



Rhode Island

Airport Corporation

Data Report for the Rhode Island T.F. Green International Airport Air Monitoring Program

Reporting Period: July 2023

Rhode Island Airport Corporation

August 2023

Table of Contents

Section 1: Introduction	2
Section 2: Sampling Program.....	3
2.1 Station Locations.....	3
2.2 Program Description	5
2.3 Sampling Methods	5
2.4 Environmental Control	5
Section 3: Summary of Monitoring Data.....	6
3.1 Overview	6
3.2 Data Completeness.....	6
3.3 Summary of Black Carbon Data.....	7
3.4 Summary of Ultrafine Particulate Data	14
3.5 Summary of Meteorological Data	21
3.6 Summary of Runway Usage Data.....	27
Section 4: Quality Control.....	28
4.1 Quality Control Activities.....	28

Section 1: Introduction

Under Section 1-7-1 of the State of Rhode Island General Laws (The Permanent Air Quality Monitoring Act, or “the Act”), RIAC is required to “design, acquire, install, operate, and maintain a long-term air monitoring program in the vicinity of T.F. Green Airport”. This report summarizes the monitoring activities and results of the RIAC Air Monitoring Program for the period July 1, 2023 through July 31, 2023.

The RIAC Air Monitoring Program includes ambient air monitoring for black carbon and particulate matter (PM_{0.1}) at four stations around Rhode Island T.F. Green International Airport. In addition, select meteorological parameters (wind speed and direction, ambient temperature, and relative humidity) measured at the airport are summarized in this report. Flight operations are also summarized in this report.

Section 2: Sampling Program

2.1 Station Locations

The four Warwick, RI monitoring sites are described below:

1. Fieldview (former location of 138 Fieldview Drive) – Located south-southwest of the airfield approximately 500 feet from Taxiway M and 2,200 feet from the end of Runway 5. Adjoining land uses include single-family residential to the west and south, long-term parking for the airport and the Terminal Ramp to the north, and the taxiway/runway system to the east.
2. Lydick (western end of Lydick Avenue) – Located adjacent to the Spring Green neighborhood and the airport's northeastern property line, approximately 3,500 feet from the end of Runway 23. Adjoining land uses include the airport to the south, commercial properties to the west, and single-family residential to the north, east, and south.
3. Smith St. (Relocated Fire Station) – Located east of Greenlawn St on the south side of Smith St approximately 1,900 feet south and east of Runway 5. Adjoining land uses include the airport to the north, open space (FAA lighting system for RWY 5) to the west and single family residential to the south, east, and west.
4. Pembroke (adjacent to Winslow Park athletic facility) – Located due east of the airport approximately 2,150 feet from the intersection of Runways 5/23 and 16/34. Adjoining land uses are the airport to the west, and residential or recreational fields to the north, east, and south.

The locations of the monitoring sites are shown on Figure 2.1.

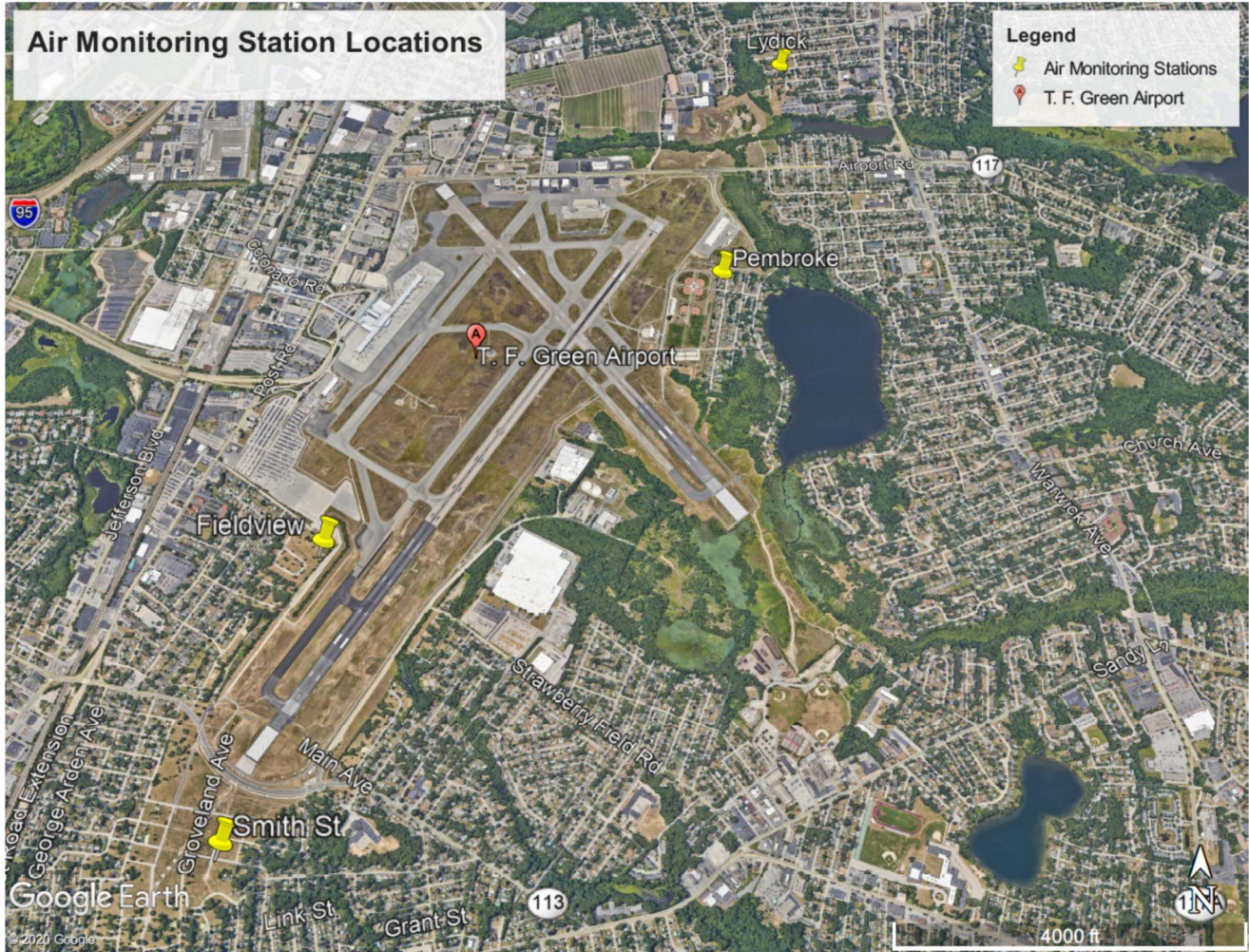


Figure 2.1. Monitoring Station Locations. Google Earth

2.2 Program Description

Table 2.1 presents the monitoring configurations of each of the RIAC monitoring stations.

Table 2.1. Sampling Configuration of the Four Monitoring Stations in the RIAC Air Quality Monitoring Program.

Parameters	Sampling and Analysis Equipment	Summary Description
Ultra-fine PM < 0.1 microns (PM0.1)	Water-based Condensation Particle Counter (EPC)	Real-time measurements based on light (infrared) scattering characteristics of airborne PM.
Black Carbon (BC)	Aethalometer monitors	Real-time measurements based on the light absorbing characteristics of soot.

2.3 Sampling Methods

Sampling of ambient air for the measurement of pollutant concentrations and atmospheric conditions was performed by appropriate monitoring methods. This assures that the air sampled was representative of the ambient air and that the measurements were representative of the actual pollutant concentrations.

2.3.1 Reference and Acceptable Methods

The instruments and systems used to collect ultrafine particulate and black carbon are acceptable real-time samplers for measurements but they are not EPA certified. Descriptions of each of these monitoring methods are presented below.

2.3.1.1 Black carbon

Optically-absorbing black-carbon (BC) aerosol particles, which are a characteristic of diesel and jet exhaust, were continuously measured by a Magee Scientific Model AE-22 aethalometer. The aethalometer is equipped with a PM_{2.5} inlet to ensure BC in the respirable size range is measured.

2.3.1.2 Ultrafine particles

Total particle count was measured using real-time, water-based condensation particle counters (EPC). The particle counters are equipped with an inlet cyclone to screen out particles larger than 3 μm. The majority of particles counted have a diameter of 0.1 μm or less.

2.4 Environmental Control

To help ensure proper performance, all analyzers and supporting equipment were installed and continue to operate in a temperature-controlled environment. An insulated enclosure with a thermostatically controlled heater was installed to house the analyzers, samplers, data acquisition system, materials, supplies, and storage of project documentation.

During the warmer months a built-in Environmental Condition Unit (ECU) maintains appropriate temperatures in the shelter. The shelter is maintained between 20 and 30 °C and is designed to minimize rapid fluctuations in temperature.

Section 3: Summary of Monitoring Data

3.1 Overview

The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS). There are no NAAQS for Black Carbon or Ultrafine Particulates (PM_{0.1}).

Meteorological data obtained from the local National Weather Service Station at Rhode Island T.F. Green International Airport is summarized in Section 3.5. Runway usage data is summarized in Section 3.6.

3.2 Data Completeness

July 2023 data capture is presented in the table below.

Table 3.2. Data Recovery from Continuous Monitors.

Site	Valid Hours	Total Hours	Recovery
Fieldview			
Aethalometer	736	744	98.92%
Ultrafine Particulate Matter	740	744	99.46%
Lydick			
Aethalometer	732	744	98.39%
Ultrafine Particulate Matter	732	744	98.39%
Pembroke			
Aethalometer	736	744	98.92%
Ultrafine Particulate Matter	741	744	99.60%
Smith St			
Aethalometer	718	744	96.51%
Ultrafine Particulate Matter	720	744	96.77%

3.3 Summary of Black Carbon Data

3.3.1 Real-Time Black Carbon Data

The black carbon data is collected at one minute increments with an aethalometer at each monitoring site. Hourly data is calculated. Previous quarter data are presented by site in Tables 3.3.1-3.3.8. Current data is presented in Figures 3. 1- 3.8.

- **Fieldview:**
 - The highest hourly value was 2,034 ng/m³. Previous quarter Maxima are displayed below.

Table 3.3.1 Fieldview Previous Quarter Maxima values

Fieldview	2023	2022	2021	2020	2019	2018	2017
Quarter 1	3,263	2,620	1,353	2,621	2,101	2,622	2513.4
Quarter 2	3,343	2,943	1,840	4,436	1,253	2,264	1755.9
Quarter 3		3,113	6,123	3,090	30,767	2,135	3,362
Quarter 4		6,611	3,086	2,837	2,933	2,965	2,808

- The average hourly value was 623 ng/m³. Previous quarter averages are displayed below.

