Report on Quarterly Air Monitoring, Area IV, Thirteenth Quarter 2021

Santa Susana Field Laboratory Ventura County, California

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Prepared for:
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Santa Susana Field Laboratory Ventura County, CA

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Santa Susana Field Laboratory
Ventura County, California

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EXECUTIVE SUMMARY

This report summarizes the United States Department of Energy (DOE) air monitoring activities conducted during the thirteenth quarter (Q13) of the monitoring period (April 1, 2021, to June 30, 2021) at Area IV within the Santa Susana Field Laboratory (SSFL), located in Ventura County, California. The area specifically discussed within this report is the DOE portion, Area IV of SSFL, known as the Energy Technology Engineering Center (ETEC). Year one of the Baseline Air Monitoring Program consisted of Quarter 1 through Quarter 4. Year two consisted of Quarter 5 through Quarter 7. Year 3 consisted of Quarter 8 through Quarter 11. The program is continuing for a fourth year, which consists of Quarter 12 through Quarter 15.

This quarterly report has been developed by North Wind Portage, Inc., on behalf of DOE in cooperation with The Boeing Company (Boeing) and the National Aeronautics and Space Administration (NASA), as part of the Baseline Air Monitoring Program.

In accordance with *the Final Baseline Air Monitoring Work Plan, Santa Susana Field Laboratory, Ventura County, California* (NASA 2017), the responsible parties are monitoring for particulate matter between 2.5 and 10 microns in aerodynamic diameter (PM_{10}), volatile organic compounds (VOCs), and radionuclides at air monitoring stations DOE-1, DOE-2, DOE-3, and DOE-4 encompassing the ETEC, Area IV portion of SSFL. Having developed the baseline levels for PM_{10}, VOCs, and radionuclides helps distinguish between levels that naturally occur or were previously present at the ETEC site and if onsite remediation activities produce elevated results. Air monitoring will be continued throughout remediation activities to be able to compare results from onsite remediation activities to baseline data in the Annual Air Monitoring Reports.

The following air monitoring activities conducted during Q13 2021 by DOE within Area IV are summarized in this report:

- Collected meteorological data from one location (DOE-4);
- Collected PM_{10} data from four locations (DOE-1 through DOE-4);
- Collected air samples from four locations (DOE-1 through DOE-4) for VOC laboratory analysis; and
- Collected radionuclide samples for laboratory analysis from four locations (DOE-1 through DOE-4).

Meteorological data, PM_{10}, and radionuclide data all met the data completeness goal of 80% and VOC data met the completeness goal of 85% for Q13. The fourteenth quarter of air monitoring is to be continued beginning July 1, 2021. Data collected during remediation activities will be compared to the baseline conditions in the year 4 annual report.

The following site activities were conducted during Q13 by DOE within Area IV:

- Annual site-wide groundwater monitor well sampling
- Quarterly site-wide groundwater level monitoring
- Deactivation of contract line item number (CLIN) 8 and 9 facilities
- Demolition of CLIN 8 facilities
- CDM Smith conducted groundwater sampling activities at the Former Sodium Disposal Facility as a part of groundwater interim measures
- Surveillance and maintenance.

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µCi	microcurie(s)
µg/m^3	microgram(s) per cubic meter
Boeing	The Boeing Company
CAAQS	California Ambient Air Quality Standard
CFR	Code of Federal Regulations
CLIN	contract line item number
DASC	Data Assessment Statistical Calculator
DOE	U.S. Department of Energy
DTSC	State of California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ETEC	Energy Technology Engineering Center
GC	gas chromatography
Hg	mercury
HHRA	Human Health Risk Assessment
m	meter(s)
m/sec	meter(s) per second
mb	millibar(s)
MDC	minimum detectable concentration
mL	milliliter(s)
mph	miles per hour
MS	mass spectrometry
NAAQS	National Ambient Air Quality Standard
NASA	National Aeronautics and Space Administration
NIST	National Institute of Standards and Technology
pCi	picocurie(s)
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
Q13	thirteenth quarter
QA	quality assurance
QC	quality control
RAWS	Remote Automatic Weather Stations
RPD	relative percent difference
RSL	regional screening level
SDG	sample delivery group
SSFL	Santa Susana Field Laboratory
VOC	volatile organic compound

1. INTRODUCTION

National Aeronautics and Space Administration (NASA), The Boeing Company (Boeing), and the U.S. Department of Energy (DOE), also known as the responsible parties, are performing air monitoring at the Santa Susana Field Laboratory (SSFL) site located in Ventura County, California. The SSFL is a business segment of Boeing. SSFL operates the 2,849-acre site located atop a range of hills between the Simi and San Fernando valleys, north of Los Angeles. The westernmost 290 acres of the SSFL, known as Area IV, contains both DOE and Boeing facilities. The DOE portion is mainly contained within the 90 acres known as the Energy Technology Engineering Center (ETEC).

When opened in the late 1950s, ETEC was ideally remote from population centers to enable development of security-sensitive projects. These projects supported research for DOE and its predecessor agencies for nuclear research and energy development. Area IV includes buildings that house test apparatus for large-scale heat transfer and fluid mechanics experiments, mechanical and chemical test facilities, office buildings, and auxiliary facilities.

Air monitoring is being conducted in accordance with the *Final Baseline Air Monitoring Work Plan, Santa Susana Field Laboratory, Ventura County, California* (NASA 2017), which was submitted to the State of California Department of Toxic Substances Control (DTSC) on September 21, 2017. DTSC approved the Work Plan. Final locations of the air monitoring locations were approved by DTSC on January 30, 2018 (DTSC 2018).

The objective of the Air Monitoring Program is to evaluate project conditions and provide a basis for determining the magnitude of deviation from those baseline conditions that may result from onsite remediation activities (project) at SSFL. Responsible parties are monitoring for particulate matter between 2.5 and 10 microns in aerodynamic diameter (PM_{10}), and volatile organic compounds (VOCs), at 14 locations at SSFL. Data were collected for four perimeter samplers (DOE-1 through DOE-4) and analyzed for gross alpha and gross beta. Individual radionuclide concentrations were determined by analysis at an offsite laboratory for these same four locations. Meteorological data are also collected as a part of the Air Monitoring Program.

Figure 1 shows the air monitoring locations for the Air Monitoring Program. These locations were selected based on the areas to be remediated, with consideration of winds in the area, topographic features, and accessibility. The air monitoring sites were also selected based on guidance obtained from the U.S. Environmental Protection Agency's (EPA's) *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume II, Ambient Air Monitoring Program (EPA 2017) and *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA 2000). Sites were evaluated per 40 Code of Federal Regulations (CFR) 58, Appendix C – Ambient Air Quality Monitoring Methodology. DOE is responsible for DOE-1, DOE-2, DOE-3, and DOE-4 of the 14 monitoring locations, represented in Figure 1. VOCs, PM_{10}, and radionuclides are monitored at the four DOE monitoring locations, and meteorological conditions are monitored at the DOE-4 location. The DOE monitoring locations DOE-1 through DOE-4 are shown in Figure 2.

This report summarizes the thirteenth quarter (Q13) quarterly results and quality assurance (QA) activities performed between April 1, 2021, and June 30, 2021.

1.1 Regional Climate and Wind Direction

The climate in the SSFL area is characterized as "Mediterranean." The mean temperature during the winter months is approximately 50 degrees Fahrenheit (°F) and the mean temperature in the summer months is approximately 70°F. Based on climate data between 2019 and 2020 from Weather Currents, average rainfall is on the order of 15.9 inches per year. The majority of the rainfall occurs between December and April with January and February being the wettest months.

The average hourly wind speed in Simi Valley varies significantly by season. The more turbulent part of the year lasts for 6 months, from November to April, with average western wind speeds of more than 7 miles per hour (mph). The calmer time of year lasts for 6 months, with northerly winds from May to October.

During the fall, winter, and spring, Santa Ana winds can blow from the north or northeast in excess of 35 mph.

2. SUMMARY

This report summarizes the air monitoring data collected during the Q13 reporting period (April 1, 2021, through June 30, 2021). Elevated air sampling levels were recorded during Q13.

Quality objectives and data completeness were met for all meteorological, PM_{10}, VOC, and radionuclide data for Q13 of the Air Monitoring Program.

Urban background data compared with air monitoring data indicate that the PM_{10} concentrations measured at stations DOE-1, DOE-2, DOE-3, and DOE-4 during Q13 are comparable to the PM_{10} concentrations measured at stations characterizing urban background. Other sources that emit VOC characteristics are motor vehicle emissions, fossil fuel combustion, and wildfires. The results are reflected when considering SSFL site's urban background and relatively remote location from vehicle traffic. PM_{10} concentrations exceeded the California Ambient Air Quality Standard (CAAQS; 50 micrograms per cubic meter [$\mu g/m^3$]) one time, at DOE-4 (June 23, 2021), but the concentration was below the National Ambient Air Quality Standard (NAAQS; 150 $\mu g/m^3$). This can be attributed to an unexpected helicopter landing next to the DOE-4 sample location, kicking up dirt and debris.

During Q13 three VOC analytes were detected above the EPA regional screening level (RSL). Ethyl acetate was detected at DOE-4, methylene chloride was detected at DOE-3 and DOE-4, and 1,4-dioxane was detected at DOE-3. Ethyl acetate is a chemical used in glues, nail polish, and decaffeination processes. There is no source for ethyl acetate on site. Methylene chloride is a chemical used as a post-harvest fumigant for grains, berries, and citrus fruits. 1,4-dioxane is a trace contaminant in some cosmetic products.

During Q13, detections for gross alpha and gross beta that exceeded the minimum detectable concentration (MDC) are all naturally occurring radionuclides. Detections are expected because the results are calculated at a 95% confidence level. No man-made radionuclides that are contaminants of concern at ETEC were detected. All radiological data reported for the air filter samples are naturally occurring.

Data collected during Q13 agrees with data collected, analyzed, and reported by the State of California DTSC, Los Angeles County Emergency Response Organization, the DOE Emergency Response organization, or other Multi-Agency Task Forces. Air monitoring at Area IV of the SSFL is to be continued starting July 1, 2021, for the fourteenth quarter of the Air Monitoring Program.

Site activities during Q13 included annual site-wide groundwater monitor well sampling, quarterly site-wide groundwater level monitoring, deactivation of contract line item number (CLIN) 8 and 9 facilities, demolition of CLIN 8 facilities, surveillance and maintenance, and CDM Smith conducted groundwater sampling activities at the Former Sodium Disposal Facility as part of the groundwater interim measures. Work area air monitoring was conducted during asbestos abatement, confirming that there was no airborne contamination resulting from abatement activities. Trucking activities were not conducted near the perimeter air monitoring stations.

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3. ANALYTICAL SAMPLING EVENTS

VOCs are collected according to the EPA Toxic Compendium Method TO-15, *Determination of Volatile Organic Compounds (VOCs) Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)* (EPA 1999). Twenty-four-hour time-integrated samples are collected into Summa canisters via a flow controller and sent to an offsite laboratory for analysis. VOCs are collected every other week. There were six VOC sampling events in this reporting period with six field duplicate samples collected during this reporting period.

During Q13, radionuclide samples were collected at four perimeter sampler locations, DOE-1 through DOE-4. These samples were collected on glass fiber (Type A/E) filters that are changed twice a week. After a minimum 120-hour holding time to allow the decay of short-lived radon and thoron daughter products, the samples are simultaneously counted for gross alpha and beta activity with a low-background, thin-window, gas-flow proportional-counting system continually purged with P-10 argon/methane counting gas over a preset time interval. There were 104 airborne radioactivity filter samples collected in Q13 — 26 each for DOE-1, DOE-2, DOE-3, and DOE-4. Following analysis for gross alpha and gross beta radiation, sample filters were combined to form one composite sample representative of each location. The four composite samples were then analyzed for individual radionuclides at an offsite laboratory.

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4. DATA

Sections 4.1 through 4.4 discuss Q13 air monitoring data.

4.1 Meteorological Data

General Summary

Meteorological data, also called weather data, is being collected as part of the ETEC cleanup and restoration effort. This information, particularly the wind direction and wind speed, can be used to help understand how dust and other air pollutants from the site are carried by the wind and possibly affect nearby public and residential areas. This is especially important when the E-BAM particulate monitors at the site detect higher-than-normal amounts of dust in the air. Scientific computer models can be used with this weather data in association with the particulate monitoring data to describe the air quality for the communities near the ETEC site. However, before the weather data can be used with the computer models it must first be tested for completeness and accuracy. A detailed description of the weather data collection and quality testing is provided in the following paragraphs.

Monitored meteorology parameters at the DOE-4 station included wind speed, wind direction, air temperature at 2 meters (m) and 10 m, relative humidity, precipitation, barometric pressure, and solar radiation. In addition, statistical parameters provided by the data logger included delta temperature (i.e., defined as the 10-m temperature minus the 2-m temperature), maximum wind speed (i.e., wind gust), and standard deviation of wind direction. Observations were recorded at 15-minute intervals for :00, :15, :30, and :45 minutes each hour. There were 91 days in this reporting period (Q13), which covers April 1, 2021, to June 30, 2021, with a total of 8,736 possible 15-minute observations. This is the second quarter in Year 4 of the Air Monitoring program.

