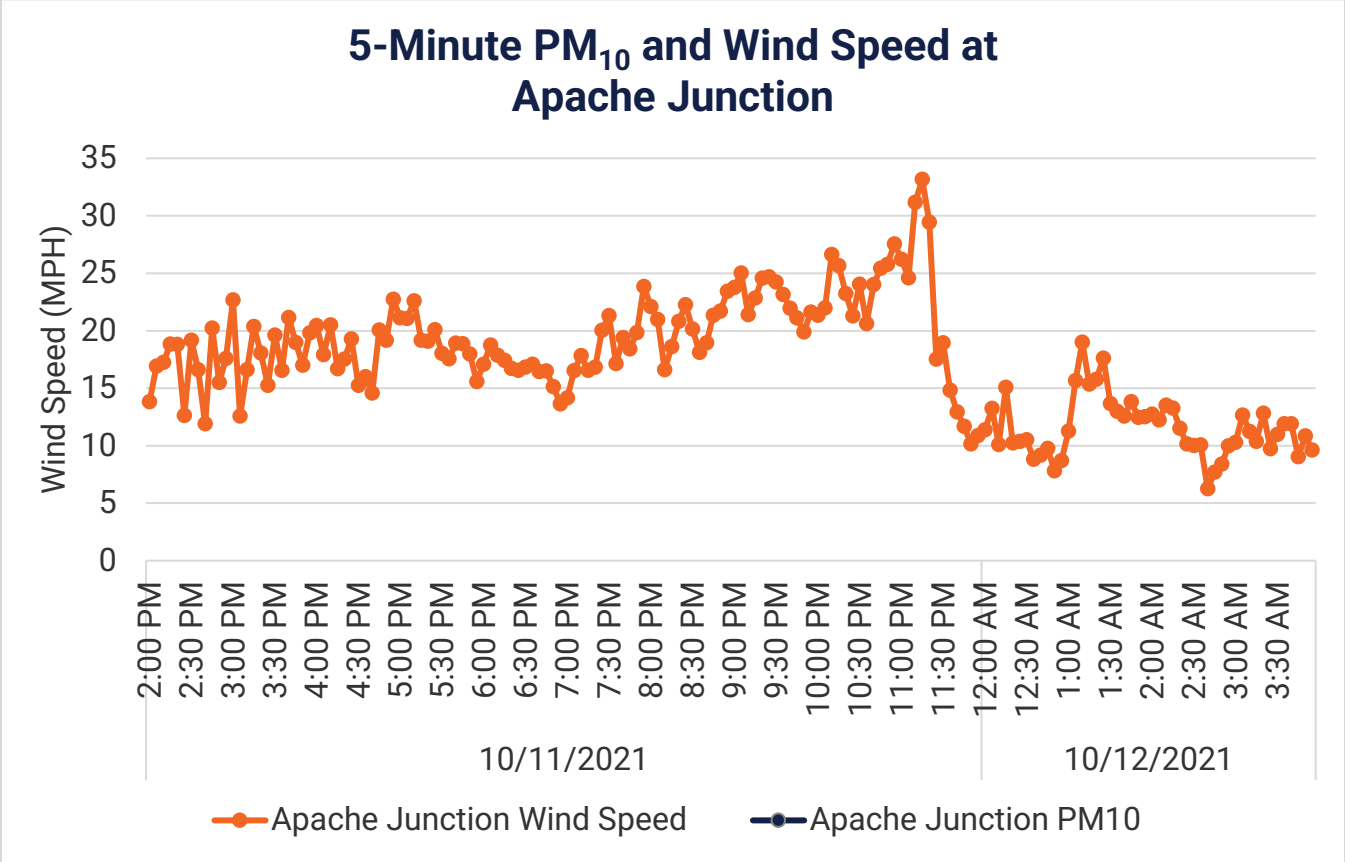

5-Minute PM10 and Wind Speed at Dysart
PM10 (µg/m3)
Wind Speed (MPH)
1,200
1,000
800
600
400
200
0
25
20
15
10
5
0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Dysart PM10
Dysart Wind Speed


5-Minute PM10 and Wind Speed at Mesa
PM10 (µg/m3)
Wind Speed (MPH)
1,600
1,400
1,200
1,000
800
600
400
200
0
20
18
16
14
12
10
8
6
4
2
0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Mesa PM10
Mesa Wind Speed

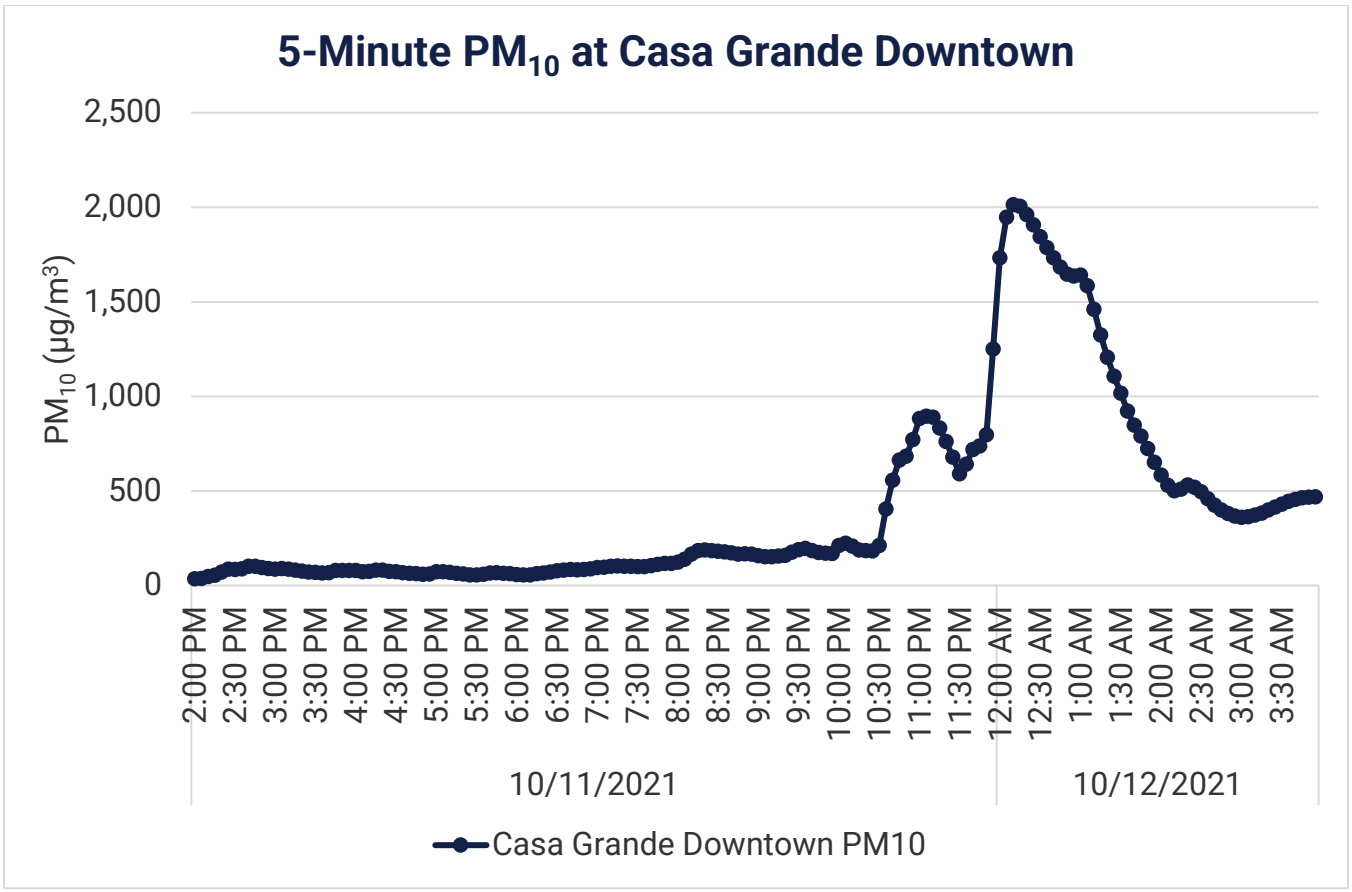

5-Minute PM10 and Wind Speed at South Scottsdale
PM10 (µg/m3)
Wind Speed (MPH)
1,200
1,000
800
600
400
200
0
25
20
15
10
5
0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
South Scottsdale PM10
South Scottsdale Wind Speed

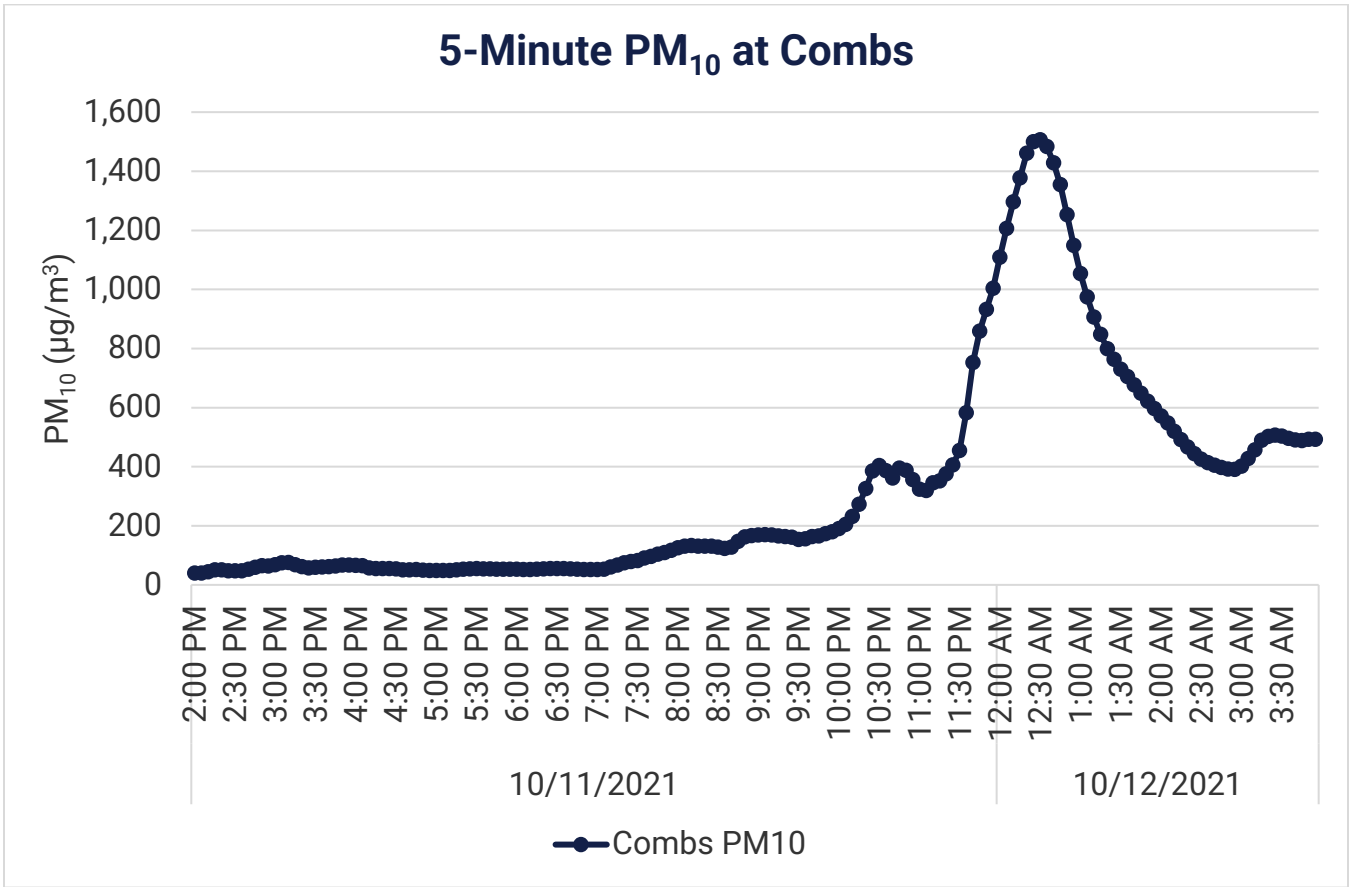

5-Minute PM10 and Wind Speed at Tempe
PM10 (µg/m3)
Wind Speed (MPH)
1,400
1,200
1,000
800
600
400
200
0
14
12
10
8
6
4
2
0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Tempe PM10
Tempe Wind Speed

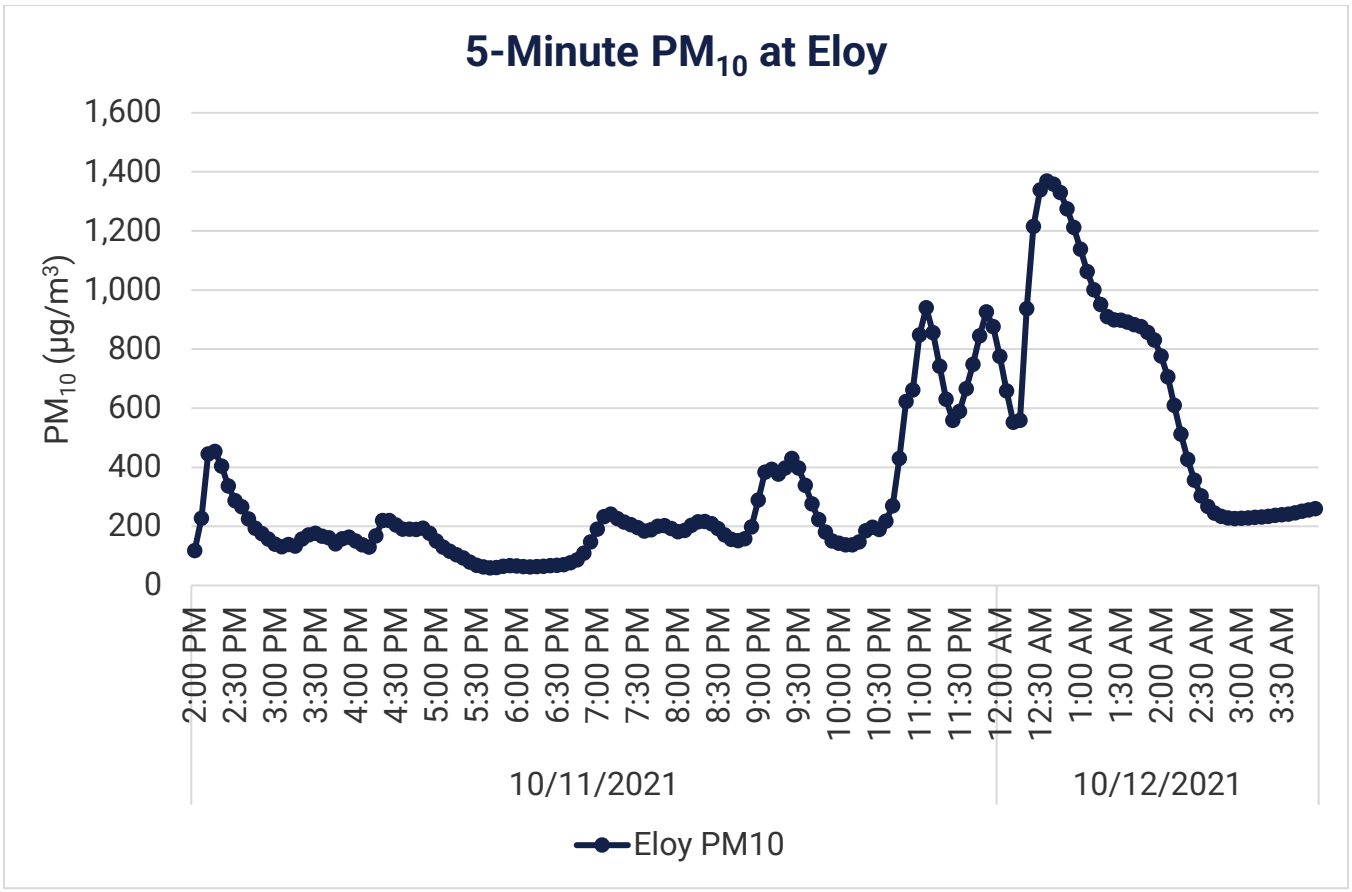


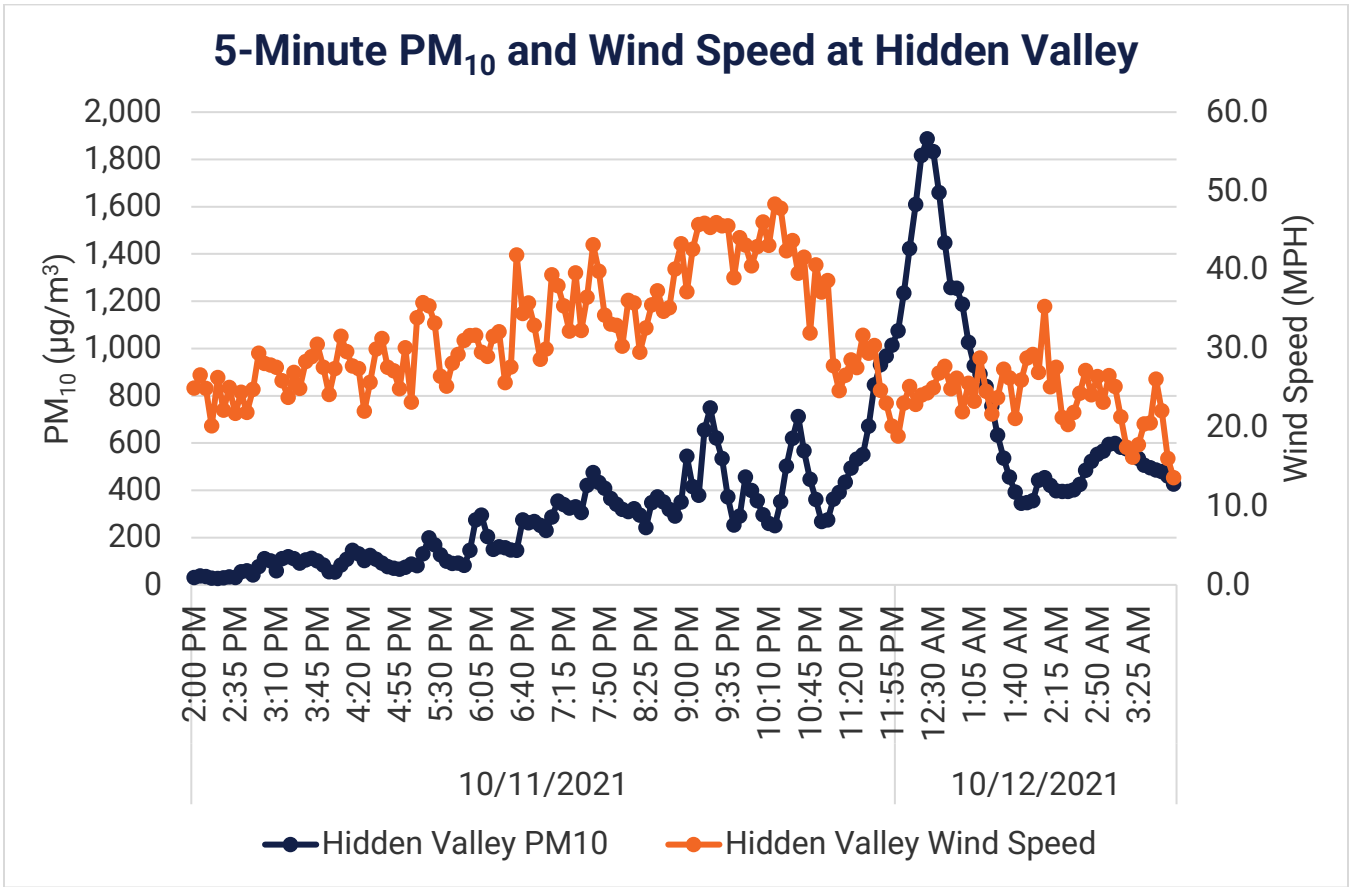


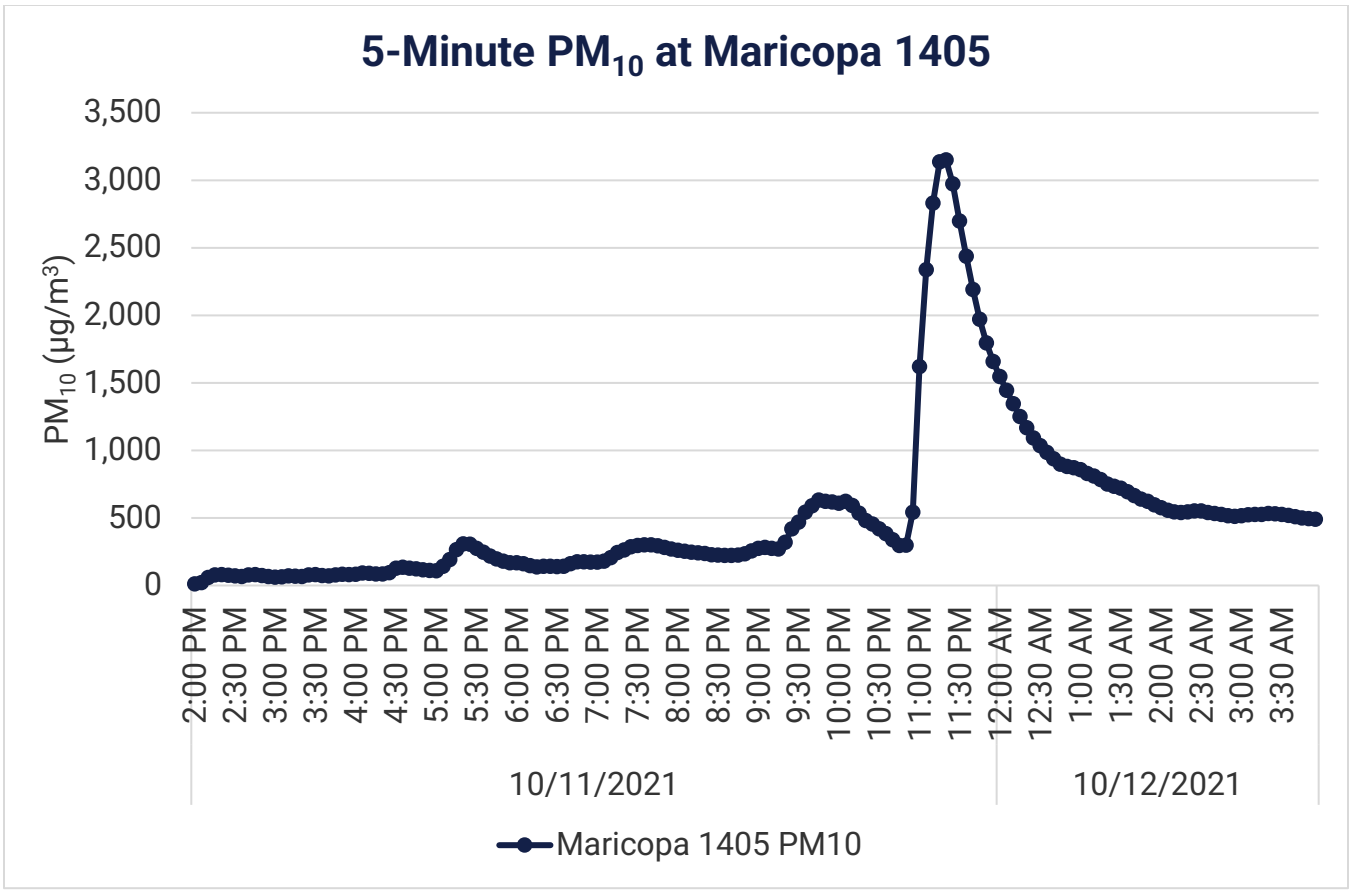
Note: 5-minute PM10 data at Apache Junction were not valid for this time period.