Table 3.3.2 Fieldview Previous Quarter Average values

Fieldview	2023	2022	2021	2020	2019	2018	2017
Quarter 1	364	384	195	273	228	308	257.1
Quarter 2	333	247	215	207	196	281	343.2
Quarter 3		402	505	262	308	305	436.5
Quarter 4		431	442	296	315	251	312

- **Smith:**
 - The highest hourly value was 1,976 ng/m³. Previous quarter averages are displayed below. Previous quarter maxima are displayed below.

Table 3.3.3 Smith Previous Quarter Maxima values

Smith	2023	2022	2021	2020
Quarter 1	2,055	3,395	1,880	Not in service
Quarter 2	3,297	5,045	2,017	5,689
Quarter 3		2,616	5,031	4,187
Quarter 4		5,381	4,033	4,595

- The average hourly value was 350 ng/m³. Previous quarter averages are displayed below.

Table 3.3.4 Smith Previous Quarter Average values

Smith	2023	2022	2021	2020
Quarter 1	211	412	218	Not in service
Quarter 2	351	282	216	230
Quarter 3		355	357	310
Quarter 4		402	419	347

- Lydick:

- The highest hourly value was 1,429 ng/m³. Previous quarter maxima are displayed below.

Lydick	2023	2022	2021	2020	2019	2018	2017
Quarter 1	1,875	3,265	1,673	2,685	2,113	3,523	5,057.6
Quarter 2	2,502	1,975	2,335	5,302	2,143	2,233	2150.8
Quarter 3		1,897	4,286	3,464	7,605	4,587	4,381
Quarter 4		2,731	2,305	4,704	3,240	4,478	4,849

- The average hourly value was 395 ng/m³. Previous quarter averages are displayed below.

Lydick	2023	2022	2021	2020	2019	2018	2017
Quarter 1	227	271	220	259	265	262	466.0
Quarter 2	301	199	213	197	197	266	440.1
Quarter 3		265	338	309	329	310	615.9
Quarter 4		288	328	340	318	276	450

- Pembroke:

- The highest hourly value was 2,334 ng/m³. Previous quarter maxima are listed below.

Pembroke	2023	2022	2021	2020	2019	2018	2017
Quarter 1	2,082	3,877	6,512	3,151	12,062	4,568	5253.9
Quarter 2	6,178	6,930	2,386	3,742	1,975	16,521	2241.5
Quarter 3		1,650	5,005	7,225	3,989	6,531	8141.7
Quarter 4		2,941	2,460	5,481	3,631	7,839	17,452

- The average hourly value was 500 ng/m³. Previous quarter averages are displayed below.

Table 3.3.8 Pembroke Previous Quarter Average values

Pembroke	2023	2022	2021	2020	2019	2018	2017
Quarter 1	298	305	497	353	392	178	484.4
Quarter 2	393	545	221	241	238	437	417.8
Quarter 3		244	349	361	380	400	619.2
Quarter 4		252	362	428	420	434	409

Figure 3.1. Plot of Hourly Average Black Carbon Concentrations (ng/m3) at Fieldview,

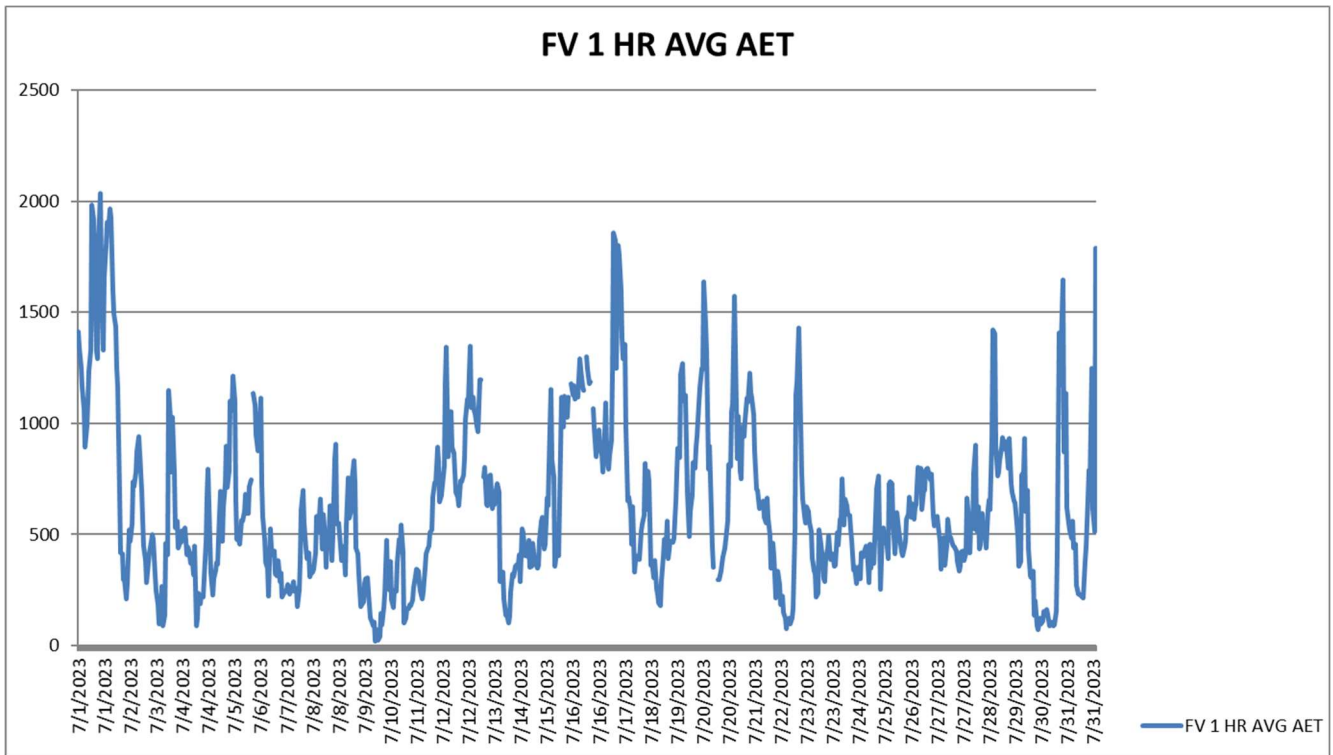


Figure 3.2. Plot of Hourly Maximum Black Carbon Concentrations (ng/m3) at Fieldview