Data Validation and Statistics

Data validation screening was performed on the recorded meteorological observations pursuant to EPA's *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA 2000), Table 8-4 (Suggested Data Screening Criteria) and Table 8-3 (Suggested Quality Control Codes). Validation screening provided the basis for evaluating data completeness and for determining sensor performance and/or maintenance status. Validation was performed following each weekly data download. Data validation quality control codes applied to the meteorological observations are defined in Table 1.

Table 1. Data screening quality control codes for meteorological data.

Code	Meaning	Description (as used for ETEC meteorological data validation)
0	Valid	PASS – Observation is accurate within the performance limits of the instrument (i.e., value passes all data validation screening criteria)
3	Acceptable	PASS – Observation originally failed initial quality control (QC) check (see Code 6), but additional review using other independent data and meteorological judgment support final validity.
6	Failed initial QC check	FAIL – Observation did not pass data validation screening criteria.
7	Suspect	FAIL – Observation failed initial data validation QC check (see Code 6) and could not be verified through additional review using other independent data.
8	Invalid	FAIL – Observation judged to be inaccurate or in error, and the cause is known.
9	Missing	FAIL – Observation was not collected.

The validation screening involved comparing, on an individual parameter basis, the recorded values (i.e., observations) against the EPA screening criteria shown in Table 2. The data validation procedure involved an initial automated review to apply a first level QC Code of 0 (valid), 6 (failed), or 9 (missing) as defined in Table 1. Observations initially flagged with a QC Code = 6 were then manually (i.e., second-level) reviewed by a project meteorologist. The procedure is outlined below:

- Values meeting all screening criteria for the respective meteorological parameter were automatically considered "valid" (QC Code = 0).
- Values not meeting a screening criterion were automatically flagged as "failed initial QC" (QC Code = 6). These values were subjected to second-level manual meteorological review using other available observations (e.g., 2-m vs. 10-m temperature at DOE-4 or from nearby Remote Automatic Weather Stations [RAWS] meteorological station CEEC1 in the Cheeseboro Canyon, California, area located 2.6 miles south of the DOE-4 site), and meteorological judgment:
  - Values confirmed by second-level review were deemed "acceptable" (final QC Code = 3).
  - Otherwise, the values were deemed "suspect" (final QC Code = 7).
- Observations known to be inaccurate (QC Code = 8).
- Missing observations were automatically flagged as "missing" (QC Code = 9).

Values that pass validation with a final QC Code of 0 or 3 are included in the data completeness statistics and the final validated meteorological data set. Values with a final QC Code of 7, 8, or 9 are excluded from the final dataset and counted against the data completeness percentage. Quarterly data statistics for the meteorological parameters are listed in Table 2 along with year-to-date and project-to-date results. Year-to-date and project-to-date percentages are calculated as total valid observations through the completed quarters for the year divided by the total possible observations through this same period.

The completeness goal for meteorological data is 80% on an annual basis. Data completeness statistics for all completed reporting quarters in Year 4 of the baseline monitoring are presented in Table 2.

Wind Rose

The final validated 15-minute meteorological dataset was used to develop the wind rose for Q13 as presented in Figure 3. A wind rose is a graphical representation of wind speed and direction distribution (or climatology) for the period of interest. The frequency of winds blowing from a particular direction is shown as petals on the wind rose, with the frequency of wind speeds depicted by color bands. Calm winds are identified as being less than 0.5 meters per second (m/sec).

During Q13, data capture for wind speed and direction at DOE-4 was 100%. The average and maximum wind speeds were 3.56 m/sec and 12.1 m/sec, respectively. The maximum recorded wind gust was 18.7 m/sec. There are two predominant wind directions: the first from the east-southeast, and the second clustered around northwest.

Table 2. Data screening summary for monitored meteorological parameters.

Meteorological Parameter	Screening Criteria [1] (for valid sensor responses)	Data Completeness Percent (%) [2]			
		Q12	Q13	Year 4 to Date	Project to Date
Wind Speed	between 0 and 25 m/sec > 0.1 m/sec variation over 3 hours > 0.5 m/sec variation over 12 hours	100	100	100	93.29
Wind Direction	between 0 and 360 degrees > 1 degree variation over 3 hours > 10 degree variation over 12 hours	100	100	100	93.29
Standard Deviation of Wind Direction	Inherits the completeness stats of Wind Direction	100	100	100	93.29
Temperature @ 2 m	≤ local record high (monthly basis) ≥ local record low (monthly basis) > 0.5 degrees Celsius (°C) variation over 12 hours	100	100	100	93.28
Temperature @ 10 m	≤ local record high (monthly basis) ≥ local record low (monthly basis) > 0.5°C variation over 12 hours	100	100	100	93.29
Delta Temperature	≤ 0.1°C during daytime ≥ -0.1°C during nighttime between -3.0 and 5.0°C	100	100	100	93.28
Relative Humidity (and Dewpoint Temperature)	relative humidity between 0-100% dew point T ≤ ambient T dew point T ≤ 5.0°C variation over 1 hour dew point T > 0.5°C variation over 12 hours	100	100	100	85.63
Precipitation	≤ 1 inch in 1 hour ≤ 4 inches in 24 hours ≥ 2 inches in 3 months	100	100	100	93.27
Barometric Pressure	between 871 and 982 millibar (mb) (local) (i.e., between 940 and 1060 mb sea level) ≤ 6 mb variation over 3 hours	100	100	100	93.29
Solar Radiation	> 0 at night ≤ maximum possible for date and latitude	95.76	94.39	95.07	92.31

(1) Screening criteria from EPA Meteorological Monitoring Guidance (EPA 2000), Table 8-4.

(2) Data Completeness % = [Observations Passing] / [Possible Observations)].

a. Missing or suspect observations count against data completeness statistics.

b. Year Two is an abbreviated data collection year spanning the period Apr 15-Dec 31, 2019 (i.e., Quarters 5, 6, and 7). This was done to synchronize future data collection years with calendar years.

c. Last column in this table represents the cumulative Completeness % for all completed quarterly reporting periods.

(3) The number of possible 15-minute observations in the completed reporting periods:

- Q1 = 8,736
- Q2 = 8,832
- Q3 = 8,832
- Q4 = 8,640
- Q5 = 8,736
- Q6 = 8,832
- Q7 = 7,488 (only 3 quarters)
- Q8 = 8,736
- Q9 = 8,736
- Q10 = 8,832
- Q11 = 8,832
- Q12 = 8,640
- Q13 = 8,736
- Year One = 35,040
- Year Two = 25,056 (abbreviated)
- Year Three = 35,136
- Year Four = 17,376 (to-date)
- Project = 112,608 (to-date)

4.2 PM_{10} Data

PM_{10} data, defined as coarse particles between 2.5 and 10 microns in aerodynamic diameter, are measured at the ETEC site. Sources of particulate matter can be naturally occurring or caused by human activity. The air monitoring conducted at ETEC is used to determine if any suspended particles are from activities conducted onsite or if they are consistent with surrounding air quality data. Some of the naturally occurring particles can originate from high winds, forest or grass fires, burning of fossil fuels in vehicles, or stirred-up road dust.

PM_{10} data are collected with Met One E-BAM monitors at four monitoring locations. The Met One E-BAM uses the principle of beta attenuation to provide a determination of mass concentration. Twenty-four-hour concentrations are calculated from the hourly concentrations. There were 91 days in this reporting period.

- DOE-1 had valid readings all 91 days.
- DOE-2 had valid readings all 91 days.
- DOE-3 had valid readings all 91 days.
- DOE-4 had valid readings all 91 days.

All four station units had 100% data completeness for PM_{10} for Q13, with a total data completeness of 100%, exceeding the project goal of 80% completeness for total samples collected (see Table 3). The complete table of daily averages is presented in Appendix A.

Table 3. PM_{10} data completeness for April 1, 2021, to June 30, 2021.

Location	Valid Readings (Days)	Possible Readings (Days)	Data Completeness (Percent)
DOE-1	91	91	100%
DOE-2	91	91	100%
DOE-3	91	91	100%
DOE-4	91	91	100%
Average Total Data Completeness			100%

The five highest PM_{10} results identified for the reporting period are listed in Table 4 along with the CAAQS for PM_{10}. PM_{10} concentrations were consistent with levels typically found in urban air. Of these top five results, three were recorded at DOE-4 and one each at DOE-1 and DOE-2. One of the five values was above the CAAQS, but below the NAAQS of 150 µg/m^3. This occurrence happened on June 23, 2021. On this date there was an unidentified helicopter that landed t next to the DOE-4 sensor, kicking up dust and debris with its rotors. Video was captured but we were unable to identify the origin of the helicopter, and this occurrence was reported to DOE and Boeing.

Table 4. Top five PM_{10} 24-hour average concentration days for Q13.

Date	Location	PM_{10} Value (µg/m^3)	CAAQS (µg/m^3)
6/23/2021	DOE-4	**60.33300**	50
4/30/2021	DOE-2	48.41600	50
6/9/2021	DOE-1	37.58300	50
4/11/2021	DOE-4	33.83300	50
6/28/2021	DOE-4	33.33300	50

Note: The bold number is above CAAQS screening level.

4.3 Volatile Organic Compound Data

VOCs are organic chemicals that have a high vapor pressure, which causes them to evaporate quickly and enter the surrounding air. VOCs can be naturally occurring or man-made. The VOC data collected can help distinguish between man-made detections from onsite activities or naturally existing organic chemicals. The VOC data collected are compared against screening levels. These screening levels are risk-based concentrations derived from standardized equations combining exposure information with toxicity data.

Three of the four DOE locations were sampled each day during the six VOC sampling events this period. Sample delivery group (SDG) P2102617 did not have samples for DOE-2 (May 11, 2021) due to a regulator malfunction that prevented air from entering the canister. Data completeness goals for VOCs exceeded the project goal of 85% (see Table 5).

Table 5. Ambient air VOC data completeness.

Location	Valid Readings (Days)	Possible Readings (Days)	Data Completeness (Percent)
DOE-1	6	6	100%
DOE-2	5	6	83.333%
DOE-3	6	6	100%
DOE-4	6	6	100%
Average Total Data Completeness			95.833%

VOC detection results are presented in Table B-1 (Appendix B), including comparison to the April 2019 DTSC Human Health Risk Assessment (HHRA) Note 3 Screening Levels (DTSC 2019) or the May 2018 EPA RSLs (EPA 2018). Three analytes were detected above the screening levels in Q13. Ethyl acetate was detected at DOE-4 during the April 13, 2021, sampling event. 1,4-dioxane was detected during the April 27, 2021, sampling event (DOE-3). Methylene chloride was detected during the May 11, 2021, sampling event (DOE-4) and the June 25, 2021, sampling event (DOE-3).

Two man-made VOC analytes, dichlorodifluoromethane (freon-12) and ethyl acetate, have been detected routinely at all four monitoring stations, during all quarterly sampling events, and in duplicate samples. These analytes were also detected as estimated values at NASA stations, but were not detected at Boeing stations. Based on laboratory QC data (method blanks, clean canister certifications), the sampling process and laboratory process are not the sources of the two analytes. The onsite source of the analytes is currently unknown.

By using the results from the baseline air monitoring program, along with other site characterization information, analytes were selected for routine air monitoring during soil disturbances. Establishing sources for specific contaminants, or performing source apportionment was not a requirement for identifying remedial air quality impacts nor was it within the scope or data quality objectives of the air monitoring program.

4.4 Radionuclide Data

ETEC continuously monitors air at multiple locations for radioactive particles. This is performed for two reasons: (1) to determine the background airborne radioactivity concentration so that any possible releases from work activities can be detected, and (2) to detect any possible release from existing activities. As shown on the trend graphs, the background airborne radioactive contamination continued at low and stable concentrations, and there was no detected release of material.

There were 104 airborne radioactivity filter samples collected in Q13 — 26 each for DOE-1, DOE-2, DOE-3, and DOE-4. Each sample was collected on a glass-fiber filter (as discussed in Section 3) and was analyzed using a "low background" Protean radiation counter system onsite. These samples included background radioactive materials and the potential of Area IV–specific radioactive materials.

The alpha and beta data are presented in Table C-1 (Appendix C). The onsite analysis determined only "alpha" or "beta/gamma" and did not analyze for specific isotopes. Isotopic analysis was performed later by an offsite laboratory. Each sample produced a gross alpha and beta-gamma count. The analysis compared these values with the background radiation count rates, and using the volume of air collected determined the net counts and the MDC for each sampling event. Some results in Table C-1 (Appendix C) are shown as negative values (because detector background is subtracted from the result).

All but six alpha samples were below the MDC, and each MDC was below the airborne effluent limits specified in California regulations. There was no possibility of significant Area IV alpha radioactive material on these filters. The single alpha sample greater than the MDC was only slightly above the MDC, and was well below the effluent limits specified in California regulations.