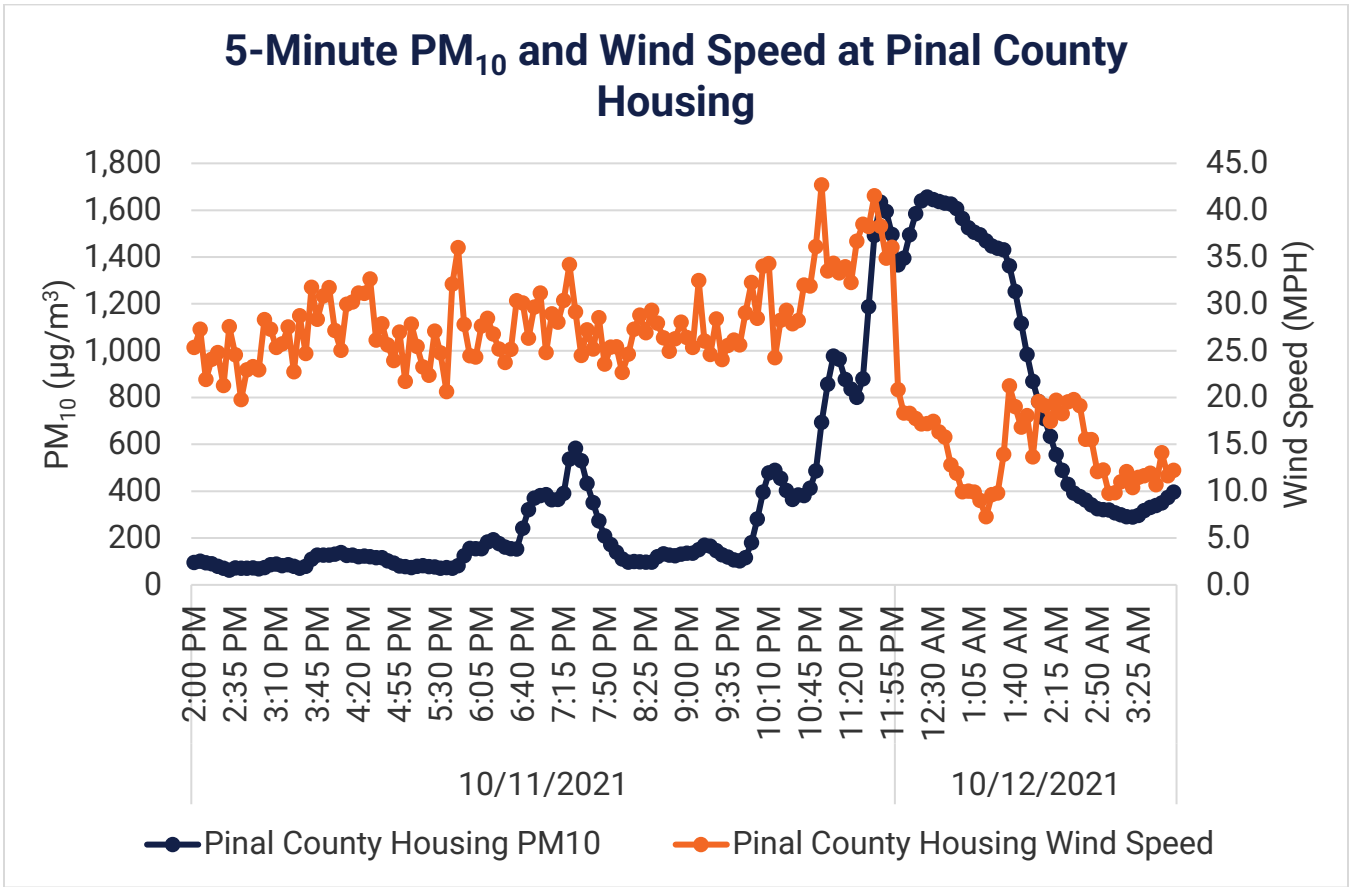

5-Minute PM10 at Casa Grande Downtown
2,500
2,000
1,500
1,000
500
0
PM10 (µg/m3)
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
10/11/2021
10/12/2021
Casa Grande Downtown PM10

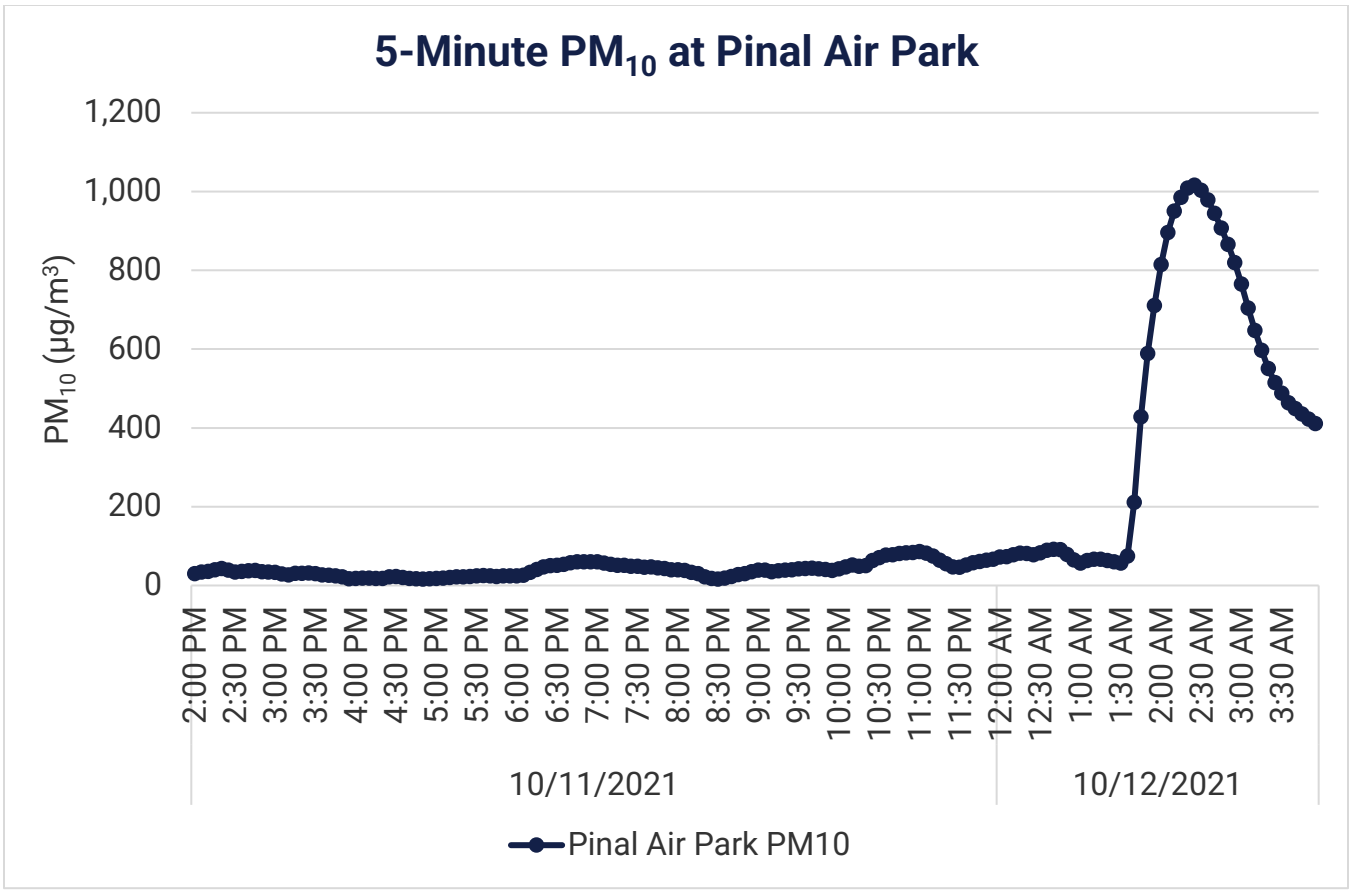

5-Minute PM10 at Combs
1,600
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
10/11/2021
10/12/2021
Combs PM10

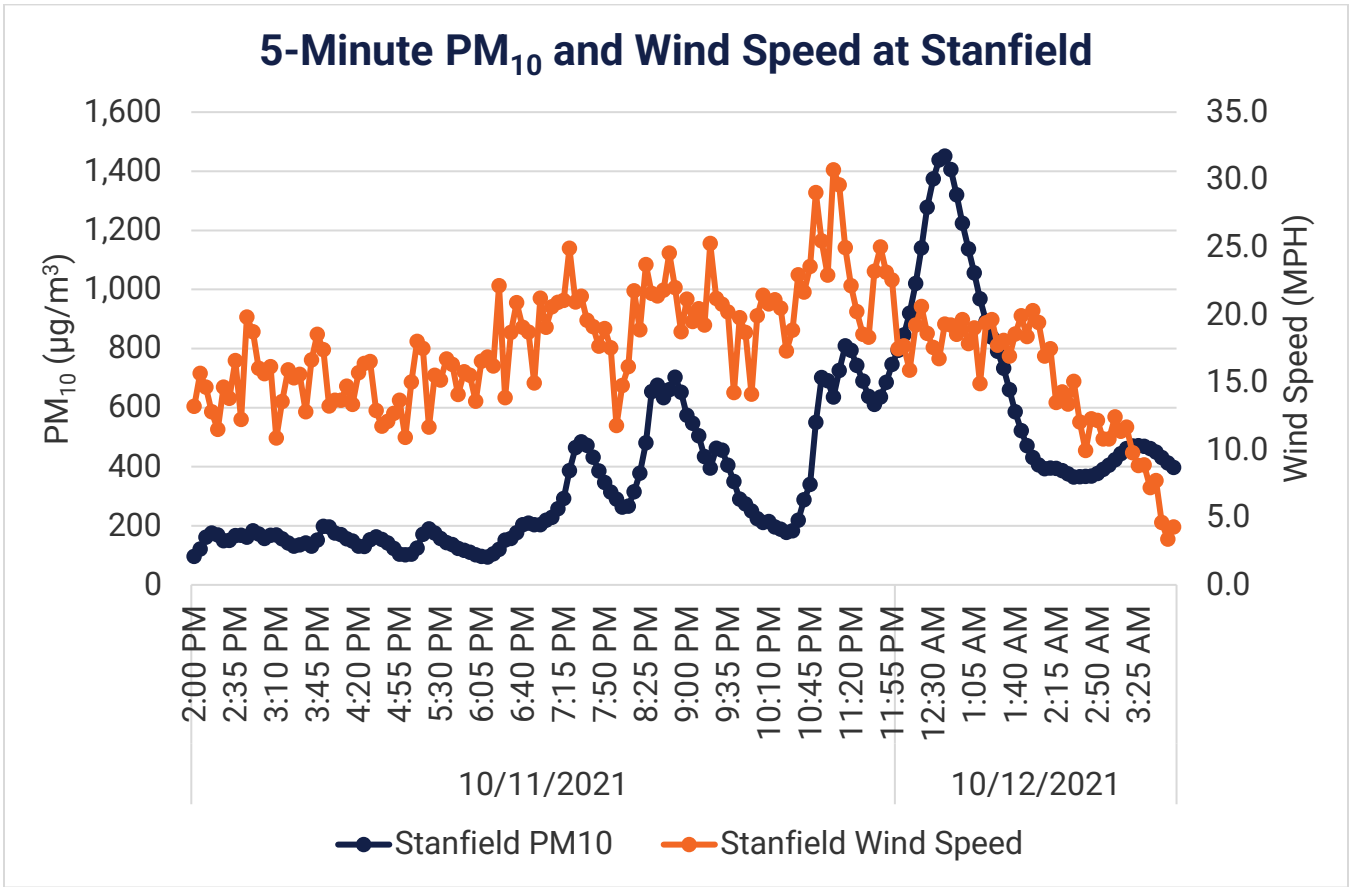

5-Minute PM10 at Eloy
PM10 (µg/m3)
1,600
1,400
1,200
1,000
800
600
400
200
0
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
10/11/2021
10/12/2021
Eloy PM10

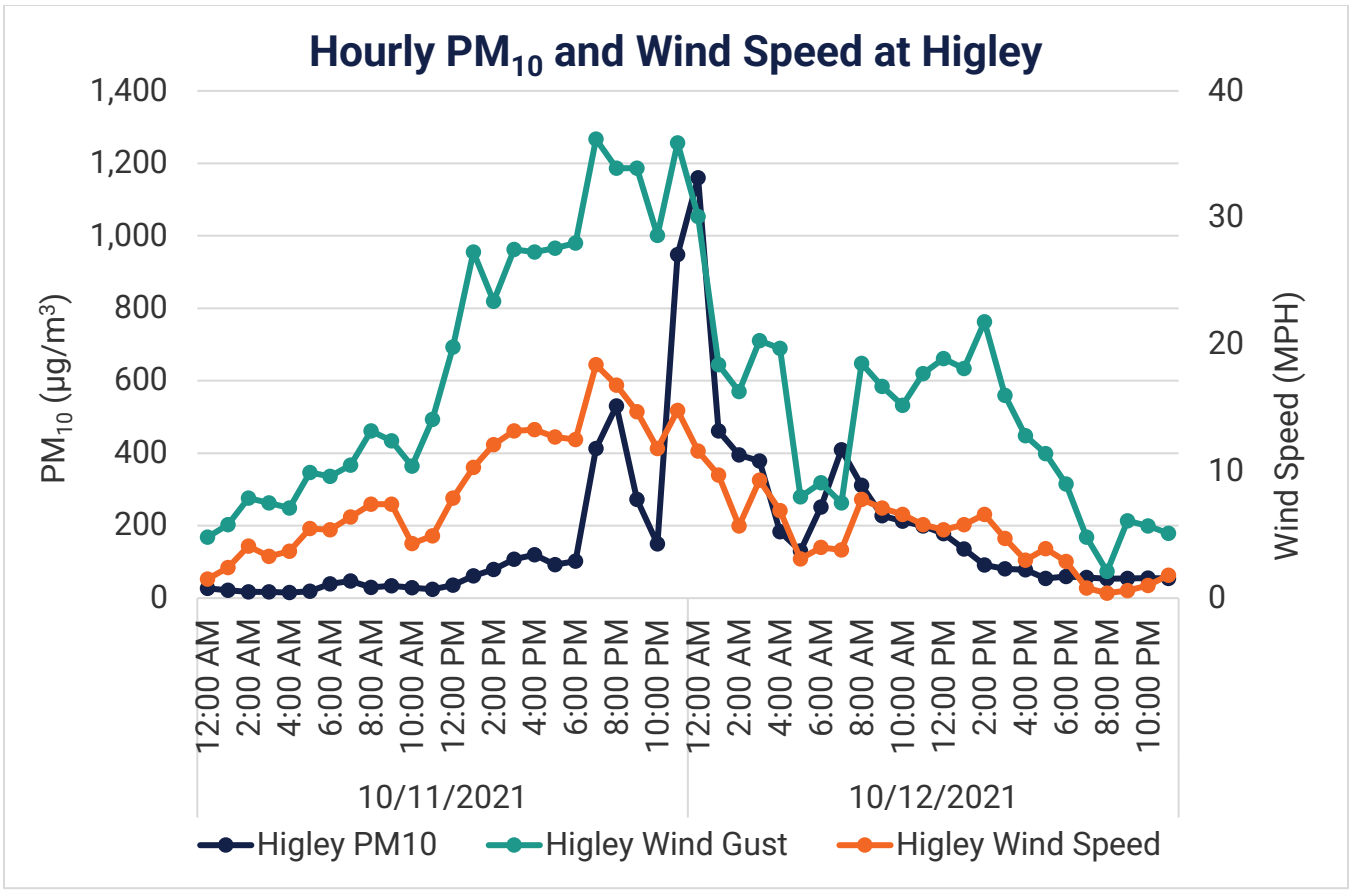

5-Minute PM10 and Wind Speed at Hidden Valley
PM10 (µg/m3)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Wind Speed (MPH)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Hidden Valley PM10
Hidden Valley Wind Speed

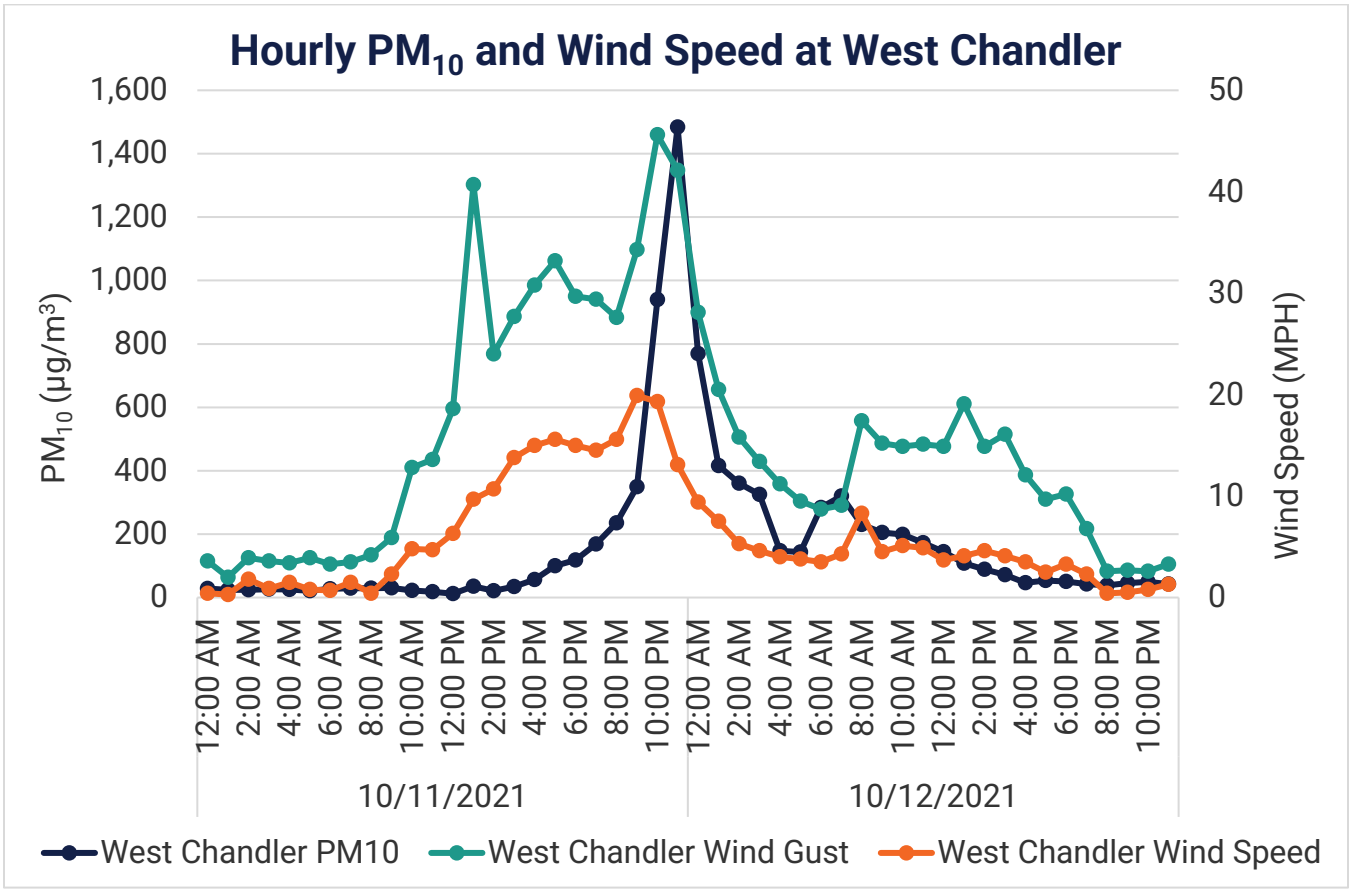

5-Minute PM10 at Maricopa 1405
PM10 (µg/m3)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
10/11/2021
10/12/2021
Maricopa 1405 PM10

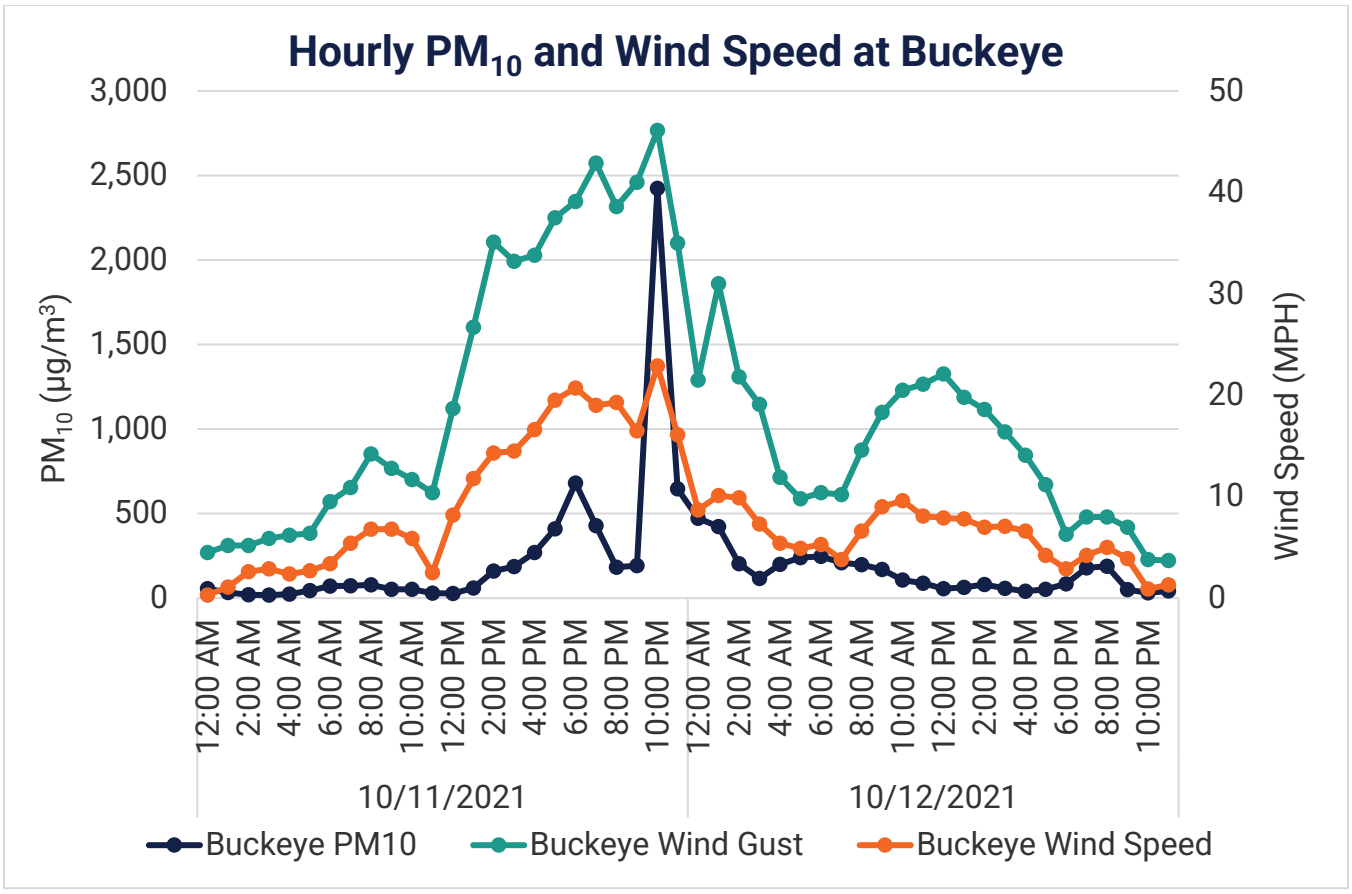

5-Minute PM10 and Wind Speed at Pinal County Housing
PM10 (µg/m3)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Wind Speed (MPH)
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Pinal County Housing PM10
Pinal County Housing Wind Speed