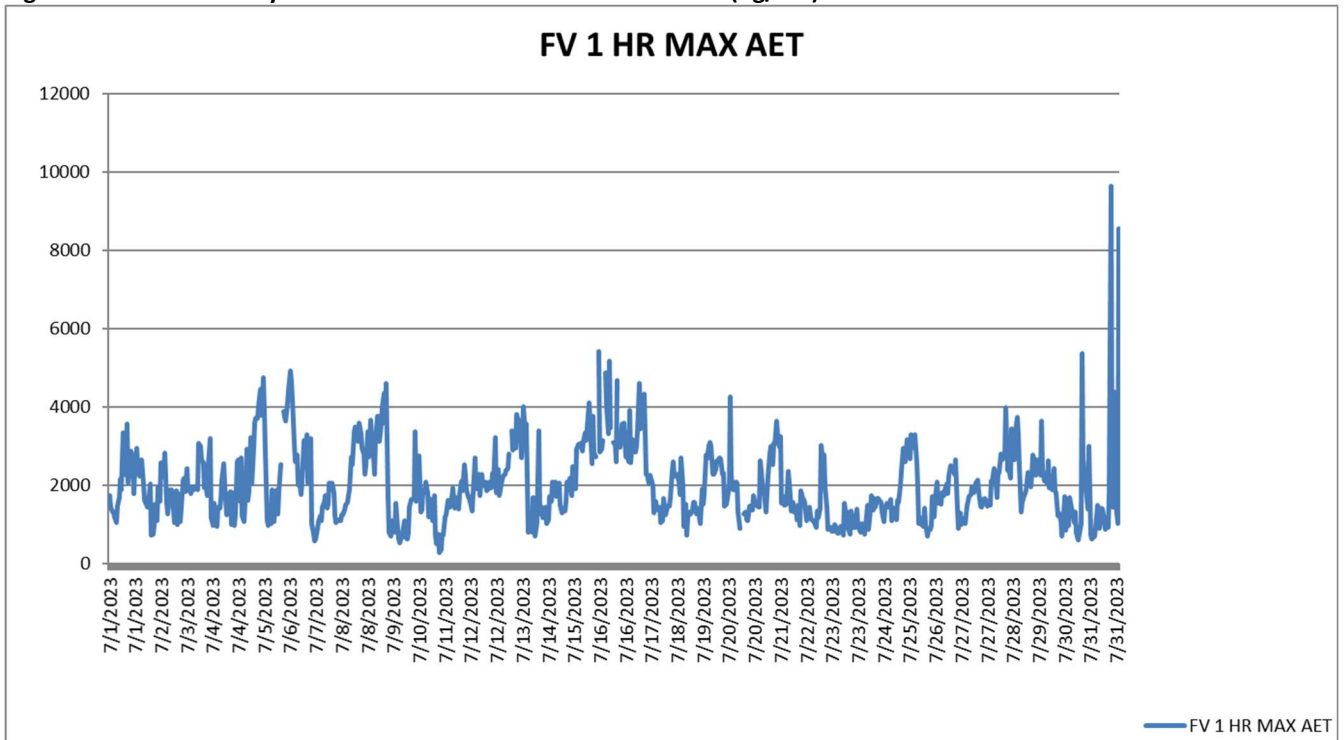


Figure 3.3. Plot of Hourly Average Black Carbon Concentrations (ng/m3) at Smith,

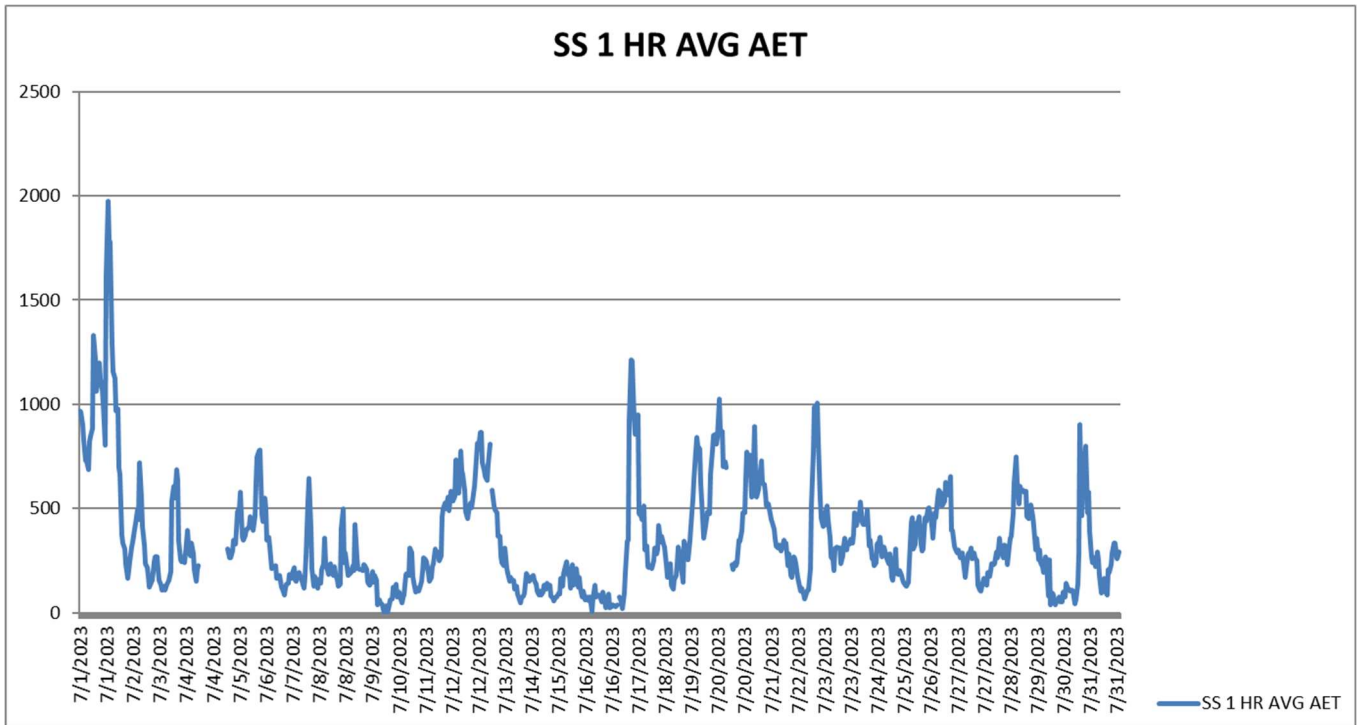
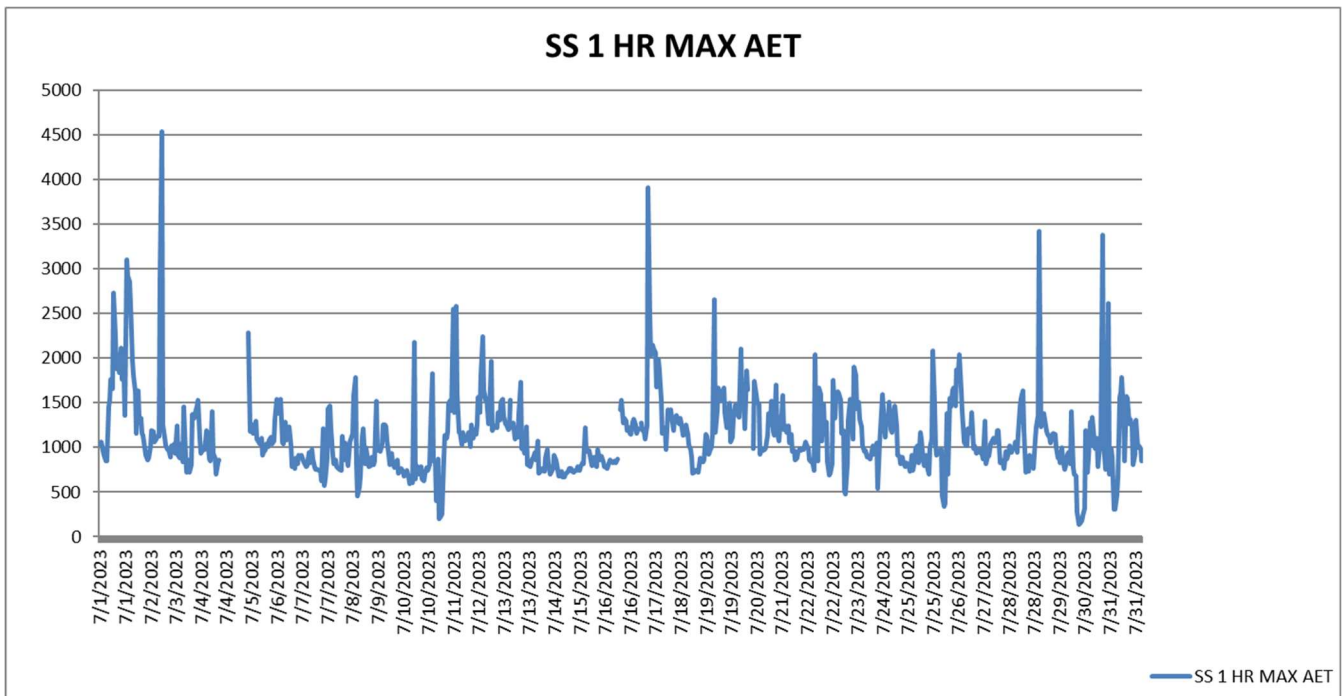


Figure 3.4. Plot of Hourly Maximum Black Carbon Concentrations (ng/m3) at Smith,



Black Carbon Lydick Site

Figure 3.5. Plot of Hourly Average Black Carbon Concentrations (ng/m3) at Lydick

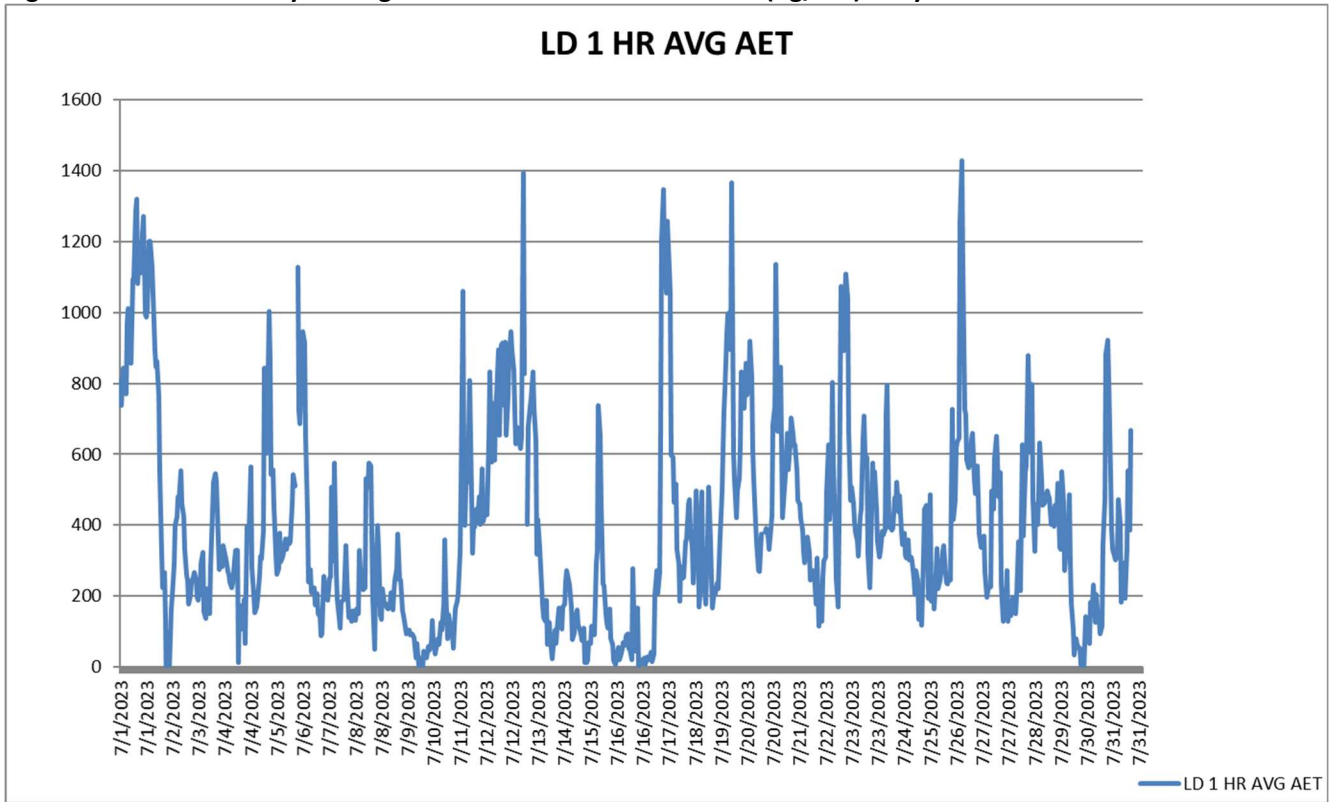


Figure 3.6. Plot of Hourly Maximum Black Carbon Concentrations (ng/m3) at Lydick

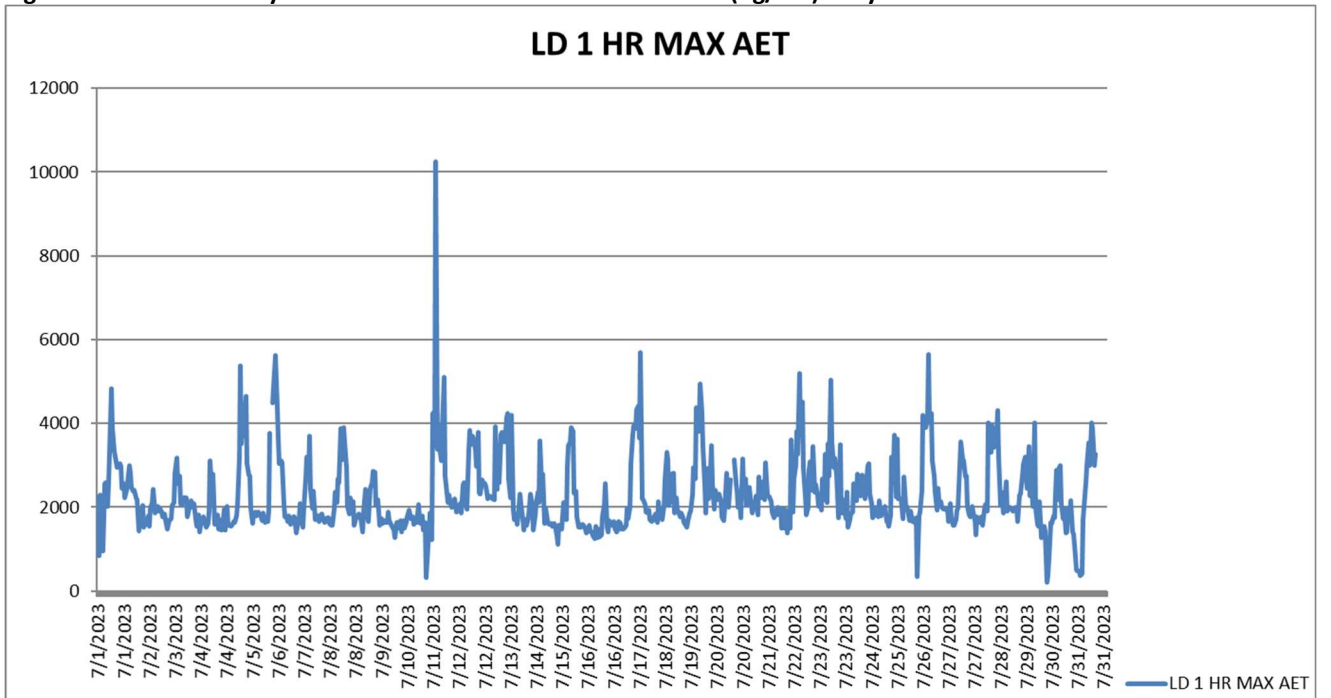


Figure 3.7. Plot of Hourly Average Black Carbon Concentrations (ng/m3) at Pembroke