Approximately 24% of the beta samples were below MDC, and the gross (background radioactive material included) samples exceeded the MDC in 76% of samples, indicating the presence of airborne radioactive material (including background materials). The beta-gamma samples greater than the MDC were only slightly above the MDC, and were well below the effluent limits specified in California regulations. The elevated (but still low) results correlate to the increased dust seen previously in the spring and summer quarter of previous years.

Following collection and onsite analysis, the air filters were composited and analyzed for specific radionuclides by an offsite laboratory. This data is shown in Table C-2 (Appendix C). This laboratory data determined that most radioactive material present was natural in origin, consisting of beryllium-7, polonium-210, potassium-40, combined radium-226 and radium-228, thorium-228, thorium-230, thorium-232, uranium-233/234, uranium-235/236, and uranium-238.

While artificial radionuclides (e.g., Cs-137, Sr-90, Pu-239) were present in very small amounts, none of the results were above the MDC in Q13. The presence of these radionuclides is considered a part of the normal variation of global fallout and resuspension activities.

A summary of the gross air sampling data is shown in Table 6.

Table 6. Gross alpha and beta-gamma average results for Q13.

Location	Average alpha result (µCi/mL)	Average alpha MDC (µCi/mL)	Average beta result (µCi/mL)	Average beta MDC (µCi/mL)
DOE-1	1.80E-15	6.10E-15	3.90E-14	2.57E-14
DOE-2	2.17E-15	6.10E-15	4.73E-14	2.57E-14
DOE-3	1.92E-15	6.11E-15	4.50E-14	2.57E-14
DOE-4	1.78E-15	6.11E-15	3.99E-14	2.57E-14
Average	1.92E-15	6.10E-15	4.28E-14	2.57E-14

5. QA/QC ACTIVITIES

The following QA/QC activities were conducted for the PM_{10}, VOC, radionuclide, and meteorological data collection and analysis.

5.1 Field QA/QC

5.1.1 PM_{10}

The 24-hour daily averages for Q13 are presented in Appendix A along with the monthly minimum, maximum, and 95th percentile for each station location.

Flow Verifications

Functionality of the Met One E-BAM units is verified and recorded monthly during instrument audits; however, the instruments are also checked several times a week for operability. During the monthly audits, the Met One E-BAM temperature, pressure, and flow rate are verified against a National Institute of Standards and Technology (NIST) traceable flowmeter. E-BAM units are occasionally swapped out for maintenance, and preliminary audits of the new units are performed. The Q13 audit results for the four DOE sites showed bias percentages that ranged from -2.10 to -0.43%. None of the results exceeded the flow rate measurement quality objective of +/- 4%.

Complete audit reports and flow verification results for Q13 are presented in Appendix D of this document. The flow rate verifications were based on 40 CFR 58, Appendix A, 3.3.1 and 4.2.2 through 4.2.3, along with the *Guideline on the Meaning and the Use of Precision and Bias Data Required by 40 CFR Part 58 Appendix A* (EPA 2007). The *Data Assessment Statistical Calculator* (DASC) tool, which is an EPA Excel-based software application, was used to perform the necessary statistical calculations based on input audit data. Sections 2 and 2.5 of this EPA guidance document (EPA 2007) provide additional information and instruction for using the DASC tool.

5.1.2 VOCs

A minimum of 20% of the VOC results are undergoing third-party data validation, annually. During this quarter, one of the SDGs, SDG P2103186, underwent data validation. The data validation ensures that the required analytical measurement quality objectives are met to ensure the data are of sufficient quality for their intended purpose.

Five of the six DOE locations had valid readings on all six sample days for a sample completeness of 95.833%. Data completeness goals for VOCs exceeded the project goal of 85%.

5.1.3 Field Duplicates

Six field duplicates were collected during this reporting period, one per sampling event. The analytes ethyl acetate in SDGs P2101939, P2102984, and P2103424 and methylene chloride and toluene in SDG P2103424 were detected in three field duplicates pairs and exceeded the quality objective of +/- 15% relative percent difference (RPD). For SDG P2102256 the analytes carbon disulfide, 2-butanone, and 1,4-dioxane; for SDG P2102617 the analytes methylene chloride, ethyl acetate, acrolein, isopropyl alcohol, and 2-butanone; and for SDG P2102984 the analytes toluene and tetrahydrofuran were detected at levels higher than the RL in either the sample or duplicate, and in comparison, were reported as a non-detect in the associated sample or duplicate and exceeded the quality objective of +/- 15% RPD. Fourteen sample and duplicate analyte detections were within the quality objective of +/- 15% RPD. There were no other detections associated with the samples and associated duplicates collected during this reporting period.

5.1.4 Canister Pressure

Vacuum in the canisters is measured before and after sampling with an analog pressure gauge to ensure proper function. Final canister vacuums ranged from -5 inches mercury (Hg) to -1 inches Hg during this reporting period.

5.1.5 Radiological

The detector for onsite gross alpha and beta sample analysis is calibrated annually by a third-party vendor using sources traceable to the NIST. The detector is checked by counting alpha- and beta-emitting sources at the site when received from the vendor following calibration. This establishes an acceptable performance range for daily source checks. On each day the detector is used, performance is determined with the site source. The detector may be used if the daily check is within the acceptable performance range.

Samples analyzed at the offsite laboratory are QC-checked at the laboratory. These QC checks include blanks, laboratory replicates, matrix spikes, and matrix spike duplicates. Barium, which behaves chemically similar to radium, is used as a carrier to determine the yield of the chemical extraction.

During this quarter, SDG 550097 underwent data validation. A minimum of 20% of the annual radiological analytical results will undergo third-party data validation for Year 4.

5.1.6 Meteorological

During the reporting period, a weekly data validation screening and review was performed on the monitored meteorological parameters based on the EPA guidance document *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA 2000), Table 8-4 – Suggested Data Screening Criteria, as outlined in Section 4.1. The data validation procedure provided the basis for evaluating data completeness and for determining sensor performance and/or maintenance status.

5.1.7 Maintenance

Routine visual checks were performed on the meteorological station during weekly data downloading site visits. This included inspection of the meteorological tower sensors, E-BAM monitoring unit wind sensors, and solar-powered batteries to ensure proper functioning.

5.1.8 Corrective Action

Issues and corrective actions regarding the PM_{10} monitors and the meteorological station are noted in Sections 5.1.8.1 and 5.1.8.2, respectively. No issues or corrective actions were noted regarding the remaining monitoring equipment or sampling events during this reporting period.

5.1.8.1 PM_{10} Monitors

Refer to Section 4.2 for a detailed description of PM_{10} air monitoring equipment issues.

5.1.8.2 Meteorological Station

Although the data percent completion goal during Q13 has been met, the solar radiometer continued to record values that exceed the daily screening criteria. Also, the improperly programmed data logger continues to affect calculation of delta temperature (i.e., temperature difference between 2 m and 10 m).

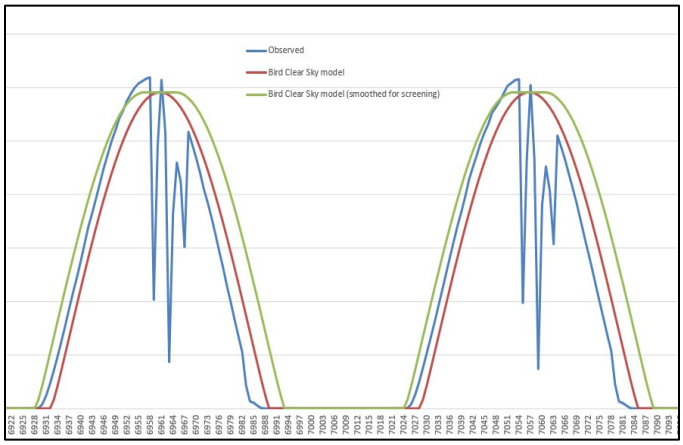
Solar Radiometer – The solar radiometer continued to record observations that exceed the maximum possible for the date, time of day, and latitude/longitude (i.e., the Level 1 screening criteria from Table 2). Theses exceedances generally continued to occur within one hour before and after solar noon, and the number of exceedances has steadily increased over the past several monitoring periods, indicating a deterioration in the quality of observations from this sensor. The maximum possible values are determined from the Bird Clear Sky Radiation Model (SERI 1981) and represent theoretical maximums that can occur under the clearest sky conditions. Level 2 screening has been unable to resolve these recurring events. Consequently, these observations are flagged with QC Code = 7 (i.e., suspect) and excluded from the final validated dataset.

During data processing at the end of Q13, an additional site investigation was performed that involved inspecting the weather station configuration and plotting a time series of solar radiometer observations against the Clear Sky Model predictions. Three data quality issues were identified with this investigation.

- Data Quality Issues:

  (1) The datalogger clock had slowly drifted (i.e., slowed) approximately by 45–60 minutes from the actual Pacific Daylight Time.

  (2) Three minimum (i.e., downward pointing) spikes in the solar radiometer observation time series graph were clearly visible almost daily approximately around solar noon. It was determined that these resulted from distinct shadows (or mini-eclipses of the sun) caused by three vertical poles comprising the tower mast. This shadowing is cast on the solar radiometer because this sensor is mounted on the north side of the tower versus. The images below show the daily downward spikes (eclipsing) in the timeseries graph caused by the sensor location relative to the sun (i.e., sun to the south and sensor to the north with the mast in between), and also show the datalogger clock drift.



A solar radiometer installation manual from Kipp & Zonen, a manufacturer of research-grade precision radiometers, states:

"When installed on a mast, the preferred orientation should be such that no shadow is cast on the Net Radiometer at any time during the day. In the Northern Hemisphere this implies that the Net Radiometer should be mounted south of the mast."

A review of all previous quarters revealed that this has been occurring since the start of the

project. These minimum spikes are clearly visible on sunny days but hard to discern on cloudy or partly sunny days. This issue was not detected by the Level 1 screening, which only flags observations in excess of the predicted theoretical maximum.

(3) After filtering out the minimum spikes caused by shadowing from the tower mast poles, the observations (on sunny days) are seen to closely follow the Clear Sky Model diurnal curve (when corrected for datalogger timestamp drift) but with an upward drift in the sensor response that has worsened over time. This is the cause of the flagged exceedances. The minimum spikes caused by shadows from the tower poles had masked this sensor drift and made it appear as though the exceedances were random spikes centered around solar noon.

- Corrective Actions:

(1) The datalogger clock was inspected at the site and found to be incorrect. The datalogger clock was reset. This will result in an apparent data gap in an upcoming weekly data download. An evaluation of the timestamp drift in the time series data will be made in order to apply a timestamp correction to previous observations. This correction will rely on the Bird Clear Sky Radiation model curve and sunrise/sunset times as ground truth for the timestamp.

(2) The solar radiometer sensor was moved from the north side of the tower mast to the south side to avoid cast shadows around solar noon. However, it is possible that similar, but lesser amplitude, shadows may occur early and late in the days during summer months due to the solar azimuth angle moving north of the east and west meridians.

(3) The glass dome of the solar radiometer was inspected and cleaned.

(4) The timestamps and solar observations will be carefully reviewed during the next several weekly data downloads and validation procedures to determine the effectiveness of the corrective actions. If the exceedances continue to occur, then a recommendation will be made to replace the solar radiometer with a new or newly certified sensor.

Delta Temperature Calculation – As stated in the corrective actions section of the Q3 air monitoring report (North Wind, Inc. 2019), the replacement data logger installed in December 2018 (due to Woolsey Fire wildfire damage on November 8, 2018) was improperly programmed to calculate delta temperature inversely to how it had been calculated in the original data logger. Consequently, the delta temperature observations are now being calculated with an opposite sign compared to the values from the original data logger.

The equations below represent the before and after delta temperature calculations:

- Prior to November 7, 2018 (correct calculation):

  Delta Temperature = [Temperature @ 10 m] minus [Temperature @ 2 m] (Eq. 4-1)

- November 7 to December 18, 2018:

  Station DOE-4 inoperable due to wildfire damage

- After December 18, 2018 (incorrect calculation):

  Delta Temperature = [Temperature @ 2 m] minus [Temperature @ 10 m] (Eq. 4-2)

For consistency with the initial data collection quarters when delta temperature was correctly recorded by the original data logger, the incorrect delta temperature calculations from the replacement data logger continue to be adjusted through postprocessing to conform with Equation 4-1. The adjustment is simply a multiplication factor of "-1" applied to the delta temperature values from the new data logger prior to performing the data validation.

Meteorological Data Sensor Maintenance – Although not a corrective action, the manufacturer's recommended maintenance frequency for meteorological sensors is presented below. Proper and timely maintenance of the meteorological sensors is critical for ensuring that the data are not only valid (based on screening criteria) but also accurate. Schedules for maintenance and calibration are listed in the sensor user manuals and are based on the service time of the sensor. Table 7 lists the maintenance schedules for the Met One sensors installed at the DOE-4 meteorological station.

