

**GUDE DRIVE LANDFILL ANNUAL  
METEOROLOGICAL REPORT  
FOR 2024**

**Prepared for  
THE MONTGOMERY COUNTY GOVERNMENT**

**BY**

**TECHNICAL ENVIRONMENTAL SERVICES, LLC**

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## **1. INTRODUCTION**

The purpose of this report is to provide a summary of the 2024 meteorological data collection at the Gude Dr. Landfill Remission site. All the calculations used hourly meteorological data from the Gude Dr. meteorological tower. The hourly average data came from the onsite Campbell Scientific CR-300 data logger. The data are collected daily via a cellular modem. The meteorological tower location was moved to a site near the Gude Drive entrance on December 29, 2022. The new location, due to the proximity of large trees, has resulted in lower wind speeds, some monthly augmented wind directions and a reduction in rainfall due to the tree canopy.

## **2. INPUT DATA**

### **2.1 Meteorological Data**

The meteorological data used in all calculations was generated by the onsite Campbell Scientific data logger. The data are hourly averages, except for the rainfall data, which is the total rainfall for the hour. Technical Environmental Services collected this data by downloading data to computer via cellular modem. Once the data was received it is reviewed and edited where necessary by a meteorologist. Periods of bad or missing data were left out of all calculations.

### 3. SUMMARY OF GUDE DRIVE LANDFILL, 2024 METEOROLOGICAL DATA

The meteorological data collection at Gude Dr. was very good in 2024 with all parameters averaging near 100% for the year. All the data were collected using the onsite CR-300 data logger. The rainfall data was compared with data from the National Weather Service (NWS) at Dulles Airport and other cooperative sites in Maryland. Table 1 summarizes the data collection for 2024.

There was only one instrument problem during 2024. The rain gauge was found to be out-of-service at times during the summer. The missing data was replaced, when possible, with data from a nearby station in Gaithersburg. The rainfall totals for April-September were possibly affected by the tree canopy near the rain gauge. This would have resulted in lower monthly totals. The meteorological instrumentation was calibrated during April and October.

Figures 1 through 5 show annual and seasonal wind roses from the 3m level. The predominant wind direction at Gude Dr. during 2024 was from the south-southwest. This was followed by a secondary peak of winds from the northwest to the north. The winds vary with the season with winds predominantly from the northwest to the north and south-southwest during the winter and spring months. During the summer winds were predominantly from the south-southwest. Fall showed winds predominantly from the north-northwest and the south-southwest. The seasonal wind directions look somewhat similar between the old and new meteorological tower location, except that the peak direction sector is very much from the south-southwest. The summer shows greater differences due to the large percentage (32.0%) of calm wind speeds and low hourly average wind speed (1.4 mph). The predominant wind direction for any given month is highly correlated to the weather pattern. During periods of cold weather, the winds are generally from the northwest to the north-northwest. During warm periods the winds are from the south-southwest. The average wind speed for the year was 1.7 mph and the highest hourly average was 11.4 mph on March 10, 2024. The average annual wind speed for the year was much lower than the seven-year average (3.51 mph). This was caused by the new location of the meteorological tower which is near large trees that at times block much of the flow of the wind. Table 2 shows the average hourly wind speed for each hour of the day over the annual period of 2024.

Figures 6 and 7 show plots of the daily maximum, minimum and average temperature and relative humidity. The temperatures for the year averaged well above normal. Temperatures were above average for all 12 months. This resulted in an overall average temperature for the year of 58.0 ° F at Gude (58.9° F at Dulles airport), which was 3.2 ° F above the long-term average temperature of 55.7° F (at Dulles airport <sup>(1)</sup>). The maximum temperature in 2024 was 98.6° F. on July 16th and the minimum temperature was 9.7° F. on January 18th. Table 2 shows the average hourly temperature at Gude Dr. over the annual 2024 period. Also, shown in Table 2 are hourly averages of relative humidity. The annual average relative humidity reading of 69.0% was a little lower than the long-term average of 70% from Dulles Airport and a recent seven-year period at the Gude site. This agrees very well with the readings from Dulles Airport and the Dickerson site.