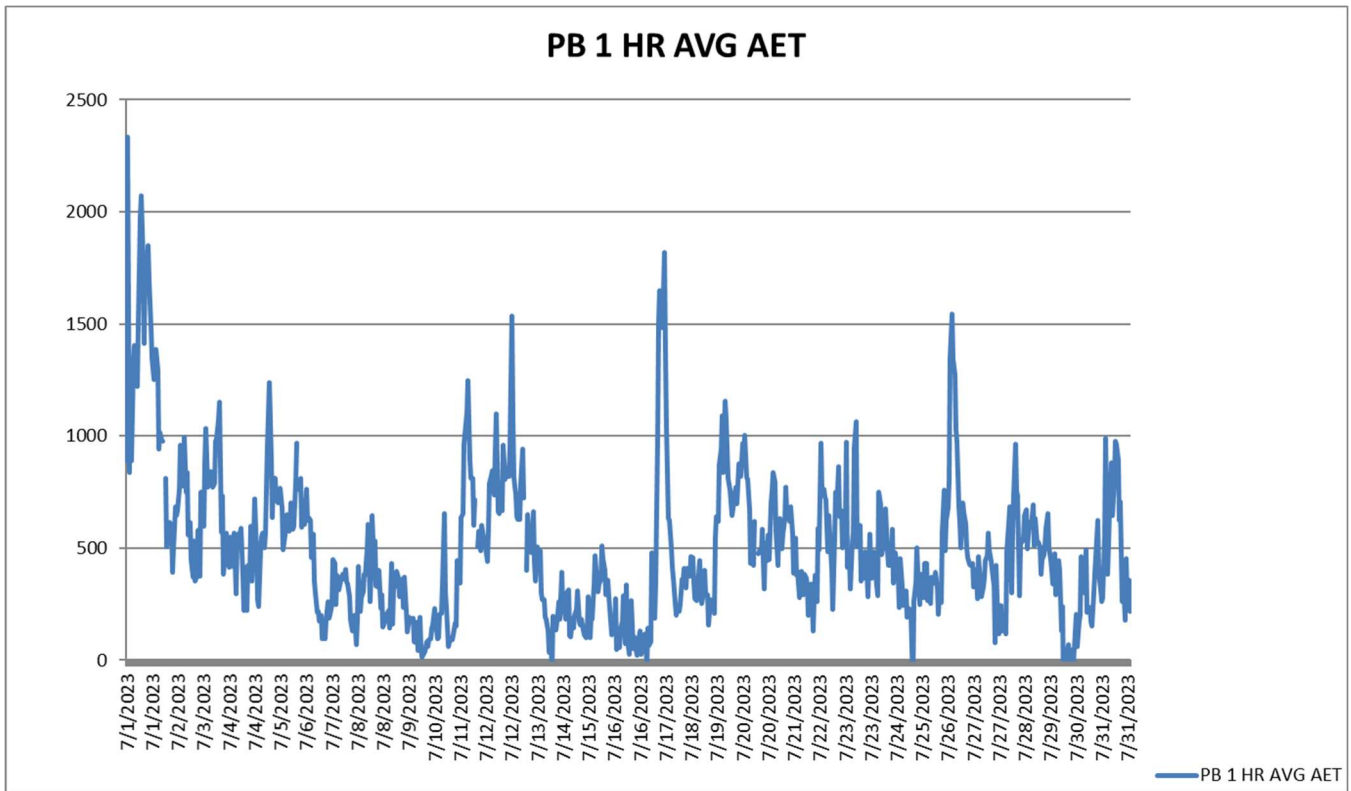
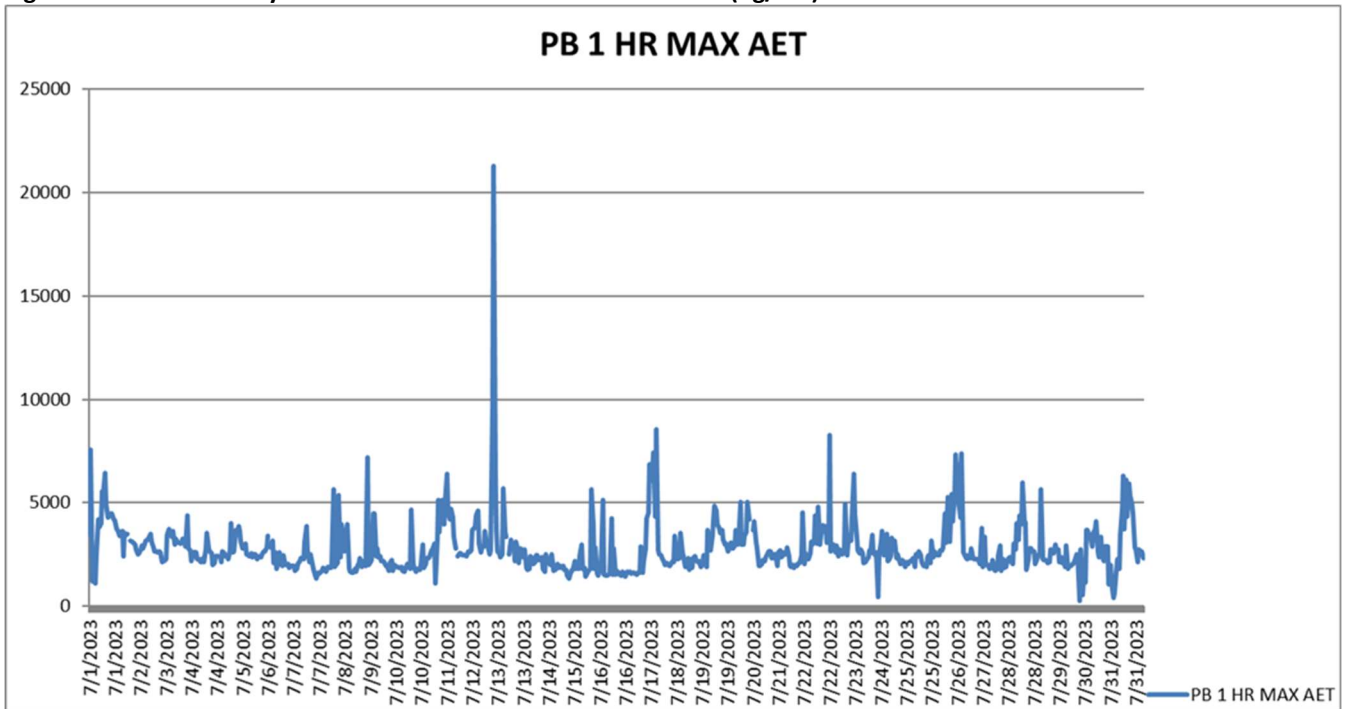


Figure 3.8. Plot of Hourly Maximum Black Carbon Concentrations (ng/m3) at Pembroke



3.4 Summary of Ultrafine Particulate Data

3.4.1 Real-Time Ultrafine Particulate Data

The ultrafine particulate data is collected in one minute increments with a particle counter equipped with an inlet cyclone to screen out particles larger than 3 mm. The majority of particles counted have a diameter of 0.1 mm or less. Hourly data is calculated. Previous quarter data are presented in Tables 3.4.1-3.4.8. Current data is presented in Figures 3.9 – 3.16.

- Fieldview
 - The highest hourly value was 31,799 particles/cm³. Previous quarter maxima values are displayed below.

Table 3.4.1 Fieldview Previous Quarter Maxima values

Fieldview	2023	2022	2021	2020	2019	2018	2017
Quarter 1	65,274	85,360	69,795	126,532	86,797	185,489	86,331
Quarter 2	61,179	65,852	53,107	64,470	58,246	105,520	57,144
Quarter 3		113,223	86,484	50,773	122,349	39,388	55,171.5
Quarter 4		184,168	97,909	93,978	118,215	8,566,778	155,878

- The average hourly value was 5,859 particles/cm³. Previous quarter average values are displayed below.

Table 3.4.2 Fieldview Previous Quarter Average values

Fieldview	2023	2022	2021	2020	2019	2018	2017
Quarter 1	9,253	10,310	8,441	10,717	5,158	10,823	11,247
Quarter 2	8,390	9,273	8,167	6,240	3,603	9,171	7,064
Quarter 3		8,536	8,309	6,604	5,224	1,454	6,439.7
Quarter 4		10,584	10,537	8,988	13,919	29,702	7,914

- Smith

- The highest hourly value was 46,899 particles/cm³. Previous quarter maxima values are displayed below.

Table 3.4.3 Smith Previous Quarter Maxima values

Smith	2023	2022	2021	2020
Quarter 1	65,742	62,115	55,947	Not in service
Quarter 2	68,844	64,130	69,903	47,969
Quarter 3		70,358	75,983	15,573
Quarter 4		96,719	81,992	60,487

- The average hourly value was 3,397 particles/cm³. Previous quarter average values are displayed below.

Table 3.4.4 Smith Previous Quarter Average values

Smith	2023	2022	2021	2020
Quarter 1	7,580	7,769	8,898	Not in service
Quarter 2	5,982	6,159	7,057	3,732
Quarter 3		5,759	6,044	1,119
Quarter 4		8,860	7,124	6,418

- Lydick
 - The highest hourly value was 103,44 particles/cm³. Previous quarter maxima values are displayed below.

Table 3.4.5 Lydick Previous Quarter Maxima values

Lydick	2023	2022	2021	2020	2019	2018	2017
Quarter 1	143,065	155,344	103,110	144,057	8,973	130,013	178,827
Quarter 2	129,966	133,688	165,123	5,854,417	138,661	104,876	131,813
Quarter 3		111,723	184,635	115,319	109,521	2,507,171	134,418
Quarter 4		145,957	149,078	81,028	124,711	3,256,429	183,703

- The average hourly value was 9,558 particles/cm³. Previous quarter average values are displayed below.

Table 3.4.6 Lydick Previous Quarter Average values

Lydick	2023	2022	2021	2020	2019	2018	2017
Quarter 1	10,624	12,811	9,279	11,848	80	12,563	14,418
Quarter 2	9,491	10,094	10,890	18,979	7,149	10,076	9,894
Quarter 3		11,367	11,374	8,336	11,281	11,217	10,936
Quarter 4		13,271	13,462	10,632	11,034	10,177	13,928

- Pembroke
 - The highest hourly value was 66,315 particles/cm³. Previous quarter maxima values are displayed below.