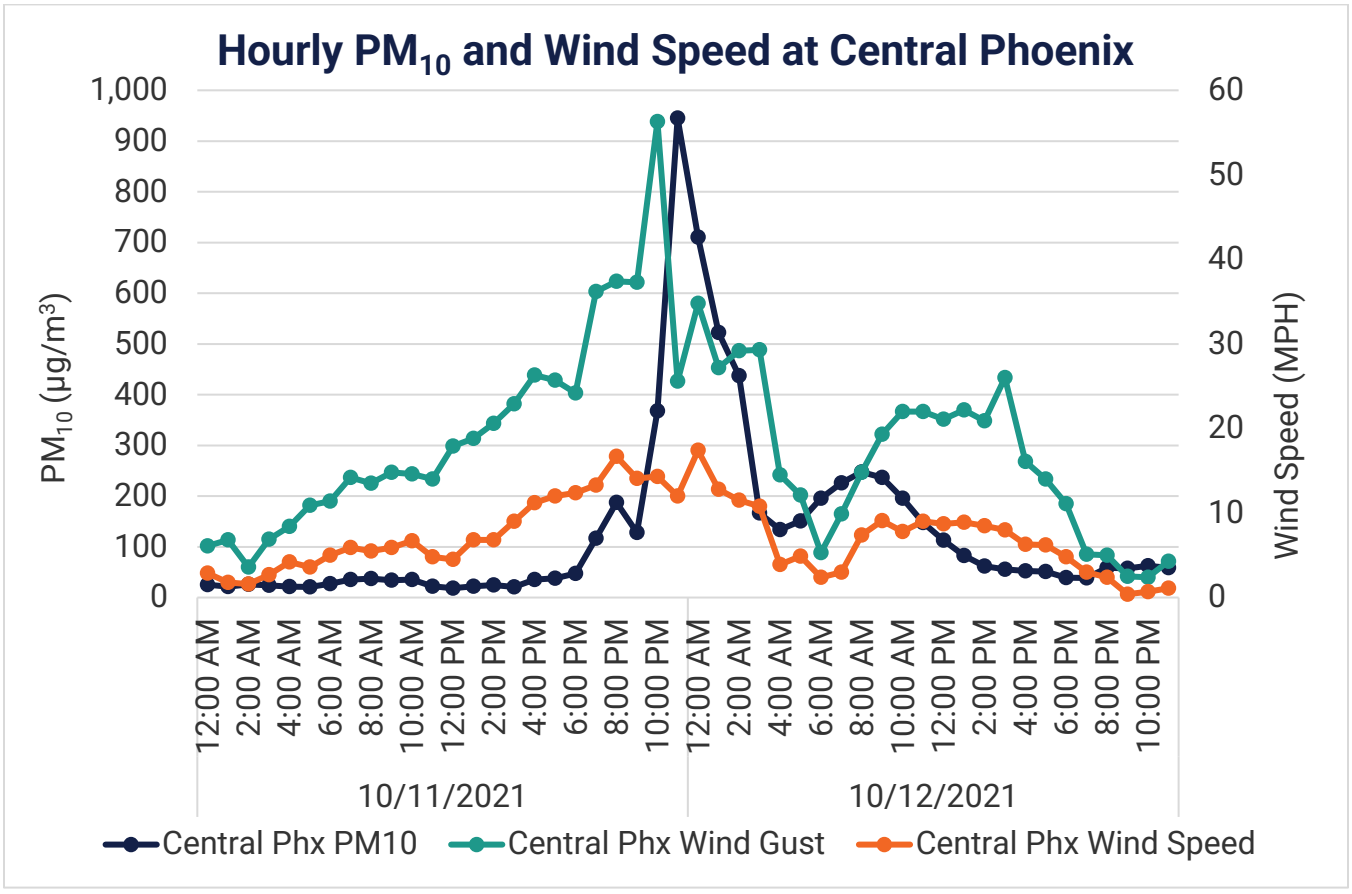

5-Minute PM10 at Pinal Air Park
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
10/11/2021
10/12/2021
Pinal Air Park PM10

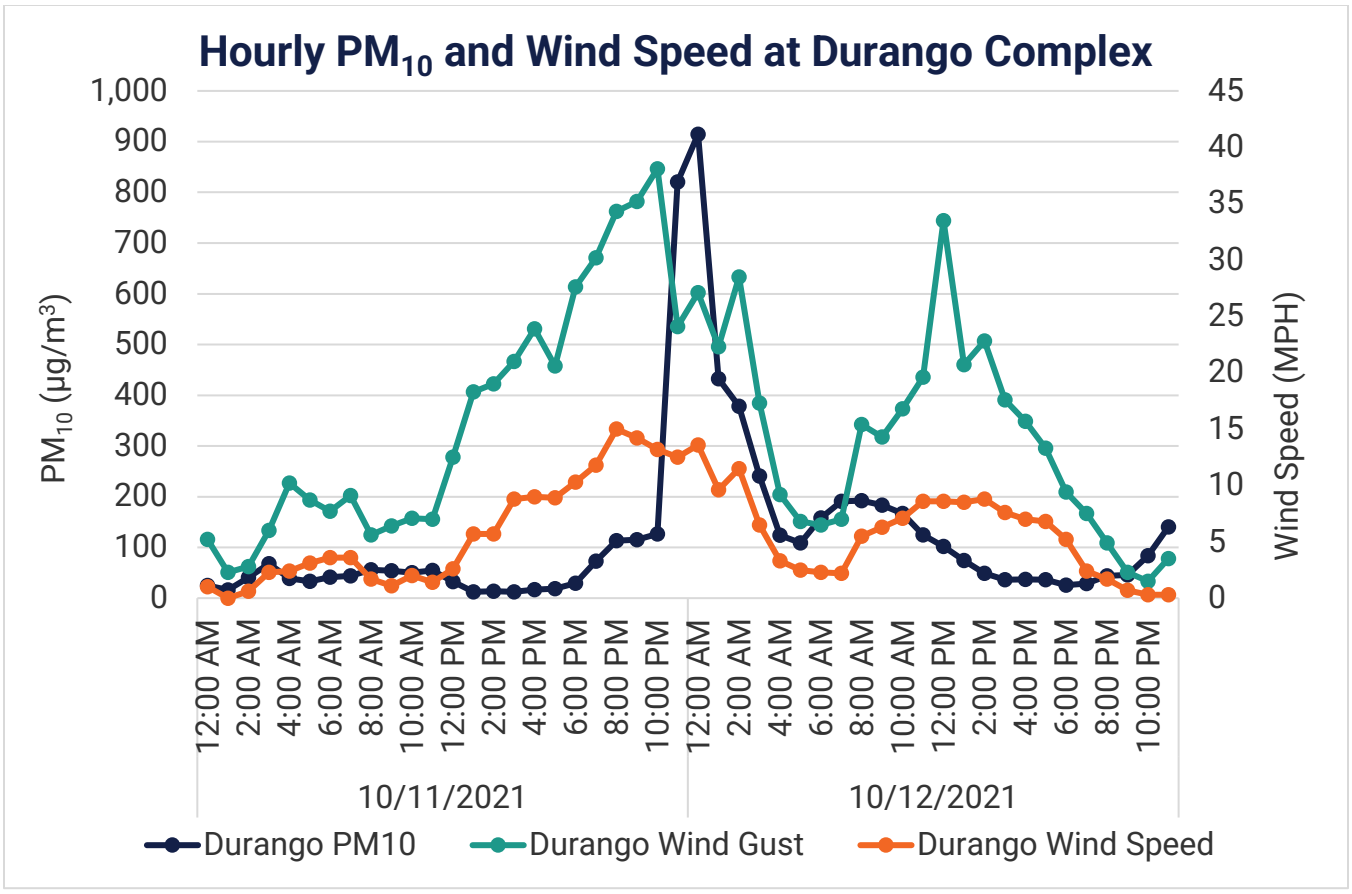

5-Minute PM10 and Wind Speed at Stanfield
1,600
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Wind Speed (MPH)
2:00 PM
2:35 PM
3:10 PM
3:45 PM
4:20 PM
4:55 PM
5:30 PM
6:05 PM
6:40 PM
7:15 PM
7:50 PM
8:25 PM
9:00 PM
9:35 PM
10:10 PM
10:45 PM
11:20 PM
11:55 PM
12:30 AM
1:05 AM
1:40 AM
2:15 AM
2:50 AM
3:25 AM
10/11/2021
10/12/2021
Stanfield PM10
Stanfield Wind Speed

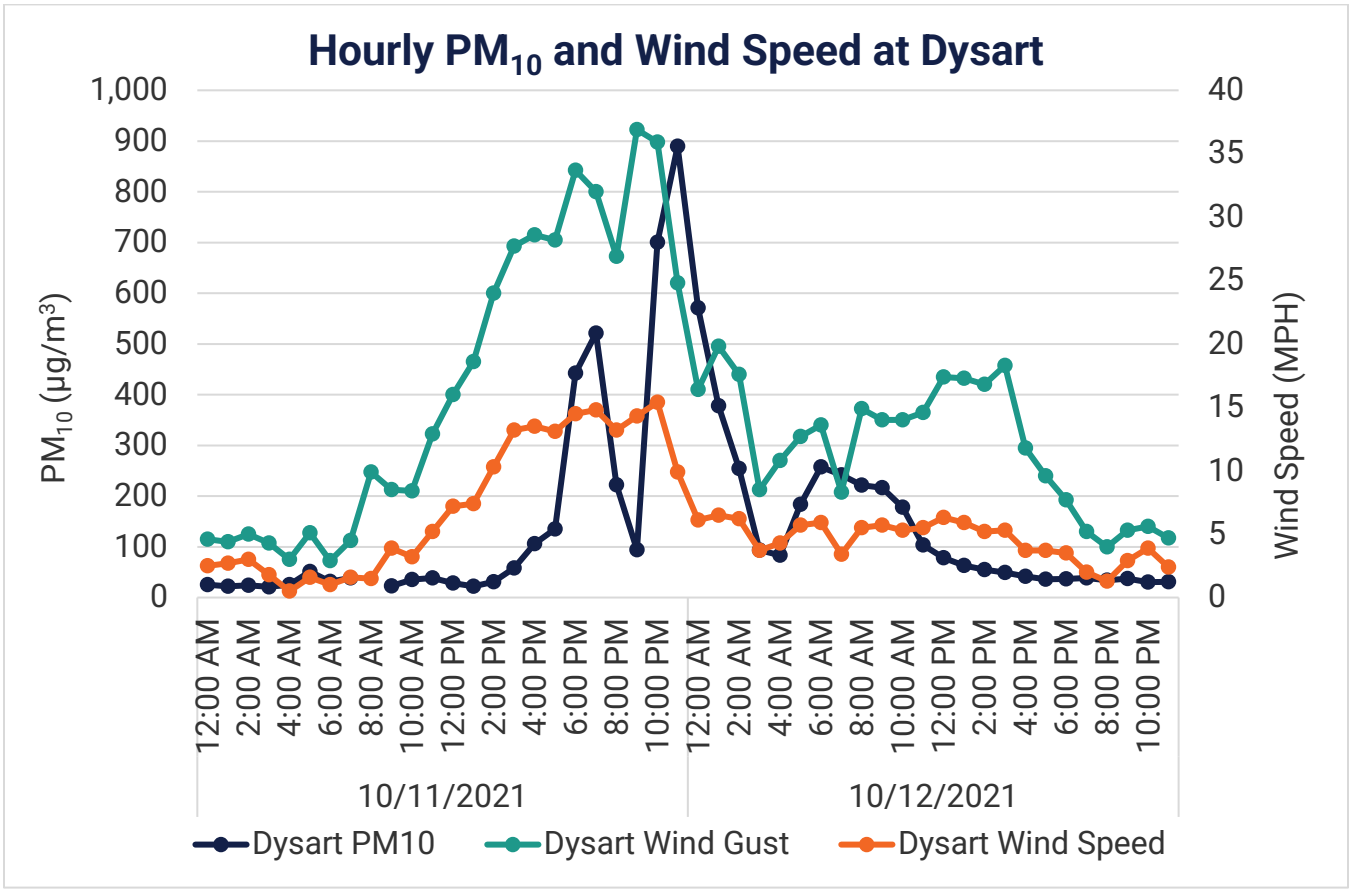

Hourly PM10 and Wind Speed at Higley
PM10 (µg/m3)
Wind Speed (MPH)
1,400
1,200
1,000
800
600
400
200
0
40
30
20
10
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Higley PM10
Higley Wind Gust
Higley Wind Speed

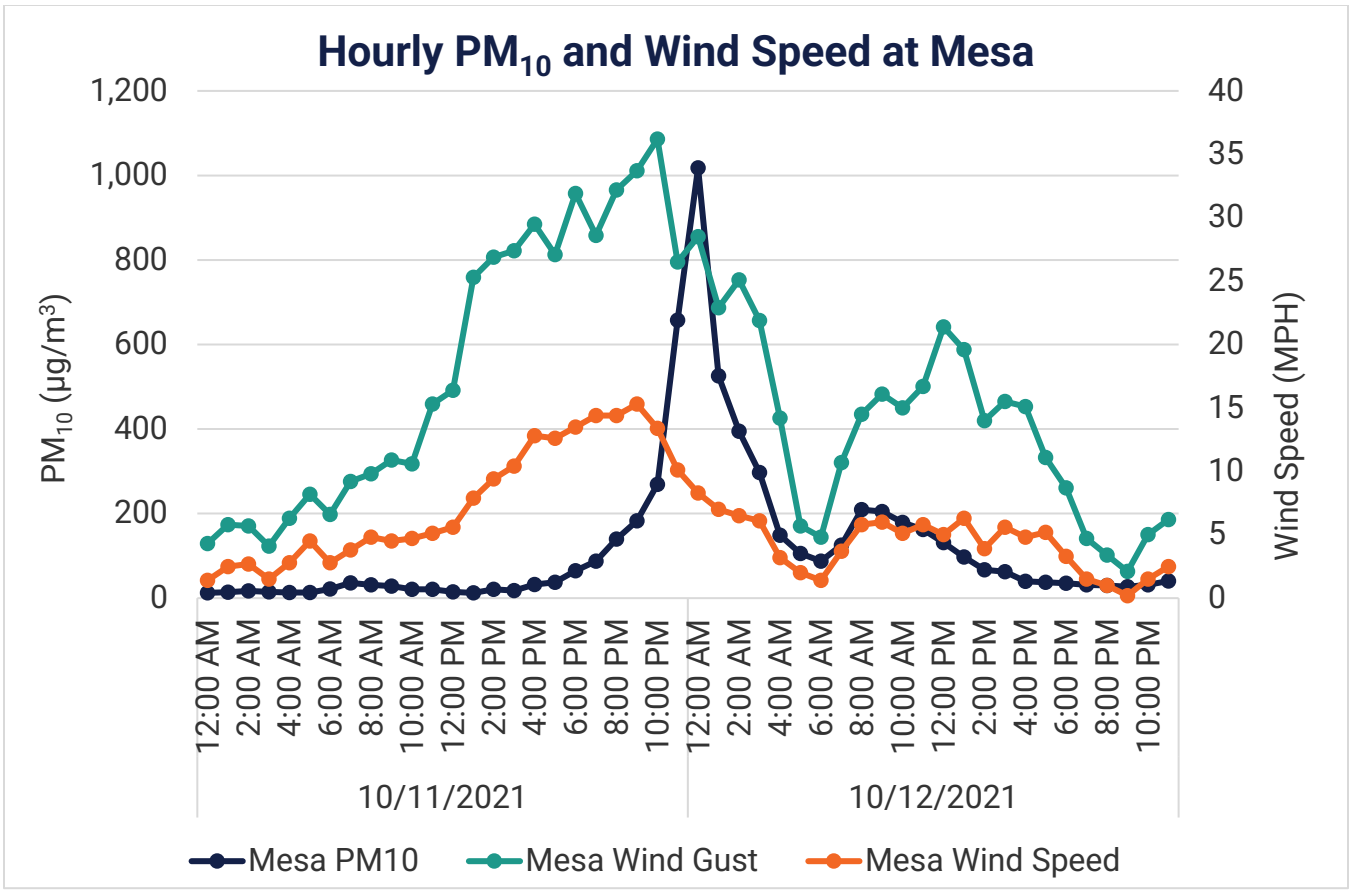

Hourly PM10 and Wind Speed at West Chandler
PM10 (µg/m3)
Wind Speed (MPH)
1,600
1,400
1,200
1,000
800
600
400
200
0
50
40
30
20
10
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
West Chandler PM10
West Chandler Wind Gust
West Chandler Wind Speed

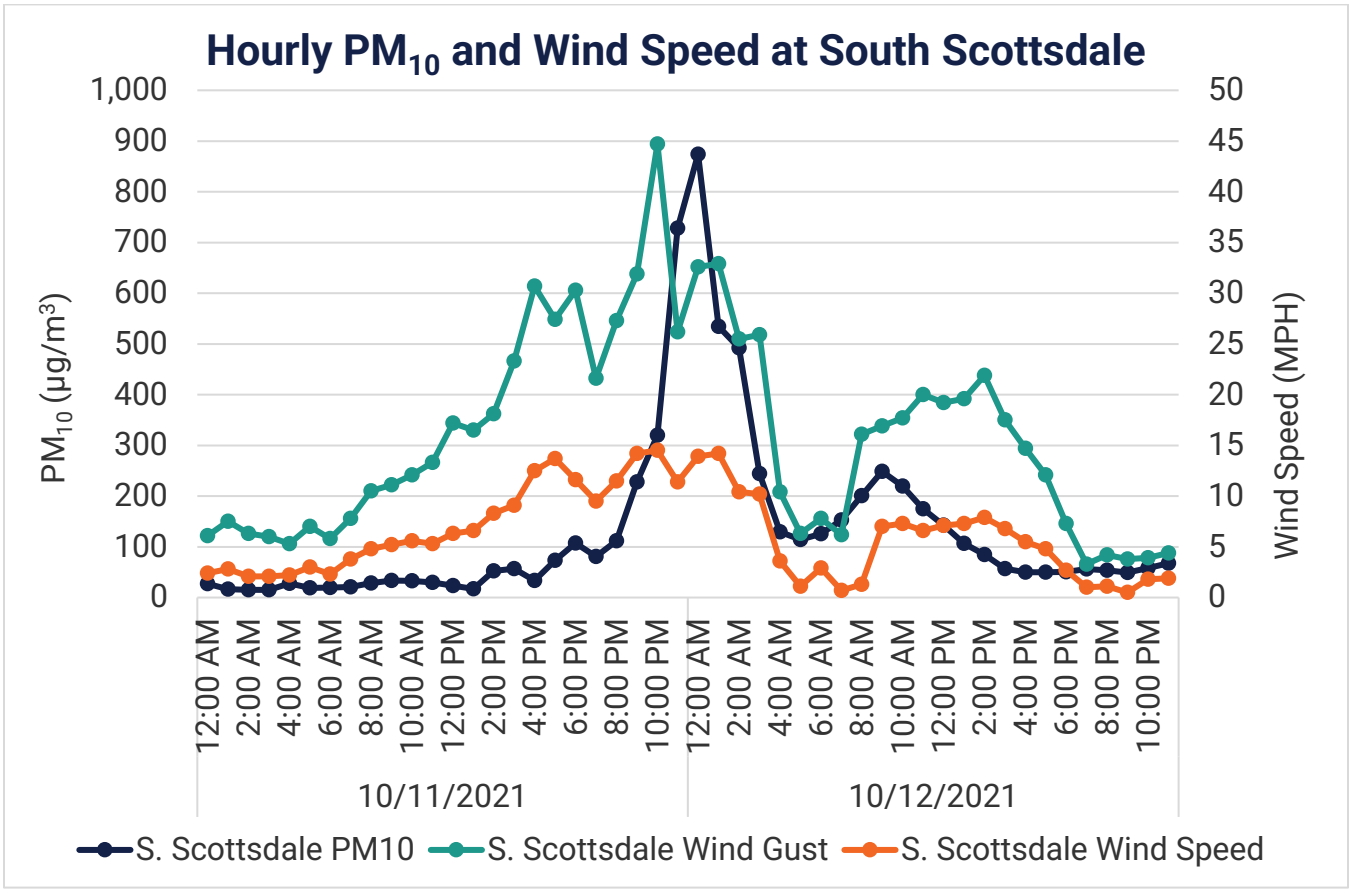

Hourly PM10 and Wind Speed at Buckeye
PM10 (µg/m3)
Wind Speed (MPH)
3,000
2,500
2,000
1,500
1,000
500
0
50
40
30
20
10
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Buckeye PM10
Buckeye Wind Gust
Buckeye Wind Speed

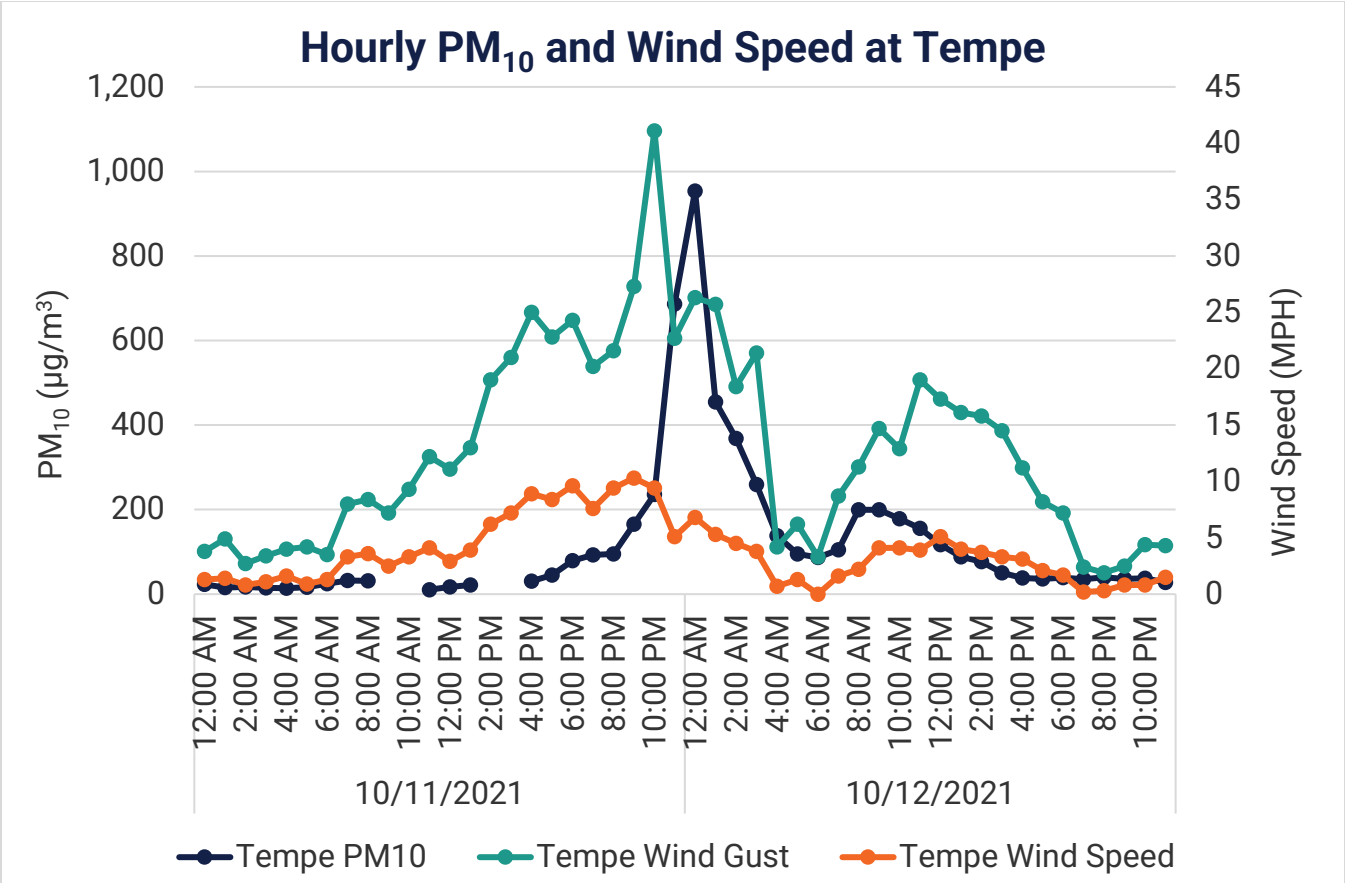

Hourly PM10 and Wind Speed at Central Phoenix
PM10 (µg/m3)
Wind Speed (MPH)
1,000
900
800
700
600
500
400
300
200
100
0
60
50
40
30
20
10
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Central Phx PM10
Central Phx Wind Gust
Central Phx Wind Speed