The total rainfall at Gude Dr. for 2024 was 28.79 inches, which was well below the long-term average. Rainfall in the Gude area during 2024 was below average for 9 of the 12 months in 2024. There was only about 7 inches of rain during the last four months of 2024. The long term annual average precipitation in the Gude area is about 41 inches. Table 3 shows monthly and annual rainfall totals for the year from Gude and several NWS and cooperative sites <sup>(2)</sup> (3) in the area. There was pretty good agreement between Gude, Dulles airport and the cooperative sites in 2024. The Gude rain gauge is somewhat shadowed by the tree canopy during the spring and summer months and does not have a heater, so snowfall is for the most part not accounted for (there was very little snowfall in 2024). During 2024 there were 4 days when more than one inch of rain fell. The maximum daily rainfall occurred on August 9th with 1.83 inches.

**REFERENCES:**

1. NOAA, NCDC, Local Climatological Data from Dulles Airport for 2024.
2. NOAA, NCDC, Cooperative Weather Stations, Maryland Stations of Gaithersburg, Williamsport and Damascus for 2024.
3. Weatherlink data from Gaithersburg, MD for 2024.

TABLE 1  GUDE DRIVE METEOROLOGICAL TOWER DATA RECOVERY JANUARY-DECEMBER 2024	
PARAMETER	RECOVERY (percent)
Wind Speed 3m	100.0
Wind Direction 3m	100.0
Temperature 2m	100.0
Relative Humidity 2m	100.0
Precipitation	100.0

**Table 2**

Hourly and Annual Average of Wind Speed,  
Temperature and Relative Humidity for 2024

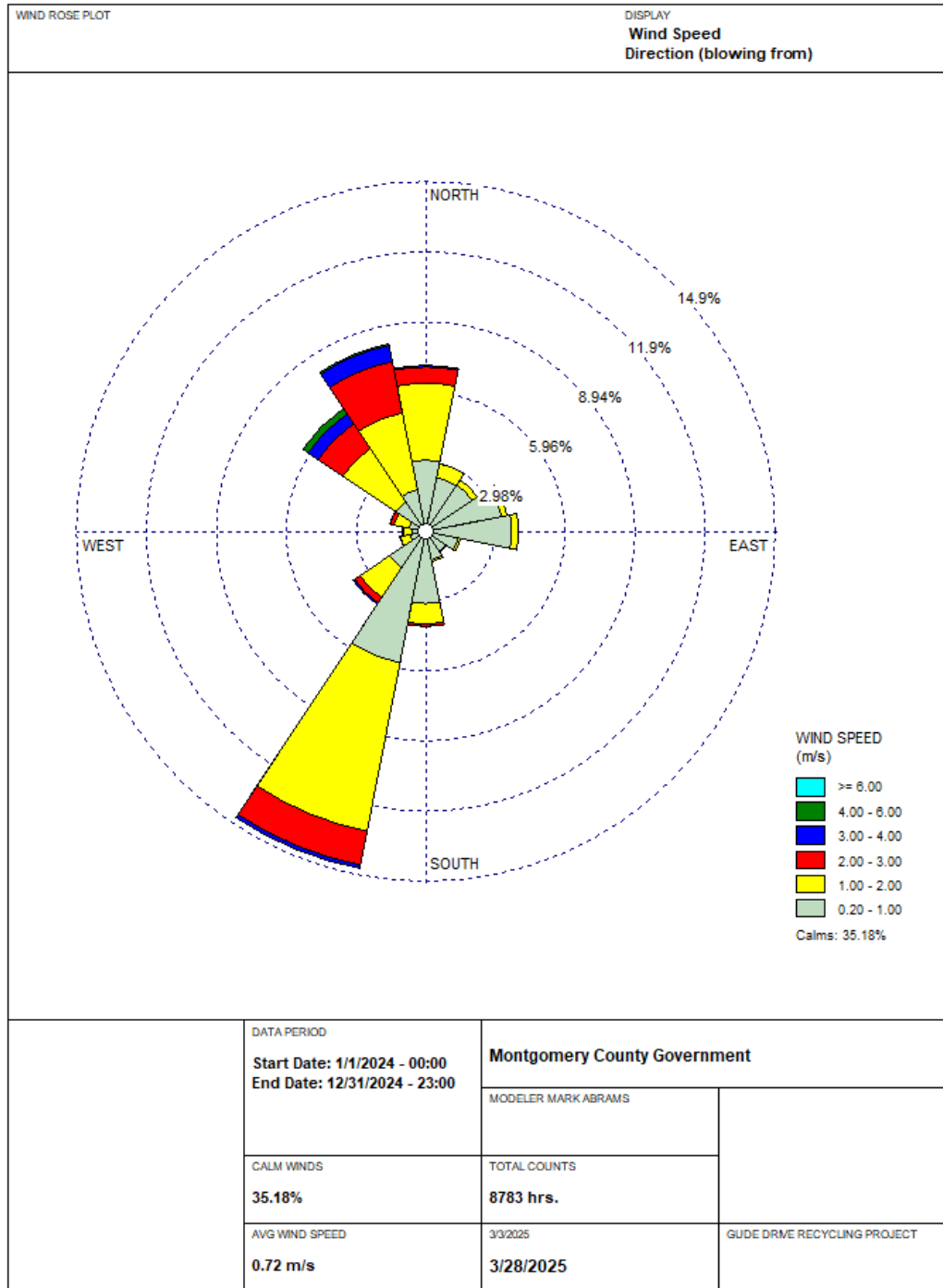
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Time of day	Wind Speed (mph)	Temperature (°F)	Relative Humidity (%)
0	1.07	53.92	78.37
1	1.07	53.14	79.92
2	0.97	52.37	81.53
3	0.94	51.76	82.56
4	0.92	51.27	83.53
5	0.87	50.84	84.06
6	0.85	50.54	84.70
7	1.01	51.10	84.02
8	1.30	52.92	80.30
9	1.78	55.90	72.92
10	2.25	58.80	65.62
11	2.58	61.33	60.08
12	2.74	63.39	56.21
13	2.81	64.96	53.42
14	2.87	66.12	51.43
15	2.88	66.75	50.47
16	2.72	66.75	50.62
17	2.36	66.03	52.16
18	1.85	64.34	55.55
19	1.43	61.93	60.55
20	1.20	58.96	66.80
21	1.10	56.98	71.50
22	1.10	55.70	74.45
23	1.10	54.75	76.61
Annual Average	1.66	57.94	69.06
Seven Year Average 2018-2024	3.48	56.84	68.55