Table 3.4.7 Pembroke Previous Quarter Maxima values

Pembroke	2023	2022	2021	2020	2019	2018	2017
Quarter 1	126,585	90,833	61,512	104,860	110,190	313,993	94,188
Quarter 2	84,063	47,352	56,828	46,331	71,270	60,853	106,170
Quarter 3		63,888	50,279	56,856	104,264	52,695	84,650
Quarter 4		110,990	75,917	89,007	109,981	100,504	134,074

- The average hourly value was 6,942 particles/cm³. Previous quarter average values are displayed below.

Table 3.4.8 Pembroke Previous Quarter Average values

Pembroke	2023	2022	2021	2020	2019	2018	2017
Quarter 1	11,594	7,120	11,406	12,081	6,331	14,835	16,033
Quarter 2	8,479	5,450	7,624	5,680	5,425	8,319	9,866
Quarter 3		6,779	5,855	6,773	8,759	6,743	9,855
Quarter 4		11,867	8,271	10,797	12,726	13,404	16,647

Ultrafine PM Fieldview Site

Figure 3.9. Plot of Hourly Average Ultrafine Particles (PM0.1) at Fieldview

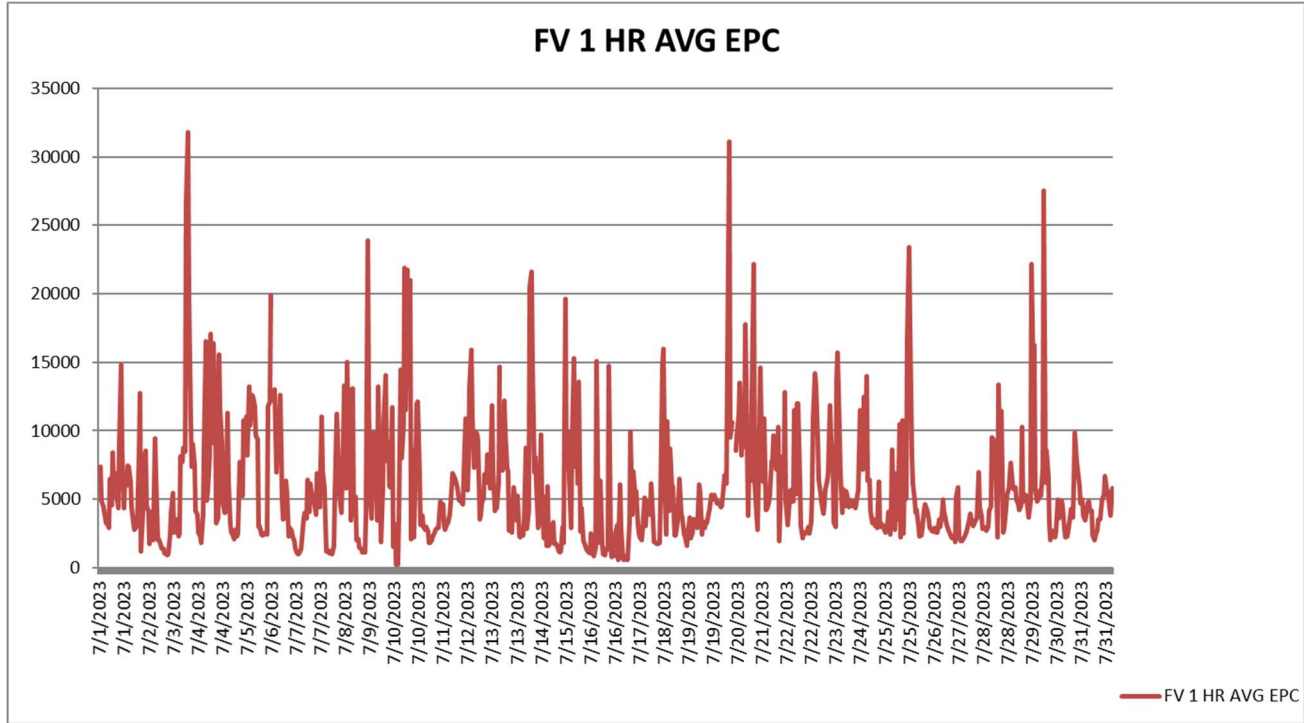
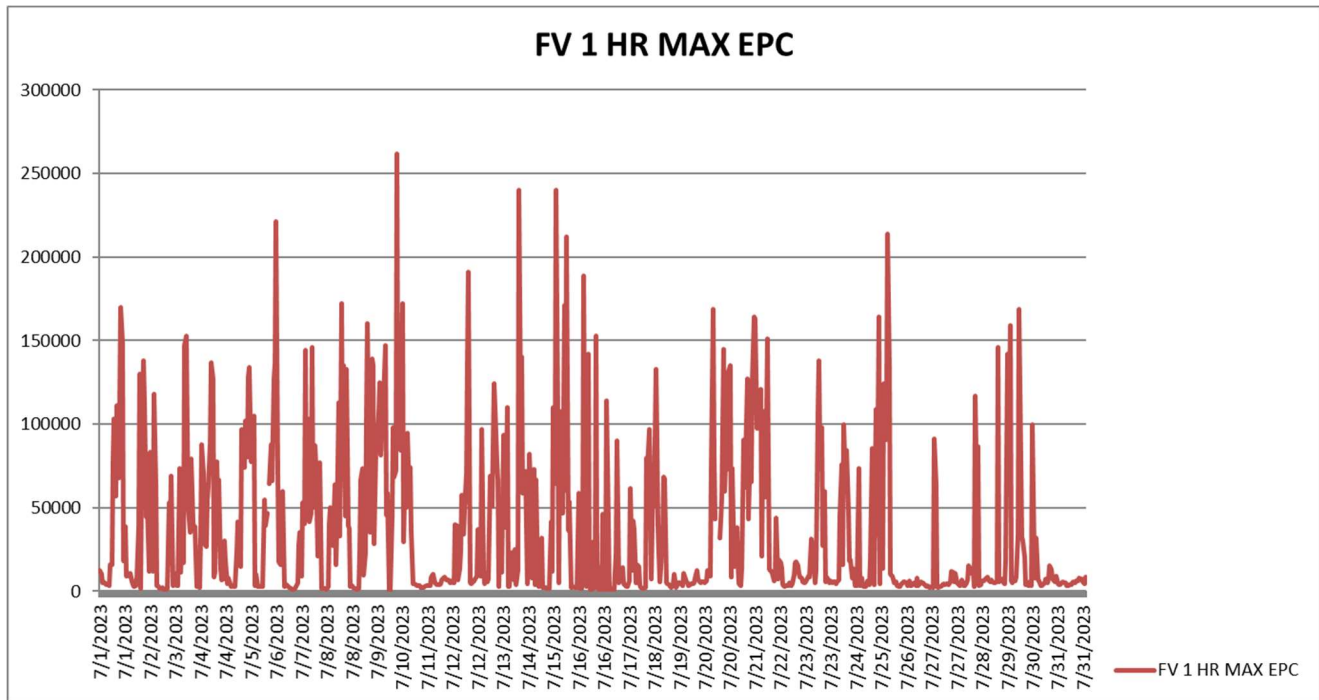


Figure 3.10. Plot of Hourly Maximum Ultrafine Particles (PM0.1) at Fieldview



Reporting period July 2023

RIAC – RI T.F. Green International Airport

August 2023

Ultrafine PM Smith Site

Figure 3.11. Plot of Hourly Average Ultrafine Particles (PM0.1) at Smith

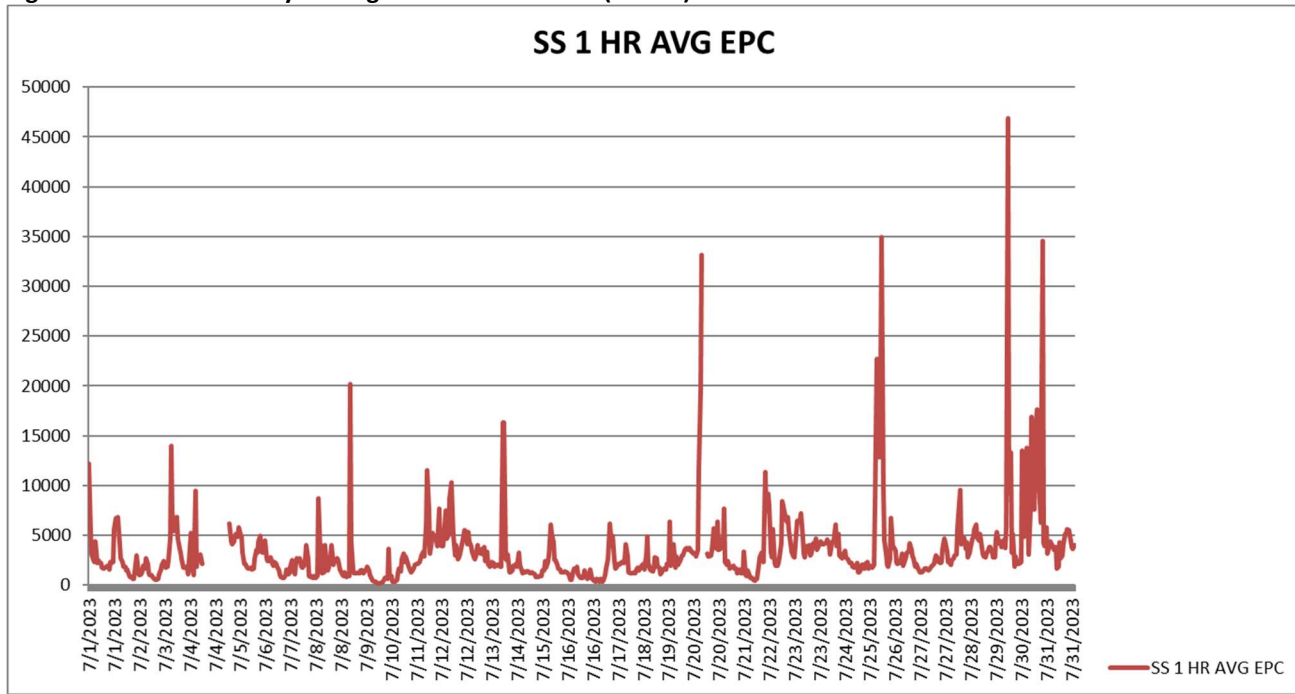
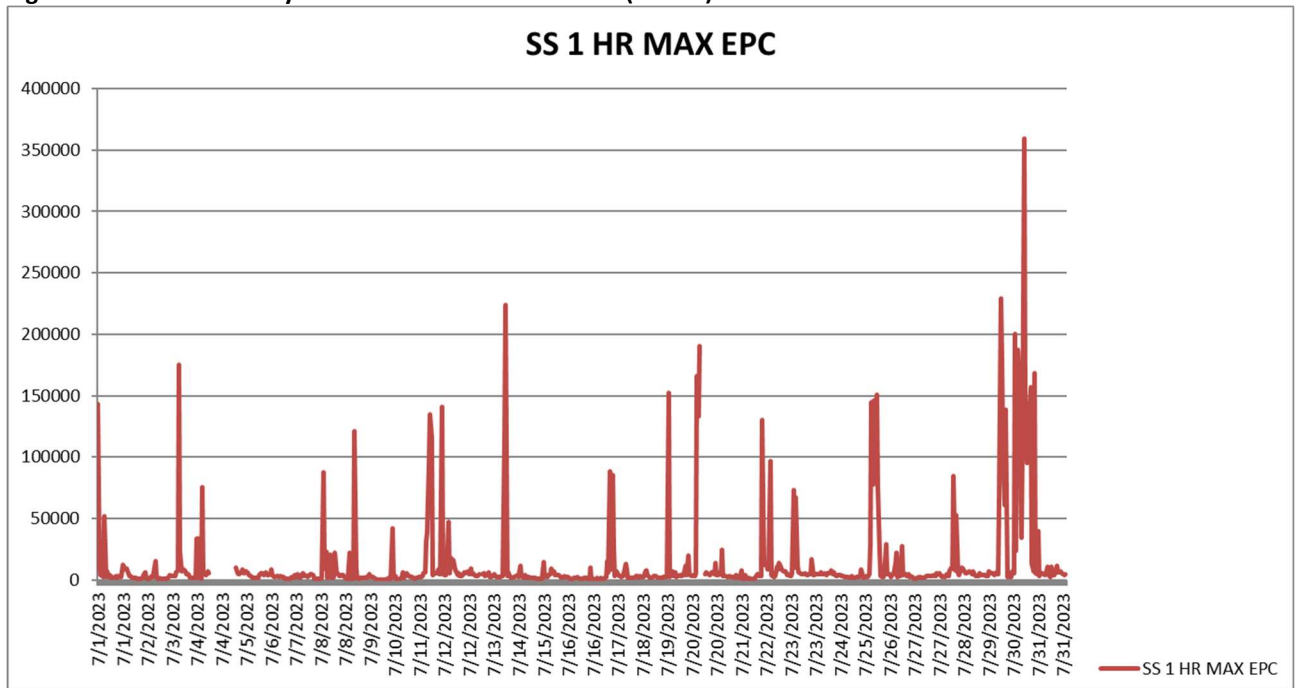