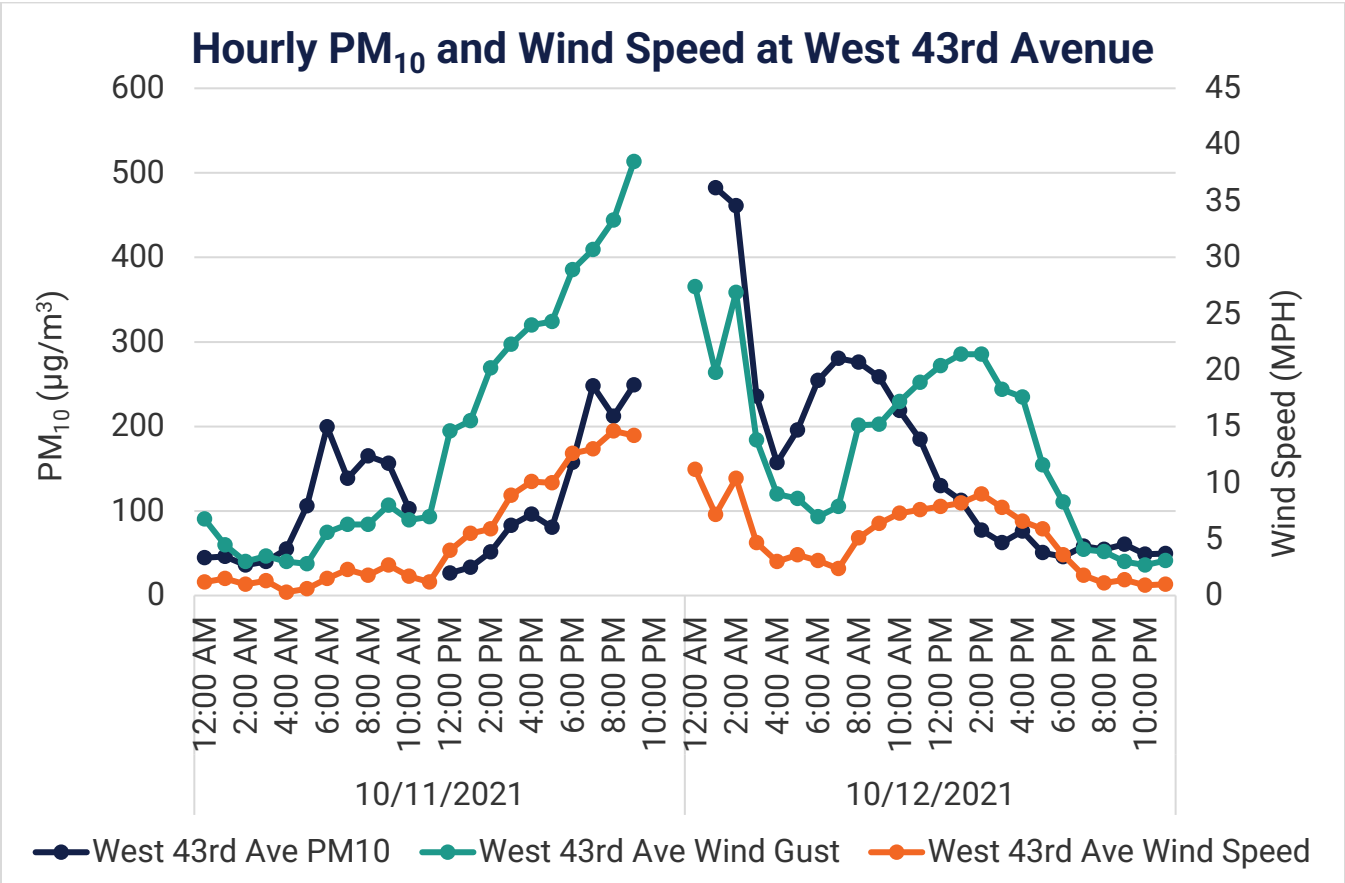

Hourly PM10 and Wind Speed at Durango Complex
PM10 (µg/m3)
Wind Speed (MPH)
1,000
900
800
700
600
500
400
300
200
100
0
45
40
35
30
25
20
15
10
5
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Durango PM10
Durango Wind Gust
Durango Wind Speed

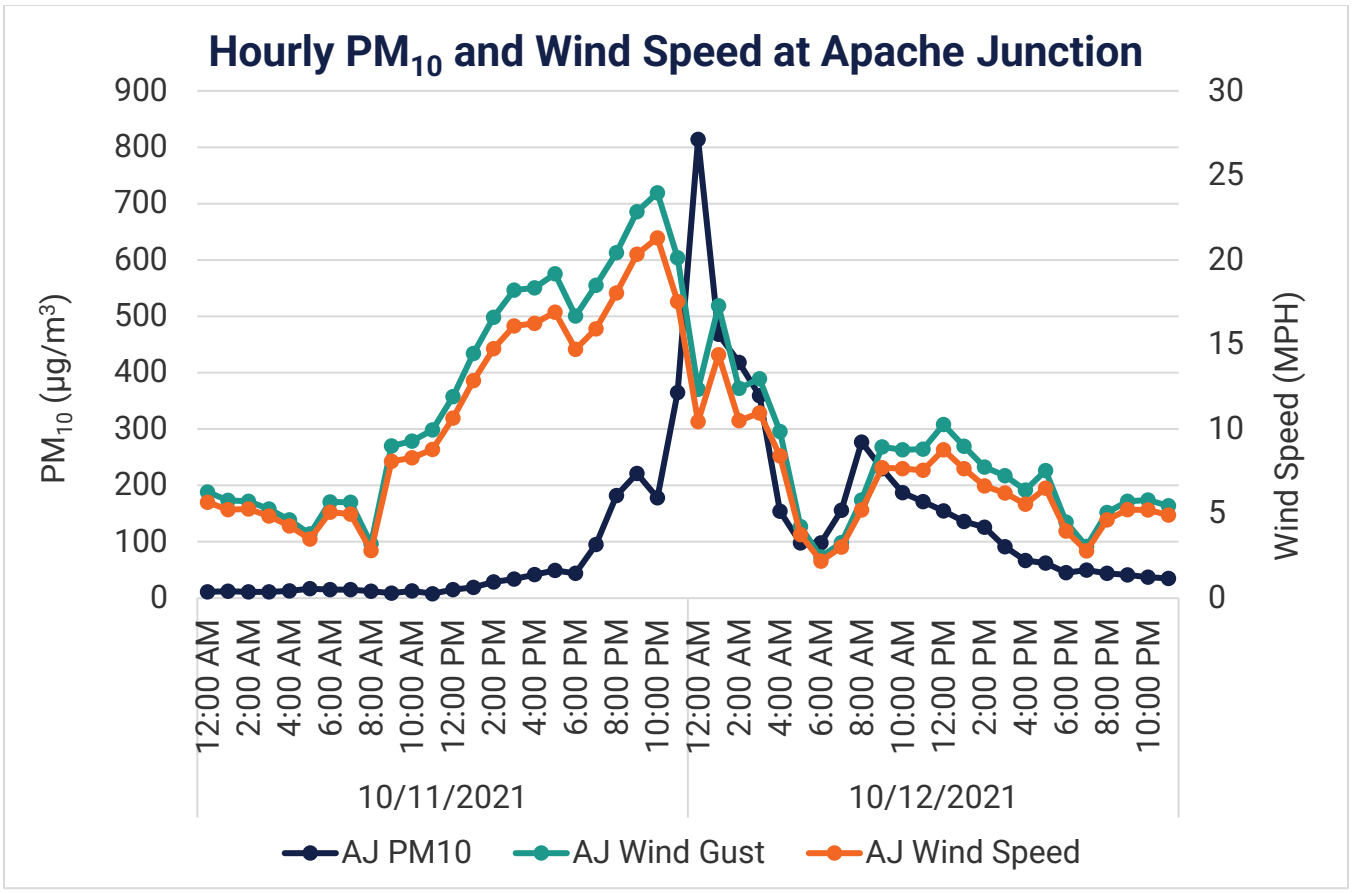

Hourly PM10 and Wind Speed at Dysart
PM10 (µg/m3)
Wind Speed (MPH)
1,000
900
800
700
600
500
400
300
200
100
0
40
35
30
25
20
15
10
5
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Dysart PM10
Dysart Wind Gust
Dysart Wind Speed

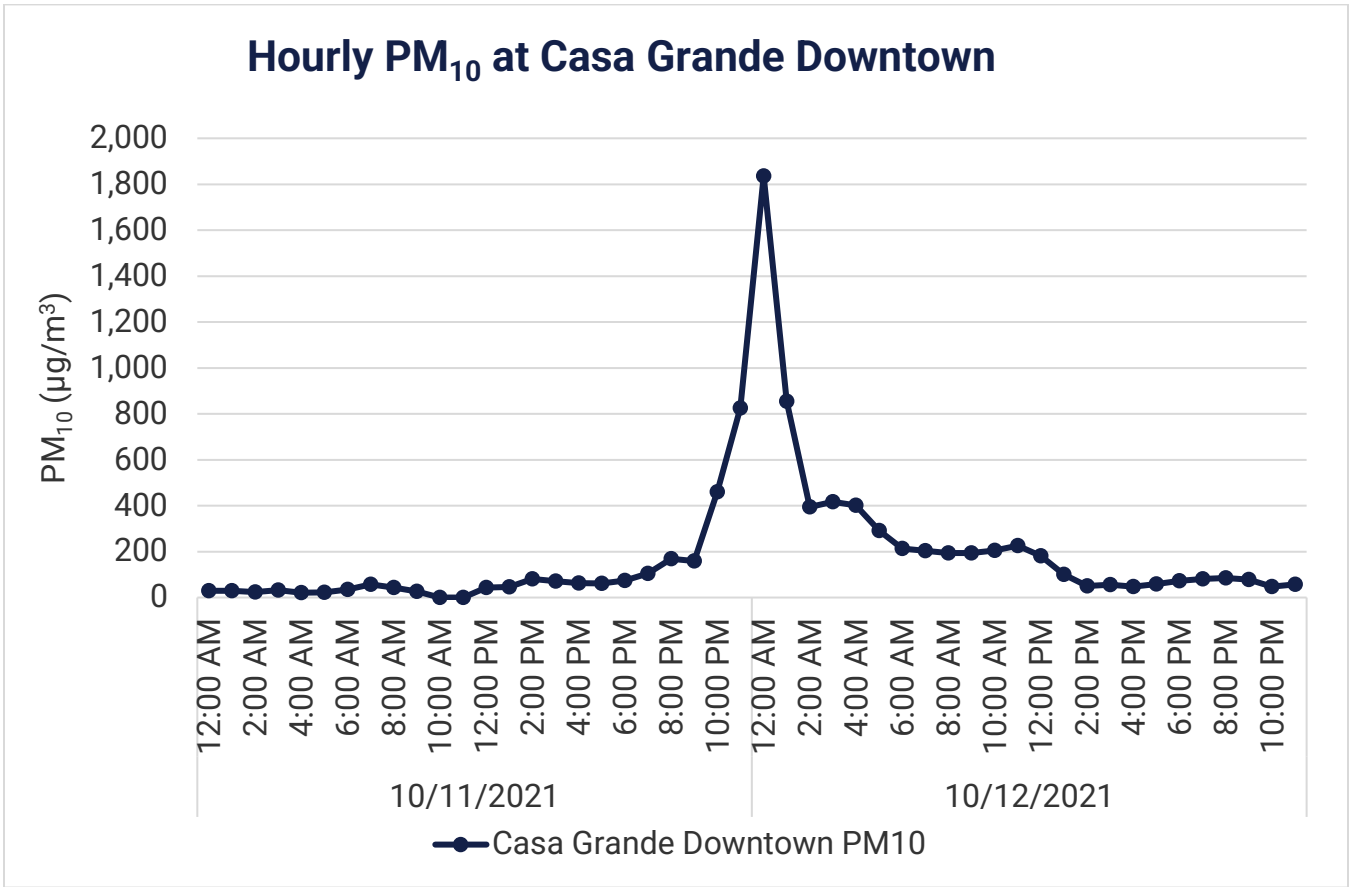

Hourly PM10 and Wind Speed at Mesa
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Mesa PM10
Mesa Wind Gust
Mesa Wind Speed

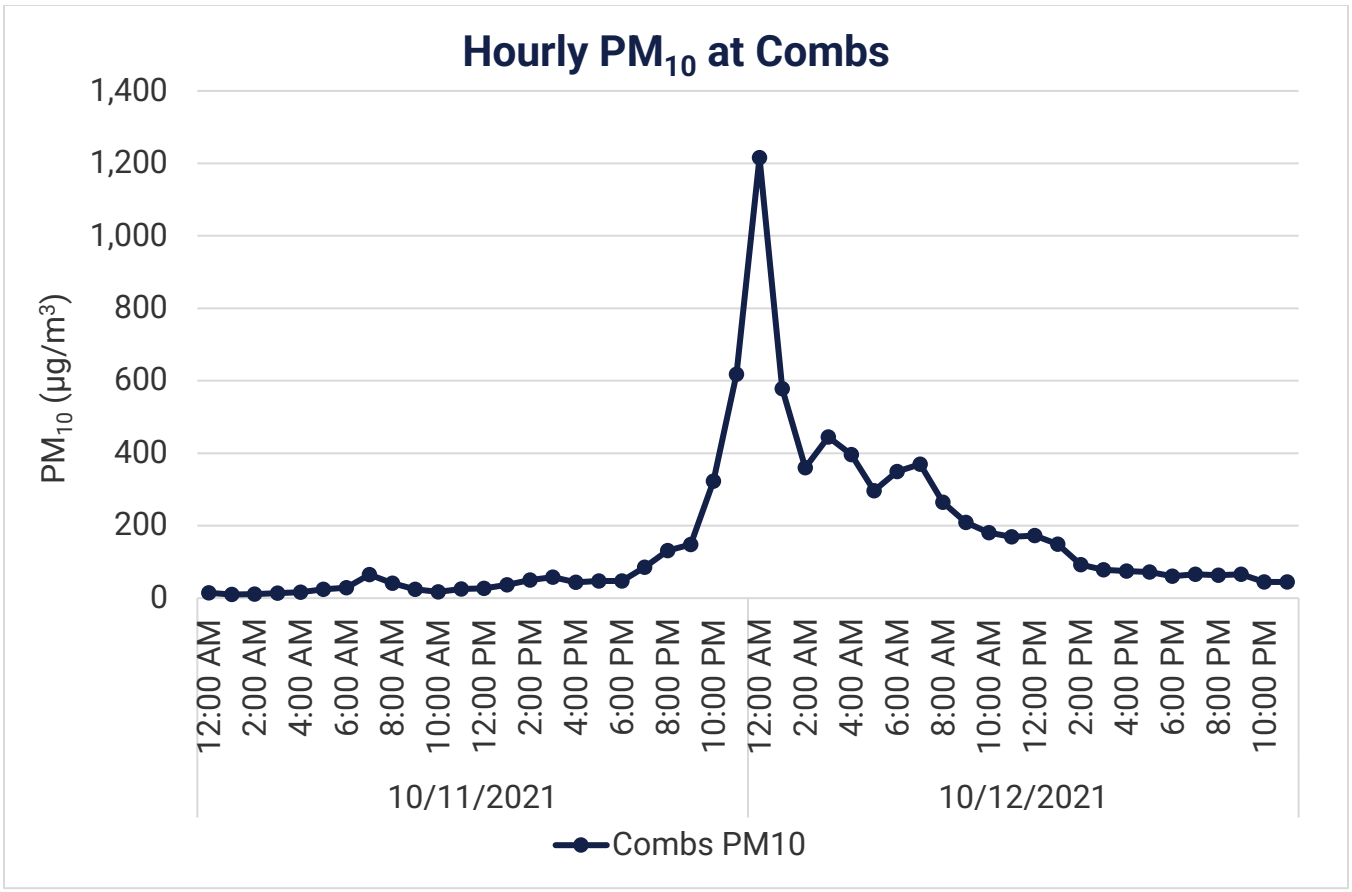

Hourly PM10 and Wind Speed at South Scottsdale
1,000
900
800
700
600
500
400
300
200
100
0
PM10 (µg/m3)
50
45
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
S. Scottsdale PM10
S. Scottsdale Wind Gust
S. Scottsdale Wind Speed

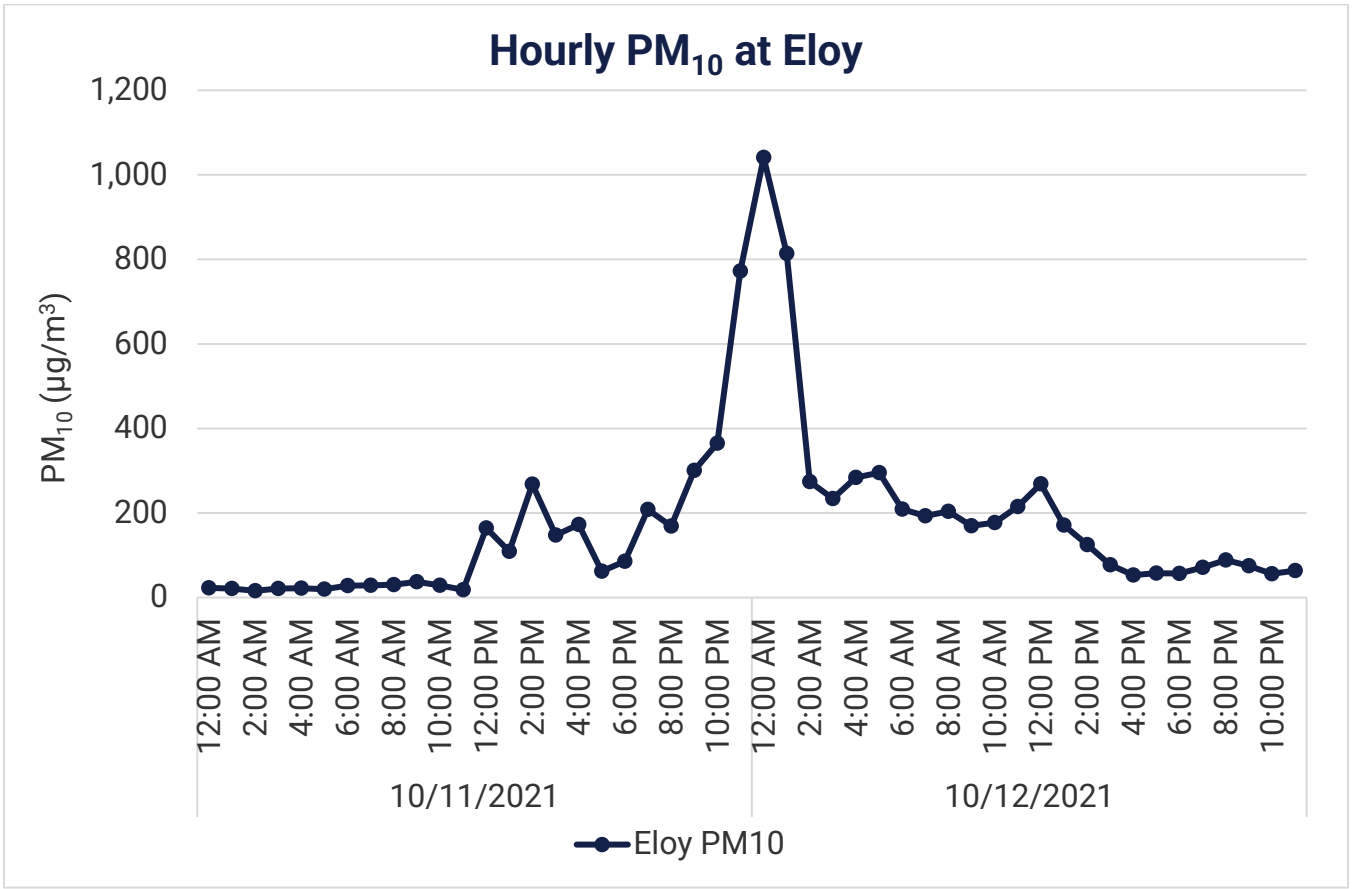

Hourly PM10 and Wind Speed at Tempe
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
45
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Tempe PM10
Tempe Wind Gust
Tempe Wind Speed

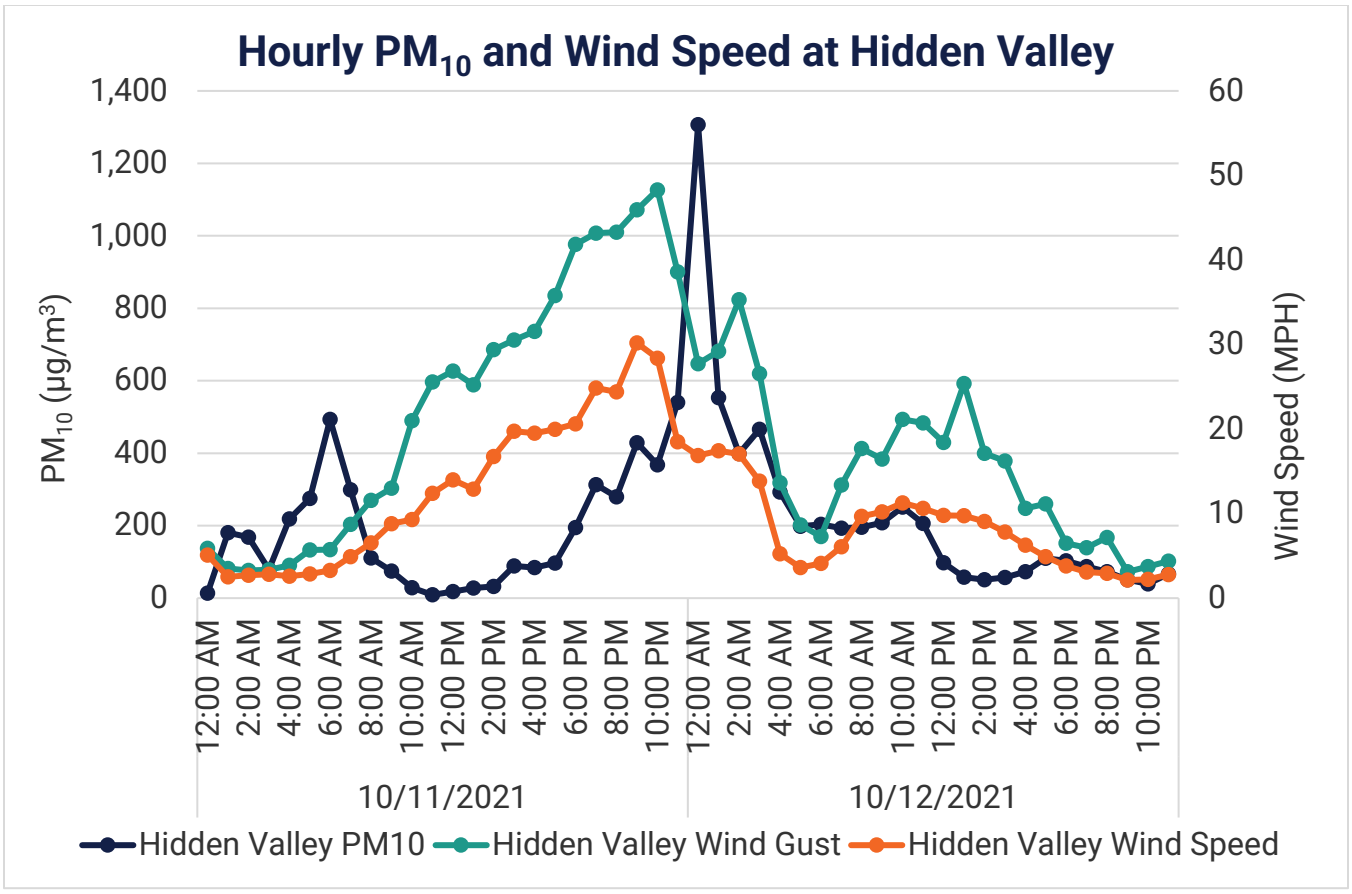

Hourly PM10 and Wind Speed at West 43rd Avenue
600
500
400
300
200
100
0
PM10 (µg/m3)
45
40
35
30
25
20
15
10
5
0
Wind Speed (MPH)
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
West 43rd Ave PM10
West 43rd Ave Wind Gust
West 43rd Ave Wind Speed