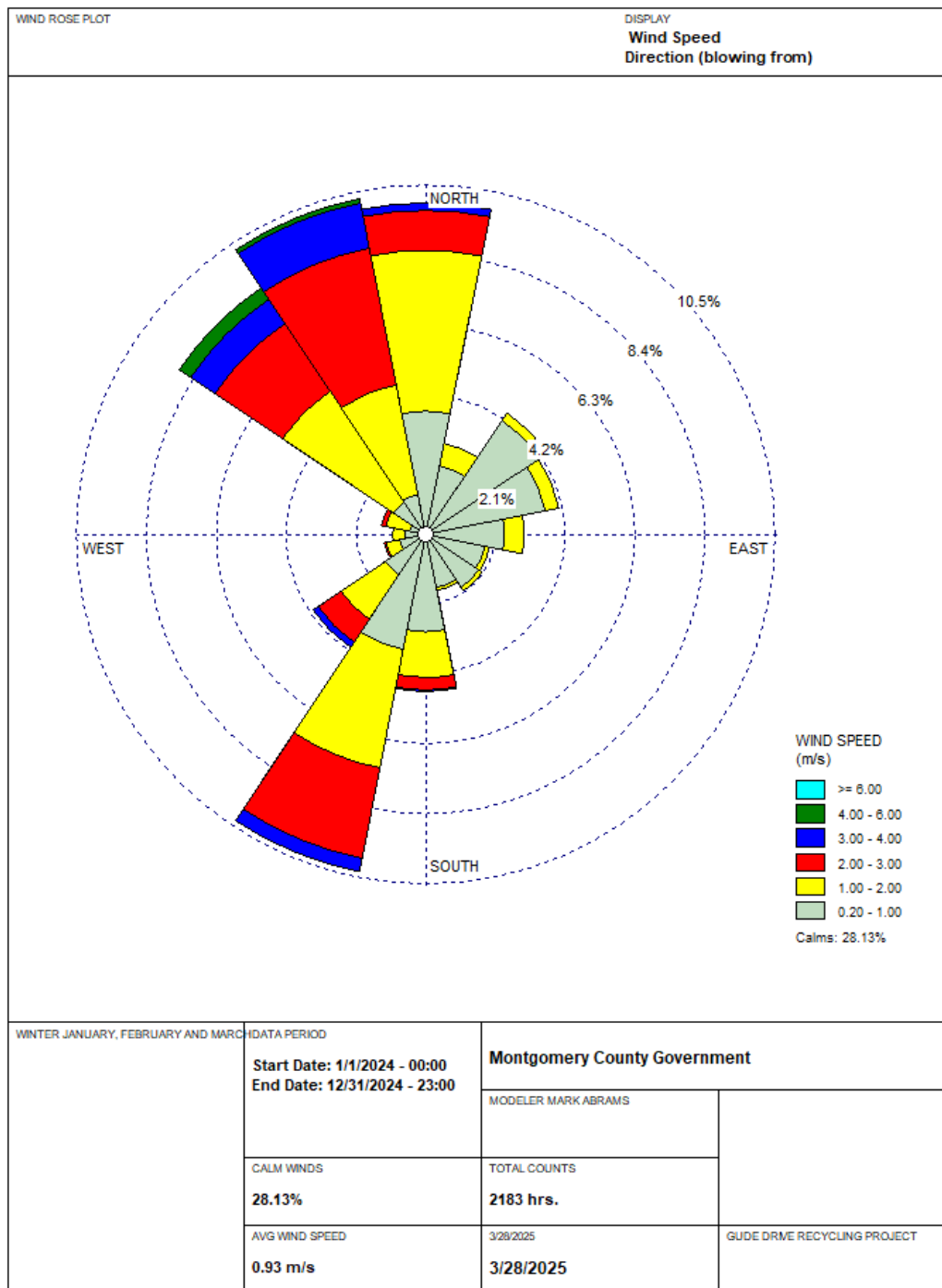


**TABLE 3 – 2024 Yearly Rainfall**

	Gude Dr.	Dulles	Dickerson	Williamsport	Damascus	Gaithersburg
January	4.22	6.00	6.07	4.55	6.33	6.43
February	1.29	1.45	2.15	2.76	1.99	1.81
March	2.64	3.89	3.87	4.14	4.13.	4.82
April	2.15	1.74	3.10	4.05	3.11	2.61
May	4.12	4.22	4.38	6.76	5.22	4.38
June	0.94	0.69	1.45	2.38	2.66	0.51
July	2.05	2.66	1.29	3.77	3.28	2.97
August	3.93	5.13	7.17	6.03	12.51	9.63
September	2.29	3.27	1.93	3.06	3.58	0.80
October	0.06	0.13	0.19	1.35	0.39	0.22
November	1.85	1.85	1.86	1.31	2.01	2.19
December	3.25	3.36	3.08	2.00	3.65	2.18
Total	28.79	34.39	36.54	42.16	48.86	38.55