Figure 3.12. Plot of Hourly Maximum Ultrafine Particles (PM0.1) at Smith



Reporting period July 2023
RIAC – RI T.F. Green International Airport

August 2023

Ultrafine PM Lydick Site

Figure 3.13. Plot of Hourly Average Ultrafine Particles (PM0.1) at Lydick

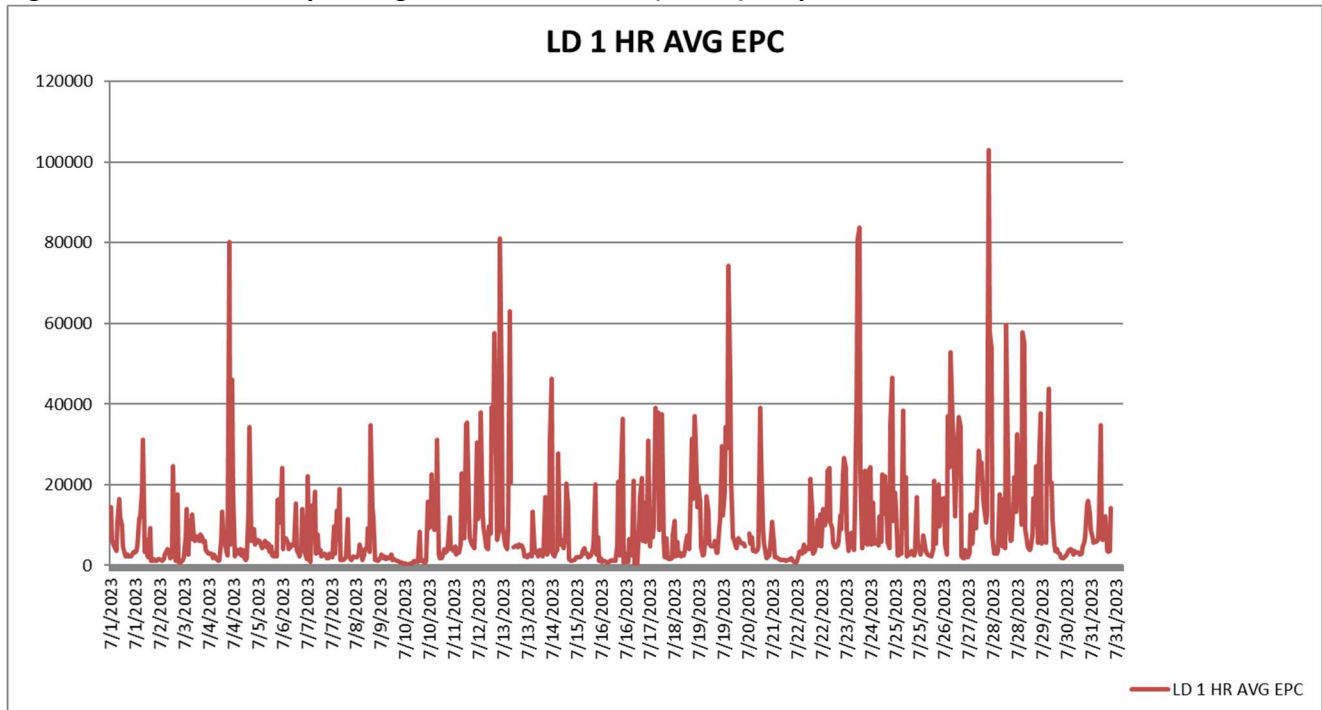
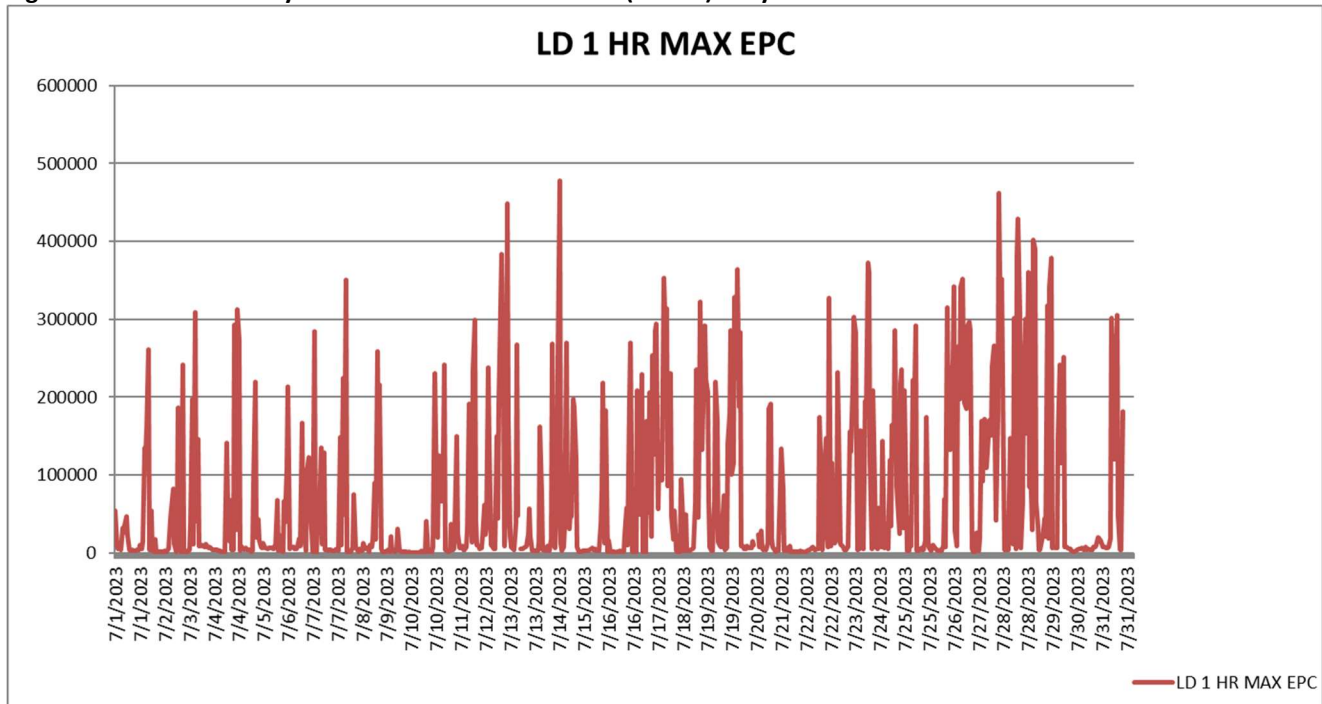