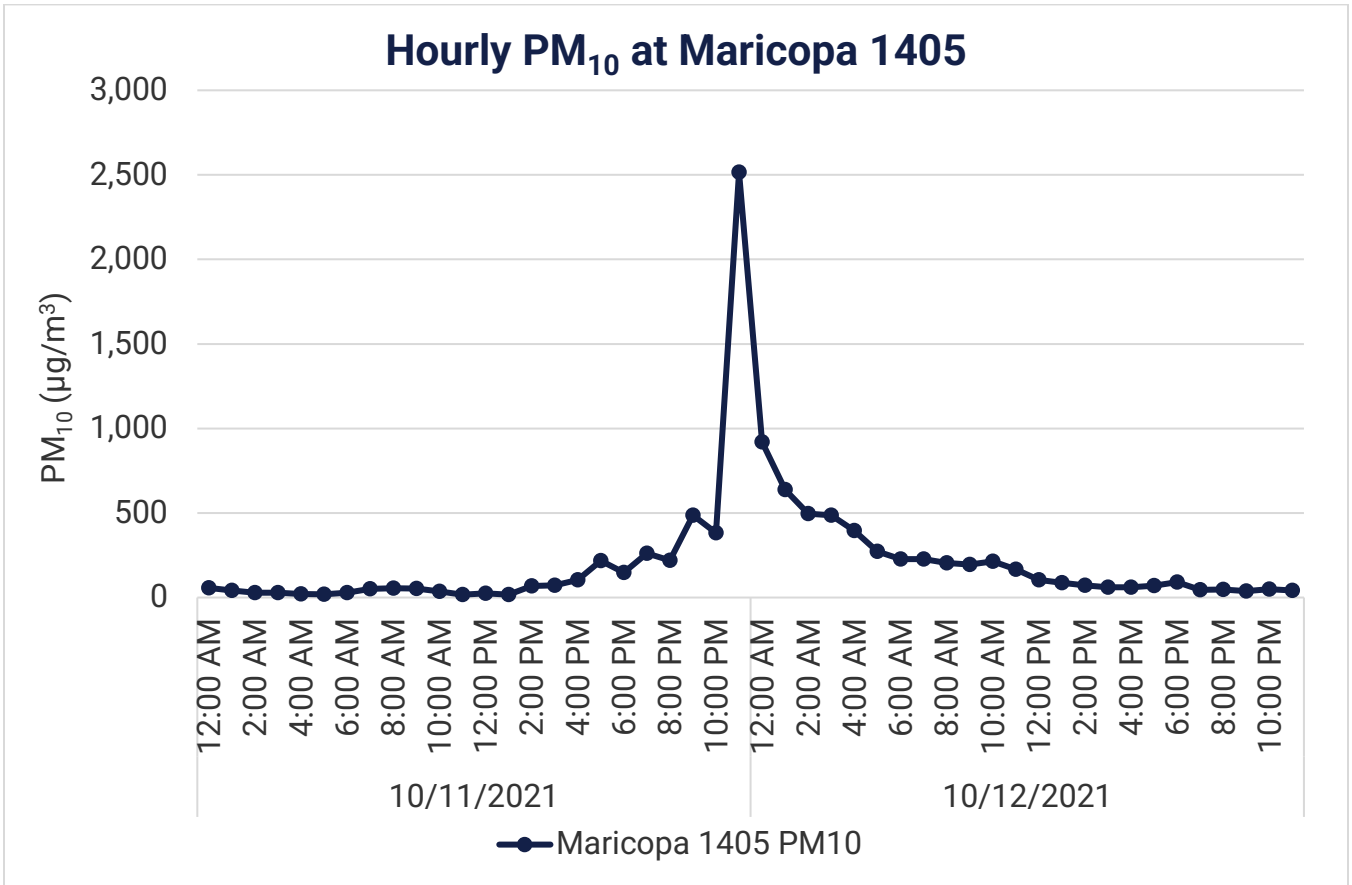

Hourly PM10 and Wind Speed at Apache Junction
PM10 (µg/m3)
Wind Speed (MPH)
900
800
700
600
500
400
300
200
100
0
30
25
20
15
10
5
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
AJ PM10
AJ Wind Gust
AJ Wind Speed

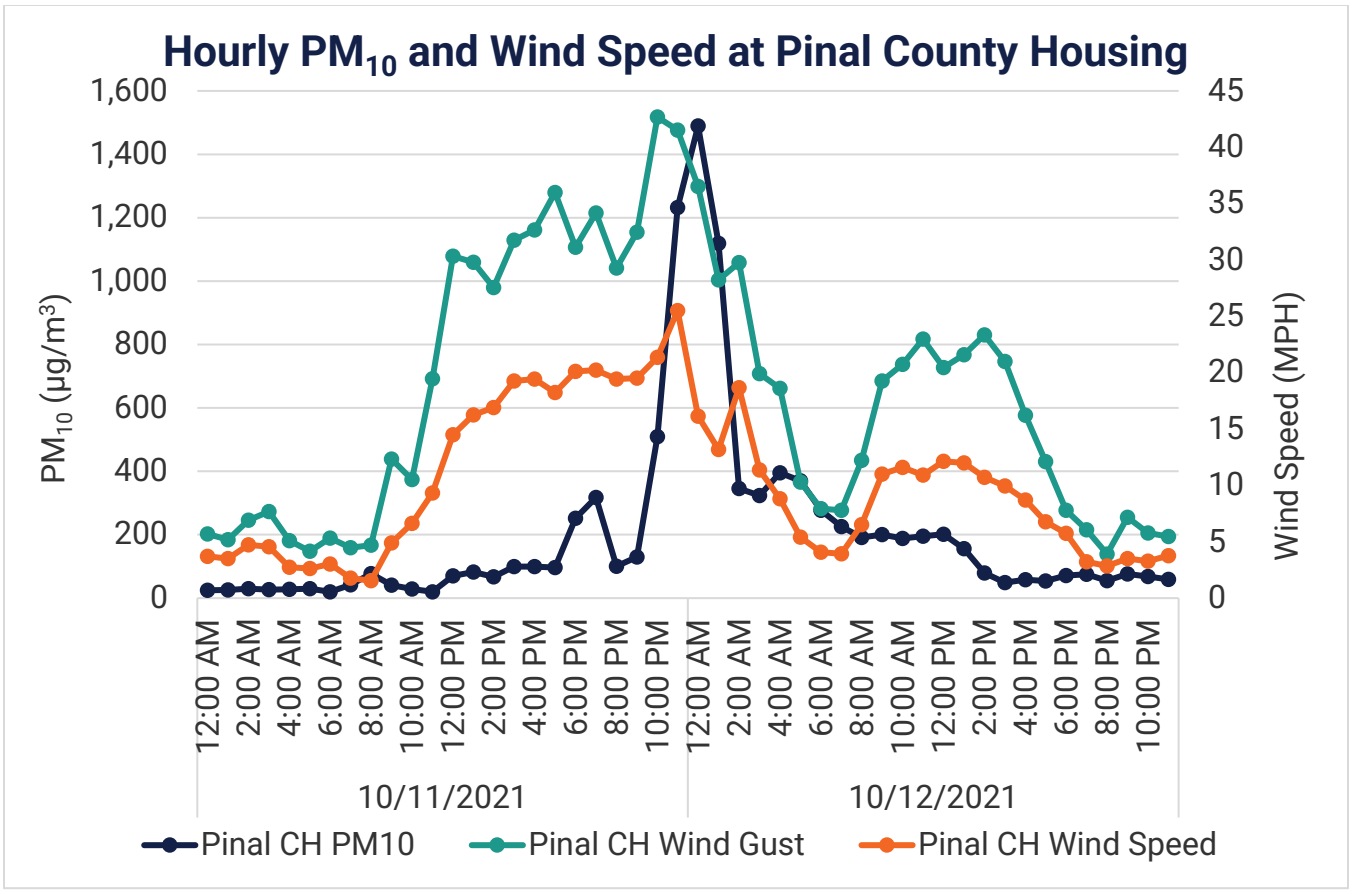

Hourly PM10 at Casa Grande Downtown
PM10 (µg/m3)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Casa Grande Downtown PM10

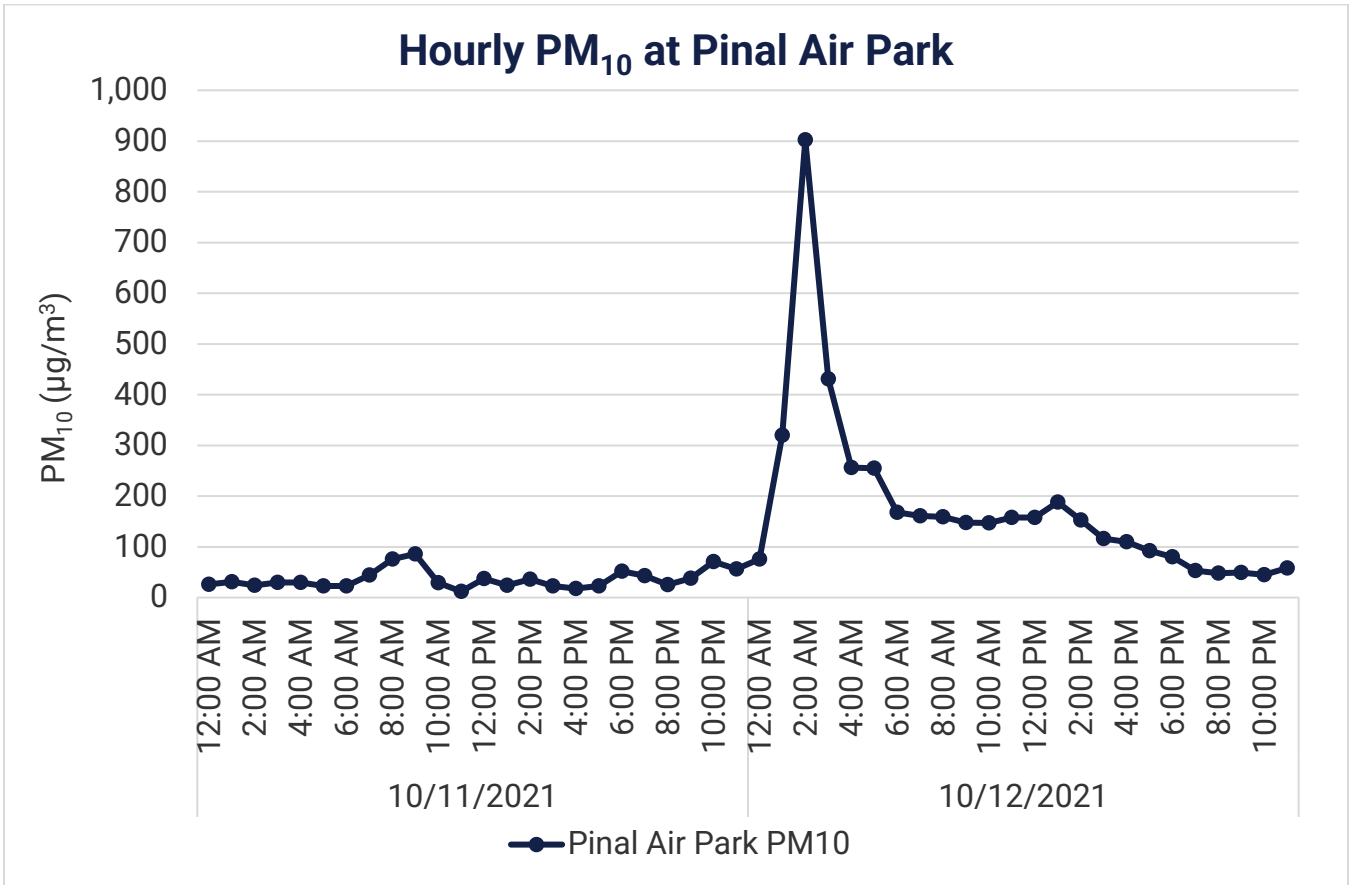

Hourly PM10 at Combs
1,400
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Combs PM10

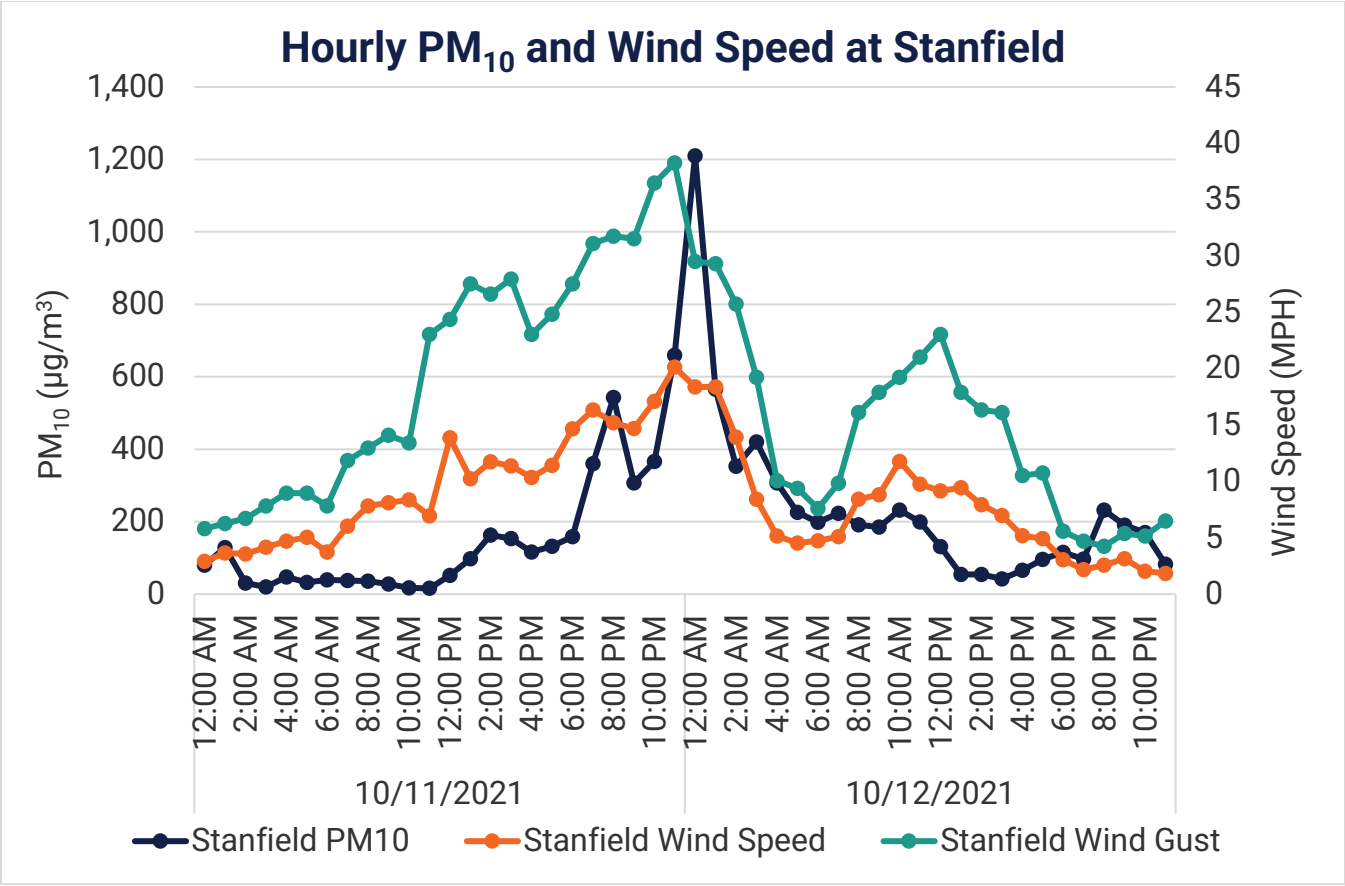

Hourly PM10 at Eloy
1,200
1,000
800
600
400
200
0
PM10 (µg/m3)
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Eloy PM10


Hourly PM10 and Wind Speed at Hidden Valley
PM10 (µg/m3)
Wind Speed (MPH)
1,400
1,200
1,000
800
600
400
200
0
60
50
40
30
20
10
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Hidden Valley PM10
Hidden Valley Wind Gust
Hidden Valley Wind Speed


Hourly PM10 at Maricopa 1405
PM10 (µg/m3)
3,000
2,500
2,000
1,500
1,000
500
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Maricopa 1405 PM10


Hourly PM10 and Wind Speed at Pinal County Housing
PM10 (µg/m3)
Wind Speed (MPH)
1,600
1,400
1,200
1,000
800
600
400
200
0
45
40
35
30
25
20
15
10
5
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Pinal CH PM10
Pinal CH Wind Gust
Pinal CH Wind Speed

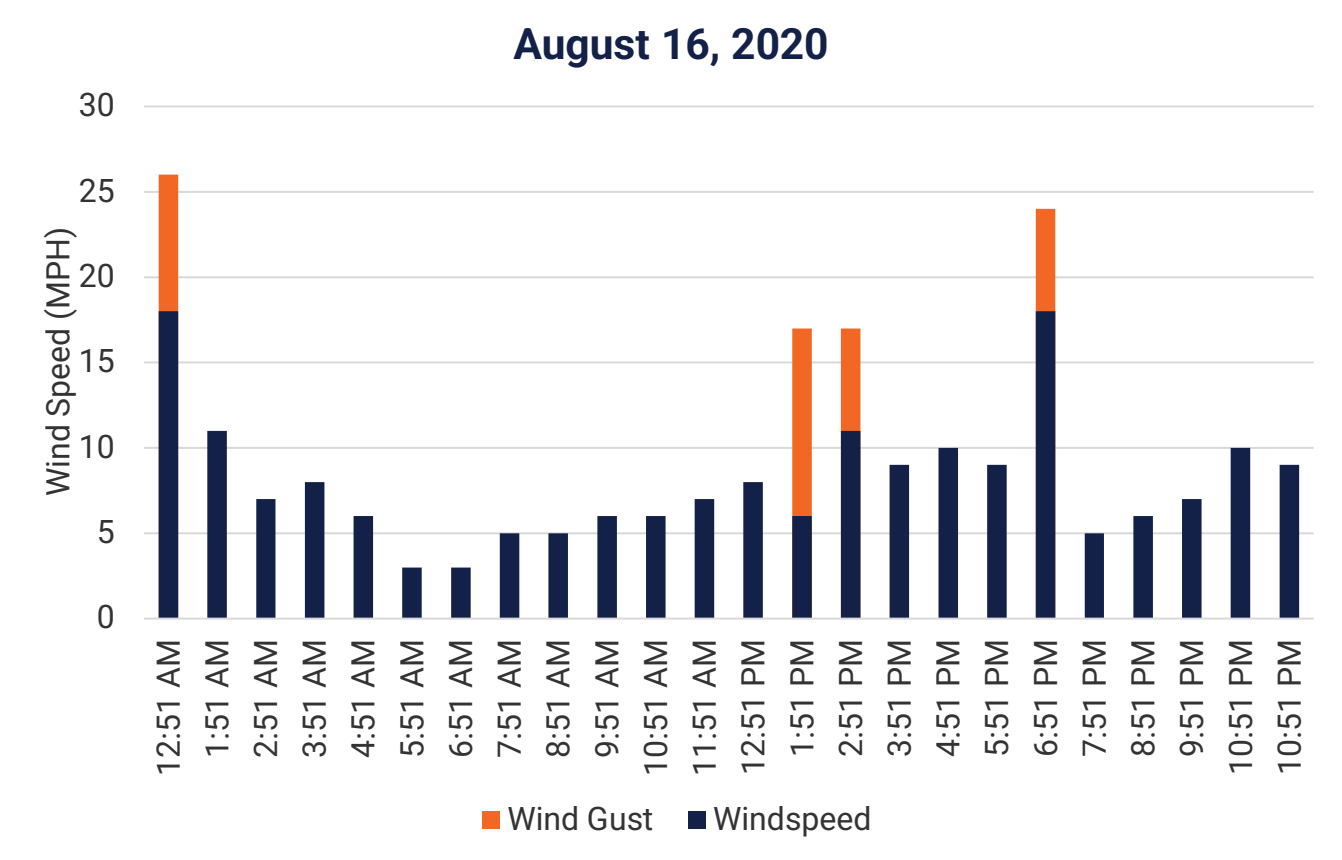

Hourly PM10 at Pinal Air Park
PM10 (µg/m3)
1,000
900
800
700
600
500
400
300
200
100
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Pinal Air Park PM10

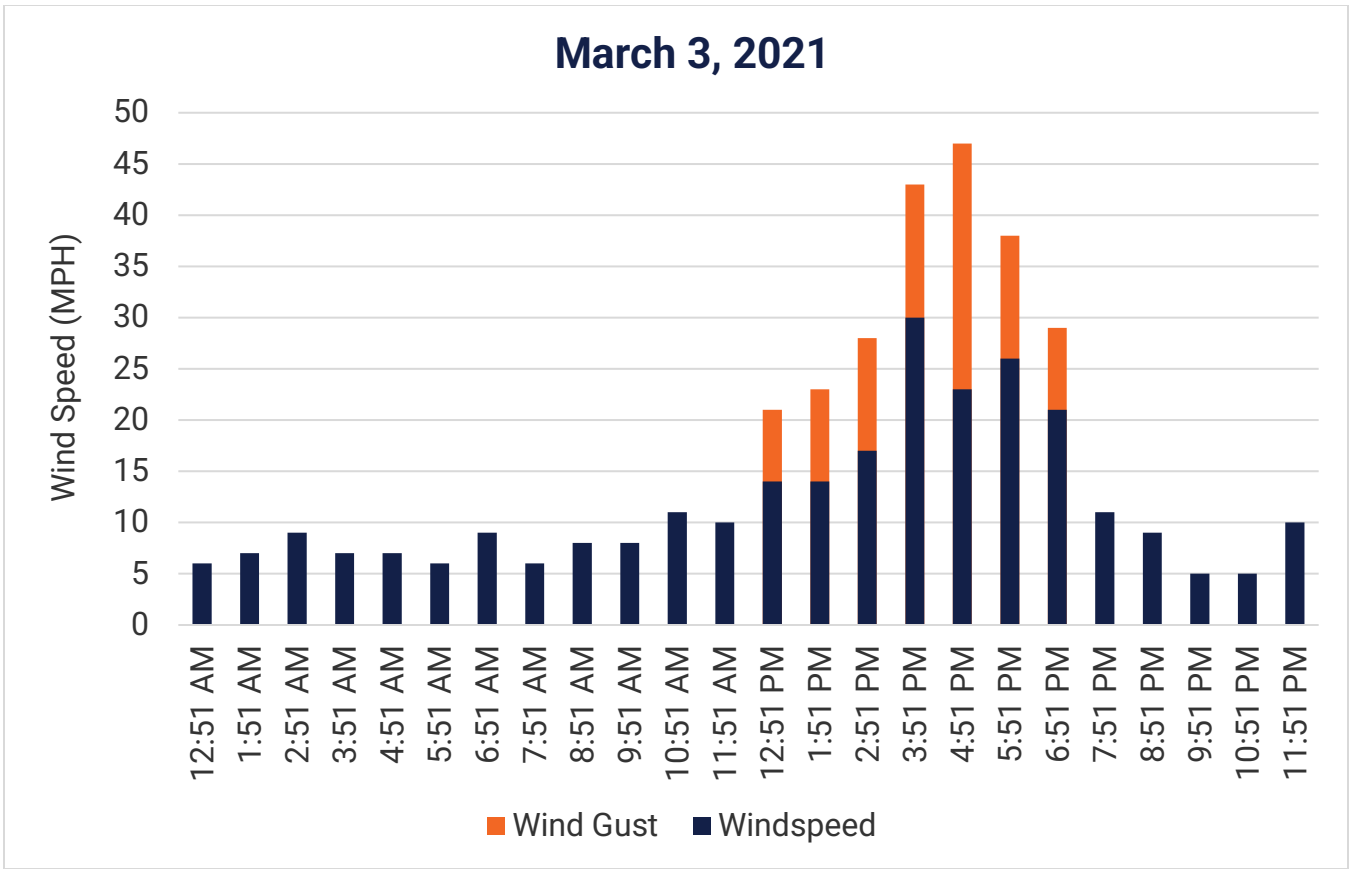

Hourly PM10 and Wind Speed at Stanfield
PM10 (µg/m3)
Wind Speed (MPH)
1,400
1,200
1,000
800
600
400
200
0
45
40
35
30
25
20
15
10
5
0
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
10/11/2021
10/12/2021
Stanfield PM10
Stanfield Wind Speed
Stanfield Wind Gust