Table 7. Meteorological sensor recommended maintenance frequency (Met One).

Sensor	Frequency	Maintenance
WS	6–12 Month	Inspect for proper operation (manual check of pulses per revolution, bearing condition, anemometer cup condition, and bearing replacement if warranted)
	12–24 Month	Return to Met One for complete overhaul
WD	6–12 Month	Inspect for proper operation (manual check of sensor readings through 360°)
	6–12 Month	Field calibration
	12–24 month	Replace bearings & potentiometer
T	6–12 Month	Inspect sensor for proper operation (field comparison sensor reading against a precision mercury thermometer)
RH	6–12 Month	Inspect sensor for proper operation (compare sensor reading against local weather service or field psychrometer)
	12 Month	Return sensor to Met One for calibration and replacement of O-rings and filter membrane
Rain Gauge	6 Month	Clean sensor and bucket and field verify proper operation
Pressure	12 Month	Return sensor to Met One for calibration and replacement of O-rings and filter membrane
Radiometer	Monthly	Clean sensor glass dome with clean rag/tissue

Note: Maintenance schedules as specified in the respective Met One sensor user manuals.

5.2 Laboratory QA/QC

This report covers 29 air monitoring samples for VOCs collected and analyzed according to the EPA Toxic Compendium Method TO-15, *Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)* (EPA 1999). These samples were reported under six SDGs by the laboratory. All six SDG analyses were performed by ALS in Simi Valley, CA. For each SDG, the laboratory ran continuing calibration verification, a method blank, and laboratory control samples, and verified surrogate recoveries for each sample.

The laboratory provided certified clean canisters for the sampling events. The certification of the canister batch is considered the equipment blank for each sampling event. The ALS case narrative discusses the cleaning of the canisters.

5.3 Audit Results

The PM_{10} instruments were calibrated at the manufacturer and were functioning properly upon installation. The PM_{10} instruments were audited monthly with a secondary NIST traceable flow meter. Although audits occur only monthly, the instruments were checked several times a week to ensure that they were functioning. Table 8 lists the dates for audits conducted in April through June. No flow rate comparisons exceeded the project's acceptance criterion of +/- 4; however, the instrument at DOE-3 (W23310) was replaced on 5/28/21. It was noted that W23310 quit working during a routine check. The repair shop stated that it was due to a bad power sensor that was prohibiting the unit from powering up properly. The sample nozzles and support vanes were cleaned as needed. Complete audit reports are presented in Appendix D.

Table 8. PM_{10} audit completeness.

Location	Met One E-BAM Serial Number	Parameter	Date
DOE-1	W23314	PM_{10}	04/23/2021
DOE-2	Y12096	PM_{10}	04/23/2021
DOE-3	W23310	PM_{10}	04/23/2021
DOE-4	X16067	PM_{10}	04/23/2021
DOE-1	W23314	PM_{10}	05/14/2021
DOE-2	Y12096	PM_{10}	05/14/2021
DOE-3	W23310	PM_{10}	05/14/2021
DOE-4	X16067	PM_{10}	05/14/2021
DOE-3	W23313	PM_{10}	05/28/2021
DOE-1	W23314	PM_{10}	06/16/2021
DOE-2	Y12096	PM_{10}	06/16/2021
DOE-3	W23313	PM_{10}	06/16/2021
DOE-4	X16067	PM_{10}	06/16/2021

6. REFERENCES

10 Code of Federal Regulations (CFR) 20, Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," Table 2.

40 CFR 58, Appendix C – Ambient Air Quality Monitoring Methodology.

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California Environmental Protection Agency, DTSC. 2019. Human and Ecological Risk Office Human Health Risk Assessment Note Number 3, DTSC-modified Screening Levels. April. https://www.dtsc.ca.gov/AssessingRisk/upload/HHRA-Note-3-April-2019.pdf.

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National Aeronautics and Space Administration (NASA). 2017. *Santa Susana Field Laboratory Baseline Air Monitoring Report Work Plan Report.* Prepared for California Department of Toxic Substances Control. Prepared on behalf of National Aeronautics and Space Administration, George C. Marshall Space Flight Center, The Boeing Company, and Department of Energy, Energy Technology and Engineering Center. September. Available online at:https://www.dtsc-ssfl.com/files/lib_air_monitor/work_plan/67496_SSFL_AirMonitoringWorkPlan_Final.pdf

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U.S. Environmental Protection Agency (EPA). 2004. *The Particle Pollution Report, Current Understanding of Air Quality and Emissions through 2003, United States Environmental Protection Agency, Office of Air Quality Planning and Standards*. EPA-454-R-04-002. December.

U.S. Environmental Protection Agency (EPA). 2007. *Guideline on the Meaning and the Use of Precision and Bias Data Required by 40 CFR Part 58 Appendix A, Version 1.1*. EPA-454/B-07-001. October 2007.

U.S. Environmental Protection Agency (EPA). 2017. *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Monitoring Program*. EPA-454/B-17-001. January.

U.S. Environmental Protection Agency (EPA). 2018. Regional Screening Levels – Generic Tables. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. May.

Figure 1 – SSFL Air Monitoring Locations

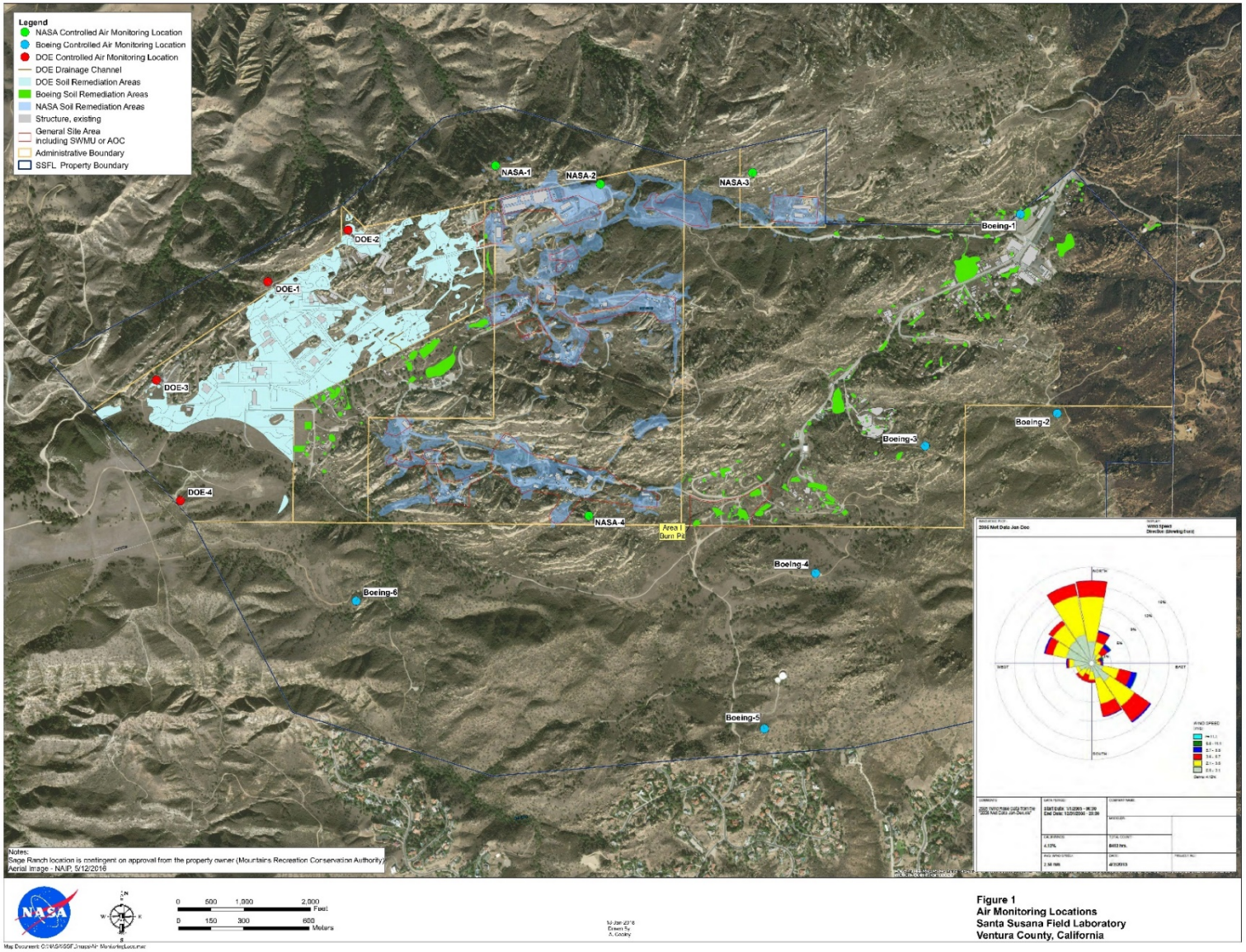


Figure 2 – DOE Air Monitoring Locations

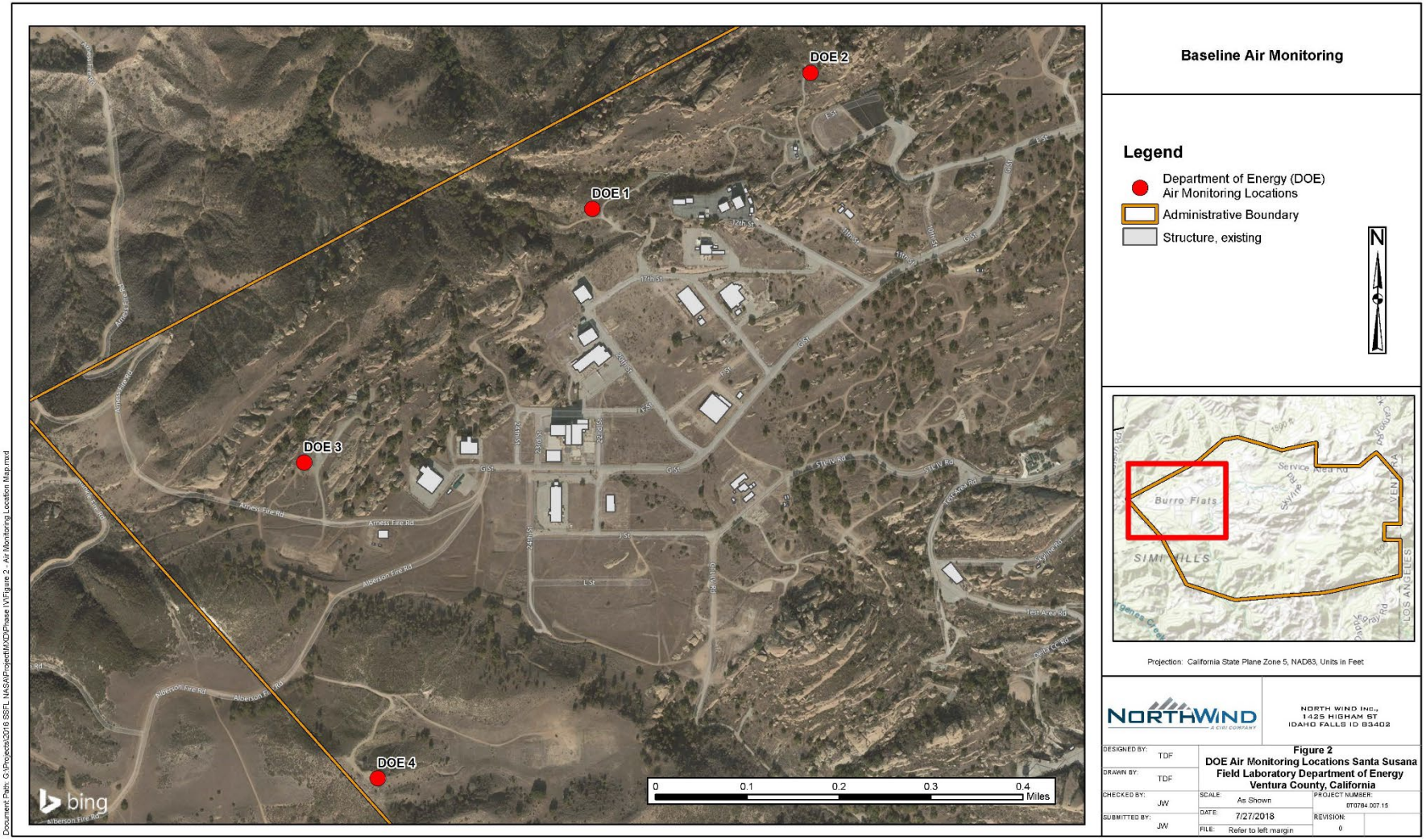
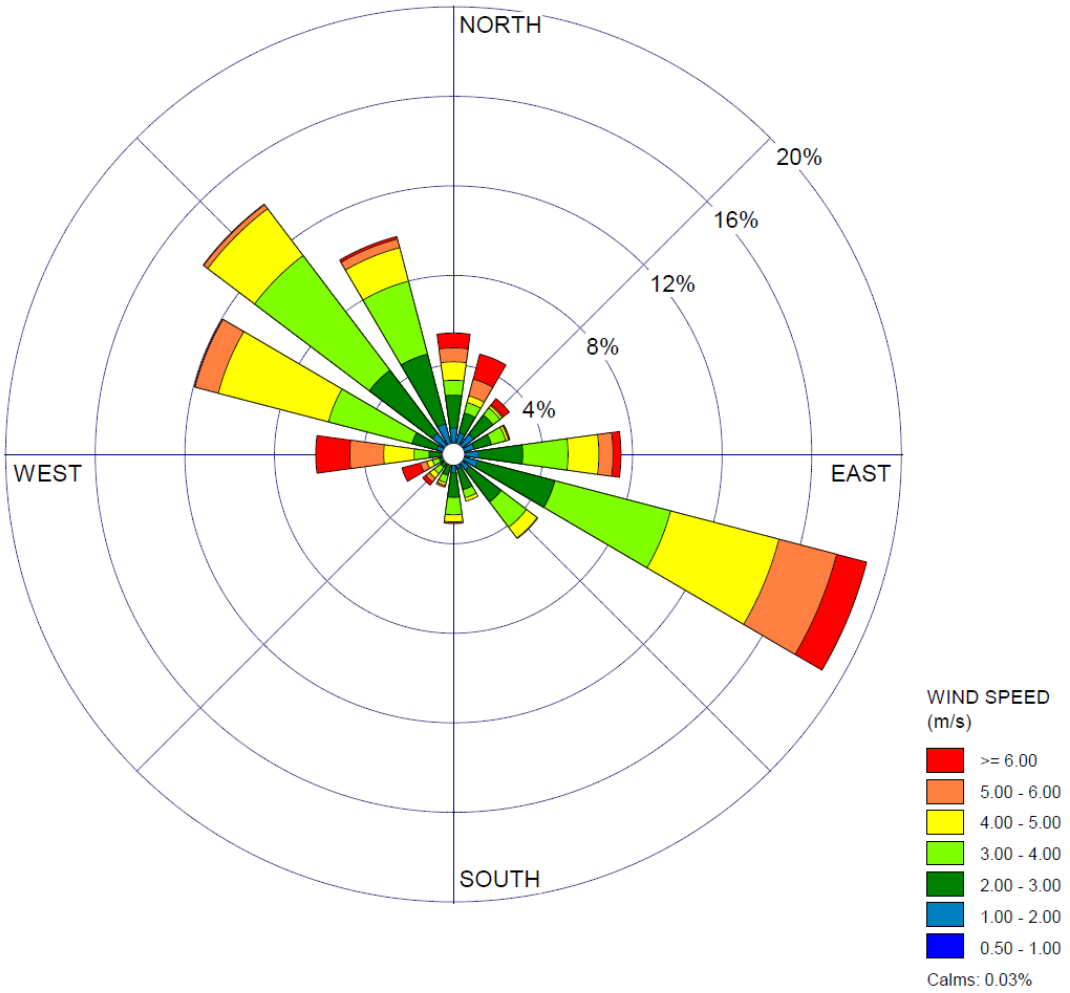