Figure 3.14. Plot of Hourly Maximum Ultrafine Particles (PM0.1) at Lydick



Ultrafine PM Pembroke Site

Figure 3.15. Plot of Hourly Average Ultrafine Particles (PM_{0.1}) at Pembroke

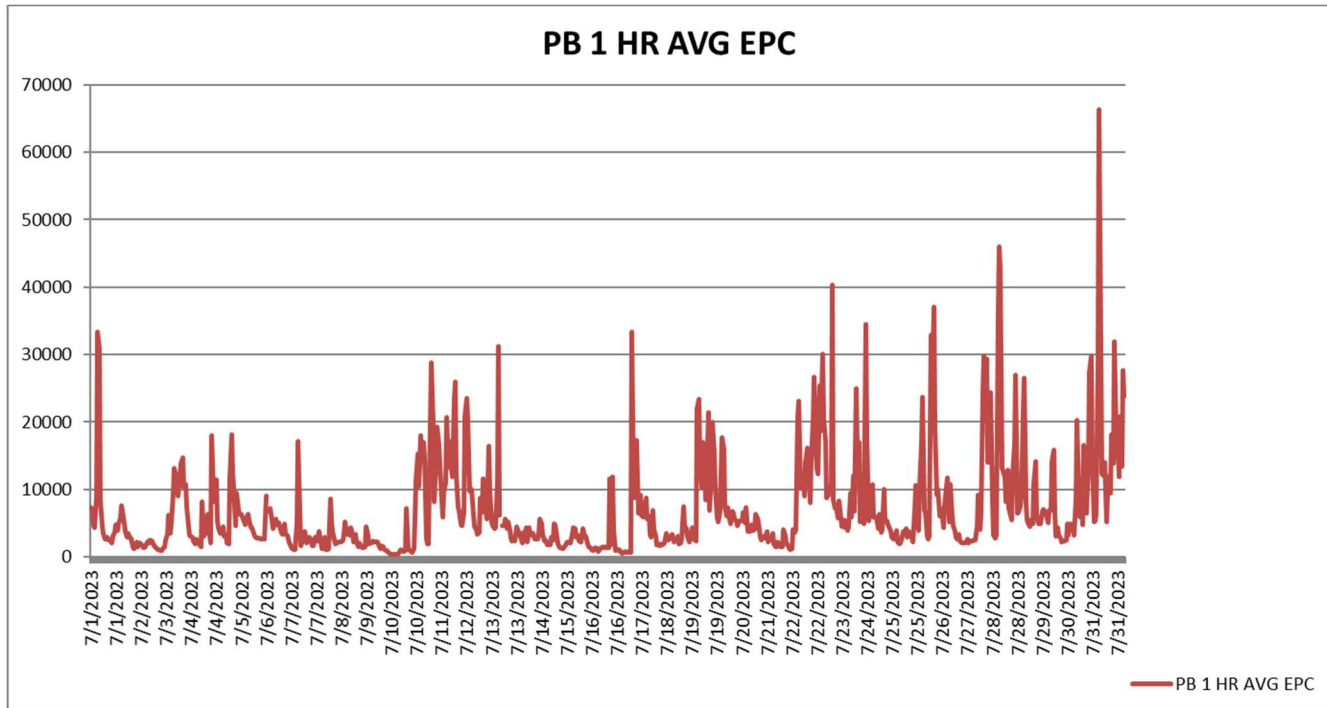
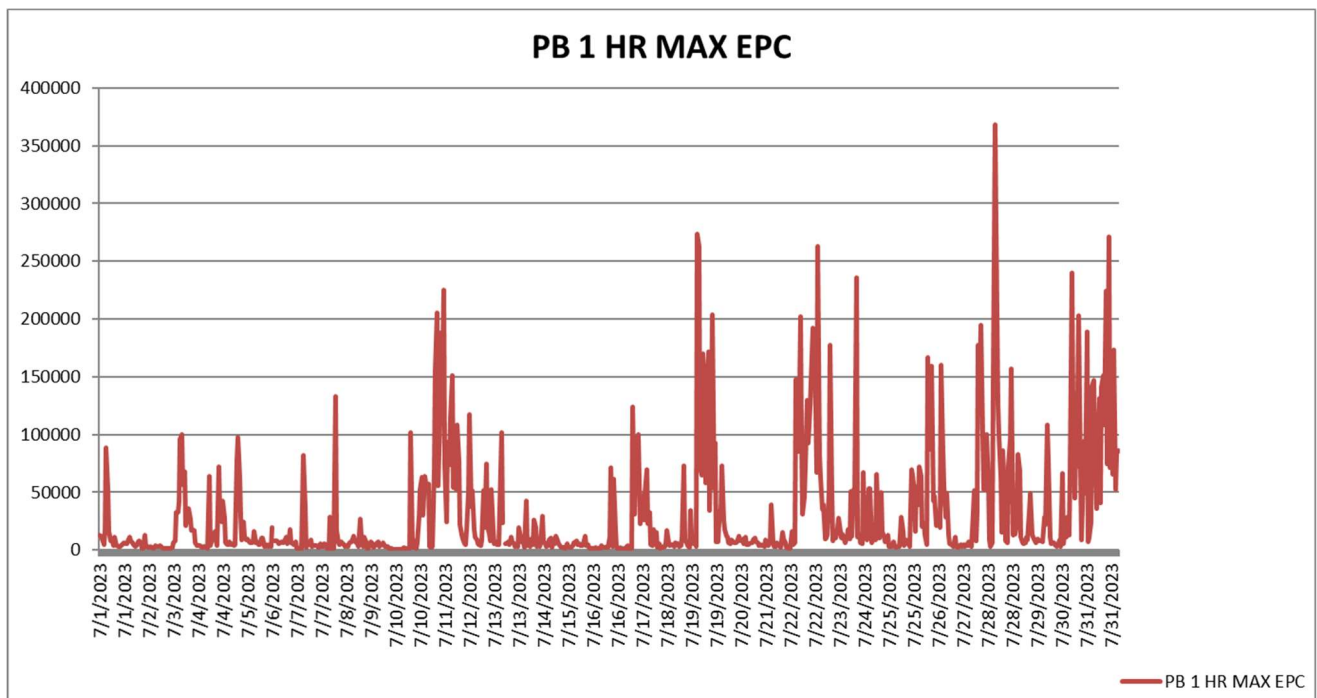


Figure 3.16. Plot of Hourly Maximum Ultrafine Particles (PM_{0.1}) at Pembroke



Reporting period July 2023

RIAC – RI T.F. Green International Airport

August 2023

3.5 Summary of Meteorological Data

3.5.1 Hourly Average Meteorological Data

Meteorological data was acquired from the National Weather Service station at Rhode Island T. F. Green International Airport. The parameters summarized below include: wind direction, wind speed, temperature, and relative humidity.

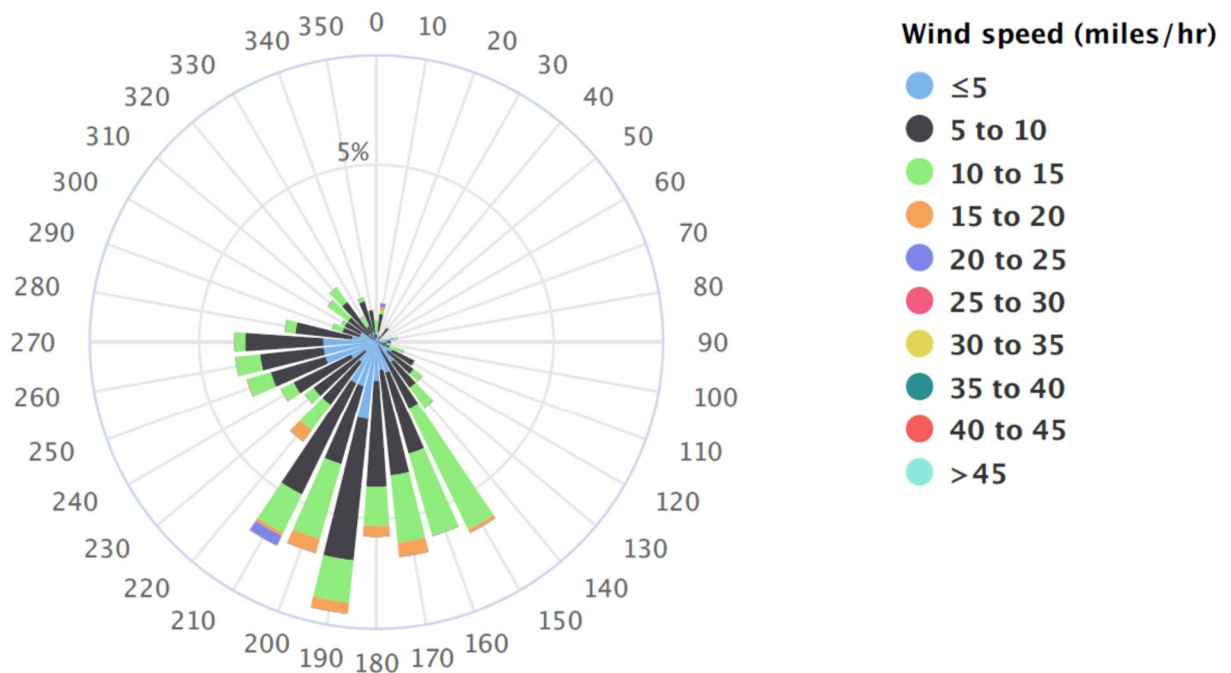
3.5.2 Wind Rose Summary

Wind rose for July 2023 is presented in Figures 3.17. Windroses are from the Northeast Regional Climate Center (NRCC) (<http://www.nrcc.cornell.edu/wxstation/windroses/windroses.html.edu>).

Figure 3.17. Wind Rose for July 2023.

RHODE ISLAND T.F. GREEN INTERNATIONAL AIRPORT, RI

Percent of winds blowing from the indicated direction
Date range: 2023-07-01 through 2023-07-31



Powered by ACIS

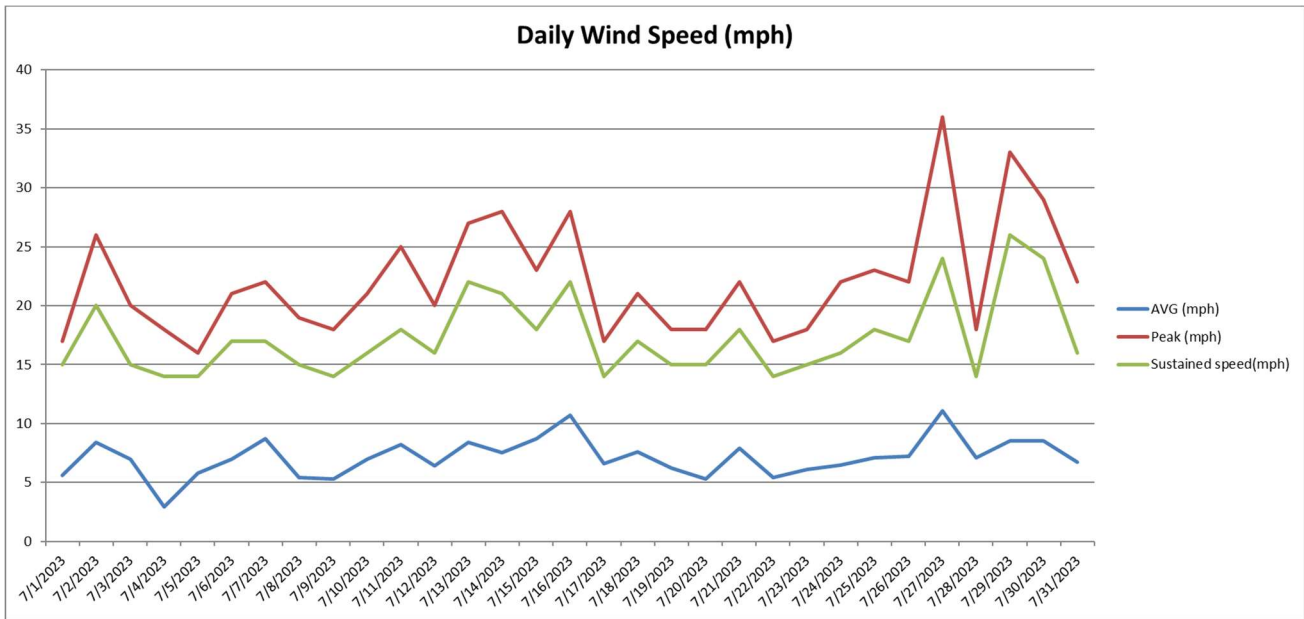
3.5.1 Wind Speed

The 10-meter wind speed summary is presented below and in Figure 3.18.