**Figure 1 - Gude Dr. Annual Wind Rose for 2024**



WRPLOT View - Lakes Environmental Software

**Figure 2 - Gude Dr. Winter Wind Rose for 2024**

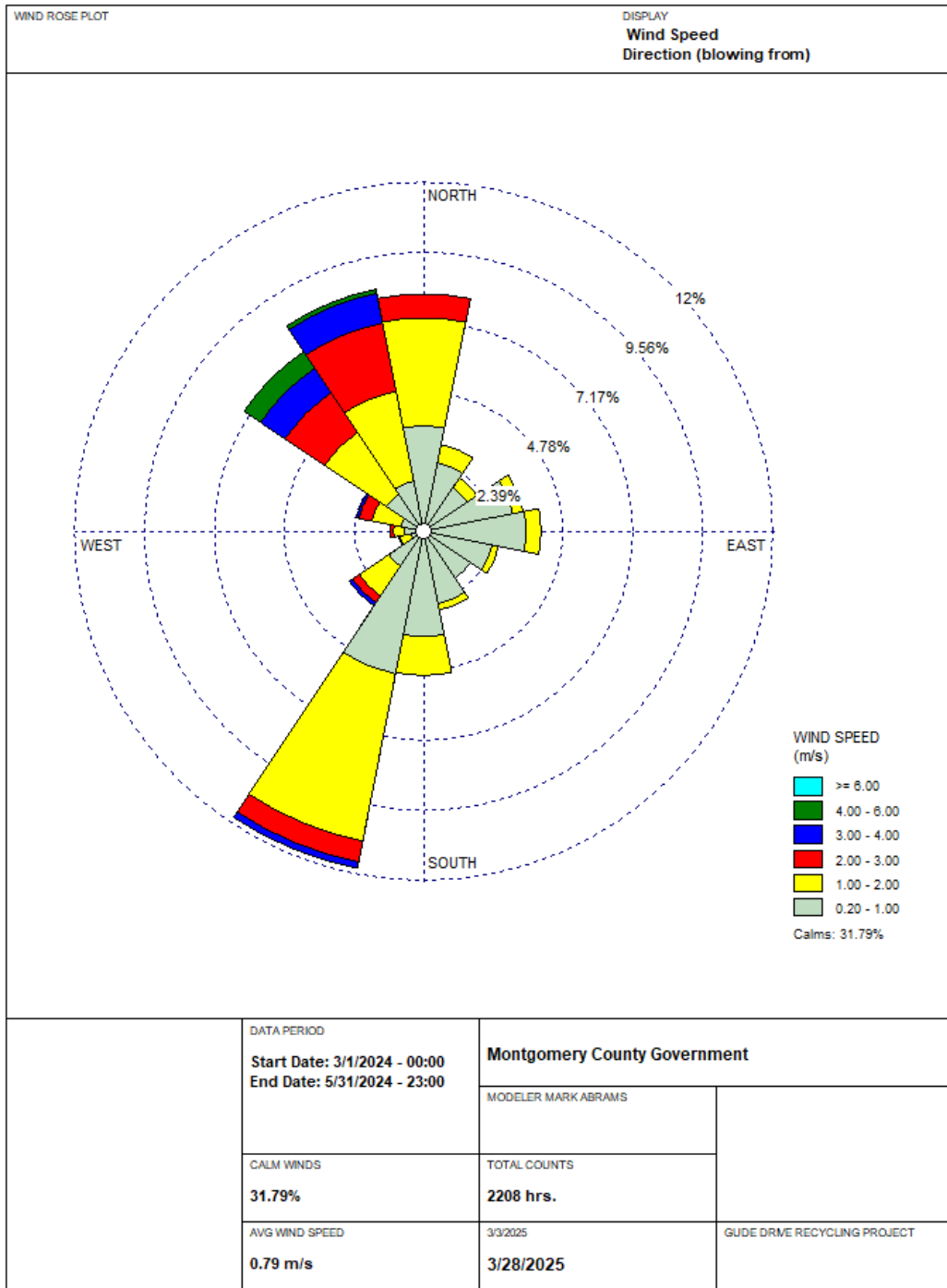


Figure 3 - Gude Dr. Spring Wind Rose for 2024