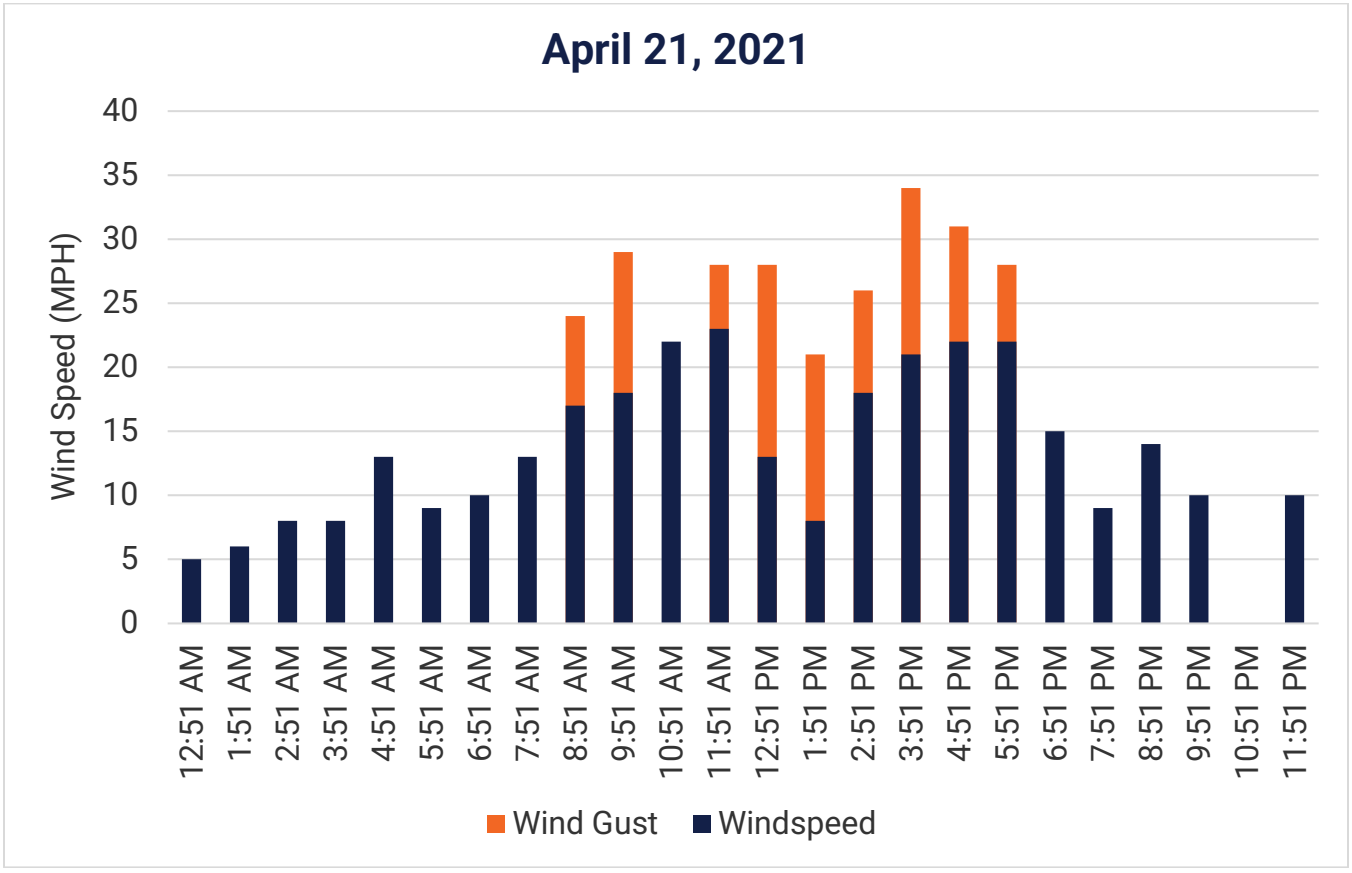
Appendix II

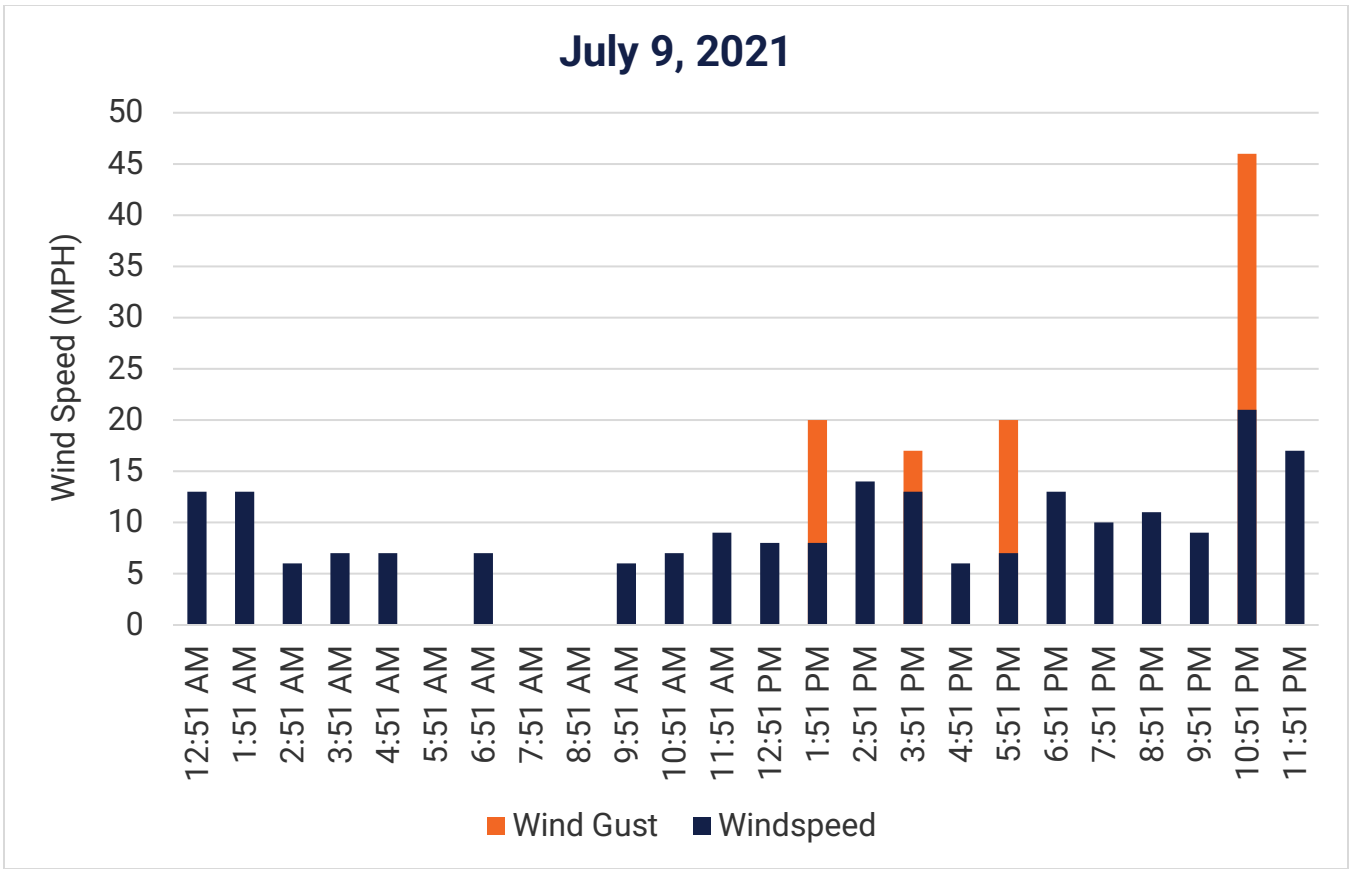
Charts of hourly windspeed and wind gust data from the Phoenix Sky Harbor Airport (KPHX), NOAA station ID WBAN:23183. Charts are presented for each of the atypical event dates listed in this report. Data were obtained from NOAA National Centers for Environmental Information site and were specified with the FM-15 report code (i.e., hourly METAR aviation routine weather report).

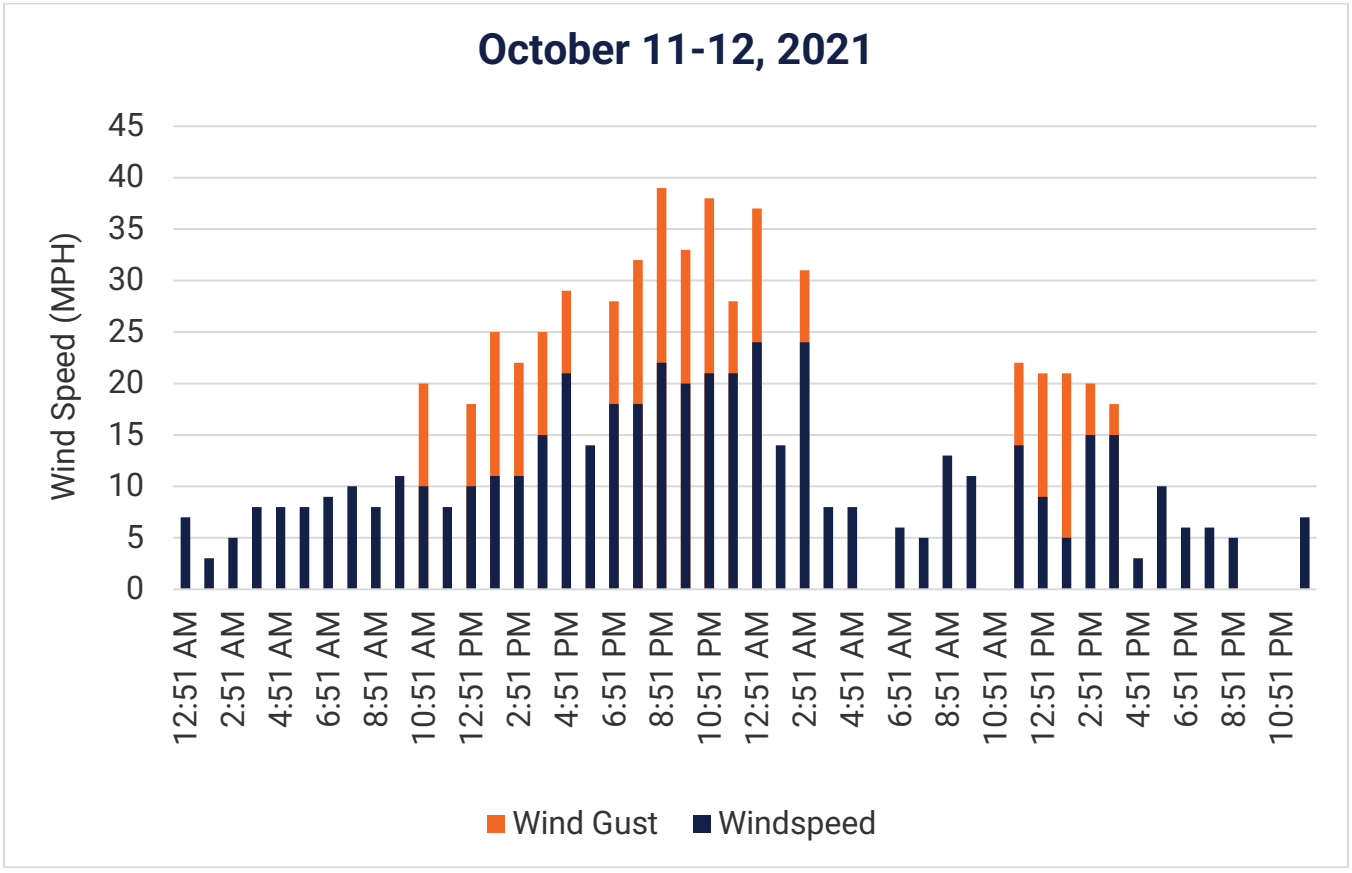
Note that wind gusts on these charts are defined by the National Weather Service as "a sudden, brief increase in speed of the wind. According to U.S. weather observing practice, gusts are reported when the peak wind speed reaches at least 16 knots and the variation in wind speed between the peaks and lulls is at least 9 knots. The duration of a gust is usually less than 20 seconds."




March 3, 2021
Wind Speed (MPH)
50
45
40
35
30
25
20
15
10
5
0
12:51 AM
1:51 AM
2:51 AM
3:51 AM
4:51 AM
5:51 AM
6:51 AM
7:51 AM
8:51 AM
9:51 AM
10:51 AM
11:51 AM
12:51 PM
1:51 PM
2:51 PM
3:51 PM
4:51 PM
5:51 PM
6:51 PM
7:51 PM
8:51 PM
9:51 PM
10:51 PM
11:51 PM
Wind Gust
Windspeed


April 21, 2021
Wind Speed (MPH)
40
35
30
25
20
15
10
5
0
12:51 AM
1:51 AM
2:51 AM
3:51 AM
4:51 AM
5:51 AM
6:51 AM
7:51 AM
8:51 AM
9:51 AM
10:51 AM
11:51 AM
12:51 PM
1:51 PM
2:51 PM
3:51 PM
4:51 PM
5:51 PM
6:51 PM
7:51 PM
8:51 PM
9:51 PM
10:51 PM
11:51 PM
Wind Gust
Windspeed


July 9, 2021
Wind Speed (MPH)
50
45
40
35
30
25
20
15
10
5
0
12:51 AM
1:51 AM
2:51 AM
3:51 AM
4:51 AM
5:51 AM
6:51 AM
7:51 AM
8:51 AM
9:51 AM
10:51 AM
11:51 AM
12:51 PM
1:51 PM
2:51 PM
3:51 PM
4:51 PM
5:51 PM
6:51 PM
7:51 PM
8:51 PM
9:51 PM
10:51 PM
11:51 PM
Wind Gust
Windspeed


October 11-12, 2021
Wind Speed (MPH)
45
40
35
30
25
20
15
10
5
0
12:51 AM
2:51 AM
4:51 AM
6:51 AM
8:51 AM
10:51 AM
12:51 PM
2:51 PM
4:51 PM
6:51 PM
8:51 PM
10:51 PM
12:51 AM
2:51 AM
4:51 AM
6:51 AM
8:51 AM
10:51 AM
12:51 PM
2:51 PM
4:51 PM
6:51 PM
8:51 PM
10:51 PM
Wind Gust
Windspeed

Maricopa County
Air Quality Department
Planning and Analysis Division
Maricopa.gov/AQ

Appendix B: NOAA Phoenix Sky Harbor Airport Station (WBAN:23183) Weather Data for March 3rd, July 9th, and October 11th, 2021

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Daily Summary
March 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W
Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	Temperature (F)							Degree Days (base 65F)		Sun (LST)		Weather	Precipitation (in)			Pressure (inHg)		Wind	Maximum Wind Speed = MPH / Direction = Degrees			
	Max	Min	Avg	Dep	ARH	ADP	AWB	Heat	Cool	Rise	Set	Weather Type	TLC	Snow Fall	Snow Depth	Avg Stn	Avg SL	Avg Speed	Peak Speed	Peak Dir	Sust. Speed	Sust. Dir
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	71	39*	55	-7.0	14	6	39	10	0	0657	1825		0.00			29.00	30.18	4.4	18	080	13	110
02	79	48	64	1.9	17	17	45	1	0	0655	1826		0.00			28.75	29.92	7.6	27	090	18	120
03	86	49	68	5.7	23	24	47	0	3	0654	1826		0.00			28.69	29.83	11.6	47	200	37	200
04	71	52	62	-0.5	43	39	50	3	0	0653	1827		0.00			28.97	30.11	4.3	19	300	14	230
05	83	50	67	4.3	31	32	50	0	2	0652	1828		0.00			28.88	30.03	3.9	17	330	10	220
06	85	58	72	9.1	19	27	51	0	7	0650	1829		0.00			28.71	29.86	5.9	25	150	18	140
07	89	58	74	10.9	20	28	51	0	9	0649	1830		0.00			28.76	29.90	5.4	22	340	13	300
08	87	66	77	13.7	17	26	52	0	12	0648	1830		0.00			28.80	29.94	7.3	25	250	18	270
09	80	59	70	6.5	21	27	49	0	5	0647	1831		0.00			28.77	29.91	9.9	35	260	28	270
10	70	49	60	-3.7	26	24	44	5	0	0645	1832		0.00			28.79	29.94	7.5	28	210	20	220
11	69	48	59	-4.9	38	30	45	6	0	0644	1833	RA	0.01			28.79	29.96	7.6	32	270	24	270
12	59	46	53	-11.1	66	40	46	12	0	0643	1834	RA BR	0.17			28.87	30.03	6.4	24	340	18	320
13	61	45	53	-11.4	61	38	45	12	0	0641	1834	RA BR	0.19			28.92	30.10	7.1	31	360	25	360
14	68	42	55	-9.6	52	36	46	10	0	0640	1835		0.00			28.88	30.06	7.1	25	290	22	290
15	74	50	62	-2.8	36	32	47	3	0	0639	1836		0.00			28.66	29.83	8.2	40	250	29	260
16	61	47	54	-11.0	34	26	42	11	0	0637	1837		T			28.77	29.90	10.1	34	270	28	270
17	73	45	59	-6.2	33	29	45	6	0	0636	1837		0.00			28.87	30.05	4.1	17	340	13	080
18	83	51	67	1.6	30	31	50	0	2	0635	1838		0.00			28.84	30.00	3.7	13	330	9	270
19	85	53	69	3.4	22	26	50	0	4	0633	1839		0.00			28.84	29.99	4.2	16	300	10	300
20	86	56	71	5.2	23	31	52	0	6	0632	1840		0.00			28.78	29.93	9.2	28	230	22	230
21	78	58	68	2.0	17	20	48	0	3	0631	1840		0.00			28.68	29.83	8.7	26	260	20	280
22	72	55	64	-2.2	14	13	43	1	0	0629	1841		0.00			28.71	29.85	10.6	32	350	23	330
23	66	52	59	-7.4	31	26	44	6	0	0628	1842		T			28.54	29.69	9.4	30	290	25	290
24	72	48	60	-6.6	37	31	47	5	0	0627	1843		0.00			28.60	29.75	5.6	25	330	17	310
25	72	50	61	-5.8	25	24	45	4	0	0625	1843		0.00			28.59	29.74	12.0	33	220	24	210
26	66	53	60	-7.1	40	34	47	5	0	0624	1844	RA	T			28.71	29.86	7.4	23	270	18	290
27	79	48	64	-3.3	35	33	49	1	0	0623	1845		0.00			28.93	30.08	4.4	20	350	13	290
28	86	53	70	2.5	19	24	50	0	5	0621	1845		0.00			28.93	30.10	3.0	17	060	14	060
29	89*	59	74	6.3	16	23	51	0	9	0620	1846		0.00			28.63	29.78	5.8	18	290	12	260
30	86	56	71	3.1	14	19	49	0	6	0619	1847		0.00			28.69	29.80	7.7	31	270	17	280
31	88	59	74	5.8	8	9	48	0	9	0617	1848		0.00			28.87	30.01	7.2	25	040	17	030
	76.6	51.7	64.1							Monthly Averages | Totals			0.37			28.78	29.93	6.9				
	-0.3	-1.8	-1.1	Departure from Normal (1981-2010)									-0.62									

Degree Days

	Monthly		Season-to-date	
	Total	Departure	Total	Departure
Heating	105	24	887	
Cooling	78	-9	95	

Number of days with...

	Temperature				Precipitation		Snow	Weather	
	Max		Min						
	>=90°	<=32°	<=32°	<=0°	>=0.01"	>=0.1"	>=1"	T-Storms	Heavy Fog
Heating	0	0	0	0	3	2			
Cooling									

Date of 5-sec to 3-sec wind equipment change	Sea Level Pressure			Greatest...		
		Date	Time	24-Hr...		Snow Depth
2007-04-03	Maximum 30.30	01	1011	Precip	Snowfall	
	Minimum 29.62	25	1810	0.35		
				Date		
				12-13		

Station Augmentation

Name:CONTRACTOR Lat: 33.4442 Lon: -112.0247 Elevation: N/A Distance: 0.5mi N Elements: TEMP, PRECIP Equipment: MXMN, SRG

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W
Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Local Climatological Data
Hourly Observations
March 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
03	0051	7	CLR:00	10.00		57	13.9	42	5.6	19	-7.2	23	6	140		28.68			29.82	FM-15	0.00	29.85
03	0151	7	CLR:00	10.00		59	15.0	42	5.6	18	-7.8	20	7	100		28.69	5	0.00	29.83	FM-15	0.00	29.86
03	0251	7	CLR:00	10.00		56	13.3	41	5.0	18	-7.8	22	9	100		28.69			29.83	FM-15	0.00	29.86
03	0351	7	CLR:00	10.00		54	12.2	40	4.4	19	-7.2	25	7	100		28.69			29.83	FM-15	0.00	29.86
03	0451	7	CLR:00	10.00		53	11.7	40	4.4	20	-6.7	27	7	110		28.69	3	-0.01	29.84	FM-15	0.00	29.87
03	0500	4		9.94		53	11.7	40	4.4	20	-6.7	27	7	110		28.70	3	-0.01	29.84	FM-12		
03	0551	7	CLR:00	10.00		50	10.0	38	3.3	20	-6.7	30	6	100		28.69			29.84	FM-15	0.00	29.87
03	0651	7	FEW:02 150 FEW:02 250	10.00		53	11.7	39	3.9	18	-7.8	25	9	120		28.69			29.84	FM-15	0.00	29.87
03	0751	7	FEW:02 150	10.00		55	12.8	41	5.0	19	-7.2	24	6	100		28.70	3	-0.01	29.85	FM-15	0.00	29.88
03	0851	7	FEW:02 150	10.00		60	15.6	43	6.1	19	-7.2	20	8	120		28.71			29.87	FM-15	0.00	29.89
03	0951	7	FEW:02 150	10.00		66	18.9	46	7.8	17	-8.3	15	8	100		28.71			29.86	FM-15	0.00	29.89
03	1051	7	FEW:02 150	10.00		72	22.2	49	9.4	18	-7.8	13	11	110		28.69	8	+0.02	29.83	FM-15	0.00	29.87
03	1100	4		9.94		72	22.2	49	9.4	18	-7.8	13	11	110		28.70	8	+0.02	29.83	FM-12		
03	1151	7	FEW:02 150	10.00		77	25.0	51	10.6	17	-8.3	10	10	160		28.66			29.80	FM-15	0.00	29.84
03	1251	7	FEW:02 120	10.00		81	27.2	51	10.6	9	-12.8	6	14	170	21	28.62			29.76	FM-15	0.00	29.79
03	1351	7	FEW:02 120	10.00		84	28.9	53	11.7	11	-11.7	6	14	180	23	28.58	8	+0.12	29.70	FM-15	0.00	29.75
03	1451	7	FEW:02 120	10.00		85	29.4	54	12.2	18	-7.8	8	17	200	28	28.54			29.67	FM-15	0.00	29.71
03	1551	7	FEW:02 120	10.00		83	28.3	55	12.8	24	-4.4	11	30	190	43	28.56			29.69	FM-15	0.00	29.73
03	1651	7	FEW:02 120	10.00		79	26.1	53	11.7	23	-5.0	12	23	210	47	28.58	3	-0.01	29.72	FM-15	0.00	29.75
03	1700	4		9.94		79	26.1	53	11.7	23	-5.0	12	23	210		28.58	3	-0.01	29.72	FM-12		
03	1751	7	FEW:02 120	10.00		72	22.2	51	10.6	26	-3.3	18	26	240	38	28.63			29.77	FM-15	0.00	29.80
03	1851	7	FEW:02 120	10.00		67	19.4	52	11.1	36	2.2	32	21	240	29	28.69			29.83	FM-15	0.00	29.86
03	1951	7	FEW:02 120 FEW:02 230	10.00		65	18.3	52	11.1	39	3.9	39	11	250		28.73	3	-0.15	29.88	FM-15	0.00	29.91
03	2051	7	FEW:02 120 FEW:02 230	10.00		64	17.8	51	10.6	38	3.3	38	9	250		28.75			29.90	FM-15	0.00	29.93
03	2151	7	BKN:07 80	10.00		64	17.8	51	10.6	37	2.8	37	5	120		28.78			29.93	FM-15	0.00	29.96
03	2251	7	BKN:07 85	10.00		62	16.7	51	10.6	40	4.4	44	5	250		28.80	3	-0.07	29.95	FM-15	0.00	29.98
03	2300	4		9.94		62	16.7	51	10.6	40	4.4	44	5	250		28.80	3	-0.07	29.95	FM-12		
03	2351	7	BKN:07 80	10.00		61	16.1	51	10.6	41	5.0	48	10	240		28.83			29.97	FM-15	0.00	30.01