Figure 3 – DOE Quarterly Wind Rose

WIND ROSE PLOT:
SANTA SUSANA FIELD LABORATORY / Station ID: DOE-4

DISPLAY: • **Wind Speed (m/s)**
• **Direction (blowing from)**



COMMENTS: **ETEC BAM Quarter #13** • **Start: 01-Apr-2021** • **End: 31-Jun-2021**	DATA PERIOD: **Start: 04/01/2021** **End: 06/30/2021**	COMPANY NAME: **North Wind Portage, Inc.**	
		OBSERVATION BASIS: **15-minute averages**	NORTHWIND PORTAGE, INC.
	CALM WINDS: **0.03%**	TOTAL COUNT: **8736 observations (100%)**	
	AVG. WIND SPEED: **3.56 m/s**	DATE: **8/12/2021**	PROJECT NO.: **080153.007.02**

WRPLOT View - Lakes Environmental Software

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APPENDIX A

PM_{10} Daily Averages and Monthly Statistics

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PM_{10} Daily Averages

Site ID	DOE-1	DOE-2	DOE-3	DOE-4
Sample Date	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)
04/01/21	11.785	11.785	10.357	13.642
04/02/21	22.541	20	18.25	29.375
04/03/21	18	15.416	17.25	22.625
04/04/21	12.416	11.083	10.541	15.291
04/05/21	17.166	19.125	19.666	26.041
04/06/21	18.541	19.458	17.333	26.291
04/07/21	22.291	17.791	20.625	20.375
04/08/21	16.125	15.041	14.083	16.25
04/09/21	19.958	16.75	15.583	17.375
04/10/21	16.375	14.666	13.458	15.333
04/11/21	27	25.041	31.416	33.833
04/12/21	24.166	27.75	25.791	28.5
04/13/21	21.916	18.541	22.625	19.875
04/14/21	17.791	19.083	21.041	16.5
04/15/21	20.5	25.416	13.461	17.916
04/16/21	21.083	18.333	20.111	21.958
04/17/21	21.5	18.875	12.125	19.166
04/18/21	11.666	10.041	15.666	18.5
04/19/21	12.5	10.916	13.791	12.916
04/20/21	24.208	23.541	8.916	27.875
04/21/21	16.75	19.541	8.75	17.416
04/22/21	11.375	11.083	9.333	10.583
04/23/21	11.375	10.75	9.625	12.333
04/24/21	14.375	11.666	7.083	11
04/25/21	6.416	6.5	13.083	13.833
04/26/21	5.75	4.416	21.541	7.333
04/27/21	9.791	6.875	24.333	8.583
04/28/21	7.458	5.833	22.791	9.166
04/29/21	7.5	7.041	21.583	8.416
04/30/21	13.625	48.416	19.833	14.125
05/01/21	24.791	20.166	20.125	28.666
05/02/21	16.75	17.5	25.5	15.333
05/03/21	23.25	22.875	23.187	23.458
05/04/21	22.625	19.916	17.916	19.5
05/05/21	31.416	21.416	15	19.958
05/06/21	17.958	17.75	14.708	20.166

Site ID	DOE-1	DOE-2	DOE-3	DOE-4
Sample Date	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)
05/07/21	14.25	15.458	17.666	15.25
05/08/21	15.291	14.833	15.041	14.791
05/09/21	16.708	15.791	15.916	17.583
05/10/21	16.125	16.166	17.666	13
05/11/21	14.5	13.333	13.375	14.291
05/12/21	14.125	12.75	10.541	25.166
05/13/21	12.041	9.416	7.291	12.125
05/14/21	12.875	9.043	7.958	20.708
05/15/21	13.583	14.083	14.791	16.791
05/16/21	5.416	4.5	14.541	9.958
05/17/21	7.916	7.333	9.9	12.166
05/18/21	12.125	12.833	30.909	16.625
05/19/21	19.083	20.333	30.208	27.041
05/20/21	23.5	24.541	20	25.666
05/21/21	24.625	20.25	7.541	26.25
05/22/21	19.25	23.583	4.625	19.25
05/23/21	14.333	11.416	6.666	12.333
05/24/21	12.291	9.458	22.208	11.416
05/25/21	14.583	12.833	12.375	16.833
05/26/21	32.083	20.375	14.375	25.875
05/27/21	21.458	24.833	24.458	23.25
05/28/21	18.333	21.041	14.625	25.375
05/29/21	12.833	12.75	4.958	14.416
05/30/21	13.833	14.458	5.708	15.958
05/31/21	16.041	16.875	3.666	17.875
06/01/21	13.458	15.291	3.5	18.208
06/02/21	14.958	15.083	7.416	14.583
06/03/21	14.166	15.125	13.375	19.375
06/04/21	16.47	15.416	3.75	29.458
06/05/21	15.833	13.166	7.125	24.25
06/06/21	15.75	11.208	5.666	25.333
06/07/21	11.25	7.5	24.416	7.208
06/08/21	9.333	9.583	9.666	15.041
06/09/21	37.583	15.041	9.5	16
06/10/21	22.875	14.416	18.125	17.708
06/11/21	26.333	11.708	17.5	16.25
06/12/21	27.583	13.708	9.208	17.75

Site ID	DOE-1	DOE-2	DOE-3	DOE-4
Sample Date	**PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)**	**PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)**	**PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)**	**PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)**
06/13/21	12.333	12.458	11.833	19.208
06/14/21	21.75	9.666	5.166	12.125
06/15/21	12.458	8.166	2.5	11.041
06/16/21	9.916	21.583	2.666	27.208
06/17/21	10.208	17.458	8.5	23.291
06/18/21	12.583	23.166	3.375	20.583
06/19/21	17.166	23.041	2.833	17.791
06/20/21	21.458	16.541	3	15.5
06/21/21	23.041	18.958	3.5	18.291
06/22/21	18.833	13.375	16.958	15.083
06/23/21	16.7	15.25	15.375	60.333
06/24/21	6.5	11.125	6.041	12.625
06/25/21	2.958	13.041	2.291	19.5
06/26/21	15.833	18.583	5.291	15.166
06/27/21	7.625	20.666	10.25	31.625
06/28/21	1.541	28	1.666	33.333
06/29/21	2.333	23.958	2.583	32.416
06/30/21	0.708	19.2	1.25	16.9

PM_{10} Monthly Statistics

Location ID	April 2021			May 2021			June 2021		
	PM_{10}			PM_{10}			PM_{10}		
	High	Low	95th PCTL	High	Low	95th PCTL	High	Low	95th PCTL
DOE-1	27.00000	5.75000	24.49950	32.08300	5.41600	28.36005	37.58300	0.70800	27.02050
DOE-2	48.41600	4.41600	26.58300	24.83300	4.50000	24.10990	28.00000	7.50000	23.60160
DOE-3	31.41600	7.08300	25.06200	30.90900	3.66600	28.08940	24.41600	1.25000	17.84375
DOE-4	33.83300	7.33300	29.02050	28.66600	9.95800	26.08125	60.33300	7.20800	32.92035

PCTL = percentile

APPENDIX B

Analytical Results for Ambient Air VOCs

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Table B-1. Ambient air VOC detection results compared to RSLs.

Location ID	Sample Date	Analyte	Result (µg/m^3)	Screening Level Value (µg/m^3)	SL Source
4	04/13/2021	Dichlorodifluoromethane	2.4	100	US EPA RSL
DOE-1	04/13/2021	Ethyl acetate	36	73	US EPA RSL
DOE-1	04/13/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-2	04/13/2021	2-butanone	2.1	5200	US EPA RSL
DOE-2	04/13/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-2	04/13/2021	Ethyl acetate	27	73	US EPA RSL
DOE-2	04/13/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-3	04/13/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-3	04/13/2021	Ethyl acetate	46	73	US EPA RSL
DOE-3	04/13/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-4	04/13/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-4	04/13/2021	Ethyl acetate	**100**	73	US EPA RSL
DOE-4	04/13/2021	Toluene	1.6	310	DTSC HHRA NOTE 3
DOE-4	04/13/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-1	04/27/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-1	04/27/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-2	04/27/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-2	04/27/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-3	04/27/2021	1,4-dioxane	**3.5**	0.56	US EPA RSL
DOE-3	04/27/2021	2-butanone	2.6	5200	US EPA RSL
DOE-3	04/27/2021	Carbon disulfide	7.0	730	US EPA RSL
DOE-3	04/27/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-3	04/27/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-4	04/27/2021	2-butanone	6.2	5200	US EPA RSL
DOE-4	04/27/2021	Dichlorodifluoromethane	2.4	100	US EPA RSL
DOE-4	04/27/2021	Ethyl acetate	1.7	73	US EPA RSL
DOE-4	04/27/2021	Trichlorofluoromethane	1.2	1300	DTSC HHRA NOTE 3
DOE-1	05/11/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-1	05/11/2021	Ethyl acetate	1.8	73	US EPA RSL
DOE-1	05/11/2021	Methylene chloride	0.80	1	DTSC HHRA NOTE 3
DOE-1	05/11/2021	Trichlorofluoromethane	1.2	1300	DTSC HHRA NOTE 3
DOE-3	05/11/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-3	05/11/2021	Ethyl acetate	5.0	73	US EPA RSL
DOE-3	05/11/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-4	05/11/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-4	05/11/2021	Ethyl acetate	6.1	73	US EPA RSL
DOE-4	05/11/2021	Methylene chloride	**1.6**	1	DTSC HHRA NOTE 3
DOE-4	05/11/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-1	05/28/2021	2-butanone	1.5	5200	US EPA RSL
DOE-1	05/28/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-1	05/28/2021	Ethyl acetate	3.6	73	US EPA RSL
DOE-1	05/28/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-2	05/28/2021	Dichlorodifluoromethane	2.6	100	US EPA RSL