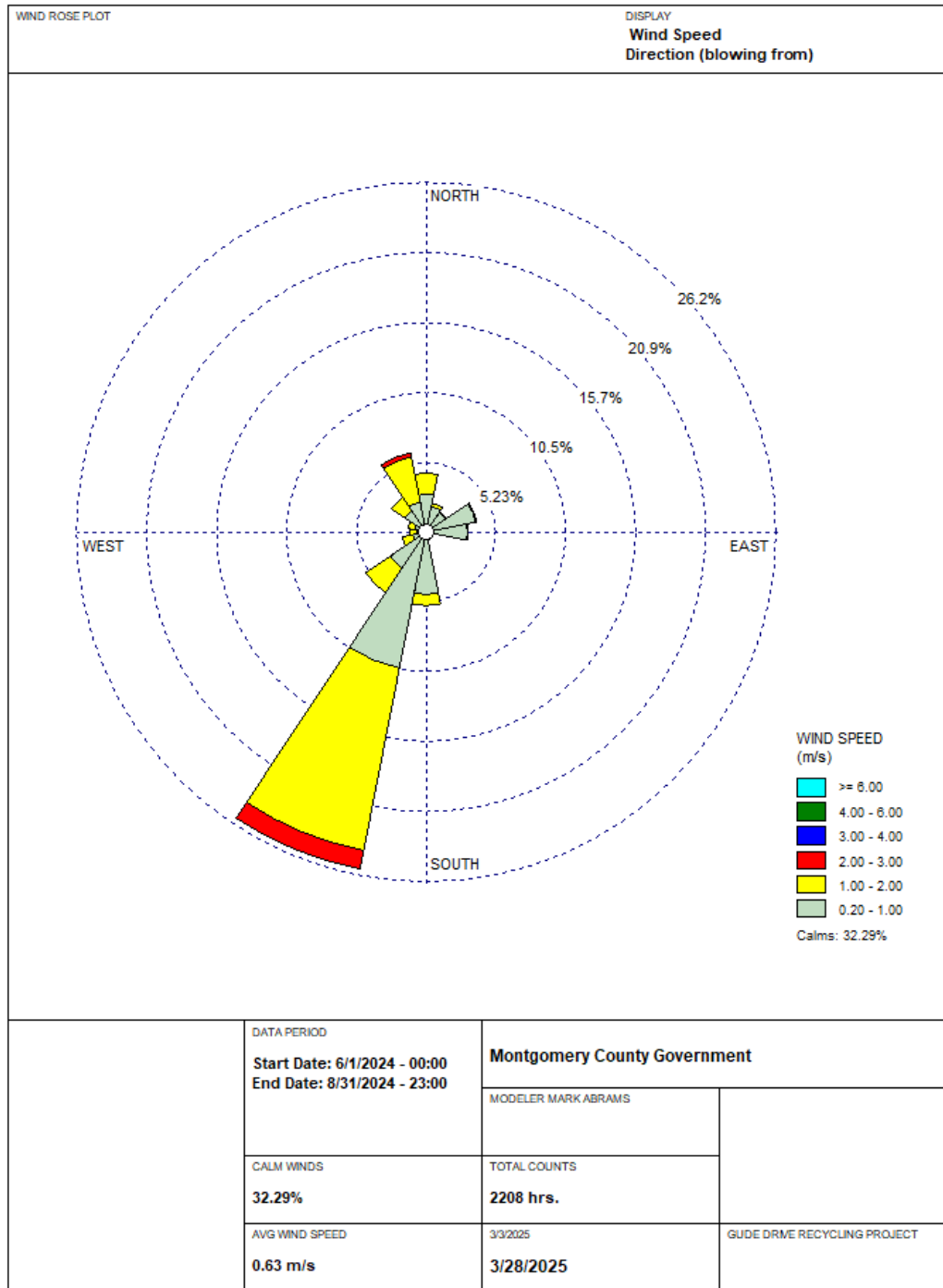


Figure 4 - Gude Dr. Summer Wind Rose for 2024

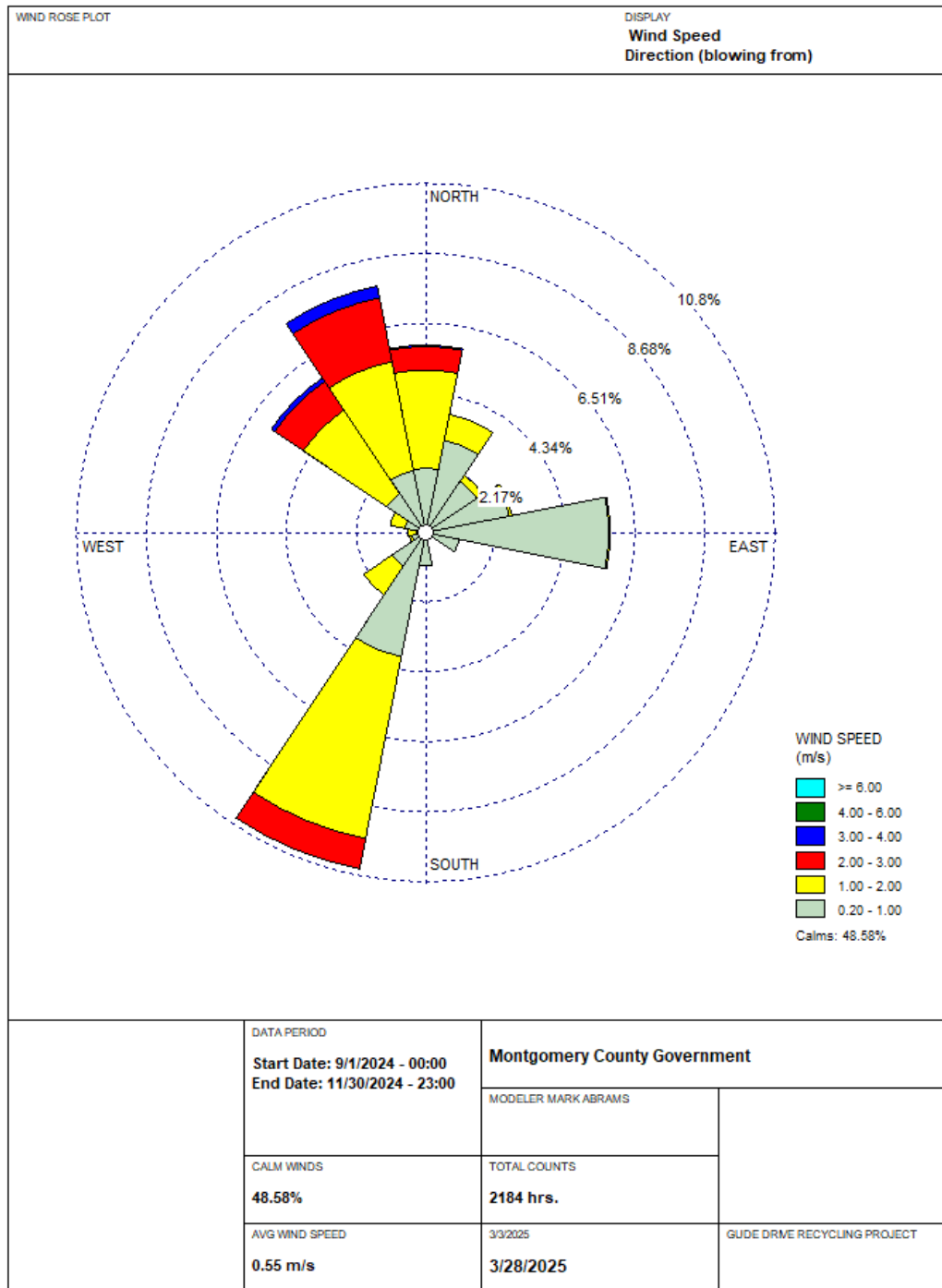