Max Hourly &
24-Hour Wind Speed

Max Hourly &
24-Hour Wind Gust
Speed

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Remarks
March 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W

Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	Time (LST)	Remarks
03	0051	MET09903/03/21 00:51:02 METAR KPHX 030751Z 14005KT 10SM CLR 14/M07 A2985 RMK AO2 SLP097 T01391072 $ (GEH)
03	0151	MET10503/03/21 01:51:02 METAR KPHX 030851Z 10006KT 10SM CLR 15/M08 A2986 RMK AO2 SLP101 T01501078 55000 $ (GEH)
03	0251	MET09903/03/21 02:51:02 METAR KPHX 030951Z 10008KT 10SM CLR 13/M08 A2986 RMK AO2 SLP101 T01331078 $ (GEH)
03	0351	MET09903/03/21 03:51:02 METAR KPHX 031051Z 10006KT 10SM CLR 12/M07 A2986 RMK AO2 SLP102 T01221072 $ (GEH)
03	0451	MET11703/03/21 04:51:02 METAR KPHX 031151Z 11006KT 10SM CLR 12/M07 A2987 RMK AO2 SLP104 T01171067 10161 20111 53002 $ (GEH)
03	0500	SYN08072278 32966 01106 10117 21067 39718 40104 53002 91151 333 10261 20111 555 90312=
03	0551	MET09903/03/21 05:51:02 METAR KPHX 031251Z 10005KT 10SM CLR 10/M07 A2987 RMK AO2 SLP104 T01001067 $ (GEH)
03	0651	MET10803/03/21 06:51:02 METAR KPHX 031351Z 12008KT 10SM FEW150 FEW250 12/M08 A2987 RMK AO2 SLP106 T01171078 $ (DZ)
03	0751	MET10703/03/21 07:51:02 METAR KPHX 031451Z 10005KT 10SM FEW150 13/M07 A2988 RMK AO2 SLP109 T01281072 53005 $ (DZ)
03	0851	MET10103/03/21 08:51:02 METAR KPHX 031551Z 12007KT 10SM FEW150 16/M07 A2989 RMK AO2 SLP114 T01561072 $ (DZ)
03	0951	MET10103/03/21 09:51:02 METAR KPHX 031651Z 10007KT 10SM FEW150 19/M08 A2989 RMK AO2 SLP112 T01891083 $ (DZ)
03	1051	MET11903/03/21 10:51:02 METAR KPHX 031751Z 11010KT 10SM FEW150 22/M08 A2987 RMK AO2 SLP102 T02221078 10222 20094 58006 $ (DZ)
03	1100	SYN08072278 32966 21110 10222 21078 39718 40102 58006 91751 333 10222 20094 555 90318=
03	1151	MET10103/03/21 11:51:02 METAR KPHX 031851Z 16009KT 10SM FEW150 25/M08 A2984 RMK AO2 SLP092 T02501083 $ (DZ)
03	1251	MET10403/03/21 12:51:02 METAR KPHX 031951Z 17012G18KT 10SM FEW120 27/M13 A2979 RMK AO2 SLP077 T02721128 $ (DZ)
03	1351	MET11003/03/21 13:51:02 METAR KPHX 032051Z 18012G20KT 10SM FEW120 29/M12 A2975 RMK AO2 SLP059 T02891117 58040 $ (DZ)
03	1451	MET12203/03/21 14:51:02 METAR KPHX 032151Z 20015G24KT 10SM FEW120 29/M08 A2971 RMK AO2 PK WND 16033/2124 SLP047 T02941078 $ (SH)
03	1551	MET13303/03/21 15:51:02 METAR KPHX 032251Z 19026G37KT 10SM FEW120 28/M04 A2973 RMK AO2 PK WND 21038/2229 SLP054 BLDU ALQDS T02831044 $ (SH)
03	1651	MET15103/03/21 16:51:02 METAR KPHX 032351Z 21020G41KT 10SM FEW120 26/M05 A2975 RMK AO2 PK WND 20041/2333 SLP064 BLDU ALQDS T02611050 10300 20222 53003 $ (SH)
03	1700	SYN08672278 32966 22120 10261 21050 39679 40064 53003 92351 333 10300 20111 91041 555 90400=
03	1751	MET12803/03/21 17:51:01 METAR KPHX 040051Z 24023G33KT 10SM FEW120 22/M03 A2980 RMK AO2 PK WND 21034/0001 SLP081 BLDU ALQDS T02221033 $
03	1851	MET12703/03/21 18:51:01 METAR KPHX 040151Z 24018G25KT 10SM FEW120 19/02 A2986 RMK AO2 PK WND 24036/0108 SLP102 BLDU ALQDS T01940022 $
03	1951	MET12603/03/21 19:51:01 METAR KPHX 040251Z 25010KT 10SM FEW120 FEW230 18/04 A2991 RMK AO2 PK WND 24027/0154 SLP120 T01830039 53051 $
03	2051	MET10203/03/21 20:51:01 METAR KPHX 040351Z 25008KT 10SM FEW120 FEW230 18/03 A2993 RMK AO2 SLP125 T01780033 $
03	2151	MET09503/03/21 21:51:02 METAR KPHX 040451Z 12004KT 10SM BKN080 18/03 A2996 RMK AO2 SLP137 T01780028 $
03	2251	MET11303/03/21 22:51:02 METAR KPHX 040551Z 25004KT 10SM BKN085 17/04 A2998 RMK AO2 SLP143 T01670044 10261 20167 53025 $
03	2300	SYN08072278 32966 62504 10167 20044 39754 40143 53025 90551 333 10261 20111 555 90406=
03	2351	MET10503/03/21 23:51:02 METAR KPHX 040651Z 24009KT 10SM BKN080 16/05 A3001 RMK AO2 SLP149 T01610050 403000094 $

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Precipitation
March 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W

Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	For Hour (LST) Ending at																							Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01																									01
02																									02
03																									03
04																									04
05																									05
06																									06
07																									07
08																									08
09																									09
10																									10
11																					0.01	T			11
12	T		T	0.04	0.06	0.01								T	T	T						T	0.01	0.05	12
13	0.02	0.12	0.04	0.01																	T				13
14																									14
15																									15
16				T	T																				16
17																									17
18																									18
19																									19
20																									20
21																									21
22																									22
23															T	T									23
24																									24
25																									25
26														T	T										26
27																									27
28																									28
29																									29
30																									30
31																									31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)	0.02	0.03	0.05	0.06	0.08	0.11	0.13	0.14	0.15	0.17	0.18	0.19
Ending Date Time (yyyy-mm-dd hh:mi)	2021-03-13 01:39	2021-03-13 01:39	2021-03-13 01:18	2021-03-13 01:27	2021-03-13 01:39	2021-03-13 01:47	2021-03-13 01:53	2021-03-13 01:53	2021-03-13 02:39	2021-03-13 02:52	2021-03-13 02:52	2021-03-13 03:36

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Daily Summary
July 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W
Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	Temperature (F)							Degree Days (base 65F)		Sun (LST)		Weather	Precipitation (in)			Pressure (inHg)		Wind	Maximum Wind Speed = MPH / Direction = Degrees			
	Max	Min	Avg	Dep	ARH	ADP	AWB	Heat	Cool	Rise	Set	Weather Type	TLC	Snow Fall	Snow Depth	Avg Stn	Avg SL	Avg Speed	Peak Speed	Peak Dir	Sust. Speed	Sust. Dir
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	107	85	96	1.9	29	57	71	0	31	0522	1942	TS RA	T			28.64	29.75	6.0	37	050	31	060
02	105	89	97	2.8	32	61	72	0	32	0522	1942	TS	T			28.64	29.75	6.0	29	150	23	160
03	107	79	93	-1.4	42	63	73	0	28	0523	1942	TS RA	0.26			28.67	29.79	7.2	42	050	35	050
04	103	80	92	-2.5	46	66	74	0	27	0523	1941		0.00			28.66	29.79	5.3	19	280	16	080
05	107	90	99	4.4	29	59	72	0	34	0524	1941		0.00			28.64	29.75	7.2	23	280	17	280
06	111	89	100	5.3	17	46	67	0	35	0524	1941		0.00			28.59	29.70	7.6	24	270	20	270
07	111	88	100	5.2	19	50	69	0	35	0525	1941		0.00			28.56	29.67	5.5	24	280	17	300
08	112	92	102	7.2	27	60	74	0	37	0525	1941		0.00			28.58	29.69	6.9	29	260	23	260
09	112	93	103	8.1	27	62	74	0	38	0526	1941	DU	0.00			28.63	29.72	8.8	46	150	32	140
10	112*	85	99	4.0	30	62	74	0	34	0526	1940	TS RA	T			28.61	29.72	11.9	49	040	38	030
11	111	85	98	3.0	33	62	74	0	33	0527	1940		0.00			28.59	29.71	8.1	24	260	21	270
12	106	90	98	3.0	28	59	72	0	33	0527	1940		0.00			28.64	29.74	7.1	30	140	23	140
13	109	86	98	2.9	31	61	73	0	33	0528	1939	HZ	0.00			28.66	29.78	8.5	30	140	22	140
14	99	77	88	-7.1	49	65	73	0	23	0529	1939	TS RA	0.10			28.74	29.85	8.6	43	290	36	290
15	102	85	94	-1.1	43	66	74	0	29	0529	1938		0.00			28.69	29.81	8.0	25	340	17	330
16	102	83	93	-2.1	46	66	74	0	28	0530	1938	RA	0.01			28.68	29.79	9.2	34	140	28	130
17	102	83	93	-2.1	39	63	72	0	28	0530	1938		0.00			28.70	29.82	5.8	18	340	13	290
18	102	88	95	-0.1	36	64	74	0	30	0531	1937		0.00			28.76	29.87	7.4	31	170	25	170
19	105	88	97	2.0	36	64	74	0	32	0532	1937		0.00			28.74	29.86	7.5	19	230	16	260
20	109	89	99	4.0	34	64	75	0	34	0532	1936		0.00			28.66	29.79	8.1	29	280	23	270
21	109	89	99	4.0	33	64	75	0	34	0533	1936	TS	0.00			28.62	29.73	8.3	32	280	25	310
22	106	78	92	-2.9	46	67	75	0	27	0534	1935	TS RA	0.21			28.72	29.83	9.8	33	150	25	050
23	83	73	78	-16.9	85	71	73	0	13	0534	1934	TS RA BR	0.80			28.87	29.99	8.7	31	130	23	150
24	83	74	79	-15.8	81	71	73	0	14	0535	1934	RA BR	0.18			28.79	29.94	8.7	18	100	15	110
25	81	73*	77	-17.8	80	71	73	0	12	0536	1933	RA	0.11			28.77	29.91	7.1	17	060	14	320
26	98	75	87	-7.7	53	66	73	0	22	0536	1932		0.00			28.74	29.87	4.8	16	200	10	160
27	104	81	93	-1.7	40	63	72	0	28	0537	1932	RA	0.00			28.74	29.85	6.6	43	140	26	170
28	105	83	94	-0.6	34	61	72	0	29	0538	1931		0.00			28.71	29.84	4.4	19	130	15	120
29	106	88	97	2.4	33	60	72	0	32	0538	1930		0.00			28.66	29.77	9.0	33	050	26	050
30	104	80	92	-2.5	36	61	72	0	27	0539	1929	TS RA	0.01			28.72	29.83	9.5	35	170	28	290
31	100	77	89	-5.5	50	66	73	0	24	0540	1929	TS RA	0.05			28.77	29.90	5.5	23	170	20	180
	103.6	83.7	93.7							Monthly Averages | Totals			1.73			28.68	29.80	7.6				
	-2.5	0.2	-1.1	Departure from Normal (1981-2010)									0.68									

Degree Days

	Monthly		Season-to-date	
	Total	Departure	Total	Departure
Heating	0	0	0	
Cooling	889	-35	2806	

Number of days with...

	Temperature				Precipitation		Snow	Weather	
	Max		Min						
	>=90°	<=32°	<=32°	<=0°	>=0.01"	>=0.1"	>=1"	T-Storms	Heavy Fog
Heating									
Cooling	28	0	0	0	9	6		12	

Date of 5-sec to 3-sec wind equipment change: 2007-04-03

Sea Level Pressure

		Date	Time
Maximum	30.06	23	1125
Minimum	29.56	07	1851

Greatest...

24-Hr...		Snow Depth
Precip	Snowfall	
1.01		
Date		
22-23		

Station Augmentation

Name:CONTRACTOR Lat: 33.4442 Lon: -112.0247 Elevation: N/A Distance: 0.5mi N Elements: TEMP, PRECIP Equipment: MXMN, SRG

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W
Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Local Climatological Data
Hourly Observations
July 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
09	0051	7	FEW:02 160	10.00		98	36.7	74	23.3	63	17.2	32	13	260		28.58			29.68	FM-15	0.00	29.75
09	0151	7	FEW:02 250	10.00		98	36.7	74	23.3	63	17.2	32	13	270		28.59	1	-0.03	29.69	FM-15	0.00	29.76
09	0251	7	FEW:02 250	10.00		97	36.1	74	23.3	63	17.2	33	6	290		28.61			29.71	FM-15	0.00	29.78
09	0351	7	FEW:02 250	10.00		96	35.6	74	23.3	63	17.2	34	7	320		28.62			29.71	FM-15	0.00	29.79
09	0451	7	FEW:02 250	10.00		95	35.0	73	22.8	63	17.2	35	7	300		28.63	1	-0.03	29.72	FM-15	0.00	29.80
09	0500	4		9.94		95	35.0	73	22.8	63	17.2	35	7	300		28.63	1	-0.03	29.72	FM-12		
09	0551	7	FEW:02 160 FEW:02 250	10.00		94	34.4	73	22.8	63	17.2	36	0	000		28.66			29.76	FM-15	0.00	29.83
09	0651	7	FEW:02 160	10.00		95	35.0	74	23.3	64	17.8	36	7	330		28.66			29.77	FM-15	0.00	29.84
09	0751	7	FEW:02 160	10.00		96	35.6	74	23.3	64	17.8	35	0	000		28.69	1	-0.06	29.79	FM-15	0.00	29.86
09	0851	7	FEW:02 160	10.00		98	36.7	75	23.9	64	17.8	33	0	000		28.69			29.79	FM-15	0.00	29.86
09	0951	7	FEW:02 160	10.00		100	37.8	75	23.9	63	17.2	30	6	VRB		28.69			29.78	FM-15	0.00	29.86
09	1051	7	FEW:02 85 FEW:02 160	10.00		103	39.4	76	24.4	64	17.8	28	7	190		28.68	8	+0.01	29.78	FM-15	0.00	29.85
09	1100	4		9.94		103	39.4	76	24.4	64	17.8	28	7	190		28.68	8	+0.01	29.78	FM-12		
09	1151	7	FEW:02 95 FEW:02 160	10.00		105	40.6	76	24.4	63	17.2	25	9	300		28.66			29.76	FM-15	0.00	29.83
09	1251	7	FEW:02 95 FEW:02 250	10.00		106	41.1	76	24.4	63	17.2	25	8	260		28.64			29.74	FM-15	0.00	29.81
09	1351	7	FEW:02 95 FEW:02 250	10.00		108	42.2	76	24.4	61	16.1	22	8	VRB	20	28.62	8	+0.06	29.71	FM-15	0.00	29.79
09	1451	7	FEW:02 95 FEW:02 250	10.00		109	42.8	75	23.9	60	15.6	20	14	280		28.60			29.70	FM-15	0.00	29.77
09	1551	7	FEW:02 95 FEW:02 250	10.00		111	43.9	76	24.4	61	16.1	20	13	VRB	17	28.56			29.66	FM-15	0.00	29.73
09	1651	7	FEW:02 95 FEW:02 170 FEW:02 250	10.00		111	43.9	75	23.9	59	15.0	18	6	230		28.55	6	+0.07	29.65	FM-15	0.00	29.72
09	1700	4		9.94		111	43.9	75	23.9	59	15.0	18	6	230		28.55	6	+0.07	29.65	FM-12		
09	1751	7	FEW:02 95 SCT:04 170 SCT:04 250	10.00		111	43.9	75	23.9	59	15.0	18	7	250	20	28.55			29.64	FM-15	0.00	29.72
09	1851	7	SCT:04 95 SCT:04 180 BKN:07 210	10.00		110	43.3	75	23.9	58	14.4	18	13	240		28.54			29.63	FM-15	0.00	29.71
09	1951	7	SCT:04 95 BKN:07 180 BKN:07 200	10.00		109	42.8	74	23.3	58	14.4	19	10	240		28.55	3	0.00	29.65	FM-15	0.00	29.72
09	2051	7	SCT:04 95 BKN:07 180 BKN:07 210	10.00		107	41.7	74	23.3	59	15.0	21	11	240		28.56			29.65	FM-15	0.00	29.73
09	2151	7	SCT:04 80 BKN:07 180 BKN:07 210	10.00		105	40.6	74	23.3	59	15.0	22	9	240		28.59			29.68	FM-15	0.00	29.76
09	2245	7	BKN:07 8	1.00	BL:5 DU:5 ||	100	37.8	74	23.3	61	16.1	27	30	120	46	28.69				FM-16		29.87
09	2249	6	VV:09 5	0.50	DS:5 ||DU s	97	36.1	73	22.8	61	16.1	30	29	140	46	28.69				FM-16		29.87

Max 24-Hour Wind Speed

Max 24-Hour Wind Gust Speed

09	2251	7	VV:09 5	0.25	DS:5 ||DU s	95	35.0	72	22.2	61	16.1	32	21	140	46	28.69	3	-0.14	29.80	FM-15	0.00	29.87
09	2258	7	VV:09 5	0.50	DS:5 ||DU s	94	34.4	71	21.7	59	15.0	31	20	130	36	28.69				FM-16		29.87
09	2300	4		0.25	||DU	95	35.0	72	22.2	61	16.1	32	21	140		28.70	3	-0.14	29.80	FM-12		
09	2308	7	OVC:08 8	1.00	BL:5 DU:5 ||	93	33.9	71	21.7	59	15.0	32	17	150	26	28.68				FM-16		29.85
09	2314	7	SCT:04 8 BKN:07 50	5.00	BL:5 DU:5 ||	93	33.9	72	22.2	61	16.1	34	22	150	31	28.66				FM-16		29.84
09	2351	7	SCT:04 60 BKN:07 120 OVC:08 180	10.00		96	35.6	73	22.8	61	16.1	31	17	190		28.66			29.75	FM-15	0.00	29.83

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Remarks
July 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W

Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	Time (LST)	Remarks
09	0051	MET09907/09/21 00:51:02 METAR KPHX 090751Z 26011KT 10SM FEW160 37/17 A2975 RMK AO2 SLP052 T03670172 (ANH)
09	0151	MET10507/09/21 01:51:02 METAR KPHX 090851Z 27011KT 10SM FEW250 37/17 A2976 RMK AO2 SLP054 T03670172 51009 (ANH)
09	0251	MET09907/09/21 02:51:02 METAR KPHX 090951Z 29005KT 10SM FEW250 36/17 A2978 RMK AO2 SLP060 T03610172 (ANH)
09	0351	MET09907/09/21 03:51:02 METAR KPHX 091051Z 32006KT 10SM FEW250 36/17 A2979 RMK AO2 SLP062 T03560172 (ANH)
09	0451	MET11707/09/21 04:51:02 METAR KPHX 091151Z 30006KT 10SM FEW250 35/17 A2980 RMK AO2 SLP066 T03500172 10394 20350 51011 (ANH)
09	0500	SYN08072278 32966 23006 10350 20172 39695 40066 51011 91151 333 10444 20350 555 90912=
09	0551	MET10607/09/21 05:51:02 METAR KPHX 091251Z 00000KT 10SM FEW160 FEW250 34/17 A2983 RMK AO2 SLP077 T03440172 (ANH)
09	0651	MET09807/09/21 06:51:02 METAR KPHX 091351Z 33006KT 10SM FEW160 35/18 A2984 RMK AO2 SLP082 T03500178 (DZ)
09	0751	MET10407/09/21 07:51:02 METAR KPHX 091451Z 00000KT 10SM FEW160 36/18 A2986 RMK AO2 SLP089 T03560178 51021 (DZ)
09	0851	MET09807/09/21 08:51:02 METAR KPHX 091551Z 00000KT 10SM FEW160 37/18 A2986 RMK AO2 SLP088 T03670178 (DZ)
09	0951	MET09807/09/21 09:51:02 METAR KPHX 091651Z VRB05KT 10SM FEW160 38/17 A2986 RMK AO2 SLP086 T03780172 (DZ)
09	1051	MET12307/09/21 10:51:02 METAR KPHX 091751Z 19006KT 10SM FEW085 FEW160 39/18 A2985 RMK AO2 SLP084 T03940178 10400 20344 58004 (DZ)
09	1100	SYN08072278 32966 21906 10394 20178 39712 40084 58004 91751 333 10400 20344 555 90918=
09	1151	MET10507/09/21 11:51:02 METAR KPHX 091851Z 30008KT 10SM FEW095 FEW160 41/17 A2983 RMK AO2 SLP078 T04060172 (DZ)
09	1251	MET12207/09/21 12:51:02 METAR KPHX 091951Z 26007KT 10SM FEW095 FEW250 41/17 A2981 RMK AO2 SLP072 CB DSNT N AND NE T04110172 (DZ)
09	1351	MET13107/09/21 13:51:02 METAR KPHX 092051Z 29007G17KT 10SM FEW095 FEW250 42/16 A2979 RMK AO2 SLP062 CB DSNT N AND NE T04220161 58021 (DZ)
09	1451	MET11707/09/21 14:51:02 METAR KPHX 092151Z 28012KT 10SM FEW095 FEW250 43/16 A2977 RMK AO2 SLP056 CB DSNT N AND NE T04280156
09	1551	MET13507/09/21 15:51:02 METAR KPHX 092251Z 27011G15KT 10SM FEW095 FEW250 44/16 A2973 RMK AO2 SLP043 CB DSNT NE AND SE AND NW-N T04390161 (SH)
09	1651	MET16707/09/21 16:51:02 METAR KPHX 092351Z 23005KT 10SM FEW095 FEW170 FEW250 44/15 A2972 RMK AO2 SLP039 CB DSNT NE AND S AND NW-N TCU DSNT E T04390150 10444 20383 56023 (SH)
09	1700	SYN08072278 32966 22305 10439 20150 39669 40039 56023 92351 333 10444 20350 555 91000=
09	1751	MET14207/09/21 17:51:01 METAR KPHX 100051Z 25006G17KT 10SM FEW095 SCT170 SCT250 44/15 A2972 RMK AO2 SLP038 CB DSNT NE AND E AND S AND NW-N T04390150
09	1851	MET13407/09/21 18:51:01 METAR KPHX 100151Z 24011KT 10SM SCT095 SCT180 BKN210 43/14 A2971 RMK AO2 SLP035 CB DSNT NE-SE AND S AND NW T04330144
09	1951	MET12507/09/21 19:51:01 METAR KPHX 100251Z 24009KT 10SM SCT095 BKN180 BKN200 43/14 A2972 RMK AO2 SLP039 SHRA DSNT E T04280144 53000
09	2051	MET14307/09/21 20:51:02 METAR KPHX 100351Z 24010KT 10SM SCT095 BKN180 BKN210 42/15 A2973 RMK AO2 SLP041 CONS LTGCGIC DSNT NE-E CB DSNT NE-E T04170150
09	2151	MET15707/09/21 21:51:02 METAR KPHX 100451Z 24008KT 10SM SCT080 BKN180 BKN210 41/15 A2976 RMK AO2 LTG DSNT SE SLP052 CONS LTGCGIC DSNT NE-SE CB DSNT NE-SE T04060150
09	2245	MET15107/09/21 22:45:02 SPECI KPHX 100545Z 12026G40KT 1SM R07L/6000VP6000FT BLDU BKN008 38/16 A2987 RMK AO2 PK WND 15040/0545 LTG DSNT E-S PRESRR BLDU BKN008
09	2249	MET14107/09/21 22:49:03 SPECI KPHX 100549Z 14025G40KT 1/2SM R07L/2600VP6000FT DS VV005 36/16 A2987 RMK AO2 PK WND 15040/0545 LTG DSNT E-S FIBI (JH)
09	2251	MET16707/09/21 22:51:02 METAR KPHX 100551Z 14018G40KT 1/4SM R07L/2600VP6000FT DS VV005 35/16 A2987 RMK AO2 PK WND 15040/0545 LTG DSNT E-SW SLP090 T03500161 10444 20350 53049
09	2258	MET15207/09/21 22:58:02 SPECI KPHX 100558Z 13017G31KT 1/2SM R07L/2600V4500FT DS VV005 34/15 A2987 RMK AO2 PK WND 12031/0553 WSHFT 0539 LTG DSNT E-SW T03440150
09	2300	SYN09272278 31204 /1418 10350 20161 39718 40090 53049 734// 90551 333 10444 20350 91040 555 91006=
09	2308	MET20507/09/21 23:08:02 SPECI KPHX 100608Z 15015G23KT 1SM R07L/6000VP6000FT BLDU OVC008 34/15 A2985 RMK AO2 PK WND 12031/0553 WSHFT 0539 LTG DSNT SE-SW CONS LTGICCG DSNT SE-SW BLDU OVC008 CB DSNT SE-SW T03390150
09	2314	MET19407/09/21 23:14:02 SPECI KPHX 100614Z 15019G27KT 5SM BLDU SCT008 BKN050 34/16 A2984 RMK AO2 PK WND 12031/0553 WSHFT 0539 LTG DSNT SE-SW CONS LTGICCG DSNT SE-SW BLDU SCT008 CB DSNT SE-SW T03390161
09	2351	MET19307/09/21 23:51:02 METAR KPHX 100651Z 19015KT 10SM SCT060 BKN120 OVC180 36/16 A2983 RMK AO2 PK WND 12031/0553 WSHFT 0539 LTG DSNT S SLP076 CONS LTGICCG DSNT S-SW CB DSNT S-SW T03560161 404440339