Location ID	Sample Date	Analyte	Result (µg/m^3)	Screening Level Value (µg/m^3)	SL Source
DOE-2	05/28/2021	Ethyl acetate	4.4	73	US EPA RSL
DOE-2	05/28/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-3	05/28/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-3	05/28/2021	Ethyl acetate	4.3	73	US EPA RSL
DOE-3	05/28/2021	Methylene chloride	1.0	1	DTSC HHRA NOTE 3
DOE-3	05/28/2021	Toluene	1.1	310	DTSC HHRA NOTE 3
DOE-3	05/28/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-4	05/28/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-4	05/28/2021	Ethyl acetate	1.6	73	US EPA RSL
DOE-4	05/28/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-1	06/10/2021	Dichlorodifluoromethane	1.7	100	US EPA RSL
DOE-1	06/10/2021	Ethyl acetate	9.6 (;J)	73	US EPA RSL
DOE-1	06/10/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-2	06/10/2021	Dichlorodifluoromethane	1.8	100	US EPA RSL
DOE-2	06/10/2021	Ethyl acetate	5.7 (;J)	73	US EPA RSL
DOE-2	06/10/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-3	06/10/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-3	06/10/2021	Ethyl acetate	9.7 (;J)	73	US EPA RSL
DOE-3	06/10/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-4	06/10/2021	Dichlorodifluoromethane	1.8	100	US EPA RSL
DOE-4	06/10/2021	Ethyl acetate	7.2 (;J)	73	US EPA RSL
DOE-4	06/10/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-1	06/25/2021	Dichlorodifluoromethane	2.0	100	US EPA RSL
DOE-1	06/25/2021	Ethyl acetate	41	73	US EPA RSL
DOE-1	06/25/2021	Toluene	0.96	310	DTSC HHRA NOTE 3
DOE-1	06/25/2021	Trichlorofluoromethane	1.0	1300	DTSC HHRA NOTE 3
DOE-2	06/25/2021	Dichlorodifluoromethane	2.0	100	US EPA RSL
DOE-2	06/25/2021	Ethyl acetate	26	73	US EPA RSL
DOE-2	06/25/2021	Trichlorofluoromethane	1.0	1300	DTSC HHRA NOTE 3
DOE-3	06/25/2021	Dichlorodifluoromethane	2.1	100	US EPA RSL
DOE-3	06/25/2021	Ethyl acetate	12	73	US EPA RSL
DOE-3	06/25/2021	Methylene chloride	**9.3**	1	DTSC HHRA NOTE 3
DOE-3	06/25/2021	Toluene	3.1	310	DTSC HHRA NOTE 3
DOE-3	06/25/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-4	06/25/2021	Dichlorodifluoromethane	2.0	100	US EPA RSL
DOE-4	06/25/2021	Ethyl acetate	7.9	73	US EPA RSL
DOE-4	06/25/2021	Trichlorofluoromethane	1.0	1300	DTSC HHRA NOTE 3

Note: The bold numbers are above the screening levels.

APPENDIX C

Radionuclide Results

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Table C-1. Gross alpha and gross beta air sample results for air samplers.

Sample Collection Date	**Result Alpha (mCi/mL)**	**MDC – Alpha (mCi/mL)**	**Result Beta (mCi/mL)**	**MDC – Beta (mCi/mL)**
Sample location DOE-1				
4/1/2021	3.51E-15	6.94E-15	8.38E-14	3.02E-14
4/5/2021	7.23E-15	5.19E-15	7.70E-14	2.26E-14
4/8/2021	3.91E-15	7.01E-15	5.68E-14	3.05E-14
4/12/2021	2.88E-15	5.17E-15	5.35E-14	2.25E-14
4/15/2021	3.57E-15	7.08E-15	7.10E-14	3.08E-14
4/19/2021	1.81E-16	5.11E-15	7.54E-14	2.22E-14
4/22/2021	2.79E-15	6.96E-15	6.21E-14	3.03E-14
4/26/2021	3.45E-15	5.21E-15	3.91E-14	2.27E-14
4/29/2021	2.52E-16	7.11E-15	3.49E-14	3.10E-14
5/3/2021	4.06E-15	5.17E-15	3.03E-14	2.15E-14
5/6/2021	3.11E-15	6.99E-15	4.25E-14	2.91E-14
5/10/2021	3.50E-15	5.08E-15	3.14E-14	2.11E-14
5/13/2021	-3.18E-16	7.07E-15	1.61E-14	2.94E-14
5/17/2021	2.55E-15	5.16E-15	1.41E-14	2.15E-14
5/20/2021	3.42E-15	6.93E-15	1.22E-14	2.88E-14
5/24/2021	2.90E-15	4.90E-15	3.23E-14	2.04E-14
5/27/2021	1.10E-15	7.29E-15	6.87E-14	3.03E-14
6/1/2021	-2.63E-15	4.17E-15	1.51E-14	1.72E-14
6/4/2021	2.05E-15	6.90E-15	2.50E-14	2.84E-14
6/7/2021	2.02E-15	6.80E-15	1.47E-15	2.80E-14
6/10/2021	-2.04E-15	7.03E-15	7.60E-15	2.89E-14
6/14/2021	1.55E-15	5.19E-15	2.97E-14	2.14E-14
6/17/2021	-1.30E-15	6.77E-15	1.80E-14	2.79E-14
6/21/2021	2.60E-15	5.28E-15	2.72E-14	2.17E-14
6/24/2021	-1.34E-15	6.98E-15	5.20E-14	2.87E-14
6/28/2021	-2.26E-15	5.19E-15	3.71E-14	2.14E-14

Sample Collection Date	Result Alpha (mCi/mL)	MDC – Alpha (mCi/mL)	Result Beta (mCi/mL)	MDC – Beta (mCi/mL)
Sample location DOE-2				
4/1/2021	5.30E-15	6.92E-15	4.73E-14	3.01E-14
4/5/2021	3.45E-15	5.21E-15	9.87E-14	2.27E-14
4/8/2021	2.44E-15	7.01E-15	1.13E-13	3.05E-14
4/12/2021	3.96E-15	5.16E-15	6.09E-14	2.25E-14
4/15/2021	9.89E-16	7.07E-15	7.83E-14	3.08E-14
4/19/2021	4.97E-15	5.10E-15	1.05E-13	2.22E-14
4/22/2021	3.51E-15	6.95E-15	5.75E-14	3.03E-14
4/26/2021	5.90E-15	5.21E-15	4.20E-14	2.27E-14
4/29/2021	2.11E-15	7.11E-15	3.15E-15	3.10E-14
5/3/2021	2.30E-15	5.17E-15	2.72E-14	2.15E-14
5/6/2021	3.11E-15	7.00E-15	2.99E-14	2.91E-14
5/10/2021	2.51E-15	5.09E-15	3.35E-14	2.11E-14
5/13/2021	2.45E-15	7.07E-15	6.33E-14	2.94E-14
5/17/2021	3.05E-15	5.16E-15	3.80E-14	2.14E-14
5/20/2021	2.07E-15	6.94E-15	5.33E-14	2.89E-14
5/24/2021	4.34E-15	4.90E-15	4.90E-14	2.04E-14
5/27/2021	3.88E-16	7.34E-15	4.24E-14	3.05E-14
6/1/2021	-5.97E-16	4.18E-15	1.92E-14	1.72E-14
6/4/2021	1.38E-15	6.89E-15	3.10E-14	2.84E-14
6/7/2021	3.36E-15	6.81E-15	4.62E-14	2.80E-14
6/10/2021	-2.04E-15	7.03E-15	3.09E-14	2.89E-14
6/14/2021	-7.42E-16	5.20E-15	5.48E-14	2.14E-14
6/17/2021	-3.04E-16	6.76E-15	6.68E-14	2.78E-14
6/21/2021	1.31E-15	5.28E-15	2.64E-14	2.17E-14
6/24/2021	1.05E-15	6.98E-15	9.68E-15	2.87E-14
6/28/2021	2.74E-16	5.18E-15	1.65E-15	2.13E-14

Sample Collection Date	Result Alpha (mCi/mL)	MDC – Alpha (mCi/mL)	Result Beta (mCi/mL)	MDC – Beta (mCi/mL)
Sample location DOE-3				
4/1/2021	4.94E-15	6.91E-15	6.89E-14	3.01E-14
4/5/2021	8.63E-15	5.22E-15	9.98E-14	2.27E-14
4/8/2021	6.10E-15	7.01E-15	8.27E-14	3.05E-14
4/12/2021	1.80E-15	5.16E-15	5.09E-14	2.25E-14
4/15/2021	1.73E-15	7.07E-15	3.23E-14	3.08E-14
4/19/2021	2.31E-15	5.10E-15	7.51E-14	2.22E-14
4/22/2021	5.32E-15	6.95E-15	6.47E-14	3.03E-14
4/26/2021	2.37E-15	5.22E-15	5.21E-14	2.28E-14
4/29/2021	-1.23E-15	7.12E-15	2.94E-14	3.10E-14
5/3/2021	7.35E-15	5.16E-15	3.83E-14	2.15E-14
5/6/2021	-1.34E-15	7.00E-15	4.79E-14	2.91E-14
5/10/2021	6.00E-15	5.09E-15	3.12E-14	2.12E-14
5/13/2021	1.76E-15	7.06E-15	6.47E-14	2.94E-14
5/17/2021	1.79E-15	5.16E-15	3.96E-14	2.14E-14
5/20/2021	3.67E-16	6.95E-15	2.58E-14	2.89E-14
5/24/2021	-1.66E-15	4.91E-15	1.62E-14	2.04E-14
5/27/2021	1.83E-15	7.34E-15	2.73E-14	3.05E-14
6/1/2021	6.29E-16	4.17E-15	2.24E-14	1.72E-14
6/4/2021	3.74E-15	6.89E-15	8.11E-14	2.84E-14
6/7/2021	6.92E-16	6.80E-15	7.21E-14	2.80E-14
6/10/2021	-3.42E-15	7.04E-15	1.69E-14	2.90E-14
6/14/2021	2.31E-15	5.20E-15	4.50E-14	2.14E-14
6/17/2021	-6.35E-16	6.76E-15	1.11E-14	2.78E-14
6/21/2021	7.94E-16	5.27E-15	2.98E-14	2.17E-14
6/24/2021	-1.00E-15	7.00E-15	1.97E-14	2.88E-14
6/28/2021	-1.25E-15	5.18E-15	2.59E-14	2.13E-14

Sample Collection Date	Result Alpha (mCi/mL)	MDC – Alpha (mCi/mL)	Result Beta (mCi/mL)	MDC – Beta (mCi/mL)
Sample location DOE-4				
4/1/2021	4.57E-15	6.91E-15	5.98E-14	3.01E-14
4/5/2021	7.26E-15	5.22E-15	8.13E-14	2.27E-14
4/8/2021	1.71E-15	7.01E-15	5.87E-14	3.05E-14
4/12/2021	3.42E-15	5.16E-15	5.44E-14	2.25E-14
4/15/2021	3.20E-15	7.06E-15	6.07E-14	3.08E-14
4/19/2021	7.14E-16	5.11E-15	8.87E-14	2.22E-14
4/22/2021	4.22E-15	6.92E-15	6.37E-14	3.02E-14
4/26/2021	-6.33E-16	5.23E-15	3.60E-14	2.28E-14
4/29/2021	-1.23E-15	7.12E-15	1.88E-14	3.10E-14
5/3/2021	1.79E-15	5.16E-15	2.66E-14	2.15E-14
5/6/2021	4.83E-15	7.01E-15	6.28E-14	2.91E-14
5/10/2021	3.26E-15	5.09E-15	3.54E-14	2.12E-14
5/13/2021	3.15E-15	7.08E-15	4.38E-14	2.94E-14
5/17/2021	2.29E-15	5.16E-15	3.51E-15	2.14E-14
5/20/2021	1.05E-15	6.95E-15	2.69E-14	2.89E-14
5/24/2021	4.99E-16	4.90E-15	9.14E-15	2.04E-14
5/27/2021	1.46E-15	7.34E-15	5.78E-14	3.05E-14
6/1/2021	2.67E-15	4.17E-15	1.81E-14	1.72E-14
6/4/2021	2.70E-17	6.89E-15	4.04E-14	2.84E-14
6/7/2021	-1.97E-15	6.80E-15	3.51E-14	2.80E-14
6/10/2021	3.73E-16	7.06E-15	2.16E-14	2.91E-14
6/14/2021	-1.51E-15	5.20E-15	1.73E-14	2.14E-14
6/17/2021	2.67E-15	6.76E-15	2.87E-14	2.78E-14
6/21/2021	1.82E-15	5.27E-15	4.94E-14	2.17E-14
6/24/2021	1.74E-15	6.99E-15	2.93E-14	2.88E-14
6/28/2021	-9.95E-16	5.19E-15	9.30E-15	2.13E-14

Note: Some values are negative after background subtraction

Table C-2. Individual radionuclide analysis for the composite filter samples.