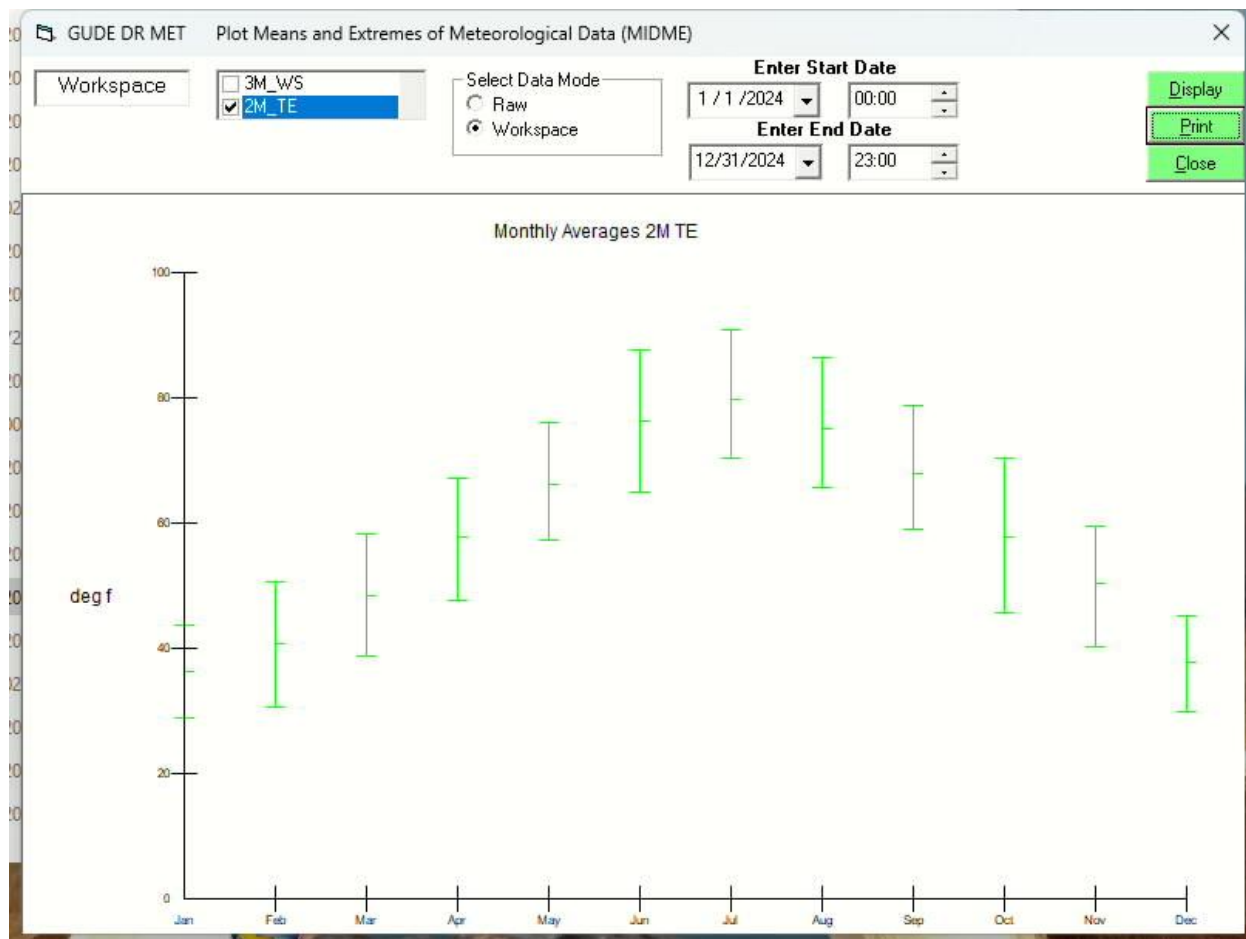
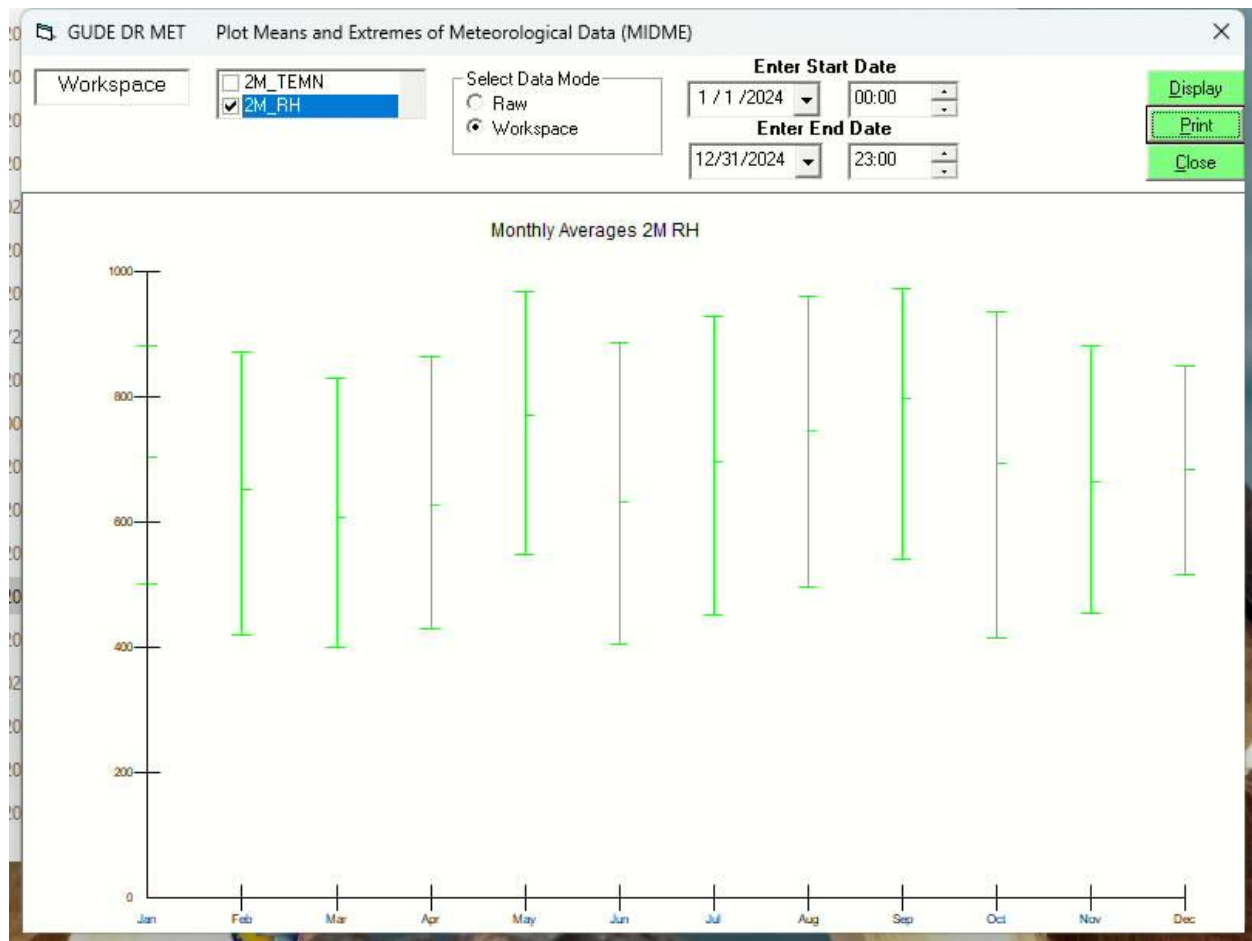


Figure 5 - Gude Dr. Fall Wind Rose for 2024



**Figure 6** - Gude Dr. 2M Temperature Max. Avg. and Min. for 2024



**Figure 7** - Gude Dr. 2M Relative Humidity Max. Avg. and Min. for 2024