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
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Local Climatological Data
Hourly Precipitation
July 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W

Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	For Hour (LST) Ending at																							Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01																								T	01
02	T																								02
03																				0.19	0.02	0.04	0.01	T	03
04																									04
05																									05
06																									06
07																									07
08																									08
09																									09
10																					T				10
11																									11
12																									12
13																									13
14					T	0.01	T	0.08	0.01																14
15																									15
16									0.01		T	T													16
17																									17
18																									18
19																									19
20																									20
21																									21
22																					0.13	0.07	0.01	T	22
23			T	T	0.02	0.14	T	0.02	0.02	0.07	0.06	0.10	0.15	0.15	0.04	0.01	0.02	T							23
24					0.09	0.06		0.01	0.01		T													0.01	24
25	0.06	0.01			T	0.03							T	0.01											25
26																									26
27																									27
28																									28
29																									29
30		T	T																					0.01	30
31	0.01	0.04	T																						31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)	0.08	0.14	0.17	0.18	0.19	0.20	0.21	0.23	0.29	0.33	0.37	0.41
Ending Date Time (yyyy-mm-dd hh:mi)	2021-07-03 19:35	2021-07-03 19:38	2021-07-03 19:41	2021-07-03 19:45	2021-07-03 19:54	2021-07-03 20:10	2021-07-03 20:14	2021-07-23 13:32	2021-07-23 13:32	2021-07-23 13:46	2021-07-23 13:58	2021-07-23 14:19

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Daily Summary
October 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W
Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	Temperature (F)							Degree Days (base 65F)		Sun (LST)		Weather	Precipitation (in)			Pressure (inHg)		Wind	Maximum Wind Speed = MPH / Direction = Degrees			
	Max	Min	Avg	Dep	ARH	ADP	AWB	Heat	Cool	Rise	Set	Weather Type	TLC	Snow Fall	Snow Depth	Avg Stn	Avg SL	Avg Speed	Peak Speed	Peak Dir	Sust. Speed	Sust. Dir
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	91	69	80	-3.2	28	42	59	0	15	0622	1813		0.00			28.78	29.91	5.5	20	080	15	090
02	94	67	81	-1.7	28	43	60	0	16	0623	1811		0.00			28.77	29.91	4.2	20	060	16	060
03	96	69	83	0.7	28	46	62	0	18	0624	1810		0.00			28.74	29.86	3.5	17	010	14	110
04	98*	74	86	4.1	30	49	64	0	21	0624	1809	RA	T			28.72	29.85	7.7	29	270	23	270
05	85	68	77	-4.5	52	59	66	0	12	0625	1807	TS RA	0.28			28.72	29.85	7.6	26	020	20	270
06	90	68	79	-2.1	45	54	64	0	14	0626	1806		0.00			28.72	29.86	4.5	18	130	13	130
07	91	71	81	0.3	37	51	63	0	16	0626	1805		0.00			28.74	29.87	5.7	27	350	14	170
08	92	72	82	1.7	36	52	64	0	17	0627	1803		0.00			28.72	29.86	8.1	27	310	21	280
09	85	69	77	-2.8	29	41	58	0	12	0628	1802		0.00			28.69	29.83	8.0	21	280	15	270
10	85	62	74	-5.4	24	33	53	0	9	0629	1801		0.00			28.70	29.84	4.2	16	340	10	290
11	88	61	75	-4.0	28	36	54	0	10	0629	1800	RA DU HZ	0.04			28.46	29.60	12.5	46	270	35	270
12	71	57	64	-14.6	25	26	46	1	0	0630	1758	DU HZ	0.00			28.61	29.77	9.0	37	260	28	270
13	75	52*	64	-14.2	30	31	49	1	0	0631	1757		0.00			28.69	29.85	4.2	22	350	10	260
14	79	55	67	-10.8	29	32	50	0	2	0632	1756		0.00			28.79	29.93	5.8	15	240	12	230
15	84	56	70	-7.4	21	26	51	0	5	0633	1755		0.00			28.87	30.02	7.0	25	050	18	050
16	92	58	75	-2.0	17	27	53	0	10	0633	1753		0.00			28.79	29.94	7.2	25	080	18	070
17	90	67	79	2.4	22	35	56	0	14	0634	1752		0.00			28.74	29.87	6.3	23	300	16	270
18	86	63	75	-1.2	33	42	57	0	10	0635	1751		0.00			28.66	29.79	9.4	28	270	23	270
19	80	61	71	-4.8	37	42	55	0	6	0636	1750		0.00			28.76	29.90	4.1	25	320	12	280
20	85	59	72	-3.4	34	42	56	0	7	0636	1749		0.00			28.84	29.99	3.5	19	340	12	080
21	89	60	75	0.0	31	41	56	0	10	0637	1748		0.00			28.84	29.99	4.4	22	340	10	300
22	89	63	76	1.4	29	39	56	0	11	0638	1746		0.00			28.71	29.85	4.4	18	310	10	290
23	85	60	73	-1.2	31	39	55	0	8	0639	1745		0.00			28.61	29.75	6.0	17	080	12	070
24	87	63	75	1.2	32	41	56	0	10	0640	1744		0.00			28.67	29.80	5.6	20	010	12	130
25	90	63	77	3.5	36	47	60	0	12	0641	1743		0.00			28.63	29.77	8.1	26	260	21	260
26	77	60	69	-4.1	32	36	53	0	4	0641	1742		0.00			28.76	29.88	12.1	29	270	22	280
27	79	56	68	-4.7	25	29	49	0	3	0642	1741		0.00			28.90	30.05	3.1	15	300	12	300
28	88	55	72	-0.3	26	34	53	0	7	0643	1740		0.00			28.82	29.97	3.8	15	080	12	080
29	93	64	79	7.1	23	34	55	0	14	0644	1739		0.00			28.71	29.85	3.6	20	070	14	080
30	89	61	75	3.5	23	33	54	0	10	0645	1738		0.00			28.71	29.84	4.2	12	100	9	120
31	88	62	75	3.9	26	38	55	0	10	0646	1737		0.00			28.73	29.87	6.0	22	330	12	200
	86.8	62.7	74.8							Monthly Averages | Totals			0.32			28.73	29.87	6.0				
	-1.7	-2.1	-1.9	Departure from Normal (1981-2010)									-0.26									

Degree Days

	Monthly		Season-to-date	
	Total	Departure	Total	Departure
Heating	2	-4	2	
Cooling	305	-62	4693	

Number of days with...

	Temperature				Precipitation		Snow	Weather	
	Max		Min						
	>=90°	<=32°	<=32°	<=0°	>=0.01"	>=0.1"	>=1"	T-Storms	Heavy Fog
Heating									
Cooling	11	0	0	0	2	1		1	

Date of 5-sec to 3-sec wind equipment change

2007-04-03

Sea Level Pressure

		Date	Time
Maximum	30.15	27	0936
Minimum	29.40	11	2151

Greatest...

24-Hr...		Snow Depth
Precip	Snowfall	
0.28		
Date		
05-05		

Station Augmentation

Name:CONTRACTOR Lat: 33.4442 Lon: -112.0247 Elevation: N/A Distance: 0.5mi N Elements: TEMP, PRECIP Equipment: MXMN, SRG

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W
Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Local Climatological Data
Hourly Observations
October 2021

Generated on 09/15/2023

Max Hourly Wind Speed

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
11	0051	7	CLR:00	10.00		68	20.0	53	11.7	38	3.3	33	7	100		28.64			29.76	FM-15	0.00	29.81
11	0151	7	CLR:00	10.00		65	18.3	52	11.1	40	4.4	40	3	160		28.63	8	+0.02	29.76	FM-15	0.00	29.80
11	0251	7	FEW:02 30	10.00		65	18.3	53	11.7	41	5.0	42	5	100		28.61			29.74	FM-15	0.00	29.78
11	0351	7	CLR:00	10.00		64	17.8	51	10.6	39	3.9	40	8	120		28.61			29.74	FM-15	0.00	29.78
11	0451	7	CLR:00	10.00		63	17.2	51	10.6	40	4.4	43	8	110		28.60	6	+0.02	29.73	FM-15	0.00	29.77
11	0500	4		9.94		63	17.2	51	10.6	40	4.4	43	8	110		28.60	6	+0.02	29.73	FM-12		
11	0551	7	CLR:00	10.00		62	16.7	50	10.0	39	3.9	43	8	110		28.60			29.73	FM-15	0.00	29.77
11	0651	7	CLR:00	10.00		61	16.1	50	10.0	38	3.3	43	9	090		28.60			29.73	FM-15	0.00	29.77
11	0751	7	CLR:00	10.00		64	17.8	51	10.6	38	3.3	38	10	110		28.59	8	+0.01	29.72	FM-15	0.00	29.76
11	0851	7	FEW:02 250	10.00		69	20.6	53	11.7	37	2.8	31	8	110		28.59			29.72	FM-15	0.00	29.76
11	0951	7	FEW:02 250	10.00		74	23.3	54	12.2	34	1.1	23	11	160		28.58			29.70	FM-15	0.00	29.75
11	1051	7	FEW:02 250	10.00		77	25.0	55	12.8	34	1.1	21	10	150	20	28.57	8	+0.03	29.69	FM-15	0.00	29.74
11	1100	4		9.94		77	25.0	55	12.8	34	1.1	21	10	150		28.57	8	+0.03	29.69	FM-12		
11	1151	7	FEW:02 250	10.00		82	27.8	57	13.9	33	0.6	17	8	VRB		28.52			29.65	FM-15	0.00	29.69
11	1251	7	FEW:02 250	10.00		83	28.3	56	13.3	30	-1.1	15	10	VRB	18	28.48			29.60	FM-15	0.00	29.65
11	1351	7	FEW:02 250	10.00		87	30.6	58	14.4	30	-1.1	13	11	180	25	28.43	8	+0.13	29.55	FM-15	0.00	29.60
11	1451	7	FEW:02 250	10.00		87	30.6	57	13.9	28	-2.2	12	11	240	22	28.39			29.51	FM-15	0.00	29.56
11	1551	7	FEW:02 100 FEW:02 250	10.00		87	30.6	57	13.9	26	-3.3	11	15	220	25	28.37			29.48	FM-15	0.00	29.53
11	1651	7	FEW:02 100	10.00		85	29.4	56	13.3	27	-2.8	12	21	210	29	28.33	8	+0.11	29.44	FM-15	0.00	29.49
11	1700	4		9.94		85	29.4	56	13.3	27	-2.8	12	21	210		28.33	8	+0.11	29.44	FM-12		
11	1751	7	SCT:04 80	10.00		83	28.3	58	14.4	35	1.7	18	14	210		28.31			29.43	FM-15	0.00	29.47
11	1851	7	FEW:02 80	10.00		81	27.2	57	13.9	37	2.8	21	18	200	28	28.30			29.42	FM-15	0.00	29.46
11	1951	7	FEW:02 80	10.00		79	26.1	57	13.9	37	2.8	22	18	210	32	28.31	5	+0.01	29.43	FM-15	0.00	29.47
11	2051	7	CLR:00	10.00		77	25.0	56	13.3	38	3.3	24	22	200	39	28.29			29.41	FM-15	0.00	29.45
11	2151	7	SCT:04 80 SCT:04 200	10.00		75	23.9	57	13.9	43	6.1	32	20	180	33	28.28			29.40	FM-15	0.00	29.44
11	2244	7	SCT:04 30 OVC:08 75	3.00	-RA:02 BL:5 DU:5 |RA |RA	67	19.4	55	12.8	45	7.2	45	28	280	46	28.35				FM-16	T	29.51
11	2251	7	SCT:04 27 OVC:08 75	2.50	+RA:02 BL:5 DU:5 |RA |RA	62	16.7	56	13.3	51	10.6	67	21	270	38	28.37	3	-0.06	29.49	FM-15	T	29.53
11	2256	7	BKN:07 41 OVC:08 75	3.00	-RA:02 BL:5 DU:5 |RA |RA	63	17.2	55	12.8	49	9.4	60	13	260		28.37				FM-16		29.53
11	2300	4	26	2.49	||RA	62	16.7	56	13.3	51	10.6	67	21	270		28.37	3	-0.06	29.49	FM-12		
11	2320	7	BKN:07 30 OVC:08 70	2.50	BL:5 DU:5 ||	65	18.3	53	11.7	43	6.1	45	20	280	29	28.39				FM-16	0.04	29.56
11	2328	7	BKN:07 28 OVC:08 70	2.50	BL:5 DU:5 ||	65	18.3	51	10.6	36	2.2	34	21	290		28.39				FM-16	0.04	29.56
11	2351	7	BKN:07 28 OVC:08 70	2.50	DU:5 |HZ |FU	64	17.8	48	8.9	29	-1.7	27	21	260	28	28.40			29.53	FM-15	0.04	29.57

Max Hourly Wind Gust Speed

Max Hourly Wind Speed

Max 24-Hour Wind Speed

Max 24-Hour Wind Gust Speed

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Remarks
October 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W
Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	Time (LST)	Remarks
11	0051	MET09610/11/21 00:51:02 METAR KPHX 110751Z 10006KT 10SM CLR 20/03 A2981 RMK AO2 SLP079 T02000033 (ADH)
11	0151	MET10210/11/21 01:51:02 METAR KPHX 110851Z 16003KT 10SM CLR 18/04 A2980 RMK AO2 SLP077 T01830044 58008 (ADH)
11	0251	MET10910/11/21 02:51:02 METAR KPHX 110951Z 10004KT 10SM FEW030 18/05 A2978 RMK AO2 SLP071 FU FEW030 T01830050 (ADH)
11	0351	MET09610/11/21 03:51:02 METAR KPHX 111051Z 12007KT 10SM CLR 18/04 A2978 RMK AO2 SLP070 T01780039 (ADH)
11	0451	MET11410/11/21 04:51:02 METAR KPHX 111151Z 11007KT 10SM CLR 17/04 A2977 RMK AO2 SLP068 T01720044 10211 20172 56008 (ADH)
11	0500	SYN08072278 32966 01107 10172 20044 39685 40068 56008 91151 333 10294 20172 555 91112=
11	0551	MET09610/11/21 05:51:02 METAR KPHX 111251Z 11007KT 10SM CLR 17/04 A2977 RMK AO2 SLP069 T01670039 (ADH)
11	0651	MET09510/11/21 06:51:02 METAR KPHX 111351Z 09008KT 10SM CLR 16/03 A2977 RMK AO2 SLP067 T01610033 (DZ)
11	0751	MET10110/11/21 07:51:02 METAR KPHX 111451Z 11009KT 10SM CLR 18/03 A2976 RMK AO2 SLP065 T01780033 58003 (DZ)
11	0851	MET09810/11/21 08:51:02 METAR KPHX 111551Z 11007KT 10SM FEW250 21/03 A2976 RMK AO2 SLP064 T02060028 (DZ)
11	0951	MET09810/11/21 09:51:02 METAR KPHX 111651Z 16010KT 10SM FEW250 23/01 A2975 RMK AO2 SLP059 T02330011 (DZ)
11	1051	MET11910/11/21 10:51:02 METAR KPHX 111751Z 15009G17KT 10SM FEW250 25/01 A2974 RMK AO2 SLP055 T02500011 10250 20161 58009 (DZ)
11	1100	SYN08672278 32966 21509 10250 20011 39675 40055 58009 91751 333 10250 20161 91017 555 91118=
11	1151	MET09810/11/21 11:51:02 METAR KPHX 111851Z 17007KT 10SM FEW250 28/01 A2969 RMK AO2 SLP039 T02780006 (DZ)
11	1251	MET10210/11/21 12:51:02 METAR KPHX 111951Z 19009G16KT 10SM FEW250 28/M01 A2965 RMK AO2 SLP024 T02831011 (DZ)
11	1351	MET10810/11/21 13:51:02 METAR KPHX 112051Z 18010G22KT 10SM FEW250 31/M01 A2960 RMK AO2 SLP006 T03061011 58045 (DZ)
11	1451	MET10210/11/21 14:51:02 METAR KPHX 112151Z 24010G19KT 10SM FEW250 31/M02 A2956 RMK AO2 SLP994 T03061022 (JH)
11	1551	MET12710/11/21 15:51:02 METAR KPHX 112251Z 22013G22KT 10SM FEW100 FEW250 31/M03 A2953 RMK AO2 PK WND 19030/2230 SLP983 T03061033 (JH)
11	1651	MET13810/11/21 16:51:02 METAR KPHX 112351Z 21018G25KT 10SM FEW100 29/M03 A2949 RMK AO2 PK WND 22027/2331 SLP970 T02941028 10311 20250 58036 (JH)
11	1700	SYN08672278 32966 22118 10294 21028 39594 49970 58036 92351 333 10311 20172 91025 555 91200=
11	1751	MET10410/11/21 17:51:01 METAR KPHX 120051Z 21012KT 10SM SCT080 28/02 A2947 RMK AO2 SLP966 BLDU ALQDS T02830017
11	1851	MET09610/11/21 18:51:01 METAR KPHX 120151Z 20016G24KT 10SM FEW080 27/03 A2946 RMK AO2 SLP963 T02720028
11	1951	MET12010/11/21 19:51:02 METAR KPHX 120251Z 21016G28KT 10SM FEW080 26/03 A2947 RMK AO2 PK WND 21030/0239 SLP965 T02610028 55005
11	2051	MET11110/11/21 20:51:02 METAR KPHX 120351Z 20019G34KT 10SM CLR 25/03 A2945 RMK AO2 PK WND 21034/0350 SLP959 T02500033
11	2151	MET12110/11/21 21:51:02 METAR KPHX 120451Z 18017G29KT 10SM SCT080 SCT200 24/06 A2944 RMK AO2 PK WND 17030/0432 SLP955 T02390061
11	2244	MET17010/11/21 22:44:02 SPECI KPHX 120544Z 28024G40KT 3SM -RA BLDU SCT030 OVC075CB 19/07 A2951 RMK AO2 PK WND 27040/0541 WSHFT 0527 RAB43 BLDU SCT030 CB W MOV E P0000 T01940072
11	2251	MET21210/11/21 22:51:02 METAR KPHX 120551Z 27018G33KT 2 1/2SM +RA BLDU SCT027 OVC075CB 17/11 A2953 RMK AO2 PK WND 27040/0541 WSHFT 0527 RAB43 PRESRR SLP986 BLDU SCT027 CB W MOV E 60000 T01670106 10294 20167 53019 PNO $
11	2256	MET14310/11/21 22:56:02 SPECI KPHX 120556Z 26011KT 3SM -RA BLDU BKN041 OVC075CB 17/09 A2953 RMK AO2 WSHFT 0538 BLDU BKN041 CB W MOV E T01720094 PNO $
11	2300	SYN09872278 11540 82718 10167 20106 39607 49986 53019 69901 765// 90551 333 10294 20167 91033 555 91206=
11	2320	MET14110/11/21 23:20:02 SPECI KPHX 120620Z 28017G25KT 2 1/2SM BLDU BKN030 OVC070 18/06 A2956 RMK AO2 WSHFT 0538 RAE05 BLDU BKN030 P0004 T01830061 $
11	2328	MET13810/11/21 23:28:02 SPECI KPHX 120628Z 29018KT 2 1/2SM BLDU BKN028 OVC070 18/02 A2956 RMK AO2 WSHFT 0538 RAE05 BLDU BKN028 P0004 T01830022 $
11	2351	MET15510/11/21 23:51:02 METAR KPHX 120651Z 26018G24KT 2 1/2SM DU BKN028 OVC070 18/M02 A2957 RMK AO2 WSHFT 0538 RAE05 SLP000 DU BKN028 P0004 T01781017 403110161 $

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
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Local Climatological Data
Hourly Precipitation
October 2021

Generated on 09/15/2023

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1113 ft. Lat: 33.4278° N Lon: 112.0037° W

Station: **PHOENIX AIRPORT, AZ US WBAN:23183 (ICAO:KPHX)**

Date	For Hour (LST) Ending at																							Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01																									01
02																									02
03																									03
04																								T	04
05	T					T						T	T	T					0.28						05
06																									06
07																									07
08																									08
09																									09
10																									10
11																							T	0.04	11
12																									12
13																									13
14																									14
15																									15
16																									16
17																									17
18																									18
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Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Ending Date Time (yyyy-mm-dd hh:mi)	2021-10-05 18:17	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18	2021-10-05 18:18

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

Appendix D

PM MOVES AND AERMOD MODELING INPUT AND OUTPUT FILES

(PM MOVES and AERMOD Modeling Files are Available Upon Request and Can be Found in the Project Folder)