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Location DOE-1 – Air volume/sample = 9.84E+08 mL				
Cesium-137	-0.0285	6.29	U U	-2.896E-17
Strontium-90	1.27	2.97	U U	1.291E-15
Cobalt-60	0.0626	5.91	U U	6.362E-17
Potassium-40	79.8	59.7	UI UJ	8.110E-14
Beryllium-7	99.4	89.5	UI UJ	1.010E-13
Plutonium-238	-0.383	1.83	U U	-3.892E-16
Polonium-210	7.69	1.05		7.815E-15
Plutonium-241	-91.2	408	U U	-9.268E-14
Thorium-230	1.23	0.484	UJ	1.250E-15
Thorium-228	0.657	0.603	UJ	6.677E-16
Actinium-228	6.53	23.9	U U	6.636E-15
Americium-241	-0.037	0.427	U UJ	-3.760E-17
Plutonium-239	-1.15	3.24	U U	-1.169E-15
Ra-228 – total	4.66	3.7		4.736E-15
Radium-226, -228 combined	7.53	7		7.652E-15
Thorium-232	0.603	0.378		6.128E-16
Uranium-238	0.688	0.13	UJ	6.992E-16
Uranium-233/234	0.608	0.182	UJ	6.179E-16
Uranium-235/236	-0.00632	0.126	U U	-6.423E-18
Location DOE-2 – Air volume/sample = 9.84E+08 mL				
Cesium-137	0.123	4.27	U U	1.250E-16
Strontium-90	0.0349	1.5	U U	3.547E-17
Cobalt-60	2.68	4.69	U U	2.724E-15
Potassium-40	78.8	43.5		8.008E-14
Beryllium-7	128	45.9		1.301E-13
Plutonium-238	0.0148	0.195	U U	1.504E-17
Polonium-210	6.07	1.08		6.169E-15
Plutonium-241	7.3	11.3	U U	7.419E-15
Thorium-230	1.21	0.612	UJ	1.230E-15
Thorium-228	0.591	0.674	U U	6.006E-16
Actinium-228	-5.68	19.6	U U	-5.772E-15
Americium-241	0	6.8	U U	0.000E+0
Plutonium-239	0.0284	0.213	U U	2.886E-17
Ra-228 – total	-0.926	4.8	U U	-9.411E-16
Radium-226, -228 combined	4.18	5.65	U U	4.248E-15
Thorium-232	1.11	0.291		1.128E-15
Uranium-238	0.921	0.12	UJ	9.360E-16

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Uranium-233/234	0.807	0.155	UJ	8.201E-16
Uranium-235/236	0.00593	0.129	U U	6.026E-18
Location DOE-3 – Air volume/sample = 9.84E+08 mL				
Cesium-137	2.14	4.63	U U	2.175E-15
Strontium-90	2	2.38	U U	2.033E-15
Cobalt-60	-1.16	3.98	U U	-1.179E-15
Potassium-40	58.2	40.5		5.915E-14
Beryllium-7	134	49.7		1.362E-13
Plutonium-238	4.07E-07	7.52	U U	4.136E-22
Polonium-210	8.72	0.525		8.862E-15
Plutonium-241	-164	1300	U U	-1.667E-13
Thorium-230	0.791	0.56	UJ	8.039E-16
Thorium-228	0.387	0.549	U U	3.933E-16
Actinium-228	26.3	21.1	UI UJ	2.673E-14
Americium-241	-1.1	6.52	U U	-1.118E-15
Plutonium-239	0.61	6.75	U U	6.199E-16
Ra-228 – total	1.46	4.93	U U	1.484E-15
Radium-226, -228 combined	4.84	8.07	U U	4.919E-15
Thorium-232	1.28	0.249		1.301E-15
Uranium-238	-1.97	6.96	U U	-2.002E-15
Uranium-233/234	-4.05	8.3	U U	-4.116E-15
Uranium-235/236	1.94	4.66	U U	1.972E-15
Location DOE-4 – Air volume/sample = 9.83E+08 mL				
Cesium-137	-0.529	4.82	U U	-5.381E-16
Strontium-90	0.0115	2.07	U U	1.170E-17
Cobalt-60	3.16	7.62	U U	3.215E-15
Potassium-40	-21.7	87.9	U U	-2.208E-14
Beryllium-7	75.6	61.9		7.691E-14
Plutonium-238	0.0648	0.409	U UJ	6.592E-17
Polonium-210	7.96	0.784		8.098E-15
Plutonium-241	4.25	32.5	U UJ	4.323E-15
Thorium-230	0.729	0.527	UJ	7.416E-16
Thorium-228	0.385	0.402	U U	3.917E-16
Actinium-228	-3.45	21.6	U U	-3.510E-15
Americium-241	-0.0199	0.398	U UJ	-2.024E-17
Plutonium-239	-0.143	0.66	U UJ	-1.455E-16
Ra-228 – total	3.06	4.41	U U	3.113E-15
Radium-226, -228 combined	13.7	16.7	U U	1.394E-14
Thorium-232	1.09	0.234		1.109E-15

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Uranium-238	0.951	0.119	UJ	9.674E-16
Uranium-233/234	0.79	0.149	UJ	8.037E-16
Uranium-235/236	0.0691	0.129	U U	7.030E-17

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APPENDIX D

PM_{10} Monthly Audit Reports and Flow Verification Results

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NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

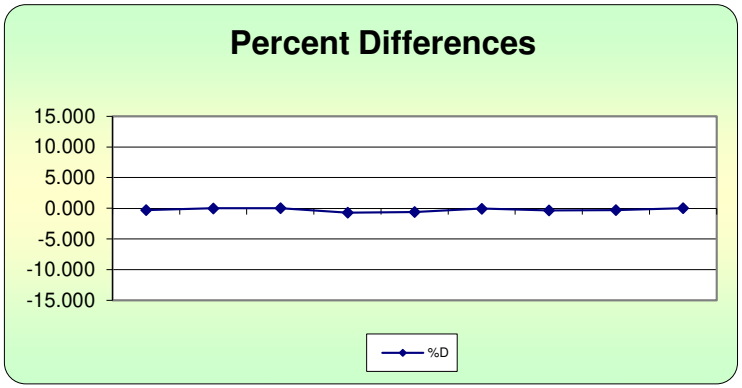
ETEC Site: DOE-1	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
13	W23314	4/23/2021	14.00	14.04	-0.285		0.081	0.285	0.081
			16.70	16.70	0.000	**25th**	0.000	0.000	0.000
			17.50	17.49	0.057	-0.356	0.003	0.057	0.003
13	W23314	5/14/2021	14.00	14.10	-0.709		0.503	0.709	0.503
			16.70	16.80	-0.595	**75th**	0.354	0.595	0.354
			17.50	17.51	-0.057	0.000	0.003	0.057	0.003
13	W23314	6/16/2021	14.00	14.05	-0.356		0.127	0.356	0.127
			16.70	16.75	-0.299		0.089	0.299	0.089
			17.50	17.49	0.057		0.003	0.057	0.003

n	$\Sigma\|d\|$	"AB" (Eqn 4)
9	2.415	0.268
n-1	$\Sigma\|d\|^2$	**"AS" (Eqn 5)**
8	1.164	0.254

Bias (%) (Eqn 3)	Both Signs Positive
0.43	FALSE
Signed Bias (%)	Both Signs Negative
-0.43	TRUE

Note: No issues encounted with this E-BAM unit during this quarter.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
Quality Indicator Assessment Reports
Data Assessment Statisical Calculator - Software to calculate precision and bias statistics
MS Excel filename - *"11/3/2017 (dasc_11_3_17.xls)"*
https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

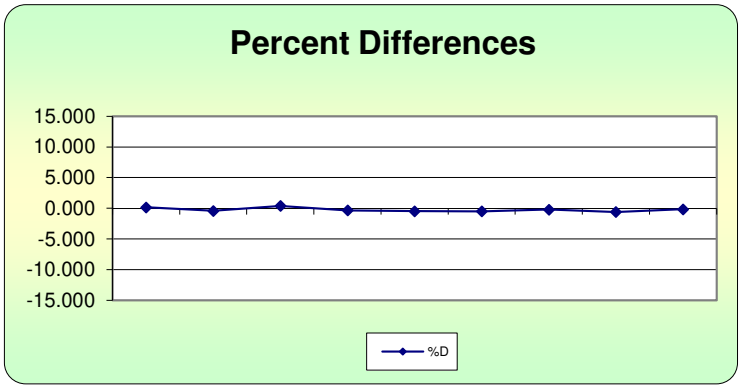
ETEC Site: DOE-2	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	|d|	$\|d\|^2$
13	Y12096	4/23/2021	14.00	13.98	0.143		0.020	0.143	0.020
			16.70	16.77	-0.417	**25th**	0.174	0.417	0.174
			17.50	17.43	0.402	-0.477	0.161	0.402	0.161
13	Y12096	5/14/2021	14.00	14.05	-0.356		0.127	0.356	0.127
			16.70	16.78	-0.477	**75th**	0.227	0.477	0.227
			17.50	17.59	-0.512	-0.171	0.262	0.512	0.262
13	Y12096	6/16/2021	14.00	14.03	-0.214		0.046	0.214	0.046
			16.70	16.80	-0.595		0.354	0.595	0.354
			17.50	17.53	-0.171		0.029	0.171	0.029

n	$\Sigma\|d\|$	"AB" (Eqn 4)
9	3.287	0.365
n-1	$\Sigma\|d\|^2$	**"AS" (Eqn 5)**
8	1.401	0.158

Bias (%) (Eqn 3)	Both Signs Positive
0.46	FALSE
Signed Bias (%)	Both Signs Negative
-0.46	TRUE

Note: No issues encounted with this E-BAM unit during this quarter.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
Quality Indicator Assessment Reports
Data Assessment Statisical Calculator - Software to calculate precision and bias statistics
MS Excel filename - *"11/3/2017 (dasc_11_3_17.xls)"*
https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

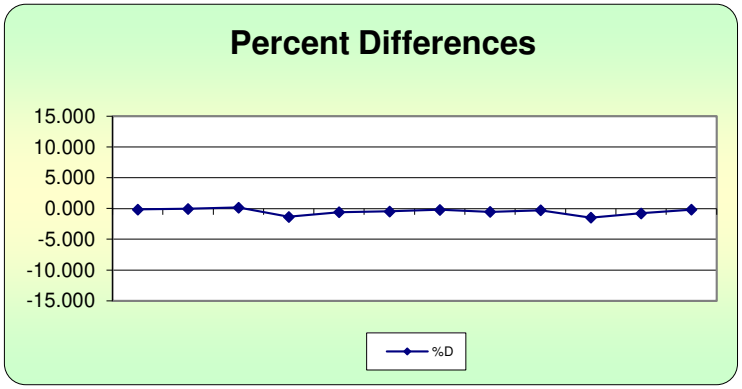
ETEC Site: DOE-3	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	|d|	$\|d\|^2$
13	W23310	4/23.2021	14.00	14.02	-0.143		0.020	0.143	0.020
			16.70	16.71	-0.060	**25th**	0.004	0.060	0.004
			17.50	17.47	0.172	-0.640	0.029	0.172	0.029
13	W23310	5/14/2021	14.00	14.19	-1.339		1.793	1.339	1.793
			16.70	16.80	-0.595	**75th**	0.354	0.595	0.354
			17.50	17.58	-0.455	-0.164	0.207	0.455	0.207
13	W23313	5/28/2021	14.00	14.03	-0.214		0.046	0.214	0.046
			16.70	16.79	-0.536		0.287	0.536	0.287
			17.50	17.55	-0.285		0.081	0.285	0.081
13	W23313	6/16/2021	14.00	14.21	-1.478		2.184	1.478	2.184
			16.70	16.83	-0.772		0.597	0.772	0.597
			17.50	17.53	-0.171		0.029	0.171	0.029

n	$\Sigma\|d\|$	"AB" (Eqn 4)
12	6.220	0.518
n-1	$\Sigma\|d\|^2$	**"AS" (Eqn 5)**
11	5.632	0.468

Bias (%) (Eqn 3)	Both Signs Positive
0.76	FALSE
Signed Bias (%)	Both Signs Negative
-0.76	TRUE

Note: The W23310 unit stopped working and was replaced with the W23313 unit.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
Quality Indicator Assessment Reports
Data Assessment Statisical Calculator - Software to calculate precision and bias statistics
MS Excel filename - *"11/3/2017 (dasc_11_3_17.xls)"*
https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