Table 3.5.3. Daily Average, Peak and Sustained Wind Speed (mph)

Date	AVG	Peak	Sustained
7/1	5.6	17	15
7/2	8.4	26	20
7/3	7	20	15
7/4	2.9	18	14
7/5	5.8	16	14
7/6	7	21	17
7/7	8.7	22	17
7/8	5.4	19	15
7/9	5.3	18	14
7/10	7	21	16
7/11	8.2	25	18
7/12	6.4	20	16
7/13	8.4	27	22
7/14	7.5	28	21
7/15	8.7	23	18
7/16	10.7	28	22
7/17	6.6	17	14
7/18	7.6	21	17
7/19	6.2	18	15
7/20	5.3	18	15
7/21	7.9	22	18
7/22	5.4	17	14
7/23	6.1	18	15
7/24	6.5	22	16
7/25	7.1	23	18
7/26	7.2	22	17
7/27	11.1	36	24
7/28	7.1	18	14
7/29	8.5	33	26
7/30	8.5	29	24
7/31	6.7	22	16

Figure 3.18. Plot of Daily Average, Peak, and Sustained Wind Speed (mph).



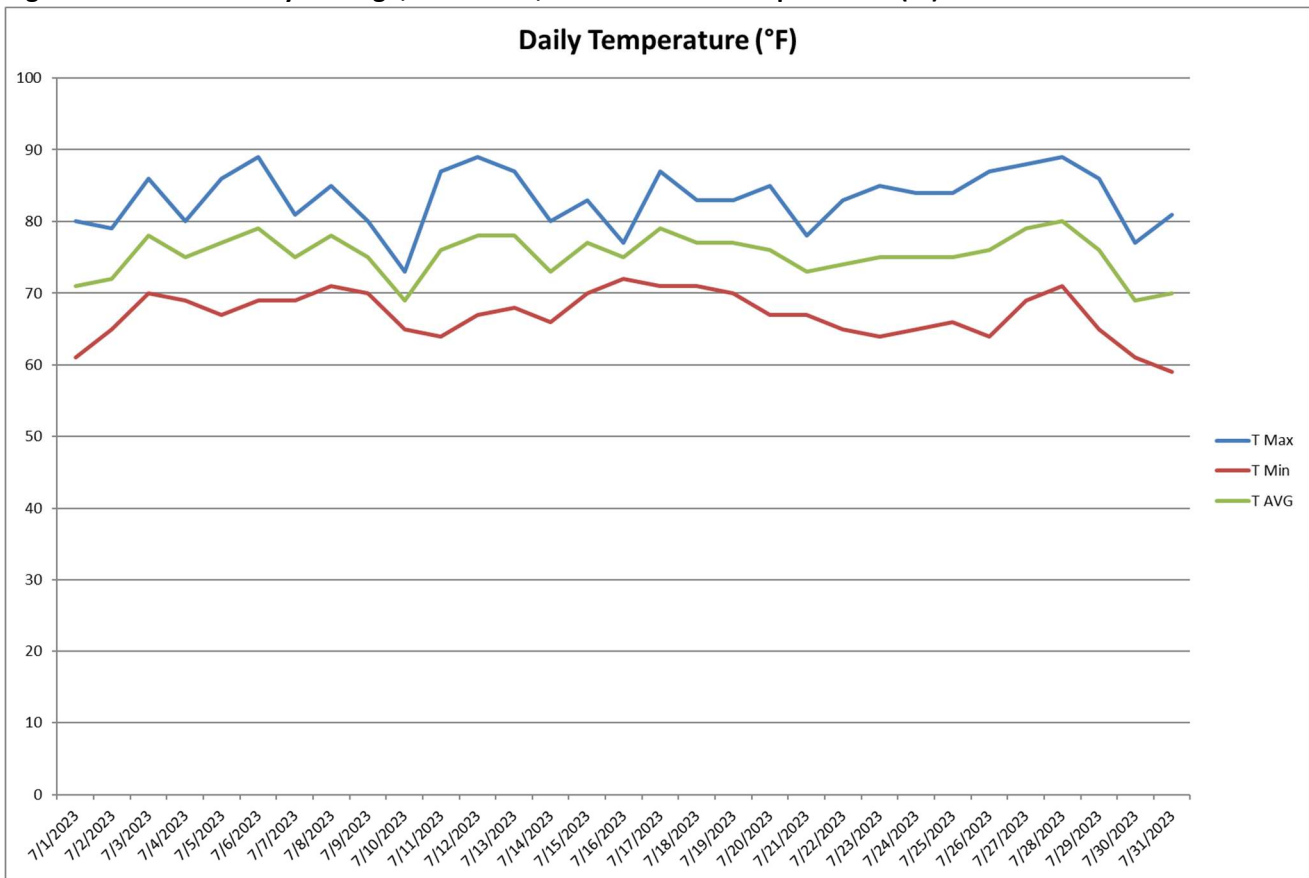
3.5.2 Temperature Summary

The daily temperature data is presented below and Figure 3.19.

Table 3.5.4. Daily Average, Maximum, and Minimum Temperatures (°F)

Date	Tmax	Tmin	Tavg
7/1	80	61	71
7/2	79	65	72
7/3	86	70	78
7/4	80	69	75
7/5	86	67	77
7/6	89	69	79
7/7	81	69	75
7/8	85	71	78
7/9	80	70	75
7/10	73	65	69
7/11	87	64	76
7/12	89	67	78
7/13	87	68	78
7/14	80	66	73
7/15	83	70	77
7/16	77	72	75
7/17	87	71	79
7/18	83	71	77
7/19	83	70	77
7/20	85	67	76
7/21	78	67	73
7/22	83	65	74
7/23	85	64	75
7/24	84	65	75
7/25	84	66	75
7/26	87	64	76
7/27	88	69	79
7/28	89	71	80
7/29	86	65	76
7/30	77	61	69
7/31	81	59	70

Figure 3.19. Plot of Daily Average, Maximum, and Minimum Temperatures (°F).



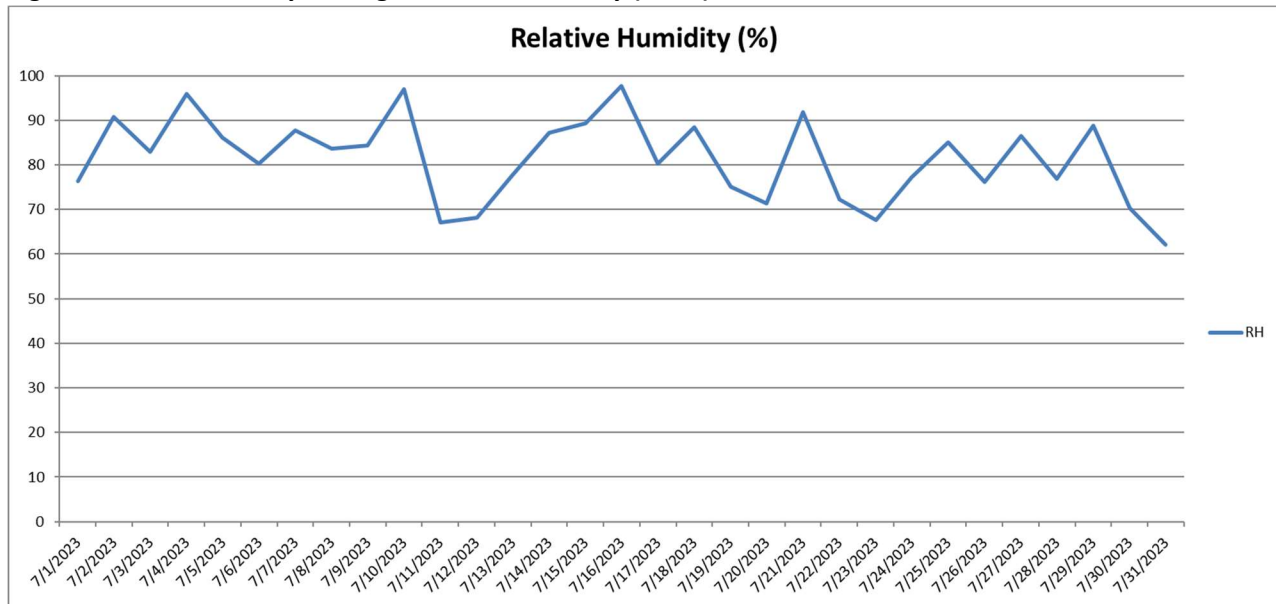
3.5.3 Relative Humidity Data

The average daily relative humidity data is presented below and Figure 3.20. Daily averages were calculated using NCDC hourly reported values.

Table 3.5.3 Daily Relative Humidity (%)

Date	RH (%)
7/1	76
7/2	91
7/3	83
7/4	96
7/5	86
7/6	80
7/7	88
7/8	84
7/9	84
7/10	97
7/11	67
7/12	68
7/13	78
7/14	87
7/15	89
7/16	98
7/17	80
7/18	89
7/19	75
7/20	71
7/21	92
7/22	72
7/23	68
7/24	77
7/25	85
7/26	76
7/27	87
7/28	77
7/29	89
7/30	70
7/31	62

Figure 3.20. Plot of Daily Average Relative Humidity (RH %)



3.6 Summary of Runway Usage Data

3.6.1 Runway Usage Data

There were 5,656 aircraft operations during July 2023. Table 3.6.1 presents previous quarter’s aircraft operations. Table 3.6.2 summarizes arrivals and departures for each runway for each month of the quarter as well as the cumulative total.

Table 3.6.1. Quarterly Aircraft Operations.

	2023	2022	2021	2020	2019	2018	2017
Quarter 1	13,600	13,294	9,022	15,917	13,663	15,499	12,316
Quarter 2	16,212	15,974	13,651	7,854	16,473	18,257	15,537
Quarter 3		17,327	15,291	11,435	18,334	17,312	16,898
Quarter 4		15,364	14,470	9,543	15,917	15,057	16,891

Table 3.6.2. Summary of Runway Usage.

Runway	Operation	JUL	
		Flights	Percent
5	Arrivals	323	5.7%
5	Departures	341	6.0%
16	Arrivals	109	1.9%
16	Departures	89	1.6%
23	Arrivals	2304	40.7%
23	Departures	2320	41.0%
34	Arrivals	73	1.3%
34	Departures	50	0.9%
HELO	Arrivals	21	0.4%
HELO	Departures	26	0.5%
	Totals	5656	

Section 4: Quality Control

4.1 Quality Control Activities

Quality controls (QC) are implemented to ensure high quality of all collected data. QC activities include weekly site checks. Site checks include performance checks on the operational, real-time samplers. RIAC continues to work with RIDEM/RIDOH to revise and improve quality controls. RIDOH Air Quality Laboratory technician provided technical support throughout this period.