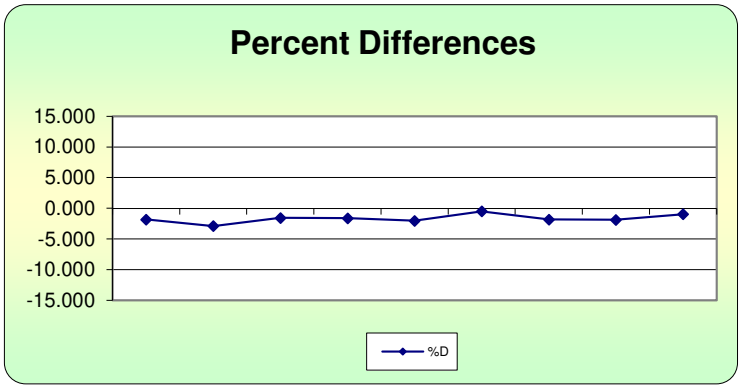
ETEC Site: DOE-4	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
13	X16067	4/23/2021	14.00	14.26	-1.823		3.324	1.823	3.324
			16.70	17.20	-2.907	**25th**	8.451	2.907	8.451
			17.50	17.78	-1.575	-1.880	2.480	1.575	2.480
13	X16067	5/14/2021	14.00	14.23	-1.616		2.612	1.616	2.612
			16.70	17.05	-2.053	**75th**	4.214	2.053	4.214
			17.50	17.59	-0.512	-1.575	0.262	0.512	0.262
13	X16067	6/16/2021	14.00	14.26	-1.823		3.324	1.823	3.324
			16.70	17.02	-1.880		3.535	1.880	3.535
			17.50	17.67	-0.962		0.926	0.962	0.926

n	$\Sigma\|d\|$	"AB" (Eqn 4)
9	15.151	1.683
n-1	$\Sigma\|d\|^2$	"AS" (Eqn 5)
8	29.128	0.673

Bias (%) (Eqn 3)	Both Signs Positive
2.1	FALSE
Signed Bias (%)	Both Signs Negative
-2.1	TRUE

Note: No issues encounted with this E-BAM unit during this quarter.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
Quality Indicator Assessment Reports
Data Assessment Statisical Calculator - Software to calculate precision and bias statistics
MS Excel filename - *"11/3/2017 (dasc_11_3_17.xls)"*
https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 4/23/21 Audited By : JS Williford

Flow Audit									
Flow Audit Device Model:	BGI Delta Cal DC-1A	Serial No:	158047	Calibration Date:	2/25/2021				
Leak Check Value:	as found:	0.4		as left:	0.4				
		E-BAM		Ref. Std.			E-BAM		Ref. Std.
Ambient Temperature:	as found:	16.2 °C		15.5 °C		as left:	16.2 °C		15.5 °C
Barometric Pressure:	as found:	713.7 mmHg		713.5 mmHg		as left:	713.7 mmHg		713.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm		16.70 lpm		as left:	16.7 lpm		16.70 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm		14.04 lpm		as left:	14.0 lpm		14.04 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm		17.49 lpm		as left:	17.5 lpm		17.49 lpm

Mechanical Audits (Y = Yes N = No)				
Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2) :	0.919	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) :	0.926			
Difference (mg/cm2) :	0.007			
% Difference / Pass or Fail:	0.76%	14.2	406.3	Marginal

Setup and Calibration Values								
Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1215	1215	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	1	1	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25 C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15 C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	ON	RH Connect	No	NO
Analog FS	1.0 v	1.0v	Flow Setpoint	16.7	16.7	Pump Protect	Off	OFF

Last 6 Errors in E-BAM Error Log					
Error	Date	Time	Error	Date	Time
No New Messages	4/23/21	1325	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W233

Audit Date: 5/14/2021 Audited By : T. Stewart Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	16.3 °C	17.0 °C	as left:	16.3 °C	17.0 °C
Barometric Pressure:	as found:	710.0 mmHg	710.0 mmHg	as left:	710.0 mmHg	710.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.80 lpm	as left:	16.7 lpm	16.80 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.10 lpm	as left:	14.0 lpm	14.10 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.51 lpm	as left:	17.5 lpm	17.51 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	
Expected Span Mass (mg/cm2) :	0.919
Measured Span Mass (mg/cm2) :	0.913
Difference (mg/cm2) :	0.006
% Difference / Pass or Fail:	0.65%

Pump Test		
Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.2	411.8	Good/Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0712	0712	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	1	1	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No new Messages	5/14/21	0830	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 6/16/2021 Audited By: T. Stewart Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.3 as left: 0.3

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	17.7 °C	18.1 °C	as left:	17.7 °C	18.1 °C
Barometric Pressure:	as found:	711.2 mmHg	710.5 mmHg	as left:	711.2 mmHg	710.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.75 lpm	as left:	16.70 lpm	16.75 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.05 lpm	as left:	14.0 lpm	14.05 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.49 lpm	as left:	17.5 lpm	17.49 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test

Expected Span Mass (mg/cm2): 0.919

Measured Span Mass (mg/cm2): 0.910

Difference (mg/cm2): 0

% Difference / (Pass) or Fail: 0%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.5	413.3	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0656	0656	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	1	1	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No New Messages	6/16/21	0655	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-2 Serial # Y12096

Audit Date: 4/23/21 Audited By : TS Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.6 as left: 0.6

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	17.9 °C	16.8 °C	as left:	17.9 °C	16.8 °C
Barometric Pressure:	as found:	710.3 mmHg	710.5 mmHg	as left:	710.3 mmHg	710.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.77 lpm	as left:	16.7 lpm	16.77 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	13.98 lpm	as left:	14.0 lpm	13.98 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.43 lpm	as left:	17.5 lpm	17.43 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	
Expected Span Mass (mg/cm2) :	0.891
Measured Span Mass (mg/cm2) :	0.894
Difference (mg/cm2) :	0.003
% Difference / Pass or Fail:	0.34%

Pump Test		
Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.9	411.3	Good

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1300	1300	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	2	2	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time		Error	Date	Time
No New Messages	4/23/21	1409	4			
			5			
			6			

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE -2 Serial #

Audit Date: 5/14/2021 Audited By : T. Suo.

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	15.93 °C	16.0 °C	as left:	15.93 °C	16.0 °C
Barometric Pressure:	as found:	710.0 mmHg	709.1 mmHg	as left:	710.0 mmHg	709.1 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.78 lpm	as left:	16.7 lpm	16.78 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.05 lpm	as left:	14.0 lpm	14.05 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.59 lpm	as left:	17.5 lpm	17.59 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test

Expected Span Mass (mg/cm2) : 0.891

Measured Span Mass (mg/cm2) : 0.908

Difference (mg/cm2) : 0.017

% Difference / (Pass) or Fail: 1.89%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.6	407.3	Good / Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0741	0741	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	2	2	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No New Messages	0851	5/14/21	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-2 Serial # Y12096

Audit Date: 6/16/2021 Audited By: T. Stewart Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	20.3 °C	19.6 °C	as left:	20.3 °C	19.6 °C
Barometric Pressure:	as found:	708 mmHg	708.2 mmHg	as left:	708 mmHg	708.2 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.8 lpm	as left:	16.7 lpm	16.8 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.03 lpm	as left:	14.0 lpm	14.03 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.53 lpm	as left:	17.5 lpm	17.53 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	N	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test

Expected Span Mass (mg/cm2): 0.891

Measured Span Mass (mg/cm2): 0.904

Difference (mg/cm2): 0.013

% Difference / ~~Pass~~ or Fail: 1.45%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.0	399.6	Good / Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0732	0732	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	2	2	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No New Messages	6/16/21	0741	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W23310

Audit Date: 4/23/21 Audited By : T. S Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.6 as left: 0.6

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	16.1 °C	15.3 °C	as left:	16.1 °C	15.3 °C
Barometric Pressure:	as found:	712.5 mmHg	712.0 mmHg	as left:	712.5 mmHg	712.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.71 lpm	as left:	16.7 lpm	16.71 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.02 lpm	as left:	14.0 lpm	14.02 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.47 lpm	as left:	17.5 lpm	17.47 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2) :	0.915	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) :	0.916			
Difference (mg/cm2) :	0.001			
% Difference / Pass or Fail:	0.11%	14.8	433.2	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1241	1241	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15°C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	on	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No New Messages	4/23/21	1250	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W23310

Audit Date: 5/14/2021 Audited By : T.S.W.

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	16.5 °C	16.7 °C	as left:	16.5 °C	16.7 °C
Barometric Pressure:	as found:	708.0 mmHg	710.0 mmHg	as left:	708.0 mmHg	710.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.80 lpm	as left:	16.7 lpm	16.80 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.19 lpm	as left:	14.0 lpm	14.19 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.58 lpm	as left:	17.5 lpm	17.58 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2) :	0.885	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) :	0.892			
Difference (mg/cm2) :	0.007			
% Difference / ~~Pass~~ or Fail:	0.79%	14.3	442.3	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0818	0818	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	Off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No Messages	5/14/21	0925	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W23313

Audit Date: 5/28/21 Audited By: T. Stewart Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	18.1 °C	18.9 °C	as left:	18.1 °C	18.9 °C
Barometric Pressure:	as found:	712.3 mmHg	713.0 mmHg	as left:	712.3 mmHg	713.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.79 lpm	as left:	16.7 lpm	16.79 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.03 lpm	as left:	14.0 lpm	14.03 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.55 lpm	as left:	17.5 lpm	17.55 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2):	0.885	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2):	0.879			
Difference (mg/cm2):	0.006			
% Difference / (Pass) or Fail:	0.69%	14.9	406.3	Good

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0831	0831	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0v	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No new messages			4		
			5		
			6		

Audit Notes:

* This is the ~~1st~~ 1st initial Audit for W23313. W23310 stopped working when I tried to restart it would go through the start up mode then turn off. Could not get past start up mode.

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W23313

Audit Date: 6/16/2021 Audited By: T. Stewart + W. Ilford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	22.0 °C	21.6 °C	as left:	22.0 °C	21.6 °C
Barometric Pressure:	as found:	710.3 mmHg	710.0 mmHg	as left:	710.3 mmHg	710.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.83 lpm	as left:	16.7 lpm	16.83 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.21 lpm	as left:	14.0 lpm	14.21 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.53 lpm	as left:	17.5 lpm	17.53 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test

Expected Span Mass (mg/cm2): 0.885

Measured Span Mass (mg/cm2): 0.890

Difference (mg/cm2): ~~0.56~~ 0.005

% Difference / (Pass) or Fail: 0.56%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
15.0	428.1	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0823	0823	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0 V	Flow Setpoint	16.7	16.7	Pump Protect	Off	~~Off~~

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No New Messages	6/16/21	0830	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # X16067

Audit Date: 4/23/21 Audited By : TS Willeford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	15.2 °C	14.8 °C	as left:	15.2 °C	14.8 °C
Barometric Pressure:	as found:	705.0 mmHg	703.5 mmHg	as left:	705.0 mmHg	703.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	17.2 lpm	as left:	16.7 lpm	17.2 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.26 lpm	as left:	14.0 lpm	14.26 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.78 lpm	as left:	17.5 lpm	17.78 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	
Expected Span Mass (mg/cm2) :	0.914
Measured Span Mass (mg/cm2) :	0.918
Difference (mg/cm2) :	0.44%
% Difference / Pass or Fail:	0.004

Pump Test		
Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.8	430.6	~~Good~~ RW Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1046	1046	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	4	4	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24 hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15°C	DAC	8.0 v	8.0 v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0 V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No New Messages	4/23/21	1051	4		
			5		
			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # ~~W233~~ TSW X16067

Audit Date: 5/14/2021 Audited By: T. Stewart Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	16.03 °C	16.0 °C	as left:	16.03 °C	16.0 °C
Barometric Pressure:	as found:	710.0 mmHg	710.7 mmHg	as left:	710.0 mmHg	~~710.7~~ mmHg TSW 710.7
16.7 lpm Flow Rate	as found:	16.7 lpm	17.05 lpm	as left:	16.7 lpm	~~16.~~ 17.05 lpm TSW
14.0 lpm Flow Rate	as found:	14.0 lpm	14.23 lpm	as left:	14.0 lpm	14.23 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.59 lpm	as left:	17.5 lpm	17.59 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	N	as left	Y
Tape support vane clean:	as found	N	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test

Expected Span Mass (mg/cm2): 0.914

Measured Span Mass (mg/cm2): 0.924

Difference (mg/cm2): 0.010

% Difference / (Pass) or Fail: 1.09%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.4	415.6	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0850	0850	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	4	4	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24 hrs	RH Setpoint	45%	45%	Std Cond Temp	25 C	25 C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0 v
Machine Type	PM-10	PM10	RH Control	On	on	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No new Messages	5/14/21	0959	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # X16067

Audit Date: 6/16/2021 Audited By: T. Stewart + Will. Ford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	26.6 °C	25.1 °C	as left:	26.6 °C	25.1 °C
Barometric Pressure:	as found:	704.0 mmHg	703.0 mmHg	as left:	704.0 mmHg	703.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	17.02 lpm	as left:	16.7 lpm	17.02 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.26 lpm	as left:	14.0 lpm	14.26 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.67 lpm	as left:	17.5 lpm	17.67 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test

Expected Span Mass (mg/cm2): 0.914

Measured Span Mass (mg/cm2): 0.925

Difference (mg/cm2): 0.011

% Difference / (Pass) or Fail: 1.19%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.0	406.2	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0907	0907	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	4	4	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5
Tape Advance	24 hrs	24 hrs	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0 v	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
No new messages	6/16/21	0859	4		
			5		
			6		

Audit Notes: